

Specifications

Frequency

Frequency Range

Spectrum analysis mode

R3671: 20 Hz to 13 GHz

Frequency range	Frequency Band	Harmonic mixing mode (N)
20 Hz to 3.5 GHz	0	1 –
3.4 to 7.5 GHz	1	1 –
7.4 to 13 GHz	2	2 –

Bands 1 to 2 use a built-in YIG tuning preselector

R3681: 20 Hz to 32 GHz

Frequency range	Frequency Band	Harmonic mixing mode (N)
20 Hz to 3.5 GHz	0	1 –
3.4 to 7.5 GHz	1	1 –
7.4 to 15.4 GHz	2	2 –
15.2 to 32 GHz	3	4 –

Bands 1 to 3 use a built-in YIG tuning preselector

Modulation analysis mode:

(Enabled when the modulation analysis option is specified)
20 MHz to 6 GHz

Frequency range	Frequency Band	Harmonic mixing mode (N)
20 MHz to 3.5 GHz	0	1 –
3.5 to 6 GHz	1M	1 –

Band 1M bypasses the built-in YIG tuning preselector

Built-in preamplifier (Band 0 only):

100 kHz to 3.5 GHz, 20 dB gain (typical)

Input coupling: DC

Internal frequency reference stability

Aging rate: $\pm 5 \times 10^{-8}$ /day, $\pm 5 \times 10^{-7}$ /year

Temperature stability: $\pm 1 \times 10^{-7}$

(at 5 to 40°C, with frequency at 25°C as reference)

Warm-up (nominal): $\pm 5 \times 10^{-7}$ /minute

Reference frequency error:

$\pm(\text{Time elapsed from the latest factory calibration} \times \text{Aging rate} + \text{Temperature stability})$

Marker frequency counter (S/N >50 dB)

Accuracy: $\pm(\text{Marker frequency} \times \text{Reference frequency error} + \text{Residual FM})$

Resolution: 0.01 Hz

Frequency reading accuracy:

(Resolution bandwidth 1 Hz to 3 MHz)
 $\pm(\text{Frequency reading} \times \text{Reference frequency error} + \text{Span} \times \text{Span accuracy} + \text{Resolution bandwidth} \times 0.1 + \text{Residual FM})$

Frequency stability

(with internal reference frequency source)

Residual FM: $\leq(3 \text{ Hz} \times N_p)/100 \text{ ms}$

Frequency span

Range

R3671: 20 Hz to 13 GHz, 0 Hz (zero span)

R3681: 20 Hz to 32 GHz, 0 Hz (zero span)

Accuracy: $\pm 1\%$ (200 Hz \leq Span)

$\pm 1 \times N\%$ (20 Hz \leq Span <200 Hz)

Signal purity:

(with internal reference frequency source, Frequency 800 MHz, and temperature range: 20 to 30°C)
100 Hz offset: $<-87 \text{ dBc/Hz}$
1 kHz offset: $<-110 \text{ dBc/Hz}$
10 kHz offset: $<-120 \text{ dBc/Hz}$
100 kHz offset: $<-120 \text{ dBc/Hz}$
1 MHz offset: $<-140 \text{ dBc/Hz}$
10 MHz offset: $<-155 \text{ dBc/Hz (nominal)}$

Resolution bandwidth (RBW)

Range: 1 Hz to 10 MHz (sequences 1, 2, 3, and 5)

Accuracy: $\pm 3\%$: Resolution bandwidth 1 Hz to 500 kHz

$\pm 7\%$: Resolution bandwidth 1 to 3 MHz

$\pm 12\%$: Resolution bandwidth 5 MHz

$\pm 20\%$: Resolution bandwidth 10 MHz

Selectivity (60 dB/3 dB): $<6: 1$ (5: 1, typ.)

