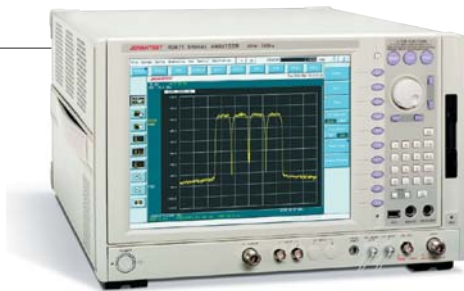


ADVANTEST

**R3671/3681
Signal Analyzers**

High Performance Spectrum and Broadband modulation analysis
in one versatile instrument

- Frequency Range: 20 Hz to 13 GHz (R3671)
20 Hz to 32 GHz (R3681)
- Wide Dynamic Range
Average Display Noise Level: -158 dBm (typical @ 1 GHz)
1 dB Compression Point: +10 dBm (typical, 200 MHz to 3.5 GHz)
Third-Order Intercept Point (TOI): +26 dBm (typical, 2 to 3.5 GHz)
- Built-in High-Performance Digital Modulation Signal Generator (OPT.72)
- Various Modulation Analysis Options
W-LAN (IEEE802.11a/b/g), W-CDMA (HSDPA), cdma2000 (1xEV-DV)



R3671/3681





With growing data communications traffic, broadband radio communication systems such as radio-LANs, are being developed that employ various modulation formats. For example, IMT-2000 and other mobile communication systems already use multicarrier methods. Broadband radio signals are already being used in the RF band. To push this envelope for higher quality data transmissions, researchers and developers are studying higher frequency/broader band carriers. In this kind of radio communications environment, new measuring instruments are needed that are not only more efficient than ever, but also more flexible to support new test requirements and communication standards. The R3671 and R3681 are one of these new measuring instruments for this new era of test and measurement requirements. The R3671 and R3681 are high performance signal analyzers. Employing our unique RF technology, the R3671 and R3681 achieve an Average Display Noise Level of -158 dBm^{*1} , a Third-Order

Intercept Point (TOI) specification of $+26 \text{ dBm}^{*2}$, and a signal purity of -122 dBc/Hz^{*3} to enable measurements over a wide dynamic range. The R3671 and R3681 also have unique noise correction functions that enhances their dynamic range (-84 dBc [typical]) for W-CDMA adjacent leakage power (ACLP) measurements. The R3671 and R3681 come standard with broadband modulation analysis functions (bandwidth 25 MHz) as well as RF measurement functions. By adding the dedicated signal analysis options for the respective communication systems to the R3671/3681, you can expand the functionality of transmitter testers. Furthermore, with an optional RF signal generator that supports digital modulation, the R3671 and R3681 provide ease of implementation of the optimum testing systems for evaluating high-frequency devices.

**1 Typical value at RBW of 1 Hz and 1 GHz with built-in preamplifier off*

**2 Typical value at 2 to 3.5 GHz*

**3 Typical value at 800 MHz and 10 kHz offset*



● **Series Models Designed to Enable Selection of Optimum Frequency Range**

R3671 (20 Hz to 13 GHz):

Used for mobile communication bandwidths

R3681 (20 Hz to 32 GHz):

Used for various methods of research and development

● **High-Performance Spectrum Analysis**

● **Flexible Digital Modulation Analysis**

3GPP/cdma2000/GSM/Bluetooth®/W-LAN

● **Digital Modulation RF SG That Can Be Mounted Inside**

R3671: 50 MHz to 3 GHz

R3681: 50 MHz to 6 GHz

● **Stable Measurement with More Digital Circuits**

● **Variety of User Interfaces and I/O Interfaces Supported**

Large 12-inch TFT display (touch screen)

Mouse, keyboard, USB, LAN, GP-IB, VGA, and FDD interfaces

Variety of Available Options (common to the R3671 and R3681)

- OPT.22** High-stability frequency reference source
 $\pm 3 \times 10^{-10}/\text{day}$ $\pm 5 \times 10^{-8}/\text{year}$
- OPT.50** 3GPP modulation analysis software (HSDPA supported)
- OPT.52** cdma2000 modulation analysis software (1xEV-DV supported)
- OPT.56** GSM (EDGE) modulation analysis software
- OPT.59** IEEE802.11b/g modulation analysis software
- OPT.68** OFDM (802.11a) modulation analysis software
- OPT.71** 2-ch arbitrary waveform generator (AWG) module
- OPT.72** Digital modulation signal generator module
R3671: 50 MHz to 3 GHz R3681: 50 MHz to 6 GHz
The OPT.72 includes the capabilities of the OPT.71 (AWG).
- OPT.73** 3GPP multi-carrier generator
- OPT.80** C/N measurement software
- OPT.83** AMP measurement software

R3671 Package Options

Special R3671 package options are available. Build a cost-effective system with one of the special R3671 packages equipped with your favorite options.

