Cellular Parametric Test

6413A UMTS (3G) Base Station Test System

- Comprehensive and independent 3GPP FDD UMTS Base Station (Node B) test system for both lab and field use
- Designed for installation and commissioning, maintenance, fault-finding, performance verification, optimization and new feature testing
- Comprehensive test coverage reduces time spent resolving cell site issues, ensures that faulty hardware is correctly identified and enables network operators to maintain quality of service obligations
- Enables testing of Base Station (node B) independent of network in a controlled environment using Iub interface
- Enables testing of Base Station (node B) receiver and transmitter on a live network without disrupting active traffic.
- Excellent measurement accurracy in field portable test equipment. Vital in UMTS where 1dB in power accuracy will impact cell performance by 11%
- Intuitive user interface and automation allows less experienced enginneers to operate this equipment.
- Rugged for field deployment
- Full support packages to keep up to date with Node B enhancements
- Builds on success of Racal Instruments 6113 GSM Base Station Test System with over 2000 units delivered to customers world wide.

INTRODUCTION

Comprehensive on-site testing of Node Bs using real-world scenarios, both at initial installation and then during ongoing maintenance, plays a vital role in preventing and solving performance problems before they impact subscribers. Thorough testing also gives network operators greater confidence in the quality of the deployed network.

Without effective test equipment the running costs of the network are more expensive as installation teams, maintenance teams and optimization teams take much longer to resolve cell site issues. It is very important to correctly identify faulty base station hardware as cost of replacement hardware is expensive when out of warranty.

A poorly operating cell can result in an increase in dropped calls, poor quality calls, poor data throughput, interference and actual network coverage not matching planned network coverage.

PRODUCT OVERVIEW

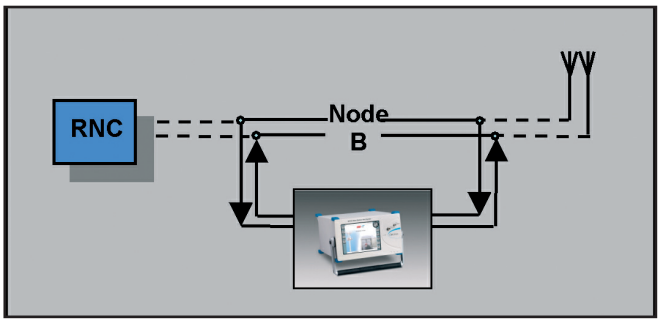
The 6413A Base Station Test System is designed specifically for installation and commissioning, maintenance, fault-finding, optimization and final unit production testing of radio base stations. The test set has two test modes:

- Iub Controlled Testing
- Live Testing

IUB CONTROLLED TESTING

In order to perform comprehensive base station testing the 6413A takes complete control of the Node B via the Iub interface using its unique RNC emulation capability. This allows the 6413A to perform all the critical transmitter, receiver and functional tests without external control equipment or need for detailed knowledge of the Node B operation and control.

The base station is tested independently of a live network using repeatable test scenarios, which are not possible when using purely on-air monitoring test equipment. The whole nature of UMTS means that propagation and cell loading conditions change dynamically so measurements recorded using purely on-air monitoring tools or test-mobiles are inconclusive when trying to establish if a BTS is operating to specification.



Iub Control using 6413A

TRANSMITTER TESTS

The 6413A sets up transmitter tests using the RF test models defined in the ETSI 25.141 specification. This test method is required to obtain meaningful base station transmitter performance measurements. The Iub control also has the additional advantage of allowing the operator to test the base station power control capability. A base station transmission too high or too low will cause network interference and handover issues.

