FCC 47 CFR PART 95 SUBPART M
&
INDUSTRY CANADA RSS-251 Issue 1

TEST REPORT

For

Automotive Radar

Model: MRR-20

Trade Name: Mando

Issued to

For FCC:
MANDO corp.
21, Pangyo-ro 255beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, 463-400, South Korea

For IC:
MANDO corp.
21, Pangyo-ro 255beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, 463-400, Korea (Rep.)

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
Issued Date: March 2, 2020

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		February 8, 2018		Initial Issue	ALL	Angel Cheng
01		March 1, 2018		See the following note Rev.(01)	P.8-9, P.20	Angel Cheng
02		March 2, 2020		See the following note Rev.(02)	P.11, P.27-28, A-1	Allison Chen

Rev.(01)

1. Removed section 4.4

2. Add equipment in table

3. Add notes for limits in radiated emission.

Rev.(02)

1. Applicant change PCB version from A to B. Verify radiated emission test data below 1GHz in section 8.3.

2. The above test method for those measurements are in accordance with FCC Part 95 subpart M and IC RSS-251 Issue 1 refer to T171122I01, please see as below: frequency band, equivalent isotropically radiated power (EIRP), radiated spurious emission above 1GHz, and frequency stability.

3. Other information, please refer to T171122I01 and this test report.

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1. TEST RESULT CERTIFICATION

Applicant:	**For FCC:** MANDO corp. 21, Pangyo-ro 255beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, 463-400, South Korea **For IC:** MANDO corp. 21, Pangyo-ro 255beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, 463-400, Korea (Rep.)
Manufacturer:	**For FCC:** MANDO corp. 21, Pangyo-ro 255beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, 463-400, South Korea **For IC:** MANDO corp. 21, Pangyo-ro 255beon-gil, Bundang-gu, Gyeonggi-do, Seongnam-si, 463-400, Korea (Rep.)
Equipment Under Test:	Automotive Radar
Trade Name:	Mando
Model:	MRR-20
Date of Test:	November 27, 2017 ~ February 5, 2018; February 20, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 95 Subpart M & INDUSTRY CANADA RSS-251 issue 1	No non-compliance noted
Statements of Conformity	
Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.	

We hereby certify that:

All test results conform to above mentioned standards.
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 ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 95.3367 and 95.3379.

The test results of this report relate only to the tested sample EUT identified in this report.
Approved by:

Kevin Tsai
Deputy Manager

2. EUT DESCRIPTION

Product	Automotive Radar
Trade Name	Mando
Model Number	MRR-20
Model Discrepancy	N/A
Received Date	February 17, 2020
Power Supply	12.0-V_{DC} from power supply
Frequency Band	76.0 – 77.0 GHz
Modulation	FMCW
Number of Channel	1 (76.5 GHz)
Antenna Designation	Patch Antenna / Gain: 20 dBi
Temperature Range	-40°C to +85 °C

Remark:

1. *The sample selected for test was production product and was provided by manufacturer.*

3. TEST SUMMERY

Report Section	FCC Standard Section	IC Standard Section	Test Item	Result
8.1	95.3379(b)	RSS-251 Sec 5.1	Frequency band	Pass
8.2	95.3367	RSS-251 Sec 5.2.2	Equivalent Isotropically Radiated Power (EIRP)	Pass
8.3	95.3379(a)	RSS-251 Sec 5.3	Radiated spurious emissions	Pass
8.4	95.3379(b)	RSS-251 Sec 5.4	Frequency stability	Pass

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 , ANSI 63.4 2014 and FCC CFR 47 Part 95.3367, 95.3379.

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 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in ANSI C63.10: 2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 1.5 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in ANSI C63.10: 2013.

4.4 DESCRIPTION OF TEST MODES

The EUT (model: MRR-20) had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed. The worst case data rate is determined as the data rate with highest output power.

The product does not transmits in stop condition.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

Radiated Emission Measurement Above 1G	
Test Condition	**Radiated Emission Above 1G**
Voltage/Hz	**12V**
Test Mode	**Mode 1:EUT power by Battery.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Voltage/Hz	**12V**
Test Mode	**Mode 1:EUT power by Battery.**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

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

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.*

Conducted Emissions Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal Date**	**Cal Due**
Spectrum Analyzer	R&S	FSV 40	101073	10/05/2017	10/04/2018
Thermostatic/Hrgrosatic Chamber	GWINSTEK	GTC-288MH-CC	TH160402	05/23/2017	05/22/2018
Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-75 / FS-Z75	10001 / 100162	04/21/2017	04/20/2018
Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-110 / FS-Z110	10003 / 100096	04/23/2017	04/22/2018
Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-170 / SAM-170	10003 / 20011	04/26/2017	04/25/2018
Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-220 / SAM-220	10003 / 20013	04/29/2017	04/28/2018
Harmonic Mixer	Radiometer Physics Gmbn	FH-PP-325 / SAM-325	10007 / 20048	05/04/2017	05/03/2018
Harmonic Mixer	A-INFO / ROHDE&SCHWARZ	LB-19-20-A / FS-Z60	J202020872 / 100142	04/16/2017	04/15/2018

3M 966 Chamber Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal Date**	**Cal Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	06/20/2017	06/19/2018
Horn Antenna	EMCO	3117	00055165	02/20/2017	02/19/2018
Pre-Amplifier	EMCI	EMC 012635	980151	08/01/2017	07/31/2018
Pre-Amplifier	EMEC	EM330	060609	06/07/2017	06/06/2018
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	7/31/2017	7/30/2018
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	7/31/2017	7/30/2018
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

Test date: Verify radiated emission test data below 1GHz in section 8.3

3M 966 Chamber Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Cal Date**	**Cal Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/26/2019	07/25/2020
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Coaxial Cable	EMCI	EMC105	190914+25111	09/20/2019	09/19/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/15/2020	01/14/2021
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/29/2019	05/28/2020
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	e3 6.11-20180413				

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 6dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
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
3M Semi Anechoic Chamber / 40G~60G	+/- 1.8509
3M Semi Anechoic Chamber / 60G~75G	+/- 1.9869
3M Semi Anechoic Chamber / 75G~110G	+/- 2.9651
3M Semi Anechoic Chamber / 110G~170G	+/- 2.7807
3M Semi Anechoic Chamber / 170G~220G	+/- 3.6437
3M Semi Anechoic Chamber / 220G~325G	+/- 4.2982

***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

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

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
Tel: 886-2-2299-9720 / Fax: 886-2-2299-9721

☐ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, TAIWAN, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

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

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 II for the actual connections between EUT and support equipment.

7.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID
1.	DC Power Source	GWINSTEK	SPS-3610	GPE880163	FCC DoC
2.	DC Power Source	Agilent	E3640A	N/A	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.*

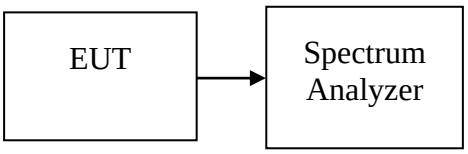
8. TEST REQUIREMENTS

8.1 FREQUENCY BAND

LIMIT

According to FCC 95.3379(b) and RSS-251 Sec 5.1, systems using digital modulation techniques may operate in the 76.0 GHz-77 GHz.

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. Set the RBW=1MHz the emission bandwidth, VBW ≥ 3 x RBW, Detector = Peak, Trace mode = Max hold, Sweep = 100S. Mark point1 and point 2 to Measure the operation frequency range.

