



ACQUA

Establish LTE (4G), 3G and 2G connections to *labCORE* via R&S®CMW500 / R&S®CMW290

Application Note

Establish LTE (4G), 3G and 2G connections to *labCORE* via
R&S[®]CMW500 / R&S[®]CMW290

Revision 2

Legal notices

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1 Introduction

1.1 Brief description

The application note describes procedures to generate LTE (4G), 3G or 2G networks with Rohde & Schwarz Radio Communication Tester R&S[®]CMW500/R&S[®]CMW290 and establish voice calls to a device under test in these networks. HEAD acoustics' *labCORE* hardware platform taps into the exchanged audio signals and forwards them to the ACQUA analysis software.

The document is written assuming that the user has an advanced knowledge of handling HEAD acoustics equipment and R&S[®]CMW500/R&S[®]CMW290. HEAD acoustics will not respond to support requests concerning general handling and technical configuration of R&S[®]CMW500/R&S[®]CMW290.

1.2 Reference documentation

Document name
<i>labCORE</i> Manual
HMS II Manual
ACQUA Online Help
R&S [®] CMW500 Wideband Radio Communication Tester User Manual
R&S [®] CMW290 Wideband Radio Communication Tester User Manual
R&S [®] CMW-B400B/-B405A Audio Measurements User Manual

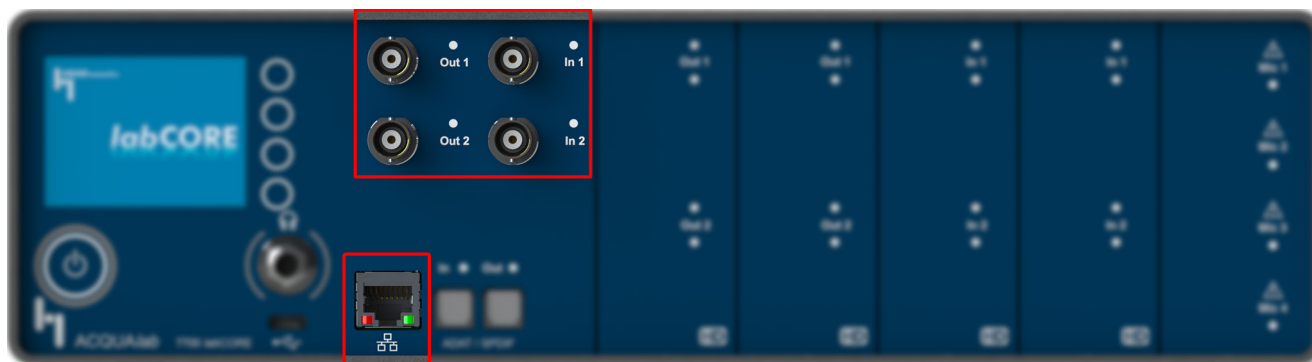
1.3 Acronyms and abbreviations

Acronym / abbreviation	Description
ACQUA	Advanced Communication Quality Analysis
AMR	Adaptive multi-rate
BNC	Bayonet Neill Concelman
dB	Decibel
dBm	Decibel-milliwatts
DUT	Device under test
EDGE	Enhanced data rates for GSM evolution
EVS	Enhanced voice services
FDD	Frequency division duplex
GPRS	General packet radio service
GSM	Global System for Mobile Communications
HSPA	High speed packet access
IMS	IP Multimedia Subsystem
IP	Internet Protocol
kBit/s	Kilobit per second
kHz	Kilohertz
LTE	Long Term Evolution
MBit/s	Megabit per second
mV/V	Millivolt per volt
RF	Radio frequency
RTP	Real-time protocol

Acronym / abbreviation	Description
SIM	Subscriber identity module
USB	Universal serial bus
V	Volt
VoIP	Voice over Internet Protocol
W-CDMA	Wideband Code Division Multiple Access

1.4 Interfaces at *labCORE* & R&S®CMW500/R&S®CMW290

1.4.1 *labCORE* interfaces



- Analog audio I/O interface for audio measurements of 2G and 3G connections
- Ethernet interface for measuring IP-based communication of an LTE connection

1.4.2 R&S®CMW500/R&S®CMW290 interfaces



- R&S®CMW-B400B, AF connectors for transmitting audio of 2G and 3G connections
- LAN switch, Ethernet interface for transmitting IP-based communication of an LTE connection

2 LTE (4G) connection

2.1 Equipment list

2.1.1 HEAD acoustics equipment

Required

- *labCORE* (Code 7700), Modular multi-channel hardware platform
 - *coreBUS* (Code 7710), I/O bus mainboard
 - *coreOUT-Amp2* (Code 7720), Power amplifier board
 - *coreIN-Mic4* (Code 7730), Microphone input board
 - *coreIP* (Code 7770), VoIP software extension with at least one of the following voice codecs according to the technical specifications of the device under test
 - ▶ *coreIP-AMR* (Code 7772), AMR extension
 - ▶ *coreIP-EVS* (Code 7773), EVS extension
- ACQUA (Code 6810), Advanced Communication Quality Analysis software
- HMS II, One of the listed versions
 - HMS II.3 (Code 1703), HEAD measurement system, basic version
 - HMS II.3 LN (Code 1703.1), HEAD measurement system, low-noise version
 - HMS II.3 LN HEC (Code 1703.2), HEAD measurement system, low-noise version with human-like ear canal simulator
 - HMS II.6 (Code 1706), HEAD measurement system, free-field microphones
 - HMS II.7 (Code 1707), HEAD measurement system, free-field ICP[®] microphones

Optional

- *labCORE* extensions depending on device under test and/or application case
 - *coreIP-IMP* (Code 7771), VoIP impairment extension
 - *coreBEQ* (Code 7741), Binaural equalization
 - *coreUSB-DR* (Code 7705), USB device reference
- Any HEAD acoustics handset positioner
 - HHP IV (Code 1406), Motorized handset positioner
 - HHP III.1 (Code 1403), Handset positioner

2.1.2 Rohde & Schwarz equipment

One of the following radio testers:

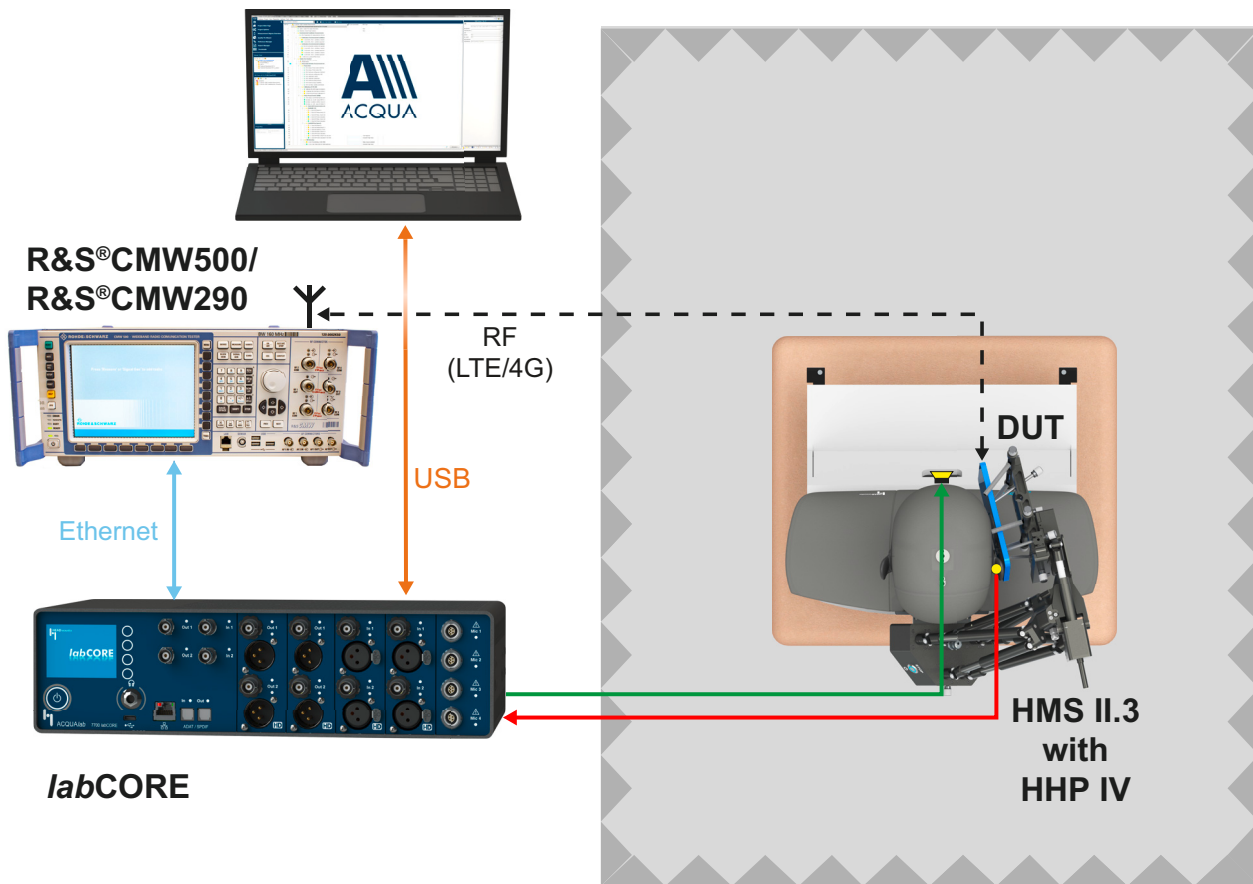
- R&S[®]CMW500
- R&S[®]CMW290

For detailed product configuration, please contact Rohde & Schwarz.

2.1.3 Third party equipment

- Device under test
- Ethernet cable
- RF antenna
- PC for running ACQUA
- Test SIM card

2.2 Configuration overview (exemplary)



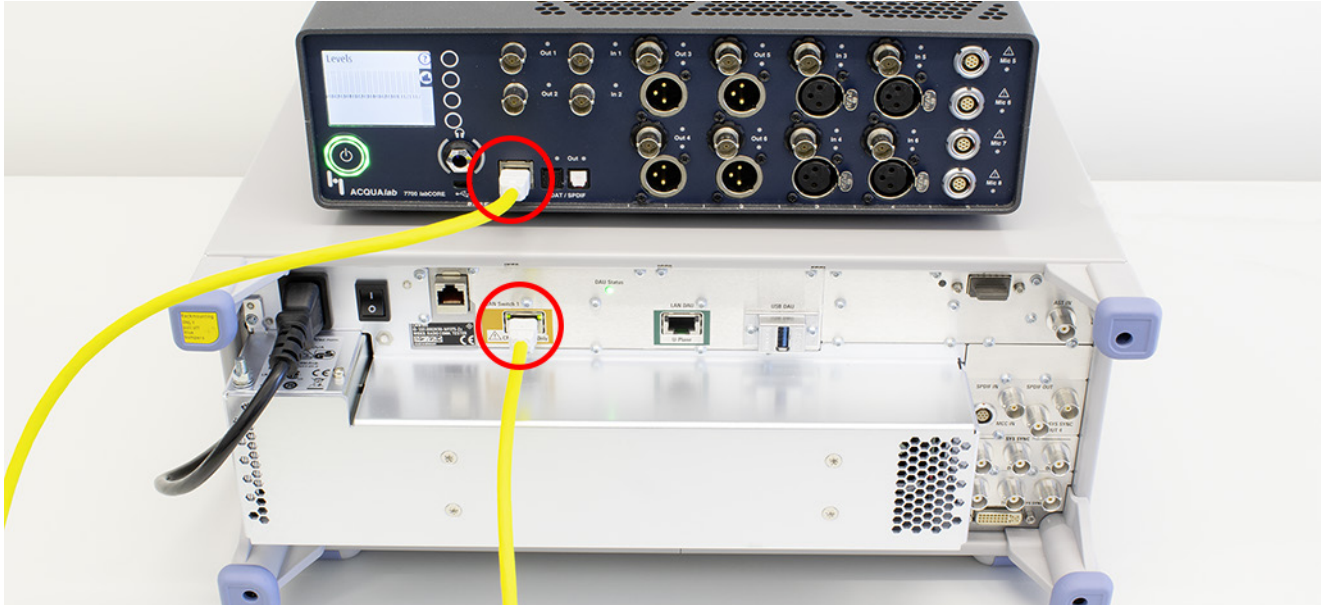
2.3 Cabling

2.3.1 Antenna



Attach the antenna to one of the provided COM connectors, e.g. RF1 COM.

2.3.2 labCORE to R&S®CMW500/R&S®CMW290 (exemplary)



- Connect the Ethernet cable to the Ethernet socket at the front panel of labCORE.
- Connect the Ethernet cable to the LAN Switch 1 Ethernet socket at the back panel of R&S®CMW500/R&S®CMW290.