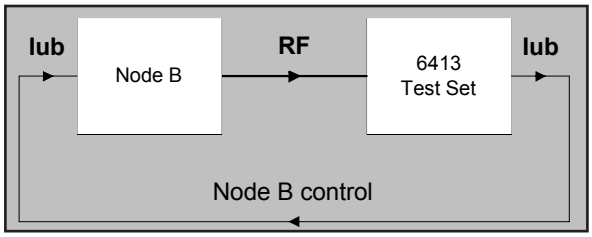
Problems with the Node B transmitter can have a number of impacts:

- Reduction in effective cell size because base station transmit power is lower than expected
- Interference with adjoining cells leading to a reduction in overall network capacity because base station transmit power is higher than expected
- Reduced data throughput due to poor modulation accuracy
- Mobile registration failures

The 6413A enables network operators to pro-actively avoid these types of problems by offering a number of transmitter measurements:

- Maximum Output Power
- Frequency Error
- Error Vector Magnitude (EVM)
- Peak Code Domain Error (PCDE)
- CPICH Power Accuracy
- Adjacent Channel Leakage Ratio (ACLR)
- Occupied Bandwidth
- Total Power Dynamic Range
- Power Control Dynamic Range
- Power Control Steps
- Spectrum Emission Mask
- Spectrum Analsysis Graph
- Code Domain Analyser

Each of these is described in further detail in the section "Measurements".



Transmitter test measurement setup

Once configured for the network (which is usually a one-time operation), the 6413A is very simple to use. Using the built-in Iub controller, it takes complete control of the Node B and automatically sets it up to transmit known signals which are then measured by the 6413A.

RECEIVER TESTS

The 6413A Iub control also allows full test of the receiver path. The receiver performance of a base station effectively defines cell coverage. The mobile transmits at a fraction of the power of the base station therefore it is most important to test the base station receiver. The 6413A's unique capability to control the Node B via Iub as well as decode information transmitted from the Node B on the Iub interface enables BER measurements to be made which are required by the key receiver measurements.

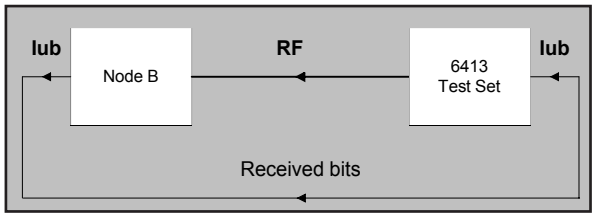
Problems with the Node B receiver can have the following impacts:

- An increase in dropped calls at the edges of the cell due to poor sensitivity
- Lower number of calls supported in affected cell. This would have the knock on affect of impacting network planned performance.
- Poor quality of calls with breaking up of speech or slow data transfer
- Inability of subscribers to utilize value-added higher data rate 3G services because of poor signal quality
- Accelerated battery usage as mobile is required to transmit at higher power. This would have a knock on affect causing cell inteference.

The 6413A is able to make the following receiver tests to prevent these issues:

- Reference Sensitivity Level
- Dynamic Range
- Uplink Wideband Power
- Absolute Sensitivity

Each of these is described in further detail in the section "Measurements".



Receiver test measurement setup

Operation is as simple as transmitter testing. Once the 6413A has been configured for the network, the 6413A acts as an RNC and configures the Node B to expect certain signals at its receiver and then transmit the received data via the Iub to the 6413A. The 6413A may then perform Bit Error Rate measurements to allow sensitivity and dynamic range measurements to be made on the complete receive path.

FUNCTIONAL TESTS

Besides testing the transmit and receive paths, the 6413A is also able to carry out a functional test of the complete Node B. This gives the engineer the ability to confirm that the Node B and E1/T1 (including IMA) network interface is not only working correctly, but also that the configuration of the Node B correctly matches the network configuration. As a result, the engineer can leave the site with greater confidence that the Node B is functioning as expected. The following functional tests are available:

- Config Iub
- Iub Status

LIVE TESTING

The Live Testing mode addresses the growing demand by network operators to be able to evaluate the performance of base stations without taking the site out of service and disrupting active cell traffic.

By emulating a subset of mobile protocol it is possible to test both transmitter and receiver paths without affecting other users on the network.

Live testing allows network operators to perform periodic performance assessments of their base stations without impacting revenue. This test mode complements the Iub test mode as the Live testing mode may be used to confirm cell site issues and the Iub testing mode, with its more comprehensive test coverage used to isolate faulty base station components.

