Product Introduction

HSPA Evolution Version

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

Product Introduction (HSPA Evolution Version)

Ver. 9.00

Anritsu Corporation
Contents

- What is HSPA Evolution?
- Benefits of HSPA Evolution
- HSPA Evolution Function Overview
- Product Lineup
- Product Configuration
- Option Configuration
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What is HSPA Evolution?

- HSPA Evolution: High Speed Packet Access Evolution
  - New functionality added by 3GPP Release 7
  - Max. DL speed of 28 Mbps and UL speed of 11 Mbps due to HSPA technology upgrade (Service roll-out from 2009)
  - Also called HSPA+ or eHSPA
  - New enhancements DC-HSDPA/ DC-HSUPA in Release 8, 9
  - Further extensions in Release 10;
    - Max. DL speed of 63 Mbps by MC-HSDPA (3C)
    - Max. UL speed of 23 Mbps by DC-HSUPA

HSPA Evolution

Higher Packet Peak Data Rate
Benefits of HSPA Evolution

- More high-speed data services and increased efficiency
  - High-speed packet access
  - Reduced user plane latency
  - Increased cell capacity
  - Increased UE battery life

<table>
<thead>
<tr>
<th>Key Benefits</th>
<th>Increased peak data rate</th>
<th>Reduced user plan latency</th>
<th>Increased cell capacity</th>
<th>Increased UE battery life</th>
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<td>Enhanced Cell FACH</td>
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<td>L2 improvement</td>
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<tr>
<td>2x2 MIMO</td>
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<td>E-UL for Cell FACH</td>
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<td>Improved L2 for UL</td>
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<td>HS-DSCH Serving Cell Change Enhancement</td>
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<td>Dual Cell HSDPA</td>
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<td>64QAM and MIMO</td>
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<td>DC-HSUPA</td>
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<td>MC-HSDPA</td>
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Rel-7, Rel-8, Rel-9, Rel-10 Features
HSPA Evolution Function Overview (1/10)

- CPC (Continuous Packet Connectivity, Rel-7)
  - UL DTX
    - Burst transfer of uplink DPCCH signal to reduce uplink overhead
  - DL DRX
    - Transfer of downlink signals (HS-SCCH, HS-PDSCH) at specified timing to reduce UE power consumption
HSPA Evolution Function Overview (2/10)

- CPC (Continuous Packet Connectivity, Rel-7)
  - HS-SCCH-less Mode
    - Enables BTS to void HS-SCCH at first transmission when Transport Block Size (TBS) selected for HS-PDSCH sending matches one of specified HS-SCCH-less TBS to reduce downlink overhead
  - Enhanced F-DPCH
    - Adds new F-DPCH slot format
  - UL DPCCH Slot Format 4
HSPA Evolution Function Overview (3/10)

- **MAC-ehs (Rel-7)**
  - Enhanced MAC-hs function supporting new Tx power control and modulation scheme selection

- **Enhanced Cell FACH (Rel-7)**
  - Function for using HS-DSCH at CELL_DCH as well as at CELL_FACH, CELL_PCH, and URA_PCH
HSPA Evolution Function Overview (4/10)

- Higher-Order Modulation (Rel-7)
  - Supports new modulation DL 64QAM and UL 16QAM schemes

Higher Order Modulation

- 16QAM (HSPA Evolution)
- 64QAM (HSPA Evolution)
- BPSK (Rel-99)
- QPSK (HSUPA)
- QPSK (Rel-99)
- 16QAM (HSDPA)

MD8480C W-CDMA Signalling Tester

Slide 8

Anritsu envision: ensure
HSPA Evolution Function Overview (5/10)

- **2x2 MIMO (Rel-7)**
  - Multiple Input Multiple Output technology for DL
  - Supports doubled transmission speed by splitting Tx data into two streams and sending each stream simultaneously using multiple antennas
  - Supports:
    - Retransmission Control
    - Single and Dual Stream
    - Stream Schedule Function for testing

![MIMO Operation Concept](image)
HSPA Evolution Function Overview (6/10)

- **CS Voice over HSPA (Rel-8)**
  - Voice communication service using channel DL_HS-DSCH and UL_E-DCH of HSDPA/HSUPA

- **Improved L2 for Uplink (Rel-8)**
  - Realizes flexible RLC PDU size to reduce header overhead and padding

- **Enhanced UL for Cell FACH State (Rel-8)**
  - 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 (Rel-8)**
  - A function for changing current serving cell to the high quality radio link rapidly
HSPA Evolution Function Overview (7/10)

- 64QAM and MIMO (Rel-8)
  - Enables maximum 42 Mbps download speed combined with 64QAM and MIMO specified by UE Category 20
- DC-HSDPA (Dual Cell HSDPA) (Rel-8)
  - Supports maximum 42 Mbps download speed with dual-cell using doubled bandwidth (5 MHz x 2) of HSDPA specified by UE Category 24

Dual-Cell HSDPA Operation Concept
HSPA Evolution Function Overview (8/10)

- 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 (9/10)

- **DC (Dual Cell) - HSUPA (Release9)**
  - DC-HSUPA is capable of receiving UL data to be paired 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 (10/10)

- **MC (Multi Carrier) - HSDPA (Release10)**
  - 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)).

