Application Note

Anritsu

3GPP LTE FDD BTS Measurement

MS2690A/MS2691A/MS2692A Signal Analyzer
MG3700A Vector Signal Generator

MS269xA Signal Analyzer
MG3700A Vector Signal Generator

3GPP LTE FDD
BTS Measurement
(TS36.141 v8.2.0)

July 2009
Anritsu Corporation

3GPP TS 36.141

			MS269xA (SPA)	MG3700A Memory A Wanted wave	MG3700A Memory B Interference wave	CW SG
Transmitter	6.2	Base station output power	OK			
	6.3.1	RE Power control dynamic range	Same as item 6.5.2			
	6.3.2	Total power dynamic range	OK			
	6.4	Transmit ON/OFF power	for LTE(TDD)			
	6.5.1	Frequency error	OK			
	6.5.2	Error Vector Magnitude	OK			
	6.5.3	Time alignment between transmitter branches	OK			
	6.5.4	DL RS power	OK			
	6.6.1	Occupied bandwidth	OK			
	6.6.2	Adjacent Channel Leakage power Ratio (ACLR)	OK			
	6.6.3	Operating band unwanted emissions	OK			
	6.6.4	Transmitter spurious emissions	OK			
	6.7	Transmitter intermodulation	OK	E-TM1.1		
Receiver	7.2	Reference sensitivity level		OK		
	7.3	Dynamic range		OK	AWGN	
	7.4	In-channel selectivity		OK	xxRBs	
	7.5	Adjacent Channel Selectivity (ACS)		OK	E-UTRA	
	7.5	Narrow-band blocking		OK	1RB	
	7.6	Blocking		OK	E-UTRA	
				OK		OK
	7.7	Receiver spurious emissions	OK			
	7.8	Receiver intermodulation		OK	E-UTRA	OK
		Receiver intermodulation (Narrow)		OK	1RB	OK

Recommended Configuration

MS269xA Signal Analyzer
MX269020A LTE Downlink Meas. Software
MS269xA-020 Vector Signal Generator
MX269908A LTE IQproducer

MG3700A Vector Signal Generator
MX370108A LTE IQproducer
MX370104A Multi-Carrier IQproducer

Usually a modulated signal source is needed (item 6.7), but another signal generator is not required with the MS269xA because it has build-in signal generator option (MS269xA-020).

With the MG3700A, both the “wanted” signal and “interference signal” can be generated at one port using two different arbitrary waveform memories.

Agenda

1. Test Model
2. Transmitter Characteristics
3. Receiver Characteristics

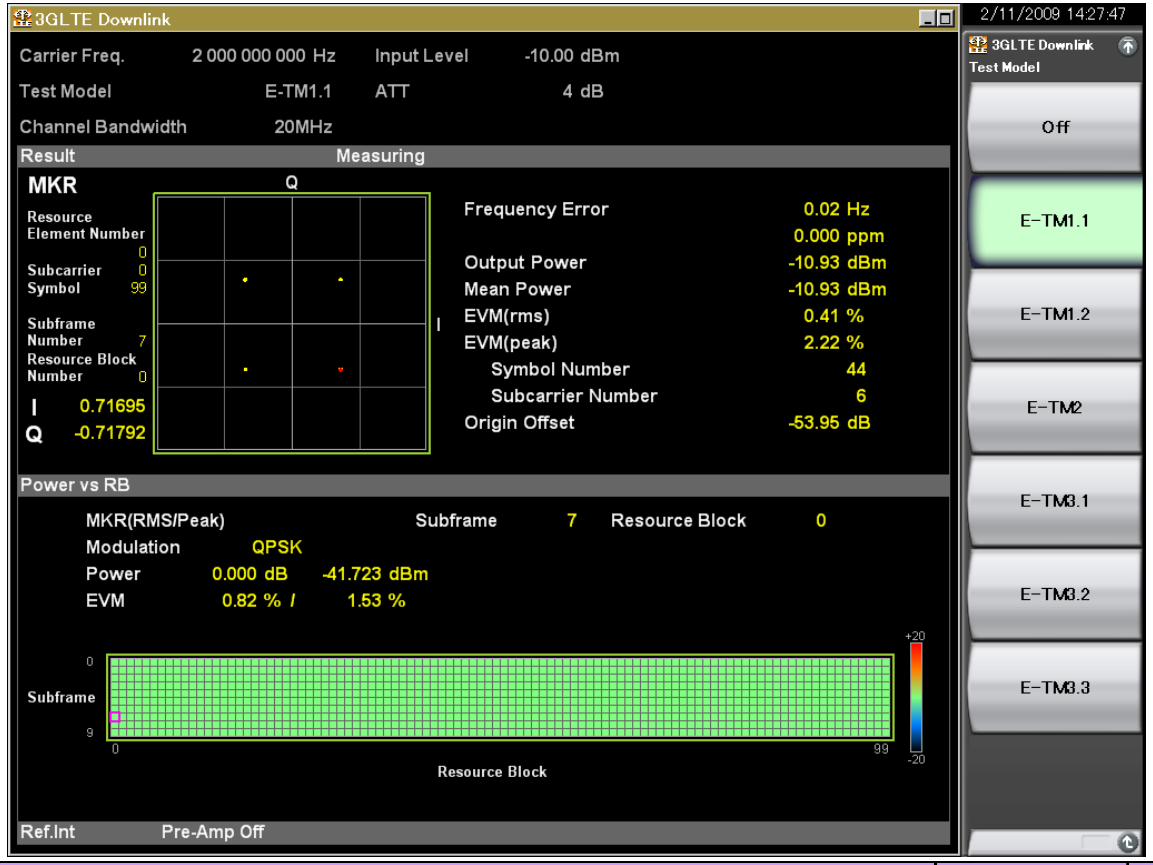
1. Test Model

Test Model for Transmitter Characteristics

	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM1.1	BS Output Power Unwanted emissions - Occupied bandwidth - ACLR - Operating band unwanted emissions - Transmitter spurious emissions Transmitter intermodulation RS Absolute accuracy	QPSK	None
E-TM1.2	Unwanted emissions - ACLR - Operating band unwanted emissions	QPSK	40%: +3 dB 60%: -4.73 dB
E-TM2	Total power dynamic range (lower OFDM symbol power limit at min. power), - EVM of single 64QAM PRB allocation (at min. power) - Frequency error (at min. power)	64QAM: 1% OFF: 99%	64QAM: 0 dB OFF: -inf
E-TM3.1	Total power dynamic range (upper OFDM symbol power limit at max. power with all 64QAM PRBs allocated) Transmitted signal quality - Frequency error - EVM for 64QAM modulation (at max. power)	64QAM	None
E-TM3.2	Transmitted signal quality - Frequency error - EVM for 16QAM modulation	16QAM: 60% QPSK: 40%	16QAM: -3 dB QPSK: +2.426 dB
E-TM3.3	Transmitted signal quality - Frequency error - EVM for QPSK modulation	16QAM: 50% QPSK: 50%	QPSK: -6 dB 16QAM: +2.427 dB

1. Test Model

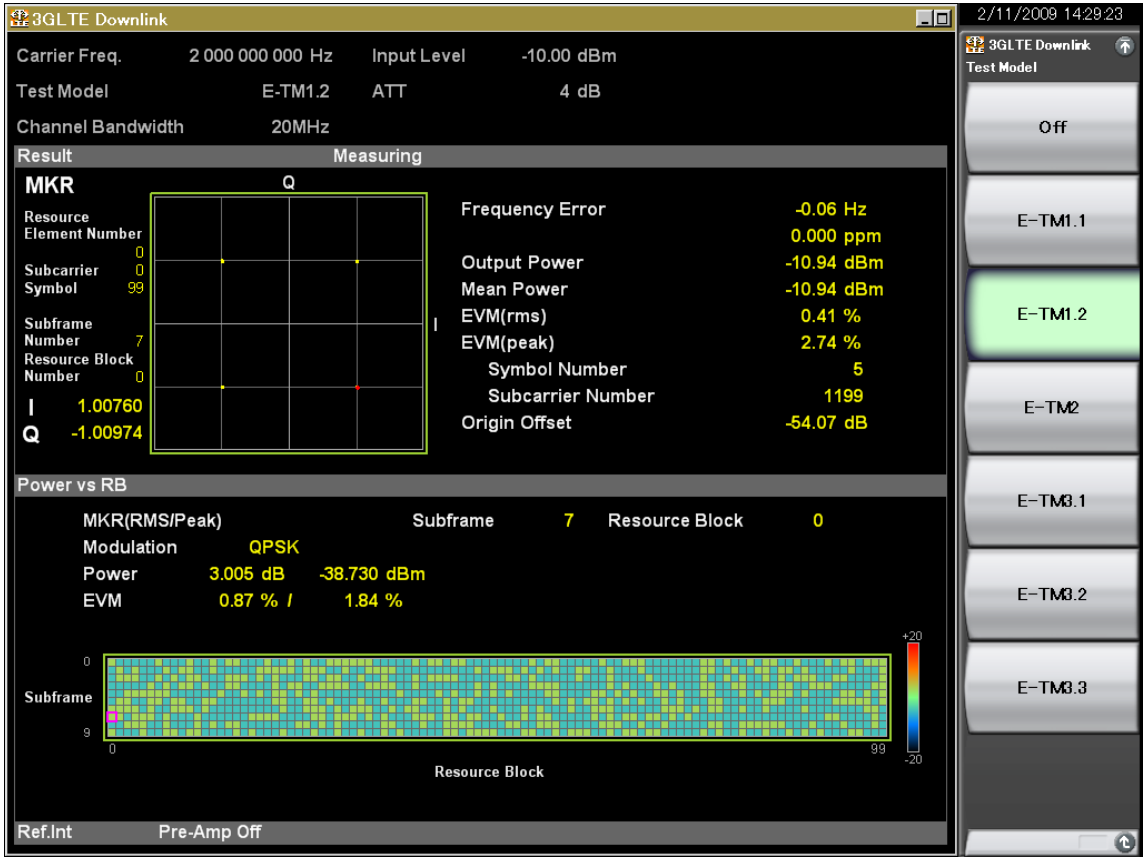
E-TM1.1



	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM1.1	BS Output Power Unwanted emissions - Occupied bandwidth - ACLR - Operating band unwanted emissions - Transmitter spurious emissions Transmitter intermodulation RS Absolute accuracy	QPSK	None

1. Test Model

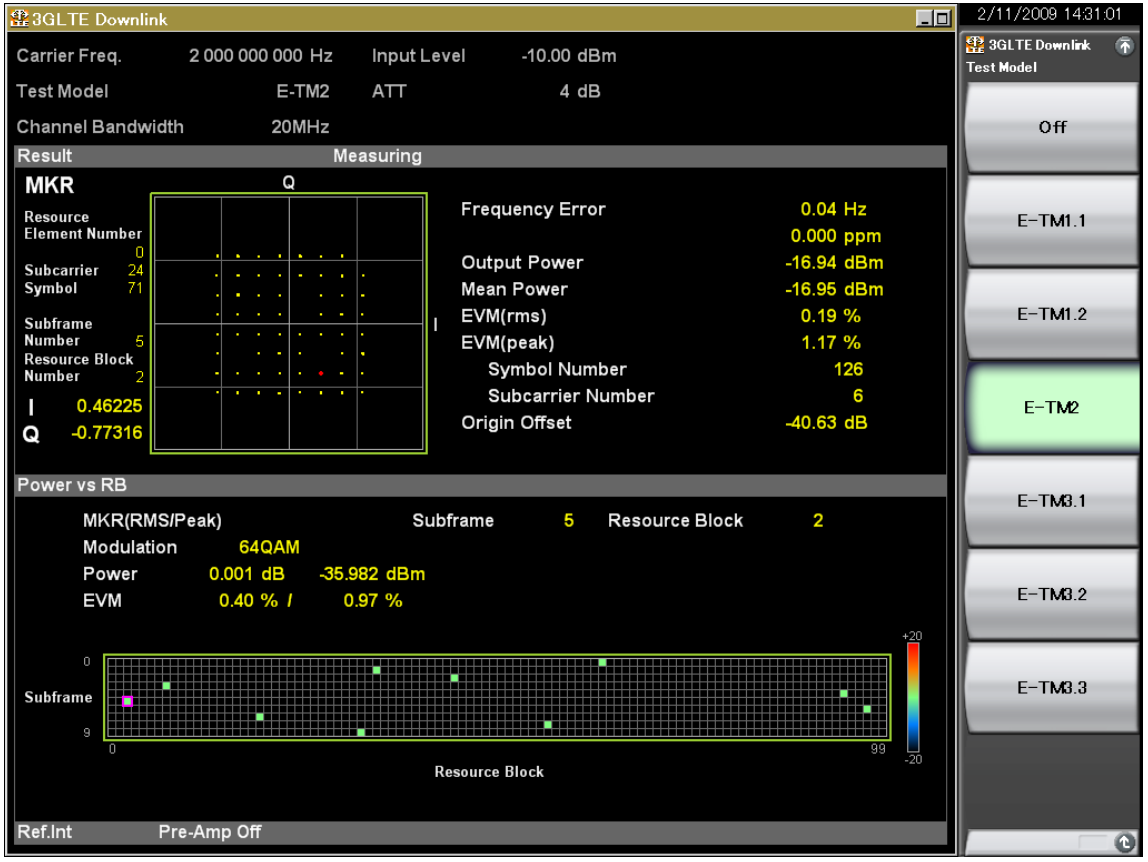
E-TM1.2



	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM1.2	Unwanted emissions - ACLR - Operating band unwanted emissions	QPSK	40%: +3 dB 60%: -4.73 dB

