✺ Bluetooth™

discover...

A complete range of Bluetooth test solutions

From product design, through qualification and into manufacturing.

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/Anritsu

Discover What's Possible™

contents

Bluetooth™

the Bluetooth™ story

By eliminating wires and simplifying connections between everyday appliances, Bluetooth wireless technology will influence our lives in many ways. Mobile phones, PCs and PDAs will soon be connected quickly and easily whenever we want. But Bluetooth will not be confined to the office – home applications will include, portable music players, digital cameras, kitchen appliances and children's toys. In future, Bluetooth technology will be found in the automotive, avionics and industrial controls markets.

We will expect Bluetooth technology to provide us with a personal networking environment, but more than that, we will expect to find it in public places, such as shopping centres, sports stadiums and airports.

Industry forecasts predict that hundreds of millions of Bluetooth products will be sold annually. We all know about this massive potential market, but the technology brings with it something that will be new to many engineers - the need for RF test at a frequency of 2.4GHz.

The success of the Bluetooth standard will depend on users of the technology enjoying reliable, high-quality connections. We will expect to use products "out of the box" to provide immediate connectivity.

Anritsu recognises the importance of Bluetooth link quality to the success of the technology and to the reputation of the products in which it is embedded, so we have developed a series of test solutions to help in development and production test of Bluetooth modules and Bluetooth products – quickly and at low cost.

Anritsu

Discover What's Possible™

Anritsu Bluetooth Test Solutions

Development

Product Qualification

Volume Production
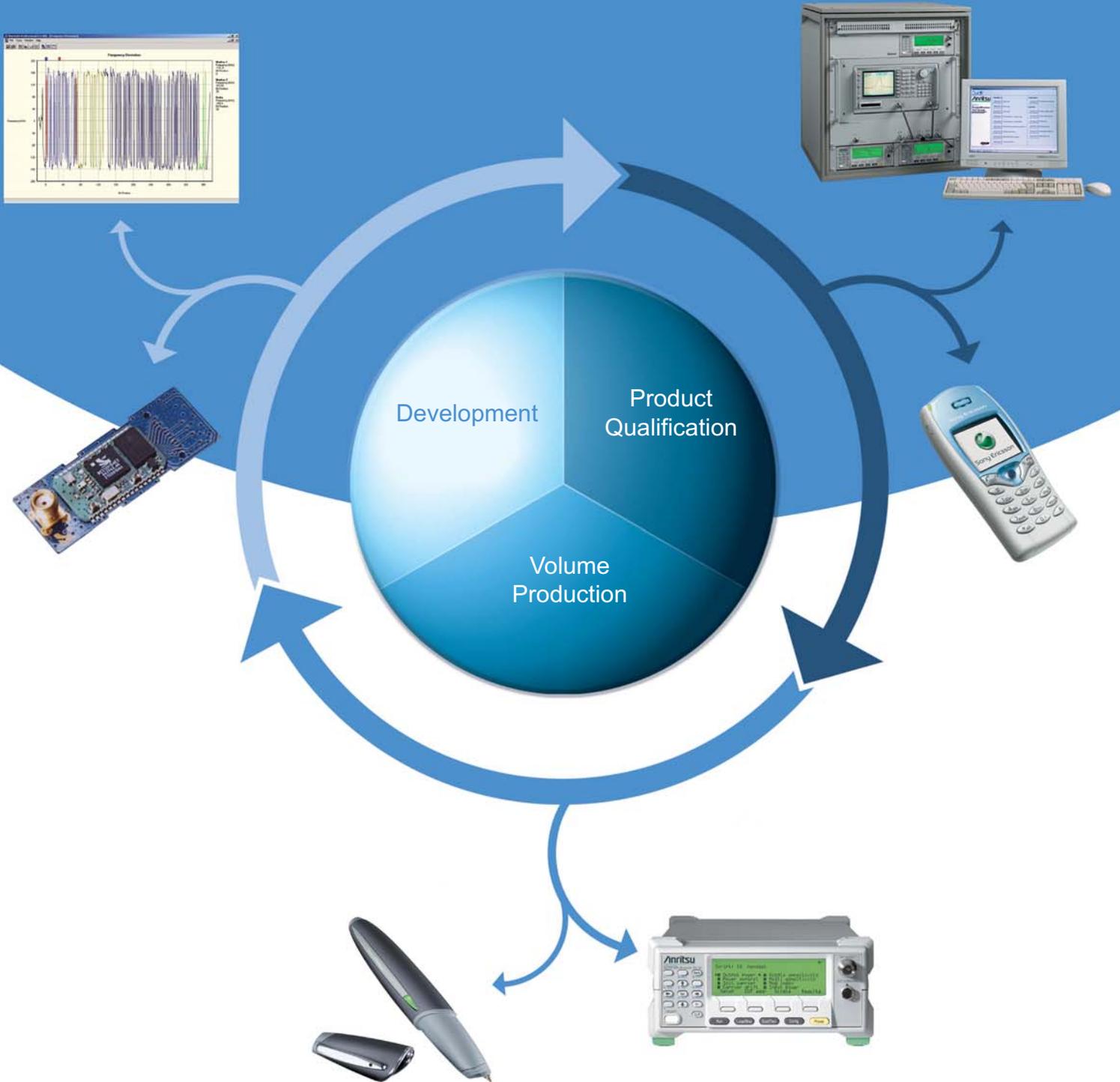
why test?

Bluetooth wireless Interfaces present a new challenge to many manufacturers. The combination of leading-edge RF and protocol technologies, coupled with the requirement to get implementation costs down to a few dollars, puts particularly high demands on the test department.

The challenge is to develop test procedures that are comprehensive in terms of both RF and functional test, but which are fast and initiated through a simple user interface. RF at 2.4 GHz is not easy to test. The integration of a module into an OEM product will not necessarily produce predictable results, and the performance of every item will be different, this makes it essential to test to a known set of parameters using an instrument traceable to International Standards.

Anritsu knows the importance of test for RF products. We know that in an OEM production environment, the key requirement will be to validate performance in the shortest time. Production engineers will need to decide on a subset of the Bluetooth RF test specification that is appropriate to their product's requirements.

your solution

As a manufacturer of Bluetooth products, you need above all else to maintain your reputation for quality and reliability. The complex demands of new technologies such as Bluetooth will require the adoption of new testing techniques.

