Rohde & Schwarz products: Universal Radio Communication Tester R&S®CMU200, Signal Analyzer R&S®FSQ, Spectrum Analyzers R&S®FSU and R&S®FSP, Signal Generators R&S®SMIQ and R&S®SMR

Measurements on 3GPP WCDMA User Equipment According to Standard TS 34.121

Application Note 1MA68

Most of the tests specified in standard TS 34.121 that 3GPP WCDMA user equipment (UE) must pass for type approval can be performed solely by the Universal Radio Communication Tester R&S® CMU200. Other tests, however, require additional instruments for generating one or more interfering signals or for high dynamic spectrum analysis up to 12.75 GHz, i.e. features that a tester optimized for production cannot offer.

This application note explains how to easily perform these tests using the R&S®CMU200 in combination with the R&S®FSQ, R&S®FSU, or R&S®FSP analyzers and the R&S®SMIQ and R&S®SMR signal generators. Predefined test items and sequences are included for remote-control software CMUgo, which is provided by Rohde & Schwarz at no charge to demonstrate the high performance of the R&S®CMU200.

ROHDE&SCHWARZ

Subject to change – Detlev Liebl, July 2004 - 1MA68_4E

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The following abbreviations are used in this Application Note for Rohde & Schwarz test equipment:

- The Universal Radio Communication Tester R&S®CMU200 is referred to as the CMU.
- The Microwave Signal Generator R&S®SMR is referred to as the SMR.
- The Vector Signal Generator R&S®SMIQ is referred to as the SMIQ.
- The Spectrum Analyzer R&S®FSP is referred to as the FSP.
- The Spectrum Analyzer R&S®FSU is referred to as the FSU.
- The Signal Analyzer R&S®FSQ is referred to as the FSQ.

1 Overview

Most of the tests specified in standard TS 34.121 that 3GPP WCDMA user equipment (UE) must pass for type approval can be performed solely by the Universal Radio Communication Tester R&S®CMU200. Other tests, however, require additional instruments for generating one or more interfering signals or for high dynamic spectrum analysis up to 12.75 GHz, i.e. features that a tester optimized for production cannot offer.

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Today, CMUgo already offers a comprehensive set of tests for 3GPP WCDMA UE measurements, e.g. for power, modulation, spectrum, and bit error tests with R&S®CMU200 alone. This list will now be expanded by predefined test sequences for the following tests:

Transmitter tests:

5.11 TX Spurious Emissions

5.12 Transmit Intermodulation

Receiver tests:

6.4 Adjacent Channel Selectivity

6.5 Blocking Characteristics

6.6 Spurious Response

6.7 Receive Intermodulation Characteristics

6.8 RX Spurious Emissions

(The numbers and test names correspond to the numbers and headings of the sections in the standard TS 34.121 which describe these tests.)

This Application Note provides a summary of each of these tests, a recommended hardware setup, and step-by-step instructions on how to perform the test.

Please read 5.11 TX Spurious Emissions at first, since details on the complete measurement procedure are given here, which are not repeated in the rest of this application note.

System Requirements

CMUgo will work under Windows 98, ME, 2000 or XP.

To ensure proper operation of CMUgo, your computer must meet the following minimum requirements.

Platform: Windows 98 / ME / 2000 / XP

Processor: Pentium 300

RAM: 64 Mbytes

Display: SVGA 800x600 pixels

(For more convenient use of CMUgo, particularly the presentation of measurement reports, the video graphics card must have a higher resolution.)

Hard-disk storage: 50 Mbytes

Peripherals: Mouse

National Instruments GPIB bus card

(CMUgo can control the instruments via a serial interface as well. But only the GPIB Interface allows the automatic test sequences to be performed at high speed.)

To make full use CMUgo's capabilities, the CMU 200 firmware version must be 3.52 or higher.

Installation of CMUgo

Application Note 1MA68 consists of two parts:

- The CMUgo software (file CMUgo.zip)
- This document (1MA68_4E.pdf)

To get the installation files:

- Unzip CMUgo.zip. One of the extracted files is setup.exe.
- Run setup.exe. When you are asked for the type of installation:
- Select *Custom*.
- Make sure that the checkbox *Demo Sequences* is active, see Fig. 1_1:

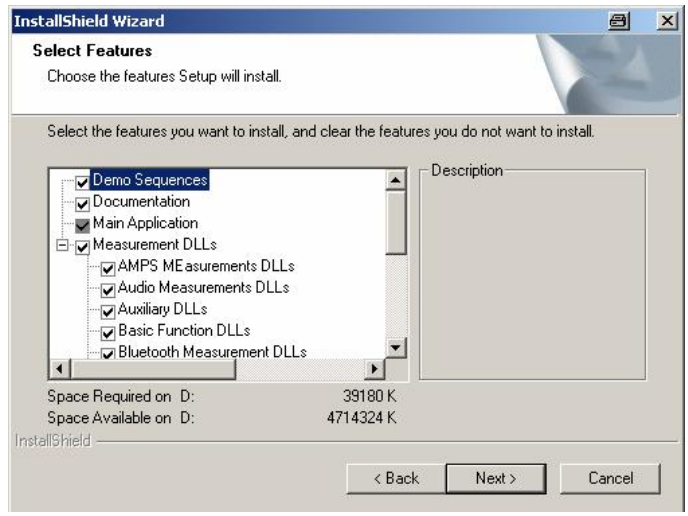


Fig. 1_1: To include the new test items and sequences, checkbox Demo Sequences must be active.

By this CMUgo.zip fully includes the new test items and sequences discussed here (starting with CMUgo version 1.5.0).

The application note 1MAA68 describes how to perform the seven tests mentioned above using CMUgo. For each of the tests, you can load a predefined sequence, modify it, and set individual parameters. You can add additional test items, run the test, output the measurement results to a file, and divert the remote commands to the clipboard.

It is presumed that you are already familiar with the CMU200 and CMUgo. If you are not, you should first read the manual CMUgo.pdf which is extracted during installation. It describes the menus, the entries and controls, and provides examples. You are encouraged to learn by doing.

- Familiarize yourself with the software.

Preparatory Work

Configuring the GPIB settings

CMUgo is a software tool for remote control of CMU200 and the other instruments. They have to be set to different IEEE-addresses, and must be connected via the GPIB bus to the controller PC where CMUgo is running.

(To keep the figures with the test setups simple, these GPIB connections have been omitted on the following pages.)

- Run CMUgo.
- Click *Configuration*

The port for remote control of CMU200 can be configured at *Remote port*. Starting with revision 1.5.0, CMUgo can control up to ten additional Auxiliary GPIB ports:

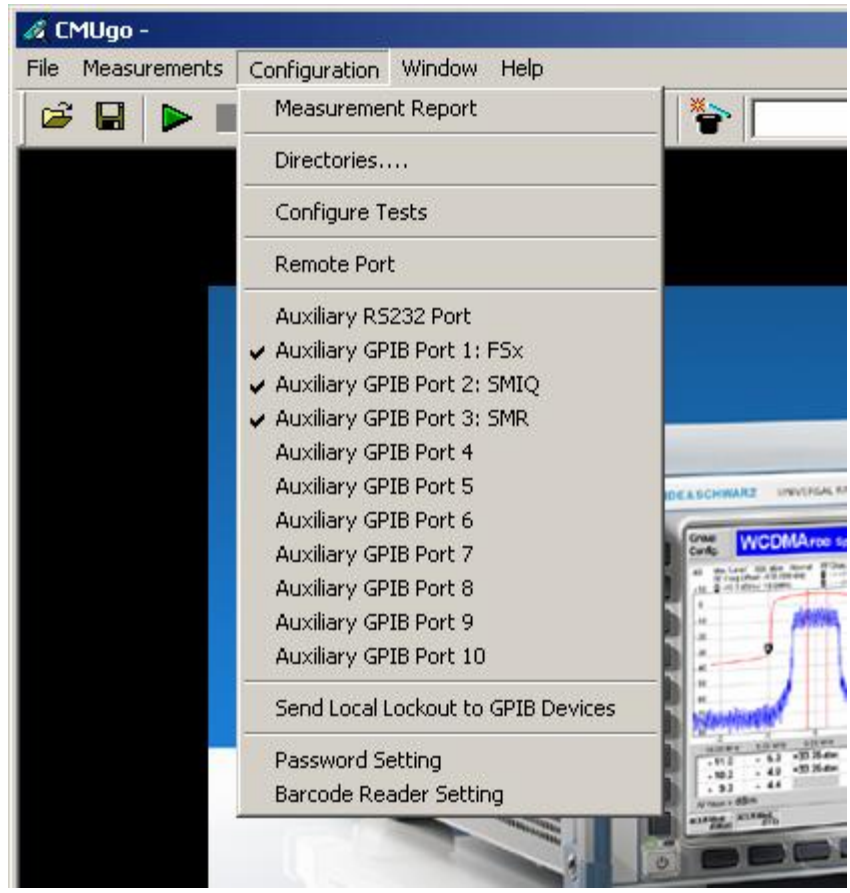


Fig. 1_2: GPIB configuration for up to ten instruments

- Double-click one of the auxiliary GPIB ports to make a device known to CMUgo.

The configuration window for this port opens (Fig. 1_3).

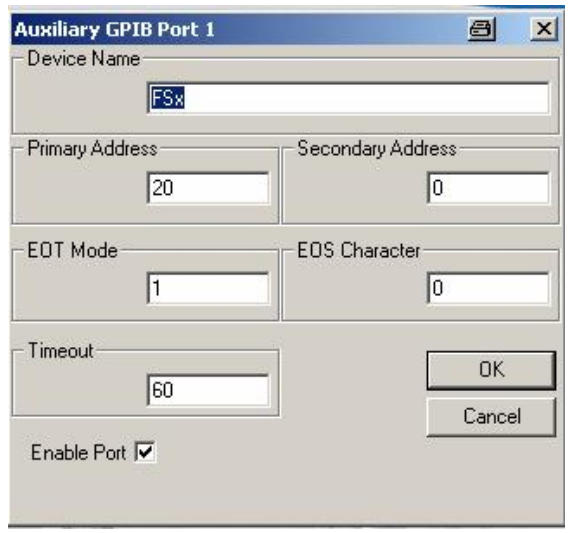


Fig. 1_3: Configuration of *Auxiliary GPIB Port, Enable* checkbox.

- Enter the device name.

  You must use the exact names and spellings shown in Fig. 1_3. 'FSx' stands for analyzer FSQ, FSU, or FSP, and 'SMIQ' and 'SMR' for the corresponding generators.
- Enter GPIB address.
- Enable port (do not omit this step!).
- Repeat this procedure for the other devices.

Measuring the path losses

Before running any of the tests, carefully measure the insertion loss between the UE and each instrument of the current hardware setup. Enter the measured values later as path losses when you edit the sequence of the test. The losses will be automatically compensated for by the software.

A helpful tool for measuring frequency response is the Rohde & Schwarz application program FreRes, part of Application Note 1MA09, which can be downloaded free of charge from

http://www.rohde-schwarz.com/appnote/1MA09

Note: For measurements below 10 MHz, set analyzer to input DC.

2 Transmitter Tests

5.11 Spurious Emissions

Spurious emissions are emissions caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products. If not suppressed sufficiently, they can considerably impair the reception of other radio services.

Spurious emissions are measured for frequencies that are more than 12.5 MHz away from the center frequencies. (Frequencies closer to the carrier are checked by tests 5.9 Spectrum Emission Mask and 5.10 Adjacent Channel Leakage Ratio. Tests 5.9 and 5.10 are performed by CMU200 without additional equipment.)

The purpose of test 5.11 is to verify that the UE spurious emissions do not exceed described values shown in Tables 5.11a and 5.11b:

Frequency band	Measurement bandwidth	Minimum requirement
9 kHz ≤ f < 150 kHz	1 kHz	–36 dBm
150 kHz ≤ f < 30 MHz	10 kHz	–36 dBm
30 MHz ≤ f < 1000 MHz	100 kHz	–36 dBm
1 GHz ≤ f < 12.75 GHz	1 MHz	–30 dBm

Table 5.11a: General Spurious Emissions test requirements

Frequency band	Measurement bandwidth	Minimum requirement
1893.5 MHz < f < 1919.6 MHz	300 kHz	–41 dBm
925 MHz ≤ f ≤ 935 MHz	100 kHz	–67 dBm
935 MHz < f ≤ 960 MHz	100 kHz	–79 dBm
1805 MHz ≤ f ≤ 1880 MHz	100 kHz	–71 dBm

Table 5.11 b: Additional Spurious Emissions test requirements

Table 5.11a (General Spurious Emissions) contains a set of limits for the continuous frequency band from 9 kHz to 12.75 GHz. These limits are checked by the test sequence *WCDMA_5.11_1.seq* (Spurious Emissions 1).

Within the frequency range of Table 5.11a, there are additional, more stringent limits for frequency bands that are allocated by other mobile services, e.g. GSM, see Table 5.11b (Additional Spurious Emissions). These limits are checked by the test sequence *WCDMA_5.11_2.seq* (Spurious Emissions 2).

To achieve the necessary high dynamic range for these measurements, a notch filter is used to suppress the UE carrier.

Recommended test setup:

Fig. 5.11_1 shows the test setup for spurious emissions measurements.

In the path between the CMU200 and the UE, the analyzer is coupled in via a resistive combiner. This guarantees a flat frequency response. Additional attenuators reduce the power and improve the impedance matching.

For measurements of the G*eneral Spurious Emissions*, connect the signal analyzer directly to the resistive divider.

For measurements of the *Additional Spurious Emissions*, a notch filter is inserted between the analyzer and the resistive divider. Tune it carefully to suppress the UE uplink signal by about 40 dB to avoid a mixer level inside the analyzer that is too high.

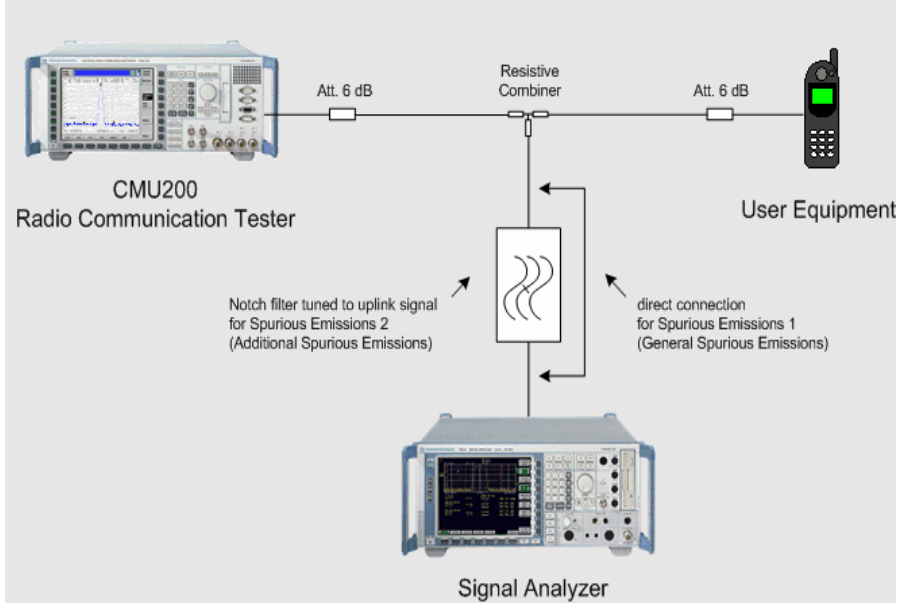


Fig. 5.11_1: Test setup for Spurious Emissions test

Instruments and accessories:

- CMU200, FSQ or FSU or FSP
- Resistive combiner: DC to 12.75 GHz (e.g. Weinschel 1515-1)
- Notch filter: 1920 MHz to 1980 MHz, 40 dB min. (e.g. Wainwright WRCT 1920/2200-(5/40)-10SSK)
- Attenuators 6 dB, DC to 12.75 GHz (e.g. Suhner)

Path loss compensation:

- Measure the path loss between UE and CMU200.
- Measure the path loss between UE and signal analyzer.

A helpful tool for measuring the path loss is the Rohde & Schwarz application program FreRes (Frequency Response), part of Application Note 1MA09, which can be downloaded free of charge from

http://www.rohde-schwarz.com/appnote/1MA09

Note: For measurements below 10 MHz, set analyzer to input DC.

