FCC 47 CFR PART 27 SUBPART L
&
INDUSTRY CANADA RSS-130 & RSS-139

For

Computer

FCC Model: AIM8Q, AIM8Qxxxxxxxxxxxxxxxx, AIM-x5BTxxxxxxxxxxxx(where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)

IC Model: AIM8Q, AIM-25BT, AIM-35BT, AIM-55BT, AIM-65BT, AIM-75BT

Trade Name: ADVANTECH

Issued to

Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
service@ccsrf.com
Issued Date: June 8, 2017

Testing Laboratory
1309

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		June 8, 2017		Initial Issue	ALL	Angel Cheng
01		July 19, 2017		1. Modify section 7.6 limit.	P.32	Angel Cheng

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1. TEST RESULT CERTIFICATION

Applicant: Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.

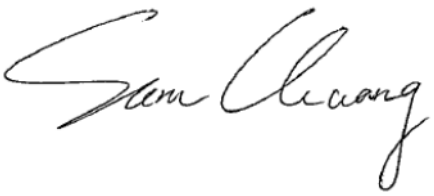
Manufacturer: Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.

Equipment Under Test: Computer
Trade Name: ADVANTECH
FCC Model: AIM8Q, AIM8Qxxxxxxxxxxxxxxx, AIM-x5BTxxxxxxxxxxx(where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)
IC Model: AIM8Q, AIM-25BT, AIM-35BT, AIM-55BT, AIM-65BT, AIM-75BT
Date of Test: May 17 ~ 31, 2017

APPLICABLE STANDARDS	
Standard	**TEST RESULT**
FCC Part 27, Subpart C, L, FCC Part 2 & RSS-130 Issue 1 October 2013 & RSS-139 Issue 3 July 2015	No non-compliance noted

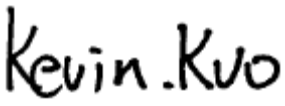
The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily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

Approved by



Sam Chuang
Manager
Compliance Certification Services Inc.

Tested by



Kevin Kuo
Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Computer	
FCC Model No.	AIM8Q, AIM8Qxxxxxxxxxxxxxxxx, AIM-x5BTxxxxxxxxxxx(where "x" may be any alphanumeric character, "-" or blank for marketing purpose and no impact safety related critical components and constructions)	
IC Model No.	AIM8Q, AIM-25BT, AIM-35BT, AIM-55BT, AIM-65BT, AIM-75BT	
Model Discrepancy	All models are electrically identical, different model names are for marketing purpose	
Trade Name	ADVANTECH	
Received Date	April 6, 2017	
Power Supply	1. VDC from Power Adapter Chicony / A16-018N1A I/P: 100-240Vac, 1A, 50-60Hz O/P: 5.15Vdc, 3A, 9.1Vdc, 2A, 18W 2. Battery ADVANTECH / AIM-BAT-8 Rating: 3.8V, 4900mAh, 18.62Wh	
Modulation Technology	LTE Band 13	QPSK, 16QAM
Frequency Range	LTE Band 13 Channel Bandwidth: 5MHz	779.5MHz ~ 784.5MHz
	LTE Band 13 Channel Bandwidth: 10MHz	782MHz
Maximum EIRP Power	LTE Band 13 Channel Bandwidth: 5MHz	QPSK: 20.40 dBm 16QAM: 20.26 dBm
	LTE Band 13 Channel Bandwidth: 10MHz	QPSK : 19.81 dBm 16QAM: 16.85 dBm
Antenna Specification	PIFA Antenna LTE Band 13: Gain: -1.69dBi	

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.*

3. TEST METHODOLOGY

3.1 DESCRIPTION OF TEST TYPE

The EUT (model: AIM8Q) had been tested under operating condition.

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

LTE Band 13: 777 MHz ~ 787 MHz

Three channels had been tested for each channel bandwidth.

Channel	5MHz		10MHz	
	Channel	Frequency(MHz)	Channel	Frequency(MHz)
Low CH	23205	779.5	-	-
Middle CH	23230	752.0	23230	782.0
High CH	23255	784.5	-	-

For test mode:

The conducted power be measured in 1, 50% and 100% RB allocation, offset to upper edge, centered and lower edge of the channel bandwidth of each required channel.

	QPSK	Worst Mode	16QAM	Worst Mode
Band13	5M	1 RB ALLOCATED AT THE UPPER EDGE	1.4M	1 RB ALLOCATED AT THE LOWER EDGE
	10M	1 RB ALLOCATED AT THE UPPER EDGE	5M	1 RB ALLOCATED AT THE UPPER EDGE

3.2 The worst mode of measurement

Radiated Emission Measurement	
Test Condition	**Band edge, Emission for Unwanted and Fundamental**
Voltage/Hz	**120V/60Hz**
Test Mode	**Mode 1:EUT power by AC adapter via power cable.** **Mode 2:EUT power by Battery.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**
Position	☐ **P**laced in fixed position. ☐ **P**laced in fixed position at X-Plane (E2-Plane) ☒ **P**laced in fixed position at Y-Plane (E1-Plane) ☐ **P**laced in fixed position at Z-Plane (H-Plane)

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Voltage/Hz	**120V/60Hz**
Test Mode	**Mode 1:EUT power by AC adapter via power cable.** **Mode 2:EUT power by Battery.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Remark:

1. The worst mode was record in this test report.

2. The EUT pre-scanned in three axis ,X,Y, Z for radiated measurement. The worst cases (Y-Plane) were recorded in this report.

3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.

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 Date**	**Calibration Due**
Power Meter	Anritsu	ML2495A	1012009	07/04/2016	07/03/2017
Power Sensor	Anritsu	MA2411B	917072	07/04/2016	07/03/2017
Base Station	R&S	CMU 200	101245	07/29/2016	07/28/2017
Base Station	Anritsu	MT-8820C	6200938900	07/26/2016	07/25/2017
Spectrum Analyzer	R&S	FSV 40	101073	10/05/2016	10/04/2017

Wugu 966 Chamber A					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/03/2016	07/02/2017
Horn Antenna	EMCO	3117	00055165	02/20/2017	02/19/2018
Pre-Amplifier	EMCI	EMC 012635	980151	06/23/2016	06/22/2017
Pre-Amplifier	EMEC	EM330	060609	06/08/2016	06/07/2017
Spectrum Analyzer	Agilent	E4446A	US42510252	12/05/2016	12/04/2017
Loop Ant	COM-POWER	AL-130	121051	03/02/2017	03/1/2018
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	EZ-EMC (CCS-3A1RE)				

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, Chunghsen 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 C63.10: 2013 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	TAF Testing Laboratory 1309
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	Canada 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	Equipment	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

TEST PROCEDURES

CONDUCTED POWER MEASUREMENT:

1. The transmitter output power was connected to the call box.

2. Set EUT at maximum output power via call box.

3. Set Call box at lowest, middle and highest channels for each band and modulation.

TEST RESULTS

LTE Band 13

Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
13	10	23230	782.0	QPSK	1	0	0	23.2	0.20893
					1	24	0	22.8	0.19055
					1	49	0	22.7	0.18621
					25	0	1	22.2	0.16596
					25	12	1	21.9	0.15488
					25	24	1	21.7	0.14791
					50	0	1	21.8	0.15136
				16QAM	1	0	1	22.3	0.16982
					1	24	1	21.8	0.15136
					1	49	1	21.8	0.15136
					25	0	2	21.2	0.13183
					25	12	2	20.9	0.12303
					25	24	2	20.8	0.12023
					50	0	2	20.7	0.11749

Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
13	5	23205	779.5	QPSK	1	0	0	23.4	0.21677
					1	12	0	23.1	0.20606
					1	24	0	23.0	0.20137
					12	0	1	22.4	0.17378
					12	6	1	22.1	0.16368
					12	11	1	22.0	0.15996
					25	0	1	22.4	0.17258
				16QAM	1	0	1	22.5	0.17660
					1	12	1	22.2	0.16749
					1	24	1	22.0	0.15996
					12	0	2	21.4	0.13868
					12	6	2	21.2	0.13305
					12	11	2	21.0	0.12706
					25	0	2	21.1	0.13002
		23230	782.0	QPSK	1	0	0	23.1	0.20512
					1	12	0	23.3	0.21577
					1	24	0	23.0	0.20045
					12	0	1	22.4	0.17298
					12	6	1	22.1	0.16293
					12	11	1	22.0	0.15922
					25	0	1	22.4	0.17179
				16QAM	1	0	1	22.5	0.17579
					1	12	1	22.2	0.16672
					1	24	1	22.0	0.15922
					12	0	2	21.4	0.13804
					12	6	2	21.2	0.13243
					12	11	2	21.0	0.12647
					25	0	2	21.1	0.12942
		23255	784.5	QPSK	1	0	0	23.4	0.21878
					1	12	0	23.2	0.20797
					1	24	0	23.1	0.20324
					12	0	1	22.4	0.17539
					12	6	1	22.2	0.16520
					12	11	1	22.1	0.16144
					25	0	1	22.4	0.17418
				16QAM	1	0	1	22.5	0.17824
					1	12	1	22.3	0.16904
					1	24	1	22.1	0.16144
					12	0	2	21.5	0.13996
					12	6	2	21.3	0.13428
					12	11	2	21.1	0.12823
					25	0	2	21.2	0.13122

Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	Output Power (W)
13	5	23205	779.5	QPSK	1	0	0	23.2	0.20654
					1	12	0	22.8	0.18836
					1	24	0	22.7	0.18408
					12	0	1	22.2	0.16406
					12	6	1	21.9	0.15311
					12	11	1	21.7	0.14622
					25	0	1	21.8	0.14962
				16QAM	1	0	1	22.3	0.16788
					1	12	1	21.8	0.14962
					1	24	1	21.8	0.14962
					12	0	2	21.2	0.13032
					12	6	2	20.9	0.12162
					12	11	2	20.8	0.11885
					25	0	2	20.7	0.11614
		23230	752.0	QPSK	1	0	0	23.1	0.20417
					1	12	0	22.7	0.18621
					1	24	0	22.6	0.18197
					12	0	1	22.1	0.16218
					12	6	1	21.8	0.15136
					12	11	1	21.6	0.14454
					25	0	1	21.7	0.14791
				16QAM	1	0	1	22.2	0.16596
					1	12	1	21.7	0.14791
					1	24	1	21.7	0.14791
					12	0	2	21.1	0.12882
					12	6	2	20.8	0.12023
					12	11	2	20.7	0.11749
					25	0	2	20.6	0.11482
		23255	784.5	QPSK	1	0	0	23.2	0.20654
					1	12	0	22.8	0.18836
					1	24	0	22.7	0.18408
					12	0	1	22.5	0.17783
					12	6	1	22.2	0.16596
					12	11	1	22.1	0.16218
					25	0	1	21.7	0.14791
				16QAM	1	0	1	22.2	0.16596
					1	12	1	21.7	0.14791
					1	24	1	21.7	0.14791
					12	0	2	21.2	0.13183
					12	6	2	20.8	0.12023
					12	11	2	21.1	0.12882
					25	0	2	20.7	0.11749

Band	BW (MHz)	Channel	Frequency (MHz)	Mode	UL RB Allocation	UL RB Start	MPR	Average power(dBm)	
								W/o Power back-off	W/ Power back-off
13	5	23205	779.5	QPSK	1	0	0	23.2	19.6
					1	12	0	22.8	19.4
					1	24	0	22.7	19.5
					12	0	1	22.2	18.6
					12	6	1	21.9	18.5
					12	11	1	21.7	18.5
					25	0	1	21.8	18.7
				16QAM	1	0	1	22.3	18.7
					1	12	1	21.8	18.5
					1	24	1	21.8	18.6
					12	0	2	21.2	17.7
					12	6	2	20.9	17.5
					12	11	2	20.8	17.5
					25	0	2	20.7	17.8
		23230	752.0	QPSK	1	0	0	23.1	19.4
					1	12	0	22.7	19.2
					1	24	0	22.6	19.3
					12	0	1	22.1	18.4
					12	6	1	21.8	18.3
					12	11	1	21.6	18.3
					25	0	1	21.7	18.5
				16QAM	1	0	1	22.2	18.5
					1	12	1	21.7	18.3
					1	24	1	21.7	18.4
					12	0	2	21.1	17.5
					12	6	2	20.8	17.3
					12	11	2	20.7	17.3
					25	0	2	20.6	17.6
		23255	784.5	QPSK	1	0	0	23.2	19.5
					1	12	0	22.8	19.3
					1	24	0	22.7	19.4
					12	0	1	22.5	18.5
					12	6	1	22.2	18.4
					12	11	1	22.1	18.4
					25	0	1	21.7	18.6
				16QAM	1	0	1	22.2	18.6
					1	12	1	21.7	18.4
					1	24	1	21.7	18.5
					12	0	2	21.2	17.6
					12	6	2	20.8	17.4
					12	11	2	21.1	17.4
					25	0	2	20.7	17.7

7.2 ERP & EIRP MEASUREMENT

LIMIT

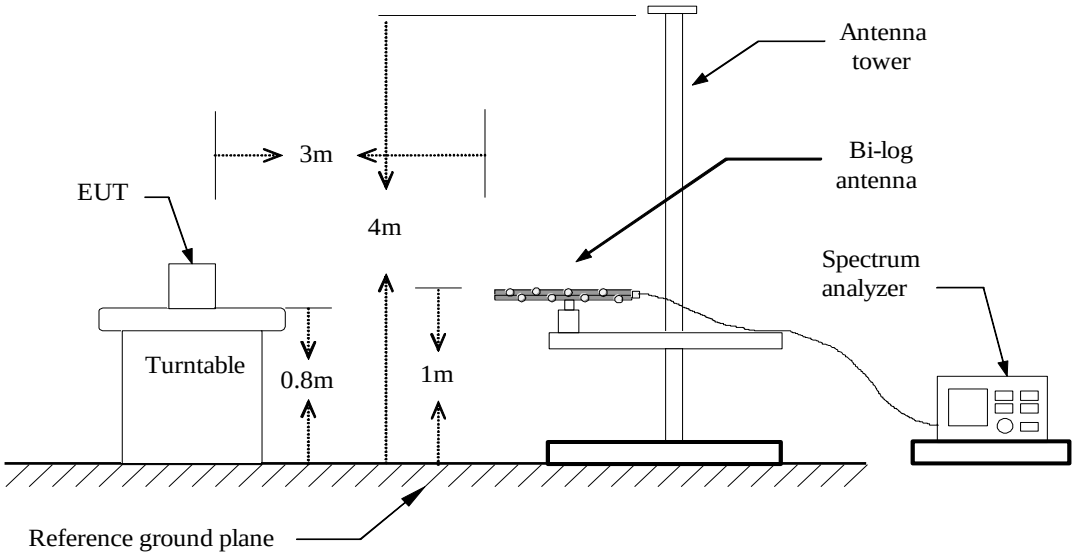
According to FCC §2.1046

FCC 27.50 (c) (10): The portable stations (hand-held devices) in the 600MHz uplink band and the 698-746MHz band, and fixed and mobile stations in the 600MHz uplink band are limited to 3 Watts ERP.

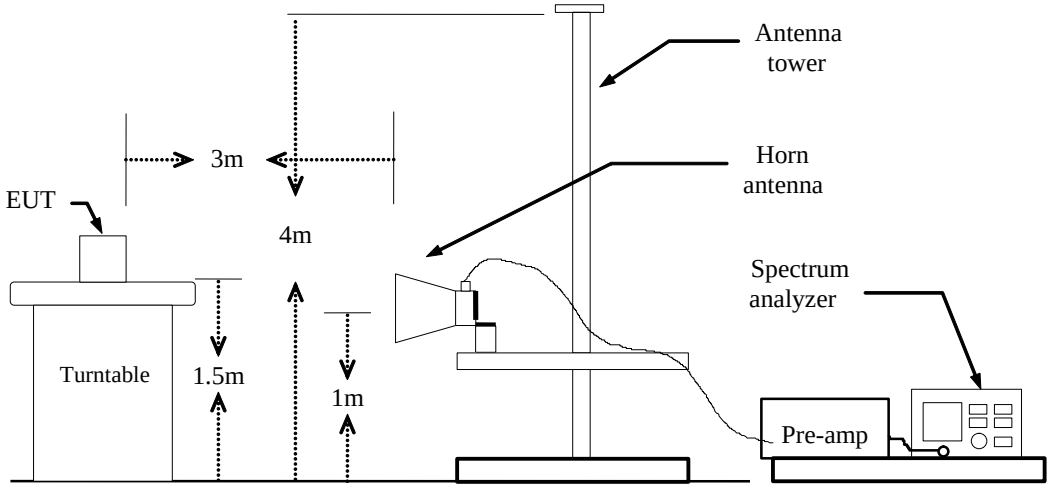
FCC 27.50 (d) (4): Fixed, mobile, and portable (handheld)stations operating in the 1710-1755MHz band and mobile and portable stations operating in the 1695-1710MHz and 1755-1780MHz bands are limited to 1 watt EIRP.

Test Configuration

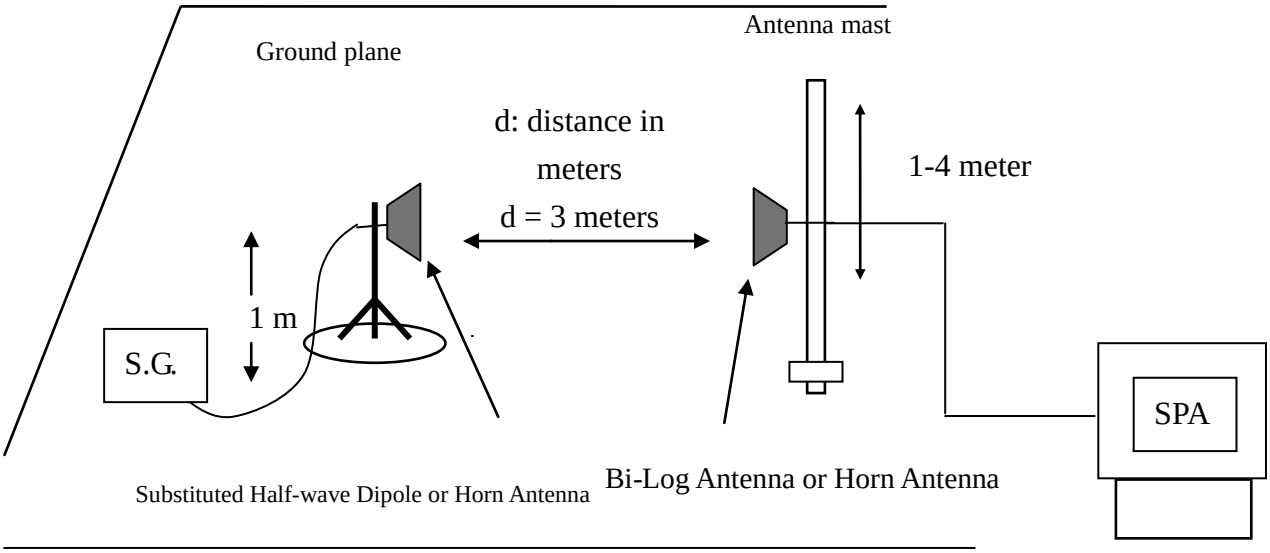
Below 1 GHz



Above 1 GHz



For Substituted Method Test Set-UP



TEST PROCEDURE

1. The EUT was placed on a non-conductive rotating platform (0.8m for below 1G and 1.5m for above 1G) in a semi-chamber. The radiated emission at the fundamental frequency was measured at 3m and SA with RMS detector per photograph 5, KDB 971168 D01.

