Signals for LTE FDD Repeater Conformance Testing according to 3GPP TS 36.143
Application Note

Products:

- R&S®SMW200A
- R&S®SMBV100A
- R&S®SMU200A
- R&S®SMJ100A
- R&S®SMATE200A
- R&S®WinIQSIM2™

This application note helps the user to configure a Rohde & Schwarz vector signal generator for LTE FDD repeater conformance testing. It explains step by step how to set up the baseband signal for the various test cases defined in the 3GPP Technical Specification 36.143.

The R&S®SMx vector signal generators provide predefined, LTE-conform test models and are therefore ideal for LTE repeater conformance testing. The test cases in TS 36.143 can be set up with a single instrument which provides all necessary test signals including the four specified repeater stimulus signals.

ROHDE&SCHWARZ

Application Note

C. Tröster

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1 Overview

This application note is intended to assist the user with the configuration of a Rohde & Schwarz vector signal generator for LTE FDD repeater conformance testing. We explain step by step how to set up the baseband signal for the various test cases defined in the 3GPP Technical Specification (TS) 36.143 version 8.4.0 (2010-12). Each test case is addressed in a separate section that is named after the test case.

Rohde & Schwarz vector signal generators provide predefined signals for LTE. Standard-conform test models can be generated with just one click. The baseband signal is automatically configured according to the test model specification. The R&S®SMx vector signal generators are therefore ideal for LTE repeater conformance testing. The generators can be used as EUTRA/LTE signal generator, WCDMA signal generator and CW source. The R&S®SMx vector signal family includes the R&S®SMW200A, R&S®SMU200A, R&S®SMATE200A, R&S®SMBV100A, and R&S®SMJ100A. The test cases in TS 36.143 can be set up with a single instrument as shown in the table below. Also shown are the options required for testing. Many test signals can be generated directly via the digital standard options. The remaining signals can be generated by making use of the internal ARB generator. Each of the above signal generators thus provides all necessary test signals including the four specified repeater stimulus signals.

The generator must be equipped with the following digital standards options:
- R&S®SMx-K55 Digital Standard EUTRA/LTE
- R&S®SMx-K42 Digital Standard 3GPP FDD

The following option is optional but recommended:
- R&S®SMx-K61 Multicarrier CW Signal Generation

Required Instruments and Options for LTE Repeater Conformance Testing			
Test Case	**Signal Generator**	**Option**	**Signal Generation via**
Output Power	R&S®SMx	R&S®SMx-K55	LTE option (DL) LTE option (UL, BW < 2.8 MHz) ARB (UL, BW ≥ 2.8 MHz)
Out Of Band Gain	R&S®SMx	– – –	CW
Unwanted Emissions	R&S®SMx	R&S®SMx-K55	LTE option (DL, BW < 2.8 MHz) ARB (DL, BW ≥ 2.8 MHz) LTE option (UL, BW < 2.8 MHz) ARB (UL, BW ≥ 2.8 MHz)
Error Vector Magnitude and Frequency Stability	R&S®SMx	R&S®SMx-K55	LTE option
Input Intermodulation	R&S®SMx	(R&S®SMx-K61)	Multicarrier CW option or ARB
Output Intermodulation	R&S®SMx200A or 2x R&S®SMx100A	2x R&S®SMx-K55	LTE option
Adjacent Channel Rejection Ratio	R&S®SMx	R&S®SMx-K42	WCDMA option

Note that it is also possible to generate all the test signals via the ARB by using the respective R&S®WinIQSIM2™ options R&S®SMx-K255 [1], R&S®SMx-K242, and R&S®SMx-K261.

2 Note

The user should always press the “Set To Default” button before configuring the baseband signal in order to start with a defined state. The default baseband settings are taken as a base for the signal settings described in the following sections.

Regarding all setups shown in this application note, the user should keep in mind that a repeater is a bi-directional device. The signal generator may need protection.

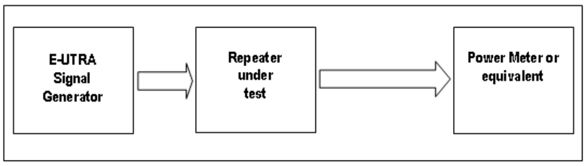
The RF frequency and level of the signal generator needs to be set by the user according to the specification. The RF frequency setting generally depends on the pass band of the repeater. The RF level setting is generally determined by the required repeater input power to produce the manufacturer-specified maximum output power at minimal or maximal gain.

[1] Use R&S®WinIQSIM2™ version 2.10.111.157 or later for signal generation, because the filter “EUtra/LTE Best ACP (Narrow)” is included from this software version on.

3 Output Power

3.1 Setup

Use the following measurement setup for testing.



Picture taken from [1].

For this setup you can use a R&S®NRP-Z sensor, either connected via USB to a PC or connected to the R&S®NRP2 power meter (base unit).

3.2 Baseband Signal

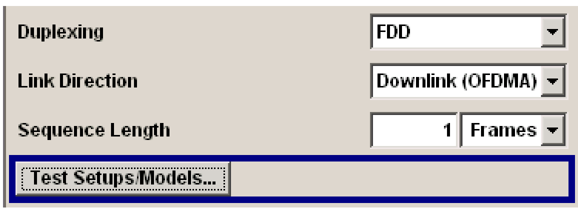
“Set the signal generator to transmit signal(s) in accordance to table 6.4.2-1” [1].

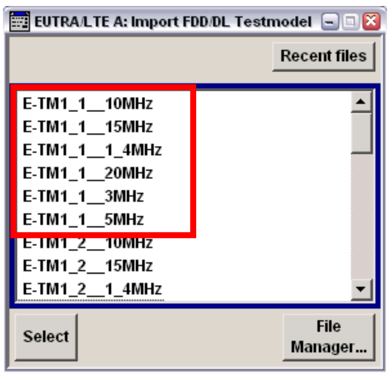
Repeater under test link and pass band bandwidth	Stimulus reference
Downlink	One E-TM1.1 of the widest possible bandwidth to fit into the Repeater pass band.
Uplink pass band BW < 2.8 MHz	Repeater stimulus signal 3
Uplink pass band BW ≥ 2.8 MHz	Repeater stimulus signal 1

Table 6.4.2-1 taken from [1].

