

# PRODUCT INTRODUCTION

## ME7873A

### W-CDMA TRX/Performance Test System

ANRITSU CORPORATION

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# **ME7873A**

## **TRX/Performance Test System**

### **- Product Introduction -**

August 2004  
Product Marketing Dept.  
Wireless Measurement Div.  
Anritsu Corporation  
Ver 1.00

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- 1. Summary of Conformance Test**
- 2. Anritsu's Proposal of Conformance Test System**
- 3. Contribution to GCF**
- 4. Summary**



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# 1. Summary of Conformance Test

## What is Conformance Test

### CT: Conformance Test

**Conformance Test is defined by 3GPP.**

**It is a generally-assumed test for 3GPP spec. and a fundamental test (it is absolutely fundamental and not everything.) to verify the conformity with 3GPP spec. To pass this test certifies that the equipment is [3GPP compliant].**

#### <Reference>

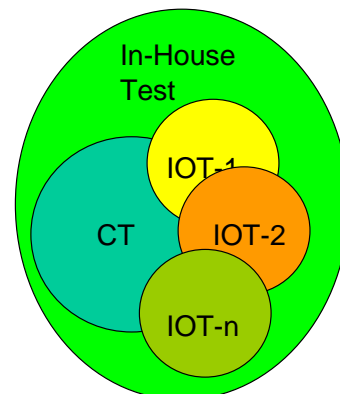
#### IOT: Inter Operability Test

Connectivity test with actual carriers (base stations).

As 3GPP standard has enormous amounts (almost infinite) of allowable parameters, it is necessary to verify connectivity with actual carriers or base stations as well as CT. This test is called IOT which is formulated in consideration of service details offered by carriers or base station makers and it exists per carrier (base station).

#### In-House Test:

The test which UE makers conduct for quality assurance of their in-house products. UE makers create their original tests based on the capability and design data of their in-house products.



# Conformance test concept

- Why is Conformance Testing important?
  - Because operators and infra-vendors rely on mobiles properly obeying the standard, non-compliant terminals cause problems if they get onto networks
    - especially when new features and services are introduced and the software in the base stations and network infrastructure is not mature.
  - Because UE manufacturer need their products to be certified so that network operators will accept them onto their networks. They also need as much evidence as possible to deflect blame away from their designs.

# How does Conformance Testing fit in the overall product verification?



## Testing against Real Network

- Proves the terminal works with **current**
  - network equipment,
  - configurations and
  - services

## Conformance Testing

- Ensures the terminal still works as:
  - Network equipment is **upgraded**
  - New **services** are added
  - Network architecture **evolves**

# Who needs to do Conformance Testing?

- Mobile Terminal manufacturers
  - prove to their customers (the network operators) that their mobile terminals conform to the standards
- Chipset and software component manufacturers supplying components or reference designs to mobile phone integrators
  - prove that their chipset designs conform to the standards
- Specialist test houses
  - offer a conformance test and validation service to manufacturers
- Network operators
  - acceptance testing or QA process

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# 3GPP RF & Protocol Conformance Specifications

**TS 34.121**  
RF Conformance, FDD

**TS 34.122**  
RF Conformance, TDD

**TS 34.123-1**  
Protocol Conformance

**TS 34.123-2**  
ICS

**TS 34.123-3**  
ATS

- RF Transmitter
- RF Receiver
- RF Performance
- RRM

- Written description of test cases

- Which test cases apply to which type of Terminal

- Formal description of test cases in TTCN

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## The Race to Introduce 3G Service

- The race is now on for operators to introduce 3G networks but with so much change and uncertainty in the specifications what initial criteria must be met?
- For providing consistent standards of product conformance testing, the GCF(**Global Certification Forum**) is formed.

## The Global Certification Forum - GCF

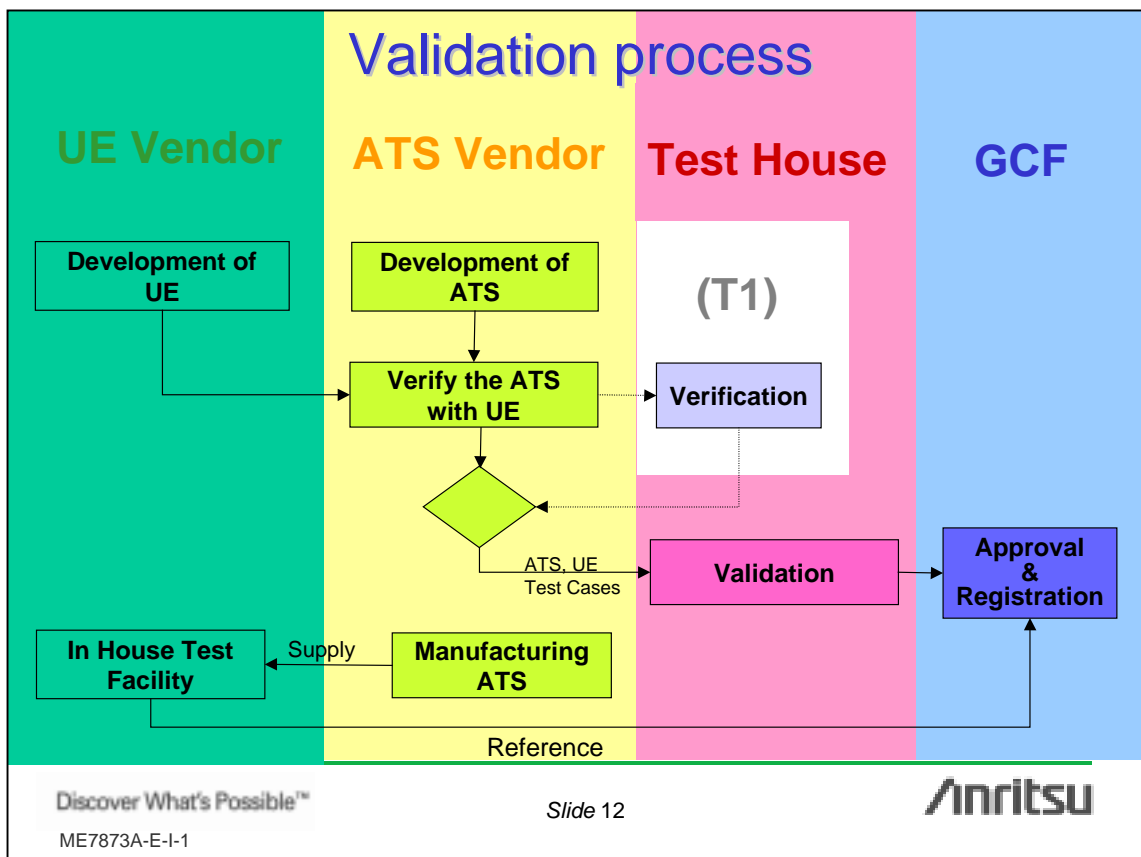
- The GCF was originally formed by the network operators and the UE manufacturers to provide consistent standards of product conformance testing
- It is a forum at which various parties, test houses, Test equipment companies, operators and manufacturers can make declarations, present evidence and ultimately receive approval
- Approval means that all member operators will recognise the products as being certified without further testing
- It has now been extended to cover 3GPP
- **The GCF does not perform any validation or conformance testing itself.**
- For 3G service, the GCF also approve test equipment (**Conformance Test System**) that is conformity with 3GPP.

