

Product Brochure

Anritsu

For MD8470A Signalling Tester

MX847016A

Multi-cell Network Simulator



Mobile Terminal Service Quality and Call Connectivity Tests during Handover



Following the sudden worldwide expansion in 2/2.5G GSM/ GPRS/ EGPRS, rollout of next-generation 3/3.5G W-CDMA/ HSDPA/ HSUPA mobile communication standards is starting in earnest. This complex mixture of 2/2.5/3/3.5G mobile networks increases the need for assured service quality and call connectivity as mobile terminals move between base-station cells.

Moreover, the general testing and verification phase of mobile terminals requires effective solutions for performing service quality, call connectivity and stability tests at handover between cells, while field tests must assure roaming services between multiple carriers in different countries.

Anritsu's MX847016A Multi-cell Network Simulator (MNS) simulates an interactive 2-cell environment for W-CDMA/ HSDPA/ HSUPA, and GSM/GPRS/EGPRS mobile networks with an easy-to-use graphical user interface (GUI) for setting the network parameters to test mobile handover and cell selection/reselection functions.

Installing the MX847016A option in one MD8470A offers a personal benchtop environment for verifying handover and cell selection/reselection functions in a 2-cell environment emulating most of the world's main mobile communication standards. Service quality, call connectivity, stability, etc., during handover are all easy to verify with high repeatability using this cost-effective test solution.

Key Multi-cell Network Simulator Applications

- Verify mobile terminal service quality and call connectivity at handover
- Verify roaming services between national carriers
- Perform pre-verification before field tests
- Perform comprehensive verification at integration tests of UMTS terminals
- Evaluate throughput performance at switching between cells supporting different data rates, as well as mobile terminal user interface (UI)
- Verify call connectivity by simulating various carrier networks

MX847016A

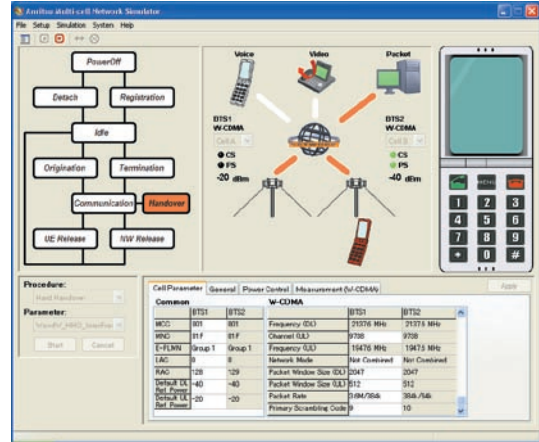
Multi-cell Network Simulator



Simulates Interactive 2-cell Environment

MX847016A Multi-cell Network Simulator (MNS)

The MNS software application runs on the MD8470A to simulate an interactive 2-cell environment. Since the bearer starts in response to requests from the mobile terminal connected to the MD8470A, call processing for each service type is achieved easily in a 2-cell environment. Tests of handover as the mobile terminal moves between cells as well cell selection and reselection to register with a suitable cell can be performed. The GUI-based operations set various network and communication parameters flexibly using system configuration settings for two base stations, cell parameter settings for up to 10 cells and test condition settings for cell switching.

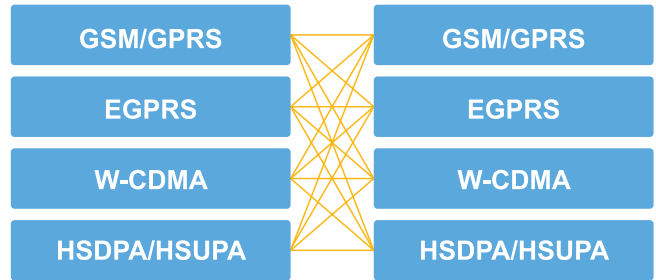


MNS (Multi-cell Network Simulator)

Features

Small Footprint Platform Supporting World Networks

One MD8470A with this software supports a 2-cell test environment for the GSM/GPRS/EGPRS and W-CDMA/HSDPA/HSUPA communication standards worldwide. Even foreign services and bearers can be tested easily at the benchtop. Verifying mobile terminal operation during handover between cells at the early development stage helps cut field test workloads and post-installation troubleshooting.



