# W-CDMA Base Station Receiver Tests

## According to TS25.141 Rel. 10

# Application Note

**Products:**

- R&S®SMW200A
- R&S®SMU200A
- R&S®SMATE200A
- R&S®SMF100A
- R&S®SMB100A
- R&S®SGS100A
- R&S®FSW
- R&S®FSV
- R&S®FSQ
- R&S®FPS

**3GPP TS25.141 [1] defines conformance tests for W-CDMA base stations (including HSPA+ features).**

**This application note describes how all required receiver (Rx) tests (TS25.141 Chapter 7) can be performed easily and quickly by using vector signal generators and CW sources from Rohde & Schwarz. One test additionally requires a spectrum analyzer from Rohde & Schwarz.**

**Example illustrates manual operation. A free software program enables and demonstrates remote operation.**

The W-CDMA base station transmitter (Tx) tests (TS25.141 Chapter 6) are described in Application Note 1MA67.

Application Note
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ROHDE&SCHWARZ

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

- The R&S®SMW200A vector signal generator is referred to as the SMW.
- The R&S®SMU200A vector signal generator is referred to as the SMU.
- The R&S®SMBV100A vector signal generator is referred to as the SMBV.
- The R&S®SMF100A signal generator is referred to as the SMF.
- The R&S®SMB100A signal generator is referred to as the SMB.
- The R&S®SGS100A signal generator is referred to as the SGS.
- The R&S®FSQ signal analyzer is referred to as the FSQ.
- The R&S®FSV spectrum analyzer is referred to as the FSV.
- The R&S®FSW spectrum analyzer is referred to as the FSW.
- The R&S®FPS spectrum analyzer is referred to as the FPS.
- The SMW, SMATE, SMBV and SMU are referred to as the SMx.
- The FSQ, FSV, FSW and FPS are referred to as the FSx.

# 1 Introduction

The Wide band code division multiple access (W-CDMA) was first introduced in 3GPP Release-99/4 considering the growing demand for higher capacity and improved data rate. Since then, it has gone through a long process of evolution to ensure high quality experience for customers and maintain market competition.

Table 1-1 gives a brief overview of the evolution of W-CDMA with 3GPP releases.

| Evolution of W-CDMA | |
|---|---|
| **3GPP Release** | **Main Features** |
| Rel-99/4 | W-CDMA |
| Rel-5 | HSDPA |
| Rel-6 | HSUPA |
| Rel-7 | ▮ Downlink MIMO<br>▮ 16 QAM for Uplink and 64 QAM for Downlink |
| Rel-8 | ▮ Combination of MIMO and 64 QAM<br>▮ Dual cell HSDPA |
| Rel-9 | ▮ Dual cell HSUPA<br>▮ Dual band HSDPA<br>▮ Dual Cell HSDPA + MIMO |
| Rel-10 | Four carrier HSDPA |

**Table 1-1: Evolution of W-CDMA from 3GPP release 99/4 to release 10**

3GPP specification TS25.141 describes the conformance tests for W-CDMA base stations operating in FDD mode. It includes transmitter (Tx), receiver (Rx) and performance (Px) tests.

This application note describes the receiver tests for W-CDMA base station according to TS25.141 Release-10. All of these tests can be performed using Rohde & Schwarz test and measurement instruments.

| Receiver Characteristics (Chapter 7) | |
|---|---|
| **Chapter (TS 25.141)** | **Test name** |
| 7.2 | Reference sensitivity level |
| 7.3 | Dynamic range |
| 7.4 | Adjacent Channel Selectivity (ACS) |
| 7.5 | Blocking characteristics |
| 7.6 | Intermodulation characteristics |
| 7.7 | Spurious Emissions |
| 7.8 | Verification of the internal BER calculation |

**Table 1-2: Covered Tests**

# 2 General Receiver Tests

## 2.1 Note

Very high power occurs on base stations! Be sure to use suitable attenuators in order to prevent damage to the test equipment.

## 2.2 RX Test setup

Fig. 2-1 shows the general test setup for receiver tests. A SMx is used to perform the tests. An FSx is required for the receiver spurious emission test (3.7). A few tests require special setups; these are described in the respective sections.

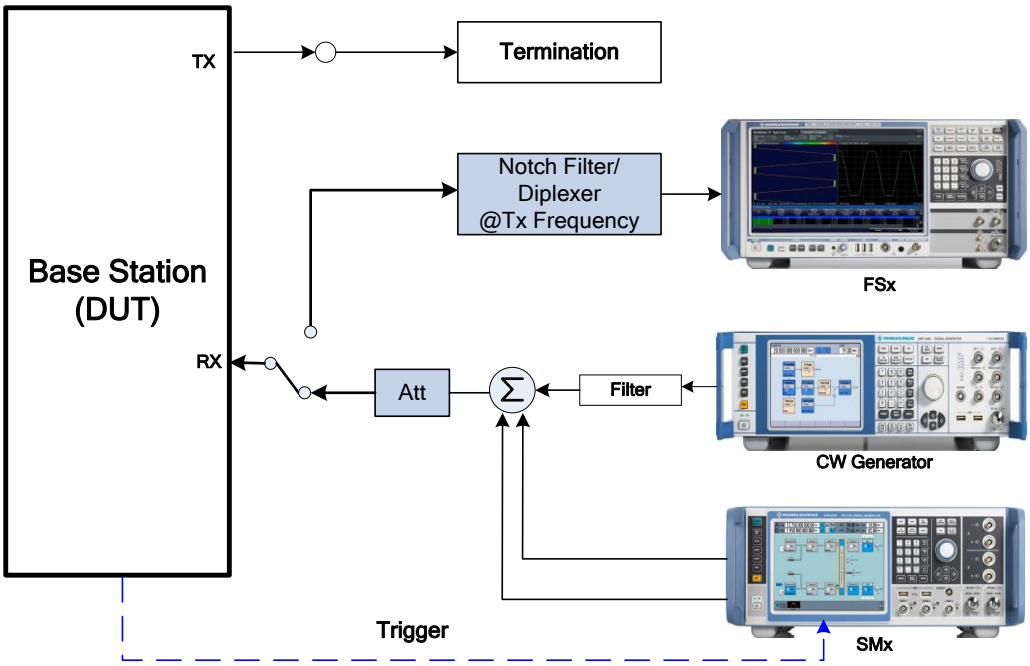



**Fig. 2-1: General test setup for Rx test. Additional settings are required for some tests.**

To synchronize the SMx to the base station frame timing, the base station provides a trigger which starts the generator. Connect this signal to the BNC socket TRIGGER1 (SMU)/User 3 (SMW) of the SMx. As the signal generator offers a channel coded signal (required by all the Reference Measurements Channels (RMC)), set the BS to emit a 'SFN mod 4' periodic trigger.

## 2.3 Instrument and Options

Several different vector signal generators can be used for the tests described here:

- SMW
- SMU
- SMJ
- SMATE

**SMx-K42/-K83** software is required for W-CDMA signal generation (for both paths).

One of the tests (Spurious emissions (Clause 7.7)) requires a spectrum analyzer. The following instruments are available:

- FSW
- FSQ
- FSV
- FPS

One test (Blocking characteristics (Clause 7.5)) requires a CW signal up to 12.75 GHz. An additional CW signal generator is used for the purpose. The following instruments are suitable:

- SMF
- SMB
- SGS

Please note that the R&S®SMW-B120 (RF path A) and R&S®SMW-B220 (RF path B) options provide support up to 20 GHz and can be used instead of additional CW generator.

Please note that the SMBV is able to generate W-CDMA signals but does not support the test case wizard described in this application note.

# 3 Receiver Tests (Chapter 7)

TS25.141 specifies various frequency channels (bottom (B), Middle (M) and Top (T)) of the operation band for the BS Test. Most of the test should be performed in all of B, M and T frequencies unless mentioned otherwise in the test. The center frequency can be set to any frequency within the supported range using Rohde & Schwarz instruments.

Table 3.1 provides basic overview of the parameters used for individual tests.

| Basic Parameter Overview | | | |
|---|---|---|---|
| **Chapter TS25.141** | **Chapter AppNote** | **Name** | **Channels** |
| 7.2 | 3.2 | Reference sensitivity level | B,M,T |
| 7.3 | 3.3 | Dynamic range | B,M,T |
| 7.4 | 3.4 | Adjacent Channel Selectivity (ACS) | B,M,T |
| 7.5 | 3.5 | Blocking characteristics | M |
| 7.6 | 3.6 | Intermodulation characteristics | B,M,T |
| 7.7 | 3.7 | Spurious Emissions | M |
| 7.8 | 3.8 | Verification of the internal BER calculation | B,M,T |

**Table 3-1: Basic parameter overview**

## 3.1 Basic Operation

### 3.1.1 Generating Uplink W-CDMA settings at SMx

The SMx generates the wanted uplink W-CDMA signal and also generates adjacent and co-channel interferences for some tests.

The basic settings for the generation of an uplink W-CDMA signal according to 3GPP standard are described here. For the generation of user defined signals and any further details, please refer to [2]..

1. Go to the block **Baseband A**

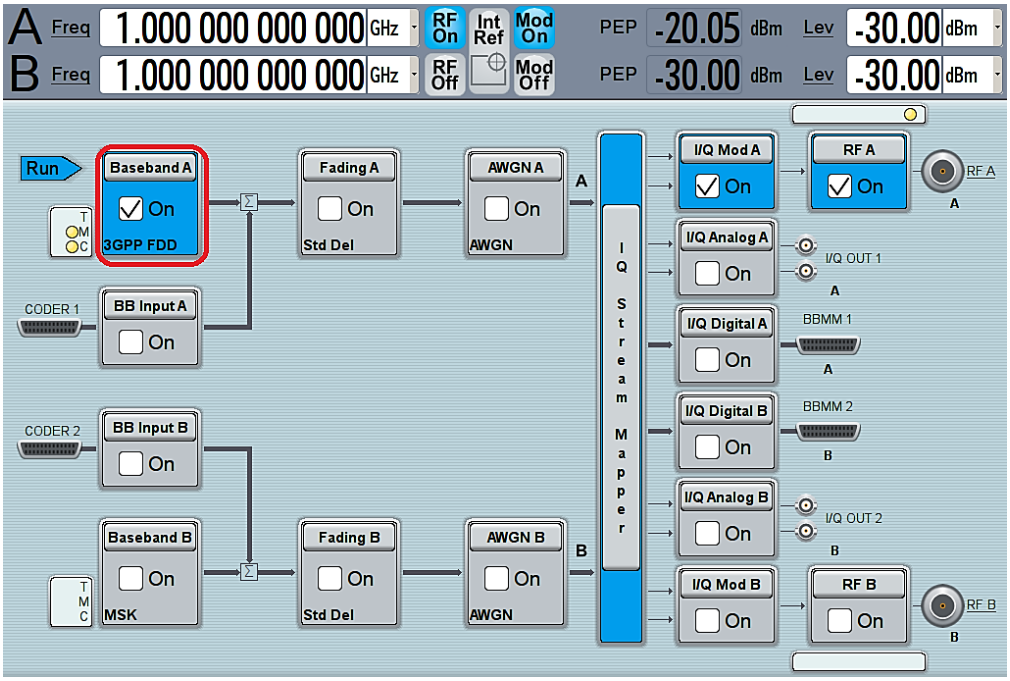



**Fig. 3-1: Select Baseband block A**

2. Click **3GPP FDD** to generate W-CDMA Signal


**Fig. 3-2: Select 3GPP FDD for W-CDMA signal**

3. Go to **Trigger In** section. Select trigger **Mode** form the list. (Fig. 3-3)

- Select **Auto** for continuous signal generation without external trigger.
- Select **Armed Auto** for continuous signal generation with the external trigger event.

4. Select trigger **Source**. (Fig. 3-4)

   SMW provides the option to configure the trigger connectors according to user preference. Select **Global Connector Settings** and change the connector setting according to preference. Use **find** function to display the location of the selected connector. Fig. 3-5 shows the default connector mapping.

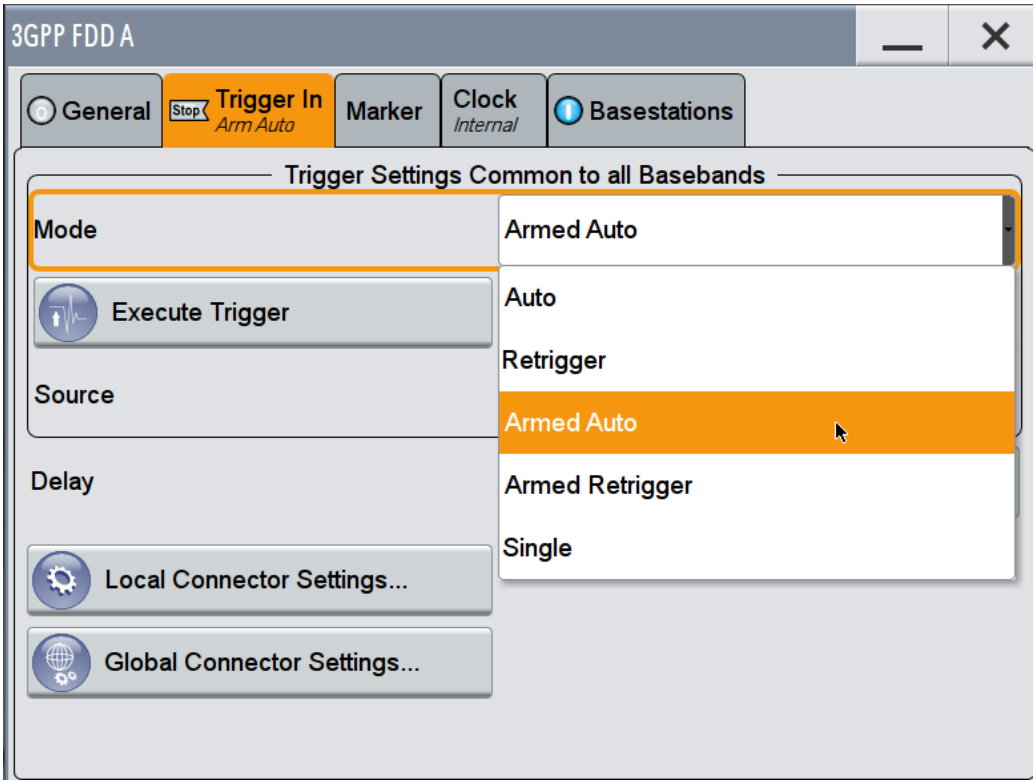



**Fig. 3-3: SMW: Select trigger mode. Select armed auto for external trigger**

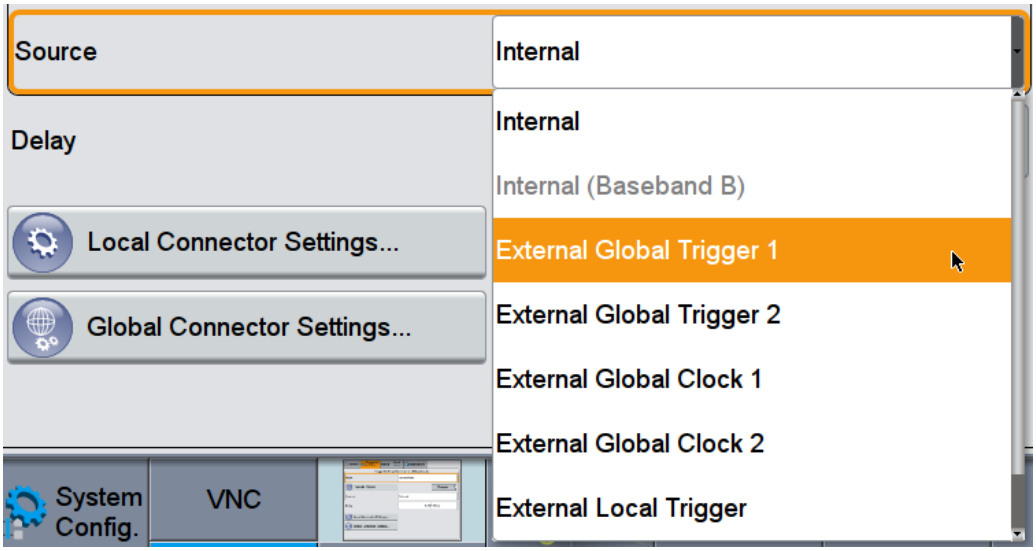



**Fig. 3-4: SMW: Select trigger source. Example: "External Global Trigger 1"**

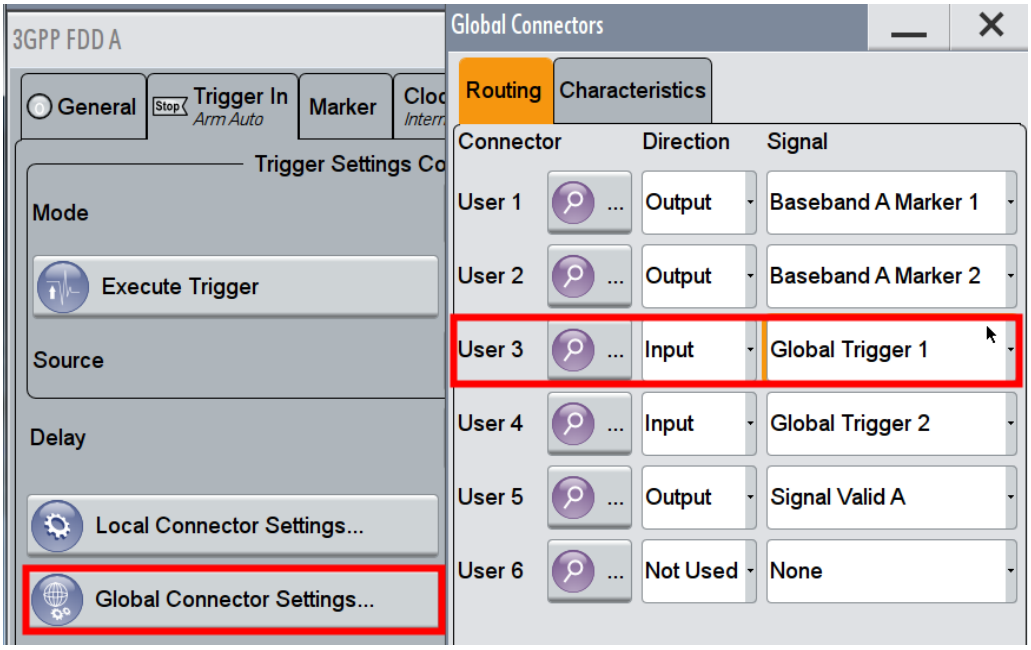



**Fig. 3-5: SMW: Configure the connector settings. Example: for the current configuration, Trigger 1 has to be supplied at the input connector USER 3.**

