

HSPA Evolution Version

MD8480C

W-CDMA Signalling Tester

MD8480C W-CDMA Signalling Tester Product Introduction (HSPA Evolution Version)

Ver. 9.00

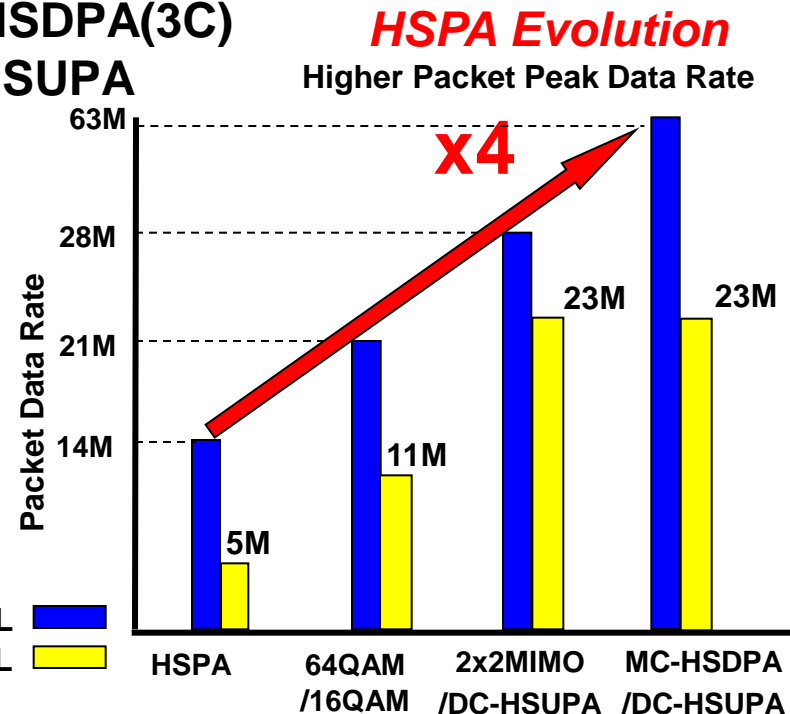
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Contents

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- Benefits of HSPA Evolution
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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



Slide 3

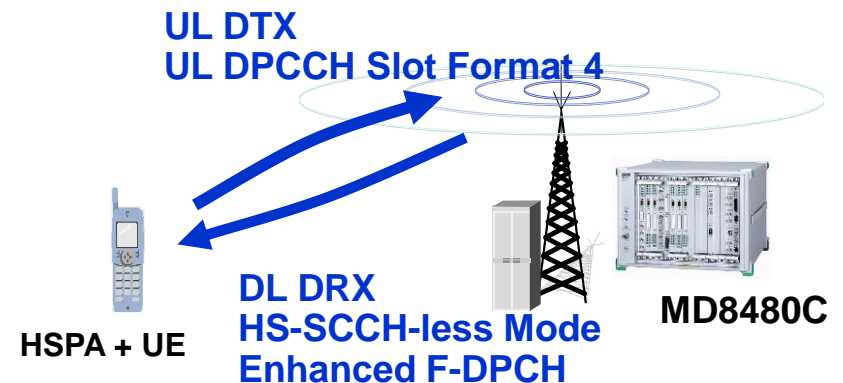
Benefits of HSPA Evolution

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

Rel-7, Rel-8, Rel-9, Rel-10 Features	Key Benefits	Increased peak data rate	Reduced user plan latency	Increased cell capacity	Increased UE battery life
	CPC		x	x	x
	Enhanced Cell FACH	x	x		
	L2 improvement	x		x	
	HOM(64QAM/16QAM)	x			
	2x2 MIMO	x			
	CS Voice over HSPA			x	x
	E-UL for Cell FACH	x	x		
	Improved L2 for UL	x		x	
	HS-DSCH Serving Cell Change Enhancemnet	x		x	
	Dual Cell HSDPA	x			
	64QAM and MIMO	x			
	DB-DC-HSDPA	x			
	DC-HSUPA	x			
MC-HSDPA	x				

HSPA Evolution Function Overview (1/10)