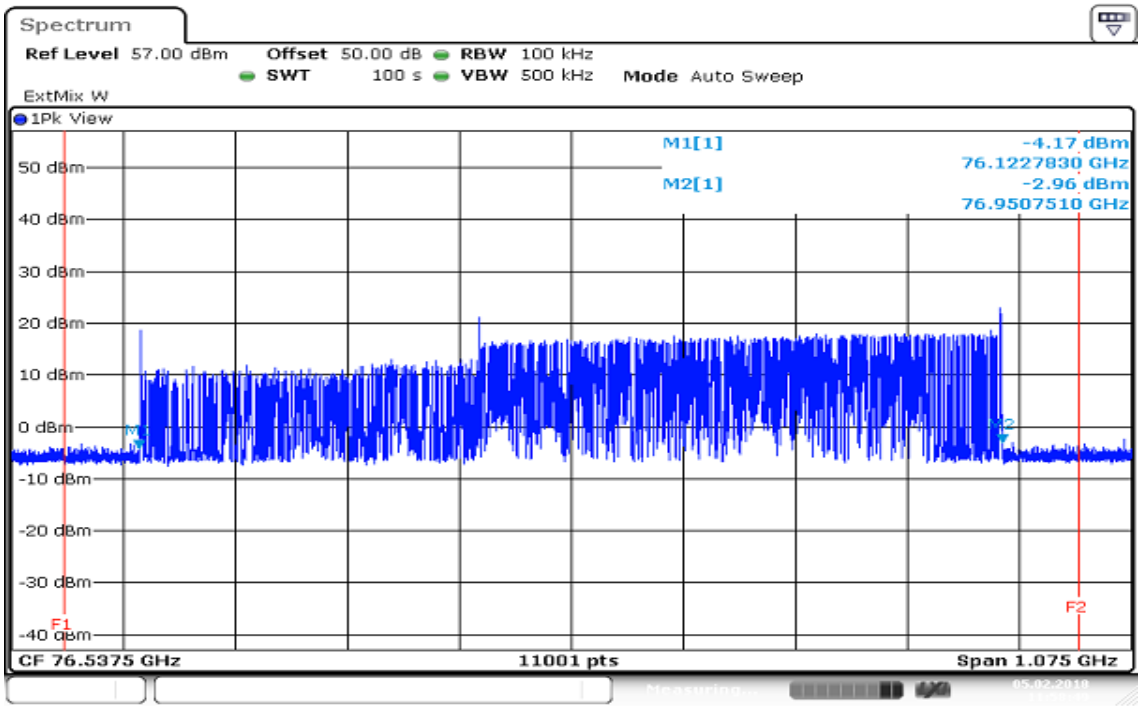
TEST RESULTS

No non-compliance noted

Test Data

Test Plot

20℃ / 12V



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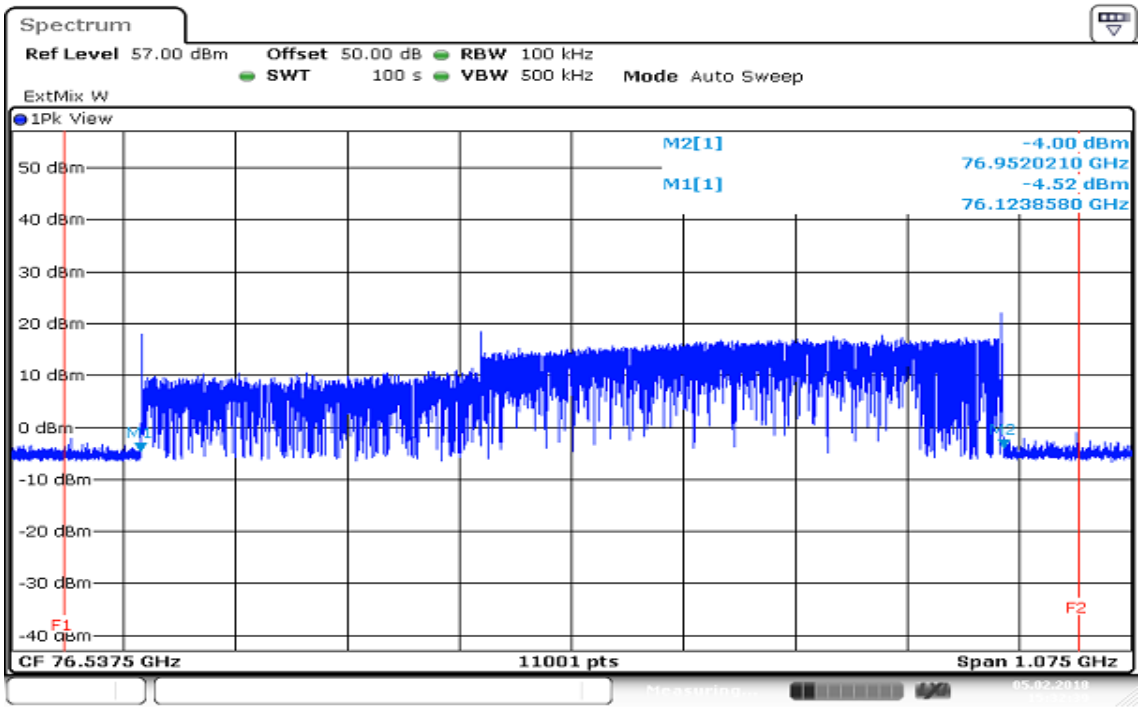
-40℃ / 12V



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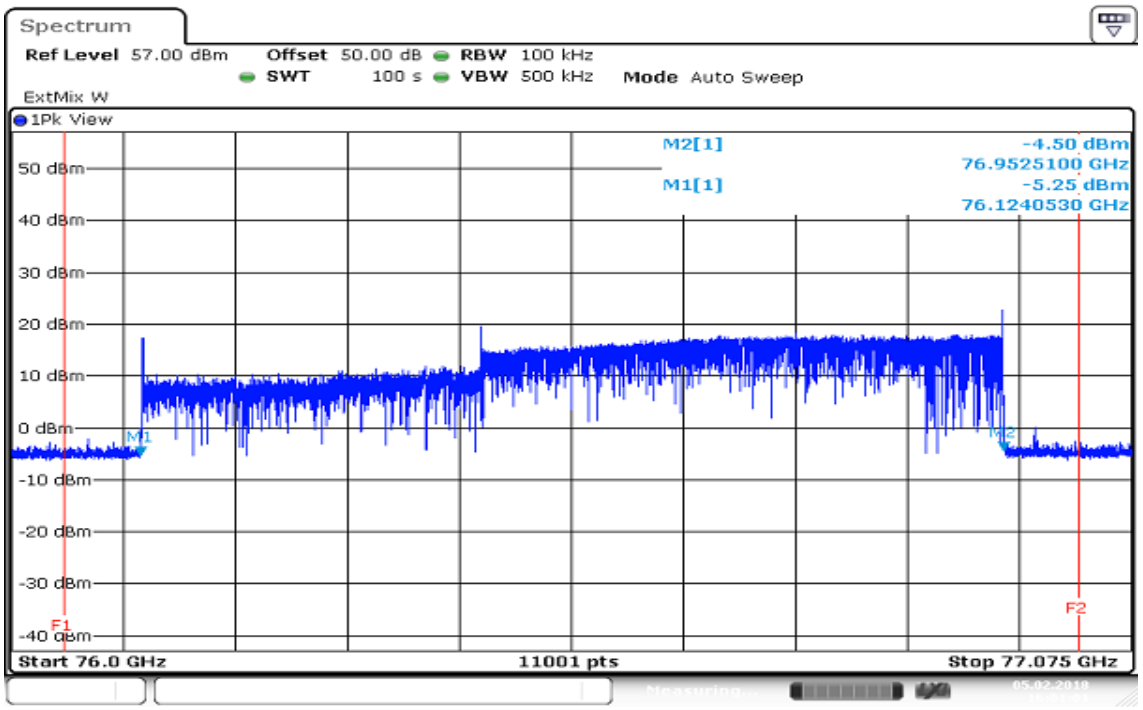
85℃ / 12V



Date: 5.FEB.2018 16:01:02

8.2 EQUIVALENT ISOTROPICALLY RADIATED POWER (EIRP)

LIMIT

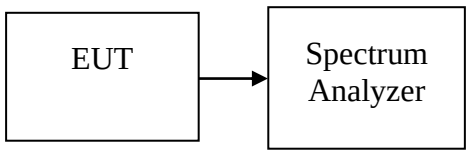
The fundamental radiated emission limits within the 76-81 GHz band are expressed in terms of Equivalent Isotropically Radiated Power (EIRP) and are as follows:

According to FCC 95.3367 and RSS-251 Sec 5.2.2

The maximum power (EIRP) within the 76-81 GHz band shall not exceed 50 dBm based on measurements employing a power averaging detector with a 1 MHz Resolution Bandwidth (RBW).

The maximum peak power (EIRP) within the 76-81 GHz band shall not exceed 55 dBm based on measurements employing a peak detector with a 1 MHz RBW.

Test Configuration



TEST RESULTS

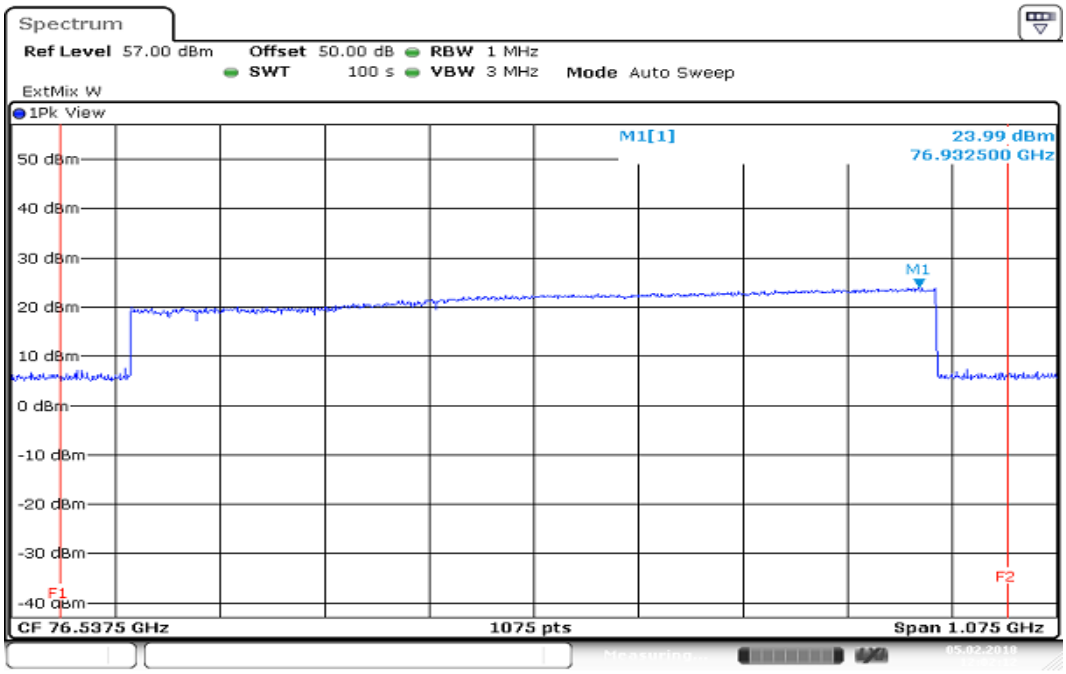
No non-compliance noted.

