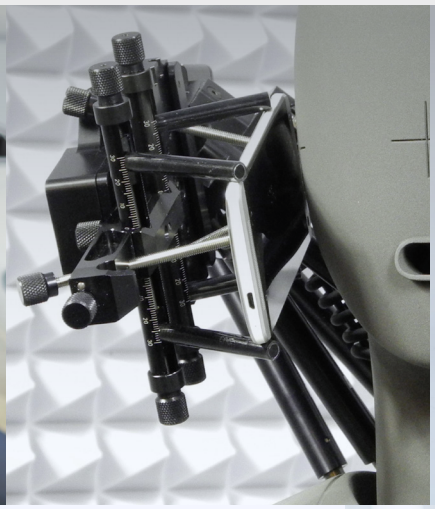
HEAD acoustics

APPLICATION NOTE



ACQUA

Establish 5G/4G connection to *lab*CORE via Anritsu MT8000A

Application Note

Establish 5G/4G connection to *lab*CORE via Anritsu MT8000A

Revision 1

Legal notices

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1 Introduction

1.1 Brief Description

This application note describes the procedure to establish a voice call in a 5G SA network (VoNR) or a 4G network (VoLTE) from the *lab*CORE hardware platform to a 5G/4G compatible device under test via the Anritsu MT8000A radio tester. The device under test registers via 5G SA network/4G network at the IMS server of Anritsu MT8000A. *lab*CORE connects to Anritsu MT8000A via wired Ethernet and also registers at its IMS server. Then, the ACQUA analysis software establishes a voice call between *lab*CORE and the device under test.

The application requires advanced knowledge HEAD acoustics equipment, Anritsu MT8000A, and Anritsu Smart-Studio NR. HEAD acoustics will not respond to support requests concerning general handling and technical configuration of Anritsu MT8000A and Anritsu SmartStudio NR.

All screenshots are exemplary and may differ from customer experience.

1.2 Reference Documentation

Document name
*lab*CORE Manual
HMS II Series Manual
ACQUA Online Help
Anritsu MX800070A SmartStudio NR Operation Manual

1.3 Acronyms and Abbreviations

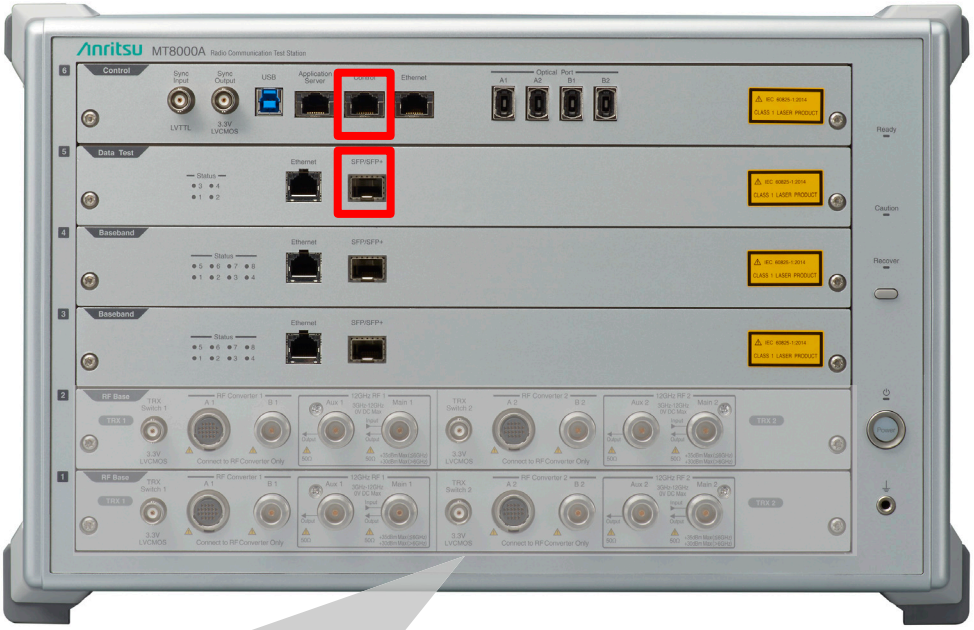
Acronym / abbreviation	**Description**
ACQUA	Advanced Communication Quality Analysis
AMR	Adaptive multi-rate
dB	Decibel
dBm	Decibel-milliwatts
DUT	Device under test
GBit	Gigabit
IMS	IP Multimedia Subsystem
IP	Internet Protocol
kHz	Kilohertz
LTE	Long Term Evolution
NR	New Radio
NSA	Non-Standalone
RF	Radio frequency
RTP	Real-time protocol
SA	Standalone
SIM	Subscriber identity module
VoIP	Voice over Internet Protocol
VoLTE	Voice over LTE
VoNR	Voice over New Radio

1.4 Applied Interfaces at *lab*CORE and Anritsu MT8000A

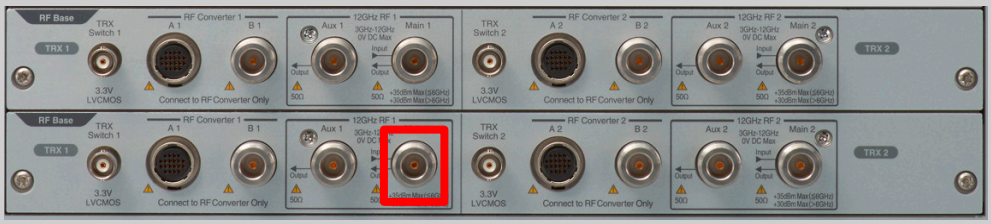
1.4.1 *lab*CORE Interfaces Front Panel

Ethernet interface (RJ45) for measuring IP-based communication

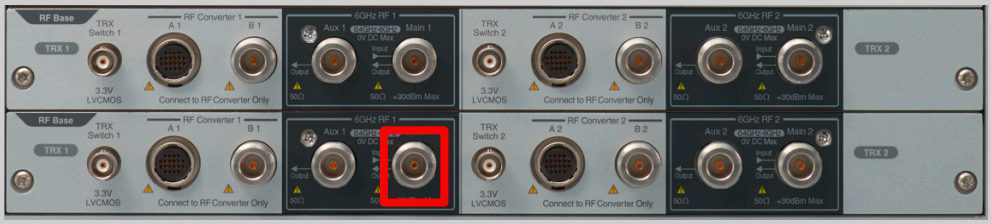
1.4.2 Anritsu MT8000A Interfaces for 5G



MT8000A-020/021



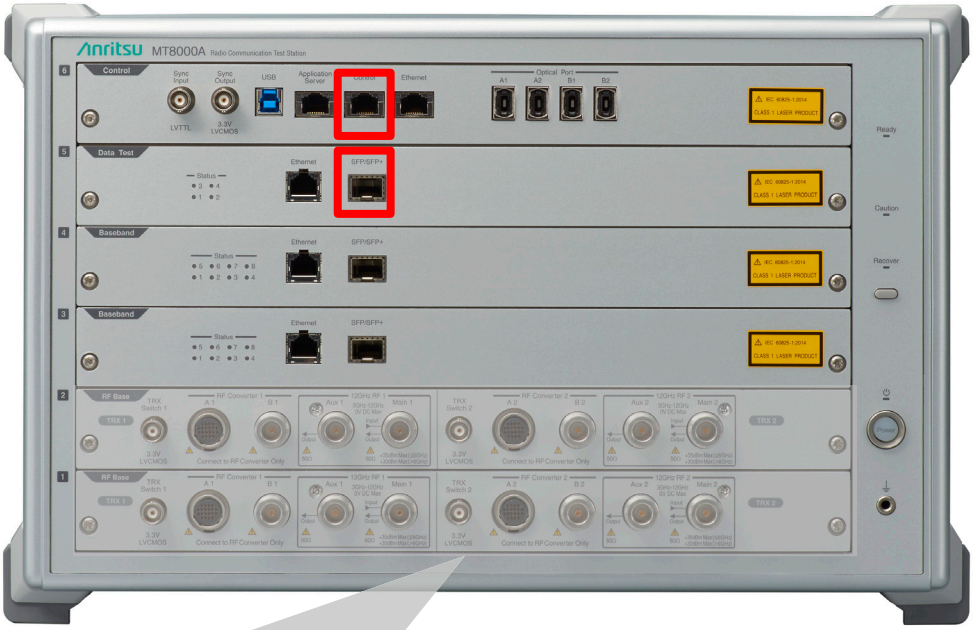
MT8000A-031/032



MT8000A-033

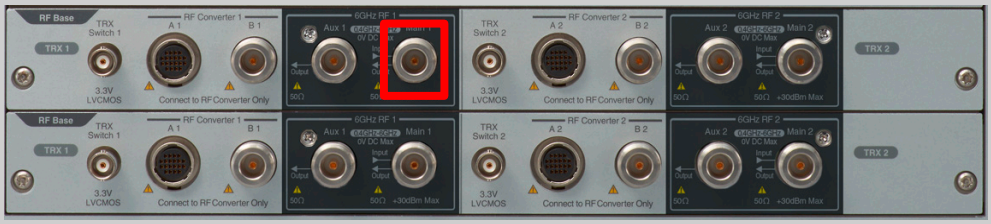
- Ethernet socket for connecting control computer
- SFP/SFP+ socket for connecting 10 GBit Ethernet switch
- Type N RF antenna connector for connecting an external antenna

1.4.3 Anritsu MT8000A Interfaces for 4G



MT8000A-020/021

MT8000A-031/032



MT8000A-033

- Ethernet socket for connecting control computer
- SFP/SFP+ socket for connecting 10 GBit Ethernet switch
- Type N RF antenna connector for connecting an external antenna

1.5 Equipment List

1.5.1 HEAD acoustics Equipment

Required

- *lab*CORE (Code 7700), Modular multi-channel hardware platform
  - *core*BUS (Code 7710), I/O bus mainboard
  - *core*OUT-Amp2 (Code 7720), Power amplifier board
  - *core*IN-Mic4 (Code 7730), Microphone input board
  - *core*IP (Code 7770), VoIP software extension with at least one of the following voice codecs
    - ► *core*IP-AMR (Code 7772), AMR extension
    - ► *core*IP-EVS (Code 7773), EVS extension
- ACQUA (Code 6810), Advanced Communication Quality Analysis software
- HMS II.3 (Code 1703), HEAD measurement system with ear simulator and artificial mouth

Optional

- *lab*CORE extensions depending on device under test and/or application case
  - *core*IP-IMP (Code 7771), VoIP impairment extension
  - *core*BEQ (Code 7741), Binaural equalization
- Any HEAD acoustics handset positioner
  - HHP IV (Code 1406), Motorized handset positioner
  - HHP III.1 (Code 1403), Handset positioner