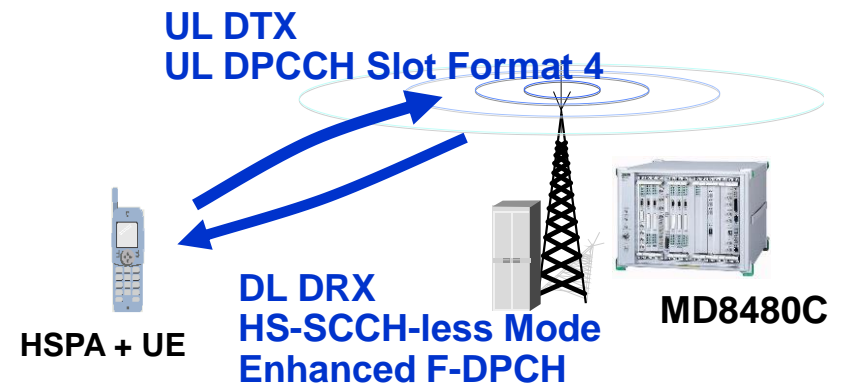
- **CPC (Continuous Packet Connectivity, Rel-7)**
 - ◆ **UL DTX**
 - Burst transfer of uplink DPCCH signal to reduce uplink overhead
 - ◆ **DL DRX**
 - Transfer of downlink signals (HS-SCCH, HS-PDSCH) at specified timing to reduce UE power consumption



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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**



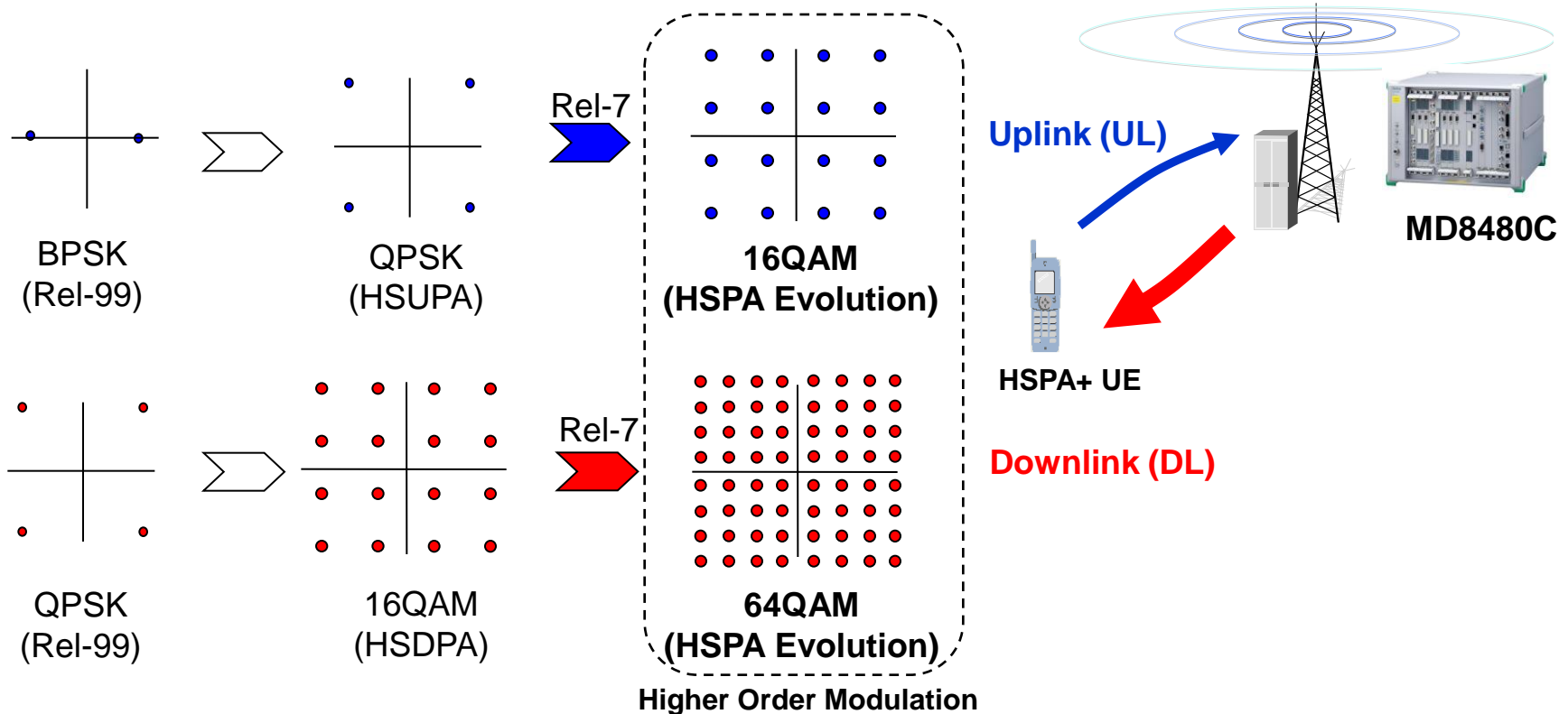
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HSPA Evolution Function Overview (3/10)