Stable, Reproducible Test Environment

Unlike live networks that are influenced by various external factors, the MD8470A is a stable, high-reproducibility test environment. Specifying each communications condition and cell switching parameter allows users to easily verify service quality, call connectivity, and stability during handover between cells at any timing. The MNS offers a stable test environment with high reproducibility and allows users to test subscribers' mobile terminal operations easily. Moreover, protocol logs saved during testing help with later debugging.



Easy Handover and Roaming Simulation

Various network parameters for target cells, such as MCC/MNC/LAC/RAC, bands, communication standards, and data rate, can be set freely by GUI operations. Call connectivity tests at handover between cells as well as roaming tests between national carriers are simulated to troubleshoot mobile terminal problems easily without needing to write complex test scripts. Simplified system settings help support high-efficiency testing.

Cell Selection, Reselection & Handover Tests

The MNS performs cell selection, reselection and handover tests. In addition to roaming verifications when moving between different national carriers, the MNS can also verify the quality of high-speed packet-based multimedia services by installing the MX847010A-01 EGPRS Software, MX847010A-11 HSDPA Software, and MX847010A-12 HSUPA Software options. Since one MD8470A with these software options closely emulates the real service environment, it greatly improves work efficiency at pre-verification of field tests.

W-CDMA/HSDPA/HSUPA (2-Cell)

- Cell Selection
- Cell Reselection
- Handover
 - Soft Handover
 - Inter-frequency Hard Handover
 - Intra-frequency Hard Handover
 - Voice Call (AMR: Handset, Loopback)
 - Video Call (Loopback)
 - Packet Call (DL384k/UL64k to DL7.2M/UL2.0M)
 - Multi-call (Voice + Packet, Video + Packet)

GSM/GPRS/EGPRS (2-Cell)

- Cell Selection
- Cell Reselection
- Inter-frequency Hard Handover
 - Voice Call (EFR/FR*/HR*/AMR: Handset, Loopback)
 - Packet Call (GPRS, EGPRS)

*: FR/HR only support Loopback

W-CDMA/HSDPA/HSUPA, GSM/GPRS/EGPRS (2-Cell/InterRAT)

- Cell Selection
- Inter-system Cell Reselection
- Inter-system Handover
 - Voice Call* (W-CDMA ↔ GSM)
 - Packet Call
 - (W-CDMA/HSDPA/HSUPA ↔ GSM/GPRS/EGPRS)

*: Voice call only support Loopback

Flexible Network Parameter Settings

Cell Parameter Settings for up to 10 Cells

Using the MNS, network parameters can be specified for up to 10 cells (Cell A to Cell J) that can be pre-set as Non-Camping Cells during testing to perform handover and cell reselection. The MNS supports mobile terminal operation verifications at switching to the specified cell. Also, it can be applied to verify measurement of throughput performance according to changes in packet data rate and to evaluate the mobile terminal user interface by performing handover between Cell A: Rel. 5 (Cat. 8) to Cell B: Rel. 5 (Cat. 6) to Cell C: Rel. 99 as an example.