2.4 LTE (4G) connection establishment

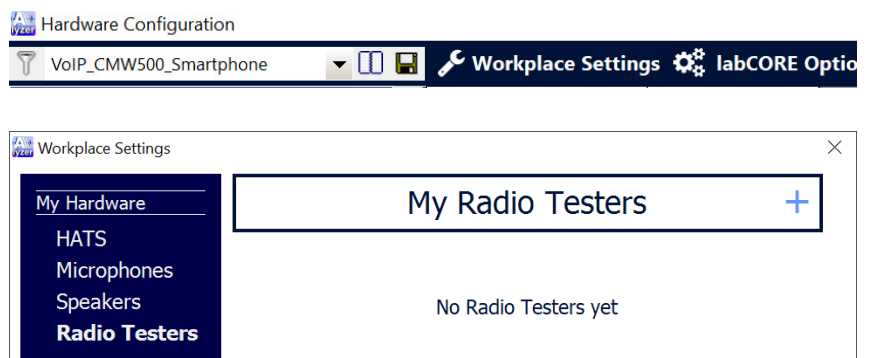
2.4.1 Preparations

- Interconnect the hardware according to chapter 2.2 and chapter 2.3
- Boot up R&S®CMW500/R&S®CMW290
- Boot up PC and start ACQUA
- Boot up labCORE
- Insert test SIM card into device under test and boot it up
- Set the device under test offline

2.4.2 Hardware configuration

ACQUA

1. Go to Hardware Configuration.
2. Select Workplace settings.
3. Select My Hardware → Radio Testers.
4. Select +.



- 5. Enter customized parameters.
- 6. Select **Close**.

RadioTester Settings

General

Type

Nickname

Serial number

Comment

Calibration

Encoder calibration

Decoder calibration

Calibration state

Date of calibration

- 7. Select **Assignments** → **Radio Testers**.
- 8. Select **+**.

Workplace Settings

My Hardware

- HATS
- Microphones
- Speakers
- Radio Testers

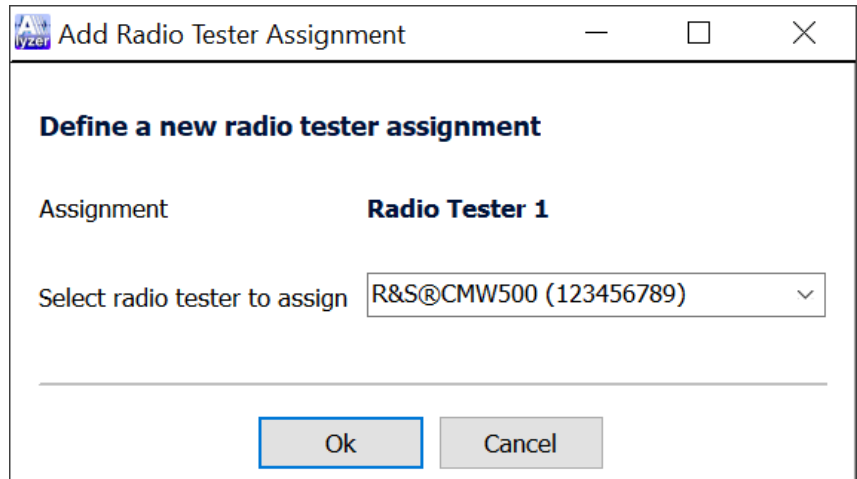
Assignments

- HATS
- Microphones
- Speakers
- Radio Testers**

Radio Tester assignments

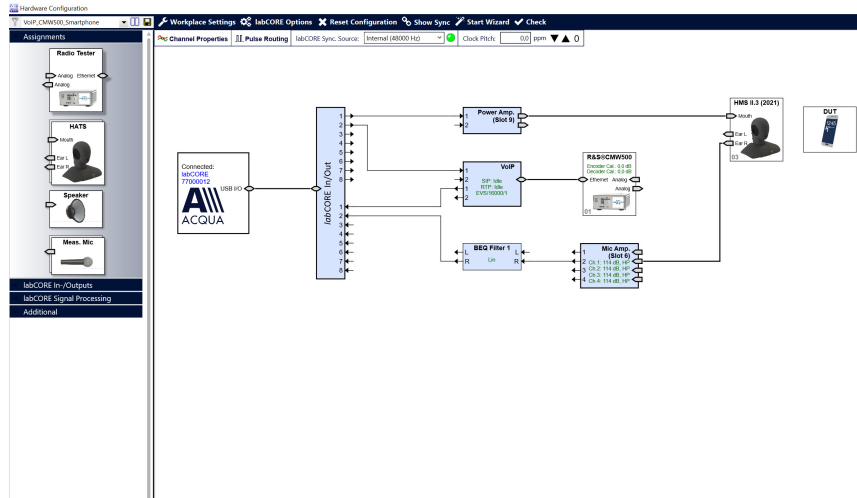
No Radio Tester assignments yet

9. Select specified radio tester from the drop-down list.
10. Select **OK**.
11. Close **Workplace settings**.



12. Set up customized configuration.
13. Drag and drop the blocks from the left selection area into the right configuration area. Interconnect the blocks according to the applied connections.

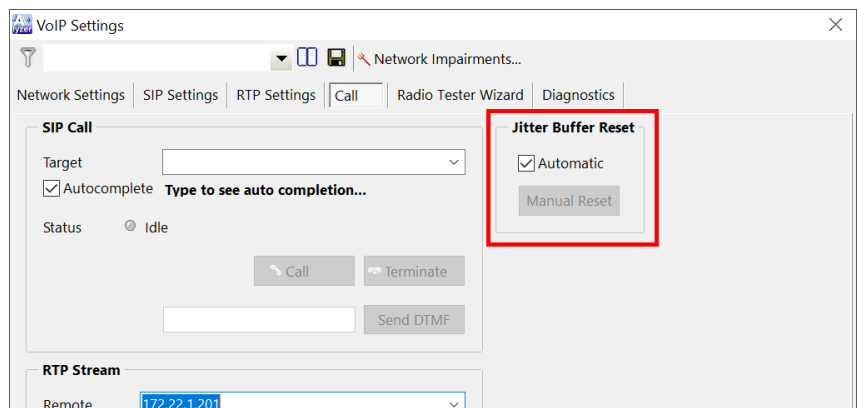
Alternatively, use the **Hardware Configuration Wizard**.



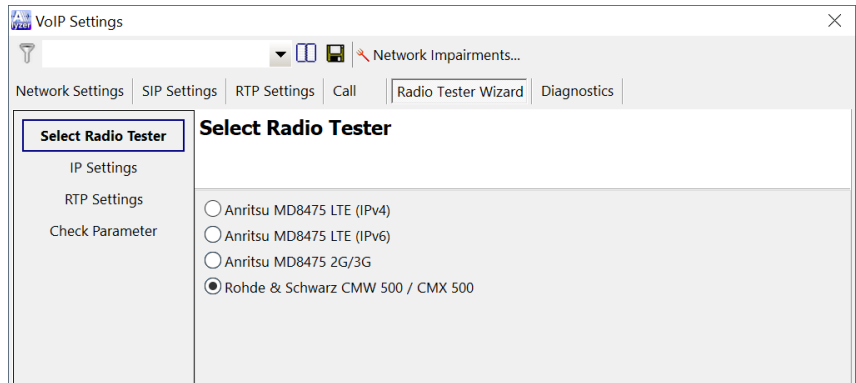
2.4.3 VoIP configuration

ACQUA

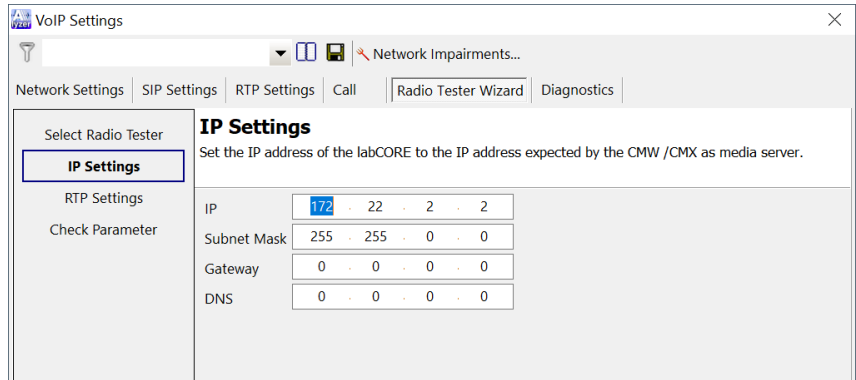
1. Open **VoIP Settings**.
2. Go to tab **Call**.
3. Enable **Automatic** in section **Jitter Buffer Reset**.



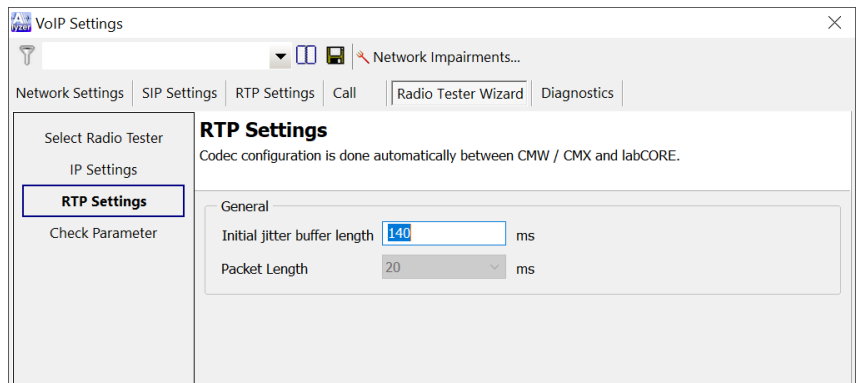
4. Go to tab **Radio Tester Wizard**.
5. Select **Rohde & Schwarz CMW 500**.
6. Select **Next**.



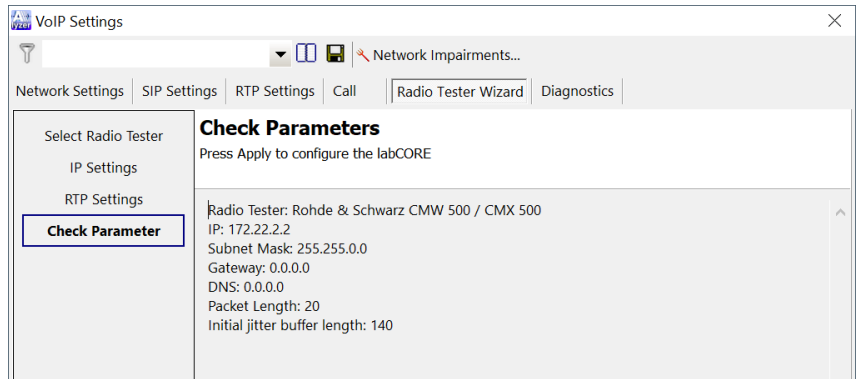
7. Specify the IP address of *labCORE*. It is recommended to leave the default IP address.
8. Select **Next**.



9. Set the desired value for **Initial jitter buffer length**.
10. Select **Next**.



11. Check and confirm the parameters.
12. Select **Apply** to activate the parameters.



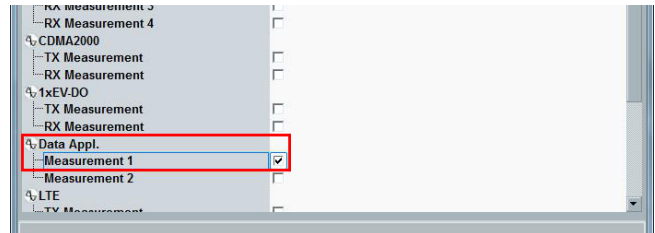
2.4.4 Configuration of LTE (4G) network

R&S[®] CMW500/R&S[®] CMW290

1. Press the **Measure** key.



2. Go to section **Data Appl.**
3. Enable **Measurement 1**.



4. Press the **Signal Gen** key..



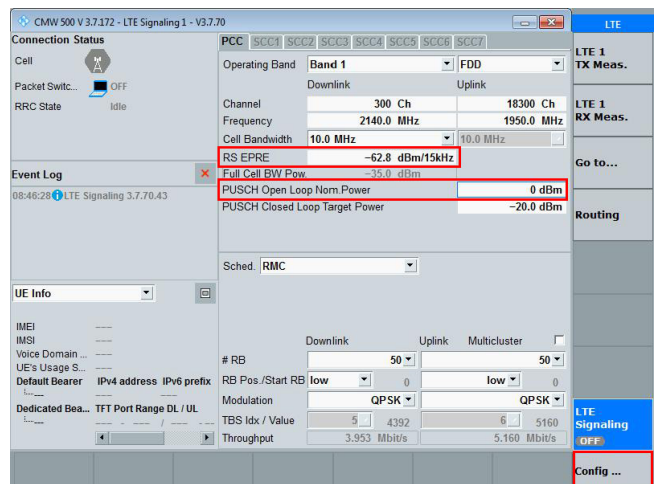
5. Go to section **LTE**.
6. Enable **Signaling 1**.



