

R&S®EVSD1000

VHF/UHF Nav/Drone Analyzer

User Manual



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This document describes the following R&S EVSD1000 models with firmware version 1.50 or later:

- R&S EVSD1000 VHF/UHF nav/drone analyzer (1330.0350K02)

Furthermore, it covers the following options:

- R&S EVSG-K1 ILS CRS/CLR analysis (1329.9005.02)
- R&S EVSG-K2 VOR analysis (1329.9011.02)
- R&S EVSG-K3 Marker beacon analysis (1329.9028.02)
- R&S EVSG-K4 GBAS analysis (1329.9034.02)
- R&S EVSG-K6 COM analysis (1329.9057.02)
- R&S EVSG-K10 RF spectrum analysis (1329.9063.02)
- R&S EVSG-K11 AF spectrum analysis (1329.9070.02)
- R&S EVSG-K12 Time domain analysis (1329.9086.02)
- R&S EVSG1-K25 I/Q data streaming (1329.9157.02)
- R&S EVSD1-Z1 Battery pack (1330.0366.02)
- R&S EVSD1-Z2 Battery charger (1330.0372.02)
- R&S EVSD1-Z3 V/UHF antenna (1330.0395.02)
- R&S EVSD1-Z5 Data-link-module (Wi-Fi) (1330.0520.02)
- R&S EVSD1-Z6 GNSS RTK device (rover) (1330.0472.02)
- R&S EVSD1-Z6 GNSS RTK device (base) (1330.0472.03)
- R&S EVSD1-Z7 GNSS antenna (1330.0437.02)
- R&S EVSG1-Z8 Power supply (1330.0289.02)
- R&S EVSD1-Z9 Transport case (1330.0508.02)
- R&S EVSG1-Z11 Verification test software (1329.8921.02)
- R&S EVSD1-Z20 Drone adapter DJI M300 RTK (1330.0443.02)

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1179.5624.02 | Version 02 | R&S®EVSD1000

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol , e.g. R&S®EVSD1000 is indicated as R&S EVSD1000.

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1 Getting started

Note: the following chapters are identical to those in the printed R&S EVSD1000 Getting Started manual.

1.1 Safety and regulatory information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following chapters.

Intended use

The R&S EVSD1000 is a signal level and modulation analyzer to be used aboard medium-sized drones. It performs measurements on instrument landing systems (ILS), ground-based augmentation systems (GBAS) and very high frequency omnidirectional range (VOR) ground stations. It analyzes air traffic control communications (ATC COM) signals measured during startup, maintenance and servicing. The instrument's mechanical and electrical design is optimized for drone-based measurements on terrestrial navigation systems.

Use the product only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

Target audience

The R&S EVSD1000 and its documentation is targeted at air navigation service providers (ANSP), ground inspection service providers, national authorities for air traffic control, and manufacturers and airport technicians for ILS, GBAS and VOR ground equipment. Users require basic knowledge of ILS, GBAS and VOR ground equipment, as well as the International Civil Aviation Organization (ICAO) specifications in document 8071, annex 10.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In [Chapter 1.1.1, "Safety instructions"](#), on page 5. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1.1 Safety instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions

provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed "Safety Instructions". If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

Reconfigure or adjust the product only as described in the product documentation or the data sheet. Any other modifications can affect safety and are not permitted.

Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Rohde & Schwarz customer service at <https://www.rohde-schwarz.com/support>.

Operating the product

The product is intended for mobile use. The maximum weight of the product is provided in the data sheet. If the product casing is not waterproof, use an adequate weather protection to carry the product outdoors with you.

When using the product in a vehicle or aircraft, make sure that the product is properly secured. If stacking is possible, secure the whole stack of products so that they cannot fall over and cause injury.

Observe the ambient conditions such as altitude, operating temperature and climatic loads; see the data sheet.

Due to their exposed location, mobile communications systems are at risk of damage from lightning. This also poses a risk to persons nearby. Vehicles carrying mobile communications systems require an electrically conductive body, a grounded antenna and also equipotential bonding that includes the cables routed into the vehicle.

Connecting to power

The product runs on DC voltage. For the specifications of the supply voltage for the product, refer to the data sheet. Under normal conditions, contact with DC voltage in this range poses a low risk of electric shock.

Take the following measures for your safety:

- If you connect the product to an external power supply, use one recommended in the product documentation.
- Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source.
- Only use intact cables and route them carefully so that they cannot be damaged. Also ensure that nobody can trip over loose cables.

Handling batteries safely

The product contains exchangeable or built-in lithium polymer or lithium ion cells or batteries. The use of the word battery in the following always means all types. Only the battery contents are potentially hazardous. As long as a battery is undamaged and the seals remain intact, there is no danger.

Impact, shock or heat can cause damage such as dents, punctures and other deformations. A damaged battery poses a risk of personal injury. Handle a damaged or leaking battery with extreme care. Immediately ventilate the area since the battery releases harmful gases. If you come into contact with the battery fluid, immediately remove all contaminated clothing. Irritation can occur if the battery fluid comes in contact with your skin or eyes. Immediately and thoroughly rinse your skin or eyes with water and seek medical aid.

For safe handling, follow these rules:

- Do not short-circuit the battery.
- Do not mechanically damage the battery. Do not open or disassemble the battery.
- Do not expose the battery to high temperatures such as open flames, hot surfaces and sunlight.
- Only use the battery with the designated Rohde & Schwarz product.
- Only use the appropriate Rohde & Schwarz charger to charge the batteries. If the batteries are improperly charged, there is a risk of explosion. For charging and discharging temperature ranges, see the product documentation.
- Replace exchangeable batteries only with the same battery type.
- Store the battery in the product or use the product packaging.
- Dispose of exchangeable batteries separately from normal household waste as specified by the local waste disposal agency.

If you disregard these rules, you risk serious personal injury or even death due to explosion, fire or hazardous chemical substances. The product documentation provides further details.

If exchangeable batteries or products with built-in batteries are defective, contact the Rohde & Schwarz customer service. Rohde & Schwarz classifies the severity of the defect. When returning batteries or Rohde & Schwarz products containing batteries, use a carrier qualified to transport dangerous goods and notify the carrier of this classification. Follow the carrier's transport stipulations in line with IATA-DGR, IMDG-Code, ADR or RID.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

	Potential hazard Read the product documentation to avoid personal injury or product damage.
	DC - direct current Connect to a DC power supply of the specified voltage range.

1.1.2 Labels on the product

Labels on the casing inform about:

- Personal safety, see "[Meaning of safety labels](#)" on page 7
- Product and environment safety, see [Table 1-1](#)

Table 1-1: Labels regarding product and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see "Disposing of electrical and electronic equipment" on page 355.
	Labeling in line with directive 2006/66/EC for disposal of batteries after they have come to the end of their service life. For more information, see "Disposing of batteries" on page 355.

1.1.3 Warning messages in the documentation

A warning message points out a risk or danger that you need to be aware of. The signal word indicates the severity of the safety hazard and how likely it will occur if you do not follow the safety precautions.

NOTICE

Potential risks of damage. Could result in damage to the supported product or to other property.

1.1.4 Korea certification class A



이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

1.2 Documentation overview

This section provides an overview of the R&S EVSD1000 user documentation. Unless specified otherwise, you find the documents at:

www.rohde-schwarz.com/manual/EVSD1000

Further documents are available at:

www.rohde-schwarz.com/product/EVSD1000

1.2.1 Getting started manual

Introduces the R&S EVSD1000 and describes how to set up and start working with the product. A printed version is delivered with the instrument.

1.2.2 User manuals and help

Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.

The contents of the user manual are also available as online help on the R&S EVSD1000.

1.2.3 Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, troubleshooting, adjustments, installing options and maintenance.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

1.2.4 Printed safety instructions

Provides safety information in many languages. The printed document is delivered with the product.

1.2.5 Data sheets and brochures

The data sheet contains the technical specifications of the R&S EVSD1000. It also lists the firmware applications and their order numbers, and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/EVSD1000/

1.2.6 Release notes and open-source acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The software makes use of several valuable open source software packages. An open-source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/EVSD1000.

1.2.7 Calibration certificate

The document is available on <https://gloris.rohde-schwarz.com/calcert>. You need the device ID of your instrument, which you can find on a label on the rear panel.

1.2.8 Videos

Find various videos on Rohde & Schwarz products and test and measurement topics on YouTube: <https://www.youtube.com/@RohdeundSchwarz>

1.3 Key features

The R&S EVSD1000 offers the following key features:

- Precise, reproducible analysis of ILS, VOR and GBAS ground measurements (in line with ICAO Doc. 8071 and ICAO Annex 10)
- Extremely compact, with integrable battery and data-link-module (Wi-Fi)
- High measurement rate for dynamic measurements, at 100 data records per second
- Simultaneous analysis of course and clearance signals on dual-frequency (2F) ILS systems
- Detailed analysis options in the frequency and time domain

1.4 Preparing for use

Here, you can find basic information about setting up the product for the first time.

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• Selecting and preparing the system components	11
• Setting up the R&S EVSD1000	12
• Opening and closing the front and rear covers	14
• Mounting the R&S EVSD1-Z20 Drone adapter DJI M300 RTK	16
• Connecting to LAN	25
• Setting up a data link (Wi-Fi) connection	26
• Connecting to power	29
• Connecting the R&S EVSD1-Z3 V/UHF antenna to the bottom of the R&S EVSD1000	32
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1.4.1 Unpacking and checking

1. Unpack the R&S EVSD1000 carefully.
2. Retain the original packing material. Use it when transporting or shipping the product later.
3. Using the delivery notes, check the equipment for completeness.

The instrument comes with the following accessories:

- DC power supply connector with cable (0.5 m long)
- LAN cable (1 m long)
- GNSS cable with an open end (2 m long)
- R&S EVSD1000 bottom antenna adapter
- Printed Getting Started manual (English)

4. Check the equipment for damage.

If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

1.4.2 Selecting and preparing the system components

The mechanical and electrical design of the R&S EVSD1000 is optimized for use with a drone. For the DJI M300, Rohde & Schwarz offers a corresponding adapter set (R&S EVSD1-Z20 Drone adapter DJI M300 RTK). Adapters for other drone types can be provided on request.

You can connect the R&S EVSD1-Z3 V/UHF antenna mechanically to the top of the DJI M300 (requires R&S EVSD1-Z20 Drone adapter DJI M300 RTK). The adapter set provides a quick-release system to fasten and unfasten the antenna and the drone from the R&S EVSD1000 quickly. The illustrations and mounting procedures in this manual are based on this setup. Use the quick-release system to connect only components with a maximum weight of 2 kilograms.

You can mount the R&S EVSD1000 to other drone types or mount the antenna to other positions using customized adapters. When selecting and designing the components, consider the following information to ensure a safe and suitable system setup.

Selecting the drone

When selecting the drone, make sure that the drone is suitable to carry the weight of the R&S EVSD1000 and all optional components.

Drones are commonly equipped with propellers made out of carbon fiber. Carbon fiber or other conductive materials can cause unwanted reflections of RF signals. Such reflections can distort the measurement results provided by the R&S EVSD1000 and make them useless. Therefore, take precautions to avoid reflections. For example, mount the R&S EVSD1000 to a drone with wooden propellers. Ensure that the drone still flies safely after the adaptations.

Wooden propellers are usually not foldable. To keep the system transportable, propeller quick-release systems are a good solution.

For the DJI M300, for example, the following third-party accessories are available:

- XOAR - PJP-N IIDJ, IIDJ-P - IIDJ21X10J: pre-drilled wooden propellers to fit onto a DJI M300
- XOAR - Quick Release for PJP-N21X10 - A-INS3-Z: pre-drilled propeller quick-release to fit onto a DJI M300

Designing the adapters

When designing the adapter, consider the R&S EVSD1000 dimensions and the center of gravity, see [Chapter E, "Reference: Dimensions"](#), on page 369. Most drone manufacturers provide information on the optimal position of the center of gravity. After setup, recalibrate the drone to the new center of gravity, if necessary.

Make sure none of the optional components and connecting cables disturb the flight of the drone, e.g. by blocking the propellers or the drone sensors.

Always use secured screws to prevent the screws from falling out due to vibrations or unsteady flight maneuvers. If components are not fastened to the R&S EVSD1000 or the drone securely, they can fall down and cause damage or injury.

1.4.3 Setting up the R&S EVSD1000

The R&S EVSD1000 was designed to be mounted on a drone. With the provided cover attached, the instrument is waterproof as specified in the data sheet. You can also set up the R&S EVSD1000 on a benchtop, for example to prepare the R&S EVSD1000 for mobile use.

See also:

- ["Intended use"](#) on page 5

1.4.3.1 Mounting the R&S EVSD1000 on a drone

You mount the R&S EVSD1000 on a drone via the adapter on the top panel. Currently, an adapter set is available for the DJI M300 (R&S EVSD1-Z20 Drone adapter DJI M300 RTK). You can design a customized drone adapter for other drone types or to mount the R&S EVSD1000 to the drone from a different position.



Figure 1-1: Example of a R&S EVSD1000 mounted to a DJI M300 drone

To mount the R&S EVSD1000 to a drone

Prerequisite: The customized drone adapter is drilled according to the drilling template in [Figure E-4](#).



Mounting the R&S EVSD1000 to a DJI M300 using the R&S EVSD1-Z20 Drone adapter DJI M300 RTK is described in [Chapter 1.4.5, "Mounting the R&S EVSD1-Z20 Drone adapter DJI M300 RTK"](#), on page 16.

1. Screw the customized drone adapter to the top panel of the R&S EVSD1000 using secured screws.

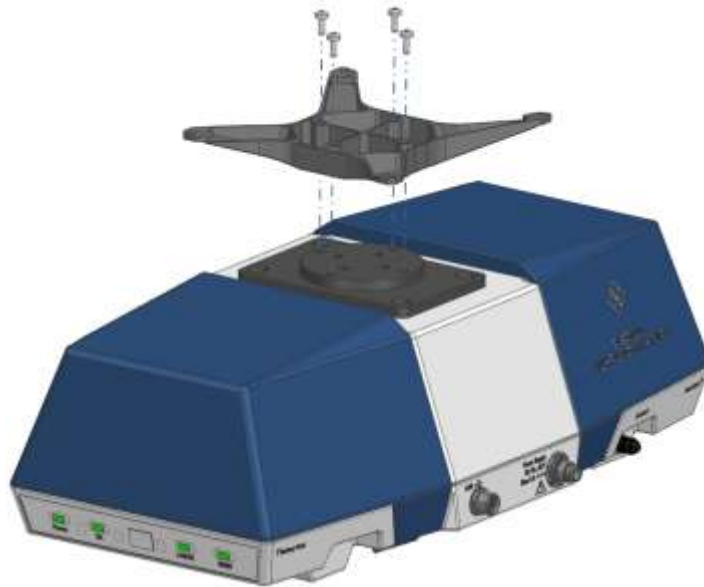


Figure 1-2: R&S EVSD1000 with a sample adapter

2. Fasten the drone adapter to the drone as designed.

1.4.3.2 Placing the R&S EVSD1000 on a benchtop

To place the R&S EVSD1000 on a bench top

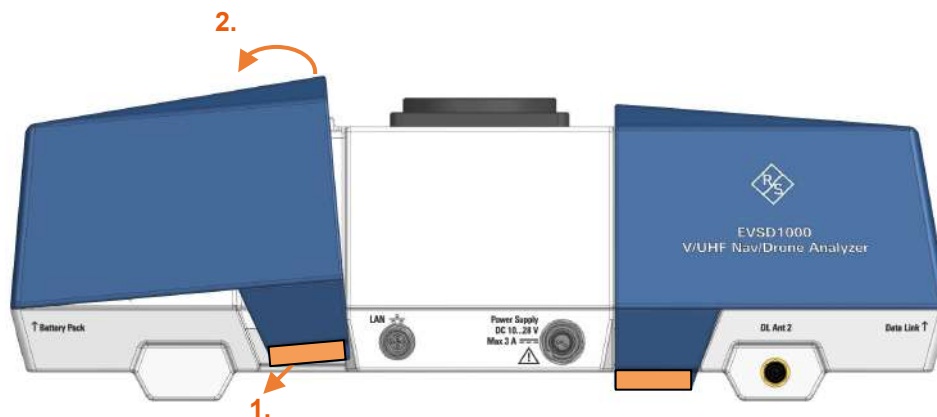
1. **NOTICE!** Risk of damaging a connected antenna. If an antenna is connected to the bottom of the R&S EVSD1000, remove the antenna before you attempt to place the instrument on a bench top. Otherwise you can damage the antenna.
Place the R&S EVSD1000 on a stable, flat and level surface. Ensure that the surface can support the weight of the R&S EVSD1000. For information on the weight, see the data sheet.
2. The top surface is not designed for stacking. If you want to stack the R&S EVSD1000 together with other products:
 - a) Follow the instructions given for the other products.
 - b) Place the R&S EVSD1000 on top.

1.4.4 Opening and closing the front and rear covers

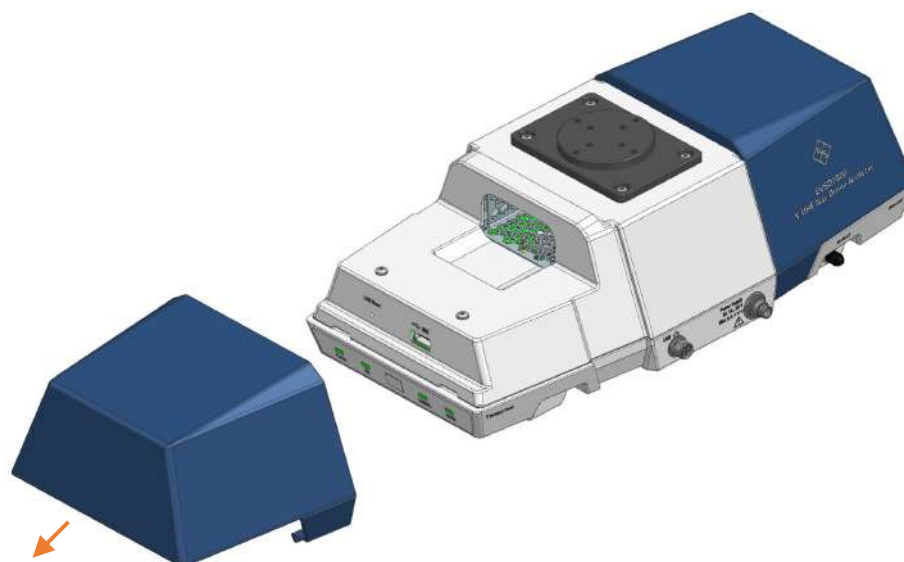
The front and rear sides of the R&S EVSD1000 are protected by two covers. Beneath the covers, you find additional connectors, the battery slot and the data link connectors. To connect devices to these connectors, you have to open the covers. Close the covers again before operation to ensure that the connectors and modules remain protected.

To open the front and rear covers

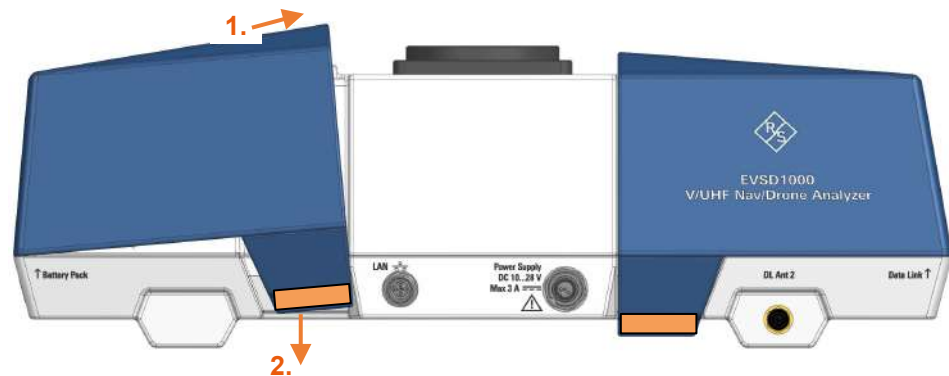
1. Pull the tabs at the bottom of the cover outwards.



2. Lift the cover by the tabs.
3. Slide off the cover.

**To close the front and rear covers**

1. Slide the cover onto the R&S EVSD1000 from the side.



2. Press the cover down onto the casing until the tabs lock into place.

1.4.5 Mounting the R&S EVSD1-Z20 Drone adapter DJI M300 RTK

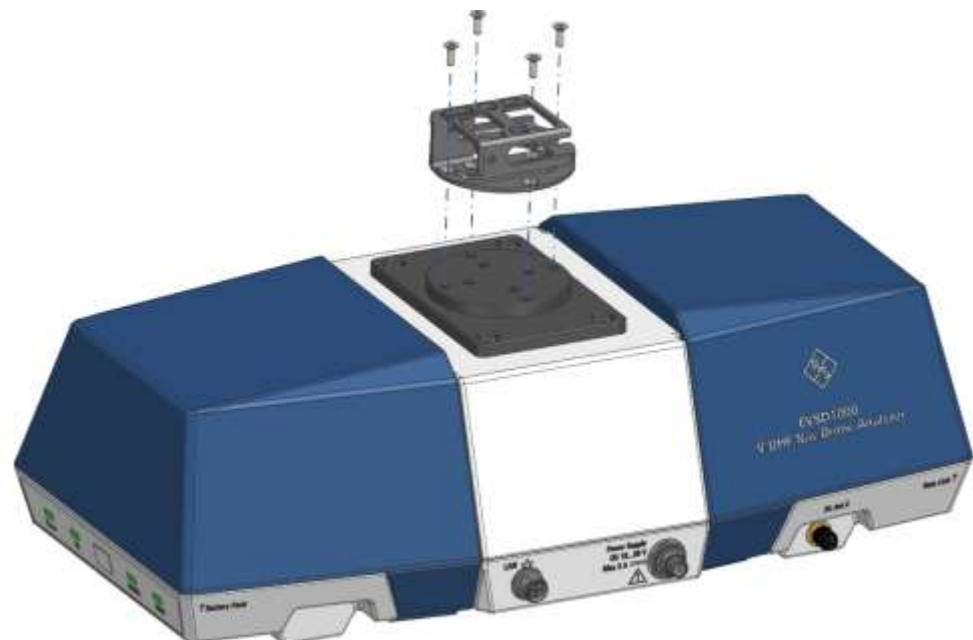
The optional R&S EVSD1-Z20 Drone adapter DJI M300 RTK allows you to connect and disconnect the R&S EVSD1000 to and from a DJI M300 drone and an ILS/VOR antenna using a quick-release system.

To mount the R&S EVSD1000 to a drone using the adapter set

Prerequisite:

R&S EVSD1-Z20 Drone adapter DJI M300 RTK

1. Insert 4 of the provided countersunk threadlocked screws through the top of the inner quick-release fastener.



2. Screw the quick-release fastener to the outer bolt circle on the top panel of the R&S EVSD1000.
3. Insert 5 of the provided countersunk threadlocked screws through the bottom of the outer quick-release fastener.



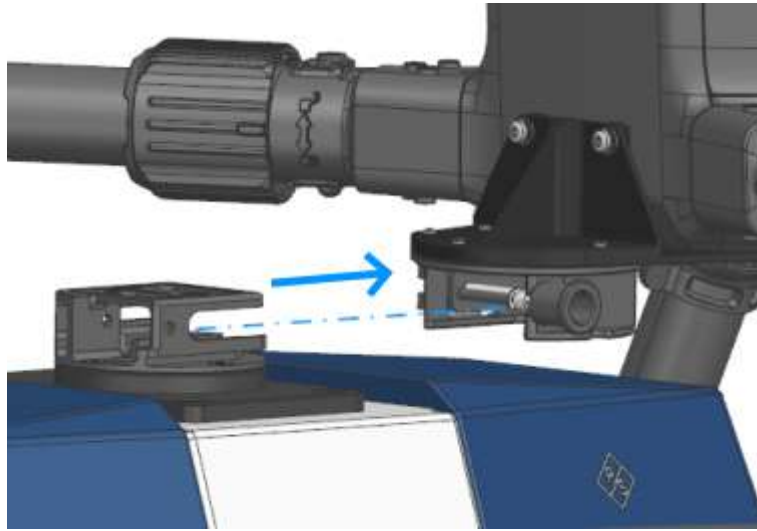
4. Screw the quick-release fastener to the drone adapter.
5. Mount the drone adapter with the quick-release fastener to the drone:



- a) Insert 2 of the provided M3x12 secured screws through the front of the drone adapter.
 - b) Screw the adapter to the front of the drone.
 - c) Insert 2 of the provided M3x8 secured screws through the bottom of the drone adapter.
 - d) Screw the adapter to the bottom of the drone.
6. Unfasten the quick-release clasp.



7. Insert the quick-release fastener on the R&S EVSD1000 in the quick-release counterpart on the drone until the locking pin catches.



8. Make sure that the two components are connected securely.
9. Fasten the quick-release clasp.



To remove the R&S EVSD1000 from the drone

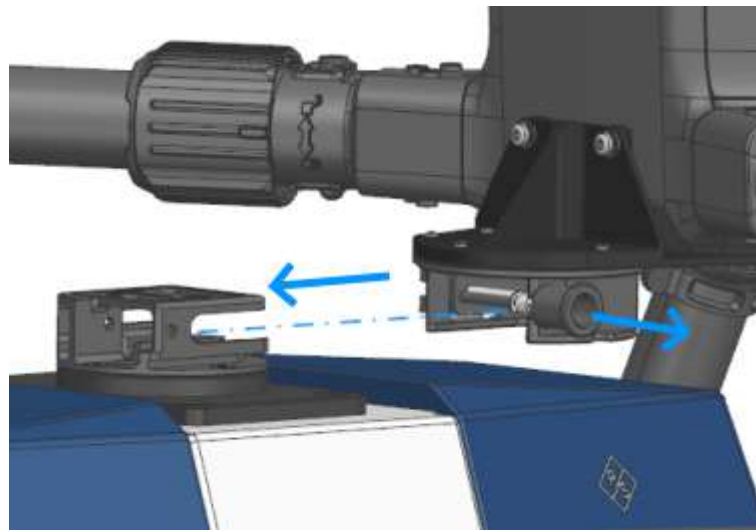
1. Unfasten the quick-release clasp.



2. Pull the locking pin on the quick-release fastener.



3. While holding the locking pin, carefully pull the R&S EVSD1000 out of the quick-release fastener.



4. Release the locking-pin.
5. Fasten the quick-release clasp.



To connect the R&S EVSD1-Z3 V/UHF antenna to the drone adapter kit

Prerequisites:

R&S EVSD1-Z20 Drone adapter DJI M300 RTK

R&S EVSD1-Z3 V/UHF antenna

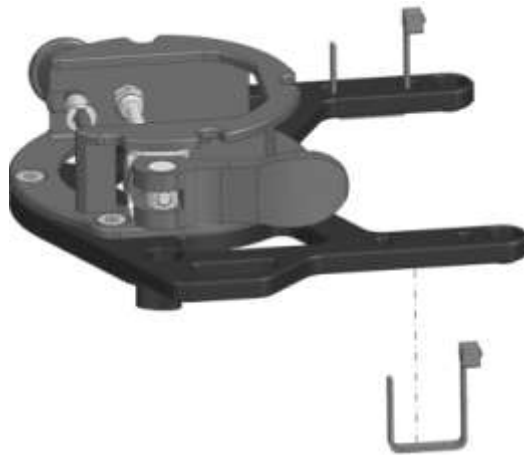
1. Insert 4 of the provided countersunk threadlocked screws through the bottom of the inner quick-release fastener.



2. Place the flange of the antenna with the cable fitted in the inlet of the flange on the quick-release fastener.
3. Screw the quick-release fastener to the flange of the antenna.
4. Insert 5 of the provided countersunk threadlocked screws through the top of the outer quick-release fastener.

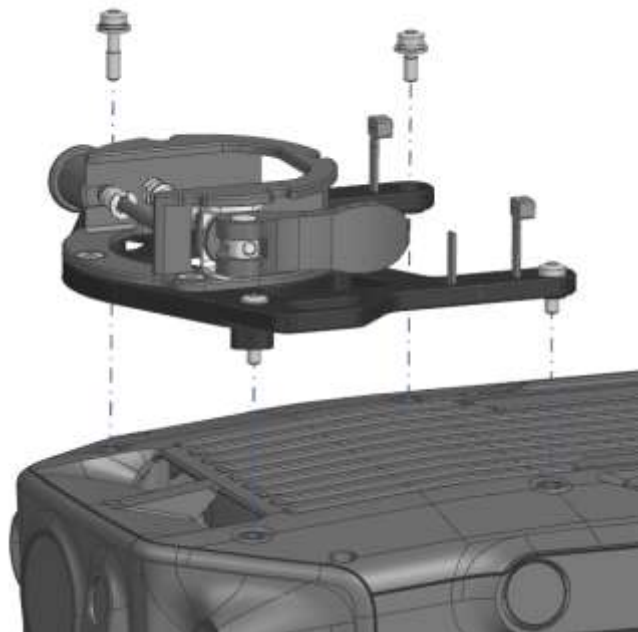


5. Screw the quick-release fastener to the antenna adapter.
6. Insert 2 cable ties in the holes of the antenna adapter. The ties are required to fasten the OSDK cable to the adapter later.



7. Insert 4 of the provided secured screws through the top of the antenna adapter:

- 2 M3x12 screws at the front
- 2 M3x8 screws at the back



8. Screw the adapter and quick-release fastener to the top of the drone.

9. Unfasten the quick-release clasp.



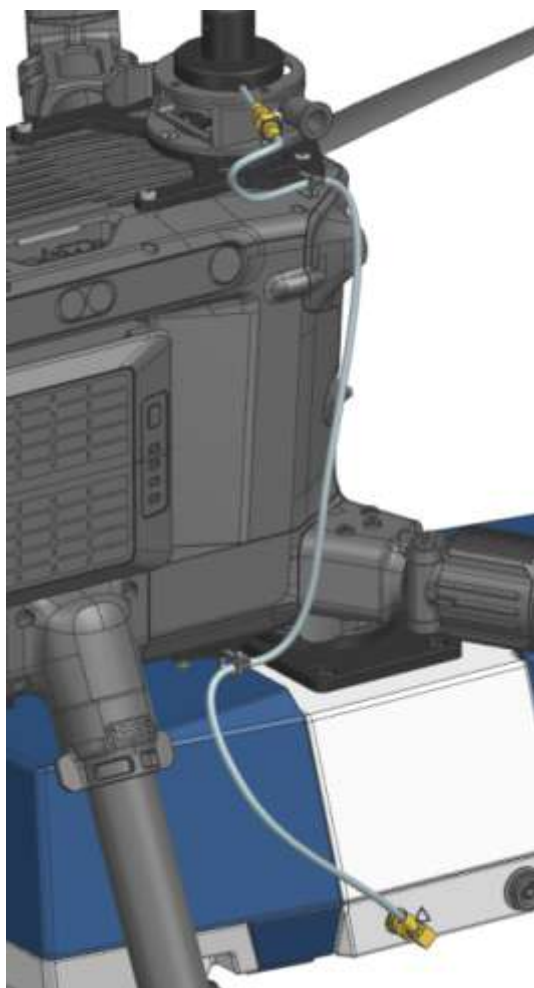
10. Insert the quick-release fastener on the antenna in the quick-release counterpart on the drone until the locking pin catches.



11. Make sure that the two components are connected securely.
12. Fasten the quick-release clasp.



13. Connect the RF output cable ("pigtail") of the antenna to the straight end of the provided RF extension cable.
14. Connect the 90° connector of the RF extension cable to the "RX In" connector on the left panel of the R&S EVSD1000.
15. **NOTICE!** Risk of blocking the drone. Make sure that the connecting cables do not block the drone propellers or the sensors required for flight.
Secure all cables to the provided loops on both adapters using cable ties. Make sure that the cables are fastened to the side of the drone securely.

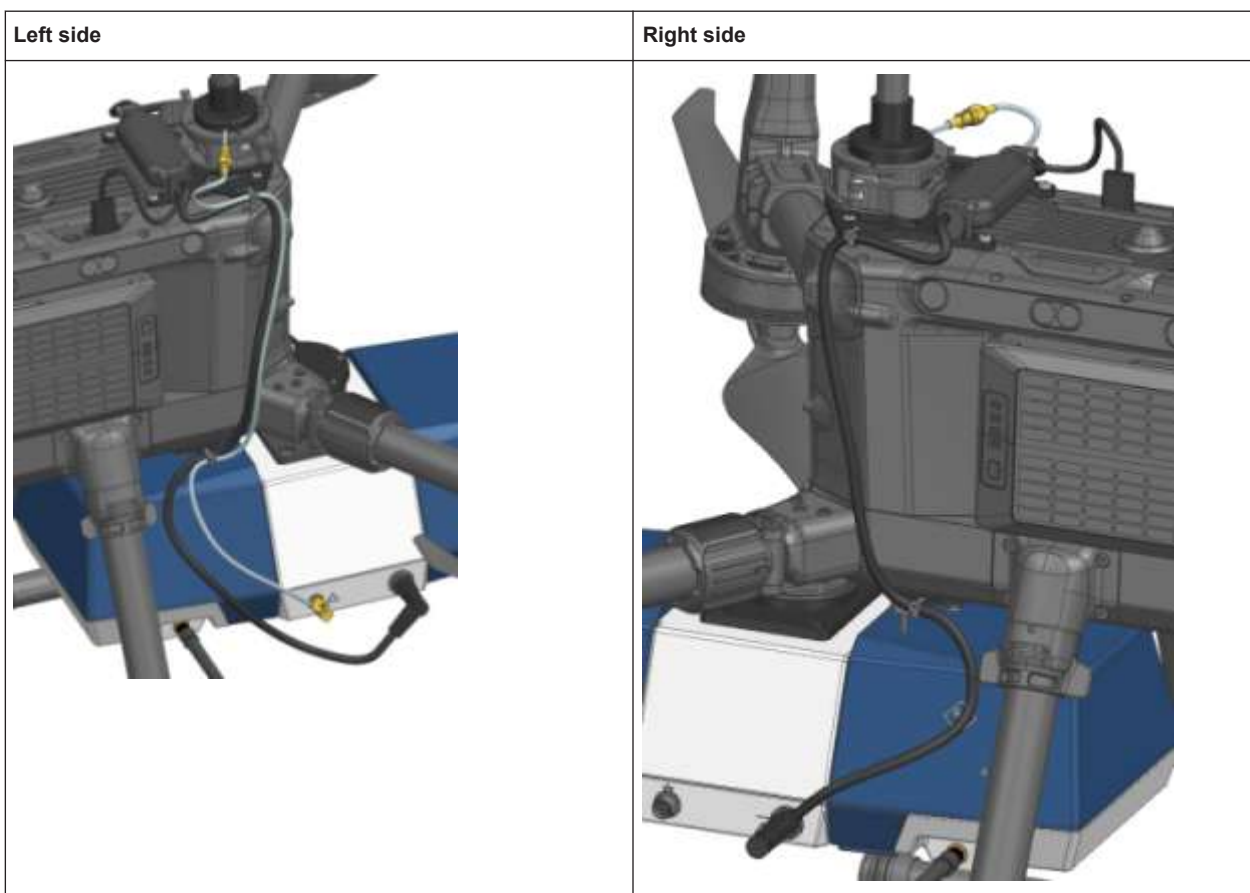
**To connect the OSDK cable**

The OSDK cable provides the electrical connections between the drone and the R&S EVSD1000.

1. Place the encased part of the OSDK cable over the adapter, with the double cables facing the USB connector of the drone.



2. Fasten the OSDK cable to the adapter using the prepared cable ties.
3. Insert the USB connector of the OSDK cable in the USB connector of the drone.
4. Connect the single DC connector cable of the OSDK cable to the "Power supply" connector on the right panel of the R&S EVSD1000.
5. Connect the remaining GNSS connector cable of the OSDK cable to the "GNSS" connector on the left panel of the R&S EVSD1000.
6. **NOTICE!** Risk of blocking the drone. Make sure that the connecting cables do not block the drone propellers or the sensors required for flight.
Secure all cables to the provided loops on both adapters using cable ties. Make sure that the cables are fastened to the side of the drone securely.



To configure GNSS reception from the drone, see [Chapter 1.4.10.1, "Receiving GNSS data from the DJI M300"](#), on page 34.

1.4.6 Connecting to LAN

You can connect the instrument to a LAN for remote operation via a remote device. For details on the connector, see [Chapter 1.5.3.1, "LAN \(ethernet\)"](#), on page 44.

Provided the network administrator has assigned you the appropriate rights and adapted the Windows firewall configuration, you can use the interface, for example:

- To stream measurement data from the R&S EVSD1000 to a connected device
- To access or control the measurement from a remote device using a VNC client
- To connect external network devices (e.g. printers)

NOTICE**Risk of network failure**

Consult your network administrator before performing the following tasks:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses
- Exchanging hardware

Errors can affect the entire network.

1. Connect the R&S EVSD1000 to the LAN via the LAN interface on the right panel of the instrument.
2. Start a VNC client on the connected remote device.
3. Enter the IP address of the R&S EVSD1000. The default address is the static IP address 10.255.255.98. Note that without a DHCP server, the network adapter on the remote device must use an IP address within the same TCP/IP subnet as the instrument. (Usually, that means only the last number of the IP address differs.)



When using DHCP, the IP address is assigned to the devices dynamically. In this case, if a dynamic name server (DNS) is available, you can use the permanent instrument name to access the R&S EVSD1000. The default instrument name is EVSD<serial_number>, for example, EVSD123456. For information on determining the serial number, see [Chapter 1.5.5.2, "Device ID"](#), on page 47.

**Resetting the IP address**

If you do not know which IP address the instrument is currently set to, you can always reset the network settings of the instrument to their default values (LAN IP address: 10.255.255.98, Wi-Fi access point IP address: 192.168.1.1).

Insert a pointed tool, such as the tip of a pencil, in the [LAN reset button](#) on the front panel of the instrument, see [Chapter 1.5.1, "Front panel"](#), on page 39. Press the "LAN Reset" button for about 3 seconds to reset the IP address of the LAN connector and the optional data-link-module (Wi-Fi).

Press the "LAN Reset" button shortly to re-establish the LAN or Wi-Fi connection without changing the settings.

For more information on LAN configuration, see [Chapter 8.2, "LAN \(remote\) settings"](#), on page 201.

1.4.7 Setting up a data link (Wi-Fi) connection

The R&S EVSD1000 can be equipped with an optional R&S EVSD1-Z5 Data-link-module (Wi-Fi). Thus, you can configure the R&S EVSD1000 as a Wi-Fi access point for

wireless communication from a remote device. The data-link-module (Wi-Fi) is connected using the connectors in the data link slot on the rear of the R&S EVSD1000 (see [Chapter 1.5.4, "Rear panel"](#), on page 45).

To connect the optional R&S EVSD1-Z5 Data-link-module (Wi-Fi)

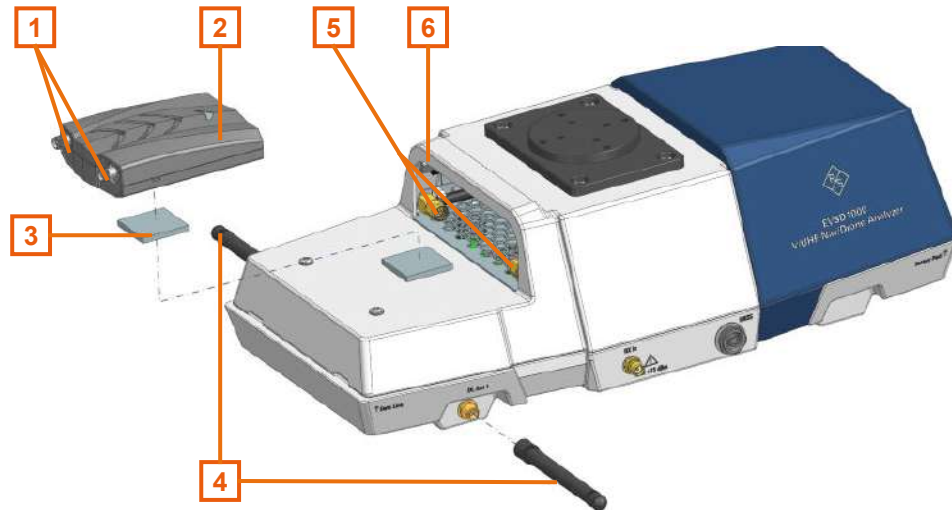


Figure 1-3: Connecting the R&S EVSD1-Z5 Data-link-module (Wi-Fi)

- 1 = RP-SMA connectors data-link-module (Wi-Fi)
- 2 = USB-C connector data-link-module (Wi-Fi)
- 3 = Hook-and-loop fastener
- 4 = Data link antennas with RP-SMA connectors
- 5 = RP-SMA cables data link slot
- 6 = USB-C cable data link slot

1. Open the rear cover of the R&S EVSD1000 as described in [Chapter 1.4.4, "Opening and closing the front and rear covers"](#), on page 14.
2. A hook-and-loop fastener is taped to the R&S EVSD1000, in front of the data link slot. Tape the upper part of the fastener to the data-link-module (Wi-Fi) as shown in [Figure 1-3](#).
3. Plug the USB-C cable from the R&S EVSD1000 data link slot in the USB-C connector on the data-link-module (Wi-Fi).
4. Screw both RP-SMA cables from the R&S EVSD1000 data link slot to the data-link-module (Wi-Fi) RP-SMA connectors.
5. Insert the data-link-module (Wi-Fi) in the data link slot of the R&S EVSD1000 until the hook-and-loop fasteners are connected.
6. **NOTICE!** Risk of blocking the drone. Make sure that the antennas and connecting cables do not block the drone propellers or the sensors required for flight.

Connect the short, non-bendable data-link antennas provided with the R&S EVSD1-Z5 Data-link-module (Wi-Fi) to the "DL Ant 1"/ "DL Ant 2" connectors on the left and right panel of the R&S EVSD1000 (see [Chapter 1.5.2.1, "Data link antenna connector"](#), on page 43).

To set up a data link (Wi-Fi) connection

Before you start the R&S EVSD1000, connect the data-link-module (Wi-Fi) to the R&S EVSD1000. Otherwise, the R&S EVSD1000 does not determine the IP information automatically.

1. Switch on the R&S EVSD1000.

The R&S EVSD1000 is configured as a Wi-Fi access point using a DHCP server. By default, the following settings are defined.



Wi-Fi	On
SSID	EVSD900252
WPA-PSK key	RS900252
Channel	1 (2.4 GHz Wi-Fi 4)
Wi-Fi Speed	Low
Country	DE
IP	192.168.1.1
Netmask	255.255.255.0
Gateway	192.168.1.2
DHCP Server	On
Status	ON CH:1 WIDTH:20MHz

2. Usually, you can access the R&S EVSD1000 using the default IP address and Wi-Fi password without further configuration. The default IP address is 192.168.1.1. The default Wi-Fi password is RS<serial_number>, e.g. RS123456. For information on determining the serial number, see [Chapter 1.5.5.2, "Device ID"](#), on page 47.

If necessary, configure the data link information for your network.

For details, see [Chapter 8.3, "Data link \(Wi-Fi\) settings"](#), on page 204.



Resetting the IP address

If you do not know which IP address the instrument is currently set to, you can always reset the network settings of the instrument to their default values (LAN IP address: 10.255.255.98, Wi-Fi access point IP address: 192.168.1.1).

Insert a pointed tool, such as the tip of a pencil, in the [LAN reset button](#) on the front panel of the instrument, see [Chapter 1.5.1, "Front panel"](#), on page 39. Press the "LAN Reset" button for about 3 seconds to reset the IP address of the LAN connector and the optional data-link-module (Wi-Fi).

Press the "LAN Reset" button shortly to re-establish the LAN or Wi-Fi connection without changing the settings.

1.4.8 Connecting to power

The R&S EVSD1000 is equipped with a DC power supply connector that can be connected to the board power of a drone. Optionally, you can operate the R&S EVSD1000 by a battery (R&S EVSD1-Z1 Battery pack).

For use without a drone, you can use an optional external AC/DC power supply unit (R&S EVSG1-Z8 Power supply) or a battery.

For safety information, see "Connecting to power" on page 6.

- [Connecting the R&S EVSD1000 to an external DC power source](#)..... 29
- [Using an optional battery pack](#).....30
- [Connecting the R&S EVSD1000 to AC power](#).....31

1.4.8.1 Connecting the R&S EVSD1000 to an external DC power source

You can connect the R&S EVSD1000 to an external DC power source, such as the board power of the drone. The power supply must provide a voltage of 10 V DC to 28 V DC.



If you use the optional R&S EVSD1-Z20 Drone adapter DJI M300 RTK, power supply is provided by the OSDK cable. See [Chapter 1.4.5, "Mounting the R&S EVSD1-Z20 Drone adapter DJI M300 RTK"](#), on page 16.

If the external power supply unit supplies safety extra-low DC voltage (SELV) to the instrument, be sure to meet the requirements for reinforced/double insulation in accordance with DIN/EN/IEC 61010 (UL 3111, CSA C22.2 No. 1010.1) or DIN/EN/IEC 60950 (UL 1950, CSA C22.2 No. 950). Provide current limitation in accordance with DIN EN 61010-1 appendix F2.1.

Connect the R&S EVSD1000 to an external DC power source as follows:

1. Connect the XLR connection cable provided with the instrument to the Power supply connector on the left panel of the R&S EVSD1000.
2. **NOTICE!** Risk of instrument damage. Excess current from the external DC power source to the instrument can cause a short-circuit, which can damage the instrument or power supply unit.

Always insert a 3 AT H fuse in the power supply connection to protect the instrument.

3. Connect the XLR connection cable to the DC power supply.
If you have to extend the cable, ensure that the entire cable has a cross section of at least 1.5 mm².

The "Power" LED on the front panel of the R&S EVSD1000 lights up (see [Table 1-2](#)).

1.4.8.2 Using an optional battery pack

As an alternative to the fixed DC power supply, you can operate the R&S EVSD1000 by a battery pack. Use only the original battery pack R&S EVSD1-Z1 Battery pack.

If the battery option was ordered together with the instrument, the R&S EVSD1000 comes with the battery management and battery pack already installed. Otherwise these options must be installed by Rohde & Schwarz service personnel.

For safety information, see ["Handling batteries safely"](#) on page 7.

If the battery pack is installed and no DC power is supplied, the R&S EVSD1000 automatically switches to battery operation. The power mode and charge condition of the battery are indicated by the "Power" LED on the front panel of the R&S EVSD1000 (see [Table 1-2](#)).

Charging batteries

Charge the battery before using it for the first time. Following a long storage period, it can be necessary to charge and discharge the battery several times to reach full capacity. The battery can only be charged outside the R&S EVSD1000 using the R&S EVSD1-Z2 Battery charger.

Look up the following details in the data sheet:

- Charging conditions
- Recharging interval to avoid deep discharge

For information on storing and disposal of a battery pack, see [Chapter 10.1, "Handling batteries"](#), on page 354.

Replacing batteries

To replace the battery

1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.
Proceed as described in [Chapter 1.4.11, "Switching on or off"](#), on page 38.
2. Disconnect the power supply.
3. Open the front cover from the R&S EVSD1000 as described in [Chapter 1.4.4, "Opening and closing the front and rear covers"](#), on page 14.
4. Pull the strap on the battery pack horizontally to remove the empty battery from the R&S EVSD1000.

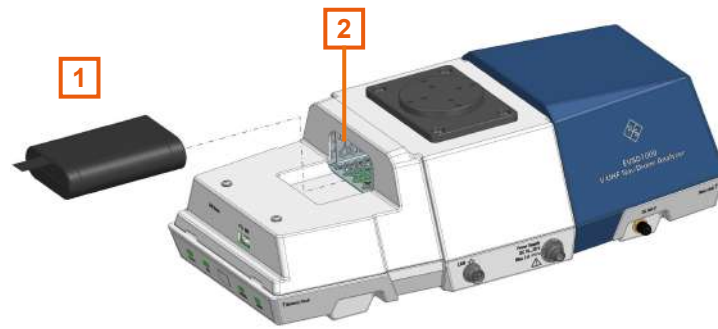


Figure 1-4: Replacing a battery pack

- 1 = Battery pack with strap
2 = Battery slot at front of the R&S EVSD1000

5. Charge the battery pack using the R&S EVSD1-Z2 Battery charger.
6. Insert the charged battery pack into the slot at the front of the R&S EVSD1000 with the charge state indicator LED facing upwards.
7. Push the battery pack onto the connector in the R&S EVSD1000.
8. Close the instrument cover as described in ["To close the front and rear covers"](#) on page 15.

1.4.8.3 Connecting the R&S EVSD1000 to AC power

If you need to operate the R&S EVSD1000 without a drone, you can use an AC/DC power supply unit, available as an accessory. When connecting to an AC power supply, only use the R&S EVSG1-Z8 Power supply.



Only operate the external power supply R&S EVSG1-Z8 Power supply up to an altitude of 2000 m. See also the R&S EVSG1-Z8 Power supply data sheet.

Connect the R&S EVSD1000 to AC power as follows:

1. Connect the DC connector on the AC/DC power supply unit to the Power Supply connector on the left side of the R&S EVSD1000 (see [Chapter 1.5.3.2, "DC power supply"](#), on page 45).
2. Plug the AC power cable into the AC/DC power supply connector. Only use the AC power cable delivered with the power supply unit.
The required ratings are indicated next to the AC power connector and in the power supply unit's data sheet.
3. Plug the AC power cable into a two-pin power outlet with ground contact.
The green operating LED of the AC/DC power supply connector lights up.
The green Power LED on the front panel of the R&S EVSD1000 lights up.

1.4.9 Connecting the R&S EVSD1-Z3 V/UHF antenna to the bottom of the R&S EVSD1000

If you do not have the optional R&S EVSD1-Z20 Drone adapter DJI M300 RTK, you can connect a receiving antenna to the bottom of the R&S EVSD1000.

To connect a receiving antenna to the bottom of the R&S EVSD1000

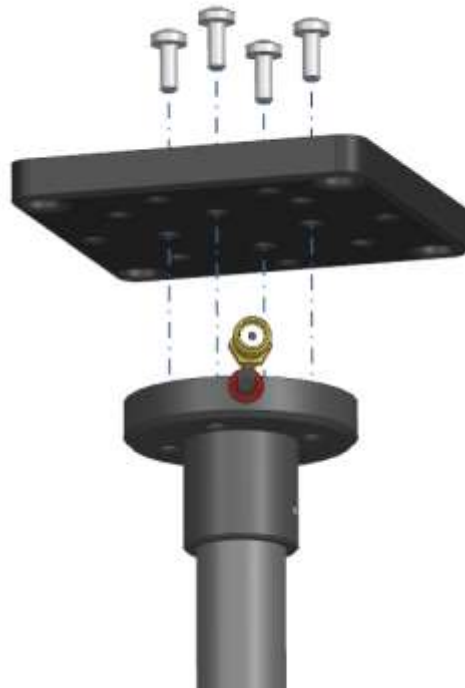
Prerequisite: R&S EVSD1-Z3 V/UHF antenna

1. On the bottom panel of the R&S EVSD1000, unscrew the protection cover.

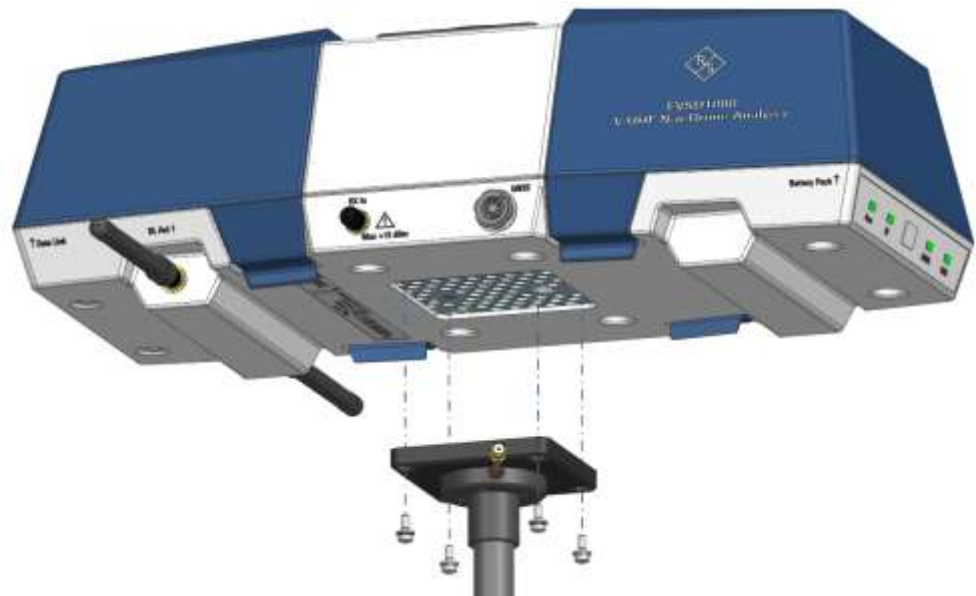


Figure 1-5: Removing the protection cover from the bottom panel

2. Insert four secured screws through the top of the antenna adapter.
3. Place the adapter on the flange of the antenna with the cable fitted in the inlet of the flange.



4. Screw the adapter to the flange of the antenna.
5. Insert four protected screws from below the antenna adapter.
6. Screw the adapter and antenna to the bottom panel of the R&S EVSD1000 with the antenna facing the flight direction.



7. Connect the RF output cable ("pig tail") of the receiving antenna to the provided RF extension cable.

8. Connect the RF extension cable to the "RX In" connector on the left panel of the R&S EVSD1000.

1.4.10 Connecting to GNSS

A GNSS receiver provides synchronization data for time and positioning results.

There are three ways to provide GNSS data to the R&S EVSD1000:

- Using the GNSS information from the drone
- Using the R&S EVSD1-Z6 GNSS RTK device (rover) and R&S EVSD1-Z7 GNSS antenna options
- Using a customer-specific GNSS receiver and antenna

You configure the used GNSS source on the R&S EVSD1000.

- [Receiving GNSS data from the DJI M300](#).....34
- [Using an optional GNSS antenna and receiver](#)..... 36
- [Using a customer-specific GNSS antenna and receiver](#).....37

1.4.10.1 Receiving GNSS data from the DJI M300

You can connect the R&S EVSD1000 to a DJI M300 and use the drone as a source for position and time data. Thus, the R&S EVSD1000 does not require an additional GNSS receiver.

To obtain the DJI M300 information

Prerequisites:

DJI Assistant 2 (Enterprise series) software (see <https://www.dji.com/>)

DJI developer account (see <https://developer.dji.com>)

1. In the DJI developer portal, register an Onboard SDK (OSDK) application for your DJI M300. For details on registration, see the developer documentation provided by the drone manufacturer.
2. In the DJI Assistant software, enable the OSDK API control. Optionally, change the baud rate. The default value is *230400*.
You do not have to define other settings, as the R&S EVSD1000 automatically enables the required data sets.
3. In the DJI developer portal, find the application ID and key for your drone.

[illegible]

Figure 1-6: Example of application information shown in the DJI developer portal (2022)

To enable DJI M300 support on the R&S EVSD1000

Prerequisites:

The application ID and key for the registered drone application

LAN access to the R&S EVSD1000 for remote control (see [Chapter 1.4.6, "Connecting to LAN"](#), on page 25)

The OSDK connection cable is connected to the "GNSS" connector on the left panel of the R&S EVSD1000 (see [Chapter 1.5.2.3, "GNSS connector"](#), on page 43).

1. Connect a terminal client, e.g. "putty" (<https://www.putty.org>) to the R&S EVSD1000 using the TCP port 8000. The required commands are simple text commands, not SCPI-conform. Use any line-based command tool, such as telnet, to send commands to the R&S EVSD1000.
2. Specify the application ID on the R&S EVSD1000 by sending the remote command `DJI:APPID`.
For example:
`DJI:APPID 1120702`
See [DJI:APPID](#) on page 243.
3. Specify the application key on the R&S EVSD1000 by sending the remote command `DJI:KEY`.
For example:
`DJI:KEY 87df76162e58ab5438453e03e493b7b5c15488d3e301a...`
See [DJI:KEY](#) on page 243.
4. To use a data rate (baud rate) other than the default 230400, define the rate on the R&S EVSD1000 by sending the remote command `DJI:BAUDRATE`.
For example:
`DJI:BAUDRATE 230400`
See [DJI:BAUDRATE](#) on page 243.

The R&S EVSD1000 is ready to communicate with the DJI M300 drone.

To configure the GNSS source on the R&S EVSD1000

Prerequisite:

LAN or Wi-Fi connection between the R&S EVSD1000 and a PC (see [Chapter 1.4.6, "Connecting to LAN"](#), on page 25 and [Chapter 1.4.7, "Setting up a data link \(Wi-Fi\) connection"](#), on page 26).

1. On the R&S EVSD1000, in the "Setup - GPS / GNSS" settings, select the "Interface": "DJI_M300".
Note that it can take up to 30 seconds after switching on or connecting to the drone before the R&S EVSD1000 receives GNSS data. See the GNSS status indicator LED on the front panel of the R&S EVSD1000.
2. Define which part of the signal is used for synchronization: "PPS-Sync": "GNSS rising".
For details, see [Chapter 8.6, "GNSS configuration"](#), on page 214.

1.4.10.2 Using an optional GNSS antenna and receiver

An optional GNSS antenna and receiver are available for the R&S EVSD1000.

- R&S EVSD1-Z6 GNSS RTK device (rover) with GNSS interface (includes USB, RS-232, PPS)
- R&S EVSD1-Z7 GNSS antenna
For enhanced precision using RTK correction data, a dual-band GNSS antenna is required (order no. 3657.0756.00).

The R&S EVSD1-Z6 GNSS RTK device is based on the µBlox F9P GNSS receiver module. The receiver is preconfigured at the factory for use with the R&S EVSD1000.

For a description of the required configuration and recommended settings for use with the R&S EVSD1000, see [Chapter 8.6, "GNSS configuration"](#), on page 214.

For more information, see the µBlox documentation (<https://www.u-blox.com>).

To connect the R&S EVSD1-Z6 GNSS RTK device (rover) and R&S EVSD1-Z7 GNSS antenna

1. Connect the GNSS antenna to the SMA connector on the GNSS receiver. Make sure that the antenna has a clear view to the sky.
2. Using the provided GNSS cable, connect the GNSS receiver to the "GNSS" connector on the left panel of the R&S EVSD1000 (see [Figure 1-9](#)).

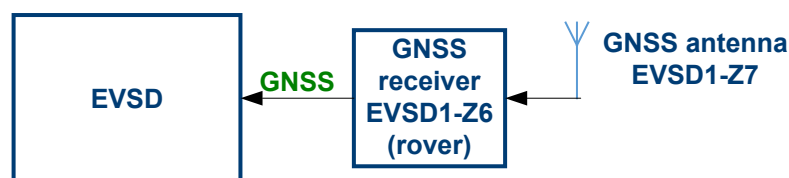


Figure 1-7: Connection of the R&S EVSD1-Z6 GNSS RTK device (rover)

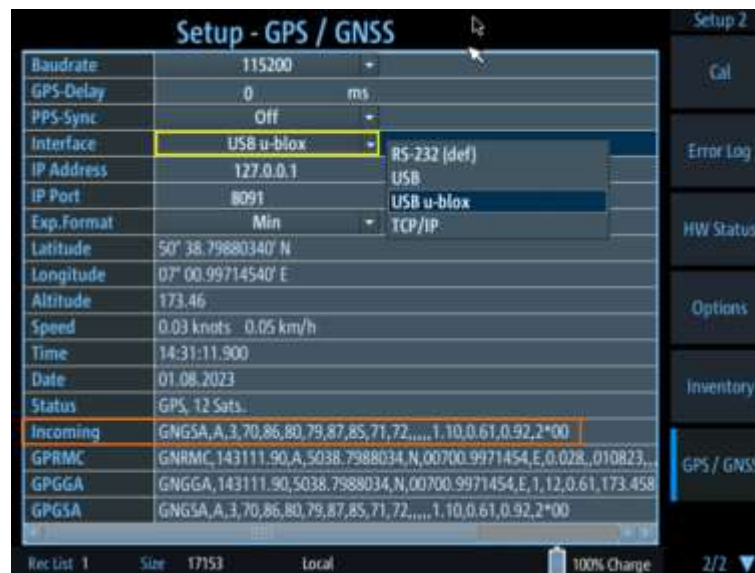
To configure the GNSS source on the R&S EVSD1000

Prerequisite:

LAN or Wi-Fi connection between the R&S EVSD1000 and a PC (see [Chapter 1.4.6, "Connecting to LAN"](#), on page 25 and [Chapter 1.4.7, "Setting up a data link \(Wi-Fi\) connection"](#), on page 26).

1. On the R&S EVSD1000, in the "Setup - GPS / GNSS" settings, select the "Interface": "USB u-blox".
As an alternative, you can use a serial "RS-232" interface connection. In this case, also define the correct "Baudrate".
2. Define which part of the signal is used for synchronization: "PPS-Sync": "PPS In Falling".
For details, see [Chapter 8.6, "GNSS configuration"](#), on page 214.

If the GNSS receiver is connected correctly, the "Setup - GPS / GNSS" window shows the incoming GNSS information ("Incoming").



If no PPS information is available, a red warning is displayed in the status bar of the R&S EVSD1000.

1.4.10.3 Using a customer-specific GNSS antenna and receiver

To obtain GNSS data using a GNSS antenna and receiver

1. Connect the GNSS antenna to the GNSS receiver.
2. Adapt the provided open-ended GNSS cable as required (see [Chapter 1.5.2.3, "GNSS connector"](#), on page 43).
3. Using the provided GNSS cable, connect the GNSS receiver to the "GNSS" connector on the left panel of the R&S EVSD1000 (see [Figure 1-9](#)).

4. Set up a LAN or Wi-Fi connection between the R&S EVSD1000 and a PC (see [Chapter 1.4.6, "Connecting to LAN"](#), on page 25 and [Chapter 1.4.7, "Setting up a data link \(Wi-Fi\) connection"](#), on page 26).
5. On the R&S EVSD1000, in the "Setup - GPS / GNSS" settings, select the interface that provides the GNSS data, e.g. RS-232 or TTL.

1.4.11 Switching on or off

To switch on the product

The product is off but connected to power.

- ▶ Press the power on/off switch. See [Chapter 1.5.1.3, "Power on/off switch"](#), on page 41.

The "Power" LED on the front panel of the R&S EVSD1000 lights up (see [Table 1-2](#)). The product boots.

To shut down the product

The R&S EVSD1000 is in the ready state.

- ▶ Press the power on/off switch. See [Table 1-2](#).

The operating system shuts down. The "Power" LED turns off (see [Chapter 1.5.1.1, "Power LED"](#), on page 40). While shutting down, the last settings are stored on the instrument.

To disconnect from power

- ▶ **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.
Disconnect the product from the power source.

1.4.12 Performing an autocalibration

After setting up the R&S EVSD1000, perform an autocalibration to ensure the accuracy of the measurements. After initial setup, we recommend that you perform an autocalibration every 2 months or if the difference of the environment temperature changes by more than 10 °C.

If valid data for automatic calibration is not available, the message "UNCAL" is displayed in the status line of the R&S EVSD1000 display.



R&S EVSG1-Z11 Verification test software

To maintain and prove the outstanding performance of the R&S EVSD1000, regular verification is mandatory, as is common for high accuracy instruments. The R&S EVSG1-Z11 Verification test software enables the customer to verify the R&S EVSD1000 on site. The main task of the R&S EVSG1-Z11 Verification test software is to provide nav aids signals that are more accurate than the R&S EVSD1000 itself. By reading the measurement results of the R&S EVSD1000 and comparing the values with the generated signal, the correct operation of the R&S EVSD1000 is proven.

For details, see the R&S EVSG1-Z11 Verification test software manual.

To perform an autocalibration

Prerequisites:

To perform an autocalibration, you require remote access to the instrument via LAN. For details see [Chapter 1.6.3, "Remote control"](#), on page 55.

Make sure that the instrument has reached its operating temperature (after about 15 minutes of operation; for details, refer to the data sheet). A message in the status bar ("Instrument warming up...") indicates that the operating temperature has not yet been reached.

During the autocalibration procedure, do not apply any input signal to the R&S EVSD1000.

1. Using the VNC viewer, select [n] > [F8] > [F1]
2. Select "Start Autocal".
3. Press [Enter].

The "Setup - CAL" display shows the status for each calibration step. When completed, after a few minutes, all entries must have the status "OK".

For more information on autocalibration, see ["Auto-Calibration \(Cal\)"](#) on page 209.

1.5 Instrument tour

1.5.1 Front panel

This chapter describes the front panel, including all function keys and connectors. Note that some of the connectors are behind a protective cover, see [Chapter 1.4.4, "Opening and closing the front and rear covers"](#), on page 14.

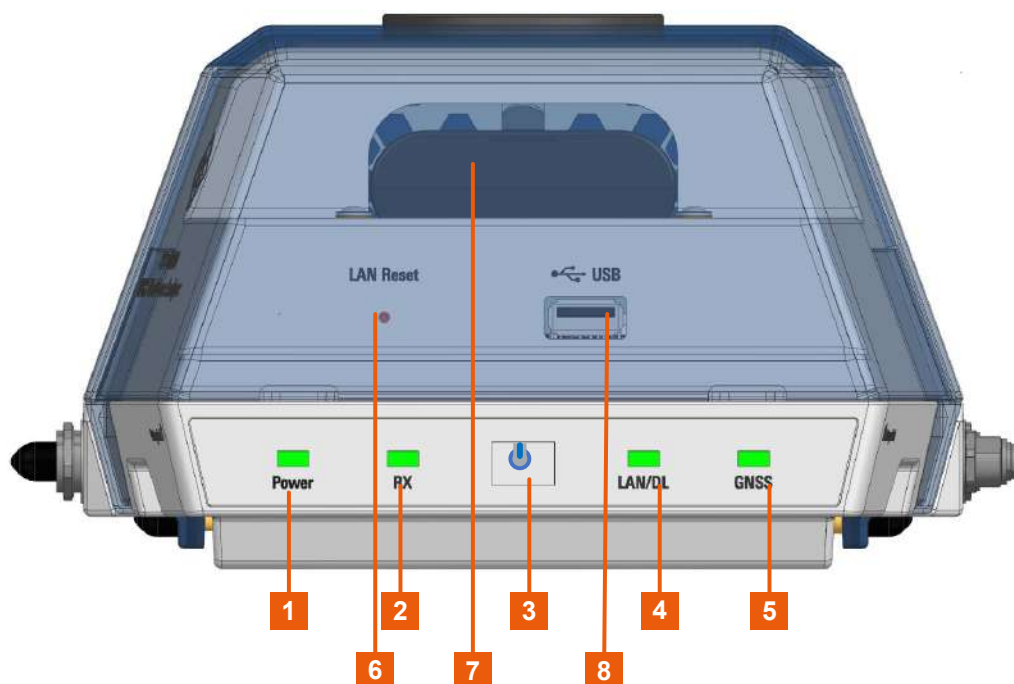


Figure 1-8: R&S EVSD1000 - Front panel view (with semi-transparent cover)

- 1 = [Chapter 1.5.1.1, "Power LED"](#), on page 40
- 2 = [Chapter 1.5.1.2, "RX input LED"](#), on page 41
- 3 = [Chapter 1.5.1.3, "Power on/off switch"](#), on page 41
- 4 = [Chapter 1.5.1.4, "LAN/ data link LED"](#), on page 41
- 5 = [Chapter 1.5.1.5, "GNSS LED"](#), on page 41
- 6 = [Chapter 1.5.1.6, "LAN reset button"](#), on page 42
- 7 = Optional Li-Ion battery, see [Chapter 1.5.3.2, "DC power supply"](#), on page 45
- 8 = [Chapter 1.5.1.7, "USB-A connector"](#), on page 42

1.5.1.1 Power LED

Indicates whether the power is supplied by an external DC power supply or the optional R&S EVSD1-Z1 Battery pack. In battery mode, the charge condition is indicated.

Table 1-2: Overview of Power LED states

LED	Power supply	Status instrument
Off	No power supply	Off
green, flashing	External DC power supply	Off
green, blinking slowly		Booting
green		Ready
blue, flashing	Internal battery	Off
blue, blinking slowly		Booting
blue	Charge condition > 50 %	Ready

LED	Power supply	Status instrument
orange	Charge condition > 20 % and < 50 %	
red	Charge condition < 20 %	
red (blinking)	Charge condition < 10 %	

1.5.1.2 RX input LED

Indicates the state of the RX input from the R&S EVSD1-Z3 V/UHF antenna.

Table 1-3: Overview of input states

LED	Status
Off	Instrument off
green	Valid signal
yellow	Invalid signal detected
red	No signal detected

1.5.1.3 Power on/off switch

Switches the R&S EVSD1000 on and off. When the instrument is ready for operation, the **Power LED** lights green.

See also [Chapter 1.4.11, "Switching on or off"](#), on page 38.

1.5.1.4 LAN/ data link LED

Indicates the state of the LAN or data link connection. See [Chapter 1.5.3.1, "LAN \(ethernet\)"](#), on page 44 and [Chapter 1.5.2.1, "Data link antenna connector"](#), on page 43.

Table 1-4: Overview of connection states

LED	Status
Off	Instrument off
orange	Active WLAN connection
blue	TCP/IP connection on port 8000 (remote)
green (blinking)	Data transfer via LAN

1.5.1.5 GNSS LED

Indicates whether a valid GNSS signal, and which type, is received from the R&S EVSD1-Z7 GNSS antenna.

Table 1-5: Overview of connection states

LED	Status
red	No GNSS signal available
yellow	GNSS signal
green	DGNSS signal
blue	RTK signal

1.5.1.6 LAN reset button

The "LAN Reset" SMD button resets the network settings of the optional data-link-module (Wi-Fi) and the LAN connector. The button is only accessible via a pointed tool to avoid accidental resets.

Press the "LAN Reset" button shortly to re-establish the LAN or Wi-Fi connection without changing the settings.

Press the "LAN Reset" button longer (approximately 3 seconds) to reset the network settings of the instrument to their default values (LAN IP address: 10.255.255.98, Wi-Fi access point IP address: 192.168.1.1).

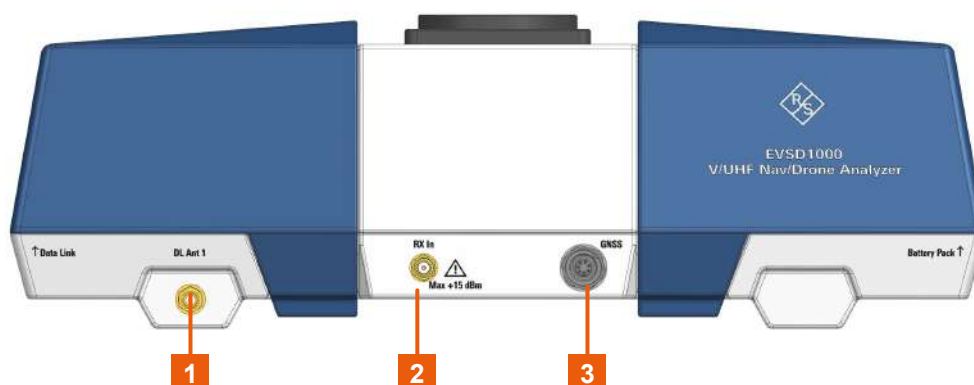
See also [Chapter 1.4.6, "Connecting to LAN"](#), on page 25.

1.5.1.7 USB-A connector

The front panel provides a female USB connector (USB-A, 2.0 standard) to connect storage devices like a memory stick.

The memory stick is used to store and reload instrument settings, to perform software updates and to export measurement data.

1.5.2 Left panel

**Figure 1-9: R&S EVSD1000 - Left panel view**

- 1 = Data link antenna 1, see [Chapter 1.5.2.1, "Data link antenna connector"](#), on page 43
 2 = [Chapter 1.5.2.2, "RX In connector"](#), on page 43
 3 = [Chapter 1.5.2.3, "GNSS connector"](#), on page 43

For the specification of the following interfaces, see the R&S EVSD1000 data sheet.

- [Data link antenna connector](#)..... 43
- [RX In connector](#)..... 43
- [GNSS connector](#)..... 43

1.5.2.1 Data link antenna connector

SMA connector for a data link antenna if an internal R&S EVSD1-Z5 Data-link-module (Wi-Fi) is installed.

Another data link antenna connector is provided on the right panel of the R&S EVSD1000, see [Figure 1-10](#).

1.5.2.2 RX In connector

The RX input connector is a 50 Ω SMA connector. Use the RX input connector to provide signal input (max. +13 dBm) from a R&S EVSD1-Z3 V/UHF antenna to the R&S EVSD1000.

The antenna itself is connected to the bottom panel of the R&S EVSD1000, see [Chapter 1.5.5, "Bottom panel"](#), on page 47.

1.5.2.3 GNSS connector

M9 IP67 connector with 7 contacts for a GNSS receiver, for various types of geopositioning data, including PPS input. The connector supports USB, RS232 and TTL (Uart) signals. The used standard is configured in the software.

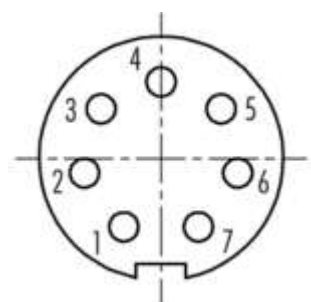


Table 1-6: Pin assignment of the GNSS connector

Pin	Signal name	Usage
1	PPS	PPS input
2	RXD	RS232 receive data
3	TXD	RS232 transmit data
4	GND	0 V ground

Pin	Signal name	Usage
5	D+	USB data positive
6	D-	USB data negative
7	5V	power supply +5 V
Shield	Shield	Shield

1.5.3 Right panel

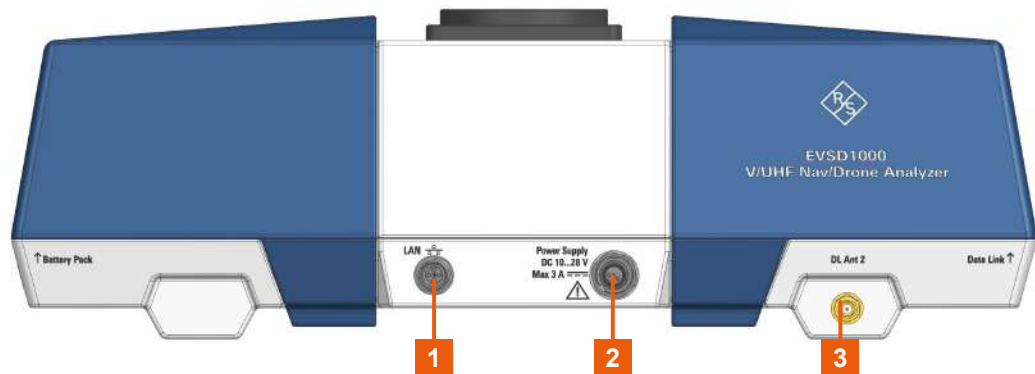


Figure 1-10: R&S EVSD1000 - Right panel view

1 = [Chapter 1.5.3.1, "LAN \(ethernet\)"](#), on page 44

2 = [Chapter 1.5.3.2, "DC power supply"](#), on page 45

3 = Data link antenna 2 connector, see [Chapter 1.5.2.1, "Data link antenna connector"](#), on page 43

1.5.3.1 LAN (ethernet)

M8-D IP67 connector with 4 contacts providing a FastEthernet LAN connection. The pins are assigned according to IEC 61076-2-114.

