FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E
INDUSTRY CANADA RSS-132 & RSS-133
(CLASS II PERMISSIVE CHANGE)

TEST REPORT

For

module

Model No.: EM7565

Trade Name: DURABOOK

Issued to

TWINHEAD INTERNATIONAL CORP.
11F, No 550, Rueiguang Rd , Neihu, Taipei, Taiwan 11492, R.O.C.

Issued by

Compliance Certification Services Inc.
Wugu Laboratory
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
Issued Date: January 29, 2019

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		January 29, 2019		Initial Issue	ALL	Allison Chen

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1. TEST RESULT CERTIFICATION

Applicant: TWINHEAD INTERNATIONAL CORP.
11F, No 550, Rueiguang Rd , Neihu, Taipei, Taiwan 11492, R.O.C.

Manufacturer: TWINHEAD INTERNATIONAL CORP.
11F, No 550, Rueiguang Rd , Neihu, Taipei, Taiwan 11492, R.O.C.

Equipment Under Test: module

Trade Name: DURABOOK

Model: EM7565

Date of Test: November 8, 2018

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E & IC RSS-132 Issue 3: January, 2013 and IC RSS-133 Issue 6: January, 2018	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA-603-E and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rule FCC PART 22 Subpart H, PART 24 Subpart E.

The test results of this report relate only to the tested sample identified in this report.

Approved by: *Tested by:*

Kevin Tsai
Deputy Manager

Jerry Chuang
Engineer

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2. EUT DESCRIPTION

Product	Module	
Trade Name	DURABOOK	
Model	EM7565	
Model Discrepancy	N/A	
Received Date	September 18, 2018	
Power Supply	1. Power from AC Adapter FSP / FSP090-DIEBN2 Input: 100-240Vac, 1.5A, 50-60Hz Output: 19Vdc, 4.74A 2. Power from Battery	
Frequency Range	LTE Band 2 Channel Bandwidth: 1.4MHz	1850.7 MHz ~ 1909.2 MHz
	LTE Band 2 Channel Bandwidth: 3MHz	1851.5 MHz ~ 1908.4 MHz
	LTE Band 2 Channel Bandwidth: 5MHz	1852.5 MHz ~ 1907.5 MHz
	LTE Band 2 Channel Bandwidth: 10MHz	1855.0 MHz ~1905.0 MHz
	LTE Band 2 Channel Bandwidth: 15MHz	1857.5 MHz ~ 1902.5 MHz
	LTE Band 2 Channel Bandwidth: 20MHz	1860.0 MHz ~1900.0 MHz
	LTE Band 5 Channel Bandwidth: 1.4MHz	824.7 MHz ~ 848.2MHz
	LTE Band 5 Channel Bandwidth: 3MHz	825.5 MHz ~ 847.4 MHz
	LTE Band 5 Channel Bandwidth: 5MHz	826.5 MHz ~846.5 MHz
	LTE Band 5 Channel Bandwidth: 10MHz	829 MHz ~844 MHz
Modulation Technique	LTE Band 2	QPSK, 16QAM
	LTE Band 5	QPSK, 16QAM
Antenna Gain	PIFA Antenna Durabook Americas inc LTE Band 2: P/N: TWR11LTPB02+B / 3.36 dBi LTE Band 5: P/N: TWR11LTPB02+B / 1.12 dBi	

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Transmit Power (ERP & EIRP Power)	LTE Band 2 Channel Bandwidth: 1.4MHz	QPSK:	30.24	dBm
		16QAM:	29.99	dBm
	LTE Band 2 Channel Bandwidth: 3MHz	QPSK:	30.09	dBm
		16QAM:	30.09	dBm
	LTE Band 2 Channel Bandwidth: 5MHz	QPSK:	30.25	dBm
		16QAM:	30.23	dBm
	LTE Band 2 Channel Bandwidth: 10MHz	QPSK:	30.59	dBm
		16QAM:	30.54	dBm
	LTE Band 2 Channel Bandwidth: 15MHz	QPSK:	30.23	dBm
		16QAM:	30.26	dBm
	LTE Band 2 Channel Bandwidth: 20MHz	QPSK:	30.33	dBm
		16QAM:	30.34	dBm
	LTE Band 5 Channel Bandwidth: 1.4MHz	QPSK:	26.77	dBm
		16QAM:	27.35	dBm
	LTE Band 5 Channel Bandwidth: 3MHz	QPSK:	26.73	dBm
		16QAM:	27.09	dBm
	LTE Band 5 Channel Bandwidth: 5MHz	QPSK:	26.96	dBm
		16QAM:	27.34	dBm
	LTE Band 5 Channel Bandwidth: 10MHz	QPSK:	26.79	dBm
		16QAM:	28.26	dBm
Class II Permissive Change	1. The subject approved module is being used in a specific host. [Product: Tablet PC, brand name: DURABOOK, FCC model:/ R11XXXXXX (X=0-9, A-Z, a-z, Blank), IC model: R11AH6] 2. Power reduction per tune-up procedure is applied in order to comply with exposure requirements.			

Remark: *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*

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3. TEST SUMMARY

FCC Standard Section	IC Standard Section	Report Section	Test Item	Result
-	-	2	Antenna Requirement	Pass
2.1046	RSS-GEN 6.12	-	Output Power measurement	N/A
22.913(a), 24.232(c)	RSS-132, section 5.4 RSS-133, section 6.4	8.1	ERP and EIRP Measurement	Pass
2.1055, 22.355, 24.235	RSS-132 section 5.3 RSS-133 section 6.3	-	Frequency Stability v.s. temperature measurement	N/A
2.1049	RSS-GEN 6.7	-	Occupied Bandwidth Measurement	N/A
22.917(a), 24.238(a)	RSS-132 section 5.5 RSS-133 section 6.5	-	Conducted Band Edge	N/A
22.913(d), 24.232(d)	RSS-132, section 5.4 RSS-133, section 6.4	-	Peak to Average Ratio	N/A
22.917(a), 24.238(a)	RSS-132 section 5.5 RSS-133 section 6.5	-	Conducted Spurious Emission	N/A
22.917(a), 24.238(a)	RSS-132 section 5.5 RSS-133 section 6.5	8.2	Spurious Radiation Measurement	Pass

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4. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures document on chapter 13 of TIA-603-E and FCC CFR 47, Part 2 and Part 22 Subpart H & Part 24 Subpart E, KDB 971168 D01 Power Meas License Digital Systems.

The tests documented in this report were performed in accordance with IC RSS-132, SPSR503, RSS-133, SPSR510 and ANSI C63.10: 2013 for IC, ANSI C63.10: 2009 for FCC.

4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

4.3 DESCRIPTION OF TEST MODES

The EUT had been tested under operating condition.

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

LTE Band 2: 1850 MHz ~ 1915MHz

Three channels had been tested for each channel bandwidth.

Channel Bandwidth	1.4MHz		3MHz		5MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low channel (L)	18607	1850.7	18615	1851.5	18625	1852.5
Middle channel (M)	18900	1880	18900	1880.0	18900	1880
High channel (H)	19192	1909.2	19184	1908.4	19175	1907.5
Channel Bandwidth	**10MHz**		**15MHz**		**20MHz**	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low channel (L)	18650	1855	18675	1857.5	18700	1860
Middle channel (M)	18900	1880	18900	1880.0	18900	1880
High channel (H)	19150	1905	19125	1902.5	19100	1900

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LTE Band 5: 824 MHz ~ 849

Three channels had been tested for each channel bandwidth.

Channel Bandwidth	1.4MHz		3MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)
Low channel (L)	20407	824.7	20415	825.5
Middle channel (M)	20525	836.5	20525	836.5
High channel (H)	20642	848.2	20634	847.4
Channel Bandwidth	**5MHz**		**10MHz**	
	Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
Low channel (L)	20425	826.5	20450	829
Middle channel (M)	20525	836.5	20525	836.5
High channel (H)	20625	846.5	20600	844

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
Band2	1.4M	1 RB ALLOCATED AT THE UPPER EDGE	1.4M	1 RB ALLOCATED AT THE UPPER EDGE
	5M	1 RB ALLOCATED AT THE UPPER EDGE	5M	1 RB ALLOCATED AT THE UPPER EDGE
	10M	1 RB ALLOCATED AT THE UPPER EDGE	10M	1 RB ALLOCATED AT THE CENTERED
	20M	1 RB ALLOCATED AT THE UPPER EDGE	20M	1 RB ALLOCATED AT THE UPPER EDGE
Band5	1.4M	1 RB ALLOCATED AT THE UPPER EDGE	1.4M	1 RB ALLOCATED AT THE UPPER EDGE
	5M	1 RB ALLOCATED AT THE UPPER EDGE	5M	1 RB ALLOCATED AT THE UPPER EDGE
	10M	1 RB ALLOCATED AT THE UPPER EDGE	10M	1 RB ALLOCATED AT THE CENTERED

4.4 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement	
Test Condition	**Band edge, Emission for Unwanted and Fundamental**
Power supply Mode	**Mode 1: EUT Power by Adapter** **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)

Remark:

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

2. The EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case (X-Plane) were recorded in this report.

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5. INSTRUMENT CALIBRATION

5.1 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.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Wugu Fully Chamber					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Bilog Antenna	Sunol Sciences	JB1	A052609	03/14/2018	03/13/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	23452	06/29/2018	06/28/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	33960	06/29/2018	06/28/2019
Digital Radio Communication Tester	R&S	CMU200	116604	07/19/2018	07/18/2019
Digital Thermo-Hygro Meter	WISEWIND	1110	D06	02/08/2018	02/07/2019
Horn Antenna	SCHWARZBECK	BBHA 9120D	779	03/14/2018	03/13/2019
Pre-Amplifier	Anritsu	MH648A	M89145	06/29/2018	06/28/2019
Pre-Amplifier	EMEC	EM01G26G	060570	06/29/2018	06/28/2019
Signal Analyzer	Agilent	N9010A	MY52220817	03/22/2018	03/21/2019
Wideband Radio Communication Tester	R&S	CMW 500	116875	04/20/2018	04/19/2019
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)				

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5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
Powerline Conducted Emission	N/A
3M Semi Anechoic Chamber / 30M~200M	+/- 3.20
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.89
3M Semi Anechoic Chamber / 1G~8G	+/- 3.52
3M Semi Anechoic Chamber / 8G~18G	+/- 3.75
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

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

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6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan, R.O.C

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

6.2 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.

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.”

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7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

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

7.2 SUPPORT EQUIPMENT

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable
	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.*

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8. FCC PART 22 & 24 AND INDUSTRY CANADA RSS-132 & RSS-133 REQUIREMENTS

8.1 ERP & EIRP MEASUREMENT

LIMIT

According to FCC §2.1046

FCC 22.913(a): The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.

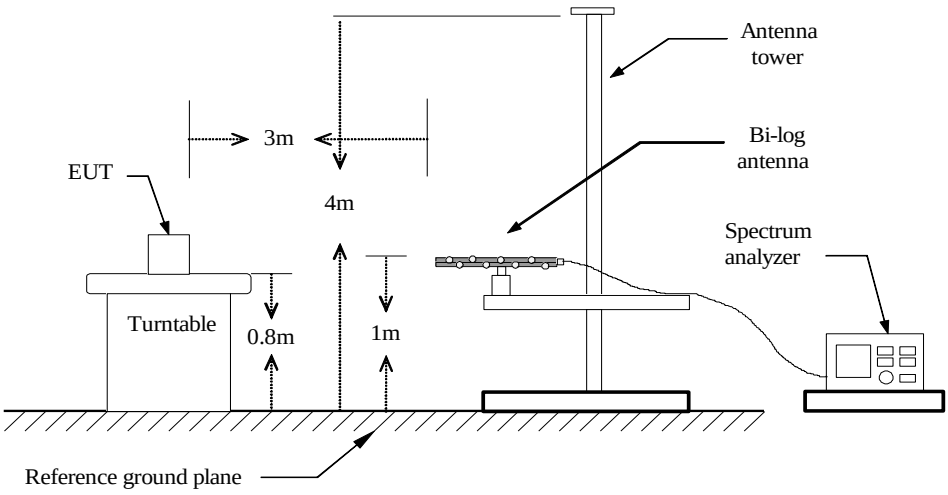
FCC 24.232(c): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

RSS-132 § 5.4 The maximum (ERP) shall be 6.3 Watts for mobile stations.

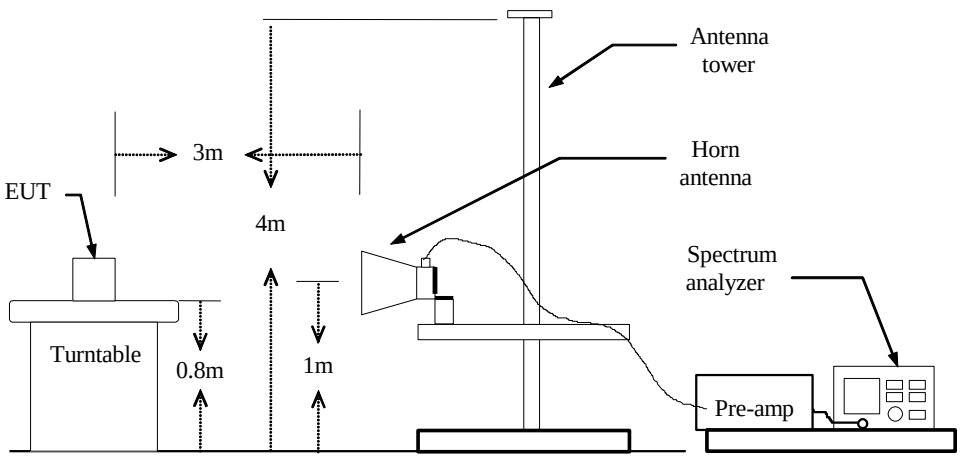
RSS133 § 6.4: Mobile stations and hand-held portables are limited to 2 watts maximum (EIRP).