By bringing our experience to bear on these demanding test requirements, Anritsu can offer you the test capability you need. The MT8850A Bluetooth Test Set gives you a one-button test to fully characterise your Bluetooth implementation and ensure that your reputation for quality is maintained

Working with RF, especially RF at over 2GHz, is not easy, but with Anritsu as your test partner you can be certain of having the most up-to-date and relevant testing capabilities for your Bluetooth products.

test concept

MT8850A makes RF measurements on Bluetooth modules and Bluetooth products. All measurements are made in accordance with the Bluetooth RF Test Specification.

- **MT8850A establishes a Bluetooth link with the EUT (Equipment Under Test) using standard signalling**
  MT8850A is the Master, establishing the link by Paging the EUT. EUT BT address can be entered manually or through the GPIB port. If the EUT BT address is not known, you can use Inquiry or read the address directly through the EUT HCI interface RS 232 (or USB, MT8852A only).

- **MT8850A activates Test Mode in the EUT and runs RF measurements**
  When the EUT is in Test Mode, the MT8850A has complete control over its operation. The EUT can be put into loopack or TX test mode, frequency hopping can be disabled or the EUT sent to defined TX and RX frequencies as required by the test specification.

- **MT8850A runs the selected test script**
  A test script comprises of all (or a user selected subset) of the available RF measurements The user can modify the measurements by editing test frequencies, number of bits/packets tested, hopping On or Off, whitening On or Off, and Pass/Fail limits.

- **Pre programmed "qualification" and "quick test" scripts plus user-defined scripts**
  Script results can be viewed on the screen and accessed over the GPIB. In addition any individual measurement can be run continuously.

MT8850A and MT8852A

Bluetooth test sets

for design proving and production test

- Tests RF performance of Bluetooth modules in under 5 seconds

- Validated by Bluetooth SIG for all supported measurements

- Audio testing capability.
  3 SCO channels with CVSD, u-Law and A-Law air interface

- Tests Bluetooth 1.1 and 1.2 core specification products

- Adaptive Frequency Hopping measurements with option 15 (MT8852A only)

- Small size (half-rack) and low weight (3.5kg)

- For design proving and production test

- Reference Bluetooth radio – meets dirty transmitter and frequency accuracy requirements of test specification

- BlueSuite software for graphical traces of modulation, power ramp, individual channel measurement and receiver sensitivity search

- Easy operation – one touch testing with RUN key

- Complementary BlueTest production test software

- GPIB and RS 232 remote control

applications

module testing

Anritsu understand the requirements of the manufacturers of Bluetooth modules. Test times must be minimised yet performance must be assured. The MT8850A can establish a link with the module under test and perform a comprehensive set of transceiver measurements in under 5 seconds. If the module address is unknown, MT8850A can read it through the module HCI RS 232 (or USB, MT8852A only) or perform an Inquiry. An integrated CW frequency counter can be used for crystal trimming if required.

Module testing requires a test fixture to interface the Bluetooth module to the MT8850A. The test fixture should provide a direct RF connection plus, if required, connection to the modules HCI interface. If the module comprises a separate radio and baseband chip, testing must be performed on the two devices together, as a radio cannot form a Bluetooth link without an associated baseband. By integrating the baseband chip onto the test fixture, it is then possible to test the radio chip in isolation.
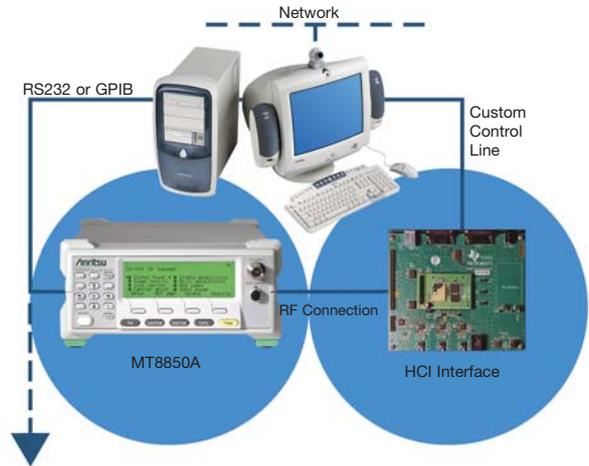
mobile phones testing

Mobile phones are among the first consumer products to benefit from Bluetooth technology. Manufacturers need to prove the performance of both the Bluetooth and mobile phone radios. Test is typically a bottleneck in any mobile phone production line and so testing the Bluetooth interface must be done with no increment to total test time. It is also vital to confirm that both radios can be active simultaneously without any interference between them. These demands result in the need for parallel testing of the Bluetooth and mobile phone radios. MT8850A is the ideal instrument used alongside a radio communications analyser to perform parallel testing.

For mobile phones without an RF test connector, MT8850A can make all its measurements over the air interface. You simply use your test fixture to position the EUT accurately with respect to the test antenna. Correction values for the path loss at each frequency can be entered into MT8850A memory and all results are corrected accordingly.
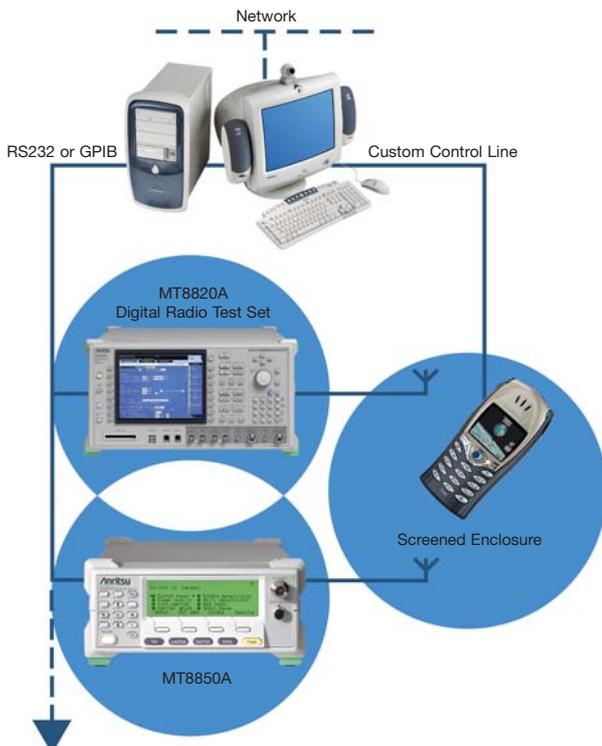
consumer product testing

Bluetooth interfaces will soon be standard on many office and consumer products. Notebook PCs, personal organisers, printers, digital cameras and audio/visual products will all be Bluetooth enabled. For many manufacturers of these products, it will be the first time that RF measurements have been made in their production facilities.

