

EMC

TEST REPORT

Report No. : 150700093TWN-001

Model No. : BEC MX-200

Issued Date : Oct. 29, 2015

Applicant: Billion Electric Co., Ltd.

Address: 8F., No. 192, Sec. 2, Zhongxing Road, Xindian Dist., New Taipei City, Taiwan

Test Method/ Standard: 47 CFR FCC Part 27,
47 CFR FCC Part 2,
ANSI/TIA-603-D-2010
KDB 971168 D01 Power Meas License Digital Systems
v02r02

Test By: Intertek Testing Services Taiwan Ltd.

Address: No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

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1. Summary of Test Data

Test Requirement	Applicable Rule	Limit	Result
Conducted Output Power	2.1046	Reporting Only	Pass
Effective Radiated Power (Band 17)	27.50(c)(10)	ERP < 3 Watts	N/A
Frequency Stability	2.1055 27.54	< 2.5 ppm / Within frequency range	Pass
Occupied Bandwidth	2.1049 27.53	Reporting Only	Pass
Peak to average ratio	27.50(d)(5)	< 13 dB	Pass
Band Edge Measurements	2.1049 27.53(g)	< 43+10log10(P[Watts])	Pass
Conducted Spurious Emissions	2.1051 27.53(g)	< 43+10log10(P[Watts])	Pass
Radiated Spurious Emissions	2.1053 27.53(g)	< 43+10log10(P[Watts])	Pass

2. General Information

2.1 Identification of the EUT

Product:	MXConnect M2M Advanced Industrial 4G/LTE Router
Model No:	BEC MX-200
FCC ID:	QI3BIL-MX200
Manufacturer:	Billion Electric Co., Ltd.
Address:	8F., No. 192, Sec.2, Zhongxing Road, Xindian Dist., New Taipei City, Taiwan
TX Frequency:	LTE Band 17: 706.5 MHz ~ 713.5 MHz
RX Frequency:	LTE Band 17: 736.5MHz ~ 743.5 MHz
Bandwidth:	5MHz / 10MHz (Band 17)
Maximum Output Power to Antenna:	LTE Band 17 : 22.67 dBm / 0.185 W
Modulation:	LTE Band 17: QPSK, 16QAM
Rated Power:	DC 12 V from adapter
Power Cord:	N/A
Sample Received:	Sept. 30, 2015
Sample condition:	Workable
Test Date(s):	Oct. 1, 2015 ~ Oct. 29, 2015
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Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.2 Emission designator

FCC Rule	System	Type of Modulation	BW	Emission Designator	Frequency Tolerance (ppm)	Maximum ERP (Watts)
Part 27	LTE Band 17	QPSK	5 MHz	4M49G7D	1.12	0.084 W
Part 27	LTE Band 17	16QAM	5 MHz	4M50D7W	1.03	0.058 W
Part 27	LTE Band 17	QPSK	10 MHz	8M93G7D	1.3	0.078 W
Part 27	LTE Band 17	16QAM	10 MHz	8M92D7W	1.05	0.059 W

2.3 Description of EUT

Product SW/HW version :	M200_GPS / 1.00C
Radio SW/HW version :	05.05.58.00 / 11
Test SW Version :	N/A

2.4 Antenna description

Antenna 1

Antenna model number: AN0727-64DP5BSM

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : -1.3 dBi (LTE Band 17)
Antenna Type : Dipole antenna
Connector Type : SMA

Antenna 2

Antenna model number: AB0727-88Y04BSM

The antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector.

Antenna Gain : -7.31 dBi (LTE Band 17)
Antenna Type : Dipole antenna
Connector Type : SMA

The model number “AN0727-64DP5BSM” is worst case in ERP/EIRP measurement.

2.5 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Brand	Model no.	Specification
Adapter	EGB	PAW018A12UL 8066	I/P: 100-240V~ 0.5A, 50/60Hz O/P: 12Vdc, 1.2A

The above EUT information is declared by Billion Electric Co., Ltd. and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

2.6 Peripherals equipment

Peripherals	Brand	Model No.	Serial No.	Data cable
Notebook PC	HP	Compaq nc2400	CNF6413CGN	LAN Cable 1 meter

2.7 Applied test modes

Conducted	Test items	Band	Bandwidth	Modulation	RB #	Test Channel
	Max. Output Power	17	5MHz / 10MHz	QPSK / 16QAM	1/Full	L/M/H
	Peak-to-Average Ratio	17	5MHz / 10MHz	QPSK / 16QAM	Full	M
	26dB and 99% Bandwidth	17	5MHz / 10MHz	QPSK / 16QAM	Full	L/M/H
	Conducted Band Edge	17	5MHz	QPSK / 16QAM	1RB/0RB Offset	L
					25RB/0RB Offset	
					1RB/24RB Offset	H
					25RB/0RB Offset	
		10MHz	1RB/0RB Offset		L	
			50RB/0RB Offset			
			1RB/49RB Offset		H	
			50RB/0RB Offset			
	Conducted Spurious Emission	17	5MHz / 10MHz	QPSK / 16QAM	Worst RB (Output Power)	L/M/H
Frequency Stability	17	10MHz	QPSK / 16QAM	Full / 0 RB Offset	L/M/H	
Radiated	E.R.P.	17	5MHz / 10MHz	QPSK / 16QAM	1/Full	L/M/H
	Radiated Spurious Emission	17	5MHz / 10MHz	QPSK / 16QAM	Worst RB (Output Power)	L/M/H

2.8 Applied test axis

Pre-Scan has been executed only at X axis.

Radiated test item	Band	Axis
ERP/EIRP	LTE Band 17	X
Radiated Spurious Emission	LTE Band 17	X

2.9 Applied standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

FCC 47 CFR Part 2

FCC 47 CFR Part 27

ANSI/TIA-603-D-2010

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

3. Output Power Measurement

3.1 Test conditions

Temperature:	20	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

3.2 Limit for output power measurement

Portable stations (hand-held devices) operating in the 704-716 MHz band are limited to 3 watts ERP.

3.3 Test procedure

3.3.1 Conducted power measurement

1. The EUT was established communication with base station simulator and set up to transmit the maximum power.
2. Set the EUT to transmit at low, middle and high channel and record the power level on the base station simulator.
- 3,According to KDB 412172 D01 Power Approach

$ERP/EIRP = P_T + G_T - L_C$, $ERP = EIRP - 2.15$,
where;

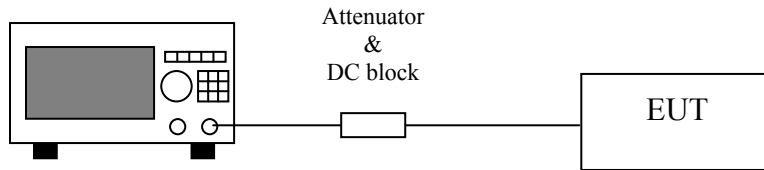
P_T =transmitter output power, in dBW, dBm

G_T = gain of the transmitting antenna, in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna,in dB.

3.4 Test diagram

3.4.1 Conducted test setup



Base station simulator

3.5 Test results

3.5.1 Conducted output power

LTE Band17							
BW	Modulation	CH	Frequency (MHz)	RB Size	RB Offset	Peak Power (dBm)	Average Power (dBm)
5MHz	QPSK	23755	706.5	1	0	26.86	22.24
		23755	706.5	1	24	27.07	22.67
		23755	706.5	25	0	27.41	21.32
		23790	710	1	0	26.24	22.62
		23790	710	1	24	27.31	22.67
		23790	710	25	0	27.59	21.45
		23825	713.5	1	0	27.3	22.36
		23825	713.5	1	24	26.09	22.03
		23825	713.5	25	0	28.13	21.25

LTE Band17							
BW	Modulation	CH	Frequency (MHz)	RB Size	RB Offset	Peak Power (dBm)	Average Power (dBm)
5MHz	16QAM	23755	706.5	1	0	26.6	21
		23755	706.5	1	24	26.27	21.06
		23755	706.5	25	0	27.52	20.67
		23790	710	1	0	26.2	21.11
		23790	710	1	24	26.88	20.91
		23790	710	25	0	27.82	20.56
		23825	713.5	1	0	26.93	21.01
		23825	713.5	1	24	26.09	20.77
		23825	713.5	25	0	27.93	20.4

LTE Band17							
BW	Modulation	CH	Frequency (MHz)	RB Size	RB Offset	Peak Power (dBm)	Average Power (dBm)
10MHz	QPSK	23780	709	1	0	26.41	21.93
		23780	709	1	49	26.85	21.98
		23780	709	50	0	27.04	21.98
		23790	710	1	0	26.69	22.35
		23790	710	1	49	26.9	22.25
		23790	710	50	0	27.81	21.4
		23800	711	1	0	25.81	21.86
		23800	711	1	49	26.94	21.59
		23800	711	50	0	27.12	20.92

LTE Band17							
BW	Modulation	CH	Frequency (MHz)	RB Size	RB Offset	Peak Power (dBm)	Average Power (dBm)
10MHz	16QAM	23780	709	1	0	26.33	20.58
		23780	709	1	49	26.83	20.48
		23780	709	50	0	27.48	19.8
		23790	710	1	0	26.63	20.9
		23790	710	1	49	26.94	21.19
		23790	710	50	0	27.51	20.33
		23800	711	1	0	25.87	20.44
		23800	711	1	49	25.63	20.29
		23800	711	50	0	27.29	19.78

3.5.2 Radiated output power

Average E.R.P. for LTE Band 17

Channel Bandwidth: 5MHz

Modulation: QPSK

Channel	Frequency (MHz)	Conducted Power	G _T (dB)	E.R.P. (dBm)
23755	706.5	22.67	-1.3	19.22
23790	710	22.67	-1.3	19.22
23825	713.5	22.63	-1.3	19.18

Note1: Conducted Power = P_T + L_c

Note2: E.R.P. = E.I.R.P. – 2.15

Average E.R.P. for LTE Band 17

Channel Bandwidth: 5MHz

Modulation: 16QAM

Channel	Frequency (MHz)	Conducted Power	G _T (dB)	E.R.P. (dBm)
23755	706.5	21.06	-1.3	17.61
23790	710	21.11	-1.3	17.66
23825	713.5	21.01	-1.3	17.56

Note1: Conducted Power = P_T + L_c

Note2: E.R.P. = E.I.R.P. – 2.15

Average E.R.P. for LTE Band 17

Channel Bandwidth: 10MHz

Modulation: QPSK

Channel	Frequency (MHz)	Conducted Power	G _T (dB)	E.R.P. (dBm)
23780	709	21.98	-1.3	18.53
23790	710	22.35	-1.3	18.9
23800	711	21.86	-1.3	18.41

Note1: Conducted Power = P_T + L_c

Note2: E.R.P. = E.I.R.P. – 2.15

Average E.R.P. for LTE Band 17**Channel Bandwidth: 10MHz****Modulation: 16QAM**

Channel	Frequency (MHz)	Conducted Power	G _T (dB)	E.R.P. (dBm)
23780	709	20.58	-1.3	17.13
23790	710	21.19	-1.3	17.74
23800	711	20.44	-1.3	16.99

Note1: Conducted Power = P_T + L_C

Note2: E.R.P. = E.I.R.P. – 2.15

4. Frequency Stability

4.1 Test conditions

Temperature:	-30~50	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

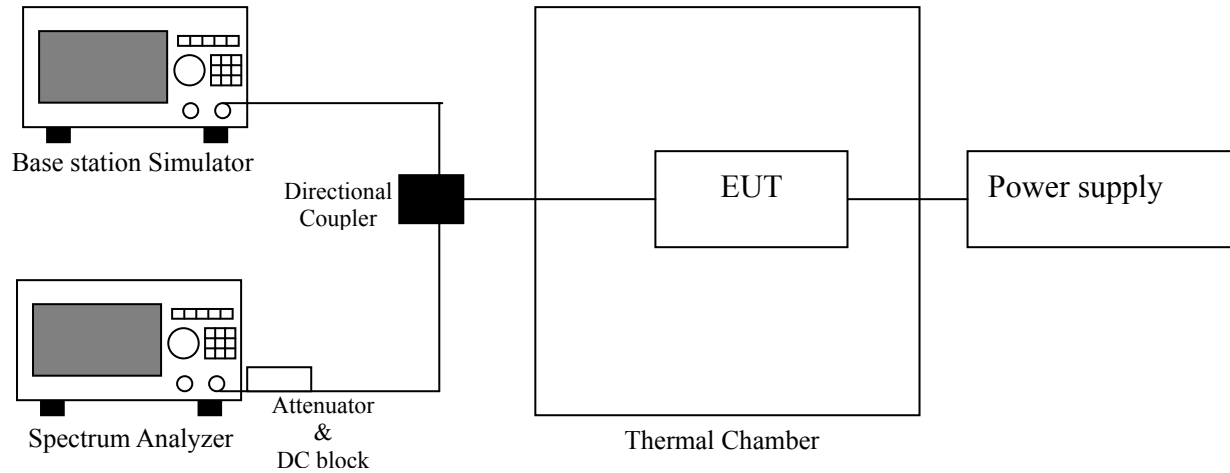
4.2 Limit for frequency stability

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

4.3 Test procedure

1. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer and Base station Simulator.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency.
5. Repeat step 2 and 3 with the temperature chamber set to the specific temperature. The temperature is decreased by 10 degrees, allowed to stabilize, and then the measurement is repeated. This is repeated until -30°C is reached.
6. The test chamber was allowed to stabilize at +20degree C for minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record

4.4 Test diagram



4.5 Test results

Voltage V.S. Frequency Stability

LTE Band 17, 10MHz QPSK					
Limit		704	716	Delta (Hz)	Frequency Stability (ppm)
Condition		FLow	FHigh		
Temperature	Voltage	@-13dBm MHz	@-13dBm MHz		
Normal(25℃)	Normal	704.26	715.75		
Extreme(50℃)		704.23	715.64	-6.24	0.88
Extreme(40℃)		704.25	715.76	-5.81	0.82
Extreme(30℃)		704.29	715.7	-9.26	1.3
Extreme(10℃)		704.23	715.65	-7.75	1.09
Extreme(0℃)		704.27	715.66	-7.78	1.1
Extreme(-10℃)		704.32	715.76	-7.35	1.04
Extreme(-20℃)		704.26	715.68	-7.42	1.05
Extreme(-30℃)		704.29	715.64	-6.91	0.97
25℃	+15%	704.29	715.75	-6.65	0.94
	-15%	704.32	715.71	-5.65	0.8

LTE Band 17, 10MHz 16QAM					
Limit		704	716	Delta (Hz)	Frequency Stability (ppm)
Condition		F _{Low}	F _{High}		
Temperature	Voltage	@-13dBm MHz	@-13dBm MHz		
Normal(25℃)	Normal	704.29	715.62		
Extreme(50℃)		704.2	715.63	-5.76	0.81
Extreme(40℃)		704.3	715.63	-7.48	1.05
Extreme(30℃)		704.31	715.62	-6.91	0.97
Extreme(10℃)		704.31	715.75	-6.04	0.85
Extreme(0℃)		704.15	715.66	-6.39	0.9
Extreme(-10℃)		704.33	715.62	-6.42	0.91
Extreme(-20℃)		704.32	715.78	-5.59	0.79
Extreme(-30℃)		704.34	715.63	5.32	0.75
25℃	+15%	704.28	715.62	6.52	0.92
	-15%	704.31	715.68	-7.06	0.99

5. Occupied Bandwidth Measurement

5.1 Test conditions

Temperature:	20	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

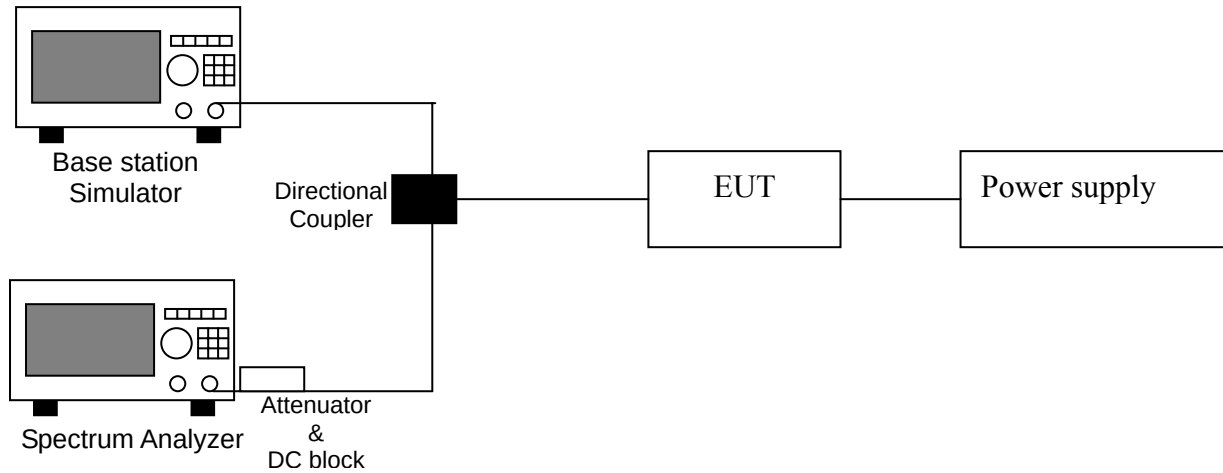
5.2 Limit for minimum occupied bandwidth

The occupied bandwidth (OBW), that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission,

5.4 Test procedure

1. The conducted occupied bandwidth test used the directional coupler via EUT RF power connector between Base station Simulator and spectrum analyzer.
2. Use OBW measurement function of Spectrum analyzer to measure 99 % Occupied bandwidth.