TEST CONFIGURATION

Below 1 GHz



Above 1 GHz



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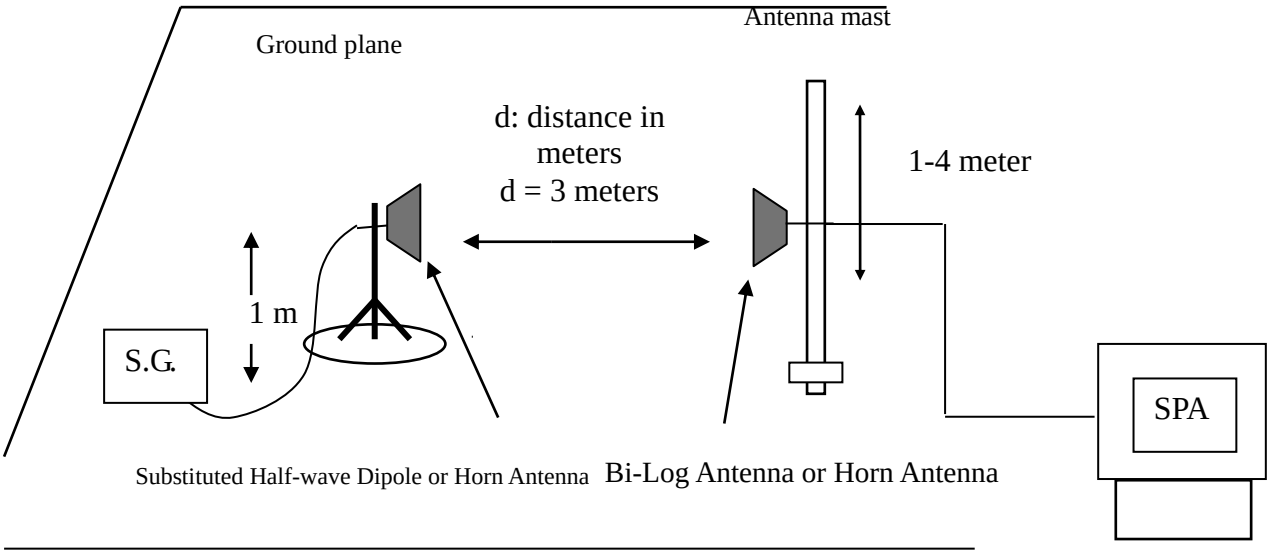
For Substituted Method Test Set-UP



TEST PROCEDURE

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

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LTE Band 2

BW: 1.4MHz / 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)
2	1.4	Lowest	QPSK	1	0	11.53	0.0142	29.28	0.8472
		Middle		1	0	11.43	0.0139	30.24	1.0568
		Highest		1	0	9.68	0.0093	27.38	0.5470
		Lowest	16 QAM	1	0	11.70	0.0148	28.88	0.7727
		Middle		1	0	11.19	0.0132	29.99	0.9977
		Highest		1	0	9.53	0.0090	27.56	0.5702

BW: 3MHz / 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)
2	3	Lowest	QPSK	1	0	11.54	0.0143	29.04	0.8017
		Middle		1	0	12.10	0.0162	30.09	1.0209
		Highest		1	0	10.04	0.0101	27.81	0.6039
		Lowest	16 QAM	1	0	11.58	0.0144	28.89	0.7745
		Middle		1	0	12.24	0.0167	30.09	1.0209
		Highest		1	0	10.33	0.0108	28.29	0.6745

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)
2	5	Lowest	QPSK	1	0	11.73	0.0149	29.18	0.8279
		Middle		1	0	12.28	0.0169	30.25	1.0593
		Highest		1	0	10.37	0.0109	28.87	0.7709
		Lowest	16 QAM	1	0	11.69	0.0148	29.37	0.8650
		Middle		1	0	12.30	0.0170	30.23	1.0544
		Highest		1	0	10.51	0.0112	29.01	0.7962

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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)
2	10	Lowest	QPSK	1	0	11.84	0.0153	29.45	0.8810
		Middle		1	0	12.76	0.0189	30.59	1.1455
		Highest		1	0	10.83	0.0121	29.90	0.9772
		Lowest	16 QAM	1	0	11.85	0.0153	29.21	0.8337
		Middle		1	0	12.93	0.0196	30.54	1.1324
		Highest		1	0	10.78	0.0120	29.92	0.9817

BW: 15MHz / 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)
2	15	Lowest	QPSK	1	0	12.03	0.0160	29.20	0.8318
		Middle		1	0	12.95	0.0197	30.23	1.0544
		Highest		1	0	10.71	0.0118	29.92	0.9817
		Lowest	16 QAM	1	0	11.84	0.0153	29.12	0.8166
		Middle		1	0	12.81	0.0191	30.26	1.0617
		Highest		1	0	10.63	0.0116	29.77	0.9484

BW: 20MHz / 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)
2	20	Lowest	QPSK	1	0	11.95	11.95	29.17	0.8260
		Middle		1	0	13.04	13.04	30.33	1.0789
		Highest		1	0	10.32	10.32	29.40	0.8710
		Lowest	16 QAM	1	0	11.92	11.92	29.17	0.8260
		Middle		1	0	12.96	12.96	30.34	1.0814
		Highest		1	0	10.33	10.33	29.15	0.8222

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LTE Band 5

BW: 1.4MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	1.4	Lowest	QPSK	1	0	4.87	0.0031	27.12	0.5152
		Middle		1	0	6.70	0.0047	26.77	0.4753
		Highest		1	0	8.39	0.0069	26.65	0.4624
		Lowest	16 QAM	1	0	5.59	0.0036	27.35	0.5433
		Middle		1	0	7.15	0.0052	27.14	0.5176
		Highest		1	0	9.22	0.0084	26.53	0.4498

BW: 3MHz / RB=1, RB Offset=0

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	3	Lowest	QPSK	1	0	5.47	0.0035	26.35	0.4315
		Middle		1	0	7.64	0.0058	26.73	0.4710
		Highest		1	0	9.55	0.0090	26.56	0.4529
		Lowest	16 QAM	1	0	6.04	0.0040	27.06	0.5082
		Middle		1	0	8.20	0.0066	26.96	0.4966
		Highest		1	0	9.05	0.0080	27.09	0.5117

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

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	5	Lowest	QPSK	1	0	5.68	0.0037	26.34	0.4305
		Middle		1	0	7.23	0.0053	26.96	0.4966
		Highest		1	0	9.03	0.0080	26.59	0.4560
		Lowest	16 QAM	1	0	6.41	0.0044	26.98	0.4989
		Middle		1	0	7.96	0.0063	27.17	0.5212
		Highest		1	0	9.66	0.0092	27.34	0.5420

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

Band	BW (MHz)	Channel	Mode	UL RB Allocation	UL RB offset	Vertical		Horizontal	
						ERP (dBm)	ERP (W)	ERP (dBm)	ERP (W)
5	10	Lowest	QPSK	1	0	5.36	0.0034	26.22	0.4188
		Middle		1	0	6.53	0.0045	26.68	0.4656
		Highest		1	0	8.15	0.0065	26.79	0.4775
		Lowest	16 QAM	1	0	6.24	0.0042	26.95	0.4955
		Middle		1	0	7.15	0.0052	28.26	0.6699
		Highest		1	0	8.32	0.0068	27.62	0.5781

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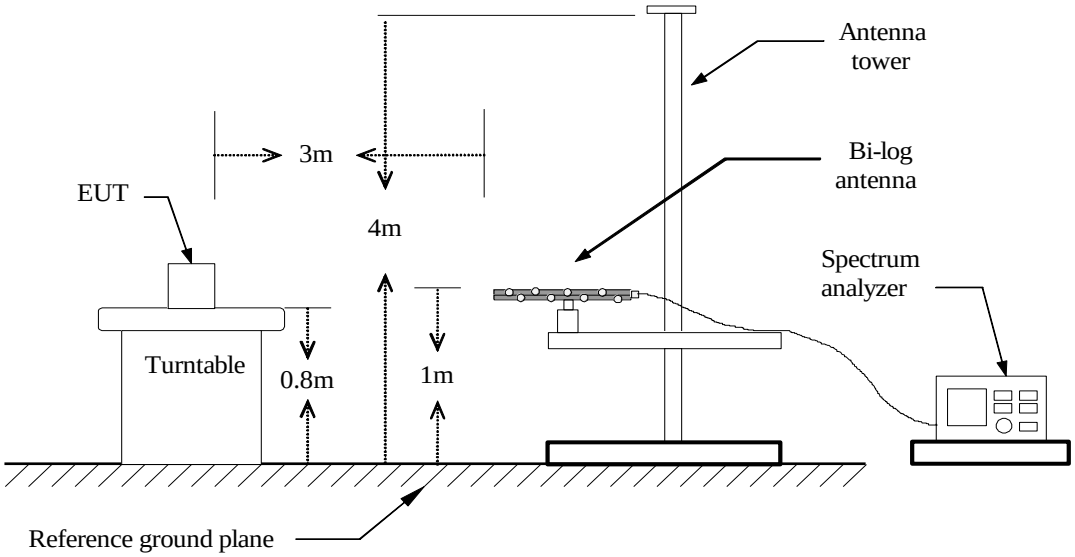
8.2 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

LIMIT

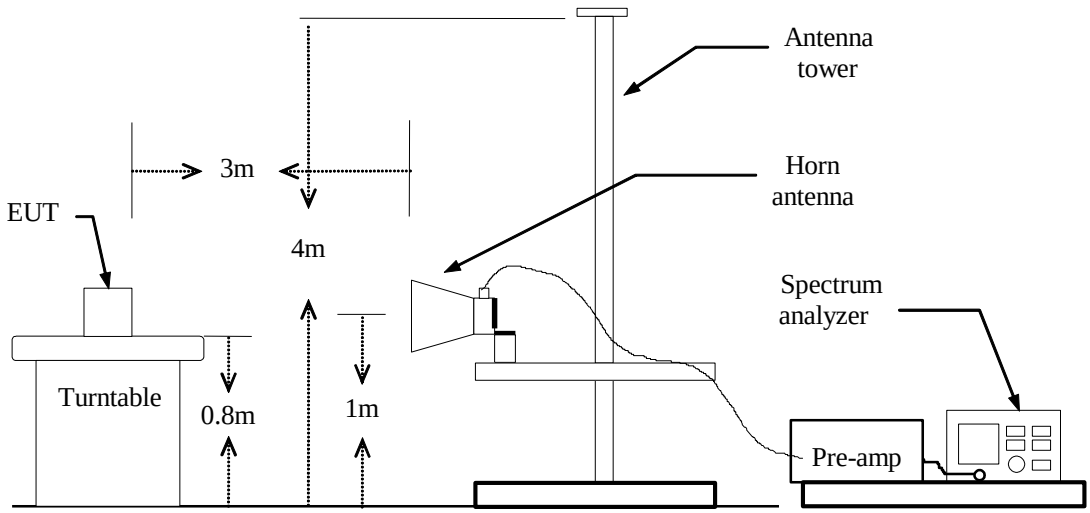
The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission equal to –13dBm

Test Configuration

Below 1 GHz



Above 1 GHz



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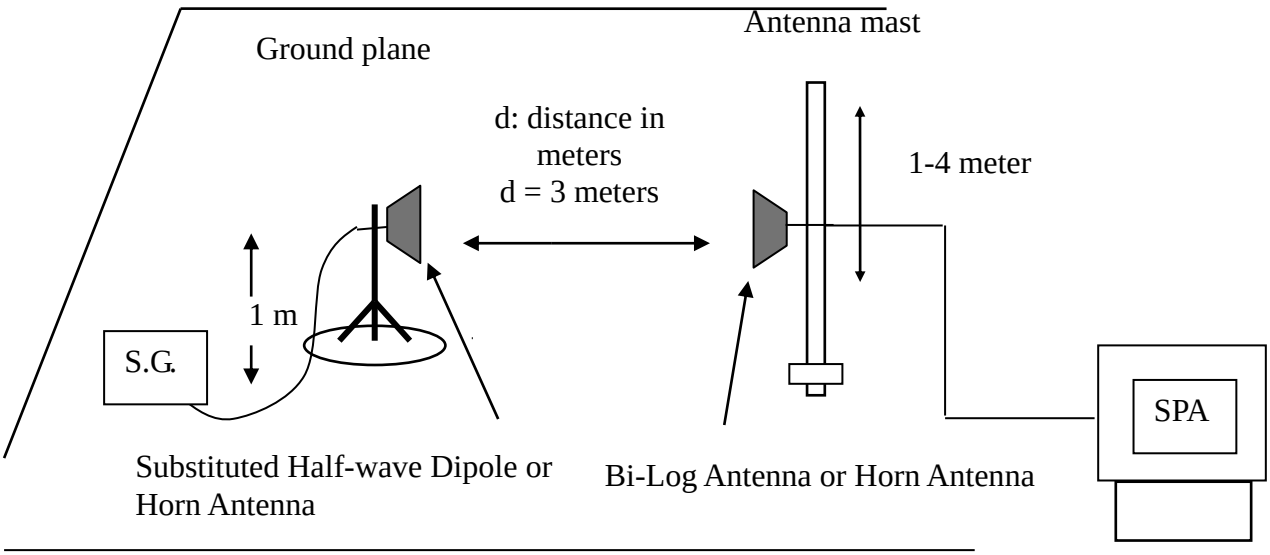
Substituted Method Test Set-up



TEST PROCEDURE

1. According to KDB 971168 D01 Power Meas License Digital Systems and TIA-603-E Section 2.2.12.
2. The EUT was placed on a turntable
   (1) Below 1G : 0.8m
   (2) Above 1G : 0.8m
   (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

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

TEST RESULTS

Refer to the attached tabular data sheets.

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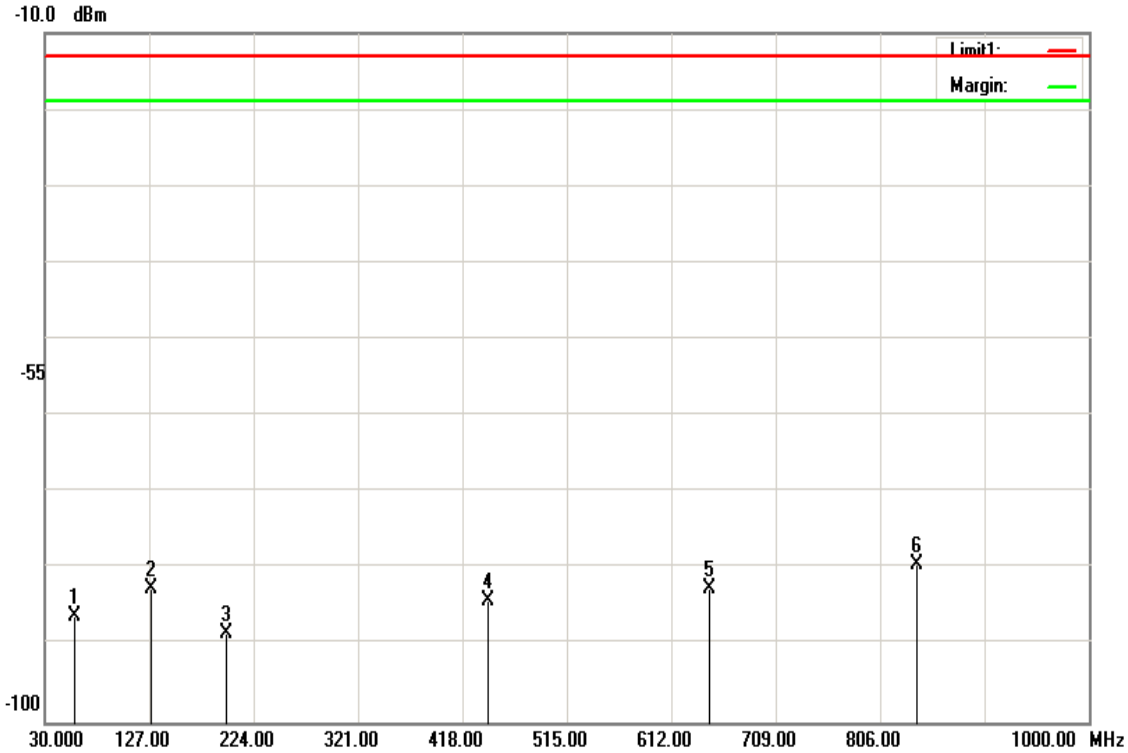
Test Results

Below 1GHz

LTE Band 2 / BW: 20MHz / QPSK / RB =1, RB Offset = 0

Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
57.1600	-85.49	0.75	-86.24	-13.00	-73.24	V
128.9400	-81.52	1.13	-82.65	-13.00	-69.65	V
198.7800	-86.93	1.4	-88.33	-13.00	-75.33	V
441.7650	-82.09	2.11	-84.20	-13.00	-71.20	V
646.9200	-79.91	2.56	-82.47	-13.00	-69.47	V
839.9500	-76.47	2.95	-79.42	-13.00	-66.42	V

Note: We selected worst case to performed test, The results can be meet other mode.

