

## FCC TEST REPORT

For

Product Name	Model
MXConnect M2M Advanced In-Vehicle 4G/LTE Wireless Router	BEC MX-1000
MXConnect M2M Wireless Router	BEC MX-500

**Trade Name: BEC**

*Issued to*

**Billion Electric Co., Ltd.**  
8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,  
New Taipei City 231, Taiwan (R.O.C.)

*Issued by*

**Compliance Certification Services Inc.**  
No.11, Wugong 6th Rd., Wugu Dist.,  
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**Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 16, 2015	Initial Issue	ALL	Kelly Cheng
01	October 19, 2015	1. Modify OCCUPIED BANDWIDTH data. 2. Modify PEAK TO AVERAGE RATIO test results.	19~26, 28	Kelly Cheng
02	October 26, 2015	Modify PEAK TO AVERAGE RATIO test results.	28~34	Kelly Cheng
03	October 30, 2015	1. Modify Occupied Bandwidth data. 2. Modify PEAK TO AVERAGE RATIO test results.	20~26, 28~34	Kelly Cheng

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# 1. TEST RESULT CERTIFICATION

**Applicant:** Billion Electric Co., Ltd.  
8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,  
New Taipei City 231, Taiwan (R.O.C.)

**Equipment Under Test / Model:**

Product Name	Model
MXConnect M2M Advanced In-Vehicle 4G/LTE Wireless Router	BEC MX-1000
MXConnect M2M Wireless Router	BEC MX-500

**Trade Name:** BEC

**Date of Test:** August 26 ~ October 30, 2015

FCC PART 27, SUBPART C, L, FCC PART 2	
OPERATING BAND: 704~716 MHz	
Standard	TEST TYPE AND LIMIT
2.1046 27.50(C)(10)	Maximum Peak Output Power Limit: max. 3 watts e.r.p peak power
2.1055 27.54	Frequency Stability
2.1049 27.53(g)	Occupied Bandwidth
27.50(d)(5)	Peak to average ratio
27.53(g)	Band Edge Measurements
2.1051 27.53(g)	Conducted Spurious Emissions
2.1053 27.53(g)	Radiated Spurious Emissions

Note: 1. The test result judgment is decided by the limit of test standard  
2. The information of measurement uncertainty is available upon the customer's request.

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by

Reviewed by




Miller Lee  
Manager  
Compliance Certification Services Inc.

Angel Cheng  
Section Manager  
Compliance Certification Services Inc.

## 2. EUT DESCRIPTION

<b>Product</b>	MXConnect M2M Advanced In-Vehicle 4G/LTE Wireless Router	MXConnect M2M Wireless Router
<b>Model Number</b>	BEC MX-1000	BEC MX-500
<b>Trade</b>	BEC	
<b>WLAN Module</b>	AzueWave / WW-DL060	
<b>Received Date</b>	July 21, 2015	
<b>Power Supply</b>	10~56VDC	
<b>Modulation Technology</b>	LTE Band 12	QPSK, 16QAM
<b>Frequency Range</b>	LTE Band 12 Channel Bandwidth: 5MHz	701.5MHz ~ 713.5MHz
	LTE Band 12 Channel Bandwidth: 10MHz	704.0MHz ~ 711.0MHz
<b>Maximum ERP Power</b>	LTE Band 12 Channel Bandwidth: 5MHz	QPSK: 17.56dBm 16QAM: 17.87dBm
	LTE Band 12 Channel Bandwidth: 10MHz	QPSK : 17.56dBm 16QAM: 18.56dBm
<b>Release</b>	9	
<b>Antenna Specification</b>	LTE Band 12: 3-cable Monopole Antenna / Gain: -7.31Bi	

**Note:** 1. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2. The detail descriptions please see as below.

<b>Model / Difference Item</b>	<b>BEC MX-1000</b>	<b>BEC MX-500</b>
LTE / SIM	2	N/A
Wi-Fi 2.4Ghz	yes	yes
Mini USB	2	N/A
GPS	yes	yes
WIFI on/off Button	1	1
Reset Button	1	1
Giga LAN	4	4
Power	10~56VDC	

3. Client consigns only one sample to test (model number: BEC MX-1000). Therefore, the testing Lab. just guarantees the unit, which has been tested.

### 3. TEST METHODOLOGY

#### 3.1 DESCRIPTION OF TEST TYPE

The EUT (model: BEC MX-1000) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

#### **LTE Band 12: 704.0MHz ~ 711.0MHz**

Three channels had been tested for each channel bandwidth.

Channel Bandwidth	5MHz		10MHz	
	Channel	Frequency(MHz)	Channel	Frequency(MHz)
Low channel (L)	23035	701.50	23060	704.00
Middle channel (M)	23095	707.50	23095	707.50
High channel (H)	23155	713.50	23130	711.00

## 4. INSTRUMENT CALIBRATION

### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

*Remark: Each piece of equipment is scheduled for calibration once a year.*

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US42510252	11/23/2015
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	10/07/2015
AC Power Source	EXTECH	6205	1140845	N.C.R
DC Power Supply	ABM	8301HD	D011531	N.C.R
Power Meter	Anritsu	ML2495A	1012009	07/07/2016
Power Sensor	Anritsu	MA2411A	0917072	07/07/2016
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/19/2016

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4407B	MY44212686	03/17/2016
Pre-Amplifier	MITEQ	AFS44-00102650-42-10P-44	1042473	04/13/2016
'Bilog Antenna	Sunol Sciences	JB1	A0526009	08/05/2016
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R
Spectrum Analyzer	ROHDE&SCHWARZ	FSV40	101073	07/19/2016
Horn Antenna	EMCO	3117	00055165	01/26/2016
Wideband Radio Communication Tester	ROHDE&SCHWARZ	CMW 500	116875	04/13/2016

### 4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683

**Remark:** This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .



## 5. FACILITIES AND ACCREDITATIONS

### 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

- No.199, Chungshen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.  
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029
- No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)  
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045
- No.81-1, Lane 210, Bade 2nd Rd., Luchu Hsiang, Taoyuan Hsien 338, Taiwan  
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### 5.2 EQUIPMENT




Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 5.3 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Taiwan	TAF	LP0002, RTTE01, FCC Method-47 CFR Part 15 Subpart C, D, E, RSS-210, RSS-310 IDA TS SRD, AS/NZS 4268, AS/NZS 4771, TS 12.1 & 12.2, ETSI EN 300 440-1, ETSI EN 300 440-2, ETSI EN 300 328, ETSI EN 300 220-1, ETSI EN 300 220-2, ETSI EN 301 893, ETSI EN 301 489-1/3/7/17 FCC OET Bulletin 65 + Supplement C, EN 50360, EN 50361, EN 50371, RSS 102, EN 50383, EN 50385, EN 50392, IEC 62209, CNS 14958-1, CNS 14959 FCC Method -47 CFR Part 15 Subpart B IEC / EN 61000-3-2, IEC / EN 61000-3-3, IEC / EN 61000-4-2/3/4/5/6/8/11	
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

*\* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix I for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
	N/A						

**Remark:**

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

## **7. TEST PROCEDURE AND RESULT**

### **7.1 OUTPUT POWER MEASUREMENT**

#### **LIMITS**

Portable stations (hand-held devices) operating in the 698–746 MHz band are limited to 3 watts ERP

#### **TEST PROCEDURES**

##### **EIRP / ERP MEASUREMENT:**

1. The EUT was set up for the maximum power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range). RWB and VBW is 10MHz for LTE.
2. E.I.R.P power 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.
3. 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 d.  $EIRP = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn}$
4.  $E.R.P = E.I.R.P - 2.15 \text{ dB}$

##### **CONDUCTED POWER MEASUREMENT:**

1. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
2. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

## TEST RESULTS

### LTE Band 12

#### Channel Bandwidth: 5MHz

Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)	Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)
QPSK 1 RB ALLOCATED AT THE LOWER EDGE	701.5	23035	25.27	QPSK 100% RB ALLOCATION CENTERED	701.5	23035	24.51
	707.5	23095	25.35		707.5	23095	24.57
	713.5	23155	25.38		713.5	23155	24.72
QPSK 1 RB ALLOCATED AT THE UPPER EDGE	701.5	23035	25.26	QPSK 50% RB ALLOCATION CENTERED	701.5	23035	24.52
	707.5	23095	25.34		707.5	23095	24.78
	713.5	23155	25.37		713.5	23155	25.13

Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)	Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)
16QAM 1 RB ALLOCATED AT THE LOWER EDGE	701.5	23035	23.80	16QAM 100% RB ALLOCATION CENTERED	701.5	23035	23.57
	707.5	23095	24.35		707.5	23095	24.12
	713.5	23155	24.57		713.5	23155	24.04
16QAM 1 RB ALLOCATED AT THE UPPER EDGE	701.5	23035	23.79	16QAM 50% RB ALLOCATION CENTERED	701.5	23035	23.58
	707.5	23095	24.34		707.5	23095	24.13
	713.5	23155	24.26		713.5	23155	24.35

**Remarks:**

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB) + 20dB Attenuator.
3. The value in bold is the worst.

## LTE Band 12

### Channel Bandwidth: 10MHz

Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)	Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)
QPSK 1 RB ALLOCATED AT THE LOWER EDGE	704.00	23060	25.22	QPSK 100% RB ALLOCATION CENTERED	704.00	23060	24.41
	707.50	23095	25.14		707.50	23095	24.34
	711.00	23130	25.36		711.00	23130	24.26
QPSK 1 RB ALLOCATED AT THE UPPER EDGE	704.00	23060	25.21	QPSK 50% RB ALLOCATION CENTERED	704.00	23060	24.52
	707.50	23095	25.23		707.50	23095	24.45
	711.00	23130	25.25		711.00	23130	24.27

Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)	Frequency (MHz)	CH	Peak Power (dBm)	Output Power (W)
16QAM 1 RB ALLOCATED AT THE LOWER EDGE	704.00	23060	23.35	16QAM 100% RB ALLOCATION CENTERED	704.00	23060	23.18
	707.50	23095	23.45		707.50	23095	23.10
	711.00	23130	23.16		711.00	23130	23.03
16QAM 1 RB ALLOCATED AT THE UPPER EDGE	704.00	23060	23.34	16QAM 50% RB ALLOCATION CENTERED	704.00	23060	23.19
	707.50	23095	23.44		707.50	23095	23.11
	711.00	23130	23.15		711.00	23130	23.04

**Remarks:**

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = Power Splitter Loss (dB) + Cable Loss (dB) + 20dB Attenuator.
3. The value in bold is the worst.

**ERP POWER**

**LTE Band 12**

**Channel Bandwidth: 5MHz / QPSK**

Channel	Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Pol.
23035	703.2500	10.03	3.12	6.36	13.27	38.45	-25.18	V
	702.8000	9.18	3.12	6.36	12.42	38.45	-26.03	H
23095	708.2000	12.65	3.14	6.31	15.82	38.45	-22.63	V
	707.9000	11.97	3.14	6.31	15.14	38.45	-23.31	H
23155	713.1500	14.34	3.15	6.37	<b>*17.56</b>	38.45	-20.89	V
	713.4500	11.96	3.15	6.37	15.18	38.45	-23.27	H

**Channel Bandwidth: 5MHz / 16QAM**

Channel	Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Pol.
23035	703.1000	10.72	3.12	6.36	13.96	38.45	-24.49	V
	703.2500	10.08	3.12	6.36	13.32	38.45	-25.13	H
23095	708.2000	13.79	3.14	6.31	16.96	38.45	-21.49	V
	708.0500	13.07	3.14	6.31	16.24	38.45	-22.21	H
23155	713.7500	14.64	3.15	6.38	<b>17.87</b>	38.45	-20.58	V
	713.4500	13.12	3.15	6.37	16.34	38.45	-22.11	H

**Remark:**

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = S.G Level + Gain of Substitution horn + TX cable loss.
3. The value in bold is the worst.

**Channel Bandwidth: 10MHz / QPSK**

Channel	Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Pol.
23060	699.3500	11.37	3.11	6.4	14.66	38.45	-23.79	V
	699.6500	10.88	3.11	6.4	14.17	38.45	-24.28	H
23095	702.8000	11.7	3.12	6.36	14.94	38.45	-23.51	V
	703.1000	11.41	3.12	6.36	14.65	38.45	-23.80	H
23130	713.1500	14.34	3.15	6.37	<b>*17.56</b>	38.45	-20.89	V
	713.4500	11.96	3.15	6.37	15.18	38.45	-23.27	H

**Channel Bandwidth: 10MHz / 16QAM**

Channel	Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Pol.
23060	699.5000	11.69	3.11	6.4	14.98	38.45	-23.47	V
	699.9500	11.25	3.11	6.39	14.53	38.45	-23.92	H
23095	702.8000	11.83	3.12	6.36	15.07	38.45	-23.38	V
	702.9500	11.65	3.12	6.36	14.89	38.45	-23.56	H
23130	706.7000	15.37	3.13	6.32	<b>*18.56</b>	38.45	-19.89	V
	706.7000	15.15	3.13	6.32	18.34	38.45	-20.11	H

**Remark:**

1. Output Power (dBm) = Raw Value (dBm) + Correction Factor (dB).
2. Correction Factor (dB) = S.G Level + Gain of Substitution horn + TX cable loss.
3. The value in bold is the worst.



## 7.2 FREQUENCY STABILITY MEASUREMENT

### LIMIT

According to the FCC part 27.54 shall be tested the frequency stability. The rule is defined that” The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation. The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with the 1055(a)(1)  $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$ .

### TEST PROCEDURE

1. Because of the measure the carrier frequency under the condition of the AFC lock, it shall be used the mobile station in the LTE link mode. This is accomplished with the use of the communication simulator station. The oven room could control the temperatures and humidity.
2. Power must be removed when changing from one temperature to another or one voltage to another voltage. Power warm up is at least 15 min and power applied should perform before recording frequency error.
3. Laptop pc is connected the external power supply to control the AC input power. The various Volts from the minimum 126.5 Volts to 93.5 Volts. Each step shall be record the frequency error rate.
4. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing.
5. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** *The frequency error was recorded frequency error from the communication simulator.*

**TEST RESULTS**

**FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT:**

**LTE Band 12**

Reference Frequency: LTE Band 12 707 MHz @ 20°C						
Limit: ± 2.5 ppm = 1767.5Hz						
Power Supply Vdc	Environment Temperature (°C)	5M Frequency (Hz)	Delta (Hz)	10M Frequency (Hz)	Delta (Hz)	Limit (Hz)
24	50	70749979	-14	70749991	-6	4331
24	40	70749986	-7	70749997	0	
24	30	70749995	2	70749995	-2	
24	20	70749993	0	70749997	0	
24	10	70749996	3	70749991	-6	
24	0	70749989	-4	70749994	-3	
24	-10	70749995	2	70749975	-22	
24	-20	70749975	-18	70749998	1	
24	-30	70749991	-2	70749989	-8	

**FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT:**

**LTE Band 12**

Reference Frequency: LTE Band 12 707 MHz @ 20°C						
Limit: ± 2.5 ppm = 1767.5Hz						
Power Supply Vdc	Environment Temperature (°C)	5M Frequency (Hz)	Delta (Hz)	10M Frequency (Hz)	Delta (Hz)	Limit (Hz)
26.4	20	70750005	1	70750011	2	4331
24		70750004	0	70750009	0	
20.4		70750009	5	70750006	-3	

## **7.3 OCCUPIED BANDWIDTH MEASUREMENT**

### **LIMITS**

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 1~5%of the total mean power of a given emission.

