HEAD acoustics

APPLICATION NOTE

ACQUA

Establish LTE and 2G/3G connections to *lab*CORE via Anritsu MD8475B

Application Note

Establish LTE and 2G/3G connections to *lab*CORE via Anritsu MD8475B

Revision 1

Legal notices

Copyright

© HEAD acoustics GmbH 2024. All rights reserved. Subject to change.

All rights derived from this, also for partial use, are reserved by HEAD acoustics GmbH, Germany. Reproducing or distributing the document or parts of it in any form is not allowed without express permission from HEAD acoustics GmbH.

Trademarks

HEAD acoustics® is a registered trademark of HEAD acoustics GmbH.

SmartStudio© is a name trademark of Anritsu Corporation.

Table of contents

1 Introduction 6
1.1 Brief Description 6
1.2 Reference Documentation 6
1.3 Acronyms and Abbreviations 6
1.4 Applied Interfaces at *lab*CORE and Anritsu MD8475B 7
1.4.1 *lab*CORE Interfaces Front Panel 7
1.4.2 *lab*CORE Interfaces Back Panel 7
1.4.3 Anritsu MD8475B Interfaces Front Panel 8
1.4.4 Anritsu MD8475B Interfaces Back Panel 8
2 LTE Connection 10
2.1 Equipment List 10
2.1.1 HEAD acoustics Equipment 10
2.1.2 Anritsu Equipment 10
2.1.3 Third Party Equipment 10
2.2 Configuration Example 11
2.3 Cabling 11
2.3.1 Antenna 11
2.3.2 *lab*CORE to Anritsu MD8475B 11
2.4 LTE Connection Establishment 12
2.4.1 Preparations 12
2.4.2 Connection Procedure 12
3 2G Connection 22
3.1 Equipment List 22
3.1.1 HEAD acoustics Equipment 22
3.1.2 Anritsu Equipment 22
3.1.3 Third Party Equipment 22
3.2 Configuration Example 23
3.3 Cabling 23
3.3.1 Antenna 23
3.3.2 *lab*CORE to Anritsu MD8475B 23
3.4 2G Connection Establishment 24
3.4.1 Preparation 24
3.4.2 Connection Procedure 24

4 3G Connection 32
4.1 Equipment List 32
4.1.1 HEAD acoustics Equipment 32
4.1.2 Anritsu Equipment 32
4.1.3 Third Party Equipment 32
4.2 Configuration Example 33
4.3 Cabling 33
4.3.1 Antenna 33
4.3.2 *lab*CORE to Anritsu MD8475B 33
4.4 3G Connection Establishment 34
4.4.1 Preparation 34
4.4.2 Connection Procedure 34

1 Introduction

1.1 Brief Description

This application note approaches the connection establishment between the Anritsu Signaling Tester MD8475B, HEAD acoustics equipment, and the DUT. The presented configurations intend testing mobile devices with current mobile communication standards (LTE, 3G, 2G).

The document consists of three main chapters. One for the LTE (4G) connection and two others for 2G or 3G connection. The structure of the main chapters is similar. The first sub-chapter illustrates the interconnection of all necessary hardware. Afterwards, the next sub-chapter guides step by step through the procedure for a successful connection establishment.

The application requires an advanced user knowledge of HEAD acoustics equipment as well as Anritsu MD8475B. HEAD acoustics will not respond to support requests concerning general handling and technical configuration of Anritsu MD8475B.

1.2 Reference Documentation

Document name
*lab*CORE Manual
HMS II Manual
ACQUA Online Help
Anritsu MD8475B User Manual

1.3 Acronyms and Abbreviations

Acronym / Abbreviation	**Description**
ACQUA	Advanced Communication Quality Analysis
AES	Audio Engineering Society
AMR	Adaptive multi-rate
APN	Access point name
BNC	Bayonet Neill Concelman
DUT	Device under test
GSM / GPRS	Global System for Mobile Communications / General Packet Radio Service
HHP	HEAD Handset Positioner
HMS	Head Measurement System
IMS	IP multimedia subsytem
IPsec	Internet protocol security
IPv4	Internet protocol version 4
IPv6	Internet protocol version 6
LED	Light-emitting diode
LTE	Long Term Evolution
MCC	Mobile country code
MNC	Mobile network code
PDN	Packet data network
QCI	QoS class identifier
RF	Radio frequency
RTP	Real-time transport protocol

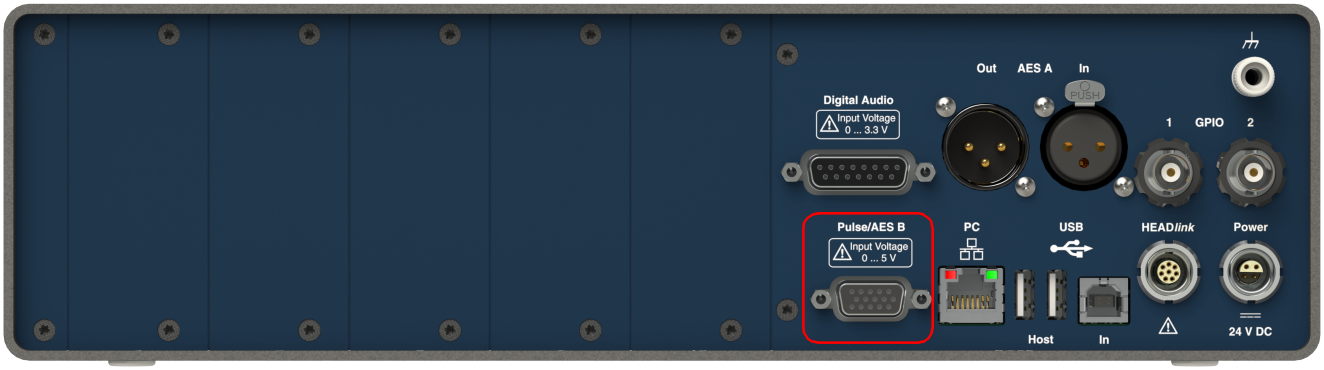
SIM	Subscriber identity module
SIP	Session initiation protocol
UIM	User identity module
VoIP	Voice over Internet Protocol
W-CDMA	Wideband Code Division Multiple Access
XLR	Ground - left - right

1.4 Applied Interfaces at *lab*CORE and Anritsu MD8475B

1.4.1 *lab*CORE Interfaces Front Panel

Ethernet interface (RJ45) for measuring IP-based communication

1.4.2 *lab*CORE Interfaces Back Panel

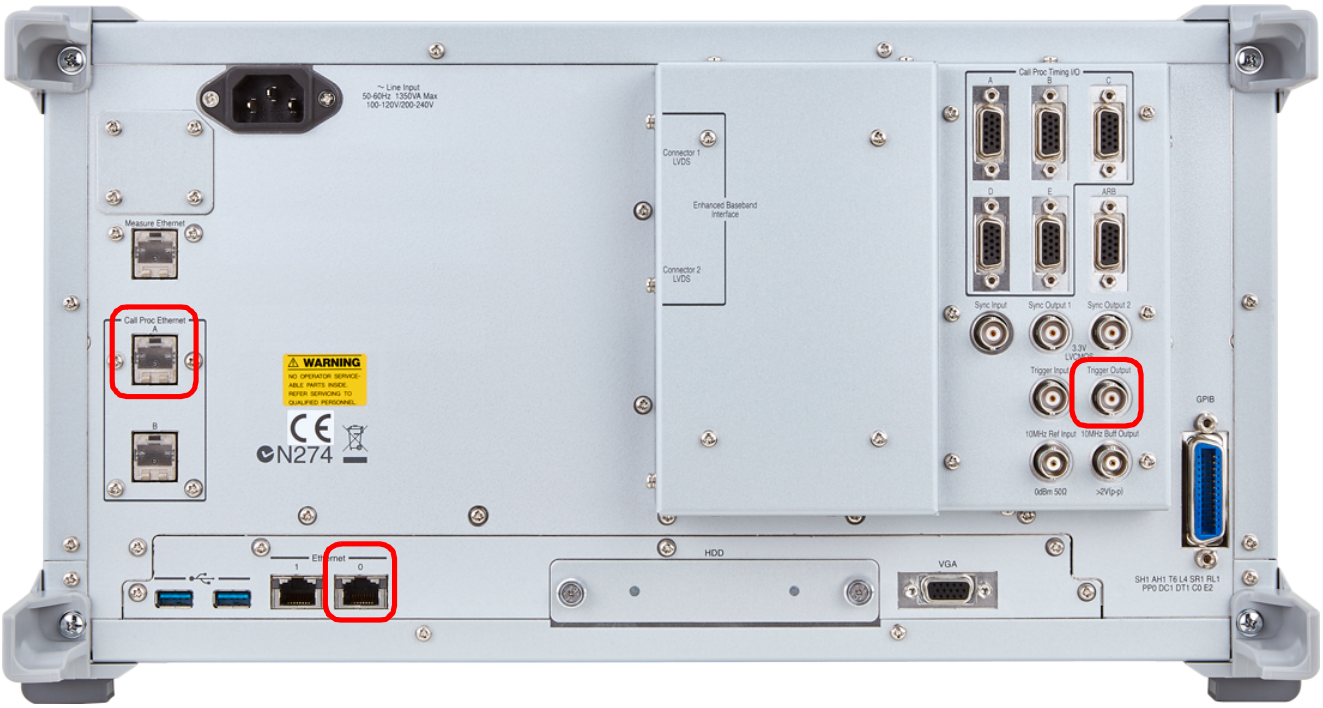


D-Sub (DE-15) Pulse interface

1.4.3 Anritsu MD8475B Interfaces Front Panel

Type N RF antenna connector

1.4.4 Anritsu MD8475B Interfaces Back Panel



- CallProc Ethernet I/O socket (RJ45)
- Ethernet 0 socket (RJ45)
- Trigger output socket (BNC)

2 LTE Connection

2.1 Equipment List

2.1.1 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

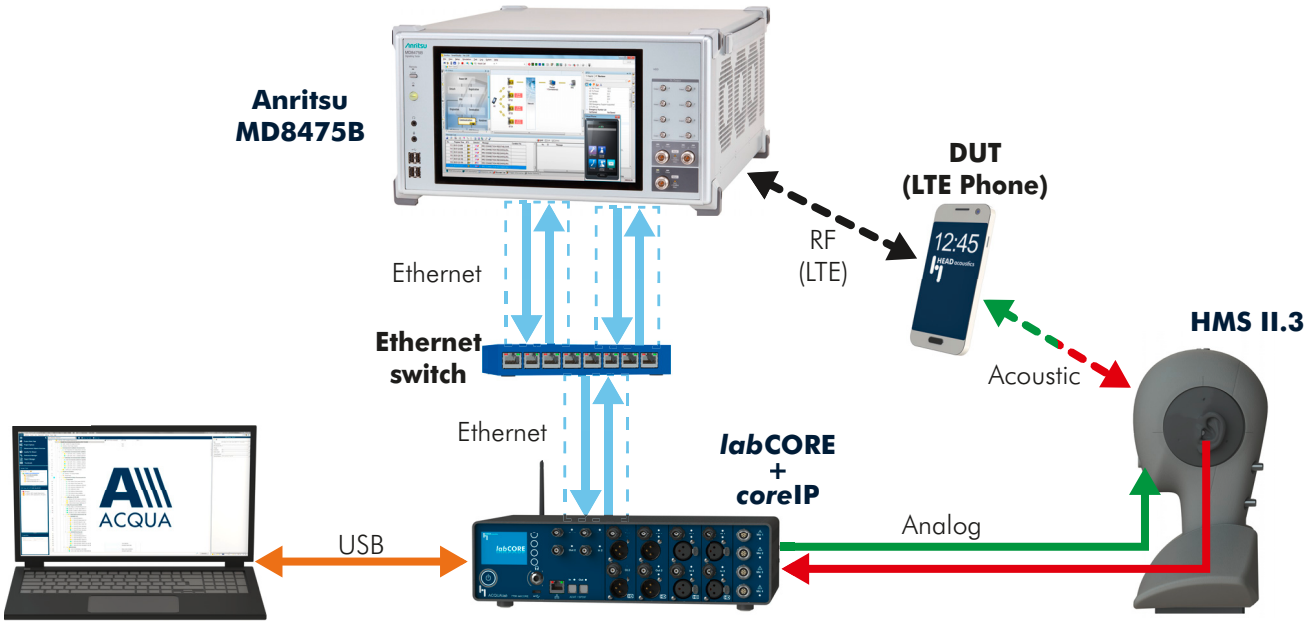
2.1.2 Anritsu Equipment

- Anritsu MD8475B Signaling Tester
- Enhanced Multi-signaling Unit
- SmartStudio©
- LTE FDD Option
- Extended CSCF Option
- LTE Simulation Software
- 1 Year Support Service

2.1.3 Third Party Equipment

- Ethernet switch
- 3 x Ethernet cable
- RF antenna
- Computer for ACQUA software
- DUT
- Test SIM card

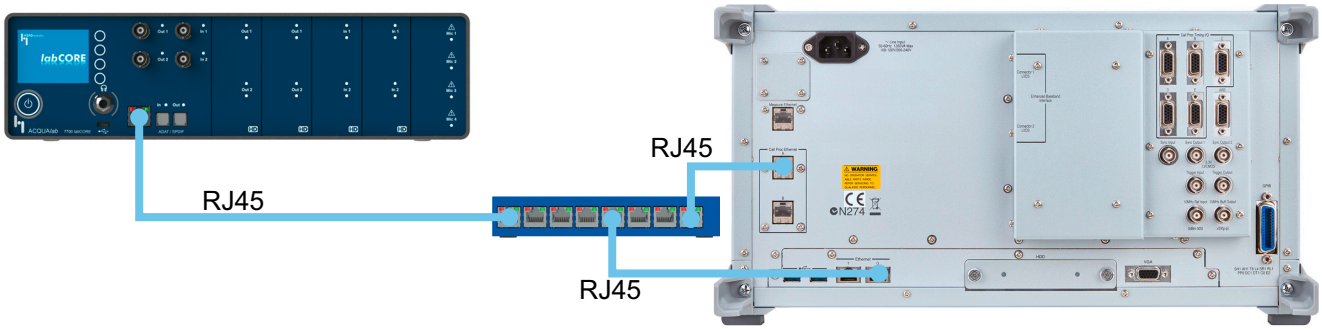
2.2 Configuration Example



2.3 Cabling

2.3.1 Antenna

2.3.2 *lab*CORE to Anritsu MD8475B



2.4 LTE Connection Establishment

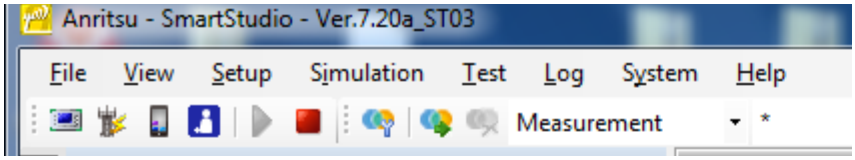
2.4.1 Preparations

- Interconnect the hardware according to chapter 2.2 and chapter 2.3
- Boot up Anritsu MD8475B
- Open SmartStudio© on Anritsu MD8475B
- Boot up computer and start ACQUA
- Boot up *lab*CORE
- Insert test SIM card into DUT and boot up DUT

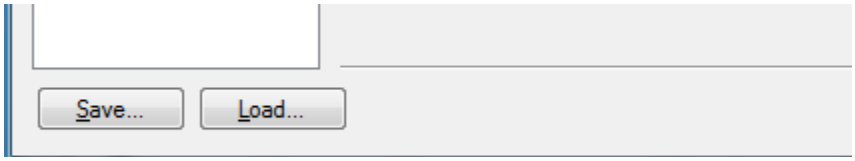
2.4.2 Connection Procedure

Anritsu MD8475B: Simulation Parameter Setup

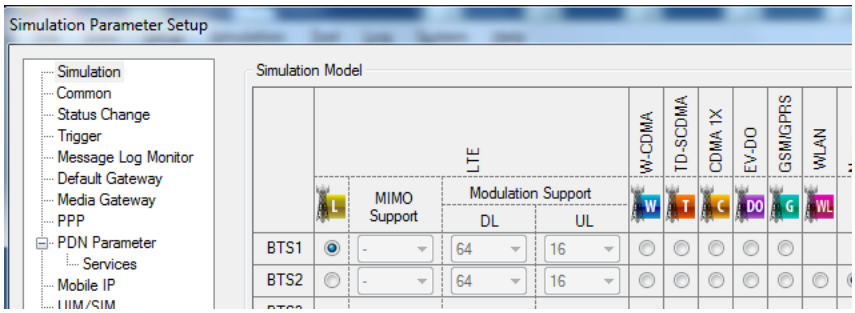
1. Open SmartStudio© on Anritsu MD8475B.
2. Select to open **Simulation Parameter Setup**.



