![Bluetooth logo]

![Anritsu logo]

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.
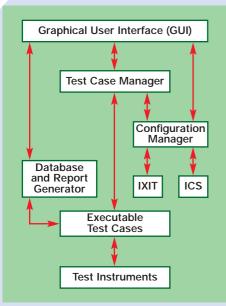
Module Testing

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.

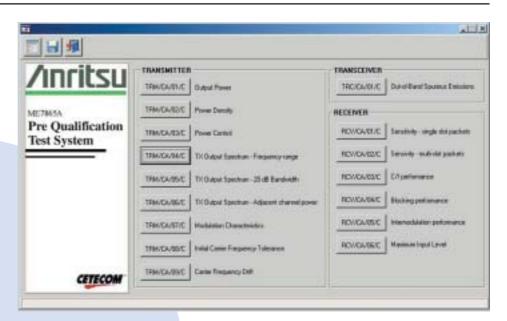### Selective test in volume production

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.
BQTF's 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 analyzer. 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 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 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 interferring signals passing through receiver non-linear circuits. The test is performed by measuring receiver BER in the presence an interfering modulated signal and a CW signal that generate intermodulation products on receiver operating frequency.
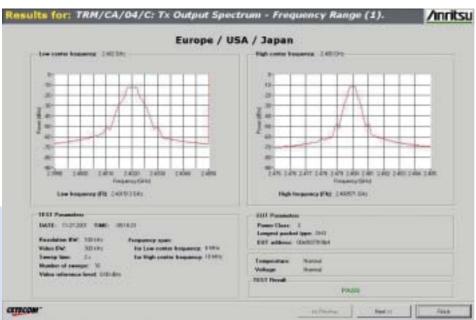
Maximum Input Level

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

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.

Example Result Screen

Support services

Software support and maintenance

The system support package provides customer technical support by email and 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.

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 Spurious Emissions *(conducted measurements to 3GHz, manual measurement)*
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 Analyzer 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 RF test cable. For automated blocking measurements to 12.75GHz (Available from April 2002)
Option 14 –
(Only available with option 10) Rack mounted MG3692A CW signal generator, 10MHz to 20GHz. RF test cable. For automated blocking measurements to 12.75GHz (Available from April 2002)
Option 22 – Software support and maintenance

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