HEAD acoustics

APPLICATION NOTE

ACQUA

Establish LTE & 2G/3G connections to *lab*CORE via Anritsu MD8475A

Application Note

Establish LTE & 2G/3G connections to *lab*CORE via Anritsu MD8475A

Revision 2

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1 Introduction

1.1 Brief description

This application note approaches the connection establishment between the Anritsu radio communication tester MD8475A, 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 two main chapters. One for the LTE connection and the other one for the 2G / 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 the Anritsu MD8475A. HEAD acoustics will not respond to support requests concerning general handling and technical configuration of the Anritsu MD8475A.

1.2 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 county 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

2 LTE configuration

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 1230), HEAD measurement system with ear simulator and artificial mouth

Optional

- *lab*CORE extensions depending on DUT and application case
  - *core*IP-IMP (Code 7771), VoIP impairment extension
  - *core*IP-OPUS (Code 7774), OPUS extension
  - *core*BEQ (Code 7741), Binaural equalization
- HHP IV (Code 1406), Motorizes handset positioner or HHP III.1 (Code 1403), Handset positioner

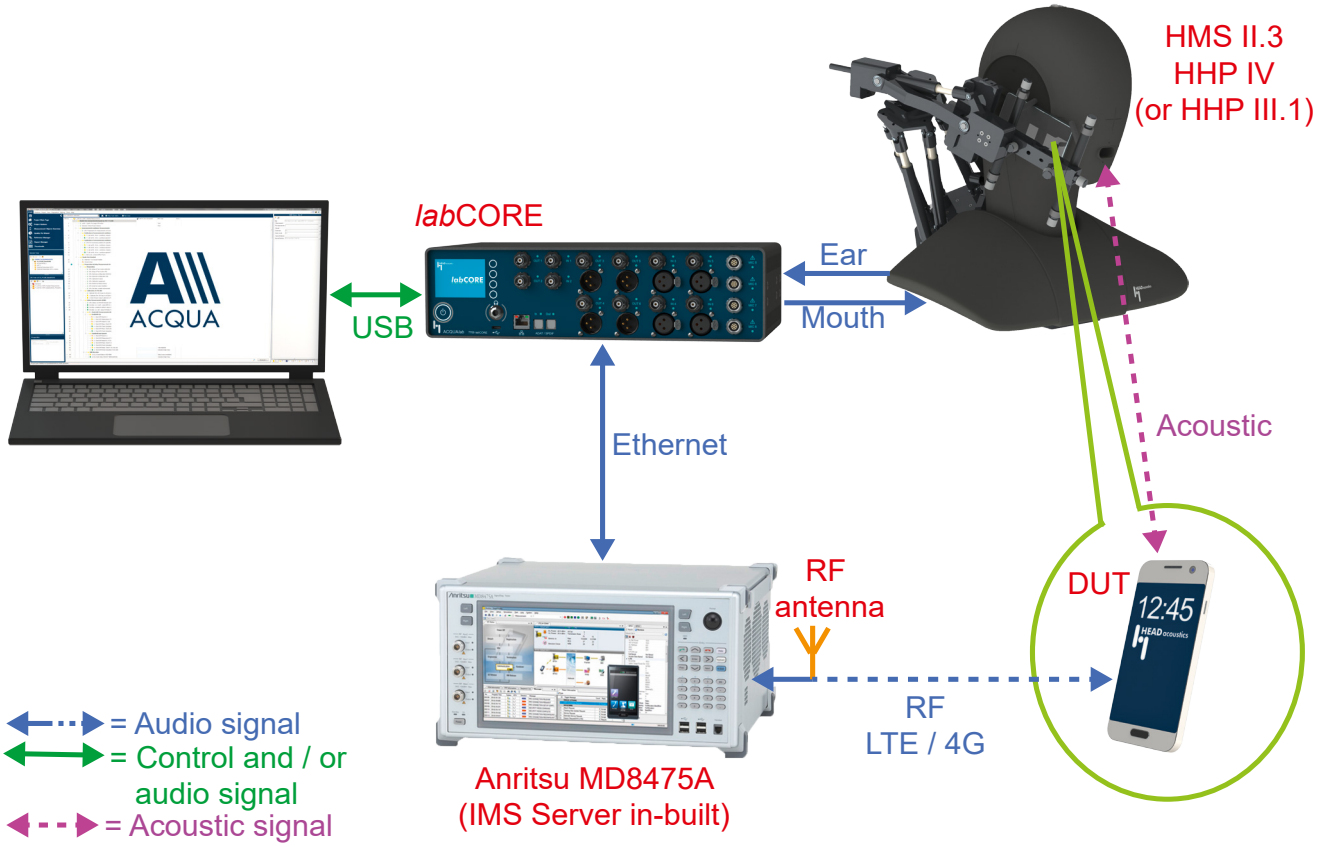
2.1.2 Anritsu equipment

- Anritsu MD8475A Signalling Tester
- Multi-signalling Unit
- SmartStudio©
- LTE FDD Option
- Extended CSCF Option
- LTE Simulation Software
- LTE FDD Option
- MX847550A 1 Year Support Service

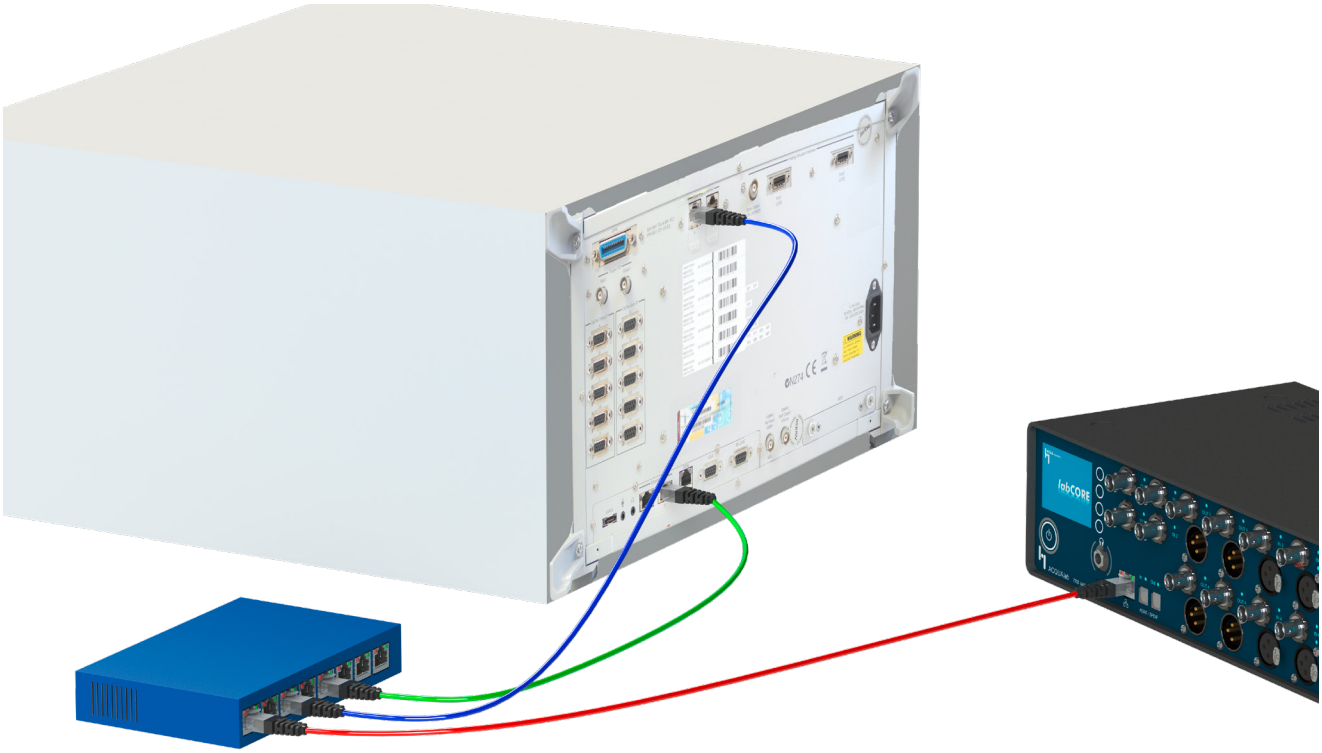
2.1.3 Third party equipment

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

2.2 Configuration overview (exemplary)



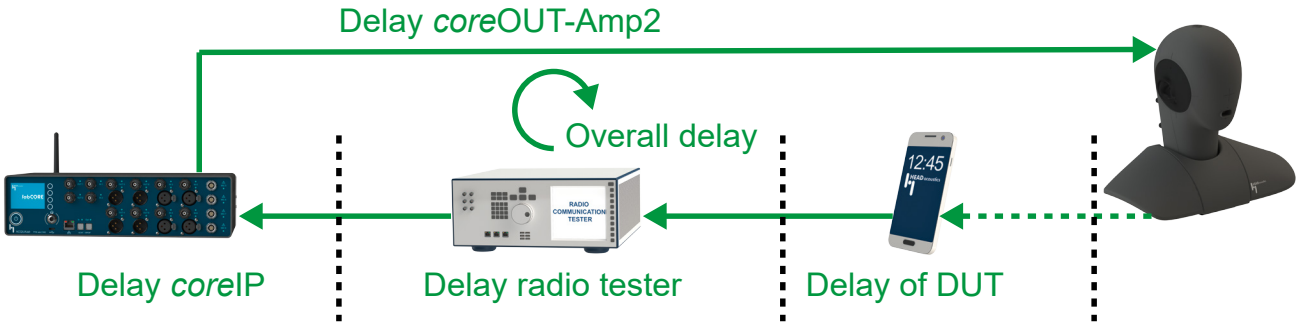
2.3 Cabling to Anritsu MD8475A



2.4 Delay calculation

Find all delays for *lab*CORE in the respective application note.

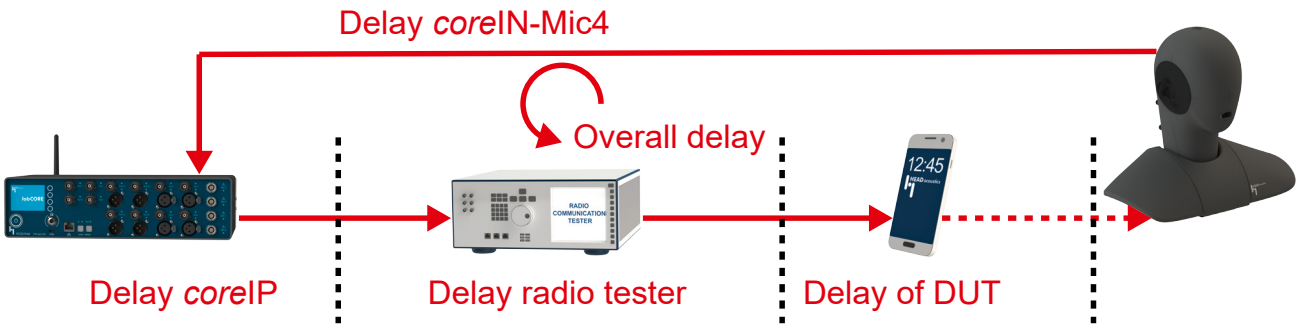
2.4.1 Sending direction



Delay key for ACQUA:

- D_SND_EQ_(...) = Overall delay in sending direction
- D_SND_DU_(...) =Delay of the DUT
- D_RAN_DA_(...) = Delay *core*OUT-Amp2
- D_SND_COREIP (...) = Delay *core*IP
- D_SND_NET_(...) = Delay of the radio tester
- D_SR_REA = D_RAN_AD + D_RAN_DA

2.4.2 Receiving direction



Delay key for ACQUA:

- D_RCV_EQ_(...) = Overall delay in receiving direction
- D_RCV_DU_(...) =Delay of the DUT
- D_RAN_AD_(...) = Delay *core*IN-Mic4
- D_RCV_COREIP_(...) = Delay *core*IP
- D_RCV_NET_(...) = Delay of the radio tester
- D_SR_REA = D_RAN_AD + D_RAN_DA

2.5 LTE connection establishment

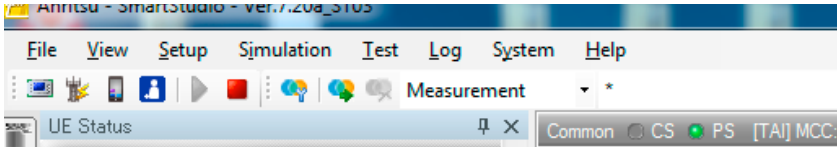
2.5.1 Preparations

- Interconnect the hardware according to section 2.2 & section 2.3.
- Boot up Anritsu MD8475A.
- Open SmartStudio© on Anritsu MD8475A.
- Boot up PC and start ACQUA.
- Boot up *lab*CORE.
- Insert test SIM card into DUT and boot up DUT.

2.5.2 Connection procedure

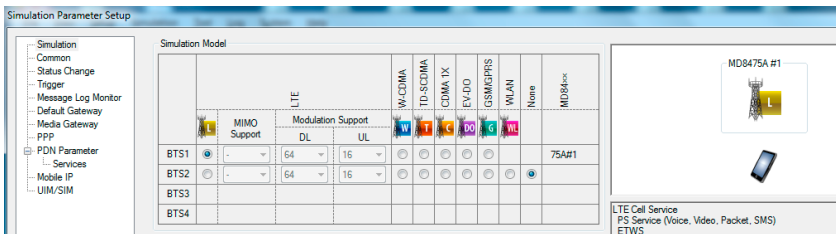
Anritsu MD8475A: Simulation parameter setup

1. Open SmartStudio© on Anritsu MD8475A.
2. Select to open simulation parameter setup.

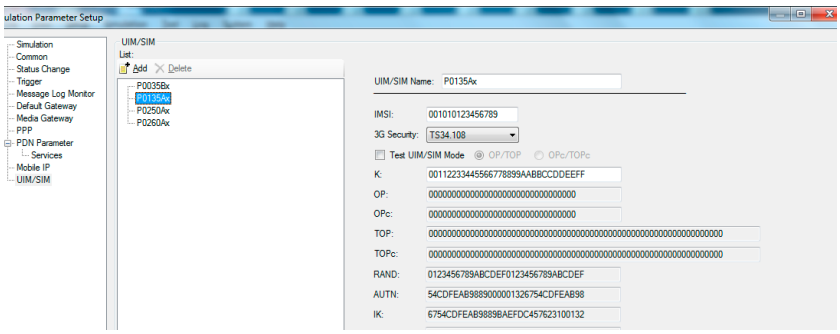


3. If available, load existing simulation parameter setup by selecting .

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

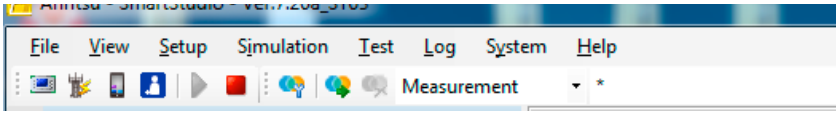


7. Check if the UIM/SIM settings apply to the SIM card of the DUT.
8. If desired, save the simulation parameter setup by selecting Save....
9. Confirm simulation parameter setup with by selecting OK.



