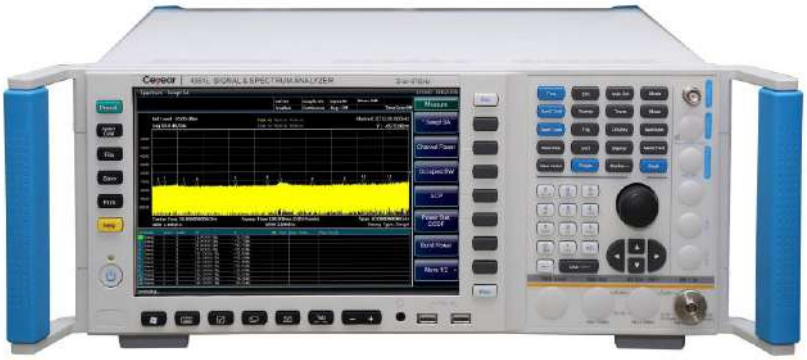
4051 Series
Signal and Spectrum Analyzer

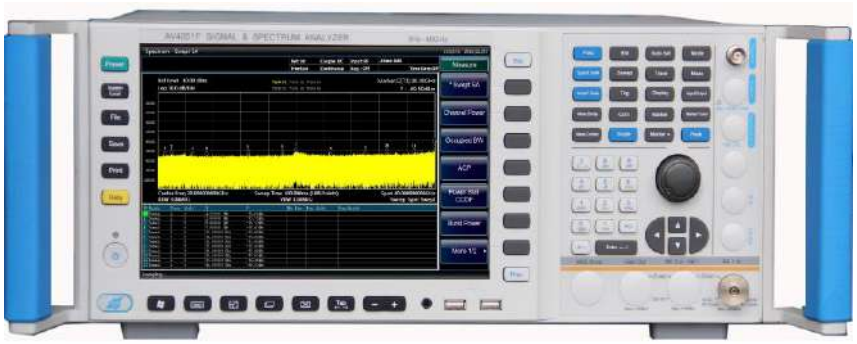
(3Hz~4GHz/9GHz/13.2GHz/18GHz/26.5GHz/40GHz/45GHz/50GHz/67GHz/ 85GHz)



CEYEAR TECHNOLOGIES Co., Ltd.

4051A/B/C/D/E/F/G/H/L/N Signal/Spectrum Analyzer

3Hz～4GHz/9GHz/13.2GHz/18GHz/26.5GHz/40GHz/45GHz/50GHz/67GHz/85GHz



Product Overview

4051 series signal/spectrum analyzer, as high-performance flagship product, has excellent performance in dynamic range, phase noise, amplitude accuracy, and measurement speed. 4051 series has various measurement functions including: high-sensitivity spectrum Analyzer, standard power measurement components, IQ Analyzer, Vector Signal Analyzer, Real-Time Spectrum Analyzer, Transient Analyzer, Pulse Signal Analyzer, Audio Analyzer, Analog Demodulation measurement, and Phase Noise measurement, Noise Figure, etc., which can provide you reliable high-performance measurement service. 4051 series have good extension capacity. Its performance can be further improved by flexible configuration of different options. Through various digital and analog signal output interfaces, the spectrum analyzer can be taken to establish measurement systems or get secondary development. It can be widely used for signal and equipment measurement in field of aviation, aerospace, radar detection, communication, electronic countermeasures, and navigation etc.

Main Characteristics

- Wide frequency range
- Max. 1GHz analysis bandwidth
- Excellent measurement & receiving performance
- Comprehensive spectrum analysis capability
- Abundant measurement application functions

- Powerful RF signal streaming and playback analysis function
- Flexible analog signal output interface
- Easy & convenient operation

Wide frequency range

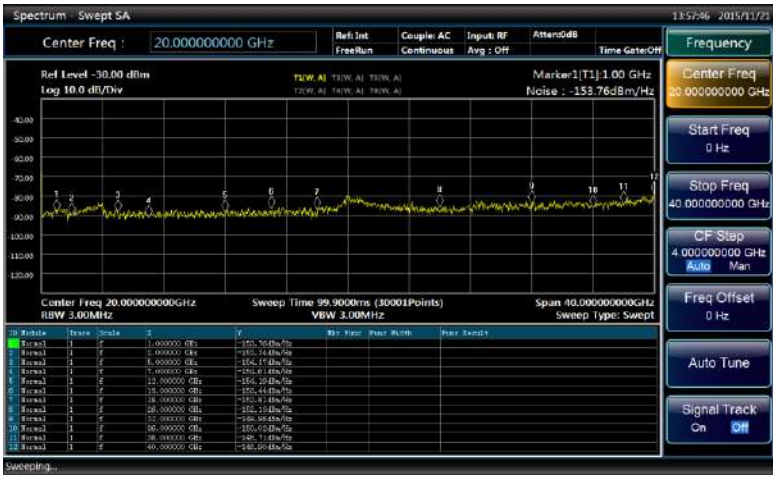
- 10 optional frequency band configurations (3Hz~4/9/13.2/18/26.5/40/45/50/67/85GHz)
- The frequency range can be extended up to 500GHz (with external frequency extension option)

