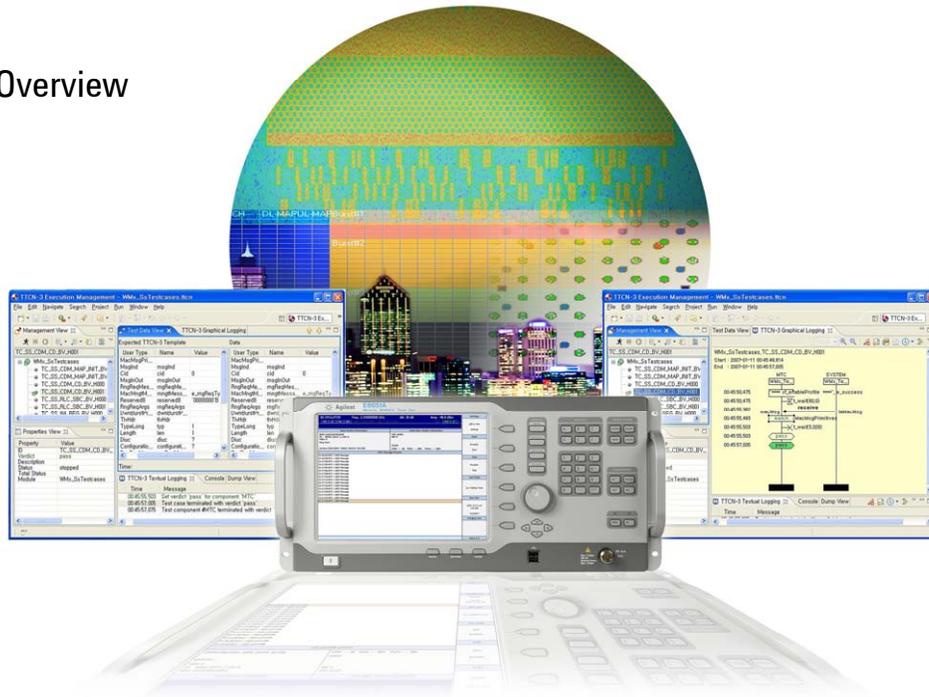


# Agilent N6430A WiMAX™ Protocol Conformance Test (PCT) and Development System

## Technical Overview



**Agilent Technologies**

# WiMAX Protocol Test

Mobile WiMAX™ promises to blend cellular-mobility with the ease-of-use of WiFi and ADSL. To deliver on this promise, WiMAX equipment needs to meet consumer's ever increasing expectations of quality, reliability and guaranteed interoperability.

The WiMAX Forum® certification program exists to ensure that equipment conforms to WiMAX standards so that consumer's expectations can be met. Agilent's N6430A protocol conformance test (PCT) and development system is an integral part of the WiMAX Forum's certification program. The system is being used by WiMAX Forum Designated Certification Labs (WFDCL) to test base stations and mobiles, making sure that Mobile WiMAX delivers the quality and interoperability that consumers expect.

As the complexity of protocol software grows year-on-year, consumer's experience of equipment reliability increasingly depends on equipment makers delivering defect-free protocol software. Agilent's N6430A is being used throughout the Mobile WiMAX equipment lifecycle to enable the delivery of reliable protocol systems. The N6430A is used by operators for equipment acceptance testing. Mobile, base station and chip-set makers use the system for development testing, regression and pre-certification test. Agilent's N6430A is helping Mobile WiMAX industry leaders deliver equipment that consumers will delight in using.