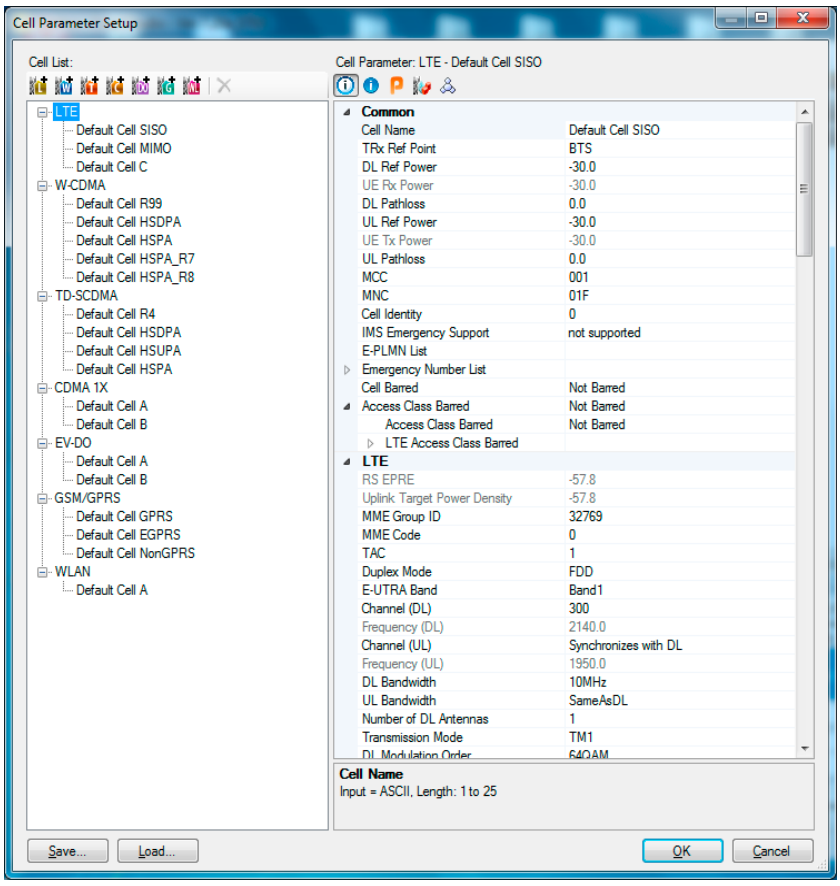
Anritsu MD8475A: Cell parameter setup

1. Select to open cell parameter setup.



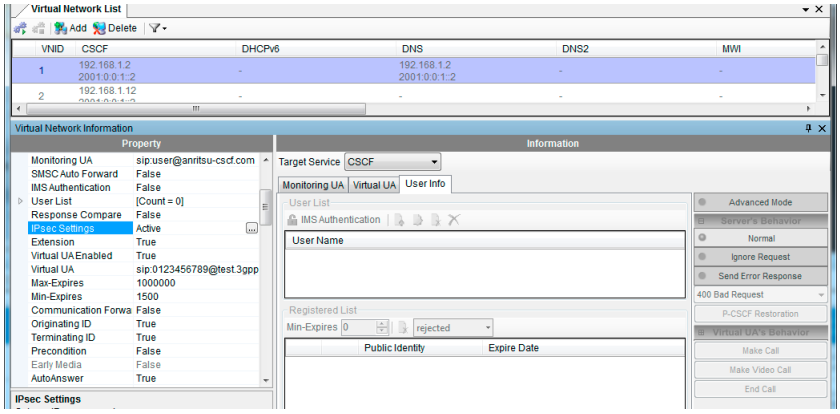
2. If available, load existing cell parameter setup by selecting Load....

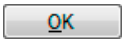
3. Select LTE from the “Cell list”.
4. Unfold “Common” in “Cell parameter”.
5. Set the external attenuation (DL Ref Power and UL Ref Power). It shall match the attenuation of the RF antenna and the antenna cable.
6. Set the operating band (“E-UTRA Band”) according to the DUT.
7. Set the network identity 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.

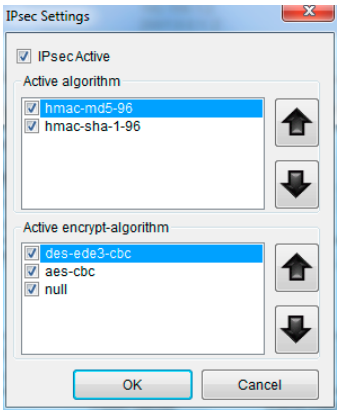


Anritsu MD8475A: IPsec and authentication settings

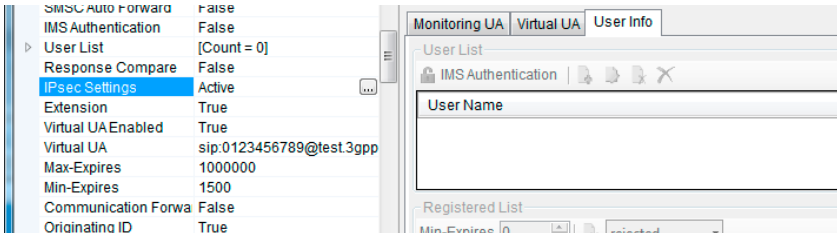
1. Select from the windows task bar to open IMS services.
2. Highlight “IPsec settings” from the “Property” list.
3. Select to edit IPsec settings.



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  to confirm “IPsec settings”.

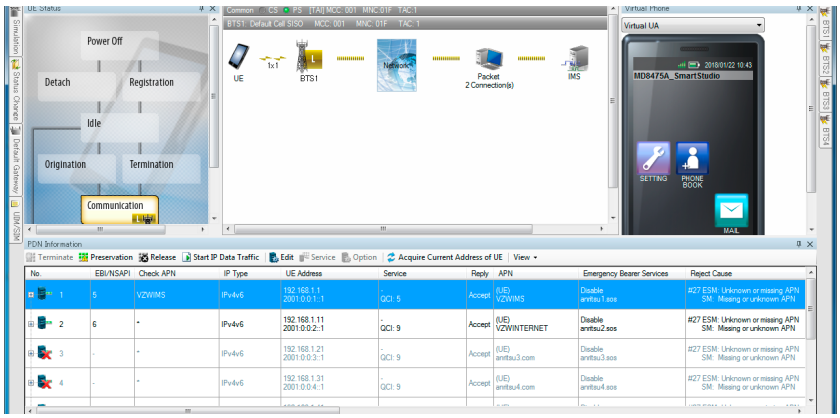


6. Set “IMS authentication” to either “True” or “False”, according to the DUT.

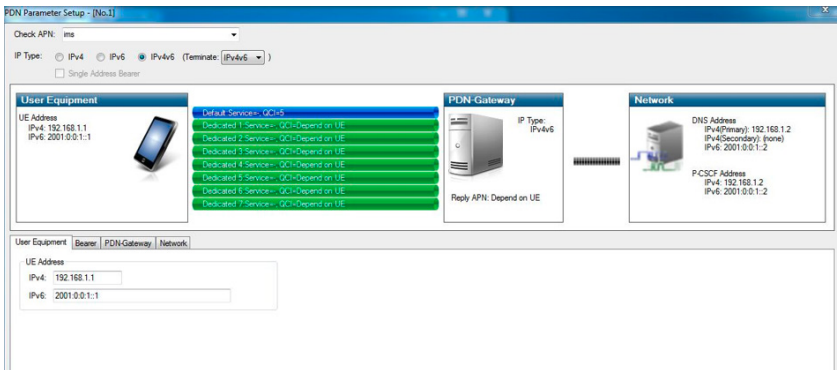


Anritsu MD8475A: PDN parameter setup

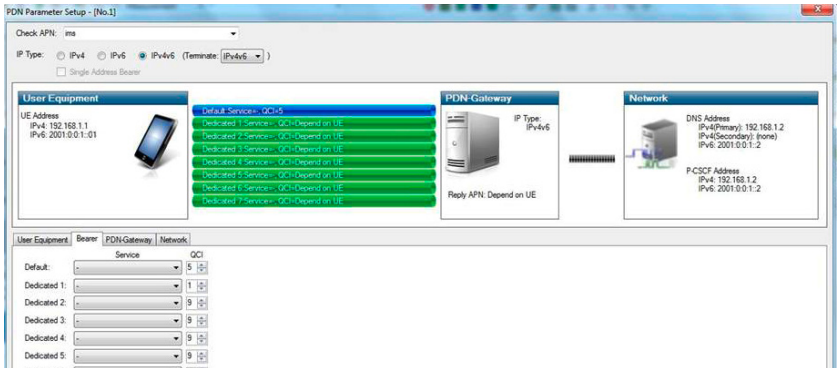
1. Select from the windows task bar to switch back to SmartStudio© main screen.
2. Select the “Packet” icon to display the PDN information window.
3. Double-click on the row of DUT that is connected via LTE connection to the radio tester. The “PDN Parameter Setup” of the DUT pops up.



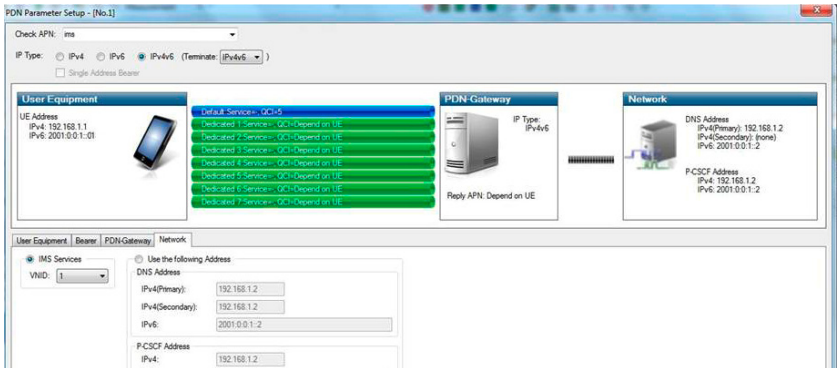
4. Confirm the APN name at “Check APN”. Change it if necessary.
5. Confirm the IP type. Change if necessary.
6. Select the tab “User equipment”. Check and confirm the IPv6 address of the DUT.



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

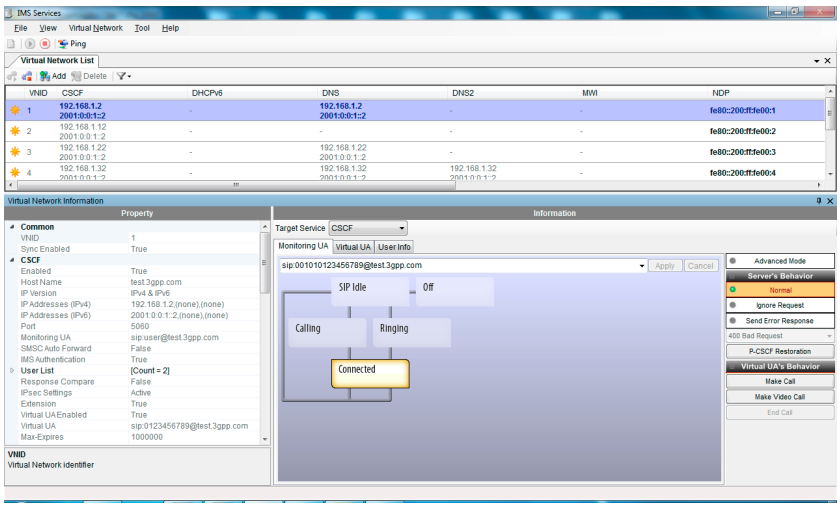


9. Select the tab “Network”
10. The default settings apply.
11. Select OK to confirm and finish“PDN Parameter Setup”.
12. Select to start the simulation.

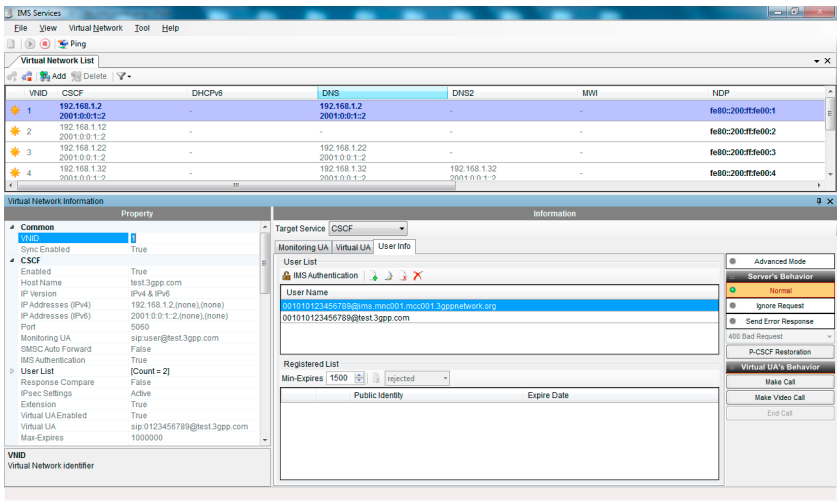


Anritsu MD8475A: IMS server

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

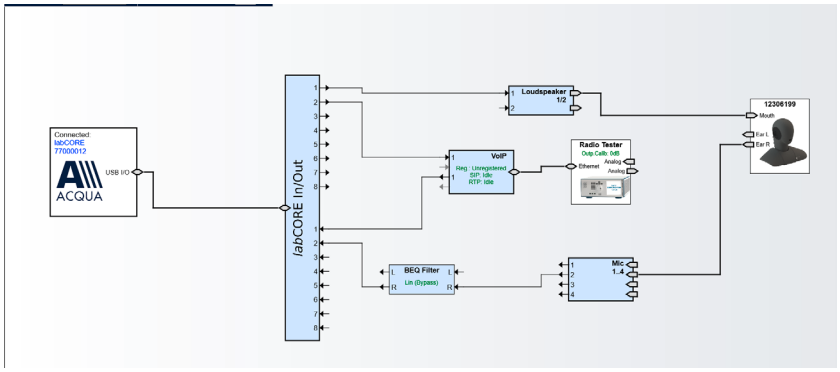


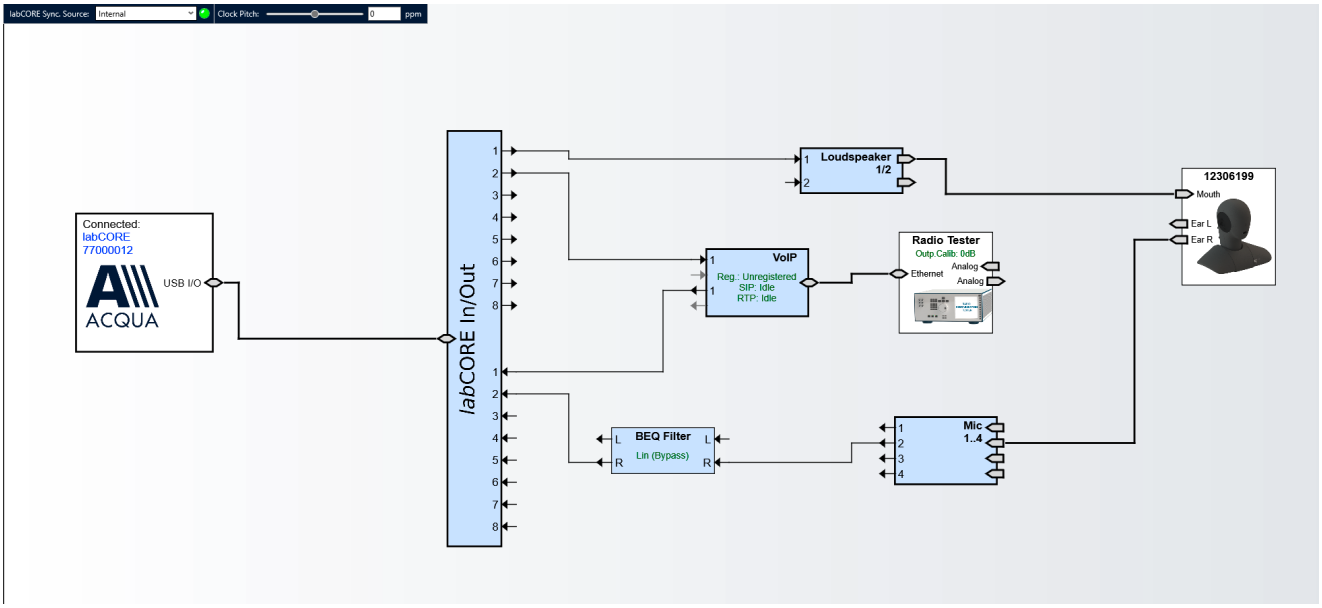
3. Select the “User Info” tab.
4. Select IMS Authentication to unlock IMS authentication.