Typical cell site

The 6413A Transmitter Live Testing mode offers the following measurements:

- Output Power
- Frequency Error
- Error Vector Magnitude (EVM)
- Peak Code Domain Error (PCDE)
- CPICH Power Accuracy
- Adjacent Channel Leakage Ratio (ACLR)
- Occupied Bandwidth
- Spectrum Emission Mask
- Spectrum Analsysis Graph
- Code Domain Analyser

The 6413A Receiver Live Testing mode offers the following measurements:

- RACH Sensitivity Level
- RACH Absolute Sensitivity
- RACH Dynamic Range

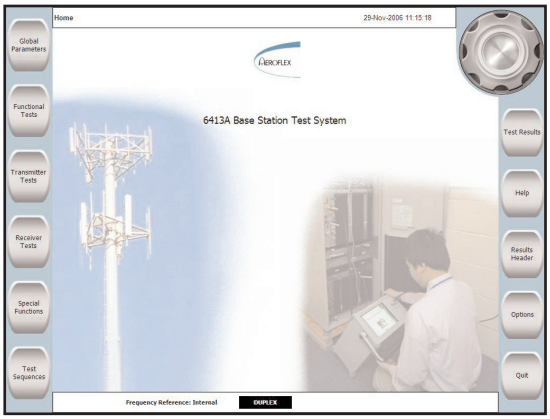
Efficient operation of the Random Access Channel (RACH) is essential to ensure actual network access coverage meets user's expectations and KPIs such as Connection Establishment Time are met.

HSDPA

High Speed Downlink Packet Access (HSDPA) throughput is particularly sensitive to code-domain noise problems and modulation quality. The 6413A's live-test Code Domain Analyser allows the engineer to verify that the performance of HSDPA channels including HS-SCCH, 16QAM HS-PDSCH and QPSK HS-PDSCH is adequate to achieve the planned network throughput KPIs.

USER INTERFACE

The 6413A MMI is intuitive to use. Based around an embedded PC and using touch-screen controls, all functions can be operated from the front panel. Measurement results can be viewed while tests are running or stored for later analysis. Tests can be run manually or automatically using pre-programmed test sequences. The product can also be driven remotely via Ethernet interface.



6413A main screen

ONE-BUTTON TEST

Comprehensive and high performance test equipment is all very well if the users have the necessary training and experience to operate it correctly. But even with skilled users, mistakes can still happen when different people have different interpretations of the way in which tests should be carried out.

The simplest solution to this is to automate the test process. Many GSM operators have found the test sequence mode on the Aeroflex 6113 to be invaluable in simplifying and accelerating operation of the product. Test sequences also guarantee consistency of measurements whether the testing is carried out by employees of the network operator or by specialist sub-contractors. The 6413A builds on this with it's 'One-Button' test facility.

One-Button test enables an operator to set up their own custom test sequence in advance that can then be run with a single key press. For operators with different Node B types, or even a mix of manufacturers, different sequences can be set up for each. Network specific configuration information can also be built into the sequences removing the need to set this up each time a new site is visited.

Of course, One-Button test does not preclude manual control of all the tests. For senior engineers carrying out fault-finding or performing new feature testing, tests can be controlled completely manually.

LOGGING AND VIEWING RESULTS

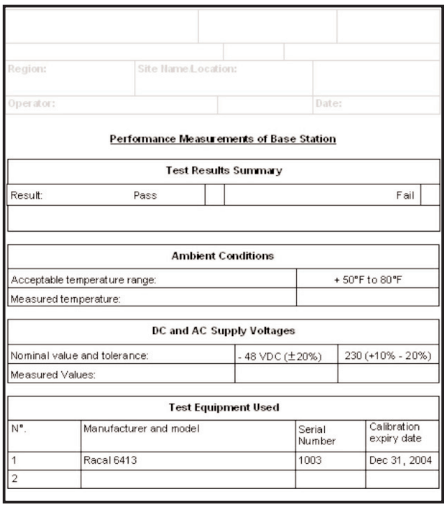
Measurement results are displayed and continuously updated while any given measurement is being performed. At the same time, all measurement result data is stored in a database so that it can be analyzed at a later date or used for comparing current against historical performance.

For current measurements, where there are pass/fail limits defined in TS25.141, these are shown on the display to give an instant indication of whether the Node B is within specification or not.

If preferred, the pass/fail limits for any measurement can be changed to reflect the network operator's particular test specifications.

Once testing is completed, most network operators require that the results are stored for future reference. The 6413A can store this information and also provides the ability to transfer the results data to another PC, either to be added to a central database or to be printed out.

