

S9110E Multiband Vector Transceiver

1 MHz to 49 GHz



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System Performance

Conditions

Information and data contained in this data sheet is subject to change without notice.

In addition to the following conditions, the S9110E system performance, documented in this data sheet, is valid for an ambient temperature of 25 °C unless otherwise noted.

- The system is within its calibration cycle.
- The system has been stored at an ambient temperature within the allowed operating range for at least two hours before being powered on.
- The system has been powered on continuously for at least 45 minutes warm-up time, with the IQ Analyzer or X-Series application (e.g. 5G NR) running, and the M1749B mmWave transceiver powered on (verify that LEDs are on, refer to “Time since start up” on base box GUI). If the system met these warm-up requirements and there is a brief power shutdown, such as a system reboot, allow 20 minutes of warm-up time after the system is powered back on.
- The alignments have been run in order of “Align Now All”, “Align LO Clock Synchronization”, “Align IF Cable” and “Align RRH Amplitude” for the first use, after the warm-up period.
- For F49, the alignments have been run in order of “Align Now All”, “Align IF Cable”, “Align RRH LO Power” and “Align RRH Amplitude”, after the warm-up period:
 - If more than 7 days have elapsed since the previous “Align Now All” alignment.
 - If more than 30 days have elapsed since the previous “Align IF Cable”, “Align RRH LO Power” or “Align RRH Amplitude” alignments.
- A “Alignment Fast” has been run within the previous 8 hours.
- The alignments have been run in order of “Align Now All”, “Align IF Cable” and “Align RRH Amplitude”, if IF cables have been disconnected, reconnected, moved or replaced.
- Corresponding alignment have been run if the base box / RRH internal temperature has changed more than 5 °C from when the previous same alignment was performed.

Characteristics

- The characteristics provided in this data sheet for operation at or below 26.5 GHz are a subset of the specifications for the Keysight M9471A PXIe Vector Transceiver module. For the most recent detailed performance information, refer to the M9471A Data Sheet (literature no. [3123-1722EN](#)). Note that the performance characteristics in that data sheet apply at the input/output connectors of the M9471A module, but in the S9110E system, there is approximately 0.25 to 0.5 dB of insertion loss between the S9110E front panel connectors and the M9471A due to the M9155C switch module and cabling.
- The sub 26.5 GHz amplitude characteristics in this data sheet include the effects of the added system insertion loss.

Definitions

Typical (typ)	Describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95% of the units exhibit with a 95% confidence level at room temperature (approximately 25 °C). Typical performance does not include measurement uncertainty. Typical performance is not warranted.
Nominal (nom)	Describes the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ω connector. This data is measured at room temperature (approximately 25 °C). Nominal performance is not warranted.
Measured (meas)	Describes an attribute measured during the design phase for purposes of communicating expected performance, such as amplitude drift vs. time. This data is measured at room temperature (approximately 25 °C). Measured performance is not warranted.

Recommended best practices

- Set chassis fan to high at environmental temperatures above 35 °C.

S9110E Standard Configurations

This data sheet contains system performance for the S9110E system that is available in two standard configurations with multiple input and output connectors. Each configuration is also specified with extended frequency ranges:

Standard configuration		High frequency extension option	Low frequency extension
S9110E-TR1	One RF and mmWave transceiver channel	Option F49, enabled by M1749B	Option LFE
S9110E-TR2	Two RF and mmWave transceiver channels	Option F49, enabled by M1749B	Option LFE

- Keysight S9110E-TR1 Multiband Vector Transceiver: one-channel base system configuration
- Keysight S9110E-TR2 Multiband Vector Transceiver: two-channel base system configuration
- Option F49: mmWave Transceiver Range 22.7 – 49.2 GHz
- Option LFE: Low frequency extension for 1 MHz

S9110E connectors (ports 1 to 6)

Note: Please refer to figures 1 through 3 below for locations of the referenced connections.