- **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**

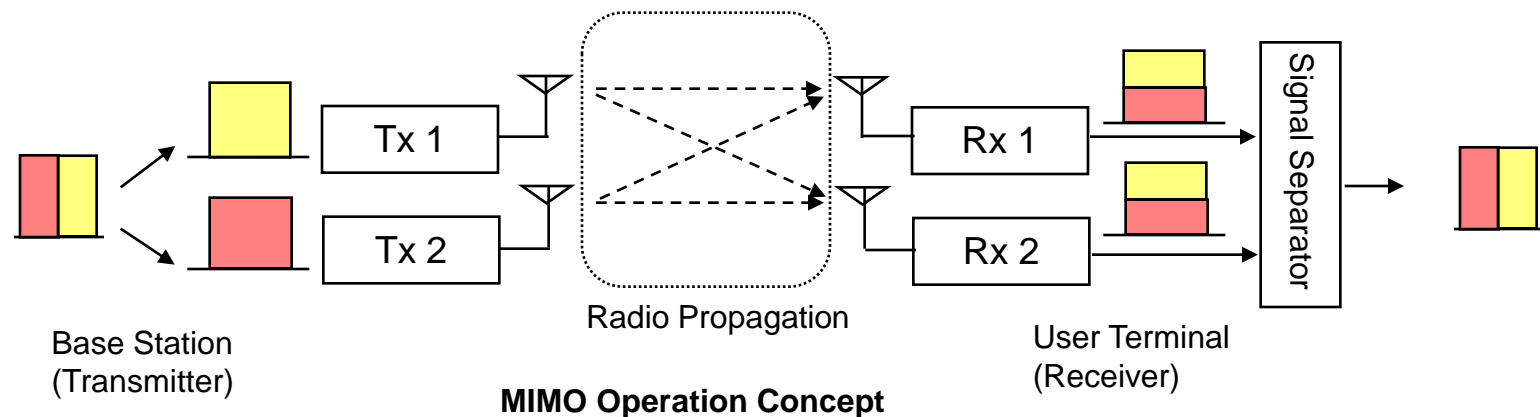
HSPA Evolution Function Overview (4/10)

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



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**



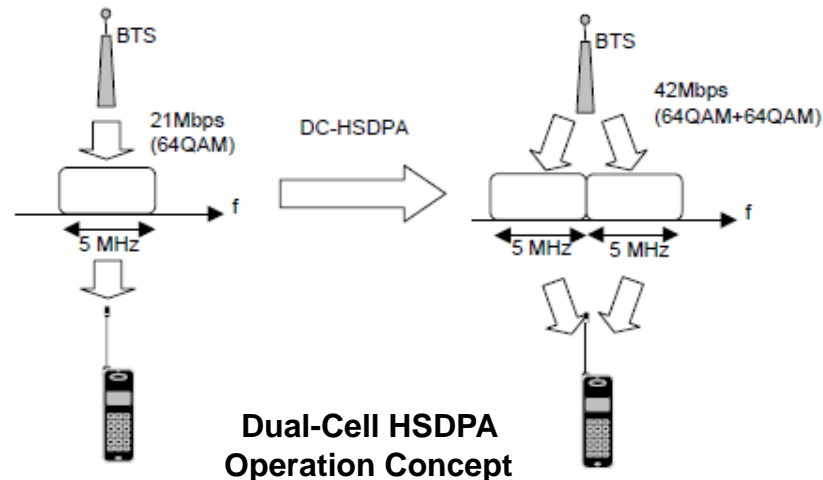
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HSPA Evolution Function Overview (6/10)

- **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)

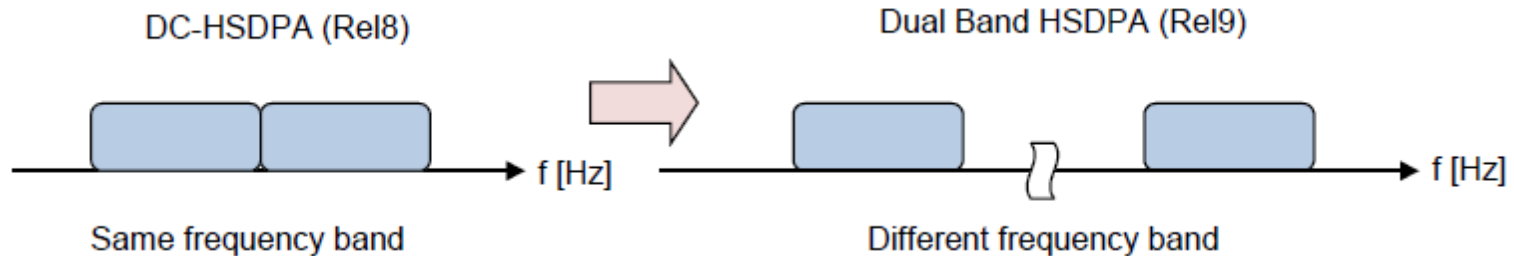
- **64QAM and MIMO (Rel-8)**
 - ◆ Enables maximum 42 Mbps download speed combined with 64QAM and MIMO specified by UE Category 20
- **DC-HSDPA (Dual Cell HSDPA) (Rel-8)**
 - ◆ Supports maximum 42 Mbps download speed with dual-cell using doubled bandwidth (5 MHz x 2) of HSDPA specified by UE Category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



