

Cellular Parametric Test

GPRS, EDGE and AMR options - 6113 EDGE Base Station Test Set

AEROFLEX
A passion for performance.



- Field portable, easy to use, fully integrated GPRS, EDGE and AMR test capability for GSM 850, 900, 1800 and 1900 MHz base station transmitter and receiver testing
- Comprehensive first line, second line and engineering testing of complete GSM, GPRS, EDGE and AMR base station performance
- Installation/commissioning, maintenance and fault-finding test capability
- Rate-adaptation tests for optimization of AMR network settings
- Support for all major base station vendors
- Unique A-bis control functions to maximise test coverage

The 6113 has long been regarded as the world's leading test tool for base station installation and maintenance - in particular, its unique receiver test capability. With the increasingly widespread adoption of GPRS, EDGE and AMR networks, these options extend the test capability of the 6113 to match the evolution of GSM networks and allow network operators to continue to have full confidence in the quality of their networks and identify potential problems before subscribers are adversely affected - both during initial network rollout and then during ongoing planned maintenance.

The GPRS, EDGE and AMR options are also designed for use by network operators' engineering teams. The comprehensive test coverage makes the 6113 suitable for use in evaluating GPRS, EDGE and AMR base stations prior to vendor selection and then for ongoing detailed performance evaluation, new feature testing and detailed fault-finding of persistent or difficult to solve problems.

The rate-adaptation tests in the AMR option can also be used by optimisation groups for helping to verify and optimise AMR threshold settings.

AMR Overview

As with any other type of base station, the transmitter and receiver paths of AMR-capable base stations need to be appropriately tested as part of ongoing preventive maintenance. In addition, new test requirements to ensure that rate-adaptation is working correctly are introduced.

For the transmitter and receiver paths, tests such as maximum output power are unaffected by AMR and can be tested using standard GSM full rate traffic channels. Other tests have been changed so that the AMR specific elements of the base station are adequately tested; in particular those that include AMR codecs in the signal path such as bit error rate (BER) and frame erasure rate (FER).

The key features of the AMR option are:

- Addition of key transmitter and receiver AMR measurements
- Full rate and half rate AMR channels
- 'BOSS' live testing for non-intrusive AMR measurements
- Rate-adaptation test
- Combined traffic/signalling BER test
- 'CiTA' option support for complete cell site test including audio loopback to assess voice quality

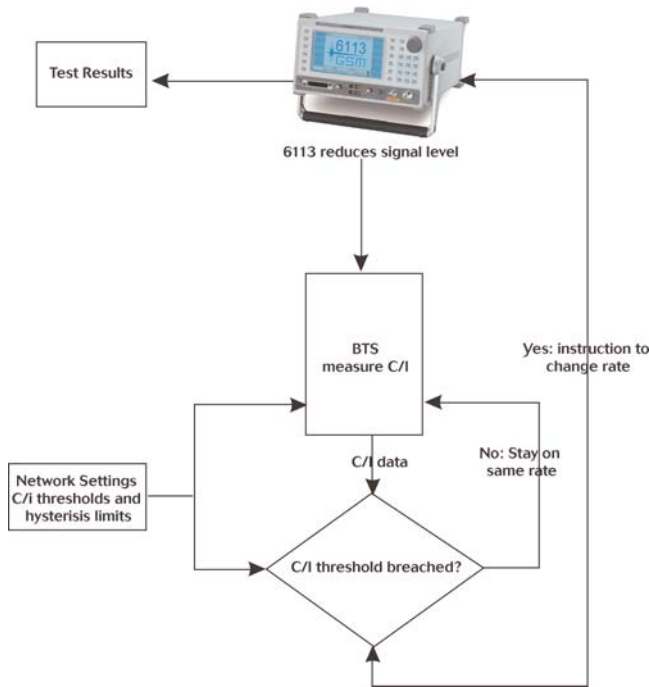
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Two key additional AMR capabilities that are offered are a rate-adaptation test and a combined traffic/signaling channel BER test. With the rate-adaptation test, the BER/FER for different codec rates is measured and logged. This test can be used not only for checking that the base station is correctly measuring carrier to interference ratio (C/I) but also as a tool for optimizing the thresholds and hysteresis settings used to trigger rate-adaptation.

The combined traffic/signaling BER test is included to help operators diagnose problems where calls are dropped despite AMR successfully maintaining speech quality in poor signal conditions. One potential cause of this is that although AMR successfully protects the traffic channel, the signaling channel does not use AMR and there are occasions when interference on the signaling channel causes the call to be dropped. The combined test allows the BER on the AMR traffic channel and on the signaling channel to be looked at simultaneously.