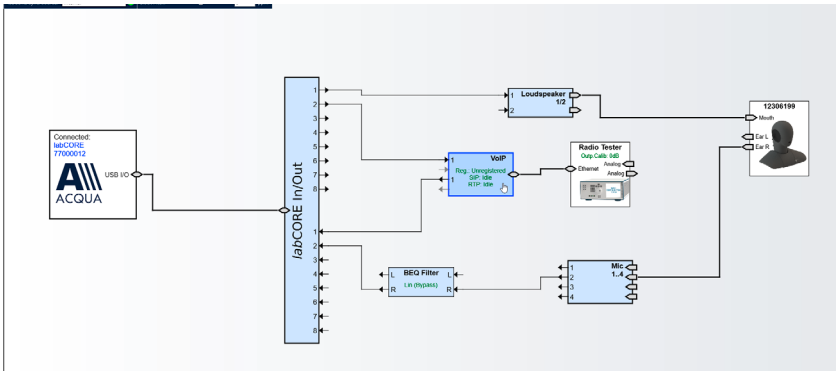
ACQUA PC: Hardware configuration & radio tester wizard

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

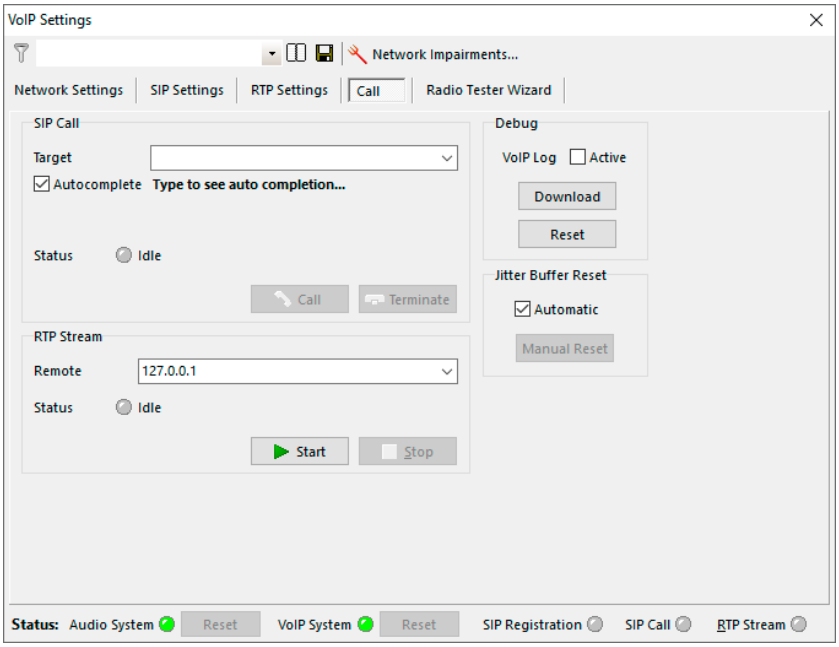




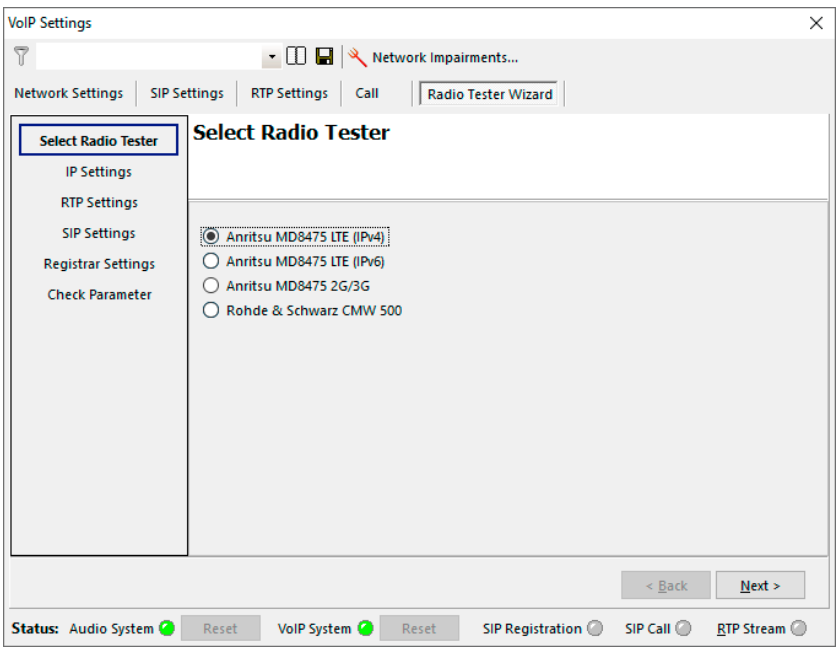
3. Select the block “VoIP”.



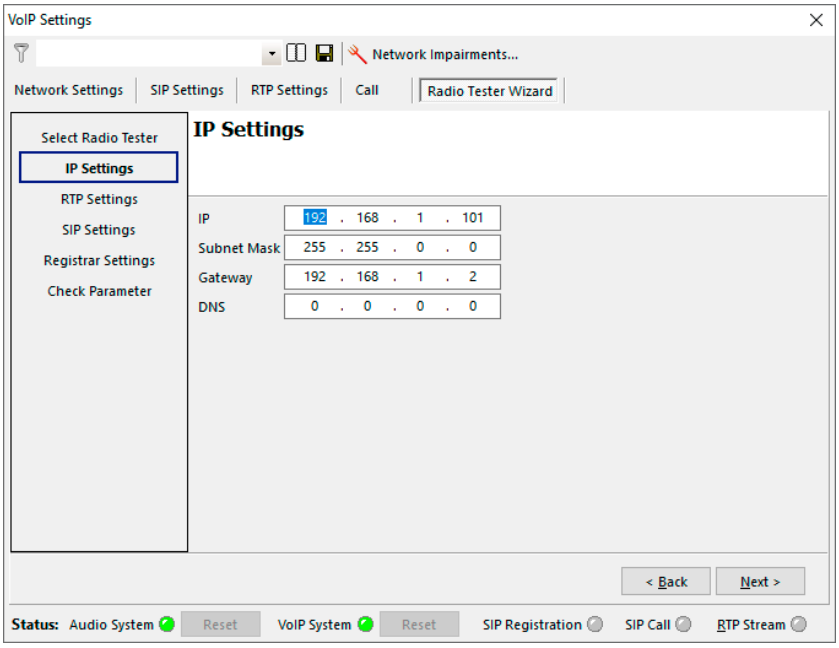
4. Select the tab “Call”.
5. Enable the automatic jitter buffer reset function by checking the box.
6. Select the tab “Radio tester wizard”.



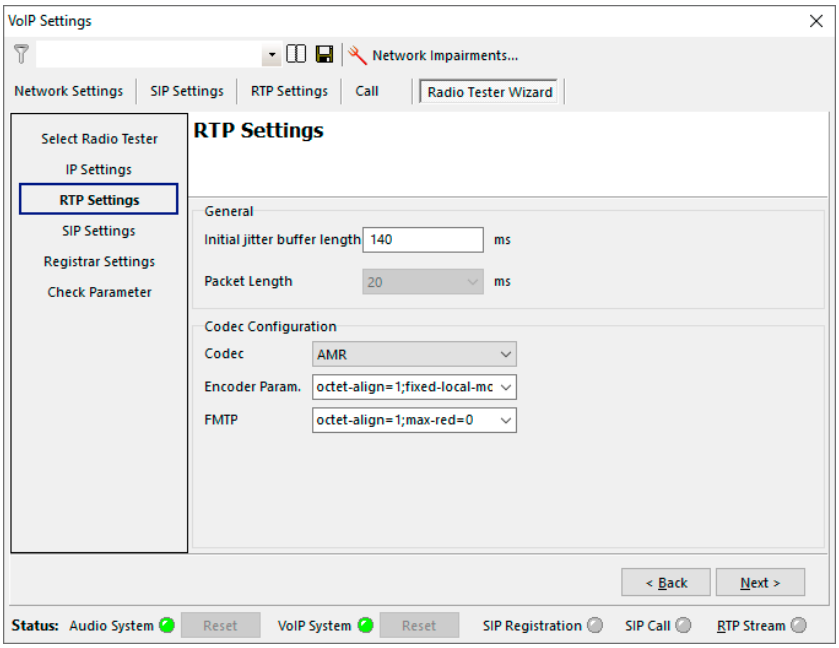
7. Select the Anritsu MD8475A. The Internet protocol (IPv4, IPv6) depends on the DUT.



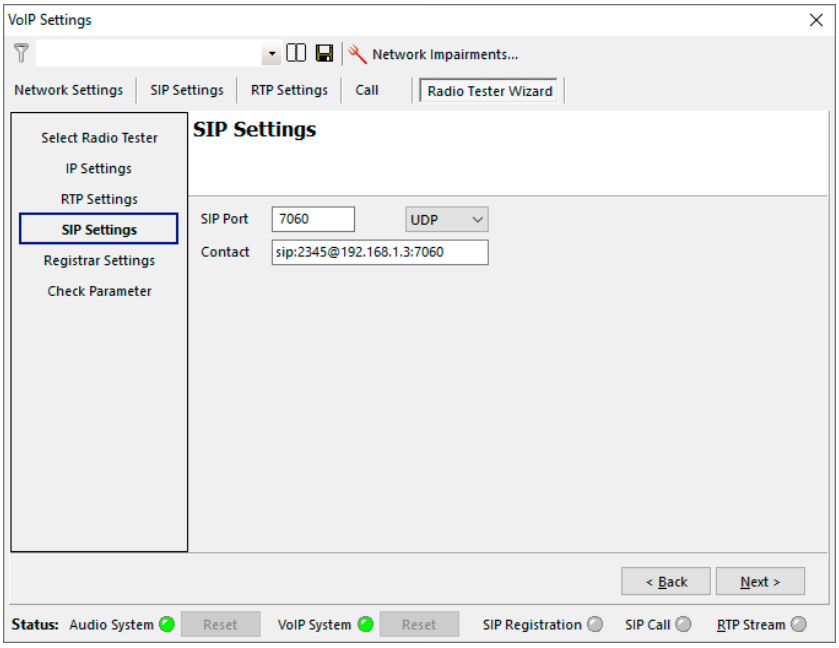
8. Select “IP Settings”.
9. Enter / verify the IP settings.



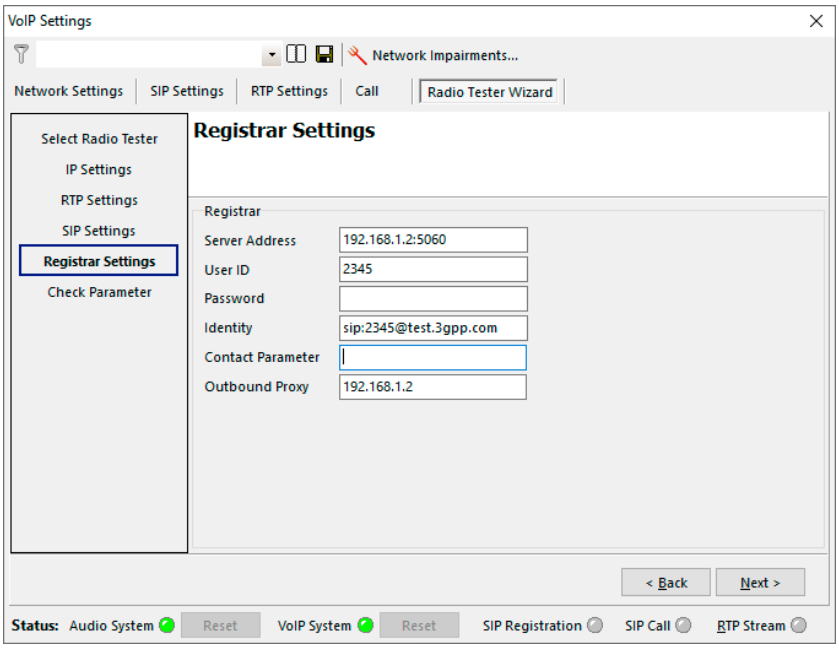
10. Select “RTP Settings”.
11. Select the desired voice codec.



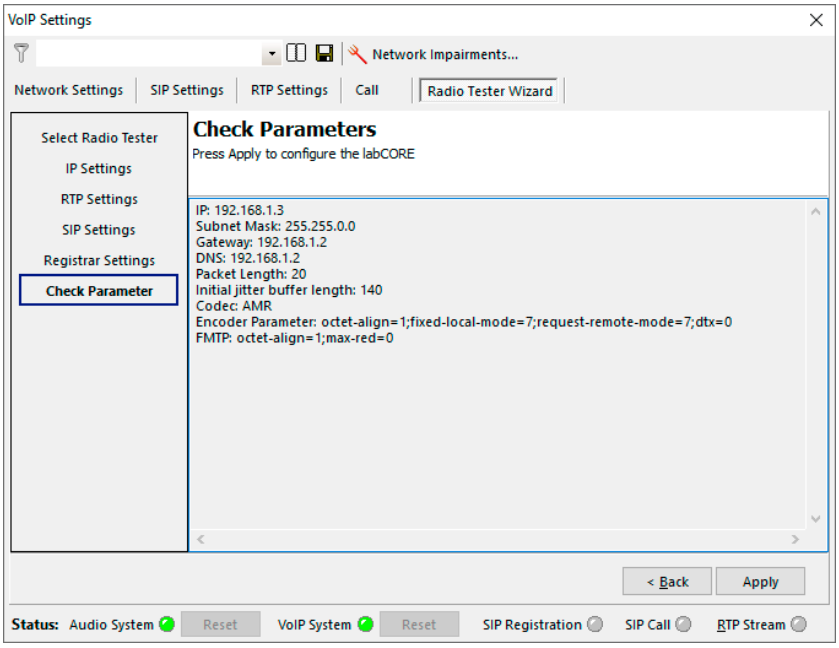
12. Select “SIP Settings”.
13. Enter / verify the SIP settings.



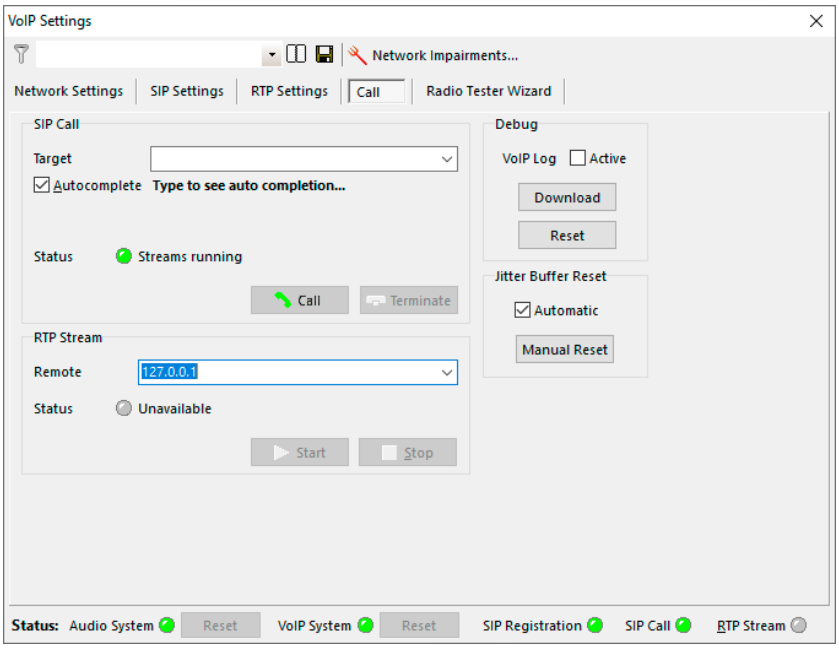
14. Select “Registrar Settings”.
15. Enter / verify the Registrar settings.