Maximum 1GHz analysis bandwidth

- Provide 5 analysis bandwidth configuration: 10MHz (standard), 40MHz, 200MHz, 550MHz, 1GHz etc.
- The bandwidth can be flexibly selected: from 10Hz to 1GHz, more than 40 levels
- 4GB storage depth, according to the selected bandwidth, the seamless capture time differs from several microsecond to several hours

Excellent measurement & receiving performance

- Wideband preamplifiers (up to 67 GHz) can be configured for the host frequency band
- 1GHz measurement DANL is -156dBm/Hz; with preamplifier on, the typical value is -167dBm/Hz
- 50GHz measurement DANL is -141dBm/Hz; configured with preamplifier, the typical value is -150dBm/Hz
- 67GHz measurement DANL is -135dBm/Hz; configured with preamplifier, the typical value is -150dBm/Hz
- 85GHz measurement DANL is -135dBm/Hz
- Fully digital IF design, excellent scale fidelity and IF error



Comprehensive spectrum analysis capability

- Support frequency sweep and FFT sweep
- Zero frequency band fast sweep, the fastest sweep time is 1μs
- Accurate frequency counting, counting resolution can be 0.001Hz
- Sweep point number can be arbitrarily selected among 101～30001
- Can be configured with 6 traces, have abundant marker operation functions
- 6 trace detector modes, 3 average types
- Time gate measurement support
- Occupied bandwidth, channel power, adjacent channel power measurement functions
- Measurement functions of power statistics, burst power, harmonic distortion, TOI, spurious emission etc.

Abundant measurement application functions

● Transient analysis and signal playback analysis

—Frequency-domain and time-domain correlation measurement is helpful for understanding and deeply analyzing transient signal events.

—Waterfall diagram display, analyzing the macroscopic law of analysis signal spectrum changing over time.

—Simultaneously analyze the changes of analysis signal frequency, amplitude, and phase over time, to assist the measurement in the process of power control and frequency locking.

—Support 500M samples (64bits accuracy) seamless capture data storage

—Support multiple storage formats of signal files: CSV, DAT etc.

—Support the playback analysis of signal files

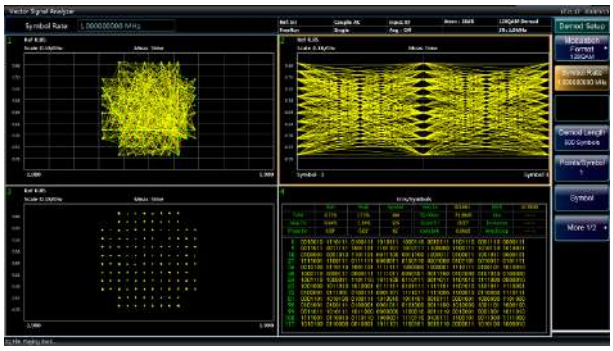
● Vector Signal Analysis function

—With comprehensive time domain, frequency domain, modulation domain signal analysis and viewing function, it supports more than 20 modulation system demodulation analysis.

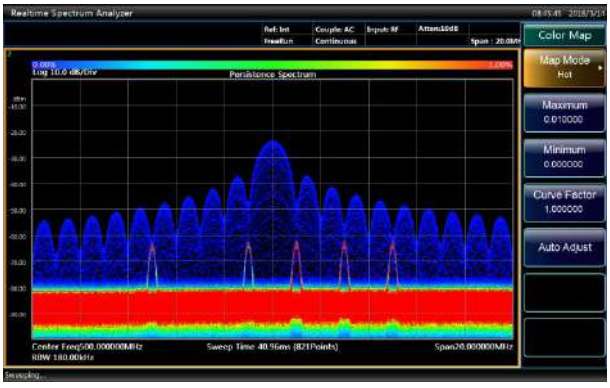
—Simultaneous display of demodulation before, after demodulation, reference signal, symbols, and various error results, and support multiple display windows such as spectrum diagram, constellation diagram, vector diagram, phase trace diagram, eye diagram, error/symbol table, etc.

—Provide pulse search function to realize the search and positioning of pulse signals, support users to input synchronization words and offsets, and display the demodulation results of designated parts.

—With adaptive equalization function, it can be used to separate the linear error from the nonlinear modulation error, and display the system amplitude-frequency response and group delay.



