Acoustic Verification System (AVS)

CMU and Rohde & Schwarz CMW 500 Hardware User Manual

Spirent Communications
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Document Version: 3.0

Contents

1 Introduction

Spirent Communications AVS is a software and hardware system for use in measuring the end to end quality of mobile devices.

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Version	Author	Notes
1.0	Metrico	Initial draft.
2.0	Andrew Boyden	
3.0	Andrew Boyden	Addition of the R&S CMU 500

2 Initial setup of CMU.

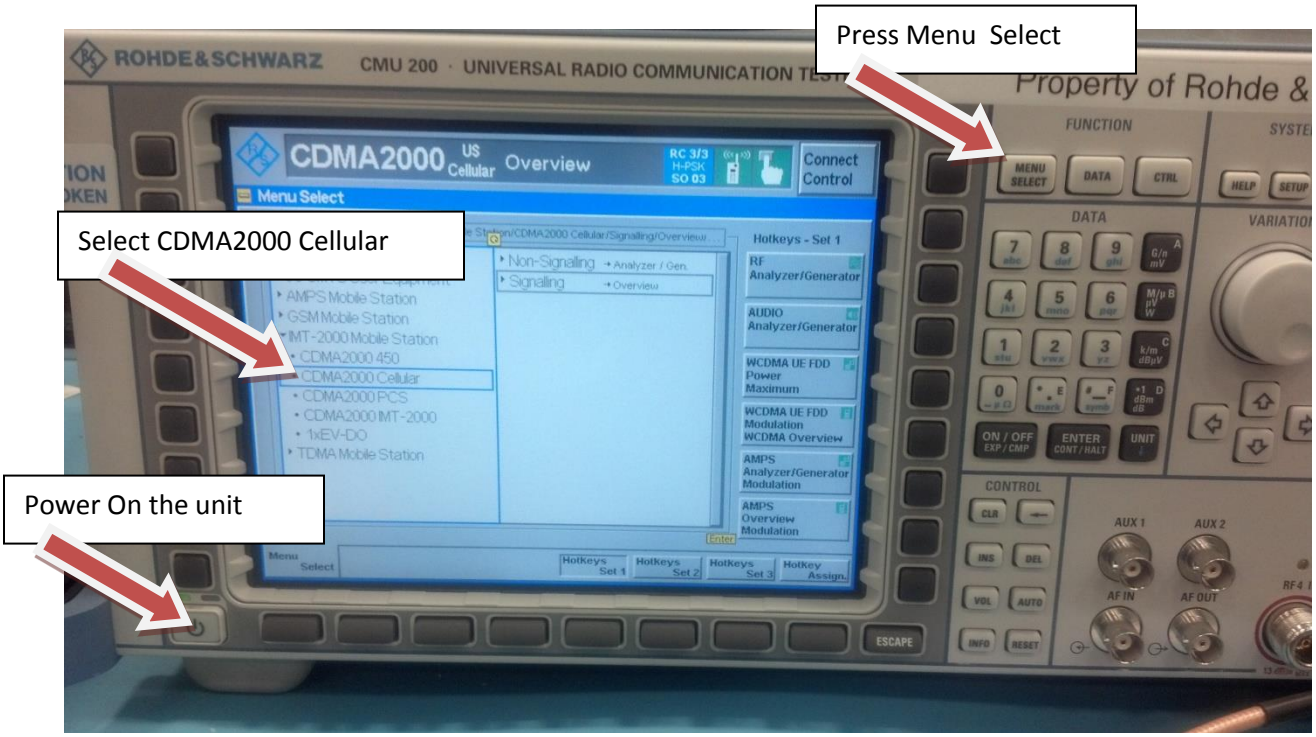

Figure 2-1 - CMU Front Panel

1. Turn on the CMU 200.
2. Press “Menu Select”.
3. Expand IMT-2000 Mobile Station.
4. Select “CDMA2000 Cellular”.
5. When done, press the “BS Signal” tab.

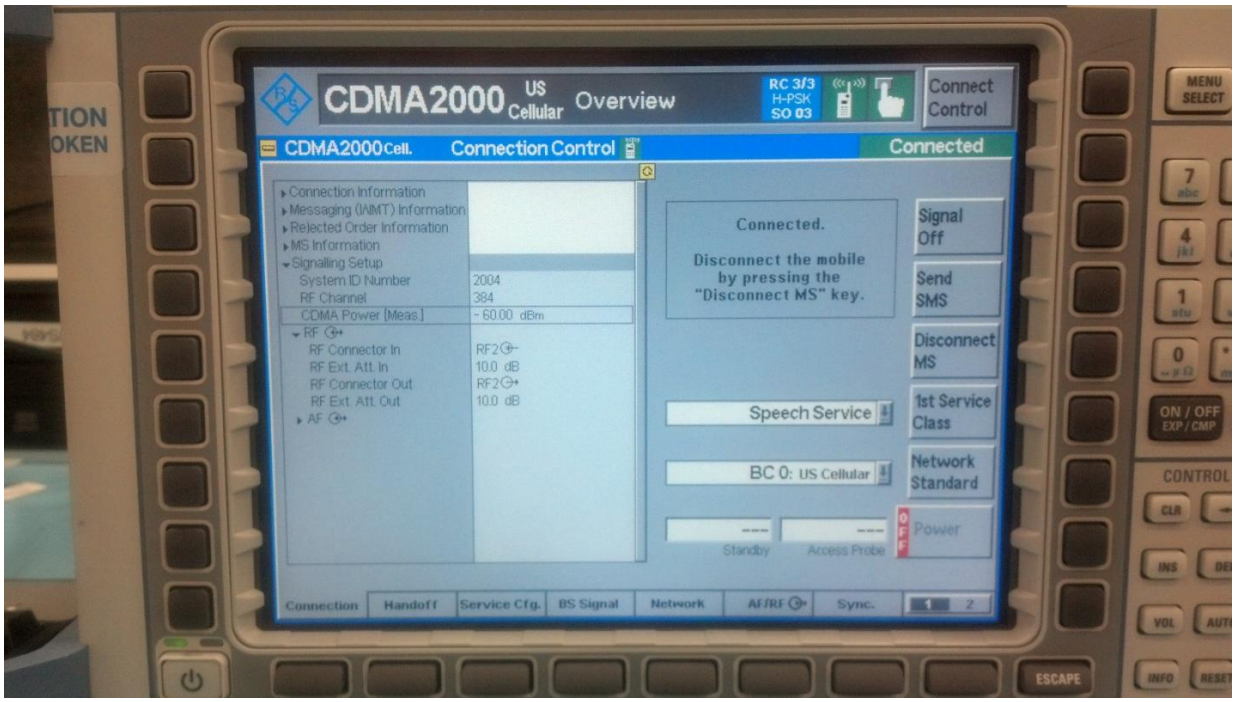

Figure 2-2 – Overview Screen

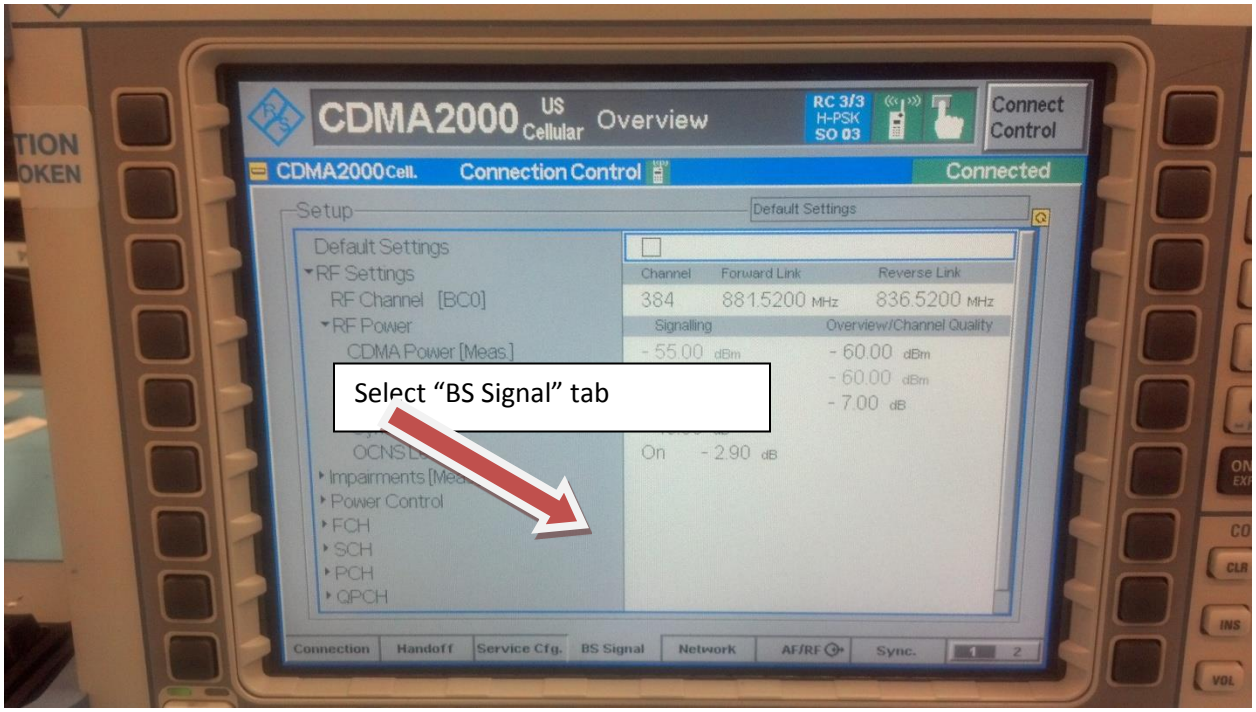

Figure 2-3 – BS Signal Tab

6. Under "BS Signal" tab Set channel to 384.
7. Set CDMA Power to -55 dBm.

8. Set the rest of the parameters to match the previous picture..
9. When done press, “Network” tab button.

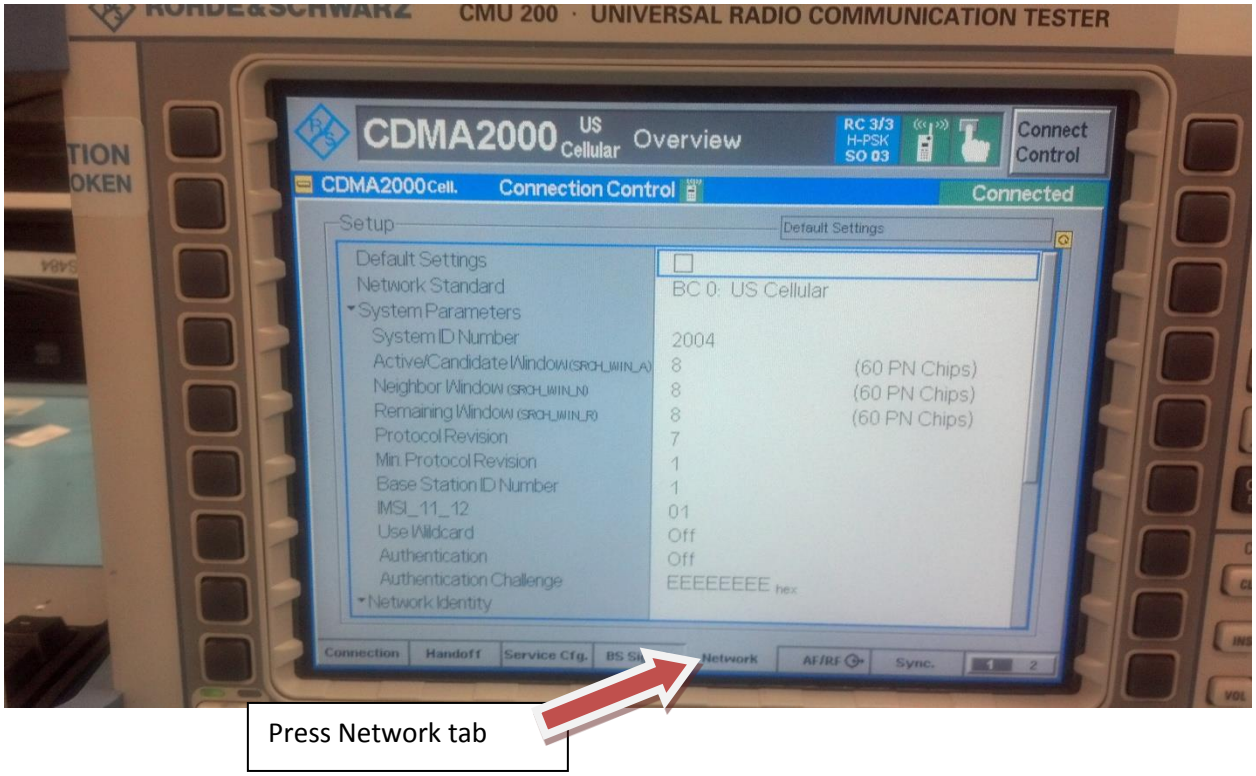

Figure 2-4 – Press Network Tab

10. Under the Network Tab expand the System Parameters tree.
11. Set System ID Number to 2004.
12. Set the rest of the parameters to match the picture above.
13. Expand the Network Identity tree.

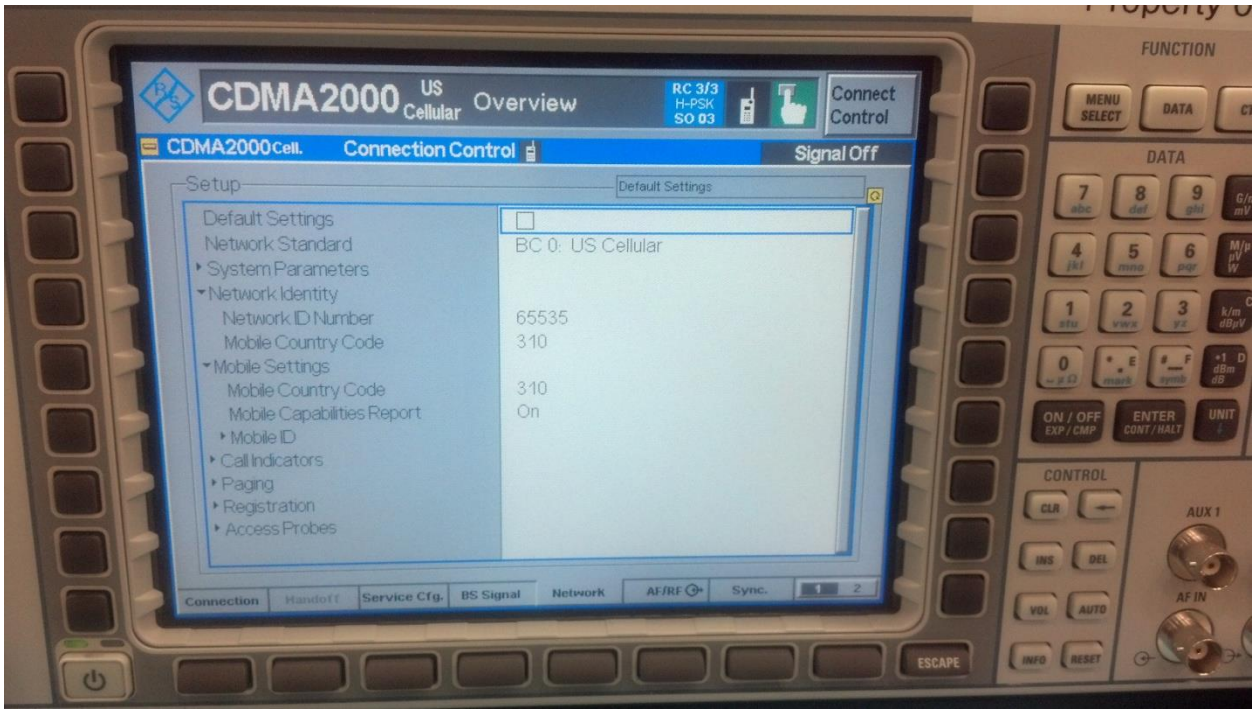

Figure 2-5 – Network Identity Tree

14. Under the Network Identity tree:
    - Set the Network ID Number to 65535.
    - Set the Mobile Country Code to 310.
    - Expand the Mobile Settings tree.
15. Under the Mobile Settings tree
    - Set the Mobile Country Code to 310.
    - Set the Mobile Compatibilities Report to On.
16. Move to AF/RF settings tab.

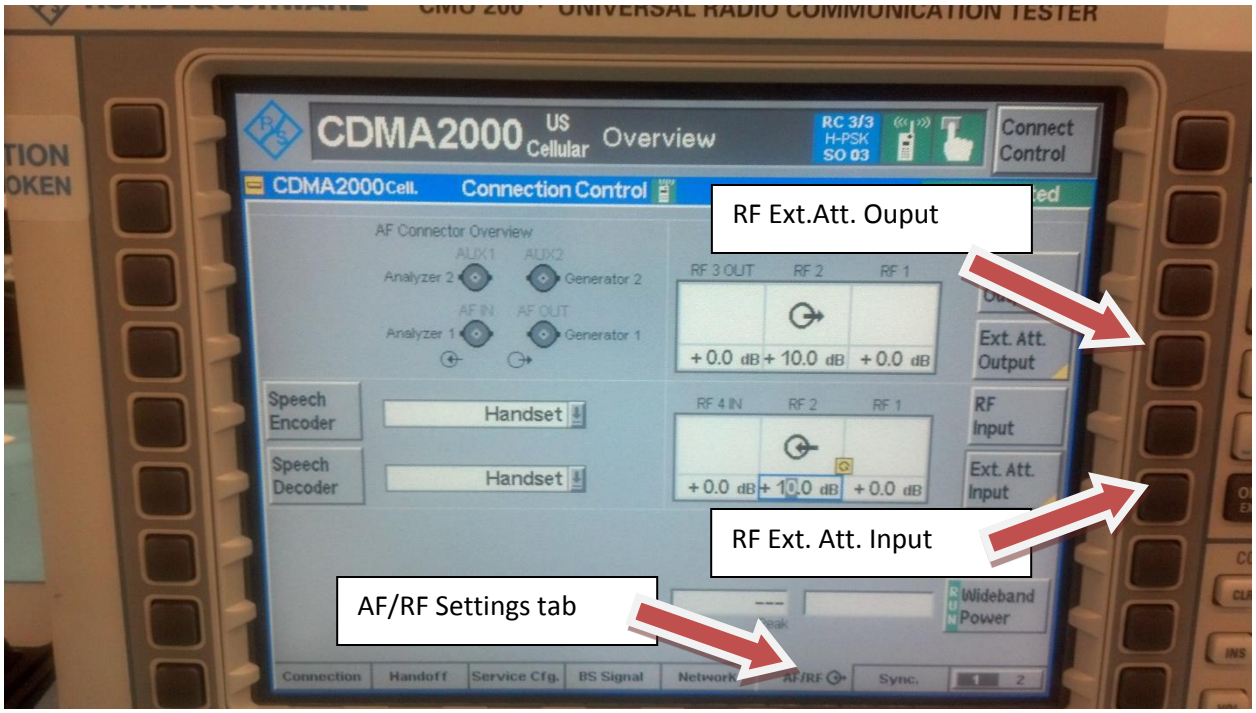

Figure 2-6 – RF Setting Tab

17. Set RF output to “RF 2”.
18. Press the “Ext. Att. Output” button.
19. Set RF external attenuation output to +10.0 dB.
20. Press the “Ext. Att. Output” button.
21. Set RF external attenuation input to +10.0 dB.
22. Set Speech Encoder to Handset.
23. Set Speech Decoder to Handset.
24. Move on to the “Service Cfg.” settings tab.

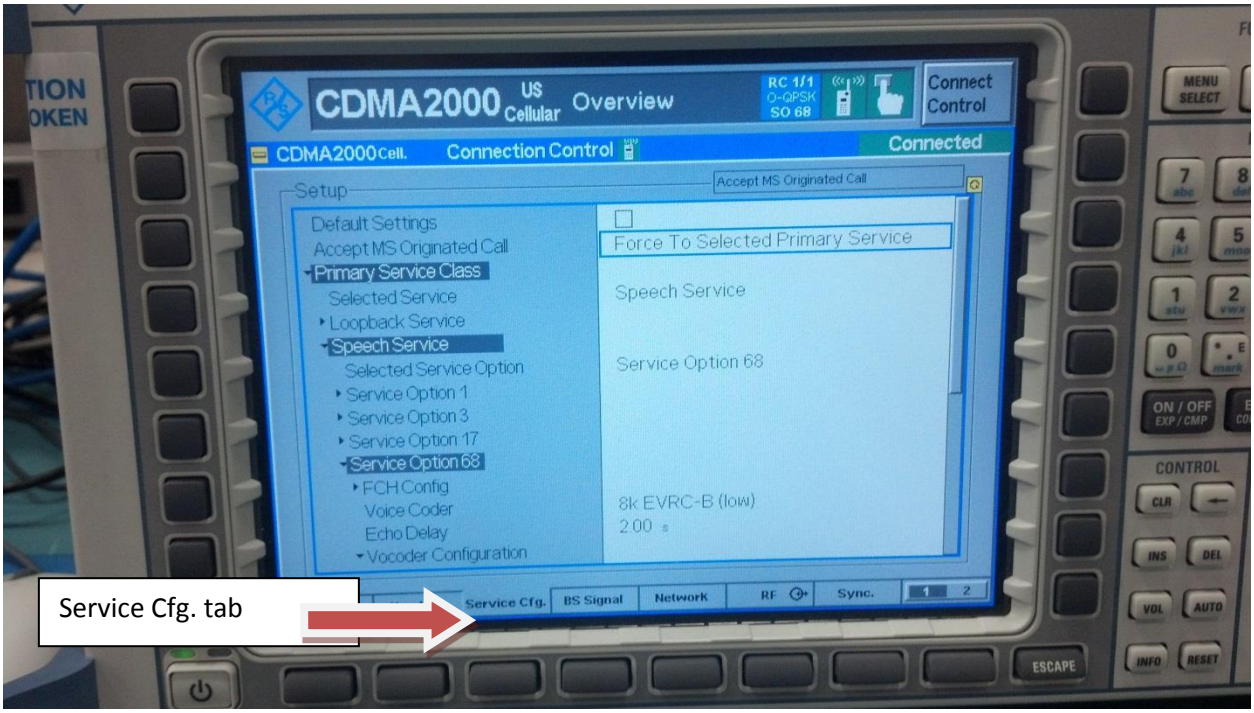

Figure 2-7 – Service Configuration Tab

25. Always enable R/C3/3.
26. Expand the Primary Service Class tree.
27. Expand Service Option 68 tree.
28. Set the Voice Coder to “8k EVRC-B (low)”.