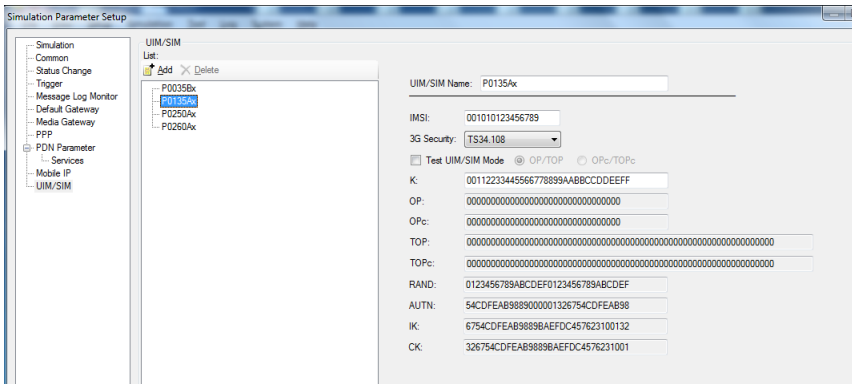
3. If available, load existing **Simulation Parameter Setup** by selecting Load... .



4. Select **Simulation**.
5. Set **Simulation Model** to **LTE**.
6. Select **UIM/SIM**.

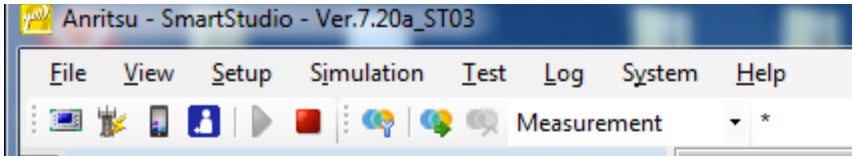


7. Check if the UIM/SIM settings apply to the SIM card of the DUT.
8. If desired, save the **Simulation Parameter Setup** by selecting Save... .
9. Confirm **Simulation Parameter Setup** by selecting OK .

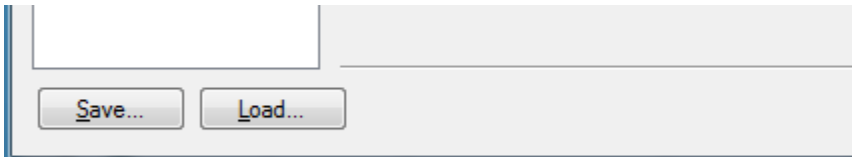


Anritsu MD8475B: Cell Parameter Setup

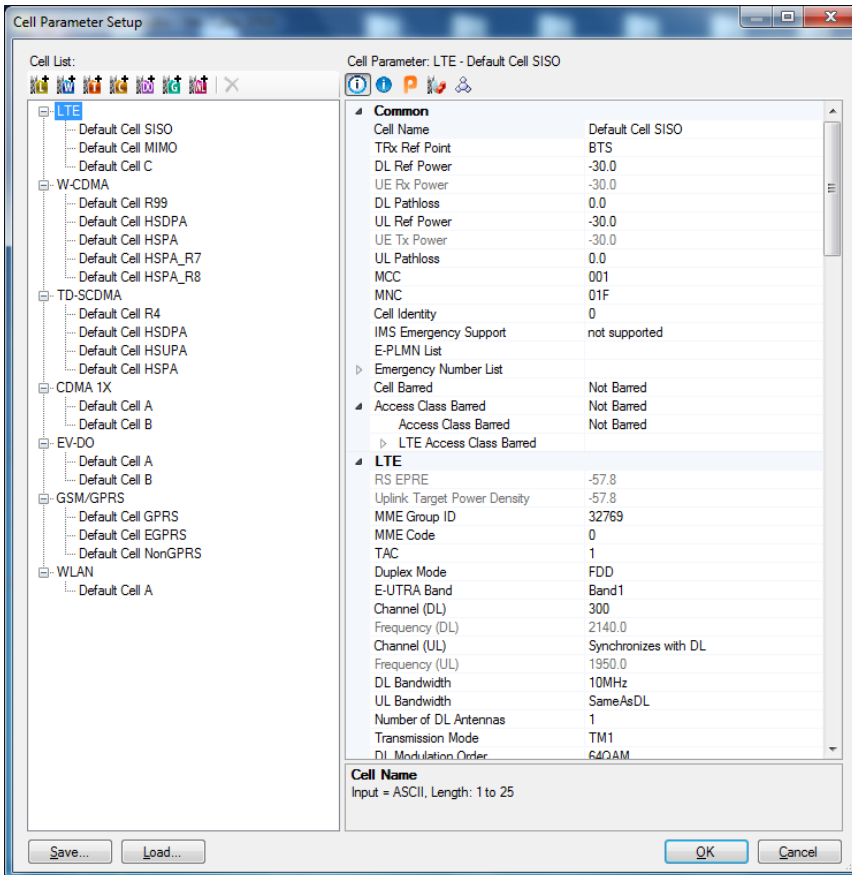
1. Select to open **Cell Parameter Setup**.



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

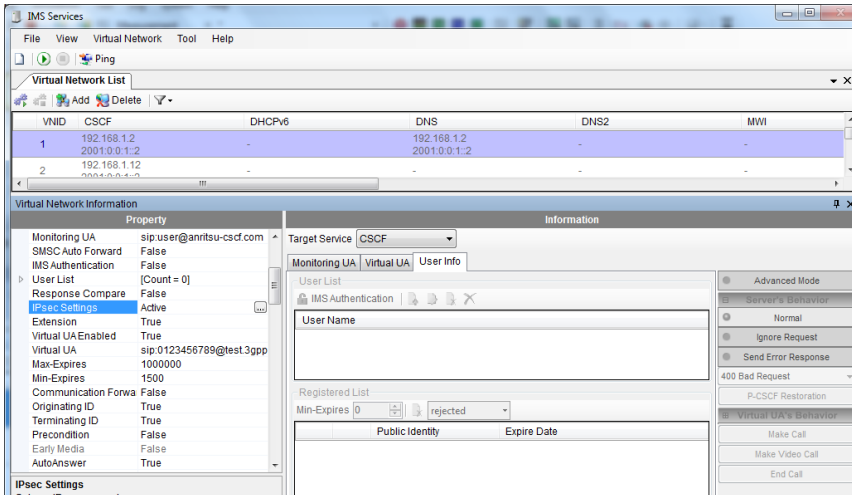


3. Select **LTE** from **Cell List**.
4. Unfold **Common** in **Cell Parameter**.
5. Set the external attenuation (**DL Ref Power** and **UL Ref Power**). It shall match the attenuation of the RF antenna and the antenna cable.
6. Set the operating band (**E-UTRA Band**) according to the DUT.
7. Set the network identity **MCC** according to SIM card preferences.
8. Set the network identity **MNC** according to SIM card preferences.
9. If desired, save the simulation parameter setup by selecting Save... .
10. Confirm cell parameter setup by selecting OK .

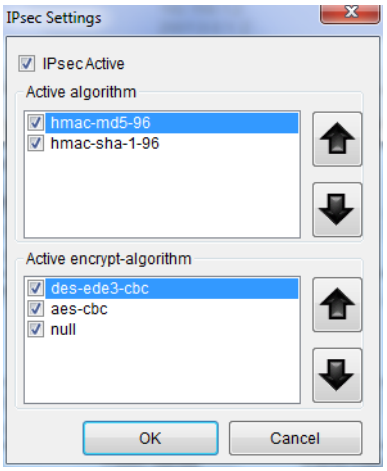


Anritsu MD8475B: IPsec and Authentication Settings

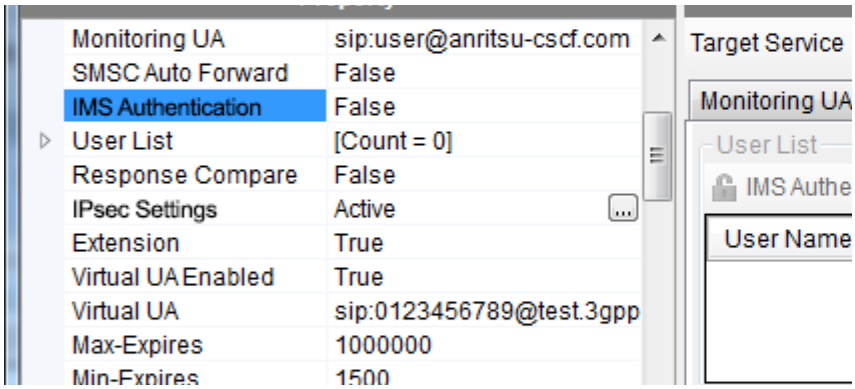
1. Select from the task bar to open IMS services.
2. Select and highlight **IPsec settings** from the **Property** list.
3. Select to edit IPsec settings.



4. Check the **IPsec Active** box and edit the settings according to the DUT.
   or
   Uncheck the **IPsec Active** box to deactivate IPsec.
5. Select OK to confirm **IPsec Settings**.

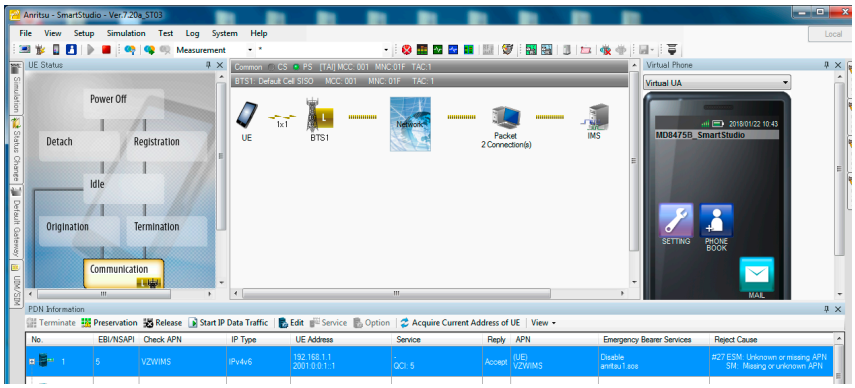


6. Set **IMS Authentication** to either **True** or **False** according to the DUT.

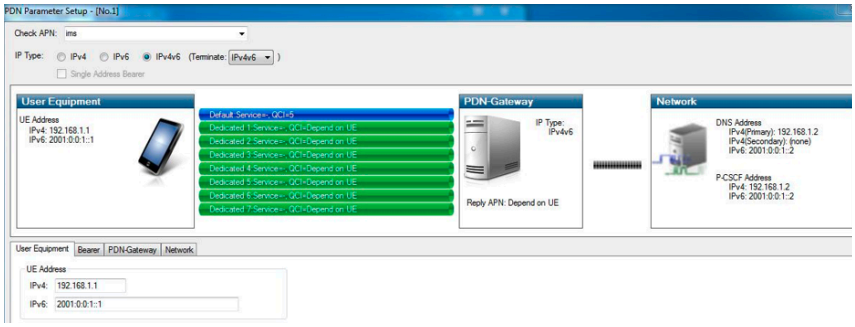


Anritsu MD8475B: PDN Parameter Setup

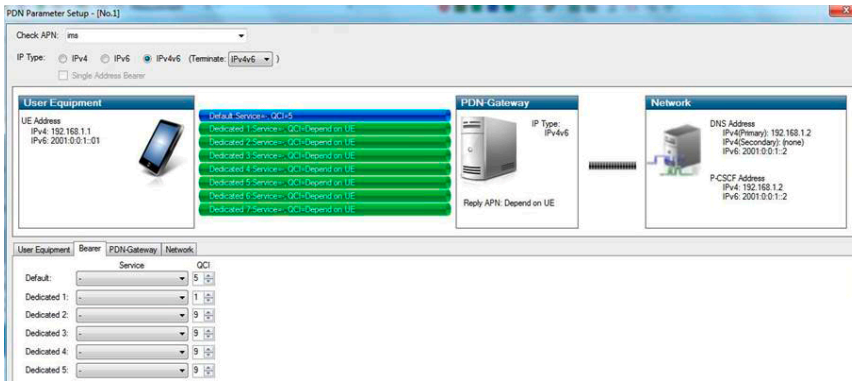
1. Select from the task bar to switch back to the SmartStudio© main screen.
2. Select the **Packet** icon to display the PDN information window.
3. Double-click on the row of the DUT that is connected via LTE connection to the radio tester. The **PDN Parameter Setup** of the DUT pops up.



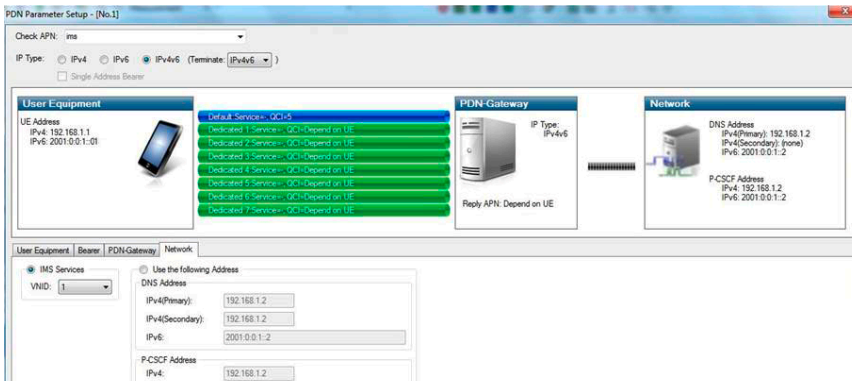
4. Confirm the APN name at **Check APN**. Change it if necessary.
5. Confirm the **IP Type**. Change if necessary.
6. Select the tab **User Equipment**. Check and confirm the **IPv6** address of the DUT.



7. Select the **Bearer** tab.
8. Confirm the value **5** for the **QCI** of the default service.

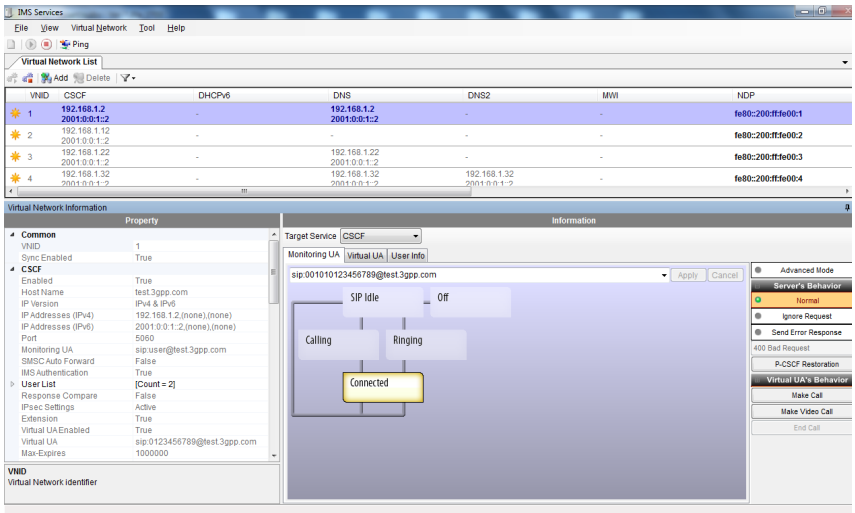


9. Select the **Network** tab.
10. The default settings apply.
11. Select OK to confirm and finish the **PDN Parameter Setup**.
12. Select ▶ to start the simulation.

