



FCC ID: 2A3MR-OSA-79G-AL
Report No.: TMWK2111001137KR



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Rev. 00

FCC 47 CFR PART 95 SUBPART M

TEST REPORT

For

79G RADAR

Model: OSA-79G-AL

Trade Name: AKT

Issued to
AKASAKATEC INC.

3F, Marina Plaza, 4-2 Shiraho, Kanazawa-ku, Yokohama-shi, Kanagawa, Japan

Issued by

**Compliance Certification Services Inc.
Wugu Laboratory**

**No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City, Taiwan. (R.O.C.)**

Issued Date: November 29, 2021

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	November 29, 2021	Initial Issue	ALL	Doris Chu

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1. TEST RESULT CERTIFICATION

Applicant: AKASAKATEC INC.
3F, Marina Plaza, 4-2 Shiraho, Kanazawa-ku, Yokohama-shi,
Kanagawa, Japan

Equipment Under Test: 79G RADAR

Trade Name: AKT

Model: OSA-79G-AL

Date of Test: November 10 ~ 12, 2021

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 95 Subpart M	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, 95.3379 and FCC KDB 653005 D01.

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

Approved by:



Shawn Wu
Supervisor

2. EUT DESCRIPTION

Product	79G RADAR
Trade Name	AKT
Model Number	OSA-79G-AL
Model Discrepancy	N/A
Received Date	November 10, 2021
Power Supply	Power from host device. (DC 12V)
Frequency Band	78.1~79.78 GHz
Modulation	FMCW
Number of Channel	1
Antenna Designation	Patch antenna / Gain: 12.01dBi
Hardware Version	1A1G
Software Version	A1G

Remark:

1. The sample selected for test was production product and was provided by manufacturer.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

3. TEST SUMMARY

Report Section	FCC Standard Section	Test Item	Result
8.1	95.3367	Equivalent Isotropically Radiated Power (EIRP)	Pass
8.2	95.3379(a)	Radiated spurious emissions	Pass
8.3	95.3379(b)	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, ANSI 63.26:2015 and FCC CFR 47 Part 95.3367, 95.3379, FCC KDB 653005 D01.

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: OSA-79G-AL) 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
Power supply Mode	Mode 1: EUT power by DC (12V)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Worst 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)

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT power by DC (12V)
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X, Y, Z and two polarity, for radiated measurement. The worst case(Z-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.

Conducted Emissions Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due
Coaxial Cable	Woken	WC12	SS01	06/28/2021	06/27/2022
Coaxial Cable	Woken	WC12	SS02	06/28/2021	06/27/2022
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-110 / FS-Z110	10003 / 100096	12/09/2019	12/08/2021
Signal Analyzer	R&S	FSV 40	101073	09/07/2021	09/06/2022
DC Power Supplies	GW Instek	SPS-3610	GPE880163	01/05/2021	01/04/2022
Thermostatic/Humidity Chamber	GWINSTEK	GTC-288MH-CC	TH160402	05/10/2021	05/09/2022
Software			N/A		

3M 966 Chamber Test Site Above 40GHz					
Name of Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due
Coaxial Cable	Woken	WC12	SS01	06/28/2021	06/27/2022
Coaxial Cable	Woken	WC12	SS02	06/28/2021	06/27/2022
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-110 / FS-Z110	10003 / 100096	12/09/2019	12/08/2021
Horn Antenna / Harmonic Mixer	A-INFOMW / ROHDE&SCHWARZ	LB-19-20-A / FS-Z60	J202020872 / 100142	12/09/2019	12/08/2021
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-75 / FS-Z75	10001 / 100162	12/09/2019	12/08/2021
Horn Antenna / Spectrum Analyzer Mixer	Radiometer Physics GmbH	FH-PP-220 / SAM-220	10003 / 20013	12/09/2019	12/08/2021
Horn Antenna / Spectrum Analyzer Mixer	Radiometer Physics GmbH	FH-PP-170 / SAM-170	10003 / 20011	12/09/2019	12/08/2021
Horn Antenna / Spectrum Analyzer Mixer	Radiometer Physics GmbH	FH-PP-325 / SAM-325	10007 / 20048	12/09/2019	12/08/2021
Signal Analyzer	R&S	FSV 40	101073	09/07/2021	09/06/2022
Software			e3 6.11-20180419c		

3M 966 Chamber Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	07/19/2021	07/18/2022
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/24/2021	02/23/2022
Coaxial Cable	EMCI	EMC105	190914+111 1	09/17/2021	09/16/2022
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022
Horn Antenna	ETS LINDGREN	3116	26370	12/11/2020	12/10/2021
Horn Antenna	ETS LINDGREN	3117	55165	07/29/2021	07/28/2022
K Type Cable	Huber+Suhner	SUCOFLEX 102	29406/2	12/09/2020	12/08/2021
K Type Cable	Huber+Suhner	SUCOFLEX 102	22470/2	12/09/2020	12/08/2021
Pre-Amplifier	EMEC	EM330	060609	02/24/2021	02/23/2022
Loop Ant	COM-POWER	AL-130	121051	04/07/2021	04/06/2022
Pre-Amplifier	HP	8449B	3008A0096 5	12/25/2020	12/24/2021
Pre-Amplifier	MITEQ	AMF-6F-180040 00-37-8P	985646	09/08/2021	09/07/2022
Spectrum Analyzer	Agilent	E4446A	US4251026 8	09/23/2021	09/22/2022
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	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30 MHz ~1 GHz (Horizontally)	+/- 3.91
3M Semi Anechoic Chamber / 30 MHz ~1 GHz (Vertically)	+/- 4.57
3M Semi Anechoic Chamber / 1 GHz ~ 6 GHz	+/- 5.20
3M Semi Anechoic Chamber / 6 GHz ~ 18 GHz	+/- 5.18
3M Semi Anechoic Chamber / 18 GHz ~ 40 GHz	+/- 3.68
3M Semi Anechoic Chamber / 40 GHz ~ 60 GHz	+/- 4.64
3M Semi Anechoic Chamber / 60 GHz ~ 75 GHz	+/- 4.64
3M Semi Anechoic Chamber / 75 GHz ~ 110 GHz	+/- 4.65
3M Semi Anechoic Chamber / 110 GHz ~ 170 GHz	+/- 4.69
3M Semi Anechoic Chamber / 170 GHz ~ 220 GHz	+/- 5.31
3M Semi Anechoic Chamber / 220 GHz ~ 325 GHz	+/- 5.73

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, Taiwan. (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2299-9721

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	NB(J)	TOSHIBA	PT345T-00L002	N/A	PD97260H

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 EQUIVALENT ISOTROPICALLY RADIATED POWER (EIRP)

LIMIT

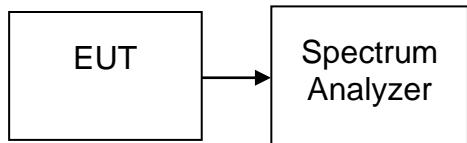
The fundamental radiated emission limits within the 76-81 GHz band are expressed in terms of Equivalent Isotropically Radiated Power (EIRP) and are as follows:

According to FCC 95.3367.

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.

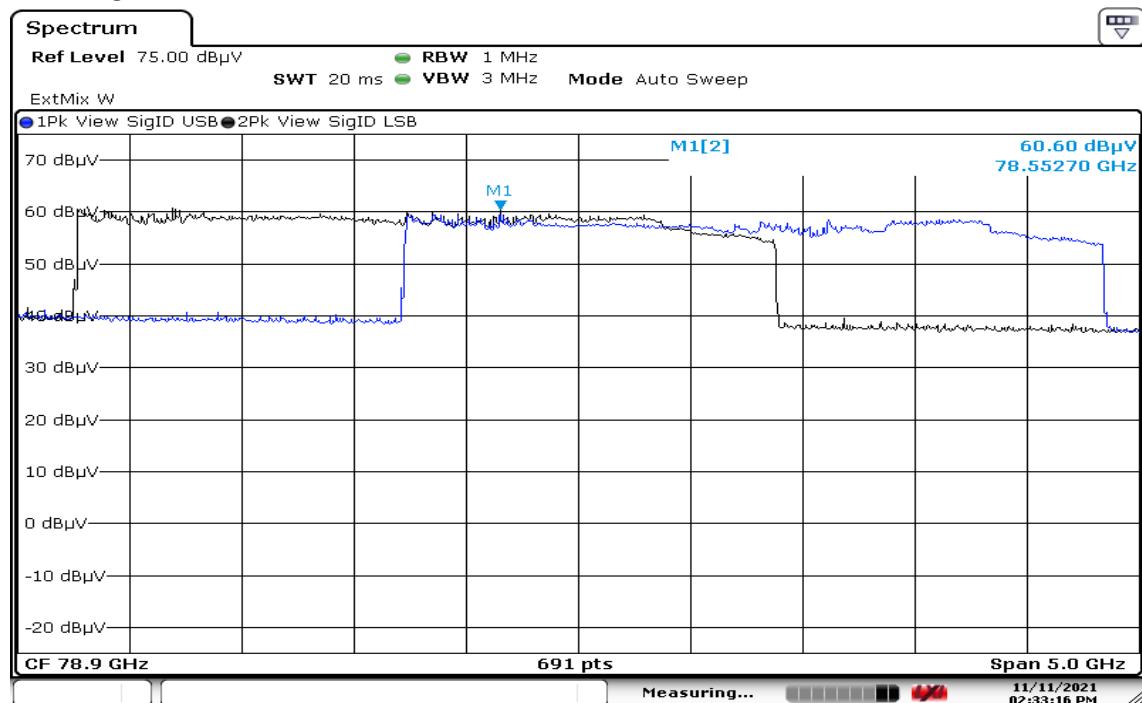
Temperature: 20.3 ~ 21.1°C**Test date:** November 10 ~ 11, 2021**Humidity:** 53 ~ 55% RH**Tested by:** Dally Hong

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	E.I.R.P.(dBm)	E.I.R.P. Limit (dBm)	Detector	ANT Pol
78.4658	73.77	50.28	1	124.05	19.25	≤55	Peak	H
78.2488	56.36	50.27	1	106.63	1.83	≤50	RMS	H
78.5527	60.6	50.28	1	110.88	6.08	≤ 55	Peak	V
78.133	41.15	50.26	1	91.41	-13.39	≤ 50	RMS	V