WARNING: if Voice Coder option is non-changeable and says “Echo”, the CMU you are using does NOT support 8k EVRC-B voice coding and can NOT be used with AVS. Please contact R&S or obtain a CMU that supports this feature.

29. Expand the Vocoder Configuration tree.
    - Set the Average Encoding Rate to 6.6 kbps.
    - Click “Execute” on the Initialize Vocoder if necessary.
30. Set the “Selected Service Option” to Service Option 68.
31. Select “Accept MS Originated Call”. Set it to “Force To Selected Primary Service”.
32. Move on to the “Connections” tab.

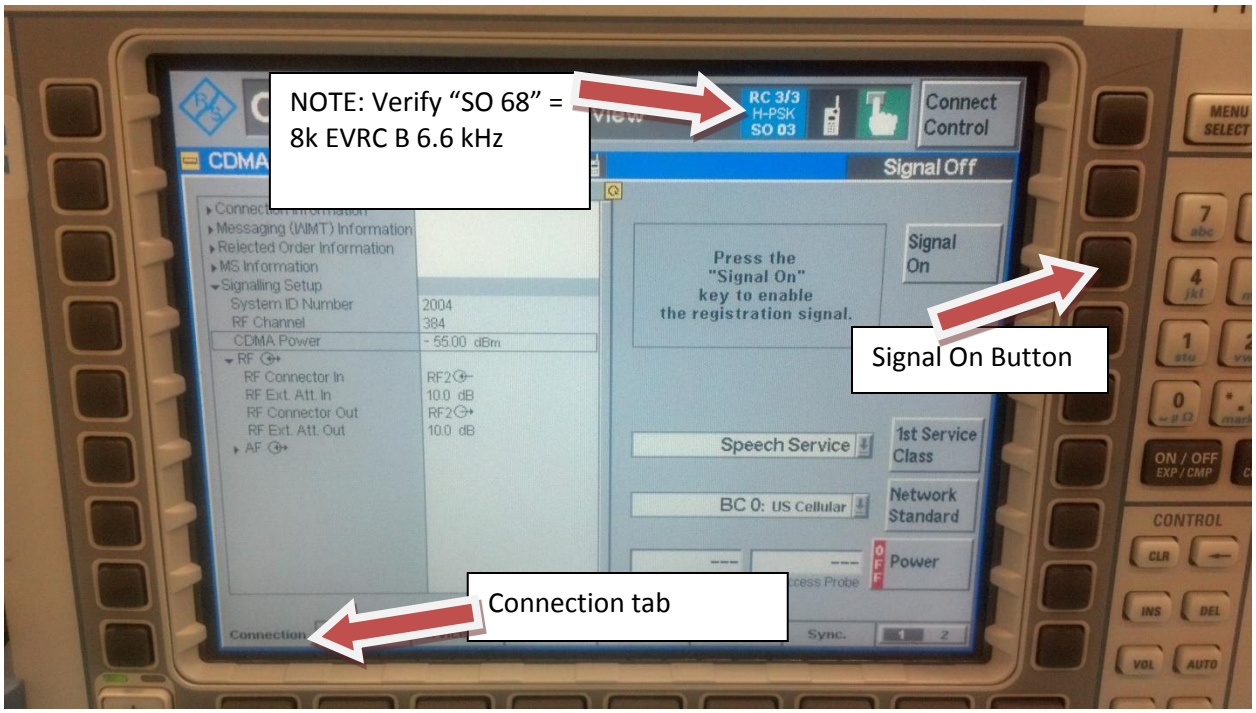

Figure 2-8 – Connection Tab

2.1 CDMA 2000 Signaling Configuration

3 Preparing a device for testing

1. Insert the special Verizon test SIM card.

Note: This card will force the device to only register to the CMU-200 network emulator (instead of a live base station)

2. Place the provided “AVS Alignment Sticker” on the phone in the following images.

Figure 3-1 - Sticker Placement

WARNING: Verify that the large hole on the alignment sticker completely covers the handset’s earpiece and that none of the handset’s earpiece is obstructed.

More examples of the proper way to place the “AVS Alignment Sticker” on the phone:

Figure 3-2 – AVS Sticker Placement

Note: The large hole on the alignment sticker completely covers the handset’s earpiece and that none of the handset’s earpiece is obstructed.

Warning: Ensure the device is set to maximum volume.

4 CDMA setup of the R&S CMU200

1. Place the device inside the AVS chamber.
2. Close the chamber door.
3. Verify that “Signal On” is the current status. **Signal On** will appear in the top right corner of the screen.
4. Verify that you are using Service Option 68. This can be done by looking at the top of the CMU screen “SO 68” = 8k EVRC B.
5. If the CODEC you wish to test is not shown above, please return to the “Service Cfg.” Tab and follow the instructions that are pertinent to the CODEC you wish to test.

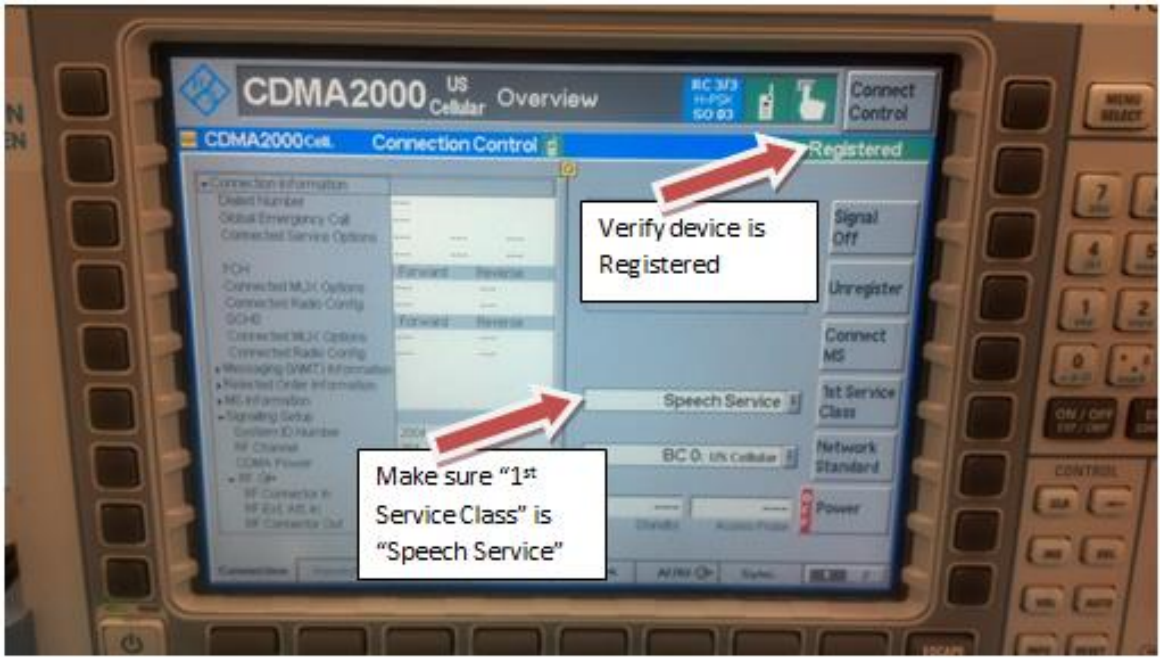

Figure 4-1 – Service Class

6. Verify “1st Service Class” is set to “Speech Service”.

Figure 4-2 - Sticker Placement

7. Wait for the CMU to “register” the phone.
8. **REGISTERED** will appear in the top right corner of the screen.

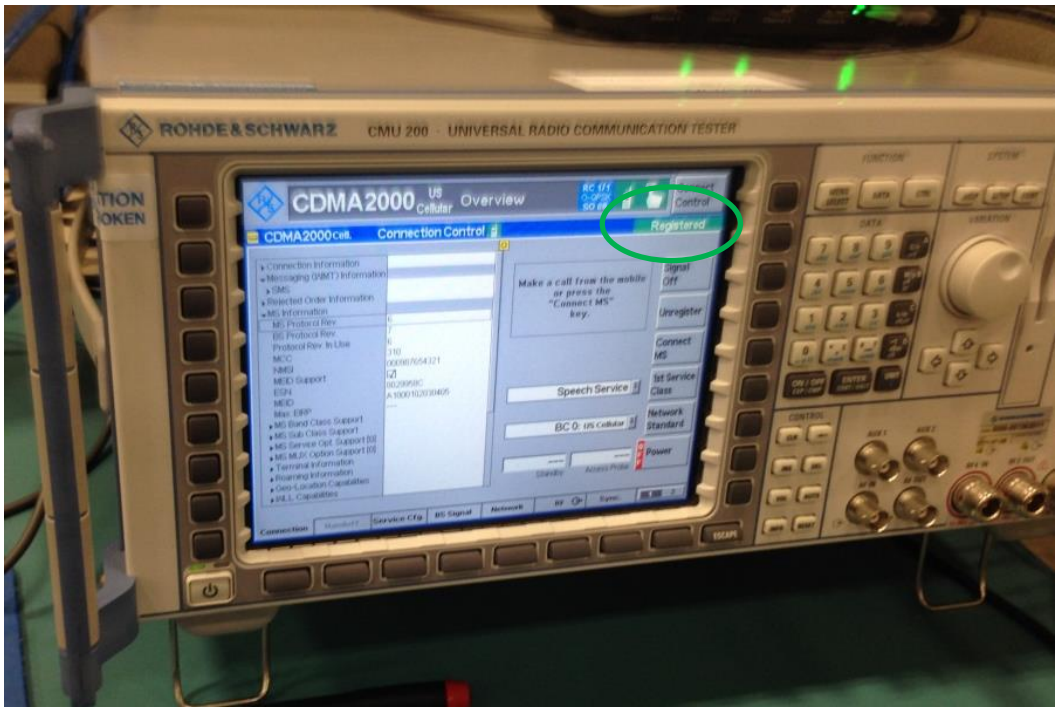

Figure 4-3 – Device Registration

9. When the device is registered, establish a call between the simulator and the UE.
10. Press the “Connect MS” button on the CMU. This will instruct the CMU to call the device under test. Within several seconds, the mobile will start to ring.
11. Open the AVS chamber.
12. Answer the call on the device.
13. Adjust the handset earpiece volume to maximum volume.

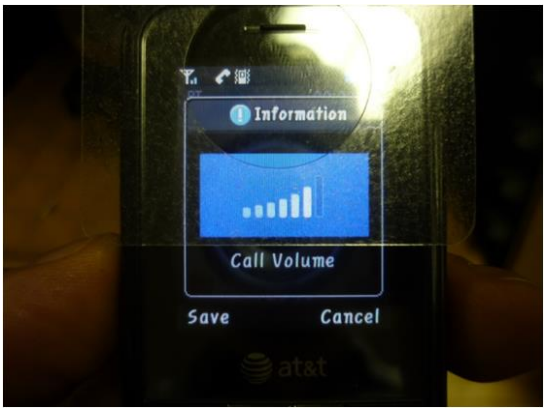

Figure 4-4 - Handset Volume Adjustment

Figure 4-5 - Fastening the Phone

14. Place the device onto the AVS alignment pins using the alignment sticker on the device.

Note: The device’s screen should be facedown.

15. The CMU screen will now look like the following screen.

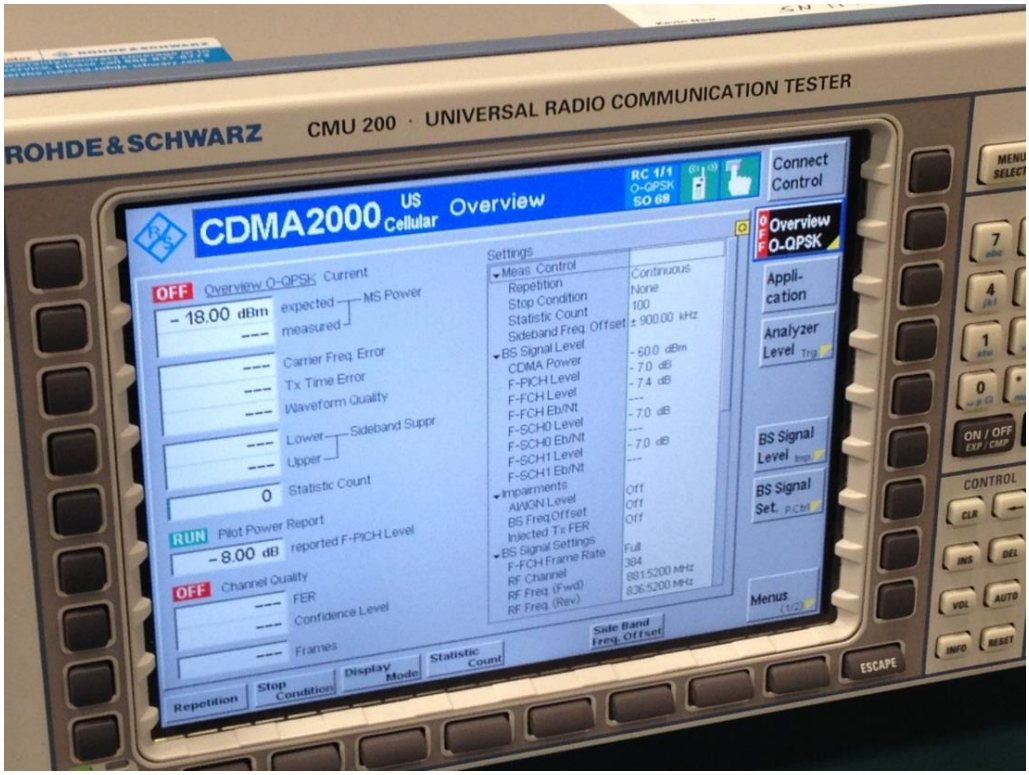

Figure 4-6 – CMU Screen

16. Turn on Q-QPSK..
17. Close the chamber door.

You are ready to execute an AVS test.

5 VoLTE setup of the R&S CMW 500

5.1 Powering Up the Box

Perform the following steps to establish the initial configuration of your Rhodes and Schwarz CMW500 unit.

1. Press the power button on the front panel as shown in the following image.

Figure 5-1 - CMW 500 Front Panel View

2. On the box, perform the following steps.

3. Click the power button. Wait for the system to cycle up. A splash screen displays prompting you to configure either measurements or the signal generator. Spirent Technologies recommends you configure the signal generator first.

5.2 Configuring the Signal Generator

1. Press the signal generator key (shown in the green circle) on the front panel and a screen like the following appears.

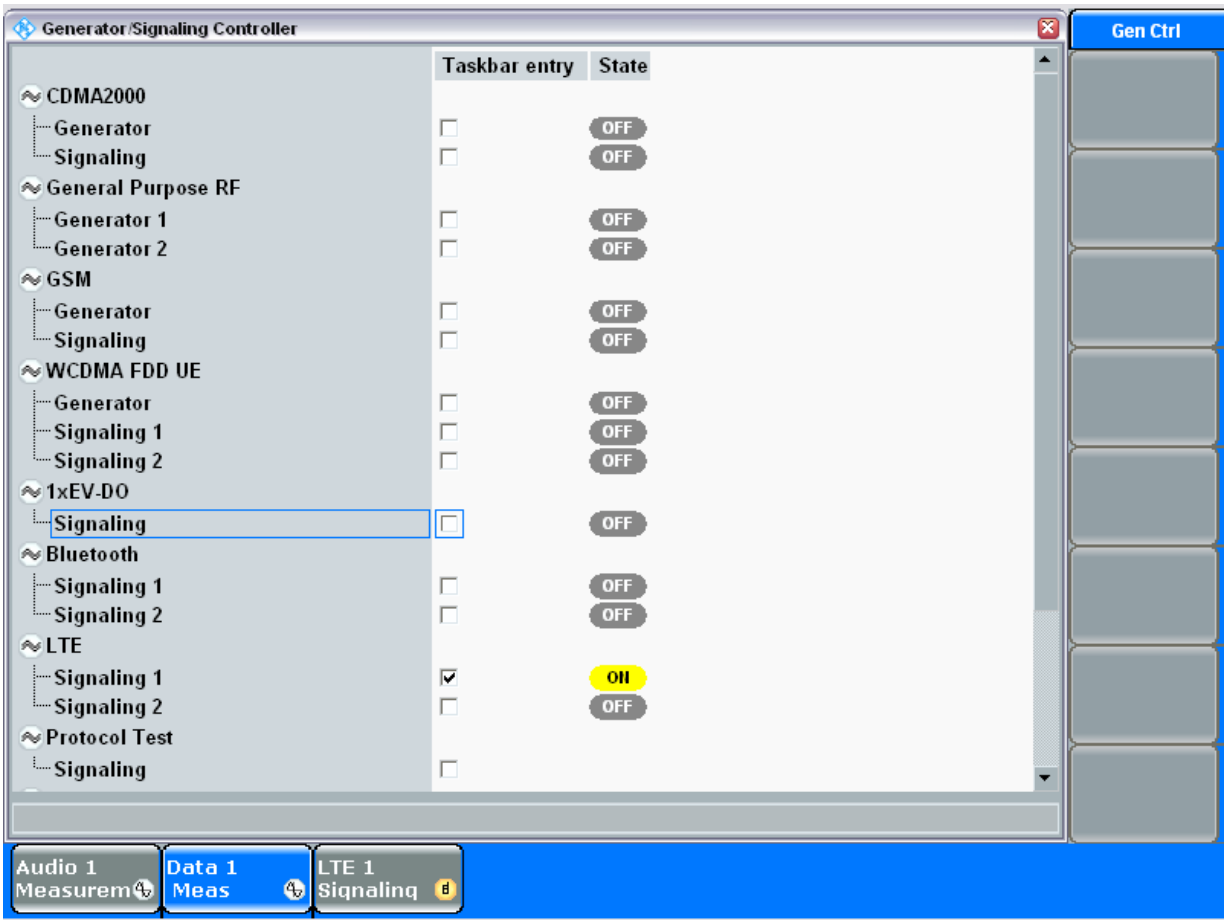

Figure 5-2 – Generator Signaling Controller

2. Set the LTE Signaling 1option to On (**checked**). At the bottom of the screen click the LTE 1 Signaling option and a screen like the following appears.

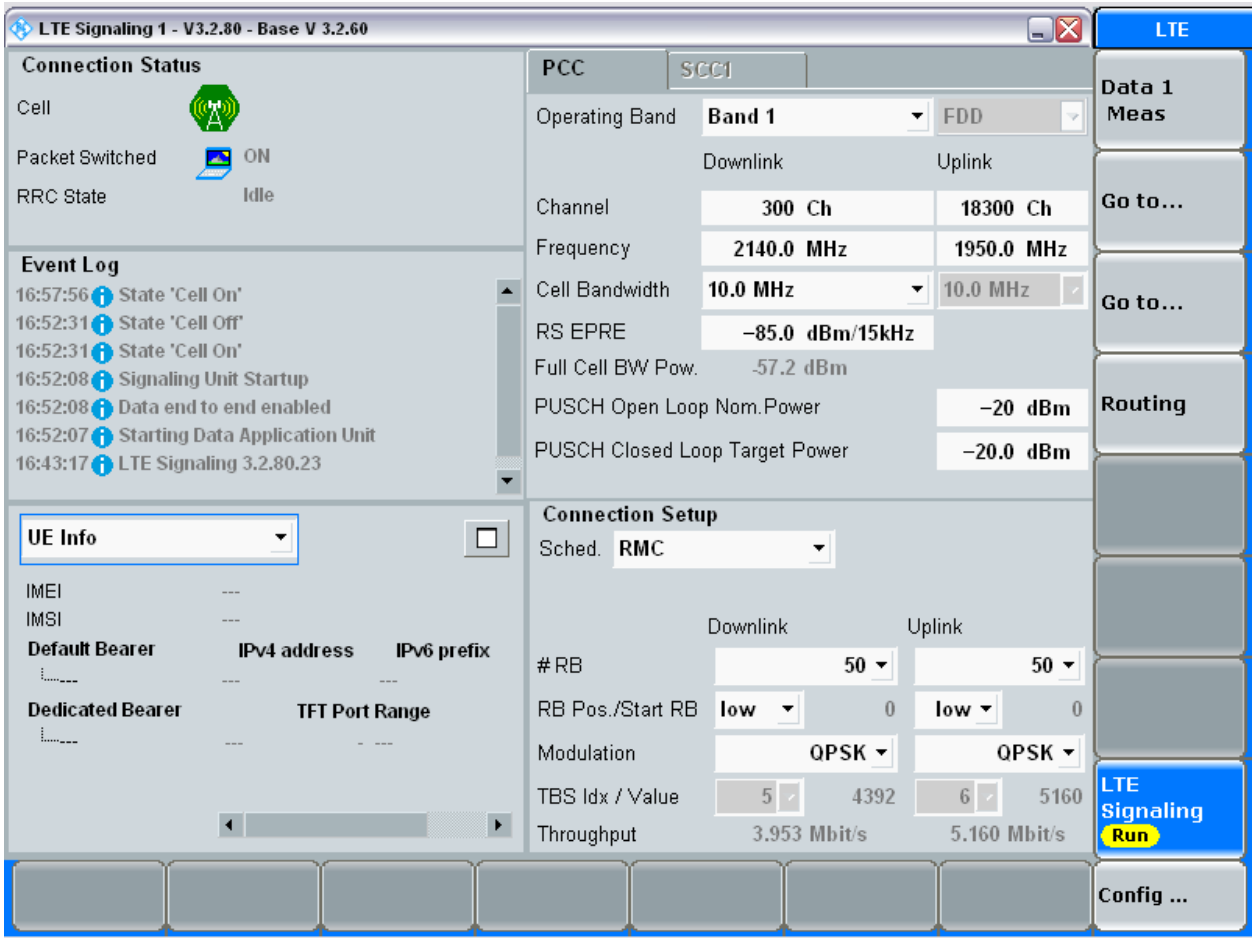

Figure 5-3 – LTE Signaling 1

3. Verify that the information on your screen matches exactly what is presented on this screen.
   Downlink Channel: 5230
   Uplink: 2320
   Cell Bandwidth: 10.0 MHz
   RS EPRE: -60.0 dBM 15kHz
   PUSCH Open Loop Nom power: 0 dBm
   PUSCH Closed Loop Target Power: 0.0 dBm
   Sched: RMS
   #RB Downlink: 50
   #RB Uplink: 50
   RB Pos/Start RB Downlink: low
   RB Pos/Start RB Uplink: low
   Modulation Uplink: OPSK
   Modulation Downlink: OPSK

4. When you are satisfied that all the information is exact, press the measurement button on the front panel of the unit and a screen like the following appears.