# Condition of Conformance Test System

- ❖ Clear definition of the measurement items.
  - TRX Test : 24 test cases
  - Performance Test : 14 test cases
  - RRM Test : 40 test cases
- ❖ Clear definition of the measurement procedure.
  - Some measurements have multiple measurement procedures that may lead to different results among those procedures.  
Ex) Test Case # 7.8.1 Power Control in the DL, Constant BLER target
- ❖ Clear definition of the specification.
  - e.g. Signal output level accuracy: +/-0.7dB

↓

Validation is necessary for ensuring above.  
Furthermore, approval by GCF is necessary





## 2. Anritsu's Proposal of Conformance Test System

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## Anritsu WCDMA Conformance Test products

TS 34.121



- Clause 5: RF Transmitter tests
- Clause 6: RF Receiver tests
- Clause 7: RF Performance tests

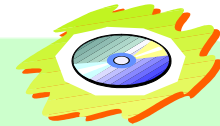


ME7873A  
TRX/  
Performance  
test system

- Clause 8: RRM (Radio Resource Management) Tests

ME7874A  
RRM test system

TS 34.123-3



- TTCN Protocol Conformance Tests



MX785201A  
Protocol Test  
System

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## ME7873A TRX/Performance Test System

- ME7873A W-CDMA TRX/Performance Test System is the test system to automatically perform transmitter/receiver characteristics test and performance test based on 3GPP open standards.
  - leading RF test system, maximum number of available test cases (as of July 2004)
  - only RF test system GCF approved for all 11 R&TTE tests required for European CE marking
  - widely used by major handset manufacturers across Europe, Japan, Asia, and USA.
  - ME7873A-10 option supports RRM test cases also.
  - Fully complies to 3GPP requirements
    - measurement accuracy, tolerances and uncertainties

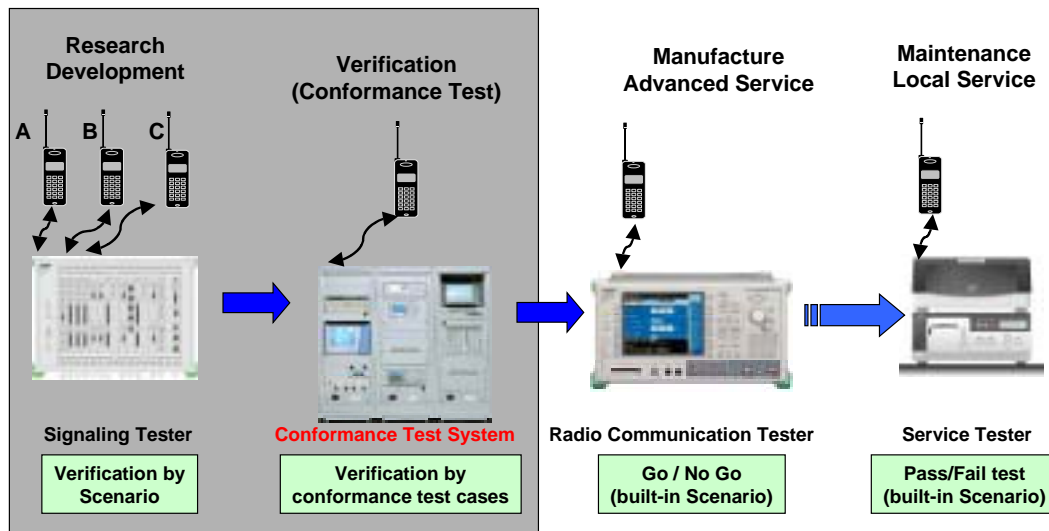
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## Product Position