**As you take WiMAX forward, Agilent clears the way.**

## Agilent N6430A Series

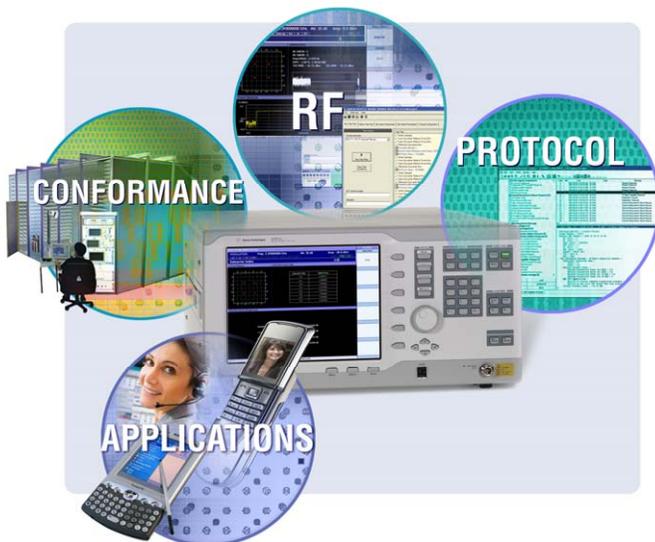
The Agilent N6430A Series is used for Mobile WiMAX development, regression, acceptance and certification test. The system features:

- TTCN-3 protocol test systems with validated PCT and NCT (Network Conformance Test) test cases
- Mobile and base station support with soft-key mode switching
- Comprehensive TTCN-3 development, execution and test automation environment
- Backing by Agilent start-up assistance, training and world-wide support

## Most Versatile WiMAX Test Set

The N6430A is one of a number of test applications that are supported by the Agilent E6651A - the industry's most versatile WiMAX test set:

- PCT/NCT software operates with the Agilent E6651A Mobile WiMAX test set
- 450MHz to 6GHz coverage for profile flexibility, SISO (single-in, single-out) and MIMO (multiple-in, multiple-out) support
- Base station emulation, RF measurements, end-to-end application tests
- Core component of ETS-Lindgren radiated performance test (RPT) system



Agilent's N6430A protocol conformance test and development system operates with the Agilent E6651A Mobile WiMAX test set – the industry's most versatile WiMAX test set

## Mobile Station Test

The Agilent E6651A WiMAX test set's intuitive soft-key user interface and built-in real-time protocol stack enables mobiles-under-test to achieve network entry and perform with a variety of channel configurations.

When used with the Agilent N6430A Series software, the Agilent E6651A's built-in protocol stack can be disabled using a soft-key selection. Higher MAC functionality is provided by TTCN-3 protocol test cases running in a Windows® PC.

The system can operate with the Agilent N6421A protocol logging and analysis tool to provide independent protocol logging in either real-time stack or TTCN-3 operating modes

## Base Station Test

The N6430A Series can be configured with software to test mobile stations and/or base stations. Base station configurations include additional software for the Agilent E6651A enabling the test set to operate as a mobile station emulator. The test set can be soft-key switched between base station emulation (BSE) and mobile station emulator (MSE) modes.

The N6430A series software executes TTCN-3 protocol test cases to test the base station. The N6421A protocol logging and analysis tool provides independent protocol logging.

## TTCN-3

The N6430A Series integrates an intuitive and complete TTCN-3 development and execution environment; TWorkbench from Testing Technologies IST GmbH

TTCN-3 (Testing and Test Control Notation) is a modern, powerful test specification and implementation language that has been adopted as a standard within the WiMAX industry.