● **Real-time Spectrum Analysis function**



4051 can achieve seamless Real-time Spectrum Analysis, and frequency template trigger function, which can be used to trigger, capture, and analyze complex signals.

—Max. real-time analysis bandwidth: 40MHz, 200MHz(optional), frequency up to 85GHz

—Digital phosphor spectrum，seamless waterfall, instantaneous spectrum, power vs. time, frequency vs. time and other charts

—100% POI, Min. duration of the signal: 4.3us

—Multiple real-time trigger functions such as frequency template trigger and power trigger which can be used to capture and analyze the data before and after the signal event of interest occurs.

● **Pulse Signal Analysis function**

— Pulse signal spectrum and time domain characteristic measurement supports more than 20 kinds of pulse parameters measurement (including time, amplitude, frequency and phase).

— Can perform detailed analysis of amplitude, intra-pulse frequency/phase characteristics, and spectral characteristics of arbitrary pulse.

— Pulse trend statistics for arbitrary pulse parameters

● **Phase Noise measurement / Audio Analysis /—Analog Demodulation Analysis function**

—The Phase Noise measurement relies on the excellent phase noise of the signal analyzer and provides one-button automatic measurement to meet the daily signal source phase noise measurement applications.

—Independently optimized audio measurement channel for low frequency signal parameter measurement and analysis.

—Analog Demodulation Analyzer is used to simulate terminal, radio, and general analog modulation source measurement. Demodulate the AM/FM/ΦM signal and measure parameters such as modulation index, modulation distortion, residual FM, and FM linearity and so on.

● **DTMB measurement function**

—Capable of measuring single-carrier and multi-carrier DTMB signals

—It has radio frequency characteristic analysis functions such as channel power, shoulder attenuation, spectrum mask, etc.

—Able to automatically identify the frame header type and modulation method of the signal, and perform modulation quality analysis

—Able to analyze channel response and impulse response

● **WLAN measurement function**

—Provides measurement functions such as modulation analysis, spectrum flatness, power vs. time, channel power, occupied bandwidth, spectrum mask, power statistics, CCDF, etc., enabling comprehensive testing of WLAN equipment.

—The measurement setting menu is flexible, which can perform one-button measurement or manual setting, which is convenient for users to perform complete test and analysis on WLAN signals.

—Provides constellation diagram, error table, symbol table, EVM vs. carrier, gain unbalance vs. carrier, quadrature error vs. carrier, amplitude error vs. time, phase error vs. time, frequency spectrum, time domain waveform, etc.

● **Absolute power measurement function**

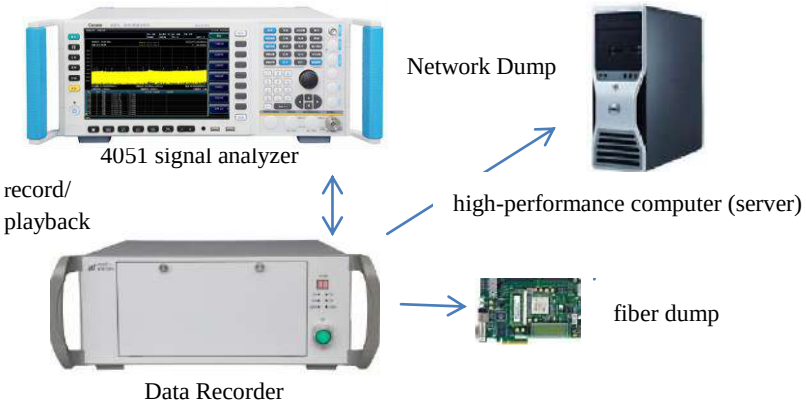
—Support USB power probe to achieve high-precision power measurement

—The performance is equivalent to high-precision power meter

Powerful RF signal streaming and playback analysis function

● Bandwidth of broadband real-time signal recording up to 200MHz/550MHz

● Data Recorder, both SSD and HDD can be selected



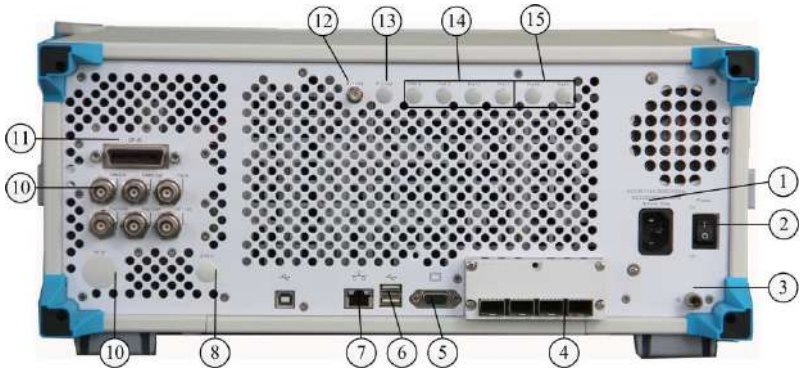
RF signal streaming and playback analysis function

Flexible analog signal output interfaces

● 275MHz～475MHz high intermediate frequency output, 1 Hz frequency steps

● 10MHz～160MHz IF output, 1Hz frequency steps, 4-gear automatic gain control level

● Digital reconstruction signal output, provide IF, AM/FM demodulation and IQ demodulation signal output.



