

FCC 47 CFR PART 22 SUBPART H AND PART 24 SUBPART E

TEST REPORT

For

Guardian Split System

Model: G2-SY-CON2-1001272, G2-SY-CON2-1001484

Trade Name: Guardian

Issued to

**Seeing Machines
Level 1, 11 Lonsdale Street, Braddon 2612 Australia**

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: March 5, 2018



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 5, 2018	Initial Issue	ALL	Allison Chen
01	March 30, 2018	1. Revised test mode in section 4.2. 2. Added types of modulation in EUT Description. 3. Added Test Summary. 4. Revised conducted power measurement on HSDPA and HSUPA in section 8.1. 5. Revised "TIA -603-D" to "TIA-603-E" for all page. 6. Revised test procedure in section 8.4, 8.5, 8.6, 8.7. 7. Added "FCC Part 2.1046" for test procedure in section 8.1. 8. Modify "Band 2 and Band 5" to "Band II and Band V" for all page. 9. Added "Frequency stability v.s. Temperature measurement" in section 8.8. 10. Added "-End of test report-".	P.4, P.5, P.6, P.7, P.12-14, P.15-17, P.22, P.25, P.30, P.35-37, P.54-59	Allison Chen
02	April 11, 2018	1. Revised test procedure in section 8.2, 8.3, 8.4, 8.6, 8.7.	P.16, P.17, P.22, P.30, P.37	Allison Chen

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1. TEST RESULT CERTIFICATION

Applicant: Seeing Machines
Level 1, 11 Lonsdale Street, Braddon 2612 Australia

Manufacturer: ADLINK TECHNOLOGY INC.
9F, No. 166, Jian Yi Rd., Zhonghe Dist., New Taipei City, 235
Taiwan

Equipment Under Test: Guardian Split System

Trade Name: Guardian

Model: G2-SY-CON2-1001272, G2-SY-CON2-1001484

Date of Test: January 30 ~ February 8, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 22 Subpart H & Part 24 Subpart E	No non-compliance noted

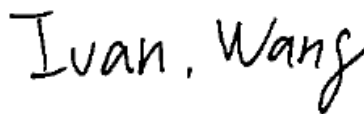
We hereby certify that:

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 conducted and radiated emission limits of FCC Rule FCC PART 22 Subpart H and PART 24 Subpart E

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

Approved by:

Tested by:



Sam Chuang
Manager
Compliance Certification Services Inc.

Ivan Wang
Assistant Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Guardian Split System
Model No.	G2-SY-CON2-1001272, G2-SY-CON2-1001484
Model Discrepancy	G2-SY-CON2-1001272→ Guardian Split System has FFC Function G2-SY-CON2-1001484→ Guardian Split System doesn't have FFC Function
Trade Name	Guardian
Received Date	January 18, 2018
Power Supply	Powered from DC supply: DC 12V and 24V.
Frequency Range	WCDMA / HSDPA / HSUPA Band II: 1852.4 ~ 1907.6 MHz WCDMA / HSDPA / HSUPA Band V: 826.4 ~ 846.6MHz
Type of Modulation	WCDMA: BPSK (uplink) HSDPA: QPSK (Uplink) HSUPA: QPSK (Uplink) HSPA+: 16QAM
Antenna Gain	Extremal Antenna WCDMA band II: 1.3dBi WCDMA band V: 2.5dBi

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. For test mode WCDMA, HSUPA and HSDPA were pretest. The worst case was WCDMA in this test report.

Emission Designator					
System	Band	Frequency Range(MHz)	Emission Designator (99% OBW)	Maximum ERP (W)	Maximum EIRP (W)
WCDMA 12.2K RMC	II	1852.4MHz ~1907.6MHz	4M13F9W	N/A	0.384
	V	826.4MHz ~ 846.6MHz	4M15F9W	0.197	N/A

3. TEST SUMMARY

FCC Standard Section	Report Section	Test Item	Result
-	1.2	Antenna Requirement	Pass
2.1046	8.1	Average Power	Pass
22.913(a), 24.232(b)	8.2	ERP and EIRP Measurement	Pass
2.1049	8.3	Occupied Bandwidth Measurement	Pass
22.917(a), 24.238(a)	8.4	Conducted Band Edge	Pass
22.913(d), 24.232(d)	8.5	Peak to Average Ratio	Pass
22.917(a), 24.238(a)	8.6	Conducted Spurious Emission	Pass
22.917(a), 24.238(a)	8.7	Spurious Radiation Measurement	Pass
2.1055, 22.355, 24.235	8.8	Frequency Stability v.s. temperature measurement	Pass

4. TEST METHODOLOGY

Both conducted and radiated testing were performed according to TIA-603-E and FCC CFR 47, Part 2, Part 22 Subpart H and Part 24 Subpart E

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 DESCRIPTION OF TEST MODES

The EUT had been tested under operating condition.

The EUT be set in maximum power transmission via call box during testing.

4.2.1 The worst mode of measurement

WCDMA Band II

Radiated Emission Measurement	
Test Condition	Band edge, Emission for Unwanted and Fundamental
Voltage/Hz	DC 12V and DC 24V
Test Mode	Mode 1: EUT power by power supply_12V. Mode 2: EUT power by power supply_24V.
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Position	<input type="checkbox"/> Placed in fixed position. <input type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input checked="" type="checkbox"/> Placed 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 (Z-Plane) were recorded in this report.

WCDMA Band V

Radiated Emission Measurement	
Test Condition	Band edge, Emission for Unwanted and Fundamental
Voltage/Hz	DC 12V and DC 24V
Test Mode	Mode 1: EUT power by power supply_12V. Mode 2: EUT power by power supply_24V.
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Position	<input type="checkbox"/> Placed in fixed position. <input type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input checked="" type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> Placed 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 (Y-Plane) were recorded in this report.

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

Remark: Each piece of equipment is scheduled for calibration once a year and Loop Antenna is scheduled for calibration once three years.

Wugu Fully Chamber B					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Signal Analyzer	Agilent	E4407B	MY44212686	04/07/2017	04/06/2018
Pre-Amplifier	EMEC	EM01M62G	60570	08/01/2017	07/31/2018
Bilog Antenna	Sunol Sciences	JB1	A052609	03/17/2017	03/16/2018
Horn Antenna	SCHWARZBECK	BBHA 9120D	779	03/08/2017	03/07/2018
Pre-Amplifier	Anritsu	MH648A	M89145	06/27/2017	06/26/2018
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
Filter	N/A	800-1G	N/A	N/A	N/A
Filter	N/A	1800-2000	N/A	N/A	N/A
WIFI signal cable	HUBER SUHNER	SUCOFLEX 104PEA	23452	07/31/2017	07/30/2018
WWAN signal cable	HUBER SUHNER	SUCOFLEX 104PEA	33960	07/31/2017	07/30/2018

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Power Meter	Anritsu	ML2495A	1033009	04/11/2017	04/10/2018
Power Sensor	Anritsu	MA2411B	917072	07/03/2017	07/02/2018
Base Station	R&S	CMU 200	101245	07/29/2017	07/28/2018
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Divider	Solvang Technology	2-18GHz 4Way	STI08-0015	07/26/2017	07/25/2018
Base Station	R&S	CMW 500	116875	04/25/2017	04/24/2018

5.3 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 $k=2$.

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.

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."

7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT

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

7.2 SUPPORT EQUIPMENT

No	Equipment	Brand	Model	Series No.	FCC ID	Data Cable
1	DC Power Source	GWINSTEK	SPS-3610	N/A	N/A	DC Cable 1.5m shielding

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.

8. FCC PART 22 & 24 REQUIREMENTS

8.1 AVERAGE POWER

Test Procedures

According to FCC Part 2.1046.

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

No non-compliance noted.

TEST DATA

WCDMA 12.2K RMC

Band	Mode	Frequency(MHz)	CH	Average power(dBm)	Output Power (W)
WCDMA Band II	WCDMA 12.2K RMC	1852.40	9262	22.94	0.19679
		1880.00	9400	22.35	0.17179
		1907.60	9538	22.21	0.16634
WCDMA Band V	WCDMA 12.2K RMC	826.40	4132	23.98	0.25003
		836.40	4183	23.41	0.21928
		846.60	4233	22.90	0.19498

HSDPA

Band II

Band	Mode	Frequency(MHz)	CH	Average power(dBm)	Output Power (W)
Band II	Subtest 1	1852.40	9262	22.90	0.19498
		1880.00	9400	23.10	0.20417
		1907.60	9538	23.00	0.19953
	Subtest 2	1852.40	9262	22.41	0.17418
		1880.00	9400	22.61	0.18239
		1907.60	9538	22.51	0.17824
	Subtest 3	1852.40	9262	21.90	0.15488
		1880.00	9400	22.10	0.16218
		1907.60	9538	22.06	0.16069
	Subtest 4	1852.40	9262	21.90	0.15488
		1880.00	9400	22.10	0.16218
		1907.60	9538	22.00	0.15849

Band V

Band	Mode	Frequency(MHz)	CH	Average power(dBm)	Output Power (W)
Band V	Subtest 1	826.40	4132	23.58	0.22803
		836.40	4182	23.69	0.23388
		846.60	4233	23.88	0.24434
	Subtest 2	826.40	4132	23.10	0.20417
		836.40	4182	23.21	0.20941
		846.60	4233	23.39	0.21827
	Subtest 3	826.40	4132	22.60	0.18197
		836.40	4182	22.71	0.18664
		846.60	4233	22.90	0.19498
	Subtest 4	826.40	4132	22.61	0.18239
		836.40	4182	22.73	0.18750
		846.60	4233	22.90	0.19498

HSUPA**Band II**

Band	Mode	Frequency(MHz)	CH	Average power(dBm)	Output Power (W)
Band II	Subtest 1	1852.40	9262	22.90	0.19498
		1880.00	9400	23.09	0.20370
		1907.60	9538	23.02	0.20045
	Subtest 2	1852.40	9262	21.00	0.12589
		1880.00	9400	21.09	0.12853
		1907.60	9538	21.10	0.12882
	Subtest 3	1852.40	9262	21.90	0.15488
		1880.00	9400	22.10	0.16218
		1907.60	9538	22.20	0.16596
	Subtest 4	1852.40	9262	20.91	0.12331
		1880.00	9400	21.11	0.12912
		1907.60	9538	21.03	0.12677
	Subtest 5	1852.40	9262	22.88	0.19409
		1880.00	9400	23.08	0.20324
		1907.60	9538	22.96	0.19770

Band V

Band	Mode	Frequency(MHz)	CH	Average power(dBm)	Output Power (W)
Band V	Subtest 1	826.40	4132	23.52	0.22491
		836.40	4182	23.62	0.23014
		846.60	4233	23.89	0.24491
	Subtest 2	826.40	4132	21.53	0.14223
		836.40	4182	21.65	0.14622
		846.60	4233	21.90	0.15488
	Subtest 3	826.40	4132	22.54	0.17947
		836.40	4182	22.63	0.18323
		846.60	4233	22.90	0.19498
	Subtest 4	826.40	4132	21.53	0.14223
		836.40	4182	21.70	0.14791
		846.60	4233	21.93	0.15596
	Subtest 5	826.40	4132	23.47	0.22233
		836.40	4182	23.60	0.22909
		846.60	4233	23.81	0.24044

8.2 ERP & EIRP MEASUREMENT

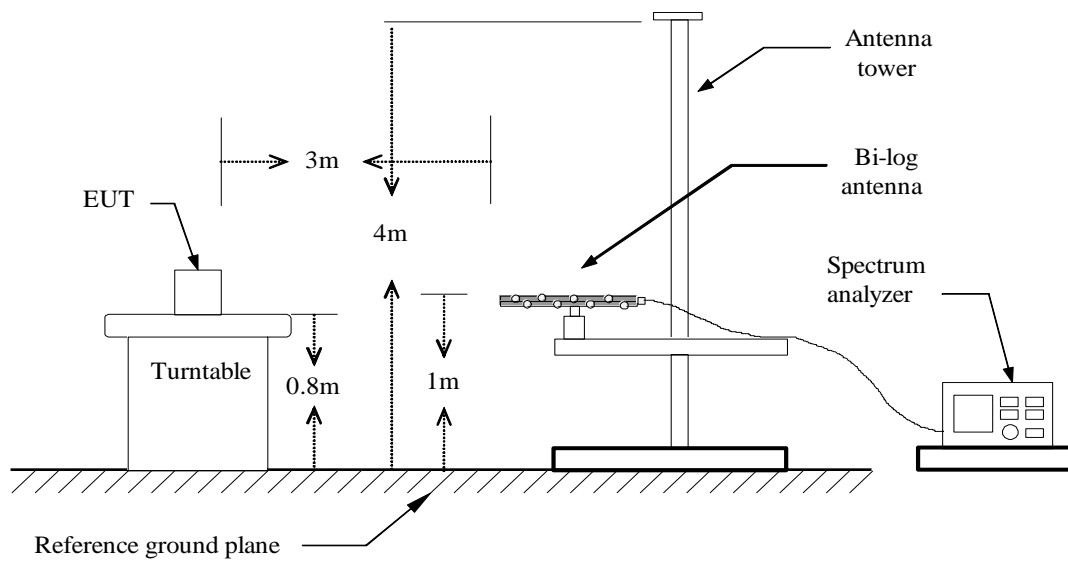
LIMIT

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

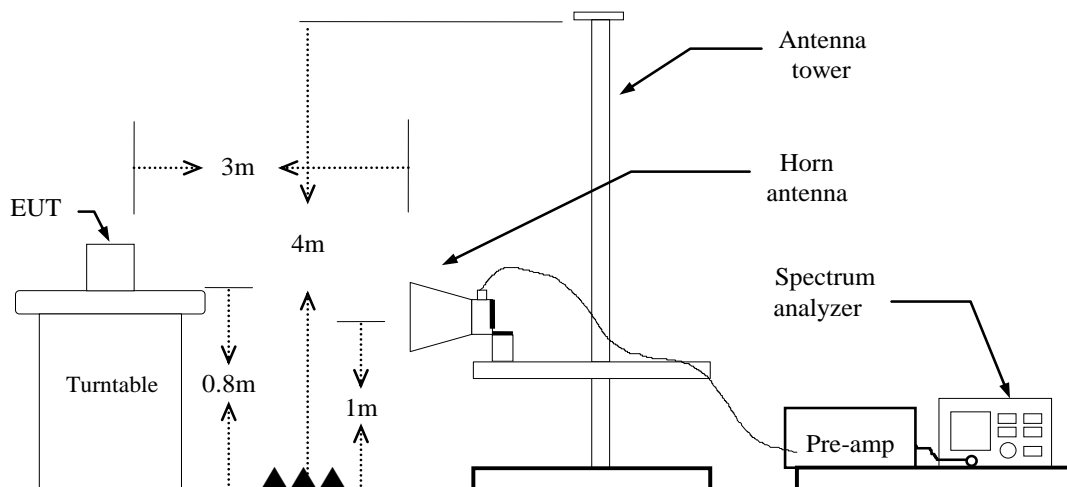
According to FCC 24.232(b): The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

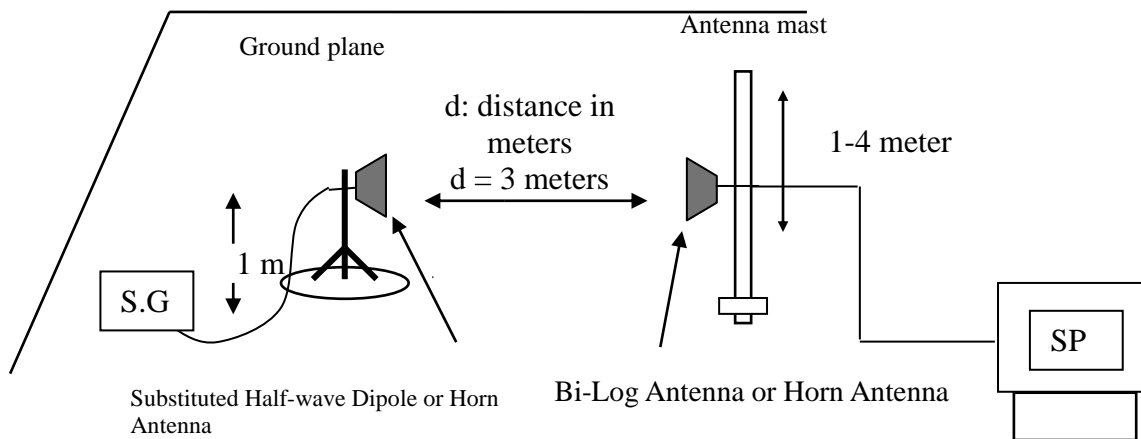
Test Configuration

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 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 V04.
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-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.

$$\text{ERP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable (dB)} - 2.15$$

$$\text{EIRP} = \text{S.G. output (dBm)} + \text{Antenna Gain (dBi)} - \text{Cable (dB)}$$

TEST RESULTS

No non-compliance noted.

WCDMA 12.2K RMC

Test Mode	Channel	Vertical		Horizontal	
		EIRP(dBm)	EIRP(W)	EIRP(dBm)	EIRP(W)
WCDMA 12.2K RMC (Band II)	Lowest	18.72	0.745	25.00	0.316
	Middle	19.93	0.984	25.85	0.384
	Highest	16.38	0.435	22.74	0.188

Test Mode	Channel	Vertical		Horizontal	
		ERP(dBm)	ERP(W)	ERP(dBm)	ERP(W)
WCDMA 12.2K RMC (Band V)	Lowest	0.72	0.012	11.81	0.152
	Middle	0.88	0.012	12.34	0.171
	Highest	2.06	0.016	12.95	0.197

8.3 OCCUPIED BANDWIDTH MEASUREMENT

Limits

For Reporting purpose only.