Test procedure:

1) Connect instruments and user equipment as shown in Fig. 5.11_1.
2) Run CMUgo, and then click *File*, *Load Sequence*.
3) For *General Spurious Emissions*, select *WCDMA_5.11_1.seq*.
   For *Additional Spurious Emissions*, select *WCDMA_5.11_2.seq*.
4) Click *Configuration* in the menu bar, and then *Configure Tests*.

   The window *Configure Test Items* opens. The left column contains all available test items. The right column shows which test items have been selected to build the sequence for test 5.11_1 or 5.11_2.

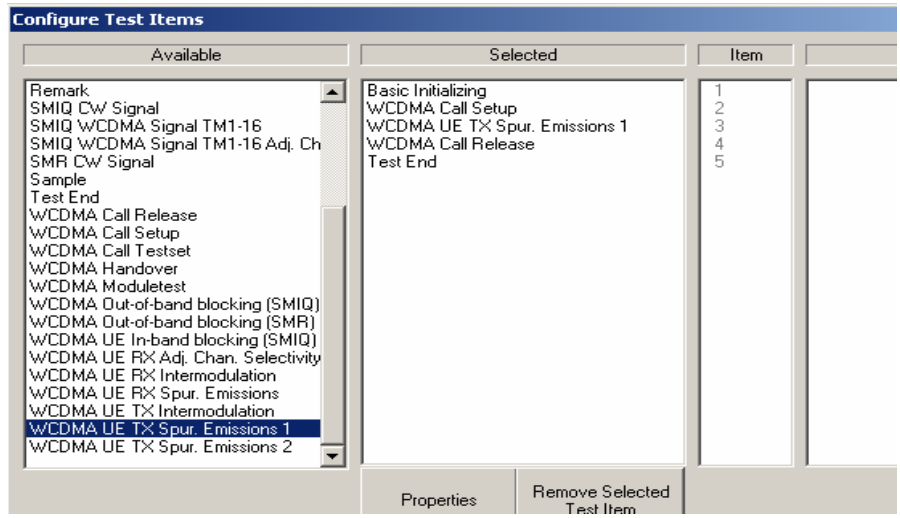


Fig. 5.11_2: Available and selected test items (test sequence) for Spurious Emission test 1

Adapt test items *WCDMA Call Setup* and *WCDMA UE TX Spur. Emissions* to your requirements by doing the following:

5) Double-click *WCDMA Call Setup* in the list of the selected test items.

   The window *Call Setup Configuration* opens, see Fig. 5.11_3

6) Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (bottom left in Fig. 5.11_3).

   The default setting of the test sequence for the channel is mid-band.

7) If you want to use a different channel , modify *RF Downlink / Uplink Channel*.

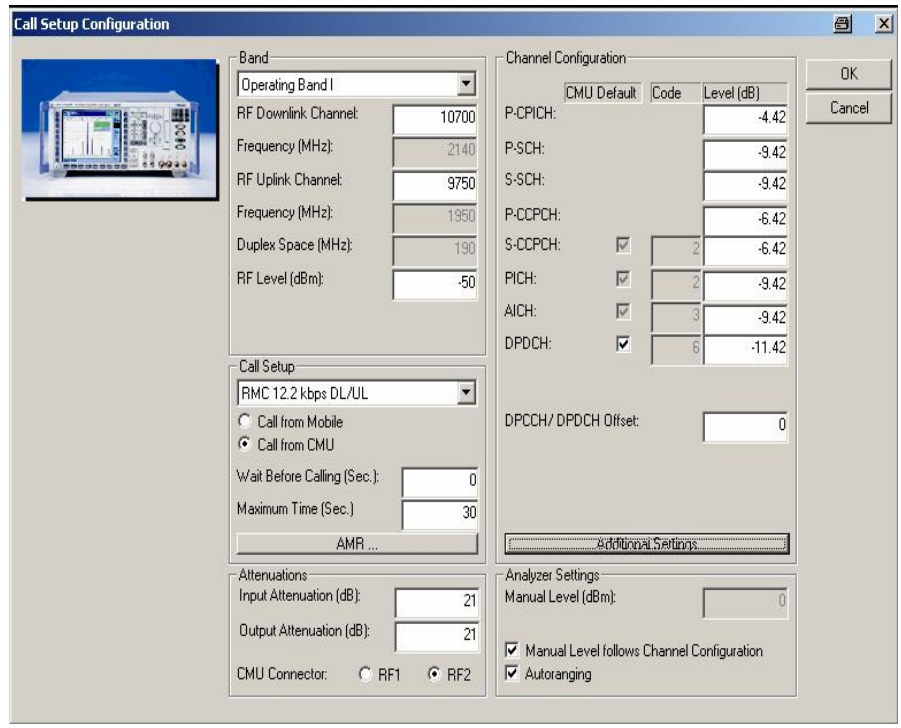


Figure 5.11_3: Call Setup configuration

8) Click *OK*.

You are back in the window *Configure Test Items* (Fig. 5.11_4).

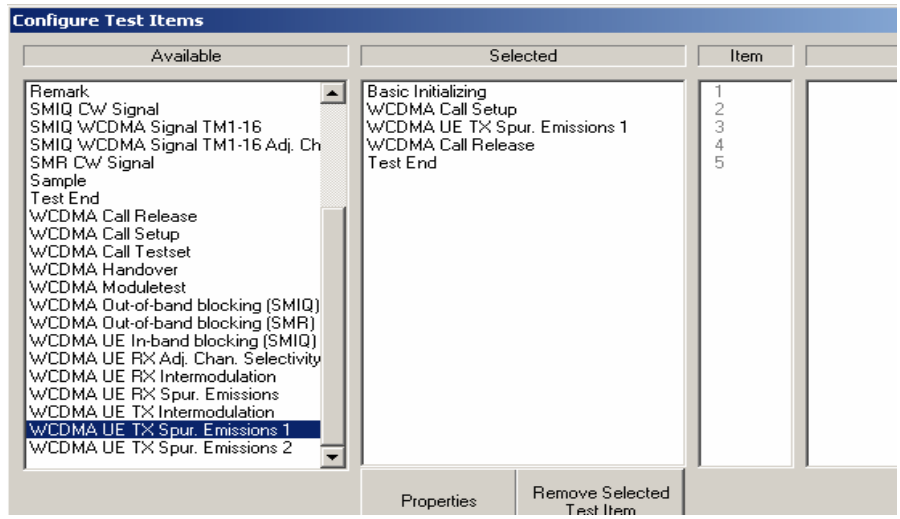


Figure 5.11_4: Window Configure Test Items e.g. for Spurious Emission test 1

Now configure the test item *WCDMA UE TX Spur. Emissions*.

9) Double-click *WCDMA UE TX Spur. Emissions (1* / 2) in the list of the selected test items

The window *FSx Settings for WCDMA Spurious Emissions* opens (e.g. for General Spurious Emmissions):

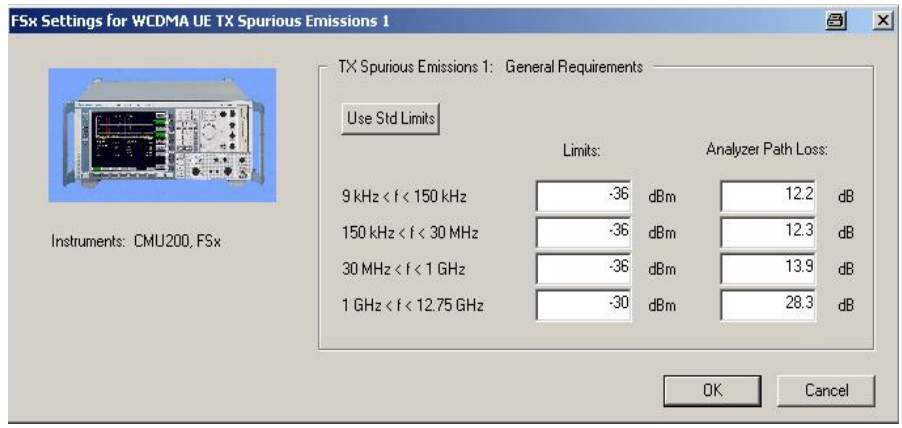


Fig. 5.11_5: Setup of the analyzer e.g. for Spurious Emission test 1

10) Enter the path loss between UE and signal analyzer. To be on the safe side, always enter the maximum path loss, i.e. the path loss at the upper end of the frequency band. If limits are exceeded at a lower frequency, reduce the entry value to the actual path loss at that frequency point, and repeat the test.

11) If necessary, enter your individual limit values.

12) To reset the limits to standard TS 34.121, click the button *Use Std. Limits*.

13) Click *OK*.

    You are back in the window *Configure Test Items* (Fig. 5.11_5). The items are now configured.

14) Click *OK*.

    This completes the measurement setup.

To start the measurement:

15) Click the *start icon* in the menu bar of CMUgo (Fig. 5.11_6).

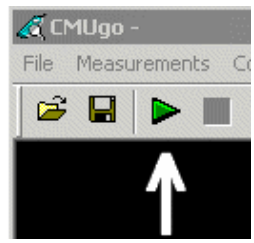


Fig. 5.11_6: Start icon in the menu bar of CMUgo

Test description and measurement report:

Once the start icon is clicked, the *Measurement Report* window opens; see Fig. 5.11_7. It shows the names and conditions of the test, the limits, and the results. You can see the list of test items that will be performed. However, to optimize speed, the report window is not updated before the last measurement of the last test item has been finished. As long as the tests are running, all test items are indicated as *not performed* in the *Measurement Report* window.

A pop-up menu instructs you to switch on the UE. The CMU200 then automatically registers the UE and sets up a call connection. The pop-up menu disappears when the call is established.

The frequency range for General Spurious Emissions - from 9 kHz up to 12.75 GHz - has been divided into several sections; see Fig. 5.11_6. The test leaves a gap of +/- 12.5 MHz around the uplink and downlink frequencies of 1950 MHz and 2140 MHz.

CMUgo now scans all sections. For General Spurious Emissions, the limit of each section specified in Fig. 5.11_4 is visible as a limit line on the analyzer's screen. Once a section is scanned, the marker of the analyzer is set to peak. This value will be displayed later as a measurement value for the section.

During the test, the currently executed test item and test step are indicated on the bottom bar of the *Measurement Report* window. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. For General Spurious Emissions a display similar to Fig. 5.11_7 appears.

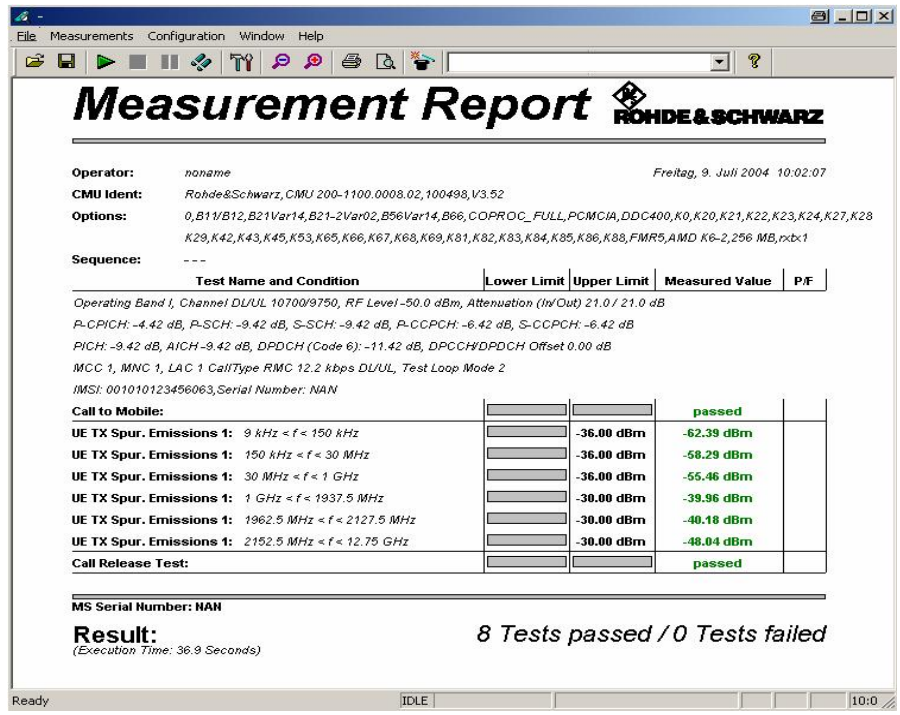


Fig. 5.11_7: Measurement report for Spurious Emission test 1 (General Spurious Emissions)

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has passed or failed.

For the Additional Spurious Emissions, the first three frequency sections are scanned in steps of 200 kHz. If a limit is exceeded, the frequency and the measurement result is displayed. If no limit is exceeded, the maximum value will be shown.

For the fourth frequency section, a limit line is visible on the analyzer's screen. The peak value will is indicated.

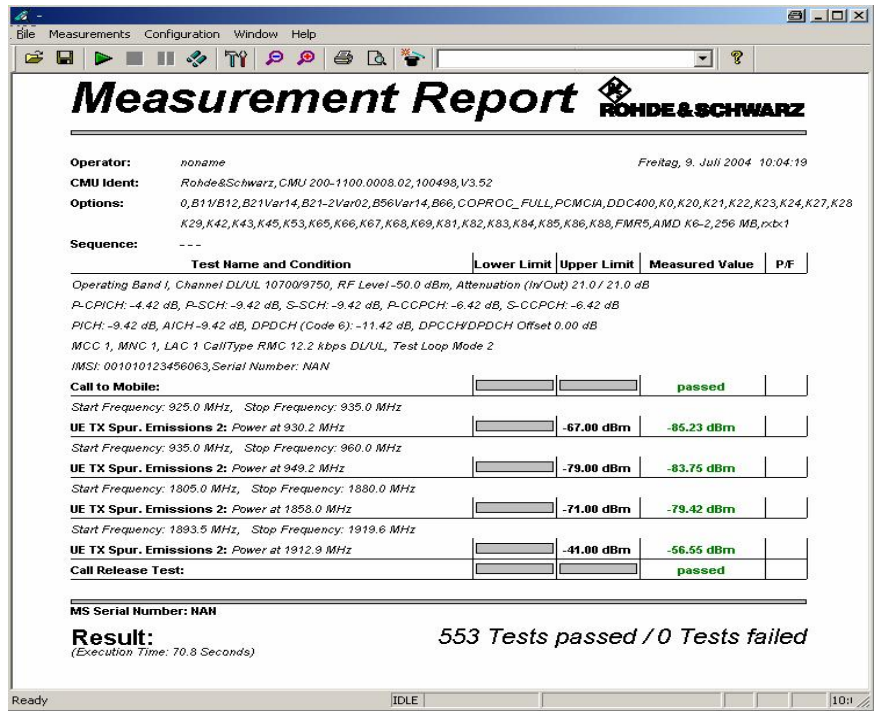


Fig. 5.11_8: Measurement report for Spurious Emission test 2 (Additional Spurious Emissions)

Note: *Call to Mobile* and *Call Release* are test items (as is *WCDMA UE TX Spur. Emissions*). Both increase the number of passed tests as tests without limits.

5.12 Transmit Intermodulation

The transmit intermodulation performance is a measure of the capability of the UE transmitter to avoid generating signals in its non-linear elements caused by the presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

UEs transmitting in close vicinity to each other can produce intermodulation products, which can fall into the UE, or Node B receive band as an unwanted interfering signal.

The UE transmit intermodulation attenuation is defined by the ratio of the output power of the wanted signal to the output power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal. Both the wanted signal power and the IM product power are measured with a filter that has a root-raised cosine (RRC) filter response with roll-off factor α = 0.22 and a bandwidth equal to the chip rate.

The purpose of test 5.12 is to verify that the UE transmit intermodulation does not exceed the value described in Table 5.12.1:

CW signal frequency offset from transmitting carrier	5 MHz	10 MHz
Interference CW signal level	–40 dBc	
Intermodulation product	– 31 dBc	– 41 dBc

Table 5.12.1: Transmit Intermodulation limits

The intermodulation products that fall into the UE transmit band appear at

$(2f_{transmitter} - f_{interferer})$ and $(2 f_{interferer} - f_{transmitter})$.