2. During the measurement, the call box parameters were set to get the maximum output power of the EUT. The maximum emission was recorded from spectrum analyzer power level (LVL) from 360 degrees rotation of turntable and the test antenna raised and lowered over a range from 1m to 4m in both horizontally and vertically polarized orientations.

3. EIRP was measured method according to TIA/EIA-603-D:2010. The EUT was replaced by the substitution antenna at same location, and then record the maximum Analyzer reading through raised and lowered the test antenna.

ERP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)-2.15
EIRP = S.G. output (dBm) + Antenna Gain (dBi) – Cable (dB)

TEST RESULTS

No non-compliance noted.

ERP POWER

LTE Band 13

BW: 5MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
13	5	Lowest	QPSK	1	0	20.40	0.109	16.97	0.049
		Middle		1	0	19.24	0.083	16.99	0.050
		Highest		1	0	18.81	0.076	15.80	0.038
		Lowest	16 QAM	1	0	20.26	0.106	17.36	0.054
		Middle		1	0	19.80	0.095	16.70	0.046
		Highest		1	0	19.02	0.079	16.12	0.040

BW: 10MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						EIRP (dBm)	EIRP (W)	EIRP (dBm)	EIRP (W)
13	10	Middle	QPSK	1	0	19.81	0.095	16.83	0.048
		Middle	16 QAM	1	0	19.80	0.095	16.85	0.048

7.3 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.

TEST PROCEDURE

Use Anritsu 8820 with frequency Error measurement capability.
Temp = -30 to +50℃
Voltage= 85% to 115% of the nominal value for AC powered equipment.

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

TEST RESULTS

FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT:

LTE Band 13

Reference Frequency: LTE Band 13 Max Bandwidth QPSK, 782MHz				
Limit: ± 2.5 ppm = 1955Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
120	50	0.02	0.000026	+/- 2.5
120	40	0.03	0.000038	
120	30	-0.01	-0.000009	
120	20	0.02	0.000026	
120	10	0.03	0.000038	
120	0	0.01	0.000013	
120	-10	-0.01	-0.000013	
120	-20	-0.02	-0.000026	

Reference Frequency: LTE Band 13 Max Bandwidth 16QAM, 782MHz				
Limit: ± 2.5 ppm = 1955Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
120	50	0.01	0.000013	+/- 2.5
120	40	0.03	0.000038	
120	30	0.03	0.000038	
120	20	0.02	0.000026	
120	10	0.01	0.000018	
120	0	0.01	0.000012	
120	-10	-0.01	-0.000013	
120	-20	-0.01	-0.000013	

FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT:

LTE Band 13

Reference Frequency: LTE Band 13 Max Bandwidth QPSK, MHz				
Limit: ± 2.5 ppm = Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
102	20	0.01	0.000008	+/- 2.5
120	20	0.02	0.000026	
138	20	0.01	0.000007	

Reference Frequency: LTE Band 13 Max Bandwidth 16QAM, MHz				
Limit: ± 2.5 ppm = Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
102	20	0.02	0.000026	+/- 2.5
120	20	0.02	0.000026	
138	20	0.01	0.000012	

7.4 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 0.5 % of the total mean power of a given emission.

TEST PROCEDURES

KDB 971168 v02r02 - Section 4.2

1. The occupied bandwidth was measured with the spectrum analyzer at the lowest, middle and highest channels in each band and different modulation. The 99% and -26dB bandwidth was measured and recorded.
2. RBW = 1-5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max. hold

TEST RESULTS

LTE Band 13

CHANNEL BANDWIDTH: 5MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
23230	782.00	4.4717

CHANNEL BANDWIDTH: 10MHz / QPSK

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
23230	782.00	8.9146

CHANNEL BANDWIDTH: 5MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
23230	782.00	4.4573

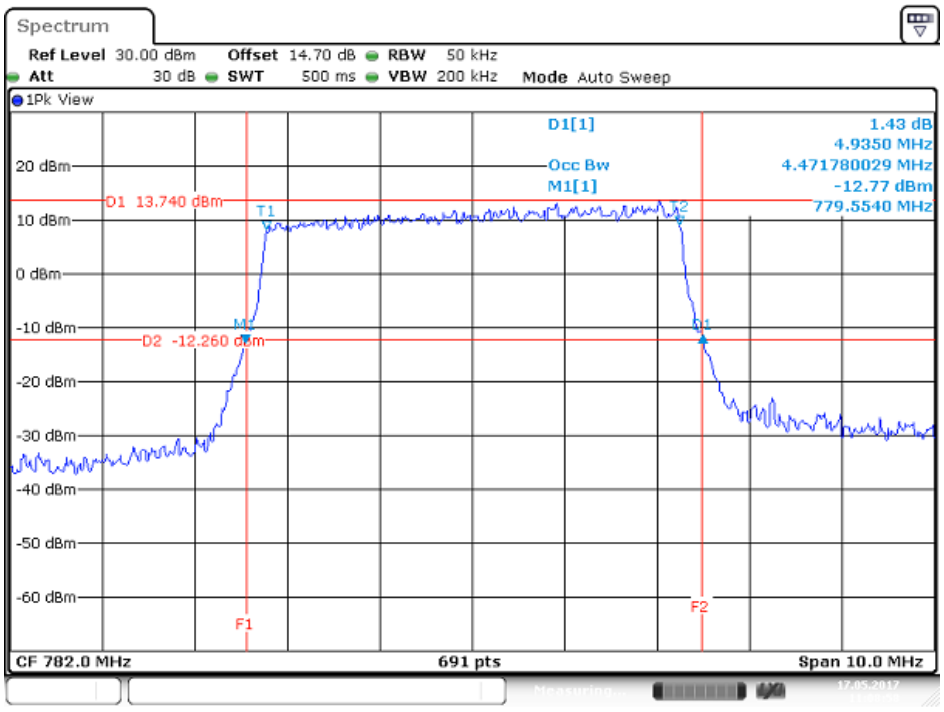
CHANNEL BANDWIDTH: 10MHz / 16QAM

Channel	FREQUENCY (MHz)	Occupied bandwidth (MHz)
23230	782.00	8.9146

LTE Band 13

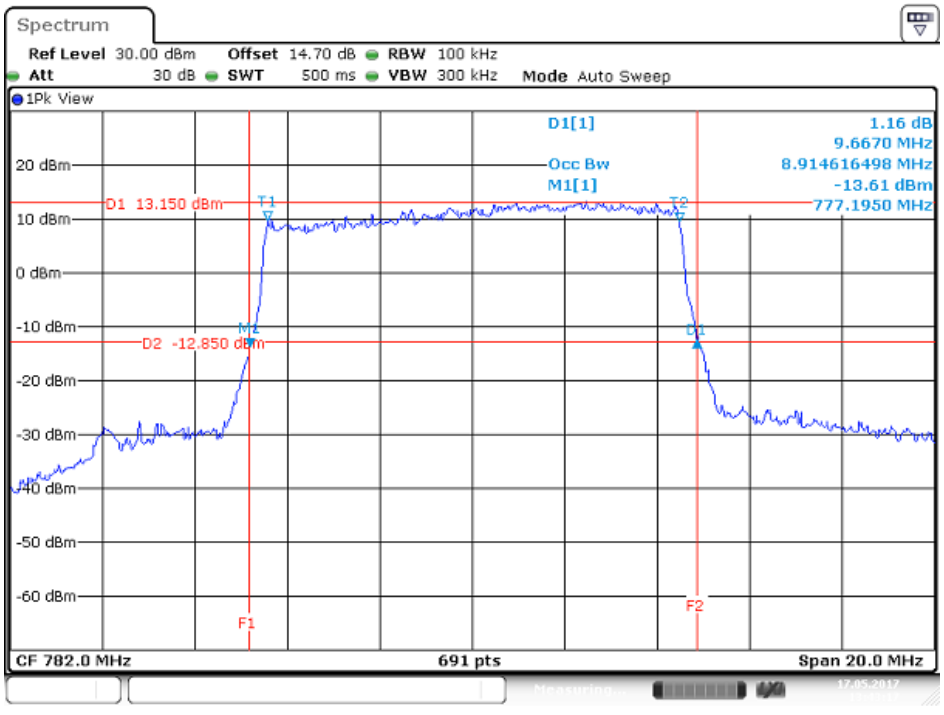
CHANNEL BANDWIDTH: 5MHz / QPSK

CH Mid



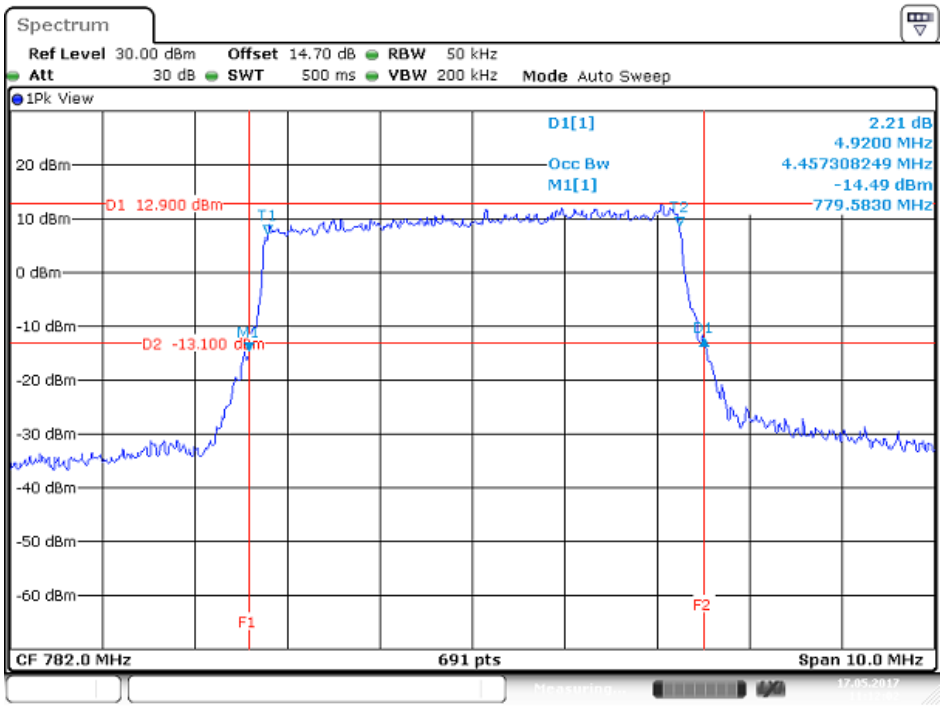
CHANNEL BANDWIDTH: 10MHz / QPSK

CH Mid



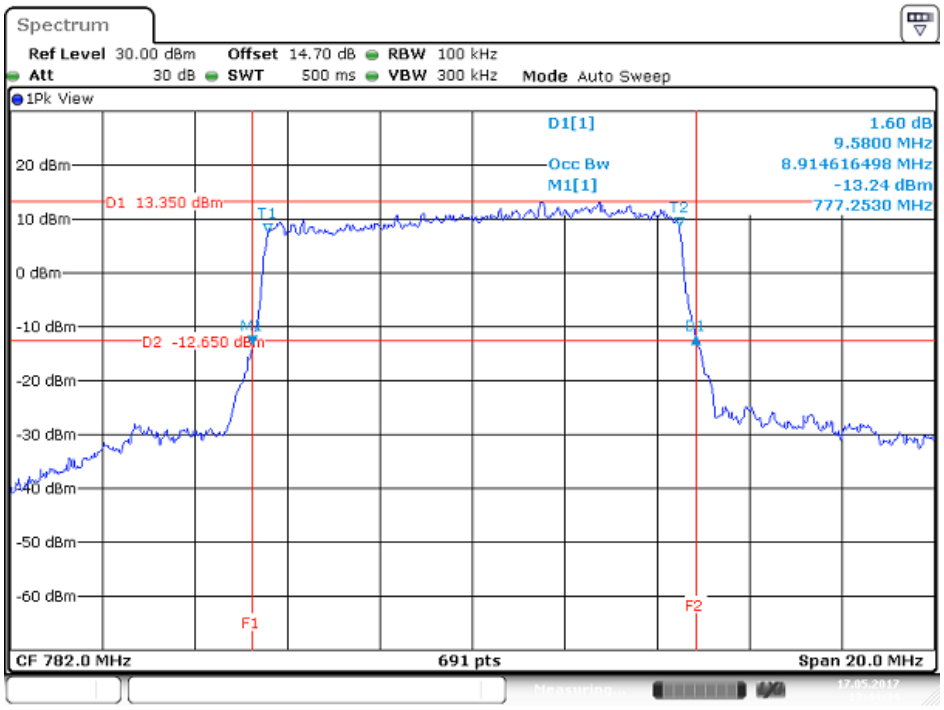
CHANNEL BANDWIDTH: 5MHz / 16QAM

CH Min



CHANNEL BANDWIDTH: 10MHz / 16QAM

CH Min



7.5 PEAK TO AVERAGE POWER RATIO

LIMIT

FCC §27.50(a)

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

RSS-139 section 6.5

The peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

TEST PROCEDURES

1. According to KDB 971168D01, photograph 5.7.1
2. The EUT was connect to spectrum analyzer and call box.
3. Set the CCDF function in spectrum analyzer.
4. The highest RF output power were measured and recorded the maximum PAPR level associated with a probability of 0.1%.
5. Record the Peak to Average Power Ratio.

TEST RESULTS

LTE Band 13

CHANNEL BANDWIDTH: 5Hz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	5.13

CHANNEL BANDWIDTH: 10Hz / QPSK / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	4.38

CHANNEL BANDWIDTH: 5Hz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	5.28

CHANNEL BANDWIDTH: 10Hz / QPSK / 100%RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	5.04

CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	6.26

CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	5.57

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

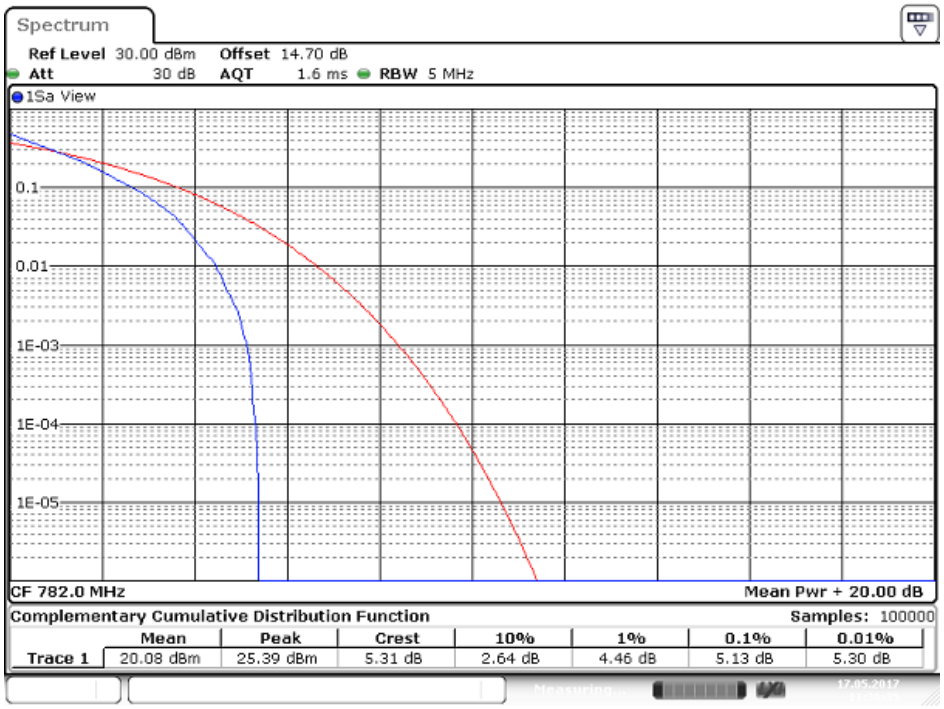
Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	6.32

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

Channel	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
23230	782.00	6.03

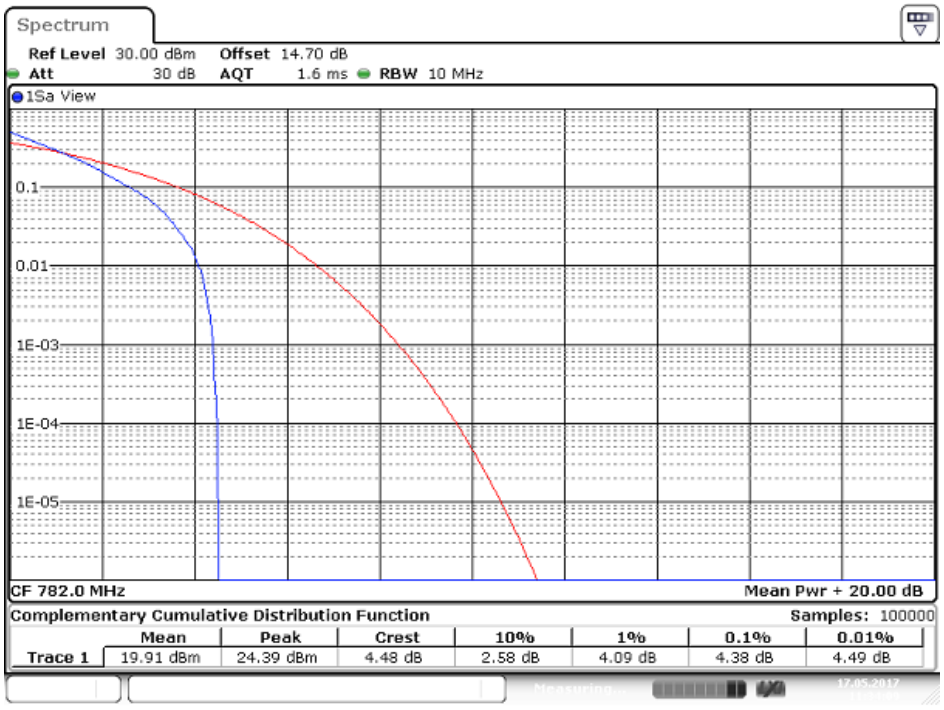
TE Band 13

CHANNEL BANDWIDTH: 5MHz / QPSK/ 1RB .