1.5.2 Anritsu Equipment

Required

- MT8000A, Anritsu MT8000A Radio Communication Test Station
- MT8000A-001, Control Module
- MT8000A-011, Baseband Module
- MT8000A-012, Data Test Module
- MT8000A-020, RF Base Module
- MT8000A-021, 0.4GHz-6GHz RF Sub Module
- MT8000A-031, 0.4 GHz-6GHz Multi RF Module
- MT8000A-032, 0.4 GHz-6 GHz Multi RF Extension
- MT8000A-033, 0.4 GHz-7.125 GHz Enhanced RF Module
- MX800078A, LTE/NR Platform Software for SmartStudio
- MX800079A, NR Platform Software for SmartStudio
- MX800070A, SmartStudio NR(SSNR)
- MX800070A-002, 5G SA option
- MX800070A-004, 5G Core option
- MX800070A-011, NR TDD option
- MX800070A-012, NR FDD option
- MX800070A-013, SDAP option
- MX800070A-SS110, SmartStudio NR Support Service

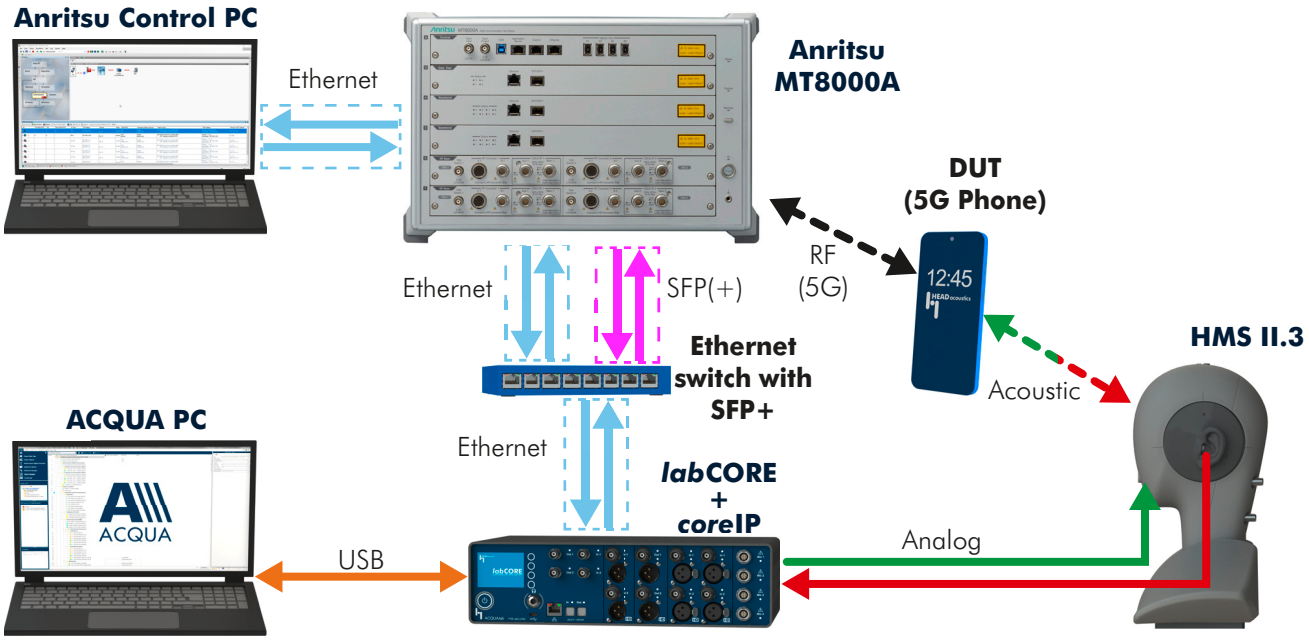
Optional

- MX800070A-080, IMS Server option
  For the following testing applications:
  - Emulates network fault at VoNR connection from UE
  - Simulates VoNR calls from MT8000A/SSNR to UE
  - Supports supplementary service functions, such as caller ID and call forwarding
  - Authenticates call connections using Early Media sequence
  - GBA certification

1.5.3 Third Party Equipment

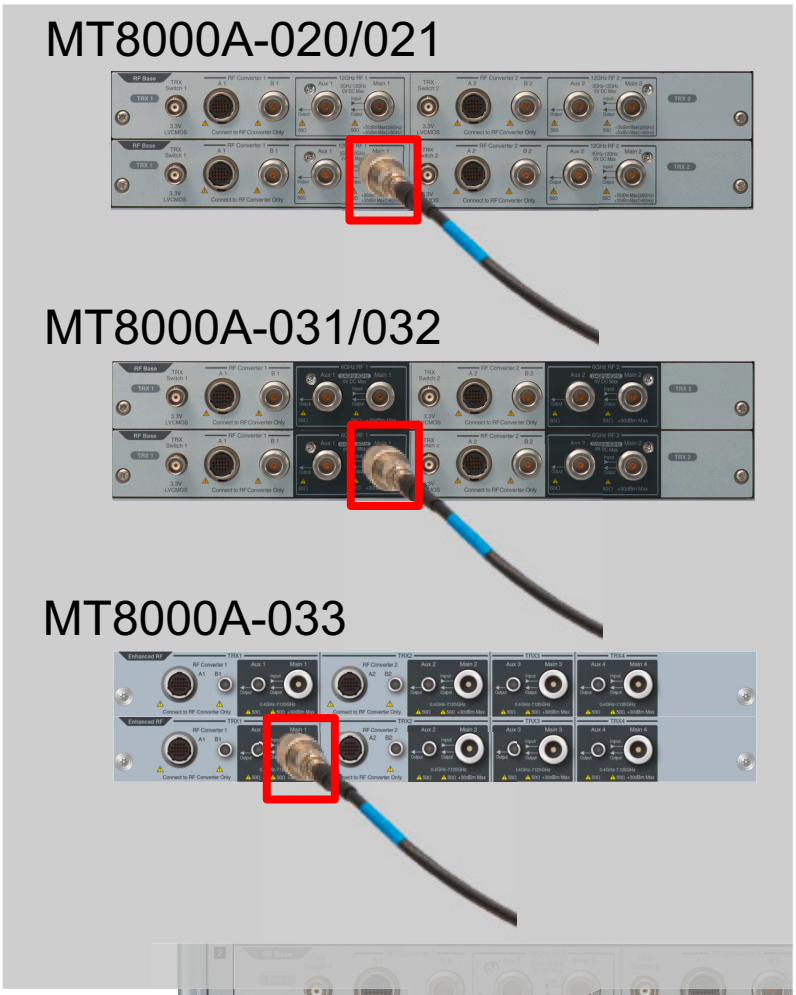
- 10 Gigabit Ethernet Switch with SFP+ port
- 3 x Ethernet cable
- 2 x Optical cable MM LC/PC to LC/PC, 3 meters
- 2 x 10 Gigabit Ethernet SR 850nm SFP+ module
- RF cable
- RF antenna
- Computer for ACQUA software
- Computer for SmartStudio NR software
- DUT
- Test SIM card

1.6 Configuration Example



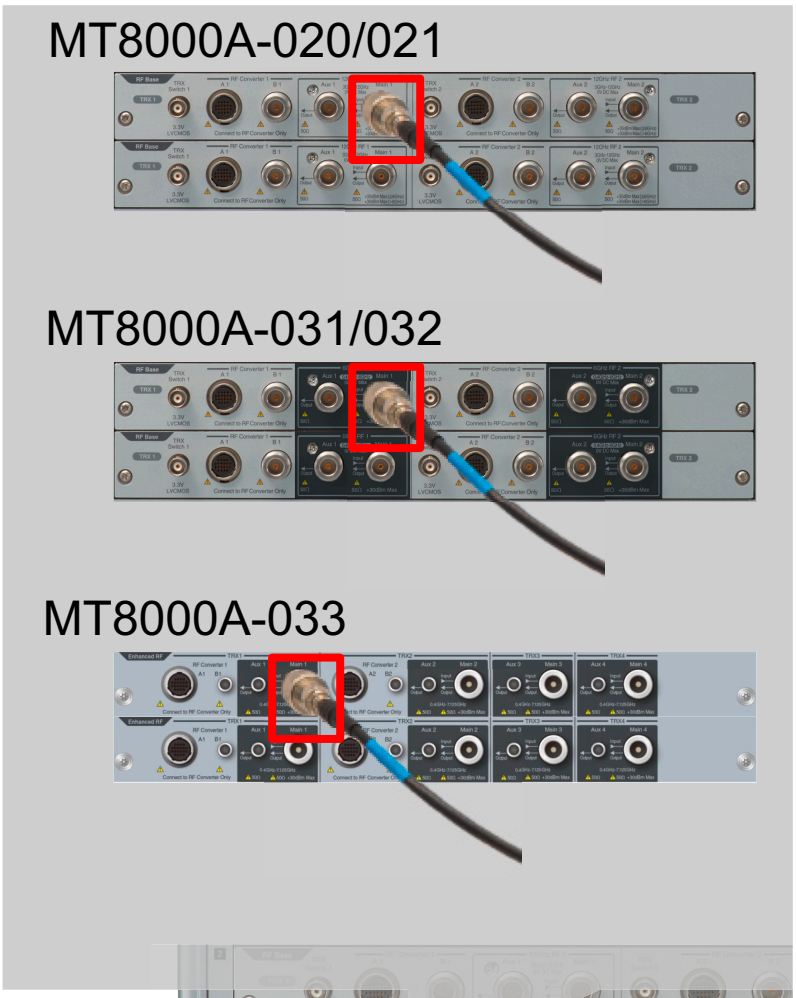
1.7 Cabling

1.7.1 Antenna 5G Connections



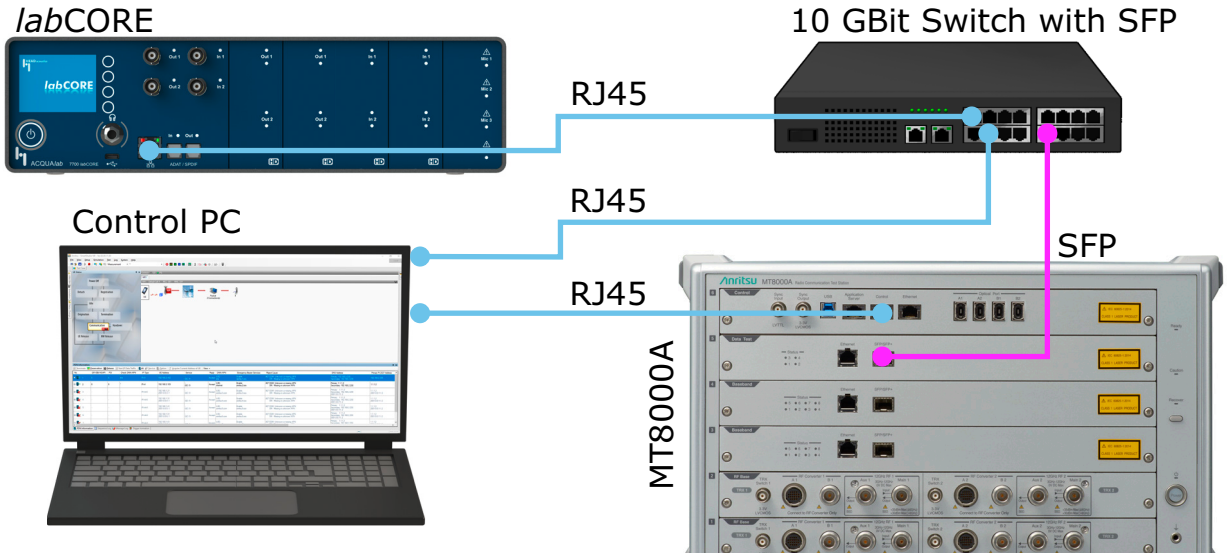
Attach the main antenna to the appropriate Type N connectors.