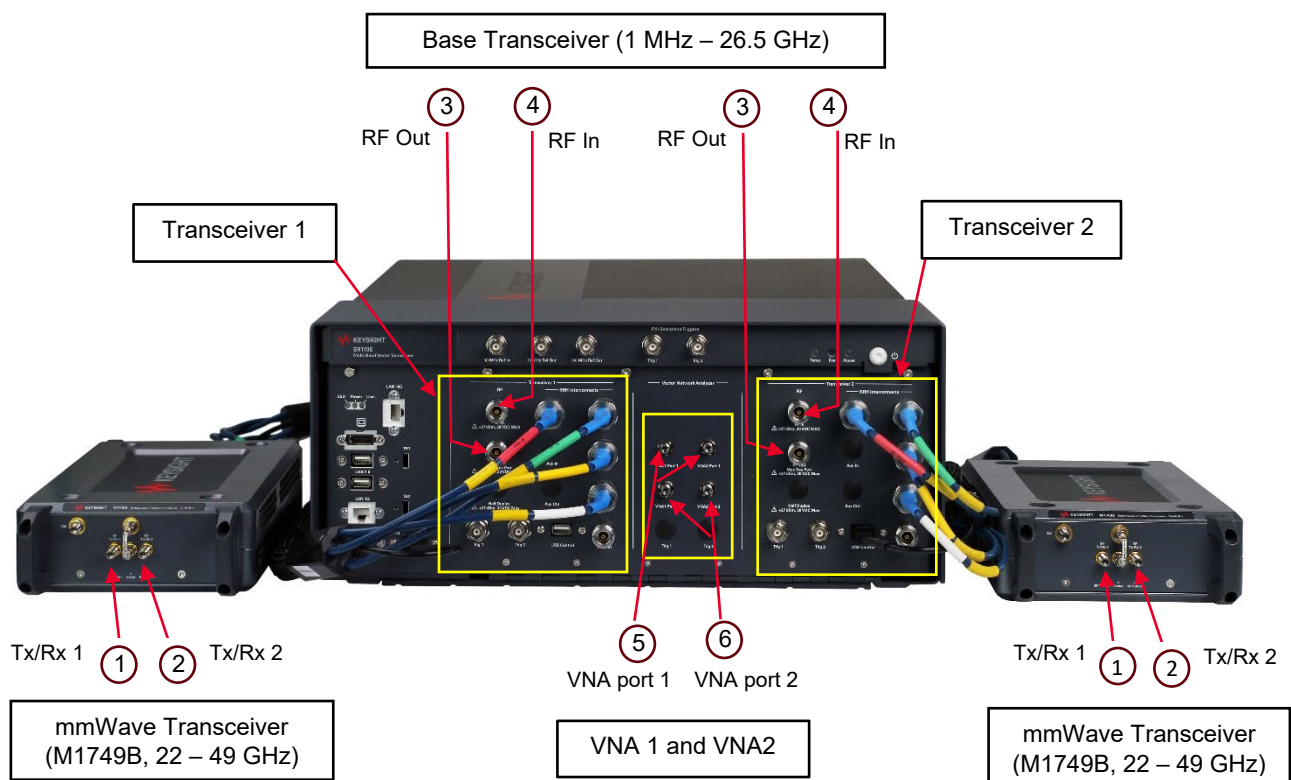


Figure 1. S9110E Multiband Vector Transceiver configurations

Each S9110E standard configuration has a different set of output and input connectors (ports):

- When ordering one S9110E-TR1 with option F49, you get one-channel standard configuration:
 - mmWave ports on the M1749B mmWave transceiver that are **RF Tx/Rx 1 ①** and **RF Tx/Rx 2 ②**
 - RF ports on the base instrument that are **RF Out ③** and **RF In ④**
- When ordering one S9110E-TR2 with option F49, you get two-channel standard configuration:
 - mmWave ports on the M1749B mmWave transceiver that are **RF Tx/Rx 1 ①** and **RF Tx/Rx 2 ②**
 - RF ports on the base instrument that are **RF Out ③** and **RF In ④**
- When adding an VNA (NA1) on top of either TR1 or TR2, you get one 2-port vector network analyzer, that are VNA port 1 ⑤ and VNA port 2 ⑥. If you need add the second VNA, order at S9110E(U)-NA2

Vector Signal Analyzer (Rx) Performance

Performance		
Capture depth	512 MSa	
Frequency		
	Frequency range	
All S9110E standard configurations RF Transceiver connectors RF In ④	380 MHz to 26.5 GHz Starting frequency extends to 10 MHz with option LFE, tunable to 1 MHz	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	22.7 to 49.2 GHz, settable	
	Frequency reference	
Accuracy, aging rate, stability	Refer to Frequency Reference information in General Performance section.	
Signal analysis bandwidth		
	Center frequency	Maximum bandwidth (nominal)
All S9110E standard configurations RF Transceiver connectors RF In ④	1 to 380 MHz	40 MHz ¹
	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 1.9 GHz	600 MHz
	1.9 to 26.5 GHz	1.2 GHz
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	22.7 to 24.2 GHz	100 MHz
	24.2 to 24.3 GHz	800 MHz
	24.3 to 49.2 GHz	1.2 GHz
Amplitude range		
	Frequency range	Settable input level ranges
All S9110E standard configurations RF Transceiver connectors RF In ④	380 MHz to 26.5 GHz	–150 dBm to +27 dBm
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	22.7 to 49.2 GHz	–100 dBm to +100 dBm ²

1. Bandwidth reduces as 1 MHz edge frequency is approached. For the maximum bandwidth below center frequency 80 MHz, refer to [M9471A data sheet](#).
2. This is settable input range in instrument software. For actual maximum allowed input level, refer to “Amplitude” specification of “RF Tx/Rx 1 and RF Tx/Rx 2” section of M1749B.

Absolute amplitude accuracy (CW mode)			
	Frequency range	Level	Accuracy (nominal)
All S9110E standard configurations Transceiver connectors RF In ④	10 to 380 MHz	–50 to 0 dBm	≤ ± 0.4 dB
	380 MHz to 26.5 GHz	–50 to 0 dBm	≤ ± 0.5 dB
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	Level	Accuracy (nominal)
	22.7 to 49.2 GHz	–50 to –10 dBm	≤ ± 1.4 dB
		–10 to –5 dBm	≤ ± 0.95 dB
VSWR			
	Frequency range	VSWR nominal	
All S9110E standard configurations Transceiver connectors RF In ④	10 to 380 MHz	2.1	
	380 MHz to 9 GHz	1.9	
	9 to 26.5 GHz	2.3	

Linearity (CW mode) (reference power level is -5 dBm)