### **TEST PROCEDURES**

1. The EUT makes a phone call to the communication simulator. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels. (low, middle and high operational frequency range.)
2. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
3. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

**TEST RESULTS**

**LTE Band 12**

**CHANNEL BANDWIDTH: 5MHz / QPSK**

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	701.50	4.4551
Mid	707.50	4.4711
High	713.50	4.4711

**CHANNEL BANDWIDTH: 5MHz / 16QAM**

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	701.50	4.4711
Mid	707.50	4.4711
High	713.50	4.4711

**CHANNEL BANDWIDTH: 10MHz / QPSK**

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	704.00	8.9423
Mid	707.50	8.9423
High	711.00	8.9423

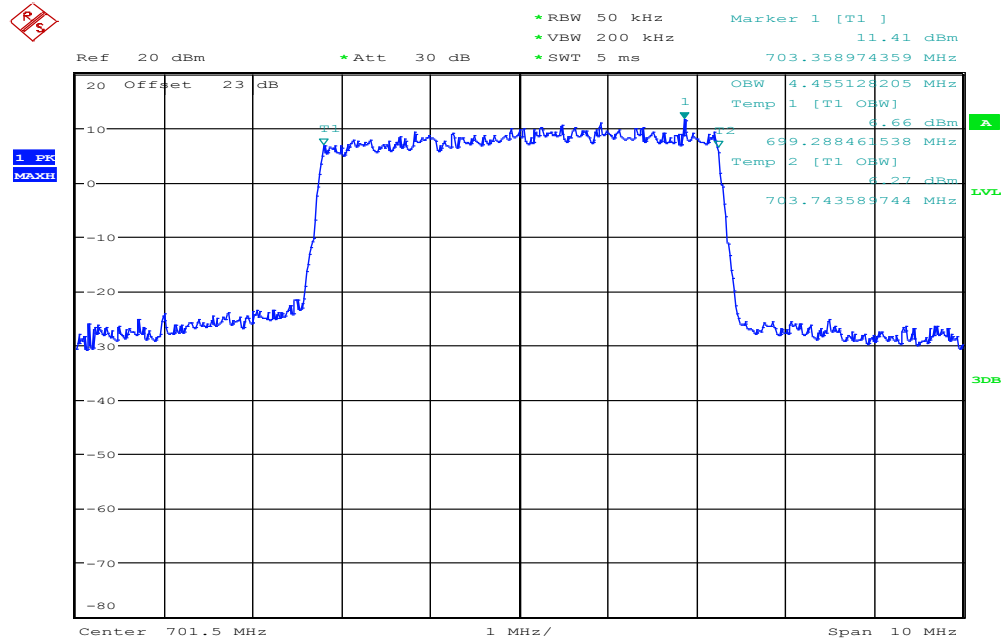
**CHANNEL BANDWIDTH: 10MHz / 16QAM**

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
Low	704.00	8.9102
Mid	707.50	8.9423
High	711.00	8.9102