1.7.2 Antenna 4G Connections



Attach the main antenna to one of the appropriate Type N connector.

1.7.3 *lab*CORE to Anritsu MT8000A



- Connect one Ethernet cable to the Ethernet socket at the front panel of *lab*CORE and to one random RJ45 socket of the Ethernet switch.
- Connect the optical cables to SFP/SFP+ socket of Anritsu MT8000A and to SFP(+) sockets of the Ethernet switch.
- Connect the Control computer via Ethernet to the socket Control of Anritsu MT8000A.
- Connect the Control computer via Ethernet to one random RJ45 socket of the Ethernet switch.

1.8 Installation of Control Computer for Anritsu MT8000A

- For installation of the control computer refer to chapter 2.3 of MX800070A SmartStudio NR Operation Manual.
- Define the network adapter via the control computer according to chapter 2.1.3.1 of MX800070A SmartStudio NR Operation Manual.

1.9 Anritsu MT8000A Delays

The forwarding delays of Anritsu MT8000A are determined and provided by Anritsu Corporation.

Anritsu Corporation accounts for the accuracy of these values.

Network type	Uplink	Downlink
NR (5G)	2.8 ms	1.8 ms
LTE (4G)	2.0 ms	2.9 ms

2 Anritsu MT8000A Configuration

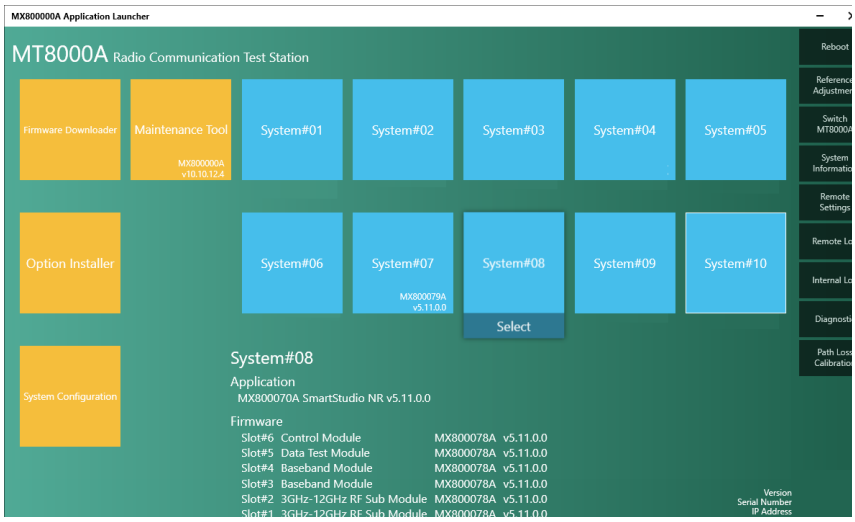
2.1 5G NR Connection Establishment

2.1.1 Preparations

- Interconnect the hardware according to chapter 1.6 and chapter 1.7
- Boot up Anritsu MT8000A.
- Boot up control computer for Anritsu MT8000A.
- Start Anritsu Application Launcher on the control computer.
- Boot up computer and start ACQUA.
- Boot up *lab*CORE.
- Insert test SIM card into DUT, boot up DUT and set it to airplane/offline mode.

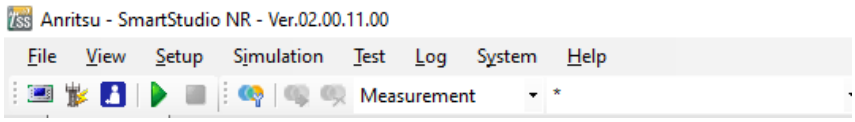
2.1.2 5G NR Connection Procedure

Start **SmartStudio NR** v5.11.0.0 from Application Launcher on the Anritsu control computer.

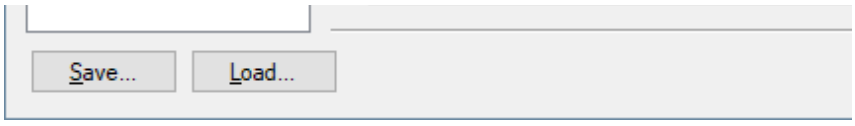


Simulation Parameter Setup

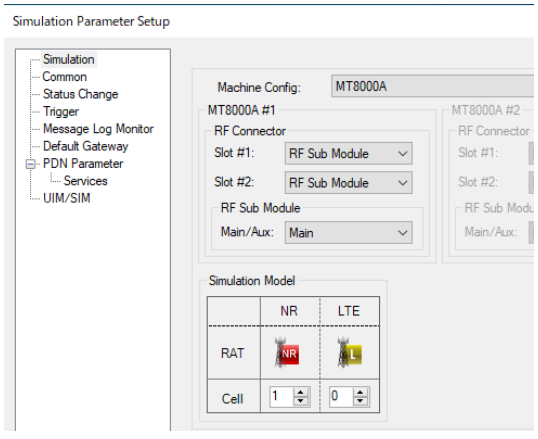
1. Select to open **Simulation Parameter Setup**.



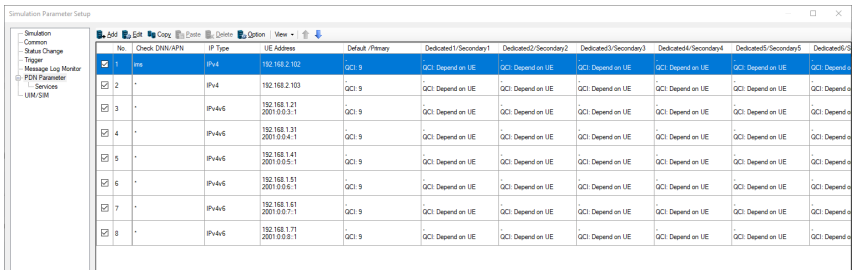
2. If available, load existing **Simulation Parameter Setup** (such as SA_NR_LTE_IMS.wnssp3) by selecting **Load**.



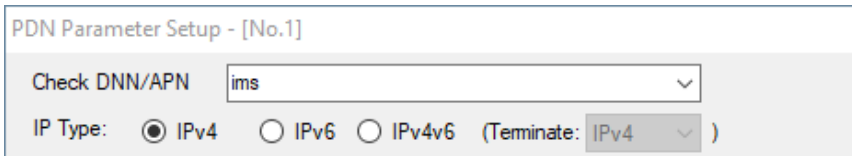
3. Select **Simulation**.
4. Set **Simulation Model** to **NR Cell** → **1** and **LTE Cell** → **0**.



5. Select **PDN Parameter**.
6. Double-click on the desired packet data network (PDN).

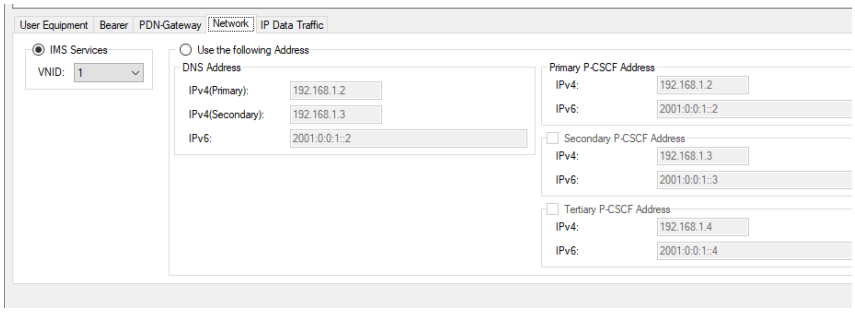


7. Enter the desired name for the APN network.
8. Select the desired Internet Protocol for the APN network.



9. Select the **User Equipment** tab.
10. Enter the IP address of the DUT according to the selected Internet Protocol.

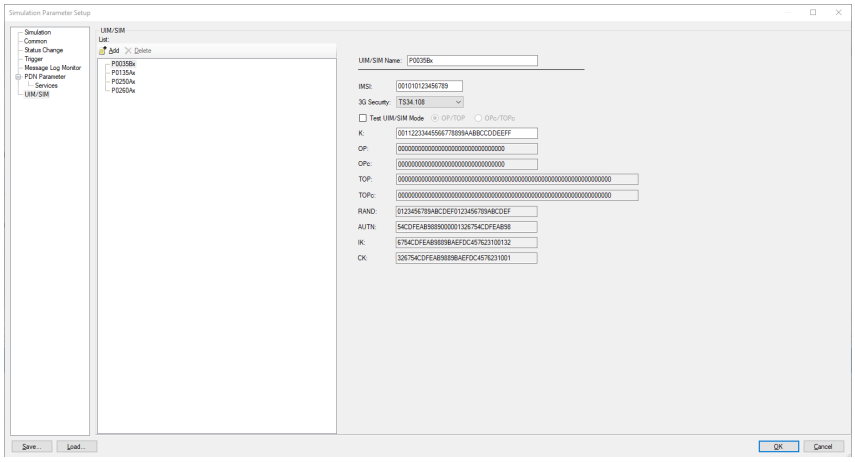
11. Select the **Network** tab.
12. Select **IMS Services**.
13. Select **OK** to confirm.



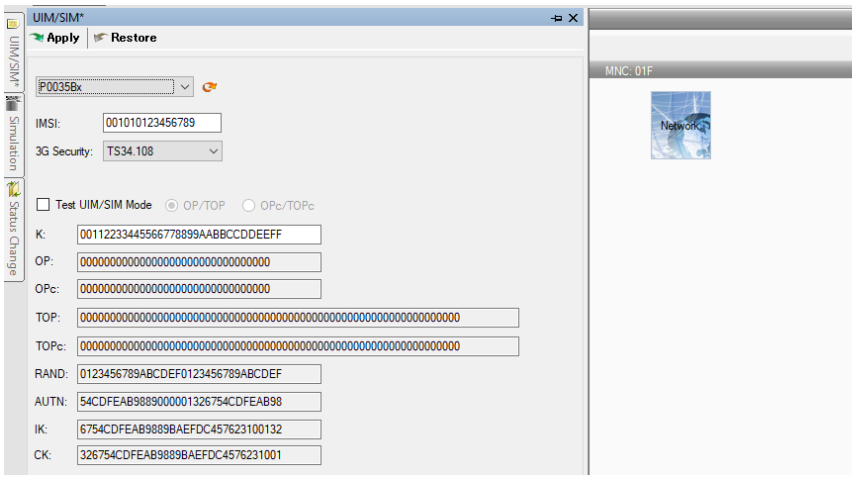
14. Select **UIM/SIM**.
15. Add or select the **UIM/SIM**.
16. Enter the appropriate UIM/SIM settings.

    or

    Confirm if the UIM/SIM settings apply to the SIM card of the DUT.
17. If desired, save the simulation parameter setup by selecting **Save**.
18. Confirm **simulation parameter setup** by selecting **OK**.