1. Test Model

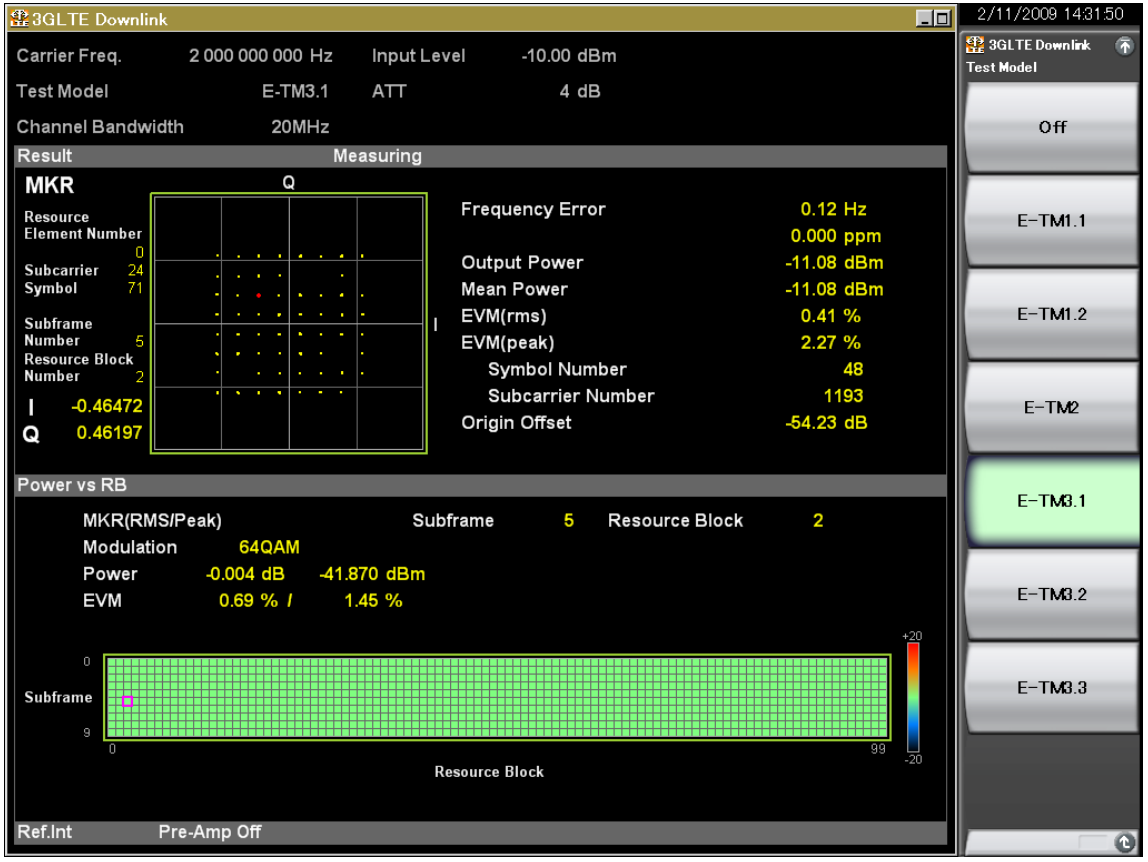
E-TM2



	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM2	Total power dynamic range (lower OFDM symbol power limit at min. power), - EVM of single 64QAM PRB allocation (at min. power) - Frequency error (at min. power)	64QAM: 1% OFF: 99%	64QAM: 0 dB OFF: -inf

1. Test Model

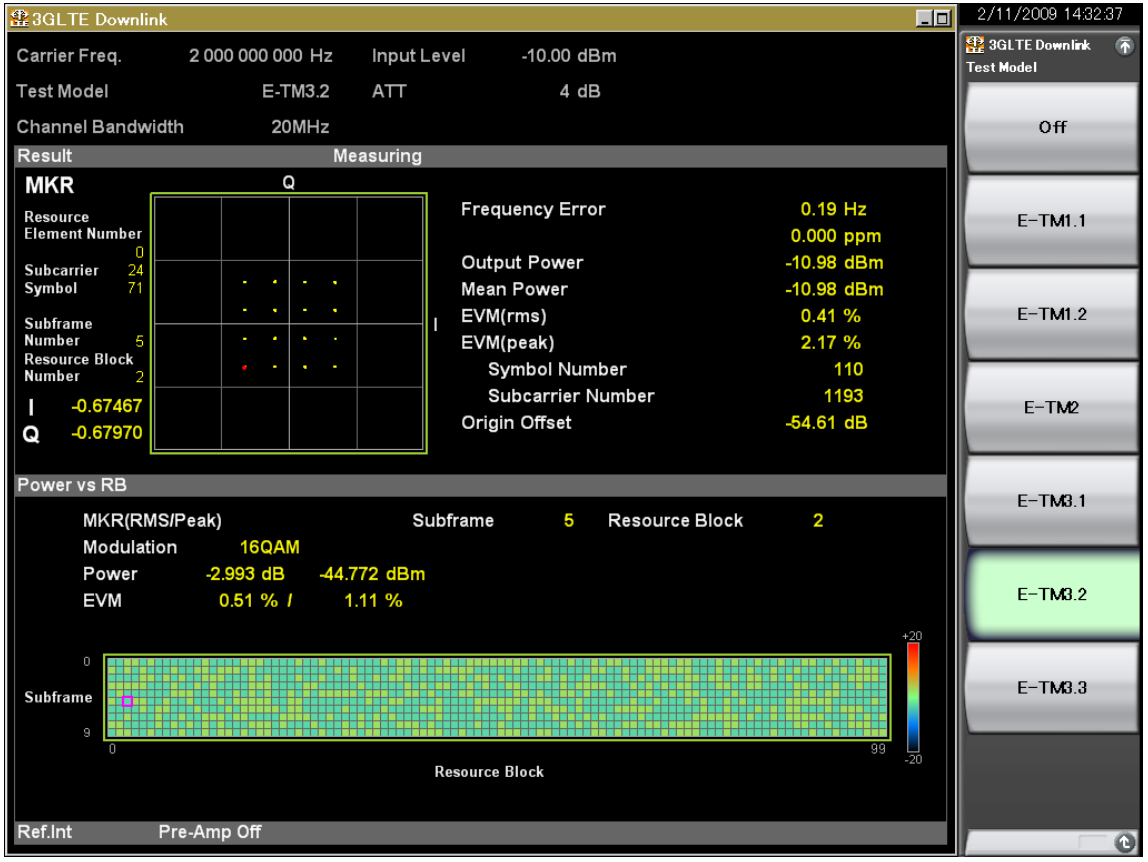
E-TM3.1



	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM3.1	Total power dynamic range (upper OFDM symbol power limit at max. power with all 64QAM PRBs allocated) Transmitted signal quality - Frequency error - EVM for 64QAM modulation (at max. power)	64QAM	None

1. Test Model

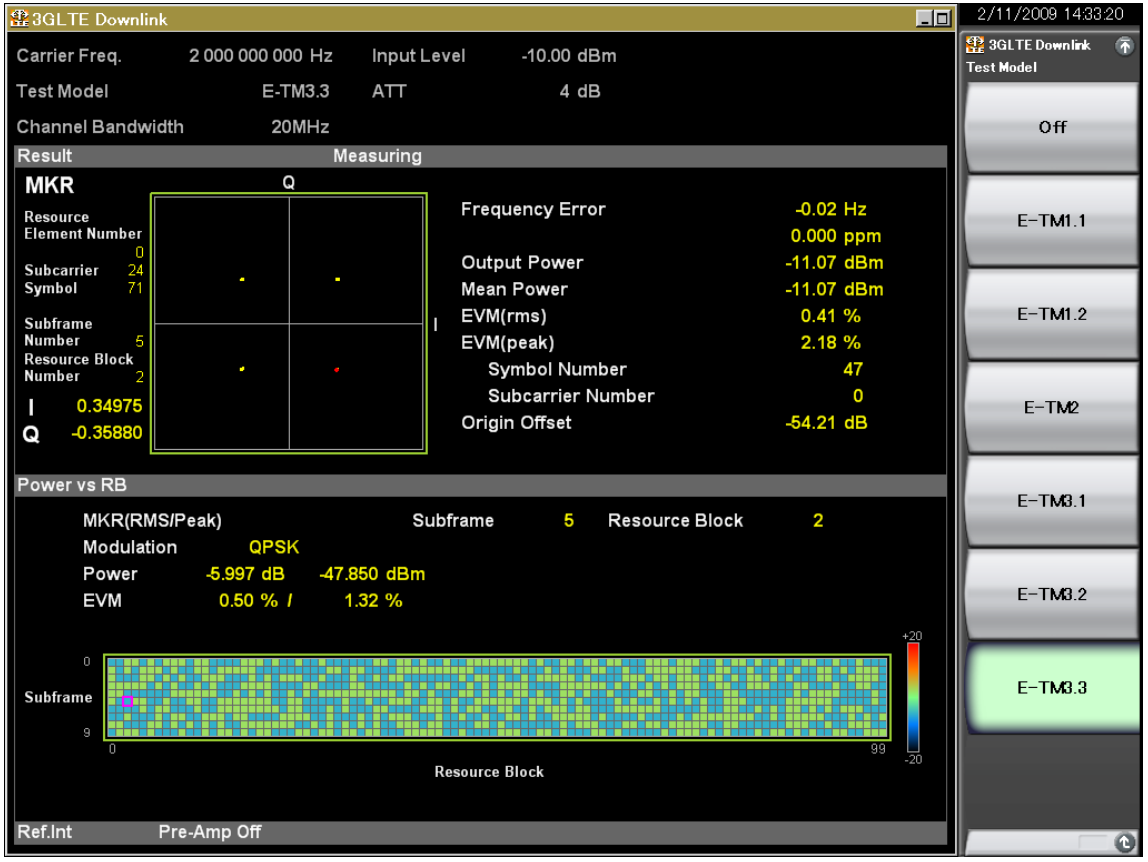
E-TM3.2



	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM3.2	Transmitted signal quality - Frequency error - EVM for 16QAM modulation	16QAM: 60% QPSK: 40%	16QAM: -3 dB QPSK: +2.426 dB

1. Test Model

E-TM3.3



	Application	Modulation Scheme	Power Variation (at 20 MHz Bandwidth)
E-TM3.3	Transmitted signal quality - Frequency error - EVM for QPSK modulation	16QAM: 50% QPSK: 50%	QPSK: -6 dB 16QAM: +2.427 dB

2. Transmitter Characteristics

Transmitter Characteristics Measurements

TS36.141	Meas. Items	Test Model	Note
Transmitter Characteristics			
6.2	Base station output power	E-TM1.1	
6.3.1	RE Power control dynamic range	-	Meaure at 6.5.2
6.3.2	Total power dynamic range	E-TM2 E-TM3.1	
6.4	Transmit ON/OFF power	-	for LTE(TDD)
6.5.1	Frequency error	E-TM2 E-TM3.1 E-TM3.2 E-TM3.3	
6.5.2	Error vector magnitude		
6.5.3	Time alignment between transmitter branches	E-TM1.1	Needed reference trigger
6.5.4	DL RS power		
6.6.1	Occupied bandwidth		
6.6.2	Adjacent channel leakage power ratio (ACLR)	E-TM1.1 E-TM1.2	
6.6.3	Operating band unwanted emissions		
6.6.4	Transmitter spurious emissions	E-TM1.1	
6.7	Transmitter intermodulation		Needed modulated signal source

2. Transmitter Characteristics

6.2 Base Station Output Power

Mean power measurement

Procedure

(1) Output E-TM1.1 from BTS
(2) Measure mean power

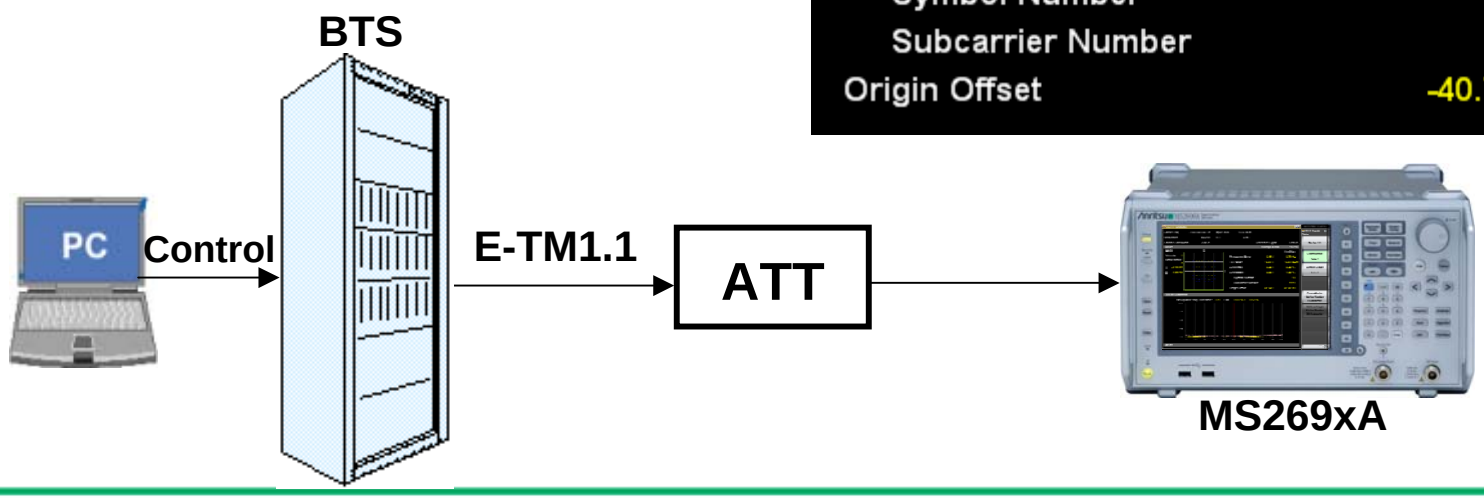
Specification

(1) ± 2.7 dB (normal conditions)
(2) ± 3.2 dB (extreme conditions)

3GLTE Downlink Measurement Software

[Trace] > [F1: Trace Mode] > [F1] to [F5]

Frequency Error	0.05 Hz
	0.000 ppm
Output Power	-16.89 dBm
Mean Power	-16.90 dBm
EVM(rms)	0.19 %
EVM(peak)	1.04 %
Symbol Number	126
Subcarrier Number	6
Origin Offset	-40.74 dB



2. Transmitter Characteristics

6.3.2 Total Power Dynamic Range

Measure difference between max. value and min. value for OFDM symbol power.

