

FCC 47 CFR PART 15.255

TEST REPORT

For

K60168-M Dongle

Model: K60168-M

Trade Name: KaiKuTeK

Issued to
KaiKuTeK.Inc
9F, 3-2, YuanQu Street, NanGang District, Taipei, 115010, Taiwan

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 3, 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	October 25, 2021	Initial Issue	ALL	Allison Chen
01	November 3, 2021	See the following Note Rev.(01)	P.7, P.11, P.31, A-6	Allison Chen

Note:**Rev.(01)**

1. Modified setup photo (P.6) title, test methodology in section 4, uncertainties in section 5.3.
2. Modified temperature of frequency stability result.

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1. TEST RESULT CERTIFICATION

Applicant: KaiKuTeK.Inc
9F., No. 3-2, Park St., Nangang Dist., Taipei City 115010,
Taiwan

Manufacturer: KaiKuTeK.Inc
9F., No. 3-2, Park St., Nangang Dist., Taipei City 115010,
Taiwan

Equipment Under Test: K60168-M Dongle

Trade Name: KaiKuTeK

Model: K60168-M

Date of Test: September 9 ~ 16, 2021

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15.255	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 15.255.

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

Approved by:



Kevin Tsai
Deputy Manager

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2. EUT DESCRIPTION

Product	K60168-M Dongle
Trade Name	KaiKuTeK
Model Number	K60168-M
Model Discrepancy	N/A
Received Date	September 9, 2021
Power Supply	Power from host device. (DC 5V)
Frequency Band	57-64 GHz
Modulation	FMCW
Number of Channel	1
Antenna Designation	Patch antenna / Gain: 9.36 dBi
Temperature Range	0°C to +85 °C

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	15.255(c)	Out Power & EIRP	Pass
8.2	15.255(d)	Radiated Spurious Emissions	Pass
8.3	15.255(f)	Frequency Stability	Pass
8.4	15.215	Emission Bandwidth	Pass

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013, FCC CFR 47 Part 15.255, Part 15.207, Part 15.209 and Part 15.215.

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.

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4.4 DESCRIPTION OF TEST MODES

The EUT (model: K60168-M) 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 Host System
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 checked="" type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input 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 Host System
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(X-Plane) were recorded in this report

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5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

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	CC001	06/27/2021	06/26/2022
Coaxial Cable	Woken	WC12	CC003	06/27/2021	06/26/2022
Horn Antenna / Harmonic Mixer	ROHDE&SCHWARZ	FH-PP-75 / FS-Z75	10001 / 100162	12/09/2019	12/08/2021
Signal Analyzer	R&S	FSV 40	101073	09/07/2021	09/06/2022
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	09/24/2020	09/23/2021
Software	N/A				

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3M 966 Chamber Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Cal Date	Cal Due
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/08/2021	02/07/2022
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+327 109/4	09/19/2020	09/18/2021
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-170 / SAM-170	10003 / 20011	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
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	09/30/2020	09/29/2021
Coaxial Cable	Woken	WC12	CC001	06/27/2021	06/26/2022
Coaxial Cable	Woken	WC12	CC003	06/27/2021	06/26/2022
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
Loop Ant	COM-POWER	AL-130	121051	03/26/2021	03/25/2022
Pre-Amplifier	EMEC	EM330	060609	02/24/2021	02/23/2022
Pre-Amplifier	EMEC	EM01G26G	060570	12/25/2020	12/24/2021
Pre-Amplifier	MITEQ	AMF-6F-18004000-37-8P	985646	08/31/2021	08/30/2022
Signal Analyzer	R&S	FSV 40	101073	09/07/2021	09/06/2022
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 6.11-20180419c				

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575 dB
Emission bandwidth, 20dB bandwidth	+/- 0.0014 MHz
RF output power, conducted	+/- 1.14 dB
Power density, conducted	+/- 1.40 dB
3M Semi Anechoic Chamber / 30M~1G (Horizontally)	+/- 3.91 dB
3M Semi Anechoic Chamber / 30M~1G (Vertically)	+/- 4.57 dB
3M Semi Anechoic Chamber / 1G~6G	+/- 5.20 dB
3M Semi Anechoic Chamber / 6G~18G	+/- 5.18 dB
3M Semi Anechoic Chamber / 18G~40G	+/- 3.68 dB
3M Semi Anechoic Chamber / 40G~60G	+/- 4.64 dB
3M Semi Anechoic Chamber / 60G~75G	+/- 4.64 dB
3M Semi Anechoic Chamber / 75G~110G	+/- 4.65 dB
3M Semi Anechoic Chamber / 110G~170G	+/- 4.69 dB
3M Semi Anechoic Chamber / 170G~220G	+/- 5.31 dB
3M Semi Anechoic Chamber / 220G~325G	+/- 5.73 dB
3M Semi Anechoic Chamber / 30M~1G (Horizontally)	+/- 3.91 dB
3M Semi Anechoic Chamber / 30M~1G (Vertically)	+/- 4.57 dB