As an additional option, Aeroflex is also able to offer an application to automatically produce test results to the network operator's own format.



Region: Site Name/Location:

Operator: Date:

Performance Measurements of Base Station

Test Results Summary		
Result:	Pass	Fail

Ambient Conditions	
Acceptable temperature range:	+ 50°F to 80°F
Measured temperature:	

DC and AC Supply Voltages		
Nominal value and tolerance:	- 48 VDC (±20%)	230 (+10% - 20%)
Measured Values:		

Test Equipment Used			
N°.	Manufacturer and model	Serial Number	Calibration expiry date
1	Racal 6413	1003	Dec 31, 2004
2			

EXTRACT OF TYPICAL NETWORK OPERATOR FORMATTED REPORT BUILDING ON GSM TESTING EXPERIENCE

Aeroflex purchased Racal Instruments Wireless Solutions and is building upon the industry standard GSM base station test sets that are used by virtually every network operator around the world.

The combination of transmitter, receiver and functional tests together with built-in manufacturer specific A-bis control has consistently delivered the test capabilities demanded by the mobile communications industry.

The fact that cell sites can be located anywhere - from inside buildings to the tops of hills - makes it vital that test equipment is designed to be portable and rugged.

Based on our experience and knowledge of network operators' needs, the 6413A has been designed to meet test needs as 3G networks are rolled out and is also able to be used wherever cell sites are located. Key to this has been to ensure that the 6413A is portable and sufficiently rugged for field use.

MANUFACTURERS SUPPORTED

What sets Aeroflex products apart from other test equipment companies is the ability to comprehensively control the base station from the test instrument and make full receiver measurements. This is done by the inclusion of manufacturer-specific Iub control software. This gives a benefit in terms of more comprehensive testing, significantly simplifies operation of the test equipment and enables far greater automation.

The 6413A is able to test Node Bs from the following manufacturers:

- Ericsson
- Huawei
- Lucent
- Nokia
- Siemens

For information about other manufacturers and specific Node B types, please contact Aeroflex. Additional manufacturers will be added as enhancements to the 6413A.

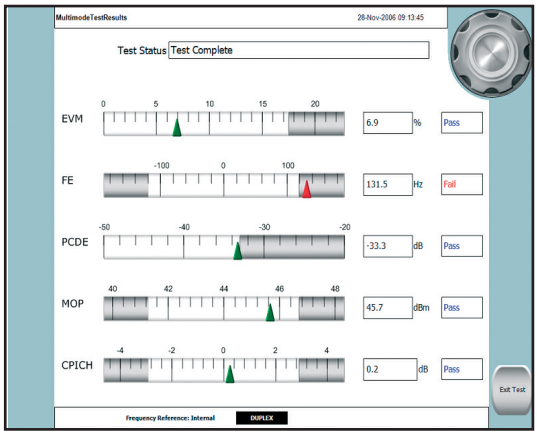
CDMA VERSUS GSM TECHNOLOGY

Networks using CDMA technology behave differently compared to GSM networks. For example, unlike GSM networks where an additional cell can be introduced to increase capacity with relative ease, the addition of a CDMA cell may initially "unbalance" the local radio network causing an overall drop in Quality of Service (QoS) until the network is re-optimised.

Cell planning and optimization assumes that the network infrastructure is performing correctly. However, if it is not, problems could lead to either incorrect decisions being made about the optimum cell planning or gaps appearing in the coverage. This could result in increased capital expenditure because more Node Bs are installed than necessary or loss of revenue from the gaps in coverage and higher subscriber churn.

By ensuring that Node Bs are performing correctly, an important unknown is removed from the equation.

MEASUREMENTS



Multimode test screen shot

The following are some of the tests that are offered as the standard test package for the 6413A. Additional tests will be added as part of the ongoing software support for the 6413A.

TRANSMITTER TESTS

Maximum output power

The 6413A has been designed to connect directly to the RF output and can measure Node Bs with a maximum rated output power between 0 and +46dBm without the need for external attenuators.

Frequency Error

The 6413A measures how accurate the BTS measured frequency is compared to the reference frequency. The TS25.141 conformance specification requires that a Node-B transmitter be within ±0.05 ppm + 12 Hz of the assigned frequency. The 6413A has an excellent internal frequency standard of 0.05 eliminating the need for external GPS receiver.