Test Condition	Frequency(GHz)	Peak EIRP(dBm)	Limit (dBm)
20℃ / 12V	76.2	23.99	55
-40℃ / 12V		23.22	
85℃ / 12V		23.00	

Test Condition	Frequency(GHz)	AVG EIRP (dBm)	Limit (dBm)
20℃ / 12V	76.2	22.35	50
-40℃ / 12V		22.35	
85℃ / 12V		22.09	

Test Data
Peak Power

20℃ / 12V



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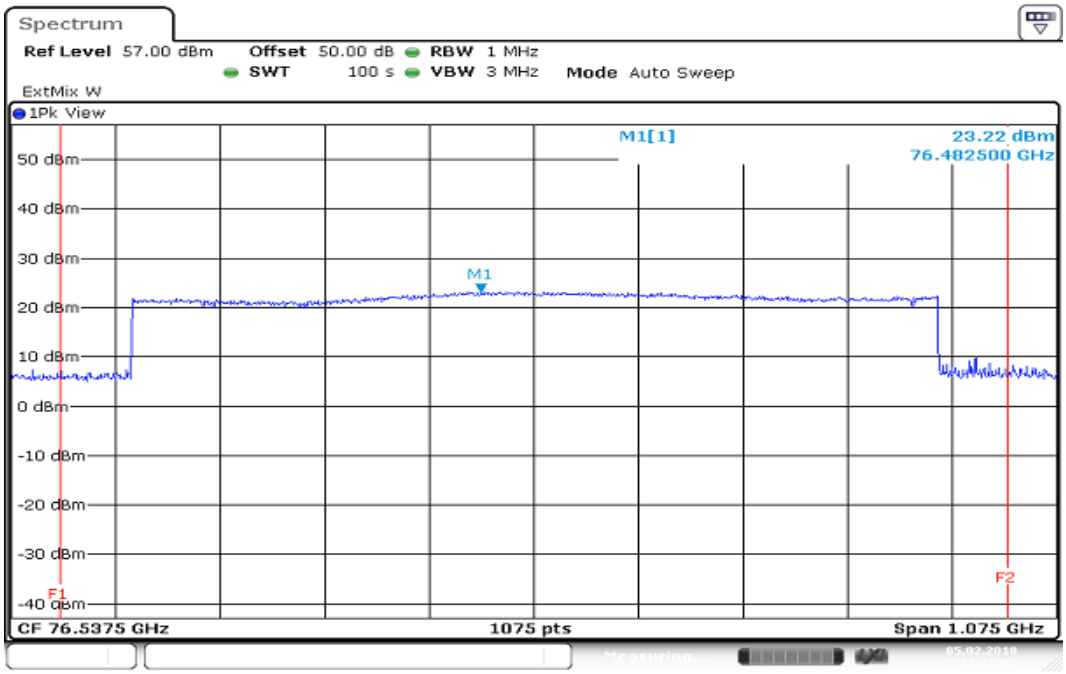
-40℃ / 12V



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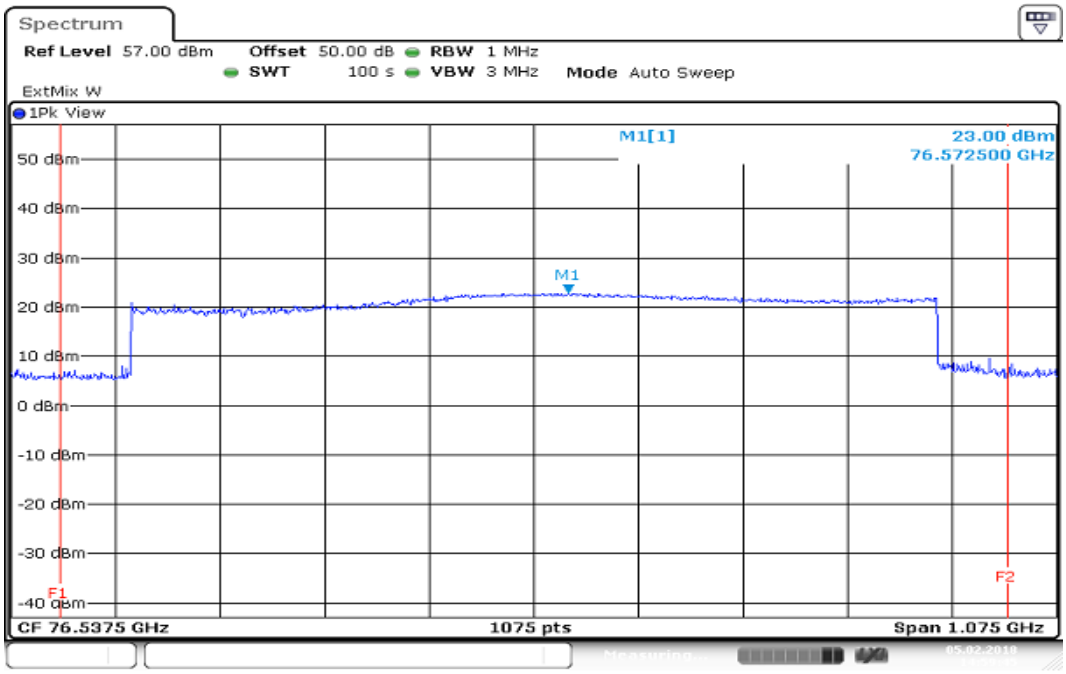
85℃ / 12V



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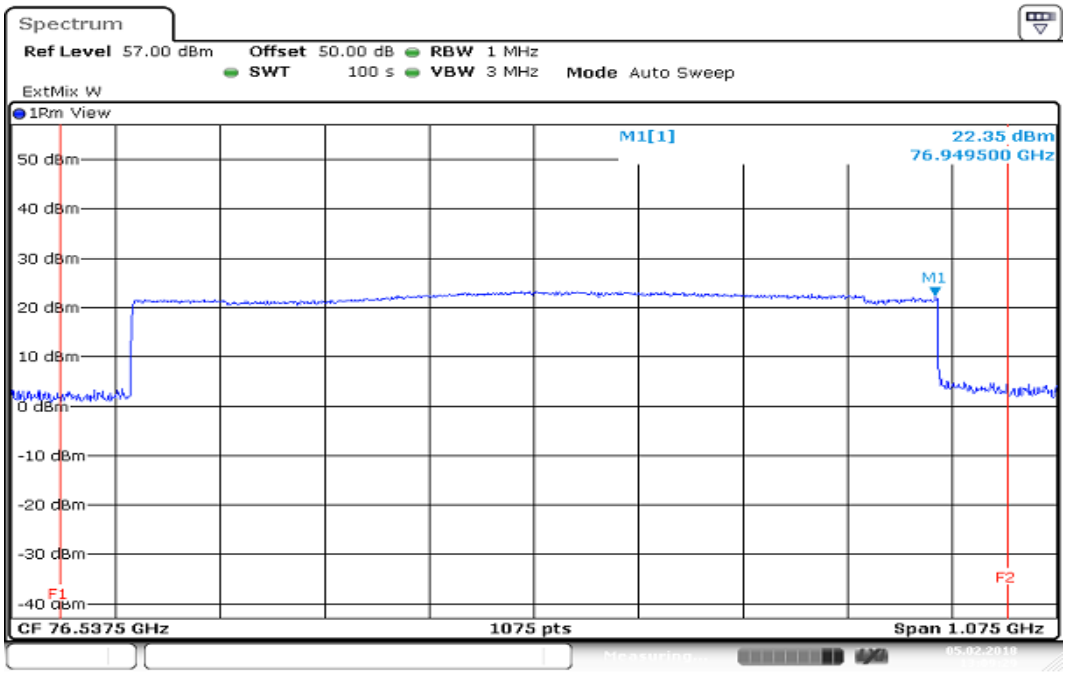
Average Power

20℃ / 12V



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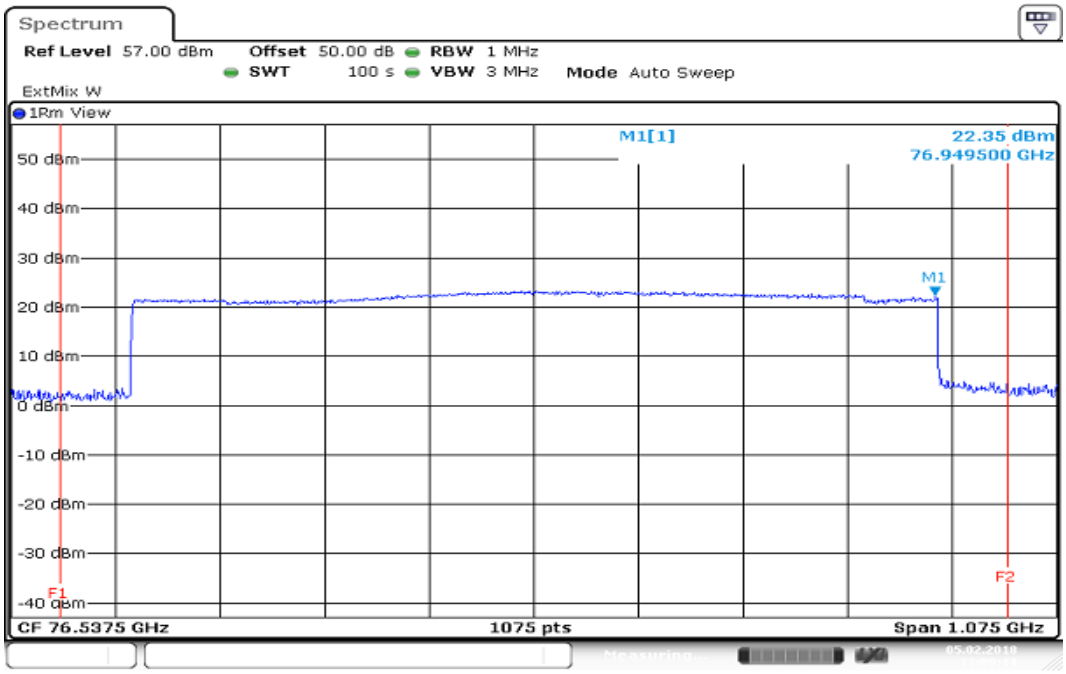
-40℃ / 12V