	Frequency range	Input level	Linearity (nominal)
All S9110E standard configurations Transceiver connectors RF In ④	10 to 380 MHz	-50 to 0 dBm	$\leq \pm 0.4$ dB
	380 MHz to 5 GHz	-50 to 0 dBm	$\leq \pm 0.21$ dB
	5 to 26.5 GHz	-50 to 0 dBm	$\leq \pm 0.3$ dB
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	Input level	Linearity (nominal)
	22.7 – 49.2 GHz	-50 to -20 dBm	$\leq \pm 1.0$ dB
		-20 to -5 dBm	$\leq \pm 0.75$ dB

Scale fidelity (CW mode)

	Frequency range	Input level	Scale fidelity (nominal)
All S9110E standard configurations Transceiver connectors RF In ④	10 to 380 MHz	-50 to -30 dBm	$\leq \pm 0.15$ dB
		-30 to 0 dBm	$\leq \pm 0.05$ dB
	380 MHz to 5 GHz	-50 to -30 dBm	$\leq \pm 0.3$ dB
		-30 to 0 dBm	$\leq \pm 0.1$ dB
	5 to 26.5 GHz	-50 to -30 dBm	$\leq \pm 0.6$ dB
		-30 to 0 dBm	$\leq \pm 0.1$ dB
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	Input level	Scale fidelity (nominal)
	22.7 – 49.2 GHz	-50 to -30 dBm	$\leq \pm 0.9$ dB
		-30 to -5 dBm	$\leq \pm 0.3$ dB

IF Flatness

M1749B: The center frequency can be set > than 48.6 GHz, but bandwidth will be reduced as 49.2 GHz is approached.

	Frequency range	Bandwidth	Flatness (nominal)
All S9110E standard configurations RF Transceiver connectors RF In ④	10 to 380 MHz	40 MHz	± 0.6 dB
		40 MHz	± 0.5 dB
	380 to 550 MHz	40 MHz	± 0.5 dB
		100 MHz	± 0.5 dB
	550 MHz to 1.31 GHz	40 MHz	± 0.5 dB
		100 MHz	± 0.5 dB
		200 MHz	± 0.5 dB
		200 MHz	± 0.5 dB
	1.31 to 1.9 GHz	400 MHz	± 0.8 dB
		600 MHz	± 0.8 dB
		200 MHz	± 0.5 dB
		400 MHz	± 0.8 dB
	1.9 to 3 GHz	600 MHz	± 0.8 dB
		800 MHz	± 0.8 dB
		1.2 GHz	± 0.8 dB
		400 MHz	± 0.8 dB
	3 to 5 GHz	600 MHz	± 0.9 dB
		800 MHz	± 0.9 dB
		1.2 GHz	± 1.0 dB
		400 MHz	± 0.5 dB
	5 to 18 GHz	600 MHz	± 0.5 dB
		800 MHz	± 0.6 dB
		1.2 GHz	± 0.8 dB
		400 MHz	± 0.5 dB
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	18 to 25.5 GHz	600 MHz	± 0.6 dB
		800 MHz	± 0.7 dB
		1.2 GHz	± 0.9 dB
		400 MHz	± 0.4 dB
	25.5 to 26.5 GHz	600 MHz	± 0.6 dB
		800 MHz	± 0.7 dB
		1.2 GHz	± 0.8 dB
	Frequency range	Bandwidth	Flatness (nominal)
	24.3 to 48.6 GHz	1.2 GHz	± 1.3 dB

Error Vector Magnitude (EVM) nominal

Test signal: FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM, loopback; Test signal: FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM, loopback

All S9110E standard configurations RF Transceiver connectors RF In ④ Input power range –20 to 0 dBm	Center Frequency	100 MHz bandwidth		400 MHz bandwidth		8 x100 MHz bandwidth	
	4 GHz	–50 dB		–45 dB		–39 dB	
	5 GHz	–47 dB		–44 dB		–39 dB	
	7 GHz	–47 dB		–45 dB		–43 dB	
	12 GHz	–47 dB		–43 dB		–39 dB	
	15 GHz	–47 dB		–41 dB		–40 dB	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	100 MHz bandwidth		400 MHz bandwidth		8x100 MHz bandwidth	
	22.7 to 49.2 GHz	Input power	EVM	Input power	EVM	Input power	EVM
		–40 to –35 dBm	–38 dB	–40 to –30 dBm	–33 dB	–40 to –25 dBm	–29 dB
		–35 to –5 dBm	–41 dB	–30 to –5 dBm	–40 dB	–25 to 0 dBm	–38 dB

Test signal: Custom DFT–S OFDM, 1000 MHz bandwidth, loopback, nominal

All S9110E standard configurations RF Transceiver connectors RF In ④	Frequency range	EVM (nominal)	
	2 to 26 GHz	–10 dB, –40 to –30 dBm input power	
		–20 dB, –30 to –20 dBm input power	
		–29 dB, –20 to –10 dBm input power	
		–37 dB, –10 to 0 dBm input power	
		–33 dB, 0 to 5 dBm input power	
		–17 dB, 5 to 10 dBm input power	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	EVM (nominal)	
	22.7 to 49.2 GHz	≤ –29 dB, –40 to –30 dBm input power	
		≤ –37 dB, –30 to –20 dBm input power	
		≤ –39 dB, –20 to –10 dBm input power	
		≤ –39 dB, –10 to –5 dBm input power	