16. Select “Check parameters”. Check if all parameter are correct.
17. Select “Apply” to register the *lab*CORE at Anritsu MD8475A.

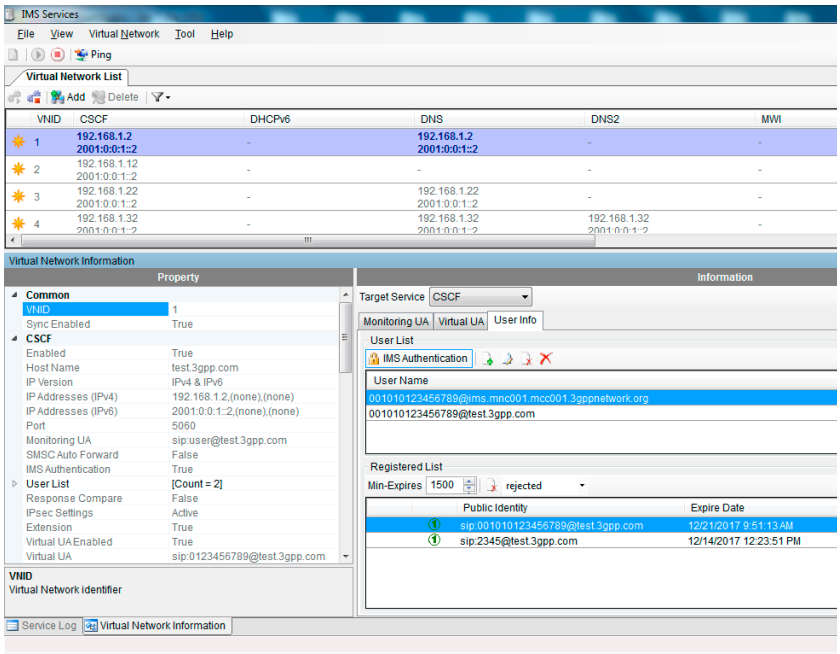


18. A green LED at the bottom confirms the successful registration.
19. The SIP address of *lab*CORE appears in the “Registered List” on Anritsu MD8475A.



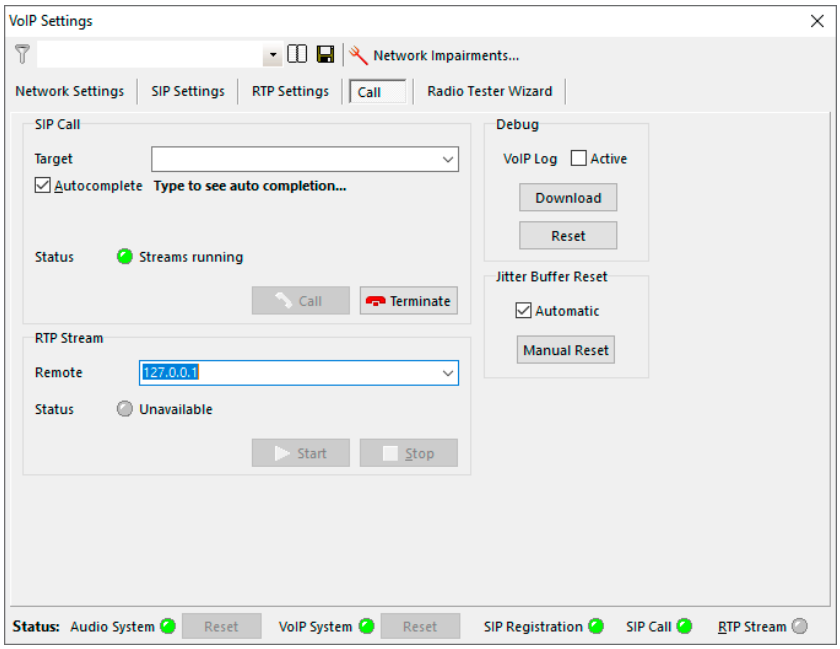
Anritsu MD8475A: IMS server

1. Set DUT back online and force it to register on IMS server.
2. The SIP address of the DUT appears in the “Registered List” on Anritsu MD8475A.
3. If IPsec is active at Anritsu MD8475A: Select IMS Authentication to lock IMS authentication.
   Do not lock IMS authentication if IPsec is inactive at Anritsu MD8475A 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 PC: Call execution

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



3 2G / 3G configuration

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
  - *core*IP-AMR (Code 7772), AMR extension (required for 3G, optional for 2G)
- ACQUA (Code 6810), Advanced Communication Analysis software
- HMS II.3 (Code 1230), 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 DUT and application case
  - *core*IP-IMP (Code 7771), VoIP impairment extension
  - *core*IP-OPUS (Code 7774), OPUS extension
  - *core*BEQ (Code 7741), Binaural equalization
- HHP IV (Code 1406), Motorizes handset positioner or
  HHP III.1 (Code 1403), Handset positioner

3.1.2 Anritsu equipment

GSM

- Anritsu MD8475A Signalling Tester
- SmartStudio©
- GSM Option
- GSM/GPRS Simulation Software
- GSM Signalling Unit
- MX847520A 1 Year Support Service

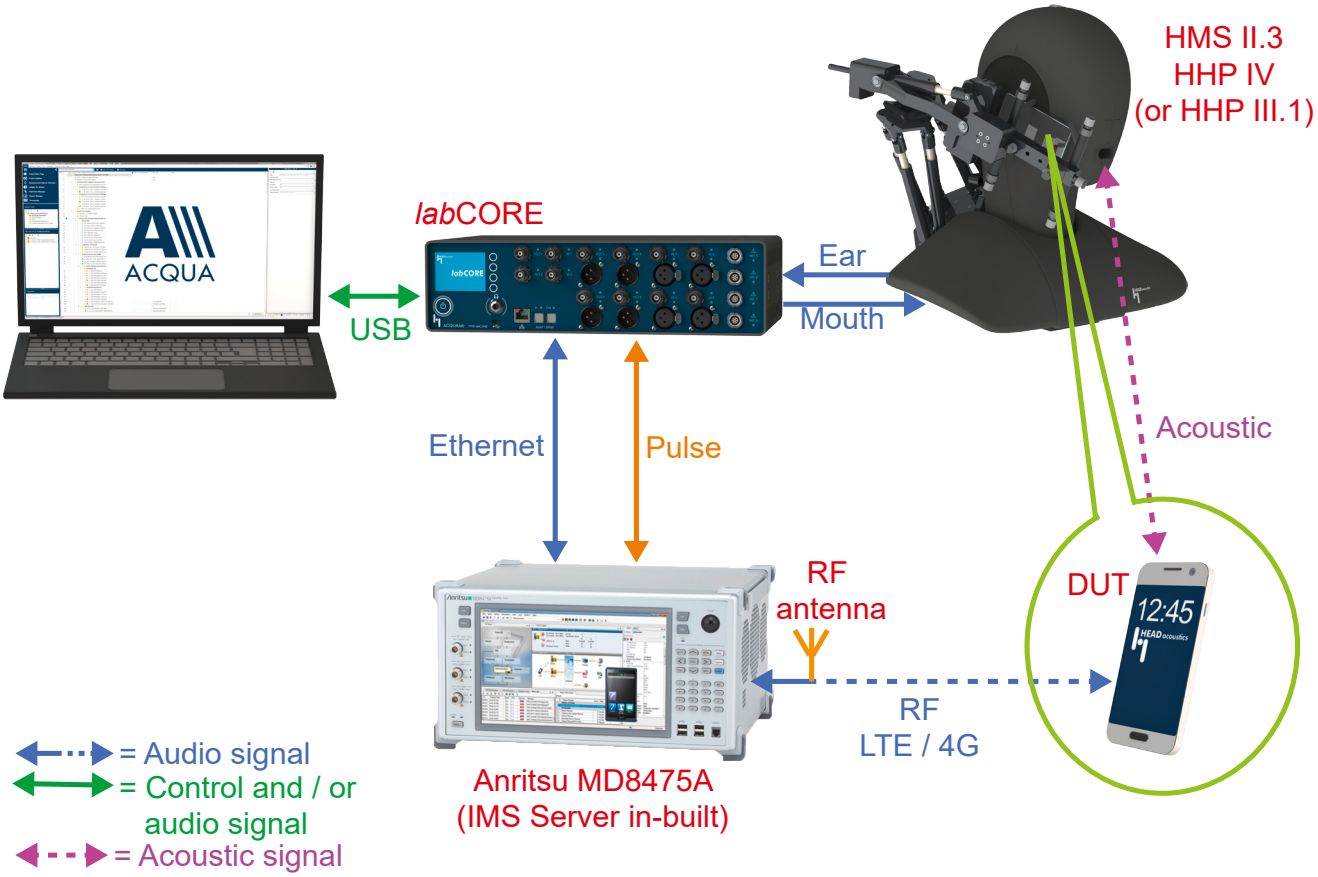
W-CDMA

- Anritsu MD8475A Signalling Tester
- SmartStudio©
- W-CDMA Option
- Multi-signalling Unit
- W-CDMA Simulation Software
- MX847510A 1 Year Support Service

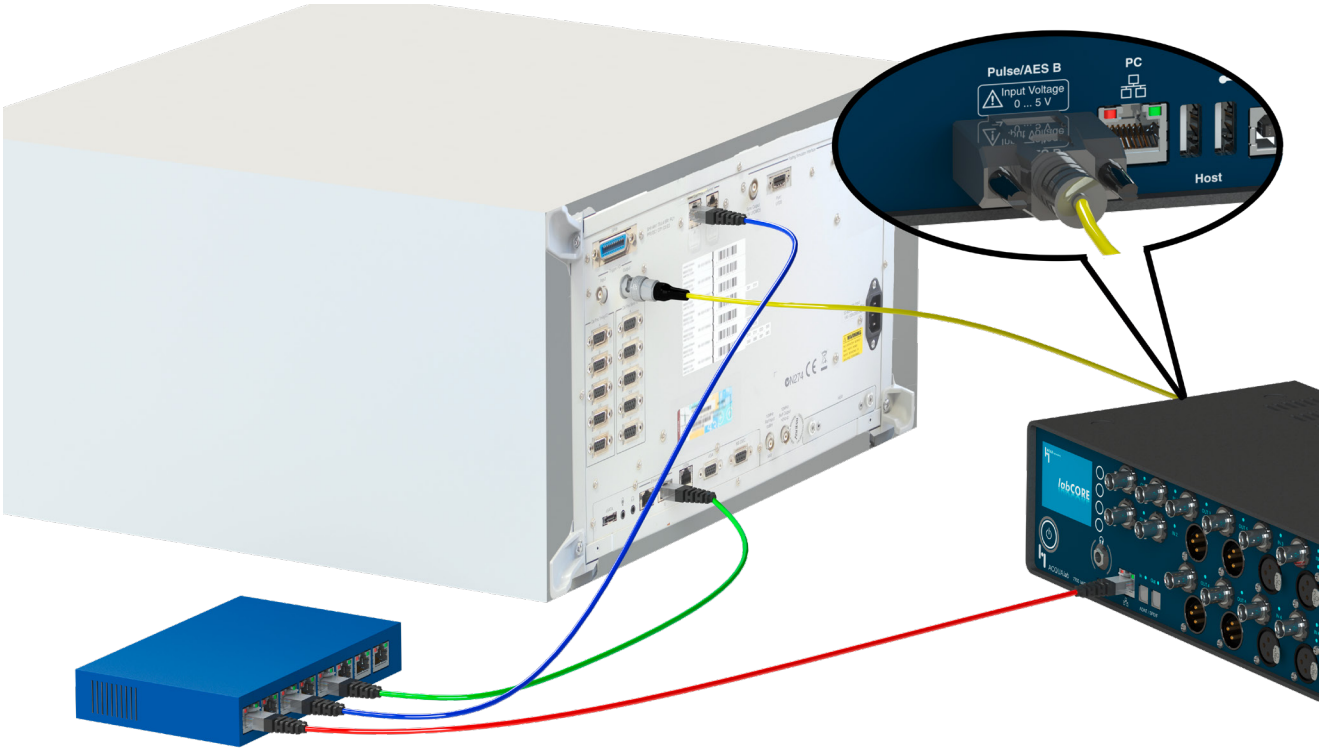
3.1.3 Third party equipment

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

3.2 Configuration overview (exemplary)



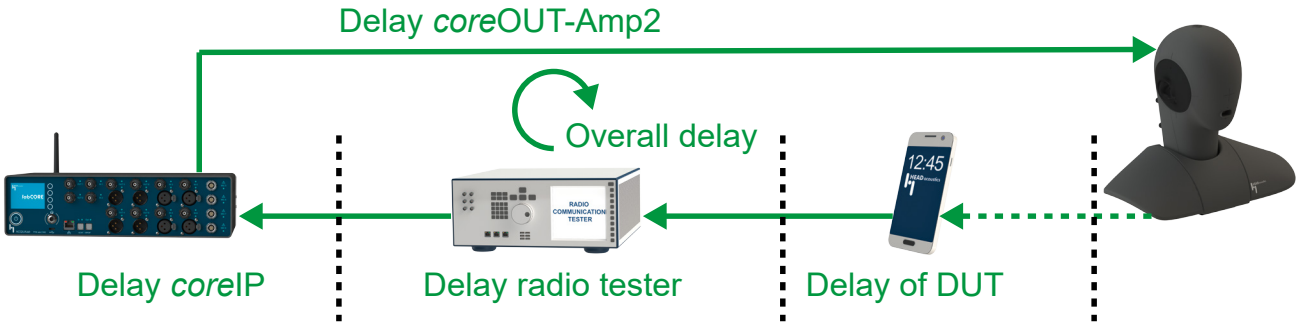
3.3 Cabling to Anritsu MD8475A



3.4 Delay calculation

Find all delays for *lab*CORE in the respective application note.