5. The SMx offers **Test Case Wizard** for quick and easy generation of signal according to standard. It opens a configuration menu with a selection of predefined settings according to test cases in TS25.141. The default settings are set according to the standard.

   It is also possible to generate user defined signals by selecting **User defined** under the "General Setting" menu of the test case.

**Select Test Case Wizard** (see Fig. 3-6).

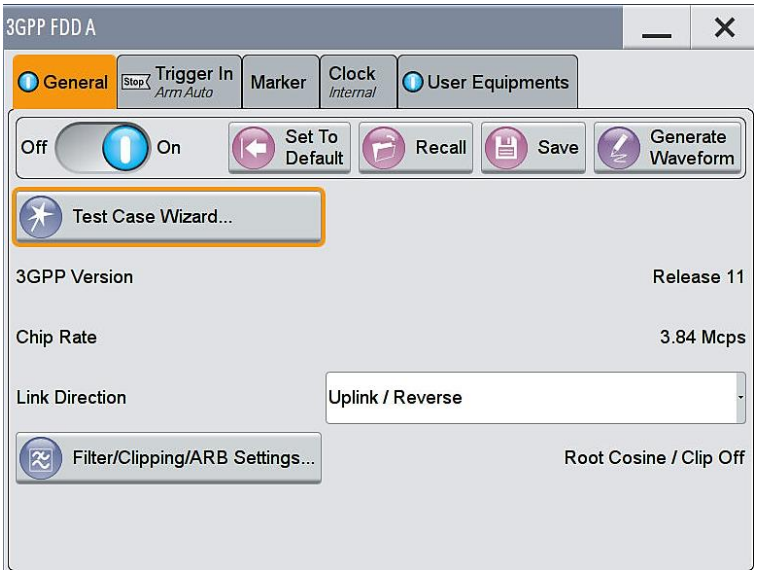



**Fig. 3-6: Open Test case wizard for easy and convenient generation of signal according to standard**

6. Go to **Test Case 7 Receiver Characteristics** and select the appropriate test from the set of “Test Case”

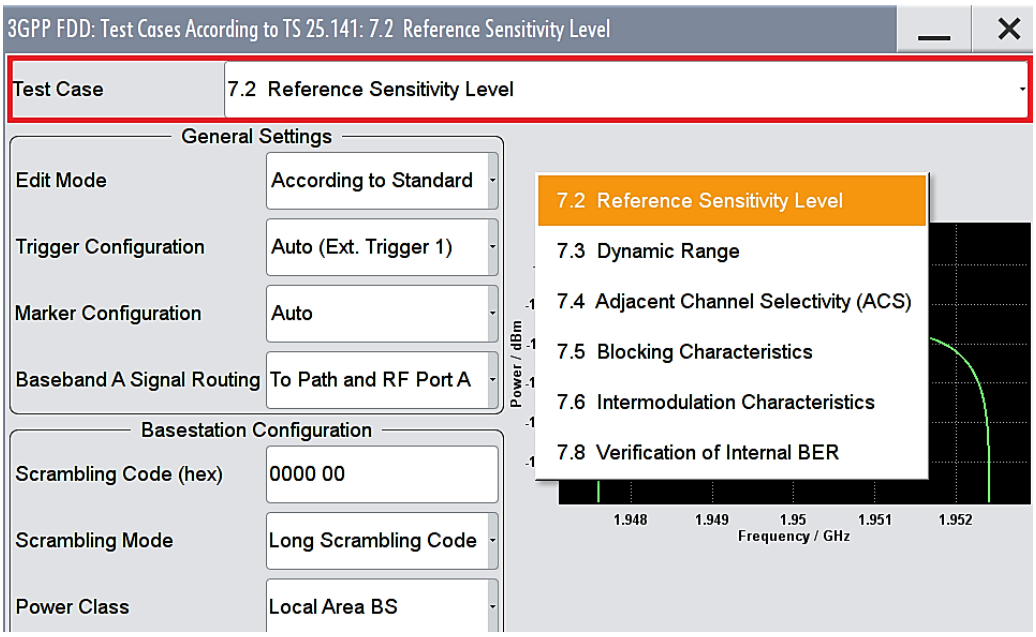



**Fig. 3-7: Select the desired test to be performed. Example: “7.2 Reference sensitivity level”**

7. Select **According to Standard** in the **Edit Mode** under the “General Settings” section (Fig. 3-8)

8. Select **Unchanged** under “Trigger Configuration” menu.

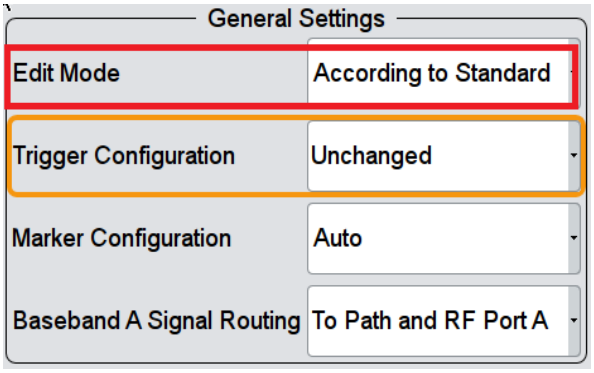



**Fig. 3-8: Select “According to Standard” to generate uplink signal according to 3GPP standard.**

9. Enter the uplink **Scrambling Code** and select **Scrambling Mode** in the “Baseband Configuration” section

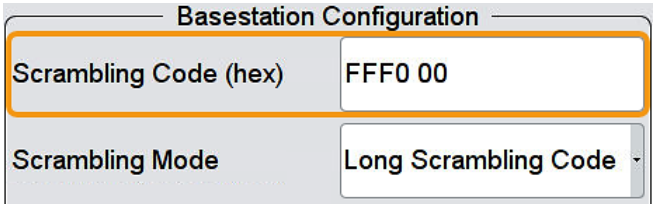



**Fig. 3-9: Enter the scrambling code and select the mode**

10. Select the **Power class**. This automatically sets the power level of the wanted signal according to standard

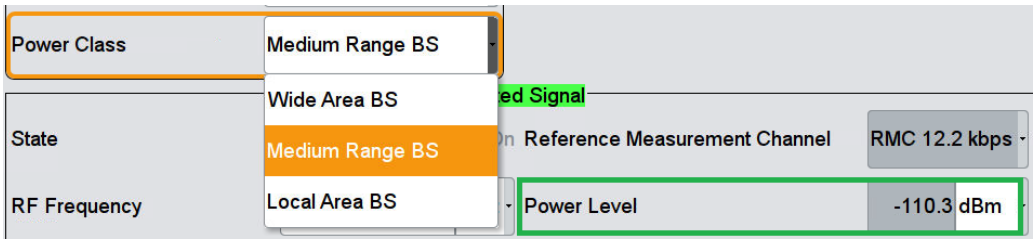



**Fig. 3-10: Select the BS power class to set the power level. Example: Medium range BS results in a power level of -110.3 dBm.**

11. Set **RF Frequency** of the wanted signal

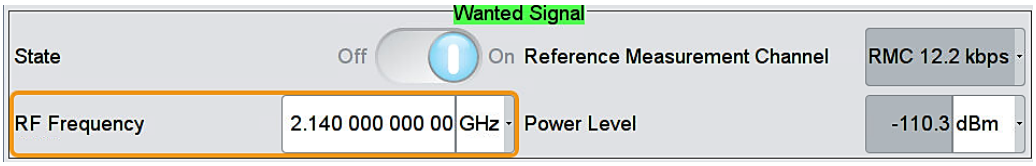



**Fig. 3-11: Set the RF frequency**

## 3.1.2 Demo Program R&S RUN

This Application Note comes with a demonstration program module called **W-CDMA BS Rx Test** for the software R&S RUN which is free of charge. The module covers all required tests.

The **W-CDMA BS Rx Test** module represents a so called test for the R&S RUN software.

See Section 4.1 for some important points on the basic operation of R&S RUN.

Each test described in this application note can be executed quickly and easily using the module. Additional individual settings can be applied.

The program offers a straightforward user interface, and SCPI remote command sequence export functions for integrating the necessary SCPI commands into any user-specific test environment. A measurement report is generated on each run. It can be saved to a file in different formats including PDF and HTML.

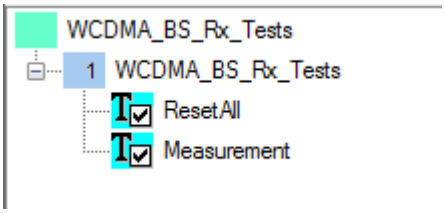
Following SCPI resources are needed:

- SMx
- CWx
- FSx

### Getting Started

This section describes only the module for the W-CDMA BS Rx tests. Double-click the test to open the window for entering parameters.

The test consists of two independent testcases:




- The testcase **ResetAll** resets all instruments (SMx, CWx and FSx). All instruments must be connected to use this feature.
- The testcase **Measurement** is the main part

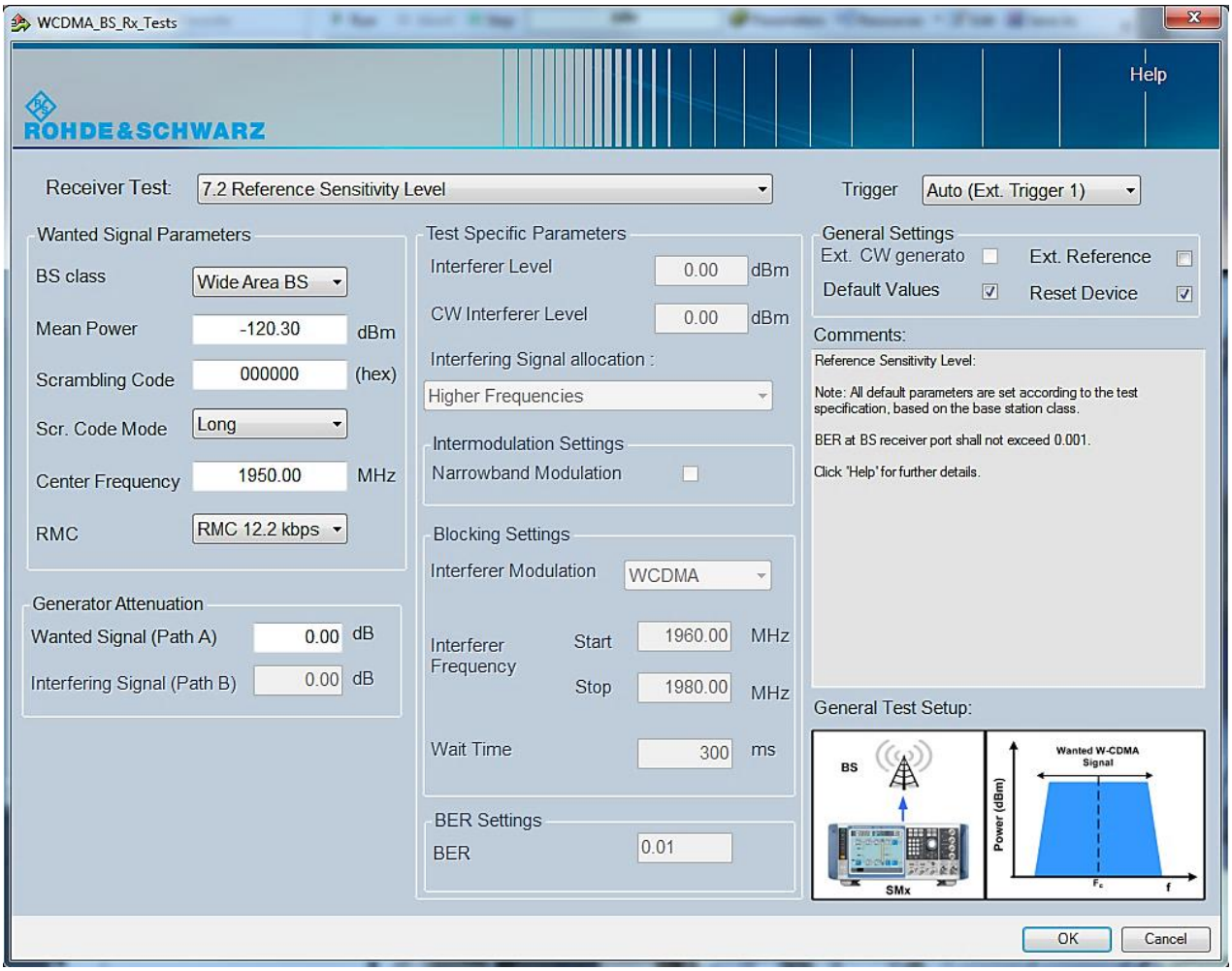



**Fig. 3-12: Full overview: setting parameters for the W-CDMA BS Rx test**

### General settings

The basic parameters are set at the top right:

- **Ext. CW generator:** uses an additional CW generator
- **Ext. Reference:** Turns on external reference mode of the instruments
- **Reset Device:** Sends a reset command to all connected instruments
- **Default Values:** Sets default values according to standard

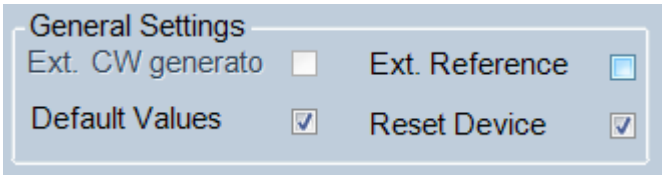



**Fig. 3-13: General settings**

The **Generator Attenuation** section is used to enter compensations for external path attenuations.

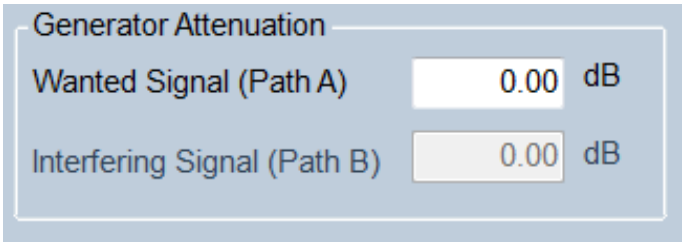



**Fig. 3-14: Attenuation Settings**

### Test Cases

This is the main parameter. Select the wanted test case here. All other remaining parameters in the window are grayed out or set active based on the requirements for the selected test case. These parameters are described in detail in the individual sections below.