Test signal: DVB–S2X, 500 MHz bandwidth, loopback, nominal; Equalizer filter length: 51; EVM normalization reference: Reference RMS

All S9110E standard configurations RF Transceiver connectors RF In ④	Frequency range	EVM (nominal)	
	2 to 26 GHz	–18 dB, –40 to –30 dBm input power	
		–23 dB, –30 to –20 dBm input power	
		–32 dB, –20 to –10 dBm input power	
		–36 dB, –10 to 0 dBm input power	
		–35 dB, 0 to 5 dBm input power	
		–22 dB, 5 to 10 dBm input power	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	EVM (nominal)	
	22.7 to 49.2 GHz	≤ –32 dB, –40 to –30 dBm input power	
		≤ –40 dB, –30 to –20 dBm input power	
		≤ –42 dB, –20 to –10 dBm input power	
		≤ –42 dB, –10 to –5 dBm input power	

Adjacent Channel Leakage Ratio (ACLR) nominal

All S9110E standard configurations RF Transceiver connectors RF In ④ Input power –20 to 0 dBm, 256QAM, loopback	Bandwidth	ACLR (nominal)					
	100 MHz BW	–56 dBc at 4 GHz, –54 dBc at 7 GHz, –52 dBc at 18 GHz					
	400 MHz BW	–49 dBc at 4 GHz, –49 dBc at 7 GHz, –46 dBc at 18 GHz					
	8 x 100 MHz BW	–45 dBc at 4 GHz, –46 dBc at 7 GHz, –42 dBc at 18 GHz					
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ② Frequency range 22.7 to 49.2 GHz Input signal: 256QAM, loopback	Bandwidth	ACLR (nominal)					
		Input power	ACLR	Input power	ACLR	Input power	ACLR
	100 MHz BW	–40 to –25 dBm	–47 dBc	–25 to –5 dBm	–50 dBc		
	400 MHz BW	–40 to –25 dBm	–41 dBc	–25 to –10 dBm	–43 dBc	–10 to –5 dBm	–41 dBc
	8 x 100 MHz	–40 to –30 dBm	–38 dBc	–30 to –5 dBm	–41 dBc		

Displayed Average Noise Level (DANL) , in IQ analyzer mode

All S9110E standard configurations RF Transceiver connectors RF In ④ Analyzer ranged to -70 dBm, LNA on	Frequency range	DANL (nominal)
	10 to 60 MHz	-159 dBm/Hz
	60 to 380 MHz	-169 dBm/Hz
	380 MHz to 5 GHz	-165 dBm/Hz
	5 to 9 GHz	-166 dBm/Hz
	9 to 12 GHz	-162 dBm/Hz
	12 to 17.5 GHz	-162 dBm/Hz
	17.5 to 20 GHz	-160 dBm/Hz
	20 to 25 GHz	-157 dBm/Hz
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ② Analyzer ranged to -70 dBm	Frequency range	DANL (nominal)
	22.7 to 23.5 GHz	-166 dBm/Hz
	23.5 to 24.4 GHz	-167 dBm/Hz
	24.4 to 24.9 GHz	-166 dBm/Hz
	24.9 to 29 GHz	-167 dBm/Hz
	29 to 31 GHz	-165 dBm/Hz
	31 to 32 GHz	-167 dBm/Hz
	32 to 34.8 GHz	-165 dBm/Hz
	34.8 to 37.5 GHz	-163 dBm/Hz
	37.5 to 38.5 GHz	-165 dBm/Hz
	38.5 to 43 GHz	-162 dBm/Hz
	43 to 46 GHz	-163 dBm/Hz
	46 to 48 GHz	-160 dBm/Hz
	48 to 49.2 GHz	-162 dBm/Hz

Residual response

Analyzer ranged to 0 dBm, offset from 10 MHz to $\frac{1}{2} \times$ analysis bandwidth, nominal

All S9110E standard configurations RF Transceiver connectors RF In ④	Frequency range	Residual response (nominal)
	80 MHz to 4 GHz	–93 dBm
	4 to 5 GHz	–79 dBm
	5 to 10 GHz	–87 dBm
	10 to 13.6 GHz	–80 dBm
	13.6 to 14.9 GHz	–76 dBm
	14.9 to 17.1 GHz	–88 dBm
	17.1 to 18.7 GHz	–82 dBm
	18.7 to 21.3 GHz	–86 dBm
	21.3 to 22.4 GHz	–73 dBm
	22.4 to 25.9 GHz	–81 dBm
	25.9 to 26.5 GHz	–70 dBm
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	Residual response (nominal)
	22.7 to 24.3 GHz	–97 dBm
	24.3 to 26.8 GHz	–69 dBm
	26.8 to 28.0 GHz	–93 dBm
	28.0 to 29.1 GHz	–76 dBm
	29.1 to 33.3 GHz	–87 dBm
	33.3 to 33.6 GHz	–59 dBm
	33.6 to 41.0 GHz	–84 dBm
	41.0 to 42.5 GHz	–74 dBm
	42.5 to 47.3 GHz	–86 dBm
	47.3 to 49.2 GHz	–81 dBm