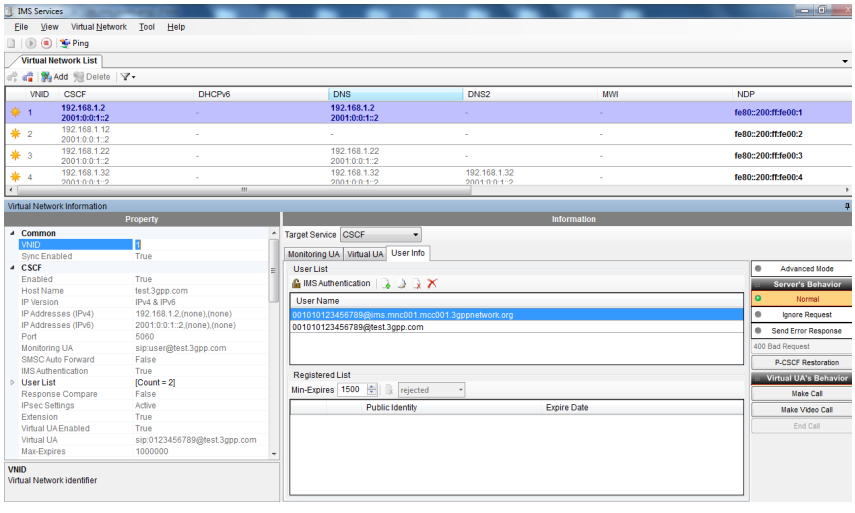


Anritsu MD8475B: IMS Server

1. Select from the task bar to open **IMS services**.
2. Set the DUT in offline mode / airplane mode.

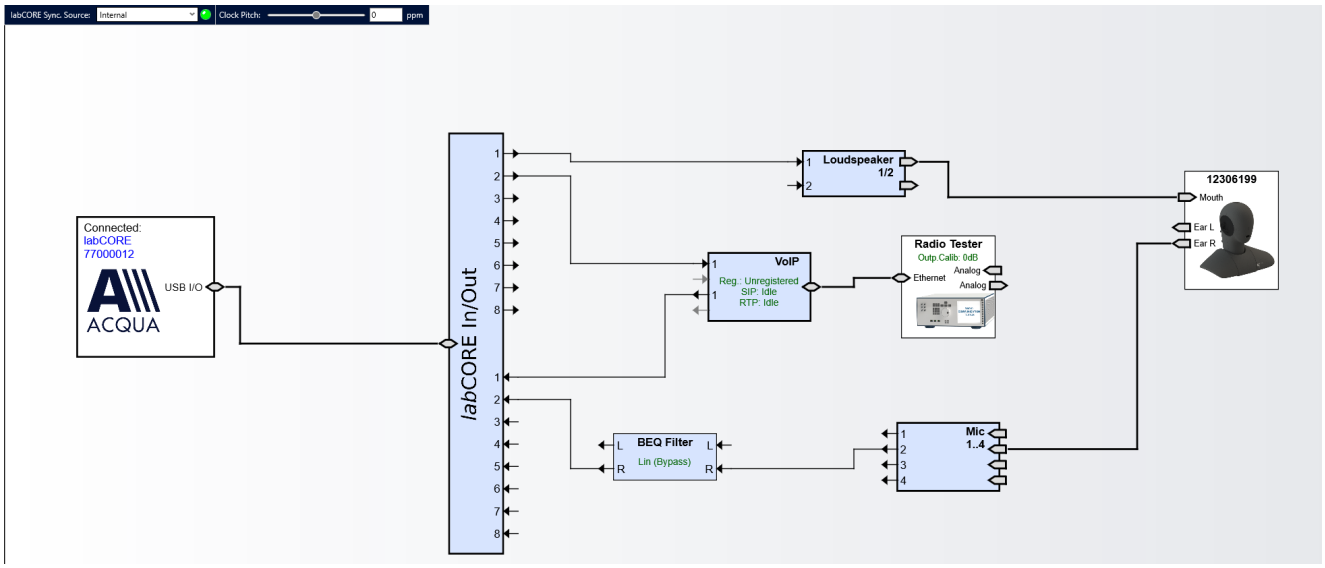


3. Select the **User Info** tab.
4. Select IMS Authentication to unlock IMS authentication.

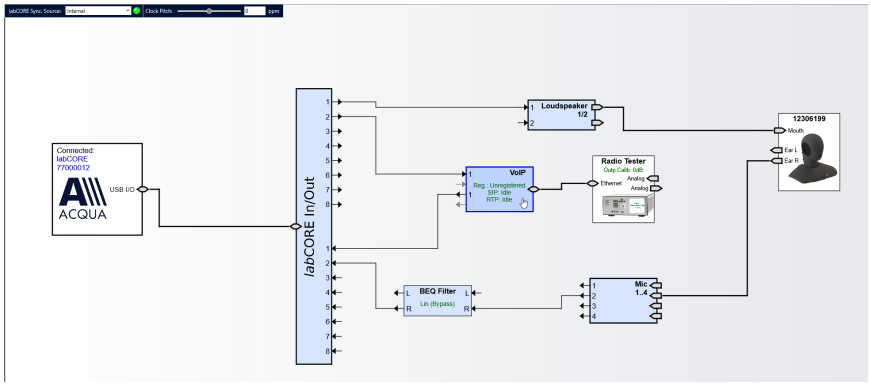


ACQUA Computer: Hardware Configuration and Radio Tester Wizard

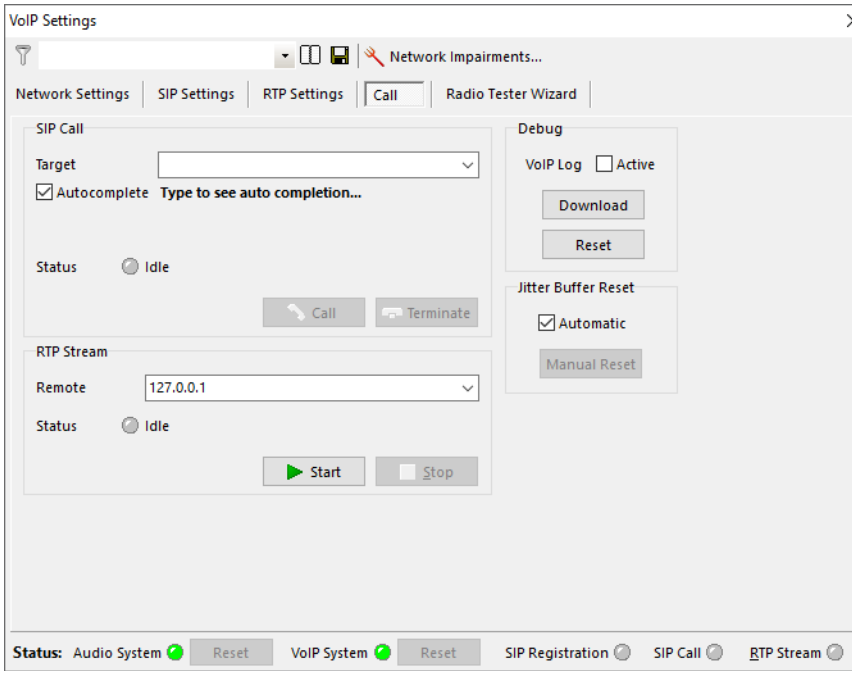
1. Start **Hardware Configuration**.
2. Select *lab*CORE and build the configuration.



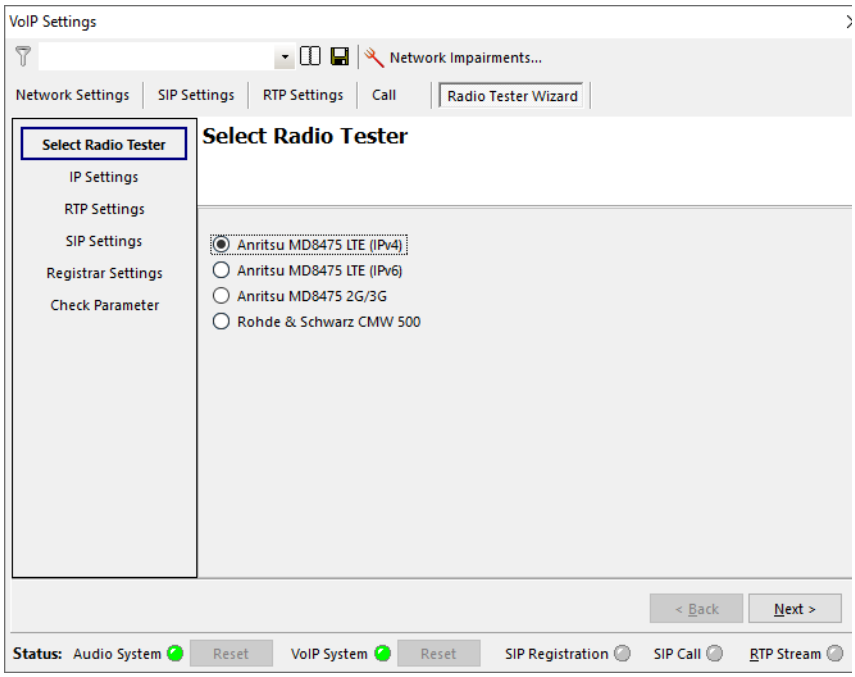
3. Select the **VoIP** block.



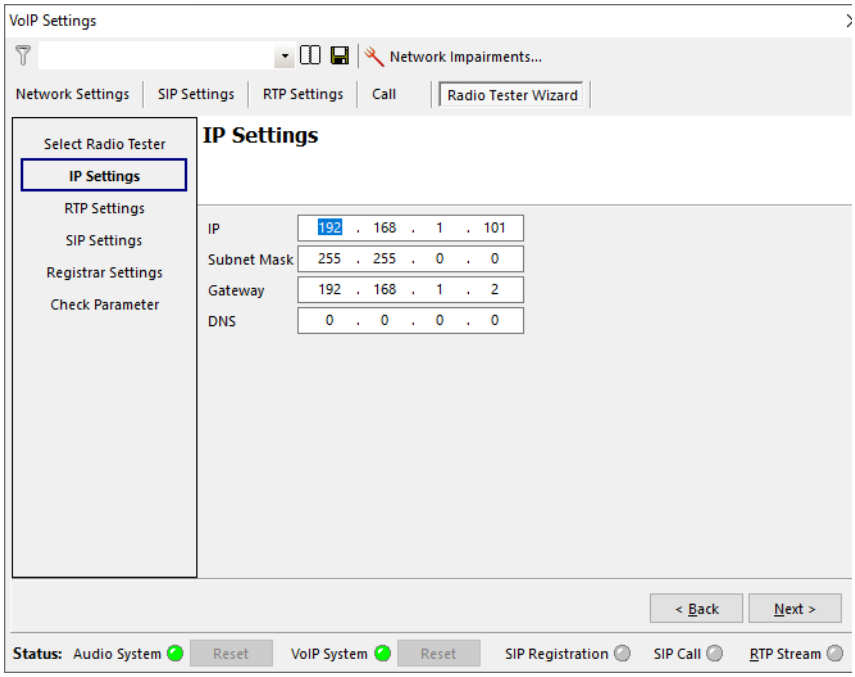
4. Select the **Call** tab.
5. Enable **Automatic Jitter Buffer Reset**.
6. Select **Radio Tester Wizard**.



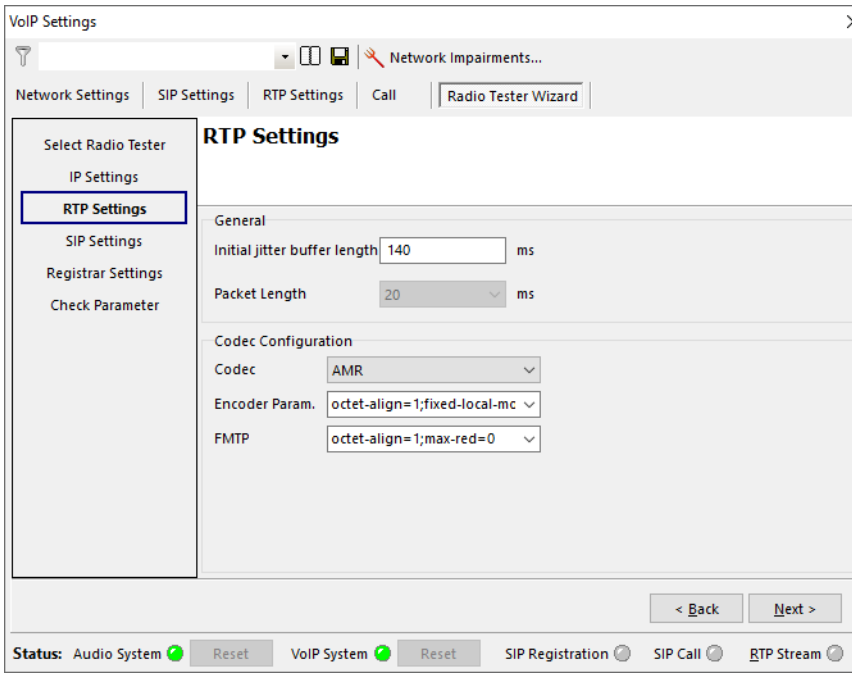
7. Select the Anritsu MD8475B. The Internet protocol (IPv4, IPv6) depends on the DUT.



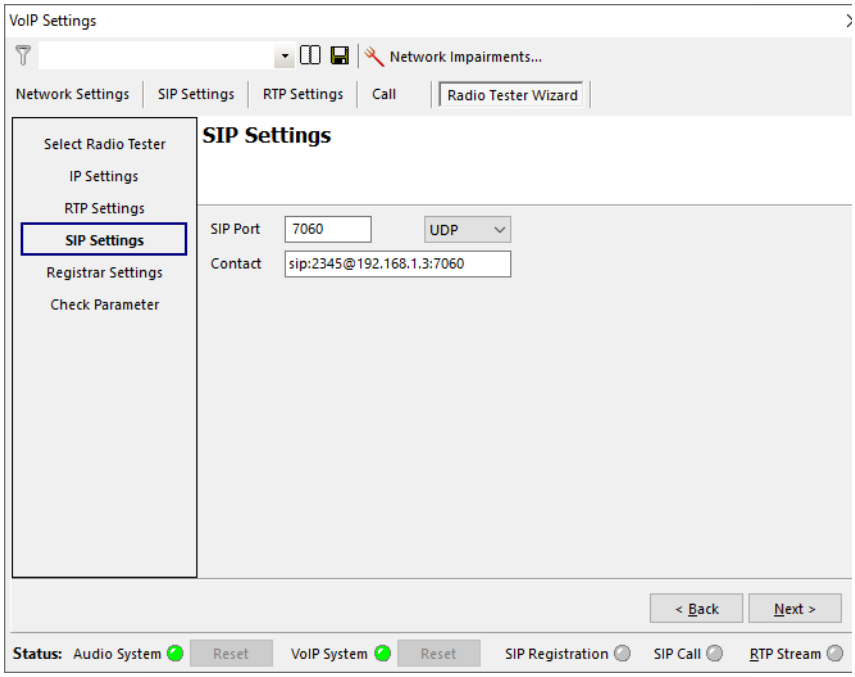
8. Select **IP Settings**.
9. Enter / verify the **IP Settings**.



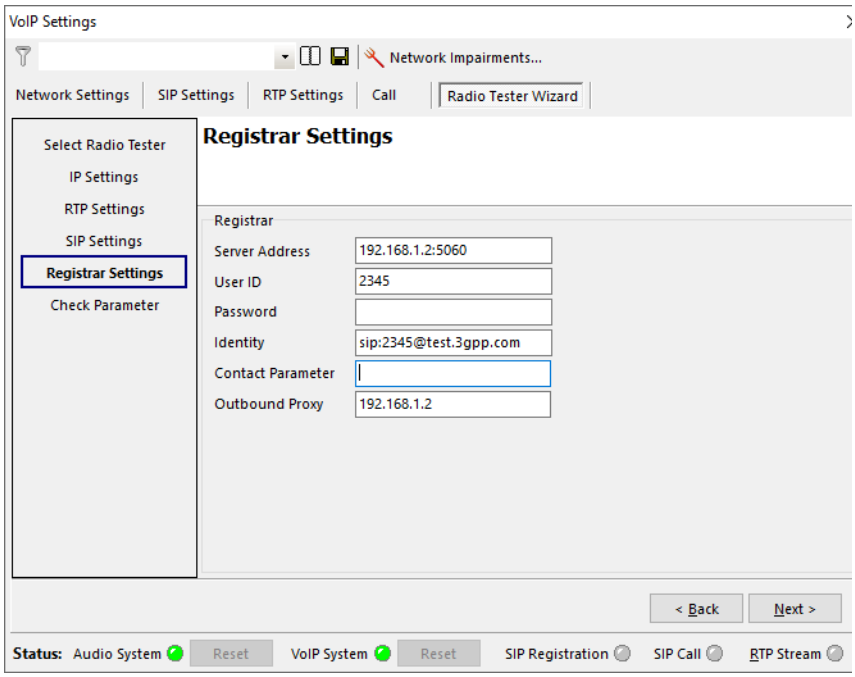
10. Select **RTP Settings**.
11. Enter a suitable initial jitter buffer length. Default setting is 140 ms.
12. Select the desired voice codec.