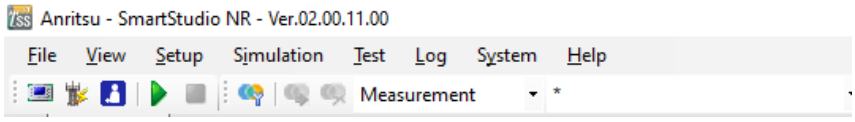


19. Select the **UIM/SIM** tab at the left-hand side of the main screen.
20. Select the applied **UIM/SIM** from the drop-down list.
21. Confirm the choice by selecting **Apply**.

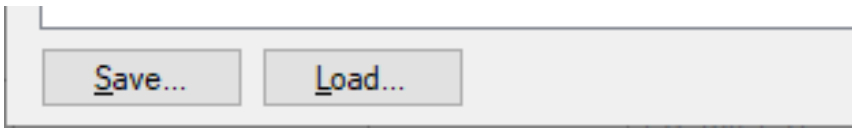


Cell Parameter Setup

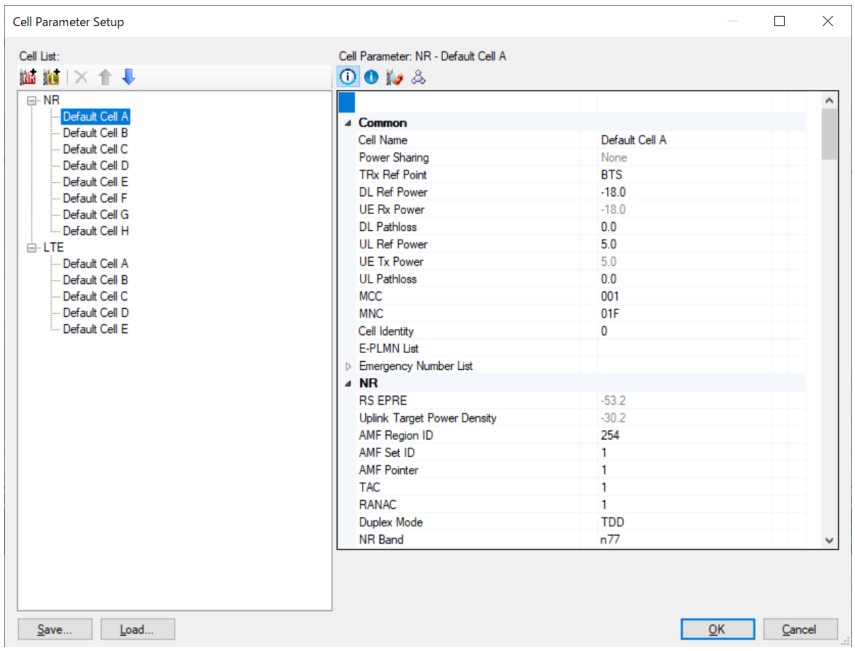
1. Select to open **Cell Parameter Setup**.



2. If available, load existing **Cell Parameter Setup** by selecting **Load**.

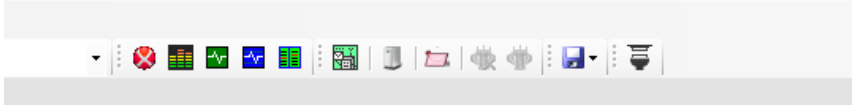


3. Select **NR** from **Cell list**.
4. Unfold **Common** in **Cell parameter**.
5. Set the external attenuation (**DL Ref Power** and **UL Ref Power**). It shall match the attenuation of the RF antenna and the antenna cable.
6. Unfold **NR** in **Cell parameter**.
7. Set the operating band (**NR Band**) according to the DUT.
8. If desired, save the cell parameter setup by selecting **Save**.
9. Confirm **Cell Parameter Setup** by selecting **OK**.

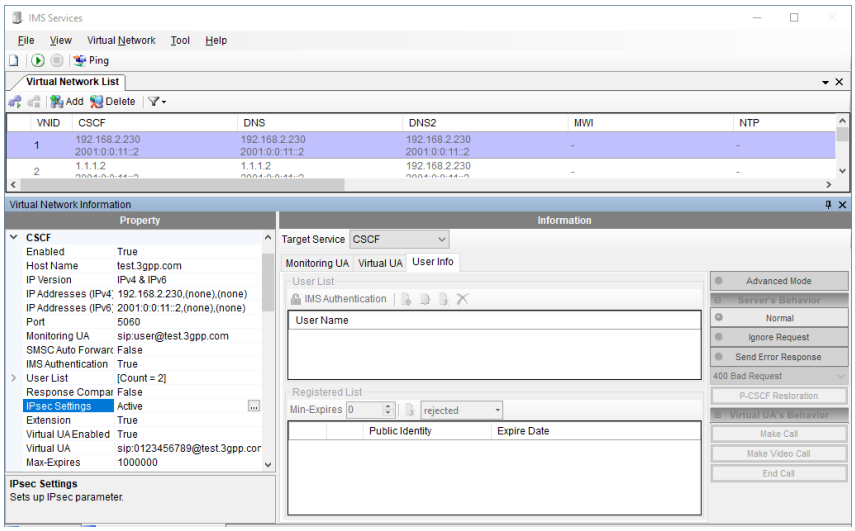


IPsec and Authentication Settings

1. Select to open **IMS Services**.



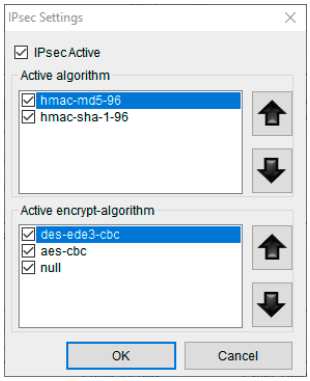
2. Go to **Property**.
3. Select andhighlight **IPsec Settings**.
4. Select ... to edit **IPsec Settings**.



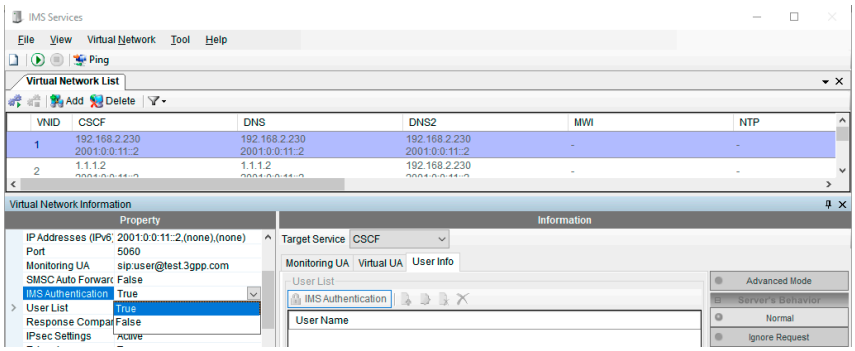
5. Enable **IPsecActive** and edit the settings according to the DUT.

   or

   Disable the **IPsecActive** to deactivate **IPsec**.
6. Select **OK** to confirm **IPsec Settings**.

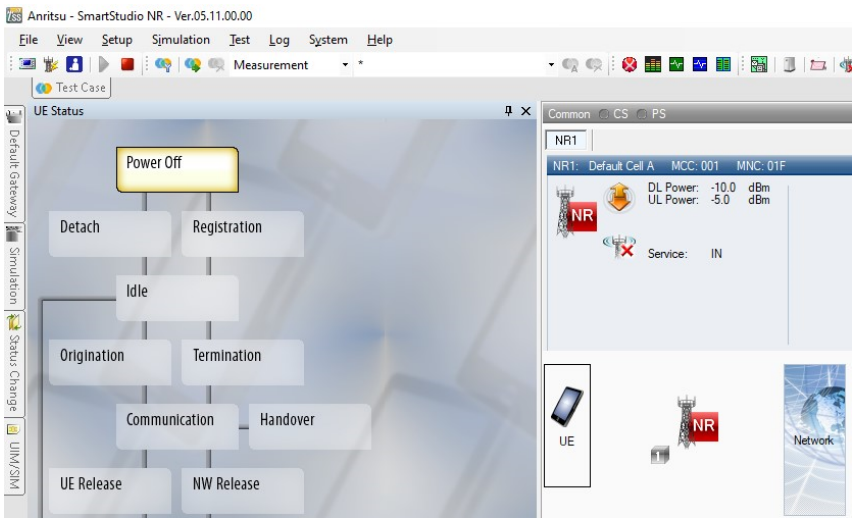


7. Set IMS authentication to either **True** or **False** according to the DUT.

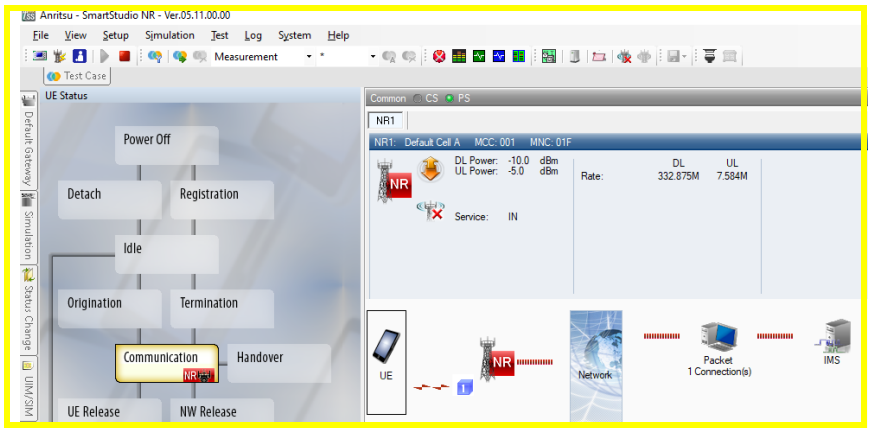


Simulation Start and DUT Registration

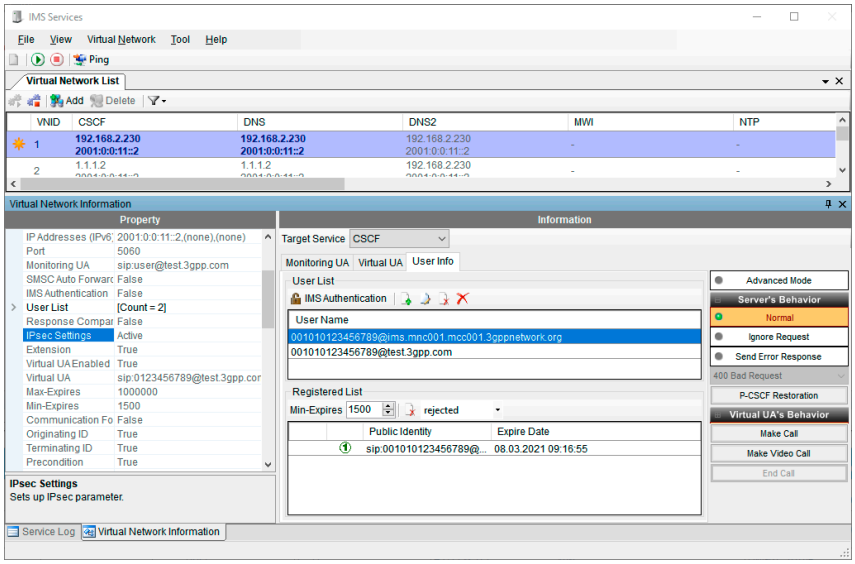
1. Select ▶ to start the simulation.