The MT8850A is a highly targeted instrument that has been designed to offer Bluetooth test capability in a compact, economical and easy to operate package. The pre-programmed test scripts provide a fast solution that can quickly be integrated into existing production facilities.

Network

RS232 or GPIB

Custom Control Line

MT8850A

Screened Enclosure
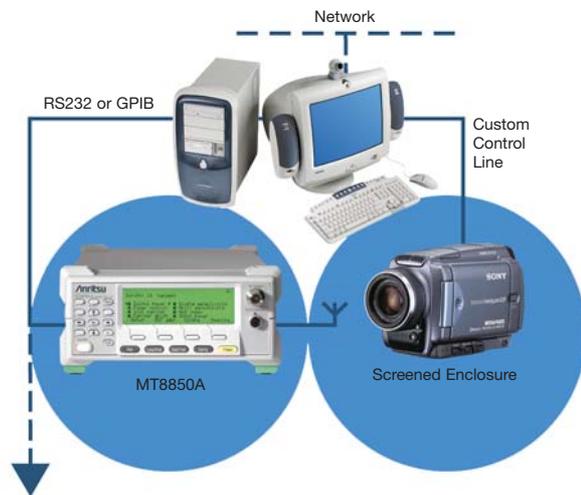
audio measurements
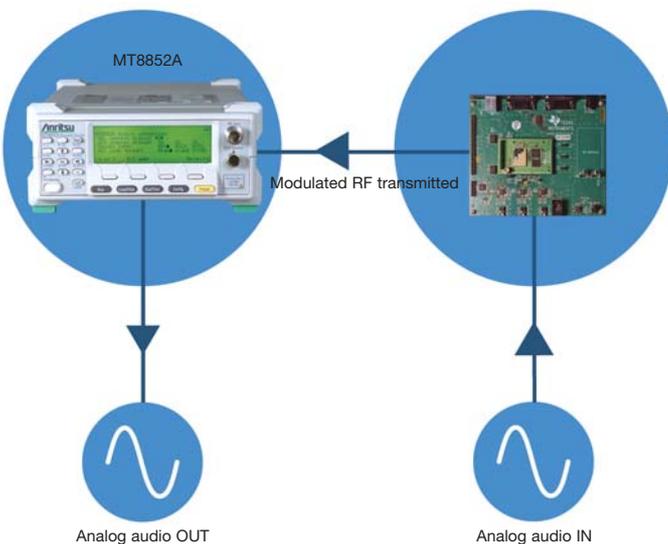
Consumer products such as headsets, audio gateways and in-car consoles that offer voice over Bluetooth will require audio measurements as well as radio layer measurements. The MT8852A offers full audio test capability. It is fully compliant with all the functionality defined in the Bluetooth audio specification. MT8852A supports all three codec air interfaces (µ-law, A-law and CVSD) on up to three SCO audio channels. Rear-panel jack-plug connectors provide analog inputs and outputs for all three audio channels to give a convenient interface to audio signal sources and analysers.

MT8852A

Modulated RF transmitted

Analog audio OUT

Analog audio IN

Bluetooth ™

Anritsu

MT8850A/MT8852A features

fast - 5 second test time

Keep your production lines flowing with the rapid "Quick Test" measurement script. Production test scripts can run in as little as 5 seconds, measuring power, frequency, modulation and receiver sensitivity (BER).

one touch testing

Once the MT8850A has been configured, each device is tested with a single keystroke. Press RUN to initiate a link – activate Test Mode – perform the measurements and report the results.

validated by Bluetooth SIG

MT8850A and MT8852A are the only integrated Bluetooth Test Sets that are Validated by the Bluetooth SIG. Validation confirms that the SIG have approved all supported measurements of the instrument, and that they fully meet the requirements of the Bluetooth System Specification. Validated Test Systems can be used for the Qualification of other Bluetooth products.

reference Bluetooth transceiver

A custom design transceiver offers <1 kHz frequency accuracy at the start of any packet and full compliance with the requirements for the "Dirty Transmitter" for true receiver sensitivity measurements. In addition to the standard dirty transmitter table, you can define customised stress conditions with user settable values of Carrier Frequency Offset, Modulation Index, Symbol Timing Error and simulated carrier frequency drift.

Adaptive Frequency Hopping - AFH

MT8852A-15 Adaptive Frequency Hopping option for MT8852A is designed to test the AFH capability of Bluetooth 1.2 enabled devices. The speed with which an EUT responds to an interfering source, such as WLAN, can easily be shown. This option gives graphical displays of FER and number of excluded channels against time as well as a display of the current active channel map. The audio capabilities of the MT8852A also support AFH, which gives a simple method to assess the impact of inter-ferers on audio quality.

headset profile emulation software

The Headset profile software option runs the higher layers of the Bluetooth protocol stack, above HCI, including the Headset profile on an external PC. MT8852A assumes the role of either an Audio Gateway or Headset. This facilitates test of integrated products that may require the test instru-ment to support profiles in order to establish a connection and pass audio through to the headset microphone and speakers.
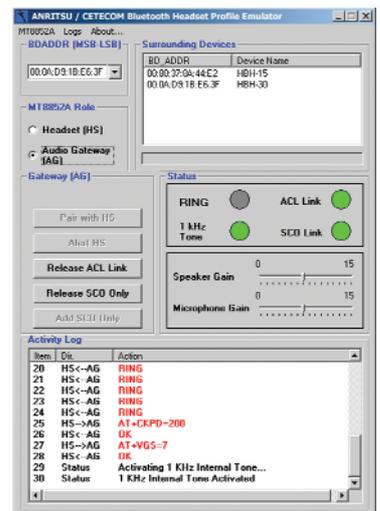
BlueSuite and BlueTest

