Anritsu Advancing beyond

SmartStudio NR MX800070A

Radio Communication Test Station

MT8000A

Statement

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This presentation provides an overview of Anritsu's short and long-term development plans.

This presentation are based upon development times, market trends, and customer requirements; they may be subject to partial amendments as requirements change.

To ensure that our products match market demands, we always value input from our customers.

Contents

Contents

5G Network Architecture Deployment

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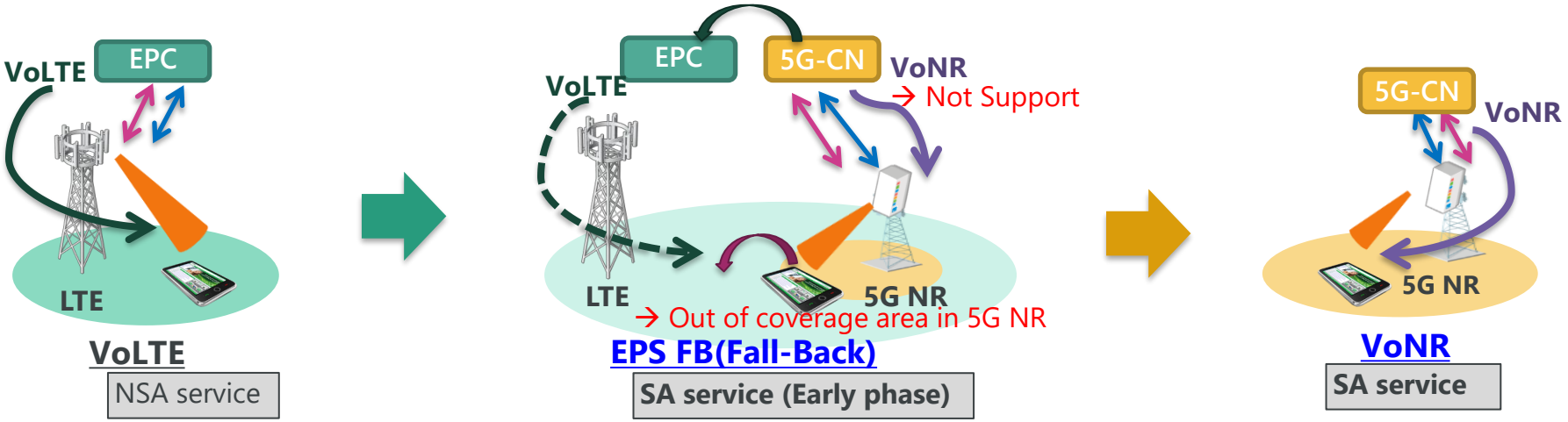
Option	SA/NSA	Structures			Official Terminology	
		Core Network	CP/UP	Add UP		
Option 1	SA	EPC(LTE)	LTE	-	E-UTRA	
Option 2	SA	**5G-CN(NR)**	NR	-		SA
Option 3/3a/3x	NSA	EPC(LTE)	LTE	NR	EN-DC (E-UTRA-NR Dual Connectivity)	NSA
Option 4/4a	NSA	5G-CN(NR)	NR	LTE		
Option 5	SA	5G-CN(NR)	LTE	-		
Option 6	SA	EPC(LTE)	NR			
Option 7/7a	NSA	5G-CN(NR)	LTE	NR		
Option 8/8a	NSA	EPC(LTE)	NR	LTE		

The voice application required for the handset has also will be changed from current VoLTE.



Mainstream voice services during the 5G introduction stage

5G-based device application testing will be required

Common Platform for Overall Mobile R&D/Mfg. Cycle

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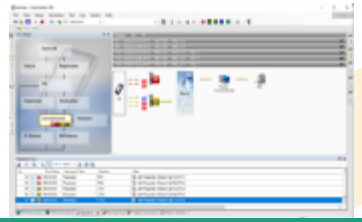
MX800070A SSNR



Smart Device Integration
Application Test/SW Maintenance

ME7873NR
RF Conformance test system

RF Conformance Test

MX800010A RF Meas.

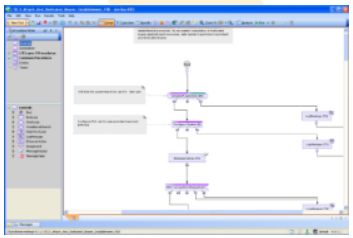
RF Performance Verification

MT8000A
Radio Communication Test Station

ME7834NR
5G NR Mobile Device Test Platform

Protocol Conformance Test
Carrier Acceptance Test

MX800050A RTD



5G

Chipset/Protocol Development

MX800040A
NR mmW Production Test

MT8870A
Universal Wireless test set

Volume Production

Comprehensive Set of Hardware & Options

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Flexible modular architecture for various test need

MT8000A-001 Control Module
Control for each MT8000A module

MT8000A-012 Data Test Module
Simulate U-plane stack with built-in IP generator

MT8000A-011 Baseband Module
Simulate full-stack 5G NR gNB signaling.

MT8000A-020 RF Base Module
RF Base module for mmW RF TRx.

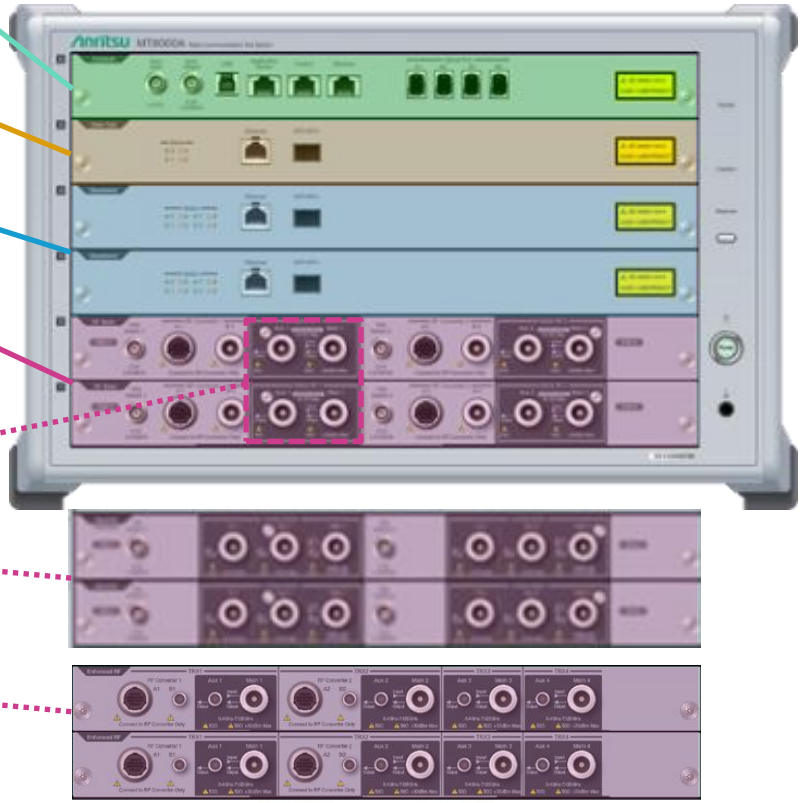
RF Sub Modules : Installed on RF Base Module

MT8000A-021 0.4GHz-6GHz RF Sub Module
RF module for Sub-6GHz RF TRx. (4Tx, 4Rx, 2SLOT).

MT8000A-031/032 Multi RF Module
RF module for Sub-6GHz RF TRx. (8Tx, 4Rx, 2SLOT).

MT8000A-033 Enhanced RF Module
8Tx/4Rx per slot, 0.4GHz to 7.125GHz, + converter IF

MT8000A Mainframe



RF Converter for mmWave

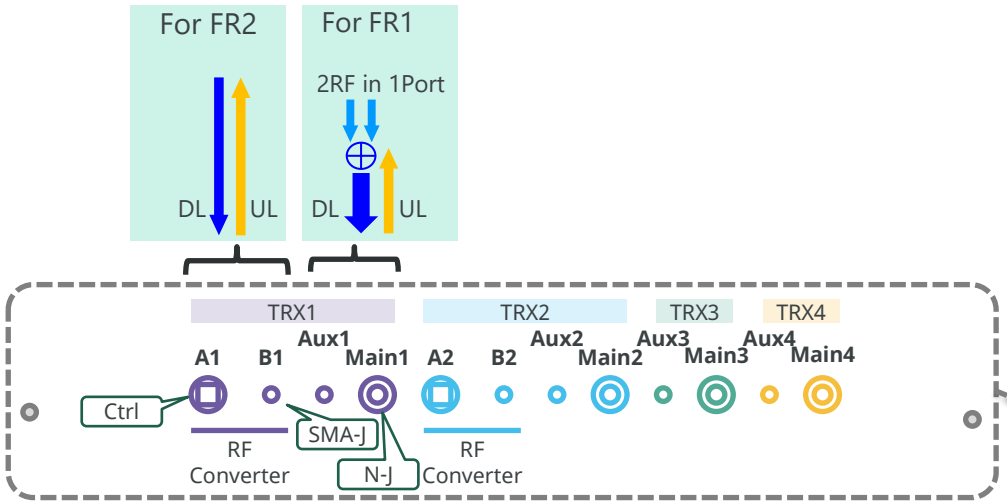
MA80003A Multiband RF Converter
Supports FR2 frequency range external up converter

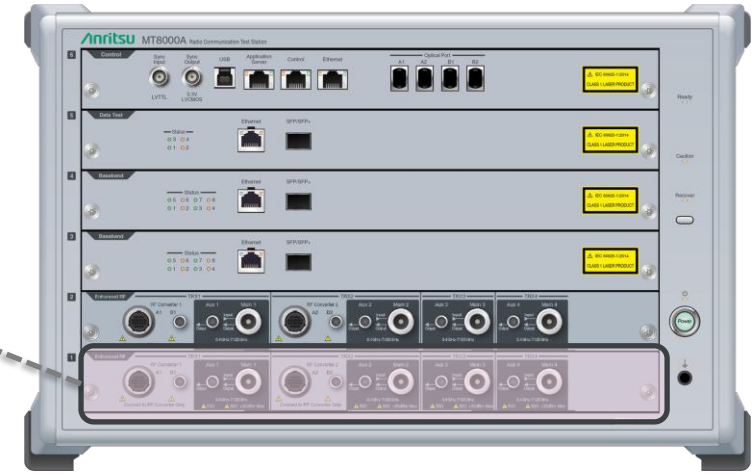
FR2 RF Converter

New RF Module MT8000A-033

- Features
  - RF Ports: **4 sets of RF input/output connectors per slot** (N type Main In/Out and SMA type Aux Out)
  - Tx: **8 RF transmitters per slot** (totally 16 Tx in a box, 4x4 MIMO 4 bands available)
  - Rx: **4 RF receivers per slot** (totally 8 Rx in a box, for UL 2x2 MIMO and UL antenna switch)
  - Frequency range: **FR1 : 400 MHz to 7125 MHz, FR2: Depends on RF converter**
- Input/output (FR1, FR2 : Ports/slot)
  - FR1 : 4 Ports/slot (Main1/2/3/4 – RF In/Out, Aux1/2/3/4 – RF Out (exclusive with Main output))
  - FR2 : 2 Ports/slot (RF Converter1/2 – MA8000xA connection)
- Transmitter
  - FR1 Bandwidth : **OBW 800 MHz (IBW 1200 MHz)**
  - FR2 Bandwidth : **1000 MHz**
  - FR1 Upper freq: 4Tx are up to 7125 MHz, remaining 4Tx are up to 5000 MHz
- Receiver
  - Receive waveform bandwidth Standard **800 MHz** / extended up to 1200 MHz
  - Signal analysis bandwidth Standard **800 MHz** / Max 1200 MHz

Output/Input for FR1 or FR2





5G Chipset & UE Test Platform

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MT8000A
Radio Communication Test Station

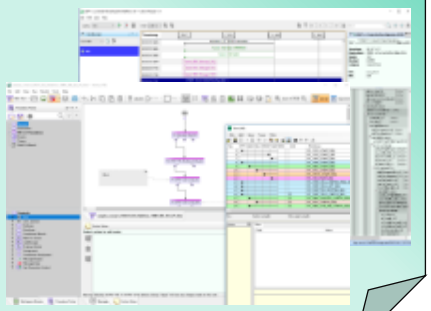
5GNR ALL in ONE test platform.

Possible to install each application in one platform and just switch by system number

Platform GUI

Test Applications

Protocol Test



MX800050A
Rapid Test Designer Platform (RTD)

RF Test

MX800010A
TRx Measurement.

Functional Test

MX800070A
SmartStudio NR (SSNR)

Contents

SmartStudio NR MX800070A

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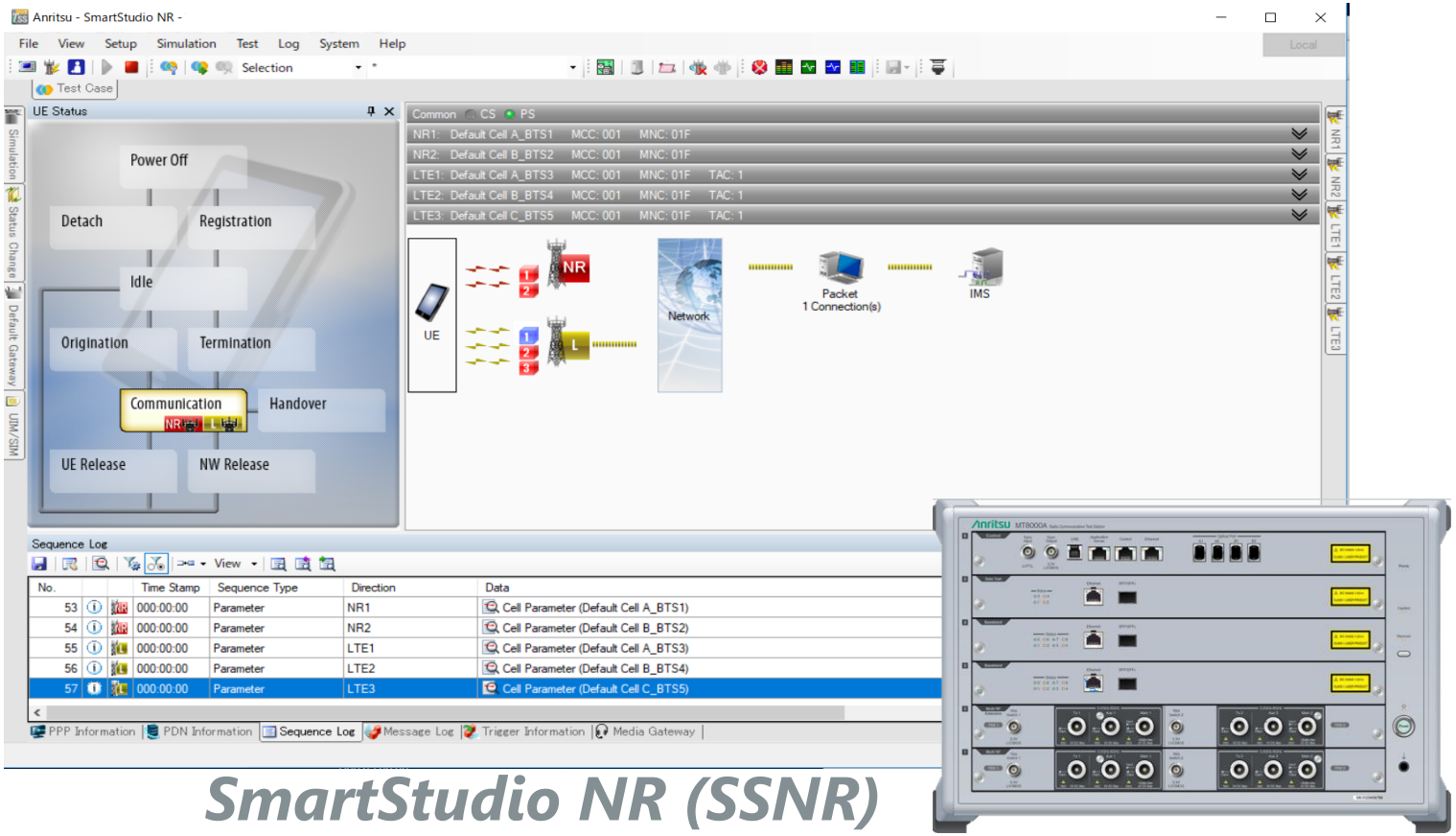
Easy Operation with State-machine GUI for 5G device function test



SmartStudio NR (SSNR)

- Interactive 5G(NSA/SA) test environment **without any complex test scripts**
- Network parameter settings matching user test environment
- Included IMS server for SIP based application test
- Unique graphical SMS/PWS Centre applications for SMS/CMAS/ETWS service

SmartStudio NR -Easy Operation with State-machine-

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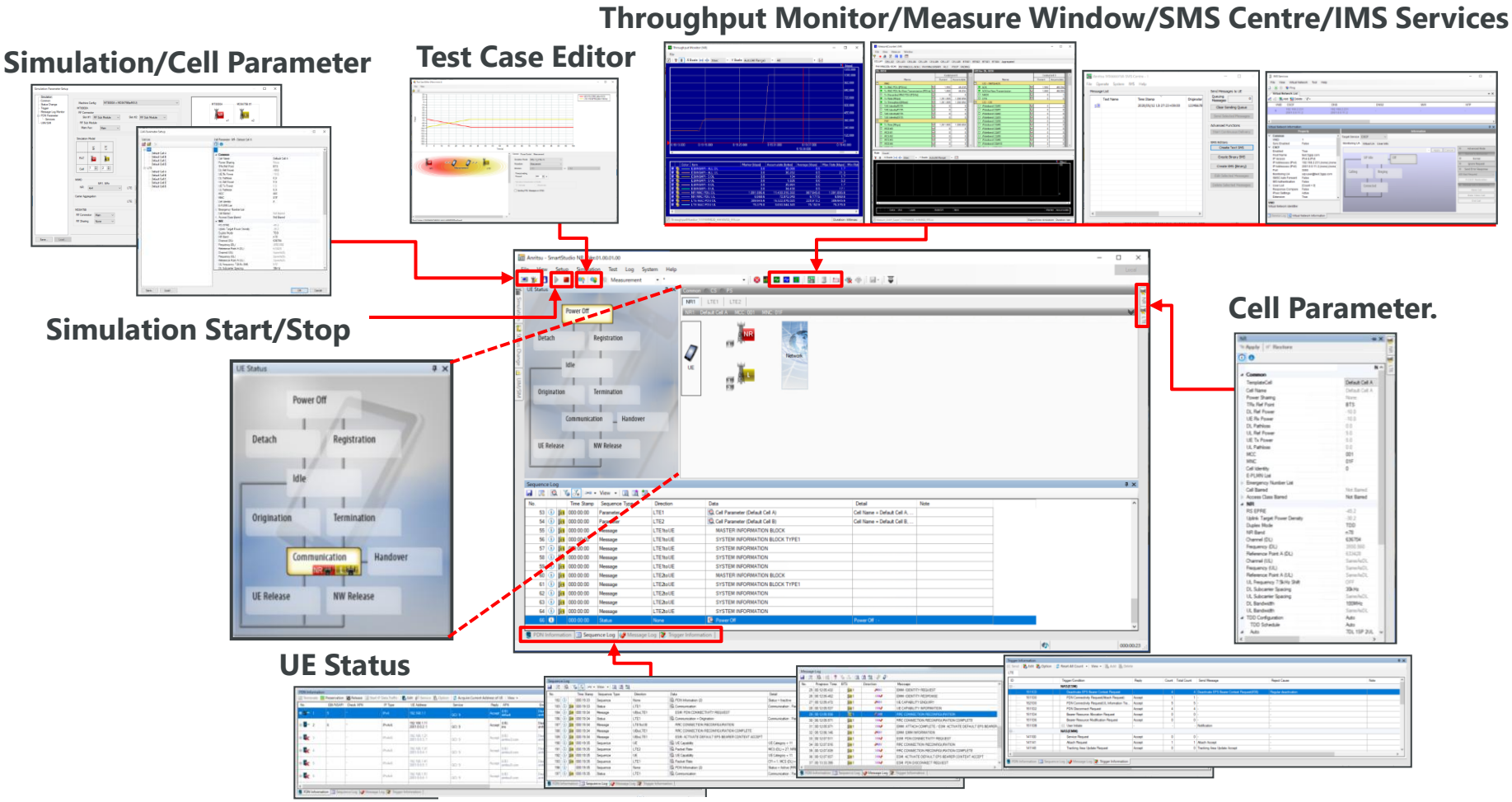
Multiple GUI windows are provided to efficiently analyze test settings and results according to the test application.



SmartStudio NR -Easy Operation with State-machine-

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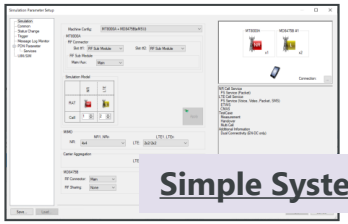
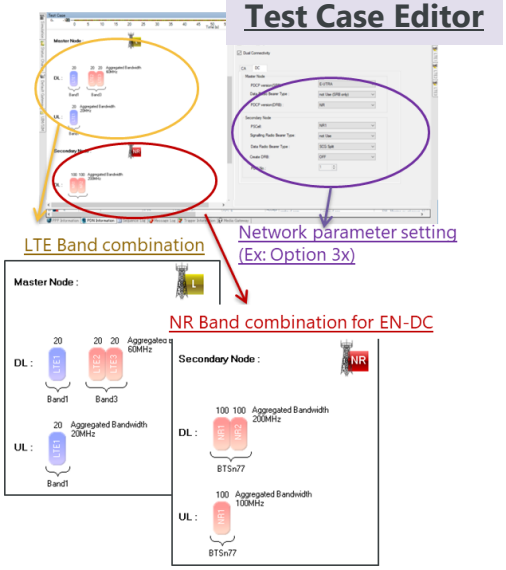
Easy setup of 5G network environment

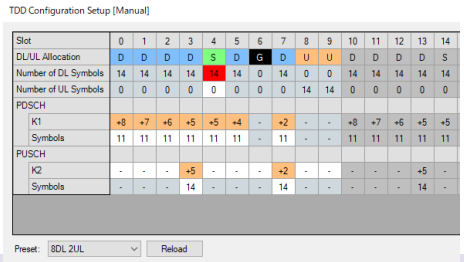
✓Easy to use and easy to understand GUI for system setting.
✓Simple setting for multi-cell test by GUI based Test Case Editor
✓Supports simple TDD setting to simulate each network.