2. Set the DUT to online and confirm that UE status switches to **Communication**.



3. Select to open **IMS Services**.
4. Go to **Information**.
5. Select the **User Info** tab.
6. Go to **Registered List**.
7. Confirm that the DUT is registered at the IMS server.



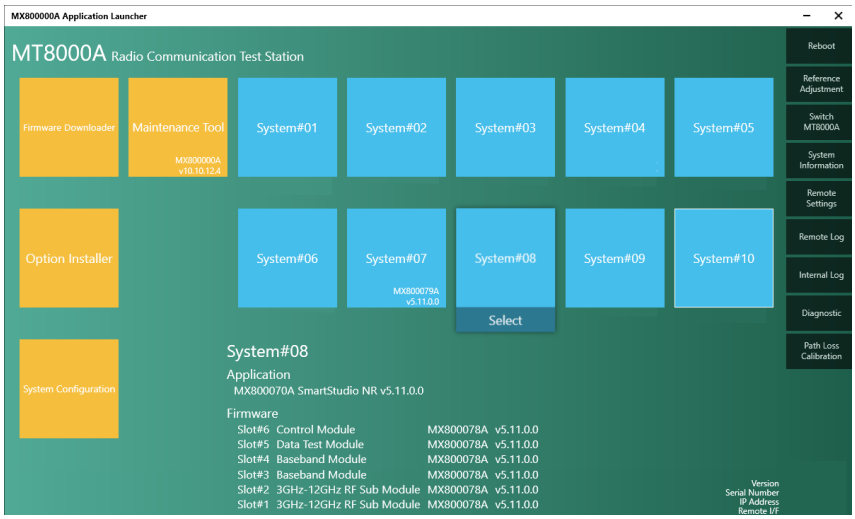
2.2 4G LTE Connection Establishment

2.2.1 Preparations

- Interconnect the hardware according to chapter 1.6 and chapter 1.7
- Boot up Anritsu MT8000A.
- Boot up control computer for Anritsu MT8000A.
- Start Anritsu Application Launcher on the control computer.
- Boot up computer and start ACQUA.
- Boot up *lab*CORE.
- Insert test SIM card into DUT, boot up DUT and set it to airplane/offline mode.

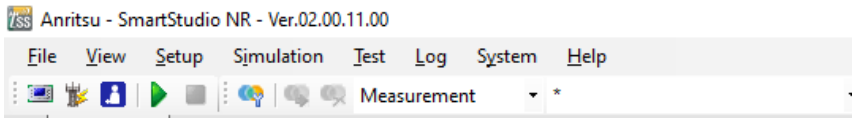
2.2.2 4G LTE Connection Procedure

Start **SmartStudio NR** v5.11.0.0 from Application Launcher on the Anritsu control computer.

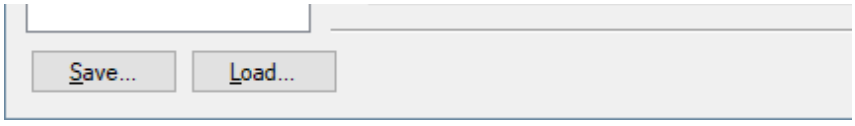


Simulation Parameter Setup

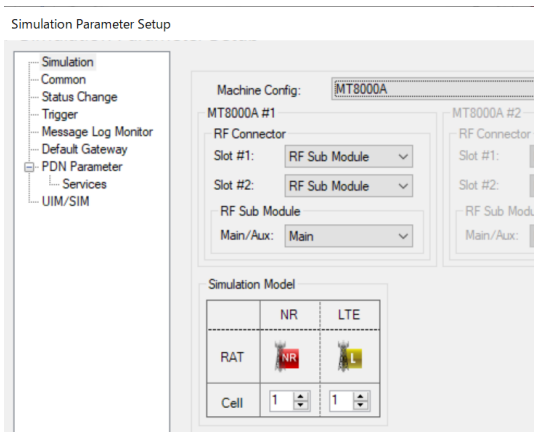
8. Select to open **Simulation Parameter Setup**.



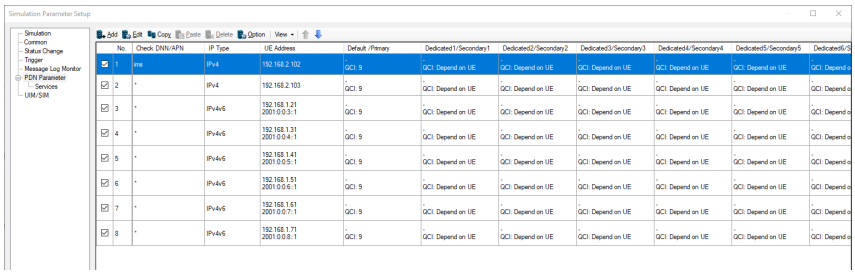
9. If available, load existing **Simulation Parameter Setup** (such as SA_NR_LTE_IMS.wnssp3) by selecting **Load**.



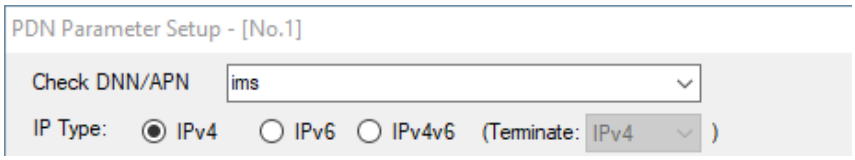
10. Select **Simulation**.
11. Set **Simulation Model** to **NR Cell → 1** and **LTE Cell → 1**.



12. Select **PDN Parameter**.
13. Double-click on the desired packet data network (PDN).

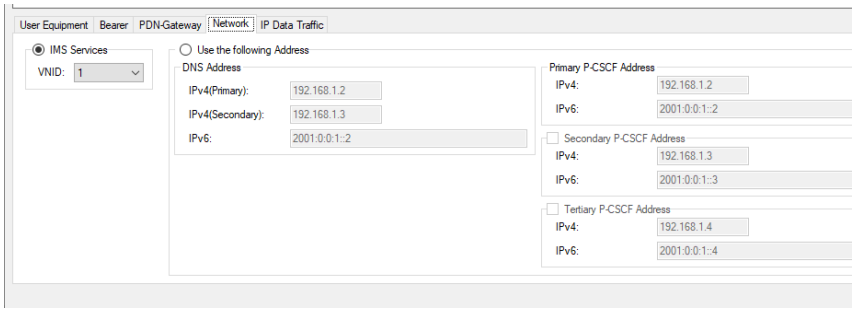


14. Enter the desired name for the APN network.
15. Select the desired Internet Protocol for the APN network.



16. Select the **User Equipment** tab.
17. Enter the IP address of the DUT according to the selection Internet Protocol.

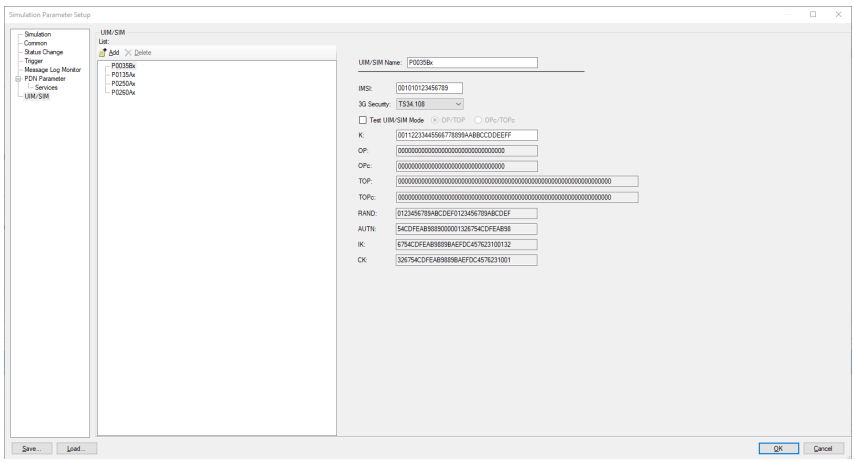
18. Select the **Network** tab.
19. Select **IMS Services**.
20. Select **OK** to confirm.



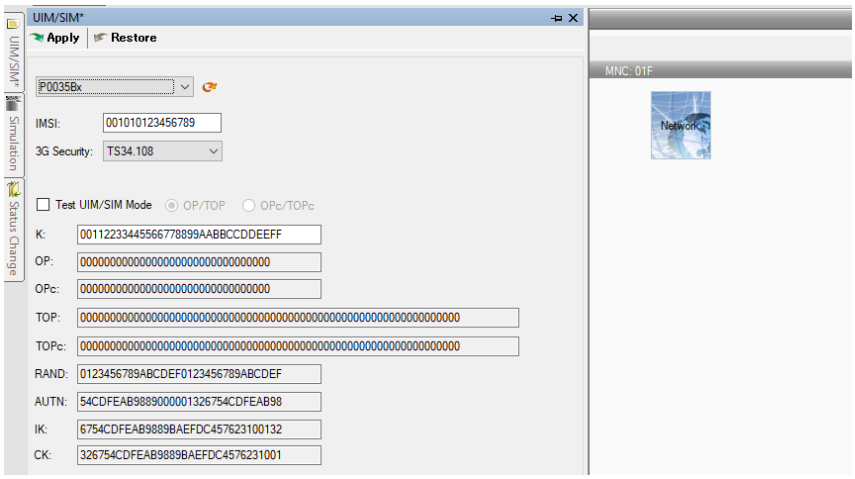
21. Select **UIM/SIM**.
22. Add or select the **UIM/SIM**.
23. Enter the appropriate UIM/SIM settings.

    or

    Confirm if the UIM/SIM settings apply to the SIM card of the DUT.
24. If desired, save the **Simulation Parameter Setup** by selecting **Save**.
25. Confirm **Simulation Parameter Setup** with by selecting **OK**.

