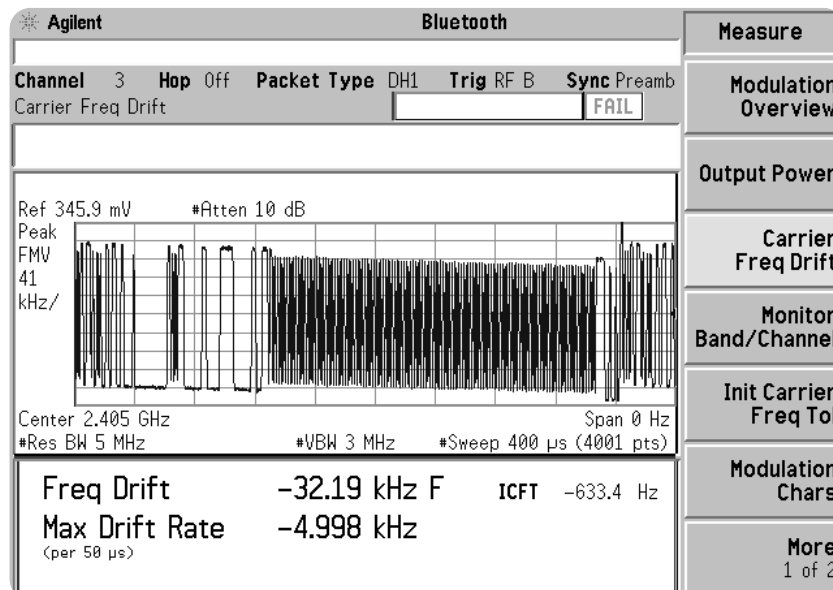


Agilent *Bluetooth*[™] Measurement Solution for the ESA-E Series Spectrum Analyzers

Technical Overview



Now the ESA-E series spectrum analyzers have one-button standard-based *Bluetooth* measurements, including output power, initial carrier frequency tolerance (ICFT), frequency drift, modulation characteristics, output spectrum -20 dB bandwidth, and adjacent channel power (ACP).

Accurate, efficient *Bluetooth* design verification and troubleshooting

The Agilent ESA-E series spectrum analyzers provide flexible general-purpose spectrum analysis and one-button standard compliant *Bluetooth* transmitter measurement capability all in a mid-priced package.

You don't have to be a *Bluetooth* measurement expert to acquire the data you need. The ESA-E series *Bluetooth* measurement personality does that for you, at the push of a button, so you can concentrate on analysis and troubleshooting.

Automated transmitter tests

The *Bluetooth* measurement personality for the ESA-E series spectrum analyzers helps you get to the data you need faster, whether it's your first time making a *Bluetooth* measurement or your hundredth.

Testing to the *Bluetooth* specification can be complex. In several cases, the burst signal must be captured and demodulated, the data packet must be parsed to locate the symbols to measure, the measurement must be made and the raw data processed to get to the final result. Doing all of this takes time to set-up and a good understanding of the specification to do properly.

The ESA-E series *Bluetooth* measurement personality saves you time and complexity by automating the test from signal capture to results display. All you have to do is select the transmitter test you want to perform from the *Bluetooth* measurement menu and press a single button for measurement results.

Standard compliant

Check your *Bluetooth* design with confidence. This tool performs *Bluetooth* transmitter tests as defined by the *Bluetooth* standard. Each measurement conforms to the *Bluetooth* SIG documentation. You can even use this tool to pre-check your design for compliance before you submit it for formal conformance testing.

Measurement reliability

Agilent makes spectrum analyzers for RF and microwave design engineers around the world. We've been doing it for over 30 years. In that time our products have earned a reputation for accuracy, flexibility and performance. They provide results you can count on, all day, everyday. That is what we mean by measurement reliability, and that is what you will get from the flexible ESA-E series spectrum analyzers from Agilent Technologies for your *Bluetooth* design verification and RF troubleshooting needs.

Here is how it benefits you

Easy-to-use

Verify and troubleshoot your design efficiently

- One-button, standard compliant *Bluetooth* transmitter measurements with Bluetooth specific displays to speed data gathering
- Easy hook-up and triggering
- Built-in help key for quick reference without manuals

With spectrum analysis

Maximize measurement capability and confidence

- 108 dB² third order dynamic range to view low level distortion and inter-modulation
- 1 Hz digital resolution bandwidth up to 220 times faster than analog
- Continuous automatic background alignment that guarantees repeatability over varying temperatures

Upgradeable

Ready for other wireless communication standards

- Versatile card-cage architecture
- Instrument firmware and software upgrades available over the Web
- Wide bandwidth digital demodulation platform

