

Agilent N4010A Wireless Connectivity Test Set

Data Sheet



General Introduction

The Agilent N4010A Wireless Connectivity Test Set is a measurement solution that enables efficient and lower cost test for products and components that incorporate *Bluetooth*[®] wireless technology, Wireless LAN (WLAN), and other emerging wireless connectivity technologies.

The *Bluetooth* (N4010A Option 101) feature set provides the ability to connect to *Bluetooth* version 1.1 and 1.2 devices in either test mode or normal mode, and make measurements in accordance with the *Bluetooth* RF test specification. *Bluetooth* EDR link plus measurements (Option 107) add BTv2.0+EDR support and Enhanced Data Rate (EDR) measurement capabilities. *Bluetooth* audio generation and analysis (Option 113), and headset profile (Option 112) enable testing of *Bluetooth* voice channels, audio gateway, and headset products.

The N4017A *Bluetooth*[®] Graphical Measurement Application, a PC-based software product, works in a complementary manner with the N4010A test set and provides the ability to fully configure the test set and display both numerical and graphical results.

The Wireless LAN feature set (N4010A Option 102/103) combines a fully-calibrated vector signal generator and wide bandwidth signal analyzer into a single test set, which enables efficient and repeatable WLAN module test from R&D through to production.

The N4010A test set also works with the Agilent 89601A and 89607A Vector Signal Analyzer software. This software provides the flexibility to make a broad range of measurements for evaluating wireless formats in the 2.4 GHz or 5 GHz band, including ZigBee/IEEE 802.15.4.

The test set will meet its warranted performance after one hour within the stated environmental operating range plus 40 minutes after turn on. Unless otherwise stated all specifications are valid over the temperature range 20 to 30 °C. Supplemental characteristics are intended to provide additional information, useful in applying the instrument by giving typical (expected), but not warranted, performance parameters. These characteristics are shown in *italics* or labeled as nominal.



Bluetooth Specifications

N4010A Option 101 Bluetooth

- provides ability to act as a *Bluetooth* master, perform inquiry, and establish a connection in Test mode or Normal mode
- makes measurements in accordance with *Bluetooth* RF Test Specification 1.2
- integral sequencer allows test plans to be created and edited easily
- all tests default to SIG standard settings – user may change settings to match particular test requirements

Bluetooth tests¹

Output power

Link conditions

Link mode	Test mode (loopback, Tx), normal mode (ACL, SCO)
Hopping ²	On or off
Packet type ²	DH1, DH3, DH5, HV3
Payload ²	PRBS9, BS00, BSFF, BS0F, BS55

Measurement

Supported measurements	Average power, peak power
Number of measurement channels ³	3
Range	+23 to -70 dBm
Measurement resolution	0.01 dB
Measurement accuracy	±0.5 dB

Power control

Link conditions

Link mode	Test mode (loopback, Tx)
Hopping	On or off
Packet type	DH1, DH3, DH5, HV3
Payload	PRBS9, BS00, BSFF, BS0F, BS55

Measurement

Supported measurements	Average power, min/max step size
Number of measurement channels ³	3
Range	+23 to -70 dBm
Measurement resolution	0.01 dB
Measurement accuracy	±0.5 dB

Modulation characteristics

Link conditions

Link mode	Test mode (loopback, Tx), normal mode (ACL, SCO)
Hopping ²	On or off
Packet type ²	DH1, DH3, DH5, HV3
Payload ²	BS55, BS0F

Measurement

Supported measurements	Min/max $\Delta f_{1\text{avg}}$, min $\Delta f_{2\text{max}}$ (kHz) total $\Delta f_{2\text{max}} > \Delta f_{2\text{max}}$ lower limit (%) min of min $\Delta f_{2\text{avg}}$ / max $\Delta f_{1\text{avg}}$, pseudo frequency deviation (Δf_1 and Δf_2) in normal mode
Number of measurement channels ³	3
RF input level range	+23 to -70 dBm
Deviation range	-400 to +400 kHz
Deviation resolution	100 Hz
Ratio resolution	0.1%
Measurement accuracy ⁴	As frequency reference ±100 Hz

1. Performance of the N4010A signal source or signal analyzer over wider temperature (specified later in this document) applies to all the *Bluetooth* tests listed.
2. Normal mode measurements made with hopping on, NULL packet, and no payload.
3. Internal sequencer enables three measurement channels to be measured consecutively. Measurements on all 79 *Bluetooth* channels are supported.
4. Example, using the 10 MHz reference with accuracy of 10 Hz (1 ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz}) / 10 \text{ MHz}) \pm 100 \text{ Hz} = \pm 2402 \text{ Hz} \pm 100 \text{ Hz} = \pm 2502 \text{ Hz}$.