This means that they can be found below the lower and above the higher one of two frequencies at a distance equal to the difference of the frequencies.

Recommended test setup:

Fig. 5.12_1 shows the test setup for Transmit Intermodulation measurements.

The CW interferer is added to the CMU200 signal using a hybrid combiner. The interfering signal comes from an SMIQ generator that is protected against the high output power of the UE by a 10 dB attenuator. The hybrid isolates the SMIQ and CMU200.

The analyzer is coupled in via a resistive combiner.

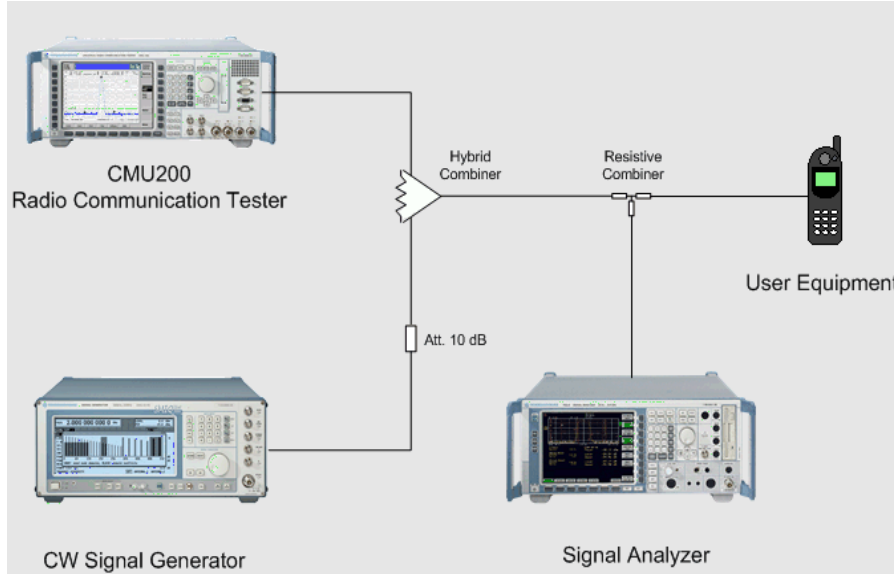


Fig. 5.12_1: Test setup forTransmit Intermodulation test

Instruments and accessories:

- CMU200, FSQ or FSU or FSP analyzer, and SMIQ generator
- Hybrid combiner: 1920 MHz to 2170 MHz (e.g. Minicircuits ZFSC-2-2500)
- Resistive combiner: up to 2.5 GHz (e.g. Weinschel 1515-1)
- Attenuator 10 dB, up to 2.5 GHz (e.g. Suhner)

Path loss compensation:

- Measure the path loss between UE and CMU200.
- Measure the path loss between UE and analyzer.
- Measure the path loss between UE and signal generator.

Test procedure:

1) Connect instruments and user equipment as shown in Fig. 5.11_1.
2) Run CMUgo, click *File*, *Load Sequence,* and select WCDMA_*5.12.seq*.
3) Click *Configuration* in the menu bar, and then *Configure Tests.*

The window *Configure Test Items* opens. The left column contains all available test items. The right one shows which test items have been selected to build test sequence 5.12.

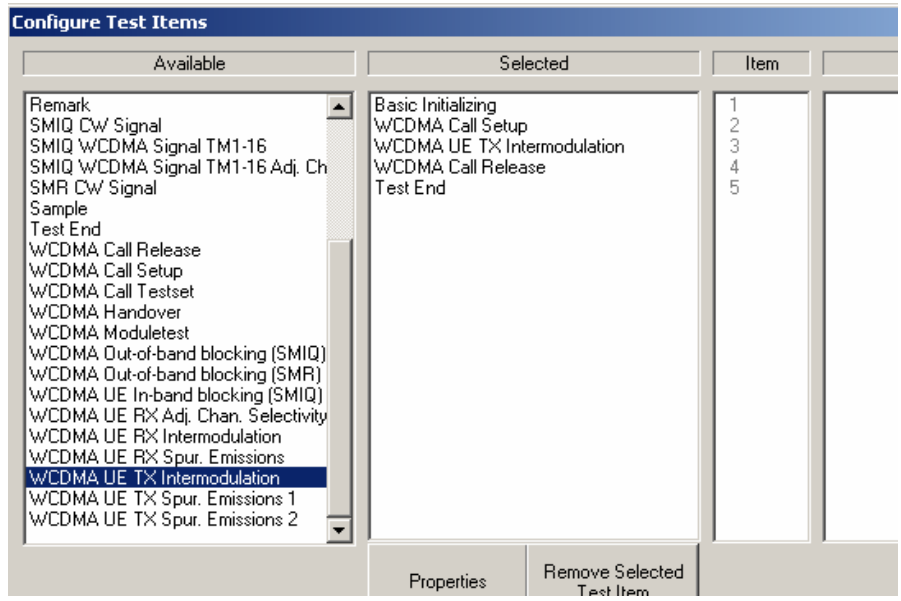


Fig. 5.12_2: Available and selected test items (test sequence) for Transmit Intermodulation

Adapt the test items *WCDMA Call Setup* and *WCDMA UE TX Intermodulation* to your requirements:

4) Double-click *WCDMA Call Setup* in the list of the selected test items.

The window *Call Setup Configuration* opens:

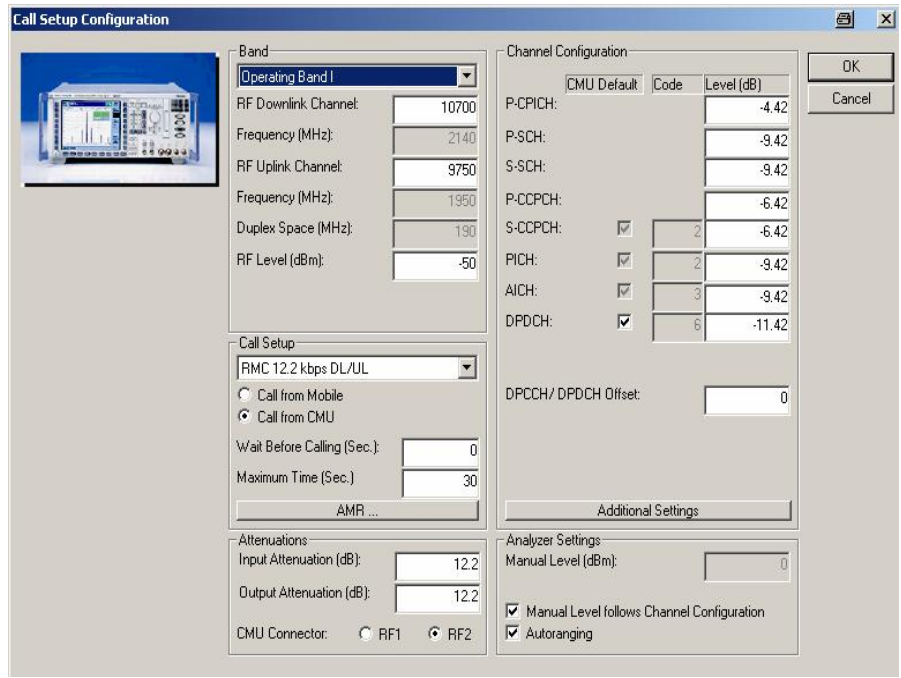


Fig. 5.12_3: Call setup configuration

Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (lower left in Fig. 5.12_3))

5) If necessary, modify *RF Downlink / Uplink Channel*.

6) Click *OK.*

You are back in the window *Configure Test Items* (Fig. 5.11_2). Now configure the test item *WCDMA UE TX Intermodulation*.

7) Double-click *WCDMA UE TX Intermodulation*.

The window *FSx and SMIQ Settings for WCDMA Transmit Intermodulation* opens:

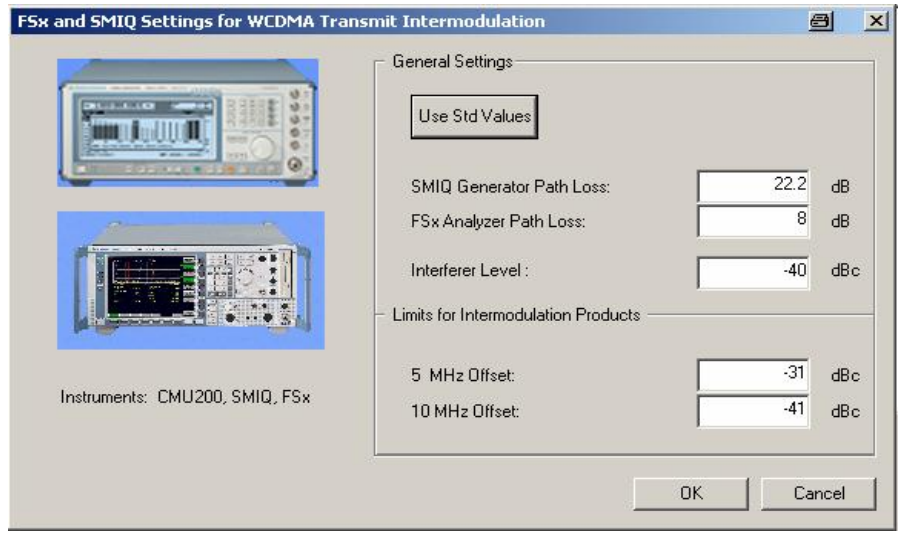


Fig. 5.12_4: Setup of generator and analyzer for Transmit Intermodulation test

8) Enter the path loss between UE and signal generator as *SMIQ Generator Path Loss.*

9) Enter the path loss between UE and signal analyzer as *FSx Analyzer Path Loss.*

10) Enter the relative value for the *Interferer Level*.

11) If necessary, enter your individual limit values.

12) To reset the limits to standard TS 34.121, click the button *Use Std. Limits*.

13) Click *OK*.

You are back in the window *Configure Test Items* (Fig. 5.12_2). The items are now configured now.

14) Click *OK*.

To start the measurement:

15) Click the *start icon* in the menu bar of CMUgo.

Test description and measurement report:

Test 5.12 uses the multi-carrier-measurement function of the analyzer. The current number of carriers (channels) to be measured simultaneously is set to 9. The channel in the middle shows the uplink signal.

In a first record, the interferer signal is set to a frequency of 5 MHz above the uplink signal (one channel offset), and the channel powers immediately below the uplink signal and above the interferer are measured.

In a second record, the frequency offset is set to 10 MHz, and the channel power is measured in a two-channel offset.

Fig. 5.12_5 shows an analyzer screenshot for the 10 MHz offset:

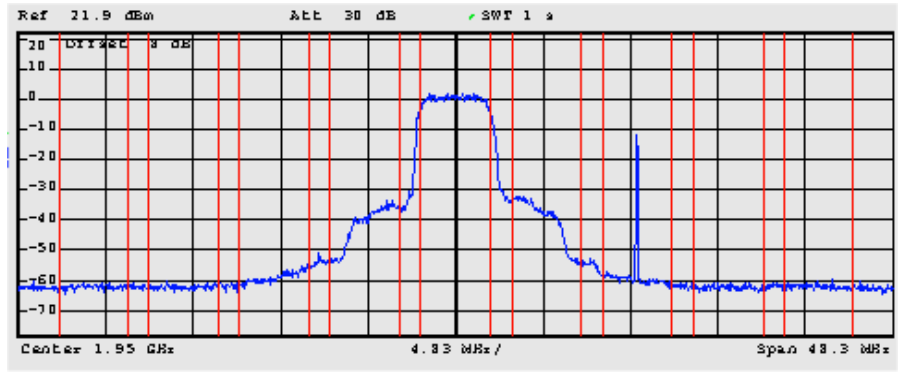


Fig. 5.12_5: Transmit Intermodulation test / 10 MHz interferer offset

In Fig. 5.12_5, no significant intermodulation products can be found. The adjacent channel power ratio of the tested UE is about 40 dB.

During the test run, the current test item and test step are indicated on the bottom bar of the *Measurement Report* window on your PC. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. A display similar to Fig. 5.12_6 appears.

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has failed.

On the CMU200, the report display uses channel numbers instead of frequencies. You obtain the frequency by dividing the channel numbers by 5:

- Channel number 9750 equals 1950 MHz (mid-band).
- Offset of 25 channel numbers equals an offset of 5 MHz.
- Offset of 50 channel numbers equals an offset of 10 MHz.

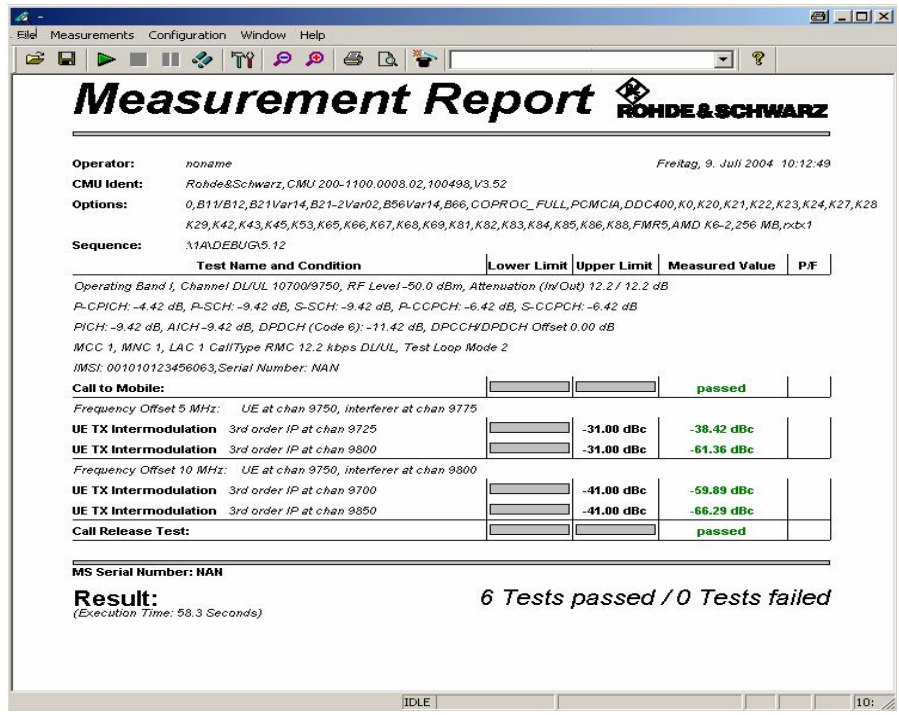


Fig. 5.12_6: Measurement report for Transmit Intermodulation test

As indicated in Fig. 5.12_6, the contribution at channel 9725 (offset -5 MHz) is not an intermodulation product but the adjacent channel power of the UE itself. The other results are far below the standard limits.

3 Receiver Tests

Nearly all receiver tests are bit error measurements. For these tests, a loop inside the device under test is closed to re-transmit the received, demodulated, and corrected bits. To make sure that the uplink does not contribute additional errors, the output power of the device under tests is fairly high.

The bit error rate (BER) is counted inside the CMU200. The confidence level and the test time depend on the number of transport blocks that are checked for one result. Unfortunately, the standard TS 34.121 does not prescribe how many blocks to take.

As an acceptable compromise, we recommend 500 blocks. Because one transport block uses two frames, i.e. 20 ms, the time for one measurement will be 10 s.

6.4 Adjacent Channel Selectivity

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive a WCDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the center frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channels.

The purpose of this test is to verify that the BER does not exceed 0.001 for the parameters specified in Table 6.4.

Parameter	Level / Status	Unit
DPCH_Ec	–103	dBm / 3.84 MHz
Îor	–92.7	dBm / 3.84 MHz
Ioac (modulated)	–52	dBm / 3.84 MHz
Fuw (offset)	–5 or +5	MHz

Table 6.4: Test parameters for adjacent channel selectivity

where

DPCH_Ec: Absolute power of the data channel of the downlink signal

Îor: Total power of the downlink signal

Ioac: Total power of the (modulated) interferer

Recommended test setup:

Fig. 6.4_1 shows the test setup for adjacent channel selectivity measurements.

The WCDMA interfering signal is generated by the SMIQ signal generator. It is added to the CMU200 signal using a resistive combiner. The SMIQ is protected against the high output power of the UE by a 10 dB attenuator.