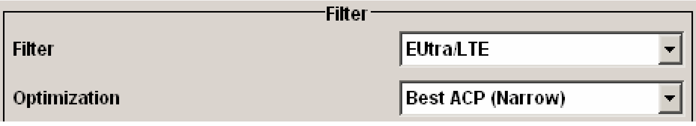
3.2.1 Downlink

In the LTE main menu, click on the “Test Setups/Models” button and choose the E-TM1.1 test model with the widest possible bandwidth that fits into the repeater pass band.





In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).



3.2.2 Uplink

3.2.2.1 Pass Band Bandwidth < 2.8 MHz

Generate the stimulus signal 3 as described in section 11.3 of this application note.

3.2.2.2 Pass Band Bandwidth ≥ 2.8 MHz

Generate the stimulus signal 1 as described in section 11.1 of this application note.

4 Frequency Stability

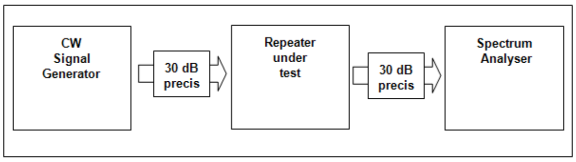
“The frequency error is derived in the measurement procedure of EVM” [1]. The error vector magnitude (EVM) measurement is a separate test case described in section 6 of this application note. Please refer to section 6.2.1 for the downlink and section 6.2.2 for the uplink.

During an EVM measurement, the spectrum analyzer also determines the frequency error. Thus, with one measurement both parameters – frequency error and EVM – are obtained.

5 Out Of Band Gain

5.1 Setup

Use the following measurement setup for testing.

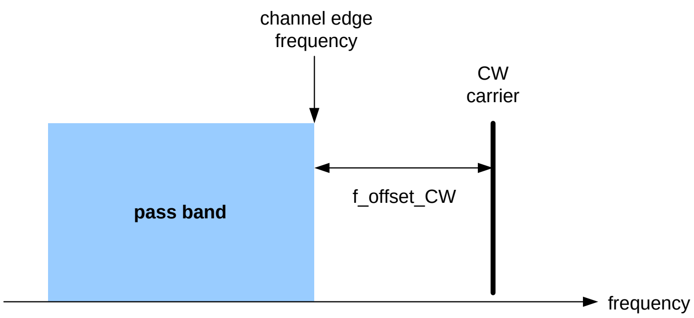


Picture taken from [1].

For this setup you can use a R&S®FSx spectrum analyzer.

5.2 CW Signal

The parameter "f_offset_CW is the offset between the outer channel edge frequency of the outer channel in the pass band and a CW-signal." [1]



"The test shall be performed with an f_offset_CW of 0.2 MHz, 0.5 MHz, 1 MHz, 5 MHz, 7.5 MHz, 10 MHz, 12.5 MHz, 15 MHz and 20 MHz, excluding other pass bands." [1]

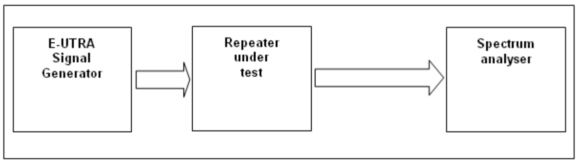
Generate a CW signal (RF only) with appropriate RF frequency and level.

6 Unwanted Emissions

The following description applies to testing operating band unwanted emissions as well as spurious emissions. For both tests, the same setup and baseband signals are used.

6.1 Setup

Use the following measurement setup for testing.



Picture taken from [1].

For this setup you can use a R&S®FSx spectrum analyzer.

6.2 Baseband Signal

"Set the signal generator to generate signal(s) in accordance to table 9.1.4.2-1" [1].

Repeater under test link and passband bandwidth	Stimulus reference
Downlink pass band BW < 2.8 MHz	Repeater stimulus signal 4
Uplink pass band BW < 2.8 MHz	Repeater stimulus signal 3
Downlink pass band BW ≥ 2.8 MHz	Repeater stimulus signal 2
Uplink pass band BW ≥ 2.8 MHz	Repeater stimulus signal 1

Table 9.1.4.2-1 taken from [1].

6.2.1 Downlink

6.2.1.1 Pass Band Bandwidth < 2.8 MHz

Generate the stimulus signal 4 as described in section 11.4 of this application note.

6.2.1.2 Pass Band Bandwidth ≥ 2.8 MHz

Generate the stimulus signal 2 as described in section 11.2 of this application note.

6.2.2 Uplink

6.2.2.1 Pass Band Bandwidth < 2.8 MHz

Generate the stimulus signal 3 as described in section 11.3 of this application note.

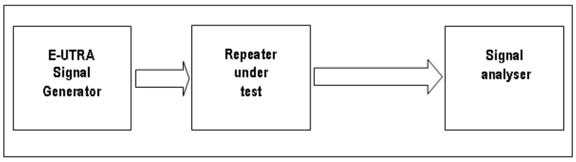
6.2.2.2 Pass Band Bandwidth ≥ 2.8 MHz

Generate the stimulus signal 1 as described in section 11.1 of this application note.

7 Error Vector Magnitude (EVM)

7.1 Setup

Use the following measurement setup for testing.



Picture taken from [1].

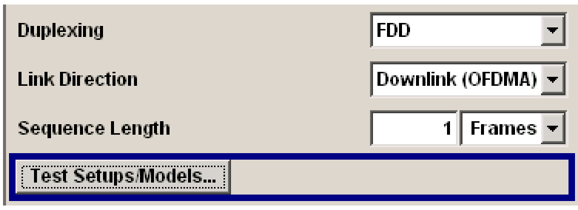
For this setup you can use a R&S®FSx signal analyzer.

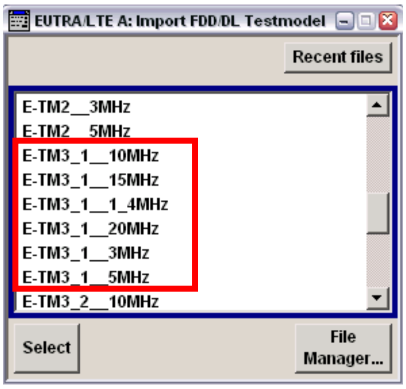
7.2 Baseband Signal

7.2.1 Downlink

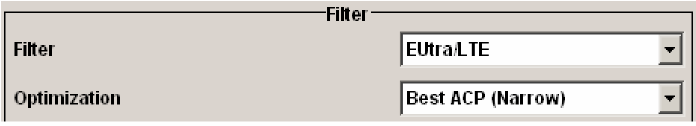
"Set the signal generator to transmit one signal according to E-TM3.1 in TS 36.141 of the widest possible bandwidth to fit into the repeater pass band.
…
Repeat the procedure with all the narrower bandwidths of E-TM3.1". [1]

In the LTE main menu, click on the "Test Setups/Models" button and choose the E-TM3.1 test model with the widest possible bandwidth that fits into the repeater pass band.





