

Protocol Test

WCDMA ACE 3G Protocol Analysis Test System

AEROFLEX
A passion for performance.



- Powerful network emulator for integration, regression and pre-conformance testing of WCDMA terminals
- Full protocol decode and debugging tools
- 3GPP Release 99, Rel-5 HSDPA and Rel-6 HSUPA capable
- Supports early development of protocol test scenarios
- Compact, one-box solution with integrated PC
- Emulation of up to 3 cells to enable handover testing
- Built-in fading simulator option
- Powerful, state of the art test development environment allows testing on partial or complete terminal designs
- Proven GUI features with a track record of boosting engineering productivity

For new mobile phones, after protocol stacks, RF and DSP have been developed, a major task is to integrate the three parts and to get the prototype mobile working reliably. Up until now, there has been a lack of test tools that are designed specifically to meet the needs of integration teams; Aeroflex's WCDMA ACE is designed to meet this need.

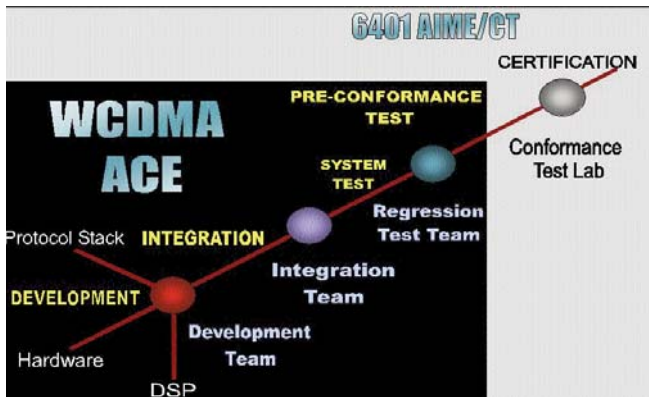
Full conformance test systems are too costly to be purchased in sufficient volumes for integration testing and radio test sets have the limitation that they rely on the design being almost complete before they can correctly inter-operate with the device under test. The WCDMA ACE is designed so that each engineer carrying out integration testing can have their own network emulator and it can also be used to test incomplete designs - for example the RF hardware, DSP and Layer 2 (L2) of the protocol stack without Layer 3 (L3) present.

The WCDMA ACE has a fully compliant 3GPP L2/L3 protocol stack and powerful baseband processing that allows a wide range of test scenarios to be executed and the protocol messaging to be logged, decoded and debugged.

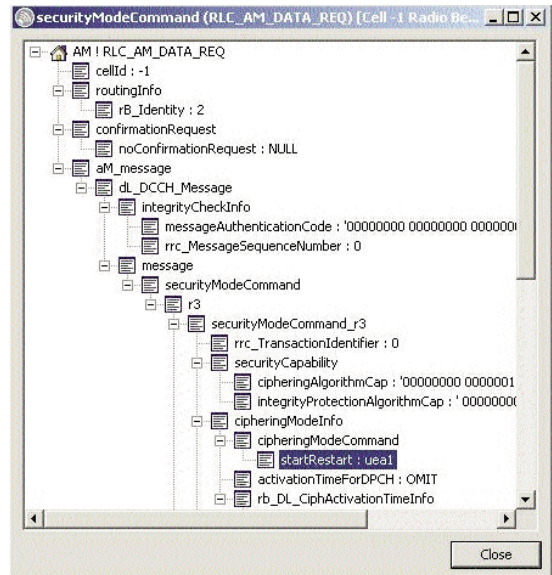
3GPP standards are not static and WCDMA ACE supports Release 99, HSDPA and HSUPA and will continue to be developed to support the standards as they evolve.

Later in the product lifecycle, the WCDMA ACE can be used to support regression testing to free capacity on formal conformance test systems and thus increase the productivity and reduce overall capital investment.

WCDMA ACE is a complementary product to the 6401 AIME/CT that is used extensively by in-house pre-conformance test teams and independent GCF/PTCRB test laboratories. The figure below shows the development lifecycle and the stages where WCDMA ACE and 6401 AIME/CT can be used.