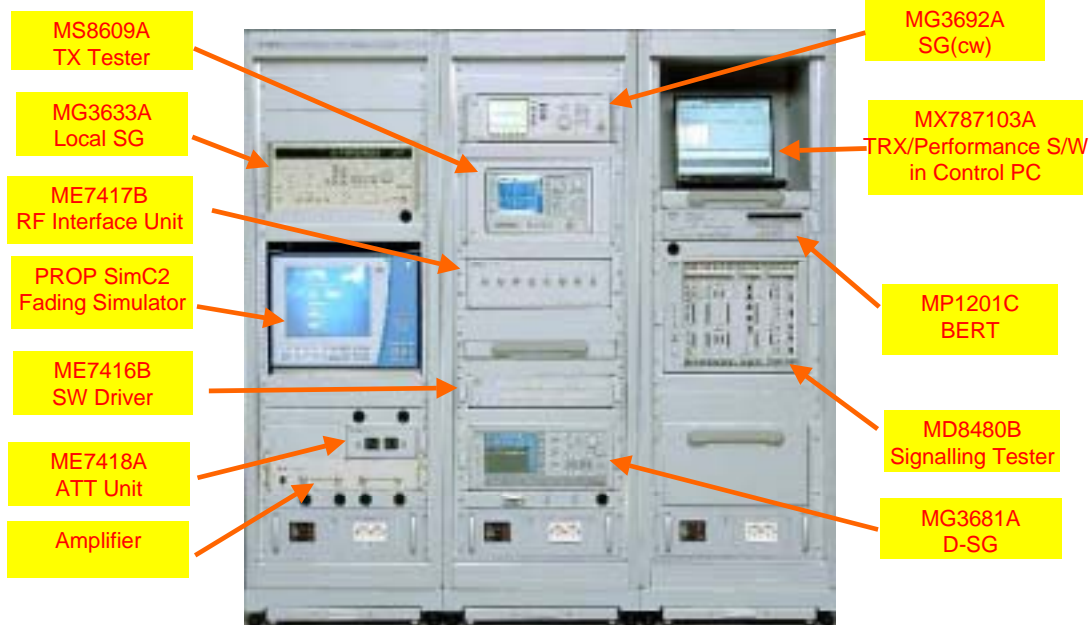
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## Configuration ~ME7873A~



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## Feature

- Full conformity to 3GPP standards
  - Realizes 3GPP-compliant measurement procedures and accuracy
  - Validated (GCF-approved) test system
- Catching up with 3GPP standard required by GCF
  - Capable of performing tests based on the latest 3GPP version
- Call processing scenario support
  - The use of in-house MD8480B easily follows up call processing scenarios when an UE is upgraded.
- Scalable System configuration
  - System can be configured by customers' own products(system components).
- Scalable test system
  - Scalable to RRM and Multiband.
- Abundant software functions
  - Flexible tests can be performed other than 3GPP test.

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# Full conformity to 3GPP standards

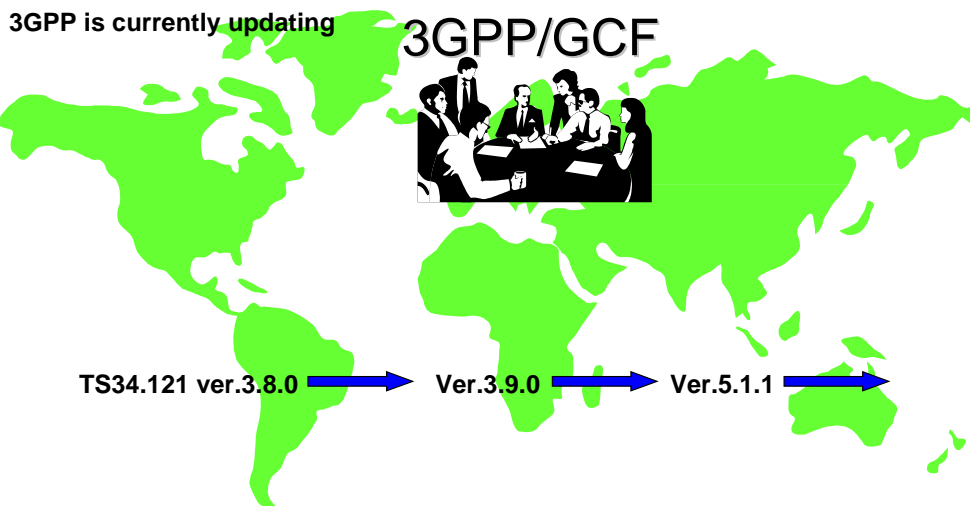
## Full conformity to clause 5, 6, 7 in 3GPP TS34.121 standards

- The measurement accuracy of full conformity to 3GPP standard (Uncertainty)
- The measurement procedure of full conformity to 3GPP standard (Loopback mode, BER/BLER, 2CH OCNS, DL TPC Power Control, Feedback Error Ratio)

**ME787xA Test System prepares a variety of correction/calibration and self-test for conformity to Uncertainty of a measurement system required by the 3GPP standard.**

- **Fundamental Correction/Calibration**  
The dedicated correction/calibration kit (Option) allows for calibration at customer's site.
- **Runtime Correction**  
It is equipped as a standard function of test software.
- **Self-test**  
Self-test software is provided as a standard component of the system.

# Catching up with the 3GPP



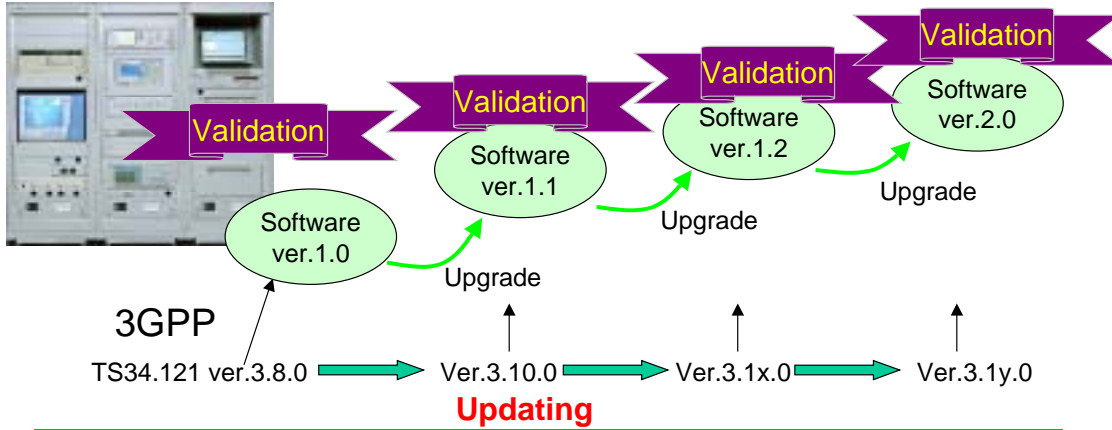
## GCF: Global Certification Forum

- organized by manufacturer and/or operator of mobile phone.
- aims to maintain confidence in 3GPP (and GSM) terminals by means of product Certification.