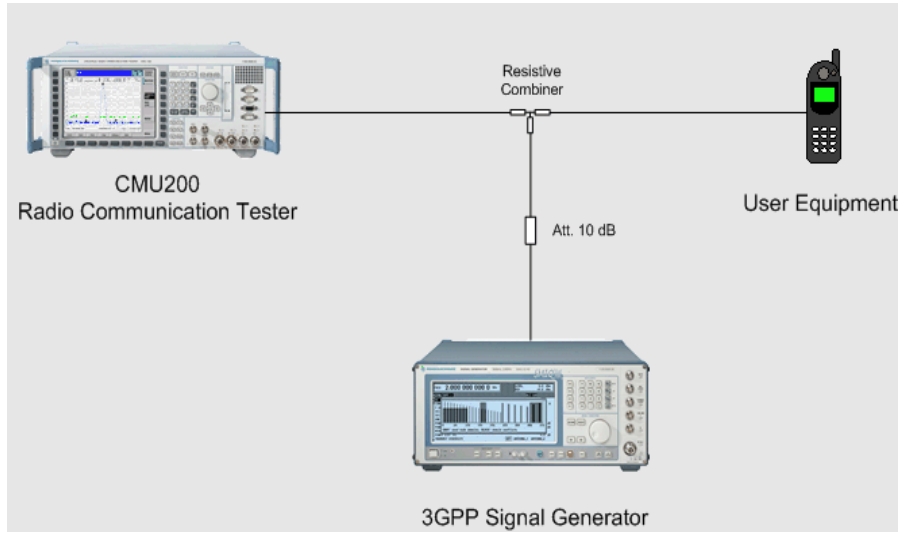


Fig. 6.4_1: Test setup for Adjacent Channel Selectivity test

Instruments and accessories:

- CMU200, SMIQ generator
- Resistive combiner: up to 2.5 GHz (e.g. Weinschel 1515-1)
- Attenuator 10 dB, up to 2.5 GHz (e.g. Suhner)

Path loss compensation:

- Measure the path loss between UE and CMU200.
- Measure the path loss between UE and signal generator.

Test procedure:

1) Connect instruments and user equipment as shown in Fig. 6.4_1.
2) Run CMUgo, click *File*, *Load Sequence,* and select WCDMA_*6.4.seq*.
3) Click *Configuration* in the menu bar, and then *Configure Tests*

The window *Configure Test Items* opens. The left column contains all available test items. The right one shows which test items have been selected to build test sequence 6.4.

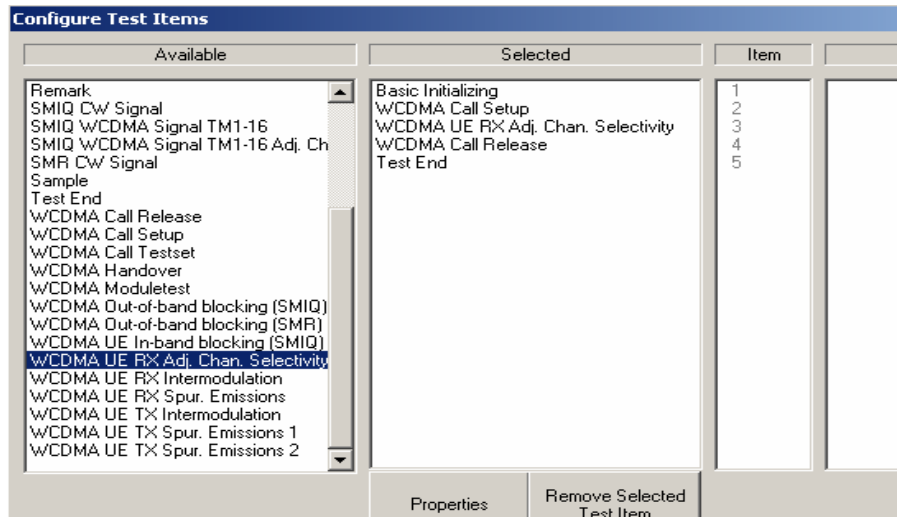


Fig. 6.4_2: Available and selected test items (test sequence) for Adj. Channel Selectivity

Adapt the test items *WCDMA Call Setup* and *WCDMA UE RX Adj. Chan. Selectivity* to your requirements as follows:

4) Double-click *WCDMA Call Setup* in the list of the selected test items.

The window *Call Setup Configuration* opens:

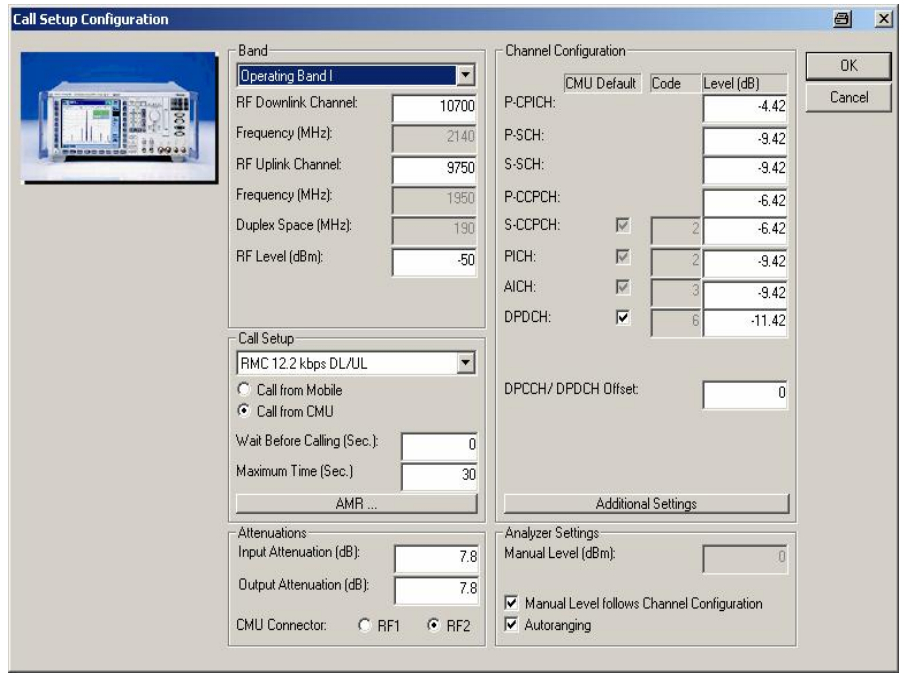


Fig. 6.4_3: Call Setup configuration

5) Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (lower left in Fig. 6.4_3))

6) If necessary, modify *RF Downlink / Uplink Channel*.

7) Click *OK.*

You are back in the window *Configure Test Items* (Fig. 6.4_2). Now configure the test item *WCDMA UE RX Adj. Chan. Selectivity*.

8) Double-click *WCDMA UE RX Adj. Chan. Selectivity*.

The window *Settings for WCDMA UE RX adjacent channel selectivity* opens:

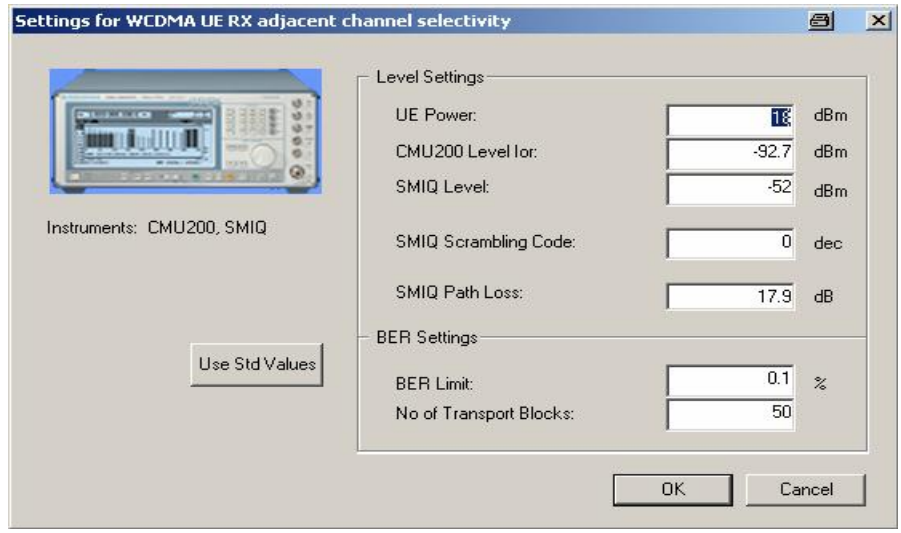


Fig. 6.4_4: Generator Setup for Adjacent Channel Selectivity

9) Enter *UE Power*. For UE power class 4, enter 18 dBm. For UE power class 3 and higher, enter 20 dBm.

10) Enter an *SMIQ Scrambling Code* that is not identical with the scrambling code used for the connection.

11) Enter the *SMIQ Path Loss* between UE and signal generator.

12) Enter the *No of Transport Blocks* that are used for one BER calculation.

13) If necessary, enter your individual levels and limit values. (The DPCH_Ec level is set automatically to 10.3 dB below the Ior level.)

14) To reset those values to the standard TS 34.121, click the button *Use Std. Values*.

15) Click *OK*.

You are back in the window *Configure Test Items* (Fig. 6.4_2). The items are now configured.

16) Click *OK*.

To start the measurement:

17) Click the *start icon* in the menu bar of CMUgo (Fig. 5.11_5).

Test description and measurement report:

The SMIQ generator calculates the WCDMA signal, and the first BER measurement is performed with the interfering signal at 5 MHz below the UE receive channel. This is followed by a BER measurement with the interfering signal at 5 MHz above the UE receive channel.

During the test run, the current test item and test step are indicated on the bottom bar of the *Measurement Report* window on your PC. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. A display similar to Fig. 6.4_6 appears.

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has failed.

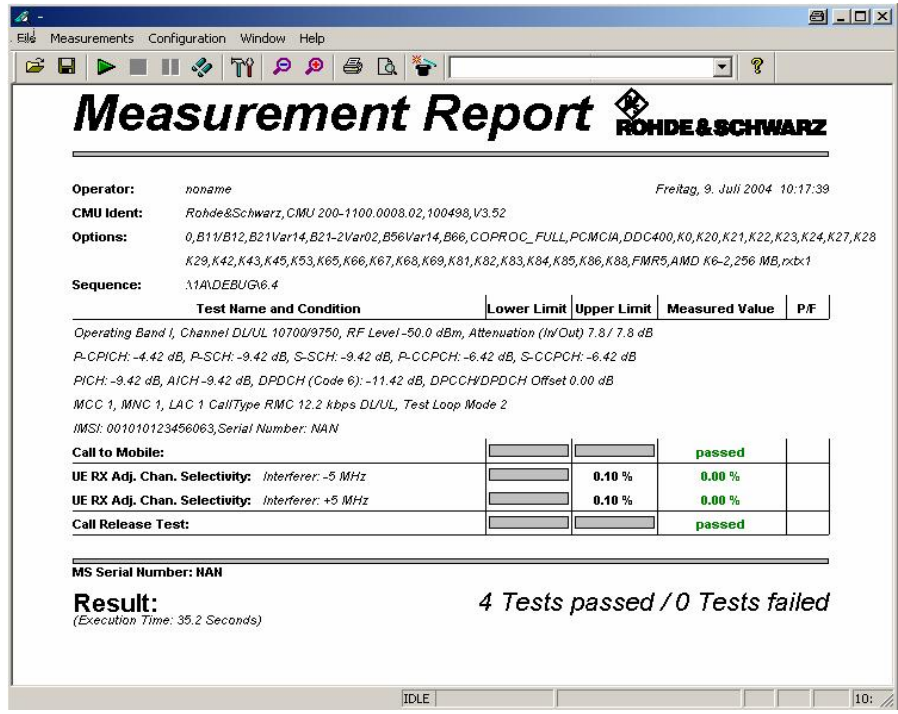


Fig. 6.4_6: Measurement report for Adjacent Channel Selectivity test

6.5 Blocking Characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit.

There are two types of blocking tests: in-band and out-of-band blocking tests.

In-Band Blocking

In-band blocking uses a WCDMA modulated interferer with frequency offsets of +/- 10 MHz and +/- 15 MHz to the frequency of the wanted signal.

The purpose of this test is to verify that the UE bit error rate (BER) does not exceed 0.001 for the parameters specified in Table 6.5.1:

Parameter	10 MHz offset	15 MHz offset	Unit
DPCH_Ec	−114	−114	dBm / 3.84 MHz
Îor	−103.7	−103.7	dBm / 3.84 MHz
Iblocking (modulated)	−56	−44	dBm / 3.84 MHz
Fuw (offset)	+10 or −10	+15 or −15	MHz

Table 6.5.1: Test parameters for In-band Blocking characteristics

with

DPCH_Ec: Absolute power of the data channel of the downlink signal (in the standard, this value is specified as REFSENS + 3 dB)

Îor: Total power of the downlink signal

Ioac: Total power of the (modulated) interferer

Recommended test setup:

Fig. 6.5_1 shows the test setup for the in-band blocking measurements.

The WCDMA interfering signal is generated by the SMIQ generator. It is added to the CMU200 signal using a resistive combiner. The SMIQ is protected against the high output power of the UE by a 10 dB attenuator.

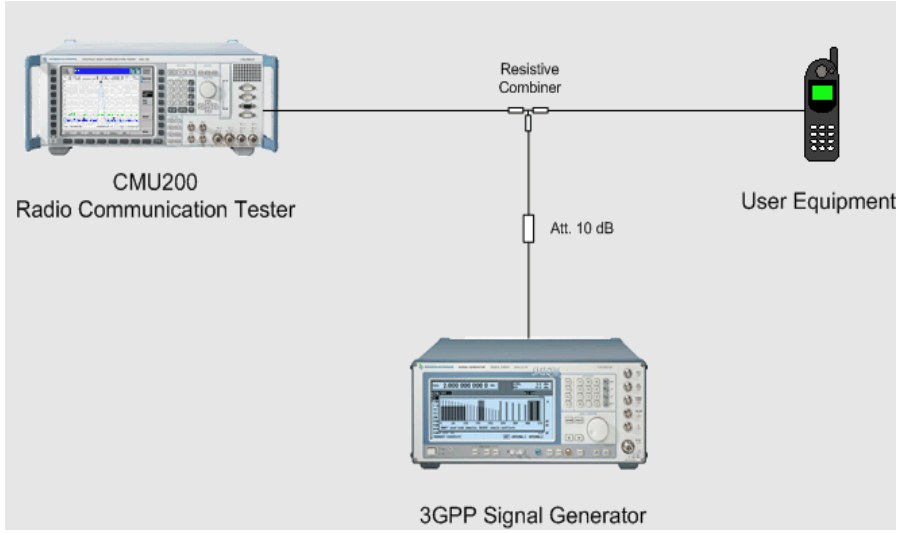


Fig. 6.5_1: Test setup for In-band Blocking Characteristics

Instruments and accessories:

- CMU200, SMIQ generator
- Resistive combiner: up to 2.5 GHz (e.g. Weinschel 1515-1)
- Attenuator 10 dB, up to 2.5 GHz (e.g. Suhner)

Path loss compensation:

- Measure the path loss between UE and CMU200.
- Measure the path loss between UE and signal generator.

Test procedure:

1) Connect instruments and user equipment as shown in Fig. 6.5_1.
2) Run CMUgo, click *File*, *Load Sequenc*e, and select WCDMA_*6.5_1.seq*.
3) Click *Configuration* in the menu bar, and then *Configure Tests*

The window *Configure Test Items* opens. The left-hand column contains all available test items. The right-hand column shows which test items have been selected to build the test sequence WCDMA_*6.5_1.seq*.