Test Data

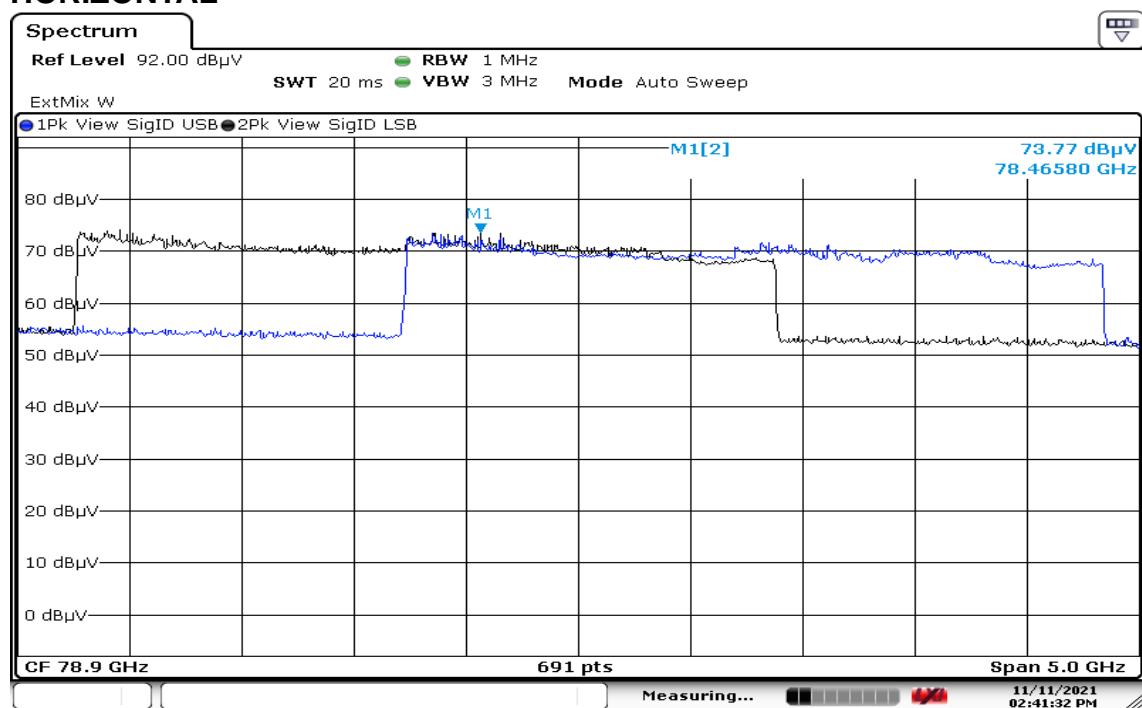
Peak Power

VERTICAL



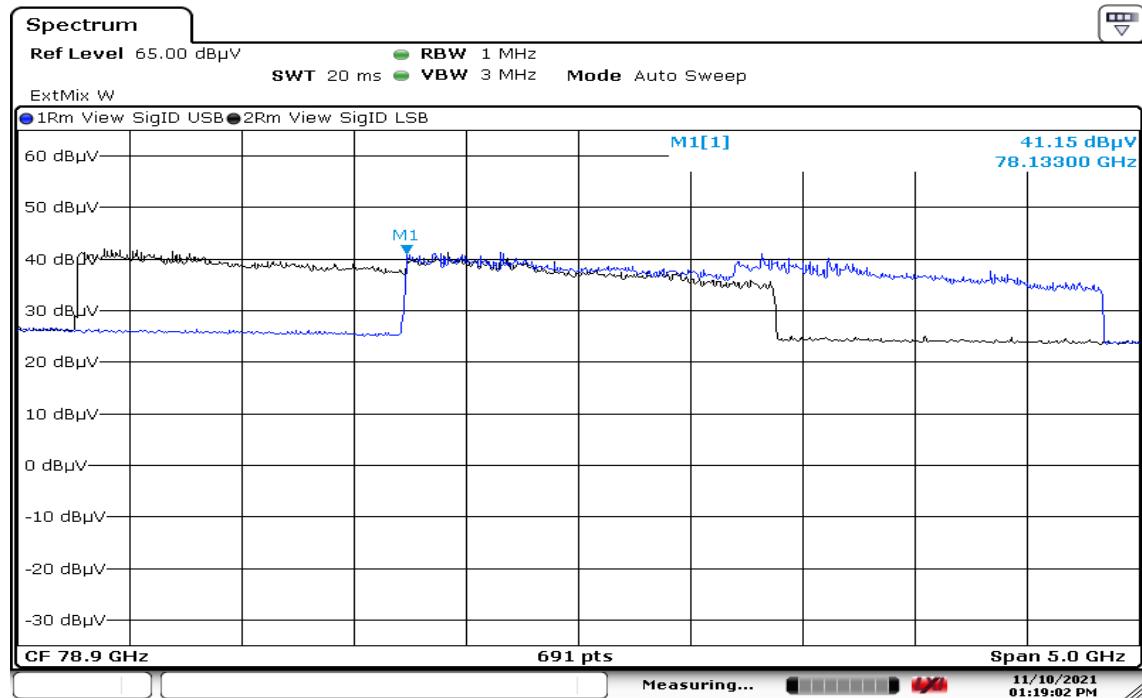
Date: 11.NOV.2021 14:33:17

HORIZONTAL



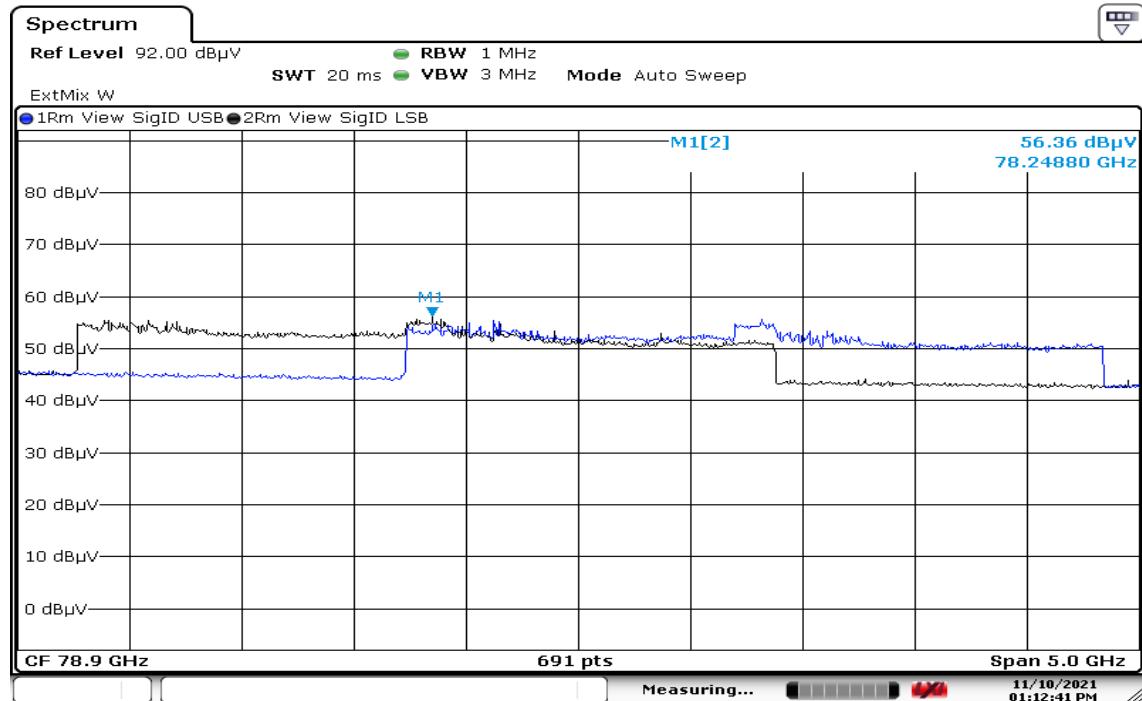
Date: 11.NOV.2021 14:41:33

RMS Power VERTICAL



Date: 10.NOV.2021 13:19:02

HORIZONTAL



Date: 10.NOV.2021 13:12:41

8.2 SPURIOUS EMISSIONS

8.2.1 Radiated Emissions

LIMIT

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

Frequency (MHz)	Field Strength (μ V/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

- 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/cm² at a distance of 3 meters from the exterior surface of the radiating structure.
- For radiated emissions above 200 GHz from field disturbance sensors and radar systems operating in the 76-81 GHz band: 1000 pW/cm² at a distance of 3 meters from the exterior surface of the radiating structure.

Notes:

$$P(mW) = \text{Power density (mW/m}^2) \times 4\pi(r)^2$$

$$600 \text{ pW/cm}^2 = -1.7 \text{ dBm} @ 3\text{m} = 7.84 \text{ dBm} @ 1\text{m}$$

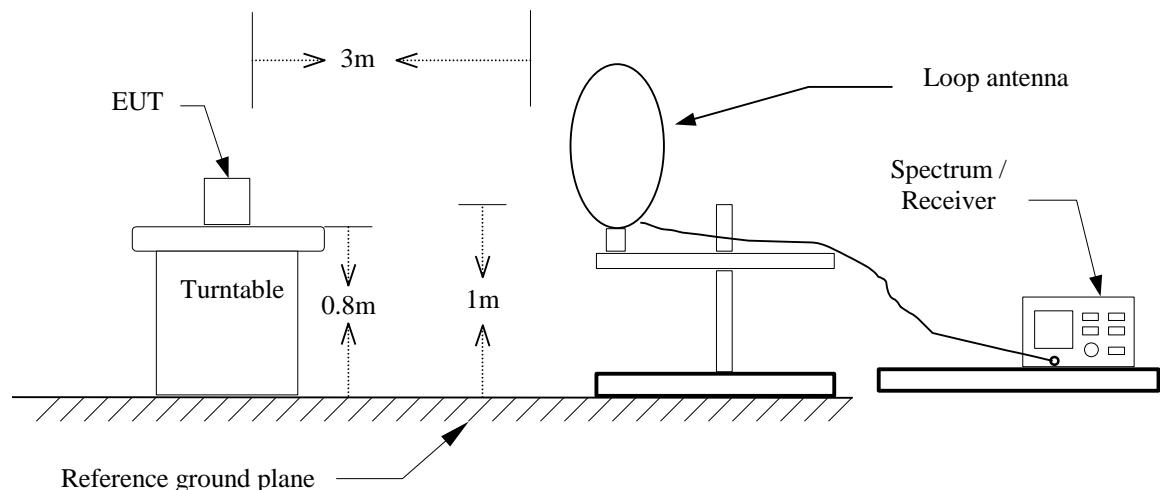
$$1000 \text{ pW/cm}^2 = 0.5 \text{ dBm} @ 3\text{m} = 10.04 \text{ dBm} @ 1\text{m}$$

P: Power

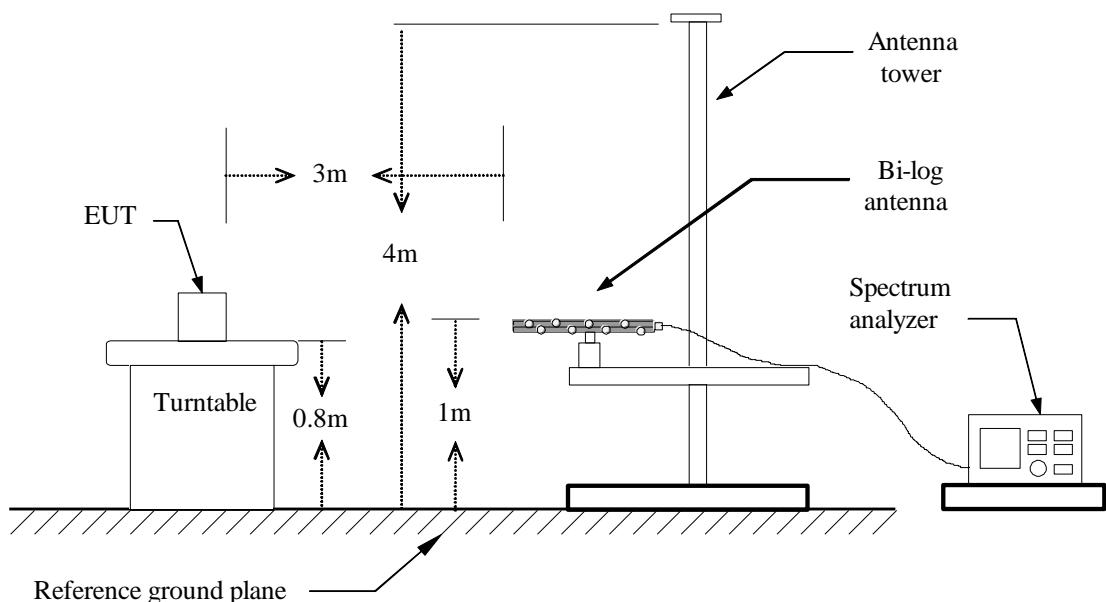
r: measurement distance(m)

