LTE-Advanced RF Conformance Test System ME7873LA
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1. Summary of Conformance Test
What is the Conformance Test?

Conformance Test: CT

The CT is a 3GPP-defined test case consisting of a set of fundamental tests. For RF testing, test specifications are defined TS34.121 (W-CDMA) or TS36.521. Passing these tests certifies that the DUT is 3GPP compliant.

Carrier Acceptance Test: CAT

The CAT is a CT with actual carriers (base stations). Because the 3GPP standard has a nearly infinite permutation of parameters, connectivity with actual base stations must be verified. The CAT is formulated for each carrier (base station) based on service details offered by carriers and base station vendors.

In-House Test:

This in-house test is performed by UE vendors for quality assurance of their products. UE vendors create their own unique tests based on the design functions and data.
How Does the CT Fit Overall Product Verification?

- Network problems caused by non-compliant terminals not permitted
- Standard compliance important
- Conformance Test required for design inspection

Testing Real Network
- Proves terminal works with current
  - Network equipment
  - Configurations
  - Services

Conformance Testing
- Ensures terminal still works when:
  - Network equipment upgraded
  - New services added
  - Network architecture evolves
Who Should Do the Conformance Testing?

- Mobile terminal manufacturers
  - Proving to customers (network operators) that mobile terminals standard compliant

- Chipset and software component manufacturers supplying components or reference designs to mobile phone integrators
  - Proving that chipset designs standard compliant

- Specialist test houses
  - Offering conformance test and validation to manufacturers

- Network operators
  - Performing acceptance testing and QA
Race to Introduce LTE Service

3GPP Specifications Still Evolving

How to Test Conformance?
Which regulation version should we comply with?
What test range required for “Conformance?”
Who approves?
Where is CT done?
Possible in own facilities?

Define International Rule and Procedures!

GCF (Global Certification Forum)
PTCRB (PCS Type Certification Review Board)
The GCF and PTCRB were formed by network operators and UE manufacturers to provide consistent standards for product conformance testing.

It is a forum where various parties, test houses, test equipment companies, operators, and manufacturers can make declarations, present evidence, and receive approval.

The GCF itself does not perform any validation or conformance testing.

The GCF also approves test equipment (Conformance Test System) that is 3GPP compliant.
TP/TC Approval and Mobile Terminal Certification

**Test Environment**
- Test case
- Test platform

**Test Environment**
- **Test house**
  - ISO9000
  - ISO17025
  - GCF Certified

**Validation**
- Conformance test
- GCF

**Terminal Certification**
- Pre-validation
- Field trial
  - CE, SAR, etc.

**Test Environment**
- **Test house**

**Approved**
- Publish on website

**Terminal manufacturers**
- Anritsu
  - Verification

**Test Environment**
- Test case
  - Test platform
2. Anritsu Conformance Test System
Anritsu LTE Conformance Test Products

<RF/RRM Conformance Tests>

ME7873LA
LTE-Advanced RF Conformance Test System

TS 36.521-1/-3
TS 34.121-1

<Protocol Conformance Tests>

ME7834LA
LTE Mobile Device Test Platform

TS 36.523-1
TS 34.123
TS 34.229
TR 37.901
3GPP specification is updated every 3 months and the ME7873LA Test System follows the update.
Contribution to the GCF

- GCF/PTCRB holds meetings every 3 months (usually in January, April, July, and October) where members discuss applicable standards for actual service management, their priority, and approval of Conformance Test Systems.

- Anritsu is currently working on validation of the ME7873LA/ME7834LA in collaboration with test houses every 3 months when GCF/PTCRB meetings are held. After validation, the test houses apply for GCF/PTCRB approval of validated test cases.

- The ME7873LA is the leading RF test system, with most GCF/PTCRB Approved Test Cases (As of November, 2016). The future policy is to acquire validation quickly.
**ME7873LA LTE-Advanced RF Conformance Test System**

- Automated system for running 3GPP TS36.521 and TS34.121-1 compliant conformance tests.


