Product Introduction

MD8480C
W-CDMA Signalling Tester
MD8480C W-CDMA Signalling Tester

Contents

- New Functionality
- Product Overview
- Applications
- Features
- Functions
- Configurations
- PC Controller
- Roadmap
HSPA Evolution Function Overview (1/6)

- 3GPP Release 10 Function
  - MC (Multi Carrier) - HSDPA (Release 10)
    - MC-HSDPA is a new technology achieving higher packet communications by triple frequency bandwidth (5 MHz x 3) of existing HSDPA. It supports maximum data throughput 41.2 Mbps of 16QAM in DL (L1 supports Category 29 of DL 63.3 Mbps (64QAM)).
HSPA Evolution Function Overview (2/6)

- 3GPP Release 9 Function
  - DC (Dual Cell) - HSUPA (Release9)
    - DC-HSUPA is capable of receiving UL data to be paired with DC-HSDPA. It is a new technology achieving higher packet communications by doubled frequency bandwidth (5 MHz x 2) of existing HSUPA channel. It supports maximum data throughput 11.5 Mbps (Category 8) in UL (L1 supports Category 9).
HSPA Evolution Function Overview (3/6)

- 3GPP Release 9 Function
  - DB-DC (Different Bands for Dual Cell) HSDPA (Release 9)
    - While the DC-HSDPA function is used for frequencies in the same band, the DB-DC-HSDPA function is useful for telecoms with multiple frequency bands where each carrier is transmitted in a different frequency band, achieving a max. data packet DL speed of 42 Mbps.
HSPA Evolution Function Overview (4/6)

- 3GPP Release 8 Function
  - 64QAM and MIMO
    - Enables maximum 42 Mbps download speed combined with 64QAM and MIMO specified by UE Category 20
  - DC-HSDPA (Dual Cell HSDPA) *1
    - Supports maximum download speed of 42 Mbps with dual cells (carrier) using doubled bandwidth (5 MHz x 2) of HSDPA

*1: Supports dual-cell with adjacent carrier.
HSPA Evolution Function Overview (5/6)

- 3GPP Release 8 Function
  - CS Voice over HSPA
    - Voice communication functionality using DL_HS-DSCH and UL_E-DCH
  - Improved L2 for UL
    - Realizes flexible RLC PDU size to reduce overhead and padding
  - Enhanced UL for CELL_FACH state
    - Enables use of E-DCH channels in non CELL_DCH states, to reduce latency and increase peak data rate
  - HS-DSCH Serving Cell Change Enhancement
    - A function for changing current serving cell to the high quality radio link rapidly
HSPA Evolution Function Overview (6/6)

- HSPA Evolution Function
  - Higher-Order Modulation
    - High-speed data transfer with higher multilevel modulation scheme
      - DL 64QAM & UL 16QAM (4PAM)
  - 2x2 MIMO (Multiple Input Multiple Output)
    - Supports doubled transmission speed by splitting Tx data into two streams and sending each stream simultaneously using multiple antennas
      - Retransmission Control
      - Single and Dual Stream
      - Stream Schedule Function for Testing
MD8480C W-CDMA Signalling Tester

Product Overview (1/5)

- MD8480C Overview

**Debug signals and LEDs**

**Control**

**Logging**

**RF**

**BB**

Analog/Digital IQ interface with BIU (MU848077C) option

**Voice**

**Data**

**ISDN**

**PC Controller**

Timing check using oscilloscope

*Requires PC controller (sold separately) for each MD8480C*
Product Overview (2/5)

- W-CDMA Signalling Tester Concept
  - UE Specifications based on standards (e.g. 3G UE => 3GPP standard)
  - UE Development based on standards
  - Developers simulate BTS connections to verify operation of developed UE
  - Important protocol stack verification and overall UE operation testing

Anritsu offers W-CDMA Signalling Tester simulating call processing of real UMTS/GSM network for mobile terminals.
Product Overview (3/5)