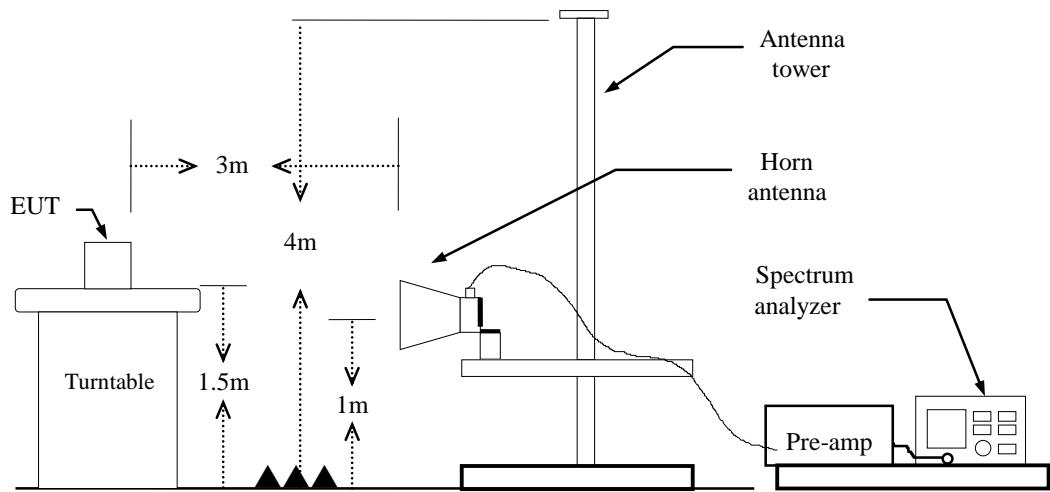
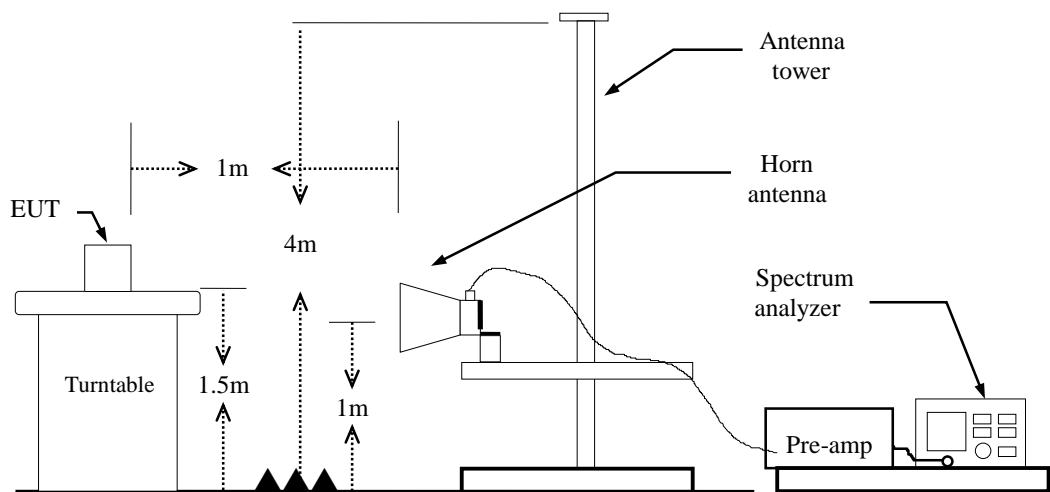
Test Configuration

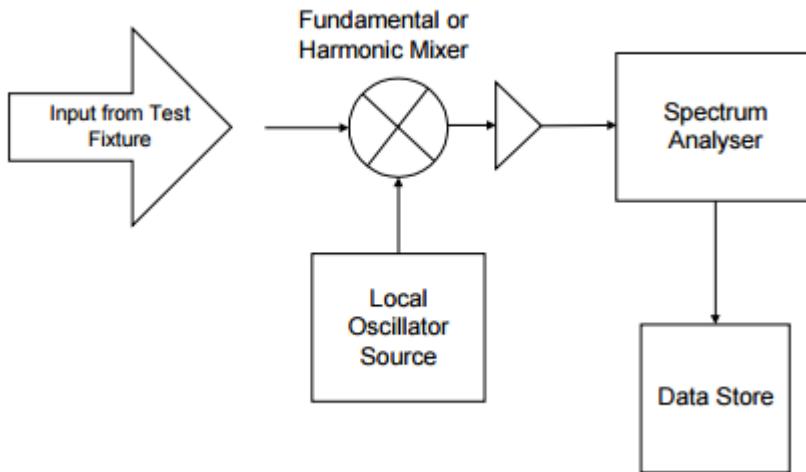
9kHz ~ 30MHz



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.

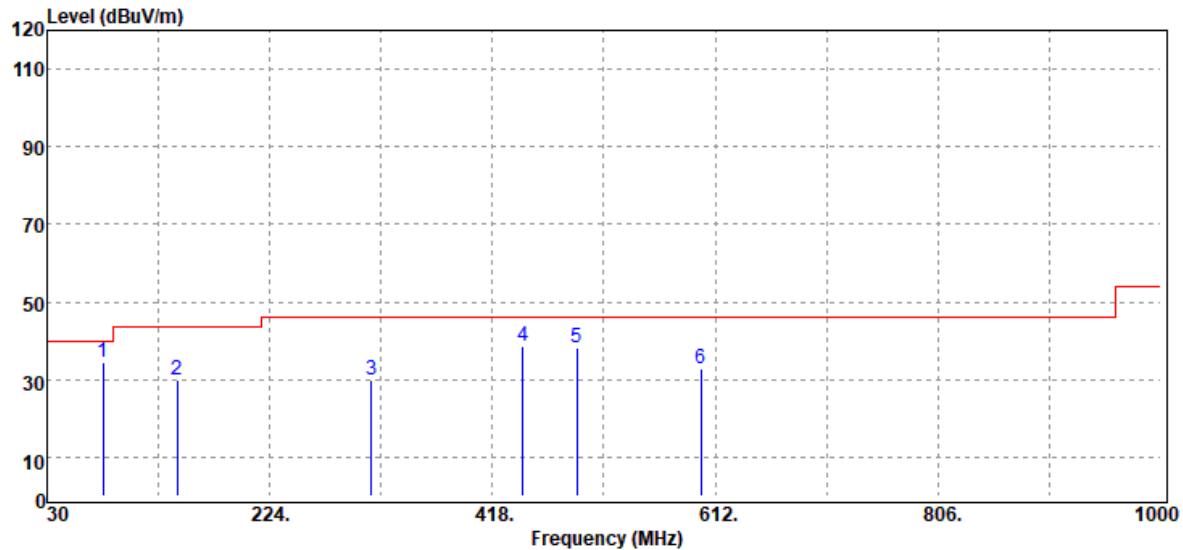
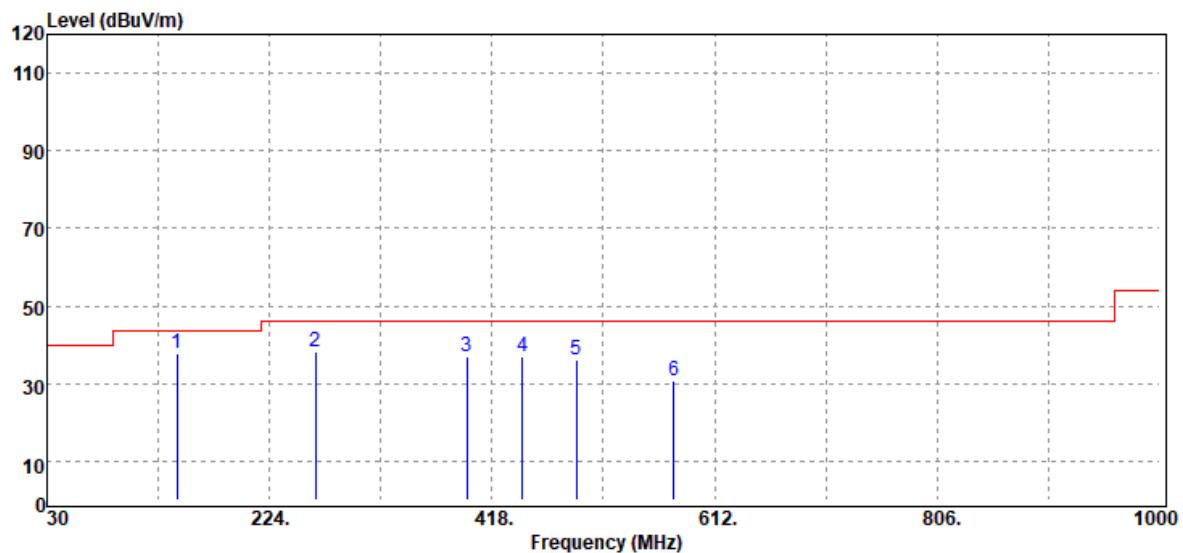
Below 1 GHz

Operation Mode:	TX CH Mid	Polarity:	Ver. / Hor.
Temperature:	20.3°C	Tested by:	Tony Chao
Humidity:	51% RH	Test Date:	November 12, 2021

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB	Ant. Pol. (H/V)
78.50	Peak	50.04	-15.53	34.51	40.00	-5.49	V
143.49	Peak	39.99	-10.17	29.82	43.50	-13.68	V
312.27	Peak	38.08	-8.36	29.72	46.00	-16.28	V
444.19	Peak	43.06	-4.55	38.51	46.00	-7.49	V
491.72	Peak	41.60	-3.43	38.17	46.00	-7.83	V
599.39	Peak	35.16	-2.27	32.89	46.00	-13.11	V
143.49	Peak	47.91	-10.17	37.74	43.50	-5.76	H
263.77	Peak	47.48	-9.47	38.01	46.00	-7.99	H
395.69	Peak	43.05	-6.20	36.85	46.00	-9.15	H
444.19	Peak	41.71	-4.55	37.16	46.00	-8.84	H
491.72	Peak	39.53	-3.43	36.10	46.00	-9.90	H
576.11	Peak	32.91	-2.13	30.78	46.00	-15.22	H

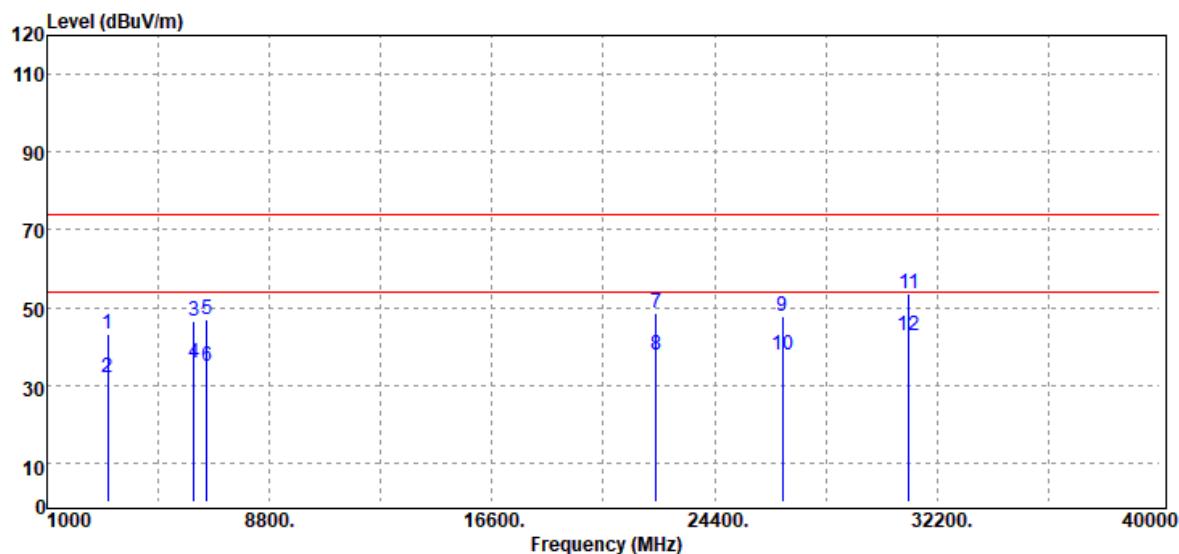
Remark:

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 (dB μ V/m) – Quasi-peak limit (dB μ V/m).