Parameter	Cell A	Cell B	Cell C	Cell D	Cell E	Cell F
Standard	W-CDMA	GSM/GPRS	GSM/GPRS	GSM/GPRS	GSM/GPRS	GSM/GPRS
MCC	262	262	262	262	262	262
MNC	001	100	100	100	100	100
Equivalent PLMN Group	Group 1	Group 1	Group 1	Group 1	Group 1	Group 1
LAC	1	1	1	1	1	1
PLMN	100	100	100	100	100	100
Default DL Net Power	-48	-48	-48	-48	-48	-48
Default UL Net Power	-36	0	0	0	0	0
W-CDMA						
Band	Band 1 #FDD1500	Band 1 #FDD1500	Band 1 #FDD1500	Band 1 #FDD1500	Band 1 #FDD1500	Band 1 #FDD1500
Channel ECU	1488	1072	1088	1088	1072	1072
Frequency ECU	2155.8 MHz	1147.8 MHz	1157.8 MHz	1157.8 MHz	1147.8 MHz	1147.8 MHz
Channel ECU	9768	9768	9768	9768	9768	9768
Frequency ECU	1920.8 MHz	1920.8 MHz	1920.8 MHz	1920.8 MHz	1920.8 MHz	1920.8 MHz
Network Mode of Operation	Not Configured	Not Configured	Not Configured	Not Configured	Not Configured	Not Configured
Packet Window Size (SU)	256	256	256	256	256	256
Packet Window Size (LU)	256	256	256	256	256	256
Packet Rate	DL384k/UL64k	DL144k/UL384k	DL384k/UL64k	DL384k/UL64k	DL384k/UL64k	DL384k/UL64k
Priority Scheduling Class	10	9	9	10	11	10
GSM/GPRS						
Band	P-GSM850	P-GSM900	P-GSM850	P-GSM900	P-GSM900	P-GSM900
CGSN APN	30	30	30	30	30	30
CGSN Frequency ECU	850.0 MHz	900.0 MHz	850.0 MHz	900.0 MHz	900.0 MHz	900.0 MHz
CGSN Frequency LU	854.0 MHz	895.0 MHz	855.0 MHz	895.0 MHz	895.0 MHz	895.0 MHz
TCN APN	40	40	40	40	40	40
TCN Frequency ECU	850.0 MHz	900.0 MHz	900.0 MHz	900.0 MHz	900.0 MHz	900.0 MHz
TCN Frequency LU	850.0 MHz	895.0 MHz	895.0 MHz	895.0 MHz	895.0 MHz	895.0 MHz
MCC	262	262	262	262	262	262
MNC	1	2	3	4	5	6
Network Mode of Operation	Not Configured	Not Configured	Not Configured	Not Configured	Not Configured	Not Configured

Cell Parameter Setup

Test Condition Settings at Cell Switching

The MNS Test Parameter Editor function makes it easy to select test types and set cell switching conditions for each test. The simple GUI allows users to configure various condition settings such as power control for Camping Cell/Non-Camping Cell, measurement control for Hard/Soft Handover, and barred cell status and registration timeout setting for Cell Selection/Reselection.

Test Parameter Editor

File Parameter Option

Procedure: W-CDMA & W-CDMA

Parameter List:

- WandW_HHO_InterFreq
- WandW_HHO_InterFreq_Meas
- WandW_HHO_IntraFreq
- WandW_HHO_IntraFreq_Meas

General | Power Control | Measurement (W-CDMA)

Measurement Control

Event Parameters

Intra Frequency:

Event Type	Reporting Constan	Hysteresis
<input type="checkbox"/> Event 1A	5	0
<input type="checkbox"/> Event 1B	5	0
<input type="checkbox"/> Event 1C	—	0
<input type="checkbox"/> Event 1D	—	0

Inter Frequency:

Event Type	Threshold (own)	Threshold (other)	Hysteresis
<input type="checkbox"/> Event 2A	—	-30	0
<input type="checkbox"/> Event 2B	-30	-30	0
<input type="checkbox"/> Event 2C	—	-30	0
<input type="checkbox"/> Event 2D	-30	—	0