Initial carrier frequency tolerance

Link conditions

Link mode	Test mode (loopback, Tx), normal mode (ACL)
Hopping ¹	On or off
Packet type ¹	DH1, DH3, DH5, HV3
Payload ¹	PRBS9, BS00, BSFF, BS0F, BS55

Measurement

Supported measurements	Maximum and minimum error/channel
Number of measurement channels ²	3
RF input level range	+23 to -70 dBm
Frequency	Nominal channel freq ±150 kHz
Measurement accuracy ³	as frequency reference ±100 Hz

Carrier frequency drift

Link conditions

Link mode	Test mode (loopback, Tx), normal mode (ACL)
Hopping ¹	On or off
Packet type ¹	DH1, DH3, DH5, HV3
Payload ¹	PRBS9, BS00, BSFF, BS0F, BS55

Measurement

Supported measurements	Maximum and minimum measurements drift at each frequency during the test, pseudo frequency drift in normal mode
Number of measurement channels ²	3
RF input level range	+23 to -70 dBm
Measurement range	±100 kHz
Measurement accuracy ³	As frequency reference ±100 Hz

Sensitivity – single slot packets

Link conditions

Link mode	Test mode (loopback, Tx), normal mode (ACL)
Hopping ¹	On or off
Packet type ¹	DH1, DH3, DH5
Payload ¹	PRBS9, BS00, BSFF, BS0F, BS55
Number of bits	1 to 200,000,000

Impairments – default to table

Frequency offset	±75 kHz
Modulation index	0.28 to 0.35
Modulation index resolution	0.01
Symbol timing	-20 ppm, 0, +20 ppm
Symbol timing resolution	1 ppm

Measurement

Supported measurements	BER, number of bit errors, Number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets. PER only in normal mode
Number of measurement channels ²	3, hopping
Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{4, 5}	±0.6 dB, -35 to -90 dBm ±1dB, > -35 dBm

Sine impairments (applicable for single slot packets, multi-slot packets, and maximum input level)

Modulation frequency range	300 Hz to 1.6 kHz
Resolution	100 Hz
Maximum deviation range	0 Hz to 40 kHz
Resolution	1 kHz

'Dirty transmitter' impairments table for Rx sensitivity tests (applicable for single slot packets, multi-slot packets, and maximum input level)

Set of parameters	Carrier frequency offset (kHz)	Modulation index	Symbol timing error (ppm)
1	75	0.28	-20
2	14	0.30	-20
3	-2	0.29	+20
4	1	0.32	+20
5	39	0.33	+20
6	0	0.34	-20
7	-42	0.29	-20
8	74	0.31	-20
9	-19	0.28	-20
10	-75	0.35	+20

1. Normal mode measurements made with hopping on, NULL packet, and no payload.
2. Internal sequencer enables three measurement channels to be measured consecutively. Measurements on all 79 *Bluetooth* channels are supported.
3. Example, using the 10 MHz reference with accuracy of 10 Hz (1 ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz}) / 10 \text{ MHz}) \pm 100 \text{ Hz} = \pm 2402 \text{ Hz} \pm 100 \text{ Hz} = \pm 2502 \text{ Hz}$.
4. Verified using CW measurements.
5. Add 0.01 dB/°C from 30 to 55 °C, add 0.07 dB/°C from 20 to 0 °C.

Sensitivity – multi-slot packets

Link conditions

Link mode	Test mode (loopback)
Hopping	On or off
Packet type	DH1, DH3, DH5
Payload	PRBS9, BS00, BSFF, BS0F, BS55
Number of bits	1 to 200,000,000

Impairments – default to table

Frequency offset	±75 kHz
Modulation index	0.28 to 0.35
Modulation index resolution	0.01
Symbol timing	-20 ppm, 0, +20 ppm
Symbol timing resolution	1 ppm

Measurement

Supported measurements	BER, number of bit errors, number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets
Number of measurement channels ¹	3, hopping
Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{2, 3}	±0.6 dB, -35 to -90 dBm ±1dB, > -35 dBm

Maximum input level

Link conditions

Link mode	Test mode (loopback)
Hopping	On or off
Packet type	DH1, DH3, DH5
Payload	PRBS9, BS00, BSFF, BS0F, BS55
Number of bits	1 to 200,000,000

Measurement

Supported measurements	BER, number of bit errors, number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets
Number of measurement channels ¹	3
Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{2, 3}	±0.6dB, -35 dBm to -90 dB ±1 dB, > -35 dBm

1. Internal sequencer enables three measurement channels to be measured consecutively. Measurements on all 79 *Bluetooth* channels are supported.
2. Verified using CW measurements.
3. Add 0.01 dB/°C from 30 to 55 °C, add 0.07 dB/°C from 20 to 0 °C.

N4010A Option 107 *Bluetooth* EDR link plus measurements

Bluetooth EDR transmitter tests EDR relative transmit power

Link conditions

Link mode	Test mode (loopback, Tx)
Hopping	On or off
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5

Measurement

Supported measurements	Power in GFSK header, power in PSK payload, relative power between GFSK header to PSK payload
Number of measurement channels ¹	3, hopping
Range	+23 to -70 dBm
Resolution	0.01 dB
Accuracy ²	±0.5 dB

EDR modulation accuracy and carrier frequency stability

Link conditions

Link mode	Test mode (loopback, Tx)
Hopping	On or off
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5

Measurement

Supported measurements	Worst case initial frequency error (ω_i) for all packets (carrier frequency stability), worst case frequency error for all blocks (ω_o), ($\omega_o + \omega_i$) for all blocks, rms DEVM, peak DEVM, 99% DEVM
Number of measurement channels ¹	3, hopping
Range	+23 to -70 dBm
Resolution	±100 Hz carrier frequency stability and frequency error