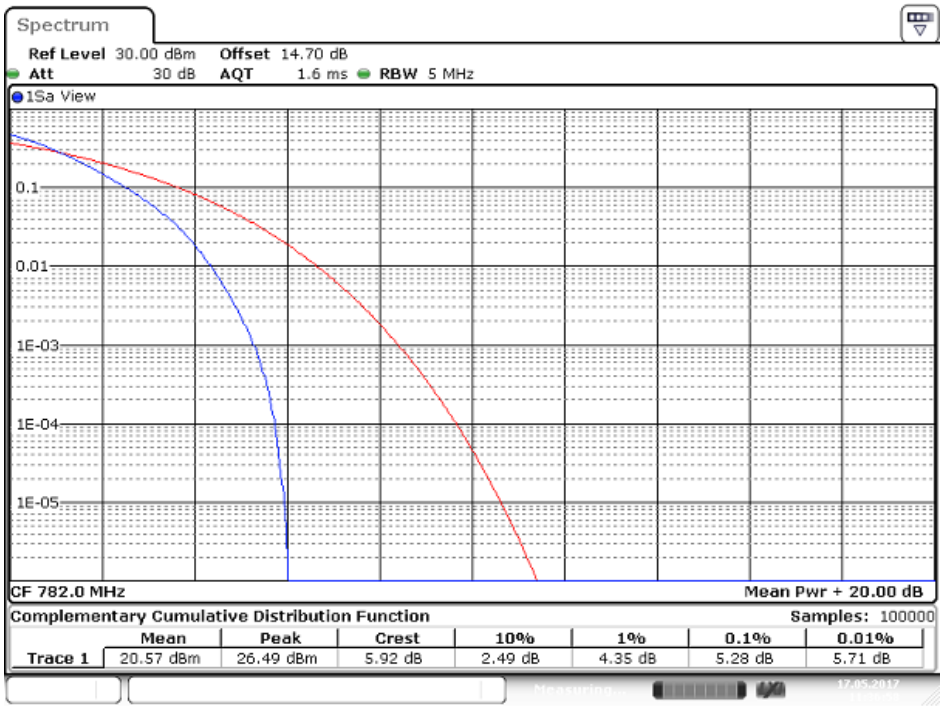
Date: 17.MAY.2017 11:36:36

CHANNEL BANDWIDTH: 10MHz / QPSK/ 1RB



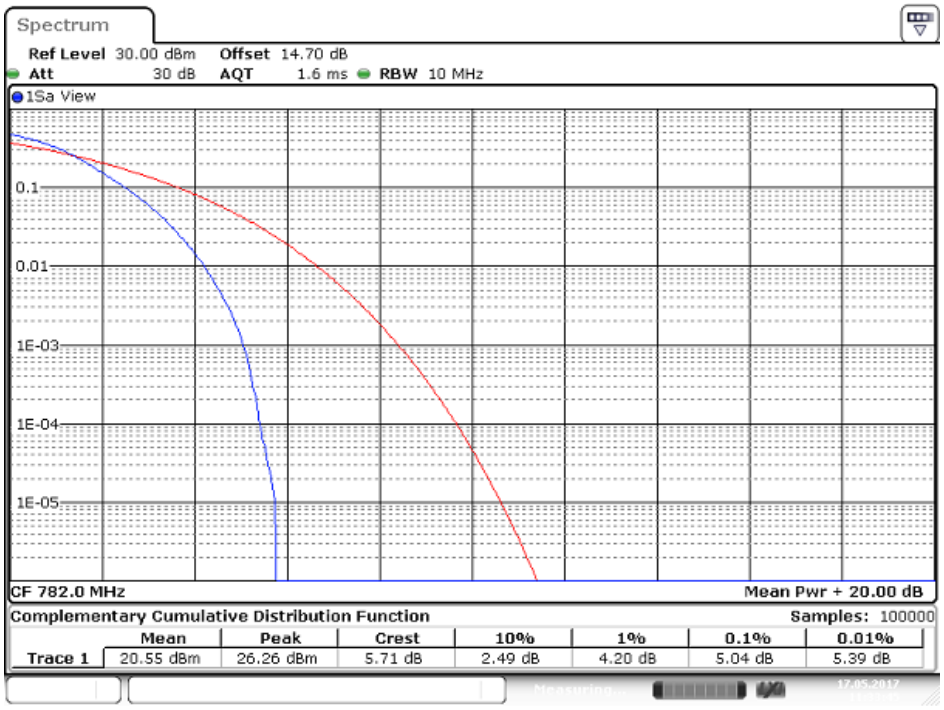
Date: 17.MAY.2017 11:34:09

CHANNEL BANDWIDTH: 5MHz / QPSK/ 100%RB



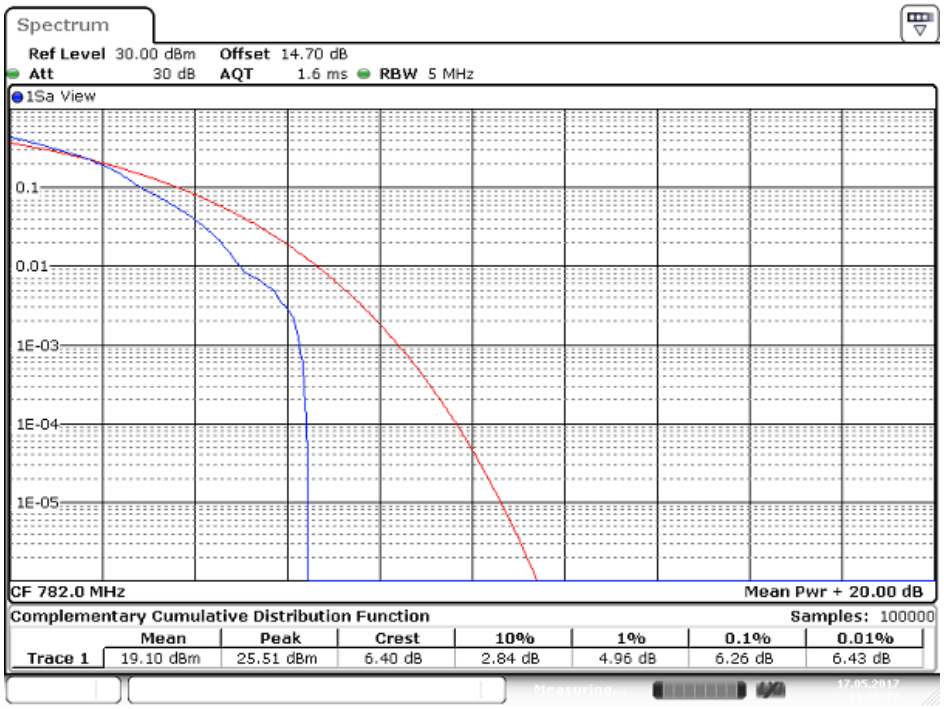
Date: 17.MAY.2017 11:36:59

CHANNEL BANDWIDTH: 10MHz / QPSK/ 100%RB



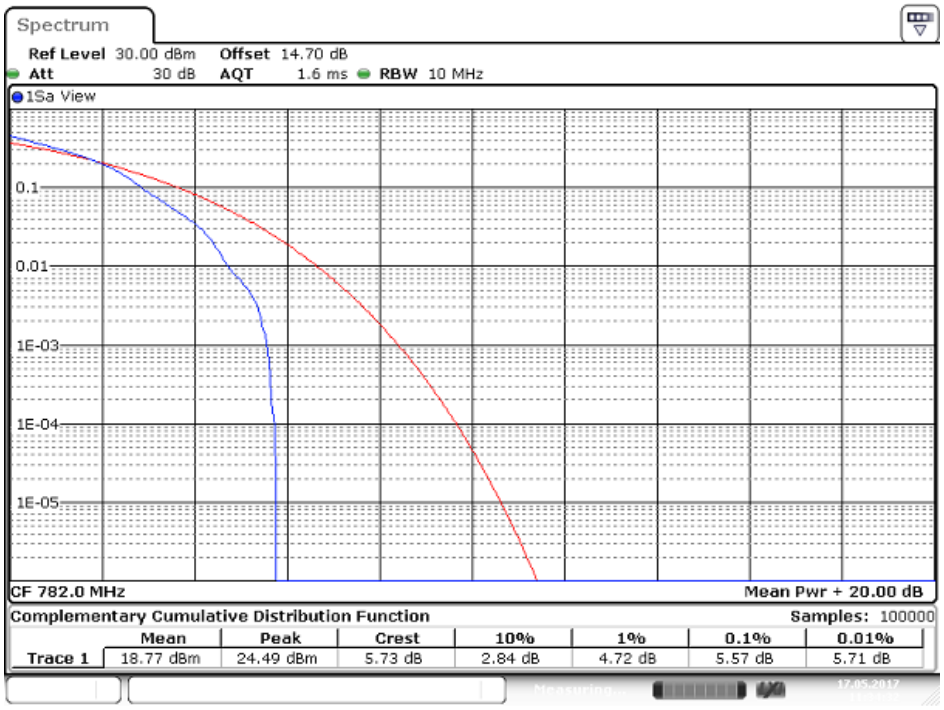
Date: 17.MAY.2017 11:33:45

CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB



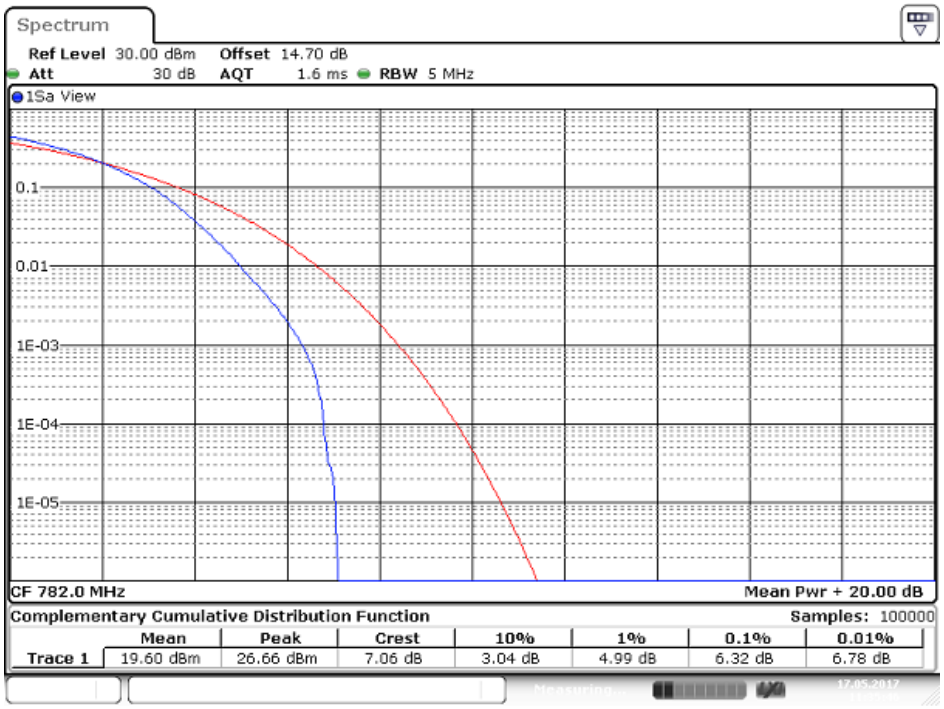
Date: 17.MAY.2017 11:36:12

CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB



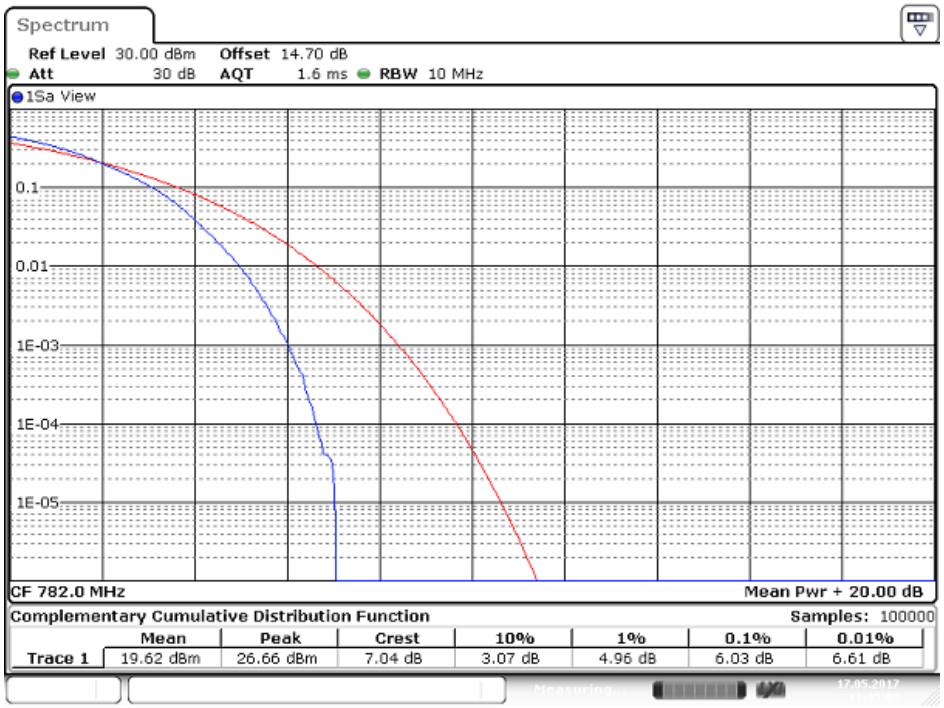
Date: 17.MAY.2017 11:34:33

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



Date: 17.MAY.2017 11:35:46

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



Date: 17.MAY.2017 11:35:03

7.6 BAND EDGE MEASUREMENT

LIMIT

Part 27.53 (C)(2)
On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.

TEST PROCEDURES

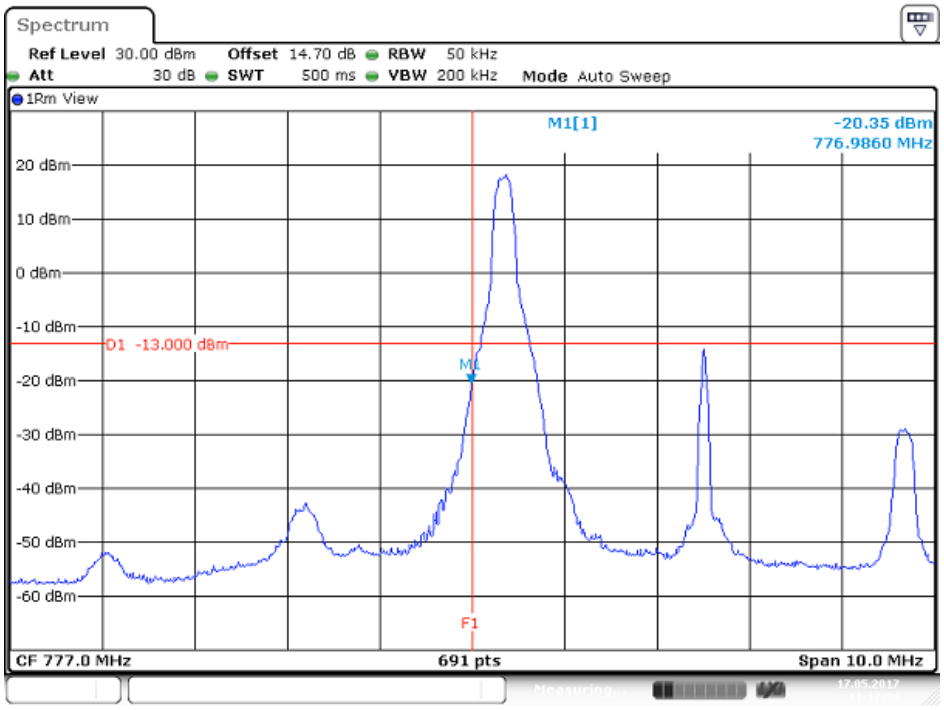
KDB 971168 v02r02 - Section 6.0
1. RBW ≥ 1% of the emission bandwidth
2. VBW ≥ 3 x RBW
3. Span was set large enough so as to capture all out of emissions near the band edge.

TEST RESULTS:

LTE Band 13

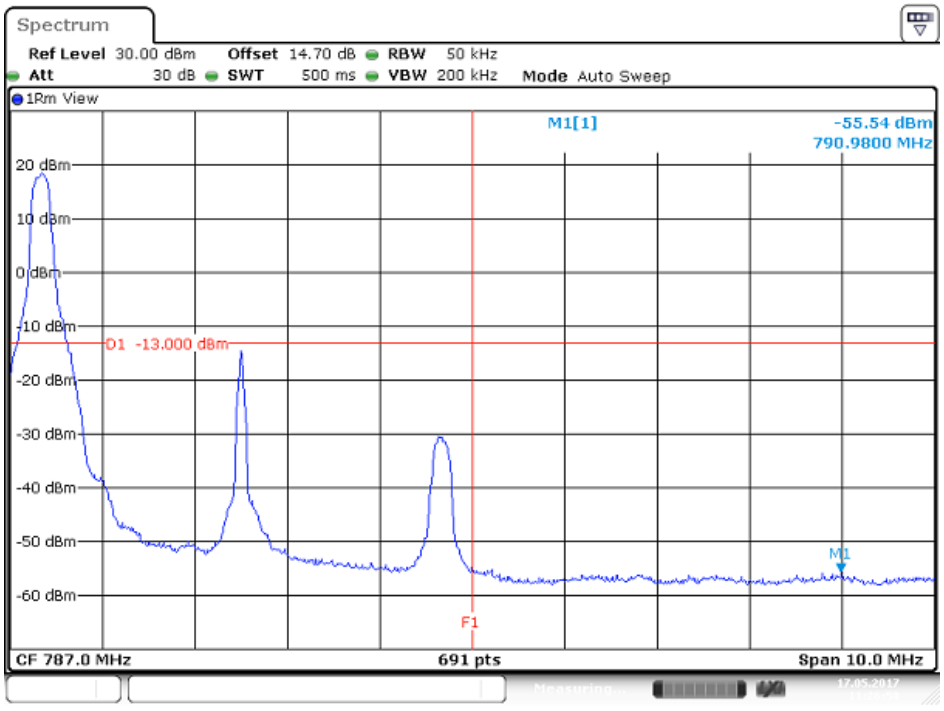
CHANNEL BANDWIDTH: 5MHz / QPSK / 1 RB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:17:35