Rate-Adaptation Test

During live test, a call is set up from the 6113 to the base station. The signal level is then steadily reduced and FER and BER measurements are performed and logged. Once the lowest codec is reached, the power is then steadily increased back to the highest codec. At the end of the test, a summary is produced of rate change power measurements versus expected rate power thresholds as well as key BER/FER measurements before and after each instruction to change the AMR rate. The process is illustrated below:



Correct measurement of C/I by the BTS can be checked by comparing the FER and BER values for given signal levels with the predefined limits set for the network. If both are incorrect, this will indicate a problem with the BTS receiver, if only the FER is incorrect, then it is most likely to be the C/I measurement that has a problem.

This same data can also be used for optimising the AMR thresholds. The results will show the FER immediately prior to the instruction to change AMR rate. This can be used as a basis for analysis as to whether the thresholds are appropriately set.

GPRS/EDGE Overview

Test Information	Running : Transmitter Test - EGPRS (8PSK) 21 JUL 2004 13:35:10			Stop / Edit
Power Profile	Graph Status	Pass		
Modulation Spectrum	Frequency Error	+7.60 Hz		
EVM	RMS EVM	2.31 %		
	Peak EVM	7.89 %		
	95%tile EVM	4.78 %		
	Origin Offset	-52.82 dB		
Test Results				
Configure Printer	T.A.:	RXLEV:	RXQUAL:	S D
	GP1B: 20	10 MHz	RsIts: OFF	Offsets: 0.00 dB
				F R EXIT

GPRS and EDGE technology introduce new channel types, and for EDGE, 8-PSK modulation in addition to GSM's and GPRS' GMSK modulation. This alters the RF specifications and performance of the base station and with it brings a corresponding need to test these new features. The GPRS and EDGE options support the following channel types:

- CS-1 to CS-2 GMSK modulation (GPRS)
- MCS-1 to MCS-4 GMSK modulation (EDGE)
- MCS-5 to MCS-9 8-PSK modulation (EDGE)

When selecting GPRS or EDGE test options, the standard 6113 tests and pass/fail limits are automatically adjusted to match the appropriate test specifications. Additional tests, such as error vector magnitude (EVM) and receiver BLER are also added for testing 8-PSK signals.

GPRS and EDGE test set parametric performance is equivalent to the standard 6113 test set product specification. The Cell Integrity and Live Test options are not available for GPRS or EDGE

Base Station Manufacturers Supported

The following BTS manufacturers' specific A-bis software is supported on the 6113 for GPRS EDGE and AMR. If support for other manufacturers is required, please contact us.

- Alcatel (EDGE only)
- Ericsson
- Motorola (EDGE only)
- Nokia
- Nortel
- Siemens

Software Support

The GSM standards and base station software continue to evolve as new features are introduced. In order to maintain compatibility

between the 6113 and the base station under test, annual software support contracts are offered. The software support contract also provides minor enhancements to the 6113 functionality as and when released and access to the Aeroflex Helpdesk for technical support and assistance in using the 6113.

Upgrades and Ordering Information

GPRS can be added to new or existing test sets by ordering option 313 for new units and option 313R for existing units.

For new test sets, or to upgrade a test set delivered after 1st January 2004, please specify option 440 for EDGE or option 451 for AMR. No hardware upgrade is required for these options.

Older units with serial numbers higher than 2000, can be upgraded to EDGE and AMR but the unit will need to be returned to Aeroflex for a hardware upgrade. The hardware is identical for both EDGE and AMR. Please specify the following options to upgrade an existing test set:

- Options 440R and 451 to upgrade to EDGE and AMR
- Option 440R to upgrade to EDGE only
- Option 450 to upgrade to AMR only

If a unit has previously been upgraded to EDGE, AMR can be added as a software only upgrade. For units that already have EDGE, AMR can be added by ordering option 451.

The appropriate software support options (S440 for EDGE, S450 for AMR) must be ordered together with the EDGE and AMR options.

Units with serial numbers 1600-1999 may be suitable for upgrade. However, the 6113 will need to be returned to Aeroflex for inspection prior to accepting any order to determine whether the unit can be upgraded. The EDGE and AMR upgrade options are not available for units with serial numbers below 1600.

SPECIFICATION

TRANSMITTER TEST

Cell Control Channel Generation Tests

Checks generation of the Cell Control Channels by the BTS.

Transmitter Test

Checks transmitted signal power level, modulation spectrum, frequency, burst profile and phase error (GMSK) or EVM (8PSK) are within defined specification.

Allows user to view transmitted burst profile, modulation spectrum and phase error (GMSK) or EVM/IQ Constellation (8PSK).

Transmitter BER/BLER Test

Checks the basic baseband signal processing (Static Layer 1) functions on the downlink (BTS to MS) side of the BTS

DOWNLINK POWER

Control Test

Checks that the transmitted TCH signal conforms to the defined average output power level of the downlink power increments.