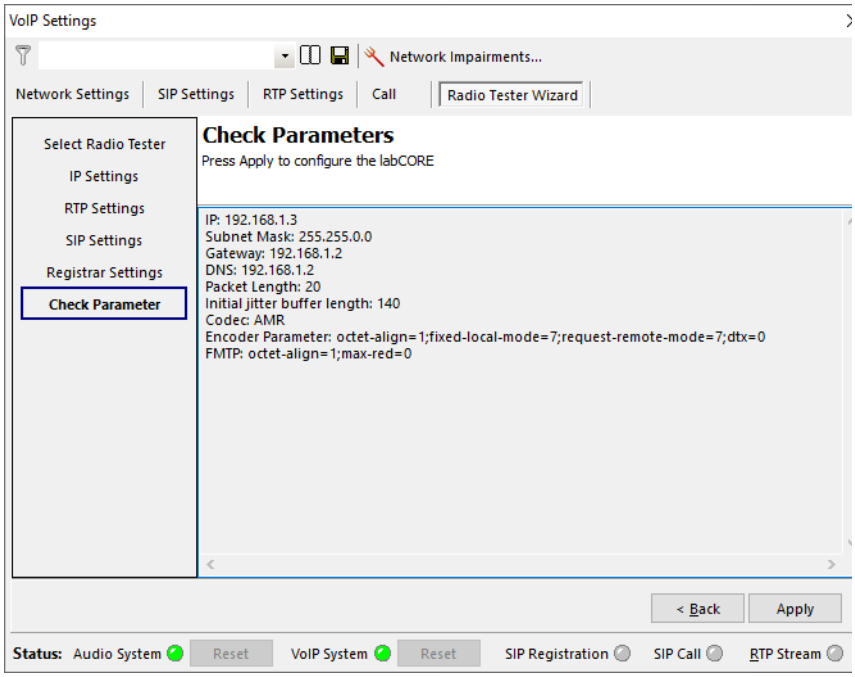
13. Select **SIP Settings**.
14. Enter / verify the SIP settings.



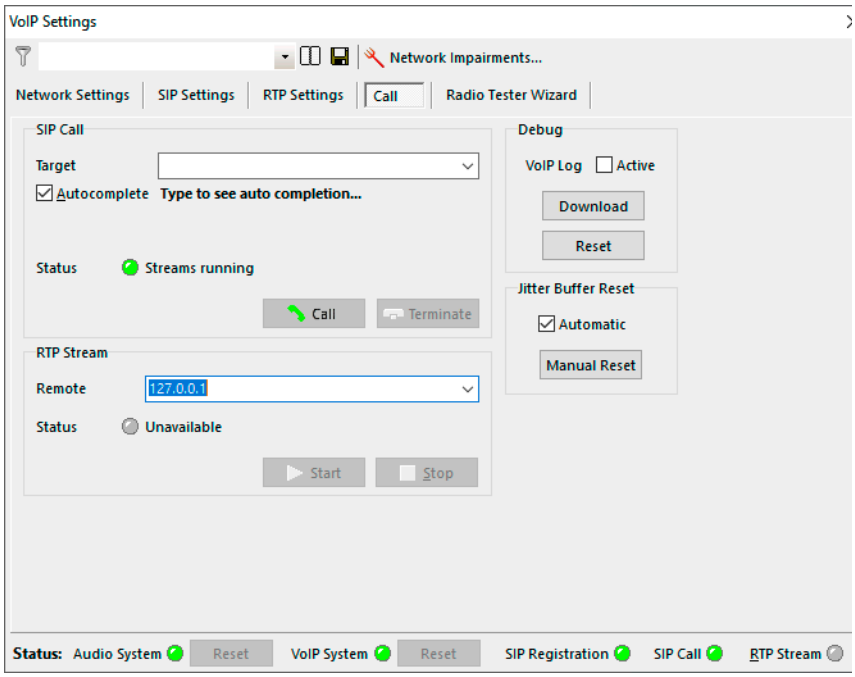
15. Select **Registrar Settings**.
16. Enter / verify the Registrar settings.



17. Select **Check Parameters**.
18. Verify all set parameters.
19. Select **Apply** to register the *lab*CORE at Anritsu MD8475B.

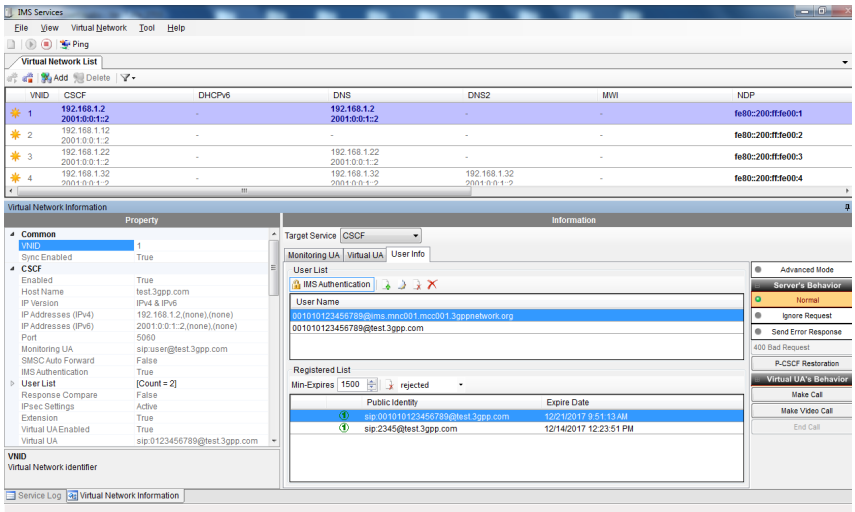


20. The green LED at the bottom confirms the successful **SIP Registration**.
21. The SIP address of *lab*CORE appears in the **Registered List** on Anritsu MD8475B.



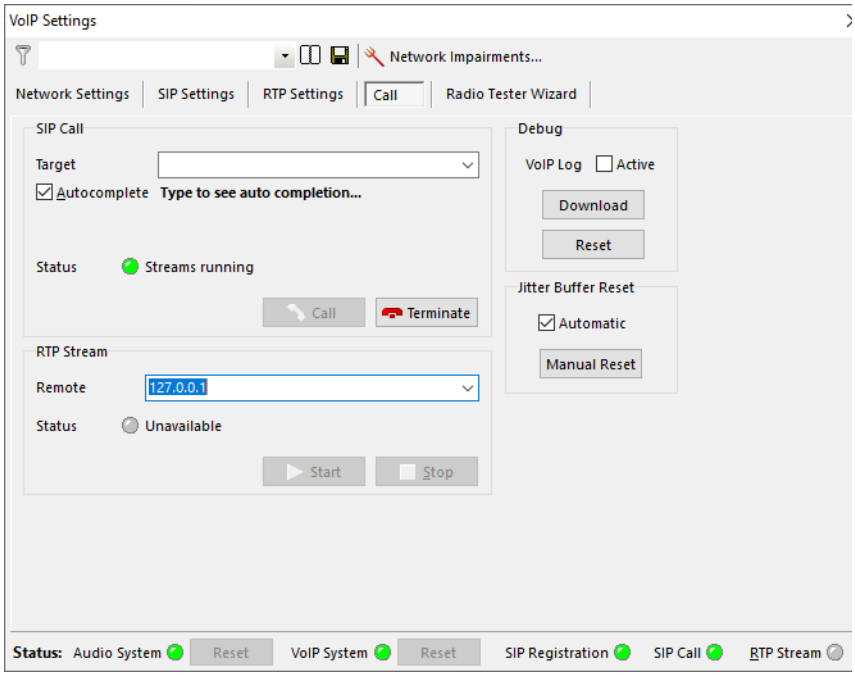
Anritsu MD8475B: IMS Server

1. Set the DUT back online and let it register at the IMS server.
2. The SIP address of the DUT appears in the **Registered List** on Anritsu MD8475B.
3. If IPsec is active at Anritsu MD8475B: Select IMS Authentication to lock IMS authentication.
   Do not lock IMS authentication if IPsec is inactive at Anritsu MD8475B and not required by the DUT.
4. Check if DUT and *lab*CORE have the same public identity address (example@test3gpp.com) in the **Registered List**.



ACQUA Computer: Call Execution

1. Enter the SIP address of the DUT in ACQUA and select **Call** to connect DUT and *lab*CORE.
2. The connection is established.



3 2G Connection

3.1 Equipment List

3.1.1 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 codec
- ACQUA (Code 6810), Advanced Communication Analysis software
- HMS II.3 (Code 1703), HEAD measurement system with ear simulator and artificial mouth
- CDM V (Code 1637), Cable D-Sub 15-pin 2 x XLR (AES/EBU in/out) + 2 x BNC (pulse in/out)

Optional

- *lab*CORE extensions depending on device under test and/or application case
  - *core*IP-IMP (Code 7771), VoIP impairment extension
  - *core*IP-AMR (Code 7772), AMR 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

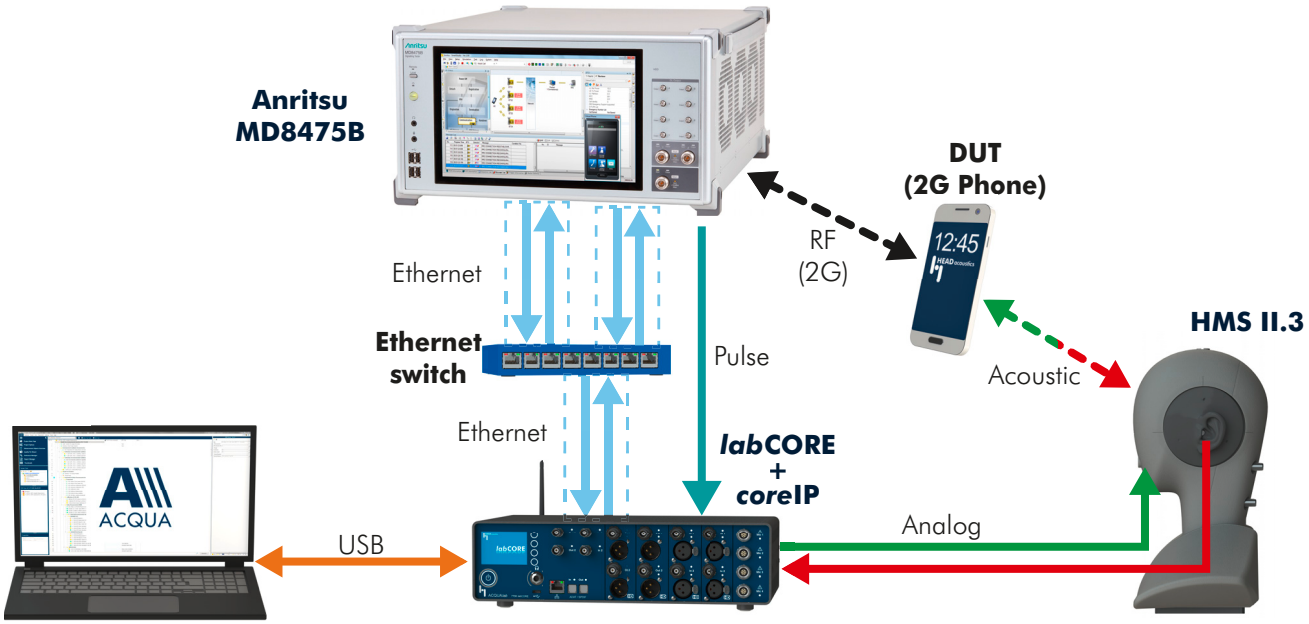
3.1.2 Anritsu Equipment

- Anritsu MD8475B Signaling Tester
- SmartStudio©
- GSM Option
- GSM/GPRS Simulation Software
- GSM Signalling Unit
- 1 Year Support Service
- SIPviaMD8475

3.1.3 Third Party Equipment

- Ethernet switch
- 3 x Ethernet cable
- BNC cable
- RF antenna
- Computer for ACQUA software
- DUT
- Test SIM card

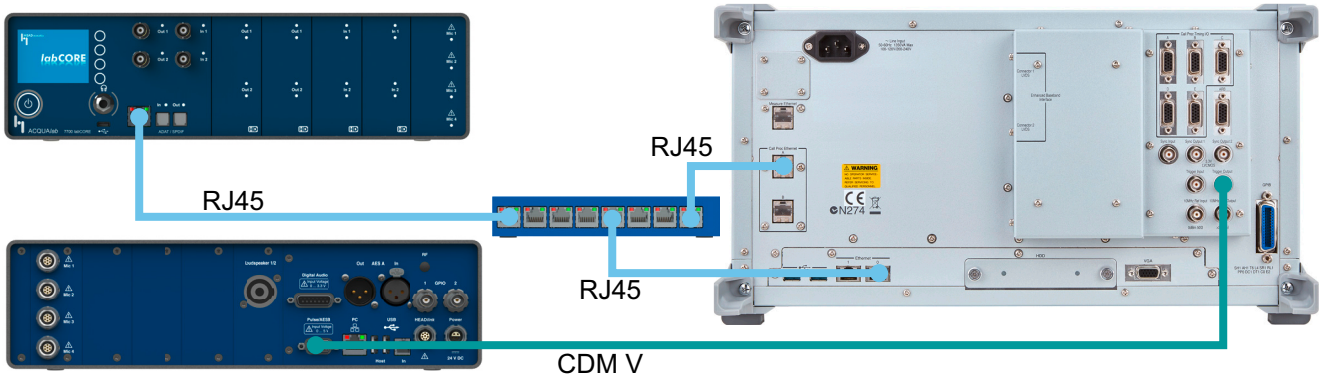
3.2 Configuration Example



3.3 Cabling

3.3.1 Antenna

3.3.2 *lab*CORE to Anritsu MD8475B



3.4 2G Connection Establishment

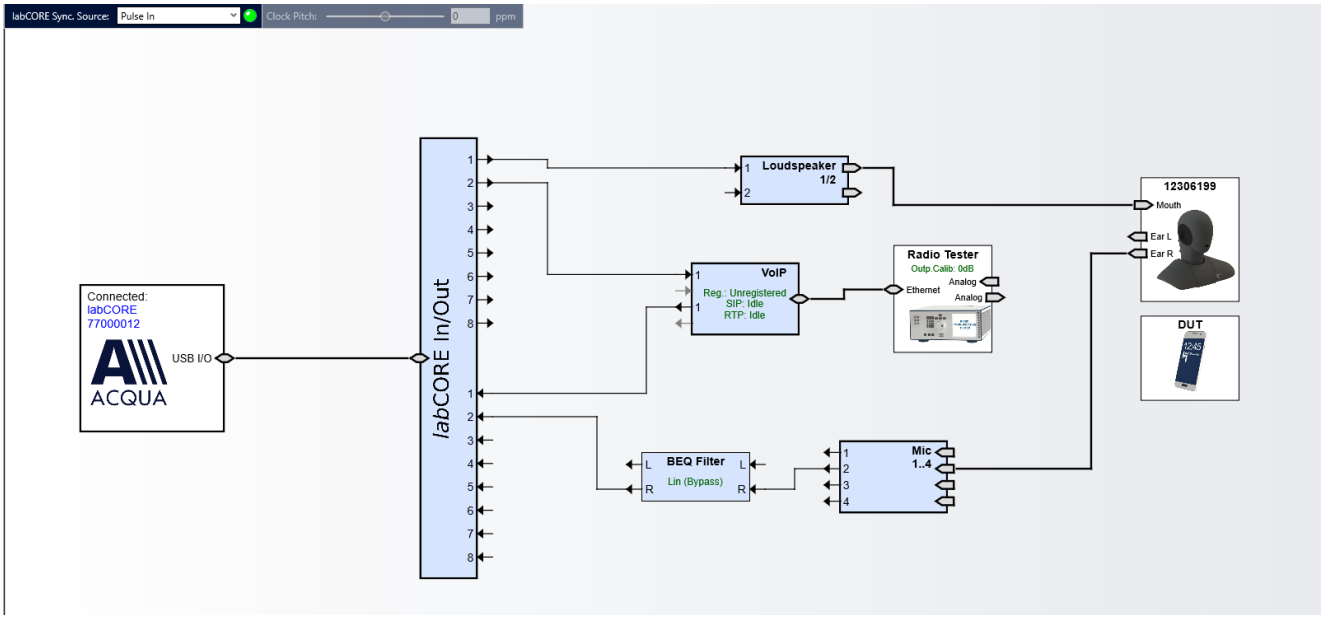
3.4.1 Preparation

- Interconnect the hardware according to chapter 3.2 and chapter 3.3
- Boot up Anritsu MD8475B
- Open SmartStudio© on Anritsu MD8475B
- Boot up computer and start ACQUA
- Boot up *lab*CORE
- Insert test SIM card into DUT and boot up DUT