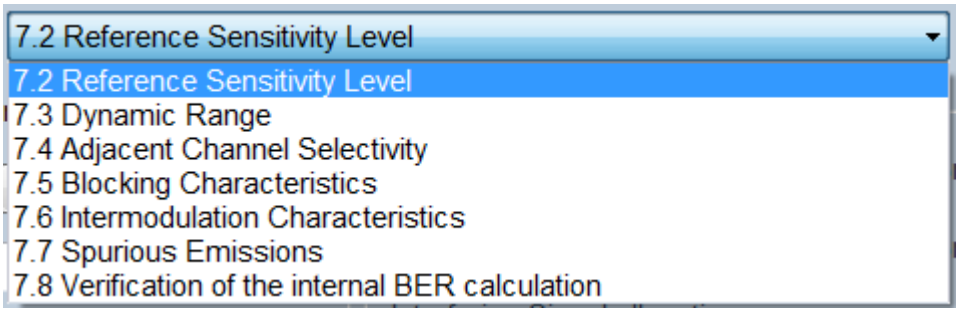



**Fig. 3-15: Available test cases**

Based on the selected test case, helpful hints are provided in the **Comments** section and an illustration of the basic test setup is displayed.

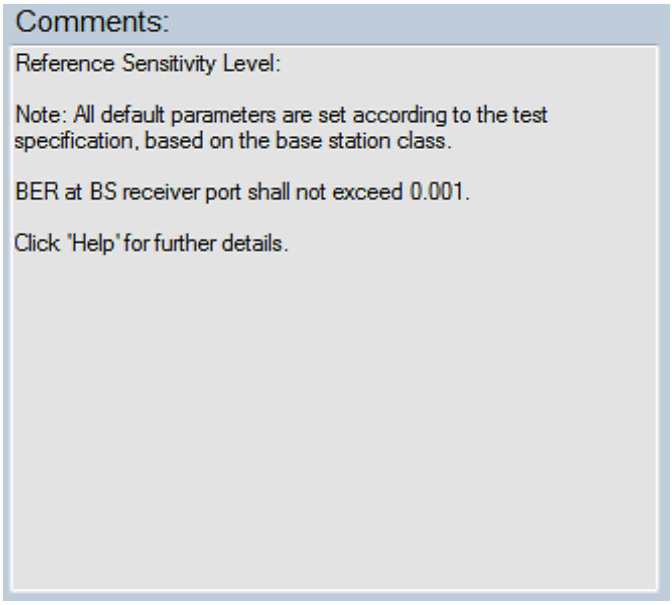



**Fig. 3-16: Brief notes are provided in the Comments section based on the selected test case.**

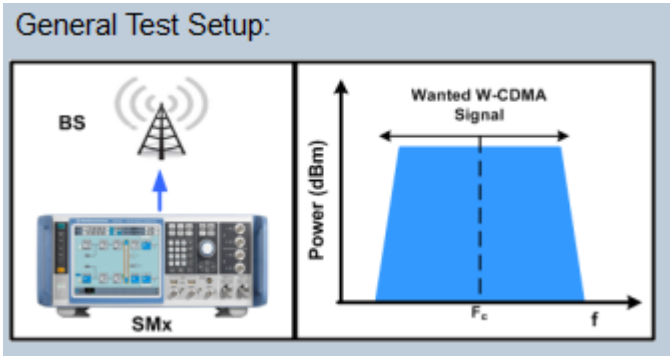



**Fig. 3-17: The Test Setup section (bottom right) displays a basic setup for the selected test case along with the location of the signals in the spectrum.**

### Settings for wanted signal

Use this section to define the basic parameters for the wanted W-CDMA signal:

- BS Class
- Mean Power
- Scrambling code
- Scrambling Mode
- Center Frequency
- Reference Measurement Channel (RMC)

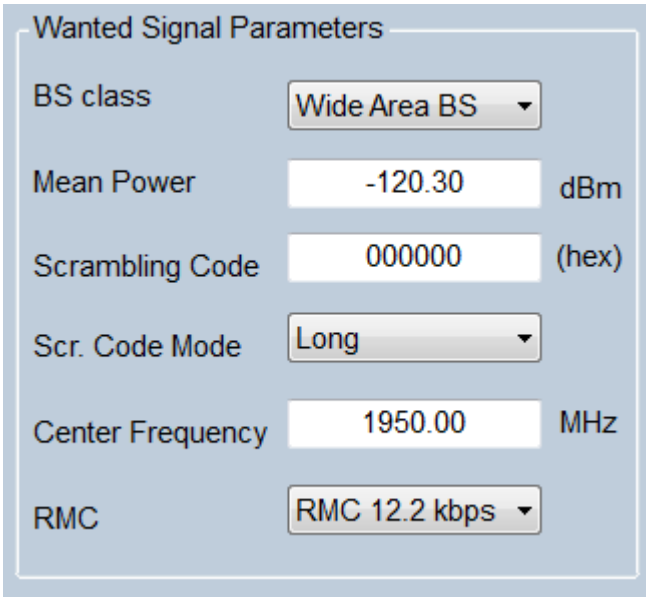



**Fig. 3-18: Main settings for wanted signal**

More advanced settings for specific tests cases are described in the corresponding sections below.

## 3.2 Reference sensitivity level (Clause 7.2)

The reference sensitivity level is the minimum mean power received at the antenna connector at which the BER shall not exceed the specific value indicated by the minimum requirement. [1]

This test verifies that the BER remains within the limits specified in Table 3-2 at the BS reference sensitivity level.

**BS reference sensitivity levels**

| BS class | Reference measurement channel data rate (kbps) | BS reference sensitivity level ( dBm) | | BER |
|---|---|---|---|---|
| | | f ≤ 3.0 GHz | 3.0 GHz < f ≤ 4.2 GHz | |
| Wide Area BS | 12.2 | -120.3 | -120.0 | ≤ 0.001 |
| Medium Range BS | | -110.3 | -110.0 | |
| Local Area BS / Home BS | | -106.3 | -106.0 | |

**Table 3-2: Requirements for BS reference sensitivity levels**

### Test Setup

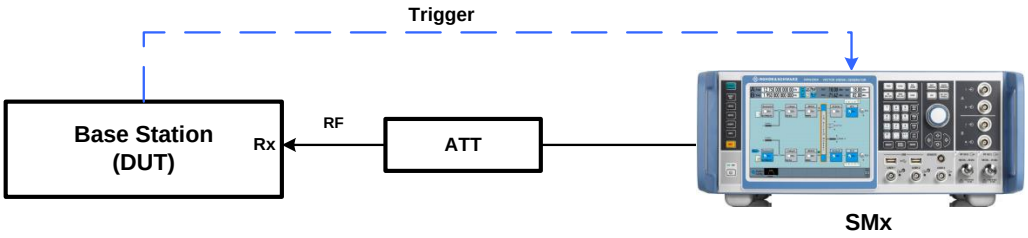



**Fig. 3-19: Test setup for reference sensitivity level. The SMx generates the wanted W-CDMA uplink reference measurement channel with data rate 12.2 kbps.**

Settings:

- The SMx generates the wanted W-CDMA signal with reference measurement channel data rate 12.2 kbps and level settings according to Table 3-2 which is applied to the BS receiver port
- Disable TPC (Transmit power control) function
- Set BS to transmit a “SFN mod 4” periodic trigger.
- Set the base station to transmit W-CDMA signal with maximum power and use TM1 for channel setting

### Test Procedure

#### Setup at SMx

1. Use standard procedure (see 3.1.1) to generate the wanted W-CDMA uplink signal
2. Press **Apply settings**
3. Measure the BER at the BS receiver ports

### Demo Program

No further special settings are needed for this test. The settings are reported.

*********** 7.2 Reference Sensitivity Level **********

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*Generator Settings:*
*- BS Class : Wide Area BS*
*- Scrambling Code: FFFFFF*
*- Scrambling Mode: Long*
*- Signal attenuation (Path A) : 0.00 dB*

| Test Item | Frequency (MHz) | Power (dBm) | --- | --- | Status |
|---|---|---|---|---|---|
| 7.2 Receiver Sensitivity Level | | | | | |
| Wanted Signal | 1950.00 | -120.30 | --- | --- | |

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**Fig. 3-20: Example report for test case 7.2**

## 3.3 Dynamic range (Clause 7.3)

Receiver dynamic range is the ability of the base station receiver to handle a rise of interference in the reception frequency channel. BER should not be greater than 0.001 for a specified sensitivity degradation of the wanted signal in the presence of an interfering AWGN signal in the same reception frequency channel. [1]

This test verifies the ability of the BS to receive the wanted signal with a BER not higher than 0.001 using the parameters specified in Table 3-3.

| Dynamic Range | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Level** | | | | **Unit** |
| | **Wide Area BS** | **Medium Range BS** | **Local Area / Home BS** | **Home BS[1]** | |
| Reference measurement channel data rate | 12.2 | | | | kbps |
| Wanted signal mean power | -89.8 | -79.8 | -75.8 | -55.8 | dBm |
| Interfering AWGN signal | -73 | -63 | -59 | -39 | dBm/3.84 MHz |
| BER | ≤ 0.001 | | | | |
| Note 1: For Home BS, this additional requirement ensures the performance is met over a large dynamic range. | | | | | |

**Table 3-3: Parameters for Dynamic range test**

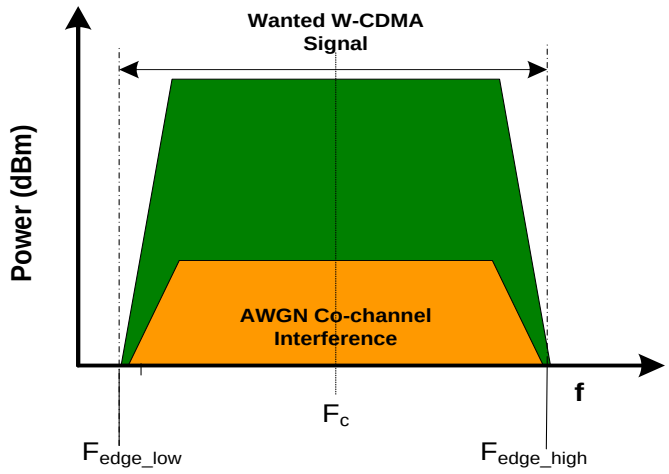



**Fig. 3-21: Receiver dynamic range. W-CDMA carrier with AWGN interferer**

### Test Setup

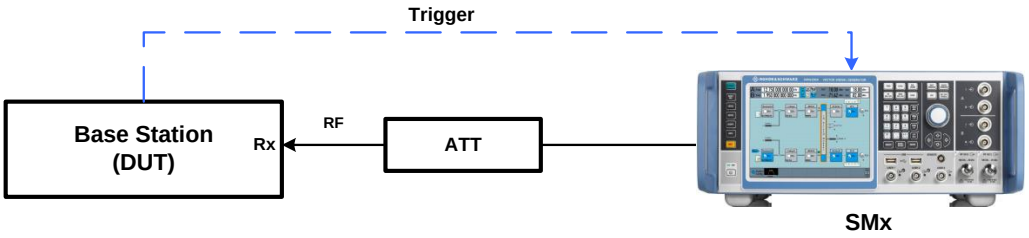



**Fig. 3-22: Test Setup for Dynamic range. The SMx generates the wanted W-CDMA uplink reference measurement channel and the AWGN interferer.**

Settings:

- The SMx generates the wanted W-CDMA signal with reference measurement channel data rate 12.2 kbps and level settings according to Table 3-3 which is applied to the BS receiver port.
- The SMx also generates the AWGN interferer according to Table 3-3
- Set BS to transmit a “SFN mod 4” periodic trigger.

### Test Procedure

1. Use standard procedure (see 3.1.1) to generate the wanted W-CDMA signal. This generates the interfering AWGN signal as well.
2. AWGN power level is set automatically based on the BS class according to Table 3-3

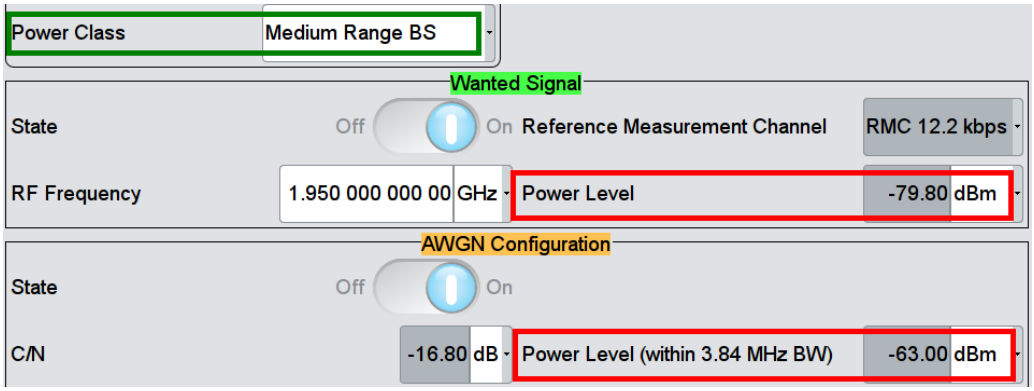



**Fig. 3-23: Select power class to set wanted signal power and AWGN power level. Example: for medium range BS , wanted signal power is set as -79.8 dBm and AWGN is set as -63 dBm (according to standard)**

3. Press **Apply settings**
4. Measure the BER at the BS receiver ports

**Demo Program**

For this test, one additional parameter must be defined. The settings are reported.

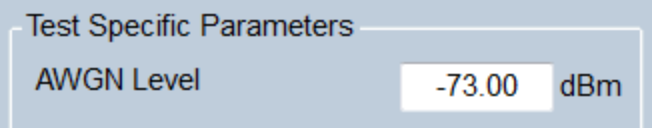
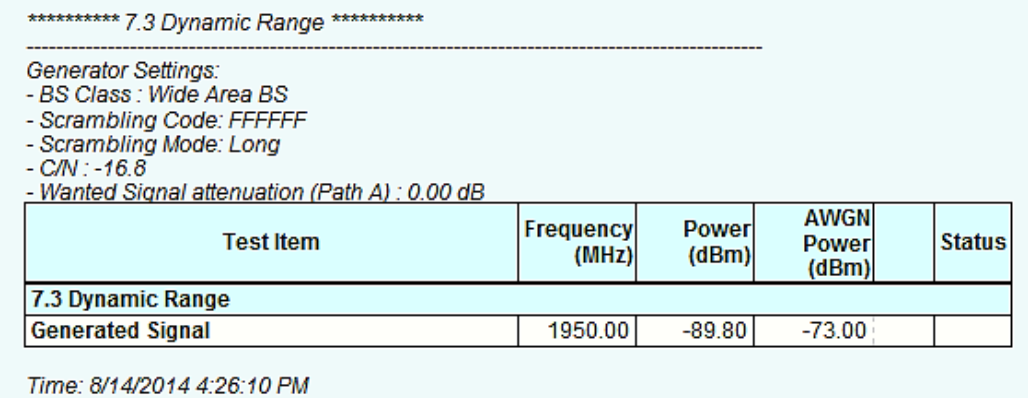



**Fig. 3-24: Special settings for Dynamic Range**

The level for AWGN can be entered directly. Please note the settings from the specification listed in Table 3-3.



********** 7.3 Dynamic Range **********

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Generator Settings:
- BS Class : Wide Area BS
- Scrambling Code: FFFFFF
- Scrambling Mode: Long
- C/N : -16.8
- Wanted Signal attenuation (Path A) : 0.00 dB

| Test Item | Frequency (MHz) | Power (dBm) | AWGN Power (dBm) | | Status |
|---|---|---|---|---|---|
| 7.3 Dynamic Range | | | | | |
| Generated Signal | 1950.00 | -89.80 | -73.00 | | |

Time: 8/14/2014 4:26:10 PM

**Fig. 3-25: Example report for test case 7.3**

## 3.4 Adjacent Channel Selectivity (ACS) (Clause 7.4)

Adjacent Channel Selectivity (ACS) is a measure of the receiver ability to receive a wanted 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 receiver filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s). [1]

The interference signal shall have an ACLR of at least 63 dB in order to eliminate the impact of interference signal adjacent channel leakage power on the ACS measurement [1]. The SMx provides an excellent ACLR performance of +70 dB (typ.) with 3GPP FDD signal, hence the impact of interfering W-CDMA signal ACLR can be neglected.