Typical Development Process



Detailed ASN.1 Message Decode

TEST CAPABILITIES

Release 99, HSDPA and HSUPA

The WCDMA ACE supports detailed testing of 3GPP R99, Rel-5 and Rel-6 protocols. Direct access to the MAC, RLC, RRC and NAS layers is provided, as well as PDCP. For Rel-5 testing, the MAC-hs, and for Rel-6, the MAC-e/es protocol entities are provided.

The availability of advanced features such as HSUPA emphasises the power of this compact, bench-top test solution, made possible by its scalable baseband design. This design provides enough channels to allow three WCDMA cells to be simulated, making soft handover testing possible.

Integration Testing

A range of protocol test scenarios is provided, allowing testing to start immediately, without the need for any programming. These tests cover all the major protocols, but it is possible to further extend test coverage in two different ways:

1. Using the ScriptWizard and built-in library of Test Steps, combined with the integrated Macro Editor this provides a rapid test development environment with little or no training required.
2. Using the optional TTCN-2 tool-suite combined with standards-compliant Target Adapter allows the 3GPP test cases to be compiled and executed, or edited and extended to increase test coverage.

Log Analysis

Extensive logging features are provided, allowing the developer to control how much information is captured during testing. During post-test analysis, further filtering is possible, allowing specific messages or events to be traced quickly and easily. Using the Log Analyzer, messages are decoded down to each information element, retaining the ASN.1 structure:

The WCDMA Log Analyzer is freely licensed, with multiple copies available on request, allowing test logs to be shared among colleagues. Alternatively, logs can be exported into HMTL format for viewing with any browser. These logs can be readily e-mailed, allowing them to be easily shared with external organizations.

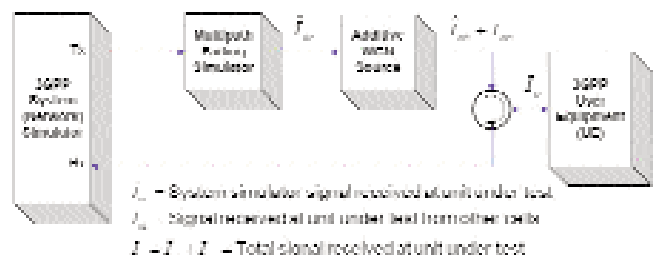
The WCDMA ACE also helps during the integration of the baseband section with the protocol stack with a set of Layer 1 Activity Reports available. These reports are particularly useful ahead of the availability of a fully operational protocol stack, giving an insight into what is happening at the physical channel level. The L1 Activity Reports cover R99, Rel-5 HSDPA and Rel-6 HSUPA.

Regression Testing

The built in Test Campaign Manager allows test cases to be dragged & dropped to rapidly form customized test plans. Each test can be associated with an individual set of parameters, such as UARFCN. Each test in the campaign can be run multiple times, and the action to be taken on failure can be defined (eg continue/stop campaign, retry). In addition, Test Campaigns can be run in sequences, allowing each Test Campaign to be organized according to, for example, sub-layer, or circuit/packet-switched mode.

Baseband Fading

The optional channel fading capability provides a unique ability to emulate dynamic signal environments, making use of the internal baseband design of the WCDMA ACE. The built in channel fader provides 8 taps and a precision AWGN source with ±0.1 dB relative accuracy.



Radio Channel Emulation with Fading and Noise Simulators

This feature provides realistic, accurate and repeatable test scenarios, meeting or exceeding the requirements of all 3GPP test scenarios without the calibration difficulties arising from the use of external RF fading simulators. The fader offers Constant, Rayleigh, Doppler, Periodic or Log-normal gain and Constant, Periodic or Pseudo-random Delay conditions.

Download and Execute ETSI Test Cases

The optional TTCN-2 Target Adapter allows users to download standard ETSI 3GPP test cases and compile them to run on the WCDMA ACE. For both integration and regression testing, this provides a powerful and unique tool for early testing of mobiles against conformance test cases to increase confidence in the strength and reliability of the design.