5.5 Test diagram

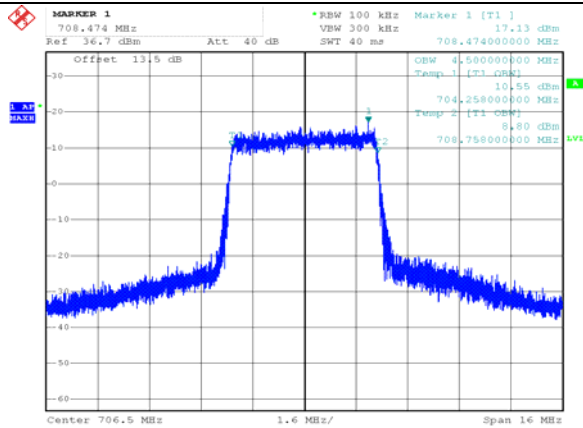


5.6 Test results

LTE Band 17									
Band Width	Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)		Band Width	Channel	Frequency (MHz)	26dB Occupied Bandwidth (MHz)	
			QPSK	16QAM				QPSK	16QAM
5MHz	23755	706.5	4.5	4.48	5MHz	23755	706.5	4.724	4.81
	23790	710	4.492	4.496		23790	710	4.76	4.874
	23825	713.5	4.492	4.502		23825	713.5	4.83	5.02
10MHz	23780	709	8.933	8.895	10MHz	23780	709	9.24	9.243
	23790	710	8.933	8.915		23790	710	9.24	9.33
	23800	711	8.928	8.913		23800	711	9.283	9.385

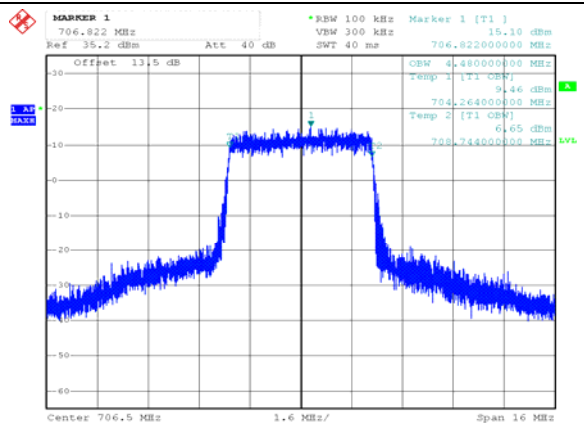
99% Occupied bandwidth

5 MHz / Low channel / QPSK



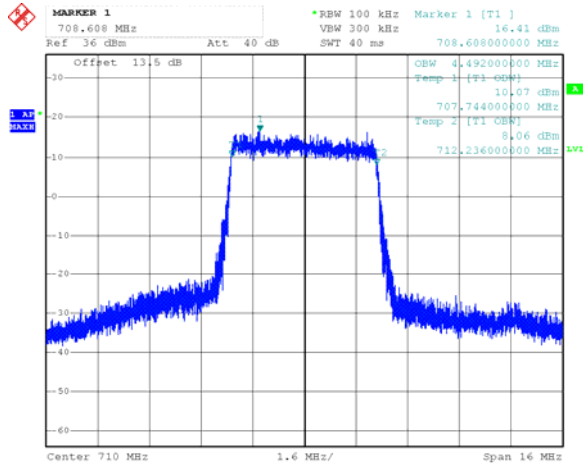
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5 MHz / Low channel / 16QAM



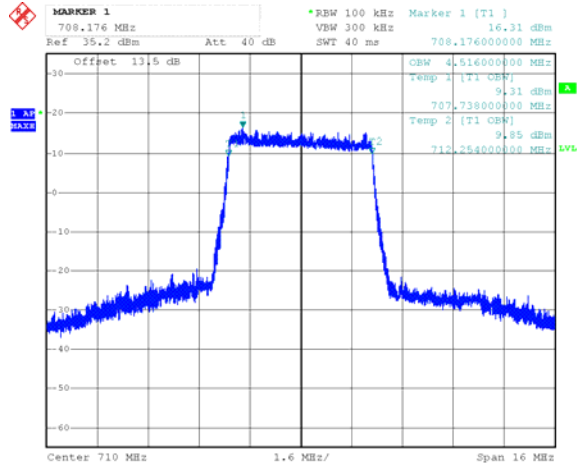
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5 MHz / Middle channel / QPSK



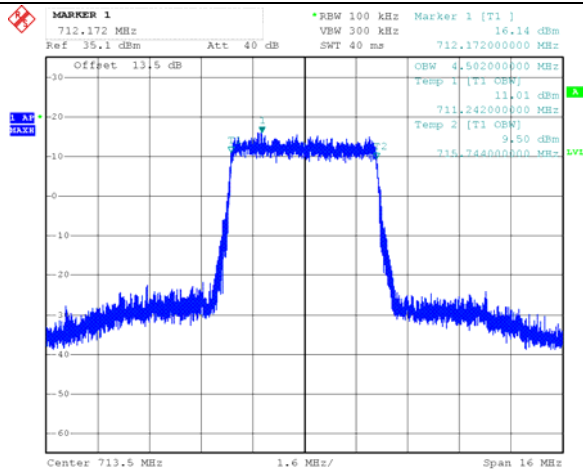
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5 MHz / Middle channel / 16QAM



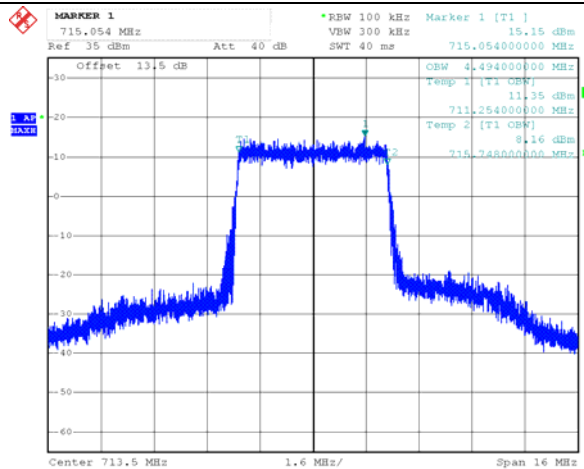
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5 MHz / High channel / QPSK



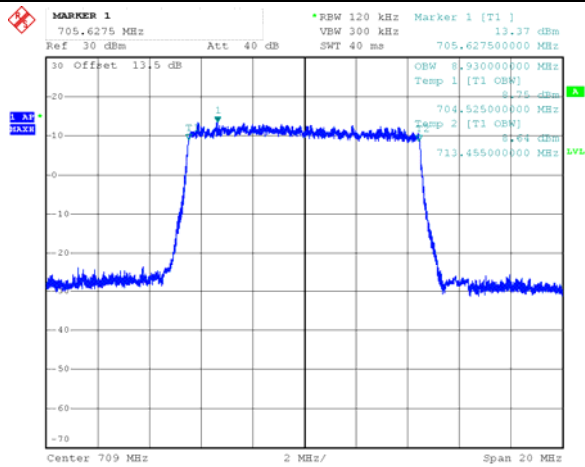
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5 MHz / High channel / 16QAM



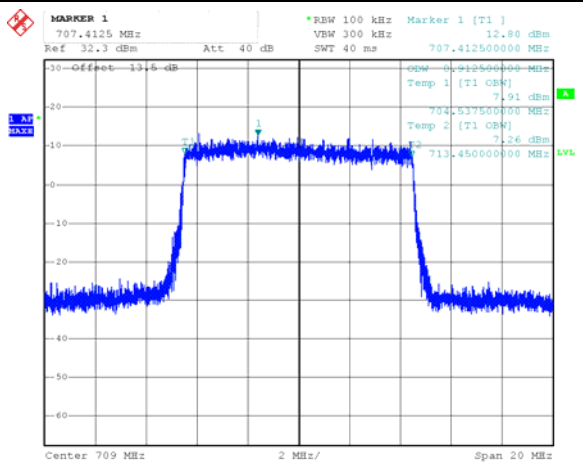
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10 MHz / Low channel / QPSK



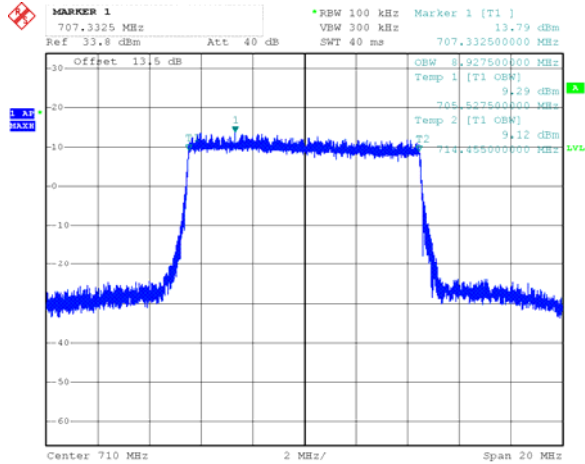
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10 MHz / Low channel / 16QAM



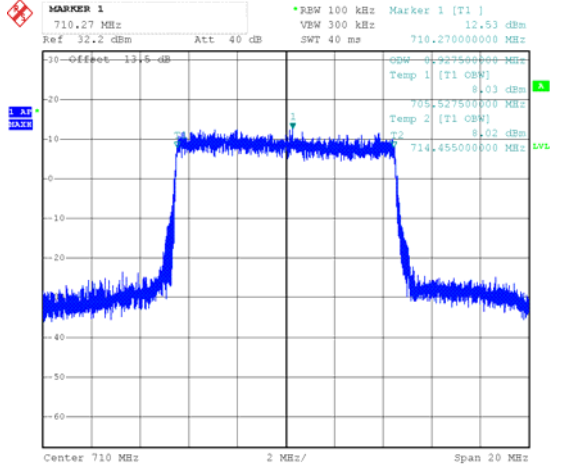
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10 MHz / Middle channel / QPSK



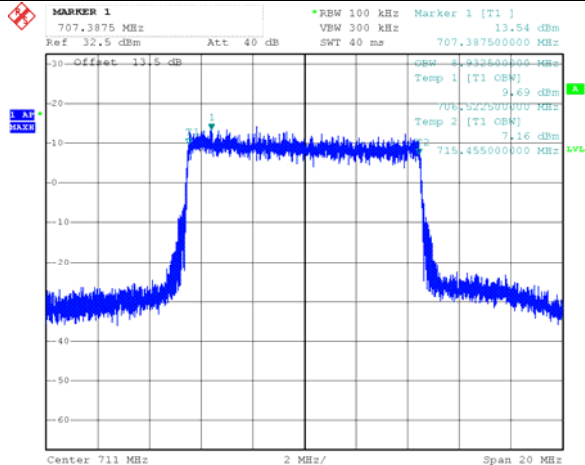
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10 MHz / Middle channel / 16QAM



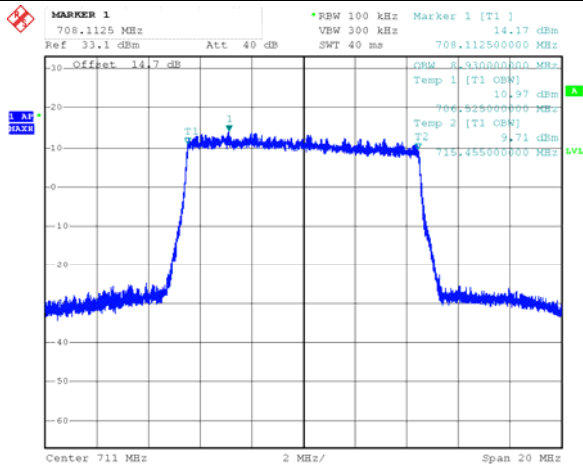
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10 MHz / High channel / QPSK



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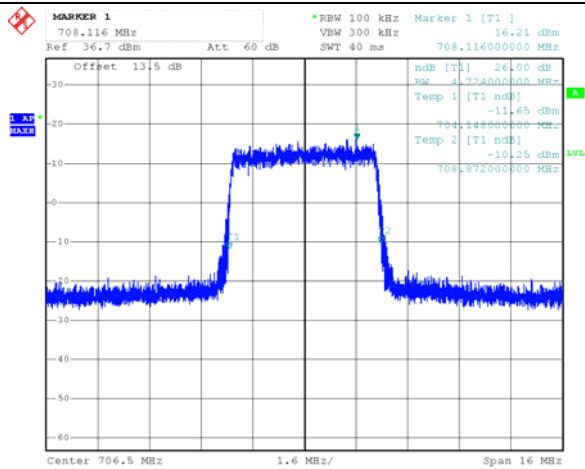
10 MHz / High channel / 16QAM



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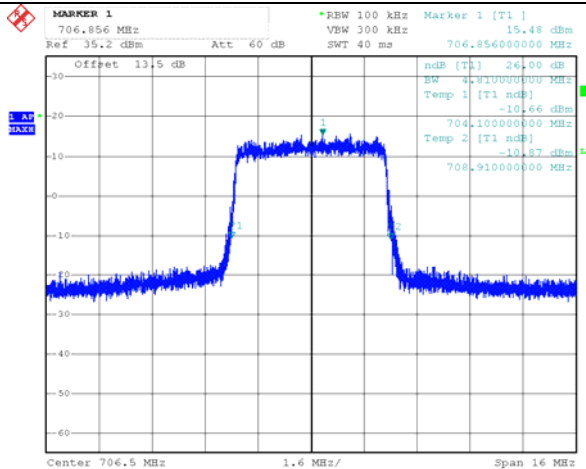
26 dB Occupied Bandwidth