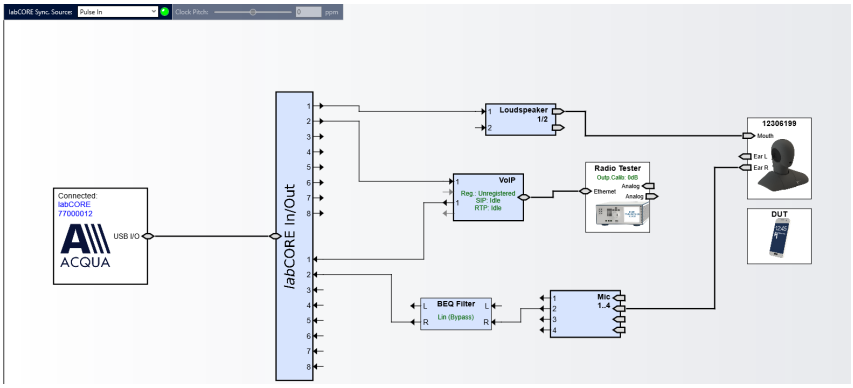
3.4.2 Connection Procedure

ACQUA Computer: Hardware Configuration

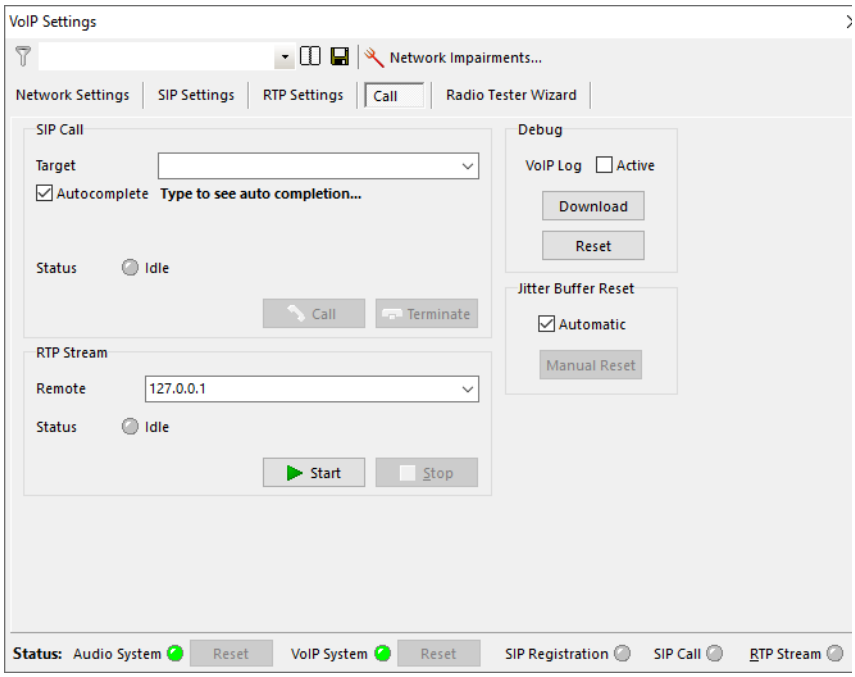
1. Start **Hardware Configuration**.
2. Select *lab*CORE and build the configuration.



3. Select the **VoIP** block.

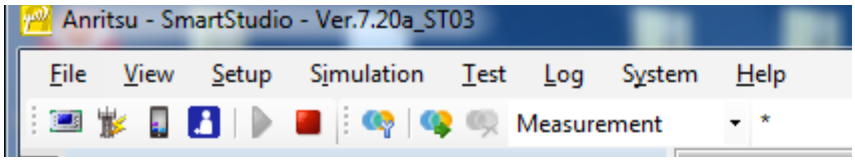


4. Select the **Call** tab.
5. Enable **Automatic Jitter Buffer Reset**.

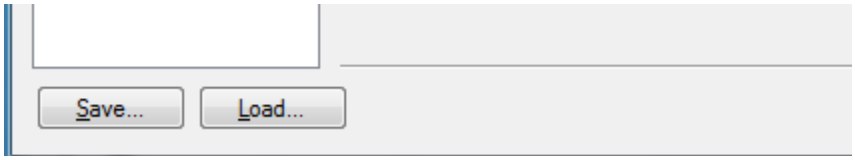


Anritsu MD8475B: Connection Parameters

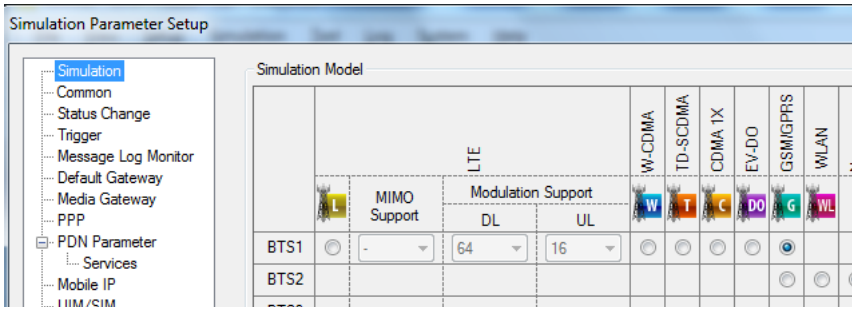
1. Open SmartStudio© on Anritsu MD8475B.
2. Select to open **Simulation Parameter Setup**.



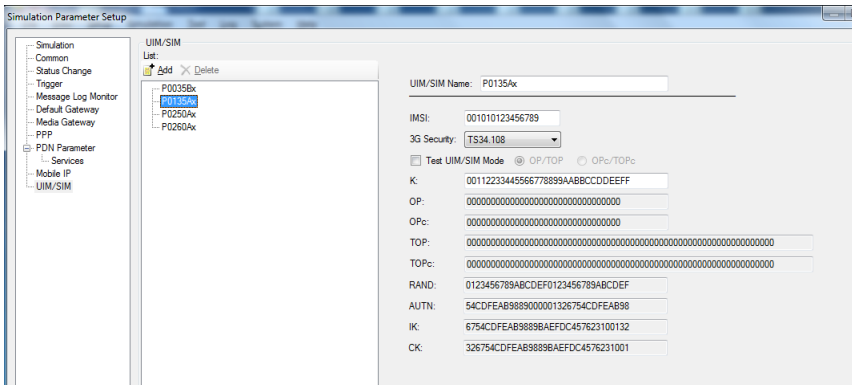
3. If available, load existing **Simulation Parameter Setup** by selecting Load....



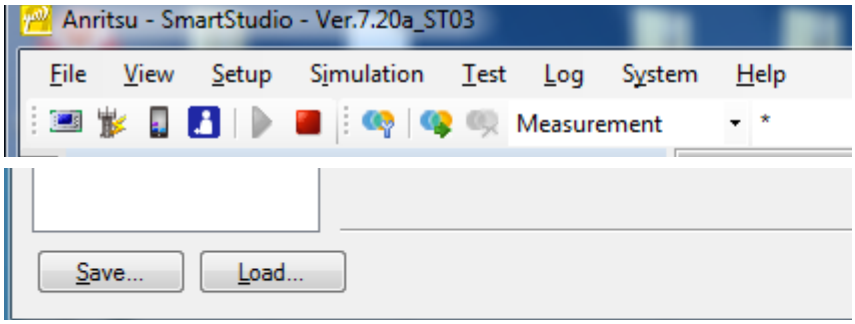
4. Select **Simulation**.
5. Set **Simulation Model** to **GSM/GPRS**.
6. Select **UIM/SIM**.



7. Check if the UIM/SIM settings apply to the SIM card of the DUT.
8. If desired, save the **Simulation Parameter Setup** by selecting Save....
9. Confirm **Simulation Parameter Setup** by selecting OK.

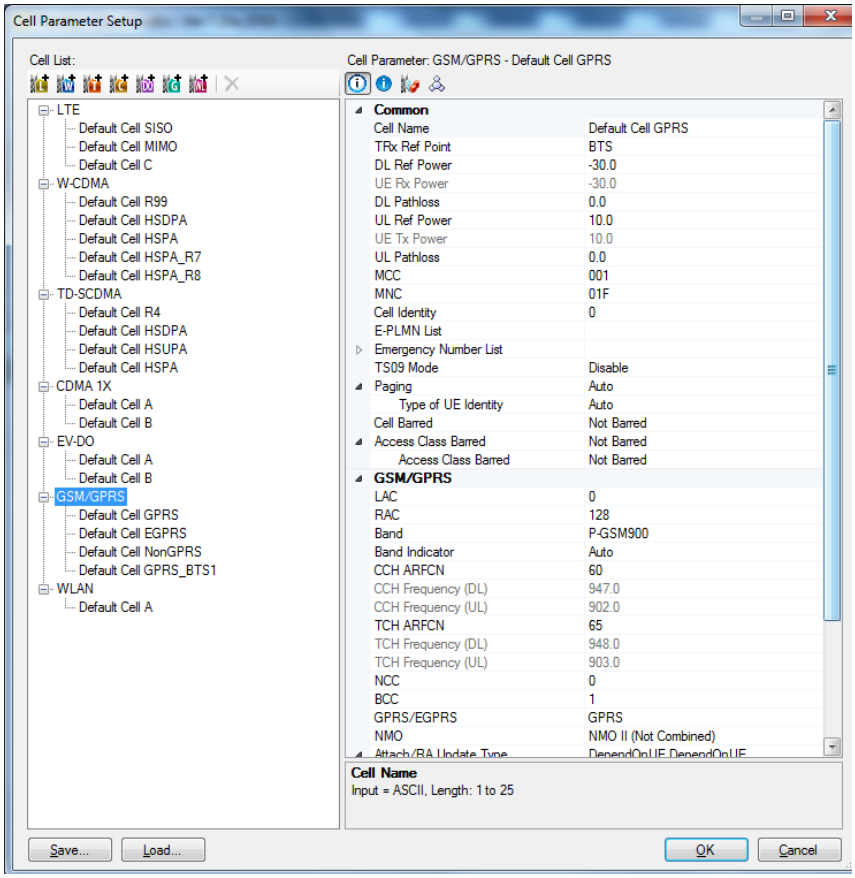


10. Select to open **Cell Parameter Setup**.

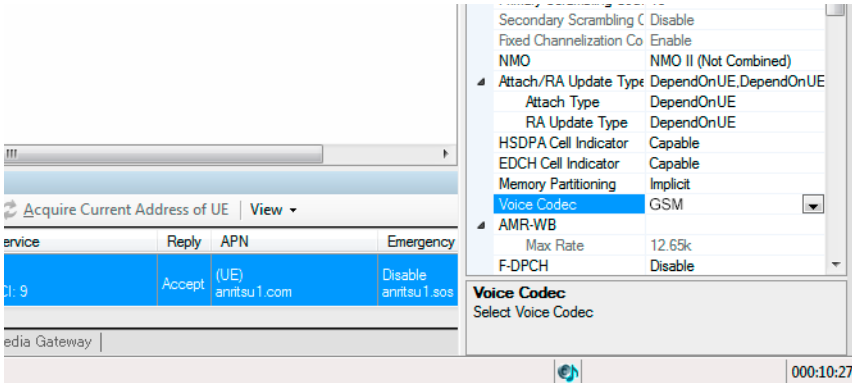


11. If available, load existing **Cell Parameter Setup** by selecting Load....

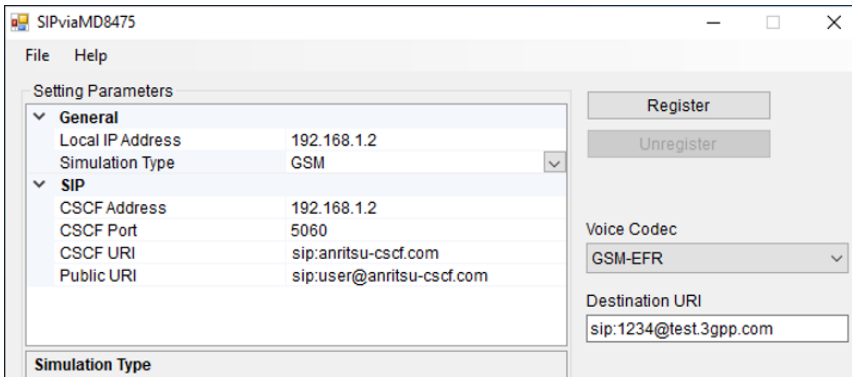
12. Select **GSM/GPRS** from the **Cell list**.
13. Unfold **Common** in **Cell parameter**.
14. Set the external attenuation (**DL Ref Power** and **UL Ref Power**). It shall match the attenuation of the RF antenna and the antenna cable.
15. Set the network identity **MCC** according to SIM card preferences.
16. Set the network identity **MNC** according to SIM card preferences.
17. If desired, save the **Cell Parameter Setup** by selecting Save....
18. Confirm **Cell Parameter Setup** by selecting OK.



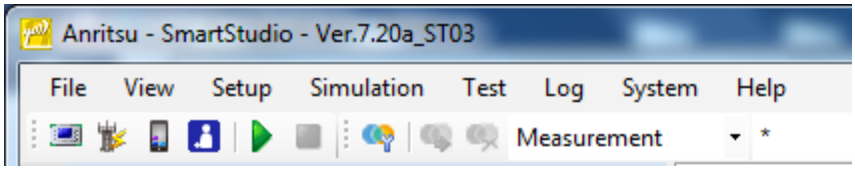
19. Select the desired GSM voice codec in SmartStudio©.



20. Open **SIPviaMD8475**.
21. Set **GSM** as **Simulation Type**.
22. Set desired codec as **Voice Codec** consistent to SmartStudio©.
23. Select **Register**.