In the LTE main menu, click on the "Filter/Clipping/Power" button and select the baseband filter "EUtra/LTE Best ACP (Narrow)". With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).



Repeat the measurement with all E-TM3.1 signals that have a lower bandwidth. Simply choose the appropriate E-TM3.1 test model from the list and set the filter.

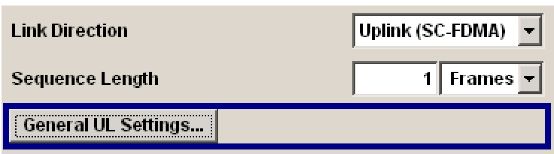
7.2.2 Uplink

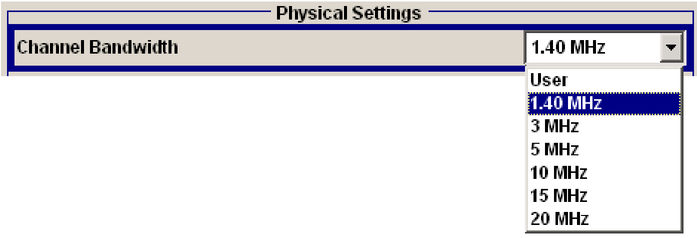
"Set the signal generator to transmit the widest bandwidth UL reference signal according to Table A.2.2.1.2-1 in TS36.521-1, that can be fitted inside the repeater pass band.
…
Repeat the procedure for all narrower BW UL reference signals according to Table A.2.2.1.2-1 in TS36.521-1." [1]

Parameter	Unit	Value					
Channel bandwidth	**MHz**	**1.4**	**3**	**5**	**10**	**15**	**20**
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3
Payload size	Bits	2600	4264	4968	21384	21384	19848
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	4	4	4
Total number of bits per Sub-Frame	Bits	3456	8640	14400	28800	43200	57600
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400
UE Category		1-5	1-5	1-5	2-5	2-5	2-5
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

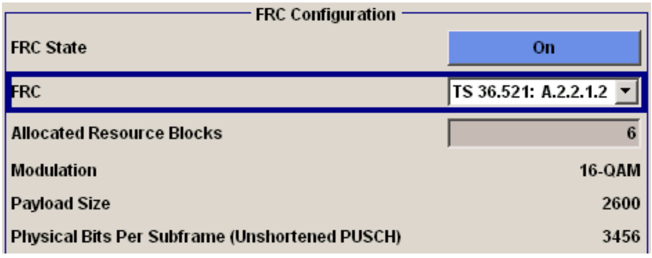
Table A.2.2.1.2-1 taken from [3].

In the LTE main menu, set the "Link Direction" to "Uplink" and click on the "General UL Settings" button. Select the widest possible "Channel Bandwidth" that fits into the repeater pass band.



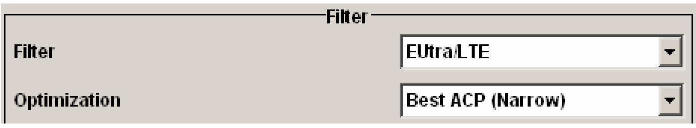


In the LTE main menu, click on the “Frame Configuration” button. Click on the user equipment “UE1”. Set the “FRC State” to “On” and set the “FRC” to “TS 36.521: A.2.2.1.2” [2].



The generated UL signal complies with all reference channel parameters of table A.2.2.1.2-1 in reference [3].

In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).

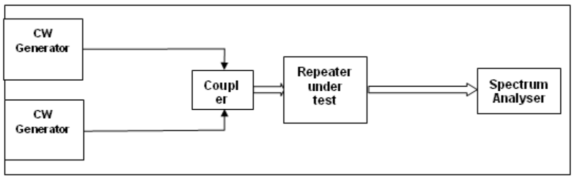


[2] Use instrument firmware and R&S®WinIQSIM2™ versions 2.20.230.xx or later for signal generation, because the FRCs for TS 36.521 are included from these firmware versions on.

8 Input Intermodulation

8.1 Setup

The following measurement setup is proposed for testing in reference [1].



Picture taken from [1].

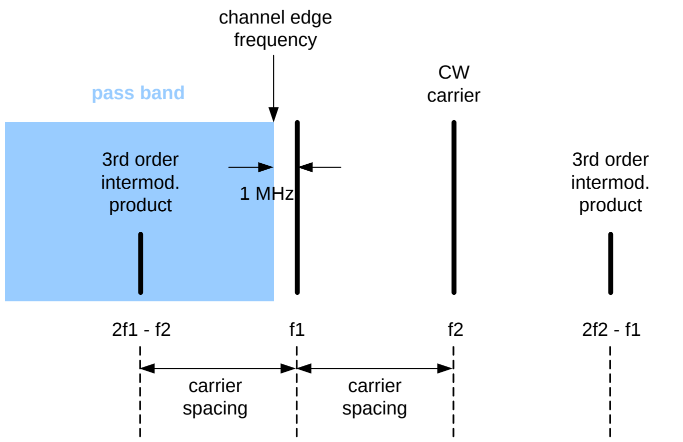
You can generate the two CW signals with a single R&S vector signal generator by using either the multicarrier CW option or the ARB generator. You can use a R&S®FSx spectrum analyzer for this setup.

8.2 Baseband Signal

“Connect two signal generators with a combining circuit or one signal generator with the ability to generate several CW carriers to the input.” [1]

“Adjust the frequency of the input signals, either below or above the pass band, so that one carrier, f_1, is 1 MHz outside the channel edge frequency of the first or last channel in the pass band, and the lowest order intermodulation product from the two carriers is positioned in the centre of the pass band.” [1]

For section “11.5.1 General requirement” of the test specification [1] the lowest order intermodulation product is defined as follows: “The frequency separation between the two interfering signals shall be adjusted so that the 3rd order intermodulation product is positioned in the centre of the pass band.” [5]
For sections “11.5.2 Co-location with BS in other systems” and “11.5.3 Co-existence with other systems” of the test specification [1] the lowest order intermodulation product is defined as follows: “The lowest intermodulation products correspond to the 4th and 3rd order for the GSM 900 and DCS 1800 bands, respectively.” [5]



8.2.1 Multicarrier CW Option

The easiest way to generate the two CW signals is to use the multicarrier CW option.