- Band options support FDD Band 1-14, 17-21, 24-32, 66 / TDD Band 33-42.
ME7873LA
LTE-Advanced RF Conformance Test System

MG3710A Vector Signal Generator
MG3692C CW Signal Generator
MN7446B Filter Block
MN7446A Filter Unit
MN7446B Filter Block
MG3710A Vector Signal Generator
MD8430A Signaling Tester
MA24218A Power Sensor (ML2488B)
MD8475A Signaling Tester
MN7448A Uplink Signal Filter
MS2692A Signal Analyzer
MN7462E RF Front End
MN7447A LTE Uplink Signal Filter
MN7463E Combining Unit
MD8430A Signaling Tester
Features

- World First: 3DL CA PTCRB Approval (at September 2015)
- Full 3GPP compliance
- The Most Approved GCF/PTCRB Test Cases (As of November 2016)
- Support TS36.521 LTE and TS34.121 W-CDMA
- Reduce Down Time Using the Tunable Filter
- R&TTE*1 Test
- LTE to CDMA2000/TD-SCDMA InterRAT Test
- Operator Acceptance Test
- Global Support
- Upgradeable from ME7873F/L

*1: Compliant with the European ETSI-defined R&TTE RF TRx test items.
Scalable Test System

Conformance Test Function

- **LTE Conformance Test**
  - TS36.521-1 LTE TRX/Performance
  - TS36.521-3 LTE RRM
  - TS34.121-1 LTE RRM(LTE/W-CDMA Inter-RAT)
  - TS34.122 LTE RRM(LTE/TD-SCDMA Inter-RAT)
  - FDD / TDD
  - 8x2MIMO
  - TM9
  - Inter-RAT (W-CDMA, GSM, CDMA2000, TD-SCDMA)
  - Future function 4x4 MIMO, DL 4CC, IoT, etc.
  - Carrier Aggregation (DL 2CA / 3CA)

- **W-CDMA Conformance Test**
  - TS34.121-1 TRX/Performance/RRM

Regulatory Test Function

- **R&TTE Test**
  - ETSI EN 301 908-13

Operator Acceptance Test Function

Frequency Band

- Selectable Band Option
  - Adapt Frequency range 450 – 3800MHz using tunable filter.

Standard Function

- Temperature Chamber Control
- DC Power Supply Control

Future function

- 4x4 MIMO, DL 4CC
- IoT, etc.
- 8x2MIMO
- TM9
- Carrier Aggregation (DL 2CA / 3CA)
Upgrade from ME7873L

Customers using the ME7873L can optimize their investment by adding LTE-A functions to make the most of existing equipment.
Using Parallel test function, 2UEs are tested simultaneously. (*1, *2) This function helps reduce the total test time.

*1: Some equipment are needed for parallel test function.
*2: Some test cases are not supported parallel test function.
Change parameters, such as level and frequency

Default parameters are set to 3GPP-standard values. Parameters, such as level, frequency, and RBs are changed easily by the control software. Non-default parameters are displayed in green.
R&D Functions (2/8)

**Real-time SS Log Trace**

An SS log is displayed automatically when measurement starts. Real-time confirmation of message exchanges between the SS and terminal supports effective operation verification.

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**Normal Example**

- **SS Sequence Display MX843090A**
  - Wait 'PRACH Preamble' (event type1)
  - Received 'PRACH Preamble' (EVENT_RA_PREAMBLE_GROUP_A)
  - Send 'PRACH Response'
  - Received 'RRC Connection Request' (EVENT_UL_SCH_SETUP_REQ)
  - Send 'RRC Connection Setup'
  - Received 'UCI HARQ-ACK (EVENT_DL_ACK_SETUP_CNF)' 
  - Received 'RRC Connection Setup Complete'
  - Send 'DL Information Transfer / IDENTITY REQUEST'
  - Received 'UL Information Transfer / IDENTITY RESPONSE'
  - TMSI=001010123456789

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**Abnormal Example**

- **SS Sequence Display MX843090A**
  - Wait 'PRACH Preamble' (event type1)
  - Not receiving 'PRACH Preamble' (EVENT_RA_PREAMBLE_GROUP_A)
  - Error End
SS Log display function

An SS log is created automatically for each measurement item when measurement finishes. The logs can be checked using viewer software bundled with the ME7873LA to troubleshoot test problems between the UE and test platform.
Search mode function

To develop reliable UE terminals with stable performance, the performance limits must be confirmed. The Search mode function performs tests while changing conditions to confirm UE performance.

The ME7873LA can measure in two ways: “Fail Condition” with tight conditions and “Pass Condition” with looser conditions.

Fail Condition

It changes to severer measurement conditions, such as downlink and interference signal levels, and SNR, etc., at fixed steps.