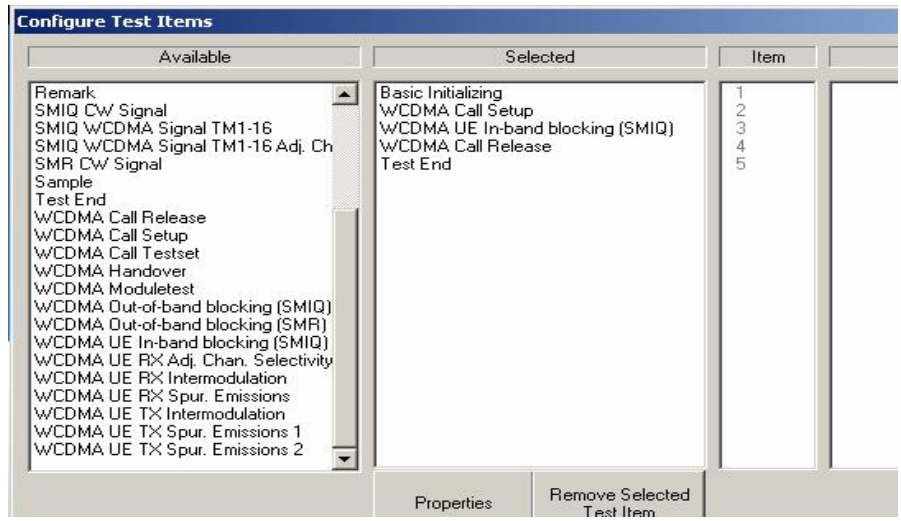


Fig. 6.5_2: Available and selected test items (test sequence) for In-band Blocking

Adapt the test items *WCDMA Call Setup* and *WCDMA UE In-band Blocking* to your requirements as follows:

4) Double-click *WCDMA Call Setup* in the list of the selected test items.

The window *Call Setup Configuration* opens:

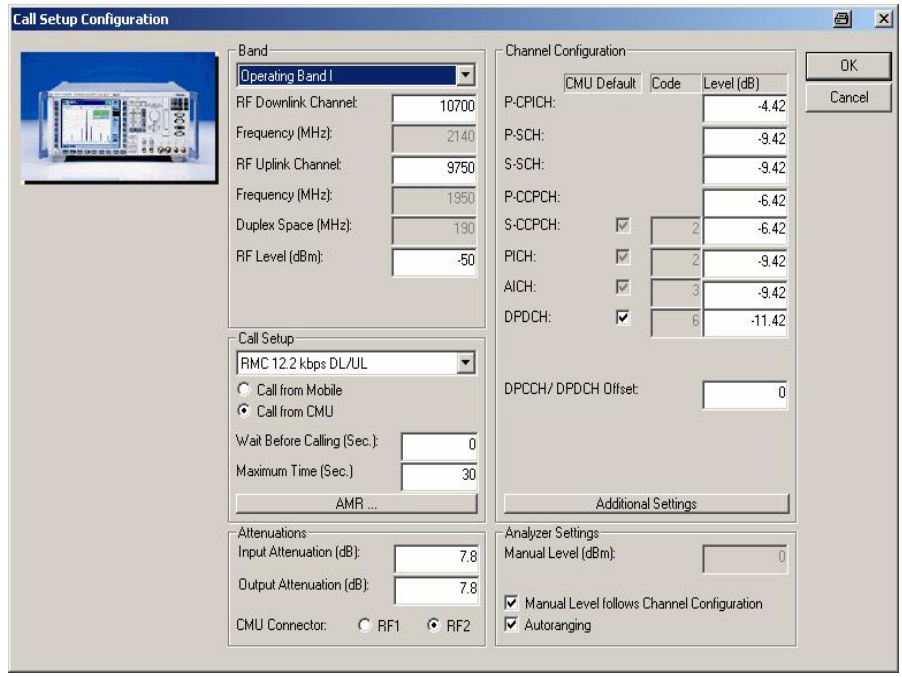


Fig. 6.5_3: Call setup configuration

5) Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (lower left in Fig. 6.5_3))

6) If necessary, modify *RF Downlink / Uplink Channel*.

7) Click *OK.*

You are back in the window *Configure Test Items* (Fig. 6.5_2). Now configure the test item *WCDMA UE In-band Blocking*.

8) Double-click *WCDMA UE In-band Blocking*

The window *Settings for WCDMA UE In-band Blocking* opens:

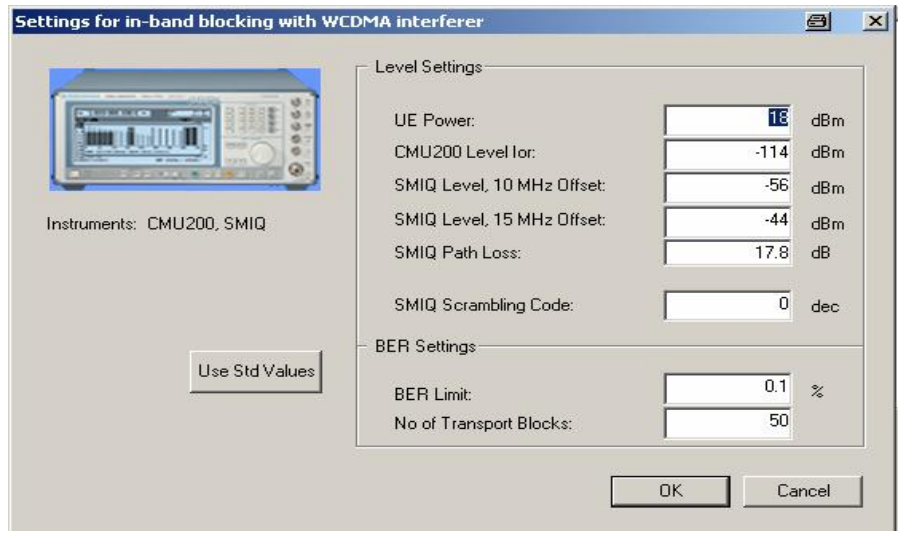


Fig. 6.5_4: Generator setting for In-band Blocking

9) Enter *UE Power*. For UE power class 4, enter 18 dBm. For UE power class 3 and higher, enter 20 dBm.

10) Enter an *SMIQ Scrambling Code* that is not identical with the scrambling code used for the connection.

11) Enter the *SMIQ Path Loss* between UE and signal generator.

12) Enter the *No of Transport Blocks* that are used for one BER calculation.

13) If necessary, enter your individual levels and limit values. (The DPCH_Ec level is automatically set to 10.3 dB below the CMU200 Ior level.)

14) To reset those values to the standard TS 34.121, click the button *Use Std. Values*.

15) Click *OK*.

You are back in the window *Configure Test Items* (Fig. 6.4_2). The items are now configured.

16) Click *OK*.

To start the measurement:

17) Click the *start icon* in the menu bar of CMUgo (Fig. 5.11_5).

Test description and measurement report:

The SMIQ generator calculates the WCDMA signal, and the first BER measurement is performed with the interfering signal at 15 MHz below the UE receive channel. This is followed by a BER measurement with the interfering signal at 10 MHz below, then 10 MHz, then 15 MHz above the UE receive channel.

During the test run, the current test item and test step are indicated on the bottom bar of the *Measurement Report* window on your PC. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. A display similar to Fig. 6.5_6 appears.

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has failed.

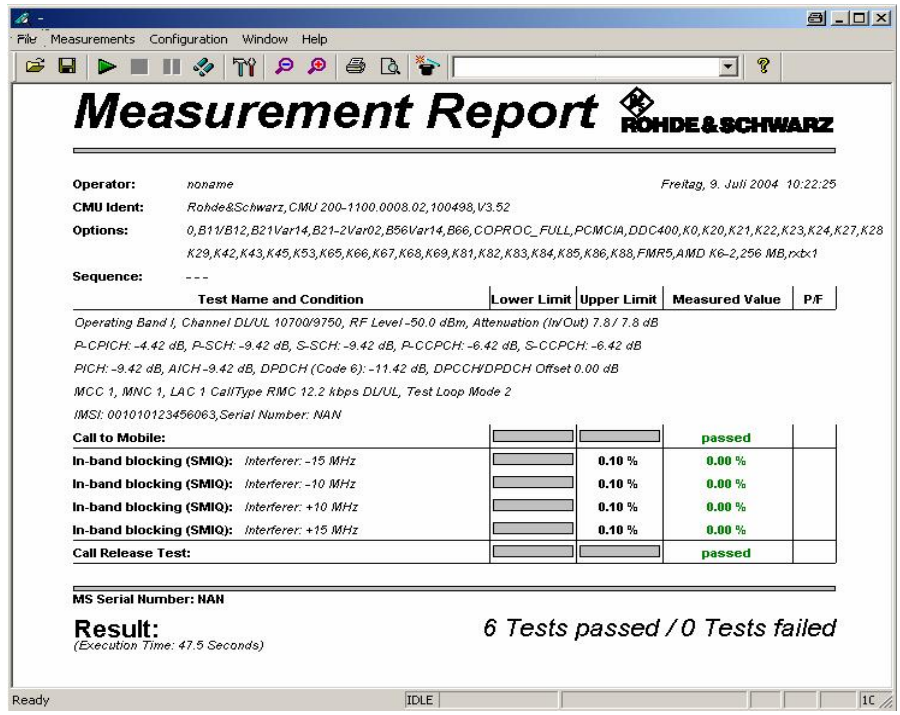


Fig. 6.5_6: Measurement report for In-band Blocking test

Out-of-Band Blocking

Out-of-band blocking uses an unmodulated (CW) interferer with frequencies from 1 MHz to 2110 MHz, and from 2170 MHz to 12.75 GHz. According to the standard TS 34.121, measurements must be performed using a 1 MHz step size.

The purpose of this test is to verify that the UE bit error rate (BER) does not exceed 0.001 for the parameters specified in Table 6.5.2:

Parameter	Unit	Frequency range 1	Frequency range 2
DPCH_Ec	dBm/3.84 MHz	-114 dBm	-114 dBm
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7 dBm	-103.7 dBm
$I_{blocking}$ (CW)	dBm	-44	-30
F_{uw}	MHz	2050 < f < 2095 2185 < f < 2230	2025 < f < 2050 2230 < f < 2255

Parameter	Unit	Frequency range 3
DPCH_Ec	dBm/3.84 MHz	-114 dBm
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7 dBm
$I_{blocking}$ (CW)	dBm	-15
F_{uw}	MHz	1 < f < 2025 2255 < f < 12750

Table 6.5.2: Test parameters for Out-of-band Blocking characteristics (band I operation only)

For 2095 < f < 2110 MHz and 2170 < f < 2185 MHz, the appropriate in-band blocking or adjacent channel selectivity in Tables 6.4 and 6.5.1 must be applied.

DPCH_Ec: Absolute power of the data channel of the downlink signal (in the standard, this value is specified as REFSENS + 3 dB)

Îor: Total power of the downlink signal (in the standard, this value is specified as REF Îor + 3 dB)

Iblocking: Total power of the (unmodulated) interferer

Exceptions:

For Table 6.5.2, exceptions are allowed:

Frequencies for which BER exceeds the test requirements of Table 6.5.2 are called *spurious response frequencies*. They have to be recorded for test 6.6 Spurious Response. The number of spurious response frequencies must not exceed 24.

The blocking performance must be applied at all frequencies except those at which a spurious response occurs.

Recommended test setup:

The test setup for out-of-band blocking characteristics is the same as for in-band blocking; see Fig. 6.5_1. For frequencies up to approx. 3 GHz, use the SMIQ. For frequencies up to 12.75 GHz, use the SMR.

Instruments and accessories:

- CMU200, SMIQ generator for frequencies to 3 GHz, SMR for frequencies up to 12.75 GHz
- Resistive combiner: up to 2.5 GHz (e.g. Weinschel 1515-1)
- Attenuator 10 dB, up to 2.5 GHz (e.g. Suhner)

Test procedure:

The procedure for out-of-band blocking is nearly the same as for in-band blocking tests. As an example, one sequence with one test item is provided for the SMIQ, and one for the SMR.

1) Connect instruments and user equipment as shown in Fig. 6.5_1.
2) Run CMUgo, click *File*, *Load Sequence*, and select WCDMA_*6.5_2.seq* for frequencies to approx. 3 GHz (SMIQ). Select WCDMA_*6.5_3.seq* for frequencies up to 12.75 GHz (SMR).
3) Click *Configuration* in the menu bar, and then *Configure Tests*

Figs. 6.5_7a and b show the test sequences WCDMA_*6.5_2.seq* and WCDMA_*6.5_3.seq*:

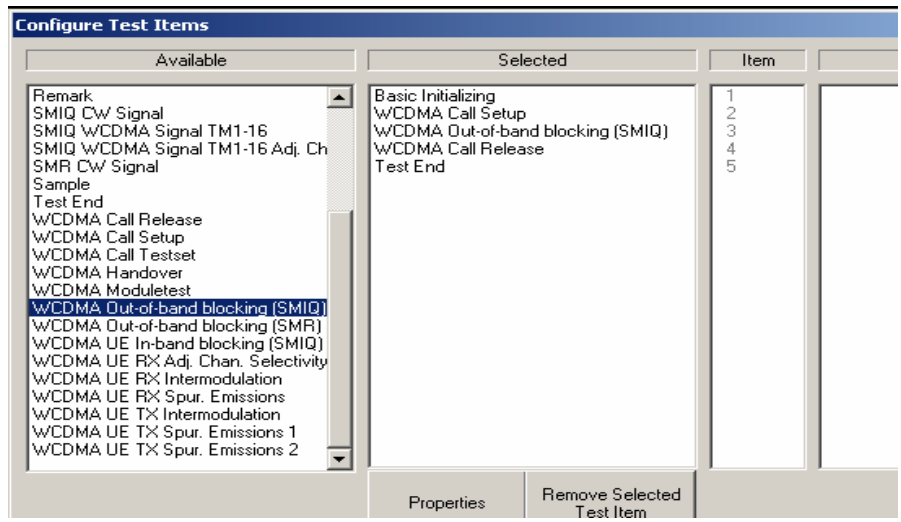


Fig. 6.5_7a: Available and selected test items for Out-of band Blocking (SMIQ)

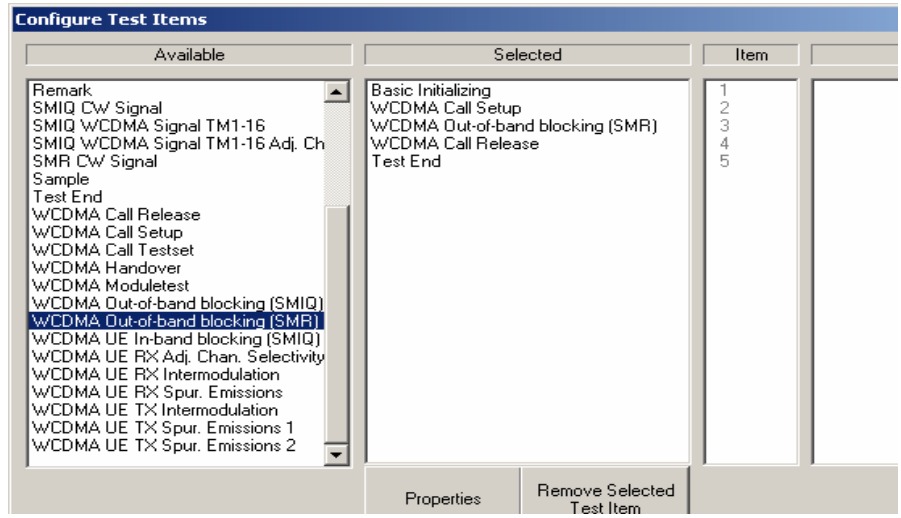


Fig. 6.5_7b: Available and selected test items for Out-of band Blocking (SMR)

Due to the huge frequency range, you should carefully construct your own test sequence as a list of test items, each with a smaller frequency span, e.g. as shown in Fig. 6.5_8.