TEST PROCEDURES

KDB 971168 D01 V04.

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 \geq 3 x RBW
4. Detector = Peak
5. Trace mode = max. hold

TEST RESULTS

No non-compliance noted

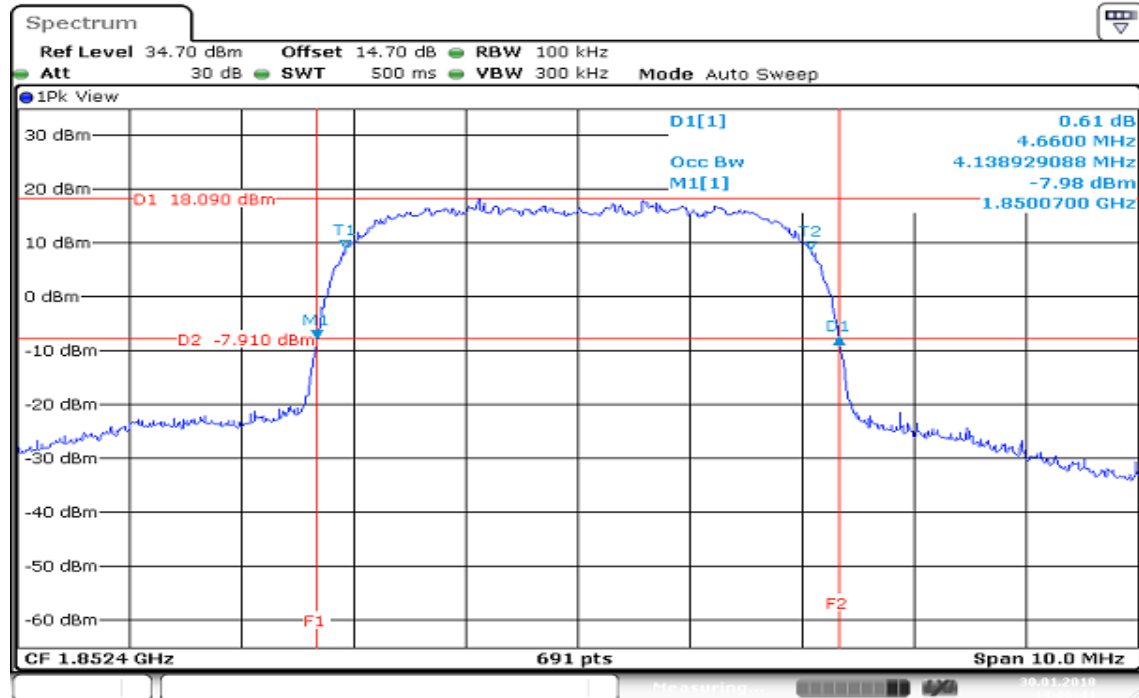
Test Data

Test Mode	CH	Frequency (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)
WCDMA 12.2k RMC (Band II)	Lowest	1852.4	4.1389	4.6600
	Middle	1880.0	4.1389	4.6890
	Highest	1907.6	4.1389	4.6740
WCDMA 12.2k RMC (Band V)	Lowest	826.4	4.1534	4.6740
	Middle	836.4	4.1389	4.6600
	Highest	846.6	4.1244	4.6450

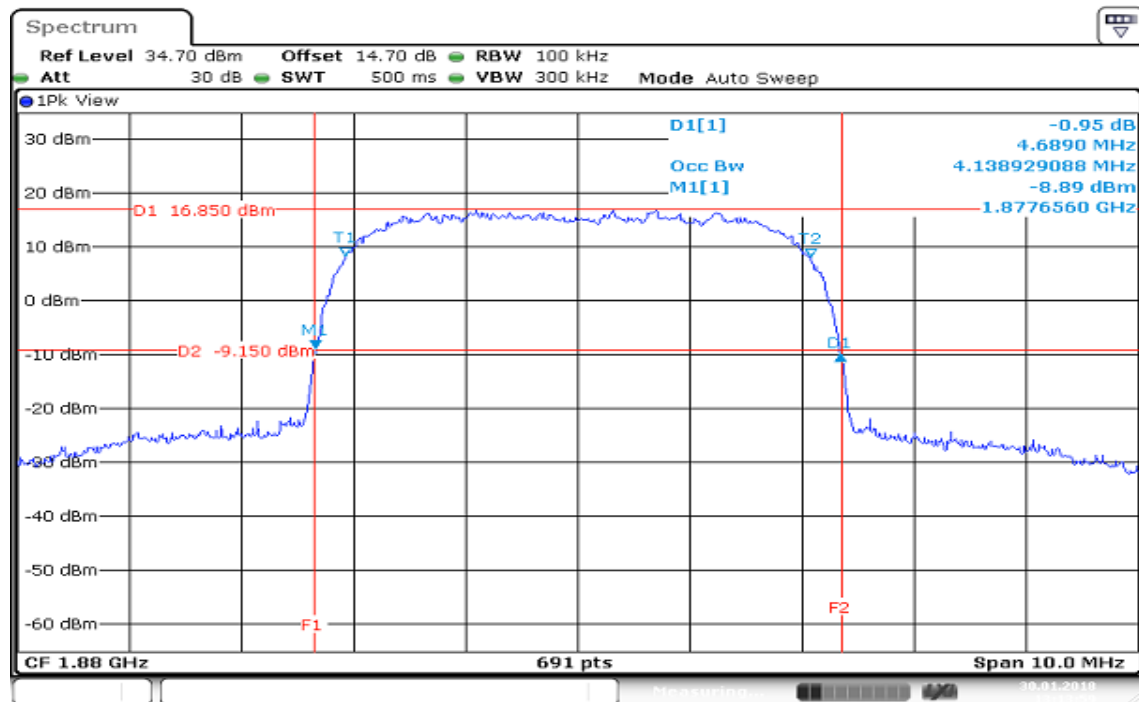
Test Plot

WCDMA 12.2k RMC (Band II)

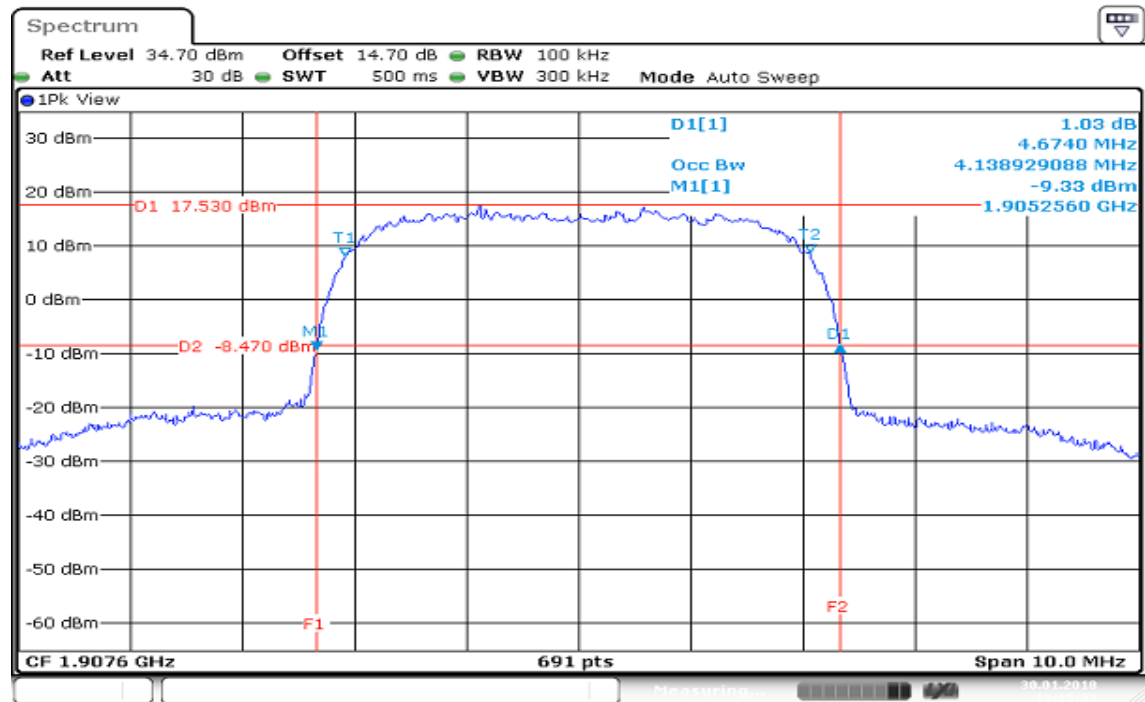
Low CH



Mid CH



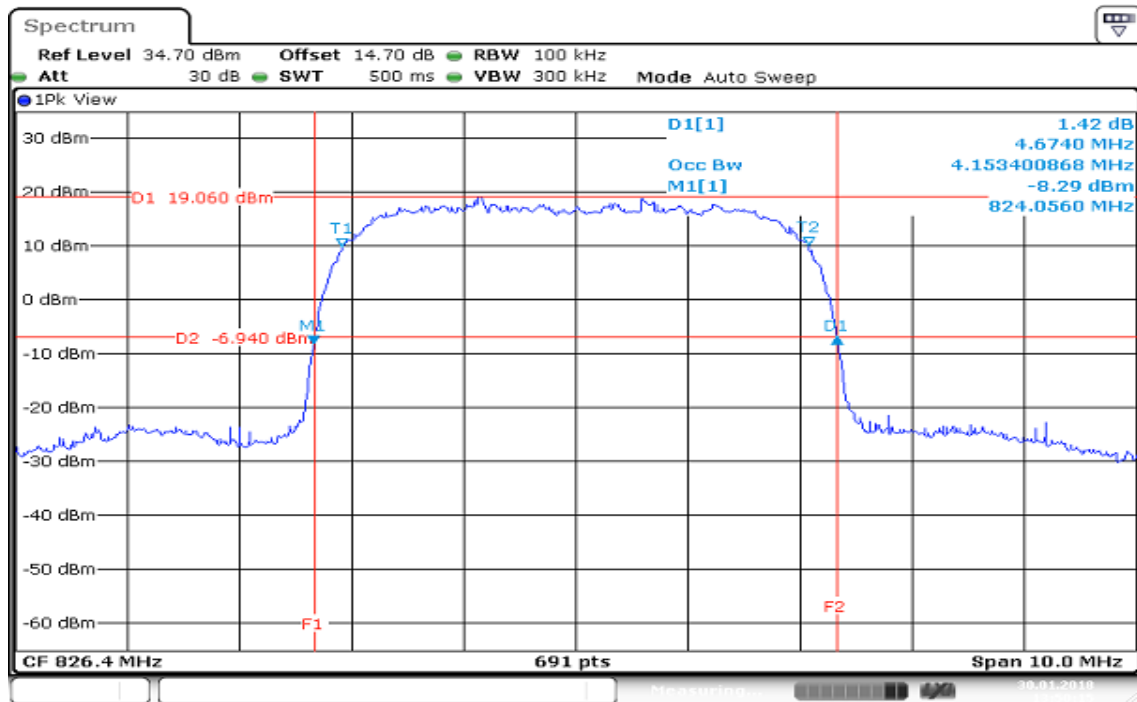
High CH



Date: 30 JAN 2018 13:15:33

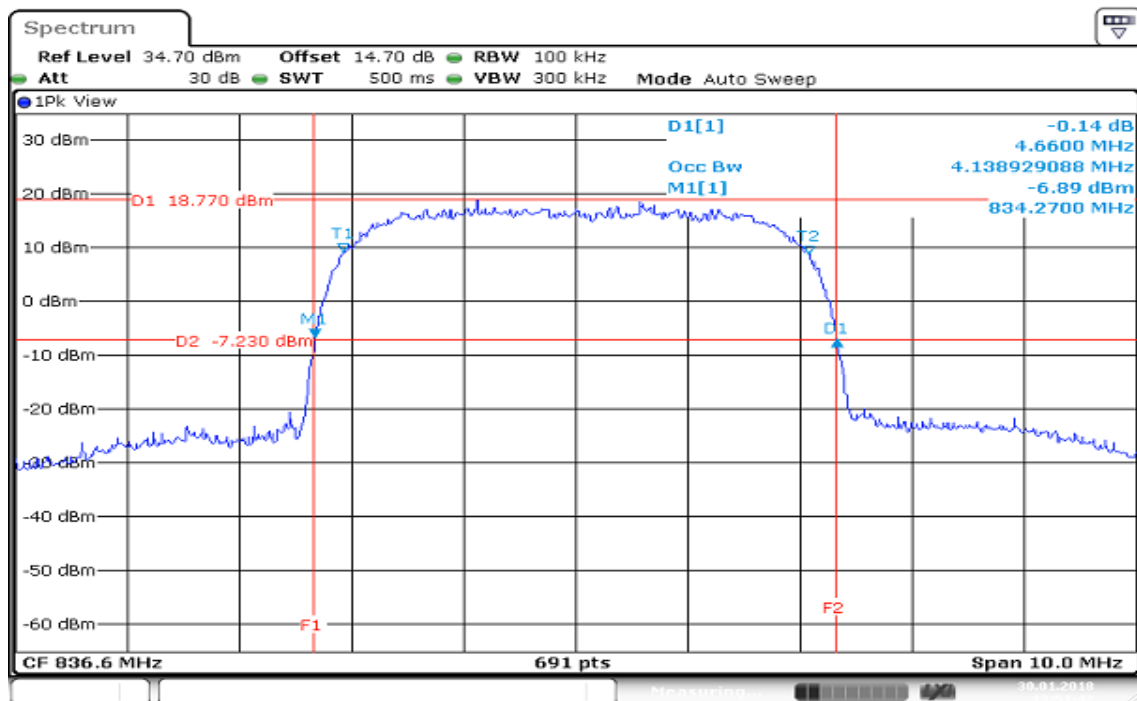
WCDMA 12.2k RMC (Band V)

Low CH



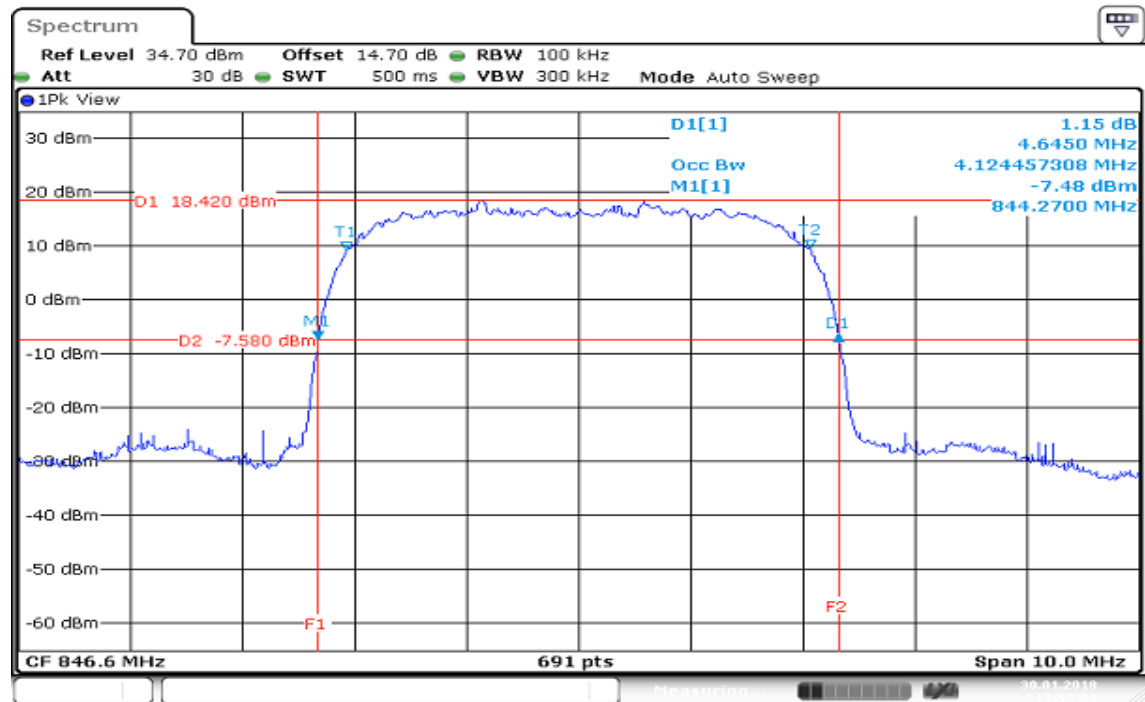
Date: 30 JAN 2018 13:50:15

Mid CH



Date: 30 JAN 2018 13:51:42

High CH



Date: 30 JAN 2018 13:53:33

8.4 CONDUCTED BANDEDG MEASUREMENT

Limit

FCC §22.917(a), Band V

For operations in the 824-849 MHz band, out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC §24.238(a), Band II

For operations in the 1850-1910 and 1930-1950 MHz band, out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

TEST PROCEDURE

According to KDB 971168 D01 V04 section 6 and TIA-603-E section 2.2.13,

1. The EUT was connected to spectrum analyzer and call box.
2. The RF output of EUT was connected to the spectrum analyzer.
3. Start and stop frequency were set such that the band edge would be placed in the center of the plot
4. Span was set large enough so as to capture all out of band emissions near the band edge
5. Set the spectrum analyzer, RBW=100kHz, VBW=300kHz.
6. Record the Band edge emission.