BlueSuite support software
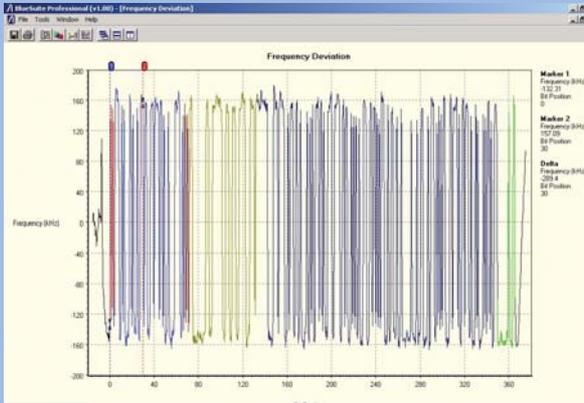
Bluetooth DH1 packet deviation viewed with BlueSuite. Red is pre-amble, light blue is access code, yellow is header, dark blue is payload and green is CRC.
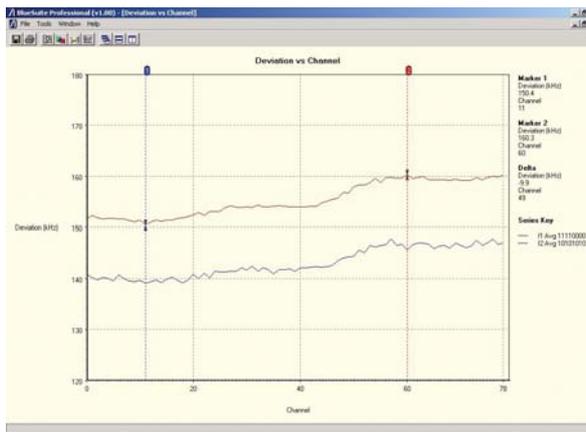
BlueSuite Pro measures deviation for 10101010 and 11110000 payloads on each channel.
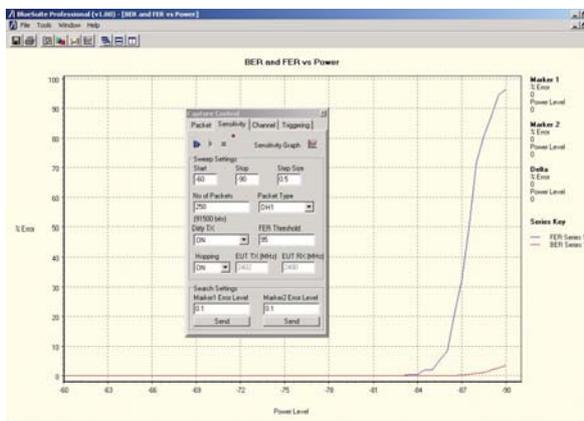
Automatic sensitivity search measured with BlueSuite Pro. Blue trace shows FER and red trace BER.

The standard BlueSuite software package gives PC control of the MT8850A/MT8852A for advanced design proving measurements on Bluetooth radios. Use BlueSuite to view packet modulation, power burst profiles and modulation eye diagrams. The standard BlueSuite software also offers a PC user interface for defining custom test scripts and reading script results into the PC. For interoperability testing during protocol development, BlueSuite offers a LMP message log capture facility. This can be used to view LMP messages between the MT8850A and the EUT during the initialisation of the link and while tests are running.

Upgrade to BlueSuite Pro to display graphs of the output power, deviation, carrier drift and sensitivity on each of the 79 channels. BlueSuite Pro also includes automated sensitivity search software for automatic measurements of BER and FER against receiver input level.

To help track down the cause of occasional rogue packets, BlueSuite Pro can be configured to only capture a packet trace when the packet fails any specific measurement.

BlueTest production software

The BlueTest PC software package controls up to 16 MT8850A/MT8852A Bluetooth Test Sets. It is designed for users requiring rapid testing of multiple devices such as modules. BlueTest software offers a simple interface for configuring scripts, triggering multiple instruments to start testing and reading script results back into the PC. The results are stored into a database from which they can be printed or archived for future analysis.

MT8850A specification

This appendix provides the specification for the MT8850A/MT8852A Bluetooth Test Set.

output power

MT8850A/MT8852A measures average and peak power according to the Bluetooth RF Test Specification. Measurement of output power is made with the EUT in test mode, loopback enabled and hopping on. MT8850A/MT8852A transmits the longest supported packets and longest supported payload length, with a PRBS 9 payload. Power is measured at three defined frequencies. MT8850A/MT8852A identifies the position of p0 and measures the power of every bit in the packet.

Link conditions

Hopping: ON or OFF – measure at Defined, All, or Any frequencies

Test mode: ON

Loopback or TX mode

Payload: PRBS 9

Packet type: DH1, DH3, DH5

Measurement

Supported measurements: Average power, peak power

Number of measurement channels: User selectable, Defined (3), All, or Any

Measurement range: +22 dBm to -50 dBm average power (+23 dBm peak power)

Resolution: 0.1dB

Accuracy: +20 dBm to -35 dBm, ±1 dB

+22 dBm to +20 dBm, ±1.5 dB

Speed: Greater than 300 DH1 packets/sec. with hopping mode set to "Any".

MT8850A/MT8852A measures modulation characteristics according to the Bluetooth RF Test Specification.

Measurement of modulation characteristics is made with the EUT in test mode, loopback enabled and hopping off. MT8850A/MT8852A transmits longest supported packets, with the defined payload to the EUT.

Modulation characteristics are measured at three defined frequencies.

Link conditions

Hopping: OFF

Test mode: ON

Loopback or TX mode

Payload: 11110000 and 10101010

Packet type: DH1, DH3, DH5

Measurement

Supported measurements: Frequency deviation. $\Delta f1max$, $\Delta f2max$, $\Delta f1avg$, $\Delta f2avg$ and $\Delta f2avg/\Delta f1avg$ plus % of $\Delta f2max$ < 115 kHz

Number of measurement frequencies: Three, default to qualification specification or user defined

RF input measurement range: +20 dBm to -35 dBm

Deviation measurement range: 0 Hz to 350 kHz peak

Deviation resolution: 1 kHz

Accuracy: 1kHz

power control

MT8850A/MT8852A measures power control according to the Bluetooth RF Test Specification. Measurement of power control is made with the EUT in test mode, loopback enabled and hopping off. MT8850A/MT8852A transmits DH1 packets, with a PRBS 9 payload. Power control is measured at three defined frequencies. MT8850A/MT8852A uses standard LMP commands to set the EUT power. MT8850A/MT8852A identifies the position of p0 and measures the power of every bit in the packet.

Link conditions

Hopping: OFF

Test mode: ON

Loopback or TX mode

Payload: PRBS 9

Packet type: DH1, DH3, DH5

Measurement

Supported measurements: Maximum power, minimum power, maximum step size, minimum step size, and power at each power step.

Number of measurement frequencies: Three, default to qualification specification or user defined

Measurement range: +22 dBm to -35 dBm average power (+23 dBm peak power)

Resolution: 0.1dB

Accuracy: +20 dBm to -35 dBm, ±1 dB

+22 dBm to +20 dBm, ±1.5 dB

initial carrier frequency tolerance

MT8850A/MT8852A measures initial carrier frequency tolerance according to the Bluetooth RF Test specification.