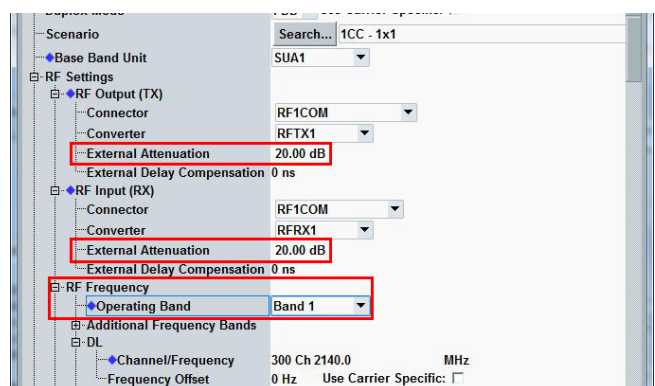
7. Press the softkey **Tasks**.
8. Open **LTE 1 Signaling** at the bottom menu bar by hot-key.



9. Set **RS EPRS** according to the technical specifications of the applied equipment.
10. Set **PUSCH Open Loop Nom. Power** to 0 dBm.
11. Open **Configuration** at the bottom menu bar by hot-key and continue with the advanced settings.



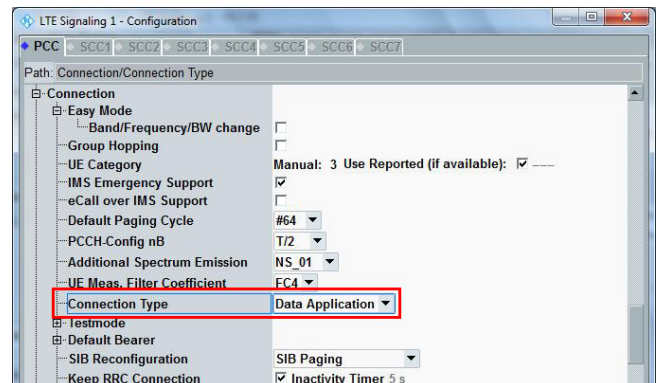
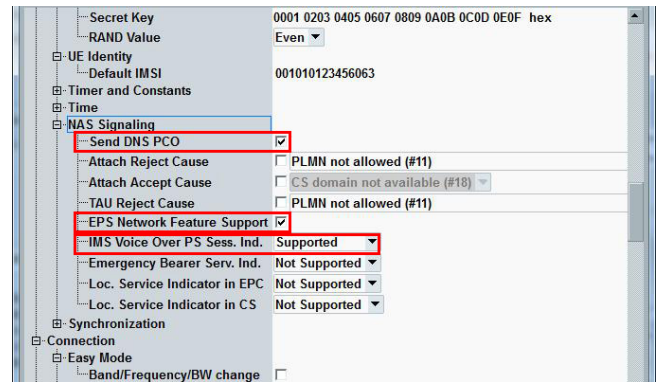
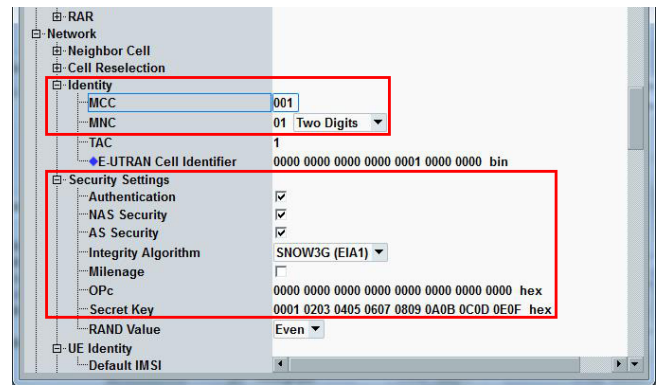
12. Go to section **RF settings**.
13. Set **RF Output (TX)** → **External Attenuation** according to the technical specification of the applied antenna and antenna cable.
14. Set **RF Input (TX)** → **External Attenuation** according to the technical specification of the applied antenna and antenna cable.
15. Go to section **RF Frequency**.
16. Set the **Operating Band** according to the device under test.



17. Go to section **Network** → **Identity**.
18. Set appropriate values for **MCC** and **MNC** according to the SIM card. The Rohde & Schwarz SIM card requires **MCC** → 001 and **MNC** → 01.
19. Go to section **Network** → **Security Settings**.
20. Set the **Security Settings** according to the applied SIM card.

21. Go to section **Network** → **NAS Signaling**.
22. Enable **Send DNS PCO**.
23. Enable **EPS Network Feature Support**.
24. Set **IMS Voice Over PS Sess. Ind.** to **Supported**.

25. Go to section **Connection**.
26. Set **Connection Type** to **Data Application**.
27. Close the **Configuration** window.



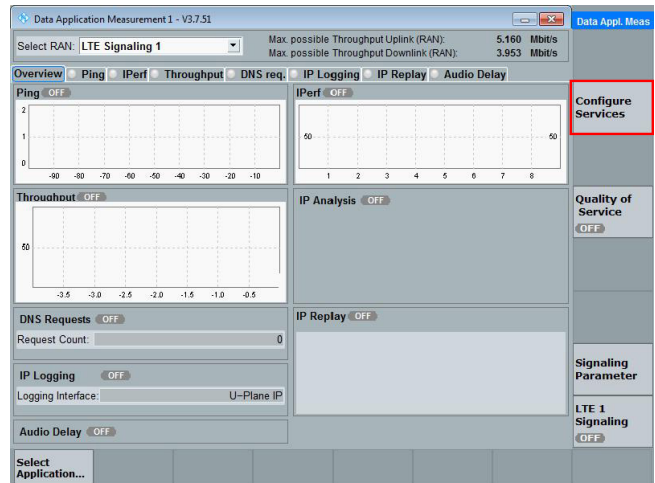
2.4.5 Generation of LTE (4G) network and start of IMS service

R&S® CMW500/R&S® CMW290

1. Press the softkey **Tasks**.
2. Open **Data 1 Meas** at the bottom menu bar by hotkey.

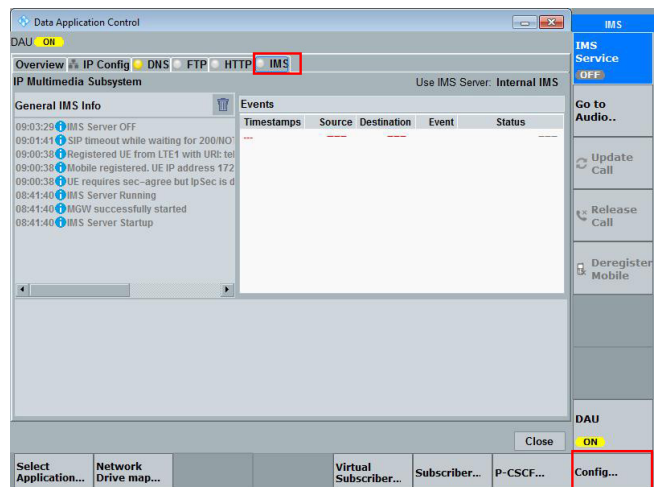


3. Select **Configure Services** by softkey.



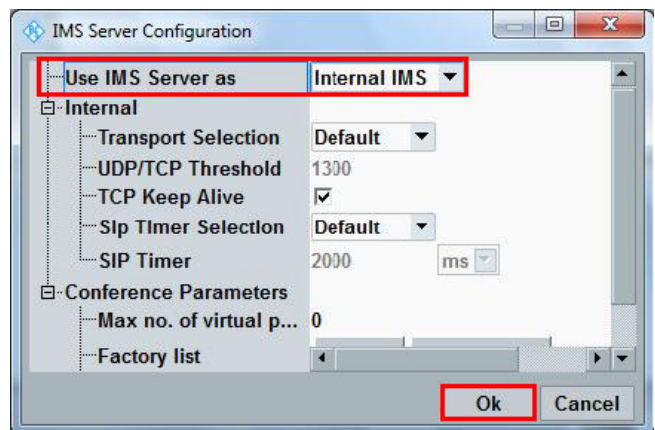
4. Go to tab **IMS**.

5. Open **Configuration** at the bottom menu bar by hot-key.

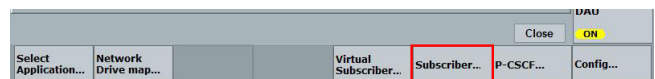


6. Set the IMS server as **intern IMS**.

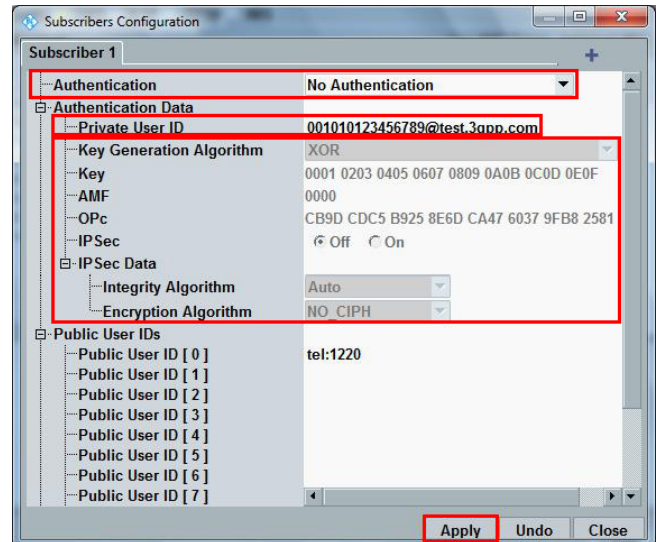
7. Confirm by selecting **Ok**.



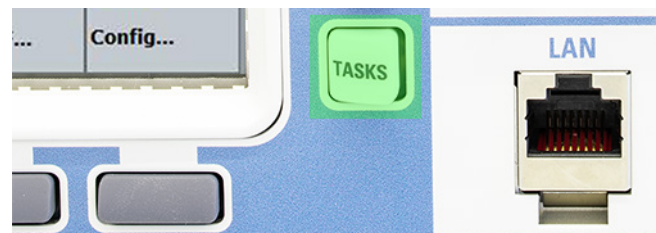
8. Open **Subscribers Configuration** at the bottom menu bar by hotkey.



9. Set the appropriate authentication method in the drop-down list under **Authentication**.
10. Enter the identification of the device under test under **Private User ID**.
11. If the registration requires authentication, adjust **Authentication Data** according to SIM card and device under test.
12. Confirm by selecting **Apply**.
13. Set the device under test online.



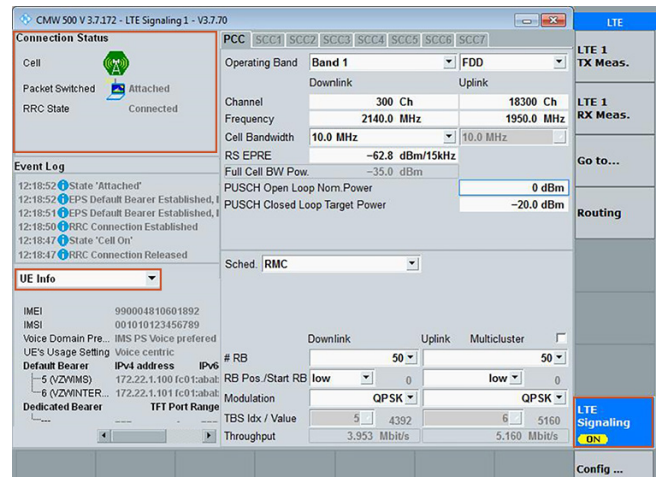
14. Press the softkey **Tasks**.
15. Open **LTE 1 Signaling** at the bottom menu bar by hot-key.



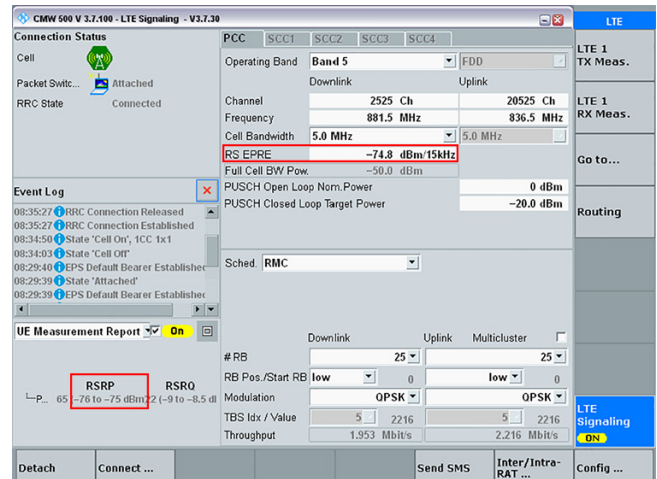
16. Press the **On/Off** key to enable **LTE Signaling**.