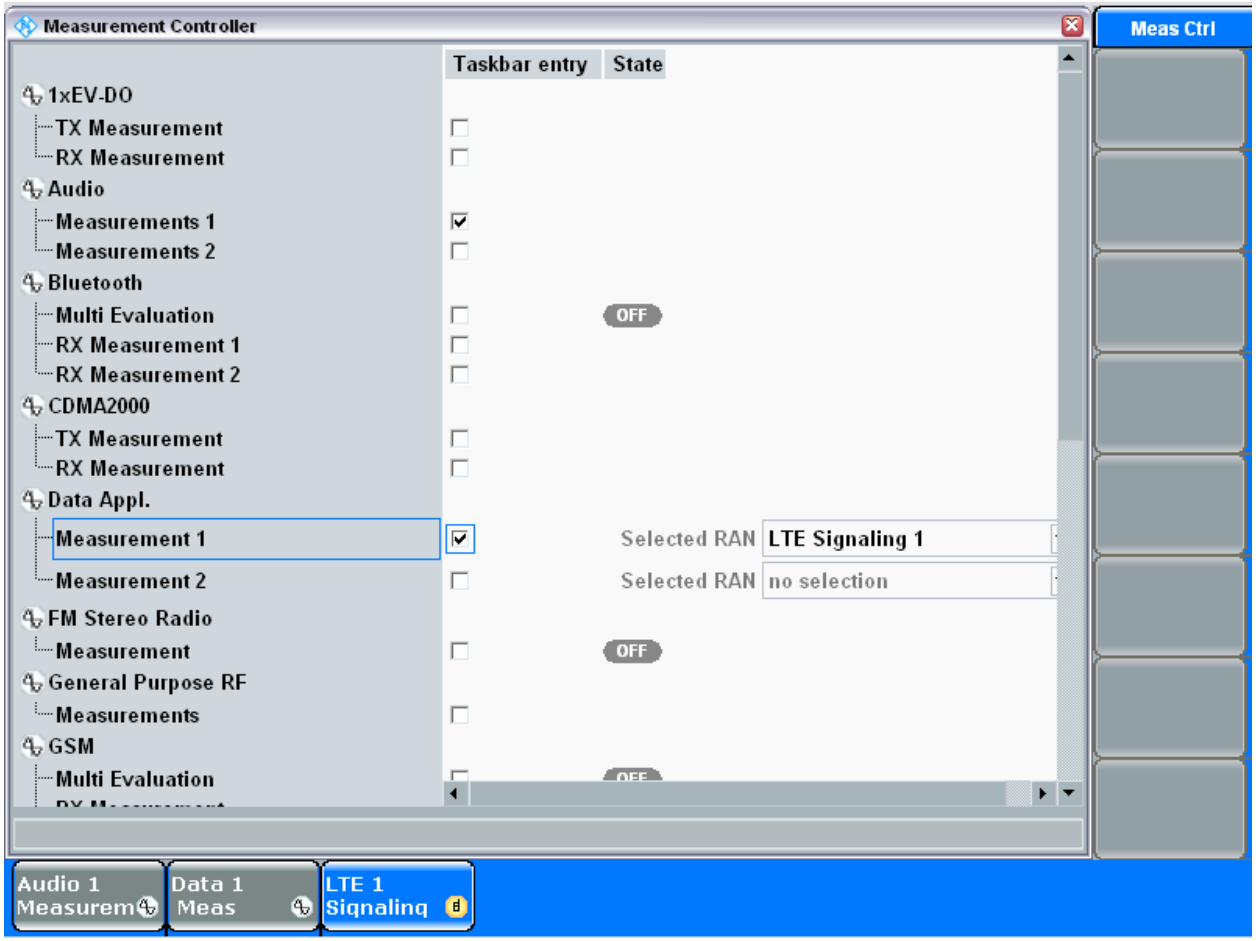

Figure 5-4 – Measurement Controller

5. Check the Data Appl, Measurement 1 option.

6. Select Audio Measurement 1 and the following screen displays.

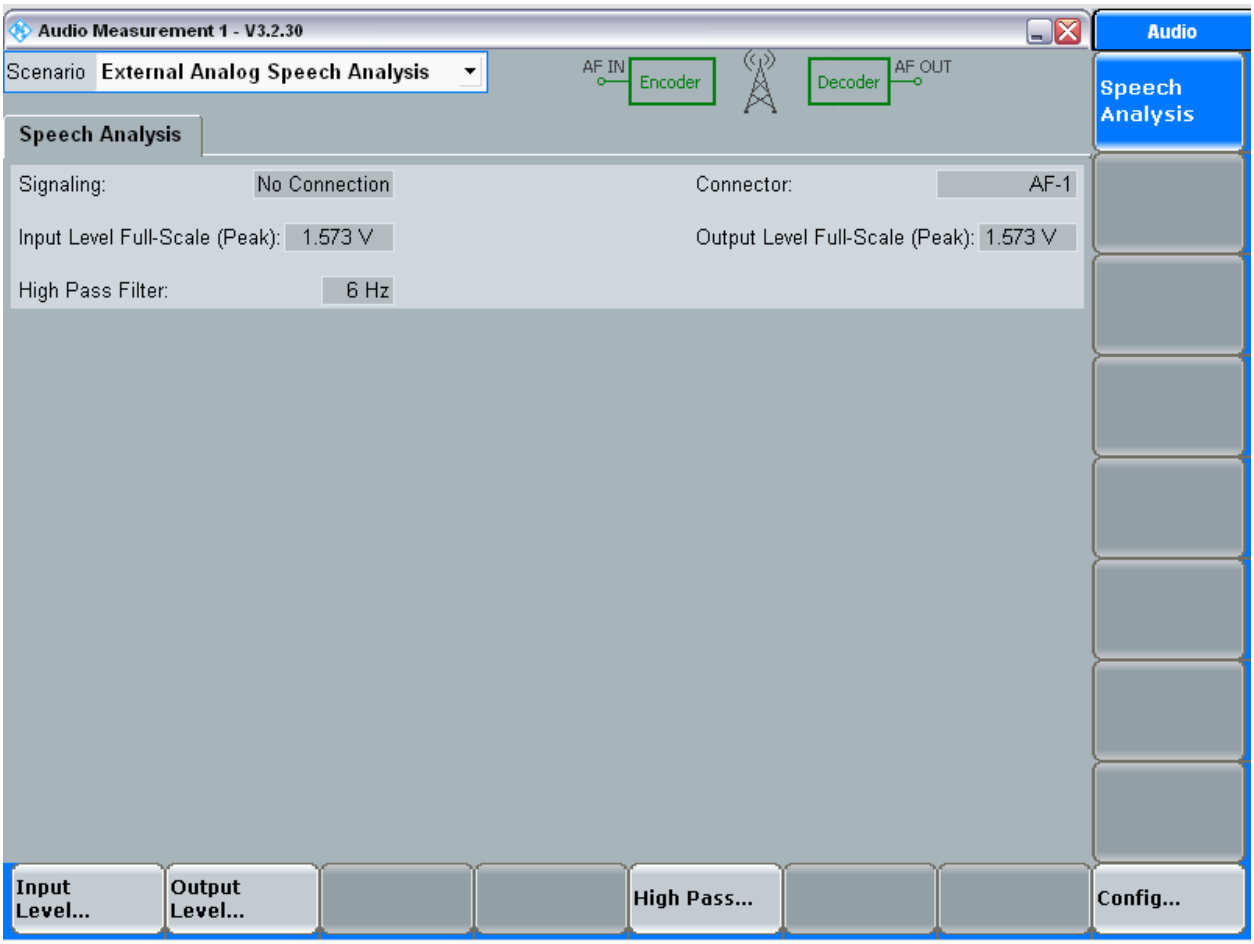

Figure 5-5 – Update Measurements

7. From this screen use the Scenario drop down option to select External Analog Speech Analysis and select External Analog Speech Analysis..

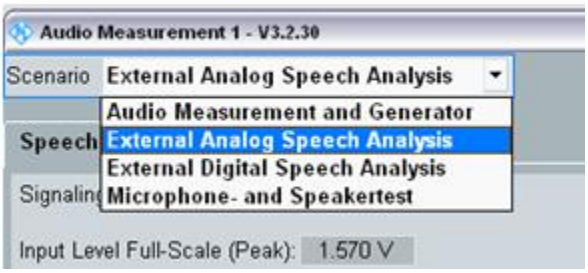

Figure 5-6 - Scenario

8. Verify that all the set values match what appears in this screen.

   Signaling: No Connection
   Input Level Full-Scale (Peak): 1.573V
   High Pass Filter: 6 Hz
   Connector: Af-1

Output Level Full-Scale (Peak): 1.573 V

9. Click LTE **Signaling 1** and the following screen displays.

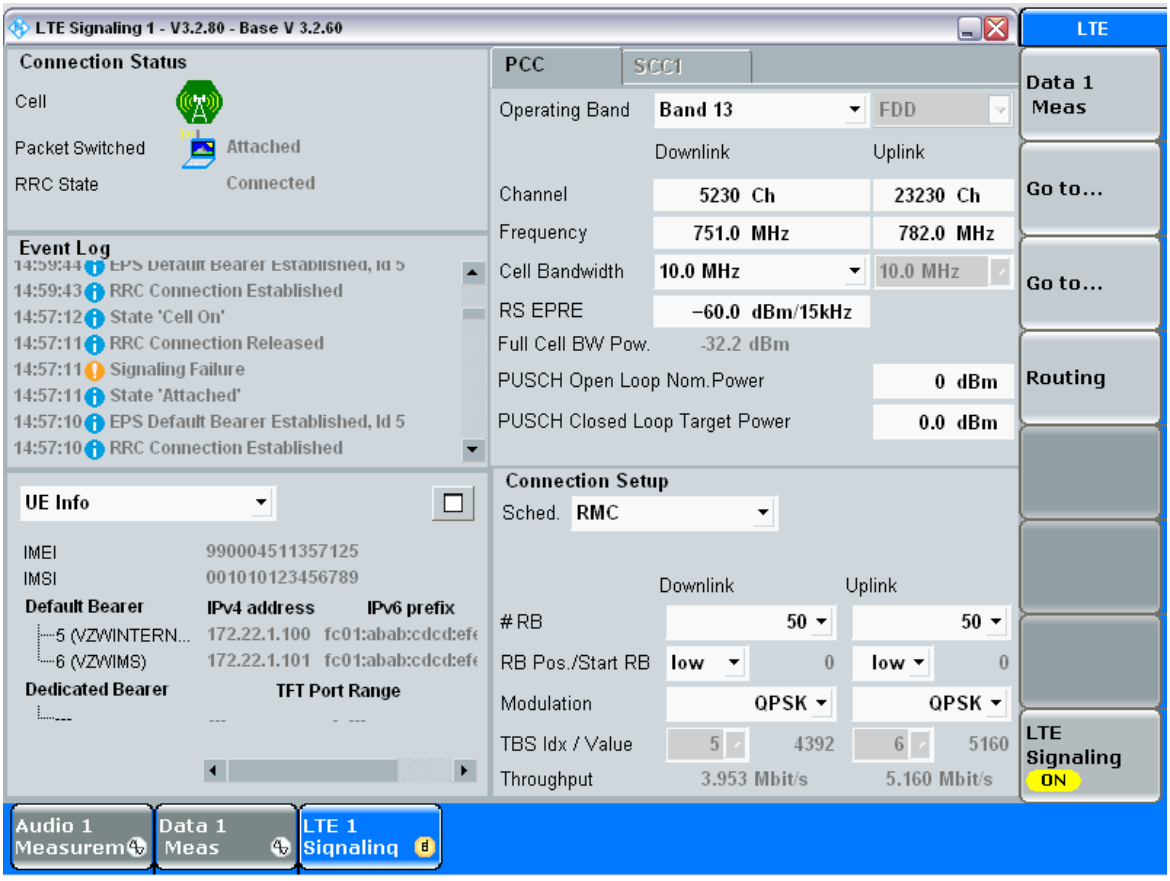

Figure 5-7 - LTE Signaling 1

10. Enter all the values shown in this screen into your system.

    Operating Band: Band 13
    Channel Downlink: 5230 Ch
    Channel uplink: 2320 Ch
    Frequency Uplink: 751.0 MHz
    Frequency Downlink 782.0 MHz
    Cell Bandwidth: 10. MHz
    RS EPRE: -60.0 dBm 15 kHz
    PUSCH Open Loop Nom Power: 0 dBm
    PUSCH Closed loop Target Power: 0.0 dBm
    Sched: RMC
    #RB Downlink: 50
    #RB Uplink: 50
    RB Pos./Start RB uplink: low
    RB Pos./Start RB downlink: low
    Modulation uplink: QPSK
    Modulation downlink: QPSK

11. Select Data 1 Meas and a screen like the following displays.

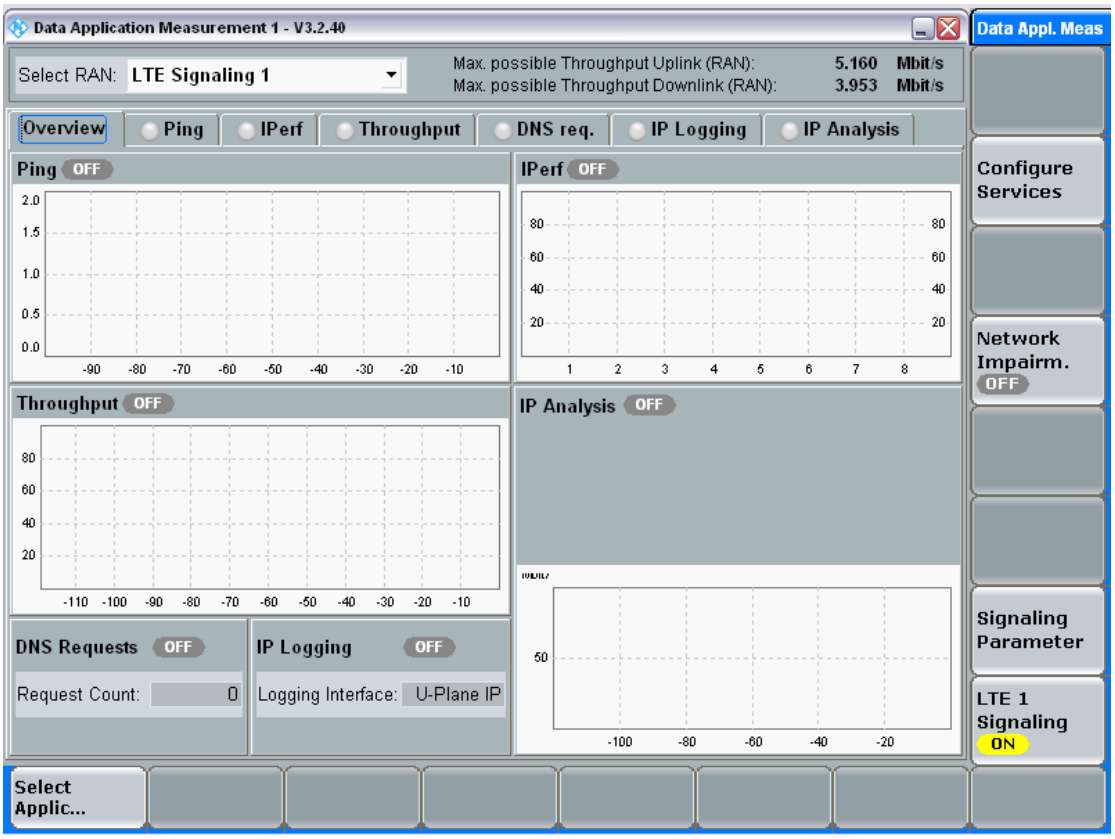

Figure 5-8 Data Application Measurement Overview Tab

12. Enter all the values shown in this screen into your system.

13. Enable speech codec can only be turned on or off if the LTE Signal is in the OFF mode.

14. To enable speech code, open the connection status window.

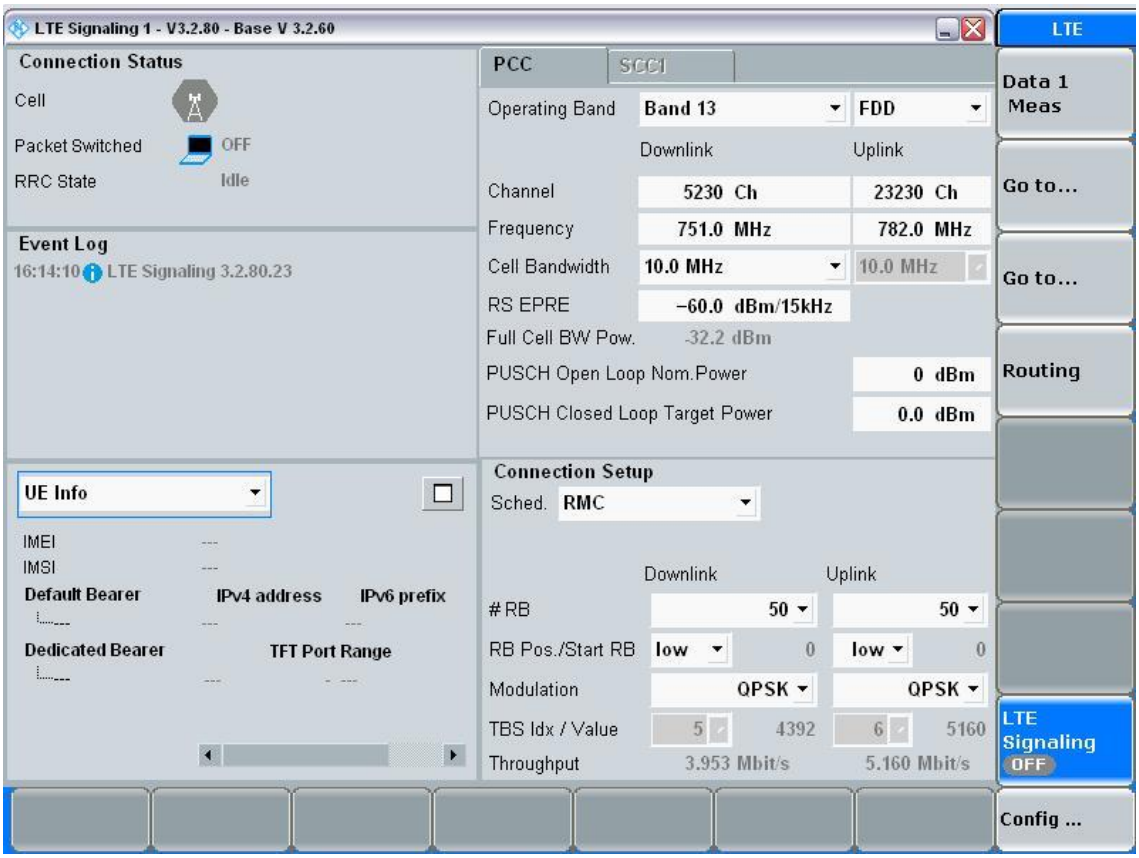

Figure 5-9 Connection Status

15. Match the entries in the screen and click Config. A screen like the following displays.

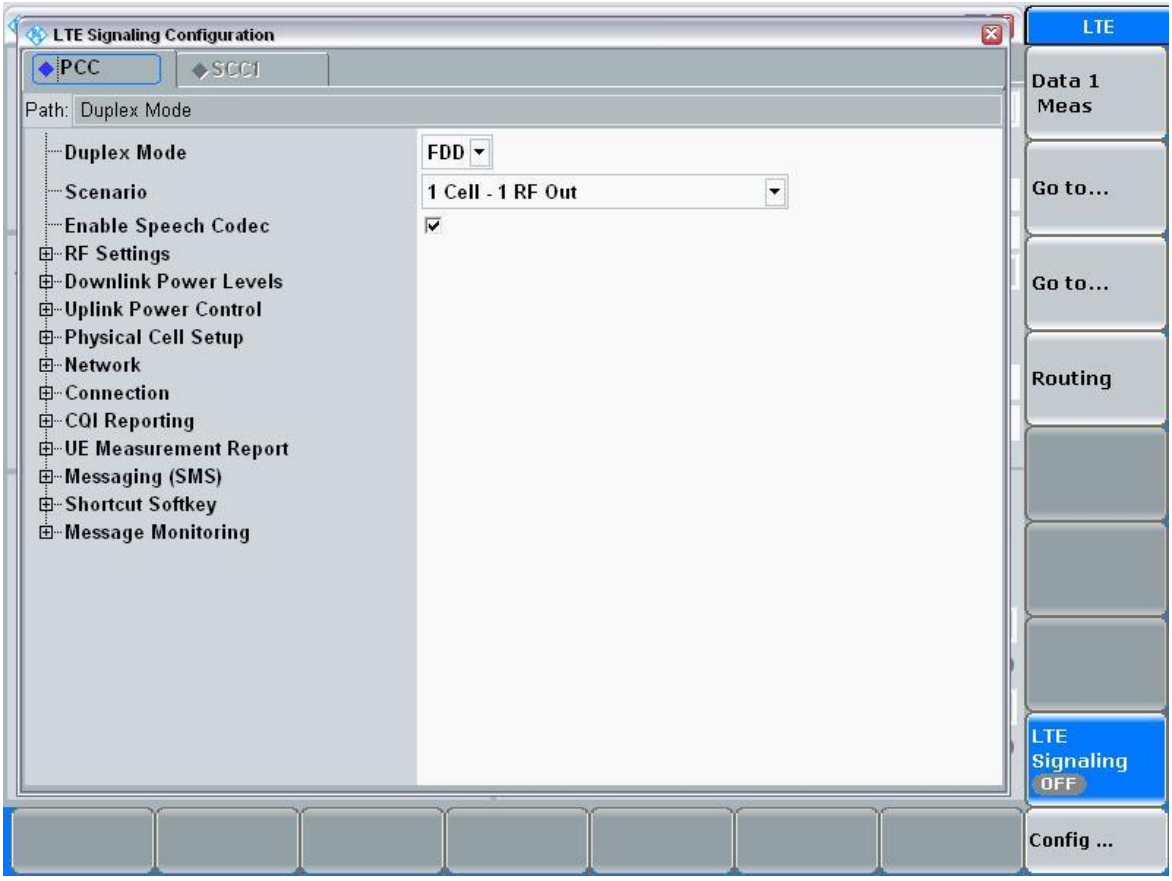

Figure 5-10 Path

16. Verify 1 Cell – 1 RF out.

17. Select the Ping Tab. Note that you can configure these tabs in any order. This document goes left to tight for readability.