Polarity : Vertical**Polarity : Horizontal**

Above 1 GHz

Operation Mode:	TX CH Mid	Polarity:	Ver.
Temperature:	20.3°C	Tested by:	Tony Chao
Humidity:	51% RH	Test Date:	November 12, 2021

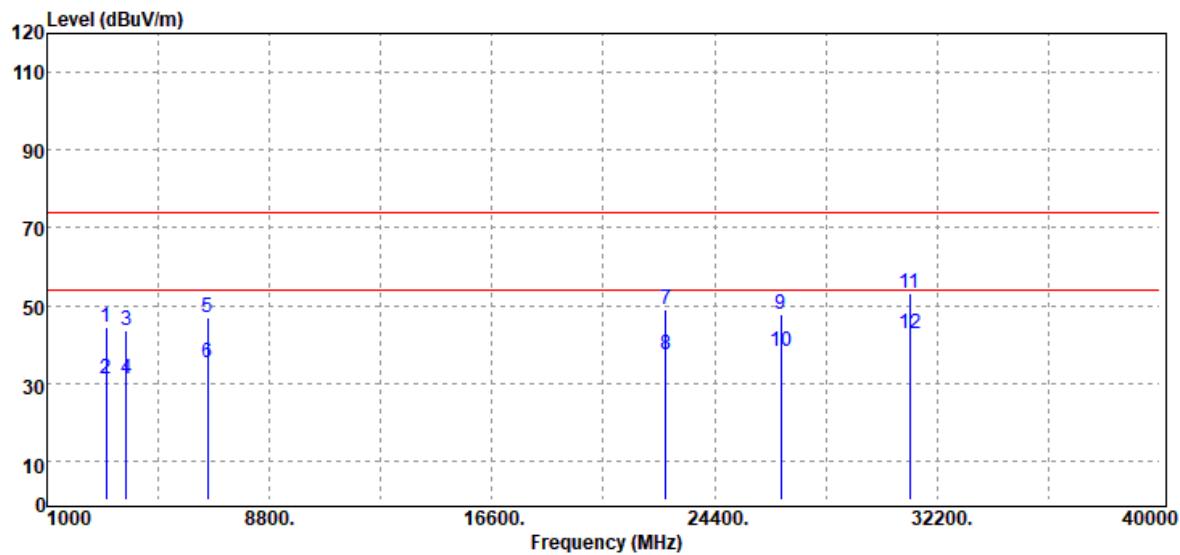


Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB	Ant. Pol. (H/V)
3144.20	Peak	36.97	6.09	43.06	74.00	-30.94	V
3144.20	Average	25.77	6.09	31.86	54.00	-22.14	V
6161.70	Peak	33.78	12.59	46.37	74.00	-27.63	V
6161.70	Average	23.19	12.59	35.78	54.00	-18.22	V
6601.90	Peak	33.96	12.80	46.76	74.00	-27.24	V
6601.90	Average	22.07	12.80	34.87	54.00	-19.13	V
22356.00	Peak	31.99	16.56	48.55	74.00	-25.45	V
22356.00	Average	21.15	16.56	37.71	54.00	-16.29	V
26778.00	Peak	34.24	13.44	47.68	74.00	-26.32	V
26778.00	Average	24.54	13.44	37.98	54.00	-16.02	V
31200.00	Peak	35.39	18.01	53.40	74.00	-20.60	V
31200.00	Average	24.68	18.01	42.69	54.00	-11.31	V

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).

Operation Mode: TX CH Mid **Polarity:** Hor.
Temperature: 20.3°C **Tested by:** Tony Chao
Humidity: 51% RH **Test Date:** November 12, 2021



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB	Ant. Pol. (H/V)
3072.00	Peak	38.89	5.65	44.54	74.00	-29.46	H
3072.00	Average	25.69	5.65	31.34	54.00	-22.66	H
3779.00	Peak	35.77	7.79	43.56	74.00	-30.44	H
3779.00	Average	23.28	7.79	31.07	54.00	-22.93	H
6635.00	Peak	33.91	12.92	46.83	74.00	-27.17	H
6635.00	Average	22.38	12.92	35.30	54.00	-18.70	H
22686.00	Peak	32.84	16.27	49.11	74.00	-24.89	H
22686.00	Average	21.23	16.27	37.50	54.00	-16.50	H
26712.00	Peak	34.28	13.47	47.75	74.00	-26.25	H
26712.00	Average	24.62	13.47	38.09	54.00	-15.91	H
31244.00	Peak	35.26	17.98	53.24	74.00	-20.76	H
31244.00	Average	24.79	17.98	42.77	54.00	-11.23	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).

40G-50G

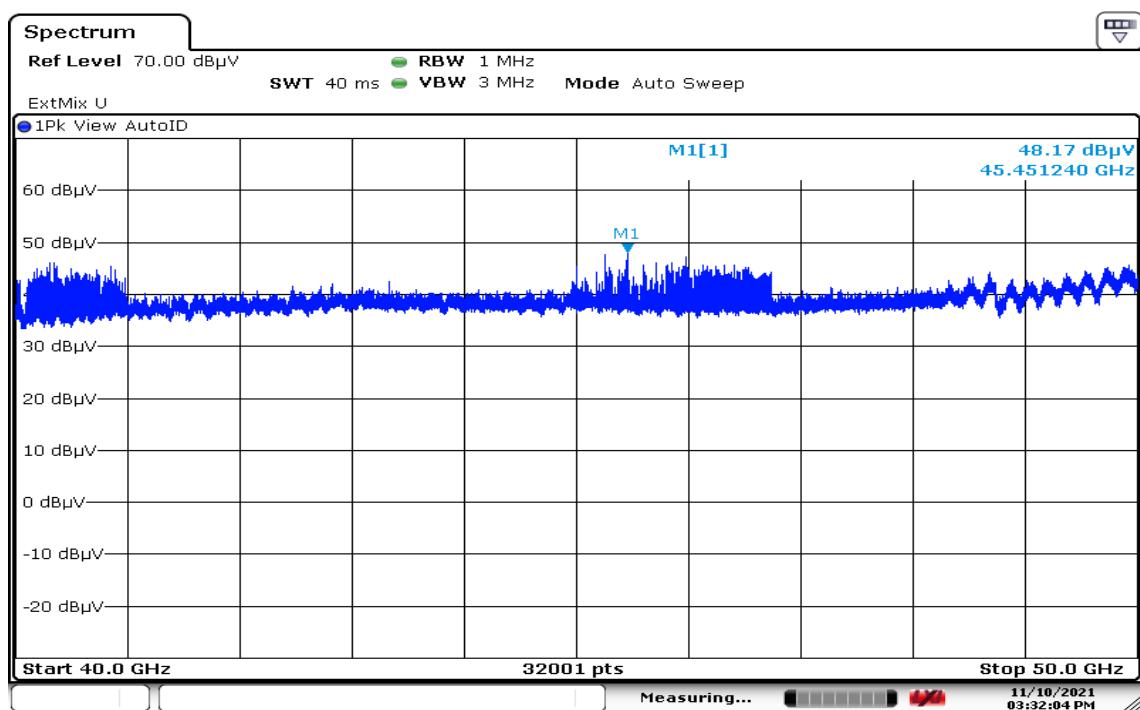
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 15:32:04

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
45.45124	48.17	46.62	1	94.79	≤103.08	Peak

Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

$$@ 3m \text{ Limit} = 20 * \log \{ (0.000006 * 377)^{0.5} * 1000000 \} = 93.54 \text{ dBuV/m}$$

$$@ 1m \text{ Limit} = 93.54 + 20 * \log (3/1) = 103.08 \text{ dBuV/m}$$

$$@ 0.5m \text{ Limit} = 93.54 + 20 * \log (3/0.5) = 109.1 \text{ dBuV/m}$$

$$@ 0.2m \text{ Limit} = 93.54 + 20 * \log (3/0.2) = 117.06 \text{ dBuV/m}$$

$$@ 0.15m \text{ Limit} = 93.54 + 20 * \log (3/0.15) = 119.56 \text{ dBuV/m}$$

Above 200GHz Limit :

$$@ 3m \text{ Limit} = 20 * \log \{ (0.00001 * 377)^{0.5} * 1000000 \} = 95.76 \text{ dBuV/m}$$

$$@ 1m \text{ Limit} = 95.76 + 20 * \log (3/1) = 105.30 \text{ dBuV/m}$$

$$@ 0.2m \text{ Limit} = 95.76 + 20 * \log (3/0.2) = 119.28 \text{ dBuV/m}$$

50G-75G

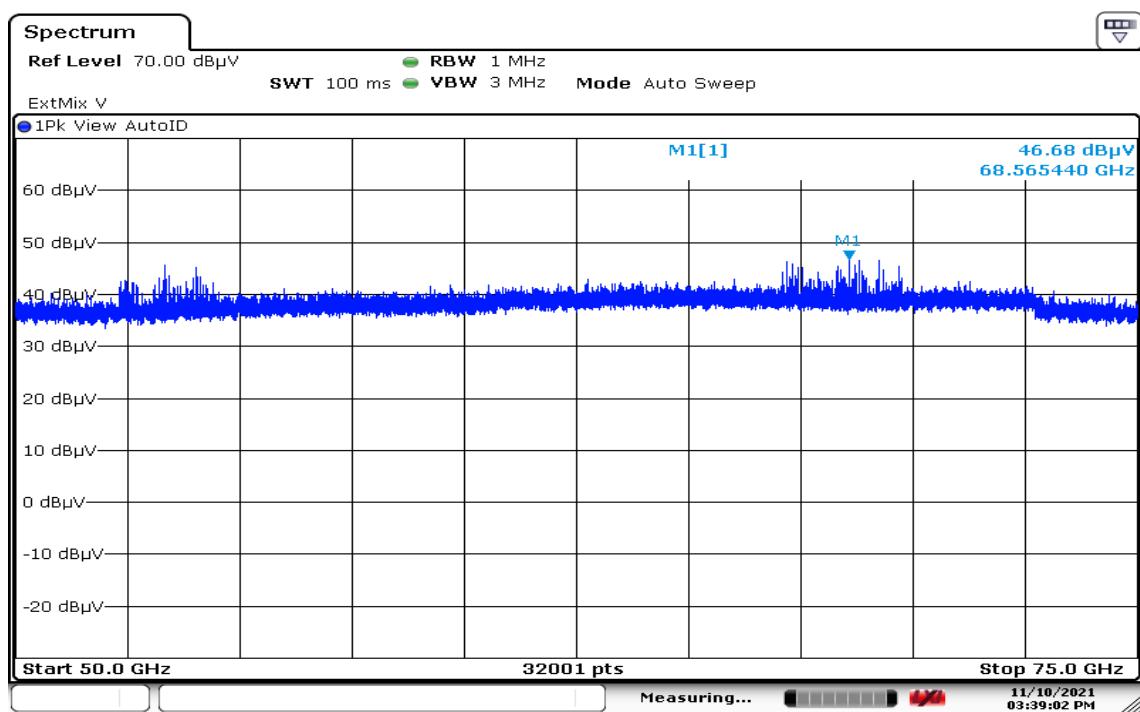
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 15:39:03