## LTE Band 12

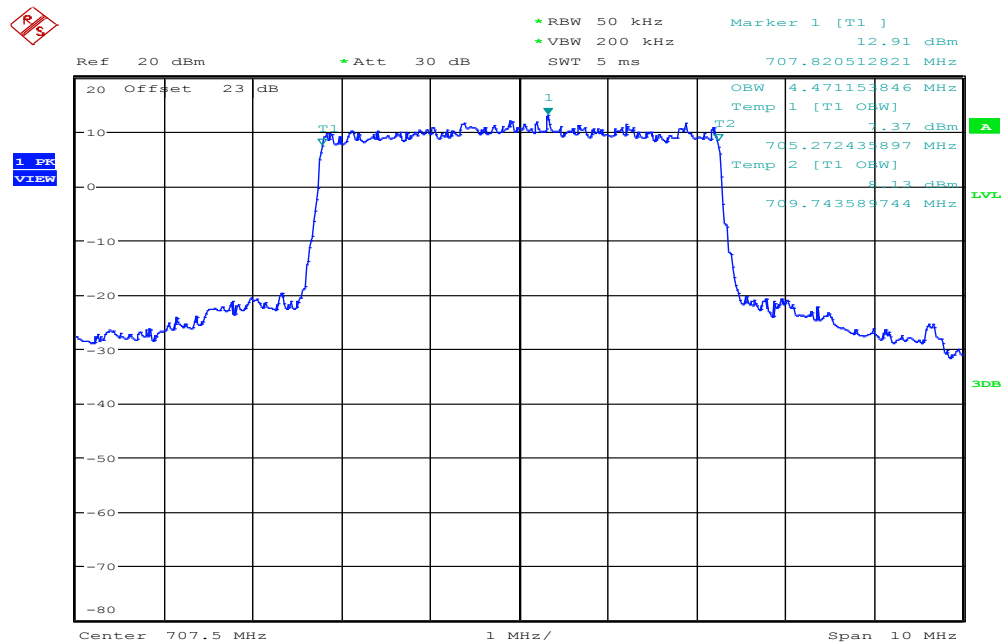
CHANNEL BANDWIDTH: 5MHz / QPSK

### CH Low



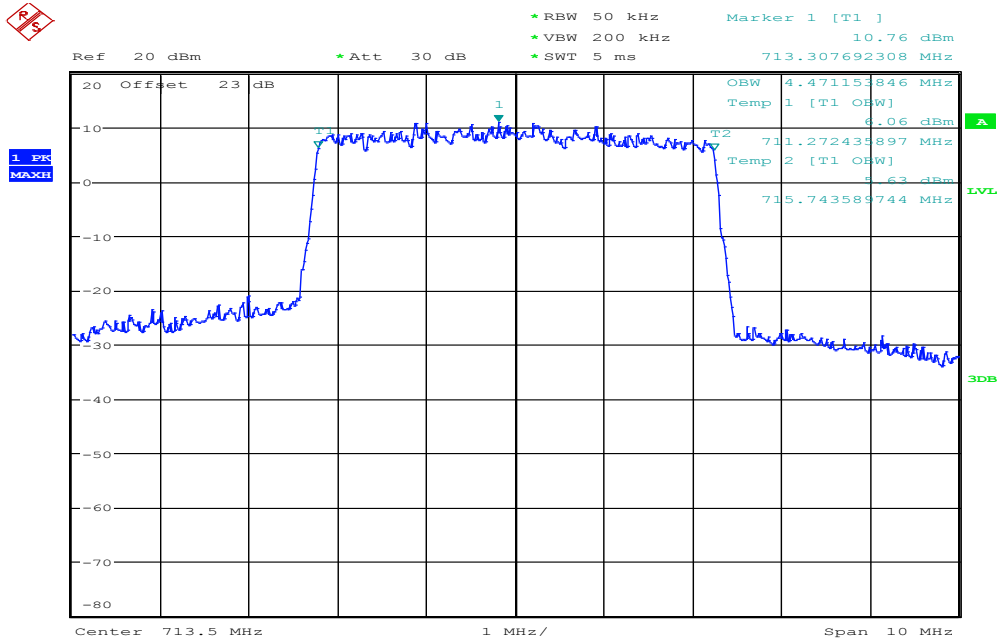
Date: 30.OCT.2015 12:06:11

### CH Mid



Date: 17.OCT.2015 11:11:33

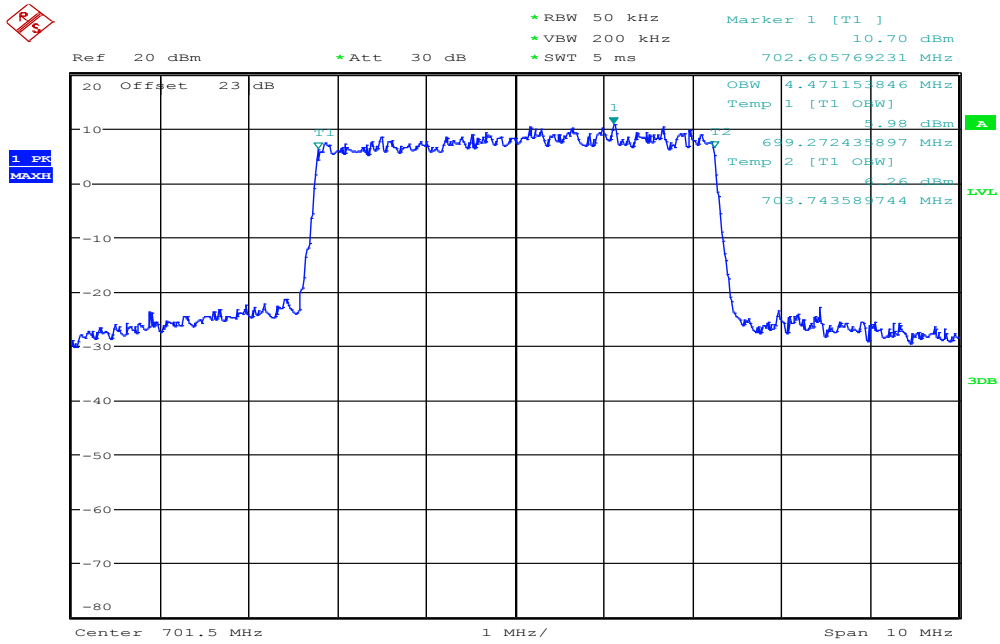
### CH High



Date: 30.OCT.2015 12:07:20

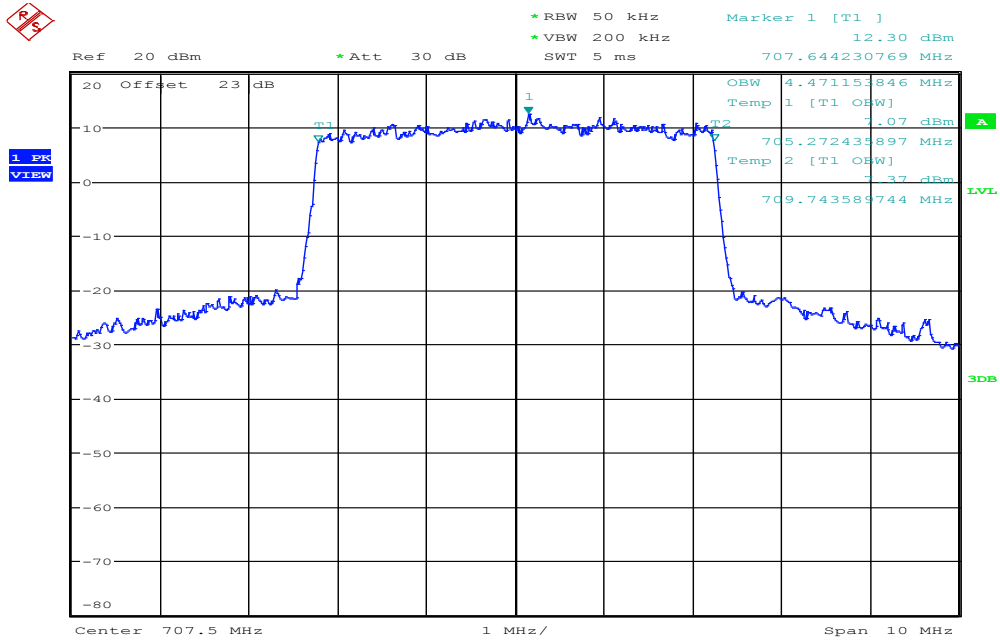
### CHANNEL BANDWIDTH: 5MHz / 16QAM

### CH Low



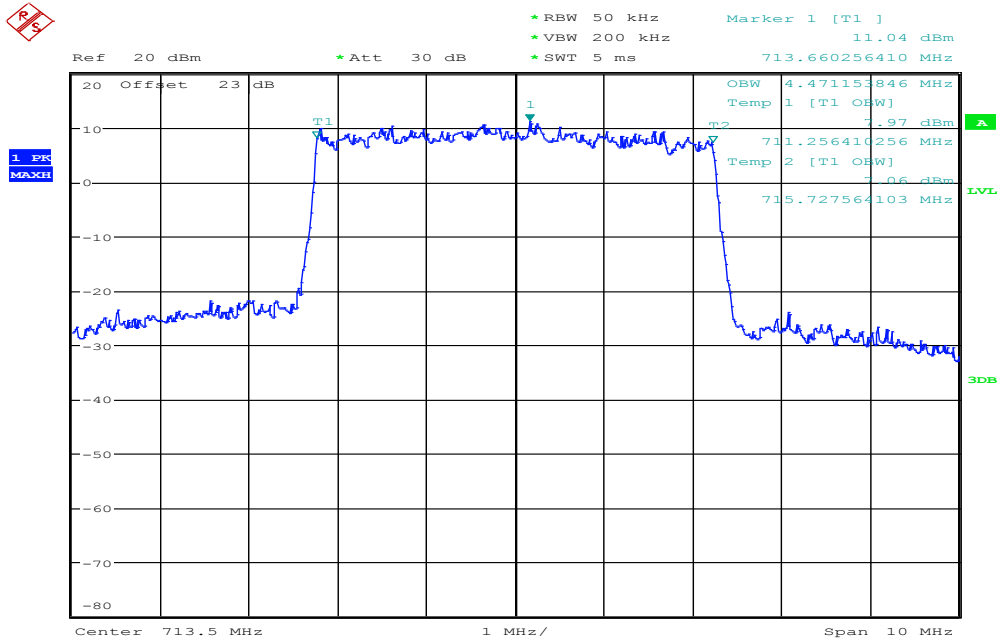
Date: 30.OCT.2015 12:09:23

### CH Mid



Date: 17.OCT.2015 11:43:57

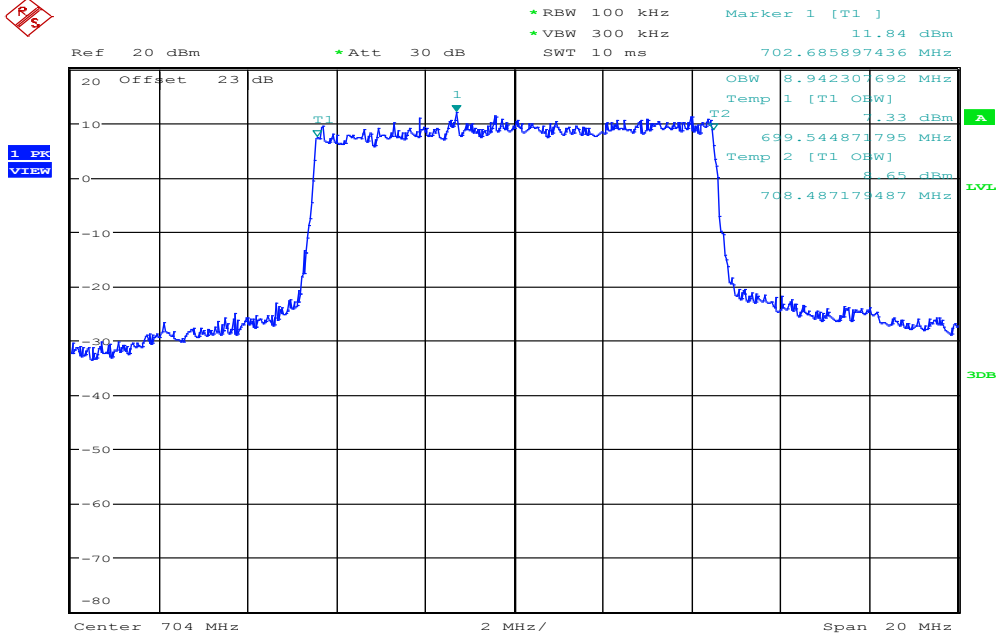
### CH High



Date: 30.OCT.2015 12:07:50

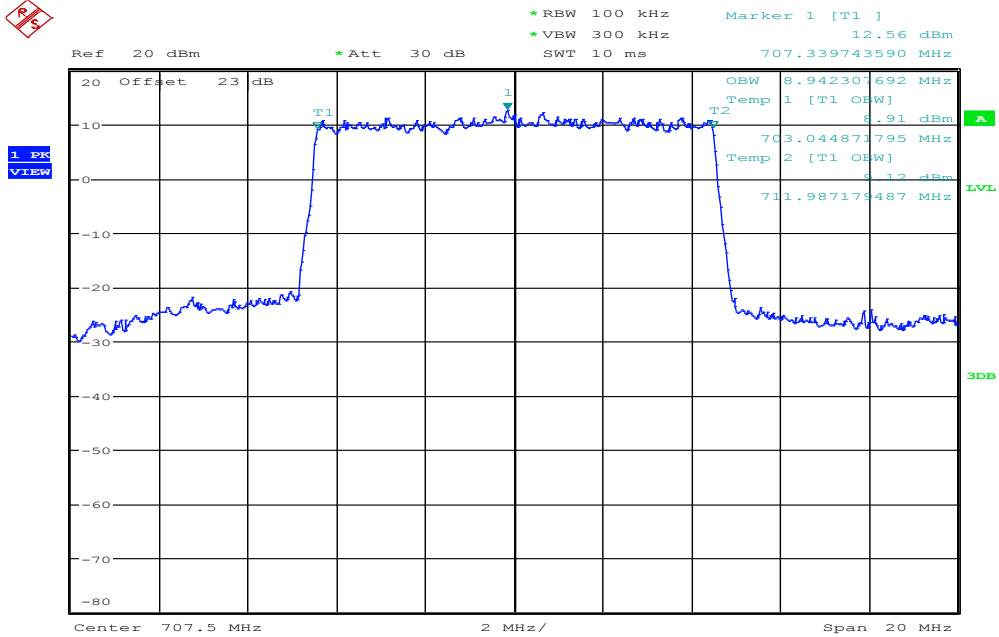
## CHANNEL BANDWIDTH: 10MHz / QPSK

### CH Low



Date: 30.OCT.2015 12:12:51

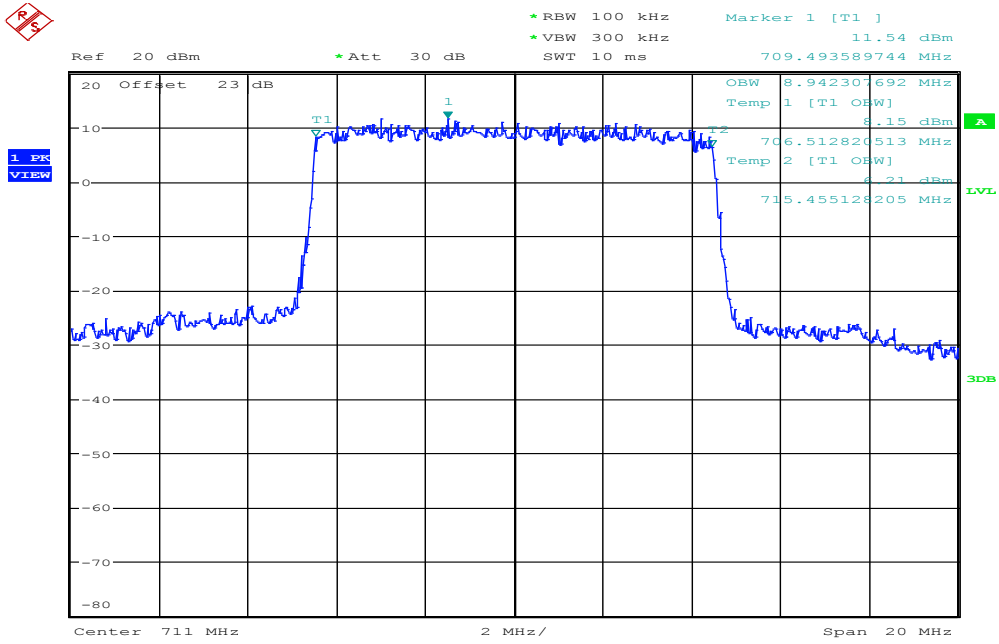
### CH Mid



Date: 17.OCT.2015 11:31:34



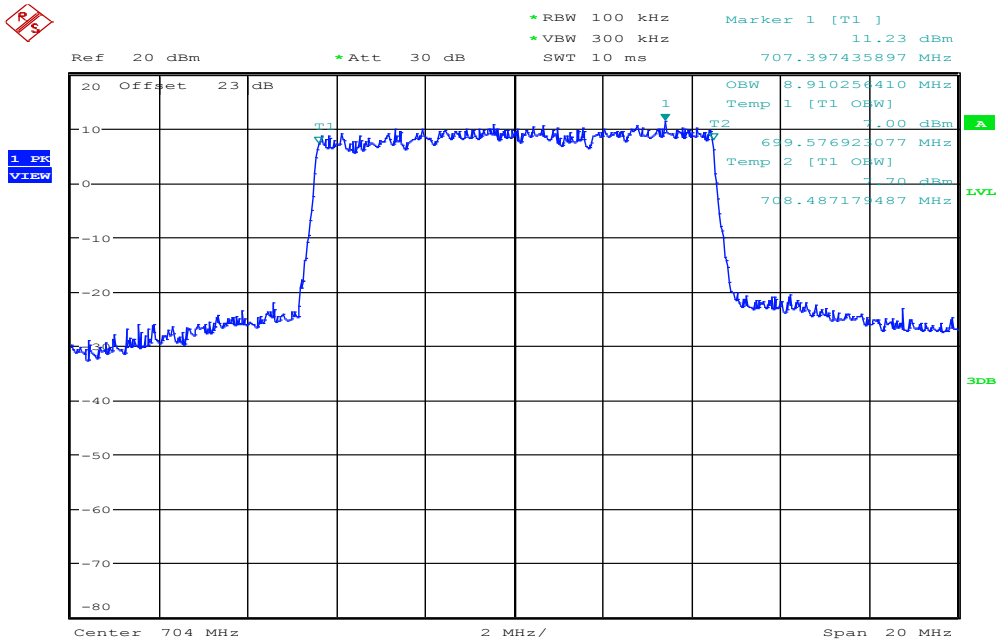
### CH High



Date: 30.OCT.2015 12:12:12

### CHANNEL BANDWIDTH: 10MHz / 16QAM

### CH Low



Date: 30.OCT.2015 12:11:01



## **7.4 PEAK TO AVERAGE RATIO**

### **LIMIT**

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.

### **TEST PROCEDURES**

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%.

## **TEST RESULTS**

### **LTE Band 12**

#### **CHANNEL BANDWIDTH: 5MHz / QPSK / 100%RB**

<b>Channel</b>	<b>FREQUENCY (MHz)</b>	<b>PEAK TO AVERAGE RATIO (dB)</b>
Low	701.50	5.13
Mid	707.50	5.25
High	713.50	5.22

#### **CHANNEL BANDWIDTH: 5MHz / 16QAM / 100%RB**

<b>Channel</b>	<b>FREQUENCY (MHz)</b>	<b>PEAK TO AVERAGE RATIO (dB)</b>
Low	701.50	5.68
Mid	707.50	6.14
High	713.50	5.97

#### **CHANNEL BANDWIDTH: 10MHz / QPSK / 100%RB**

<b>Channel</b>	<b>FREQUENCY (MHz)</b>	<b>PEAK TO AVERAGE RATIO (dB)</b>
Low	704.00	5.97
Mid	707.50	5.30
High	711.00	5.94

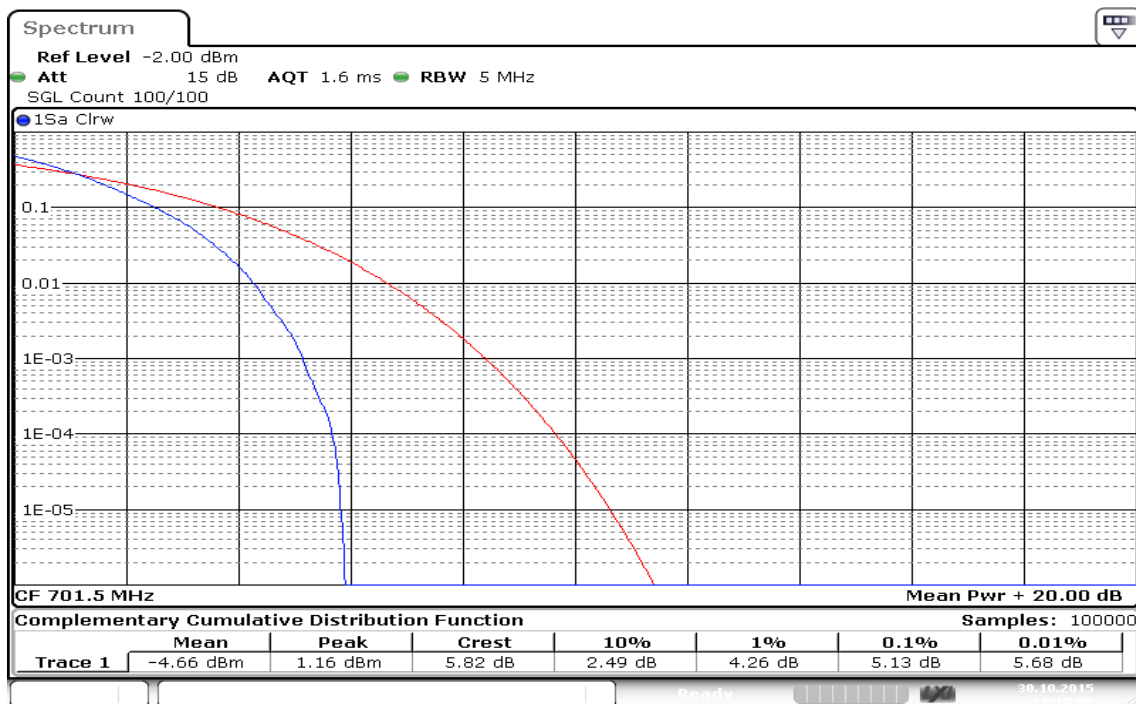
#### **CHANNEL BANDWIDTH: 10MHz / 16QAM / 100%RB**

<b>Channel</b>	<b>FREQUENCY (MHz)</b>	<b>PEAK TO AVERAGE RATIO (dB)</b>
Low	704.00	5.97
Mid	707.50	6.12
High	711.00	6.06