Accuracy

Modulation accuracy	
N4010A receiver rms DEVM	< 2% (<i>nominal</i>)
N4010A source rms DEVM	< 5% (<i>nominal</i>)

Carrier frequency stability and frequency error ³	As frequency reference ±100 Hz
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EDR differential phase encoding

Link conditions

Link mode	Test mode (Tx)
Hopping	On or off
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5

Measurement

Supported measurements	BER, number of bit errors, number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets, number of HEC, CRC, and NACK error
Number of measurement channels ¹	3, hopping
RF input level range	+23 to -70 dBm

Guard interval measurement

Link conditions

Link mode	Test mode (loopback, Tx)
Hopping	On or off
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5

Measurement

Supported measurements	Average, maximum, and minimum guard time
Number of measurement channels ¹	3, hopping
RF input level range	+23 to -70 dBm
Resolution	0.1 μ s

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1. Internal sequencer enables three measurement channels to be measured consecutively. Measurements on all 79 *Bluetooth* channels are supported.
 2. Example, using the 10 MHz reference with accuracy of 10 Hz (1ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz}) / 10 \text{ MHz}) \pm 25 \text{ Hz} = \pm 2402 \text{ Hz} \pm 25 \text{ Hz} = \pm 2427 \text{ Hz}$.
 3. Example, using the 10 MHz reference with accuracy of 10 Hz (1ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz}) / 10 \text{ MHz}) \pm 100 \text{ Hz} = \pm 2402 \text{ Hz} \pm 100 \text{ Hz} = \pm 2502 \text{ Hz}$.

Bluetooth EDR receiver tests

EDR Rx sensitivity

Link conditions

Link mode	Test mode (loopback)
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5
Number of bits	1 to 200,000,000

Measurement

Supported measurements	BER, number of bit errors, number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets, number of HEC, CRC, and NACK error
Number of measurement channels ¹	3, hopping
Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{2, 3}	± 0.6 dB, -35 to -90 dBm ± 1 dB, > -35 dBm

EDR Rx BER floor sensitivity

Link conditions

Link mode	Test mode (loopback)
Hopping	On or off
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5
Number of bits	1 to 200,000,000

Measurement

Supported measurements	BER, number of bit errors, number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets, number of HEC, CRC, and NACK error
Number of measurement channels ¹	3, hopping
Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{2, 3}	± 0.6 dB, -35 to -90 dBm ± 1 dB, > -35 dBm

EDR Rx maximum input level

Link conditions

Link mode	Test mode (loopback)
Hopping	On or off
Payload	PRBS9, BS00, BSFF, BS55
Packet type	2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5
Number of bits	1 to 200,000,000

Measurement

Supported measurements	BER, number of bit errors, number of Rx bits, PER, number of NACK packets, number of errored packets, number of Tx packets, number of HEC, CRC, and NACK error
Number of measurement channels ¹	3, hopping
Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{2, 3}	± 0.6 dB, -35 to -90 dBm ± 1 dB, > -35 dBm

1. Internal sequencer enables three measurement channels to be measured consecutively. Measurements on all 79 Bluetooth channels are supported.

2. Verified using CW measurements.

3. Add 0.01 dB/°C from 30 to 55 °C, add 0.07 dB/°C from 20 to 0 °C.

N4010A Option 101 and Option 107 signal source

The N4010A signal source is used in *Bluetooth* test cases described earlier in this document.

Frequency

Range	2.402 to 2.480 GHz; 79 channels at 1 MHz spacing
Accuracy ¹	As frequency reference ± 25 Hz
Offset range	± 300 kHz
Offset accuracy	± 210 Hz, ± 200 Hz typical

Output power

Range	0 to -90 dBm
Resolution	0.1 dB
Accuracy ^{2, 3}	± 0.6 dB, -35 to -90 dBm ± 1 dB > -35 dBm

Output VSWR 1.5:1

Modulation

In accordance with *Bluetooth* Radio specification version 2.0+EDR

Type GFSK, DQPSK, D8PSK

Modulation index range 0.28 to 0.35

Modulation index resolution 0.01

GFSK depth accuracy⁴ ± 0.5 kHz

DQPSK and D8PSK < 5% (nominal)

rms differential error vector magnitude (DEVm)

Baseband filter To *Bluetooth* specification

Symbol timing -20 to +20 ppm

Symbol timing resolution 1 ppm

N4010A Option 101 and Option 107 signal analyzer

The N4010A signal analyzer is used in *Bluetooth* test cases described earlier in this document.

Frequency

Range	2.402 to 2.480 GHz; 79 channels at 1 MHz spacing
Accuracy ² (center frequency ± 400 kHz)	As frequency reference ± 100 Hz

Power measurement

Range	+23 to -70 dBm
Damage level	+25 dBm
Resolution	0.01 dB
Accuracy ⁵	± 0.5 dB
Input VSWR	< 1.5:1

Modulation

Type GFSK, DQPSK, D8PSK

Deviation range ± 400 kHz

Deviation resolution 0.1 kHz

Modulation depth As frequency reference ± 100 Hz

DQPSK and D8PSK rms < 2% (nominal)

differential error vector magnitude (DEVm)

accuracy⁶

Baseband filter 1.3 MHz (compliant to *Bluetooth* specification), 3 or 5 MHz

1. Example, using the 10 MHz reference with accuracy of 10 Hz (1 ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz})/10 \text{ MHz}) \pm 25 \text{ Hz} = \pm 2402 \text{ Hz} \pm 25 \text{ Hz} = \pm 2427 \text{ Hz}$.