1. Input interface of power supply
2. Power switch
3. ground terminal
4. 40/200MHz bandwidth digital interface
5. monitor
6. USB interface
7. LAN interface
8. positioning antenna input
9. rear panel RF input
10. rear panel BNC in/out
11. GPIB interface
12. IF OUT 1
13. IF OUT 2
14. broadband reconstruction IF/video signal output
15. reconstructing IF/video signal output

Easy & convenient operation

● Humanized automatic tuning and automatic scale

● One-button measurement

●10.1-inch LCD with 1280*800 resolution, to display the measurement results more clearly

●Support multiple auxiliary interfaces of USB, LAN, GPIB, monitor etc. for user's convenience

Typical Applications

● Comprehensive performance assessment of electronic system: As a multifunctional signal/spectrum analyzer, 4051 can be widely used for the comprehensive performance assessment of electronic systems in fields of radar and communication etc., which provides high-sensitivity, large dynamic range, high-precision, and high-efficiency solutions.

● Measurement and diagnosis of transmitter and receiver: With the functions of spectrum analysis, one-button measurement, instantaneous analysis, Analog Demodulation Analyzer, Pulse Signal Analyzer, Phase Noise Measurement etc. 4051 can provide comprehensive diagnosis service for transmitter and receiver measurement.

● Can be directly used for the integration of ATE, and provide signal output, data output and result analysis for the system.

● The application of electromagnetic signal RF streaming: it can be applied to signal data recording space, electromagnetic spectrum environment acquisition and recording in the process of large-scale weapon and equipment measurement.

Technical Specifications

<table>
<tr><td>Frequency range</td><td>
<table>
<tr><td>Model</td><td>DC coupled</td><td>AC coupled</td></tr>
<tr><td>4051A</td><td>3Hz～4GHz</td><td>10MHz～4GHz</td></tr>
<tr><td>4051B</td><td>3Hz～9GHz</td><td>10MHz～9GHz</td></tr>
<tr><td>4051C</td><td>3Hz～13.2GHz</td><td>10MHz～13.2GHz</td></tr>
<tr><td>4051D</td><td>3Hz～18GHz</td><td>10MHz～18GHz</td></tr>
<tr><td>4051E</td><td>3Hz～26.5GHz</td><td>10MHz～26.5GHz</td></tr>
<tr><td>405 F</td><td>3Hz～40GHz</td><td>10MHz～40GHz</td></tr>
<tr><td>4051G</td><td>3Hz～45GHz</td><td>10MHz～45GHz</td></tr>
<tr><td>4051H</td><td>3Hz～50GHz</td><td>10MHz～50GHz</td></tr>
<tr><td>4051L</td><td>3Hz～67GHz</td><td>/</td></tr>
<tr><td>4051N</td><td>3Hz～85GHz</td><td>/</td></tr>
</table>
</td></tr>
<tr><td>10MHz Precise frequency reference</td><td>Frequency accuracy: ±(last calibration date ×aging rate ＋ temperature stability ＋ calibration accuracy)
Aging rate: ±1×10^{-7}/year
Temperature stability: ±1.5×10^{-8} (20 ℃ ~ 30 ℃) ±5×10^{-8} (0 ℃ ~ 55 ℃)
Calibration accuracy: ±4 ×10^{-8}</td></tr>
<tr><td>Frequency readout accuracy</td><td>±(frequency readout ×frequency reference accuracy＋0.1% frequency band＋5% resolution bandwidth＋2Hz＋0.5 horizontal resolution*)
*: horizontal resolution = span/ (sweep points number – 1)</td></tr>
<tr><td>Frequency counting accuracy</td><td>±(frequency readout ×frequency reference accuracy＋0.1Hz）</td></tr>
<tr><td>Span</td><td>Range:0Hz (zero span), 10Hz～the highest frequency of the model
Accuracy: ±(0.1%×span＋span/ (sweep points number-1))</td></tr>
<tr><td>Sweep time range</td><td>span≥10Hz: 1ms～6000s
span=0Hz: 1us～6000s</td></tr>
<tr><td>Resolution bandwidth</td><td>Range: 1Hz～3MHz (1, 2, 3, 5 steps) 4, 5, 6, 8, 10, 20MHz
Conversion uncertainty: ±0.3dB 1Hz～10MHz
±1.0dB 20MHz</td></tr>
<tr><td>Video bandwidth</td><td>1Hz～3MHz (1, 2, 3, 5 steps) 4, 5, 6, 8, 10, 20MHz (rated value)</td></tr>
<tr><td>Signal analysis bandwidth</td><td>10Hz～10MHz (standard), 40MHz (option H38A), 200MHz (option H38B), 550MHz(option H38C), 1GHz(option H38D)</td></tr>
<tr><td>Memory</td><td>4GB</td></tr>
<tr><td>Trigger source</td><td>Free, Line, video, external level (front panel), external level (back panel), burst RF, timer</td></tr>
</table>