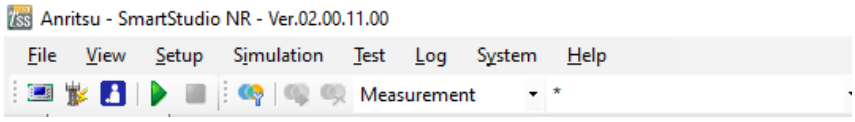


26. Select the **UIM/SIM** tab at the left-hand side of the main screen.
27. Select the applied **UIM/SIM** from the drop-down list.
28. Confirm the choice by selecting **Apply**.

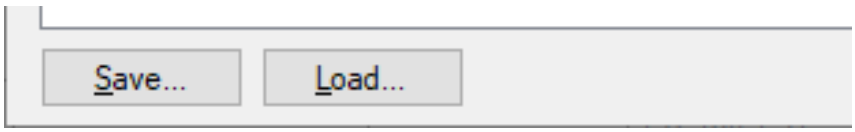


Cell Parameter Setup

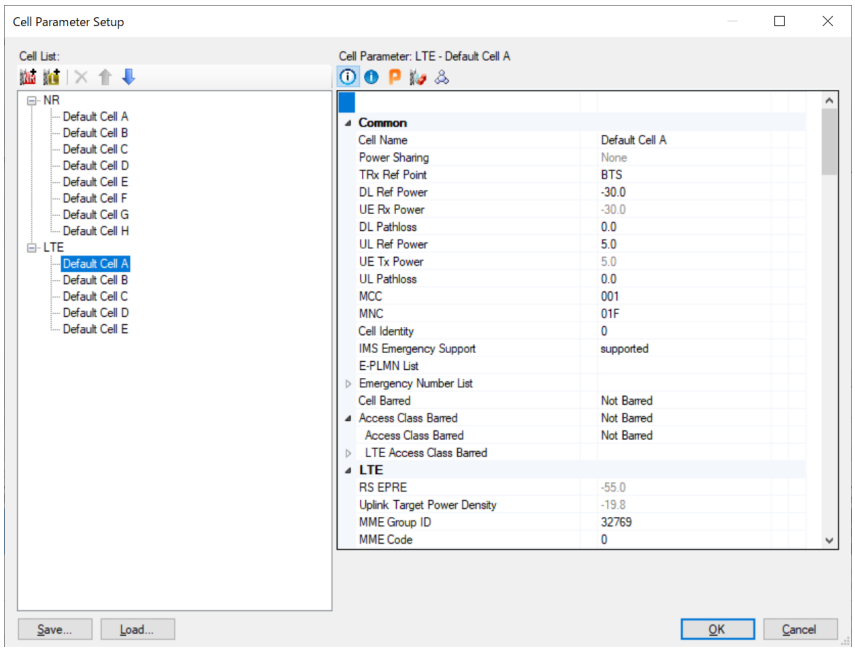
1. Select to open **Cell Parameter Setup**.



2. If available, load existing **Cell Parameter Setup** by selecting **Load**.

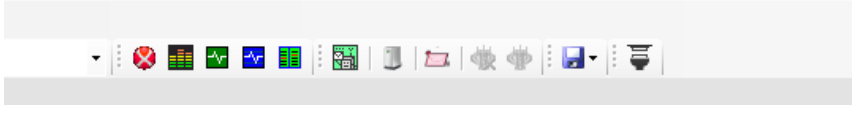


3. Select **LTE** from **Cell list**.
4. Unfold **Common** in **Cell parameter**.
5. Set the external attenuation (**DL Ref Power** and **UL Ref Power**). It shall match the attenuation of the RF antenna and the antenna cable.
6. Unfold **LTE** in **Cell parameter**.
7. Set the operating band (**LTE Band**) according to the DUT.
8. If desired, save the cell parameter setup by selecting **Save**.
9. Confirm **Cell Parameter Setup** by selecting **OK**.

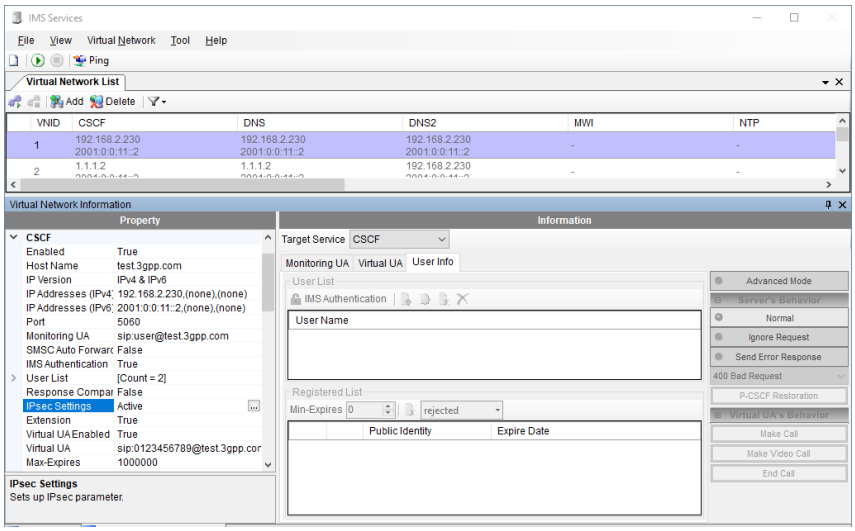


IPsec and Authentication Settings

1. Select to open **IMS Services**.



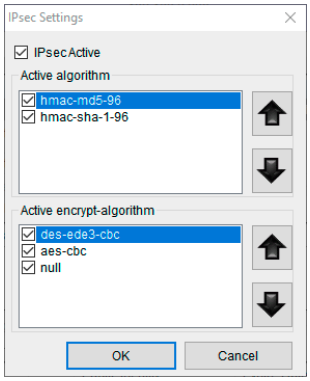
2. Go to **Property**.
3. Select and highlight **IPsec Settings**.
4. Select ... to edit **IPsec Settings**.



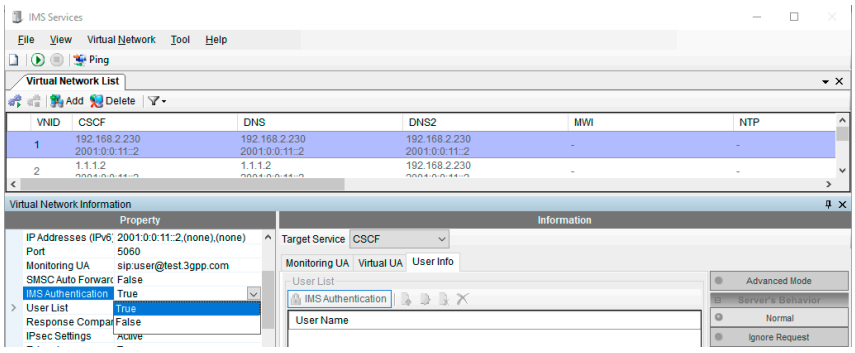
5. Enable **IPsecActive** and edit the settings according to the DUT.

   or

   Disable the **IPsecActive** to deactivate **IPsec**.
6. Select **OK** to confirm **IPsec Settings**.