# Catching up with the 3GPP

## Anritsu's Stance

TS34.121 in 3GPP standards is upgraded every 3 months.  
The Test System can support the upgrade.



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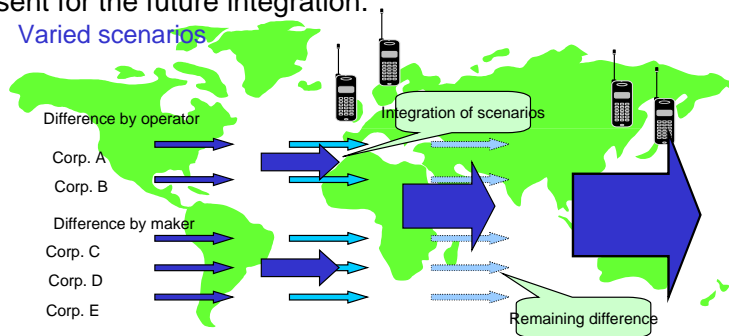
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## Scenario support(1)

### ◆ Background

At the launch of 3G service, call processing scenarios that are used in the test environment are varied by company or operator as the 3GPP specification has not been defined in detail. These scenarios will be integrated in the future. In fact, however, the difference still remains as of July 2004. UE is continuously updating at present for the future integration.

Varied scenarios



\*In above diagram, 'scenario' means call processing scenario.

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## Scenario support(2)

### ◆ Merits of adopting Anritsu's MD8480B as a main system component of ME7873A.

#### <Point 1>

Anritsu's MD8480B Signalling Tester is highly evaluated by customers and it is almost known as a de-facto standard in the current W-CDMA development environment. Anritsu has accumulated much know-how of scenarios as a result of supporting many customers through the MD8480B. The ME7873A, which adopts the MD8480B as a main system component, can follow up UE updates promptly by making the most of this know-how.

#### <Point 2>

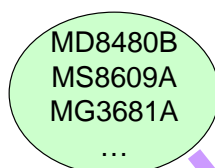
The ME7873A is able to perform loop-back and HARIKIRI tests.

## Scalable System configuration

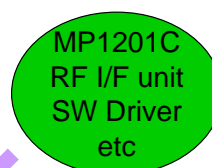
### Scalable System configuration

If the customer has some equipment of system, we can provide the rest of equipment and integrate with them.

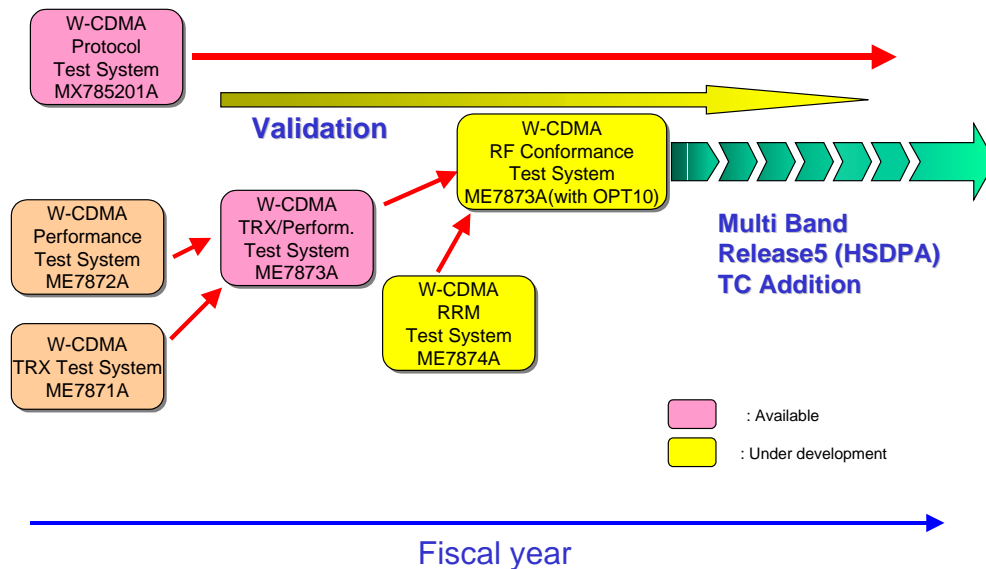
If the customer has...



We can provide ...



# Roadmap of Conformance Test System



## Abundant software functions

### 1. Windows-based software

As the dedicated software runs on Windows2000, it is easy to administrate measurement parameters for tests and test result data.

### 2. Flexible test parameters

(1) Various test parameters can be set freely depending on every customer's needs such as automated batch measurement, manual selection measurement and step measurement.

(2) Test items can be selected per test by arbitrary frequency channels. Furthermore, detailed parameters such as spec. and average can be specified per test item. Also, each test parameter that is changed can be saved to a file and recalled when needed.

### 3. Search mode

Reception test and performance test have search mode. Unlike normal measurements, marginal performance test of UE can be performed in the state BER and BLER are fixed.