## LTE Band 12

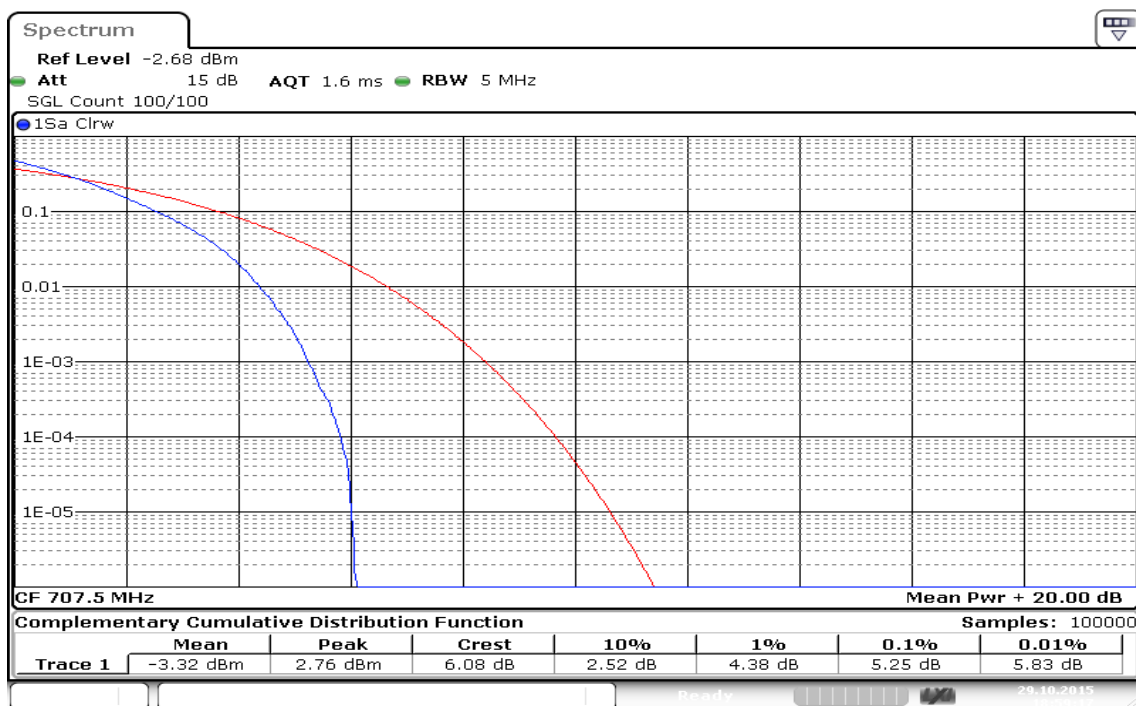
CHANNEL BANDWIDTH: 5MHz / QPSK

### CH Low



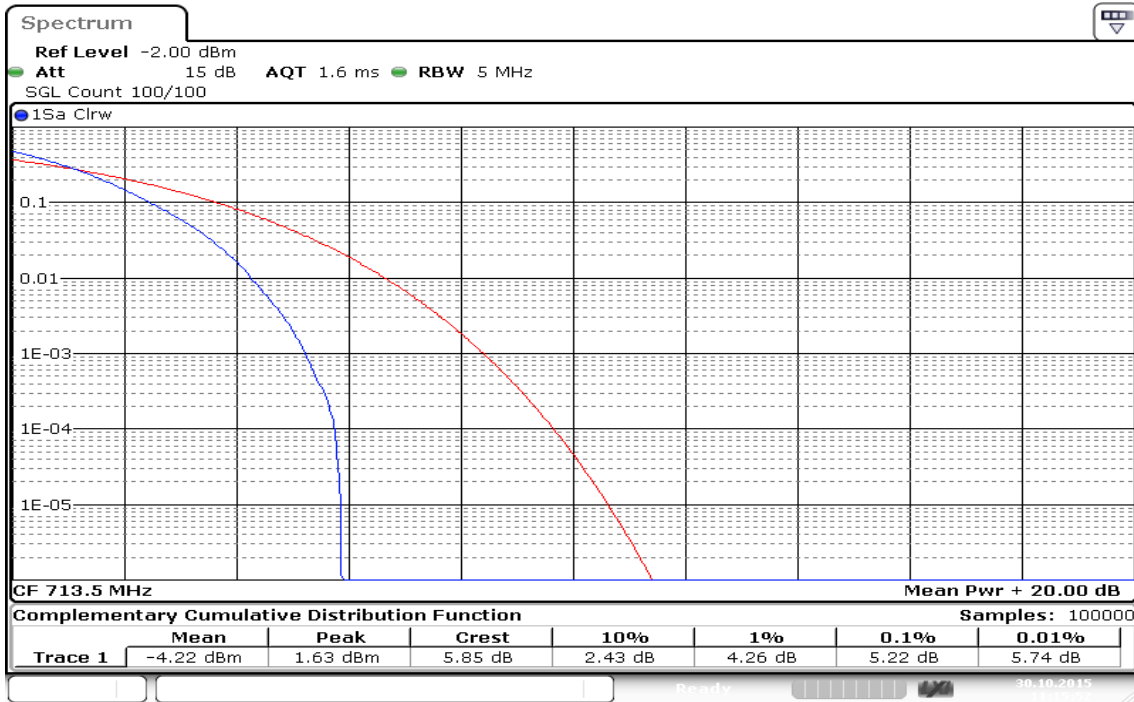
Date: 30.OCT.2015 11:15:06

### CH Mid



Date: 29.OCT.2015 18:59:17

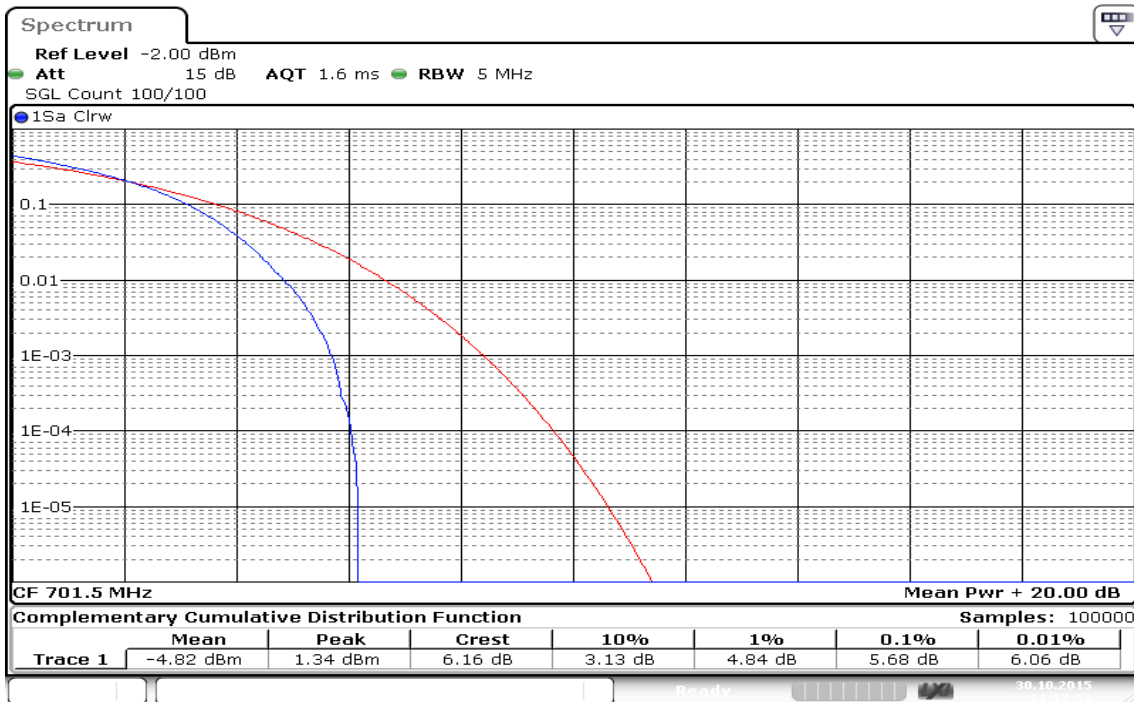
### CH High



Date: 30.OCT.2015 11:15:53

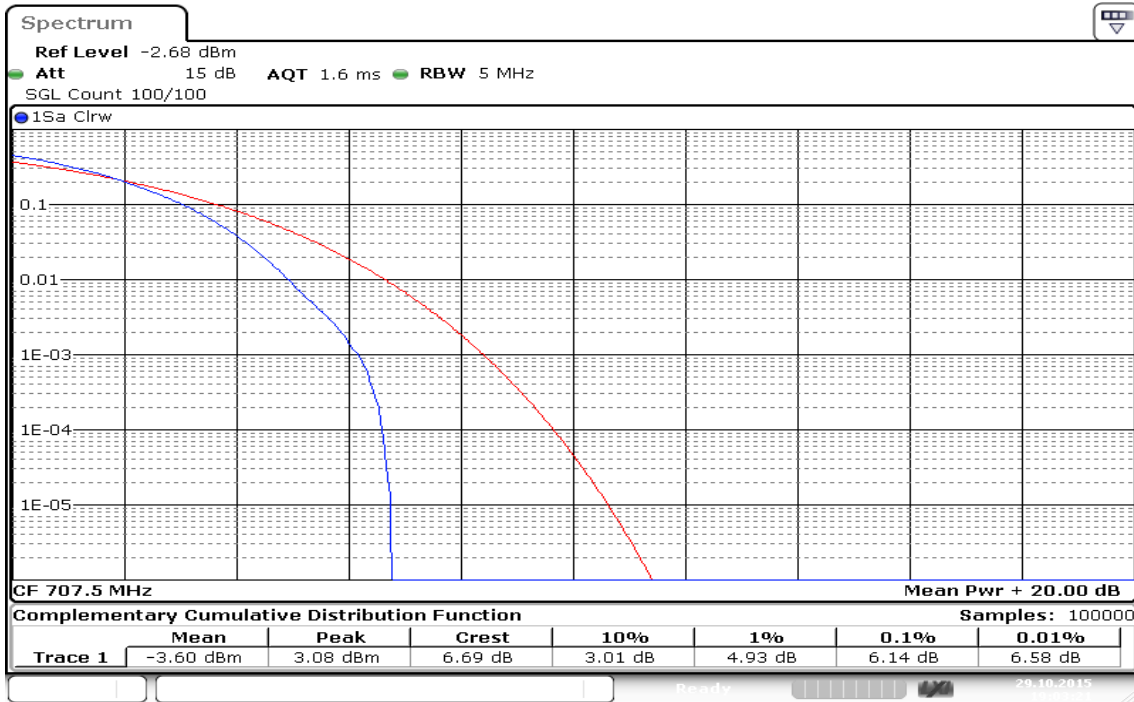
### CHANNEL BANDWIDTH: 5MHz / 16QAM

### CH Low



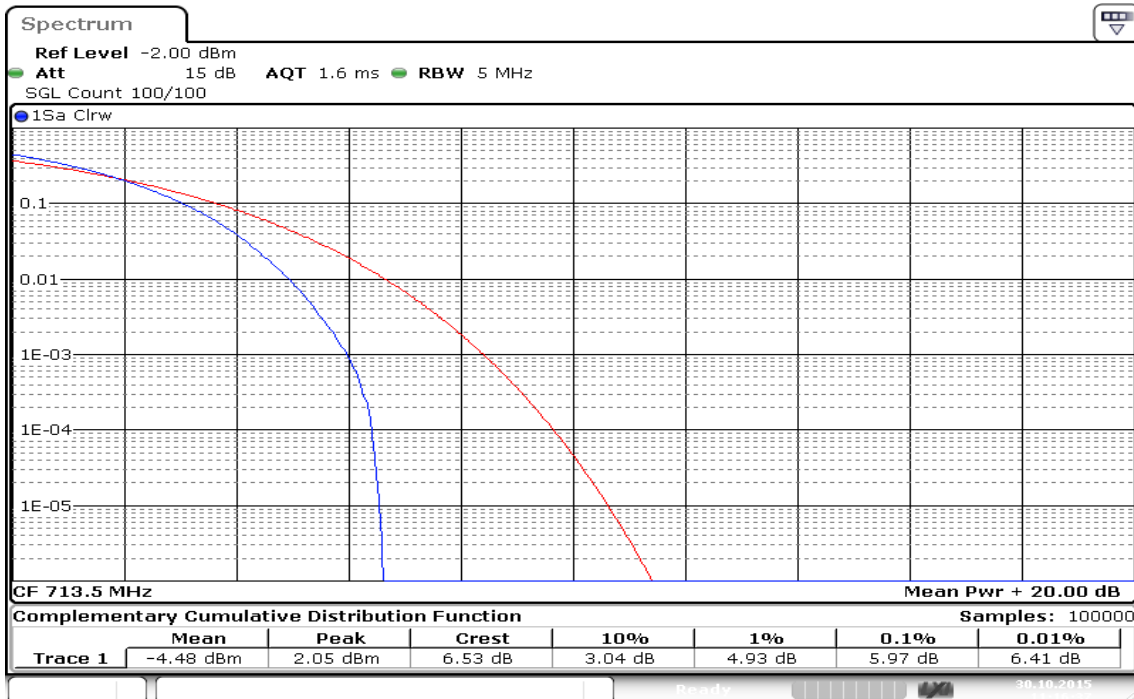
Date: 30.OCT.2015 11:17:53

### CH Mid



Date: 29.OCT.2015 19:03:21

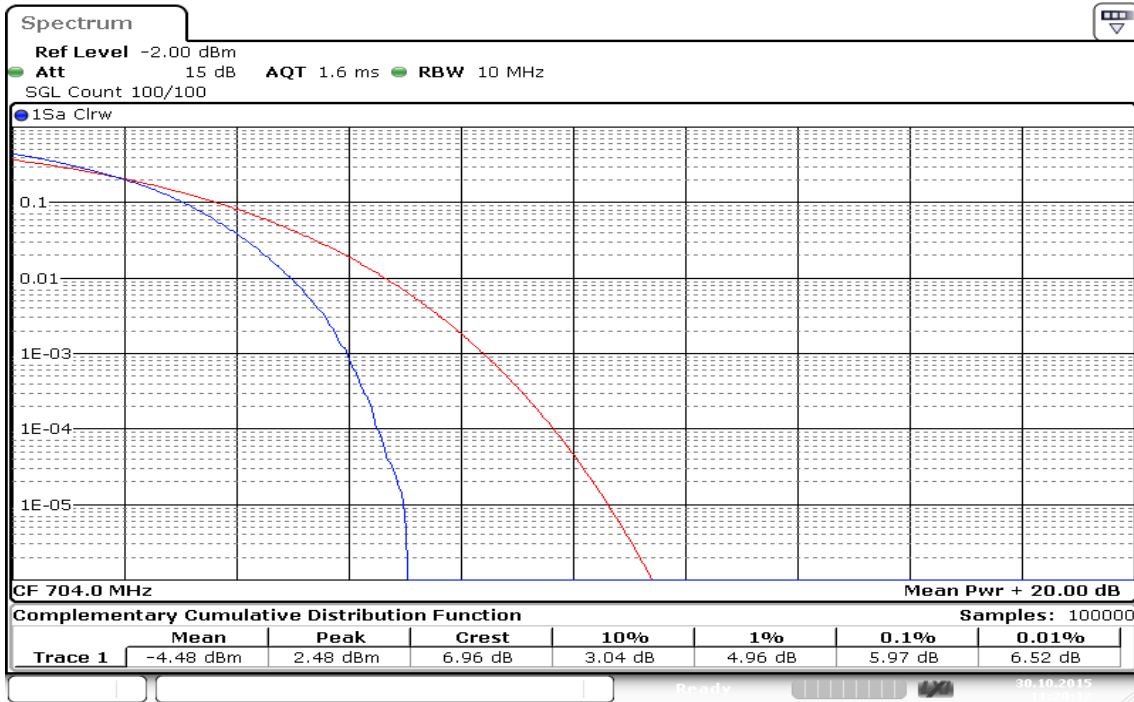
### CH High



Date: 30.OCT.2015 11:16:37

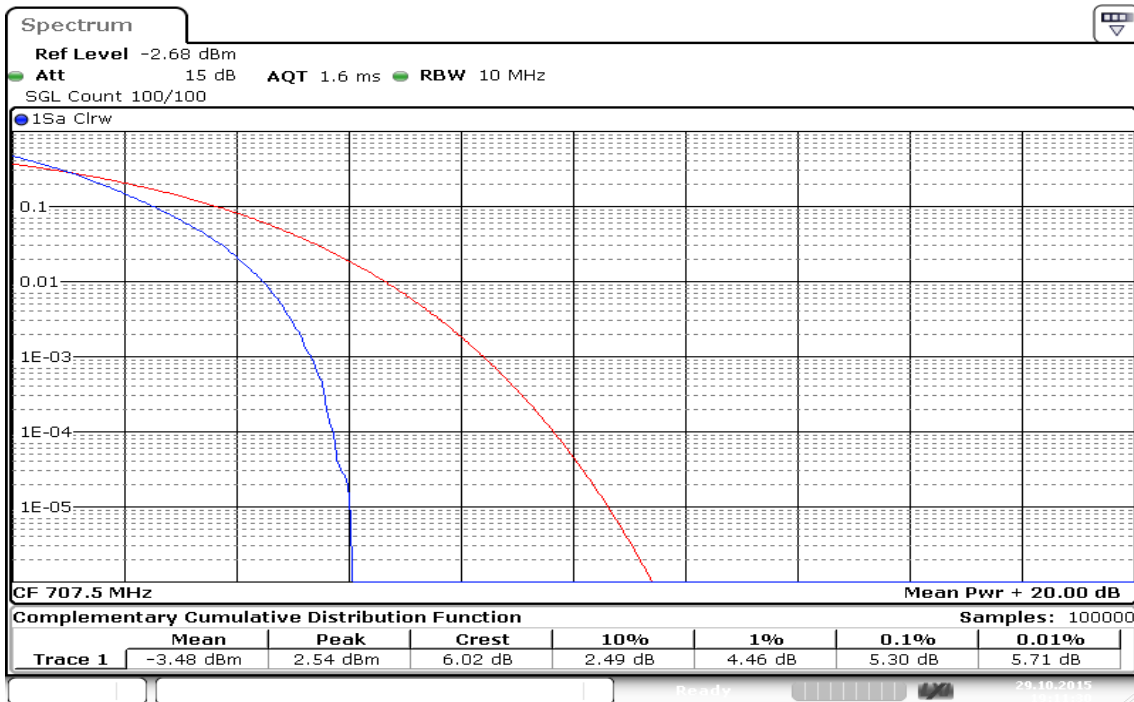
**CHANNEL BANDWIDTH: 10MHz / QPSK**

**CH Low**



Date: 30.OCT.2015 11:20:13

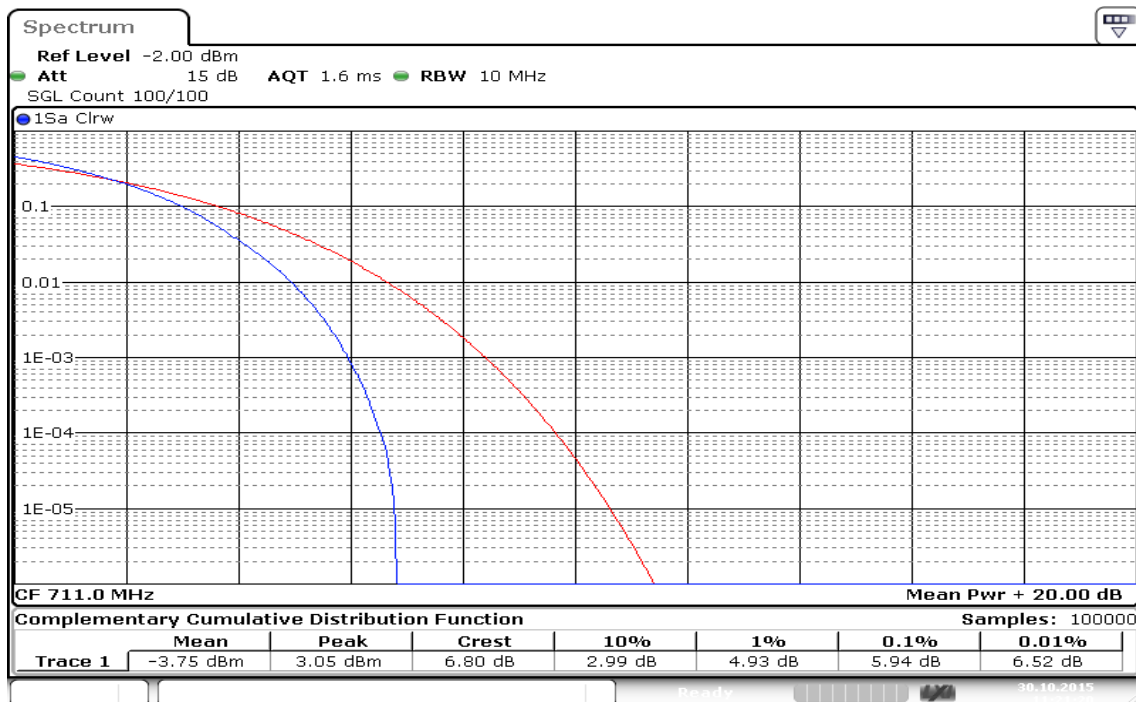
**CH Mid**



Date: 29.OCT.2015 19:11:29



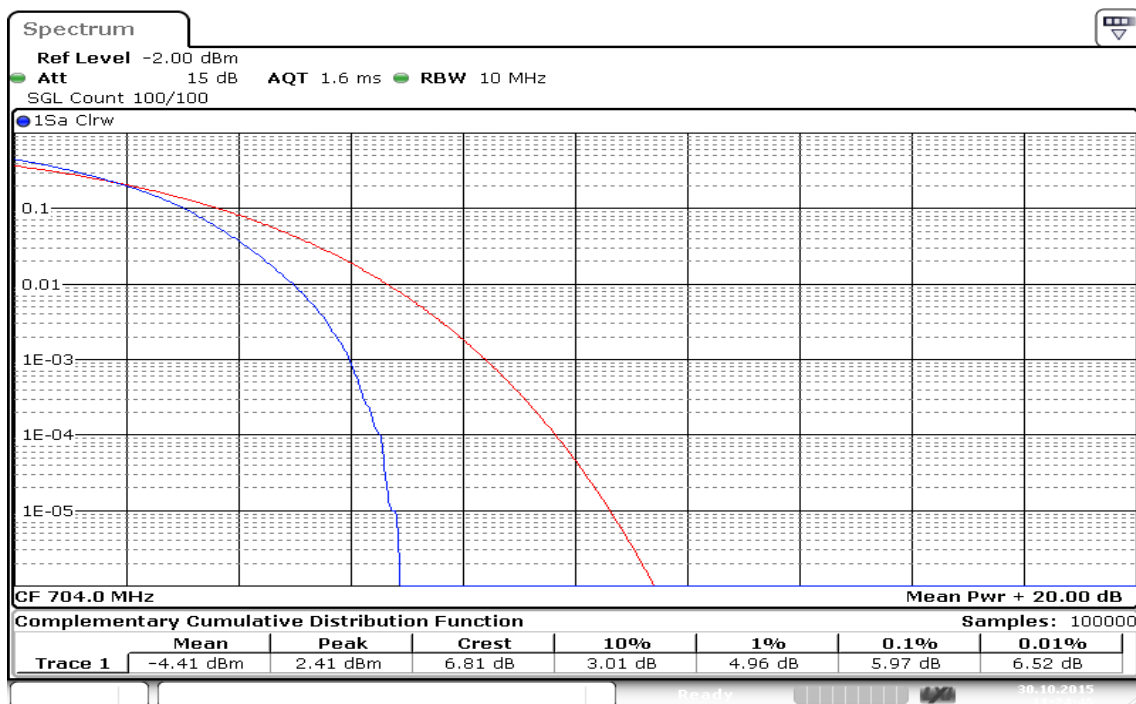
### CH High



Date: 30.OCT.2015 11:21:20

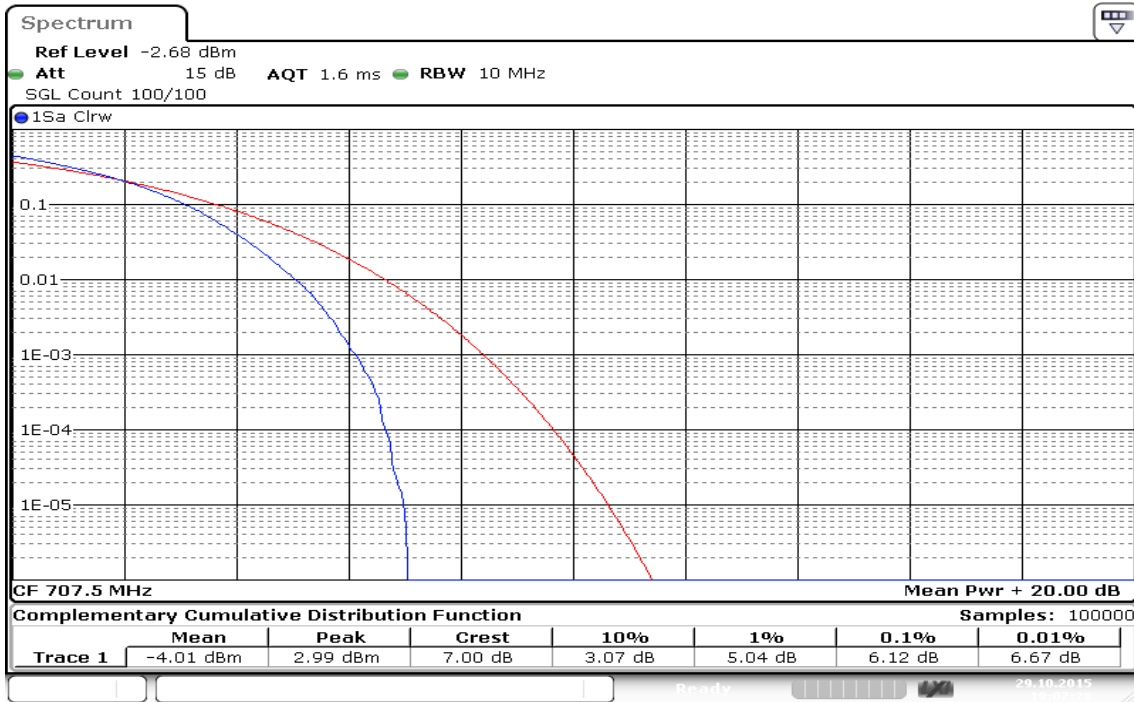
### CHANNEL BANDWIDTH: 10MHz / 16QAM

### CH Low



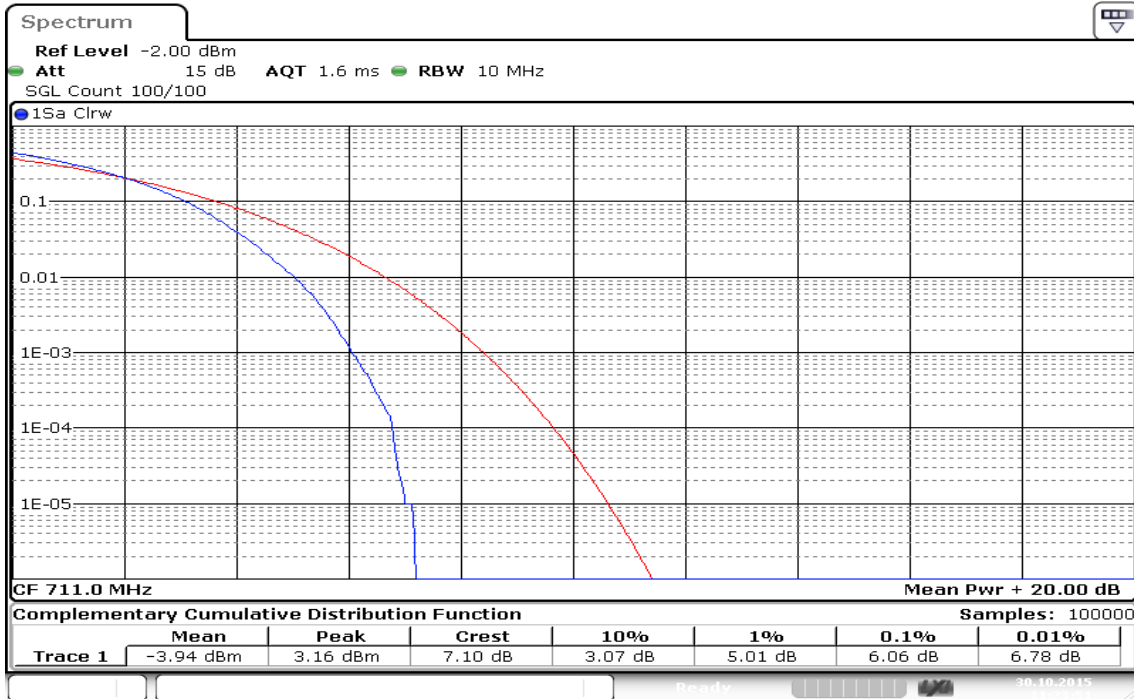
Date: 30.OCT.2015 11:24:46

### CH Mid



Date: 29.OCT.2015 19:07:28

### CH High



Date: 30.OCT.2015 11:23:51

## 7.5 BAND EDGE MEASUREMENT

### LIMIT

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. For operations in the 1710–1755 MHz and 2110–2155 MHz bands, 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  $-13\text{dBm}$ . In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