Simple System Setting

Test Case Editor

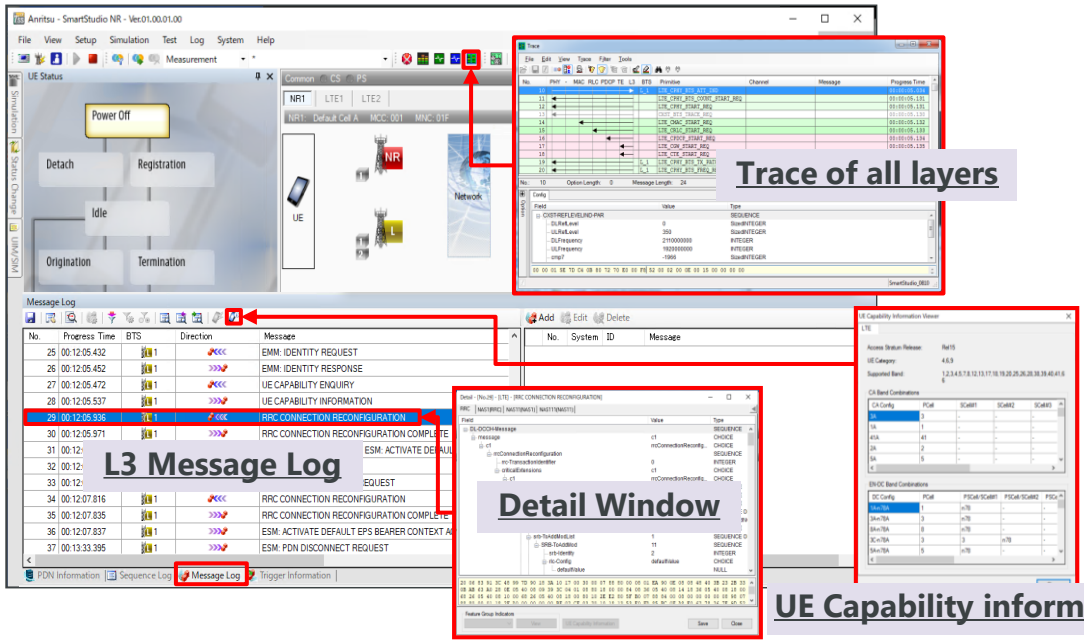




NR TDD Configuration Setup

Supports effective analysis by real-time logging

✓L3 Message log
✓L3 Message detail window
✓UE Capability information



Trace of all layers

L3 Message Log

Detail Window

UE Capability information

Covers All Kind of 5G Device Test Demand

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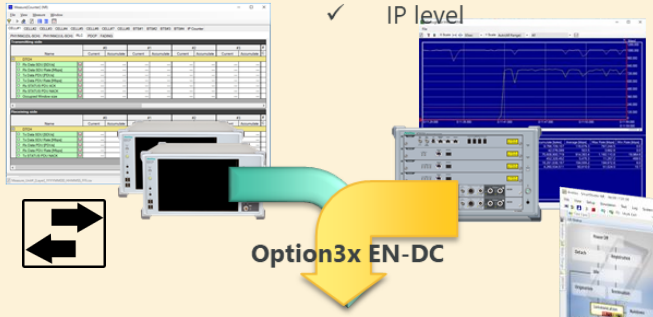
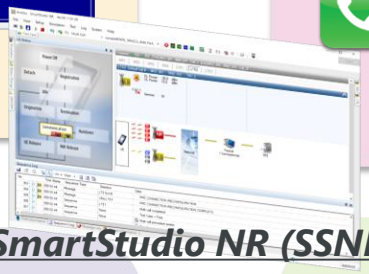
Contribute to 5G device UX improvement with SSNR

T-put performance

Measurement counter
- ✓ ACK, NACK, DTX
- ✓ CQI

T-put monitor
- ✓ MAC level (LTE, NR)
- ✓ IP level

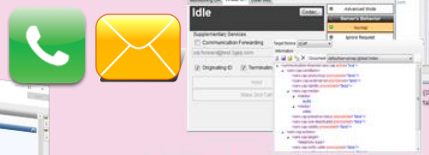




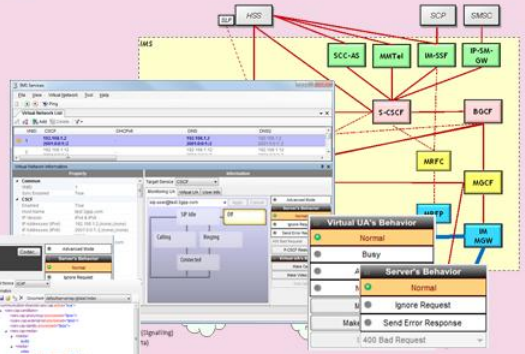
SmartStudio NR (SSNR)

IMS Functions

IMS Services
- ✓ CSCF/DNS
- ✓ NDP/XCAP
- ✓ Suppl. Service
- ✓ Conference
- ✓ RTP Frame control



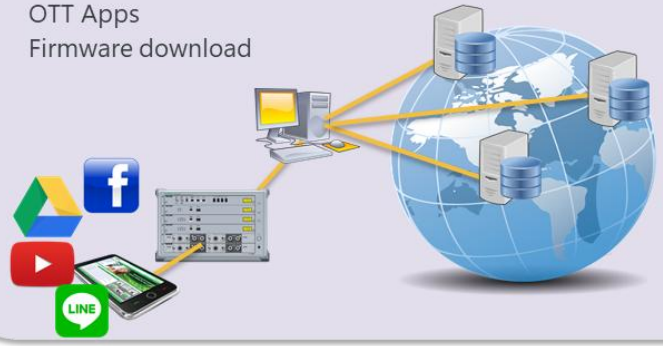
Supplementary Service



CSCF Operation

Server Applications

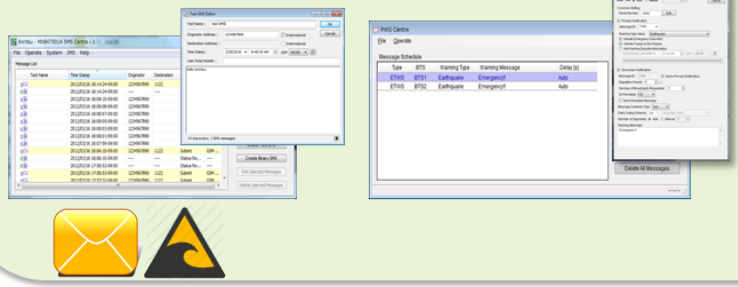
Internet connection
- ✓ OTT Apps
- ✓ Firmware download



Messaging service

SMS Centre
- ✓ SMS over SGs
- ✓ SMS over IMS

PWS Centre
- ✓ ETWS
- ✓ CMAS



Thermal Test/Battery Life Test

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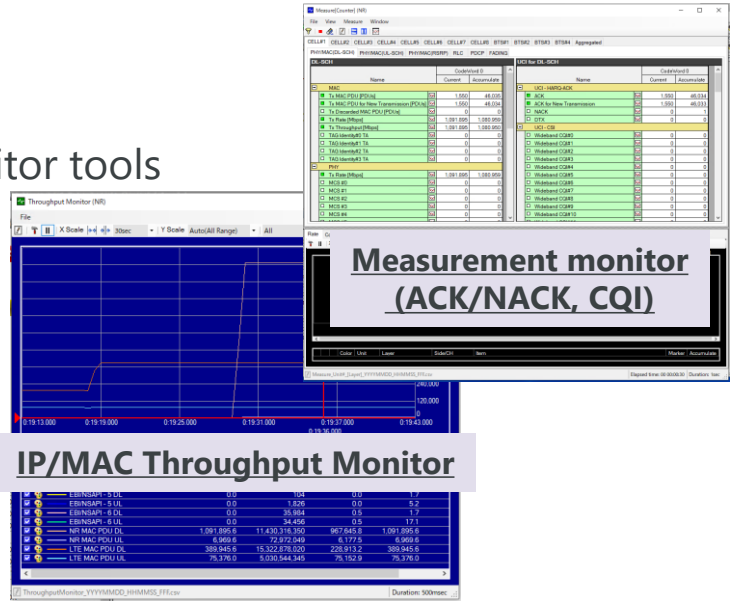
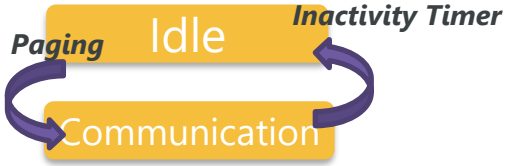
HW performance check for Max T-put

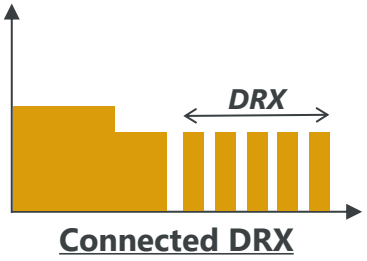
- ✓ Easy to check the status of each cell and IP layer by monitor tools
  - ⇒ Software tuning for maximum throughput
- ✓ Ensured the stability and reproducibility IP connection
  - ⇒ Device Thermal Test in high throughput condition

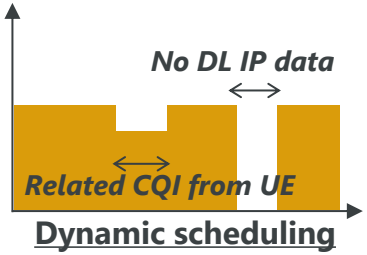


User Experience Evaluation using Real Application

- ✓ Automatic operation according to the connection status by the state machine GUI
  - ➢ UE Status change, Connected DRX(CDRX), Dynamic scheduling, Auto EN-DC Connection
  - ⇒ Device Battery Life Test using OTT application







EN-DC Mobility Test Environment

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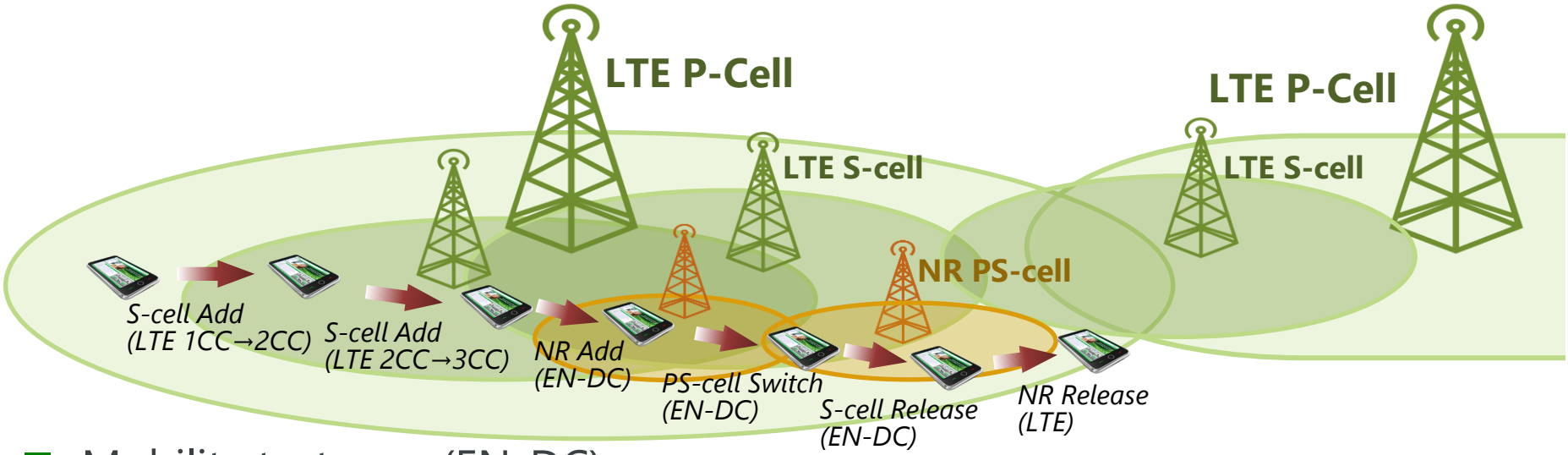
SSNR provides a more efficient test environment for EN-DC mobility testing without the need to create complicated scenarios.



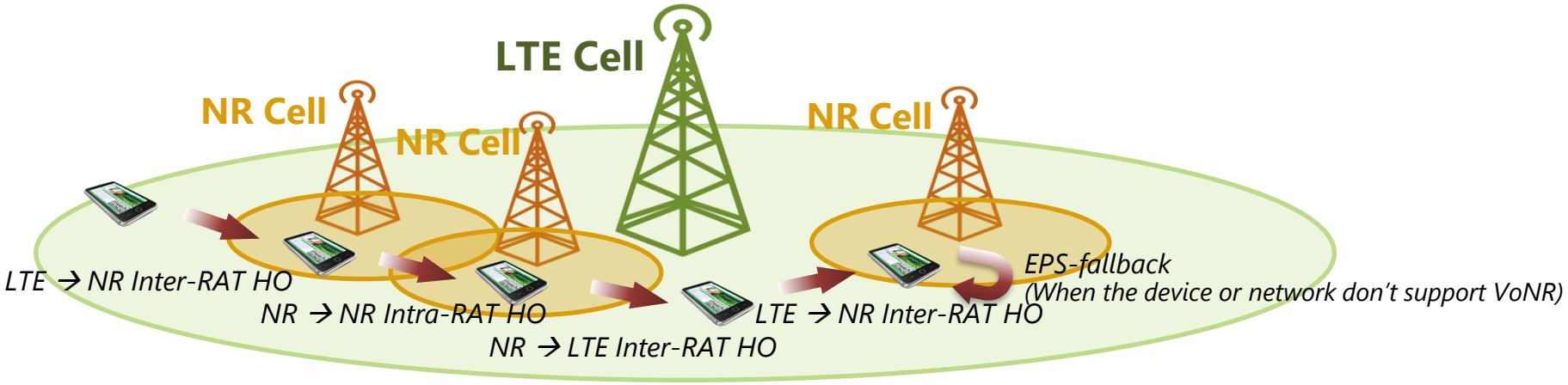
- Mobility test case (EN-DC)

Test case	SmartStudio	SSNR	Remarks
LTE S-cell Add	Supported	Supported	
LTE S-cell Release	Supported	Supported	
LTE S-cell Switch	Supported	Supported	Up to 2CC & 2x2MIMO configuration
NR Add (EN-DC connection)	-	Supported	
NR Release (LTE connection)	-	Supported	
NR Switch (PS-cell Switch)	-	Supported	
LTE P-cell HO	Supported	Supported	Up to 2CC & 2x2MIMO configuration

SA Mobility Test Environment

When the SA service starts, the mobility function with LTE is very important to secure the coverage area of UE.

→ SSNR is preparing to conduct mobility tests effectively.



Mobility test case (SA(NR) –LTE)

Test case	SSNR (MT8000A Single box)	SSNR (MT8000A+MD8475B)	Remarks
EPS-fallback	Supported	Supported	
NR -> NR Intra-RAT Handover	Supported	Supported	NR SIB2, SIB3 and SIB4 are supported.
NR -> LTE Inter-RAT Handover	Supported	Supported	NR SIB2, SIB3 and SIB4 are supported.
LTE -> NR Inter-RAT Handover	Supported	Supported	LTE SIB24 is supported.

RedCap

New

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Products supported RedCap—a low-power, low-cost 5G bearer—such as CPEs, wearable devices, and notebook PCs, as well as **services** offered by mobile network operators, are also **expanding**.

Consumer IoT
- ✓ *Wearables*
- ✓ *XR*

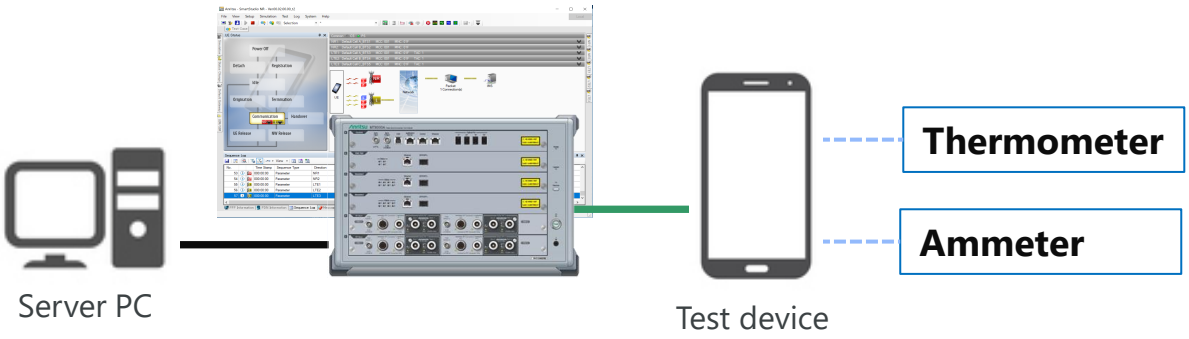
Industrial IoT
- ✓ *Smart home*
- ✓ *Smart city*
- ✓ *Security Camera*
- ✓ *Robots*

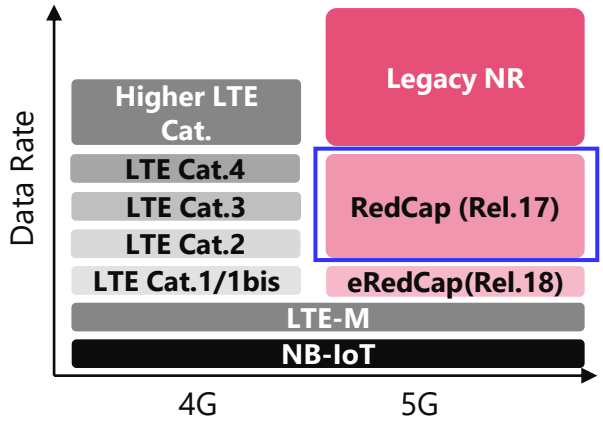
Provide a test environment for combining RedCap with existing services such as 4G, and 5G SA. (T-PUT/Internet Connection/Mobility/IMS/ Power Consumption Measurement)

	LTE CAT.1	RedCap (Rel 17)
Bandwidth	20MHz	20MHz
T-Put DL/UL	150M/ 50M	150M/ 50M
Duplex	Full	Full Half (TDD)
Antenna	2(For Rx)	DL 2/UL 1

■ Function Scope

- IP Packet communication, IP T-PUT
- Call Connection : SMS, VoNR, IMS, Access Control, CMAS
- Mobility : Selection, HO between RedCap cells, HO between RedCap cell and LTE cell





UE/NW Trigger for Abnormal Simulation

SSNR supports LTE/NSA abnormal simulation by easy setup

→Possible to evaluate device that are more like a live network environment.

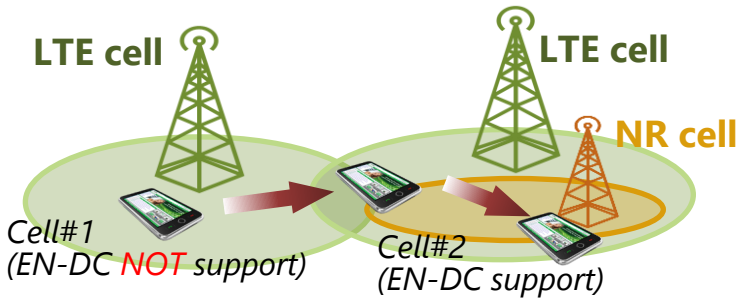
Supported Message(UE Trigger)

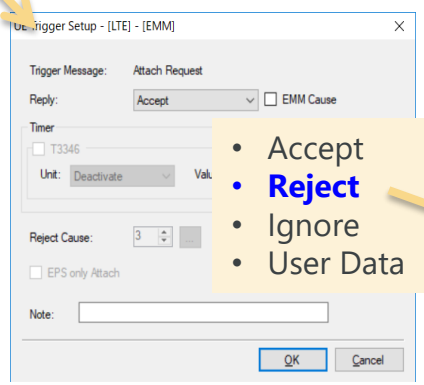
LTE	Message Name
NAS(ESM)	PDN Connectivity Request(Attach Request)
	PDN Connectivity Request(UL Information Transfer)
	PDN Disconnect Request
	Bearer Resource Allocation Request
	Bearer Resource Modification Request
	Deactivate EPS Bearer Context Request
NAS(EMM)	Service Request
	Attach Request
	Tracking Area Update Request
	Extended Service Request
	Authentication Failure
	Detach Request(NW to UE)
RRC (E-UTRAN)	RRC Connection Reestablishment Request
	RRC Connection Request

Extended support for Octet 5 (RestrictDCNR, S1-UData...)

Supported Message (NW Trigger)

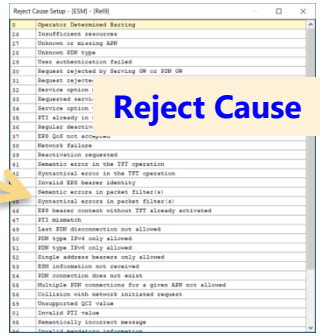
LTE	Message Name
NAS(ESM)	Notification
NAS(EMM)	Detach Request(NW to UE)
	GUTI reallocation command
	Identity Request
	EMM Information
RRC (E-UTRAN)	RRC Connection Release
	UE Capability Enquiry
	Counter Check
	UE Information Request
	Logged Measurement Configuration
MAC	Activation MAC Control Element
	Deactivation MAC Control Element
	Activation/Deactivation MAC Control Element
PHY	Aperiodic CSI Request





- Accept
- **Reject**
- Ignore
- User Data

Reject Cause



UE Trigger for SA Abnormal Simulation

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Plan to support setting 5G protocol-based Reject cause without the need to modify the scenario.

Possible to easily simulate various 5GC network situations.