RECEIVER TESTS

Receiver BER/BLER Test

Checks the basic baseband signal processing (Static Layer 1) functions on the uplink (MS to BTS) side of the BTS, and checks that the BER and BLER is acceptable at Reference Input Sensitivity level (GMSK & 8-PSK).

Absolute Sensitivity Test

Measures the actual sensitivity of the transceiver by finding the threshold at which the measured BER and BLER deteriorates beyond the specified limits (GMSK & 8-PSK).

RACH & PRACH Test

Checks the performance of the BTS in detecting and reporting the presence of Random Access Channel Requests (RACH & PRACH).

RX Level Test

This test checks the performance of the BTS in measuring and reporting the level of the received signal (RX LEV) on the uplink side of the BTS.

RX Quality Test

This test checks the performance of the BTS in measuring and reporting the quality of the received signal (RX QUAL) on the uplink side of the BTS. updated in line with any changes. Adding new BTS software versions or updating existing software features of the 6113 can be performed quickly and easily in the field via memory card, IEEE488 or RS232 interface.

Combined Signaling/Traffic BER Test

Simultaneous measurement of BER on both signaling and AMR channels. This test is useful for diagnosing dropped calls that occur even when AMR maintains good speech quality..

8-PSK MEASUREMENTS

Frequency Error

< +/- 20 Hz + Freq.Std.

RMS EVM

1% accuracy at 7% EVM

EVM Range

0 to 25% Nominal

Power Profile

>45 dB dynamic range

Modulation Spectrum

>49 dB dynamic range

Note: GSM measurement performance remains the same as the standard 6113 test set.

(See 6113 Datasheet for details)

OPTIMISATION TESTS

Rate-Adaptation Test (requires live test option)

Sets up a call from 6113 to BTS and logs FER and BER Measurements as 6113 signal level is reduced. Allows C/I measurement by BTS to be verified and optimisation of AMR network settings.

Absolute Sensitivity Test on Live Network (requires live test option)

Performs an absolute sensitivity measurement during a live call. Allows real-world receiver performance to be checked and tuned for optimum performance.

6113 Originated Call with Audio Loopback (requires CITA option 311)

Allows user to assess voice quality of the air interface link between the BTS and the mobile handset. Please refer to main 6113 data sheet for full details of the CITA option

FUNCTIONAL TESTS

Configure BTS Test

Brings the BTS to a fully 'configured' state, ready for testing.

Reset BTS Test

Resets the BTS to a 'non-configured' state.

INTERACTIVE TEST MODE

Multimode

All the major measurements are run continuously. The operator can vary the majority of the test parameters without terminating the test. Test results are displayed simultaneously and are continuously updated.

SPECIAL FUNCTIONS MODE

Signal Generator Mode

This mode allows the 6113 to operate as a signal generator that can transmit a variety of GSM / EDGE structured signals and other signals. No signal monitoring is performed in this mode.

Power Meter Mode

This mode allows the 6113 to operate as a power meter to monitor the power on a nominated channel, or to indicate the channel that contains maximum power.

CHANNEL TYPES

CHANNEL TYPES

GSM: EFR, FR, HR, GSM data 2.4-14.4kbit/s

GPRS: CS-1 to CS-2*

EGPRS: MCS-1 to MCS-4 GMSK

MCS-5 to MCS-9 8-PSK

AMR full-rate:

4.75, 5.15, 5.90, 6.70, 7.40, 7.95, 10.2, 12.2 kbit/s*

AMR half-rate:

4.75, 5.15, 5.90, 6.70, 7.40 kbit/s*

* Note that not all GPRS coding schemes and AMR channel rates are supported by each base station manufacturer.

CHINA Beijing

Tel: [+86] (10) 6467 2716
Fax: [+86] (10) 6467 2821

CHINA Shanghai

Tel: [+86] (21) 6282 8001
Fax: [+86] (21) 62828 8002

FINLAND

Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE

Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY

Tel: [+49] 8131 2926-0
Fax: [+49] 8131 2926-130

HONG KONG

Tel: [+852] 2832 7988
Fax: [+852] 2834 5364

INDIA

Tel: [+91] 80 5115 4501
Fax: [+91] 80 5115 4502

KOREA

Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA

Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SPAIN

Tel: [+34] (91) 640 11 34
Fax: [+34] (91) 640 06 40

UK Burnham

Tel: [+44] (0) 1628 604455
Fax: [+44] (0) 1628 662017

UK Stevenage

Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA

Tel: [+1] (316) 522 4981
Fax: [+1] (316) 522 1360
Toll Free: 800 835 2352

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www.aeroflex.com
info-test@eroflex.com



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