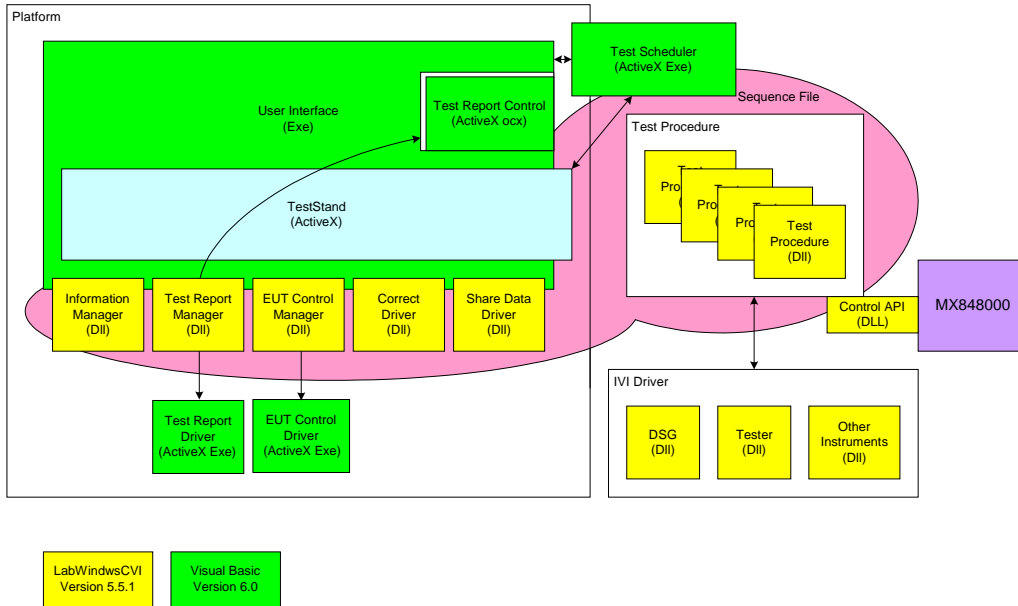
### 4. Measured data administrative function

Measured data can be saved in HTML or CSV data format. HTML data format is able to store evaluation results, parameters, test data and graphs of each test.

### 5. Help guide

Help guide is prepared as an operation guide.

# Software Architecture



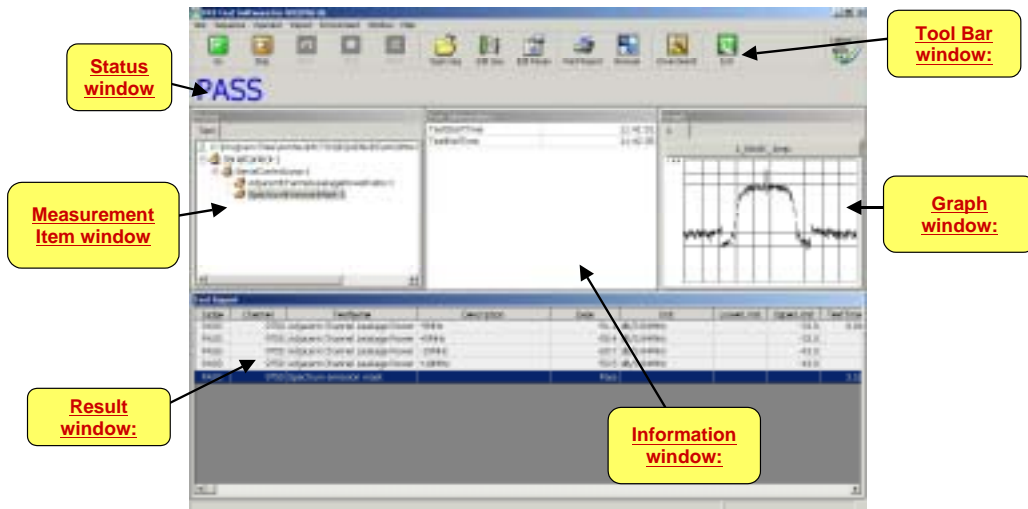
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# Graphical User Interface



Main Screen

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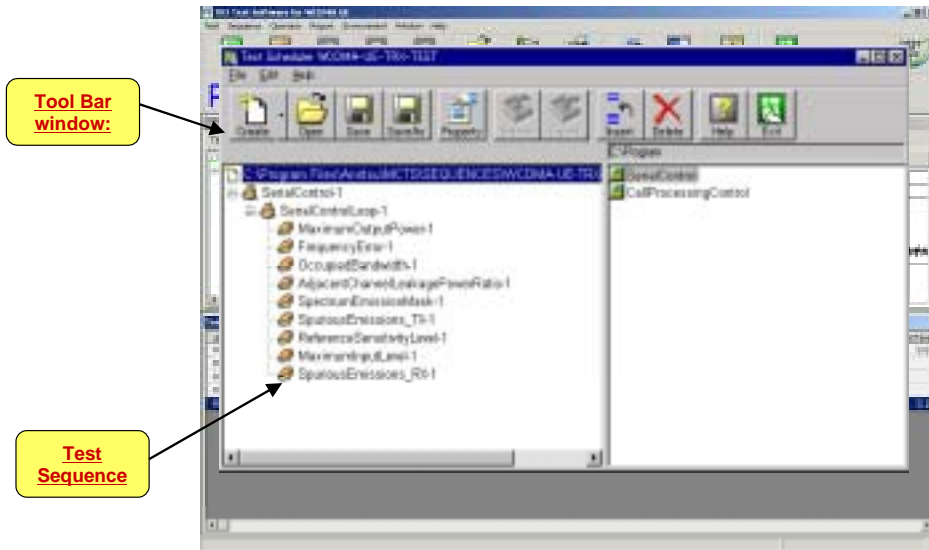
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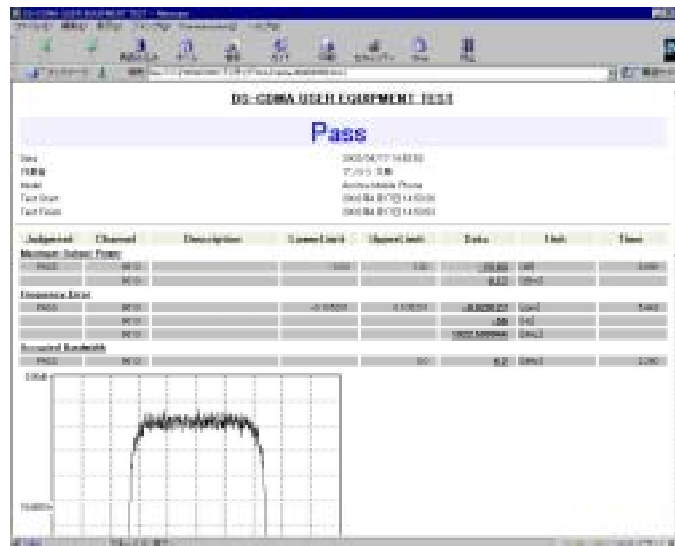