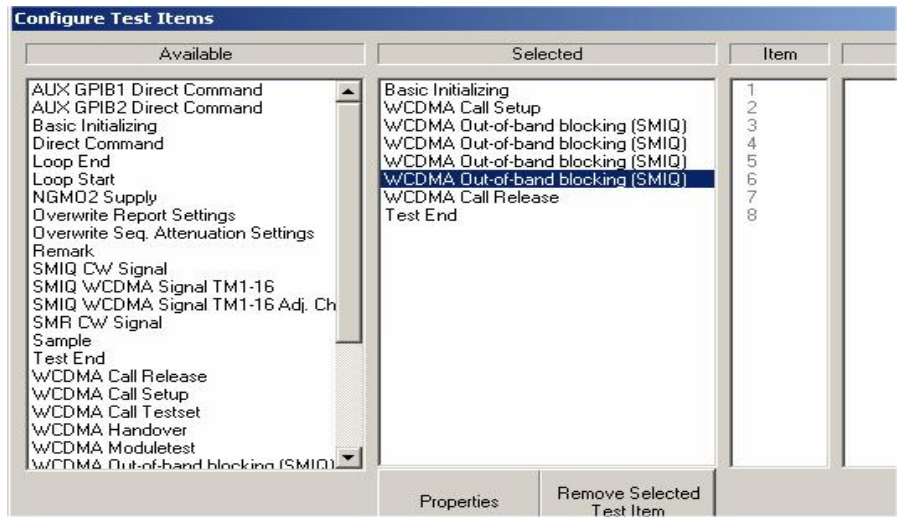


Fig. 6.5_8: Enhanced test sequence for different frequency bands

As for in-band blocking, first configure WCDMA call setup:

4) Double-click *WCDMA Call Setup* in the list of the selected test items.

The window *Call Setup Configuration* opens:

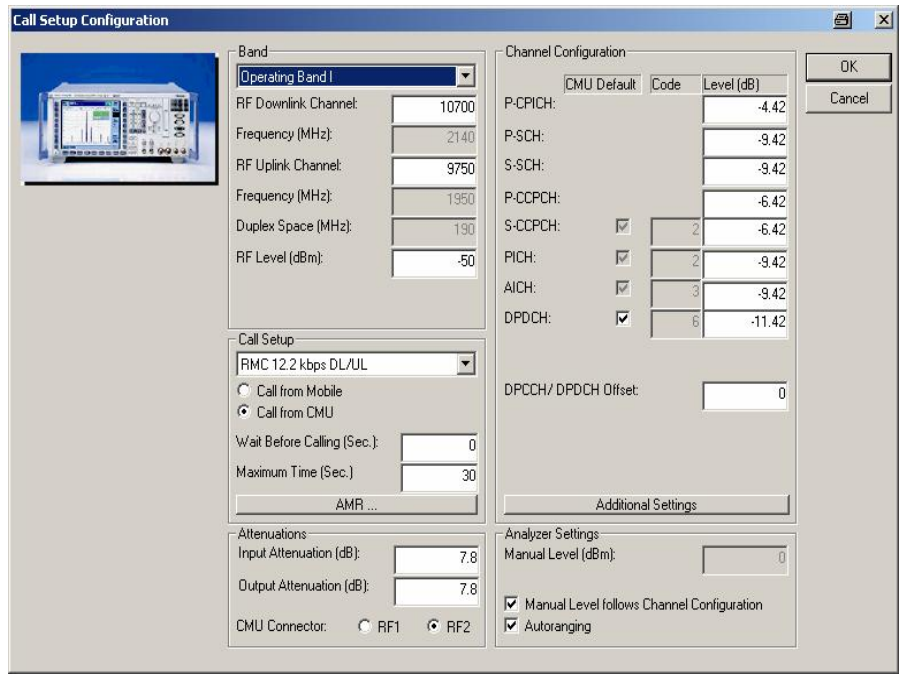


Fig. 6.5_8: Call setup configuration

5) Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (lower left in Fig. 6.5_8).

6) If necessary, modify *RF Downlink / Uplink Channel*.

7) Click *OK*.

   You are now back in the window *Configure Test Items* (Fig. 6.5_2). Now configure the test item *WCDMA UE In-band Blocking*.

8) Double-click *WCDMA Out-of-band Blocking*

   The window *Settings for WCDMA Out-of-band Blocking* opens (e.g. for SMR):

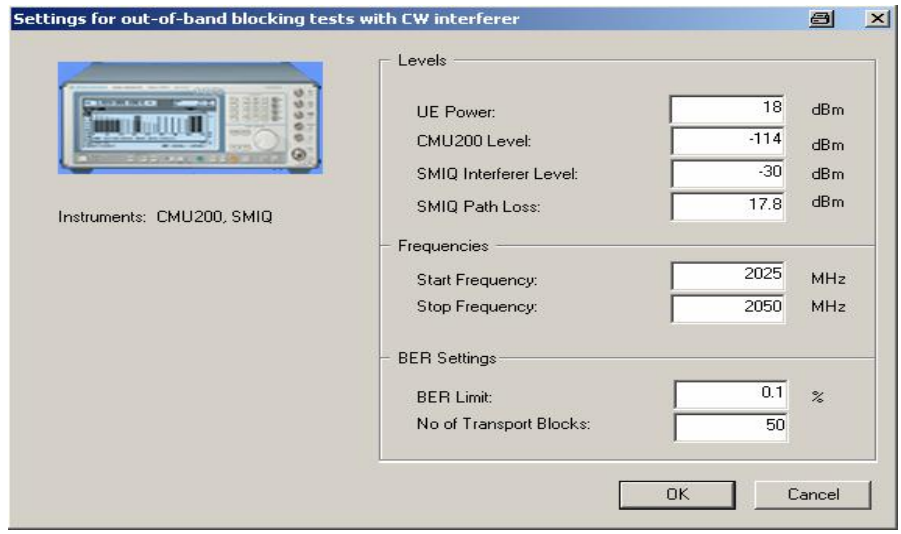


Fig. 6.5_9: Generator settings for Out-of-band Blocking

9) Enter *UE Power*. For UE power class 4, enter 18 dBm. For UE power class 3 and higher, enter 20 dBm.

10) Enter the *Start* and *Stop Frequency* and the *Path Loss* between UE and signal generator.

11) Enter the *No of Transport Blocks* that are used for one BER calculation.

12) If necessary, enter your individual levels and limit values. (The DPCH_Ec level is automatically set to 10.3 dB below the CMU200 Ior level.)

13) To reset those values to the standard TS 34.121, click the button *Use Std. Values*.

14) Click *OK*.

    You are now back in the window *Configure Test Items* (Fig. 6.5_7). The items are now configured.

15) Click *OK*.

To start the measurement:

16) Click the start icon in the menu bar of CMUgo (Fig. 5.11_5).

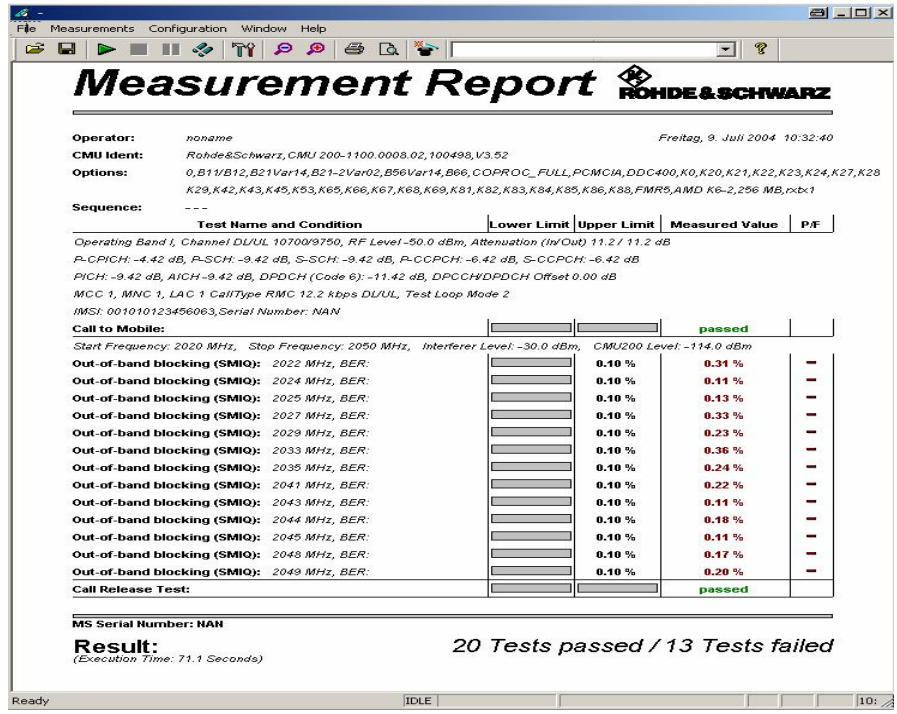
Test description and measurement report:

The signal generator is set to the start frequency, and the first BER measurement is performed. When finished, the measurement is repeated with an interferer frequency incremented by 1 MHz, and so on, until the stop frequency is reached.

During the test run, the current test item and test step are indicated on the bottom bar of the *Measurement Report* window on your PC. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. A display similar to Fig. 6.5_10 appears.

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has failed.



File Measurements Configuration Window Help

Measurement Report

ROHDE&SCHWARZ

Operator: noname — Freitag, 9. Juli 2004 10:32:40
CMU Ident: Rohde&Schwarz,CMU 200-1100.0008.02,100498,V3.52
Options: 0,B11/B12,B21Var14,B21-2Var02,B56Var14,B66,COPROC_FULL,PCMCIA,DDC400,K0,K20,K21,K22,K23,K24,K27,K28 K29,K42,K43,K45,K53,K65,K66,K67,K68,K69,K81,K82,K83,K84,K85,K86,K88,FMR5,AMD K6-2,256 MB,rxbx1
Sequence: ---

Test Name and Condition	Lower Limit	Upper Limit	Measured Value	P/F
Operating Band I, Channel DL/UL 10700/9750, RF Level -50.0 dBm, Attenuation (In/Out) 11.2 / 11.2 dB				
P-CPICH: -4.42 dB, P-SCH: -9.42 dB, S-SCH: -9.42 dB, P-CCPCH: -6.42 dB, S-CCPCH: -6.42 dB				
PICH: -9.42 dB, AICH -9.42 dB, DPDCH (Code 6): -11.42 dB, DPCCH/DPDCH Offset 0.00 dB				
MCC 1, MNC 1, LAC 1 CallType RMC 12.2 kbps DL/UL, Test Loop Mode 2				
IMSI: 001010123456063,Serial Number: NAN				
Call to Mobile:			passed	
Start Frequency: 2020 MHz, Stop Frequency: 2050 MHz, Interferer Level: -30.0 dBm, CMU200 Level: -114.0 dBm				
Out-of-band blocking (SMIQ): 2022 MHz, BER:		0.10 %	0.31 %	-
Out-of-band blocking (SMIQ): 2024 MHz, BER:		0.10 %	0.11 %	-
Out-of-band blocking (SMIQ): 2025 MHz, BER:		0.10 %	0.13 %	-
Out-of-band blocking (SMIQ): 2027 MHz, BER:		0.10 %	0.33 %	-
Out-of-band blocking (SMIQ): 2029 MHz, BER:		0.10 %	0.23 %	-
Out-of-band blocking (SMIQ): 2033 MHz, BER:		0.10 %	0.36 %	-
Out-of-band blocking (SMIQ): 2035 MHz, BER:		0.10 %	0.24 %	-
Out-of-band blocking (SMIQ): 2041 MHz, BER:		0.10 %	0.22 %	-
Out-of-band blocking (SMIQ): 2043 MHz, BER:		0.10 %	0.11 %	-
Out-of-band blocking (SMIQ): 2044 MHz, BER:		0.10 %	0.18 %	-
Out-of-band blocking (SMIQ): 2045 MHz, BER:		0.10 %	0.11 %	-
Out-of-band blocking (SMIQ): 2048 MHz, BER:		0.10 %	0.17 %	-
Out-of-band blocking (SMIQ): 2049 MHz, BER:		0.10 %	0.20 %	-
Call Release Test:			passed	

MS Serial Number: NAN

Result: *20 Tests passed / 13 Tests failed*
(Execution Time: 71.1 Seconds)

Ready IDLE

Fig. 6.5_10: Measurement report for Out-of-band Blocking test

If all BER results are below the limit values, only the result of the last measurement result is displayed (in green colour). If the limits were exceeded for one or more frequencies, only these measurement results are displayed (in red). These frequencies are used as spurious response frequencies for test 6.6 Spurious Response.

The program interrupts the test at the 25th limit violation.

6.6 Spurious Response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained, i.e. for which the blocking limit is not met.

For test 6.5 of the out-of-band blocking characteristics, up to 24 exceptions were allowed to exceed the limits. The frequencies at which the limits for blocking were exceeded – the *spurious response frequencies* – can now be checked again using an interferer level of -44 dBm.

The purpose of this test is to verify that the UE bit error rate (BER) does not exceed 0.001 for the parameters in Table 6.6.1 at the spurious response frequencies:

Parameter	Level	Unit
DPCH_Ec	−114	dBm / 3.84 MHz
Îor	−103.7	dBm / 3.84 MHz
Iblocking(CW)	−44	dBm
Fuw	Spurious response frequencies	MHz

Table 6.6.1: Test parameters for Spurious Response

DPCH_Ec: Absolute power of the data channel of the downlink signal (in the standard, this value is specified as REFSENS + 3 dB)

Îor: Total power of the downlink signal (in the standard, this value is specified as REFÎor + 3 dB)

Iblocking: Total power of the (unmodulated) interferer

Test setup, instruments and accessories, test procedure:

The test setup, the instruments and accessories, and all test steps are the same as for test 6.5 Out-of-band Blocking Characteristic.

Proceed exactly as for 6.5 Out-of-band Blocking using an interferer level of -44 dBm.

For single frequency measurements, you can enter the same value for the start and stop frequencies at items WCDMA Out-of-band Blocking for SMIQ and SMR:

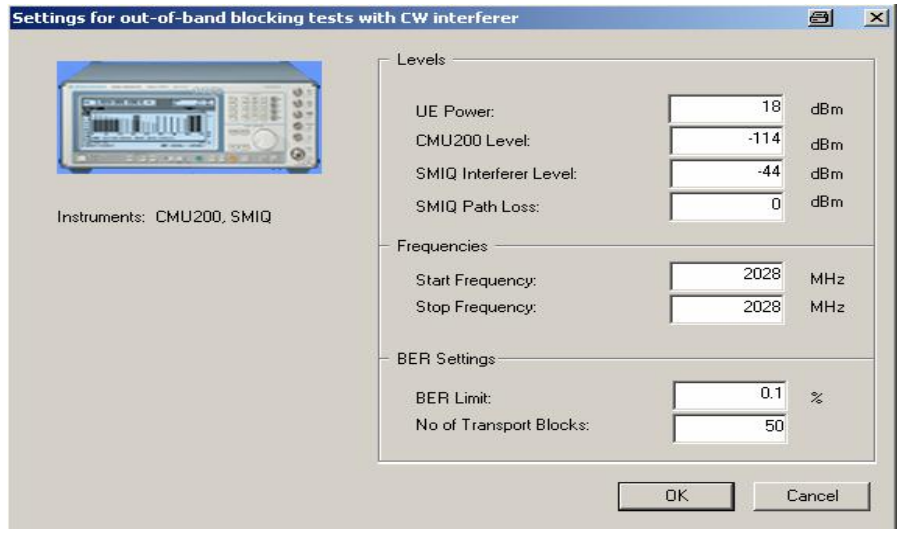


Fig. 6.6_1: Parameters for a single frequency measurement

Fig. 6.6_2 shows the measurement result:

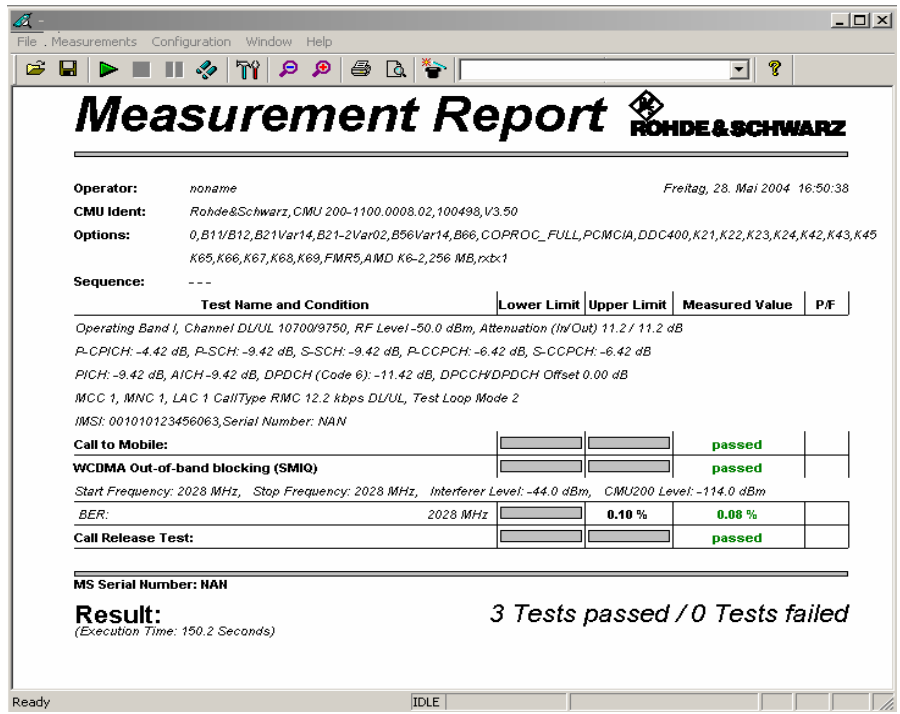


Fig. 6.6_2: Spurious Response result of a single frequency measurement

6.7 Intermodulation Characteristics

Third- and higher-order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals that have a specific frequency relationship to the wanted signal.