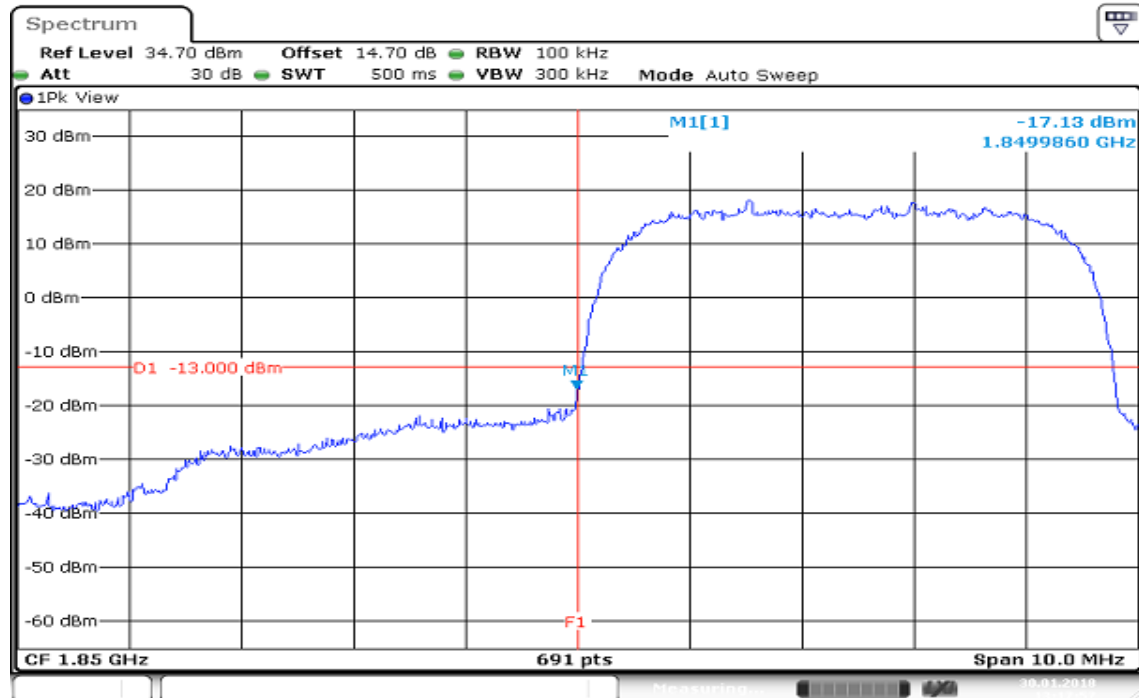
TEST RESULTS

No non-compliance noted.

Test Data

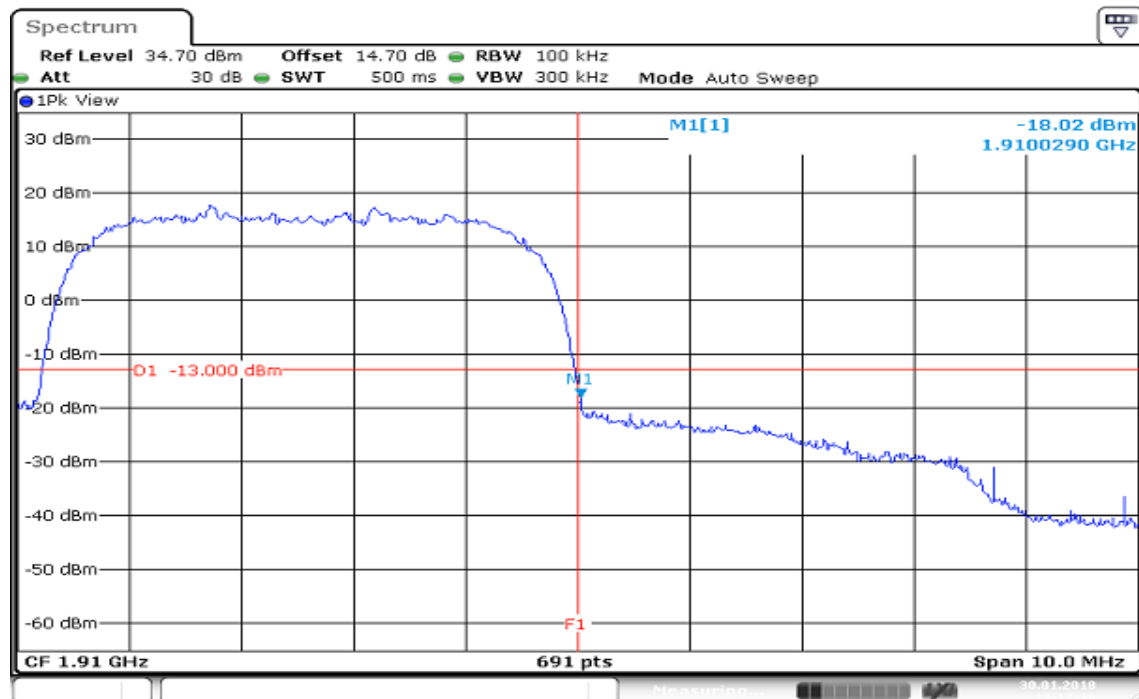
WCDMA 12.2k RMC (Band II)

Low CH



Date: 30 JAN 2018 13:17:57

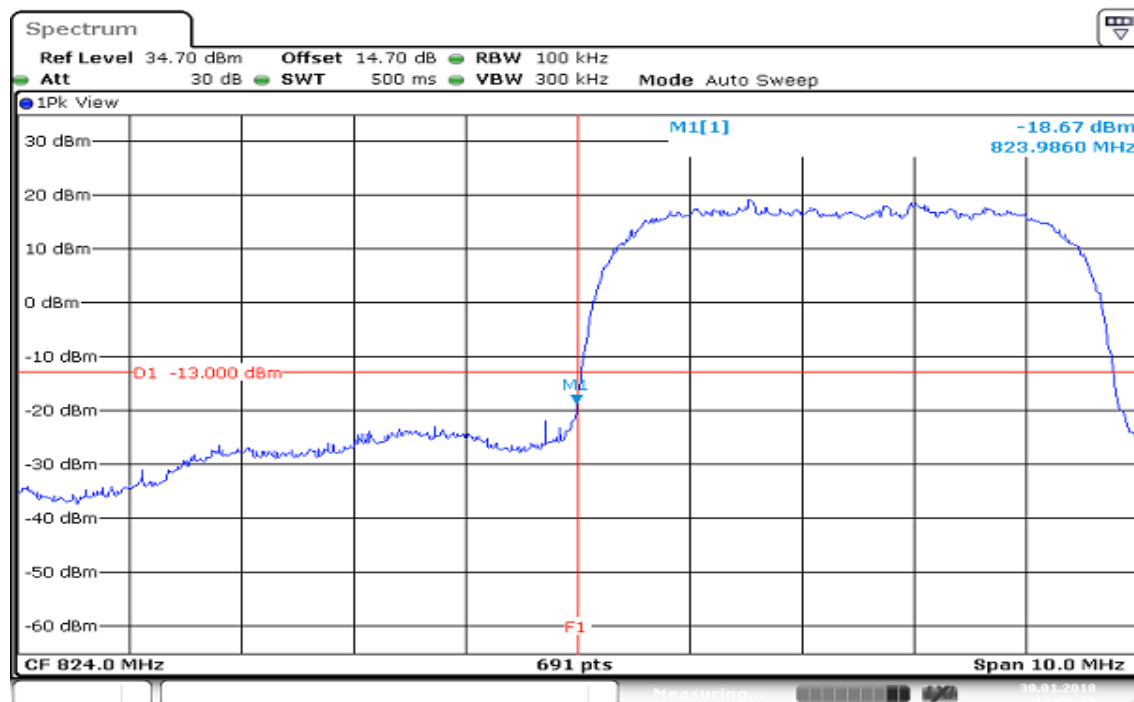
High CH



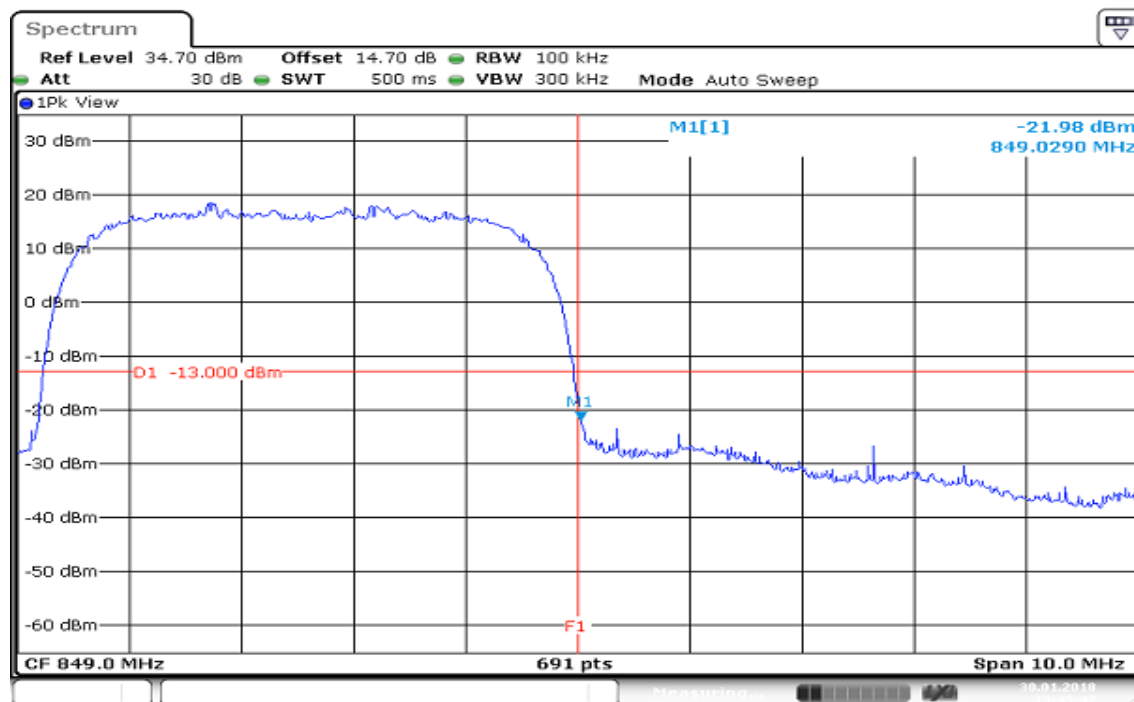
Date: 30 JAN 2018 13:17:16

WCDMA 12.2k RMC (Band V)

Low CH



High CH



8.5 PEAK TO AVERAGE RATIO

Limit

FCC §22.913(d), Band V

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

FCC §24.232(d), Band II

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

Test Procedures

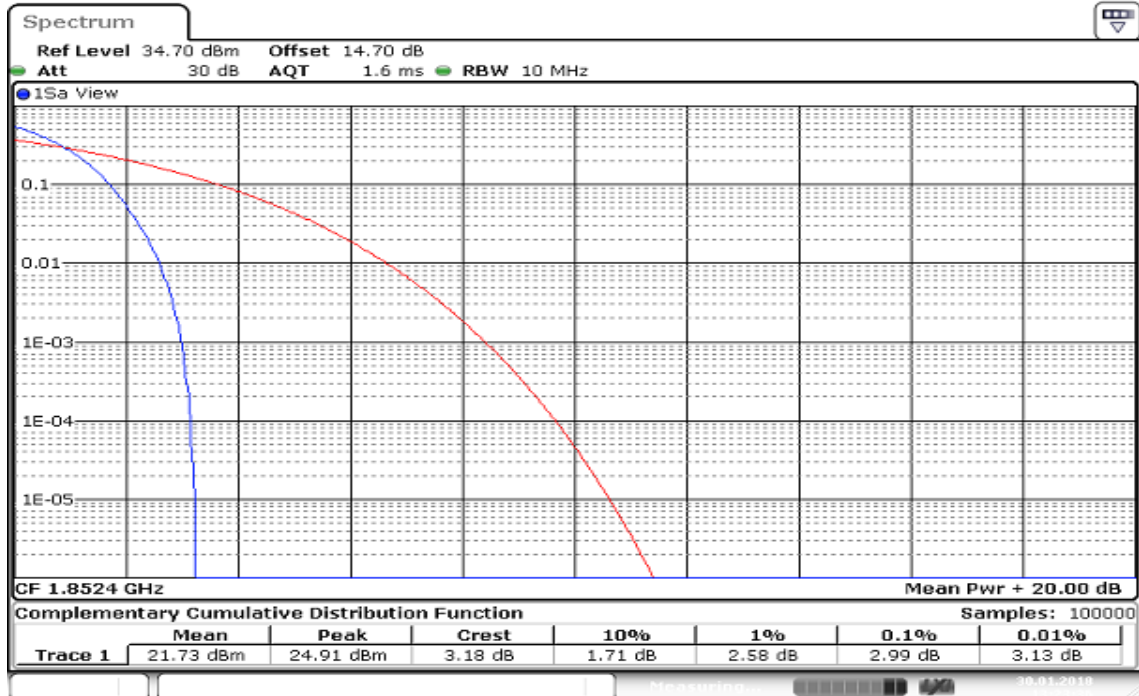
According to KDB 971168 D01 V04 Section 5.7,

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

Test Data

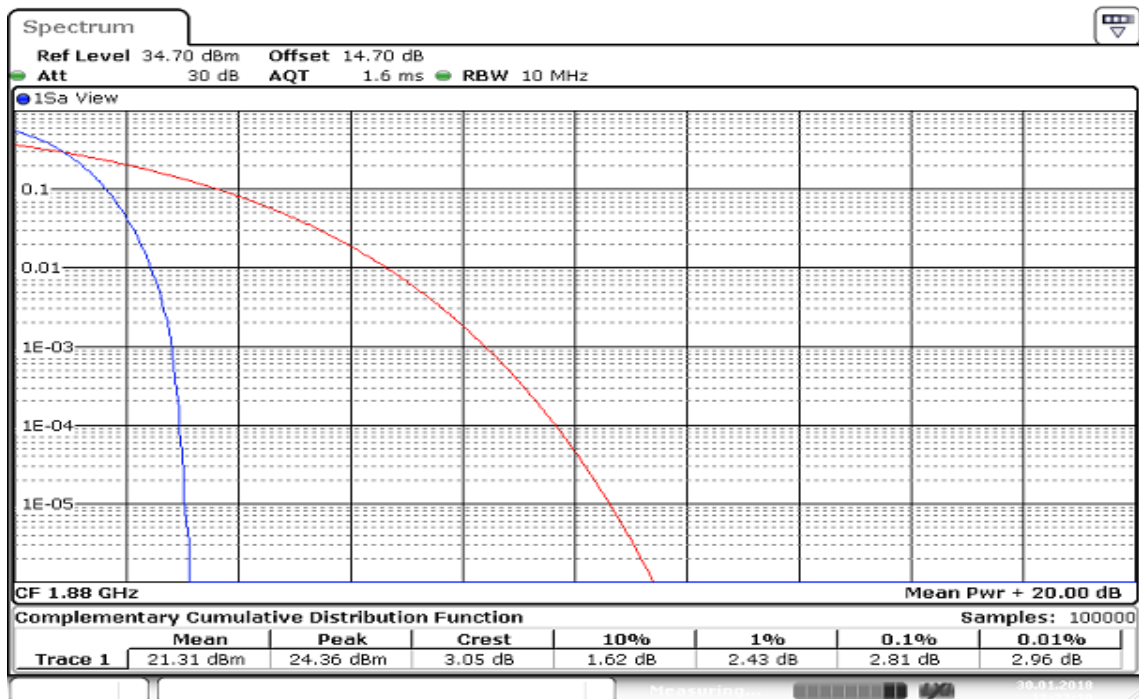
WCDMA 12.2k RMC (Band II)