Video bandwidth (VBW)

Range: 1 Hz to 10 MHz (sequences 1, 2, 3, and 5)

Sweep

Sweep time setting range

Zero span: 1 μs to 6000 s

Span > 0 Hz: 10 ms to 2000 s

Sweep time accuracy: $\pm 2\%$

Sweep mode:

Continuous and single

Trigger function

Trigger source: Free-run, Video, IF, Line, Ext 1 (TTL level), and Ext 2 (0 to 5 V, Resolution: 20 mV)

Trigger delay setting range: 10 ns to 1 s

Resolution: 10 ns

Amplitude

Amplitude measurement range

Preamplifier off: +30 dBm to Average display noise level

Preamplifier on (Band 0 only): +20 dBm to Average display noise level

Maximum safety input level

Average continuous power

Preamplifier off: +30 dBm (at input ATT. $\geq 10 \text{ dB}$)

Preamplifier on: +13 dBm (at input ATT. $\geq 10 \text{ dB}$)

DC voltage: 0 V (No DC applied to signals)

Input ATT. range: 0 to 75 dB by 5 dB steps

Scale display range:

10 div., fixed

Log scale: 0.1 to 1 dB/div. by 0.1 dB steps

1 to 20 dB/div. by 1 dB steps

Linear scale: 10%/div. of reference level

Scale unit: dBm, dBmV, dB μ V, dB μ Vemf, dBpW, W, V

Reference level setting range

Preamplifier off

Log scale: -170 to +60 dBm by 0.01 dB steps

Linear scale: 707.1 pV to 223.6 V by Approx. 1% steps

Preamplifier on

Log scale: -170 to +30 dBm, 0.01 dB steps

Linear scale: 707.1 pV to 7.071 V by Approx. 1% steps

Trace:

4 maximum

Detector modes:

Normal, positive peak, negative peak, sample, RMS, video average, and voltage average

Amplitude accuracy

Calibration signal (50 MHz)

Amplitude:	-10 dBm
Accuracy:	±0.2 dB (temperature range: 20 to 30°C) ±0.3 dB (temperature range: 5 to 40°C)

Frequency response (After automatic calibration, where reference frequency: 50 MHz; input ATT.: 10 dB; pre-selector: peak-adjusted; and temperature range: 20 to 30°C)

Spectrum analysis mode

Preamplifier off:	50 MHz to 2.5 GHz: <±0.4 dB 20 Hz to 3.5 GHz: <±1.0 dB 3.5 to 7.5 GHz: <±1.5 dB 7.5 to 13 GHz: <±2.0 dB 13 to 15.4 GHz: <±2.0 dB
R3681 only:	15.4 to 32 GHz: <±2.5 dB
Preamplifier on:	50 MHz to 2.5 GHz: <±1.0 dB 100 kHz to 3.5 GHz: <±2.0 dB

Input ATT. switching error: (At input ATT. 5 to 50 dB, with ATT. 10 dB as reference)
20 Hz to 8 GHz: <±1.0 dB
8 to 12 GHz: <±1.3 dB
12 to 13 GHz: <±1.4 dB

R3681 only:	13 to 20 GHz: <±1.4 dB 20 to 26.5 GHz: <±1.8 dB 26.5 to 32 GHz: <±2.1 dB
-------------	--

Scale display error: (Mixer level: -20 dBm as reference, mixer level range: -10 to -50 dBm, and temperature range: 20 to 30°C)
<±0.13 dB

Resolution bandwidth switching uncertainty: (RBW 100 kHz as reference, after automatic calibration with and 10 dB/div. or less)
<±0.05 dB: Resolution bandwidth 1 Hz to 3 MHz
<±0.3 dB: Resolution bandwidth 5 MHz, 10 MHz

Total level accuracy: (After automatic calibration, mixer level: -10 to -50 dBm, preamplifier: off; input ATT.: 10 dB; RBW: 100 kHz; and temperature range: 20 to 30°C)
<±(0.2 dB + Frequency response + Scale display error)