2. Verified using CW measurements.

3. Add 0.01 dB/°C from 30 to 55 °C, add 0.07 dB/°C from 20 to 0 °C.

4. Verified by interpolation to static frequency offset measurements.

5. Add 0.02 dB/°C from 30 to 55 °C and 0.025 dB/°C from 20 to 0 °C.

6. Example, using the 10 MHz reference with accuracy of 10 Hz (1 ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz})/10 \text{ MHz}) \pm 100 \text{ Hz} = \pm 2402 \text{ Hz} \pm 100 \text{ Hz} = 2502 \text{ Hz}$.

N4010A Option 113 Bluetooth audio generation and analysis¹

Audio routing settings Loopback, audio input/output,
audio generator/analyzer

Audio generator/analyzer

Audio generator

Frequency *125 Hz to 4 kHz, default 1 kHz*
 Frequency resolution *125 Hz*
 Level *-75 to +3 dBm0, default
-15 dBm0*
 Level resolution *1 dBm0*

Audio analyzer

Measurements *SINAD (dB), distortion (%),
frequency (Hz), level (dBm0)*
 Number of averages *1 to 100*

**Number of SCO
channels supported** *1*

**CODEC air interfaces
supported** *CVSD, A-law, μ -law*

Frequency response *+0.6 to -1.0 dB
(320 to 3200 Hz^{2, 3})
See Figure 1 for CVSD
frequency response*

**Maximum input/output
signal levels** *3.28 V pk-pk = 1.16 Vrms^{3, 4}
For CVSD, recommend level
 ≤ 138 mVrms⁴*

**Distortion/noise
(THD+N)** *better than -52 dB (A-law, μ -law)
better than -35 dB (CVSD^{3, 4})
see Figures 2a and 2b for CVSD
distortion characteristics*

Input/output connectors *BNC input, BNC output*

Input impedance *150 k Ω*

Output impedance *50 k Ω (AC coupled)*

Minimum output load *0 Ω (AC coupled, no damage
caused by short)*

Variation of gain *< 0.5 dB^{3, 4}
(-55 to +3 dBm,
225 to 2040 Hz)*

Idle noise *better than -64 dBm
(200 Hz to 20 kHz)*

Out of band performance *better than -30 dB (A-law, μ -law)
(4 to 32 kHz) better than -42 dB (CVSD)*

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1. Qualified in accordance to ITU specification G.711 [8], where 775 mVrms (0 dBm) analog sine wave input voltage is translated to 0 dBm0 digital CVSD transmit signal and 0 dBm0 sine wave CVSD receive signal is output as 775 mVrms (0 dBm) analog voltage. All audio characteristics are nominal.
 2. For CVSD this performance only applies within the CVSD linear range.
 3. CVSD linear range is defined as signals of 320 to 3200 Hz and level < -15 dBm0 (138 mVrms analogue). Outside the CVSD linear range (e.g. signals of frequencies above 600 Hz with levels > -15 dBm0) the response rolls off due to the slew-rate limitations set by Bluetooth's CVSD algorithm parameters.
 4. CVSD distortion (THD+N) at 1020 Hz and level -15 dBm0 is better than 4 percent.