5 MHz / Low channel / QPSK



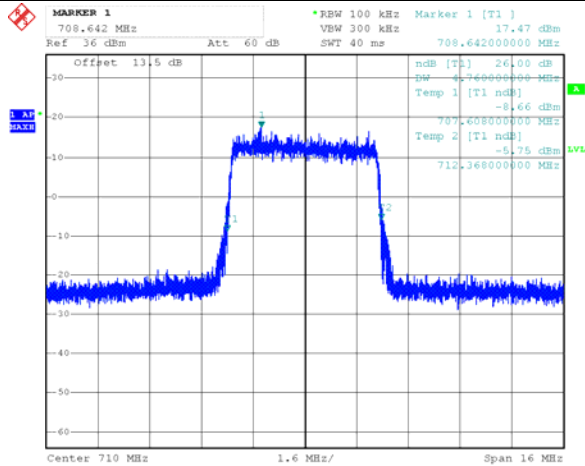
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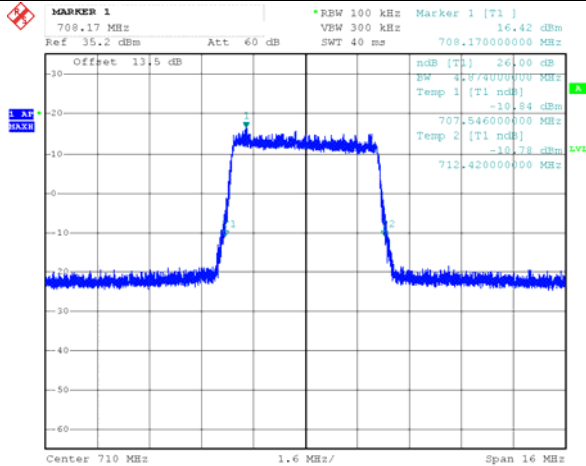
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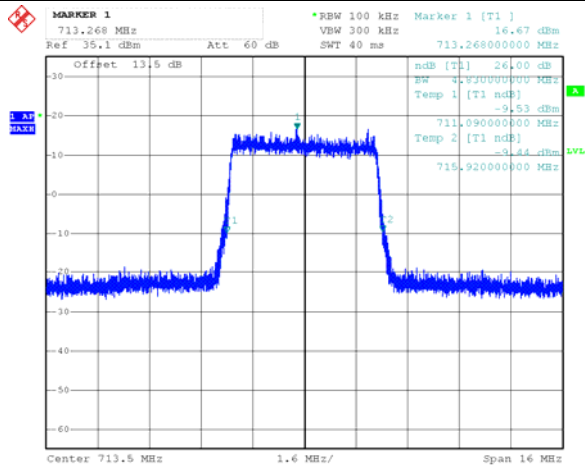
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5 MHz / Middle channel / 16QAM



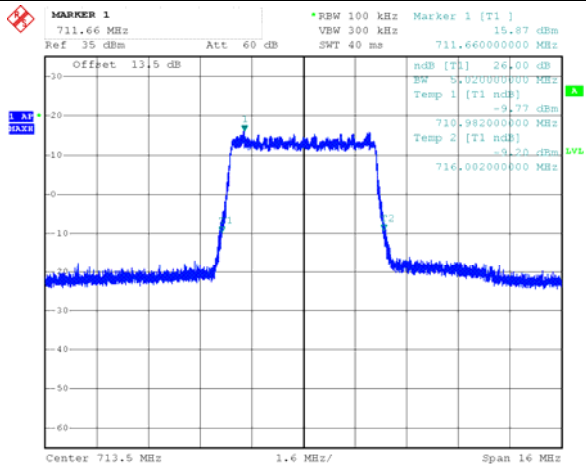
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Date: 23.OCT.2015 19:19:59

5 MHz / High channel / QPSK



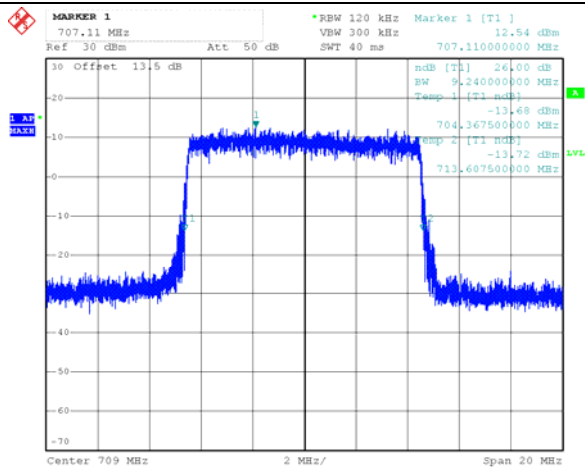
Comments: LTE-Band 17_QPSK_5_Chain0_713.5
Date: 23.OCT.2015 13:17:57

5 MHz / High channel / 16QAM



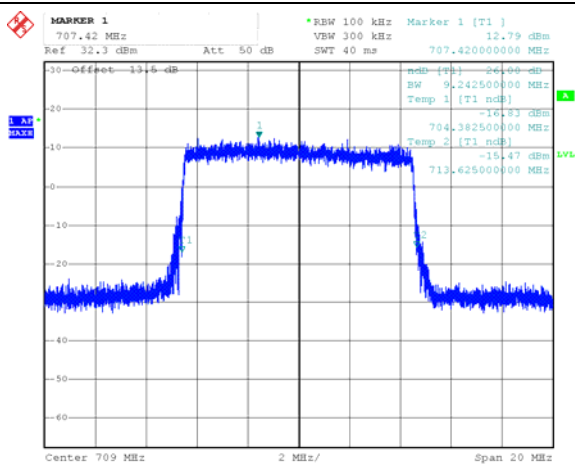
Comments: LTE-Band 17_16QAM_5_Chain0_713.5
Date: 23.OCT.2015 19:29:39

10 MHz / Low channel / QPSK



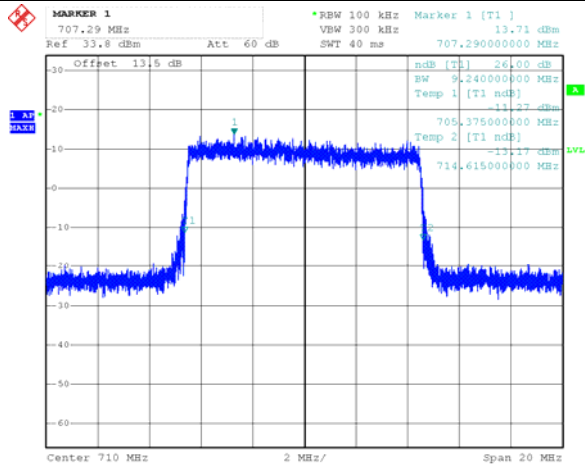
Comments: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 20:16:15

10 MHz / Low channel / 16QAM



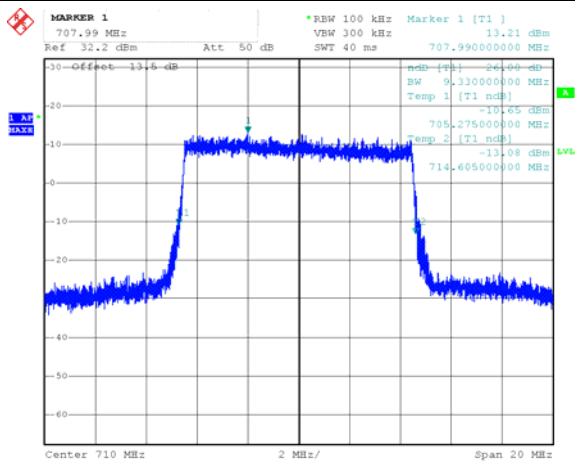
Comments: LTE-Band 17_16QAM_10_Chain0_709
Date: 23.OCT.2015 22:57:53

10 MHz / Middle channel / QPSK



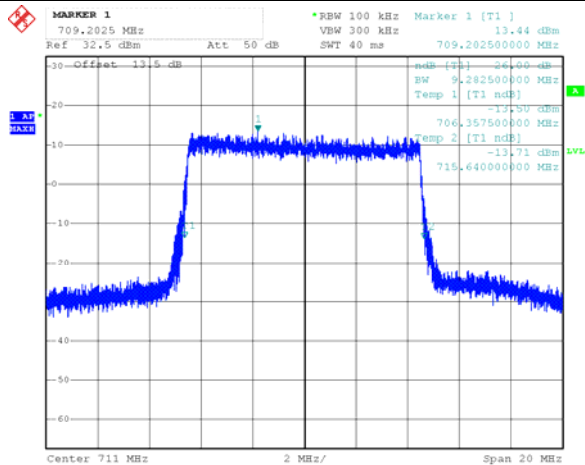
Comments: LTE-Band 17_QPSK_10_Chain0_710
Date: 23.OCT.2015 20:20:41

10 MHz / Middle channel / 16QAM



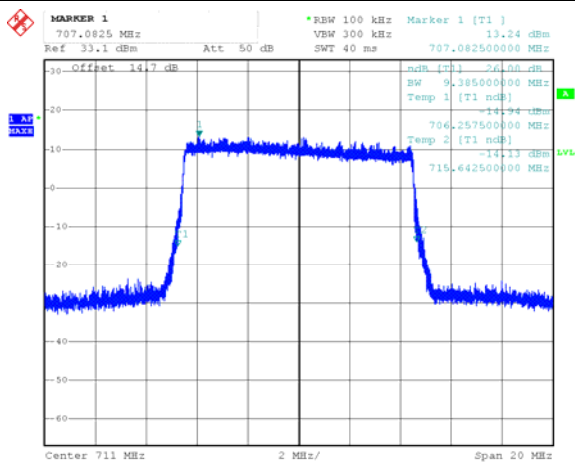
Comments: LTE-Band 17_16QAM_10_Chain0_710
Date: 23.OCT.2015 23:03:55

10 MHz / High channel / QPSK



Comments: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 20:24:27

10 MHz / High channel / 16QAM



Comments: LTE-Band 17_16QAM_10_Chain0_711
Date: 27.OCT.2015 21:11:48

6. Peak Excursion to Average Ratio

6.1 Test conditions

Temperature:	20	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

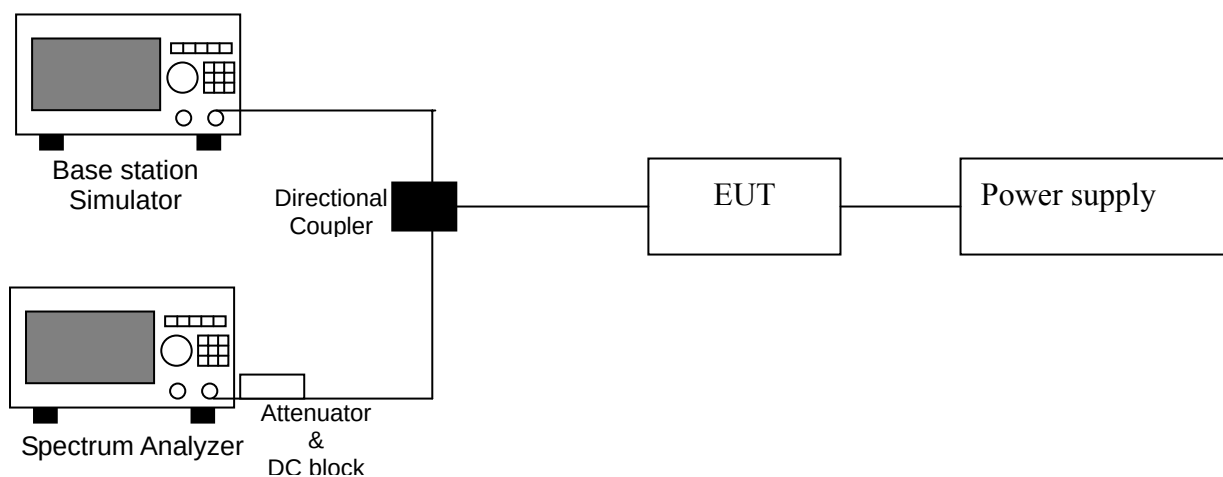
6.2 Limit for peak excursion to average ratio

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

6.3 Test procedure

1. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

6.4 Test diagram



6.5 Test results

Band 17					
BW	Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Pass/Fail
			QPSK	16QAM	
5 MHz	23790	710	5.155	5.494	Pass
10 MHz	23790	710	4.786	6.061	Pass