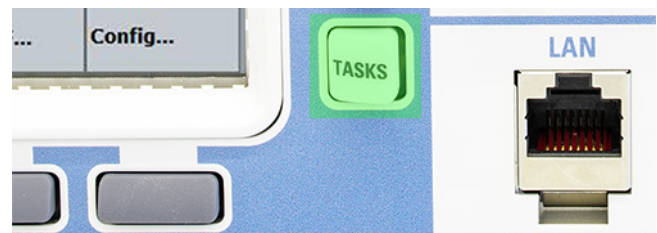
17. The connection status is displayed in the upper left corner of the **LTE Signaling 1** screen.
18. Select **UE Measurement Report** in the drop-down list in the bottom left corner.



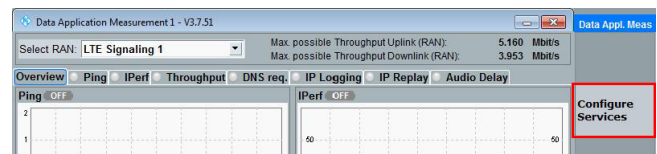
- 19. The **RSRP** range shall approximately match the **RS EPRE** value. Change the **RSRP** range by adjusting **External attenuation** in **RF settings** → **RF Input (TX) / RF Output (TX)**.
- 20. Set the device under test offline.



- 21. Press the softkey **Tasks**.
- 22. Open **Data 1 Meas** at the bottom menu bar by hotkey.



- 23. Select **Configure Services** by softkey.

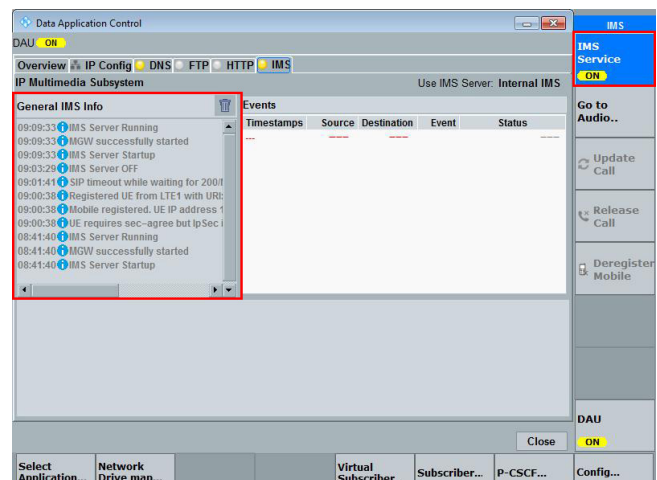


- 24. Press the **On/Off** key to enable **IMS Service**.



- 25. Confirm the **IMS Service** startup and the registration of the device under test in the info box **General IMS Info**.

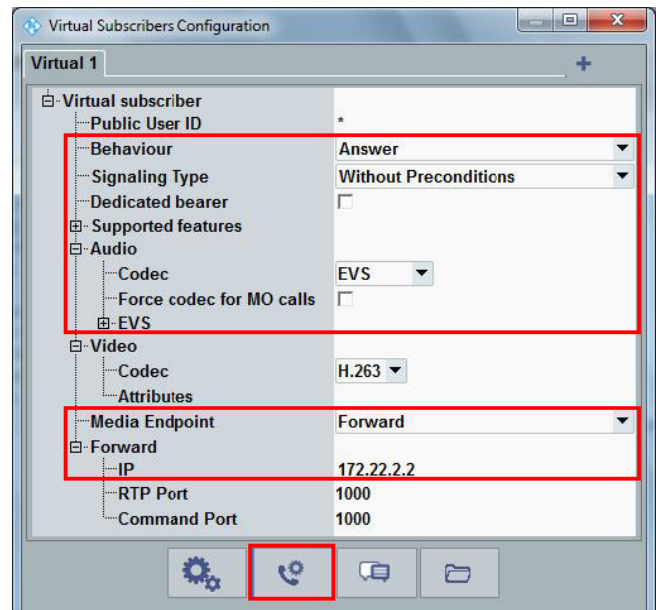
- 26. Set the device under test online.



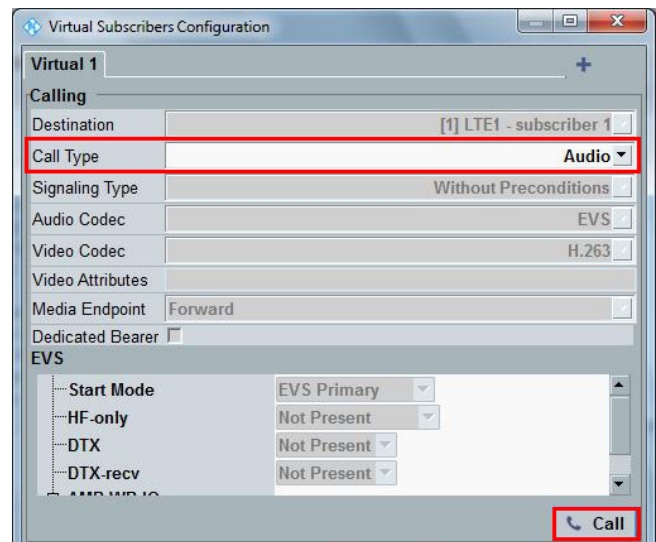
- 27. Open **Virtual Subscribers Configuration** at the bottom menu bar by hotkey.



28. Set **Signaling Type** according to device under test.
29. Go to **Audio** → **Codec**.
30. Set the desired audio codec.
31. Set specifications of the codec in the section named after the codec, e.g. **EVS** or **AMR**.
32. Set **Media Endpoint** to **Forward**.
33. Go to **Forward** → **IP**.
34. Enter the IP address of *labCORE*. Thus, *labCORE* receives the RTP stream of the call between R&S®CMW500/R&S®CMW290 and the device under test.
35. Open the call menu by selecting the phone symbol.



36. Confirm **Call Type** → **Audio**.
37. Select **Call** to establish the connection.

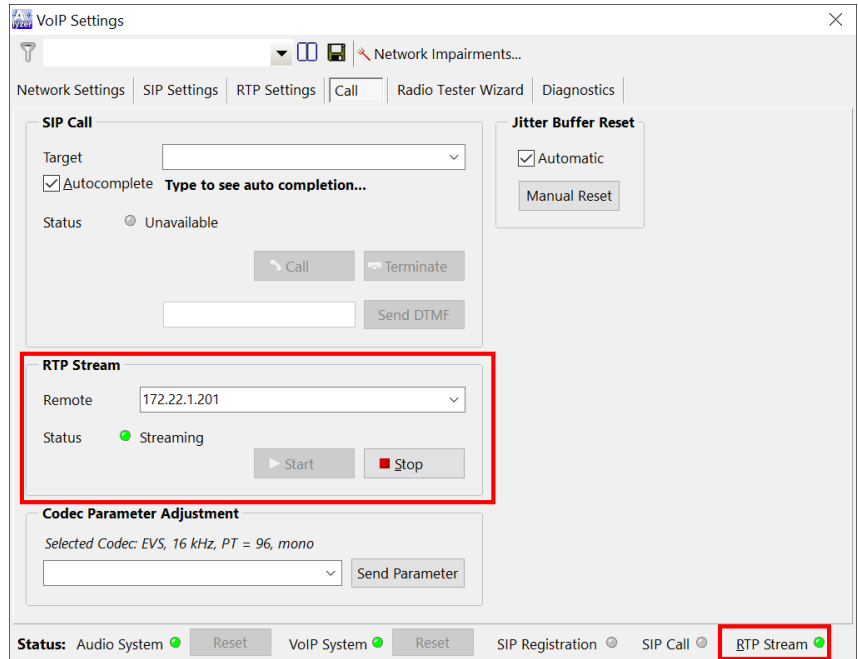


38. Confirm the established call between R&S®CMW500/R&S®CMW290 and the device under test in **Data Application Control**.



ACQUA

- 39. Open **Hardware Configuration** in ACQUA.
- 40. Open **VoIP Settings**.
- 41. Select the tab **Call**.
- 42. Confirm established RTP stream.



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
- ACQUA (Code 6810), Advanced Communication Quality Analysis software
- HMS II, One of the listed versions
 - HMS II.3 (Code 1703), HEAD measurement system, basic version
 - HMS II.3 LN (Code 1703.1), HEAD measurement system, low-noise version
 - HMS II.3 LN HEC (Code 1703.2), HEAD measurement system, low-noise version with human-like ear canal simulator
 - HMS II.6 (Code 1706), HEAD measurement system, free-field microphones
 - HMS II.7 (Code 1707), HEAD measurement system, free-field ICP[®] microphones

Optional

- *lab*CORE extensions depending on device under test and/or application case
 - *core*BEQ (Code 7741), Binaural equalization
 - *core*USB-DR (Code 7705), USB device reference
- Any HEAD acoustics handset positioner
 - HHP IV (Code 1406), Motorized handset positioner
 - HHP III.1 (Code 1403), Handset positioner

3.1.2 Rohde & Schwarz equipment

One of the following radio testers:

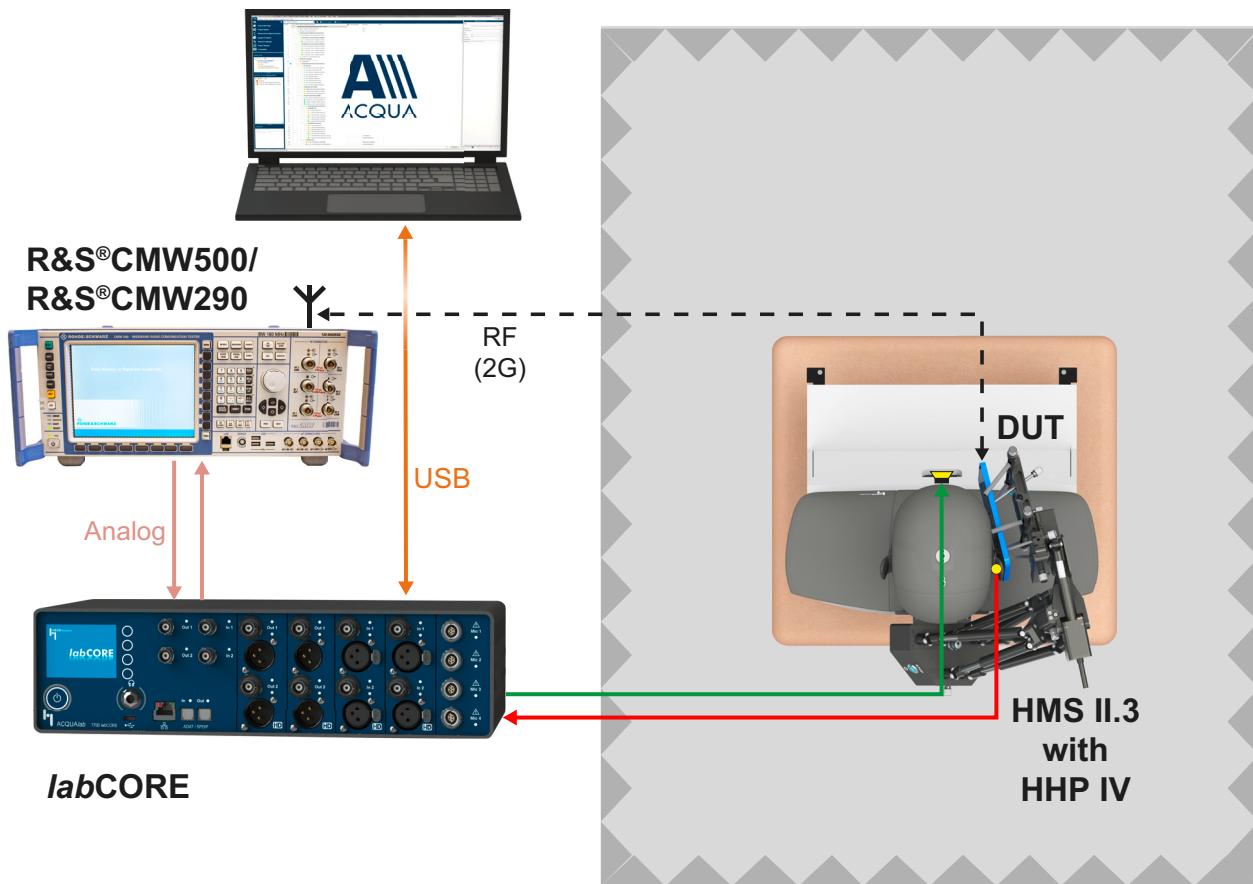
- R&S[®]CMW500
 - R&S[®]CMW-B400B
- R&S[®]CMW290
 - R&S[®]CMW-B400B

For detailed product configuration, please contact Rohde & Schwarz.