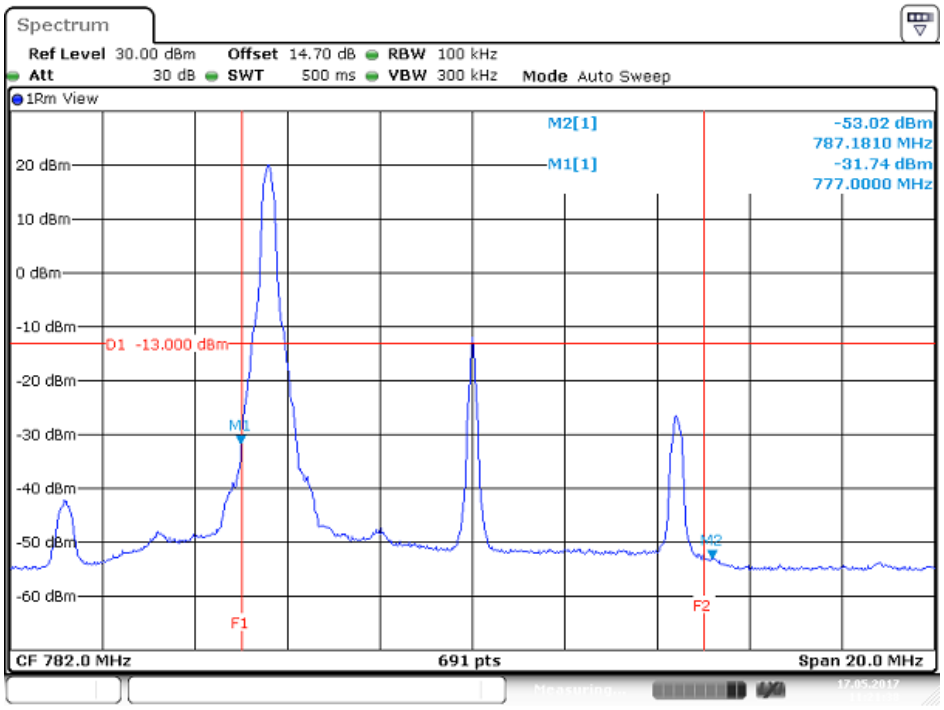
HIGHER BAND EDGE



Date: 17.MAY.2017 11:26:58

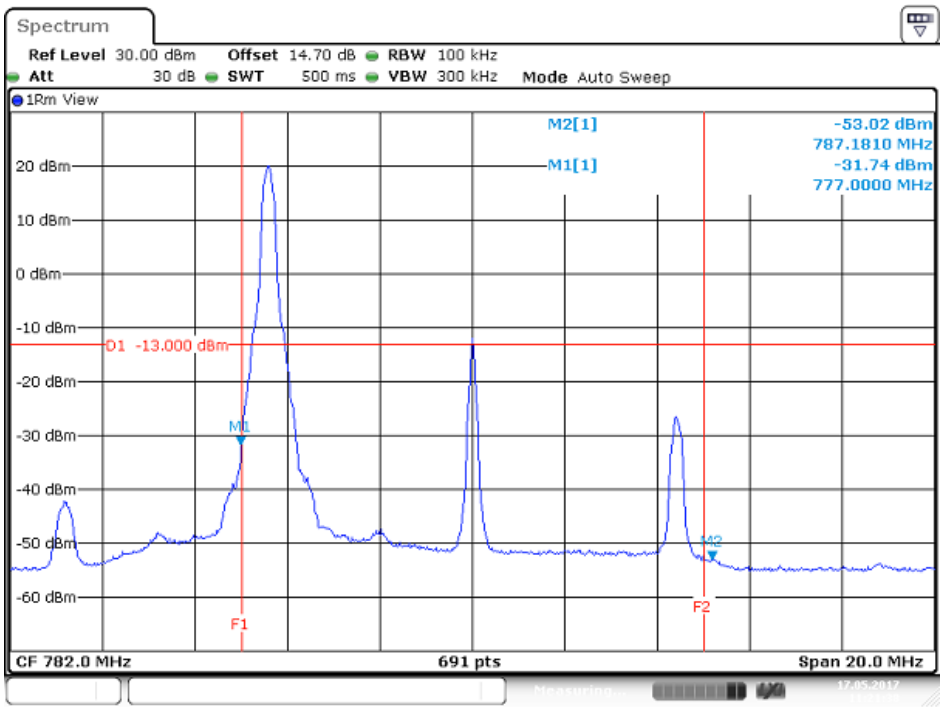
CHANNEL BANDWIDTH: 10MHz / QPSK / 1 RB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:21:38

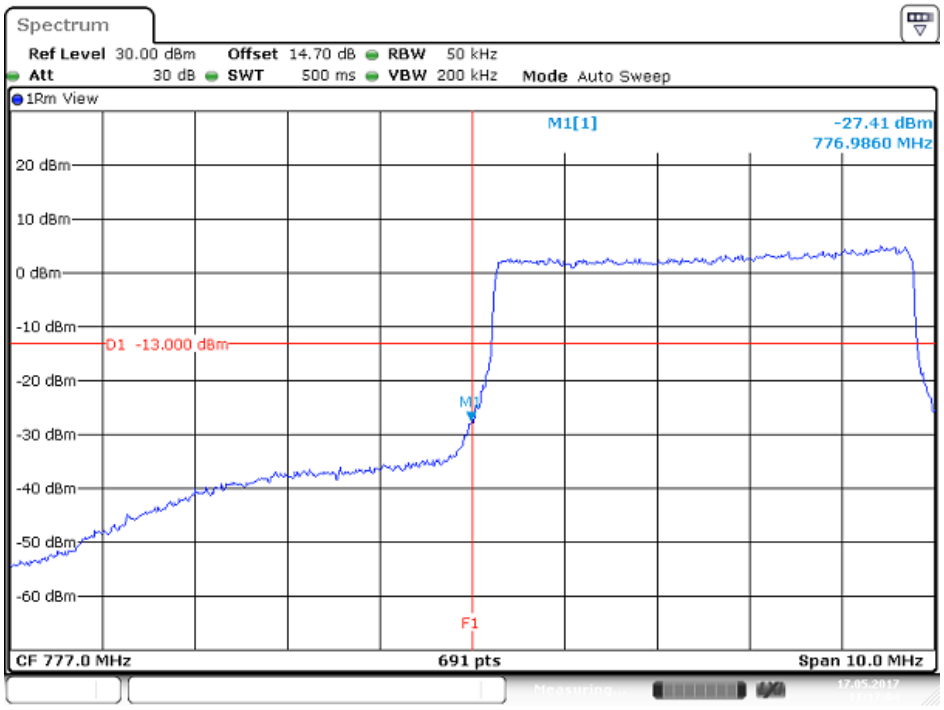
HIGHER BAND EDGE



Date: 17.MAY.2017 11:21:38

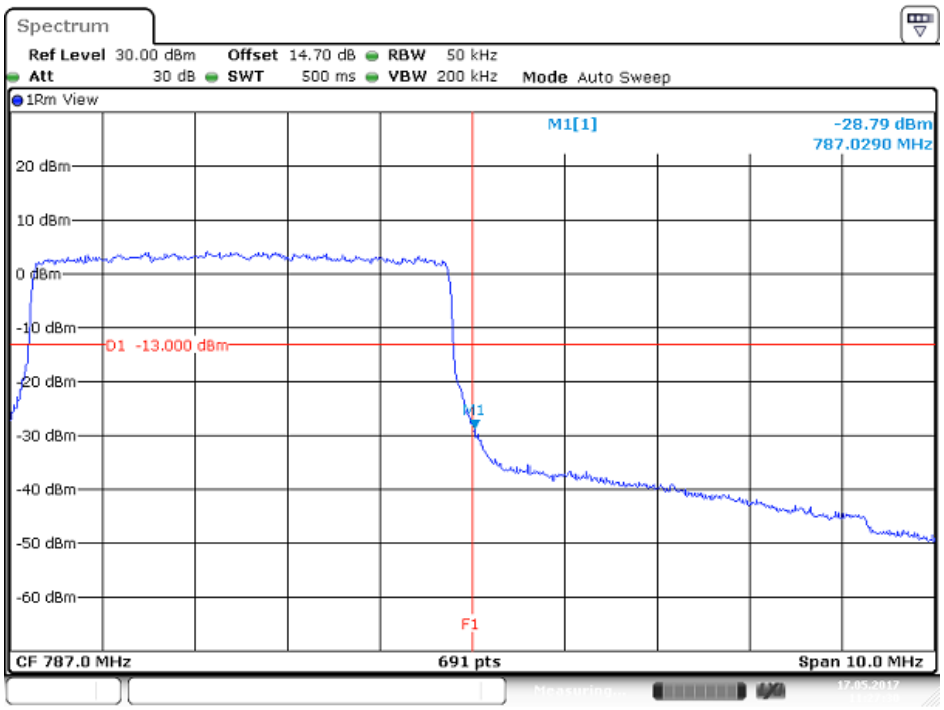
CHANNEL BANDWIDTH: 5MHz / QPSK / FULL RB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:17:04

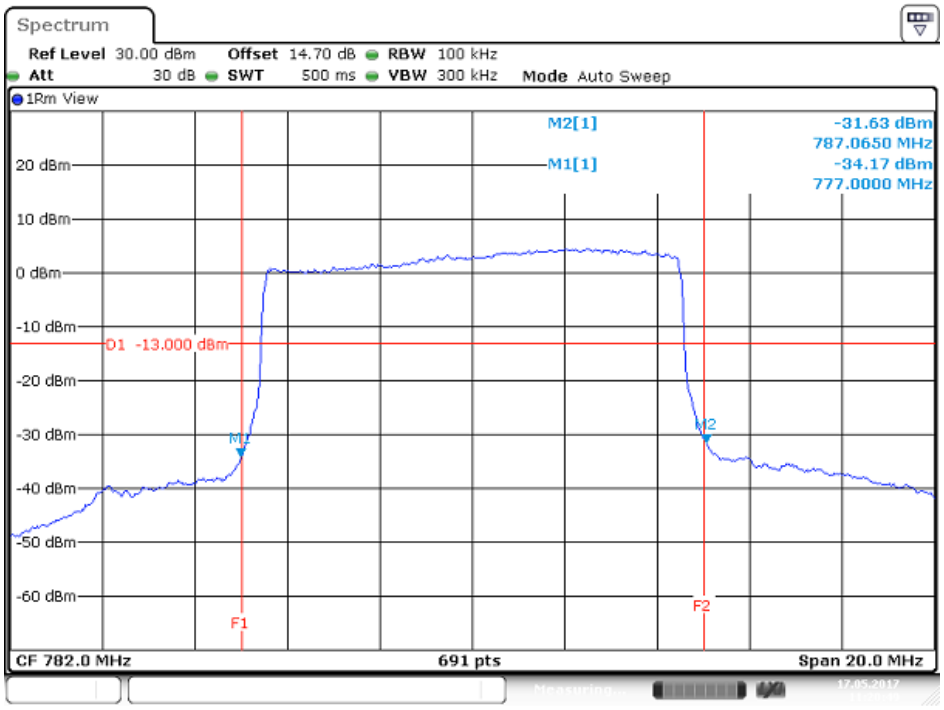
HIGHER BAND EDGE



Date: 17.MAY.2017 11:27:30

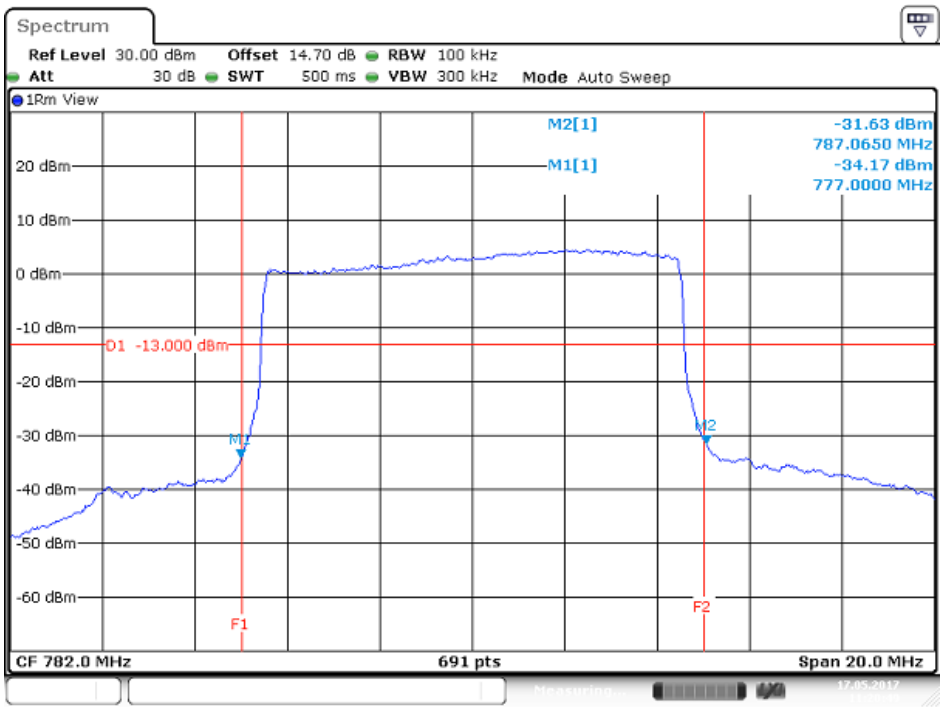
CHANNEL BANDWIDTH: 10MHz / QPSK / FULL RB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:20:50

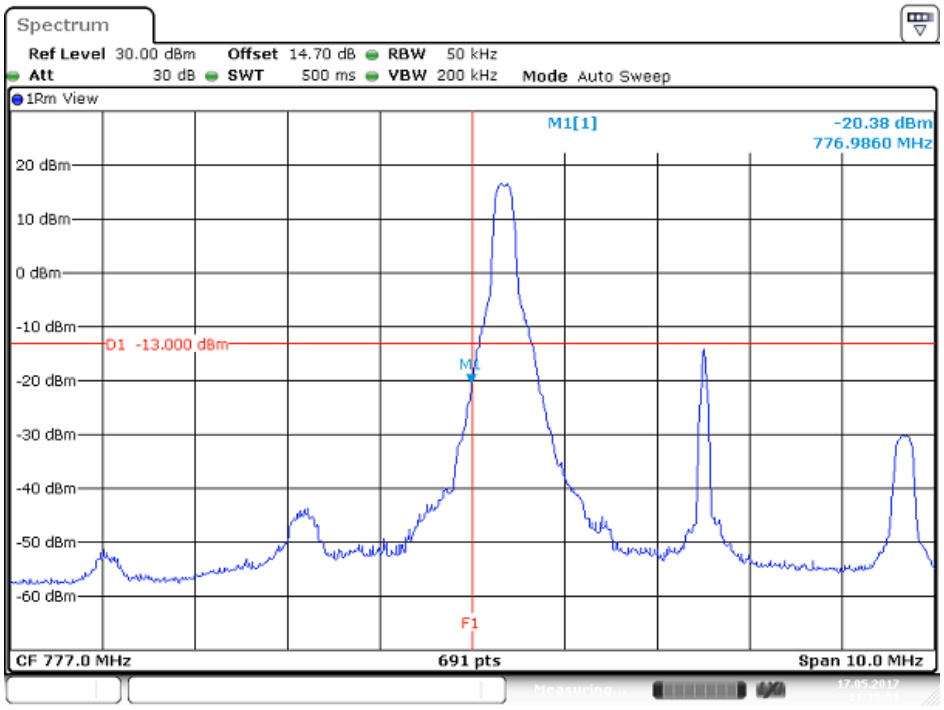
HIGHER BAND EDGE



Date: 17.MAY.2017 11:20:50

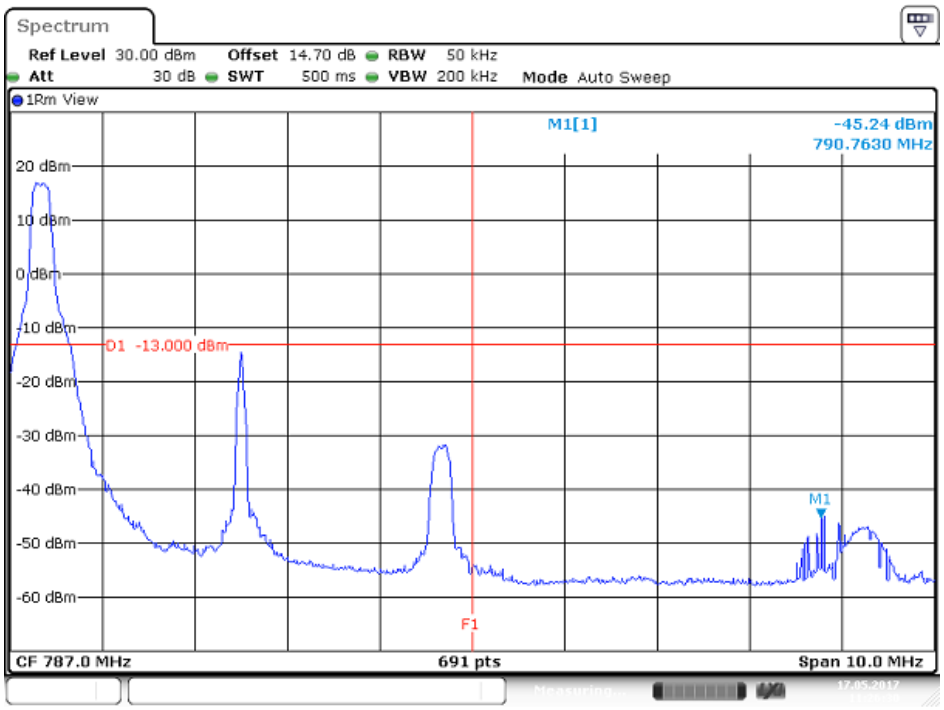
CHANNEL BANDWIDTH: 5MHz / 16QAM / 1RB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:15:51