Vector Signal Generator (Tx) Performance

Performance				
ARB depth		512 MSa		
Frequency				
		Frequency range		
M1749B mmWave connectors RF Tx/Rx 1 ❶ and RF Tx/Rx 2 ❷		22.7 to 49.2 GHz, settable		
All S9110E standard configurations RF Transceiver connectors RF Out ❸		380 MHz to 26.5 GHz Starting frequency down to 10 MHz with option LFE, tunable to 1 MHz		
		Frequency reference		
Accuracy, aging rate, stability		Refer to Frequency Reference information in General Performance section.		
Signal generation bandwidth				
All S9110E standard configurations RF Transceiver connectors RF Out ❸	Center frequency		Maximum bandwidth (nominal)	
	1 to 380 MHz		40 MHz ¹	
	380 to 550 MHz		100 MHz	
	550 MHz to 1.31 GHz		200 MHz	
	1.31 to 1.9 GHz		600 MHz	
	1.9 to 26.5 GHz		1.2 GHz	
M1749B mmWave connectors RF Tx/Rx 1 ❶ and RF Tx/Rx 2 ❷	22.7 to 24.2 GHz		100 MHz	
	24.2 to 24.3 GHz		800 MHz	
	24.3 to 49.2 GHz		1.2 GHz	
Amplitude range				
		Frequency range	Settable amplitude range	
S9110E option TR1 or TR2 RF transceiver connectors RF Out ❸		10 MHz to 26.5 GHz	CW: –120 dBm to +20 dBm Modulated: Depends on Crest Factor	
M1749B mmWave connectors RF Tx/Rx 1 ❶ and RF Tx/Rx 2 ❷		22.7 GHz – 49.2 GHz	CW: –70dBm to +10 dBm Modulated: –40 dBm to +5 dBm	
VSWR				
S9110E option TR1 or TR2 RF transceiver connectors RF Out ❸	Frequency range		VSWR (nominal)	
	10 to 380 MHz		1.8	
	380 MHz to 5 GHz		2.0	
	5 to 12 GHz		2.1	
	12 to 26.5 GHz		2.2	
Linearity (CW mode) (reference power level is –5 dBm)				
S9110E option TR1 or TR2 RF transceiver connectors RF Out ❸	Frequency range		Input level	Linearity (nominal)
	10 to 380 MHz		–80 to –30 dBm	≤ ± 0.4 dB
			–60 to 0 dBm	≤ ± 0.4 dB
	380 MHz to 5 GHz		–80 to –30 dBm	≤ ± 1 dB
			–60 to 0 dBm	≤ ± 0.5 dB
	5 to 26.5 GHz		–80 to –30 dBm	≤ ± 0.6 dB
			–60 to 0 dBm	≤ ± 0.5 dB
M1749B mmWave connectors RF Tx/Rx 1 ❶ and RF Tx/Rx 2 ❷	Frequency range		Input level	Linearity (nominal)
	22.7 – 49.2 GHz		–50 to –30 dBm	≤ ± 1.5 dB
			–30 to –5 dBm	≤ ± 1.0 dB

1. Bandwidth reduces as 1 MHz edge frequency is approached. For the maximum bandwidth below center frequency 80 MHz, refer to [M9471A data sheet](#)

Absolute amplitude accuracy (CW mode)

	Frequency range	Level	Accuracy (nominal)
S9110E Option TR1 or TR2 RF transceiver connectors RF Out ③	10 to 380 MHz	-80 to 0 dBm	$\leq \pm 0.5$ dB
	380 MHz to 5 GHz	-80 to -60 dBm	$\leq \pm 0.9$ dB
		-60 to 0 dBm	$\leq \pm 0.7$ dB
	5 to 21 GHz	-80 dBm	$\leq \pm 1$ dB
		-80 to -30 dBm	$\leq \pm 0.7$ dB
		-30 to 0 dBm	$\leq \pm 0.4$ dB
	21 to 25.9 GHz	-80 dBm	$\leq \pm 1$ dB
		-80 to -30 dBm	$\leq \pm 0.6$ dB
		-30 to 0 dBm	$\leq \pm 0.4$ dB
	25.9 to 26.5 GHz	-80 to -30 dBm	$\leq \pm 1$ dB
		-30 to 0 dBm	$\leq \pm 0.5$ dB
	Frequency range	Level	Accuracy (nominal)
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	22.7 to 49.2 GHz	-50 dBm to -10 dBm	$\leq \pm 1.2$ dB
		-10 dBm to -5 dBm	$\leq \pm 1.0$ dB

IF flatness

When working with M1749B, the center frequency can be set > than 48.6 GHz, but bandwidth will be reduced as 49.2 GHz is approached.

	Frequency range	Bandwidth	Flatness (nominal)
All S9110E standard configurations RF Transceiver connectors RF Out ③	10 to 380 MHz	40 MHz	± 0.5 dB
	380 to 550 MHz	40 MHz	± 0.7 dB
		100 MHz	± 0.7 dB
	550 MHz to 1.31 GHz	40 MHz	± 0.4 dB
		100 MHz	± 0.4 dB
		200 MHz	± 0.5 dB
	1.31 to 1.9 GHz	200 MHz	± 0.8 dB
		400 MHz	± 0.8 dB
		600 MHz	± 0.9 dB
	1.9 to 5 GHz	40 MHz	± 0.6 dB
		100 MHz	± 0.6 dB
		400 MHz	± 0.6 dB
		600 MHz	± 0.7 dB
		800 MHz	± 0.7 dB
		1.2 GHz	± 0.7 dB
	5 to 16 GHz	400 MHz	± 0.7 dB
		600 MHz	± 0.7 dB
		800 MHz	± 0.7 dB
		1.2 GHz	± 0.8 dB
	16 to 26.5 GHz	400 MHz	± 1.3 dB
		600 MHz	± 1.3 dB
		800 MHz	± 1.3 dB
		1.2 GHz	± 1.3 dB
	Frequency range	Bandwidth	Flatness (nominal)
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	24.3 to 48.6 GHz	1.2 GHz	± 1.5 dB