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HSPA Evolution Function Overview (8/10)

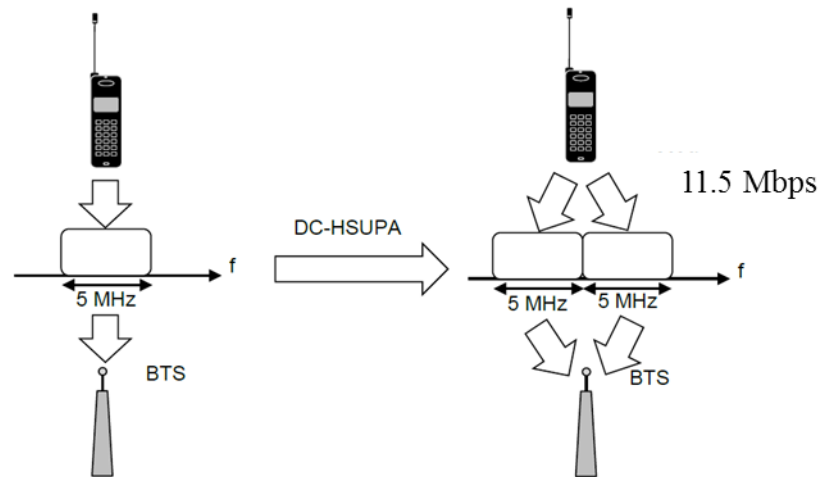
- DB-DC (Different Bands for Dual Cell) HSDPA (Release9)
 - ◆ DB-DC (Different Bands for Dual Cell) HSDPA (Release 9)
 - While the DC-HSDPA function is used for frequencies in the same band, the DB-DC-HSDPA function is useful for telecoms with multiple frequency bands where each carrier is transmitted in a different frequency band, achieving a max. data packet DL speed of 42 Mbps.



DB-DC-HSDPA
Operation Concept

HSPA Evolution Function Overview (9/10)

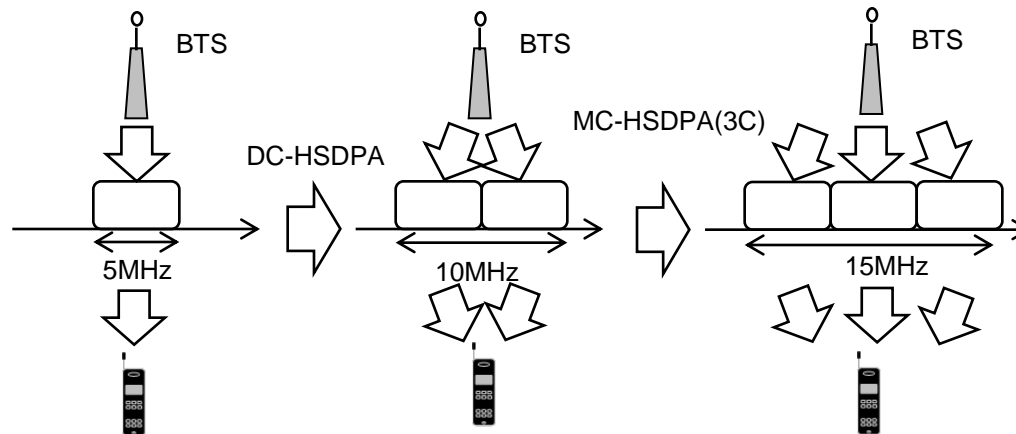
- DC (Dual Cell) - HSUPA (Release9)
 - ◆ DC-HSUPA is capable of receiving UL data to be paired DC-HSDPA. It is a new technology achieving higher packet communications by doubled frequency bandwidth (5 MHz x 2) of existing HSUPA channel. It supports maximum data throughput 11.5 Mbps (Category 8) in UL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



DC-HSUPA Operation Concept

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)).