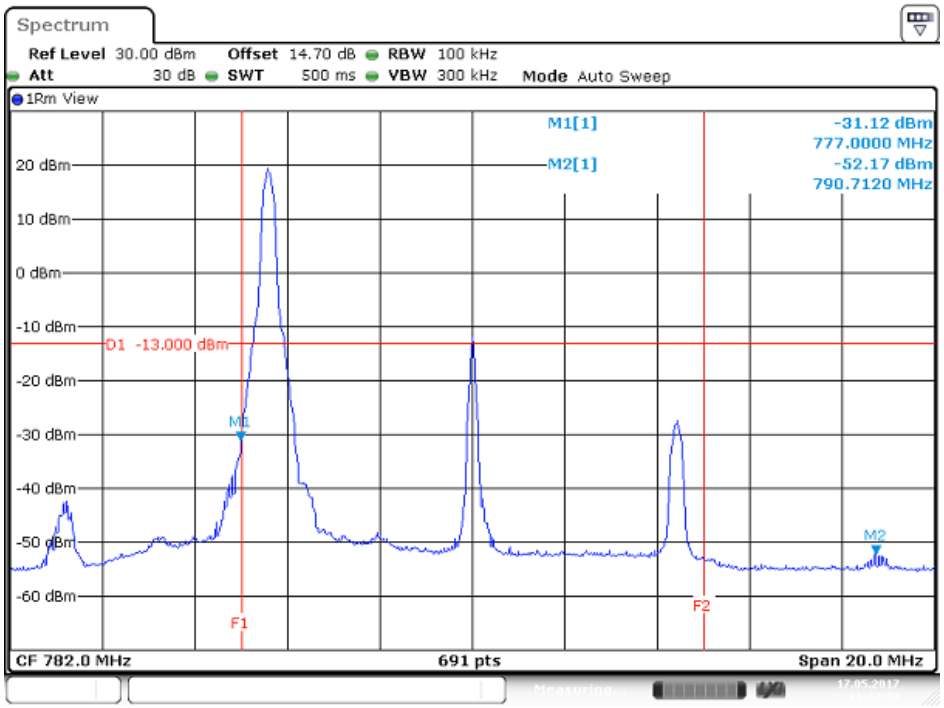
HIGHER BAND EDGE



Date: 17.MAY.2017 11:26:31

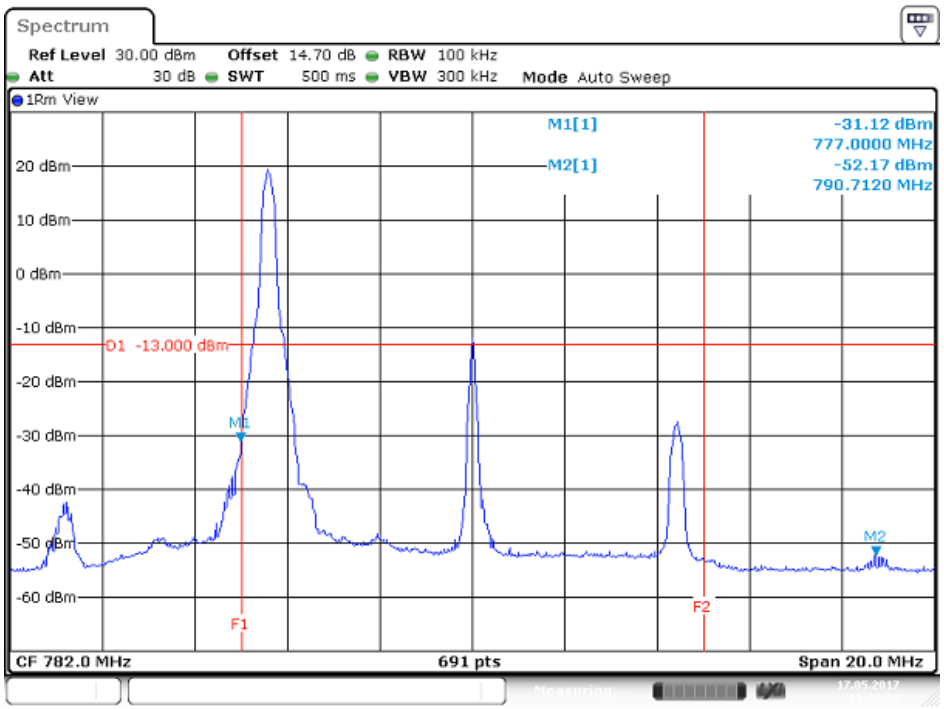
CHANNEL BANDWIDTH: 10MHz / 16QAM / 1RB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:22:23

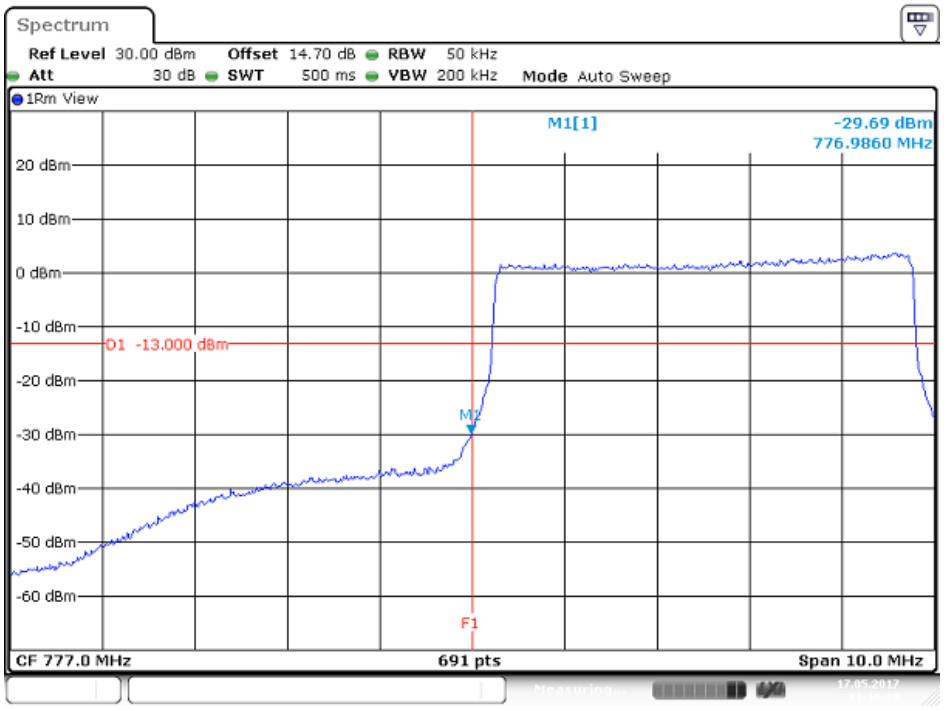
HIGHER BAND EDGE



Date: 17.MAY.2017 11:22:23

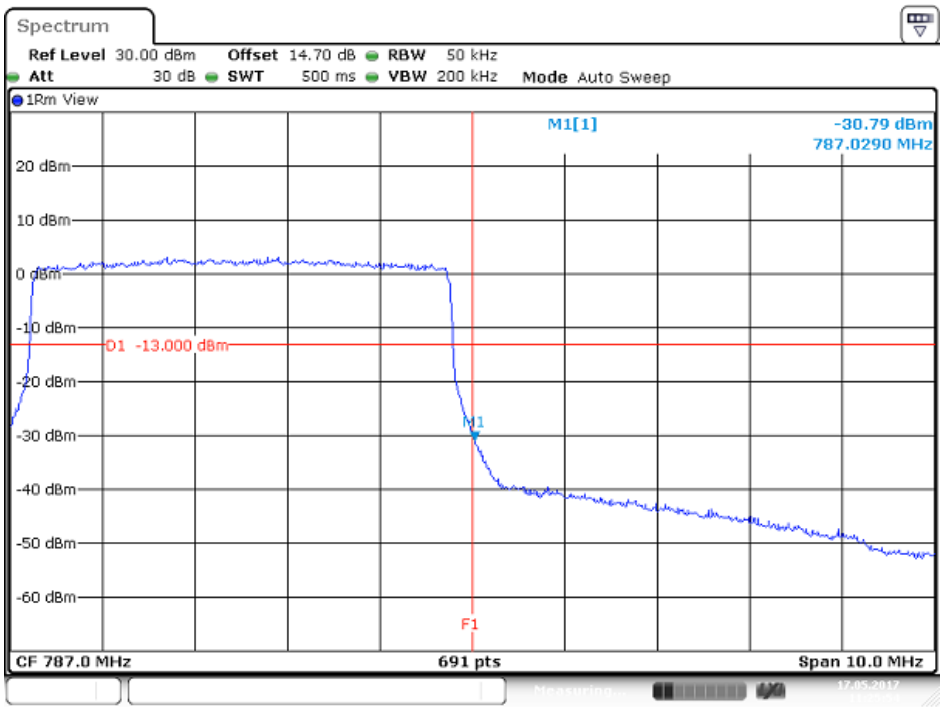
CHANNEL BANDWIDTH: 5MHz / 16QAM / FULLRB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:16:30

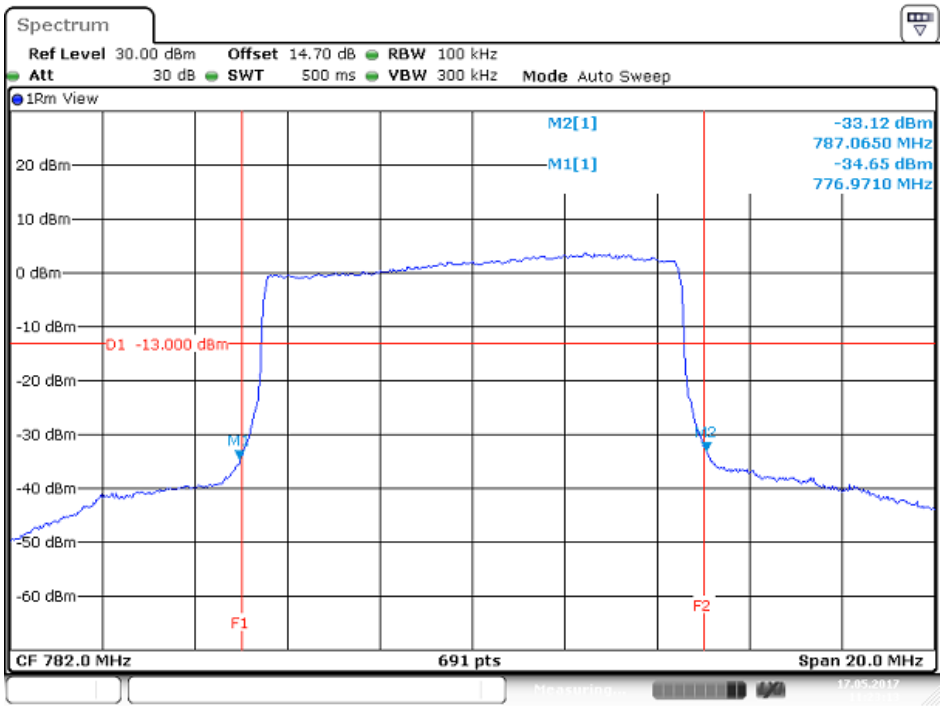
HIGHER BAND EDGE



Date: 17.MAY.2017 11:25:55

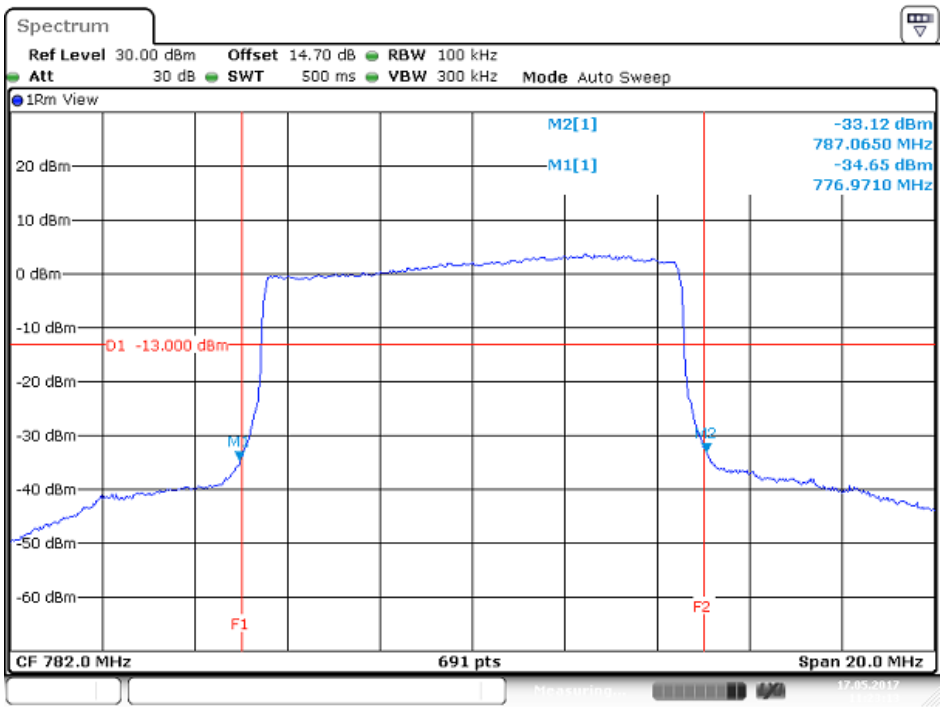
CHANNEL BANDWIDTH: 10MHz / 16QAM / FULLRB ALLOCATED

LOWER BAND EDGE



Date: 17.MAY.2017 11:23:14

HIGHER BAND EDGE



Date: 17.MAY.2017 11:23:14

7.7 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 log10(P) dB. The limit of emission equal to –13dBm

TEST PROCEDURES

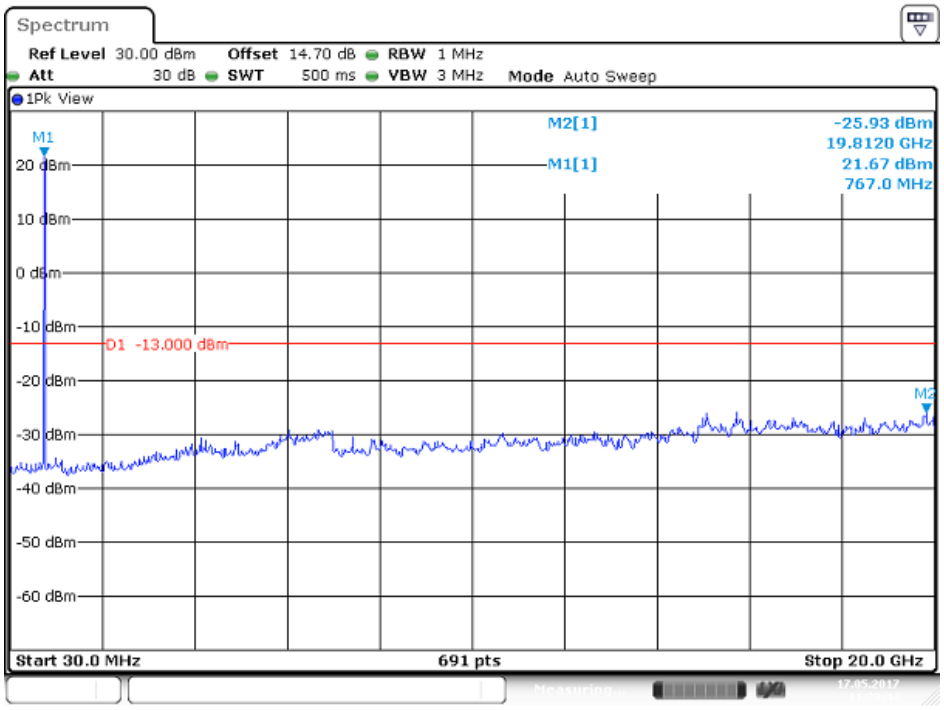
1. According to KDB 971168D01, photograph 6.0
2. The EUT was connect to spectrum analyzer and call box.
3. The RF output of EUT was connected to the spectrum analyzer.
4. Set the spectrum analyzer , RBW=1MHz, VBW=3MHz.
5. Record the maximum spurious emission.
6. The fundamental frequency should be excluded against the limit in operating band.

TEST RESULTS

LTE Band 13

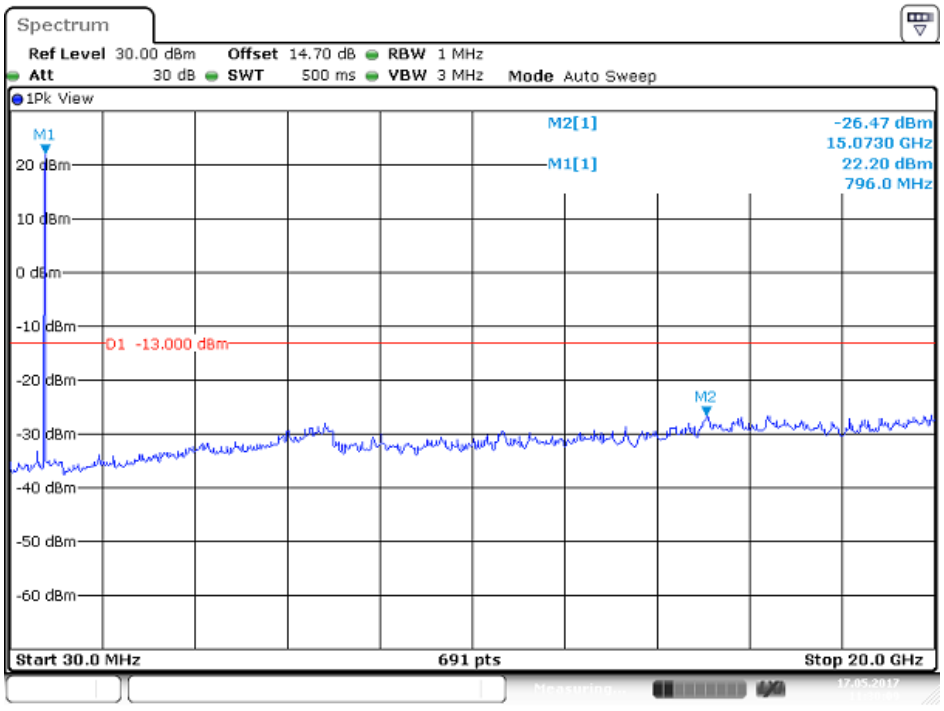
CHANNEL BANDWIDTH: 5MHz / QPSK

CH Low



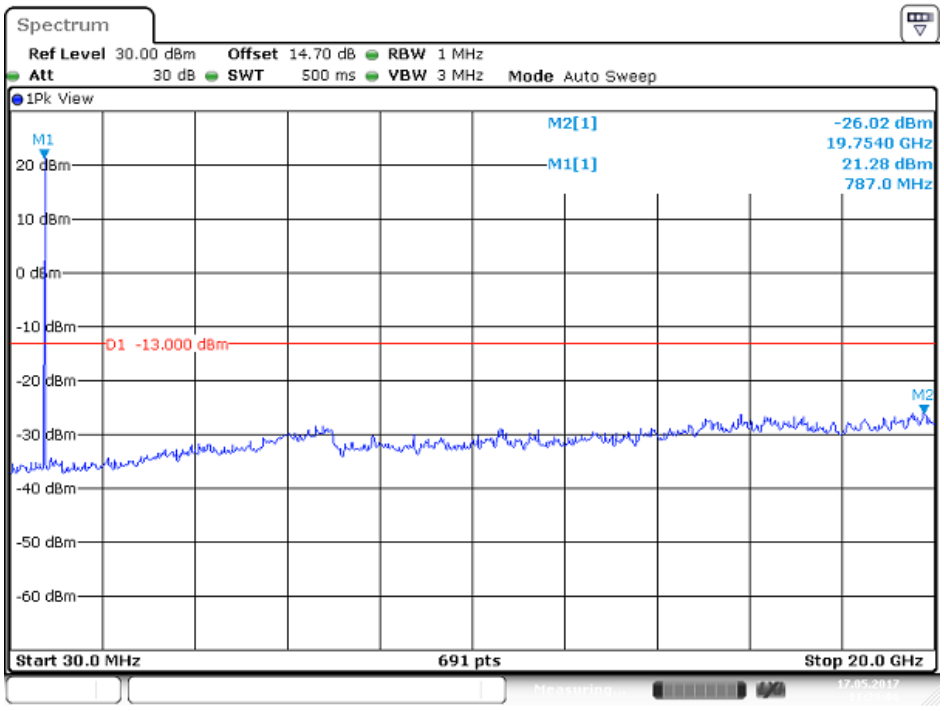
Date: 17.MAY.2017 11:29:45

CH Mid



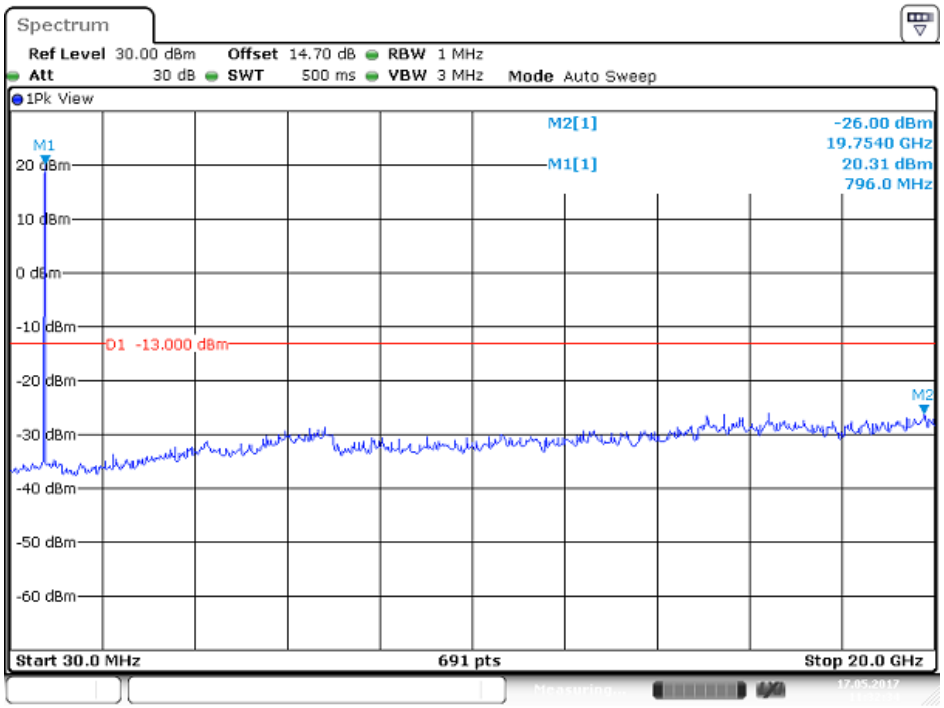
Date: 17.MAY.2017 11:30:09

CH High


Spectrum
Ref Level 30.00 dBm Offset 14.70 dB RBW 1 MHz
Att 30 dB SWT 500 ms VBW 3 MHz Mode Auto Sweep
1Pk View
M1
M2[1] -26.02 dBm
19.7540 GHz
M1[1] 21.28 dBm
787.0 MHz
20 dBm
10 dBm
0 dBm
-10 dBm
D1 -13.000 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M2
Start 30.0 MHz
691 pts
Stop 20.0 GHz
Measuring...
17.05.2017
Date: 17.MAY.2017 11:29:07