Supported Message(UE Trigger)

NR(5G Core)	Message Name
NAS (5GSM)	PDU Session Establishment Request
NAS (5GMM)	Registration Request
	Service Request
RRC (E-UTRAN)	RRC Setup Request

5GMM Cause value (octet 2)

8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	1	Illegal UE
0	0	0	0	0	0	1	0	PEI not accepted
0	0	0	0	0	0	1	1	Illegal ME
0	0	0	0	0	1	1	1	5GS services not allowed
0	0	0	0	1	0	0	1	UE identity cannot be derived by the network
0	0	0	0	1	0	1	0	Implicitly de-registered
0	0	0	0	1	0	1	1	PLMN not allowed
0	0	0	0	1	1	0	0	Tracking area not allowed
0	0	0	0	1	1	0	1	Roaming not allowed in this tracking area
0	0	0	0	1	1	1	1	No suitable cells in tracking area
0	0	0	1	0	0	0	0	MAC failure
0	0	0	1	0	0	0	1	Synch failure
0	0	0	1	0	1	1	0	Congestion
0	0	0	1	0	1	1	1	UE security capabilities mismatch
0	0	0	1	1	0	0	0	Security mode rejected, unspecified
0	0	0	1	1	0	1	0	Non-5G authentication unacceptable
0	0	0	1	1	0	1	1	N1 mode not allowed
0	0	0	1	1	1	0	0	Restricted service area
0	0	0	1	1	1	1	1	Redirection to EPC required
0	0	1	0	1	0	1	1	LADN not available
0	0	1	1	1	1	1	0	No network slices available
0	1	0	0	0	0	0	1	Maximum number of PDU sessions reached
0	1	0	0	0	0	1	1	Insufficient resources for specific slice and DNN
0	1	0	0	0	1	0	1	Insufficient resources for specific slice
0	1	0	0	0	1	1	1	ngKSI already in use
0	1	0	0	1	0	0	0	Non-3GPP access to 5GCN not allowed
0	1	0	0	1	0	0	1	Serving network not authorized
0	1	0	0	1	0	1	0	Temporarily not authorized for this SNPN
0	1	0	0	1	0	1	1	Permanently not authorized for this SNPN
0	1	0	0	1	1	0	0	Not authorized for this CAG or authorized for CAG cells only
0	1	0	0	1	1	0	1	Wireline access area not allowed
0	1	0	1	1	0	1	0	Payload was not forwarded
0	1	0	1	1	0	1	1	DNN not supported or not subscribed in the slice
0	1	0	1	1	1	0	0	Insufficient user-plane resources for the PDU session
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

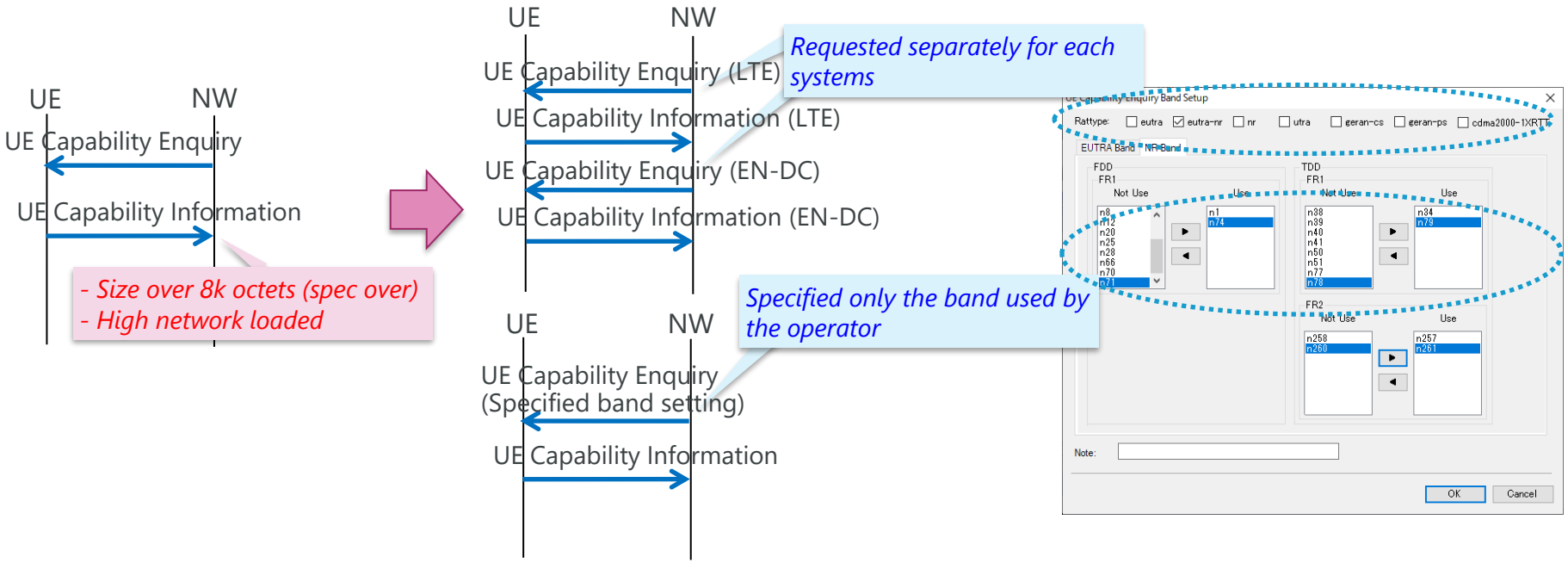
5GSM Cause value (octet 2)

8	7	6	5	4	3	2	1	
0	0	0	0	1	0	0	0	Operator determined barring
0	0	0	1	1	0	1	0	Insufficient resources
0	0	0	1	1	0	1	1	Missing or unknown DNN
0	0	0	1	1	1	0	0	Unknown PDU session type
0	0	0	1	1	1	0	1	User authentication or authorization failed
0	0	0	1	1	1	1	1	Request rejected, unspecified
0	0	1	0	0	0	0	0	Service option not supported
0	0	1	0	0	0	0	1	Requested service option not subscribed
0	0	1	0	0	0	1	1	PTI already in use
0	0	1	0	0	1	0	0	Regular deactivation
0	0	1	0	0	1	1	0	Network failure
0	0	1	0	0	1	1	1	Reactivation requested
0	0	1	0	1	0	0	1	Semantic error in the TFT operation
0	0	1	0	1	0	1	0	Syntactical error in the TFT operation
0	0	1	0	1	0	1	1	Invalid PDU session identity
0	0	1	0	1	1	0	0	Semantic errors in packet filter(s)
0	0	1	0	1	1	0	1	Syntactical error in packet filter(s)
0	0	1	0	1	1	1	0	Out of LADN service area
0	0	1	0	1	1	1	1	PTI mismatch
0	0	1	1	0	0	0	0	PDU session type IPv4 only allowed
0	0	1	1	0	0	0	1	PDU session type IPv6 only allowed
0	0	1	1	0	0	1	0	PDU session does not exist
0	0	1	1	0	0	1	1	PDU session type IPv4v6 only allowed
0	0	1	1	0	1	0	0	PDU session type Unstructured only allowed
0	0	1	1	0	1	0	1	Unsupported 5QI value
0	0	1	1	0	1	1	0	PDU session type Ethernet only allowed
0	0	1	1	0	1	1	1	Insufficient resources for specific slice and DNN
0	0	1	1	1	0	0	0	Not supported SSC mode
0	0	1	1	1	0	0	1	Insufficient resources for specific slice
0	0	1	1	1	0	1	0	Missing or unknown DNN in a slice
0	0	1	1	1	0	1	1	Invalid PTI value
0	0	1	1	1	1	0	0	Maximum data rate per UE for user-plane integrity protection is too low
0	0	1	1	1	1	0	1	Semantic error in the QoS operation
0	0	1	1	1	1	1	0	Syntactical error in the QoS operation
0	0	1	1	1	1	1	1	Invalid mapped EPS bearer identity
0	1	0	1	1	1	1	1	Semantically incorrect message
0	1	1	0	0	0	0	0	Invalid mandatory information
0	1	1	0	0	0	0	1	Message type non-existent or not implemented
0	1	1	0	0	0	1	0	Message type not compatible with the protocol state
0	1	1	0	0	0	1	1	Information element non-existent or not implemented
0	1	1	0	0	1	0	0	Conditional IE error
0	1	1	0	0	1	0	1	Message not compatible with the protocol state
0	1	1	0	1	1	1	1	Protocol error, unspecified

UE/NW Trigger for EN-DC UE Capability Info

The information on “band combination” is huge due to the combination with EN-DC in addition to the higher-order CA of LTE. In some cases, global devices send more than the 3GPP specifications. Even if the size does not exceed the specifications, the load on the network side is an issue for large size data, so network are considering to reduce the data size of one message.

→ In order to simulate the above situation on the device, the “UE capability enquiry” function is extended with the Trigger function of SSNR.



UE Capability Info Segmentation · SDL · Band expansion

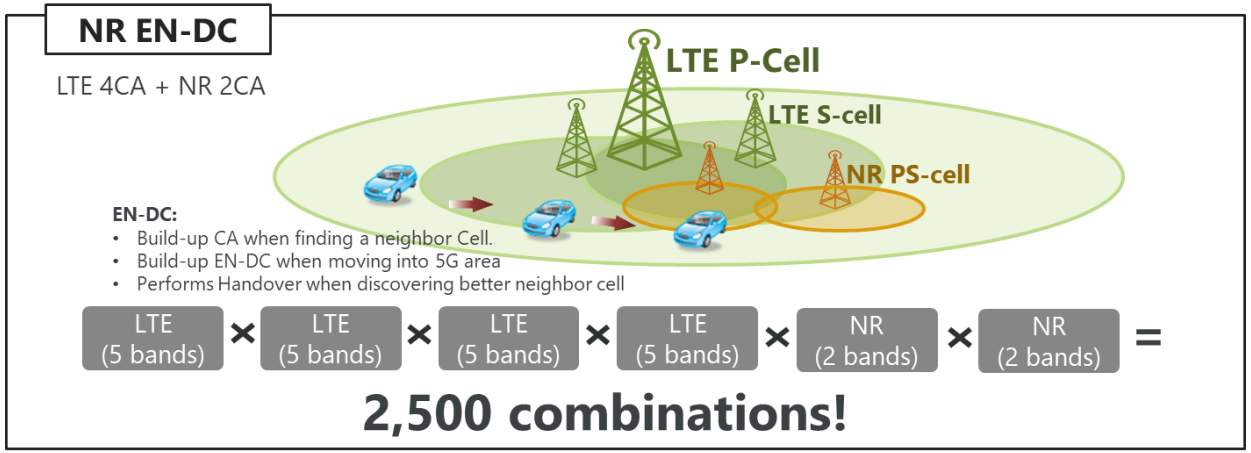
New

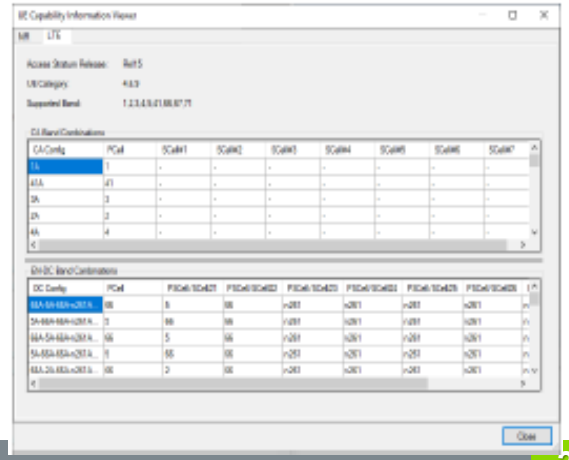
Anritsu
Advancing beyond

With the refarming of frequencies to 5G following the shutdown of 3G, the number of **LTE/NR bands has increased**. Additionally, the rapid growth in downlink traffic has led to a rise in mobile network operators and devices performing Carrier Aggregation (CA) using downlink-only bands (SDL). As a result, improving **the efficiency of evaluating the vast number of band combinations involving existing LTE and 5G bands has become a major challenge**.

- Supports SDL (*1) and FR1 bands/bandwidth defined in Release 18 (*2), **expanding the scope of band combination testing**
- By obtaining all band combination which the latest devices supports at once, **the design process for band combination testing is greatly improved efficiency**.

(*1) Supported SDL Band : n29, n67, n75, n76.
(*2) Excluding SUL Band, Unlicensed Band and BW3MHz





Comprehensive IMS Test Environment - IMS Services

Anritsu
Advancing beyond

Key Unique Points

Ease-of-use

- SSNR GUI for easy IMS test configuration and setting
- No complex test scripts

Comprehensive IMS Tests

- Supports wide test range, including irregular and supplementary services tests
- Add-in Service PSAP supports emergency test and loopback voice data test functions

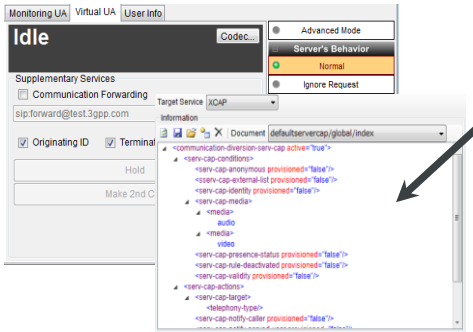
Analysis and Debug

- Simultaneous Wireshark and signalling protocol logging

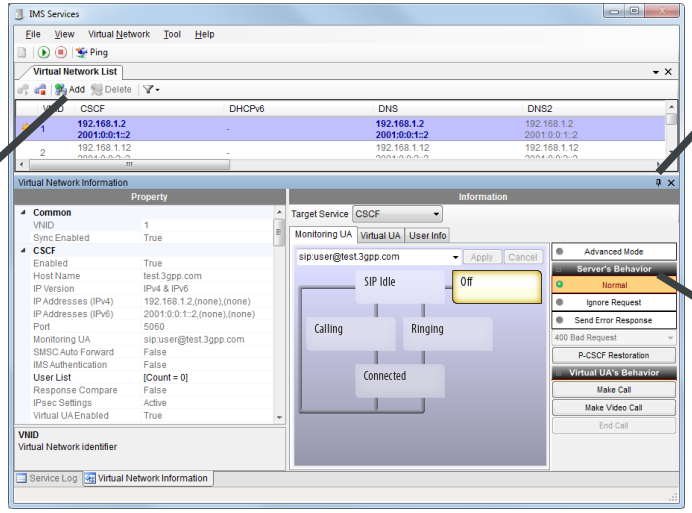
Supported

- ✓ *VoLTE (Option1, Option3x)*
- ✓ *EPS-FB(Option2 (Early-phase))*
- ✓ ***VoNR (Option2)***

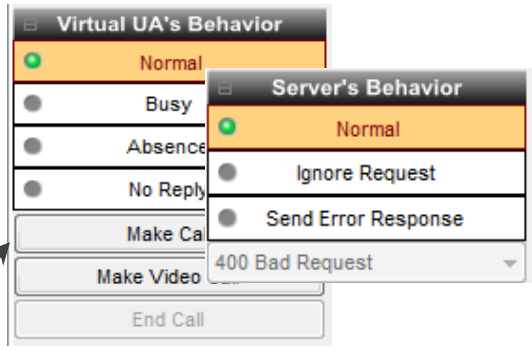
IMS Supplementary Service



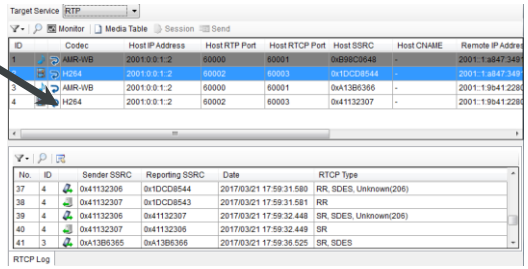
IMS Services



Simulate Abnormal Condition



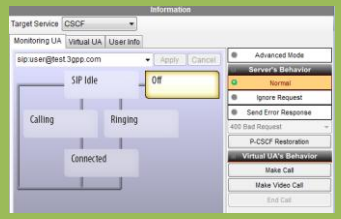
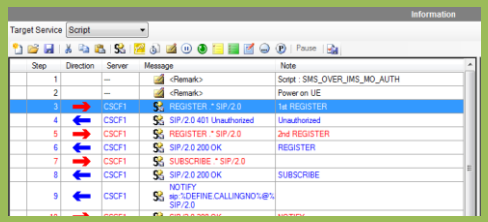
RTP Frame Control



SmartStudio/SSNR IMS Test Solution

Anritsu
Advancing beyond

Propose two type IMS test solutions according to the customers situation.

Server mode	Script mode
	
✓ Interactive test environment **without complicated test scripts** ✓ Possible to test for IMS function(VoLTE, SMS) without requiring deep knowledge of protocol	✓ It is necessary to create a test case by the user ➢ Deep knowledge of IMS protocol required →Providing technical support service separately **→Conversion of Wireshark logs for easier test case creation**
✓ Abnormal test for user specific doesn't support (Some abnormal tests are supported by Extended CSCF option.) ✓ Doesn't support operator-specific information. (Can't support ...)	✓ Scripts can be created using a ladder sequence, **supporting high flexibility and scalability**. ➢ Possible to check user-specific abnormal tests and protocol check at any message level. ➢ Call processing of LTE is by using the SmartStudio, the user can focus on function of IMS development and evaluation. ➢ **Flexible support for evolving 5G core specification such as VoNR**

IMS Script/Log Import

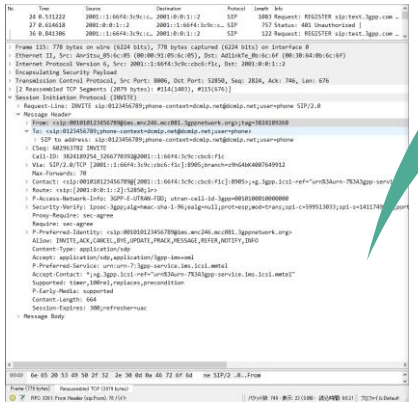
Anritsu
Advancing beyond

Support to build IMS test environment from Wireshark logs
→ Easy to reproduce the behavior in a live network

Key Features

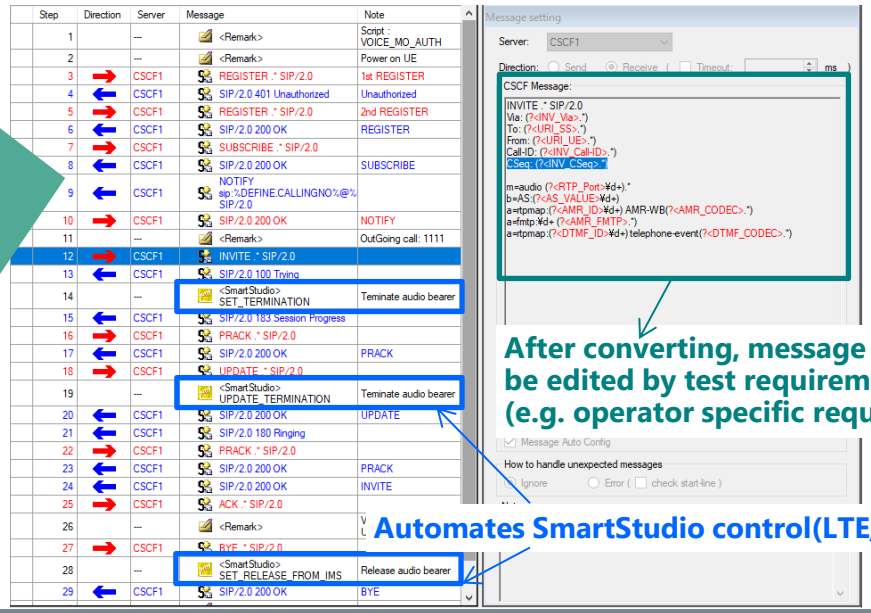
- Fully automated IMS script file (.tef file) creation tools
- Supports SIP protocol and XCAP protocol
- Converted from Wireshark Log captured in live network operation
- An encrypted message can be converted with key value set
- Automates SSNR control (LTE/NR) part during converting process
- Converted script can be edited in message level using the Add-in Server window

Wireshark log



Import

IMS Script



After converting, message header can be edited by test requirements (e.g. operator specific requirements)

Automates SmartStudio control(LTE/NR) part

Unique Messaging Application Tool - SMS/PWS Centre

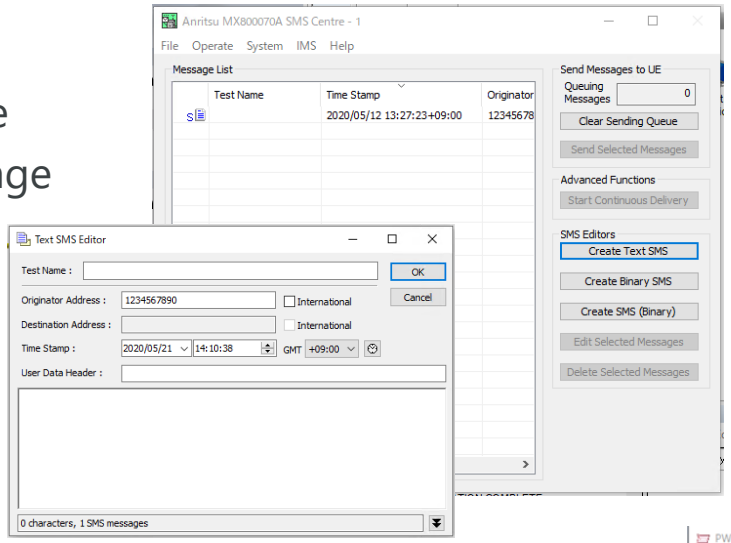
Anritsu Advancing beyond

SSNR prepare the unique GUI to simplify messaging test.