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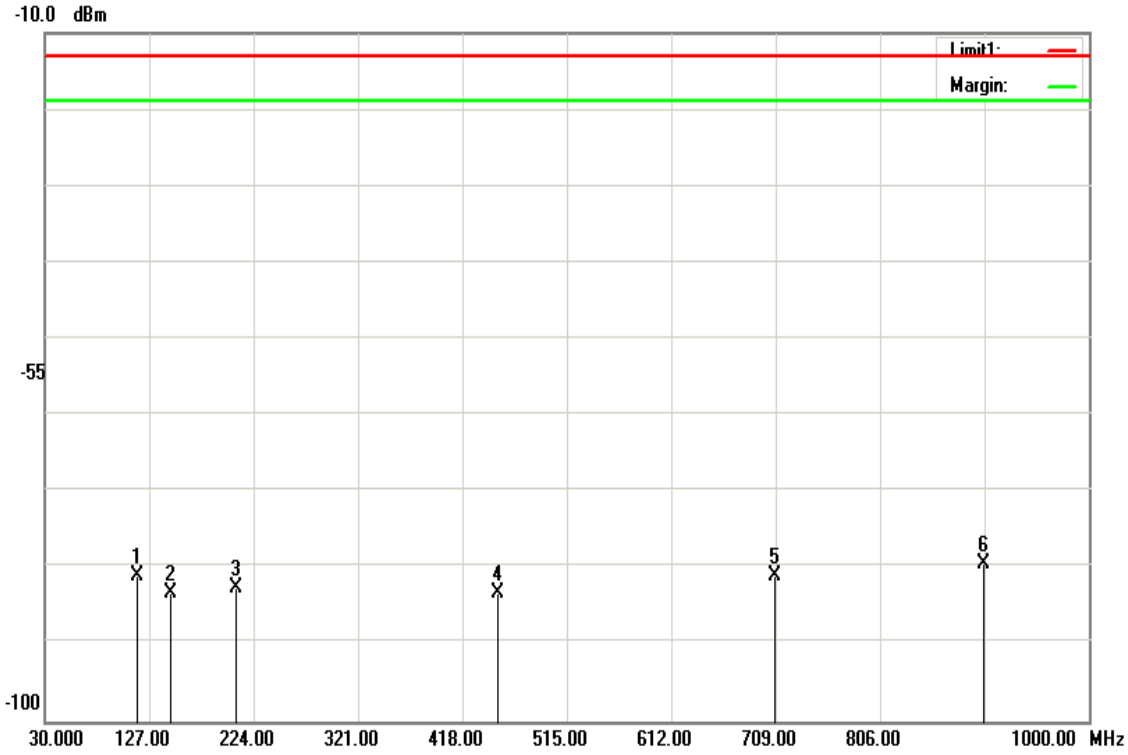
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
115.8450	-80.02	1.07	-81.09	-13.00	-68.09	H
146.8850	-82.1	1.2	-83.30	-13.00	-70.30	H
207.5100	-81.13	1.43	-82.56	-13.00	-69.56	H
451.4650	-81.07	2.13	-83.20	-13.00	-70.20	H
708.5150	-78.25	2.7	-80.95	-13.00	-67.95	H
902.5150	-76.3	3.06	-79.36	-13.00	-66.36	H

Note: We selected worst case to performed test, The results can be meet other mode.

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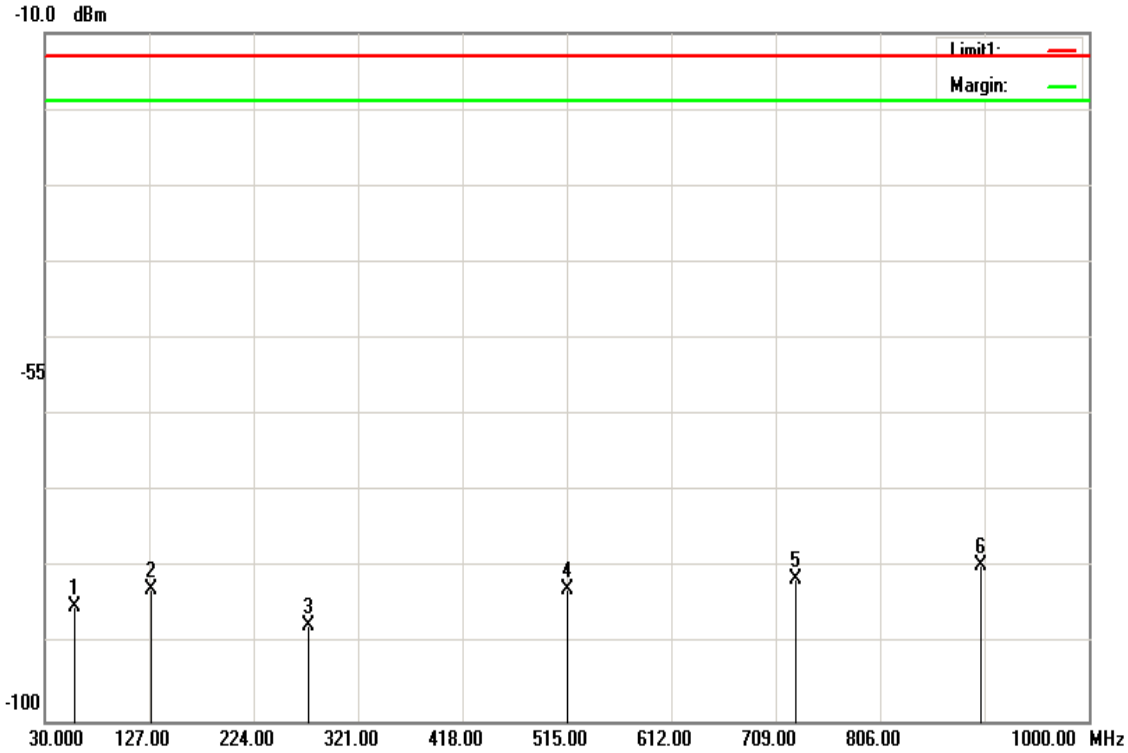
LTE Band 2 / BW: 20MHz / 16QAM / RB =1, RB Offset = 0

Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
57.1600	-84.33	0.75	-85.08	-13.00	-72.08	V
128.9400	-81.69	1.13	-82.82	-13.00	-69.82	V
275.8950	-85.83	1.65	-87.48	-13.00	-74.48	V
515.9700	-80.42	2.29	-82.71	-13.00	-69.71	V
727.9150	-78.73	2.74	-81.47	-13.00	-68.47	V
899.6050	-76.54	3.06	-79.60	-13.00	-66.60	V

Note: We selected worst case to performed test, The results can be meet other mode.

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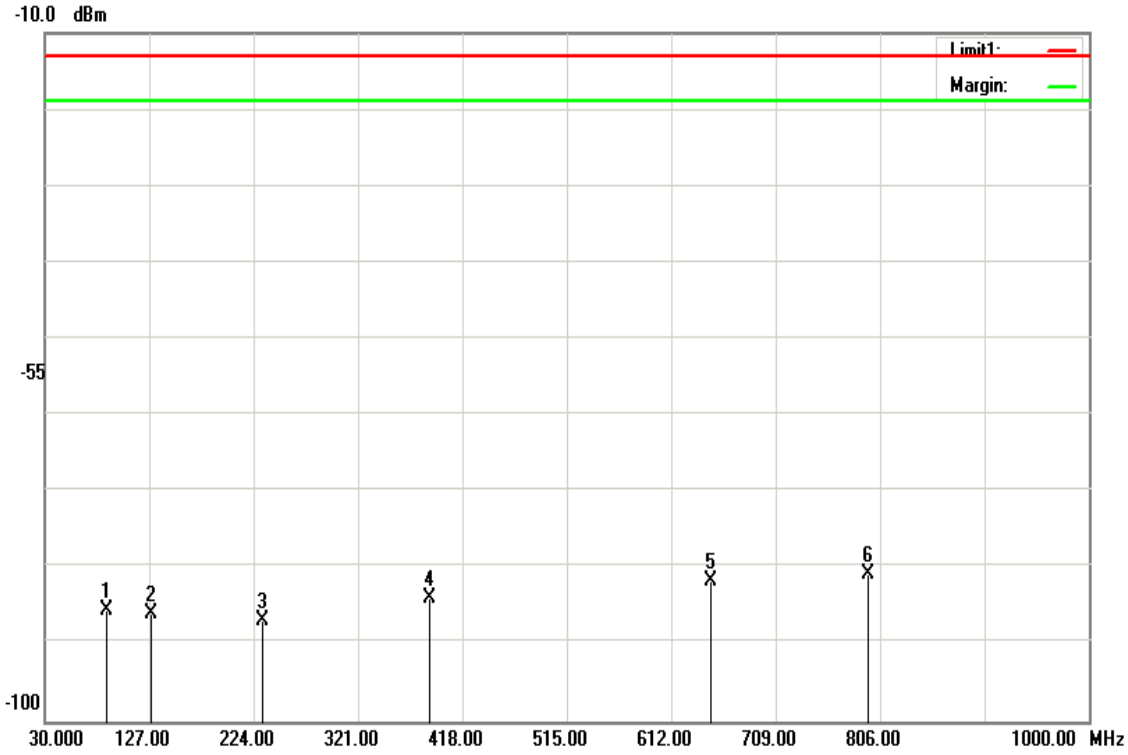
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
87.7150	-84.58	0.92	-85.50	-13.00	-72.50	H
128.9400	-84.81	1.13	-85.94	-13.00	-72.94	H
232.7300	-85.42	1.51	-86.93	-13.00	-73.93	H
386.9600	-82.05	1.97	-84.02	-13.00	-71.02	H
648.8600	-79.17	2.57	-81.74	-13.00	-68.74	H
794.3600	-77.87	2.86	-80.73	-13.00	-67.73	H

Note: We selected worst case to performed test, The results can be meet other mode.

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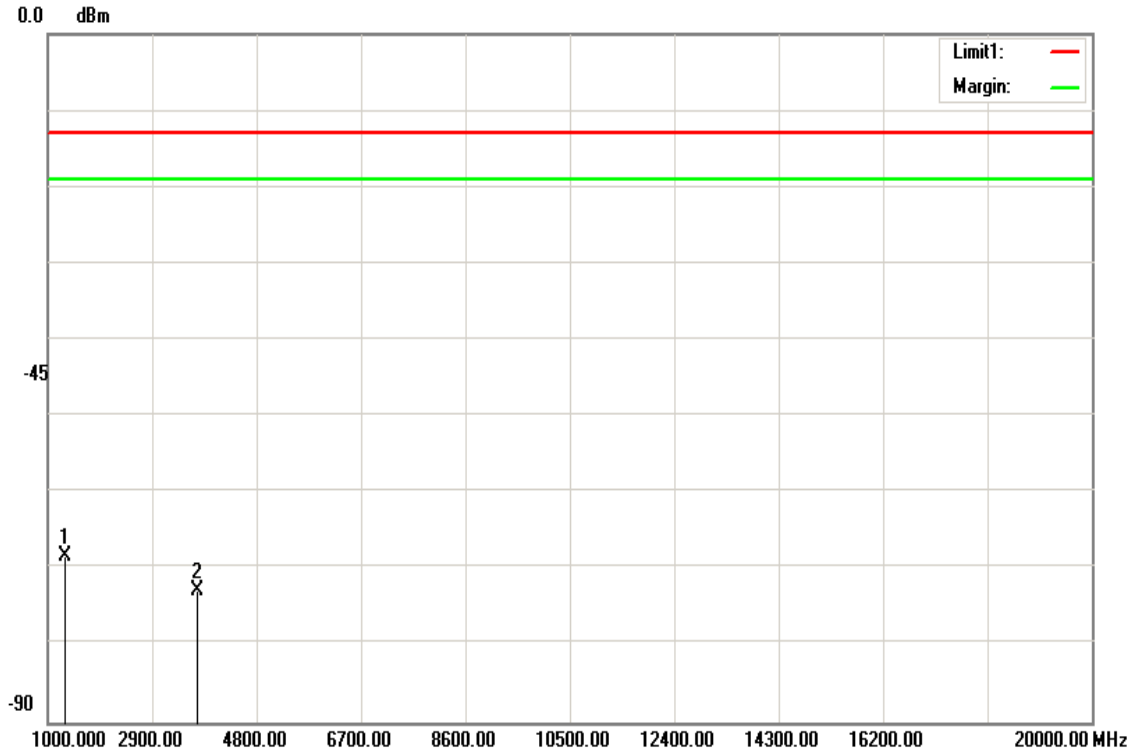
Above 1GHz

LTE Band 2 / BW: 20MHz / QPSK RB =1, RB Offset = 0

Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1329.000	-64.59	3.72	-68.31	-13.00	-55.31	V
3720.000	-66.08	6.65	-72.73	-13.00	-59.73	V
N/A						

Remark:

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

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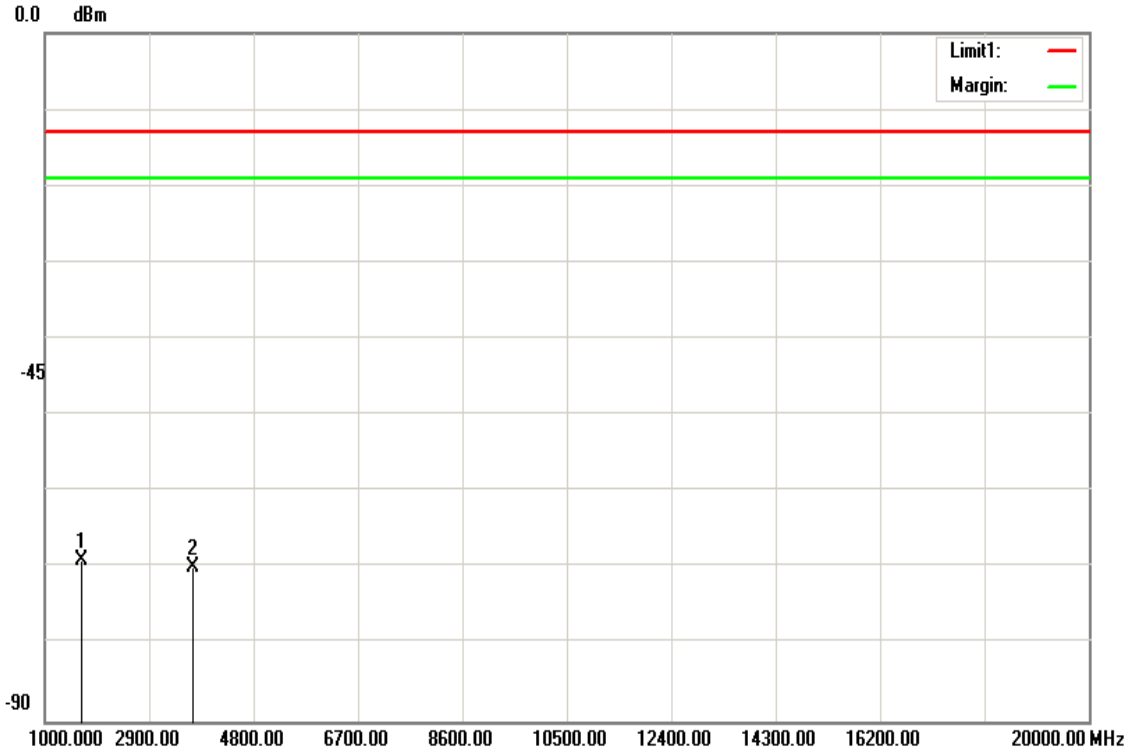
Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1661.500	-64.77	4.22	-68.99	-13.00	-55.99	H
3702.000	-63.22	6.63	-69.85	-13.00	-56.85	H
N/A						

Remark:

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

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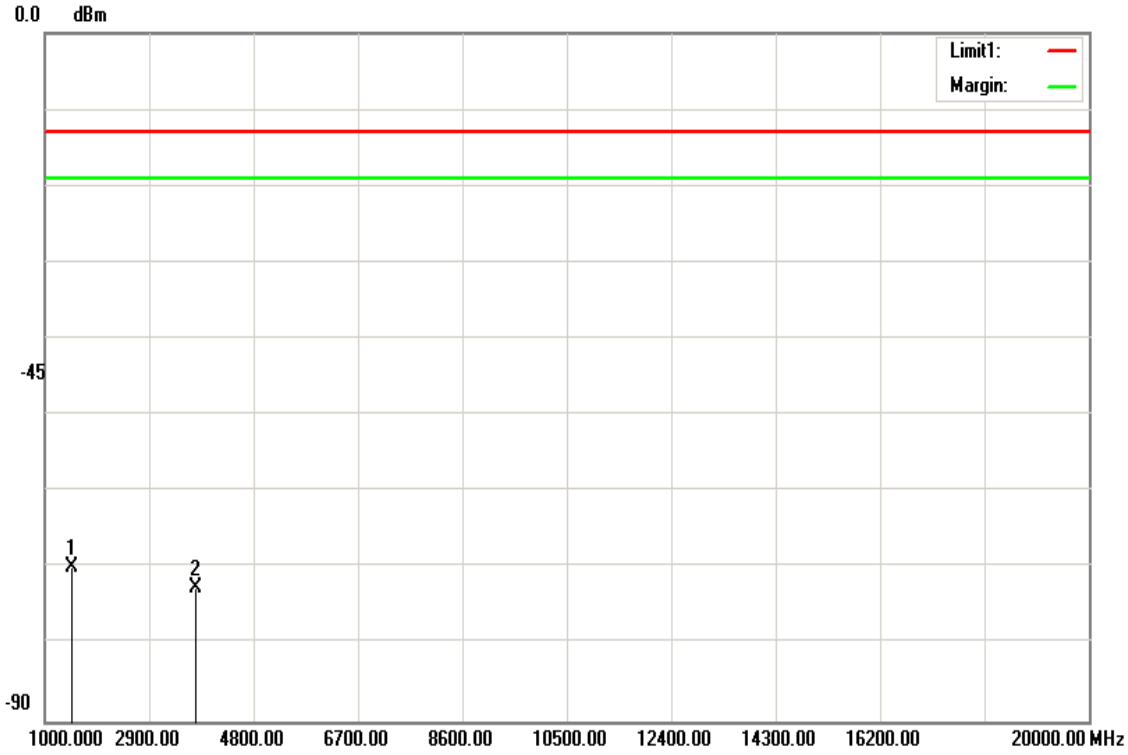
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1497.000	-65.81	3.99	-69.80	-13.00	-56.80	V
3760.000	-65.8	6.68	-72.48	-13.00	-59.48	V
N/A						

Remark:

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

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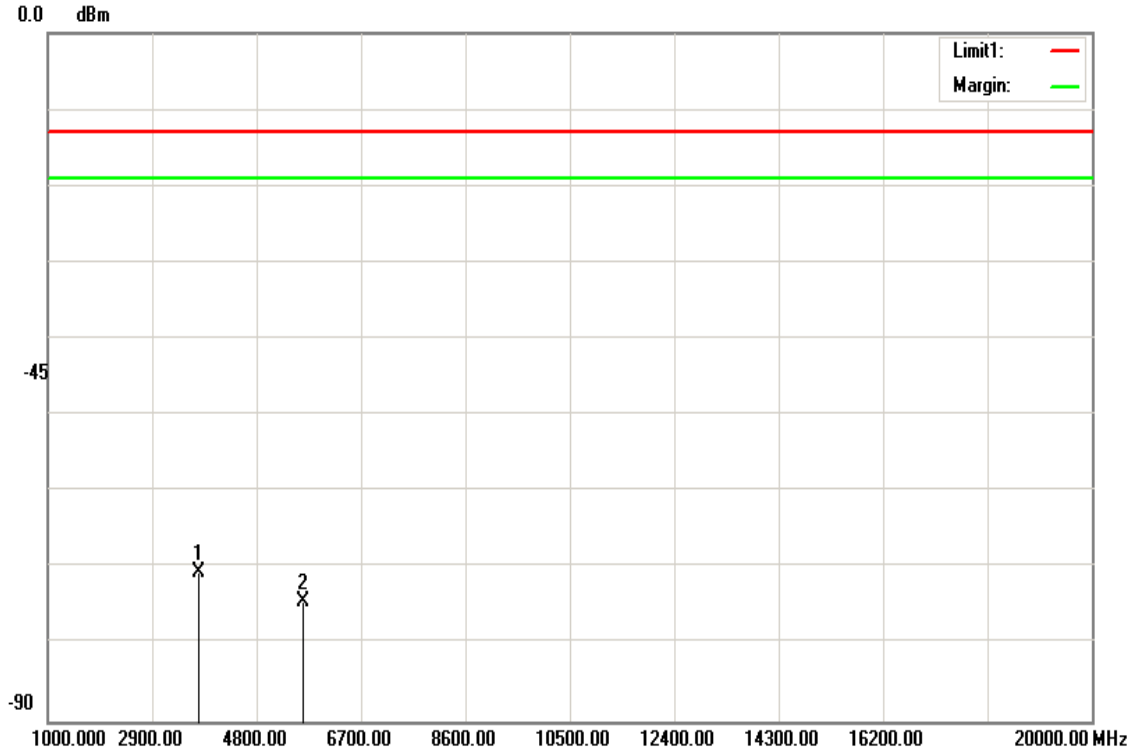
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3744.000	-63.93	6.67	-70.60	-13.00	-57.60	H
5640.000	-66.08	8.37	-74.45	-13.00	-61.45	H
N/A						

Remark:

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

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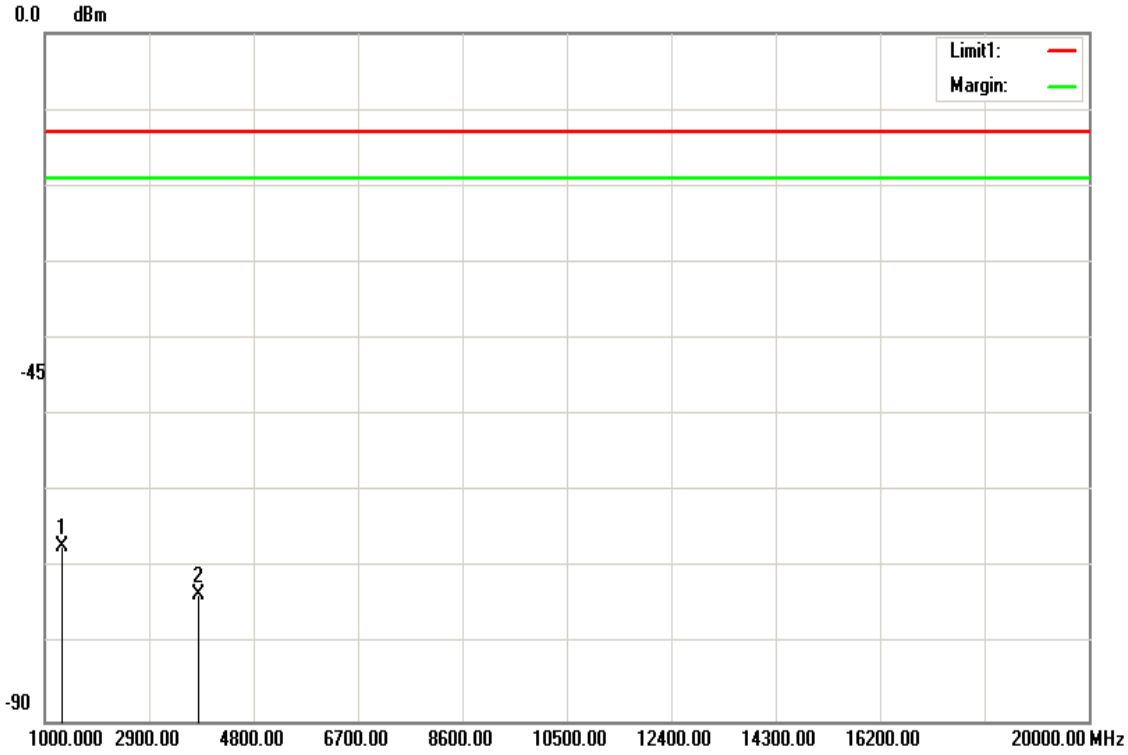
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1329.000	-63.52	3.72	-67.24	-13.00	-54.24	V
3800.000	-66.72	6.72	-73.44	-13.00	-60.44	V
N/A						

Remark:

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

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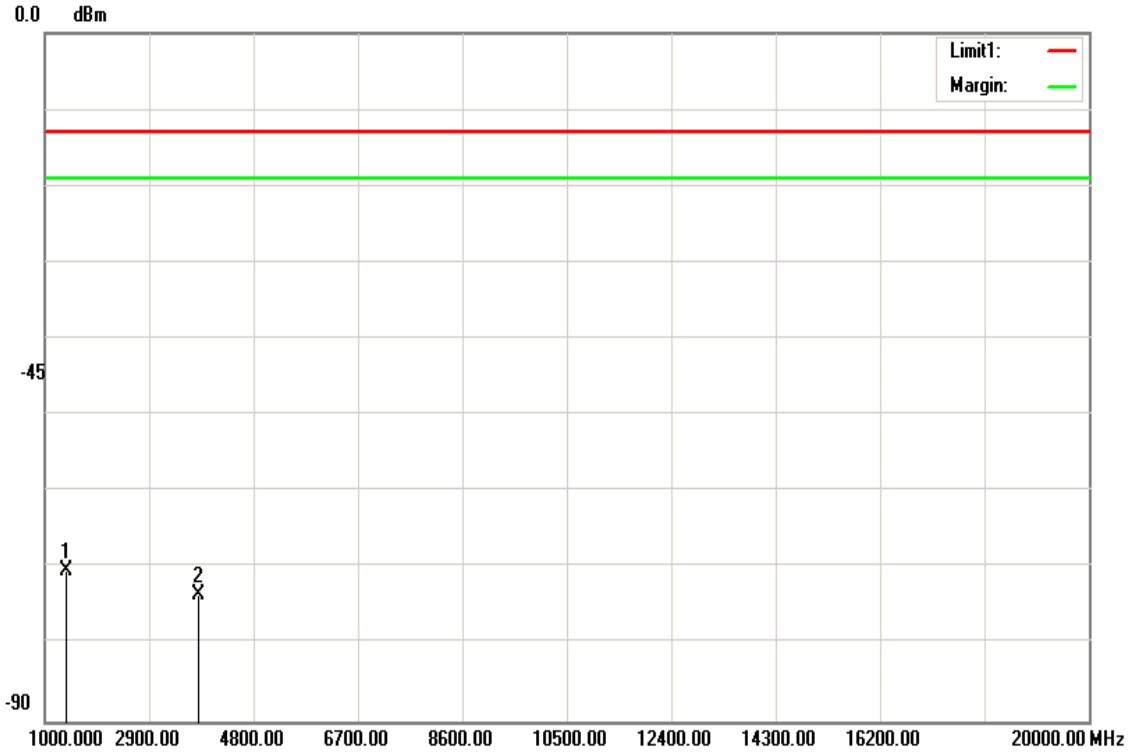
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1399.000	-66.52	3.83	-70.35	-13.00	-57.35	H
3800.000	-66.76	6.72	-73.48	-13.00	-60.48	H
N/A						

Remark:

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

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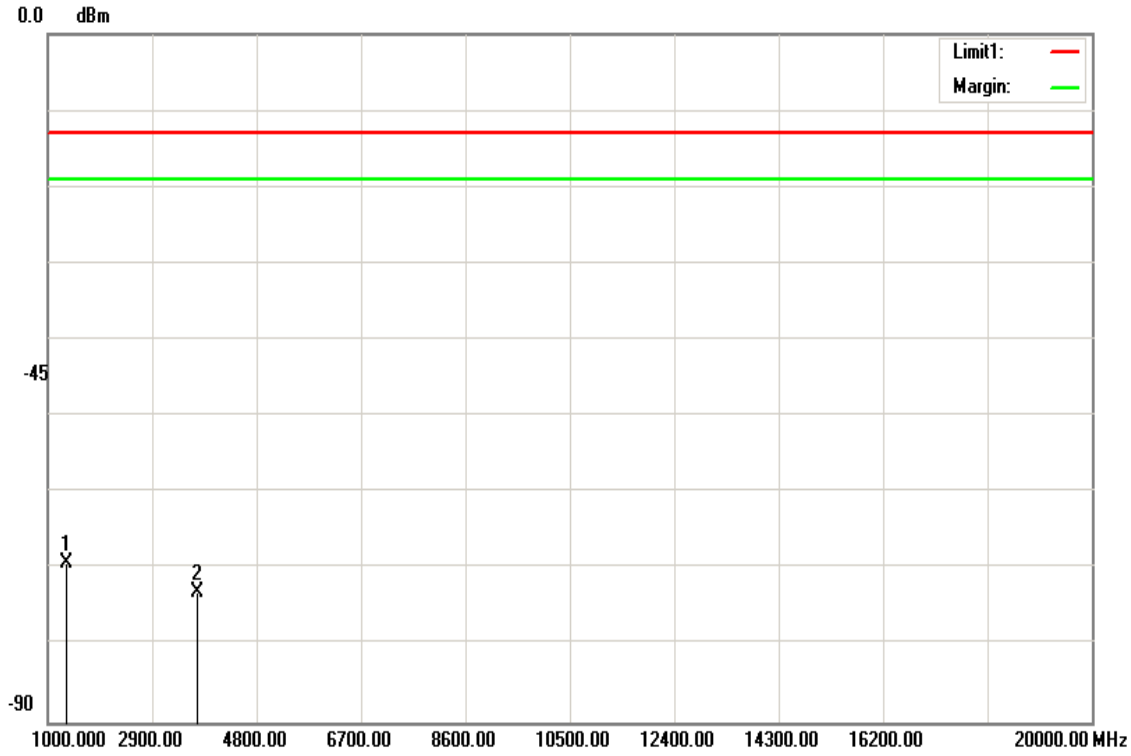
LTE Band 2 / BW: 20MHz / 16QAM / RB =1, RB Offset = 0

Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1332.500	-65.45	3.73	-69.18	-13.00	-56.18	V
3720.000	-66.38	6.65	-73.03	-13.00	-60.03	V
N/A						

Remark:

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

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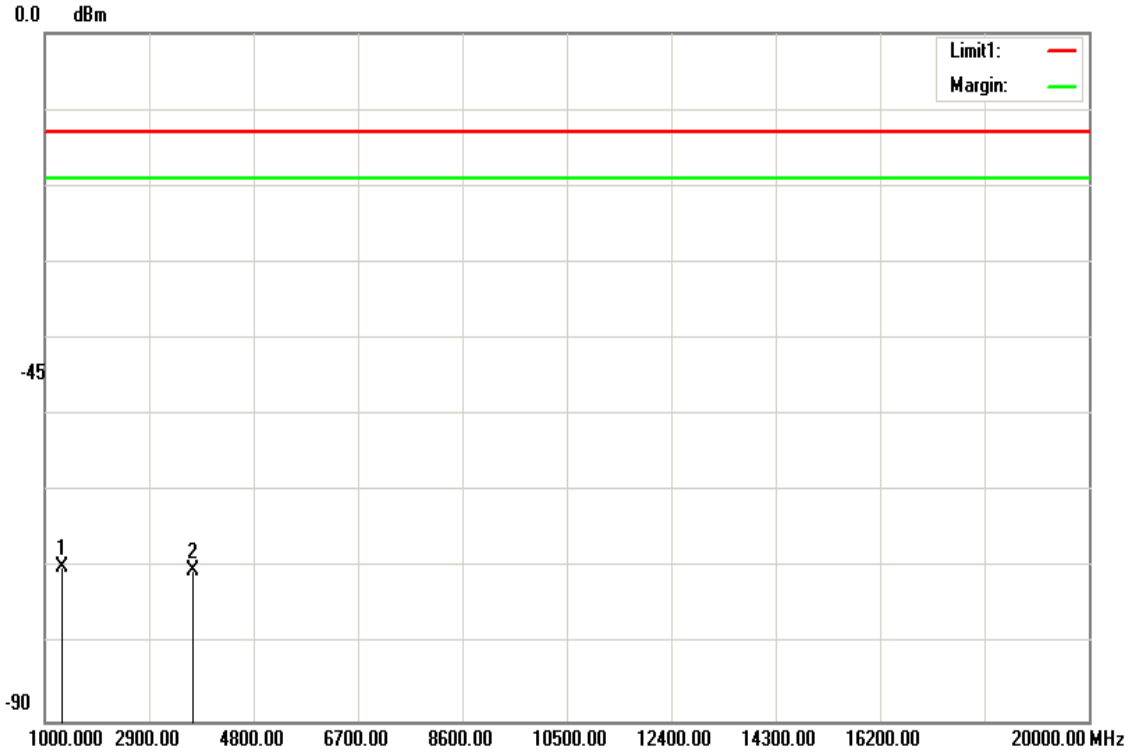
Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1329.000	-66.09	3.72	-69.81	-13.00	-56.81	H
3702.000	-63.68	6.63	-70.31	-13.00	-57.31	H
N/A						

Remark:

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

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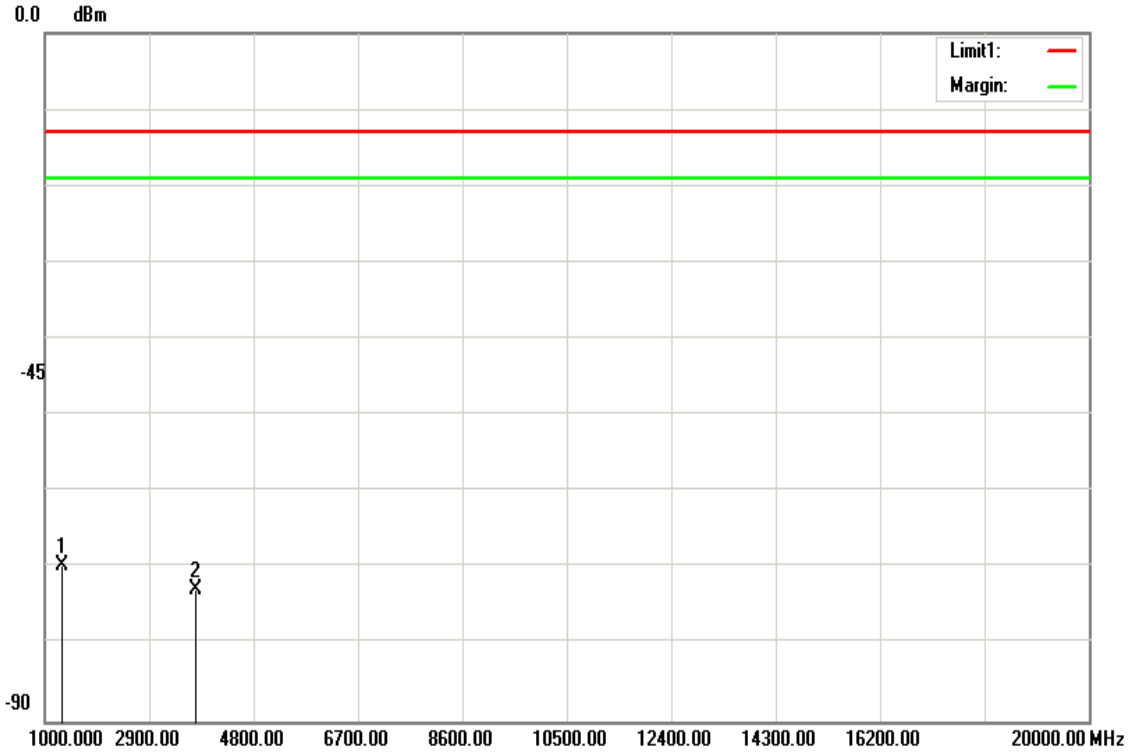
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1329.000	-65.86	3.72	-69.58	-13.00	-56.58	V
3760.000	-66.18	6.68	-72.86	-13.00	-59.86	V
N/A						

Remark:

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

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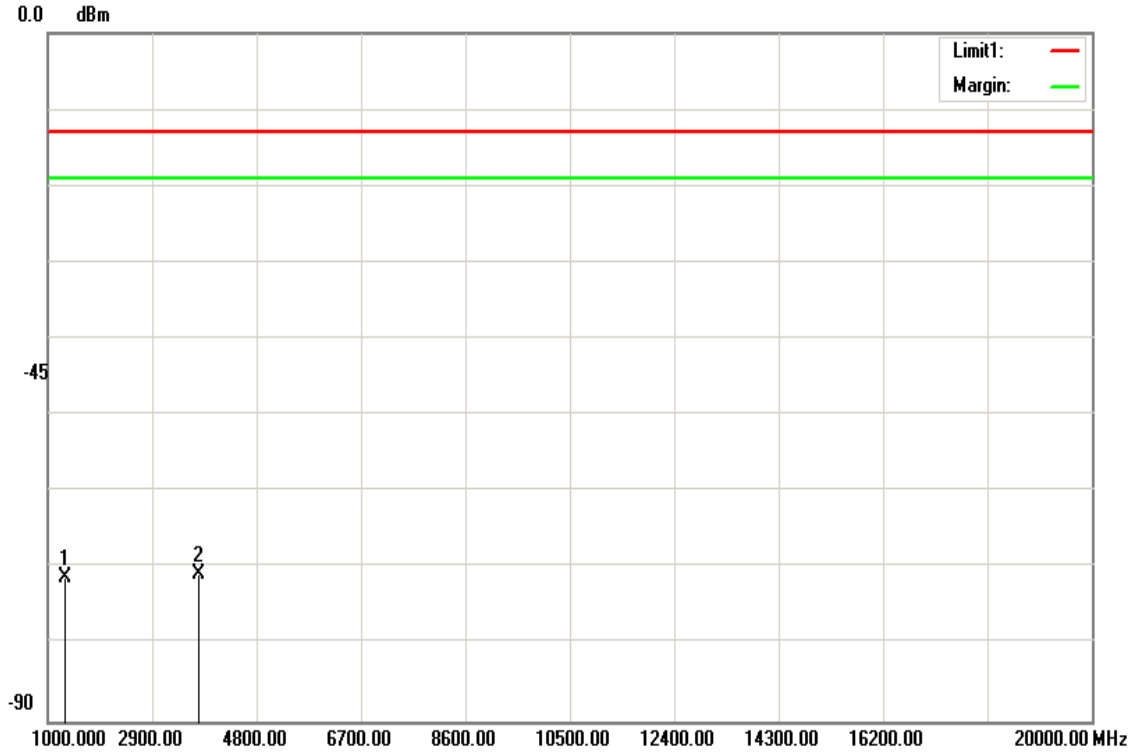
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1329.000	-67.41	3.72	-71.13	-13.00	-58.13	H
3740.500	-64.03	6.67	-70.70	-13.00	-57.70	H
N/A						

Remark:

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

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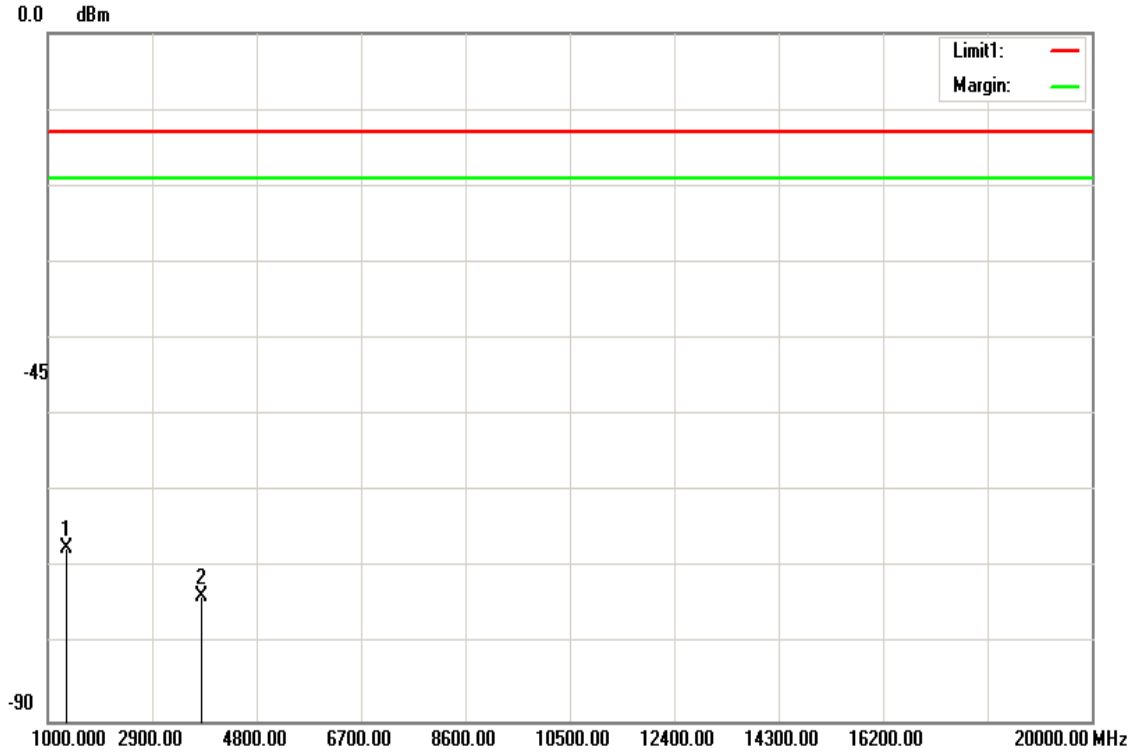
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1332.500	-63.74	3.73	-67.47	-13.00	-54.47	V
3800.000	-66.93	6.72	-73.65	-13.00	-60.65	V
N/A						

Remark:

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

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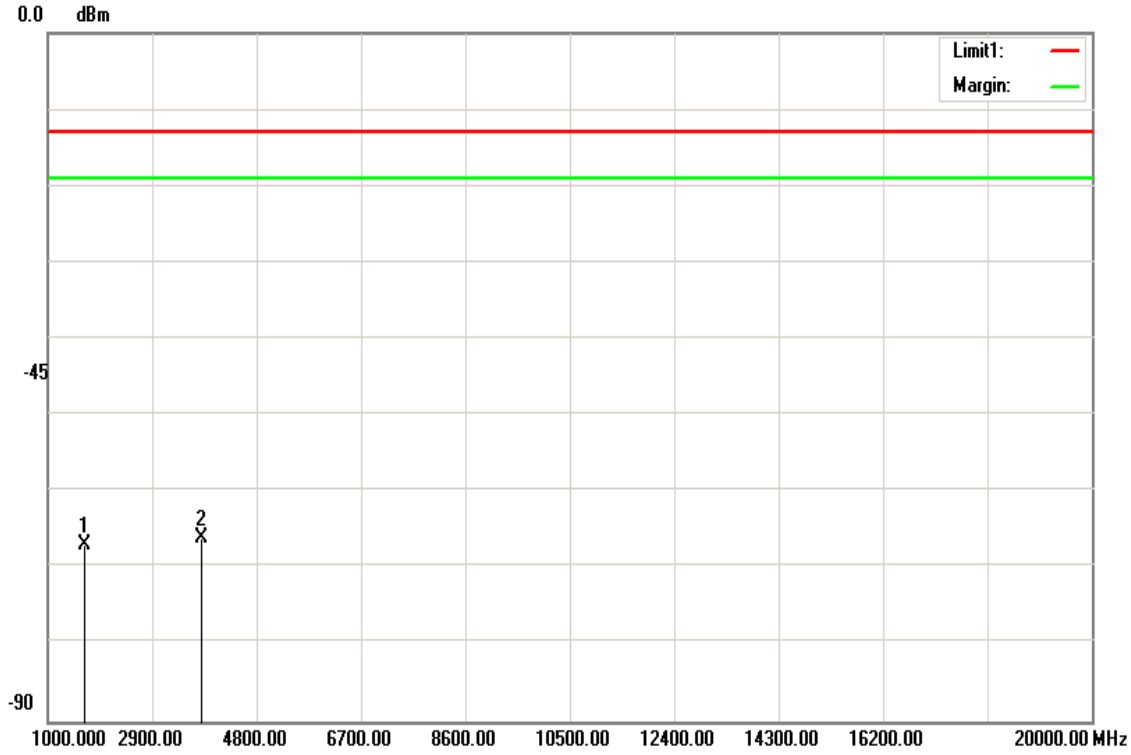
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1661.500	-62.72	4.22	-66.94	-13.00	-53.94	H
3800.000	-59.35	6.72	-66.07	-13.00	-53.07	H
N/A						

Remark:

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

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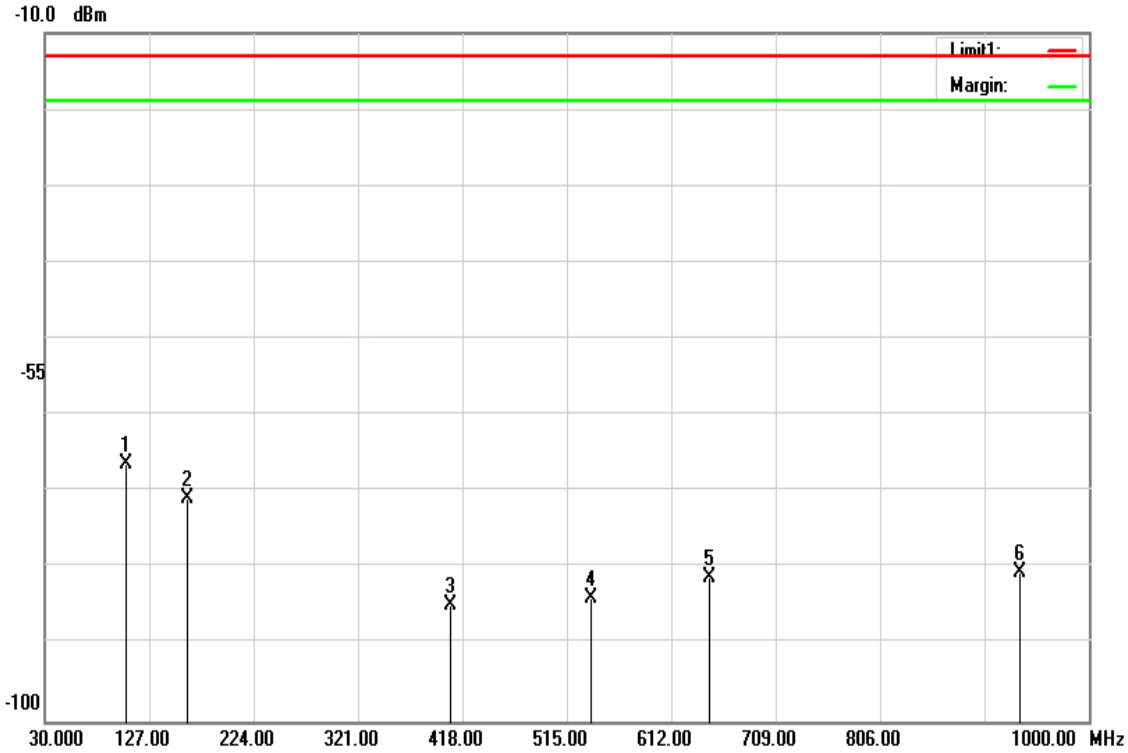
Test Results