# Graphical User Interface



Sequence Editor

# Graphical User Interface



Test Result (html)

# Others

## Temperature test / Power consumption test

DC power supply and temperature chamber\*1 realize power consumption tests and temperature tests of W-CDMA mobile phones.

(\*1: DC power supply and temperature chamber need to be prepared by customer separately. Refer to recommended DC power supply and temperature chamber)

<Temperature Chamber (recommended)>

Product name : TH4800 or VT4002

Manufacturer : Votsch

<DC Power Supply (recommended)>

Product name : 2306-PJ

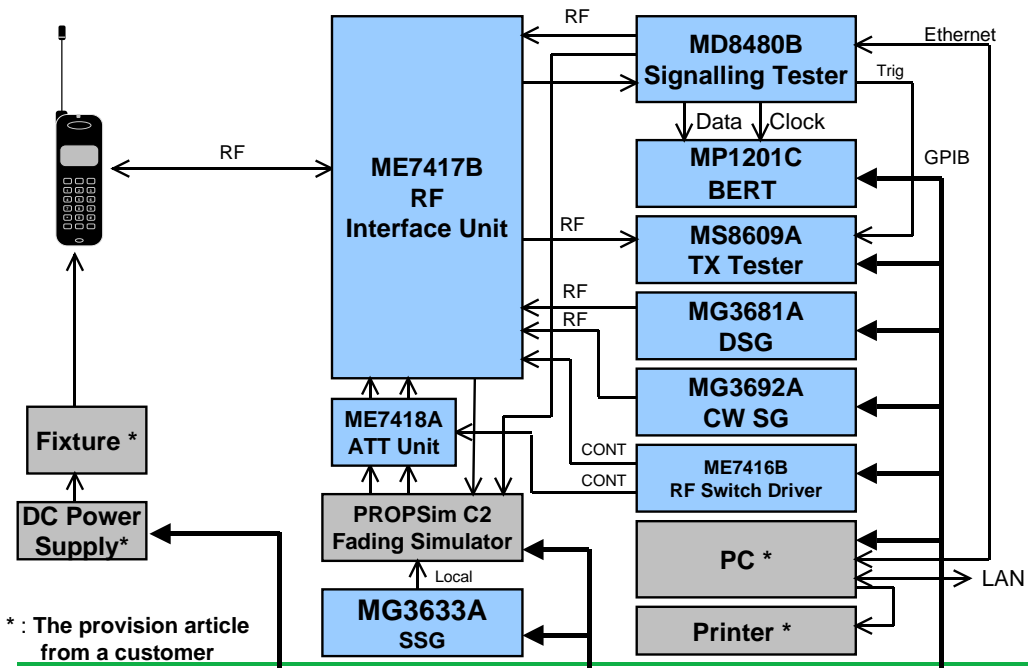
Manufacturer : Keithley

or

Product name : 66311B

Manufacturer : Agilent

# Hardware Block Diagram



\* : The provision article from a customer

## Configuration(1) - ME7873A -

Mainframe ME7873A      W-CDMA TRX/Performance Test System

ME7873A is formed by the combination of the dedicated components, stand-alone system components and dedicated software.

### <Dedicated components>

-Z0621	Accessory Kit
-B05xx*1	System Rack
-ME7416B	RF Switch Driver Unit
-ME7417B	RF Interface Unit
-ME7418A	Attenuator Unit
-Z0622	Low Noise Amplifier

\*1: System Rack is selected from;  
Japan:B0512, Europe:B0519, U.S.:B0520 and China:B0521 depending on the destination.

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## Configuration(2) - ME7873A -

Mainframe ME7873A      W-CDMA TRX/Performance Test System

ME7873A is formed by the combination of the dedicated components, stand-alone system components and dedicated software.

### <Stand-alone system components>

-MD8480B	Signaling Tester
-MP1201C	Error Rate Tester
-MS8609A	Digital Mobile Radio Transmitter Tester
-MG3681A	Digital Modulation Signal Generator
-MG3692A	Synthesized Signal Generator
-MG3633A	Synthesized Signal Generator
-PROPSim C2	Multipath Fading Simulator*2

\*2: Multipath Fading Simulator PROPSim C2 is product of Elektrobit.

### <Software\*3>

-MX787103A	W-CDMA TRX/Performance Test Software
-MX787133A	Selftest Software for TRX/Performance test

\*3: Personal computer for installing software needs to be prepared by customer.