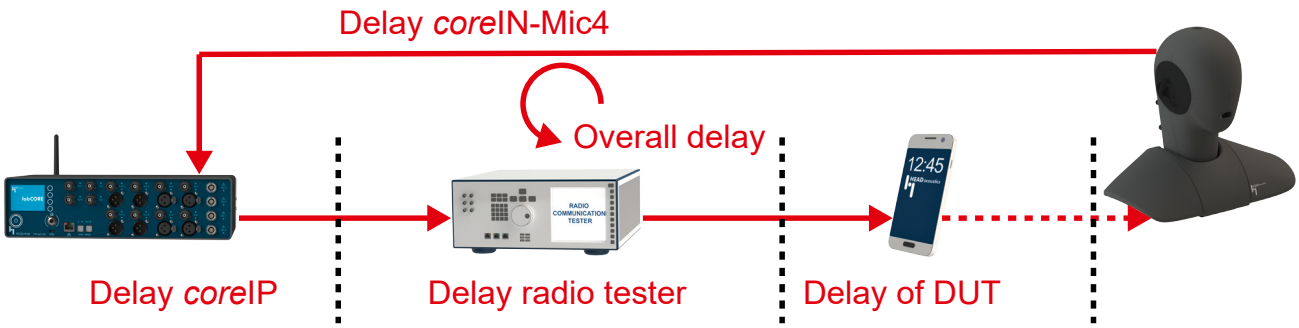
3.4.1 Sending direction



Delay key for ACQUA:

- D_SND_EQ_(...) = Overall delay in sending direction
- D_SND_DU_(...) =Delay of the DUT
- D_RAN_DA_(...) = Delay *core*OUT-Amp2
- D_SND_COREIP (...) = Delay *core*IP
- D_SND_NET_(...) = Delay of the radio tester
- D_SR_REA = D_RAN_AD + D_RAN_DA

3.4.2 Receiving direction



Delay key for ACQUA:

- D_RCV_EQ_(...) = Overall delay in receiving direction
- D_RCV_DU_(...) =Delay of the DUT
- D_RAN_AD_(...) = Delay *core*IN-Mic4
- D_RCV_COREIP_(...) = Delay *core*IP
- D_RCV_NET_(...) = Delay of the radio tester
- D_SR_REA = D_RAN_AD + D_RAN_DA

3.5 2G connection establishment

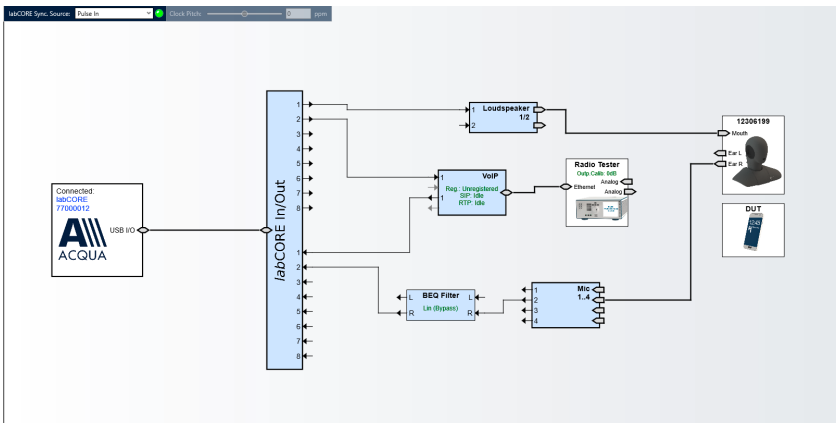
3.5.1 Preparation

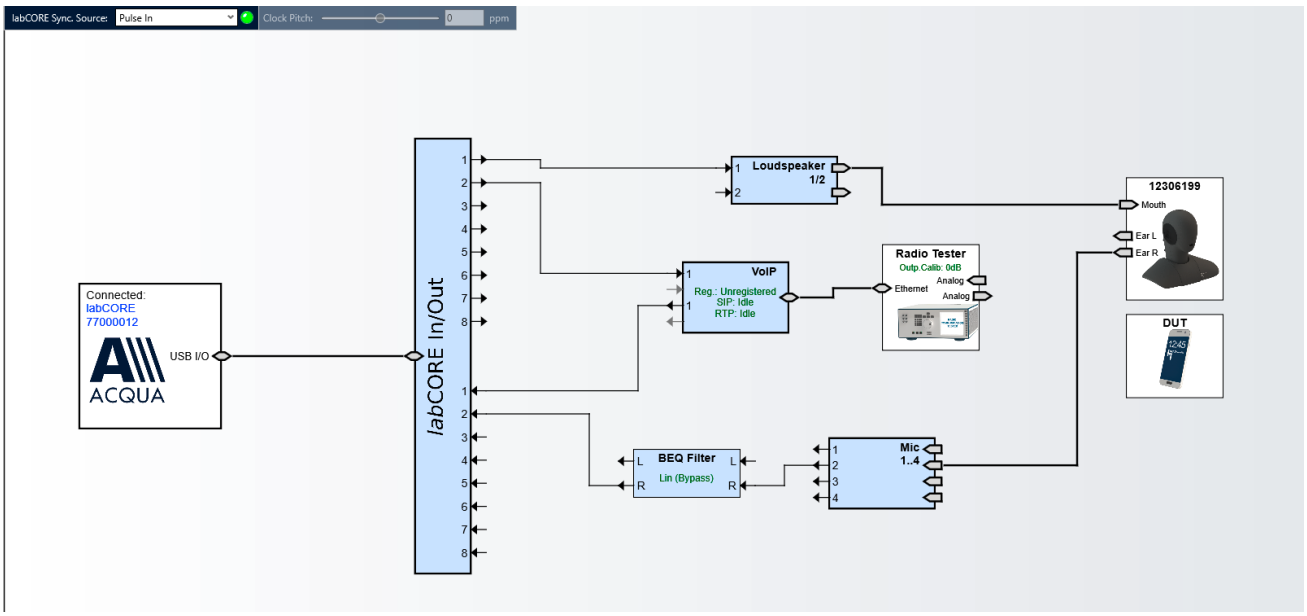
- Interconnect the hardware according section 3.2 & section 3.3.
- Boot up Anritsu MD8475A.
- Open SmartStudio© on Anritsu MD8475A.
- Boot up PC and start ACQUA.
- Boot up *lab*CORE.
- Insert test SIM card into DUT and boot up DUT.

3.5.2 Connection procedure

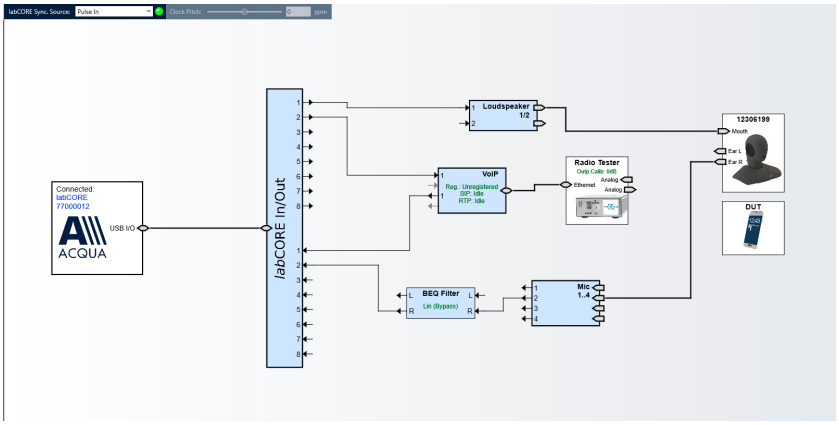
ACQUA PC: Hardware configuration

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

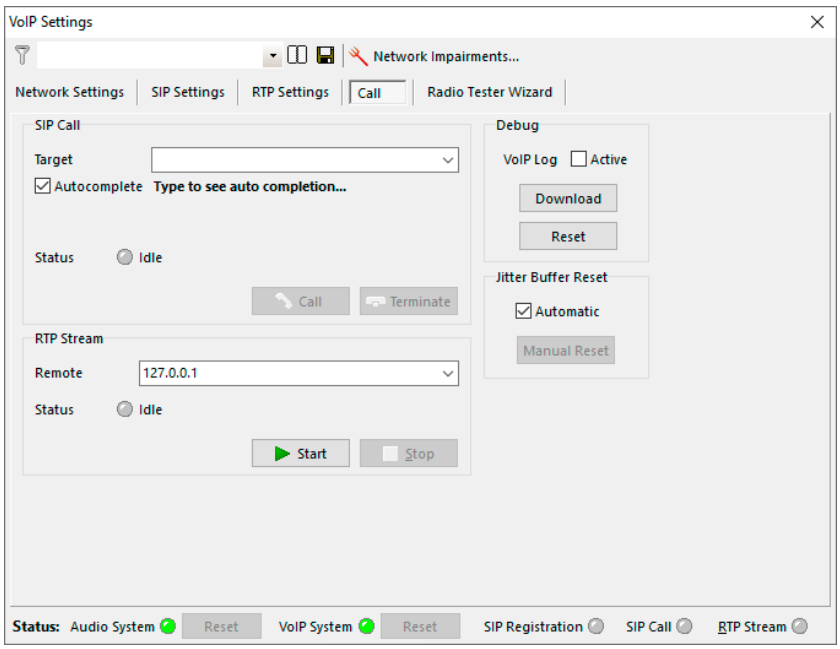




3. Select the block “VoIP”.

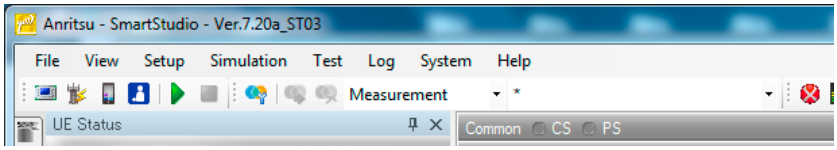


4. Select the tab “Call”.
5. Enable the automatic jitter buffer reset function by checking the box.

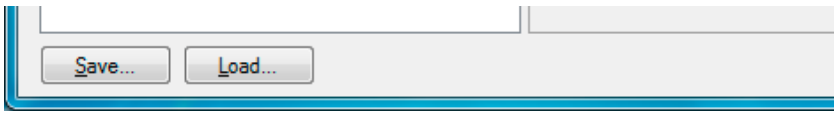


Anritsu MD8475A: Connection parameters

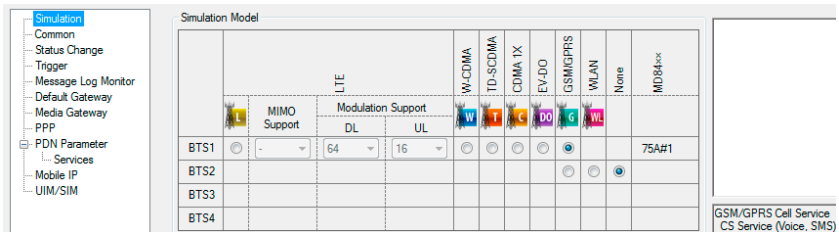
1. Open SmartStudio© on Anritsu MD8475A.
2. Select to open simulation parameter setup.



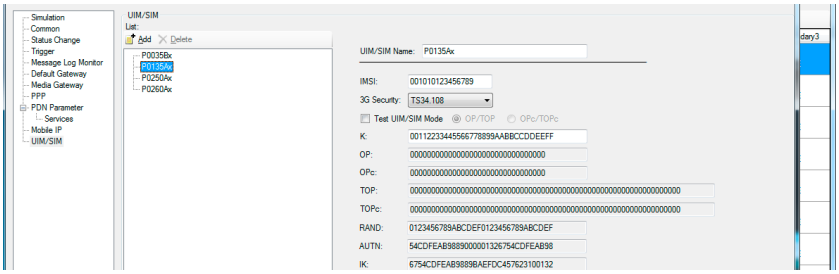
3. If available, load existing simulation parameter setup by selecting Load....



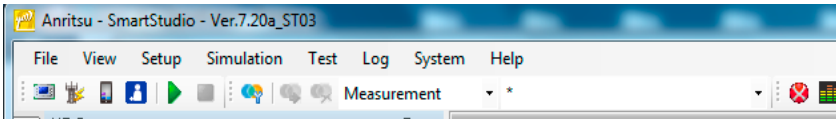
4. Select “Simulation”.
5. Set “Simulation Model” to GSM/GPRS.
6. Select “UIM/SIM”.



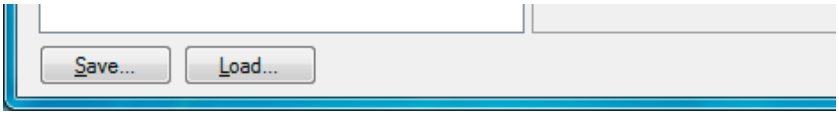
7. Check if the UIM/SIM settings apply to the SIM card of the DUT.
8. If desired, save the simulation parameter setup by selecting Save....
9. Confirm simulation parameter setup with by selecting OK.



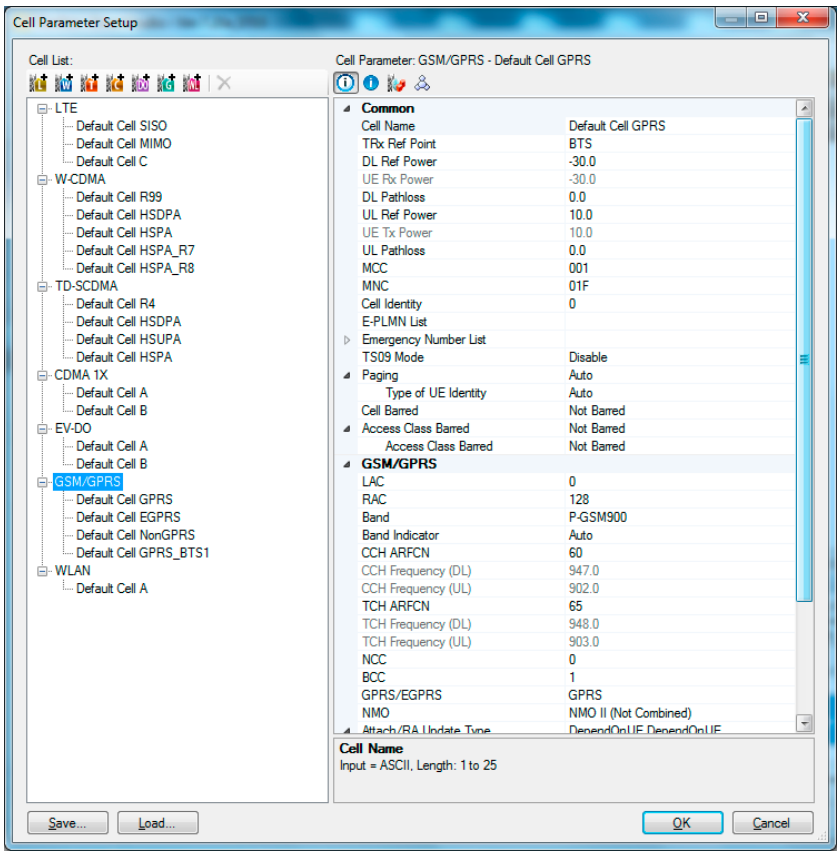
10. Select to open cell parameter setup.



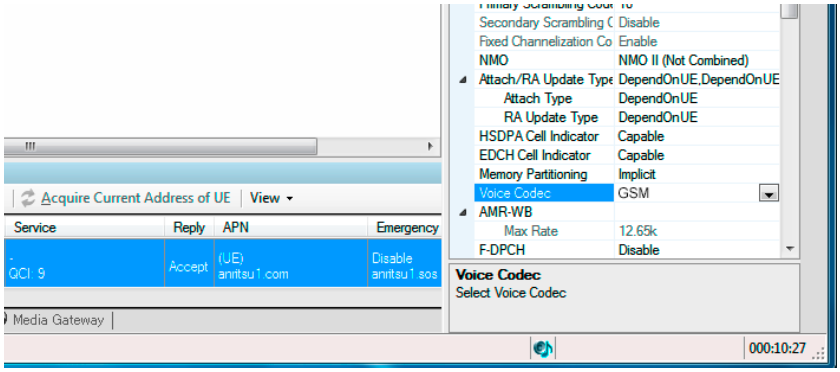
11. If available, load existing cell parameter setup by selecting Load....



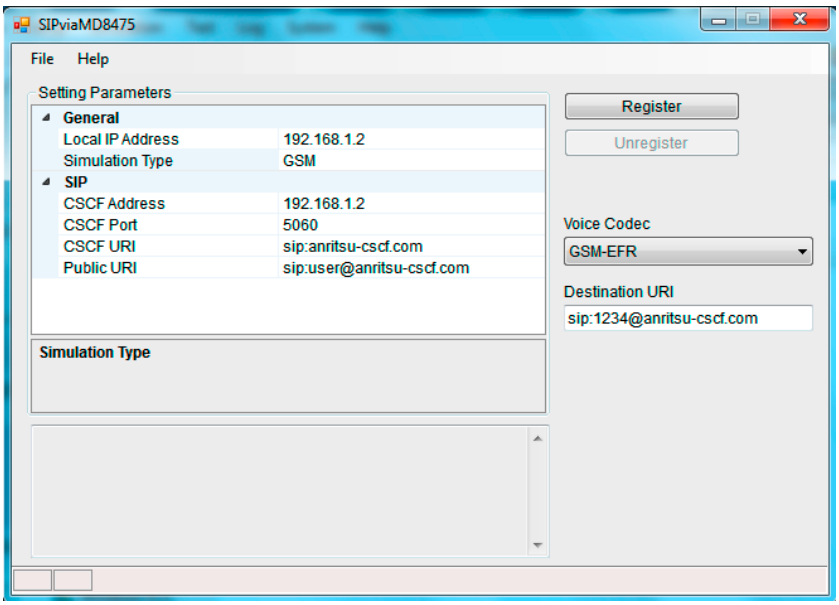
12. Select GSM/GPRS from the “Cell list”.
13. Unfold “Common” in “Cell parameter”.
14. Set the external attenuation (DL Ref Power and UL Ref Power). It shall match the attenuation of the RF antenna and the antenna cable.
15. Set the network identity MCC according to SIM card preferences.
16. Set the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



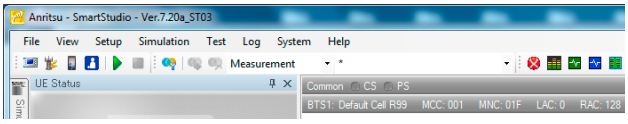
19. Select the desired GSM voice codec in SmartStudio©.