Procedure

(1) Output E-TM3.1 from BTS (Upper)
(2) Measure averaged OFDM symbol power
(3) Output E-TM2 from BTS (Lower)
(4) Measure averaged OFDM symbol power
(5) Calculate difference between TM3.1 and TM2

Specification

E-UTRA channel bandwidth (MHz)	Total power dynamic range (dB)
1.4	7.7 – [TT]
3	11.7 – [TT]
5	13.9 – [TT]
10	16.9 – [TT]
15	18.7 – [TT]
20	20 – [TT]

(3GPP TS36.141)

2. Transmitter Characteristics

6.3.2 Total Power Dynamic Range

3GLTE Downlink Measurement Software

[Trace] > [F1: Trace Mode] > [F6: Summary]

Summary

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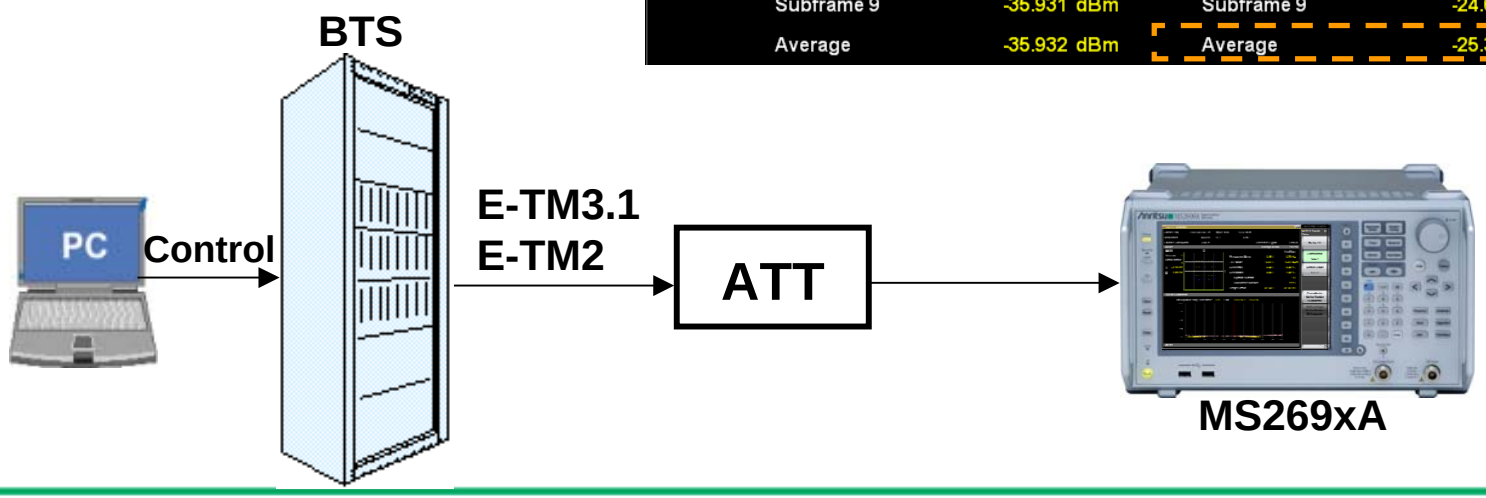
RS Power		OFDM Symbol Tx Power	
Subframe 0	-35.932 dBm	Subframe 0	-24.95 dBm
Subframe 1	-35.931 dBm	Subframe 1	-26.13 dBm
Subframe 2	-35.931 dBm	Subframe 2	-24.90 dBm
Subframe 3	-35.932 dBm	Subframe 3	-25.75 dBm
Subframe 4	-35.932 dBm	Subframe 4	-24.37 dBm
Subframe 5	-35.932 dBm	Subframe 5	-26.43 dBm
Subframe 6	-35.932 dBm	Subframe 6	-25.00 dBm
Subframe 7	-35.932 dBm	Subframe 7	-26.29 dBm
Subframe 8	-35.931 dBm	Subframe 8	-25.05 dBm
Subframe 9	-35.931 dBm	Subframe 9	-24.66 dBm
Average	-35.932 dBm	Average	-25.30 dBm



2. Transmitter Characteristics

6.5.1 Frequency Error
6.5.2 Error Vector Magnitude

Procedure

(1) Output E-TM2/3.1/3.2/3.3 from BTS sequentially
(2) Measure Frequency error and EVM each test model

Specification for Frequency Error

± 0.05 ppm

Specification for Error Vector Magnitude

Modulation scheme for PDSCH	Required EVM [%]
QPSK	17.5 + [TT] %
16QAM	12.5 + [TT] %
64QAM	8 + [TT] %

(3GPP TS36.141)

2. Transmitter Characteristics

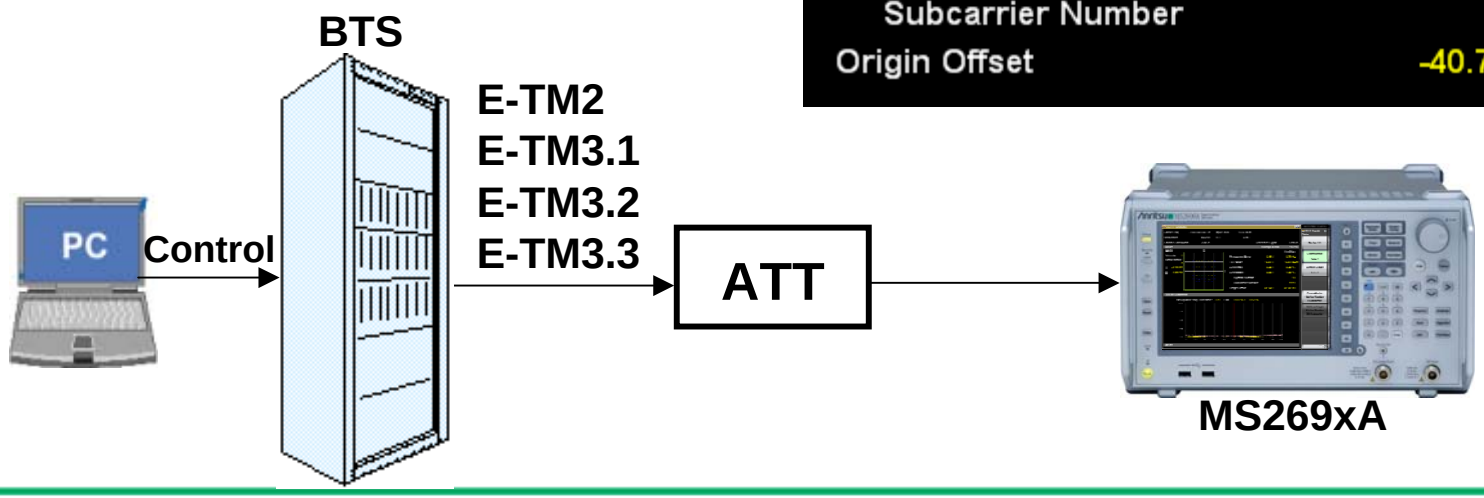
6.5.1 Frequency Error

6.5.2 Error Vector Magnitude

3GLTE Downlink Measurement Software

[Trace] > [F1: Trace Mode] > [F1] to [F5]

Frequency Error	0.05 Hz
	0.000 ppm
Output Power	-16.89 dBm
Mean Power	-16.90 dBm
EVM(rms)	0.19 %
EVM(peak)	1.04 %
Symbol Number	126
Subcarrier Number	6
Origin Offset	-40.74 dB



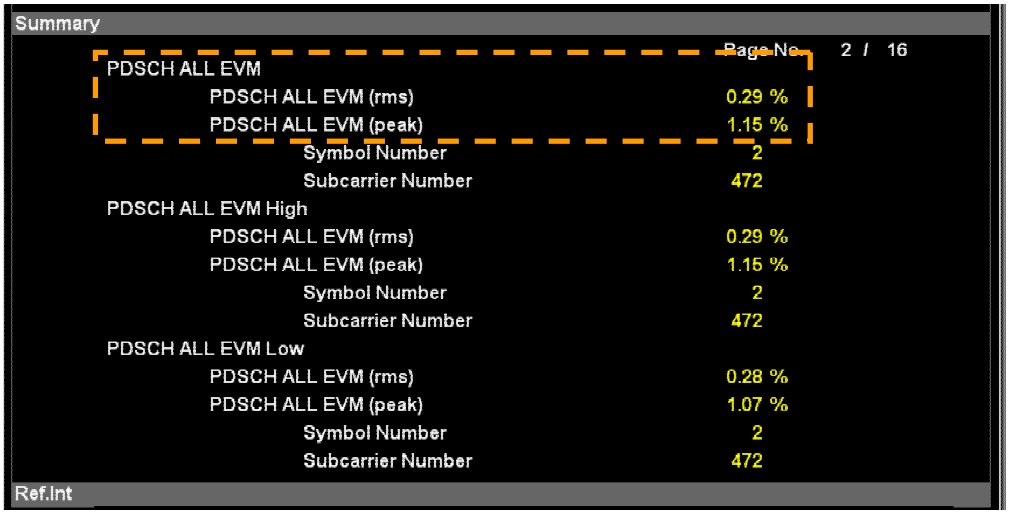
2. Transmitter Characteristics

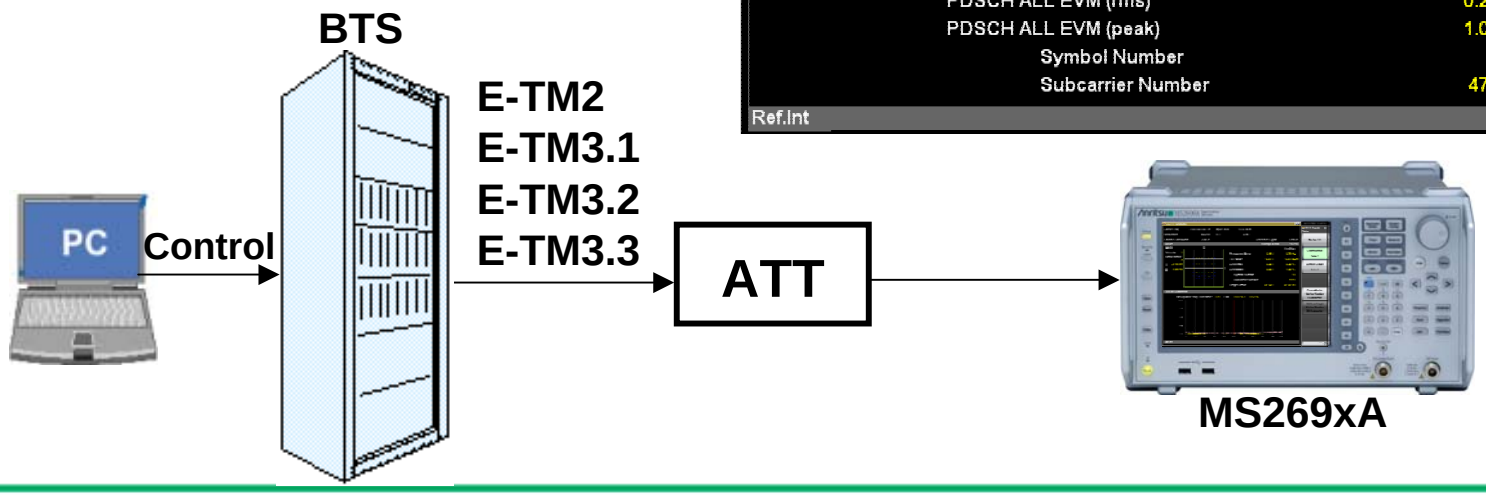
6.5.1 Frequency Error

6.5.2 Error Vector Magnitude

3GLTE Downlink Measurement Software

[Trace] > [F1: Trace Mode] > [F1] to [F5]





2. Transmitter Characteristics

6.5.3 Time Alignment between Transmitter Branches

Procedure

(1) Output reference signal (trigger) from BTS to MS269xA
(2) Output TM1 from BTS antenna 1
(3) Measure time offset
(4) Measure antenna 2 in same way as (2) and (3)
(5) Calculate difference

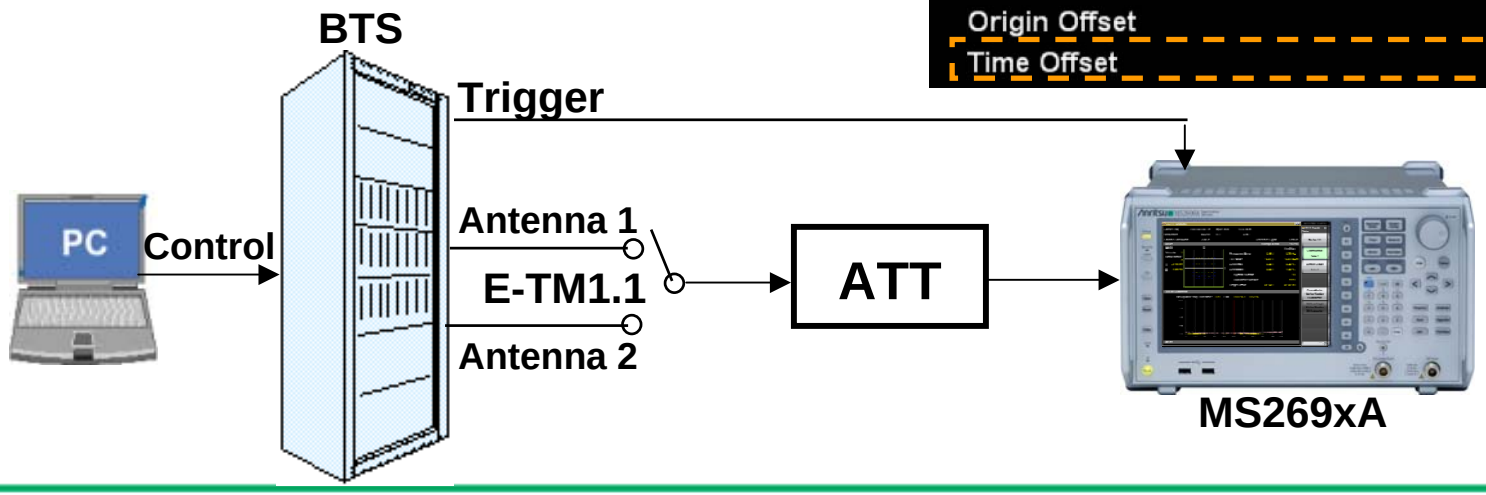
Specification

within 65 ns

3GLTE Downlink Measurement Software

[Trace] > [F1: Trace Mode] > [F1] to [F5]
(Time Offset enabled when External Trigger On)

Frequency Error	0.26 Hz
Output Power	-7.60 dBm
Mean Power	-7.59 dBm
EVM(rms)	0.80 %
EVM(peak)	5.42 %
Symbol Number	13
Subcarrier Number	1096
Origin Offset	-69.07 dB
Time Offset	-32.1 ns



2. Transmitter Characteristics

6.5.4 DL RS Power

Measure difference between setting value and actual measured value for DL RS Power

Procedure

(1) Output E-TM1.1 from BTS
(2) Measure RS Power
(3) Calculate actual measured value

Specification

± 2.1 dB

3GLTE Downlink Measurement Software

[Trace] > [F1: Trace Mode] > [F6: Summary]