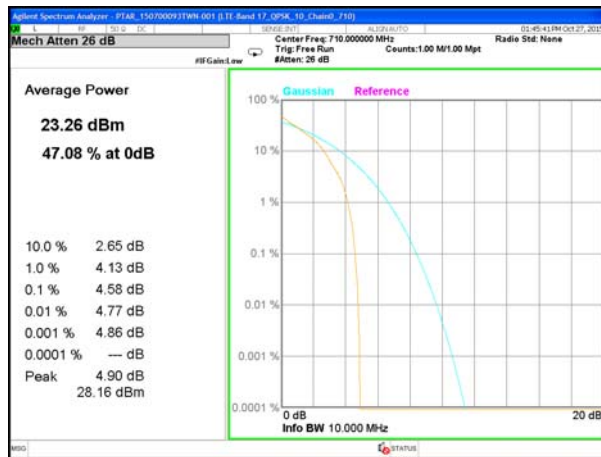
5 MHz / QPSK



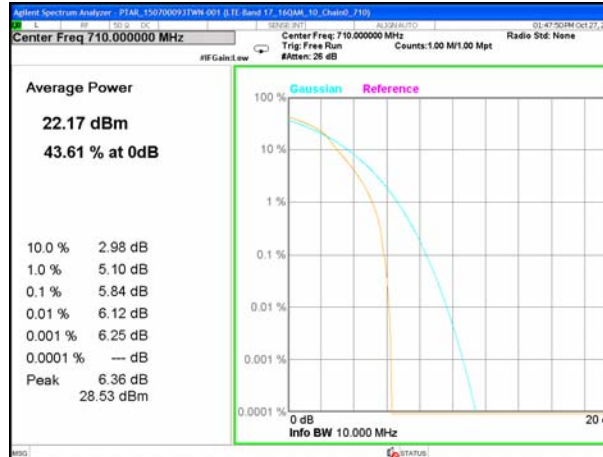
5 MHz / 16QAM



10 MHz / QPSK



10 MHz / 16QAM



7. Emission on the Band Edge

7.1 Test conditions

Temperature:	20	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

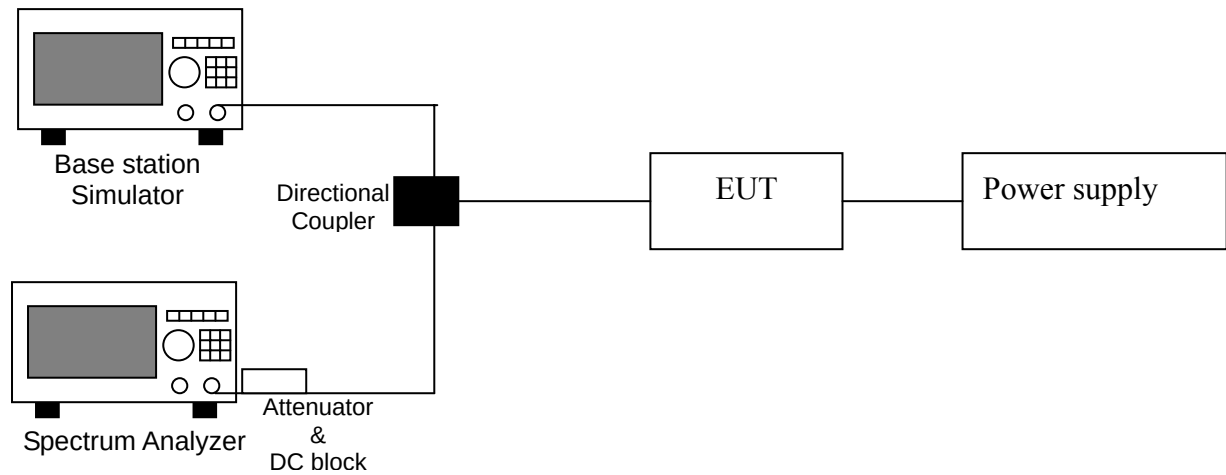
7.2 Limit for emission on the band edge

For operations in the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

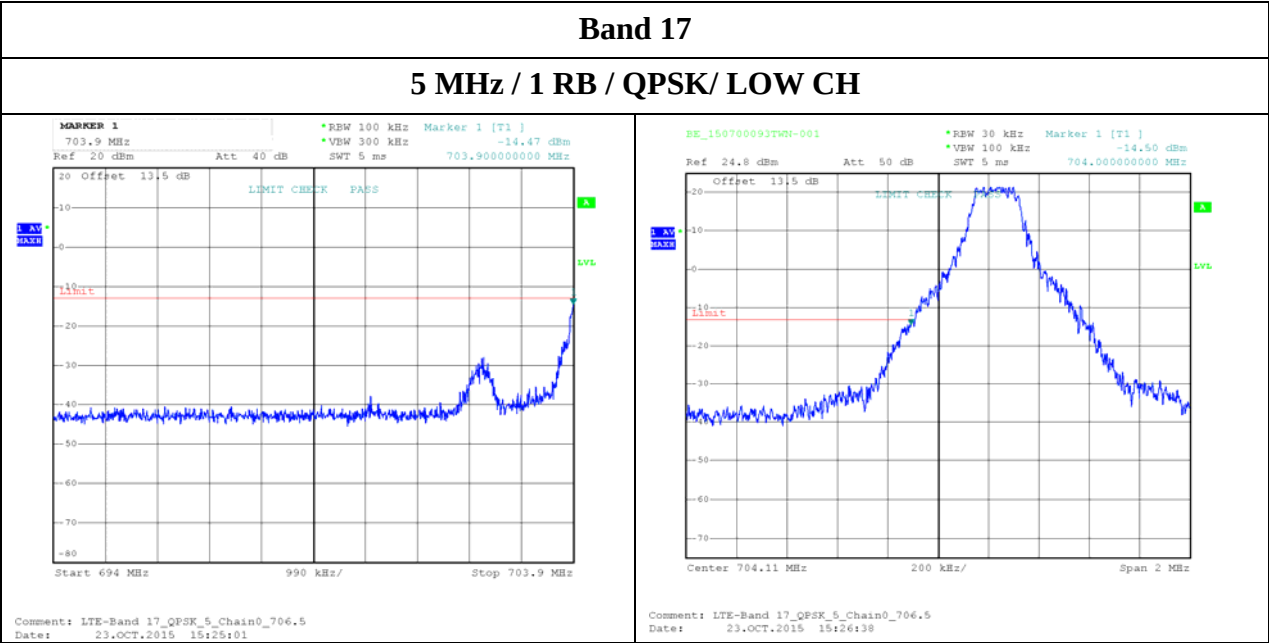
7.3 Test procedure

1. The EUT was set up for the maximum peak power with LTE link data modulation.
The power was measured with Spectrum Analyzer. All measurements were done at 2 channels (lowest and highest operating channel for each band.).
2. The band edge measurement used the directional coupler via EUT RF power connector between Base station Simulator and spectrum analyzer.
3. Set the spectrum analyzer span to include the block edge frequency.
4. Set a marker to point the corresponding band edge frequency in each band.
5. Record the max trace plot into the test report.

7.4 Test diagram

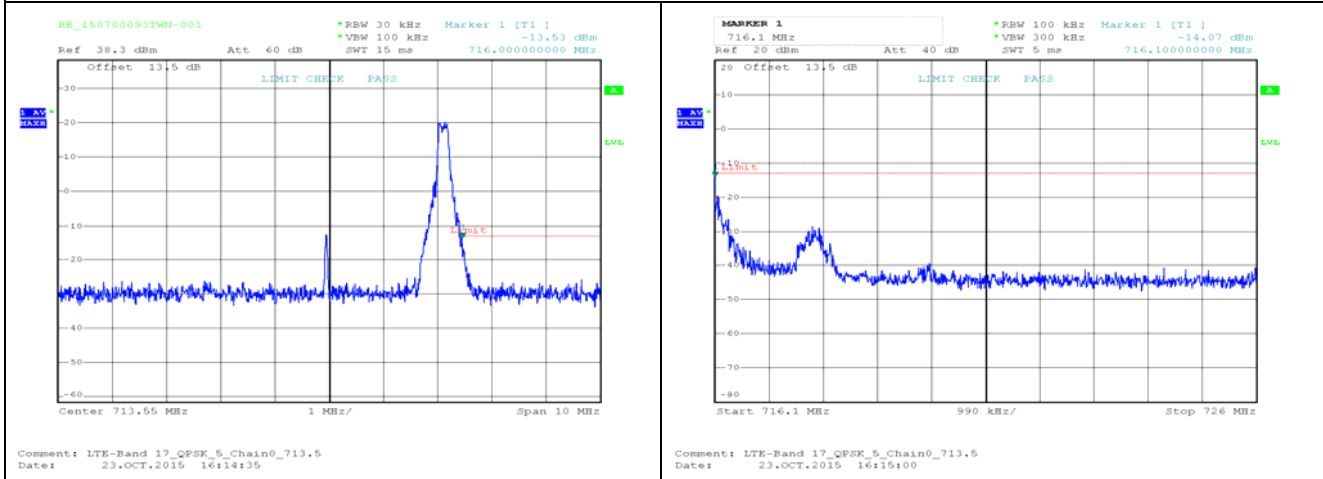


7.4 Test results

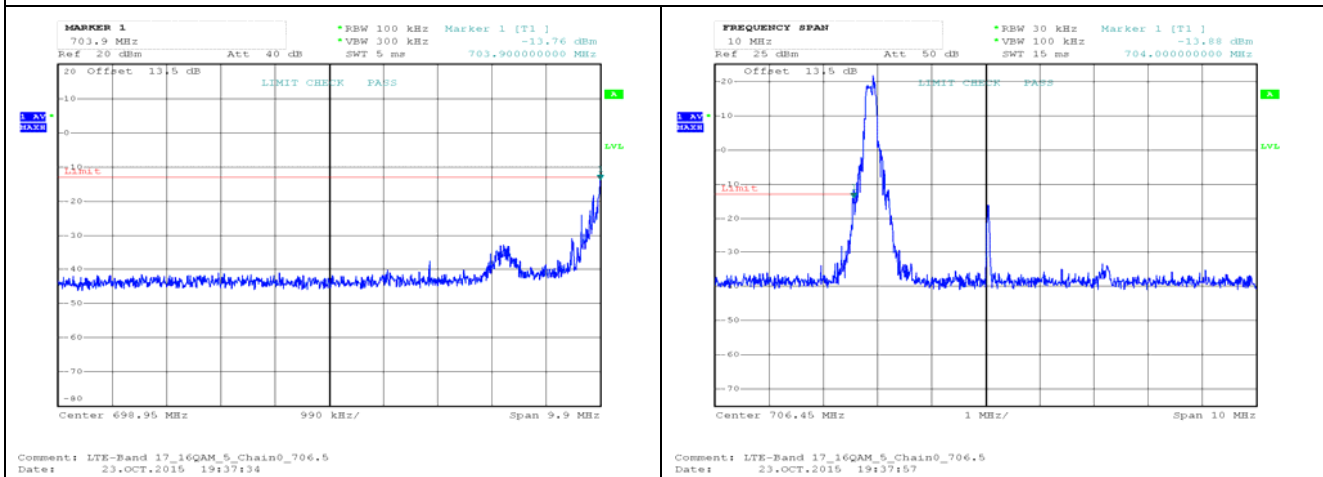


Band 17

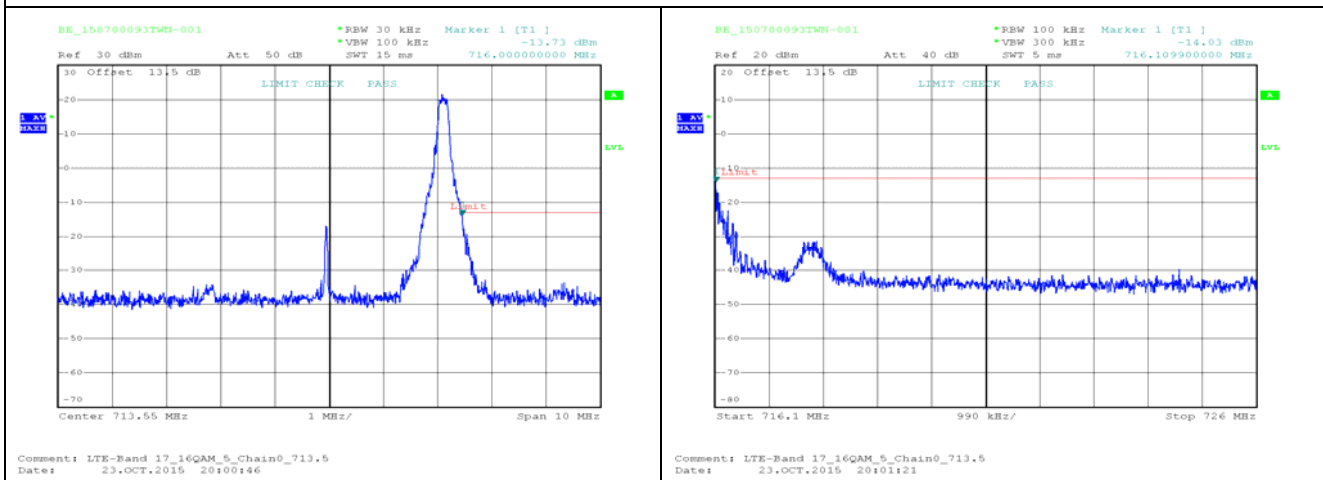
5 MHz / 1 RB / QPSK/ HIGH CH



5 MHz / 1 RB / 16QAM/ LOW CH

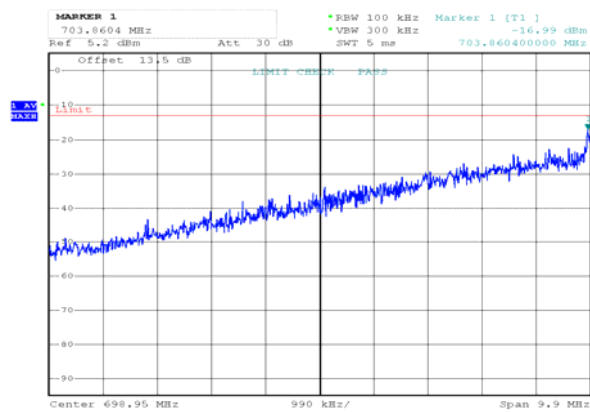


5 MHz / 1 RB / 16QAM / HIGH CH

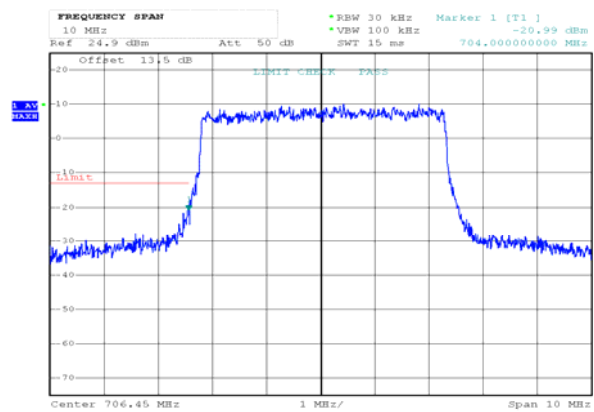


Band 17

5 MHz / Full RB / QPSK/ LOW CH

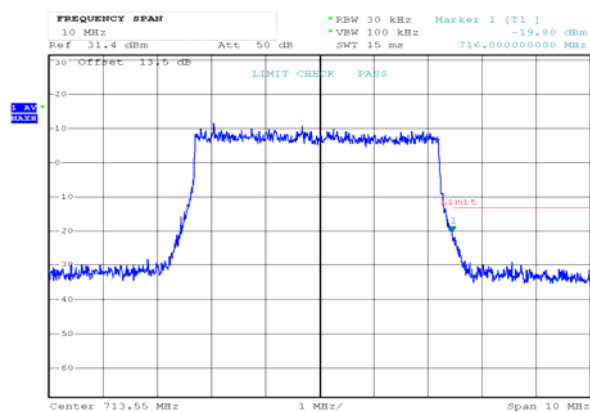


Comment: LTE-Band 17_QPSK_5_Chain0_706.5
Date: 23.OCT.2015 13:06:11

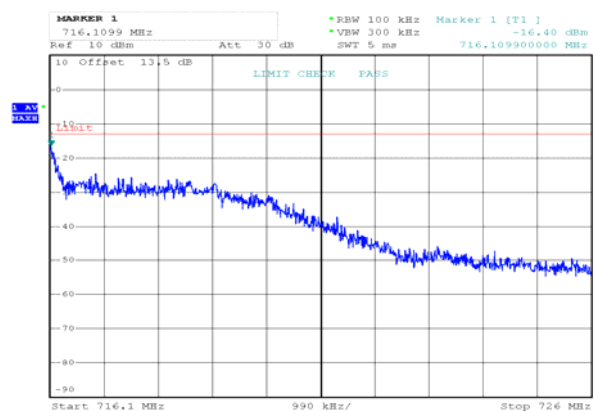


Comment: LTE-Band 17_QPSK_5_Chain0_706.5
Date: 23.OCT.2015 13:06:11

5 MHz / Full RB / QPSK/ HIGH CH

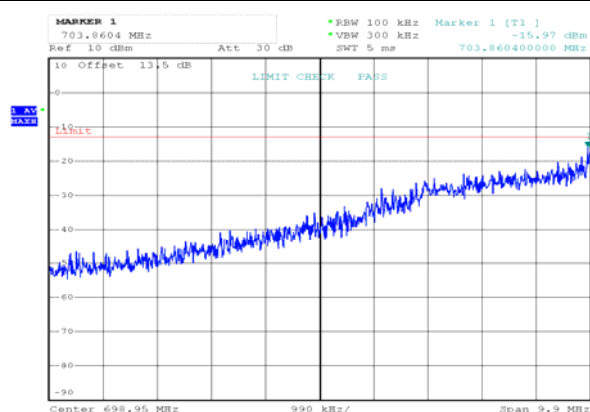


Comment: LTE-Band 17_QPSK_5_Chain0_713.5
Date: 23.OCT.2015 13:20:16

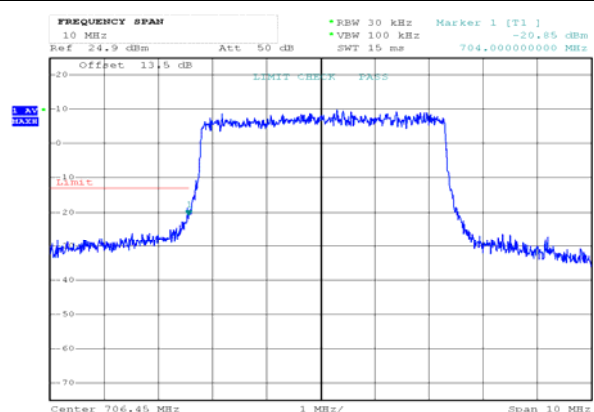


Comment: LTE-Band 17_QPSK_5_Chain0_713.5
Date: 23.OCT.2015 13:21:03

5 MHz / Full RB / 16QAM/ LOW CH



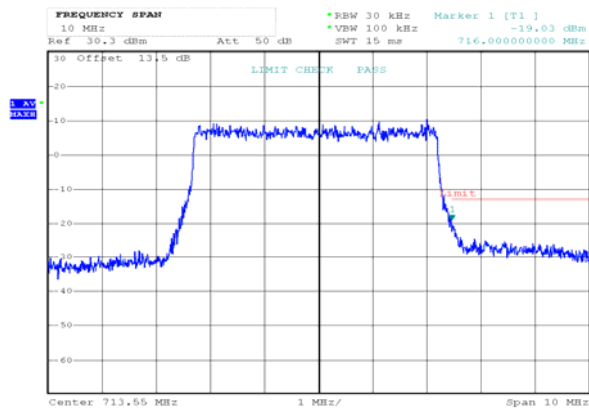
Comment: LTE-Band 17_16QAM_5_Chain0_706.5
Date: 23.OCT.2015 19:15:02