### TEST PROCEDURES

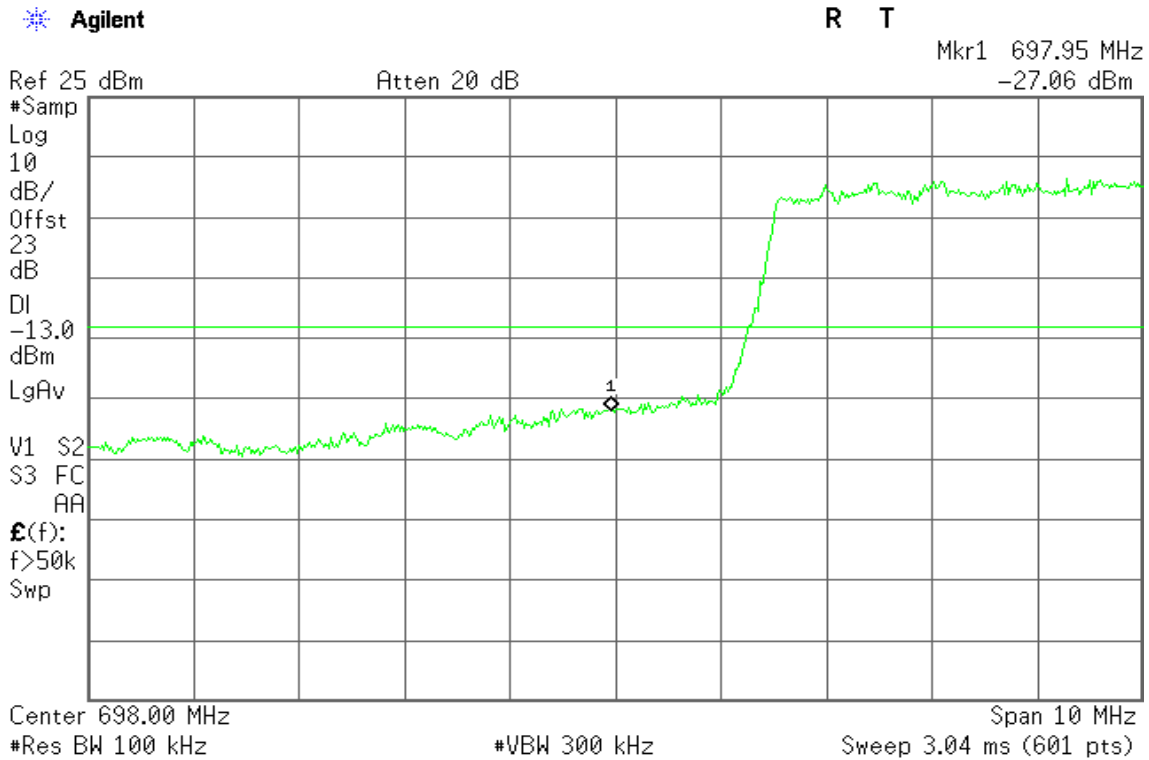
1. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
2. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer. This splitter loss and cable loss are the worst loss 7.2 dB in the transmitted path track.
3. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 50kHz and VB of the spectrum is 200kHz.
4. Record the max trace plot into the test report.

**TEST RESULTS:**

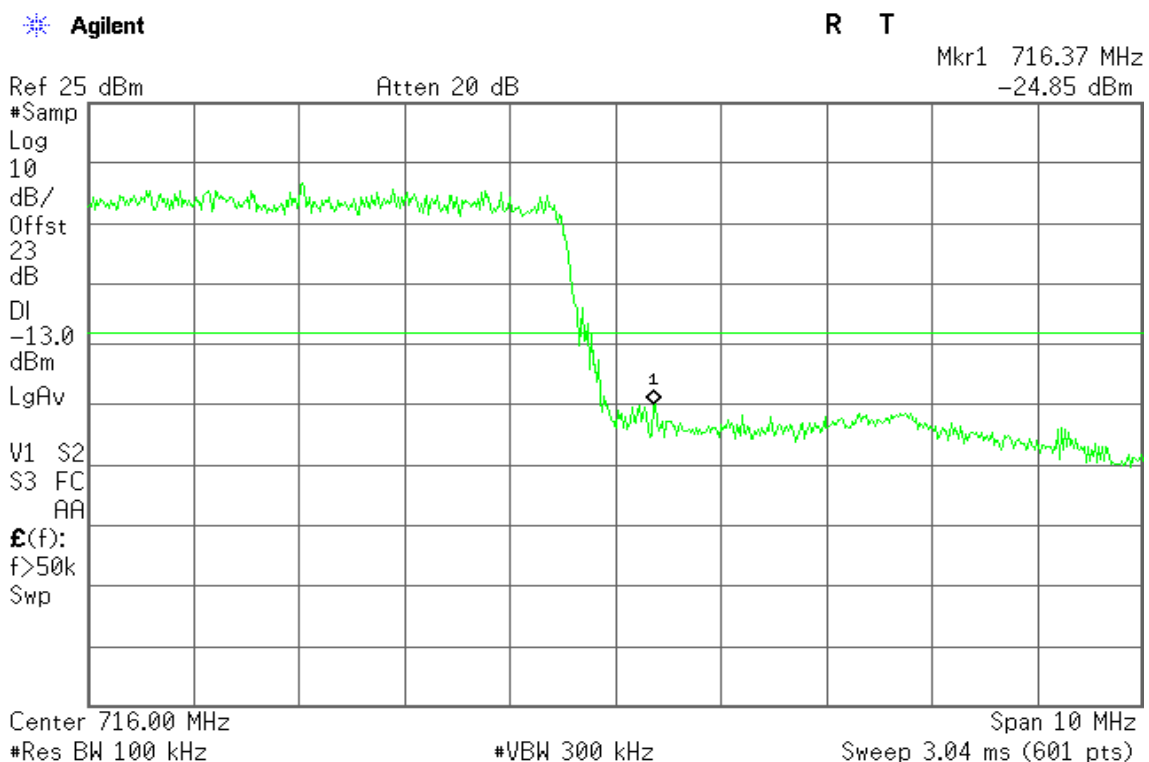
**LTE Band 12**

**CHANNEL BANDWIDTH: 10MHz / QPSK / FULL RB ALLOCATED**

**LOWER BAND EDGE**



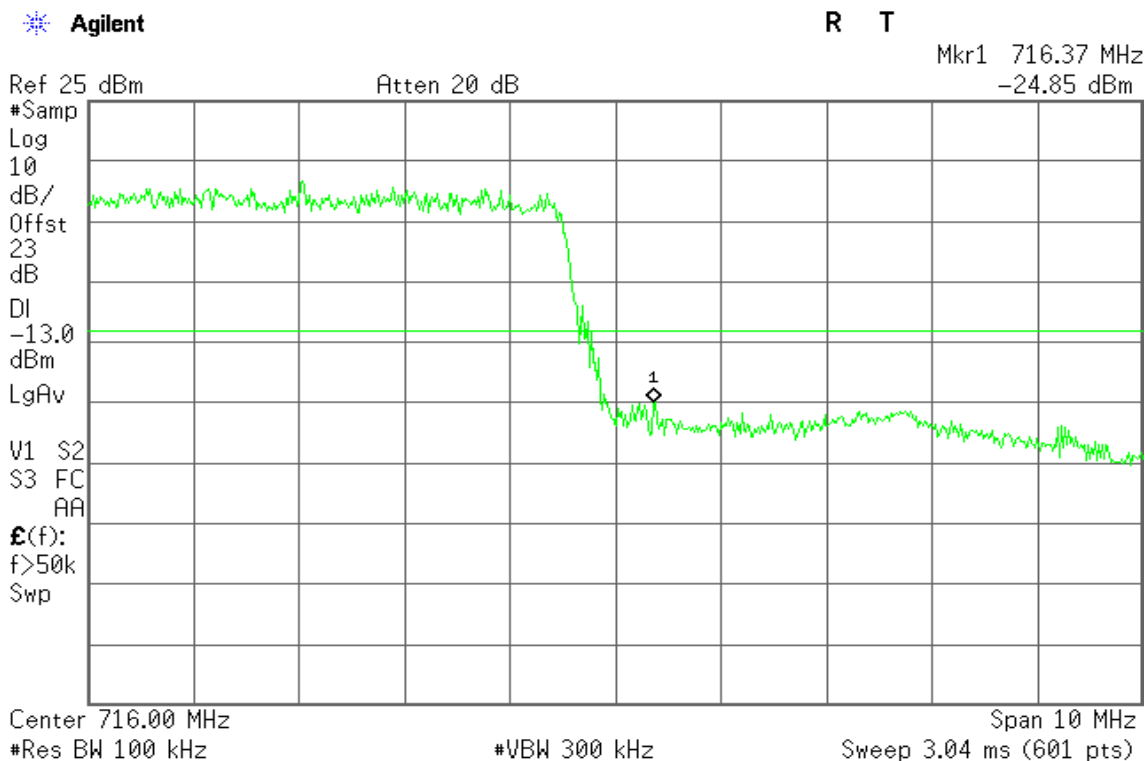
**HIGHER BAND EDGE**



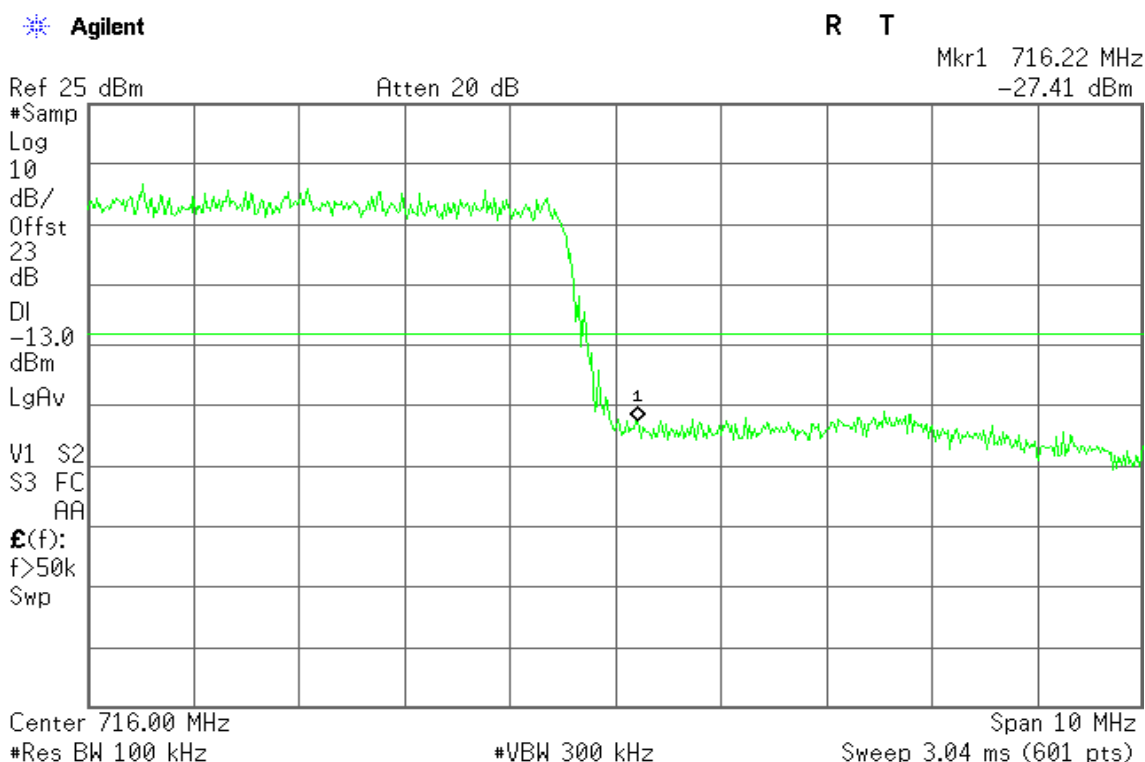
## LTE Band 12

**CHANNEL BANDWIDTH: 10MHz / 16QAM / FULL RB ALLOCATED**

### LOWER BAND EDGE



### HIGHER BAND EDGE



## 7.6 CONDUCTED SPURIOUS EMISSIONS

### LIMITS

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  $-13\text{dBm}$

### TEST PROCEDURES

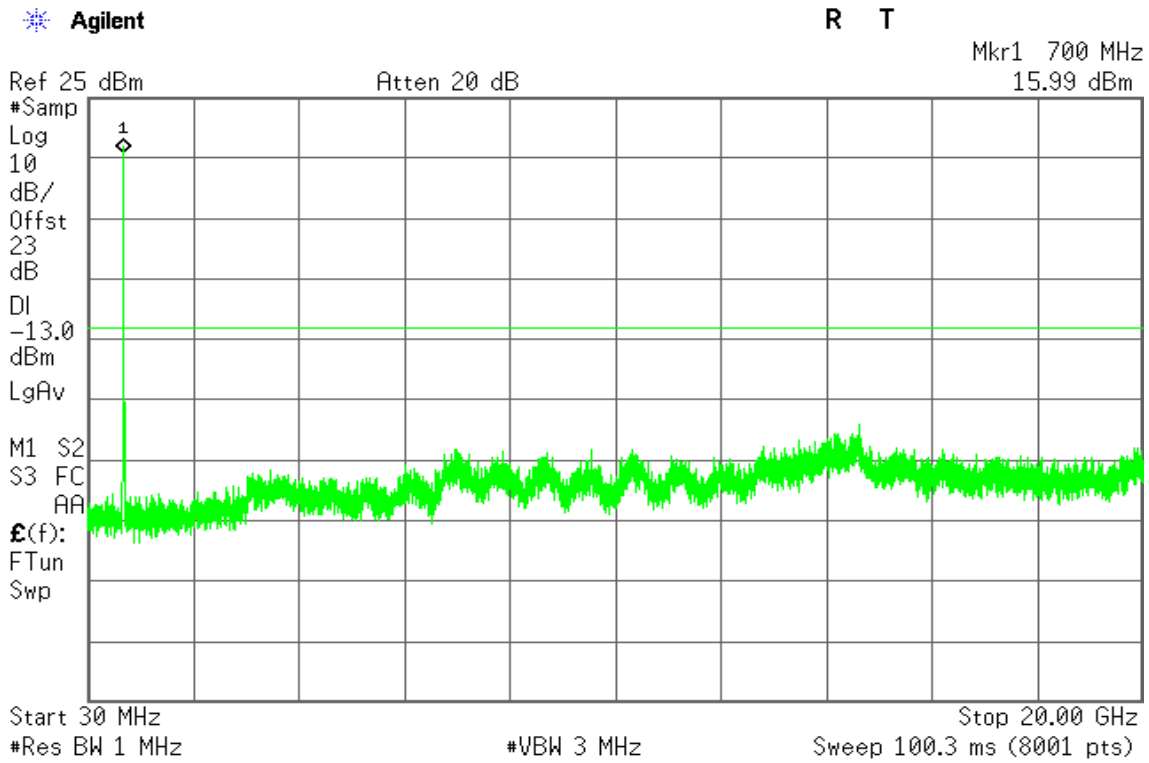
1. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high operational frequency range.).
2. The conducted spurious emission used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
3. When the spectrum scanned from 30MHz to 3GHz, it shall be connected to the band reject filter attenuated the carried frequency. The spectrum set  $\text{RB}=1\text{MHz}$ ,  $\text{VB}=3\text{MHz}$ .
4. When the spectrum scanned from 3GHz to 20GHz, it shall be connected to the high pass filter attenuated the carried frequency. The spectrum set  $\text{RB}=1\text{MHz}$ ,  $\text{VB}=3\text{MHz}$ .