SMS Centre

- ✓Text Message
- ✓Binary Message

SMS Centre



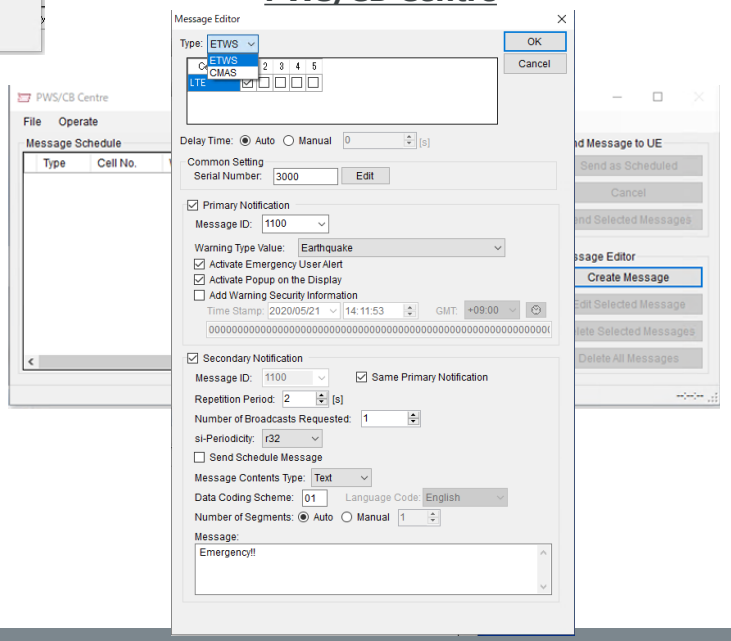
Supported condition

- ✓ *Option1 (LTE)*
- ✓ *Option3x (EN-DC)*
- ✓ ***Option2 (SA)(Support in Oct.2020)***

PWS/CB Centre

- ✓ETWS Message
- ✓CMAS Message

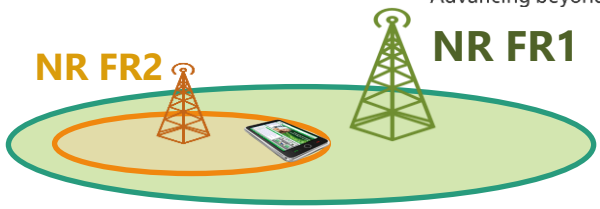
PWS/CB Centre

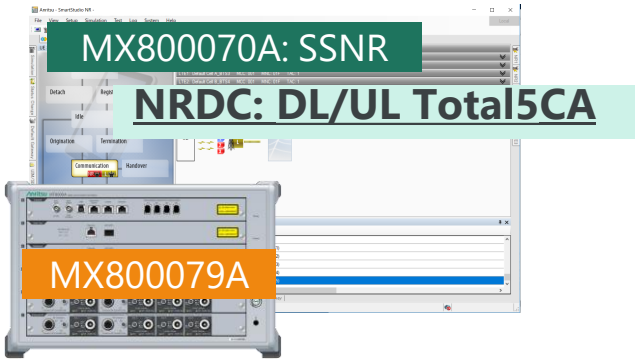


NRDC & UL 5CA

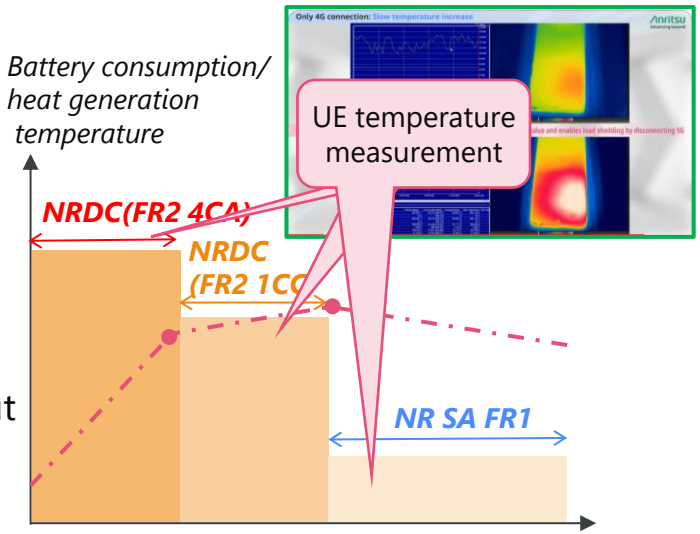
- **MX800070A-014 NR FR1+FR2 Inter-working Option**
- **MX800070A-063 NR UL 5CA Option**

- **Background:**
  - Based on the full-scale launch of NR SA service, ensure area coverage with FR1 and increase speed/capacity with NRDC that utilizes FR2
- **Functional Scope:**
  - Supports NRDC bearer extension with MT8000A-033 installed
    - DL: FR1 1CC 4x4MIMO + FR2 4CCs 2x2MIMO
    - UL: FR1 1CC SISO + FR2 4CCs SISO
  - Expandable up to FR1/FR2 UL 2x2MIMO with 2 MT8000A (including 063Opt)
  - Provides flexible bearer expansion with GUI for configuration changes such as Band Combination/MIMO/CA
- **Customer Value:**
  - Realizes dynamic state control of test device assuming actual operation including SCG Add/Release at NRDC
  - Combined DC/CA bearer expansion to create a high throughput environment. Possible to apply to device thermal test and battery consumption test.





SSNR T-put test configuration

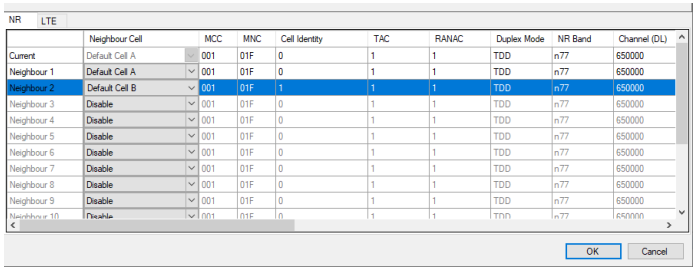


Changes in battery consumption/device heat generation temperature during NRDC

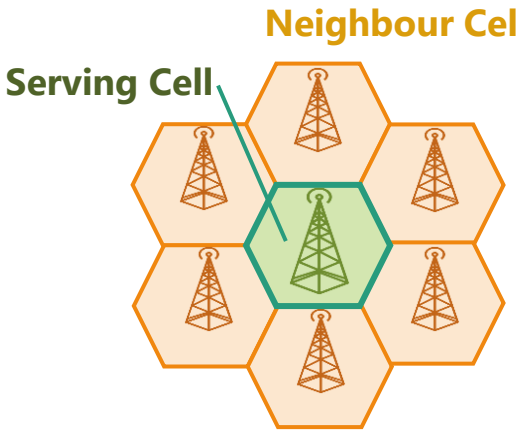
Neighbour Cell List

■ MX800070A-090 NR Neighbour Cell List

- **Background:**
  - In order to optimize the cell search function of the device, which is difficult to do in the field, we will build a roaming test environment in the laboratory that conforms to the network of each country's operator.
- **Functional scope:**
  - Optional notification information including neighbour cell information for cell search and roaming
  - Transmission of up to 16 neighbour cell info for each NR/LTE
  - Parameter modification via Remote API/GPIB commands
- **Customer Value:**
  - In NR SA service, it is possible to flexibly simulate difficult cell search tests and roaming tests in the field by setting parameters related to selection/reselection to neighbour cell such as PLMN/Band/Power.



SSNR GUI image



Cell arrangement image

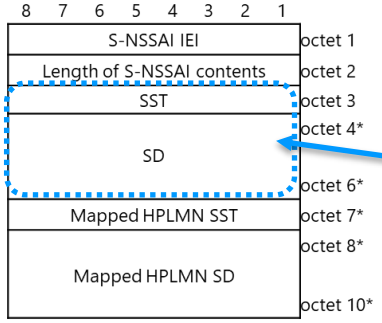
Neighbour Cell Parameters	NR	LTE
Enable/Disable	✓	✓
MCC	✓	✓
MNC	✓	✓
Cell Identity	✓	✓
TAC	✓	✓
Channel(DL)	✓	✓
DL Bandwidth	✓	✓
Physical Cell ID	✓	✓
P-Max	✓	✓
RANAC	✓	
Duplex Mode	✓	
NR Band	✓	
DL Subcarrier Spacing	✓	
SSB Subcarrier Spacing	✓	
Carrier Frequency Mode	✓	
GSCN	✓	
Channel (SSB)	✓	
Q-RxLevMin		✓
Q-QualMin		✓
Cell Reselection Priority		✓

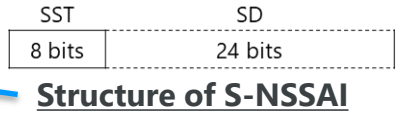
Neighbour cell info list (NR/LTE)

Network Slicing

SSNR supports the flexible configuration of S-NSSAI (SST/SD).
→ User can simulate various network situations.

TS24.501 9.11.2.8 S-NSSAI





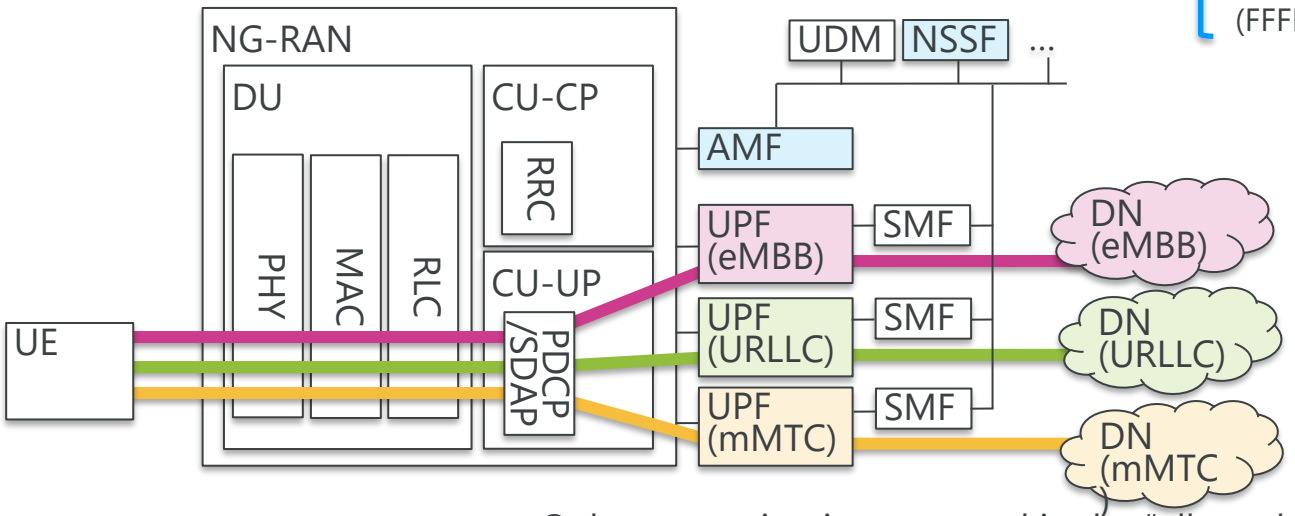
Structure of S-NSSAI

Slice/Service Type(SST)

Slice/Service type	SST value
eMBB	1
URLLC	2
MIoT	3
V2X	4
Operator-specified	128-255

Slice Differentiator (SD)

Unique value by Operator
(FFFFFF : no SD value associated with the SST)



- DN : Data Network
- UPF : User Plane Function
- SMF : Session Management Function
- NSSF : Network Slice Selection Function
- UDM : Unified Data Management
- AMF : Access and Mobility Management Function
- CU-CP : Centralized Unit - Control Plane
- CU-UP : Centralized Unit - User Plane

Only one setting is supported in the "allowed NSSAI list".
→ Support to set multiple S-NSSAI is currently under consideration.

Audio Quality Solution with HEAD acoustics

5G **Audio Quality** evaluation is available with HEAD acoustics solution and SSNR.

Audio Quality test is categorized by MOS testing such as POLQA and Acoustics test such as 3GPP TS26.131/132. HEAD acoustics provides both test environment with strong suites.

5G voice communication (**VoNR**) has been already supported by SSNR.
By using SmartStudio/SSNR, customer can easily build Audio Quality evaluation environment for commercial device that suits each market.

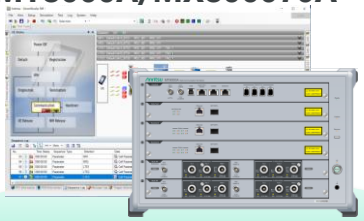
Signalling Tester
MD8475B

- VoLTE (LTE)
- CS Call (GSM/WCDMA)

HEAD acoustics
labCORE and ACQUA

- 3GPP TS 26.131/132
  (GSM/WCDMA/LTE/**NR**)
- HAC-suite
  (ex. ANSI C63.19)

SmartStudio NR
MT8000A/MX800070A



- **VoNR**
- VoLTE (EN-DC)

Video Quality Test Solution with Umetrix

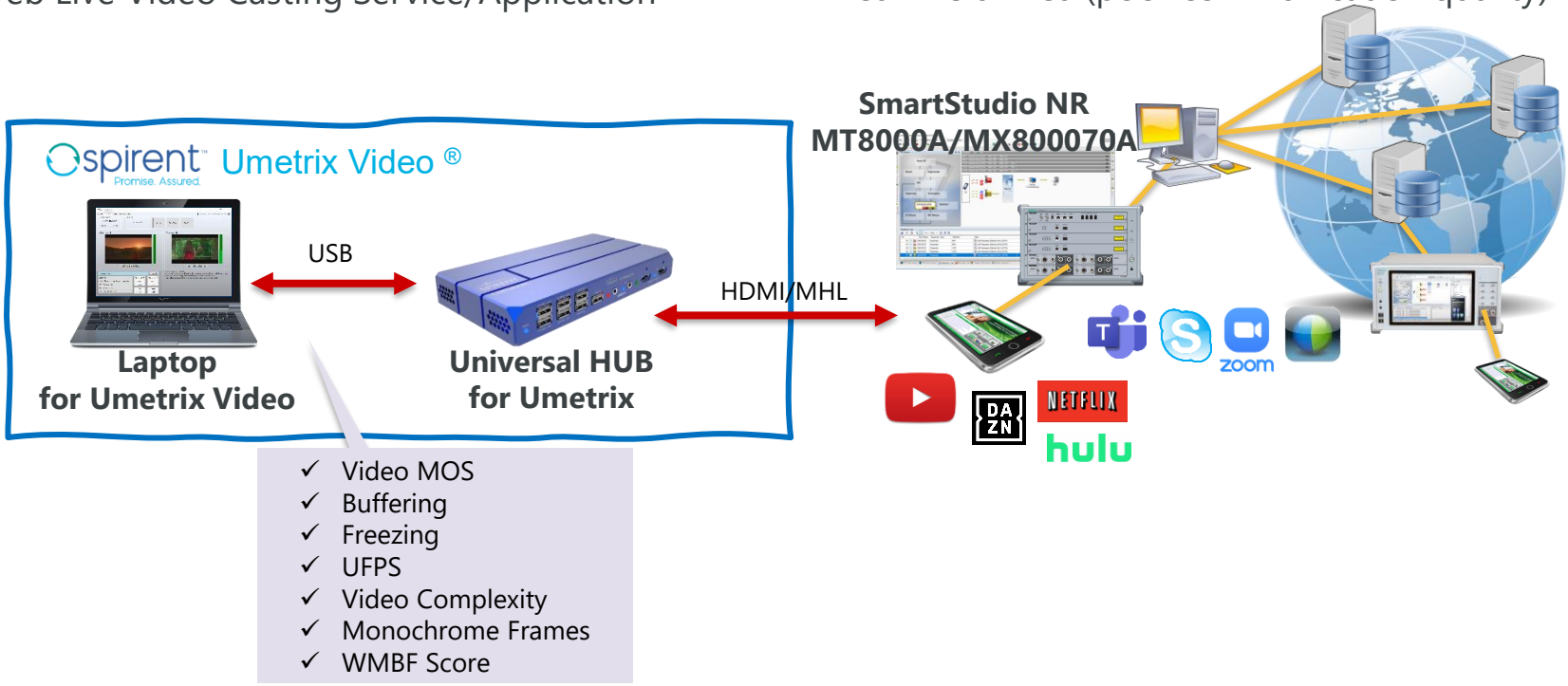
The combination of Umetrix and SSNR supports efficient video quality checks of mobile device that simulate various mobile communication environments.
→ Devices can be evaluated and optimized efficiently by establishing reproducibility, which is difficult to achieve with live networks.

■ Test Application

- Video Streaming Service/Application
- Video Chat/Conference Service/Application
- Web Live Video Casting Service/Application

■ Possible Situations

- Normal Connection (Stable connection)
- Cell Edge Area (Mobility environment)
- Weak Field Area (poor communication quality)

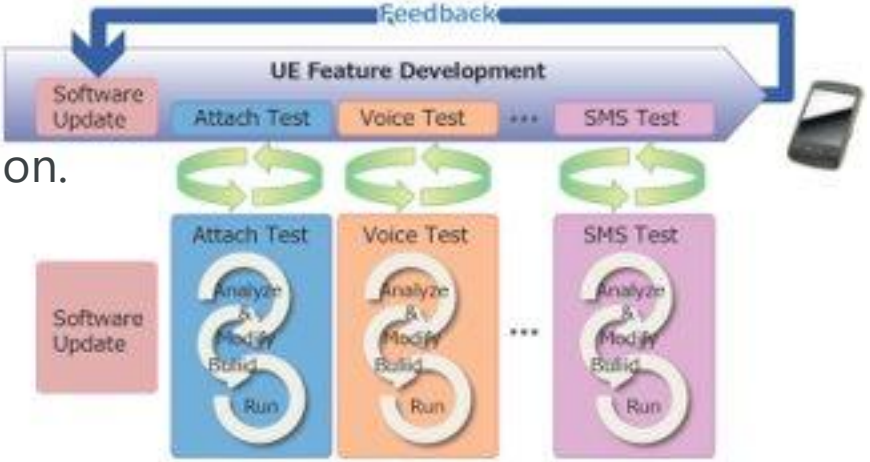


Support for Test Automation Environment

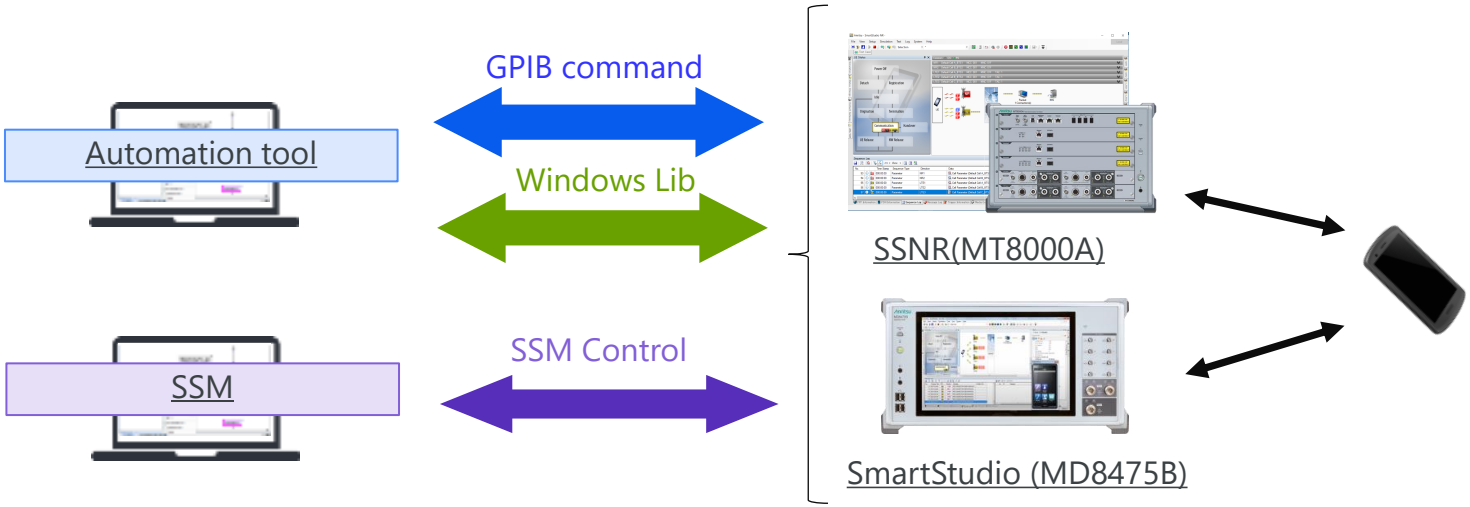
In DUT development, continuous testing by automated environment is effective for confirming existing functions and degradation testing associated with SW updates.

SSNR offers a variety of external control interfaces depending on the customer situation.

- GPIB
- Windows API
- SSM*



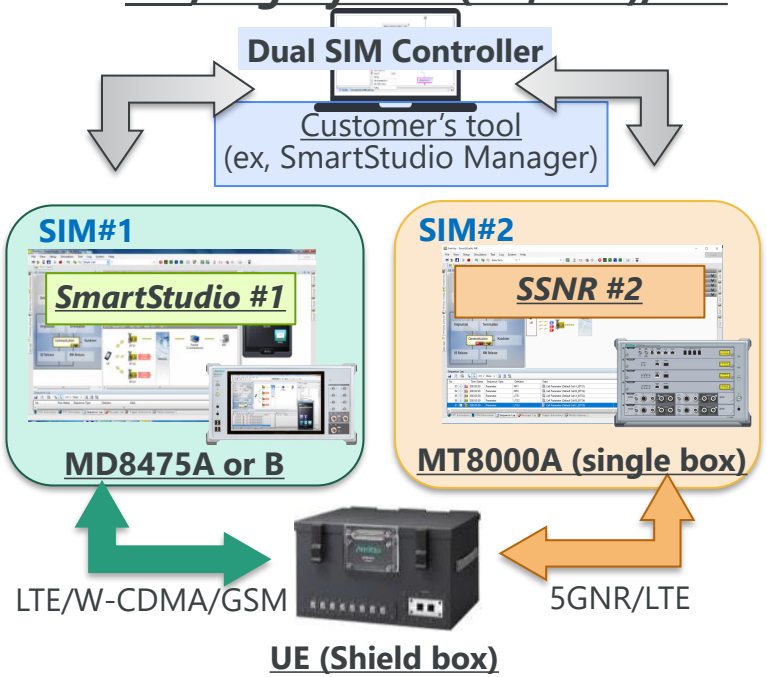
*SSM: MX847503A SmartStudio Manager.
Test sequence editing and execution software for automatic control of MT8000A, MD8475B, UE.