- **What is MD8480C?**
  - The MD8480C is a base station simulator for testing 3.5G W-CDMA/ GSM mobiles with HSPA (including HSPA Evolution) functions.
  - It has a 3GPP-compliant air interface supporting a full range of application tests, such as chipset and mobile station coding/decoding processing, voice calling, and packet communications as well as MS-to-MS testing (requires two MD8480C units). MD8480C protocol sequence tests include position registration, origination/termination, handover (option), and disconnection from mobile station/network.
  - Handover tests between W-CDMA/HSPA and GSM/GPRS/EGPRS BTS can be performed by adding optional functions for 2G. The MD8480C is ideal for developing UMTS/GSM mobiles and chipsets.
Product Overview (4/5)

- Block Diagram
  - Basic spec overview (1)

Comm. Speed: DL 42 Mbps*1 max.
  UL 11 Mbps*2 max.
Number of BTS: 4 BTS (W) 2 BTS (G) max.
Modulation: QPSK/16QAM/64QAM
Demodulation: BPSK/4PAM
SHO: Soft/Softer handover (4 branches),
  Tx diversity (2 branches)
HHO: Inter-frequency HHO
Tx Diversity: STTD, TSTD, Closed Loop
  Mode 1, 2
Rx Diversity: Supported
Compressed Mode: SF/2, Puncturing,
  Higher Layer Scheduling
TE Connection:
  AMR Speech (for voice)
  ISDN (for videophone, etc.)
  Server PC (for data)

*1: 63 Mbps for L1 testing
*2: 23 Mbps for L1 testing
Product Overview (5/5)

- Block Diagram
  - Basic spec overview (2)

TE: PN, fixed pattern transmission
  TE connection
    Handset, ISDN, Server PC, etc.
PPP: RFC1661
PDCP: TS25.323 compliant
RLC: TS25.322 compliant
MAC
  MAC-c/d:
    TS25.321 compliant
MAC-ehs:
  TS25.321 compliant
PHY:
  AMR Speech
  AV64K, UDI, AV32K
Packet (DCH) DL32K, 128K, 384K, UL64K
Packet (HSDPA) ~ 63 Mbps
Packet (HSUPA) ~ 23 Mbps
Multi Call
  AMR Speech + Packet (DCH)
  AMR Speech + Packet (HSPA), etc.
MD8480C W-CDMA Signalling Tester

Applications (1/9)
- UE Development Cycle and MD8480C

MD8480C for Development Phase

- Software/Hardware R&D Integration
- Protocol Conformance
- Interoperability (IOT)
- Application Test
- Field Test
- Production

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MD8480C-E-I-1
Applications (2/9)

- Coding Decoding Test
  - UE Coding/Decoding functions tested using following setup

![Diagram of MD8480C W-CDMA Signalling Tester](image)

- Compare
- Demodulated Data (DL)
- Output Data (UL)
- Output Data (DL)
- Demodulated Data (UL)
MD8480C W-CDMA Signalling Tester

Applications (3/9)

- Coding Decoding Test
  - Can visually check UE operations at dynamic propagation conditions (such as CQI acknowledgement to BTS) combined with MF6900A Fading Simulator.
  - DL and UL constellation and power variation monitored using MS2691A Signal Analyzer
Applications (4/9)

- Protocol Sequence Test
  - UE Call Processing tests performed using following setup.

Troubleshooting using Trace Window
Applications (5/9)

- Application Tests A
  - The MD8480C simulates these various applications.
    - **AMR Voice Test**: A handset is connected to the MD8480C to perform a voice test between MS and MD8480C.
    - **User Data Test**: Any data can be inserted into the transmitted DTCH and the demodulated DTCH data is output externally. This is effective for measuring bit error rate.
    - **IP Packet Test**: A PC with 10BASE-T I/F is connected to the MD8480C to test the IP protocol data communications.
    - **PPP Packet Test**: A PC with RS-232C I/F is connected to the MD8480C to test the PPP protocol data communications.
    - **PPP (Built-in Server) Test**: The MD8480C with PPP protocol stack acts as the PPP terminal. The PC connected via 10BASE-T I/F supports high-speed services up to 42 Mbps (HSDPA) and 11 Mbps (HSUPA).
    - **ISDN Test (Option)**: A videophone or other ISDN device is connected to the MD8480C to test video and audio communications between the MS and MD8480C.
    - **MS-to-MS Test (requires two MD8480C units)**: End-to-end communication tests can be performed between two MS sets by connecting two MD8480C units via 10BASE-T.
Applications (6/9)