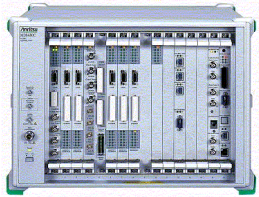


MC-HSDPA Operation Concept

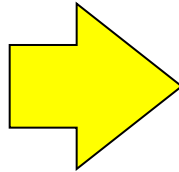
MD8480C W-CDMA Signalling Tester

Product Lineup

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



MD8480C
(HSPA)



MD8480C
(HSPA Evolution)

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 (Release9) 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 (Release10) 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

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*1: 23Mbps for L1 testing

*2: 63Mbps for L1 testing

MD8480C W-CDMA Signalling Tester

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)**

Rel-7 & 8 Features	Key Benefits	Increased peak data rate	Reduced user plane latency	Increased cell capacity	Increased UE battery life
	CPC		X	X	X
	Enhanced Cell FACH	X	X		
	L2 Improvement	X		X	
	CS Voice over HSPA			X	X
	HOM (64QAM/16QAM)	X			
	MIMO	X			

Blue arrow pointing to C-12

Red arrow pointing to E-13

Green arrow pointing to E-14

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)

Key Benefits	Increased peak data rate	Reduced user plane latency	Increased cell capacity	Increased UE battery life
Enhanced UL for Cell FACH	X	X		
Improved L2 for UL	X		X	
HS-DSCH Serving Cell Change Enhancement	X		X	
Dual Cell HSDPA	X			
64QAM and MIMO for HSDPA	X			
DB-DC-HSDPA	X			
DC-HSUPA	X			
MC-HSDPA	X			

Rel-8, Rel-9, Rel-10 Features

E-15

E-16

E-17

E-18

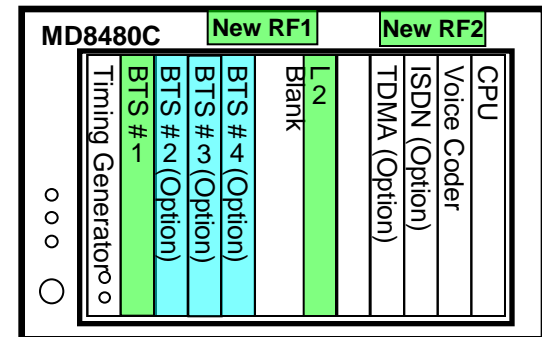
E-20

E-21

MD8480C W-CDMA Signalling Tester

Product Configuration (3/4)

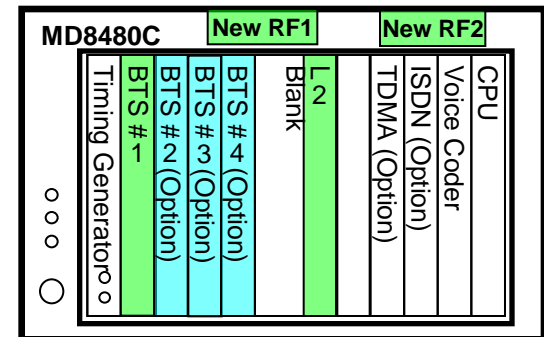
- Upgrade from MD8480A/B
 - ◆ Main-frame upgrade
 - Z1181A/B MD8480B to HSPA Evo Main-Frame Upgrade
 - Upgrades RF Module, Frame Coder/Decoder and Tx/Rx Baseband (installed as standard) for HSPA Evo by upgrading MD8480A/B main frame to MD8480C (Z1181A for 1RF configuration, Z1181B for 2RF configuration)
 - ◆ 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