Dynamic range

Average display noise level

Spectrum analysis mode	(Input terminated, input ATT.: 0 dB; RBW: 1 Hz; VBW: 1Hz, detector: sample; average: 20 times or more; AVG mode: Video; and temperature range: 20 to 30°C. For a temperature range of 5 to 40°C, 2 dB is added.)
Preamplifier off:	100 Hz: <-96 dBm 1 kHz: <-119 dBm 10 kHz: <-129 dBm 100 kHz: <-130 dBm 1 MHz: <-140 dBm 10 MHz to 1 GHz: <-156 dBm (typical: -158 dBm) 1 to 2 GHz: <-154 dBm (typical: -156 dBm) 2 to 2.5 GHz: <-152 dBm (typical: -154 dBm) 2.5 to 3 GHz: <-150 dBm (typical: -152 dBm) 3 to 3.5 GHz: <-148 dBm (typical: -150 dBm) 3.5 to 13 GHz: <-146 dBm (typical: -149 dBm)
R3681 only:	13 to 15.4 GHz: <-146 dBm (typical: -149 dBm) 15.4 to 26.5 GHz: <-141 dBm (typical: -144 dBm) 26.5 to 32 GHz: <-140 dBm (typical: -143 dBm)
Preamplifier on:	100 kHz: <-136 dBm 1 MHz: <-146 dBm 10 MHz to 1 GHz: <-162 dBm (typical: -168 dBm) 1 to 2.5 GHz: <-160 dBm (typical: -166 dBm) 2.5 to 3 GHz: <-158 dBm (typical: -164 dBm) 3 to 3.5 GHz: <-156 dBm (typical: -162 dBm)

1 dB gain compression: (Separation: Resolution bandwidth x 15, 50 kHz min.)
10 to 200 MHz: >+2 dBm (typical: +5 dBm)
200 MHz to 3.5 GHz: >+7 dBm (typical: +10 dBm)
3.5 to 7.5 GHz: >-5 dBm (typical: -2 dBm)
7.5 to 13 GHz: >-3 dBm (typical: 0 dBm)
13 to 32 GHz: >-3 dBm (typical: 0 dBm)

R3681 only:

2nd order harmonic distortion: 10 MHz to 1.75 GHz: <-60 dBc (mixer level: -20 dBm)
>1.75 GHz: <-90 dBc (mixer level: -10 dBm)

3rd order intercept point (TOI): (Mixer level: -20 dBm, separation: 25 kHz)
10 to 200 MHz: >+12 dBm (typical: +16 dBm)
200 to 500 MHz: >+16 dBm (typical: +20 dBm)
500 MHz to 1 GHz: >+20 dBm (typical: +24 dBm)
1 to 2 GHz: >+21 dBm (typical: +25 dBm)
2 to 3.5 GHz: >+22 dBm (typical: +26 dBm)
3.5 to 7.5 GHz: >+5 dBm (typical: +10 dBm)
7.5 to 13 GHz: >+8 dBm (typical: +12 dBm)
13 to 32 GHz: >+8 dBm (typical: +12 dBm)

R3681 only:

Image/multiple/out-band spurious

Spectrum analysis mode

R3671:	10 MHz to 13 GHz: <-70 dBc
R3681:	13 MHz to 15.4 GHz: <-70 dBc 15.4 to 26.5 GHz: <-65 dBc 26.5 to 32.0 GHz: <-60 dBc

Residual spurious (Spectrum analysis mode, no input, input terminated, input ATT.: 0 dB)
1 MHz to 3.5 GHz: <-95 dBm

Preamplifier on:
Preamplifier off

R3671:	1 MHz to 13 GHz: <-90 dBm
R3681:	1 MHz to 32 GHz: <-90 dBm

Input/Output

RF input

Connector:	N type (female), front panel K type (male), front panel
R3671:	50 Ω (nominal)
R3681:	50 Ω (nominal)
Impedance:	(Input ATT.: ≥10 dB, at the specified frequency) <1.5: 1 (<3.5 GHz) (nominal) <2.0: 1 (>3.5 GHz) (nominal)
VSWR:	