Operate the R&S EVSD1000 remotely using the LAN connection (Fast Ethernet). The LAN connection can also be used to stream measurement data (TCP port 8000; for I/Q data: 8001). The data transfer rate is 100 Mbit/s.

Using a VNC viewer, you can perform hardkey and softkey tasks on the R&S EVSD1000 in a LAN via shortcuts on a remote keyboard.

For details about remote control, see [Chapter 9, "Remote commands"](#), on page 229.

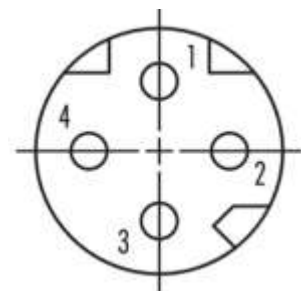


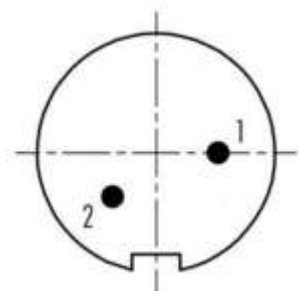
Table 1-7: Pin assignment of the LAN M8-D IP67 connector

Pin	Signal name	Usage
1	TXP	Transmit data positive
2	RXP	Receive data positive
3	TXN	Transmit data negative
4	RXN	Receive data negative
Shield	Shield	Shield

1.5.3.2 DC power supply

M9 IP67 connector with 2 contacts for an external DC power source (10 V DC to 28 V DC, max. 3 A).

The external DC power supply allows you to connect the R&S EVSD1000 to the drone board supply, for example.

*Table 1-8: Pin assignment of the DC M9 IP67 connector*

Pin	Signal name	Usage
1	DC-IN (+)	10 V DC to 28 V DC
2	DC-IN (-)	0 V ground

For details, refer to ["Connecting to power"](#) on page 6 and [Chapter 1.4.8, "Connecting to power"](#), on page 29.

1.5.4 Rear panel

The rear panel of the R&S EVSD1000 provides a data link slot with connectors. In the R&S EVSD1000 data link slot, you can connect an optional R&S EVSD1-Z5 Data-link-module (Wi-Fi)). Thus, you can configure the R&S EVSD1000 as a Wi-Fi access point for wireless communication from a remote device.

Note that the slot is located behind a protective cover, see [Chapter 1.4.4, "Opening and closing the front and rear covers"](#), on page 14.

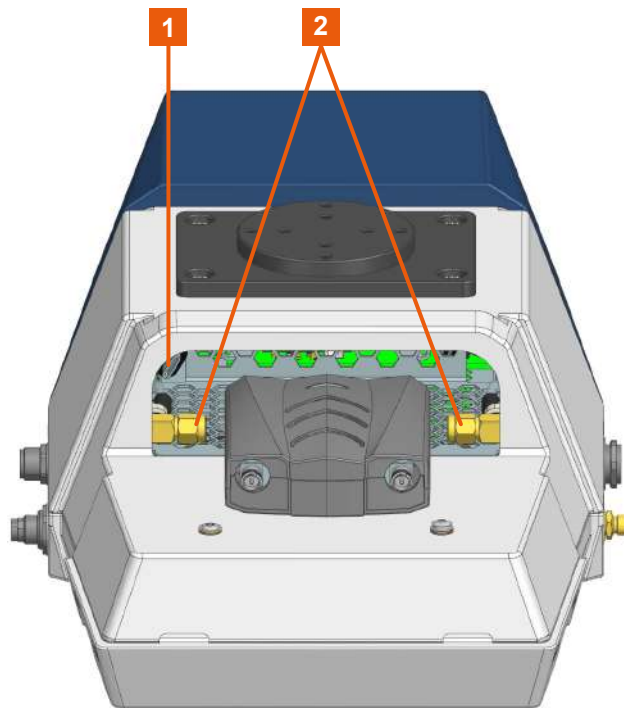


Figure 1-11: R&S EVSD1000 - Rear panel view (with installed optional R&S EVSD1-Z5 Data-link-module (Wi-Fi))

1 = USB-C connector

2 = SMA connectors

The R&S EVSD1000 data link slot provides the following connectors:

- Two 50-Ω SMA connectors for the signal input from the data link antennas (via the R&S EVSD1-Z5 Data-link-module (Wi-Fi)).
- USB-C 2.0 connector for signal input from the R&S EVSD1-Z5 Data-link-module (Wi-Fi).

The R&S EVSD1-Z5 Data-link-module (Wi-Fi) comes with two data link antennas with RP-SMA connectors.

For details, see [Chapter 1.4.7, "Setting up a data link \(Wi-Fi\) connection"](#), on page 26.

1.5.5 Bottom panel



Figure 1-12: R&S EVSD1000 - Bottom panel view

1 = Designated position for ILS (LOC/GS) and VOR antenna

1.5.5.1 Mounting position for ILS (LOC/GS) and VOR receiver antenna

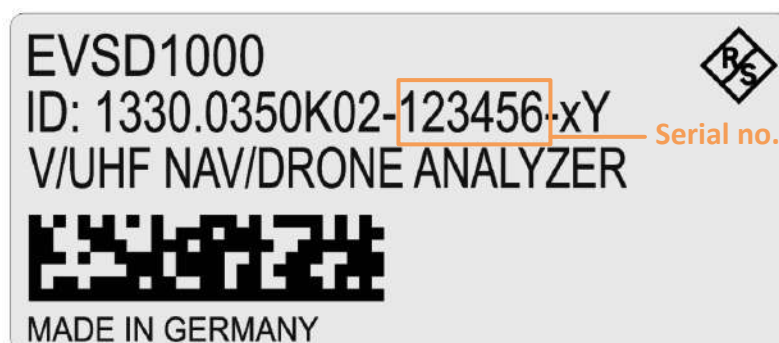
You can connect the R&S EVSD1-Z3 V/UHF antenna to the R&S EVSD1000 via an adapter on the bottom panel.

See also [Chapter 1.4.9, "Connecting the R&S EVSD1-Z3 V/UHF antenna to the bottom of the R&S EVSD1000"](#), on page 32.

1.5.5.2 Device ID

The unique device identifier is provided as a barcode sticker on the bottom panel of the R&S EVSD1000.

It consists of the device order number and a serial number.





The serial number is used to define the **default instrument name**, which is:

<Type><variant>-<serial_number>

For example, EVSD123456.

The instrument name is required to establish a connection to the instrument in a LAN.

1.5.6 Top panel



Figure 1-13: R&S EVSD1000 - Top panel view

1 = Drone adapter

The R&S EVSD1000 is equipped with a mechanical adapter on its top panel to mount it to a drone.

Adapter sets are available for the following drone types:

- DJI M300

To mount the R&S EVSD1000 on any other type of drone, create a customized adapter (see [Chapter 1.4.2, "Selecting and preparing the system components"](#), on page 11).

See also [Chapter 1.4.3.1, "Mounting the R&S EVSD1000 on a drone"](#), on page 12.

1.6 Operating basics

The R&S EVSD1000 is designed for operation on a drone, and is thus completely remote-controlled, via predefined commands. It does not have a graphical user interface for manual interaction.

Nevertheless, the instrument can also be controlled manually, by simulating a user interface on a remotely connected device, and using a connected keyboard. As a prerequisite, the R&S EVSD1000 must be connected to a remote device via LAN or Wi-Fi. See [Chapter 1.4.6, "Connecting to LAN"](#), on page 25 and [Chapter 1.4.7, "Setting up a data link \(Wi-Fi\) connection"](#), on page 26.

1.6.1 Basic connection settings

To operate the R&S EVSD1000 from a remote device, you require connection information.

By default, the R&S EVSD1000 is set to use the static IP address 10.255.255.98.



Resetting the IP address

If you do not know which IP address the instrument is currently set to, you can always reset the network settings of the instrument to their default values (LAN IP address: 10.255.255.98, Wi-Fi access point IP address: 192.168.1.1).

Insert a pointed tool, such as the tip of a pencil, in the [LAN reset button](#) on the front panel of the instrument, see [Chapter 1.5.1, "Front panel"](#), on page 39. Press the "LAN Reset" button for about 3 seconds to reset the IP address of the LAN connector and the optional data-link-module (Wi-Fi).

Press the "LAN Reset" button shortly to re-establish the LAN or Wi-Fi connection without changing the settings.

Use this IP address for the initial connection from a remote device to the R&S EVSD1000.

When using DHCP, the IP address is assigned to the devices dynamically. In this case, if a dynamic name server (DNS) is available, you can use the permanent instrument name to access the R&S EVSD1000. The default instrument name is EVSD<serial_number>, for example, EVSD123456. For information on determining the serial number, see [Chapter 1.5.5.2, "Device ID"](#), on page 47.

To change the settings, see [Chapter 8.2, "LAN \(remote\) settings"](#), on page 201.

1.6.2 Manual operation from a VNC viewer

You can operate the R&S EVSD1000 manually from a connected PC using a keyboard.

You merely require a VNC viewer application, of which a variety is available on the Internet free of charge.

Using a VNC viewer application, you simply connect to the instrument, defined by its IP address. A graphical interface for the R&S EVSD1000 is shown on the control PC. The keys and other graphical user interface elements are operated using associated keyboard shortcuts on the connected keyboard.



Operation via VNC is not possible during remote control (indicated by "Remote" in the status bar). To switch from remote control to manual operation, press [ESC].

Access to the R&S EVSD1000 via VNC can be protected by a password. In this case, enter *instrument* as the password in the login window.

(See also [Chapter 8.2, "LAN \(remote\) settings"](#), on page 201.)

1.6.2.1 Understanding the display information

The following figure shows a typical screen display for the R&S EVSD1000. All different screen elements are labeled. They are explained in more detail in the following sections.

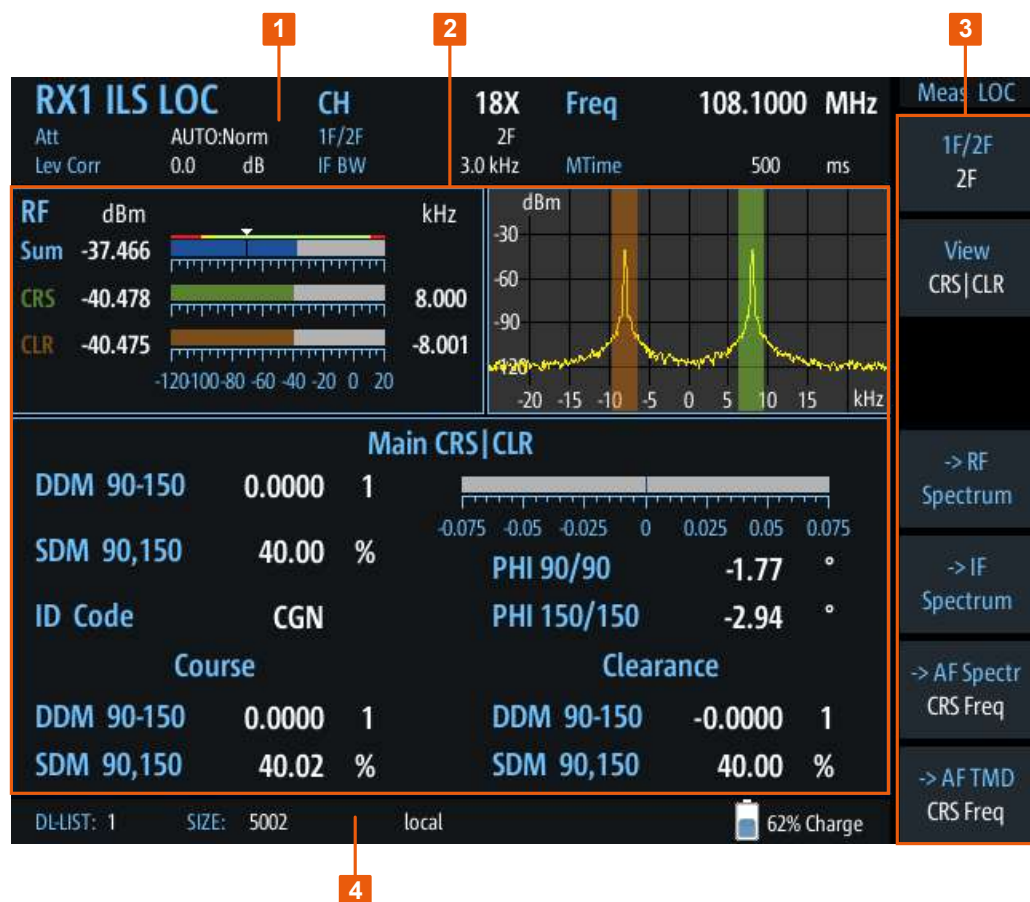


Figure 1-14: R&S EVSD1000 - GUI overview

1 = Measurement settings area (numeric modes only)

2 = Measurement result area

3 = Softkeys to edit settings and activate functions

4 = Status bar

Measurement settings and results area

During a measurement, the available settings are displayed at the top of the screen; the measurement results at the bottom. If a general instrument setting or data manage-

ment function is selected, the settings and information are displayed in the main part of the screen.

Which settings and results are displayed depends on the current measurement or instrument function. See the following chapters for details:

- [Chapter 2, "Measurements and results"](#), on page 56
- [Chapter 7, "Data management"](#), on page 189
- [Chapter 8, "Common instrument settings"](#), on page 200

Softkeys

Softkeys are virtual function keys whose actual function is defined by the software, depending on the currently selected measurement mode or key, or both.



Sometimes, more functions are available than softkeys can be displayed at the same time. In this case, a second menu of functions is available, indicated by "1/2" and "2/2" beneath the softkeys in the display.

To switch between the two menus of softkey functions, press [F8].

Status bar

The status bar at the bottom of the screen contains information on the operating status of the instrument.

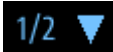
- Current list of data recording and size of this list
(See [Chapter 7.2, "Recording measurement data"](#), on page 191)
- Local or remote operation (see [Chapter 1.6.3, "Remote control"](#), on page 55)
- Battery status and charge status (in %)
(See [Chapter 8.5, "Instrument configuration and operating status settings"](#), on page 209)

1.6.2.2 Keyboard commands for operation via a VNC viewer

[Table 1-9](#) shows the mapping between the keyboard shortcuts and the interface elements on the R&S EVSD1000.

Table 1-9: Keyboard commands (VNC viewer)

Keyboard	Usage
y	Preset
c	Audio
v	Display
b	Help
n	Setup
m	Mode
z	Undo
r	Redo

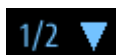
Keyboard	Usage
PAGE UP	Field right
PAGE DOWN	Field left
x	Screenshot
a	Meas
s	Config
F1	Softkey 1
F2	Softkey 2
F3	Softkey 3
F4	Softkey 4
F5	Softkey 5
F6	Softkey 6
F7	Softkey 7
F8	 Show additional softkeys
k	Trigger
l	Single
ESC	ESC
0	0
1	1
4	4
7	7
q	CH/FREQ
d	MTime
BACKSPACE	Back
ENTER	Enter
.	.
2	2
5	5
8	8
w	Ampt

Keyboard	Usage
F9	Hz
3	3
6	6
9	9
e	BW (Bandwidth)
F10	kHz
F11	MHz
F12	GHz
p	Record
i	Marker

1.6.2.3 Changing settings and activating functions

All functions available on the R&S EVSD1000 can be accessed using the keys on the external keyboard. Some keys provide a softkey menu on the display with further functions and settings.

1. Select a key as described in [Table 1-9](#) to activate a function directly, or to display a softkey menu.



2. Select the key for the setting or function as required.
If necessary, select [F8] to switch to the second softkey menu.
The function is activated, or a new window is displayed to view or change specific settings.
3. To set the focus on a specific setting in the displayed window, scroll through the individual settings by pressing the Up and Down arrow keys.
4. Enter a numeric or alphanumeric value as described in [Chapter 1.6.2.4, "Entering data"](#), on page 53.
5. Press [ENTER] to confirm the new setting and remove the focus.

1.6.2.4 Entering data

You enter data in input fields using the external keyboard, as described in [Table 1-9](#).

Entering numeric parameters

If a field requires numeric input, the keypad provides only numbers.

1. Define the parameter value by doing one of the following:

- Change the currently used parameter value by pressing the Up or Down arrow keys.
 - Enter the parameter value using the keypad.
2. To define the unit, press the corresponding unit key.
The unit is added to the entry.
 3. If the parameter does not require a unit, confirm the entered value by pressing [ENTER] or any of the unit keys.

Entering numbers and (special) characters via the keypad

If a field requires alphanumeric input, use the keypad on the external keyboard. Every alphanumeric key represents several characters and one number. The decimal point key (.) represents special characters, and the sign key (-) toggles between capital and small letters. The assignment of keys to characters is provided in [Table 1-10](#).

1. Press the key once to enter the first possible value.
All characters available via this key are displayed.
2. To choose another value provided by this key, press the key again, until your desired value is displayed.
3. With every key stroke, the next possible value of this key is displayed. If all possible values have been displayed, the series starts with the first value again. For information on the series, refer to [Table 1-10](#).
4. To change from capital to small letters and vice versa, press the sign key (-).
5. After entering a value, wait for 2 seconds to use the same key again.

Entering a blank

- Press the "0" key for 2 seconds.

Correcting an entry

1. Using the arrow keys, move the cursor to the right of the entry you want to delete.
2. Press the [BACK] key.
The entry to the left of the cursor is deleted.
3. Enter your correction.

Completing the entry

- Press [ENTER].
For numeric values, the default unit is appended to the numeric input.
To enter a value using a different unit, select the corresponding key.

Aborting the entry

- Press the [ESC] key.
The previous entry is restored.

Table 1-10: Keys for alphanumeric parameters

Key name (upper inscription)	Series of (special) characters and number provided
7	7 μ Ω ° € ¥ \$ ¢
8	A B C 8 Ä Å Ç
9	D E F 9 É
4	G H I 4
5	J K L 5
6	M N O 6 Ñ Ö
1	P Q R S 1
2	T U V 2 Ü
3	W X Y Z 3
0	<blank> 0 – @ + / \ < > = % &
.	. * : _ , ; " ' ? () #
–	<toggles between capital and small letters>

1.6.3 Remote control

You can control the R&S EVSD1000, including data transfer, remotely from another device using the LAN connection (Fast Ethernet).

You define the IP address and subnet mask in the "Setup" menu.

See [Chapter 1.6.1, "Basic connection settings"](#), on page 49.

Remote control is performed using predefined remote commands which are sent from the control device to the R&S EVSD1000. The R&S EVSD1000 can also return queried data to the control device.

For details on the available remote commands, see [Chapter 9, "Remote commands"](#), on page 229.

While in remote control, the R&S EVSD1000 display indicates "Remote" in the status bar. During remote control, the instrument is locked for manual operation via VNC. To return to manual operation, press [ESC].

2 Measurements and results

The R&S EVSD1000 provides both numerical and graphical results, depending on the current measurement task.

Different measurement tasks are performed in individual measurement modes, some of which are optional. The individual measurement modes are described in detail in the subsequent chapters of this documentation.

Measurement modes with numerical results

The following measurement modes provide numerical results:

- ILS LOC mode - determines localizer signal parameters
- ILS GP mode - determines glidepath signal parameters
- ILS MB mode - determines marker beacon signal parameters
- VOR mode (R&S EVSG-K2 VOR analysis) - determines modulation and signal parameters, as well as voice identifier parameters
- COM (R&S EVSG-K6 COM analysis) - determines signal parameters from VHF/UHF communication channels

Measurement modes with graphical results

The following measurement modes provide graphical results:

- RF Spectrum mode (R&S EVSG-K10 RF spectrum analysis) - displays the power vs. frequency diagram (spectrum) for a variable frequency range of the input signal
- IF Spectrum mode (R&S EVSG-K10 RF spectrum analysis) - displays an enlarged view of the spectrum for a fixed frequency of the input signal
- AF Spectrum mode (R&S EVSG-K11 AF spectrum analysis) - displays the spectrum of a demodulated RF signal with AM components
- AF Time Domain mode (R&S EVSG-K12 Time domain analysis) - displays the frequency vs. time diagram of the input signal, similar to an oscilloscope



Generally, each mode is configured individually. When you switch modes, the most recently defined settings for that mode are applied.

However, graphical results can also be displayed directly from the measurement modes with numeric results. In this case, the settings for the current mode are applied to the graphical results.

If the original measurement mode analyzes multiple carriers, you must select the carrier for which you want to see the graphical results when you switch the mode.

Measurement modes with both numerical and graphical results

The following measurement modes provide both numerical and graphical results:

- R&S EVSG-K4 GBAS analysis - displays measured and decoded information from GBAS/SCAT-I sequences, frames, and slots, and graphical displays for individual slots

Remote commands to retrieve results:[GETMDEF](#) on page 231[GETMEAS](#) on page 230[GBAS : GETMDEF](#) on page 315[GBAS : GETMEAS](#) on page 316**Common Numerical Measurement Mode Settings**

The following settings are displayed for most numerical measurement modes.

Measurement mode	57
Channel (CH)	57
Frequency (FREQ)	57
RF attenuation (Att)	57
Channel definition (1F/2F) - ILS LOC and ILS GP mode only	57
Level correction (Lev Corr)	57
Bandwidth (IF BW)	58
Measurement time (MTime)	58

Measurement mode

The currently active measurement mode on the active receiver board, e.g. "ILS LOC".
See [Chapter 3.2, "Measurement mode"](#), on page 59.

Channel (CH)

The receiver frequency channel on the active receiver board according to the ICAO frequency list. See ["Channel frequency configuration \(CH FREQ\)"](#) on page 81.

Frequency (FREQ)

The measured frequency on the active receiver board. See ["Channel frequency configuration \(CH FREQ\)"](#) on page 81.

RF attenuation (Att)

The used attenuation mode; see also ["RF Mode"](#) on page 82.

Channel definition (1F/2F) - ILS LOC and ILS GP mode only

The ILS Localizer and Glidepath measurements can detect both course and clearance data simultaneously. Alternatively, the individual channels can be measured only, or any one or two user-defined frequencies. By default, a wideband measurement is performed. The displayed measurement results depend on the selected channel and frequency configuration.

See [Chapter 4.1.4.1, "Channel and frequency configuration"](#), on page 77.

Level correction (Lev Corr)

The applied level correction by a transducer. See ["Transducer Correction"](#) on page 83.

Bandwidth (IF BW)

Bandwidth on which the measurement is performed. Depends on the [Channel definition \(1F/2F\) - ILS LOC and ILS GP mode only](#). See [Chapter 4.1.4.3, "Bandwidth \(BW\)"](#), on page 83.

Measurement time (MTime)

The duration of a single measurement. See [Chapter 4.1.4.4, "Setting the measurement time \(MTime\)"](#), on page 84.

3 Configuring the input signal and measurement mode

The following settings are common to all measurement modes. They define which data is measured and how, and are indicated at the top of the measurement window.

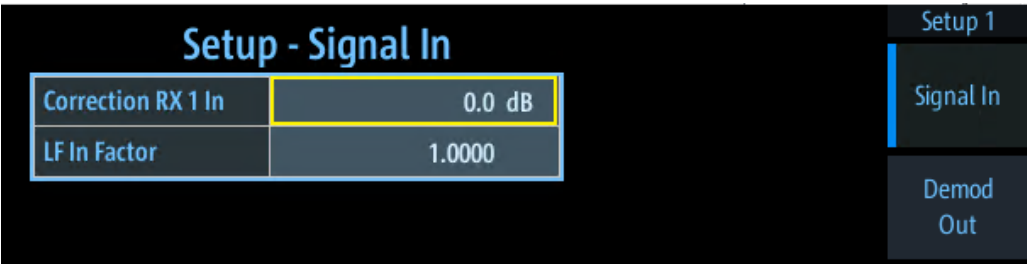
- [Input signal settings](#)..... 59
- [Measurement mode](#)..... 59

3.1 Input signal settings

Access VNC: [n] > [F1]

The following settings configure the receiver signal to be measured by the R&S EVSD1000.

For some measurement modes, you can switch the type of signal input. See the description of the individual modes.



- [Correction RX 1 In/ Correction RX 2 In](#)..... 59

Correction RX 1 In/ Correction RX 2 In

Configures the correction of the RX 1/ RX 2 input signal, respectively (in dB).
This value is subtracted from all levels and compensates effects of upstream lines and attenuators.

3.2 Measurement mode

The measurement mode determines the type of signal for which the measurement is performed (see [Chapter 2, "Measurements and results"](#), on page 56).

To select a measurement mode via VNC

1. Press the [m] key on the remote keyboard.
2. Select the required measurement mode using the arrow keys.
3. Press [Enter] to confirm the selection.

Remote commands:

[MODE_LOC](#) on page 257

[MODE_GP](#) on page 257

[MODE_MB](#) on page 283

[MODE_VOR](#) on page 289

[MODE_COM](#) on page 298

[MODE_FSCAN](#) on page 321

[MODE_IFSPECT](#) on page 326

[MODE_FFT](#) on page 331

[MODE_SCOPE](#) on page 336

[MODE_GBAS](#) on page 312

4 Numeric measurement modes

• ILS localizer and ILS glidepath (GP) modes.....	61
• R&S EVSG-K3 Marker beacon analysis.....	85
• R&S EVSG-K2 VOR analysis.....	95
• R&S EVSG-K6 COM analysis.....	114

4.1 ILS localizer and ILS glidepath (GP) modes

Access VNC: [m] > Down arrow key

The ILS Localizer and Glidepath measurements demodulate the AM components of the ILS signal and calculate characteristic parameters such as the modulation depth and frequency or phase for specific components. Furthermore, an FFT is performed on all components of the AF signal. The resulting AF spectrum allows you to measure the required components and their distortions (harmonics).

Remote command:

[MODE_LOC](#) on page 257

[MODE_GP](#) on page 257

• Localizer basics.....	61
• Glide slope basics.....	62
• ILS localizer and glidepath measurements and results.....	63
• ILS localizer and glidepath configuration.....	77

4.1.1 Localizer basics

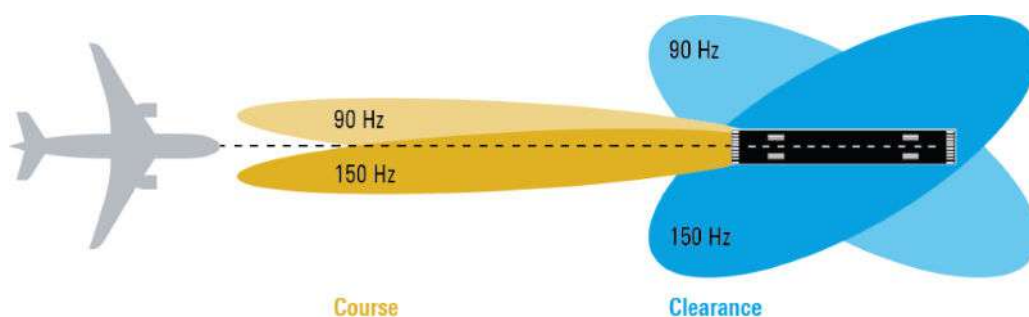
The localizer transmitter is located near the end of the runway (nearest to the start of the aircraft approach). Typically, horizontally aligned antennas transmit two intersecting main beams beside one another at carrier frequencies between 108 MHz and 112 MHz. As seen from the approaching aircraft coming in for a landing, the left beam is usually modulated at 90 Hz and the right beam at 150 Hz.

The information on position is provided after demodulation of the beam signals by evaluating the difference in depth of modulation (DDM).

$$DDM = m(x90) - m(x150)$$

The following scenarios are possible:

- Predominance of the 90 Hz beam: the aircraft is too far to the left and must turn to the right
- Predominance of the 150 Hz beam: the aircraft is too far to the right and must turn to the left
- The signal strength from both beams is equal: the aircraft is in the center, on the right course.



Course and clearance signals

The landing path is divided into the region further away from the runway, referred to as the course, and the runway itself, referred to as the clearance. Localizers are positioned in both areas, however they transmit their ILS signals using different frequencies, one that must travel farther, one for close-up. The frequencies differ only in a few kilohertz. The aircraft always receives both signals, and cannot (and need not) distinguish the two. However, for test purposes, it can be useful to measure the signals individually.

Morse code identification signal

The localizer not only allows the aircraft to determine its position, it also provides identification of the ILS transmitter. The localizer periodically transmits a Morse code at 1020 Hz which uniquely identifies the transmitter. The receiver thus knows that the ILS is operating correctly and that it is receiving the correct signal. The glide slope station does not transmit an identification signal.

4.1.2 Glide slope basics

The following description is taken from the Rohde & Schwarz Application Note [1MA193: "Aeronautical radio navigation measurement solutions"](#).

The glide slope transmitter is located near the end of the runway (nearest to the start of the aircraft approach).

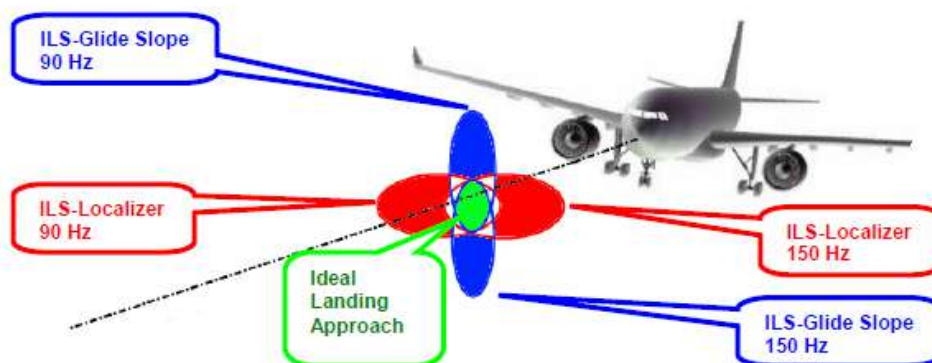


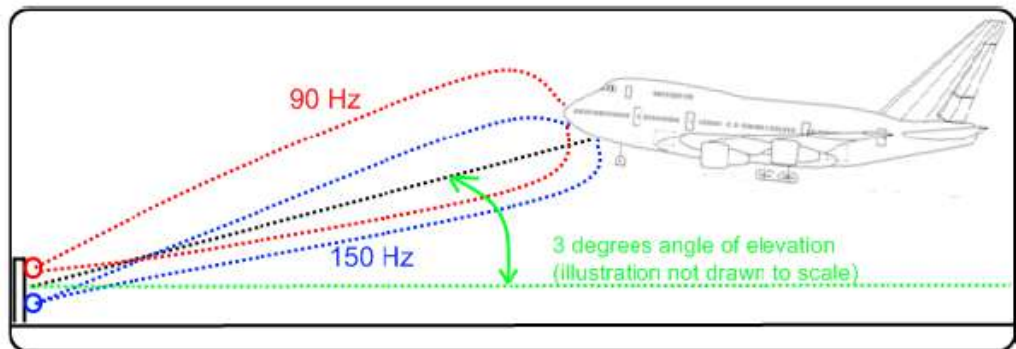
Figure 4-1: Approach navigation using instrument landing system (ILS)

Typically, vertically aligned antennas transmit two intersecting main beams on top of one another at carrier frequencies between 329 MHz and 335 MHz. The top beam is usually modulated at 90 Hz and the beam below at 150 Hz.

The information on position is provided after demodulation of the beam signals by evaluating the difference in depth of modulation (DDM). The following scenarios are possible:

- Predominance of the 90 Hz beam: the aircraft is too high and must descend
- Predominance of the 150 Hz beam: the aircraft is too low and needs to climb
- The signal strength from both beams is equal: the aircraft is in the center, on the right course.

If there is a predominance of the 90 Hz beam, then the aircraft is too high and must descend. A predominant 150 Hz means that the aircraft is too low and needs to climb.



4.1.3 ILS localizer and glidepath measurements and results

A single receiver board in the R&S EVSD1000 can measure data at two different receiver frequencies at the same time. Therefore, the ILS Localizer and Glidepath measurements can detect both course and clearance data simultaneously, and display the individual results. Alternatively, the individual channels can be measured only, or any one or two user-defined frequencies. By default, a wideband measurement is performed to obtain an initial overview of the input signal and determine the basic signal characteristics. The displayed measurement results depend on the selected channel and frequency configuration.

Autotune function

An autotune function is available to determine the precise frequencies of the signal components automatically. Thus, the demodulation bandwidth can be selected very precisely. Automatic mode is indicated by "Autotune" in the measurement settings area, followed by the current processing status.

The autotune process consists of the following steps:

1. "Search": the R&S EVSD1000 searches the input signal for peaks. You can define a power threshold that the carrier must exceed to be detected ("[Carrier Thresh](#)" on page 80).

2. "Check": the R&S EVSD1000 checks whether the detected peak is a valid ILS signal, based on the detected modulation and S/N ratio.

A valid signal is indicated by a green DDM measurement result, see ["DDM 90-150"](#) on page 69. In the recorded dataset, the STIOCPM status indicates a "V" for valid (see ["Status flags"](#) on page 77).

3.
 - "Auto Lock" option (default): "Lock": the R&S EVSD1000 remains tuned to the valid ILS signal frequency.

The frequency remains locked until:

- You switch measurement modes
- You change the channel or frequency settings
- You select the [Find Carrier](#) function.

In this case, a new search starts.

- "Auto Retune" option: "Found": As long as the R&S EVSD1000 determines a valid ILS signal, it remains tuned to that frequency. If the signal becomes invalid at that frequency, the R&S EVSD1000 returns to the "Search" process.



Adapting the frequency in autotune mode

The autotune function sets the measurement filter position such that the detected frequency is in the center of the filter bandwidth. While the frequency is locked, the filter position remains unchanged. If the bandwidth is narrow and the signal frequency changes, e.g. due to changes of the transmitter, the signal may no longer be covered completely by the measurement filter. In this case, the measurement results are distorted. If you assume that the ILS signal frequency has possibly changed, we recommend performing a new search using the [Find Carrier](#) function.

Measurement result views

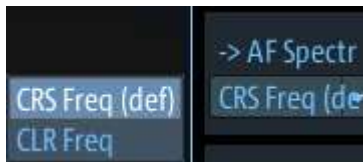
Due to the large number of different signal parameters, the ILS Localizer and Glidepath measurements provide multiple views for the measurement results.



Switching from numeric to graphical results

You can display graphical results directly from the ILS Localizer or Glidepath mode by selecting the softkey in the "Meas" menu. In this case, the settings for the current measurement are applied to the graphical results.

The graphical results are only available for a single carrier. Thus, when you switch to a graphical measurement mode from an ILS mode, you must select the carrier for which you want to see the graphical results. When you select the softkey, a submenu is displayed to select the carrier.



To return from the graphical results to the ILS Localizer or Glidepath mode, select "Return" ([F7]).

For details on the graphical results, see:

- [Chapter 5.1, "R&S EVSG-K10 RF spectrum analysis"](#), on page 124
- [Chapter 5.2, "IF spectrum analysis"](#), on page 128
- [Chapter 5.3, "R&S EVSG-K11 AF spectrum analysis"](#), on page 133
- [Chapter 5.4, "R&S EVSG-K12 Time domain analysis"](#), on page 139



Figure 4-2: ILS Localizer mode main results view

The following settings are displayed in the measurement settings area of the ILS Localizer/ ILS GS mode:

- Measurement mode
The currently active measurement mode on the active receiver board, e.g. "ILS GP". See [Chapter 3.2, "Measurement mode"](#), on page 59.
- "CH"
Receiver frequency channel, see ["Channel setup"](#) on page 78
- "Freq"
Nominal measurement frequency of the RF signal, see ["Freq"](#) on page 81.
- RF attenuation ("Att")
The used attenuation mode; see also ["RF Mode"](#) on page 82.
- Frequency selection "1F/2F"
See ["Carrier configuration \(1F/2F Config\)"](#) on page 78
- "Autotune"
Status of the automatic carrier selection, see ["Autotune function"](#) on page 63
- "Lev Corr"
Applied level correction, see ["Transducer Correction"](#) on page 83
- "IF BW"
Measurement bandwidth, see [Chapter 4.1.4.3, "Bandwidth \(BW\)"](#), on page 83
- Measurement time ("MTime")
See [Chapter 4.1.4.4, "Setting the measurement time \(MTime\)"](#), on page 84.

Remote command:

[VIEW_LLZ](#) on page 264

• RF level and frequency display	66
• IF spectrum preview	67
• ILS localizer and glidepath main view	68
• ILS localizer distortion view	71
• ILS localizer ID analysis view	73
• ILS localizer recording view	76

4.1.3.1 RF level and frequency display

The measured RF power and frequency of the input signal are displayed both numerically and graphically.

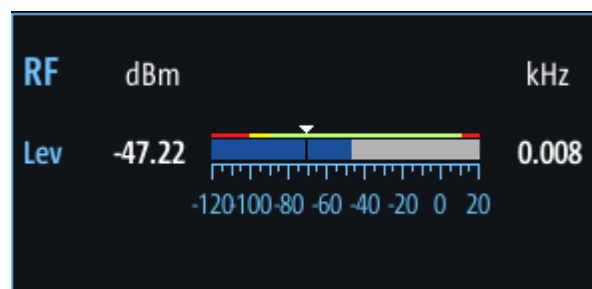


Figure 4-3: RF level display

The following results are provided:

- Numeric power level in dBm ("Lev")
For measurements on two frequencies: individual and sum power levels
- Measured frequency offset to the nominal frequency in kHz
- Numeric frequency offset of measured power
- Bargraph indicating the power and a color-coded overload state, where:
 - **Red**: overload state, check message
 - **Yellow**: power approaching overload state
 - **Green**: power in a valid range
- If applicable: overload messages



Overload messages

The following messages indicate an overload:

- "RF Overload"
Overload of the input mixer or of the analog IF path.
- "IF Overload"
Overload of the IF signal.
- "ADC Overload"
The dynamic range of the AD-converter is exceeded (clipping).

A combination of these overloads is also possible.

In all cases, set the RF attenuation to normal or low distortion (for RF input), or reduce the input level.

In recorded data lists, overloads are indicated by an "O", see ["Status flags"](#) on page 77.

Remote commands to retrieve results:

[LA?](#) on page 231

[RF?](#) on page 232

ILS LOC/GS mode:

[FSINGLE](#) on page 274

[FCRS](#) on page 274

[FCLR](#) on page 274

[LCRS](#) on page 276

[LCLR](#) on page 276

4.1.3.2 IF spectrum preview

A preview of the measured spectrum (power level vs. frequency) for the IF (intermediate frequency) signal is provided. The center frequency is the nominal channel fre-

quency. The frequency range shows the measured bandwidth. The power range is selected such that the noise level remains visible.

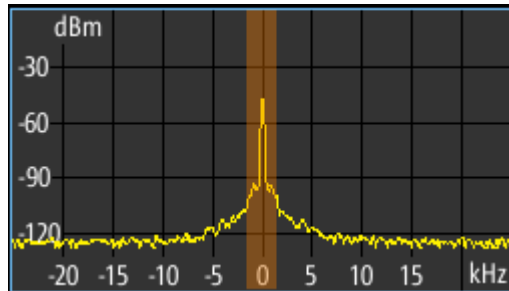


Figure 4-4: IF spectrum preview

This preview spectrum allows you to check if the current measurement settings are appropriate, such as the bandwidth or frequency offsets. For a larger, more detailed spectrum diagram, select one of the graphical Spectrum modes. If you switch to such a mode directly from a numeric measurement mode, the current measurement settings are applied to the spectrum automatically.

4.1.3.3 ILS localizer and glidepath main view

The ILS Localizer and Glidepath main view provides the following results:



Figure 4-5: ILS Localizer main view

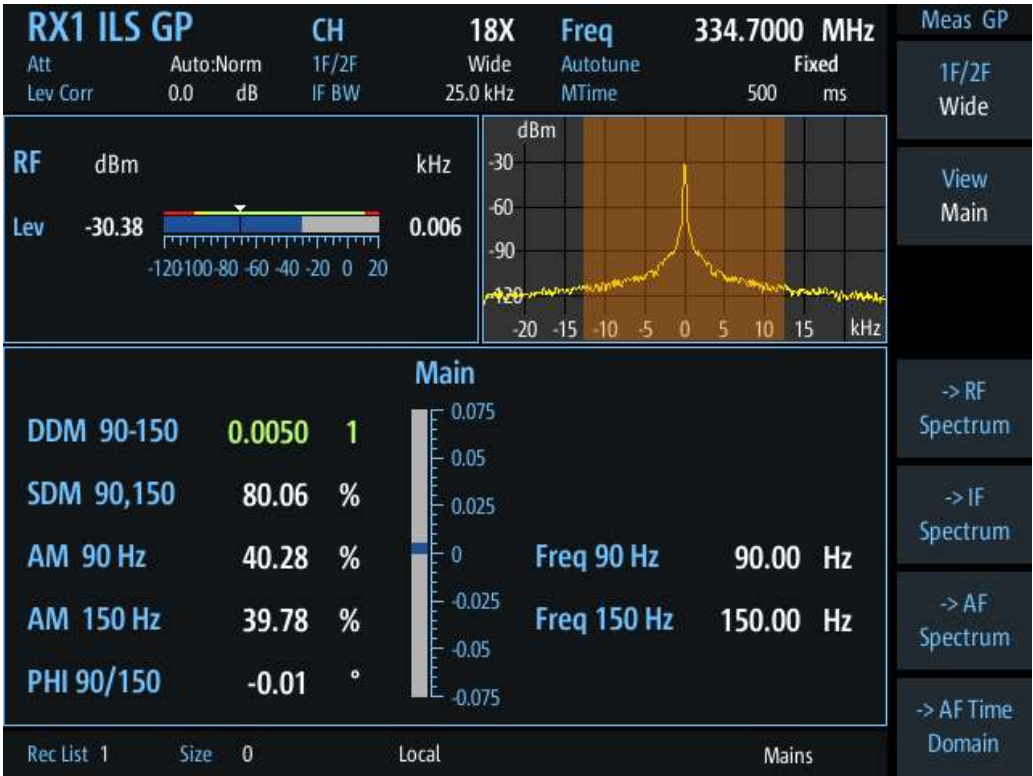


Figure 4-6: ILS Glidepath main view

DDM 90-150.....	69
SDM 90,150.....	70
AM 90 Hz.....	70
Freq 90 Hz.....	70
AM 150 Hz.....	70
Freq 150 Hz.....	70
PHI 90/150.....	70
ID Code.....	70

DDM 90-150

Difference in depth of modulation (DDM) between 90 Hz and 150 Hz AM signal ($m_{90\text{ Hz}} - m_{150\text{ Hz}}$)

Note: The DDM value is also displayed graphically as a bargraph for quick evaluation. A green DDM value indicates that a valid ILS signal has been determined.

Remote command:

- DD0 on page 274
- DD1 on page 274
- DCLR on page 273
- DCRS on page 273

SDM 90,150

Sum in Depth of Modulation (SDM); arithmetic sum of the modulation depth of the 90 Hz and the 150 Hz components without any influence of the phase between the components.

Remote command:

[SD0](#) on page 277

[SD1](#) on page 277

[SCLR](#) on page 277

[SCRS](#) on page 277

AM 90 Hz

AM modulation depth of 90 Hz ILS component

Remote command:

[AM2](#) on page 272

[AM2CLR](#) on page 272

[AM2CRS](#) on page 272

Freq 90 Hz

AF frequency of 90 Hz ILS component

Remote command:

[AF2](#) on page 271

AM 150 Hz

AM modulation depth of 150 Hz ILS component

Remote command:

[AM3](#) on page 272

[AM3CLR](#) on page 272

[AM3CRS](#) on page 273

Freq 150 Hz

AF frequency of 150 Hz ILS component

Remote command:

[AF3](#) on page 271

PHI 90/150

Phase angle measurement between 90 Hz and 150 Hz AM signal (90 Hz = reference signal); measurement range: ± 60 degrees

Remote command:

[PH](#) on page 276

ID Code

Morse-decoded ID with three or four letters.

Remote command:

[AC8](#) on page 271

[AC8](#) on page 293

4.1.3.4 ILS localizer distortion view

The ILS Localizer Dist view comprises all measurement parameters for the determination of the distortion factors for the 90 Hz / 150 Hz signal components.

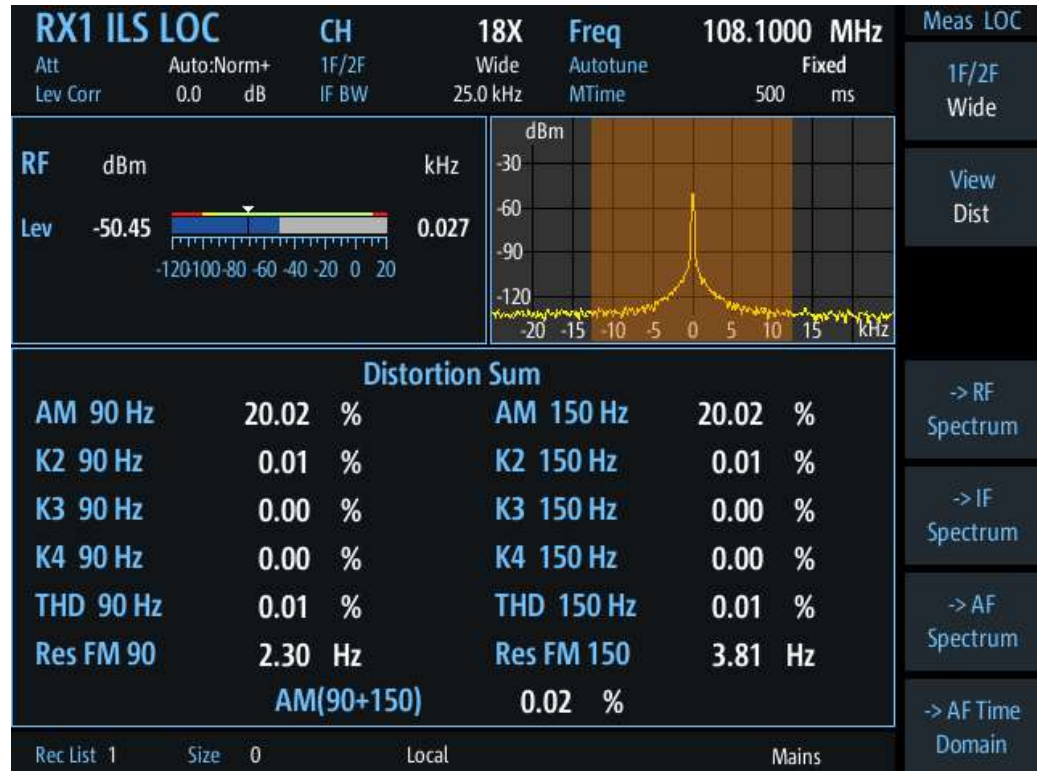


Figure 4-7: ILS Localizer Distortion view

AM 90 Hz.....	71
K2 90 Hz.....	72
K3 90 Hz.....	72
K4 90 Hz.....	72
THD 90 Hz.....	72
Res. FM 90.....	72
AM 150 Hz.....	72
K2 150 Hz.....	72
K3 150 Hz.....	73
K4 150 Hz.....	73
THD 150 Hz.....	73
Res. FM 150.....	73
AM (90+150).....	73

AM 90 Hz

AM modulation depth of 90 Hz ILS component

Remote command:

[AM2](#) on page 272

[AM2CLR](#) on page 272

[AM2CRS](#) on page 272

K2 90 Hz

Distortion 2nd order, 90 Hz signal

Remote command:

[K2_90](#) on page 275

K3 90 Hz

Distortion 3rd order, 90 Hz signal

Remote command:

[K3_90](#) on page 275

K4 90 Hz

Distortion 4th order, 90 Hz signal

Remote command:

[K4_90](#) on page 275

THD 90 Hz

Total Harmonic Distortion (THD), 90 Hz signal

Remote command:

[THD_90](#) on page 277

Res. FM 90

Residual frequency modulation for 90 Hz signal

Configure the filter using "[Res. FM Filt. \(ILS only\)](#)" on page 84.

Remote command:

[RESIDFM_90](#) on page 276

AM 150 Hz

AM modulation depth of 150 Hz ILS component

Remote command:

[AM3](#) on page 272

[AM3CLR](#) on page 272

[AM3CRS](#) on page 273

K2 150 Hz

Relative amplitude of an AF signal's second harmonic, calculated as:

<amplitude of second harmonic> / <amplitude of fundamental>

For 90 Hz + 150 Hz:

<mean amplitude of second harmonics> / <mean amplitude of fundamentals>

Remote command:

[K2_150](#) on page 275

K3 150 Hz

Relative amplitude of an AF signal's third harmonic, calculated as:

$\langle \text{amplitude of third harmonic} \rangle / \langle \text{amplitude of fundamental} \rangle$

For 90 Hz + 150 Hz:

$\langle \text{mean amplitude of third harmonics} \rangle / \langle \text{mean amplitude of fundamentals} \rangle$

Remote command:

[K3_150](#) on page 275

K4 150 Hz

Relative amplitude of the fourth harmonic for the 150 Hz signal component

Remote command:

[K4_150](#) on page 275

THD 150 Hz

Total Harmonic Distortion (THD) for the 150 Hz signal component

Remote command:

[THD_150](#) on page 277

Res. FM 150

Residual frequency modulation for 150 Hz signal

Remote command:

[RESIDFM_150](#) on page 276

AM (90+150)

Total AM modulation depth of the 90 Hz and the 150 Hz components, taking the phase between the components into account.

Remote command:

[AMMOD240](#) on page 273

4.1.3.5 ILS localizer ID analysis view

The ILS Localizer ID Analysis view provides the following results.



This view is not available for clearance (CLR) signals in two-frequency systems.

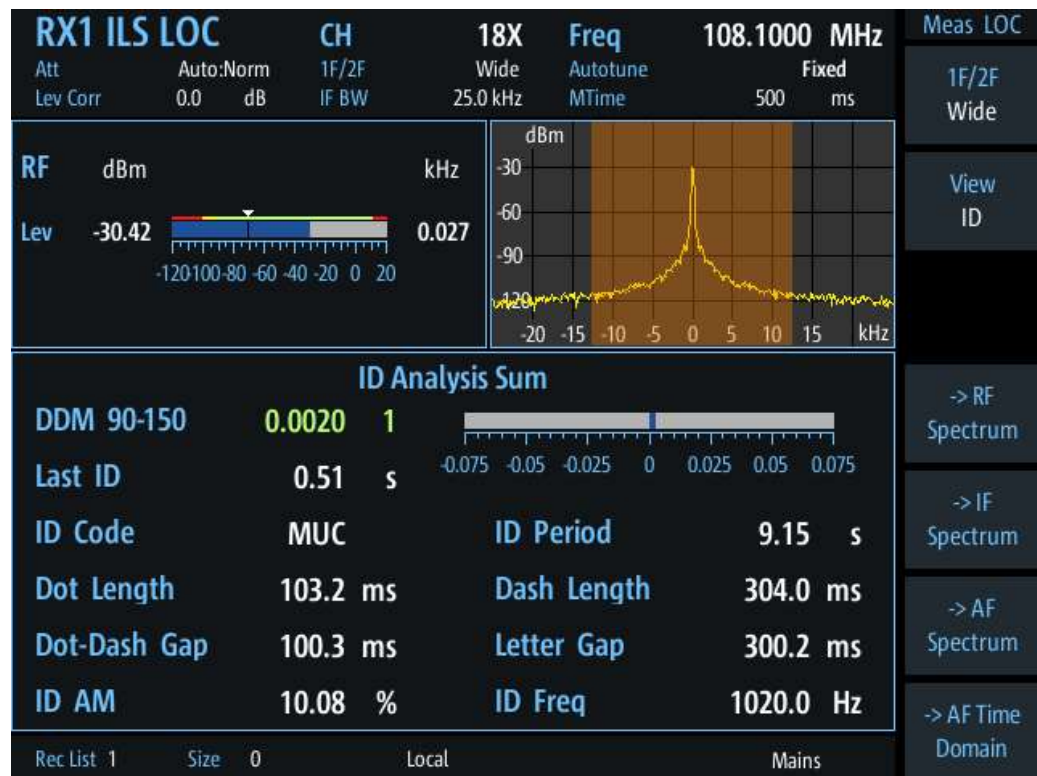


Figure 4-8: ID Analysis view

DDM 90-150	74
Last ID	75
ID Code	75
ID Period	75
Dot Length	75
Dash Length	75
Dot-Dash Gap	75
Letter Gap	75
ID AM	75
ID Freq	75

DDM 90-150

Difference in depth of modulation (DDM) between 90 Hz and 150 Hz AM signal ($m_{90 \text{ Hz}} - m_{150 \text{ Hz}}$)

Note: The DDM value is also displayed graphically as a bargraph for quick evaluation. A green DDM value indicates that a valid ILS signal has been determined.

Remote command:

[DD0](#) on page 274

[DD1](#) on page 274

[DCLR](#) on page 273

[DCRS](#) on page 273

Last ID

Time since last ID pulse was measured

Remote command:

[LASTID_TIME](#) on page 279

ID Code

Morse-decoded ID with three or four letters.

Remote command:

[AC8](#) on page 271

[AC8](#) on page 293

ID Period

Time between two measured ID pulses

Remote command:

[ID_PERIOD](#) on page 279

Dot Length

Length of time a dot is transmitted in the used Morse code in milliseconds.

Remote command:

[ID_DOT_LENGTH](#) on page 278

Dash Length

Length of time a dash is transmitted in the used Morse code in milliseconds.

Remote command:

[ID_DASH_LENGTH](#) on page 278

Dot-Dash Gap

Length of time that passes between a transmitted dot and a dash in the used Morse code in milliseconds.

Remote command:

[ID_DOTDASH_GAP](#) on page 278

Letter Gap

Length of time that passes between two transmitted letters in the used Morse code in milliseconds.

Remote command:

[ID_LETTER_GAP](#) on page 278

ID AM

AM Modulation depth of identifier signal (default: 1020 Hz).

Remote command:

[AM8](#) on page 273

[AM8](#) on page 294

ID Freq

Frequency of the morse signal.

Remote command:

[AF8](#) on page 272

[AF8](#) on page 294

4.1.3.6 ILS localizer recording view

The Recording view displays the recorded data for ILS Localizer measurements from the selected data list (see ["List"](#) on page 193). If available, the stored GNSS data from the GNSS receiver is also displayed.



Which measurement results are stored is described in the remote commands, see [GETDATADEF](#) on page 345.

The individual measurement results are described in the result views.



Status flags

The "STIOCPMV" value contains status flags, if applicable:

- **S**: Start (started manually)
- **T**: Triggered (externally)
- **I**: Invalid
- **O**: Overload (RF input signal too high)
- **C**: Corrected (includes RF input correction factor)
- **P**: PPS-synced
- **M**: Morse ID available
- **V**: Valid signal (ILS LOC/GP and VOR only)

For details on data logging, see [Chapter 7.2, "Recording measurement data"](#), on page 191.

Remote commands to retrieve data:

[GETDATADEF](#) on page 345

[GETDATASET](#) on page 346

4.1.4 ILS localizer and glidepath configuration

The following settings are available for the ILS Localizer and Glidepath measurements.



Settings for recording, including trigger settings, are described in [Chapter 7.2, "Recording measurement data"](#), on page 191.

• Channel and frequency configuration	77
• Ampt	82
• Bandwidth (BW)	83
• Setting the measurement time (MTime)	84
• DDM and SDM configuration	84

4.1.4.1 Channel and frequency configuration

The ILS Localizer and Glidepath measurements can detect both course and clearance carriers simultaneously. As an alternative, the individual carriers can be measured only, or any one or two user-defined frequencies. By default, a wideband measurement is performed to obtain an initial overview of the input signal and determine the basic signal characteristics. An autotune function is available to determine the precise frequencies of the signal components automatically. Thus, the demodulation bandwidth can be selected very precisely. The available measurement settings depend on the selected channel and frequency configuration.

- [Channel setup](#).....78
- [Carrier configuration \(1F/2F Config\)](#).....78
- [Channel frequency configuration \(CH FREQ\)](#).....81

Channel setup

Access VNC: [m] > [F1]

1F/2F

Selects the number of frequencies or channels to be measured.

For all frequencies except the wideband measurement, the autotune function automatically determines the measurement frequency (see "[CRS/CLR Carr \(Autotune function\)](#)" on page 79).

"1F"	One frequency only is measured, namely the nominal frequency, which is also the center frequency. The nominal frequency is configured by the Channel frequency configuration (CH FREQ) settings.
"2F"	Two frequencies are measured at the same time. Which frequencies are measured is configured by the Channel frequency configuration (CH FREQ) settings. The numeric results are calculated as the sum of both frequencies. In the RF Level display, the individual carriers are also indicated. In the RF Spectrum preview, both carriers are displayed.
"2F CRS"	Both the course and clearance frequencies are measured simultaneously. The results for both frequencies, as well as the sum of both, are displayed in the RF Level display. Both frequencies are displayed in the RF Spectrum preview. The numeric results are displayed for the course frequency. To view the results for the clearance frequency, switch to "2F CLR"
"2F CLR"	Both the course and clearance frequencies are measured simultaneously. The results for both frequencies, as well as the sum of both, are displayed in the RF Level display. Both frequencies are displayed in the RF Spectrum preview. The numeric results are displayed for the course frequency. To view the results for the course frequency, switch to "2F CRS". Note: Depending on the ILS system and the country, the course can be the upper or lower frequency (see " Upper Freq " on page 81).
"Wide"	A wideband measurement is performed around the nominal frequency. The frequency range is defined by the IF BW .

Remote command:

[DEMODE_LLZ](#) on page 258

[DEMODE_GS](#) on page 265

Carrier configuration (1F/2F Config)

Access VNC: [s] > "F1"

Configures the carriers and frequencies for measurements on a single or two frequencies (not wideband). Which settings are available depends on the "1F/2F" on page 78.

CRS/CLR Carr (Autotune function).....	79
Course.....	79
Clearance.....	80
1F Offset.....	80
Find Carrier.....	80
Carrier Thresh.....	80
Upper Freq.....	81

CRS/CLR Carr (Autotune function)

Defines whether the course and clearance carriers are determined automatically or manually.

"Man"	Specify the frequencies manually as offsets to either direction of the nominal frequency, see "Course" on page 79 and "Clearance" on page 80.
"Auto Lock"	Both carriers are determined automatically at the beginning of the measurement. Once a valid signal has been found, the carrier frequencies remain fixed until you perform a manual change. Automatic mode is indicated by "Autotune" in the measurement settings area, followed by the current processing status, see "Autotune function" on page 63. For all carrier measurements (not the wideband measurement), the "Auto Lock" function is enabled by default (see "1F/2F" on page 78).
"Auto Retune"	Both carriers are determined automatically at the beginning of the measurement. If the carrier frequency changes, the R&S EVSD1000 starts a new search (retuning). Automatic mode is indicated by "Autotune" in the measurement settings area, followed by the current processing status, see "Autotune function" on page 63.

Note: Adapting the frequency in autotune mode.

The autotune function sets the measurement filter position such that the detected frequency is in the center of the filter bandwidth. While the frequency is locked, the filter position remains unchanged. If the bandwidth is narrow and the signal frequency changes, e.g. due to changes of the transmitter, the signal may no longer be covered completely by the measurement filter. In this case, the measurement results are distorted. If you assume that the ILS signal frequency has possibly changed, we recommend performing a new search using the [Find Carrier](#) function.

Remote command:

Mode:

[LLZ_DEMFREQS_OFFSET_AUTOMAN](#) on page 261

[GS_DEMFREQS_OFFSET_AUTOMAN](#) on page 267

Course

Defines the course carrier as a frequency offset from the nominal frequency.

Remote command:

[LLZ_DEMFREQS_OFFSET_UPPERFREQ](#) on page 262

[GS_DEMFREQS_OFFSET_UPPERFREQ](#) on page 268

Clearance

Defines the clearance carrier as a frequency offset from the nominal frequency in the opposite direction to the course carrier.

Remote command:

[LLZ_DEMFREQS_OFFSET_LOWERFREQ](#) on page 261

[GS_DEMFREQS_OFFSET_LOWERFREQ](#) on page 268

1F Offset

For single frequency measurements only:

Defines an offset of the measured frequency to the nominal frequency.

Remote command:

[LLZ_DEMFREQS_OFFSET_1F](#) on page 261

[GS_DEMFREQS_OFFSET_1F](#) on page 268

Find Carrier

For manual carrier determination ([CRS/CLR Carr \(Autotune function\)](#)): "MAN"):

Determines the carrier frequencies automatically, but only once. The frequencies do not change automatically if the input signal changes.

For automatic carrier determination ("Autotune"): a new search is performed, see ["CRS/CLR Carr \(Autotune function\)"](#) on page 79.

Note: Adapting the frequency in autotune mode.

The autotune function sets the measurement filter position such that the detected frequency is in the center of the filter bandwidth. While the frequency is locked, the filter position remains unchanged. If the bandwidth is narrow and the signal frequency changes, e.g. due to changes of the transmitter, the signal may no longer be covered completely by the measurement filter. In this case, the measurement results are distorted. If you assume that the ILS signal frequency has possibly changed, we recommend performing a new search using the [Find Carrier](#) function.

Remote command:

[LLZ_START_FINDCARRIER](#) on page 262

[GS_START_FINDCARRIER](#) on page 269

Carrier Thresh

Defines a threshold for automatic carrier determination. The measured power level must exceed this level before the carrier frequency is adapted.

Remote command:

[GS_CARRIER_THRESHOLD_DB](#) on page 266

[LLZ_CARRIER_THRESHOLD_DB](#) on page 259

Upper Freq

The course and clearance carriers are defined as offsets to either side of the center frequency. Which frequency is considered to be the course carrier - the upper or lower frequency - depends on the used standard and the country it is used in. Thus, you can swap the carrier definition if necessary.

Remote command:
[SETUP:UNIT:UPPERFREQ](#) on page 251

Channel frequency configuration (CH FREQ)

Access VNC: [q]

The channel frequency determines the nominal frequency at which the measurement is performed. For some avionics standards, the channels are associated with specific frequencies. (See [Chapter A, "ILS channel frequency list"](#), on page 358 and [Chapter B, "VOR channel frequency list"](#), on page 360.)

[CH](#).....81

[Freq](#).....81

[Step Size](#).....81

CH

Sets the receiver frequency channel on the active receiver board according to the ICAO frequency list.

Remote command:
[RFCH](#) on page 232

Freq

Sets the nominal frequency for the measurement. By default, this frequency is also assumed to be the center frequency for spectrum displays, unless an offset is defined.

For measurements on two frequencies, the frequencies are defined as offsets to this nominal frequency.

Remote command:
[RF](#) on page 232

Step Size

Defines the frequency step size for the rotary knob when setting the frequency.

In many avionics signals, channels are assigned to frequencies with a fixed offset. By setting the step size of the rotary knob to the fixed offset, you can easily scroll through the signal's channel frequencies using the rotary knob. Thus, for example, you can analyze the measurement results for one channel after the other simply by changing the selected channel frequency with the rotary knob.

The default step size for ILS/VOR mode is 50 kHz.

Remote command:

ILS mode:
[LLZ_DEFAULT_FREQSTEP](#) on page 259
[GS_DEFAULT_FREQSTEP](#) on page 266

VOR mode:
[VOR_DEFAULT_FREQSTEP](#) on page 290

4.1.4.2 Ampt

Access VNC: [w]

The following settings define the amplification for the input signal.

RF Att.....	82
RF Mode.....	82
Transducer Correction.....	83

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see [Figure 4-3](#)). Note that the valid level range depends on the selected measurement mode.

"Manual"	The RF attenuation mode is specified manually (see "RF Mode" on page 82).
"Auto"	The RF attenuation mode is selected automatically. The signal attenuation is selected automatically according to the signal strength. This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable. When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

Remote command:

[SETATTMODE](#) on page 233

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

Transducer Correction

Configures the level correction. The specified value is added to the measured power levels to compensate for an inherent offset by the measurement setup, for example the antenna.

Remote command:

[SETUP:EXTERNALATT_RX1](#) on page 234

4.1.4.3 Bandwidth (BW)

Access VNC: [e]

The bandwidth determines the frequency range for which the measurement is performed. Depending on the measurement mode, and whether a wideband or a specific frequency is measured, different settings are available.

IF BW

Specifies the measurement filter bandwidth.

Ensure that the entire input signal lies within the specified bandwidth, particularly for narrow bandwidths.

Note: Adapting the frequency in autotune mode.

The autotune function sets the measurement filter position such that the detected frequency is in the center of the filter bandwidth. While the frequency is locked, the filter position remains unchanged. If the bandwidth is narrow and the signal frequency changes, e.g. due to changes of the transmitter, the signal may no longer be covered completely by the measurement filter. In this case, the measurement results are distorted. If you assume that the ILS signal frequency has possibly changed, we recommend performing a new search using the [Find Carrier](#) function.

Remote command:

1F/2F measurements:

[LLZ_DEM_1F2F_BW](#) on page 260

[GS_DEM_1F2F_BW](#) on page 266

Wideband measurements:

[LLZ_DEM_WIDE_BW](#) on page 260

[GS_DEM_WIDE_BW](#) on page 267

IF BW Dist/ID

Specifies the demodulation filter bandwidth for distortion and ID measurements.

Remote command:

1F/2F measurements:

[LLZ_DEM_ID_BW](#) on page 259

[GS_DEM_ID_BW](#) on page 266

Wideband measurements:

[LLZ_DEM_ID_WIDE_BW](#) on page 260

[GS_DEM_ID_WIDE_BW](#) on page 267

Res. FM Filt. (ILS only)

Defines the filter type used to determine residual FM (see [Chapter 4.1.3.4, "ILS localizer distortion view"](#), on page 71).

"ICAO" Filter according to ICAO specification

"Narrow" Narrow filter; the DDM filters used to determine the 90 Hz/ 150 Hz modulation values are used to avoid interference between the signals

Remote command:

[FILTER_LLZ_RESIDFM](#) on page 262

4.1.4.4 Setting the measurement time (MTime)

Access VNC: [d]

The measurement time determines the interval at which new measurement results are displayed. Internally, values are captured every 10 ms, that is: 100 per second.

If the defined measurement time is longer, the values captured internally in that interval are averaged and only the average value is displayed.

Note that the measurement time determines the minimum interval for values to be stored during recording (see ["Time"](#) on page 193).

Enter the time in milliseconds.

Remote command:

[MEASTIME](#) on page 232

4.1.4.5 DDM and SDM configuration

The following settings configure the DDM and SDM measurement results.

DDM Unit	84
SDM Unit	84
ILS Phase	85
DDM Polarity	85
DDM Bargr	85

DDM Unit

Specifies the unit of the DDM display.

1 (dimensionless value) | % | μ A

Remote command:

[SETUP:UNIT:DDM](#) on page 250

SDM Unit

Specifies the unit of the SDM display.

1 (dimensionless value) | % | μ A

Remote command:

[SETUP:UNIT:SDM](#) on page 251

ILS Phase

Specifies the value range in the ILS phase.

Bipolar: -60 ... +60° | Unipolar: 0 ... 120°

Remote command:

[SETUP:UNIT:ILSPHASE](#) on page 250

DDM Polarity

Specifies the DDM polarity.

90–150 | 150–90

Remote command:

[SETUP:UNIT:POLARITYDDM](#) on page 250

DDM Bargr

Configures the scaling of the DDM bargraph.

0.075 | 0.150 | 0.400 (dimensionless)

Remote command:

[SETUP:UNIT:BARGRAPH](#) on page 249

4.2 R&S EVSG-K3 Marker beacon analysis

Access VNC: [m] > Down arrow key

Remote command:

[MODE_MB](#) on page 283

- [Basics on marker beacons](#).....85
- [ILS marker beacon measurements and results](#)..... 86
- [Configuring ILS marker beacon measurements](#).....92

4.2.1 Basics on marker beacons

Marker beacon (MB) receivers are used for a rough distance measurement. They are available only for some ILS installations.

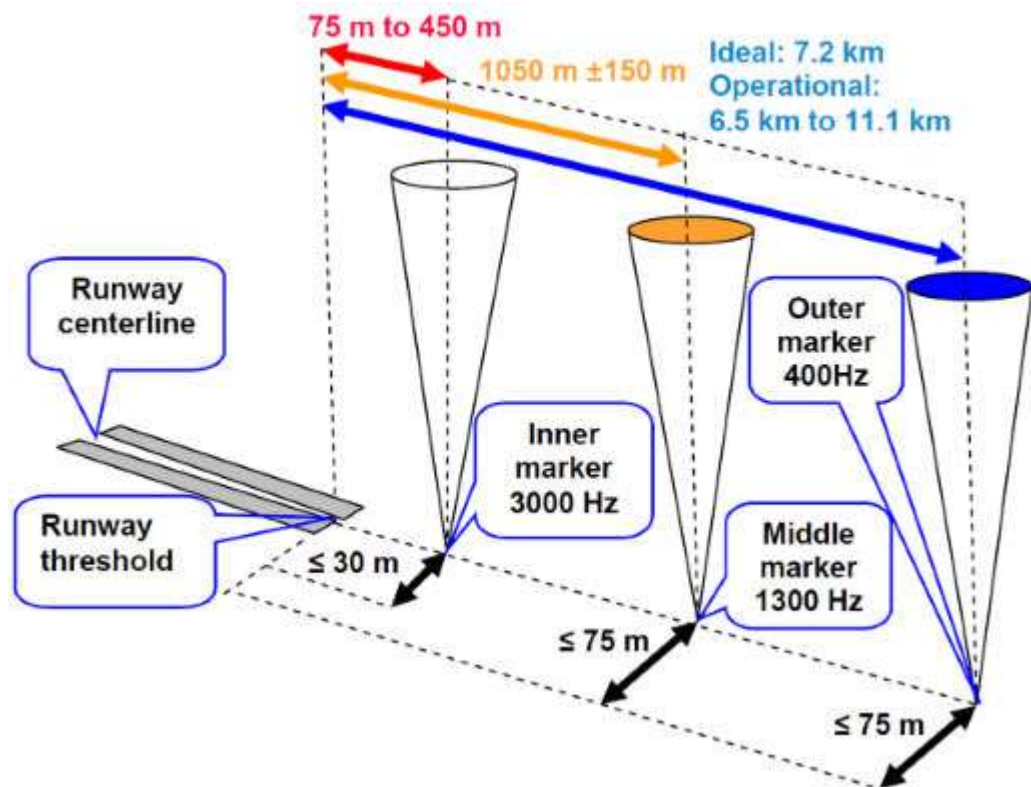


Figure 4-9: Marker beacon placement with respect to runway

Marker beacon receivers decode audio and provide signaling output to identify one of three marker beacons installed near the runway. They transmit a narrow beam width at 75 MHz carrier frequency in a vertical direction. Each of them has a different distinct modulation code to allow the receiver to identify which one it is flying over.

Both visual (color of the marker beacon) and audio tone identification is supported for determining which marker has been flown over. The audio/visual pairing of marker beacons is as follows:

- Outer marker flashes BLUE in the cockpit at 400 Hz (“relaxed” tone).
- Middle marker flashes AMBER in the cockpit at 1300 Hz (“hurried” tone).
- Inner marker flashes WHITE in the cockpit at 3000 Hz (“urgent” tone).

4.2.2 ILS marker beacon measurements and results

The ILS Marker Beacon measurement provides multiple views for the measurement results.



You can display graphical results directly from the ILS Marker Beacon mode by selecting the softkey in the "Meas" menu. In this case, the settings for the current measurement are applied to the graphical results.

To return from the graphical results to the ILS Marker Beacon mode, select "Return" ([F7]).

For details on the graphical results, see:

- Chapter 5.1, "R&S EVSG-K10 RF spectrum analysis", on page 124
- Chapter 5.2, "IF spectrum analysis", on page 128
- Chapter 5.3, "R&S EVSG-K11 AF spectrum analysis", on page 133
- Chapter 5.4, "R&S EVSG-K12 Time domain analysis", on page 139

Remote command:

VIEW_MB on page 284

• RF level and frequency display.....	87
• IF spectrum preview.....	88
• ILS marker beacon main view.....	89
• ILS marker beacon ID analysis.....	90
• ILS marker beacon recording view.....	91

4.2.2.1 RF level and frequency display

The measured RF power and frequency of the input signal are displayed both numerically and graphically.

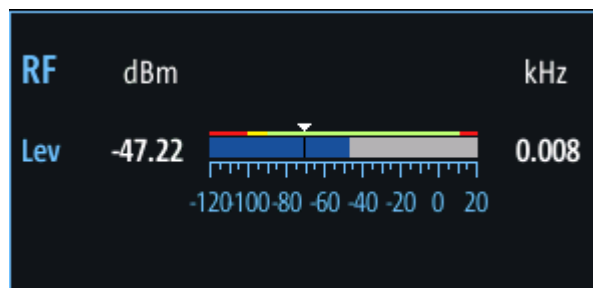


Figure 4-10: RF level display

The following results are provided:

- Numeric power level in dBm ("Lev")
For measurements on two frequencies: individual and sum power levels
- Measured frequency offset to the nominal frequency in kHz
- Numeric frequency offset of measured power
- Bargraph indicating the power and a color-coded overload state, where:
 - **Red:** overload state, check message
 - **Yellow:** power approaching overload state
 - **Green:** power in a valid range

- If applicable: overload messages



Overload messages

The following messages indicate an overload:

- "RF Overload"
Overload of the input mixer or of the analog IF path.
- "IF Overload"
Overload of the IF signal.
- "ADC Overload"
The dynamic range of the AD-converter is exceeded (clipping).

A combination of these overloads is also possible.

In all cases, set the RF attenuation to normal or low distortion (for RF input), or reduce the input level.

In recorded data lists, overloads are indicated by an "O", see ["Status flags"](#) on page 77.