Error Vector Magnitude

The 6413A measures the EVM, which is the magnitude of the geometric difference (ie the error vector) between the perfect modulation vector and that from the Node B. This test measures the modulation accuracy, which can affect the data throughput of the cell, especially for more complex modulation schemes such as those used by HSDPA. The test is carried out in accordance with the recommendations in the TS25.141 conformance specification.

Peak Code Domain Error

This test indicates the error between each received code channel and its ideal representation. The 6413A displays the worst case error for all of the received code channels, otherwise known as Peak Code Domain Error. A channel's Bit Error Rate (BER) and hence its throughput depends upon the ratio of signal code power to error code power so PCDE is especially important for HSDPA channels. This test also meets the requirements of TS25.141.

Adjacent Channel Leakage Ratio

ACLR is a measure of the spectral spreading of the transmitted signal. The 6413A measures the on-channel power relative to the power in the upper and lower adjacent channels at both 5 MHz and 10 MHz offsets, in accordance with TS25.141. The test failing will highlight potential mobile, cell and network interference issues. A poor ACLR may also be an early indicator of a power amplifier that is out of specification.

Occupied Bandwidth

The 6413A measures the occupied bandwidth of the base station transmitted signal, which is the bandwidth containing 99% of the transmitted signal.

CPICH Power Accuracy

The Code Domain Power of the primary Common Power Channel, CPICH, averaged over one frame is measured for power accuracy relative to its value as indicated on the Broadcast Channel, BCH, in accordance with TS25.141. UMTS network performance critically depends upon accurate setting of the pilot power for each cell as "pilot pollution" is one of the main causes of poor network performance.

Total Power Dynamic Range

The Total Power Dynamic Range tests the maximum and minimum power in accordance with TS25.141.

Power Control Dynamic Range

The Total Power Control Dynamic range tests maximum and minimum power of a coded channel in accordance with TS25.141.

Power Control Steps

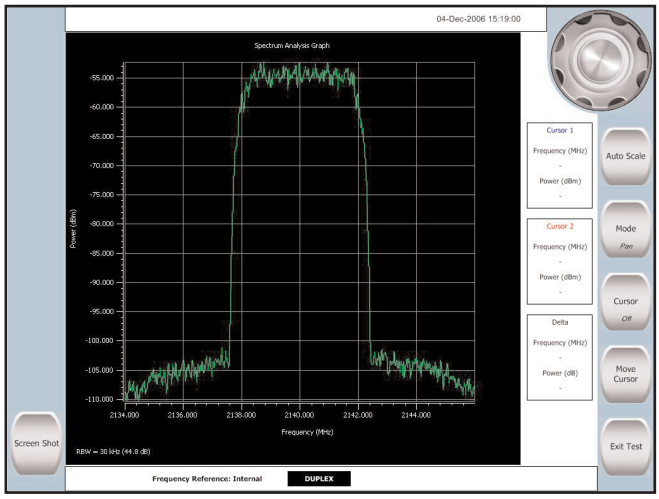
The 6413 using the Iub interface requests the Node B to drop the transmit power of coded channels over a number of steps. The 6413A receiver then measures the accuracy of the transmit power from the Node B. If the base station is transmitting too high or too low at each power step a failure is reported. A test failure will highlight potential mobile, cell and network interference issues as accurate fast power control is essential to achieve the target capacity.

Spectrum Emission Mask

The Spectrum Emission Mask Test measures the transmit power of the base station for a specified frequency against the spectrum emission mask defined in TS25.141. A test failure will highlight a base station is transmitting out of specification, which may cause an interference issue.