Package No.	Combinations and Descriptions
1	R3671+50 Suitable for evaluation of RF transmission characteristics and modulation analysis testing involving 3GPP
2	R3671+52 Suitable for evaluation of RF transmission characteristics and modulation analysis testing involving cdma2000
3	R3671+50+52 Suitable for evaluation of RF transmission characteristics and modulation analysis testing involving 3GPP/cdma2000
4	R3671+72+73 Suitable for evaluation of RF transmission characteristics through 3 GHz digital modulation SG
5	R3671+72+73+50 Suitable for modulation analysis testing of 3GPP devices
6	R3671+72+73+52 Suitable for modulation analysis testing of cdma2000 devices
7	R3671+72+73+50+52 Suitable for modulation analysis testing of 3GPP/cdma2000 devices

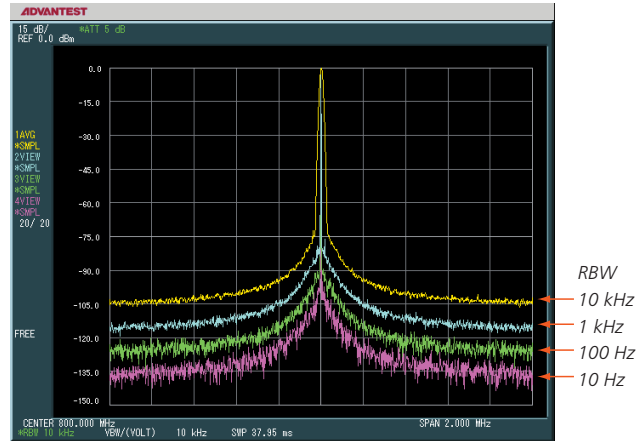
High-Performance Spectrum Analysis

Dynamic range measurement

By making full use of the latest RF techniques, the R3671 and R3681 enable measurement over a wide dynamic range:

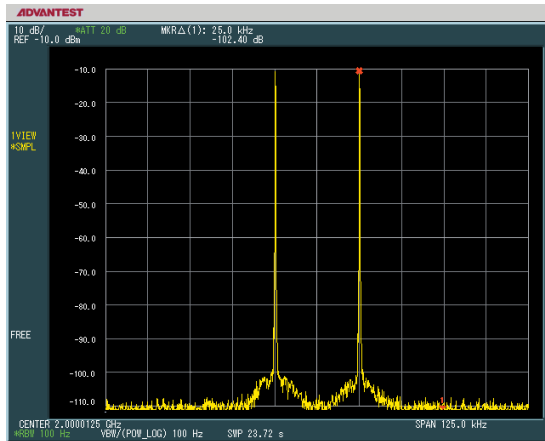
- Average Display Noise Level: -158 dBm typ. (RBW=1 Hz, @ 1 GHz)
Built-in Pre-amplifier On: -168 dBm typ. (RBW=1 Hz, @ 1 GHz)
- 1 dB Compression Point: +10 dBm typ. (@ 200 MHz to 3.5 GHz)
- Third-Order Intercept Point (TOI): +26 dBm typ. (@ 2 to 3.5 GHz)
- Built-in Attenuator: 5 dB steps
- Resolution Bandwidth (RBW):
1 Hz to 10 MHz (Sequences 1, 2, 3, and 5)
- Dynamic Display Range: 10 div. fixed
0.1 to 1 dB/div. (0.1 dB steps)
1 to 20 dB/div. (1 dB steps)
- Steep Shape Factor
Approximately 3 times the conventional value. This greatly narrows the carrier near-field measurement resolution.