MC-HSDPA Operation Concept
MD8480C W-CDMA Signalling Tester

Product Lineup

Five MD8480C packages tailored to MX848001C-12 HSPA Evolution (Rel-7) requirements

Function Test Configuration (DL 14M/UL 5.7 M)
CPC, Enhanced Cell FACH, L2 improvement, CS Voice over HSPA
Required Opt: MX848001C-12

High Speed Test Configuration (DL 21M/UL 11 M)
High-speed data rate with DL 64QAM and UL 16QAM
Required Opt: HW upgrade + MX848001C-12, 13

MIMO Test Configuration (DL 28 M)
High-speed data rate with 2x2 MIMO
Required Opt: HW upgrade + MX848001C-12 + MX848001E-14

DC-HSPA (Release 9) Test Configuration (DL 42M / UL 11M*1)
High-speed data rate with DC-HSDPA, DC-HSUPA
Required Opt: HW upgrade + MX848001C-12 + MX848001E-15, 16 & 20

MC-HSDPA (Release 10) Test Configuration (DL 42 M*2/ UL 11M*1)
High-speed data rate with Multi Carrier - HSDPA
Required Opt: HW upgrade + MX848001C-12 + MX848001E-15, 16, 18, 20 & 21

*1: 23Mbps for L1 testing
*2: 63Mbps for L1 testing
## Product Configuration (1/4)

- Supports 3GPP Rel-7 & 8 with following options
  - [ ] MX848001C-12 HSPA Evolution (Release 7)
  - [ ] MX848001E-13 Higher-Order Modulation (Release 7)
  - [ ] MX848001E-14 2x2 MIMO (Release 7)

### Key Benefits

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<tr>
<th>Rel-7 &amp; 8 Features</th>
<th>Increased peak data rate</th>
<th>Reduced user plane latency</th>
<th>Increased cell capacity</th>
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MD8480C W-CDMA Signalling Tester

Product Configuration (2/4)
- Supports 3GPP Rel-8/9/10 with following options
  - MX848001E-15 HSPA Evolution for uplink (Release 8)
  - MX848001E-16 DC-HSDPA (Release 8)
  - MX848001E-17 64QAM and MIMO for HSDPA (Release 8)
  - MX848001E-18 DB-DC-HSDPA (Release 9)
  - MX848001E-20 DC-HSUPA (Release 9)
  - MX848001E-21 MC-HSDPA (Release 10)

<table>
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<td>MC-HSDPA</td>
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Product Configuration (3/4)

- Upgrade from MD8480A/B
  - Main-frame upgrade
    - Z1181A/B MD8480B to HSPA Evo Main-Frame Upgrade
      - Upgrades RF Module, Frame Coder/Decoder and Tx/Rx Baseband (installed as standard) for HSPA Evo by upgrading MD8480A/B main frame to MD8480C (Z1181A for 1RF configuration, Z1181B for 2RF configuration)
  - BTS Unit upgrade
    - Z1187A BTS Evolution Upgrade
      - Upgrades additional BTS unit (MU848058A Rx baseband on slide 2 and 3) for HSPA Evolution
      - Requires all BTS unit upgrades at upgrade
### Product Configuration (4/4)

- **Upgrade from MD8480C**
  - **Main-frame upgrade**
    - Z1183A/B MD8480C to HSPA Evo Main-Frame Upgrade
      - Upgrades RF module, L2 unit and 1st BTS unit (installed as standard) of MD8480C main frame for HSPA Evolution (Z1183A for 1RF configuration and Z1183B for 2RF configuration)
  - **BTS Unit upgrade**
    - Z1187A BTS Evolution Upgrade
      - Upgrades additional BTS unit (MU848072C/C1 BTS unit on slides 2, 3, and 4) for HSPA Evolution
      - Requires all BTS unit upgrades at upgrade

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<th>MD8480C</th>
<th>New RF1</th>
<th>New RF2</th>
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<tr>
<td>Timing Generator</td>
<td>BTS #1 (Option)</td>
<td>BTS #2 (Option)</td>
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<td>BTS #3 (Option)</td>
<td>L2</td>
<td>TDMA (Option)</td>
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<td>Blank</td>
<td>ISDN (Option)</td>
<td>Voice Coder</td>
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<td>CPU</td>
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Option Configuration