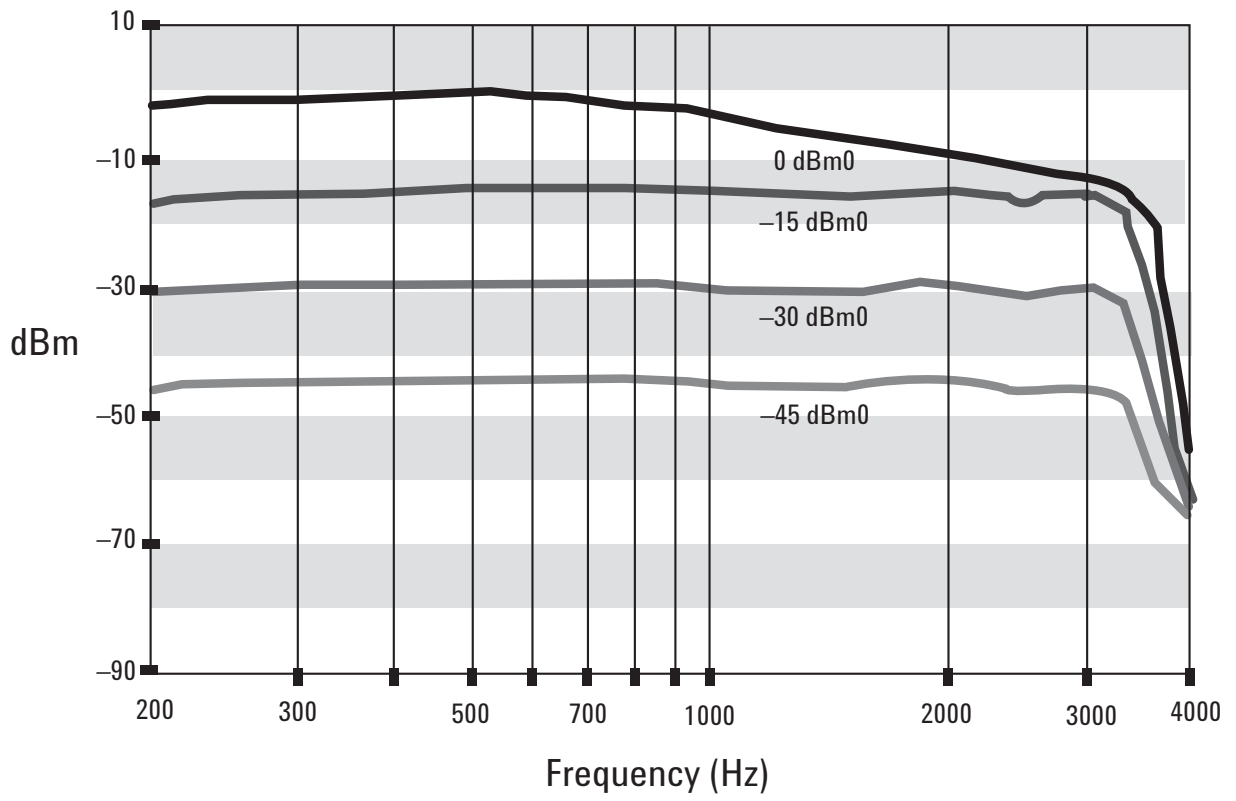


Figure 1. CVSD frequency response

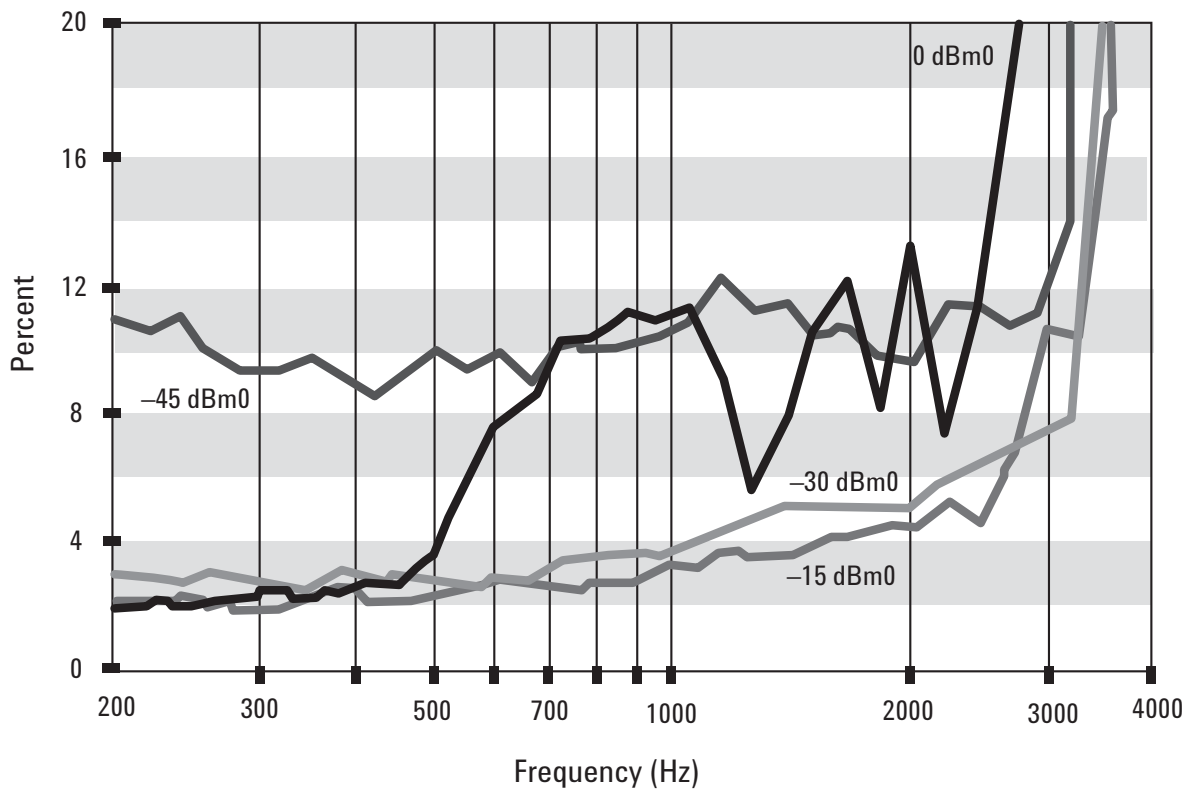


Figure 2a. CVSD distortion percentage characteristic

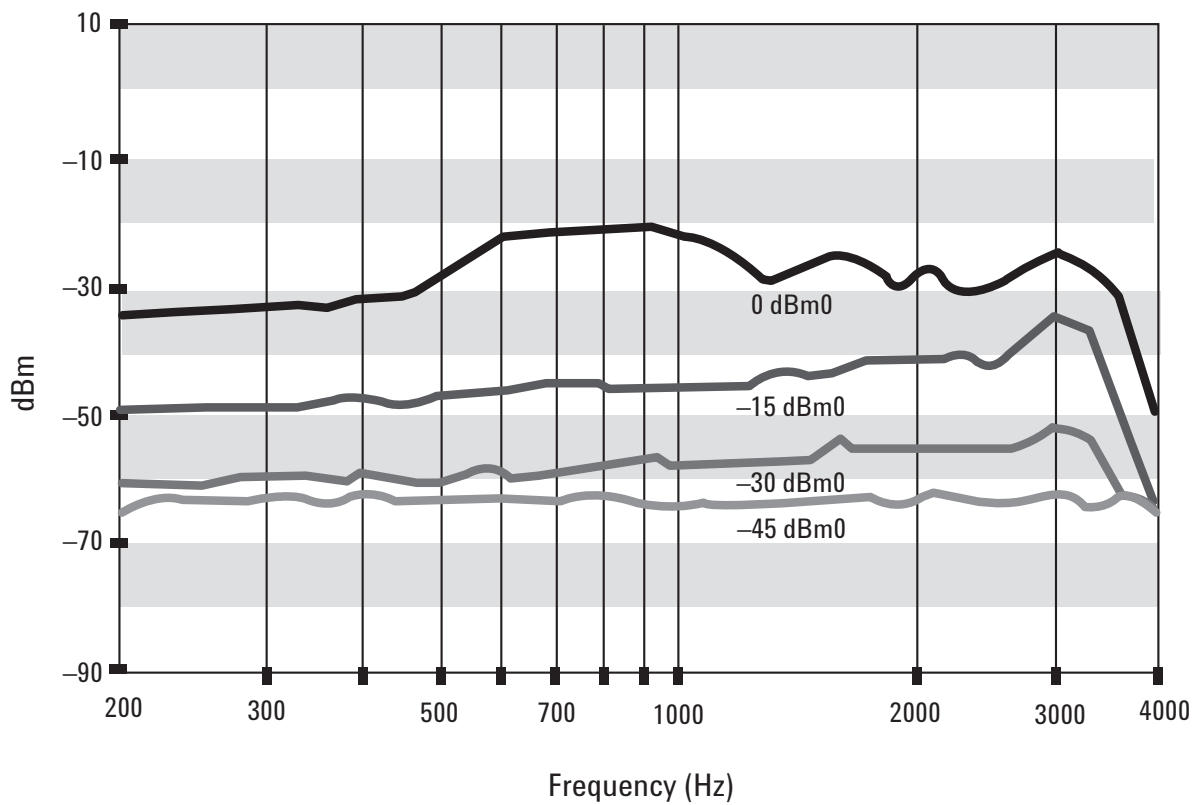


Figure 2b. CVSD distortion dBm characteristic

Wireless LAN specifications

N4010A Options 102/103 WLAN Tx/Rx analysis

Measurements

The table below shows the key measurements covered by the N4010A Options 102/103 and the 89607A WLAN test suite software. For further N4010A/89607A data, refer to the application note *Agilent N4010A Wireless Connectivity Test Set Performance Guide Using the 89601A Vector Signal Analysis Software and the 89607A WLAN Test Suite Software*, literature number 5989-0637EN.

Transmitter functionality	N4010A Options 102/103	89607A
Auto-range	Yes	Yes
CW		
Average power	Yes	No
CW frequency offset	Yes	No
Burst OFDM		
Average power	Yes	Yes
Peak power	No	Yes
Center frequency tolerance	Yes (Frequency error)	Yes
Clock frequency tolerance	No	Yes
Constellation error (EVM)	Yes	Yes
Center frequency leakage	Yes	Yes
Spectral flatness	Yes	Yes
Spectral mask	Yes	Yes
Fast OFDM demodulation measurement		
EVM	Yes	No
Frequency error	Yes	No