The purpose of this test is to verify that the UE bit error rate (BER) does not exceed 0.001 for the parameters specified in Table 6.7.1

Parameter	Level		Unit
DPCH_Ec	–114		dBm / 3.84 MHz
Îor	–103.7		dBm / 3.84 MHz
Iouw1 (CW)	–46		dBm
Iouw2 (modulated)	–46		dBm / 3.84 MHz
Fuw1 (offset)	10	-10	MHz
Fuw2 (offset)	20	-20	MHz

Table 6.7_1: Test parameters for Intermodulation characteristics

Recommended test setup:

Fig. 6.7_1 shows the test setup for RX intermodulation characteristics.

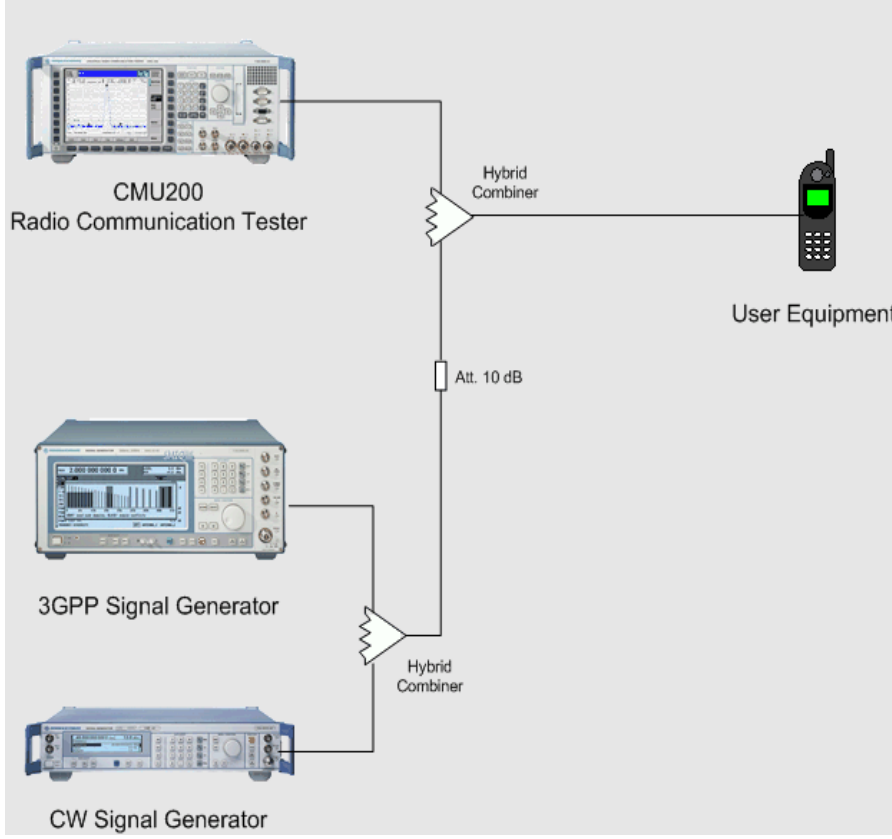


Fig. 6.7_1: Test setup for RX Intermodulation test

The WCDMA signal generated by the SMIQ and the CW signal generated by the SMR are combined using a hybrid coupler. The generators are protected against the high output power of the UE by a 10 dB attenuator.

Another hybrid feeds the interferer signals in the RF path between UE and CMU200 towards the UE.

Instruments and accessories:

- CMU200, SMIQ and SMR
- Hybrid combiner: 1920 MHz to 2170 MHz (e.g. Minicircuits ZFSC-2-2500)
- Resistive combiner: up to 2.5 GHz (e.g. Weinschel 1515-1)
- Attenuator 10 dB, up to 2.5 GHz (e.g. Suhner)

Path loss compensation:

- Measure the path loss between UE and CMU200.
- Measure the path loss between UE and signal generators.

Test procedure:

1) Connect instruments and user equipment as shown in Fig. 6.7_1.
2) Run CMUgo, click *File*, *Load Sequence,* and select WCDMA_*6.7.seq*.
3) Click *Configuration* in the menu bar, and then *Configure Tests*

The window *Configure Test Items* opens. The left-hand column contains all available test items. The right-hand column shows which test items have been selected to build test sequence 6.7.

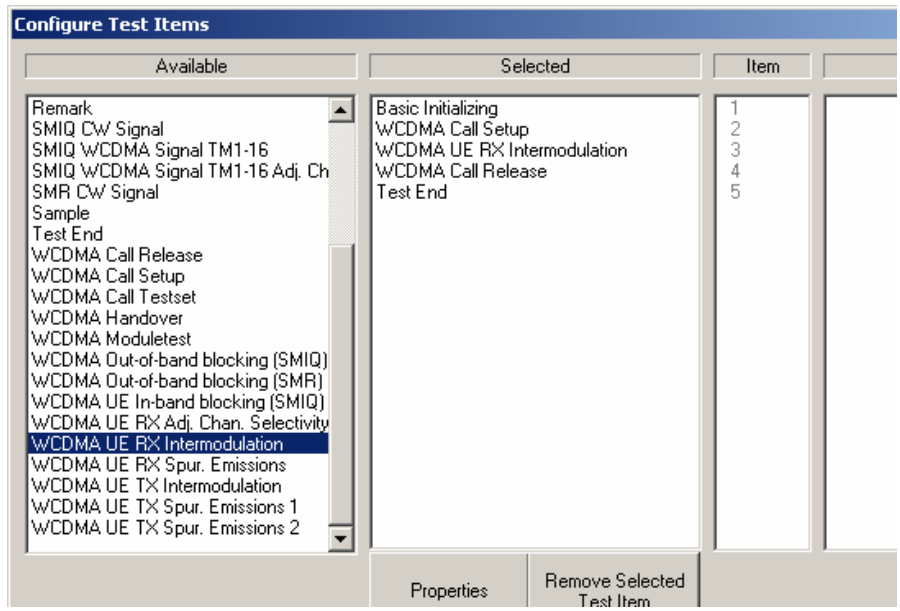


Fig. 6.7_2: Available and selected test items (test sequence) for RX Intermodulation

Adapt the test items *WCDMA Call Setup* and *WCDMA UE RX Intermodulation* to your requirements as follows:

4) Double-click *WCDMA Call Setup* in the list of the selected test items.

The window *Call Setup Configuration* opens:

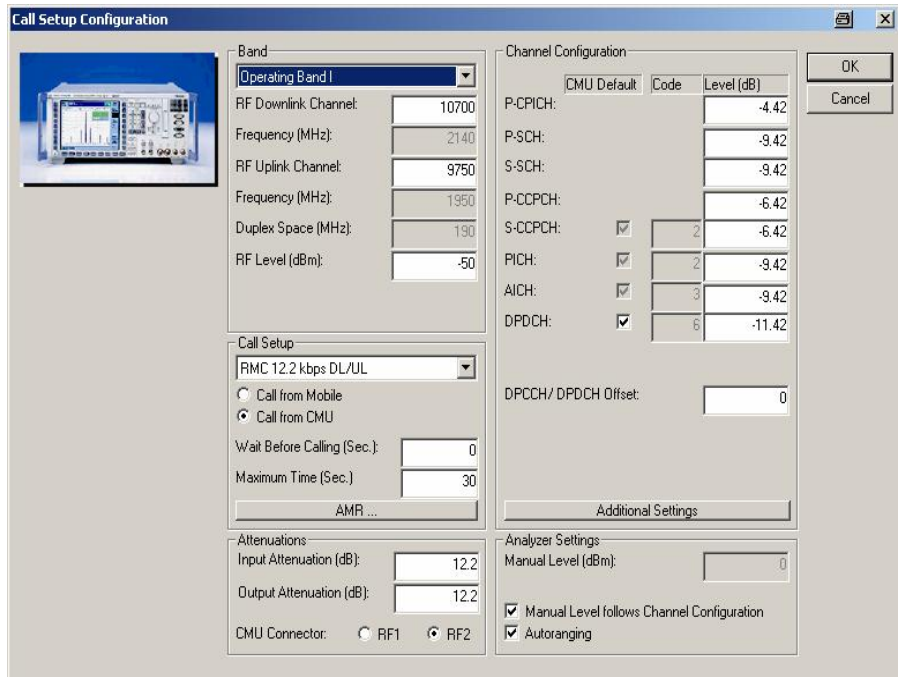


Fig. 6.5_3: Call Setup configuration

Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (lower left in Fig. 5.12_3))

5) If necessary, modify *RF Downlink / Uplink Channel*.

6) Click *OK.*

You are now back in the window *Configure Test Items* (Fig. 5.11_2). Now configure the test item *WCDMA UE RX Intermodulation*.

7) Double-click *WCDMA UE RX Intermodulation*.

The window *FSx and SMIQ Settings for WCDMA RX Intermodulation* opens (Fig. 6.5_4).

8) Enter *UE Power*. For UE power class 4, enter 18 dBm. For UE power class 3 and higher, enter 20 dBm.

9) Enter an *SMIQ Scrambling Code* that is not identical with the scrambling code used for the connection.

10) Enter the path loss between UE and signal generators as *SMR and SMIQ Path Loss.*

11) Enter the *No of Transport Blocks* that are used for one BER calculation.

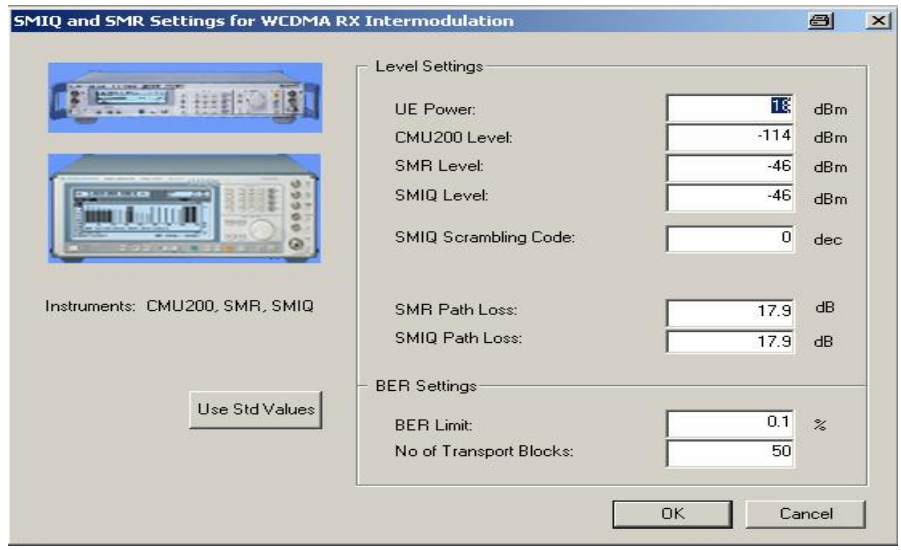


Fig. 6.5_4: Setting of the generators for RX Intermodulation test

12) If necessary, enter your individual limit values.

13) To reset the limits to the standard TS 34.121, click the button *Use Std. Limits*.

14) Click *OK*.

    You are now back in the window *Configure Test Items* (Fig. 5.12_2). The items are now configured.

15) Click *OK*.

To start the measurement:

16) Click the start icon in the menu bar of CMUgo.

Test description and measurement report:

The first generator establishes a WCDMA signal at 20 MHz below the UE receive channel, and the second generator an unmodulated interferer at 10 MHz below the UE receive channel.

A BER measurement is performed with the number of transport blocks as specified in the setting menu.

Then, the first generator is then set to 20 MHz above the UE receive channel, and the second generator to 10 MHz above. Another BER measurement is performed.

During the test run, the current test item and test step are indicated on the bottom bar of the *Measurement Report* window on your PC. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. A display similar to Fig. 6.7_5 appears.

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has failed.

Call to Mobile and *Call Release* increase the number of passed tests as tests without limits.

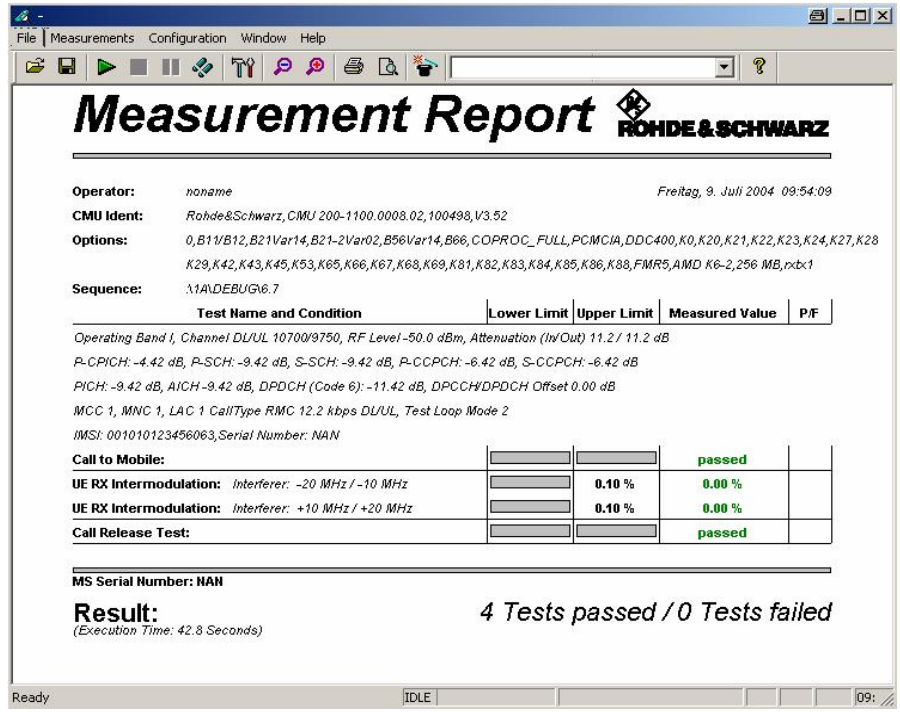


Fig. 6.7_5: Measurement report for RX Intermodulation test

6.8 Spurious Emissions

The spurious emission power is the power of emissions generated or amplified in a UE's receiver that appears at the UE antenna connector. Excess spurious emissions increase interference to other systems.

The purpose of test 6.8 is to verify that the UE spurious emissions do not exceed described values shown in Tables 6.8 a and 6.8 b:

Frequency band	Measurement bandwidth	Max. level	Note
30 MHz ≤ f < 1 GHz	100 kHz	-57 dBm	
1 GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	

Table 6.8 a: General Spurious Emissions test requirements

Table 6.5. Frequency band	Measurement bandwidth	Max. level	Note
1920 MHz ≤ f ≤ 1980 MHz	3.84 MHz	-60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm	UE receive band

Table 6.8 b: Additional Spurious Emissions test requirements

Table 6.8 a contains a set of limits for the continuous frequency band from 30 MHz to 12.75 GHz (band I operation only). Additional, more stringent limits are defined for the inherent transmit and receive band in Table 6.8 b.

The setup procedure changes the UE to the CELL_FACH state. In this state, no transmission of the UE will interfere the measurement.

Recommended test setup:

Fig. 6.8_1 shows the test setup for spurious emissions measurements.