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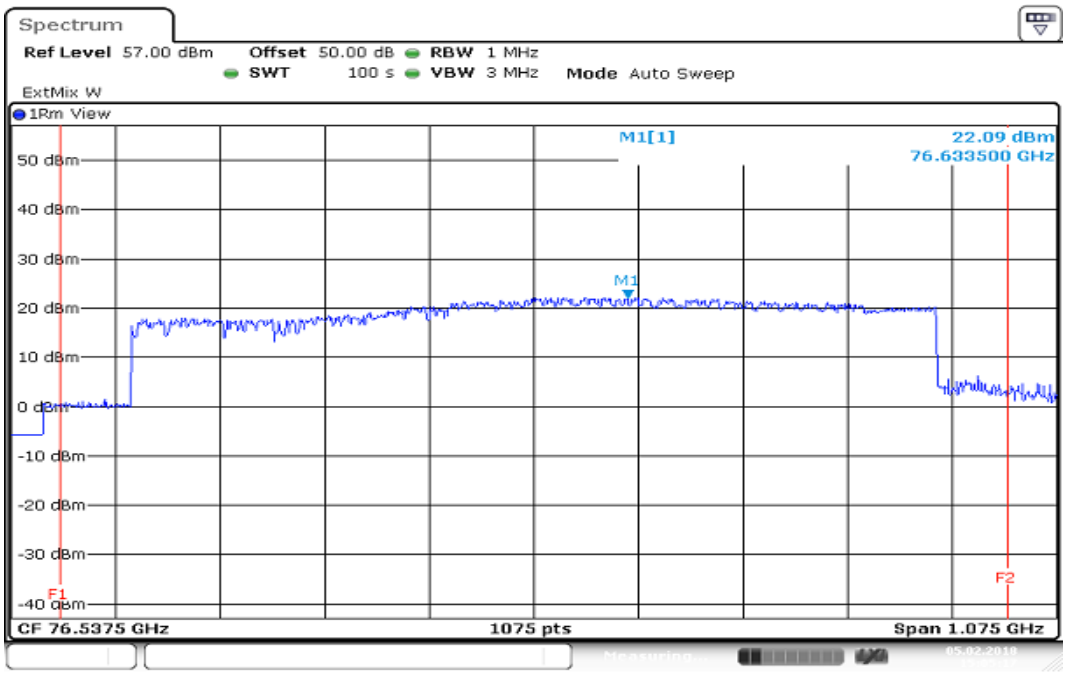
85℃ / 12V



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8.3 SPURIOUS EMISSIONS

8.3.1 Radiated Emissions

LIMIT

1. According to FCC PART 95.3379(a) and RSS-251 Sec 5.3, Radiated emissions below 40 GHz shall not exceed the field strength as shown in the following emissions table.

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

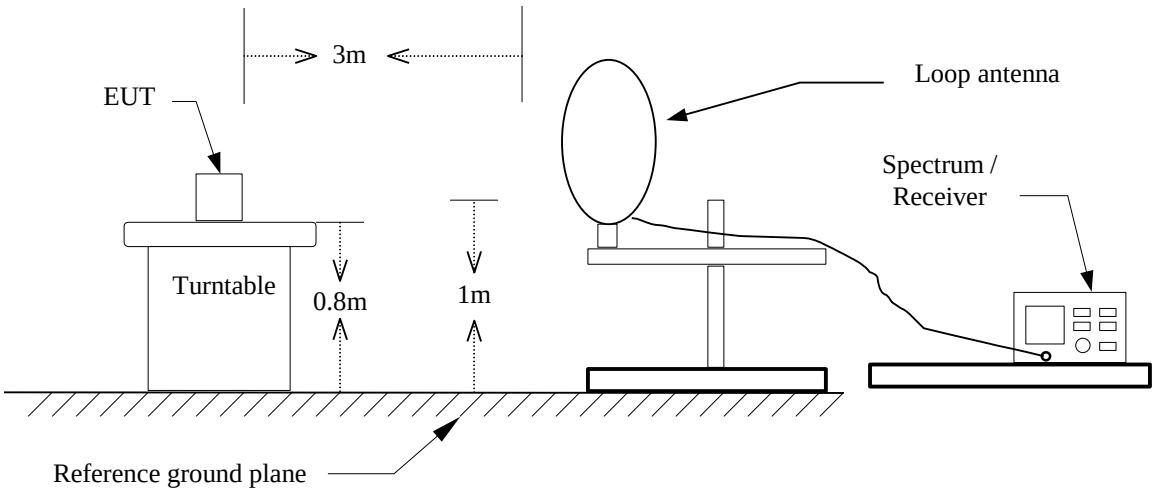
2. For radiated emissions outside the 76-81 GHz band between 40 GHz and 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 600 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.
3. For radiated emissions above 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 1000 pW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure.

Notes:
P(mW) = Power density (mW/m^2) X 4π(r)^2
600 pW/cm^2 = -1.7dBm @ 3m = 7.84 dBm @ 1m
1000 pW/cm^2 = 0.5 dBm @ 3m = 10.04 dBm @ 1m

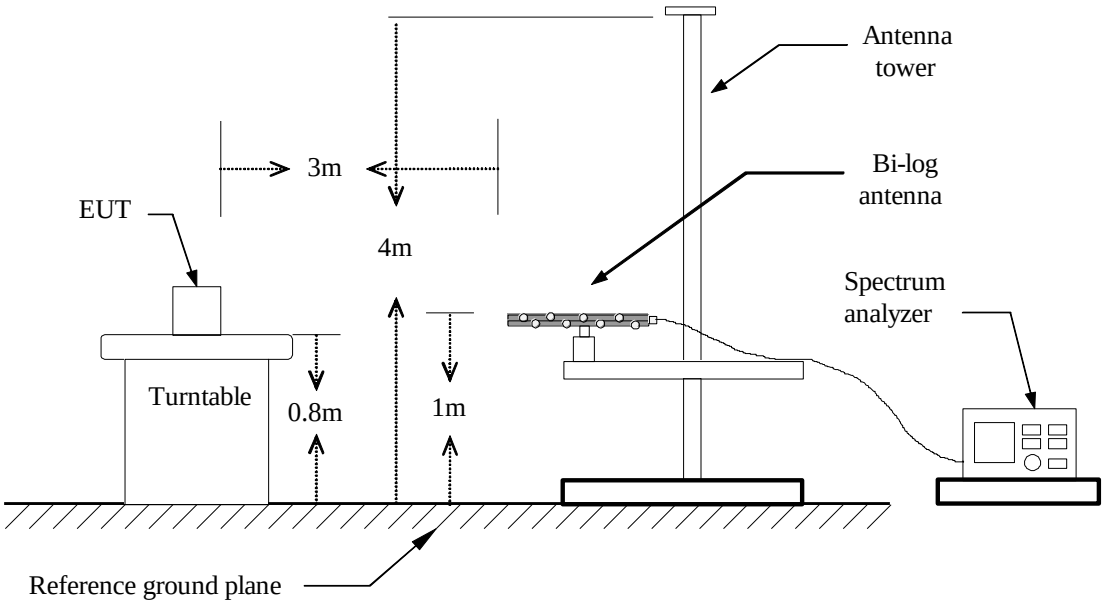
P: Power
r: measurement distance(m)