3.1.3 Third party equipment

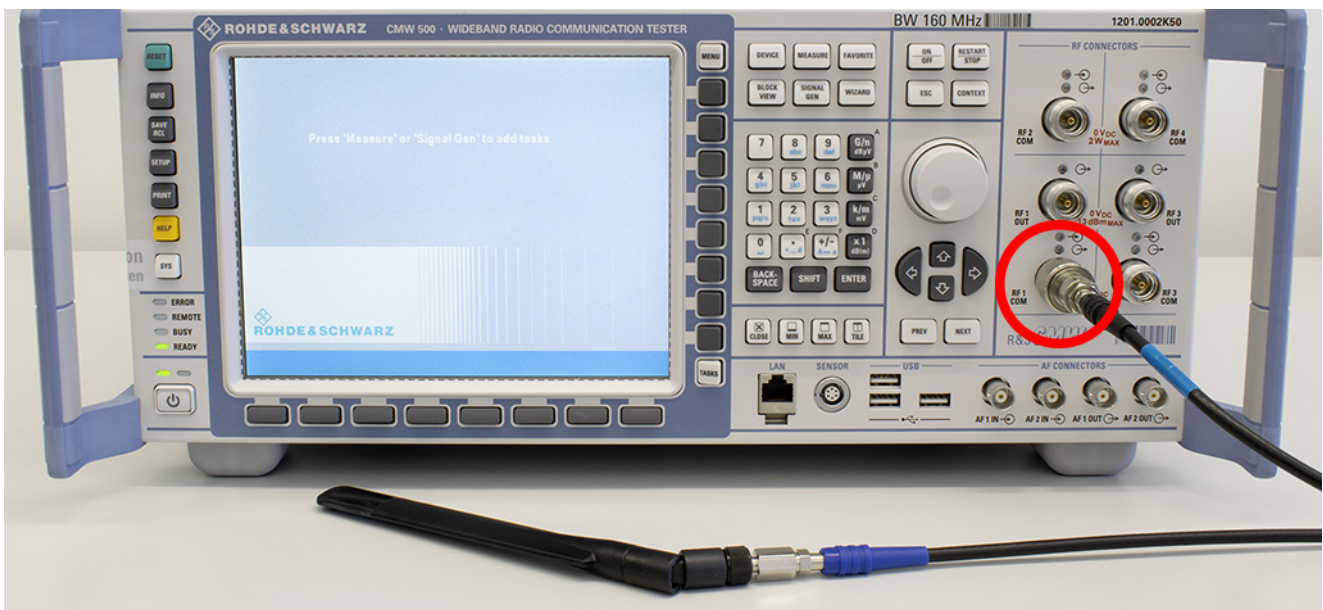
- 2 x BNC cable
- RF antenna
- PC for ACQUA software
- Device under test
- Test SIM card

3.2 Configuration overview (exemplary)



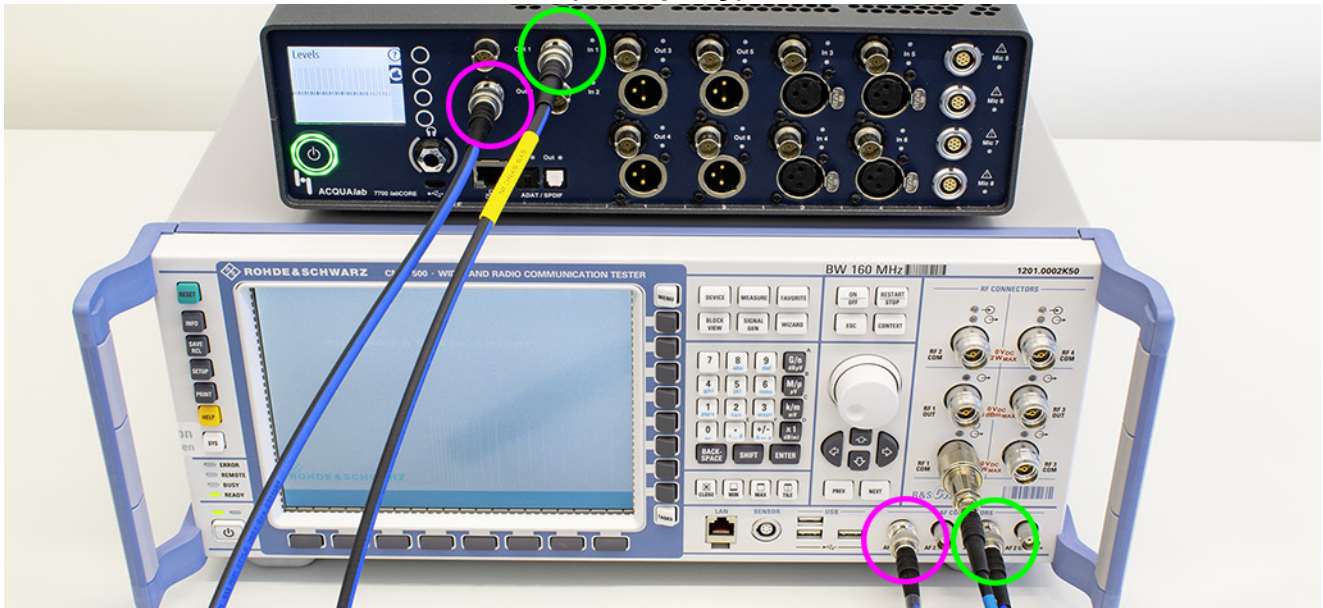
3.3 Cabling

3.3.1 Antenna



Attach the antenna to one of the provided COM connectors, e.g. RF1 COM.

3.3.2 *labCORE* to R&S®CMW-B400B (exemplary)



- Connect one analog output of *labCORE* with one audio frequency (AF) input of R&S®CMW-B400B using a BNC cable.
- Connect one analog input of *labCORE* with one audio frequency (AF) output of R&S®CMW-B400B using a BNC cable.

3.4 Connection establishment

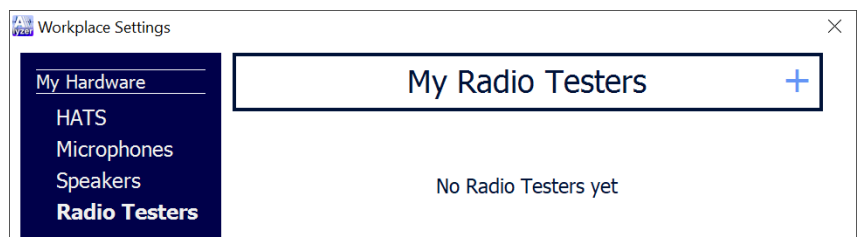
3.4.1 Preparations

- Interconnect the hardware according to chapter 3.2 and chapter 3.3
- Boot up R&S®CMW500/R&S®CMW290
- Boot up PC and start ACQUA
- Boot up *labCORE*
- Insert test SIM card into device under test and boot it up
- Set device under test offline

3.4.2 Hardware configuration

ACQUA

1. Go to **Hardware Configuration**.
2. Select **Workplace settings**.
3. Select **My Hardware** → **Radio Testers**.
4. Select **+**.



5. Enter customized parameters.
6. Set **Encoder calibration** → 0 dB.
7. Set **Decoder calibration** → 0 dB.
8. Select **Close**.

RadioTester Settings

General

Type

Nickname

Serial number

Comment

Calibration

Encoder calibration

Decoder calibration

Calibration state

Date of calibration

9. Select **Assignments** → **Radio Testers**.
10. Select **+**.

Workplace Settings

My Hardware

- HATS
- Microphones
- Speakers
- Radio Testers

Assignments

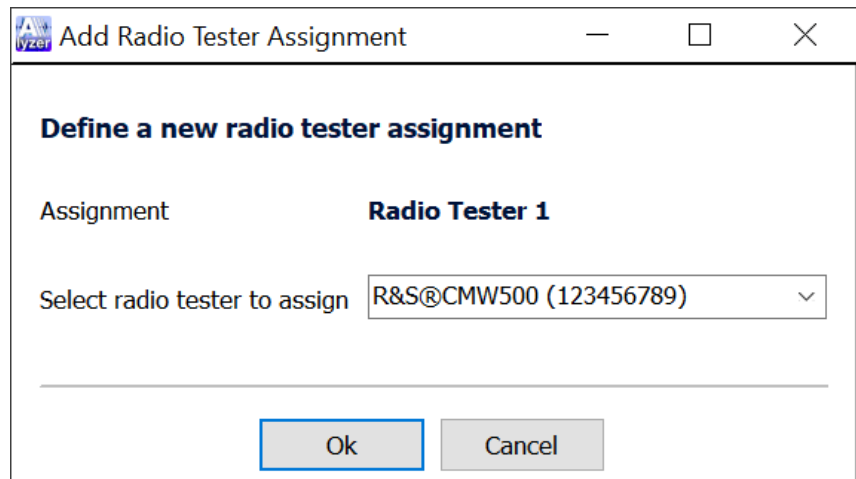
- HATS
- Microphones
- Speakers
- Radio Testers**

Radio Tester assignments

+

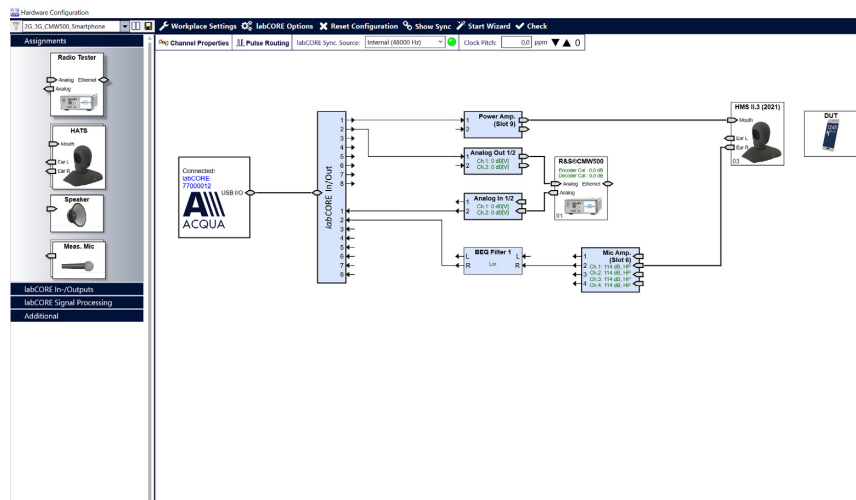
No Radio Tester assignments yet

11. Select specified radio tester from the drop-down list.
12. Select **OK**.
13. Close **Workplace settings**.



14. Set up customized configuration.
15. Drag and drop the blocks from the left selection area into the right configuration area. Interconnect the blocks according to the applied connections.

Alternatively, use the **Hardware Configuration Wizard**.



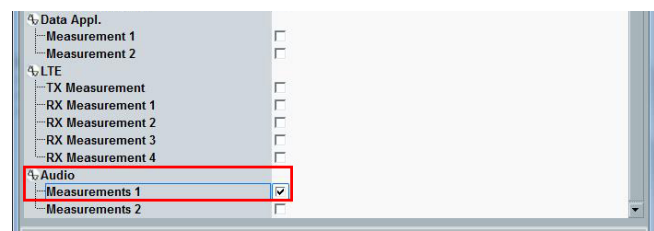
3.4.3 Configuration of 2G network

R&S®CMW500/R&S®CMW290

1. Press the **Measure** key



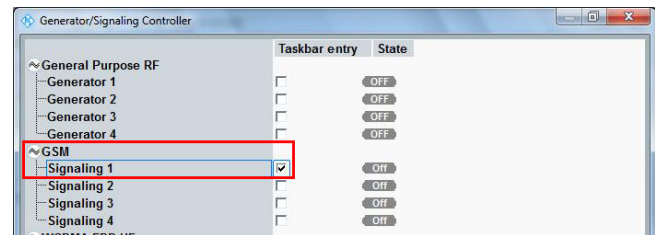
2. Go to section **Audio**.
3. Enable **Measurements 1**.



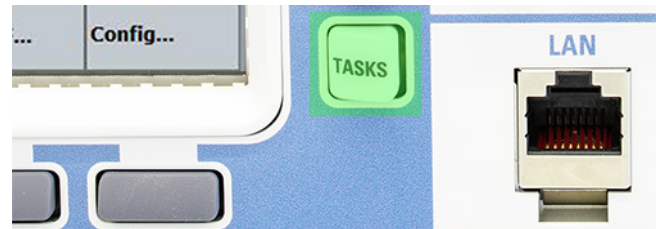
4. Press the **Signal Gen** key.



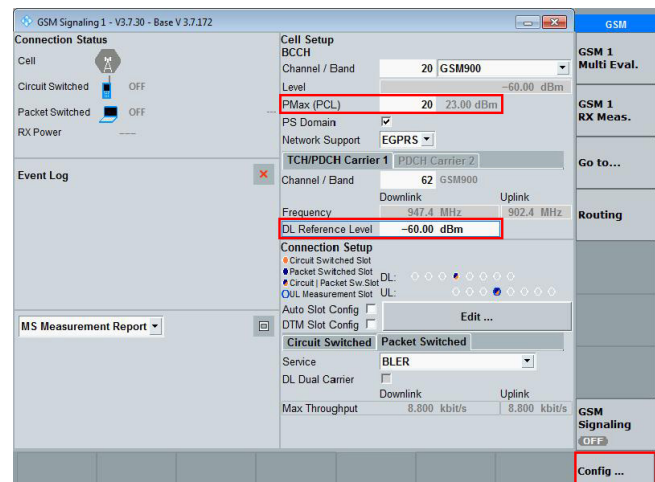
5. Go to section **GSM**.
6. Enable **Signaling 1**.