Measurement of initial carrier frequency is made with the EUT in test mode, TX mode and hopping on and/or off. MT8850A/MT8852A transmits DH1 packets, with a PRBS 9 payload. Initial carrier frequency is measured at three defined frequencies. MT8850A/MT8852A identifies the position of p0 and measures the average frequency of the 4 preamble bits.

Link conditions

Hopping: OFF or ON – measure at Defined, All, or Any frequencies

Test mode: ON

Loopback or TX mode

Payload: PRBS 9

Packet type: DH1

Measurement

Supported measurements: Initial carrier frequency error

Number of measurement channels: User selectable, Defined (3), All, or Any

RF input measurement range: +20 dBm to -35 dBm

Initial frequency error measurement range: 0 Hz to ±150 kHz

Frequency resolution: 1 kHz

Accuracy: 1 kHz

Speed: Greater than 300 DH1 packets/sec. with hopping mode set to "Any".

carrier frequency drift

MT8850A/MT8852A measures carrier frequency drift according to the Bluetooth RF Test Specification. Measurement of frequency drift is made with the EUT in test mode, with either loopback or transmitter test mode enabled. EUT transmits longest supported packets, with a 10101010 payload to the EUT. Measurements are made with hopping off and then with hopping on. Frequency drift is measured at three defined frequencies with hopping off and every frequency with hopping on.

Link conditions

Hopping: OFF or ON – measure at Defined, All, or Any frequencies

Test mode: ON

Loopback or TX Mode

Payload: 10101010

Packet type: DH1, DH3, DH5

Measurement

Supported measurements: Carrier frequency drift

Number of measurement channels: User selectable, Defined (3), All, or Any

RF input measurement range: +20 dBm to -35 dBm

Frequency drift measurement range: 0 Hz to 200 kHz, and > 2000/50µs

Frequency resolution: 1 kHz

Accuracy: 1 kHz

sensitivity - single slot packets

MT8850A/MT8852A measures single slot sensitivity according to the Bluetooth RF Test Specification.

BER and FER are measured with the EUT in test mode and loopback on. MT8850A/MT8852A transmits DH1 packets, with a PRBS 9 payload to the EUT. The user can select to run the measurement with hopping on or off. Dirty transmitter conditions as defined in the Bluetooth test specifications can be enabled.

Link conditions
Hopping: OFF or ON, user selectable
Test mode: ON
Loopback: ON
Payload: PRBS 9
Packet type: DH1
Dirty transmitter (as defined in RF test spec): ON or OFF, user selectable

Measurement
Supported measurements: BER, total number of bit errors and FER
Number of measurement frequencies: Three with hopping off, or hopping on.
Number of measured bits: 1 to 10,000 packets (216 to 2,160,000 bits)
MT8850A/MT8852A transmitter output range: 0 dBm to -90 dBm, resolution 0.1 dB
BER/FER measurement range: 0.00% to 100%
BER/FER resolution: 0.001%
Dirty transmitter specification

MT8850A/MT8852A transmits for the first 20 ms with the first set of measurement conditions, the second 20 ms with the second set of measurement conditions up to the tenth set of conditions. The cycle is then repeated until the test is complete.

In addition to the above measurement conditions, MT8850A/MT8852A transmits with a sine wave, frequency modulation, with a deviation of ±25 kHz, rate 1.6 kHz, alternate packets switch start phase between 0 and 180 degrees.
Dirty transmitter, user control; any entry in the dirty transmitter table can be edited within the following ranges;

- carrier frequency offset: 0 Hz to 100 kHz, 1 kHz resolution.
- Modulation index: 0.25 to 0.38, 0.01 resolution
- Symbol timing error: 0 ppm, +20 ppm or 20 ppm

Measurement conditions	Carrier frequency offset	modulation index	symbol timing error
1	75 kHz	0.28	-20 ppm
2	14 kHz	0.30	-20 ppm
3	-2 kHz	0.29	+20 ppm
4	1 kHz	0.32	+20 ppm
5	39 kHz	0.33	+20 ppm
6	0 kHz	0.34	-20 ppm
7	-42 kHz	0.29	-20 ppm
8	74 kHz	0.31	-20 ppm
9	-19 kHz	0.28	-20 ppm
10	-75 kHz	0.35	+20 ppm

sensitivity - multi-slot packets

MT8850A/MT8852A measures multi-slot sensitivity according to the Bluetooth RF Test Specification.

BER and FER are measured with the EUT in test mode and loopback on. MT8850A/MT8852A transmits DH5 packets (or DH3 packets if DH5 not supported by EUT), with a PRBS 9 payload to the EUT. The user can select to run the measurement with hopping on or off. Dirty transmitter conditions as defined in the Bluetooth test specifications can be enabled.

Link conditions
Hopping: OFF or ON, user selectable

Test mode: ON

Loopback: ON

Payload: PRBS 9

Packet type: DH3, DH5

Dirty transmitter (as defined in RF test spec): ON or OFF, user selectable

Measurement
Supported measurements: BER, total number of bit errors and FER
Number of measurement frequencies: Three with hopping off, or hopping on.

Number of measured bits: 1 to 10,000 packets (for DH3, 1,464 to 14,640,000 bits), (for DH5, 2,712 to 27,120,000 bits).

MT8850A/MT8852A transmitter output range: 0 dBm to -90 dBm, 0.1 dB resolution

BER/FER measurement range: 0.00% to 100%

BER/FER resolution: 0.001%

Dirty transmitter specification: as for single-slot sensitivity section except; in addition to the measurement condition table, MT8850A/MT8852A transmits with a sine wave, frequency modulation, with a deviation of ±40 kHz, rate 500 Hz (3 slots) or 300 Hz (5 slots), alternate packets switch start phase between 0 and 180 degrees.

maximum input level

MT8850A/MT8852A measures BER and FER at the EUT maximum input level according to the Bluetooth RF Test Specification. Measurement is made with the EUT in test mode, loopback enabled and hopping off. MT8850A/MT8852A transmits the DH1 packets with a PRBS 9 payload. The MT8850A/MT8852A transmitter level is set so that the EUT receiver input level is -20 dBm. BER and FER are measured at three defined frequencies.