Calibration signal output

Connector:	BNC (female), front panel
Impedance:	50 Ω (nominal)
Frequency:	50 MHz

Probe power source

Connector:	4-pin connector, front panel
Output voltage and current:	±15 V, 150 mA (nominal)

I/Q input

Connector:	BNC (female), front panel
Impedance:	50 Ω (nominal), AC/DC coupling
Maximum input amplitude:	1.0 Vp-p (DC ±0.5 V or less)

External trigger input 1

Connector:	BNC (female), rear panel
Impedance:	10 kΩ (nominal), DC coupling
Trigger level:	TTL level

External trigger input 2

Connector:	BNC (female), rear panel
Impedance:	10 kΩ (nominal), DC coupling
Trigger level:	0 to 5 V

Trigger output

Connector:	BNC (female), rear panel
Amplitude:	TTL level

Frequency reference input

Connector:	BNC (female), rear panel
Impedance:	50 Ω (nominal)
Frequency:	5 to 20 MHz
Amplitude:	0 dBm ±5 dB

10 MHz frequency reference output	
Connector:	BNC (female), rear panel
Impedance:	50 Ω (nominal)
Frequency:	10 MHz
Amplitude:	0 dBm ±5 dB

21.4 MHz IF output	
Connector:	BNC (female), rear panel
Impedance:	50 Ω (nominal)
Frequency:	21.4 MHz
Amplitude:	Mixer level: +2 dB (typical at 50 MHz)

I/O	
Keyboard:	PS/2 101/106 keyboard, front panel
Mouse:	PS/2 mouse, front panel
USB:	Front panel
GPIO:	Conforming to IEEE-488.2, rear panel
LAN port:	10 Base-T, supporting TCP/IP, rear panel
Printer port:	Conforming to IEEE-1284-1994, rear panel
Signal for external indicator:	15-pin D-subconnector (VGA), rear panel

Notice: RS232 and EXT IN 1 to 4 connectors are not available.

General specifications

Operating environment range:	
Ambient temperature:	+5 to +40°C
Relative humidity:	80% or less (No condensation)

Storage environment range:	
Ambient temperature:	-20 to +60°C
Relative humidity:	80% or less (No condensation)

AC power input:	
100 to 120 VAC, 50 Hz/60 Hz	220 to 240 VAC, 50 Hz/60 Hz
(automatic switching between 100 VAC and 220 VAC)	

Power consumption:	
500 VA or less	Approx. 220 VA (excluding options)

Dimensions:	
Approx. 424 (W) x 266 (H) x 530 (D) mm	

Mass:	
32 kg or less (excluding options)	

Options

OPT.22 High-stability frequency reference source

Reference frequency stability	
Aging rate:	±3 x 10 ⁻¹⁰ / day, ±2 x 10 ⁻⁸ / year
Temperature stability:	±5 x 10 ⁻⁹ (5 to 40°C, with frequency at 25°C as reference)
Warm-up (nominal):	(At 25°C, the frequency at 24 hours after power is turned on is used as a reference) ±1 x 10 ⁻⁸ /30 minutes ±5 x 10 ⁻⁹ /60 minutes
Reference frequency error:	±(Time elapsed from the latest factory calibration x Aging rate + Temperature stability)

OPT.71 2-ch arbitrary waveform generator (AWG) module OPT.72 3 GHz (R3671)/6 GHz (R3681) digital signal generator module

Arbitrary waveform generator module

Waveform resolution	
DAC resolution:	14 bits

Number of channels/Waveform memory size	
Number of channels:	2
Maximum memory size:	64M samples/channel
Number of waveforms storable:	Up to 4 waveforms

Waveform amplitude	
AC waveform amplitude:	1 Vp-p (Fix Gain Path mode) 2 Vp-p (Variable Gain Path mode)
Amplitude variable range:	0.2 to 2 Vp-p (Variable Gain Path mode)
Amplitude setting resolution:	5 mV