18. Open the Ping tab and a screen like the following displays.

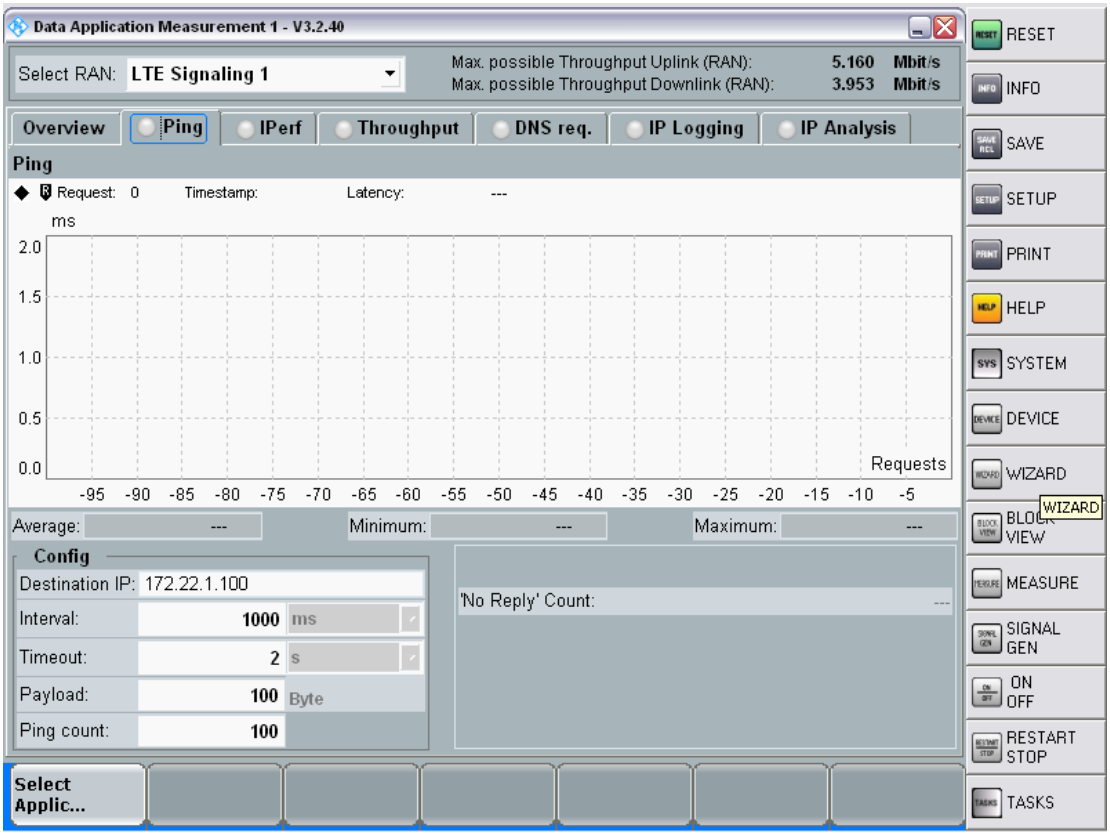

Figure 5-11 - Data Application Measurement Ping Tab

19. Enter all the values shown in this screen into your system.

    Conf Destination IP: 172.22.1.100
    Interval: 1000
    Timeout: 2
    Payload: 100
    Ping count: 100

20. Click the Config tab on the bottom right and a screen like the following appears.

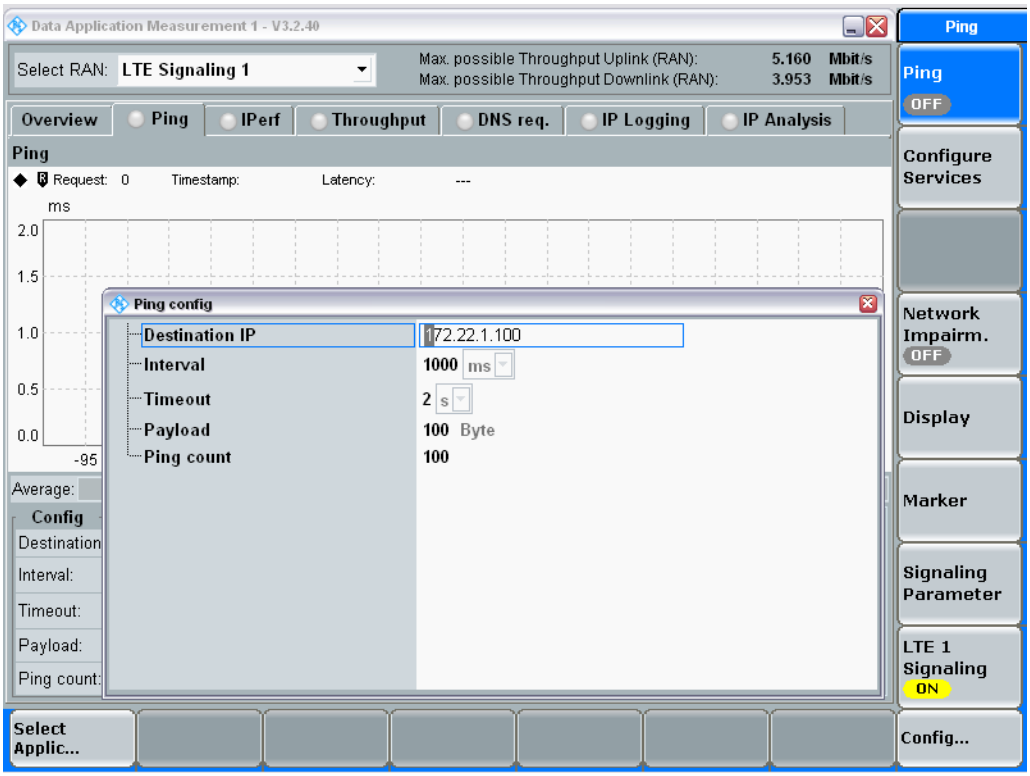

Figure 5-12 - Data Application Measurement Ping Tab Configuration Option

21. Enter all the values shown in this screen into your system.

    Destination IP: 172.22.1.100
    Interval: 1000 ms
    Timeout: 2
    Payload: 100 Bytes
    Ping count: 100

22. Open the I Perf tab and a screen like the following appears.

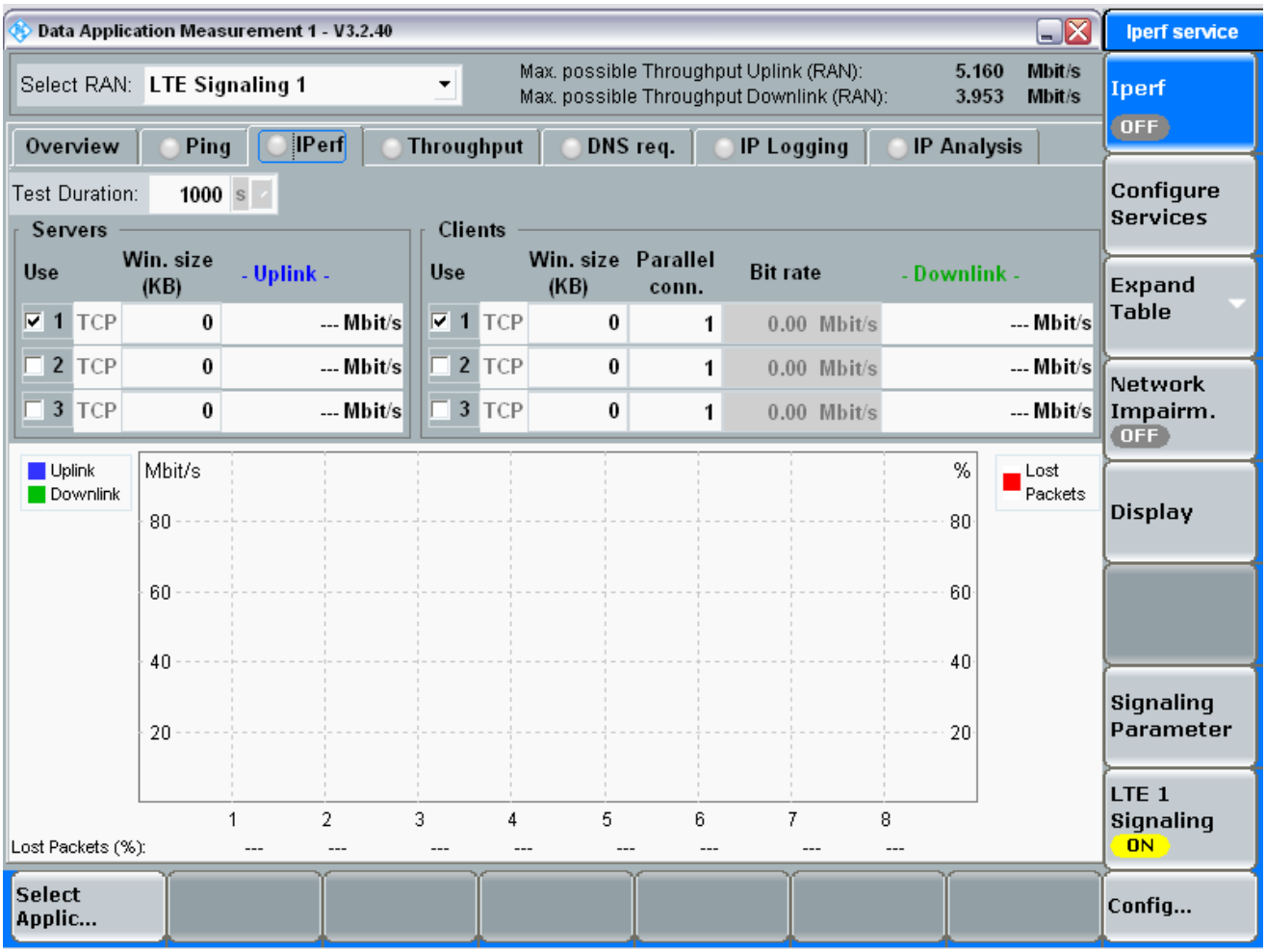

Figure 5-13 - Data Application Measurement Iperf Tab

23. Enter all the values shown in this screen into your system.

    Select RAN: LTE Signaling 1
    Test Duration: 1000
    Server, select 1 TCP.
    Clients select 1 TCP with parallel

24. Click Config on the lower right and a screen like the following appears.

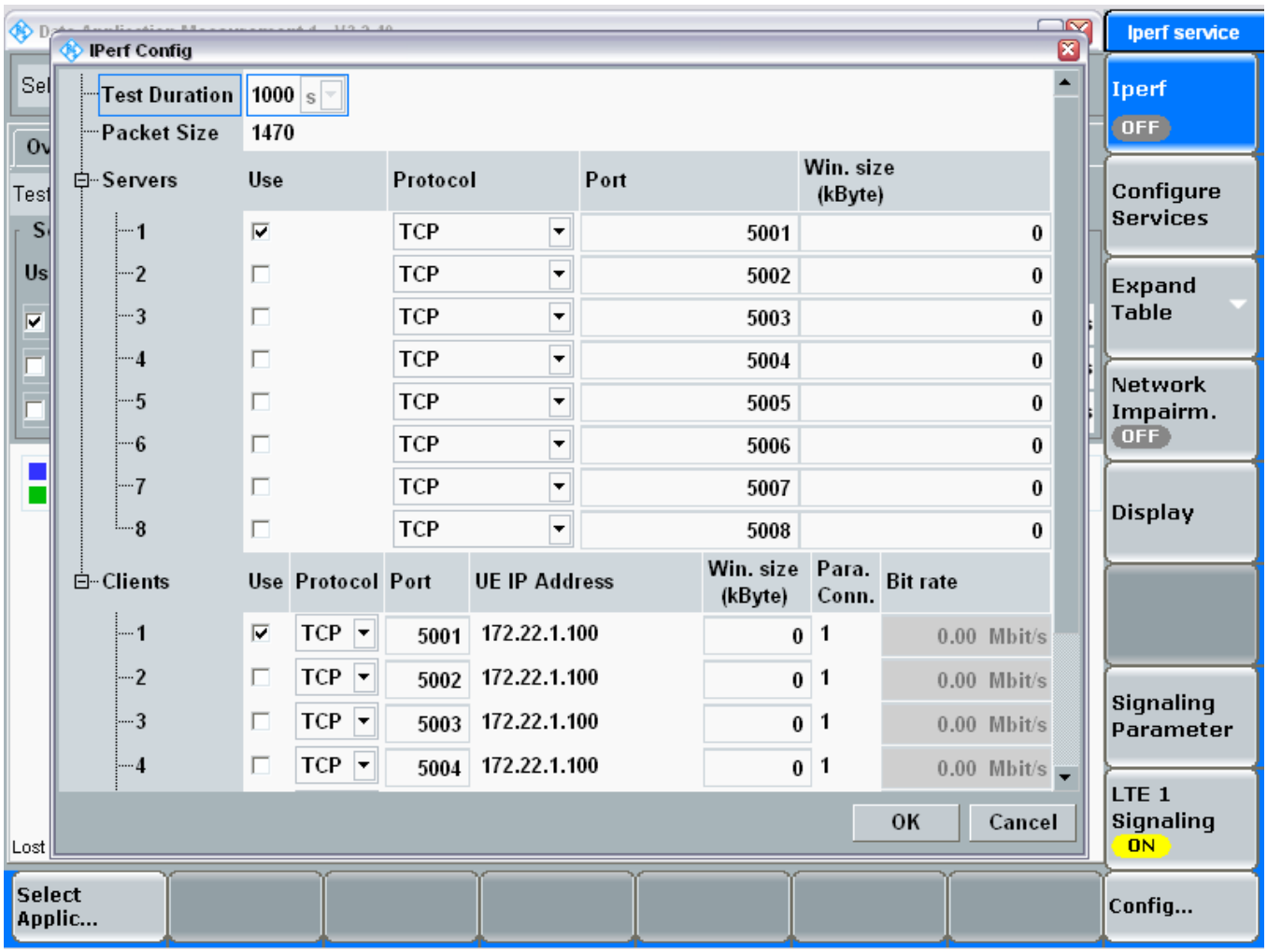

Figure 5-14 - Data Application Measurement Iperf Tab Configuration (part I)

25. Enter all the values on your system match the values shown in the screen.

    Test Duration: 1000
    Packet Size: 1470
    Servers, use TCP on Port 5001
    Clients, use TCP on {Port 5001
    UE IP Address: 172.22.1.100
    Parallel Conn: 1

26. Scroll down and the bottom half of the screen displays.

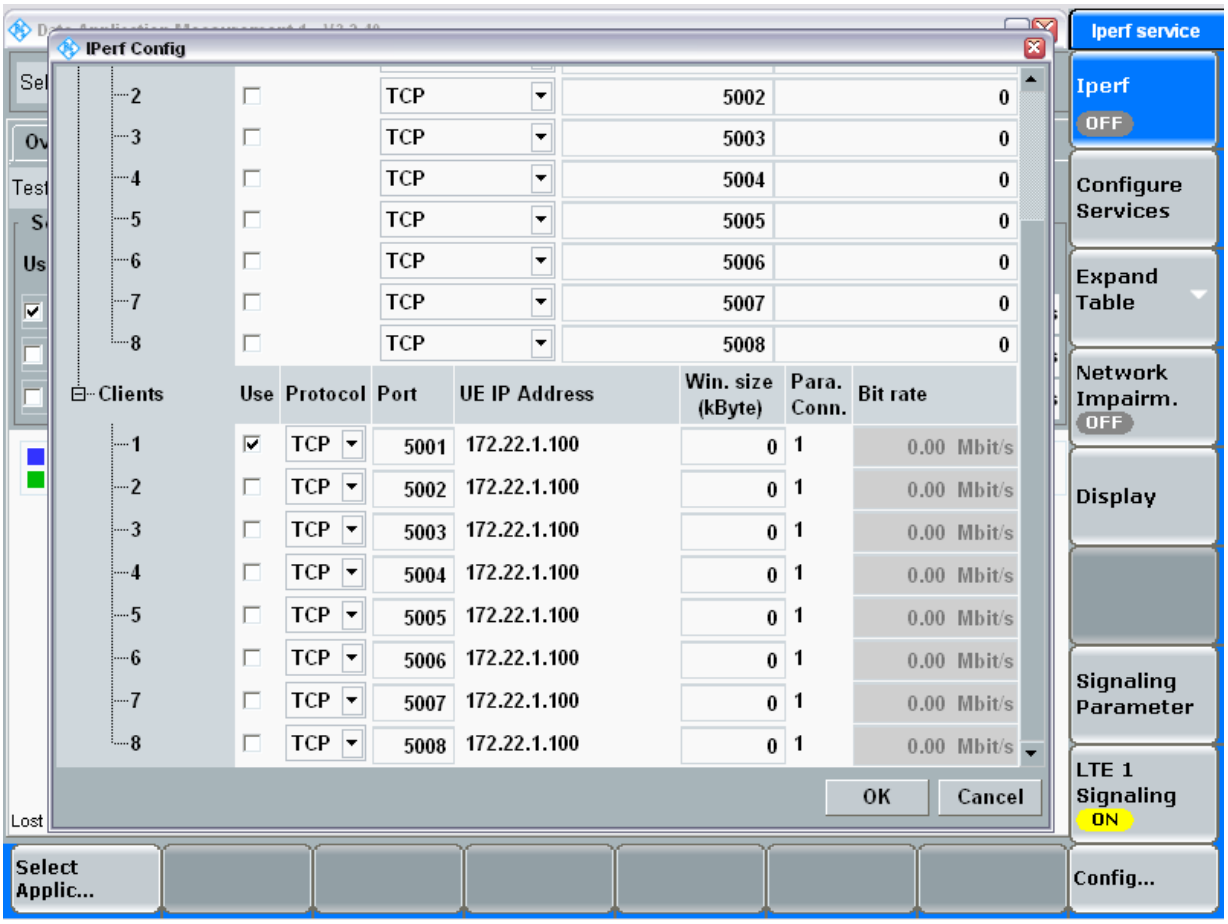

Figure 5-15 - Data Application Measurement Iperf Tab Configuration (part I)