IQ offset	Yes	No
Gated power	Yes	No
Gated spectrum	Yes	No
Burst DSSS		
Average power	Yes	Yes
Peak power	No	Yes
Center frequency tolerance	Yes (Frequency error)	Yes
Chip clock frequency tolerance	No	Yes
Center frequency leakage	Yes (Carrier suppression)	Yes
Predicted suppression	No	Yes
EVM (RMS)	Yes	Yes
EVM (peak)	yes	Yes
Power up ramp	No	Yes
Power down ramp	No	Yes
Spectral mask	Yes	Yes
Fast DSSS demodulation measurement		
EVM (peak)	Yes	No
EVM (RMS)	Yes	No
Frequency error	Yes	No
IQ offset	Yes	No
Gated power	Yes	No
Gated spectrum	Yes	No

Receiver functionality	N4010A Options 102/103	89607A
Standard DSSS waveform file	Yes	No
Standard DSSS sequence file	Yes	No
Standard OFDM waveform file	Yes	No
Standard OFDM sequence file	Yes	No
Blanking marker files	Yes	No
High power mode	Yes	No
CW tone	Yes	No
Sampling rate	Yes	No

N4010A vector signal generator specifications

The specifications apply to the N4010A with Options 102 or 103 installed. The vector signal generator is used in WLAN receiver tests described earlier in this document. N4010A-101 and 107 *Bluetooth* signal source specifications are different and are given in the *Bluetooth* section in this document.