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

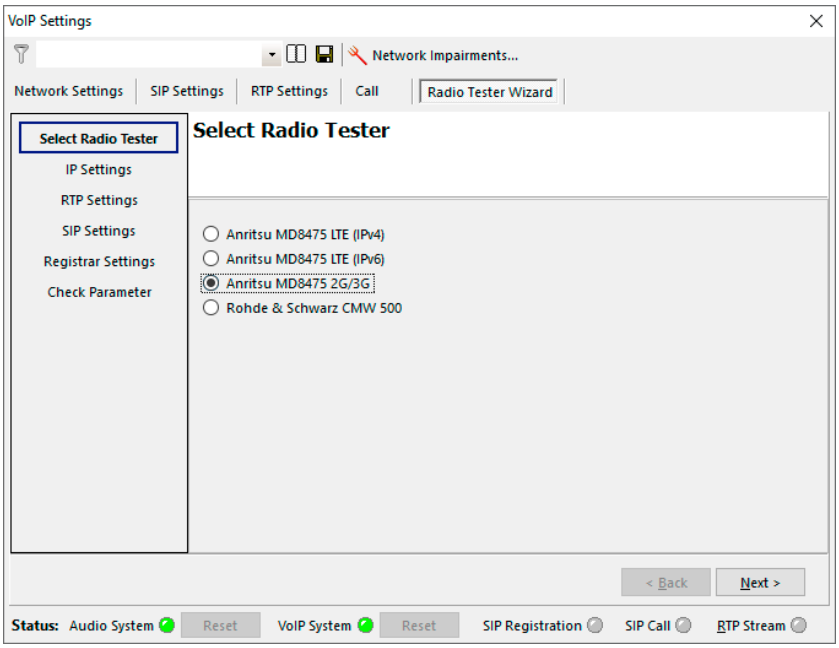


24. Select to start the simulation.

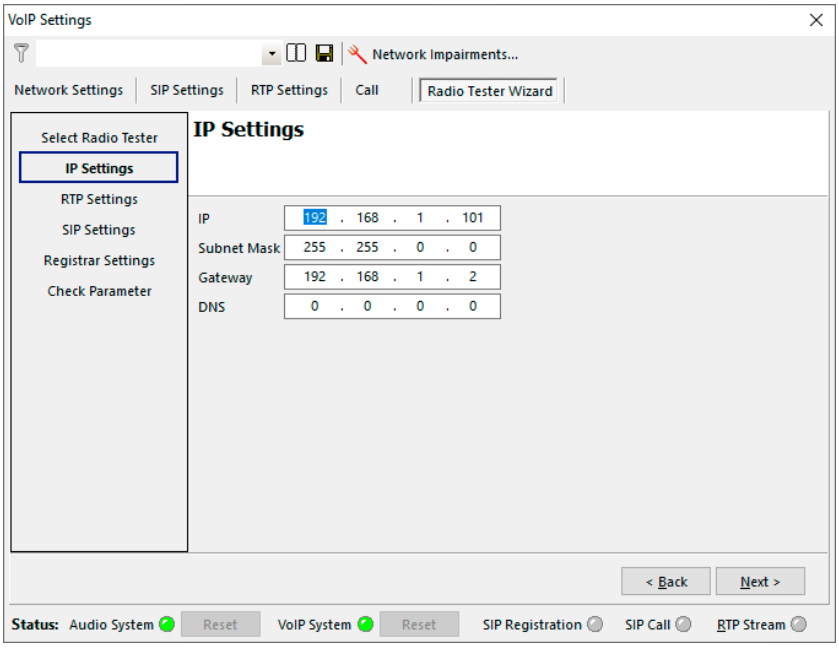


ACQUA PC: Radio tester wizard

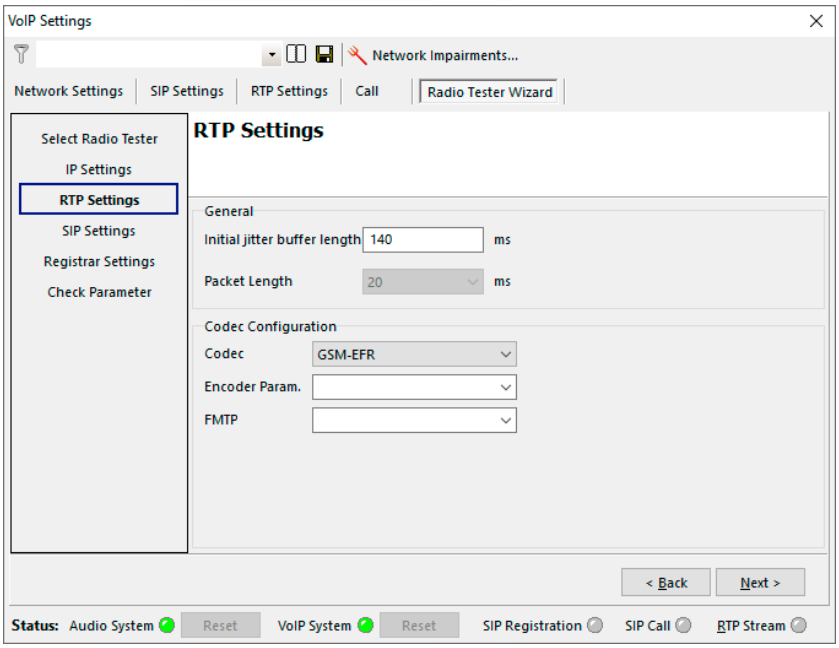
1. Select the tab “Radio tester wizard”.
2. Select “Anritsu MD8475 2G/3G”.



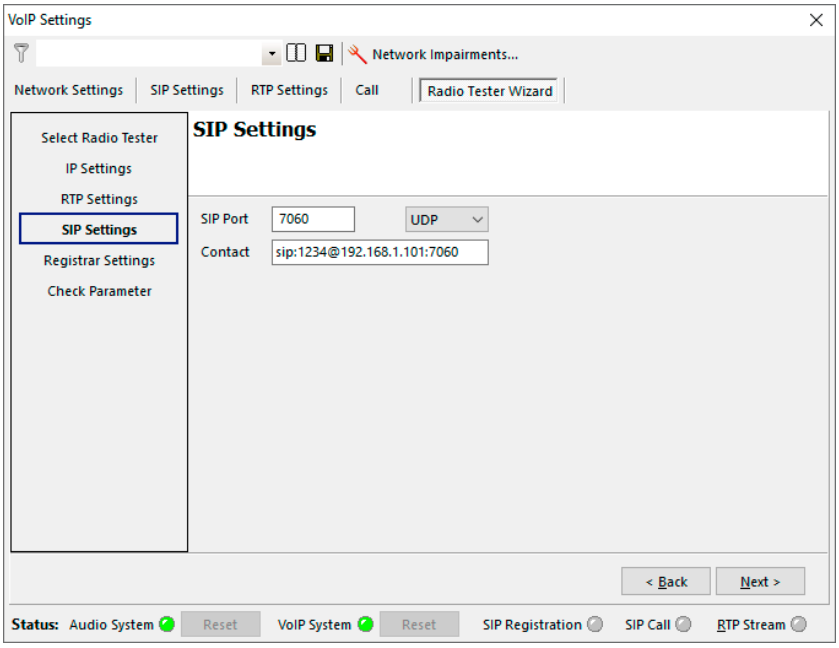
3. Select “IP Settings”.
4. Enter / verify the IP settings.



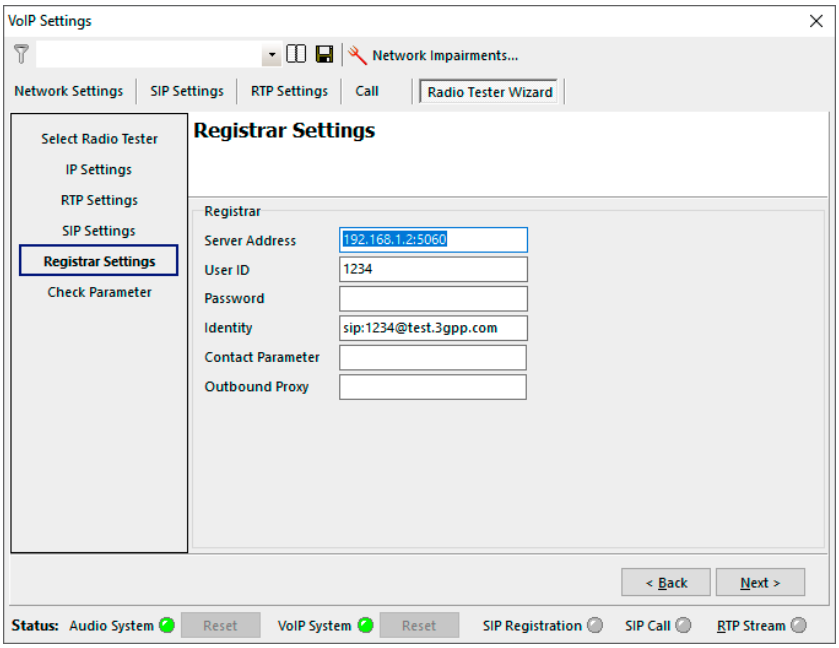
5. Select “RTP settings”.
6. Select a suitable initial buffer length. Default setting is 140 ms.
7. Select the voice codec in accordance with SIPviaMD8475.



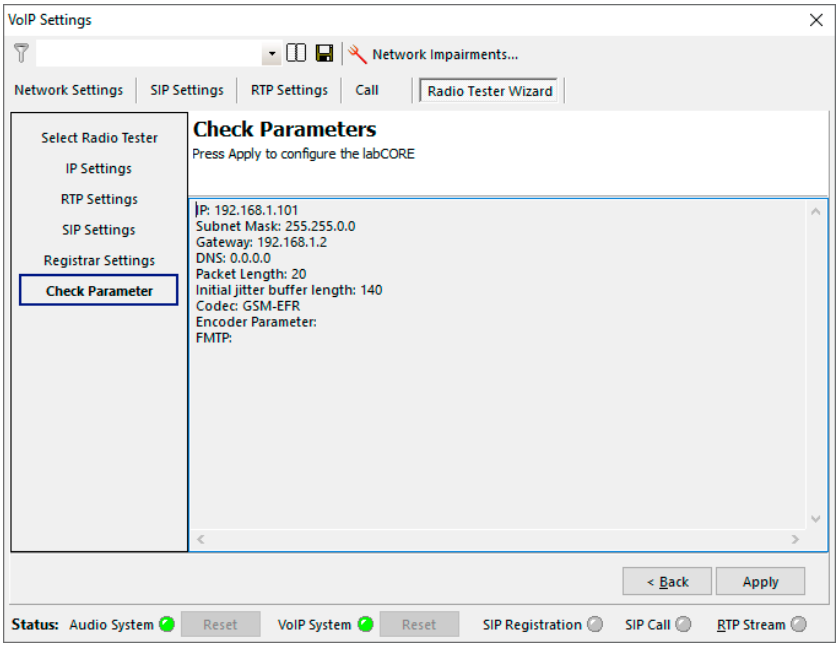
8. Select “SIP Settings”.
9. Enter / verify the SIP settings.



10. Select “Registrar Settings”.
11. Enter / verify the Registrar settings.

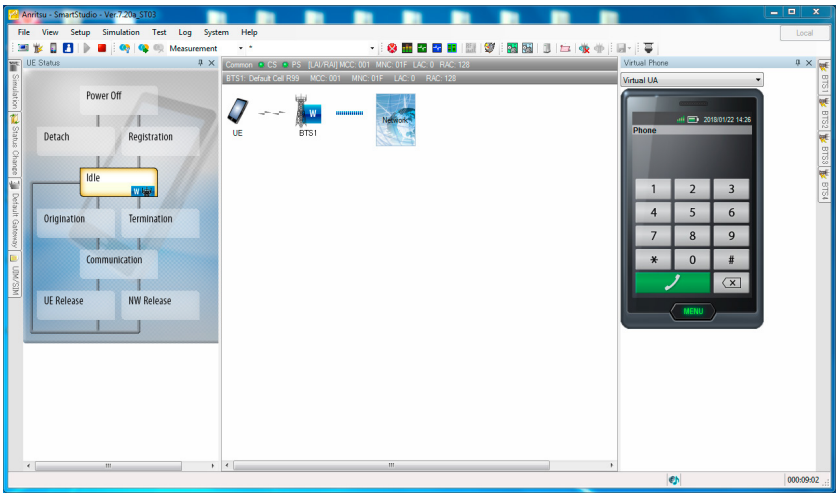


12. Select “Check Parameter”.
13. Double check all set parameters.
14. Select “Apply” to register the *lab*CORE at Anritsu MD8475A.



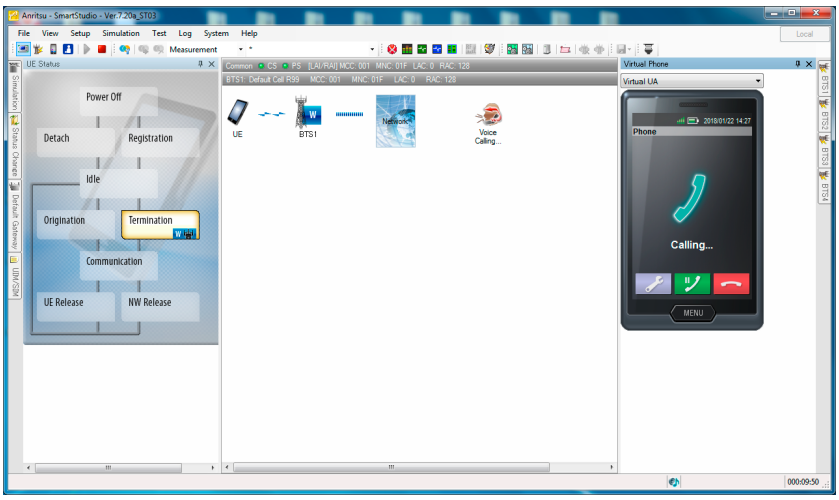
Anritsu MD8475A: Call execution

1. Go to SmartStudio© main screen. The status of the DUT (“UE stauts”) 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 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”.