Pass Condition

It changes to easier measurement conditions, such as downlink and interference signal levels, and SNR, etc., at fixed steps.
R&D Functions (5/8)

**RRM Graphical Tool**
Test items and results are displayed in real time as a histogram showing the UE operation trends at a glance.
R&D Functions (6/8)

♦ **Auto re-measurement function for Fail test**

When multiple items are tested by one sequence file, Fail items are re-measured automatically.

♦ **Auto-measurement optimization to minimize measurement time**

When multiple items are tested by one sequence file, the test system automatically measures in the order that minimizes measurement times.
R&D Functions (7/8)

**UE Automation Tool**

The UE Automation tool is a standard function. Customers can use it to send AT commands, simplifying automated measurement of various terminal types.
R&D Functions (8/8)

- **Cable Loss Measurement Tool**
  This tool measures the frequency characteristics of the RF cable connecting the ME7873LA and UE for use as cable loss data.
Test Result Format

Measurement results are saved to the server PC automatically in html, xml, or csv format.

### 6.2.2 UE Maximum Output Power

**Test case information**
- Test case: 6.2.2 UE Maximum Output Power
- Test case limitation: none
- Test specification: 3GPP TS36.521-1
- Test specification version: V8.4.0 (2009-12)
- Test case software: MCHR111LE-003 LTE TX Test Case Conformance Package
- Test case version: V2.0 (2010-03)
- Test case verdict: PASS
- Test case version ID: 56d698e-2192-4b6e-4e8b-045f7b0855

**Test case result summary**
- Band: LTE FDD 1
- Vibration: none
- Parameter: Low (25, 100), Mid (300, 1000), High (75, 400)
- Channel BW: Nulled, Highest (20 MB)
- Voltage: Normal (3.4 V)
- Temperature: Normal (25°C)

<table>
<thead>
<tr>
<th>Verdict</th>
<th>Channel BW</th>
<th>Voltage-Temperature Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>SMH</td>
<td>INVN</td>
</tr>
<tr>
<td>Mid</td>
<td>SMH</td>
<td>PASS</td>
</tr>
<tr>
<td>High</td>
<td>Highest</td>
<td>PASS</td>
</tr>
<tr>
<td>High</td>
<td>Highest</td>
<td>PASS</td>
</tr>
<tr>
<td>High</td>
<td>SMH</td>
<td>PASS</td>
</tr>
</tbody>
</table>

**Test case configuration**

**Test case detail**
- PASS LTE FDD: Low (25) / Nominal (5 MHz): VN3 (10%/VN1 (25°C))
- PASS LTE FDD: Low (25) / Nominal (5 MHz): VN3 (10%/VN1 (25°C))
- PASS LTE FDD: Mid (300) / Nominal (5 MHz): VN3 (80%/VN (21°C))
- PASS LTE FDD: Mid (300) / Nominal (5 MHz): VN3 (80%/VN (21°C))
- PASS LTE FDD: High (500) / Nominal (5 MHz): VN3 (80%/VN (21°C))
- PASS LTE FDD: High (500) / Nominal (5 MHz): VN3 (80%/VN (21°C))

### HTML

### XML
The measurement system uncertainty at each test procedure must comply with the 3GPP standards. The ME7873LA has the following three calibration and correction functions to assure compliance.

- Fundamental correction at delivery
- Internal calibration at work start
- Run-time correction before each measurement
3. Support Service Proposal
Support Service Outline

The support service includes hardware and software from operation to maintenance to assure stable ME7873LA operation.

**Technical Support**
- Technical support
  - Operational technical support and troubleshooting
- Customer system status management
  - Understand customer’s system status on regular basis for quick response

**Software Update**
- 3GPP follow up
  - Update ME7873LA according to 3GPP standards
- Validation
  - Acquire validation for GCF-defined target 3GPP standard

**Hardware Maintenance**
- Repair service
  - Hardware repair
  - Backup loan unit during repair
- Regular checks
  - Regularly checks of electrical parts that may degrade with time

**Calibration**
- Calibration service
  - Calibration at customer’s site
  - System calibration to assure reliable measurement accuracy
  - Correction, calibration and result report
4. Summary
Anritsu offers a future-proof conformance test system with wide scalability and high reliability

- **Reliability**
  - Full 3GPP compliance (GCF Approved Test System)
  - Various correction/calibration functions to improve measurement reliability

- **Evolving**
  - Fast and flexible response to new technology
  - Updates to evolving 3GPP standard

- **Scalability**
  - Measurement functions implemented selectively
  - Operating bands implemented selectively
  - Future-proof upgrades based on existing platform
Appendix 1
System Installation
Customer Supplied Parts (1/2)

● DC Power Supply

The following models is required when controlling the power supply using the ME7873LA.