Flexible

Include just the options that you need now or in the future

- GSM and cdmaOne measurement personalities are two of many available
- Load all three personalities in one ESA
- Over 30 hardware options also available

PC connected

Speed analysis of *Bluetooth* transmitter performance data

- Store measurement results in spreadsheet format to disk using the built-in floppy disk drive or transfer directly to your PC with IntuiLink software¹
- Industry standard SCPI instrument language for remote control
- GPIB (Option A4H), RS-232 (Option 1AX) interface available

Fast

Finish your job quicker

- 5 minute warm-up time for full accuracy
- Quick Bluetooth transmitter measurement set-ups

Portable

Sophisticated measurement performance anywhere

- Rugged case, water resistant front panel
- Snap-on battery (E1779A) or 12 Vdc adapter (Option A5D)
- Carrying/operating case (Option AYT/AYU)

Great for R&D and manufacturing plus more

R&D

- Affordable spectrum analysis on every engineer's bench
- *Bluetooth* compliance verification

Manufacturing

- Spurious testing to 26.5 GHz
- Flexible troubleshooting tool for production rework
- Engineering analysis of root cause

Maintenance

- Flexible fault isolation tool for the repair bench
- Portable trouble shooting tool for field repairs

1. For more information about IntuiLink software visit our Web site at: <http://www.agilent.com/find/IntuiLink>

2. Typical

Standard compliant *Bluetooth* transmitter measurements

The Agilent ESA-E series spectrum analyzer with built-in *Bluetooth* measurement capability gives you the tools you need to verify the performance of your *Bluetooth* design and troubleshoot problems.

These key *Bluetooth* transmitter measurement features are available at the press of a single button:

- *Output power*: Measures average power across a burst and peak power in a burst.
- *Initial carrier frequency tolerance (ICFT)*: Uses first four bits of burst, as called out by *Bluetooth* specification, to measure carrier behavior at burst turn-on.
- *Carrier frequency drift*: Measures carrier drift and drift rate in the payload field to determine carrier stability during burst.
- *Modulation characteristics*: Measures and compares the frequency deviation of two *Bluetooth* data patterns.
- *Output spectrum –20 dB bandwidth*: Determines the –20 dB bandwidth of the *Bluetooth* transmitter.
- *Adjacent channel power (ACP)* : Measures channel emission power across the entire *Bluetooth* operating band (2402 MHz to 2480 MHz) except for the main transmit channel and its immediately adjacent channels.
- *Monitor band/channel*: Sets wideband frequency sweep to show if hopping signal uses the entire band (band mode). Displays the channel using optimum analyzer settings (channel mode).¹
- *Modulation overview*: Quick measurement of ICFT and modulation metrics at a lower sampling rate.¹