In the path between CMU200 and UE, the analyzer is coupled in via a resistive combiner. This guarantees a flat frequency response. An additional attenuator reduces the power to protect the analyzer input.

Instruments and accessories:

- CMU200, FSQ or FSU or FSP
- Resistive combiner: DC to 12.75 GHz (e.g. Weinschel 1515-1)
- Attenuators 10 dB, DC to 12.75 GHz (e.g. Suhner)

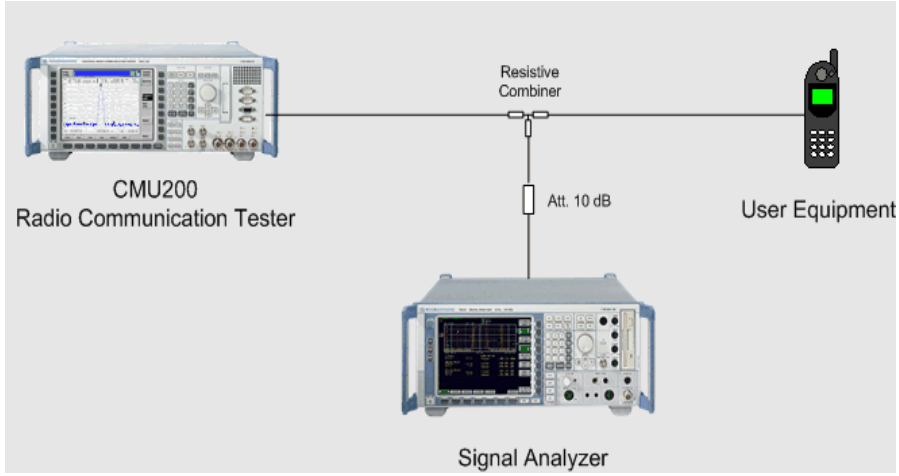


Fig. 6.8_1: Test setup for RX Spurious Emission test

Path loss compensation:

- Measure the path loss between UE and CMU200.
- Measure the path loss between UE and signal analyzer.

Test procedure:

1) Connect instruments and user equipment as shown in Fig. 6.8_1.
2) Run CMUgo, and click *File*, *Load Sequence* WCDMA_*6.8.seq*.
3) Click *Configuration* in the menu bar, and then *Configure Tests*

The window *Configure Test Items* opens. The left-hand column contains all available test items. The right-hand column shows which test items have been selected to build the test sequence 6.8.

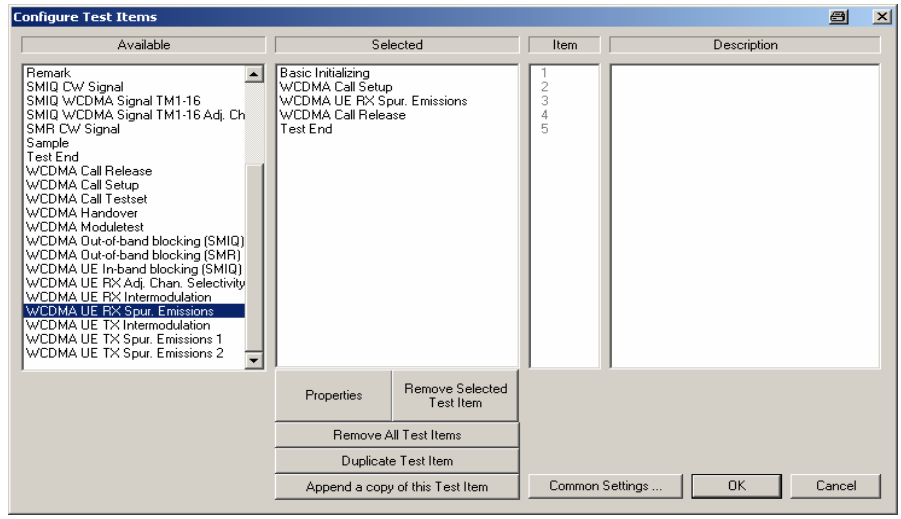


Fig. 6.8_2: Available and selected test items (test sequence) for RX Spurious Emissions

Adapt the test items *WCDMA Call Setup* and *WCDMA UE RX Spur. Emissions* to your requirements as follows:

4) Double-click *WCDMA Call Setup* in the list of the selected test items.

The window *Call Setup Configuration* opens:

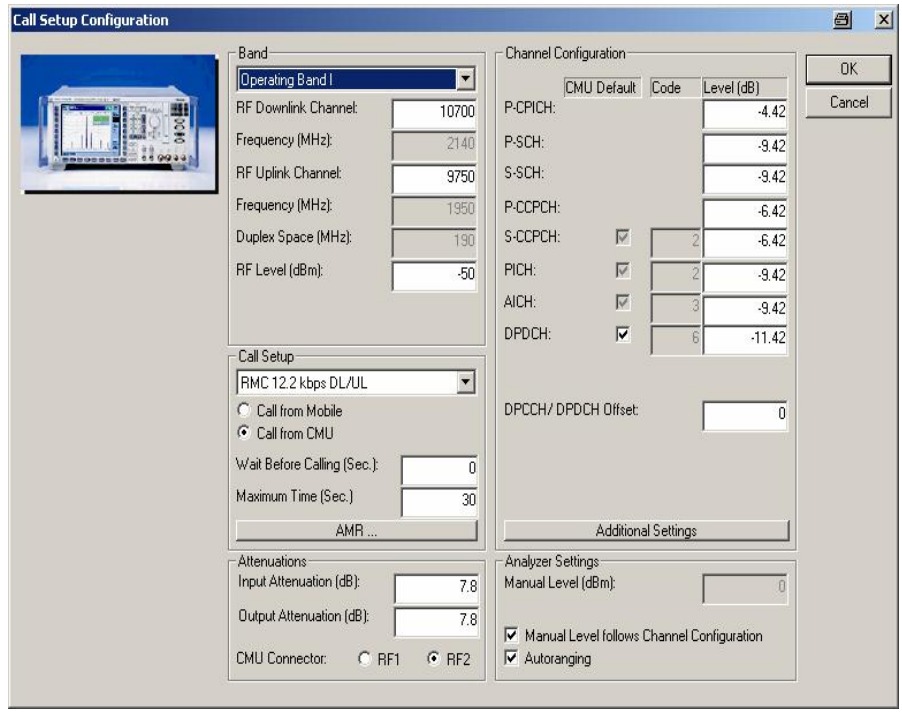


Fig. 6.8_3: Call Setup configuration

5) Enter the path loss you measured between UE and CMU200 as *Input Attenuation* and *Output Attenuation* (lower left in Fig. 5.11_3))

6) If necessary, modify *RF Downlink / Uplink Channel*.

7) Click *OK.*

You are now back in the window Configure Test Items (Fig. 5.11_2). Now configure the test item *WCDMA UE RX Spur. Emissions*.

8) Double-click *WCDMA UE RX Spur. Emissions*.

The window *Settings for WCDMA UE RX Spurious Emissions* opens:

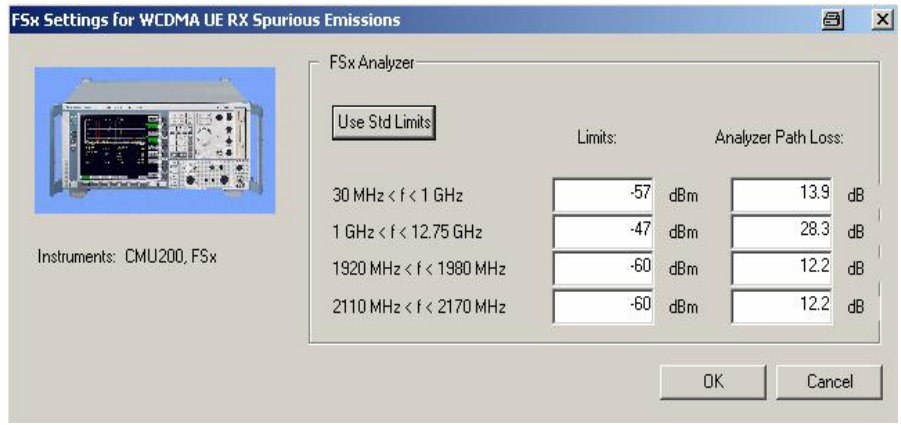


Fig. 6.8_4: Setup of the analyzer for RX Spurious Emission tests

9) Enter the path loss between UE and signal analyzer. To be on the safe side, always enter the maximum path loss, i.e. the path loss at the upper end of the frequency band. If limits are exceeded at a lower frequency, reduce the entry value to the actual path loss at that frequency point, and repeat the test.

10) If necessary, enter your individual limit values.

11) To reset the limits to the standard TS 34.121, click the button *Use Std. Limits*.

12) Click *OK*.

    You are now back in the window *Configure Test Items* (Fig. 5.11_2). The items are now configured.

13) Click *OK*.

To start the measurement:

14) Click the start icon in the menu bar of CMUgo (Fig. 5.11_5).

Test description and measurement report:

The frequency range for the RX spurious emission test - from 30 MHz up to 12.75 GHz - has been divided into two sections; see Fig. 6.8_6. In addition, measurements are performed in the inherent receive and transmit bands.

CMUgo now scans all sections. The upper limit of each section is visible as a limit line on the analyzer's screen. Once a section is scanned, the marker of the analyzer is set to peak. This value will be displayed later as a measurement value for the section.

During the test run, the current test item and test step are indicated on the bottom bar of the *Measurement Report* window on your PC. (The test step is an internal count within each test item.)

Once all steps have been completed, the *Measurement Report* window is updated. A display similar to Fig. 6.8_6 appears.

Measurement values that are below the limits are displayed in green, those that exceed the limits in red. In addition, the right-hand column (Pass / Fail P/F) indicates whether a test has failed.

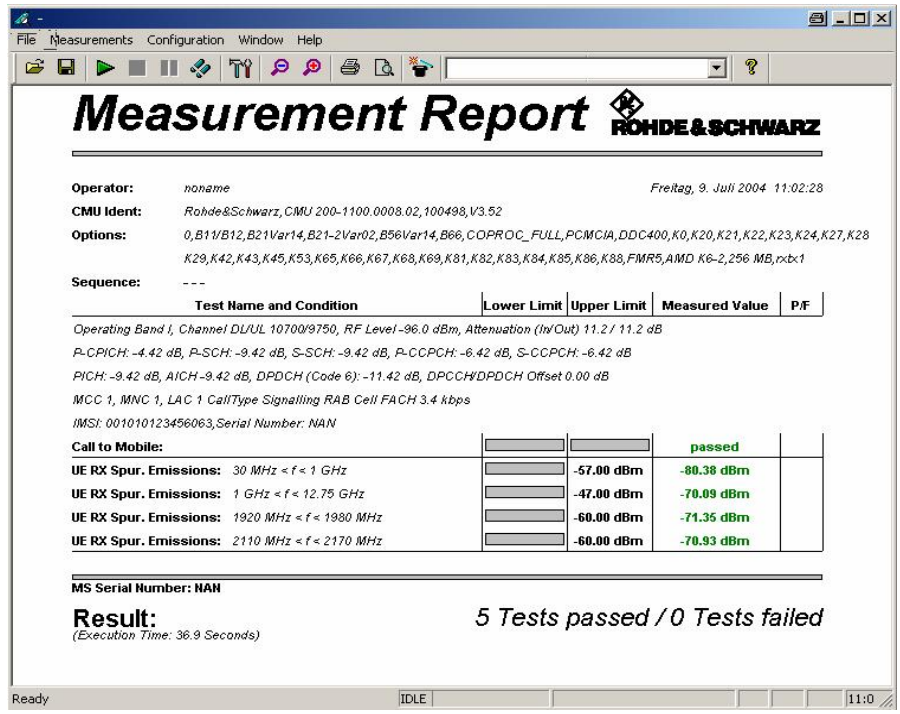


Fig. 6.8_6:Measurement report for RX Spurious Emission test

4 Additional Information

This application note describes all the necessary tests on user equipmentwith CMU200, SMIQ, SMR, and FSP, FSU, or FSQ. Beyond this Rohde & Schwarz offers a wide spectrum of test and measurement equipment for 2G/3G. Fig. 7 gives you an overview of the systems for

- RF conformance tests,
- RF precompliance tests,
- protocol test, and the
- general purpose standalone tester CMU.

For more information visit http://www.rohde-schwarz.com, then click Test & Measurement, and Test Systems.

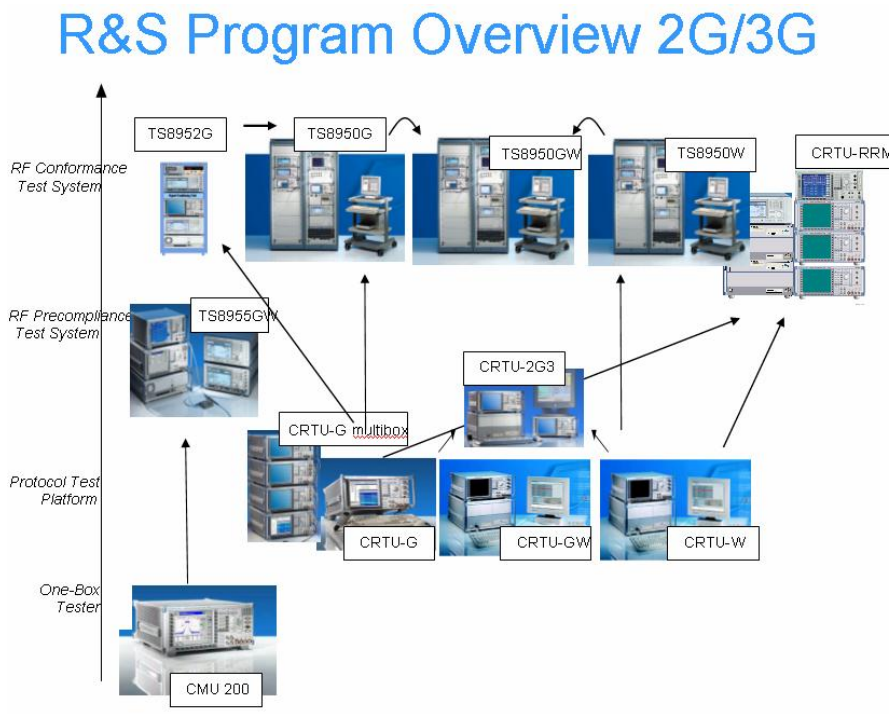


Fig. 7: Overview of Rohde&Schwarz test systems for 2G/3G

For comments and suggestions to this application note please contact TM-Applications@rsd.rohde-schwarz.com.

5 Ordering Information

Universal Radio Communication Testers

R&S CMU200		1100.0008.02
R&S CMU-K68		1115.5300.02

Vector Signal Generators

R&S SMIQ02B	0.3 to 2.2 GHz	1125.5555.02
R&S SMIQ03B	0.3 to 3.3 GHz	1125.5555.03
R&S SMIQ04B	0.3 to 4.4 GHz	1125.5555.04
R&S SMIQ06B	0.3 to 6.4 GHz	1125.5555.06
R&S SMIQ03HD	0.3 to 3.3 GHz	1125.5555.33

Vector Signal Generators

R&S SMR20	1 to 20 GHz	1104.0002.20
R&S SMR-B11	0.01to 1 GHz	1104.4250.02

Signal Analyzers, Spectrum Analyzers and Options

R&S FSP3	9 kHz to 3 GHz	1093.4495.03
R&S FSP7	9 kHz to 7 GHz	1093.4495.07
R&S FSP13	9 kHz to 13 GHz	1093.4495.13
R&S FSP30	9 kHz to 30 GHz	1093.4495.30
R&S FSP40	9 kHz to 40 GHz	1093.4495.40
R&S FSQ3	20 Hz to 3.6 GHz	1155.5001.03
R&S FSQ8	20 Hz to 8 GHz	1155.5001.08
R&S FSQ26	20 Hz to 26,5 GHz	1155.5001.26
R&S FSU3	20 Hz to 3.6 GHz	1166.1660.03
R&S FSU8	20 Hz to 8 GHz	1166.1660.08
R&S FSU26	20 Hz to 26.5 GHz	1166.1660.26
R&S FSU46	20 Hz to 46 GHz	1166.1660.46

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