Low CH



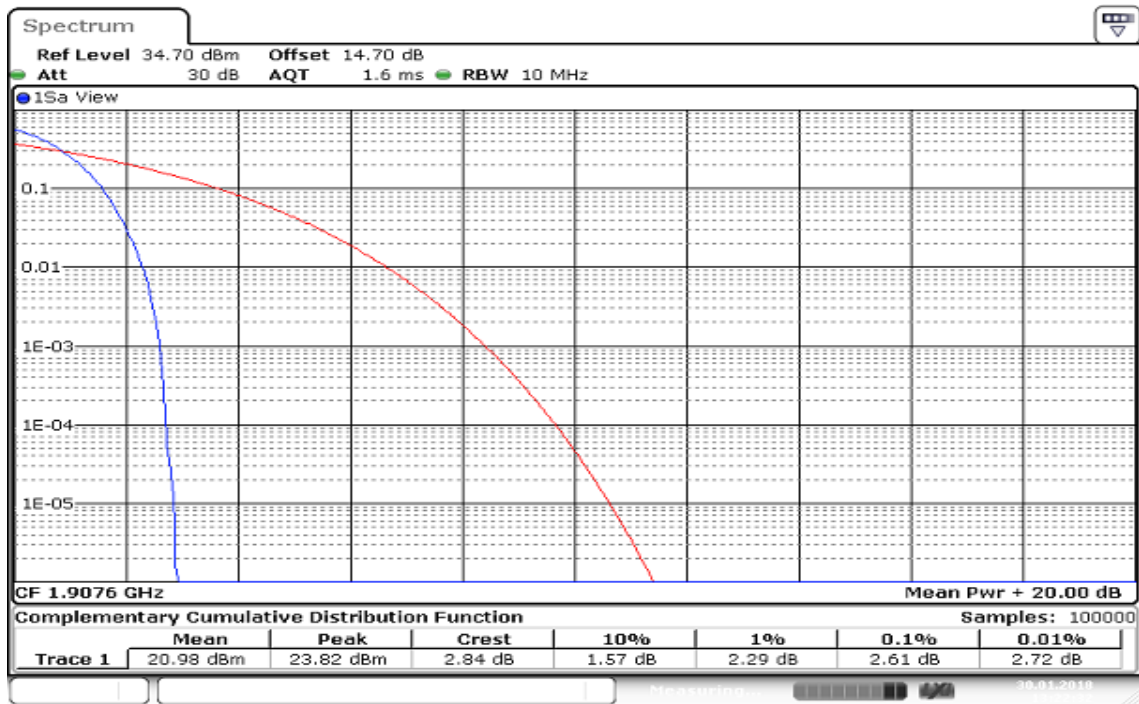
Date: 30 JAN 2018 13:23:37

Mid CH



Date: 30 JAN 2018 13:23:10

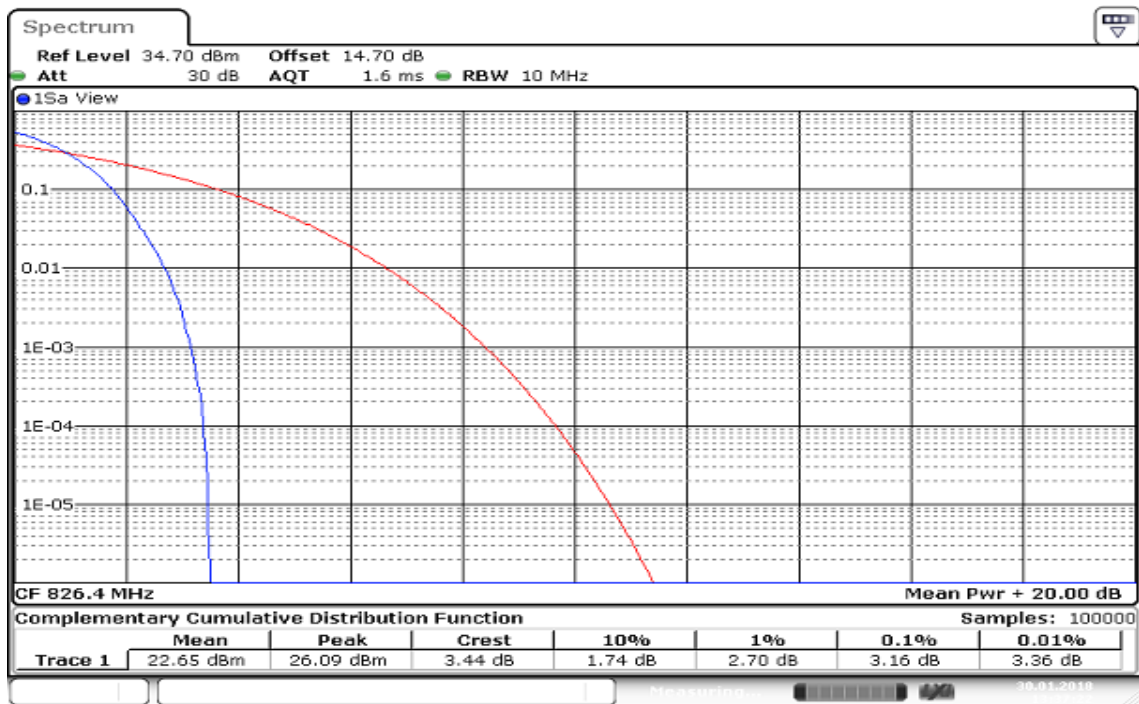
High CH



Date: 30 JAN 2018 13:22:33

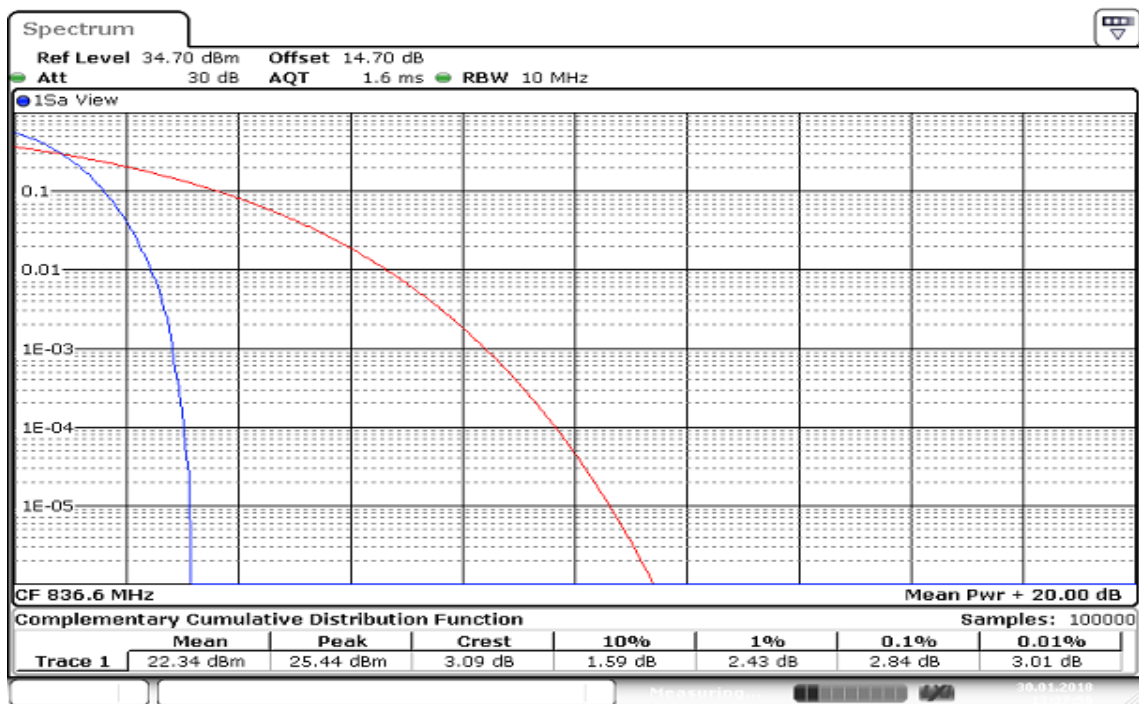
WCDMA 12.2k RMC (Band V)

Low CH



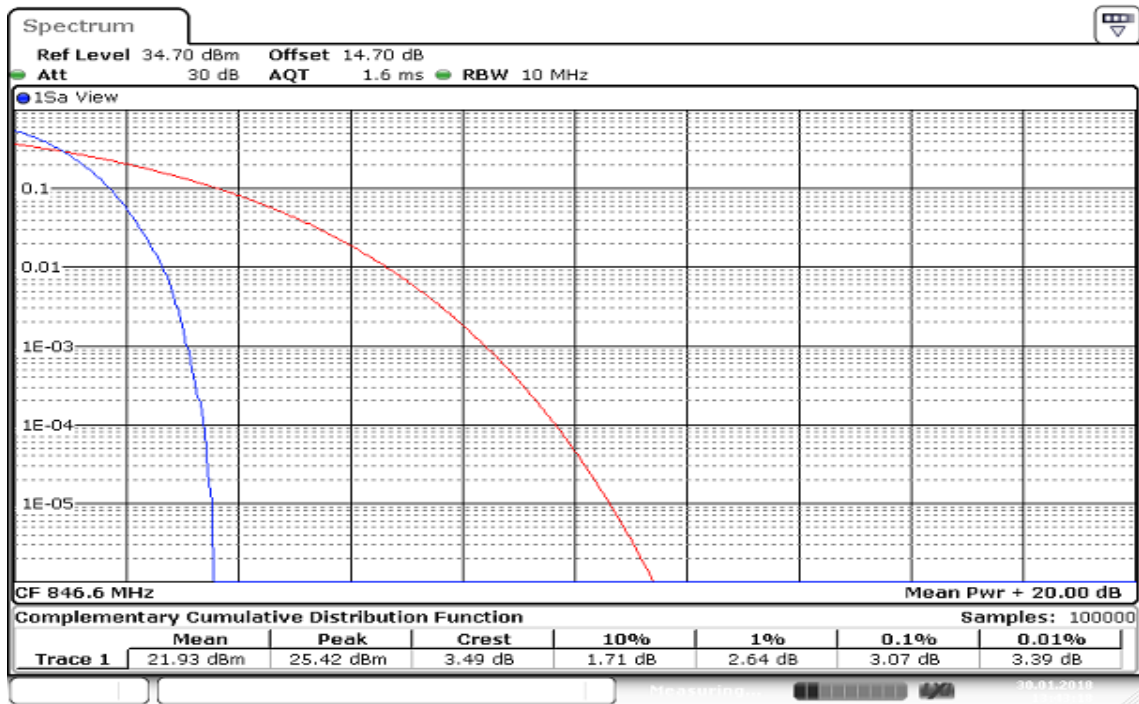
Date: 30 JAN 2018 13:27:22

Mid CH



Date: 30 JAN 2018 13:27:56

High CH



Date: 30 JAN 2018 13:43:18

8.6 CONDUCTED SPURIOUS EMISSIONS

Limit

FCC §22.917(a), Band V

For operations in the 824-849 MHz band, out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC §24.238(a), Band II

For operations in the 1850-1910 and 1930-1950 MHz band, out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Test Procedures

According to KDB 971168 D01 V04 section 6 and TIA-603-E section 2.2.13,

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

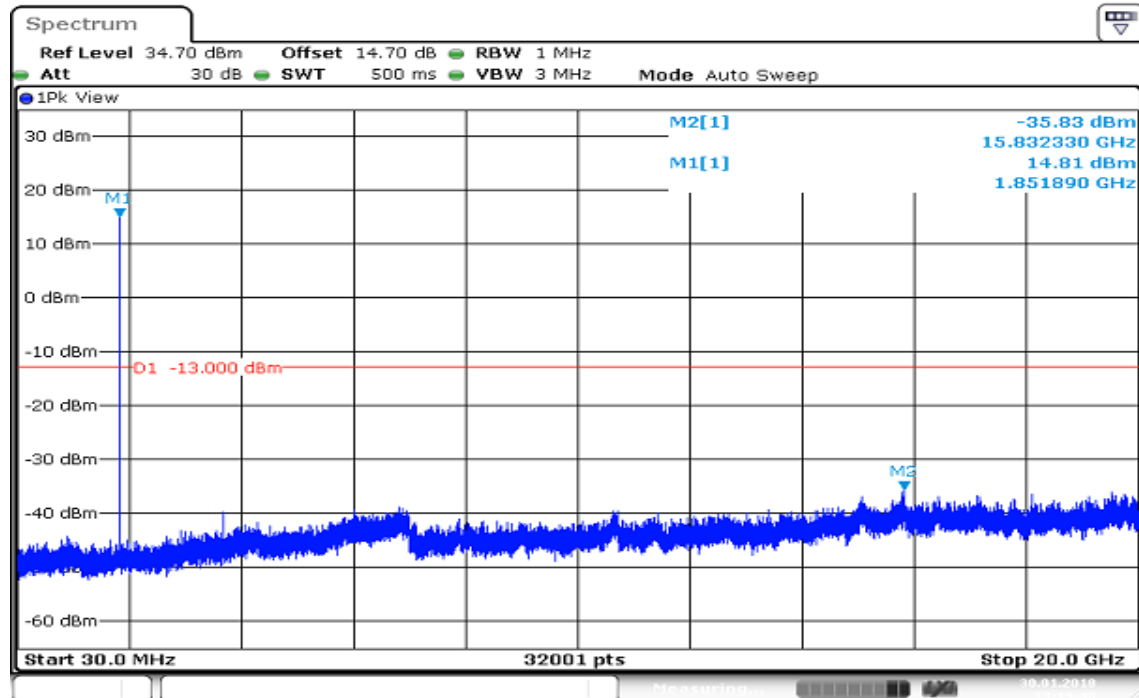
TEST RESULTS

No non-compliance noted

Test Data

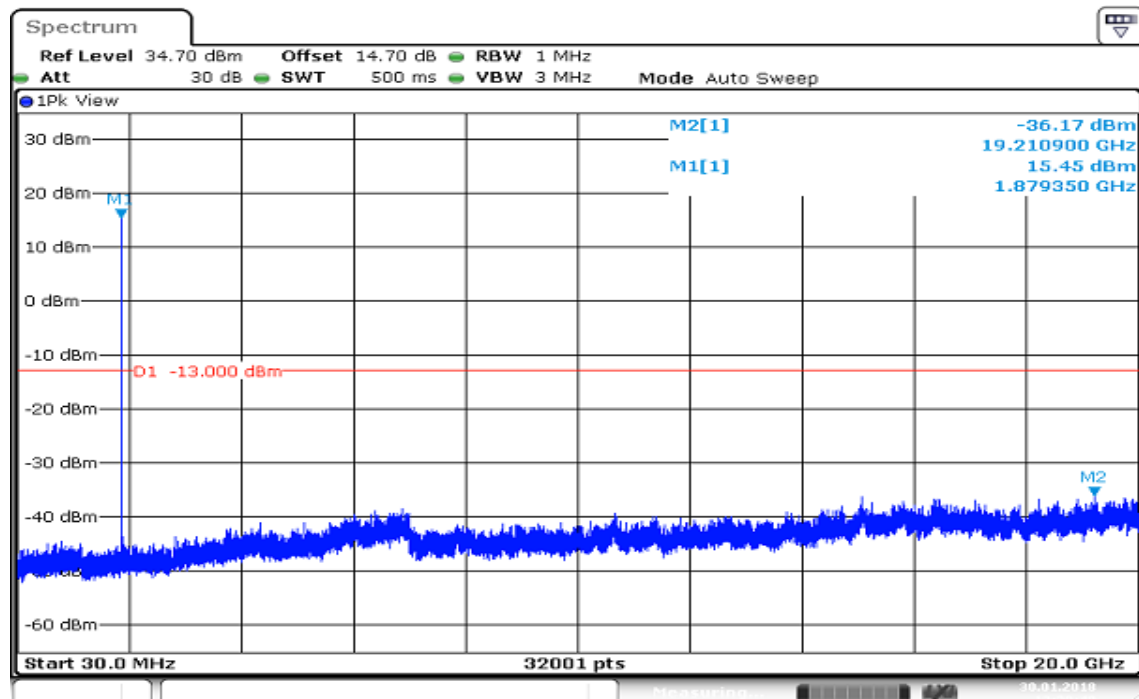
WCDMA 12.2k RMC (Band II)