Link conditions
Hopping: OFF

Test mode: ON

Loopback: ON

Payload: PRBS 9

Packet type: DH1

Measurement
Supported measurements: BER and FER for -20 dBm at receiver input

Number of measurement frequencies: Three, default to qualification specification or user defined

Number of measured bits: 1 to 10,000 packets (216 - 2,160,000 bits)

Transmitter power settable range: 0 dBm to -80 dBm

Resolution: 0.1 dB

MT8850A/MT8852A signal generator

Frequency

Frequency range:	2.40 to 2.5 GHz
Frequency resolution	1 kHz
Frequency accuracy	As frequency standard ± 25 Hz

Level

Amplitude range	0 dBm to -90 dBm
Amplitude accuracy	±1 dB, 0 dBm to -80 dBm
Amplitude resolution	±0.1 dB
Output impedance	50 Ohm (nominal)
Output VSWR	1.5:1 (typically 1.3)
	Adjacent channels 3 or higher -40 dBc
Spurious	30 MHz to 1 GHz; -36 dBc
	1 GHz to 12 GHz; -30 dBc
	1.8 GHz to 1.9 GHz; -47 dBc
	5.15 GHz to, 5.3 GHz; -47 dBc
	or -80 dBm, whichever is greater

Modulation

Modulation	GFSK
Modulation index	Variable, 0.25 to 0.38
	(125 kHz to 190 kHz)
Mod index resolution	0.01
Mod index accuracy	1 kHz
Baseband filter	BT=0.5

EUT Control Interface

The EUT control interface provides RS232 HCI commands to EUT through a standard RS232 interface. Interface meets requirements of Bluetooth V1.1 specification for HCI UART transport layer. An RS232 cable supplied.

The EUT control interface provides USB HCI commands to EUT through a standard USB interface. The interface meets the requirements of Bluetooth V1.1 specification section H:2. A USB cable is supplied (MT8852A only).

Audio Specifications (MT8852A only)

Number of SCO channels supported	3
Codec air interfaces supported	CVSD, A-Law, µ-Law
Frequency response	(-3dB) measured CODEC in to CODEC out: 160Hz -3.5kHz. Measured with 50Ω source impedance and 10MΩ load impedance.
Maximum input / output signal level	$3.4V_{pk-pk}$ = 1.2V RMS.
Distortion/noise	greater than –40dB relative to 1kHz, 1V RMS input/output.
Input/Output connectors	3.5mm audio jack plugs (one for each SCO channel)
Input impedance	20kΩ.
Minimum output load	600Ω.
Internal audio source	1kHz fixed frequency

AFH (MT8852A Option 15 only)

Supported in ACL and SCO connections.

Displays	Active channel vs time, FER vs time, current active channel map
Other Features	ACL connection timer, resolution 1 ms

Frequency Standard

Frequency	10 MHz
Accuracy	±0.5 ppm at 25ºC
Temperature Stability	±0.5 ppm, -10ºC to +85ºC
Aging (1st year)	±1.0 ppm
Aging (over 10 years)	±2.5 ppm, including year 1

Rear Panel Connectors

External frequency standard input	Rear panel BNC socket, 50Ω 1 volt
Output 1	TTL high when TX on (MT8850A/MT8852A)
	Plus TX data, RX data, and correlator (MT8852A only)
Output 2	TTL high when RX on (MT8850A/MT8852A)
	Plus TX data, RX data, and correlator (MT8852A only)
Input 1	For service use only

GPIB

IEEE 488.2. Offers full instrument control as standard. User can also read the 16 x over-sampled magnitude and frequency values of each data bit in the last measured packet.

MT8850A/MT8852A measuring receiver

Frequency

Range	2.40 to 2.5 GHz
Resolution	1 kHz
Accuracy	As frequency standard ± 25 Hz
Measurement channel bandwidth	2 MHz 3dB bandwidth, flat response Fc ± 550 kHz, and 1.3 MHz 3dB bandwidth, flat response Fc ± 550 kHz.

Level

Range	+22 dBm to -55 dBm average power
Power measurement accuracy	±1 dB (+20 dBm to -35 dBm)
Input VSWR	1.5:1
Damage level	+25 dBm
Resolution	0.1 dB

Modulation

Modulation	GFSK
Deviation measurement range	0 to 350 kHz peak
Accuracy	1 kHz

Additional standard features

Authentication with PIN codes
Signal generator mode
CW measurement mode
Read and display EUT supported features
RF path offset tables
Simplified measurements on NULL packets in standard ACL connection
LMP message logging and display

RS 232

RS 232 interface offering full instrument control as standard

Power Requirements

Supply	85 to 264 Volts AC
	47 to 63 Hz
	150 VA MAX

Environmental

Operating temperature	5 to +40ºC
Operating humidity	20% to 75%
Safety	Complies with IEC 1010-1
EMC	Conforms to the protection requirements of EEC Council Directive 89/336/EEC.

Size and Weight

Dimensions	216.5 mm x 88 mm x 380 mm
Weight	<3.45 kg

Ordering Information

MT8850A Bluetooth Test Set
MT8852A Bluetooth Test Set with audio

Included accessories
Power cord for destination country
RS232 EUT control interface lead
USB EUT control interface lead (MT8852A only)
RS232 cable for firmware updates
Operation Manual
Remote programming manual
Certificate of Calibration
LabVIEW™ Driver
BlueSuite software (standard version)
BlueTest production test software
3.5 mm jack plug x 3 (MT8852A only)

Options and accessories

MT8850A-01	Rack Mount, single instrument
MT8850A-03	Rack Mount, side-by-side
MT8850A-10	Bluetooth antenna and adapter
MY8852A-12 P/U	Headset Profile Emulator software (MT8852A only)
MT8852A-15	Adaptive Frequency Hopping (MT8852A only)
MT8850A-20	Spare EUT/RS232 cable
MT8850A-21	Spare EUT USB cable set
MT8850A-30	Extra Operation and Programming Manual
D41310	Soft Carry Case with shoulder strap
2300-259	BlueSuite Pro software

ME7865A

Bluetooth Pre Qualification Test System

Perform measurements on Bluetooth radios according to the RF test specification

- Cost effective Pre Qualification of Bluetooth radios
- All test cases run as defined in Bluetooth RF test specification
- Test management software provides fully automated creation and execution of test cases
- Compact (12U) instrument rack suitable for bench top operation
- Automatic report generation for documentation and archiving of results
- Integrated combiner network with single test port
- Automatic path calibration software ensures accuracy of power and sensitivity measurements

introduction

The Anritsu ME7865A Bluetooth Pre Qualification Test System (PQTS) addresses the 16 test cases defined in the Bluetooth RF test specification.