Spectrum Analysis Graph

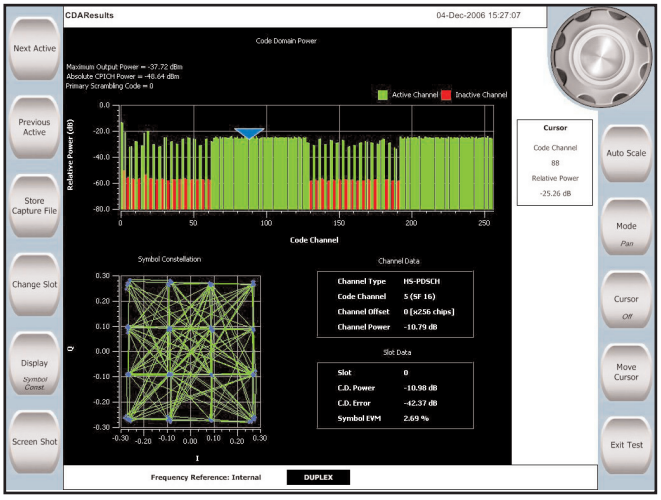
To aid fault-finding, the 6413A includes a Spectrum Analysis Graph to allow engineers to view the Node B power spectrum.



HSDPA spectrum analysis graph screen shot

Code Domain Analyzer

To aid fault-finding, the 6413A includes a code domain analyser to allow engineers to view all the coded channels for a specified frequency. Slot power, symbol EVM and symbol constellation for specified slot may also be analysed for WCDMA/HSDPA channels.



HSDPA code domain analyzer screen shot

RECEIVER TESTS

Reference Sensitivity Level

The reference sensitivity test provides a single uplink channel at a specified power to the Node B's receiver, which effectively simulates a mobile making a call and if the Node B can decode the signal and be within the BER measurement thresholds the performance is acceptable.

The 6413A signal generator operates down to -125 dBm enabling engineers to make reference sensitivity level measurements that match conditions experienced in the field.

Uplink Wideband Power

The 6413A signal generator transmits a signal at a specified power level to the Node B. The 6413A then decodes the BTS signal measurement reports received on the uplink Iub interface. If the Node reports a power level much lower or higher than expected this could incorrectly influence handover decision making and therefore impact the amount of traffic that can be supported in the cell.

Dynamic Range

The dynamic range test simulates the scenario where many mobiles are active, by setting up an uplink channel for a single mobile (the wanted signal), along with superimposed Additive White Gaussian Noise (AWGN) to represent the interference from all the other mobiles. The unwanted noise is much greater in overall power then the wanted signal, so the test measures the Node B receiver's ability to extract the wanted signal from the interference.

The 6413A's internal AWGN generator allows Bit Error Rate (throughput) measurements to be made with appropriate signal powers and noise levels to verify performance.

Absolute Sensitivity Level

The Absolute sensitivity test allows the operator to automatically measure the true sensitivity of the base station receiver system.

The 6413A signal generator starts at a pre-defined signal level and drops or raises power depending on the Bit Error Rate measurements until a definitive receiver sensitivity performance can be identified.

It is important that a cell achieves the required uplink sensitivity in order to provide the planned coverage. A 1 dB loss in sensitivity means 11% more cells may be required to achieve the target coverage [WCDMA for UMTS, Holma & Toskala].

RACH Reference Sensitivity Level

The RACH reference sensitivity test provides uplink RACH signalling requests at a specified power to the Node B's receiver, simulating a mobile at the edge of the cell under ideal propagation conditions. If the Node B can decode and respond to a specified percentage (defined in TS25.141) of RACH signals successfully the performance is acceptable.

RACH Dynamic Range

The dynamic range test simulates the scenario where many mobiles are active by transmitting a series of RACH access preambles for a single mobile (the wanted signal), along with AWGN to represent the interference from all the other mobiles. The test measures the Node B receiver's ability to detect the RACH preambles in the presence of interference.