MD8480C W-CDMA Signalling Tester

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



MD8480C W-CDMA Signalling Tester

Option Configuration

● Examples

Number: Qty

No.	Configuration	Minimum Config (incl. 1BTS)							Hardware Upgrade			Hardware Option							Software Option					Others						
		MD8480C W-CDMA Signalling Test	MU848051A CPU	MU848056A Voice Codec	MU848071E L2 Evolution	MU848072E BTS Evolution	MU848073C Timing Generator	Z1190A	MD8480C 1st RF Unit 3	Z1181A/B MD8480B to HSPA Evolution Mainframe Upgrade	Z1183A/B MD8480C to HSPA Evolution Mainframe Upgrade	Z1187A BTS Evolution Upgrade	MU848072E BTS Evolution	MU848072C-01 HSDPA	MU848072C-02 HSUPA	MD8480C-04 Additional RF Unit 3	MU848060C TDMA2	MU848060C-01 EGPRS(R99)	MU848077C BIU	MX848001C-12/MX848041C-12 HSPA Evolution (Rel-7)	MX848001E-13/MX848041E-13 Higher Order Modulation (Rel-7)	MX848001E-14/MX848041E-14 2x2 MIMO (Rel-7)	MX848001E-15/MX848041E-15 HSPA Evolution for Uplink (Rel-8)	MX848001E-16/MX848041E-16 DC-HSDPA (Rel-8)	MX848041E Firmware for Ciphering	MX848041E-10 HSDPA Ciphering	MX848045C GSM/GPRS2 Ciphering	MD8480C-SS150/SS151 1 Year Support Service(W/G/HSPA)	MD8480C-SS250/SS251 2 Year Support Service(W/G/HSPA)	Z1217A/Z1218A MD8480C Software CD-ROM
1	New MD8480C Release 7 2x2 MIMO (28Mbps) Minimum	1										1	2	2	1				1		1				1 ^{*1}	1		1 ^{*2}		1 ^{*3}
2	New MD8480C Release 8 64QAM + DC-HSDPA (42Mbps) Minimum	1											1	1					1	1		1	1	1 ^{*1}	1		1 ^{*2}		1 ^{*3}	
3	Upgrade - MD8480C HSDPA 2BTS to Rel-7 2x2 MIMO									1	1			2					1		1			1 ^{*1}	1		1 ^{*2}		1 ^{*3}	
4	Upgrade - MD8480C HSDPA 3BTS to Rel-8 DC-HSDPA									1	2			3					1	1		1	1	1 ^{*1}	1		1 ^{*2}		1 ^{*3}	
5	Upgrade - MD8480A/B 2BTS to Rel-7 2x2 MIMO									1	1		2	2					1		1			1 ^{*1}	1		1 ^{*2}		1 ^{*3}	
6	Upgrade - MD8480A/B 3BTS to Rel-8 DC-HSDPA									1	2		3	3					1	1		1	1	1 ^{*1}	1		1 ^{*2}		1 ^{*3}	

*1: Use in combination with MX848041C-xx or MX848041E-xx when using MX848001C-xx or MX848001E-xx.

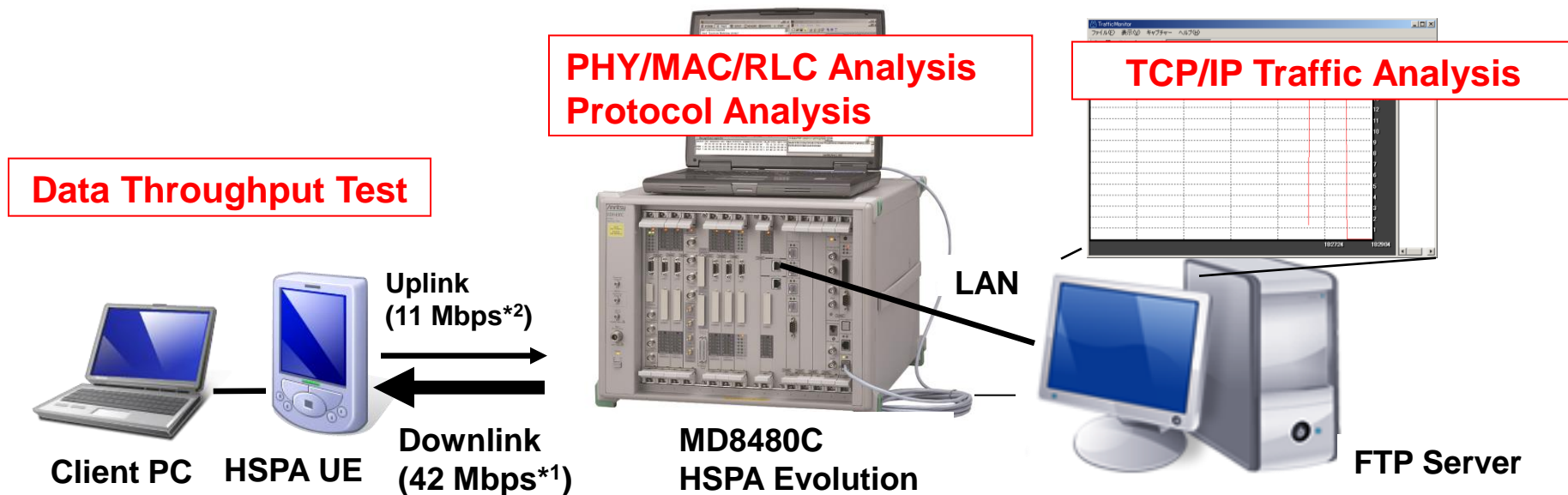
*2: Package support option (for all systems). Integrated with MD8480C-SS120, SS121, SS122, SS123 and SS124, SS125.