Developed in partnership with CETECOM, (Centro de Tecnologia de las Comunicaciones S.A.) the ME7865A offers an integrated solution including all the necessary test instruments and test case software to rapidly characterise Bluetooth radios.

applications

Pre qualification testing of chip sets

For Bluetooth chip set developers the ME7865A provides a test system that enables comprehensive testing of the radio performance before submission to a Bluetooth Qualification Test Facility (BQTF). This gives the developer a high degree of confidence that the chip set will achieve qualification first time.

All measurements are made in accordance with the Bluetooth RF test specification. The ME7865A generates test reports that are ideal for documenting the results from an EUT. Reports can include both numeric results as well as graphical traces of the measured packets.

Module testing

After integrating a Bluetooth chip set onto a module, it is necessary to revalidate the RF performance. Module manufacturers will typically design a module that is based on a reference design from the chip set supplier.

When the module design is complete, the implementation must be tested and characterised. The ME7865A is the ideal test system for proving the performance of new module designs.

Module selection

Selecting the appropriate module for integration into an end user product requires a complete understanding of the characteristics of each Bluetooth module.

The ME7865A provides a test system for comparative testing of chip sets and modules. This facilitates the selection of a Bluetooth module that is best suited to the specific product being developed.

Selective test in volume production

The MT8850A Bluetooth Test Set has been developed for high speed testing of all products manufactured with a Bluetooth interface. MT8850A measures key radio parameters such as power, frequency, modulation and sensitivity in a test time of typically under 10 seconds. Volume manufacturers who wish to continuously monitor the quality of output often chose to selectively test a sample of the output more rigorously.

ME7865A is designed to be integrated into a high volume production test facility and used alongside the MT8850A for sample testing. The PC is supplied with a network interface so that results can be archived onto a company network.

Bluetooth Qualification Test Facilities

Full qualification of a Bluetooth radio requires submission to a Bluetooth Qualification Test Facility (BQTF). The qualification process can be costly and time consuming. The ME7865A provides a solution for companies who wish to have a faster and lower cost analysis of their device before proceeding to full qualification.

The ME7865A reports generated will give the developer a full understanding of the performance of their device.

BQTFs can use ME7865A to offer a Pre Qualification test service.

test management software

ME7865A software runs on an integrated rack mounted PC. The PC is supplied with a CD drive to facilitate software upgrades.   A networking interface is also standard so that the ME7865A can easily be integrated into a company network. Free standing flat panel 15 inch TFT display, keyboard, and mouse are also supplied.

The ME7865A software consists of the following modules:

Executable test cases

The RF test case software will control all of the instruments to perform the measurements automatically.

ICS/IXIT modules

These modules contain the characteristics of the Equipment Under Test (EUT) for the selection of the applicable test cases. The data can be manually entered or read from the EUT supported features register.

Configuration manager

The configuration manager is used to develop the test cases dependant on the contents entered into the IXIT module.

Test case manager

The test case manager starts and finishes the test cases.

It also performs the verdict handling. The test case manager is also responsible for test case selection and the management of system files.

Database and report generator

This module displays the results of test cases and generates reports in Microsoft Word format.
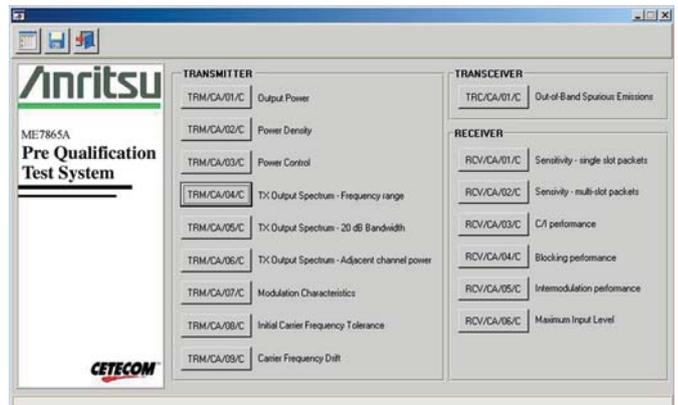
transmitter measurements

Output power

Output power measurements are made within the MT8850A Bluetooth Test Set. MT8850A identifies the position of P0 and measures the power in each of the bits within the packet. The average power across all the bits and the peak power are recorded.

Power density

The power density measurement provides the peak power density in a 100 kHz bandwidth.

The measurement is made using the spectrum analyser. In the frequency domain a sweep over the ISM band is performed. The channel with the highest power is identified and this is set as the analyser's new centre frequency. A new one-minute single sweep is performed in the time domain. The power density is defined as the peak value of this trace.

Power control

Power control tests allow for testing or calibration to be performed on the level control circuitry of the EUT.

This test is only performed on devices that support power control. The measure is performed in the same way as the average power measurement. The test verifies if power control step sizes are within the specified range.

Transmit output spectrum tests

The transmit output spectrum measurements analyse the power levels in the frequency domain to ensure that out-of–channel emissions are minimised. The spectrum analyser performs these measurements.

The Bluetooth specifications split the test into three parts; frequency range, - 20 dB bandwidth, and adjacent channel power.

The frequency range measurement uses peak detection and validates that there is no spectral content outside the ISM band.

The – 20dB bandwidth test verifies the individual channel occupancy.

The adjacent channel power measurement uses average detection to validate the power spectral density over of all channels in the ISM band with a given wanted channel.

Modulation tests

Modulation measurements reflect the performance of the modulator circuitry as well as local oscillator stability, and consist of modulation characteristics, initial carrier frequency tolerance and carrier frequency drift. Verification of modulation characteristics requires the ability to demodulate the Bluetooth signal so that the frequency of each bit can be determined.