Remote commands to retrieve results:

[LA?](#) on page 231

[RF?](#) on page 232

[FMEAS](#) on page 285

4.2.2.2 IF spectrum preview

A preview of the measured spectrum (power level vs. frequency) for the IF (intermediate frequency) signal is provided. The center frequency is the nominal channel frequency. The frequency range shows the measured bandwidth. The power range is selected such that the noise level remains visible.

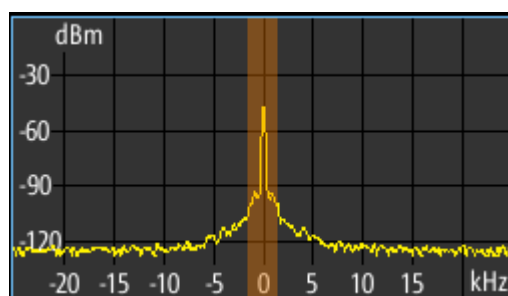
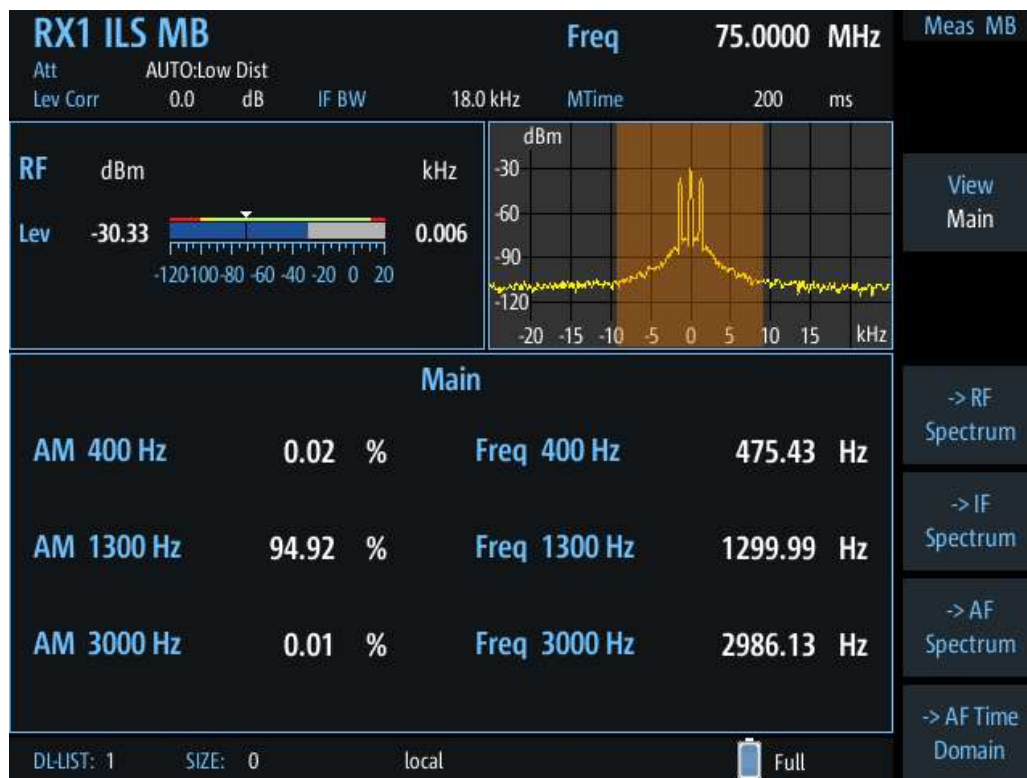


Figure 4-11: IF spectrum preview

This preview spectrum allows you to check if the current measurement settings are appropriate, such as the bandwidth or frequency offsets. For a larger, more detailed spectrum diagram, select one of the graphical Spectrum modes. If you switch to such a mode directly from a numeric measurement mode, the current measurement settings are applied to the spectrum automatically.

4.2.2.3 ILS marker beacon main view

The ILS Marker Beacon Main view provides the following results:



AM 400 Hz	89
Freq 400 Hz	89
AM 1300 Hz	89
Freq 1300 Hz	90
AM 3000 Hz	90
Freq 3000 Hz	90

AM 400 Hz

AM modulation depth of the 400-Hz component

Remote command:

[AM6](#) on page 286

Freq 400 Hz

Measured frequency of the 400-Hz component

Remote command:

[AF6](#) on page 285

AM 1300 Hz

AM modulation depth of the 1300-Hz component

Remote command:

[AM5](#) on page 286

Freq 1300 Hz

Measured frequency of the 1300-Hz component

Remote command:

[AF5](#) on page 285

AM 3000 Hz

AM modulation depth of the 3000-Hz component

Remote command:

[AM4](#) on page 285

Freq 3000 Hz

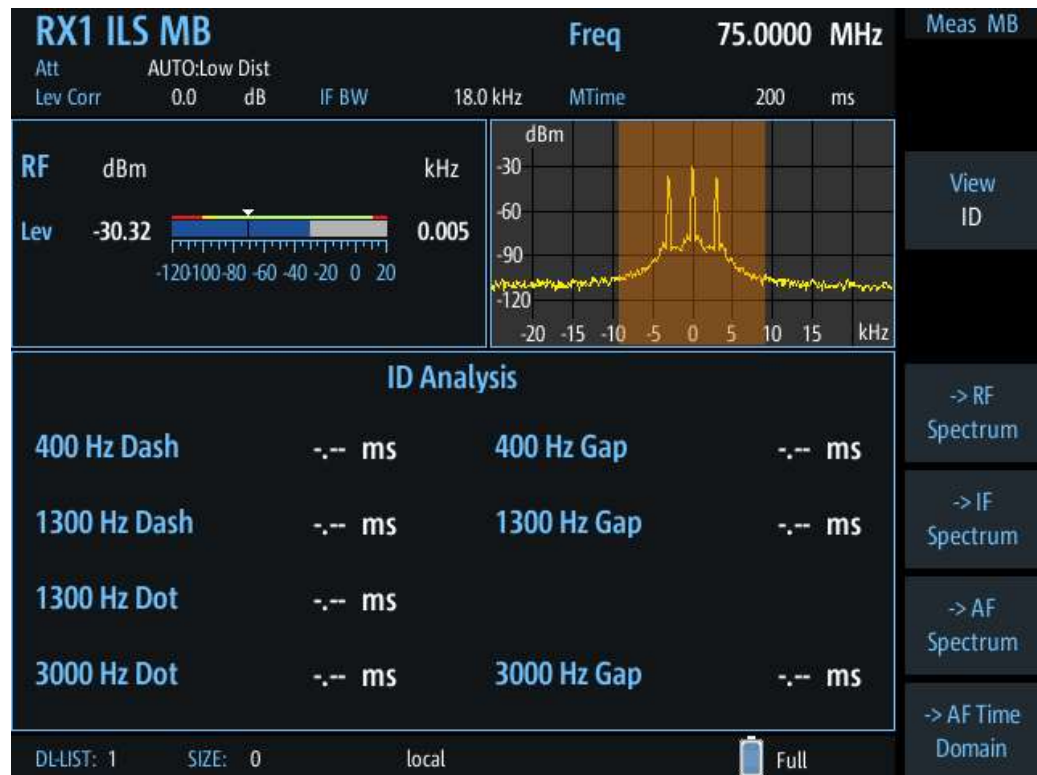
Measured frequency of the 3000-Hz component

Remote command:

[AF4](#) on page 285

4.2.2.4 ILS marker beacon ID analysis

Displays the results of the marker beacon signal id analysis.



400 Hz Dash.....	91
400 Hz Gap.....	91
1300 Hz Dash.....	91
1300 Hz Dot.....	91

1300 Hz Gap.....	91
3000 Hz Dot.....	91
3000 Hz Gap.....	91

400 Hz Dash

Displays the length of a dash for the outer marker (in ms).

Remote command:

[ID_F400_DASHLEN](#) on page 286

400 Hz Gap

Displays the gap between two dashes for the outer marker (in ms).

Remote command:

[ID_F400_GAP](#) on page 287

1300 Hz Dash

Displays the length of a dash for the middle marker (in ms).

Remote command:

[ID_F1300_DASHLEN](#) on page 286

1300 Hz Dot

Displays the length of a dot for the middle marker (in ms).

Remote command:

[ID_F1300_DOTLEN](#) on page 287

1300 Hz Gap

Displays the gap between dot and dash for the middle marker (in ms).

Remote command:

[ID_F1300_GAP](#) on page 287

3000 Hz Dot

Displays the length of a dot for the inner marker (in ms).

Remote command:

[ID_F3000_DOTLEN](#) on page 287

3000 Hz Gap

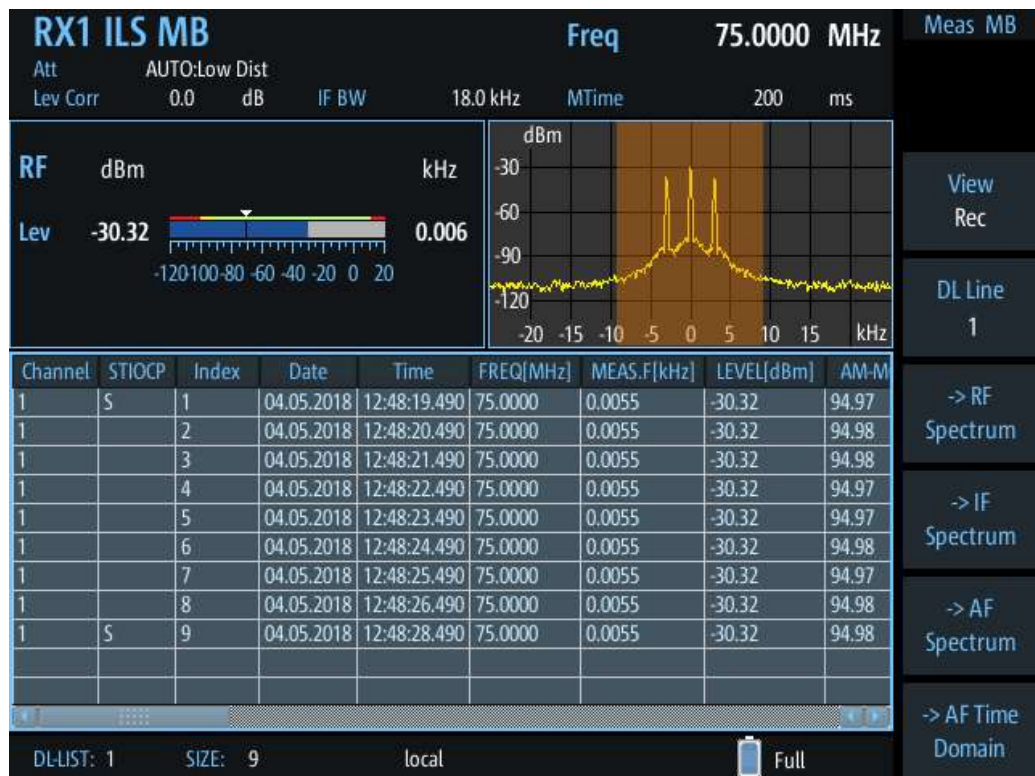
Displays the gap between two dashes for the inner marker (in ms).

Remote command:

[ID_F3000_GAP](#) on page 287

4.2.2.5 ILS marker beacon recording view

The Recording view displays the recorded data for ILS Localizer measurements from the selected data list (see "[List](#)" on page 193). If available, the stored GNSS data from the GNSS receiver is also displayed.



Which measurement results are stored is described in the remote commands, see [GETDATADEF](#) on page 345.

The individual measurement results are described in the other ILS Marker Beacon result views.

For details on data logging, see [Chapter 7.2, "Recording measurement data"](#), on page 191.



Status flags

The "STIOCPMV" value contains status flags, if applicable:

- **S**: Start (started manually)
- **T**: Triggered (externally)
- **I**: Invalid
- **O**: Overload (RF input signal too high)
- **C**: Corrected (includes RF input correction factor)
- **P**: PPS-synced
- **M**: Morse ID available
- **V**: Valid signal (ILS LOC/GP and VOR only)

4.2.3 Configuring ILS marker beacon measurements

The following settings are available for the ILS Marker Beacon measurement.



Settings for recording, including trigger settings, are described in [Chapter 7.2, "Recording measurement data"](#), on page 191.

- [Setting the receiver frequency](#)..... 93
- [Ampt](#).....93
- [Setting the measurement time \(MTime\)](#).....94

4.2.3.1 Setting the receiver frequency

Access VNC: [q]

The receiver frequency determines the nominal frequency at which the measurement is performed.

Freq	93
Step Size	93

Freq

Sets the nominal frequency for the measurement.

Remote command:

[RF](#) on page 232

Step Size

Defines the frequency step size for the rotary knob when setting the frequency.

The default step size for ILS MB mode is 50 kHz.

4.2.3.2 Ampt

Access VNC: [w]

The following settings define the amplification for the input signal.

RF Att	93
RF Mode	94
Transducer Correction	94

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see [Figure 4-3](#)). Note that the valid level range depends on the selected measurement mode.

"Manual" The RF attenuation mode is specified manually (see ["RF Mode"](#) on page 82).

"Auto" The RF attenuation mode is selected automatically.
The signal attenuation is selected automatically according to the signal strength.
This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable.
When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

Remote command:

[SETATTMODE](#) on page 233

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

Transducer Correction

Configures the level correction. The specified value is added to the measured power levels to compensate for an inherent offset by the measurement setup, for example the antenna.

Remote command:

[SETUP:EXTERNALATT_RX1](#) on page 234

4.2.3.3 Setting the measurement time (MTime)

Access VNC: [d]

The measurement time determines the interval at which new measurement results are displayed. Internally, values are captured every 10 ms, that is: 100 per second.

If the defined measurement time is longer, the values captured internally in that interval are averaged and only the average value is displayed.

Note that the measurement time determines the minimum interval for values to be stored during recording (see "Time" on page 193).

Enter the time in milliseconds.

Remote command:

[MEASTIME](#) on page 232

4.3 R&S EVSG-K2 VOR analysis

Access VNC: [m] > Down arrow key

If the optional R&S EVSG-K2 VOR analysis is installed, signals from VOR systems can be analyzed with the R&S EVSD1000.

Remote command:

[MODE_VOR](#) on page 289

4.3.1 VOR basics

Some background knowledge on basic terms and principles used in VOR measurements is provided here for a better understanding of the required configuration settings.

4.3.1.1 VHF omnidirectional radio range (VOR)

Very high frequency (VHF) omnidirectional radio range (VOR) is a radio navigation system for short and medium distance navigation. The VOR radio navigation aid supplies the aircraft with directional information, angle information relative to the magnetic north from the site of the beacon. Thus, it helps aircraft to determine their position and stay on course. The range covered by a VOR station is ideally a circle around the VOR station with a radius depending on the flight altitude.

A VOR system consists of a ground transmission station and a VOR receiver on board the aircraft.

Ground transmitter

The transmitter stations operate at VHF frequencies of 108 MHz to 118 MHz, with the code identification (COM/ID) transmitting on a modulation tone of 1.020 kHz. It emits two types of signals:

- An omnidirectional reference signal (REF) that can consist of two parts:
 - 30 Hz frequency modulated (FM) sine wave on subcarrier 9.96 kHz from amplitude modulation (AM) carrier

- 1020 Hz AM modulated sine wave Morse code
- A directional positioning signal, variable (VAR): 30 Hz AM modulated sine waves with variable phase shift

VOR receiver

The VOR receiver obtains the directional information by measuring the phase difference of two 30 Hz signals transmitted by the beacon. A conventional VOR station (CVOR) transmits with a rotating antenna. From the rotation, a sine wave AM signal arises in the receiver, whose phase position depends on the present angle of rotation. The rotation frequency of the antenna sets the modulation frequency at 30 Hz.

Instead of using a rotating antenna, DVOR stations (Doppler) divide the circumference of the antenna into 48 or 50 segments, covering each segment by its own antenna. Each antenna transmits the unmodulated subcarrier from one antenna to the next, so that the signal completes the round trip 30 times per second.

To determine the radial, the phase difference to a reference phase must be measured. This reference phase must be independent of the rotation of the antenna. Thus, it is modulated with a frequency deviation of 480 Hz in FM onto a secondary carrier with 9.96 kHz. It is then emitted over a separate antenna with a round characteristic.

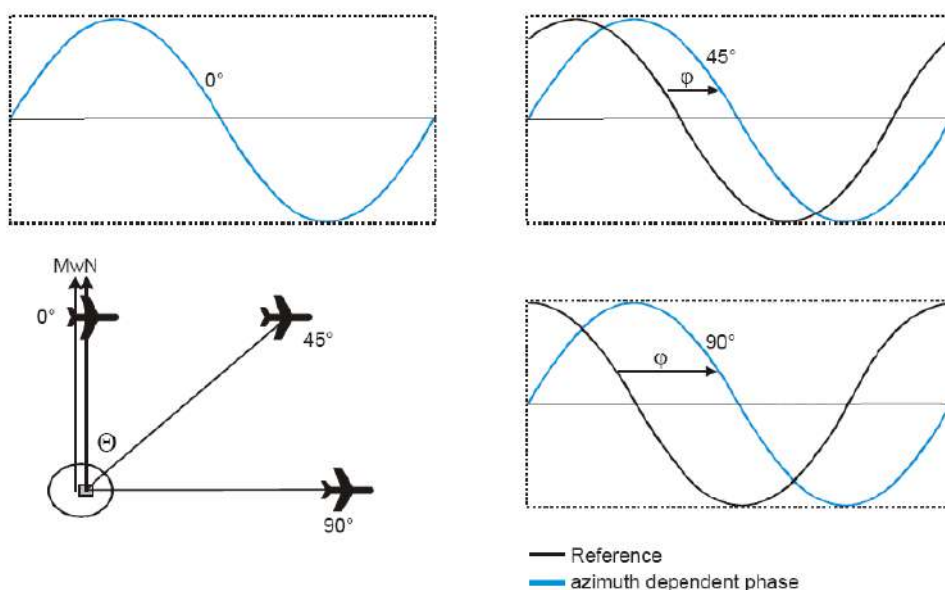


Figure 4-12: Basics of the VOR phase angles (Φ) depending on the azimuth angle (Θ)

The frequency modulated secondary carrier for the reference phase is itself again modulated in AM on the RF carrier of the VOR station. In addition to the signals necessary for navigation, a Morse code with 1020 Hz can be transmitted on the VOR carrier. Also, speech in the usual AF from 300 Hz to 3.3 kHz can be transmitted. Often the voice channel of a VOR station is used for the transmission of ATIS (Automatic Terminal Information Service) messages. The Morse code can be used to identify the VOR station, similar to the "Morse code identification signal" on page 62 in the ILS signal.

The spectrum of a VOR signal is therefore composed of the carrier and three modulated components.

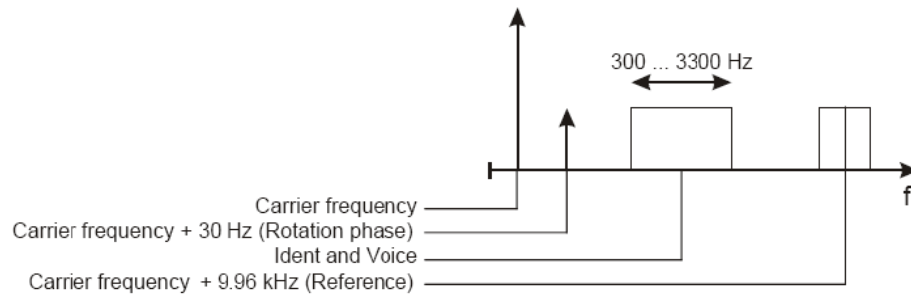


Figure 4-13: Example of the VOR Spectrum

The identical modulation degree $m = 0.3$ for all three components was selected in ICAO annex-10 [63] such that the total signal still contains 10% modulation reserve. The carrier is therefore not suppressed at any time. The 9960 Hz reference carrier is FM modulated with 480 Hz deviation. The VOR signal generation as under ICAO is shown below.

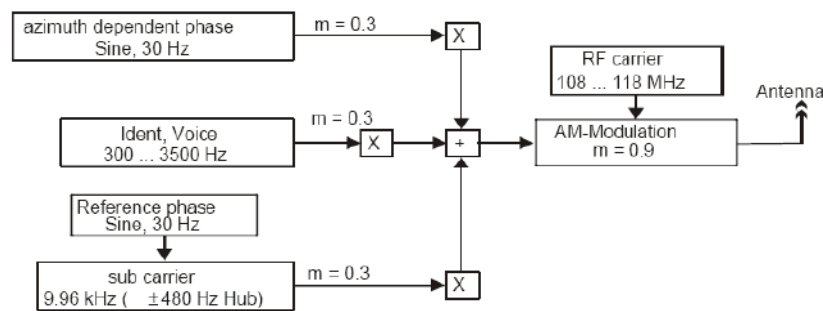


Figure 4-14: Basics of the VOR signal generation

4.3.1.2 VOR demodulator

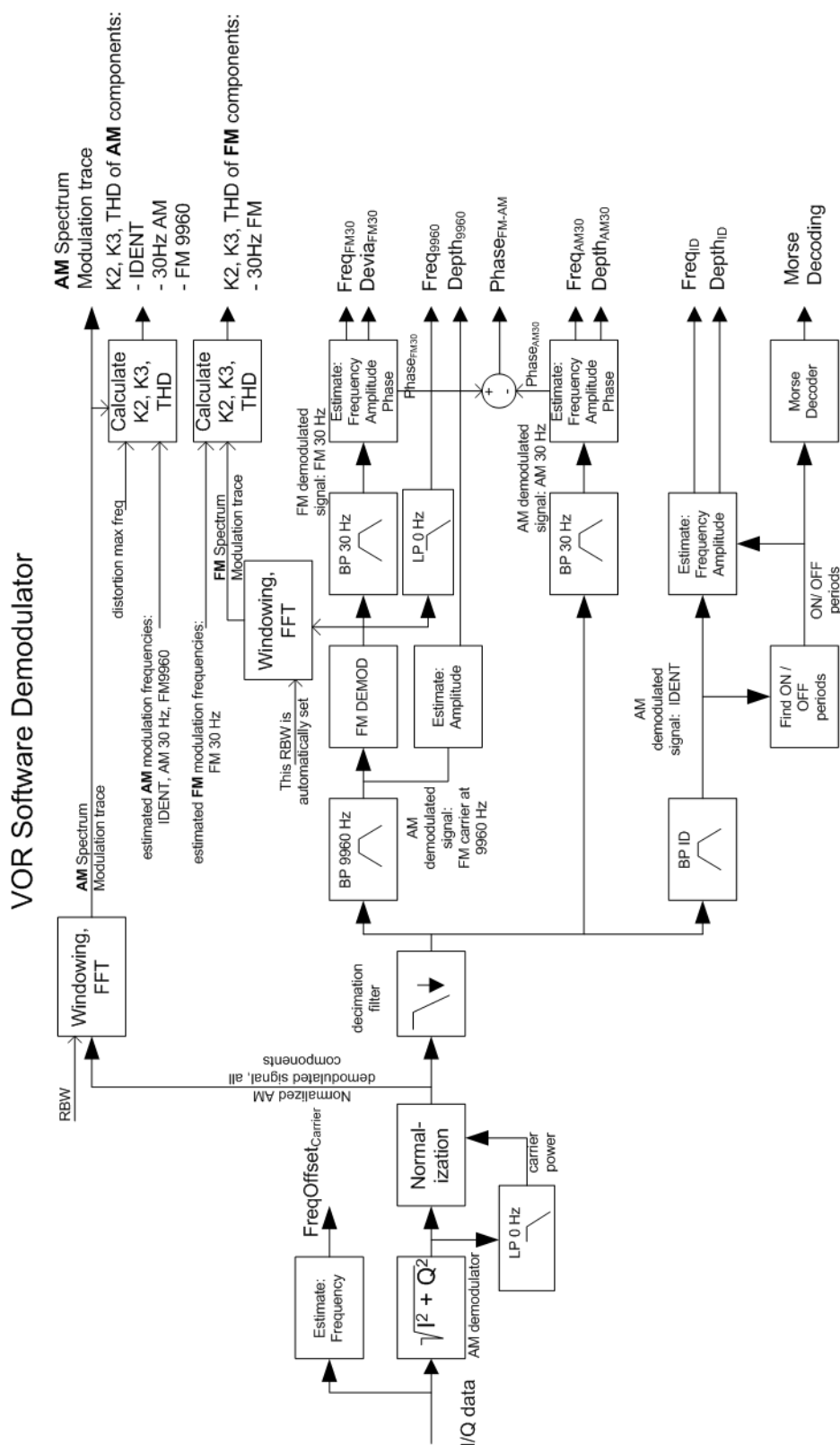


Figure 4-15: Block diagram of the VOR software demodulator

The VOR signal contains three AM modulated components that must be separated in a first step:

- Rotational signal (30 Hz)
- Identification/voice part (300 Hz to 4 kHz)
- FM modulated carrier (9960 Hz $\pm$ 700 Hz)

To obtain the AM depth, a lowpass filter must calculate the mean carrier power, while suppressing all other signal components. The mean carrier power is then used to normalize the instantaneous magnitude of the I/Q signal. The result is the AM modulation depth signal vs. time. The three AM components are separated using bandpass filters covering the individual frequency ranges.

A Morse decoder detects and decodes the ON and OFF periods in the identifier signal.

The separated FM modulated carrier is passed through an FM demodulator. The FM carrier frequency (nominal 9960 Hz) is calculated as the average output value of the FM demodulator. To obtain the 30 Hz reference signal, the FM demodulator output is filtered by the same narrow 30 Hz bandpass as the 30 Hz AM rotational component. FM deviation is calculated using the estimated magnitude of the 30 Hz reference signal.

The azimuth is calculated as the phase difference of the 30 Hz reference signal and the 30 Hz rotational signal.

VOR distortion

In the VOR software demodulator two kinds of signals are analyzed regarding distortions:

- AM Distortion: The AM modulation depth vs time signal is processed by an FFT, with a user-defined resolution bandwidth. The trace is displayed in the "Modulation Spectrum" display. The K2, K3 and THD results of the AM components are calculated based on the FFT trace and the estimated modulation frequencies.
- FM Distortion: The FM modulation depth vs time signal is processed by an FFT, using a resolution bandwidth automatically set by the application. You cannot view the resulting trace. The K2, K3 and THD results of the FM components are calculated based on the FFT trace and the estimated modulation frequencies.

AM modulation depth

To obtain the AM depth, a lowpass filter must calculate the mean carrier power, while suppressing all other signal components. The mean carrier power is then used to normalize the instantaneous magnitude of the I/Q signal. The result is the AM modulation depth signal versus time. It is then used to calculate the following AM modulation depths:

- Depth₉₉₆₀: AM modulation depth of the FM carrier, typically at 9960 Hz
- Depth_{AM30}: AM modulation depth of the 30 Hz rotational signal
- Depth_{ID}: AM modulation depth of the identification/voice signal

FM modulation depth

The FM deviation $\text{Devia}_{\text{FM30}}$ (typically 480 Hz) is calculated by estimating the magnitude of the FM demodulated 30 Hz reference signal.

Azimuth (phase difference at 30 hz)

The phases of both the 30 Hz FM and 30 Hz AM signal are estimated at exactly the same time instant. The azimuth (Phase FM-AM) is calculated as the phase difference between the two.

AF frequencies

In the VOR demodulator the AF frequencies are calculated:

- $\text{Freq}_{\text{AM30}}$: 30 Hz Rotational-signal (AM)
- $\text{Freq}_{\text{FM30}}$: 30 Hz Reference-signal (FM)
- Freq_{ID} : voice / identification; From 300 Hz to 4 kHz, typically 1020 Hz
- Freq_{9960} : The carrier frequency of the FM carrier, typically 9960 Hz; Calculated as mean value of the FM demodulator output

4.3.1.3 Phase notation in VOR measurements

In VOR measurements, the phase can be provided using two different notations, indicated in the following illustration:

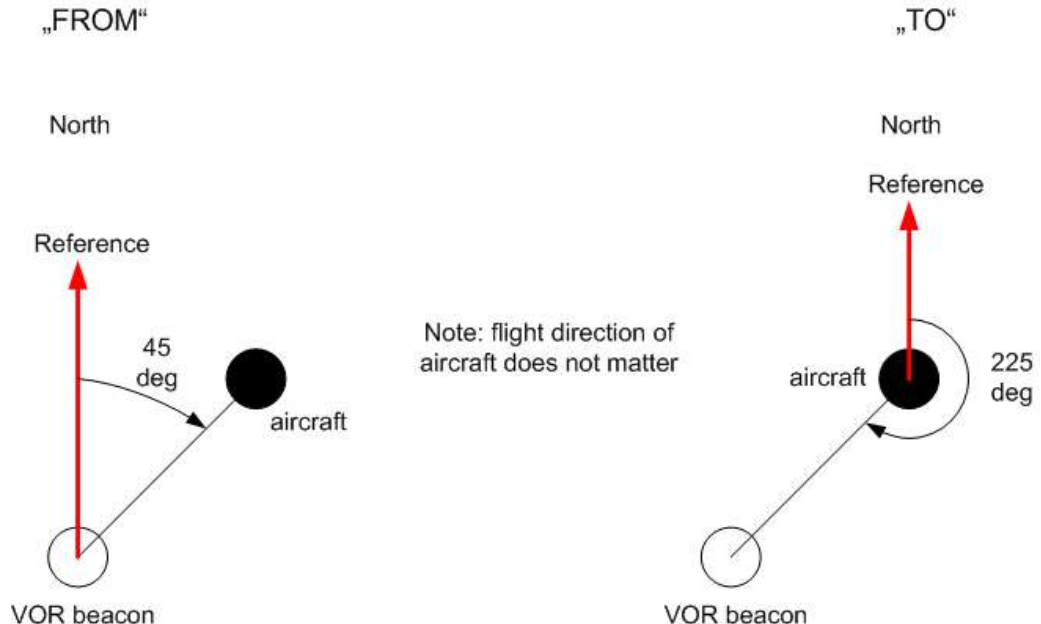


Figure 4-16: Phase notation in VOR measurements

Phase is always counted counter-clockwise, starting at the reference.

The reference depends on the selected notation:

- **FROM:** North direction at the VOR beacon

- **TO:** North direction at the receiver/ aircraft

To convert one notation to the other, use the following equation:

$$Phase_{TO} = Phase_{FROM} + 180 \text{ deg}$$

4.3.2 VOR measurements and results

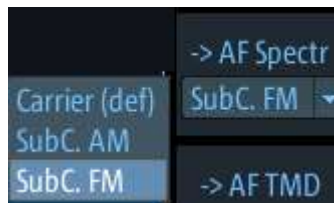
The VOR measurement provides multiple views for the measurement results.



Switching from numeric to graphical results

You can display graphical results directly from the VOR mode by selecting the softkey in the "Meas" menu. In this case, the settings for the current measurement are applied to the graphical results.

The graphical results are only available for a single carrier. Thus, when you switch to a graphical measurement mode from VOR mode, you must select the carrier for which you want to see the graphical results. When you select the softkey, a submenu is displayed to select the carrier.



You can select one of the following carriers:

- Main carrier, AM demodulated
- Subcarrier, AM demodulated (AM component)
- Subcarrier, FM demodulated (FM component)

To return from the graphical results to the VOR mode, select "Return" ([F7]).

For details on the graphical results, see:

- [Chapter 5.1, "R&S EVSG-K10 RF spectrum analysis"](#), on page 124
- [Chapter 5.2, "IF spectrum analysis"](#), on page 128
- [Chapter 5.3, "R&S EVSG-K11 AF spectrum analysis"](#), on page 133
- [Chapter 5.4, "R&S EVSG-K12 Time domain analysis"](#), on page 139

Remote command:

[VIEW_VOR](#) on page 290

• RF level and frequency display	102
• IF spectrum preview	103
• VOR main view	103
• VOR distortion view	105
• VOR ID analysis view	107
• VOR recording view	109

4.3.2.1 RF level and frequency display

The measured RF power and frequency of the input signal are displayed both numerically and graphically.

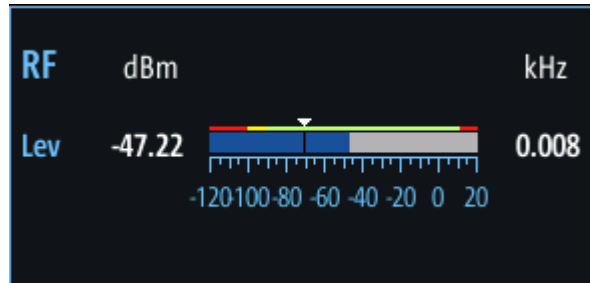


Figure 4-17: RF level display

The following results are provided:

- Numeric power level in dBm ("Lev")
For measurements on two frequencies: individual and sum power levels
- Measured frequency offset to the nominal frequency in kHz
- Numeric frequency offset of measured power
- Bargraph indicating the power and a color-coded overload state, where:
 - **Red:** overload state, check message
 - **Yellow:** power approaching overload state
 - **Green:** power in a valid range
- If applicable: overload messages



Overload messages

The following messages indicate an overload:

- "RF Overload"
Overload of the input mixer or of the analog IF path.
- "IF Overload"
Overload of the IF signal.
- "ADC Overload"
The dynamic range of the AD-converter is exceeded (clipping).

A combination of these overloads is also possible.

In all cases, set the RF attenuation to normal or low distortion (for RF input), or reduce the input level.

In recorded data lists, overloads are indicated by an "O", see ["Status flags"](#) on page 77.

Remote commands to retrieve results:

[LA?](#) on page 231

[RF?](#) on page 232

[FMEAS](#) on page 295

4.3.2.2 IF spectrum preview

A preview of the measured spectrum (power level vs. frequency) for the IF (intermediate frequency) signal is provided. The center frequency is the nominal channel frequency. The frequency range shows the measured bandwidth. The power range is selected such that the noise level remains visible.

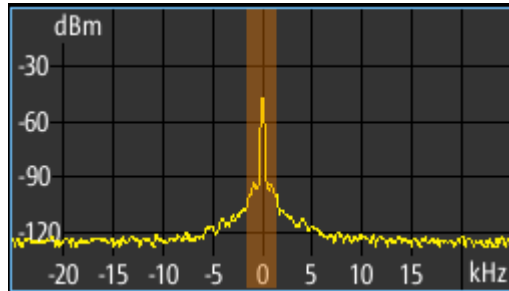
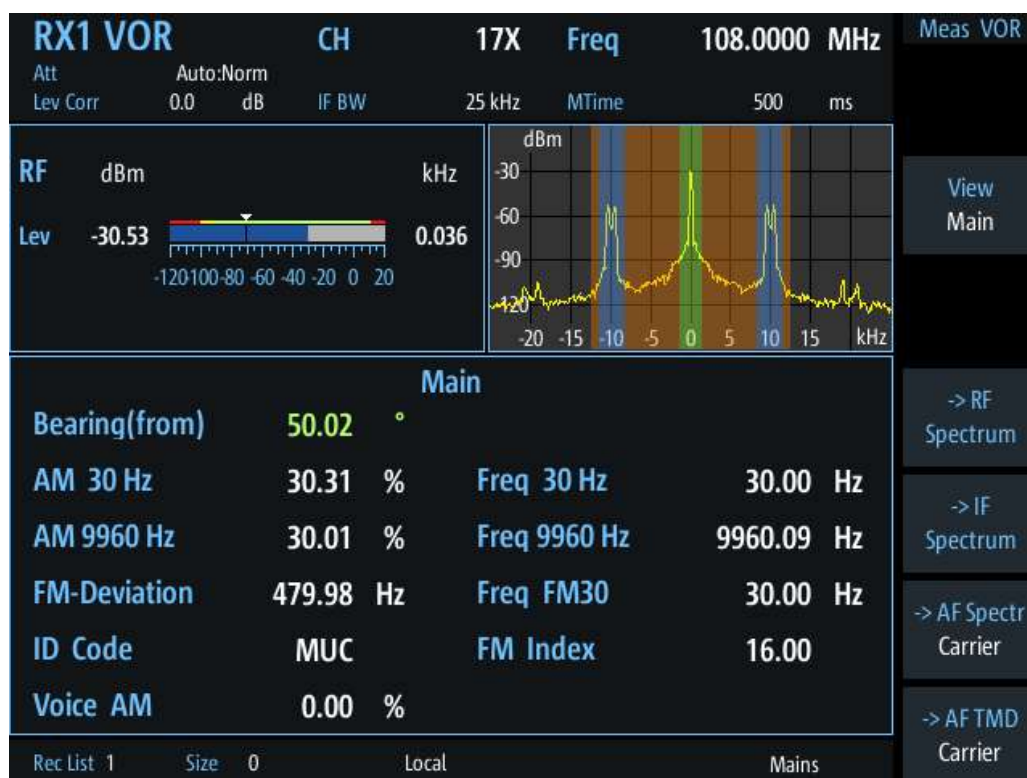


Figure 4-18: IF spectrum preview

This preview spectrum allows you to check if the current measurement settings are appropriate, such as the bandwidth or frequency offsets. For a larger, more detailed spectrum diagram, select one of the graphical Spectrum modes. If you switch to such a mode directly from a numeric measurement mode, the current measurement settings are applied to the spectrum automatically.

4.3.2.3 VOR main view

Displays the main measurement results.



Bearing (from).....	104
AM 30 Hz.....	104
AM 9960 Hz.....	104
FM-Deviation.....	105
ID Code.....	105
Voice AM.....	105
Freq 30 Hz.....	105
Freq 9960 Hz.....	105
Freq FM30.....	105
FM Index.....	105

Bearing (from)

Phase between both 30-Hz signals (direction of the R&S EVSD1000 in relation to the ground station).

A green bearing value indicates that a valid VOR signal has been determined.

Remote command:

[BE](#) on page 295

AM 30 Hz

AM modulation depth of 30 Hz AM rotational signal

Remote command:

[AM0](#) on page 294

AM 9960 Hz

AM modulation depth of 9.96 kHz subcarrier

Remote command:

[AM1](#) on page 294

FM-Deviation

FM frequency deviation of 30 Hz subcarrier

Remote command:

[FM0](#) on page 295

ID Code

Morse-decoded ID with three or four letters.

Remote command:

[AC8](#) on page 271

[AC8](#) on page 293

Voice AM

AM-Modulation depth of the voice signal (in the range 300 Hz to 3000 Hz, identifier notched).

Remote command:

[AM9](#) on page 294

Freq 30 Hz

AF frequency of 30 Hz AM rotational signal

Remote command:

[AF0](#) on page 293

Freq 9960 Hz

Mean carrier frequency of the FM modulated subcarrier, typically at 9.96 kHz

Remote command:

[AF1](#) on page 293

Freq FM30

AF frequency of the 30 Hz reference signal

Remote command:

[AF2](#) on page 294

FM Index

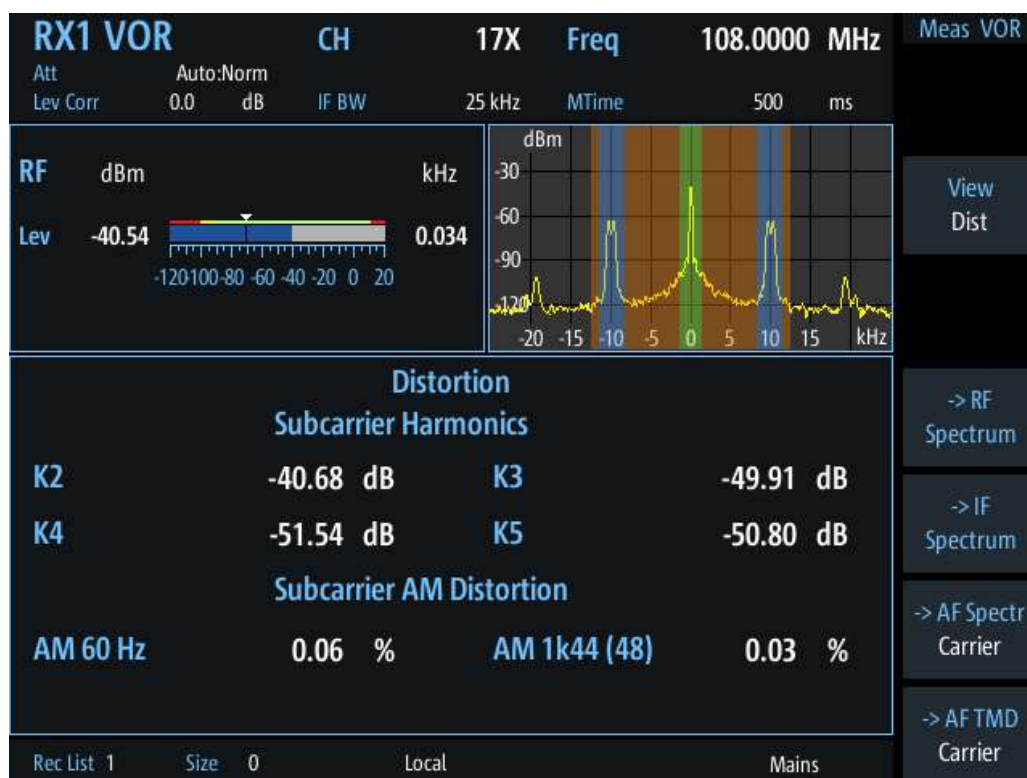
FM frequency deviation of 30 Hz subcarrier

Remote command:

[FM1](#) on page 295

4.3.2.4 VOR distortion view

This view comprises all measurement parameters for the determination of the distortion factors in the VOR mode.



Subcarrier Harmonics.....	106
Subcarrier AM Distortion.....	106

Subcarrier Harmonics

Measures the distortions (up to 5th order) of the subcarrier harmonics.

"K2"	Distortion 2 nd order
"K3"	Distortion 3 rd order
"K4"	Distortion 4 th order
"K5"	Distortion 5 th order

Remote command:

[SUBCARR_K2](#) on page 296

[SUBCARR_K3](#) on page 296

[SUBCARR_K4](#) on page 296

[SUBCARR_K5](#) on page 297

Subcarrier AM Distortion

Measures the AM distortion of the subcarrier. During signal generation, different unwanted AM components appear. Depending on the number of segments used by the antenna, different results are displayed in the "Distortion" view (see ["No. of Segm"](#) on page 111). Note that in the data recording, all results are included, not only those displayed in the "Distortion" view.

"AM 60 Hz" Displays the AM distortion at a modulation frequency of 60 Hz

"AM 1k44(48)" Displays the AM distortion at 1440 Hz (48 segments * 30 Hz).

"AM 1k50(50)" Displays the AM distortion at 1500 Hz (50 segments * 30 Hz).

Remote command:

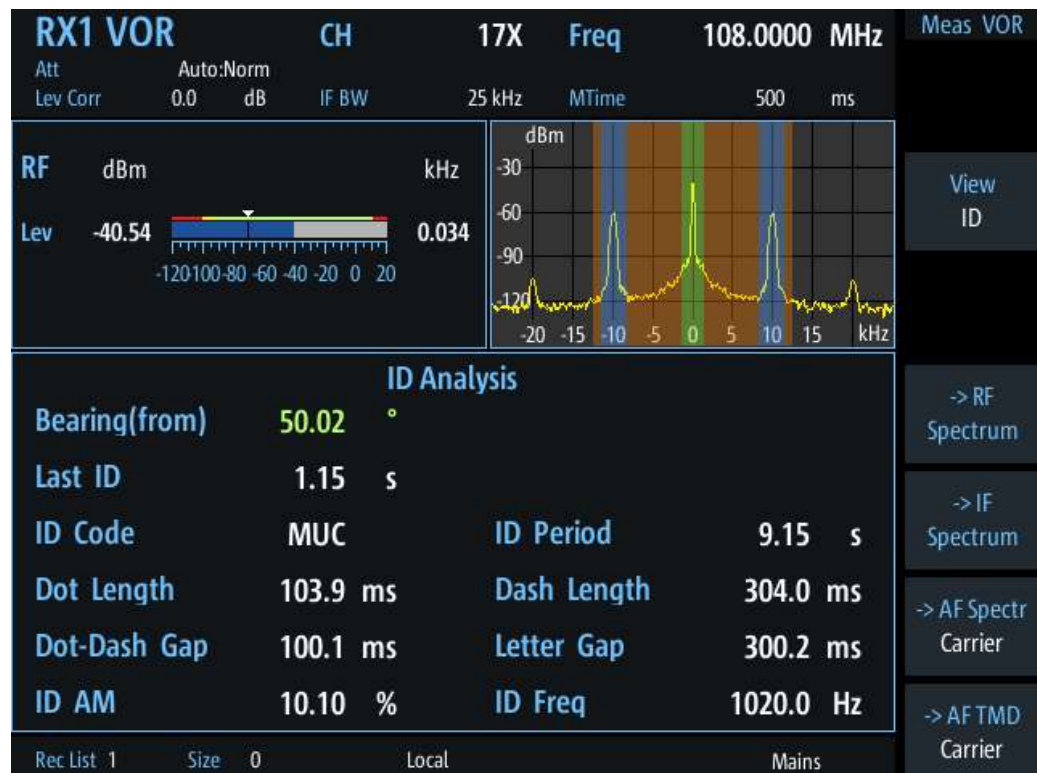
SUBCARR_AM1K44 on page 295

SUBCARR_AM1K50 on page 296

SUBCARR_AM60HZ on page 296

4.3.2.5 VOR ID analysis view

Displays the results of a morse signal analysis (optional).



Bearing (from).....	107
Last ID.....	108
ID Code.....	108
ID Period.....	108
Dot Length.....	108
Dash Length.....	108
Dot-Dash Gap.....	108
Letter Gap.....	108
ID AM.....	108
ID Freq.....	109

Bearing (from)

Phase between both 30-Hz signals (direction of the R&S EVSD1000 in relation to the ground station).

A green bearing value indicates that a valid VOR signal has been determined.

Remote command:

[BE](#) on page 295

Last ID

Time since last ID pulse was measured

Remote command:

[LASTID_TIME](#) on page 279

ID Code

Morse-decoded ID with three or four letters.

Remote command:

[AC8](#) on page 271

[AC8](#) on page 293

ID Period

Time between two measured ID pulses

Remote command:

[ID_PERIOD](#) on page 279

Dot Length

Length of time a dot is transmitted in the used Morse code in milliseconds.

Remote command:

[ID_DOT_LENGTH](#) on page 278

Dash Length

Length of time a dash is transmitted in the used Morse cod in milliseconds.

Remote command:

[ID_DASH_LENGTH](#) on page 278

Dot-Dash Gap

Length of time that passes between a transmitted dot and a dash in the used Morse code in milliseconds.

Remote command:

[ID_DOTDASH_GAP](#) on page 278

Letter Gap

Length of time that passes between two transmitted letters in the used Morse code in milliseconds.

Remote command:

[ID_LETTER_GAP](#) on page 278

ID AM

AM Modulation depth of identifier signal (default: 1020 Hz).

Remote command:

[AM8](#) on page 273

[AM8](#) on page 294

ID Freq

Frequency of the morse signal.

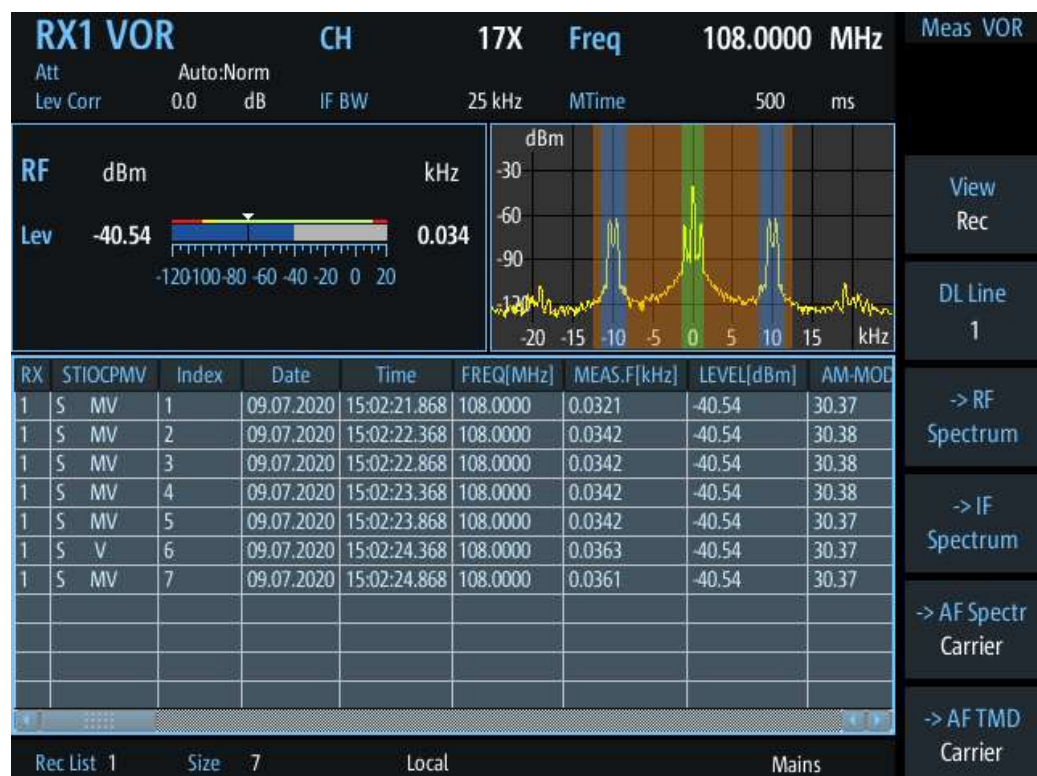
Remote command:

[AF8](#) on page 272

[AF8](#) on page 294

4.3.2.6 VOR recording view

The Recording view displays the recorded data for VOR measurements from the selected data list (see ["List"](#) on page 193). If available, the stored GNSS data from the GNSS receiver is also displayed.



Which measurement results are stored is described in the remote commands, see [GETDATADEF](#) on page 345.

The individual measurement results are described in the other result views.

For details on data logging, see [Chapter 7.2, "Recording measurement data"](#), on page 191.



Status flags

The "STIOCPMV" value contains status flags, if applicable:

- **S**: Start (started manually)
- **T**: Triggered (externally)
- **I**: Invalid
- **O**: Overload (RF input signal too high)
- **C**: Corrected (includes RF input correction factor)
- **P**: PPS-synced
- **M**: Morse ID available
- **V**: Valid signal (ILS LOC/GP and VOR only)

Remote commands for retrieving results:

[GETDATADEF](#) on page 345

[GETDATASET](#) on page 346

4.3.3 Configuring VOR measurements

The following settings are available for VOR measurements.



Settings for recording, including trigger settings, are described in [Chapter 7.2, "Recording measurement data"](#), on page 191.

- [General measurement configuration](#)..... 110
- [Channel frequency configuration \(CH FREQ\)](#)..... 111
- [Ampt.](#)..... 112
- [Bandwidth \(BW\)](#)..... 113
- [Setting the measurement time \(MTime\)](#)..... 114

4.3.3.1 General measurement configuration

Access VNC: [s]

- [Signal Direction](#)..... 110
- [No. of Segm.](#)..... 111
- [Freq Offset](#)..... 111

Signal Direction

Defines the reference for phase notation (see [Chapter 4.3.1.3, "Phase notation in VOR measurements"](#), on page 100).

"From" North direction at the VOR beacon

"To" North direction at the receiver/ aircraft

Remote command:

[SETUP:UNIT:VORDIRECTION](#) on page 251

No. of Segm

Selects the number of used antenna segments for which the AM distortion results are displayed. See also "[VOR receiver](#)" on page 96. Note that the data recording always includes all results.

48	The antenna contains 48 segments, the subcarrier has a modulation frequency of 1440 Hz. (Result: "AM1k44 (48)")
50	The antenna contains 50 segments, the subcarrier has a modulation frequency of 1500 Hz. (Result: "AM 1k50(50)")

Freq Offset

Defines a fixed frequency offset from the carrier.

Remote command:

[VOR_DEMFREQS_OFFSET](#) on page 291

4.3.3.2 Channel frequency configuration (CH FREQ)**Access VNC:** [q]

The channel frequency determines the nominal frequency at which the measurement is performed. For some avionics standards, the channels are associated with specific frequencies. (See [Chapter A, "ILS channel frequency list"](#), on page 358 and [Chapter B, "VOR channel frequency list"](#), on page 360.)

CH	111
Freq	111
Step Size	111

CH

Sets the receiver frequency channel on the active receiver board according to the ICAO frequency list.

Remote command:

[RFCH](#) on page 232

Freq

Sets the nominal frequency for the measurement. By default, this frequency is also assumed to be the center frequency for spectrum displays, unless an offset is defined.

For measurements on two frequencies, the frequencies are defined as offsets to this nominal frequency.

Remote command:

[RF](#) on page 232

Step Size

Defines the frequency step size for the rotary knob when setting the frequency.

In many avionics signals, channels are assigned to frequencies with a fixed offset. By setting the step size of the rotary knob to the fixed offset, you can easily scroll through the signal's channel frequencies using the rotary knob. Thus, for example, you can analyze the measurement results for one channel after the other simply by changing the selected channel frequency with the rotary knob.

The default step size for ILS/VOR mode is 50 kHz.

- Remote command:
- ILS mode:
 - [LLZ_DEFAULT_FREQSTEP](#) on page 259
 - [GS_DEFAULT_FREQSTEP](#) on page 266
- VOR mode:
 - [VOR_DEFAULT_FREQSTEP](#) on page 290

4.3.3.3 Ampt

Access VNC: [w]

The following settings define the amplification for the input signal.

RF Att	112
RF Mode	112
Transducer Correction	113

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see [Figure 4-3](#)). Note that the valid level range depends on the selected measurement mode.

- "Manual" The RF attenuation mode is specified manually (see ["RF Mode"](#) on page 82).
- "Auto" The RF attenuation mode is selected automatically.
The signal attenuation is selected automatically according to the signal strength.
This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable.
When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

- Remote command:
- [SETATTMODE](#) on page 233
- [SCOPE_ATTMODE](#) on page 337
- [FFT_ATTMODE](#) on page 331
- [IFSPECT_ATTMODE](#) on page 327

RF Mode

Defines the RF attenuation mode to be used.

- "Low Noise" 15 dB pre-amplification
Provides a high sensitivity. Suitable when scanning the area for distant signals.
- "Norm" 0 dB
Provides a normal sensitivity.

"Low Dist" 15 dB attenuation
Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

Transducer Correction

Configures the level correction. The specified value is added to the measured power levels to compensate for an inherent offset by the measurement setup, for example the antenna.

Remote command:

[SETUP:EXTERNALATT_RX1](#) on page 234

4.3.3.4 Bandwidth (BW)

Access VNC: [e]

IF BW

Determines the frequency range for which the measurement is performed on the IF signal.

Ensure that the entire input signal lies within the specified bandwidth, particularly for narrow bandwidths.

Remote command:

[VOR_DEM_BW](#) on page 291

AM30 BW

Defines the filter bandwidth with which the 30 Hz AM rotational signal is demodulated.

Remote command:

[VOR_DEM_AM_BW](#) on page 290

FM BW

Defines the filter bandwidth with which the 30 Hz reference signal is demodulated.

Remote command:

[VOR_DEM_FM_BW](#) on page 291

Bear.Filt.

Defines the filter type used to determine the bearing angle.

"Narrow" For small input levels

"Wide" Faster; used in previous software releases

Remote command:

[VOR_DEM_BEARFILTER](#) on page 290

4.3.3.5 Setting the measurement time (MTime)

Access VNC: [d]

The measurement time determines the interval at which new measurement results are displayed. Internally, values are captured every 10 ms, that is: 100 per second.

If the defined measurement time is longer, the values captured internally in that interval are averaged and only the average value is displayed.

Note that the measurement time determines the minimum interval for values to be stored during recording (see "Time" on page 193).

Enter the time in milliseconds.

Remote command:

[MEASTIME](#) on page 232

4.4 R&S EVSG-K6 COM analysis

Access VNC: [m] > Down arrow key

If the R&S EVSG-K6 COM analysis option is installed, signals from VHF/UHF communication channels can be analyzed with the R&S EVSD1000. Very high frequency (VHF) and ultrahigh frequency (UHF) communication is used for air traffic control (ATC COM), for example.

The COM mode can be used to analyze both the civil aircraft band and military frequencies, with channels spaced at 25 kHz or 8.33 kHz.

The R&S EVSD1000 can perform COM measurements on signals containing one or two carriers (see [Chapter 4.1.4.1, "Channel and frequency configuration"](#), on page 77). It assumes a 1000 Hz test tone is being sent.

Remote command:

[MODE_COM](#) on page 298

4.4.1 COM measurement results

The COM measurement provides the following results. For measurements on two frequencies, the results for the individual frequencies and the sum of both are displayed.



You can display graphical results directly from the COM mode by selecting the softkey in the "Meas" menu. In this case, the settings for the current measurement are applied to the graphical results.

To return from the graphical results to the COM mode, select "Return" ([F7]).

For details on the graphical results, see:

- [Chapter 5.1, "R&S EVSG-K10 RF spectrum analysis"](#), on page 124
- [Chapter 5.2, "IF spectrum analysis"](#), on page 128
- [Chapter 5.3, "R&S EVSG-K11 AF spectrum analysis"](#), on page 133
- [Chapter 5.4, "R&S EVSG-K12 Time domain analysis"](#), on page 139

Remote command:

`MODE_COM` on page 298

• RF level and frequency display	115
• IF spectrum preview	116
• COM main view	117
• COM recording view	119

4.4.1.1 RF level and frequency display

The measured RF power and frequency of the input signal are displayed both numerically and graphically.

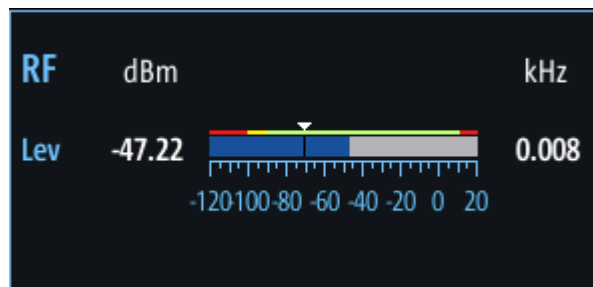


Figure 4-19: RF level display

The following results are provided:

- Numeric power level in dBm ("Lev")
For measurements on two frequencies: individual and sum power levels
- Measured frequency offset to the nominal frequency in kHz
- Numeric frequency offset of measured power
- Bargraph indicating the power and a color-coded overload state, where:
 - **Red:** overload state, check message
 - **Yellow:** power approaching overload state
 - **Green:** power in a valid range
- If applicable: overload messages



Overflow messages

The following messages indicate an overload:

- "RF Overload"
Overload of the input mixer or of the analog IF path.
- "IF Overload"
Overload of the IF signal.
- "ADC Overload"
The dynamic range of the AD-converter is exceeded (clipping).

A combination of these overloads is also possible.

In all cases, set the RF attenuation to normal or low distortion (for RF input), or reduce the input level.

In recorded data lists, overloads are indicated by an "O", see ["Status flags"](#) on page 77.

Remote commands to retrieve results:

[LA?](#) on page 231

[RF?](#) on page 232

COM mode:

[GET_MEASFREQ](#) on page 304

[GET_TX1_MEASFREQ](#) on page 307

[GET_TX2_MEASFREQ](#) on page 308

[GET_TX1_LEVEL](#) on page 306

[GET_TX2_LEVEL](#) on page 308

4.4.1.2 IF spectrum preview

A preview of the measured spectrum (power level vs. frequency) for the IF (intermediate frequency) signal is provided. The center frequency is the nominal channel frequency. The frequency range shows the measured bandwidth. The power range is selected such that the noise level remains visible.

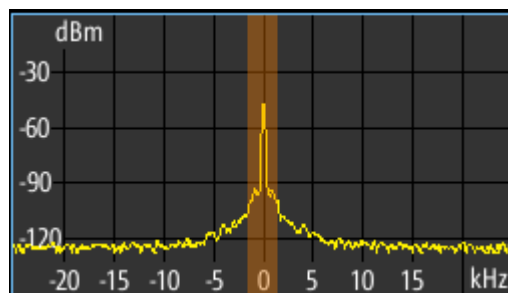


Figure 4-20: IF spectrum preview

This preview spectrum allows you to check if the current measurement settings are appropriate, such as the bandwidth or frequency offsets. For a larger, more detailed spectrum diagram, select one of the graphical Spectrum modes. If you switch to such a mode directly from a numeric measurement mode, the current measurement settings are applied to the spectrum automatically.

4.4.1.3 COM main view

The COM Main view provides the following measurement results for the 1 kHz/ 1.2 kHz test tone (see "Tone Freq." on page 121):

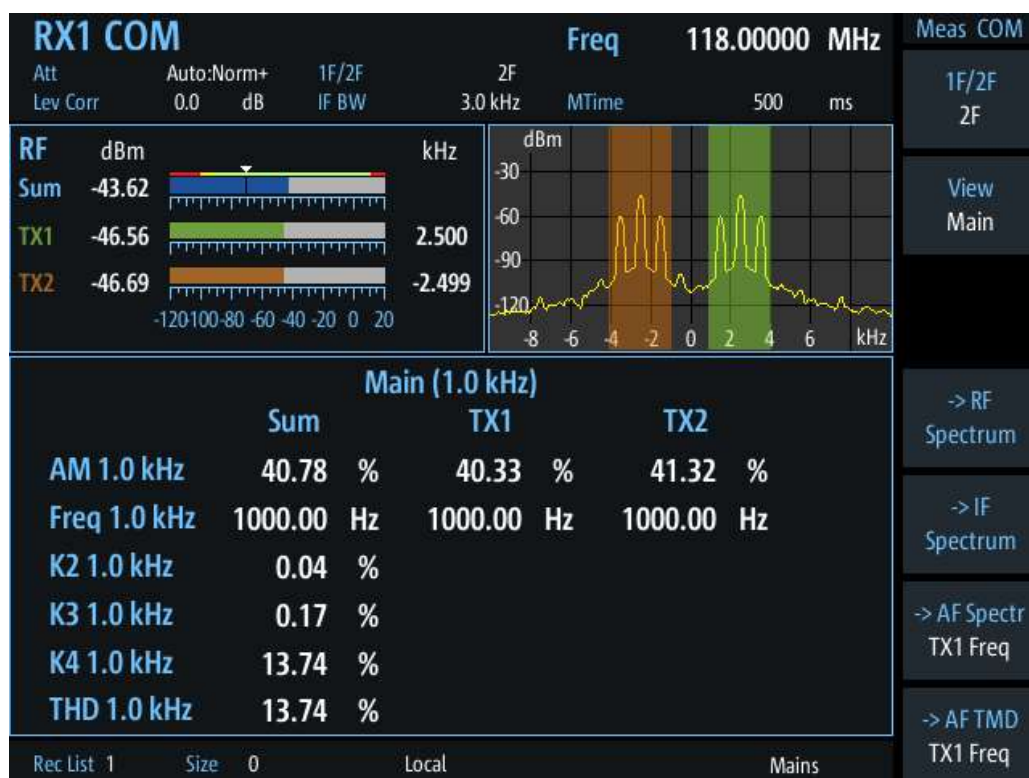


Figure 4-21: COM Main view



You can display graphical results directly from the COM mode by selecting the softkey in the "Meas" menu. In this case, the settings for the current measurement are applied to the graphical results.

To return from the graphical results to the COM mode, select "Return" ([F7]).

For details on the graphical results, see:

- [Chapter 5.1, "R&S EVSG-K10 RF spectrum analysis"](#), on page 124
- [Chapter 5.2, "IF spectrum analysis"](#), on page 128
- [Chapter 5.3, "R&S EVSG-K11 AF spectrum analysis"](#), on page 133
- [Chapter 5.4, "R&S EVSG-K12 Time domain analysis"](#), on page 139

Remote command:

[VIEW_COM](#) on page 299

AM 1.0 kHz/ 1.2 kHz	118
Freq 1.0 kHz/ 1.2 kHz	118
K2 1.0 kHz/ 1.2 kHz	118
K3 1.0 kHz/ 1.2 kHz	118
K4 1.0 kHz/ 1.2 kHz	118
THD 1.0 kHz/ 1.2 kHz	119

AM 1.0 kHz/ 1.2 kHz

Displays the AM modulation of a 1 kHz/ 1.2 kHz test tone at the individual carrier frequencies and for both carriers together.

Remote command:

[GET_ONE_AMMOD_1_0](#) on page 304

[GET_TX1_AMMOD_1_0](#) on page 306

[GET_TX2_AMMOD_1_0](#) on page 308

[GET_ONE_AMMOD_1_2](#) on page 304

[GET_TX1_AMMOD_1_2](#) on page 306

[GET_TX2_AMMOD_1_2](#) on page 308

Freq 1.0 kHz/ 1.2 kHz

Displays the demodulated frequency of the 1 kHz/ 1.2 kHz AM test tone at the individual carrier frequencies and for both carriers together.

Remote command:

[GET_ONE_AMFREQ_1_0](#) on page 304

[GET_TX1_AMFREQ_1_0](#) on page 306

[GET_TX2_AMFREQ_1_0](#) on page 307

[GET_ONE_AMFREQ_1_2](#) on page 304

[GET_TX1_AMFREQ_1_2](#) on page 306

[GET_TX2_AMFREQ_1_2](#) on page 308

K2 1.0 kHz/ 1.2 kHz

Distortion 2nd order, 1.0 kHz/ 1.2 kHz signal

Remote command:

[GET_K2_1K0](#) on page 303

[GET_K2_1K2](#) on page 303

K3 1.0 kHz/ 1.2 kHz

Distortion 3rd order, 1.0 kHz/ 1.2 kHz signal

Remote command:

[GET_K3_1K0](#) on page 303

[GET_K3_1K2](#) on page 303

K4 1.0 kHz/ 1.2 kHz

Distortion 4th order, 1.0 kHz/ 1.2 kHz signal

Remote command:

[GET_K4_1K0](#) on page 303

[GET_K4_1K2](#) on page 303

THD 1.0 kHz/ 1.2 kHz

Total Harmonic Distortion (THD), 1.0 kHz/ 1.2 kHz signal

Remote command:

[GET_THD_1K0](#) on page 305

[GET_THD_1K2](#) on page 305

4.4.1.4 COM recording view

The Recording view displays the recorded data for COM measurements from the selected data list (see ["List"](#) on page 193). If available, the stored GNSS data from the GNSS receiver is also displayed.



Which measurement results are stored is described in the remote commands, see [GETDATADEF](#) on page 345.

The individual measurement results are described in [Chapter 4.4.1.3, "COM main view"](#), on page 117.

For details on data logging see [Chapter 7.2, "Recording measurement data"](#), on page 191.



Status flags

The "STIOCPMV" value contains status flags, if applicable:

- **S**: Start (started manually)
- **T**: Triggered (externally)
- **I**: Invalid
- **O**: Overload (RF input signal too high)
- **C**: Corrected (includes RF input correction factor)
- **P**: PPS-synced
- **M**: Morse ID available
- **V**: Valid signal (ILS LOC/GP and VOR only)

4.4.2 COM configuration

In this view, the measurements settings available for the currently active mode, can be configured.

- [Channel and frequency configuration](#)..... 120
- [Ampt](#)..... 122
- [Bandwidth \(BW\)](#)..... 123
- [Setting the measurement time \(MTime\)](#)..... 123

4.4.2.1 Channel and frequency configuration

The ILS Localizer and Glidepath measurements can detect both course and clearance carriers simultaneously. Alternatively, the individual carriers can be measured only, or any one or two user-defined frequencies. By default, a wideband measurement is performed. The available measurement settings depend on the selected channel and frequency configuration.

- [Channel setup](#)..... 120
- [Carrier configuration](#)..... 121
- [Channel frequency configuration \(CH FREQ\)](#)..... 121

Channel setup

Access VNC: [a] > [F1]

1F/2F

Selects the number of frequencies or channels to be measured.

- "1F" One frequency only is measured, namely the nominal frequency, which is also the center frequency.
 The nominal frequency is configured by the [Freq](#) settings.

"2F" Two frequencies are measured at the same time. Which frequencies are measured is configured by the [Freq](#) settings. The numeric results are calculated as the sum of both frequencies. In the RF Level display, the individual carriers are also indicated. In the RF Spectrum preview, both carriers are displayed.

Remote command:

[COM_1F2F_MEASMODE](#) on page 299

Carrier configuration

Access VNC: [s] > "F1"

Configures the carriers and frequencies for measurements on a single or two frequencies. Which settings are available depends on the measurements on the ["1F/2F"](#) on page 120.

TX1 Offset/TX2 Offset	121
Tone Freq	121

TX1 Offset/TX2 Offset

The two carriers are defined as offsets to either side of the nominal tone frequency. "TX1 Offset" defines the upper carrier with a positive offset to the tone frequency. "TX2 Offset" defines the lower carrier with a negative offset to the tone frequency.

Remote command:

[AMFREQ_OFFSET_TX1](#) on page 299

[AMFREQ_OFFSET_TX2](#) on page 299

Tone Freq.

The nominal tone frequency used to measure all results for both carriers.

Remote command:

[COM_TONEFREQ_1K01K2](#) on page 300

Channel frequency configuration (CH FREQ)

Access VNC: [q]

The carrier frequency determines the nominal frequency at which the measurement is performed.

Freq	121
Step Size	122

Freq

Sets the nominal frequency for the measurement. By default, this frequency is also assumed to be the center frequency for spectrum displays, unless an offset is defined.

For measurements on two frequencies, the frequencies are defined as offsets to this nominal frequency.

Remote command:

[RF](#) on page 232

Step Size

Defines the frequency step size for the rotary knob when setting the frequency.

The default step size for COM mode is 8.33 kHz.

4.4.2.2 Ampt**Access VNC:** [w]

The following settings define the amplification for the input signal.

RF Att.....	122
RF Mode.....	122
Transducer Correction.....	123

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see [Figure 4-3](#)). Note that the valid level range depends on the selected measurement mode.

"Manual"	The RF attenuation mode is specified manually (see "RF Mode" on page 82).
"Auto"	The RF attenuation mode is selected automatically. The signal attenuation is selected automatically according to the signal strength. This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable. When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

Remote command:

[SETATTMODE](#) on page 233

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

Transducer Correction

Configures the level correction. The specified value is added to the measured power levels to compensate for an inherent offset by the measurement setup, for example the antenna.

Remote command:

[SETUP:EXTERNALATT_RX1](#) on page 234

4.4.2.3 Bandwidth (BW)

Access VNC: [e]

The bandwidth determines the filter width with which the measurement is performed. The wider the filter, the less measurement time is required, but also the less sensitive the frequency results.

BW 1F BW 2F

Specifies the filter bandwidth for the single or both carriers.

Remote command:

[COM_DEMOD_BW_1F](#) on page 300

[COM_DEMOD_BW_2F](#) on page 300

4.4.2.4 Setting the measurement time (MTime)

Access VNC: [d]

The measurement time determines the interval at which new measurement results are displayed. Internally, values are captured every 10 ms, that is: 100 per second.

If the defined measurement time is longer, the values captured internally in that interval are averaged and only the average value is displayed.

Note that the measurement time determines the minimum interval for values to be stored during recording (see "[Time](#)" on page 193).

Enter the time in milliseconds.

Remote command:

[MEASTIME](#) on page 232

5 Graphic measurement modes

- [R&S EVSG-K10 RF spectrum analysis](#).....124
- [IF spectrum analysis](#).....128
- [R&S EVSG-K11 AF spectrum analysis](#).....133
- [R&S EVSG-K12 Time domain analysis](#).....139
- [Using markers in the graphical displays](#).....144

5.1 R&S EVSG-K10 RF spectrum analysis

Access VNC: [m] > Down arrow key

The RF Spectrum mode displays the power vs. frequency diagram (spectrum) for a user-defined frequency range of the input signal. This diagram is useful to obtain an overview of the entire input signal. The RF Spectrum requires the R&S EVSG-K10 RF spectrum analysis option.

The x-axis displays the absolute measured frequency in Hz. The y-axis displays the measured power levels in dBm.

Marker functions allow you to analyze specific details in the spectrum.

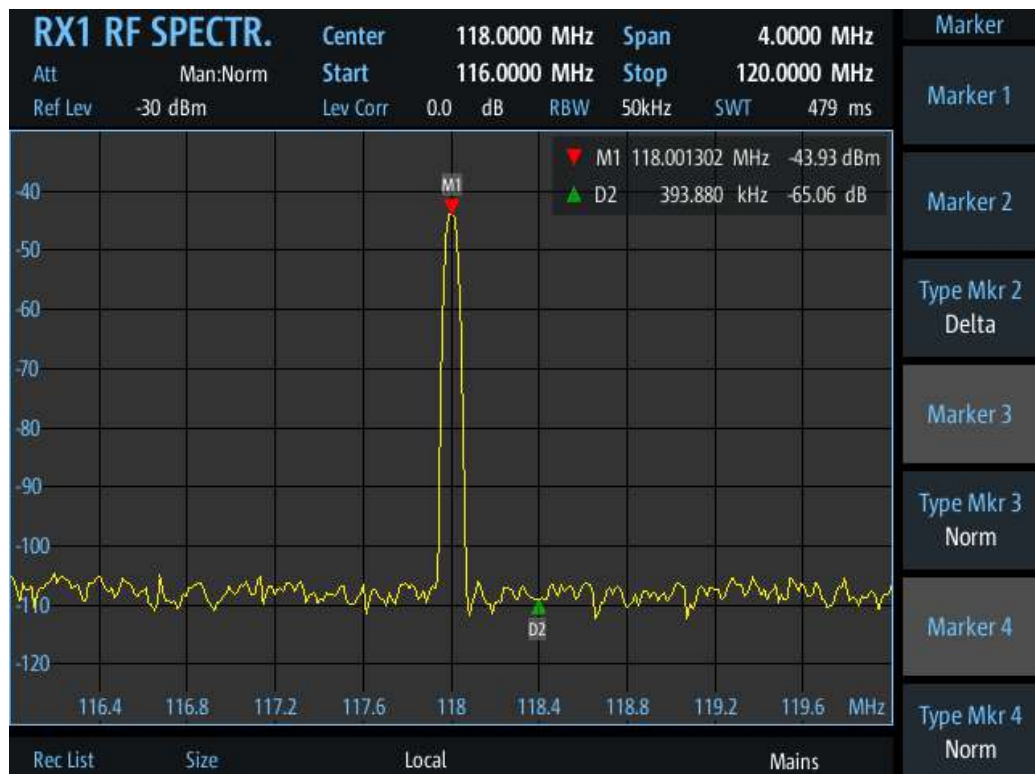


Figure 5-1: RF Spectrum



Generally, each mode is configured individually. When you switch modes, the most recently defined settings for that mode are applied.

However, graphical results can also be displayed directly from the measurement modes with numeric results. In this case, the settings for the current mode are applied to the graphical results.