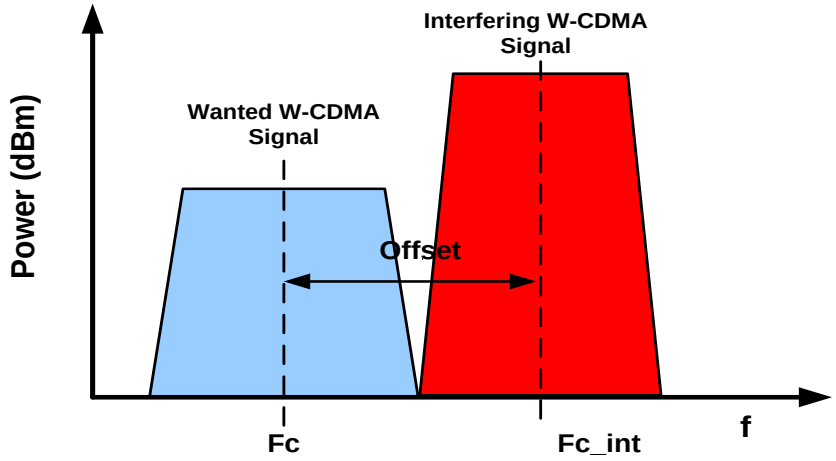


**Fig. 3-26: Adjacent channel selectivity. An interfering W-CDMA signal is placed at an offset of ±5 MHz**

This test verifies the ability of the BS receiver filter to suppress interfering signals in the channels adjacent to the wanted channel following the parameters specified in Table 3-4.

| Adjacent Channel Selectivity | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Level** | | | | **Unit** |
| | **Wide Area BS** | **Medium Range BS** | **Local Area / Home BS** | **Home BS[1]** | |
| Reference measurement channel data rate | 12.2 | | | | kbps |
| Wanted signal mean power | -115 | -105 | -101 | -91 | dBm |
| Interfering signal mean power | -52 | -42 | -38 | -28 | dBm |
| Frequency Offset (Interferer) | ±5 | | | | MHz |
| BER | ≤ 0.001 | | | | |
| Note 1: For Home BS, this additional requirement ensures the performance is met over a large dynamic range. | | | | | |

**Table 3-4: Parameters for Adjacent channel selectivity test**

### Test Setup

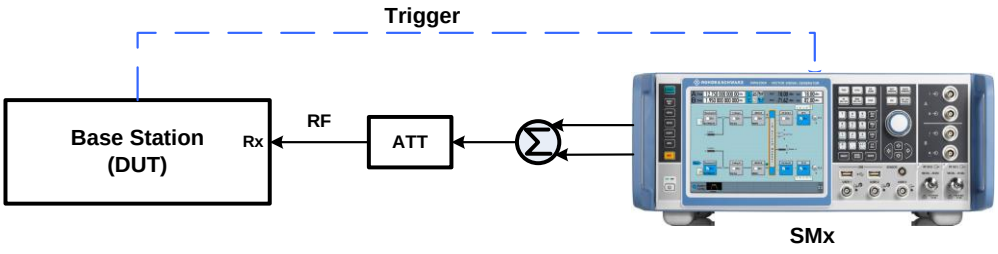


**Fig. 3-27: Test Setup for ACS Test. The SMx generates the wanted W-CDMA uplink signal and the interfering W-CDMA signal at ±5 MHz offset frequency with two paths.**

Settings:

- The SMx generates the wanted W-CDMA signal with reference measurement channel data rate 12.2 kbps and level settings according to Table 3-4 which is applied to the BS receiver port.
- The SMx also generates the adjacent channel W-CDMA interfering signal according to Table 3-4
- Use a hybrid combiner to sum two signals
- Set BS to transmit a “SFN mod 4” periodic trigger.

### Test Procedure

#### Setup at SMx

1. Use standard procedure (see 3.1.1) to generate the uplink signal
2. Power level of the wanted W-CDMA signal and the interfering W-CDMA signal is set automatically according to selected BS power class
3. Set the **Frequency Offset** of the interfering W-CDMA signal in the “Interferer Configuration” section

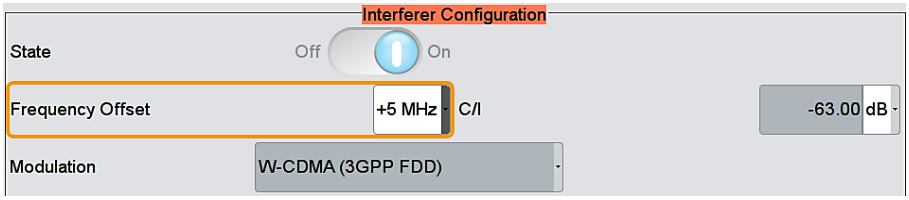


**Fig. 3-28: Frequency offset = 5 MHz is applied**

4. Press **Apply settings**
5. Measure the BER at the BS receiver ports

### Demo Program

For this test, additional parameters (**W-CDMA Interferer** and **Interfering Signal Allocation**) must be defined. The settings are reported.

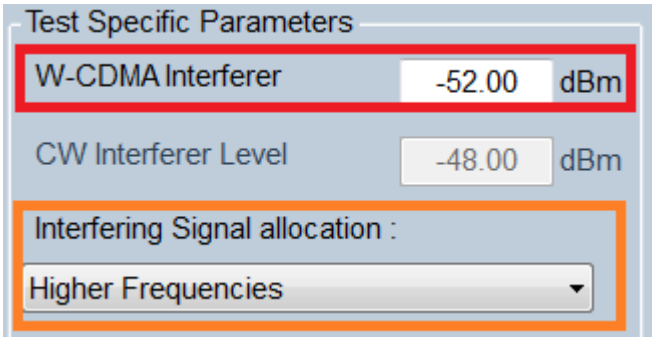


**Fig. 3-29: Special settings for ACS**

The level for the W-CDMA interferer can be entered directly. Select the position of the interferer.  Please note the settings from the specification listed in Table 3-4**.**

********** 7.4 Adjacent Channel Selectivity **********

---

Generator Settings:
- BS Class : Wide Area BS
- Scrambling Code : FFFFFF
- Scrambling Mode : Long
- Interfering Signal: W-CDMA
- Wanted Signal attenuation (Path A) : 0.00 dB
- Interfering Signal attenuation (Path B) : 0.00 dB

| Test Item | Frequency (MHz) | Power (dBm) | --- | --- | Status |
|---|---|---|---|---|---|
| 7.4 Adjacent Channel Selectivity | | | | | |
| Wanted Signal | 1950 | -115.00 | | | |
| W-CDMA Interferer Signal | 1955 | -52.00 | | | |

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**Fig. 3-30: Example report for test case 7.4**

## 3.5 Blocking characteristics (Clause 7.5)

The blocking characteristics are measures of the receiver 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 adjacent channels. [1]

The test stresses the ability of the BS receiver to withstand high-level interference from unwanted signals at frequency offsets of 10 MHz or more, without undue degradation of its sensitivity. The BER for wanted signal shall not exceed 0.001 for the parameters specified in Table 3-5, Table 3-6 and Table 3-7.

Blocking can be divided into the three following scenarios:

- **Wideband blocking-** This kind of blocking occurs if there is an interfering W-CDMA signal within the “operating band ± 20 MHz” range, known as in-band blocking or if there is a CW carrier signal out of the “operating band ± 20 MHz” range, known as out-of-band blocking.

  The minimum frequency offset, Fuw between the wanted signal and interferer shall be ±10 MHz and it shall be increased by 1 MHz steps so that the interfering signal covers the range from 1 MHz to 12750 MHz.

  Table 3-5 describes the requirements for wideband blocking based on the BS class depending on the frequency band.

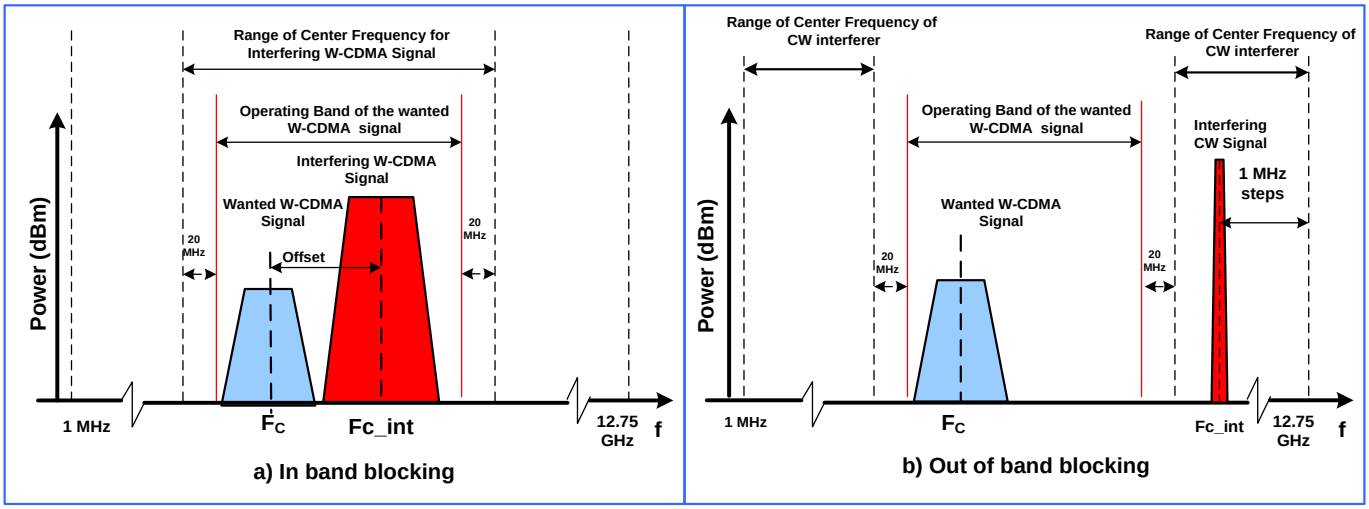


**Fig. 3-31: Wideband blocking example. Fig a) shows in-band blocking with W-CDMA interferer where the center frequency of the interfering signal is within the operating band ± 20 MHz range. Fig b) shows out-of-band blocking with CW interferer where the center frequency of the interfering signal is out of the operating band ± 20 MHz range.**

- **Co-located blocking:** This test maybe applied if a BS is co- located with another BS using different wireless standards and another frequency band. For the test, blocking is done by a CW carrier signal within the operating band of wanted W-CDMA signal. This test is optional.

  Requirements for co-located blocking are mentioned in in Table 3-6.

- **Narrowband Blocking-** This test is applied if a BS is located in one of the frequency bands specified for GSM. For the test, blocking is done by a narrowband GMSK signal within the operating band.

  The GMSK modulated interfering signal shall have an ACLR of at least 72 dB in order to eliminate the impact of interference signal adjacent channel leakage power on the blocking characteristics measurement [1]. Use a notch filter to eliminate the impact.

  Requirements for co-located blocking are mentioned in in Table 3-7.

| Blocking characteristics for Wideband blocking | | | | |
|---|---|---|---|---|
| **BS class** | **Operating Band** | **Interfering Signal mean power (dBm)** | | **Wanted signal mean power (dBm)** |
| | | **$F_{high}$ – 20 MHz ↔ $F_{low}$ + 20 MHz**<br>Min. offset = ±10 MHz | **1 MHz↔ $F_{high}$ - 20 MHz and $F_{low}$ + 20 MHz↔12750 MHz** | |
| Wide Area BS | I - XXV | -40 | -15 | -115 |
| Medium Range BS | I - XXV | -35 | | -105 |
| Local Area/ Home BS | I - XXV | -30 | | -101 |
| Type of Interferer | I - XXV | WCDMA interferer | CW carrier | |
| Note: Check TS 25.141 table 7.4K ↔ 7.4M for further details | | | | |

**Table 3-5: Blocking characteristics for wideband blocking for different BS**

| Blocking characteristics for Co-located blocking | | | |
|---|---|---|---|
| **BS class** | **Operating Band** | **Interfering Signal mean power (dBm)** | **Wanted signal mean power (dBm)** |
| Wide Area BS | Macro GSM900, Macro DCS1800, Macro PCS1900, Macro GSM850 or CDMA850;<br>WA E-UTRA 1 ↔ 25, 33,34,38 ↔ 43;<br>WA UTRA-FDD I ↔ XIV , XIX ↔ XXII, XXV | +16 | -115 |
| Medium Range BS | Macro GSM900, Macro GSM850 | -3 | -105 |
| | Macro DCS1800, Macro PCS1900 | +5 | |
| | MR UTRA-FDD I ↔ XIV, XIX ↔ XXII,XXV | +8 | |
| Local Area/ Home BS | Pico GSM900, Pico GSM850 | -7 | -101 |
| | Pico DCS1800, Pico PCS1900 | -4 | |
| | LA E-UTRA 1 ↔ 25, 33,34,38 ↔ 43;<br>LA UTRA-FDD I ↔ XIV , XIX ↔ XXII, XXV | -6 | |
| Type of Interferer | CW carrier | | |
| Note 1: Check TS 25.141 table 7.4N ↔ 7.4 Q for further details | | | |

**Table 3-6: Blocking characteristics for co-located blocking for different BS**

| Blocking characteristics for Narrow band blocking | | | | |
|---|---|---|---|---|
| **BS class** | **Operating Band** | **Min. Offset of Interfering Signal (MHz)** | **Interfering Signal mean power (dBm)** | **Wanted signal mean power (dBm)** |
| Wide Area BS | II, IV, V, X, XII ↔ XIV, XXV | ±2.7 | -47 | -115 |
| | III, VIII | ±2.8 | | |
| Medium Range BS | II, IV, V, X, XII ↔ XIV, XXV | ±2.7 | -42 | -105 |
| | III, VIII | ±2.8 | | |
| Local Area/ Home BS | II, IV, V, X, XII ↔ XIV, XXV | ±2.7 | -37 | -101 |
| | III, VIII | ±2.8 | | |
| Type of Interferer | GMSK modulated | | | |
| Note 1: Use a notch filter to eliminate the impact of interfering GMSK signal adjacent channel leakage power on the blocking characteristics measurement.<br>Note 2: Check TS 25.141 table 7.4NR ↔ 7.4T for further details | | | | |

**Table 3-7: Blocking characteristics for narrowband blocking for different BS**

### Test Setup

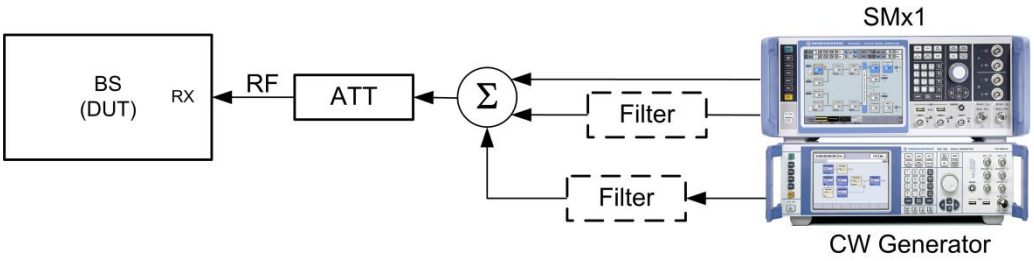


**Fig. 3-32: Test setup for blocking characteristics. The SMx generates the wanted W-CDMA signal and the interfering signal with two paths. The CW generator provides the CW interferer up to 12.75 GHz**

RF channel to be tested: Middle (M)

### Settings

- The BS transmits a W-CDMA signal at Pmax using channel setup according to TM1
- The SMx generates the wanted W-CDMA signal with reference measurement channel data rate 12.2 kbps and level settings according to the level specified in Table 3-5, Table 3-6 and Table 3-7 which is applied to the BS receiver port
- The SMx also generates a W-CDMA, CW or GMSK modulated interferer according to the level specified in Table 3-5, Table 3-6 and Table 3-7. For the narrowband blocking (Interferer GMSK modulated) use a notch filter to fulfil the ACLR requirement
- For out-of-band blocking, use an additional CW generator to generate the CW interferer up to 12.75 GHz. Use a filter to suppress harmonics in the receive band.
- Use a hybrid combiner to sum all signals

- Set BS to transmit a “SFN mod 4” periodic trigger.

### Procedure

SMx “Test Case Wizard” offers three blocking scenarios: Wideband blocking, Co located blocking and Narrowband blocking. Modulation of the interfering signal is done based on the blocking scenario.