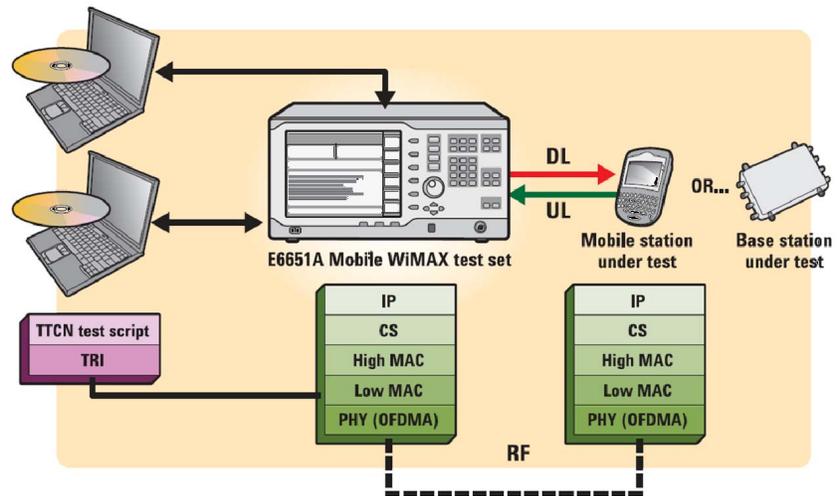
Users can run standard WiMAX TTCN-3 PCT or NCT test cases supplied with N6430A Series releases, or can customize test cases to explore new test scenarios using TWorkbench's rich feature set.

## PCT and NCT

The N6430A Series includes validated test cases for both PCT (Protocol Conformance Test) and NCT (Network Conformance Test). PCT tests cases are developed to test the MAC layer implementation for conformance to the relevant IEEE 802.16 specifications. NCT performs similar testing with the purpose of testing the network layer protocols (for example DHCP, IPv4, IPv6, 802.16g etc.) NCT testing uses the same hardware configuration as PCT.

Protocol logging and analysis software (N6421A) running on a PC

Protocol conformance test and development software (N6430A) running TTCN-3 scripts



Agilent N6430A protocol conformance test and development system for mobile and/or base station test



The Agilent N6430A Series includes the intuitive and powerful TWorkbench from Testing Technologies IST GmbH

## Test Execution

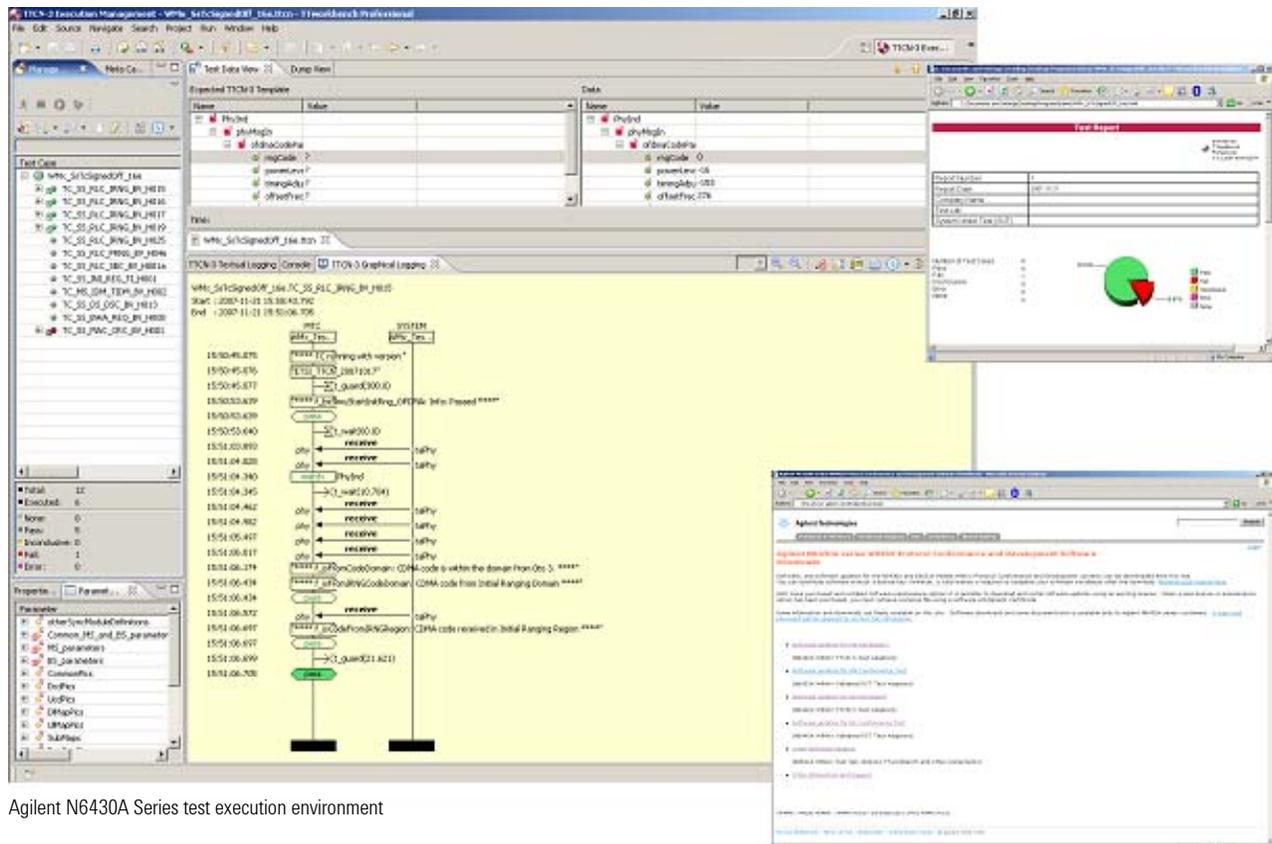
Agilent's N6430A series PCT systems include a powerful test execution and automation environment:

- Supplied or custom test cases are grouped in supplied or user-defined test campaigns
- Individual test cases or an entire test campaign can be executed with user-defined action on fail and test-to-test delays
- Test parameters (PICS and PIXIT) such as timer values, frequency, power, IP addresses can be modified and saved to customize test campaigns
- Received and expected messages and templates are matched during test execution and linked to graphical logs
- Matches and mismatches can be analyzed with point-and-click navigation from graphical log
- For test de-bugging, TTCN-3 source code is linked directly from graphical logs
- Test reports can be exported as pdf, html or xls format files
- Detailed test logs including results, matches, graphical logs and parameters can be exported to allow remote test result analysis by other N6430A Series users

## Validated Test Cases

Agilent's N6430A series PCT systems are being used today by the world's leading WiMAX Forum Designated Certification Labs (WFDCL) to certify WiMAX base stations and mobiles.

N6430A users download regular software updates that incorporate the latest PCT and NCT test cases developed by ETSI for the WiMAX Forum. Additional test cases are integrated and validated each week and are included in software updates as the WiMAX Certification Requirements Status List (CRSL) defines the industry's increasingly comprehensive certification regime.



Agilent N6430A Series test execution environment

Users download software and test case updates from a secure internet site

## Test Development

The N6430A series is available with a complete and intuitive TTCN-3 development environment. Supplied ETSI TTCN-3 test cases and libraries can be analyzed and modified using powerful Ttworkbench features:

