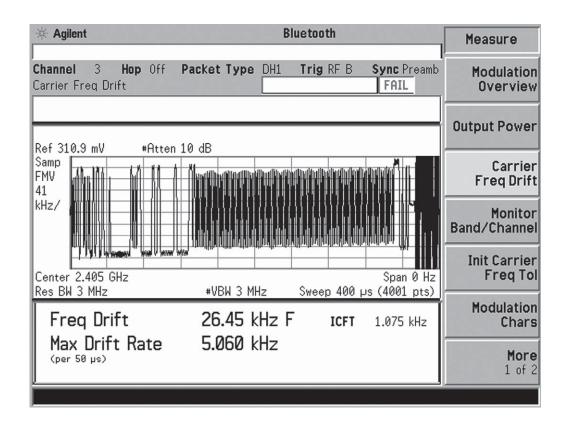


# Agilent Bluetooth™ Measurement Solution for the ESA-E Series Spectrum Analyzers

**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 generalpurpose spectrum analysis and one-button standard compliant *Bluetooth* transmitter measurements 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's 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 dB<sup>1</sup> 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 software <sup>2</sup>
- 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/E1779B) 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

<sup>1.</sup> Typical

for more information about IntuiLink software visit our Web site at: http://www.agilent.com/find/IntuiLink.

# 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).<sup>1</sup>
- Modulation overview: Quick measurement of ICFT and modulation metrics at a lower sampling rate.<sup>1</sup>

<sup>1.</sup> Not a standard Bluetooth test.

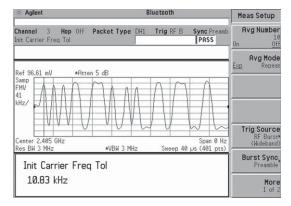


Figure 1. Initial carrier frequency tolerance test

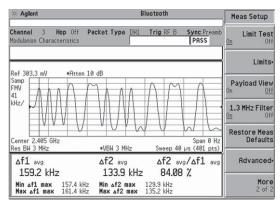


Figure 2. Modulation characteristics test

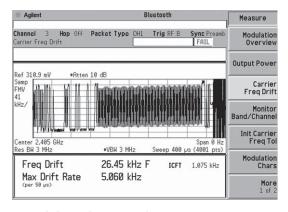


Figure 3. Carrier frequency drift test

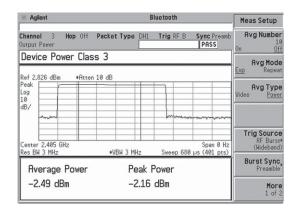
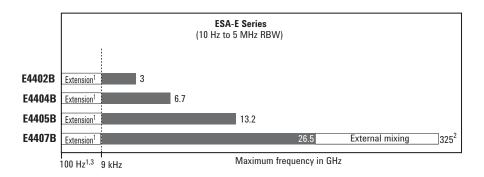


Figure 4. Output power test

# Here is How You Order Your ESA-E Spectrum Analyzer



Tasks	Required option configuration <sup>4</sup> ESA-E Series spectrum analyzer plus options:	
Bluetooth testing (test mode		
and/or hopping mode)	E440xB-304	Bluetooth premium bundle
General RF troubleshooting	Includes options	s:
	E440xB-228	Bluetooth measurement personality
	E440xB-106	Bluetooth FSK demodulator
	E440xB-B7D	Digital signal processing and fast ADC
	E440xB-B7E	RF communication hardware
	E440xB-1DS	3.0 GHz pre-amp
	E440xB-1D5	High stability reference
	Recommended options:	
	E440xB-1DR	Narrow resolution bandwidths
	E440xB-1D6	Time gated spectrum analysis
	E440xB-UKB	100 Hz low frequency extension
	Accessories:	
	E440xB-A5D	12 Vdc power cable
	E440xB-AXT	Hard transit case
	E440xB-AYT	Soft carrying/operating case (gray)
	E440xB-AYU	Soft carrying/operating case (yellow
	E440xB-UK9	Front panel cover
	E440xB-1CP	Rackmount handle kit with slides
	E440xB-B7K	Distance to fault accessory kit
	E1779A	Ni-Cad battery pack
	E1779B	Ni-MH battery pack for European Union
	8498A	Coaxial fixed attenuator

<sup>1.</sup> Optional.