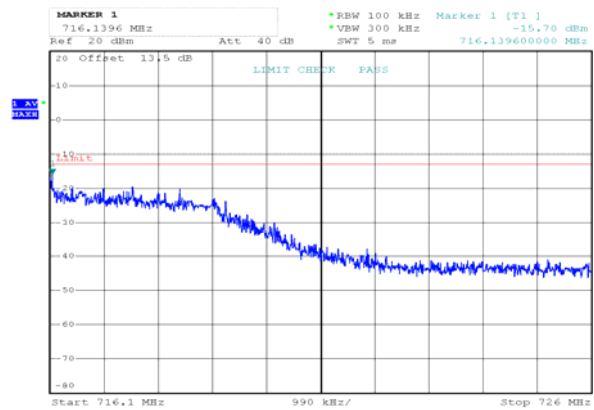
Comment: LTE-Band 17_16QAM_5_Chain0_706.5
Date: 23.OCT.2015 19:15:10

Band 17

5 MHz / Full RB / 16QAM/ HIGH CH

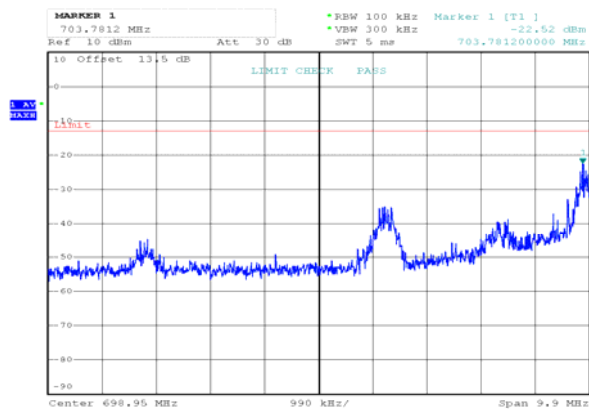


Comment: LTE-Band 17_16QAM_5_Chain0_713.5
Date: 23.OCT.2015 19:31:31

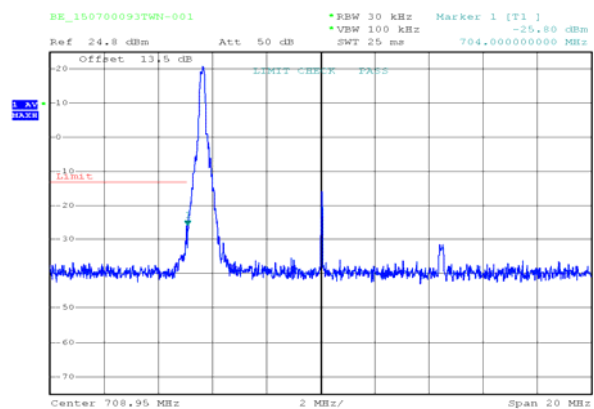


Comment: LTE-Band 17_16QAM_5_Chain0_713.5
Date: 23.OCT.2015 19:32:03

10 MHz / 1 RB / QPSK/ LOW CH

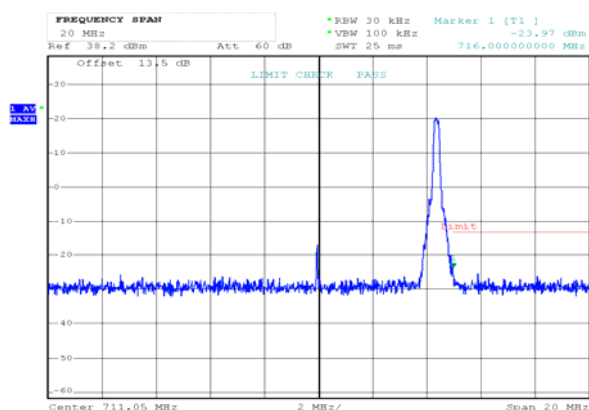


Comment: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 22:37:44

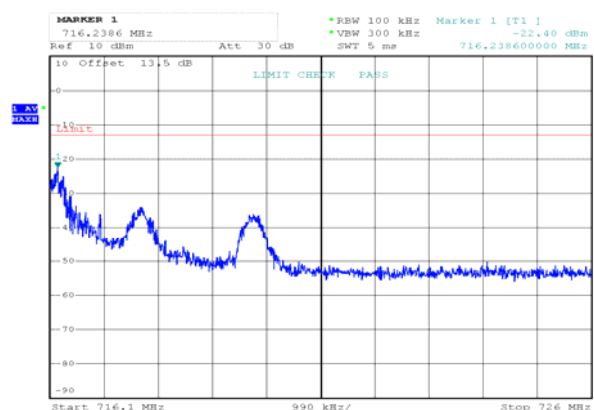


Comment: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 22:38:48

10 MHz / 1 RB / QPSK/ HIGH CH



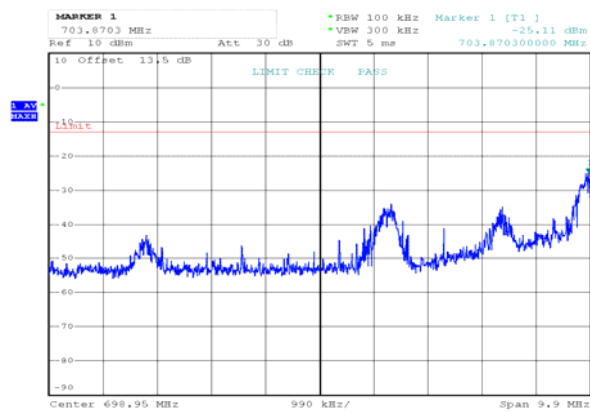
Comment: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 22:54:47



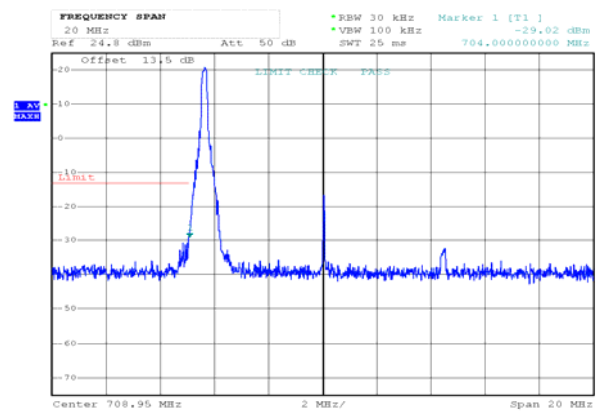
Comment: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 22:55:19

Band 17

10 MHz / 1 RB / 16QAM/ LOW CH

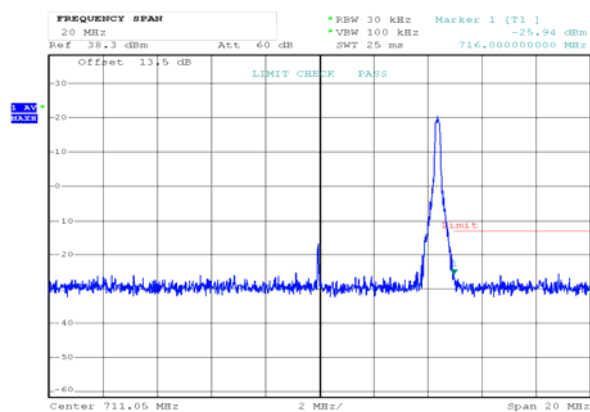


Comment: LTE-Band 17_16QAM_10_Chain0_709
Date: 23.OCT.2015 23:09:02

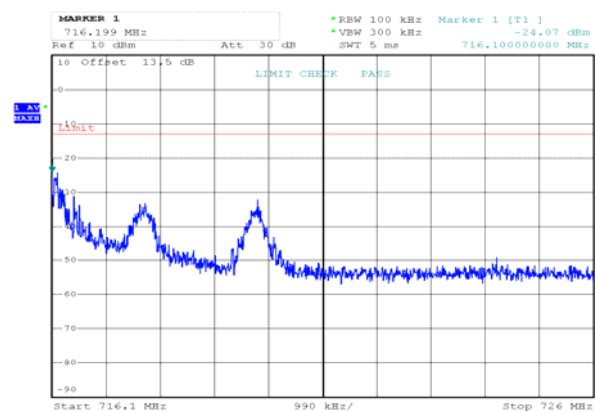


Comment: LTE-Band 17_16QAM_10_Chain0_709
Date: 23.OCT.2015 23:09:26

10 MHz / 1 RB / 16QAM/ HIGH CH

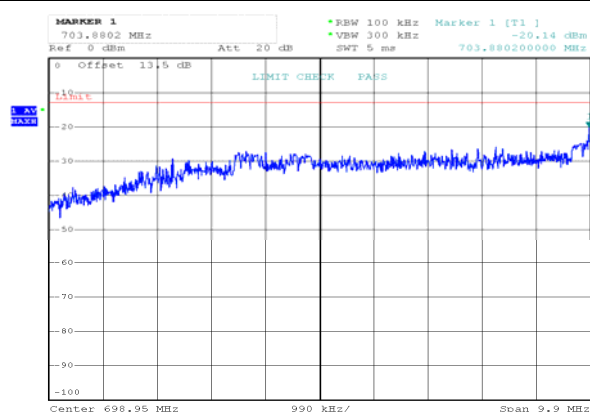


Comment: LTE-Band 17_16QAM_10_Chain0_711
Date: 23.OCT.2015 23:31:34

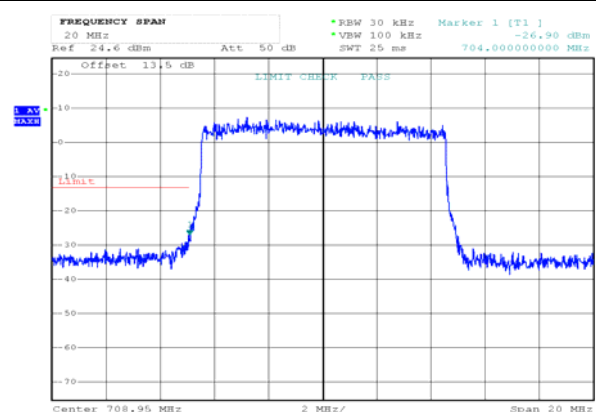


Comment: LTE-Band 17_16QAM_10_Chain0_711
Date: 23.OCT.2015 23:32:06

10 MHz / Full RB / QPSK/ LOW CH



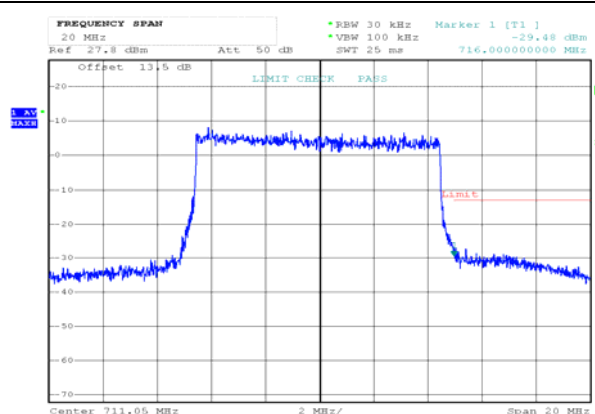
Comment: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 20:18:27



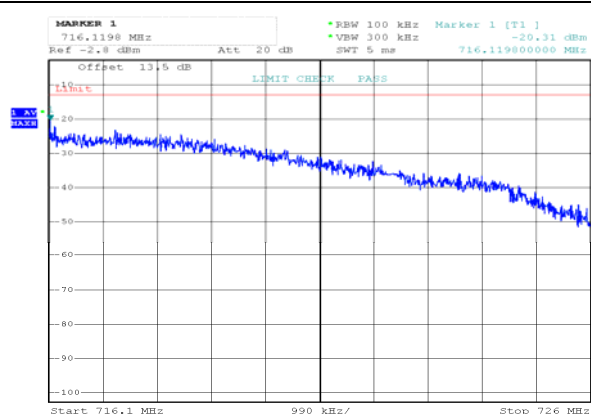
Comment: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 20:18:48