C:\Program Files\Anritsu\substf\MX847016A\MNS\TstParam

Test Parameter Editor

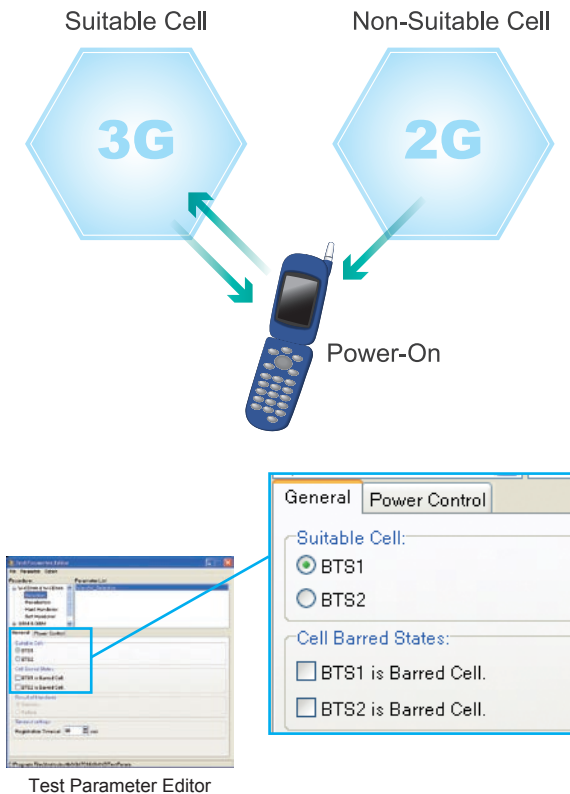
Cell Selection Test

About Cell Selection Test

When a mobile terminal is switched on, it selects a suitable cell using the PLMN, barred conditions, downlink signal level, etc., of each cell and then tests registration with that cell. The test for confirming that the mobile terminal selects a suitable cell is called the Cell Selection Test.

Cell Selection Test

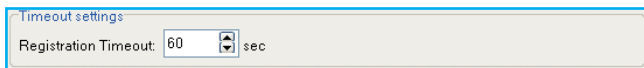
The MNS allows users to configure various conditions such as a suitable cell where registration should be performed, downlink power level, barred cell status for each cell as BTS1 and BTS2. This supports simple verification of whether a suitable cell is selected at registration after power-on.



Test Parameter Editor

Registration Timeout Setting

The wait time of the message (W-CDMA; RRC Connection Request, GSM: CHANNEL REQUEST) sent by the mobile terminal can be specified from 30 to 120 s when registration is performed for the cell selection/ reselection test.



Timeout Settings

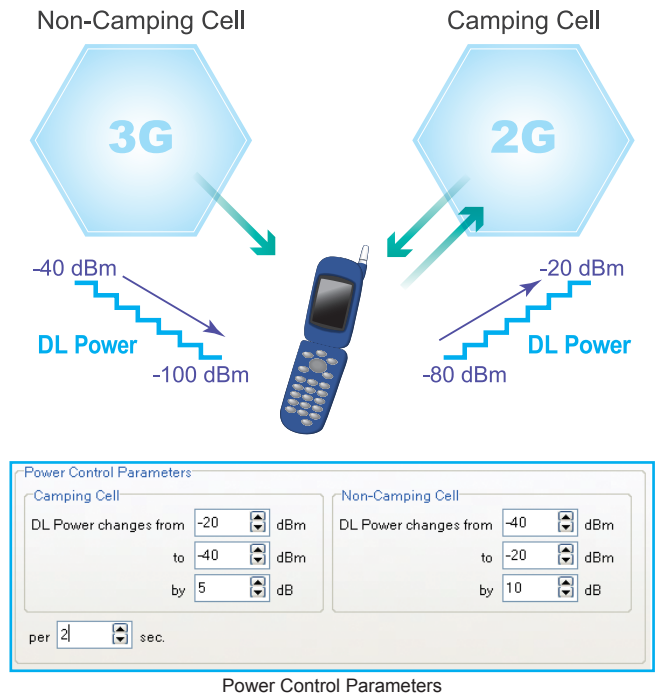
Cell Reselection Test

About Cell Reselection Test

If the mobile terminal cannot use the service after completing registration, it may sometimes change the suitable cell depending on the barred conditions and downlink signal level of each cell. In this case, the mobile terminal reselects a suitable cell based on the E-PLMN List, and PLMN, barred conditions and downlink signal level of each cell and then tests registration again with that new cell. The test for confirming that the mobile terminal reselects a suitable cell is called the Cell Reselection Test.