In the Multicarrier CW main menu, set the “No. of Carriers” to 2 and adjust the “Carrier Spacing”. The carrier spacing needs to be adjusted depending on the repeater’s pass band. If the 3rd order intermodulation product shall be positioned in the centre of the pass band, the required carrier spacing can be determined as follows (see also the above figure).

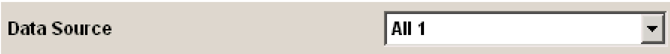
Carrier Spacing = pass band bandwidth / 2 + 1 MHz

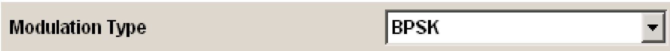
8.2.2 ARB Multicarrier

Another, more complicated way to generate the two CW signals is to use the ARB multicarrier function.

First step: Generate a CW signal with the R&S®WinIQSIM2™ simulation software.

Open the “Custom Digital Modulation” main menu and set the “Data Source” to “All 1”. Select “BPSK” as “Modulation Type”.



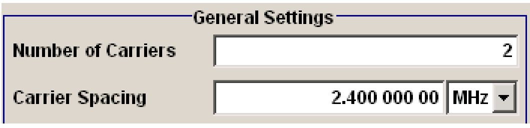


Use the “Generate Waveform File” button to save the CW signal to a file, named e.g. “CWsignal.wv”.

Second step: Generate the dual carrier signal with the ARB Multicarrier feature.

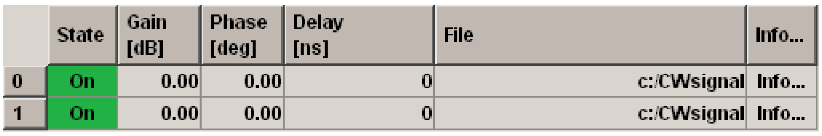
In the ARB Multicarrier main menu, set the “Number of Carriers” to 2 and adjust the “Carrier Spacing”. The carrier spacing needs to be adjusted depending on the repeater’s pass band. If the 3rd order intermodulation product shall be positioned in the centre of the pass band, the required carrier spacing can be determined as follows (see also the above figure).

Carrier Spacing = pass band bandwidth / 2 + 1 MHz



Click on the “Output File” button to enter a file name, e.g. “2ToneCW.wv”.

Click on the “Carrier Table” button and select the CW signal waveform (generated in step 1) as “File” for both carriers in the carrier table. Set the “State” of both carriers to “On”.



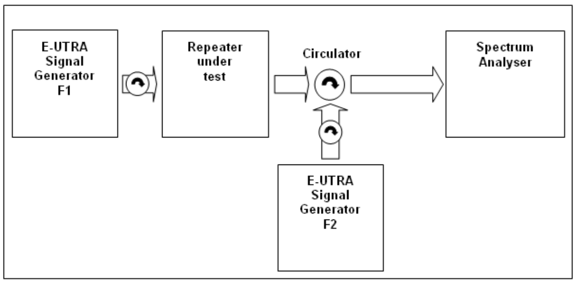
	State	Gain [dB]	Phase [deg]	Delay [ns]	File	Info...
0	On	0.00	0.00	0	c:/CWsignal	Info...
1	On	0.00	0.00	0	c:/CWsignal	Info...

Third step: Transfer the dual carrier waveform to the vector signal generator and play it back via the ARB.

9 Output Intermodulation

9.1 Setup

“Connect a signal generator to the input port of the repeater (wanted signal). Connect a signal generator to the circulator on the output port (interfering signal) and make sure the signal generator power is directed to the repeater output port.” [1]



Picture taken from [1].

For this setup you can use a two-path R&S®SMU200A or R&S®SMW200A to generate both LTE signals. Use instrument path A to generate the wanted signal and path B to generate the interferer. Alternatively, you can use e.g. two R&S®SMBV100A to generate the signals. A R&S®FSx spectrum analyzer completes this setup.

9.2 Baseband Signal

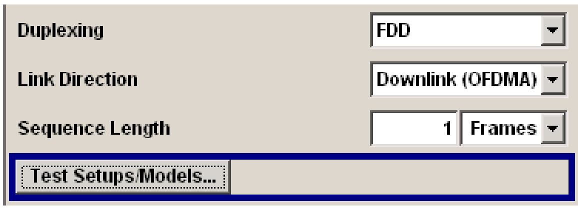
“Set the signal generator at the repeater input port (wanted signal) to generate a signal in accordance to test model E-TM 1.1, TS 36.141 subclause 6.1.1.1, with a bandwidth as defined in table 12.1-1, at the level which produce the manufacturer specified maximum output power at maximum gain.
Set the signal generator at the repeater output port (interference signal) to generate a signal in accordance to test model E-TM 1.1, TS 36.141 subclause 6.1.1.1, with a bandwidth, level and frequency offset as defined in table 12.1-1.” [1]

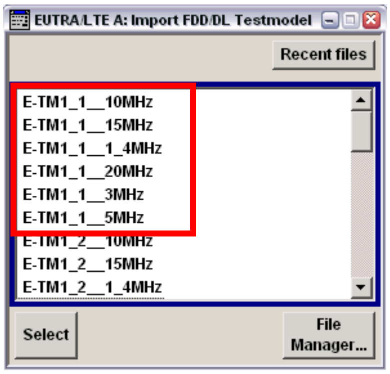
Parameter	Value
Wanted signal	E-UTRA signal of maximum channel bandwidth $BW_{Channel}$
Interfering signal type	E-UTRA signal of channel bandwidth 5 MHz
Interfering signal level	Mean power level 30 dB below the mean power of the wanted signal
Interfering signal centre frequency offset from wanted signal carrier centre frequency	$-BW_{Channel}$ /2 - 12,5 MHz $-BW_{Channel}$ /2 - 7,5 MHz $-BW_{Channel}$ /2 - 2,5 MHz $BW_{Channel}$ /2 + 2,5 MHz $BW_{Channel}$ /2 + 7,5 MHz $BW_{Channel}$ /2 + 12,5 MHz
NOTE: Interfering signal positions that are partially or completely outside of the downlink operating band of the repeater are excluded from the requirement.	