- Application Tests B
  - IP Packet Test Example
    - Throughout tests using external FTP server
    - Layer 1, Layer 2 Trace Log and Throughput Monitor
    - TCP/IP Traffic Analysis using general analysis software

Data Throughput Test

Uplink (11 Mbps*2)
Downlink (42 Mbps*1)

PHY/MAC/RLC Analysis
Protocol Analysis

TCP/IP Traffic Analysis

*1: 63 Mbps for L1 testing
*2: 23 Mbps for L1 testing
Applications (7/9)

- Fading Performance Test
  - Simple Performance (RF & Throughput) Test Solution
    - Combined with Anritsu MF6900A Digital Fader
  - High Reproducibility
    - Stable fading test using digital baseband interface
  - Easy Operation
    - Standard 3GPP TS25.101, TS34.121-1 fading profiles
    - Easy profile setting from test scenarios
    - Direct RF power control by MD8480C
    - No calibration with RF combiner and power meters
  - Free Maintenance
    - No periodic calibration
    - Low failure rate

- Faded RF: DUT (UE)
- FTP Server
- Fading Simulator (MF6900A)
- Digital I/F
Features (1/5)

- One Unit Supports Latest 2/3/3.5G Mobile Technology including HSPA Evolution
  - Small footprint with expanded functions for testing up to four HSPA/WCDMA base stations including HSPA Evolution
  - One unit supports up to two GSM/GPRS base stations including EGPRS for Inter-RAT and Intra-RAT handover tests

Supported by one unit
Features (2/5)

- Supports DL 42 Mbps*¹ Data Throughput (with MC-HSDPA) Specified by 3GPP Rel-10
  - Throughout tests using external FTP server
  - Layer 1, Layer 2 Trace Log and Throughput Monitor
  - TCP/IP Traffic Analysis using general analysis software

*S1: 63 Mbps for L1 testing
*S2: 23 Mbps for L1 testing
### Features (3/5)

- Supports 3GPP Rel-7 and Rel-8 UE Categories
  - New hardware supporting DL 64 QAM, and UL 16 QAM modulation schemes as well as 2x2 MIMO
  - Supports 64QAM and MIMO (Category 20), DC-HSDPA (Category 24), DB-DC-HSDPA (Category 24)
  - Supports DC-HSDPA with MIMO (Cat. 26*1)
  - Supports DC-HSUPA (UL Cat. 8)
  - Supports MC-HSDPA (Cat. 29*1)

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**3GPP TS.25.306 V10.10.0 (Release 10) Table 5.1a: FDD HS-DSCH physical layer categories**

<table>
<thead>
<tr>
<th>HS-DSCH category</th>
<th>Maximum number of HS-DSCH codes received</th>
<th>Minimum inter-TTI interval</th>
<th>Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI</th>
<th>Total number of soft channel bits</th>
<th>Total Number of Serving/Secondary serving HS-DSCH</th>
<th>Total Number of Serving/Secondary serving HS-DSCH TTI</th>
<th>Supported modulations without MIMO operation or aggregated cell operation</th>
<th>Supported modulations with MIMO operation and without aggregated cell operation</th>
<th>Supported modulations with MIMO operation with aggregated cell operation</th>
<th>Supported modulations with MIMO operation and aggregated cell operation</th>
<th>Maximum Throughput [bits/s]</th>
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<td>Category 13</td>
<td>15</td>
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<td>35280</td>
<td>259200</td>
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<td>QPSK, 16QAM</td>
<td>QPSK, 16QAM</td>
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</tbody>
</table>

*1 : Limitation Max Throughput

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**Note:**
- QPSK, 16QAM, 64QAM
- Not Applicable (MIMO not supported)
- Not Applicable (aggregated carriers operation not supported)
- Not applicable (simultaneous aggregated carriers and MIMO operation not supported)
Features (4/5)

- Diversity Support for Four BTS (max.)
  - Built-in support for handover tests between four BTS with diversity reception to simulate handover tests in near-to-real network environment
  - Field verification items can be bench-tested, reducing time in field testing
Features (5/5)

- **Strong Baseband Support**
  - The optional Baseband Interface Unit (MU848077C) supports stable W-CDMA/HSPA chipset performance and function evaluation tests irrespective of the RF section performance.
  - Development of HSPA mobiles requiring performance evaluation in severe mobile environments is supported by configuration of a high-reproducibility coding/decoding test environment.