3.6 3G connection establishment

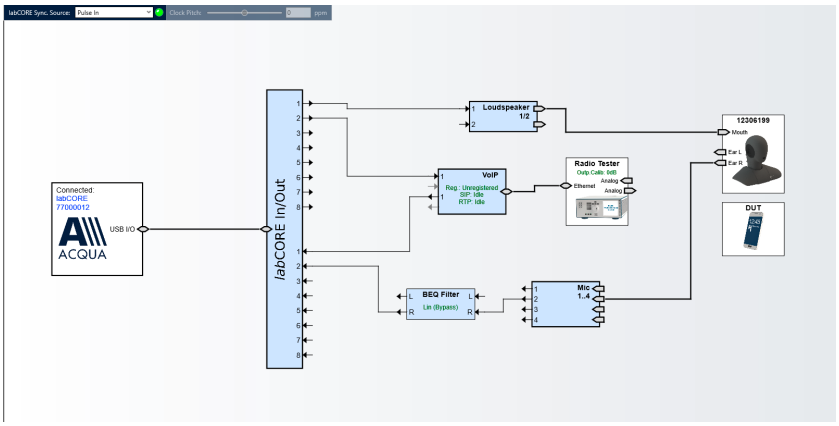
3.6.1 Preparation

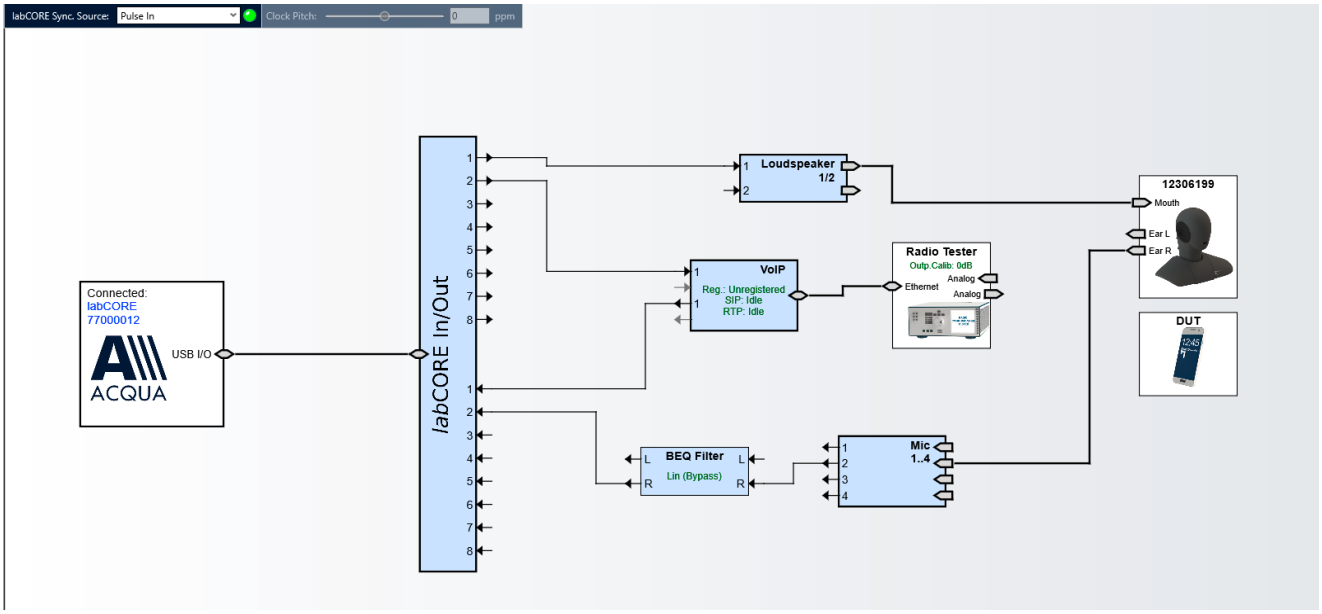
- Interconnect the hardware according to section 3.2 & section 3.3.
- Boot up Anritsu MD8475A.
- Open SmartStudio© on Anritsu MD8475A.
- Boot up PC and start ACQUA.
- Boot up HEAD acoustics front end(s).
- Insert SIM card into DUT and boot up DUT.

3.6.2 Connection procedure

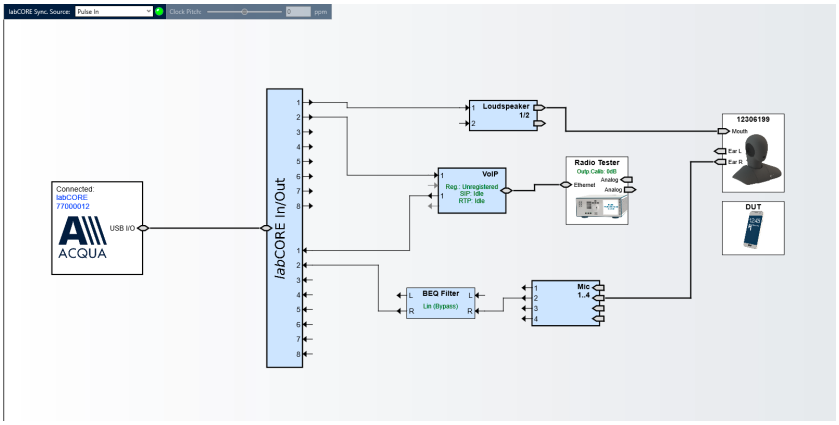
ACQUA PC: Hardware configuration

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

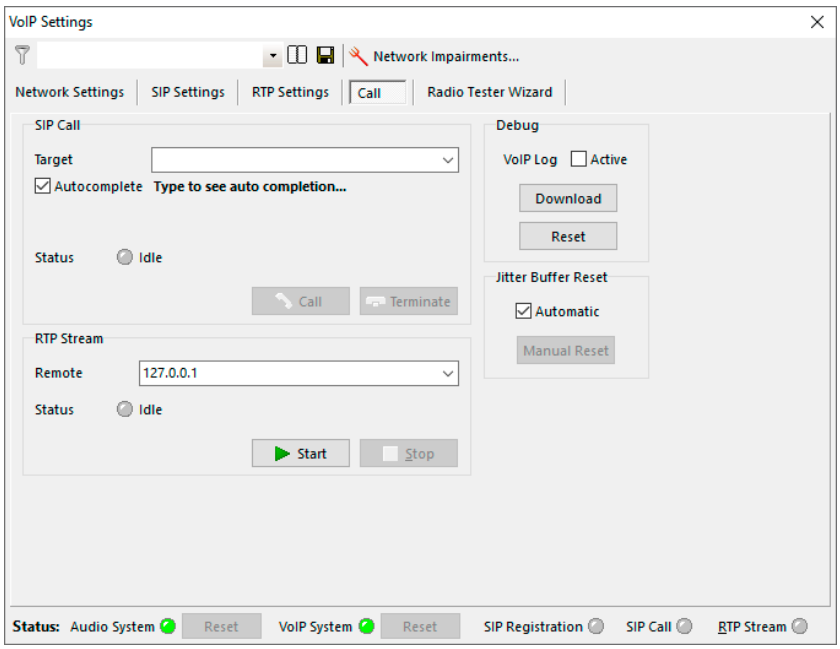




3. Select the block “VoIP”.

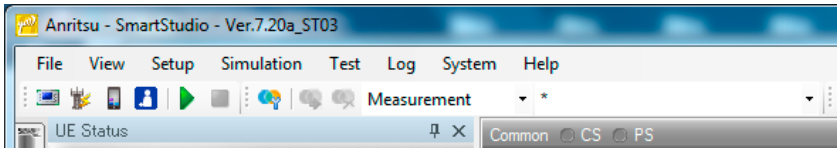


4. Select the tab “Call”.
5. Enable the automatic jitter buffer reset function by checking the box.



Anritsu MD8475A: Connection parameters

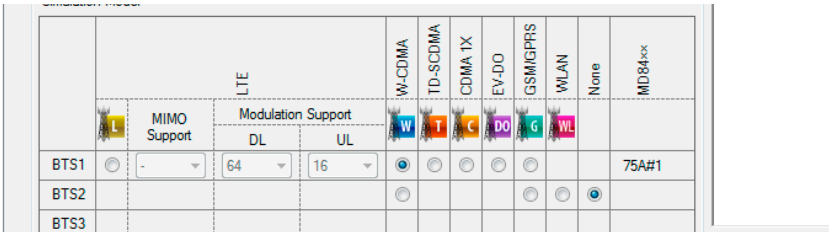
1. Open SmartStudio© on Anritsu MD8475A.



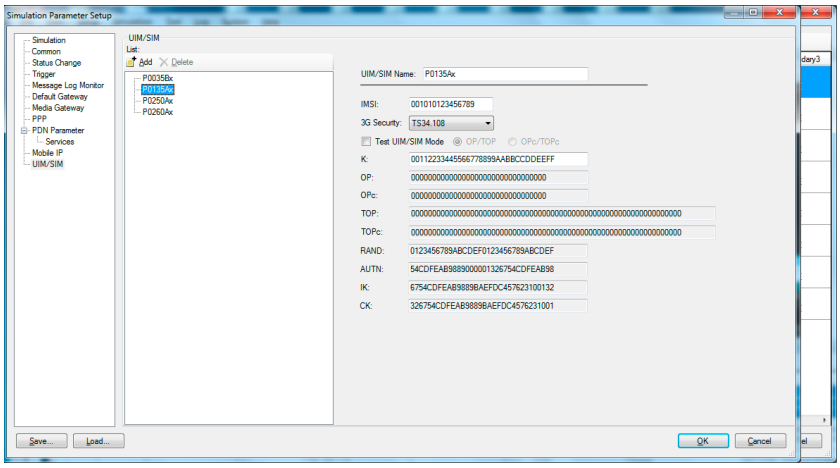
2. Select to open simulation parameter setup.

3. If available, load existing simulation parameter setup by selecting Load....

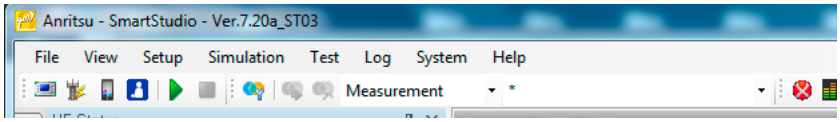
4. Select “Simulation”.
5. Set “Simulation Model” to W-CDMA.
6. Select “UIM/SIM”.



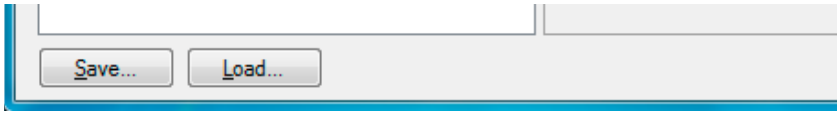
7. Check if the UIM/SIM settings apply to the SIM card of the DUT.
8. If desired, save the simulation parameter setup by selecting Save....
9. Confirm simulation parameter setup with by selecting OK.



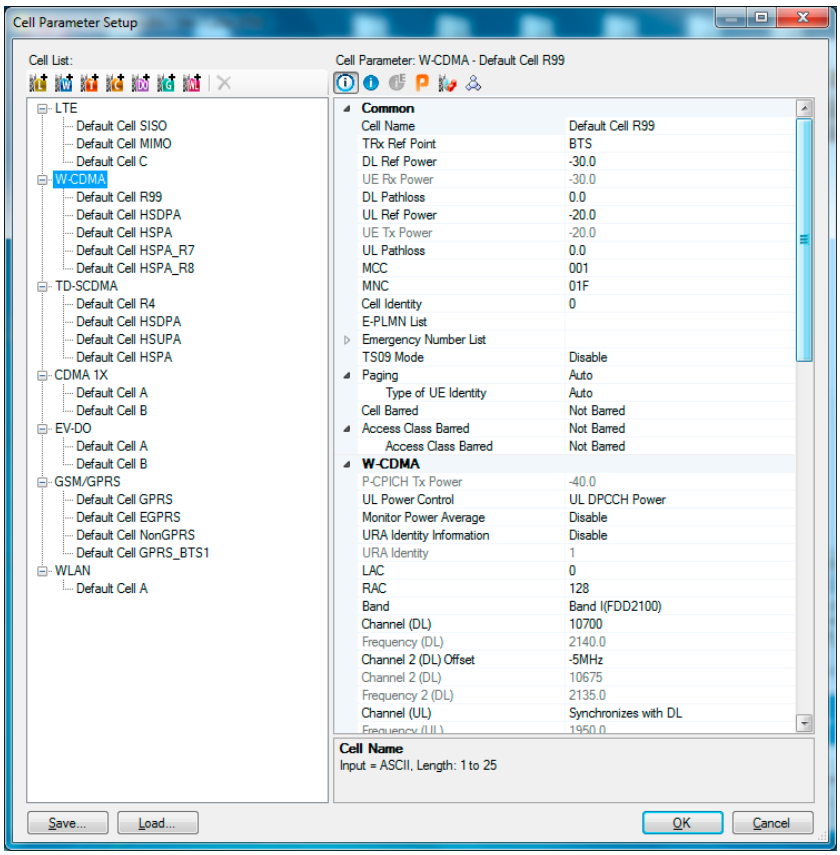
10. Select to open cell parameter setup.



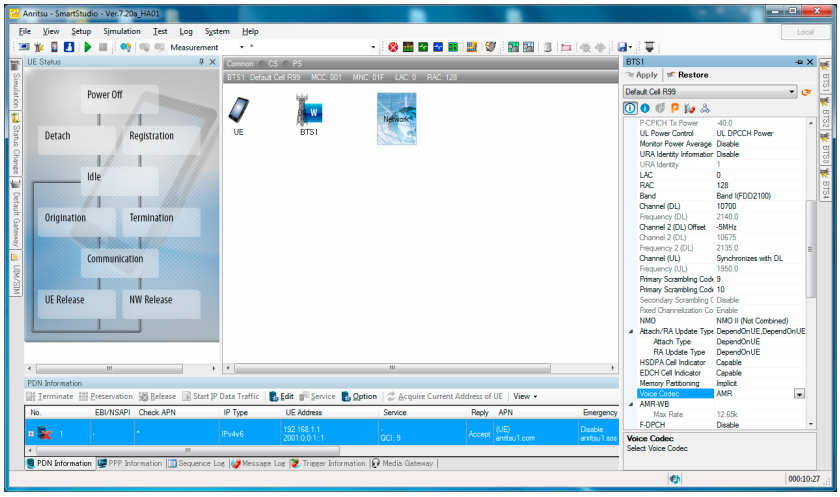
11. If available, load existing cell parameter setup by selecting Load....



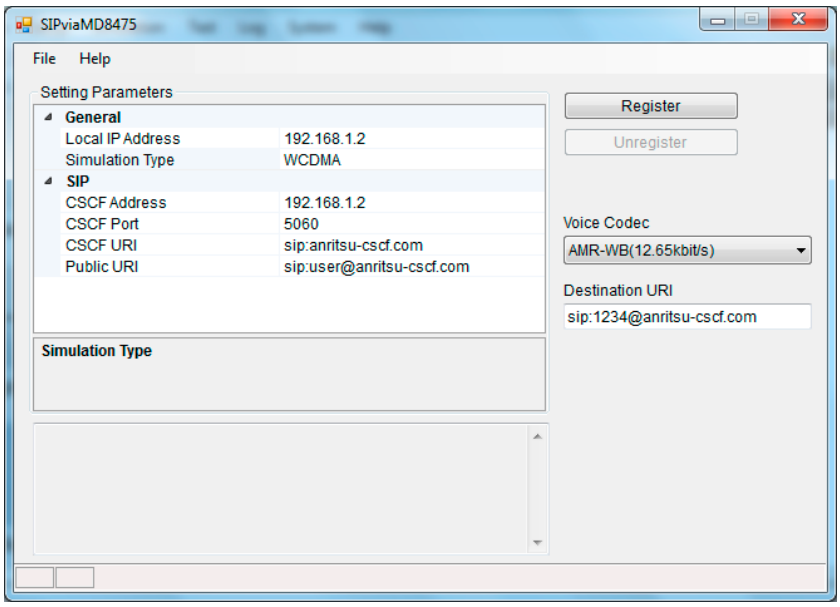
12. Select W-CDMA from the “Cell list”.
13. Unfold “Common” in “Cell parameter”.
14. Set the external attenuation (DL Ref Power and UL Ref Power). It shall match the attenuation of the RF antenna and the antenna cable.
15. Set the network identity MCC according to SIM card preferences.
16. Set the network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



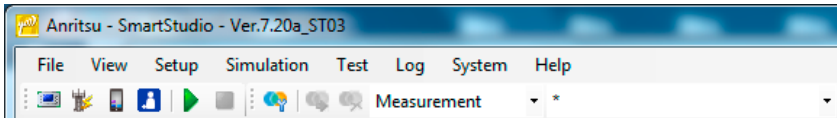
19. Set the desired AMR voice codec in SmartStudio©.