Test Case Packages

The standard ETSI 3GPP test cases are also available in ready-compiled form. Three packages are offered, covering R99, R5 (including HSDPA) and R6 (including HSUPA), enabling an immediate start to be made on pre-conformance testing. Purchase of the ready-compiled test cases does not require purchase of the Target Adapter or TTCN-2 Tool Suite. The WCDMA ACE is capable of executing test cases requiring a maximum of three cells on one RF carrier - currently this includes >75% of the test cases.

BOOSTING ENGINEERS' PRODUCTIVITY

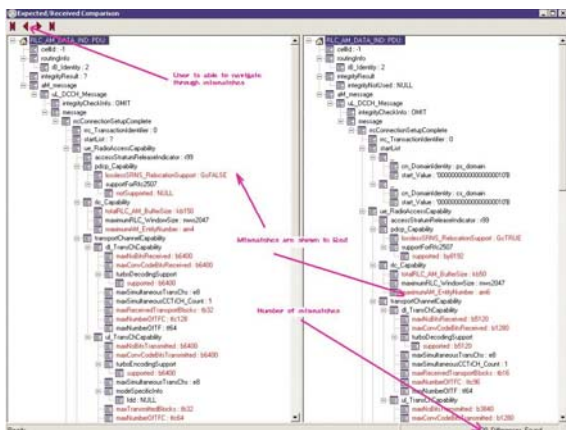
Aeroflex is a market leader in conformance test in both the 3GPP and 3GPP2 (CDMA) families. It has used this experience to design a GUI for WCDMA ACE that enables engineers to maximize the amount of time spent testing, and minimize the amount of time spent working out how to use the test system.

Parameter Generator

The built-in Parameter Generator queries the capabilities of the device under test and saves a Parameter File for use in subsequent testing. This feature allows testing on an unknown device type to start immediately, without the lengthy process of setting many parameters manually.

Message Comparison Tool

A powerful debugging feature is the simultaneous display of both the actual received message content and the expected message sequence. Any errors are automatically highlighted to allow engineers to immediately spot problems.

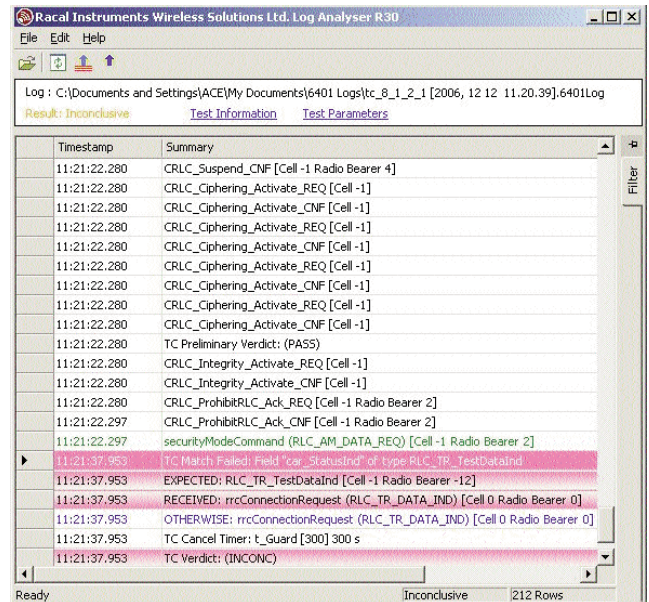


Expected v Received Message Comparison

Even if an error occurs, WCDMA ACE will attempt to continue the test to avoid minor errors from disrupting the entire test session.

Color Coding to Highlight Message Sequences and Errors

It may sound simple, but by highlighting uplink messages in blue and downlink messages in green, users can rapidly identify the flow and follow the sequence of messages.



Protocol Errors Highlighted

Incorrect messages are highlighted in red to make them immediately stand out.