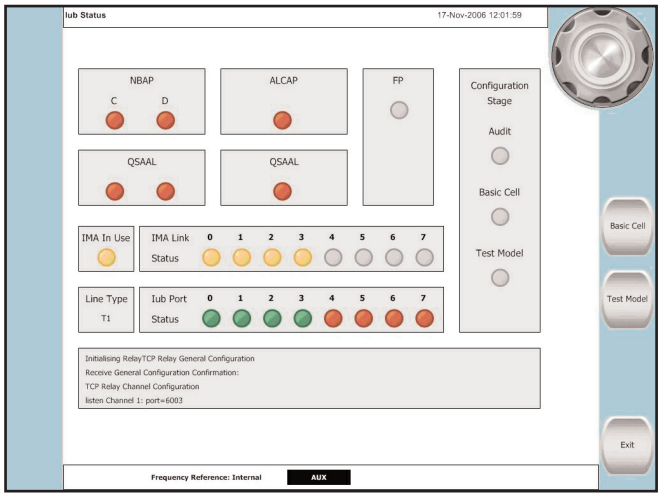
RACH Absolute Sensitivity Level

The RACH Absolute sensitivity test allows the operator to automatically measure the RACH preamble detection threshold with no interference present. This level is related to the overall receiver sensitivity so is a guide to how far a mobile can be away from the Node B and still decode the mobile's call setup/cell register request in a quiet cell.

The 6413A signal generator starts at a pre-defined signal level and drops or raises power depending on whether the RACH preamble is detected.

Iub Status

The Iub Status screen confirms that the Iub network interface (E1/T1/IMA) interface between the 6413A and base station is operating correctly both at the electrical/physical level and at the protocol level.



Iub status screen shot

SUPPORT

The 6413A is offered with comprehensive worldwide hardware and software support packages. Different tiers of support packages are offered to the user depending on specific needs and can be customized as required. Regardless of the level of support chosen, users have access to a helpdesk facility where any faults or issues can be logged, and are guaranteed to receive a response from Aeroflex within the next working day.

Support of the system hardware is an essential element in maximizing efficiency and return on investment of your equipment. Aeroflex offers several comprehensive hardware support packages, which are tailored to typical usage profiles. A range of extended warranty and calibration packages are also available.

Node Bs are continually being enhanced and new models introduced. Aeroflex software support packages are designed to ensure that the 6413A remains current and up to date with the latest versions of software being deployed in the network. To get the maximum benefit from the 6413A, it is important that a valid software support contract is in place.

Software updates can be downloaded by the customer from the Aeroflex Customer Download Portal avoiding the need to return units to Aeroflex.

Further details about support can be found in the support section on the Aeroflex web site.

SPECIFICATION

TEST CAPABILITY

Transmitter tests

Max Output Power

Frequency Error

Error Vector Magnitude

Peak Code Domain Error

CPICH Power Accuracy

Adjacent Channel Leakage Ratio

Occupied Bandwidth

Spectrum Monitor

Total Power Dynamic Range

Power Control Dynamic Range

Power Control Steps

Receiver tests

Reference Sensitivity Level

Dynamic Range

Uplink Wideband

Absolute Sensitivity

RACH Reference Sensitivity

RACH Dynamic

RACH Absolute Sensitivity

Functional tests

Node B Reset

Iub Link Tests

Iub Status

RF SIGNAL SOURCE

Frequency range

800 to 960 MHz

1.71 to 2.20 GHz

Output power

-125 to -55 dBm

Impedance

50 Ω nominal

Connector

N-type female (duplex)

TNC female (simplex)

RF MEASUREMENT RECEIVER

Frequency range

800 to 960 MHz

1.71 to 2.20 GHz

Input power survival level

+47 dBm continuous, or 50 W combined RF and DC power

Impedance

50 Ω nominal

Connector

N-type female (DC coupled)

SWR

1.2:1 maximum

Uu DATA RATES

The 6413A platform supports data rates up to a maximum of 2Mbit/s. For initial deliveries, data rates will be:

Uplink

Up to 64 kbit/s

Downlink

Up to 64 kbit/s

The maximum data rates will be increased as part of the ongoing software support of the 6413A.

3GPP FDD MODE NODE B TRANSMITTER TESTS

MAXIMUM OUTPUT POWER

Power measurement range

0 to +46 dBm

Absolute accuracy

+18° to +28°C ±1.5 dB

0° to +45°C ±2.0 dB

FREQUENCY ERROR

Frequency error range

0 to 500 Hz

ERROR VECTOR MAGNITUDE (EVM)

EVM range

5 to 25%

PEAK CODE DOMAIN ERROR

Code power range

30 to -36 dB for each code at SF=256

ACLR (ADJACENT CHANNEL LEAKAGE RATIO)