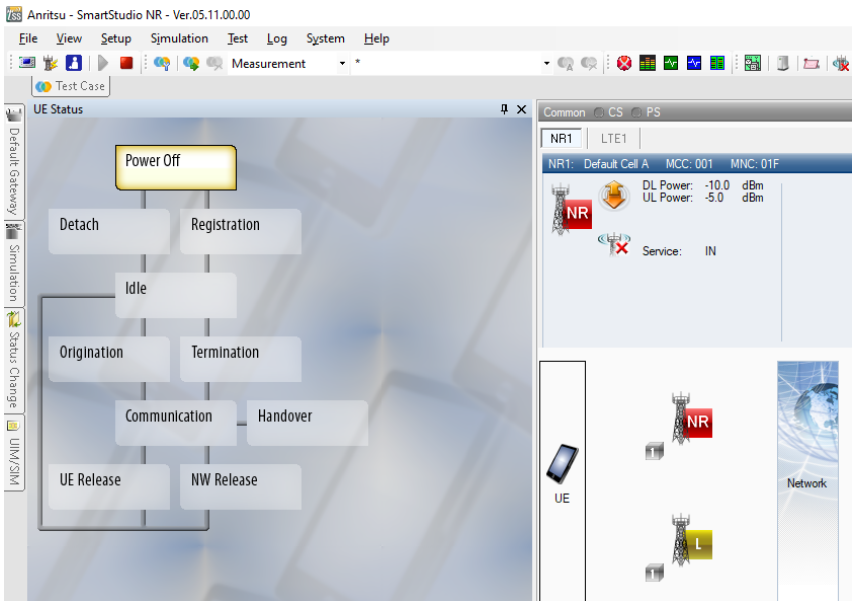


7. Set IMS authentication to either **True** or **False** according to the DUT.



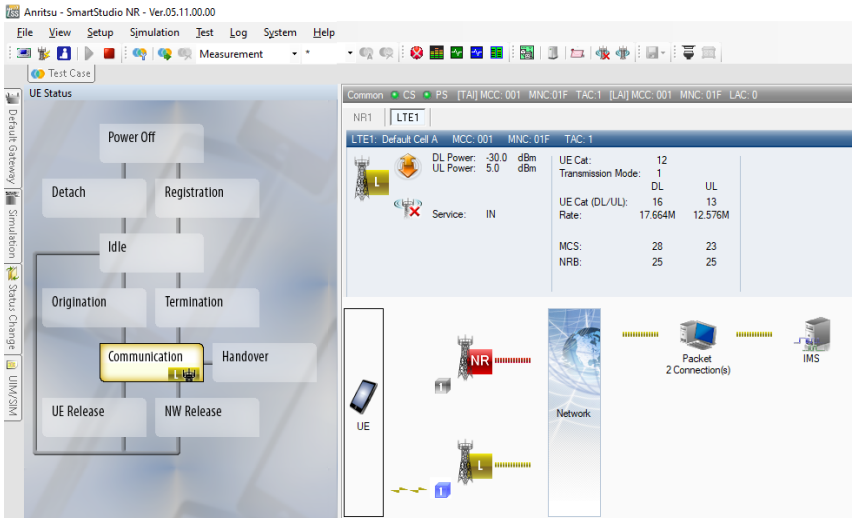
Simulation Start and DUT Registration

1. Select to start the simulation.

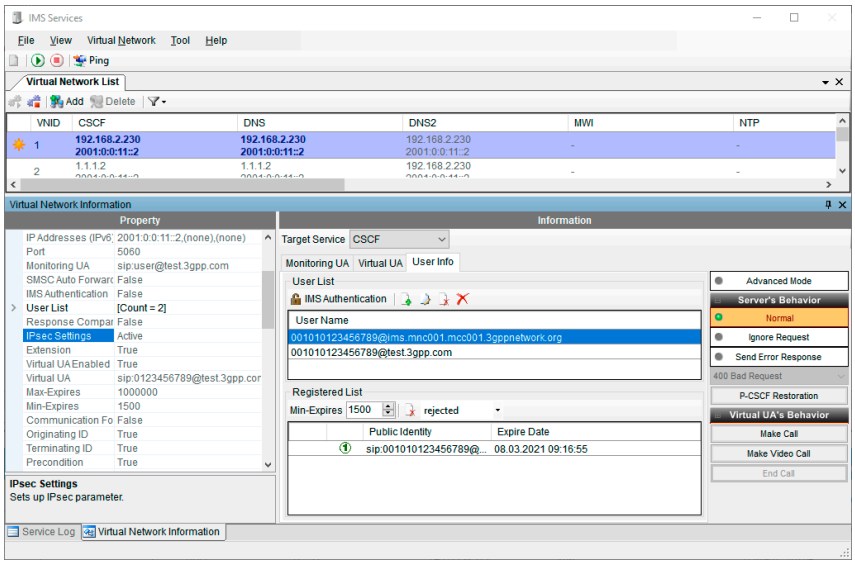


2. Set NR cell to OUT of service by selecting .

3. Set the DUT to online and confirm that UE status switches to **Communication**.



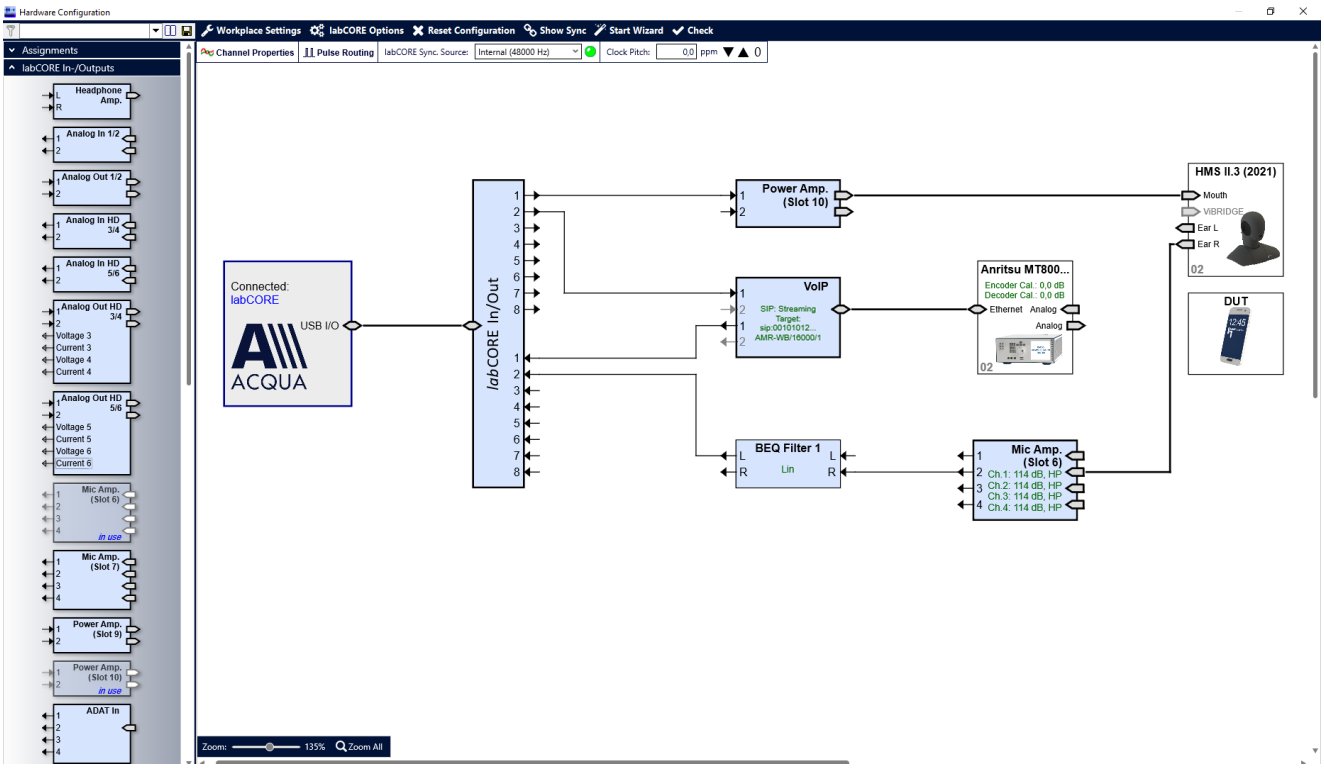
4. Select to open **IMS Services**.
5. Go to **Information**.
6. Select **User Info** the tab.
7. Go to **Registered List**.
8. Confirm that the DUT is registered at the IMS server.



3 ACQUA Configuration

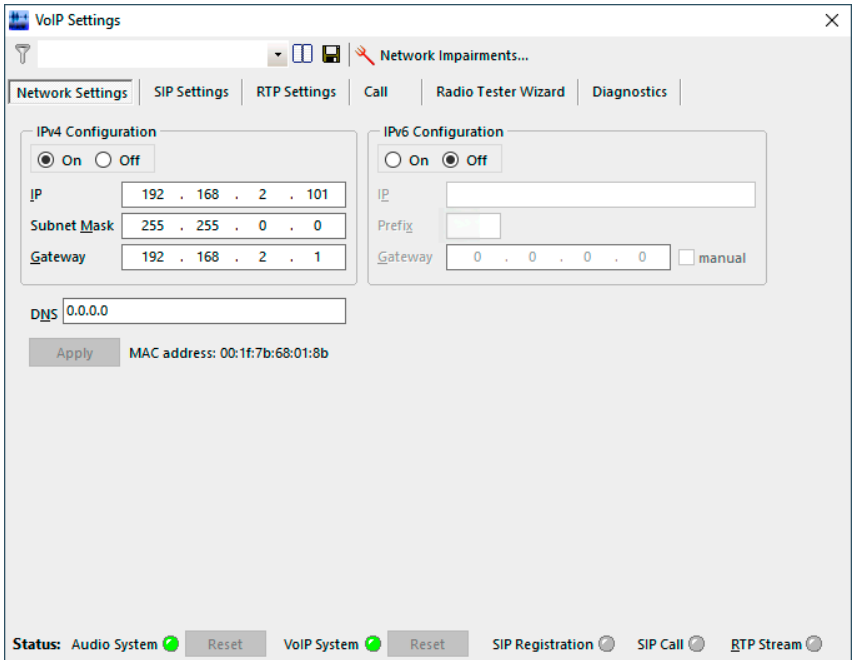
3.1 General Settings

1. Start **Hardware Configuration**.
2. Drag and drop the blocks from the left-hand selection area into the right-hand configuration area. Interconnect the blocks according to the applied connections. Alternatively, use the **Hardware Configuration Wizard**.

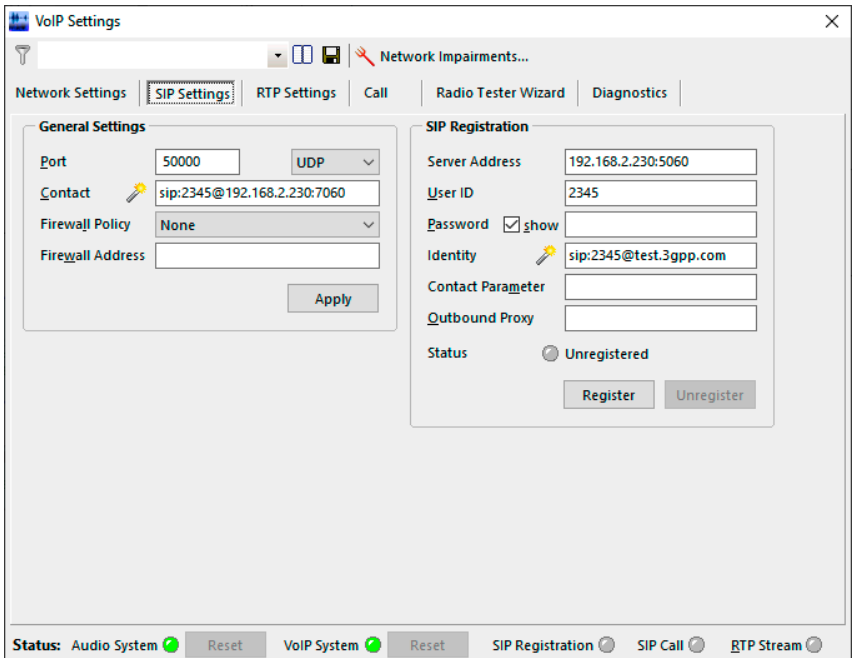


3.2 *lab*CORE Settings

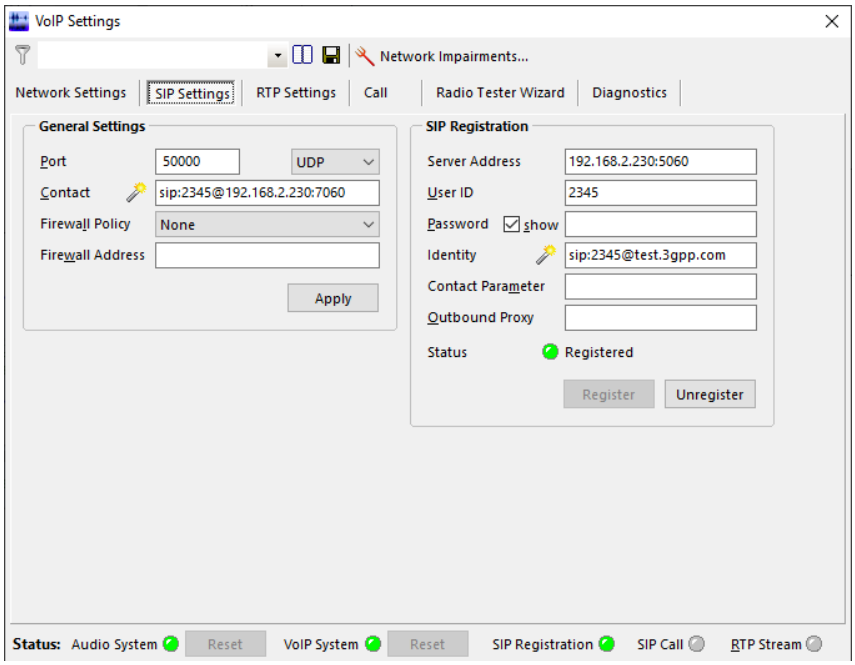
1. Open **VoIP Settings**.
2. Go to the **Network Settings** tab.
3. Select the desired Internet Protocol.
4. Determine the IP address of *lab*CORE.