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
68.56544	46.68	47.99	1	94.67	≤103.08	Peak

Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

$$@ 3m Limit = 20 * \log \{ (0.000006 * 377)^{0.5} * 1000000 \} = 93.54 \text{ dBuV/m}$$

$$@ 1m Limit = 93.54 + 20 * \log (3/1) = 103.08 \text{ dBuV/m}$$

$$@ 0.5m Limit = 93.54 + 20 * \log (3/0.5) = 109.1 \text{ dBuV/m}$$

$$@ 0.2m Limit = 93.54 + 20 * \log (3/0.2) = 117.06 \text{ dBuV/m}$$

$$@ 0.15m Limit = 93.54 + 20 * \log (3/0.15) = 119.56 \text{ dBuV/m}$$

Above 200GHz Limit :

$$@ 3m Limit = 20 * \log \{ (0.00001 * 377)^{0.5} * 1000000 \} = 95.76 \text{ dBuV/m}$$

$$@ 1m Limit = 95.76 + 20 * \log (3/1) = 105.30 \text{ dBuV/m}$$

$$@ 0.2m Limit = 95.76 + 20 * \log (3/0.2) = 119.28 \text{ dBuV/m}$$

75G-95G

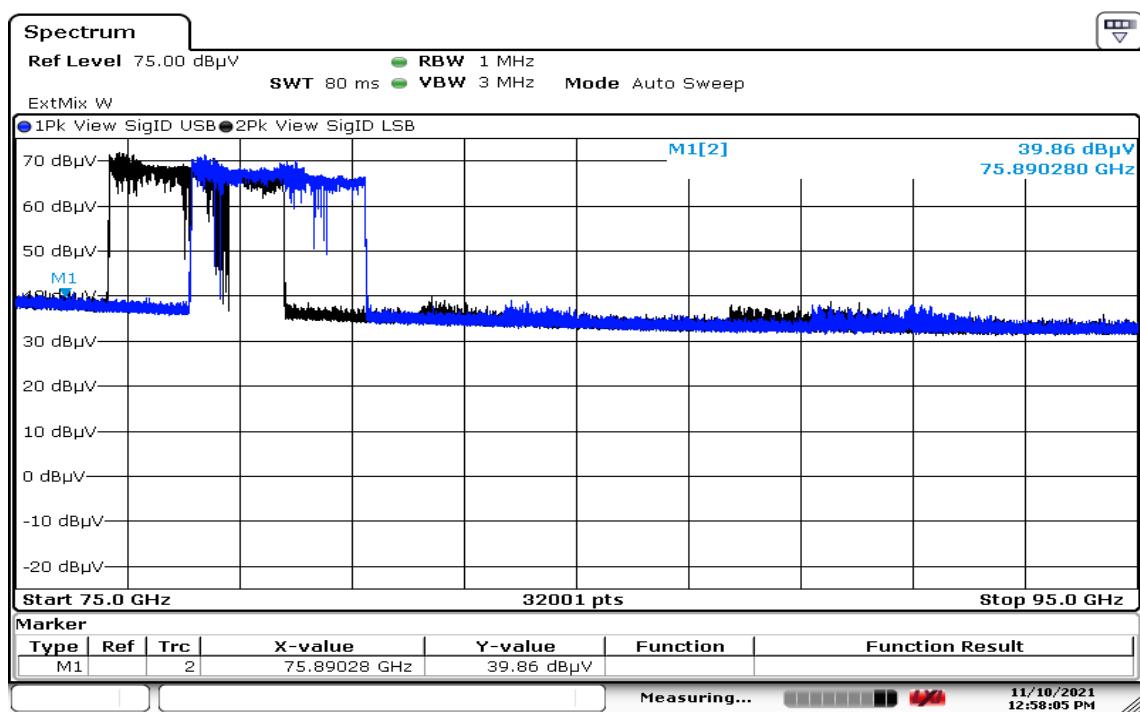
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 12:58:05

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
75.89028	39.86	50.16	1	90.02	≤103.08	Peak

Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.000006 \times 377)^{0.5} \times 1000000 \} = 93.54 \text{ dBuV/m}$

@ 1m Limit = $93.54 + 20 \times \log (3/1) = 103.08 \text{ dBuV/m}$

@ 0.5m Limit = $93.54 + 20 \times \log (3/0.5) = 109.1 \text{ dBuV/m}$

@ 0.2m Limit = $93.54 + 20 \times \log (3/0.2) = 117.06 \text{ dBuV/m}$

@ 0.15m Limit = $93.54 + 20 \times \log (3/0.15) = 119.56 \text{ dBuV/m}$

Above 200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.00001 \times 377)^{0.5} \times 1000000 \} = 95.76 \text{ dBuV/m}$

@ 1m Limit = $95.76 + 20 \times \log (3/1) = 105.30 \text{ dBuV/m}$

@ 0.2m Limit = $95.76 + 20 \times \log (3/0.2) = 119.28 \text{ dBuV/m}$

95G-110G

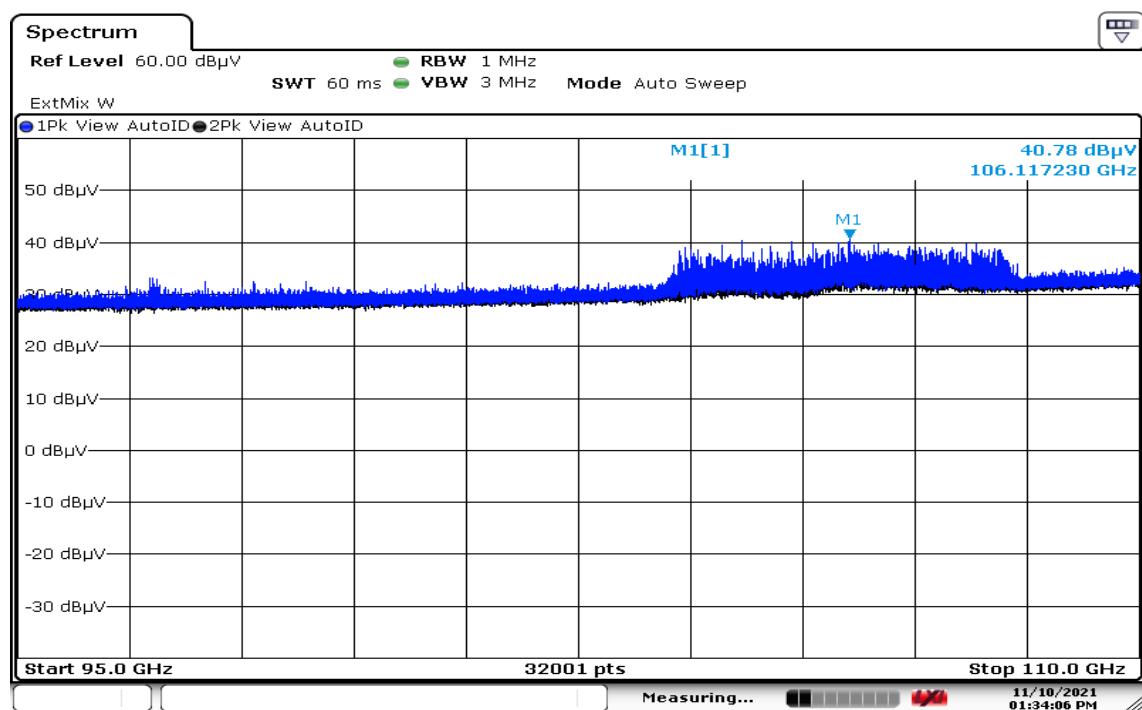
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 13:34:07

Frequency (GHz)	Spectrum Reading (dB μ V)	Antenna Factor (dB/m)	Distance (m)	dB μ V/m	Limit (dB μ V/m)	Detector
106.11723	40.78	52.84	1	93.62	≤103.08	Peak

Remark:

1. dB μ V/m = Spectrum Reading (dB μ V) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.000006 \times 377)^{0.5} \times 1000000 \} = 93.54 \text{ dB}\mu\text{V/m}$

@ 1m Limit = $93.54 + 20 \times \log (3/1) = 103.08 \text{ dB}\mu\text{V/m}$

@ 0.5m Limit = $93.54 + 20 \times \log (3/0.5) = 109.1 \text{ dB}\mu\text{V/m}$

@ 0.2m Limit = $93.54 + 20 \times \log (3/0.2) = 117.06 \text{ dB}\mu\text{V/m}$

@ 0.15m Limit = $93.54 + 20 \times \log (3/0.15) = 119.56 \text{ dB}\mu\text{V/m}$

Above 200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.00001 \times 377)^{0.5} \times 1000000 \} = 95.76 \text{ dB}\mu\text{V/m}$

@ 1m Limit = $95.76 + 20 \times \log (3/1) = 105.30 \text{ dB}\mu\text{V/m}$

@ 0.2m Limit = $95.76 + 20 \times \log (3/0.2) = 119.28 \text{ dB}\mu\text{V/m}$

110G-140G

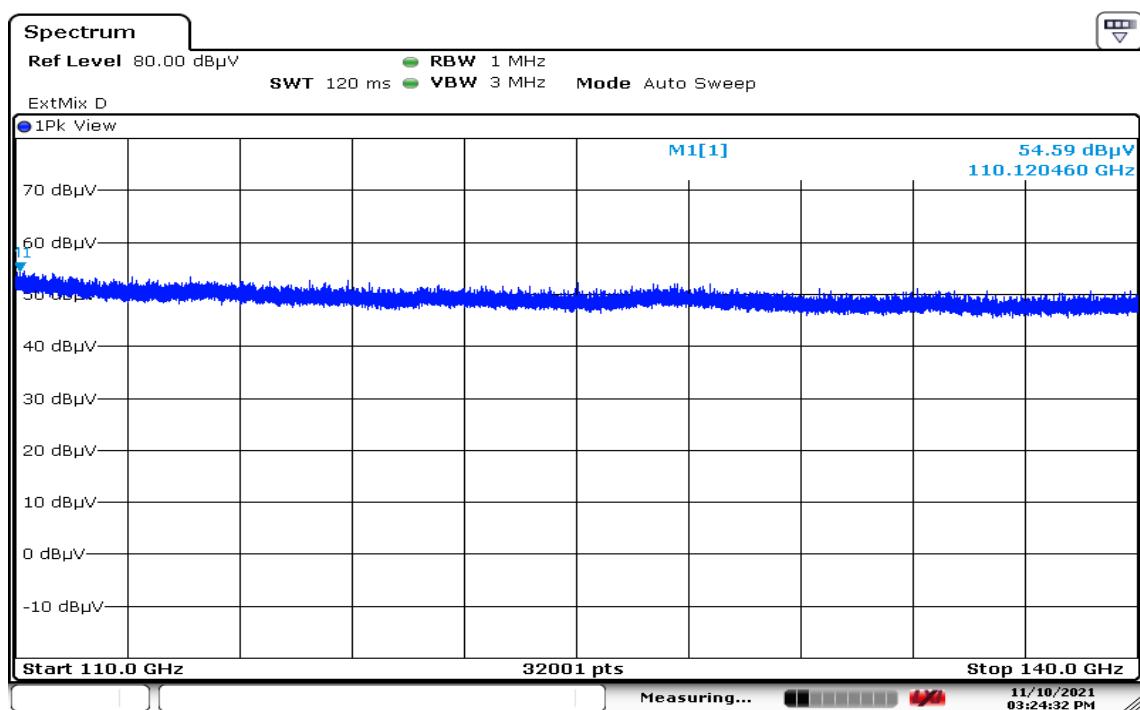
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 15:24:32