Trace detector	Normal, positive peak, negative peak, sample, video average, power average, voltage average		
SSB phase noise（1GHz carrier，20℃～30℃)	Frequency offset	Feature	Typical
	100Hz	-96dBc/Hz	-105dBc/Hz
	1kHz	-115dBc/Hz	-118dBc/Hz
	10kHz	-125dBc/Hz	-129dBc/Hz
	100kHz	-125dBc/Hz	-129dBc/Hz
Residual FM (central frequency 1 GHz, resolution bandwidth 10Hz, video bandwidth 10Hz)	≤(0.25 Hz x N) p-p，the rated value within 20ms N is the number of frequency multiple times of LO		
Displayed average noise level (the input end is connected to match load, sample or average wave detection, the average type is logarithm, 0dBinput attenuation, RF gain takes the DANL as the priority, 20℃～30℃)	4051A/B/C/D/E/F/G/H		
	Frequency range	Feature	Typical
	10MHz～1GHz	-153dBm	-156dBm
	1GHz～2GHz	-151dBm	-154dBm
	2GHz～3GHz	-150dBm	-153dBm
	3GHz～3.6GHz	-148dBm	-151dBm
	3.6GHz～4GHz	-145dBm	-148dBm
	4GHz～5GHz	-148dBm	-152dBm
	5GHz～9GHz	-150dBm	-152dBm
	9GHz～18GHz	-148dBm	-151dBm
	18GHz～26.5GHz	-143dBm	-146dBm
	26.5GHz～40GHz	-138dBm	-144dBm

	40GHz～50GHz	-133dBm	-141dBm
	4051L/N		
	Frequency range	Feature	Typical
	10MHz～1GHz	-153dBm	-155dBm
	1GHz～2GHz	-151dBm	-153dBm
	2GHz～3GHz	-148dBm	-150dBm
	3GHz～3.6GHz	-147dBm	-148dBm
	3.6GHz～4GHz	-143dBm	-145dBm
	4GHz～5GHz	-144dBm	-147dBm
	5GHz～9GHz	-145dBm	-147dBm
	9GHz～18GHz	-145dBm	-148dBm
	18GHz～26.5GHz	-141dBm	-143dBm
	26.5GHz～40GHz	-135dBm	-138dBm
	40GHz～50GHz	-131dBm	-135dBm
	50GHz～67GHz	-131dBm	-135dBm
	67GHz～72GHz	-124dBm	-128dBm
	72GHz～85GHz	-131dBm	-135dBm
	4051A/B/C/D/E/F/G/H/L		
	Frequency range	With preamplifier (on)	With preamplifier (on) (typical)
	10MHz～1GHz	-162dBm	-164dBm
	1GHz～2GHz	-162dBm	-165dBm
	2GHz～3GHz	-160dBm	-164dBm
	3GHz～3.6GHz	-156dBm	-163dBm
	3.6GHz～4GHz	-155dBm	-162dBm
	4GHz～5GHz	-155dBm	-164dBm
	5GHz～9GHz	-155dBm	-164dBm
	9GHz～18GHz	-154dBm	-160dBm
	18GHz～26.5GHz	-154dBm	-157dBm