Summary

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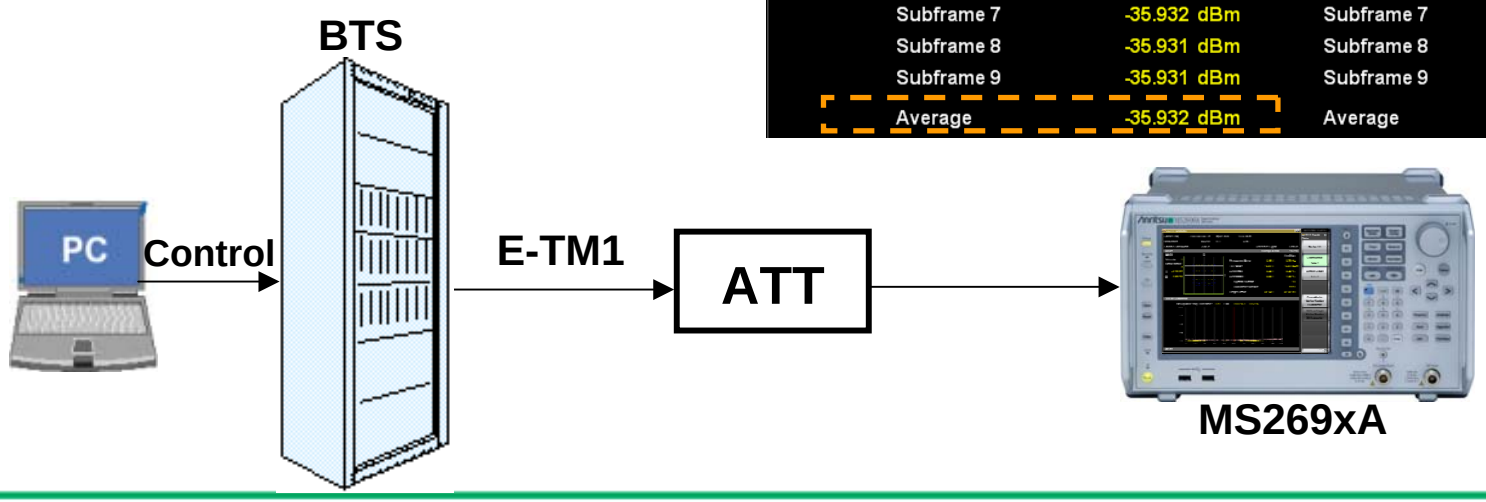
RS Power		OFDM Symbol Tx Power	
Subframe 0	-35.932 dBm	Subframe 0	-24.95 dBm
Subframe 1	-35.931 dBm	Subframe 1	-26.13 dBm
Subframe 2	-35.931 dBm	Subframe 2	-24.90 dBm
Subframe 3	-35.932 dBm	Subframe 3	-25.75 dBm
Subframe 4	-35.932 dBm	Subframe 4	-24.37 dBm
Subframe 5	-35.932 dBm	Subframe 5	-26.43 dBm
Subframe 6	-35.932 dBm	Subframe 6	-25.00 dBm
Subframe 7	-35.932 dBm	Subframe 7	-26.29 dBm
Subframe 8	-35.931 dBm	Subframe 8	-25.05 dBm
Subframe 9	-35.931 dBm	Subframe 9	-24.66 dBm
Average	-35.932 dBm	Average	-25.30 dBm



2. Transmitter Characteristics

6.6.1 Occupied Bandwidth

Procedure

(1) Output E-TM1.1 from BTS

(2) Setting for spectrum analyzer

Span: 20 MHz

RBW: 30 kHz

Point: > 400

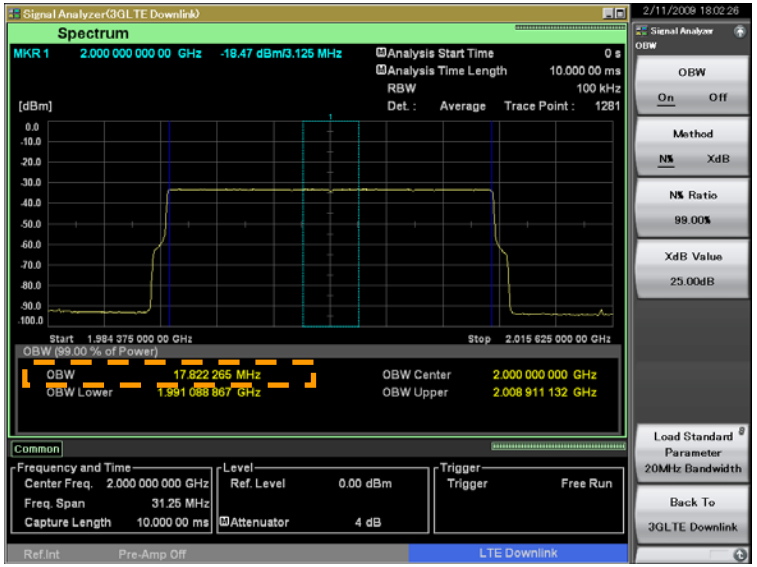
(3) Measure OBW (99% power)

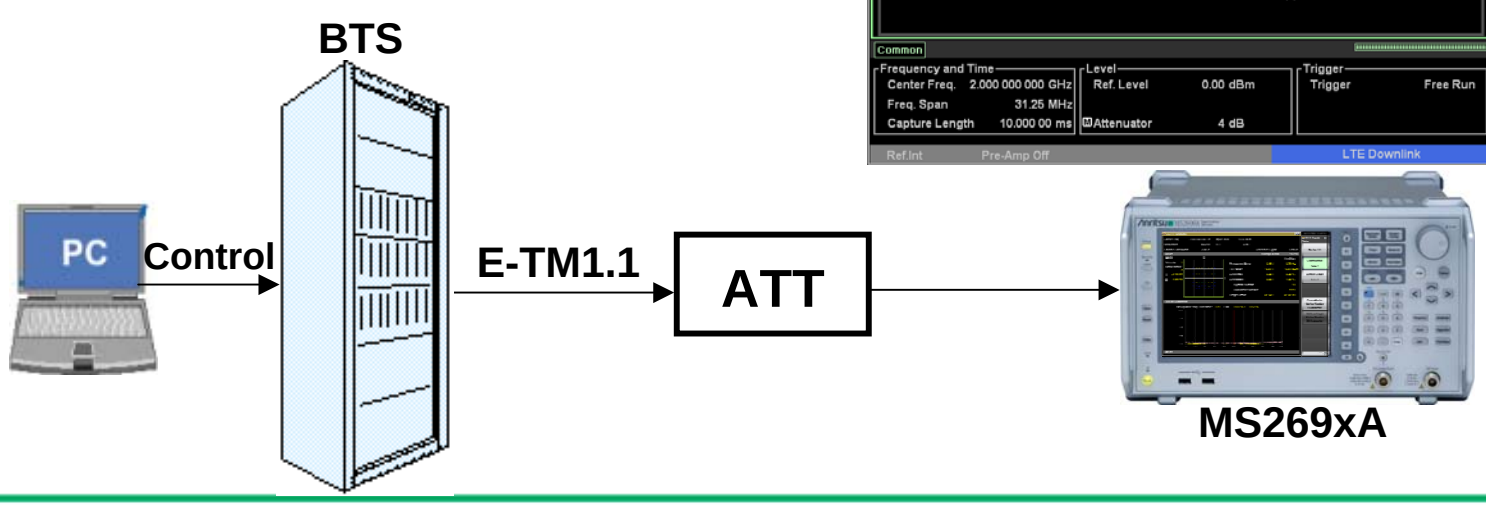
Specification

within Channel Bandwidth

3GLTE Downlink Measurement Software

[Measure] > [F6] or [F7]





2. Transmitter Characteristics

6.6.2 Adjacent Channel Leakage Power Ratio

Procedure

(1) Output E-TM1.1/1.2 from BTS sequentially
(2) Measure ACLR each test model

Specification

E-UTRA transmitted signal channel bandwidth $BW_{Channel}$ [MHz]	BS adjacent channel centre frequency offset below the first or above the last carrier centre frequency transmitted	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit
1.4, 3.0, 5, 10, 15, 20	$BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2 dB
	2 x $BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2 dB
	$BW_{Channel}$ /2 + 2.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2 dB
	$BW_{Channel}$ /2 + 7.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2 dB
NOTE 1: $BW_{Channel}$ and BW_{Config} are the channel bandwidth and transmission bandwidth configuration of the E-UTRA transmitted signal on the assigned channel frequency. NOTE 2: The RRC filter shall be equivalent to the transmit pulse shape filter defined in [15], with a chip rate as defined in this table.				

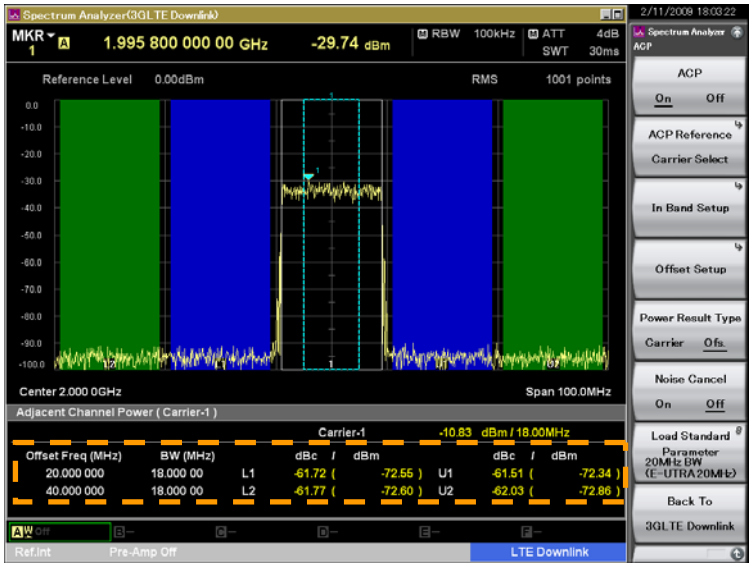
(3GPP TS36.141)

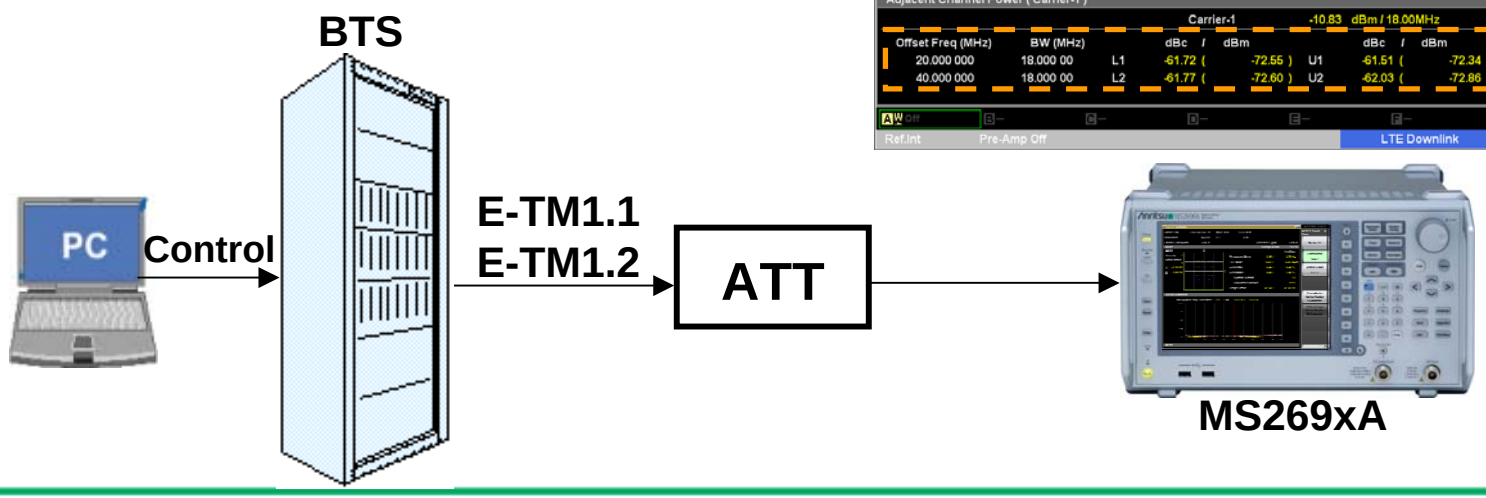
2. Transmitter Characteristics

6.6.2 Adjacent Channel Leakage Power Ratio

3GLTE Downlink Measurement Software

[Measure] > [F2] or [F3]





2. Transmitter Characteristics

6.6.3 Operation Band Unwanted Emissions

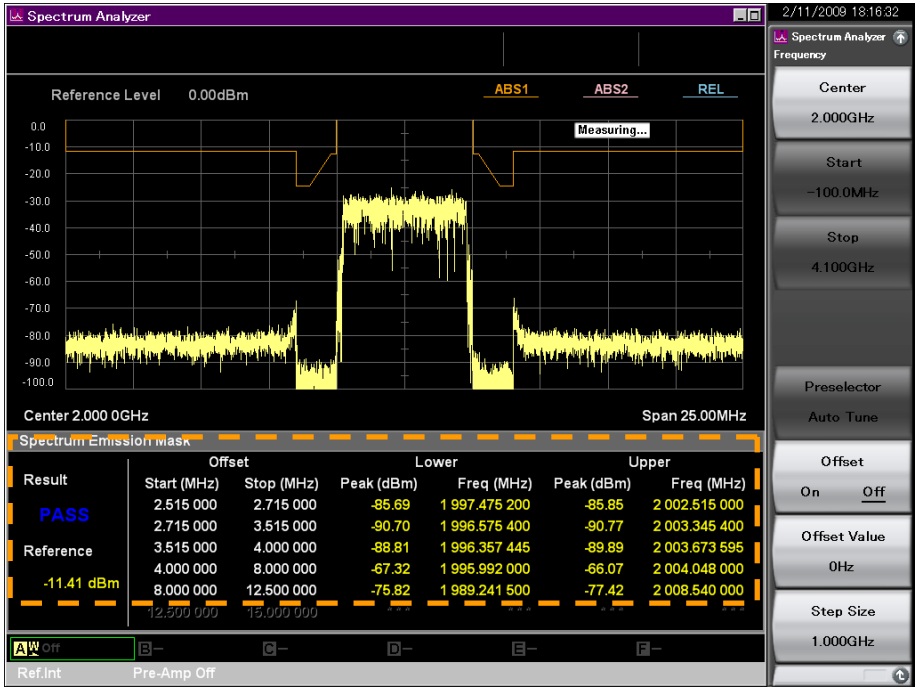
Procedure

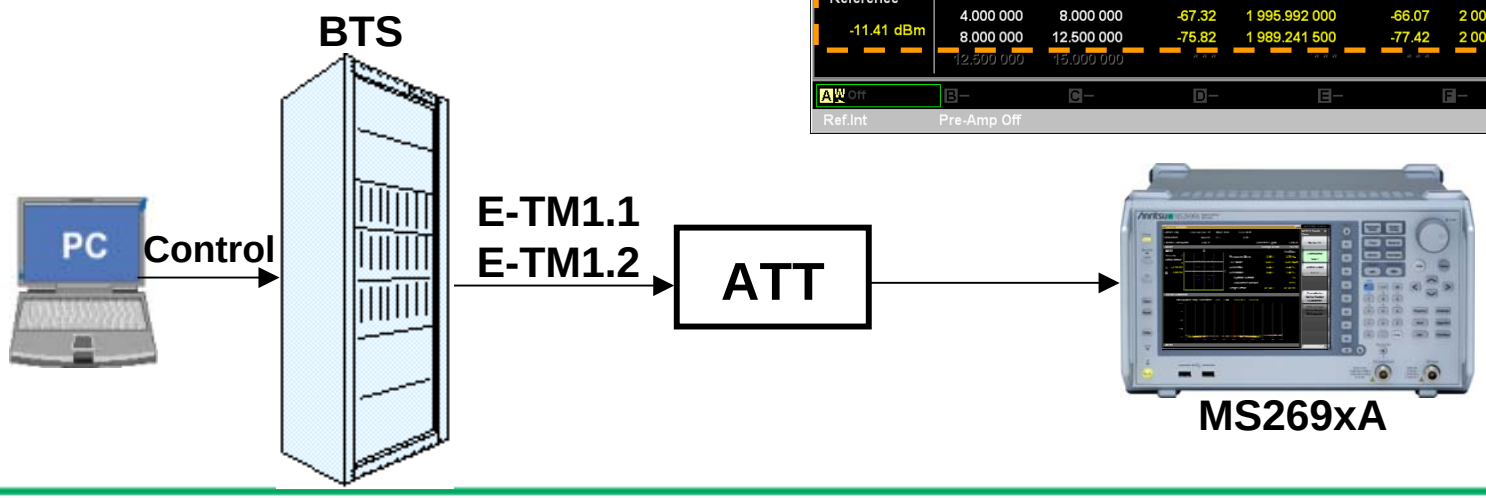
(1) Output E-TM1.1/1.2 from BTS sequentially