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## Configuration(3) - ME7873A -

### <Option>

**ME7417B-02 Four Antenna Connection**

### <Application Parts>

**MX787113A Correction Software for TRX/Performance test**

**Z0616 Accessory for Correction**

MX787113A Correction Software for TRX/Performance Test System and Z0616 Accessory Kit can be provided as the [Fundamental Correction Kit] by combining with the components below

#### <Components of Fundamental Correction Kit>

ML2530A Calibration Receiver

ML2483A Power Meter (MA2421A, MA2472A)

MG3692A CW Signal Generator(Opt 2A, 4, 22, 34RKNF50)

## System Calibration (Background)

### ◆ The measurement accuracy of full conformity to 3GPP standard

Measurement system uncertainty is required for each test procedure of 3GPP standards.

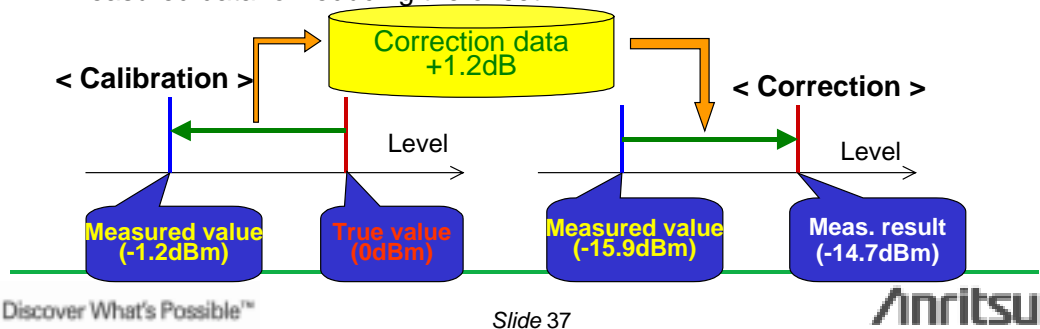
TRX/Performance Test System conforms to the measurement system uncertainty required by 3GPP standards.

Therefore, several calibration/correction are executed.

# Definitions

## Definitions

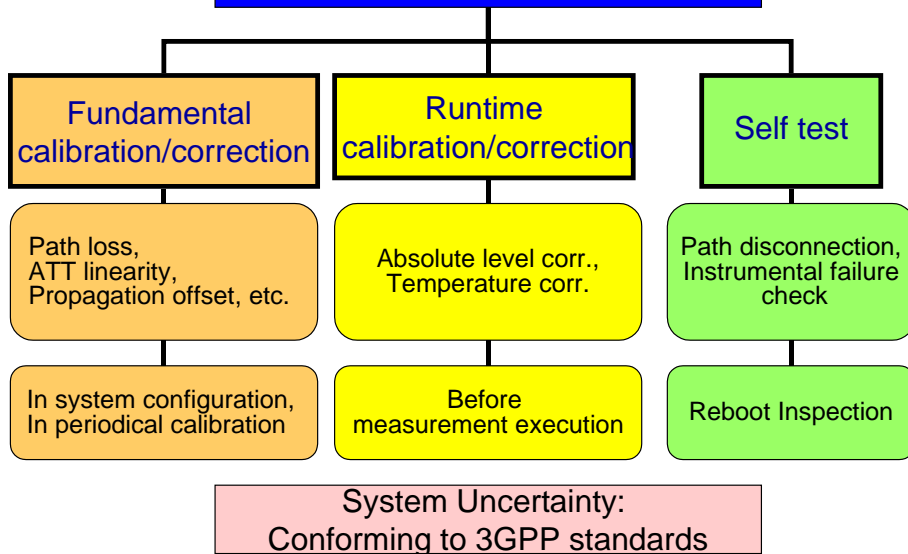
- Calibration  
To calculate the difference between true value (expected value) and measured value and to verify that the difference is within the range of instrument's accuracy.
- Correction  
To calculate the difference between true value (expected value) and measured value and to enhance the accuracy by adding correction data to measured data for reducing the offset.



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# System Calibration

## Concept of Calibration



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## Calibration / Fundamental correction

- ME787xA Test System conforms to the measurement system uncertainty required by 3GPP standards. Therefore, calibration/correction are executed.
    - Calibration  
System performance (system specification) calibration performed in system shipment. Fundamental correction items\*1 are simultaneously measured and then saved in the system as fundamental correction value in system shipment. Furthermore, fundamental correction values are updated on demand in periodical calibration.
    - Fundamental correction  
Fundamental correction values are used for actual measurement.
- \*1: Fundamental correction items:  
Signal level, Path loss (frequency characteristics), ATT linearity,  
Propagation offset value of fading simulator

## Runtime correction

- ME787xA Test System executes runtime correction on demand. Consequently, The difference value (to the value in fundamental calibration) caused by temperature variation etc. while executing each test procedure is corrected.
    - Pre-measurement for runtime correction  
Runtime correction items\*2 are measured with internal path.
    - Runtime correction  
The difference value ( to the value in fundamental calibration) measured in pre-measurement is used as runtime correction value in actual measurement.
- \*2: Runtime correction items: Signal output level (wanted signal / interfering signal)

# Selftest

- Assuring the daily operation of ME787xA Test System enhances the reliability of measurement system. In order to achieve this, the self test function (software) is prepared for the system.
  - Simple path check function  
Measuring path loss detects path disconnection and instrumental failure at an early stage. It is intended for the applications as reboot check and short-term periodical inspection.
  - Full check function of configured instruments  
Checking functions of each configured instrument detects the failure of configured instruments at an early stage. It is intended for the detection of abnormality in simple path check and the periodical inspection between calibrations.

## 3. Contribution to GCF

## Contribution to GCF

- GCF holds GCF meetings every three months, normally in March, June, September and December. In the meetings, members discuss applicable standards for actual service management, their priority and approval of Conformance Test Systems.
- Anritsu currently works on validation of ME7873A/74A in collaboration with RFI corporation which is a test house in U.K. every three months when the above GCF meetings are held. After the validation, RFI corporation applies for GCF approval of validated test cases.
- Also, Anritsu basically considers GCF approval of 'Batch1' test cases as a first step and plans to work on approval of 'Batch2' test cases as needed from the stage where over 80% of 'Batch1' test cases is approved.