27. Enter all the values shown in this screen into your system.

28. Select Throughput and a screen like the following appears.

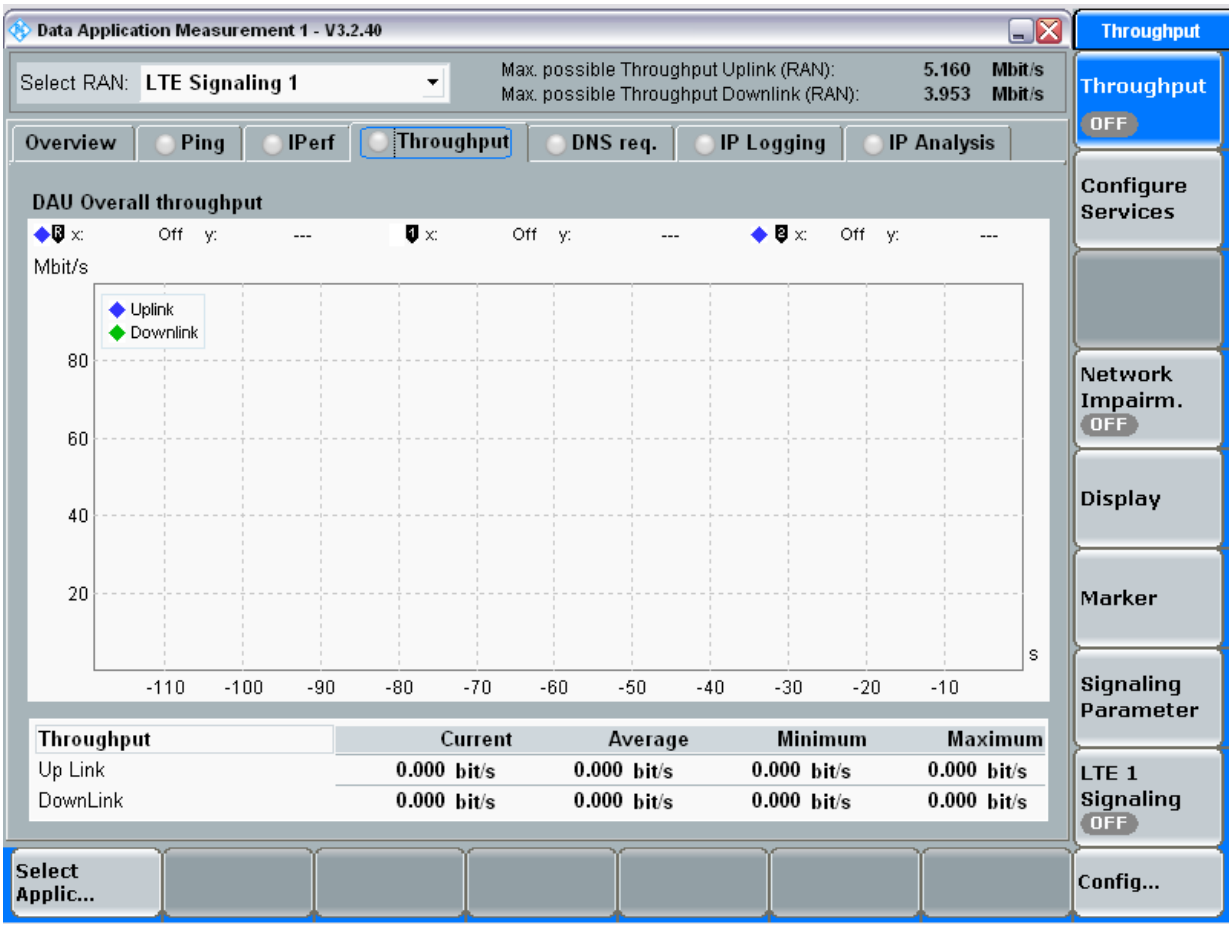

Figure 5-16 - Data Application Measurement Throughput Tab

29. Enter all the values shown in this screen into your system.

30. Click Config on the lower right and a screen like the following appears.

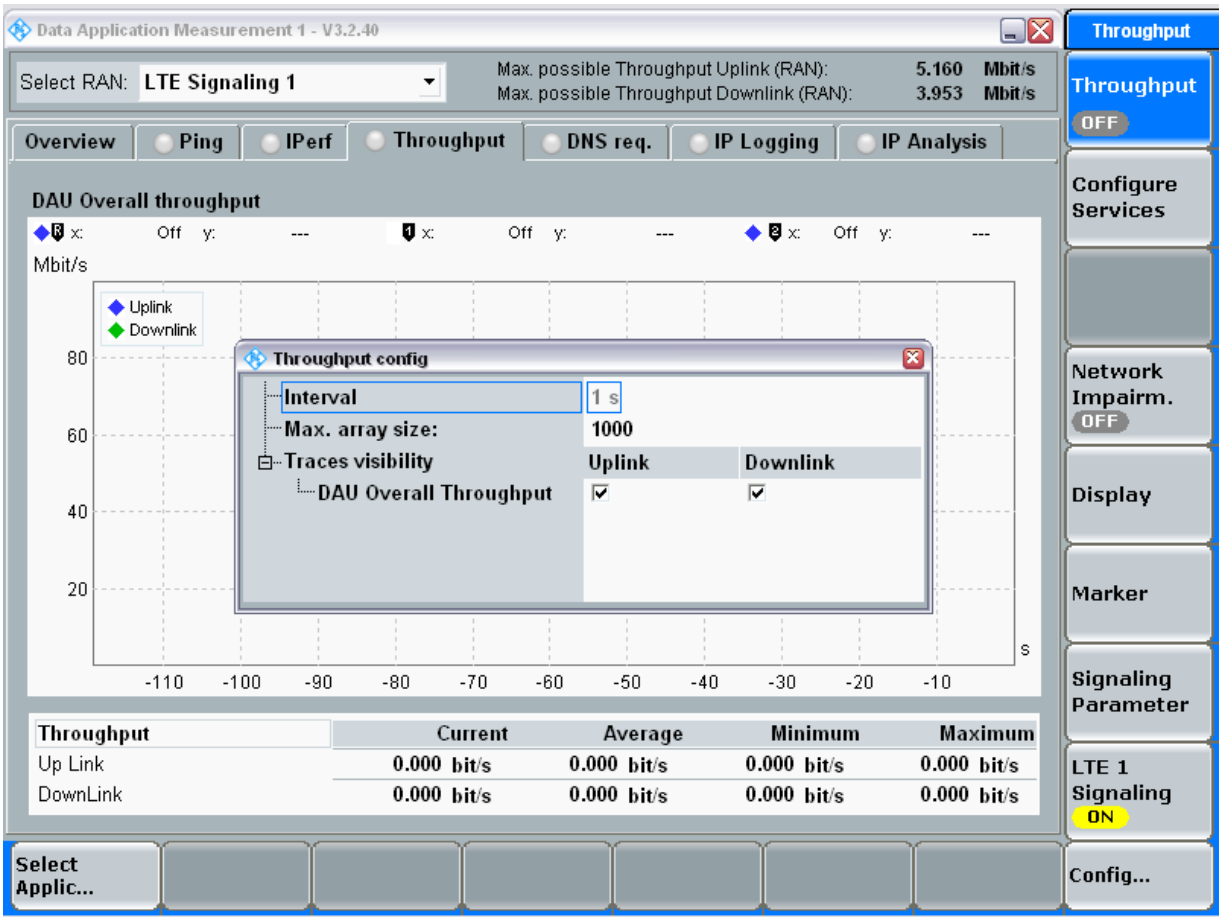

Figure 5-17 - Data Application Measurement Throughput Tab Configuration

31. Enter all the values shown in this screen into your system.

    Interval:1
    Max array size: 1000
    Traces visibility, vDAU Overall throughput is enables for the uplink and the downlink