## TEST RESULTS

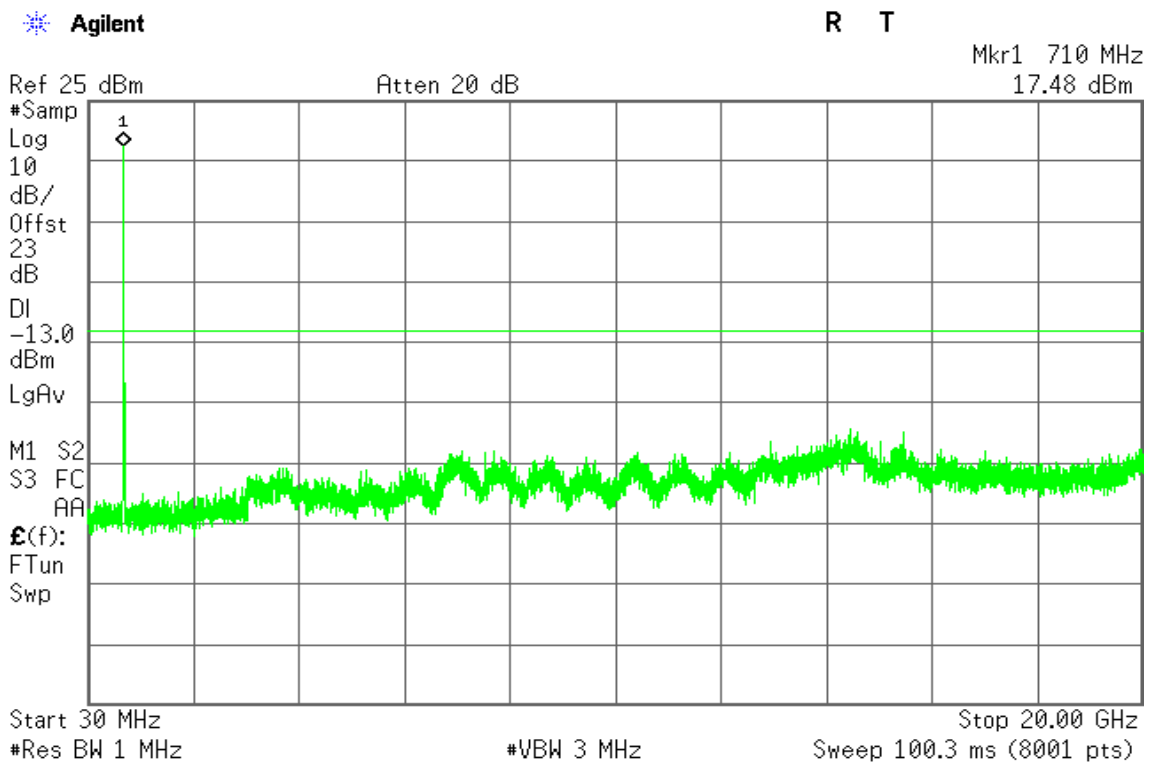
### LTE Band 12

CHANNEL BANDWIDTH: 5MHz / QPSK

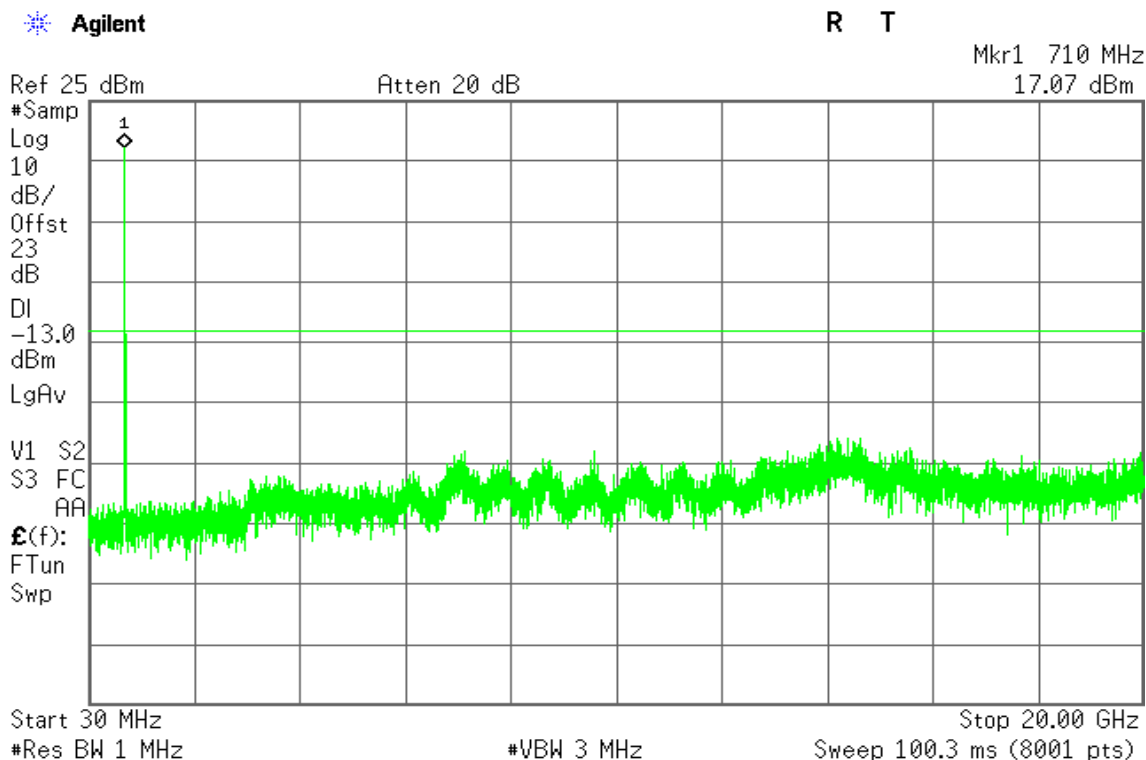
CH Low



CH Mid

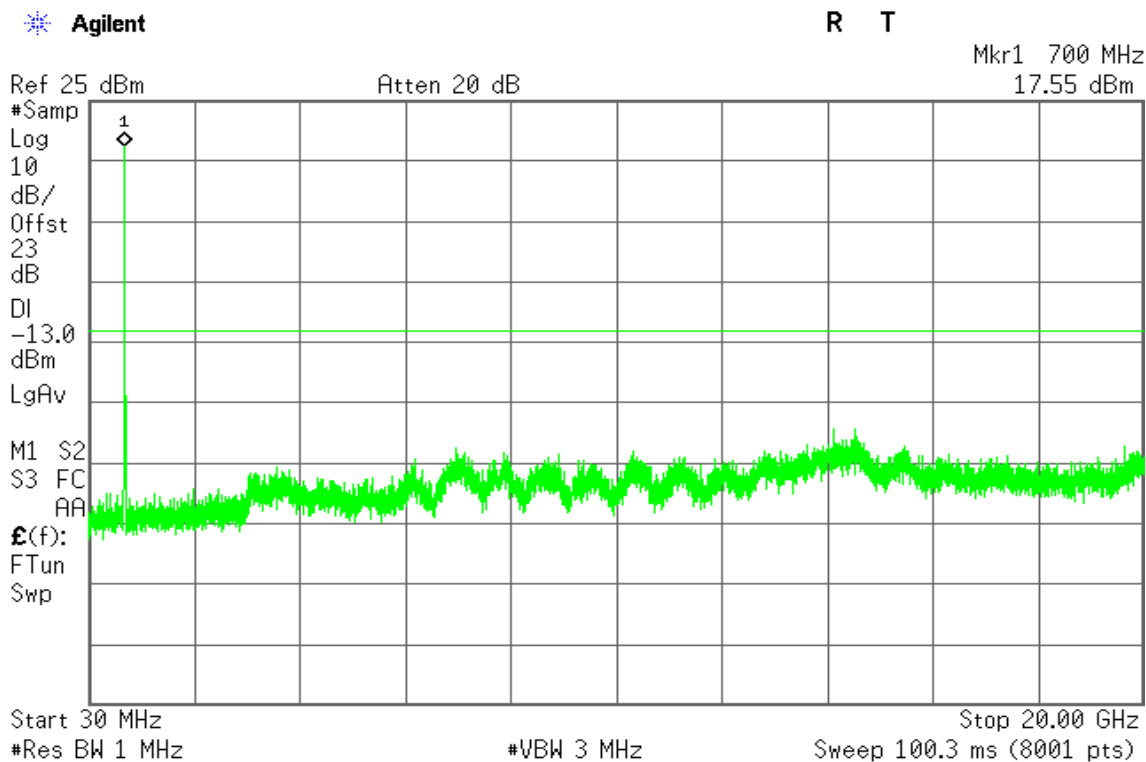


### CH High



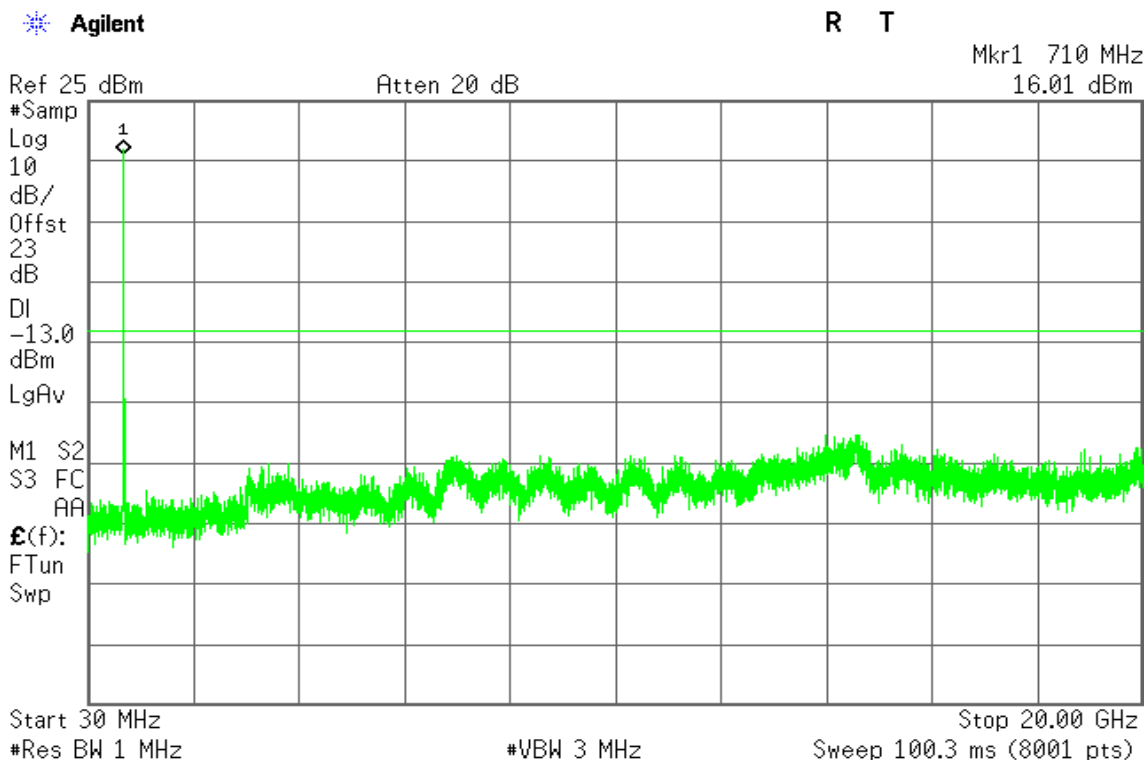
### CHANNEL BANDWIDTH: 5MHz / 16QAM

### CH Low

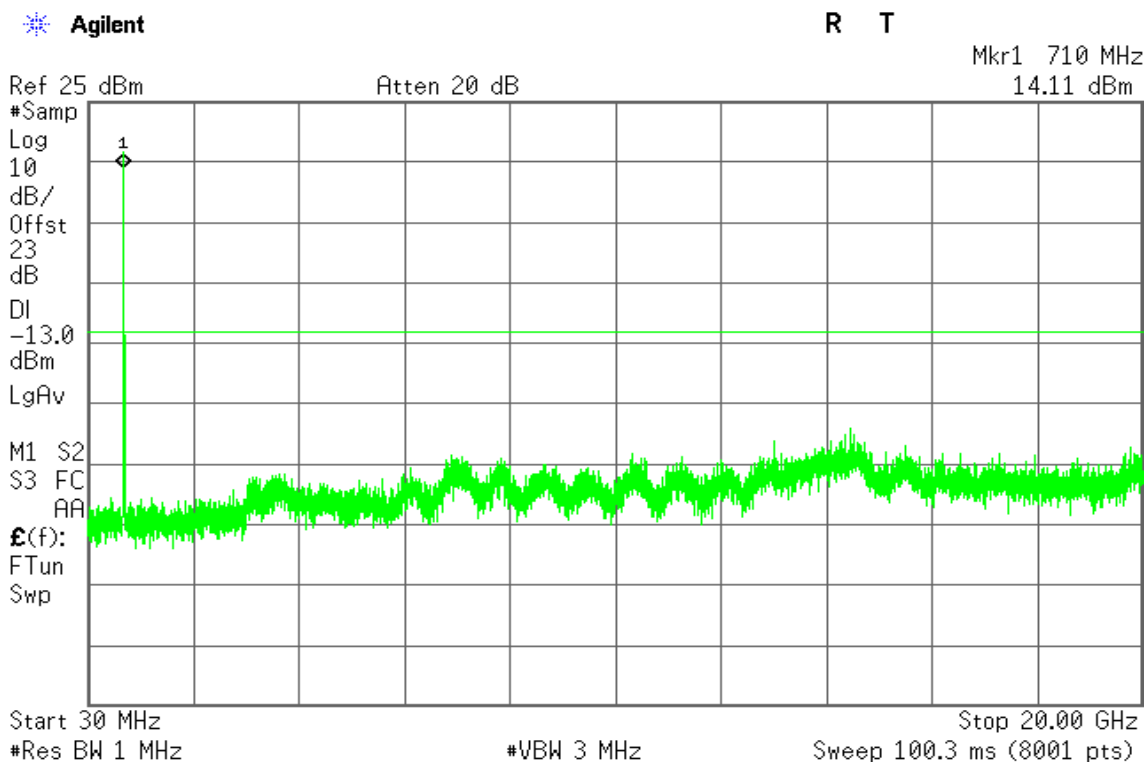




### CH Mid

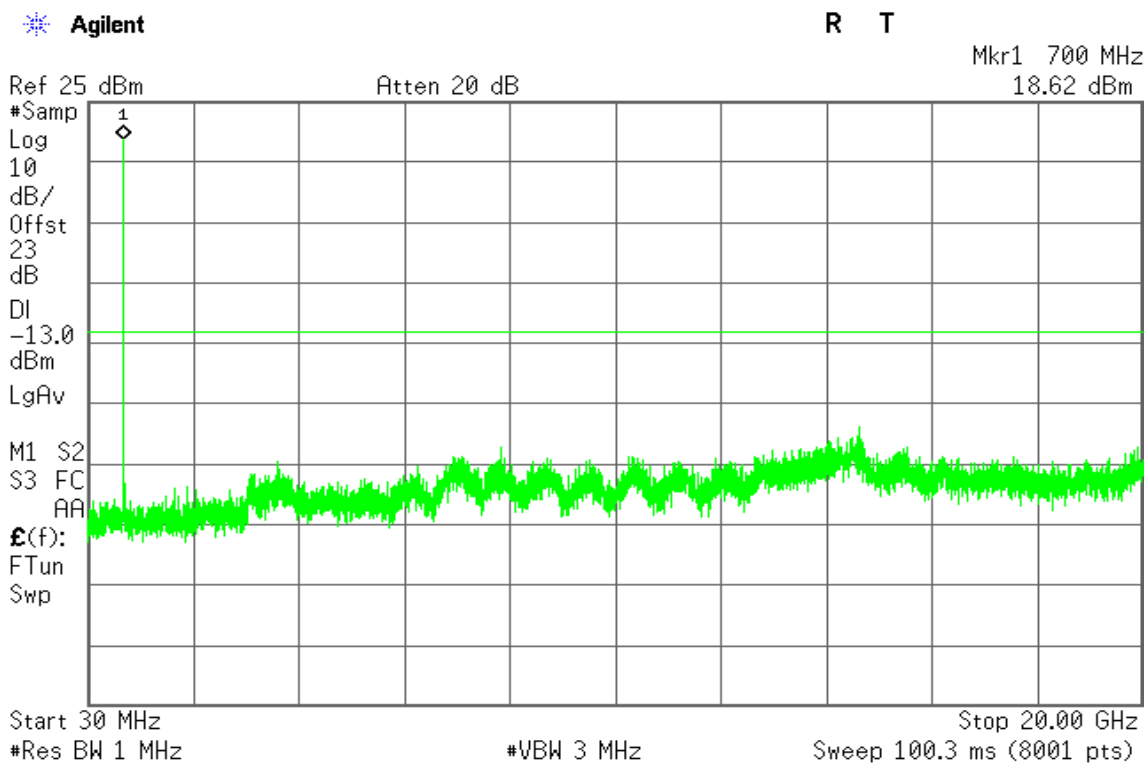


### CH High

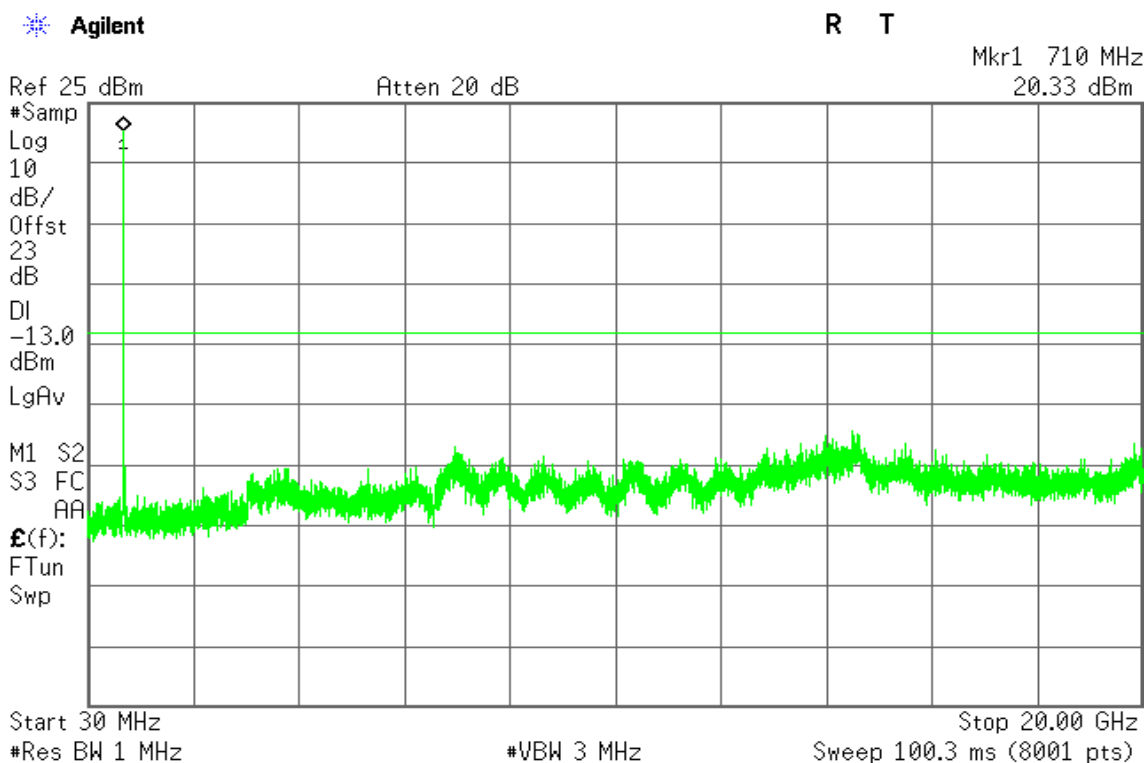


**CHANNEL BANDWIDTH: 10MHz / QPSK**

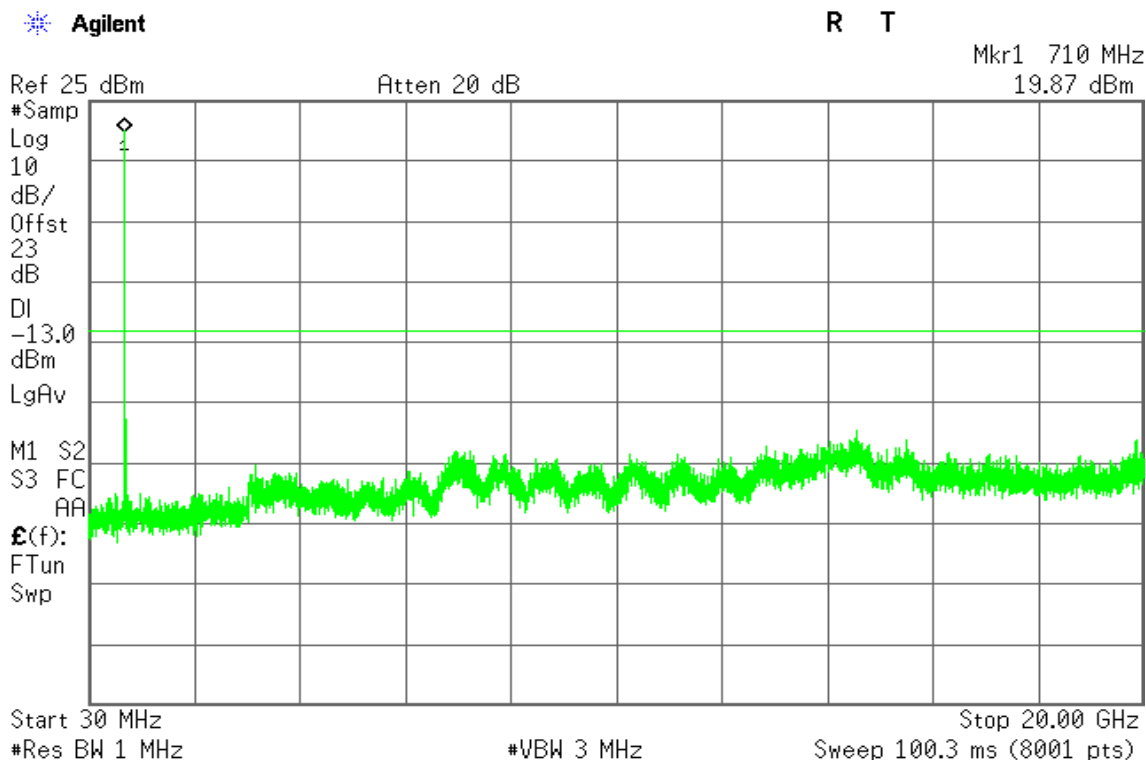
**CH Low**



**CH Mid**

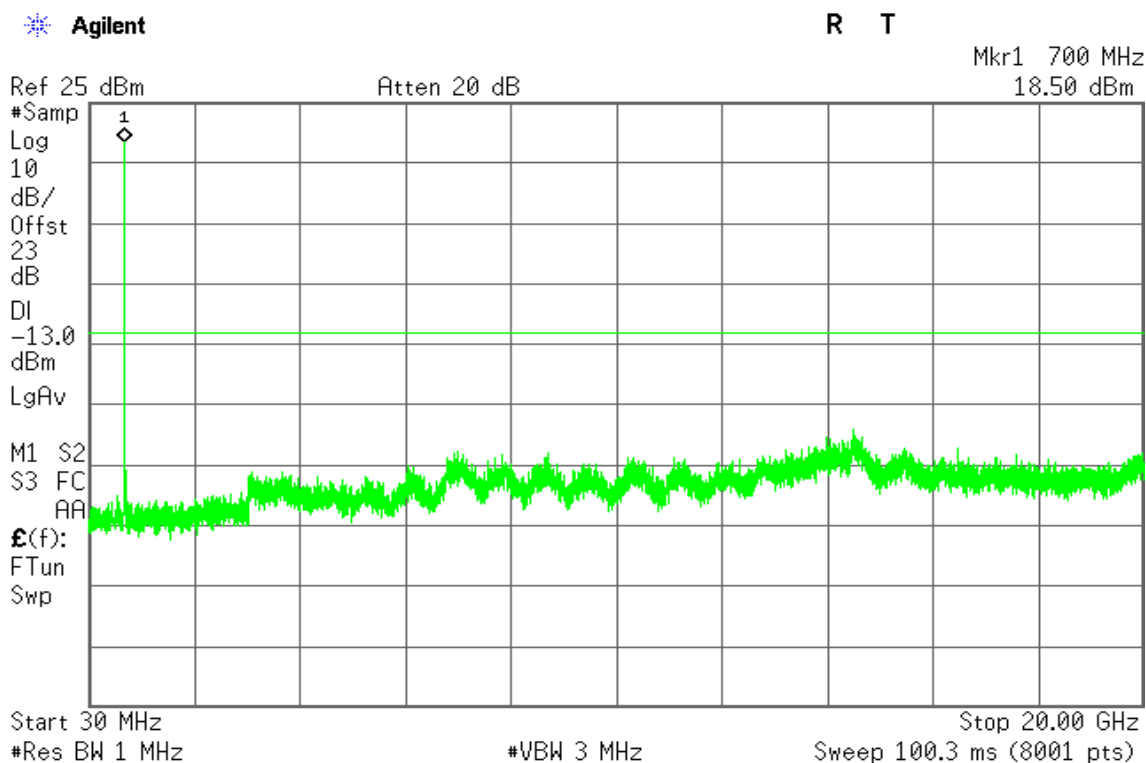


### CH High

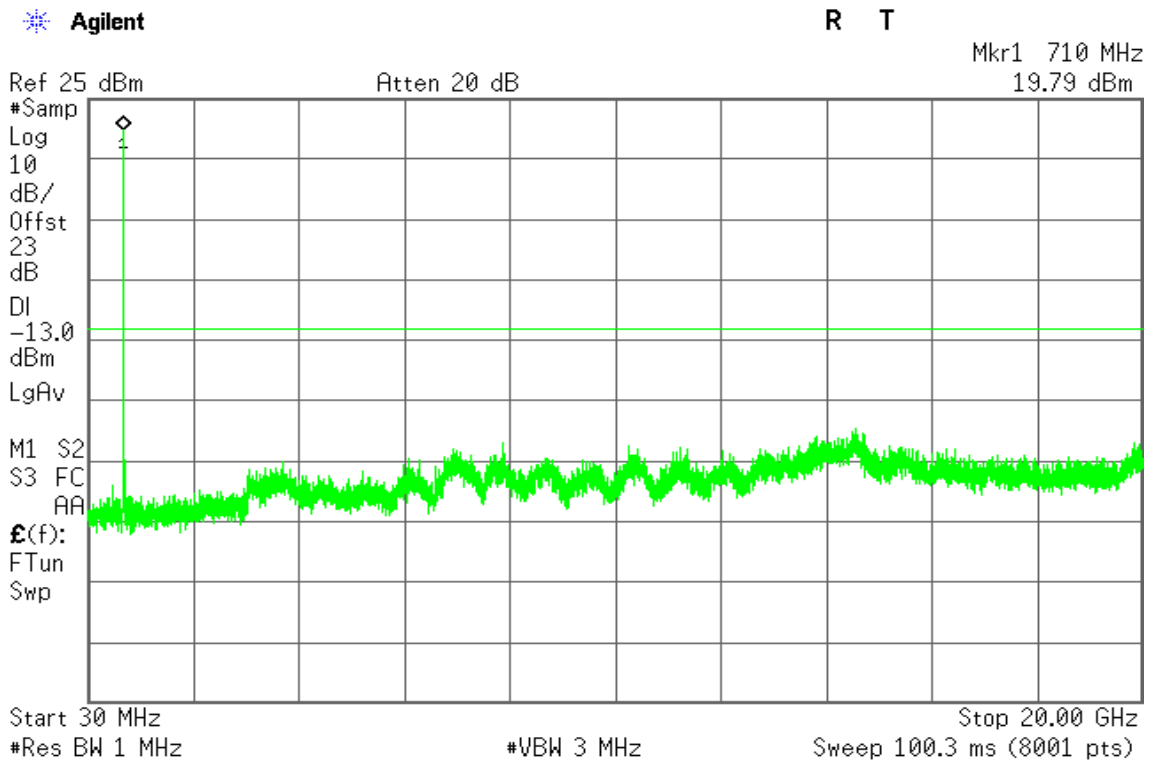