Built-in Test Scenarios

WCDMA ACE is supplied with a number of built-in test scenarios, some of which have been derived from the GSMA's TW.11 Field Trials Guidelines. Additional tests have been added to these scenarios to provide a powerful test facility available out of the box, with no programming required:

1. Data Call
2. End To End Data Call
3. HSDPA-End To End Data Call
4. GPRS Attach and Detach
5. GPRS Attach Reject
6. HPLMN Search
7. IMSI Attach Detach
8. Location Area Update
9. PDP Context Activation and Deactivation
10. Periodic Location Area Update
11. Periodic Location Area Update - Special Cases
12. Periodic Routing Area Update
13. Manual PLMN Selection
14. Preferred PLMN Selection
15. Random PLMN Selection
16. HSDPA RAB Setup-Release
17. Registered PLMN Selection
18. Routing Area Update
19. Routing Area Update Reject
20. SMS
21. Soft Handover
22. Voice Call

The test scenarios are interactive in nature, allowing the user to control the path taken. For example call setups can be mobile-originated or network-originated. Each test step offers a range of configurable parameters, extending further test coverage. These scripts can be used on their own for testing or as the basis to write more complex customer test scenarios.

ScriptWizard

The ScriptWizard tool allows new test cases to be very rapidly composed and executed without specialist programming skills. A library of test steps is supplied, providing all the standard protocol procedures needed. The library includes such steps as:

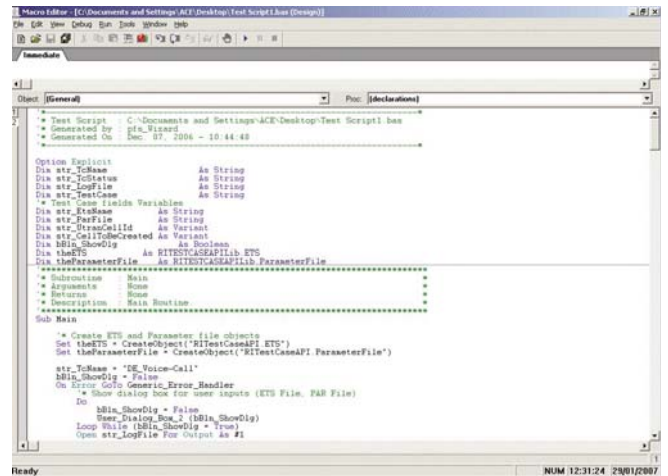
1. Create UMTS Cell
2. Register UE
3. Perform MO Voice Call
4. Perform MT Voice Call
5. Perform MO SMS
6. Perform MT SMS
7. Perform MO Data Call
8. Perform MT Data Call
9. Terminate Voice Call from UE
10. Terminate Voice Call from BS
11. UE Data Call Terminate
12. BS Data Call Terminate
13. Delete UMTS Cell
14. Perform PDP Context Activation
15. Change Cell Attenuation Level
16. Change UMTS Cell Power Level
17. Perform PDP Context DeActivation
18. GPRS Attach
19. GPRS Attach Reject
20. IMSI Detach Success
21. Location Update
22. MM Registration Without UE Off
23. Page UE Attach Reject
24. Periodic Routing Area Update
25. Perform MO End to End Call
26. Periodic HPLMN Searching
27. Manual PLMN Selection
31. Registration Reject
32. Registration Without UE Off
33. Reselect UMTS Cell
35. Routing Area Update Reject
36. Without Preferred PLMN List

Using the ScriptWizard interface, these test steps can be added into a sequence that can be saved and executed. Each test step has a number of parameters available, allowing the test to be customized as required.

The ScriptWizard test cases can be re-loaded for subsequent editing. The ScriptWizard can also automatically generate source code for further editing with the built-in Macro Editor.

Macro Editor

The Macro Editor provides a programming language and development environment (a form of VisualBasic) that allows new tests to be created.



VisualBasic Development

In addition, the tests created with the ScriptWizard can be enhanced to create more complex test procedures, adding user dialog boxes, creating customized test results sheets or interfacing with external instruments and databases. The ScriptWizard and Macro Editor both run on the embedded PC within the WCDMA ACE.