1. Not a standard *Bluetooth* test.

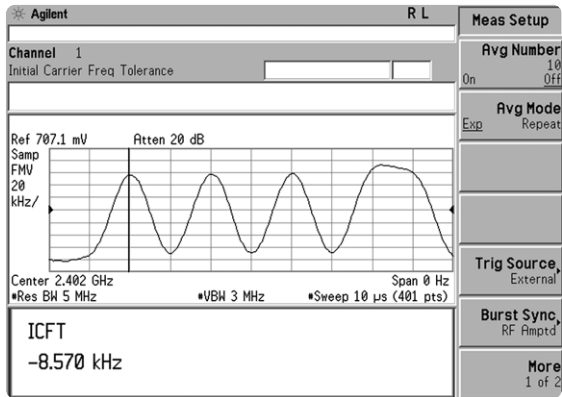


Figure 1: ICFT test

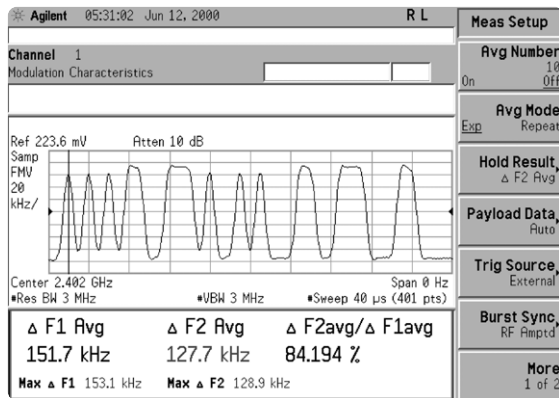


Figure 2. Modulation characteristics test

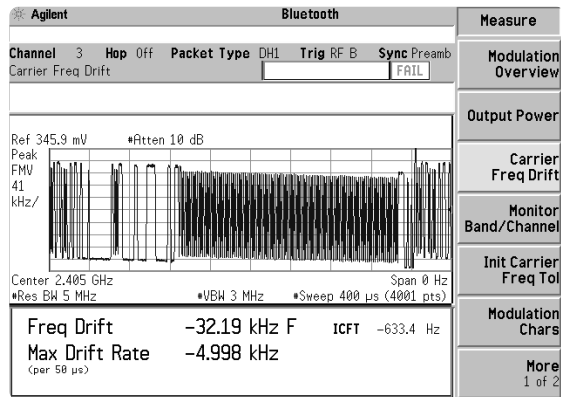


Figure 3. Carrier frequency drift test

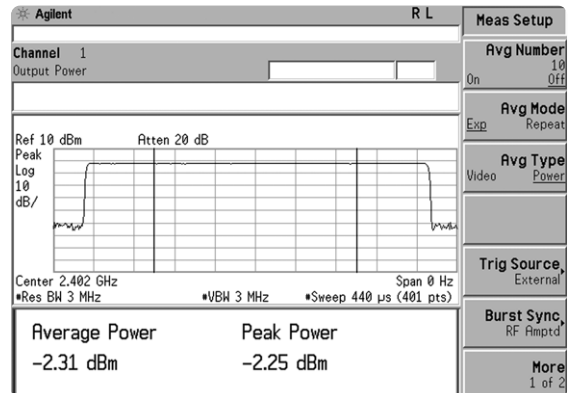
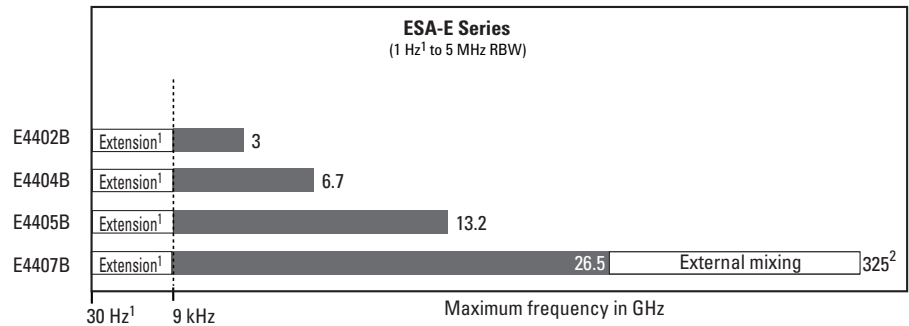


Figure 4. Output power test

Here is how you order your ESA-E spectrum analyzer

First, choose your frequency range



Now, choose your option configuration

Tasks	Required option configuration
<ul style="list-style-type: none"> Bluetooth testing (test mode only, except for output power measurement) General RF troubleshooting 	<p>ESA-E series³ spectrum analyzer plus options:</p> <p>228 – Bluetooth measurement personality 106 – Bluetooth FSK demodulator AYX – Fast zero span sweeps B72⁴ – Memory extension</p> <p>Recommended options and accessories: 1DR – Narrow resolution bandwidths 1DS – 3.0 GHz pre-amp 1D5 – High stability reference 1D6 – Time gated spectrum analysis</p>
<ul style="list-style-type: none"> Bluetooth testing (test mode and/or hopping mode) GSM testing cdmaOne testing General RF troubleshooting 	<p>ESA-E series³ spectrum analyzer plus options: 304 – Bluetooth premium bundle <i>or order the following:</i> 228 – Bluetooth measurement personality 106 – Bluetooth FSK demodulator B7D – Digital signal processing and fast ADC B7E – RF communication hardware B72⁴ – Memory extension 1DS – 3.0 GHz pre-amp 1D5 – High stability reference</p> <p>Recommended options: BAC – cdmaOne measurement personality BAH – GSM measurement personality 1DR – Narrow resolution bandwidths 1D6 – Time gated spectrum analysis</p>

1. Optional

2. To 110 GHz with Agilent mixers

3. Bluetooth and GSM measurement personalities available for all ESA-E series analyzers except the E4401B 1.5 GHz analyzer.

4. Option B72 is standard if the serial prefix number is ≥ US4144 or MY4144.

Bluetooth specifications and characteristics

All specifications apply over 0° C to +55° C (unless stated otherwise). The analyzer will meet specifications 5 minutes after turn-on when the following conditions are met: the analyzer has been calibrated within the last 12 months, the analyzer has been stored within its operating temperature range for at least 2 hours, Auto Align All has been selected, and Align Now RF has been run within the last 24 hours.