### CHANNEL BANDWIDTH: 10MHz / 16QAM

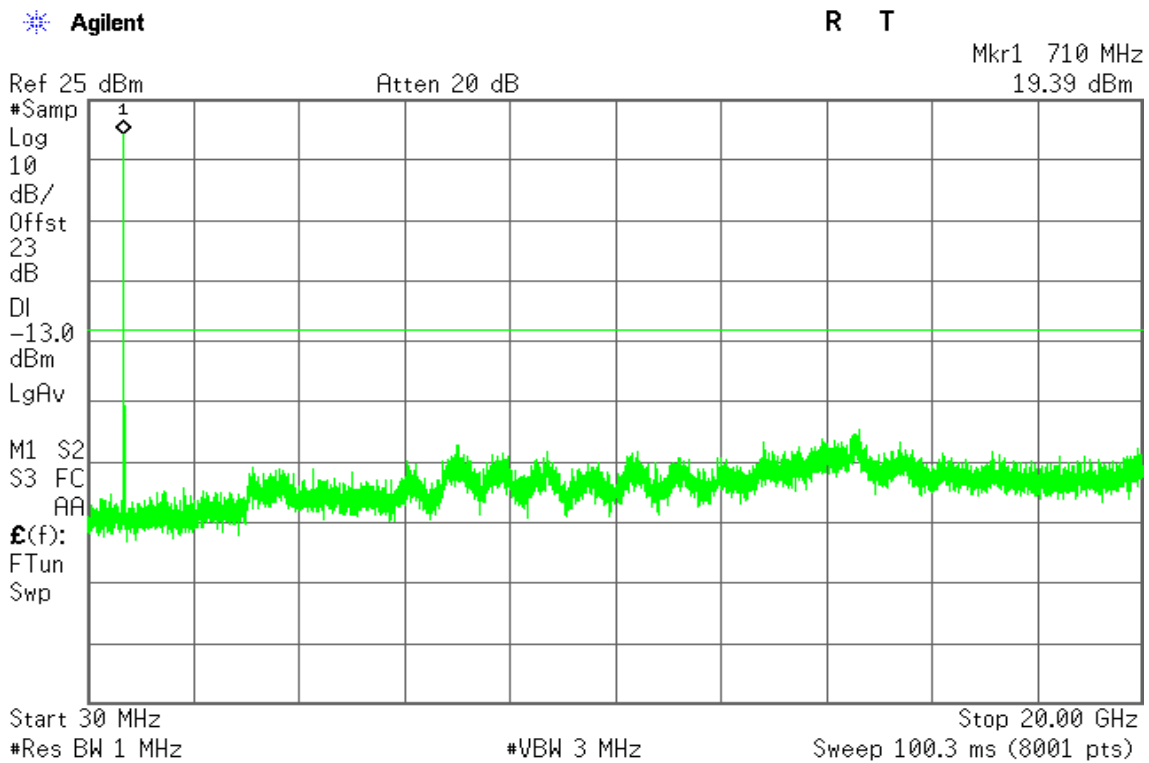
### CH Low



### CH Mid



### CH High



## 7.7 RADIATED EMISSION MEASUREMENT

### LIMITS

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  $-13\text{dBm}$

So the limit of emission is the same absolute specified line.

Limits	EQUIVALENT FIELD STRENGTH AT 3m (dBuV/m) (NOTE)
-13	82.22

**NOTE:** The following formula is used to convert the equipment radiated power to field strength.

$$E = [1000000\sqrt{(30P)}] / 3 \text{ uV/m, where P is Watts}$$

### TEST PROCEDURES

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
3. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
4. Repeat step 1 ~ 3 for horizontal polarization.