Test Configuration

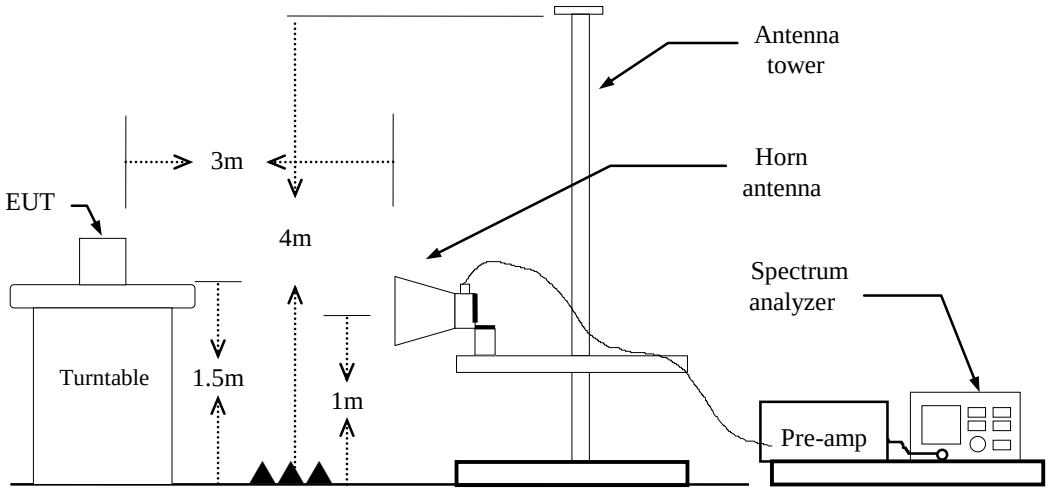
9kHz ~ 30MHz



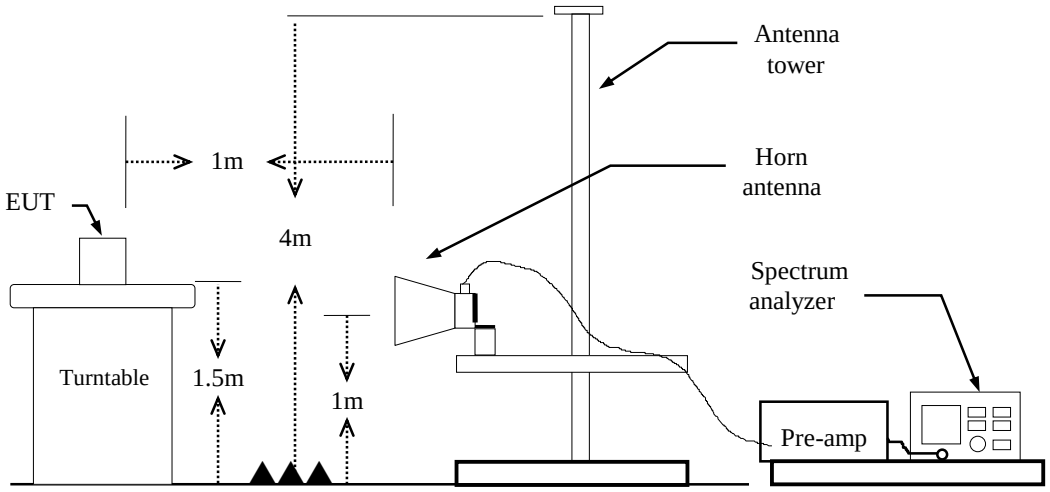
30MHz ~ 1 GHz



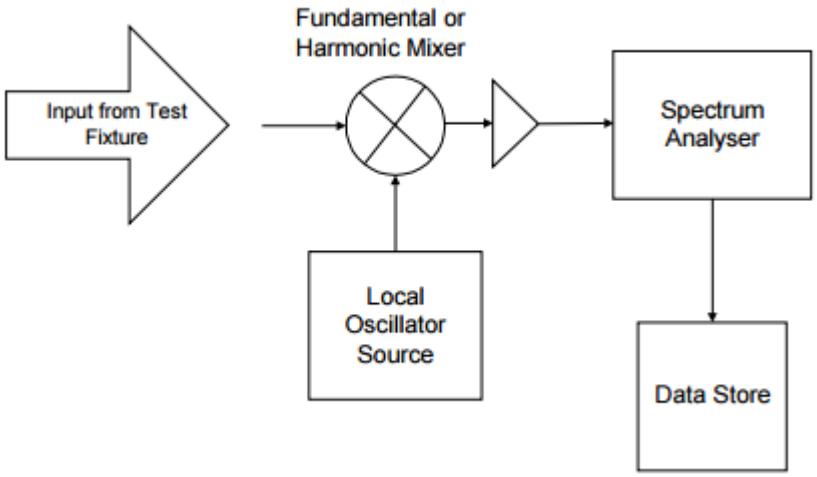
Above 1 GHz ~ 18GHz



18GHz ~ 40GHz



Above 40 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 1GHz:

   RBW=100kHz / VBW=300kHz / Sweep=AUTO

   Above 1GHz:

   (a)PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

   (b)AVERAGE: RBW=1MHz,

   Above 40GHz:

   RBW = 1 MHz, VBW= 3 MHz,

   Detector = Peak, Trace mode = max hold, Sweep = AUTO.
7. Repeat above procedures until the measurements for all frequencies are complete.

Below 1 GHz

Operation Mode: Normal Link **Test Date:** 2020/02/20

Temperature: 19.1℃ **Tested by:** Jerry Chang

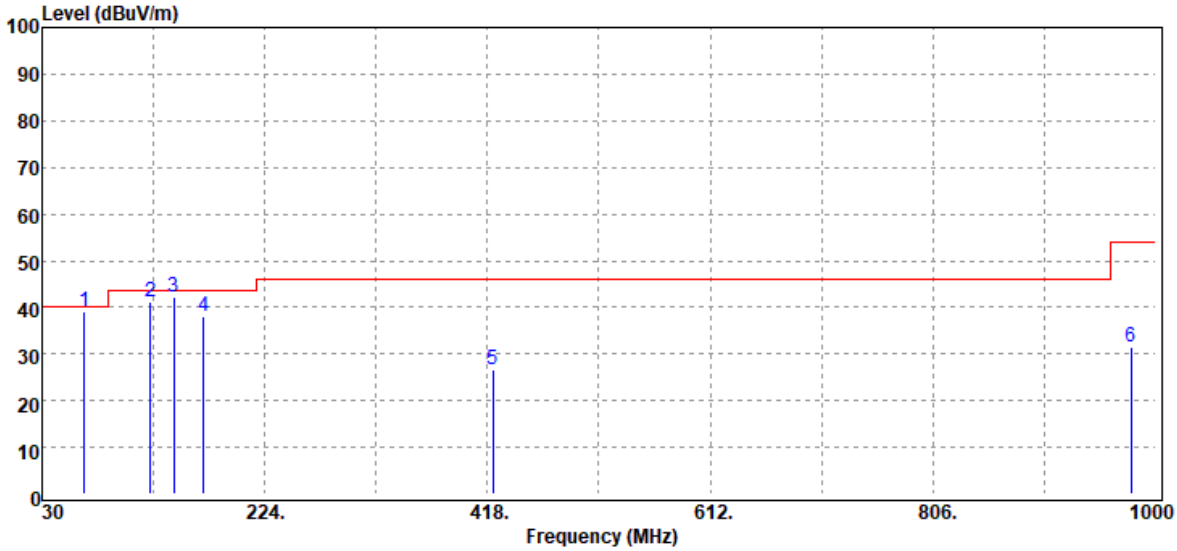
Humidity: 55% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
66.86	54.13	-15.16	38.97	40.00	-1.03	peak	V
124.09	50.03	-8.85	41.18	43.50	-2.32	peak	V
144.46	52.12	-9.92	42.20	43.50	-1.30	peak	V
170.65	48.81	-10.83	37.98	43.50	-5.52	peak	V
422.85	31.23	-4.65	26.58	46.00	-19.42	peak	V
978.66	25.85	5.60	31.45	54.00	-22.55	peak	V
66.86	53.84	-15.16	38.68	40.00	-1.32	peak	H
104.69	50.65	-11.18	39.47	43.50	-4.03	peak	H
124.09	50.21	-8.85	41.36	43.50	-2.14	peak	H
144.46	52.05	-9.92	42.13	43.50	-1.37	peak	H
173.56	47.74	-10.99	36.75	43.50	-6.75	peak	H
422.85	31.41	-4.65	26.76	46.00	-19.24	peak	H

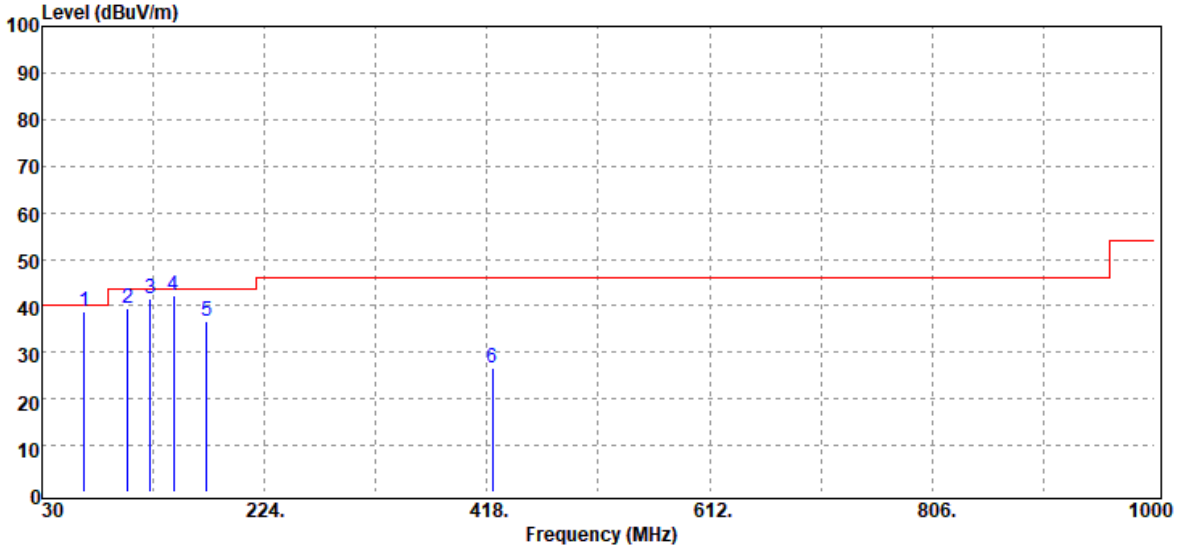
Remark:

1. *No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).*
2. *Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.*
3. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.*
4. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
5. *Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).*