If the original measurement mode analyzes multiple carriers, you must select the carrier for which you want to see the graphical results when you switch the mode.

The following settings are displayed in the measurement settings area of the RF spectrum:

- **Measurement mode**
The currently active measurement mode on the active receiver board, e.g. "RF Spectrum". See [Chapter 3.2, "Measurement mode"](#), on page 59.
- **Frequency range**
"Center", "Span", "Start", "Stop"
The swept frequency range, see [Chapter 5.1.1, "Configuring the frequency range"](#), on page 125.
- **RF attenuation ("Att")**
The used attenuation mode; see also ["RF Mode"](#) on page 82.
- **Reference level ("Ref Lev")**
The maximum expected power level, see ["Ref Level"](#) on page 127.
- **Level correction ("Lev Corr")**
The applied level correction by a transducer. See ["Transducer Correction"](#) on page 83.
- **Resolution Bandwidth ("RBW")**
Resolution bandwidth with which the measurement is performed. See ["Resolution Bandwidth \(RBW Mode/Res BW\)"](#) on page 126.

Remote command to select RF Spectrum mode:

[MODE_FSCAN](#) on page 321

Remote command to retrieve trace results:

[FSCAN_GETSPECT](#) on page 325

5.1.1 Configuring the frequency range

Access VNC: [q]

The following settings configure the frequency range of the spectrum, that is: the x-axis.

Define the frequency range to be displayed using one of the following methods:

- **Center + Span:** the center frequency is displayed in the center of the x-axis, with half the span to either side

- **Start + Stop:** the x-axis starts with the start frequency and ends with the stop frequency

Center	126
Span	126
Start	126
Stop	126

Center

Configures the center frequency. The configured value is displayed as "Center" in the measurement settings area.

Remote command:

[FSCAN_FREQCENTER](#) on page 322

Span

Configures the frequency span, which must be at least 100 kHz. The configured value is displayed as "Span" in the measurement settings area.

Remote command:

[FSCAN_FREQSPAN](#) on page 322

Start

Configures the start frequency of the x-axis. The configured value is displayed as "Start" in the measurement settings area.

Remote command:

[FSCAN_FREQSTART](#) on page 323

Stop

Configures the stop frequency of the x-axis. The configured value is displayed as "Stop" in the measurement settings area.

Remote command:

[FSCAN_FREQSTOP](#) on page 323

5.1.2 Configuring the bandwidth

Access VNC: [e] > "F1"

Resolution Bandwidth (RBW Mode/Res BW)	126

Resolution Bandwidth (RBW Mode/Res BW)

Defines the resolution bandwidth (RBW) of the spectrum. The resolution bandwidth defines the minimum frequency separation at which the individual components of a spectrum can be distinguished. Small values result in high precision, as the distance between two distinguishable frequencies is small. Higher values decrease the precision, but increase measurement speed.

The RBW can be determined automatically by the R&S EVSD1000, or manually.

AUTO mode The RBW is determined automatically according to the sweep time and frequency range.

Manual mode Select a predefined fixed value manually.

Remote command:

[FSCAN_RESBW_AUTO](#) on page 324

[FSCAN_RES_BW](#) on page 324

5.1.3 Configuring the amplitude (y-axis)

Access VNC: [w]

The amplitude settings configure the y-axis of the spectrum.

Ref Level	127
Y-Range	127
RF Mode	127
Transducer Correction	128

Ref Level

The reference level determines the maximum power level displayed in the spectrum. Adjust the reference level as close as possible to the highest expected power level to avoid overload at the RF input or signal clipping.

Remote command:

[FSCAN_REFLEVEL](#) on page 323

Y-Range

Determines the displayed power level range on the y-axis of the spectrum. The range starts at the specified [Ref Level](#) at the top of the diagram.

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

Transducer Correction

Configures the level correction. The specified value is added to the measured power levels to compensate for an inherent offset by the measurement setup, for example the antenna.

Remote command:

[SETUP:EXTERNALATT_RX1](#) on page 234

5.1.4 Configuring the trace

Access VNC: [a]

Trace settings determine how the display values are calculated from the measured values.

Trace mode	128
Average Count	128

Trace mode

Defines the update mode for subsequent traces.

"Clear/Write"	Overwrite mode (default): the trace is overwritten by each sweep
"Average"	The average is determined over several sweeps The Average Count determines the number of averaging procedures.
"Max Hold"	The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one. The Average Count determines the number of sweeps to evaluate.
"RMS"	The RMS value for each trace point over several sweeps is determined and displayed. The Average Count determines the number of sweeps to evaluate.

Remote command:

[FFT_TRACEMODE](#) on page 335

[IFSPECT_TRACE_MODE](#) on page 329

[FSCAN_TRACE_MODE](#) on page 324

Average Count

Determines the number of sweeps over which trace evaluation is performed (e.g. averaging or maxhold).

Remote command:

[FFT_TRACE_AVRGCOUNT](#) on page 335

[IFSPECT_TRACE_AVRGCOUNT](#) on page 329

[FSCAN_TRACE_AVRGCOUNT](#) on page 325

5.2 IF spectrum analysis

Access VNC: [m] > Down arrow key

IF Spectrum mode displays the measured power vs frequency spectrum for a (small) span around the center frequency of the input signal. This diagram is useful to perform detailed analysis on the signal around the center frequency. This mode requires the R&S EVSG-K10 RF spectrum analysis option.

The x-axis displays the frequency offset to the nominal RF frequency in Hz. The y-axis displays the measured power levels in dBm.

Marker functions allow you to analyze specific details in the spectrum.



Figure 5-2: IF Spectrum



Generally, each mode is configured individually. When you switch modes, the most recently defined settings for that mode are applied.

However, graphical results can also be displayed directly from the measurement modes with numeric results. In this case, the settings for the current mode are applied to the graphical results.

If the original measurement mode analyzes multiple carriers, you must select the carrier for which you want to see the graphical results when you switch the mode.

The following settings are displayed in the measurement settings area of the RF spectrum:

- Measurement mode
The currently active measurement mode on the active receiver board, e.g. "RF Spectrum". See [Chapter 3.2, "Measurement mode"](#), on page 59.
- Frequency range ("RF Freq", "Span")

The swept frequency range, see "RF Freq" on page 130.

- Reference level ("Ref Lev")
The maximum expected power level, see "Ref Level" on page 131.
- Level correction ("Lev Corr")
The applied level correction by a transducer. See "Transducer Correction" on page 83.
- Resolution Bandwidth ("RBW")
Resolution bandwidth with which the measurement is performed. See "RBW" on page 131.

Remote command to select RF Spectrum mode:

MODE_IFSPECT on page 326

Remote command to retrieve trace results:

IFSPECT_GETSPECT on page 330

5.2.1 Configuring the frequency range

Access VNC: [q]

The following settings configure the frequency range of the spectrum, that is: the x-axis.

RF Freq.....	130
Span.....	130

RF Freq

Configures the center frequency. The configured value is displayed as "RF Freq" in the measurement settings area.

Remote command:

IFSPECT_FREQRF on page 327

Span

Configures the frequency span, which must be at least 100 kHz. The span is distributed evenly to the left and right of the "RF Freq" on page 130. The configured value is displayed as "Span" in the measurement settings area.

Remote command:

IFSPECT_FREQ_SPAN on page 327

5.2.2 Configuring the bandwidth

Access VNC: [e] > "F1"

RBW.....	131

RBW

Defines the resolution bandwidth (RBW) of the spectrum. The resolution bandwidth defines the minimum frequency separation at which the individual components of a spectrum can be distinguished. Small values result in high precision, as the distance between two distinguishable frequencies is small. Higher values decrease the precision, but increase measurement speed.

The RBW can be determined automatically by the R&S EVSD1000, or manually.

AUTO mode The RBW is determined automatically according to the sweep time and frequency range.

Manual mode Select a predefined fixed value manually.

Remote command:

[IFSPECT_RES_BW](#) on page 328

[IFSPECT_RESBW_AUTO](#) on page 328

5.2.3 Configuring the amplitude (Y-Axis)

Access VNC: [w]

The amplitude settings configure the y-axis of the spectrum.

Ref Level	131
Y-Range	131
RF Att	131
RF Mode	132
Transducer Correction	132

Ref Level

The reference level determines the maximum power level displayed in the spectrum. Set the reference level as close as possible to the highest expected power level to avoid overload at the RF input or signal clipping.

Remote command:

[IFSPECT_REFLEVEL](#) on page 328

Y-Range

Determines the displayed power level range on the y-axis of the spectrum. The range starts at the specified [Ref Level](#) at the top of the diagram.

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see [Figure 4-3](#)). Note that the valid level range depends on the selected measurement mode.

"Manual" The RF attenuation mode is specified manually (see ["RF Mode"](#) on page 82).

"Auto" The RF attenuation mode is selected automatically.
The signal attenuation is selected automatically according to the signal strength.
This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable.
When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

Remote command:

[SETATTMODE](#) on page 233

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

Transducer Correction

Configures the level correction. The specified value is added to the measured power levels to compensate for an inherent offset by the measurement setup, for example the antenna.

Remote command:

[SETUP:EXTERNALATT_RX1](#) on page 234

5.2.4 Configuring the trace

Access VNC: [a]

Trace settings determine how the display values are calculated from the measured values.

Trace mode	133
Average Count	133

Trace mode

Defines the update mode for subsequent traces.

"Clear/Write"	Overwrite mode (default): the trace is overwritten by each sweep
"Average"	The average is determined over several sweeps The Average Count determines the number of averaging procedures.
"Max Hold"	The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one. The Average Count determines the number of sweeps to evaluate.
"RMS"	The RMS value for each trace point over several sweeps is determined and displayed. The Average Count determines the number of sweeps to evaluate.

Remote command:

[FFT_TRACEMODE](#) on page 335

[IFSPECT_TRACE_MODE](#) on page 329

[FSCAN_TRACE_MODE](#) on page 324

Average Count

Determines the number of sweeps over which trace evaluation is performed (e.g. averaging or maxhold).

Remote command:

[FFT_TRACE_AVRGCOUNT](#) on page 335

[IFSPECT_TRACE_AVRGCOUNT](#) on page 329

[FSCAN_TRACE_AVRGCOUNT](#) on page 325

5.3 R&S EVSG-K11 AF spectrum analysis

Access VNC: [m] > Down arrow key

AF Spectrum mode displays the spectrum of a demodulated RF signal with AM components. This mode requires the R&S EVSG-K11 AF spectrum analysis option.

The x-axis displays the absolute measured frequency in kHz. The y-axis displays the modulation depth in dB.

Marker functions allow you to analyze specific details in the spectrum.



Figure 5-3: AF Spectrum for RF input

The following settings are displayed in the measurement settings area of the RF spectrum:

- **Measurement mode**
The currently active measurement mode on the active receiver board, e.g. "AF Spectrum". See [Chapter 3.2, "Measurement mode"](#), on page 59.
- **"RF Freq"**
Nominal measurement frequency of the RF signal, see ["RF Freq"](#) on page 135.
- **"RF Lev"**
The measured level of the RF signal
- **Frequency range**
"AF Center", "AF Span", "AF Start", "AF Stop"
The swept frequency range, see [Chapter 5.1.1, "Configuring the frequency range"](#), on page 125.
- **RF attenuation ("Att")**
The used attenuation mode; see also ["RF Mode"](#) on page 82.
- **Resolution Bandwidth ("RBW")**
Resolution bandwidth with which the measurement is performed. See ["Resolution Bandwidth \(RBW Mode/Res BW\)"](#) on page 126.
- **For ILS or VOR signals: the modulation of the selected carrier ("AM Demod", "VOR Subc. AM", "VOR Subc. FM")**, see ["Switching from numeric to graphical results"](#) on page 101



Generally, each mode is configured individually. When you switch modes, the most recently defined settings for that mode are applied.

However, graphical results can also be displayed directly from the measurement modes with numeric results. In this case, the settings for the current mode are applied to the graphical results.

If the original measurement mode analyzes multiple carriers, you must select the carrier for which you want to see the graphical results when you switch the mode.

Remote command to select RF Spectrum mode:

`MODE_FFT` on page 331

Remote command to retrieve trace results:

`FFT_GETSPECT` on page 336

- [Configuring the frequency range](#)..... 135
- [Configuring the bandwidth](#)..... 136
- [Configuring the amplitude \(Y-Axis\) for RF input](#)..... 137
- [Configuring the trace](#)..... 138

5.3.1 Configuring the frequency range

Access VNC: [q]

The following settings configure the frequency range of the spectrum, that is: the x-axis.

Define the frequency range to be displayed using one of the following methods:

- [AF Center](#) + [AF Span](#): the center frequency is displayed in the center of the x-axis, with half the span to either side
- [AF Start](#) + [AF Stop](#): the x-axis starts with the start frequency and ends with the stop frequency

RF Freq	135
AF Center	135
AF Span	136
AF Start	136
AF Stop	136

RF Freq

Configures the nominal frequency of the RF input signal. The configured value is displayed as "RF Freq" in the measurement settings area.

Remote command:

`FFT_FREQRF` on page 333

AF Center

Configures the center frequency for the demodulated AM signal components. The configured value is displayed as "AF Center" in the measurement settings area.

Remote command:
[FFT_FREQ_CENTER](#) on page 332

AF Span
Configures the frequency span, which must be at least 100 kHz. The configured value is displayed as "AF Span" in the measurement settings area.

Remote command:
[FFT_FREQ_SPAN](#) on page 332

AF Start
Configures the start frequency of the x-axis. The configured value is displayed as "AF Start" in the measurement settings area.

Remote command:
[FFT_FREQ_START](#) on page 332

AF Stop
Configures the stop frequency of the x-axis. The configured value is displayed as "AF Stop" in the measurement settings area.

Remote command:
[FFT_FREQSTOP](#) on page 333

5.3.2 **Configuring the bandwidth**

Access VNC: [e] > "F1"

RBW	136
IF BW	136

RBW
Defines the resolution bandwidth (RBW) of the spectrum. The resolution bandwidth defines the minimum frequency separation at which the individual components of a spectrum can be distinguished. Small values result in high precision, as the distance between two distinguishable frequencies is small. Higher values decrease the precision, but increase measurement speed.

- The RBW can be determined automatically by the R&S EVSD1000, or manually.
- | | |
|-------------|--|
| AUTO mode | The RBW is determined automatically according to the sweep time and frequency range. |
| Manual mode | Select a predefined fixed value manually. |

Remote command:
[FFT_RESBW_AUTO](#) on page 334
[FFT_RESBW_FIX_KHZ](#) on page 334

IF BW
Defines the IF demodulation bandwidth for RX input in "AF Spectrum" mode.

Remote command:
[FFT_IF_BW_KHZ](#) on page 333

5.3.3 Configuring the amplitude (Y-Axis) for RF input

Access VNC: [w]

The amplitude settings configure the y-axis of the spectrum. For the AF Spectrum, the modulation depth of the AM signal components is displayed on the y-axis.

The following settings are available for RF input.

Y-Range.....	137
RF Att.....	137
RF Mode.....	137

Y-Range

Determines the displayed modulation depth range on the y-axis of the spectrum.

Remote command:

FFT_GRID_YRANGE_DB on page 333

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see Figure 4-3). Note that the valid level range depends on the selected measurement mode.

- "Manual" The RF attenuation mode is specified manually (see "RF Mode" on page 82).
- "Auto" The RF attenuation mode is selected automatically.
The signal attenuation is selected automatically according to the signal strength.
This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable.
When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

Remote command:

- SETATTMODE on page 233
- SCOPE_ATTMODE on page 337
- FFT_ATTMODE on page 331
- IFSPECT_ATTMODE on page 327

RF Mode

Defines the RF attenuation mode to be used.

- "Low Noise" 15 dB pre-amplification
Provides a high sensitivity. Suitable when scanning the area for distant signals.
- "Norm" 0 dB
Provides a normal sensitivity.

"Low Dist" 15 dB attenuation
Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

5.3.4 Configuring the trace

Access VNC: [a]

Trace settings determine how the display values are calculated from the measured values.

[Trace mode](#)..... 138

[Average Count](#)..... 138

Trace mode

Defines the update mode for subsequent traces.

"Clear/Write" Overwrite mode (default): the trace is overwritten by each sweep

"Average" The average is determined over several sweeps
The [Average Count](#) determines the number of averaging procedures.

"Max Hold" The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one.
The [Average Count](#) determines the number of sweeps to evaluate.

"RMS" The RMS value for each trace point over several sweeps is determined and displayed.
The [Average Count](#) determines the number of sweeps to evaluate.

Remote command:

[FFT_TRACEMODE](#) on page 335

[IFSPECT_TRACE_MODE](#) on page 329

[FSCAN_TRACE_MODE](#) on page 324

Average Count

Determines the number of sweeps over which trace evaluation is performed (e.g. averaging or maxhold).

Remote command:

[FFT_TRACE_AVRGCOUNT](#) on page 335

[IFSPECT_TRACE_AVRGCOUNT](#) on page 329

[FSCAN_TRACE_AVRGCOUNT](#) on page 325

5.4 R&S EVSG-K12 Time domain analysis

Access VNC: [m] > Down arrow key

The AF Time Domain mode displays the modulation vs. time diagram of the demodulated RF signal, similar to an oscilloscope.

This mode requires the R&S EVSG-K12 Time domain analysis option.

The x-axis displays the measurement time. The y-axis displays the modulation depth in percent.

Marker functions allow you to analyze specific details in the spectrum.

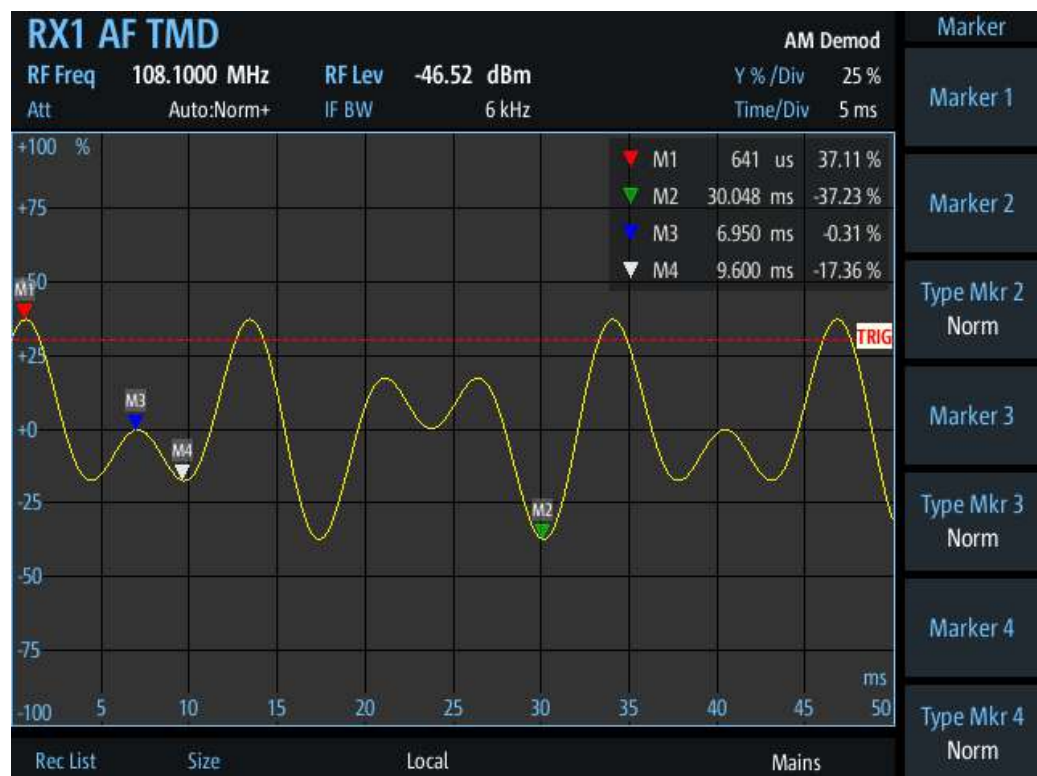


Figure 5-4: AF Time Domain Mode of an ILS signal with DDM = 0,0 %



Generally, each mode is configured individually. When you switch modes, the most recently defined settings for that mode are applied.

However, graphical results can also be displayed directly from the measurement modes with numeric results. In this case, the settings for the current mode are applied to the graphical results.

If the original measurement mode analyzes multiple carriers, you must select the carrier for which you want to see the graphical results when you switch the mode.

The following settings are displayed in the measurement settings area of the RF spectrum:

- Measurement mode

The currently active measurement mode on the active receiver board, e.g. "AF Spectrum". See [Chapter 3.2, "Measurement mode"](#), on page 59.

- "RF Freq"
Nominal measurement frequency of the RF signal, see ["RF Freq"](#) on page 135.
- "RF Lev"
The measured level of the RF signal
- RF attenuation ("Att")
The used attenuation mode; see also ["RF Mode"](#) on page 82.
- Y-axis scaling ("Y % / Div")
Range per y-axis division. See ["Y % /Div"](#) on page 141.
- X-axis scaling ("Time / Div")
Time per x-axis division. See ["Time/Div"](#) on page 142.

Remote command to select AF time domain mode:

[MODE_SCOPE](#) on page 336

Remote command to retrieve trace results:

[SCOPE_GETMEAS](#) on page 340

5.4.1 Configuring the frequency range and bandwidth

The following settings configure the measured RF frequency or bandwidth of the time domain measurement.

RF Freq	140
IF BW	140

RF Freq

Access VNC: [q]

Configures the nominal frequency of the RF input signal. The configured value is displayed as "RF Freq" in the measurement settings area.

Remote command:

[SCOPE_FREQRF](#) on page 337

IF BW

Defines the bandwidth with which the RX input is measured.

Remote command:

[SCOPE_IF_BW_KHZ](#) on page 337

5.4.2 Configuring the amplitude (Y-Axis) for RF input

Access VNC: [w]

The amplitude settings configure the y-axis of the spectrum. The following settings are available for RF input.

Y % /Div.....	141
RF Att.....	141
RF Mode.....	141

Y % /Div

Defines the value range displayed in each division of the y-axis. The full y-axis range is eight times this value.

RF Att

Determines how the attenuation of the RF signal is defined. Adjust the attenuation such that the measured power level remains in the valid level range (indicated by the green area of the bargraph, see [Figure 4-3](#)). Note that the valid level range depends on the selected measurement mode.

"Manual"	The RF attenuation mode is specified manually (see "RF Mode" on page 82).
"Auto"	The RF attenuation mode is selected automatically. The signal attenuation is selected automatically according to the signal strength. This mode works best with clean signals. In difficult receiving conditions, the "Low Noise", "Normal" or "Low Distortion" modes can be more stable. When monitoring signals with mostly constant signal levels, it is also recommended that you use the "Low Noise", "Normal" or "Low Distortion" mode.

Remote command:

[SETATTMODE](#) on page 233

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[SETATTMODE](#) on page 233

[FSCAN_ATTMODE](#) on page 322

[SCOPE_ATTMODE](#) on page 337

[FFT_ATTMODE](#) on page 331

[IFSPECT_ATTMODE](#) on page 327

[GBAS:ATTMODE](#) on page 310

5.4.3 Configuring the measurement time

Access VNC: [d] > "F1"

Time/Div

Defines the time range displayed in each division of the x-axis. The full x-axis range, that is: the total measurement time, is eight times this value.

Remote command:

[SCOPE_TIMEDIV_RF](#) on page 338

5.4.4 Configuring the trigger

Access VNC: [k]

The trigger determines how often and when a new measurement is performed.



Performing a single sweep

To perform a single sweep, press [Single] (VNC: [L]).

Trigger mode.....	142
Trigger Source.....	142
Trigger Edge.....	142
Trigger Level.....	143

Trigger mode

Determines how the trigger is evaluated.

"Norm"	Each time a trigger event occurs, a measurement is performed.
"Auto"	Each time a trigger event occurs, a measurement is performed. If no trigger event occurs during a predefined waiting period, a measurement is performed without a trigger. This setting helps you determine the required trigger level.
"Single"	When the trigger event occurs, a single measurement is performed.

Trigger Source

Determines how often and when a new sweep is performed.

"Ext."	A measurement is performed each time a trigger signal from a connected external trigger device is received. The trigger device must be connected to the "Trigger In" connector on the rear panel of the R&S EVSD1000.
"Level"	A measurement is performed when the input signal reaches the defined trigger level.

Trigger Edge

For external triggering, this setting defines whether a measurement is performed when the positive (rising) or negative (falling) edge of the trigger signal is received. Select the key repeatedly to toggle between the two settings.

Remote command:

[SCOPE_TRIGSLOPE](#) on page 339

Trigger Level

For the [Trigger Source](#) = "Level", this value specifies the level in percent the input signal must reach to trigger a measurement.

Remote command:

[SCOPE_TRIGLEVEL_RFPCT](#) on page 339

5.4.5 Configuring the trace

Access VNC: [a]

Trace settings determine how the display values are calculated from the measured values.

Trace mode	143
Average Count	143

Trace mode

Defines the update mode for subsequent traces.

"Clear/Write"	Overwrite mode (default): the trace is overwritten by each sweep
"Average"	The average is determined over several sweeps The Average Count determines the number of averaging procedures.
"Max Hold"	The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one. The Average Count determines the number of sweeps to evaluate.
"RMS"	The RMS value for each trace point over several sweeps is determined and displayed. The Average Count determines the number of sweeps to evaluate.

Remote command:

[FFT_TRACEMODE](#) on page 335

[IFSPECT_TRACE_MODE](#) on page 329

[FSCAN_TRACE_MODE](#) on page 324

Average Count

Determines the number of sweeps over which trace evaluation is performed (e.g. averaging or maxhold).

Remote command:

[FFT_TRACE_AVRGCOUNT](#) on page 335

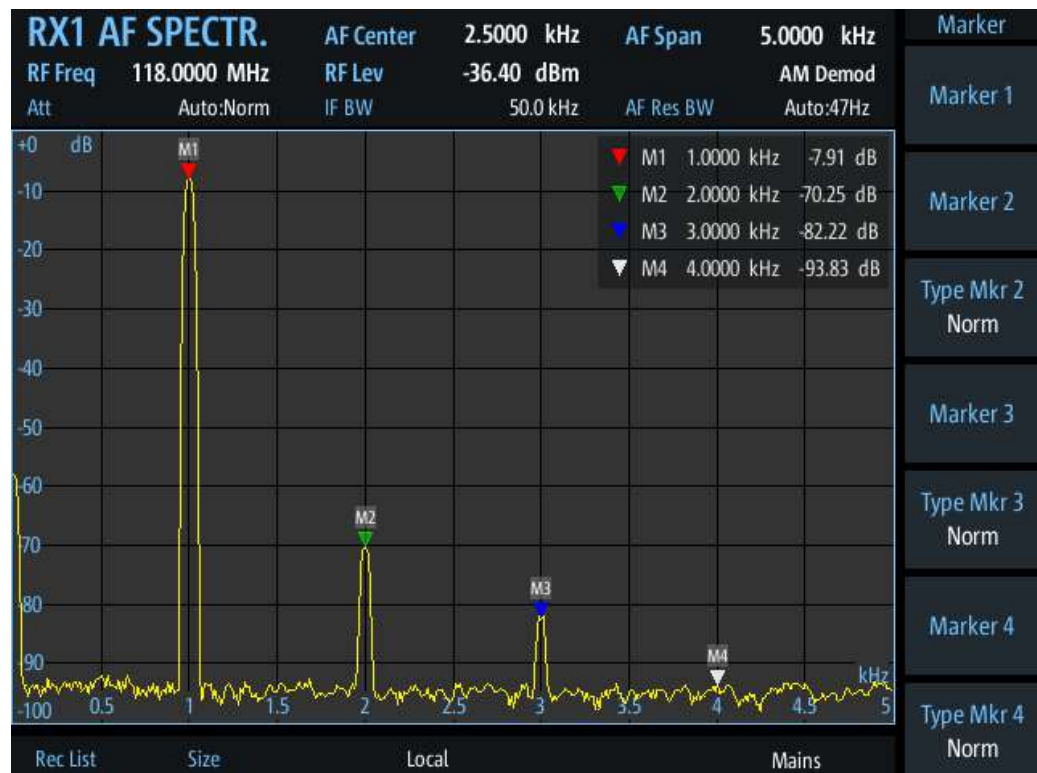
[IFSPECT_TRACE_AVRGCOUNT](#) on page 329

[FSCAN_TRACE_AVRGCOUNT](#) on page 325

5.5 Using markers in the graphical displays

Marker functions allow you to analyze specific details in the spectrum or time domain diagrams.

Active markers are displayed as colored triangles in the spectrum at the position they were placed. The exact position (frequency or time) and measured level at that position is indicated in the marker box in the upper right-hand corner of the diagram. Active markers are indicated by a highlighted softkey.



Up to four markers can be active at the same time. Markers 2 to 4 can be either normal markers or delta markers. A normal marker indicates the absolute signal value at the defined position in the diagram. A delta marker indicates the value of the marker relative to marker 1.

Activating/Deactivating a marker.....	144
L Marker type (Type Mkr <2-4>).....	145
Deactivating all markers.....	145
Moving a marker to a peak in the diagram.....	145
Adapting the center frequency to the current marker position.....	145
Relative Unit (for AF spectrum only).....	145

Activating/Deactivating a marker

Access VNC: [i] > "F1"- "F4"

To activate a marker, select the corresponding softkey. An active marker is highlighted.

To select a marker that is already active, for example to move its position (see ["Moving a marker to a peak in the diagram"](#) on page 145), select the softkey again. A selected (editable) marker is highlighted orange.

To deactivate an active marker, select the marker until the highlighting is no longer displayed.

Marker type (Type Mrk <2-4>) ← Activating/Deactivating a marker

Determines the type of marker results.

"Normal"	A normal marker indicates the absolute value at the defined position in the diagram.
"Delta"	A delta marker defines the value of the marker relative to marker 1 (which is always of type "normal").

Deactivating all markers

Access VNC: [j] > "F1"

Deactivates all markers in the diagram.

Moving a marker to a peak in the diagram

Access VNC: [o] > "F1" / "F2"

Sets the currently active and selected marker (indicated in the softkey) to the highest or next-highest peak detected in the diagram. If no marker is active or selected, this function has no effect. To select a marker, see ["Activating/Deactivating a marker"](#) on page 144.

Adapting the center frequency to the current marker position

Access VNC: [o] > "F3"

Sets the center frequency of the spectrum to the position of the currently active and selected marker (indicated in the softkey). The spectrum is updated to the new frequency range. The span is maintained.

If no marker is active or selected, this function has no effect. To select a marker, see ["Activating/Deactivating a marker"](#) on page 144.

Relative Unit (for AF spectrum only)

Determines the unit for relative markers in the AF Spectrum diagram. Percentage and dB values are available.

6 GBAS/SCAT-I mode

Access VNC: [m] > Down arrow key

The R&S EVSG-K4 GBAS analysis/R&S EVSG-K5 SCAT-I Analysis options are firm-ware applications that add functionality to perform GBAS and SCAT-I analysis on the R&S EVSD1000.

The R&S EVSG-K4 GBAS analysis option enables you to receive and analyze the very high frequency (VHF) data broadcast (VDB) signal-in-space transmitted from a ground-based augmentation system (GBAS) ground subsystem to the airborne subsystem. This implementation is in line with the specification ICAO AN10 Vol1 [3] and RTCA DO-246 [1] (see [Chapter C, "References"](#), on page 362).

Similarly, using option R&S EVSG-K5 SCAT-I Analysis, data from special category I (SCAT-I) systems can be received and analyzed. The main difference is the content of the message data. This implementation is in line with the specification ICAO AN10 Vol1 [3] and RTCA DO-217 [2] (see [Chapter C, "References"](#), on page 362).

The R&S EVSG-K4 GBAS analysis/R&S EVSG-K5 SCAT-I Analysis applications feature:

- Receiving GBAS signal data from a GBAS ground station in a frequency range between 108.025 MHz and 117.950 MHz with a channel spacing of 25 kHz
- Receiving SCAT-I signal data from a SCAT-I ground station in a frequency range between 108.025 MHz and 117.950 MHz with a channel spacing of 25 kHz
- Analyzing the RF characteristics, signal strength and frequency accuracy of the GBAS/SCAT-I signal
- Demodulating, decoding and displaying GBAS/SCAT-I signal data
- Analyzing up to 8 time slots or individual time slot details in the GBAS/SCAT-I signal data
- Analyzing individual Final Approach Segment (FAS) data blocks
- Logging and storing up to 9999 lists of received GBAS/SCAT-I signal data



We strongly recommend that you provide a PPS signal for reference. Without PPS synchronization, signal timing and slot positions are possibly not correct.

For details, see [Chapter 6.1.4, "Time slot synchronization via PPS"](#), on page 150.

- [Basics on GBAS and SCAT-I analysis](#)..... 147
- [GBAS / SCAT-I measurement information](#)..... 150
- [GBAS / SCAT-I measurement views and results](#)..... 152
- [GBAS/ SCAT-I measurement configuration](#)..... 165
- [Message XML interface](#)..... 169

6.1 Basics on GBAS and SCAT-I analysis

The following topics summarize some background information on the GBAS and other avionics-related standards. The provided overview information is intended as an explanation of the used terms and does not aim to be comprehensive.

- [GBAS specifics](#)..... 147
- [Broadcast timing structure](#)..... 149
- [Final approach segment \(FAS\) construction data](#)..... 149
- [Time slot synchronization via PPS](#)..... 150

6.1.1 GBAS specifics

GBAS is a ground-based augmentation system that can enhance satellite navigation. The GBAS is intended to improve aircraft safety and to enhance satellite navigation and the full range of precision approach and landing procedures, as well as the terminal area operations.

GBAS components

The illustration in [Figure 6-1](#) is a simplified representation of the GBAS' three main components:

- The GNSS satellite subsystem
- The airborne subsystem
- The GBAS ground subsystem.

The ground equipment consists of four reference GNSS receivers at exactly defined positions around the airport, GBAS ground station, and a VHF data broadcast transmitter (VDB).

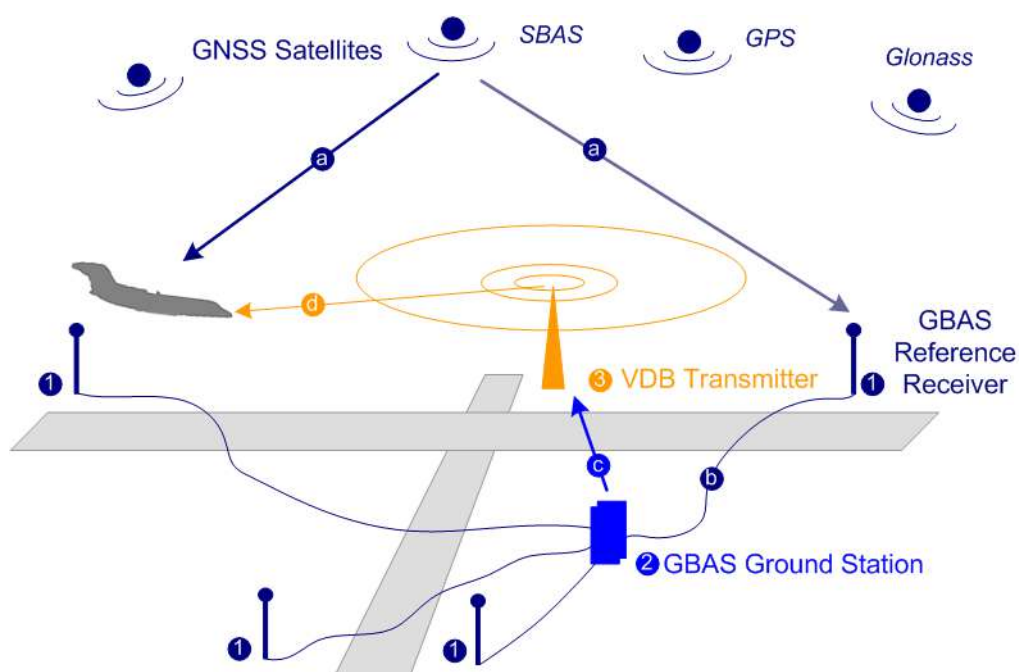


Figure 6-1: GBAS components and signals (simplified representation)

- 1 = GNSS reference receiver
- 2 = GBAS ground station
- 3 = VHF data broadcast (VDB) transmitter
- a = GNSS navigation message
- b = Pseudorange
- c = GBAS Correction message
- d = VDB signal

The GBAS GNSS reference receivers receive the *GNSS navigation message*, perform pseudorange measurements and transmit this information to the GBAS ground station. The GBAS ground station determines errors in the calculated positions, adds additional parameters and approach path information, produces a *GBAS correction message* and sends it the VDB transmitter. The VDB transmitter modulates and encodes this message and *broadcasts* it to the airborne GBAS equipment, for example a GBAS receiver in the airplane. The GBAS equipment in the airplane is a high-precision multimode receiver that evaluates the message and applies correction parameters to improve the navigation algorithms from GPS.

This list outlines the three signals transmitted between the components and referred to as GBAS Signal-in-Space:

- GNSS satellite to GBAS ground subsystem navigation signal
- GNSS satellite to GBAS airborne subsystem navigation signal
- GBAS ground subsystem to GBAS airborne subsystem VHF data broadcast

Carrier frequencies and frequency channels

The VHF data broadcast is defined for carrier frequencies within the range of 108.025 MHz to 117.950 MHz and carrier spacing of 25.0 kHz.

6.1.2 Broadcast timing structure

The broadcast is a Time Division Multiple Access (TDMA). According to [1], the TDMA timing structure uses a two level hierarchy, composed of 500 ms long frames, each divided into 8 VDB time slots (A - H), see [Figure 6-2](#).

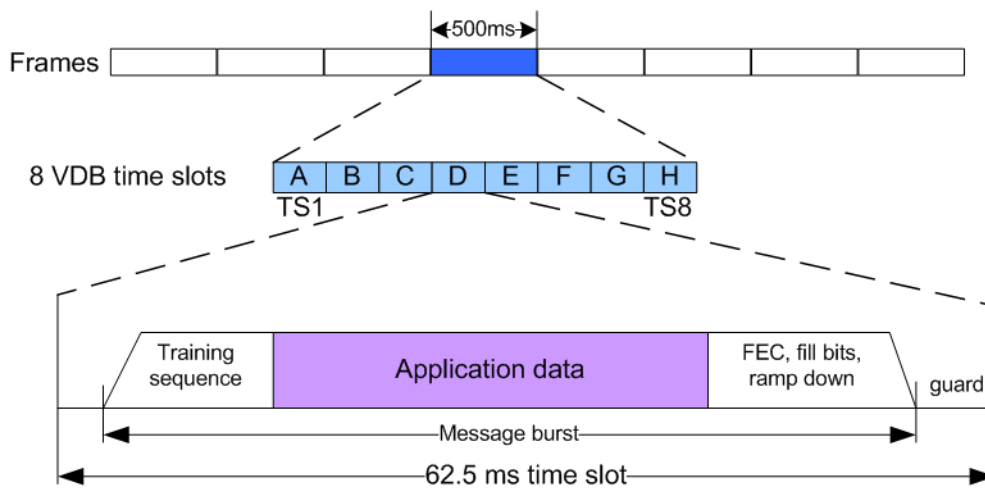


Figure 6-2: TDMA timing structure (simplified representation)

A VDB time slot is the minimum resource that an individual VDB transmitter can use. During one time slot, a VDB transmitter transmits exactly one burst.

The GBAS specification [1] defines the TDMA timing structure, including timing budget of the VDB bursts, burst data contents and message encoding in great details. The R&S EVSD1000 receives the required training sequence, decodes the message according to [1] and demodulates the D8PSK modulated data automatically.

6.1.3 Final approach segment (FAS) construction data

According to the standard [1], the message type 4 contains one or more data sets that contain approach data, associated vertical/lateral alert limits, and/or the Terminal Area Path (TAP).

The FAS path is a line in space that defines the path an airplane follows on its final approach. This line is defined by the Landing Threshold Point/Fictitious Threshold Point (LTP/FTP), Flight Path Alignment Point (FPAP), Threshold Crossing Height (TCH), and the Glide Path Angle (GPA).

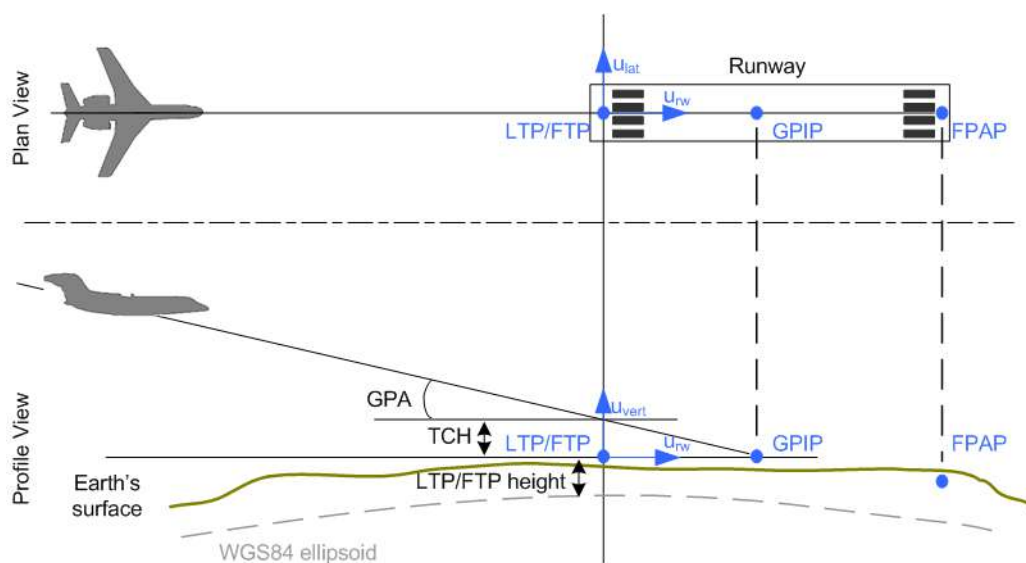


Figure 6-3: Final Approach Segment (FAS) diagram, according to [1]

LTP/FTP = Landing Threshold Point/Fictitious Threshold Point; point at the center of the landing runway, defined by its WGS84 coordinates

GPIP = Glide Path Intercept Point; the point where the final approach path intercepts the local level plane

FPAP = Flight Path Alignment Point; point at the end of the runway that in conjunction with the LTP/FTP defines the geodesic plane of the precision final approach, landing and flight path.

TCH = Threshold Crossing Height

GPA = Glide Path Angle; angle at the TCH that describes the intended angle of descent at the final approach path.

The coordinates of the LTP/FTP are defined in WGS84 coordinates. In this coordinate system, a location is identified by three coordinates, the altitude, the latitude and the longitude.

6.1.4 Time slot synchronization via PPS

The GBAS/SCAT-I signal is synchronous to the PPS signal of the GNSS system. With the help of this synchronization, the GBAS/SCAT-I signal is assigned to eight time slots (twice a second).

If the R&S EVSD1000 finds a valid PPS signal at its selected trigger connector, the status line of the display indicates "PPS Locked". In this case, the R&S EVSD1000 can analyze the GBAS/SCAT-I signal and detect the individual GBAS time slots.

If no valid PPS signal is detected, the R&S EVSD1000 still analyzes the GBAS/SCAT-I signal and tries to synchronize to the GBAS/SCAT-I burst raster. In this case, the status line of the display indicates "Burst Locked". Without PPS synchronization, signal timing and slot positions are possibly not correct.

6.2 GBAS / SCAT-I measurement information

The following measurement information is displayed in all GBAS / SCAT-I views.

RX1 GBAS	Frame T	Slot E	Freq	116.42500 MHz
Att	MAN:Low Noise+			
Lev Corr	0.0 dB	IF BW 16.8 kHz	Time Ref. PPS Locked	Mode Run

Measurement mode.....	151
Frame.....	151
Slot.....	151
Frequency (Freq).....	151
RF attenuation (Att).....	151
Level correction (Lev Corr).....	151
Bandwidth (IF BW).....	151
Time reference status (Time Ref.).....	151
Display Update Status (Mode).....	152

Measurement mode

The currently active measurement mode on the active receiver board; in this case: "GBAS" (for both GBAS and SCAT-I modes). See [Chapter 3.2, "Measurement mode"](#), on page 59.

Frame

The currently selected frame for which the results are displayed. The most recent frame is referred to as T, previous frames are T minus 1 (T-1), T-2, to T-39.

Slot

The currently selected slot for which the results are displayed. The slots are labeled A, B, C, D, E, F, G, H.

Frequency (Freq)

The channel frequency that determines the carrier frequency at which the measurement is performed.

The VHF data broadcast is defined for carrier frequencies within the range of 108.025 MHz to 117.950 MHz with a channel spacing of 25 kHz.

Remote command:

[GBAS : FREQRF](#) on page 312

RF attenuation (Att)

The used attenuation mode; see also ["RF Mode"](#) on page 167.

Level correction (Lev Corr)

The applied level correction by a transducer. See ["Transducer Correction"](#) on page 83.

Bandwidth (IF BW)

Bandwidth on which the measurement is performed. The default bandwidth is 16.8 kHz. For GBAS/SCAT-I measurements, the complete bandwidth is 25 kHz.

See also ["IF Filter"](#) on page 167.

Time reference status (Time Ref.)

Indicates the status of the PPS signal from an external GNSS device.

"PPS Locked"	A GNSS receiver or a valid signal is available at the PPS-In, Trigger-In, or RS232-GPS connector.
"Burst Locked"	No valid PPS signal available at any input connector, but a valid GBAS/SCAT-I burst raster was found. Signal timing and slot positions are possibly not correct.
"Unlocked"	No valid signal available at any input connector, and no valid GBAS/SCAT-I burst raster was found. GBAS/SCAT-I signals cannot be detected correctly.

Remote command:

[GBAS : PPSLOCKED?](#) on page 318

Display Update Status (Mode)

Indicates whether the display is updated or not.

Note: Data recording and streaming continue regardless of the display update status.

"Run" Display is updated continuously.

"Pause" Display is temporarily not updated.

Remote command:

[GBAS : BUFFER_RUNPAUSE](#) on page 310

6.3 GBAS / SCAT-I measurement views and results

The GBAS/SCAT-I measurement provides both numerical and graphical results in various views.

Remote command:

[GBAS : SCREENVIEW](#) on page 312

• Sequence view	152
• Frame view	154
• Burst view	158
• Constellation view	161
• Message view	162
• Recording view	163

6.3.1 Sequence view

Access: [Meas] > "View" > "Sequence"

The "Sequence" view is the default view in GBAS/SCAT-I mode and provides an overview of the GBAS/SCAT-I transmissions over time. Each frame contains 8 TDMA slots (see also [Chapter 6.1.2, "Broadcast timing structure"](#), on page 149). Six sequential frames are displayed at a time, in a table with one column for each slot and one row per frame. You can scroll through all available frames using the rotary knob or the [Frame](#) and [Slot](#) functions.

In the "Sequence" view, the data from the last 40 frames is available. The data is stored in a so-called *ring buffer*. When the ring buffer is full, the next data set overwrites the first data set, that is: the oldest. Thus, the most recent 40 data sets are available. The most recently received frame is referred to as T. Each previous frame is referred to as T minus 1 (T-1), T-2 etc. Every 500 ms, a new frame is inserted, overwriting the frame T-39, and becomes the new frame T. Thus, the display is updated every 500 ms. To freeze the current display for evaluation, you can pause the table update (see "Run/Pause" on page 166). Data recording and streaming, however, continue as usual. When updating is resumed, all frames in the table are updated.

RX1 GBAS		Frame T		Slot E		Freq 116.42500 MHz		Meas GBAS
Att	MAN:Low Noise+							Run/Pause
Lev Corr	0.0 dB	IF BW 16.8 kHz		Time Ref. PPS Locked		Mode Pause		Pause
T	-125.2 dBm	-125.0 dBm	-124.7 dBm	-124.7 dBm	EDDF MT: 1	-126.1 dBm	EDDF MT: 4	View Sequence
T-1	-125.7 dBm	-124.1 dBm	-123.4 dBm	-123.6 dBm	EDDF MT: 1	-125.2 dBm	EDDF MT: 4	Frame 0
T-2	-125.3 dBm	-124.9 dBm	-125.4 dBm	-125.2 dBm	EDDF MT: 1	-126.2 dBm	EDDF MT: 4	Slot E
T-3	-124.9 dBm	-124.3 dBm	-124.8 dBm	-125.0 dBm	EDDF MT: 1	-124.5 dBm	EDDF MT: 2	
T-4	-125.6 dBm	-123.3 dBm	-125.5 dBm	-125.4 dBm	EDDF MT: 1	-125.6 dBm	EDDF MT: 4	
T-5	-125.6 dBm	-125.4 dBm	-125.5 dBm	-124.5 dBm	EDDF MT: 1	-124.3 dBm	EDDF MT: 4	
	A	B	C	D	E	F	G	H
DLIST: 1		SIZE: 158		local		Full		



Results for a single frame or slot

The currently selected frame and slot are indicated by a dotted rectangle in the table. To view the details for a particular frame or slot, turn the rotary knob to scroll through the slots and frames. When the required slot or frame is selected, select the view you want to see the slot results in.

For more details, see:

- [Chapter 6.3.2, "Frame view"](#), on page 154
- [Chapter 6.3.3, "Burst view"](#), on page 158
- [Chapter 6.3.4, "Constellation view"](#), on page 161
- [Chapter 6.3.5, "Message view"](#), on page 162

For each slot in each displayed frame, the following information is provided in the corresponding table cell (for a valid GBAS burst, if available).

EDDF
-65.4 dBm
MT: 1

GBAS ID.....	154
Burst Level Average (Av [dBm]).....	154
Application Data (App. Dat.).....	154
Status.....	154

GBAS ID

4-character identifier of the ground station broadcasting the message. If there is more than one message inside the burst, the first GBAS ID is displayed.

Remote command:

[GBAS:GBASID?](#) on page 315

Burst Level Average (Av [dBm])

Arithmetic average of the burst power level measured over the period of the synchronization and ambiguity resolution field of the burst.

If no burst was detected, the arithmetic average of the noise power is displayed.

Remote command:

[LA?](#) on page 312

Application Data (App. Dat.)

Detected message types (MT) in the burst

Example: "MT:1,2": messages of type 1 and 2 detected

Status

The burst status is indicated by the color of the slot cell:

Green	The status is "OK". The received burst passed the cyclic redundancy check (CRC).
Red	An error occurred. The received burst did not pass the cyclic redundancy check (CRC).
Gray	No burst received.

6.3.2 Frame view

Access: [Meas] > "View" > "Frame"

To use the available spectrum most efficiently, despite the low data rate, GBAS transmissions use the Time Division Multiple Access (TDMA) method (see also [Chapter 6.1.2, "Broadcast timing structure"](#), on page 149). Thus, multiple GBAS bursts, even from different transmitters, can be sent in a single frame. To do so, the transmitters must adhere to the time slots strictly. Nevertheless, time delays can occur during transmission. The GBAS "Frame" view allows you to measure the time behavior of the slots precisely.

As opposed to the "Sequence" view, the "Frame" view displays the results of a single frame only. By default, the most recently measured frame T is displayed. To display the results for a different frame, use the [Frame](#) function.

The display is updated each time a complete frame has been measured, that is: every 500 ms. To freeze the current display for evaluation, you can pause the view update (see ["Run/Pause"](#) on page 166). Data recording and streaming, however, continue as usual. When updating is resumed, the displayed results in the view are updated.

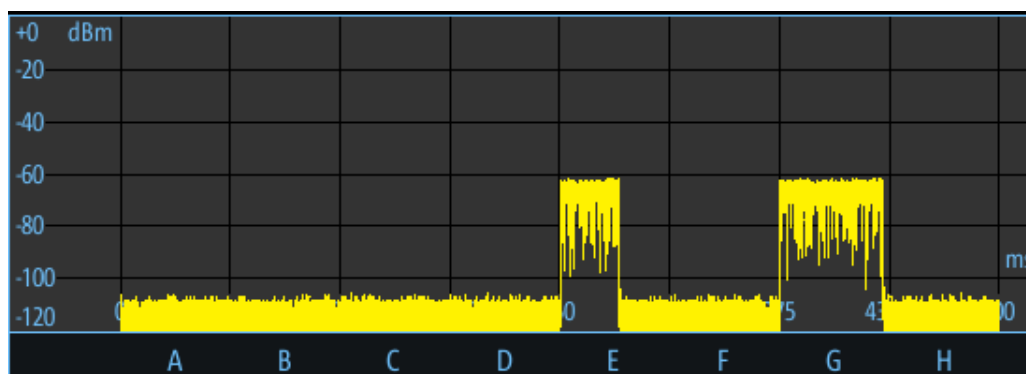


The "Frame" view contains two different displays:

- [Chapter 6.3.2.1, "Frame power vs. time diagram"](#), on page 155
- [Chapter 6.3.2.2, "Frame results table"](#), on page 156

6.3.2.1 Frame power vs. time diagram

The power vs. time diagram displays the measured power per time, normalized to the PPS signal. The fixed slot grid defined by the PPS (reference) signal is indicated by vertical lines in the diagram. In addition to the time in milliseconds, the slot label A to H is indicated on the x-axis. The time axis always starts at 0 seconds or 500 milliseconds.



The measured power is indicated for a range of -120 dBm to 0 dBm on the y-axis.

6.3.2.2 Frame results table

In the frame results table, the details for each slot in the selected frame are displayed, one slot per column. The currently selected slot is indicated by a dotted rectangle in the frame results table. If a slot timing error or a signal level error occurs, the slot is highlighted red.

	A	B	C	D	E	F	G	H
Train.FEC					OK		OK	
App.Dat.					MT: 1		MT: 4	
App.FEC					OK		OK	
S.Occu[%]	--	--	--	--	54.552	--	94.781	--
BER					0.0e+00		0.0e+00	
Valid B.					110		110	
Failed B.					0		0	
Sync.[μs]					576.0		576.0	
Overload								



To scroll through the parameters in the table for a single slot, use the arrow keys up and down.

Burst Level Average (Av [dBm]).....	157
Slot Level Peak (Pk [dBm]).....	157
Carrier frequency offset (Offs. [kHz]).....	157
EVM RMS.....	157
GBAS ID.....	157
Training Sequence FEC (Train. FEC).....	157
Application Data (App. Dat.).....	157
Application FEC (App. FEC).....	158
Slot Occupancy (S.Occu [%]).....	158
Bit error rate (BER) before FEC.....	158
Valid Bursts (Valid B.).....	158

Failed Bursts (Failed B.).....	158
Sync. Sequence (Sync. [us]).....	158
Overload.....	158

Burst Level Average (Av [dBm])

Arithmetic average of the burst power level measured over the period of the synchronization and ambiguity resolution field of the burst.

If no burst was detected, the arithmetic average of the noise power is displayed.

Remote command:

[LA?](#) on page 312

Slot Level Peak (Pk [dBm])

Highest measured power level in the slot in dBm

Remote command:

[GBAS : PEAKLEV?](#) on page 318

Carrier frequency offset (Offs. [kHz])

Offset of the measured carrier frequency from the nominal frequency

Remote command:

[GBAS : FMEAS?](#) on page 311

EVM RMS

Error vector magnitude RMS in percent.

Indicates the quality of the transmitted symbols in relation to the ideal constellation point. The EVM normalization reference is the mean constellation power.

Remote command:

[GBAS : EVM?](#) on page 314

For baseband input also:

[GBAS : EVM_ANGLE_NORM](#) on page 311

GBAS ID

4-character identifier of the ground station broadcasting the message. If there is more than one message inside the burst, the first GBAS ID is displayed.

Remote command:

[GBAS : GBASID?](#) on page 315

Training Sequence FEC (Train. FEC)

Training sequence status based on the FEC

"OK" Training sequence correct

"NOK" Training sequence not valid, no bits corrected

<x> Number of corrected bits in the training sequence

Application Data (App. Dat.)

Detected message types (MT) in the burst

Example: "MT:1,2": messages of type 1 and 2 detected

Application FEC (App. FEC)

Application data status based on the FEC

"OK"	Application data correct
"NOK"	Application data not valid, no bits corrected
<x>	Number of corrected bits in the application data

Slot Occupancy (S.Occu [%])

The percentage of the available bits in the slot that contain burst data, calculated as:

$\text{<bits\_burst> / 1968.75 bits * 100 \%}$

Bit error rate (BER) before FEC

Bit error rate (BER) before forward error correction (FEC). The [Training Sequence FEC \(Train. FEC\)](#) and the [Application FEC \(App. FEC\)](#) are used to detect the bit errors.

Calculated as:

$\text{<bits\_ok> / <bits\_error>}$

To reset the BER value, use the [Reset BER](#) function.

Remote command:

[GBAS : GBASBER?](#) on page 314

Valid Bursts (Valid B.)

Number of received bursts that passed the cyclic redundancy check (CRC) and are thus considered valid.

To reset the value, use the [Reset BER](#) function.

Failed Bursts (Failed B.)

Number of received bursts that did not pass the cyclic redundancy check (CRC) and are thus considered invalid.

To reset the value, use the [Reset BER](#) function.

Sync. Sequence (Sync. [us])

Position of the synchronization sequence within the burst in μs .

Overload

Indicates a power overload at any of the input connectors, which can account for inaccurate results. If an overload occurs, an error message is also displayed in the measurement information in all GBAS / SCAT-I views.

"OK"	No overload
"RF Ovld"	Input signal too high
"IF Ovld"	IF signal too high
"ADC Ovld"	ADC input signal too high

6.3.3 Burst view

Access: [Meas] > "View" > "Burst view"

The "Burst" view is similar to the "Frame" view. However, the "Burst" view displays the results for an individual slot.

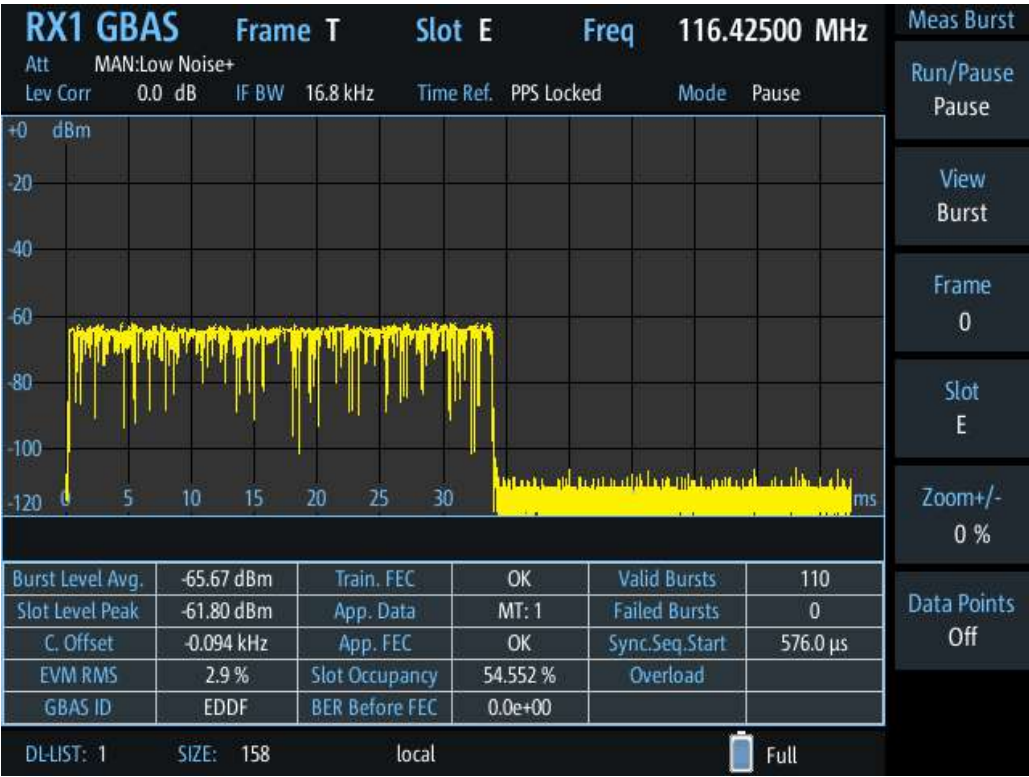


Figure 6-4: Example for a "Burst" view with a diagram and result table

By default, the first slot (A) from the most recently measured frame T is selected. To display the results for a different slot, use the [Frame](#) and [Slot](#) functions.

The display is updated each time a complete slot has been measured, that is: every 62.5 ms. To freeze the current display for evaluation, you can pause the view update (see ["Run/Pause"](#) on page 166). Data recording and streaming, however, continue as usual. When updating is resumed, the displayed results in the view are updated.

The "Burst" view contains two different displays:

- [Chapter 6.3.3.1, "Slot power vs. time diagram"](#), on page 159
 - [Chapter 6.3.3.2, "Slot results table"](#), on page 160
- [Slot power vs. time diagram](#)..... 159
 - [Slot results table](#).....160

6.3.3.1 Slot power vs. time diagram

A power vs. time diagram displays the measured power in the slot per time, normalized to the PPS signal. The x-axis shows the time in milliseconds. It always starts at 0 seconds or a multiple of 62.5 milliseconds. The default range is 62.5 milliseconds. If a TDMA timing error occurs, the GBAS/SCAT burst can exceed the displayed time range.

The measured power is indicated for a range of -120 dBm to 0 dBm on the y-axis.

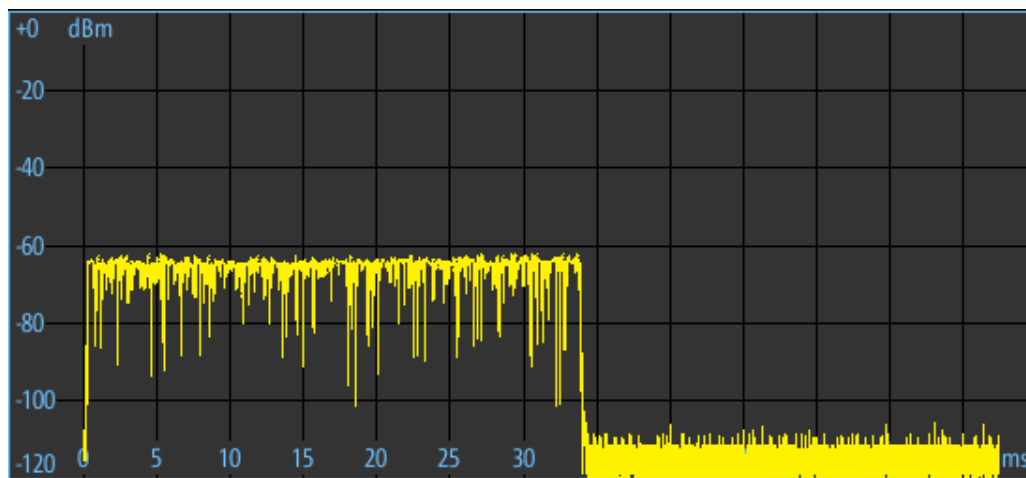


Figure 6-5: Power vs. time diagram for a slot in Burst view

The following functions are available for the slot power vs. time diagram:

Zoom +/ Zoom -

Changes the time range displayed in the diagram to view more details in a slot ("Zoom +") or outside of the slot ("Zoom -").

Data points

Shows or hides dots in the diagram indicating the measured data points.

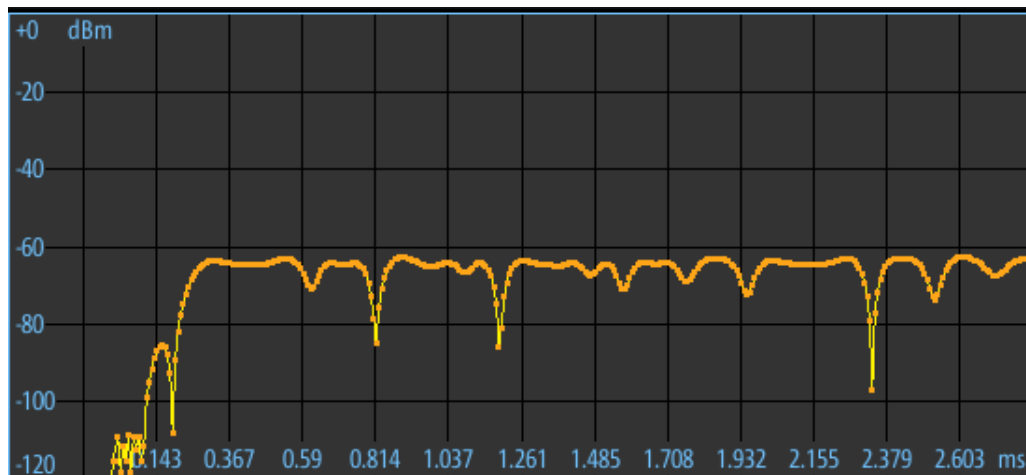


Figure 6-6: Power vs. time diagram with highlighted data points

6.3.3.2 Slot results table

In the slot results table, the slot details for the selected slot are displayed. The results are the same as those displayed in the [Frame results table](#).

Burst Level Avg.	-65.67 dBm	Train. FEC	OK	Valid Bursts	110
Slot Level Peak	-61.80 dBm	App. Data	MT: 1	Failed Bursts	0
C. Offset	-0.094 kHz	App. FEC	OK	Sync.Seq.Start	576.0 µs
EVM RMS	2.9 %	Slot Occupancy	54.552 %	Overload	
GBAS ID	EDDF	BER Before FEC	0.0e+00		

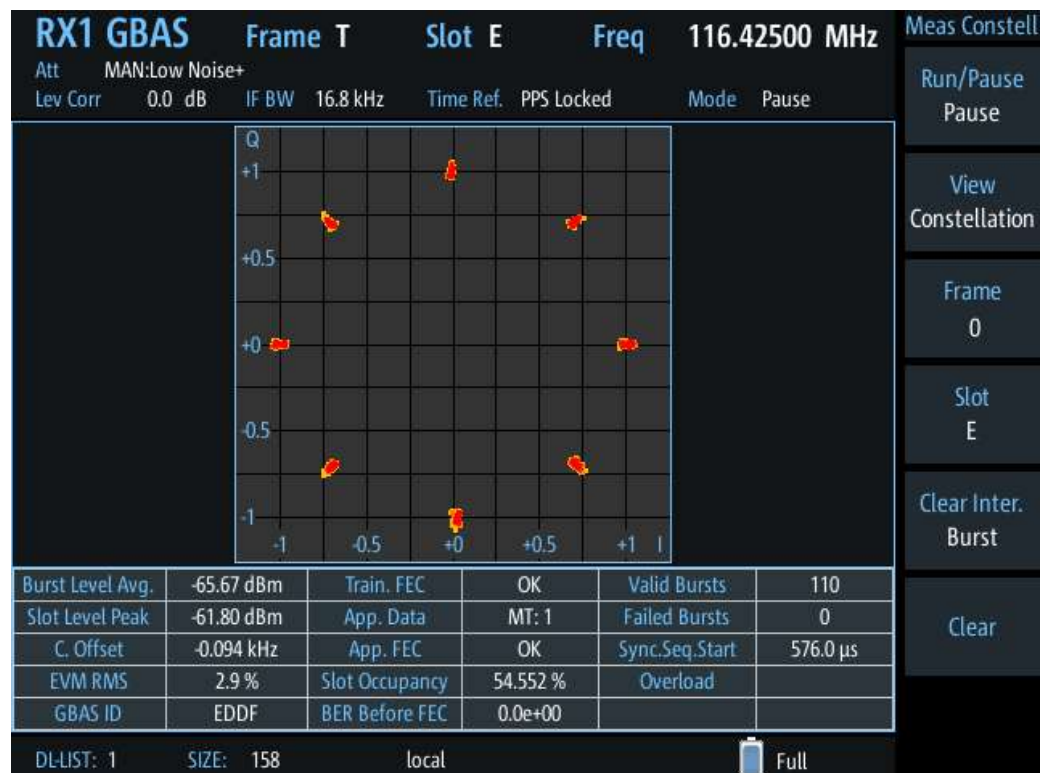


If no valid burst is detected in the slot, the slot results table shows only the measured noise level.

6.3.4 Constellation view

Access: [Meas] > "View" > "Constell. view"

The "Constellation" view consists of a constellation diagram and the measured values for the individual slot (see [Chapter 6.3.2.2, "Frame results table"](#), on page 156).



The constellation diagram shows the in-phase and quadrature components of the received D8PSK symbols in the slot. The in-phase components (I) are displayed on the x-axis, the quadrature (Q) components on the y-axis.

The eight ideal constellation points for D8PSK modulation are indicated by red dots.

The following functions are available for the constellation diagram:

Clear Inter.

Determines the interval after which the constellation diagram is cleared automatically.

"Off"	(Default:) All constellation points from all bursts are displayed in the same diagram, no automatic clearance.
"Burst"	After each burst, the diagram is cleared and a new constellation diagram is displayed.

Clear

Clears all points from previous bursts in the constellation diagram and starts a new diagram.

6.3.5 Message view

Access: [Meas] > "View" > "Message view"

The "Message" view shows the messages received during a single slot or burst. In addition to the message itself, the header and footer are analyzed. If the burst contains multiple messages, they are listed in the table one after the other.

The data is interpreted from the received burst bitstream according to rules and data definitions configured in XML files. You can configure the information provided in the "Message" view table using the message xml interface (see [Chapter 6.5, "Message XML interface"](#), on page 169).

For each type of data content, a separate row is displayed with the following information:

- "Data content": textual description of the type of information
- "Bits": number of bits from the burst bitstream that were evaluated to obtain the information
- "Value": result of the interpreted bits
- "Binary representation": the raw data in the evaluated bits

RX1 GBAS				Frame T	Slot E	Freq	116.42500 MHz	Meas Msg
Att MAN:Low Noise+								Run/Pause
Lev Corr 0.0 dB				IF BW 16.8 kHz	Time Ref. PPS Locked	Mode	Pause	Pause
Data content	Bits	Value	Binary representation					
Station Slot Identifier	3	E	100					
Transmission Length	17	976	00000001111010000					
Training Sequence FEC	5	OK	01110					
Message Block	0							
Message Block Identifier	8	normal	10101010					
GBAS ID	24	EDDF	000101000100000100000110					
Message Type Identifier	8	MsgType1	00000001					
Message Length	8	928	01110100					
Message	0	MTI:1						
Modified Z-count [s]	14	213.5	00100001010111					
Additional Message Flag	2	all	00					
Number of Measurements	5	9	01001					
Measurement Type	3	C/A_L1	000					
Ephemeris Decorrelation Parameter...	8	0.000180	00100100					
Ephemeris CRC MSB	8	121	01111001					
Ephemeris CRC LSB	8	115	01110011					
DL-LIST: 1				SIZE: 158	local	Full		



Use the arrow keys and the rotary knob to scroll through the table.

6.3.6 Recording view

Access: [Meas] > "View" > "Rec."

The Recording view displays the recorded data for GBAS/SCAT-I measurements from the selected data list (see "[List](#)" on page 193). If available, the stored GNSS data from the GNSS receiver is also displayed.

RX1 GBAS DL-List 1 Line 11 Freq 116.42500 MHz										Meas REC
Att MAN:Low Noise+										DL Line 11
Lev Corr 0.0 dB IF BW 16.8 kHz Time Ref. PPS Locked Mode Pause										View Rec
RX	STIOCP	Index	Date	Time	Slot	FREQ[MHz]	Lev.Av[dBm]	Lev.Pk[dBm]	C.Offse	-> Rec Burst View -> Rec Const. View -> Rec Msg. View
1	S	1	04.12.2018	13:35:24.760	C	116.42500	-124.98	-114.89	---	
1		2	04.12.2018	13:35:24.823	D	116.42500	-124.92	-115.20	---	
1		3	04.12.2018	13:35:24.885	E	116.42500	-65.67	-61.80	-0.094	
1		4	04.12.2018	13:35:24.948	F	116.42500	-125.27	-115.08	---	
1		5	04.12.2018	13:35:25.010	G	116.42500	-65.32	-61.88	-0.093	
1		6	04.12.2018	13:35:25.073	H	116.42500	-125.64	-115.38	---	
1		7	04.12.2018	13:35:25.135	A	116.42500	-124.59	-114.70	---	
1		8	04.12.2018	13:35:25.198	B	116.42500	-125.03	-114.58	---	
1		9	04.12.2018	13:35:25.260	C	116.42500	-124.56	-114.44	---	
1		10	04.12.2018	13:35:25.323	D	116.42500	-124.78	-115.13	---	
1		11	04.12.2018	13:35:25.385	E	116.42500	-65.41	-61.87	-0.092	
1		12	04.12.2018	13:35:25.448	F	116.42500	-124.02	-114.61	---	
1		13	04.12.2018	13:35:25.510	G	116.42500	-64.84	-61.73	-0.096	
1		14	04.12.2018	13:35:25.573	H	116.42500	-123.81	-115.05	---	
1		15	04.12.2018	13:35:25.635	A	116.42500	-123.77	-114.57	---	
1		16	04.12.2018	13:35:25.698	B	116.42500	-124.90	-114.26	---	
1		17	04.12.2018	13:35:25.760	C	116.42500	-125.19	-115.49	---	
DL-LIST: 1 SIZE: 158 local Full										

The individual measurement results are described in [Chapter 6.3.2.2, "Frame results table"](#), on page 156.



Recording GBAS/SCAT-I measurement results

When recording data in GBAS/SCAT-I mode, one record is stored for each slot, with a duration of 62.5 ms. The record contains measurement values and message data. Recording is continued even if the display update is temporarily stopped (by the "Pause" function, see ["Run/Pause"](#) on page 166). Start and stop recording from any measurement view using the [Record] key. Record only the selected and currently displayed slot or frame using the [Single] key.

You can define which data is stored; see [Chapter 7.2.3, "Recording settings"](#), on page 193.

For details on data logging, see [Chapter 7.2, "Recording measurement data"](#), on page 191.



Status flags

The "STIOCPMV" value contains status flags, if applicable:

- **S**: Start (started manually)
- **T**: Triggered (externally)
- **I**: Invalid
- **O**: Overload (RF input signal too high)
- **C**: Corrected (includes RF input correction factor)
- **P**: PPS-synced
- **M**: Morse ID available
- **V**: Valid signal (ILS LOC/GP and VOR only)

The following functions are available to configure the "Recording" view.

DL Line	165
-> Rec. Burst View / -> Rec. Const. View / -> Rec. Msg. View	165

DL Line

Selects a particular line (record) in the data recording file.

-> Rec. Burst View / -> Rec. Const. View / -> Rec. Msg. View

Displays the selected data record in detail in the selected view. Message view is only available if message data was stored in the data record.

To return to the "Recording" view, select "-> Return".