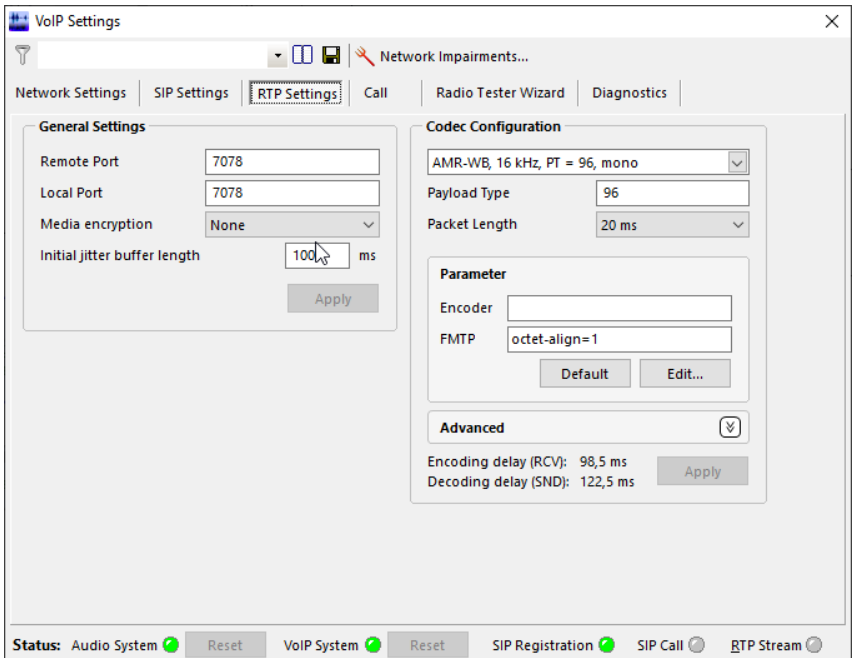
5. Select the **SIP Settings** tab.
6. Enter **Port** and **Server address** according to **IMS Services** from SmartStudio NR.



7. Select **Register** to register *lab*CORE at the IMS server of Anritsu MT8000A.
8. ACQUA indicates the successful registration via the green virtual LED and a text hint on screen.



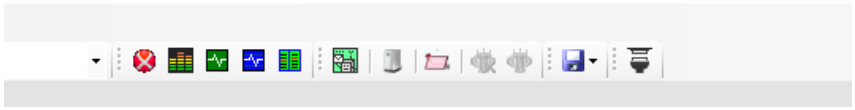
9. Select the **RTP Settings** tab.
10. Set the appropriate voice codec.



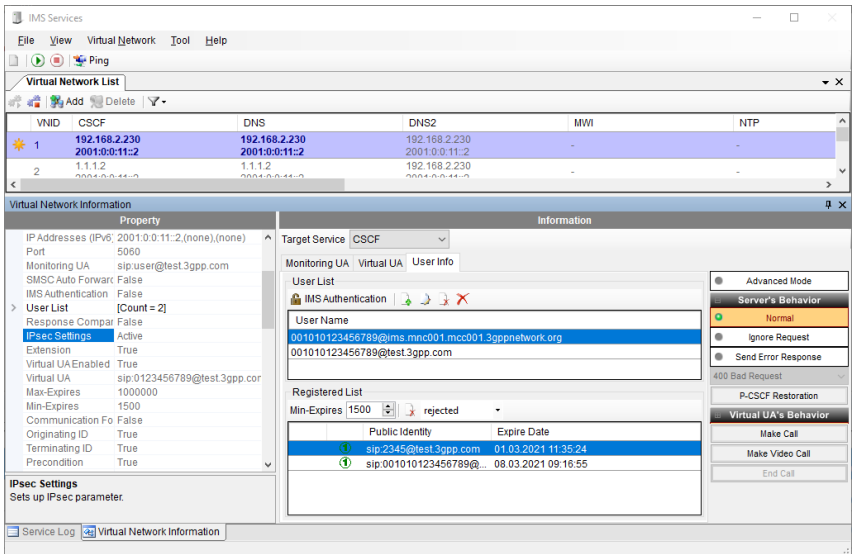
3.3 Call Establishment

Anritsu MT8000A Control Computer

1. Open **IMS Services** .



2. Go to **Information**.
3. Select the **User Info** tab.
4. Go to **Registered List**.
5. Confirm that both clients (*lab*CORE and DUT) are registered at the IMS server.

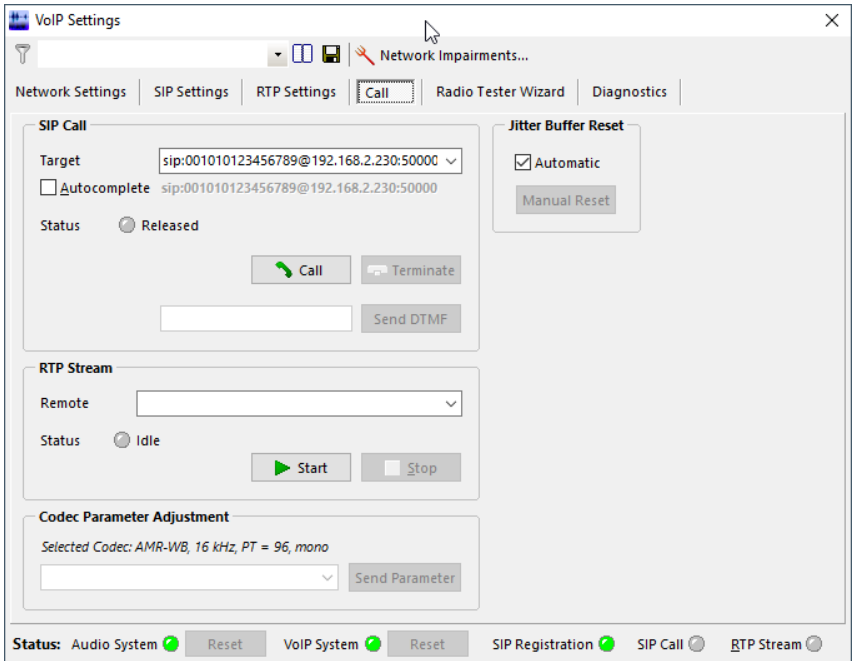


ACQUA Computer

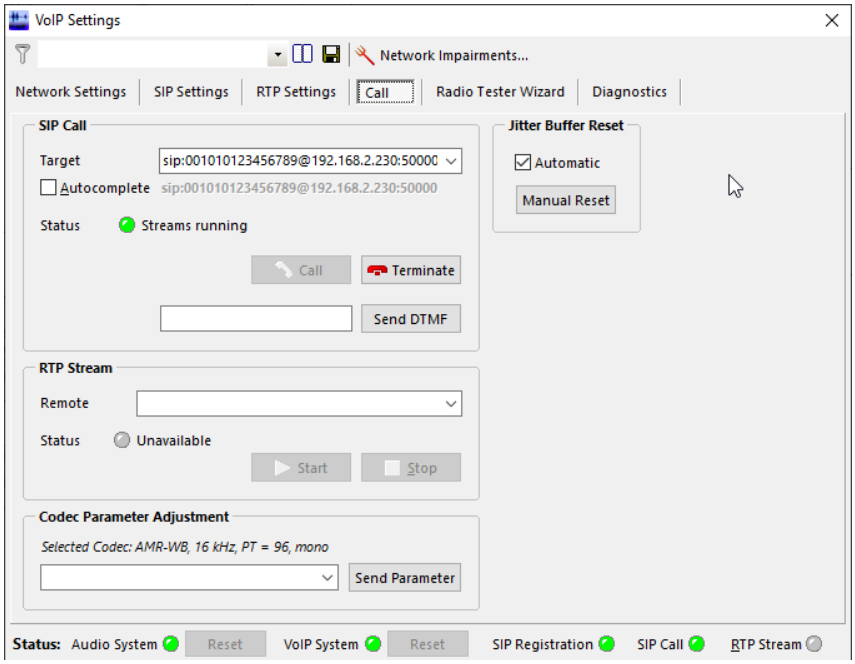
1. Select the **Call** tab.
2. Enable **Automatic** in section **Jitter Buffer Reset**.
3. Enter the **SIP URI** (SIP address) of the DUT in the textbox **Target**.
4. Select **Call**.

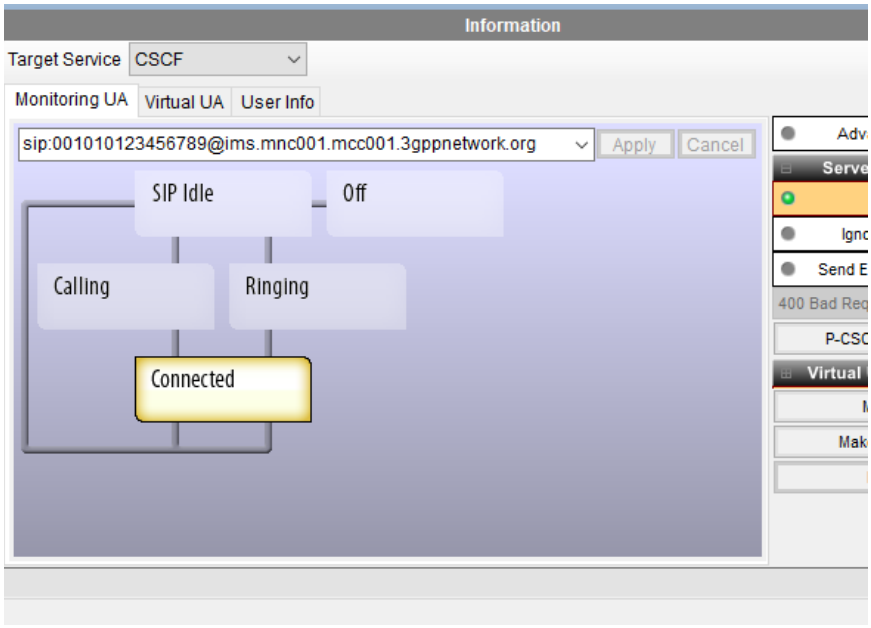
   or

   Call *lab*CORE from the DUT. Dial *lab*CORE identity (e.g., 2345) and execute call.



5. The status switches from **Released** to **Streams running**. The virtual LED switches from gray to green. The virtual LED **SIP Call** illuminates green.



Anritsu MT8000A Control Computer

1. Open **IMS Services**.
2. Go to **Information**.
3. Select the **Monitoring UA** tab.
4. Select *lab*CORE/DUT from the drop-down list and select apply.
5. Confirm if the applied device has the status **Connected**.