(2) Measure SEM for each test model

Specification

within each limit range





2. Transmitter Characteristics

6.6.4 Transmitter Spurious Emissions

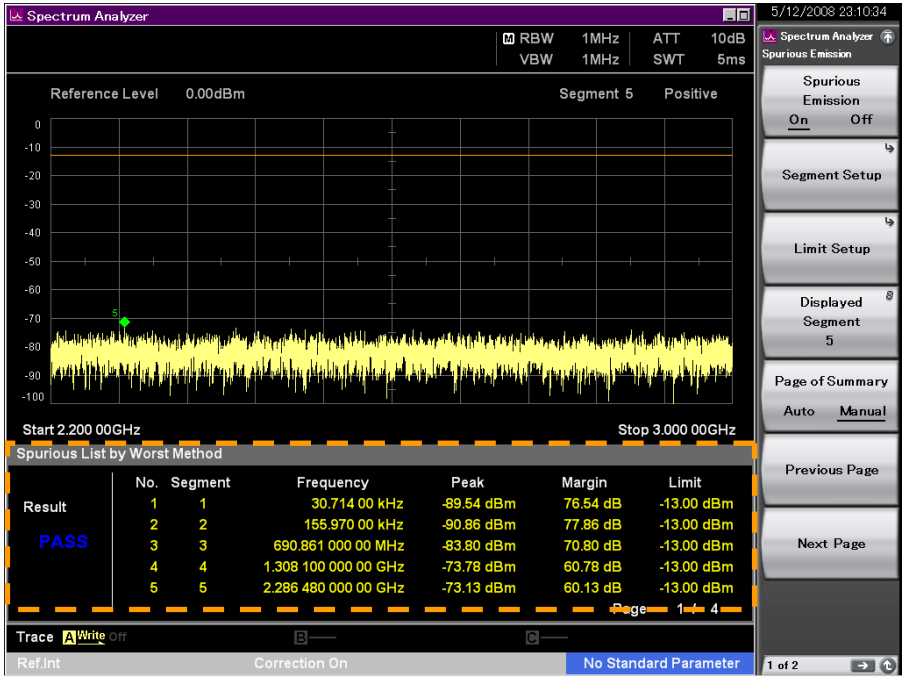
Procedure

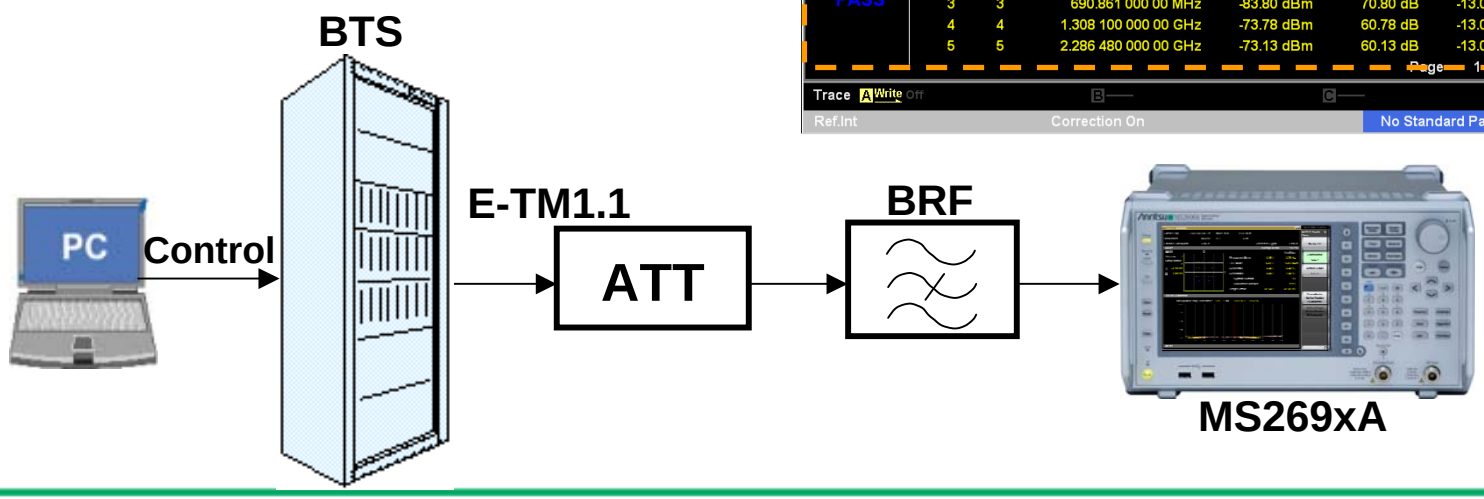
(1) Output E-TM1.1 from BTS

(2) Measure spurious emission

Specification

within each limit range





2. Transmitter Characteristics

6.7 Transmitter Inter-modulation

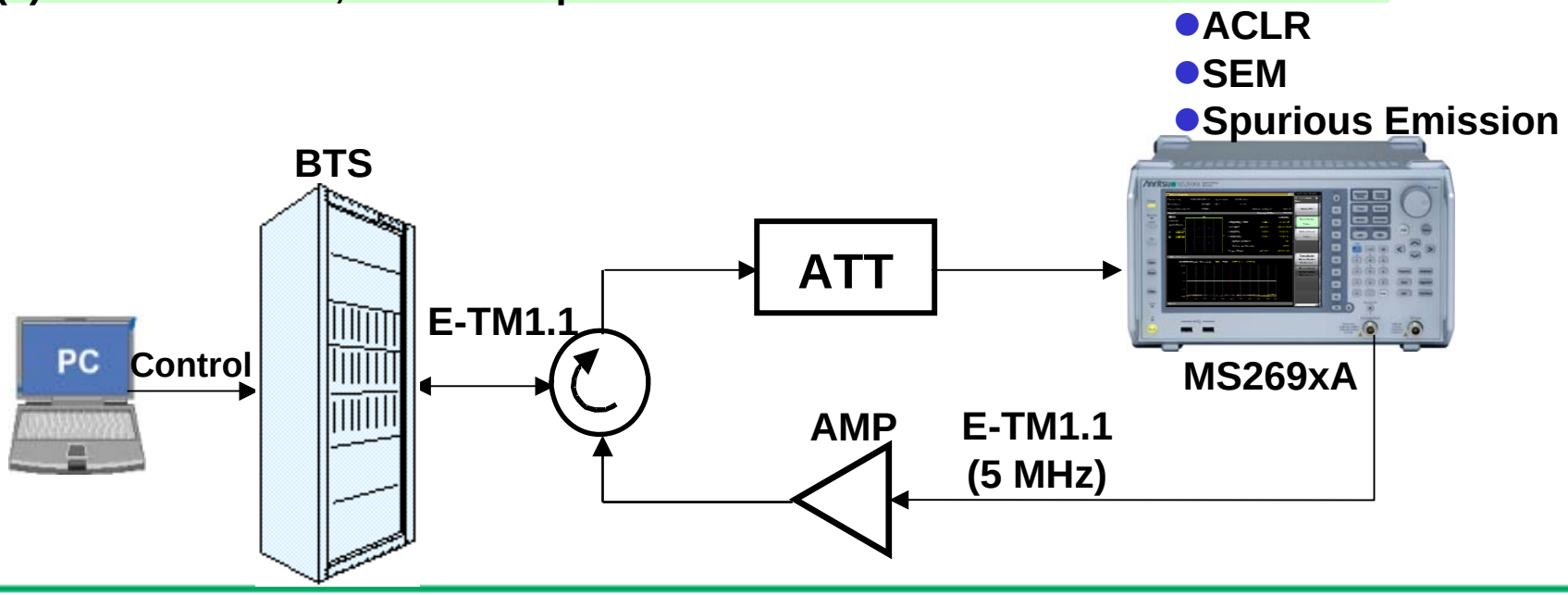
Procedure

(1) Output E-TM1.1 from BTS

(2) Output interfering E-TM1.1 (5 MHz bandwidth) signal from SG with following offset sequence

1. $Bw_{channel}/2 + 2.5$ MHz
2. $Bw_{channel}/2 - 2.5$ MHz
3. $Bw_{channel}/2 + 7.5$ MHz
4. $Bw_{channel}/2 - 7.5$ MHz
5. $Bw_{channel}/2 + 12.5$ MHz
6. $Bw_{channel}/2 - 12.5$ MHz

(3) Measure ACLR, SEM and spurious emission in each case



3. Receiver Characteristics

Receiver Characteristics Measurements

TS36.141	Measurement items	Configuration					
Receiver Characteristics		MG3700A					CW SG
		Platform	MX370108A (opt)	MX370104A (opt)	AWGN (std)	Clipping (std)	
7.2	Reference sensitivity level	OK	OK				
7.3	Dynamic range				OK		
7.4	In-channel selectivity	OK(*1)		OK(*1)		OK(*2)	
7.5	Adjacent channel selectivity (ACS) and narrow-band blocking					OK(*2)	
7.6	Blocking (modulated interfere signal)						
7.6	Blocking (CW Interfere Signal)	OK					OK
7.7	Receiver spurious emissions	MS269xA					
7.8	Receiver intermodulation	OK(*1)	OK	OK(*1)		OK(*2)	OK

MX370108A LTE IQproducer
MX370104A Multi-Carrier IQproducer

*1: MG3700A can generate combination signal (wanted signal and modulated interference signal) using two arbitrary waveform memories. Need MX370104A Multi-Carrier IQproducer to create the interference signal.

*2: Need narrow bandwidth modulated interference signal (1RB, 10RB etc.). After creating 1RB and 10RB, etc., pattern using LTE IQproducer, perform clip-free filtering using Clipping (standard IQproducer function).

3. Receiver Characteristics

7.2 Reference sensitivity level

Procedure

(1) Set test signal as shown in table

(2) Measure throughput

E-UTRA channel bandwidth [MHz]	Reference measurement channel	Reference sensitivity power level, $P_{REFSENS}$ [dBm]
1.4	FRC A1-1 in Annex A.1	-106.1
3	FRC A1-2 in Annex A.1	-102.3
5	FRC A1-3 in Annex A.1	-100.8
10	FRC A1-3 in Annex A.1*	-100.8
15	FRC A1-3 in Annex A.1*	-100.8
20	FRC A1-3 in Annex A.1*	-100.8

Note*: $P_{REFSENS}$ is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of FRC A1-3 mapped to disjoint frequency ranges with a width of 25 Resource Blocks each.

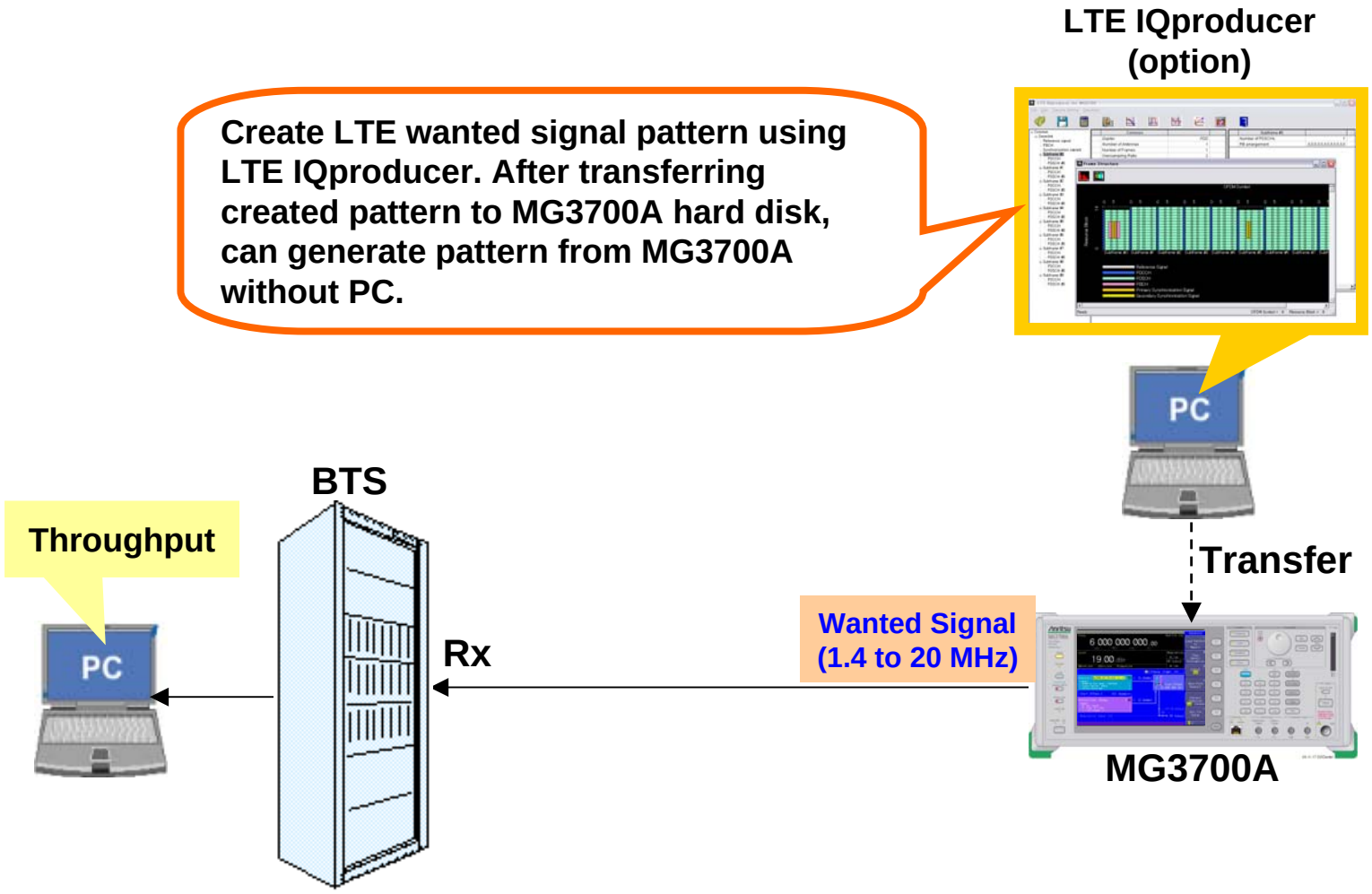
(3GPP TS36.141)