Wide Dynamic Display Range

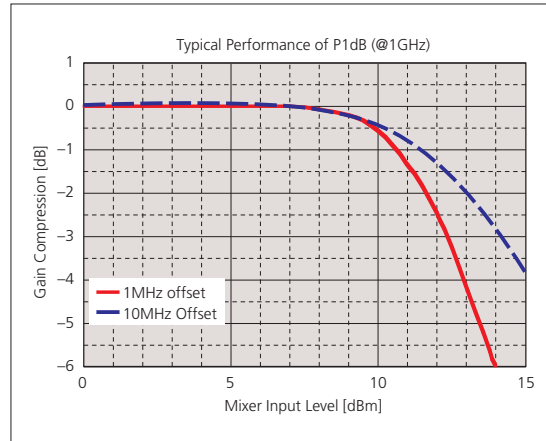


Dynamic display range: 150 dB

Low Distortion

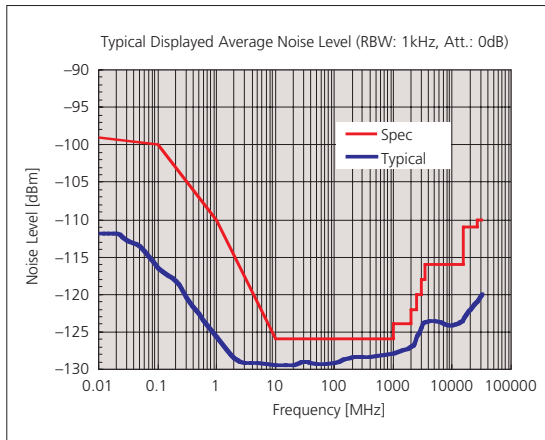


Characteristic phase noise (typical)



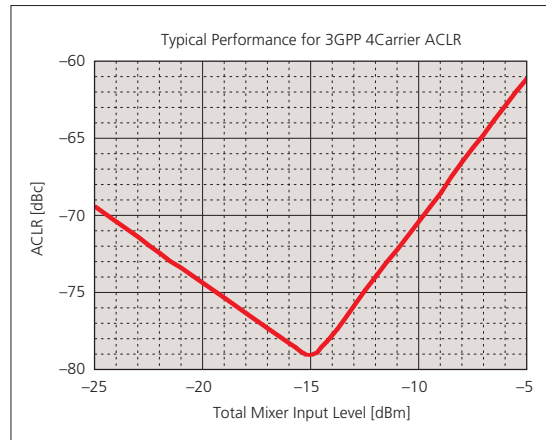
Gain compression characteristics (typical values in two-signal measurement)

Low Noise Level



Average display noise level (typical values)

Wide Dynamic Range

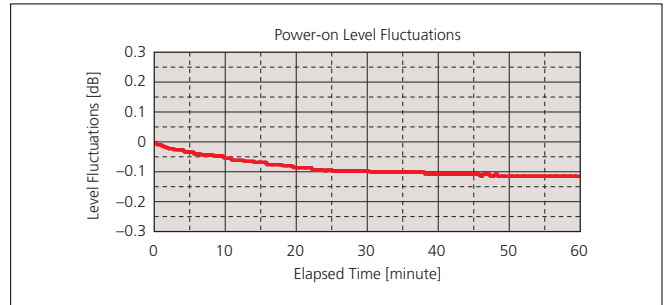


Limits of measurement on W-CDMA four-carrier ACLR (typical values)

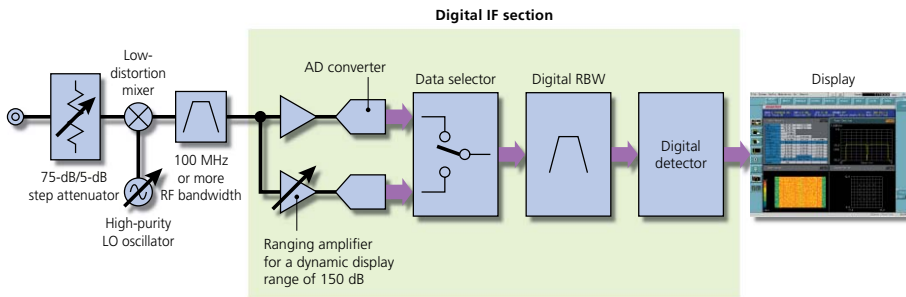
Highly Accurate Measurement

The R3671 and 3681 provide highly accurate measurement by adopting high-performance digital IF technology.