Polarity : Vertical



Polarity : Horizontal



Above 1 GHz

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

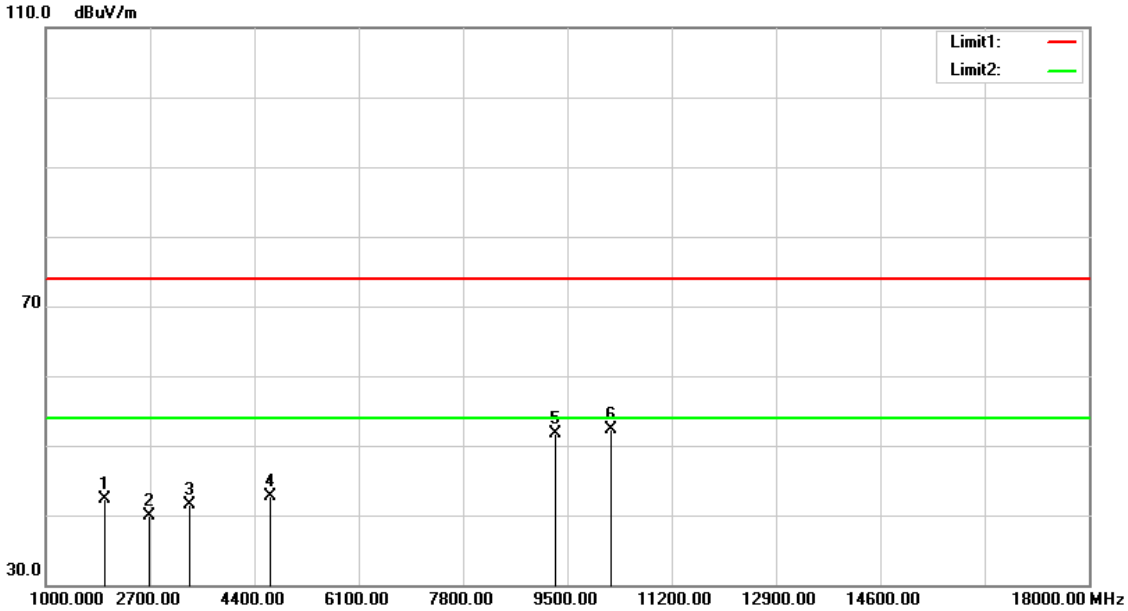
Humidity: 53% RH **Polarity:** Ver. / Hor.

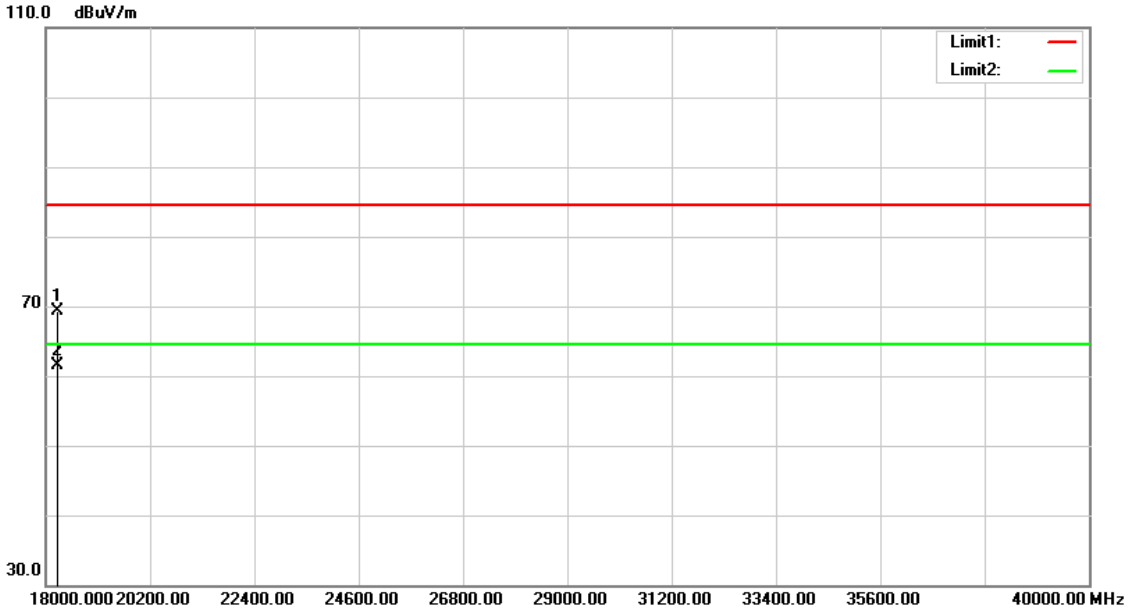
Frequency (MHz)	Reading (dBuV)	Correction (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pol. (H/V)
1966.000	46.71	-4.44	42.27	74.00	-31.73	peak	V
2687.000	42.12	-2.27	39.85	74.00	-34.15	peak	V
3345.000	41.09	0.36	41.45	74.00	-32.55	peak	V
4668.000	38.69	4.10	42.79	74.00	-31.21	peak	V
9300.000	38.69	12.98	51.67	74.00	-22.33	peak	V
10210.000	38.31	13.94	52.25	74.00	-21.75	peak	V
18255.000	25.21	44.05	69.26	84.54	-15.28	peak	V
18255.000	17.41	44.05	61.46	64.54	-3.08	AVG	V
1966.000	52.92	-4.44	48.48	74.00	-25.52	peak	H
3093.000	41.77	-1.10	40.67	74.00	-33.33	peak	H
4591.000	38.92	3.96	42.88	74.00	-31.12	peak	H
5354.000	39.05	5.56	44.61	74.00	-29.39	peak	H
7755.000	38.34	11.12	49.46	74.00	-24.54	peak	H
9170.000	38.64	12.96	51.60	74.00	-22.40	peak	H
18195.000	22.50	43.99	66.49	84.54	-18.05	peak	H
18195.000	17.04	43.99	61.03	64.54	-3.51	AVG	H

Remark:

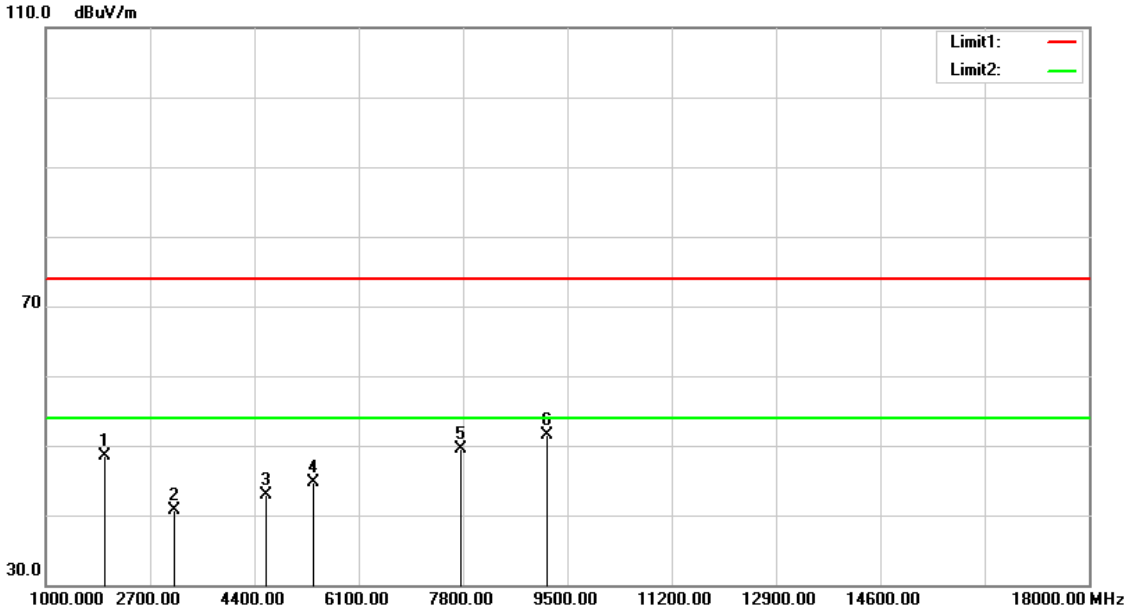
1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