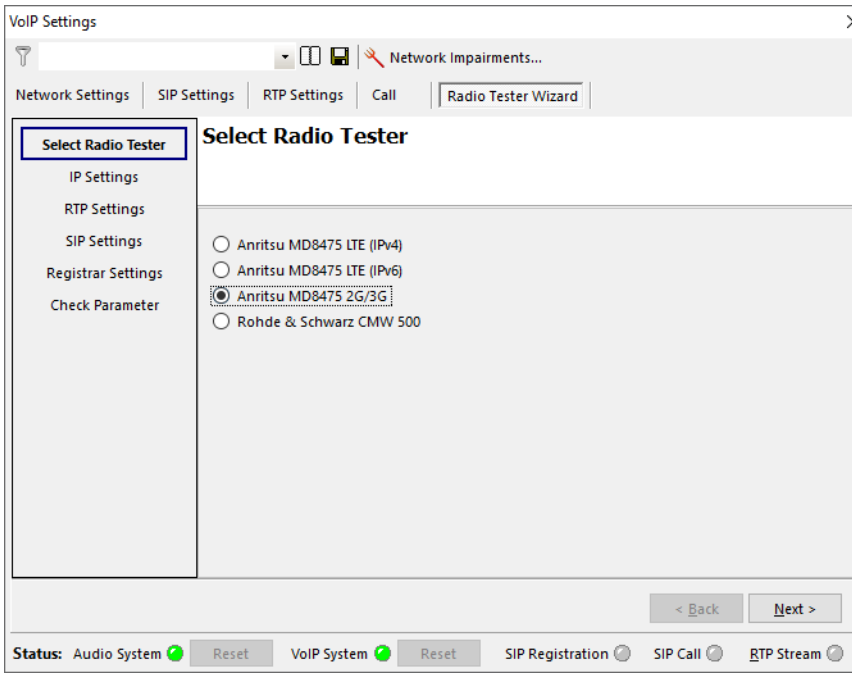


24. Go to SmartStudio©.
25. Select ▶ to start the simulation.

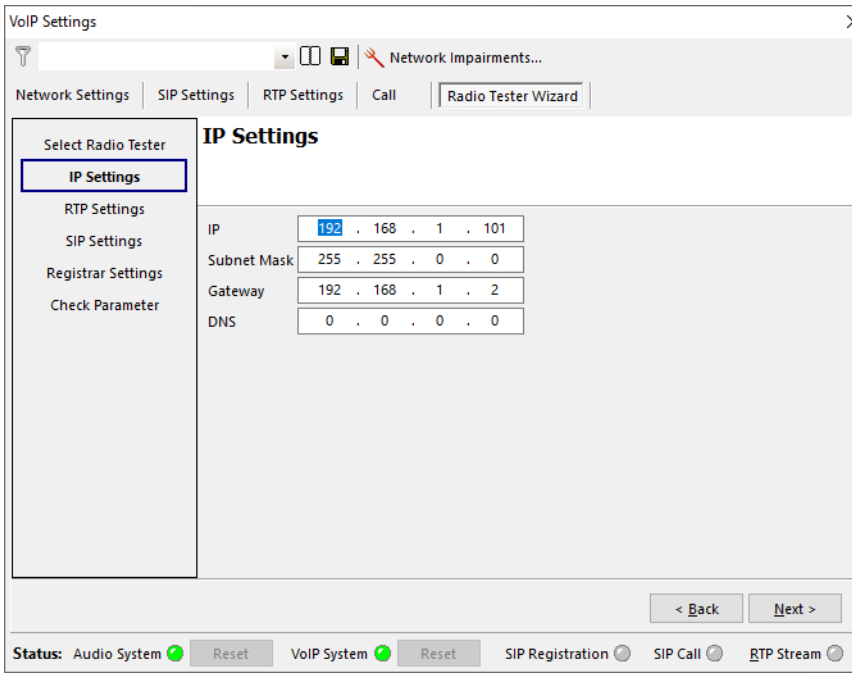


ACQUA Computer: Radio Tester Wizard

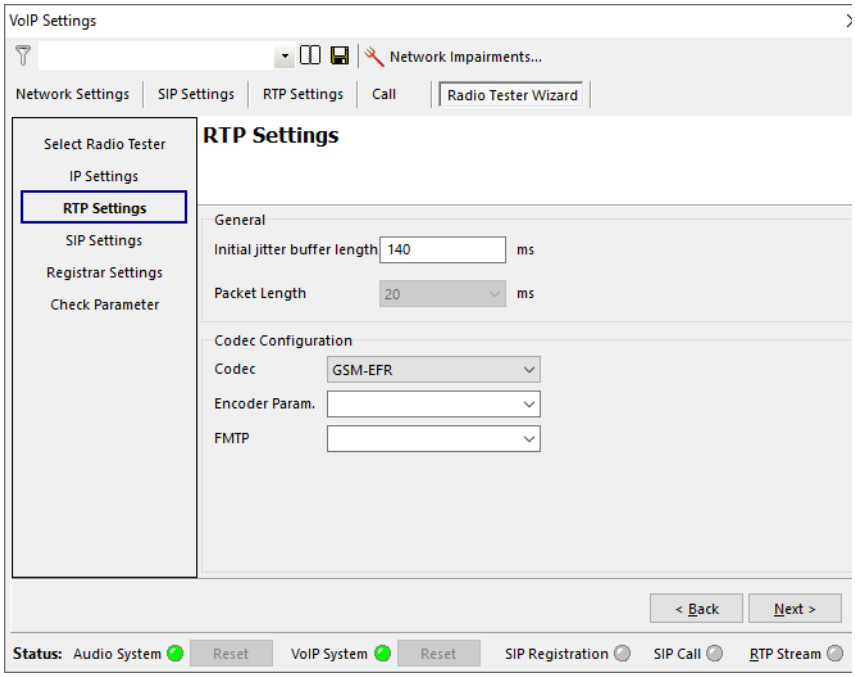
1. Select the **Radio Tester Wizard** tab.
2. Select **Anritsu MD8475 2G/3G**.



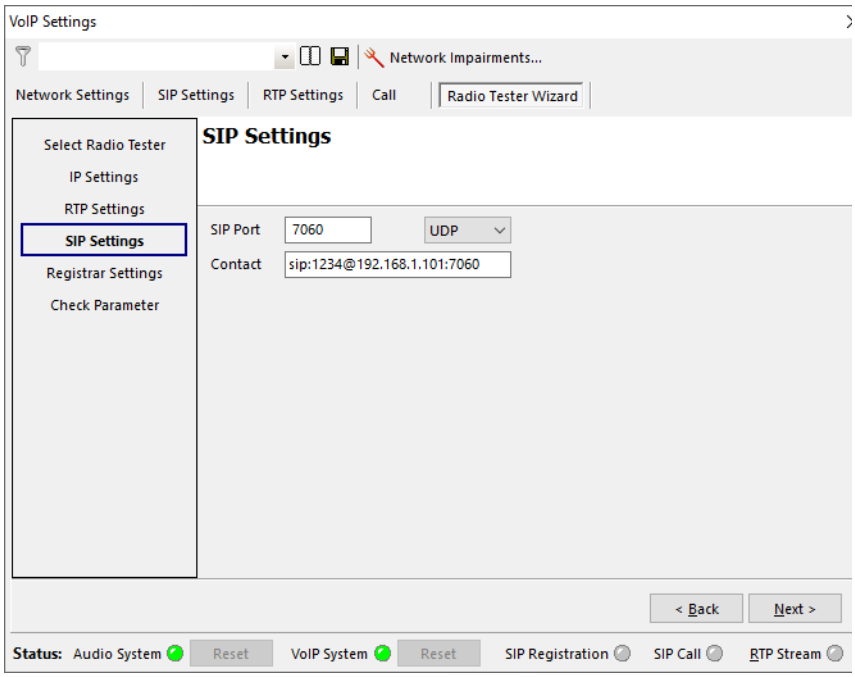
3. Select **IP Settings**.
4. Enter/verify the **IP Settings**.



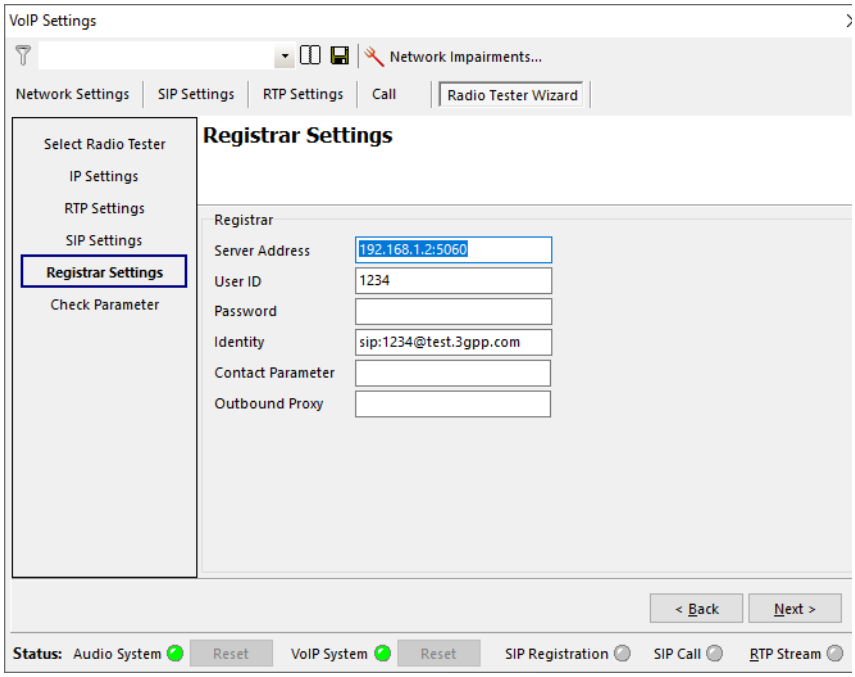
5. Select **RTP Settings**.
6. Enter a suitable **Initial jitter buffer length**. Default setting is 140 ms.
7. Select the voice codec in accordance with **SIPviaMD8475**.



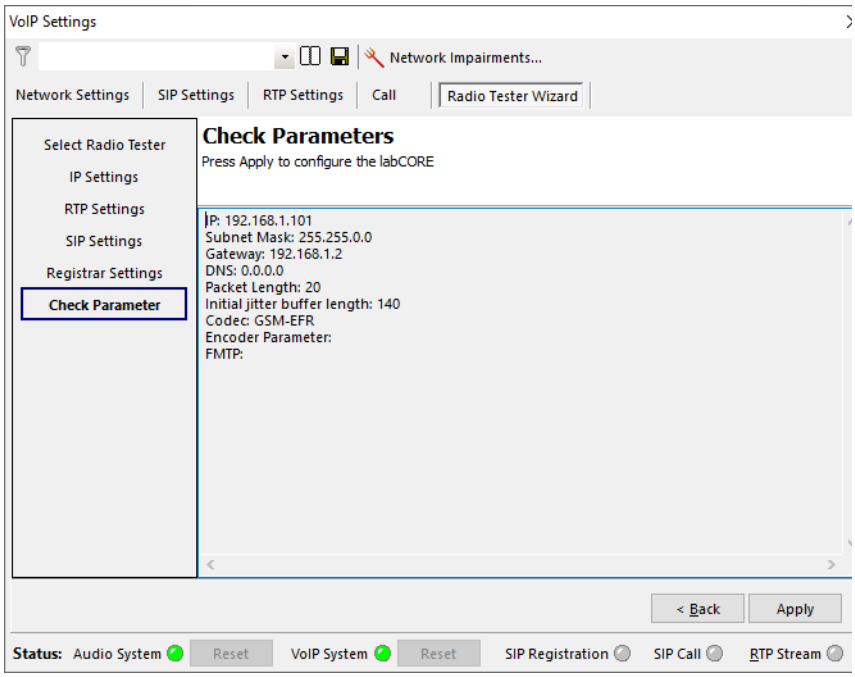
8. Select **SIP Settings**.
9. Enter/verify the **SIP Settings**.



10. Select **Registrar Settings**.
11. Enter/verify the **Registrar Settings**.

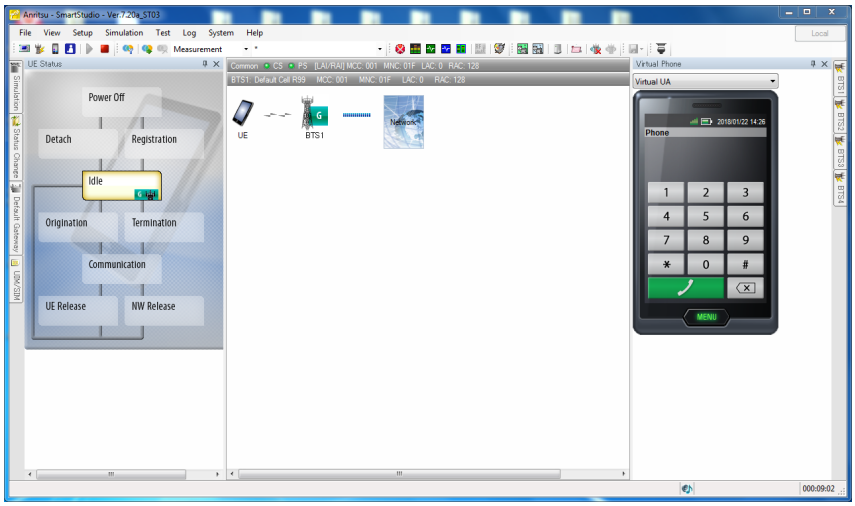


12. Select **Check Parameter**.
13. Verify all set parameters.
14. Select **Apply** to register the *lab*CORE at Anritsu MD8475B.



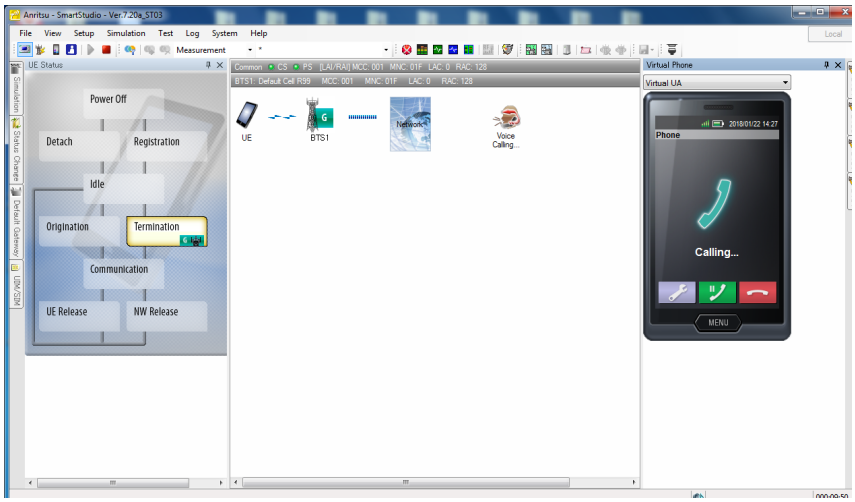
Anritsu MD8475B: Call Execution

1. Go to the SmartStudio© main screen. The status of the DUT (UE status) is **Idle**.



2. Enter any number (e.g.,123) on the keypad of the virtual phone on the screen.
3. Select the green call button to initiate the call. The radio tester waits for the call acceptance of the DUT.

4. Accept the call at the DUT.
5. The status of the DUT switches from **Termination** to **Communication**.



4 3G Connection

4.1 Equipment List

4.1.1 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 codec
  - *core*IP-AMR (Code 7772), AMR extension
- ACQUA (Code 6810), Advanced Communication Analysis software
- HMS II.3 (Code 1703), HEAD measurement system with ear simulator and artificial mouth
- CDM V (Code 1637), Cable D-Sub 15-pin 2 x XLR (AES/EBU in/out) + 2 x BNC (pulse in/out)

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

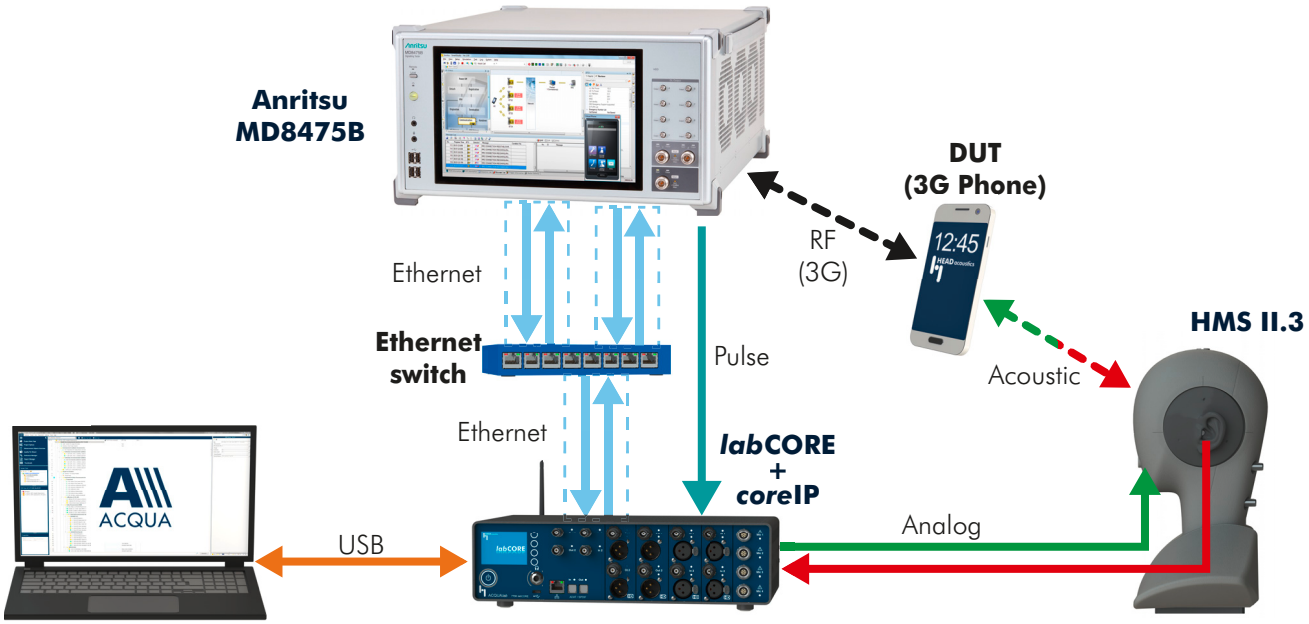
4.1.2 Anritsu Equipment

- Anritsu MD8475B Signalling Tester
- SmartStudio©
- W-CDMA Option
- Enhanced Multi-signalling Unit
- W-CDMA Simulation Software
- 1 Year Support Service
- SIPviaMD8475

4.1.3 Third Party Equipment

- Ethernet switch
- 3 x Ethernet cable
- BNC cable
- RF antenna
- Computer for ACQUA software
- DUT
- Test SIM card