32. C**lick** the DNS req tab and a screen like the following appears.

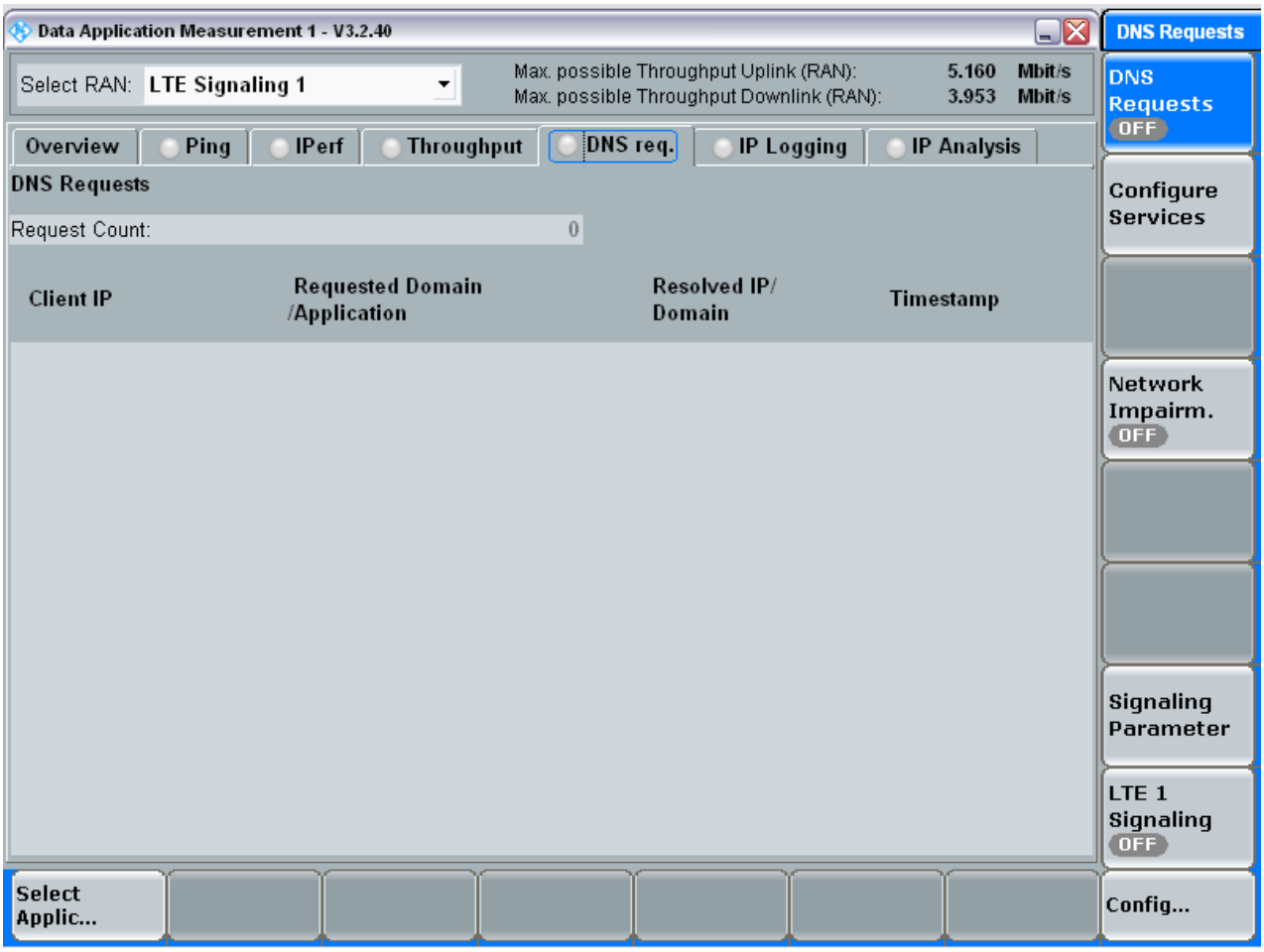

Figure 5-18 Data Application Measurement DNS Req Tab

33. Enter all the values shown in this screen into your system.

34. Click Config on the lower right and a screen like the following appears.

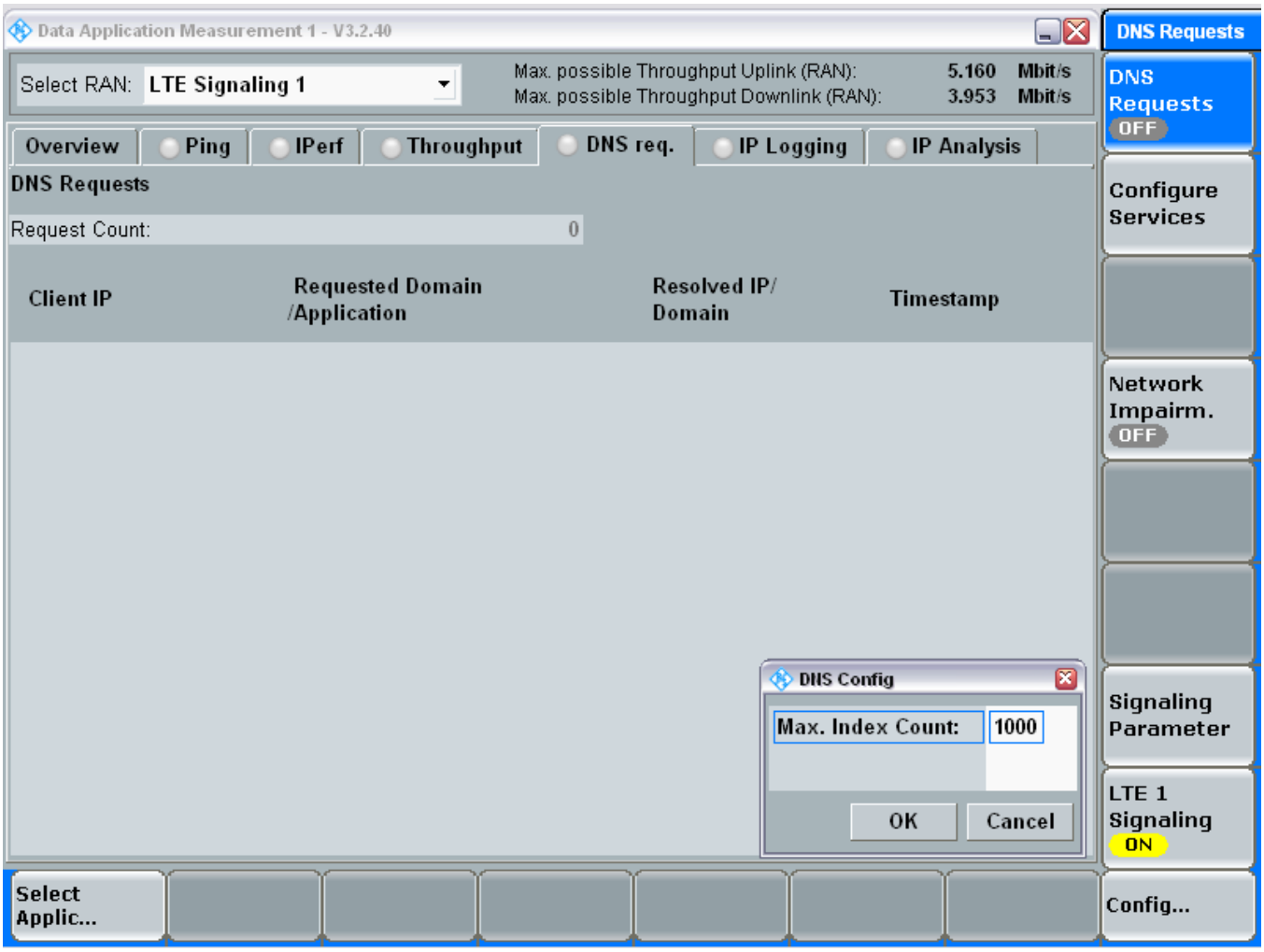

Figure 5-19 Data Application Measurement DNS Req Tab Configuration

35. Enter all the values shown in this screen into your system.

    Max. Index Count: 1000

36. Click IP logging and a screen like the following appears.

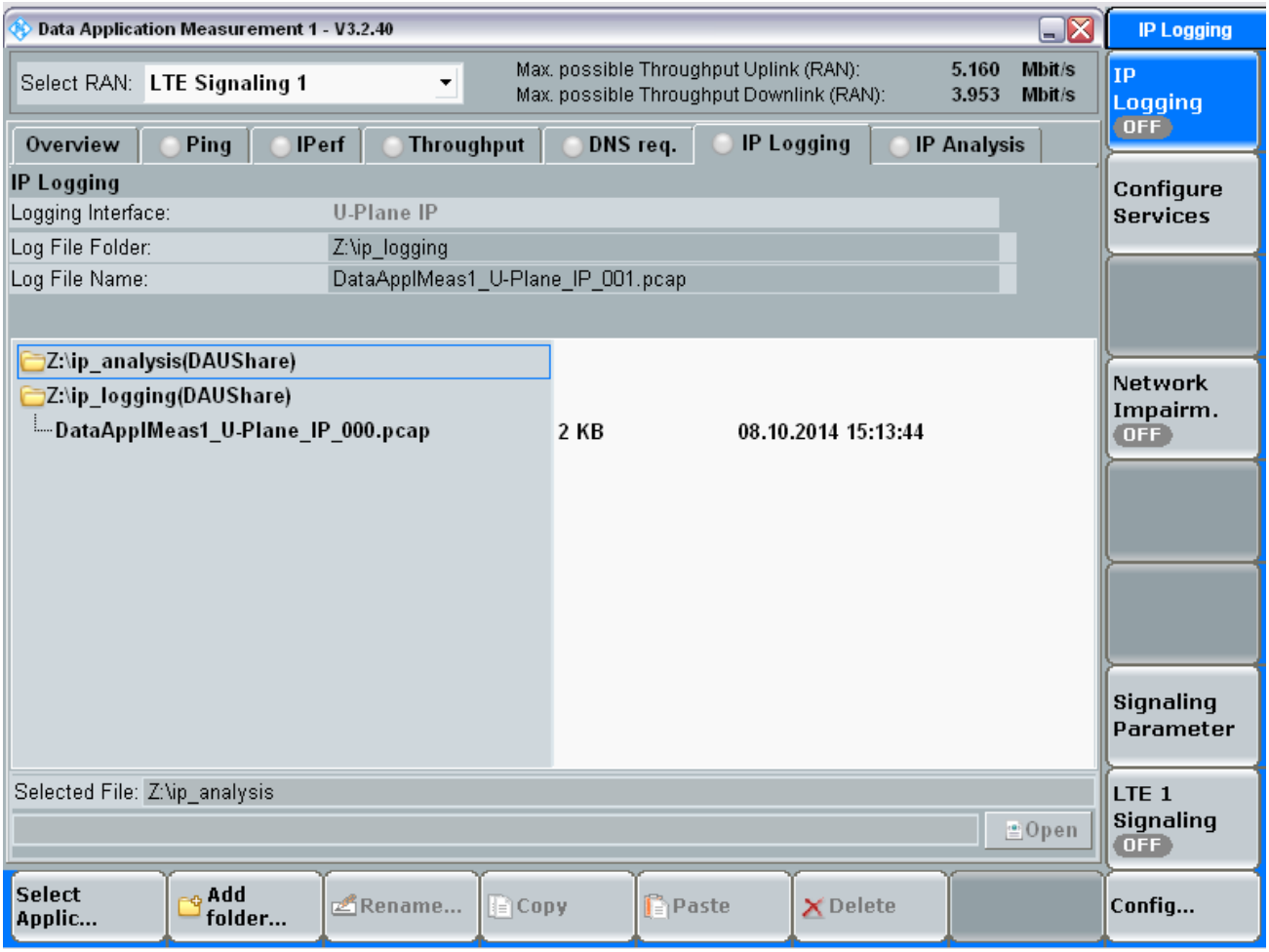

Figure 5-20 Data Application Measurement IP Logging

37. Enter all the values shown in this screen into your system.

38. Click Config on the lower right and a screen like the following appears.

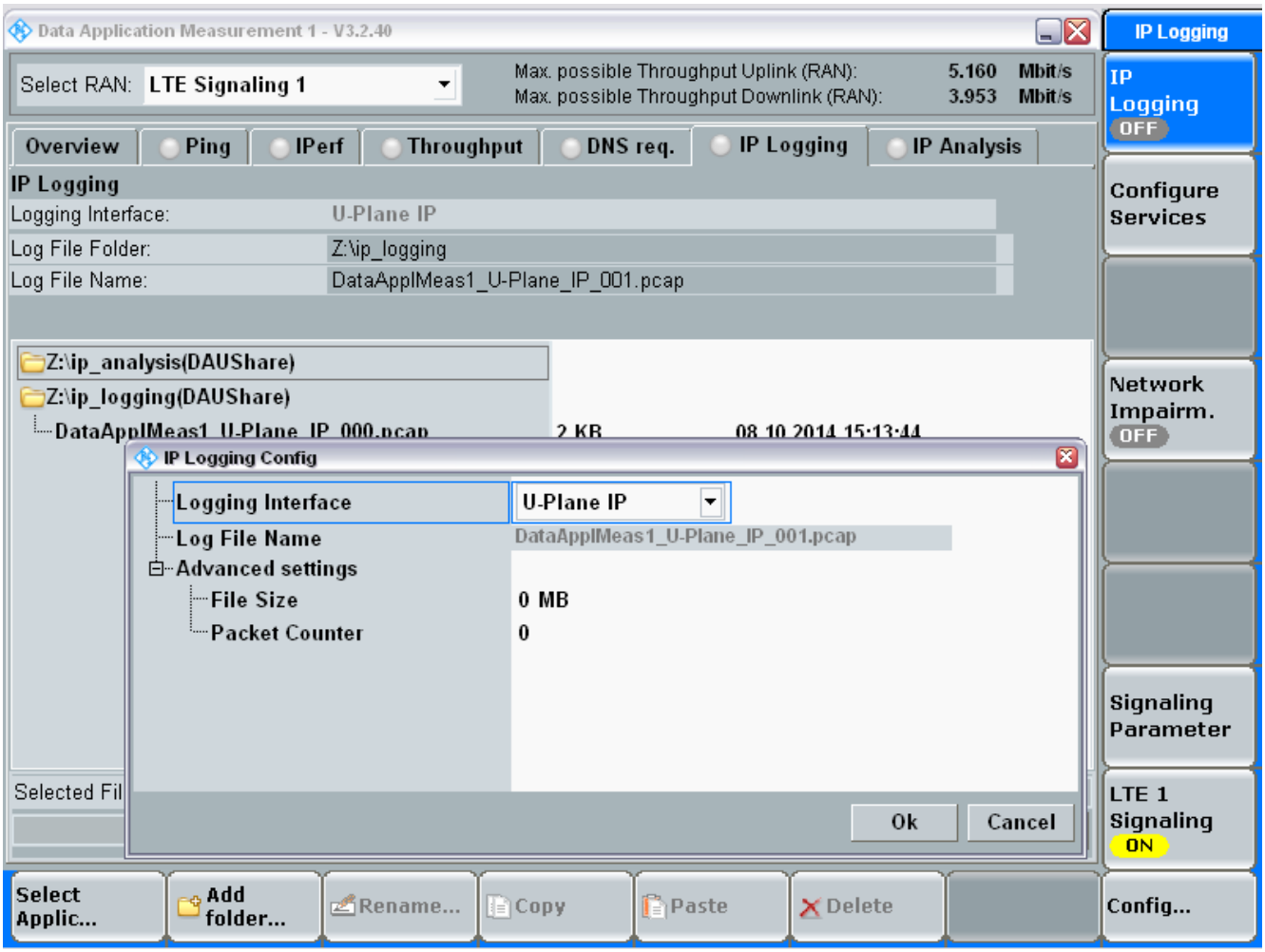

Figure 5-21 - - Data Application Measurement IP Logging Tab Configuration

39. Enter all the values shown in this screen into your system.

    Logging Interface: U-Plane IP
    File size: 0
    Packet Counter: 0

40. Click IP Analysis and a screen like the following appears.

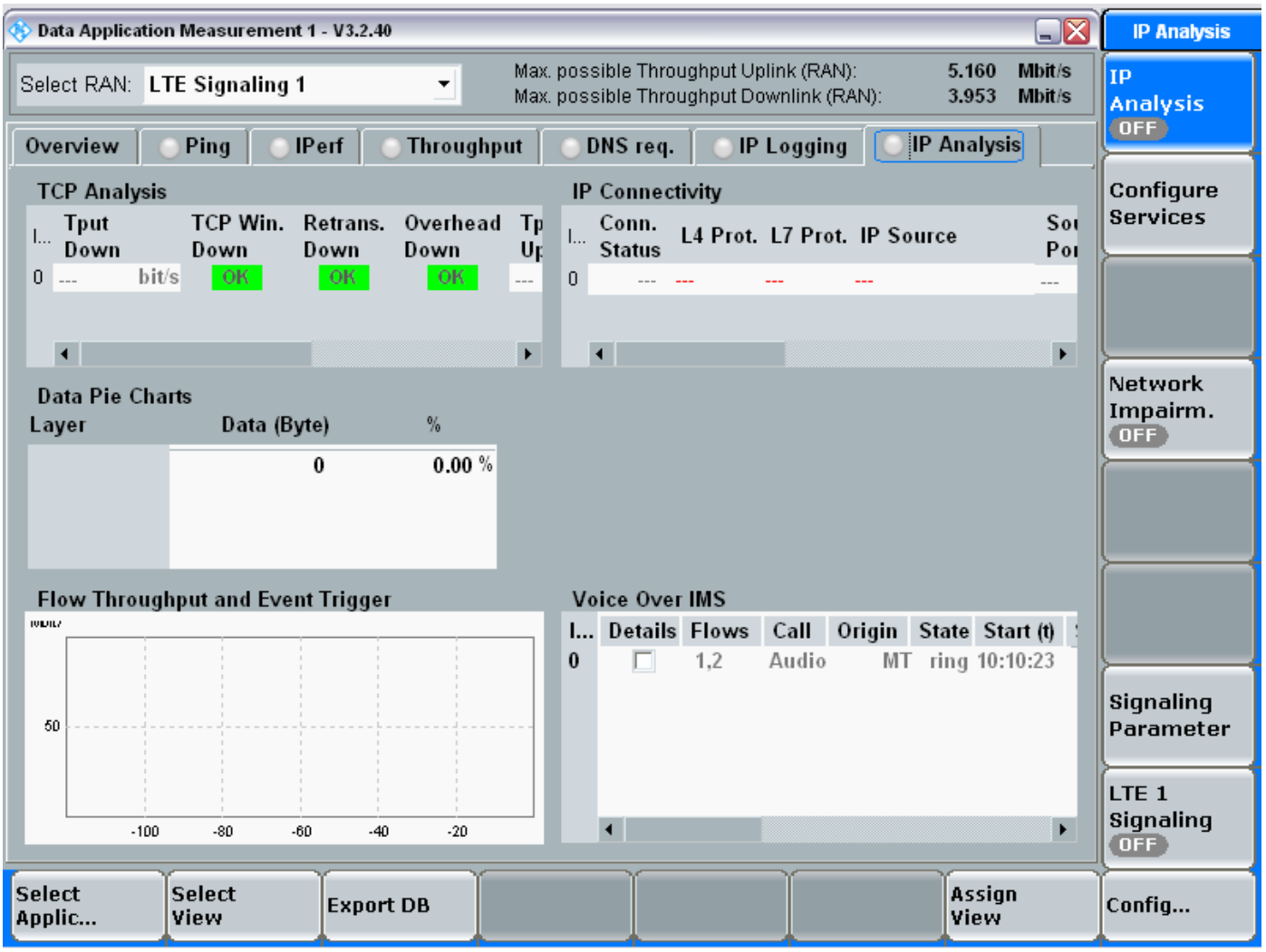

Figure 5-22 Data Application Measurement IP Analysis Tab

41. Enter all the values shown in this screen into your system.

    Select RAN: LTE Signaling 1

42. Click Config on the lower right and a screen like the following appears.

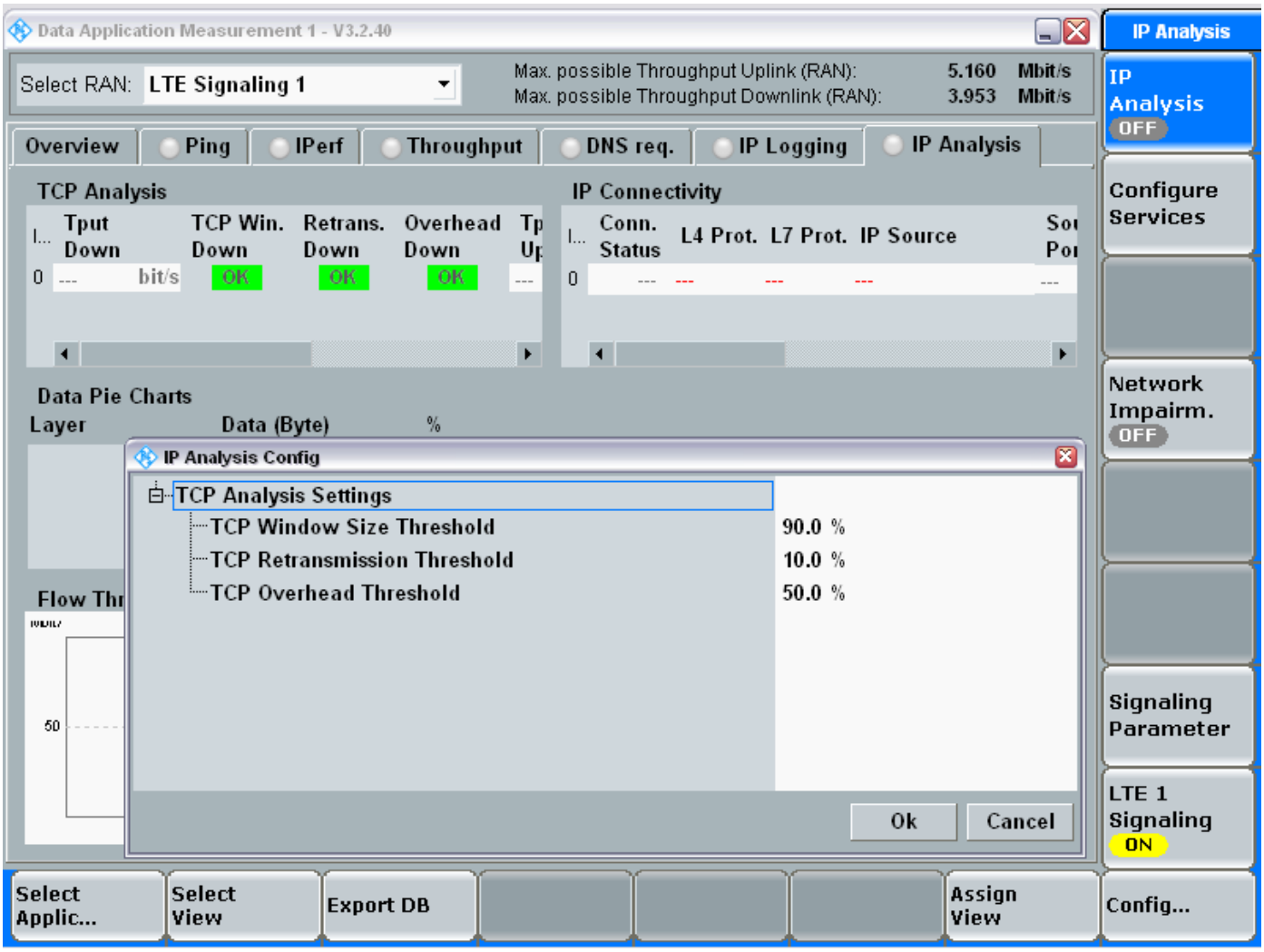

Figure 5-23 Data Application Measurement IP Analysis Tab Configuration

43. Enter all the values shown in this screen into your system.

    TCP Analysis Settings: 90.0 %
    TCP Retransmission Threshold: 10%
    TCP Overhead Threshold: 50%

5.3 Setting Data Application Control (Appling the Main Configuration Options)

From Data Print Measure select Configure on the upper right and the following screen displays.

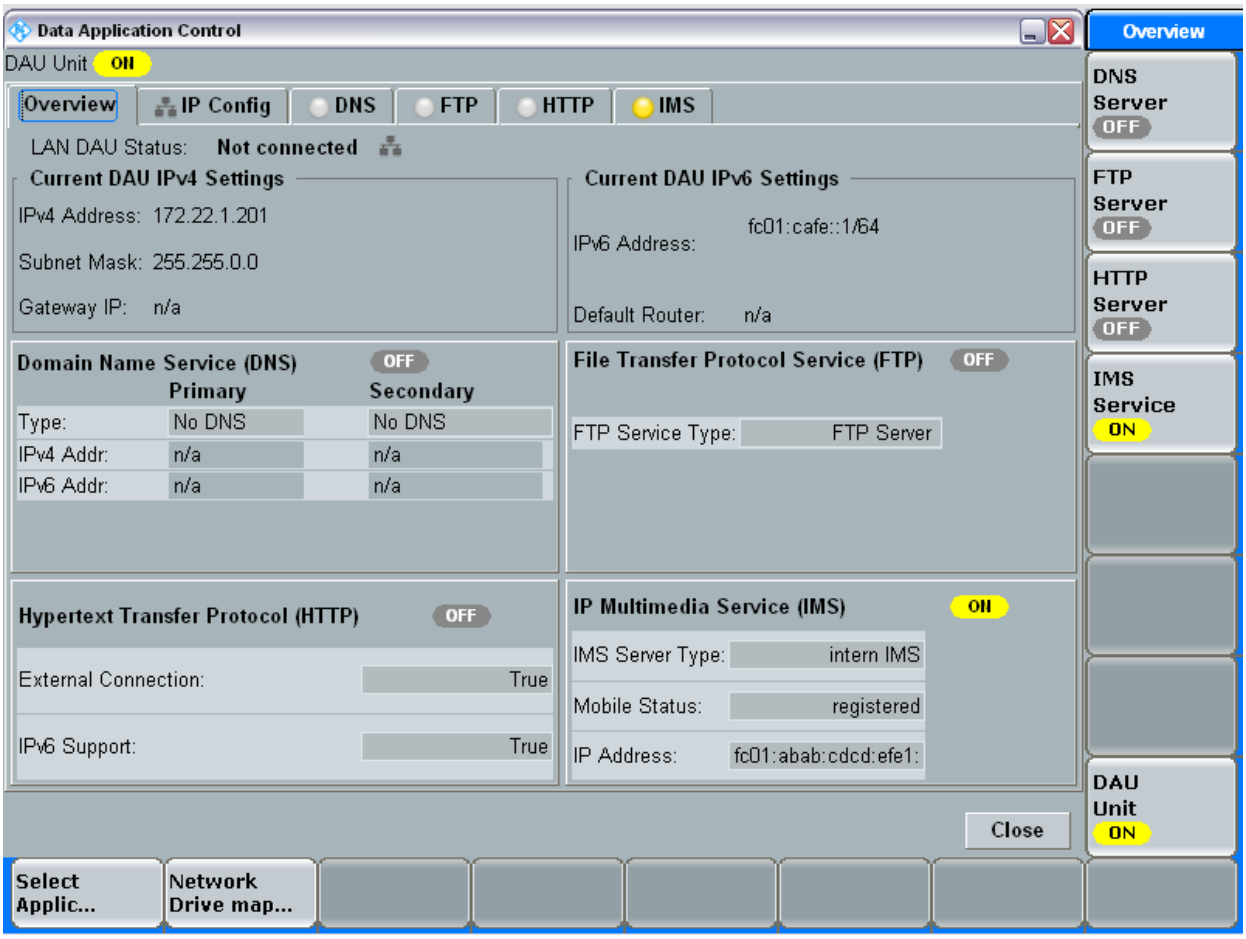

Figure 5-24 Data Application Measurement Overview

From this screen perform the following options.

1. Enter all the values shown in this screen into your system.

   Domain Name Service (DNS): Off
   File Transfer Protocol Service (FTP: Off
   Hypertext Transfer Protocol (HTTP): Off
   IP Multimedia Service (IMS) On
   IMS server Type: intern IMS
   Mobile Status: registered
   Ip Address: fc01: abab:cdcd:efe1

2. Click IP Config and the following appears.

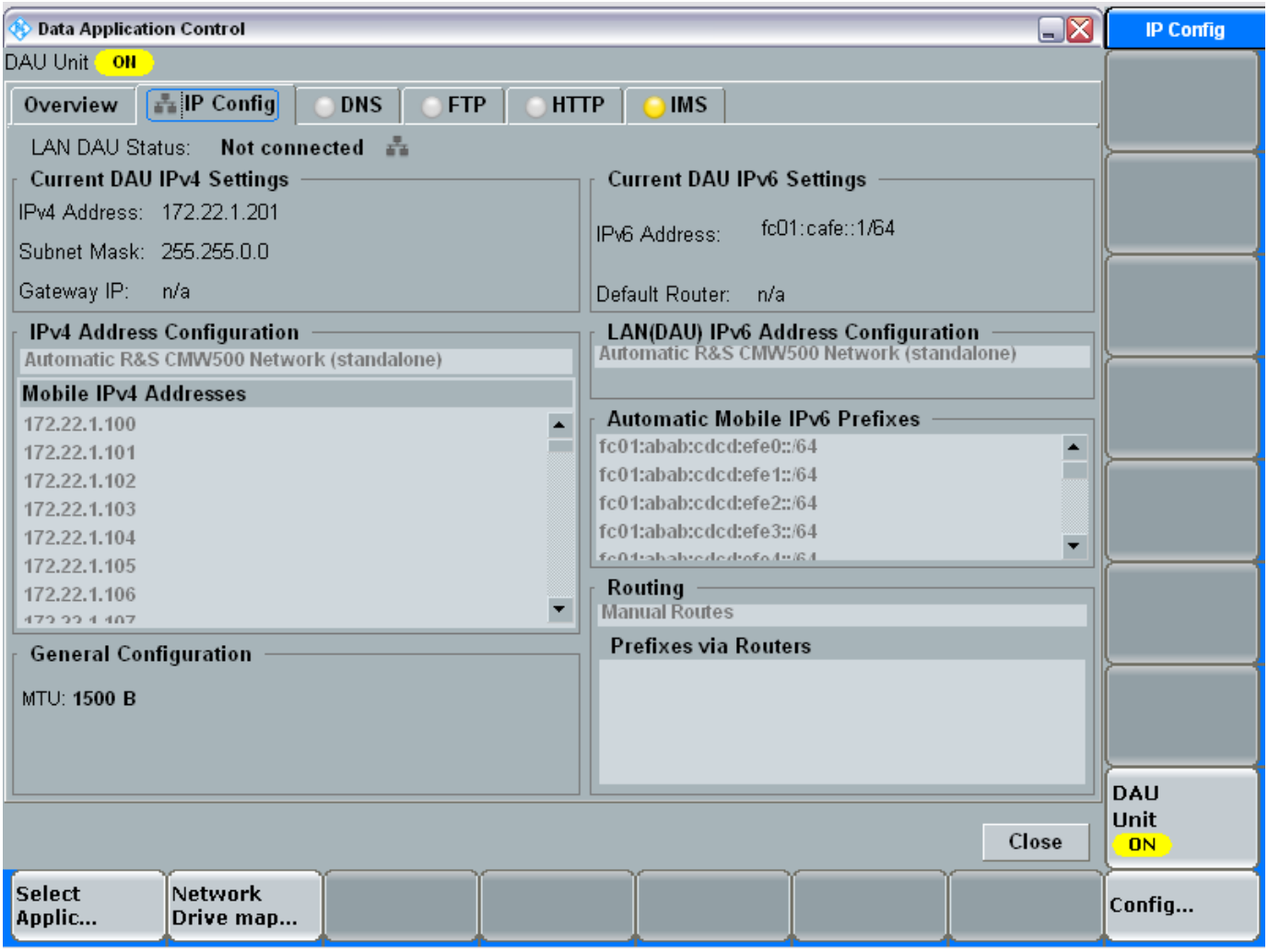

Figure 5-25 – IP Config

3. Enter all the values shown in this screen into your system.
4. Click DNS Config and a screen like the following appears.