- **General Level Accuracy:**
 $\geq \pm 0.73$ dB (50 MHz to 2.5 GHz, 10 dB ATT, 100 kHz RBW)
- **Level Display Linearity:** Inaccuracy reduced
- **Level Display Stability:** Instability significantly improved
- **Self-calibration:** Calibration time shortened



Less fluctuation after power-on



Superb Signal Purity

The superb signal purity provided by a highly pure frequency synthesizer and the 150 dB dynamic display range are effective for measuring spurious signals close to carriers.

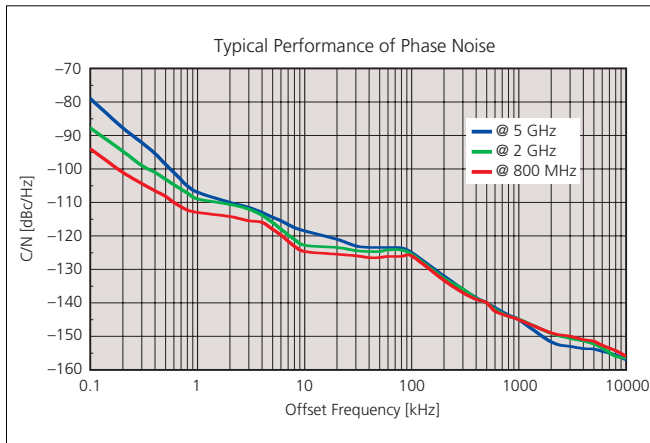
Signal purity (@ 800 MHz)

- 10 kHz offset: -120 dBc/Hz or more
- 1 MHz offset: -140 dBc/Hz or more
- 10 MHz offset: -155 dBc/Hz or more

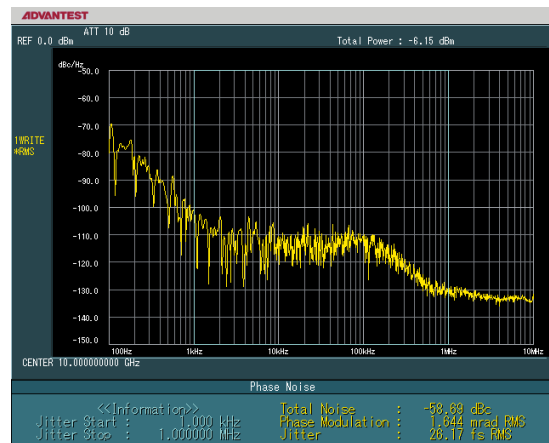
■ OPT.80 C/N Measurement Software

The C/N measurement software OPT.80 can plot offset frequencies from carrier frequencies on the horizontal axis and phase noise associated with the frequencies on the vertical axis. OPT.80 is useful for developing and troubleshooting generators and frequency synthesizers.

- **Offset Frequency Range:** 10 Hz to 1 GHz
- **Up to 8 Decades Logged and Displayed**
- **Signal Track Function for Carrier Frequency Signal Tracking Measurement**
- **Effective Values of Phase Jitters Calculable**



Phase noise characteristics (typical values)



Sample of phase jitter measurement by C/N measurement software

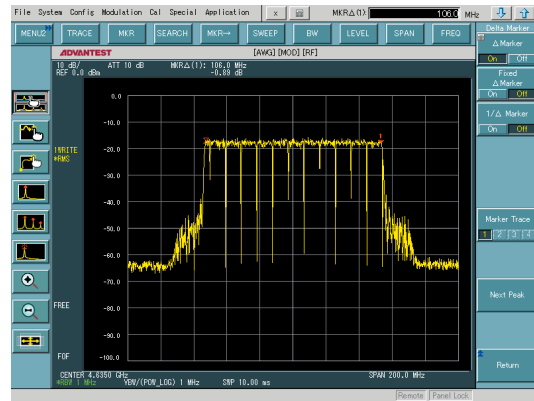
I & Q Arbitrary Waveform Generator Option (OPT.71)

2-ch Arbitrary Waveform Generator Option (OPT.71)

The 2-ch arbitrary waveform generator (AWG) option, OPT.71, can generate arbitrary waveforms based on waveform data created by the user. The OPT.71 facilitates generation of different types of signals.