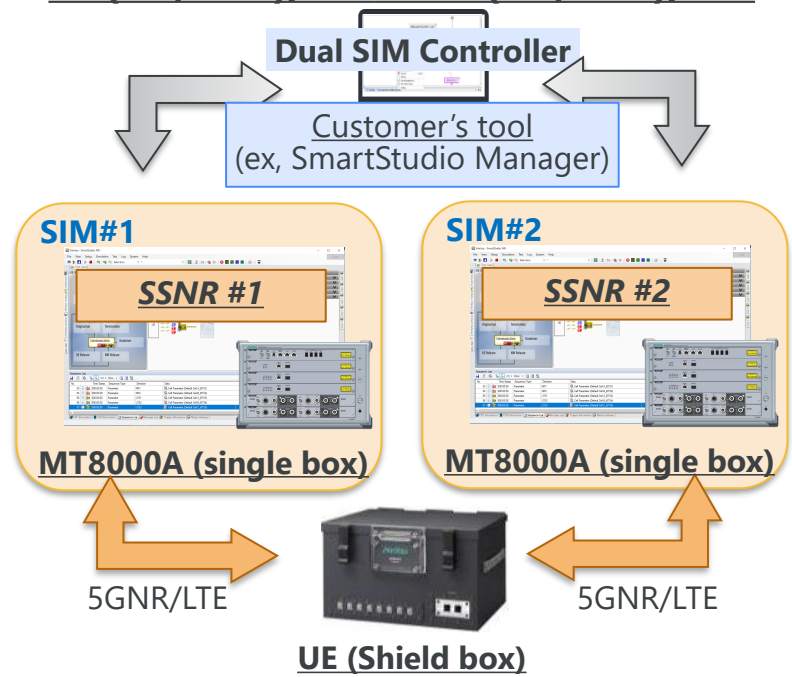
Dual SIM Test Configuration

Anritsu
Advancing beyond

■ LTE/Legacy + 5G(SA,NSA)/LTE



■ 5G(SA,NSA)/LTE + 5G(SA,NSA)/LTE



Dual SIM test case (for reference)

SIM#1	SIM#2
Power on Registration	Power on Registration
Data communication	Data communication
Voice call (Origination)	Voice call (Origination)
Voice call (Termination)	Voice call (Termination)
SMS (Sending)	SMS (Sending)
SMS (Receiving)	SMS (Receiving)
Cell Reselection	Cell Reselection
Measurement	Measurement
Handover	Handover

NR Access Control

New

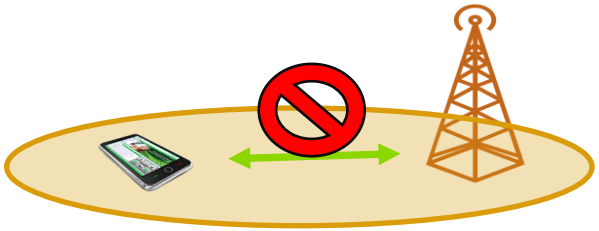
Anritsu
Advancing beyond

During disasters or network congestion, connection control is applied based on device category—for example, prioritizing public communication—or all devices may be barred from accessing the cell. As NR SA services, including RedCap, continue to expand, **testing device behavior under NR access control is becoming increasingly important** for smartphones, IoT devices, and automotive TCUs.

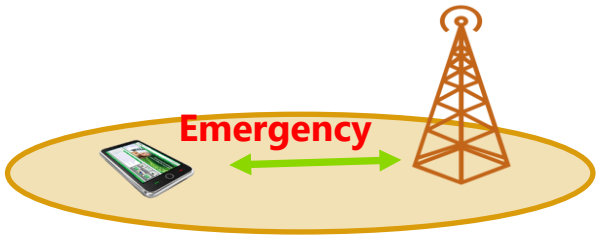
Provide an emergency service testing environment that cannot be realized on a live network.

Function Scope

- Cell Barred : Full restriction on cell access
- UAC (User Access Control) : Access restrictions applied by device category



Cell Barred



UAC

Configure connection permissions by access category, including:

- Set the probability of connection allowance
- Set the time duration for applying connection restrictions
- Apply restrictions based on specific device IDs or usage types

CMAS Periodic Paging

New

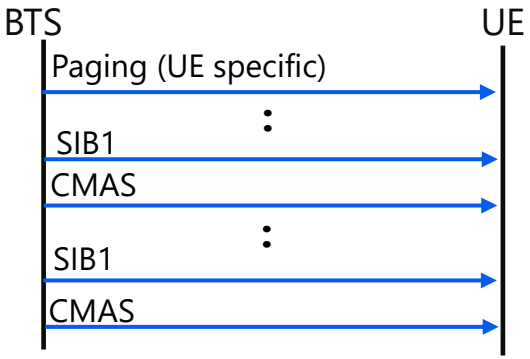
Anritsu
Advancing beyond

CMAS (Commercial Mobile Alert System) is used to deliver critical emergency messages that can impact human lives. **To establish a reliable CMAS transmission sequence, it is necessary to evaluate various cases**.

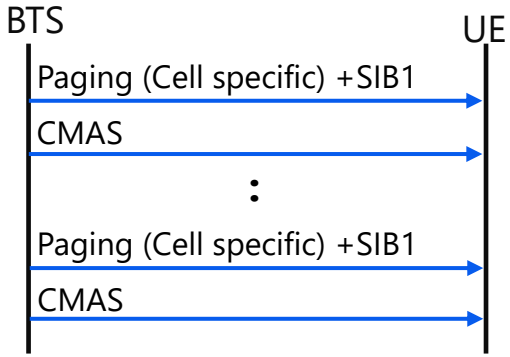
Provide an emergency service testing environment that cannot be realized on a live network.

Function Scope

In addition to the conventional CMAS transmission method, CMAS transmission using Periodic Paging has been added.



Conventional method



Additional method (Periodic Paging)

Release 17 Device Test

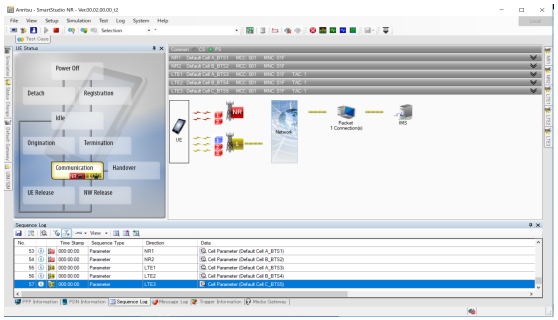
Any devices which supports release 17 are starting to launch, and NR spectrum bands are expanding in the release as well as spectrum refarming. This causes complexed band combination test resources.

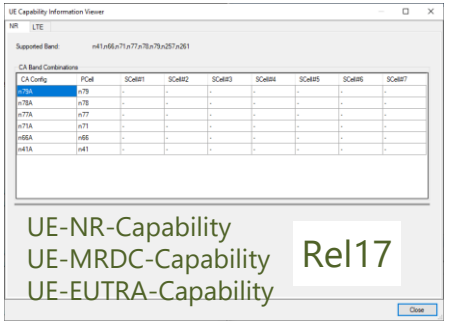
SSNR UE Capability Information Viewer supports release 17 band information, and provides test efficiency for band combination test design.

Rel-17 Message (Call Connection/UE Capability Info)

- Existing features including Call Connection can be guaranteed for Rel17 message.
- UE Capability Information Viewer supports Rel17 message

Rel17 Messages





Contents

SSNR Support Features

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Support features

		MX800079A (NSA) (v05.00.00.00)	MX800079A (SA) (v05.00.00.00)	MX800078A (NSA) (v05.00.00.00)	MX800078A (SA) (v05.00.00.00)
HW Configuration		MT8000A + MD8475B	MT8000A (+ MD8475B)	MT8000A	MT8000A
NR Features	**FDD/TDD CA**	Support	Support	Support	Support
	FDD DSS	Support	Support	Support	Support
	FR1 UL 256QAM	Support	Support	Support	Support
	Absolute Frequency SSB	Support	Support	Support	Support
	Arranges UE Cap. Enquiry	Support	Support	Support	Support
	Dynamic Scheduling	Support	Support	Support	Support
	Auto EN-DC Connection	Support	-	Support	-
	Mobility	Support	Support	Support	Support
	EPS-fallback	-	Support (*a)	Support	Support
	Network Trigger	Support	Support	Support	Support
	UE Status Change	Support	Support	Support	Support
	NDP/DHCP	Support	Support	Support	Support
	NSSAI/S-NSSAI	-	Changeable (*b)	-	Changeable (*b)
Applications	**SMS**	Support	Support	Support	Support
	ETWS/CMAS	Support	Support	Support	Support
	IMS	Support	Support	Support	Support

Note:
(a) Required MD8475B for LTE
(b) Supported by ini.file

SSNR Capability (NR-DC)

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						MT8000A FR1 + FR2 HW Capability (*)								
						FR1					FR2(*6)			
Box	RFM (Box1)	BBM (Box1)	Total CC	FR1 CC (*2)	FR2 CC	DL SISO (*3)	DL 2x2	DL 4x4	UL SISO (*4)	UL 2x2 (*4)	DL SISO (*3)	DL 2x2 (*5)	UL SISO (*4)	UL 2x2 (*4)
1box	021/021 (*1)	011/011	2	1	1	1band 1CA	1band 1CA	N/A	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA
1box	021/021 (*1)	011/011	3	1	2	1band 1CA	1band 1CA	N/A	1band 1CA	1band 1CA	1band 2CA	1band 2CA	1band 2CA	1band 2CA
1box	021/021 (*1)	011/011	4	1	3	1band 1CA	1band 1CA	N/A	1band 1CA	1band 1CA	1band 3CA	1band 3CA	1band 3CA	1band 3CA
1box	033/033	011/011	2	1	1	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA
1box	033/033	011/011	3	1	2	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 2CA	1band 2CA	1band 2CA	1band 2CA
1box	033/033	011/011	4	1	3	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 3CA	1band 3CA	1band 3CA	1band 3CA
1box	033/033	011/011	5	1	4	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 1CA	1band 4CA	1band 4CA	1band 4CA	N/A

Note:
(*) Indicates Capability from HW perspective.
Please contact M2A for the latest status such as connection results for each CA/MIMO condition.
(*1) Assuming MT8000A-021 is installed.
(*2) FR1 : RF supports up to 2CA.
(*3) RF indicates the number of bands when combined with UL SISO.
(*4) RF indicates the number of bands when combined with DL SISO.
(*5) FR2 : RF converter requires 2sets for 1band 2x2MIMO and 4sets for 2bands 2x2MIMO.
FR2 : RF can be set up to DL 2bands CA.
(*6) Only 100MHz FR2 bandwidth of SSNR is supported.

SSNR Capability (NR Only)

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				MT8000A HW Capability (*)				
				NR (*2)				
RAT	Box	RFM (Box1)	BBM (Box1)	DL SISO (*3)	DL 2x2 (*3, 4)	DL 4x4 (*3)	UL SISO (*5)	UL 2x2 (*5)
FR1	1box	021/021 (*1)	011	4bands 4CA	2bands 4CA	1band 2CA	2bands 2CA	2bands 2CA
FR1	1box	021/021 (*1)	011/011	4bands 4CA	2bands 4CA	1band 2CA	2bands 2CA	2bands 2CA
FR1	1box	031	011	2bands 4CA	1band 2CA	1band 2CA	2bands 2CA	1band 2CA
FR1	1box	031/032	011/011	4bands 4CA	2bands 4CA	2bands 4CA	2bands 2CA	2bands 2CA
FR1	1box	033/033	011/011	4bands 4CA	4bands 4CA	4bands 4CA	2bands 2CA	2bands 2CA
FR1	2box	031/032 021/021	011/011 011/011	4bands 4CA	4bands 4CA	3bands 4CA	2bands 2CA	2bands 2CA
FR1	2box	031/032 031/032	011/011 011/011	4bands 4CA	4bands 4CA	4bands 4CA	2bands 2CA	2bands 2CA
FR1	1box	021 (*1)	011	2bands 4CA	1band 2CA	N/A	2bands 2CA	1band 2CA
FR2	1box	033/033	011/011	1band 8CA	1band 8CA	N/A	1band 4CA	1band 4CA

Note:
(*) Shows HW Capability. Please contact M2A for the latest status such as connection results for each CA/MIMO condition.
(*1) Assuming MT8000A-021 is installed.
(*2) Only 100MHz FR2 bandwidth of SSNR is supported.
(*3) RF indicates the number of bands when combined with UL SISO.
(*4) FR2 : RF converter requires 2sets for 1band 2x2MIMO and 4sets for 2bands 2x2MIMO.
(*5) RF indicates the number of bands when combined with DL SISO.

SSNR Capability (NSASB)

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Advancing beyond

			MT8000A HW Capability (*)								
			NR (*2)					LTE (*6)			
RAT	RFM (Box1)	BBM (Box1)	DL SISO (*3)	DL 2x2 (*3, 4)	DL 4x4 (*3)	UL SISO (*5)	UL 2x2 (*5)	DL SISO	DL 2x2	DL 4x4	UL SISO
FR1	021/021 (*1)	011/011	2bands 4CA	1band 2CA	N/A	2bands 2CA	1band 2CA	2bands 3CA	1band 3CA	N/A	2bands 2CA
FR1	031/032	011/011	2bands 4CA	1band 2CA	1band 2CA	2band 2CA	1band 2CA	2bands 3CA	2bands 3CA	1band 3CA	2bands 2CA
FR1	033/033	011/011	4bands 4CA	2bands 2CA	2bands 2CA	2bands 2CA (*7)	2bands 2CA (*7)	3bands 3CA	3bands 3CA	2band 3CA	2band 2CA (*7)
FR2	033/033	011/011	1band 4CA	1band 4CA	N/A	1band 4CA	1band 2CA	3bands 3CA	3bands 3CA	2band 3CA	2bands 2CA (*7)

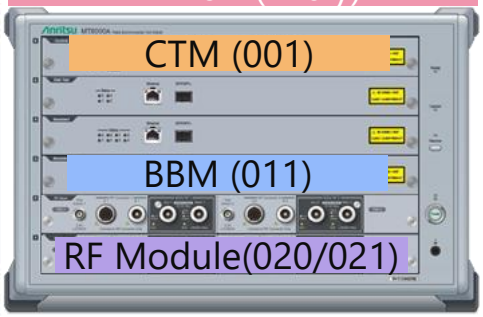
Note:
(*) Shows HW Capability. Please contact M2A for the latest status such as connection results for each CA/MIMO condition.
(*1) Assuming MT8000A-021 is installed.
(*2) Only 100MHz FR2 bandwidth of SSNR is supported.
(*3) RF indicates the number of bands when combined with UL SISO.
(*4) FR2 : RF converter requires 2sets for 1band 2x2MIMO and 4sets for 2bands 2x2MIMO.
(*5) RF indicates the number of bands when combined with DL SISO.
(*6) Please note that the number of LTE bands that can be supported is limited depending on the bandwidth supported by RFM.
(*7) When DL 4x4MIMO, number of UL bands is 1. When DL 2x2MIMO or SISO, number of UL bands is 2.

MT8000A Single Box Series

Upgradability from Entry model to Full test configuration for future changes in customer testing needs.

Entry

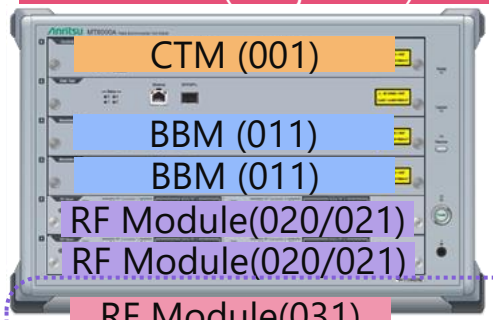
MX10A (Entry)



HW/SW Upgrade

Majority

MX10A (Single box)



RF Module(031)
RF Module(032)

HW/SW Upgrade

MX70/MX78A (Single Box)
MX10A (Single box)

RF Module(031)
RF Module(032)

Possible to install 031/032 RF module
Plan to support 033x2 RF module

SW Upgrade

SW Upgrade

Full MT8000A

MX70/MX79A (w/MD8475B)
MX10A (w/MT8821C)

Leading-Edge/Performance

Device Quality Improvement with One Platform

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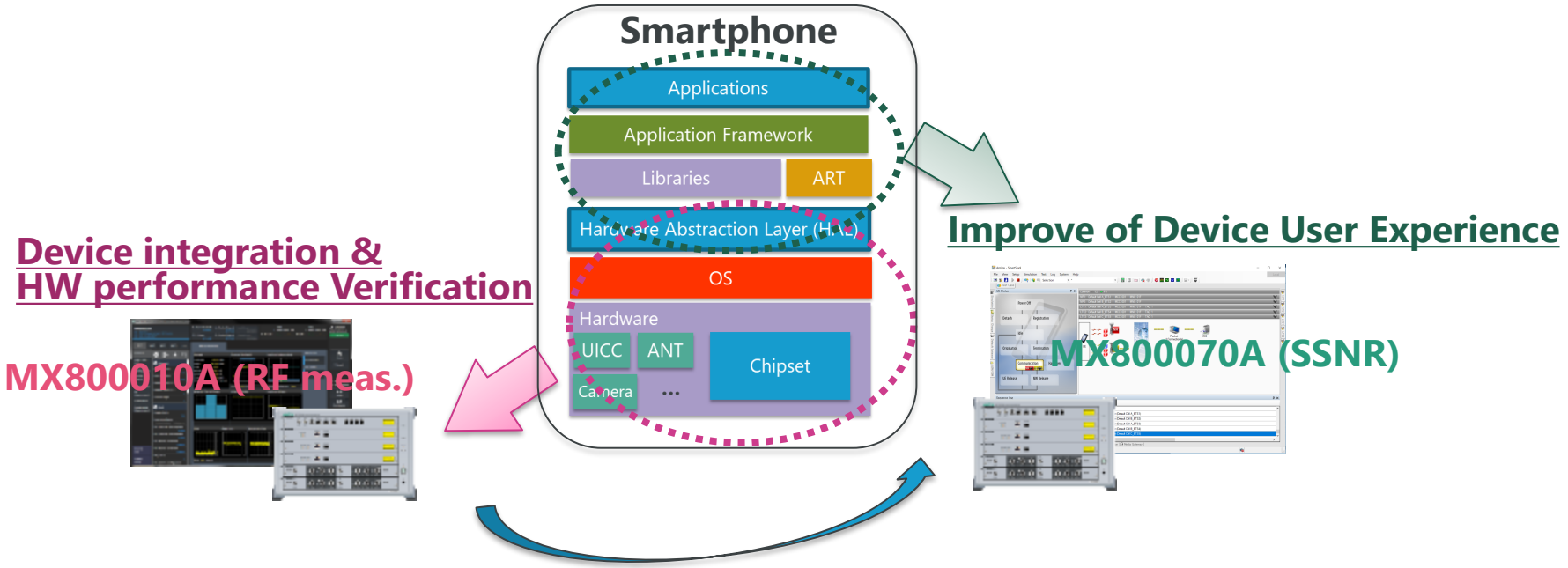
Strong support for device commercialization with two applications focused on each test application

- ✓ HW evaluation including device integration and RF calibration
- ✓ Application evaluation to improve device User experience



Only SW switching can be used according to the test application

Note : Requires additional HW depend on the customers' instrument

MT8000A RF Test Solution

Anritsu
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Useful RF test solution for Various use cases.

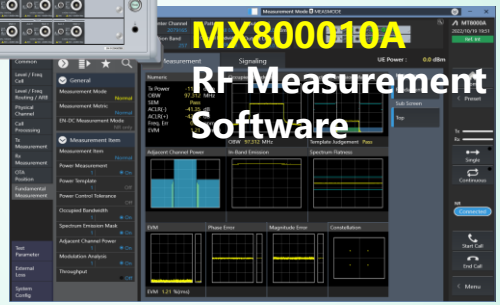
RF test (TRx test)

- TRx test (TS38.521) and RF parametric test
- Signaling and non-signaling

FR1: Conducted

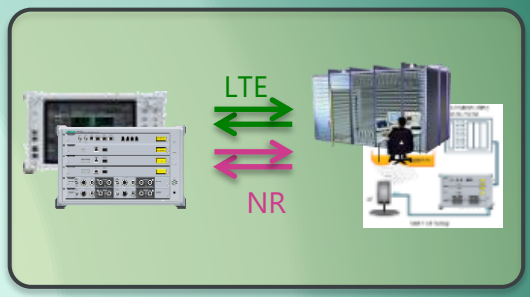
FR2: OTA

MT8000A



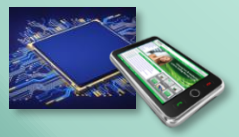
OTA/SAR etc

- Collaborate with 3rd party for OTA/SAR test area
- Expand to MIMO OTA features



Chipset RF Calibration

- RF Calibration
- RF Characterization



Support FR1 and FR2 for both NSA and SA

For FR1: Support FDD and TDD
(450MHz to 7.125GHz)
For FR2: Support TDD
(24GHz to 43GHz band :n257~n261)

IP Data T-put

Utilization of Installed MT8000A/RF Meas. Platform

Anritsu Advancing beyond

Can be used SSNR for device application test depending on the operating status of MT8000A deployed in the lab.

➡ Contribute to the efficiency of MT8000A platform operation.