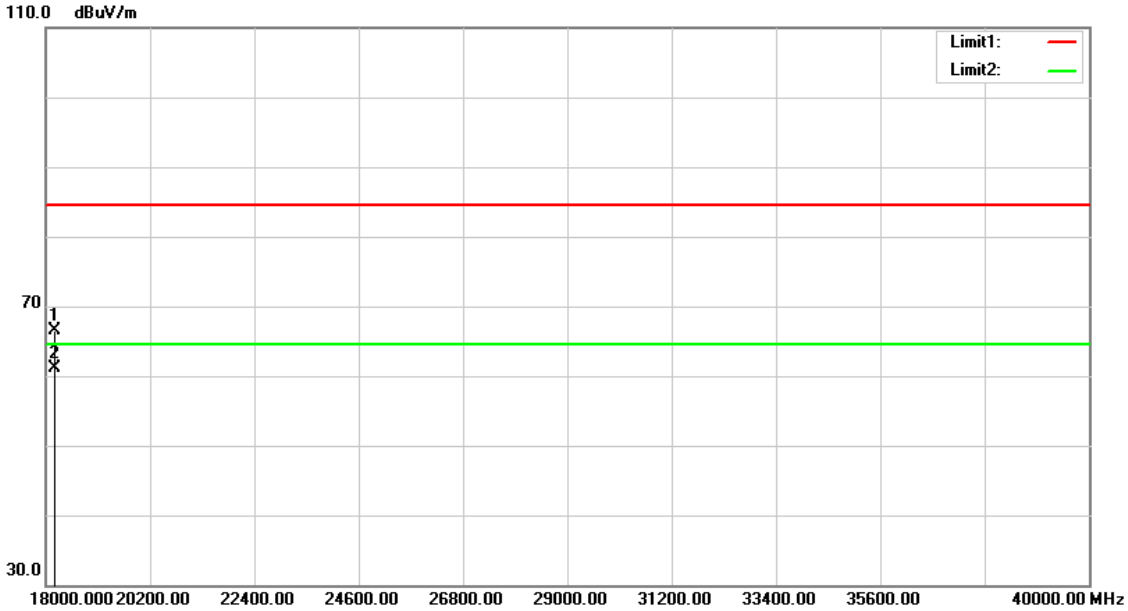
Polarity : Vertical





Polarity : Horizontal



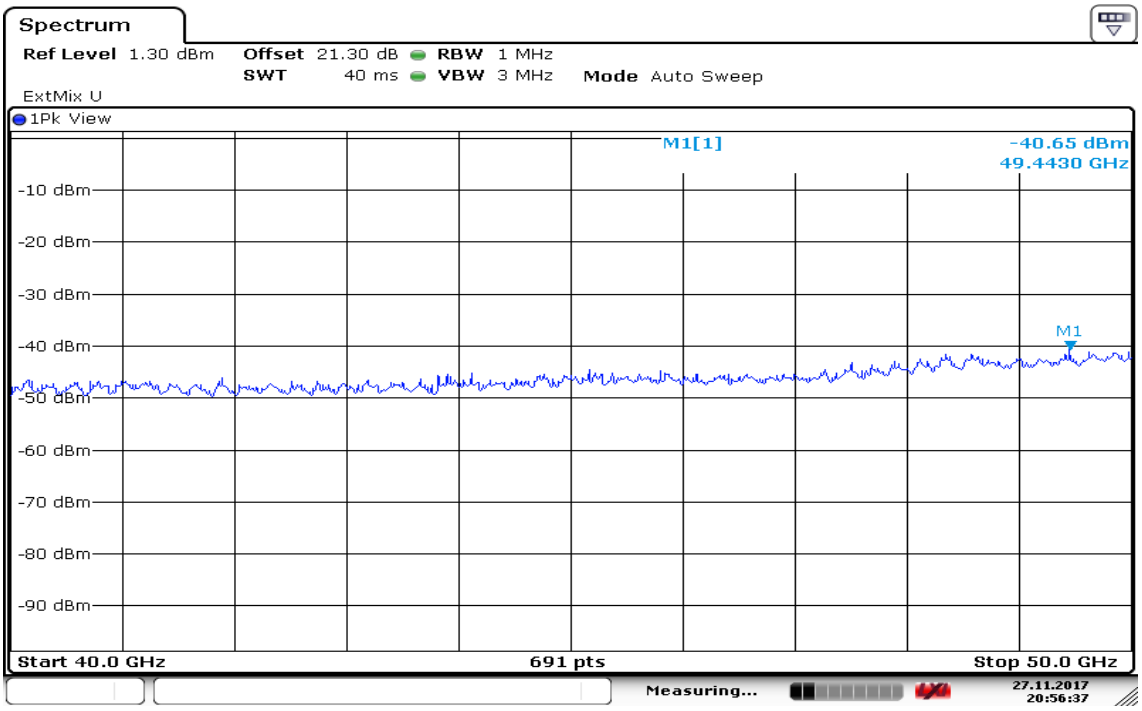


40G-50G

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

Humidity: 53% RH



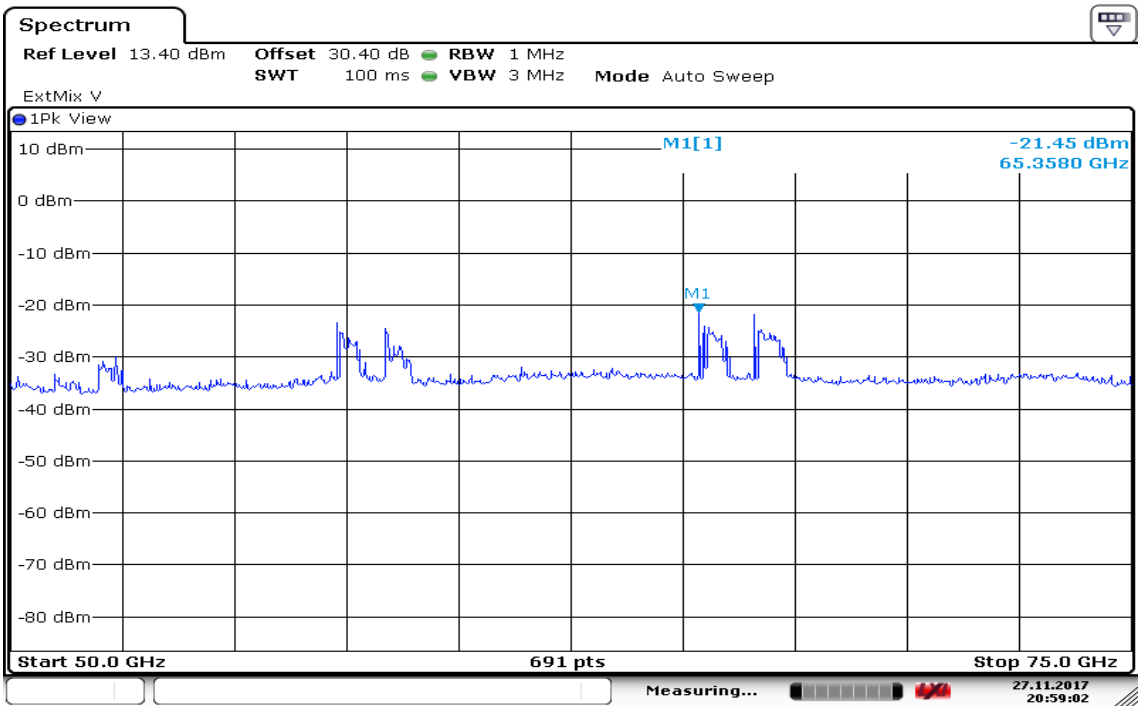
Date: 27.NOV.2017 20:56:38

50G-75G

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

Humidity: 53% RH



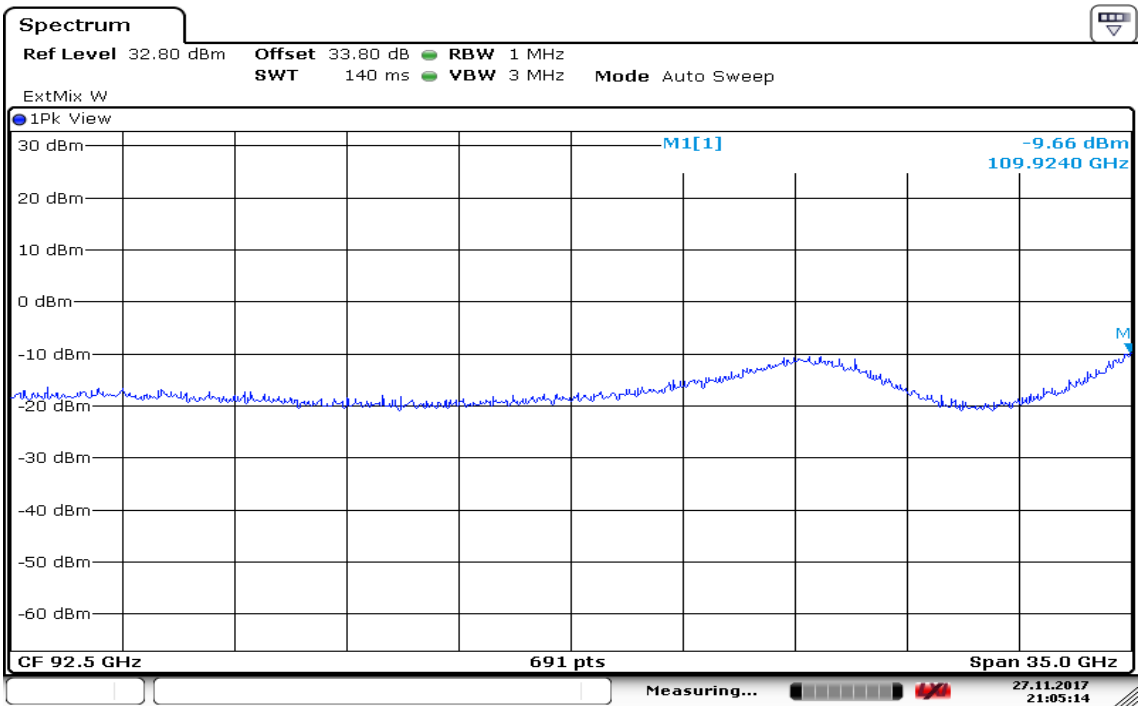
Date: 27.NOV.2017 20:59:02

75G-110G

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

Humidity: 53% RH



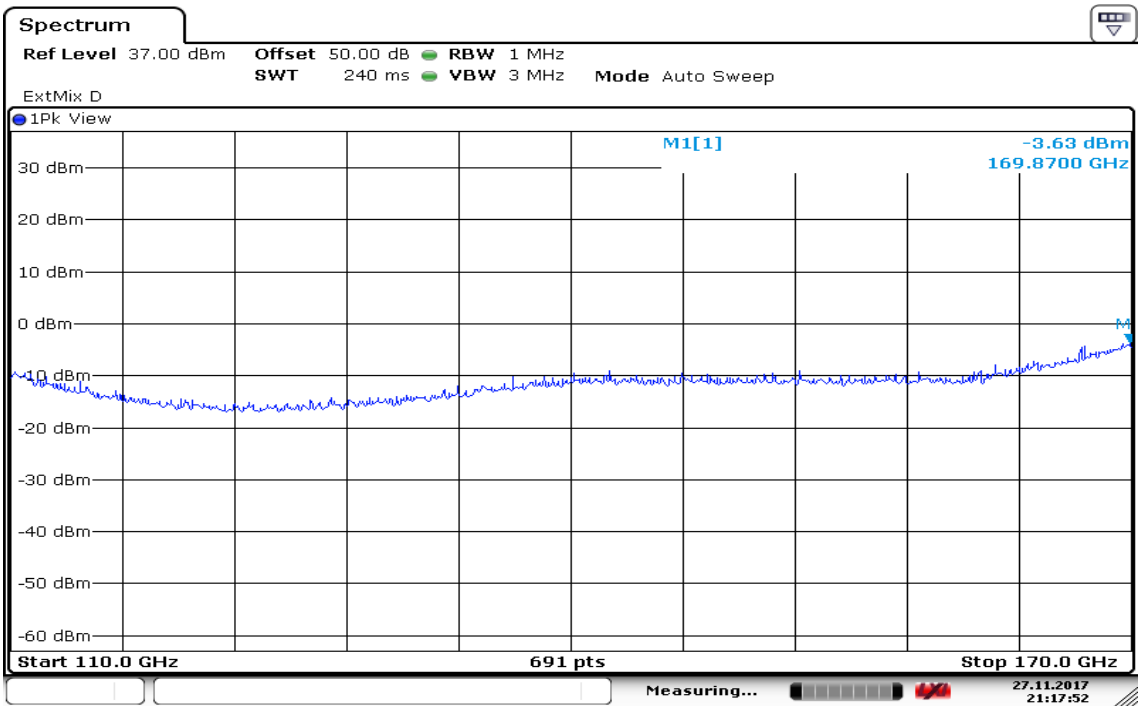
Date: 27.NOV.2017 21:05:15

110G-170G

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

Humidity: 53% RH



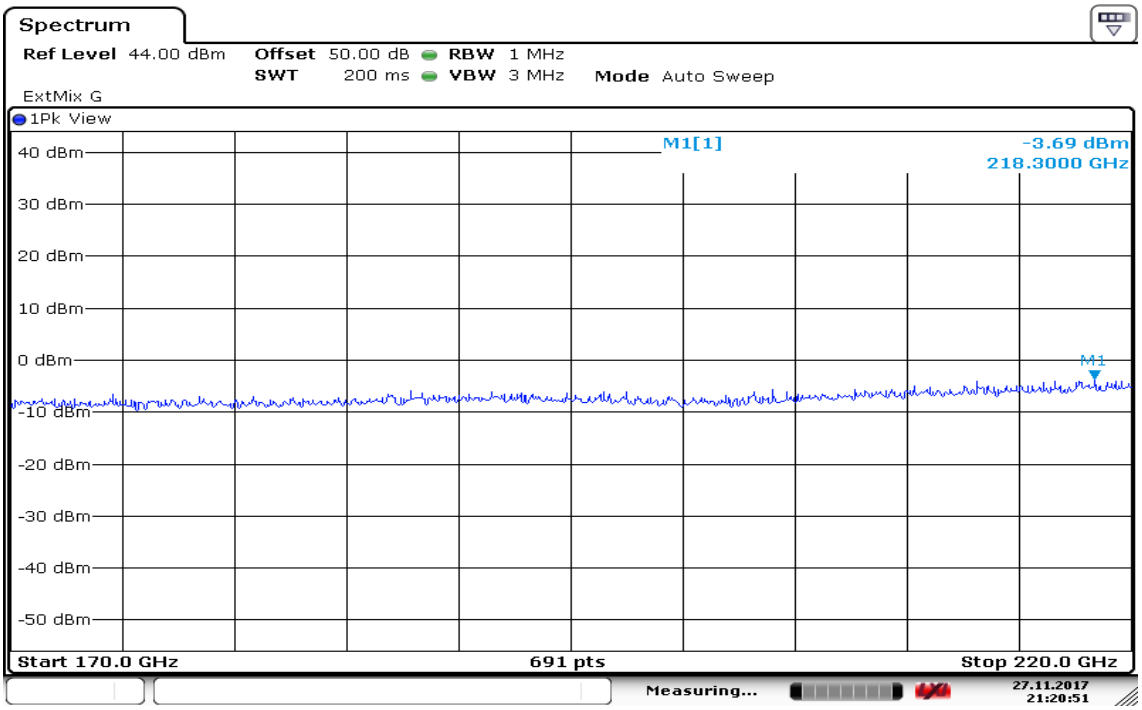
Date: 27.NOV.2017 21:17:53

170G-220G

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

Humidity: 53% RH



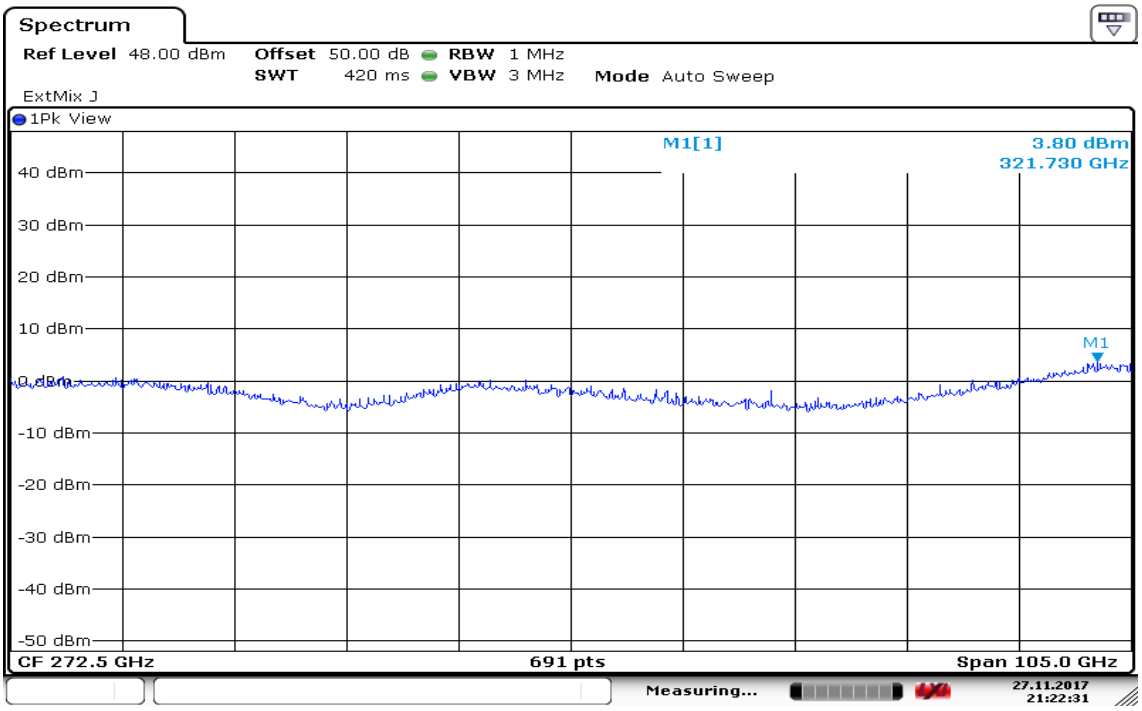
Date: 27.NOV.2017 21:20:52

220G-325G

Operation Mode: Test Mode **Test Date:** 2017/11/27

Temperature: 28°C **Tested by:** Jerry Chuang