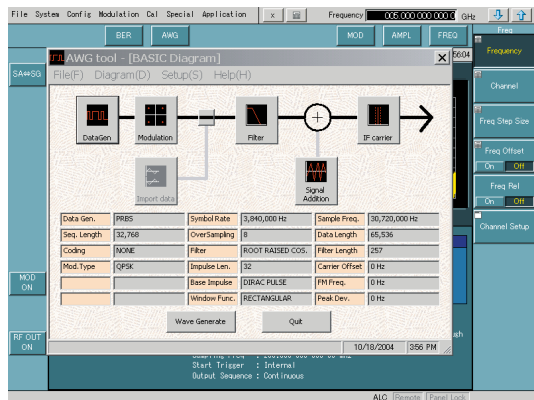
- Sampling Rate by Broadband Modulation: 12.5 to 200 MHz
- High-Capacity Waveform Data Memory: 128M samples (for I and Q altogether)
- Built-in Bit-Error-Rate Counter
- Tools for Conversion of Data Created by User into AWG (OPT.71) Format, Such as By Means of MATLAB
- Specific Waveform Generator Software for Generating Different Types of Regulated Carrier Waveforms
- Clipping Function of Waveform Generator Software, Enabling Ideal Evaluations of Amplifiers (The software is installed on an external PC.)

100 MHz Broadband Modulation Signal Generator



AWG Waveform Characteristics

Easy Setup



Waveform setup window

Waveform Generator Software Lineup (Freeware*)

- IEEE802.11a/b/g waveform generator
- Bluetooth waveform generator
- GSM/EDGE waveform generator
- 3GPP waveform generator
- cdma2000 1X EV-DV waveform generator
- cdma2000 1X EV-DO waveform generator
- General-purpose multi-carrier waveform generator software

*1: Multiple waveforms can be synthesized to create or clip multi-carrier waveforms.

Applicable environment: The waveform generator software runs on an external PC.

[PC system requirements]

OS: Microsoft® Windows® 2000, Microsoft Windows XP

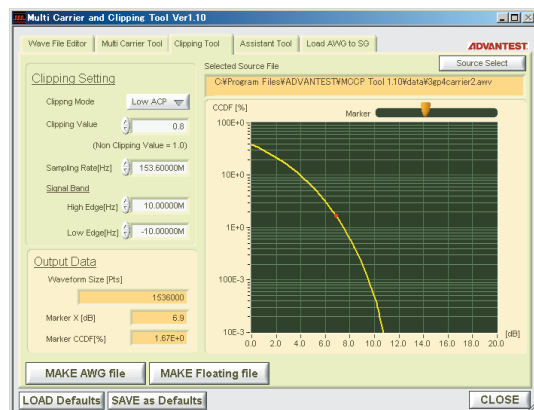
PC: 1.6 GHz Pentium® 4 or higher recommended

Main Memory: 256 MB or more recommended

Display: Super VGA (800 x 600) or higher-resolution monitor with 256 colors

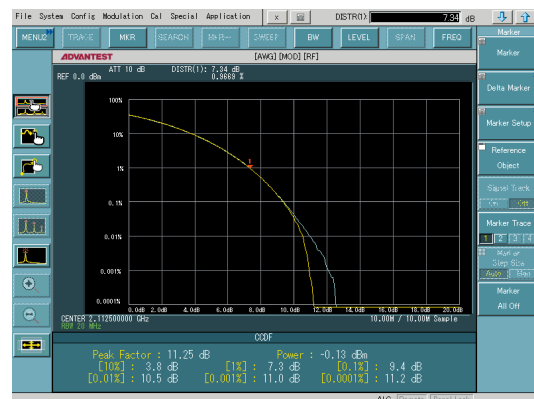
HDD Space: 4.01 MB

Waveform Generator Software (on an External PC)



Clipping window

Clipping Function Suitable for Evaluation of Amplifiers



Sample view of CCDF characteristics clipped

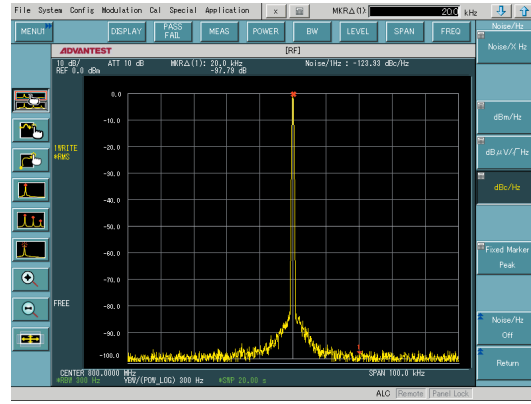
RF Vector Modulation Signal Generator (OPT.72/73)

SG (OPT.72)

The SG OPT.72 can generate signals with digital modulation. The OPT.72 includes a highly pure synthesizer, broadband orthogonal modulator, and arbitrary waveform generation (AWG) function to provide flexibility in generating modulated signals. The OPT.72 also has a BER counter, which is indispensable for measuring communication quality.