**Wideband Blocking (In-Band)**

1. Use standard procedure (see 3.1.1) to generate the uplink W-CDMA signal
2. Select **Wideband Blocking** as **Blocking Scenario** in the “Wanted Signal” menu. (Fig. 3-33).
3. Select the **Operating band** of the wanted signal (Fig. 3-33).
4. Set **RF frequency** of the wanted signal within the operating band. (Fig. 3-33)
5. **Power level** for the wanted signal is set automatically according to specification.

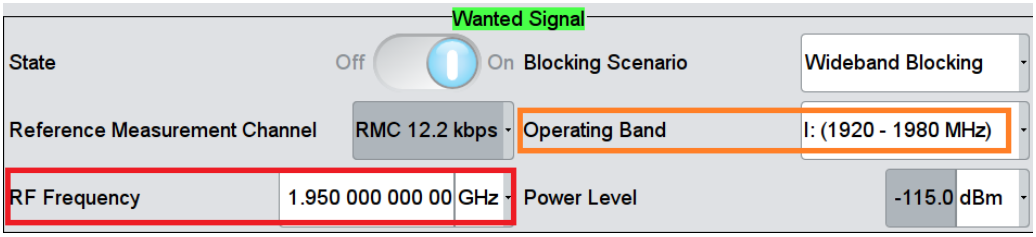


**Fig. 3-33: Set parameters for wideband blocking**

6. Set **Frequency offset** of the interfering signal from the wanted signal such that the center frequency of the interfering signal is within “operating band ± 20 MHz” range. Maintain minimum offset of ± 10 MHz. (Fig. 3-34)
7. Modulation of the interfering signal is set as **W-CDMA (3GPP FDD)** and **Power level** is set automatically according to specification.

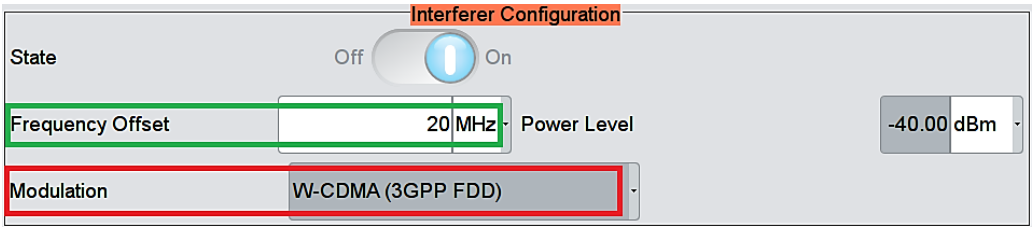


**Fig. 3-34: Frequency offset is selected as 20 MHz which is within ± 20 MHz of the highest and lowest edge of the operating band. So, a -40 dBm W-CDMA interferer is used for wideband blocking scenario of a wide area BS.**

8. Press **Apply Setting**
9. Measure the BER at the BS receiver ports
10. Shift the interferer in 1 MHz steps up in the range (operating band ± 20 MHz) by changing the frequency offset and press **Apply Settings**
11. Repeat the measurement at BS receiver port

### Wideband Blocking (Out-of-Band)

An additional CW signal generator is needed for out-of-band blocking. Follow the steps below to generate a CW interferer in addition to the wanted W-CDMA signal.

SMx settings:

1. Use step 1-5 of the standard procedure (see 3.1.1) to generate the uplink W-CDMA signal
2. Select **User Definable** in the **Edit Mode** under the **General settings** section of Test case “7.5 Blocking characteristics”
3. Select **Unchanged** under “Trigger Configuration” menu.
4. Enter uplink **Scrambling Code** and select **Scrambling Mode** in the “Baseband Configuration” section

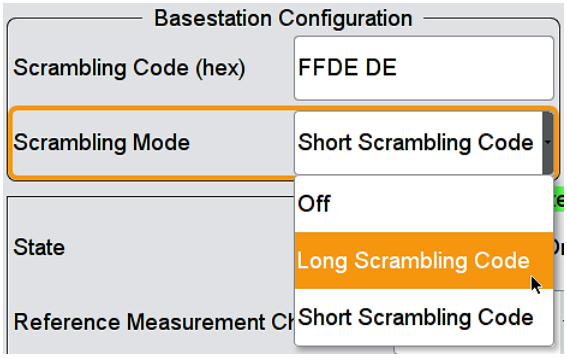


**Fig. 3-35: Set scrambling code and scrambling code mode of the wanted W-CDMA signal**

5. Select **Reference Measurement Channel** of the wanted signal (Fig. 3-36)
6. Set **RF Frequency** and **Power Level** of the wanted signal

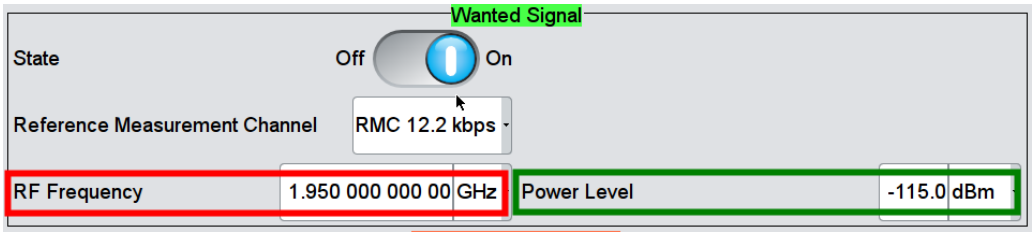


**Fig. 3-36: Set reference measurement channel, RF frequency and Power level of the wanted signal**

6. Turn off the interfering signal.

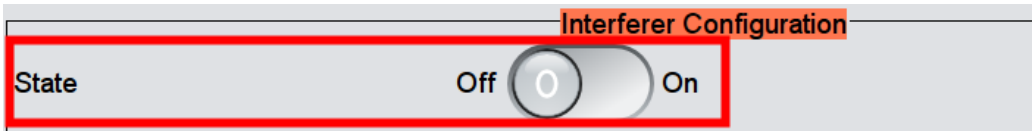


**Fig. 3-37: Turn off interfering signal.**

7. Press **Apply Settings**

**CW generator settings:**

8. Set RF Frequency and level in the CW generator and start measurement. (start frequency 1 MHz, level -15 dBm)

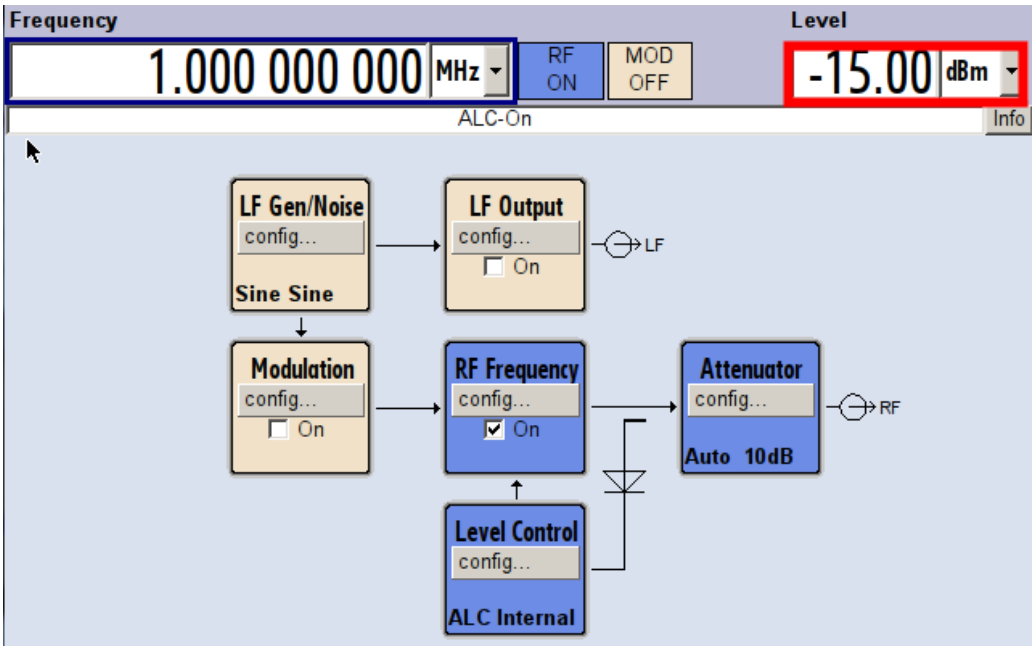


**Fig. 3-38: CWx: set RF frequency and Power level of CW signal**

9. Shift the interferer in 1 MHz steps up in the range and repeat the measurement up to 12750 MHz. Skip the operating band plus additional range (example: skip 1900 to 2000 MHz range for operating band I (1920-1980 MHz)

10. Measure the BER at the BS receiver ports for each frequency step

**Co-located blocking:**

1. Use the standard procedure (see 3.1.1) to generate the uplink W-CDMA signal

2. Select **Co-located BS blocking** as **Blocking Scenario** in the “Wanted Signal” menu. (Fig. 3-39)

3. Set **RF frequency** of the wanted signal. (Fig. 3-39)

4. **Power level** for the wanted signal is set automatically based on the power class and blocking scenario. (Fig. 3-39)

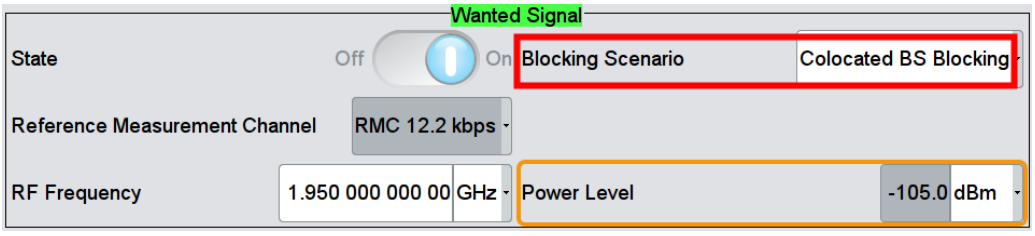


**Fig. 3-39: Set blocking scenario as Colocated BS Blocking. Set Frequency**

5. Set **Frequency offset** of the interfering signal from the wanted signal such that the center frequency of the interfering signal is within the operating band. (Fig. 3-40)
6. Modulation of the interfering signal is set as CW Carrier and **Power level** is set automatically according to standard. (Fig. 3-40)

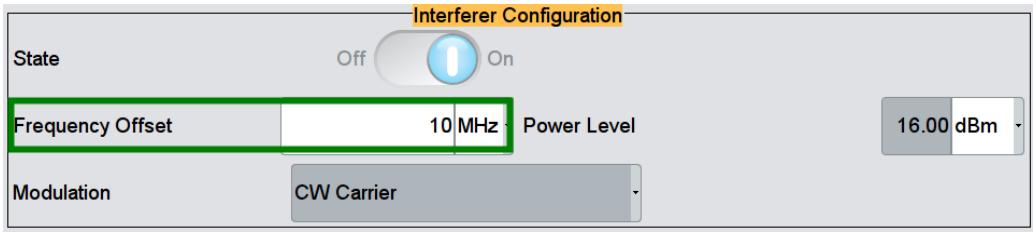


**Fig. 3-40: Set frequency offset**

7. Press **Apply Setting**
8. Measure the BER at the BS receiver ports
9. Shift the interferer in 1 MHz steps up in the range by increasing the frequency offset and press **Apply Settings**
10. Repeat the measurement at BS receiver port

**Narrowband Blocking:**

1. Use step 1-10 of the standard procedure (see 3.1.1) to generate the uplink W-CDMA signal
2. Select **Narrowband BS blocking** as **Blocking Scenario** in the “Wanted Signal” menu. (Fig. 3-41)
3. Set **RF frequency** of the wanted signal. (Fig. 3-41)
4. **Power level** for the wanted signal is set automatically based on the power class and blocking scenario. (Fig. 3-41)

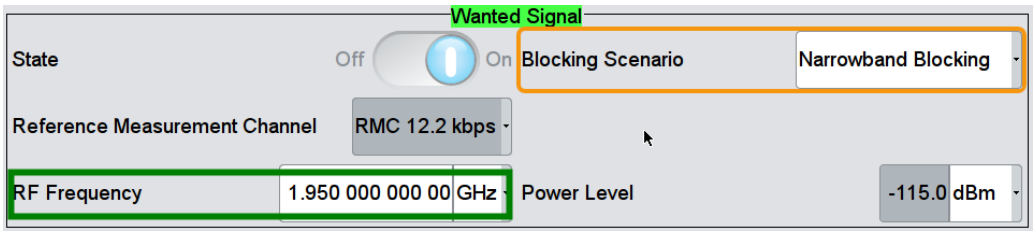


**Fig. 3-41: Select Narrowband Blocking. Set RF Frequency**

5. Set **Frequency offset** of the interfering signal from the wanted signal such that the center frequency of the interfering signal is within the operating band. Maintain minimum offset between the signals according to Table 3-7.
6. Modulation of the interfering signal is set as **GMSK (270.833 kHz)** and **Power level** is set automatically according to specification.

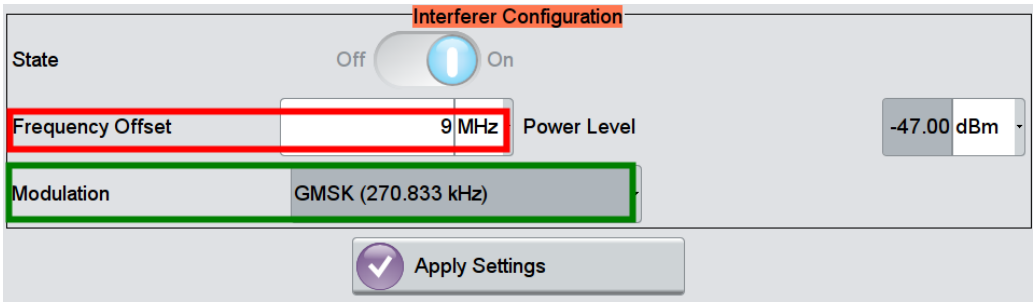


**Fig. 3-42: Set Frequency Offset. GMSK modulation is set automatically.**

7. Press **Apply Setting**
8. Measure the BER at the BS receiver ports
9. Shift the interferer in 1 MHz steps up in the range by changing the frequency offset and press **Apply Settings**
10. Repeat the measurement at BS receiver port

### Demo Program

For this test, additional parameters must be defined. The settings are reported.

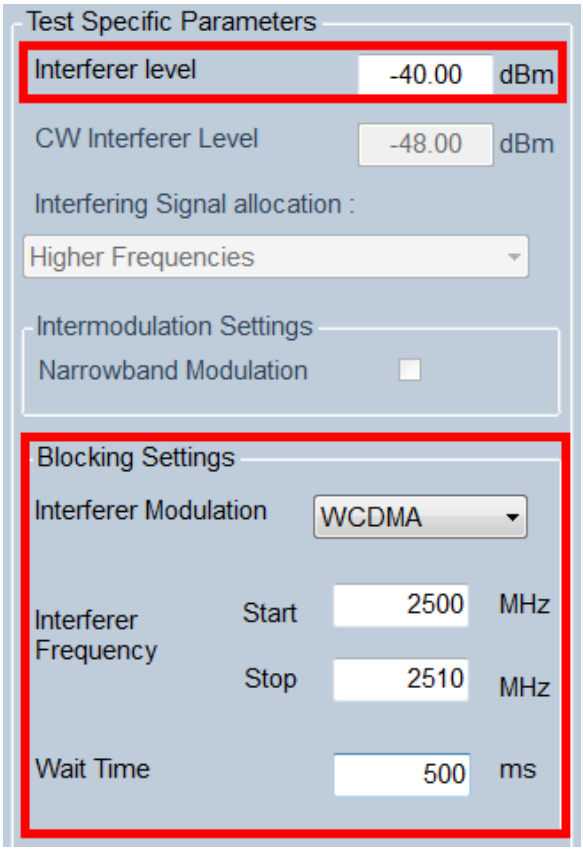


**Fig. 3-43: Special settings for blocking**

Choose the modulation of the interferer and set the level for the interferer. Set the start and stop frequency of the interferer. Set the wait time between two steps. Please note, that the entered frequencies are not checked for validity. Please note the settings from the specification listed in Table 3-5, Table 3-6 and Table 3-7.