Below 1GHz

LTE Band 5 / BW: 10MHz / QPSK / RB =1, RB Offset = 0

Operation Mode:	Tx / Mid CH	**Test Date:**	November 6, 2018
Temperature:	22℃	**Tested by:**	Jerry Chuang
Humidity:	43 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
106.1450	-65.34	1.02	-66.36	-13.00	-53.36	V
162.4050	-69.58	1.26	-70.84	-13.00	-57.84	V
406.3600	-82.72	2.03	-84.75	-13.00	-71.75	V
537.7950	-81.51	2.33	-83.84	-13.00	-70.84	V
648.3750	-78.7	2.57	-81.27	-13.00	-68.27	V
935.9800	-77.4	3.12	-80.52	-13.00	-67.52	V

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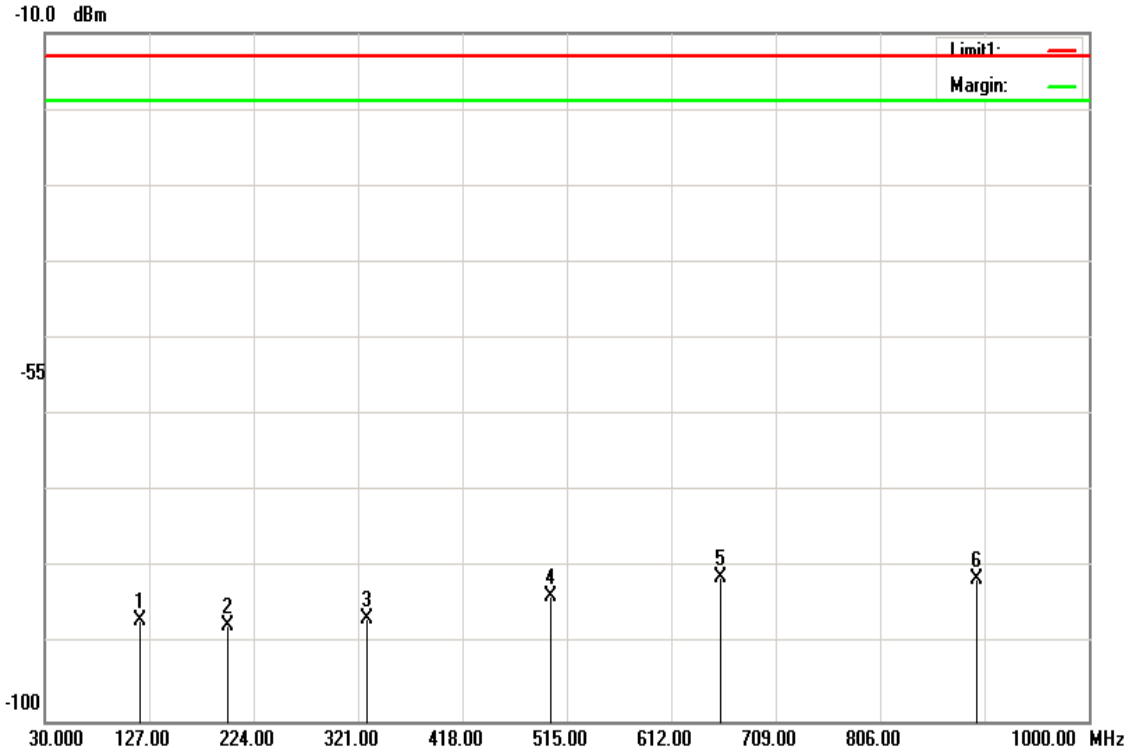
Operation Mode:	Tx / Mid CH	**Test Date:**	November 6, 2018
Temperature:	22℃	**Tested by:**	Jerry Chuang
Humidity:	43 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
118.7550	-85.86	1.08	-86.94	-13.00	-73.94	H
199.7500	-86.18	1.4	-87.58	-13.00	-74.58	H
330.2150	-84.83	1.81	-86.64	-13.00	-73.64	H
500.9350	-81.43	2.25	-83.68	-13.00	-70.68	H
657.5900	-78.53	2.59	-81.12	-13.00	-68.12	H
896.2100	-78.43	3.05	-81.48	-13.00	-68.48	H

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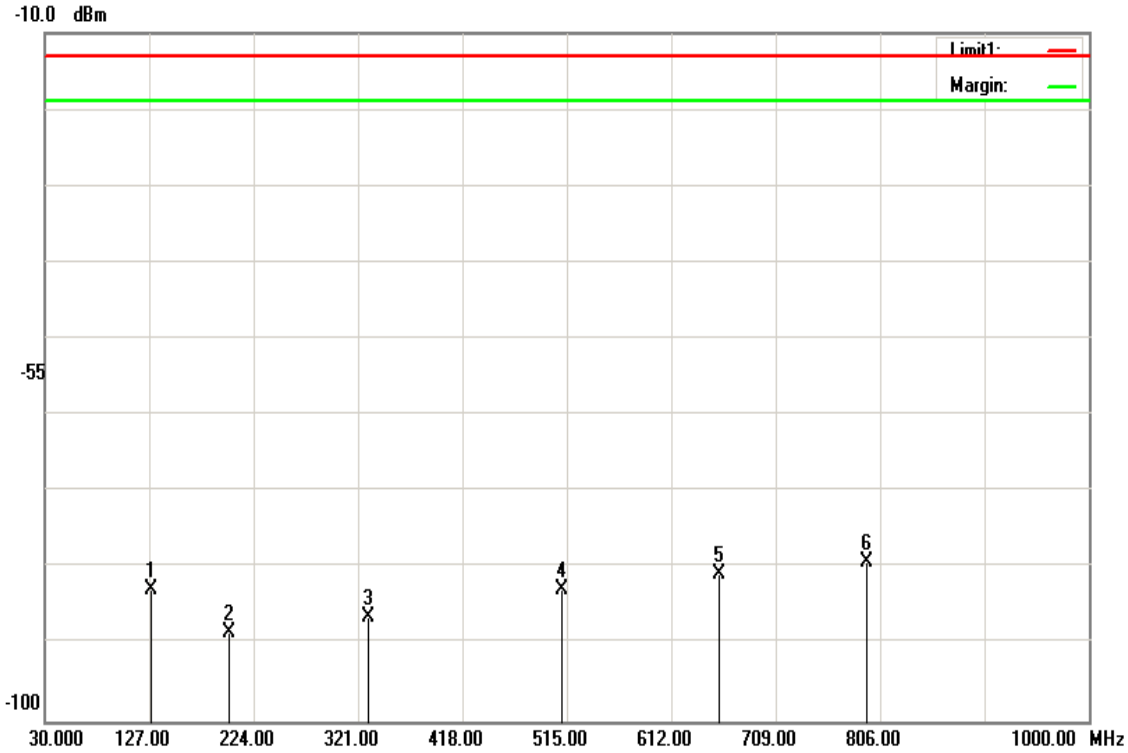
LTE Band 5 / BW: 10MHz / 16QAM / RB =1, RB Offset = 0

Operation Mode:	Tx / Mid CH	**Test Date:**	November 6, 2018
Temperature:	22℃	**Tested by:**	Jerry Chuang
Humidity:	43 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
128.9400	-81.56	1.13	-82.69	-13.00	-69.69	V
201.2050	-86.92	1.4	-88.32	-13.00	-75.32	V
330.7000	-84.62	1.82	-86.44	-13.00	-73.44	V
510.1500	-80.47	2.27	-82.74	-13.00	-69.74	V
656.6200	-78.26	2.58	-80.84	-13.00	-67.84	V
793.8750	-76.35	2.86	-79.21	-13.00	-66.21	V

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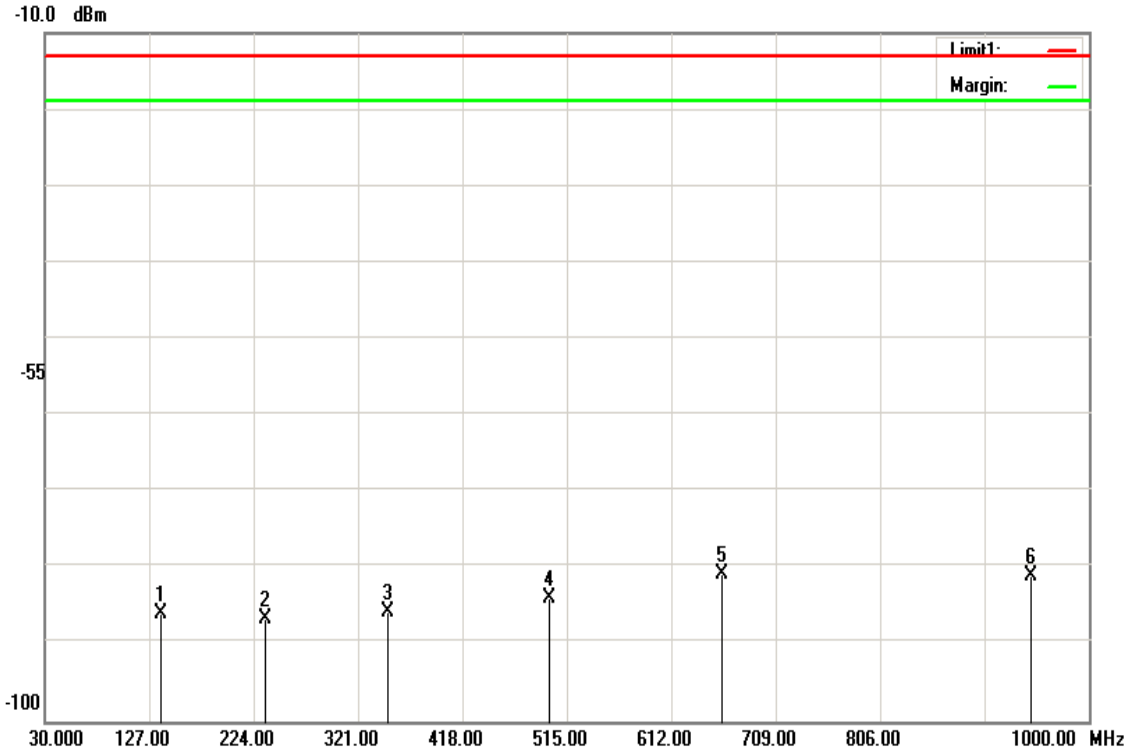
Operation Mode:	Tx / Mid CH l	**Test Date:**	November 6, 2018
Temperature:	22℃	**Tested by:**	Jerry Chuang
Humidity:	43 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
138.1550	-84.85	1.16	-86.01	-13.00	-73.01	H
235.1550	-85.2	1.52	-86.72	-13.00	-73.72	H
349.1300	-83.74	1.87	-85.61	-13.00	-72.61	H
498.5100	-81.57	2.25	-83.82	-13.00	-70.82	H
659.5300	-78.16	2.59	-80.75	-13.00	-67.75	H
946.6500	-77.76	3.13	-80.89	-13.00	-67.89	H

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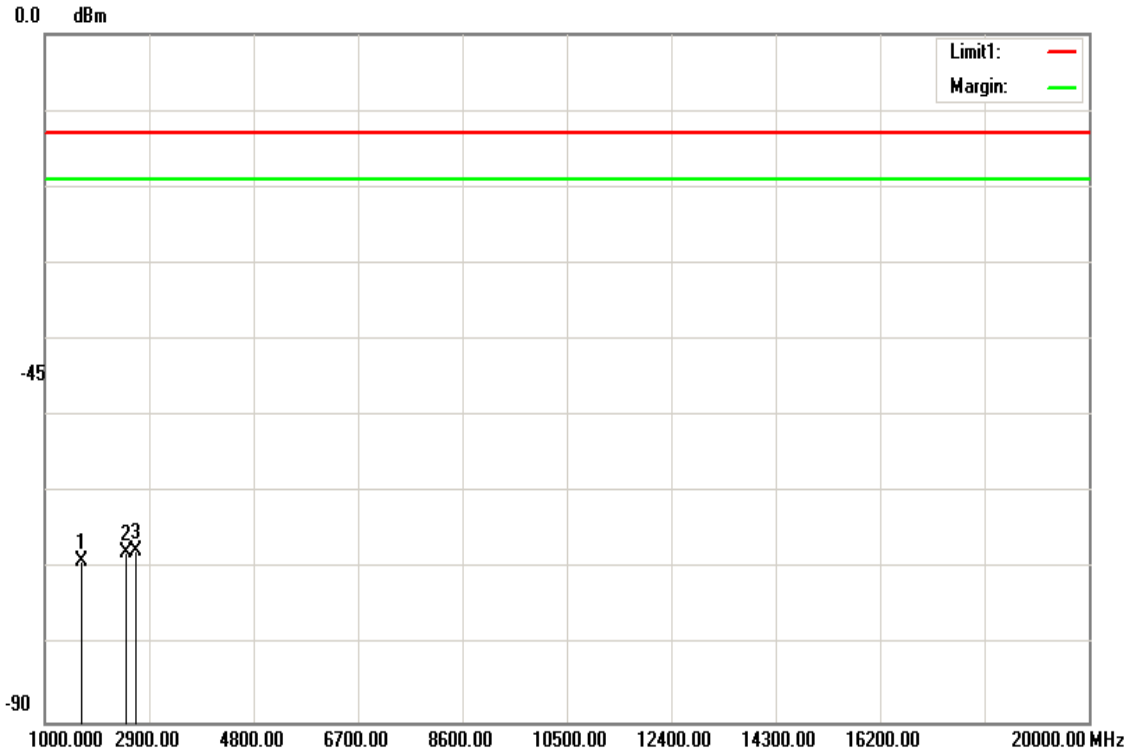
Above 1GHz

LTE Band 5 / BW: 10 MHz / QPSK / RB =1, RB Offset = 0

Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1661.500	-64.8	4.22	-69.02	-13.00	-56.02	V
2473.500	-62.51	5.3	-67.81	-13.00	-54.81	V
2655.500	-62.2	5.51	-67.71	-13.00	-54.71	V
N/A						

Remark:

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

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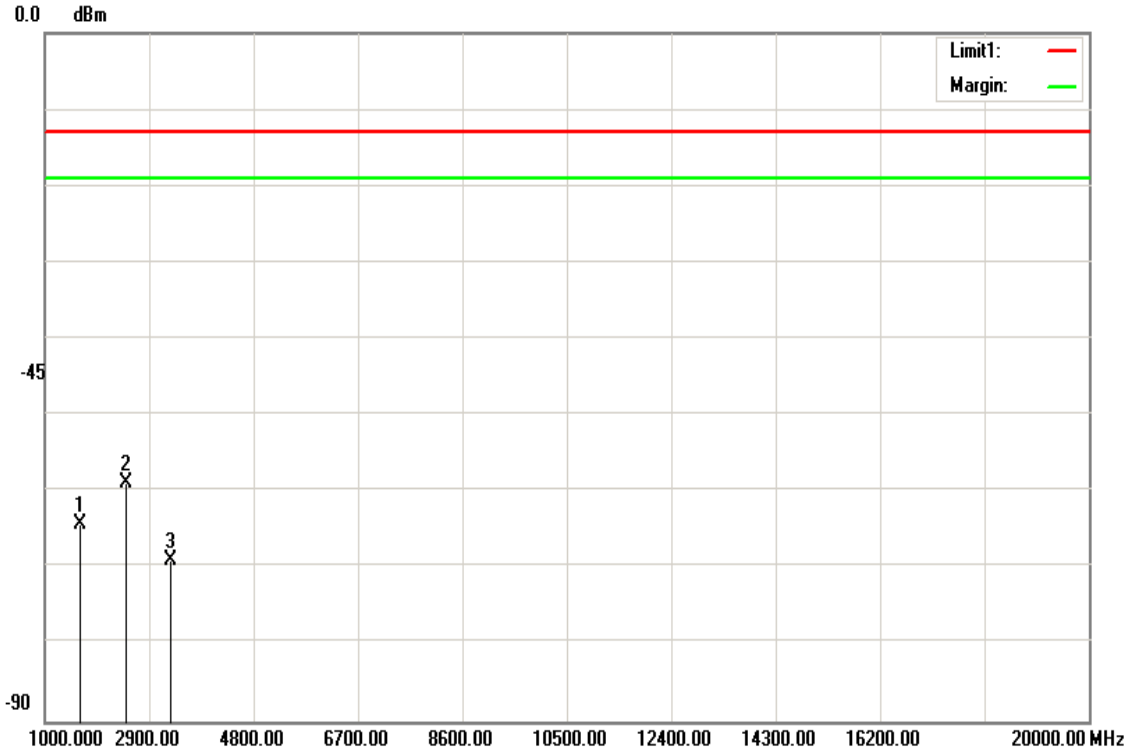
Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1647.500	-59.99	4.2	-64.19	-13.00	-51.19	H
2473.500	-53.52	5.3	-58.82	-13.00	-45.82	H
3299.500	-62.8	6.22	-69.02	-13.00	-56.02	H
N/A						

Remark:

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

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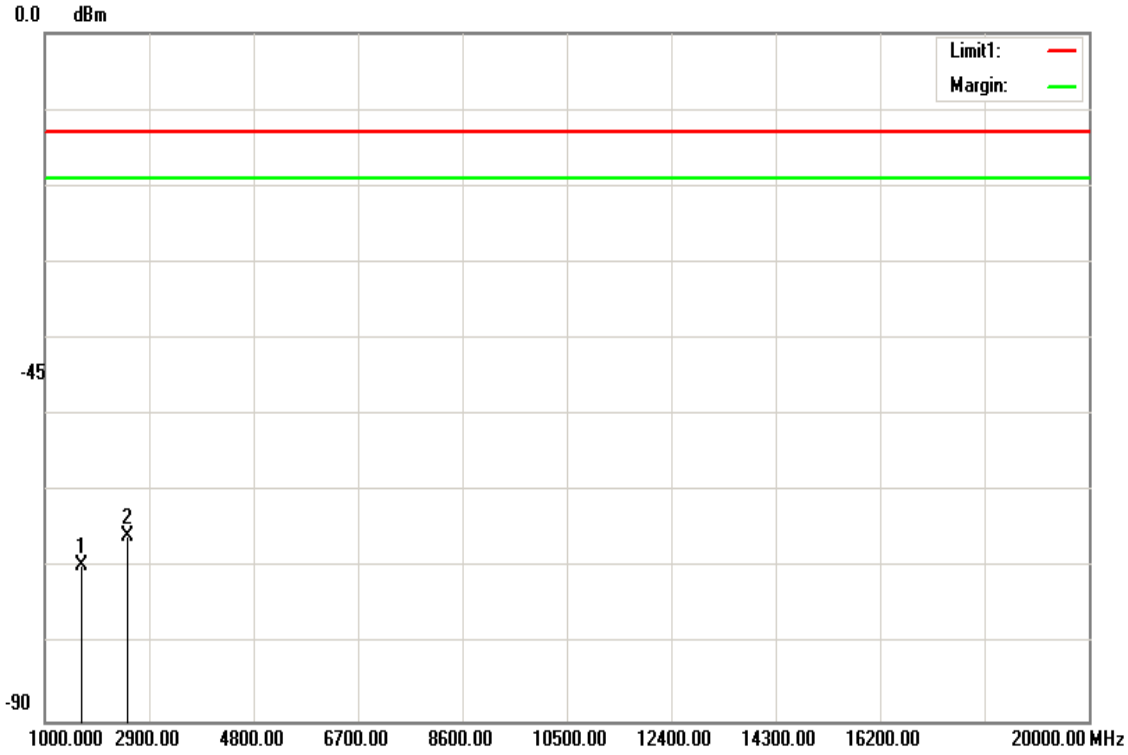
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1661.500	-65.39	4.22	-69.61	-13.00	-56.61	V
2498.000	-60.44	5.33	-65.77	-13.00	-52.77	V
N/A						

Remark:

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

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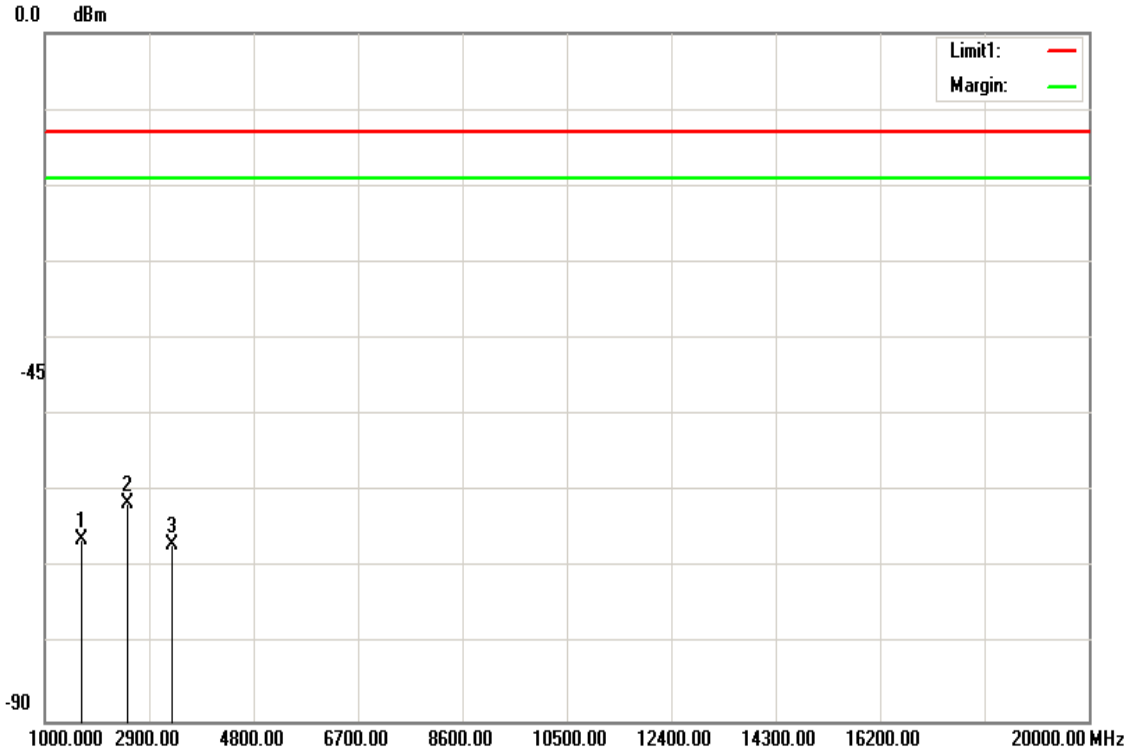
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1665.000	-62	4.22	-66.22	-13.00	-53.22	H
2498.000	-56.26	5.33	-61.59	-13.00	-48.59	H
3327.500	-60.71	6.25	-66.96	-13.00	-53.96	H
N/A						

Remark:

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

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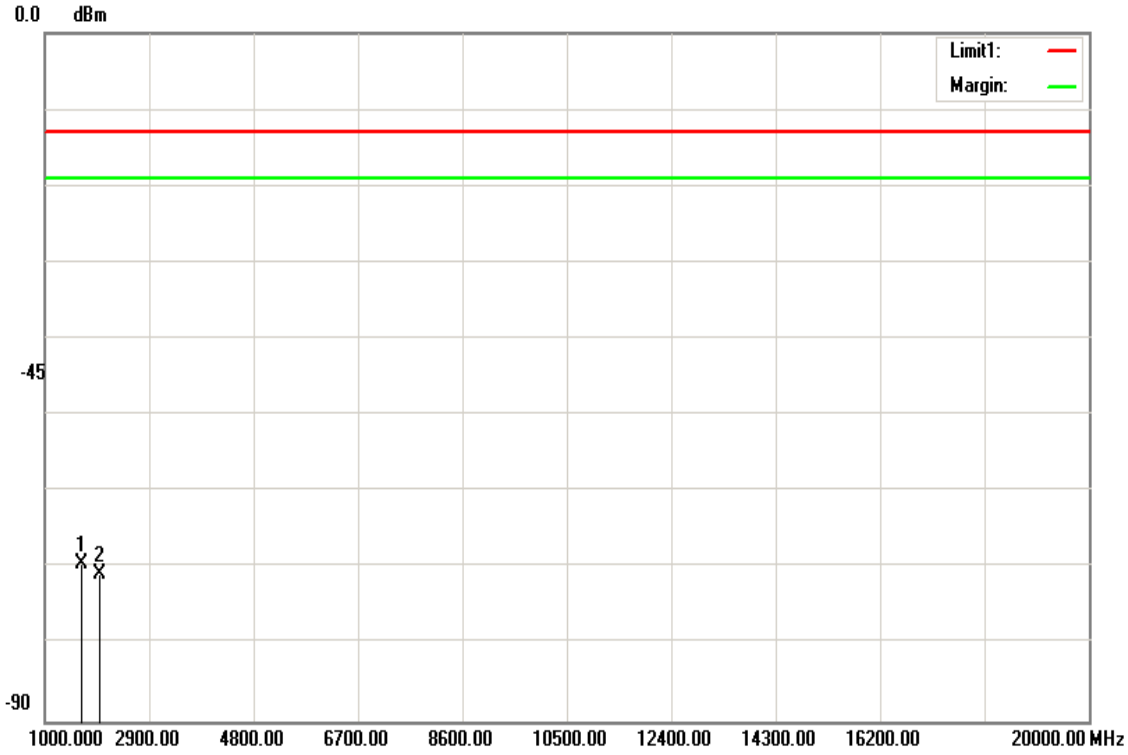
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1661.500	-65.29	4.22	-69.51	-13.00	-56.51	V
1994.000	-66.1	4.68	-70.78	-13.00	-57.78	V
N/A						

Remark:

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

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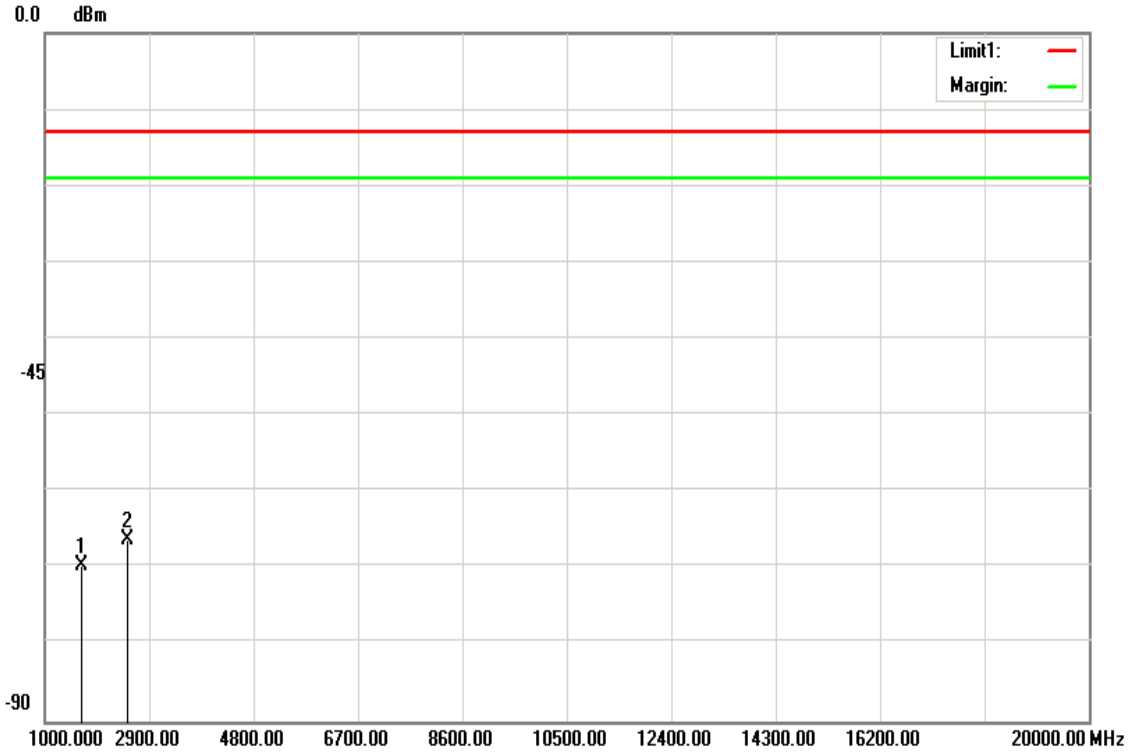
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1679.000	-65.32	4.24	-69.56	-13.00	-56.56	H
2519.000	-60.88	5.35	-66.23	-13.00	-53.23	H
N/A						

Remark:

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

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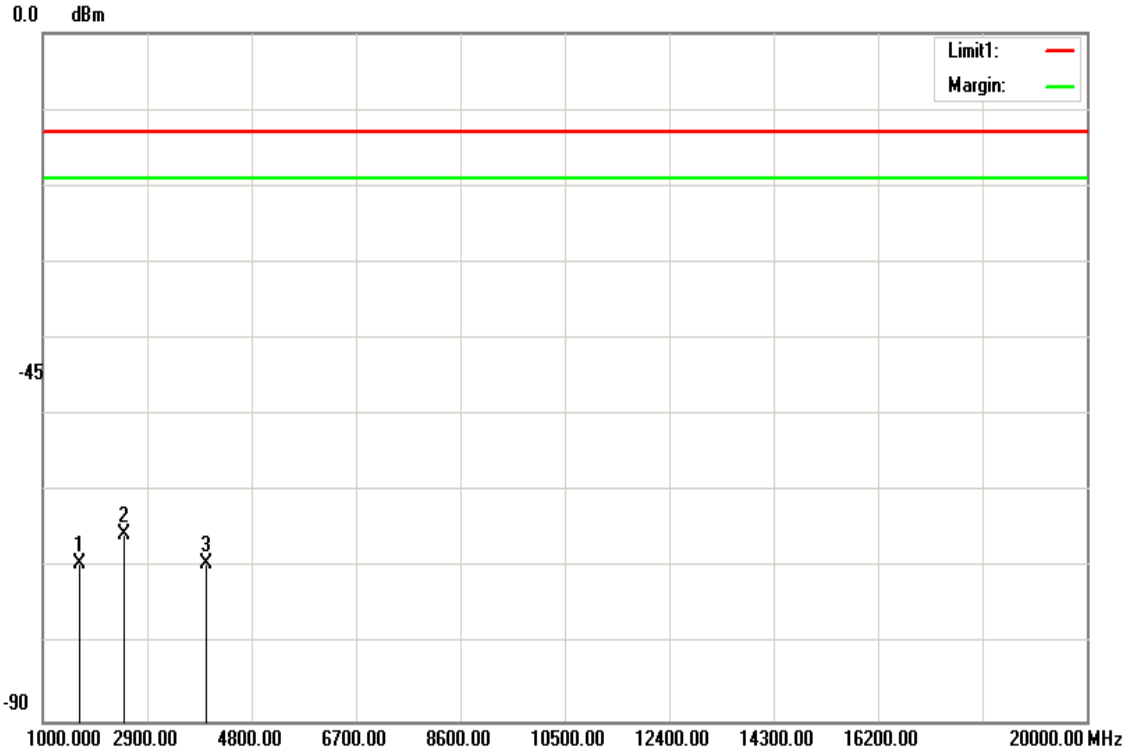
LTE Band 5 / BW: 10MHz / 16QAM / RB =1, RB Offset = 0

Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1665.000	-65.18	4.22	-69.40	-13.00	-56.40	V
2473.500	-60.23	5.3	-65.53	-13.00	-52.53	V
3985.500	-62.6	6.91	-69.51	-13.00	-56.51	V
N/A						

Remark:

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

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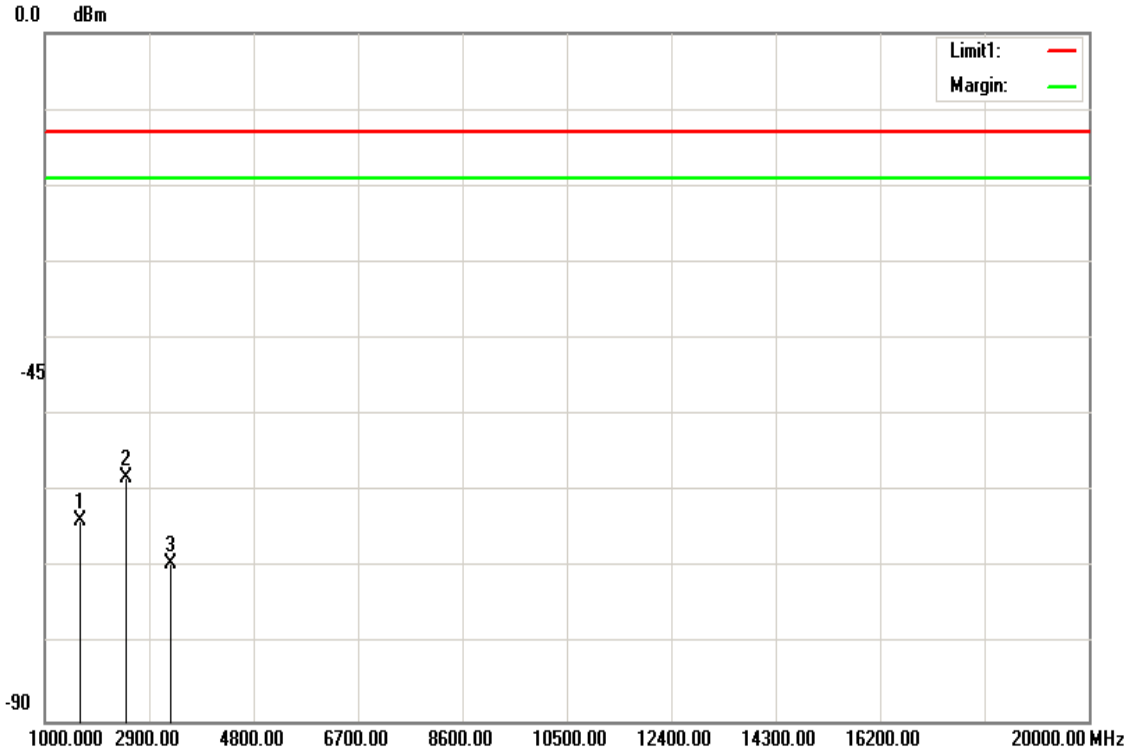
Operation Mode:	Tx / Low CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1647.500	-59.64	4.2	-63.84	-13.00	-50.84	H
2473.500	-52.91	5.3	-58.21	-13.00	-45.21	H
3299.500	-63.1	6.22	-69.32	-13.00	-56.32	H
N/A						

Remark:

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

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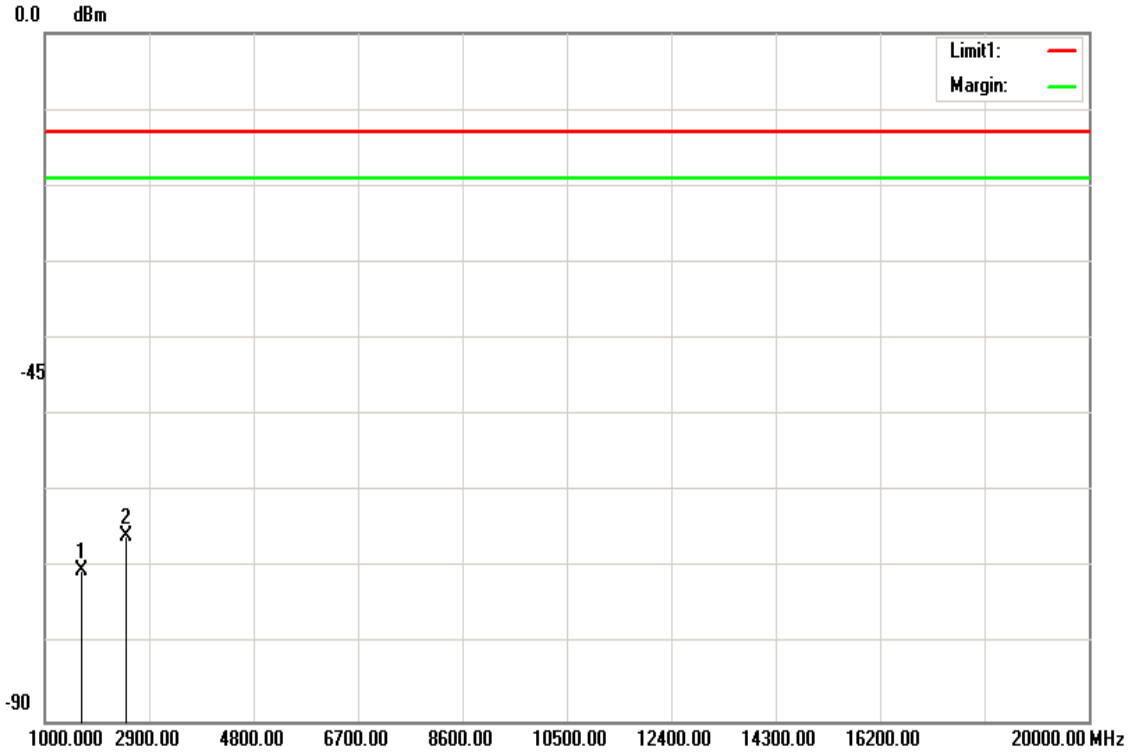
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1661.500	-65.99	4.22	-70.21	-13.00	-57.21	V
2494.500	-60.43	5.32	-65.75	-13.00	-52.75	V
N/A						

Remark:

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

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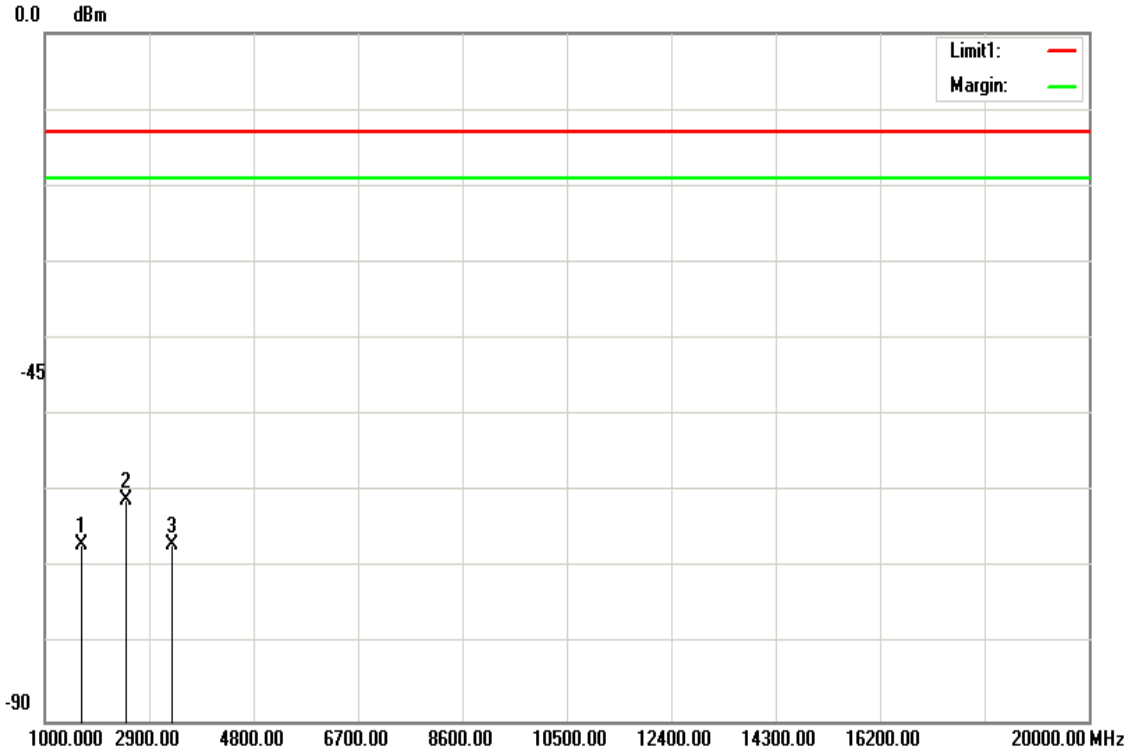
Operation Mode:	Tx / Mid CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1665.000	-62.64	4.22	-66.86	-13.00	-53.86	H
2494.500	-55.76	5.32	-61.08	-13.00	-48.08	H
3327.500	-60.72	6.25	-66.97	-13.00	-53.97	H
N/A						

Remark:

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

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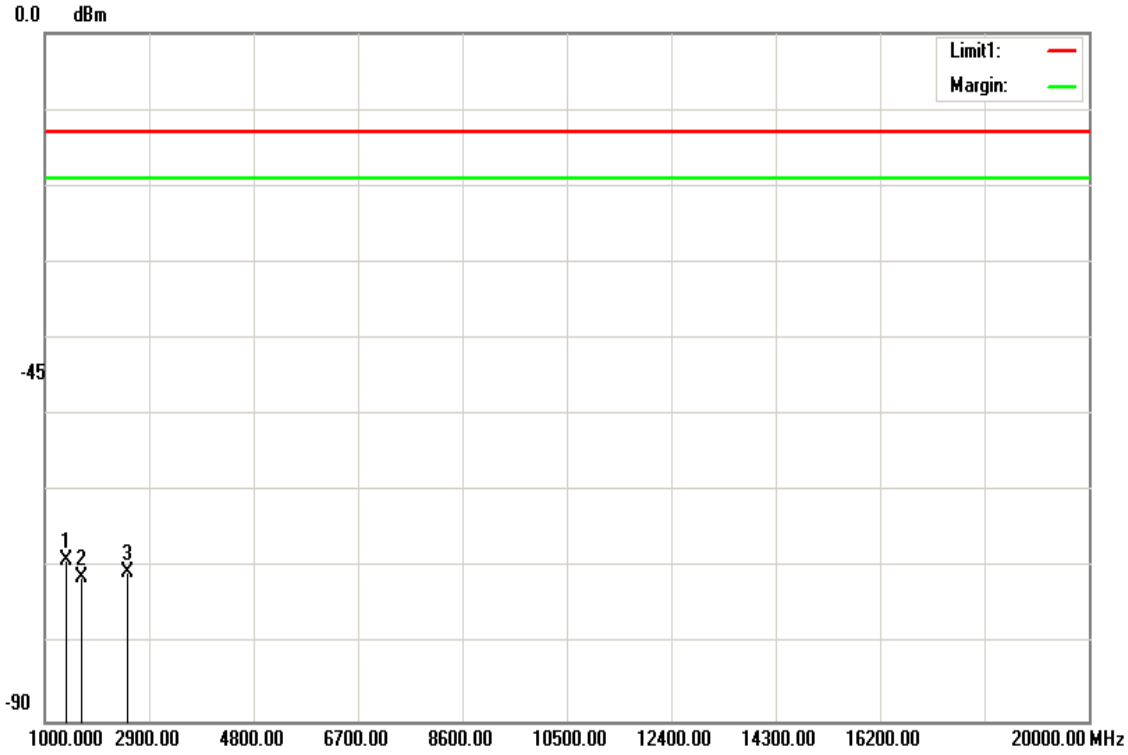
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1399.000	-65.07	3.83	-68.90	-13.00	-55.90	V
1661.500	-67.02	4.22	-71.24	-13.00	-58.24	V
2519.000	-65.21	5.35	-70.56	-13.00	-57.56	V
N/A						

Remark:

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

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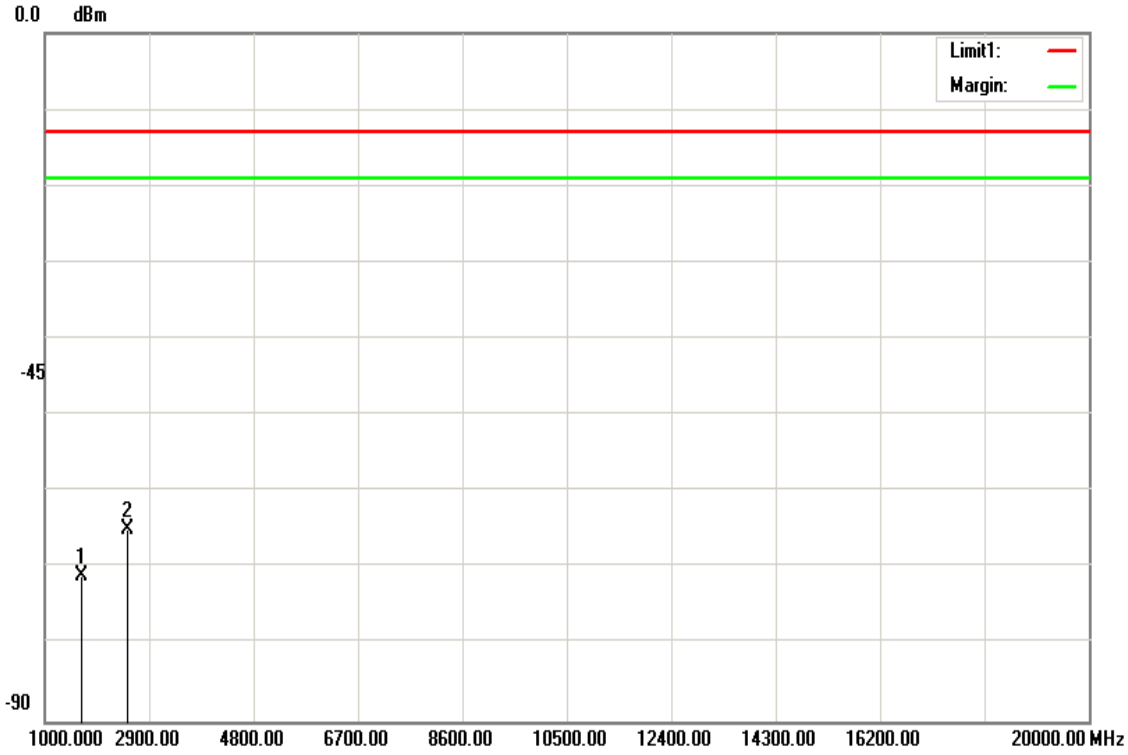
Operation Mode:	Tx / High CH	**Test Date:**	November 8, 2018
Temperature:	23℃	**Tested by:**	Jerry Chuang
Humidity:	46 %RH	**Polarity:**	Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1679.000	-66.74	4.24	-70.98	-13.00	-57.98	H
2519.000	-59.58	5.35	-64.93	-13.00	-51.93	H
N/A						

Remark:

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

- End of Test Report -

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