6.4 GBAS/ SCAT-I measurement configuration

The following settings are available for GBAS/ SCAT-I measurements.



Settings for recording are described in [Chapter 7.2, "Recording measurement data"](#), on page 191.

• View configuration	165
• Frequency configuration	166
• Amplitude configuration	166
• Bandwidth configuration	167
• General configuration	167

6.4.1 View configuration

The following functions are available to configure the GBAS/ SCAT-I views except for the "Recording" view.

Access VNC: [A]

Run/Pause.....	166
View.....	166
Frame.....	166
Slot.....	166

Run/Pause

Stops and resumes the display update. Data recording and streaming continue as usual. When updating is resumed, the display reflects the latest results again.

View

Switches between

- [Sequence view](#)
- [Frame view](#)
- [Burst view](#)
- [Constellation view](#)
- [Message view](#)
- [Recording view](#)

Frame

Selects the frame to be displayed in the power vs. time diagram and at the top of the results table. By changing the frame number, for example using the rotary knob, you can scroll through the frames in the table and through the most recent 40 frames in the diagram.

Slot

Selects the slot to be displayed in the power vs. time diagram and at the top of the results table. By changing the slot name, for example using the rotary knob, you can scroll through the slots in the table and in the diagram.

Remote command:

[GBAS : SEQN_SLOT](#) on page 313

6.4.2 Frequency configuration

Access VNC: [Q] > [F2]

Frequency (Freq)

The channel frequency that determines the carrier frequency at which the measurement is performed.

The VHF data broadcast is defined for carrier frequencies within the range of 108.025 MHz to 117.950 MHz with a channel spacing of 25 kHz.

Remote command:

[GBAS : FREQRF](#) on page 312

6.4.3 Amplitude configuration

Access VNC: [w]

The following settings define the amplification for the input signal.

RF Att

Determines whether the RF attenuation is defined automatically or manually.

"Manual"	Select the RF Mode manually. For signals with mostly constant signal levels, it is recommended that you select the optimal mode manually.
"Auto"	The optimal mode is selected automatically according to the input signal strength. In difficult receiving conditions, for example the presence of high-level interferers or areas with strong multi-path conditions, selecting the suitable attenuation mode manually can lead to more stable measurement results. If the R&S EVSD1000 has to adapt the attenuation frequently, indicated by a frequent clicking noise from the attenuator, spikes can occur in the trace.

Remote command:

GBAS:ATTMODE AUTO, see [GBAS:ATTMODE](#) on page 310

RF Mode

Defines the RF attenuation mode to be used.

"Low Noise"	15 dB pre-amplification Provides a high sensitivity. Suitable when scanning the area for distant signals.
"Norm"	0 dB Provides a normal sensitivity.
"Low Dist"	15 dB attenuation Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Remote command:

[GBAS:ATTMODE](#) on page 310

6.4.4 Bandwidth configuration

Access VNC: [e]

IF Filter

The IF filter determines the bandwidth on which the measurement is performed. The default filter bandwidth is 16.8 kHz. For GBAS/SCAT-I measurements, the complete channel bandwidth is 25 kHz.

6.4.5 General configuration

Access VNC: [S]

PPS SRC.....	168
Export xml.....	168
Import xml.....	168
DEC DEF.....	168
Reset BER.....	168
EVM Mode.....	168

PPS SRC

Source of the PPS signal required as a time reference

"PPS SMA"	Signal provided at the PPS In connector
"PPS GPS"	Signal provided at the RS232-GPS connector

Export xml

Exports the internal message type xml definition to a connected USB storage device (see [Chapter 6.5, "Message XML interface"](#), on page 169).

Exporting the xml definition is useful to create a customized definition without having to start from an empty file.

Import xml

Imports a customized message type xml definition from a connected USB storage device to the R&S EVSD1000 (see [Chapter 6.5, "Message XML interface"](#), on page 169).

Note that this definition is only used if you set [DEC DEF](#) to "Custom".

DEC DEF

Determines which message type xml definition that the decoder uses.

"Default"	Uses the definition stored internally on the R&S EVSD1000
"Custom"	Uses the imported definition (see "Import xml" on page 168).

Reset BER

Resets the values for the following measurement results:

- ["Bit error rate \(BER\) before FEC"](#) on page 158
- ["Valid Bursts \(Valid B.\)"](#) on page 158
- ["Failed Bursts \(Failed B.\)"](#) on page 158

Remote command:

[GBAS : RESETBER](#) on page 319

EVM Mode

Determines the mode of EVM calculation for baseband input in "GBAS" mode.

"ANGLE"	Only angle deviations are considered in EVM calculation.
"NORM"	Both angle and amplitude deviation are considered in EVM calculation.

Remote command:

[GBAS : EVM_ANGLE_NORM](#) on page 311

6.5 Message XML interface

The R&S EVSG-K4 GBAS analysis / R&S EVSG-K5 SCAT-I Analysis options receive and analyze VDB GBAS transmissions according to ICAO AN10 Vol1 [3] and RTCA DO-246 [1]. Analysis includes physical measurement values such as level, frequency or EVM. The results can be displayed or recorded. A bitstream is also provided with each transmission (*burst*). The bitstream contains the digital information required by a GNSS receiver for its calculations. To display this information in human-readable format, the bitstream needs to be interpreted as described in the document.

The R&S EVSG-K4 GBAS analysis / R&S EVSG-K5 SCAT-I Analysis options provide a special parser that transforms the data efficiently, controlled by a set of XML files. The XML files contain the rules and data definitions for conversion and are loaded during runtime. The converted, human-readable data is then displayed in the "Message" view (see [Chapter 6.3.5, "Message view"](#), on page 162).

You can edit the XML control files with any text editor to obtain specific outputs, for example, or to accommodate the output to changes in the specifications. However, a good knowledge of the ICAO AN10 Vol1 [3] and RTCA DO-217 [2] specifications is essential to understand the transformation process.

The R&S EVSD1000 provides a default set of XML files for an initial message type definition. These files are stored internally on the instrument. You can export the files to a USB storage device and import the customized files back to the R&S EVSD1000 (see ["Import xml"](#) on page 168).

To customize the "Message" view results

1. Connect a USB storage device to the R&S EVSD1000.
2. Select [Config] > "Export xml".
The required file structure and files are stored on the storage device.
3. Edit the files as required. See the descriptions below for more information.
4. Select [Config] > "Import xml".

The edited files are stored on the R&S EVSD1000.

5. Select [Config] > "DEC DEF" > "Custom".

The R&S EVSD1000 decoder uses the edited, imported message definition and displays the defined results in the "Message" view.

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6.5.1 General processing

The parser in the GBAS/SCAT-I application uses the first message control XML file as instructions for processing. As input, it receives a bitstream from the GBAS burst in the input signal.

The general process of interpreting the bitstream consists of the following steps:

1. The parser applies the first instruction on the leading bits of the bitstream, which usually produces a value or text as output.

2. The parser applies the next instruction on the subsequent bits of the bitstream.

As a result, either an output is produced, or further instructions are provided. Further instructions can be provided in additional XML files, or depend on the current bitstream value, or on a previous value (see ["Control elements"](#) on page 172).

3. The parser continues to process the instructions as defined in the XML file, applying them to the subsequent, not-yet-processed bits of the bitstream.

4. When the end of the last XML file has been processed, the parser stops.

The converted, human-readable data is displayed in the "Message" view.

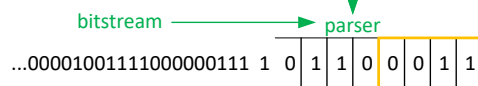
Step 1

```

<Element>
  <data_content>ABC_XYZ</data_content>
  <data_content_short>ABC</data_content_short>
  <bits_used>4</bits_used>
  <type>value</type>
</Element>

```

XML file

**Interpretation**

Data Content	Bits used	Value	Binary
ABC_XYZ	4	3	0011

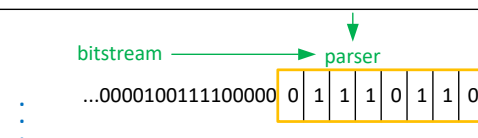
Step 2

```

<Element>
  <data_content>KLMO</data_content>
  <data_content_short>KLM</data_content_short>
  <bits_used>8</bits_used>
  <type>value</type>
</Element>

```

XML file

**Interpretation**

Data Content	Bits used	Value	Binary
KLMO	8	118	01110110

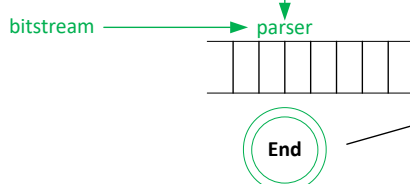
Step n

```

<Element>
  <data_content>Fill Bits</data_content>
  <data_content_short>FILL_BITS</data_content_short>
  <type>fill</type>
</Element>
</Gbas>

```

XML file

**Output in Message view table**

Data Content	Bits used	Value	Binary
ABC_XYZ	4	3	0011
KLMO	8	118	01110110

6.5.2 Output elements and control elements

Different types of elements are supported to interpret all existing values in a GBAS burst. However, the types are generic and can be configured to handle other values, as well.

Many elements simply convert a binary value in the bitstream to human-readable output for the "Message" view table. Conversion in this case can consist of various different instructions, such as:

- Comparing bitstrings and providing a check result
- Converting binary values to decimal values
- Converting binary values to text descriptions

For different instructions, you must define different element types.

Example: Interpretation of a "fixed"-type element

The `fixed`-type element expects a certain number of bits to have a specific value. If the incoming bitstream matches, the result value is `OK`, otherwise it is `NOK`.

The result of the interpretation on the R&S EVSD1000 is a table similar to the examples in DO246, in this case:

Table 6-1: Output in Message view table

Data Content	Bits used	Value	Binary
Power stabilization	15	OK	000000000000000
Sync. and ambiguity resolution	48	OK	010001111101111 1000110001110110 0000011110010000

All available element types are described in [Chapter 6.5.4, "Format description of elements"](#), on page 176.

Control elements

Each GBAS burst can contain one or more messages. The messages have different message types with different content. The content of the same message type can depend on certain parameters which are only known during runtime. Therefore, control elements such as a case-dependent branch to a further XML file are supported.

Example: Case-dependent processing

This example shows how the parser is directed to different instructions, which are stored in additional XML files, depending on the determined message type:

```
<Element>
  <data_content>Message</data_content>
  <data_content_short>MSG</data_content_short>
  <type>link_sel</type>
  <link_sel>MTI</link_sel>
  <link_case>
    <value>1</value>
    <link>GbasMsgType1.xml</link>
  </link_case>
  <link_case>
    <value>2</value>
    <link>GbasMsgType2.xml</link>
  </link_case>
  <link_case>
    <value>4</value>
    <link>GbasMsgType4.xml</link>
  </link_case>
</Element>
```

The additional XML files have the same format and supported elements. They can branch to even more files, there is no limit to how deeply the files are nested.

Further control elements implement loops which repeat sequences for several repetitions ("for"-loop) or while there is enough data left ("while"-loop).

Control elements can also contain references to previous elements, that is: to results obtained in previous instruction steps. References are defined using the element's unique identifier, which is a mandatory part of each element.

Using links and loops, the parser can navigate through the entire bitstream.

Parser results

The result of the interpreted bitstream is a comma-separated list of values which is displayed in the "Message" view (see [Chapter 6.3.5, "Message view"](#), on page 162).

Recording GBAS data

When you record and export the results of a GBAS measurement, all measured values and the bitstream for each record are stored as a comma-separated list. This basic CSV file contains a data link for each record in the list. The link points to a further CSV file which contains all human-readable texts for that record. All data files for the current recording are stored in a subdirectory that is exported together with the basic CSV file. The file with the human-readable text values contains the data that is displayed in the "Message" view.

Example:

One row of data from the basic CSV file for list number 20 (gbas_rx1_list20.csv):

```
1,,3,18.09.2018,14:29:57.844,D,108.0000,0.000,-8.15,-4.63,-,7.0,CMJ ,NOK,4,NOK,
0.0e+00,882,-.-,-.-,-.-,20.553,481.0,00° 00.00000000' N,00° 00.00000000' E,0.00,0.00,
--.--,--,--,0,NO GPS,NO GPS,--,--,MAN:Norm,0,1 82 30 00 55 05 4B 30 20
3A 94 0F F0 40 60 30 F2 98 C0 C8 40 28 E0 61 47 5D 48 09 7B C9 00 AD D8 33 3C BF 34
07 40 AA 81 34 80 26 00 B2 15 A5 45 26 13 94 08 F0 40 60 30 86 90 A8 04 70 28 E0 3D
83 ED 48 38 C5 E9 00 4B D8 DF 46 40 3C 21 BF 8C 81 B4 80 26 00 EB 05 B2 F5 26 13 D9
7F C0 EA A1 A4 3D 54 89 D8 00 00 ,=HYPERLINK("gbas_rx1_list20/MSG000003_D.csv")
```

Extract of data file gbas_rx1_list20/MSG000003_D.csv:

```
Name,Type,bits used,Value,Unit,binary
Power Stabilization,fixed,15,OK,,0000000000000000
Sync. and Amb. Resolution,fixed,48,OK,,01000111110111110001100011101100000011110010000
```

Table 6-2: Output in Message view table

Data Content	Bits used	Value	Binary
Power stabilization	15	OK	0000000000000000
Sync. and ambiguity resolution	48	OK	010001111101111100011000111011000 00011110010000

6.5.3 XML file format description

The GBAS/SCAT-I message interpretation files comprise at least the following XML files:

- **Burst.xml**: describes the basic structure of a message and is identical for all messages.
This is the basic (root) file for interpretation.
- **GbasMsgBlock.xml**: describes the LAAS message block.
This file is referred to by **Burst.xml** and can refer to further XML files.
- **GbasMsgType<x>.xml**: describes each message type in an individual file.
These files are referred to by **Burst.xml** and can refer to further XML files.

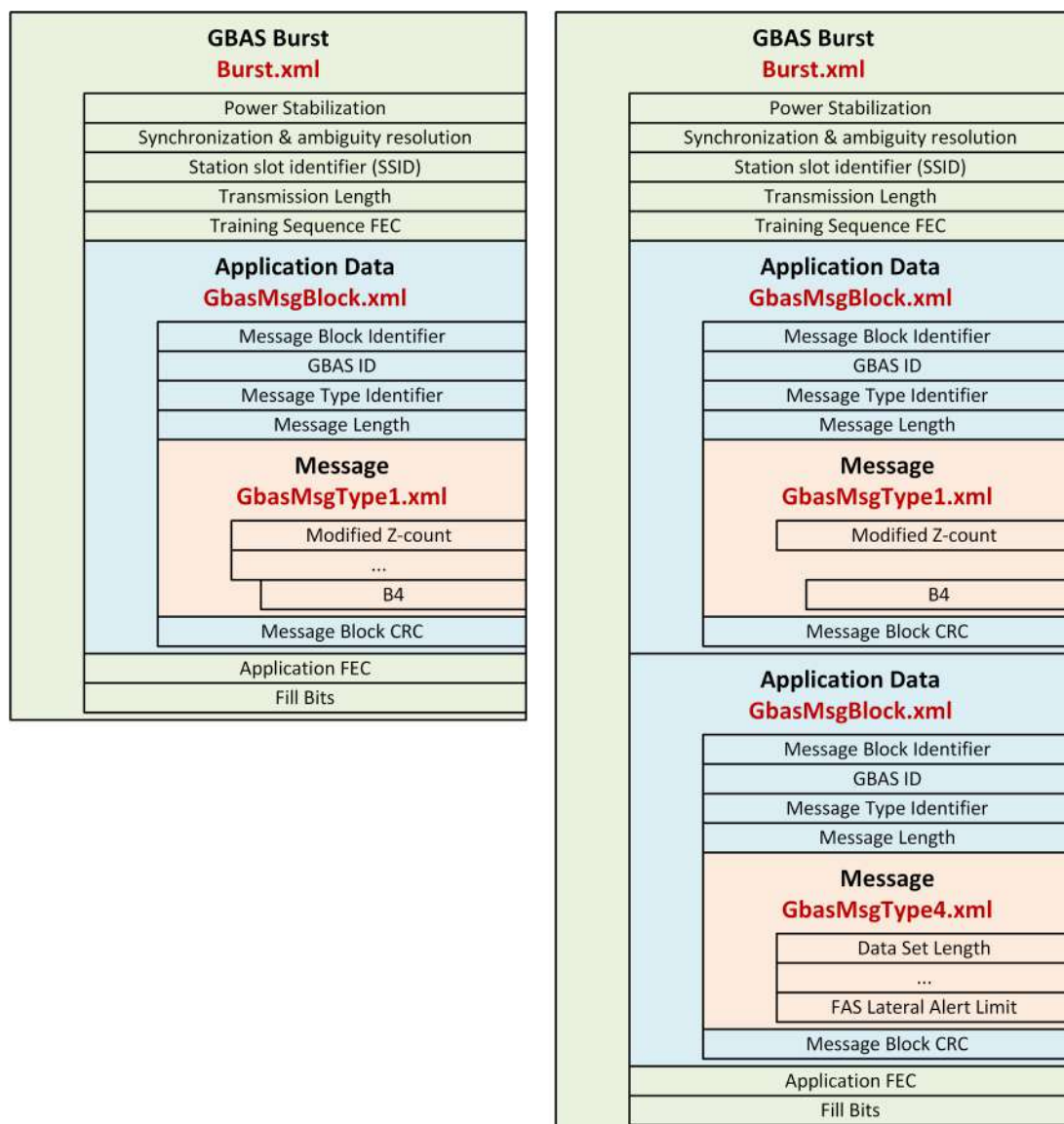


Figure 6-7: Examples for xml message interpretation files; left: message type 1; right: message types 1 and 4

The GBAS/SCAT-I option provides XML files for all currently supported GBAS/SCAT-I message types, as shown in [Table 6-3](#).

Table 6-3: Provided XML files for GBAS/SCAT-I message types

Message type	Description	Reference
GBAS-MT1	Pseudo-range corrections – 100 second smoothed pseudo-ranges.	ICAO AN10 Vol1 / RTCA DO-246
GBAS-MT2	GBAS-related data.	ICAO AN10 Vol1 / RTCA DO-246
GBAS-MT4	Final approach segment (FAS) data.	ICAO AN10 Vol1 / RTCA DO-246
GBAS-MT11	Pseudo-range corrections – 30 second smoothed pseudo-ranges.	ICAO AN10 Vol1 / RTCA DO-246
SCAT-I-MT1		RTCA DO-217
SCAT-I-MT4		RTCA DO-217

Burst.xml

Each GBAS bitstream consists of several elements. The first elements are the same for all bursts:

- Power stabilization (15 bits)
- Synchronicity & ambiguity resolution (48 bits)
- SSID (3 bits)
- Transmission length (17 bits)
- ...

This general information is provided in the `Burst.xml` file, which is the start file for conversion. The root element in this file is `<Gbas>`, which means the file starts with `<Gbas>` and ends with `</Gbas>`.

Within the `<Gbas>` element, a definition for each subelement (`<Element>`) is provided.

Example: Element definition in burst.xml file

```
<Gbas>
  <Element>
    <data_content>Power Stabilization</data_content>
    <data_content_short>POW_STAB</data_content_short>
    <bits>0000000000000000</bits>
    <type>fixed</type>
  </Element>
  <Element>
    <data_content>Sync. and Amb. Resolution</data_content>
    <data_content_short>SYNC_AMB_RES</data_content_short>
    <bits>00001001111000000110111000110001111101111100010</bits>
    <type>fixed</type>
  </Element>
  ...
</Gbas>
```

The format of the individual elements is described in the following sections.

6.5.4 Format description of elements

Different types of elements are supported to interpret all existing values in a GBAS burst. However, the types are generic can be configured to handle other values, as well.

Each `<Element>` in the XML file must have the following subelements:

Table 6-4: Mandatory subelements

Name	Description
<code><data_content></code>	Text that describes the content, usually the description from the DO246 document
<code><data_content_short></code>	A short description or unique keyword used to reference the element. Select the name carefully - changing the name later can cause errors in the functionality of other elements
<code><type></code>	Determines how the parser processes the element

The element type determines how the data is interpreted. Depending on the `<type>`, further elements can be mandatory.

6.5.5 Output elements

• Unsigned type	176
• Signed type	177
• Longitude type	178
• Latitude type	179
• Id type	180
• Fixed type	180
• Value type	180
• FEC type	181
• CRC type	181
• List type	182
• Enum type	183
• Dummy type	184

6.5.5.1 Unsigned type

Interprets the value in a given number of bits as an unsigned (positive) integer value in decimal format

Table 6-5: Mandatory subelements

Name	Description
<code><bits_used></code>	Static number of bits

Table 6-6: Optional subelements

Name		Description
<resolution>		Determines the resolution of the element contents, e.g. a result value. The value is multiplied with the <resolution> factor to obtain the output result. Note that the number of decimals of the <resolution> factor also defines the number of decimals in the result. (Default: 1)
<unit>		Additional unit which is appended to the result
<special>		Special text that is provided as a result instead of using the value and resolution
	<value>	Actual result value
	<name>	Provided result text

Example:

```

<Element>
  <data_content>Source Availability Duration</data_content>
  <data_content_short>SRC_DUR</data_content_short>
  <bits_used>8</bits_used>
  <type>unsigned</type>
  <special>  <value>254</value>  <name>&gt;2540</name>  </special>
  <special>  <value>255</value>  <name>not provided</name>  </special>
  <resolution>10</resolution>
  <unit>s</unit>
</Element>

```

6.5.5.2 Signed type

Interprets the value in a given number of bits as a signed integer value in decimal format

Table 6-7: Mandatory subelements

Name	Description
<bits_used>	Static number of bits

Table 6-8: Optional subelements

Name	Description
<resolution>	Determines the resolution of the element contents, e.g. a result value. The value is multiplied with the <resolution> factor to obtain the output result. Note that the number of decimals of the <resolution> factor also defines the number of decimals in the result. (Default: 1)
<unit>	Additional unit which is appended to the result
<special>	Special text that is provided as a result instead of using the value and resolution

Name		Description
	<value>	Actual result value
	<name>	Provided result text

Example:

```

<Element>
  <data_content>Pseudorange    Correction    (PRC)</data_content>
  <data_content_short>PRC</data_content_short>
  <bits_used>16</bits_used>
  <type>signed</type>
  <resolution>0.01</resolution>
  <unit>m</unit>
</Element>

```

6.5.5.3 Longitude type

Like a signed value, but output is formatted in <degree>-<minute>-<second> format, with "E" = East for positive and "W" = West for negative values

Table 6-9: Mandatory subelements

Name	Description
<bits_used>	Static number of bits

Table 6-10: Optional subelements

Name		Description
<resolution>		Determines the resolution of the element contents, e.g. a result value. The value is multiplied with the <resolution> factor to obtain the output result. Note that the number of decimals of the <resolution> factor also defines the number of decimals in the result. (Default: 1)
<unit>		Additional unit which is appended to the result
<special>		Special text that is provided as a result instead of using the value and resolution
	<value>	Actual result value
	<name>	Provided result text

Example:

```

<Element>
  <data_content>Longitude</data_content>
  <data_content_short>Long</data_content_short>
  <bits_used>32</bits_used>
  <type>long</type>
  <resolution>0.0005</resolution>
</Element>

```

Table 6-11: Output in Message view table

Data Content	Bits used	Value	Binary
Longitude	32	W93°25'13.0000"	11010111111010001000101010110000

6.5.5.4 Latitude type

Like a signed value, but output is formatted in degree-minute-second format, with "E" = East for positive and "W" = West for negative values

Table 6-12: Mandatory subelements

Name	Description
<bits_used>	Static number of bits

Table 6-13: Optional subelements

Name	Description
<resolution>	Determines the resolution of the element contents, e.g. a result value. The value is multiplied with the <resolution> factor to obtain the output result. Note that the number of decimals of the <resolution> factor also defines the number of decimals in the result. (Default: 1)
<unit>	Additional unit which is appended to the result
<special>	Special text that is provided as a result instead of using the value and resolution
	<value> Actual result value
	<name> Provided result text

Example:

```

<Element>
  <data_content>Latitude</data_content>
  <data_content_short>Lat</data_content_short>
  <bits_used>32</bits_used>
  <type>lat</type>
  <resolution>0.0005</resolution>
</Element>

```

Table 6-14: Output in Message view table

Data Content	Bits used	Value	Binary
Latitude	32	N45°40'32.0000"	00010011100110100001000100000000

6.5.5.5 Id type

Decodes the unique airport ID which consists of 4 characters, coded in 24 bits.

Example:

```

<Element>
  <data_content>GBAS ID</data_content>
  <data_content_short>GBAS_ID</data_content_short>
  <type>id</type>
</Element>

```

6.5.5.6 Fixed type

The *fixed*-type element expects a certain number of bits to have a specific value. If the incoming bitstream matches, the result value is OK, otherwise it is NOK.

Table 6-15: Mandatory subelements

Name	Description
<bits>	Binary bitstream content made of 0 and 1

Example:

```

<Element>
  <data_content>Reserved and Zero</data_content>
  <data_content_short>Zeroes</data_content_short>
  <bits>00000</bits>
  <type>fixed</type>
</Element>

```

6.5.5.7 Value type

Binary data without evaluation. Used to document content when a numerical interpretation does not make sense.

Table 6-16: Mandatory subelements

Name	Description
<bits_used>	Static number of bits

Example:

```

<Element>
  <data_content>Ephemeris  CRC  LSB</data_content>
  <data_content_short>EPH_CRC_LSB</data_content_short>
  <bits_used>8</bits_used>
  <type>value</type>
</Element>

```

6.5.5.8 FEC type

Binary data without evaluation.

Table 6-17: Mandatory subelements

Name	Description
<bits_used>	Static number of bits

Example:

```

<Element>
  <data_content>Ephemeris  CRC  LSB</data_content>
  <data_content_short>EPH_CRC_LSB</data_content_short>
  <bits_used>8</bits_used>
  <type>value</type>
</Element>

```

6.5.5.9 CRC type

Calculates a checksum and compares it with the given value. Evaluates to OK or NOK.

Table 6-18: Mandatory subelements

Name	Description
<bits_used>	Static number of bits
<start>	Reference (<data_content_short>) to the element at which the checksum calculation starts

Example:

```

<Element>
  <data_content>Message Block CRC</data_content>
  <data_content_short>MSG_B_CRC</data_content_short>
  <bits_used>32</bits_used>
  <start>MBI</start>
  <type>crc</type>
</Element>

```

Table 6-19: Output in Message view table

Data Content	Bits used	Value	Binary
Message Block CRC	32	OK	11100000011100100001110100100100

6.5.5.10 List type

Converts different integer values to text output

Requires a <list> subelement for each pair of <name> and <value>.

Table 6-20: Mandatory subelements

Name		Description
<bits_used>		Static number of bits
<list>		Pair of <name> and <value> subelements; Multiple <list> elements allowed
	<name>	Provided result text
	<value>	Result value (integer) For last entry in list also default; Default applies if no other case does

Example:

```
<Element>
  <data_content>Message Block Identifier</data_content>
  <data_content_short>MBI</data_content_short>
  <bits_used>8</bits_used>
  <type>list</type>
  <list>
    <name>normal</name>
    <value>170</value>
  </list>
  <list>
    <name>test</name>
    <value>255</value>
  </list>
  <list>
    <name>invalid   MBI</name>
    <value>default</value>
  </list>
</Element>
```

6.5.5.11 Enum type

Converts each different result value to an output text. Requires an `<enum>` subelement for each possible result value. If there are undefined values, use the `list` type.

Table 6-21: Mandatory subelements

Name	Description
<code><bits_used></code>	Static number of bits
<code><enum></code>	Texts to be output for specific number values; Multiple <code><enum></code> elements allowed and required The number of <code><enum></code> subelements must equal the number of possible results for the number of <code><bits_used></code>. Number values are implicitly defined as the order number of the <code><enum></code> subelement and start at 0.
<code><name></code>	Provided result text

Example:

```
<Element>
  <data_content>Ground Station Accuracy Designator</data_content>
  <data_content_short>GStAccDes</data_content_short>
  <bits_used>2</bits_used>
  <type>enum</type>
  <enum> <name>A</name> </enum>
  <enum> <name>B</name> </enum>
  <enum> <name>C</name> </enum>
  <enum> <name>spare</name></enum>
</Element>
```

6.5.5.12 Dummy type

No evaluation, but the binary content is documented, and the parser continues with the next element.

Can be used when there are unknown contents whose length is known.

Table 6-22: Mandatory subelements

Name	Description
<Length>	Previous element (<data_content_short>) that contains the length of the unknown elements in bit.
<Start>	Previous element (<data_content_short>) after which the length count starts

Example:

Example for a dummy that reads additional MT2 block without further definition.

```
<Element>
  <data_content>Unknown Additional Block</data_content>
  <data_content_short>UnBlk</data_content_short>
  <type>dummy</type>
  <Length>AddBlkLen</Length>
  <Start>AddBlkLen</Start>
</Element>
```

6.5.6 Control elements

- [Link_sel type](#)..... 184
- [Loop type](#)..... 187
- [While type](#)..... 187

6.5.6.1 Link_sel type

Depending on the result of the selected element, processing continues with the specified element or subprocess.

Requires a <link_sel> and one or more <link_case> subelements.

Table 6-23: Mandatory subelements

Name	Description
<link_sel>	Reference (<data_content_short>) to a previous element whose value determines further processing; If no <link_sel> subelement is provided and only one <link_case> subelement, processing always continues with the referenced element.
<link_case>	Possible case of further processing

Name	Description
<value>	Integer value or default If the value of the <link_sel> subelement corresponds to this value, processing continues with this <link_case>. Default applies if no other case does
<link> <sub>	Reference to the element (<data_content_short>) or a file with which processing continues Subprocess containing further elements to be processed

Example: Link selector with files and a default value

```
<Element>
  <data_content>Message</data_content>
  <data_content_short>MSG</data_content_short>
  <type>link_sel</type>
  <link_sel>MTI</link_sel>
  <link_case><value>1</value><link>GbasMsgType1.xml</link></link_case>
  <link_case><value>2</value><link>GbasMsgType2.xml</link></link_case>
  <link_case><value>4</value><link>GbasMsgType4.xml</link></link_case>
  <link_case><value>default</value><link>GbasMsgTypeX.xml</link></link_case>
</Element>
```

Example: Link selector with a direct link

With only one link and no decisive value, processing continues with the given file.

```
<Element>
  <data_content>Message Block Header</data_content>
  <data_content_short>MB_HEAD</data_content_short>
  <type>link_sel</type>
  <link_case>
    <link>GbasMsgBlock.xml</link>
  </link_case>
</Element>
```

Example: Link selector with subdefinitions

```

<Element>
  <data_content>Additional Data Block</data_content>
  <data_content_short>AddBlk</data_content_short>
  <type>link_sel</type>
  <link_sel>AddBlkNum</link_sel>
    <link_case>
      <value>2</value>
      <sub>
        <Element>
          <data_content>Channel Number</data_content>
          <data_content_short>ChNum</data_content_short>
          <bits_used>16</bits_used>
          <type>unsigned</type>
        </Element>
        <Element>
          <data_content>Delta Latitude</data_content>
          <data_content_short>DLat</data_content_short>
          <bits_used>8</bits_used>
          <type>signed</type>
          <resolution>0.2</resolution>
          <unit>°</unit>
        </Element>
      ...
    </link_case>
    <link_case>
      <value>3</value>
      <sub>
        <Element>
          <data_content>K md e D GPS</data_content>
          <data_content_short>KmdeDGps</data_content_short>
          <bits_used>8</bits_used>
          <type>unsigned</type>
          <resolution>0.05</resolution>
          <unit></unit>
        </Element>
        <Element>
          <data_content>K md e D GLONASS</data_content>
          <data_content_short>KmdeDGlo</data_content_short>
          <bits_used>8</bits_used>
          <type>unsigned</type>
          <resolution>0.05</resolution>
          <unit></unit>
        </Element>
      ...
    </link_case>
  </Element>

```

6.5.6.2 Loop type

Repeats the included elements for a given number of times;

Table 6-24: Mandatory subelements

Name	Description
<NUM>	Only for type loop: Reference to the element (<data_content_short>) whose value determines the number of processing repetitions
<loop>	Only for type loop: Subprocess containing further elements to be processed within a loop

Example:

Abbreviated example for a loop over the MT1-satellites:

```
<Element>
  <data_content>Measurement   Block</data_content>
  <data_content_short>MSG_BLK</data_content_short>
  <type>loop</type>
  <NUM>NOF_M</NUM>
  <Loop>
    <Element>
      <data_content>Ranging   Source   ID</data_content>
      <data_content_short>Z_COUNT</data_content_short>
      <bits_used>8</bits_used>
      <type>unsigned</type>
      <resolution>1</resolution>
    </Element>
    <Element>
      <data_content>Issue   of   Data   (IOD)</data_content>
      ...   </Element>
    </Loop>
  </Element>
```

6.5.6.3 While type

Repeats the included elements while there are enough bits left to proceed;

Table 6-25: Mandatory subelements

Name	Description
<BitsLeft>	Number of bits required at the end of the loop to perform the next cycle (minimum+1 required); otherwise loop is finished
<TrLen>	Previous element that contains the transmission length in bit. Sometimes the transmission length is provided in bytes; in this case, make sure the resolution of that previous element is set to 8 to convert its value to bits
<TrStart>	Previous element at which the transmission length begins to count bits
<loop>	Subprocess containing further elements to be processed within a loop

Example:

Example of a "while" loop that repeats the message block as long as there are more than 48 bits left:

```
<Element>
  <data_content>Message   Block</data_content>
  <data_content_short>MSG_BLOCK</data_content_short>
  <type>while</type>
  <BitsLeft>48</BitsLeft>
  <TrLen>TRANS_L</TrLen>
  <TrStart>MSG_BLOCK</TrStart>
  <Loop>
    <Element>
      <data_content>Message   Block   Header</data_content>
      <data_content_short>MB_HEAD</data_content_short>
      <type>link_sel</type>
      <link_case>
        <link>GbasMsgBlock.xml</link>
      </link_case>
    </Element>
  </Loop>
</Element>
```

6.5.7 Auxiliary elements

- [Fill type](#).....188

6.5.7.1 Fill type

Used for the transmission end. It determines the number of bits that are left in the data stream. This number is usually 0. Otherwise the `<fill>` element indicates how many bits are still available at the end of the transmission.

Example:

```
<Element>
  <data_content>Fill Bits</data_content>
  <data_content_short>FILL_BITS</data_content_short>
  <type>fill</type>
</Element>
```

7 Data management

The R&S EVSD1000 allows you to store and load measurement settings, and export measurement data for analysis later. Finally, you can store the measurement results displayed on the screen.

- [Storing and recalling measurement settings \(preset\)](#)..... 189
- [Recording measurement data](#)..... 191
- [Creating and storing screenshots](#)..... 198

7.1 Storing and recalling measurement settings (preset)

Possibly you would like to restore or repeat a measurement you performed under specific conditions on the R&S EVSD1000. Or you would like to troubleshoot a measurement and require a defined instrument state to detect the precise cause of the error. In these cases, you can store and recall instrument and measurement settings. You can store and recall up to 20 different settings, referred to as *UserPresets*, on the instrument.

Settings stored in a UserPreset

In each UserPreset, the following current settings are stored:

- All measurement settings (see [Chapter 2, "Measurements and results"](#), on page 56)
- All general instrument settings except for the network settings (see [Chapter 8, "Common instrument settings"](#), on page 200)
- Date and time of storage

The list of UserPresets and the corresponding functions are available in the [Preset] menu.

- [Storage and recall functions](#)..... 189

7.1.1 Storage and recall functions

VNC access: [y]

For each stored UserPreset, the storage date and time are indicated in the "Preset" window. Empty UserPresets are indicated as "not used".

Preset			Preset
No	Preset Name	Date and Time of Saving	Preset
1	User_Preset_01	09.07.2020 16:32:08	Preset
2	User_Preset_02	Not used	
3	User_Preset_03	Not used	Save
4	User_Preset_04	Not used	
5	User_Preset_05	Not used	Save to USB
6	User_Preset_06	Not used	
7	User_Preset_07	Not used	Recall
8	User_Preset_08	Not used	
9	User_Preset_09	Not used	Recall from USB
10	User_Preset_10	Not used	
11	User_Preset_11	Not used	Delete
12	User_Preset_12	Not used	
13	User_Preset_13	Not used	Rename
14	User_Preset_14	Not used	
15	User_Preset_15	Not used	
16	User_Preset_16	Not used	
17	User_Preset_17	Not used	
18	User_Preset_18	Not used	
19	User_Preset_19	Not used	
20	User_Preset_20	Not used	
Rec List 1	Size 11	Local	Mains

Use the arrow keys to scroll through the UserPresets.



While the "Preset" view is displayed, audio and display settings are not available. Return to a measurement view first ([a]).

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Preset

When delivered, the R&S EVSD1000 has a default configuration. You can restore this defined initial state at any time as a known starting point for measurements. Presetting is often recommendable as a first step in troubleshooting when unusual measurement results arise.

Two different preset functions are available, the "simple" preset and the "Factory Preset".

The "simple" preset function retains the instrument's IP address and host name, and all stored data.

Factory Preset ← Preset**VNC access:** [y]

The default configuration is restored, except for the instrument's IP address and host name. All stored data is deleted!

Remote command:

[FACTORY_PRESET](#) on page 248

Save

Stores the current measurement settings in the selected UserPreset under the specified name, together with the current date and time.

If the selected UserPreset already contained settings before, they are overwritten.

Save to USB

Stores the current measurement settings under the specified name on a connected USB storage device, together with the current date and time.

Recall

Overwrites the current measurement settings by the settings stored in the selected UserPreset.

Recall from USB

Overwrites the current measurement settings by the settings stored in the selected UserPreset on a connected USB storage device.

Delete

Deletes the settings and the name assigned to the selected UserPreset.

Rename

Renames the selected UserPreset.

7.2 Recording measurement data

During a measurement with the R&S EVSD1000, the input signal is captured and various results are calculated and displayed on the screen (see [Chapter 2, "Measurements and results"](#), on page 56). These results can also be stored in data lists, which can be exported as `.csv` files for further investigation.

Data is stored continuously for all measurements that are performed after recording is started and until it is stopped. The data for each recording session is stored to a file internally. The file name is defined by the following syntax:

```
<measmode>_<rx_board>_list<no.>.csv
```

Where:

- **<measmode>**: the used measurement mode
- **<rx_board>**: rx1
- **list<no.>**: the used data list

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• Analyzing recorded I/Q data.....	197
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7.2.1 GNSS data synchronization

Together with the measurement results, the GNSS data at the time of signal input is also stored, if available (see [Chapter 8.6, "GNSS configuration"](#), on page 214). Storing GNSS data is useful to synchronize specific measurement results with the precise time and location of the input signal. However, signal transmission via the RS232 serial connection can cause delays in the stored GNSS time as opposed to the actual time of input. Therefore, it is useful to synchronize the stored GNSS data to the PPS signal also provided by the GNSS receiver.

7.2.2 I/Q data recording and streaming

Optionally, the raw, unprocessed I/Q data can also be stored with the data recording. In this case, the I/Q data is stored as a separate file with the same file name as the data list, but the extension `.iq`. This feature requires the R&S EVSG1-K25 I/Q data streaming option.

I/Q data is stored with a sample rate of 125000 samples per second. I and Q values are stored with 32 bit each, in little endian and signed integer format. The I/Q data level is aligned to the RF input signal of the R&S EVSD1000. That is: 0 dBm correspond to a magnitude value of 0x10000000 (hexadecimal). Each sample requires 8 bytes of storage, which adds up to 1 MB per second. The I/Q data files can become very large. After 33 minutes, they exceed 2 GB, meaning they can no longer be stored on a FAT-formatted USB storage device. In this case, you require a storage device with a linux file system, e.g. ext4. Also consider the limitations of the internal storage device. When using two RX boards simultaneously, the storage is filled up twice as quickly.

I/Q data can also be streamed during the measurement using the LAN interface of the R&S EVSD1000 (TCP port 8001). Simply connect a TCP/IP client to the port and the data is streamed immediately. The format is the same as for recording.

Example:

```
netcat 172.23.226.22 8001 > File1.iq
```

Starts streaming I/Q data from the RX1 input to a file named `File1.iq`.

You can use the I/Q data to analyze the signal in external software, for example, or to reproduce the signal on a signal generator.

7.2.3 Recording settings

Access VNC: [s] > [F7]

(For numeric measurement modes only)



Recording GBAS/SCAT-I measurement results

In GBAS/SCAT-I mode, one record is stored for each slot, in a time interval of 62.5 ms, as long as recording is active. Triggering is not supported. Recording is continued even if the display update is temporarily stopped (by the "Pause" function).

Start and stop recording from any measurement view using the [Record] key.

Record the selected and currently displayed slot or frame only using the [Single] key.

The record contains measurement values and the message bitstream for the slot. All records are stored in a CSV file. This basic CSV file contains a data link for each record in the list. The link points to a further CSV file which contains all human-readable texts for that record. All data files for the current recording are stored in a subdirectory that is exported together with the basic CSV file.

See also "[Recording GBAS data](#)" on page 173.

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List

Selects a specific data set list (1 to 999, the list number is shown in the softkey).

Remote command:

[SETACTIVELIST](#) on page 345

[GETACTIVELIST](#) on page 341

Clear List

Deletes all entries in the current list.

Remote command:

[CLEARACTIVELIST](#) on page 341

Time

Specifies how often an entry is appended to the data list. Enter the time in milliseconds.

Note that the minimum spacing between two values is defined by the availability of measurement result values (see [Chapter 4.1.4.4, "Setting the measurement time \(MTime\)"](#), on page 84). If more values are available than are stored, that is: "Time" > [Setting the measurement time \(MTime\)](#), the calculated values are averaged to obtain only the required number of results.

In GBAS/SCAT-I mode, one record is stored for each slot, in a time interval of 62.5 ms, as long as recording is active. The time interval cannot be edited.

Data selection (Sel, not GBAS/SCAT-I mode)

By default, the whole data set is recorded. You can configure the scope of the data to be displayed and exported. For details on the individual data sets, see the remote command ([SELECTLISTPARAM](#) on page 344).

"All"	Includes all EVSD1000 and R&S EVS300 values.
"Full"	Compatible to R&S EVS300.
"Medium"	A reduced set of values
"Short"	A minimum set of values

Remote command:

[SELECTLISTPARAM](#) on page 344

Data selection (Select, GBAS/SCAT-I mode only)

By default, the whole data set for every slot is recorded. You can configure the scope of the data to be displayed and exported. For details on the individual data sets, see the remote command ([GBAS:GETMEAS](#) on page 316).

Parameter ← Data selection (Select, GBAS/SCAT-I mode only)

Defines which parameters are stored for each slot.

"All"	Includes all EVSD1000 and R&S EVS300 values
"Full"	Compatible to R&S EVS300
"Medium"	A reduced set of values
"Short"	A minimum set of values
"Raw"	Only the decoded, non-interpreted measurement values from the bitstream in binary format

Remote command:

[GBAS:GETMEAS](#) on page 316

Msg Log ← Data selection (Select, GBAS/SCAT-I mode only)

Defines which message information is stored for each slot.

"All"	All message data (human-readable + bitstream) is stored (default).
"TXT"	Only the human-readable, interpreted message values are stored.
"RAW HEX"	Only the decoded, non-interpreted message data from the bitstream in binary format is stored.
"None"	Message data is not included in the slot data record.

Remote command:

[GBAS:MSG_TOLOGG](#) on page 317

Graph Log ← Data selection (Select, GBAS/SCAT-I mode only)

Defines whether graphical information such as the time domain and constellation values are stored.

Remote command:

[GBAS:GRAPH_TOLOGG](#) on page 317

Slot <x> Log ← Data selection (Select, GBAS/SCAT-I mode only)

Activates or deactivates data recording for the corresponding slot.

To toggle between the slots A to D and slots E to H in the menu, press the "More soft-keys" key.

Export List to USB

Exports the data list to a connected USB storage device.

Remote command:

[SAVEACTIVELIST2USB](#) on page 344

Clear All Lists

Deletes all entries in all data lists.

Remote command:

[CLEARALLLISTS](#) on page 343

Rec IQ

If enabled, the raw, unprocessed I/Q data is also recorded. This feature requires the R&S EVSG1-K25 I/Q data streaming option.

I/Q data is stored as a separate file with the same file name as the data list, but the extension `.iq`. Furthermore, the data list contains two additional entries:

"IQSamples": indicates how many samples the data set includes; depending on the measurement time this number can vary.

"IQPosition": indicates the starting position of the data set within the I/Q data file

Remote command:

[RECIQ](#) on page 343

7.2.4 Activating and triggering data recording

By default, data is recorded in a specific time interval (see ["Time"](#) on page 193) as long as recording is active. Alternatively, you can use an external trigger, if available, to determine when data is stored. For example, you can store data at regular distances during a moving measurement, based on a rotary position transducer.

**Recording GBAS/SCAT-I measurement results**

In GBAS/SCAT-I mode, one record is stored for each slot, in a time interval of 62.5 ms, as long as recording is active. Triggering is not supported. Recording is continued even if the display update is temporarily stopped (by the "Pause" function).

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Starting and Stopping Recording

Access VNC: [p]

When you press the key, data is recorded to the selected list, indicated in the status bar ("Rec List"). The number of data sets that the list currently contains is indicated as "Size". How often and when a new data set is entered in the list depends on the ["Trigger Source"](#) on page 196.

If enabled, raw, unprocessed I/Q data is also recorded to a separate file (see ["Rec IQ"](#) on page 195).

Trigger Source

Access VNC: [k] > "F2"

Determines how often and when a new data set is entered in the list during recording.

"Time"	Data is stored in regular time intervals, defined by "Time" on page 193.
"Ext."	Data is stored each time a trigger signal from a connected external trigger device is received. The trigger device must be connected to the "Trigger In" connector on the rear panel of the R&S EVSD1000.

Offset

Access VNC: [k] > "F4"

Defines an offset to the specified trigger event before data storage is actually started.

Trigger Edge

Access VNC: [k] > "F5"

For external triggering, this setting defines whether data is stored when the positive (rising) or negative (falling) edge of the trigger signal is received. Select the key repeatedly to toggle between the two settings.

Input

Access VNC: [k] > "F7"

Determines which input triggers data storage or defines the GNSS PPS synchronization source.

"PPS GPS"	Signal provided at the RS232-GPS or GNSS connector

Remote command:

[PPSSMA_TRIG_SOURCE?](#) on page 235

Recording a single data record (GBAS/SCAT-I mode only)

Access: [Single]

Records the selected and currently displayed slot or frame only.

This function is only available for GBAS/SCAT-I mode (R&S EVSG-K4 GBAS analysis/R&S EVSG-K5 SCAT-I Analysis).

7.2.5 Viewing recorded data

The "Recording" view displays the recorded data for the current measurement mode from the selected data file (see "List" on page 193).

The following functions are available in the "Recording" view for all modes.

DL Line

Selects a particular line (record) in the data recording file.

7.2.6 Analyzing recorded I/Q data

Optionally, raw, unprocessed I/Q data is recorded to a separate file during recording (see "Rec IQ" on page 195).

Additional information on the I/Q data is stored in the CSV data list, indicating where in the `.iq` file the I/Q data for a specific data set starts and how many samples it contains. You can use this information to synchronize the raw I/Q data with the evaluated measurement data for each data set.

You can also use the stored I/Q data to reproduce the measured signal on a signal generator. Using the R&S ARB Toolbox, for example, you can convert the `.iq` data file to a `.wav` file.

To convert the `.iq` data file to a `.wav` file

1. In the R&S ARB Toolbox, right-click the `.iq` data file.
2. Select "Convert" > "Convert from Data".
3. Select the following settings for the data format:
 - "File Type": "Binary"
 - "Data format": "Integer"
 - "Endianness": "Little-Endian (x86)"
 - "Precision": "32 Bit"
 - "Signedness": "Signed (Two's Complement)"
4. Define the clock rate as *125 kHz*.

7.2.7 Exporting measurement data

After recording measurement data, you can export the CSV files with the results for further investigation.

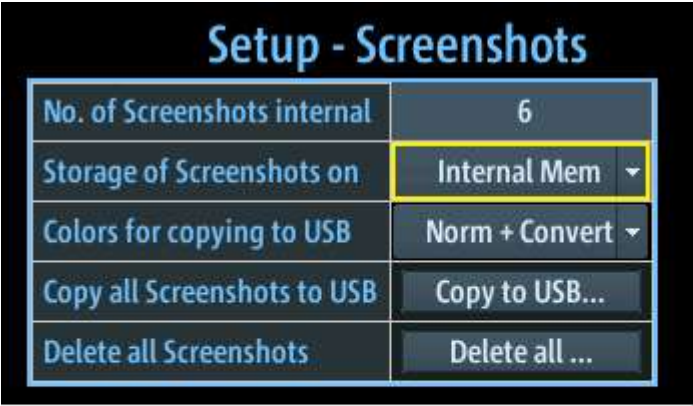
To export measurement data

1. Open the front cover of the R&S EVSD1000 as described in [Chapter 1.4.4, "Opening and closing the front and rear covers"](#), on page 14 to access the USB connector on the front panel of the instrument. See [Figure 1-8](#).
2. Connect the storage device to the USB connector on the instrument.
3. In the "Recording" settings, select "Export List to USB".

7.3 Creating and storing screenshots

Access: [Setup] > "Screenshots"

You can create a screenshot of the current display on the R&S EVSD1000 at any time during operation. Creating screenshots is useful to document measurement results, for example.



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Creating a Screenshot

Access VNC: [x]

When you create a screenshot, the display is stored as a graphic file on the instrument (until it is explicitly deleted). It can be copied to a USB memory device later (see [Exporting Screenshots to a USB device](#)). Internally, the screenshot files are named "Screenshot_", followed by a consecutive number.

If a USB device is connected to the R&S EVSD1000 when the screenshot is created, the screenshot is stored there directly as a `.PNG` file. A dialog box with the default file name is displayed. To change the name of the file on the USB device, click in the name field and overwrite the default name. Note, however, that the file is also stored internally, and the file name remains unchanged. Thus, if you export all screenshots to a USB device later, the same screenshot is stored with the internal name again.

The [Number of Screenshots](#) indicated in the "Setup - Screenshots" window is increased after each new screenshot.

Number of Screenshots

Indicates the number of screenshots currently stored on the instrument.

Storage of screenshots on

Specifies the location of the screenshots to be saved.

"Internal mem"	The screenshots are stored in the internal memory (default setting).
"Internal + USB"	The screenshots are stored in the internal memory and on a connected USB device.
"USBstick"	The screenshots are stored directly on a connected USB device.

Colors for copying to USB

If the screenshots are stored to a USB device, you can specify the colors used for the screenshot.

"Normal"	The screenshot is stored as shown on the screen.
"Converted"	The screenshot is stored with inverted colors, that is: black text on a white background for better legibility on paper.
"Norm + Convert"	Default: two screenshots are stored, one as shown on the screen, one with inverted colors.

Exporting Screenshots to a USB device

All internally stored screenshots on the R&S EVSD1000 are stored as `.PNG` files in the main directory of the connected USB device. The file name is defined by the following syntax:

```
EVsx_<date>_<time>[_converted].png
```

where the `_converted` suffix is only applied to screenshots with inverted colors.

Deleting all Screenshots Stored on the R&S EVSD1000

All screenshots stored on the R&S EVSD1000 are deleted irrevocably.

Once the screenshots have been stored to an external memory device, you can delete them from the instrument. Otherwise you copy them again each time you create new screenshots and want to store them to a USB device.

8 Common instrument settings

Common instrument settings are applied regardless of which measurement mode is selected.

All common instrument settings can be configured via remote commands (see [Table 1-9](#)) or using a remote keyboard via VNC.

- 

For the mapping of hard- and softkey commands to keyboard commands using VNC, see [Table 1-9](#).
- 

Configuring screenshots is described in [Chapter 7, "Data management"](#), on page 189. Configuring the signal input is described in [Chapter 3.1, "Input signal settings"](#), on page 59.

8.1 Display

Access VNC: [v]
(Not in "Preset" view.)

Some general settings are available for the VNC display of the R&S EVSD1000.

Level View	200
Zoom	200

Level View
Configure the display of power levels.

"Digits"	The level value is displayed numerically, as digits.
"Bargraph"	The level value is displayed graphically, as a bargraph.

Remote command:
[SETUP:UNIT:BARGRAPH](#) on page 249

Zoom
This command is available in LOC, GS, VOR and COM modes.

If enabled, the most important measurement parameters are displayed enlarged for better readability.



8.2 LAN (remote) settings

Access VNC: [n] > [F4]

The following settings are required to operate the R&S EVSD1000 in a LAN, for example from a controller PC.

Setup - Remote

TCP/IP DHCP	On
TCP/IP Address	10.255.255.98
TCP/IP Netmask	255.255.255.0
TCP/IP Gateway	10.255.255.1
Hostname	EVSG-900015
VNC Password	Off
Used IP Address	172.23.226.41
Used IP Netmask	255.255.255.128
Used IP Gateway	172.23.226.1



Resetting the IP address

If you do not know which IP address the instrument is currently set to, you can always reset the network settings of the instrument to their default values (LAN IP address: 10.255.255.98, Wi-Fi access point IP address: 192.168.1.1).

Insert a pointed tool, such as the tip of a pencil, in the LAN reset button on the front panel of the instrument, see Chapter 1.5.1, "Front panel", on page 39. Press the "LAN Reset" button for about 3 seconds to reset the IP address of the LAN connector and the optional data-link-module (Wi-Fi).

Press the "LAN Reset" button shortly to re-establish the LAN or Wi-Fi connection without changing the settings.

TCP/IP DHCP	203
TCP/IP Address	203
TCP/IP Netmask	203
TCP/IP Gateway	203
Hostname	204

VNC Password.....	204
Used IP Address.....	204
Used IP Netmask.....	204
Used IP Gateway.....	204

TCP/IP DHCP

If the network supports dynamic TCP/IP configuration using the Dynamic Host Configuration Protocol (DHCP), all address information is assigned to the instrument automatically. In this case, the TCP/IP parameters are not editable. The currently used settings are indicated as [Used IP Address](#), [Used IP Netmask](#), [Used IP Gateway](#).

If the network does not support DHCP, you must set the addresses manually.

By default, the instrument is configured to use a static IP address, that is: DHCP is disabled.

If DHCP is disabled, remote devices must use an IP address within the same [TCP/IP Netmask](#) as the instrument. (Usually, that means only the last number of the IP address differs.)

To toggle this setting via the remote keyboard, press the [Tab] key.

Note: When a DHCP server is used, a new IP address can be assigned each time you restart the instrument. You must determine this address on the instrument itself. Thus, when using a DHCP server, it is recommended that you use the permanent instrument name, which determines the address via the DNS server, if available (see ["Hostname"](#) on page 204).

TCP/IP Address

Unique address of the instrument in the network. The currently assigned IP address and submask are indicated next to the setting. The default address is 10.255.255.98.

The IP address consists of four number blocks separated by dots. Each block contains values between 0 and 255.

To change the IP address via the remote keyboard, press the [INS] key and enter the new address.

The IP address is shown on the instrument's mini display (see [Chapter 1.6.1, "Basic connection settings"](#), on page 49).

Example:

172.17.40.139

TCP/IP Netmask

The subnet mask consists of four number blocks separated by dots. Each block contains values between 0 and 255.

Example:

255.255.255.0

TCP/IP Gateway

The gateway consists of four number blocks separated by dots. Each block contains values between 0 and 255.

Example:

192.168.1.1

This setting is only required if the R&S EVSD1000 is installed in a network and the instrument needs to communicate with other connected devices. For simple 1:1 connections between the instrument and control PC, the setting is irrelevant.

Hostname

Unique instrument name in the network, as an alternative to the unique IP address.

Each instrument is delivered with an assigned instrument name, but this name can be changed.

The default instrument name is a non-case-sensitive string with the following syntax:

EVSD<serial_number>

For example, EVSD123456.

For information on determining the serial number, see [Chapter 1.5.5.2, "Device ID"](#), on page 47.

Use the keypad to enter the name, see [Table 1-10](#).

Remote command:

[GETHOSTNAME](#) on page 241

VNC Password

Enables or disables the requirement of a password to access the instrument remotely via VNC.

After enabling the use of a password, you must reboot the R&S EVSD1000 before it becomes active.

The password for VNC access is *instrument*. It cannot be changed.

Used IP Address

If [TCP/IP DHCP](#) is activated, the assigned IP address is displayed.

Used IP Netmask

If [TCP/IP DHCP](#) is activated, the assigned netmask is displayed.

Used IP Gateway

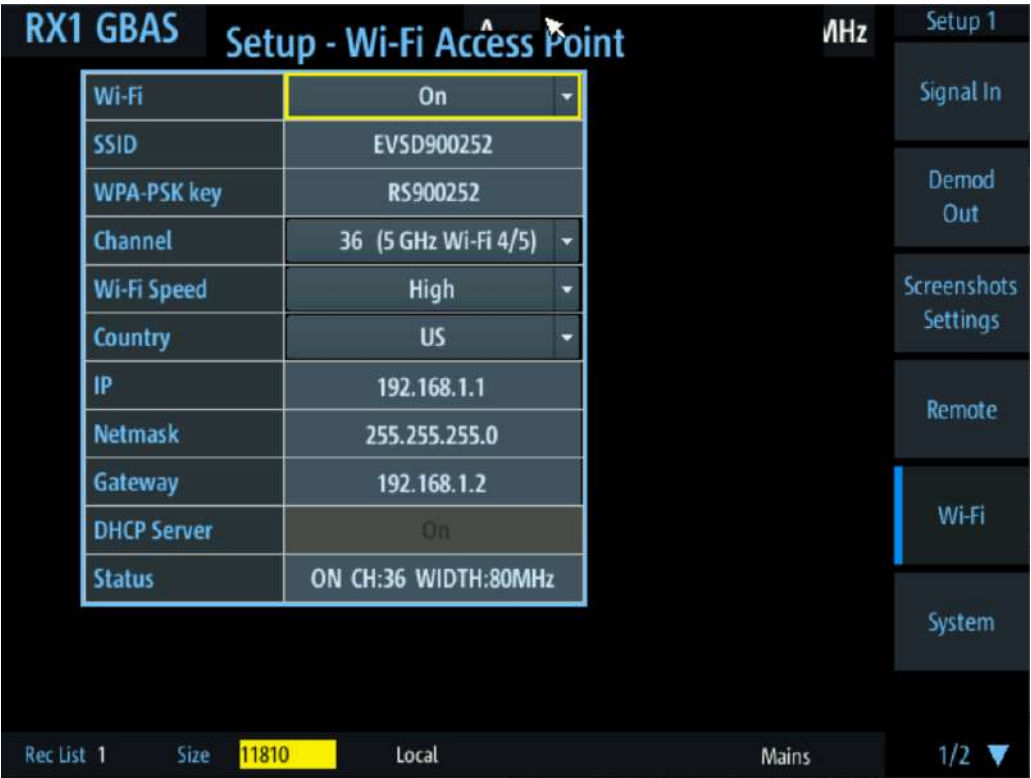
If [TCP/IP DHCP](#) is activated, the assigned gateway address is displayed.

8.3 Data link (Wi-Fi) settings

Access VNC: [n] > [F5]

The R&S EVSD1000 can be equipped with an optional R&S EVSD1-Z5 Data-link-module (Wi-Fi). Thus, you can configure the R&S EVSD1000 as a Wi-Fi access point for wireless communication from a remote device.

The following settings configure the R&S EVSD1000 as a Wi-Fi access point.



Resetting the IP address

If you do not know which IP address the instrument is currently set to, you can always reset the network settings of the instrument to their default values (LAN IP address: 10.255.255.98, Wi-Fi access point IP address: 192.168.1.1).

Insert a pointed tool, such as the tip of a pencil, in the LAN reset button on the front panel of the instrument, see Chapter 1.5.1, "Front panel", on page 39. Press the "LAN Reset" button for about 3 seconds to reset the IP address of the LAN connector and the optional data-link-module (Wi-Fi).

Press the "LAN Reset" button shortly to re-establish the LAN or Wi-Fi connection without changing the settings.

Wi-Fi.....	206
SSID.....	206
WPA-PSK Key.....	206
Channel.....	206
Wi-Fi Speed.....	206
Country.....	207
IP.....	207
Netmask.....	207
Gateway.....	207
DHCP server.....	207
Status.....	207

Wi-Fi

Enables or disables a data connection via the optional Wi-Fi interface.

Remote command:

[WIFI:ONOFF](#) on page 245

SSID

Service set identifier, the name of the Wi-Fi. The default name is EVSD<serial number>.

Note: Enter the ID using the (number) keypad on the external keyboard as described in ["Entering numbers and \(special\) characters via the keypad"](#) on page 54.

Remote command:

[WIFI:SSID](#) on page 244

WPA-PSK Key

Wi-Fi password. Consists of minimum 8 characters.

The default Wi-Fi password is RS<serial_number>, e.g. RS123456.

For information on determining the serial number, see [Chapter 1.5.5.2, "Device ID"](#), on page 47.

Note: Enter the key using the (number) keypad on the external keyboard as described in ["Entering numbers and \(special\) characters via the keypad"](#) on page 54.

Remote command:

[WIFI:WPAPSK](#) on page 244

Channel

Wi-Fi channel.

The frequency range and the supported Wi-Fi standard for the selected channel are indicated for reference.

Supported channels:

1,2,3,4,5,6,7,8,9,10,11,12,13,36,40, 44, 48, 52, 56, 60,64, 100, 104, 108, 112, 116, 120, 124,128,132, 136,140,149,153,157,161,165

Default: 1

Remote command:

[WIFI:CHANNEL](#) on page 246

Wi-Fi Speed

Determines the used Wi-Fi data rate.

"Low" (Default:) Uses 20 MHz bandwidth. Data transfer is less susceptible to distortion.

"High" Uses 80 MHz bandwidth, if available. Guard interval is reduced to increase the data rate. Data transfer becomes more susceptible to distortion.

Remote command:

[WIFI:SPEED](#) on page 246

Country

Country code of the country the drone is operated in. National legislations support different channels, bandwidths etc. for Wi-Fi communication. If you select a channel or bandwidth that is not supported by the selected country, an error message is displayed in the [Status](#) information.

Remote command:

[WIFI:COUNTRY](#) on page 246

IP

Unique address of the instrument in the network. The currently assigned IP address and submask are indicated next to the setting. The default address is 192.168.1.1.

The IP address consists of four number blocks separated by dots. Each block contains values between 0 and 255.

To change the IP address via the remote keyboard, press the [INS] key and enter the new address.

Example:

172.17.40.139

Remote command:

[WIFI:IP](#) on page 245

Netmask

The subnet mask consists of four number blocks separated by dots. Each block contains values between 0 and 255.

Example:

255.255.255.0

Remote command:

[WIFI:NETMASK](#) on page 245

Gateway

The gateway consists of four number blocks separated by dots. Each block contains values between 0 and 255.

Example:

192.168.1.1

Remote command:

[WIFI:GATEWAY](#) on page 245

DHCP server

Indicates that a DHCP server is used. The IP address and subnet mask of the connected devices are obtained automatically from the DHCP server.

Status

Indicates the status of the Wi-Fi connection.

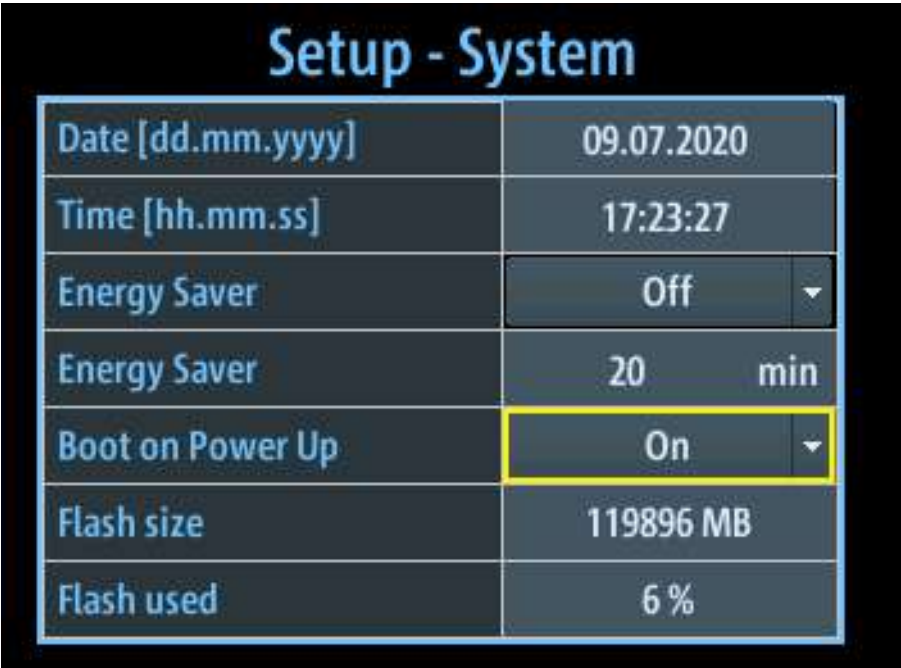
"ON"	Wi-Fi access point is running. In addition, the following information is indicated: "CH:"<used channel number> "WIDTH:"<used channel bandwidth> The used channel number can differ from the selected Channel, if a signal is detected elsewhere (dynamic frequency selection).
"OFF"	Wi-Fi access point not (yet) running successfully. Additional information indicates the reason for the error. • None: Wi-Fi is disabled • "CONFIG": Configuration is in progress • "NO HW": Wi-Fi adapter not installed or not supported on instrument • "AP ERROR": Access point could not be started, e.g. because selected Channel is not supported.

Remote command:
[WIFI:STATUS](#) on page 247

8.4 System settings

Access VNC: [n] > [F6]

The following settings configure the general instrument system.



Date.....	209
Time.....	209
Boot on Power Up.....	209
Flash size / Flash used.....	209

Date

Sets the date of the internal clock in the format `dd.mm.yyyy`.

Example:

10.05.2017

Remote command:

[SETUP:DATE](#) on page 248

Time

Sets the time of the internal clock in the format `hh.mm.ss`.

Example:

12.08.23

Remote command:

[SETUP:TIME](#) on page 248

Boot on Power Up

Automatically switches on the R&S EVSD1000 when it is connected to an external power supply (if not in operation already). This setting cannot be changed on the R&S EVSD1000.

Remote command:

[SETUP:BOOTONPOWERUP](#) on page 248

Flash size / Flash used

Indicates the size of the flash memory in the R&S EVSD1000, and the percentage currently in use.

8.5 Instrument configuration and operating status settings

The following settings concern the instrument operating status, and hardware and software configuration.

Auto-Calibration (Cal)	209
Error Log	211
L Copy to USB	211
L Delete all error messages	211
HW Status	211
Installed Options	212
Inventory	213
L SW Update	214

Auto-Calibration (Cal)

Access VNC: [n] > [F8] > [F1]

Autocalibration corrects changes in the attenuation characteristics of the internal RF signal paths (on both receiver boards, if available) using an internal calibration signal. These changes can occur due to the aging process or temperature drifts. The calibration optimizes the accuracy of the level measurements.

The "Setup - CAL" display shows the status for each calibration step for the most recent calibration. The first line of the result table indicates the date and time of the auto-calibration, and the temperature during the autocalibration.

Note: Start the instrument at least 15 minutes before starting autocalibration to ensure that the instrument has reached its operating temperature (for details, refer to the data sheet).

During the auto-calibration procedure, do not apply any input signal to the R&S EVSD1000.

To start the auto-calibration, select "Start Autocal" and press the [Enter] key.

The auto-calibration procedure is ready after a few minutes and in the result table, all entries must have the status "OK".



	RX1	RX2
Start Autocal	01.06.2017 09:13:25 34.0°C	
75MHz Low Noise	OK	
75MHz Norm	OK	
75MHz Low Dist	OK	
108MHz Low Noise	OK	
108MHz Norm	OK	
108MHz Low Dist	OK	
118MHz Low Noise	OK	
118MHz Norm	OK	
118MHz Low Dist	OK	
220MHz Low Noise	OK	
220MHz Norm	OK	
220MHz Low Dist	OK	
Bypass Low Noise	OK	
Bypass Norm	OK	

Figure 8-1: Successful auto-calibration

If an error occurs during the auto-calibration process, switch the instrument off and on again and repeat the auto-calibration process. If the error still exists, contact the Rohde & Schwarz service.

It is recommended that you perform an autocalibration every 2 months or if the difference of the environment temperature changes by more than 10 °C.

Remote command:

[AUTOKALSTATUS](#) on page 254

[KALSCREEN](#) on page 255

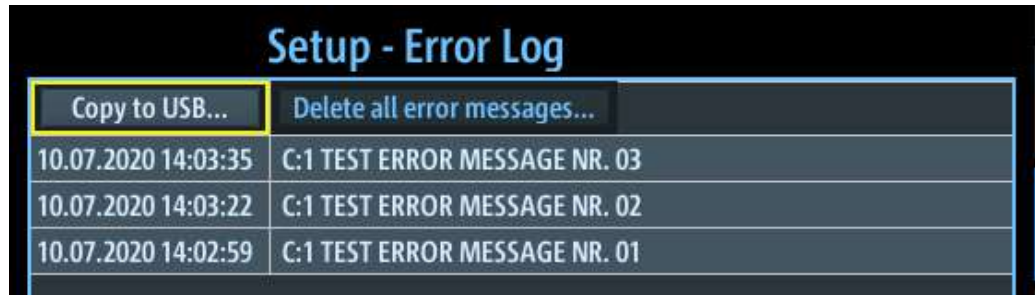
[STARTKAL](#) on page 255

[GETKALSTATUS](#) on page 254

Error Log

Access VNC: [n] > [F8] > [F2]

The last 100 instrument status messages or errors displayed in the status bar during operation of the R&S EVSD1000 are also stored in an error log file on the instrument. Thus, if problems occur, you can check the error log for irregular behavior or failures.



Copy to USB...	Delete all error messages...
10.07.2020 14:03:35	C:1 TEST ERROR MESSAGE NR. 03
10.07.2020 14:03:22	C:1 TEST ERROR MESSAGE NR. 02
10.07.2020 14:02:59	C:1 TEST ERROR MESSAGE NR. 01

Remote command:

[GETERRORLOG](#) on page 252

Copy to USB ← Error Log

Copies all entries in the error log to a text file on a connected USB device. The default filename is `EVsx_errorlog_<datetime>.txt`.

This file is useful if problems occur and you need support. Send the copied error file to the Rohde & Schwarz support center for troubleshooting.

Delete all error messages ← Error Log

Deletes all entries in the error log irrevocably.

Remote command:

[CLEARERRORLOG](#) on page 252

HW Status

Access VNC: [n] > [F8] > [F3]

The hardware status overview provides information on the current operating status of the individual hardware components in the R&S EVSD1000, such as test voltages and temperatures.

Setup - HW Status		
RX Board	RX1	RX2
IF2_MINUS_5V	-4.98V OK	
IF2_5V	4.92V OK	
RF_MINUS_5V6	-5.46V OK	
RF_5V6	5.63V OK	
LO1_LEVEL	2.06V OK	
LO1_PRETUNE	10.13V OK	
LO1_6V5	6.85V OK	
RFDIV_3V3	3.28V OK	
LO3_5V	4.96V OK	
DDS_3V3	3.31V OK	
IF1_AMP2	5.56V OK	
IF1_AMP1	5.49V OK	
VV_SUPPL	5.42V OK	
VV_BYP_ATT	2.50V OK	
RAND_SW	2.50V OK	

The test voltages are measured continuously, internally, and checked against defined limit values. If one of the test voltages exceeds the tolerance for more than 10 s, the following measures are taken by the R&S EVSD1000:

- An error message is created in the error log (see ["Error Log"](#) on page 211).
- The measured test voltage is indicated in red.
- "UNCAL" is displayed in the measurement window, indicating the measured values are possibly invalid.

The "UNCAL" message is displayed until you switch off the instrument and switch it back on again. If the message appears again, contact the Rohde & Schwarz support center. See [Chapter 12, "Contacting customer support"](#), on page 357.

Remote command:

[GETUNCAL](#) on page 231

[BI?](#) on page 252

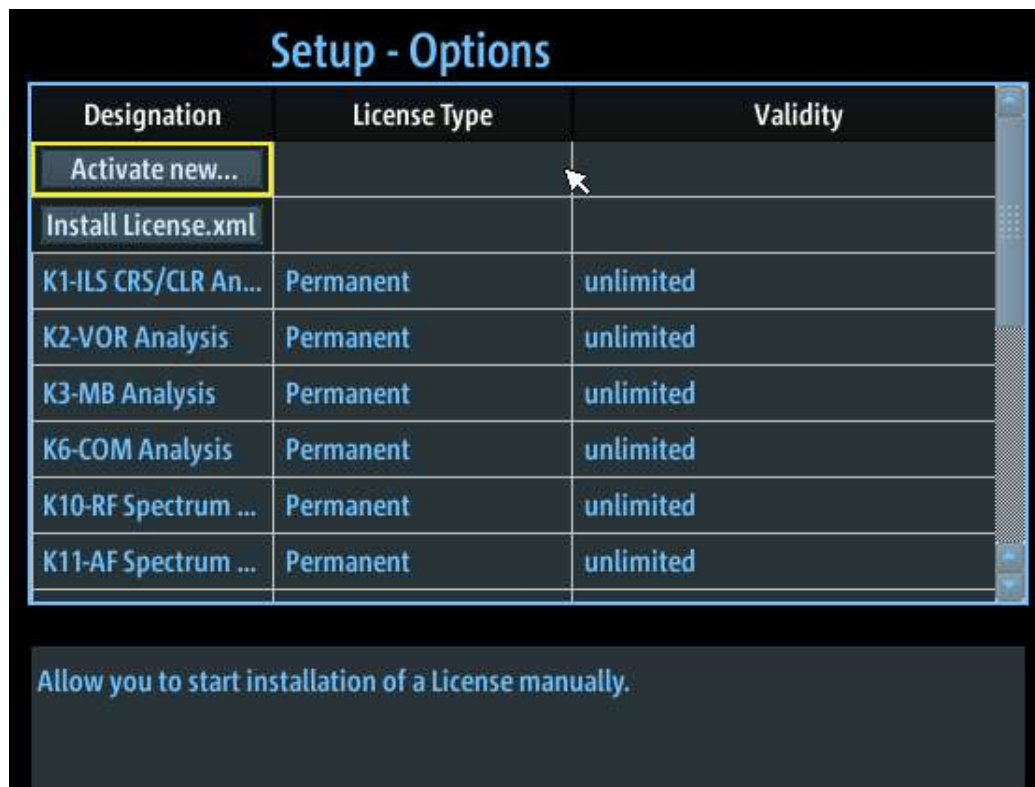
[GETTEMP](#) on page 253

Installed Options

Access VNC: [n] > [F8] > [F4]

Displays a table with the currently installed option keys.