Frequency range	2.402 to 2.484 GHz; 4.800 to 5.875 GHz (Option 103 only)
Frequency accuracy ¹	As frequency reference ± 25 Hz ²
Output power range ¹	2.402 to 2.484 GHz: -10 to -95 dBm 4.800 to 5.875 GHz: -15 to -95 dBm 802.11a/g OFDM: -13 dBm maximum (nominal) 802.11b DSSS: -8 dBm maximum (nominal)
Absolute amplitude accuracy ¹	2.402 to 2.484 GHz: ± 0.9 dB ³ (-10 to -90 dBm); ± 0.9 dB (> -90 to -95 dBm) 4.800 to 5.875 GHz: ± 0.9 dB ³ (-15 to -90 dBm); ± 0.9 dB (> -90 to -95 dBm)
Resolution	0.1 dB
Output impedance	50 Ω (nominal)
Modulation type	Arbitrary based on downloaded file
Arbitrary waveform memory	64 Msa (256 MB RAM; 1 sample = 4 bytes)
Error vector magnitude	802.11a: < 2% ⁴ 802.11b: < 10% ⁴ 802.11g: < 2% ⁴

1. Verified using CW measurements.

2. Example, using the 10 MHz reference with accuracy of 10 Hz (1 ppm), at frequency of 2.402 GHz, frequency accuracy would be in the range $\pm((2.402 \text{ GHz} \times 10 \text{ Hz}) / 10 \text{ MHz}) \pm 25 \text{ Hz} = \pm 2402 \text{ Hz} \pm 25 \text{ Hz} = \pm 2427 \text{ Hz}$.

3. Add 0.013 dB/°C from 30 to 55 °C, add 0.02 dB/°C from 20 to 0 °C.

4. Up to 40 MHz bandwidth.

N4010A vector signal analyzer specifications

When used with 89601A/89607A (requires Option 110 and at least one of Option 101, 102, or 103). For the full N4010A/89601A performance guide refer to application note *Agilent N4010A Wireless Connectivity Test Set Performance Guide Using the 89601A Vector Signal Analysis Software and the 89607A WLAN Test Suite Software*, literature number 5989-0637EN.

Performance

Sampling frequency	100 MHz digital down-conversion
Quantization	14 bits
Sampling resolution	10 ns
Acquisition buffer	5 ms

Frequency specifications

Frequency range ¹	2.381 to 2.519 GHz 4.800 to 5.875 GHz (Option 103 only)
Frequency resolution	1 MHz
Frequency accuracy ²	As frequency reference ± 50 Hz
IF bandwidth	switchable between 22 and 40 MHz
Stability (noise sidebands) offset	10 kHz: < -75 dBc/Hz (nominal) 100 kHz: < -95 dBc/Hz (nominal)

Amplitude specifications

Power measurement range	+23 to -70 dBm (2.381 to 2.519 GHz) +23 to -50 dBm (4.800 to 5.875 GHz)
Maximum safe input level	+25 dBm
Absolute power measurement accuracy ²	± 0.5 dB ³ (2.381 to 2.519 GHz) ± 0.8 dB ³ (4.800 to 5.875 GHz)
RF input VSWR	$< 1.5:1$ (return loss: > 14 dB) (2.381 to 2.519 GHz) $< 1.8:1$ (return loss: > 10 dB) (4.800 to 5.875 GHz)
Signal-to-noise ratio ^{4,5}	> 52 dB for 22 MHz bandwidth (2.381 to 2.519 GHz) > 45 dB for 22 MHz bandwidth (4.800 to 5.875 GHz)
Spurious responses In-band spurious ⁶	< -90 dBm (2.381 to 2.519 GHz); < -60 dBm (4.800 to 5.875 GHz)

Trigger ranges

Internal trigger power	-60 to +23 dBm for 22 MHz bandwidth; -65 to +23 dBm for 5 MHz bandwidth (2.381 to 2.519 GHz) -65 to 0 dBm for 22 MHz bandwidth (4.800 to 5.875 GHz)
External trigger voltage	3.3 V (TTL)
Trigger delay range	-4.5 to 5.2 ms, or time capture length, whichever is shorter (see performance guide 5989-0637EN)

Trigger hold-off range 20 ns to 0.65 ms

Modulation specifications⁷

Residual error vector magnitude (EVM)	802.11a: $< 2\%$ 802.11b: $< 2\%$ 802.11g: $< 2\%$ Bluetooth EDR: $< 2\%$ (rms DEV _M)
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1. This is the center frequency tuning range for a 22 MHz span. With a 40 MHz span, the frequency ranges are 2.39 to 2.51 GHz and 4.809 to 5.866 GHz.
2. Verified using CW measurements.
3. Add 0.02 dB/°C from 30 to 55 °C, add 0.025 dB/°C from 20 to 0 °C.
4. 0 dBm input.
5. Specification applies to instruments serial number GB45460101 or greater, otherwise this specification for the 2.4 GHz band is > 46 dB (22 MHz bandwidth), > 50 dB (5 MHz bandwidth).
6. Specification applies to instruments serial number GB45460101 or greater, otherwise this specification is < -70 dBm (2.381 to 2.519 GHz).
7. For power levels > -50 dBm.