DC offset	
Variable range:	±0.75 V
Setting resolution:	5 mV
Residual DC offset:	<±0.5 mV (Fix Gain Path mode) ^{*1)} <±1.0 mV (Variable Gain Path mode) ^{*1)}

Sampling frequency	
Frequency setting range:	12.5 to 200 MHz
Frequency setting resolution:	10 μHz

Amplitude/Phase difference	
Phase difference	
between channels:	<2 ns
Level error	
between channels ^{*2)} :	<0.2% (Fix Gain Path mode) <1.0% (Variable Gain Path mode)

Baseband filter:	
2.5 MHz/50 MHz/Through (Low Path Filter: Tchebyscheff)	

Distortion characteristics^{*3)*4)}	
SFDR:	<-67 dBc (Fix Gain Path mode) ^{*5)} <-61 dBc (Variable Gain Path mode) ^{*6)}

Start trigger	
Type:	Continuous/Single/Target
Source:	Internal/External
Trigger polarity:	Positive/Negative

Marker	
Mode:	Memory marker/Sequence marker
Marker polarity:	Positive/Negative
Number of markers:	2 (one of two markers internally connected to SA)

BER counter	
PRBS:	PN7, 9, 11, 15, 19, 20, 23, ALL-0, and ALL-1
Number of channels:	1
Clock rate:	<60 MHz
External input signal:	data, clock, clock gate, and reset
Data polarity:	Positive/Negative
Clock polarity:	Rising/Falling

Input/Output	
I/Q output:	SMA (female), rear panel, 50 Ω (nominal)
Marker output:	BNC (female), rear panel, 180 Ω (nominal) TTL LEVEL
BER data input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTTL level
BER clock input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTTL level
BER clock gate input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTTL level
BER reset input:	BNC (female), rear panel, 5 kΩ (nominal) TTL level or LVTTTL level

RF signal generator module (only in OPT.72)

Frequency	
Range:	R3671: 50 MHz to 3 GHz R3681: 50 MHz to 6 GHz
Resolution:	0.1 Hz
Accuracy:	Depends on accuracy of reference source
Output level	
Range:	+13 to -100 dBm (modulation OFF) +10 to -100 dBm (modulation ON)
Attenuator hold	
Level variable range:	>10 dBp-p
Resolution:	0.01 dB
Accuracy ^{*7)} :	<±1.4 dB (+13 to -15 dBm, modulation OFF), ±1.0 dB (2 Sigma) <±1.8 dB (-15 to -100 dBm, modulation OFF), ±1.2 dB (2 Sigma) <±1.4 dB (+10 to -15 dBm, modulation ON), ±1.0 dB (2 Sigma) <±2.3 dB (-15 to -100 dBm, modulation ON), ±1.6 dB (2 Sigma) ±0.25 dB (relative to ALC ON)
ALC Hold ADJ accuracy:	±0.25 dB (relative to ALC ON)
Output impedance:	50 Ω (nominal), front panel N (female)
SWR ^{*8)} :	<1.7: ≤3 GHz
R3681 only:	<2.0: ≤6 GHz
Maximum reverse input power:	1 W
Signal purity	
SSB phase noise (20 kHz offset)	
R3671/3681:	<-115 dBc/Hz (50 MHz ≤ f ≤ 500 MHz) <-123 dBc/Hz (500 MHz < f ≤ 2 GHz) <-118 dBc/Hz (2 GHz < f ≤ 3 GHz)
R3681:	<-118 dBc/Hz (3 GHz < f ≤ 4 GHz) <-115 dBc/Hz (4 GHz < f ≤ 6 GHz)
Broadband noise:	<-132 dBc/Hz (for 2 GHz 0 dBm output)
Harmonic component:	<-30 dBc (for +10 dBm output)
Non-harmonic component:	<-65 dBc (for 0 dBm output)
Modulation^{*7) *9)}	
Modulation accuracy ^{*10)} :	EVM < 4% rms
Origin offset:	<-15 dBc
ACLR ^{*11)} :	<-53 dBc (basic) <-60 dBc (OPT.73 ACLR mode)
External IQ input	
Input level:	$\sqrt{I^2 + Q^2} = 0.5 \text{ Vrms}$
Impedance:	50 Ω (nominal), rear panel SMA (female)