Examples

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<th>No.</th>
<th>Configuration</th>
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<td>1</td>
<td>New MD8480C Release 7 2x2 MIMO (28Mbps) Minimum</td>
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<tr>
<td>2</td>
<td>New MD8480C Release 8 64QAM + DC-HSDPA (42Mbps) Minimum</td>
</tr>
<tr>
<td>3</td>
<td>Upgrade - MD8480C HSDPA 2BTS to Rel-7 2x2 MIMO</td>
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<tr>
<td>4</td>
<td>Upgrade - MD8480C HSDPA 3BTS to Rel-8 DC-HSDPA</td>
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<td>5</td>
<td>Upgrade - MD8480A/B 2BTS to Rel-7 2x2 MIMO</td>
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<tr>
<td>6</td>
<td>Upgrade - MD8480A/B 3BTS to Rel-8 DC-HSDPA</td>
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<tr>
<th>Minimum Config (incl. 1BTS)</th>
<th>Hardware Upgrade</th>
<th>Hardware Option</th>
<th>Software Option</th>
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<td>Z1221 1 Year Support Service(W/G/HSPA)</td>
<td>Z1222 2 Year Support Service(W/G/HSPA)</td>
<td>Z1223 MD8480C Software CD-ROM</td>
<td>Z1224 11 Year Support Service(W/G/HSPA)</td>
<td>Z1225 2 Year Support Service(W/G/HSPA)</td>
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*1: Use in combination with MX848041C-xx or MX848041E-xx when using MX848001C-xx or MX848001E-xx.
*2: Package support option (for all systems). Integrated with MD8480C-SS120, SS121, SS122, SS123 and SS124, SS125.
*3: MD8480C software CD-ROM provides newest firmware and instruction manuals required at hardware upgrade.
MD8480C W-CDMA Signalling Tester

Features (1/3)

- Data transfer tests for DL speed of 42 Mbps\(^1\)
  supported by 3GPP Release 10
  - Throughout tests using external FTP server
  - Layer 1, Layer 2 Trace Log and Throughput Monitor
  - TCP/IP Traffic Analysis using general analysis software

*\(^1\): 63Mbps for L1 testing
*\(^2\): 23Mbps for L1 testing
**Features (2/3)**

- Supports 3GPP Rel-7 / 8 / 9 / 10 UE categories
  - New hardware supporting DL 64QAM, and UL 16QAM modulation schemes as well as 2x2 MIMO
  - Supports 64QAM & MIMO (Cat. 20), DC-HSDPA (Cat. 24) and DB-DC-HSDPA (Cat. 24)
  - Supports DC-HSDPA with MIMO (Cat. 26*)
  - Supports DC-HSUPA (UL Cat. 8)
  - Supports MC-HSDPA (Cat. 29*)

*1 : Limitation Max Throughput

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### Table: FDD HS-DSCH physical layer categories

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<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/Serving HS-DSCH</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 and aggregated cell operation</th>
<th>Supported modulations with MIMO operation with aggregated cell operation</th>
<th>Maximum Throughput [bits/s]</th>
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## Features (3/3)

- 3GPP Rel-7, Rel-8 and Rel-9 support at low extra investment
  - Customized options tailored to HSPA Evolution service
  - Maintain compatibility and current investment by adding expanded functions with minimum extra cost

<table>
<thead>
<tr>
<th>Type</th>
<th>Function Test</th>
<th>High-Speed Data</th>
<th>MIMO Test</th>
<th>DC-HSDPA Test</th>
<th>DB-DC-HSDPA Test</th>
<th>DC-HSPA(DL/UL)</th>
<th>MC-HSDPA(DL/UL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported</td>
<td>CPC</td>
<td>CPC</td>
<td>CPC</td>
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<td>CPC</td>
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<td>CPC</td>
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<tr>
<td>Function</td>
<td>Enhanced Cell FACH L2 improvement, CS Voice Over HSPA</td>
<td>Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA 2x2MIMO</td>
<td>Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA DC-HSDPA</td>
<td>Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA DC-HSDPA</td>
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</tbody>
</table>


<table>
<thead>
<tr>
<th>Max. Data Speed</th>
<th>14Mbps(DL) 5Mbps(UL)</th>
<th>21Mbps(DL) 11Mbps(UL)</th>
<th>28Mbps(DL) 11Mbps(UL)</th>
<th>42Mbps(DL) 11Mbps(UL)</th>
<th>42Mbps(DL) 11Mbps(UL)*1</th>
<th>42Mbps(DL)*2 11Mbps(UL)*1</th>
</tr>
</thead>
</table>

*1: 23Mbps for L1 testing
*2: 63Mbps for L1 testing
MD8480C W-CDMA Signalling Tester

Roadmap

- MX848001E-16 DC-HSDPA
- MX848001E-13/14 HOM / MIMO
- MX848001E-15 HSPA Evolution for UL
- MX848001E-17 64QAM and MIMO
- MX848001E-18 DB-DC-HSDPA
- MX848001E-20 DC-HSUPA
- MX848001E-21 MC-HSDPA

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

HSPA (Rel-7) → HSPA Evolution (Rel-8) → Rel-9

MD8430A LTE Signalling Tester

20 MHz BW OFDMA MIMO

DC-HSUPA

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

HSPA/LTE Inter-System Handover

LTE

HSPA & LTE

Slide 24

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