Low CH



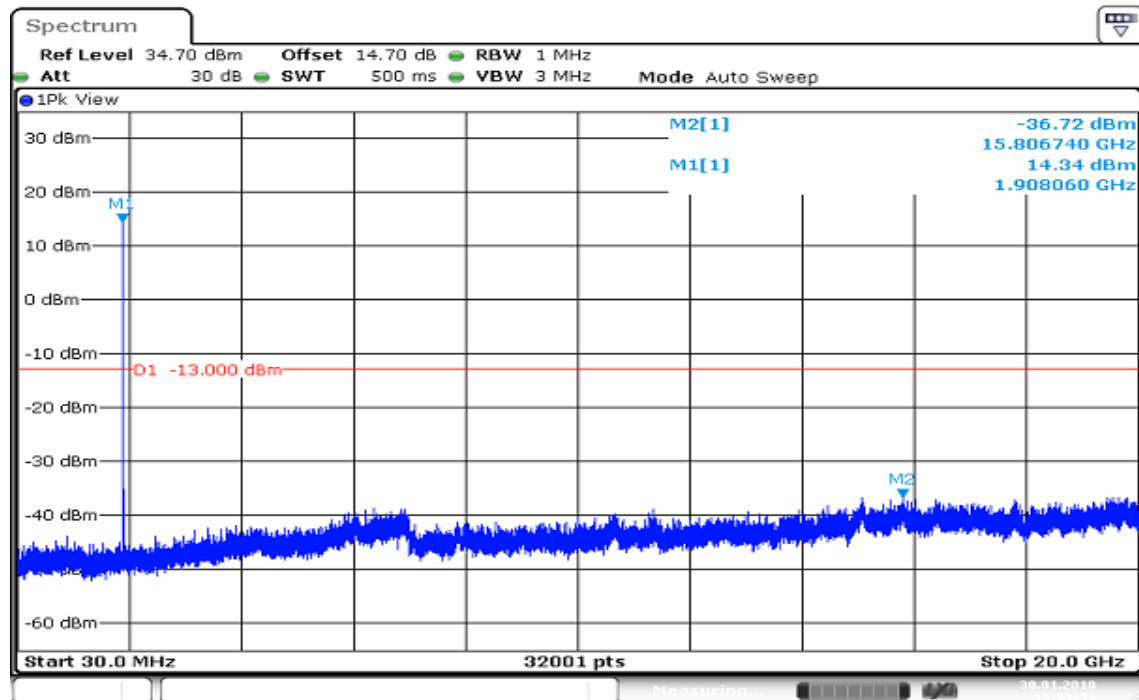
Date: 30 JAN 2018 13:19:49

Mid CH



Date: 30 JAN 2018 13:20:49

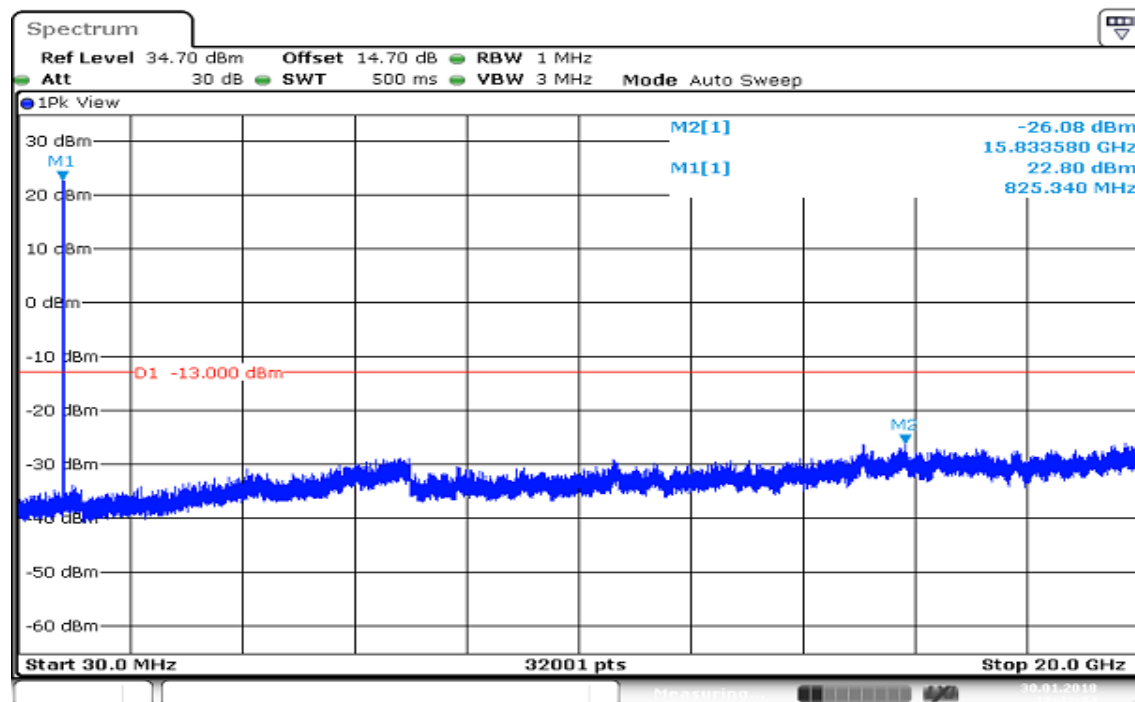
High CH



Date: 30 JAN 2018 13:21:31

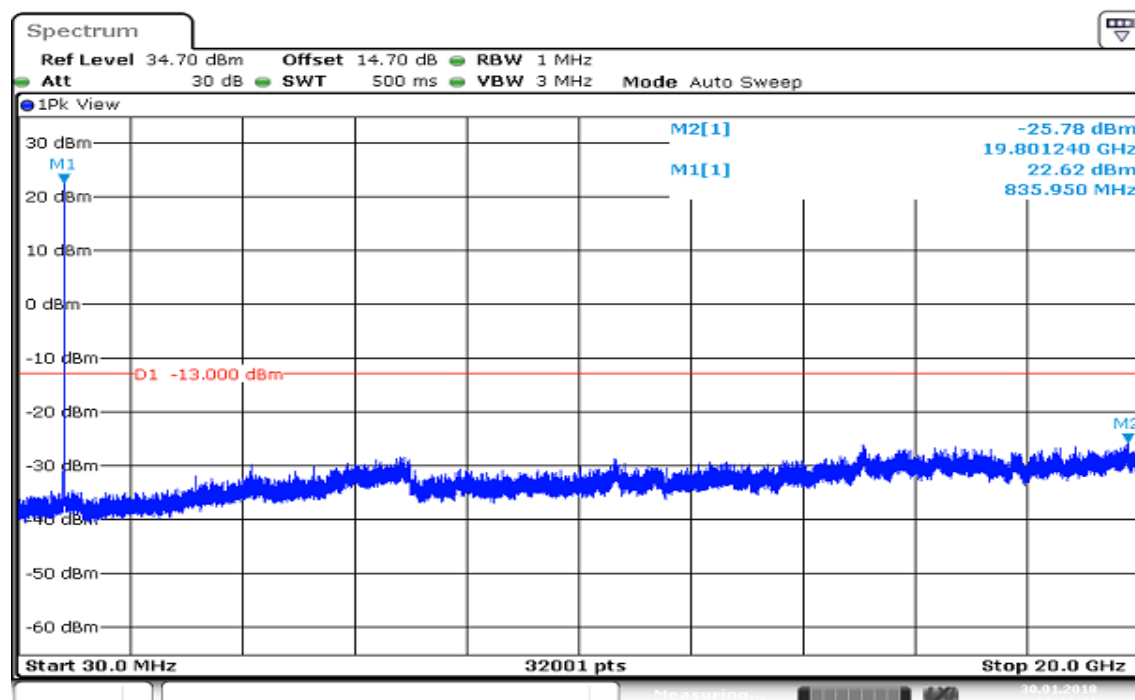
WCDMA 12.2k RMC (Band V)

Low CH



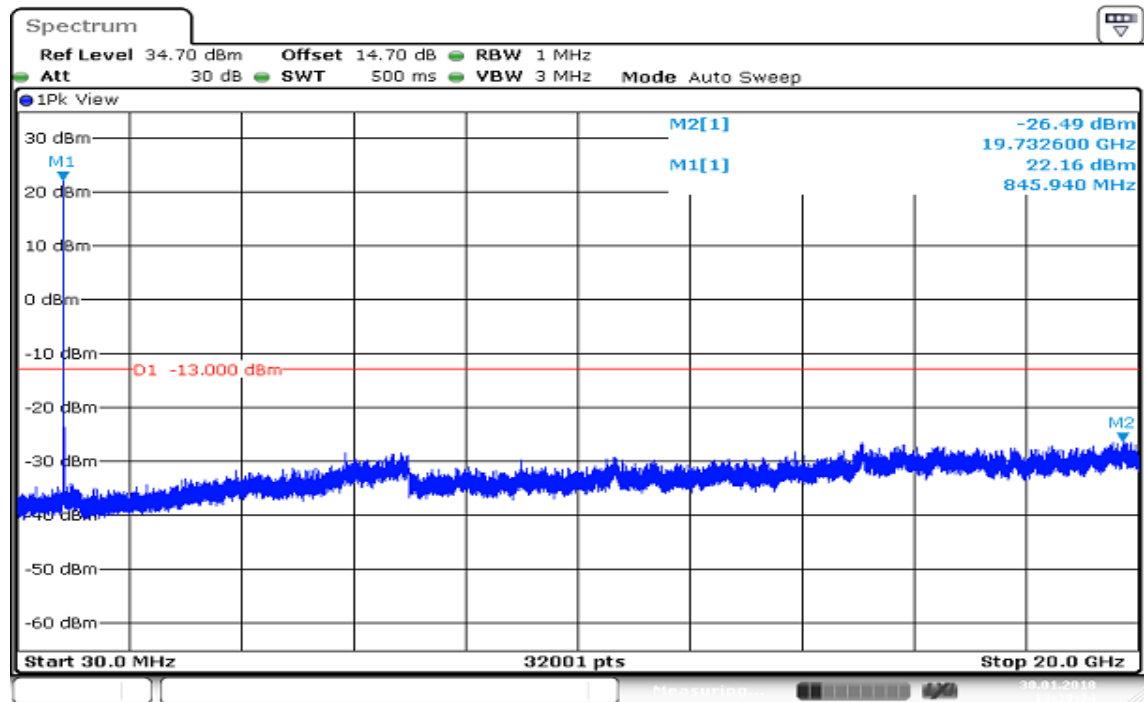
Date: 30 JAN 2018 13:42:35

Mid CH



Date: 30 JAN 2018 13:41:41

High CH



Date: 30 JAN 2018 13:39:35

8.7 SPURIOUS RADIATION MEASUREMENT

Limit

FCC §22.917(a), Band V

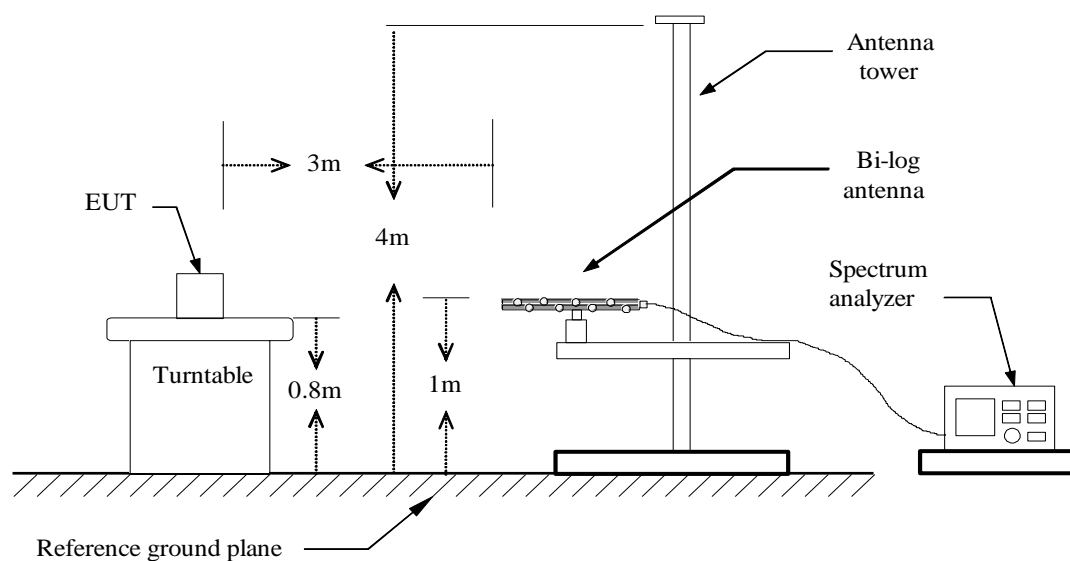
For operations in the 824-849 MHz band, out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC §24.238(a), Band II

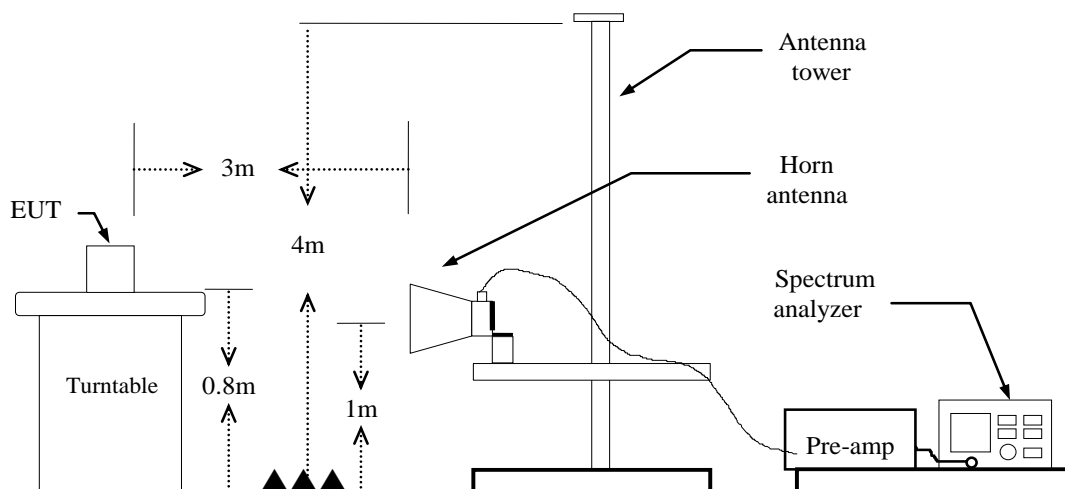
For operations in the 1850-1910 and 1930-1950 MHz band, out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

Test Configuration

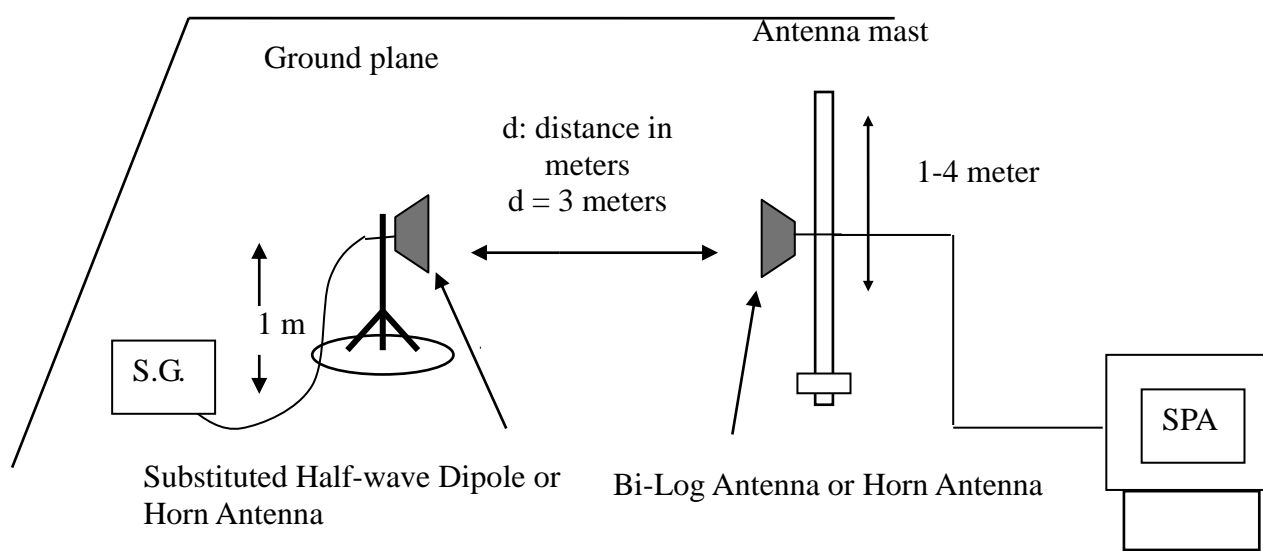
Below 1 GHz



Above 1 GHz



Substituted Method Test Set-up



TEST PROCEDURE

1. According to KDB 971168 D01 V04 section 6 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 (dBd) – Cable (dB)

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

TEST RESULTS

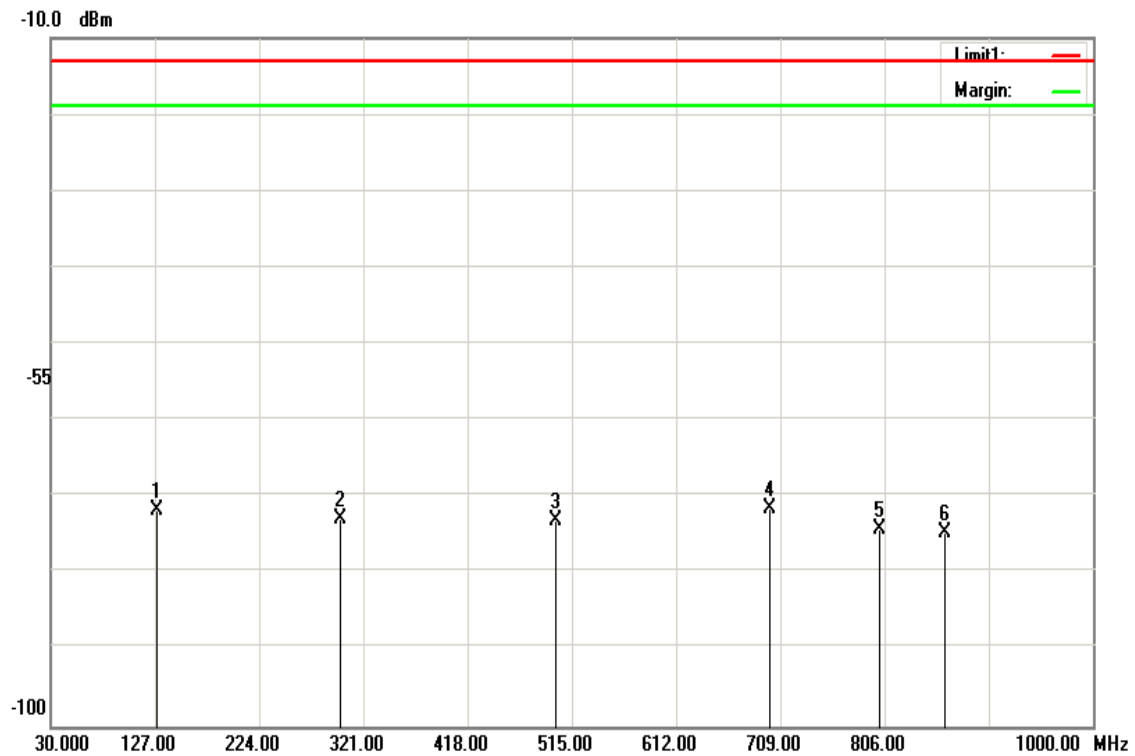
Refer to the attached tabular data sheets.