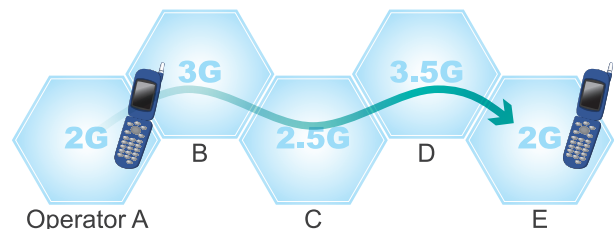
Cell Reselection Test

After registration is completed, the power [dBm] when the downlink signal starts, the final targeted power [dBm], the power change steps [dB] and the power step change period [s] as well as the barred cell status can all be set for each cell of BTS1 and BTS2. This supports simple verification of whether a suitable cell is reselected after registration.



Power Control Parameters

Furthermore, since cell parameters including MCC/MNC/LAC/RAC and Band can be preset for up to 10 cells (Cell A to Cell J), a test environment that emulates roaming between national carriers is easily configured. Using the MNS to perform effective debugging before field tests helps to cut post-installation troubleshooting workloads.



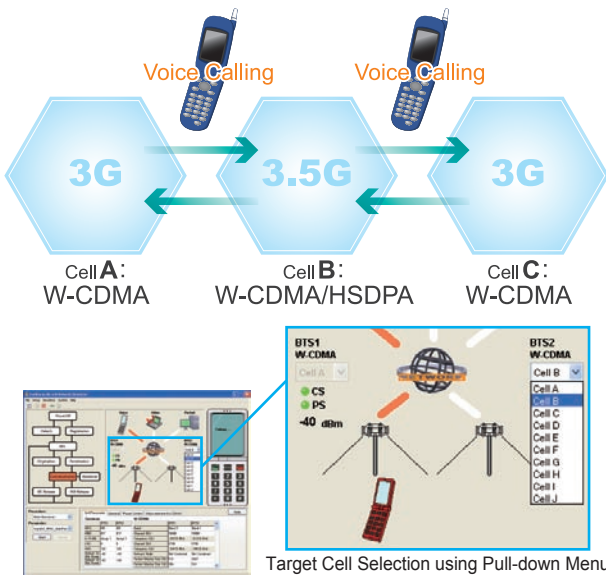
Handover Test

About Handover Test

When a mobile terminal is using a service, it sometimes switches to another cell depending on changes in the downlink signal level. The mobile terminal reselects the suitable cell using the downlink signal level and tries to continue the service while switching to the new cell according to instructions from the network. The test for confirming that the mobile terminal can maintain service while switching between cells is called the Handover Test.

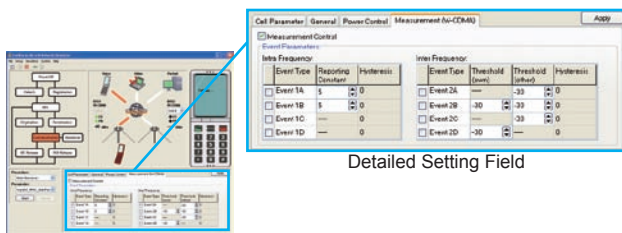
Handover Reliability Test

The MNS tests whether the call connection (voice call, video call, packet call, multi-call) can be maintained in an environment where handover occurs repeatedly. Switching between pre-set cells is performed according to the cell parameters so the mobile terminal call connection reliability and stability can be tested efficiently, helping debugging before field tests and lightening post-installation troubleshooting workloads.