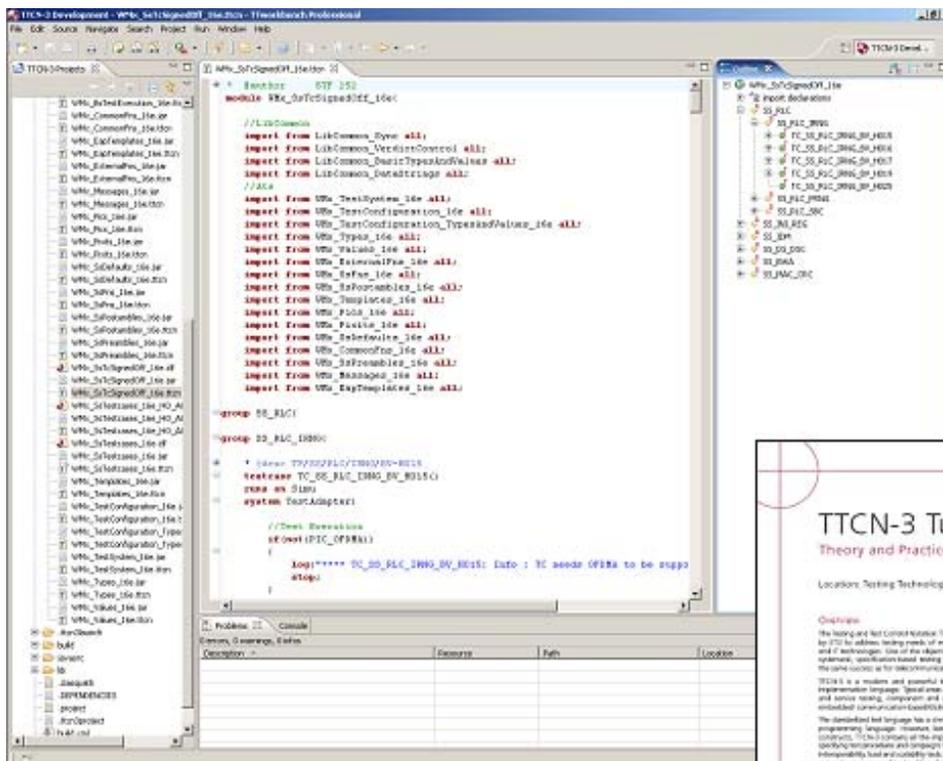
- Easy navigation through TTCN-3 files within project
- Outline view of each TTCN-3 file aids navigation to individual test case code
- Hyperlinked navigation from TTCN-3 test case files through to files containing function calls
- Test cases can be customized to meet specific test needs, leveraging existing test cases and libraries
- TTCN-3 checking, HTML document generation
- Ttworkbench Command Line Interface (CLI) enabling integration with other test executives

## Development, Regression, Acceptance and Certification

Leading WiMAX chip-set suppliers, equipment makers and network operators are using Agilent's N6430A Series PCT system throughout their development and acceptance lifecycle.

The N6430A series PCT combined with the E6651A's versatility means that operators are able to develop acceptance test procedures that cost-effectively combine protocol, RF and application test scenarios on a single test platform.

Chip-set and equipment makers have built the Agilent system into their pre-certification test plans. The system's capacity to fully automate test sequences means that the system is also ideally suited to regression test applications.



Agilent N6430A Series test development environment



TTCN-3 training and certification is available from Testing Technologies and Agilent

# Multi-layer Logging and Debug

The Agilent N6430A Series allows detailed TTCN-3 logs to be exported for record keeping and analysis. Agilent N6430A systems also include the Agilent N6421A protocol logging application providing a fully independent view of exchanged messages. The Agilent N6421A logs and decodes PHY and MAC messages and combines them with traces of UL-MAP and synchronized TTCN-3 events enabling powerful analysis and de-bug:

- PHY and MAC message logging and decoding
- Coordinated TTCN-3 execution event logging
- UL-MAP trace logging
- Detailed log analysis with off-line tool

The image displays several screenshots from the Agilent N6421A Protocol Logging and N6421A MAC Management Message Viewer software. The top-left screenshot shows the 'Agilent N6421A Protocol Logging' interface with a 'Test Message Viewer' window displaying a list of events. The top-right screenshot shows a 'PHY Layer Events' window with a table of PHY layer events. The middle-left screenshot shows the 'UL-MAP Information Viewer' window with a table of UL-MAP information and a graph below it. The middle-right screenshot shows the 'MAC Management Message Viewer' window with a detailed view of a MAC management message. The bottom-left screenshot shows the 'Agilent N6421A MAC Management Message Viewer' window with a detailed view of a MAC management message. The bottom-right screenshot shows a detailed view of a MAC management message with fields like CID, DSR Code, and various descriptors.

Agilent N6430A Series systems include Agilent N6421A protocol logging and analysis tools



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