Radiated Spurious Emission Measurement Result / Below 1GHz

Operation Mode: WCDMA 12.2k RMC
Band II / TX /Mid CH **Test Date:** February 8, 2018

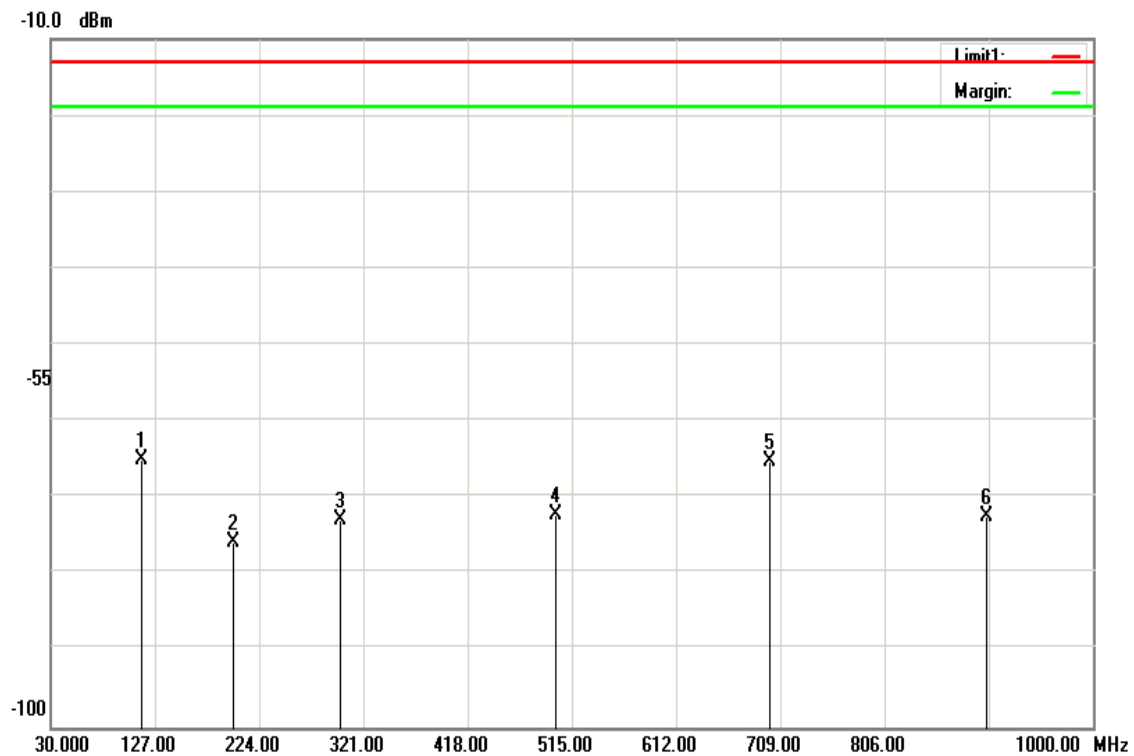
Temperature: 24°C **Tested by:** Ivan Wang

Humidity: 52 % RH **Polarity:** Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
129.4250	-72.89	1.04	-71.85	-13.00	-58.85	V
299.1750	-79.9	6.91	-72.99	-13.00	-59.99	V
500.4500	-79.99	6.8	-73.19	-13.00	-60.19	V
699.3000	-73.53	2.04	-71.49	-13.00	-58.49	V
801.1500	-75.63	1.29	-74.34	-13.00	-61.34	V
861.7750	-75.98	1.24	-74.74	-13.00	-61.74	V

Operation Mode:	WCDMA 12.2k RMC Band II / TX /Mid CH	Test Date:	February 8, 2018
Temperature:	24°C	Tested by:	Ivan Wang
Humidity:	52 % RH	Polarity:	Hor.



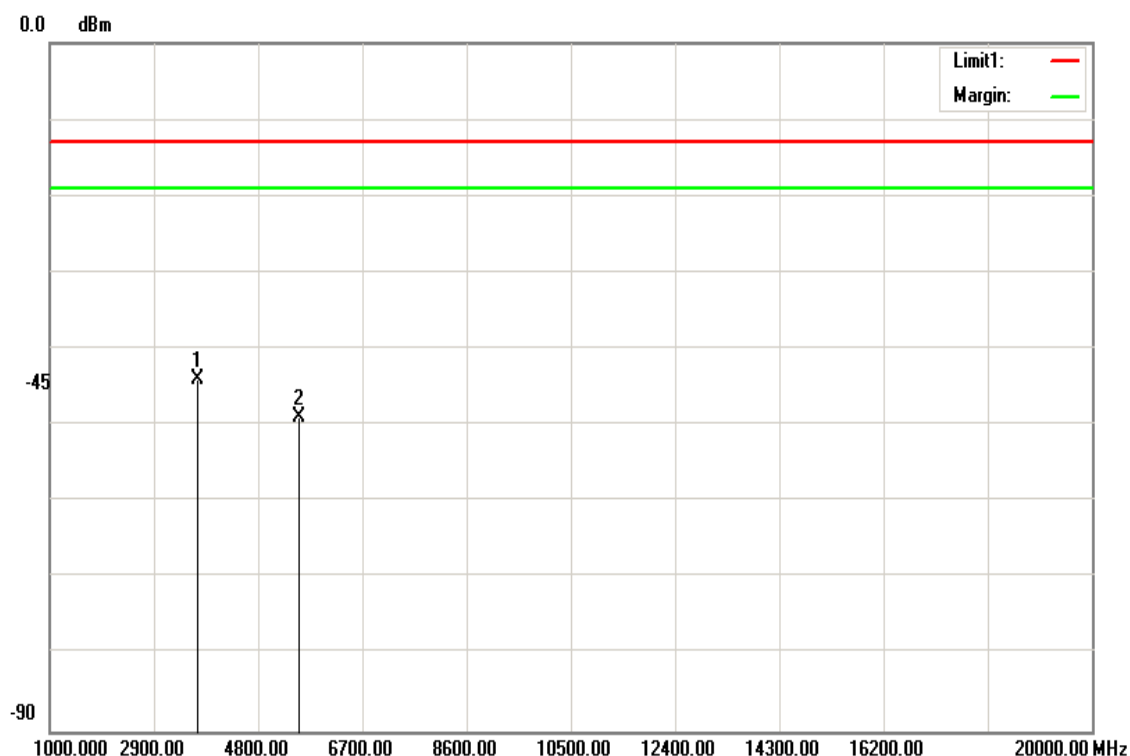
Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
114.8750	-65.65	0.7	-64.95	-13.00	-51.95	H
199.7500	-79.96	4.1	-75.86	-13.00	-62.86	H
299.1750	-79.76	6.91	-72.85	-13.00	-59.85	H
500.4500	-78.96	6.8	-72.16	-13.00	-59.16	H
699.3000	-67.17	2.04	-65.13	-13.00	-52.13	H
900.5750	-73.9	1.45	-72.45	-13.00	-59.45	H

Above 1GHz

Operation Mode: WCDMA 12.2k RMC
Band II / TX / Low CH **Test Date:** February 8, 2018

Temperature: 24°C **Tested by:** Ivan Wang

Humidity: 52 % RH **Polarity:** Ver.

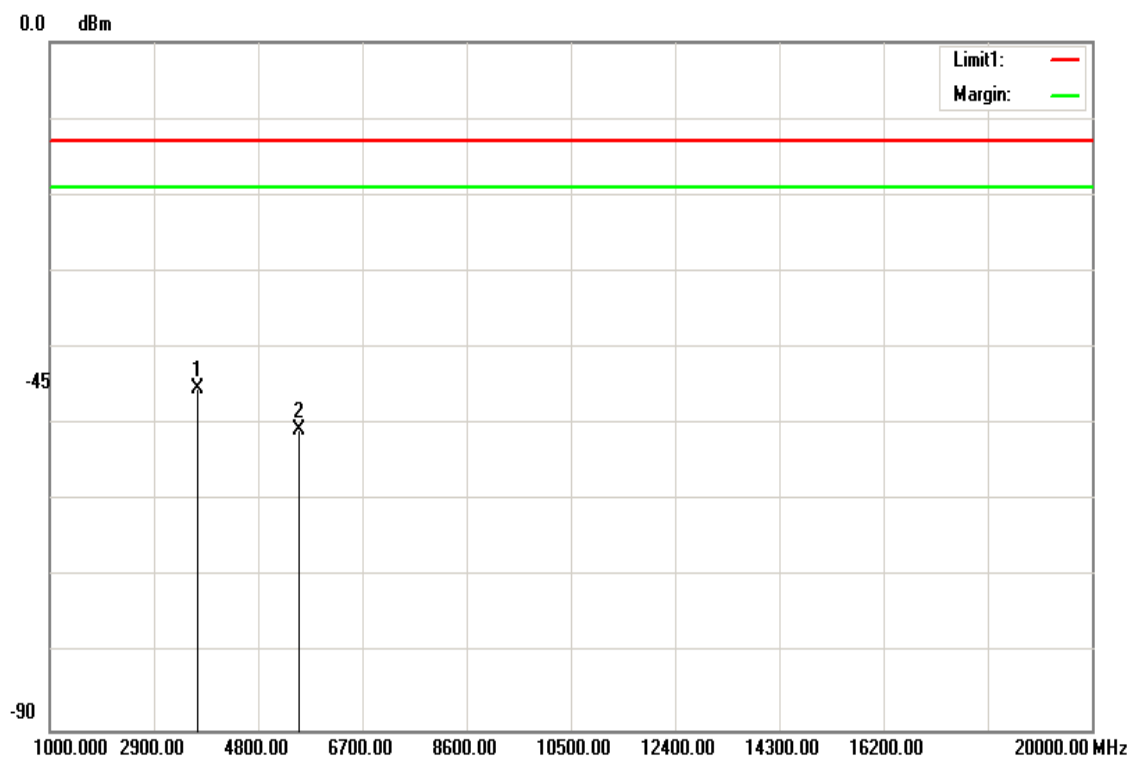


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3704.000	-56.52	12.54	-43.98	-13.00	-30.98	V
5557.000	-61.82	12.88	-48.94	-13.00	-35.94	V
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band II / TX / Low CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Hor.

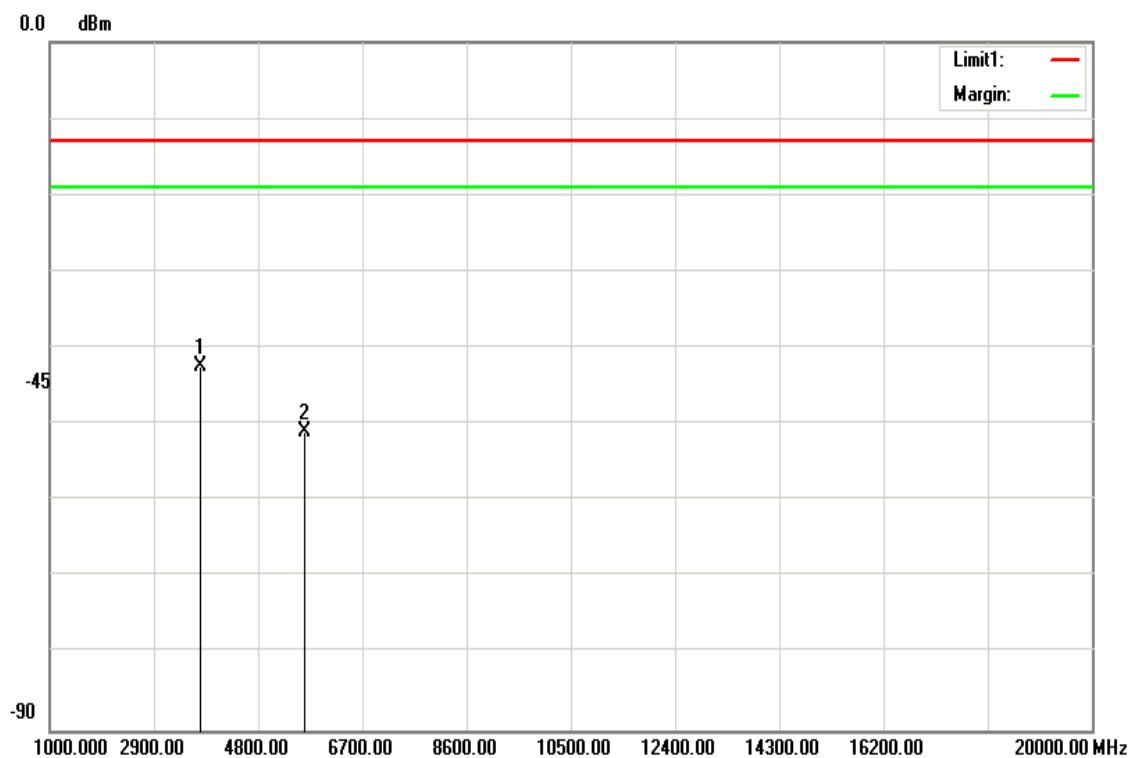


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3704.000	-57.97	12.54	-45.43	-13.00	-32.43	H
5557.000	-63.69	12.88	-50.81	-13.00	-37.81	H
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band II / TX / Mid CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Ver.

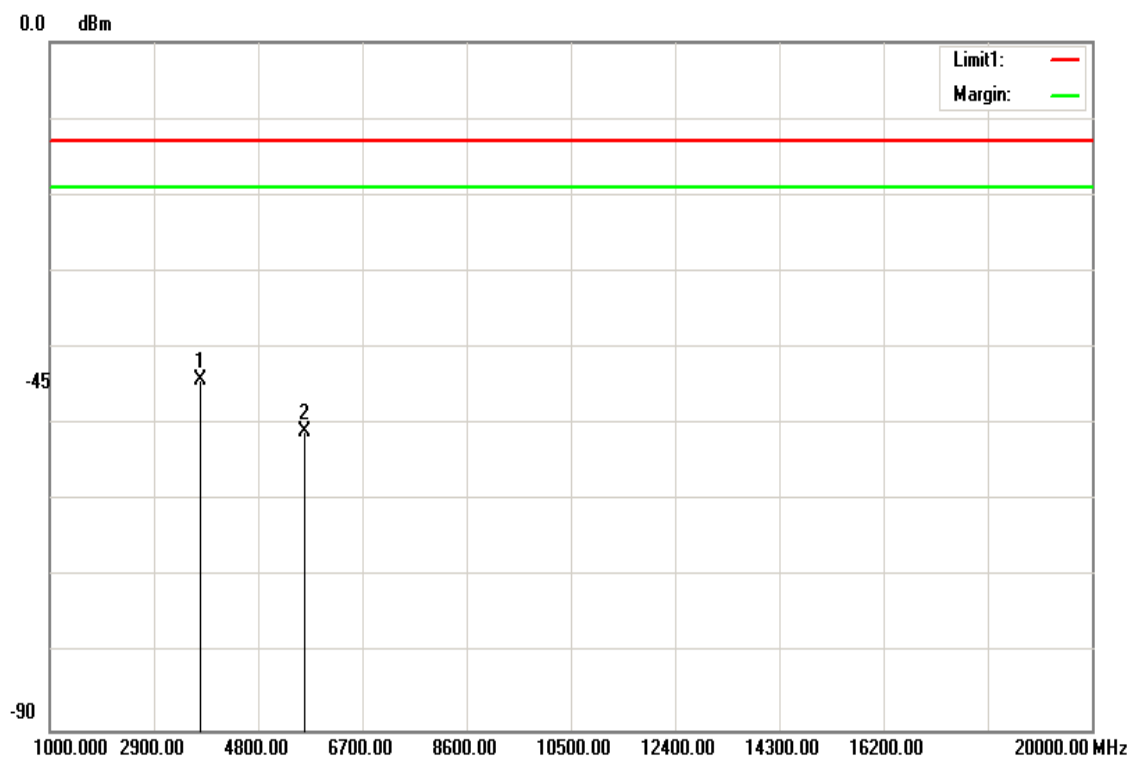


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3760.000	-55	12.55	-42.45	-13.00	-29.45	V
5640.000	-63.76	12.84	-50.92	-13.00	-37.92	V
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band II / TX / Mid CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Hor.

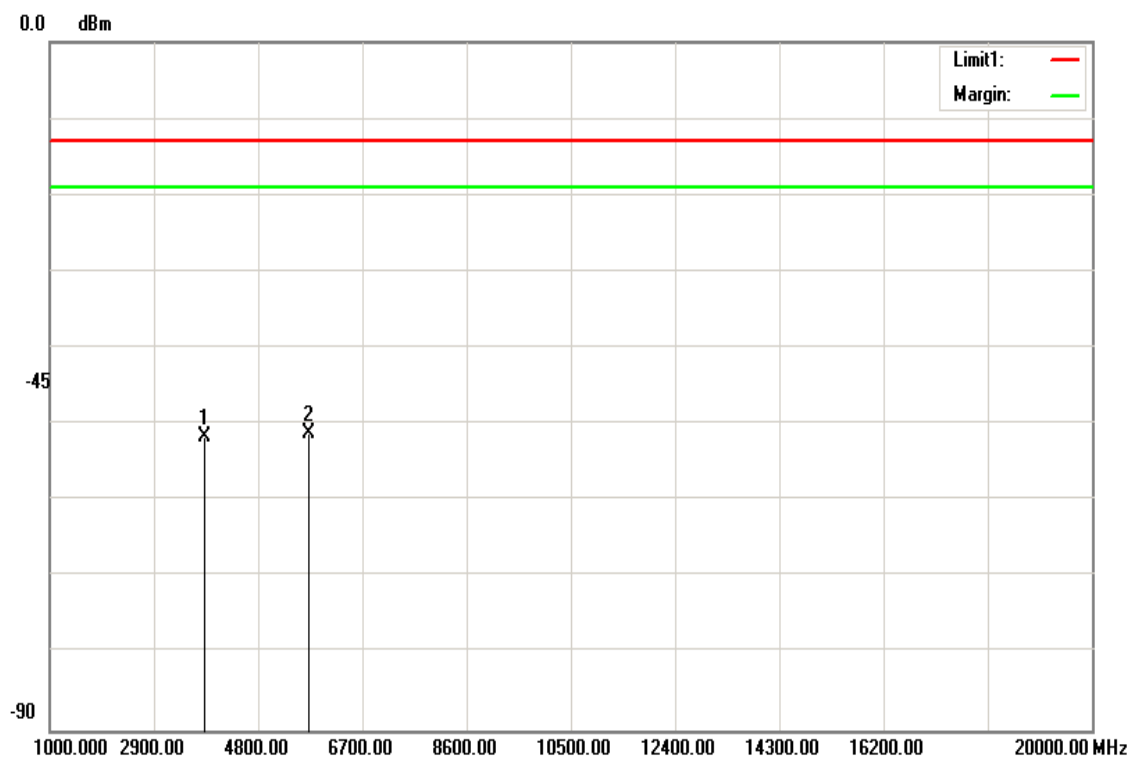


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3760.000	-56.8	12.55	-44.25	-13.00	-31.25	H
5640.000	-63.74	12.84	-50.90	-13.00	-37.90	H
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band II / TX / High CH
 Test Date: February 8, 2018
Temperature: 24°C
 Tested by: Ivan Wang
Humidity: 52 % RH
 Polarity: Ver.