********** 7.5 Blocking Characteristics **********

---

Generator Settings:
- BS Class : Wide Area BS
- Scrambling Code : 000000
- Scrambling Mode : Long
- Interfering Signal : WCDMA
- Measurment Frequency range : (2500 to 2510 MHz)
- Wanted Signal attenuation (Path A) : 0.00 dB
- Interfering Signal attenuation (Path B) : 0.00 dB

| Test Item | Frequency (MHz) | Power (dBm) | | | Status |
|---|---|---|---|---|---|
| 7.5 Blocking Characteristics | | | | | |
| Wanted Signal | 1950 | -115.00 | | | |
| Blocking Signal | 2500 | -40.00 | | | |
| Blocking Signal | 2501 | -40.00 | — | | |
| Blocking Signal | 2502 | -40.00 | — | | |
| Blocking Signal | 2503 | -40.00 | — | | |
| Blocking Signal | 2504 | -40.00 | — | | |
| Blocking Signal | 2505 | -40.00 | — | | |
| Blocking Signal | 2506 | -40.00 | — | | |
| Blocking Signal | 2507 | -40.00 | — | | |
| Blocking Signal | 2508 | -40.00 | — | | |
| Blocking Signal | 2509 | -40.00 | — | | |
| Blocking Signal | 2510 | -40.00 | — | | |

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**Fig. 3-44: Example report for test case 7.5**

## 3.6 Intermodulation characteristics (Clause 7.6)

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 which have a specific frequency relationship to the wanted signal. Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. [1]

The following figure shows the wanted signal along with a CW interfering signal at 10MHz offset from the wanted signal and a W-CDMA interfering signal at 20 MHz offset.

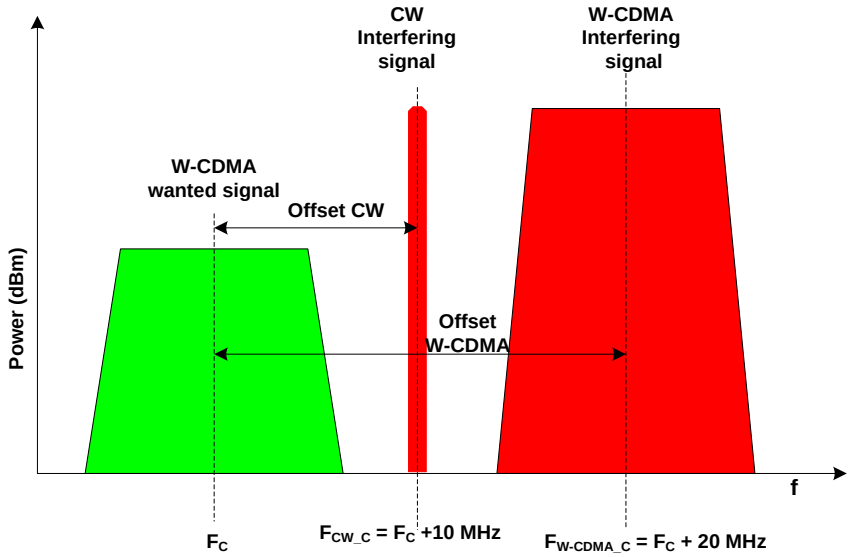



**Fig. 3-45: Intermodulation performance. W-CDMA and CW interfering signals cause interference in the wanted signal frequency band.**

The test purpose is to verify the ability of the BS receiver to inhibit the generation of intermodulation products in its non-linear elements caused by the presence of two high -level interfering signals at frequencies with a specific relationship to the frequency of the wanted signal. [1]

The BER for wanted signal shall not be greater than 0.001 for the parameters specified in Table 3-8 and Table 3-9

| Intermodulation parameter requirement | | | | | |
|---|---|---|---|---|---|
| **Operating Band** | **Type of Signal** | **Offset** | **Signal mean power (dBm)** | | |
| | | | **Wide Area BS** | **Medium Range BS** | **Local Area / Home BS** |
| All bands | Wanted signal | --- | -115 | -105 | -101 |
| | CW signal | ±10 MHz | -48 | -44 | -38 |
| | WCDMA signal | ±20 MHz | -48 | -44 | -38 |

**Table 3-8: Interferer signals for intermodulation performance requirement**

| Narrowband intermodulation parameter requirement | | | | | |
|---|---|---|---|---|---|
| **Operating Band** | **Type of Signal** | **Offset** | **Signal mean power (dBm)** | | |
| | | | **Wide Area BS** | **Medium Range BS** | **Local Area / Home BS** |
| II, III, IV, V, VIII, X, XII, XIII, XIV, XXV | Wanted signal | --- | -115 | -105 | -101 |
| | CW signal | ±3.5 MHz | -47 | -43 | -37 |
| | GMSK modulated | ±5.9 MHz | -47 | -43 | -37 |
| Use a notch filter to fulfil the ACLR requirement | | | | | |

**Table 3-9: Narrowband intermodulation performance requirement**

### Test Setup

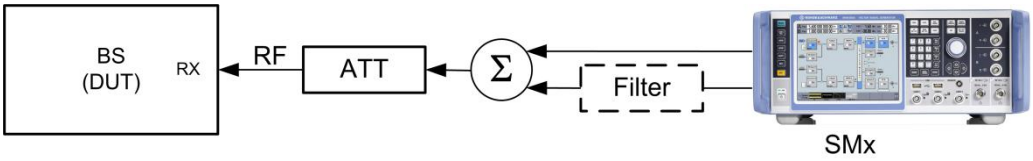



**Fig. 3-46: Test setup for Intermodulation characteristics. The SMx generates the wanted W-CDMA signal and the interfering signal with two paths.**

Settings:

- The SMx generates the wanted W-CDMA signal with reference measurement channel data rate 12.2 kbps and level settings according to the level specified in Table 3-8 and Table 3-9 which is applied to the BS receiver port
- The SMx also generates two interferers (CW and W-CDMA/GMSK) based on the modulation bandwidth and according level specified in Table 3-8 and Table 3-9. For the narrowband intermodulation (Interferer GMSK modulated) use a notch filter to fulfil the ACLR requirement
- Use a hybrid combiner to sum all signals
- Set BS to transmit a “SFN mod 4” periodic trigger.

### Test Procedure

1. Use the standard procedure (see 3.1.1) to generate the uplink signal
2. Select **Bandwidth type** in the “Interferer Configuration settings”

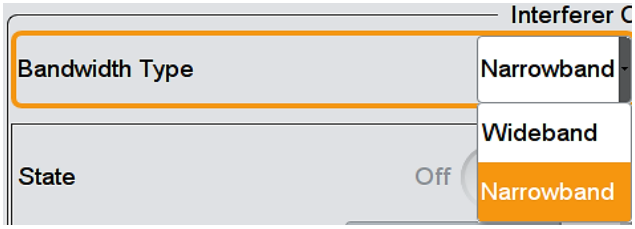



**Fig. 3-47: Set bandwidth type of the interferer (Example: narrowband is chosen here).**

3. All the settings (frequency offset, Modulation type and power level) for CW interferer (interferer 1) and Modulated Signal (interferer 2) are set automatically based on the power class and interferer bandwidth type according to standard.

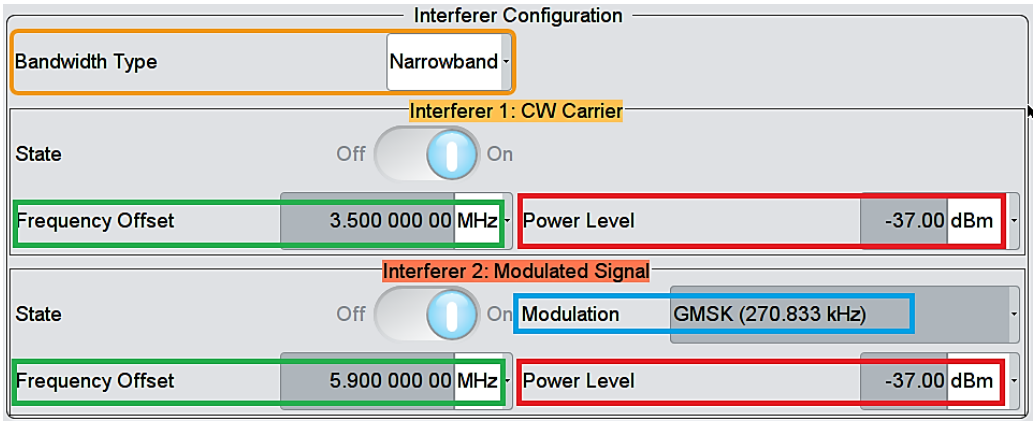



**Fig. 3-48: Power levels (marked red), frequency offsets (marked green) and modulation type (marked blue) for the interferers are set automatically according to standard.**

4. Press **Apply Settings**
5. Measure the BER at the BS Receiver ports

### Demo Program

For this test, additional parameters must be defined. The settings are reported.

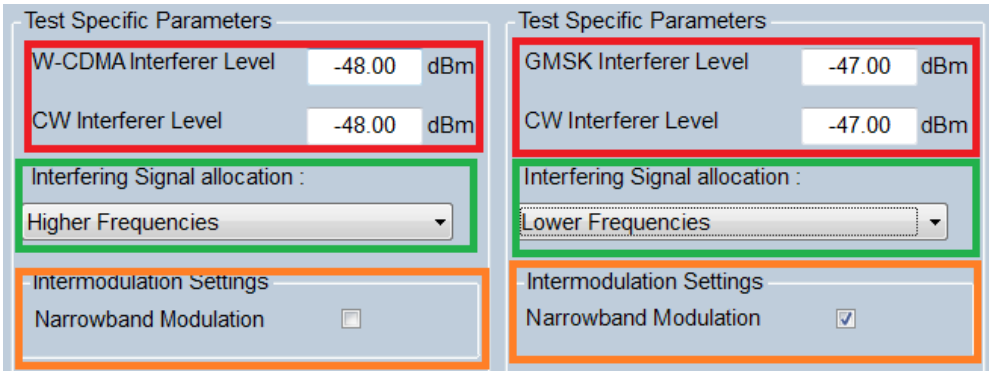



**Fig. 3-49: Special settings for Intermodulation characteristics. Change modulation setting to change between W-CDMA and GMSK interferer.**

Check **Narrowband Modulation** to switch to “Narrowband Intermodulation”. The level for the W-CDMA/GMSK interferer and CW interferer can be entered directly. Select the Interfering signal allocation. Please note the settings from the specification listed in Table 3-8 and Table 3-9

********** 7.6 Intermodulation Characteristics **********

Generator Settings:
- BS Class : Wide Area BS
- Scrambling Code : 000000
- Scrambling Mode : Long
- Interferer 1 : CW - Interferer 2: W-CDMA
- Wanted Signal attenuation (Path A) : 0.00 dB
- Interfering Signal attenuation (Path B) : 0.00 dB

| Test Item | Frequency (MHz) | Power (dBm) | | | Status |
|---|---|---|---|---|---|
| 7.6 Intermodulation characteristics | | | | | |
| Generated signal | 1950.00 | -115.00 | | | |
| CW Interferer | 1960 | -48.00 | | | |
| W-CDMA Interferer | 1970 | -48.00 | | | |

Time: 8/14/2014 5:26:49 PM

**Fig. 3-50: Example report for test case 7.6.**

## 3.7 Spurious emissions (Clause 7.7)

The spurious emission power is the power of the emissions generated or amplified in a receiver that appears at the BS antenna connector. The requirements apply to all BS with separate RX and TX antenna port. The test shall be performed when both TX and RX are on with the TX port terminated. [1]

The transmitter spurious emission limits apply from 30 MHz to 12.75 GHz. The frequencies between 12.5 MHz below the first carrier frequency and 12.5 MHz above the last carrier frequency used by the BS is excluded. [1]

The test purpose is to verify the ability of the BS to limit the interference caused by receiver spurious emissions to other systems. All the measured spurious emissions shall be within the limits specified in Table 3-10

| Spurious emission minimum requirement | | |
|---|---|---|
| **Band** | **Maximum level** | **Measurement Bandwidth** |
| 30 MHz - 1 GHz | -57 dBm | 100 kHz |
| 1 GHz - 12.75 GHz | -47 dBm | 1 MHz |
| Applies only for Band XXII:<br>12.75 GHz - 5th harmonic of the upper frequency edge of the UL operating band in GHz | -47 dBm | 1 MHz |

**Table 3-10: Limits for Spurious emissions**

### Test Setup

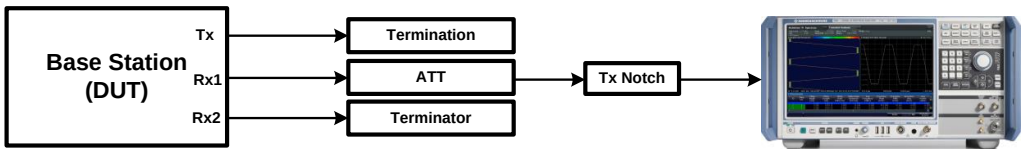



**Fig. 3-51: Receiver spurious emission test setup. A notch filter suppresses the Tx signal**

RF channels to be tested: M

Setting

- The base station transmits a W-CDMA signal at Pmax with channel configuration according to TM1

- The FSx analyzes the emissions on the Rx port via a notch filter and performs measurement
- Tx and unused Rx ports are terminated

### Test Procedure

### Measurement at FSx

**1.** In the **Spectrum** mode, press hardkey **MEAS** and select **Spurious Emission**

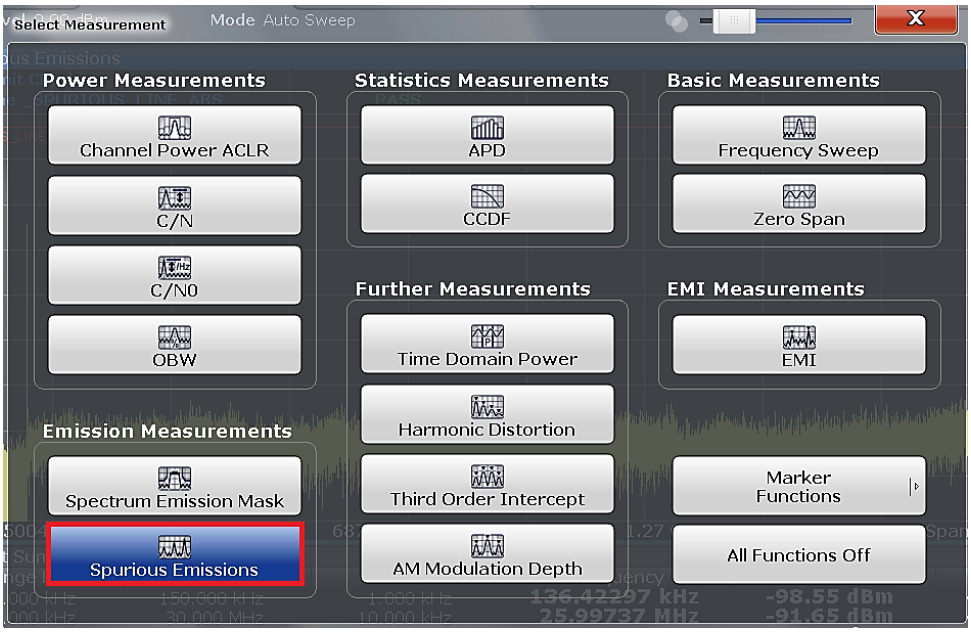



**Fig. 3-52: Select spurious emissions via hardkey MEAS**

2. In the **Sweep list**, delete ranges 1 and 2. Exclude frequencies between 12.5 MHz below the first carrier frequency and 12.5 MHz above the last carrier frequency. Example: for operating band I (1920-1980 MHz), frequency range “1907.5 MHz to 1992.5” MHz is excluded. (Fig. 3-53)
3. Adjust the limit settings in the remaining two ranges to -57 dBm and -47 dBm. Check the other settings. (Fig. 3-53)
4. Press **Adjust X-Axis**. This applies the settings.