APPLICATIONS TESTING

Third party applications testers require an independent network emulator to provide a realistic test environment. The WCDMA ACE has been designed to provide an affordable one box solution that complements a variety of applications test packages for technologies such as Video Telephony, MMS and Push-to-talk over Cellular (PoC).

Video Telephony



An example of a third party application is IXIA's IxMobile video telephony test suite. IxMobile is a complete 3G-324M/H.324 M and H.323 diagnostic solution that provides interoperability testing, troubleshooting, service optimization and video telephony call traffic monitoring capabilities.

IxMobile is a GCF and PTCRB-listed test platform (TP60) offering the WI-19 conformance test cases required for certifying videophone devices. See www.ixiacom.com for more details.

Aeroflex applications engineers are able to provide further information on using WCDMA in conjunction with IxMobile or other third party application test tools.

FUTURE-PROOF DESIGN

The RF transceiver of WCDMA ACE operates from 800-2200 MHz so that besides the standard UMTS bands used in Europe and many parts of Asia, it can be used to design terminals for Japan, Korea and USA.

WCDMA ACE also contains powerful baseband processors and utilizes software defined radio techniques to allow the changes in standards to be tracked without the constant need to change the hardware - instead most upgrades can be carried out by software upgrade only. For example, migrating from Release 99 to HSUPA does not require any hardware change.

POST-SALES SUPPORT

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

The WCDMA ACE comes with comprehensive worldwide hardware and software support. Users have access to a helpdesk facility where any faults, issues or enhancement requests can be logged, and are guaranteed to receive a response from Aeroflex within the next working day.

Aeroflex employs a team of dedicated applications engineers located around the world to provide rapid and locally based technical assistance when required.

The support also covers issues such as specification tracking and any changes in the 3GPP versions of the standard.

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

TECHNICAL INFORMATION

ENVIRONMENTAL AND SAFETY

Voltage Range

85 to 264 V AC

Power Consumption

320 VA max

Frequency Range

47 to 66 Hz

Operating Temperature Range

10 °C to 35 °C

Humidity

5% to 85% RH (non-condensing)

Calibration Period

2 years

EMC

Complies with EN61326-1:1997+A1:1998, Class (emissions), EN61326-1:1997+A1:1998 Table 1 (immunity)

Safety

Complies with EN61010-1:2001

Protocol Support

3GPP R99, Rel-5 & Rel-6 standards

Frequency Bands Supported

UTRA FDD Bands I, II, III, IV, V, VI, VIII, IX & X from 3GPP25.101 v7.5.0

Interfaces

Main RF Duplex port, N-type, max output level -24.6 dBm, damage level 5 W max

Aux RF Duplex port, TNC, max output level -15.7 dBm, damage level 1 W max

Frequency Reference In, BNC

Frequency Reference Out, BNC

Timing Marker In/Out, BNC

External VGA Monitor port, 15-pin D-type

Two USB ports, 10/100 Mbps Ethernet

ORDERING INFORMATION

W-ACE-001 WCDMA ACE Protocol Test System

Optional Upgrades

W-ACE-160 Rel-5 HSDPA Protocol Test Capability

W-ACE-165 Rel-6 HSUPA Protocol Test Capability

W-ACE-170 Internal Fading Simulator

TTCN-2 Tool Suite, consisting of:

W-ACE-110 Target Adapter

W-ACE-111 TTCN-2 Compiler

W-ACE-112 TTCN-2 Editor

Video Telephony Test

W-ACE-180 IxMobile VT test, CE Edition

Test Case Packages

W-ACE-TCR99 R99 Test Cases

W-ACE-TCR5 R5 Test Cases

W-ACE-TCR6 R6 Test Cases

W-ACE-520 Test USIMs for WCDMA testing

Support

On-site Installation and Training

Annual software support

Extended warranty, 1, 2 or 3 year extensions available.

Packages

Package deals are available for purchase of multiple WCDMA ACE units plus HSxPA and Test Case packages. Contact your local Aeroflex Sales Office for further information.

For the very latest specifications visit www.aeroflex.com

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.