![Diagram of MD8480C W-CDMA Signalling Tester](image)

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MD8480C-E-I-1
Functions (1/6)

- Main MD8480C Functions
  - 3GPP-compliant BTS simulator
  - Supports W-CDMA including HSPA Evolution and GSM/GPRS/EGPRS
  - Expandable to 4 WCDMA or 2 GSM cells with 2RF
  - Supports Layer 1 and Layer 2
  - Supports editing of Layer-3 protocol sequences controlling Layer 1 and Layer 2 as required
  - Supports monitoring data exchange between MD8480C and UE, and other parameters, such as communication status
MD8480C W-CDMA Signalling Tester

Functions (2/6)

- PC Controller Window
  - Controls and configures MD8480C main frame
MD8480C W-CDMA Signalling Tester

Functions (3/6)

- Trace Functions A
  - Checks message exchange between layers and test sequence
MD8480C W-CDMA Signalling Tester

Functions (4/6)

- **Trace Functions B**
  - Saves and analyzes trace log data up to specified capacity
  - Outputs HS-DSCH parameters generated in CSV format by standard tool and analyzes using spreadsheet

![ConvMeasLogFormat.exe](ConvMeasLogFormat.exe)

![Log file](test.log)
Functions (5/6)

- **Monitor Function**
  - Monitors frequencies and powers per BTS or channel in real time
  - Saves monitor data to log file and checks frequency and power changes at each test step
MD8480C W-CDMA Signalling Tester

Functions (6/6)

- Measure (Counter) Function
  - Analyzes HSDPA parameters in real time
  - Saves result to log file

- **HS-DSCH**
  - MAC-hs PDU Tx Rate
    - Tx Rate [Kbps]
    - Tx Throughput 1 [Kbps]
  - MAC-hs PDUs/PDU Size
    - Tx MAC-hs PDU

- **HS-DPCCH**
  - HS-DPCCH ACK
    - ACK
    - NACK
    - DTX
  - HS-DPCCH CQI
    - Average CQI
    - CQI#0 [TBs]
    - CQI#1 [TBs]
    - CQI#30 [TBs]

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MD8480C-E-I-1
MD8480C W-CDMA Signalling Tester

Configurations (C-composition)

MD8480C Standard Configuration
(W-CDMA 1 BTS included)
- MU848051A: CPU
- MU848056A: Voice codec
- MU848071C: L2
- MU848072C1: BTS Unit
- MU848073C: Timing Generator
- Z1189A: MD8480C 1st RF Unit 2

Additional Units (Option)
- MD8480C-03: Additional RF Unit 2
- MU848060C: TDMA2 (for GSM/GPRS/EGPRS)
- MU848060C-01: EGPRS (R99)
- MU848055C: ISDN/CSD
- MU848077C: Baseband Interface Unit

Additional BTS Units (Option)
- MU848072C1: BTS Unit (for BTS #2-4)
- MU848072C-01: HSDPA (for BTS #1-4)
- MU848072C-02: HSUPA (for BTS #1-4)

Software Options
- MX848001A-01: Tx Diversity
- MX848001C-11: HSDPA Tx Diversity
- MX848001A-02: Compressed Mode
- MX848001A-03: Router Connection
- MX848001A-04: GSM CSD
- MX848001A-05: GSM Frequency Hopping
- MX848001A-06: W-CDMA CSD
- MX848001A-07: Message Encoder/Decoder

- MX848001C-12: HSPA Evolution
- MX848001C-30: DTM (R99)
- MX848041C: Ciphering (for W-CDMA)
- MX848041C-10: HSDPA Ciphering
- MX848045C: GSM/GPRS Ciphering