Characteristics provide useful, but non-warranted, information about the functions and performance of the instrument. Typical performance and nominal values are shown in *Italics*. For spectrum analyzer specifications, see ESA-E Series Technical Specifications.

General characteristics

Unless otherwise noted these characteristics are with RF input range auto, default measurement settings, and all measurements being performed within the *Bluetooth* (ISM) frequency band. The nominal performance described assumes a *Bluetooth* DH1 packet, with a peak-to-peak deviation of ± 157.5 kHz. Align Now, FM Demod must have been run to achieve demodulation related measurement nominals.

In-band frequency range

Bluetooth (ISM) band: 2400 to 2483.5 MHz

Output power

(Requires Option AYX or B7D)

Range at RF input:

+30 to -40 dBm (+30 to -60 dBm with preamp Option 1DS)

Absolute amplitude accuracy: See base instrument Absolute Accuracy.

Average type: Video, power

Average mode: Exponential, repeat

Trigger source: Video, RF burst¹, external, free run

Burst synch: RF amplitude, preamble², none

Modulation characteristics³

(Requires Option 106 and AYX or B7D)

Range at RF input:

+30 to -40 dBm (+30 to -60 dBm with Option 1DS preamp)

FM deviation range:

± 200 kHz full scale, nominal

FM deviation accuracy:

(25 measurement averages, signal level > -30 dBm) ± 3 kHz, nominal

Payload data: 11110000, 10101010, auto-detect

Average mode: Exponential, repeat

Trigger source: RF burst¹, external, free run

Burst synch: Preamble², none

Limits: $\Delta f_2/Df_1$ lower, Δf_1 max lower/upper, Δf_2 max lower/upper

Initial carrier frequency tolerance (ICFT)³

(Requires Option 106 and AYX or B7D)

Range at RF input:

+30 to -40 dBm (+30 to -60 dBm with preamp Option 1DS)

Measurement range:

± 100 kHz, nominal

Measurement accuracy:

(25 measurement averages, signal level > -30 dBm) ± 4 kHz, nominal

Average mode: Exponential, repeat

Trigger source: RF burst¹, external, free run

Burst synch: Preamble², none

Limits: ICFT upper/lower

Carrier frequency drift³

(Requires Option 106 and AYX or B7D)

Range at RF input:

+30 to -40 dBm (+30 to -60 dBm with preamp Option 1DS)

Measurement range:

± 100 kHz, nominal

Measurement accuracy:

(25 measurement averages, signal level > -30 dBm) ± 4 kHz, nominal

Average mode: Exponential, repeat

Trigger source: RF burst¹, external, free run

Burst synch: Preamble², none

Tx output spectrum - 20 dB bandwidth³

Range at RF input:

+30 to -40 dBm (+30 to -60 dBm with preamp Option 1DS)

Average mode: Exponential, repeat

Trigger source: Freerun

Burst synch: None

Limits: Upper

Adjacent channel power (ACP)³

Range at RF input:

+30 to -40 dBm (+30 to -60 dBm with preamp Option 1DS)

Average mode: Exponential, repeat

Detector: Average, peak

Trigger source: Freerun

Burst synch: None

Limits: Upper

1. Requires Option B7E RF communications hardware.

2. Requires Option 106 Bluetooth FM demodulation.

3. The DUT must have frequency-hopping disabled.

Agilent ESA-E series spectrum analyzer product and application information

Additional recommended options and accessories:

Option A5D	12 Vdc power cable
Option AXT	Hard transit case
Option AYT	Soft carrying/operating case (gray)
Option AYU	Soft carrying/operating case (yellow)
Option AYZ	External mixing
Option UK9	Front panel cover
Option A4H	GPIB and parallel printer interfaces
Option 1AX	RS-232 and parallel printer interfaces
Option 1CP	Rackmount handle kit with slides
Option B7K	Distance to fault accessory kit
E1779A	Battery pack
8498A	Coaxial fixed attenuator
11970/74	Series harmonic mixers

Product literature

ESA-E Series Spectrum Analyzers, Brochure, literature number 5968-3278E
ESA-E Series Spectrum Analyzers, Data Sheet, literature number 5968-3386E
ESA/EMC Spectrum Analyzers, Configuration Guide, literature number 5968-3412E
Select the Right Portable Spectrum Analyzer, Selection Guide, literature number 5968-3413E
ESA Snap-On Battery Pack, Product Overview, literature number 5966-1851E
IntuiLink Software, Data Sheet, literature number 5980-3115EN

Application note literature

Performing Bluetooth RF Measurements Today, Application Note 1333, literature number 5968-7746E

For further information
For the latest news, product, and support information, application literature and more visit our Web page at:
<http://www.agilent.com/find/esa>.

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