	26.5GHz～40GHz	-150dBm	-152dBm
	40GHz～50GHz	-145dBm	-150dBm
	50GHz～67GHz	-145dBm	-150dBm
Frequency response & absolute amplitude accuracy (10dB attenuation, 20℃ ~ 30℃)	Frequency range	Feature	Typical
	3Hz～20MHz	±0.7dB	±0.5dB
	20MHz～2GHz	±0.5dB	±0.4dB
	2GHz～3.6GHz	±0.7dB	±0.5dB
	3.6GHz～4GHz	±1.0dB	±0.8dB
	4GHz～9GHz	±1.5dB	±0.9dB
	9GHz～18GHz	±2.0dB	±1.0dB
	18GHz～26.5GHz	±2.5dB	±1.2dB
	26.5GHz～40GHz	±3.0dB	±1.8dB
	40GHz～50GHz	±3.0dB	±2.0dB
	50GHz～67GHz	±3.5dB	±3.0dB
	67GHz～85GHz	±4.0dB	±3.0dB
	Frequency range	Preamplifier on/off	Preamplifier on/off (typical)
	3Hz～20MHz	±1.2dB/±1.5dB	±0.6dB/±0.6dB
	20MHz～2GHz	±1.0dB/±1.5dB	±0.6dB/±0.8dB
	2GHz～3.6GHz	±1.2dB/±1.5dB	±0.6dB/±0.9dB
	3.6GHz～4GHz	±1.5dB/±1.8dB	±1.0dB/±1.2dB
	4GHz～9GHz	±2.0dB/±2.5dB	±1.3dB/±1.5dB
	9GHz～18GHz	±2.5dB/±3.0dB	±1.5dB/±1.6dB
	18GHz～26.5GHz	±3.0dB/±3.5dB	±1.6dB/±1.8dB
	26.5GHz～40GHz	±3.5dB/±4.0dB	±2.2dB/±2.3dB
	40GHz～67GHz	±3.5dB/±4.0dB	±2.4dB/±2.6dB

<table>
<tr><td></td><td colspan="3">Absolute amplitude accuracy (10 dB attenuation, 20℃ ~ 30℃, 1 Hz ≤resolution bandwidth≤ 1 MHz, input signal -10 ～ -50 dBm):
±0.24dB 500MHz
±(0.24dB＋frequency response) all frequency</td></tr>
<tr><td rowspan="7">1dB gain compression (mixer level, dual-tone test, resolution bandwidth is 5kHz, 3MHz frequency interval, 20℃ ~ 30℃)</td><td>Frequency range</td><td colspan="2">Feature</td></tr>
<tr><td>20MHz～40MHz</td><td colspan="2">-3dBm</td></tr>
<tr><td>40MHz～200MHz</td><td colspan="2">+1dBm</td></tr>
<tr><td>200MHz～4GHz</td><td colspan="2">+3dBm</td></tr>
<tr><td>4GHz～9GHz</td><td colspan="2">-1dBm</td></tr>
<tr><td>9GHz～50GHz</td><td colspan="2">+1dBm</td></tr>
<tr><td>50GHz～85GHz</td><td colspan="2">-1dBm</td></tr>
<tr><td rowspan="8">TOI distortion (input mixer 2 -10dBm signal test, frequency interval is 50kHz，20℃～30℃）</td><td>Frequency range</td><td>Feature</td><td>Typical</td></tr>
<tr><td>10MHz～200MHz</td><td>+13dBm</td><td>+15dBm</td></tr>
<tr><td>200MHz～4GHz</td><td>+13dBm</td><td>+16dBm</td></tr>
<tr><td>4GHz～9GHz</td><td>+11dBm</td><td>+15dBm</td></tr>
<tr><td>9GHz～18GHz</td><td>+13dBm</td><td>+15dBm</td></tr>
<tr><td>18GHz～50GHz(L Type)</td><td>+13dBm</td><td>+17dBm</td></tr>
<tr><td>50GHz～67GHz</td><td>+9dBm</td><td>+11dBm</td></tr>
<tr><td>67GHz～85GHz</td><td>+9dBm</td><td>+11dBm</td></tr>
<tr><td>Residual response (the input end is connected to match load, 0dB attenuation)</td><td colspan="3">-100dBm 200kHz～9GHz
-100dBm (rated value) other frequency</td></tr>
<tr><td>Dimensions</td><td colspan="3">W×H×D= 510mm×190mm×534mm (including handle, foot-pad, bottom feet)
W×H×D= 426mm×177mm×460mm (excluding handle, foot-pad, bottom feet)</td></tr>
<tr><td>Weight</td><td colspan="3">About 25kg (different configuration cause different weight)</td></tr>
<tr><td>Power supply</td><td colspan="3">Standard： AC 220~240V: 50~60Hz
4051-H98：AC 100~240V：50~60Hz</td></tr>
<tr><td>Power consumption</td><td colspan="3">Standby: less than 20W; operating: less than 400W</td></tr>
</table>

Temperature range	Operating temperature: 0 ℃ ~ +50 ℃; storage temperature: -40 ℃ ~ +70 ℃
Input connector	4051A/B/C/D: type N (female), impedance: 50Ω 4051E: 3.5mm (male), impedance: 50Ω 4051F/4051G/4051H: 2.4mm (male), impedance: 50Ω 4051L: 1.85mm (male), impedance: 50Ω 4051N: 1.0mm (male), impedance: 50Ω

Notes:

1. Rated values refer to the estimated performance, or the performance which is useful for the product beyond the warrant range.