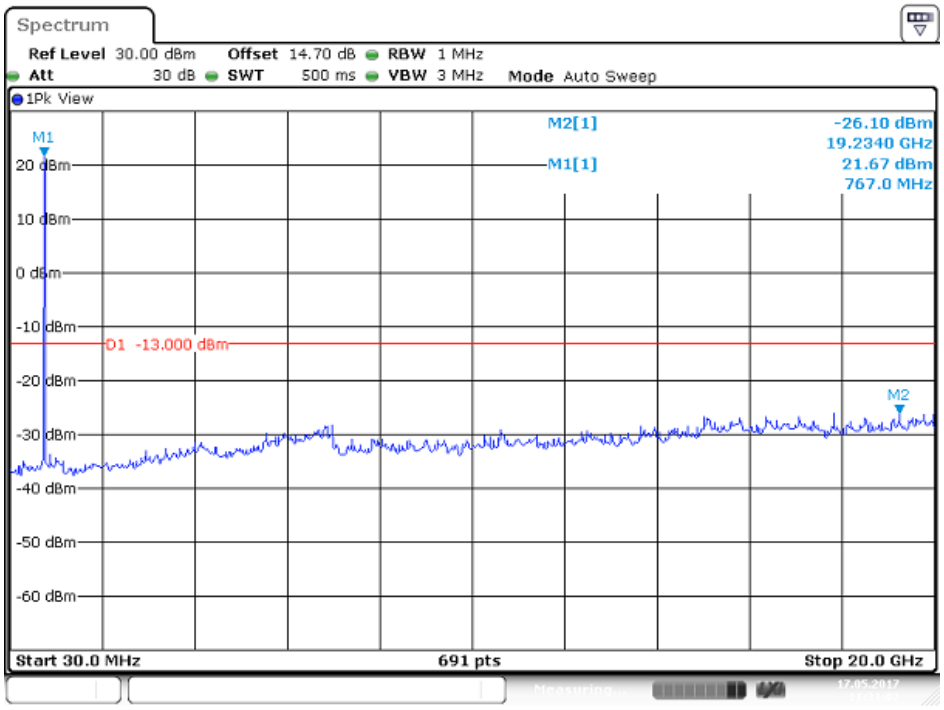
CHANNEL BANDWIDTH: 10MHz / QPSK

CH Mid



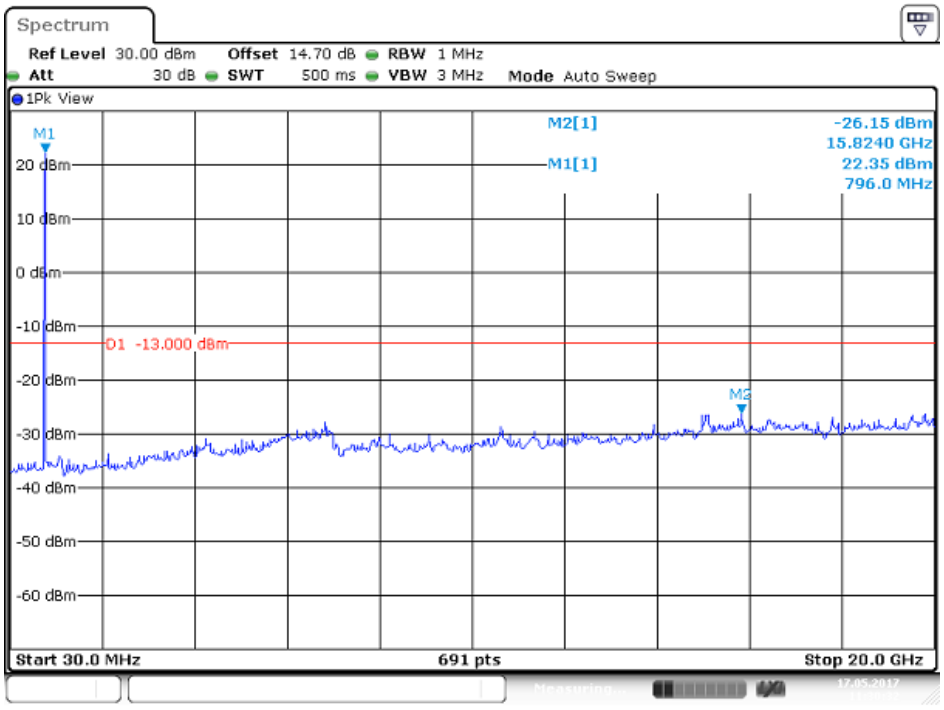
CHANNEL BANDWIDTH: 5MHz / 16QAM

CH Low



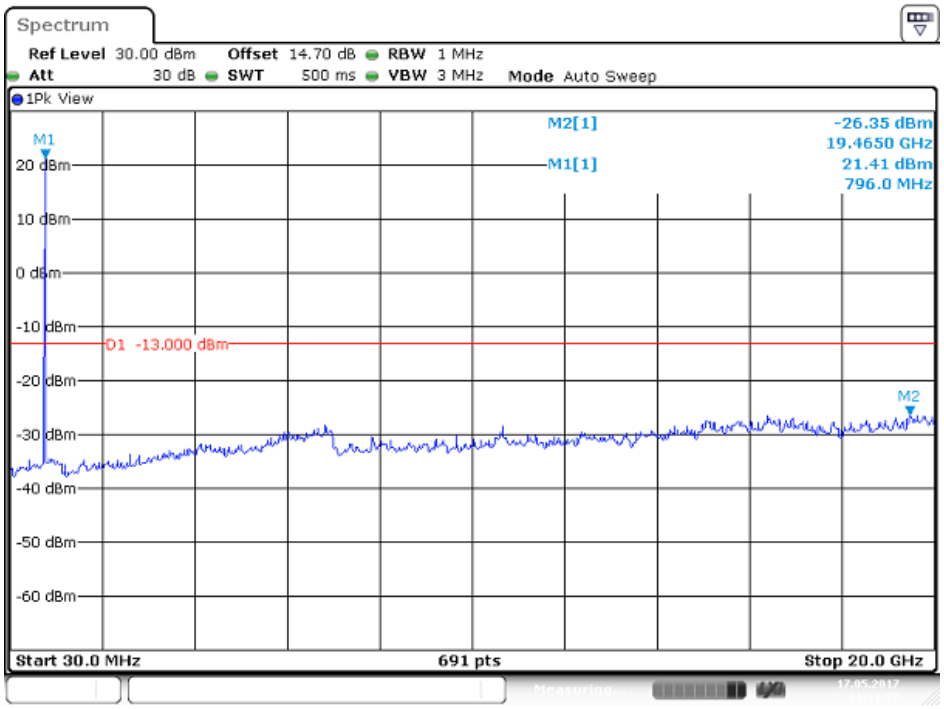
Date: 17.MAY.2017 11:31:03

CH Mid



Date: 17.MAY.2017 11:30:32

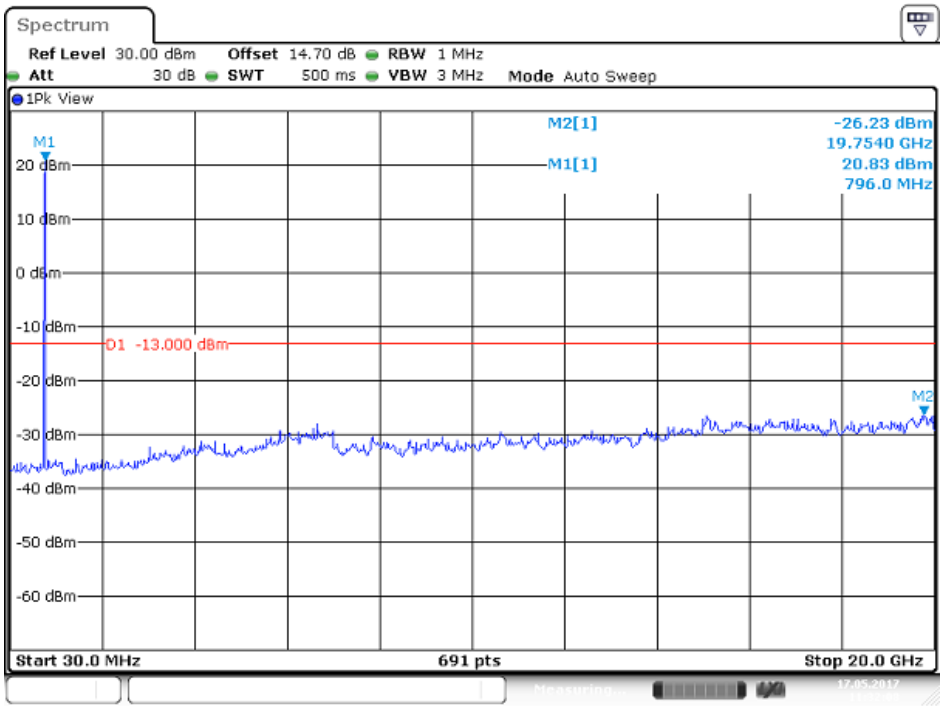
CH High



Date: 17.MAY.2017 11:31:27

CHANNEL BANDWIDTH: 10MHz / 16QAM

CH Mid



7.8 RADIATED EMISSION MEASUREMENT

LIMITS

27.53(g), Band 13

For operations in the 600 MHz band and the 698-746MHz 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.

Limit Line: -13dBm

TEST PROCEDURES

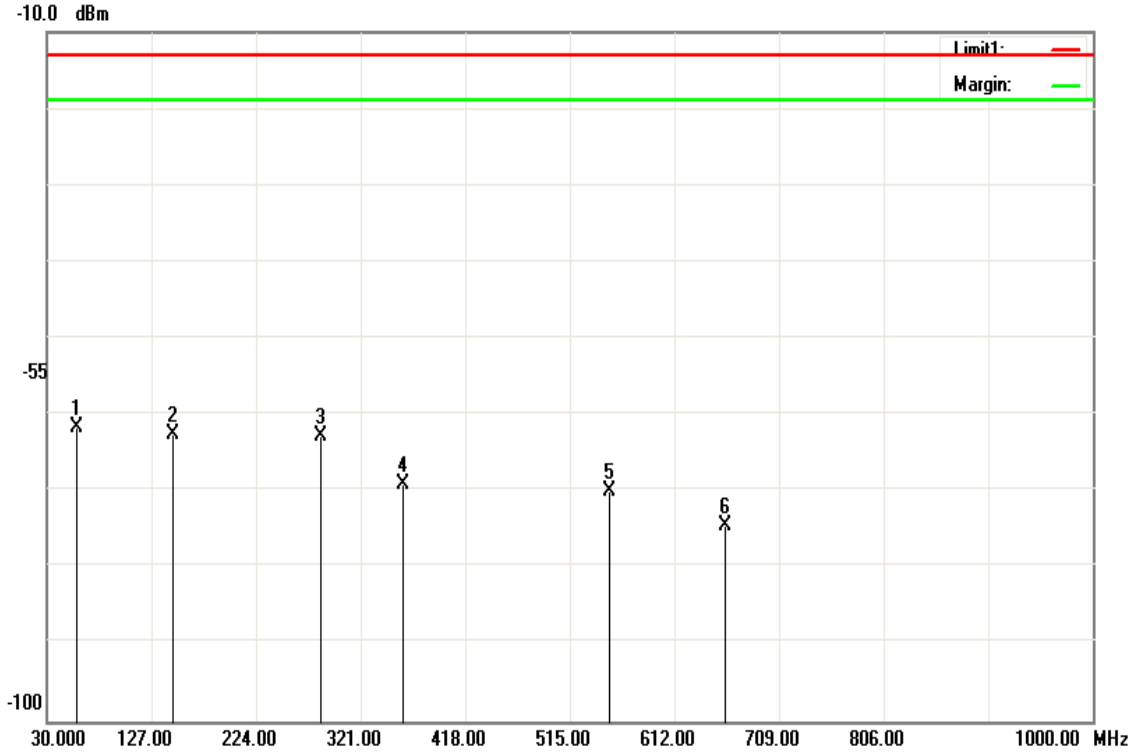
1. According to KDB 971168 D01. Photograph 5.8 and TIA-603-D:2010 Photograph 2.2.12.
2. The EUT was placed on a turntable
   (1) Below 1G : 0.8m
   (2) Above 1G : 1.5m
   (3) EUT set 3m from the receiving antenna
   (4) The table was rotated 360 degrees of the highest spurious emission to determine the position.
3. Set the spectrum analyzer , RBW=1MHz, VBW=3MHz.
4. A horn antenna was driven by a signal generator.
5. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission

Test Results

Below 1GHz

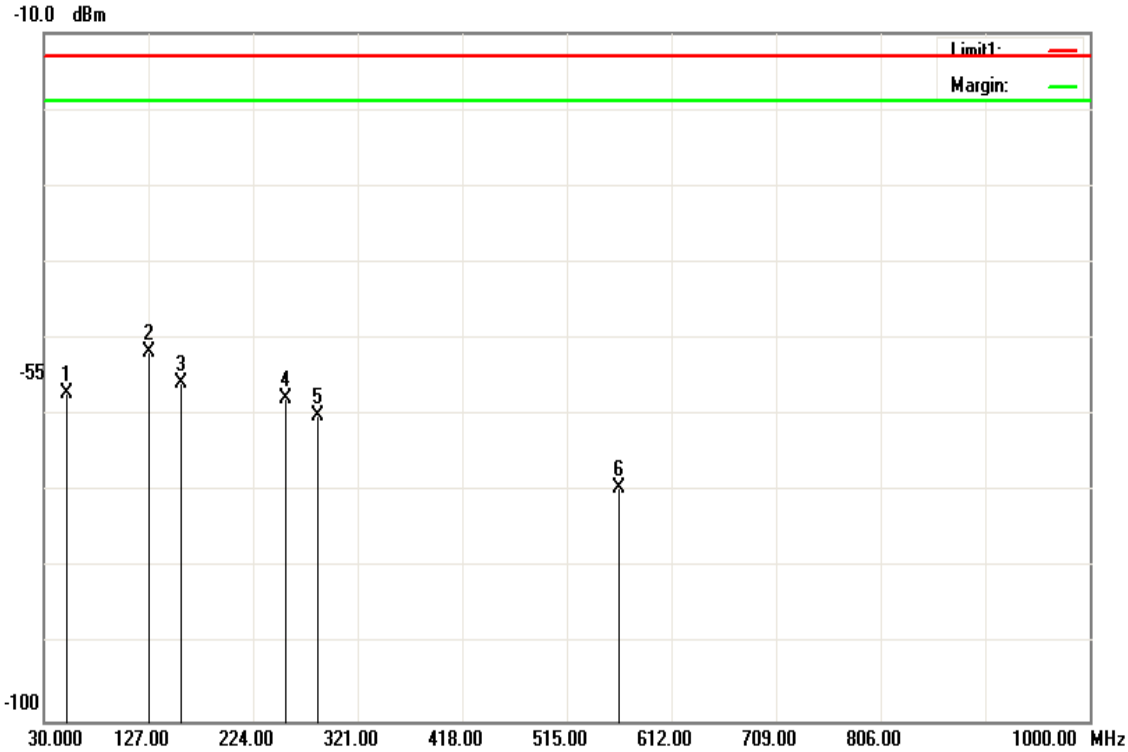
LTE Band 13 / BW: 10MHz / QPSK / RB =1, RB Offset = 0

Operation Mode:	Tx / Mid CH	**Test Date:**	May 22, 2017
Temperature:	23°C	**Tested by:**	Kevin Kuo
Humidity:	51% RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
57.1600	-59.95	-1.58	-61.53	-13.00	-48.53	V
146.4000	-63.16	0.62	-62.54	-13.00	-49.54	V
284.1400	-69.82	7.06	-62.76	-13.00	-49.76	V
359.8000	-76.23	7.14	-69.09	-13.00	-56.09	V
551.8600	-76.56	6.54	-70.02	-13.00	-57.02	V
658.5600	-75.96	1.42	-74.54	-13.00	-61.54	V