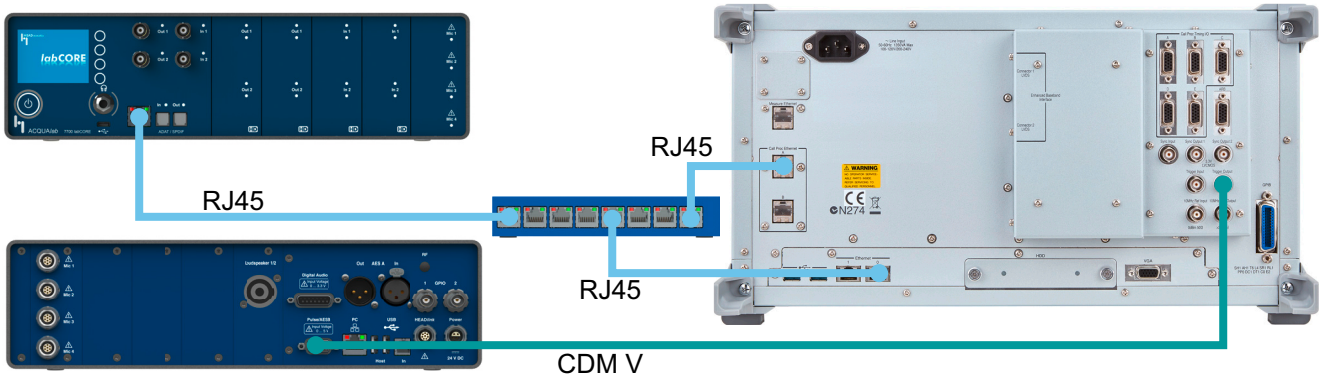
4.2 Configuration Example



4.3 Cabling

4.3.1 Antenna

4.3.2 *lab*CORE to Anritsu MD8475B



4.4 3G Connection Establishment

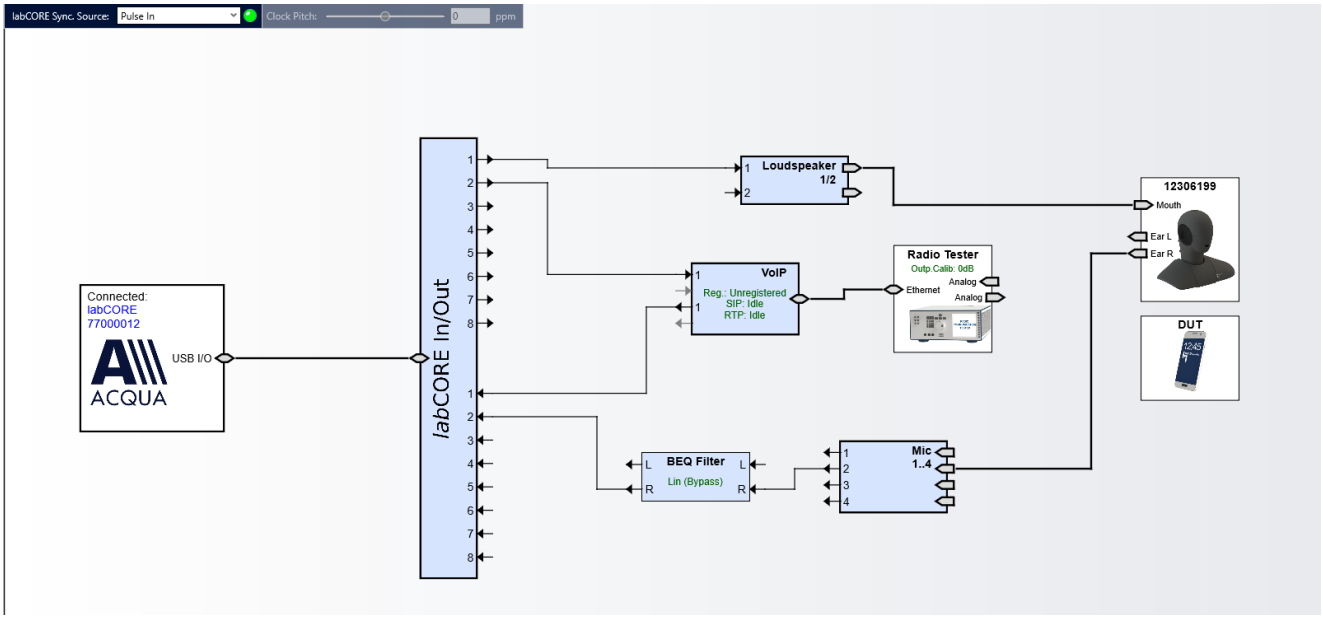
4.4.1 Preparation

- Interconnect the hardware according to chapter 4.2 and chapter 4.3
- Boot up Anritsu MD8475B
- Open SmartStudio© on Anritsu MD8475B
- Boot up computer and start ACQUA
- Boot up *lab*CORE
- Insert SIM card into DUT and boot up DUT

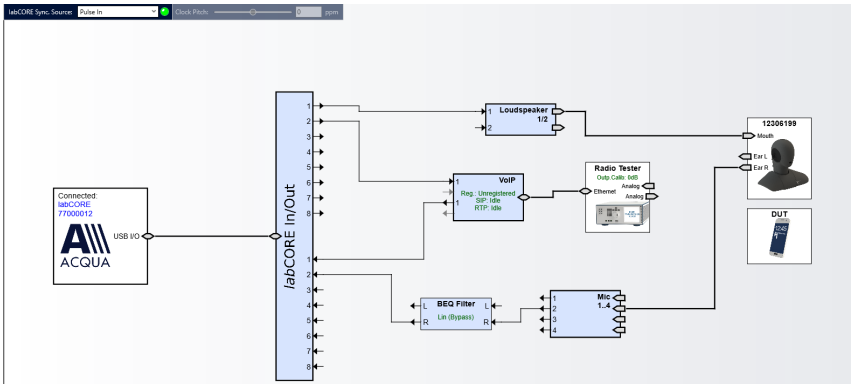
4.4.2 Connection Procedure

ACQUA Computer: Hardware Configuration

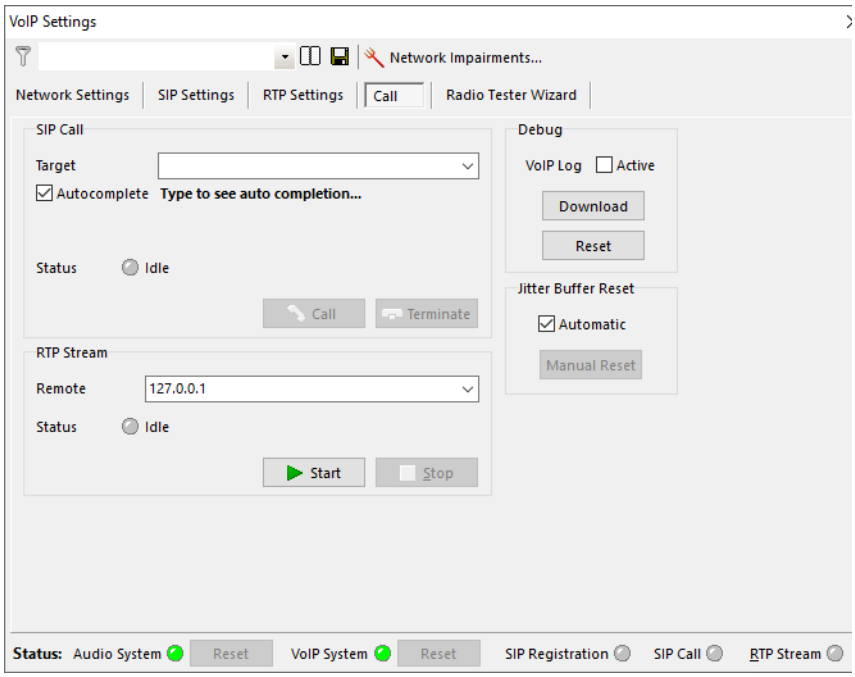
1. Start **Hardware Configuration**.
2. Select *lab*CORE and build the configuration.



3. Select the **VoIP** block.

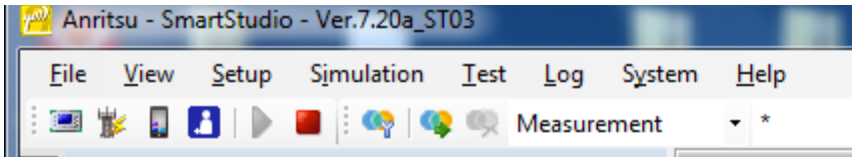


4. Select the **Call** tab.
5. Enable **Automatic Jitter Buffer Reset**.

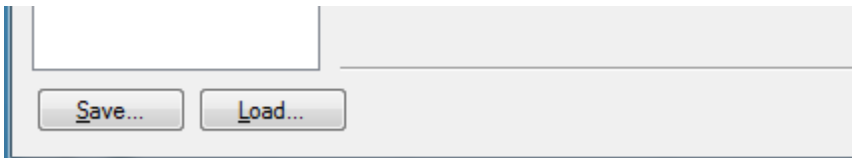


Anritsu MD8475B: Connection Parameters

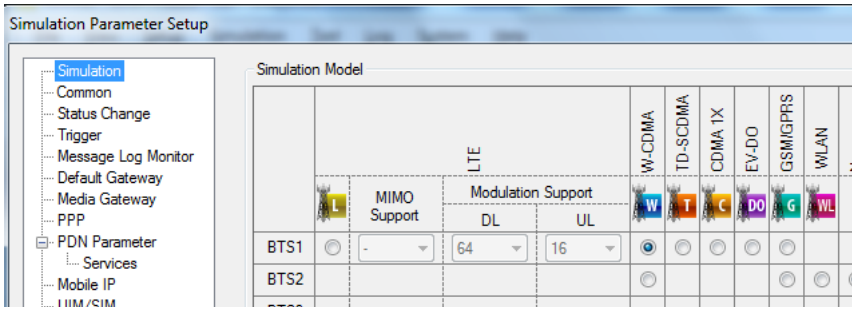
1. Open SmartStudio© on Anritsu MD8475B.
2. Select to open **Simulation Parameter Setup**.



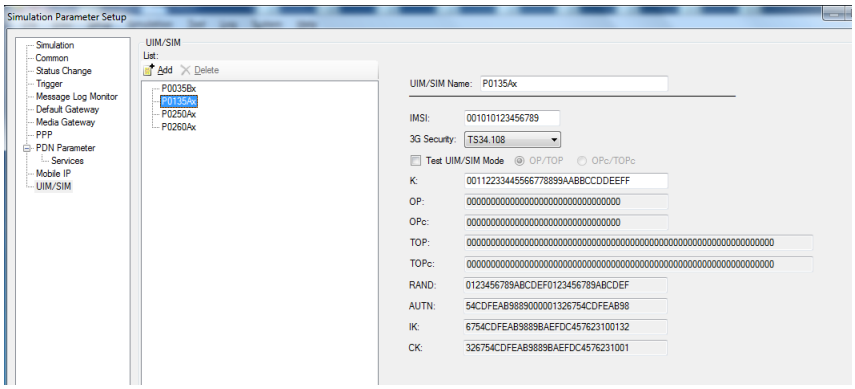
3. If available, load existing **Simulation Parameter Setup** by selecting Load....



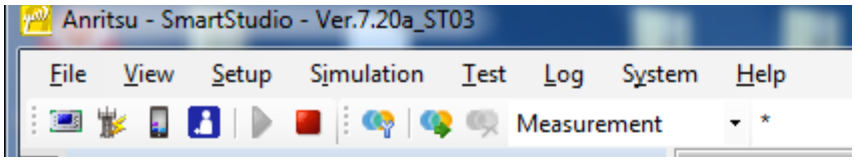
4. Select **Simulation**.
5. Set **Simulation Model** to **W-CDMA**.
6. Select **UIM/SIM**.



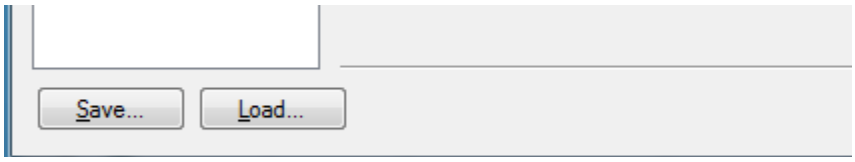
7. Check if the UIM/SIM settings apply to the SIM card of the DUT.
8. If desired, save the **Simulation Parameter Setup** by selecting Save....
9. Confirm **Simulation Parameter Setup** by selecting OK.



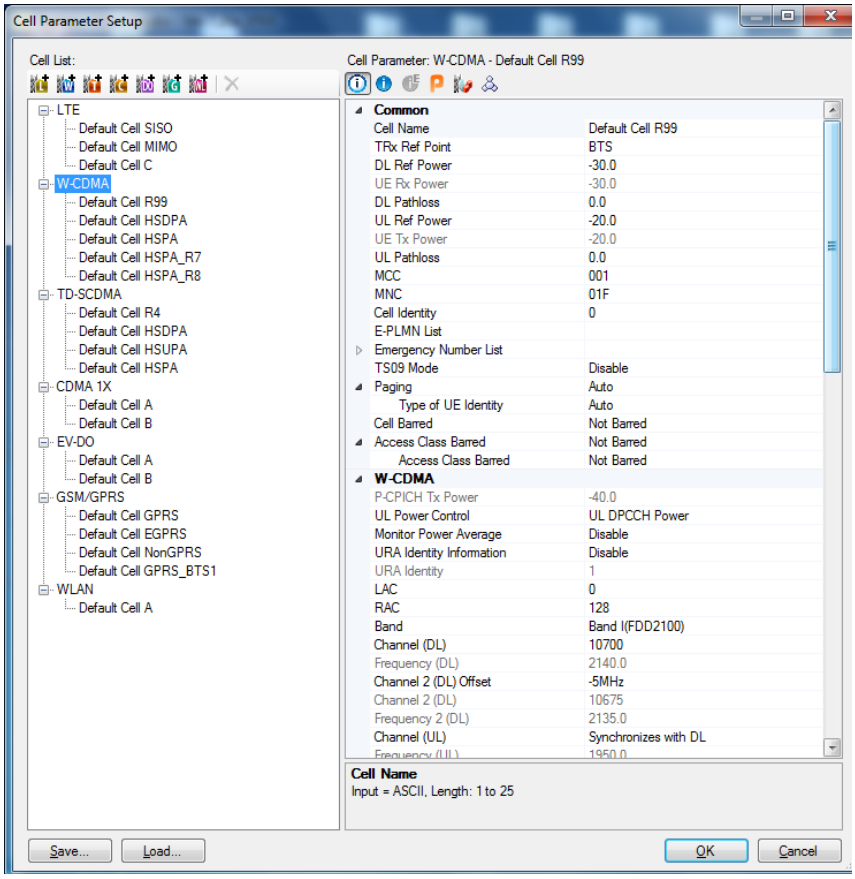
10. Select to open **Cell Parameter Setup**.



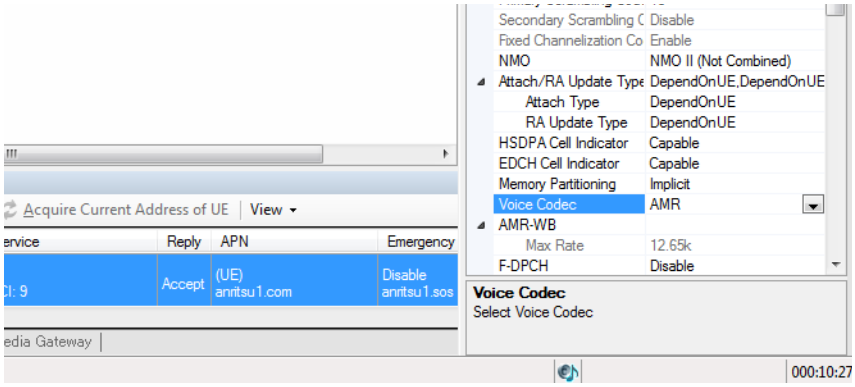
11. If available, load existing **Cell Parameter Setup** by selecting Load... .



12. Select **W-CDMA** from the **Cell list**.
13. Unfold **Common** in **Cell parameter**.
14. Set the external attenuation (**DL Ref Power** and **UL Ref Power**). It shall match the attenuation of the RF antenna and the antenna cable.
15. Set the network identity **MCC** according to SIM card preferences.
16. Set the network identity **MNC** according to SIM card preferences.
17. If desired, save the **Cell Parameter Setup** by selecting Save... .
18. Confirm **Cell Parameter Setup** by selecting OK .