Table 12.1-1 taken from [1].

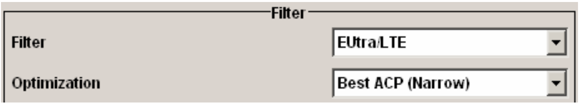
9.2.1 Wanted Signal

In the LTE main menu, click on the “Test Setups/Models” button and choose the E-TM1.1 test model with the widest possible bandwidth that fits into the repeater pass band.



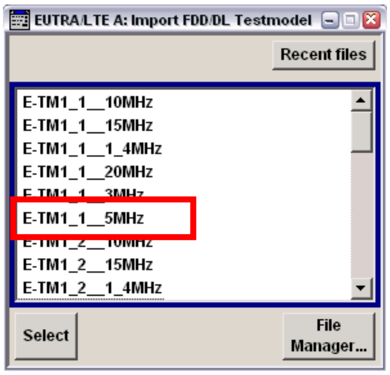


In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).

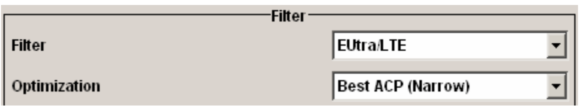


9.2.2 Interferer

Select the 5 MHz E-TM1.1 test model.



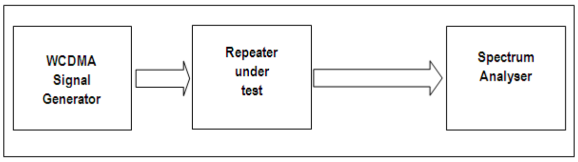
Select the baseband filter “EUtra/LTE Best ACP (Narrow)”.



10 Adjacent Channel Rejection Ratio (ACRR)

10.1 Setup

Use the following measurement setup for testing.



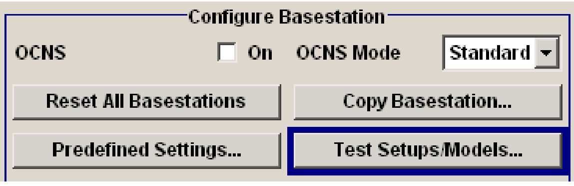
Picture taken from [1].

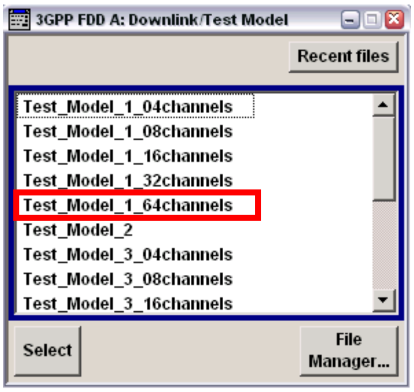
For this setup you can use a R&S®FSx spectrum analyzer.

10.2 Baseband Signal

"Set the signal generator to transmit a signal modulated with a combination of PCCPCH, SCCPCH and Dedicated Physical Channels specified as test model 1 in TS 25.141 at the first or last 5 MHz channel within the pass band." [1]

In the 3GPP FDD main menu, click on the "Test Setups/Models" button and select the test model 1 containing 64 Dedicated Physical Channels.





11 Repeater Stimulus Signals

11.1 Stimulus Signal 1

The repeater stimulus signal 1 shall consist of “two uplink fixed reference channels for performance requirements (16QAM ¾) for FDD according to the TS36.141, A.4 table A.4-1, channel reference A4-3 of 1.4 MHz bandwidth” [1]. The two UL fixed reference channels (FRCs) shall be “generated on separate centre frequencies with equal power and combined with a time difference of 266,7 us (4 OFDM symbols).” [1]

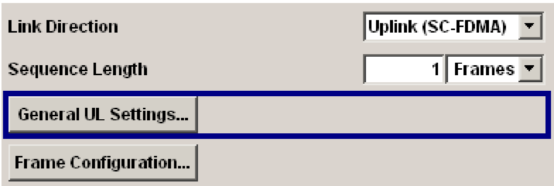
“The PUSCH data payload shall contain only zeroes (0000 0000).” [1]

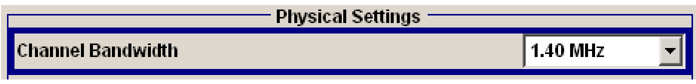
Reference channel	A4-1	A4-2	A4-3	A4-4	A4-5	A4-6	A4-7	A4-8
Allocated resource blocks	1	1	6	15	25	50	75	100
DFT-OFDM Symbols per subframe	12	10	12	12	12	12	12	12
Modulation	16QAM	16QAM	16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Code rate	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Payload size (bits)	408	376	2600	6456	10680	21384	32856	43816
Transport block CRC (bits)	24	24	24	24	24	24	24	24
Code block CRC size (bits)	0	0	0	24	24	24	24	24
Number of code blocks - C	1	1	1	2	2	4	6	8
Coded block size including 12bits trellis termination (bits)	1308	1212	7884	9804	16140	16140	16524	16524
Total number of bits per sub-frame	576	480	3456	8640	14400	28800	43200	57600
Total symbols per sub-frame	144	120	864	2160	3600	7200	10800	14400

Table A.4-1 taken from [2].

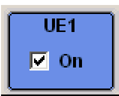
First step: Generate the LTE signal and save it as a waveform file.

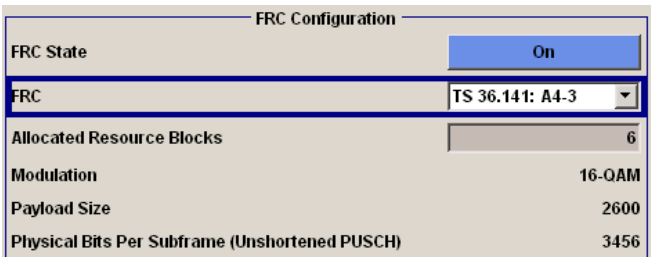
In the LTE main menu, set the “Link Direction” to “Uplink” and click on the “General UL Settings” button. Set the “Channel Bandwidth” to 1.4 MHz.