*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



Slide 21

MD8480C-E-L-4

*1: 63Mbps for L1 testing

*2: 23Mbps for L1 testing

MD8480C W-CDMA Signalling Tester

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*1)
- ◆ Supports DC-HSUPA (UL Cat. 8)
- ◆ Supports MC-HSDPA (Cat. 29*1)

*1 : Limitation Max Throughput

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

HS-DSCH category	Maximum number of HS-DSCH codes received	Minimum inter-TTI interval	Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI	Total number of soft channel bits	Total Number of Serving/S secondary serving HS-DSCH	Supported modulations without MIMO operation or aggregated cell operation	Supported modulations with MIMO operation and without aggregated cell operation	Supported modulations without MIMO operation with aggregated cell operation	Supported modulations with MIMO operation and aggregated cell operation	Maximum Throughput [bits/s]	
Category 13	15	1	35280	259200	1	QPSK, 16QAM, 64QAM	Not Applicable (MIMO not supported)			17,640,000	
Category 14	15	1	42192	259200	1					21,096,000	
Category 15	15	1	23370	345600	1					11,685,000	
Category 16	15	1	27952	345600	1					13,976,000	
Category 17	15	1	35280	259200	1	QPSK, 16QAM, 64QAM	-	Not Applicable (aggregated carriers operation not supported)	Not applicable (simultaneous aggregated carriers and MIMO operation not supported)	17,640,000	
			23370	345600	1	-	QPSK, 16QAM			23,370,000	
Category 18	15	1	42192	259200	1	QPSK, 16QAM, 64QAM	-			21,096,000	
			27952	345600	1	-	QPSK, 16QAM			27,952,000	
Category 19	15	1	35280	518400	1	QPSK, 16QAM, 64QAM				35,280,000	
Category 20	15	1	42192	518400	1					42,192,000	
Category 21	15	1	23370	345600	2	-	-	QPSK, 16QAM		23,370,000	
Category 22	15	1	27952	345600	2					27,952,000	
Category 23	15	1	35280	518400	2			QPSK, 16QAM, 64QAM			35,280,000
Category 24	15	1	42192	518400	2						42,192,000
Category 25	15	1	23370	691200	2	-	-	-	QPSK, 16QAM	46,740,000	
Category 26	15	1	27952	691200	2				-	-	-
Category 27	15	1	35280	1036800	2	-	-	-	QPSK, 16QAM, 64QAM	70,560,000	
Category 28	15	1	42192	1036800	2					-	-
Category 29	15	1	42192	777600	3			QPSK, 16QAM, 64QAM	-	63,288,000	

MD8480C W-CDMA Signalling Tester

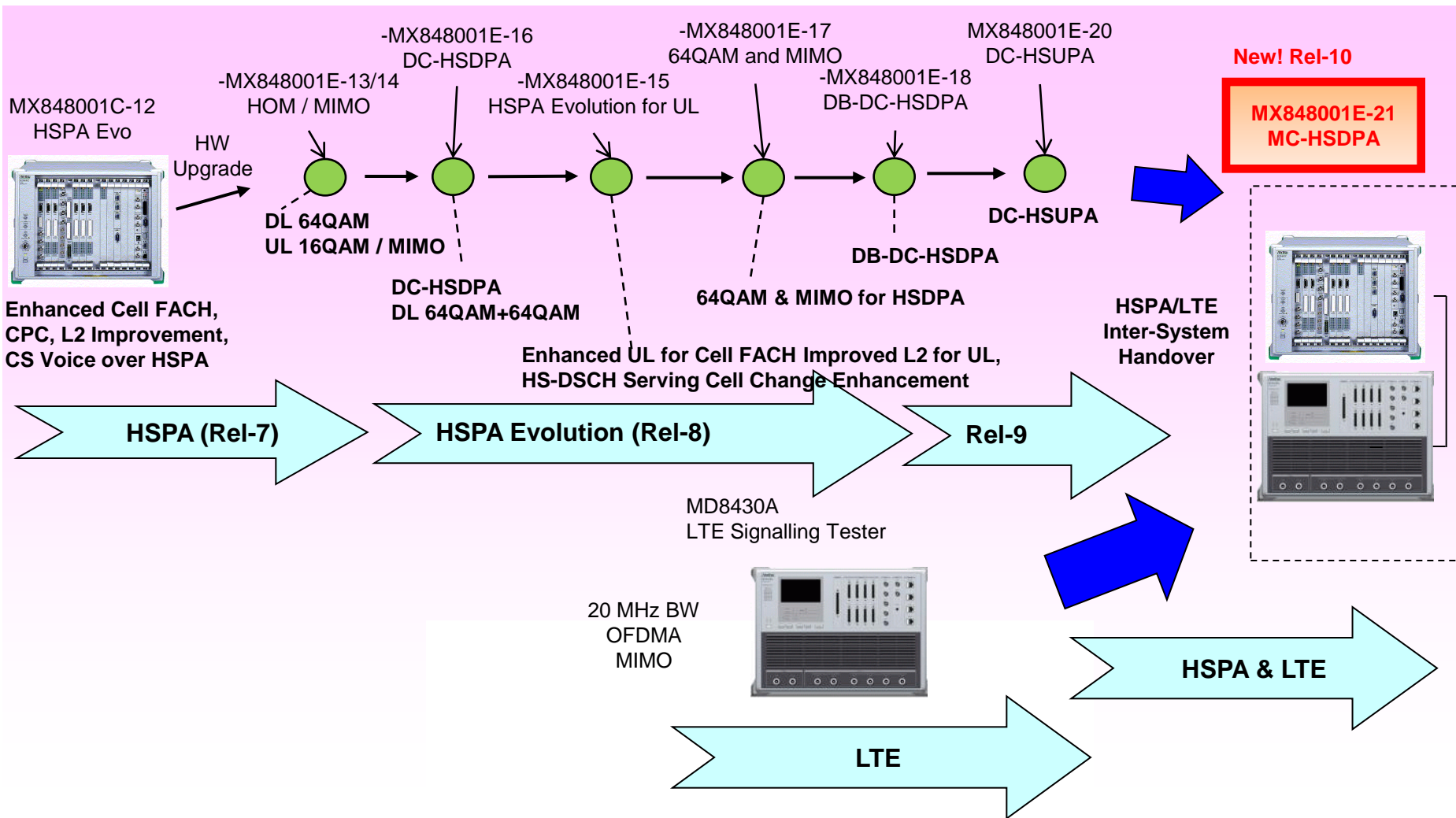
Features (3/3)