March 29, 2013 last day of order entry
**MD8480C W-CDMA Signalling Tester**

**Configurations** (E-composition)

### Standard Unit
- MU848051A: CPU
- MU848056A: Voice codec
- MU848071E: L2 Evolution
- MU848072E: BTS Evolution
- MU848073C: Timing Generator
- Z1190A: MD8480C 1st RF Unit 3

### Additional Units (Option)
- MD848001A: Tx Diversity
- MX848001C-01: HSDPA Tx Diversity
- MX848001A-02: Compressed Mode
- MX848001A-03: Router Connection
- MX848001A-04: GSM CSD
- MX848001A-05: GSM Frequency Hopping
- MX848001A-06: W-CDMA CSD
- MX848001A-07: Message Encoder/Decoder
- MX848001C-30: DTM

### Additional BTS Units (Option)
- MD848001E-12: HSPA Evolution
- MX848001E-13: Higher Order Modulation
- MX848001E-14: 2x2 MIMO
- MX848001E-15: HSPA Evolution for uplink
- MX848001E-16: DC-HSDPA
- MX848001E-17: 64QAM and MIMO for HSDPA
- MX848001E-18: DB-DC- HSDPA
- MX848001E-20: DC- HSDPA
- MX848001E-21: MC- HSDPA
- MX848041E: Ciphering
- MX848041E-10: HSDPA Ciphering
- MX848045C: GSM/GPRS Ciphering

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**Software Options**
- MX848001A-01: Tx Diversity
- MX848001C-11: HSDPA Tx Diversity
- MX848001A-02: Compressed Mode
- MX848001A-03: Router Connection
- MX848001A-04: GSM CSD
- MX848001A-05: GSM Frequency Hopping
- MX848001A-06: W-CDMA CSD
- MX848001A-07: Message Encoder/Decoder
- MX848001C-30: DTM

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**MD8480C Standard Configuration** (W-CDMA 1 BTS included)
- MU848051A: CPU
- MU848056A: Voice codec
- MU848071E: L2 Evolution
- MU848072E: BTS Evolution
- MU848073C: Timing Generator
- Z1190A: MD8480C 1st RF Unit 3

**New!**
PC Controller

- The MD8480C requires a PC controller with Microsoft Visual C++ or Visual Studio*1.

Specifications

- OS: Windows XP (SP2), Windows Vista, Windows 7*2
- CPU: Pentium 4, ≥1.6 GHz (Core2Duo supported)*3
- Memory: >512 MB
- Interface: RS-232C x1, Ethernet (10BASE-T/100BASE-TX)
- CD-ROM drive

*1: Standard edition. Microsoft Visual Studio are registered trademarks of Microsoft Corporation in the USA and other countries.
*2: Microsoft Windows XP and Vista are registered trademarks of Microsoft Corporation in the USA and other countries.
*3: Pentium and Core2Duo are registered trademarks of Intel Corporation in the USA and other countries.
MD8480C W-CDMA Signalling Tester

Roadmap

MX848001C-12
HSPA Evo

Enhanced Cell FACH, CPC, L2 Improvement, CS Voice over HSPA

MX848001E-13/14
HOM / MIMO

MX848001E-16
DC-HSDPA

DL 64QAM
UL 16QAM / MIMO

MX848001E-15
HSPA Evolution for UL

DC-HSDPA
DL 64QAM+64QAM

MX848001E-17
64QAM and MIMO

64QAM & MIMO for HSDPA

MX848001E-18
DB-DC-HSDPA

Enhanced UL for Cell FACH
improved L2 for UL,
HS-DSCH Serving Cell Change Enhancement

MX848001E-20
DC-HSUPA

DB-DC-HSDPA

MX848001E-21
MC-HSDPA

New! Rel-10

HSPA/LTE Inter-System Handover

HSPA (Rel-7)

HSPA Evolution (Rel-8)

Rel-9

HL8430A
LTE Signalling Tester

20 MHz BW
OFDMA
MIMO

20 MHz BW
OFDMA
MIMO

LTE

HSPA & LTE

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MD8480C-E-I-1
Note