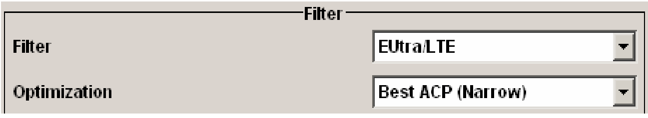
In the LTE main menu, click on the “Frame Configuration” button. Click on the user equipment “UE1”. Set the “FRC State” to “On” and set the “FRC” to “TS 36.141: A4-3”.





In the same menu, set the PUSCH “Data Source” to “All 0”.

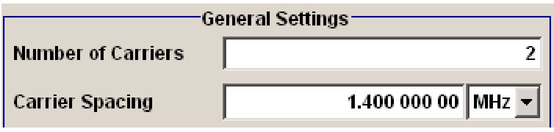
In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).



Set the “State” to “On” in the LTE main menu and use the “Generate Waveform File” button to save the LTE signal to a file, named e.g. “FRC.wv”.

Second step: Generate the dual carrier signal with the ARB Multicarrier feature.

In the ARB Multicarrier main menu, set the “Number of Carriers” to 2. The spacing between the two signal carriers is not explicitly defined in the specification. To generate two adjacent channels, set the “Carrier Spacing” to 1.4 MHz.



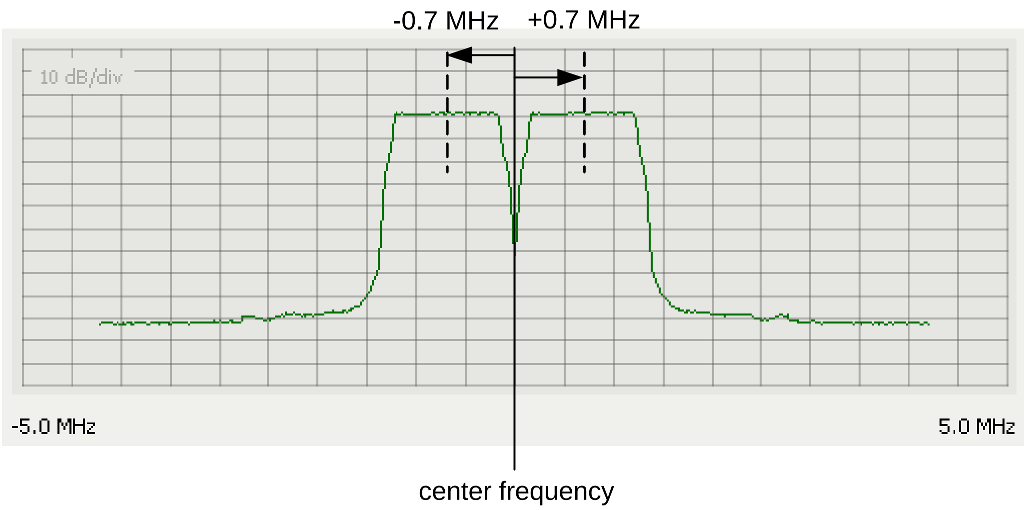
Click on the “Output File” button to enter a file name, e.g. “StimulusSignal1”.

Click on the “Carrier Table” button and select the LTE waveform (generated in step 1) as “File” for both carriers in the carrier table. In addition, apply a time difference of 266,7 us between the two signals by setting the “Delay” to “266700” for the second carrier. Set the “State” of both carriers to “On”.

	State	Gain [dB]	Phase [deg]	Delay [ns]	File	Info...
0	On	0.00	0.00	0	c:/FRC	Info...
1	On	0.00	0.00	266 700	c:/FRC	Info...

In the ARB Multicarrier main menu of your instrument, click on the “Create and Load” button to generate the signal. Respectively, in the ARB Multicarrier main menu of R&S®WinIQSIM2™, set the “State” to “On” and transfer the generated waveform to the signal generator for playback via its ARB.

The generated dual carrier waveform looks like this:

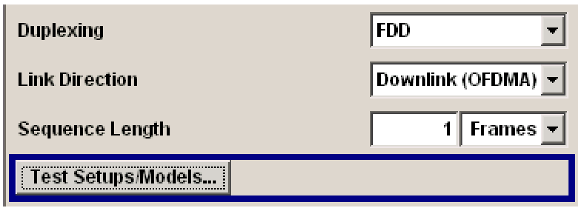


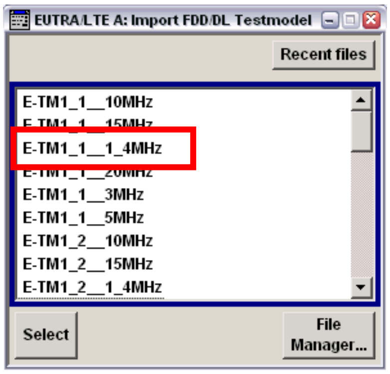
11.2 Stimulus Signal 2

The repeater stimulus signal 2 shall consist of “two E-TM1.1 channels according to the TS36.141 of 1.4 MHz bandwidth” [1]. The two DL channels shall be “generated on separate centre frequencies with equal power and combined with a time difference of 1400 us (21 OFDM symbols).” [1]

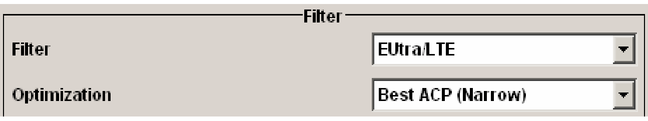
First step: Generate the LTE signal and save it as a waveform file.

In the LTE main menu, click on the “Test Setups/Models” button and select the 1.4 MHz E-TM1.1 test model.





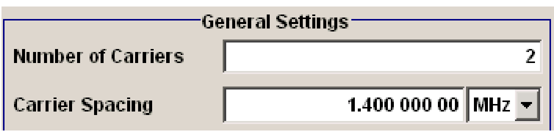
In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).



Set the “State” to “On” in the LTE main menu and use the “Generate Waveform File” button to save the LTE signal to a file, named e.g. “ETM11.wv”.

Second step: Generate the dual carrier signal with the ARB Multicarrier feature.

In the ARB Multicarrier main menu, set the “Number of Carriers” to 2. The spacing between the two signal carriers is not explicitly defined in the specification. To generate two adjacent channels, set the “Carrier Spacing” to 1.4 MHz.