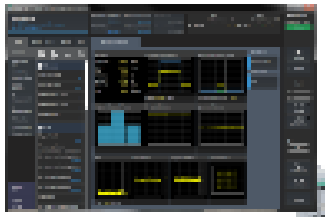
RF test

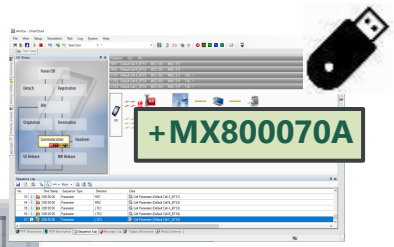
- RF TRx
- OTA test
- SAR/EMC
  :

Only add simple software option

+SSNR

RF + Application Test





- RF TRx
- OTA test
- SAR/EMC
  :

- **VoNR**
- **Messaging**
- **OTT application**
  :

SSNR license is not related to MT8000A platform

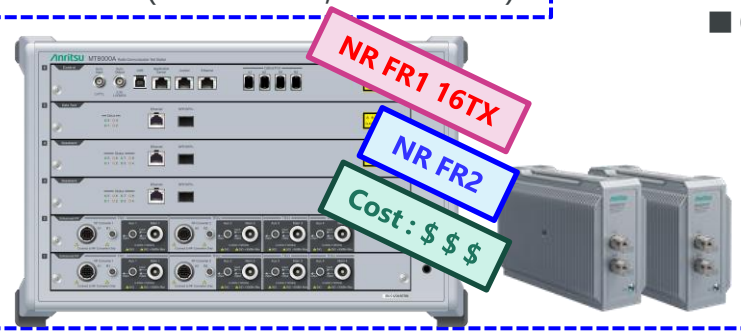
➡ Utilize the MT8000A that is available at that time

Contents

MT8000A RF Module Product Overview

Anritsu
Advancing beyond

033 model (FR1: **16TX**, **FR2: OTA**)



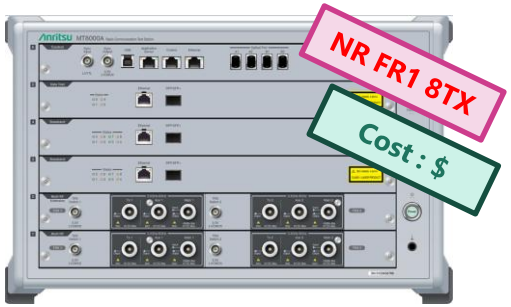
■ **Configuration**

MT8000A-033 0.4 to 7.125 GHz Enhanced RF Module x2

	Module	0.4 -**7.125**GHz	IF 6-12GHz	RF Converter
Slot 2	033	8TX(4Port)/4RX	N/A	**2**
Slot 1	033	8TX(4Port)/4RX	N/A	
Total		**16TX(8Port)/8RX**	----	**2**

for Max T-put test by Higher CA & MIMO

031 model (FR1: **8TX**)



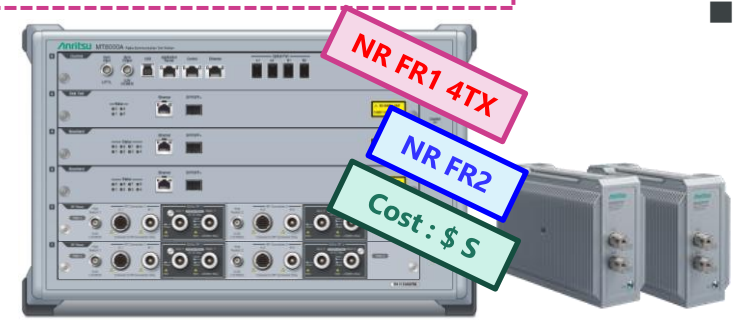
■ **Configuration**

MT8000A-031 0.4GHz-6GHz Multi RF Module
MT8000A-032 0.4GHz-6GHz Multi RF Extension

	Module	0.4 -6GHz	IF 6-12GHz	RF Converter
Slot 2	031	4TX(4Port)/2RX	N/A	N/A
Slot 1	032	4TX(4Port)/2RX	N/A	N/A
Total		**8TX**(8Port)/4RX	----	----

for Majority utilization (SW/Application tests)

021 model (FR1: 4TX, **FR2: OTA**)



■ **Configuration**

MT8000A-020 RF Base Module x2
+MT8000A-021 0.4GHz-6GHz RF Sub Module x2

	Module	0.4 -6GHz	IF 6-12GHz	RF Converter
Slot 2	020/021	2TX(2Port)/2RX	N/A	**2**
Slot 1	020/021	2TX(2Port)/2RX	N/A	
Total		**4TX**(4Port)/4RX	----	**2**

MT8000A Platform FW for SSNR

Subject to change

Anritsu Advancing beyond

Supported by SW switching for test purposes such as performance evaluation (IP T-put) and application testing.

Platform Capability

RF module	DL / UL CA&MIMO	MX800079A (NR Platform)	MX800078A (NSA Single Box)(*C)
020/021x2 RF	LTE	DL:5CA & 4x4 MIMO, 20Layers, 16Tx (*a) (*b) UL:2CA & SISO, 2Tx	DL:3CA & 2x2 MIMO, 2Tx UL:2CA & SISO, 2Tx
	NR FR1	DL:4CA & 4x4 MIMO, 4Tx UL: 2CA & 2x2 MIMO 4Tx	DL:2CA & 2x2 MIMO, 2Tx UL:1CC & 2x2 MIMO 2Tx
	NR FR2	DL:8CA & 2x2 MIMO 4Tx UL:4CA & 2x2 MIMO 4Tx	DL:4CA & 2x2 MIMO 2Tx UL:1CC & 2x2 MIMO 2Tx
031/032 RF	LTE	DL:5CA & 4x4 MIMO, 20Layers, 16Tx (*a) (*b) UL:2CA & SISO, 2Tx	DL:3CA & 4x4 MIMO, 4Tx UL:2CA & SISO, 2Tx
	NR FR1	DL:4CA & 4x4 MIMO, 8Tx UL:2CA & 2x2 MIMO 4Tx	DL:2CA & 4x4 MIMO, 4Tx UL:1CC & 2x2 MIMO 2Tx
	NR FR2	Not Supported	Not Supported
033x2 RF	LTE	DL:5CA & 4x4 MIMO, 20Layers, 16Tx (*a) (*b) UL:2CA & SISO, 2Tx	DL:3CA & 4x4 MIMO, 8Tx UL:2CA & SISO, 2Tx
	NR FR1	DL:4CA & 4x4 MIMO, 16Tx UL:2CA 2x2 MIMO 8Tx	DL:2CA & 4x4 MIMO, 8Tx UL:1CC 2x2 MIMO 4Tx
	NR FR2	DL:8CA & 2x2 MIMO 16Tx UL:4CA 2x2 MIMO 8Tx	DL:4CA & 2x2 MIMO 8Tx UL: 2CA 2x2 MIMO 4Tx

Note:
(a) Use internal IP packet for IP data over LTE 800Mbps.
(b) Required **MD8475Bx2** for more than 16 layers of LTE.
(c) Please use MD8475B for pure LTE.

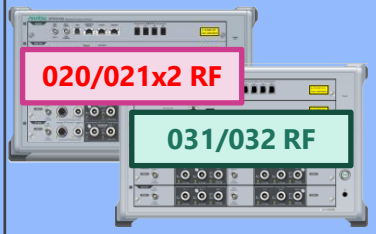
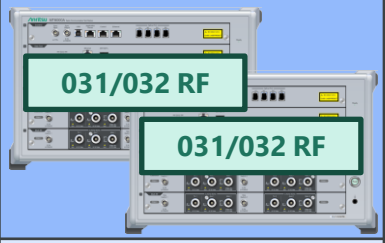
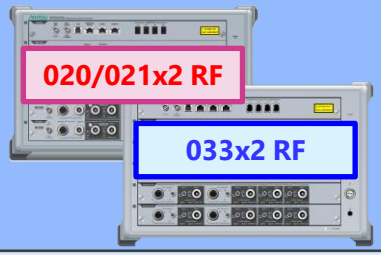
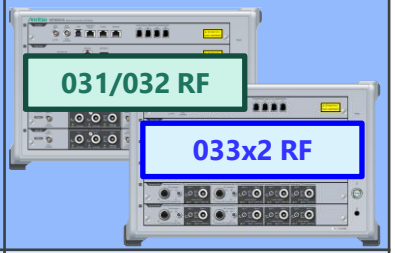
Required MD8475B for EN-DC configuration

SSNR Multi-box Configuration

Subject to change

Anritsu Advancing beyond

■ MX800079A+MX800079A

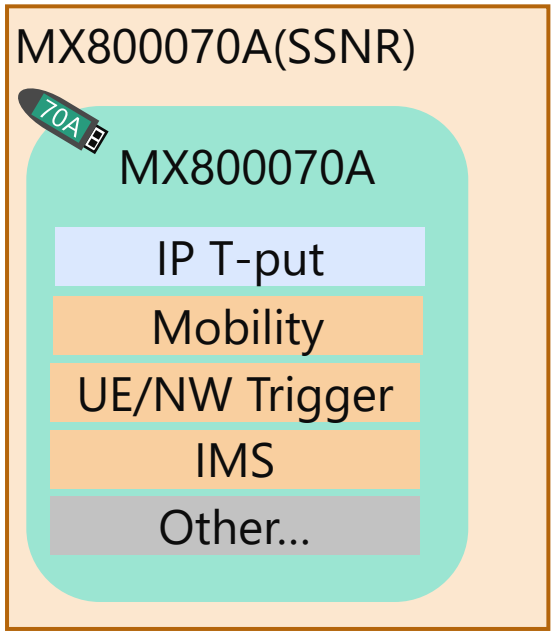
Option 2 SA	MT8000Ax2 (020/021x2 + 031/032)	MT8000Ax2 (031/032+ 031/032)	MT8000Ax2 (020/021x2 + 033x2)	MT8000Ax2 (031/032+ 033x2)
				
FR1 3CA	**Q1 2022**	**Q1 2022**	-- Supported MT8000Ax1 (033RF model)	-- Supported MT8000Ax1 (033RF model)
FR1 4CA	**Q1 2022** (Up to 3band)	**Q1 2022**	-- Supported MT8000Ax1 (033RF model)	-- Supported MT8000Ax1 (033RF model)
FR1 5CA and over	Not supported	Not supported	Under investigation	Plan to support depending on market trends
FR1/FR2 DC	**Under investigation** FR1: 3CC (up to 2band) FR2: 8CA	--	**Under investigation** FR1: 3CA FR2: 8CA	**Under investigation** FR1: 3CA FR2: 8CA

SSNR SW Structure

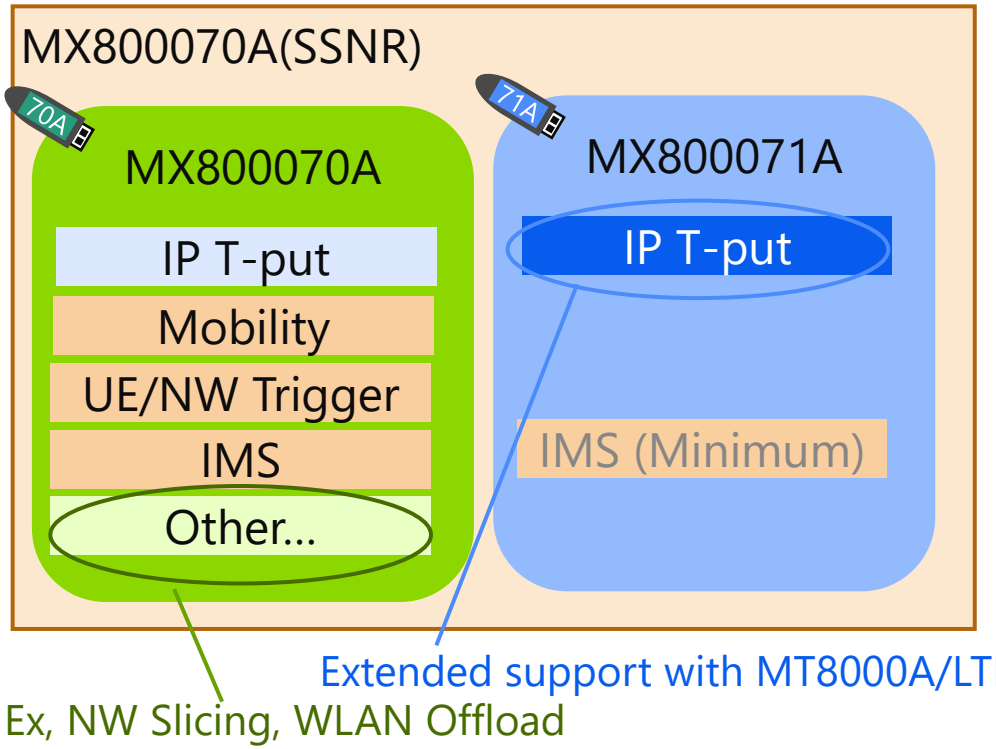
Subject to change

Anritsu Advancing beyond

SSNR SW(~2021)



SSNR SW(Q2.2022~)

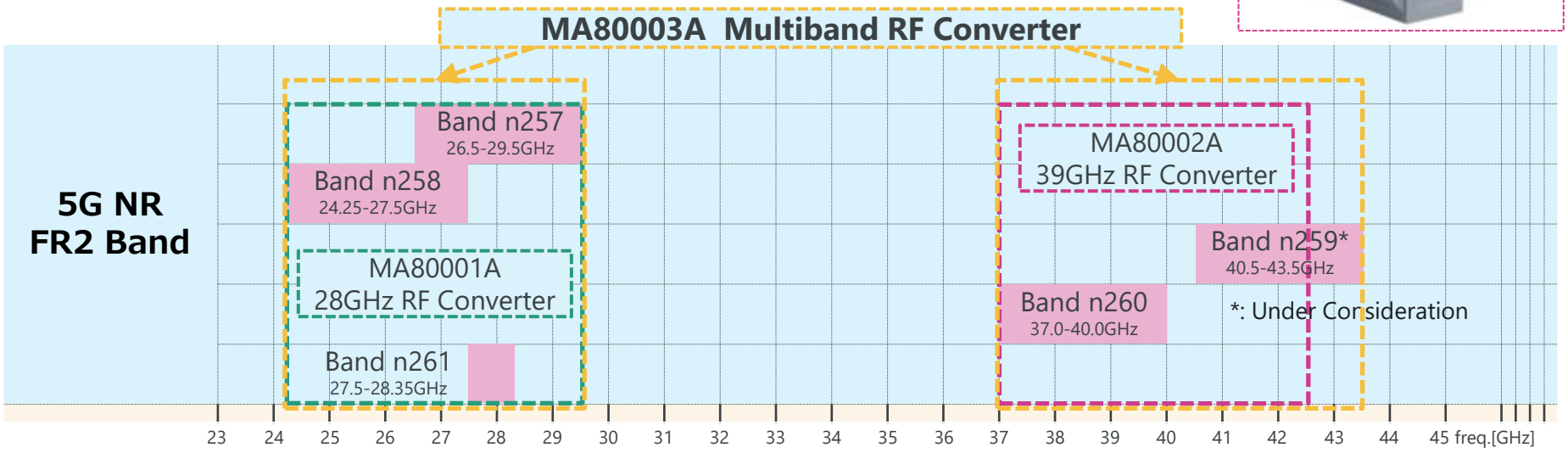


Scope of application for SW license/support services

	Application	
SW License/Support service	MX800070A	MX800071A
MX800070A(-xx)	✓	✓
MX800071A(-xx)	-	✓

RF Converter Product Overview - for FR2

- According to the frequency band, 3 types of converters are available.
  - ✓ **MA80001A 28GHz RF**
  - ✓ **MA80002A 39GHz RF**
  - ✓ **MA80003A Multiband RF**



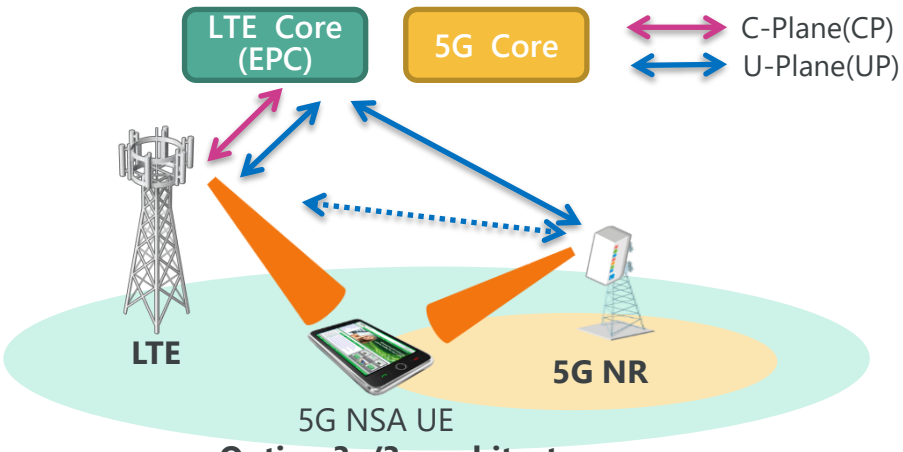
Configuration Example

Use Case	2019 release	Now
24/28GHz	MA80001A	MA80001A
24/28GHz＋39GHz	MA80001A+MA80002A	**MA80003A**
24/28GHz＋39GHz＋43GHz	---	**MA80003A**

OTA Solution Comparison

	MA8161A	MA8171A	MA8172A
Type	Shield Box	Anechoic Chamber	CATR Anechoic Chamber
Figure			
Solution	Protocol Test - **IP/PHY Throughput** - Function test	Protocol Test - R&D (white box) - PCT/CAT Beam Management - R&D & PCT/CAT	RF Test - R&D (Black box) - RFCT - TRX/Performance
Support Product	MT8000A(RTD/**SSNR**)/ME7834NR	MT8000A(RTD)/ME7834NR	MT8000A(RF meas.)/ME7873A
Antenna Type	Spiral Antenna (Max, 2x2 x 4 antennas)	Multi Antenna (Max. 4 antennas)	Reflector Antenna(CATR)
Meas. Condition	White Box (Gray Box)	White Box (Gray Box)	Black Box
	Radiative NFM	Radiative NFM for protocol Test Direct FFM for Protocol & RF Test	Indirect FFM
Measurable DUT Size	15mm(H) * 300(W) * 200(D) mm or less	(Diagonal) 300mm or less	(Diagonal) 330mm or less
OuterSize W*D*H(m)	0.44 x 0.33 x 0.27	2.08 x 1.00 x 1.79 (with rack)	2.20 x 1.20 x 2.00 (with rack)
Weight	≦ 20kg	≦ 240kg	≦830kg

5G Function Test Environment



Option 3a/3x architecture

Option	SA/ NSA	Structures			3GPP schedule	Official Terminology
		Core network	CP/UP	Add UP		
Option 1	SA	EPC(LTE)	LTE	---	Support	E-UTRA
Option 2	SA	5G-CN(NR)	NR	---	Jun'18	TBD
Option 3/3a/**3x**	NSA	EPC(LTE)	LTE	NR	Dec'17	EN-DC(*)
Option 4/4a	NSA	5G-CN(NR)	NR	LTE	Jun'18	TBD
Option 5	SA	5G-CN(NR)	LTE	---	TBD	TBD
Option 6	SA	EPC(LTE)	NR	---	TBD	TBD
Option 7/7a	NSA	5G-CN(NR)	LTE	NR	Jun'18	TBD
Option 8/8a	NSA	EPC(LTE)	NR	LTE	TBD	TBD

*E-UTRA-NR Dual Connectivity

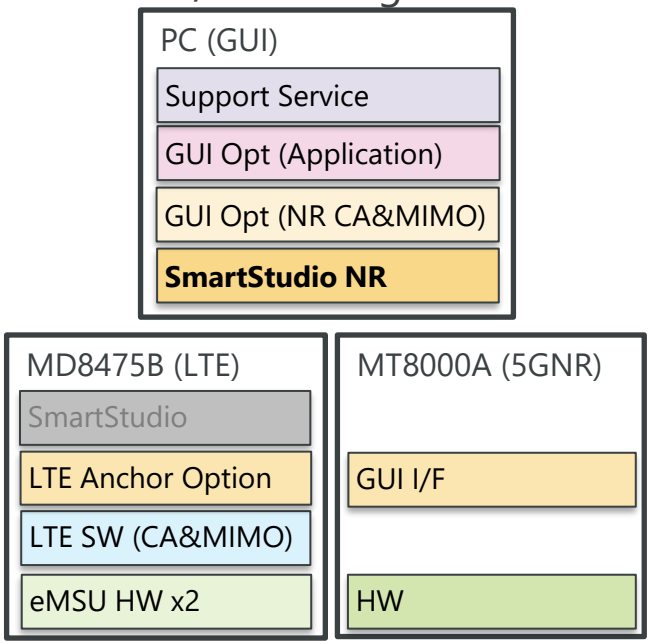
SmartStudio NR (SSNR)

New GUI for 5G

MD8475B(LTE) MT8000(5G NR)

NSA-NR Test Solution Configuration

◆ HW/SW configuration



EN-DC Throughput Configuration

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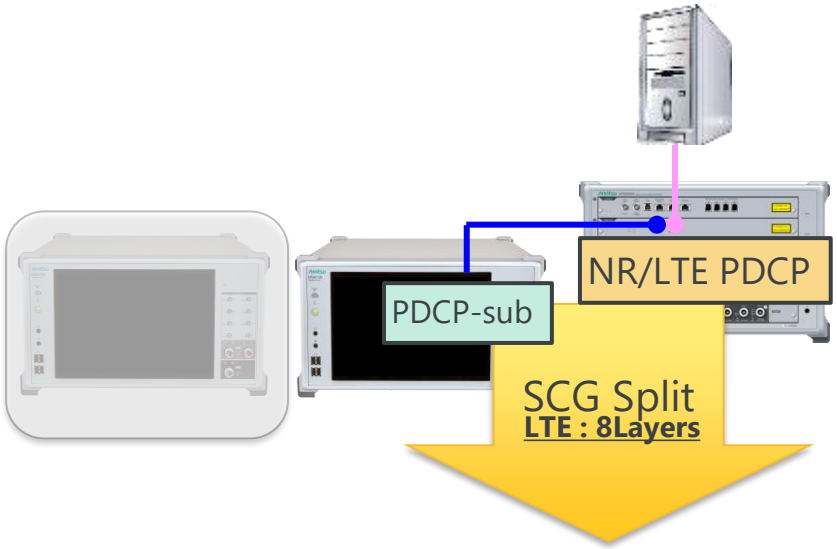
Advancing beyond