ACLR range

40 to 48 dB at 5 MHz offset

40 to 60 dB at 10 MHz offset

CPICH POWER ACCURACY

CPICH power error range

-6 to +6 dB

3GPP FDD MODE NODE B RECEIVER TESTS

DYNAMIC RANGE

RF signal power

-91 dBm/3.84 MHz

AWGN power

+10 to +35 dBc/3.84 MHz relative to RF signal power

Absolute accuracy (for RF signal & AWGN combined)

+18° to +28°C: ±1.0 dB

0° to +45°C: ±1.5 dB

REFERENCE SENSITIVITY LEVEL

RF signal power

-125 to -100 dBm/3.84 MHz

Absolute accuracy

+18° to +28°C ±1.0 dB

0° to +45°C ±1.5 dB

IUB INTERFACE

Format

E1, T1, E1 IMA, T1 IMA

E1 interface

75 Ω unbalanced,

120 Ω balanced

STM-1 interface

Single mode 1300 nm

INTERFACES

PC Interface

USB and Ethernet

External keyboard

PS/2 or USB

External mouse

USB

DIMENSIONS, ENVIRONMENTAL AND SAFETY

Typical weight (excluding accessories)

18 kg

Voltage Range

85 to 264 V AC

Frequency Range

45 to 66 Hz

Operating temperature

0° to 45°C

Storage temperature

-40° to 70°C

Altitude range

0 to 2000 m

Humidity

0 to 75%

Calibration interval

1 year

EMC

Complies with

EN61326-1:1997 + A1:1998 + A2:2001, Class A (emissions), EN61326-1 :1997 + A1:1998 + A2:2001 Table 1 (immunity)

Safety

Complies with EN61010-1: 2001

Environmental Classifications

According to EN60721 'Classification of environmental conditions'

Exceeds the requirements of BS EN60721-3-7:1996 'Portable and non-stationary use', classification IE73 (when used with the Environmental protection case, Option 6413-Opt61)

Exceeds the requirements of BS EN60721-3-3:1996 'Stationary use at weather protected locations', classification IE33

Exceeds the requirements of BS EN60721-3-2:1997 'Transportation', classification IE21 (when suitably packaged)

Exceeds the requirements of BS EN60721-3-1:1997 'Storage', classification IE11

VERSIONS AND ACCESSORIES

When ordering please quote the full ordering number information.

ORDERING NUMBERS

HARDWARE

6413A	Base Station Test System
6413-LIVE	Cabled Live Tests
6413-AIR	On-Air Live Tests via Antenna

CELLULAR STANDARD SOFTWARE

Should be specified on all units

6413-FDD	3GPP WCDMA FDD

Iub INTERFACES

At least one should be specified

6413-E1T1	E1/T1/J1 Iub protocol module

MANUFACTURER-SPECIFIC CONTROL SOFTWARE

At least one should be specified. A software support option must also be ordered for each control software option.

6413-ERIC	Ericsson software
6413-HUA	Huawei software
6413-LUC	Lucent software
6413-NOK	Nokia software
6413-SIE	Siemens software

ACCESSORIES

6413-Opt61	Environmental protection case
6413-Opt62	Rigid transit case
6413-Opt64	Front panel protection cover
USB-DRIVE	128MB USB memory drive
USB-HUB	USB hub
USB-488	USB-IEEE488 converter
USB-PRINT	USB-Parallel printer converter

Aeroflex is able to provide a range of cables and adapters if required. Please contact Aeroflex for further information.

SUPPORT OPTIONS ORDERING INFORMATION

CALIBRATION AND EXTENDED WARRANTY OPTIONS

All 6413A units come with one year warranty as standard. Longer warranty periods may be ordered if required. The calibration interval is 1 year.

6413-C1	One annual calibration
6413-C2	Two annual calibrations
6413-W1	One year extended warranty with calibration
6413-W2	Two year extended warranty with calibrations

SOFTWARE SUPPORT OPTIONS

Provides support for first cellular standard software and first Iub control software.

6413-S1	One year software support
6413-S2	Two year software support
6413-S3	Three year software support

If more than one cellular standard or manufacturer's software option is fitted then a second 'S' charge is payable on each subsequent option. E.g. A unit with 2 cellular and 2 Iub options would require one 6413-S1 and two 6413-SS1 for one year software support.

6413-SS1	One year second software support
6413-SS2	Two year second software support
6413-SS3	Three year second software support

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