Band 17

10 MHz / Full RB / QPSK/ HIGH CH

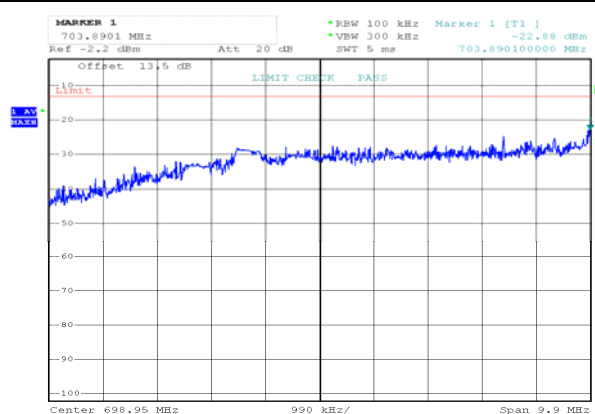


Comment: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 20:26:42

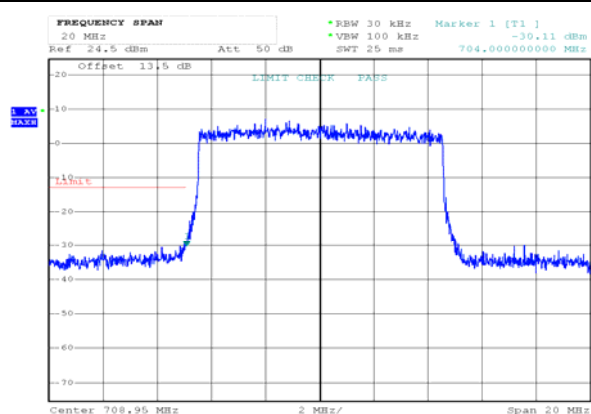


Comment: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 20:27:04

10 MHz / Full RB / 16QAM/ LOW CH

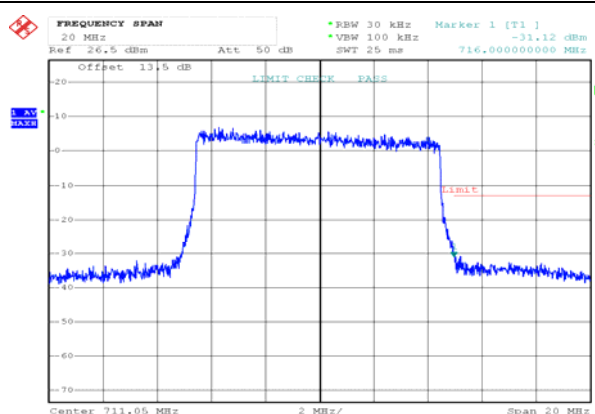


Comment: LTE-Band 17_16QAM_10_Chain0_709
Date: 23.OCT.2015 23:00:15

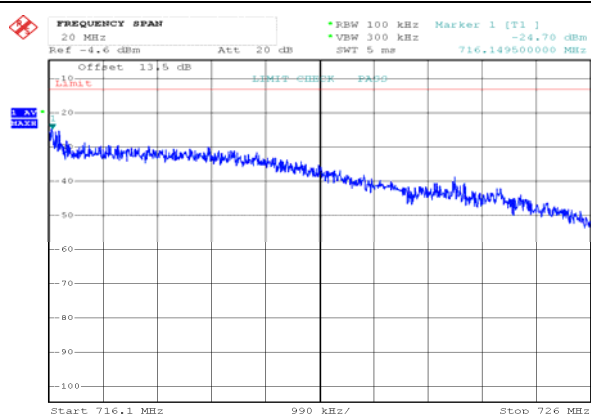


Comment: LTE-Band 17_16QAM_10_Chain0_709
Date: 23.OCT.2015 23:00:37

10 MHz / Full RB / 16QAM/ HIGH CH



Comment: LTE-Band 17_16QAM_10_Chain0_711
Date: 29.OCT.2015 15:02:19



Comment: LTE-Band 17_16QAM_10_Chain0_711
Date: 29.OCT.2015 15:02:40

8. Conducted Spurious Emissions

8.1 Test conditions

Temperature:	20	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

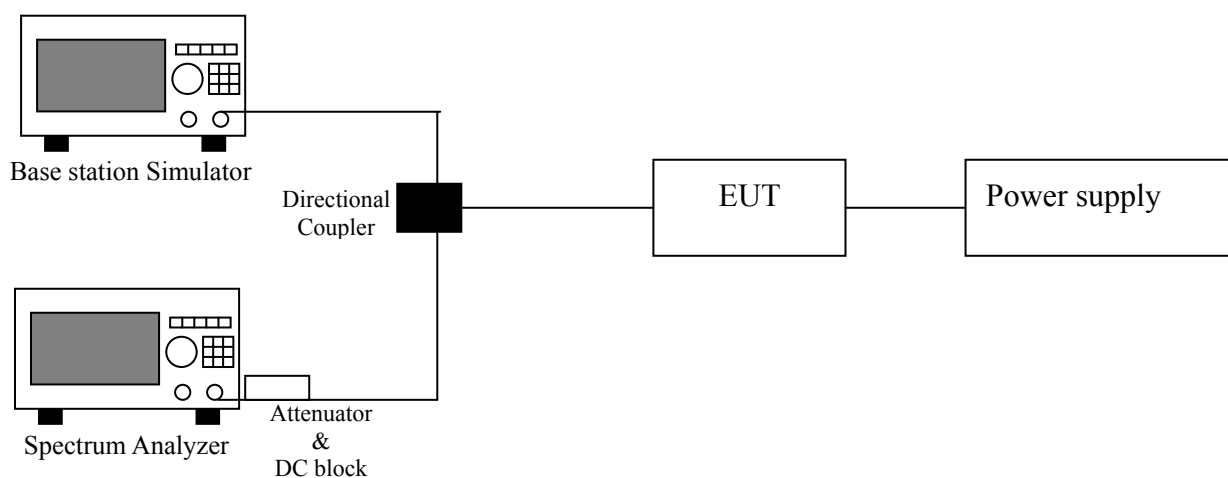
8.2 Limit for conducted spurious emissions

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm

8.3 Test procedure

1. The EUT connected to the Base station simulator. All measurements were done at low, middle and high operational frequency range.
2. Measuring frequency range is from 30 MHz to 10^{th} harmonic for LTE Band 17. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

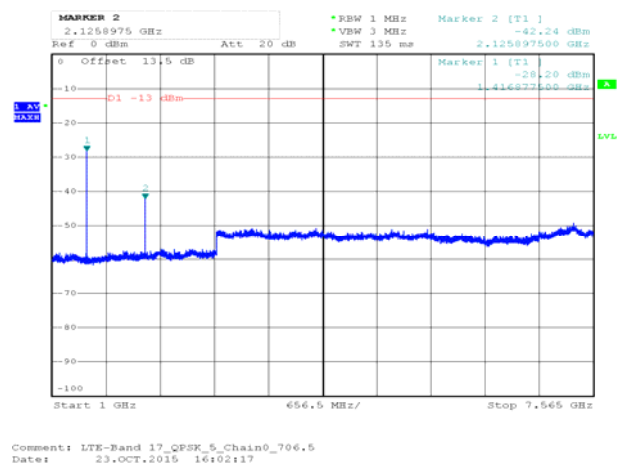
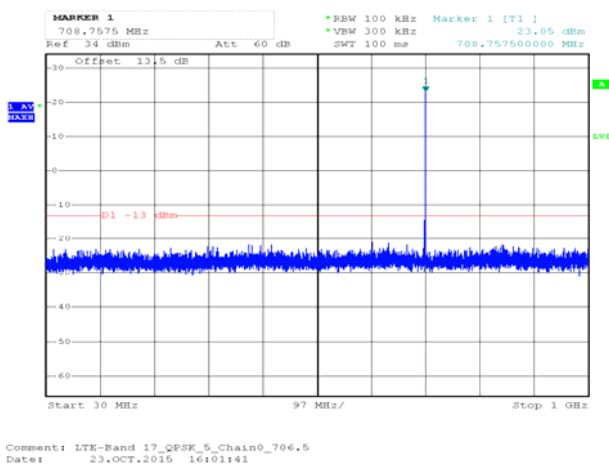
8.4 Test diagram



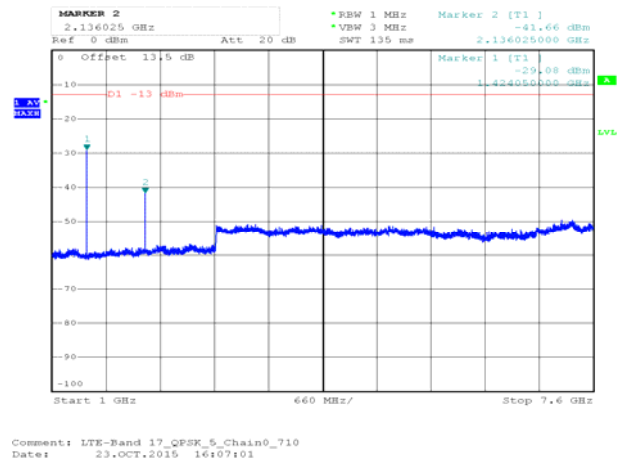
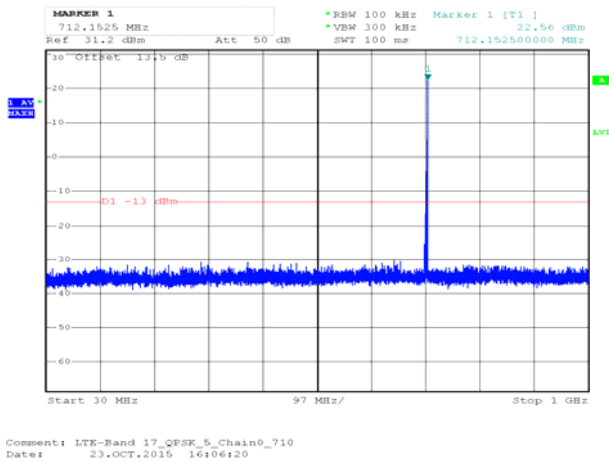
8.5 Test results

Band 17

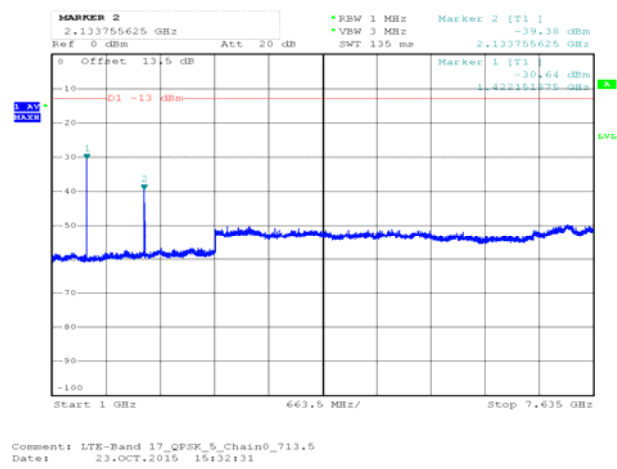
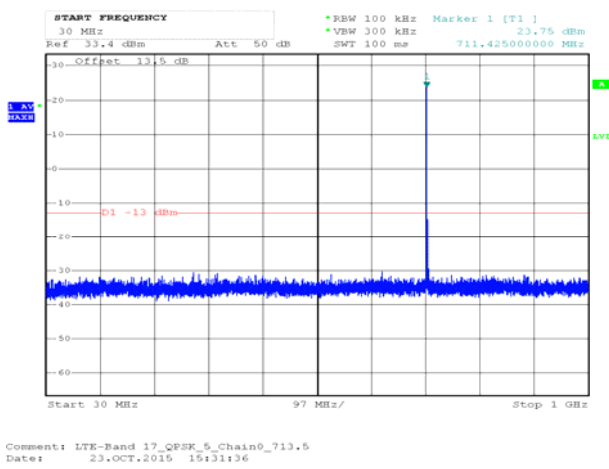
5 MHz / QPSK/ LOW CH



5 MHz / QPSK/ MIDDLE CH

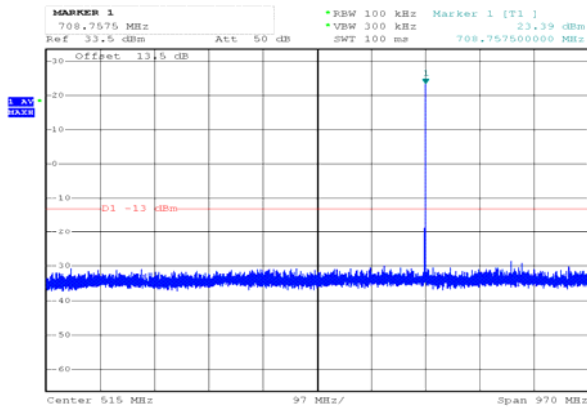


5 MHz / QPSK/ HIGH CH

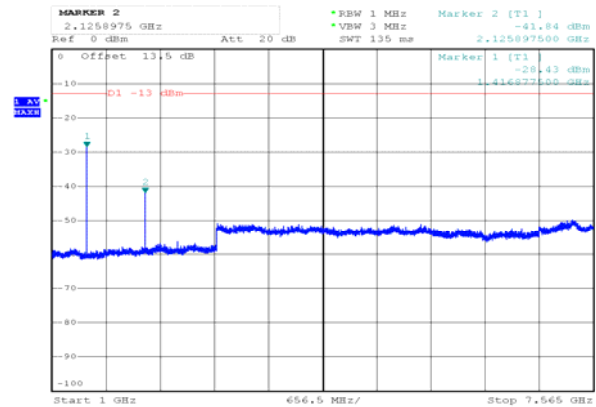


Band 17

5 MHz / 16QAM/ LOW CH

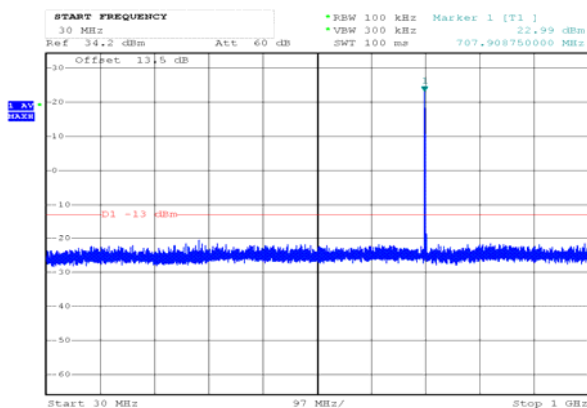


Comment: LTE-Band 17_16QAM_5_Chain0_706.5
Date: 23.OCT.2015 19:49:35

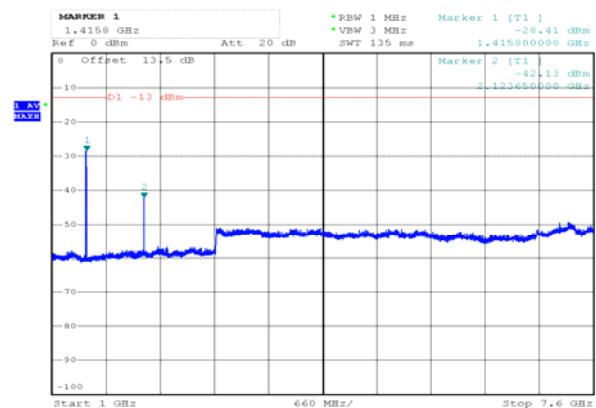


Comment: LTE-Band 17_16QAM_5_Chain0_706.5
Date: 23.OCT.2015 19:50:10

5 MHz / 16QAM/ MIDDLE CH

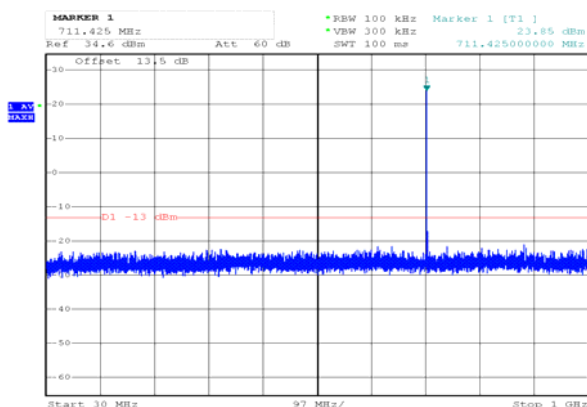


Comment: LTE-Band 17_16QAM_5_Chain0_710
Date: 23.OCT.2015 19:41:33

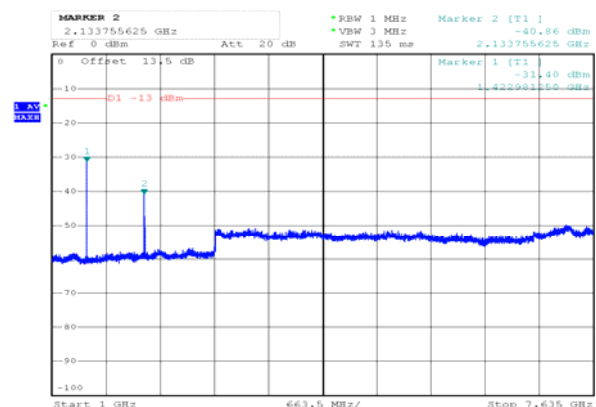


Comment: LTE-Band 17_16QAM_5_Chain0_710
Date: 23.OCT.2015 19:42:18

5 MHz / 16QAM/ HIGH CH



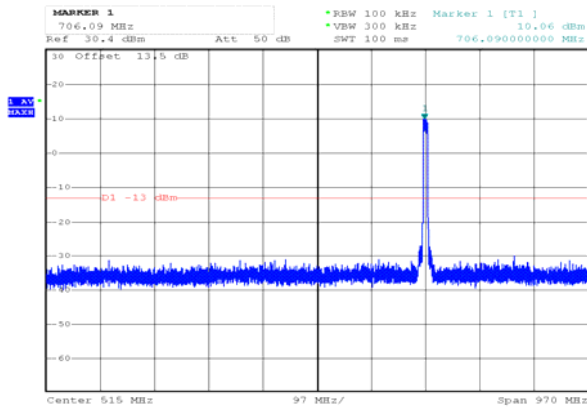
Comment: LTE-Band 17_16QAM_5_Chain0_713.5
Date: 23.OCT.2015 19:45:15