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

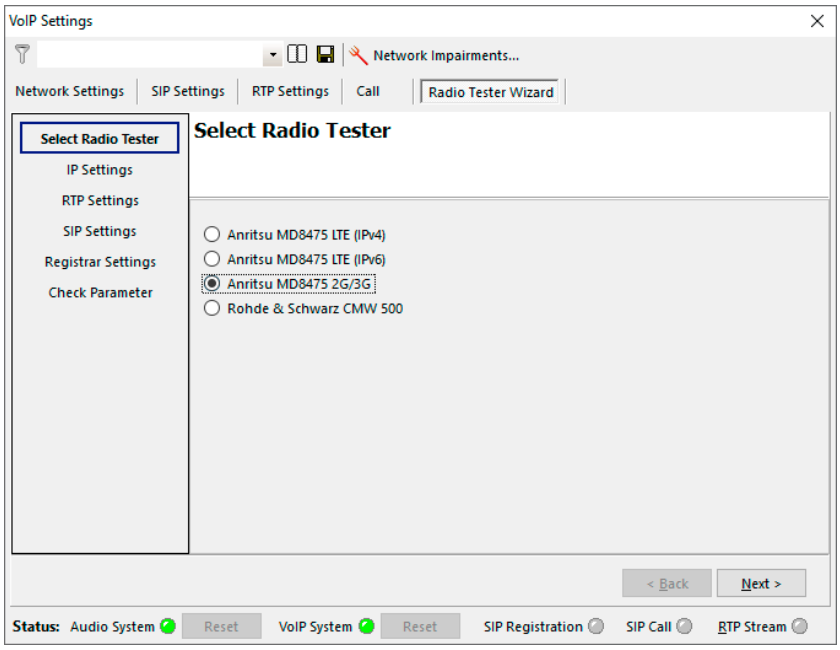


24. Select to start the simulation.

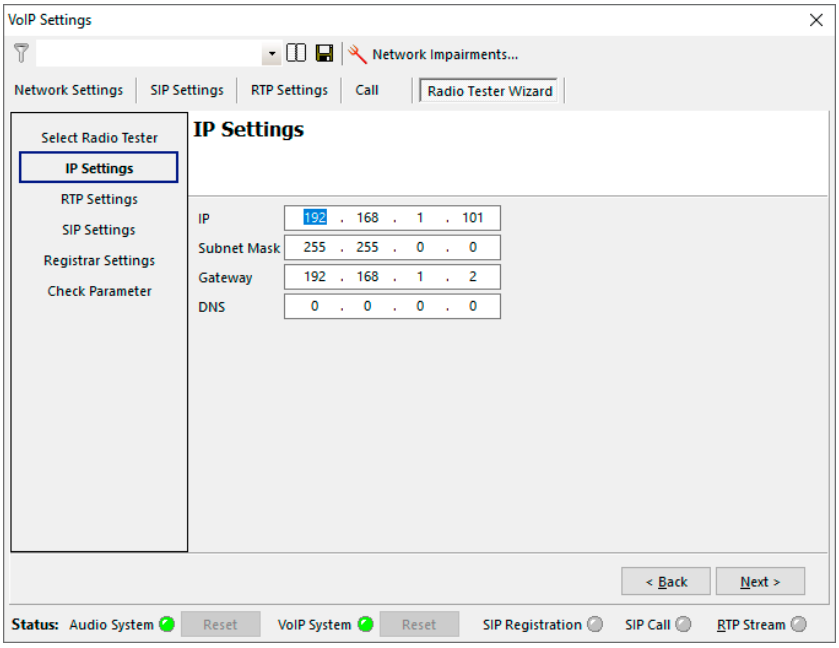


ACQUA PC: Radio tester wizard

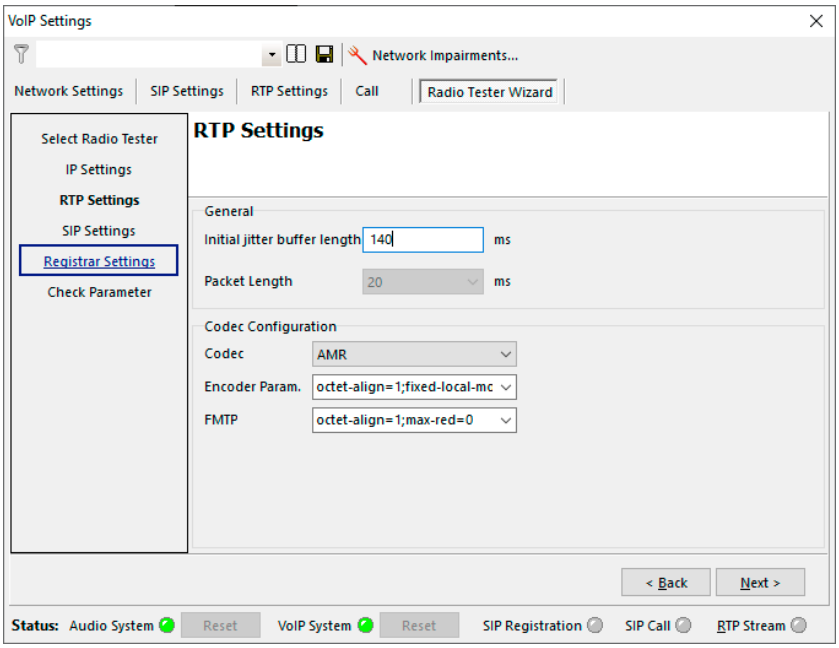
1. Select the tab “Radio tester wizard”.
2. Select “Anritsu MD8475 2G/3G”.



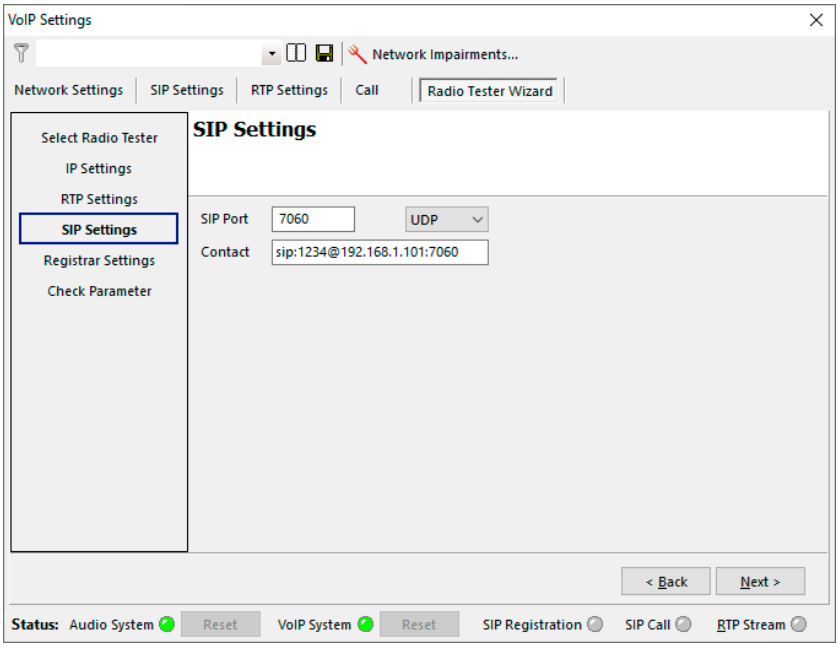
3. Select “IP Settings”.
4. Enter / verify the IP settings.



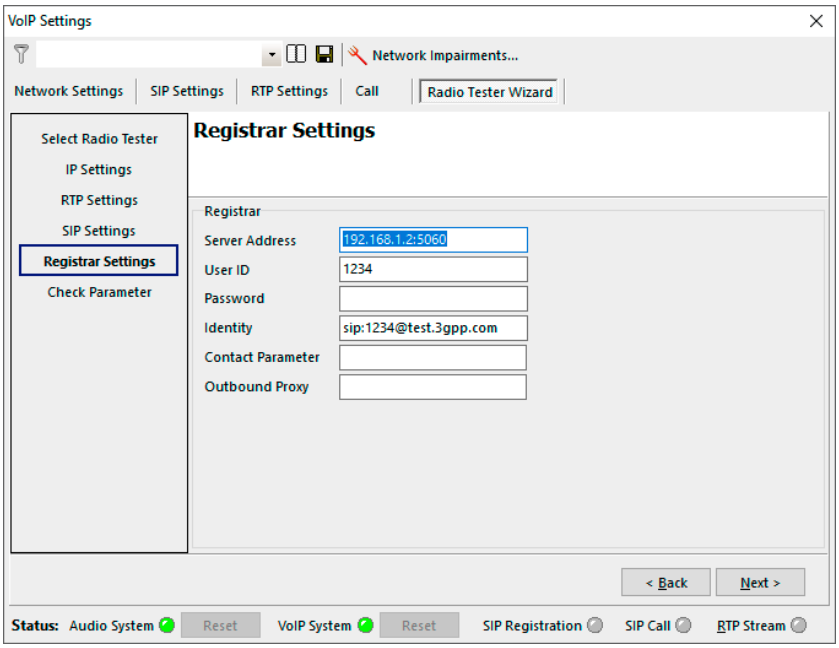
5. Select “RTP settings”.
6. Select a suitable initial buffer length. Default setting is 140 ms.
7. Select the voice codec in accordance with SIPviaMD8475.



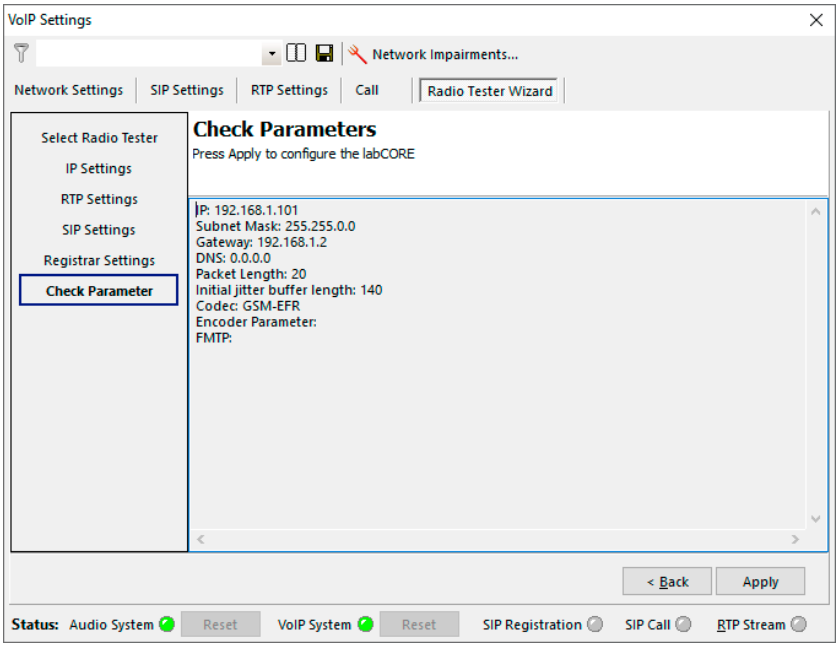
8. Select “SIP Settings”.
9. Enter / verify the SIP settings.



10. Select “Registrar Settings”.
11. Enter / verify the Registrar settings.

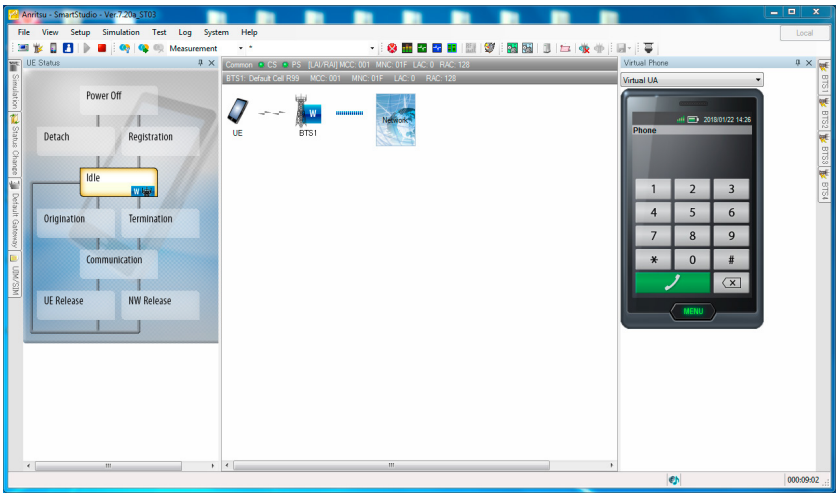


12. Select “Check Parameter”.
13. Double check all set parameters.
14. Select “Apply” to register the *lab*CORE at Anritsu MD8475A.

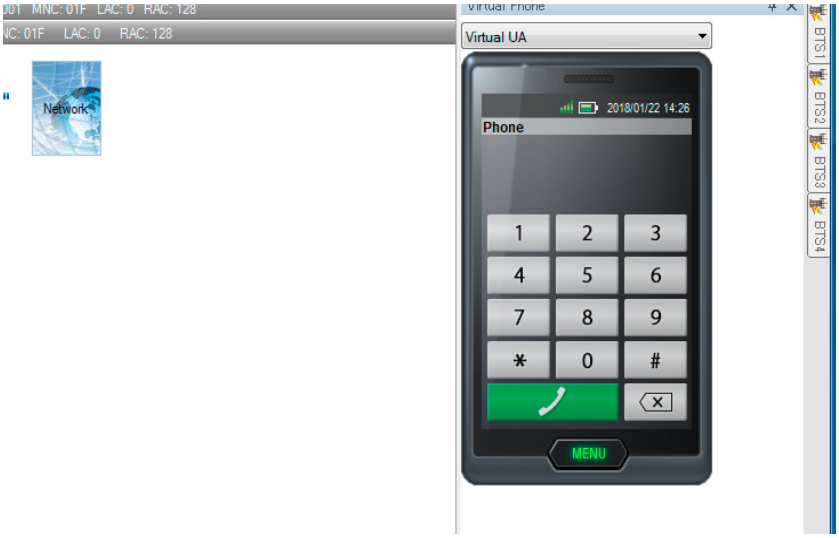
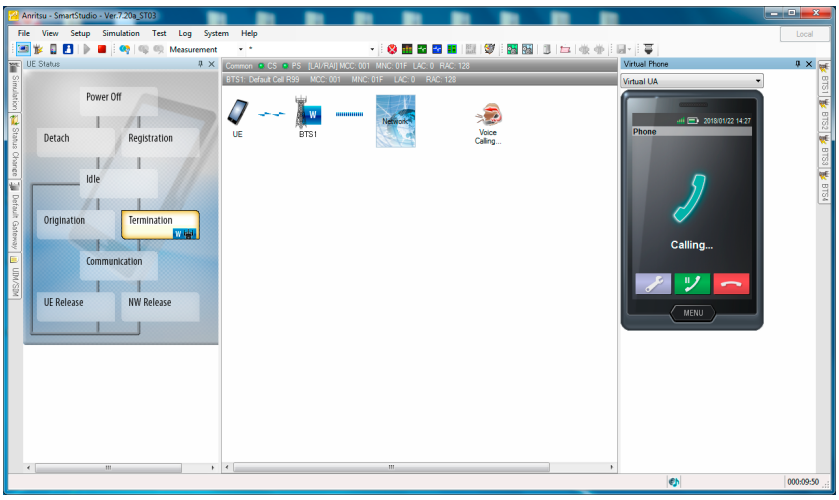


Anritsu MD8475A: Call execution

1. Go to SmartStudio© main screen. The status of the DUT (“UE stauts”) 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 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”.