For all purchased R&S EVSD1000 options, a license key is provided by Rohde & Schwarz.



To activate a new option key, select "Activate new..." and enter the number of the license key.

Alternatively, select "Install license.xml" to install a license from the main directory of a connected USB device.

The following information is displayed in the Options table:

"Designation" Specifies the name of the license key.

"License Type" The license type can be permanent or limited to a temporary duration.

"Validity" For temporary licenses, the validity is indicated. If the expiry date has passed, the license becomes invalid.

Additional information on the selected option is displayed below the table.

Remote command:

[GETOPTIONS](#) on page 253

Inventory

Access VNC: [n] > [F5]

The hardware and software inventory list provides information on the hardware version of the instrument (integrated modules, options etc.) and on the currently installed software versions. Additionally installed software options are provided in the [Installed Options](#) list.

For each piece of hardware, the identification number, serial number and revision are provided in the inventory list. For each software item, the installed version number is provided.

Setup - Inventory			
Hardware	Ident No.	Revision	Serial No.
EVSG	1329.8009.02	01.00	900015
Datasheet	01.00		
EVSG_K	1329.8009K02	01.00	900015
MAINBOARD	1329.8050.02	05.00	101018
RX_BOARD	1329.8015.02	04.08	101006
Battery Board	1329.8121.02	03.00	101059
Software	Ident No.	Version	
Release	1329.8650	01.40 BETA12	SW Update
EVSG SW		01.38I	
Build:	Jul 10 2020 11:44:00		
ILS/VOR FPGA Version		00.49.08	
GBAS FPGA Version		00.09.01*	

Remote command:

[INV?](#) on page 253

[VER?](#) on page 254

SW Update ← Inventory

Updates the R&S EVSD1000 software using an update file on a connected USB device.

The R&S EVSD1000 automatically searches the USB device for new software. The update file has the extension `.evs` and must be located in the main directory of the USB device. The search can take a few seconds.

When the software has been found, press the [ENTER] key to confirm the message to install the software.

Note: Never remove the USB device or switch off the instrument during a software update. Otherwise, an undefined software state can be the result.

8.6 GNSS configuration

Access VNC: [n] > [F8] > [F6]

If a GNSS receiver is connected to the R&S EVSD1000, the basic GNSS receiver settings are displayed here.

Setup - GPS / GNSS	
Baudrate	115200
GPS-Delay	0 ms
PPS-Sync	Off
Interface	USB u-blox
IP Address	127.0.0.1
IP Port	8091
Exp.Format	Min
Latitude	50° 38.78580000' N
Longitude	07° 01.00859000' E
Altitude	192.10
Speed	0.14 knots 0.26 km/h
Time	09:24:24.600
Date	24.01.2023
Status	GPS, 8 Sats.
Incoming	GPGGA,092424.60,5038.78581,N,00701.00857,E,1,08,1.58,192.1,M,47.7
GPRMC	GPRMC,092424.60,A,5038.78581,N,00701.00857,E,0.142,43.16,240123,,
GPGGA	GPGGA,092424.60,5038.78581,N,00701.00857,E,1,08,1.58,192.1,M,47.7
GPGSA	

Rec List 1 Size 2239 Local Mains 2/2 ▼

Baudrate.....	215
GPS-Delay.....	215
PPS-Sync.....	215
Interface.....	216
Exp. Format.....	216

Baudrate

Specifies the baud rate of the GNSS signal. The following values are supported:

4800 | 9600 | 19200 | 38400 | 57600 | 115200 | 230400

Remote command:

[SETUP:GPS_BAUDRATE](#) on page 238

GPS-Delay

Specifies a delay between the received GNSS time and the actual time. This value corrects the delay of the transmission of GNSS coordinates via a serial interface. Supported values are from -300 ms to +1000 ms.

Remote command:

[SETUP:SETGPSDELAY](#) on page 239

PPS-Sync

Activates/deactivates synchronization between the GNSS time in the stored data sets and the PPS signal provided by the GNSS receiver.

Note: PPS input recommended. We strongly recommend that you connect the PPS signal of the GNSS receiver to the "PPS In" connector of the R&S EVSD1000.

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

Although it is possible to store data on the R&S EVSD1000 without the PPS signal connected, the stored data can be assigned to the actual GNSS time incorrectly. For details, see [Chapter 7.2.1, "GNSS data synchronization"](#), on page 192.

"OFF"	No PPS synchronization is performed.
"PPS_IN rise"	Stored GNSS time is synchronized to the rising edge of the incoming PPS signal.
"PPS_IN fall"	Stored GNSS time is synchronized to the falling edge of the incoming PPS signal.
"RS232 rise"	Stored GNSS time is synchronized to the rising edge of the incoming GNSS signal.
"RS232 fall"	Stored GNSS time is synchronized to the falling edge of the incoming GNSS signal.
"GNSS rise"	Stored GNSS time is synchronized to the rising edge of the incoming GNSS signal from the connected drone.
"GNSS fall"	Stored GNSS time is synchronized to the falling edge of the incoming GNSS signal from the connected drone.

Remote command:

[SETUP:PPS_SYNC](#) on page 239

Interface

Determines the interface used to connect a GNSS receiver.

"RS-232"	Chapter 1.5.2.3, "GNSS connector" , on page 43
"USB"	Chapter 1.5.1.7, "USB-A connector" , on page 42
"USB u-blox"	Chapter 1.5.1.7, "USB-A connector" , on page 42
"TCP/IP"	GNSS data provided from specified IP address. Define the "IP Address" and "IP Port" at which the signal is provided.
"TTL"	See Chapter 1.5.2.3, "GNSS connector" , on page 43.
"DJI M300"	GNSS signal from the connected drone. Define the "IP Address" and "IP Port" at which the signal is provided.

Remote command:

[SETUP:SETGPSINTERFACE](#) on page 237

Exp. Format

Export format for the GNSS data output by the data logger.

"Min"	(Default:) Minutes, seconds, degrees
"Decimal"	Decimal format

8.7 GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

An optional GNSS antenna and receiver are available for the R&S EVSD1000. The R&S EVSD1-Z6 GNSS RTK device is based on the μ Blox F9P GNSS receiver module.

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

The receiver is preconfigured at the factory for use with the R&S EVSD1000. However, you can adapt the configuration. Here, we describe only the required configuration and recommended settings for use with the R&S EVSD1000.

For more information, see the µBlox documentation (<https://www.u-blox.com>).

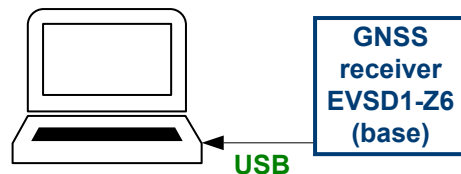
µBlox provides the "µ-Center" software to configure and monitor µBlox-based GNSS receivers. The software is available for Microsoft Windows operating systems. You can download the software for free at <https://www.u-blox.com>. The configuration shown here uses version 22.07.

There are 2 different ways to configure the R&S EVSD1-Z6 GNSS RTK device via the "µ-Center" software, depending on the type of receiver:

- Connect the R&S EVSD1-Z6 GNSS RTK device (rover) to the R&S EVSD1000, and the R&S EVSD1000 to a PC with the "µ-Center" software installed via LAN or Wi-Fi.



- Connect the R&S EVSD1-Z6 GNSS RTK device (base) to a PC with the "µ-Center" software installed via USB.



8.7.1 Configuring the R&S EVSD1-Z6 GNSS RTK device (base) via a PC

You can connect the R&S EVSD1-Z6 GNSS RTK device (base) to a PC directly via the USB connector.

To configure the R&S EVSD1-Z6 GNSS RTK device (base) via a PC

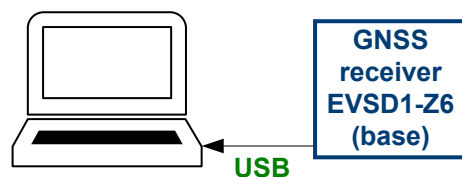
Prerequisites:

R&S EVSD1-Z6 GNSS RTK device (base)

PC with the "µ-Center" software installed

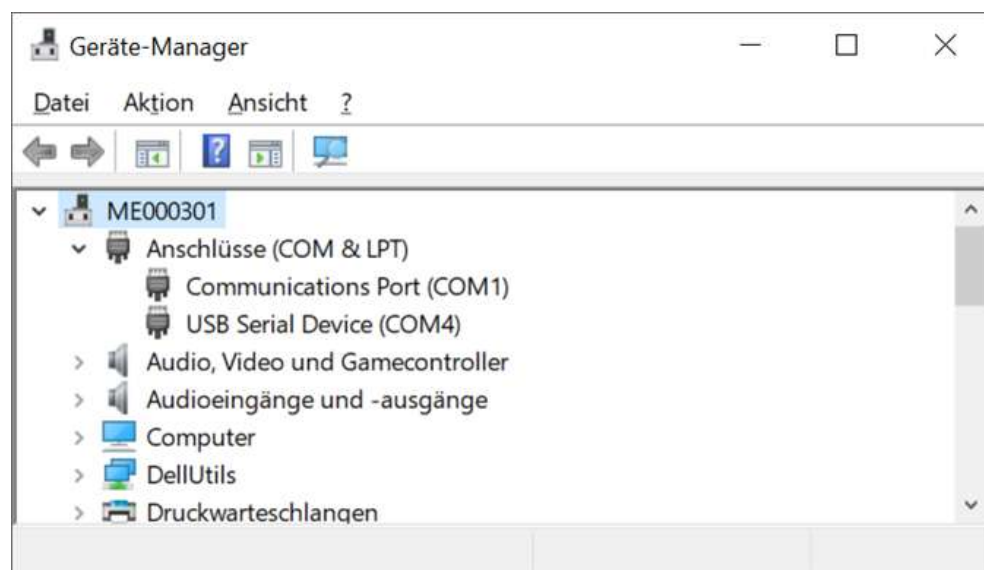
1. Connect the R&S EVSD1-Z6 GNSS RTK device (base) to a USB connector on the PC.

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device



The connection is indicated as a COM port in the device manager.

2. On the PC, open the device manager and determine the COM port number.



In this example, the receiver is connected to COM port 4 at ME000301.

3. Start the "μ-Center".
4. Select your COM port:  > "<COM<x>".

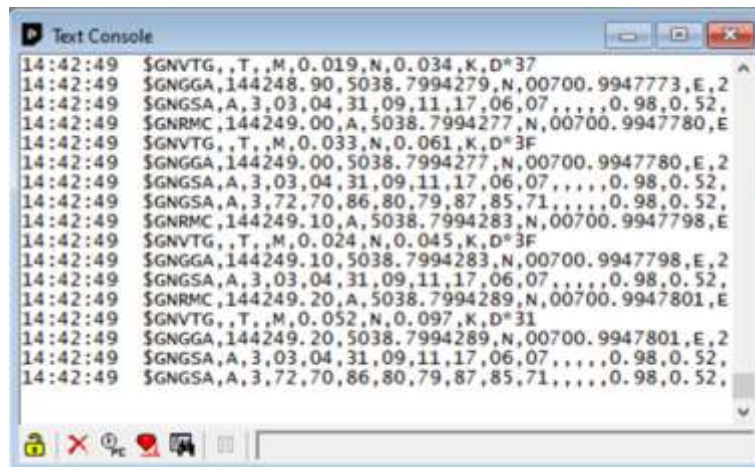


5. Enter the IP address of the R&S EVSD1000 using the syntax:
`tcp://<ip-address>:8090`

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

6. Press [F8] to open a "Text console" window.

If the GNSS receiver is connected correctly, the "Text console" window shows the incoming GNSS information from the connected receiver.



8.7.2 Configuring the R&S EVSD1-Z6 GNSS RTK device (rover) via the R&S EVSD1000

You cannot connect the R&S EVSD1-Z6 GNSS RTK device (rover) to a PC directly. Thus, you configure the R&S EVSD1-Z6 GNSS RTK device (rover) via the R&S EVSD1000.



The connection from the R&S EVSD1000 to the R&S EVSD1-Z6 GNSS RTK device (rover) is not suitable to update the R&S EVSD1-Z6 GNSS RTK device (rover) firmware, or to transfer complete configuration files to the GNSS receiver.



Figure 8-2: Configuring the R&S EVSD1-Z6 GNSS RTK device (rover) via the R&S EVSD1000

To configure the R&S EVSD1-Z6 GNSS RTK device (rover) via the R&S EVSD1000

Prerequisites:

A PC with the "µ-Center" software installed

LAN or Wi-Fi connection between the R&S EVSD1000 and the PC

VNC viewer application for the R&S EVSD1000, as described in [Chapter 1.6.2, "Manual operation from a VNC viewer"](#), on page 49.

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

R&S EVSD1-Z6 GNSS RTK device (rover) connected to the R&S EVSD1000

1. On the R&S EVSD1000, in the "Setup - GPS / GNSS" settings, select the "Interface": "USB u-blox".

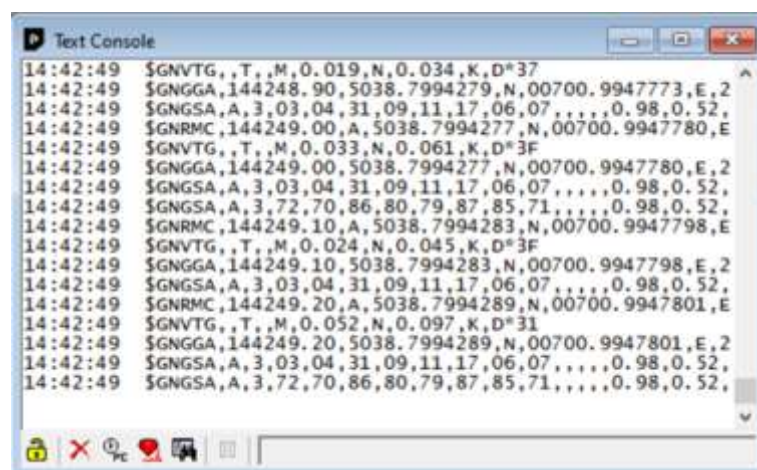
As an alternative, you can use a serial "RS-232" interface connection. In this case, also define the correct "Baudrate".

2. Start the "µ-Center".
3. Select  > "Network connection" > "New".



4. Enter the IP address of the R&S EVSD1000 using the syntax:
tcp://<ip-address>:8090
5. Press [F8] to open a "Text console" window.

If the GNSS receiver is connected correctly, the "Text console" window shows the incoming GNSS information from the connected receiver via the R&S EVSD1000.



8.7.3 Recommended configuration for use with R&S EVSD1000

The receiver is preconfigured at the factory for use with the R&S EVSD1000. The required configuration and recommended settings are described here. All settings are available in the "µ-Center" "Configuration View."

To adopt a changed setting on the receiver immediately, select "Send" in the task bar. However, you have to store the changed settings on the receiver permanently before you disconnect it from power, or they are lost. See [Chapter 8.7.4, "Storing changed settings on the R&S EVSD1-Z6 GNSS RTK device permanently"](#), on page 222.

Update rate (RATE (Rates)).....	221
Navigation messages (MSG (Messages)).....	221
Satellite-based correction data (SBAS (SBAS Settings)).....	221
Time pulse (TP5 (Timepulse 5)).....	221
Ports (PRT (Ports)).....	222
Enhanced precision (NMEA (NMEA Protocol)).....	222

Update rate (RATE (Rates))

The update rate of the NMEA messages. The default value is 5 Hz / 200 ms.

Navigation messages (MSG (Messages))

Navigation messages that are transmitted continuously. You can enable or disable each message type individually for each possible (internal) interface of the receiver. The following messages are evaluated by the R&S EVSD1000 and enabled by default. Note that the R&S EVSD1000 ignores any other messages. Irrelevant messages can prevent the instrument from obtaining the required information. In particular, "GxGSV" messages are very long and should be disabled.

Enable the following messages:

- "GxRMC"
- "GxGGA"
- "GxGSA"

For the following output:

- "USB"
- "UART1"
- "UART2"

Note: "NAV-PVT" message. The R&S EVSD1000 does not evaluate the "NAV-PVT" message. However, it is useful when you check the GNSS reception using the "µ-Center" software. Enable the message to display the accuracy for 2D and 3D position data ("3D Acc" and "2D Acc").

Satellite-based correction data (SBAS (SBAS Settings))

Satellite-based correction data increases accuracy, especially when no ground-based correction data is available. It is enabled by default.

Time pulse (TP5 (Timepulse 5))

The period between time pulses.

The default settings are:

- "Period": 1 second (1 Hz)
- "Lock to GNSS frequency if available": enabled

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

- "Length Locked": 100 ms (=100000µs)

Note: If the pulse polarity is not clear, set the "Length Locked" to a very short value, e.g. 100µs. Then the polarity has very little influence on the timing.

Ports (PRT (Ports))

The receiver ports support all provided protocols and baud rates. By default, USB is selected, with no further settings required.

The R&S EVSD1000 with the R&S EVSD1-Z6 GNSS RTK device (rover) uses the "Target": "1 - UART1".

For serial connections, select the same baudrate (e.g. 230400) on the R&S EVSD1-Z6 GNSS RTK device (rover) and the R&S EVSD1000.

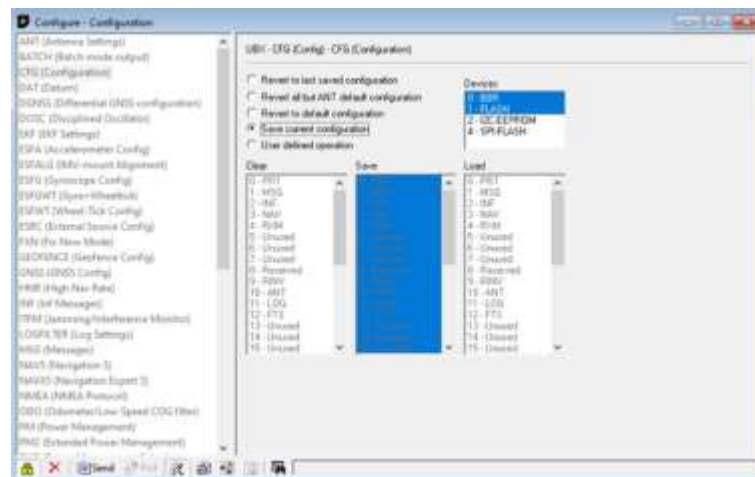
Enhanced precision (NMEA (NMEA Protocol))

The NMEA protocol provides a high precision mode, which increases the number of digits for each position from 5 to 7. This mode is required to use differential RTK correction (see [Chapter 8.7.5, "Improving precision \(RTK differential correction\)"](#), on page 223).

8.7.4 Storing changed settings on the R&S EVSD1-Z6 GNSS RTK device permanently

After you change any configuration settings in the "µ-Center", you have to store the changed settings on the receiver permanently. Any changes not stored permanently are lost when you disconnect the receiver from power.

1. Select "View" > "Configuration View".



2. Select "CFG (Configuration)" in the left pane.
3. Select "Devices":
 - "0 - BBR"
 - "1 - Flash"

4. Select "Send".

The configuration is stored to the R&S EVSD1-Z6 GNSS RTK device permanently.

8.7.5 Improving precision (RTK differential correction)

Real-time kinematic (RTK) is a method to improve the precision of the GNSS positioning data. It uses measured phase data of the GNSS carrier signal to determine the required correction data. The correction data is then applied to the actual content of the signal. The correction data is provided by a commercial or governmental base station, or by a second R&S EVSD1-Z6 GNSS RTK device. The correction data can be transferred from the R&S EVSD1000 to the receiver using a TCP/IP (LAN or Wi-Fi) connection and the "µ-Center" software.

To configure RTK differential correction from a public provider

Prerequisites:

R&S EVSD1000 connected to the R&S EVSD1-Z6 GNSS RTK device and configured for use (see [Chapter 8.7.2, "Configuring the R&S EVSD1-Z6 GNSS RTK device \(rover\) via the R&S EVSD1000"](#), on page 219)

LAN or Wi-Fi connection between the R&S EVSD1000 and the PC.

(See [Chapter 1.4.6, "Connecting to LAN"](#), on page 25 and [Chapter 1.4.7, "Setting up a data link \(Wi-Fi\) connection"](#), on page 26.)

RTK data provider

Clear view from the GNSS antenna to the sky in all directions.

1. Start the "µ-Center".
2. Select  > "Network connection".
3. Select the IP address of the R&S EVSD1000.
4. Press [F8] to open a "Text console" window.

Make sure that the GNSS receiver is connected correctly, and the "Text console" window shows the incoming GNSS information from the connected receiver via the R&S EVSD1000.

5. In the "µ-Center", select "Receiver" > "NTRIP Client".

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

NTRIP client settings

NTRIP caster settings

Address:

Port:

Username:

Password:

NTRIP stream

NTRIP mount point:

☐ Use manual position

Longitude (deg):

Latitude (deg):

Altitude (m):

Geoid sep. (m):

6. Enter the login information from your RTK data provider.
7. Select "Update source table".
8. Select "Mount point details".

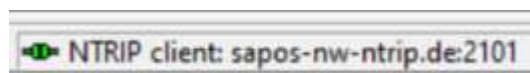
Table of NTRIP mount points

Name	Source identifier	Formats supported	Formats details	Center	Navigation system	Network
EPS_NW	EPS_NW	RTCM 2		0	GPS	SAPOS-NW_EPS
EPS_NW-VRS	EPS_NW-VRS	RTCM 2		0	GPS	
FKP_3_2G_NW	FKP_3_2G_NW	RTCM 3		2	GPS+GLO	
MAC_3_2G_NW	MAC_3_2G_NW	RTCM 3		2	GPS+GLO	
VRS_3_2G_NW	VRS_3_2G_NW	RTCM 3		2	GPS+GLO	
VRS_3_3G_NW	VRS_3_3G_NW	RTCM 3		2	GPS+GLO+GAL	
VRS_3_4G_NW	VRS_3_4G_NW	RTCM 3		2	GPS+GLO+GAL+BDG	

A list of possible mount points is displayed.

9. If possible, select a source that:
 - Supports "RTCM3" format
 - Has the most navigation systems
 - Is located nearest the R&S EVSD1-Z6 GNSS RTK device
10. Select "OK".

The "μ-Center" status line indicates that the correction data is available:



The correction data is sent to the R&S EVSD1000 and from there to the R&S EVSD1-Z6 GNSS RTK device (rover).

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

You can see the effect of the correction data in the "µ-Center" display. The precision is now provided in the centimeter range. The "Fix Mode" is "FIXED".

Longitude		7.01652857 °
Latitude		50.64666479 °
Altitude		216.505 m
Altitude (msl)		169.705 m
TTFF		
Fix Mode		3D/DGNSS/FIXED
3D Acc. [m]	0	0.02 0.1
2D Acc. [m]	0	0.01 0.1
PDOP	0	1.2 5
HDOP	0	0.7 5

On the R&S EVSD1000, the "Setup - GPS / GNSS" dialog box indicates the "Status": "RTK FIX". The incoming data is more precise.

Note that it can take up to several minutes after enabling RTK before the R&S EVSD1000 achieves a fixed RTK state.

Using the R&S EVSD1-Z6 GNSS RTK device as a base station

As an alternative to obtaining RTK correction data from a provider, you can also use a second R&S EVSD1-Z6 GNSS RTK device as a base station. In this case, the R&S EVSD1-Z6 GNSS RTK device connected to the R&S EVSD1000 is called the *rover*. The second R&S EVSD1-Z6 GNSS RTK device, called the base-station receiver, is connected to the PC directly. The correction data is obtained from the base-station receiver and transmitted to the rover.

Note that the "µ-Center" software can only configure a single device at a time. Thus, you require two "µ-Center" software instances, possibly on the same PC.

Correction data obtained using a second R&S EVSD1-Z6 GNSS RTK device as a base station is even more accurate than data from an RTK provider base station.

To configure RTK differential correction from a second R&S EVSD1-Z6 GNSS RTK device (base)

Prerequisites:

R&S EVSD1-Z6 GNSS RTK device (rover) connected to the R&S EVSD1000

GNSS antenna connected to the R&S EVSD1-Z6 GNSS RTK device (rover)

LAN or Wi-Fi connection between the R&S EVSD1000 and a PC with the "µ-Center" software installed

R&S EVSD1-Z6 GNSS RTK device (base), located near the R&S EVSD1000, and connected to a PC with a (second) "µ-Center" software instance

Dual-band GNSS antenna connected to the R&S EVSD1-Z6 GNSS RTK device (base)

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

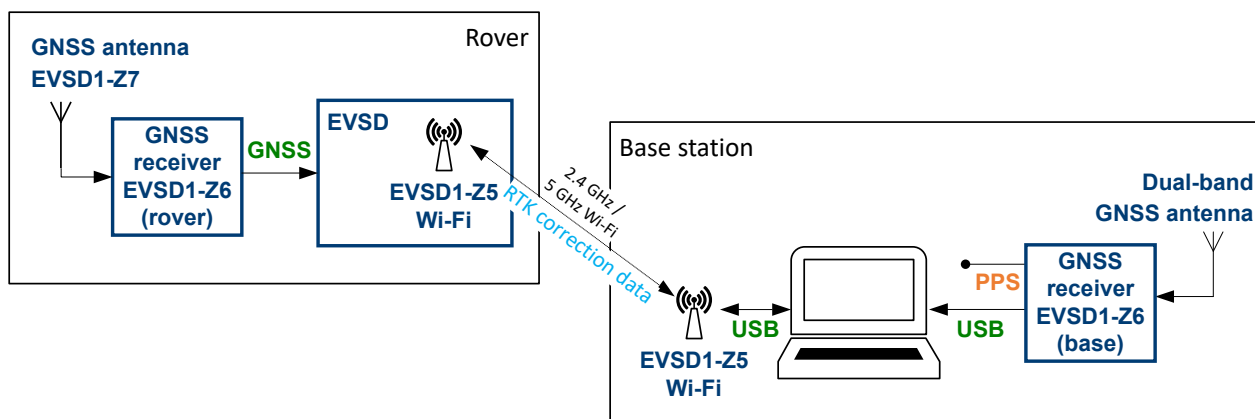


Figure 8-3: RTK correction data via Wi-Fi

1. Start the first "μ-Center".
2. Select  > "Network connection".
3. Select the IP address of the R&S EVSD1000.
4. Press [F8] to open a "Text console" window.

Make sure that the GNSS receiver is connected correctly, and the "Text console" window shows the incoming GNSS information from the connected receiver via the R&S EVSD1000.

5. In the second "μ-Center", select "Receiver" > "NTRIP Caster".



6. Define login information for the second receiver that is used as a base-station (or (broad)caster).
7. Select the "Mount point" tab.

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

NTRIP client settings

NTRIP caster settings

Address: sapos-nw-ntrip.de

Port: 2101

Username: nw-425629

Password: *****

NTRIP stream

Update source table Request Interval (sec)

NTRIP mount point: VRS_3_4G_NW

☐ Use manual position

Longitude (deg): 0

Latitude (deg): 0

Altitude (m): 0

Geoid sep. (m): 0

OK Cancel

8. Enter the precise position of the R&S EVSD1-Z6 GNSS RTK device (base).
9. Select "OK".

The "μ-Center" status line indicates that the NTRIP server is available, but not yet active:

NTRIP server: 172.23.226.58:2101 Active:0

10. Start the second "μ-Center" instance.
11. In the second "μ-Center", select "Receiver" > "NTRIP Client".

GNSS configuration on the R&S EVSD1-Z6 GNSS RTK device

12. Enter the login information as defined for the R&S EVSD1-Z6 GNSS RTK device (base).

13. Select "Update Source Table".

The R&S EVSD1-Z6 GNSS RTK device (base) is indicated as the (only) NTRIP mount point.

14. Select "OK".

The correction data is sent to the R&S EVSD1000 and from there to the connected R&S EVSD1-Z6 GNSS RTK device (rover).

You can see the effect of the correction data in the "µ-Center" display. The precision is now provided in the centimeter range. The "Fix Mode" is "FIXED".

Longitude	7.01652857 °
Latitude	50.64666479 °
Altitude	216.505 m
Altitude (msl)	169.705 m
TTFF	
Fix Mode	3D/DGNSS/FIXED
3D Acc. [m]	0.02
2D Acc. [m]	0.01
PDOP	1.2
HDOP	0.7

On the R&S EVSD1000, the "Setup - GPS / GNSS" dialog box indicates the "Status": "RTK FIX". The incoming data is more precise.

9 Remote commands

Using the LAN connection (Fast Ethernet), you can operate nearly all device functions and transfer measurement data remotely from a PC or network.

Connect a terminal client, e.g. "putty" (<https://www.putty.org>) to the R&S EVSD1000 using the TCP port 8000. The required commands are simple text commands, not SCPI-conform. Use any line-based command tool, such as telnet, to send commands to the R&S EVSD1000.

Set the IP addresses and subnet mask identifier in the setup menu (see [Chapter 8.2, "LAN \(remote\) settings"](#), on page 201).



Only one remote session can be active. A new attempt to establish a connection disconnects the current active session.

Channel addressing

- Direct Addressing
To address an RX board directly, any command can be preceded by the prefix @1 or @2 followed by the command.
Example: Set frequency of RX board 1
@1 RF108100
Example: Get DDM from RX board 2
@2 DDO

9.1 Common instrument and measurement setup

The following commands are required to configure general instrument and measurement settings that are independent of the measurement mode.

• Common measurement settings	230
• Signal input	234
• Trigger settings	235
• GNSS data	235
• Network settings and remote operation	241
• Connecting the drone	242
• Wi-Fi commands	244
• System settings	247
• Result display settings	249
• Retrieving instrument information	252
• Calibration	254
• Deprecated commands	255

9.1.1 Common measurement settings

The following commands are required for all measurements.

GETMEAS.....	230
GETMDEF.....	231
GETUNCAL.....	231
LA?.....	231
MEASTIME?.....	232
MEASTIME.....	232
RF?.....	232
RF.....	232
RFCH.....	232
SETATTMODE.....	233
SETUP:DEMOD_OUT_AGC.....	233
SETUP:DEMOD_OUT_COUPLING.....	233
SETUP:EXTERNALATT_RX1?.....	234
SETUP:EXTERNALATT_RX1.....	234

GETMEAS <result type>,<RX-board>

This command outputs the current measurement result for one or both RX-boards. Several measurement result types are defined.

Parameters:

<result type> Outputs the measurement result as one of the listed types.

FULL

EVS300 compatibility mode

ALL

All values of the current measurement mode are sent as comma-separated text, using actual units.

MEDIUM

A fixed selection of parameters is exported.

SHORT

A short, fixed selection of parameters is exported.

<RX-Board>

Output measurement result for the selected RX board.

1

RX board 1 selected

2

RX board 2 selected

1+2

Both RX boards selected

Return values:

<results> Measurement result.

<State>

READY.

The command was executed successfully.

Example:

GETMEAS FULL,1+2

GETMDEF <ParamSel>,<RX-board>

This command outputs the header columns for data provided by [GETMEAS](#).

Parameters:

<ParamSel>	Determines which parameter selection is output. FULL EVS300 compatibility mode ALL All values of the current measurement mode are sent as comma-separated text, using actual units. MEDIUM A fixed selection of parameters is exported. SHORT A short, fixed selection of parameters is exported.
<RX-Board>	Selects the RX board for which results are exported. 1 RX board 1 selected 2 RX board 2 selected 1+2 Both RX boards selected

Return values:

<Results>	Comma-separated list of header data for the selected results.
<State>	READY. The command was executed successfully.

GETUNCAL <State>

Indicates whether an **UNCAL** condition has occurred on the instrument. This condition either indicates the calibration data is invalid, or it is caused by a hardware error.

The "UNCAL" condition remains active until you switch off the instrument and switch it back on again. If the message appears again, contact the Rohde & Schwarz support center. See [Chapter 12, "Contacting customer support"](#), on page 357.

Parameters:

<State>	OK Instrument is calibrated correctly and no errors occurred. UNCAL Instrument calibration invalid or an error has occurred.

Manual operation: See ["HW Status"](#) on page 211

LA?

This command queries the RF signal level in numeric measurement modes.

Return values:

<signal level> RF signal level
Default unit: dBm

Usage:

Query only

MEASTIME?

MEASTIME <Time>

This command gets or sets the measurement time for "ILS LOC", "ILS GP", "ILS MB", "VOR" and "COM" mode.

Parameters:

<Time> Measurement time
Default unit: ms

Return values:

<State> **READY.**
The command was executed successfully.

RF?

RF

This command sets RF frequency. All values are interpreted with one digit behind the decimal point, for example, RF 108700.5 in numeric measurement modes.

Parameters:

<freq> RF frequency
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Freq"](#) on page 81
See ["Freq"](#) on page 93
See ["Freq"](#) on page 121

RFCH <Channel>

This command sets the receiver frequency channel on the active receiver board according to the ICAO frequency list, or returns the currently defined channel.

Parameters:

<Channel> The specified ICAO-channel for the measurement. See [Chapter A, "ILS channel frequency list"](#), on page 358.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["CH"](#) on page 81

SETATTMODE

This command selects the attenuation of the active mode ("ILS LOC", "ILS GP", "ILS MB", "VOR" or "COM" mode).

Parameters:

<Attenuation>

Select the attenuation type from the listed ones.

AUTO

The RF attenuation mode is selected automatically.

LN

(Low Noise) 15 dB pre-amplification

Provides a high sensitivity. Suitable when scanning the area for distant signals.

NORM

0 dB

Provides a normal sensitivity.

LD

(Low Dist) 15 dB attenuation

Provides a low sensitivity. Suitable when analyzing a nearby signal, to avoid overload due to high-level signals.

Return values:

<State>

READY.

Command was executed successfully.

Manual operation:See ["RF Att"](#) on page 82See ["RF Mode"](#) on page 82**SETUP:DEMODOUT_AGC <Mode>**

Determines whether the level for demodulation output is automatically corrected using the automatic gain control (AGC).

Parameters:

<Mode>

OFF | ON

Return values:

<State>

READY.

The command was executed successfully.

SETUP:DEMODOUT_COUPLING <Mode>

Gets or sets the coupling type for Demodulation-Out mode.

Parameters:

<Mode>

AC | DC

Return values:

<State>

READY.

The command was executed successfully.

SETUP:EXTERNALATT_RX1?**SETUP:EXTERNALATT_RX1** <Attenuation>

Gets or sets the external attenuation of "RX1 IN".

Parameters:

<Attenuation> External attenuation
 Default unit: dB

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[Transducer Correction](#)" on page 83

9.1.2 Signal input

The following commands are required to configure the signal input.

CH?	234
CH	234
GETNRPTYPE	234
GETNRPPOW	234

CH?**CH** <RX board>

This command selects the active RX-board.

Parameters:

<RX board> **1**
 Select the RX-board 1.
 2
 Select the RX-board 2.

Return values:

<State> **READY.**
 The command was executed successfully.

GETNRPTYPE

Gets the type of a connected NRP power sensor.

Return values:

<String> Type of NRP power sensor.

GETNRPPOW

Gets the current NRP power sensor level.

Return values:

<level> Power sensor level
 Default unit: dBm

9.1.3 Trigger settings

The following command is required to configure basic trigger settings.

[PPSSMA_TRIG_SOURCE?](#).....235

PPSSMA_TRIG_SOURCE? <Source>

Gets or sets the external trigger event source for "ILS LOC", "ILS GP", "ILS MB", "VOR" and "COM" modes, or defines the PPS synchronization source.

Return values:

<Source> **PPS GPS**
 Signal provided at the RS232-GPS or GNSS connector

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["Input"](#) on page 196

9.1.4 GNSS data

The following commands are required to configure and retrieve GNSS data.

To obtain GNSS data from the drone, see also [Chapter 9.1.6, "Connecting the drone"](#), on page 242.

GETGPSGPBOD	236
GETGPSGPGBA	236
GETGPSGPGLL	236
GETGPSGPHDT	236
GETGPSGPRMC	236
GETGPSGPGSA	236
GETGPSGPGRSV	237
GETGPSGPTRF	237
GETGPSGPVBW	237
GETGPSGPVTG	237
GETGPSGPXTE	237
GETGPSGPZDA	237
SETUP:SETGPSINTERFACE	237
GETGPSUNDULATION	238
SETUP:GPS_BAUDRATE?	238
SETUP:GPS_BAUDRATE	238
SETUP:GPS_IP_AD	238
SETUP:GPS_IP_PORT	239
SETUP:SETGPSDELAY	239
SETUP:PPS_SYNC?	239

SETUP:PPS_SYNC.....	239
SETUP:GPSREF.....	240
SETUP:REFLAT?.....	240
SETUP:REFLAT.....	240
SETUP:REFLONG?.....	241
SETUP:REFLONG.....	241
SETUP:TIMESYNC?.....	241
SETUP:TIMESYNC.....	241

GETGPSGPBOD

This command requests the last incoming GPBOD message from the GNSS receiver.

Return values:

<message> The last incoming GPBOD message.

GETGPSGPGGA

This command requests the last incoming GPGGA message from the GNSS receiver.

Parameters:

<message> The last incoming GPGGA message.

GETGPSGPGLL

This command requests the last incoming GPGLL message from the GNSS receiver.

Return values:

<message> The last incoming GPGLL message.

GETGPSGPHDT

This command requests the last incoming GPHDT message from the GNSS receiver.

Return values:

<message> The last incoming GPHDT message.

GETGPSGPRMC

This command requests the last incoming GPRMC message from the GNSS receiver.

Parameters:

<message> The last incoming GPRMC message.

GETGPSGPGSA

This command requests the last incoming GPGSA message from the GNSS receiver.

Return values:

<message> The last incoming GPGSA message.

GETGPSGPGSV

This command requests the last incoming GPGSV message from the GNSS receiver.

Return values:

<message> The last incoming GPGSV message.

GETGPSGPTRF

This command requests the last incoming GPTRF message from the GNSS receiver.

Return values:

<message> The last incoming GPTRF message.

GETGPSGPVBW

This command requests the last incoming GPVBW message from the GNSS receiver.

Return values:

<message> The last incoming GPVBW message.

GETGPSGPVTG

This command requests the last incoming GPVTG message from the GNSS receiver.

Return values:

<message> The last incoming GPVTG message.

GETGPSGPXTE

This command requests the last incoming GPXTE message from the GNSS receiver.

Return values:

<message> The last incoming GPXTE message.

GETGPSGPZDA

This command requires the last incoming GPZDA message from the GNSS receiver.

Return values:

<message> The last incoming GPZDA message.

SETUP:SETGPSINTERFACE <Connector>

Determines the interface used to connect a GNSS receiver.

Parameters:

<Connector> **RS_232**
 RS-232 interface

USB

USB interface

USB_UBLOX

USB u-blox interface

TCPIP

GNSS data provided from IP address specified using **SETUP:GPS_IP_AD** and **SETUP:GPS_IP_PORT**.

TTL

See [Chapter 1.5.2.3, "GNSS connector"](#), on page 43.

DJI-M300

GNSS signal from the connected drone.

*RST: RS_232

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Interface"](#) on page 216

GETGPSUNDULATION

Gets the undulation.

Return values:

<string>

SETUP:GPS_BAUDRATE? <Baudrate>**SETUP:GPS_BAUDRATE** <Baudrate>

This command sets or returns the baud rate.

NOTE: Make sure to use a valid GNSS baud rate.**Parameters:**

<Baudrate> 4800 | 9600 | 19200 | 38400 | 57600 | 115200 | 230400
Possible baud rates

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Baudrate"](#) on page 215

SETUP:GPS_IP_AD <IPAddress>

Defines the IP address of a GNSS receiver connected via TCP/IP.

Parameters:

<IPAddress> TCP/IP address between 0.0.0.0 and 0.255.255.255

Return values:

<State> **READY.**
The command was executed successfully.

Example: SETUP:GPS_IP_AD 10.0.2.166

SETUP:GPS_IP_PORT <IPPort>

Defines the IP port of a GNSS receiver connected via TCP/IP.

Parameters:

<IPPort> TCP/IP port

Return values:

<State> **READY.**
The command was executed successfully.

Example: SETUP:GPS_IP_PORT 8000

SETUP:SETGPSDELAY <Delay>

This command specifies the GNSS delay compensation.

NOTE: This setting has no effect when using PPS synchronization.

Parameters:

<Delay> Specify the delay compensation. Default is 100 ms.
Range: -500 to +500
Default unit: ms

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[GPS-Delay](#)" on page 215

SETUP:PPS_SYNC?**SETUP:PPS_SYNC <synchronization>**

Gets or sets the PPS synchronization for the instrument.

Parameters:

<Synchronization> **OFF**
No PPS synchronization is performed.

PPS_IN_RISE
Stored GNSS time is synchronized to the rising edge of the incoming PPS signal.

PPS_IN_FALL
Stored GNSS time is synchronized to the falling edge of the incoming PPS signal.

RS232_RISE

Stored GNSS time is synchronized to the rising edge of the incoming GNSS signal.

RS232_FALL

Stored GNSS time is synchronized to the falling edge of the incoming GNSS signal.

GNSS_RISE

Stored GNSS time is synchronized to the rising edge of the incoming GNSS signal from the connected drone.

GNSS_FALL

Stored GNSS time is synchronized to the falling edge of the incoming GNSS signal from the connected drone.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See "[PPS-Sync](#)" on page 215

SETUP:GPSREF <Latitude>,<Longitude>

By default, the reference point for GNSS information is automatically taken from the position of the built-in GNSS antenna of the R&S EVSD1000. However, it can be changed manually to any other position using this command.

Parameters:

<Latitude>

<degrees><minutes><direction>

Latitude of the reference point in degrees, minutes (decimal format) and direction (S | N)

<Longitude>

<degrees><minutes><direction>

Longitude of the reference point in degrees, minutes (decimal format) and direction (W | E)

Example:

SETUP:GPSREF 89°44.123456789S,23°55.123456789S

SETUP:REFLAT?**SETUP:REFLAT <Latitude>**

Gets or sets the latitude of the GNSS reference point.

Parameters:

<Latitude>

GNSS reference point latitude

Return values:

<State>

READY.

The command was executed successfully.

SETUP:REFLONG?**SETUP:REFLONG** <Longitude>

Gets or sets the longitude of the GNSS reference point.

Parameters:

<Longitude> GNSS reference point longitude.

Return values:

<State> **READY.**
The command was executed successfully.

SETUP:TIMESYNC?**SETUP:TIMESYNC** <Source>

Defines or queries the time source with which the R&S EVSD1000 clock is synchronized. If the R&S EVSD1000 clock differs from the selected synchronization source time by more than 1000 ms, the R&S EVSD1000 clock is adjusted accordingly.

Parameters:

<Source> **OFF**
No synchronization is performed for the internal R&S EVSD1000 clock.

GPS
Synchronization with a connected GNSS (see the main R&S EVSD1000 User Manual).

Example: `SETUP:TIMESYNC OFF`

9.1.5 Network settings and remote operation

The following commands are required to configure network settings and remote operation.

GETHOSTNAME	241
LO	242
MLOC	242
RLC	242
REMOTELOCK	242
SETUP:NTPSERVER?	242
SETUP:NTPSERVER	242

GETHOSTNAME

This command returns the host name of the instrument.

Return values:

<hostname>

Manual operation: See "[Hostname](#)" on page 204

LO

This command sets the R&S EVSD1000 back to local control.

Return values:

<State> **READY.**
The command was executed successfully.

Usage: Setting only

MLOC

The **MLOC** command is identical to the **LO** command.

Return values:

<State> **READY.**
The command was executed successfully.

RLC <State>**REMOTELOCK <State>**

This command deactivates/activates local operation by keyboard.

Parameters:

<State> **ON**
If set, no local operation by keyboard is possible.

OFF
The R&S EVSD1000 must be set to "OFF" or must be restarted to activate local operation by keyboard.

Return values:

<State> **READY.**
The command was executed successfully.

SETUP:NTPSERVER?**SETUP:NTPSERVER <IPAddress>**

Defines the IP address of the NTP server used for time synchronization of the internal R&S EVSD1000 clock (see [SETUP:TIMESYNC](#) on page 241).

Parameters:

<IPAddress> TCP/IP address between 0.0.0.0 and 0.255.255.255

Example:

```
SETUP:TIMESYNC NTP
SETUP:NTPSERVER 10.0.2.166
```

Usage: Setting only

9.1.6 Connecting the drone

The following commands are required to communicate with the connected drone.

DJI:KEY.....	243
DJI:INTERFACE.....	243
DJI:BAUDRATE.....	243
DJI:APPID.....	243

DJI:KEY <Key>

Application key for the DJI M300 drone, specified by DJI. See ["To obtain the DJI M300 information"](#) on page 34.

Parameters:

<Key> string

Return values:

<State> **READY.**
The command was executed successfully.

Usage: Setting only

DJI:INTERFACE <Port>

The internal serial port that the DJI M300 is connected to.

Parameters:

<Port> /dev/ttymx1 | /dev/ttyUSB0

Return values:

<State> **READY.**
The command was executed successfully.

Usage: Setting only

DJI:BAUDRATE <Datarate>

Baud rate (data rate) between the R&S EVSD1000 and the DJI-M300.

Parameters:

<Datarate> numeric value

Return values:

<State> **READY.**
The command was executed successfully.

Usage: Setting only

DJI:APPID <parameter>

Application ID of the DJI-M300. See ["To obtain the DJI M300 information"](#) on page 34.

Parameters:

<ID> string

Return values:

<State> **READY.**
The command was executed successfully.

Usage: Setting only

9.1.7 Wi-Fi commands

The following commands are required to configure and control the optional R&S EVSD1-Z5 Data-link-module (Wi-Fi).

WIFI:SSID.....	244
WIFI:WPAPSK.....	244
WIFI:IP.....	245
WIFI:NETMASK.....	245
WIFI:GATEWAY.....	245
WIFI:ONOFF?.....	245
WIFI:ONOFF.....	245
WIFI:CHANNEL?.....	246
WIFI:CHANNEL.....	246
WIFI:SPEED?.....	246
WIFI:SPEED.....	246
WIFI:COUNTRY?.....	246
WIFI:COUNTRY.....	246
WIFI:STATUS.....	247

WIFI:SSID <ID>

Defines the service set identifier, the name of the Wi-Fi.

Parameters:

<ID> *RST: EVSD<serial number>

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "SSID" on page 206

WIFI:WPAPSK <Password>

Defines the Wi-Fi password.

Parameters:

<Password> *RST: RS<serial number>

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "WPA-PSK Key" on page 206

WIFI:IP <IPAddress>

Unique address of the instrument in the network.

Parameters:

<IPAddress>

Four number blocks separated by dots. Each block contains values between 0 and 255.

*RST: 192.168.1.1

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["IP"](#) on page 207

WIFI:NETMASK <Mask>

Defines the Wi-Fi subnet mask.

Parameters:

<Mask>

Four number blocks separated by dots. Each block contains values between 0 and 255.

*RST: 255.255.255.0

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Netmask"](#) on page 207

WIFI:GATEWAY <Address>

Wi-Fi gateway address

Parameters:

<Address>

Four number blocks separated by dots. Each block contains values between 0 and 255.

*RST: 192.168.1.2

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Gateway"](#) on page 207

WIFI:ONOFF?

WIFI:ONOFF <State>

Enables or disables a data connection via the optional Wi-Fi interface.

Parameters:

<State>

ON | OFF

Return values:

<State>

READY.

The command was executed successfully.

Manual operation:See ["Wi-Fi"](#) on page 206**WIFI:CHANNEL?****WIFI:CHANNEL** <Channel>

Wi-Fi channel

Parameters:

<Channel>

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 36 | 40 | 44 | 48 |
52 | 56 | 60 | 64 | 100 | 104 | 108 | 112 | 116 | 120 | 124 | 128 |
132 | 136 | 140 | 149 | 153 | 157 | 161 | 165

*RST: 1

Return values:

<State>

READY.

The command was executed successfully.

Manual operation:See ["Channel"](#) on page 206**WIFI:SPEED?****WIFI:SPEED** <DataRate>

Determines the used Wi-Fi data rate.

Parameters:

<DataRate>

LOW

(Default:) Uses 20 MHz bandwidth. Data transfer is less susceptible to distortion.

HIGH

Uses 80 MHz bandwidth, if available. Guard interval is reduced to increase the data rate. Data transfer becomes more susceptible to distortion.

*RST: LOW

Return values:

<State>

READY.

The command was executed successfully.

Manual operation:See ["Wi-Fi Speed"](#) on page 206**WIFI:COUNTRY?****WIFI:COUNTRY** <Code>

Country code

Parameters:

<Code> 00 | AD | AE | AF | AI | AL | AM | AN | AR | AS | AT | AU | AW |
 AZ | BA | BB | BD | BE | BF | BG | BH | BL | BM | BN | BO | BR |
 BS | BT | BY | BZ | CA | CF | CH | CI | CL | CN | CO | CR | CU |
 CX | CY | CZ | DE | DK | DM | DO | DZ | EC | EE | EG | ES | ET |
 EI | FM | FR | GB | GD | GE | GF | GH | GL | GP | GR | GT | GU |
 GY | HK | HN | HR | HT | HU | ID | IE | IL | IN | IR | IS | IT | JM |
 JO | JP | KE | KH | KN | KP | KR | KW | KY | KZ | LB | LC | LI |
 LK | LS | LT | LU | LV | MA | MC | MD | ME | MF | MH | MK | MN |
 MO | MP | MQ | MR | MT | MU | MV | MW | MX | MY | NG | NI |
 NL | NO | NP | NZ | OM | PA | PE | PF | PG | PH | PK | PL | PM |
 PR | PT | PW | PY | QA | RE | RO | RS | RU | RW | SA | SE |
 SG | SI | SK | SN | SR | SV | SY | TC | TD | TG | TH | TN | TR |
 TT | TW | TZ | UA | UG | US | UY | UZ | VC | VE | VI | VN | VU |
 WF | WS | YE | YT | ZA | ZW

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["Country"](#) on page 207

WIFI:STATUS <Status>

Indicates the status of the Wi-Fi connection.

Parameters:

<Status> **ON**
 Wi-Fi access point is running.

OFF
 Wi-Fi access point not (yet) running successfully. Additional information indicates the reason for the error. See ["Status"](#) on page 207.

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["Status"](#) on page 207

9.1.8 System settings

The following commands are required to configure basic system settings.

FACTORY_PRESET	248
SETUP:BOOTONPOWERUP	248
SETUP:DATE	248
SETUP:TIME	248
WAIT4EXE	249

FACTORY_PRESET

This command restores the factory default settings. The IP-settings and Data logger lists are not modified.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Factory Preset"](#) on page 191

SETUP:BOOTONPOWERUP <State>

If power is applied to the instrument, it can be started immediately.

Parameters:

<State> **ON**
The R&S EVSD1000 is started immediately after power is applied to the instrument.

Return values:

<State> **READY.**
The command was executed successfully.

Example: `SETUP:BOOTONPOWERUP ON`

Manual operation: See ["Boot on Power Up"](#) on page 209

SETUP:DATE <Date>

This command sets the instrument date.

Parameters:

<Date> DD.MM.YYYY

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Date"](#) on page 209

SETUP:TIME <Time>

This command sets the instrument time.

Parameters:

<Time> HH:MM:SS

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Time"](#) on page 209

WAIT4EXE <State>

Sets the behavior of the status message "READY".

Parameters:

<State>

ON

The "READY." message is delayed until every command is executed.

OFF

The "READY." message is returned as soon as a command is syntactically accepted.

Return values:

<State>

READY.

The command was executed successfully.

9.1.9 Result display settings

The following commands are required to configure the result displays for measurements.

SETUP:UNIT:BARGRAPH?	249
SETUP:UNIT:BARGRAPH	249
SETUP:UNIT:DDM?	250
SETUP:UNIT:DDM	250
SETUP:UNIT:ILSPHASE?	250
SETUP:UNIT:ILSPHASE	250
SETUP:UNIT:POLARITYDDM?	250
SETUP:UNIT:POLARITYDDM	250
SETUP:UNIT:SDM?	251
SETUP:UNIT:SDM	251
SETUP:UNIT:UPPERFREQ?	251
SETUP:UNIT:UPPERFREQ	251
SETUP:UNIT:VORDIRECTION?	251
SETUP:UNIT:VORDIRECTION	251

SETUP:UNIT:BARGRAPH?**SETUP:UNIT:BARGRAPH** <MesDe>

This command sets the representation of bar graph.

Parameters:

<MesDe>

ILSPHASE

Sets the MesDe parameter as ILSPHASE.

Cockpit

Sets the MesDe parameter as Cockpit.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["DDM Bargr"](#) on page 85
See ["Level View"](#) on page 200

SETUP:UNIT:DDM?

SETUP:UNIT:DDM <Unit>

This command sets the DDM unit.

Parameters:

<Unit> **1**
Sets DDM unit as dimensionless.

uA
Sets DDM unit as μ A.

PCT
Sets DDM unit as percentage.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["DDM Unit"](#) on page 84

SETUP:UNIT:ILSPHASE?

SETUP:UNIT:ILSPHASE <ILS phase>

This command gets or sets the ILS phase representation.

Parameters:

<ILS phase> **BIPOLAR**
The phase is represented as bipolar, if between -60...+60.

UNIPOLAR
The phase is represented as unipolar, if between 0...+120.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["ILS Phase"](#) on page 85

SETUP:UNIT:POLARITYDDM?

SETUP:UNIT:POLARITYDDM <Value>

This command gets or sets the DDM polarity.

The phase is represented as unipolar, if between 0...+120.

Parameters:

<Value> **90-150**
Sets DDM polarity as 90-150.

150-90
Sets DDM polarity as 150-90.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[DDM Polarity](#)" on page 85

SETUP:UNIT:SDM?

SETUP:UNIT:SDM <Unit>

This command sets the SDM unit.

Parameters:

<Unit> **1**
Sets SDM unit as dimensionless.

uA
Sets SDM unit as μA .

PCT
Sets SDM unit as percentage.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[SDM Unit](#)" on page 84

SETUP:UNIT:UPPERFREQ?

SETUP:UNIT:UPPERFREQ <Upper frequency>

This command gets or sets the upper frequency to course or clearance (while the lower frequency is always vice versa).

Parameters:

<Upper frequency> **CRS**
Sets the upper frequency to course.

CRL
Sets the upper frequency to clear.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Upper Freq](#)" on page 81

SETUP:UNIT:VORDIRECTION?

SETUP:UNIT:VORDIRECTION <Direction>

This command gets or sets the VOR direction point of view.

Parameters:

<Direction> **from | to**
Sets the VOR direction point of view as "from" or "to".

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Signal Direction"](#) on page 110

9.1.10 Retrieving instrument information

The following commands are required to retrieve information on the instrument and operation status.

BI?	252
CLEARERRORLOG	252
GETERRORLOG	252
SETUP:GETERRORLOG	252
GETOPTIONS	253
GETTEMP	253
*IDN?	253
INV?	253
OPTIONGETCHECKED	253
SAVEDATA	254
VER?	254

BI?

This command returns built-in-test information.

Return values:

<BI-Info>

Usage: Query only**Manual operation:** See ["HW Status"](#) on page 211

CLEARERRORLOG

This command clears the error log.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Delete all error messages"](#) on page 211

GETERRORLOG
SETUP:GETERRORLOG

Returns the error log.

Return values:

<string>

Entries of the error log

GETOPTIONS

This command returns a list of installed and available options.

Return values:

<list of options> Examples: ILS CRS/CLR Analysis, VOR Analysis, MB Analysis, ...

Manual operation: See ["Installed Options"](#) on page 212

GETTEMP

This command queries the temperatures of the main and RX boards.

Return values:

<temperature> Temperature value of the main and boards.

Manual operation: See ["HW Status"](#) on page 211

*IDN?

This command queries the instrument identification.

Return values:

<Instrument
Identification>

Usage: Query only

INV?

This command queries the inventory that contains, among other information, serial numbers of device and boards.

Return values:

<Inv-Info>

Usage: Query only

Manual operation: See ["Inventory"](#) on page 213

OPTIONGETCHECKED

Check if all options are available.

Return values:

<Option State> **true**
 The option is available.
 false
 The option is not available.

Example: OPTIONGETCHECKED
 K1=true,K2=true,K3=true,K4=false

SAVEDATA

This command stores the current settings in the flash memory. The settings are normally stored during shutdown. However, if the R&S EVSD1000 restarts after a power interruption, it does not remember the settings. Use this function sparingly for essential settings that you want to avoid losing by all means. Each write process to the flash causes additional wear.

Return values:

<State>

READY.

The command was executed successfully.

VER?

This command queries SW version.

Return values:

<sw-version>

Usage: Query only**Manual operation:** See ["Inventory"](#) on page 213**9.1.11 Calibration**

The following commands are required to perform and analyze calibration.

AUTOKALSTATUS	254
AUTOKALSTATUS_EXTENDED	254
GETKALSTATUS	254
KALSCREEN	255
STARTKAL	255

AUTOKALSTATUS

This command gets the auto-calibration (Autocal) status and date for the RX boards.

Manual operation: See ["Auto-Calibration \(Cal\)"](#) on page 209

AUTOKALSTATUS_EXTENDED

This command gets the extended autocal state for RX boards.

Return values:

<State>

Extended autocal state

GETKALSTATUS

This command shows the current task of auto-calibration.

Return values:

Status

Current task of auto-calibration.

Manual operation: See ["Auto-Calibration \(Cal\)"](#) on page 209

KALSCREEN

This command shows the auto-calibration ("Setup - Cal") screen.

Return values:
<State> **READY.**
Command was executed successfully.

Manual operation: See ["Auto-Calibration \(Cal\)"](#) on page 209

STARTKAL

This command launches autocalibration for current RX-board.

The command returns immediately, while the calibration takes several minutes. To find out when the calibration is ready, use the [GETKALSTATUS](#) command.

Return values:
<State> **READY.**
The command was executed successfully.

Manual operation: See ["Auto-Calibration \(Cal\)"](#) on page 209

9.1.12 Deprecated commands

The following commands are maintained for compatibility with former Rohde & Schwarz analyzers only. For new remote control programs, use the following commands:

- [MODE_LOC](#) on page 257
- [MODE_LOC](#) on page 257
- [MODE_GP](#) on page 257
- [MODE_MB](#) on page 283
- [MODE_VOR](#) on page 289
- [MODE_COM](#) on page 298
- [MODE_FSCAN](#) on page 321
- [MODE_IFSPECT](#) on page 326
- [MODE_FFT](#) on page 331
- [MODE_SCOPE](#) on page 336

M?	256
MB	256
MI	256
MV	257

M?

This command queries the current active mode.

Return values:

<ActiveMode>	ILS_LOC ILS Localizer mode
	ILS_GP ILS Glide Path mode
	MB Marker Beacon mode
	VOR VHF omnidirectional radio range mode (R&S EVSG-K2 VOR analysis)
	COM COM mode (R&S EVSG-K6 COM analysis)
	FSCAN RF spectrum mode (R&S EVSG-K10 RF spectrum analysis)
	IFSPECTRUM IF spectrum mode (R&S EVSG-K10 RF spectrum analysis)
	FFT AF Spectrum mode (R&S EVSG-K11 AF spectrum analysis)
	SCOPE AF Time Domain mode (R&S EVSG-K12 Time domain analysis)
	GBAS GBAS/SCAT-I mode (R&S EVSG-K4 GBAS analysis / R&S EVSG-K5 SCAT-I Analysis)

Usage: Query only

MB

This command switches the instrument to the "ILS MB" mode.

Return values:

<State>	READY. The command was executed successfully.

MI

This command switches the instrument to the "ILS LOC" mode.

Return values:

<State>	READY. The command was executed successfully.

MV

This command switches the instrument to the "VOR" mode.

Return values:

<State>

READY.

The command was executed successfully.

9.2 ILS localizer (LOC) and glidepath (GP) modes

The following commands are required to configure and perform measurements in the ILS Localizer and Glidepath modes.

- [Configuring the ILS LOC and GP modes](#).....257
- [Configuring ILS localizer measurements](#).....257
- [Configuring ILS glidepath measurements](#).....264
- [Retrieving ILS loc and GP results](#).....270
- [Retrieving ID results](#).....278
- [Deprecated commands](#).....279

9.2.1 Configuring the ILS LOC and GP modes

The following commands are required to activate the modes.

- [MODE_LOC](#).....257
- [MODE_GP](#).....257

MODE_LOC

The `MODE_LOC` command is identical to the `MI` command.

For description, see [MI](#) on page 256.

MODE_GP

This command switches the instrument to the "ILS GP" mode.

Return values:

<State>

READY.

The command was executed successfully.

9.2.2 Configuring ILS localizer measurements

The following commands are required to configure ILS Loc measurements

- [DEMODE_LLZ?](#).....258
- [DEMODE_LLZ](#).....258
- [LLZ_CARRIER_THRESHOLD_DB?](#).....259

LLZ_CARRIER_THRESHOLD_DB.....	259
LLZ_DEFAULT_FREQSTEP?.....	259
LLZ_DEFAULT_FREQSTEP.....	259
LLZ_DEM_ID_BW?.....	259
LLZ_DEM_ID_BW.....	259
LLZ_DEM_ID_WIDE_BW?.....	260
LLZ_DEM_ID_WIDE_BW.....	260
LLZ_DEM_WIDE_BW?.....	260
LLZ_DEM_WIDE_BW.....	260
LLZ_DEM_1F2F_BW?.....	260
LLZ_DEM_1F2F_BW.....	260
LLZ_DEMFREQS_OFFSET_1F?.....	261
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FILTER_LLZ_RESIDFM.....	262
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LLZ_TRIG_EDGE?.....	263
LLZ_TRIG_EDGE.....	263
LLZ_TRIG_SOURCE?.....	263
LLZ_TRIG_SOURCE.....	263
VIEW_GS?.....	263
VIEW_GS.....	263
VIEW_LLZ?.....	264
VIEW_LLZ.....	264

DEMODE_LLZ?**DEMODE_LLZ** <1F/2F mode>

Gets or sets the 1F/2F mode in "ILS LOC" mode.

Parameters:

<1F/2F mode>

1F

ILS system with one carrier. The nominal frequency is the carrier frequency.

2F

ILS system with two carriers. The carrier frequencies (Course and Clearance) are above and below the nominal frequency (in a distance of a few kHz).

2F_CRS

Course of an ILS system (depending on the ILS system, it can be the upper or lower carrier frequency).

2F_CLR

Clearance of an ILS system (depending on the ILS system, it can be the upper or lower carrier frequency).

WIDE

In the wideband mode, 1-frequency and 2-frequency systems can be analyzed. Both carriers are inside one filter and can be demodulated together.

Note: In this mode, there is no configuration and display of the carrier offset.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["1F/2F"](#) on page 78

LLZ_CARRIER_THRESHOLD_DB?

LLZ_CARRIER_THRESHOLD_DB <Threshold>

Gets or sets the carrier threshold in "ILS LOC" mode.

Parameters:

<Threshold>

Carrier threshold

Default unit: dB

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Carrier Thresh"](#) on page 80

LLZ_DEFAULT_FREQSTEP? <StepSize>

LLZ_DEFAULT_FREQSTEP <StepSize>

Gets or sets the default RF frequency step size in "ILS LOC" mode.

Parameters:

<StepSize>

8.33_KHZ | 12.5_KHZ | 25_KHZ | 50_KHZ

*RST: 50_KHZ

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Step Size"](#) on page 81

LLZ_DEM_ID_BW?

LLZ_DEM_ID_BW <Bandwidth>

Gets or sets the demodulator bandwidth for ID and distortion measurement in "ILS LOC" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:<State> **READY.**
The command was executed successfully.**Manual operation:** See "IF BW Dist/ID" on page 83**LLZ_DEM_ID_WIDE_BW?** <Bandwidth>**LLZ_DEM_ID_WIDE_BW** <Bandwidth>

Gets or sets the WIDE demodulator bandwidth for ID and distortion analysis in "ILS LOC" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ | 50KHZ

Return values:<State> **READY.**
The command was executed successfully.**Manual operation:** See "IF BW Dist/ID" on page 83**LLZ_DEM_WIDE_BW?****LLZ_DEM_WIDE_BW** <Bandwidth>

Gets or sets the WIDE demodulator bandwidth in "ILS LOC" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ | 50KHZ

Return values:<State> **READY.**
The command was executed successfully.**Manual operation:** See "IF BW" on page 83**LLZ_DEM_1F2F_BW?****LLZ_DEM_1F2F_BW** <Bandwidth>

Gets or Sets the 1F2F demodulator bandwidth in "ILS LOC" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:<State> **READY.**
The command was executed successfully.**Manual operation:** See "IF BW" on page 83

LLZ_DEMFREQS_OFFSET_1F?**LLZ_DEMFREQS_OFFSET_1F** <Freq. Offset>

Gets or sets the demodulator 1F frequency offset in "ILS LOC" mode.

Parameters:

<Freq. Offset> Frequency offset
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[1F Offset](#)" on page 80**LLZ_DEMFREQS_OFFSET_AUTOMAN?****LLZ_DEMFREQS_OFFSET_AUTOMAN** <Mode>

Gets or sets the mode of the demodulator frequency offset in "ILS LOC" mode.

Parameters:

<Mode> **AUTO_LOCK**
 Sets the demodulator frequency offset automatically. Once a valid signal has been found, the carrier frequencies remain fixed until you perform a manual change.

AUTO_RETUNE
 Sets the demodulator frequency offset automatically. If the carrier frequency changes, the R&S EVSD1000 starts a new search (retuning).

MANUAL
 Sets the demodulator frequency offset manually.

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[CRS/CLR Carr \(Autotune function\)](#)" on page 79**LLZ_DEMFREQS_OFFSET_LOWERFREQ?****LLZ_DEMFREQS_OFFSET_LOWERFREQ** <Freq. Offset>

Gets or Sets the demodulator lower frequency offset in "ILS LOC" mode.

Parameters:

<Freq. Offset> Lower frequency offset
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[Clearance](#)" on page 80

LLZ_DEMFREQS_OFFSET_UPPERFREQ?**LLZ_DEMFREQS_OFFSET_UPPERFREQ** <Freq. Offset>

Gets or Sets the demodulator upper frequency offset in "ILS LOC" mode.

Parameters:

<Freq. Offset> Upper frequency offset
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[Course](#)" on page 79

LLZ_ID_STAT?**LLZ_ID_STAT** <State>

Enables or disables the ID statistics calculation in ILS Localizer measurements.

Parameters:

<State> **ON**
 The ID code is determined as the most probable code based on the previous decoding results.
 OFF
 The most recently decoded ID is used.

FILTER_LLZ_RESIDFM?**FILTER_LLZ_RESIDFM** <Bandwidth>

Defines or queries the filter type used to determine residual FM

Return values:

<Bandwidth> **ICAO**
 Filter according to ICAO specification
 NARROW
 Narrow filter; the DDM filters used to determine the 90 Hz/150 Hz modulation values are used to avoid interference between the signals
 *RST: ICAO

Example: `FILTER_LLZ_RESIDFM NARROW`**Manual operation:** See "[Res. FM Filt. \(ILS only\)](#)" on page 84

LLZ_START_FINDCARRIER

Starts to search for a carrier in "ILS LOC" mode.

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["Find Carrier"](#) on page 80

LLZ_TRIG_EDGE? <TrigEdge>

LLZ_TRIG_EDGE <TrigEdge>

Gets or sets whether triggering occurs when the signal rises to the trigger level or falls down to it in "ILS LOC" mode.

Parameters:

<TrigEdge>

POSITIVE | NEGATIVE

POSITIVE

Triggers when the signal rises to the trigger level

NEGATIVE

Triggers when the signal falls down to the trigger level

Return values:

<State>

READY.

The command was executed successfully.

LLZ_TRIG_SOURCE? <TrigSource>

LLZ_TRIG_SOURCE <TrigSource>

Gets or sets the trigger source in "ILS LOC" mode.

Parameters:

<TrigSource>

OFF | TIME | EXT

OFF

Free run mode, no trigger used

TIME

time trigger

EXT

external trigger

Return values:

<State>

READY.

The command was executed successfully.

VIEW_GS?

VIEW_GS <View type>

Gets or sets the view in "ILS GP" mode. See [Chapter 4.1.3, "ILS localizer and glide-path measurements and results"](#), on page 63 for details.

Parameters:

<View type>

MAIN

Main view

CRS|CLR

Course or clearance view

DIST

Distortion view

REC

Recording view

Return values:

<State>

READY.

The command was executed successfully.

VIEW_LLZ?**VIEW_LLZ** <View type>

Gets or sets the view in "ILS LOC" mode. See [Chapter 4.1.3, "ILS localizer and glidepath measurements and results"](#), on page 63 for details.

Parameters:

<View type>

MAIN

Main view

CRS|CLR

Course or clearance view

DIST

Distortion view

ID

ID Analysis view

REC

Recording view

Return values:

<State>

READY.

The command was executed successfully.

9.2.3 Configuring ILS glidepath measurements

The following commands are required to configure ILS GP measurements

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GS_TRIG_EDGE.....	269
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GS_TRIG_SOURCE.....	270

DEMODE_GS?**DEMODE_GS** <1F/2F mode>

Gets or sets the 1F/2F mode in "ILS GP" mode.

Parameters:

<1F/2F mode>

1F

ILS system with one carrier. The nominal frequency is the carrier frequency.

2F

ILS system with two carriers. The carrier frequencies (Course and Clearance) are above and below the nominal frequency (in a distance of a few kHz).

2F_CRS

Course of an ILS system (depending on the ILS system, it can be the upper or lower carrier frequency).

2F_CLR

Clearance of an ILS system (depending on the ILS system, it can be the upper or lower carrier frequency).

WIDE

In the wideband mode, 1-frequency and 2-frequency systems can be analyzed. Both carriers are inside one filter and can be demodulated together.

Note: In this mode, there is no configuration and display of the carrier offset.**Return values:**

<State>

READY.

The command was executed successfully.

Manual operation: See "1F/2F" on page 78

GS_CARRIER_THRESHOLD_DB?**GS_CARRIER_THRESHOLD_DB** <Threshold>

Gets or sets the carrier threshold in "ILS GP" mode.

Parameters:

<Threshold> Carrier threshold
 Default unit: dB

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[Carrier Thresh](#)" on page 80

GS_DEFAULT_FREQSTEP? <StepSize>**GS_DEFAULT_FREQSTEP** <StepSize>

Gets or sets the default RF frequency step size in "ILS GP" mode.

Parameters:

<StepSize> 8.33_KHZ | 12.5_KHZ | 25_KHZ | 50_KHZ
 *RST: 50_KHZ

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[Step Size](#)" on page 81

GS_DEM_1F2F_BW?**GS_DEM_1F2F_BW** <Bandwidth>

Gets or Sets the 1F2F demodulator bandwidth in "ILS GP" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ
 Demodulator bandwidth

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[IF BW](#)" on page 83

GS_DEM_ID_BW?**GS_DEM_ID_BW** <Bandwidth>

Gets or sets the ID demodulator Bandwidth in "ILS GP" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "IF BW Dist/ID" on page 83

GS_DEM_ID_WIDE_BW? <Bandwidth>

GS_DEM_ID_WIDE_BW <Bandwidth>

Gets or sets the WIDE demodulator bandwidth for ID and distortion analysis in "ILS GP" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ | 50KHZ

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "IF BW Dist/ID" on page 83

GS_DEM_WIDE_BW?

GS_DEM_WIDE_BW <Bandwidth>

Gets or sets the WIDE demodulator bandwidth in "ILS GP" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ | 50KHZ

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "IF BW" on page 83

GS_DEMFREQS_OFFSET_AUTOMAN?

GS_DEMFREQS_OFFSET_AUTOMAN <Mode>

Gets or sets the mode of the demodulator frequency offset in "ILS GP" mode.

Parameters:

<Mode> **AUTO_LOCK**
Sets the demodulator frequency offset automatically. Once a valid signal has been found, the carrier frequencies remain fixed until you perform a manual change.

AUTO_RETUNE
Sets the demodulator frequency offset automatically. If the carrier frequency changes, the R&S EVSD1000 starts a new search (retuning).

MANUAL
Sets the demodulator frequency offset manually.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[CRS/CLR Carr \(Autotune function\)](#)" on page 79

GS_DEMFREQS_OFFSET_1F?

GS_DEMFREQS_OFFSET_1F <Freq. Offset>

Gets or sets the demodulator 1F frequency offset in "ILS GP" mode.

Parameters:

<Freq. Offset> Frequency offset
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[1F Offset](#)" on page 80

GS_DEMFREQS_OFFSET_LOWERFREQ?

GS_DEMFREQS_OFFSET_LOWERFREQ <Freq. Offset>

Gets or Sets the demodulator lower frequency offset in "ILS GP" mode.

Parameters:

<Freq. Offset> Lower frequency offset
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Clearance](#)" on page 80

GS_DEMFREQS_OFFSET_UPPERFREQ?

GS_DEMFREQS_OFFSET_UPPERFREQ <Freq. Offset>

Gets or Sets the demodulator upper frequency offset in "ILS GP" mode.

Parameters:

<Freq. Offset> Upper frequency offset
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Course](#)" on page 79

GS_ID_STAT?**GS_ID_STAT** <State>

Enables or disables the ID statistics calculation for ILS glidepath measurements.

Parameters:

<State>

ON

The ID code is determined as the most probable code based on the previous decoding results.

OFF

The most recently decoded ID is used.

FILTER_GS_RESIDFM?**FILTER_GS_RESIDFM** <Bandwidth>

Defines or queries the filter type used to determine residual FM in "ILS GP" mode

Return values:

<Bandwidth>

ICAO

Filter according to ICAO specification

NARROW

Narrow filter; the DDM filters used to determine the 90 Hz/150 Hz modulation values are used to avoid interference between the signals

*RST: ICAO

Example:

`FILTER_GS_RESIDFM NARROW`

GS_START_FINDCARRIER

Starts to search for a carrier in "ILS GP" mode.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Find Carrier"](#) on page 80

GS_TRIG_EDGE? <TrigEdge>**GS_TRIG_EDGE** <TrigEdge>

Gets or sets whether triggering occurs when the signal rises to the trigger level or falls down to it in "ILS GP" mode.

Parameters:

<TrigEdge>

POSITIVE | NEGATIVE

POSITIVE

Triggers when the signal rises to the trigger level

NEGATIVE

Triggers when the signal falls down to the trigger level

Return values:

<State>

READY.

The command was executed successfully.

GS_TRIG_SOURCE? <TrigSource>**GS_TRIG_SOURCE** <TrigSource>

Gets or sets the trigger source in "ILS GP" mode.