Specification

Throughput ≥95%

3. Receiver Characteristics

7.2 Reference Sensitivity Level



3. Receiver Characteristics

7.3 Dynamic Range

Procedure

(1) Set test signal as in table

(2) Measure throughput

Wanted signal | Interference signal (AWGN)

E-UTRA channel bandwidth [MHz]	Reference measurement channel	Wanted signal mean power [dBm]	Interfering signal mean power [dBm] /channel BW	Type of interfering signal
1.4	FRC A2-1 in Annex A.2	-76.3+[TT]	-88.7	AWGN
3	FRC A2-2 in Annex A.2	-72.4+[TT]	-84.7	AWGN
5	FRC A2-3 in Annex A.2	-70.2+[TT]	-82.5	AWGN
10	FRC A2-3 in Annex A.2*	-70.2+[TT]	-79.5	AWGN
15	FRC A2-3 in Annex A.2*	-70.2+[TT]	-77.7	AWGN
20	FRC A2-3 in Annex A.2*	-70.2+[TT]	-76.4	AWGN
Note*: The wanted signal mean power is the power level of a single instance of the reference measurement channel. This requirement shall be met for each consecutive application of a single instance of FRC A2-3 mapped to disjoint frequency ranges with a width of 25 resource blocks each				

(3GPP TS36.141)

Specification

Throughput ≥95%

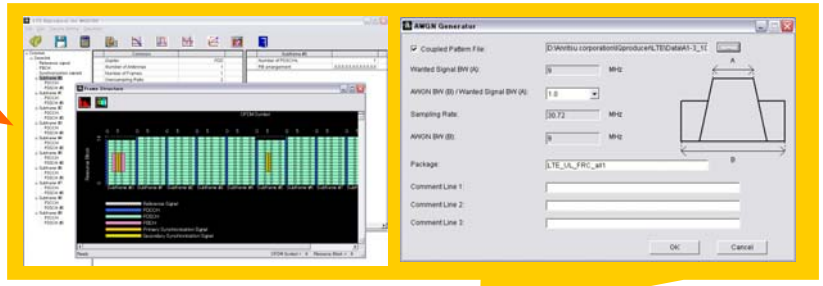
3. Receiver Characteristics

7.3 Dynamic Range

Create LTE wanted signal pattern using LTE IQproducer.
Use AWGN function as standard function. Easy to create by selecting expected signal (LTE) and selecting bandwidth scale (1/1.5/2/2.5).

LTE IQproducer (option)

AWGN Function (standard function)

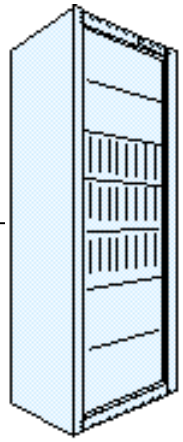


Transfer

MG3700A

Wanted Signal
+ Interfere Signal (AWGN)

Rx



BTS

Throughput

Generate combined signal from one MG3700A
Adjust power level difference on the screen
No external coupler
Fast level checking

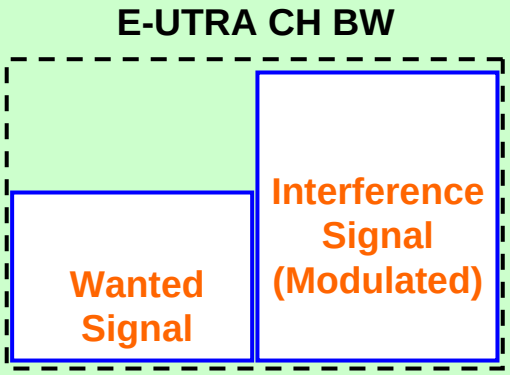
3. Receiver Characteristics

7.4 In-channel Selectivity

Procedure

(1) Set test signal as the table below

(2) Measure the throughput



Wanted signal / Interference signal (16QAM)

E-UTRA channel bandwidth (MHz)	Reference measurement channel	Wanted signal mean power [dBm]	Interfering signal mean power [dBm]	Type of interfering signal
1.4 6RBs	A1-4 in Annex A.1 3RBs	-106.9+[TT]	-87	1.4 MHz E-UTRA signal, 3 RBs
3 15RBs	A1-5 in Annex A.1 9RBs	-102.1+ [TT]	-84	3 MHz E-UTRA signal, 6 RBs
5 25RBs	A1-2 in Annex A.1 15RBs	-100.0+ [TT]	-81	5 MHz E-UTRA signal, 10 RBs
10 50RBs	A1-3 in Annex A.1 25RBs	-98.5+ [TT]	-77	10 MHz E-UTRA signal, 25 RBs
15 75RBs	A1-3 in Annex A.1* ← 25RBs	-98.5+ [TT]	-77	15 MHz E-UTRA signal, 25 RBs*
20 100RBs	A1-3 in Annex A.1* ← 25RBs	-98.5+ [TT]	-77	20 MHz E-UTRA signal, 25 RBs*
Note*: ← Wanted and interfering signal are placed adjacently around DC				

(3GPP TS36.141)

Specification

Throughput ≥95%

3. Receiver Characteristics

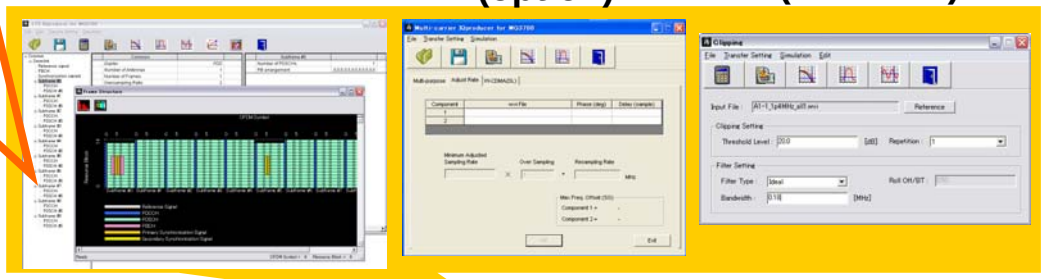
7.4 In-channel Selectivity

Create wanted LTE signal pattern with specified RB number using LTE IQproducer.
For interference signal, first create waveform pattern with specified RB number near center frequency using LTE IQproducer. Then drift ½ RB (90 kHz) from center frequency (symmetrical) using Multi-Carrier IQproducer. Finally, cut nearby noise with ideal filter using clipping function.

LTE IQproducer (option)

Multi-Carrier IQproducer (option)

Clipping Function (standard)



PC

Transfer

BTS

Throughput

PC

Rx

Wanted Signal
+ Interfere Signal (xx RBs)

MG3700A

Generate combined signal from one MG3700A

Adjust frequency offset and power level difference on screen

No external coupler

Fast level checking

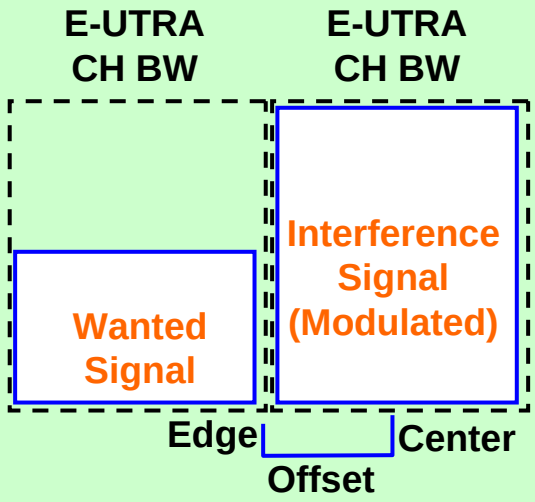
3. Receiver Characteristics

7.5 Adjacent Channel Selectivity and Narrow Band Blocking

Procedure

(1) Set test signal as in table

(2) Measure throughput



Wanted signal | Interference signal (Modulated signal)

E-UTRA channel bandwidth [MHz]	Wanted signal mean power [dBm]	Interfering signal mean power [dBm]	Interfering signal centre frequency offset from the channel edge of the wanted signal [MHz]	Type of interfering signal
1.4	$P_{REFSENS}$ + 11dB*	-52	0.7025	1.4MHz E-UTRA signal
3	$P_{REFSENS}$ + 8dB*	-52	1.5075	3MHz E-UTRA signal
5	$P_{REFSENS}$ + 6dB*	-52	2.5075	5MHz E-UTRA signal
10	$P_{REFSENS}$ + 6dB*	-52	2.5025	5MHz E-UTRA signal
15	$P_{REFSENS}$ + 6dB*	-52	2.5125	5MHz E-UTRA signal
20	$P_{REFSENS}$ + 6dB*	-52	2.5025	5MHz E-UTRA signal
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 [2] subclause 7.2.1.				

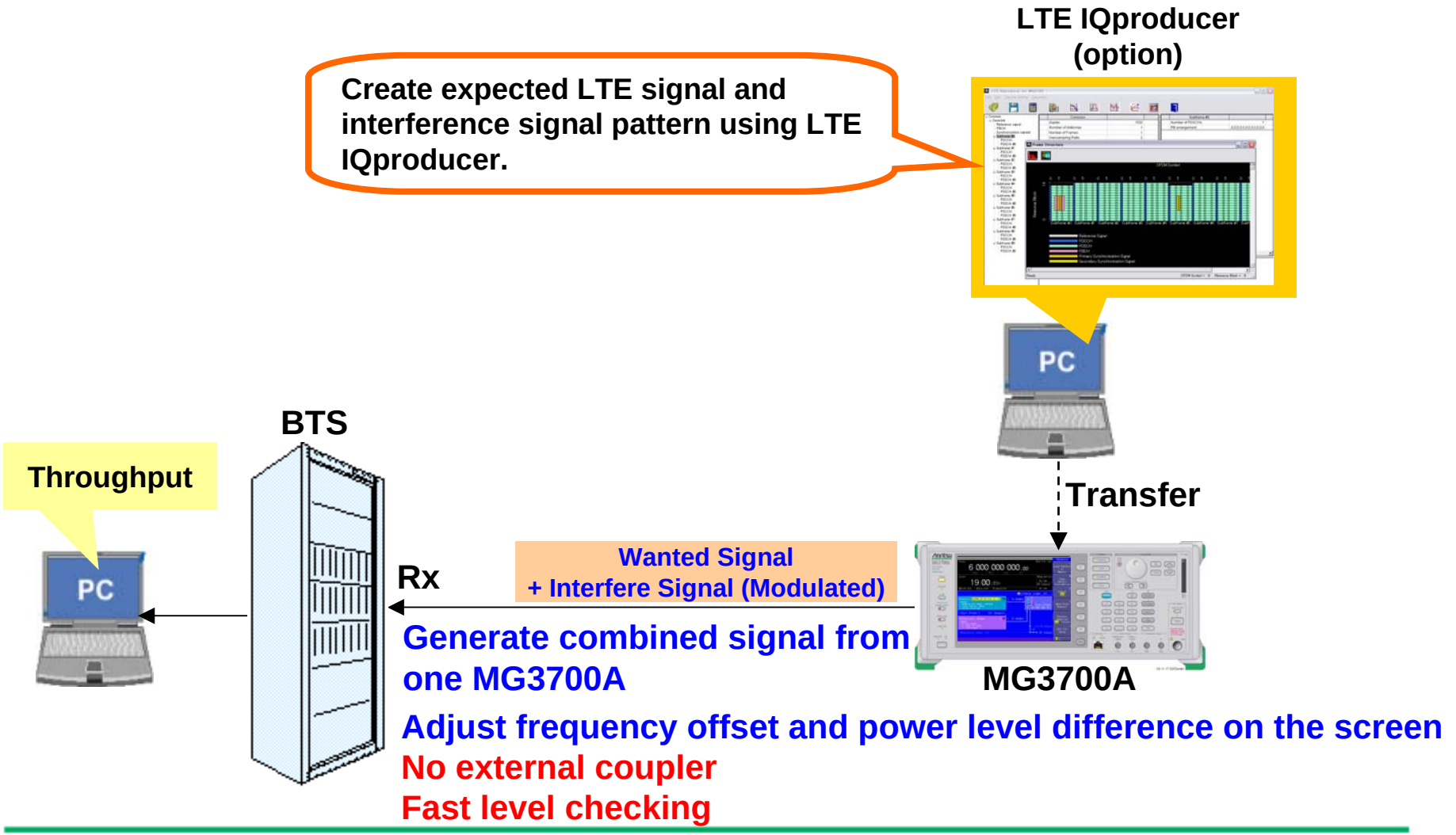
(3GPP TS36.141)

Specification

Throughput ≥95%

3. Receiver Characteristics

7.5 Adjacent Channel Selectivity and Narrow Band Blocking



3. Receiver Characteristics

7.5 Adjacent Channel Selectivity and Narrow Band Blocking

Procedure

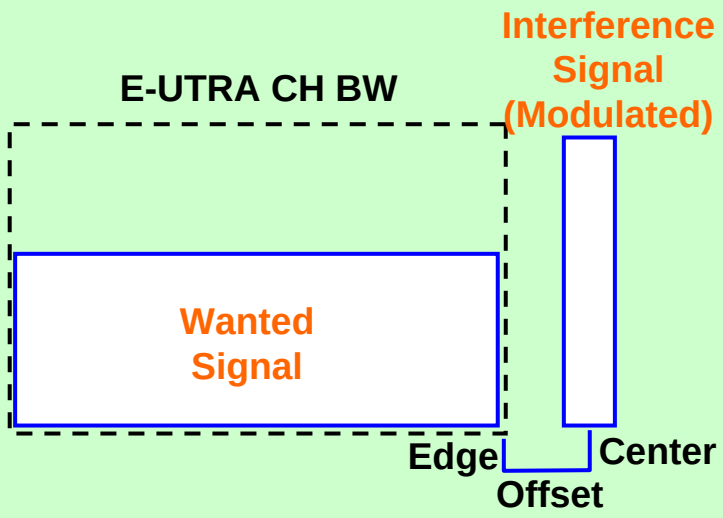
(1) Set test signal as in table

(2) Measure throughput

Wanted signal — Interference signal (QPSK)

Wanted signal mean power [dBm]	Interfering signal mean power [dBm]	Type of interfering signal
$P_{REFSENS}$ + 6dB*	-49	See Table 7.5-2
Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 [2] subclause 7.2.1.		