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
110.12046	54.59	54.48	0.4	109.07	≤111.04	Peak

Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.000006 \times 377)^{0.5} \times 1000000 \} = 93.54 \text{ dBuV/m}$

@ 1m Limit = $93.54 + 20 \times \log (3/1) = 103.08 \text{ dBuV/m}$

@ 0.4m Limit = $93.54 + 20 \times \log (3/0.5) = 111.04 \text{ dBuV/m}$

@ 0.2m Limit = $93.54 + 20 \times \log (3/0.2) = 117.06 \text{ dBuV/m}$

@ 0.15m Limit = $93.54 + 20 \times \log (3/0.15) = 119.56 \text{ dBuV/m}$

Above 200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.00001 \times 377)^{0.5} \times 1000000 \} = 95.76 \text{ dBuV/m}$

@ 1m Limit = $95.76 + 20 \times \log (3/1) = 105.30 \text{ dBuV/m}$

@ 0.2m Limit = $95.76 + 20 \times \log (3/0.2) = 119.28 \text{ dBuV/m}$

Report No.: TMWK2111001137KR

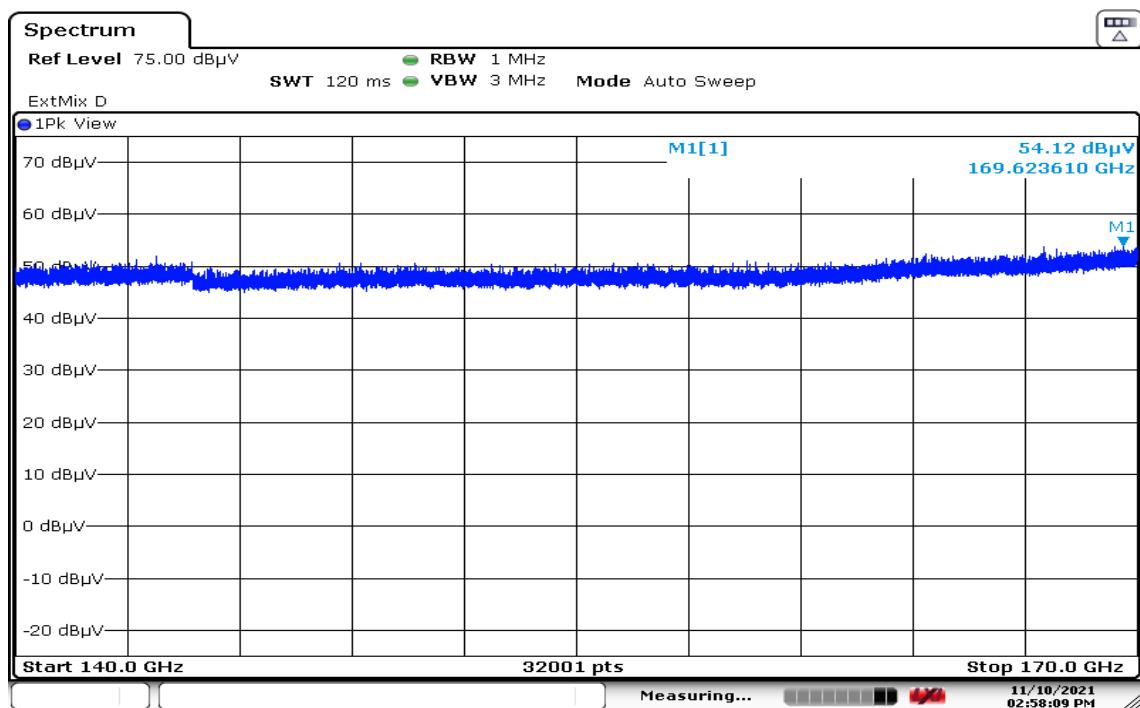
140G-170G

Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong


Date: 10.NOV.2021 14:58:10

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
169.62361	54.12	56.71	0.4	110.83	≤111.04	Peak

Remark:

1. dBuV/m = Spectrum Reading (dBuV) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

 @ 3m Limit = $20 \times \log \{ (0.000006 \times 377)^{0.5} \times 1000000 \} = 93.54 \text{ dBuV/m}$

 @ 1m Limit = $93.54 + 20 \times \log (3/1) = 103.08 \text{ dBuV/m}$

 @ 0.4m Limit = $93.54 + 20 \times \log (3/0.5) = 111.04 \text{ dBuV/m}$

 @ 0.2m Limit = $93.54 + 20 \times \log (3/0.2) = 117.06 \text{ dBuV/m}$

 @ 0.15m Limit = $93.54 + 20 \times \log (3/0.15) = 119.56 \text{ dBuV/m}$

Above 200GHz Limit :

 @ 3m Limit = $20 \times \log \{ (0.00001 \times 377)^{0.5} \times 1000000 \} = 95.76 \text{ dBuV/m}$

 @ 1m Limit = $95.76 + 20 \times \log (3/1) = 105.30 \text{ dBuV/m}$

 @ 0.2m Limit = $95.76 + 20 \times \log (3/0.2) = 119.28 \text{ dBuV/m}$

170G-200G

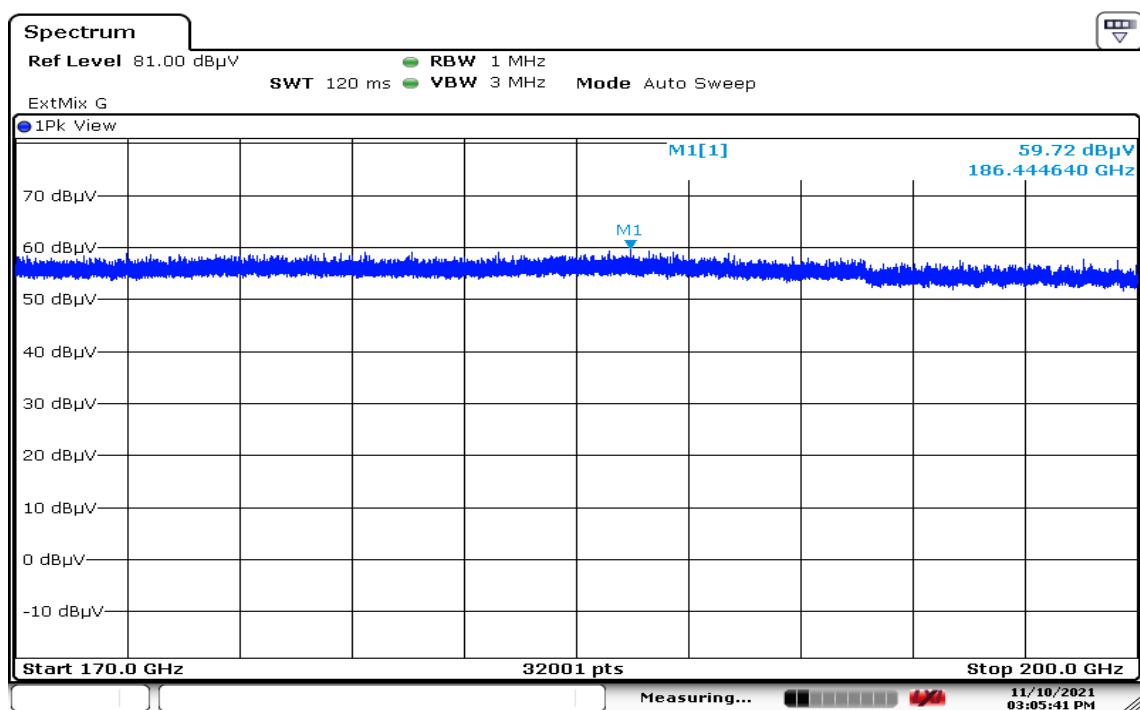
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 15:05:41

Frequency (GHz)	Spectrum Reading (dB μ V)	Antenna Factor (dB/m)	Distance (m)	dB μ V/m	Limit (dB μ V/m)	Detector
186.44464	59.72	57.23	0.2	116.95	≤117.06	Peak

Remark:

1. dB μ V/m = Spectrum Reading (dB μ V) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

$$@ 3m Limit = 20 * \log \{ (0.000006 * 377)^{0.5} * 1000000 \} = 93.54 \text{ dB}\mu\text{V/m}$$

$$@ 1m Limit = 93.54 + 20 * \log (3/1) = 103.08 \text{ dB}\mu\text{V/m}$$

$$@ 0.5m Limit = 93.54 + 20 * \log (3/0.5) = 109.1 \text{ dB}\mu\text{V/m}$$

$$@ 0.2m Limit = 93.54 + 20 * \log (3/0.2) = 117.06 \text{ dB}\mu\text{V/m}$$

$$@ 0.15m Limit = 93.54 + 20 * \log (3/0.15) = 119.56 \text{ dB}\mu\text{V/m}$$

Above 200GHz Limit :

$$@ 3m Limit = 20 * \log \{ (0.00001 * 377)^{0.5} * 1000000 \} = 95.76 \text{ dB}\mu\text{V/m}$$

$$@ 1m Limit = 95.76 + 20 * \log (3/1) = 105.30 \text{ dB}\mu\text{V/m}$$

$$@ 0.2m Limit = 95.76 + 20 * \log (3/0.2) = 119.28 \text{ dB}\mu\text{V/m}$$

200G-220G

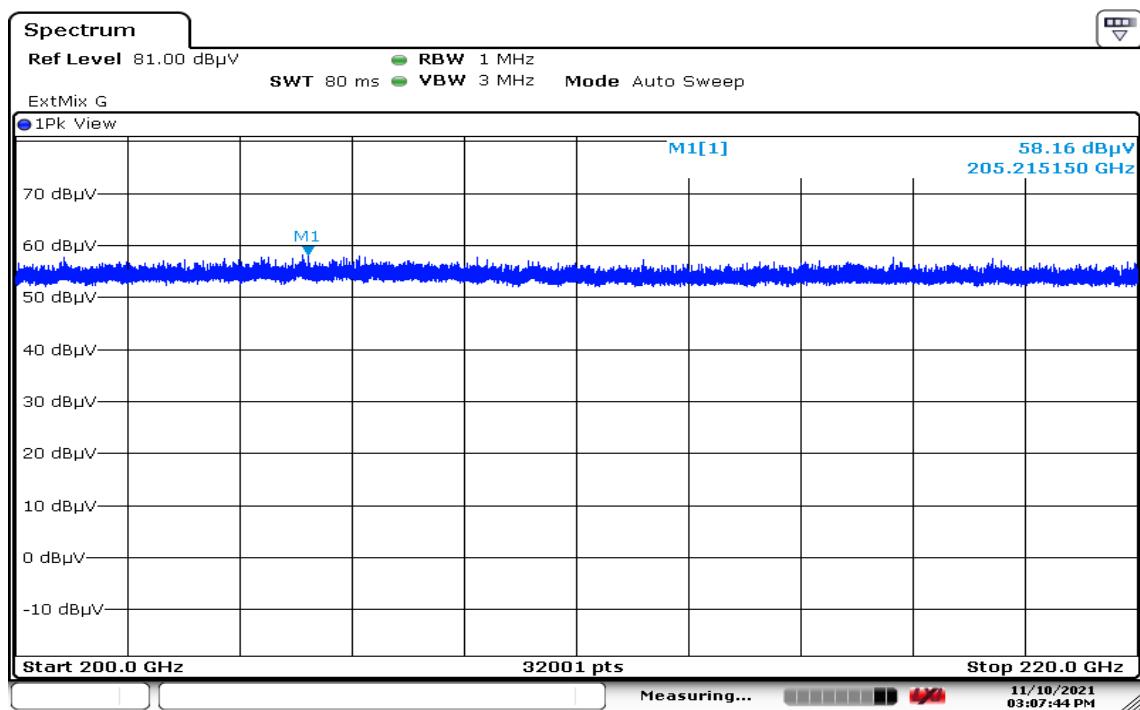
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 15:07:45