Parameters:

<TrigSource>

OFF | TIME | EXT

OFF

Free run mode, no trigger used

TIME

Time trigger

EXT

External trigger

Return values:

<State>

READY.

The command was executed successfully.

9.2.4 Retrieving ILS loc and GP results

The following commands are required to retrieve results for ILS Loc or GP measurements

Useful commands for retrieving results described elsewhere:

- [GETDATADEF](#) on page 345
- [GETDATASET](#) on page 346
- [LA?](#) on page 231
- [RF](#) on page 232
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SD1.....	277
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THD_90.....	277

AC8

This command queries the code of identifier, LLZ only.

Return values:

<[CODE]> AC8 value of the identifier

Manual operation: See "[ID Code](#)" on page 70

AF2

This command queries the AF frequency of 90 Hz signal.

Return values:

<[Hz]> AF2 value of the frequency

Manual operation: See "[Freq 90 Hz](#)" on page 70

AF3

This command queries the AF frequency of 150 Hz signal.

Return values:

<[Hz]> AF3 value of the frequency

Manual operation: See ["Freq 150 Hz"](#) on page 70

AF8

This command queries the AF frequency of the identifier, LLZ only.

Return values:

<[Hz]> AF8 value of the frequency

Manual operation: See ["ID Freq"](#) on page 75

AM2

This command shows the AM modulation depth of 90 Hz signal.

Return values:

<[%]> AM modulation depth value of 90 Hz

Manual operation: See ["AM 90 Hz"](#) on page 70

AM2CLR

This command shows the AM modulation depth of 90 Hz clearance signal.

Return values:

<[%]> AM modulation depth value of 90 Hz clearance signal

Manual operation: See ["AM 90 Hz"](#) on page 70

AM2CRS

This command shows the AM modulation depth of 90 Hz course signal.

Return values:

<[%]> AM modulation depth value of 90 Hz course signal

Manual operation: See ["AM 90 Hz"](#) on page 70

AM3

This command shows the AM modulation depth of 150 Hz signal.

Return values:

<[%]> AM modulation depth value of 150 Hz

Manual operation: See ["AM 150 Hz"](#) on page 70

AM3CLR

This command shows the AM modulation depth of 150 Hz clearance signal.

Return values:

<[%]> AM modulation depth value of 150 Hz clearance signal

Manual operation: See ["AM 150 Hz"](#) on page 70

AM3CRS

This command shows the AM modulation depth of 150 Hz course signal.

Return values:

<[%]> AM modulation depth value of 150 Hz course signal

Manual operation: See ["AM 150 Hz"](#) on page 70

AM8

This command queries the AM modulation of identifier, LLZ only.

Return values:

<[%]> AM8 value of the identifier

Manual operation: See ["ID AM"](#) on page 75

AM9

This command queries the AM modulation of voice, LLZ only.

Return values:

<[%]> AM9 value of voice

AMMOD240

This command queries the AM modulation depth of $90 + 150 = 240$ Hz signal.

Return values:

<[%]> AM modulation depth

Manual operation: See ["AM \(90+150\)"](#) on page 73

DCLR

This command queries the current DDM Clearance value.

Return values:

DDM_CLR [1] DDM Clearance Value (dimensionless)

Manual operation: See ["DDM 90-150"](#) on page 69

DCRS

This command queries the current DDM Course value.

Return values:

DDM_CRS [1] DDM Course Value (dimensionless)

Manual operation: See "DDM 90-150" on page 69

DD0

This command queries the current DDM value.

Return values:

<DDM [1]> DDM value (dimensionless)

Manual operation: See "DDM 90-150" on page 69

DD1

This command queries the current DDM value.

Return values:

DDM [μA] DDM value (μA)

Manual operation: See "DDM 90-150" on page 69

FCLR

This command queries the current frequency Clearance value.

Return values:

<[Hz]> RF Clearance frequency in Hz.

Example:FCRS
-8000.3Hz

FCRS

This command queries the current frequency Course value.

Return values:

<[Hz]> RF Course frequency in Hz.

Example:FCRS
8000.2Hz

FSINGLE

This command queries the current frequency Single value.

Parameters:

<[Hz]> RF Single Frequency in Hz

K2_150

This command queries the K2 distortion parameter of 150 Hz signal.

Return values:

<[%]> K2 distortion value of 150 Hz signal

Manual operation: See "[K2 150 Hz](#)" on page 72

K2_90

This command queries the K2 distortion parameter of 90 Hz signal.

Return values:

<[%]> K2 distortion value of 90 Hz signal

Manual operation: See "[K2 90 Hz](#)" on page 72

K3_150

This command queries the K3 distortion parameter of 150 Hz signal.

Return values:

<[%]> K3 distortion value of 150 Hz signal

Manual operation: See "[K3 150 Hz](#)" on page 73

K3_90

This command queries the K3 distortion parameter of 90 Hz signal.

Return values:

<[%]> K3 distortion value of 90 Hz signal

Manual operation: See "[K3 90 Hz](#)" on page 72

K4_90

This command queries the K4 distortion parameter of 90 Hz signal.

Return values:

<[%]> K4 distortion value of 90 Hz signal

Manual operation: See "[K4 90 Hz](#)" on page 72

K4_150

This command queries the K4 distortion parameter of 150 Hz signal.

Return values:

<[%]> K4 distortion value of 150 Hz signal

Manual operation: See "[K4 150 Hz](#)" on page 73

LCLR

This command queries the current Clearance Level value.

Return values:

<[dBm]> Clearance Level value in dBm

LCRS

This command queries the current Course Level value.

Return values:

<[dBm]> Course Level value in dBm

PH

Phase shift between 90 Hz/150 Hz.

Return values:

<[°]> Phase shift

Manual operation: See "[PHI 90/150](#)" on page 70

PH_90_90

Phase shift between 90 Hz/90 Hz.

Return values:

<[°]> Phase shift

PH_150_150

Phase shift between 150 Hz/150 Hz.

Return values:

<[°]> Phase shift

RESIDFM_90

This command queries the residual FM distortion parameter of 90 Hz signal.

Return values:

<[%]> Residual FM distortion value of 90 Hz signal

Manual operation: See "[Res. FM 90](#)" on page 72

RESIDFM_150

This command queries the residual FM distortion parameter of 150 Hz signal.

Return values:

<[%]> Residual FM distortion value of 150 Hz signal

Manual operation: See ["Res. FM 150"](#) on page 73

SCLR

This command queries the current SDM Clearance value.

Return values:

SDM_CLR [1] SDM Clearance Value (dimensionless)

Manual operation: See ["SDM 90,150"](#) on page 70

SCRS

This command queries the current SDM Course value.

Return values:

SDM_CRS [1] SDM Course Value (dimensionless)

Manual operation: See ["SDM 90,150"](#) on page 70

SD0

This command queries the current SDM value.

Return values:

SDM [1] SDM value (dimensionless)

Manual operation: See ["SDM 90,150"](#) on page 70

SD1

This command queries the current SDM value.

Return values:

SDM [μA] SDM value (μA)

Manual operation: See ["SDM 90,150"](#) on page 70

THD_150

This command queries the THD distortion parameter of 150 Hz signal.

Return values:

<[%]> THD distortion value of 150 Hz signal

Manual operation: See ["THD 150 Hz"](#) on page 73

THD_90

This command queries the THD distortion parameter of 90 Hz signal.

Return values:

<[%]> THD distortion value of 90 Hz signal

Manual operation: See ["THD 90 Hz"](#) on page 72

9.2.5 Retrieving ID results

The following commands are required to retrieve ILS Loc identifier results.

ID_DASH_LENGTH	278
ID_DOT_LENGTH	278
ID_DOTDASH_GAP	278
ID_LETTER_GAP	278
ID_PERIOD	279
LASTID_TIME	279

ID_DASH_LENGTH

Queries the length of time a dash is transmitted in the used Morse code in "ILS LOC" mode

Return values:

<Time> Dash time of ID signal
 Default unit: ms

Manual operation: See ["Dash Length"](#) on page 75

ID_DOT_LENGTH

Queries the length of time a dot is transmitted in the used Morse code in "ILS LOC" mode

Return values:

<Time> Dot time of ID signal
 Default unit: ms

Manual operation: See ["Dot Length"](#) on page 75

ID_DOTDASH_GAP

Queries the length of time that passes between a transmitted dot and a dash in the used Morse code in "ILS LOC" mode.

Return values:

<Time> Dot-Dash gap time of ID signal
 Default unit: ms

Manual operation: See ["Dot-Dash Gap"](#) on page 75

ID_LETTER_GAP

Queries the length of time that passes between two transmitted letters in the used Morse code in "ILS LOC" mode.

Return values:

<Time> Letter gap time of ID signal
Default unit: ms

Manual operation: See ["Letter Gap"](#) on page 75

ID_PERIOD

Queries the periodic time between two measured ID pulses in "ILS LOC" mode.

Return values:

<Time> Periodic time between two ID pulses.
Default unit: s

Manual operation: See ["ID Period"](#) on page 75

LASTID_TIME

Queries the time since last valid ID pulse was measured in "ILS LOC" mode.

Return values:

<Time> Time since last valid ID pulse
Default unit: s

Manual operation: See ["Last ID"](#) on page 75

9.2.6 Deprecated commands

The following commands are maintained for compatibility with former Rohde & Schwarz analyzers only. For new remote control programs, use the commands described in [Chapter 9.2.1, "Configuring the ILS LOC and GP modes"](#), on page 257 and [Chapter 9.11, "Data management"](#), on page 340.

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MEASMODE	280
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FA5	282

MEASMODE?**MEASMODE** <Measurement mode>

This command sets the current LLZ or GS measurement mode and the associated threshold distortion values.

Parameters:

<Measurement mode>

CRS+CLR_MOD

Sets the Course and Clearance measurement mode.

COURSE_MOD

Sets the Course measurement mode.

CLEAR_MOD

Sets the Clearance measurement mode.

CRS|CLR_MOD

Sets Course or Clearance measurement mode.

SINGLE_MOD

Sets single frequency measurement mode.

WIDEBAND_MOD

Sets wideband frequency measurement mode.

CRS+CLR_THD

Sets the Course and Clearance THD distortion value.

COURSE_THD

Sets the Course THD distortion value.

CLEAR_THD

Sets the Clearance THD distortion value.

SINGLE_THD

Sets single frequency THD distortion value.

WIDEBAND_THD

Sets wideband frequency THD distortion value.

Return values:

<State>

READY.

The command was executed successfully.

LLZ

This command switches the mode to the "ILS LOC" mode. The **LLZ** command is identical to the **MODE_LOC** command.

Parameters:

<State>

READY.

The command was executed successfully.

GS

This command switches the mode to the "ILS GP" mode. The **GS** command is identical to the **MODE_GP** command.

Parameters:

<State>

READY.

The command was executed successfully.

FA0

This command stops the continuous output that was started with FA1, FA2, FA4, FA5, STREAM.

Return values:

<State>

READY.

The command was executed successfully.

FA1

This command activates the continuous output of DDM /level measurement results. The output rate is defined by the current measurement time. Values are separated by a TAB (ASC 09) DDM [1] RF level [dBm].

The command FA0 stops the output.

Return values:

<State>

READY.

The command was executed successfully.

FA2

This command activates the continuous repetition of a set of values. The output rate is defined by the current measurement time.

All values are transmitted as integer values, multiplied with a constant factor:

- DDM [1], Multiplier: 10000
- RF level [dBm], Multiplier: 10
- AM-Mod90 [%], Multiplier: 100
- AM-Mod150 [%], Multiplier: 100

The command FA0 stops the output.

Return values:

<State>

READY.

The command was executed successfully.

FA3

The same output format as [FA2](#) on page 281, but the values are only transmitted when triggered by another FA3 command. Note that this behavior is different from EVS200, where the trigger is an arbitrary ASCII character.

Return values:

<State>

READY.

The command was executed successfully.

FA4

The same as [FA1](#) on page 281, but output is preceded by a timestamp.

Return values:

<State>

READY.

The command was executed successfully.

FA5

The same as [FA1](#) on page 281, but output is preceded by the time in ms since the FA5 is started.

The command FA0 stops the output.

Return values:

<State>

READY.

The command was executed successfully.

9.3 ILS marker beacon (MB) mode

The following commands are required to configure and perform measurements in the ILS Marker beacon mode.

- [Configuring ILS MB measurements](#)..... 282
- [Retrieving ILS MB results](#)..... 284
- [Retrieving ILS MB identifier results](#)..... 286
- [Deprecated commands](#)..... 288

9.3.1 Configuring ILS MB measurements

The following commands are required to configure ILS MB measurements.

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MB_DEFAULT_FREQSTEP?	283
MB_DEFAULT_FREQSTEP	283
MB_DEM_BW?	283
MB_DEM_BW	283
VIEW_MB?	283
MB_TRIG_EDGE?	283
MB_TRIG_EDGE	283
MB_TRIG_SOURCE?	284
MB_TRIG_SOURCE	284
VIEW_MB	284

MODE_MB

The `MODE_MB` command is identical to the `MB` command.

For description, see [MB](#) on page 256.

MB_DEFAULT_FREQSTEP? <StepSize>**MB_DEFAULT_FREQSTEP <StepSize>**

Gets or sets the default RF frequency step size in "ILS MB" mode.

Parameters:

<StepSize> 8.33_KHZ | 12.5_KHZ | 25_KHZ | 50_KHZ
*RST: 50_KHZ

Return values:

<State> **READY.**
The command was executed successfully.

MB_DEM_BW?**MB_DEM_BW <Bandwidth>**

Gets or sets the demodulator bandwidth in "ILS MB" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ |
 50KHZ
 Demodulator bandwidth

Return values:

<State> **READY.**
The command was executed successfully.

VIEW_MB?**MB_TRIG_EDGE? <TrigEdge>****MB_TRIG_EDGE <TrigEdge>**

Gets or sets whether triggering occurs when the signal rises to the trigger level or falls down to it in "ILS MB" mode.

Parameters:

<TrigEdge> POSITIVE | NEGATIVE
POSITIVE
Triggers when the signal rises to the trigger level
NEGATIVE
Triggers when the signal falls down to the trigger level

Return values:

<State> **READY.**
The command was executed successfully.

MB_TRIG_SOURCE? <TrigSource>

MB_TRIG_SOURCE <TrigSource>

Gets or sets the trigger source in "ILS MB" mode.

Parameters:

<TrigSource> OFF | TIME | EXT

OFF
Free run mode, no trigger used

TIME
Time trigger

EXT
External trigger

Return values:

<State> **READY.**
The command was executed successfully.

VIEW_MB <View type>

This command selects a view type for the MB mode.

Parameters:

<View type> **MAIN | DIST | LOG**
Available views for the MB mode.

Return values:

<State> **READY.**
The command was executed successfully.

9.3.2 Retrieving ILS MB results

The following commands are required to retrieve results from ILS MB measurements.

Useful commands for retrieving results described elsewhere:

- [GETDATADEF](#) on page 345
- [GETDATASET](#) on page 346

Remote commands exclusive to ILS MB results:

FMEAS	285
AF4	285
AF5	285
AF6	285
AF7	285
AM4	285
AM5	286
AM6	286
AM7	286

FMEAS

This command queries the measured value of RF frequency.

Return values:

<kHz> Provides the value of measured RF frequency in kHz.

AF4

This command queries the AF frequency of 3000 Hz signal.

Return values:

<Hz> Provides the AF4 frequency in Hz.

Manual operation: See "[Freq 3000 Hz](#)" on page 90

AF5

This command queries the AF frequency of 1300 Hz signal.

Return values:

<Hz> Provides the AF5 frequency in Hz.

Manual operation: See "[Freq 1300 Hz](#)" on page 90

AF6

This command queries the AF frequency of 400 Hz signal.

Return values:

<Hz> Provides the AF6 frequency in Hz.

Manual operation: See "[Freq 400 Hz](#)" on page 89

AF7

This command queries the AF frequency of the identifier.

Return values:

<Hz> Provides the identifier's frequency in Hz.

AM4

This command queries the AM modulation of 3000 Hz signal.

Return values:

<%> Provides the AM4 modulation in %.

Manual operation: See "[AM 3000 Hz](#)" on page 90

AM5

This command queries the AM modulation of 1300 Hz signal.

Return values:

<%> Provides the AM5 modulation in %.

Manual operation: See "AM 1300 Hz" on page 89

AM6

This command queries the AM modulation of 400 Hz signal.

Return values:

<%> Provides the AM6 modulation in %.

Manual operation: See "AM 400 Hz" on page 89

AM7

This command queries the AM modulation of the identifier.

Return values:

<%> Provides the AM7 modulation in %.

9.3.3 Retrieving ILS MB identifier results

The following commands are required to retrieve identifier results from ILS MB measurements.

ID_F400_DASHLEN.....	286
ID_F1300_DASHLEN.....	286
ID_F1300_DOTLEN.....	287
ID_F3000_DOTLEN.....	287
ID_F400_GAP.....	287
ID_F1300_GAP.....	287
ID_F3000_GAP.....	287

ID_F400_DASHLEN

Queries the dash time of 400 Hz signal in "ILS" MB mode.

Return values:

<Time> Length of time a dash for the outer marker.
Default unit: ms

Manual operation: See "400 Hz Dash" on page 91

ID_F1300_DASHLEN

Queries the dash time of 1300 Hz signal in "ILS" MB mode.

Return values:

<Time> Length of time a dash is transmitted for the middle marker.
Default unit: ms

Manual operation: See ["1300 Hz Dash"](#) on page 91

ID_F1300_DOTLEN

Queries the dot time of 1300 Hz signal in "ILS" MB mode.

Return values:

<Time> Length of time a dot is transmitted for the middle marker.
Default unit: ms

Manual operation: See ["1300 Hz Dot"](#) on page 91

ID_F3000_DOTLEN

Queries the dot time of 3000 Hz signal in "ILS" MB mode.

Return values:

<Time> Length of time a dot is transmitted for the inner marker.
Default unit: ms

Manual operation: See ["3000 Hz Dot"](#) on page 91

ID_F400_GAP

Queries the dash-dash gap time of 400 Hz signal in "ILS MB" mode.

Return values:

<Time> Length of time that passes between two transmitted dashes for the outer marker.
Default unit: ms

Manual operation: See ["400 Hz Gap"](#) on page 91

ID_F1300_GAP

Queries the dash-dot gap time of 1300 Hz signal in "ILS MB" mode.

Return values:

<Time> Length of time that passes between a transmitted dot and a dash for the middle marker.
Default unit: ms

Manual operation: See ["1300 Hz Gap"](#) on page 91

ID_F3000_GAP

Queries the dot-dot gap time of 3000 Hz signal in "ILS MB" mode.

Return values:

<Time> Length of time that passes between two transmitted dots for the inner marker.

Default unit: ms

Manual operation: See "3000 Hz Gap" on page 91

9.3.4 Deprecated commands

The following commands are maintained for compatibility with former Rohde & Schwarz analyzers only. For new remote control programs, use the commands described in [Chapter 9.3.1, "Configuring ILS MB measurements"](#), on page 282 and [Chapter 9.11, "Data management"](#), on page 340.

FA0.....	288
FA2.....	288

FA0

This command stops the continuous output that was started with FA2.

Return values:

<State> **READY.**
The command was executed successfully.

FA2

This command activates the continuous repetition of a set of values. The output rate is defined by the current measurement time.

All values are transmitted as integer values, multiplied with a constant factor.

The following multipliers are applied:

- 10 for RF level [dBm]
- 100 for AM-Mod400 [%]
- 100 for AM-Mod1300 [%]
- 100 for AM-Mod3000 [%]
- 100 for AM-Mod ID [%]

The command FA0 stops the output.

Return values:

<State> **READY.**
The command was executed successfully.

9.4 VOR mode

The following commands are required to configure and perform measurements in the VOR mode. They are only available if the R&S EVSG-K2 VOR analysis option is installed.

- [Configuring VOR measurements](#).....289
- [Retrieving VOR results](#).....292
- [Deprecated commands](#).....297

9.4.1 Configuring VOR measurements

The following commands are required to configure VOR measurements.

Useful commands for VOR measurements described elsewhere:

- [RFCH](#) on page 232

Remote commands exclusive to VOR measurements:

MODE_VOR	289
VIEW_VOR?	290
VIEW_VOR	290
VOR_DEFAULT_FREQSTEP?	290
VOR_DEFAULT_FREQSTEP	290
VOR_DEM_AM_BW?	290
VOR_DEM_AM_BW	290
VOR_DEM_BEARFILTER?	290
VOR_DEM_BEARFILTER	290
VOR_DEM_BW?	291
VOR_DEM_BW	291
VOR_DEM_FM_BW?	291
VOR_DEM_FM_BW	291
VOR_DEMFREQS_OFFSET?	291
VOR_DEMFREQS_OFFSET	291
VOR_ID_STAT?	292
VOR_ID_STAT	292
VOR_TRIG_EDGE?	292
VOR_TRIG_EDGE	292
VOR_TRIG_SOURCE?	292
VOR_TRIG_SOURCE	292

MODE_VOR

The `MODE_VOR` command is identical to the `MV` command.

For description, see [MV](#) on page 257.

VIEW_VOR?**VIEW_VOR** <View type>

This command selects a view type for the VOR mode.

Parameters:

<View type>

MAIN | DIST | ID | LOG

Available views for VOR mode.

Return values:

<State>

READY.

The command was executed successfully.

VOR_DEFAULT_FREQSTEP? <StepSize>**VOR_DEFAULT_FREQSTEP** <StepSize>

Gets or sets the default RF frequency step size in "VOR" mode.

Parameters:

<StepSize>

8.33_KHZ | 12.5_KHZ | 25_KHZ | 50_KHZ

*RST: 50_KHZ

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Step Size"](#) on page 81

VOR_DEM_AM_BW?**VOR_DEM_AM_BW** <Bandwidth>

Gets or sets the demodulator bandwidth for the AM 30 Hz modulation in "VOR" mode.

Parameters:

<Bandwidth>

1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["AM30 BW"](#) on page 113

VOR_DEM_BEARFILTER? <Type>**VOR_DEM_BEARFILTER** <Type>

Defines the filter type used to determine the bearing angle.

Parameters:

<Type>

NARROW

For small input levels

WIDE

Faster; used in previous software releases

*RST: WIDE

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Bear.Filt.](#)" on page 113

VOR_DEM_BW?

VOR_DEM_BW <Bandwidth>

Gets or sets the demodulator Bandwidth in "VOR" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ |
50KHZ

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[IF BW](#)" on page 113

VOR_DEM_FM_BW?

VOR_DEM_FM_BW <Bandwidth>

Gets or sets the demodulator bandwidth for the FM 9960 Hz modulation in "VOR" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[FM BW](#)" on page 113

VOR_DEMFREQS_OFFSET? <Freq. Offset>

VOR_DEMFREQS_OFFSET <Freq. Offset>

Gets or sets a frequency offset of the carrier frequency in "VOR" mode.

Parameters:

<Freq. Offset> Frequency offset
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Freq Offset](#)" on page 111

VOR_ID_STAT?**VOR_ID_STAT** <State>

Enables or disables the ID statistics calculation in VOR measurements.

Parameters:

<State>

ON

The ID code is determined as the most probable code based on the previous decoding results.

OFF

The most recently decoded ID is used.

VOR_TRIG_EDGE? <TrigEdge>**VOR_TRIG_EDGE** <TrigEdge>

Gets or sets whether triggering occurs when the signal rises to the trigger level or falls down to it in "VOR" mode.

Parameters:

<TrigEdge>

POSITIVE | NEGATIVE

POSITIVE

Triggers when the signal rises to the trigger level

NEGATIVE

Triggers when the signal falls down to the trigger level

Return values:

<State>

READY.

The command was executed successfully.

VOR_TRIG_SOURCE? <TrigSource>**VOR_TRIG_SOURCE** <TrigSource>

Gets or sets the trigger source in "VOR" mode.

Parameters:

<TrigSource>

OFF | TIME | EXT

OFF

Free run mode, no trigger used

TIME

time trigger

EXT

external trigger

Return values:

<State>

READY.

The command was executed successfully.

9.4.2 Retrieving VOR results

The following commands are required to retrieve results from VOR measurements.

Useful commands for retrieving results described elsewhere:

- [GETDATADEF](#) on page 345
- [GETDATASET](#) on page 346

Remote commands exclusive to VOR results:

AC8	293
AF0	293
AF1	293
AF2	294
AF8	294
AM0	294
AM1	294
AM8	294
AM9	294
BE?	295
BE_TO?	295
BE	295
DIST_9960	295
FM0	295
FM1	295
FMEAS	295
SUBCARR_AM1K44	295
SUBCARR_AM1K50	296
SUBCARR_AM60HZ	296
SUBCARR_K2	296
SUBCARR_K3	296
SUBCARR_K4	296
SUBCARR_K5	297

AC8

This command queries the CODE of an identifier.

Return values:

<CODE> Code of an identifier

Manual operation: See ["ID Code"](#) on page 70

AF0

This command queries the AF frequency of the 30 Hz signal.

Return values:

<[Hz]> AF frequency of 30 Hz signal

Manual operation: See ["Freq 30 Hz"](#) on page 105

AF1

This command queries the AF frequency of the 9960 Hz signal.

Return values:

<[Hz]> AF frequency 9960 Hz signal

Manual operation: See "[Freq 9960 Hz](#)" on page 105

AF2

This command queries the AF frequency of the FM 30 Hz signal.

Return values:

<[Hz]> AF frequency of FM 30 Hz signal

Manual operation: See "[Freq FM30](#)" on page 105

AF8

This command queries the AF frequency of identifier.

Return values:

<[Hz]> Identifier AF frequency

Manual operation: See "[ID Freq](#)" on page 75

AM0

This command queries the modulation of the 30 Hz signal.

Return values:

<[%]> 30 Hz signal modulation

Manual operation: See "[AM 30 Hz](#)" on page 104

AM1

This command queries the modulation of the 9960 Hz signal.

Return values:

<[%]> 9960 Hz signal modulation

Manual operation: See "[AM 9960 Hz](#)" on page 104

AM8

This command queries the modulation of identifier.

Return values:

<[%]> Identifier modulation

Manual operation: See "[ID AM](#)" on page 75

AM9

This command queries the modulation of voice.

Return values:

<[%]> Voice modulation

Manual operation: See ["Voice AM"](#) on page 105

BE?**BE_TO?****BE**

This command queries the bearing angle.

Return values:

<[°]> Bearing angle in [°].

Manual operation: See ["Bearing \(from\)"](#) on page 104

DIST_9960

This command queries the AM distortion of the 9960 Hz signal.

Return values:

<[%]> AM distortion of 9960 Hz signal

FM0

This command queries the FM deviation.

Return values:

<[Hz]> FM deviation

Manual operation: See ["FM-Deviation"](#) on page 105

FM1

This command queries the FM index.

Return values:

<[1]> FM index (dimensionless)

Manual operation: See ["FM Index"](#) on page 105

FMEAS

This command queries the measured value of the RF frequency.

Return values:

<Hz> Measured RF frequency

SUBCARR_AM1K44

Queries the AM distortion at 1440 Hz (48 segments * 30 Hz) in "VOR" mode.

Return values:

<Distortion> Distortion
 Default unit: %

Manual operation: See ["Subcarrier AM Distortion"](#) on page 106

SUBCARR_AM1K50

Queries the AM distortion at 1500 Hz (50 segments * 30 Hz) in "VOR" mode.

Return values:

<Distortion> Distortion
 Default unit: %

Manual operation: See ["Subcarrier AM Distortion"](#) on page 106

SUBCARR_AM60HZ

Queries the AM distortion at a modulation frequency of 60 Hz in "VOR" mode.

Return values:

<Distortion> Distortion
 Default unit: %

Manual operation: See ["Subcarrier AM Distortion"](#) on page 106

SUBCARR_K2

Queries K2 subcarrier harmonic of VOR signal in "VOR" mode.

Return values:

<Distortion> Distortion 2nd order
 Default unit: dB

Manual operation: See ["Subcarrier Harmonics"](#) on page 106

SUBCARR_K3

Queries K3 subcarrier harmonic of VOR signal in "VOR" mode.

Return values:

<Distortion> Distortion 3rd order
 Default unit: dB

Manual operation: See ["Subcarrier Harmonics"](#) on page 106

SUBCARR_K4

Queries K4 subcarrier harmonic of VOR signal in "VOR" mode.

Return values:

<Distortion> Distortion 4th order
 Default unit: dB

Manual operation: See ["Subcarrier Harmonics"](#) on page 106

SUBCARR_K5

Queries K5 subcarrier harmonic of VOR signal in "VOR" mode.

Return values:

<Distortion> Distortion 5th order
 Default unit: dB

Manual operation: See ["Subcarrier Harmonics"](#) on page 106

9.4.3 Deprecated commands

The following commands are maintained for compatibility with former Rohde & Schwarz analyzers only. For new remote control programs, use the commands described in [Chapter 9.4.1, "Configuring VOR measurements"](#), on page 289 and [Chapter 9.11, "Data management"](#), on page 340.

FA2	297
FA0	297

FA2

This command activates the continuous repetition of a set of values. The output rate is defined by the current measurement time.

All values are transmitted as integer values, multiplied with a constant factor.

The following multipliers are applied:

- 10 for RF level [dBm]
- 100 for Bearing [DEG]
- 100 for AM-Mod30 [%]
- 100 for AM-Mod9960 [%]
- 10 for FM-Deviation [Hz]
- 10 for FM-Index [1]

The command FA0 stops the output.

Return values:

<State> **READY.**
 The command was executed successfully.

FA0

This command stops the continuous output that was started with FA2.

Return values:

<State>

READY.

The command was executed successfully.

9.5 COM mode

The following commands are required to configure and perform measurements in the COM mode. They are only available if the R&S EVSG-K6 COM analysis option is installed.

- [Configuring COM measurements](#).....298
- [Retrieving COM results](#).....302

9.5.1 Configuring COM measurements

The following commands are required to configure COM measurements.

MODE_COM	298
VIEW_COM?	299
VIEW_COM	299
AMFREQ_OFFSET_TX1?	299
AMFREQ_OFFSET_TX1	299
AMFREQ_OFFSET_TX2?	299
AMFREQ_OFFSET_TX2	299
COM_1F2F_MEASMODE?	299
COM_1F2F_MEASMODE	299
COM_DEFAULT_FREQSTEP?	300
COM_DEFAULT_FREQSTEP	300
COM_DEMOD_BW_1F?	300
COM_DEMOD_BW_1F	300
COM_DEMOD_BW_2F?	300
COM_DEMOD_BW_2F	300
COM_TONEFREQ_1K01K2?	300
COM_TONEFREQ_1K01K2	300
COM_TRIG_EDGE?	301
COM_TRIG_EDGE	301
COM_TRIG_SOURCE?	301
COM_TRIG_SOURCE	301
RF_MHZ_5DECIMALS?	301
RF_MHZ_5DECIMALS	301

MODE_COM

This command switches the instrument to the "COM" mode.

Return values:

<State>

READY.

The command was executed successfully.

VIEW_COM?**VIEW_COM**

Gets or sets the view in "COM" mode.

Parameters:

<View type>

MAIN_1_0kHz | MAIN_1_2kHz | REC

Available views for COM mode.

Return values:

<State>

READY.

The command was executed successfully.

AMFREQ_OFFSET_TX1?**AMFREQ_OFFSET_TX1** <Freq>

Gets or sets the demodulator upper frequency offset in "COM" mode.

Parameters:

<Freq>

Demodulator upper frequency offset.

Default unit: kHz

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["TX1 Offset/TX2 Offset"](#) on page 121

AMFREQ_OFFSET_TX2?**AMFREQ_OFFSET_TX2** <Freq>

Gets or Sets the demodulator lower frequency offset in "COM" mode.

Parameters:

<Freq>

Demodulator lower frequency offset.

Default unit: kHz

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["TX1 Offset/TX2 Offset"](#) on page 121

COM_1F2F_MEASMODE? <Mode>**COM_1F2F_MEASMODE** <Mode>

Selects the number of frequencies or channels to be measured.

Parameters:

<Mode>

1F

One frequency only is measured, namely the nominal frequency, which is also the center frequency.

2F

Two frequencies are measured at the same time. Which frequencies are measured is configured by the [AMFREQ_OFFSET_TX1](#) and [AMFREQ_OFFSET_TX2](#) commands.

Manual operation: See "[1F/2F](#)" on page 120

COM_DEFAULT_FREQSTEP? <StepSize>

COM_DEFAULT_FREQSTEP <StepSize>

Gets or sets the default RF frequency step size in "COM" mode.

Parameters:

<StepSize> 8.33_KHZ | 12.5_KHZ | 25_KHZ | 50_KHZ
 *RST: 50_KHZ

Return values:

<State> **READY.**
 The command was executed successfully.

COM_DEMOD_BW_1F?

COM_DEMOD_BW_1F <Bandwidth>

Gets or sets the 1F demodulator bandwidth in "COM" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[BW 1F BW 2F](#)" on page 123

COM_DEMOD_BW_2F?

COM_DEMOD_BW_2F <Bandwidth>

Gets or sets the 2F demodulator bandwidth in "COM" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "[BW 1F BW 2F](#)" on page 123

COM_TONEFREQ_1K01K2? <Frequency>

COM_TONEFREQ_1K01K2 <Frequency>

Gets or sets the tone frequency to measure AM and distortion values in "COM" mode.

Parameters:

<Frequency> Tone frequency
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Tone Freq."](#) on page 121

COM_TRIG_EDGE? <TrigEdge>

COM_TRIG_EDGE <TrigEdge>

Gets or sets whether triggering occurs when the signal rises to the trigger level or falls down to it in "COM" mode.

Parameters:

<TrigEdge> POSITIVE | NEGATIVE
POSITIVE
Triggers when the signal rises to the trigger level
NEGATIVE
Triggers when the signal falls down to the trigger level

Return values:

<State> **READY.**
The command was executed successfully.

COM_TRIG_SOURCE? <TrigSource>

COM_TRIG_SOURCE <TrigSource>

Gets or sets the trigger source in "COM" mode.

Parameters:

<TrigSource> OFF | TIME | EXT
OFF
Free run mode, no trigger used
TIME
Time trigger
EXT
External trigger

Return values:

<State> **READY.**
The command was executed successfully.

RF_MHZ_5DECIMALS?

RF_MHZ_5DECIMALS <Frequency>

Gets or sets RF frequency in "COM" mode.

Parameters:

<Frequency> RF frequency
Default unit: MHz

Return values:

<State> **READY.**
The command was executed successfully.

9.5.2 Retrieving COM results

The following commands are required to retrieve results from COM measurements.

GET_K2_1K0.....	303
GET_K2_1K2.....	303
GET_K3_1K0.....	303
GET_K3_1K2.....	303
GET_K4_1K0.....	303
GET_K4_1K2.....	303
GET_MEASFREQ.....	304
GET_ONE_AMFREQ_1_0.....	304
GET_ONE_AMFREQ_1_2.....	304
GET_ONE_AMMOD_1_0.....	304
GET_ONE_AMMOD_1_2.....	304
GET_ONE_SINAD_1_0.....	305
GET_ONE_SINAD_1_2.....	305
GET_ONE_THD_1_0.....	305
GET_ONE_THD_1_2.....	305
GET_THD_1K0.....	305
GET_THD_1K2.....	305
GET_TX1_AMFREQ_1_0.....	306
GET_TX1_AMFREQ_1_2.....	306
GET_TX1_AMMOD_1_0.....	306
GET_TX1_AMMOD_1_2.....	306
GET_TX1_LEVEL.....	306
GET_TX1_MEASFREQ.....	307
GET_TX1_SINAD_1_0.....	307
GET_TX1_SINAD_1_2.....	307
GET_TX1_THD_1_0.....	307
GET_TX1_THD_1_2.....	307
GET_TX2_AMFREQ_1_0.....	307
GET_TX2_AMFREQ_1_2.....	308
GET_TX2_AMMOD_1_0.....	308
GET_TX2_AMMOD_1_2.....	308
GET_TX2_LEVEL.....	308
GET_TX2_MEASFREQ.....	308
GET_TX2_SINAD_1_0.....	308
GET_TX2_SINAD_1_2.....	309
GET_TX2_THD_1_0.....	309
GET_TX2_THD_1_2.....	309

GET_K2_1K0

This command queries the K2 distortion parameter of 1.0 kHz signal.

Return values:

<[%]> K2 distortion value of 1.0 kHz signal

Manual operation: See "K2 1.0 kHz/ 1.2 kHz" on page 118

GET_K2_1K2

This command queries the K2 distortion parameter of 1.2 kHz signal.

Return values:

<[%]> K2 distortion value of 1.2 kHz signal

Manual operation: See "K2 1.0 kHz/ 1.2 kHz" on page 118

GET_K3_1K0

This command queries the K3 distortion parameter of 1.0 kHz signal.

Return values:

<[%]> K3 distortion value of 1.0 kHz signal

Manual operation: See "K3 1.0 kHz/ 1.2 kHz" on page 118

GET_K3_1K2

This command queries the K3 distortion parameter of 1.2 kHz signal.

Return values:

<[%]> K3 distortion value of 1.2 kHz signal

Manual operation: See "K3 1.0 kHz/ 1.2 kHz" on page 118

GET_K4_1K0

This command queries the K4 distortion parameter of 1.0 kHz signal.

Return values:

<[%]> K4 distortion value of 1.0 kHz signal

Manual operation: See "K4 1.0 kHz/ 1.2 kHz" on page 118

GET_K4_1K2

This command queries the K4 distortion parameter of 1.2 kHz signal.

Return values:

<[%]> K4 distortion value of 1.2 kHz signal

Manual operation: See "K4 1.0 kHz/ 1.2 kHz" on page 118

GET_MEASFREQ

Query the measured value of delta RF carrier frequency to set RF frequency in "COM" mode.

Return values:

<freq> Delta between measured and set RF frequency.
Default unit: kHz

GET_ONE_AMFREQ_1_0

Query the AF frequency of 1F 1.0 kHz signal in "COM" mode.

Return values:

<Freq> AF frequency of 1F 1.0 kHz signal.
Default unit: Hz

Manual operation: See "[Freq 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_ONE_AMFREQ_1_2

Query the AF frequency of 1F 1.2 kHz signal in "COM" mode.

Return values:

<Freq> AF frequency of 1F 1.2 kHz signal.
Default unit: Hz

Manual operation: See "[Freq 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_ONE_AMMOD_1_0

Query the AM modulation depth of the 1.0 kHz signal in "COM" mode.

Return values:

<ModDepth> AM modulation depth
Default unit: %

Manual operation: See "[AM 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_ONE_AMMOD_1_2

Query the AM modulation depth of 1.2 kHz signal in "COM" mode.

Return values:

<ModDepth> AM modulation depth
Default unit: %

Manual operation: See "[AM 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_ONE_SINAD_1_0

Query the SINAD frequency of 1F 1.0 kHz signal in "COM" mode.

Return values:

<Freq> SINAD frequency of 1F 1.0 kHz signal.
Default unit: Hz

GET_ONE_SINAD_1_2

Query the SINAD frequency of 1F 1.2 kHz signal in "COM" mode.

Return values:

<Freq> SINAD frequency of 1F 1.2 kHz signal.
Default unit: Hz

GET_ONE_THD_1_0

Query the THD value of 1F 1.0 kHz signal in "COM" mode.

Return values:

<Freq> THD value of 1F 1.0 kHz signal.
Default unit: Hz

GET_ONE_THD_1_2

Query the THD value of 1F 1.2 kHz signal in "COM" mode.

Return values:

<Freq> THD value of 1F 1.2 kHz signal.
Default unit: Hz

GET_THD_1K0

This command queries the THD distortion parameter of 1.0 kHz signal.

Return values:

<[%]> THD distortion value of 1.0 kHz signal

Manual operation: See ["THD 1.0 kHz/ 1.2 kHz"](#) on page 119

GET_THD_1K2

This command queries the THD distortion parameter of 1.2 kHz signal.

Return values:

<[%]> THD distortion value of 1.2 kHz signal

Manual operation: See ["THD 1.0 kHz/ 1.2 kHz"](#) on page 119

GET_TX1_AMFREQ_1_0

Query the AF upper frequency of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<Freq> AF upper frequency of 2F 1.0 kHz signal.
Default unit: Hz

Manual operation: See "[Freq 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX1_AMFREQ_1_2

Query the AF upper frequency of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<Freq> AF upper frequency of 2F 1.2 kHz signal.
Default unit: Hz

Manual operation: See "[Freq 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX1_AMMOD_1_0

Query the TX1 AM modulation depth of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<ModDepth> TX1 AM modulation depth of 2F 1.0 kHz signal.
Default unit: %

Manual operation: See "[AM 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX1_AMMOD_1_2

Query the TX1 AM modulation depth of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<ModDepth> TX1 AM modulation depth of 2F 1.2 kHz signal.
Default unit: %

Manual operation: See "[AM 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX1_LEVEL

Query TX1 RF signal level in "COM" mode.

Return values:

<level> RF signal level of TX1
Default unit: dBm

GET_TX1_MEASFREQ

Query the measured value of delta TX1 RF carrier frequency to set RF frequency in "COM" mode.

Return values:

<freq> Delta between measured TX1 frequency and set RF frequency.
Default unit: kHz

GET_TX1_SINAD_1_0

Query the SINAD of upper frequency of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<Freq> SINAD of upper frequency of 2F 1.0 kHz signal.
Default unit: Hz

GET_TX1_SINAD_1_2

Query the SINAD of upper frequency of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<Freq> SINAD of upper frequency of 2F 1.2 kHz signal.
Default unit: Hz

GET_TX1_THD_1_0

Query the THD of upper frequency of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<Freq> THD of upper frequency of 2F 1.0 kHz signal.
Default unit: Hz

GET_TX1_THD_1_2

Query the THD of upper frequency of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<Freq> THD of upper frequency of 2F 1.2 kHz signal.
Default unit: Hz

GET_TX2_AMFREQ_1_0

Query the AF lower frequency of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<Freq> AF lower frequency of 2F 1.0 kHz signal.
Default unit: Hz

Manual operation: See "[Freq 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX2_AMFREQ_1_2

Query the AF lower frequency of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<Freq> AF lower frequency of 2F 1.2 kHz signal.
Default unit: Hz

Manual operation: See "[Freq 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX2_AMMOD_1_0

Query the TX2 AM modulation depth of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<ModDepth> TX2 AM modulation depth of 2F 1.0 kHz signal.
Default unit: %

Manual operation: See "[AM 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX2_AMMOD_1_2

Query the TX2 AM modulation depth of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<ModDepth> TX2 AM modulation depth of 2F 1.2 kHz signal.
Default unit: %

Manual operation: See "[AM 1.0 kHz/ 1.2 kHz](#)" on page 118

GET_TX2_LEVEL

Query TX2 RF signal level in "COM" mode.

Return values:

<level> RF signal level of TX2
Default unit: dBm

GET_TX2_MEASFREQ

Query the measured value of delta TX2 RF carrier frequency to set RF frequency in "COM" mode.

Return values:

<freq> Delta between measured TX2 frequency and set RF frequency.
Default unit: kHz

GET_TX2_SINAD_1_0

Query the SINAD of lower frequency of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<Freq> SINAD of lower frequency of 2F 1.0 kHz signal.
Default unit: Hz

GET_TX2_SINAD_1_2

Query the SINAD of lower frequency of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<Freq> SINAD of lower frequency of 2F 1.2 kHz signal.
Default unit: Hz

GET_TX2_THD_1_0

Query the THD of lower frequency of 2F 1.0 kHz signal in "COM" mode.

Parameters:

<Freq> THD of lower frequency of 2F 1.0 kHz signal.
Default unit: Hz

GET_TX2_THD_1_2

Query the THD of lower frequency of 2F 1.2 kHz signal in "COM" mode.

Parameters:

<Freq> THD of lower frequency of 2F 1.2 kHz signal.
Default unit: Hz

9.6 GBAS/ SCAT-I mode

The following commands are required to configure and perform measurements in the GBAS/ SCAT-I mode. They are only available if the R&S EVSG-K4 GBAS analysis or R&S EVSG-K5 SCAT-I Analysis option is installed.

- [Configuring GBAS/ SCAT-I measurements](#).....309
- [Retrieving GBAS/ SCAT-I results](#).....313

9.6.1 Configuring GBAS/ SCAT-I measurements

The following commands are required to configure GBAS/ SCAT-I measurements.

Useful commands for configuring GBAS measurements described elsewhere:

- [MODE_GBAS](#) on page 312
- [GBAS : GETMEAS](#) on page 316

Remote commands exclusive to GBAS/ SCAT-I measurements

GBAS:ATTMODE?	310
GBAS:ATTMODE	310
GBAS:BUFFER_RUNPAUSE?	310
GBAS:BUFFER_RUNPAUSE	310
GBAS:EVM_ANGLE_NORM?	311
GBAS:EVM_ANGLE_NORM	311
GBAS:FMEAS?	311
GBAS:FREQRF?	312
GBAS:FREQRF	312
GBAS:LEV?	312
LA?	312
MODE_GBAS	312
GBAS:SCREENVIEW ?	312
GBAS:SCREENVIEW	312
GBAS:SEQN_SLOT?	313
GBAS:SEQN_SLOT	313
SETUP:GBAS_PPS_SOURCE?	313
SETUP:GBAS_PPS_SOURCE	313

GBAS:ATTMODE?**GBAS:ATTMODE** <Mode>

Selects the attenuation of the "GBAS" mode.

Parameters:

<Mode>

AUTO

Automatic attenuation

LN

Low noise attenuation

NORM

Normal attenuation

LD

Low distortion attenuation

<State>

READY.

The command was executed successfully.

Manual operation:

See "RF Mode" on page 82

See "RF Att" on page 167

See "RF Mode" on page 167

GBAS:BUFFER_RUNPAUSE? <State>**GBAS:BUFFER_RUNPAUSE** <State>

This command determines whether the display is currently being updated.

Note that data recording and streaming continue regardless of the display update status.

Parameters:

<State> **RUN**
Display is updated continuously.

PAUSE
Display is temporarily not updated.

Example:

Manual operation: See ["Display Update Status \(Mode\)"](#) on page 152

GBAS:EVM_ANGLE_NORM? <Mode>

GBAS:EVM_ANGLE_NORM <Mode>

Determines the mode of EVM calculation for baseband input in "GBAS" mode.

Parameters:

<State> **READY.**
The command was executed successfully.

Query parameters:

<Mode> ANGLE | NORM

ANGLE
Only angle deviations are considered in EVM calculation.

NORM
Both angle and amplitude deviation are considered in EVM calculation.

Manual operation: See ["EVM RMS"](#) on page 157
 See ["EVM Mode"](#) on page 168

GBAS:FMEAS? <Slot>

This command queries the offset of the measured carrier frequency from the nominal frequency in "GBAS" mode.

Parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
Selects the slot for which results are queried.

Return values:

<Offset> Measured offset
Default unit: kHz

Usage: Query only

Manual operation: See ["Carrier frequency offset \(Offs. \[kHz\]\)"](#) on page 157

GBAS:FREQRF?**GBAS:FREQRF** <Freq>

Gets or sets the channel frequency that determines the carrier frequency at which the GBAS measurement is performed.

Parameters:

<Freq> RF frequency
 The VHF data broadcast is defined for carrier frequencies within the range of 108.025 MHz to 117.950 MHz with a channel spacing of 25 kHz.
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["Frequency \(Freq\)"](#) on page 151

GBAS:LEV? <Slot>**LA?** <Slot>

Queries the arithmetic average of the burst power level measured over the period of the synchronization and ambiguity resolution field of the burst.

If no burst was detected, the arithmetic average of the noise power is returned.

Parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
 Selects the slot for which results are queried.

Return values:

<Freq> Signal level
 Default unit: dBm

Example: GBAS:LEV? 2

Usage: Query only

Manual operation: See ["Burst Level Average \(Av \[dBm\]\)"](#) on page 154

MODE_GBAS

This command starts GBAS mode.

Return values:

<State> **READY.**
 Command was executed successfully.

GBAS:SCREENVIEW ? <View>**GBAS:SCREENVIEW** <View>

This command sets or queries the displayed measurement view in "GBAS" mode.

Parameters:

<View> SEQUENCE | FRAME | BURST | CONSTELLATION |
MESSAGE | REC

*RST: SEQUENCE

<State> **READY.**

The command was executed successfully.

GBAS:SEQN_SLOT? <Slot>

GBAS:SEQN_SLOT <Slot>

Gets or sets the slot to be displayed in the power vs. time diagram and at the top of the results table in "GBAS" mode.

Parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7

The slot for which results are determined.

Manual operation: See "Slot" on page 166

SETUP:GBAS_PPS_SOURCE?

SETUP:GBAS_PPS_SOURCE <Source>

Gets or sets the source of the PPS signal required as a time reference.

Parameters:

<Source> **PPS GPS**

Signal provided at the RS232-GPS connector

9.6.2 Retrieving GBAS/ SCAT-I results

The following commands are required to retrieve results from GBAS/ SCAT-I measurements.

GBAS:EVM?	314
GBAS:FAILEDMSG?	314
GBAS:GBASBER?	314
GBAS:GBASID?	315
GBAS:GETMDEF	315
GBAS:GETMEAS	316
GBAS:GRAPH_TOLOGG?	317
GBAS:GRAPH_TOLOGG	317
GBAS:MSG_TOLOGG?	317
GBAS:MSG_TOLOGG	317
GBAS:LOGSLOTS	318
GBAS:PEAKLEV?	318
GBAS:PPSLOCKED?	318
GBAS:RESETBER	319

GBAS:STOPSTREAM.....	319
GBAS:STREAM.....	319
GBAS:VALIDMSG?.....	320

GBAS:EVM? <Slot>

Queries the error vector magnitude measured over the period of the burst.

If no burst was detected, the arithmetic average of the noise power is returned.

Query parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
 Selects the slot for which results are queried.

Return values:

<Result> EVM
 Default unit: %

Usage: Query only

Manual operation: See "EVM RMS" on page 157

GBAS:FAILEDMSG? <Slot>

Queries the number of failed GBAS messages within the period of the burst.

Query parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
 Selects the slot for which results are queried.

Return values:

<Result> integer
 Number of failed messages
 Default unit: None.

Usage: Query only

GBAS:GBASBER? <Slot>

Queries the bit error rate (BER) before forward error correction (FEC).

Query parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
 Selects the slot for which results are queried.

Return values:

<Result> <bits_ok> / <bits_error>
 Default unit: None.

Usage: Query only

Manual operation: See "Bit error rate (BER) before FEC" on page 158

GBAS:GBASID? <Slot>

Queries the GBAS ID. If there is more than one message inside the burst, the first GBAS ID is displayed.

Query parameters:

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
Selects the slot for which results are queried.

Return values:

<ID> 4-character identifier of the ground station broadcasting the message
Default unit: None.

Usage: Query only

Manual operation: See "GBAS ID" on page 154

GBAS:GETMDEF <ParamSel>,<RX-board>

This command outputs the header columns for data delivered by [GBAS : GETMEAS](#).

Parameters:

<ParamSel> Determines which parameter selection is output.

FULL
EVS300 compatibility mode

ALL
All values of the current measurement mode are sent as comma-separated text, using actual units.

MEDIUM
A fixed selection of parameters is exported.

SHORT
A short, fixed selection of parameters is exported.

RAW
Only the non-interpreted measurement values from the bit-stream in binary format are exported.

<RX-Board> Selects the RX board for which results are exported.

1
RX board 1 selected

2
RX board 2 selected

1+2
Both RX boards selected

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
Selects the slot for which results are exported.

Return values:

<Results> Comma-separated list of header data for the selected results.

<State> **READY.**
The command was executed successfully.

GBAS:GETMEAS <ParamSel>, <RX-board>, <Slot>

This command outputs the current measurement result for one or both RX-boards.

For details on the parameters see [Chapter 6.3.3.2, "Slot results table"](#), on page 160.

Parameters:

<ParamSel> Determines which parameter selection is output.

FULL

EVS300 compatibility mode

Channel, STIOCP, Index, Date, Slot, Time,
FREQ[MHz], Lev.Av[dBm], SSID, GBAS ID,
Train.FEC, App.Dat., App.FEC, GPS_lat.,
GPS_long., GPS_alt[m], GPS_speed[km/h],
GPS_date, GPS_time, GPS_Sat, GPS_Status,
GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C],
ATT.MODE, TrigCounter

ALL

All values of the current measurement mode are sent as
comma-separated text, using actual units.

RX, STIOCP, Index, Date, Time, Slot, FREQ[MHz],
C.Offset[kHz], Lev.Av[dBm], Lev.Pk[dBm], SSID,
EVM[%], GBAS ID, Train.FEC, App.Dat., App.FEC,
BER, Transm.Len, StartDelay[us],
GuardInterv[us], RampUp[us], BurstDur[ms],
RampDown[us], GPS_lat., GPS_long., GPS_alt[m],
GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat,
GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP,
Temp[°C], ATT.MODE, TrigCounter, RawData

MEDIUM

A fixed selection of parameters is exported.

RX, STIOCP, Index, Time, Slot, C.Offset[kHz],
Lev.Av[dBm], GBAS ID, Train.FEC, App.Dat.,
App.FEC, GPS_lat., GPS_long., TrigCounter

SHORT

A short, fixed selection of parameters is exported.

RX, Index, Time, Slot, Lev.Av[dBm], GBAS ID,
App.Dat., GPS_lat., GPS_long.

RAW

Only the non-interpreted measurement values from the bit-
stream in binary format are exported.

<RX-Board> Selects the RX board for which results are exported.

1

RX board 1 selected

2
RX board 2 selected

1+2
Both RX boards selected

<Slot> 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7
Selects the slot for which results are exported.

Return values:

<Results> Comma-separated list of selected results.

<State> **READY.**
The command was executed successfully.

Example: GETMEAS FULL, 1+2, 2
Returns all measurement results for slot 2 in all measurements on both receiver boards.

Manual operation: See "[Parameter](#)" on page 194

GBAS:GRAPH_TOLOGG? <Type>

GBAS:GRAPH_TOLOGG <State>

Defines whether graphical information is stored.

Parameters:

<State> **ON**
Graphical information such as the time domain and constellation values are stored.

OFF
Graphical information is not stored.

Manual operation: See "[Graph Log](#)" on page 195

GBAS:MSG_TOLOGG? <Type>

GBAS:MSG_TOLOGG <Type>

This command defines which message information is stored for each slot.

Parameters:

<Type> **ALL**
All message data (human-readable + bitstream) is stored (default).

TXT
Only the human-readable, interpreted message values are stored.

RAW
Only the decoded, non-interpreted message data from the bitstream in binary format is stored.

NONE
Message data is not included in the slot data record.

*RST: ALL

Manual operation: See ["Msg Log"](#) on page 194

GBAS:LOGSLOTS <RX-board>,<Slot>

Selects the GBAS slot to be recorded with the data recorder.

Parameters:

<RX-board>	Selects the RX board for which results are exported. 1 RX board 1 selected 2 RX board 2 selected 1+2 Both RX boards selected
<Slot>	0 1 2 3 4 5 6 7 Selects the slot for which results are exported.

Return values:

<State>	READY Command was executed successfully.

GBAS:PEAKLEV? <Slot>

Queries the peak burst power level measured over the period of the burst.

If no burst was detected, the arithmetic average of the noise power is returned.

Query parameters:

<Slot>	0 1 2 3 4 5 6 7 Selects the slot for which results are queried.

Return values:

<Power>	Signal level Default unit: dBm

Example: GBAS:PEAKLEV? 2

Usage: Query only

Manual operation: See ["Slot Level Peak \(Pk \[dBm\]\)"](#) on page 157

GBAS:PPSLOCKED? <Slot>

Queries the state of the PPS synchronization.

Return values:

<Result>	Unlocked No valid PPS signal detected. Burst Locked Valid burst detected.

PPS Locked

Valid PPS signal detected

Usage: Query only**Manual operation:** See ["Time reference status \(Time Ref.\)"](#) on page 151**GBAS:RESETBER**

Resets the values for the following measurement results:

- ["Bit error rate \(BER\) before FEC"](#) on page 158
- ["Valid Bursts \(Valid B.\)"](#) on page 158
- ["Failed Bursts \(Failed B.\)"](#) on page 158

Parameters:

<State> **READY.**
The command was executed successfully.

Usage: Event**Manual operation:** See ["Reset BER"](#) on page 168**GBAS:STOPSTREAM**

This command terminates the data stream for both RX Boards in GBAS mode.

Return values:

<State> **READY.**
The command was executed successfully.

GBAS:STREAM <ParamSel>, [+MSG,] <RX Board>, <Slots>

Starts data streaming. In streaming mode, a measured data set is automatically sent to the remote interface. One data set is provided per slot, that is: every 62.5 ms. Streaming can produce large quantities of output. It is mandatory to have a fast data connection and an application that is able to handle the data.

For details on the output see [Chapter 9.11.3.6, "GBAS mode"](#), on page 352**Parameters:**

<ParamSel> Determines which parameter selection is output.

FULL
EVS300 compatibility mode

ALL
All values of the current measurement mode are sent as comma-separated text, using actual units.

MEDIUM
A fixed selection of parameters is exported.

SHORT
A short, fixed selection of parameters is exported.

RAW

Only the non-interpreted measurement values from the bit-stream in binary format are exported.

+MSG	Optional: If specified, the message data is included in the data stream, surrounded by curly brackets { }.
<RX-Board>	Selects the RX board for which results are exported. 1 RX board 1 selected 2 RX board 2 selected 1+2 Both RX boards selected
<Slots>	0 1 2 3 4 5 6 7 Selects one or more slots for which results are exported. Multiple slots can be selected.
Return values:	
<State>	READY. The command was executed successfully.
Example:	<code>GBAS:STREAM RAW,1+2,3</code> Sends the data for slot 3 on both receiver boards as binary data to the USB output.
Example:	<code>GBAS:STREAM ALL,1,01234567</code> Outputs the evaluated data (without the message data) for all slots on receiver board 1.
Example:	<code>GBAS:STREAM ALL+MSG,1,0</code> Outputs all evaluated data, including message data, for slot 0 on receiver board 1.

GBAS:VALIDMSG? <Slot>

Queries the number of valid GBAS messages within the period of the burst.

Query parameters:

<Slot>	0 1 2 3 4 5 6 7 Selects the slot for which results are queried.

Return values:

<Result>	integer Number of valid messages Default unit: None.

Usage:	Query only

9.7 RF spectrum mode

The following commands are required to configure and perform measurements in the RF Spectrum mode. They are only available if the R&S EVSG-K10 RF spectrum analysis option is installed.

- [Configuring RF spectrum measurements](#)..... 321
- [Retrieving RF spectrum results](#).....325

9.7.1 Configuring RF spectrum measurements

The following commands are required to configure RF Spectrum measurements.

MODE_FSCAN	321
FSCAN_ATTMODE?	322
FSCAN_ATTMODE	322
FSCAN_FREQCENTER?	322
FSCAN_FREQCENTER	322
FSCAN_FREQSPAN?	322
FSCAN_FREQSPAN	322
FSCAN_FREQSTART?	323
FSCAN_FREQSTART	323
FSCAN_FREQSTOP?	323
FSCAN_FREQSTOP	323
FSCAN_GRID_YRANGE_DB?	323
FSCAN_GRID_YRANGE_DB	323
FSCAN_REFLEVEL?	323
FSCAN_REFLEVEL	323
FSCAN_RESBW_AUTO?	324
FSCAN_RESBW_AUTO	324
FSCAN_RES_BW?	324
FSCAN_RES_BW	324
FSCAN_TRACE_MODE?	324
FSCAN_TRACE_MODE	324
FSCAN_TRACE_AVRGCOUNT?	325
FSCAN_TRACE_AVRGCOUNT	325

MODE_FSCAN

This command switches the instrument to the "RF Spectrum" mode.

Return values:

<State>

READY.

The command was executed successfully.

FSCAN_ATTMODE?**FSCAN_ATTMODE** <Attenuation mode>

This command gets or selects the attenuation mode in the "RF Spectrum" mode.

Parameters:

<Attenuation mode> **COUPLED**
Coupled attenuation
LN
Low noise attenuation
NORM
Normal attenuation (0 dB attenuation)
LD
Low distance attenuation

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[RF Mode](#)" on page 82

FSCAN_FREQCENTER?**FSCAN_FREQCENTER** <Frequency>

This command gets or sets the center frequency in "RF Spectrum" mode.

Parameters:

<Frequency> FSCAN CENTER frequency
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Center](#)" on page 126

FSCAN_FREQSPAN?**FSCAN_FREQSPAN** <Frequency>

This command gets or sets the span frequency in "RF Spectrum" mode.

Parameters:

<Frequency> FSCAN SPAN frequency
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See "[Span](#)" on page 126

FSCAN_FREQSTART?**FSCAN_FREQSTART** <Frequency>

This command gets or sets the start frequency in "RF Spectrum" mode.

Parameters:

<Frequency> FSCAN START frequency
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Start"](#) on page 126

FSCAN_FREQSTOP?**FSCAN_FREQSTOP** <Frequency>

This command gets or sets the stop frequency in "RF Spectrum" mode.

Parameters:

<Frequency> FSCAN STOP frequency
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Stop"](#) on page 126

FSCAN_GRID_YRANGE_DB? <Range>**FSCAN_GRID_YRANGE_DB** <Range>

Gets or selects the range of the y-axis in "RF Spectrum" mode.

Parameters:

<Range> 10_DB | 20_DB | 30_DB | 40_DB | 50_DB | 60_DB | 80_DB |
100_DB | 120_DB

Return values:

<State> **READY.**
The command was executed successfully.

FSCAN_REFLEVEL?**FSCAN_REFLEVEL** <Level>

This command gets or sets the reference level in "RF Spectrum" mode.

Parameters:

<Level> FSCAN Reference Level
Default unit: dBm

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Ref Level"](#) on page 127

FSCAN_RESBW_AUTO?

FSCAN_RESBW_AUTO <Mode>

This command gets or sets the mode of specifying the resolution bandwidth in "RF Spectrum" mode.

Parameters:

<Mode> **AUTO**
Set resolution bandwidth automatically.

MANUAL
Set resolution bandwidth manually.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Resolution Bandwidth \(RBW Mode/Res BW\)"](#) on page 126

FSCAN_RES_BW?

FSCAN_RES_BW <Bandwidth>

This command gets or sets the resolution bandwidth in "RF Spectrum" mode.

Parameters:

<Bandwidth> 15K | 7K5 | 3K75 | 1K87 | 937 | 468 | 234 | 117 | 12K | 6K | 3K |
1K5 | 750 | 375 | 187 | 94 | 47 | 23.4 | 11.7 | 1K2 | 600 | 300 |
150 | 75 | 37.4 | 18.7 | 9.4 | 4.7 | 2.3
FSCAN resolution bandwidth
Default unit: kHz

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Resolution Bandwidth \(RBW Mode/Res BW\)"](#) on page 126

FSCAN_TRACE_MODE?

FSCAN_TRACE_MODE <Trace mode>

Gets or selects the trace mode of the "RF Spectrum" mode.

Parameters:

<Trace Mode> **CLWR**
Overwrite mode (default): the trace is overwritten by each sweep

AVRG

The average is determined over several sweeps
 The number of averaging procedures is defined by
[FFT_TRACE_AVRGCOUNT](#) on page 335.

MAXHOLD

The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one.
 The number of evaluated sweeps is defined by
[FFT_TRACE_AVRGCOUNT](#) on page 335.

RMS

The RMS value for each trace point over several sweeps is determined and displayed.
 The number of evaluated sweeps is defined by
[FFT_TRACE_AVRGCOUNT](#) on page 335.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Trace mode"](#) on page 128

FSCAN_TRACE_AVRGCOUNT?

FSCAN_TRACE_AVRGCOUNT <trace average count>

Gets or sets the trace average count of the "RF Spectrum" mode.

Parameters:

<Trace average count> Range: 0 to 100

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Average Count"](#) on page 128

9.7.2 Retrieving RF spectrum results

The following commands are required to retrieve results from RF Spectrum measurements.

[FSCAN_GETSPECT](#)..... 325

FSCAN_GETSPECT

All measurement values are returned as one comma-separated string in "RF Spectrum" mode.

Parameters:

<Trace Data> Measurement values
 Default unit: dBm

<State>

READY.

The command was executed successfully.

9.8 IF spectrum mode

The following commands are required to configure and perform measurements in the IF Spectrum mode. They are only available if the R&S EVSG-K10 RF spectrum analysis option is installed.

- [Configuring IF spectrum measurements](#)..... 326
- [Retrieving IF spectrum results](#)..... 330

9.8.1 Configuring IF spectrum measurements

The following commands are required to configure IF Spectrum measurements.

MODE_IFSPECT	326
IFSPECT_ATTMODE	327
IFSPECT_FREQRF?	327
IFSPECT_FREQRF	327
IFSPECT_FREQ_SPAN?	327
IFSPECT_FREQ_SPAN	327
IFSPECT_GRID_YRANGE_DB?	327
IFSPECT_GRID_YRANGE_DB	327
IFSPECT_REFLEVEL?	328
IFSPECT_REFLEVEL	328
IFSPECT_RES_BW?	328
IFSPECT_RES_BW	328
IFSPECT_RESBW_AUTO?	328
IFSPECT_RESBW_AUTO	328
IFSPECT_TRACE_MODE?	329
IFSPECT_TRACE_MODE	329
IFSPECT_TRACE_AVRGCOUNT?	329
IFSPECT_TRACE_AVRGCOUNT	329

MODE_IFSPECT

This command switches the instrument to the "IF Spectrum" mode.

Return values:

<State>

READY.

The command was executed successfully.

IFSPECT_ATTMODE <Mode>

Selects the attenuation of the "IF Spectrum" mode.

Parameters:

<Mode>	AUTO Automatic attenuation
	LN Low noise attenuation
	NORM Normal attenuation
	LD Low distortion attenuation

<State> **READY.**
The command was executed successfully.

Manual operation: See ["RF Att"](#) on page 82
See ["RF Mode"](#) on page 82

IFSPECT_FREQRF?**IFSPECT_FREQRF <Freq>**

Gets or sets the RF frequency in "IF Spectrum" mode.

Parameters:

<Freq> RF frequency
Default unit: kHz

<State> **READY.**
The command was executed successfully.

Manual operation: See ["RF Freq"](#) on page 130

IFSPECT_FREQ_SPAN?**IFSPECT_FREQ_SPAN <Freq>**

Gets or sets the span frequency in "IF Spectrum" mode.

Parameters:

<Freq> Span frequency
Default unit: kHz

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Span"](#) on page 130

IFSPECT_GRID_YRANGE_DB? <Range>**IFSPECT_GRID_YRANGE_DB <Range>**

Gets or selects the range of the y-axis in "IF Spectrum" mode.

Parameters:

<Range> 10_DB | 20_DB | 30_DB | 40_DB | 50_DB | 60_DB | 80_DB |
100_DB | 120_DB

Return values:

<State> **READY.**
The command was executed successfully.

IFSPECT_REFLEVEL?

IFSPECT_REFLEVEL <Frequency>

Gets or sets the reference level of the "IF Spectrum" mode.

Parameters:

<Freq> Ref Level
Default unit: dBm

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Ref Level"](#) on page 131

IFSPECT_RES_BW?

IFSPECT_RES_BW <Bandwidth>

Gets or sets the resolution bandwidth for "IF Spectrum" mode.

Parameters:

<Bandwidth> 200K | 100K | 50K | 25K | 12K5 | 6K2 | 3K1 | 1K6 | 800 | 240K |
120K | 60K | 30K | 15K | 7K5 | 3K75 | 1K87 | 937 | 468 | 234 |
117 | 12K | 6K | 3K | 1K5 | 750 | 375 | 187 | 94 | 47 | 23.4 | 11.7 |
1K2 | 600 | 300 | 150 | 75 | 37.4 | 18.7 | 9.4 | 4.7 | 2.3 | 120.0 |
60.0 | 30.0 | 15.0 | 7.5 | 3.7 | 1.9 | 0.9 | 0.5

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["RBW"](#) on page 131

IFSPECT_RESBW_AUTO?

IFSPECT_RESBW_AUTO <Mode>

This command gets or sets the mode of specifying the resolution bandwidth in "IF Spectrum" mode.

Parameters:

<Mode> **AUTO**
Set resolution bandwidth automatically.
MANUAL
Set resolution bandwidth manually.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["RBW"](#) on page 131

IFSPECT_TRACE_MODE?

IFSPECT_TRACE_MODE <Trace mode>

Gets or selects the trace mode of the "IF Spectrum" mode.

Parameters:

<Trace Mode> **CLWR**
Overwrite mode (default): the trace is overwritten by each sweep

AVRG
The average is determined over several sweeps
The number of averaging procedures is defined by
[FFT_TRACE_AVRGCOUNT](#) on page 335.

MAXHOLD
The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one.
The number of evaluated sweeps is defined by
[FFT_TRACE_AVRGCOUNT](#) on page 335.

RMS
The RMS value for each trace point over several sweeps is determined and displayed.
The number of evaluated sweeps is defined by
[FFT_TRACE_AVRGCOUNT](#) on page 335.

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Trace mode"](#) on page 128

IFSPECT_TRACE_AVRGCOUNT?

IFSPECT_TRACE_AVRGCOUNT <trace average count>

Gets or sets the trace average count of the "IF Spectrum" mode.

Parameters:

<Trace average count> Range: 0 to 100

Return values:

<State> **READY.**
The command was executed successfully.

Manual operation: See ["Average Count"](#) on page 128

9.8.2 Retrieving IF spectrum results

The following commands are required to retrieve results from IF Spectrum measurements.

IFSPECT_GETSPECT	330

IFSPECT_GETSPECT

All measurement values are returned as one comma-separated string in "IF Spectrum" mode.

Parameters:

<Trace Data>	Measurement values Default unit: dBm
<State>	READY. The command was executed successfully.

9.9 AF spectrum mode

The following commands are required to configure and perform measurements in the AF Spectrum mode. They are only available if the R&S EVSG-K11 AF spectrum analysis option is installed.

- [Configuring AF spectrum measurements](#).....330
- [Retrieving AF spectrum results](#).....335

9.9.1 Configuring AF spectrum measurements

The following commands are required to configure AF Spectrum measurements.

MODE_FFT	331
FFT_ATTMODE?	331
FFT_ATTMODE	331
FFT_BB_IF_BW_KHZ?	331
FFT_BB_IF_BW_KHZ	331
FFT_FREQ_CENTER?	332
FFT_FREQ_CENTER	332
FFT_FREQ_SPAN?	332
FFT_FREQ_SPAN	332
FFT_FREQ_START?	332
FFT_FREQ_START	332
FFT_FREQSTOP?	333
FFT_FREQSTOP	333
FFT_FREQRF?	333
FFT_FREQRF	333
FFT_GRID_YRANGE_DB?	333
FFT_GRID_YRANGE_DB	333

FFT_IF_BW_KHZ?	333
FFT_IF_BW_KHZ	333
FFT_RESBW_AUTO?	334
FFT_RESBW_AUTO	334
FFT_RESBW_FIX_KHZ?	334
FFT_RESBW_FIX_KHZ	334
FFT_TRACE_MODE?	335
FFT_TRACEMODE	335
FFT_TRACE_AVRGCOUNT?	335
FFT_TRACE_AVRGCOUNT	335

MODE_FFT

This command switches the instrument to the "AF Spectrum" mode.

Return values:

<State> **READY.**
The command was executed successfully.

FFT_ATTMODE?

FFT_ATTMODE <Mode>

This command selects the attenuation mode of the "AF Spectrum" mode.

Parameters:

<Mode> **COUPLED**
Coupled attenuation

LN
Low noise attenuation

NORM
Normal attenuation (0 dB attenuation)

LD
Low distance attenuation

Return values:

<State> **READY.**
The command was executed successfully.

Example: FFT_ATTMODE LD

Manual operation: See "RF Att" on page 82
 See "RF Mode" on page 82

FFT_BB_IF_BW_KHZ? <Bandwidth>

FFT_BB_IF_BW_KHZ <Bandwidth>

This command gets or sets the IF demodulation bandwidth for AM input in "AF Spectrum" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ | 50KHZ
 If bandwidth
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

FFT_FREQ_CENTER?

FFT_FREQ_CENTER <Frequency>

Gets or sets the FFT center frequency in "AF Spectrum" mode.

Parameters:

<Frequency> Value of the FFT center frequency.
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["AF Center"](#) on page 135

FFT_FREQ_SPAN?

FFT_FREQ_SPAN <Frequency>

Gets or sets the FFT span frequency in "AF Spectrum" mode.

Parameters:

<Frequency> Value of the FFT span frequency.
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["AF Span"](#) on page 136

FFT_FREQ_START?

FFT_FREQ_START <Frequency>

Gets or sets the FFT start frequency in "AF Spectrum" mode.

Parameters:

<Frequency> Value of the FFT start frequency.
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["AF Start"](#) on page 136

FFT_FREQSTOP?

FFT_FREQSTOP <Frequency>

Gets or sets the FFT stop frequency in "AF Spectrum" mode.

Parameters:

<Frequency> Value of the FFT Stop frequency.
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["AF Stop"](#) on page 136

FFT_FREQRF?

FFT_FREQRF <Freq>

Gets or Sets RF frequency in "AF Spectrum" mode.

Parameters:

<Freq> FFT RF frequency
 Default unit: <kHz>

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["RF Freq"](#) on page 135

FFT_GRID_YRANGE_DB? <Range>

FFT_GRID_YRANGE_DB <Range>

Gets or selects the range of the y-axis in "AF Spectrum" mode.

Parameters:

<Range> 10_DB | 20_DB | 50_DB | 100_DB

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See ["Y-Range"](#) on page 137

FFT_IF_BW_KHZ? <Bandwidth>

FFT_IF_BW_KHZ <Bandwidth>

This command gets or sets the IF demodulation bandwidth for RX input in "AF Spectrum" mode.

Parameters:

<Bandwidth> 1KHZ | 3KHZ | 6KHZ | 10KHZ | 18KHZ | 25KHZ | 36KHZ | 50KHZ
 RX bandwidth
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "IF BW" on page 136

FFT_RESBW_AUTO? <Mode>

FFT_RESBW_AUTO <Mode>

This command gets or sets the mode of specifying the resolution bandwidth in "aF Spectrum" mode.

Parameters:

<Mode> **AUTO**
 Set resolution bandwidth automatically.
MANUAL
 Set resolution bandwidth manually.

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "RBW" on page 136

FFT_RESBW_FIX_KHZ? <Bandwidth>

FFT_RESBW_FIX_KHZ <Bandwidth>

This command gets or sets the resolution bandwidth for RX input in "AF Spectrum" mode.