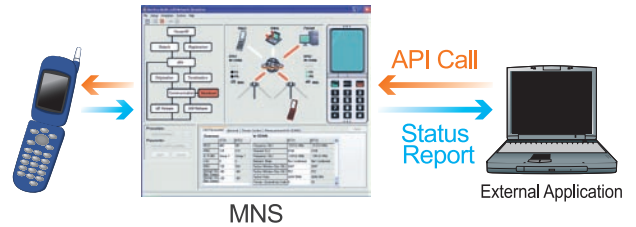
Setting Non-Camping Cell Parameters during Testing

The Details Setting Field is used to display and edit the network parameters and test settings for each selected cell. The MCC/MNC/LAC/RAC and Band, packet data rate, Power Control, and Measurement Control settings can all be easily changed during testing to increase test work efficiency.



Remote Control Interface

The MNS supports remote control using the dedicated functions of the MX847010A external control library (RmtSvcLib.dll), making it easy to configure an automated test system by calling the API from external applications.

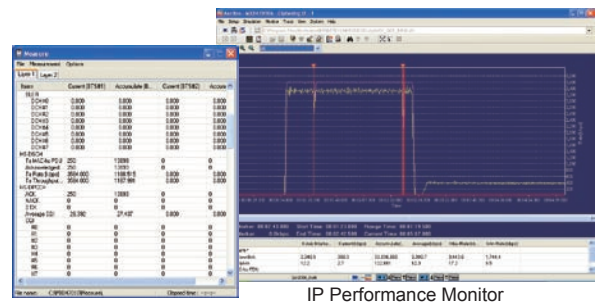
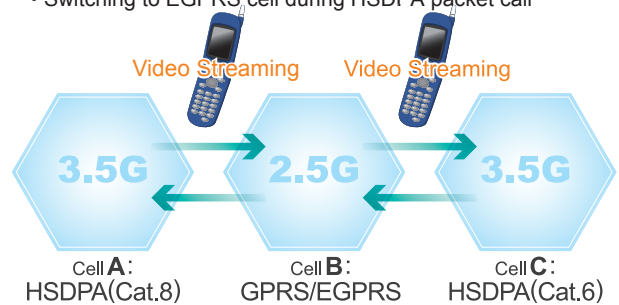


Network Service Selection Test

The MNS can be used to test whether the mobile terminal switches as intended when performing network service selection during voice call, packet call, and multi-calling. In addition, the throughput performance at switching to a cell supporting a different packet rate can be tested along with evaluation of the mobile terminal user interface.

(Examples)

- Switching to different packet rate cell during multi-call (HSDPA/3.6M + Voice → W-CDMA/384k + Voice)
- Switching to different voice codec cell during GSM voice call (GSM/AMR → GSM/EFR)
- Switching to W-CDMA cell during HSDPA packet call
- Switching to EGPRS cell during HSDPA packet call



Main Functions

MX847016A Multi-cell Network Simulator (MNS)