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

**TEST RESULTS**

**Below 1GHz**

**LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / QPSK**

**Operation Mode:** Tx / Low channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
90.1400	-61.79	1.11	1.07	-61.83	-13.00	-48.83	V
149.3100	-66.71	1.42	0.62	-67.51	-13.00	-54.51	V
237.5800	-75.68	1.81	5.36	-72.13	-13.00	-59.13	V
286.0800	-84	2.01	5.36	-80.65	-13.00	-67.65	V
437.4000	-82.62	2.52	5.88	-79.26	-13.00	-66.26	V
482.9900	-73.03	2.65	5.58	-70.10	-13.00	-57.10	V
53.2800	-62.42	0.83	-3.94	-67.19	-13.00	-54.19	H
126.0300	-61.6	1.32	-1.69	-64.61	-13.00	-51.61	H
190.0500	-72.51	1.62	4	-70.13	-13.00	-57.13	H
244.3700	-79.04	1.82	5.47	-75.39	-13.00	-62.39	H
362.7100	-73.23	2.28	5.73	-69.78	-13.00	-56.78	H
480.0800	-70.62	2.64	5.54	-67.72	-13.00	-54.72	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / Middle channel    **Test Date:** August 27, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
62.0100	-55.06	0.89	-2.1	-58.05	-13.00	-45.05	V
78.5000	-66.4	1.03	-0.43	-67.86	-13.00	-54.86	V
266.6800	-77.78	1.96	5.27	-74.47	-13.00	-61.47	V
377.2600	-79.15	2.31	5.94	-75.52	-13.00	-62.52	V
480.0800	-76.64	2.64	5.54	-73.74	-13.00	-60.74	V
531.4900	-78.52	2.76	6.05	-75.23	-13.00	-62.23	V
66.8600	-64.36	0.93	-1.89	-67.18	-13.00	-54.18	H
151.2500	-62.26	1.43	0.8	-62.89	-13.00	-49.89	H
209.4500	-73.87	1.68	5.45	-70.10	-13.00	-57.10	H
256.9800	-74.44	1.89	5.62	-70.71	-13.00	-57.71	H
376.2900	-71.68	2.31	5.93	-68.06	-13.00	-55.06	H
480.0800	-69.46	2.64	5.54	-66.56	-13.00	-53.56	H

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** Tx / High channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
54.2500	-62.68	0.83	-3.66	-67.17	-13.00	-54.17	V
62.9800	-55.89	0.9	-2.06	-58.85	-13.00	-45.85	V
145.4300	-65.97	1.41	0.26	-67.12	-13.00	-54.12	V
219.1500	-79.01	1.76	5.32	-75.45	-13.00	-62.45	V
377.2600	-77.81	2.31	5.94	-74.18	-13.00	-61.18	V
480.0800	-75.08	2.64	5.54	-72.18	-13.00	-59.18	V
53.2800	-61.99	0.83	-3.94	-66.76	-13.00	-53.76	H
128.9400	-62.05	1.34	-1.5	-64.89	-13.00	-51.89	H
208.4800	-74.53	1.67	5.2	-71.00	-13.00	-58.00	H
336.5200	-75.13	2.17	5.76	-71.54	-13.00	-58.54	H
377.2600	-72.94	2.31	5.94	-69.31	-13.00	-56.31	H
480.0800	-69.99	2.64	5.54	-67.09	-13.00	-54.09	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



**LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / 16QAM**

**Operation Mode:** Tx / Low channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
54.2500	-63.09	0.83	-3.66	-67.58	-13.00	-54.58	V
136.7000	-70.38	1.38	-0.61	-72.37	-13.00	-59.37	V
233.7000	-75.59	1.8	5.39	-72.00	-13.00	-59.00	V
352.0400	-82.8	2.24	5.78	-79.26	-13.00	-66.26	V
379.2000	-79.57	2.31	5.98	-75.90	-13.00	-62.90	V
480.0800	-76.37	2.64	5.54	-73.47	-13.00	-60.47	V
52.3100	-60.36	0.82	-4.22	-65.40	-13.00	-52.40	H
125.0600	-56.31	1.31	-1.75	-59.37	-13.00	-46.37	H
191.9900	-62.44	1.62	3.79	-60.27	-13.00	-47.27	H
256.9800	-66.24	1.89	5.62	-62.51	-13.00	-49.51	H
378.2300	-72.46	2.31	5.96	-68.81	-13.00	-55.81	H
480.0800	-70.56	2.64	5.54	-67.66	-13.00	-54.66	H

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** Tx / Middle channel    **Test Date:** August 27, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
53.2800	-63.19	0.83	-3.94	-67.96	-13.00	-54.96	V
106.6300	-57.51	1.19	-1.26	-59.96	-13.00	-46.96	V
196.8400	-73.98	1.63	3.26	-72.35	-13.00	-59.35	V
262.8000	-68.47	1.93	5.46	-64.94	-13.00	-51.94	V
312.2700	-81.04	2.14	5.76	-77.42	-13.00	-64.42	V
387.9300	-81.11	2.32	6	-77.43	-13.00	-64.43	V
62.9800	-58.57	0.9	-2.06	-61.53	-13.00	-48.53	H
133.7900	-58.33	1.36	-0.95	-60.64	-13.00	-47.64	H
196.8400	-71.01	1.63	3.26	-69.38	-13.00	-56.38	H
272.5000	-71.36	1.99	5.15	-68.20	-13.00	-55.20	H
375.3200	-72.32	2.31	5.91	-68.72	-13.00	-55.72	H
480.0800	-70.19	2.64	5.54	-67.29	-13.00	-54.29	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / High channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
54.2500	-62.88	0.83	-3.66	-67.37	-13.00	-54.37	V
167.7400	-68.76	1.55	2.26	-68.05	-13.00	-55.05	V
194.9000	-73.97	1.63	3.47	-72.13	-13.00	-59.13	V
257.9500	-71.85	1.89	5.61	-68.13	-13.00	-55.13	V
381.1400	-78.49	2.31	5.98	-74.82	-13.00	-61.82	V
480.0800	-76.41	2.64	5.54	-73.51	-13.00	-60.51	V
69.7700	-55.38	0.96	-1.76	-58.10	-13.00	-45.10	H
138.6400	-60.55	1.39	-0.38	-62.32	-13.00	-49.32	H
264.7400	-59.45	1.94	5.36	-56.03	-13.00	-43.03	H
379.2000	-72.23	2.31	5.98	-68.56	-13.00	-55.56	H
480.0800	-69.72	2.64	5.54	-66.82	-13.00	-53.82	H
627.5200	-76.02	2.97	6.17	-72.82	-13.00	-59.82	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**LTE Band 12 / CHANNEL BANDWIDTH: 10MHz / QPSK**

**Operation Mode:** Tx / Low channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
53.2800	-62.46	0.83	-3.94	-67.23	-13.00	-54.23	V
138.6400	-71.16	1.39	-0.38	-72.93	-13.00	-59.93	V
194.9000	-74.33	1.63	3.47	-72.49	-13.00	-59.49	V
269.5900	-80.84	1.98	5.12	-77.70	-13.00	-64.70	V
389.8700	-79.06	2.32	6	-75.38	-13.00	-62.38	V
480.0800	-75.92	2.64	5.54	-73.02	-13.00	-60.02	V
68.8000	-65.3	0.95	-1.81	-68.06	-13.00	-55.06	H
161.9200	-63.08	1.5	1.61	-62.97	-13.00	-49.97	H
251.1600	-69.94	1.84	5.69	-66.09	-13.00	-53.09	H
332.6400	-71.2	2.16	5.73	-67.63	-13.00	-54.63	H
397.6300	-76.56	2.37	5.99	-72.94	-13.00	-59.94	H
480.0800	-69.46	2.64	5.54	-66.56	-13.00	-53.56	H

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** Tx / Middle channel    **Test Date:** August 27, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
52.3100	-60.38	0.82	-4.22	-65.42	-13.00	-52.42	V
106.6300	-62.54	1.19	-1.26	-64.99	-13.00	-51.99	V
195.8700	-73.68	1.63	3.36	-71.95	-13.00	-58.95	V
262.8000	-76.13	1.93	5.46	-72.60	-13.00	-59.60	V
380.1700	-79.74	2.31	5.98	-76.07	-13.00	-63.07	V
480.0800	-75.99	2.64	5.54	-73.09	-13.00	-60.09	V
91.1100	-66	1.11	1.05	-66.06	-13.00	-53.06	H
191.0200	-67.86	1.62	3.89	-65.59	-13.00	-52.59	H
269.5900	-74.5	1.98	5.12	-71.36	-13.00	-58.36	H
355.9200	-74.86	2.25	5.74	-71.37	-13.00	-58.37	H
480.0800	-68.61	2.64	5.54	-65.71	-13.00	-52.71	H
622.6700	-76.38	2.95	6.14	-73.19	-13.00	-60.19	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

<b>Operation Mode:</b>	Tx / High channel	<b>Test Date:</b>	August 27, 2015
<b>Temperature:</b>	21°C	<b>Tested by:</b>	David Shu
<b>Humidity:</b>	56% RH	<b>Polarity:</b>	Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
71.7100	-57.69	0.97	-1.61	-60.27	-13.00	-47.27	V
118.2700	-64.44	1.26	-2.03	-67.73	-13.00	-54.73	V
207.5100	-77.05	1.67	4.95	-73.77	-13.00	-60.77	V
349.1300	-82.88	2.22	5.8	-79.30	-13.00	-66.30	V
377.2600	-78.83	2.31	5.94	-75.20	-13.00	-62.20	V
480.0800	-75.67	2.64	5.54	-72.77	-13.00	-59.77	V
105.6600	-65.73	1.18	-1.14	-68.05	-13.00	-55.05	H
193.9300	-71.89	1.62	3.58	-69.93	-13.00	-56.93	H
286.0800	-73.68	2.01	5.36	-70.33	-13.00	-57.33	H
380.1700	-72	2.31	5.98	-68.33	-13.00	-55.33	H
445.1600	-78.06	2.56	5.8	-74.82	-13.00	-61.82	H
480.0800	-69.7	2.64	5.54	-66.80	-13.00	-53.80	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**LTE Band 12 / CHANNEL BANDWIDTH: 10MHz / 16QAM**

**Operation Mode:** Tx / Low channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
54.2500	-62.48	0.83	-3.66	-66.97	-13.00	-53.97	V
143.4900	-65.62	1.4	0.08	-66.94	-13.00	-53.94	V
226.9100	-73.01	1.79	5.37	-69.43	-13.00	-56.43	V
309.3600	-83.57	2.13	5.78	-79.92	-13.00	-66.92	V
389.8700	-81.69	2.32	6	-78.01	-13.00	-65.01	V
480.0800	-76.14	2.64	5.54	-73.24	-13.00	-60.24	V
53.2800	-63.01	0.83	-3.94	-67.78	-13.00	-54.78	H
105.6600	-58.54	1.18	-1.14	-60.86	-13.00	-47.86	H
191.0200	-71.84	1.62	3.89	-69.57	-13.00	-56.57	H
265.7100	-78.9	1.95	5.32	-75.53	-13.00	-62.53	H
362.7100	-71.5	2.28	5.73	-68.05	-13.00	-55.05	H
480.0800	-69.23	2.64	5.54	-66.33	-13.00	-53.33	H

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** Tx / Middle channel    **Test Date:** August 27, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
53.2800	-62.73	0.83	-3.94	-67.50	-13.00	-54.50	V
99.8400	-70.62	1.15	-0.37	-72.14	-13.00	-59.14	V
199.7500	-72.31	1.63	2.94	-71.00	-13.00	-58.00	V
217.2100	-78.67	1.74	5.35	-75.06	-13.00	-62.06	V
378.2300	-80.46	2.31	5.96	-76.81	-13.00	-63.81	V
480.0800	-76.02	2.64	5.54	-73.12	-13.00	-60.12	V
93.0500	-59.75	1.12	0.74	-60.13	-13.00	-47.13	H
118.2700	-57.24	1.26	-2.03	-60.53	-13.00	-47.53	H
264.7400	-64.03	1.94	5.36	-60.61	-13.00	-47.61	H
377.2600	-72.33	2.31	5.94	-68.70	-13.00	-55.70	H
480.0800	-69.85	2.64	5.54	-66.95	-13.00	-53.95	H
620.7300	-74.77	2.94	6.12	-71.59	-13.00	-58.59	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



**Operation Mode:** Tx / High channel      **Test Date:** August 27, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
54.2500	-62.85	0.83	-3.66	-67.34	-13.00	-54.34	V
86.2600	-68.64	1.08	0.62	-69.10	-13.00	-56.10	V
137.6700	-70.17	1.38	-0.49	-72.04	-13.00	-59.04	V
194.9000	-74.25	1.63	3.47	-72.41	-13.00	-59.41	V
293.8400	-83.24	2.05	5.48	-79.81	-13.00	-66.81	V
480.0800	-76.03	2.64	5.54	-73.13	-13.00	-60.13	V
87.2300	-57.08	1.09	0.73	-57.44	-13.00	-44.44	H
135.7300	-59.74	1.37	-0.72	-61.83	-13.00	-48.83	H
191.0200	-71.52	1.62	3.89	-69.25	-13.00	-56.25	H
287.0500	-72.66	2.01	5.37	-69.30	-13.00	-56.30	H
360.7700	-71.96	2.27	5.71	-68.52	-13.00	-55.52	H
480.0800	-70.32	2.64	5.54	-67.42	-13.00	-54.42	H

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Above 1GHz**

**LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / QPSK**

**Operation Mode:** Tx / Low channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
2435.000	-52.07	6.24	6.01	-52.30	-13.00	-39.30	V
6117.000	-49.1	10.72	10.99	-48.83	-13.00	-35.83	V
N/A							
3597.000	-53.26	8.1	9	-52.36	-13.00	-39.36	H
6453.000	-48.15	11.12	11.26	-48.01	-13.00	-35.01	H
N/A							

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**Operation Mode:** Tx / Middle channel    **Test Date:** August 26, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4339.000	-50.3	8.62	9.67	-49.25	-13.00	-36.25	V
6124.000	-48.78	10.76	11	-48.54	-13.00	-35.54	V
N/A							
3884.000	-51.8	8.37	9.28	-50.89	-13.00	-37.89	H
5949.000	-49.42	10.61	10.89	-49.14	-13.00	-36.14	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / High channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3933.000	-51.71	8.38	9.33	-50.76	-13.00	-37.76	V
6208.000	-48.12	11.18	11.07	-48.23	-13.00	-35.23	V
N/A							
4101.000	-49.88	8.46	9.48	-48.86	-13.00	-35.86	H
6635.000	-45.93	11.25	11.46	-45.72	-13.00	-32.72	H
N/A							

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**LTE Band 12 / CHANNEL BANDWIDTH: 5MHz / 16QAM**

**Operation Mode:** Tx / Low channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3779.000	-53.92	8.25	9.18	-52.99	-13.00	-39.99	V
5515.000	-52.32	9.98	10.8	-51.50	-13.00	-38.50	V
N/A							
4549.000	-51.12	9.02	9.88	-50.26	-13.00	-37.26	H
6985.000	-46.01	11.54	11.88	-45.67	-13.00	-32.67	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / Middle channel    **Test Date:** August 26, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4745.000	-52.33	9.22	10.19	-51.36	-13.00	-38.36	V
6712.000	-47.99	11.3	11.55	-47.74	-13.00	-34.74	V
N/A							
3611.000	-53.77	8.12	9.01	-52.88	-13.00	-39.88	H
5389.000	-50.46	9.8	10.76	-49.50	-13.00	-36.50	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / High channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3114.000	-55.34	7.18	7.74	-54.78	-13.00	-41.78	V
6250.000	-49.49	10.98	11.1	-49.37	-13.00	-36.37	V
N/A							
4451.000	-51.34	8.78	9.76	-50.36	-13.00	-37.36	H
6481.000	-47.24	11.07	11.28	-47.03	-13.00	-34.03	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**LTE Band 12 / CHANNEL BANDWIDTH: 10MHz / QPSK**

**Operation Mode:** Tx / Low channel      **Test Date:** August 26, 2015

**Temperature:** 21°C      **Tested by:** David Shu

**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3891.000	-52.4	8.38	9.29	-51.49	-13.00	-38.49	V
6208.000	-50.02	11.18	11.07	-50.13	-13.00	-37.13	V
N/A							
3023.000	-53.21	7.05	7.47	-52.79	-13.00	-39.79	H
6432.000	-46.67	11.16	11.25	-46.58	-13.00	-33.58	H
N/A							

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*



**Operation Mode:** Tx / Middle channel    **Test Date:** August 26, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4339.000	-51.61	8.62	9.67	-50.56	-13.00	-37.56	V
6649.000	-48.97	11.26	11.48	-48.75	-13.00	-35.75	V
N/A							
3247.000	-52.88	7.35	8.14	-52.09	-13.00	-39.09	H
5522.000	-49.52	9.99	10.8	-48.71	-13.00	-35.71	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / High channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3366.000	-53.42	7.53	8.5	-52.45	-13.00	-39.45	V
5865.000	-49.03	10.41	10.87	-48.57	-13.00	-35.57	V
N/A							
3576.000	-52.94	8.05	8.98	-52.01	-13.00	-39.01	H
6194.000	-47.27	11.18	11.06	-47.39	-13.00	-34.39	H
N/A							

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*

**LTE Band 12 / CHANNEL BANDWIDTH: 10MHz / 16QAM**

**Operation Mode:** Tx / Low channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
4325.000	-52.3	8.61	9.66	-51.25	-13.00	-38.25	V
6537.000	-49.25	11.11	11.34	-49.02	-13.00	-36.02	V
N/A							
2435.000	-50.3	6.24	6.01	-50.53	-13.00	-37.53	H
5725.000	-50.96	10.22	10.84	-50.34	-13.00	-37.34	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / Middle channel    **Test Date:** August 26, 2015  
**Temperature:** 21°C    **Tested by:** David Shu  
**Humidity:** 56% RH    **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
5256.000	-52.08	9.61	10.7	-50.99	-13.00	-37.99	V
7265.000	-45.51	11.97	12.32	-45.16	-13.00	-32.16	V
N/A							
3772.000	-52.57	8.24	9.17	-51.64	-13.00	-38.64	H
6327.000	-48.79	10.88	11.16	-48.51	-13.00	-35.51	H
N/A							

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.

**Operation Mode:** Tx / High channel      **Test Date:** August 26, 2015  
**Temperature:** 21°C      **Tested by:** David Shu  
**Humidity:** 56% RH      **Polarity:** Ver. / Hor.

Frequency (MHz)	S.G. (dBm)	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3933.000	-51.83	8.38	9.33	-50.88	-13.00	-37.88	V
6495.000	-49	11.05	11.3	-48.75	-13.00	-35.75	V
N/A							
4045.000	-52.01	8.4	9.44	-50.97	-13.00	-37.97	H
6670.000	-47.41	11.28	11.5	-47.19	-13.00	-34.19	H
N/A							

**Remark:**

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*