Spurious Emissions

| | Range 1 | Range 2 | Range 3 |
|---|---|---|---|
| Range Start | 30 MHz | 1 GHz | 1.9925 GHz |
| Range Stop | 1 GHz | 1.9075 GHz | 12.75 GHz |
| Filter Type | Normal(3... | Normal(3... | Normal(3... |
| RBW | 100 kHz | 1 MHz | 1 MHz |
| VBW | 300 kHz | 3 MHz | 3 MHz |
| Sweep Time Mode | Auto | Auto | Auto |
| Sweep Time | 32.1 ms | 32.1 ms | 43.1 ms |
| Detector | RMS | RMS | RMS |
| Ref Level | 0 dBm | 0 dBm | 0 dBm |
| RF Att Mode | Auto | Auto | Auto |
| RF Attenuation | 10 dB | 10 dB | 10 dB |
| Preamp | Off | Off | Off |
| Sweep Points | 32001 | 32001 | 32001 |
| Stop After Sweep | Off | Off | Off |
| Transducer | None | None | None |
| Limit Check | Absolute | Absolute | Absolute |
| Abs Limit Start | -57 dBm | -47 dBm | -47 dBm |
| Abs Limit Stop | -57 dBm | -47 dBm | -47 dBm |

**Fig. 3-53: Sweep list settings for spurious emission test. Sweep range is set 30 MHz to 12.75 GHz and RMS detector is selected. 1907.5 to 1992.5 MHz is excluded (example: Operating band I)**

**Limit check line** shows the result of the test.

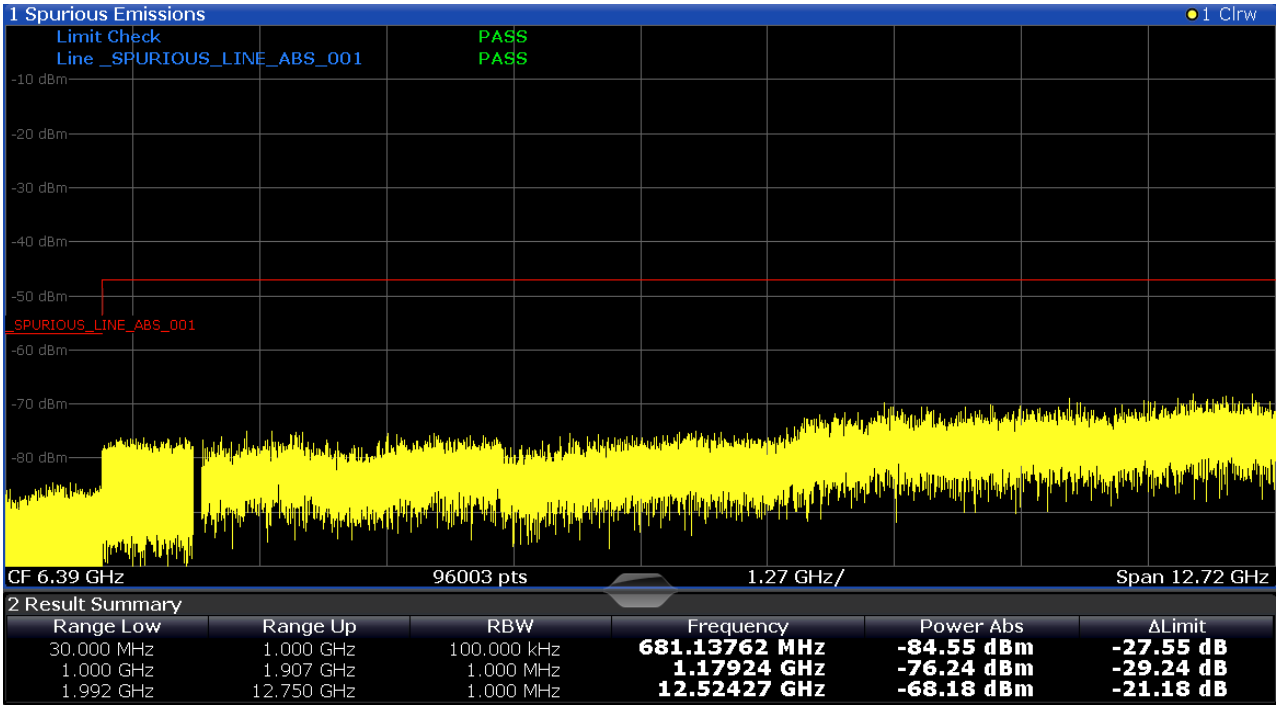



**Fig. 3-54: Result for spurious emission. Limit check shows “Pass” if spurious emission remains below the limit. Measurements for individual range are shown in the result summary section**

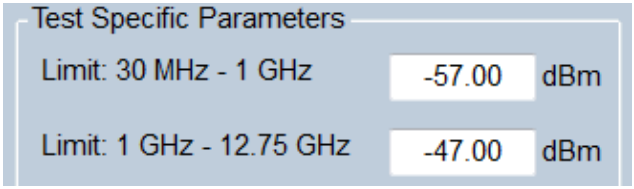
### Additional Co-existing requirements

Additional requirements may apply for:

- Protection of the BS receiver of own or different BS (see subclause 6.5.3.7.3)
- Co-existence with other systems in the same geographical area (see subclause 6.5.3.7.4 and 6.5.3.7.8.2) [1]
- Co-existence requirements for co-located BS ( see subclause 6.5.3.7.5 and 6.5.3.7.8.2) [1]

### Demo Program

For this test, additional parameters must be defined. The settings are reported. A spectrum analyzer is used.



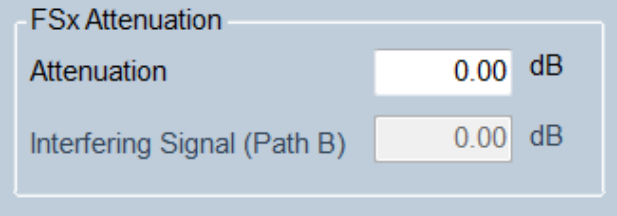



**Fig. 3-55: Special settings receiver spurious emissions.**

The limits for the spectrum measurement can be entered directly. Set the FSx attenuation. Please note the settings from the specification listed in Table 3-10.

********** 7.7 Receiver Spurious Emissions **********

FSx Attenuation Level: 0.00 dB

| Test Frequency Range | --- | --- | Power (dBm) | Limit (dBm) | Status |
|---|---|---|---|---|---|
| 7.7 Receiver Spurious Emissions | | | | | |
| 30 MHz - 1 GHz | --- | --- | -87.07 | -57.00 | Passed |
| 1 GHz - 12.75 GHz | --- | --- | -76.92 | -47.00 | Passed |

**Fig. 3-56: Example report for test case 7.7**

## 3.8 Verification of the internal BER calculation (Clause 7.8)

Base station System with internal BER calculation can synchronize it's receiver to known pseudo-random data sequence and calculates bit error ratio from the received data. This test is performed only if base station System has this kind of feature. This test is performed by feeding measurement signal with known BER to the input of the receiver. Locations of the erroneous bits shall be randomly distributed within a frame. Erroneous bits shall be inserted to the data bit stream as shown in Fig. 3-57.

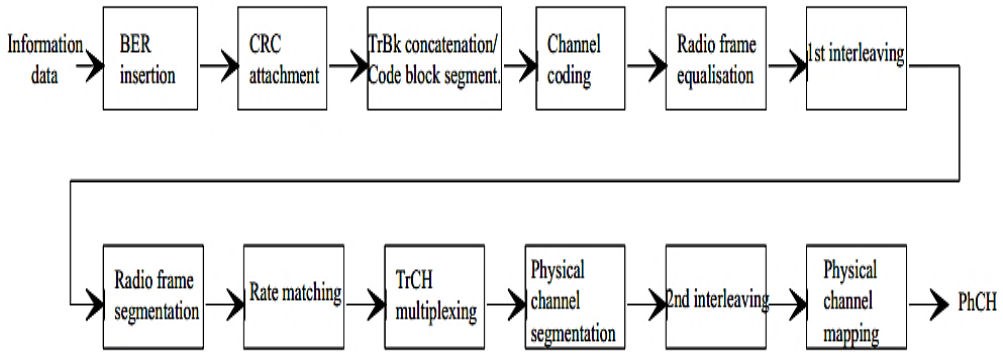



**Fig. 3-57: BER insertion into the information data [1]**

The aim of this test is to verify that the internal BER calculation accuracy shall meet requirements for conformance testing. BER indicated by the base station System shall be within ±10% of the BER generated by the RF signal source for the measurement signals specified in Table 3-11.

| Measurement signal requirements | | |
|---|---|---|
| **Transport channel combination** | **Data rate** | **BER** |
| DPCH | 12.2 kbps | 0.01 |

**Table 3-11: Measurement signals requirements for internal BER calculation**

Signal source parameters should be set according Table 3-12

| Signal source parameters | | | | |
|---|---|---|---|---|
| **Parameters** | **Level/status** | | | **Unit** |
| UL signal level | **BS Class** | **f ≤ 3.0 GHz** | **3.0 GHz < f ≤ 4.2 GHz** | dBm/3.84 MHz |
| | Wide Area BS | -110.3 dBm | -110 dBm | |
| | Medium Range BS | -100.3 dBm | -100 dBm | |
| | Local Area BS / Home BS | -96.3 dBm | -96 dBm | |
| Data sequence | PN9 or longer | | | |

**Table 3-12: Parameters for signal source**

### Test Setup

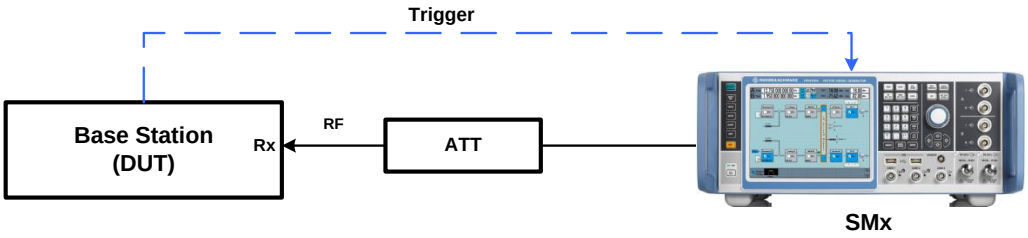



**Fig. 3-58: Verification of the internal BER calculation test setup. The SMx generates the W-CDMA uplink reference measurement channel with data rate 12.2 kbps.**

Settings

- The SMx generates a W-CDMA signal with reference measurement channel data rate 12.2 kbps, a known BER and level settings according to Table 3-11 and Table 3-12 which is applied to the BS receiver port.
- Set BS to transmit a “SFN mod 4” periodic trigger.

### Test procedure

1. Use standard procedure (see 3.1.1) to generate the uplink signal.

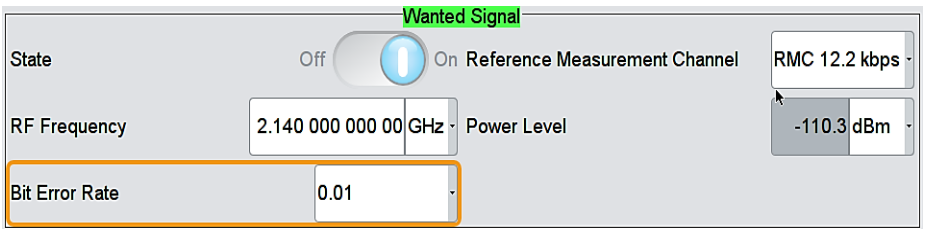



**Fig. 3-59: Set Bit error rate of the wanted signal**

2. Set **Bit Error Rate** = 0.01 in the Wanted Signal section
3. Press **Apply Settings**

4. Measure the BER at the BS receiver ports. Calculation shall be done at least over 50,000 bits.

### Demo Program

For this test, additional parameters must be defined. The settings are reported.

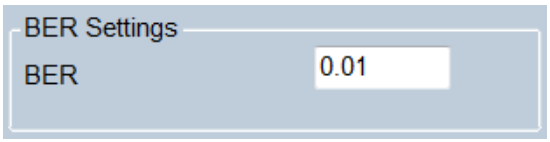



**Fig. 3-60: Special settings for Verification of BER calculation**

BER can be entered directly. Please note the settings from the specification listed in Table 3-11.

*********** 7.8 Verification of the internal BER calculation **********

---

*Generator Settings:*
*- BS Class: Wide Area BS*
*- Scrambling Code: 000000*
*- Scrambling Mode: Long*
*- Signal attenuation (Path A) : 0.00 dB*

| Test Item | Frequency (MHz) | Power (dBm) | BER | | Status |
|---|---|---|---|---|---|
| **7.8 Verification of the internal BER calculation** | | | | | |
| **Generated Signal** | 1950.00 | -110.30 | 0.01 | | |

*Time: 8/14/2014 5:27:55 PM*

**Fig. 3-61: Example report for test case 7.8**

# 4 Appendix

## 4.1 R&S RUN Program

The R&S RUN software application makes it possible to combine tests (modules) provided by Rohde & Schwarz into test plans to allow rapid and easy remote control of test instruments. This program is available free of charge from our website.

**Requirements**

Operating system:

- Microsoft Windows XP / Vista / Windows 7 / Windows 8
- NET framework V2.0 or higher

General PC requirements:

- Pentium 1 GHz or faster
- 1 Gbyte RAM
- 100 Mbyte space harddisk
- XGA monitor (1024x768)

Remote control interface:

- National Instruments VISA
- GPIB card

Or

- LAN connection After R&S RUN is launched, the following splash screen appears:

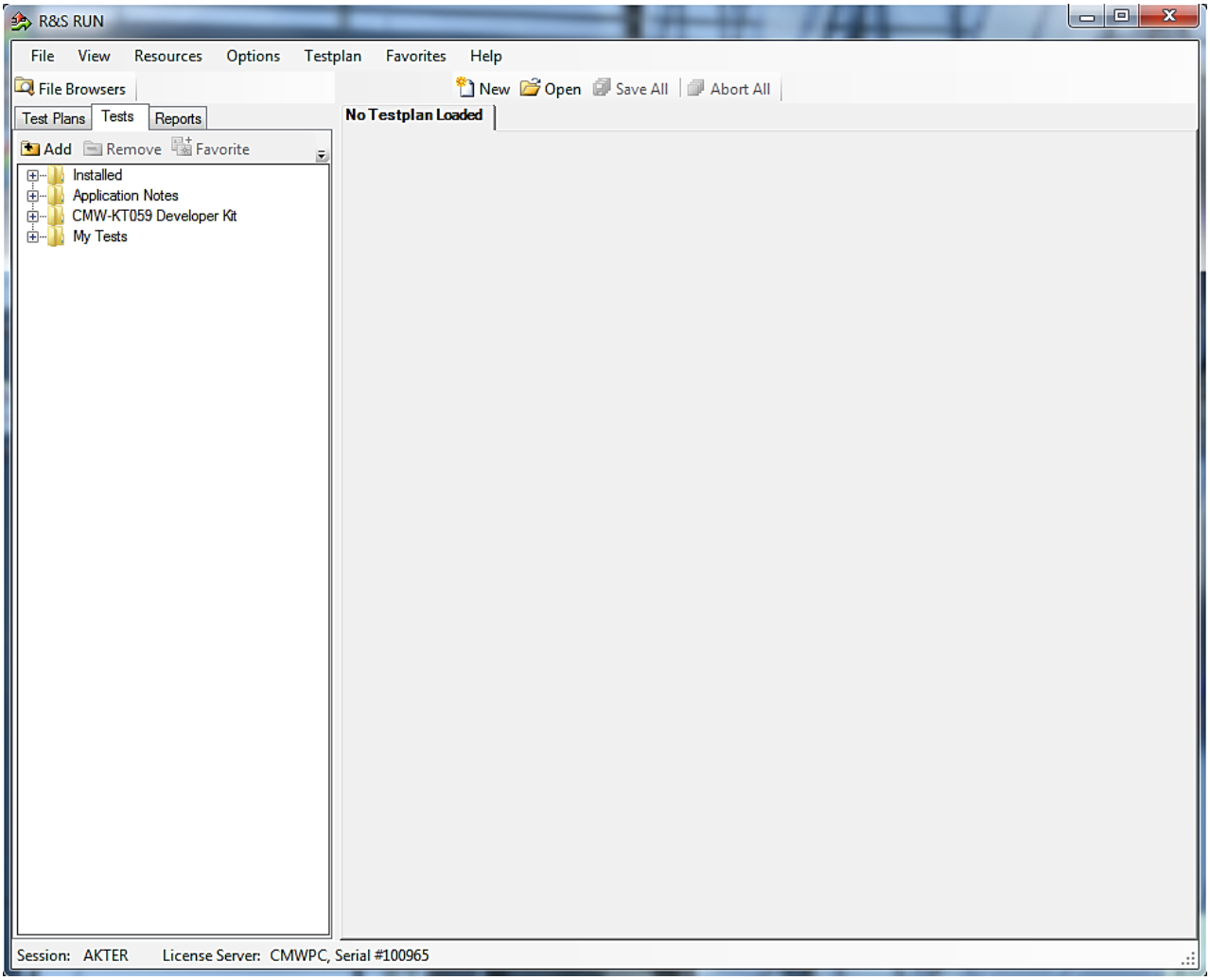



**Fig. 4-1: Overview R&S RUN**

### Tests and test plans

Tests are separate, closed modules for R&S RUN. A test plan can consist of one or more tests.