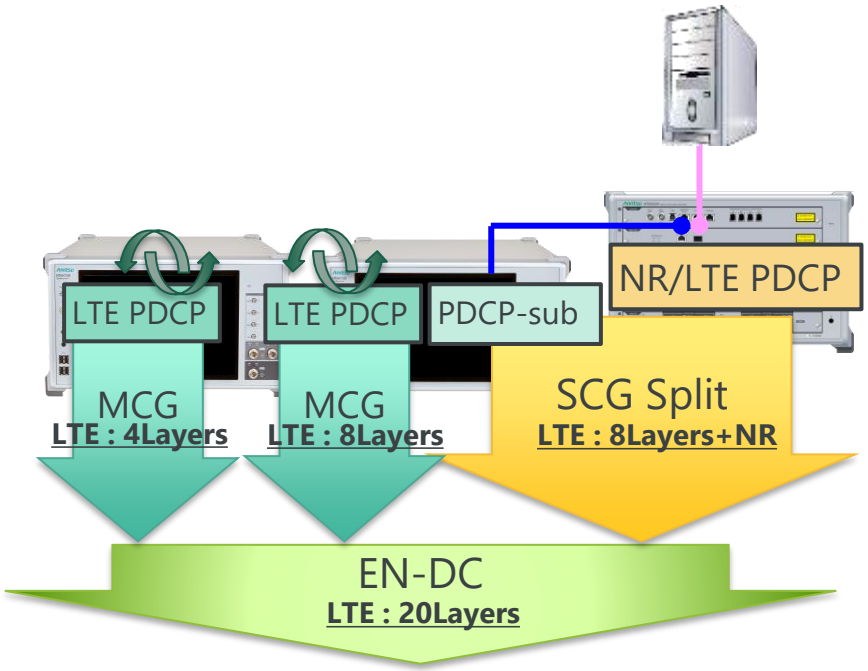
■ Option 3x (EN-DC : LTE up to 8 Layers)



◆ HW/SW configuration

MD8475B (LTE)	MT8000A (NR)
SmartStudio	NR PF for SSNR
LTE Anchor	
LTE (CA&MIMO)	
eMSU HW x2	HW

■ Option 3x (EN-DC : LTE 20 Layers)



◆ HW/SW configuration

MD8475B (LTE)	MD8475B (LTE)	MT8000A (NR)
SmartStudio	SmartStudio	NR PF for SSNR
LTE Anchor	LTE Anchor	
LTE (CA&MIMO)	LTE (CA&MIMO)	
eMSU HW x2	eMSU HW x2	HW

EN-DC LTE CA & MIMO Status

Anritsu
Advancing beyond

DL 3CA (all 256QAM, 20MHz Bandwidth)

Non-contiguous	Supported (6RF)	Supported (8RF)	Supported (10RF)	Supported (12RF)
1-pair contiguous	Supported (4RF)	Supported (6RF)	Supported (6RF)	Supported (8RF)
4x4 MIMO Cell Max Throughput	0 600 Mbps	1CC 800 Mbps	2CC 1000 Mbps	3CC 1200 Mbps

MD8475B
3 units (24Tx)

MD8475B
2 units (16Tx)

MD8475B
1 unit (8Tx)

DL 4CA (all 256QAM, 20MHz Bandwidth)

Non-contiguous	Supported (8RF)	Supported (10RF)	Supported (12RF)	Supported (14RF)	Supported (16RF)
1-pair contiguous	Supported (6RF)	Supported (8RF)	Supported(10RF) Supported(8RF)	Supported (10RF)	Supported (12RF)
2-pair contiguous	Supported (4RF)	N/A	Supported (6RF)	N/A	Supported (8RF)
4x4 MIMO Cell Max Throughput	0 800 Mbps	1CC 1000 Mbps	2CC 1200 Mbps	3CC 1400 Mbps	4CC 1600 Mbps

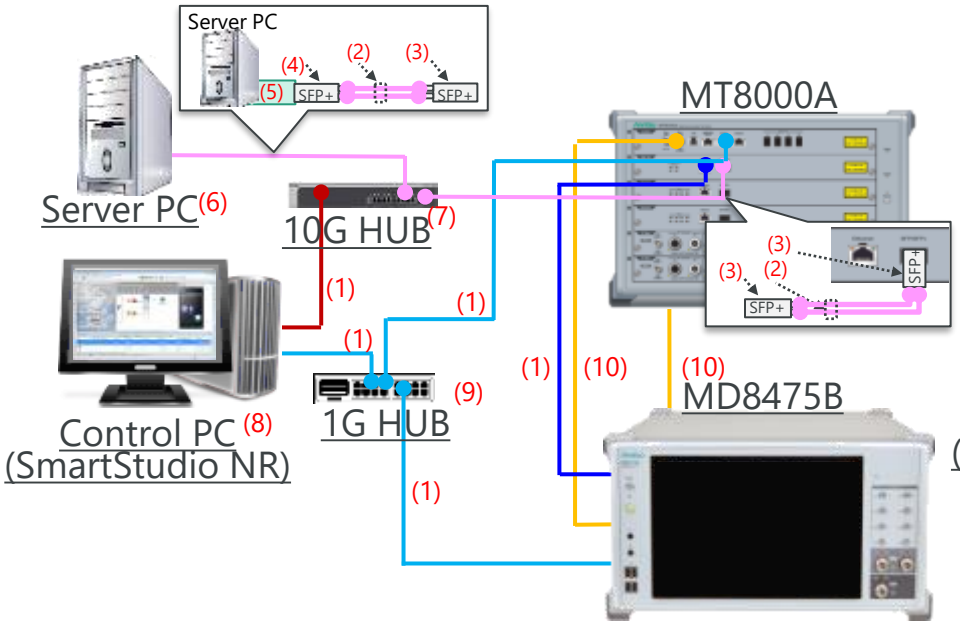
DL 5CA (all 256QAM, 20MHz Bandwidth)

Non-contiguous	Supported (10RF)	Supported (12RF)	Supported (14RF)	Supported (16RF)	Under Consideration (18RF)	Under Consideration (20RF)
1-pair contiguous	Supported (8RF)	Supported (10RF)	Supported (10, 12RF)	Supported (12, 14RF)	Supported (14RF)	Supported (16RF)
2-pair contiguous	Supported (6RF)	Supported (8RF)	Supported (8RF)	Supported (10RF)	Supported (10RF)	Supported (12RF)
4x4 MIMO Cell Max Throughput	0 1000 Mbps	1CC 1200 Mbps	2CC 1400 Mbps	3CC 1600 Mbps	4CC 1800 Mbps	5CC 2000 Mbps

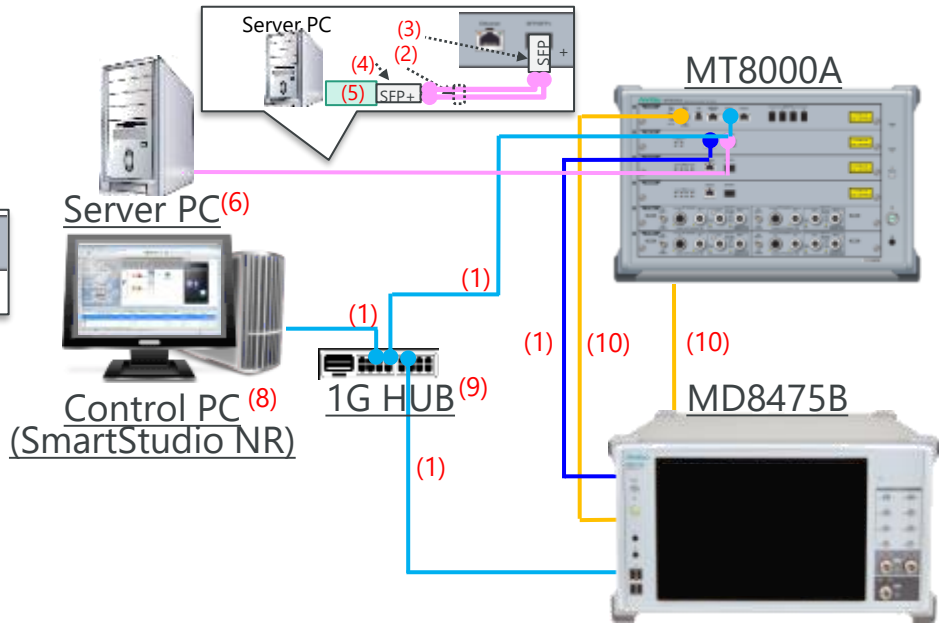
5G Test Configuration - FR1/FR2 Common

Anritsu
Advancing beyond

Option 3x EN-DC (with IMS)



Option 3x EN-DC (without IMS)



No.	Model Number	Model Name	Qty. (w/IMS)	Note	Qty. (w/o IMS)	Note
(1)	J1440A	LAN Cable	5	Control :3(Aqua), IMS :1(Red), NR/LTE :1(Blue)	4	Control :3(Aqua), NR/LTE :1(Blue)
(2)	J1581A	Optical cable MM LC/PC to LC/PC 3 meter	4	SFP+ Cable	2	SFP+ Cable
(3)	G0356A	8G FC/10G SR 850 nm SFP+	3	for 10G Switch, MT8000A	1	for MT8000A
(4)	N/A	SFP+ Transceiver	1	for Server	1	for Server
(5)	N/A	10G SFP NIC	1	for Server	1	for Server
(6)	N/A	Server PC	1		1	
(7)	N/A	10G Ethernet Switching HUB	1	Required **SFP port x2** (Ex, NETGEAR XS708T-100AJS)	0	Required **SFP port x2** (Ex, NETGEAR XS708T-100AJS)
(8)	N/A	Control PC for SmartStudio	1	Windows 10 64bits	1	Windows 10 64bits
(9)	N/A	1G Ethernet Switching HUB	1	No router functionality	1	No router functionality
(10)	J0127B	COAXIAL CORD	2	Sync, 10MHz Ref (Yellow)	2	Sync, 10MHz Ref (Yellow)

5G Test Configuration

Anritsu
Advancing beyond

Required PC Specification

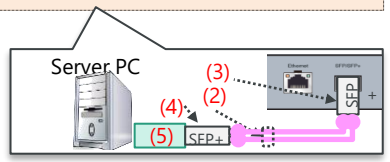
(6) For Server PC

Item	Specifications
OS	
CPU	・Intel® Xeon® E3-1220 v6 3.0GHz, 8M Cache, 4Core / 4Thread, Turbo (72W)
HDD	・1 × 500GB SATA, 3.5", 7.2K RPM, 3Gbps,
Memory	・1 × 8GB UDIMM 2400MT/s, 1R, x8 Data Width
Interface	・SATA DVD+/-RW ・Broadcom BCM5720 1Gb Base-T 2port (On board) ・**10GbE Ethernet Converged Network Adaptor (SFP+)**

Need to check for vendor lock-in between NIC(4) and SFP+ Transceiver(5).

MT8000A-AK002

Items
Dell Power Edge R240 (CentOS 6.9 Linux) - 540-BBBV Intel Ethernet I350 DP 1Gb Server Adaptor, Low profile - 10Gtek Transceivers X520-10G-2S-X8 (5) - WTD RTXM228-551 (G0356A) (4)
Optical Cable - LC.PC-LC.PC(MM3M)Fiber (J1581A) (2)
SFP+ Transceiver for MT8000A - WTD RTXM228-551 (G0356A) (3)



(8) For control PC (SmartStudio NR)

Item	Specifications
OS	・**Windows 10 64bit**
CPU	・Intel Core i7 or more (recommendation)
HDD	・500 GB 2.5 inch SATA HDD (7200 rpm) or more
Memory	・8 GB (4 GB x 2) or more ・Non-ECC DDR3 1600 MHz SDRAM Memory
LCD size	・24" Monitor with screen resolution 1920 x 1080

Z2035A

Items
Dell Optiplex XE3 (Windows 10 64bit) with monitor - 540-BBMO Kit - Intel 1GB SP PCIe Network card

5G Test Configuration - FR1

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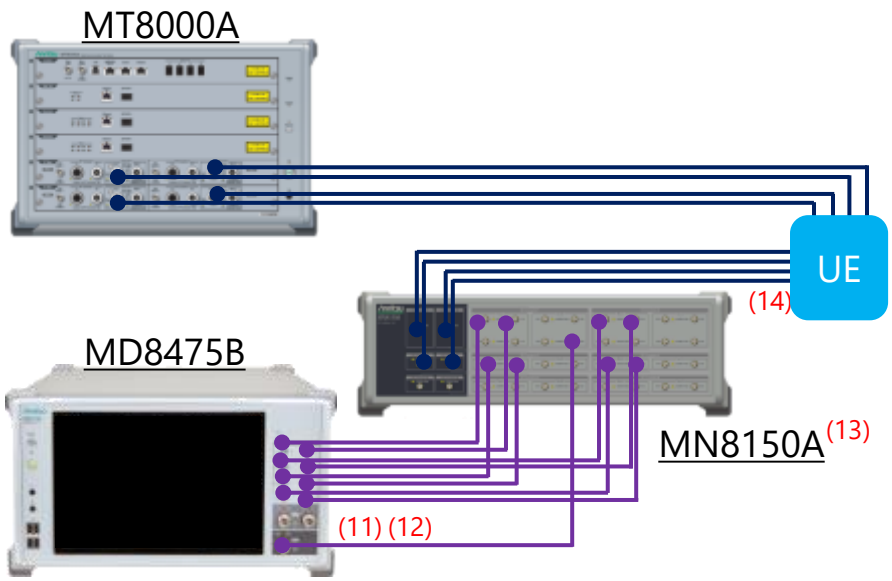
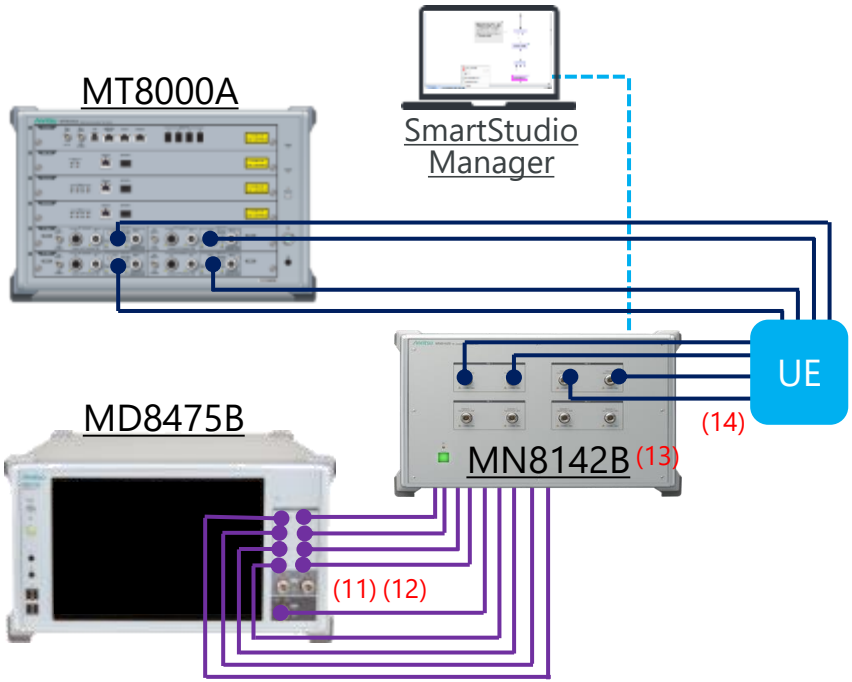
EN-DC Throughput Test

Sub 6GHz(4x4MIMO)/LTE 8Layers





No.	Model Number	Model Name	Qty.	Note
(11)	J1398A	N-SMA ADAPTOR	5	MT8000A :4, MD8475B :1,
(12)	J1674A	SMA/P-SMA/P Soft Rigid Cable	9	MD8475B :9
(13)	MN8150A	RF Combiner Unit	1	
(14)	N/A	UE Cable	8	SMA type

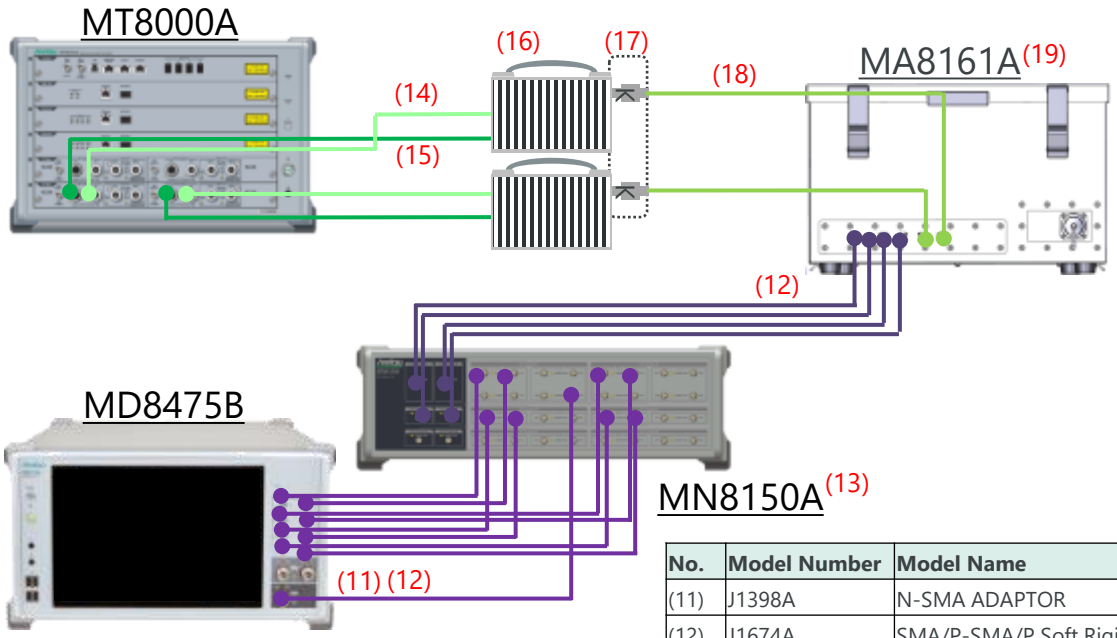
No.	Model Number	Model Name	Qty.	Note
(11)	J1398A	N-SMA ADAPTOR	5	MT8000A :4, MD8475B :1,
(12)	J1674A	SMA/P-SMA/P Soft Rigid Cable	9	MD8475B :9
(13)	MN8142B	RF Combiner Unit	1	
(14)	N/A	UE Cable	8	SMA type

5G Test Configuration – FR2

Anritsu
Advancing beyond

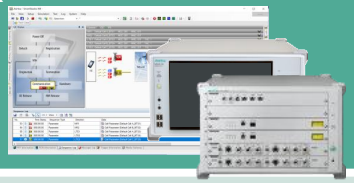
EN-DC Throughput Test

mmW (2x2MIMO)/LTE 8Layers



No.	Model Number	Model Name	Qty.	Note
(11)	J1398A	N-SMA ADAPTOR	1	MD8475B :1,
(12)	J1674A	SMA/P-SMA/P Soft Rigid Cable	13	MD8475B :9, MN8150A :4
(13)	MN8150A	RF Combiner Unit	1	
(14)	J1771B	Coaxial Cord (N-N, 3.0m)	2	IF Signal to Converter (Light green)
(15)	J1772B	Control Cable, 3.0m	2	Control to Converter (Green)
(16)	MA80001A /MA80002A	28GHz RF Converter/ 39GHz RF Converter	2	
(17)	K222B	Precision Adapter	2	KF-KF Connector. Standard accessories (MA80001A)
(18)	J1775A (J1775B)	Coaxial Cable (KM-KM, 0.3m) (Coaxial Cable (KM-KM, **1m**))	2 (2)	mmWave RF cable
(19)	MA8161A	Shield Box	1	with Antenna Unit

SmartStudio vs SSNR

	SmartStudio 	SSNR 	Remarks
Legacy(2G/3G)	Supported	-	
LTE	Supported	Supported	
LTE-A	Supported (5CC&20Layers)	Supported (5CC&20Layers)	
5G NR (NSA)	-	Supported (Option 3, 3a, 3x)	
5G NR (SA)	-	Supported (Option 2)	
Mobility	-	-	-
LTE P-cell HO	Supported	Supported	Up to 2CC&2x2MIMO
LTE S-cell Add	Supported	Supported	Up to 3CC&8layers
LTE S-cell Release	Supported	Supported	Up to 3CC&8layers
LTE S-cell Switch	Supported	Supported	Up to 2CC&2x2MIMO
NR Add (EN-DC connection)	-	Supported	
NR Release (LTE connection)	-	Supported	
NR Switch (PS-cell Switch)	-	Supported	
Inter-RAT HO to 2G/3G	Supported	-	
Application	-	-	-
Network Failure(Abnormal)	Supported	Supported	
SMS	Supported	Supported	
PWS	Supported	Supported	
IMS (Server)	Supported	Supported	
IMS (Script)	Supported	Supported	
RCS	Supported	-	
Wi-Fi Offload	Supported	-	

Support Status of IMS Features

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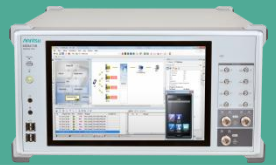
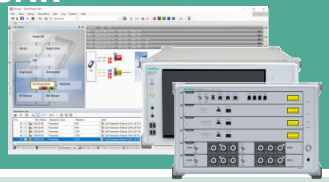
	SmartStudio 	SSNR 	Remarks
Legacy(2G/3G)	Supported	-	
LTE	Supported	Supported	
LTE-A	Supported (5CC&20Layers)	Supported (5CC&20Layers)	
5G NSA	-	Supported (Option 3x)	
5G SA	-	Supported (Option 2)	
IMS Services	-	-	-
IP Address Setting	IPv4 : 3, IPv6 : 3	IPv4 : 3, IPv6 : 3	
CSCF	Support	Support	
DHCPv6	Support	Support	
DNS	Support	Support	
MWI	Limited Support	Limited Support	Only notifies is supported. (3GPP TS 24.606 Rel10 only)
NDP	Support	Support	
NTP	Support	Support	
PSAP	Support	Support	
RCS	Support	-	
VoLTE Conference	Support	Support	
XCAP	Support	Support	
BSF	Support	Support	
MRF	Support	Support	
IMS Script	Support	Support	
RTP	Support	Support	

SW Test Application Configuration

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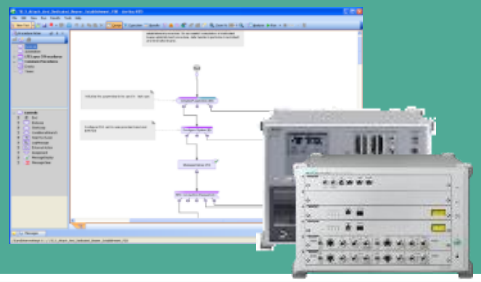
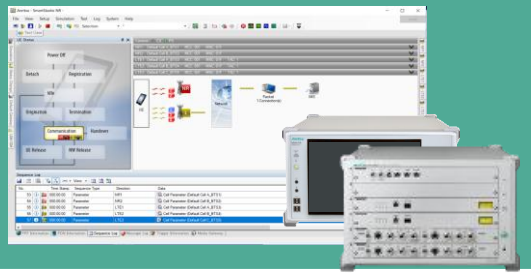
Difference between RTD and SmartStudio in UE software(protocol) test.