Humidity: 53% RH



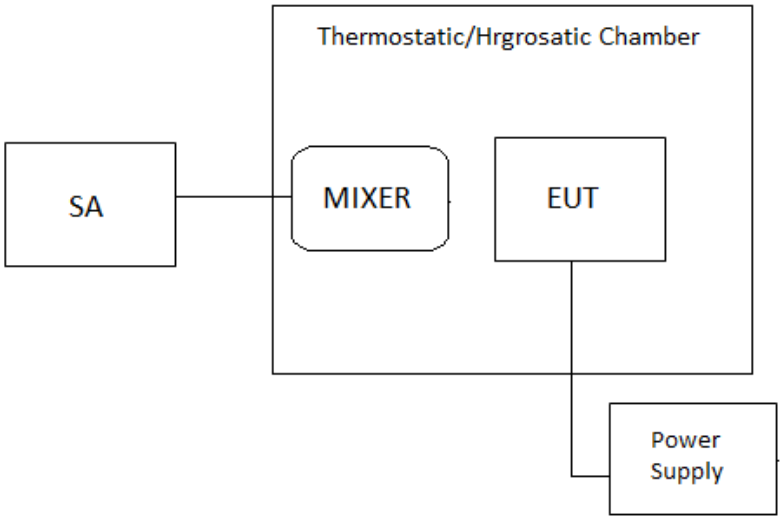
Date: 27.NOV.2017 21:22:31

8.4 FREQUENCY STABILITY

LIMIT

According to FCC 95.3379(b) and RSS-251 Sec 5.4, Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to + 50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

Test Configuration



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.

Operating Frequency: 76.5 GHz					
Environment Temperature(ºC)	Voltage (V)	Measured Frequency (GHz)	Margin	Limit Range(GHz)	Test Result
50	12	76.9513	0.4513	76-77	Pass
40	12	76.9498	0.4498	76-77	Pass
30	12	76.9513	0.4513	76-77	Pass
20	12	76.9498	0.4498	76-77	Pass
10	12	76.9498	0.4498	76-77	Pass
0	12	76.2481	-0.2519	76-77	Pass
-10	12	76.9513	0.4513	76-77	Pass
-20	12	76.2481	-0.2519	76-77	Pass
-30	12	76.9513	0.4513	76-77	Pass

Operating Frequency: 76.5 GHz					
Environment Temperature(ºC)	Voltage (V)	Measured Frequency (GHz)	Margin	Limit Range(GHz)	Test Result
20	10.8	76.9498	0.4498	76-77	Pass
	12	76.9498	0.4498	76-77	Pass
	13.2	76.9501	0.4501	76-77	Pass