2. Typical value refers to other performance information beyond the product guarantee range; when the performance is over the technical index, 80% of the samples will present 95% confidence within 20°C ~ 30°C temperature range; typical performance excludes test uncertainty

Ordering Information

- **Main unit**

4051A signal/spectrum analyzer 3Hz～4GHz

4051B signal/spectrum analyzer 3Hz～9GHz

4051C signal/spectrum analyzer 3Hz～13.2GHz

4051D signal/spectrum analyzer 3Hz～18GHz

4051E signal/spectrum analyzer 3Hz～26.5GHz

4051F signal/spectrum analyzer 3Hz～40GHz

4051G signal/spectrum analyzer 3Hz～45GHz

4051H signal/spectrum analyzer 3Hz～50GHz

4051L signal/spectrum analyzer 3Hz～67GHz

4051N signal/spectrum analyzer 3Hz～85GHz

4051N signal/spectrum analyzer 3Hz～90GHz(Option H90)

- **Standard accessories**

No.	Description	Remarks
1	Power cord	Standard 3-core power cord
2	USB mouse	--
3	User manual	--
4	Programming manual	--

- **Options**

No.	Description	Functions

4051-H01	Back RF input	To post position the RF signal input interface
4051-H02	High IF output	Output secondary IF signal, output frequency range is 275MHz ~ 475MHz, steps resolution is 1Hz.
4051-H03	IF output	Output third IF signal, output frequency range is 10MHz ~ 160MHz, steps resolution is 1Hz。
4051-H04A	Reconstruct IF/Video Signal Output	To realize IF, AM/FM or I/Q signal output in form of digital reconstruction, the bandwidth upper limit is 40MHz. (Notes: H04A and H04B can be selected at the same time)
4051-H04B	Wide band Reconstruct IF/Video Signal Output	To realize IF, AM/FM or I/Q signal output in form of digital reconstruction, bandwidth range is 50MHz~100MHz. (Notes: H04B can only be selected when option H38B with 200MHz broadband is selected; H04A and H04B can be selected together)
4051-H08	Wide Log Detect Output	To output the logarithm wave-detection signal which can reflect the input signal level characteristics
4051-H12A	40MHz bandwidth digital interface	To output real-time broadband collecting data through optical fiber, support max. 400MHz bandwidth signal data output. (Notes: H12A cannot be selected when H38B has been selected; once this option is selected, H12B and H39 cannot be selected)
4051-H12B	200MHz bandwidth digital interface	To output real-time broadband collecting data through optical fiber, support max. 200MHz bandwidth signal data output. (Notes: H12B can only be selected when option H38B with 200MHz broadband is selected；once this option is selected, H12B and H39 cannot be selected）
4051-H12C	550MHz bandwidth digital interface	To output real-time broadband collecting data through optical fiber, support max. 550MHz bandwidth signal data output. (Notes: H12C can only be selected when option H38C with 550MHz broadband is selected；once this option is selected, H12A, H12B and H39 cannot be selected）
4051-H15	+24V DC power supply	+24V DC power supply
4051-H22A	4711 Data Recorder	Configured with SSD Data Recorder (have same interface characteristics) to realize real-time large-capacity recording of signal data. (Notes: A22A can only be selected together with H12A or H12B. For the recorder capacity selection, please refer to 4711 recorder data sheet).

4051-H22B	4712 Data Recorder	Configured with HDD Data Recorder (have same interface characteristics) to realize real-time large-capacity recording of signal data. (Notes: A22B can only be selected together with H12A or H12B. For the recorder capacity selection, please refer to 4712recorder data sheet).
4051-H33	Electronic Attenuator	Frequency range: 3Hz~4GHz, attenuation range: 30dB, 1dB steps.
4051-H34-04 4051-H34-09 4051-H34-13 4051-H34-18 4051-H34-26 4051-H34-40 4051-H34-45 4051-H34-50 4051-H34-67	Low-noise Preamplifier	Can select low-waveband preamplifier or full-waveband preamplifier. When you select full-waveband preamplifier, we provide above 4 GHz frequency band noise optimization path. (Notes: the No. of low-waveband preamplifier is H34-04. The full-waveband preamplifier should be selected according to the frequency upper limit of the main unit. For example, the max. frequency of 4051E is 26.5GHz, then the full-waveband preamplifier H34-26 should be selected)
4051-H36	Pre-selector Bypass	The tracking pre-selector in the bypass receiving channel. (Notes: option H36 is needed together with H38A or H38B to provide the best wideband signal receiving characteristics)
4051-H38A	40MHz Analysis Bandwidth	Support 10Hz~40MHz analysis bandwidth. (Notes: option H38B and option H36 should be selected together to provide the best wideband signal receiving characteristics, H38B and H38A are no need to be selected at the same time)
4051-H38B	200MHz Analysis Bandwidth	Support 10Hz~200MHz analysis bandwidth. (Notes: option H38B and option H36 should be selected together to provide the best wideband signal receiving characteristics)
4051-H38C	550MHz Analysis Bandwidth	Support 10Hz~550MHz analysis bandwidth. (Notes: option H38C and option H36 should be selected together to provide the best wideband signal receiving characteristics, H38B and H38C are no need to be selected at the same time)
4051-H38D	1GHz Analysis Bandwidth	Support 10Hz~1GHz analysis bandwidth. (Notes: option H38D and option H36 should be selected together to provide the best wideband signal receiving characteristics, H38B and H38C are no need to be selected at the same time)
4051-H39	Audio Analyzer	Realize audio frequency signal parameter measurement, distortion measurement and waveform analysis (Notes: option H12A and H12B cannot be selected when selecting this option)