Protocol model (RTD)	Function Model (SmartStudio NR)
	
✓ It is necessary to create each test case by the user ➢ Deep knowledge of 3GPP protocol required	✓ Interactive test environment without complicated test scripts ✓ Possible to test for UE function(Voice, data communication, Messaging…) without requiring deep knowledge of protocol
✓ Test scripts can be created using flow chart interface, supporting high flexibility and scalability. ➢ Possible to check user-specific abnormal tests and protocol message at one by one.	✓ Abnormal test for user specific doesn't support (Some abnormal tests are supported by SmartStudio GUI.)
Check at protocol message level ➢ Chipset R&D ➢ Chipset integration to the UE in the early phase	**Check as UE function** ➢ UE application test ➢ UE regression test on software update ➢ UE maintenance (ex, localization)

Contents

MD8475B Signalling Tester Product Overview

Anritsu
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- **Equipped with 8TX/4RX RFs for carrier aggregation**
- **Support LTE-Advanced 4CCs 4x4MIMO (16layers) in single box**
- **Multi-system capable platform**
  - W-CDMA/HSPA/HSPA evo/DC-HSDPA, GSM/GPRS/EGPRS
  - CDMA2000 1X/EV-DO, TD-SCDMA/HSPA
  - 5GNR-NSA (w/ MT8000A)
- **Easy operation with State-machine based GUI "SmartStudio"**
- **2-cell IntraRAT / InterRAT capable platform**
  - 2-cell/3-cell IntraRAT: LTE 3-cell, W-CDMA 2-cell, GSM 2-cell , TD-S 2-cell
  - 2 system InterRAT: LTE/LTE/W, LTE/LTE/G, LTE/LTE/C2K, LTE/LTE/TD

- **Built-in IMS service function**
  - CSCF/DHCP/DNS Server functions
  - NDP/XCAP/GBA/Early Media function
  - IMS Supplementary Service
  - RTP control for VoLTE quality test
  - RCS (Rich Communication Suite)
  - Script-based I/F for advanced test
- **Built-in SMS center**
- **Built-in PWS center**
  - ETWS (LTE/W-CDMA/GSM)
  - CMAS (LTE/W-CDMA/GSM/cdma2000)
- **Built-in UE/Network Trigger function**
  - Sub-normal condition(LTE/W-CDMA/GSM/TD-SCDMA))
- **WLAN Offloading**
  - EAP authentication
  - ePDG access
  - ANDSF policy distribution
- **Automation**
  - Remote control of SmartStudio
  - Script-based automation engine
  - Included more than sample 180 TCs

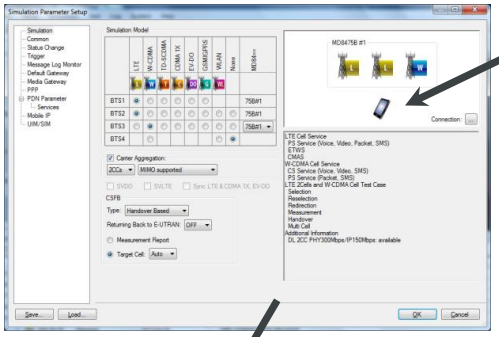
No new sales for CDMA2000

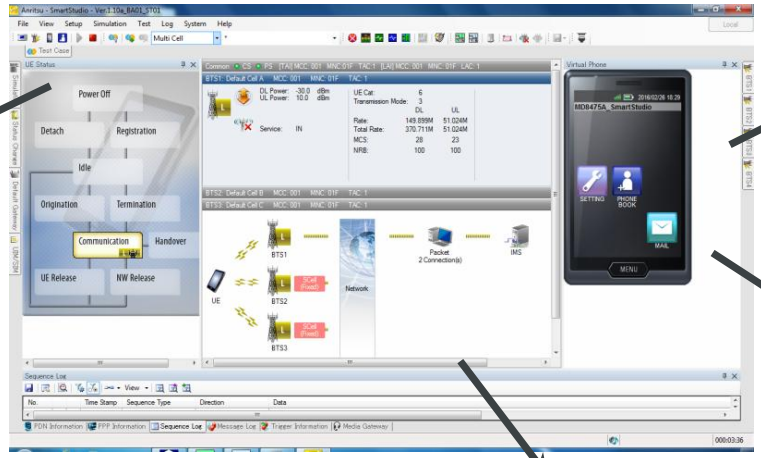
SmartStudio - Easy Operation with State-Machine GUI

- Interactive test environment without complex test scripts
- Built-in IMS server
- Unique graphical SMS/PWS Centre applications for SMS/CMAS/ETWS service
- Network parameter settings matching user test environment
- Automatic call setting matching DUT ability

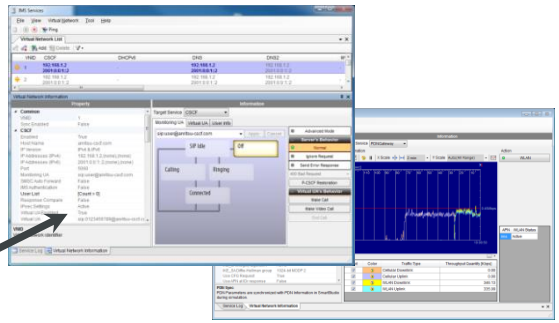
SmartStudio

Various System Configurations
(InterRAT/IntraRAT condition)



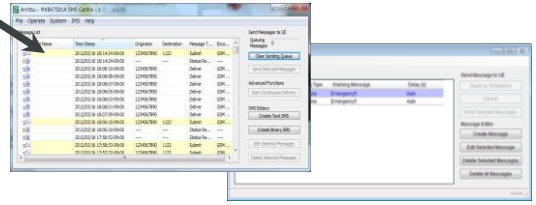


IMS Services



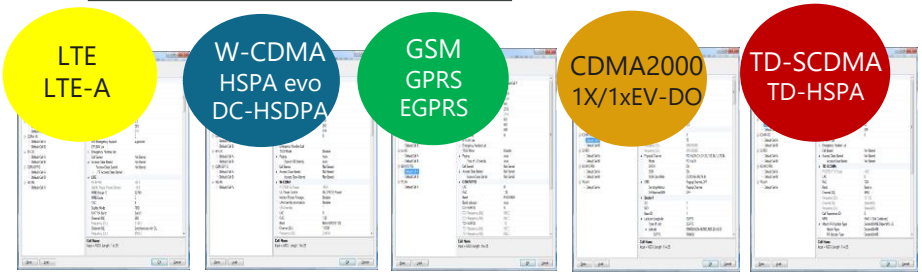
WLAN Offload services

SMS Centre

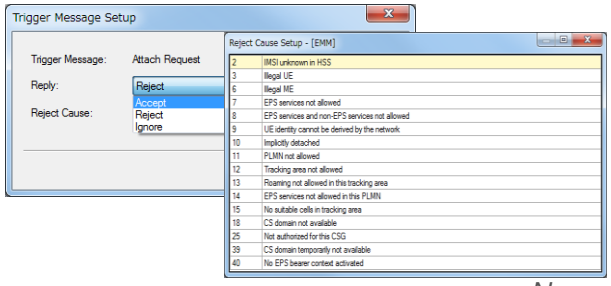


PWS Centre

Extensive Network Parameters



UE/Network Trigger(Abnormal Condition)



No new sales for CDMA2000

Key Feature and Specification of MD8475A/B

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			MD8475B		MD8475A (Discontinued)
Maximum # of RFs			**8TX/4RX**		2TX/2RX
TX	Frequency		350 MHz to **6 GHz**		350 MHz to 3.6 GHz
	Level	MAIN AUX1/2	-130 to -27 dBm (to 3.8 GHz) -130 to -32 dBm (3.8 GHz to 6 GHz) *G/C2k: -130 to -25 dBm		-130 to -10 dBm
		DL Out1-8	-115 to -5 dBm (to 3.8 GHz) -115 to -10 dBm (3.8 GHz to 6 GHz)		—
RX	Frequency		350 MHz to **6 GHz**		350 MHz to 3.6 GHz
	Level	MAIN AUX1/2	-60 to +35 dBm -30 to +40 dBm (GSM: in-burst average)		-60 to +35 dBm -30 to +40 dBm (GSM: in-burst average)
Signalling Unit			eMSU(MD8475B-071)	MSU(MD8475B-070)	MSU(MD8475A-070)
LTE			Support	Support	Support
IP Traffic Generator			Support	Support	Not support
UE DL Category			**1 to 7, 9 to 13, 15, 16, 18, 19, 20**	1 to 4, 6, 9, 11	1 to 4 and 6 (2box)
Maximum number of CCs			**5**	4	2
Antenna connection			SISO, 2x2 MIMO, **4x4 MIMO**	SISO, 2x2 MIMO	SISO, 2x2 MIMO
Modulation			64QAM, **256QAM**	64QAM	64QAM
FDD/TDD joint CA			**Support**	Not support	Not support
LAA			**Support**	Not support	Not support
UE UL Category			**1 to 7, 9 to 13**	1 to 4,6,9 and 11	1 to 4 and 6 (2box)
Maximum number of CCs			**2**	2 (*1)	2 (*1)
Modulation			16QAM, **64QAM**	16QAM, 64QAM(*1)	16QAM
W-CDMA			Support	Support	Support
GSM			Support	Support	Support
TD-SCDMA			Support	Support	Support
SSNR			**Support**	Not support	Not support

(*1)Maximum throughput is up to 50 Mbps

LTE-A CA & MIMO Status (MD8475B/eMSU)

Anritsu
Advancing beyond

DL 3CA (all 256QAM, 20MHz Bandwidth)

Non-contiguous	Supported (6RF)	Supported (8RF)	Supported (10RF)	Supported (12RF)
1-pair contiguous	Supported (4RF)	Supported (6RF)	Supported (6RF)	Supported (8RF)
4x4 MIMO Cell Max Throughput	0 600 Mbps	1CC 800 Mbps	2CC 1000 Mbps	3CC 1200 Mbps

MD8475B
3 units (24Tx)

MD8475B
2 units (16Tx)

MD8475B
1 unit (8Tx)

DL 4CA (all 256QAM, 20MHz Bandwidth)

Non-contiguous	Supported (8RF)	Supported (10RF)	Supported (12RF)	Supported (14RF)	Supported (16RF)
1-pair contiguous	Supported (6RF)	Supported (8RF)	Supported(10RF) Supported(8RF)	Supported (10RF)	Supported (12RF)
2-pair contiguous	Supported (4RF)	N/A	Supported (6RF)	N/A	Supported (8RF)
4x4 MIMO Cell Max Throughput	0 800 Mbps	1CC 1000 Mbps	2CC 1200 Mbps	3CC 1400 Mbps	4CC 1600 Mbps

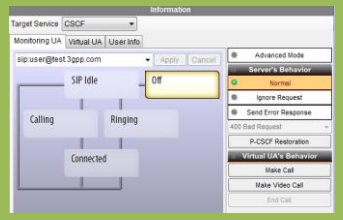
DL 5CA (all 256QAM, 20MHz Bandwidth)

Non-contiguous	Supported (10RF)	Supported (12RF)	Supported (14RF)	Supported (16RF)	Under Consideration (18RF)	Under Consideration (20RF)
1-pair contiguous	Supported (8RF)	Supported (10RF)	Supported (10, 12RF)	Supported (12, 14RF)	Supported (14RF)	Supported (16RF)
2-pair contiguous	Supported (6RF)	Supported (8RF)	Supported (8RF)	Supported (10RF)	Supported (10RF)	Supported (12RF)
4x4 MIMO Cell Max Throughput	0 1000 Mbps	1CC 1200 Mbps	2CC 1400 Mbps	3CC 1600 Mbps	4CC 1800 Mbps	5CC 2000 Mbps

SmartStudio IMS Test Solution

Anritsu
Advancing beyond

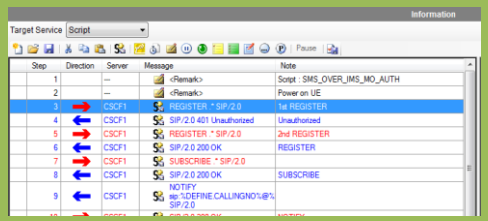
Server mode



- ✓ Interactive test environment **without complicated test scripts**
- ✓ Possible to test for IMS function(VoLTE, SMS) without requiring deep knowledge of protocol

- ✓ Abnormal test for user specific doesn't support
  (Some abnormal tests are supported by Extended CSCF option.)
- ✓ Doesn't support operator-specific information.
  (Can't support ...)

Script mode



- ✓ It is necessary to create a test case by the user
  - ➢ Deep knowledge of IMS protocol required

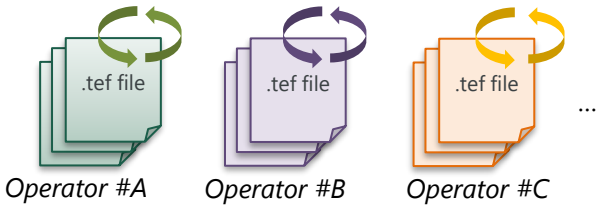
  * Providing technical support service separately

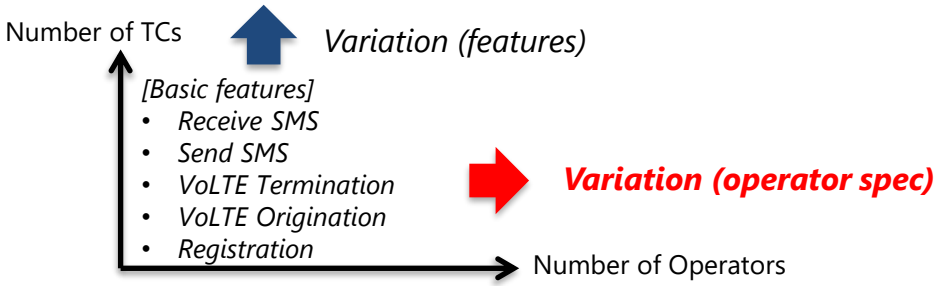
Help to create test case by "Log Import Option"

- ✓ Scripts can be created using a ladder sequence, **supporting high flexibility and scalability**.
  - ➢ Possible to check user-specific abnormal tests and protocol check at any message level.
  - ➢ Call processing of LTE is by using the SmartStudio, the user can focus on function of IMS development and evaluation.

Application example :

Regression test for each operator using the automation tool(SmartStudio Manager)





IMS Script/Log Import (MD8475B Option)

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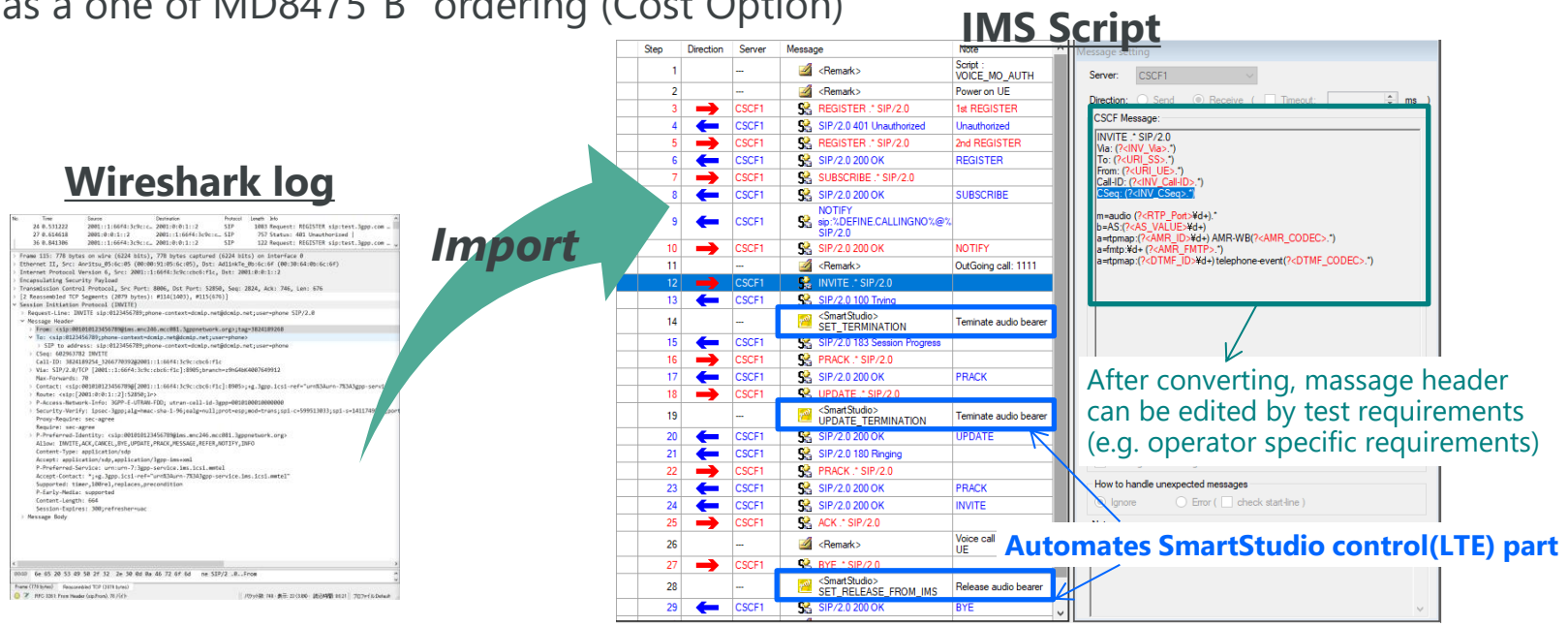
Key Features

- Fully automated IMS script file (.tef file) creation tools
- Supports SIP protocol and XCAP protocol
- Converted from Wireshark Log captured in live network operation
- An encrypted massage can be converted with key value set
- Automates SmartStudio control (LTE) part during converting process
- Converted script can be edited in massage level using the Add-in Server window
- Listed as a one of MD8475"B" ordering (Cost Option)



Advanced Test for IMS data part - RTP frame control

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RTP Frame Control Option (MD8475A/B support)

Support evaluation for the purpose of differentiation in terms of quality in the VoLTE function.

■ VoLTE Loopback

Supports both VoLTE and ViLTE calls.

DL: Loopback voice/video

UL: Voice/video

Supports data delay or/and packet loss condition

■ Mute/Silent (DTX)

Support test environment simulating silent state

DL: SID frame

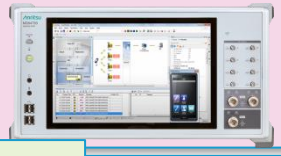
UL: Voice

■ Fixed Pattern

Simulation of calls that imagined various voices
(ex. Woman's voice (high tone), man's voice (low tone))

DL: Fixed pattern

UL: Voice



■ No Data

Check the operation of the UE in no received data condition.

DL: No data

UL: Voice

■ Text Data for **RTT** (Real-time text)

This mode transmits text data to UE by RTT.

DL：Text (user data)

UL：Text

■ Binary Data

This mode transmits binary data to UE.

DL：Binary (user data)

UL：Voice/Video/Text

EU Energy Labeling with SmartViser

New

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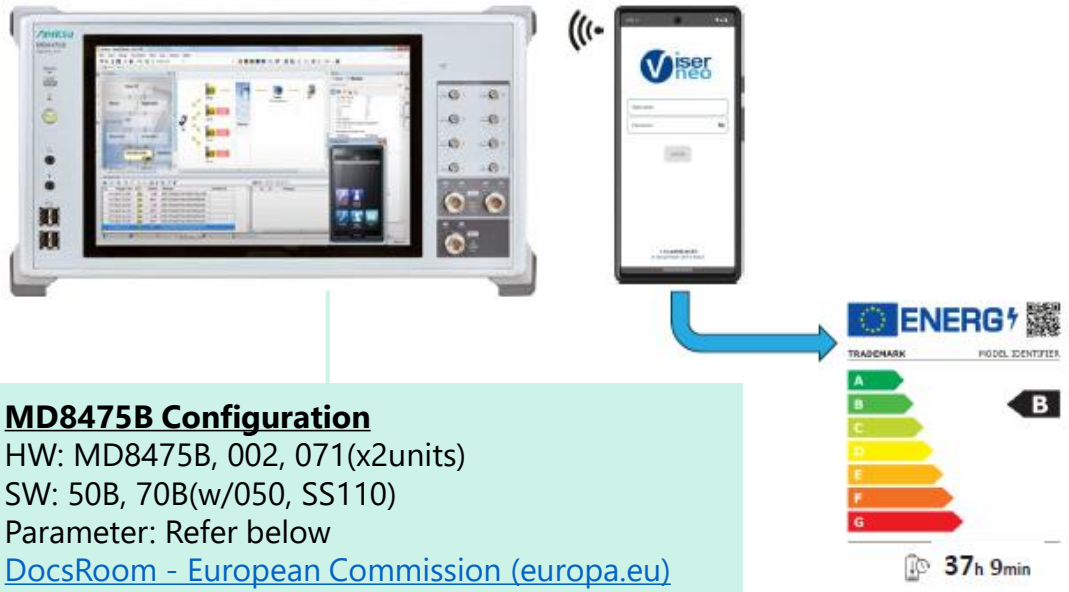
The EU Regulation of Energy Labelling **for smartphones and Tablets** was published in the Original Journal of EU on the 20th of September 2023 and after 21 months of transition period will **become mandatory on the 20th of June 2025**.

→ UE and tablets placed in EU market will require Energy Label.

Anritsu MD8475B and SmartViser test application provides energy labelling automatic test solution according to the following test process.

✓ Call/Web browsing/Video streaming/Data transfer/Video playback/Idle



MD8475B Configuration
HW: MD8475B, 002, 071(x2units)
SW: 50B, 70B(w/050, SS110)
Parameter: Refer below
DocsRoom - European Commission (europa.eu)

Energy Class - This is calculated with the Energy Efficiency Index score.

Battery Endurance - How long does it take for the device to go from 100% battery to 0% with the testing loop

News: SmartViser and Anritsu unite to optimise testing for Energy Labelling regulation for smartphones and tablets with Strategic Partnership | Anritsu Europe

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