(3GPP TS36.141)



Wanted signal — Interference signal (QPSK)

E-UTRA Assigned BW [MHz]	Interfering RB centre frequency offset to the channel edge of the wanted signal [kHz]	Type of interfering signal
1.4 6RBs	252.5+m*180, m=0, 1, 2, 3, 4, 5	1.4 MHz E-UTRA signal, 1 RB*
3 15RBs	247.5+m*180, m=0, 1, 2, 3, 4, 7, 10, 13	3 MHz E-UTRA signal, 1 RB*
5 25RBs	342.5+m*180, m=0, 1, 2, 3, 4, 9, 14, 19, 24	5 MHz E-UTRA signal, 1 RB*
10 50RBs	347.5+m*180, m=0, 1, 2, 3, 4, 9, 14, 19, 24	5 MHz E-UTRA signal, 1 RB*
15 75RBs	352.5+m*180, m=0, 1, 2, 3, 4, 9, 14, 19, 24	5 MHz E-UTRA signal, 1 RB*
20 100RBs	342.5+m*180, m=0, 1, 2, 3, 4, 9, 14, 19, 24	5 MHz E-UTRA signal, 1 RB*
Note*: Interfering signal consisting of one resource block adjacent to the wanted signal		

(3GPP TS36.141)

Specification

Throughput ≥95%

3. Receiver Characteristics

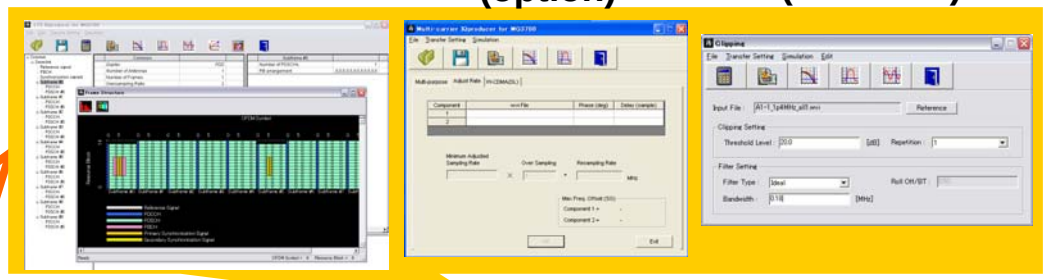
7.5 Adjacent Channel Selectivity and Narrow Band Blocking

Create wanted LTE signal pattern using LTE IQproducer.
For interference signal, first create waveform pattern specified 1 RB number near center frequency using LTE IQproducer. Then drift ½ RB (90 kHz) from center frequency (symmetrical) with Multi-Carrier IQproducer. Finally, cut nearby noise with ideal filter using clipping function.

LTE IQproducer (option)

Multi-Ccarrier IQproducer (option)

Clipping Function (standard)

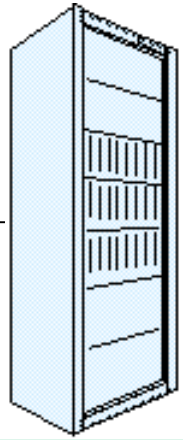


Transfer

MG3700A

Wanted Signal + Interfere Signal (1RB)

Rx



BTS

Throughput

Generate combined signal from one MG3700A

Adjust frequency offset and power level difference on screen

No external coupler

Fast level checking

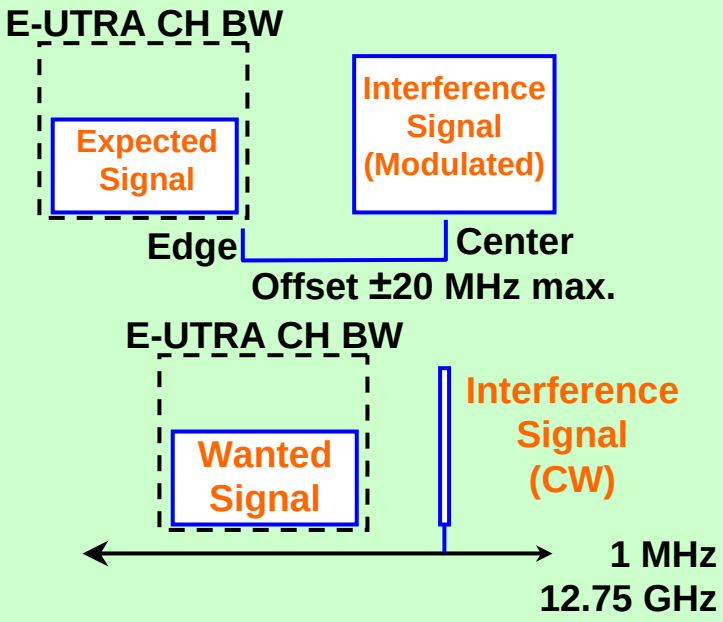
3. Receiver Characteristics

7.6 Blocking

Procedure

(1) Set test signal as in table

(2) Measure throughput



Specification

Throughput ≥95%

Interference signal (Modulated/CW) | Wanted signal | Interference signal (Modulated/CW)

Operating Band	Centre Frequency of Interfering Signal [MHz]			Interfering Signal mean power [dBm]	Wanted Signal mean power [dBm]	Interfering signal centre frequency minimum frequency offset from the channel edge of the wanted signal [MHz]	Type of Interfering Signal
1-7, 9-11, 13-14, 33-40	($F_{UL\ low}$ -20)	to	($F_{UL\ high}$ +20)	-43	$P_{REFSENS}$ +6dB*	See table 7.6-2	See table 7.6-2
	1 ($F_{UL\ high}$ +20)	to to	($F_{UL\ low}$ -20) 12750	-15	$P_{REFSENS}$ +6dB*	—	CW carrier
8	($F_{UL\ low}$ -20)	to	($F_{UL\ high}$ +10)	-43	$P_{REFSENS}$ +6dB*	See table 7.6-2	See table 7.6-2
	1 ($F_{UL\ high}$ +10)	to to	($F_{UL\ low}$ -20) 12750	-15	$P_{REFSENS}$ +6dB*	—	CW carrier
12	($F_{UL\ low}$ -20)	to	($F_{UL\ high}$ +12)	-43	$P_{REFSENS}$ +6dB*	See table 7.6-2	See table 7.6-2
	1 ($F_{UL\ high}$ +12)	to to	($F_{UL\ low}$ -20) 12750	-15	$P_{REFSENS}$ +6dB*	—	CW carrier
17	($F_{UL\ low}$ -20)	to	($F_{UL\ high}$ +18)	-43	$P_{REFSENS}$ +6dB*	See table 7.6-2	See table 7.6-2
	1 ($F_{UL\ high}$ +18)	to to	($F_{UL\ low}$ -20) 12750	-15	$P_{REFSENS}$ +6dB*	—	CW carrier

Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 [2] subclause 7.2.1.

(3GPP TS36.141)

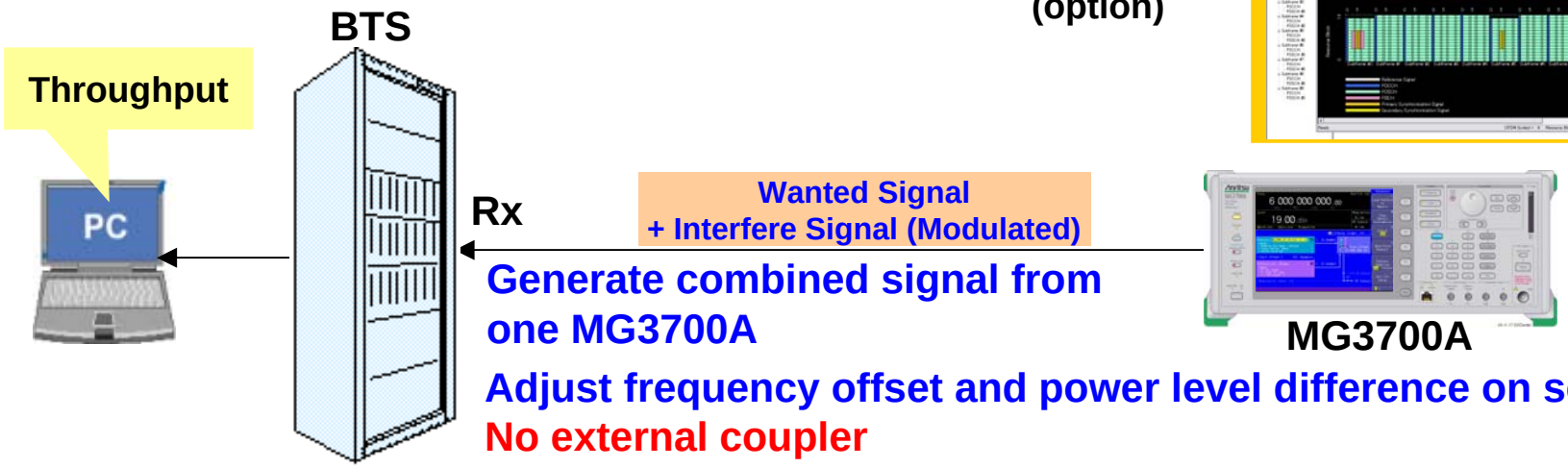
E-UTRA channel BW [MHz]	Interfering signal centre frequency minimum offset to the channel edge of the wanted signal [MHz]	Type of interfering signal
1.4	2.1	1.4MHz E-UTRA signal
3	4.5	3MHz E-UTRA signal
5	7.5	5MHz E-UTRA signal
10	7.5	5MHz E-UTRA signal
15	7.5	5MHz E-UTRA signal
20	7.5	5MHz E-UTRA signal

(3GPP TS36.141)

3. Receiver Characteristics

7.6 Blocking

LTE IQproducer (option)

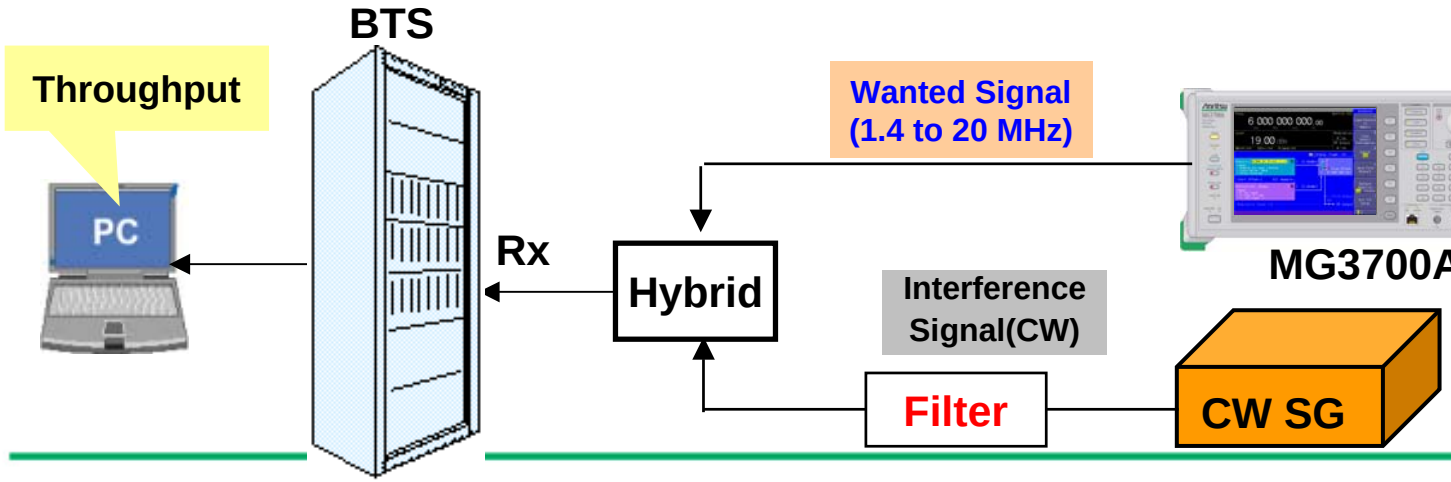


Generate combined signal from one MG3700A

Adjust frequency offset and power level difference on screen

No external coupler

Fast level checking



3. Receiver Characteristics

7.7 Receiver Spurious Emissions

Procedure

(1) Transfer E-TM1.1 with Pmax from BTS
(2) Terminate Tx port
(3) Measure spurious at Rx port

Frequency range	Maximum level	Measurement Bandwidth	Note
30MHz - 1 GHz	-57 dBm	100 kHz	
1 GHz - 12.75 GHz	-47 dBm	1 MHz	
NOTE: The frequency range between 2.5 * $BW_{Channel}$ below the first carrier frequency and 2.5 * $BW_{Channel}$ above the last carrier frequency transmitted by the BS, where $BW_{Channel}$ is the channel bandwidth according to Table 5.6-1, may be excluded from the requirement. However, frequencies that are more than 10 MHz below the lowest frequency of the BS downlink operating band or more than 10 MHz above the highest frequency of the BS downlink operating band (see Table 5.5-1) shall not be excluded from the requirement.			