*1: After calibration

*2: $f_{out} = 1 \text{ kHz}$ after calibration

*3: Sampling clock = 200 MHz

*4: $f_{out} = 5 \text{ MHz}$, sine wave

*5: Output level = 1 Vp-p

*6: Output level = 2 Vp-p

*7: Temperature range: 25 ±5°C

*8: Output level: -10 dBm or less

*9: 3GPP, IEEE802.11a/b/g, 0 dBm output

*10: Carrier-Shift 2.5 MHz (3GPP)

*11: 3GPP DL Test Model 1 64DPCH, 2110 to 2170 MHz

OPT.73 3GPP multi-carrier generator option**Maximum number of carriers: 4****Test models that can be generated:**

Test Model 1
(64DPCH/32DPCH/16DPCH)
Test Model 2
Test Model 3 (32DPCH/16DPCH)
Test Model 4
Test Model 5 (8HS-PDSCH+30DPCH)
Test Model 5 (4HS-PDSCH+14DPCH)
Test Model 5 (2HS-PDSCH+6DPCH)

Scrambling code: 0, 16, 32, 48**Slot timing:** 0, 1/5, 2/5, 3/5 slot**Waveform generation mode:** ACLR mode, EVM mode**Ordering information****Accessories**

Power cable:	A01402	1
Input cable (50 Ω):	A01261-30	1
N – BNC adapter (R3671) :	JUG-201A/U	1
K (f)–K (f) adapter (R3681):	5A-SFF40 (A)	1
SMA (f) – SMA (f) adapter (R3681):	HRM-501	1
SMA (m) – BNC (m) adapter (R3681):	HRM-517 (09)	1
Stylus pen:	ST-PEN	1

Options

High-stability frequency reference source:	OPT.22	
3GPP modulation analysis software:	OPT.50	
cdma2000 modulation analysis software:	OPT.52	
GSM/EDGE modulation analysis software	OPT.56	
IEEE802.11b/g modulation analysis software:	OPT.59	
OFDM (802.11a) modulation analysis software:	OPT.68	
2-ch arbitrary waveform generator (AWG) module:	OPT.71	
SMA (male) - BNC (female) adapter:	HRM-517(09)	2
3 GHz/6 GHz digital signal generator module:	OPT.72	
SMA (male) - BNC (female) adapter:	HRM-517(09)	2
N (male) - BNC (female) adapter:	JUG-201/U	1
Input cable:	A01413	1
3GPP multi-carrier generator:	OPT.73	
C/N measurement software:	OPT.80	
AMP measurement software:	OPT.83	
Differential IQ input fixture:	R14603	
BNC cable:	A01261-60	2
USB cable:	A112008	1
Probe power cable:	A01294-0800	1
W-LAN 11.a technical adaptability test software		
IEEE802.11a:	PR36810101-FD	
TELEC (IEEE802.11a frequency band):	PR36810102-FD	
FCC (IEEE802.11a frequency band):	PR36810103-FD	
W-LAN 11.b/g technical adaptability test software		
IEEE802.11b/g:	PR36810104-FD	
TELEC (IEEE802.11b/g frequency band):	PR36810105-FD	
FCC (IEEE802.11b/g frequency band):	PR36810106-FD	

Accessories (optional)

Rack-mount set B:	A02724	EIA standard
	A02725	JIS standard
Panel extension cable (3 m):	A112003	

Bluetooth is a trademark owned by Bluetooth SIG, Inc., U. S. A.

Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and other countries.

Pentium is a registered trademark of Intel Corporation.

Please be sure to read the product manual thoroughly before using the products.
Specifications may change without notification.