Frequency (GHz)	Spectrum Reading (dB μ V)	Antenna Factor (dB/m)	Distance (m)	dB μ V/m	Limit (dB μ V/m)	Detector
205.51515	58.16	57.83	0.2	115.99	≤119.28	Peak

Remark:

1. dB μ V/m = Spectrum Reading (dB μ V) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.000006 \times 377)^{0.5} \times 1000000 \} = 93.54 \text{ dB}\mu\text{V/m}$
@ 1m Limit = $93.54 + 20 \times \log (3/1) = 103.08 \text{ dB}\mu\text{V/m}$
@ 0.5m Limit = $93.54 + 20 \times \log (3/0.5) = 109.1 \text{ dB}\mu\text{V/m}$
@ 0.2m Limit = $93.54 + 20 \times \log (3/0.2) = 117.06 \text{ dB}\mu\text{V/m}$
@ 0.15m Limit = $93.54 + 20 \times \log (3/0.15) = 119.56 \text{ dB}\mu\text{V/m}$

Above 200GHz Limit :

@ 3m Limit = $20 \times \log \{ (0.00001 \times 377)^{0.5} \times 1000000 \} = 95.76 \text{ dB}\mu\text{V/m}$
@ 1m Limit = $95.76 + 20 \times \log (3/1) = 105.30 \text{ dB}\mu\text{V/m}$
@ 0.2m Limit = $95.76 + 20 \times \log (3/0.2) = 119.28 \text{ dB}\mu\text{V/m}$

220G-231G

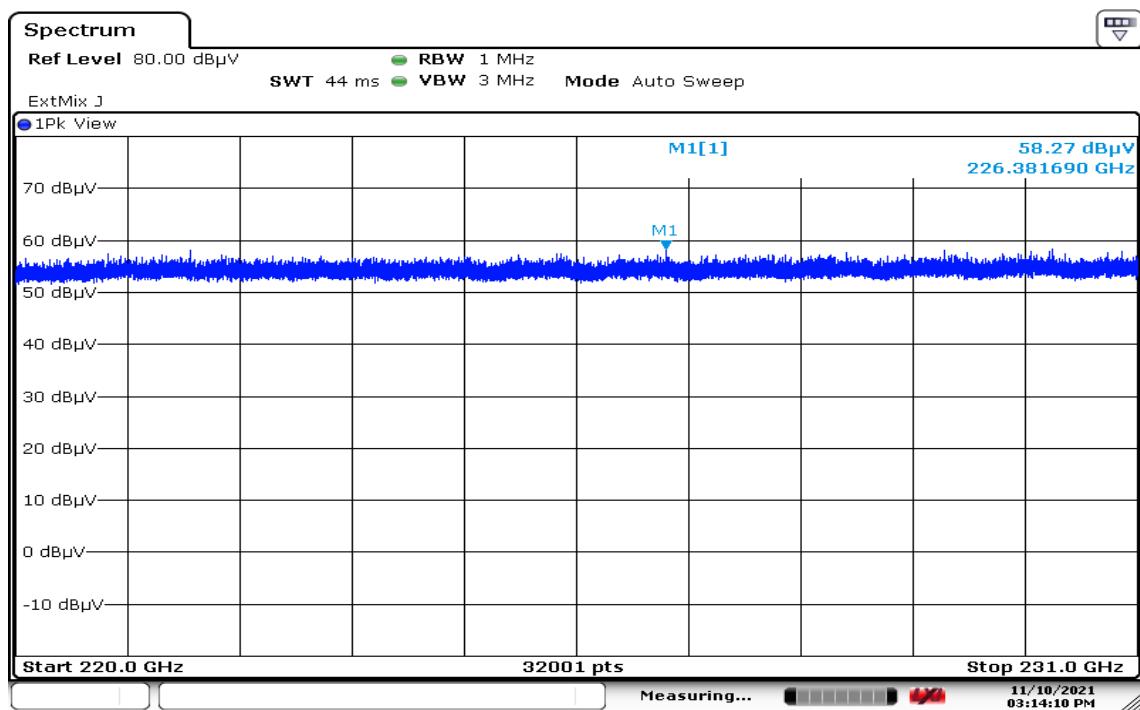
Operation Mode: Test Mode

Temperature: 20.3 ~ 21.1°C

Test date: November 10 ~ 11, 2021

Humidity: 53 ~ 55% RH

Tested by: Dally Hong



Date: 10.NOV.2021 15:14:11

Frequency (GHz)	Spectrum Reading (dB μ V)	Antenna Factor (dB/m)	Distance (m)	dB μ V/m	Limit (dB μ V/m)	Detector
226.38169	58.27	58.48	0.2	116.75	≤119.28	Peak

Remark:

1. dB μ V/m = Spectrum Reading (dB μ V) + Antenna Factor (dB/m)

2. 40GHz~200GHz Limit :

$$@ 3m Limit = 20 * \log \{ (0.000006 * 377)^{0.5} * 1000000 \} = 93.54 \text{ dB}\mu\text{V/m}$$

$$@ 1m Limit = 93.54 + 20 * \log (3/1) = 103.08 \text{ dB}\mu\text{V/m}$$

$$@ 0.5m Limit = 93.54 + 20 * \log (3/0.5) = 109.1 \text{ dB}\mu\text{V/m}$$

$$@ 0.2m Limit = 93.54 + 20 * \log (3/0.2) = 117.06 \text{ dB}\mu\text{V/m}$$

$$@ 0.15m Limit = 93.54 + 20 * \log (3/0.15) = 119.56 \text{ dB}\mu\text{V/m}$$

Above 200GHz Limit :

$$@ 3m Limit = 20 * \log \{ (0.00001 * 377)^{0.5} * 1000000 \} = 95.76 \text{ dB}\mu\text{V/m}$$

$$@ 1m Limit = 95.76 + 20 * \log (3/1) = 105.30 \text{ dB}\mu\text{V/m}$$

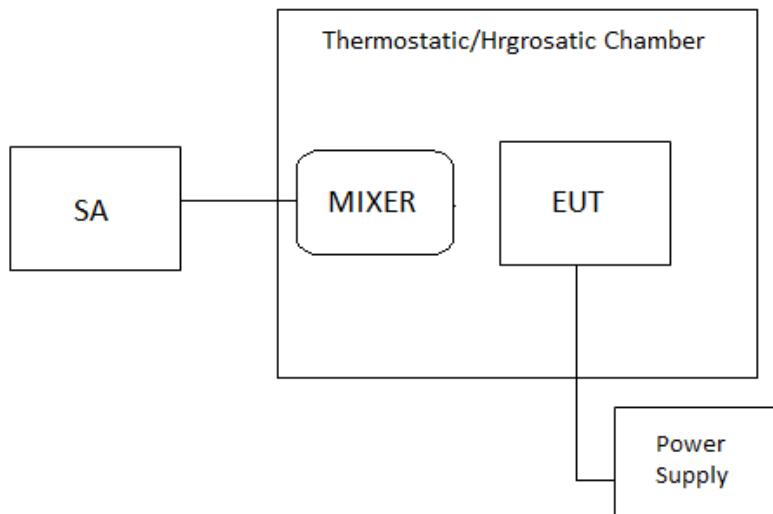
$$@ 0.2m Limit = 95.76 + 20 * \log (3/0.2) = 119.28 \text{ dB}\mu\text{V/m}$$

8.3 FREQUENCY STABILITY

LIMIT

According to FCC 95.3379(b), 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 -40 to +85 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 -40°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 +85°C reached.

TEST RESULTS

No non-compliance noted.

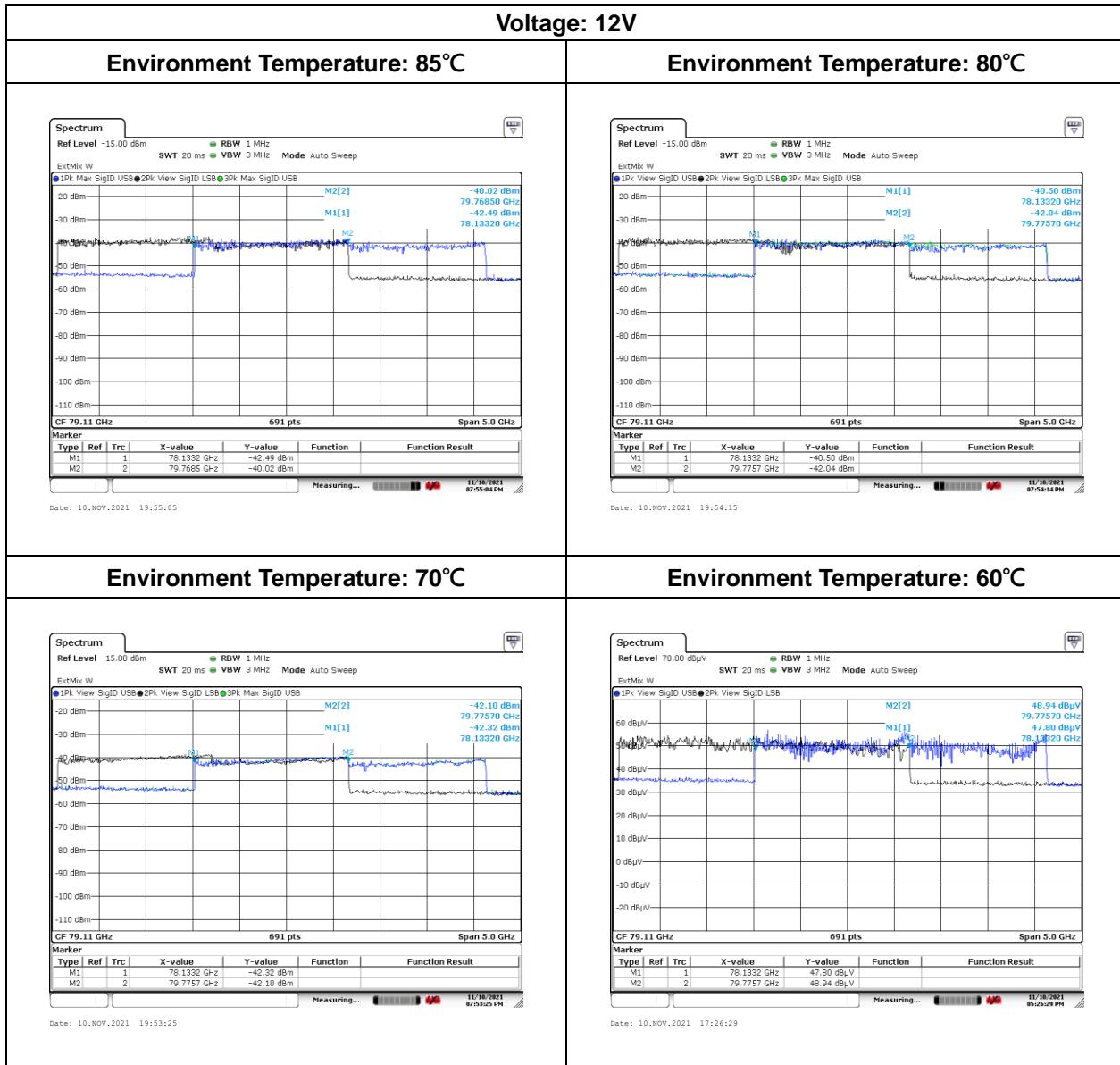
Temperature: 20.3°C **Test date:** November 10, 2021
Humidity: 53% RH **Tested by:** Dally Hong