Error Vector Magnitude (EVM) nominal

Test signal: FR1: 5G NR, 30 kHz subcarrier spacing, 256QAM, loopback; Test signal: FR2: 5G NR, 120 kHz subcarrier spacing, 256QAM, loopback

All S9110E standard configurations RF Transceiver connectors RF In ④ Input power range –20 to 0 dBm	Center Frequency	100 MHz bandwidth		400 MHz bandwidth		8 x100 MHz bandwidth	
	4 GHz	–50 dB		–45 dB		–39 dB	
	5 GHz	–47 dB		–44 dB		–39 dB	
	7 GHz	–47 dB		–45 dB		–43 dB	
	12 GHz	–47 dB		–43 dB		–39 dB	
	15 GHz	–47 dB		–41 dB		–40 dB	
	18 GHz	–46 dB		–42 dB		–38 dB	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	100 MHz bandwidth		400 MHz bandwidth		8x100 MHz bandwidth	
	22.7 to 49.2 GHz	Input power	EVM	Input power	EVM	Input power	EVM
		–40 to –35 dBm	–38 dB	–40 to –30 dBm	–33 dB	–40 to –25 dBm	–29 dB
		–35 to –5 dBm	–41 dB	–30 to –5 dBm	–40 dB	–25 to –5 dBm	–38 dB

Test signal: Custom DFT–S OFDM, 1000 MHz bandwidth, loopback, nominal

All S9110E standard configurations RF Transceiver connectors RF In ④	Frequency range	EVM (nominal)	
	2 to 26 GHz	–10 dB, –40 to –30 dBm input power	
		–20 dB, –30 to –20 dBm input power	
		–29 dB, –20 to –10 dBm input power	
		–37 dB, –10 to 0 dBm input power	
		–33 dB, 0 to 5 dBm input power	
		–17 dB, 5 to 10 dBm input power	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	EVM (nominal)	
	22.7 to 49.2 GHz	≤ –29 dB, –40 to –30 dBm input power	
		≤ –37 dB, –30 to –20 dBm input power	
		≤ –39 dB, –20 to –5 dBm input power	

Test signal: DVB–S2X, 500 MHz bandwidth, loopback, nominal; Equalizer filter length: 51; EVM normalization reference: Reference RMS

All S9110E standard configurations RF Transceiver connectors RF In ④	Frequency range	EVM (nominal)	
	2 to 26 GHz	–18 dB, –40 to –30 dBm input power	
		–23 dB, –30 to –20 dBm input power	
		–32 dB, –20 to –10 dBm input power	
		–36 dB, –10 to 0 dBm input power	
		–35 dB, 0 to 5 dBm input power	
		–22 dB, 5 to 10 dBm input power	
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	Frequency range	EVM (nominal)	
	22.7 to 49.2 GHz	≤ –32 dB, –40 to –30 dBm input power	
		≤ –40 dB, –30 to –20 dBm input power	
		≤ –42 dB, –20 to –10 dBm input power	
		≤ –42 dB, –10 to –5 dBm input power	

Adjacent Channel Leakage Ration (ACLR) nominal

All S9110E standard configurations RF Transceiver connectors RF In ④ Input power –20 to 0 dBm, 256QAM, loopback	Bandwidth	ACLR (nominal)					
	100 MHz BW	–56 dBc at 4 GHz, –54 dBc at 7 GHz, –52 dBc at 18 GHz					
	400 MHz BW	–49 dBc at 4 GHz, –49 dBc at 7 GHz, –46 dBc at 18 GHz					
	8 x 100 MHz BW	–45 dBc at 4 GHz, –46 dBc at 7 GHz, –42 dBc at 4 GHz					
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ② Frequency range 22.7 to 49.2 GHz Input signal: 256QAM, loopback	Bandwidth	ACLR (nominal)					
		Input power	ACLR	Input power	ACLR	Input power	ACLR
	100 MHz BW	–40 to –25 dBm	–47 dBc	–25 to –5 dBm	–50 dBc		
	400 MHz BW	–40 to –25 dBm	–41 dBc	–25 to –10 dBm	–43 dBc	–10 to –5 dBm	–41 dBc
	8 x 100 MHz	–40 to –30 dBm	–38 dBc	–30 to –5 dBm	–41 dBc		

Spectrum analyzer mode

Option SAA is required to enable the spectrum analyzer measurement application on S9110E.