<sup>2.</sup> To 110 GHz with Agilent mixers.

<sup>3. 30</sup> Hz characteristic.

<sup>4.</sup> The option "prefix" is E440xB, where x can equal 2, 4, 5, or 7.

## **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 peakto-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<sup>1</sup>

#### 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 burst<sup>2</sup>,

external, free run

Burst synch: RF amplitude, preamble<sup>3</sup>, none

#### Modulation characteristics<sup>4,5</sup>

#### 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)  $\pm 3$  kHz, nominal Pavload data: 11110000, 10101010.

auto-detect

Average mode: Exponential, repeat

**Trigger source:** RF burst<sup>2</sup>, external, free run

Burst synch: Preamble<sup>3</sup>, none

**Limits:**  $\Delta f_2/Df_1$  lower,  $\Delta f_1$  max lower/upper,

 $\Delta$ f2 max lower/upper

Filter: 1.3 MHz post detection ON/OFF

#### Initial carrier frequency tolerance (ICFT)4,5

#### 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)  $\pm 4$  kHz, nominal Average mode: Exponential, repeat

Trigger source: RF burst<sup>2</sup>, external, free run

Burst synch: Preamble<sup>3</sup>, none Limits: ICFT upper/lower

Filter: 1.3 MHz post detection ON/OFF

#### Carrier frequency drift 4,5

#### 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)  $\pm 4 \text{ kHz}$ , nominal Average mode: Exponential, repeat **Trigger source**: RF burst<sup>2</sup>, external, free run

Burst synch: Preamble<sup>3</sup>, none

Filter: 1.3 MHz post detection ON/OFF

#### Tx output spectrum -20 dB bandwidth4

#### 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)4

#### 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

Requires Option AYX or B7D.

Requires Option B7E RF communications hardware...

Requires Option 106 Bluetooth FM demodulation.

The DUT must have frequency-hopping disabled.

Requires Option 106 and AYX or B7D.

#### **Product Literature**

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

# **Application Note Literature**

- Bluetooth RF Measurement Fundamentals, Application Note 1333-1, P/N 5988-3760EN
- Investigating Bluetooth Modules: The First Step in Enabling Your Device with a Wireless Link, Application Note 1333-2, P/N 5988-2417EN
- Bluetooth Manufacturing Test:
   A Guide to Getting Started,
   Application Note 1333-4,
   P/N 5988-5412EN

For further information go to:

www.agilent.com/find/esa www.agilent.com/find/bluetooth

#### www.agilent.com

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

#### www.agilent.com/find/contactus

#### **Americas**

Canada	(877) 894-4414
Latin America	305 269 7500
United States	(800) 829-4444

#### **Asia Pacific**

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008

#### **Europe & Middle East**

Austria	01 36027 71571	
Belgium	32 (0) 2 404 93 40	
Denmark	45 70 13 15 15	
Finland	358 (0) 10 855 2100	
France	0825 010 700*	
	*0.125 €/minute	
Germany	07031 464 6333	
Ireland	1890 924 204	
Israel	972-3-9288-504/544	
Italy	39 02 92 60 8484	
Netherlands	31 (0) 20 547 2111	
Spain	34 (91) 631 3300	
Sweden	0200-88 22 55	
Switzerland	0800 80 53 53	
United Kingdom	44 (0) 118 9276201	
Other European Countries:		

#### Other European Countries:

Revised: October 1, 2008

Product specifications and descriptions in this document subject to change without notice.

www.agilent.com/find/contactus

© Agilent Technologies, Inc. 2002, 2003, 2004, 2009 Printed in USA, August 10, 2009 5980-2786EN

# Agilent Email Updates

www.agilent.com/find/emailupdates
Get the latest information on the
products and applications you select.

Bluetooth and the Bluetooth logos are trademarks owned by Bluetooth SIG, Inc., U.S.A. and licensed to Agilent Technologies.