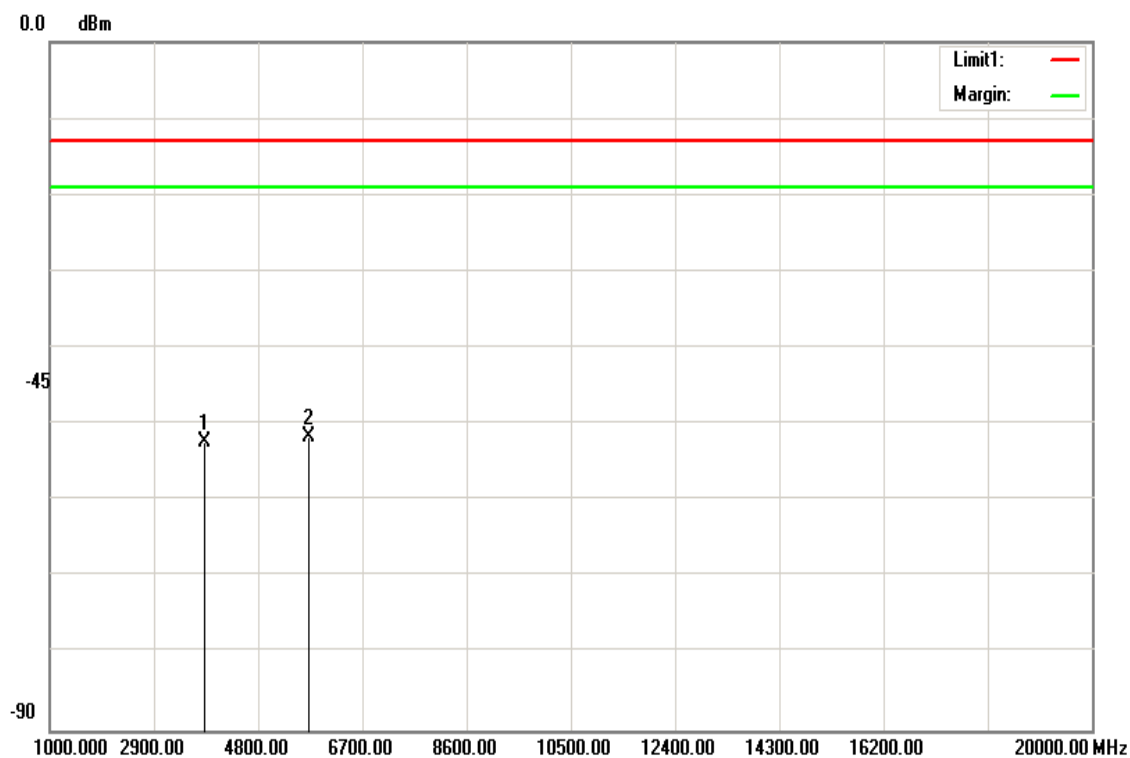


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3814.000	-64.24	12.56	-51.68	-13.00	-38.68	V
5721.000	-64.05	12.81	-51.24	-13.00	-38.24	V
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band II / TX / High CH
 Test Date: February 8, 2018
Temperature: 24°C
 Tested by: Ivan Wang
Humidity: 52 % RH
 Polarity: Hor.



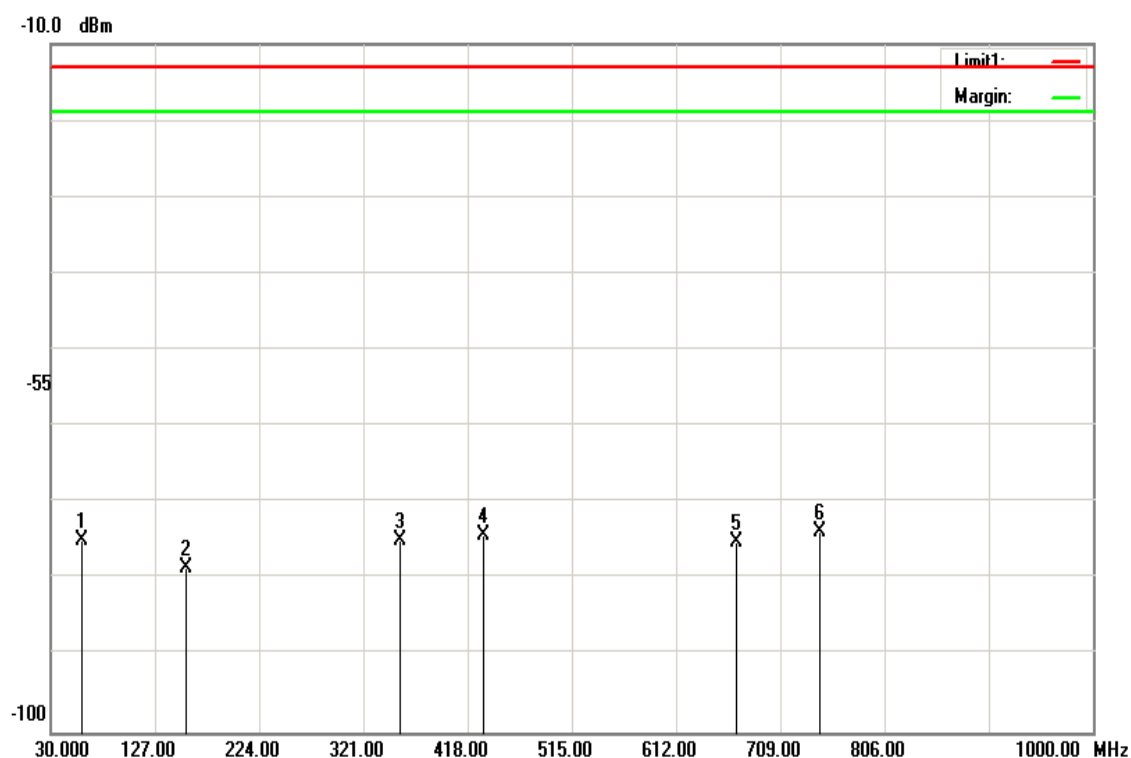
Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
3814.000	-64.95	12.56	-52.39	-13.00	-39.39	H
5721.000	-64.46	12.81	-51.65	-13.00	-38.65	H
N/A						

Remark:

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

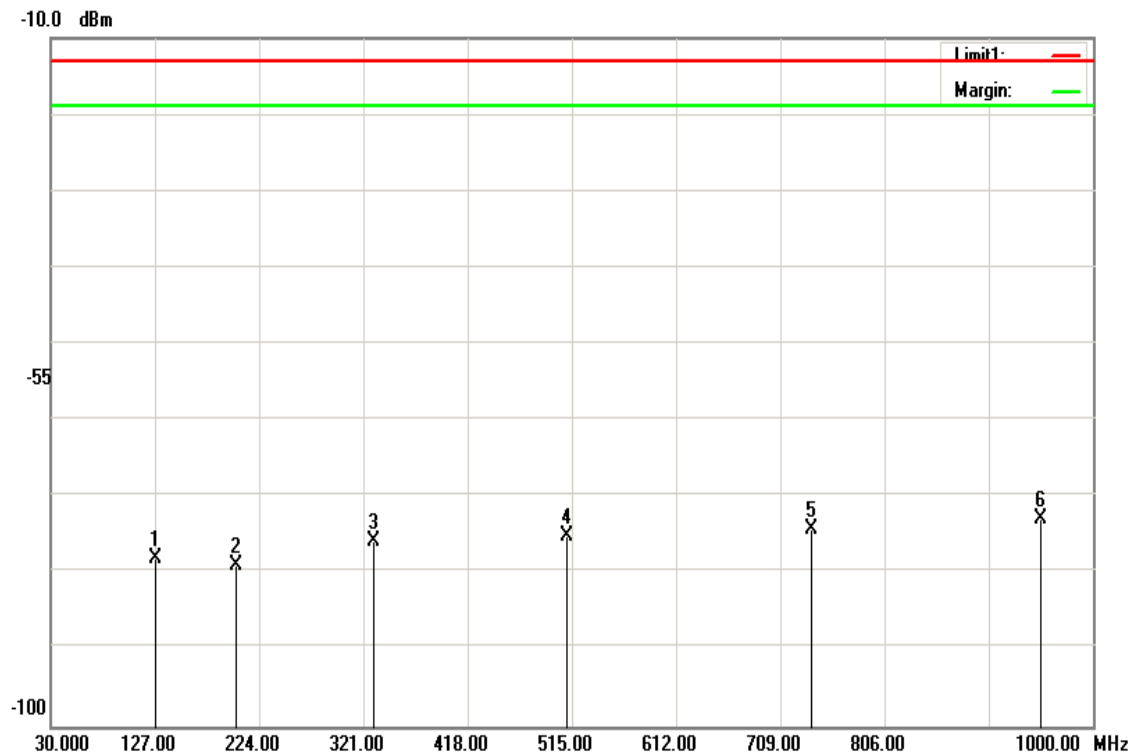
Radiated Spurious Emission Measurement Result / Below 1GHz

Operation Mode: WCDMA 12.2k RMC
 Band V / TX /Mid CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Ver.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
59.1000	-73.47	-1.39	-74.86	-13.00	-61.86	V
156.1000	-78.28	-0.25	-78.53	-13.00	-65.53	V
354.9500	-82.12	7.12	-75.00	-13.00	-62.00	V
432.5500	-81.43	7.14	-74.29	-13.00	-61.29	V
667.7750	-76.65	1.56	-75.09	-13.00	-62.09	V
745.3750	-75.6	1.71	-73.89	-13.00	-60.89	V

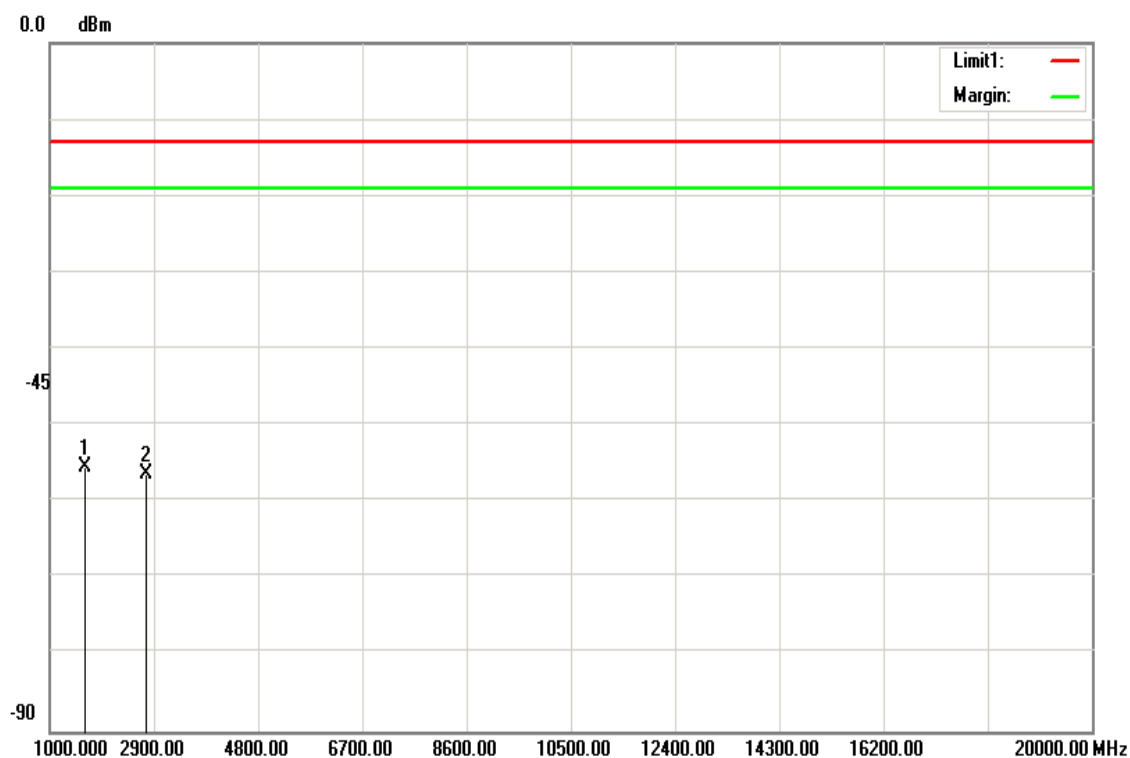
Operation Mode:	WCDMA 12.2k RMC Band V / TX /Mid CH	Test Date:	February 8, 2018
Temperature:	24°C	Tested by:	Ivan Wang
Humidity:	52 % RH	Polarity:	Hor.



Frequency (MHz)	S.G. (dBm)	Ant. Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
127.0000	-78.98	1.01	-77.97	-13.00	-64.97	H
202.1750	-83.16	4.24	-78.92	-13.00	-65.92	H
330.7000	-82.93	7.02	-75.91	-13.00	-62.91	H
510.1500	-81.88	6.81	-75.07	-13.00	-62.07	H
738.1000	-76.04	1.76	-74.28	-13.00	-61.28	H
951.5000	-74.31	1.47	-72.84	-13.00	-59.84	H

Above 1GHz

Operation Mode: WCDMA 12.2k RMC
 Band V / TX / Low CH
 Test Date: February 8, 2018
Temperature: 24°C
 Tested by: Ivan Wang
Humidity: 52 % RH
 Polarity: Ver.

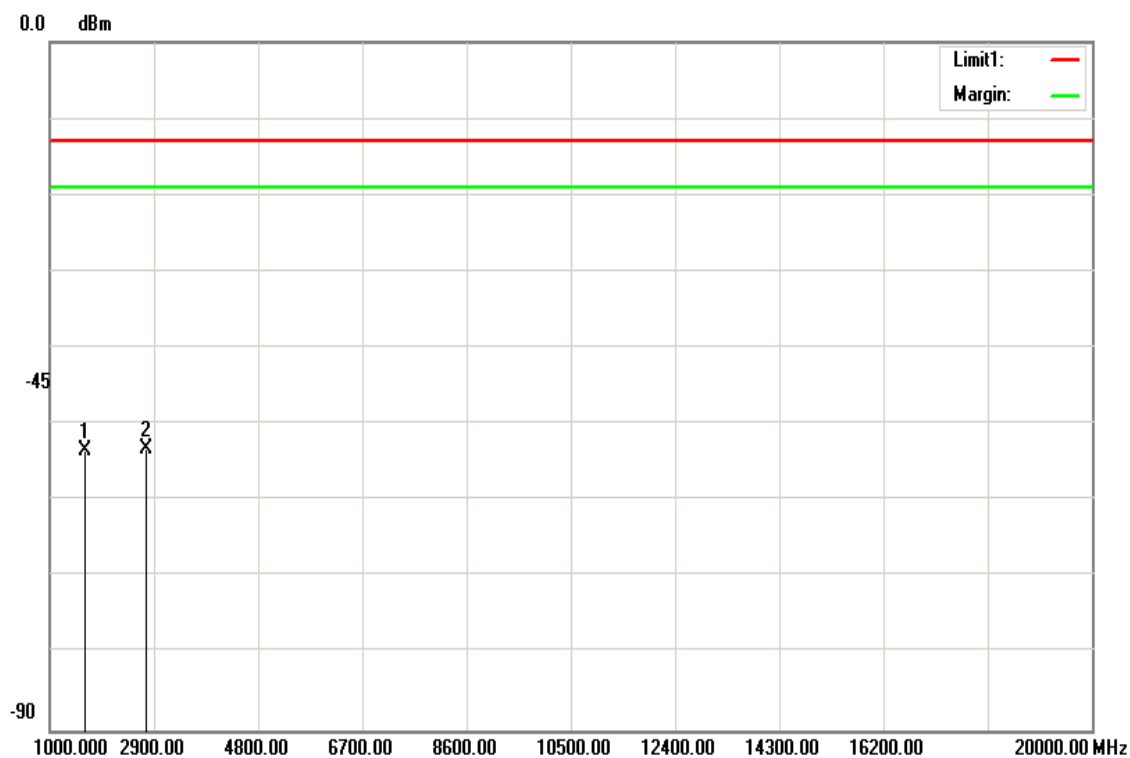


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1652.000	-56.88	1.52	-55.36	-13.00	-42.36	V
2749.000	-62.88	6.51	-56.37	-13.00	-43.37	V
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band V / TX / Low CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Hor.

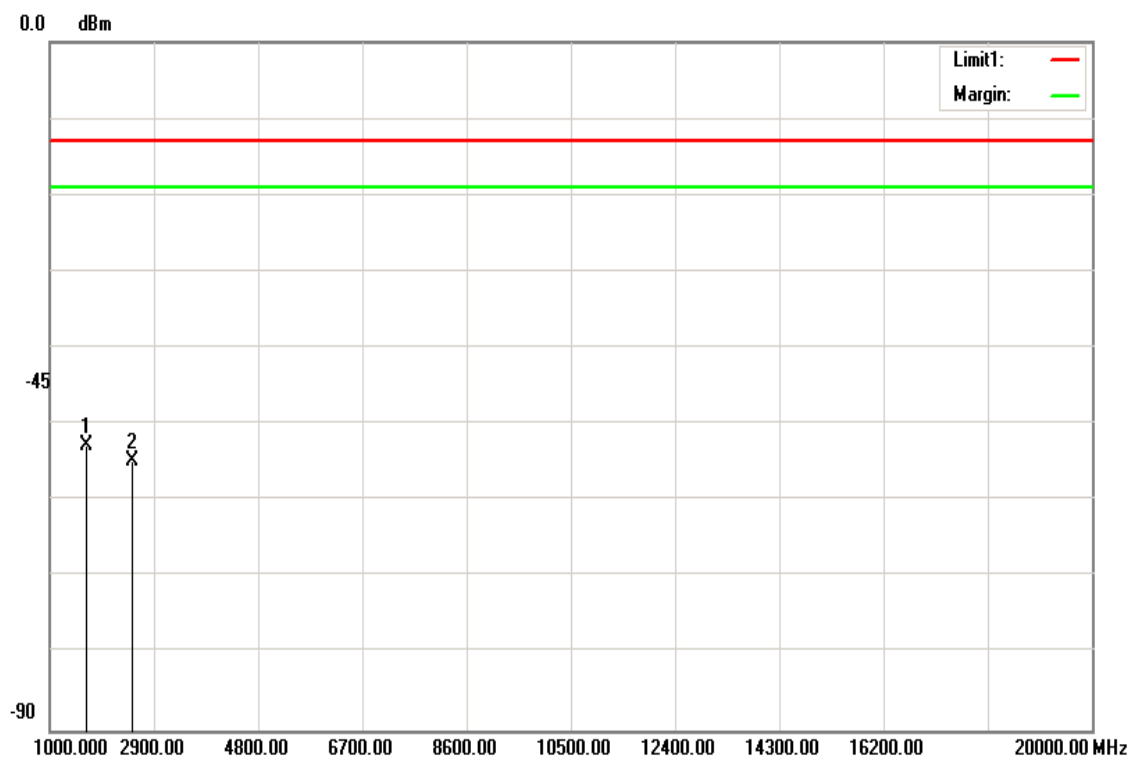


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1652.000	-54.95	1.52	-53.43	-13.00	-40.43	H
2749.000	-59.82	6.51	-53.31	-13.00	-40.31	H
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band V / TX / Mid CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Ver.