- **RF Output Frequency Range:**
 - 50 MHz to 3 GHz (R3671)
 - 50 MHz to 6 GHz (R3681)
- **Sampling Rate by Broadband Modulation: 12.5 to 200 MHz**
- **High-Capacity Waveform Data Memory:**
 - 128M samples (for I and Q altogether)
- **Built-in Bit-Error-Rate Counter**
- **Generator (this option) Integrated in Analyzer (body)**

■ Superb Signal Purity



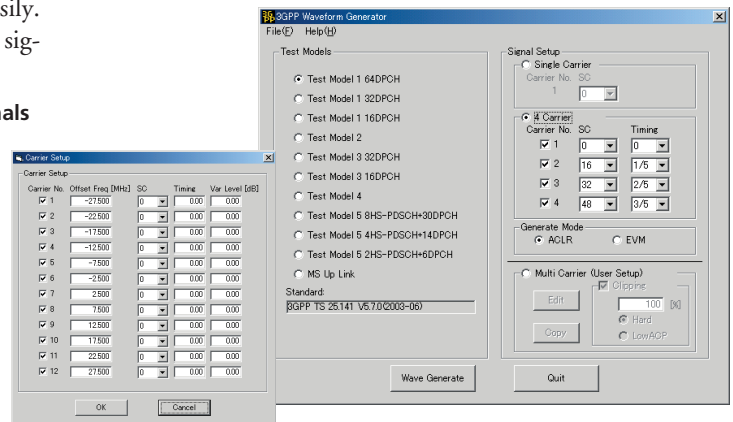
Noise/1 Hz: -123 dBc/Hz (20-kHz offset) @ 800 MHz

3GPP Multi-Carrier Generator (OPT.73)

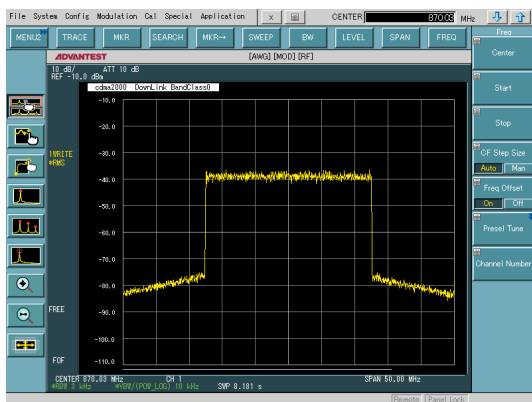
The 3GPP multi-carrier generator OPT.73 has a GUI that allows 3GPP-defined test model signals to be generated easily. With its baseband filters intended for 3GPP multi-carrier signals, the OPT.73 can generate high ACLR signals.

- **Dedicated Software for Easy Generation of Test Model Signals**
- **Dedicated Baseband Filters for Generating High ACLR Signals**
- **Generation of 3GPP-Defined Four-Carrier and Twelve-Carrier Signals (clipping f available)**
- **Generation of cdma2000-Based Twenty-Carrier Signals**

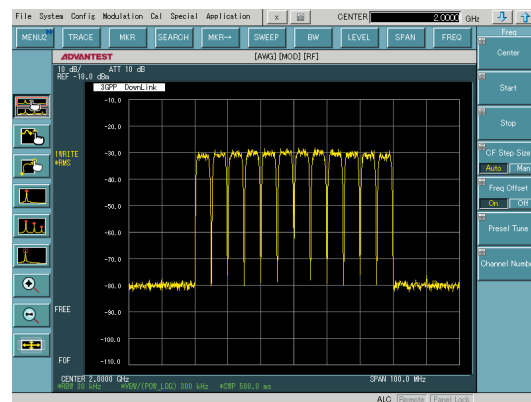
■ Easy Generation of Test Model Signals



■ cdma2000: Twenty-carrier signals generated



■ 3GPP: Twelve-carrier signals generated



Differential IQ Input Fixture and Variety of I/O Interfaces

R14603 Differential IQ Input Fixture

The R3671 and R3681 are equipped with the R14603 differential IQ input fixture, which is a signal converter for differential IQ signal measurement. The R14603 converts high-impedance differential baseband IQ signals to 50 Ω single-end IQ signals. Power and control signals to the R14603 are supplied from the R3671/3681 through an attached cable.