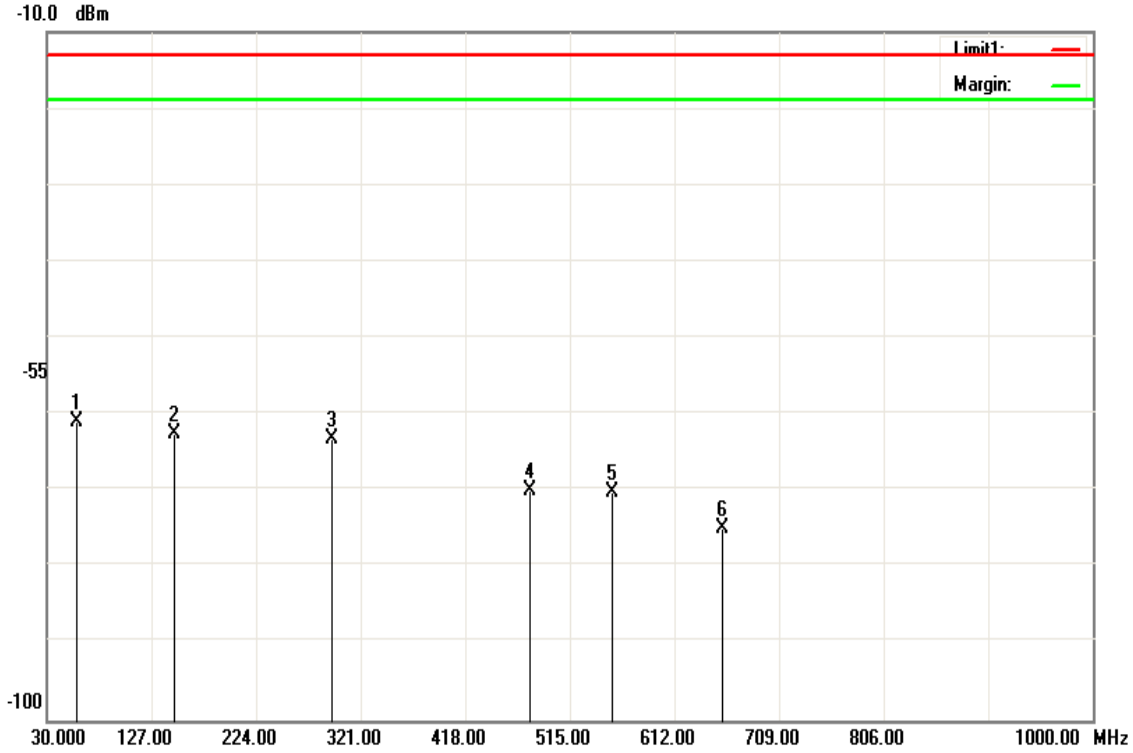
Operation Mode:	Tx / Mid CH	**Test Date:**	May 22, 2017
Temperature:	23°C	**Tested by:**	Kevin Kuo
Humidity:	51% RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
51.3400	-54.94	-2.17	-57.11	-13.00	-44.11	H
127.9700	-52.84	1.02	-51.82	-13.00	-38.82	H
157.0700	-55.51	-0.34	-55.85	-13.00	-42.85	H
254.0700	-65.15	7.36	-57.79	-13.00	-44.79	H
284.1400	-67.01	7.06	-59.95	-13.00	-46.95	H
563.5000	-74.12	4.57	-69.55	-13.00	-56.55	H

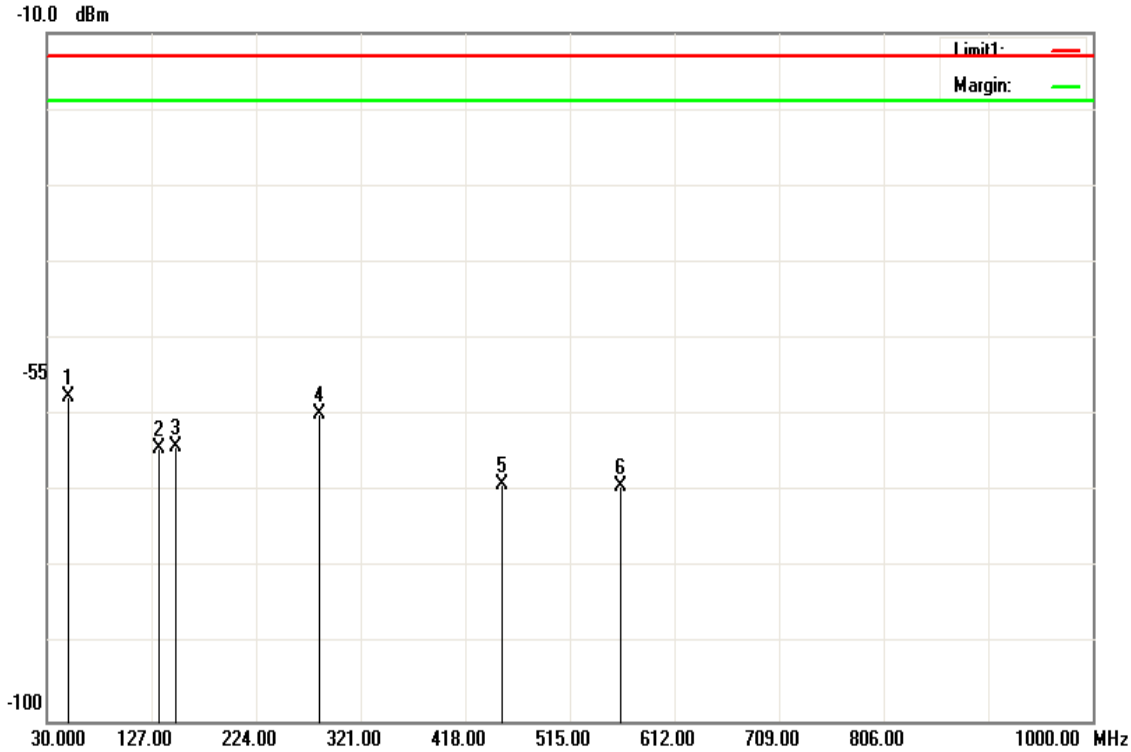
LTE Band 13 / BW: 10MHz / 16QAM / RB =1, RB Offset = 0

Operation Mode:	Tx / Mid CH	**Test Date:**	May 22, 2017
Temperature:	23°C	**Tested by:**	Kevin Kuo
Humidity:	51% RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
57.1600	-59.42	-1.58	-61.00	-13.00	-48.00	V
148.3400	-63	0.45	-62.55	-13.00	-49.55	V
294.8100	-70.11	6.95	-63.16	-13.00	-50.16	V
478.1400	-76.93	6.91	-70.02	-13.00	-57.02	V
553.8000	-76.46	6.21	-70.25	-13.00	-57.25	V
656.6200	-76.2	1.39	-74.81	-13.00	-61.81	V

Operation Mode:	Tx / Mid CH	**Test Date:**	May 22, 2017
Temperature:	23°C	**Tested by:**	Kevin Kuo
Humidity:	51% RH	**Polarity:**	Hor.

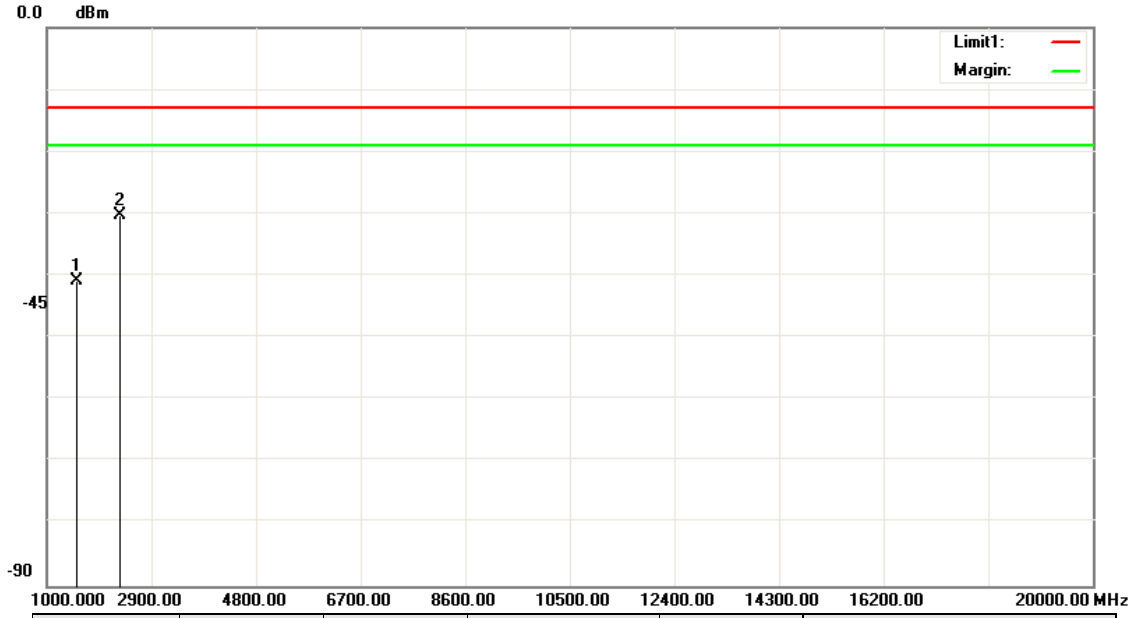


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
50.3700	-55.23	-2.26	-57.49	-13.00	-44.49	H
133.7900	-65.46	1.11	-64.35	-13.00	-51.35	H
149.3100	-64.41	0.36	-64.05	-13.00	-51.05	H
283.1700	-66.81	7.07	-59.74	-13.00	-46.74	H
451.9500	-76.21	7.04	-69.17	-13.00	-56.17	H
562.5300	-74.02	4.74	-69.28	-13.00	-56.28	H

Above 1GHz

LTE Band 13 / BW: 10MHz / QPSK RB =1, RB Offset = 0

Operation Mode:	Tx / Low CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Ver.

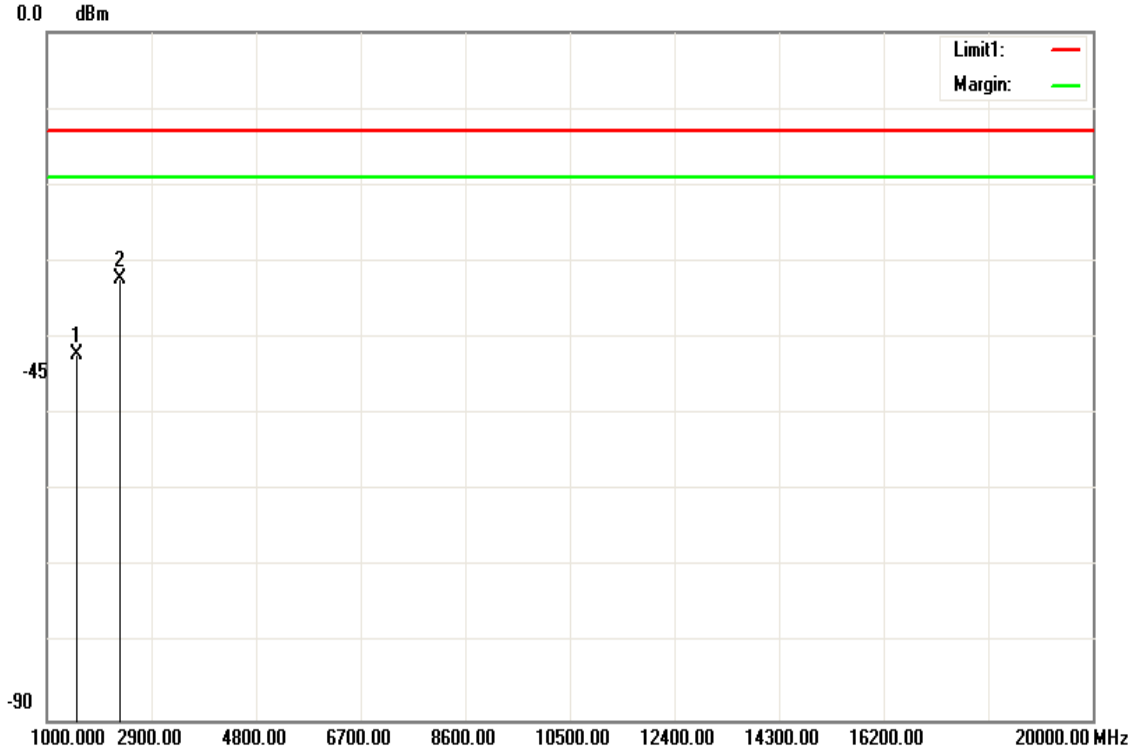


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-42.36	1.53	-40.83	-13.00	-27.83	V
2323.000	-31.92	1.72	-30.20	-13.00	-17.20	V
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / Low CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Hor.

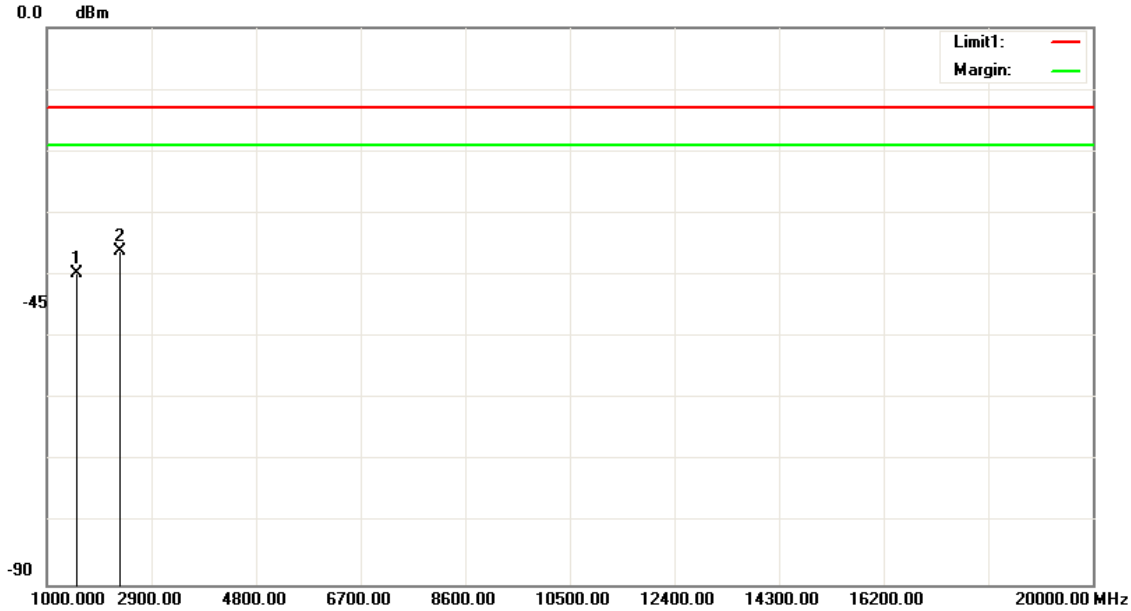


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-43.64	1.53	-42.11	-13.00	-29.11	V
2323.000	-33.97	1.72	-32.25	-13.00	-19.25	V
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / Mid CH	**Test Date:**	May 22, 2017
Temperature:	23°C	**Tested by:**	Kevin Kuo
Humidity:	51% RH	**Polarity:**	Ver.

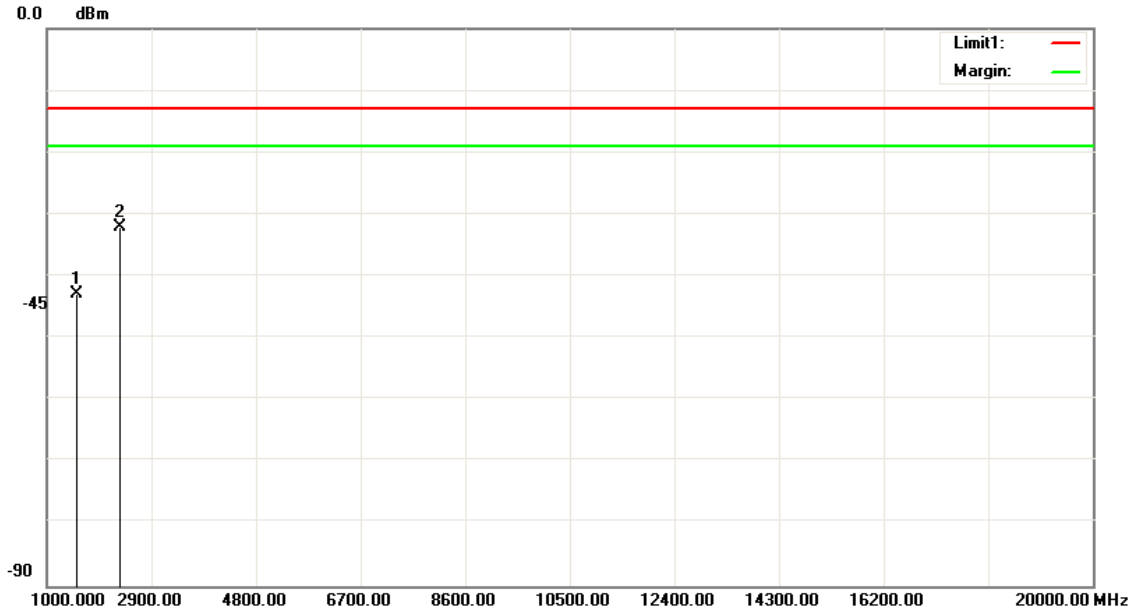


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-41.18	1.53	-39.65	-13.00	-26.65	V
2330.000	-37.74	1.73	-36.01	-13.00	-23.01	V
N/A						

Remark:

2. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / Mid CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Hor.

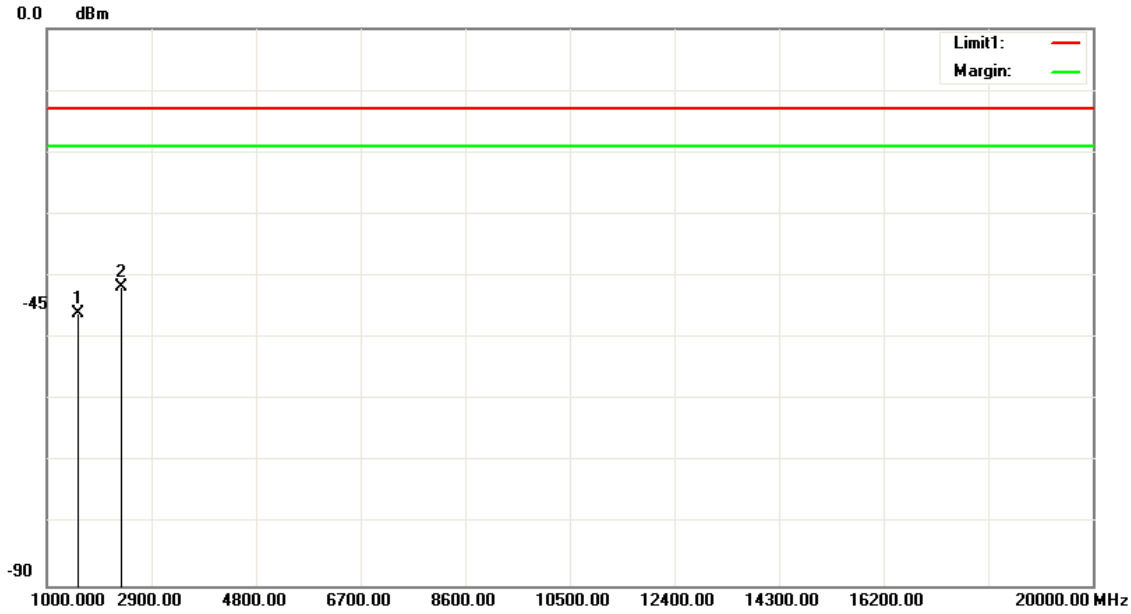


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-44.43	1.53	-42.90	-13.00	-29.90	H
2330.000	-33.78	1.73	-32.05	-13.00	-19.05	H
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / High CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Ver.