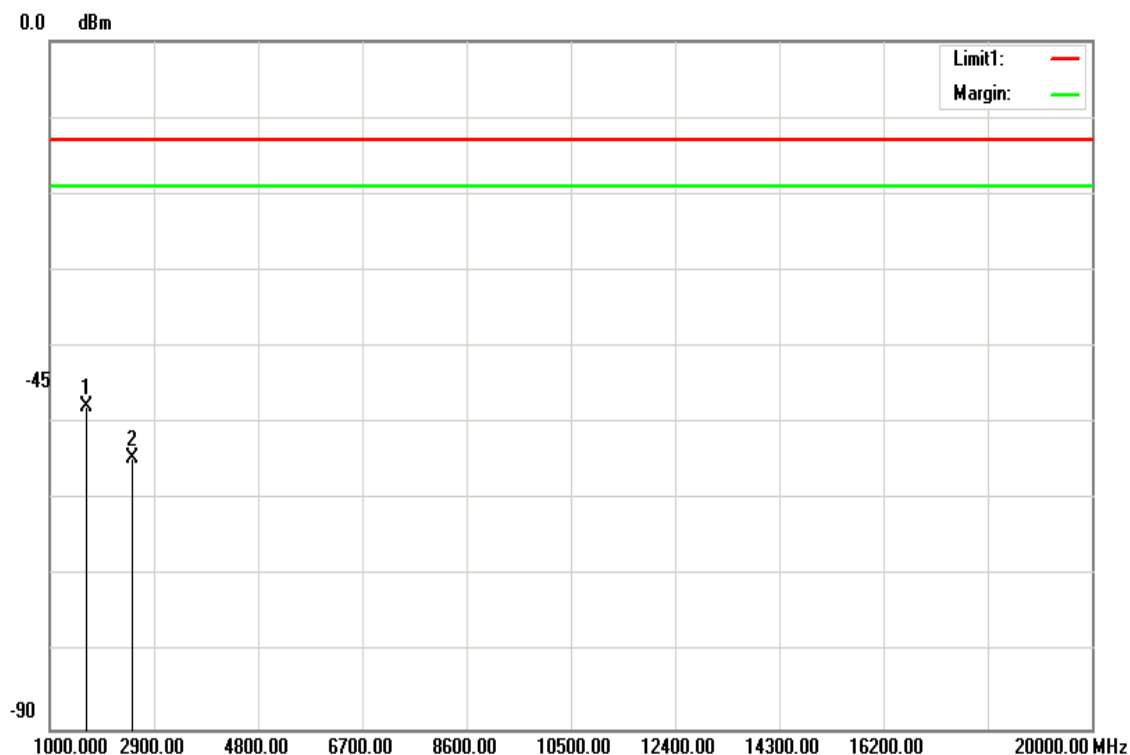


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1672.000	-54.38	1.52	-52.86	-13.00	-39.86	V
2509.000	-56.81	2.02	-54.79	-13.00	-41.79	V
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band V / TX / Mid CH 4182
Test Date: February 8, 2018
Temperature: 24°C
Tested by: Ivan Wang
Humidity: 52 % RH
Polarity: Hor.

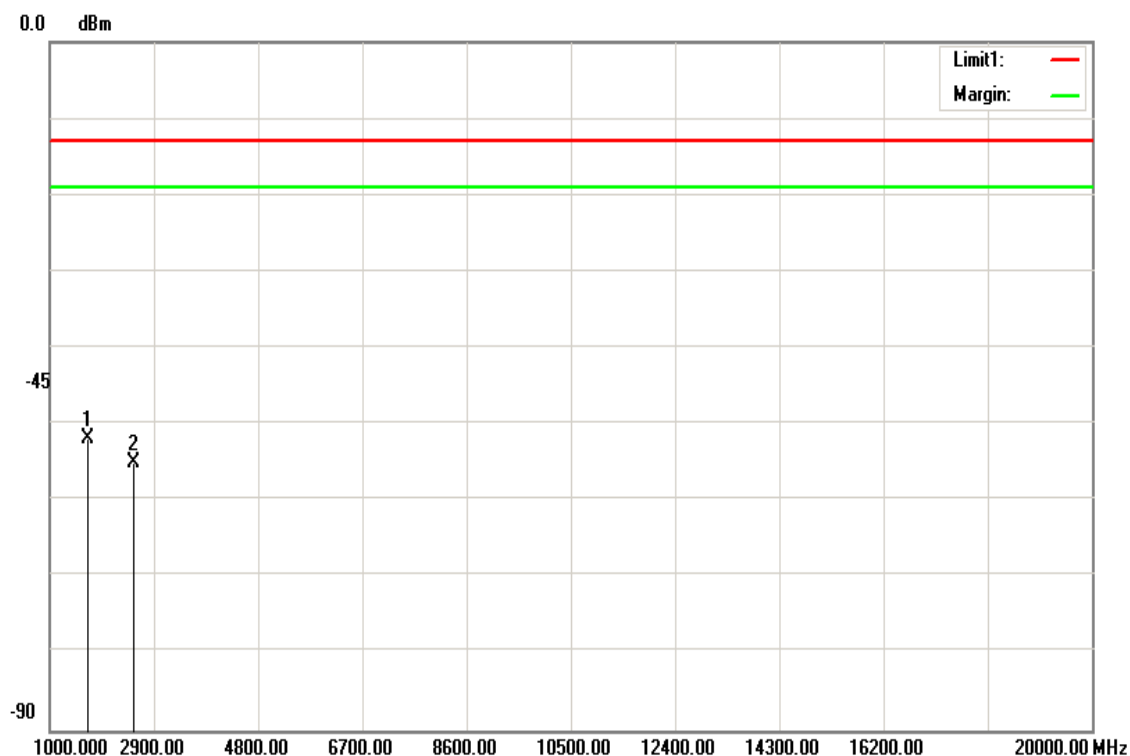


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1672.000	-49.33	1.52	-47.81	-13.00	-34.81	H
2509.000	-56.53	2.02	-54.51	-13.00	-41.51	H
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band V / TX /High CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Ver.

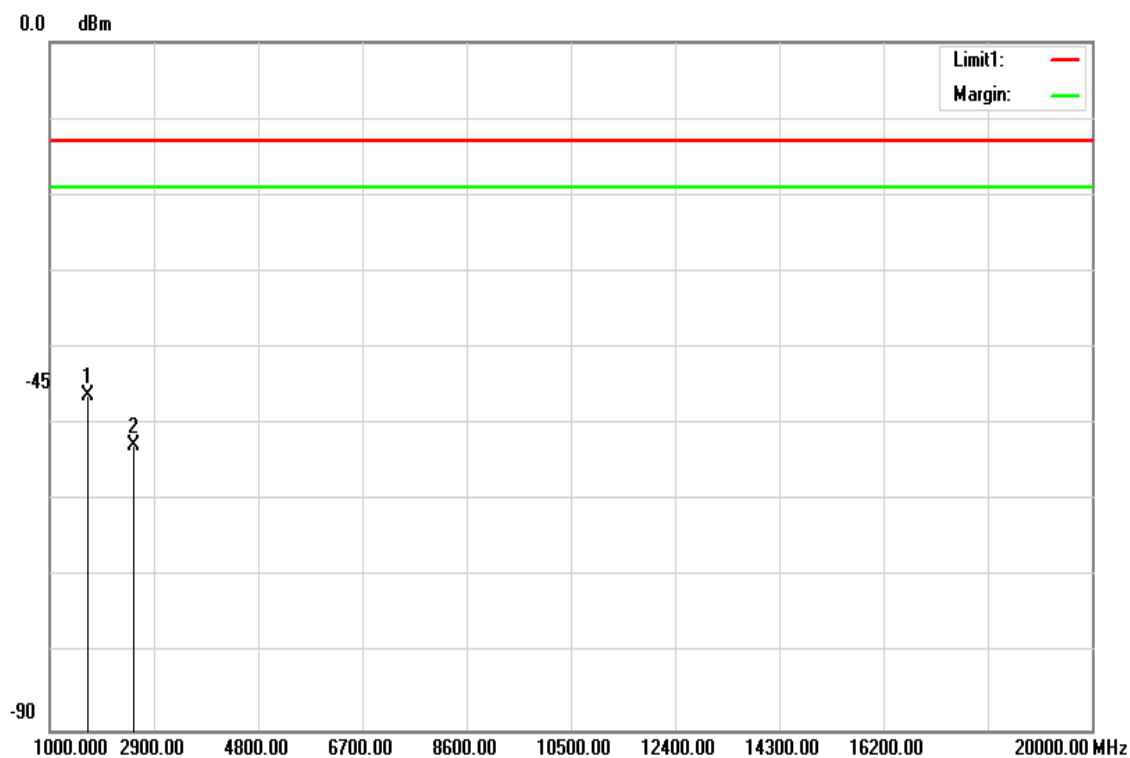


Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1693.000	-53.26	1.51	-51.75	-13.00	-38.75	V
2539.000	-57.62	2.58	-55.04	-13.00	-42.04	V
N/A						

Remark:

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

Operation Mode: WCDMA 12.2k RMC
 Band V / TX /High CH **Test Date:** February 8, 2018
Temperature: 24°C **Tested by:** Ivan Wang
Humidity: 52 % RH **Polarity:** Hor.



Frequency (MHz)	S.G. (dBm)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)	Antenna Polarization (V/H)
1693.000	-47.85	1.51	-46.34	-13.00	-33.34	H
2539.000	-55.3	2.58	-52.72	-13.00	-39.72	H
N/A						

Remark:

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

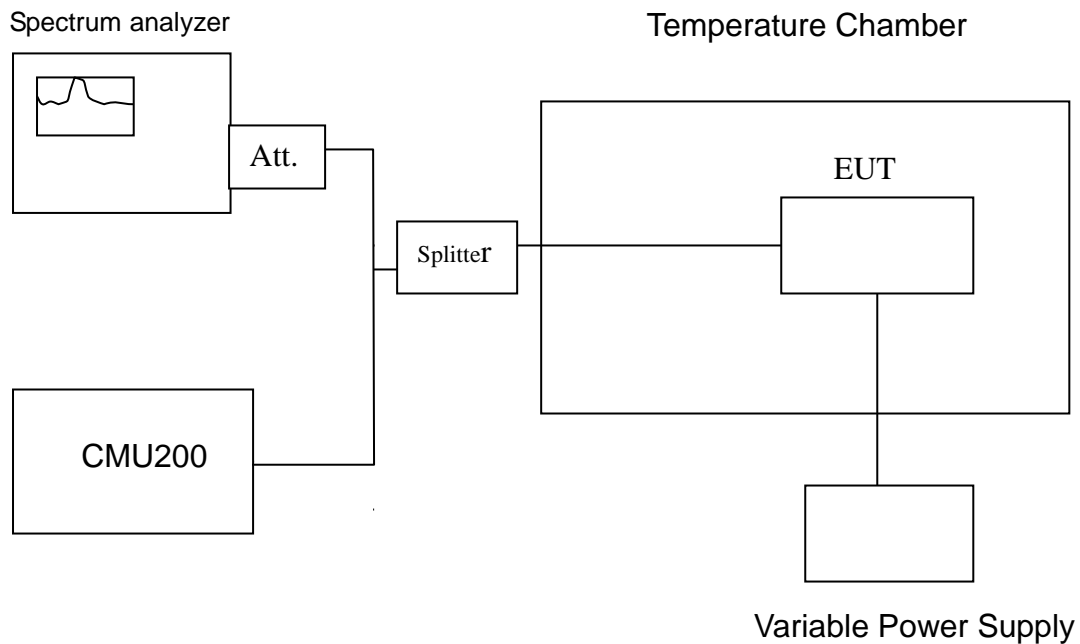
8.8 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

LIMIT

According to FCC §2.1055, FCC §22.355, FCC §24.235.

Frequency Tolerance: 2.5 ppm

Test Configuration



Remark: Measurement setup for testing on Antenna connector

TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST RESULTS

No non-compliance noted.

Test Results

FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT:

Reference Frequency: WCDMA 12.2k RMC Band II Low Channel 1852.4 MHz				
Limit: ± 2.5 ppm = 4631Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
12	50	2.00	0.0011	+/- 2.5
12	40	1.00	0.0005	
12	30	5.00	0.0027	
12	20	9.00	0.0049	
12	10	3.00	0.0016	
12	0	5.00	0.0027	
12	-10	1.00	0.0005	
12	-20	8.00	0.0043	

Reference Frequency: WCDMA 12.2k RMC Band II Mid Channel 1880 MHz				
Limit: ± 2.5 ppm = 4700Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
12	50	3.00	0.0016	+/- 2.5
12	40	4.00	0.0021	
12	30	4.00	0.0021	
12	20	4.00	0.0021	
12	10	6.00	0.0032	
12	0	8.00	0.0043	
12	-10	7.00	0.0037	
12	-20	5.00	0.0027	

Reference Frequency: WCDMA 12.2k RMC Band II High Channel 1907.6 MHz				
Limit: ± 2.5 ppm = 4769Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
12	50	-5.00	-0.0026	+/- 2.5
12	40	-2.00	-0.0010	
12	30	-3.00	-0.0016	
12	20	-7.00	-0.0037	
12	10	-2.00	-0.0010	
12	0	-5.00	-0.0026	
12	-10	-1.00	-0.0005	
12	-20	-8.00	-0.0042	

Reference Frequency: WCDMA 12.2k RMC Band V Low Channel 826.4 MHz				
Limit: ± 2.5 ppm = 2066Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
12	50	3.00	0.0036	+/- 2.5
12	40	2.00	0.0024	
12	30	5.00	0.0061	
12	20	5.00	0.0061	
12	10	4.00	0.0048	
12	0	2.00	0.0024	
12	-10	1.00	0.0012	
12	-20	3.00	0.0036	

Reference Frequency: WCDMA 12.2k RMC Band V Mid Channel 836.6 MHz				
Limit: ± 2.5 ppm = 2091.5Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
12	50	-1.00	-0.0012	+/- 2.5
12	40	-5.00	-0.0060	
12	30	-3.00	-0.0036	
12	20	-2.00	-0.0024	
12	10	-5.00	-0.0060	
12	0	-4.00	-0.0048	
12	-10	-8.00	-0.0096	
12	-20	-1.00	-0.0012	

Reference Frequency: WCDMA 12.2k RMC Band II High Channel 846.6 MHz				
Limit: ± 2.5 ppm = 2116.5Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
12	50	-5.00	-0.0059	+/- 2.5
12	40	-6.00	-0.0071	
12	30	-4.00	-0.0047	
12	20	-8.00	-0.0094	
12	10	-8.00	-0.0094	
12	0	-4.00	-0.0047	
12	-10	-2.00	-0.0024	
12	-20	-1.00	-0.0012	

FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT:

Reference Frequency: WCDMA 12.2k RMC Band II Low Channel 1852.4 MHz				
Limit: ± 2.5 ppm = 4700Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
10.2	20	6.00	0.0032	+/- 2.5
12	20	9.00	0.0049	
13.8	20	4.00	0.0022	

Reference Frequency: WCDMA 12.2k RMC Band II Mid Channel 1880 MHz				
Limit: ± 2.5 ppm = 4700Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
10.2	20	8.00	0.0043	+/- 2.5
12	20	4.00	0.0021	
13.8	20	5.00	0.0027	

Reference Frequency: WCDMA 12.2k RMC Band II High Channel 1907.6 MHz				
Limit: ± 2.5 ppm = 4769Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
10.2	20	-2.00	-0.0010	+/- 2.5
12	20	-7.00	-0.0037	
13.8	20	-8.00	-0.0042	

Reference Frequency: WCDMA 12.2k RMC Band V Low Channel 826.4 MHz				
Limit: ± 2.5 ppm = 2066Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
10.2	20	2.00	0.0024	+/- 2.5
12	20	5.00	0.0061	
13.8	20	1.00	0.0012	

Reference Frequency: WCDMA 12.2k RMC Band V Mid Channel 836.6 MHz				
Limit: ± 2.5 ppm = 2091.5Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
10.2	20	-4.00	-0.0048	+/- 2.5
12	20	-2.00	-0.0024	
13.8	20	-1.00	-0.0012	

Reference Frequency: WCDMA 12.2k RMC Band II High Channel 846.6 MHz				
Limit: ± 2.5 ppm = 2116.5Hz				
Power Supply	Environment	Frequency Error	Frequency Error	Limit (ppm)
Vdc	Temperature (°C)	(Hz)	(ppm)	(ppm)
10.2	20	-5.00	-0.0059	+/- 2.5
12	20	-8.00	-0.0094	
13.8	20	-2.00	-0.0024	

- End of test report-