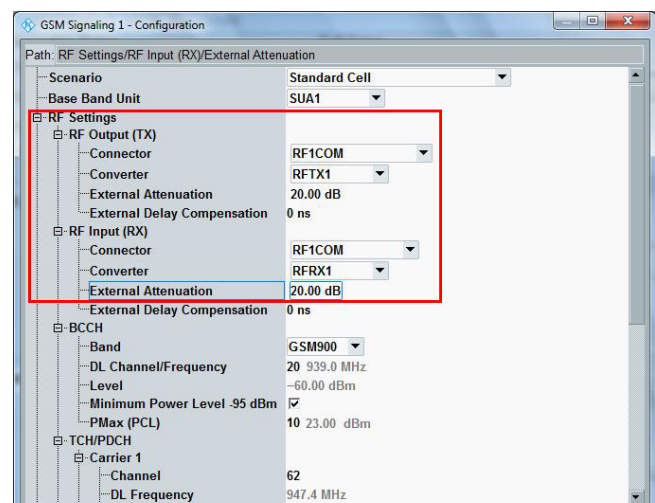
7. Press the softkey **Tasks**.
8. Open **GSM Signaling 1** at the bottom menu bar by hotkey.



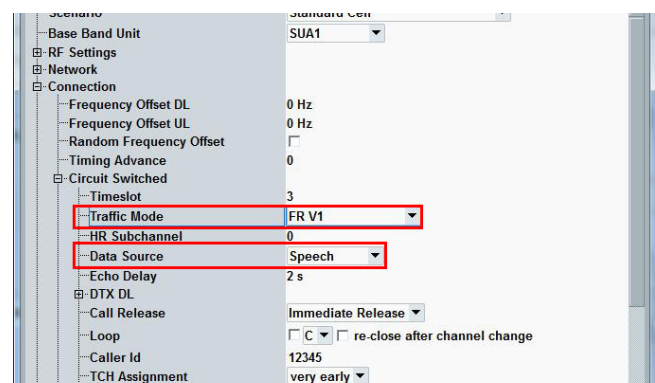
9. Set **PMax (PCL)** to twenty (20).
10. Set **DL Reference Level** to -60 dBm.
11. Open **Configuration** at the bottom menu bar by hotkey and continue with the advanced settings.



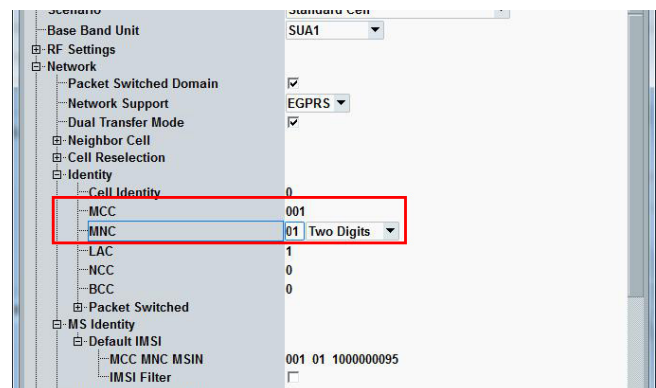
12. Go to section **RF settings**.
13. Set **RF Output (TX)** → **External Attenuation** according to the technical specification of the applied antenna and antenna cable.
14. Set **RF Input (TX)** → **External Attenuation** according to the technical specification of the applied antenna and antenna cable.



15. Go to **Connection** → **Circuit Switched**.
16. Set **Traffic Mode** to the desired codec.
17. Set **Data Source** to **Speech**.



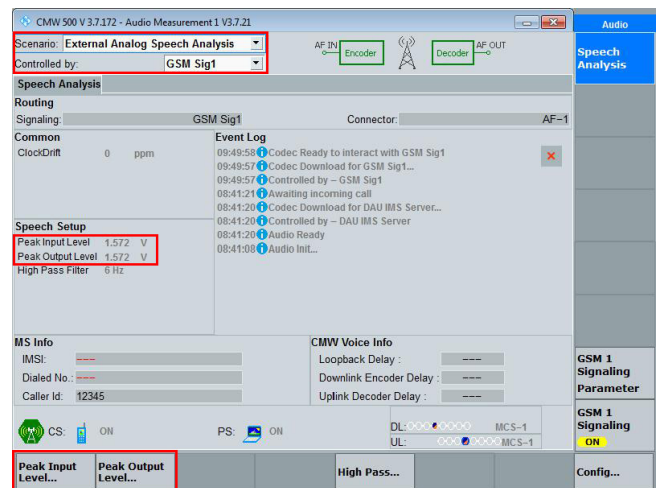
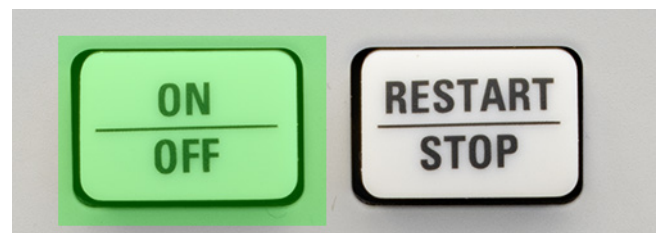
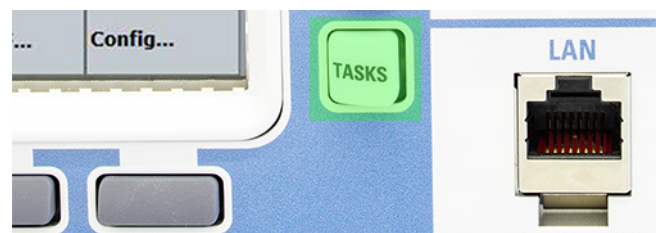
18. Go to section **Network** → **Identity**.
19. Set appropriate values for **MCC** and **MNC** according to the applied SIM card. The Rohde & Schwarz SIM card requires **MCC** → 001 and **MNC** → 01.
20. Close the **Configuration** window.



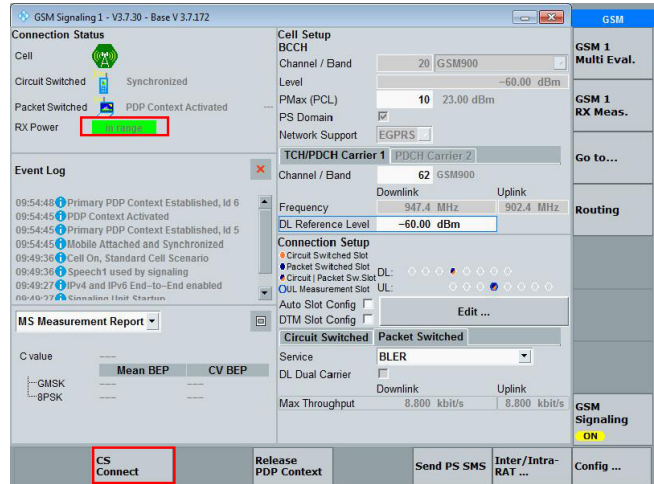
3.4.4 Generation of 2G network and call establishment

R&S® CMW500/R&S® CMW290

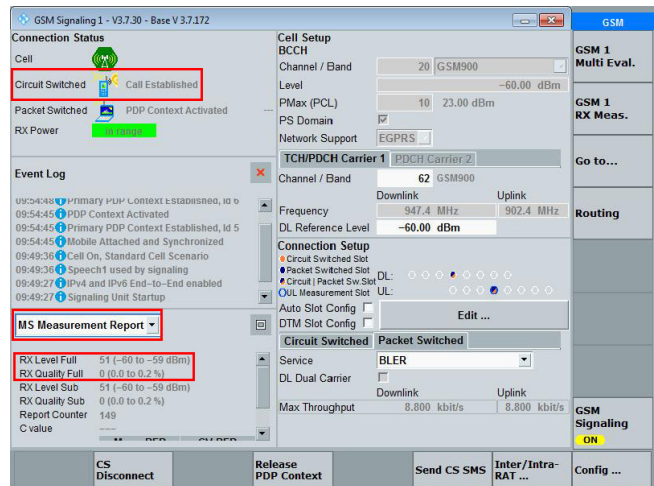
1. Press the **Tasks** key and switch to **Audio Measurement 1** by hotkey.
2. Press the **On/Off** key to enable **GSM 1 Signaling**.
3. Go to **Scenario** and select **External Analog Speech Analysis**.
4. Go to **Routing** and confirm **Controlled by GSM Sig1**.
5. Open **Input Level (FS-Peak)** by hotkey.
6. Set **Input Level (FS-Peak)** to 1.572 V.
7. Open **Output Level (FS-Peak)** by hotkey.
8. Set **Output Level (FS-Peak)** to 1.572 V.
9. Press the **Tasks** key and switch to **GSM Signaling 1** by hotkey.
10. Set device under test online.



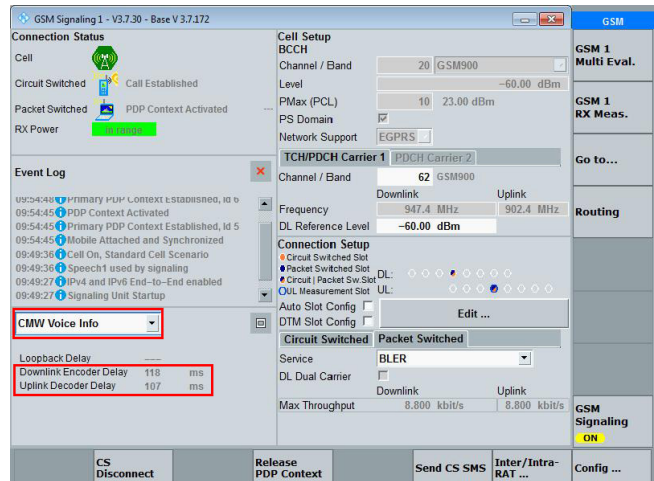
11. Position the RF antenna **In Range** of the device under test.
12. The device under test registers automatically to the 2G network of R&S®CMW500/R&S®CMW290.
13. Establish the call between R&S®CMW500/R&S®CMW290 and device under test. Select **CS Connect** by hotkey.
14. Accept the incoming call at the device under test.



15. Confirm the successful call establishment in **Connection Status**.
16. Set **MS Measurement Report**.
17. The power level range of **RX Level Full** shall almost match **DL Reference Level**. Adjust **RF Settings** if necessary.



18. Set **CMW Voice Info** to get the downlink and uplink delay of R&S®CMW500/R&S®CMW290.



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
- ACQUA (Code 6810), Advanced Communication Quality Analysis software
- HMS II, One of the listed versions
 - HMS II.3 (Code 1703), HEAD measurement system, basic version
 - HMS II.3 LN (Code 1703.1), HEAD measurement system, low-noise version
 - HMS II.3 LN HEC (Code 1703.2), HEAD measurement system, low-noise version with human-like ear canal simulator
 - HMS II.6 (Code 1706), HEAD measurement system, free-field microphones
 - HMS II.7 (Code 1707), HEAD measurement system, free-field ICP[®] microphones

Optional

- *lab*CORE extensions depending on device under test and/or application case
 - *core*BEQ (Code 7741), Binaural equalization
 - *core*USB-DR (Code 7705), USB device reference
- Any HEAD acoustics handset positioner
 - HHP IV (Code 1406), Motorized handset positioner
 - HHP III.1 (Code 1403), Handset positioner

4.1.2 Rohde & Schwarz equipment

One of the following radio testers:

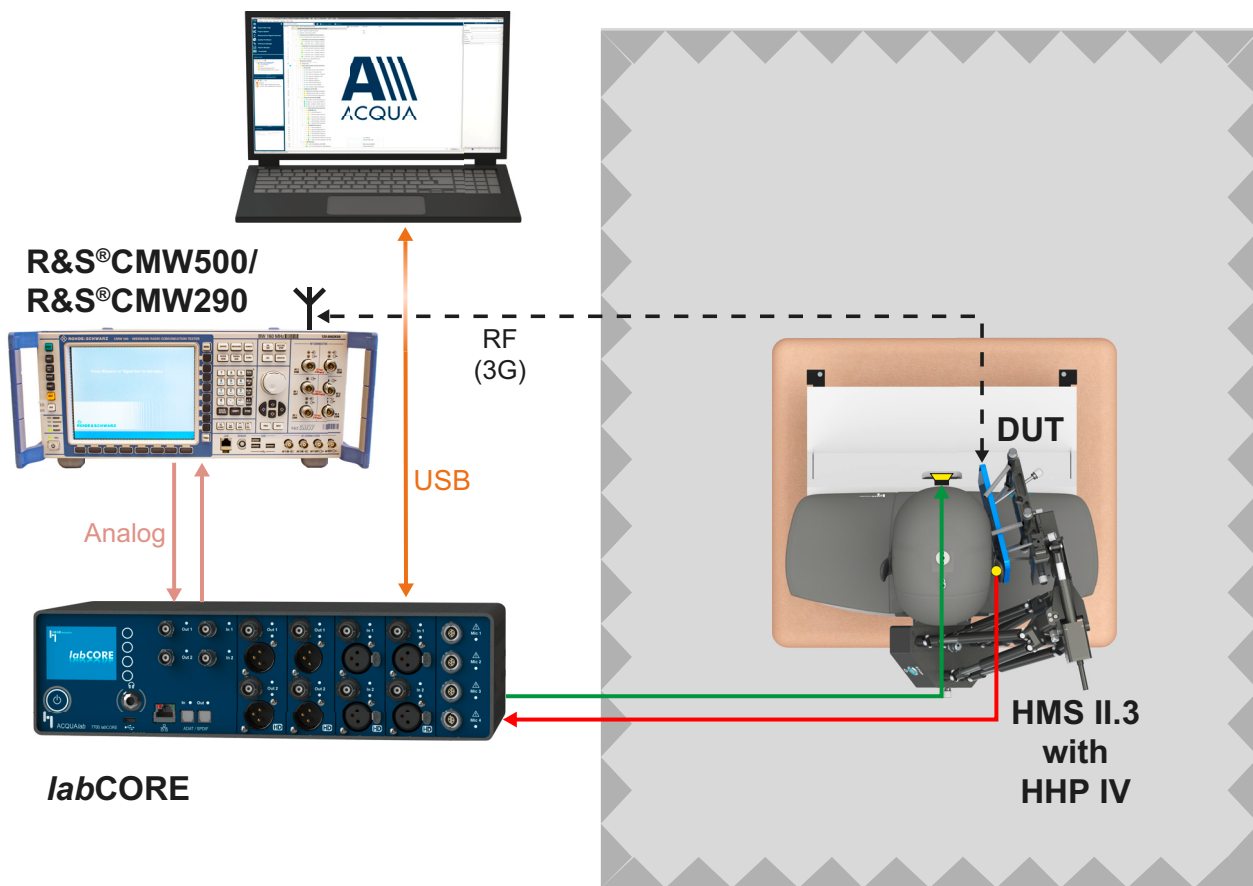
- R&S[®]CMW500
 - R&S[®]CMW-B400B
- R&S[®]CMW290
 - R&S[®]CMW-B400B

For detailed product configuration, please contact Rohde & Schwarz.

4.1.3 Third party equipment

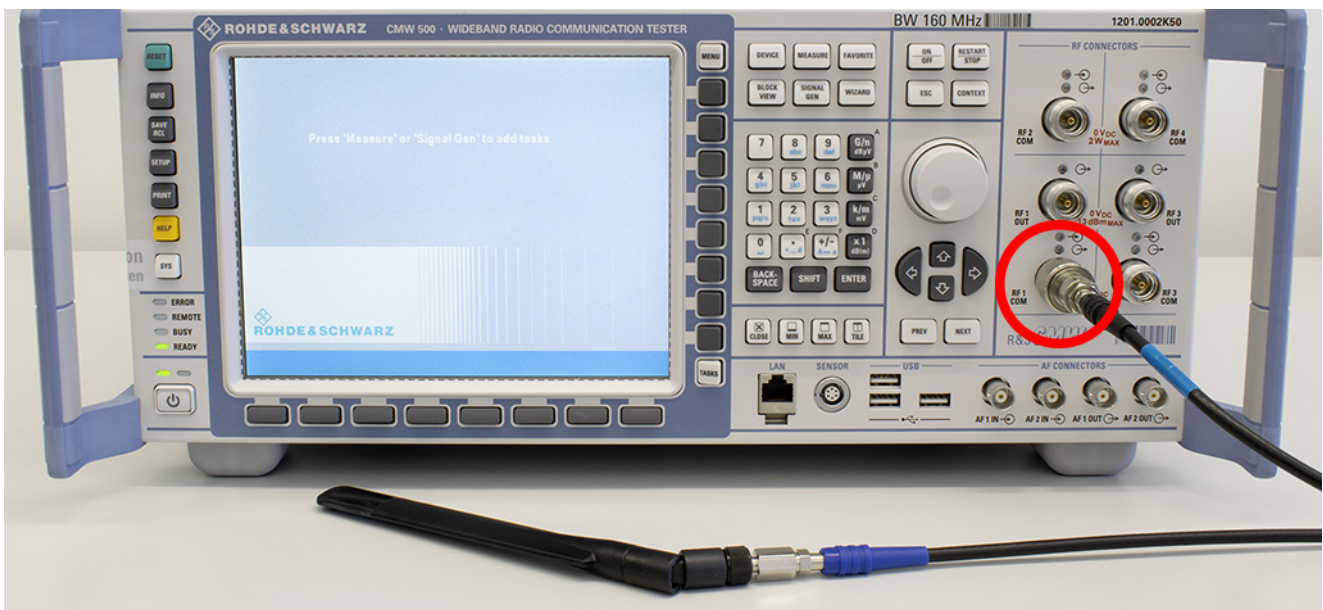
- 2 x BNC cable
- RF antenna
- PC for ACQUA software
- Device under test
- Test SIM card

4.2 Configuration overview (exemplary)



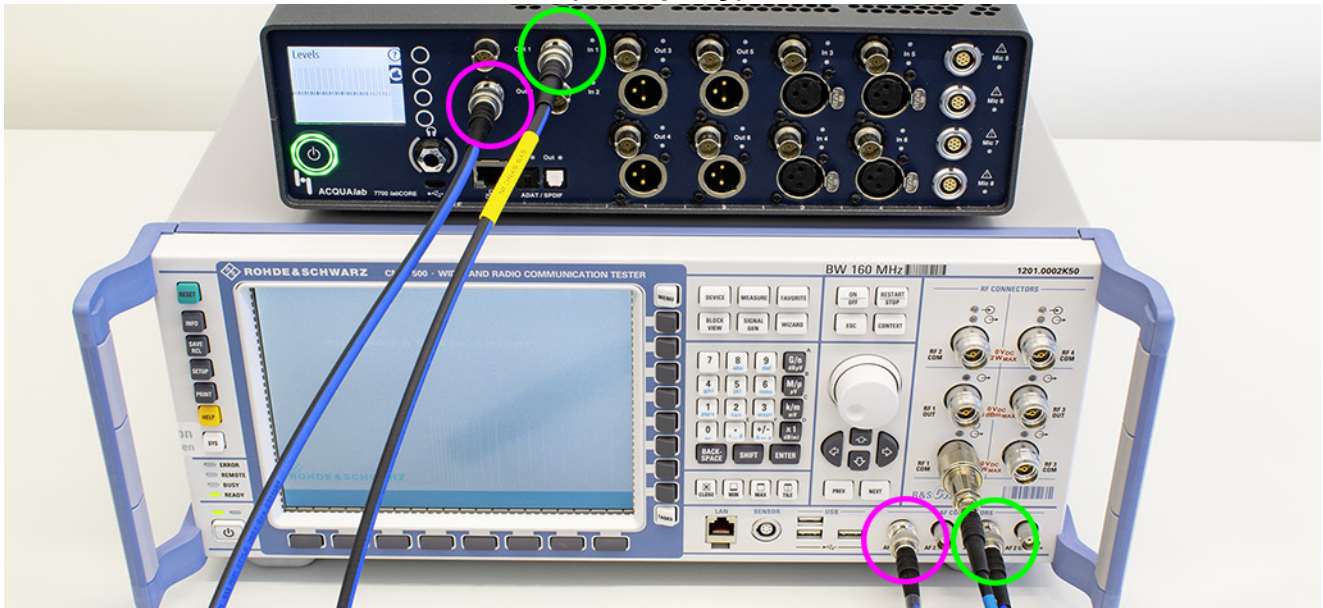
4.3 Cabling

4.3.1 Antenna



Attach the antenna to one of the provided COM connectors, e.g. RF1 COM.

4.3.2 *labCORE* to R&S®CMW-B400B (exemplary)



- Connect one analog output of *labCORE* with one audio frequency (AF) input of R&S®CMW-B400B using a BNC cable.
- Connect one analog input of *labCORE* with one audio frequency (AF) output of R&S®CMW-B400B using a BNC cable.

4.4 Connection establishment

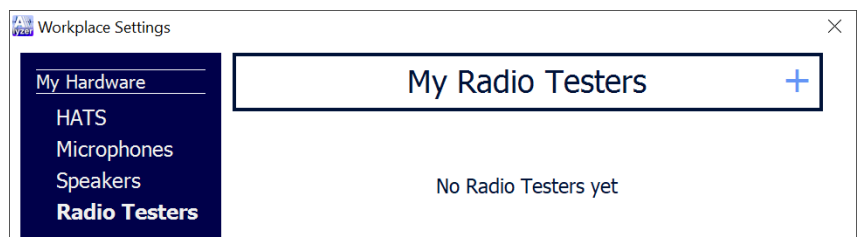
4.4.1 Preparations

- Interconnect the hardware according to chapter 4.2 and chapter 4.3
- Boot up R&S®CMW500/R&S®CMW290
- Boot up PC and start ACQUA
- Boot up *labCORE*
- Insert test SIM card into device under test and boot it up
- Set device under test offline

4.4.2 Hardware configuration

ACQUA

1. Go to Hardware Configuration.
2. Select Workplace settings.
3. Select My Hardware → Radio Testers.
4. Select +.



5. Enter customized parameters.
6. Set **Encoder calibration** → 0 dB.
7. Set **Decoder calibration** → 0 dB.
8. Select **Close**.

RadioTester Settings

General

Type

Nickname

Serial number

Comment

Calibration

Encoder calibration

Decoder calibration

Calibration state

Date of calibration

9. Select **Assignments** → **Radio Testers**.
10. Select **+**.

Workplace Settings ×

My Hardware

HATS

Microphones

Speakers

Radio Testers

Assignments

HATS

Microphones

Speakers

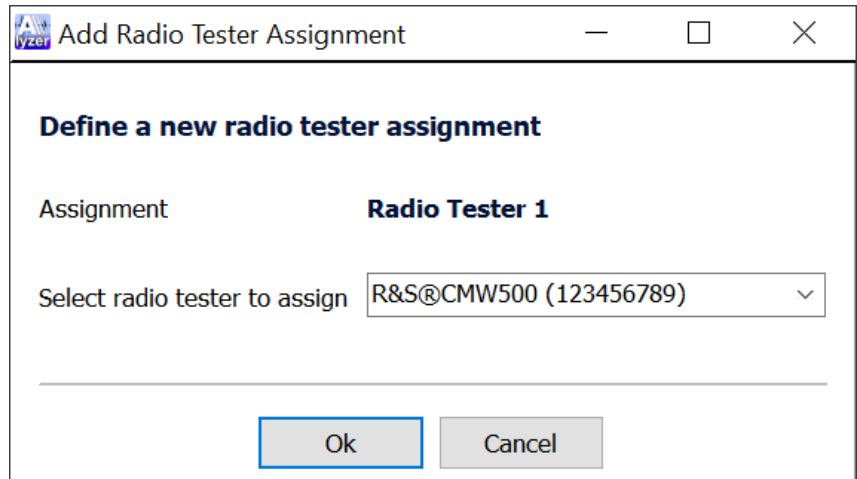
Radio Testers

Radio Tester assignments

+

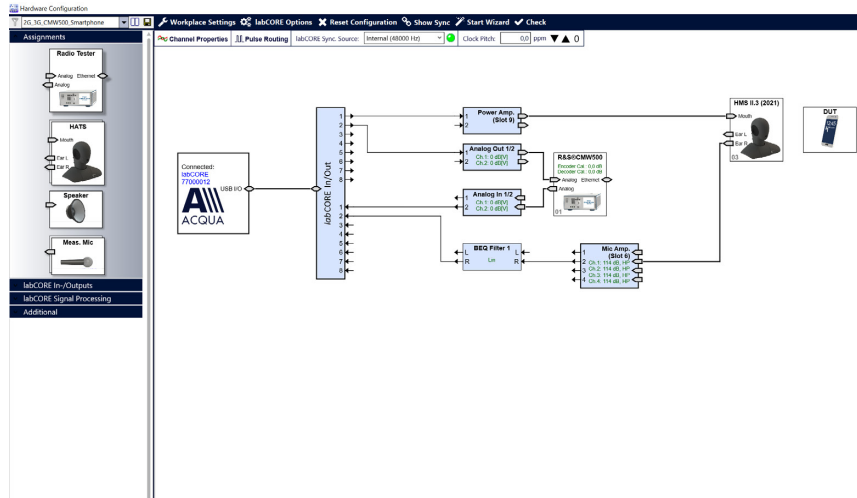
No Radio Tester assignments yet

11. Select specified radio tester from the drop-down list.
12. Select **OK**.
13. Close **Workplace settings**.



14. Set up customized configuration.
15. Drag and drop the blocks from the left selection area into the right configuration area. Interconnect the blocks according to the applied connections.

Alternatively, use the **Hardware Configuration Wizard**.