Supported Bearers	W-CDMA/HSDPA ^{*1} /HSUPA ^{*2}		Voice (MO/MT), Packet data (MO), PPP [built-in server] packet data (MO), Video [Loopback] (MO/MT), Multi-call (Voice+Packet, Video+Packet)	
	GSM/GPRS/EGPRS ^{*3}		Voice (MO/MT), Packet data (MO)	
Setting Parameters	Simulation Parameter Setup	Simulation Model	W-CDMA/W-CDMA W01-W01, W03-W03: Cell Selection/Reselection, Hard Handover, Soft Handover GSM/GSM G01-G01: Cell Selection/Reselection, Hard Handover W-CDMA/GSM W01-G01: Cell Selection/Reselection, Hard Handover	
		Common	Security: ON/OFF/Fake Handset: Handset or Loopback	
		IP Address	Client IP address, Server IP address, Router connection setting	
		USIM	USIM Parameter: Test USIM MODE, K, RAND, AUTN, IK	
	Cell Parameter Setup	Common	Communications standard: W-CDMA or GSM/GPRS MCC/MNC/Equivalent PLMN Group/LAC/RAC Initial DL Ref. Power: -120 to -20 dBm Initial UL Ref. Power: -40 to +30 dBm	
		W-CDMA HSDPA HSUPA	Band: I, II, III, IV, V, VI, VII, VIII, IX, X, Not specified Channel: DL/UL NMO: Combined Attach, Not Combined Attach Packet Window Size: DL/UL Packet Rate: DL384k/UL64k, DLHS-Auto/UL384k, DL1.8M/UL384k, DL3.6M/UL384k, DL7.2M/UL384k, DLHS-Auto/ULHS-Auto, DL1.8M/UL1.46M, DL1.8M/UL2.0M, DL3.6M/UL1.46M, DL3.6M/UL2.0M, DL7.2M/UL1.46M, DL7.2M/UL2.0M Primary Scrambling Code: 0 to 511	
		GSM GPRS EGPRS	Band: GSM450, GSM480, GSM850, P-GSM900, E-GSM900, R-GSM900, DCS1800, PCS1900 ARFCN (CCH, TCH) NCC: 0 to 7 BCC: 0 to 7 NMO: Combined Attach, Not Combined Attach Voice Codec: EFR, FR (Loopback), HR (Loopback), AMR Packet connection type selection: GPRS, EGPRS, NO GPRS (cell not using PS) Slot: DL1/UL1, DL2/UL1, DL3/UL1, DL4/UL1, DL1/UL2, DL2/UL2, DL3/UL2, DL1/UL3, DL2/UL3, DL1/UL4 GPRS Coding Scheme: CS1, CS2, CS3, CS4 EGPRS Modulation and Coding Scheme DL: MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8, MCS9 UL: MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7, MCS8, MCS9	
	Test Parameter Editor	General	Suitable Cell: BTS1, BTS2 (Cell Selection tests only) Cell Barred States: Barred Cell ON/OFF settings (Cell Selection/Reselection tests only) Results of Handover: Success, Failure (Hard HO/Soft HO tests only) Registration Timeout: 30 to 120 s (Cell Selection/Reselection tests only)	
		Power Control	Test start downlink power: -120 to -20 dBm (Camping Cell, Non-Camping Cell) Test end downlink power: -120 to -20 dBm (Camping Cell, Non-Camping Cell) Power change step: 1 to 100 dB (Camping Cell, Non-Camping Cell) Power change step cycle: 1 to 30 s (Camping Cell, Non-Camping Cell)	
		Measurement (Hard HO/Soft HO tests only)	Measurement Control: ON or OFF Event Parameters: W-CDMA 2-Cell Hard Handover Intra Frequency: Event Type, Reporting Constant, Hysteresis Inter Frequency: Event Type, Threshold (own), Threshold (other), Hysteresis Event Parameters: W-CDMA 2-Cell Soft Handover Intra Frequency: Event Type, Reporting Constant, Hysteresis Event Parameters: GSM 2-Cell Handover Threshold: Own, Other Event Parameters: W-CDMA/GSM InterRAT Handover Event Parameters (W-CDMA): Event Type, Threshold (own), Threshold (other), Hysteresis Threshold (GSM): Own, Other	
	Cell Test Items	Test Procedure	W-CDMA/W-CDMA	Cell Selection, Cell Reselection, Hard Handover, Soft Handover
			GSM/GSM	Cell Selection, Cell Reselection, Hard Handover
			W-CDMA/GSM	Cell Selection, Cell Reselection, Hard Handover

*1: MX847010A-11: HSDPA Software option separately required

*2: MX847010A-12: HSUPA Software option separately required

*3: MX847010A-01: EGPRS Software option separately required