PC Hardware Specifications

- Microsoft® Windows® 2000 and XP® only
- 2.4 GHz Pentium® or equivalent minimum, 2.8 GHz recommended
- 200 MB available on hard drive
- 256 MB RAM minimum, 500 MB RAM recommended
- USB 2.0, TCP-IP LAN, or GPIB connection to test set
- Agilent I/O Libraries Suite 14.1 or greater. For information on Agilent IO Libraries Suite features and installation requirements, please go to: www.agilent.com/find/iosuite/datasheet

N4010A General Specifications

Frequency reference

Frequency	10 MHz
Accuracy	
20 to 30 °C	$\pm 1 \times 10^{-6}$ (± 1 ppm)
0 to 55 °C	$\pm 1.5 \times 10^{-6}$ (± 1.5 ppm)
Aging (first year)	$\pm 1 \times 10^{-6}$ /year
10 MHz input	BNC(f), 50 Ω
10 MHz output	BNC(f), 50 Ω

Power requirements

Voltage	100 to 240 VAC, 47 to 63 Hz
Power	150 VA maximum

Environmental

Operating temperature	0 to 55 °C
Storage temperature	-40 to +70 °C
Operating humidity	15 to 95% relative humidity (non condensing)
EMI compatibility	Radiated emission is in compliance with CISPR Pub 11/1990 Group 1 Class A

Inputs/Outputs

Front panel

RF input/output	Type-N (f), 50 Ω
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Rear panel

10 MHz REF IN	BNC(f), 50 Ω
10 MHz REF OUT	BNC(f), 50 Ω
GPIB	IEEE-488
LAN	RJ-45, 10/100-T
USB	USB 1.0/2.0

Additional rear panel connectivity with N4010A input/output connectivity Option 110

AUX RF input/output	Type-N (f), 50 Ω
TRIG IN	BNC (f), 50 Ω ; input has TTL compatible logic levels
TRIG OUT	BNC (f), 50 Ω ; output has TTL compatible logic levels
75 MHz IF output	SMA (f), 50 Ω
Event 1	BNC (f), 50 Ω
Event 2	BNC (f), 50 Ω
Bluetooth and WLAN	25-way D (f) triggers, data, and clock

Size and weight

Dimensions	(H x W x D)
With handle and bumpers	105 mm x 370 mm x 390 mm
Without handle and bumpers	105 mm x 330 mm x 375 mm
Weight	5.9 kg (12.98 lbs) for N4010A-101 7.2 kg (15.84 lbs) for N4010A-102, 103

Regulatory information

Product safety	Conforms to the following product specifications: IEC61010-1:2001/ EN61010-1:2001 CAN/CSA-C22.2 No 1010.1-92 Low voltage directive 72/23/EEC
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Electromagnetic compatibility	Complies with the requirements of the EMC Directive 89/336/EEC
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Ordering Information

Model no	Description
N4010A	Wireless Connectivity Test Set
N4010A-101	<i>Bluetooth</i> test
N4010A-107	<i>Bluetooth</i> EDR link plus measurements
N4010A-113	<i>Bluetooth</i> audio generation and analysis
N4010A-112	<i>Bluetooth</i> headset profile
N4010A-102	2.4 GHz wireless LAN Tx/Rx analysis
N4010A-103	2.4 GHz/5 GHz wireless LAN Tx/Rx analysis
N4010A-104	Fully-flexible arbitrary waveform generation
N4010A-204	N4010A Signal Studio license
N4010A-110 ¹	Additional input/output connectivity (required with N4010A-102/103)
N4010A-AX4 ¹	Rack flange kit
N4010A-191 ¹	Carry handle kit

Also available when N4010A Option 110 ordered:

N4017A	<i>Bluetooth</i> Graphical Measurement Application
N4017A-205	<i>Bluetooth</i> EDR
89601A	Vector signal analysis software (version 5.20 or greater required)
89601A-200	Basic vector signal analysis software
89601A-300	Hardware connectivity
89601A-AYA	Vector modulation analysis
89601A-B7R	WLAN modulation analysis (OFDM and DSSS/CCK/PBCC)
or	
89607A-100	Basic WLAN test suite (with hardware connectivity)

1. Options 110, AX4, and 191 are supplied as standard with N4010A products ordered after March 2006.

Related Literature

Agilent N4010A Wireless Connectivity Test Set Configuration Guide, literature number 5989-3486EN

Test Multiple Wireless Connectivity Technologies with One Test Platform, brochure, literature number 5989-4150EN

Agilent N4017A Bluetooth Graphical Measurement Application, product overview, literature number 5989-2771EN

Agilent N4010A Wireless Connectivity Test Set Performance Guide Using the 89601A Vector Signal Analysis Software and the 89607A WLAN Test Suite Software, literature number 5989-0637EN

89600 Series Wide-Bandwidth Vector Signal Analyzer, brochure, literature number 5980-0723E

89607A WLAN Test Suite Software, technical overview, literature number 5988-9547EN

Agilent - Next Generation of WLAN Manufacturing Test Solutions, brochure, literature number 5989-1194EN

Test ZigBee™ modules and appliances - today!, product overview, literature number 5989-3980EN

For More Information

For more information on N4010A visit www.agilent.com/find/N4010A

For more information on N4017A Graphical Measurement Application visit www.agilent.com/find/N4017A

For more information on Agilent Technologies' Bluetooth, WLAN, and ZigBee™ solutions visit www.agilent.com/find/bluetooth
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