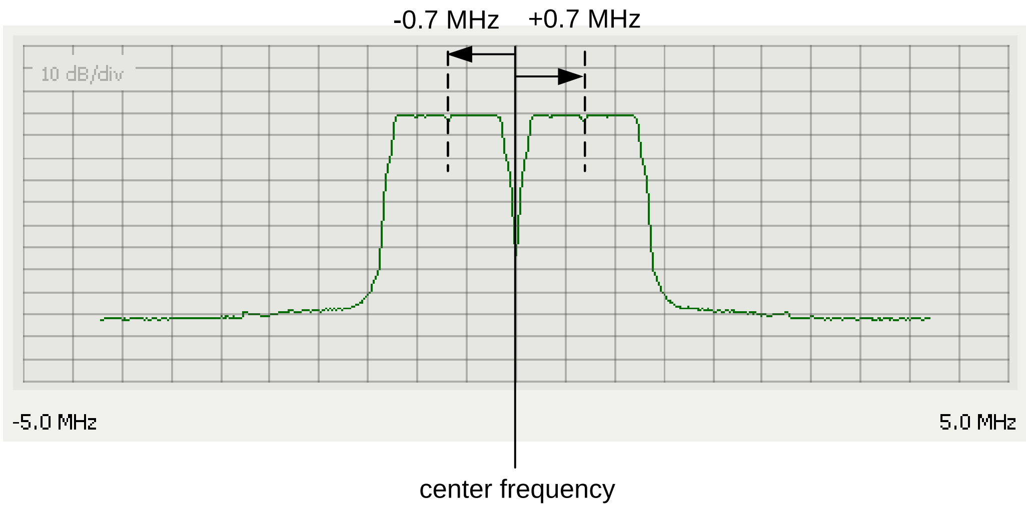
Click on the “Output File” button to enter a file name, e.g. “StimulusSignal2”.

Click on the “Carrier Table” button and select the LTE waveform (generated in step 1) as “File” for both carriers in the carrier table. In addition, apply a time difference of 1400 us between the two signals by setting the “Delay” to “1400000” for the second carrier. Set the “State” of both carriers to “On”.

	State	Gain [dB]	Phase [deg]	Delay [ns]	File	Info...
0	On	0.00	0.00	0	c:/ETM11	Info...
1	On	0.00	0.00	1 400 000	c:/ETM11	Info...

In the ARB Multicarrier main menu of your instrument, click on the “Create and Load” button to generate the signal. Respectively, in the ARB Multicarrier main menu of R&S®WinIQSIM2™, set the “State” to “On” and transfer the generated waveform to the signal generator for playback via its ARB.

The generated dual carrier waveform looks like this:



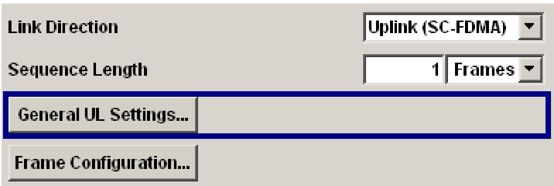
11.3 Stimulus Signal 3

The repeater stimulus signal 3 shall consist of “one uplink fixed reference channel for performance requirements (16QAM ¾) for FDD according to the TS36.141, A.4 table A.4-1, channel reference A4-3 of 1.4 MHz bandwidth.” [1]

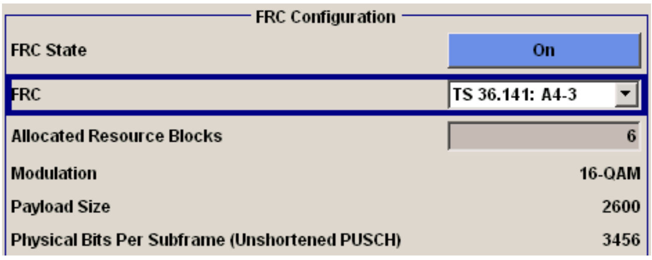
“The PUSCH data payload shall contain only zeroes (0000 0000).” [1]

See table A.4-1 shown in section 11.1 of this application note.

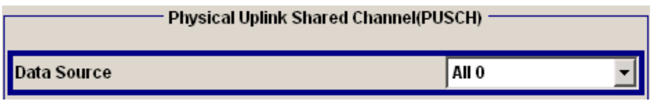
In the LTE main menu, set the “Link Direction” to “Uplink” and click on the “General UL Settings” button. Set the “Channel Bandwidth” to 1.4 MHz.



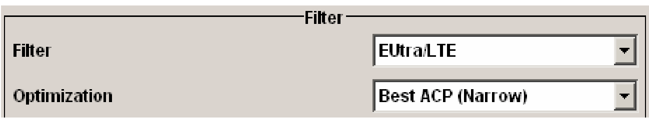
In the LTE main menu, click on the “Frame Configuration” button. Click on the user equipment “UE1”. Set the “FRC State” to “On” and set the “FRC” to “TS 36.141: A4-3”.



In the same menu, set the PUSCH “Data Source” to “All 0”.



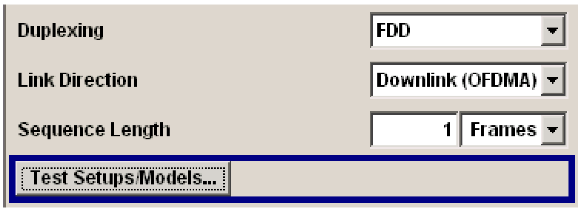
In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).

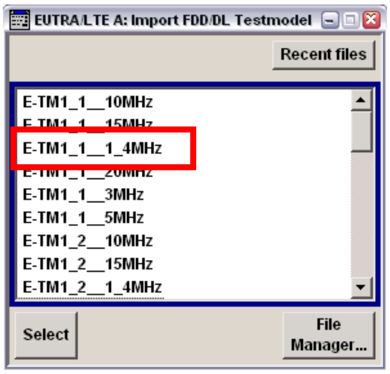


11.4 Stimulus Signal 4

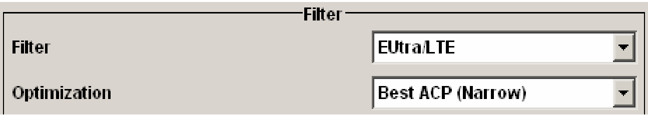
The repeater stimulus signal 4 shall consist of “one E-TM1.1 channel according to the TS36.141 of 1.4 MHz.” [1]

In the LTE main menu, click on the “Test Setups/Models” button and select the 1.4 MHz E-TM1.1 test model.