Absolute Amplitude Accuracy (CW mode)		
	Frequency range	Absolute amplitude accuracy (nominal)
All S9110E standard configurations Transceiver connectors RF In ④ Input level from –50 dBm to 0 dBm	1 to 380 MHz	±0.5 dB
	380 MHz to 23.5 GHz	±0.8 dB
	23.5 to 24.5 GHz	±1 dB
	24.5 to 26.5 GHz	±0.8 dB
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	22.7 to 49.2 GHz	±1.5 dB, input level from –50 to –10 dBm ±1.2 dB, input level from –10 to –5 dBm
Residual responses		
RF input port, with analyzer ranged to 0 dBm, offset from 10 MHz to ½ × analysis bandwidth, nominal		
	Frequency range	Residual response (nominal)
All S9110E standard configurations Transceiver connectors RF In ④	80 MHz to 4 GHz	–98 dBm
	4 to 5 GHz	–106 dBm
	5 to 10 GHz	–106 dBm
	10 to 13.6 GHz	–107 dBm
	13.6 to 14.9 GHz	–103 dBm
	14.9 to 17.1 GHz	–105 dBm
	17.1 to 18.7 GHz	–106 dBm
	18.7 to 21.3 GHz	–105 dBm
	21.3 to 22.4 GHz	–103 dBm
	22.4 to 25.9 GHz	–99 dBm
	25.9 to 26.5 GHz	–95 dBm
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	22.7 to 24.3 GHz	–102 dBm
	24.3 to 26.8 GHz	–71 dBm
	26.8 to 28 GHz	–86 dBm
	28 to 29.1 GHz	–70 dBm
	29.1 to 33.3 GHz	–69 dBm
	33.3 to 33.6 GHz	–57 dBm
	33.6 to 41 GHz	–56 dBm
	41 to 42.5 GHz	–103 dBm
	42.5 to 47.3 GHz	–60 dBm
	47.3 to 49.2 GHz	–83 dBm

Displayed Average Noise Floor (DANL)		
	Frequency range	Displayed average noise floor, nominal
All S9110E standard configurations Transceiver connectors RF In ④ Input ranged to -70 dBm, LNA on	1 to 10 MHz	-155 dBm/Hz
	10 to 310 MHz	-160 dBm/Hz
	310 MHz to 5 GHz	-161 dBm/Hz
	5 to 9 GHz	-163 dBm/Hz
	9 to 12 GHz	-157 dBm/Hz
	12 to 17.5 GHz	-158 dBm/Hz
	17.5 to 20 GHz	-155 dBm/Hz
	20 to 25 GHz	-146 dBm/Hz
	25 to 26.5 GHz	-134 dBm/Hz
	22.7 to 23.5 GHz	-164 dBm/Hz
M1749B mmWave connectors RF Tx/Rx 1 ① and RF Tx/Rx 2 ②	23.5 to 29 GHz	-163 dBm/Hz
	29 to 31 GHz	-165 dBm/Hz
	31 to 32 GHz	-164 dBm/Hz
	32 to 34.8 GHz	-163 dBm/Hz
	34.8 to 37.5 GHz	-162 dBm/Hz
	37.5 to 38.5 GHz	-160 dBm/Hz
	38.5 to 43 GHz	-161 dBm/Hz
	43 to 46 GHz	-162 dBm/Hz
	46 to 48 GHz	-161 dBm/Hz
	48 to 49.2 GHz	-163 dBm/Hz

General Performance

Environmental characteristics		
S9110E multiband vector transceiver	For indoor use only	
	Altitude up to 6,561.68 ft (2,000 m)	
	Operating temperature 15 to 35° C maximum relative humidity (non–condensing): 85% RH	
Power requirements		
	Voltage & frequency	Power consumption
S9110E base system (PXle chassis with modules, rugged panel, and cables)	100/120 V, 50/60 Hz 220/240 V, 50/60 Hz	1200 W Max (lower range) 1300 W Max (upper range)
M1749B performance mmWave transceiver	120 VAC (via supplied 0950-6166 AC/DC adapter)	105 W
Size and weights		
Dimensions		
S9110E base system	Height: 197.8 mm (7.79 in); with feet installed	
	Width: 449.5 mm (17.70 in); with rugged panel	
	Depth: 568.9 mm (22.40 in); with rugged panel (from back bumper to front BNC)	
M1749B performance mmWave transceiver	Height: 70 mm (2.76 in)	
	Width: 175 mm (6.89 in)	
	Depth: 345 mm (13.58 in)	
Weight		
S9110E–TR1 base system	18.6 kg (45.0 lbs)	
S9110E–TR2 base system	21.9 kg (49.8 lbs)	
M1749B performance mmWave transceiver	3.5 kg (7.7 lbs)	
M9808A PXle vector network analyzer	540 g (1.2 lbs)	
Remote programming		
Interface	LAN RJ–45	
Warranty		
Standard 1–year warranty		
Calibration cycle		
The recommended calibration cycle is one year; calibration services are available through Keysight service centers.		

LAN, Display Port, and USB Connectors, M9038A PXle Embedded Controller

LAN 1 and LAN2 (TCP/IP interface)	
Connectors (Ethernet)	One, 10/100/1000 BASE-T (RJ-45) One, 100/1000/10GB BASE-T (RJ-45)
Video/Dual Display Ports	
Connectors (video)	One, DisplayPort++
USB 2.0 and 3.0	
Connectors	Two, USB 2.0 (Type A)
Connectors	Two, USB 3.0 (Type A)

S9110E Base System Front Panel (with Rugged Front Panel)

Frequency reference, 100 MHz Ref Out and 10 MHz Ref In/Out connectors above the rugged front panel