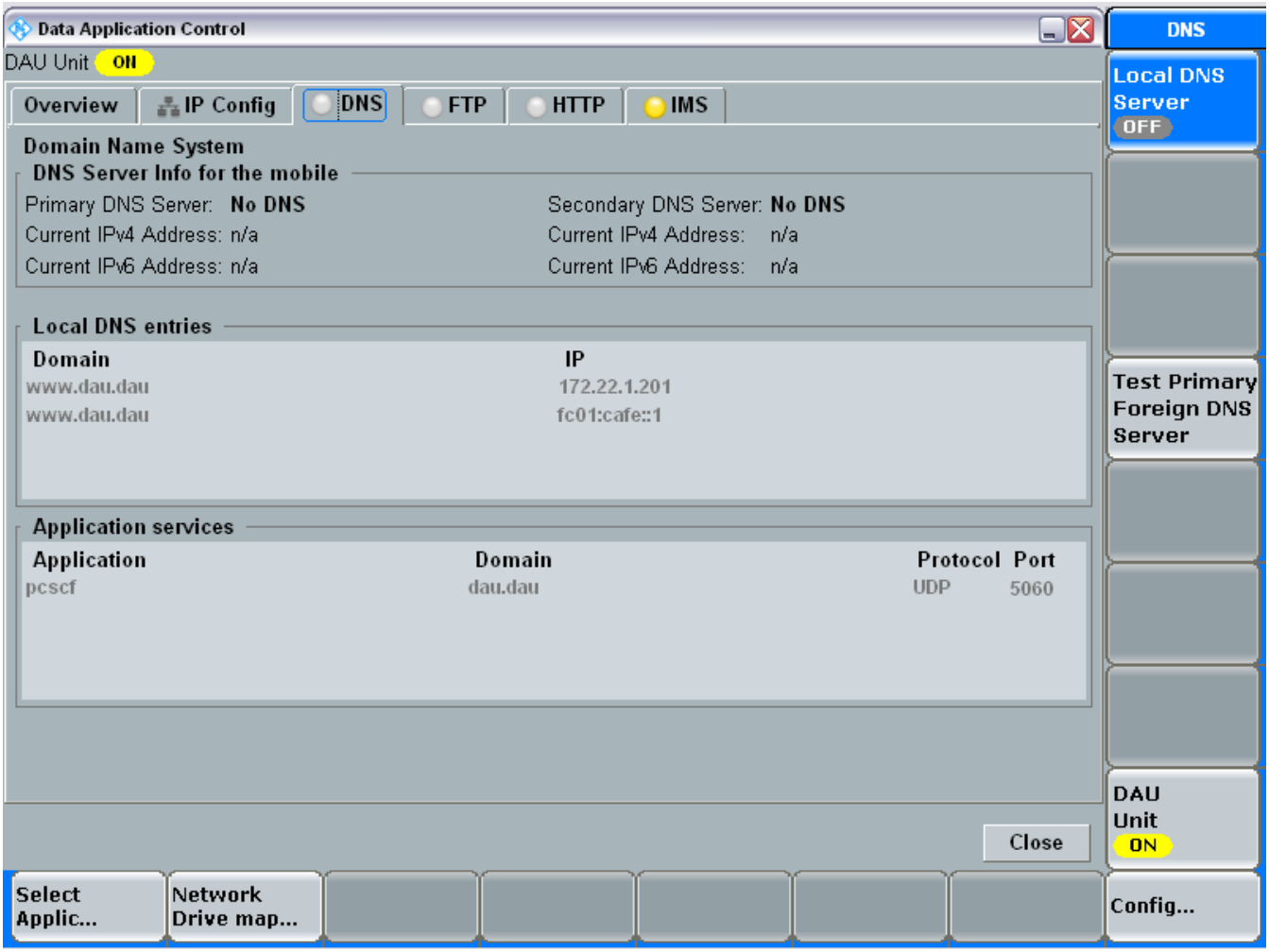

Figure 5-26 - DNS

5. Enter all the values shown in this screen into your system.

6. Click FTP and a screen like the following appears.

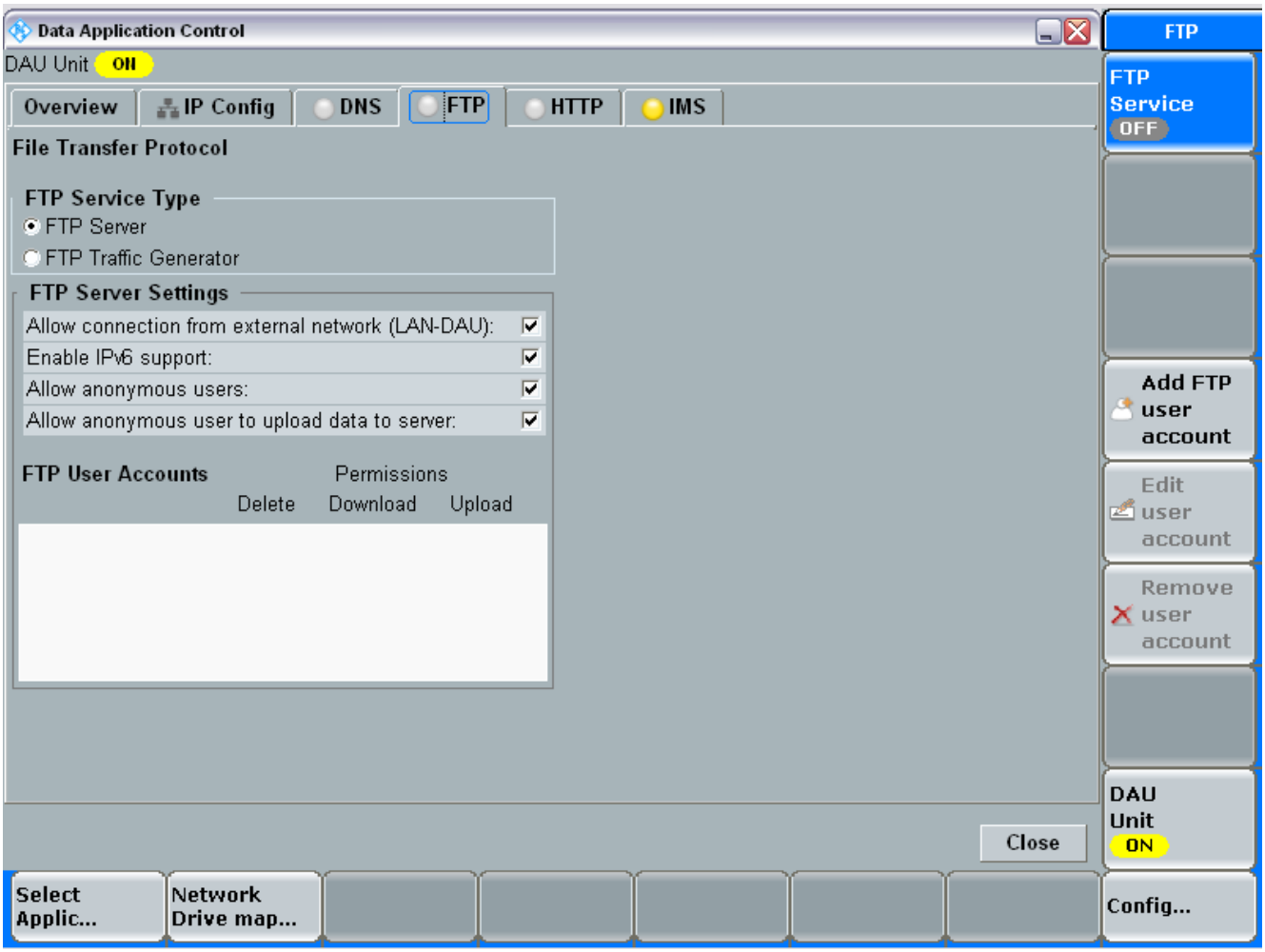

Figure 5-27 FTP

7. Enter all the values shown in this screen into your system.

   FTP Service Type: FTP Server

8. Click HTTP and a screen like the following appears.

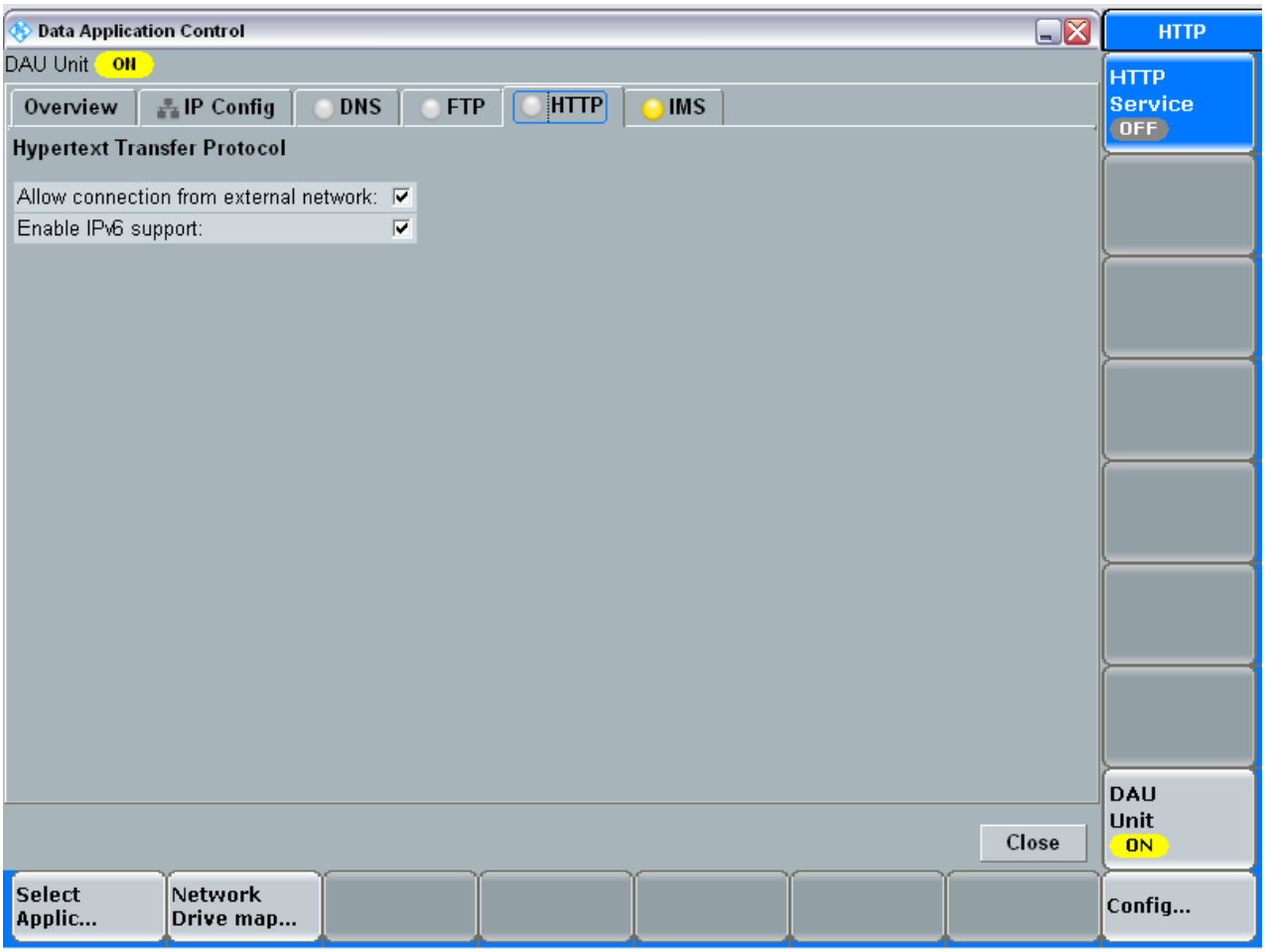

Figure 5-28 - HTTP

9. Enter all the values shown in this screen into your system.

10. Click IMS and a screen like the following appears.

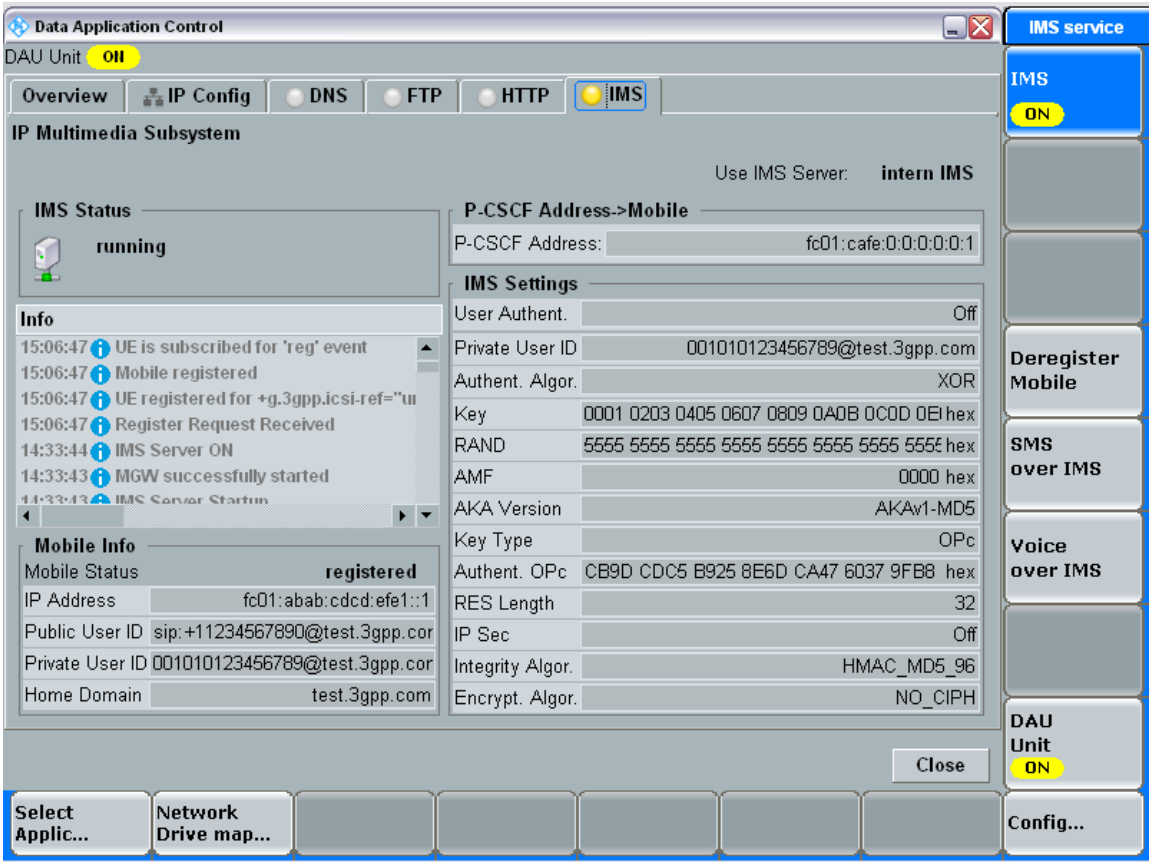

Figure 5-29 - IMS

11. Enter all the values shown in this screen into your system.
12. To configure Voice over IMS and create an outgoing call click Config and a screen like the following displays.

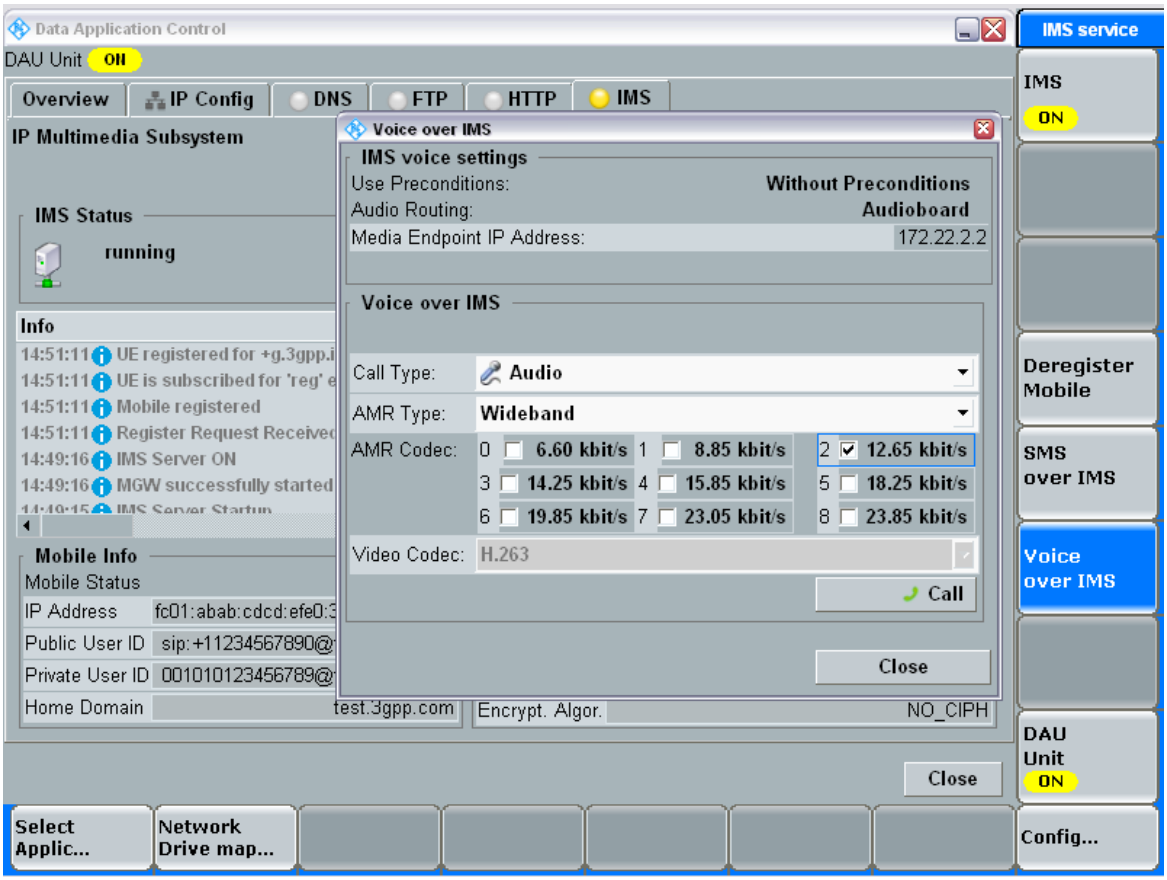

Figure 5-30 –Configuring Voice Over IMS

13. Enter all the values shown in this screen into your system.
14. Verify or enter that the Call Type is Audio (not Video)..
15. AMR must equal wideband.
16. The AMR Code must be checked and equal to 12.65.

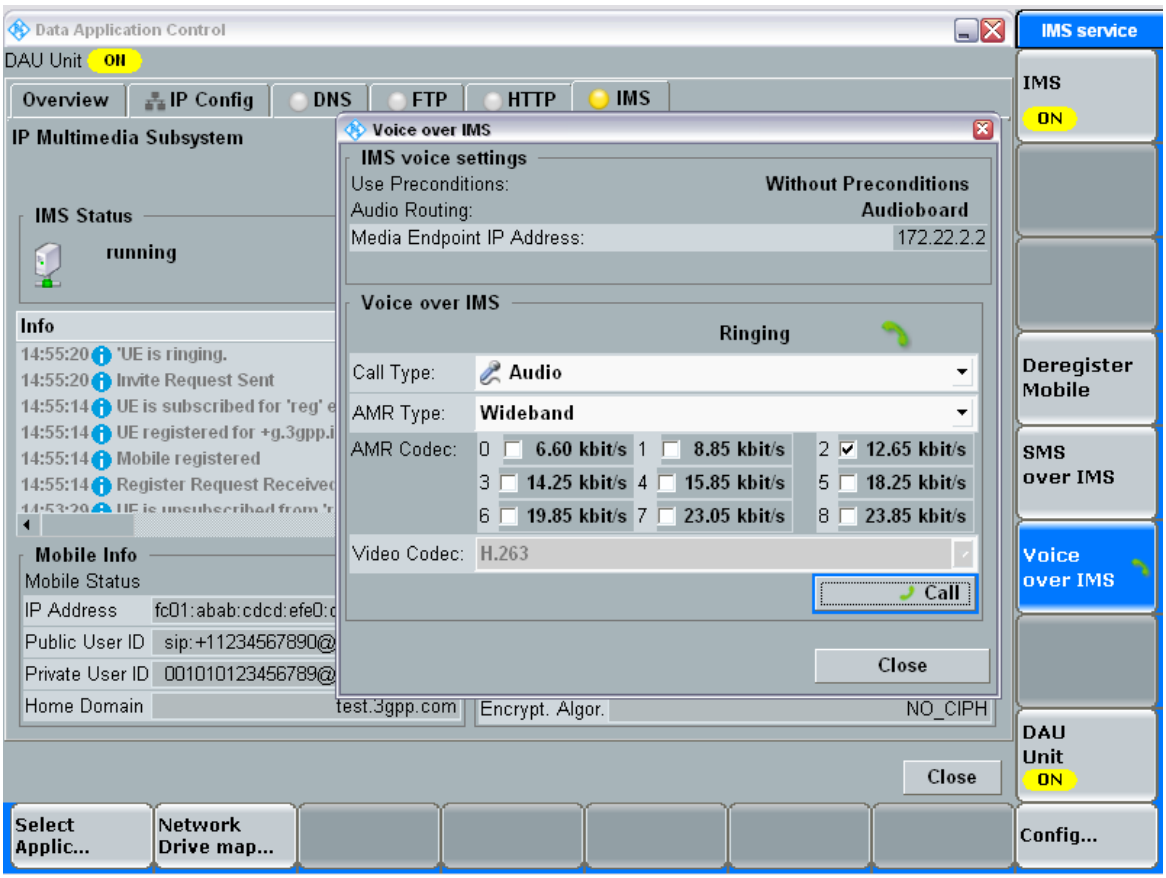

Figure 5-31 –When the call begins the telephone symbol next to ringing will begin to rotate.

17. Push the call button

6 CMDA setup of the R&S CMW500

To configure the CDMA Signaling options, perform the following steps.

1. Press the Sig Gen key on the front panel, select “CDMA2000 Signaling”

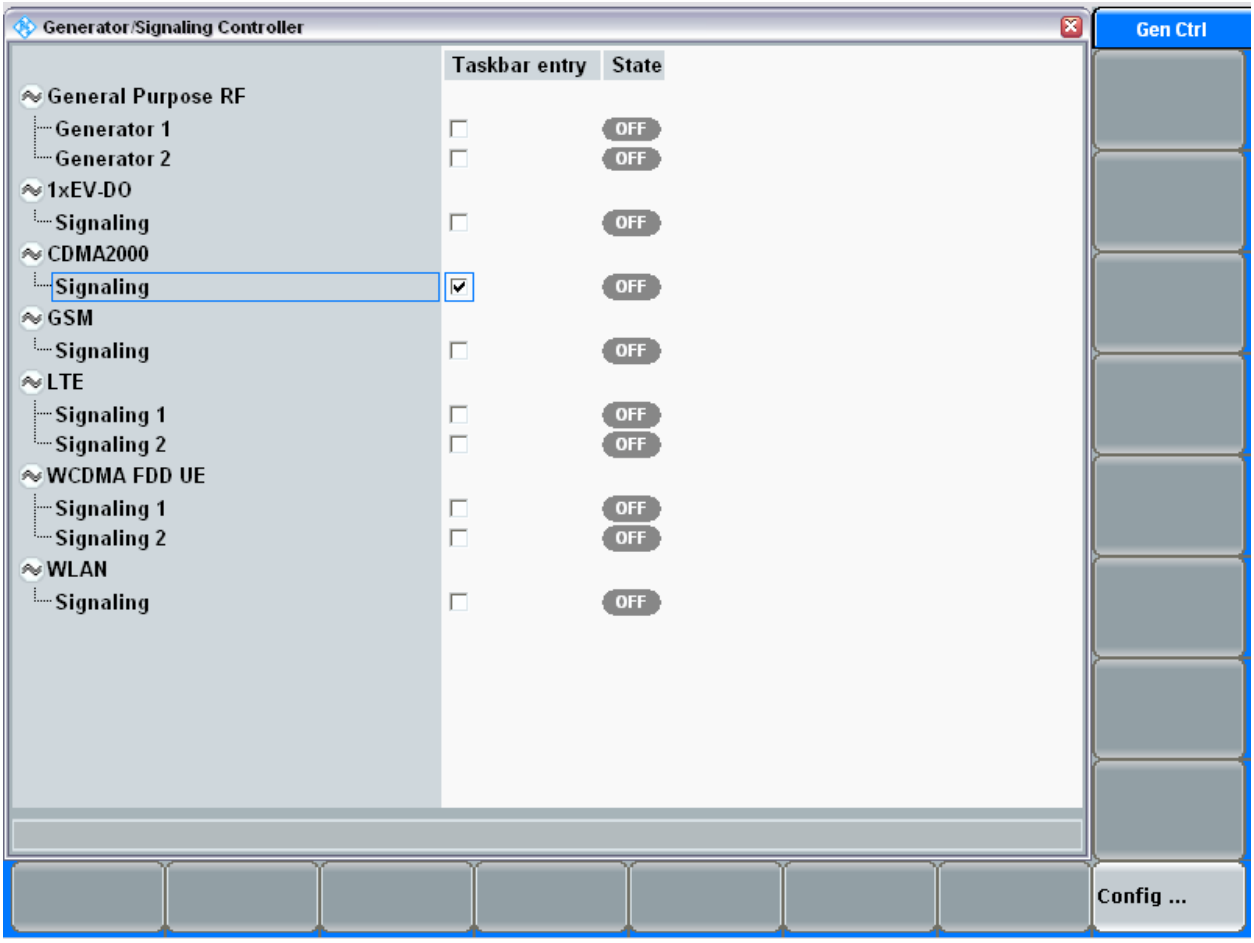

Figure 6-1 –Generate Signaling Controler.

2. From the front CDMA screen select the Config button in the lower right hand corner and a screen like the following displays.

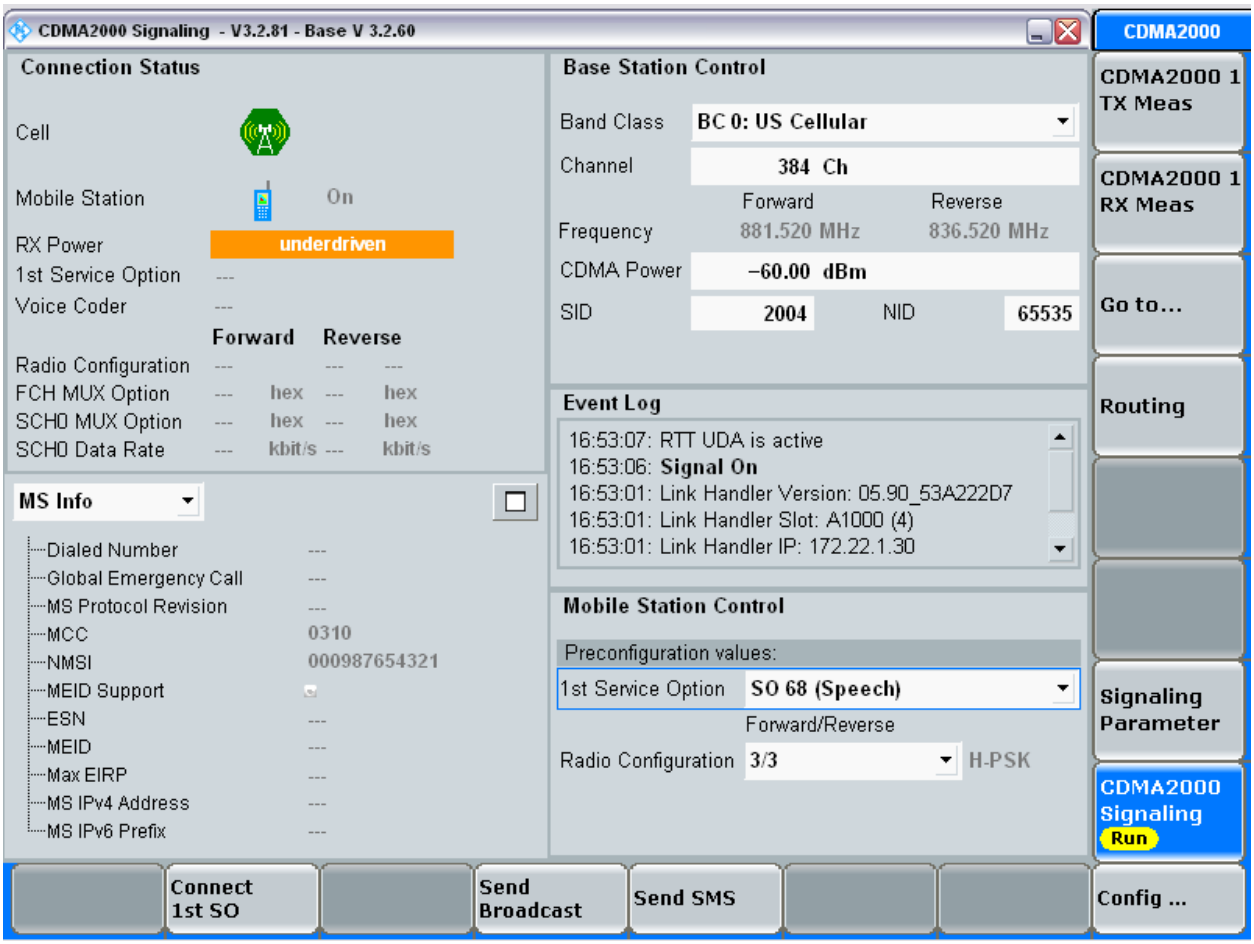

Figure 6-2 –Connection Status.

3. Verify you have the same settings as are displayed on this screen.
4. Click Config and a screen like the following displays.