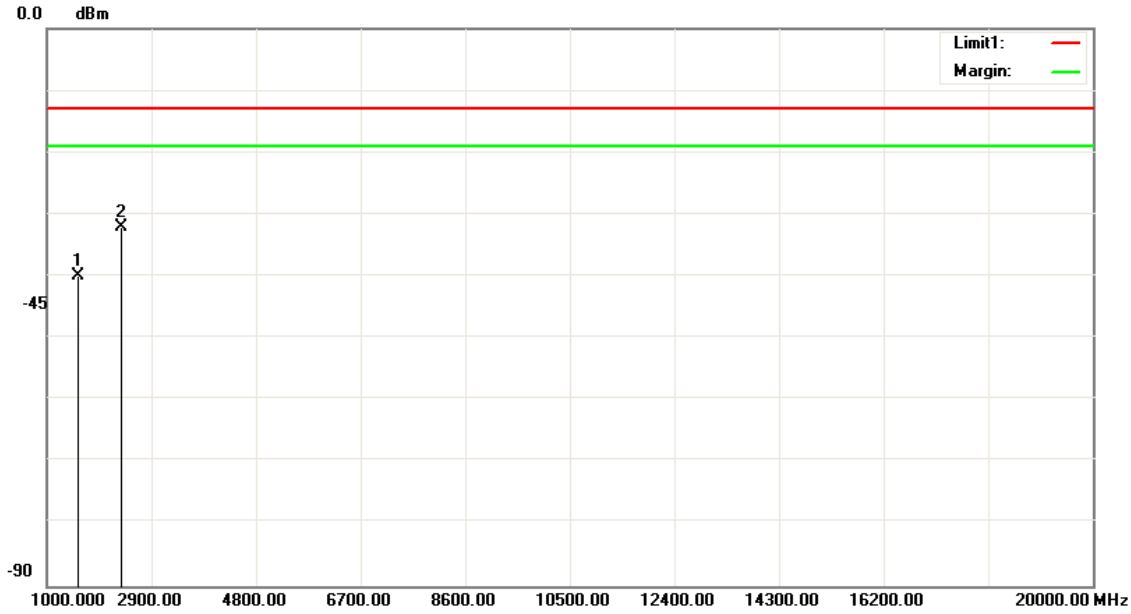


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1560.000	-47.48	1.53	-45.95	-13.00	-32.95	V
2344.000	-43.52	1.74	-41.78	-13.00	-28.78	V
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / High CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Hor.



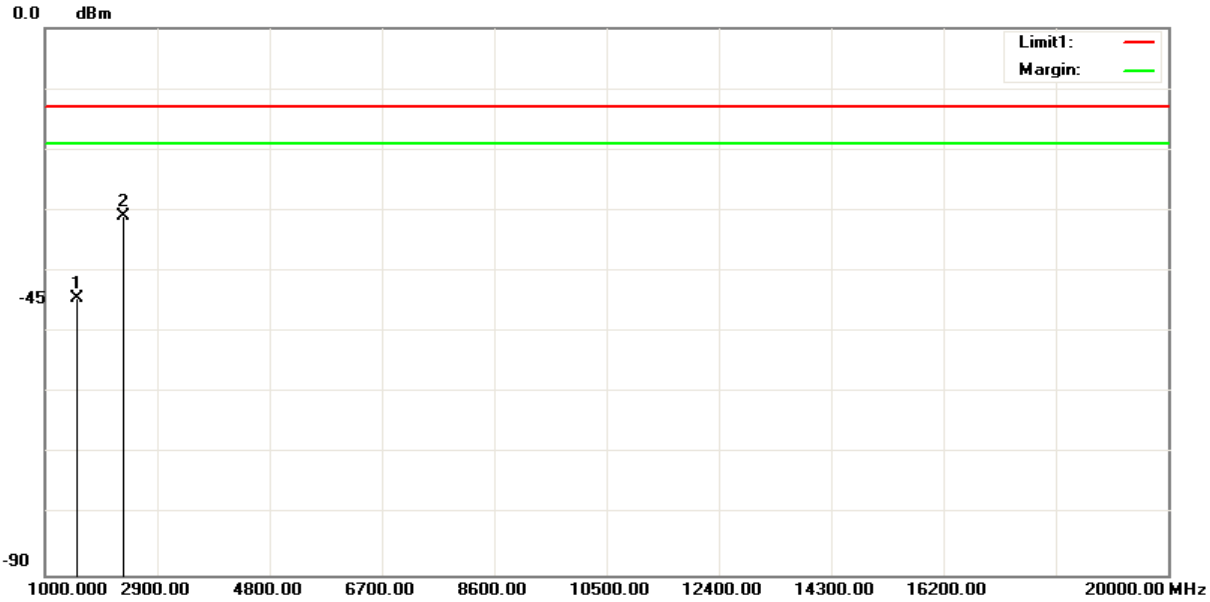
Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1560.000	-41.44	1.53	-39.91	-13.00	-26.91	H
2344.000	-33.72	1.74	-31.98	-13.00	-18.98	H
N/A						

Remark:

2. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

LTE Band 13 / BW: 10MHz / 16QAM RB =1, RB Offset = 0

Operation Mode:	Tx / Low CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Ver.

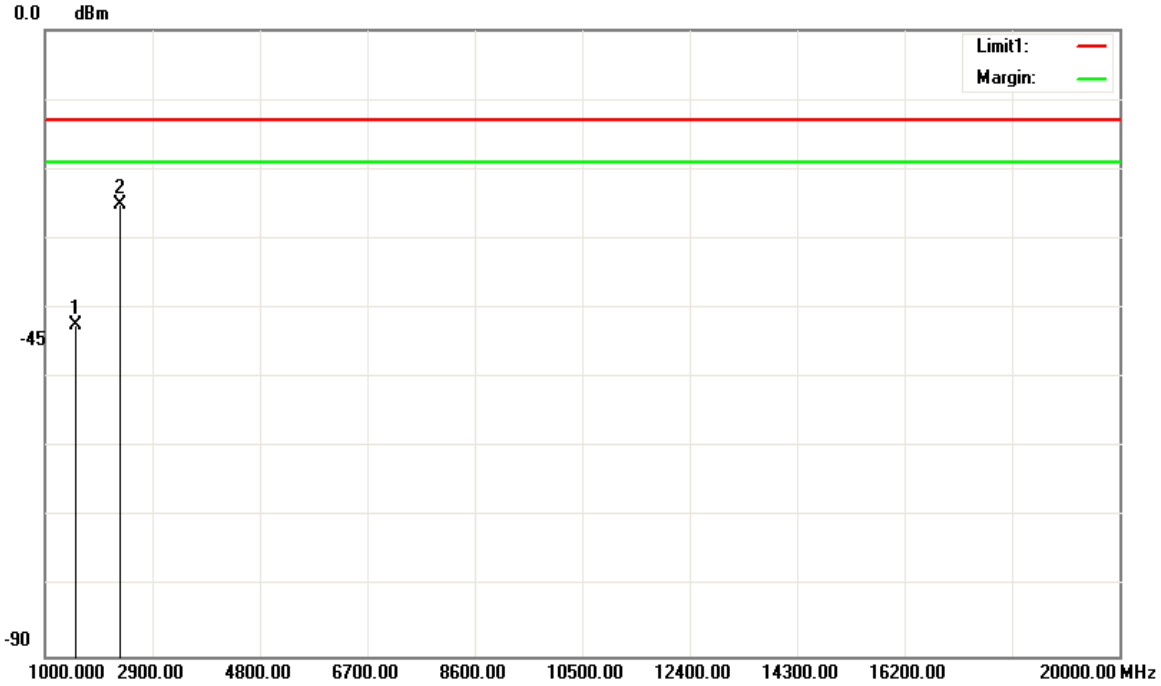


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-45.94	1.53	-44.41	-13.00	-31.41	V
2323.000	-32.7	1.72	-30.98	-13.00	-17.98	V
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / Low CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	53% RH	**Polarity:**	Hor.

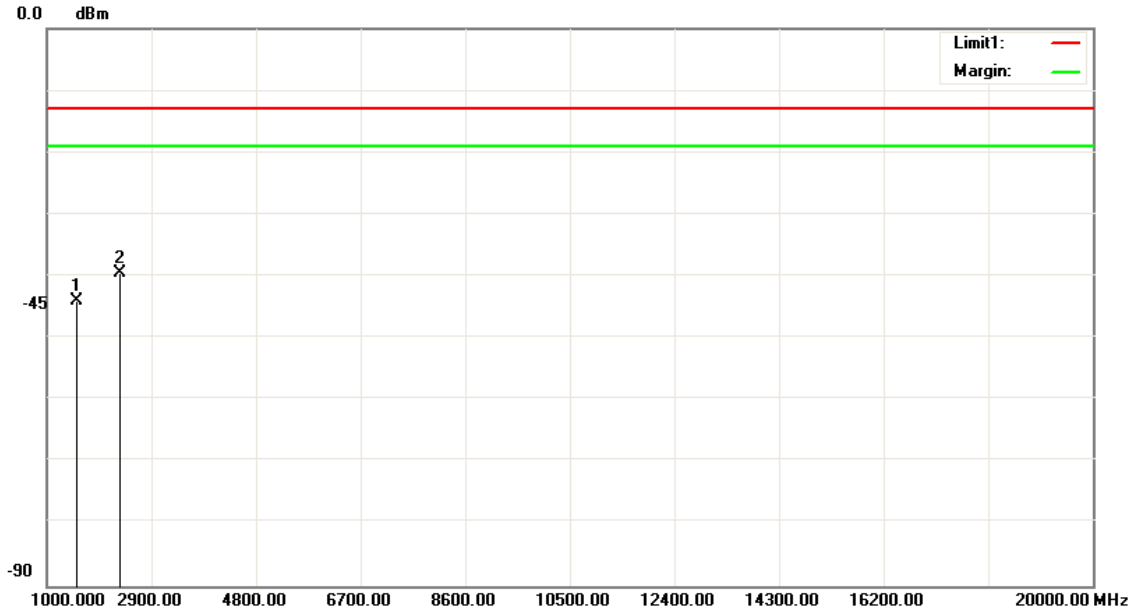


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-43.93	1.53	-42.40	-13.00	-29.40	H
2323.000	-26.89	1.72	-25.17	-13.00	-12.17	H
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / Mid CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	54% RH	**Polarity:**	Ver.

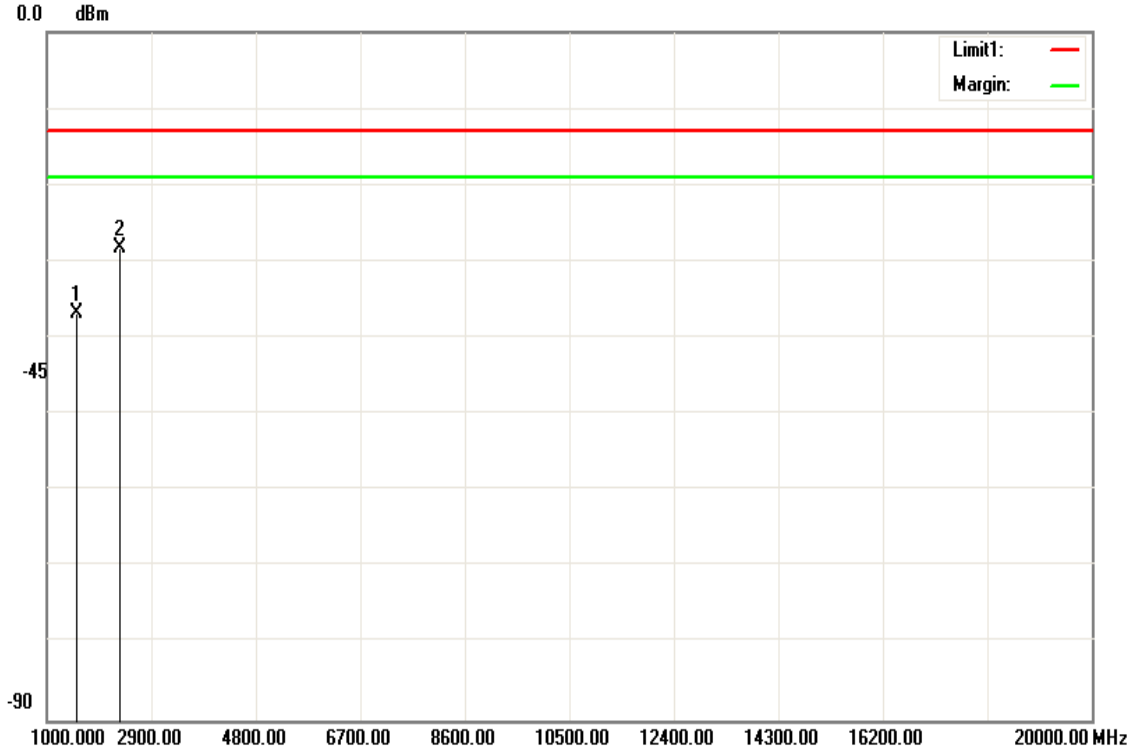


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-45.56	1.53	-44.03	-13.00	-31.03	V
2330.000	-41.13	1.73	-39.40	-13.00	-26.40	V
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / Mid CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	54% RH	**Polarity:**	Hor.

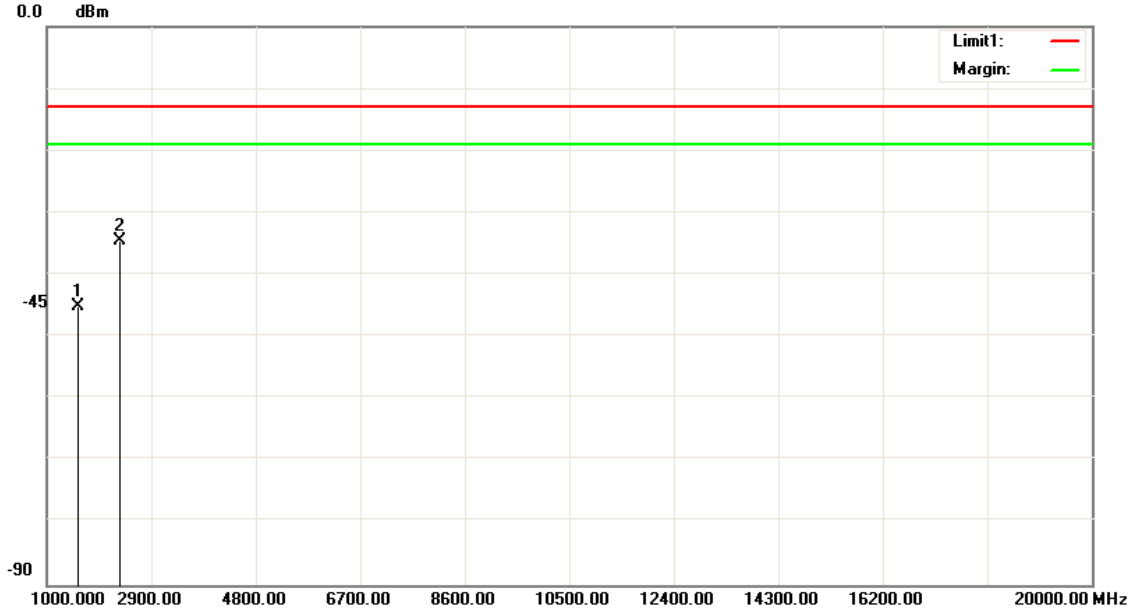


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1553.000	-38.35	1.53	-36.82	-13.00	-23.82	H
2330.000	-29.98	1.73	-28.25	-13.00	-15.25	H
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / High CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	54% RH	**Polarity:**	Ver.

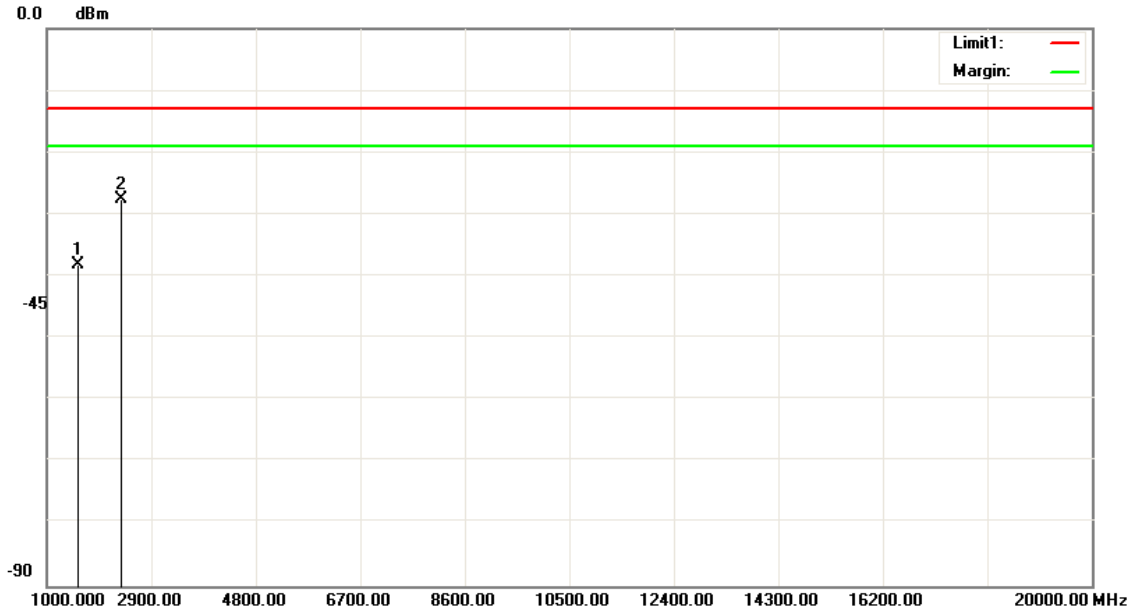


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1560.000	-46.72	1.53	-45.19	-13.00	-32.19	V
2337.000	-36.34	1.73	-34.61	-13.00	-21.61	V
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Operation Mode:	Tx / High CH	**Test Date:**	May 31, 2017
Temperature:	24°C	**Tested by:**	Kevin Kuo
Humidity:	54% RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1560.000	-39.68	1.53	-38.15	-13.00	-25.15	H
2344.000	-29.21	1.74	-27.47	-13.00	-14.47	H
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*