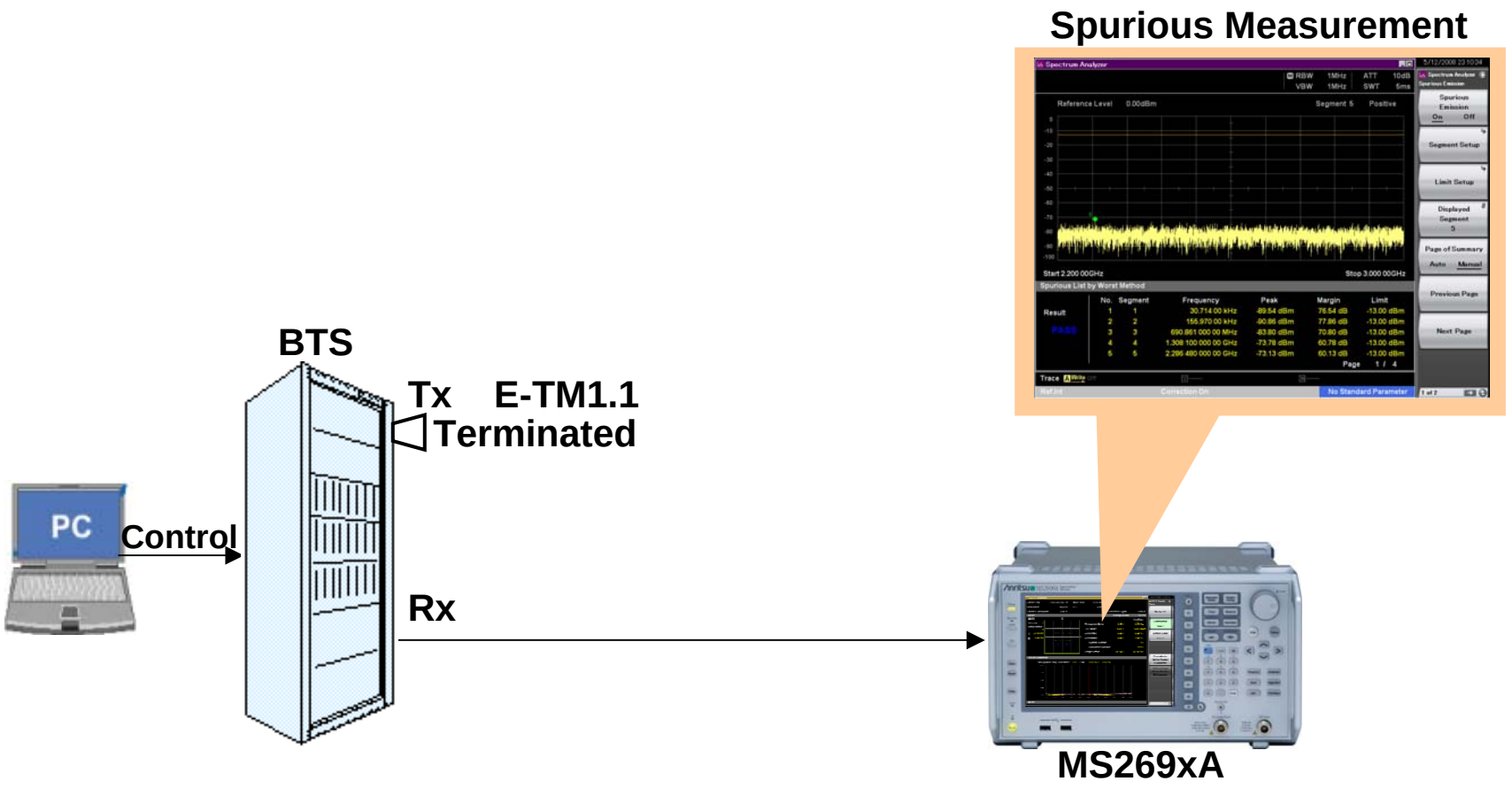
(3GPP TS36.141)

Specification

Not exceeding power level in above table

3. Receiver Characteristics

7.7 Receiver Spurious Emissions



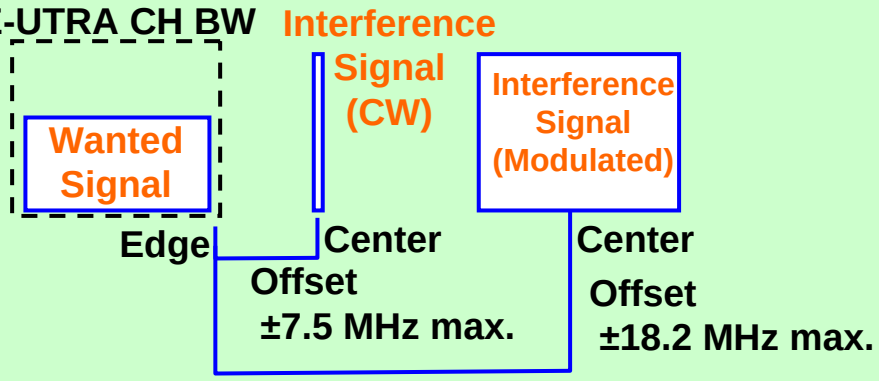
3. Receiver Characteristics

7.8 Receiver Inter-modulation

Procedure

(1) Set test signal as in table

(2) Measure throughput



Specification

Throughput ≥95%

Wanted signal **Interference signal (Modulated/CW)**

Wanted signal mean power [dBm]	Interfering signal mean power [dBm]	Type of interfering signal
$P_{REFSENS}$ + 6dB*	-52	See Table 7.8-2

Note*: $P_{REFSENS}$ depends on the channel bandwidth as specified in TS 36.104 [2] subclause 7.2.1.

(3GPP TS36.141)

Interference signal (Modulated/CW)

E-UTRA channel bandwidth [MHz]	Interfering signal centre frequency offset from the channel edge of the wanted signal [MHz]	Type of interfering signal
1.4	2.1	CW
	4.9	1.4MHz E-UTRA signal
3	4.5	CW
	10.5	3MHz E-UTRA signal
5	7.5	CW
	17.5	5MHz E-UTRA signal
10	7.5	CW
	17.7	5MHz E-UTRA signal
15	7.5	CW
	18	5MHz E-UTRA signal
20	7.5	CW
	18.2	5MHz E-UTRA signal

(3GPP TS36.141)

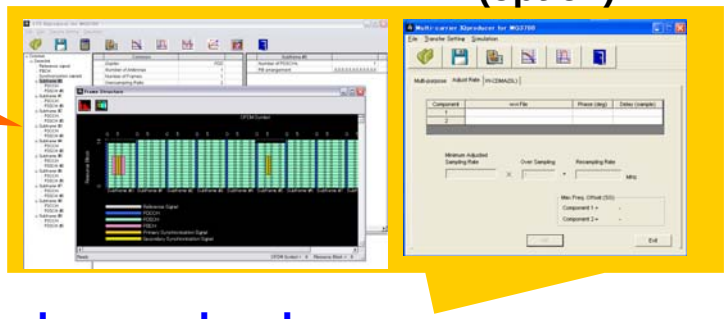
3. Receiver Characteristics

7.8 Receiver Inter-modulation

Same as 7.5 Adjacent Channel Selectivity and Narrow Band Blocking

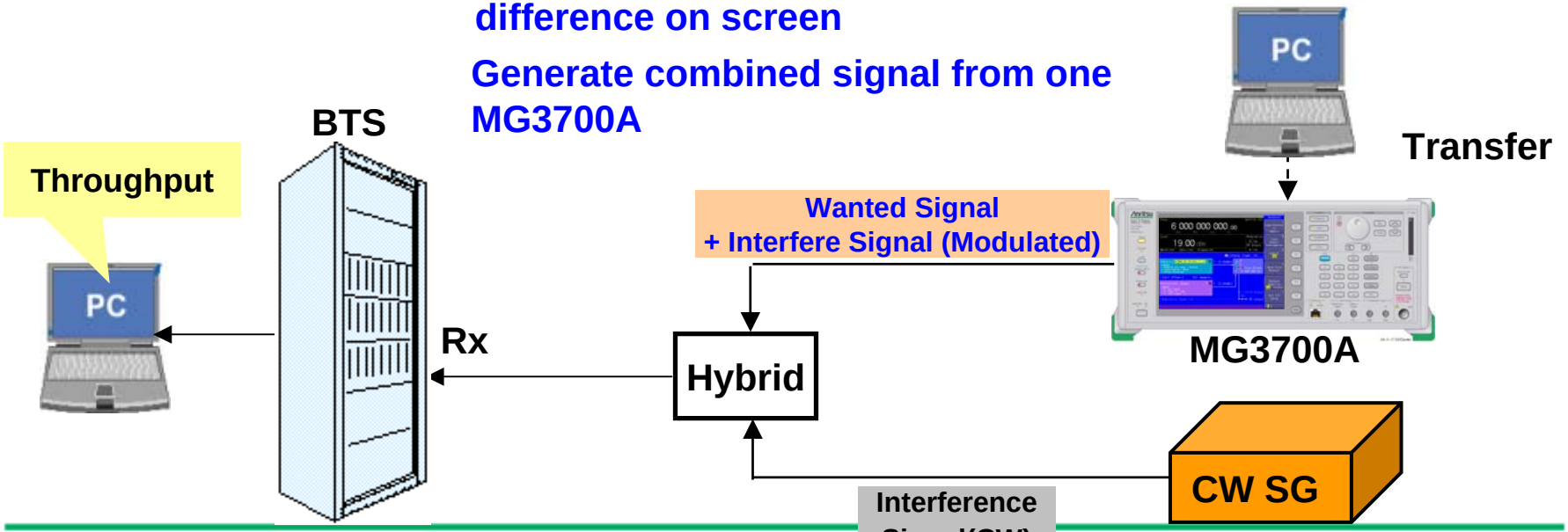
LTE IQproducer (option)

Multi-Carrier IQproducer (option)



Adjust frequency offset and power level difference on screen

Generate combined signal from one MG3700A



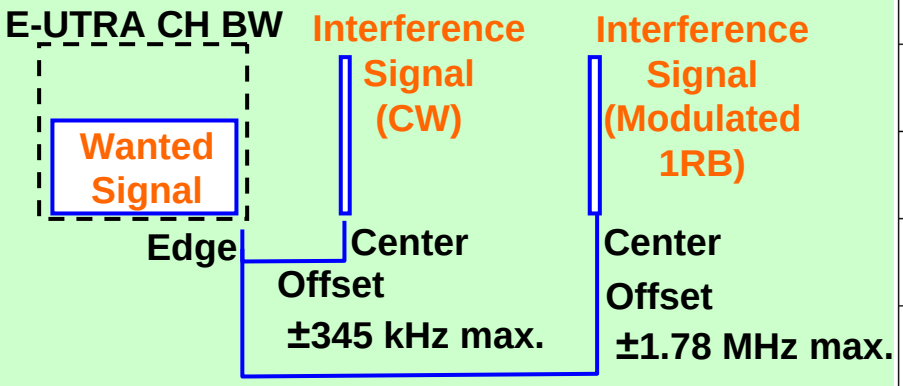
3. Receiver Characteristics

7.8 Receiver Inter-modulation (Narrowband)

Procedure

(1) Set test signal as in table

(2) Measure throughput



Wanted signal

Interference signal (Modulated/CW)

E-UTRA channel bandwidth [MHz]	Wanted signal mean power [dBm]	Interfering signal mean power [dBm]	Interfering RB centre frequency offset from the channel edge of the wanted signal [kHz]	Type of interfering signal
1.4	$P_{REFSENS}$ + 6dB*	-52	270	CW
		-52	790	1.4 MHz E-UTRA signal, 1 RB**
3	$P_{REFSENS}$ + 6dB*	-52	275	CW
		-52	790	3.0 MHz E-UTRA signal, 1 RB**
5	$P_{REFSENS}$ + 6dB*	-52	360	CW
		-52	1060	5 MHz E-UTRA signal, 1 RB**
10	$P_{REFSENS}$ + 6dB* (***)	-52	415	CW
		-52	1420	5 MHz E-UTRA signal, 1 RB**
15	$P_{REFSENS}$ + 6dB* (***)	-52	380	CW
		-52	1600	5MHz E-UTRA signal, 1 RB**
20	$P_{REFSENS}$ + 6dB* (***)	-52	345	CW
		-52	1780	5MHz E-UTRA signal, 1 RB**

Note*: $P_{REFSENS}$ is related to the channel bandwidth as specified in TS 36.104 [2] subclause 7.2.1.
Note**: Interfering signal consisting of one resource block positioned at the stated offset.
Note***: This requirement shall apply only for a FRC A1-3 mapped to the frequency range at the channel edge adjacent to the interfering signals

(3GPP TS36.141)

Specification

Throughput ≥95%

3. Receiver Characteristics

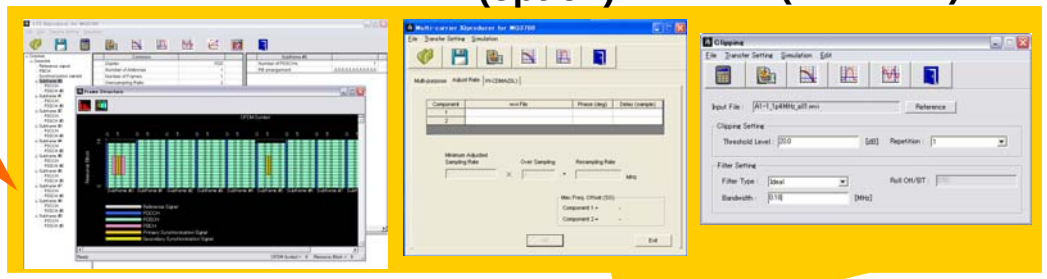
7.8 Receiver Inter-modulation

LTE IQproducer (option)

Multi-carrier IQproducer (option)

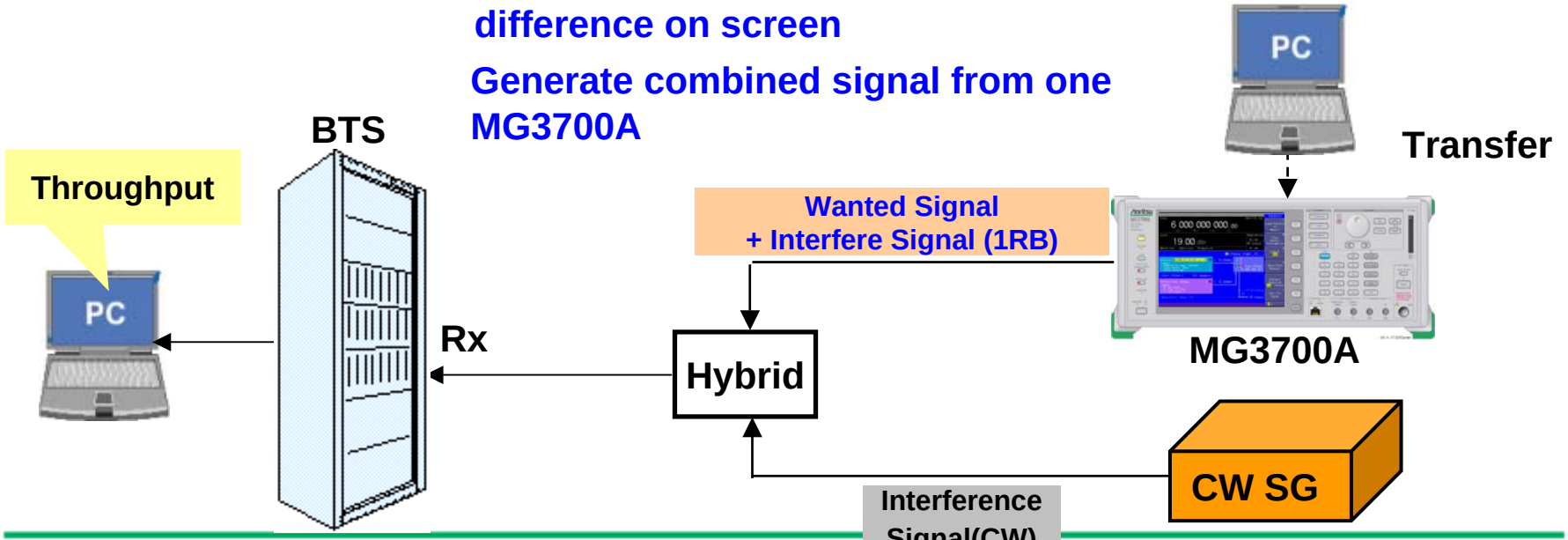
Clipping Function (standard)

Same as 7.5 Adjacent Channel Selectivity and Narrow Band Blocking



Adjust frequency offset and power level difference on screen

Generate combined signal from one MG3700A



Anritsu

Specifications are subject to change without notice.

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