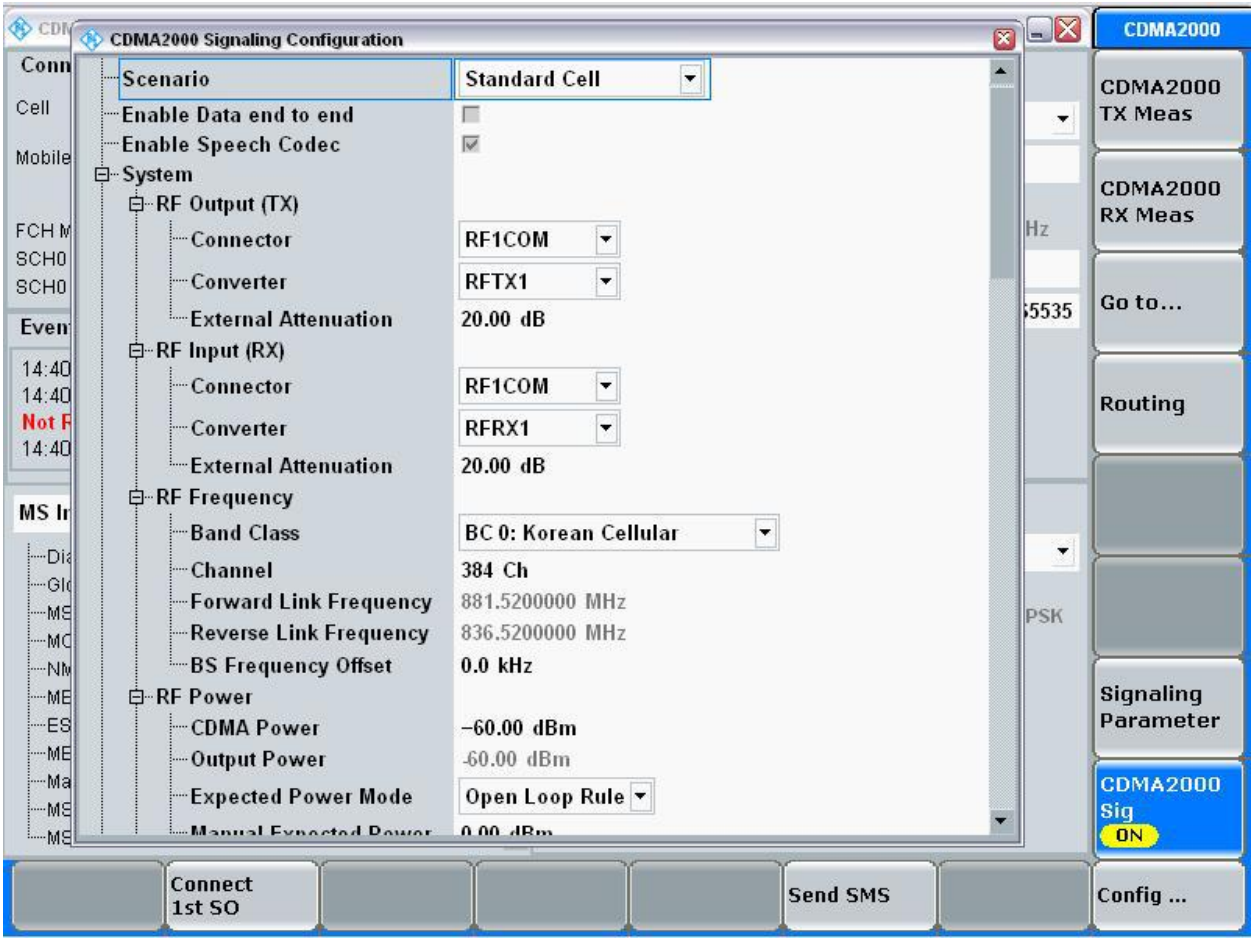

Figure 6-3 – CDMA Configuration Screen 1.

5. Configure the CMW per the following screen shots.

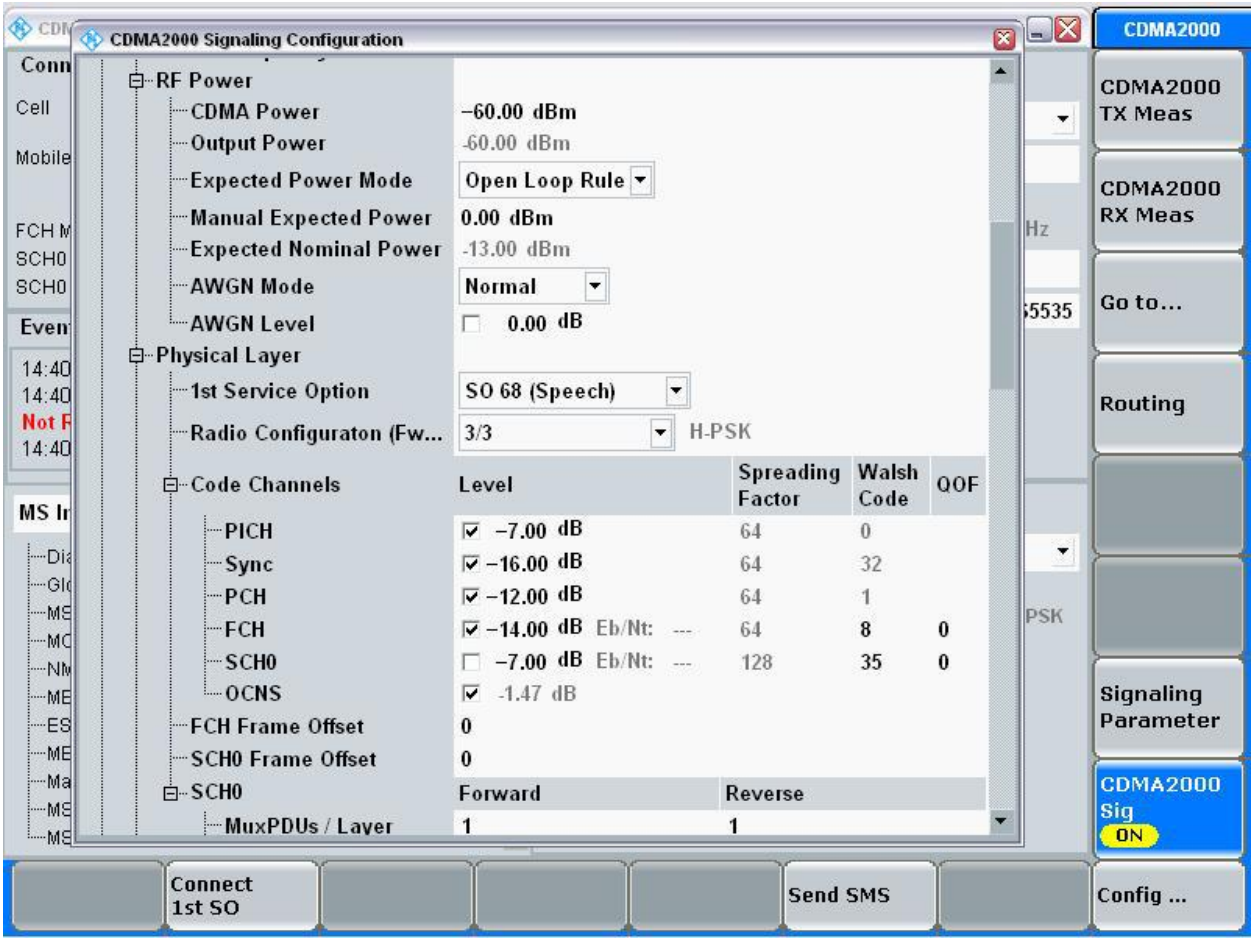

Figure 6-4 – CDMA Configuration Screen 2.

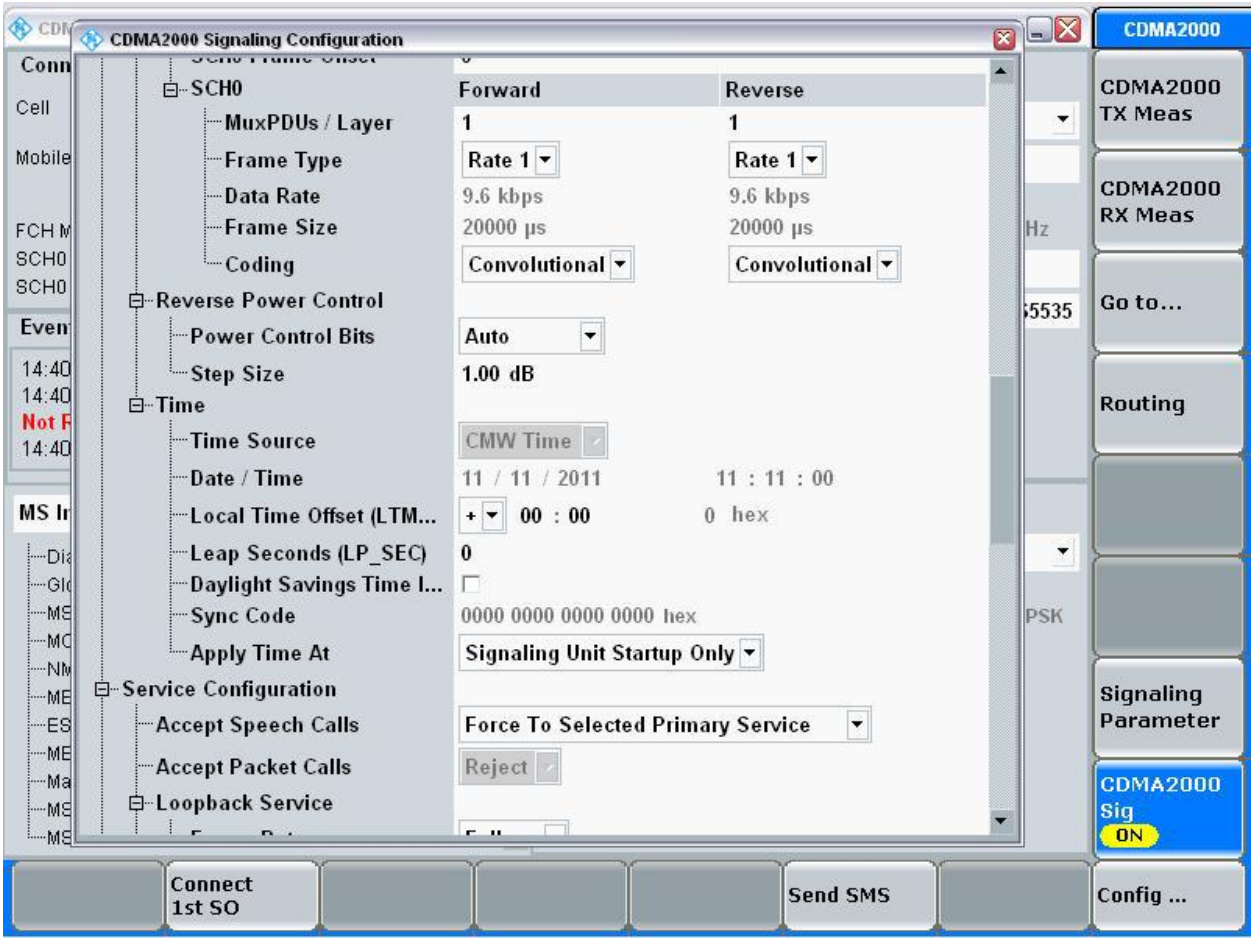

Figure 6-5 – CDMA Configuration Screen 3.

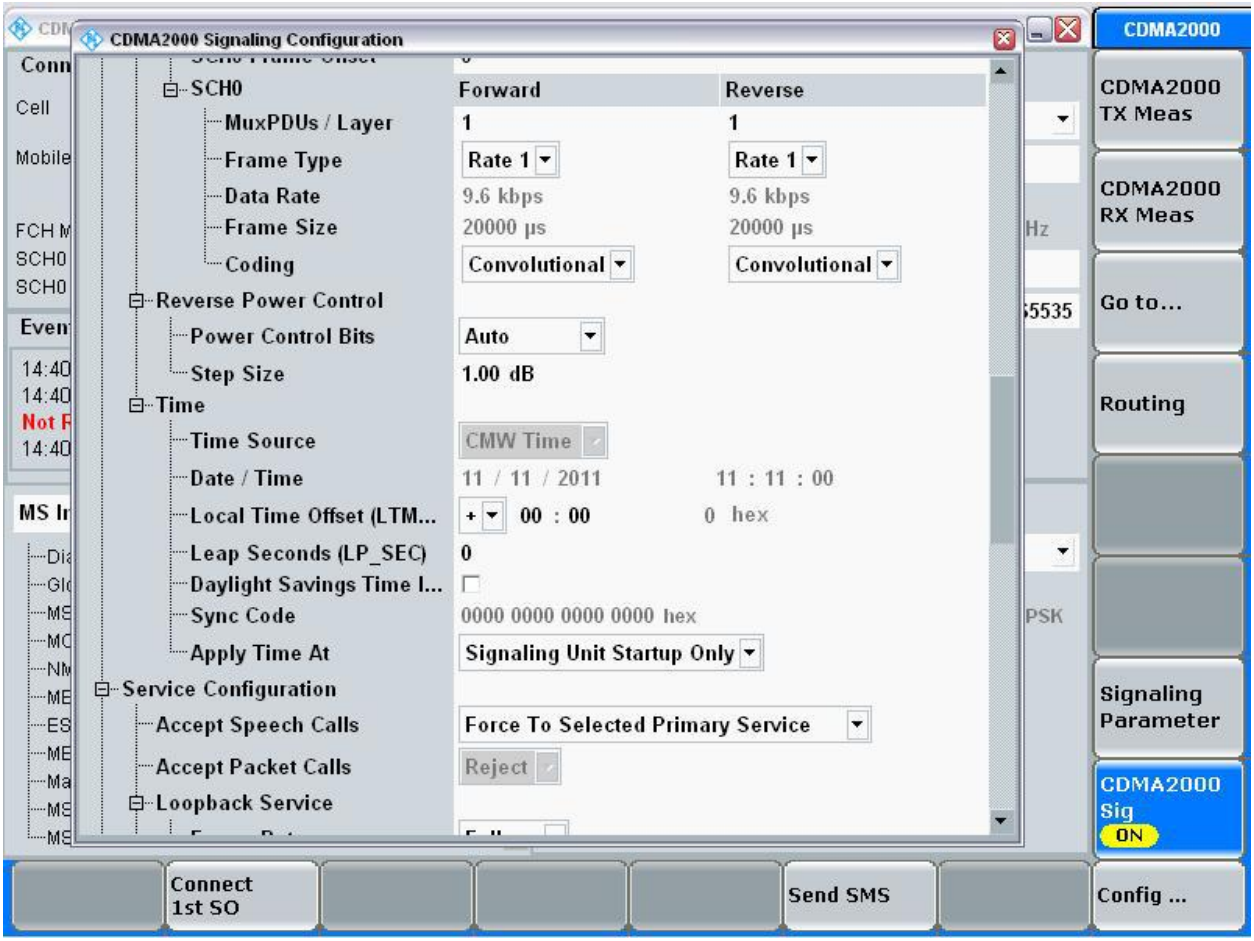

Figure 6-6 – CDMA Configuration Screen 4.

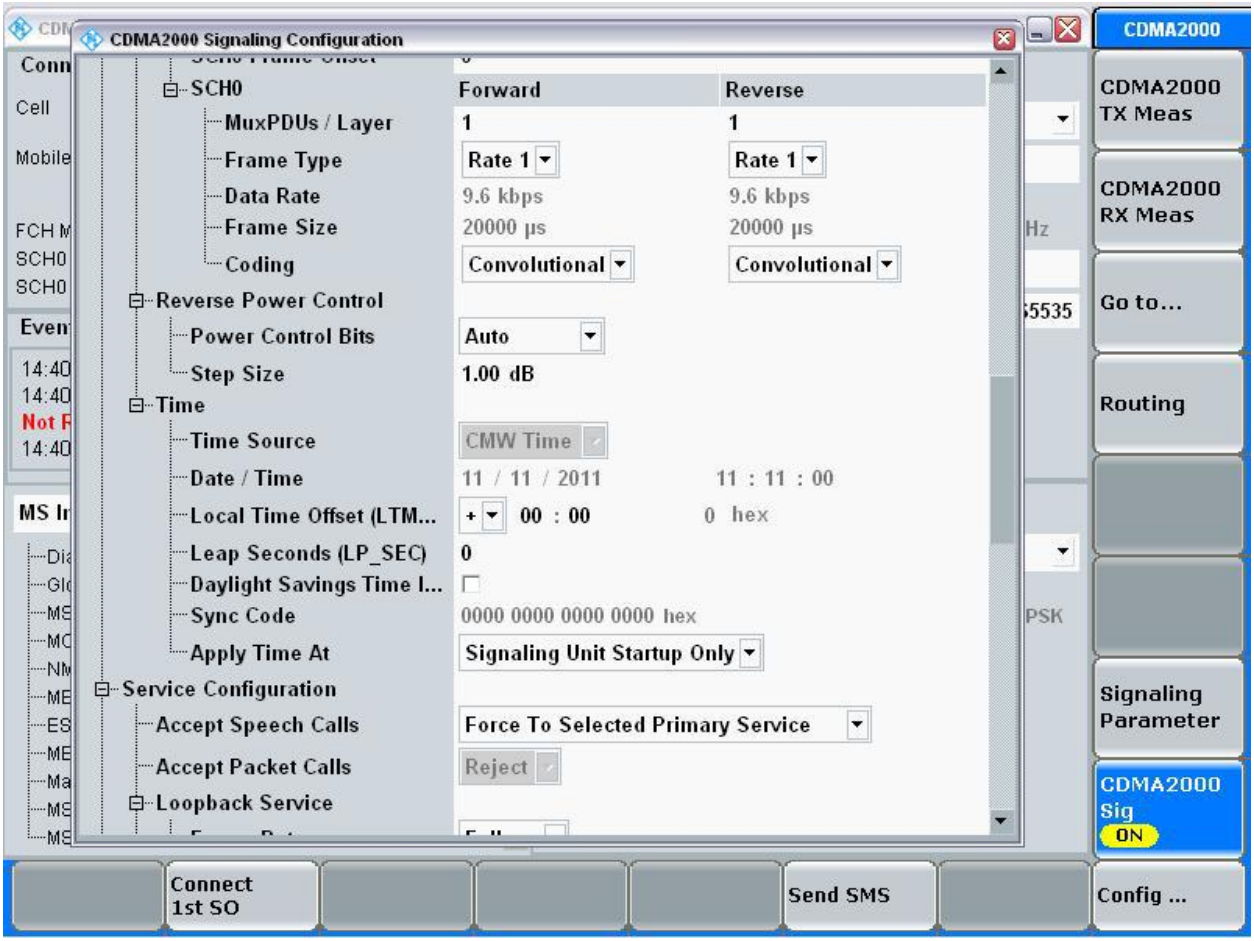

Figure 6-7 – CDMA Configuration Screen 5.

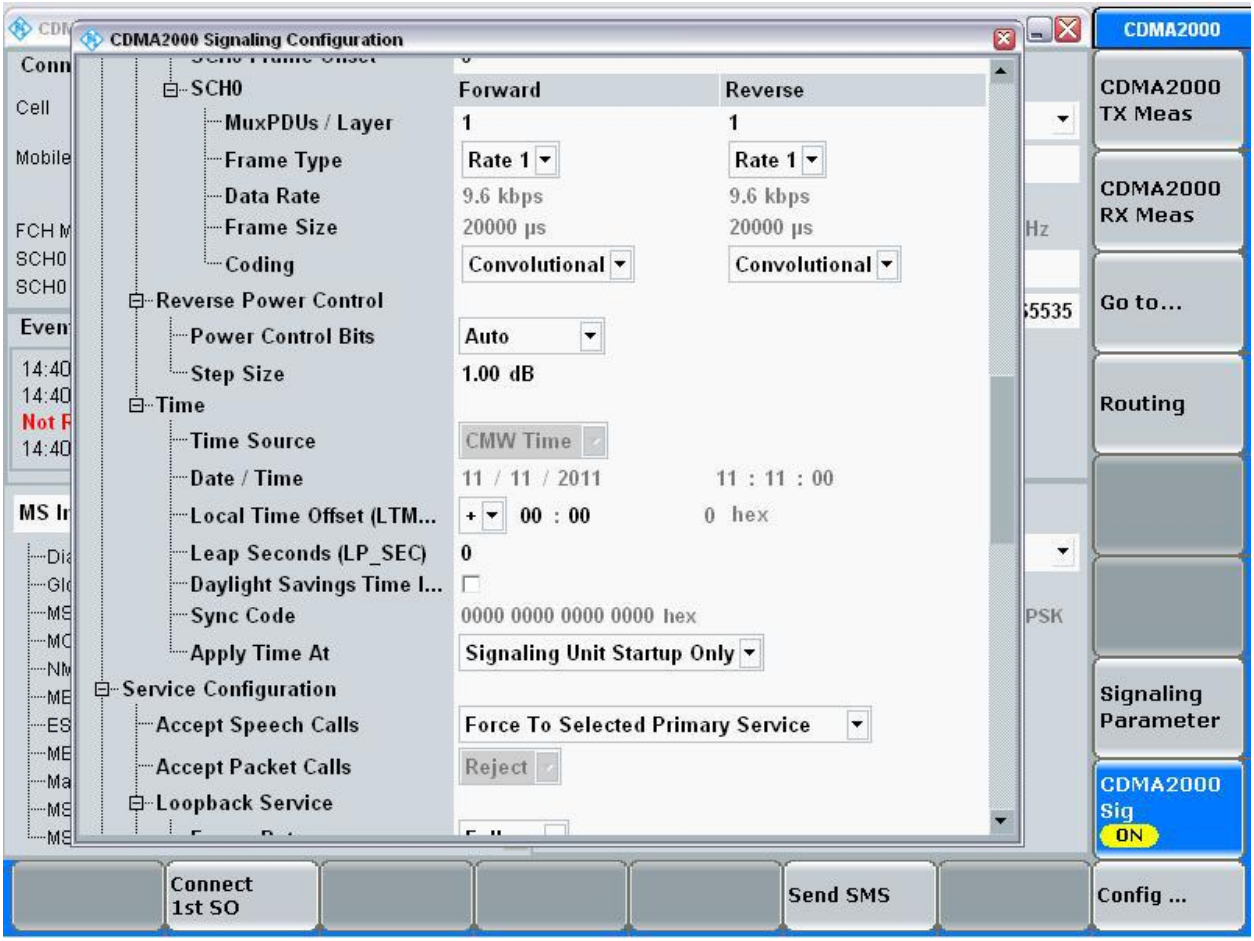

Figure 6-8 – CDMA Configuration Screen 6.

This completes the configuration.