## 'Batch 1' Test Cases by GCF-CC

- TRX
  - All of test cases are required GCF-CC(v3.10.2)
- Performance
  - Almost all of test cases are required.  
(Exception)
    - 7.6.1, 7.6.2 are required as 'priority 2.2'.
- RRM
  - The following test cases is required.
    - 8.2.2.1 Idle Mode / Cell Re-Selection / Scenario 1: Single carrier case
    - 8.2.2.2 Idle Mode / Cell Re-Selection / Scenario 2: Multi carrier case
    - 8.2.3.1 Idle Mode / UTRAN to GSM Cell Re-Selection / Scenario 1:  
Both UTRA and GSM level changed
    - 8.2.3.2 Idle Mode / UTRAN to GSM Cell Re-Selection / Scenario 2: Only UTRA level changed
    - 8.3.5.1 UTRAN Connected Mode Mobility / Cell Re-selection in CELL\_FACH /  
One frequency present in neighbour list
    - 8.3.5.2 UTRAN Connected Mode Mobility / Cell Re-selection in CELL\_FACH /  
Two frequencies present in the neighbour list
    - 8.7.3.C Measurements Performance Requirements / UE transmitted power
    - 8.7.6.1 Measurements Performance Requirements / UE Rx-Tx time difference /  
UE Rx-Tx time difference type 1



# GCF Approved Test Cases

UAG#08 Current 34.121 RF (RRM) Test Platform Approval Status Summary

2004.06.30

Version 3.0

Approved by GCF

R&TTE 10TCs

Clause of 34.121	Title	GCF batch	ME7873A
<b>5 Transmitter Characteristics (18TCs)</b>			
5.2	Maximum Output Power	1	✓
5.3	Frequency Error	1	✓
5.4.1	Output Power Dynamics in the Uplink / Open Loop Power Control in the Uplink	1	✓
5.4.2	Output Power Dynamics in the Uplink / Inner Loop Power Control in the Uplink	1	✓
5.4.3	Output Power Dynamics in the Uplink / Minimum Output Power	1	✓
5.4.4	Output Power Dynamics in the Uplink / Out-of-synchronisation Handling of Output Power	1	✓
5.5.2	Transmit ON/OFF Time Mask	1	✓
5.6	Change of TPC	1	✓
5.7	Power Setting in Uplink Compressed Mode	1	✓
5.8	Occupied Bandwidth (OBW)	1	✓
5.9	Spectrum Emission Mask	1	✓
5.10	Adjacent Channel Leakage Power Ratio (ACLR)	1	✓
5.11	Spurious Emissions	1	✓
5.12	Transmit Intermodulation	1	✓
5.13.1	Transmit Modulation / Error Vector Magnitude	1	✓
<b>6 Receiver Characteristics (7TCs)</b>			
6.2	Reference Sensitivity Level	1	✓
6.3	Maximum Input Level	1	✓
6.4	Adjacent Channel Selectivity (ACS)	1	✓
6.5	Blocking Characteristics	1	✓
6.6	Spurious Response	1	✓
6.7	Intermodulation Characteristics	1	✓
6.8	Spurious Emissions	1	✓
<b>7 Performance requirements (14TCs)</b>			
7.2.1	Demodulation in Static Propagation conditions / Demodulation of Dedicated Channel (DCH)	1	✓
7.3.1	Demodulation of DCH in Multi-path Fading Propagation conditions / Single Link Performance	1	✓
7.4.1	Demodulation of DCH in Moving Propagation conditions / Single Link Performance	1	✓
7.5.1	Demodulation of DCH in Birth-Death Propagation conditions / Single Link Performance	1	✓
7.7.1	Demodulation in Handover conditions / Demodulation of DCH in Inter-Cell Soft Handover	1	✓
7.7.2	Demodulation in Handover conditions / Combining of TPC commands from radio links of different radio link sets	1	✓
7.8.1	Power control in downlink / Power control in the downlink, constant BLER target	1	✓
7.8.2	Power control in downlink / Power control in the downlink, initial convergence	1	✓
7.8.3	Power control in downlink / Power control in the downlink, wind up effects	1	✓
<b>8 Requirements for support of RRM (48TCs)</b>			
8.2.2.1	Idle Mode / Cell Re-Selection / Scenario 1: Single carrier case	1	✓
8.3.5.1	UTRAN Connected Mode Mobility / Cell Re-selection in CELL_FACH / One frequency present in neighbour list	1	✓
8.4.2.1	RRC Connection Control / Random Access / Correct behaviour when receiving an ACK	2.1	✓
8.4.2.3	RRC Connection Control / Random Access / Correct behaviour at Time-out	2.1	✓
8.7.3C	Measurements Performance Requirements / UE transmitted power	1	✓
8.7.6.1	Measurements Performance Requirements / UE Rx-Tx time difference / UE Rx-Tx time difference type 1	1	✓
<b>TOTAL</b>			<b>37</b>

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## 4. Summary

# Summary

- Most reliable system
  - Fully conformance to 3GPP standard
  - Using reliable hardware components such as MD8480B adopted by world's major UE vendors.
- Fastest time to market
  - Common signalling scenarios
    - easily track latest changes and enhancements
      - 3GPP specification changes
      - UE supported functions and modes
- Scalable System Solution
  - Scalable to RRM and Multiband
    - equipment re-use within R&D and test labs
    - re-use between TRX, Performance, RRM and Protocol testing



***“Anritsu Conformance test solution is a fast to market, reliable, cost effective solution for a conformance test strategy”***

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## **ME7873A TRX/Performance Test System - Product Introduction -**

**End**

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Specifications are subject to change without notice.

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