To use the R14603, the optional R3671/3681 modulation analysis software is required.



The high-impedance differential IQ signal converter circuit, which is independent from the R3671/3681 signal analyzer, can be placed close to the target device. The high-impedance signal line between a DUT and the measuring device can thus be shortened, and this reduces adverse effects on modulation precision by stray capacitance on the signal line and differences in line length.

- **Flat Input Frequency Characteristics**

Flat input frequency characteristics: 0.1 dBp-p (typical)

(DC to 10 MHz): ≤ 0.3 dBp-p (maximum)

Input capacitance: 22 pF (typical)

- **Input Modes Available for Different Types of Measurements**

IQ input: Switchable between Balanced and Unbalanced

Input coupling: Switchable between DC and AC

Input impedance: Switchable between 50 Ω (only for DC coupling) and 100 k Ω

- **3-Step Input Amplitude Range Switch and DC Biasing**

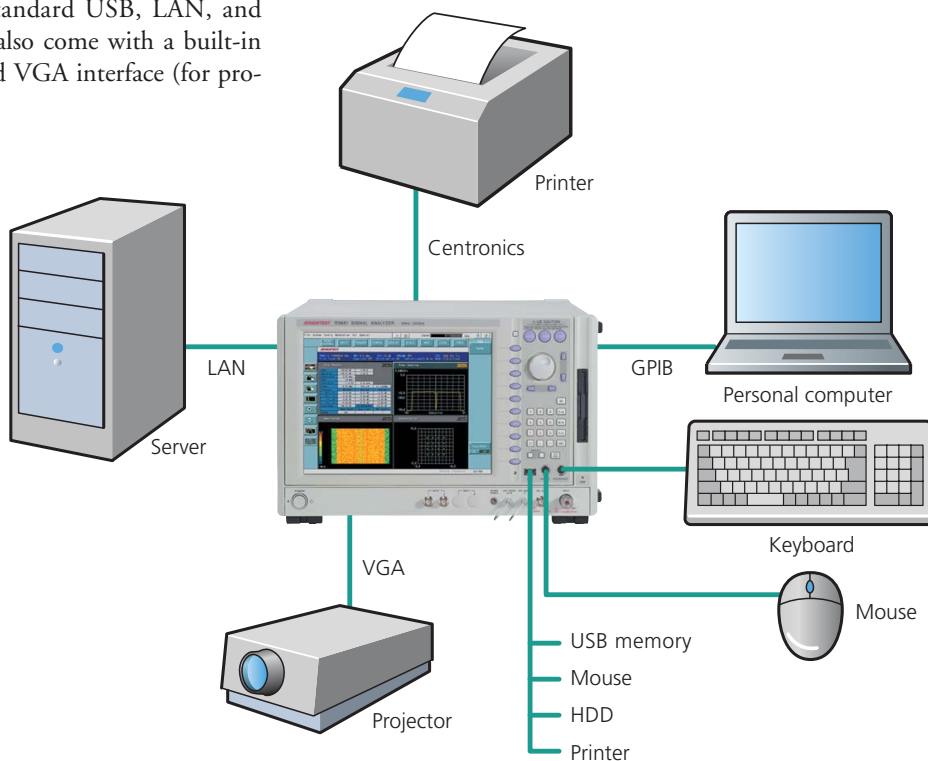
Input range: 0.25 Vp-p, 0.5 Vp-p, and 1.0 Vp-p (for Balanced input)

0.5 Vp-p, 1.0 Vp-p, 2.0 Vp-p (for Unbalanced input)

DC biasing: ± 2.5 V, 50 mV steps

Variety of Interfaces

The R3671 and 3681 come with standard USB, LAN, and GPIB control interfaces. The units also come with a built-in Centronics interface (for printers) and VGA interface (for projectors).



Adopting a Large TFT Display

FRONT PANEL

Large 12-inch TFT display

- Touch screen for quick operation
- Large screen for increased work efficiency
- Comparative analysis capabilities on multi-screens
- Indicator function for low-speed sweep position check, and more

Measurement toolbar

Displays the icon buttons for useful measurement functions.

Power switch

Turns the analyzer on and off. Setting this switch to Off shuts the OS down and turns off the analyzer.

Menu bar

Displays the analyzer's system operation menu.