4051-H40	External Mixer	To extend the frequency range using external frequency mixing method. This option provides LO output and IF input, as well as signal recognition ability. (Notes: this option can be selected when the main unit is not 4051A: the extended frequency range depends on the selected extension modules; the frequency extension module needs to buy additionally)
4051-H41	Real-time Spectrum Analyzer	This option provides digital phosphor spectrum and seamless waterfall, including frequency template trigger, which can support real-time spectrum analysis of 200MHz bandwidth.（Notes: Max. real-time analysis bandwidth depends on 4051-H38A, 4051-H38B options.）
4051-H48	Noise Figure	Noise source drive and noise figure measurement function (4051L exception)（Notes: H34 low-noise preamplifier option and corresponding 1660X noise source sensor needed）
4051-S04	Phase Noise Measurement	SSB phase noise curves and single-point phase noise measurement.
4051-S09	Analog Demodulation Analyzer	modulation characteristics and distortion characteristics analysis of AM, FM, PM signals
4051-S10	Transient Analyzer	To realize the measurement & analysis of transient parameters, spectrum, and time-varying characteristics of signals, support playback of the recorded data.
4051-S12	Vector Signal Analyzer	This option provides flexible demodulation functions of multiple single-carrier digital modulation signals. It can provide vector charts, constellation diagrams, eye diagrams, spectrum diagrams, etc., to analyze the characteristics of the modulation signal. The modulation error of the signal can be obtained by demodulation, which helps to judge the cause of the signal error.
4051-S13	Pulse Signal Analyzer	Automatic measurement on time, level and modulation parameters of pulse waveform and statistical analysis of pulse sequence
4051-S40	WLAN802.11a/b/g Measurement	Broadband wireless local area network protocol physical layer test (802.11a/ b/g), covering radio frequency, modulation analysis, and modulation quality testing.
4051-S40N	WLAN802.11n Measurement	Broadband wireless local area network protocol physical layer test (802.11n), covering radio frequency, modulation analysis, and modulation quality testing.

4051-S40AC	WLAN802.11ac Measurement	Broadband wireless local area network protocol physical layer test (802.11ac), covering radio frequency, modulation analysis, and modulation quality testing.
4051-S40AX	WLAN802.11ax Measurement	Broadband wireless local area network protocol physical layer test (802.11ax), covering radio frequency, modulation analysis, and modulation quality testing.
4051-S51	DTMB Signal Measurement	Provides one-button power and modulation in compliance with DTMB standards Analysis function.
4051-H90	Coaxial Frequency Extension	Extend the 4051N coaxial frequency coverage to 90GHz
4051-H97	Mounting suit	handles and accessories for 4051 mounting on standard racks
4051-H98	English options	English panels, user manual, operation interface, and operation system. Power supply: AC 100/115V：50/60/400Hz; AC 220/240V：50/60Hz
4051-H99	Aluminum transportation case	High-strength lightweight aluminum transportation case, with handle and roller, convenient for transportation

- **Power sensor options**

Model	Frequency range
87230 USB CW power sensor	9kHz～6GHz
87231 USB CW power sensor	10MHz～18GHz
87232 USB CW power sensor	50MHz～26.5GHz
87233 USB CW power sensor	50MHz～40GHz

- **Millimeter wave extender options (4051-H40 required)**

Model	Frequency range
82407 spectrum analyzer extender	50GHz～75GHz
82407A spectrum analyzer extender	75GHz～110GHz
82407B spectrum analyzer extender	110GHz～170GHz
82407C spectrum analyzer extender	170GHz～220GHz
82407D spectrum analyzer extender	220GHz～325GHz
82407R spectrum analyzer extender	325GHz～500GHz

- **Noise source options (4051-H48, 4051-H34 required)**

Model	Frequency range
16603DB Noise source	10MHz～18GHz
16603EB Noise source	10MHz～26.5GHz
16603FB Noise source	10MHz～40GHz
16603HB Noise source	10MHz～50GHz

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