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>pcs</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>N6700B</td>
<td>Mainframe</td>
<td>1</td>
<td>Keysight Technologies, Inc</td>
</tr>
<tr>
<td>N6732B*1</td>
<td>8 V, 6.25 A, 50 W DC Power Module</td>
<td>4^2</td>
<td></td>
</tr>
<tr>
<td>N6709A</td>
<td>Low-Profile MPS Mainframe Rack Mount Kit</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*1: At rack mounting, the maximum current is 2 A. To draw more than 2 A of current, use a separate cable to supply DC to the terminal. However, since this will prevent rack mounting, decide on the installation location for the DC power supply in advance.

When using a power supply other than the N6732B, ask the power supply manufacture for details.

*2: Four modules are required when testing up to four mobiles continuously.

In addition, the following equipment can also be controlled. However, since rack-mounting is not possible when using the 2306-PJ, decide on the installation location for the DC power supply in advance.

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>pcs</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2306-PJ</td>
<td>Dual-Channel Battery/Charger Simulator with 500mA Range</td>
<td>2^3</td>
<td>Keithley Instruments</td>
</tr>
</tbody>
</table>

*3: Two sets of the 2306-PJ are required when testing up to four mobiles continuously.
Customer Supplied Parts (2/2)

Temperature Chamber

One of the following equipment is required to control the temperature chamber from the ME7873LA.

<table>
<thead>
<tr>
<th>Model</th>
<th>Name</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>SH-241</td>
<td>Temperature &amp; Humidity Chamber</td>
<td>ESPEC Corp.</td>
</tr>
<tr>
<td>SH-242</td>
<td>Temperature &amp; Humidity Chamber</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Benchtop Temperature Chamber</td>
<td>TestEquity</td>
</tr>
<tr>
<td>107</td>
<td>Benchtop Temperature Chamber</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Temperature Chamber</td>
<td></td>
</tr>
</tbody>
</table>

*1: GPIB Cable (Double-Shield, 2m) is required to control this chamber automatically.
Delivery (1/2)

- **Delivery Time**
  3 months (changes with stock situation)

- **Onsite Installation**
  Anritsu engineer visits delivery site to perform system setup calibration. Required time varies with system composition

  - System Setup (assembly, wiring, software installation)
  - System Correction
  - UE Functional Tests
  - System Performance Tests
  - Explanation at Delivery Acceptance
Support After Delivery

The following warranty is offered for free of charge after product delivery.

Duration

- Newly Purchased: 1 year (from next month after installation)
- Upgrade: 3 month (from next month after installation)

Support Contents

- Hardware guarantee: Repair faults for all products in the system and re-calibration if needed

Support service applies to new hardware and software. Guarantee for customer-provided parts follows the upgrade guarantee on condition of calibrating each instrument.

Hardware guarantee in upgrading is applied only when a hardware is added or modified.

Free-of-charge guarantee period extendable by charged service contract.
# System Installation Environment

The system installation environment must meet the following specifications.

<table>
<thead>
<tr>
<th>Items</th>
<th>Condition</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| Size            | 1980 (H) x 1140 (W) x 797 (D) mm               | 2 rack *1  
Except prongs.  
A space of 300 mm is required in both the back and side faces for heat release.  
The required indoor height is 2200 mm or more. |
| Weight          | 600 kg or less                                 | *2                                                                      |
| Power Supply    | 100 to 120, or 200 to 240 Vac                  | From 4 to 6 outlets are required                                       |
| Wattage         | 4400VA or less (Min conf.)  
6600VA or less (Max conf.) | *3                                                                      |
| Temperature Range | 15° to 35°C*4 (Operating)  
0° to 50°C (Storage) | Accuracy is guaranteed under the performance environment of the temperature +/- 10°C during correction. |

*1: Secure using hooks at rack top recommended. Basic calibration at acceptance inspection must meet this requirement.
*2: The installation location must be able to safely bear the above floor loads plus 100 kg for basic calibration equipment at acceptance inspection.
*3: Sufficient power (600 VA) for basic calibration at acceptance inspection as well as for ME7873LA must be supplied.
*4: Basic calibration at acceptance inspection must meet this requirement. Use in air-conditioned room recommended for stable measurement.