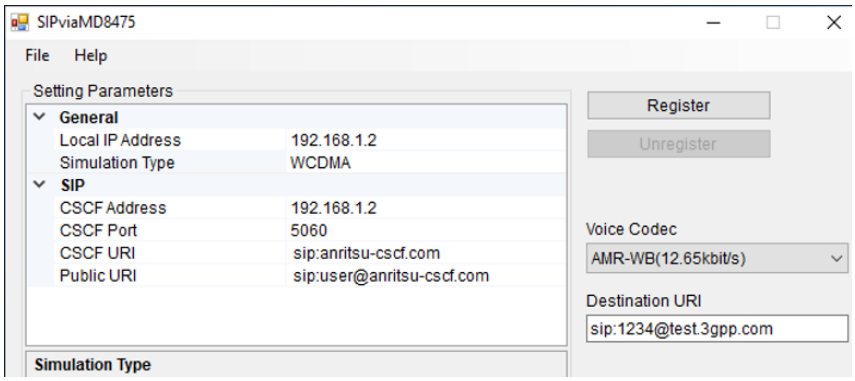


19. Select the desired GSM voice codec in SmartStudio©.

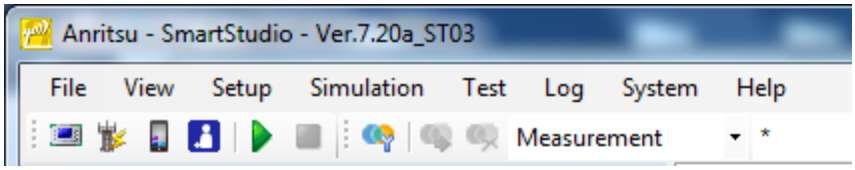


#

20. Open **SIPviaMD8475**.
21. Set **WCDMA** as **Simulation Type**.
22. Set desired codec as **Voice Codec** consistent to SmartStudio©.
23. Select **Register**.

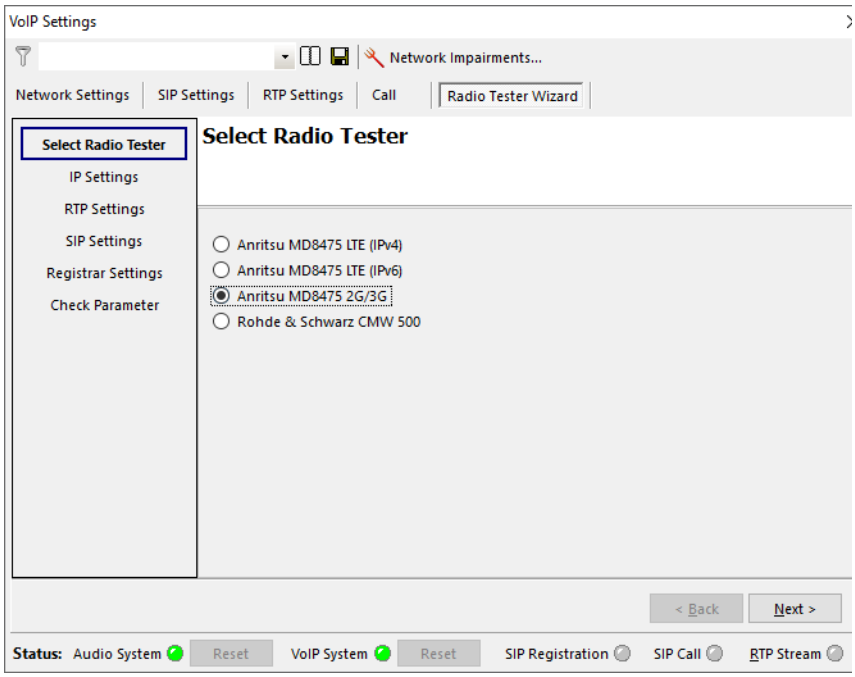


24. Go to SmartStudio©.
25. Select ▶ to start the simulation.

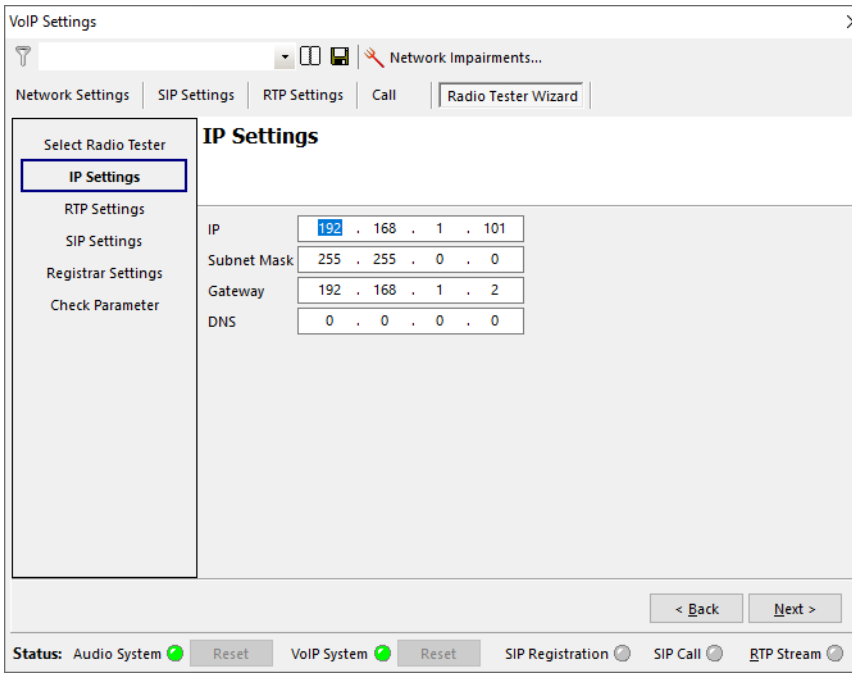


ACQUA Computer: Radio Tester Wizard

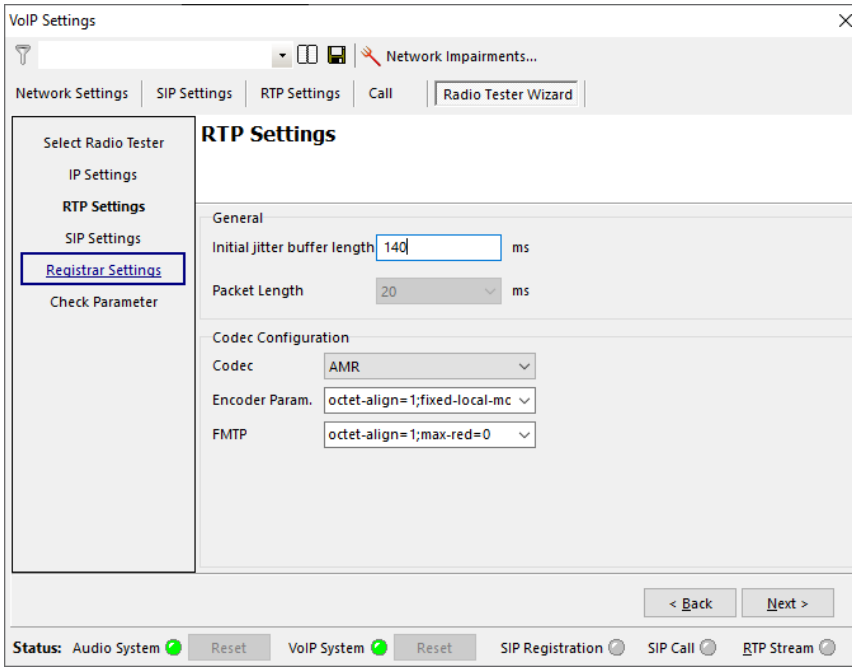
1. Select the **Radio Tester Wizard** tab.
2. Select **Anritsu MD8475 2G/3G**.



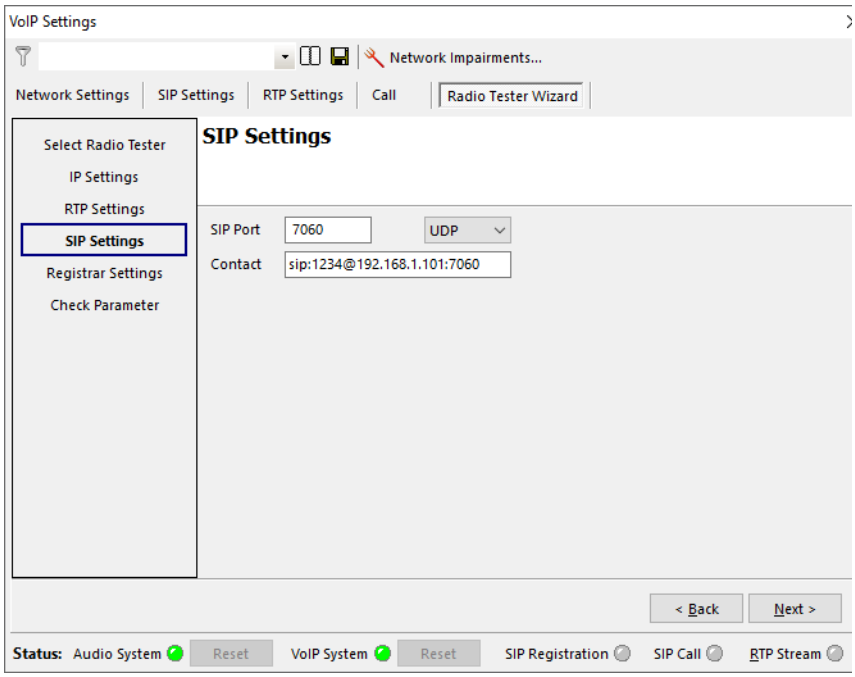
3. Select **IP Settings**.
4. Enter/verify the **IP Settings**.



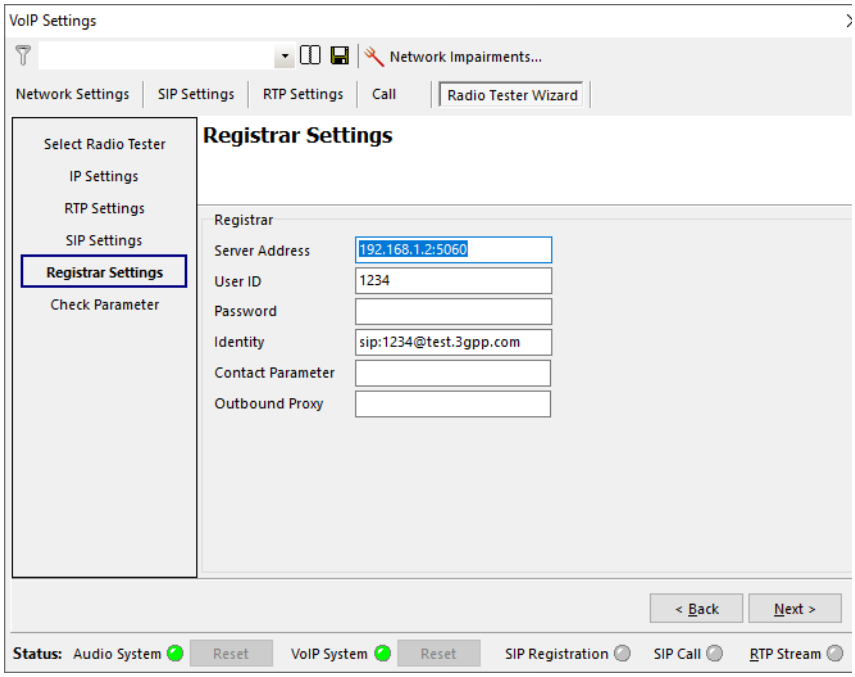
5. Select **RTP settings**.
6. Enter a suitable **Initial jitter buffer length**. Default setting is 140 ms.
7. Select the voice codec in accordance with **SIPviaMD8475**.



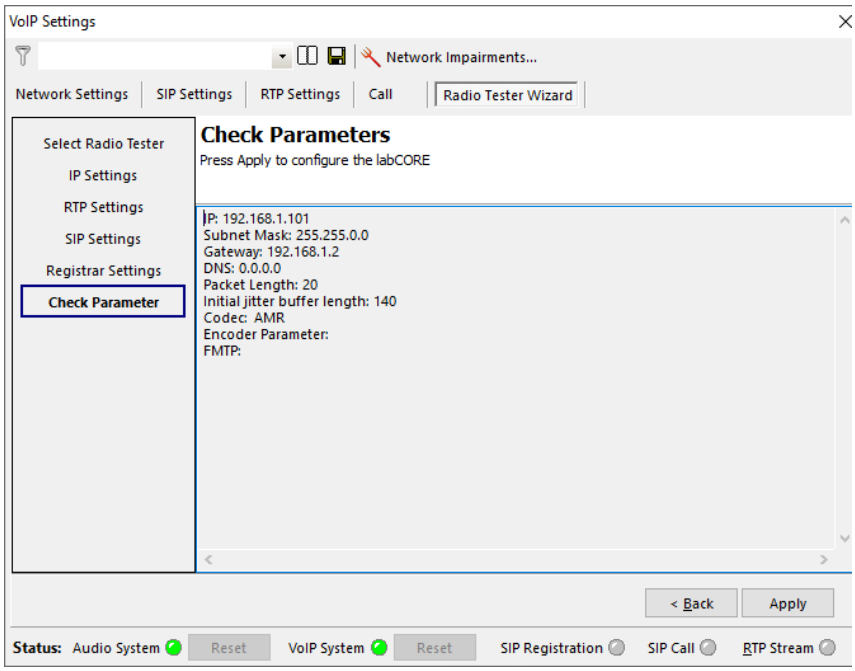
8. Select **SIP Settings**.
9. Enter/verify the **SIP Settings**.



10. Select **Registrar Settings**.
11. Enter/verify the **Registrar Settings**.

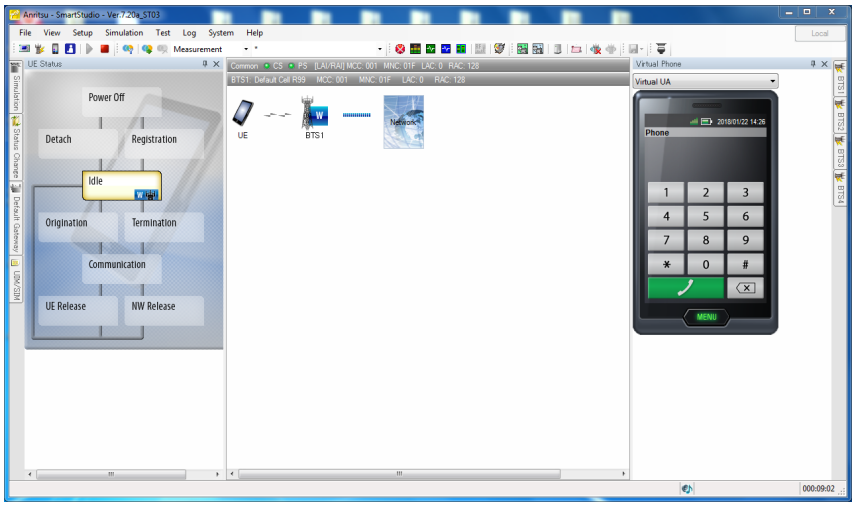


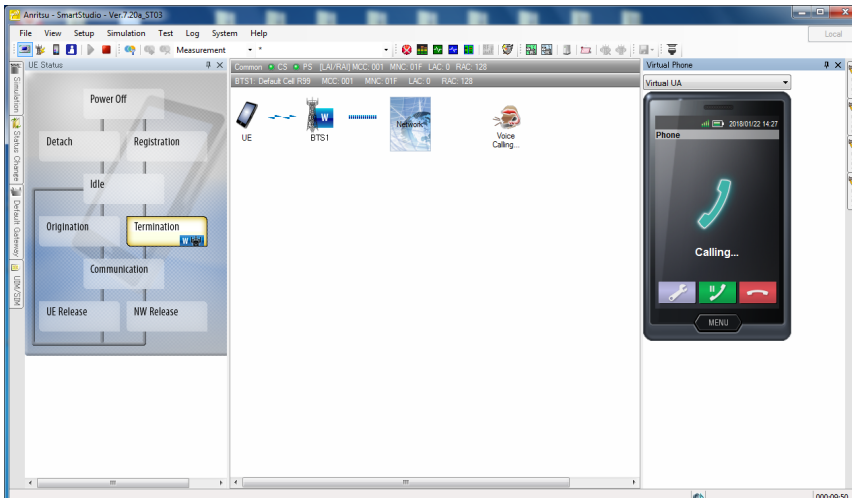
12. Select **Check Parameter**.
13. Verify all set parameters.
14. Select **Apply** to register the *lab*CORE at Anritsu MD8475B.



Anritsu MD8475B: Call Execution

1. Go to the SmartStudio© main screen. The status of the DUT (UE status) is **Idle**.



2. Enter any number (e.g., 123) on the keypad of the virtual phone on the screen.
3. Select the green call button to initiate the call. The radio tester waits for the call acceptance of the DUT.

4. Accept the call at the DUT.
5. The status of the DUT switches from **Termination** to **Communication**.