Function bar

Displays the buttons for basic functions.

Software menu bar

Displays a software menu for various functions.

Application keys

Used to select from a side menu on the display.

Program keys

Used for measurement control. SINGLE, STOP, and START

Floppy disk drive

Data knob and numerical keypad

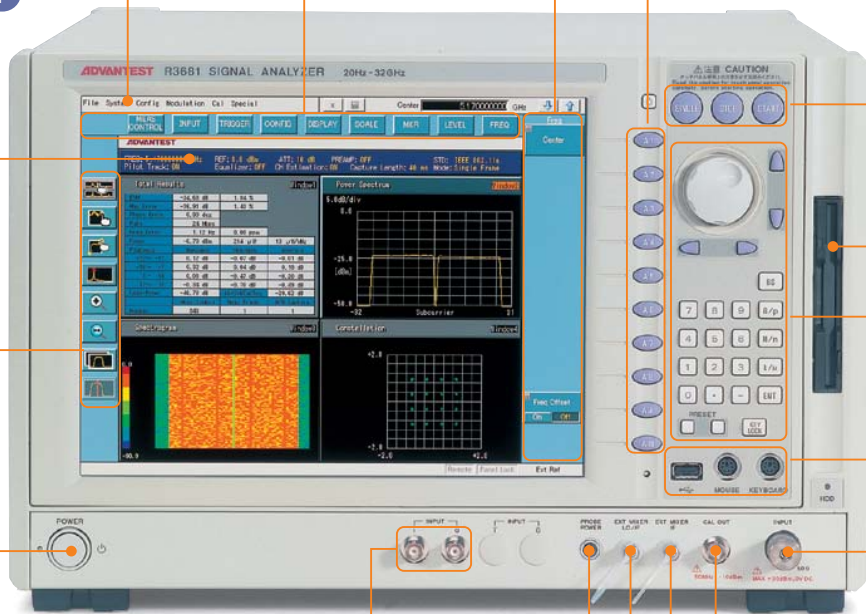
Used to enter numeric values and units.

I/O connector block

- USB connector
- Mouse connector
- Keyboard connector

Input connector

Used to input RF signals.



I/Q Input connectors

Used to connect baseband I/Q signals.

CAL OUT connector

Used to calibrate.

Probe connector

Used for the probe power connection (± 15 V output)

EXT MIX IF connector

Used to connect an external mixer for extending the measuring frequency range.

OPTION For a 2-port mixer

EXT MIX LO/IF connector

Used to connect an external mixer for extending the measuring frequency range.

OPTION For a 2-port mixer

REAR PANEL

GPIB
(conforming to IEEE488.2)

LAN (10Base-T, TCP/IP)

VIDEO (VGA specifications)

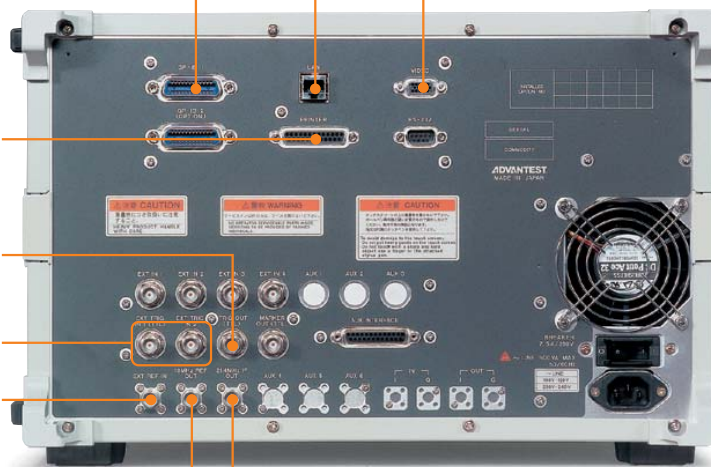
PRINTER
(conforming to IEEE1284-1994)

TRIG OUT (TTL)

EXT TRIG IN 1 (TTL)
EXT TRIG IN 2
(0 to 5 V, DC coupled)

EXT REF IN

10 MHz REF OUT **21.4 MHz IF OUT**



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)

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)

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:	
R3681:	
Impedance:	50 Ω (nominal)
VSWR:	(Input ATT.: ≥10 dB, at the specified frequency) <1.5: 1 (<3.5 GHz) (nominal) <2.0: 1 (>3.5 GHz) (nominal)

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.