- 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

Type	Function Test	High-Speed Data	MIMO Test	DC-HSDPA Test	DB-DC-HSDPA Test	DC-HSPA(DL/UL)	MC-HSDPA(DL/UL)
Supported Function	CPC Enhanced Cell FACH L2 improvement, CS Voice Over HSPA	CPC Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA	CPC Enhanced Cell FACH L2 improvement CS Voice Over HSPA 2x2MIMO	CPC Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA DC-HSDPA	CPC Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA DC-HSDPA DB-DC-HSDPA	CPC Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA DC-HSDPA DC-HSUPA	CPC Enhanced Cell FACH L2 improvement 64QAM 16QAM CS Voice Over HSPA DC-HSDPA DC-HSUPA MC-HSDPA
Supported Function	MX848001C-12 HSPA Evolution	MX848001C-12 HSPA Evolution MX848001E-13 Higher Order Modulation	MX848001C-12 HSPA Evolution MX848001E-14 2x2MIMO	MX848001C-12 HSPA Evolution MX848001E-13 HOM MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA	MX848001C-12 HSPA Evolution MX848001E-13 HOM MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA MX848001E-18 DB-DC-HSDPA	MX848001C-12 HSPA Evolution MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA MX848001E-20 DC-HSUPA	MX848001C-12 HSPA Evolution MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA MX848001E-18 DB-DC-HSDPA MX848001E-20 DC-HSUPA MX848001E-21 MC-HSDPA
Upgrade	MX848001C-12 HSPA Evolution	HW upgrade MX848001C-12 HSPA Evolution MX848001E-13 Higher Order Modulation	HW upgrade MX848001C-12 HSPA Evolution MX848001E-14 2x2MIMO	HW upgrade MX848001C-12 HSPA Evolution MX848001E-13 HOM MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA	HW upgrade MX848001C-12 HSPA Evolution MX848001E-13 HOM MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA MX848001E-18 DB-DC-HSDPA	HW upgrade MX848001C-12 HSPA Evolution MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA MX848001E-20 DC-HSUPA	HW upgrade MX848001C-12 HSPA Evolution MX848001E-15 HSPA Evolution for UL MX848001E-16 DC-HSDPA MX848001E-18 DB-DC-HSDPA MX848001E-20 DC-HSUPA MX848001E-21 MC-HSDPA
Max. Data Speed	14Mbps(DL) 5Mbps(UL)	21Mbps(DL) 11Mbps(UL)	28Mbps(DL) 5Mbps(UL)	42Mbps(DL) 11Mbps(UL)	42Mbps(DL) 11Mbps(UL)	42Mbps(DL) 11Mbps(UL)*1	42Mbps(DL)*2 11Mbps(UL)*1

MD8480C W-CDMA Signalling Tester

Roadmap



Slide 24

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