For modulation characteristics, two sets of a repeating 8-bit sequence are used in the payload to check both the modulator performance and the pre-modulation filtering. Initial frequency error is measured by measuring the average frequency of the four preamble bits. Frequency drift is measured by comparing preamble bits with payload data. The maximum drift rate is also calculated in the payload.
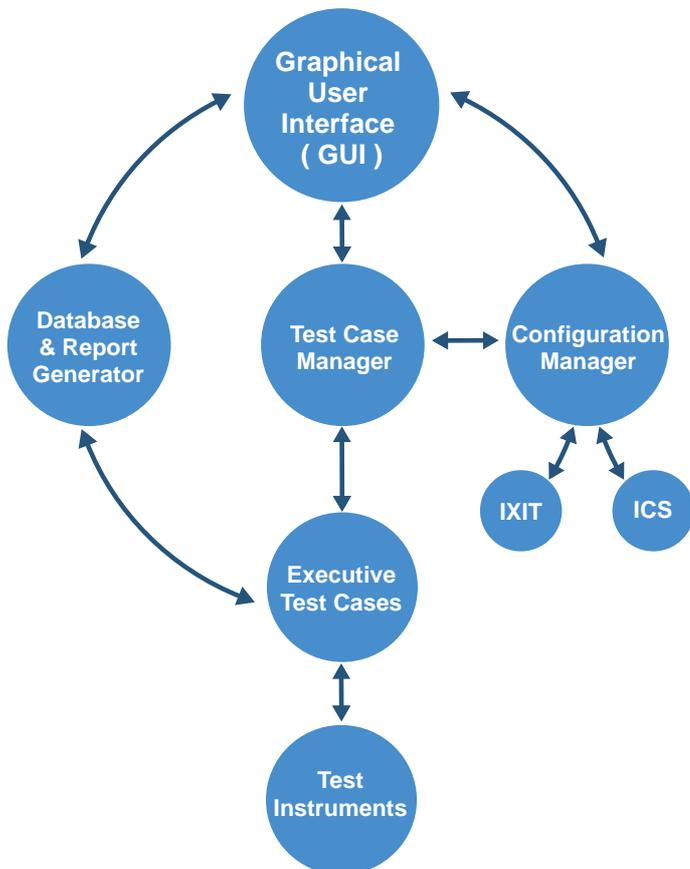
receiver measurements

BER is the parameter used to determine receiver performance. These tests perform BER analysis under various different conditions.

Sensitivity tests

Sensitivity is tested by transmitting impaired signals (using a defined dirty transmitter) to the receiver. The transmitted power is fixed, with impairments defined in the test procedure, which include carrier frequency offset, modulation index variation and symbol timing error.

Carrier-to-interference performance

C/I performance is measured by sending co-channel or adjacent channel Bluetooth modulated signals in parallel with the wanted signal and measuring the receiver's BER. One MT8850A delivers the wanted signal and a second MT8850A provides the PRBS15 interferer.

Blocking performance

Blocking performance is measured by sending an out of band CW interfering carrier with the wanted signals in parallel and measuring the receiver's BER. One MT8850A delivers the wanted signal and a second source provides the CW interferer.

Intermodulation performance

Intermodulation performance measures the effect of unwanted frequency components resulting from interaction between two interfering signals passing through receiver non-linear circuits. The test is performed by measuring receiver BER in the presence of an interfering modulated signal and a CW signal that generate an intermodulation product on the receiver operating frequency.

Maximum input level

This test measures the BER performance when EUT input signal is at maximum input power level specified of –20 dBm.

example result screen
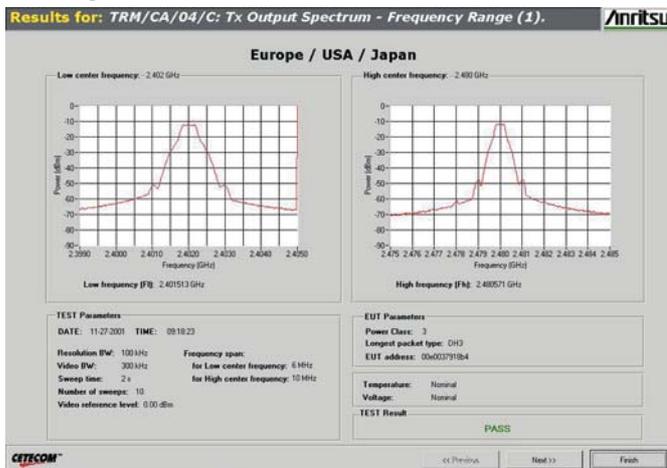
Software support and maintenance

The system support package provides customer technical support by email, fax, and telephone. Support staff are based in a European time zone and support response in guaranteed within one working day.

Following the release of the base line software, software upgrades will automatically be issued to customers on a maintenance contract. The ME7865A will be continually developed to follow changes to the RF Test Specification and to follow errata in the Bluetooth core specification.

system calibration

The ME7865A is supplied with an integrated power meter. Automated software routines calibrate the path losses from each measuring instrument port to the common EUT test port.

This path loss data is held in system files and corrected for during all measurements.

supported measurements

Test case	Description
TRM/CA/01/C	Output Power
TRM/CA/02/C	Power Density
TRM/CA/03/C	Power Control
TRM/CA/04/C	TX Output Spectrum frequency range
TRM/CA/05/C	TX Output Spectrum 20dB Bandwidth
TRM/CA/06/C	TX Output Spectrum Adjacent channel power
TRM/CA/07/C	Modulation Characteristics
TRM/CA/08/C	Initial Carrier Frequency Tolerance
TRM/CA/09/C	Carrier Frequency Drift
TRC/CA/01/C	Out-of-Band Conducted Spurious Emissions (automated to 3GHz - with option 12 or 14 only)
RCV/CA/01/C	Sensitivity – single slot packets
RCV/CA/02/C	Sensitivity – multi-slot packets
RCV/CA/03/C	C/I performance
RCV/CA/04/C	Blocking performance (3GHz standard, 12.75GHz with option 12 or 14)
RCV/CA/05/C	Intermodulation Performance
RCV/CA/06/C	Maximum Input Level

ordering information

ME7865A Bluetooth Pre-Qualification Test System
(comprises the following items integrated in a 12U rack)

Test management software

MT8850A Bluetooth Test Set
System Bluetooth controller version

MT8850A Bluetooth Test Set
System Bluetooth interferer version

MS2661C Spectrum Analyser with following options;
  Option 01 – reference crystal oscillator
  Option 02 – narrow resolution bandwidth filters
  Option 12 – quasi peak detector
  Option 20 – tracking generator

ML2437A Power Meter

MA2472A Power Sensor

Combiner Network Unit

Rack mount PC

Microsoft Windows 2000 Operating System

Microsoft Word

15 inch TFT PC display

PC keyboard and mouse

Options and accessories

  Option 10 – Replaces the 12U rack with a 34U rack on casters. This option adds a pull out EUT support shelf and space to integrate option 14
  Option 12 – Free standing MG3692A CW signal generator, 10MHz to 20GHz, with attenuator. RF test cable. For automated blocking measurements to 12.75GHz
  Option 14 – (Only available with option 10) Rack mounted MG3692A CW signal generator, 10MHz to 20GHz, with attenuator. RF test cable. For automated blocking measurements to 12.75GHz
  Option 22 – Software support and maintenance

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