100 MHz Ref Out, frequency reference (if available)	
Accuracy	± 16 Hz, typical, within 1 year since last calibration, from 20 to 30°C. Refer to the Keysight M9300A PXIe Frequency Reference Data Sheet for details on accuracy, aging rate, and stability.
Recommended calibration cycle	1 year
Connector	BNC (f)
Amplitude	9.5 dBm (nominal)
10 MHz Ref Out, Frequency Reference	
Accuracy	± 1.6 Hz, typical, within 1 year since last calibration, from 20 to 30°C. Refer to the Keysight M9300A PXIe Frequency Reference Data Sheet for details on accuracy, aging rate, and stability.
Recommended calibration cycle	1 year
Connector	BNC (f)
Amplitude	9.5 dBm (nominal)
10 MHz Ref In	
Connects behind rugged panel to M9300A PXIe Reference Ref In and locks to another reference with a value from 1 to 110 MHz.	
Connector	BNC (f)
Frequency	1 MHz to 110 MHz, sine wave
Lock range	± 1 ppm (nominal)
Input amplitude	0 to 10 dBm (nominal)
Impedance	50 Ω (nominal)

Trig 1 and Trig 2 Connectors above the rugged front panel

Trig 1 and Trig 2	
Connects behind rugged panel to M9019A PXIe Chassis Trig 1 and Trig 2. These two front panel trigger connectors (Trig 1 and Trig 2) above the rugged front panel connect to the PXI [0:7] backplane trigger bus in the M9019A chassis and can be configured as Input or Output.	
Connector	BNC (f)
Direction control	Input or output (configurable)
Output level	3.3 V CMOS (TTL compatible, 5 V tolerant)
Output impedance	50 Ω (typical)
Output trigger source	PXI_Trig0 - PXI_Trig7 (Segment 2 or 3)
Input level	3.3 V CMOS (TTL compatible, 5 V tolerant)
Input impedance	3 k Ω (typical)
Input trigger destination	PXI_Trig0 - PXI_Trig7 (Segment 2 or 3)
Input threshold	1.65 V (typical)
Minimum swing	250 mV (typical)
Minimum pulse width	100 ns (typical)

Transceiver Connectors, RF 1 MHz to 26.5 GHz on the rugged front panel

RF In	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	1 MHz to 26.5 GHz
Amplitude	0 VDC, +27 dBm maximum safe input power
RF Out	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	1 MHz to 26.5 GHz
Amplitude	0 VDC, +30 dBm maximum applied reverse input power

Transceiver Connectors, Head mmWave 22.7 to 49.2 GHz on the rugged front panel

IF In, IF Out, and LO/Pwr/Ctrl Out connect to the M1749B.

IF In	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	1 MHz to 26.5 GHz
Amplitude	± 10 VDC, +33 dBm maximum
IF Out	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	1 MHz to 26.5 GHz
Amplitude	± 10 VDC, +33 dBm maximum
LO1 and LO2 Out	
Connector	Type-N (f), 50 Ω (nominal)
Frequency range	1 MHz to 26.5 GHz
USB control	
Connector	USB 2.0 (Type A)
4.8GHz Out (not used with F49 options)	
Connector	Type-N (f), 50 Ω (nominal)

M1749B mmWave Transceiver (Optional)

Although the M1749B mmWave Transceiver is operational from 22.7 to 49.2 GHz, the performance information for the S9110E is only provided for the frequency bands called out in this Data Sheet.

RF Tx/Rx 1 and RF Tx/Rx 2	
Connector	2.4 mm (f), 50 Ω (nominal) These ports can be configured either to supply a mmWave signal to a Device Under Test (DUT) or to receive a mmWave signal from a DUT.
Amplitude	10 VDC, +10 dBm maximum input
Cal (internal use only)	
Connector	2.4 mm (f), 50 Ω (nominal)
Rx IF Out /Tx IF In	
Connector	SMA (f), 50 Ω (nominal)
LO In	
Connector	3.5 mm (f)
9.6 GHz In	
Connector	3.5 mm (f)
9.6 GHz Out	
Connector	3.5 mm (f)
USB	
Connector	USB micro-B (f)
Trig 1/Trig 2	
Connector	SMB (m)
Control (not used with S9110E)	
Connector	SMA (f)
Power	
Connector	19 V DC power supply input

M9808A PXIe vector network analyzer (optional)

S9110E integrates M9808A PXIe vector network analyzer (VNA) via option NA1 or NA2, in order to add 2-port network analysis capability. For more detailed specification of the VNA portion, refer to [M980xA data sheet](#) for reference.

Note that in the S9110E system, the cable loss between the front panel and the M9808A VNA module may cause performance degradation of the VNA.

Related Literature

For more detailed product and specification information refer to the following literature and web pages:

Keysight M9019A PXIe 18 slot Chassis, Data Sheet (literature no. [5992-1481EN](#))

Keysight M9038A PXIe High Performance Embedded Controller, Data Sheet (literature no. [3122-1717.EN](#))

Keysight M9300A PXIe Frequency Reference, Data Sheet (literature no. [5991-0898EN](#))

Keysight M9410A and M9411A PXIe VXT Vector Transceivers, Data Sheet (literature no. [5992-3331EN](#))

Keysight M980xA Series PXIe Vector Network Analyzer, Data Sheet (literature no. [5992-3596EN](#))

Keysight M9471A PXIe Vector Transceiver, Data Sheet (literature no. [3123-1722.EN](#))

Product page:

[S9110E Multiband Vector Transceiver | Keysight](#)



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