In the LTE main menu, click on the “Filter/Clipping/Power” button and select the baseband filter “EUtra/LTE Best ACP (Narrow)”. With this filter the signal fulfils the spectral purity requirements defined in the specification (D.5 of [1]).



12 References

[1] 3GPP Technical Specification 36.143 V8.4.0, FDD repeater conformance testing

[2] 3GPP Technical Specification 36.141 V8.9.0, Base Station (BS) conformance testing

[3] 3GPP Technical Specification 36.521-1 V8.5.0, User Equipment (UE) conformance specification radio transmission and reception, part 1: conformance testing

[4] 3GPP Technical Specification 25.141 V8.12.0, Base Station (BS) conformance testing (FDD)

[5] 3GPP Technical Specification 36.106 V8.6.0, FDD repeater radio transmission and reception

13 Abbreviations

ARB	Arbitrary waveform generator
BW	Bandwidth
CW	Continuous Wave
DL	Downlink
EVM	Error Vector Magnitude
FRC	Fixed Reference channel
UE	User Equipment
UL	Uplink
TS	Test Specification

14 Ordering Information

Please visit the Rohde & Schwarz product websites at www.rohde-schwarz.com for comprehensive ordering information on the following Rohde & Schwarz vector signal generators:

- R&S®SMW200A vector signal generator
- R&S®SMU200A vector signal generator
- R&S®SMATE200A vector signal generator
- R&S®SMBV100A vector signal generator
- R&S®SMJ100A vector signal generator

R&S®SMU200A	**Vector Signal Generator**	1141.2005.02
R&S®SMU-B102	Frequency option 2.2 GHz, 1st RF path	1141.8503.02
R&S®SMU-B103	Frequency option 3 GHz, 1st RF path	1141.8603.02
R&S®SMU-B104	Frequency option 4 GHz, 1st RF path	1141.8603.02
R&S®SMU-B106	Frequency option 6 GHz, 1st RF path	1141.8803.02
R&S®SMU-B202	Frequency option 2.2 GHz, 2nd RF path	1141.9400.02
R&S®SMU-B203	Frequency option 3 GHz, 2nd RF path	1141.9500.02
R&S®SMU-B13	Baseband Main Module	1141.8003.04
R&S®SMU-B9	Baseband Generator with ARB (128 Msamples)	1161.0866.02
R&S®SMU-B10	Baseband Generator with ARB (64 Msamples)	1141.7007.02
R&S®SMU-B11	Baseband Generator with ARB (16 Msamples)	1159.8411.02
R&S®SMU-B16	Differential I/Q Out	1161.0066.02
R&S®SMU-B17	Baseband Input (analog/digital)	1142.2880.02
R&S®SMU-B18	Digital Baseband Output	1159.6954.02
R&S®SMU-K62	Additive White Gaussian Noise (AWGN)	1159.8511.02
R&S®SMU-K42	Digital Standard 3GPP FDD	1160.7909.02
R&S®SMU-K43	3GPP Enhanced BS/MS Tests incl. HSDPA	1160.9660.02
R&S®SMU-K45	Digital Standard 3GPP FDD HSUPA	1161.0666.02
R&S®SMU-K59	Digital Standard 3GPP FDD HSPA+	1415.0053.02
R&S®SMU-K55	Digital Standard EUTRA/LTE	1408.7310.02
R&S®SMU-K69	EUTRA/LTE Closed-Loop BS Test	1408.8117.02
R&S®SMU-K84	LTE Rel.9, Enhanced Features	1408.8475.02
R&S®SMU-K61	Multicarrier CW Signal Generation	1160.8505.02
R&S®SMU-K242	Digital Standard 3GPP FDD (WinIQSIM2)	1408.5618.02
R&S®SMU-K255	Digital Standard EUTRA/LTE (WinIQSIM2)	1408.7362.02
R&S®SMU-K261	Multicarrier CW Signal Generation (WinIQSIM2)	1408.6514.02

R&S®SMBV100A	**Vector Signal Generator**	1407.6004.02
R&S®SMBV-B103	Frequency option 3.2 GHz	1407.9603.02
R&S®SMBV-B106	Frequency option 6 GHz	1407.9703.02
R&S®SMBV-B1	Reference Oscillator OCXO	1407.8407.02
R&S®SMBV-B1H	Reference Oscillator OCXO High Performance	1419.1602.02
R&S®SMBV-B10	Baseband Generator with Digital Modulation (realtime) and ARB (32 Msample), 120 MHz RF bandwidth	1407.8607.02
R&S®SMBV-B50	Baseband Generator with ARB (32 Msample), 120 MHz RF bandwidth	1407.8907.02
R&S®SMBV-B51	Baseband Generator with ARB (32 Msample), 60 MHz RF bandwidth	1407.9003.02
R&S®SMBV-B55	Memory Extension for ARB to 256 Msample	1407.9203.02
R&S®SMBV-B92	Hard Disk (removable)	1407.9403.02
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R&S®SMBV-K62	Additive White Gaussian Noise (AWGN)	1415.8419.02
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R&S®SMBV-K61	Multicarrier CW Signal Generation	1415.8225.02
R&S®SMBV-K242	Digital Standard 3GPP FDD (WinIQSIM2)	1415.8248.02
R&S®SMBV-K255	Digital Standard EUTRA/LTE (WinIQSIM2)	1415.8360.02
R&S®SMBV-K261	Multicarrier CW Signal Generation (WinIQSIM2)	1415.8383.02

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Regional contact
Europe, Africa, Middle East
+49 89 4129 12345
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North America
1-888-TEST-RSA (1-888-837-8772)
customer.support@rsa.rohde-schwarz.com

Latin America
+1-410-910-7988
customersupport.la@rohde-schwarz.com

Asia/Pacific
+65 65 13 04 88
customersupport.asia@rohde-schwarz.com

China
+86-800-810-8228 /+86-400-650-5896
customersupport.china@rohde-schwarz.com

Rohde & Schwarz GmbH & Co. KG
Mühldorfstraße 15 | D - 81671 München
Phone + 49 89 4129 - 0 | Fax + 49 89 4129 – 13777

www.rohde-schwarz.com