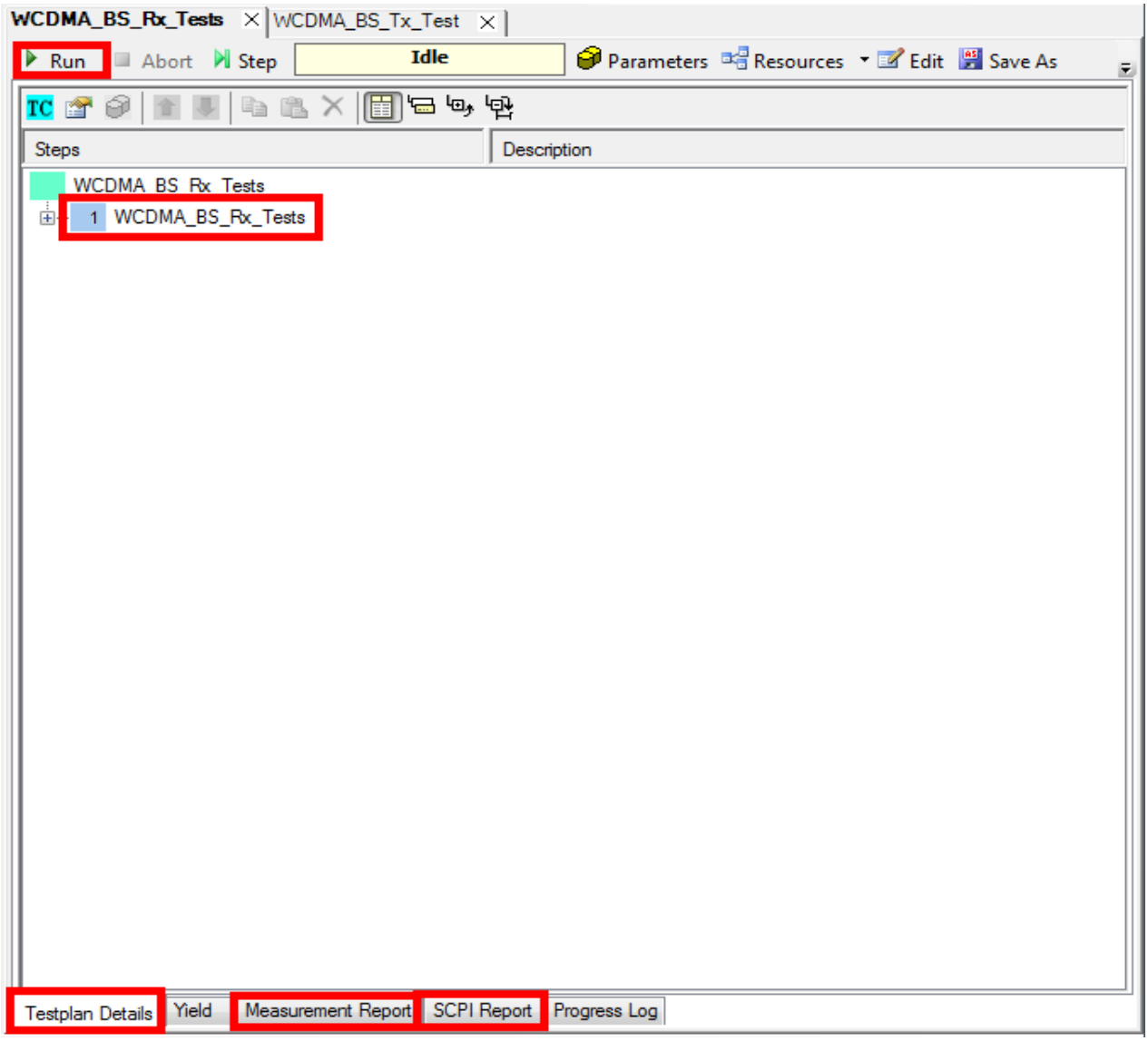



**Fig. 4-2: Overview of a test plan in R&S RUN. The test plan in the example contains only one test (WCDMA_BS_Rx_Tests). After the test is completed, the bar along the bottom can be used to display the measurement and SCPI reports.**

The WCDMA BS tests can be found under Tests/ApplicationNotes.

Click **RUN** to start the current test plan.

### SCPI connections

Under **Resources|SCPI Connections,** you can add all required instruments for remote control.

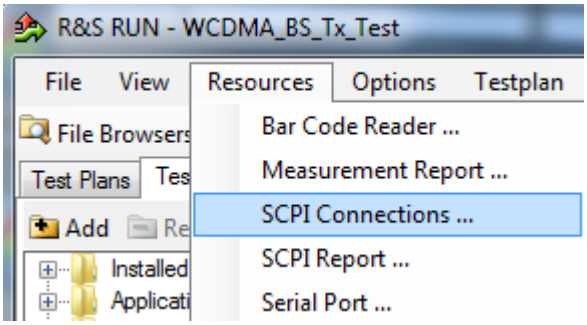



**Fig. 4-3: Setting the SCPI connections.**

Use **Configure…** to open a wizard for entering the VISA parameters (Fig. 4-4).Use the **Test Connection** button to test the connection to the instrument. When the **Demo Mode** button is enabled, no instruments need to be connected because R&S RUN will run in demo mode and output a fictitious test report.

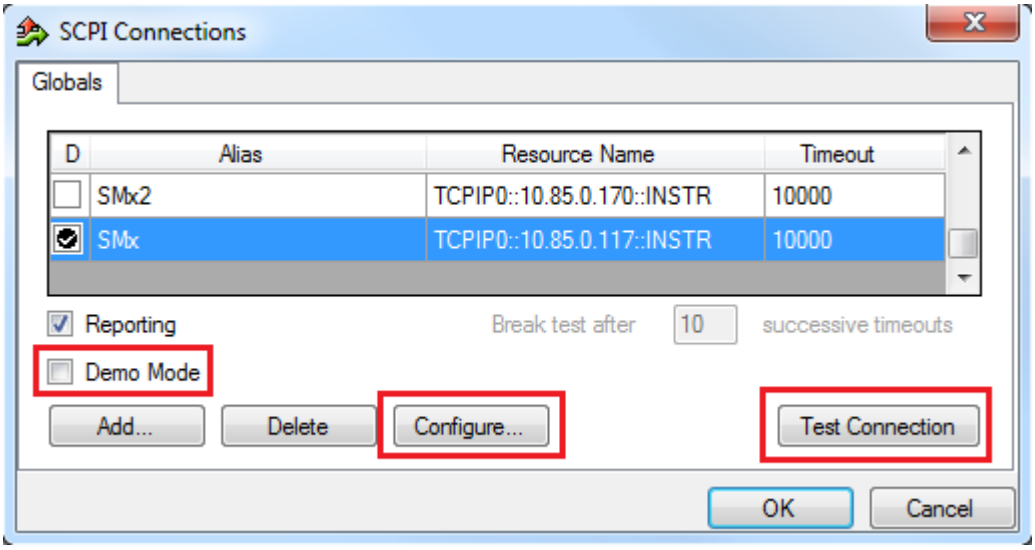



**Fig. 4-4: SCPI connections.**

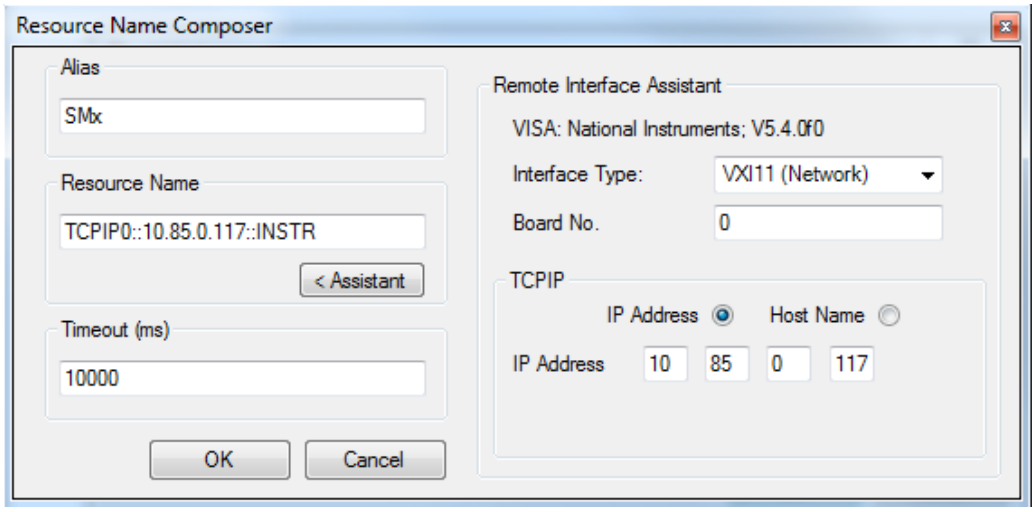



**Fig. 4-5: Wizard for entering VISA parameters. Both the IP address and a host name can be entered directly.**

**Reports: Measurement and SCPI**

After the test is completed, R&S RUN automatically generates both a **Measurement Report** and a **SCPI Report**.

The measurement report shows the actual results and the selected settings.

The **SCPI Report** returns a LOG file of all transmitted SCPI commands. These can then be copied and easily used in separate applications.

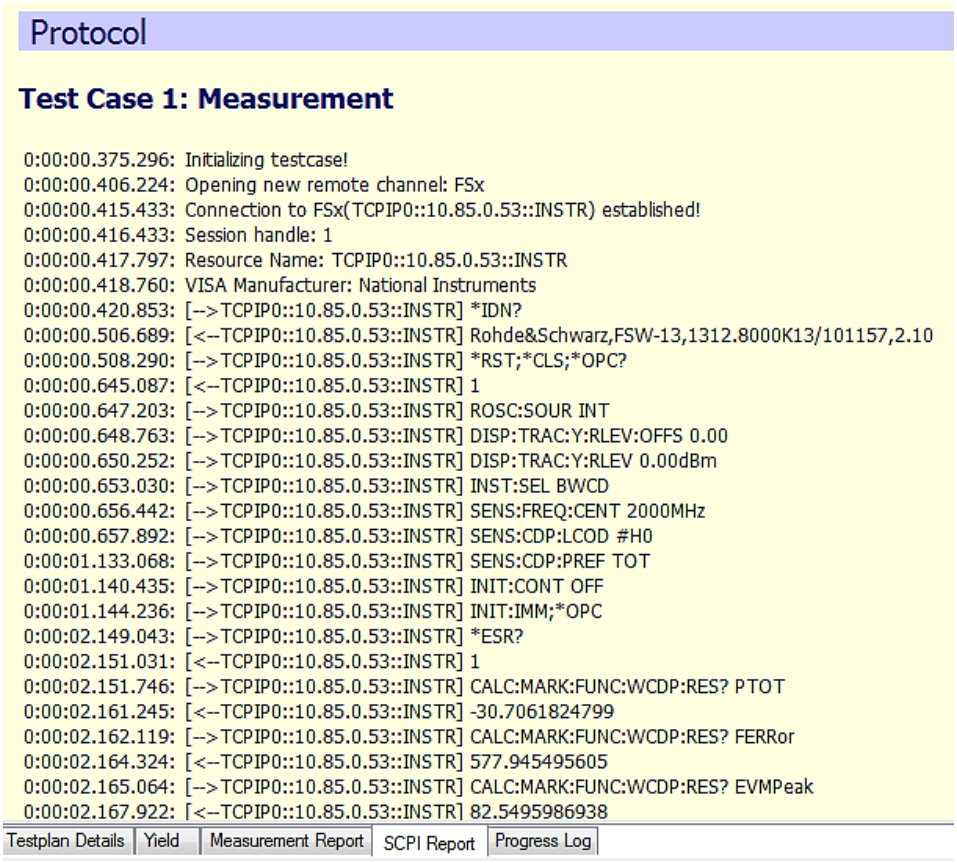



**Fig. 4-6: SCPI report**

## 4.2 References

[1] Technical Specification Group Radio Access Network**; Base Station (BS) conformance testing (FDD) (Release 10)**, 3GPP TS 25.141 V10.10.0 (2014-03)

[2] Rohde & Schwarz: **3GPP FDD incl. enhanced MS/BS tests, HSPA, HSPA+, Digital Standard for R&S®SMW200A**, User Manual

## 4.3 Additional Information

Please send your comments and suggestions regarding this application note to

TM-Applications@rohde-schwarz.com

## 4.4 Ordering Information

| Ordering Information for Signal Generators | | |
|---|---|---|
| **Vector Signal Generator** | | |
| **Product Description** | **Type** | **Ordering No.** |
| **Vector Signal Generator** | **SMW200A** | **1412.0000.02** |
| Baseband Generator | SMW-B10 | 1413.1200.02 |
| SMU-B11 Baseband Generator | SMW-B11 | 1159.8411.02 |
| Baseband Main Module | SMW-B13 | 1141.8003.04 |
| 1st RF path up to 6 GHz | SMW-B10x | |
| 2nd RF path up to 6 GHz | SMW-B20x | |
| 1st RF path up to 20 GHz | SMW-B120 | 1413.0404.02 |
| 2nd RF path up to 20 GHz | SMW-B220 | 1413.1100.02 |
| AWGN | SMW-K-62 | 1413.3484.02 |
| Digital Standard 3GPP FDD | SMW-K42 | 1413.3784.02 |

| Ordering Information for Signal Generators | | |
|---|---|---|
| **Vector Signal Generator** | | |
| **Product Description** | **Type** | **Ordering No.** |
| **Vector Signal Generator** | **SMU200A** | **1141.2005.02** |
| Baseband Generator | SMU-B9 | 1161.0766.02 |
| Baseband Generator | SMU-B10 | 1141.7007.02 |
| SMU-B11 Baseband Generator | SMU-B11 | 1159.8411.02 |
| Baseband Main Module | SMU-B13 | 1141.8003.04 |
| 1st RF path | SMU-B10x | |
| 2nd RF path | SMU-B20x | |
| AWGN | SMU-K62 | 1159.8511.02 |
| Digital Standard 3GPP FDD | SMU-K42 | 1160.7909.02 |
| 3GPP FDD Enhanced MS/BS Tests, incl. HSDPA | SMU-K43 | 1160.9660.02 |
| Digital Standard 3GPP FDD HSUPA | SMU-K45 | 1161.0666.02 |
| Digital Standard HSPA+ | SMU-K59 | 1415.0001.02 |

| Ordering Information for Signal Generators | | |
|---|---|---|
| **Vector Signal Generator** | | |
| **Product Description** | **Type** | **Ordering No.** |
| **Vector Signal Generator** | **SMBV100A** | **1407.6004.02** |
| RF 9 kHz – 6 GHz | SMBV-B106 | 1407.9703.02 |
| Baseband Generator with Digital Modulation (Realtime) and ARB (32 Msample), 120-MHz RF BW | SMBV-B10 | 407.8907.02 |
| AWGN | SMBV-K62 | 1415.8419.02 |
| Digital Standard 3GPP FDD | SMBV-K42 | 1415.8048.02 |
| 3GPP FDD Enhanced MS/BS Tests, incl. HSDPA | SMBV-K43 | 1415.8054.02 |
| Digital Standard HSPA+ | SMBV-K59 | 1415.8219.02 |

| Ordering Information for Signal Generators | | |
|---|---|---|
| **Signal Generator** | | |
| **Product Description** | **Type** | **Ordering No.** |
| **Microwave Signal Generator** | **SMF100A** | **1167.0000.02** |
| **RF and Microwave Signal Generator** | **SMB100A** | **1406.6000.02** |
| **SGMA RF Source** | **SGS100A** | **1416.0505.02** |

| Ordering Information for Analyzers | | |
|---|---|---|
| **Signal and Spectrum Analyzers** | | |
| **Product Description** | **Type** | **Ordering No.** |
| **Up to 13, 26, 43, 50 or 67 GHz** | **FSW** | **1312.8000Kxx** |
| **Up to 26, 43, 46, 50 or 67 GHz** | **FSQ** | **1313.9000.xx** |
| **Up to 13, 30, or 40 GHz** | **FSV** | **1307.9002Kxx** |
| **Up to 13, 30, or 40 GHz** | **FPS** | **1319.2008.xx** |

## About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

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## Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Certified Quality System
ISO 9001




PAD-T-M: 3573.7380.02/02.00/CI/1/EN/



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