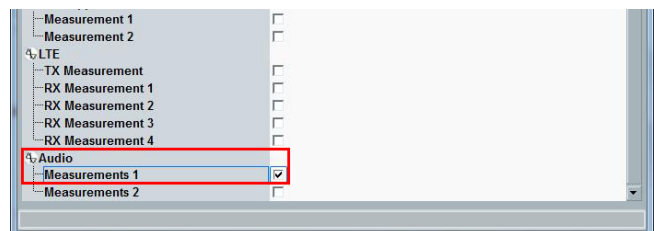
4.4.3 Configuration of 3G network

R&S®CMW500/R&S®CMW290

1. Press the **Measure** key.



2. Go to section **Audio**.
3. Enable **Measurements 1**.



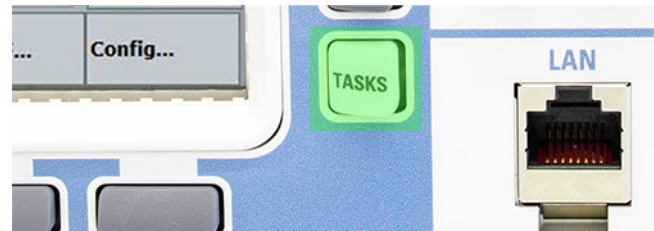
4. Press the **Signal Gen** key.



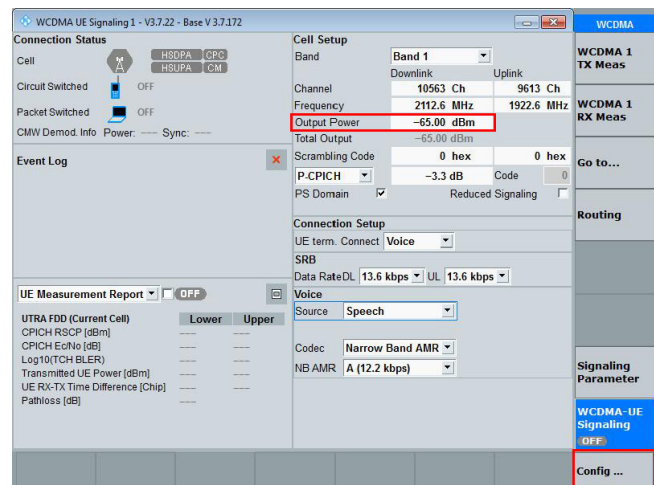
5. Go to section **WCDMA FDD UE**.
6. Enable **Signaling 1**.



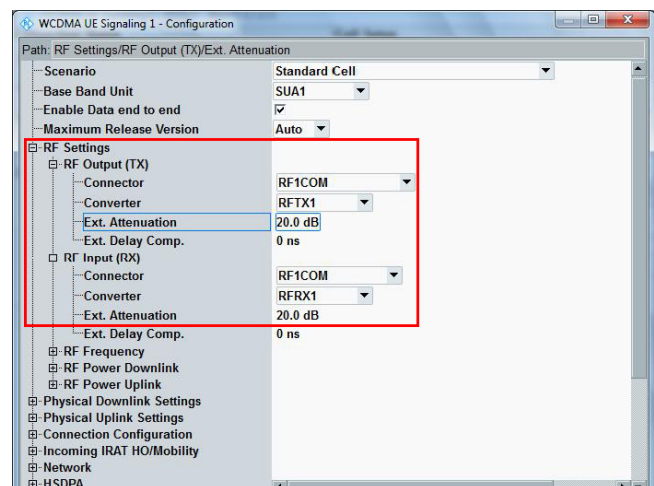
7. Press the softkey **Tasks**.
8. Open **WCDMA UE Signaling 1** at the bottom menu bar by hotkey.



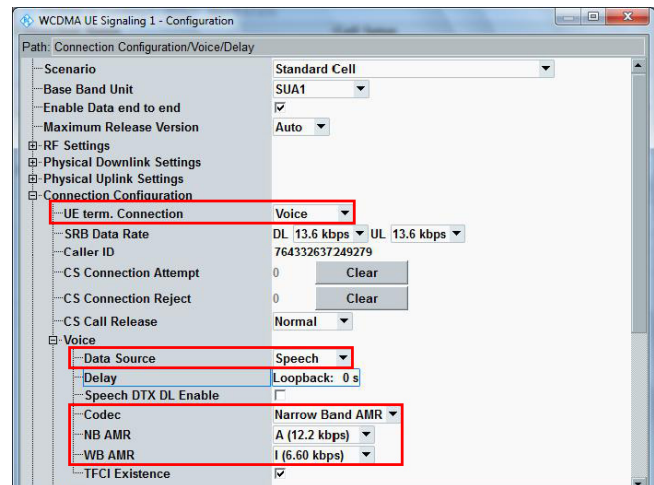
9. Set **Output Power** to **-65 dBm**.
10. Open **Configuration** at the bottom menu bar by hotkey and continue with the advanced settings.



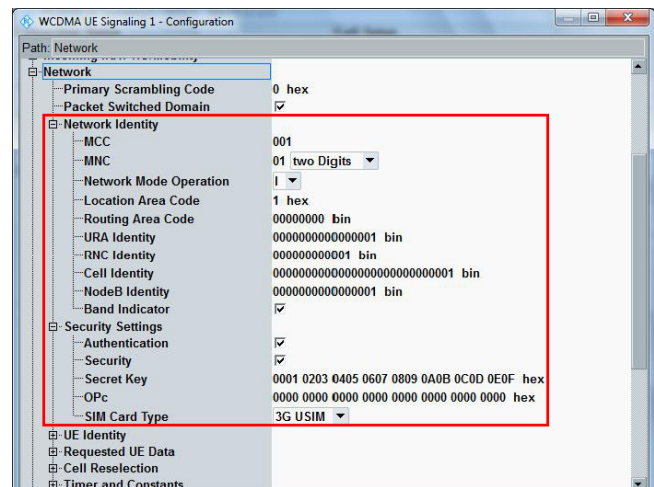
11. Go to section **RF settings**.
12. Set **RF Output (TX)** → **External Attenuation** according to the technical specification of the applied antenna and antenna cable.
13. Set **RF Input (TX)** → **External Attenuation** according to the technical specification of the applied antenna and antenna cable.



14. Go to section **Connection Configuration**.
15. Set **UE term. Connection** to **Voice**.
16. Set **Voice** → **Data source** to **Speech**.
17. Set **Voice** → **Codec** as desired.



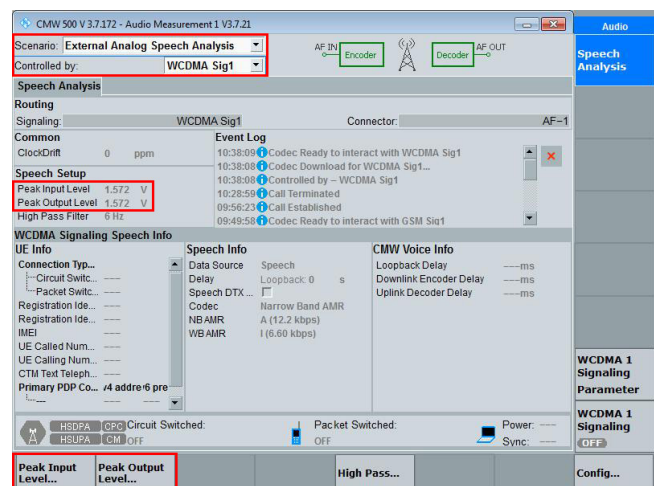
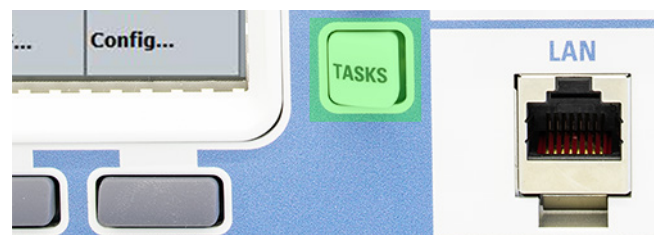
18. Go to section **Network** → **Network Identity**.
19. Set appropriate values for **MCC** and **MNC** according to the applied SIM card. The Rohde & Schwarz SIM card requires **MCC** → 001 and **MNC** → 01.
20. Go to section **Network** → **Security Settings**.
21. Set **Security Settings** according to the applied SIM card.
22. Close the **Configuration** window.



4.4.4 Generation of 3G network and call establishment

R&S® CMW500/R&S® CMW290

1. Press the **Tasks** key and switch to **Audio Measurement 1** by hotkey.
2. Go to **Scenario** and select **External Analog Speech Analysis**.
3. Go to **Routing** and confirm **Controlled by GSM Sig1**.
4. Open **Input Level (FS-Peak)** by hotkey.
5. Set **Input Level (FS-Peak)** to 1.572 V.
6. Open **Output Level (FS-Peak)** by hotkey.
7. Set **Output Level (FS-Peak)** to 1.572 V.



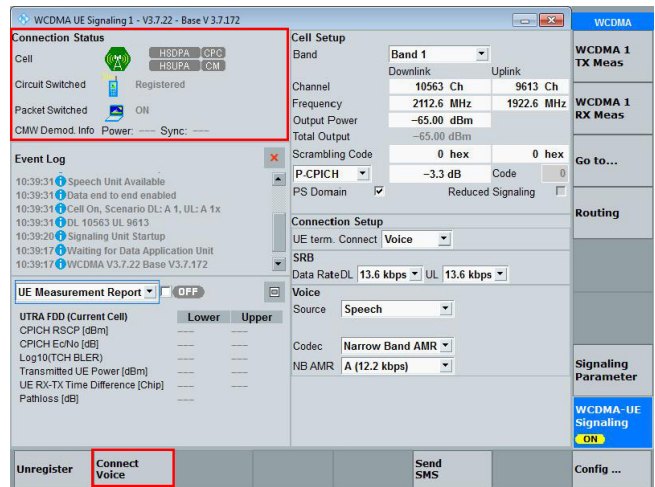
8. Press the **Tasks** key and switch to **WCDMA UE Signaling 1** by hotkey.
9. Set device under test online.



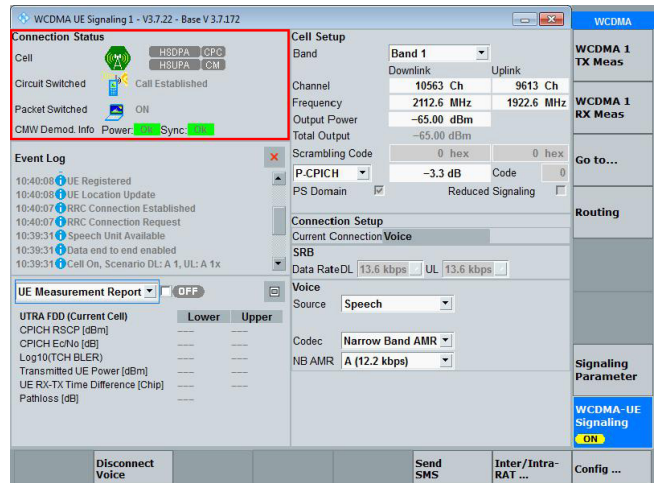
10. Press the **On/Off** key to enable **WCDMA 1 Signaling**.



11. Position the RF antenna close to the device under test.
12. The device under test registers automatically to the 3G network of R&S[®]CMW500/R&S[®]CMW290.
13. Establish the call between R&S[®]CMW500/R&S[®]CMW290 and device under test. Select **Connect Voice** by hotkey.
14. Accept the incoming call at the device under test.



15. Confirm the successful call establishment in **Connection Status**.



16. Set **CMW Voice Info** to get the downlink and uplink delay of R&S[®]CMW500/R&S[®]CMW290.

The screenshot displays the WCDMA UE Signaling 1 - V3.7.22 - Base V 3.7.172 interface. The 'CMW Voice Info' section is highlighted with a red box, showing the following values:

Parameter	Value
Loopback Delay	--ms
Downlink Encoder Delay	134ms
Uplink Decoder Delay	121ms

The interface also shows various other settings and status indicators:

- Connection Status:** HSDPA, HSPA, HSPA+, HSPA+ (Ch), Call Established.
- Cell Setup:** Band 1, Downlink 10563 Ch, Uplink 9613 Ch, Frequency 2112.6 MHz, Output Power -65.00 dBm, Total Output -65.00 dBm.
- Event Log:** 10:40:08 UE Registered, 10:40:08 UE Location Update, 10:40:07 RRC Connection Established, 10:40:07 RRC Connection Request, 10:39:31 Speech Unit Available, 10:39:31 Data end to end enabled, 10:39:31 Cell On, Scenario DL:A 1, UL:A 1x.
- Connection Setup:** Current Connection Voice, SRB, Data Rate DL 13.6 kbps, UL 13.6 kbps.
- Voice:** Source Speech, Codec Narrow Band AMR, NB AMR A (12.2 kbps).
- Buttons:** Disconnect Voice, Send SMS, Inter/Intra-RAT ..., Config ...