Parameters:

<Bandwidth> 100K | 50K | 25K | 12K5 | 6K2 | 3K1 | 1K6 | 800 | 240K | 120K | 60K | 30K | 15K | 7K5 | 3K75 | 1K87 | 937 | 468 | 234 | 117 | 12K | 6K | 3K | 1K5 | 750 | 375 | 187 | 94 | 47 | 23.4 | 11.7 | 1K2 | 600 | 300 | 150 | 75 | 37.4 | 18.7 | 9.4 | 4.7 | 2.3 | 120.0 | 60.0 | 30.0 | 15.0 | 7.5 | 3.7 | 1.9 | 0.9 | 0.5
 RX input resolution bandwidth
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

Manual operation: See "RBW" on page 136

FFT_TRACE_MODE?**FFT_TRACEMODE** <Trace Mode>

Gets or sets the trace mode of the "AF Spectrum" mode.

Parameters:

<Trace Mode>

CLWR

Overwrite mode (default): the trace is overwritten by each sweep

AVRG

The average is determined over several sweeps

The number of averaging procedures is defined by

[FFT_TRACE_AVRGCOUNT](#) on page 335.**MAXHOLD**

The maximum value is determined over several sweeps and displayed. The R&S EVSD1000 saves each trace point in the trace memory only if the new value is greater than the previous one.

The number of evaluated sweeps is defined by

[FFT_TRACE_AVRGCOUNT](#) on page 335.**RMS**

The RMS value for each trace point over several sweeps is determined and displayed.

The number of evaluated sweeps is defined by

[FFT_TRACE_AVRGCOUNT](#) on page 335.**Return values:**

<State>

READY.

The command was executed successfully.

Manual operation: See ["Trace mode"](#) on page 128**FFT_TRACE_AVRGCOUNT?****FFT_TRACE_AVRGCOUNT** <trace average count>

Gets or sets the trace average count of the "AF Spectrum" mode.

Parameters:<Trace average
count>

Range: 0 to 100

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Average Count"](#) on page 128

9.9.2 Retrieving AF spectrum results

The following commands are required to retrieve results from AF Spectrum measurements.

[FFT_GETSPECT](#)..... 336

FFT_GETSPECT

All measurement values in dBm are returned as one comma-separated string.

Return values:

All values Shows all spectrum values.

9.10 AF time domain mode

The following commands are required to configure and perform measurements in the AF Time domain mode. They are only available if the R&S EVSG-K11 AF spectrum analysis option is installed.

- [Configuring AF time domain measurements](#).....336
- [Retrieving RF spectrum results](#).....340

9.10.1 Configuring AF time domain measurements

The following commands are required to configure AF Time Domain measurements.

MODE_SCOPE	336
SCOPE_ATTMODE	337
SCOPE_FREQRF?	337
SCOPE_FREQRF	337
SCOPE_IF_BW_KHZ?	337
SCOPE_IF_BW_KHZ	337
SCOPE_REFLEVEL?	338
SCOPE_REFLEVEL	338
SCOPE_RESBW_FIX_KHZ?	338
SCOPE_RESBW_FIX_KHZ	338
SCOPE_TIMEDIV_RF?	338
SCOPE_TIMEDIV_RF	338
SCOPE_TRIGLEVEL_RFPCT?	339
SCOPE_TRIGLEVEL_RFPCT	339
SCOPE_TRIGSLOPE?	339
SCOPE_TRIGSLOPE	339

MODE_SCOPE

This command switches the instrument to the "AF Time Domain" mode.

Return values:

<State>

READY.

The command was executed successfully.

SCOPE_ATTMODE <Mode>

This command selects the attenuation mode of the "AF Time Domain" mode.

Parameters:

<Mode>	COUPLED Coupled attenuation
	LN Low noise attenuation
	NORM Normal attenuation (0 dB attenuation)
	LD Low distance attenuation

Return values:

<State>	READY. The command was executed successfully.

Example: `SCOPE_ATTMODE LD`

Manual operation: See ["RF Att"](#) on page 82
See ["RF Mode"](#) on page 82

SCOPE_FREQRF?**SCOPE_FREQRF <Freq>**

This command gets or sets the RF frequency in "AF Time Domain".

Parameters:

<Freq>	RF frequency Default unit: <kHz>

Return values:

<State>	READY. The command was executed successfully.

Manual operation: See ["RF Freq"](#) on page 140

SCOPE_IF_BW_KHZ? <Bandwidth>**SCOPE_IF_BW_KHZ <Bandwidth>**

This command gets or sets the bandwidth for RX input in "AF Time Domain" mode.

Parameters:

<Bandwidth>	1KHZ 3KHZ 6KHZ 10KHZ 18KHZ 25KHZ 36KHZ 50KHZ RX bandwidth Default unit: kHz

Return values:

<State>	READY. The command was executed successfully.

Manual operation: See "IF BW" on page 140

SCOPE_REFLEVEL?

SCOPE_REFLEVEL <RefLev>

This command gets or sets the reference level of the "AF Time Domain" mode.

Parameters:

<RefLev> Set the reference level.
 Default unit: <dBm>

Return values:

<State> **READY.**
 The command was executed successfully.

SCOPE_RESBW_FIX_KHZ? <Bandwidth>

SCOPE_RESBW_FIX_KHZ <Bandwidth>

This command gets or sets the resolution bandwidth for RX input in "AF Time Domain" mode.

Parameters:

<Bandwidth> 200K | 100K | 50K | 25K | 12K5 | 6K2 | 3K1 | 1K6 | 800 | 240K |
 120K | 60K | 30K | 15K | 7K5 | 3K75 | 1K87 | 937 | 468 | 234 |
 117 | 12K | 6K | 3K | 1K5 | 750 | 375 | 187 | 94 | 47 | 23.4 | 11.7 |
 1K2 | 600 | 300 | 150 | 75 | 37.4 | 18.7 | 9.4 | 4.7 | 2.3 | 120.0 |
 60.0 | 30.0 | 15.0 | 7.5 | 3.7 | 1.9 | 0.9 | 0.5
 RX input resolution bandwidth
 Default unit: kHz

Return values:

<State> **READY.**
 The command was executed successfully.

SCOPE_TIMEDIV_RF?

SCOPE_TIMEDIV_RF <time/div>

This command gets or sets the Time/Div for RF input in "AF Time Domain" mode.

Parameters:

<time/div> Set value for the Time/Div for RF input.
 100_MS
 Sets the value to 100 ms.
 50_MS
 Sets the value to 50 ms.
 20_MS
 Sets the value to 20 ms.
 10_MS
 Sets the value to 10 ms.

5_MS

Sets the value to 5 ms.

2_MS

Sets the value to 2 ms.

1_MS

Sets the value to 1 ms.

500_US

Sets the value to 0.5 ms.

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Time/Div"](#) on page 142**SCOPE_TRIGLEVEL_RFPCT?****SCOPE_TRIGLEVEL_RFPCT** <Trig level>

This command gets or sets the trigger level for RF Input of the "AF Time Domain" mode.

Parameters:

<Trig level>

Set trigger level.

Range: -100 to 100

Default unit: <%>

Return values:

<State>

READY.

The command was executed successfully.

Manual operation: See ["Trigger Level"](#) on page 143**SCOPE_TRIGSLOPE?****SCOPE_TRIGSLOPE** <Trigger edge>

This command gets or selects the trigger edge for RF Input of the "AF Time Domain" mode.

Parameters:

<Trigger edge>

POSITIVE

Sets positive SCOPE trigger slope.

NEGATIVE

Sets negative SCOPE trigger slope.

BOTH

Sets positive and negative SCOPE trigger slope.

<State>

READY.

The command was executed successfully.

Manual operation: See ["Trigger Edge"](#) on page 142

9.10.2 Retrieving RF spectrum results

The following commands are required to retrieve results from AF Time Domain measurements.

SCOPE_GETMEAS	340

SCOPE_GETMEAS

All measurement values in % (RF Input) or in mV (BB Input) are returned as one comma-separated string.

Return values:

All values Shows all measured values.

9.11 Data management

The following commands are required to configure data streaming and recording.

• Data recording	340
• Data streaming	345
• Results for data streaming	347

9.11.1 Data recording

The following commands are required for data recording.

CLEARACTIVELIST	341
DL_START	341
DL_STOP	341
GETACTIVELIST	341
GETDATA_FROM_ACTIVELIST	342
GETDLTIME?	342
GETFREEMEMORY	342
GETLISTDATA	342
GETLISTSIZE	343
CLEARALLLISTS	343
SETUP:GBAS_PPS_SOURCE?	343
PPSSMA_TRIG_SOURCE	343
RECIQ	343
SAVEACTIVELIST2USB	344
SELECTLISTPARAM	344
SETACTIVELIST	345
SETDLTIME	345

CLEARACTIVELIST

This command clears the currently active list. All entries are deleted.

Return values:

<EventResult>

READY

Command was executed successfully

ERROR

An error occurred; command was not successful

Example:

SETACTIVELIST 2

Defines list 2 as the active list.

CLEARACTIVELIST

Clears list 2.

Manual operation: See ["Clear List"](#) on page 193

DL_START

Starts logging data for the active RX board and the currently selected parameters until the [DL_STOP](#) command is executed. The data received from the active RX board is stored internally.

To reduce the amount of logged data, restrict it to specific parameters.

Return values:

<EventResult>

READY.

The command was executed successfully.

ERROR

An error occurred; command was not successful.

DL_STOP

Stops logging data.

Return values:

<EventResult>

READY

Command was executed successfully

ERROR

An error occurred; command was not successful

Usage:

Event

GETACTIVELIST

Return values:

<ListNo>

integer

List number

Range: 1 to 999

Example:

```
SETACTIVELIST 2
Sets list 2 as the active list.
GETACTIVELIST
Queries the number of the active list.
Result:
2
```

Manual operation: See ["List"](#) on page 193

GETDATA_FROM_ACTIVELIST <start index>,<stop index>

Exports the selected data lines of the active data logger list.

Parameters:

<Start index> Specifies the data line of the data logger list to start with.

<Stop index> Specifies the data line of the data logger list to stop with. A stop parameter of -1 exports the data logger list to the end.

GETDLTIME?

Gets the data logger time for the current mode: "ILS LOC", "ILS GP", "ILS MB", "VOR", or "COM".

Parameters:

<Time> Data logger time
Default unit: ms

Usage: Query only

GETFREEMEMORY

This command queries the amount of free storage space on the internal flash memory.

Return values:

<FreeMemSize> Default unit: MByte

GETLISTDATA <ListNo>

This command queries the contents of the selected list.

Setting parameters:

<ListNo> List number
Range: 1 to 9999

Return values:

<ListData> Contents of the list.

<EventResult> **READY.**
The command was executed successfully.

ERROR
An error occurred; command was not successful.

GETLISTSIZE

This command queries the size of the active list.

Return values:

<NoEntries> integer
 Number of entries in the active list.
 Range: 0 to 1 000 000

CLEARALLLISTS**Return values:**

<EventResult> **READY**
 Command was executed successfully
 ERROR
 An error occurred; command was not successful

Manual operation: See "[Clear All Lists](#)" on page 195

SETUP:GBAS_PPS_SOURCE?

PPSSMA_TRIG_SOURCE <Source>

Determines which input triggers data storage for ILS LOC, ILS GP, ILS MB, VOR and COM modes.

Parameters:

<Source> **PPS GPS**
 PPS input of the GNSS connector

RECIQ <State>

If enabled, the raw, unprocessed I/Q data is also recorded when you execute [DL_START](#). This feature requires the R&S EVSG1-K25 I/Q data streaming option. I/Q data is available in ILS, VOR, MB, COM, and GBAS mode.

I/Q data is stored as a separate file with the same file name as the data list, but the extension `.iq`.

For details see [Chapter 7.2.2, "I/Q data recording and streaming"](#), on page 192.

Parameters:

<State> ON | OFF

Return values:

<EventResult> **READY.**
 The command was executed successfully.
 ERROR
 An error occurred; command was not successful.

Manual operation: See "[Rec IQ](#)" on page 195

SAVEACTIVELIST2USB <Filename>

This command copies the active list to a connected USB storage device as a .csv file. The file name is set automatically (e.g llz_rx1_list9.csv).

Note that this command is time-consuming for long lists (max. 1 000 000 entries).

To reduce the amount of logged data, restrict it to specific parameters.

Parameters:

<Filename> string
Path, file name and extension of the file on the USB device to which the data is stored: Note that a specified path must already exist on the USB device, otherwise an error occurs.

Return values:

<EventResult> **READY.**
The command was executed successfully.
ERROR
An error occurred; command was not successful.

Example:

```
SETACTIVELIST 2
//Defines list 2 as the active list.
SAVEACTIVELIST2USB
```

Manual operation: See ["Export List to USB"](#) on page 195

SELECTLISTPARAM <Params>

This command selects the parameters to be logged.

Parameters:

<Params> Set of parameters to be included in data log.
ALL
All parameters are selected for logging.
FULL
The selected parameters are compatible to EVS300.
MEDIUM
A reduced set of parameters is selected.
SHORT
A minimum set of parameters is selected.

Example:

```
//Select all parameters for logging
SELECTLISTPARAM ALL
```

Manual operation: See ["Data selection \(Sel, not GBAS/SCAT-I mode\)"](#) on page 194

SETACTIVELIST <ListNo>**Setting parameters:**

<ListNo> integer
 List number
 Range: 1 to 999

Return values:

<EventResult> **READY**
 Command was executed successfully.
 ERROR
 An error occurred; command was not successful.

Example: SETACTIVELIST 2

Usage: Setting only

Manual operation: See "[List](#)" on page 193

SETDLTIME <Time>

Sets the data logger time for the current mode: "ILS LOC", "ILS GP", "ILS MB", "VOR", or "COM".

Parameters:

<Time> Data logger time
 Default unit: ms

Return values:

<State> **READY.**
 The command was executed successfully.

9.11.2 Data streaming

The following commands are required for data streaming.

Useful commands for streaming described elsewhere:

- [GBAS : STREAM](#) on page 319
 [GBAS : STOPSTREAM](#) on page 319

Remote commands exclusive to data streaming:

GETDATADEF	345
GETDATASET	346
STREAM	346
STOPSTREAM	346
MARKSTREAM	347

GETDATADEF

This command defines the data delivered by [GETDATASET](#) on page 346.

GETDATASET

This command creates the output of the current streaming measurement results for the active board.

Return values:

<ActBoard>	CH:1 CH:2 The currently active receiver board for which the results are returned.
<Data>	Data for the active board as described by GETDATADEF on page 345.
<State>	READY. The command was executed successfully.

STREAM <ParamSelection>, <RX Board>

Starts data streaming. In streaming mode, a measured data set is automatically sent to the remote interface. The Meastime (see [MEASTIME](#) on page 232) defines how often the data sets are produced. Every data set is preceded by the channel number. Streaming can produce large quantities of output. It is mandatory to have a fast data connection and an application that is able to handle the data.

For details on the output see [Chapter 9.11.3, "Results for data streaming"](#), on page 347

Parameters:

<ParamSelection>	ALL All values of the current measurement are send as comma-separated text, using current units. FULL Compatible to R&S EVS300. MEDIUM A fixed selection of parameters is exported. SHORT A short, fixed selection of parameters is exported.
<RX Board>	1 Data streaming is started for RX board 1. 2 Data streaming is started for RX board 2. 1+2 Data streaming is started for both RX boards.

Return values:

<State>	READY. The command was executed successfully.

STOPSTREAM

This command terminates the data stream for both RX Boards.

Return values:

<State>

READY.

The command was executed successfully.

MARKSTREAMThis command sets the *s* flag in the running stream output.**Return values:**

<State>

READY.

The command was executed successfully.

9.11.3 Results for data streaming

Which parameters and results are returned during streaming depends on the measurement mode and the parameter selection.

The individual measurement results are described in the result views.

**Status flags**

The "STIOCPMV" value contains status flags, if applicable:

- **S**: Start (started manually)
- **T**: Triggered (externally)
- **I**: Invalid
- **O**: Overload (RF input signal too high)
- **C**: Corrected (includes RF input correction factor)
- **P**: PPS-synced
- **M**: Morse ID available
- **V**: Valid signal (ILS LOC/GP and VOR only)



For compatibility reasons, the streaming results contain placeholders for all R&S EVSx variants and options, regardless of whether the particular instrument supports or provides those results. If not applicable, the result remains empty.

• ILS LOC mode	348
• ILS GP mode	349
• ILS MB mode	350
• VOR mode	351
• COM mode	351
• GBAS mode	352
• NDB mode	353

9.11.3.1 ILS LOC mode

All parameters

RX, STIOCPM, Index , Date, Time, FREQ[MHz], SINGLE[kHz], CRS_UF, CLR_LF[kHz], LEVEL[dBm], AM-MOD./90Hz[%], AM-MOD./150Hz[%], FREQ_90[Hz], FREQ_150[Hz], DDM(90-150)[1], SDM[%], PHI-90/150[°], VOICE-MOD.[%], ID-MOD.[%], ID-F.[Hz], ID-CODE, ID-Per.[s], Last_ID[s], DotLen[ms], DashLen[ms], DotDashGap[ms], Lettergap[ms], LEV_CLR_LF[dBm], LEV_CRS_UF[dBm], AM-MOD_CLR_LF/90Hz[%], AM-MOD_CLR_LF/150Hz[%], FREQ_90_CLR_LF[Hz], FREQ_150_CLR_LF[Hz], DDM_CLR_LF(90-150)[1], SDM_CLR_LF[%], PHI-90/150_CLR_LF[°], AM-MOD_CRS_UF/90Hz[%], AM-MOD_CRS_UF/150Hz[%], FREQ_90_CRS_UF[Hz], FREQ_150_CRS_UF[Hz], DDM_CRS_UF(90-150)[1], SDM_CRS_UF[%], PHI-90/150_CRS_UF[°], PHI-90/90[°], PHI-150/150[°], ResFM90[Hz], ResFM150[Hz], K2/90Hz[%], K2/150Hz[%], K3/90Hz[%], K3/150Hz[%], K4/90Hz[%], K4/150Hz[%], THD/90Hz[%], THD/150Hz[%], AM240[%], GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, GPS_Und.[m], Temp[°C], MeasTime[ms], MeasMode, LOC_GP, ATT.MODE, DemodOffset_1F, DemodOffset_CRS, DemodOffset_CLR, Autotune_1F, Autotune_CRS, Autotune_CLR, IFBW_Man_WIDE, IFBW_Man_UCLC, TrigCounter, IQPosition, IQSamples

Full parameters

Channel, STIOCPM, Index , Date, Time, FREQ[MHz], CRS_UF/SINGLE[kHz], CLR_LF[kHz], LEVEL[dBm], AM-MOD./90Hz[%], AM-MOD./150Hz[%], FREQ_90[Hz], FREQ_150[Hz], DDM(90-150)[1], SDM[%], PHI-90/150[°], VOICE-MOD.[%], ID-MOD.[%], ID-F.[Hz], ID-CODE, LEV_CLR_LF[dBm], LEV_CRS_UF[dBm], AM-MOD_CLR_LF/90Hz[%], AM-MOD_CLR_LF/150Hz[%], DDM_CLR_LF(90-150)[1], SDM_CLR_LF[%], AM-MOD_CRS_UF/90Hz[%], AM-MOD_CRS_UF/150Hz[%], DDM_CRS_UF(90-150)[1], SDM_CRS_UF[%], PHI-90/90[°], PHI-150/150[°], K2/90Hz[%], K2/150Hz[%], K3/90Hz[%], K3/150Hz[%], THD/90Hz[%], THD/150Hz[%], GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], MeasTime[ms], MeasMode, LOC_GP, ATT.MODE, TrigCounter

Medium parameters

RX, STIOCPM, Index , Date, Time, LEVEL[dBm], DDM(90-150)[1], SDM[%], LEV_CLR_LF[dBm], LEV_CRS_UF[dBm], DDM_CLR_LF(90-150)[1], SDM_CLR_LF[%], DDM_CRS_UF(90-150)[1], SDM_CRS_UF[%], GPS_lat., GPS_long., MeasMode, LOC_GP, ATT.MODE, TrigCounter

Short parameters

RX, Time, LEVEL[dBm], LEV_CRS_UF[dBm], LEV_CLR_LF[dBm],
DDM(90-150)[1], DDM_CRS_UF(90-150)[1], DDM_CLR_LF(90-150)[1],
SDM[%], SDM_CRS_UF[%], SDM_CLR_LF[%], GPS_lat., GPS_long.

9.11.3.2 ILS GP mode**All parameters**

RX, STIOCPM, Index, Date, Time, FREQ[MHz], SINGLE[kHz], CRS_UF,
CLR_LF[kHz], LEVEL[dBm], AM-MOD./90Hz[%], AM-MOD./150Hz[%],
FREQ_90[Hz], FREQ_150[Hz], DDM(90-150)[1], SDM[%],
PHI-90/150[°], VOICE-MOD.[%], ID-MOD.[%], ID-F.[Hz], ID-CODE,
ID-Per.[s], Last_ID[s], DotLen[ms], DashLen[ms], DotDashGap[ms],
Lettergap[ms], LEV_CLR_LF[dBm], LEV_CRS_UF[dBm],
AM-MOD_CLR_LF/90Hz[%], AM-MOD_CLR_LF/150Hz[%],
FREQ_90_CLR_LF[Hz], FREQ_150_CLR_LF[Hz], DDM_CLR_LF(90-150)[1],
SDM_CLR_LF[%], PHI-90/150_CLR_LF[°], AM-MOD_CRS_UF/90Hz[%],
AM-MOD_CRS_UF/150Hz[%], FREQ_90_CRS_UF[Hz], FREQ_150_CRS_UF[Hz],
DDM_CRS_UF(90-150)[1], SDM_CRS_UF[%], PHI-90/150_CRS_UF[°],
PHI-90/90[°], PHI-150/150[°], ResFM90[Hz], ResFM150[Hz],
K2/90Hz[%], K2/150Hz[%], K3/90Hz[%], K3/150Hz[%], K4/90Hz[%],
K4/150Hz[%], THD/90Hz[%], THD/150Hz[%], AM240[%], GPS_lat.,
GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time,
GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, GPS_Und.[m],
Temp[°C], MeasTime[ms], MeasMode, LOC_GP, ATT.MODE,
DemodOffset_1F, DemodOffset_CRS, DemodOffset_CLR, Autotune_1F,
Autotune_CRS, Autotune_CLR, IFBW_Man_WIDE, IFBW_Man_UCLC,
TrigCounter, IQPosition, IQSamples

Full parameters

Channel, STIOCPM, Index, Date, Time, FREQ[MHz],
CRS_UF/SINGLE[kHz], CLR_LF[kHz], LEVEL[dBm], AM-MOD./90Hz[%],
AM-MOD./150Hz[%], FREQ_90[Hz], FREQ_150[Hz], DDM(90-150)[1],
SDM[%], PHI-90/150[°], VOICE-MOD.[%], ID-MOD.[%], ID-F.[Hz],
ID-CODE, LEV_CLR_LF[dBm], LEV_CRS_UF[dBm],
AM-MOD_CLR_LF/90Hz[%], AM-MOD_CLR_LF/150Hz[%],
DDM_CLR_LF(90-150)[1], SDM_CLR_LF[%], AM-MOD_CRS_UF/90Hz[%],
AM-MOD_CRS_UF/150Hz[%], DDM_CRS_UF(90-150)[1], SDM_CRS_UF[%],
PHI-90/90[°], PHI-150/150[°], K2/90Hz[%], K2/150Hz[%],
K3/90Hz[%], K3/150Hz[%], THD/90Hz[%], THD/150Hz[%], GPS_lat.,
GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time,
GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C],
MeasTime[ms], MeasMode, LOC_GP, ATT.MODE, TrigCounter

Medium parameters

RX, STIOCPM, Index , Date, Time, LEVEL[dBm], DDM(90-150)[1],
SDM[%], LEV_CLR_LF[dBm], LEV_CRS_UF[dBm], DDM_CLR_LF(90-150)[1],
SDM_CLR_LF[%], DDM_CRS_UF(90-150)[1], SDM_CRS_UF[%], GPS_lat.,
GPS_long., MeasMode, LOC_GP, ATT.MODE, TrigCounter

Short parameters

RX, Time, LEVEL[dBm], LEV_CRS_UF[dBm], LEV_CLR_LF[dBm],
DDM(90-150)[1], DDM_CRS_UF(90-150)[1], DDM_CLR_LF(90-150)[1],
SDM[%], SDM_CRS_UF[%], SDM_CLR_LF[%], GPS_lat., GPS_long.

9.11.3.3 ILS MB mode**All parameters**

RX, STIOCP, Index , Date, Time, FREQ[MHz], MEAS.F[kHz],
LEVEL[dBm], AM-MOD./3000Hz[%], AM-MOD./1300Hz[%],
AM-MOD./400Hz[%], FREQ_3000[Hz], FREQ_1300[Hz], FREQ_400[Hz],
ID-MOD.[%], ID-F.[Hz], GPS_lat., GPS_long., GPS_alt[m],
GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status,
GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], IFBW Manual,
MeasTime[ms], ATT.MODE, TrigCounter

Full parameters

Channel, STIOCP, Index , Date, Time, FREQ[MHz], MEAS.F[MHz],
LEVEL[dBm], AM-MOD./3000Hz[%], AM-MOD./1300Hz[%],
AM-MOD./400Hz[%], FREQ_3000[Hz], FREQ_1300[Hz], FREQ_400[Hz],
ID-MOD.[%], ID-F.[Hz], GPS_lat., GPS_long., GPS_alt[m],
GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status,
GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], MeasTime[ms], ATT.MODE,
TrigCounter

Medium parameters

RX, STIOCP, Index , Date, Time, LEVEL[dBm], AM-MOD./3000Hz[%],
AM-MOD./1300Hz[%], AM-MOD./400Hz[%], FREQ_3000[Hz],
FREQ_1300[Hz], FREQ_400[Hz], GPS_lat., GPS_long., TrigCounter

Short parameters

RX, Time, LEVEL[dBm], AM-MOD./400Hz[%], AM-MOD./1300Hz[%],
AM-MOD./3000Hz[%], GPS_lat., GPS_long.

9.11.3.4 VOR mode

All parameters

RX, STIOCPMV, Index , Date, Time, FREQ[MHz], MEAS.F[kHz], LEVEL[dBm], AM-MOD./30Hz[%], AM-MOD./9960Hz[%], FREQ_30[Hz], FREQ_9960[Hz], FREQ_FM30[Hz], BEARING(from)[°], FM-DEV.[Hz], FM-INDEX, VOICE-MOD.[%], ID-MOD.[%], ID-F.[Hz], ID-CODE, ID-Per.[s], Last_ID[s], DotLen[ms], DashLen[ms], DotDashGap[ms], Lettergap[ms], SubCarr_K2[dB], SubCarr_K3[dB], SubCarr_K4[dB], SubCarr_K5[dB], AM60Hz[%], AM1k44[%], AM1k50[%], No.Of Segm, GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, GPS_Und.[m], Temp[°C], IFBW Manual, MeasTime[ms], ATT.MODE, TrigCounter, I/Q_Position, I/Q_Samples

Full parameters

Channel, STIOCPM, Index , Date, Time, FREQ[MHz], MEAS.F[MHz], LEVEL[dBm], AM-MOD./30Hz[%], AM-MOD./9960Hz[%], AM-DIST./9960[%], FREQ_30[Hz], FREQ_9960[Hz], FREQ_FM30[Hz], BEARING(from)[°], FM-DEV.[Hz], FM-INDEX, VOICE-MOD.[%], ID-MOD.[%], ID-F.[Hz], ID-CODE, GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], MeasTime[ms], ATT.MODE, TrigCounter

Medium parameters

RX, STIOCPM, Index , Date, Time, LEVEL[dBm], BEARING(from)[°], GPS_lat., GPS_long., GPS_alt[m], TrigCounter

Short parameters

RX, Time, LEVEL[dBm], BEARING(from)[°], AM-MOD./30Hz[%], AM-MOD./9960Hz[%], FM-DEV.[Hz], GPS_lat., GPS_long.

9.11.3.5 COM mode

All parameters

RX, STIOCP, Index , Date, Time, FREQ[MHz], MEAS.F[MHz], MEAS.F_TX1[MHz], MEAS.F_TX2[MHz], LEVEL[dBm], LEVEL_TX1[dBm], LEVEL_TX2[dBm], AM-MOD[%], AM-MOD_TX1[%], AM-MOD_TX2[%], AMFREQ[Hz], AMFREQ_TX1[Hz], AMFREQ_TX2[Hz], GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], IFBW Manual 1F, IFBW Manual 2F, MeasTime[ms], ATT.MODE, TrigCounter

Full parameters

Channel, STIOCP, Index , Date, Time, FREQ[MHz], MEAS.F_TX1[MHz], MEAS.F_TX2[MHz], LEVEL[dBm], LEVEL_TX1[dBm], LEVEL_TX2[dBm], AM-MOD[%], AM-MOD_TX1[%], AM-MOD_TX2[%], AMFREQ[Hz], AMFREQ_TX1[Hz], AMFREQ_TX2[Hz], GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], MeasTime[ms], ATT.MODE, TrigCounter

Medium parameters

RX, STIOCP, Index , Date, Time, MEAS.F[MHz], MEAS.F_TX1[MHz], MEAS.F_TX2[MHz], LEVEL[dBm], LEVEL_TX1[dBm], LEVEL_TX2[dBm], AM-MOD[%], AM-MOD_TX1[%], AM-MOD_TX2[%], GPS_lat., GPS_long., TrigCounter

Short parameters

RX, Time, LEVEL[dBm], AM-MOD[%], AM-MOD_TX1[%], AM-MOD_TX2[%], GPS_lat., GPS_long.

9.11.3.6 GBAS mode**All parameters**

RX, STIOCP, Index , Date, Time, Slot, FREQ[MHz], C.Offset[kHz], Lev.Av[dBm], Lev.Pk[dBm], SSID, EVM[%], GBAS ID, Train.FEC, App.Dat., App.FEC, BER, BER Recv. Bursts, BER Missed Bursts, Transm.Len, StartDelay[us], Sync. Seq.[us], GuardInterv[ms], GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], ATT.MODE, TrigCounter, GraphData, IQPosition, IQSamples, RawData

Full parameters

Channel, STIOCP, Index , Date, Slot, Time, FREQ[MHz], Lev.Av[dBm], SSID, GBAS ID, Train.FEC, App.Dat., App.FEC, GPS_lat., GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat, GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, Temp[°C], ATT.MODE, TrigCounter

Medium parameters

RX, STIOCP, Index , Time, Slot, C.Offset[kHz], Lev.Av[dBm], GBAS ID, Train.FEC, App.Dat., App.FEC, GPS_lat., GPS_long., TrigCounter

Short parameters

RX, Index, Time, Slot, Lev.Av[dBm], GBAS ID, App.Dat.,
GPS_lat., GPS_long.

9.11.3.7 NDB mode**All parameters**

RX, STIOCP,
Index, Date, Time, FREQ[kHz], IDFREQ[Hz], MEAS.F[kHz], LEVEL[dB ∇ V],
IMP[Ohm], CarLevChange[dB], AM-MOD/[%], AM-FREQ[Hz], ID-CODE,
ID-Per.[s], Last_ID[s], DotLen[ms], DashLen[ms], DotDashGap[ms],
Lettergap[ms], K2[%], K3[%], K4[%], THD[%], PSFC[%], GPS_lat.,
GPS_long., GPS_alt[m], GPS_speed[km/h], GPS_date, GPS_time, GPS_Sat,
GPS_Status, GPS_Fix, GPS_HDOP, GPS_VDOP, GPS_Und.[m], IF-BW[kHz],
MeasTime[ms], ATT.MODE, TrigCounter, I/Q_Position, I/Q_Samples

Medium parameters

RX, STIOCP,
Index, Date, Time, FREQ[kHz], IDFREQ[Hz], MEAS.F[kHz], LEVEL[dB ∇ V],
IMP[Ohm], AM-MOD/[%], AM-FREQ[Hz], ID-CODE, K2[%], K3[%], K4[%],
THD[%], PSFC[%], GPS_lat., GPS_long., MeasTime[ms], ATT.MODE

Short parameters

RX, STIOCP,
Index, FREQ[kHz], IDFREQ[Hz], MEAS.F[kHz], LEVEL[dB ∇ V], AM-MOD/[%],
AM-FREQ[Hz], ID-CODE

9.12 Information on commands**HELP?**

Returns a list of all remote commands available for the R&S EVSD1000, including a short description.

Return values:

<CommandList> List of commands, consisting of the command syntax and a short description.

Usage: Query only

10 Maintenance, storage and disposal

The product does not require regular maintenance. It only requires occasional cleaning. It is however advisable to check the nominal data from time to time.

Cleaning

Do not use any liquids for cleaning. Cleaning agents, solvents, acids and bases can damage the front panel labeling, plastic parts and display.

Lubrication

If necessary, or at the latest after 6 months, lubricate the sliding surfaces of the quick-release systems (R&S EVSD1-Z20 Drone adapter DJI M300 RTK) with silicone spray or similar.

Storage

Protect the product against dust. Ensure that the environmental conditions, e.g. temperature range and climatic load, meet the values specified in the data sheet.

10.1 Handling batteries

Safe handling of batteries is described in "[Handling batteries safely](#)" on page 7. Maintenance information is provided here.

Keep the batteries clean and dry. If the terminals become soiled, clean them with a dry, clean cloth.

Charging batteries

Charge the battery before using it for the first time. Following a long storage period, it can be necessary to charge and discharge the battery several times to reach full capacity. The battery can only be charged outside the R&S EVSD1000.

For information on replacing batteries, see "[Replacing batteries](#)" on page 30.

Look up the following details in the data sheet:

- Charging conditions
- Recharging interval to avoid deep discharge

Storing batteries

Ideally, store the battery in the product and follow the instructions in "[Storage](#)" on page 354. Otherwise, observe the following rules:

- Prevent short-circuiting of the batteries, which can happen if batteries touch each other or come into contact with metallic objects in the storage container. As storage container, you can use the product packaging.
- Do not expose to direct sunlight.

- Store the battery at room temperature.
- Store the battery at a state of charge between 50 % and 70 %.

10.2 Disposal

Rohde & Schwarz is committed to making careful, ecologically sound use of natural resources and minimizing the environmental footprint of our products. Help us by disposing of waste in a way that causes minimum environmental impact.

Disposing of electrical and electronic equipment

A product that is labeled as follows cannot be disposed of in normal household waste after it has come to the end of its life. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.



Figure 10-1: Labeling in line with EU directive WEEE

Rohde & Schwarz has developed a disposal concept for the eco-friendly disposal or recycling of waste material. As a manufacturer, Rohde & Schwarz completely fulfills its obligation to take back and dispose of electrical and electronic waste. Contact your local service representative to dispose of the product.

Disposing of batteries

A product that contains a battery cannot be disposed of in the normal household waste after it has come to the end of its service life. It is labeled as follows:



Figure 10-2: Disposal information in line with EU battery directive

Dispose of batteries as specified by the local waste disposal agency. Alternatively, you can contact the Rohde & Schwarz local service representative.

For information on returning batteries to Rohde & Schwarz subsidiaries, see "[Handling batteries safely](#)" on page 7.

11 Transporting

If you need to transport the instrument to another location, consider the following.

Packing

Use the original packaging material. It consists of antistatic wrap for electrostatic protection and packing material designed for the product.

If you do not have the original packaging, use similar materials that provide the same level of protection. You can also contact your local Rohde & Schwarz service center for advice.

Securing

When moving the product in a vehicle or using transporting equipment, make sure that the product is properly secured. Only use items intended for securing objects.

Transport altitude

The maximum transport altitude without pressure compensation is specified in the data sheet.

12 Contacting customer support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:



Figure 12-1: QR code to the Rohde & Schwarz support page

Annex

A ILS channel frequency list

The following table indicates the frequencies for the signals for specific ILS channels as defined by the International Civil Aviation Organization (ICAO).

Table A-1: ILS LOC and ILS GP - channel and frequency

ICAO Channel	Localizer mode Frequency (MHz)	Glidepath mode Frequency (MHz)
18X	108.10	334.70
18Y	108.15	334.55
20X	108.30	334.10
20Y	108.35	333.95
22X	108.50	329.90
22Y	108.55	329.75
24X	108.70	330.50
24Y	108.75	330.35
26X	108.90	329.30
26Y	108.95	329.15
28X	109.10	331.40
28Y	109.15	331.25
30X	109.30	332.00
30Y	109.35	331.85
32X	109.50	332.60
32Y	109.55	332.45
34X	109.70	333.20
34Y	109.75	333.05
36X	109.90	333.80
36Y	109.95	333.65
38X	110.10	334.40
38Y	110.15	334.25
40X	110.30	335.00
40Y	110.35	334.85
42X	110.50	329.60
42Y	110.55	329.45

ICAO Channel	Localizer mode Frequency (MHz)	Glidepath mode Frequency (MHz)
44X	110.70	330.20
44Y	110.75	330.05
46X	110.90	330.80
46Y	110.95	330.65
48X	111.10	331.70
48Y	111.15	331.55
50X	111.30	332.30
50Y	111.35	332.15
52X	111.50	332.90
52Y	111.55	332.75
54X	111.70	333.50
54Y	111.75	333.35
56X	111.90	331.10
56Y	111.95	330.95

B VOR channel frequency list

The following table indicates the frequencies for the signals for specific VOR channels as defined by the International Civil Aviation Organization (ICAO).

Table B-1: VOR - channel and frequency list

ICAO Channel	VOR Frequency (MHz)		ICAO Channel	VOR Frequency (MHz)		ICAO Channel	VOR Frequency (MHz)
17X	108.00		75X	112.80		103X	115.60
17Y	108.05		75Y	112.85		103Y	115.65
19X	108.20		76X	112.90		104X	115.70
19Y	108.25		76Y	112.95		104Y	115.75
21X	108.40		77X	113.00		105X	115.80
21Y	108.45		77Y	113.05		105Y	115.85
23X	108.60		78X	113.10		106X	115.90
23Y	108.65		78Y	113.15		106Y	115.95
25X	108.80		79X	113.20		107X	116.00
25Y	108.85		79Y	113.25		107Y	116.05
27X	109.00		80X	113.30		108X	116.10
27Y	109.05		80Y	113.35		108Y	116.15
29X	109.20		81X	113.40		109X	116.20
29Y	109.25		81Y	113.45		109Y	116.25
31X	109.40		82X	113.50		110X	116.30
31Y	109.45		82Y	113.55		110Y	116.35
33X	109.60		83X	113.60		111X	116.40
33Y	109.65		83Y	113.65		111Y	116.45
35X	109.80		84X	113.70		112X	116.50
35Y	109.85		84Y	113.75		112Y	116.55
37X	110.00		85X	113.80		113X	116.60
37Y	110.05		85Y	113.85		113Y	116.65
39X	110.20		86X	113.90		114X	116.70
39Y	110.25		86Y	113.95		114Y	116.75
41X	110.40		87X	114.00		115X	116.80
41Y	110.45		87Y	114.05		115Y	116.85
43X	110.60		88X	114.10		116X	116.90

ICAO Channel	VOR Frequency (MHz)		ICAO Channel	VOR Frequency (MHz)		ICAO Channel	VOR Frequency (MHz)
43Y	110.65		88Y	114.15		116Y	116.95
45X	110.80		89X	114.20		117X	117.00
45Y	110.85		89Y	114.25		117Y	117.05
47X	111.00		90X	114.30		118X	117.10
47Y	111.05		90Y	114.35		118Y	117.15
49X	111.20		91X	114.40		119X	117.20
49Y	111.25		91Y	114.45		119Y	117.25
51X	111.40		92X	114.50		120X	117.30
51Y	111.45		92Y	114.55		120Y	117.35
53Y	111.65		93Y	114.65		121X	117.40
55X	111.80		94X	114.70		121Y	117.45
55Y	111.85		94Y	114.75		122X	117.50
57X	112.00		95X	114.80		122Y	117.55
57Y	112.05		95Y	114.85		123X	117.60
53X	111.60		93X	114.60		123Y	117.65
58X	112.10		96X	114.90		124X	117.70
58Y	112.15		96Y	114.95		124Y	117.75
59X	112.20		97X	115.00		125X	117.80
59Y	112.25		97Y	115.05		125Y	117.85
70X	112.30		98X	115.10		126X	117.90
70Y	112.35		98Y	115.15		126Y	117.95
71X	112.40		99X	115.20			
71Y	112.45		99Y	115.25			
72X	112.50		100X	115.30			
72Y	112.55		100Y	115.35			
73X	112.60		101X	115.40			
73Y	112.65		101Y	115.45			
74X	112.70		102X	115.50			
74Y	112.75		102Y	115.55			

C References

- [1] RTCA DO-246, GNSS-Based Precision Approach Local Area Augmentation System (LAAS) Signal-in-Space Interface Control Document (ICD), July 2017
- [2] RTCA DO-217, Minimum aviation system performance standards DGNSS instrument approach system: Special Category I (SCAT-I), August 1996
- [3] ICAO AN10 Vol1, ICAO Annex 10, Aeronautical Telecommunications, Volume 1, July 2018

D Format description of GBAS and SCAT-I data

The Data Recorder records and manages the data captured during one or a series of measurements. Up to 999 lists with a maximum of 1 000 000 data lines each can be recorded. One line corresponds to the captured data at the receive frequency for the GBAS/SCAT-I signal in one time slot.

Similarly, a data stream consists of lines of measurement results, where one line corresponds to the captured data at the receive frequency for the GBAS/SCAT-I signal in one time slot.

You can also query a single measurement result, which corresponds to one row in the Data Recorder list.

In all three cases, the available parameters and their format are identical.



Which parameters are recorded is user-definable and can be defined individually for each list. The following overview describes all available parameters (full list) in their default order.

The format of the data for each slot is identical, regardless whether a parameter contains data or not. Thus, you can create a table from the exported comma-separated list. If a slot is empty, only the general data is stored in the list entry; the message-specific parameters are cropped.

When a list is stored to a file, a header line is automatically included that describes the provided parameters.

General Information

The following general information is always included, regardless whether the slot contains data or not, and whether the signal is GBAS or SCAT type.

Table D-1: General information for the individual slot

No.	Column	Description
	Channel	RF board 1 or 2
1	STIOCP	Status Flags: • S: Start (started manually) • T: Triggered (externally) • I: Invalid (power level not permitted or too low) • O: Overload (RF input signal too high) • C: Corrected (includes RF input correction factor) • P: PPS-synced (triggered by external PPS)
2	Index	Counts each measurement
3	Date	Date of measurement
4	Time	Time of measurement
5	Temp[°C]	Temperature on R&S EVSD1000 mainboard
6	SLOT	Time slot (A B C D E F G H)

No.	Column	Description
7	FREQ[MHz]	Receiving frequency
8	F_DEV[kHz]	Frequency deviation
9	LEVEL[dBm]	Level measured over the "Synchronization and Ambiguity Resolution" period of the GBAS/SCAT signal
10	SSID	Received Station ID, equivalent to GBAS ID or SCAT ID
11	Len[bit]	Length of the entire message block
12	Train.FEC	FEC of the training sequence
13	Applic.FEC	FEC of the data content
14	MBI	Message block identifier
15	MT 1	Message type 1 available (YES NO)
16	MT 4	Message type 4 available (YES NO)
17	GPS_lat.	Received GPS data
18	GPS_long.	
19	GPS_alt[m]	
20	GPS_speed[km/h]	
21	GPS_date	
22	GPS_time	
23	GPS_Sat	
24	GPS_Status	
25	GPS_Fix	
26	GPS_HDOP	
27	GPS_VDOP	
28	GPS_Dist[m]	Distance between GPS reference point and current GPS position
29	GPS_Angle[°]	Angle between GPS reference point and current GPS position
30	ATT.MODE	Attenuator mode during slot measurement (LN NORM LD) In AUTO mode: the used hardware setting

GBAS Signal - MT1

After the general information, if the slot contains a message type 1, the following burst data is provided for each of the up to 32 satellites (in "full" list only):

Table D-2: Decoded message type 1 data for the individual slot and each satellite (GBAS)

Column	Description
MT1 GBAS	Section label (separator in list)
MB CRC	

Column	Description
MB ID	Message block ID: 1010 1010: normal LAAS message (GBAS) 1111 1111: test LAAS message (GBAS)
Stat ID	Received Station ID, equivalent to GBAS ID or SCAT ID
MsgLen[byte]	
Z-Cnt[m:s]	
Add.Msg.Flag	
NrOfMeasn	
MeasnType	
EphDecorPar[m/m]	
EphemCrcMSB	
EphemCrcLSB	
SrcAvailDur[sec]	
SatID	
IOD	
PRC[m]	
RRCor[m/s]	
S_pr_gnd[m]	
DiffnprcB1[m]	
DiffnprcB2[m]	
DiffnprcB3[m]	
DiffnprcB4[m]	

For details on the correction data parameters, refer to the GBAS specification [1].

MT4

If the slot contains a message type 4, the following decoded message data is provided for each of the up to 15 FASDBs (in "full" list only):

Table D-3: Decoded message type 4 data for the individual slot and each FASDB (GBAS)

Column	Description
MT4 GBAS	Section label (separator in list)
MB CRC	
MB ID	Message block ID: 1010 1010: normal LAAS message (GBAS) 1111 1111: test LAAS message (GBAS)
Stat ID	Received Station ID, equivalent to GBAS ID or SCAT ID
MsgLen[byte]	

Column	Description
DataSetLen	
OpType	
SbasServProv	
AirportID	
RunwayNo	
RunwayLtr	
ApproachPerfDesig	
RouteInd	
RPDS	
RefPathID	
LTP_FTP_Lat[°]	
LTP_FTP_Long[°]	
LTP_FTP_Height[m]	
DeltaFPAP_Lat[°]	
DeltaFPAP_Long[°]	
TCH	
UnitTCH	
GPA[°]	
CourseWidth[m]	
DeltaLenOffset[m]	
VertAlertLim[m]	
LatrAlertLim[m]	
FASCRC	

SCAT-I Signal - MT1

After the general information, if the slot contains a message type 1, the following burst data is provided for each of the up to 32 satellites (in "full" list only):

Table D-4: Decoded message type 1 data for the individual slot and each satellite (SCAT-I)

Column	Description
MT1 SCAT	Section label (separator in list)
MB CRC	
MB ID	Message block ID: 1001 1001: SCAT-I
Stat ID	Received Station ID, equivalent to GBAS ID or SCAT ID
MsgLen[byte]	

Column	Description
Z-Cnt[m:s]	
Acc.Err.Bnd.[m/s*s]	
K_md_gnd	
SatID	
PRC[m]	
IOD	
RRCor[m/s]	
S_pr_gnd[m]	
B_pr_gnd[m]	
S_fail_gnd[m]	
B_fail_gnd[m]	
PRC[m]	

For details on the correction data parameters, refer to the SCAT-I specification [2].

MT4

If the slot contains a message type 4, the following decoded message data is provided for each of the up to 15 FASDBs (in "full" list only):

Table D-5: Decoded message type 4 data for the individual slot and each FASDB (SCAT-I)

Column	Description
MT4 DATA	Section label (separator in list)
MB CRC	
MB ID	Message block ID: 1001 1001: SCAT-I
Stat ID	Received Station ID, equivalent to GBAS ID or SCAT ID
MsgLen[byte]	
OpType	
AirportID	
RunwayNo	
RunwayLtr	
RouteInd	
ValInd	
RPDS	
RefPathID	
ThDP_Lat[°]	

Column	Description
ThDP_Long[°]	
ThDP_Height[m]	
DERP_LAT[°]	
DERP_Long[°]	
TCH[ft]	
GPA[°]	
FASCRC	

E Reference: Dimensions

E.1 Instrument dimensions

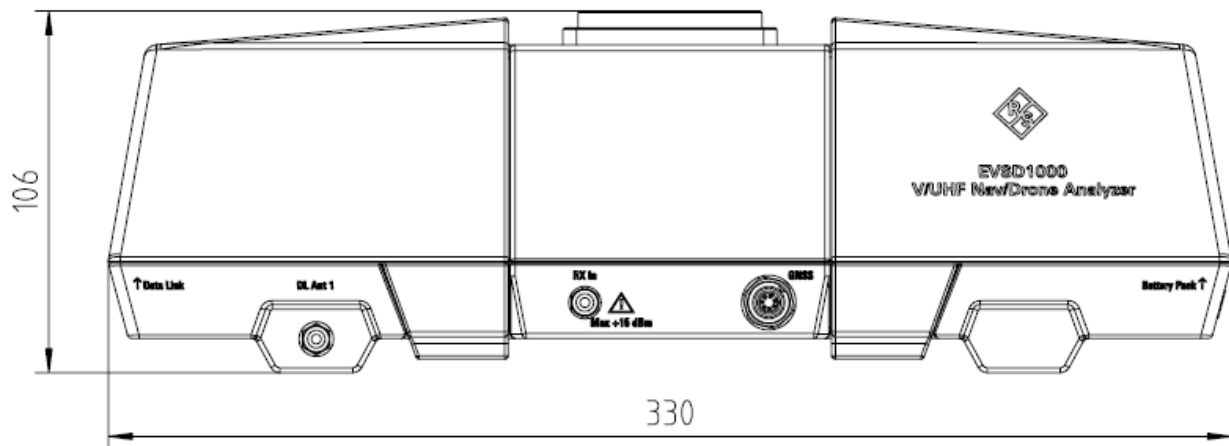


Figure E-1: Instrument dimensions (side view)

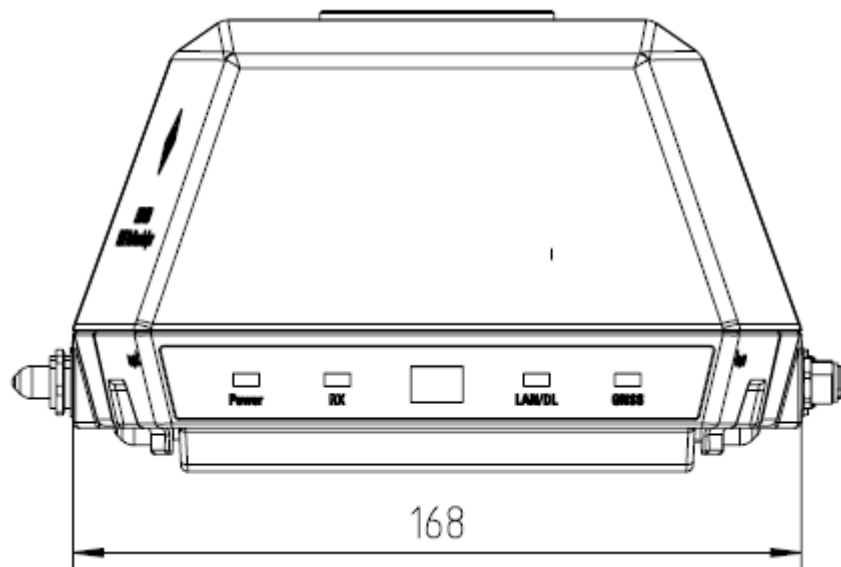


Figure E-2: Instrument dimensions (front view)

E.2 Dimensions for drone adapter

The R&S EVSD1000 is equipped with a mechanical adapter on its top panel to mount it to a drone.

To mount the R&S EVSD1000 on a customer-specific drone, create a customized adapter according to the following dimensions.

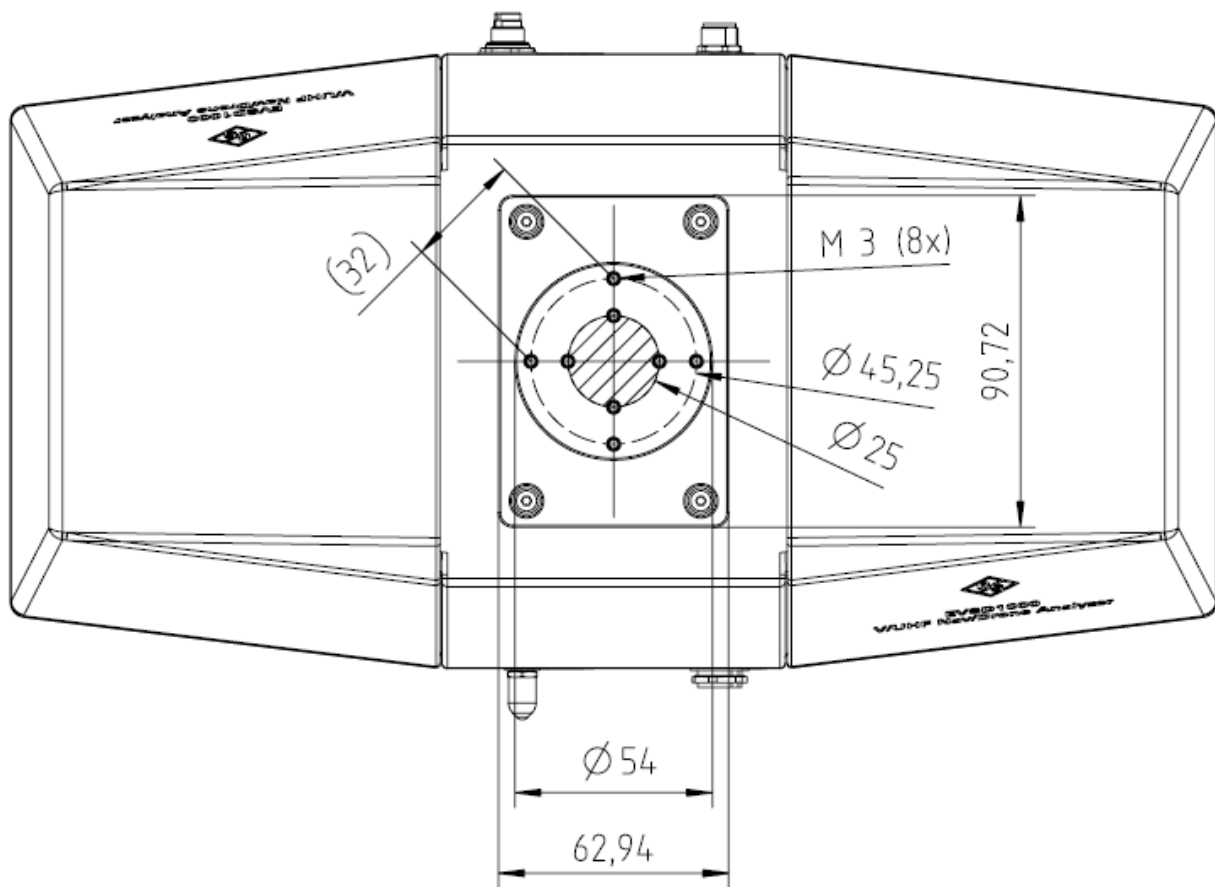


Figure E-3: Drone dimensions for adapter (top view)

Center of gravity

The center of gravity of the R&S EVSD1000 lies within the area indicated by $\varnothing 25$ in [Figure E-3](#). It remains within that area even if the optional components R&S EVSD1-Z1 Battery pack or R&S EVSD1-Z5 Data-link-module (Wi-Fi) are installed.

When creating a customized drone or antenna adapter, use the following drilling template to design the required holes for the fixed adapter of the R&S EVSD1000. Make sure to align the vertical or horizontal lines with the direction of flight.

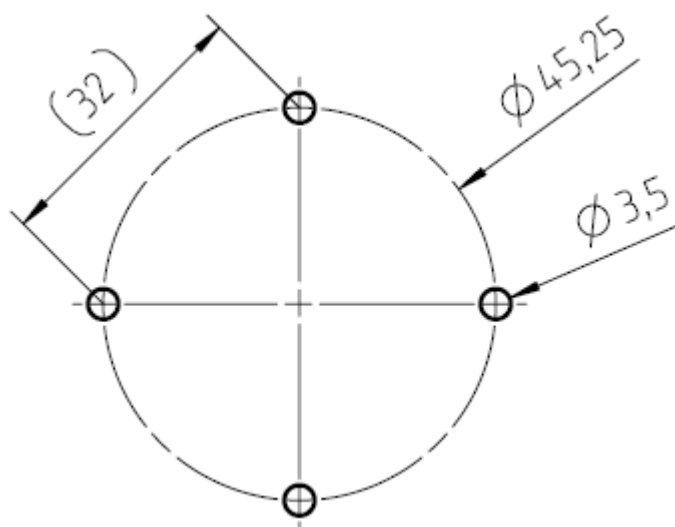


Figure E-4: Drilling template for antenna and drone adapter

E.3 R&S EVSD1-Z3 V/UHF antenna dimensions

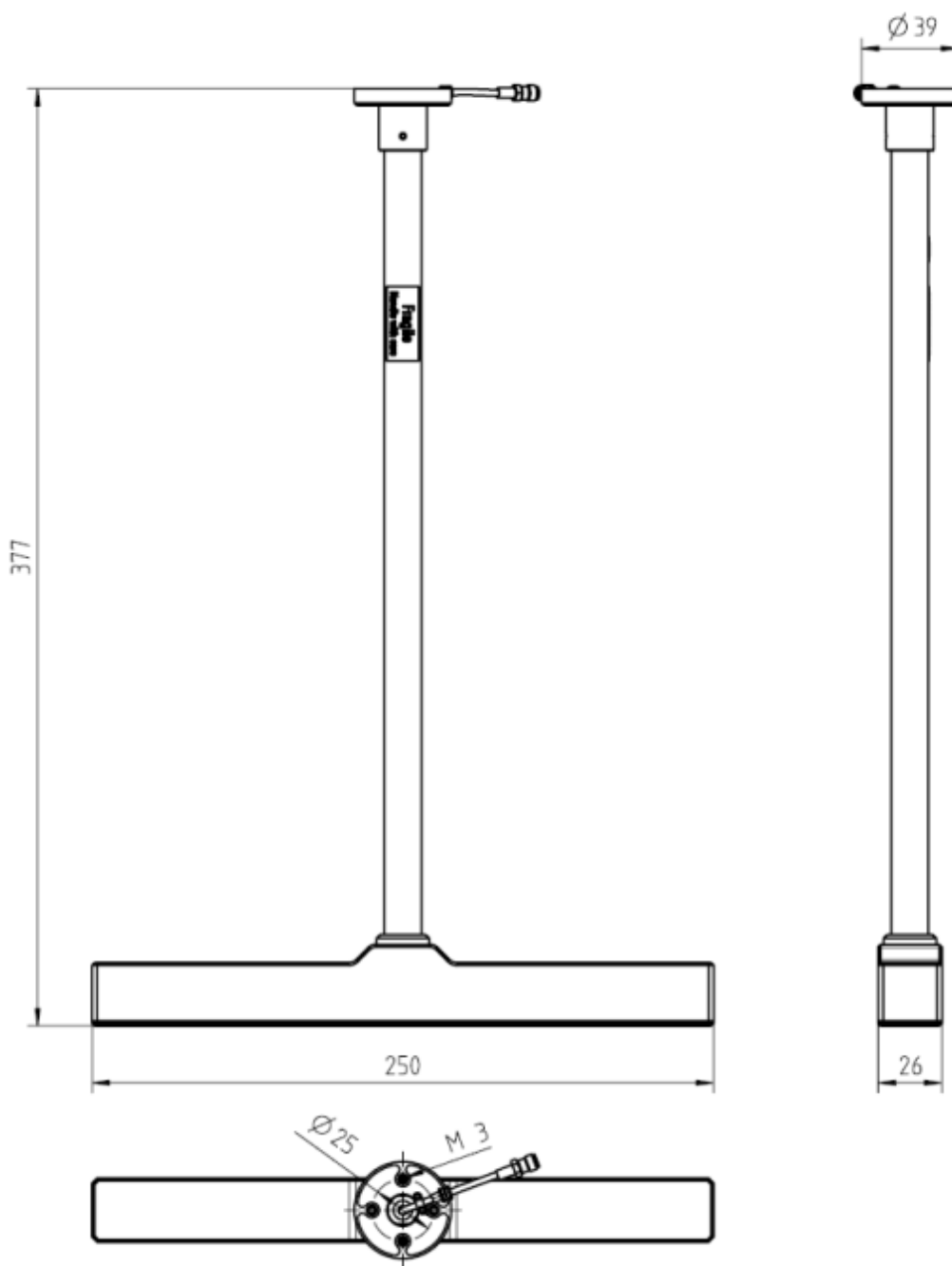


Figure E-5: R&S EVSD1-Z3 V/UHF antenna dimensions and fixing points

E.4 R&S EVSD1-Z6 GNSS RTK device dimensions

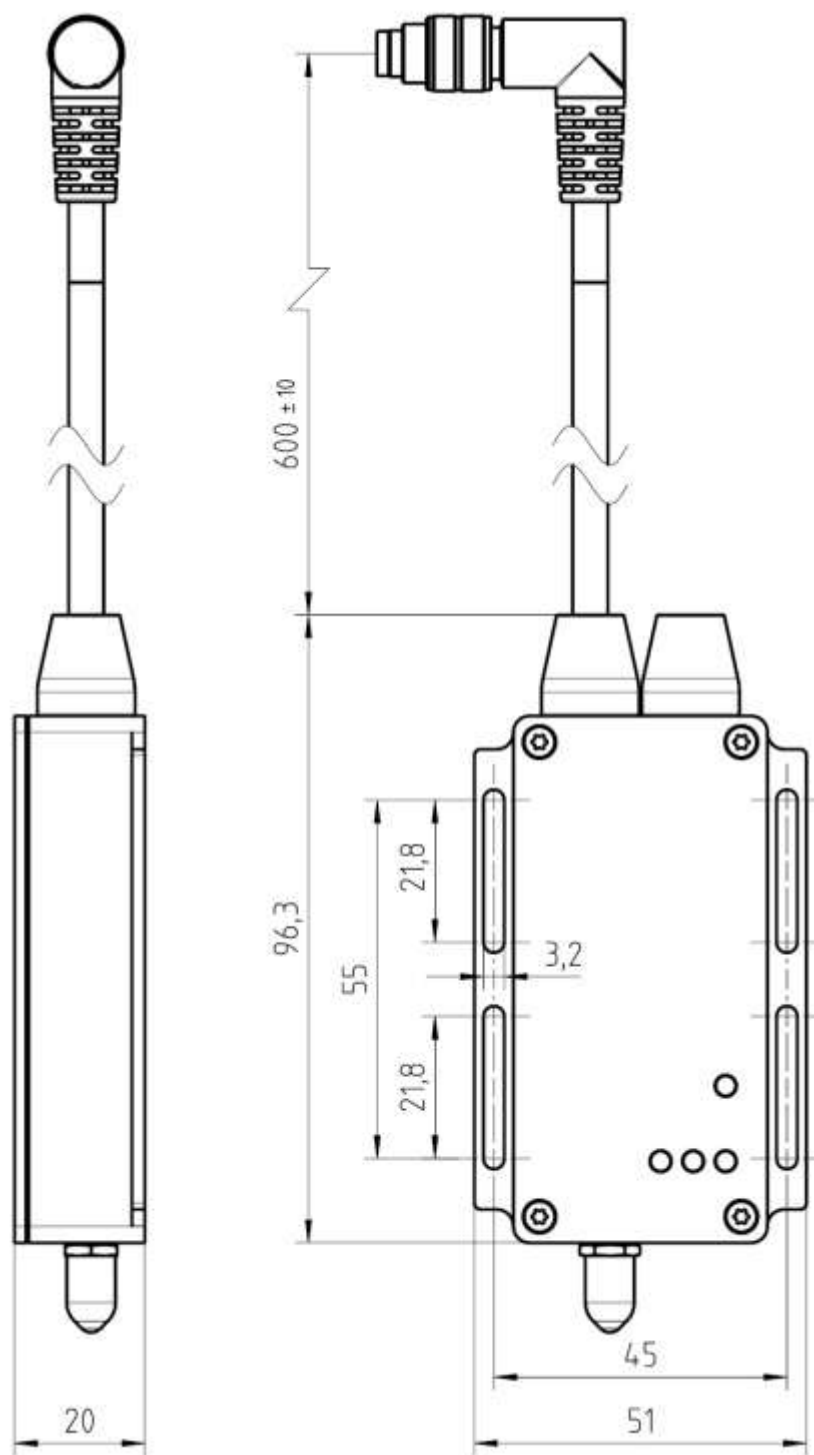


Figure E-6: R&S EVSD1-Z6 GNSS RTK device (rover)

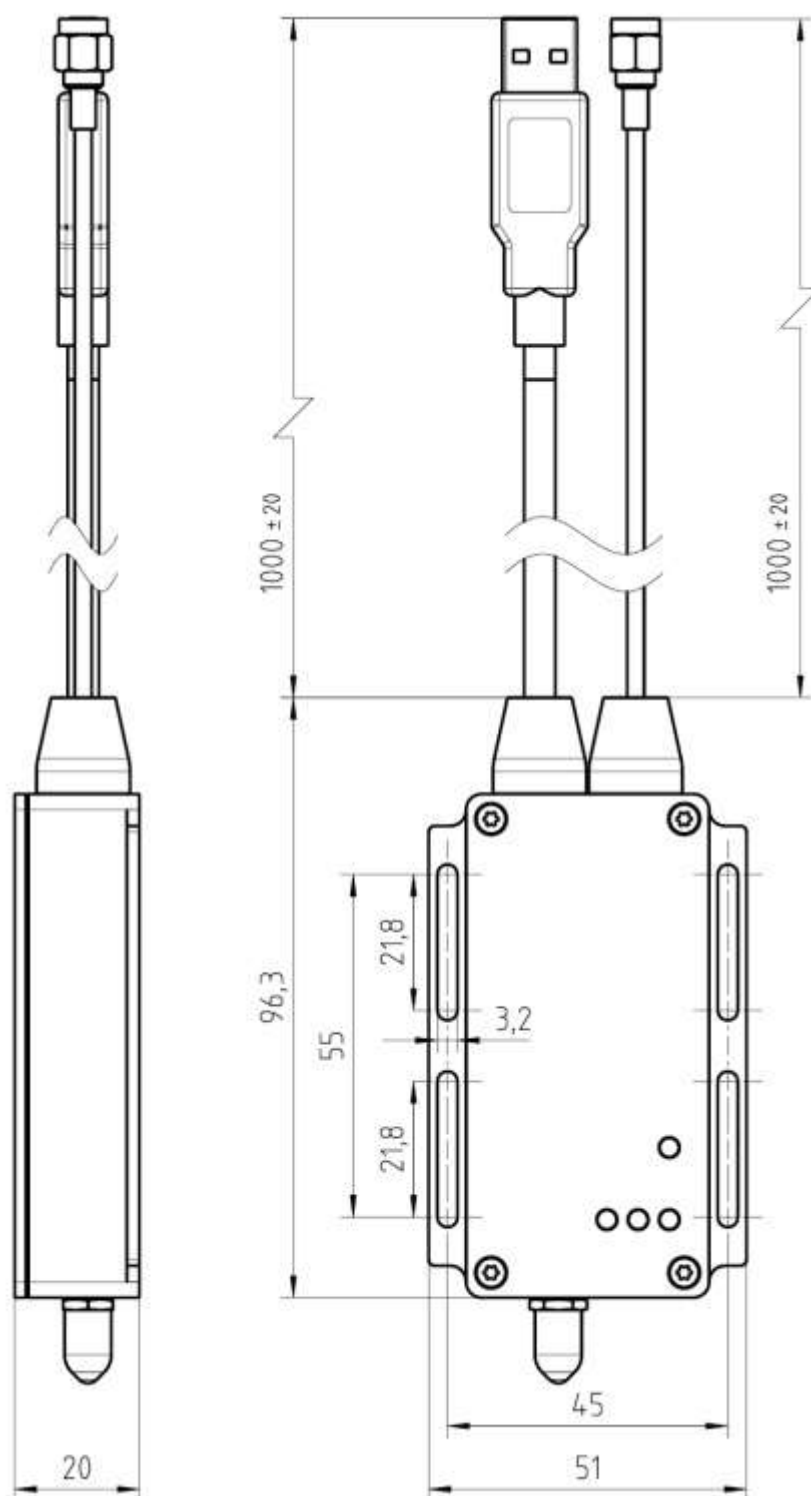


Figure E-7: R&S EVSD1-Z6 GNSS RTK device (base)

List of commands

*IDN?	253
AC8	271
AC8	293
AF0	293
AF1	293
AF2	271
AF2	294
AF3	271
AF4	285
AF5	285
AF6	285
AF7	285
AF8	272
AF8	294
AM0	294
AM1	294
AM2	272
AM2CLR	272
AM2CRS	272
AM3	272
AM3CLR	272
AM3CRS	273
AM4	285
AM5	286
AM6	286
AM7	286
AM8	273
AM8	294
AM9	273
AM9	294
AMFREQ_OFFSET_TX1	299
AMFREQ_OFFSET_TX1?	299
AMFREQ_OFFSET_TX2	299
AMFREQ_OFFSET_TX2?	299
AMMOD240	273
AUTOKALSTATUS	254
AUTOKALSTATUS_EXTENDED	254
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CH	234
CH?	234
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CLEARALLLISTS	343
CLEARERRORLOG	252
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COM_DEFAULT_FREQSTEP?	300
COM_DEMOD_BW_1F	300
COM_DEMOD_BW_1F?	300
COM_DEMOD_BW_2F	300
COM_DEMOD_BW_2F?	300
COM_TONEFREQ_1K01K2	300
COM_TONEFREQ_1K01K2?	300
COM_TRIG_EDGE	301
COM_TRIG_EDGE?	301
COM_TRIG_SOURCE	301
COM_TRIG_SOURCE?	301
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DD1	274
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DEMODE_LLZ	258
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DJI:APPID	243
DJI:BAUDRATE	243
DJI:INTERFACE	243
DJI:KEY	243
DL_START	341
DL_STOP	341
FA0	281
FA0	288
FA0	297
FA1	281
FA2	281
FA2	288
FA2	297
FA3	281
FA4	282
FA5	282
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FCLR	274
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FFT_ATTMODE	331
FFT_ATTMODE?	331
FFT_BB_IF_BW_KHZ	331
FFT_BB_IF_BW_KHZ?	331
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FFT_FREQ_CENTER?	332
FFT_FREQ_SPAN	332
FFT_FREQ_SPAN?	332
FFT_FREQ_START	332

FFT_FREQ_START?	332
FFT_FREQRF	333
FFT_FREQRF?	333
FFT_FREQSTOP	333
FFT_FREQSTOP?	333
FFT_GETSPECT	336
FFT_GRID_YRANGE_DB	333
FFT_GRID_YRANGE_DB?	333
FFT_IF_BW_KHZ	333
FFT_IF_BW_KHZ?	333
FFT_RESBW_AUTO	334
FFT_RESBW_AUTO?	334
FFT_RESBW_FIX_KHZ	334
FFT_RESBW_FIX_KHZ?	334
FFT_TRACE_AVRGCOUNT	335
FFT_TRACE_AVRGCOUNT?	335
FFT_TRACE_MODE?	335
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FILTER_GS_RESIDFM?	269
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FSCAN_FREQCENTER	322
FSCAN_FREQCENTER?	322
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FSCAN_FREQSPAN?	322
FSCAN_FREQSTART	323
FSCAN_FREQSTART?	323
FSCAN_FREQSTOP	323
FSCAN_FREQSTOP?	323
FSCAN_GETSPECT	325
FSCAN_GRID_YRANGE_DB	323
FSCAN_GRID_YRANGE_DB?	323
FSCAN_REFLEVEL	323
FSCAN_REFLEVEL?	323
FSCAN_RES_BW	324
FSCAN_RES_BW?	324
FSCAN_RESBW_AUTO	324
FSCAN_RESBW_AUTO?	324
FSCAN_TRACE_AVRGCOUNT	325
FSCAN_TRACE_AVRGCOUNT?	325
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GET_ONE_AMMOD_1_0.....	304
GET_ONE_AMMOD_1_2.....	304
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GET_ONE_SINAD_1_2.....	305
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GET_ONE_THD_1_2.....	305
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GET_THD_1K2.....	305
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GET_TX1_AMMOD_1_2.....	306
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GET_TX1_MEASFREQ.....	307
GET_TX1_SINAD_1_0.....	307
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GET_TX1_THD_1_0.....	307
GET_TX1_THD_1_2.....	307
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GET_TX2_AMFREQ_1_2.....	308
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GET_TX2_AMMOD_1_2.....	308
GET_TX2_LEVEL.....	308
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GET_TX2_SINAD_1_0.....	308
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GS_DEM_ID_WIDE_BW?.....	267
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GS_DEMFREQS_OFFSET_1F?.....	268
GS_DEMFREQS_OFFSET_AUTOMAN.....	267
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GS_TRIG_SOURCE?.....	270
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IFSPECT_RESBW_AUTO.....	328
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LA?.....	312
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LLZ_CARRIER_THRESHOLD_DB?.....	259
LLZ_DEFAULT_FREQSTEP.....	259
LLZ_DEFAULT_FREQSTEP?.....	259
LLZ_DEM_1F2F_BW.....	260
LLZ_DEM_1F2F_BW?.....	260
LLZ_DEM_ID_BW.....	259
LLZ_DEM_ID_BW?.....	259
LLZ_DEM_ID_WIDE_BW.....	260
LLZ_DEM_ID_WIDE_BW?.....	260
LLZ_DEM_WIDE_BW.....	260
LLZ_DEM_WIDE_BW?.....	260
LLZ_DEMFREQS_OFFSET_1F.....	261
LLZ_DEMFREQS_OFFSET_1F?.....	261
LLZ_DEMFREQS_OFFSET_AUTOMAN.....	261
LLZ_DEMFREQS_OFFSET_AUTOMAN?.....	261
LLZ_DEMFREQS_OFFSET_LOWERFREQ.....	261
LLZ_DEMFREQS_OFFSET_LOWERFREQ?.....	261
LLZ_DEMFREQS_OFFSET_UPPERFREQ.....	262
LLZ_DEMFREQS_OFFSET_UPPERFREQ?.....	262
LLZ_ID_STAT.....	262
LLZ_ID_STAT?.....	262
LLZ_START_FINDCARRIER.....	262
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MB_DEFAULT_FREQSTEP?	283
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MB_DEM_BW?	283
MB_TRIG_EDGE	283
MB_TRIG_EDGE?	283
MB_TRIG_SOURCE	284
MB_TRIG_SOURCE?	284
MEASMODE	280
MEASMODE?	280
MEASTIME	232
MEASTIME?	232
MI	256
MLOC	242
MODE_COM	298
MODE_FFT	331
MODE_FSCAN	321
MODE_GBAS	312
MODE_GP	257
MODE_IFSPECT	326
MODE_LOC	257
MODE_MB	283
MODE_SCOPE	336
MODE_VOR	289
MV	257
OPTIONGETCHECKED	253
PH	276
PH_90_90	276
PH_150_150	276
PPSSMA_TRIG_SOURCE	343
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