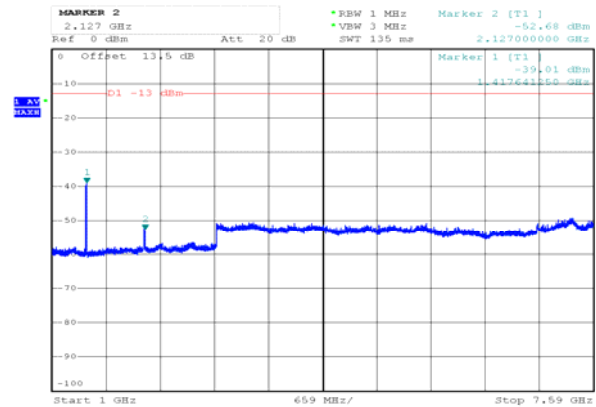
Comment: LTE-Band 17_16QAM_5_Chain0_713.5
Date: 23.OCT.2015 19:45:15

Band 17

10 MHz / QPSK/ LOW CH

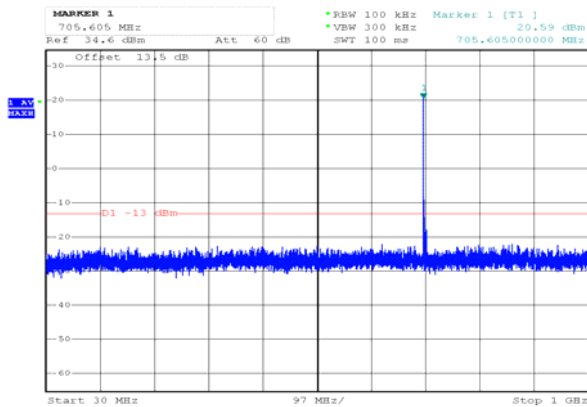


Comment: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 20:16:46

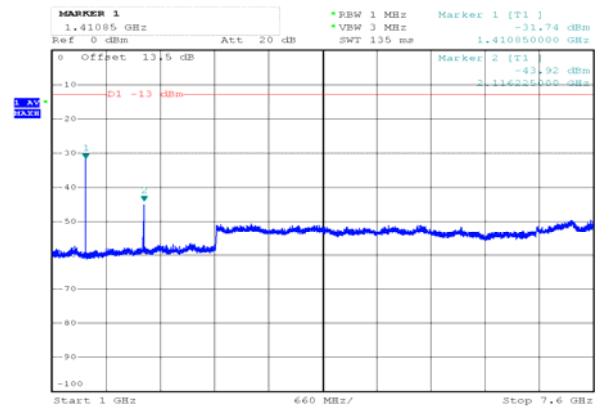


Comment: LTE-Band 17_QPSK_10_Chain0_709
Date: 23.OCT.2015 20:17:44

10 MHz / QPSK/ MIDDLE CH

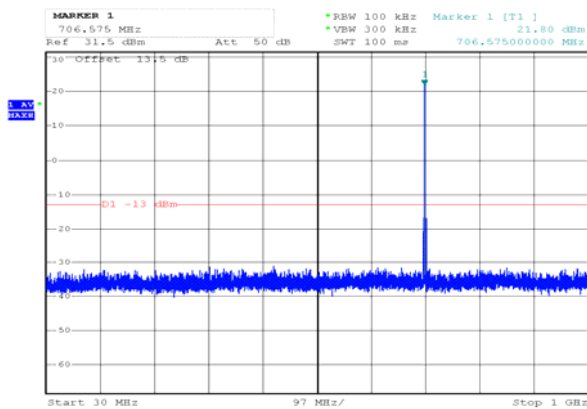


Comment: LTE-Band 17_QPSK_10_Chain0_710
Date: 23.OCT.2015 22:13:45

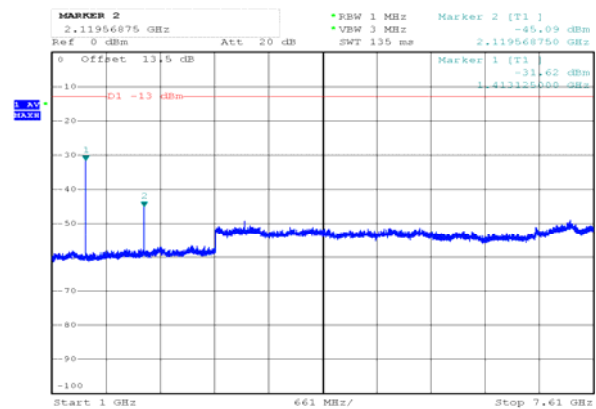


Comment: LTE-Band 17_QPSK_10_Chain0_710
Date: 23.OCT.2015 22:14:29

10 MHz / QPSK/ HIGH CH



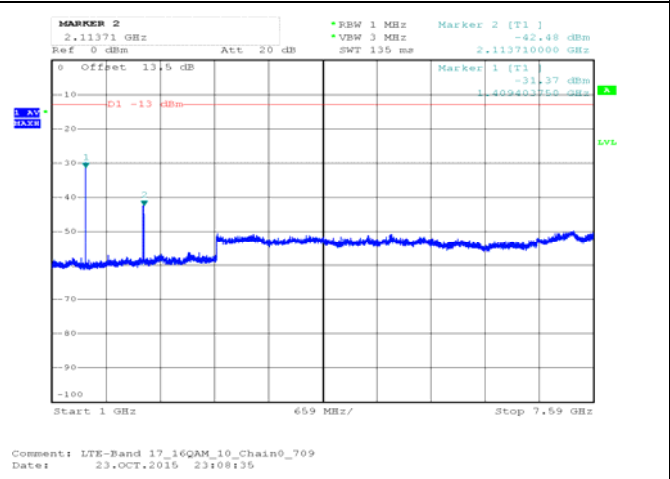
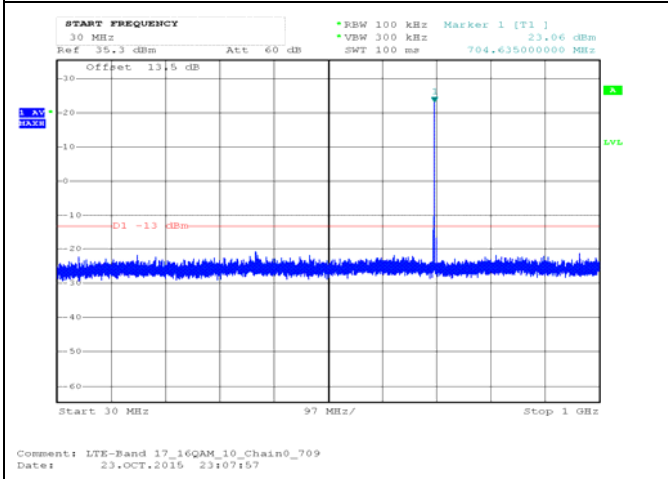
Comment: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 22:43:06



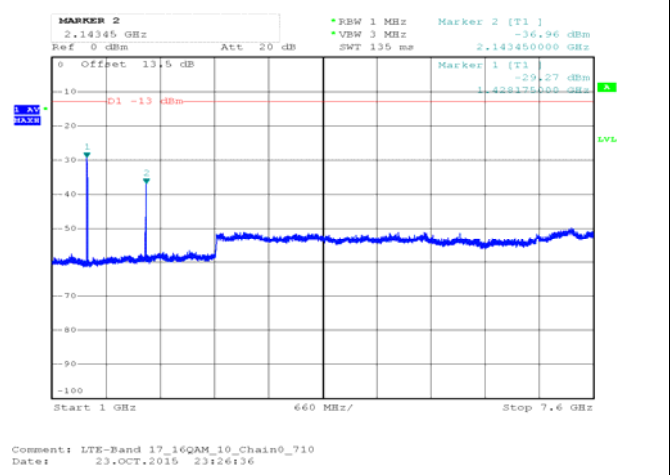
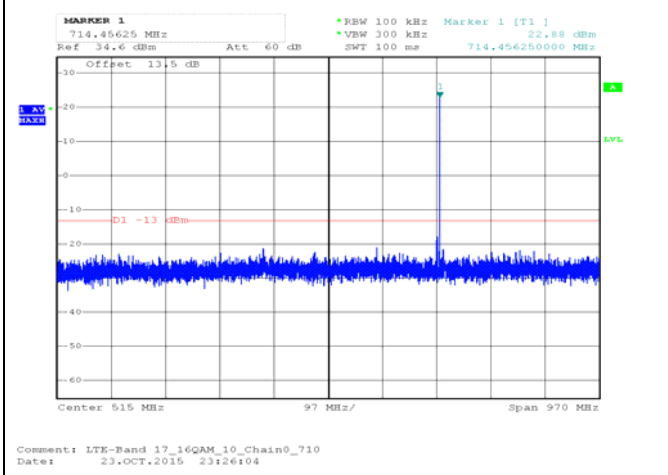
Comment: LTE-Band 17_QPSK_10_Chain0_711
Date: 23.OCT.2015 22:43:43

Band 17

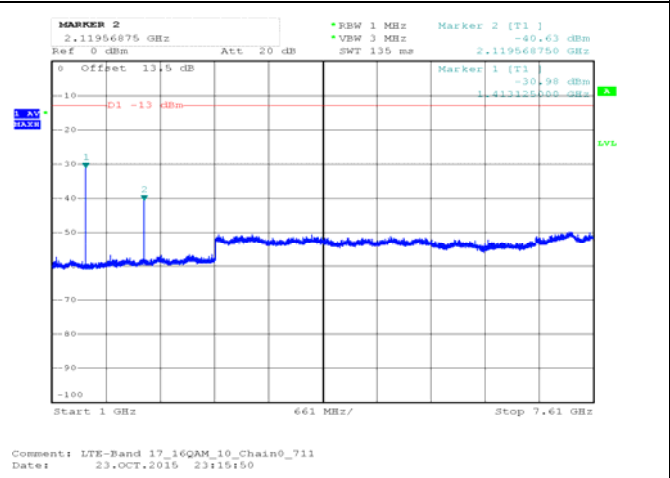
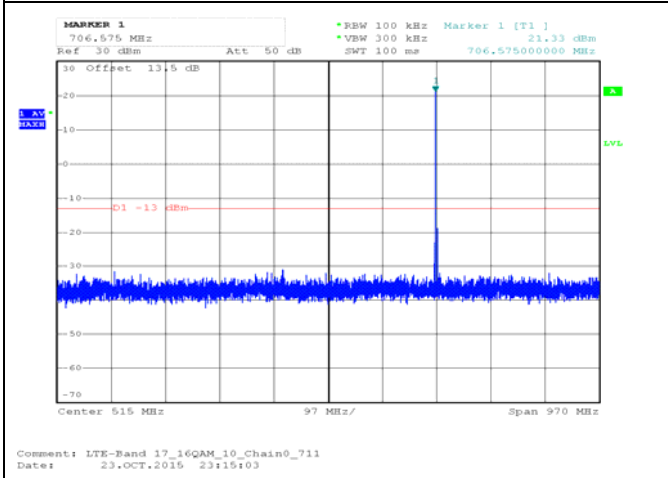
10 MHz / 16QAM/ LOW CH



10 MHz / 16QAM/ MIDDLE CH



10 MHz / 16QAM/ HIGH CH



9. Radiated Emission Measurement

9.1 Test conditions

Temperature:	20	°C
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

9.2 Limit for radiated emission measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB. The limit of emission equal to -13dBm

9.3 Test procedure

1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the turn table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value“ of step a. Record the power level of S.G

3. EIRP = Output power level of S.G –TX cable loss + Antenna gain of substitution horn.
4. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

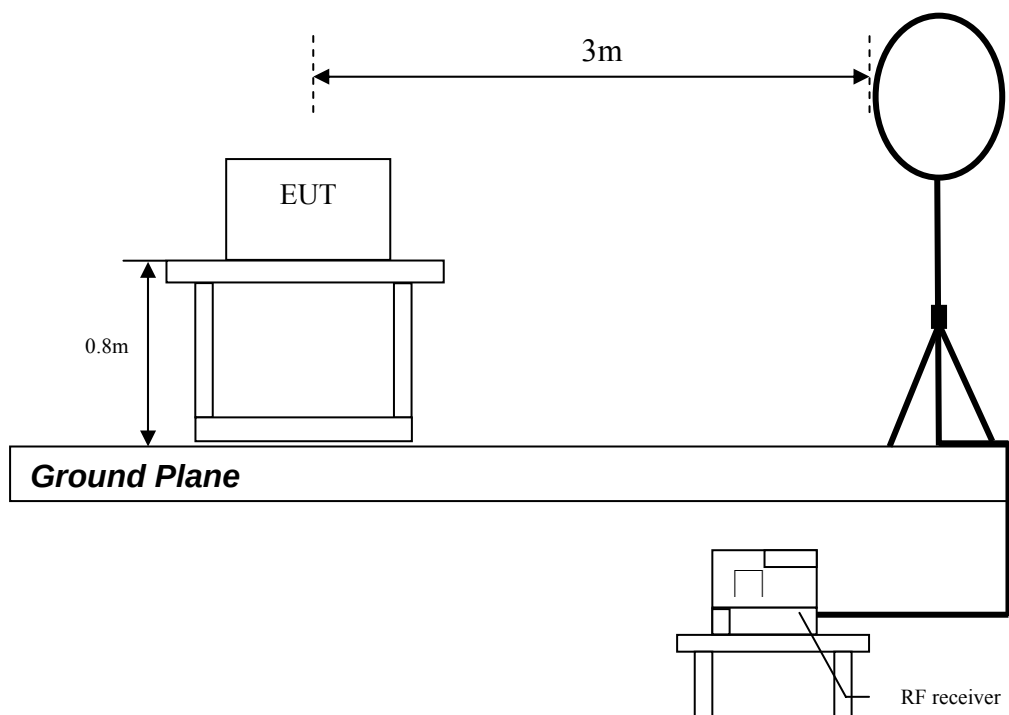
NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