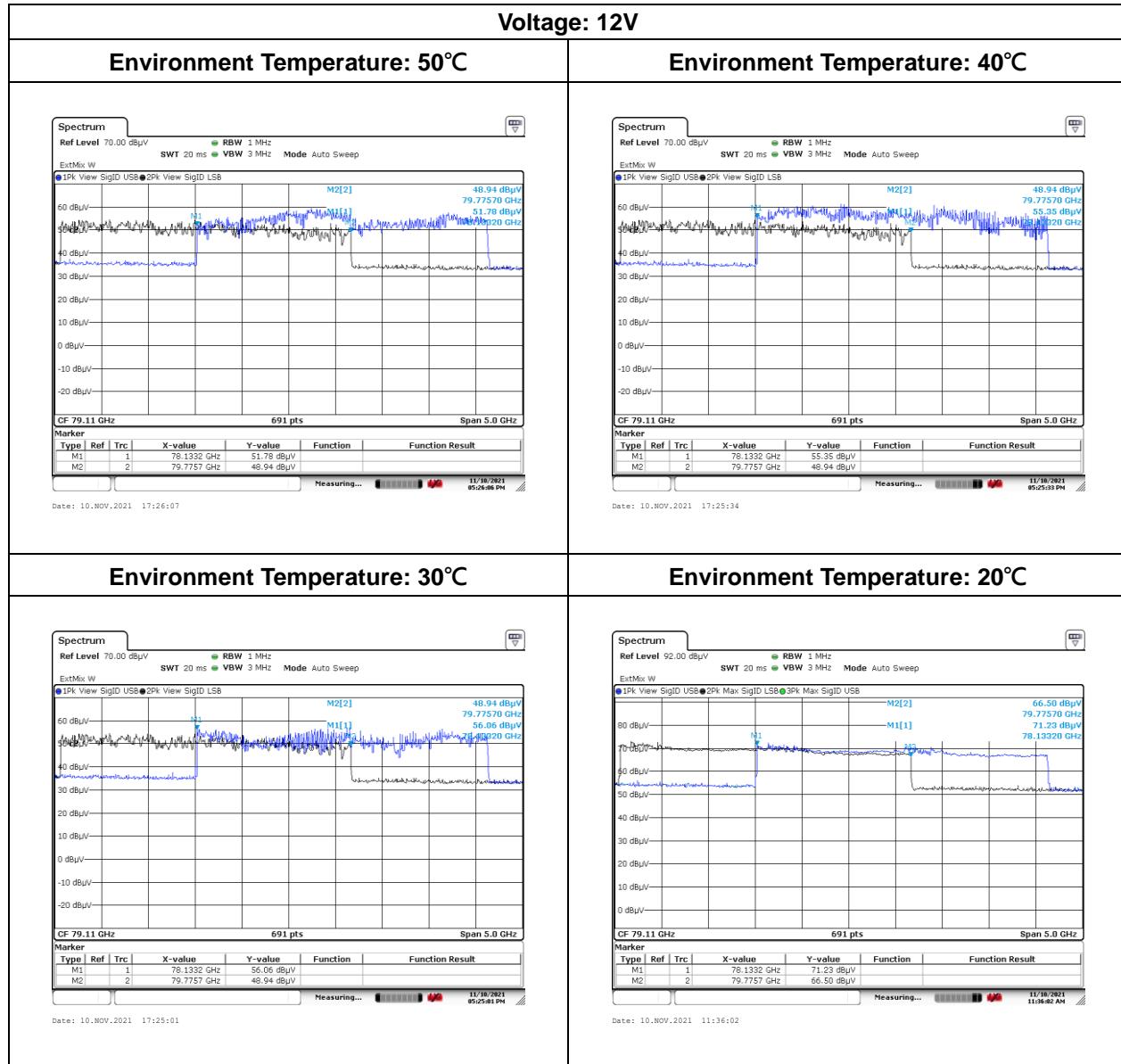
Operating Frequency					
Environment Temperature(°C)	Voltage (V)	FL (GHz)	FH (GHz)	Limit Range(GHz)	Test Result
85	12	78.1332	79.7685	76-81	Pass
80		78.1332	79.7757		Pass
70		78.1332	79.7757		Pass
60		78.1332	79.7757		Pass
50		78.1332	79.7757		Pass
40		78.1332	79.7757		Pass
30		78.1332	79.7757		Pass
20		78.1332	79.7757		Pass
10		78.1404	79.7757		Pass
0		78.1404	79.7612		Pass
-10		78.1332	79.7757		Pass
-20		78.1404	79.7757		Pass
-30		78.1332	79.7757		Pass
-40		78.1332	79.7757		Pass

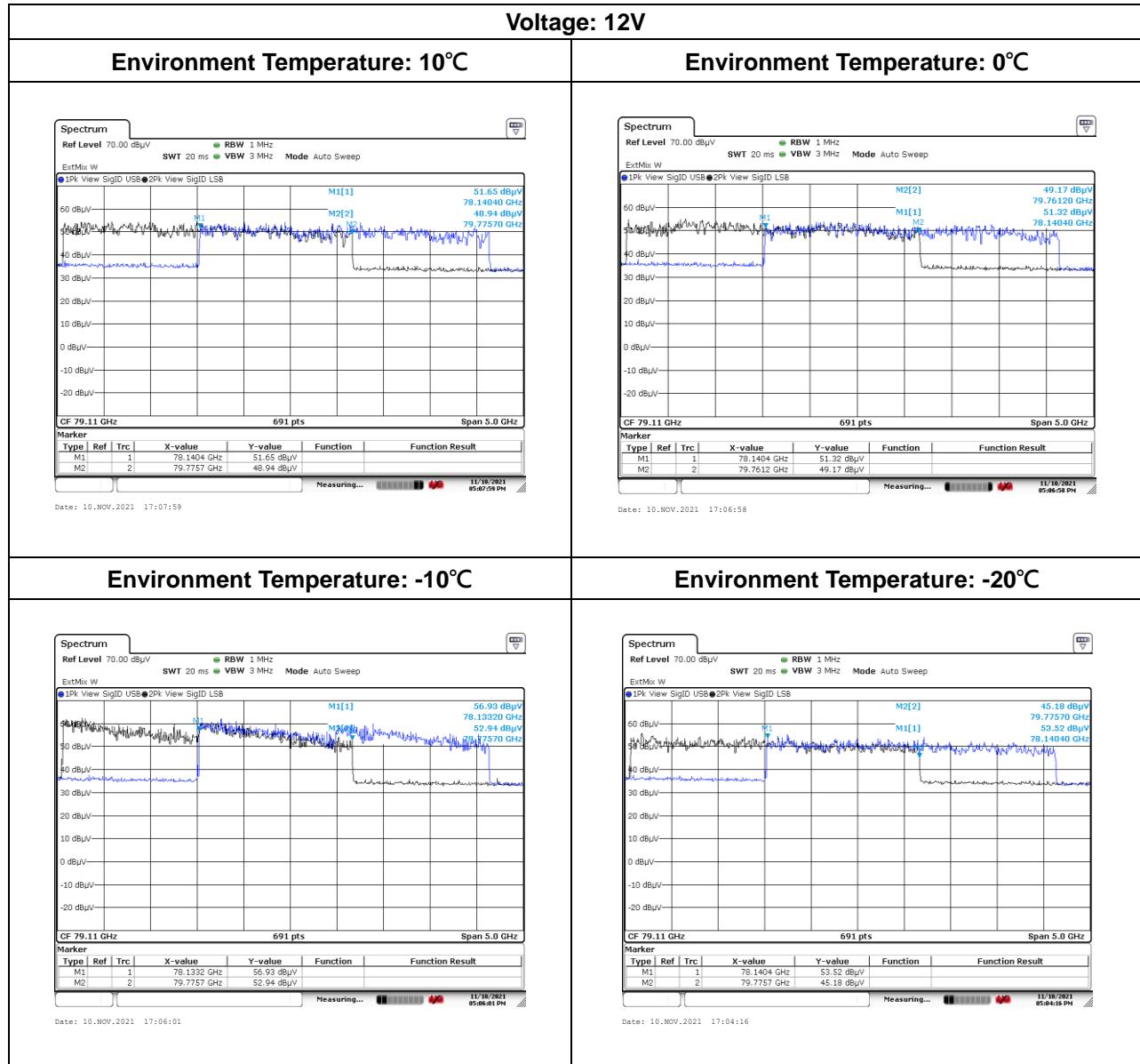
Operating Frequency					
Environment Temperature(°C)	Voltage (V)	FL (GHz)	FH (GHz)	Limit Range(GHz)	Test Result
20	10.2	78.1332	79.7757	76-81	Pass
	12	78.1332	79.7757		Pass
	13.8	78.1404	79.7757		Pass

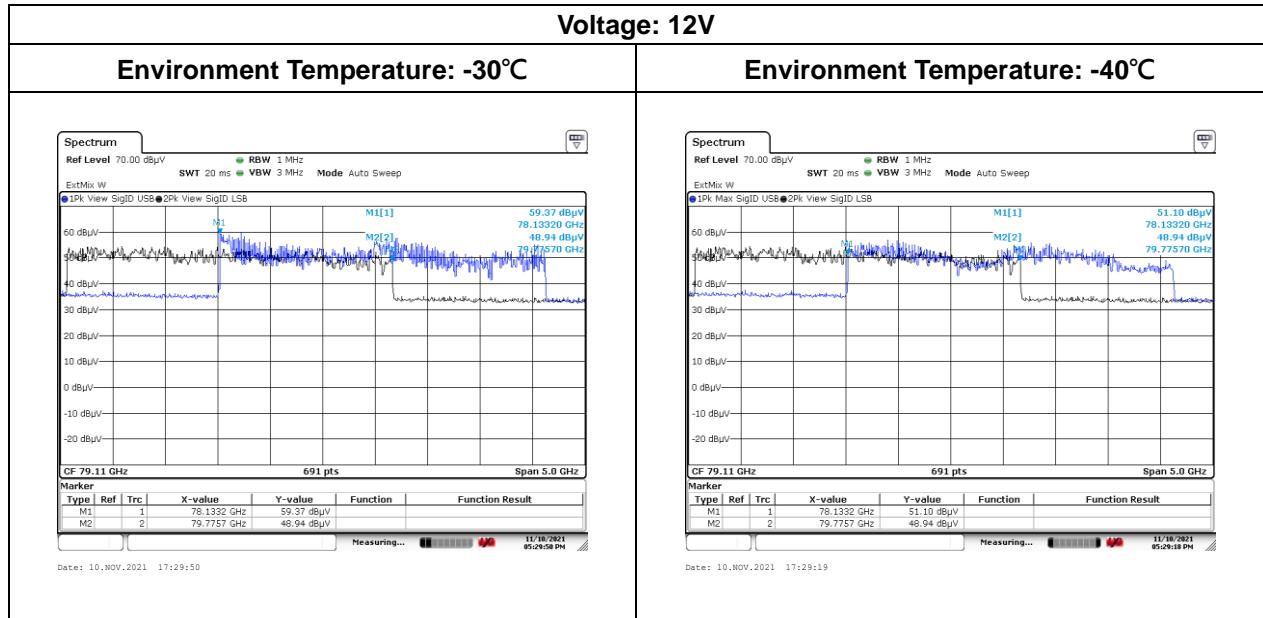
Test Plot

99%









- End of Test Report -