9.4 Test diagram

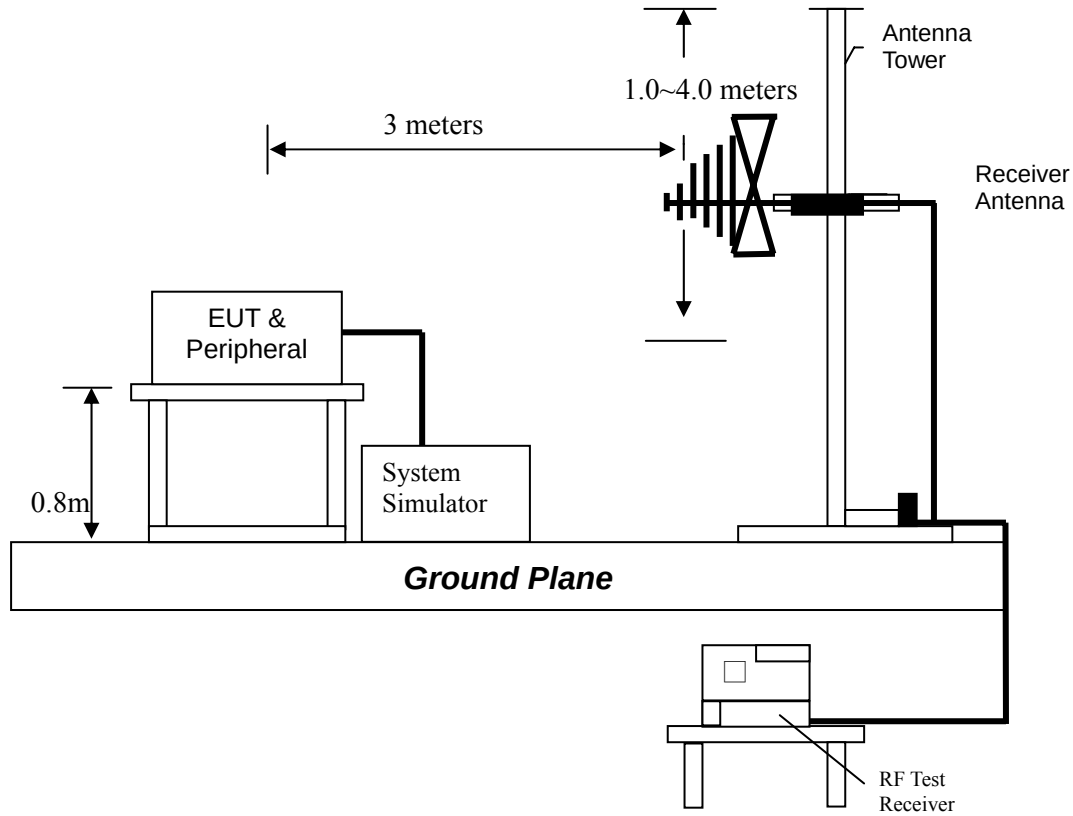
The EUT can only placement in one orthogonal axis.
The final test data was executed under this configuration.

9.5 Test configuration

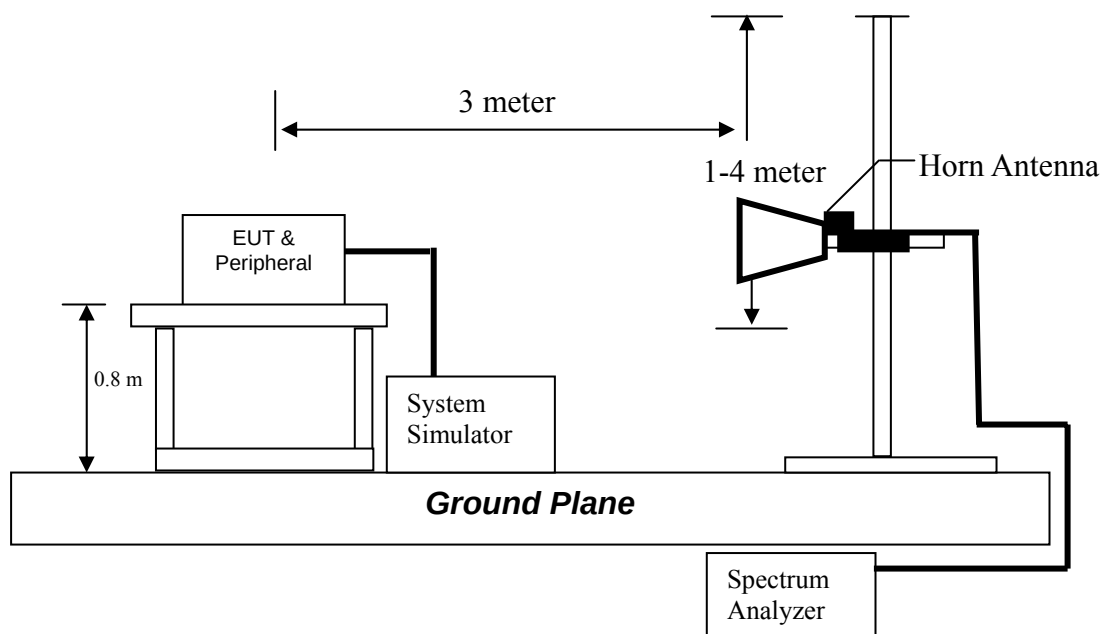
9.5.1 Radiated emission from 9 kHz to 30MHz using Loop Antenna



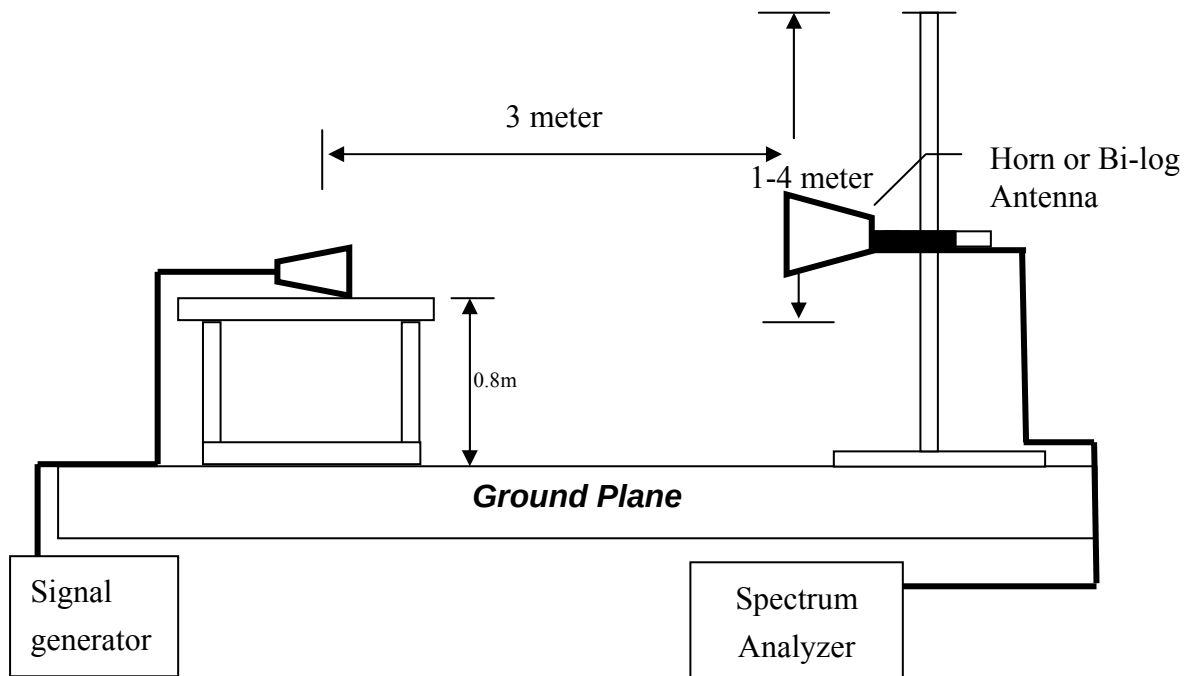
9.5.2 Radiated emission below 1GHz using Bilog Antenna



9.5.3 Radiated emission above 1GHz using Horn Antenna



9.5.4 Radiated emission with Substitution Antenna



9.5 Test results

Average E.R.P. for LTE Band 17

Channel Bandwidth: 5MHz

Mode	Channel	Vertical		Horizontal		Ant Gain (dBi)	Cable Loss (dB)	Result		Margin		Limit
		Frequency (MHz)	S.G. Value (dBm)	Frequency (MHz)	S.G. Value (dBm)			Ver	Hor	Ver	Hor	
QPSK	Low	1413	-62.77	1413	-62.04	8.15	2.39	-57.02	-56.29	-44.02	-43.29	-13
		2119.5	-51.73	2119.5	-44.52	9.19	2.92	-45.46	-38.25	-32.46	-25.25	-13
		2826	-60.68	2826	-70.59	9.67	3.43	-54.44	-64.35	-41.44	-51.35	-13
	Middle	1420	-55.73	1420	-57.13	8.18	2.40	-49.94	-51.34	-36.94	-38.34	-13
		2130	-59.37	2130	-59.06	9.21	2.94	-53.11	-52.80	-40.11	-39.80	-13
		2840	-66.87	N/A	N/A	9.66	3.44	-60.65	N/A	-47.65	N/A	-13
	High	1427	-70.26	1427	-70.11	8.22	2.40	-64.44	-64.29	-51.44	-51.29	-13
16QAM	Low	1413	-64.13	1413	-66.89	8.15	2.39	-58.38	-61.14	-45.38	-48.14	-13
		2119.5	-56.83	2119.5	-49.63	9.19	2.92	-50.56	-43.36	-37.56	-30.36	-13
		2826	-67.25	N/A	N/A	9.67	3.43	-61.01	N/A	-48.01	N/A	-13
		3532.5	-64.77	N/A	N/A	9.79	3.69	-58.67	N/A	-45.67	N/A	-13
	Middle	1420	-63.88	1420	-67.22	8.18	2.40	-58.09	-61.43	-45.09	-48.43	-13
		2130	-56.83	2130	-51.02	9.21	2.94	-50.57	-44.76	-37.57	-31.76	-13
		2840	-65.88	2840	-74.58	9.66	3.44	-59.66	-68.36	-46.66	-55.36	-13
		3550	-57.07	N/A	N/A	9.79	3.70	-50.98	N/A	-37.98	N/A	-13
	High	1427	-58.87	1427	-58.37	8.22	2.40	-53.05	-52.55	-40.05	-39.55	-13
		2140.5	-65.23	2140.5	-67.93	9.22	2.97	-58.97	-61.67	-45.97	-48.67	-13
		2854	-70.22	N/A	N/A	9.66	3.44	-64.01	N/A	-51.01	N/A	-13
		3567.5	-64.73	N/A	N/A	9.79	3.70	-58.65	N/A	-45.65	N/A	-13

Average E.R.P. for LTE Band 17

Channel Bandwidth: 10MHz

Mode	Channel	Vertical		Horizontal		Ant	Cable	Result		Margin		Limit
		Frequency (MHz)	S.G. Value (dBm)	Frequency (MHz)	S.G. Value (dBm)	Gain (dBi)	Loss (dB)	Ver	Hor	Ver	Hor	
QPSK	Low	1418	-63.58	1418	-67.15	8.17	2.40	-57.80	-61.37	-44.80	-48.37	-13
		2127	-71.65	2127	-63.99	9.20	2.94	-65.38	-57.72	-52.38	-44.72	-13
		2836	-69.37	2836	-71.36	9.67	3.44	-63.14	-65.13	-50.14	-52.13	-13
	Middle	1420	-59.46	1420	-61.08	8.18	2.40	-53.67	-55.29	-40.67	-42.29	-13
		2130	-48.77	2130	-44.49	9.21	2.94	-42.51	-38.23	-29.51	-25.23	-13
		2840	-53.89	2840	-63.67	9.66	3.44	-47.67	-57.45	-34.67	-44.45	-13
		3550	-55.43	N/A	N/A	9.79	3.70	-49.34	NA	-36.34	NA	-13
	High	1422	-59.33	1422	-58.44	8.19	2.40	-53.53	-52.64	-40.53	-39.64	-13
		2133	-66.13	2133	-67.93	9.21	2.95	-59.87	-61.67	-46.87	-48.67	-13
		2844	-70.69	N/A	N/A	9.66	3.44	-64.47	NA	-51.47	NA	-13
		3555	-69.73	N/A	N/A	9.79	3.70	-63.64	NA	-50.64	NA	-13
16QAM	Low	1418	-57.92	1418	-59.16	8.17	2.40	-52.14	-53.38	-39.14	-40.38	-13
		2127	-50.79	2127	-43.98	9.20	2.94	-44.52	-37.71	-31.52	-24.71	-13
		2836	-55.83	2836	-64.11	9.67	3.44	-49.60	-57.88	-36.60	-44.88	-13
		3545	-53.37	3545	-70.26	9.79	3.69	-47.27	-64.16	-34.27	-51.16	-13
	Middle	1420	-56.83	1420	-57.91	8.18	2.40	-51.04	-52.12	-38.04	-39.12	-13
		2130	-51.91	2130	-45.19	9.21	2.94	-45.65	-38.93	-32.65	-25.93	-13
		2840	-54.43	2840	-62.85	9.66	3.44	-48.21	-56.63	-35.21	-43.63	-13
		3550	-57.83	3550	-71.79	9.79	3.70	-51.74	-65.70	-38.74	-52.70	-13
	High	1422	-61.02	1422	-52.31	8.19	2.40	-55.22	-46.51	-42.22	-33.51	-13
		2133	-51.63	2133	-46.81	9.21	2.95	-45.37	-40.55	-32.37	-27.55	-13
		2844	-55.73	2844	-63.41	9.66	3.44	-49.51	-57.19	-36.51	-44.19	-13
		3555	-54.03	3555	-71.63	9.79	3.70	-47.94	-65.54	-34.94	-52.54	-13

Appendix A: Test equipments list

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
EMI Test Receiver	Rohde & Schwarz	ESR-7	101232	2014/12/01	2015/11/30
Spectrum Analyzer	Rohde & Schwarz	FSP30	100137	2015/08/18	2016/08/16
Signal Generator	Rohde & Schwarz	SMR27	100036	2014/11/3	2015/11/2
Horn Antenna (1-18G)	EMCO	3115	9906-5822	2014/6/5	2017/6/3
Broadband Antenna	SCHWARZBECK	VULB 9168	9168-172	2013/08/08	2016/08/06
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-067	2015/04/30	2016/04/28
Pre-Amplifier(1-26. 5G)	EMC Co.	EMC12635SE	980205	2015/10/07	2016/10/05
966-2_3m Semi-Anechoic Chamber	966_2	CEM-966_2	N/A	2015/02/24	2016/02/23
966-2(A) Cable	SUHNER	SMA / EX 100	N/A	2015/05/06	2016/05/04
966-2(B) Cable	JUNFLON	SMA / J12J100880-00	AUG-26-08-002	2015/05/09	2016/05/07
RF Cable	SUHNER	SUCOFLEX 102	CB0006	2015/05/06	2016/05/04
RF Cable	Mini-Circuits	CBL-4FT-SMS M+	CB0001	2015/05/06	2016/05/04
RF Cable	Mini-Circuits	CBL-4FT-SMS M+	CB0002	2015/05/06	2016/05/04
Simulator	Rohde & Schwarz	CMW 500	124781	2015/09/27	2016/09/25
Spectrum Analyzer	Agilent	N9030A	MY51380492	2015/09/21	2016/09/19
Brand		Software		Version	
ADT		Radiated test system		7.5.14	

Appendix B: Measurement Uncertainty

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty		
Radiated Emission	Below 1 GHz	Vertical	3.90 dB
		Horizontal	3.86 dB
	1G~18GHz	Vertical	4.19 dB
		Horizontal	4.30 dB
	18GHz~40GHz	Vertical	2.92 dB
		Horizontal	2.90 dB
Conducted Output power	0.86 dB		
Conducted Spurious Emission	0.84 dB		

This uncertainty represents an expanded uncertainty expressed at approximately the 95 %