Remark:

- 1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

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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

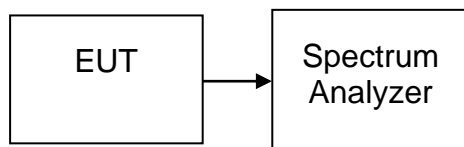
8.1 OUTPUT POWER & EIRP

LIMIT

Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

For fixed field disturbance sensors other than those operating under the provisions of paragraph (c)(2) of this section, and short-range devices for interactive motion sensing, the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm.

Test Configuration



TEST RESULTS

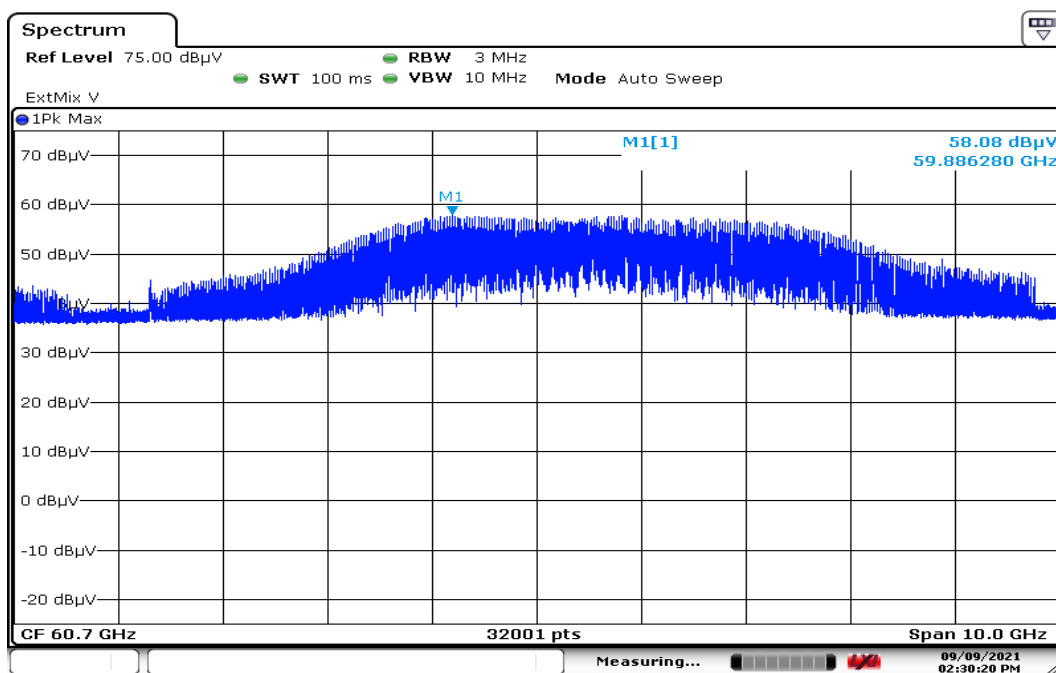
No non-compliance noted.

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Test Data

Temperature: 22.4~23.3°C **Test date:** September 9, 2021
Humidity: 45~59% RH **Tested by:** Ray Li

Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	E.I.R.P. (dBm)	Limit (dBm)	Detector
59.886	58.08	43.39	1	101.47	-3.32684	<= 10	Peak
					Conducted Power (dBm)	Limit (dBm)	Detector
					-12.68684	<= -10	Peak



Date: 9.SEP.2021 14:30:20

8.2 SPURIOUS EMISSIONS

8.2.1 Radiated Emissions

LIMIT

1. According to FCC PART 15.255(d), 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. Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm² at a distance of 3 meters.
3. The levels of the spurious emissions shall not exceed the level of the fundamental emission.

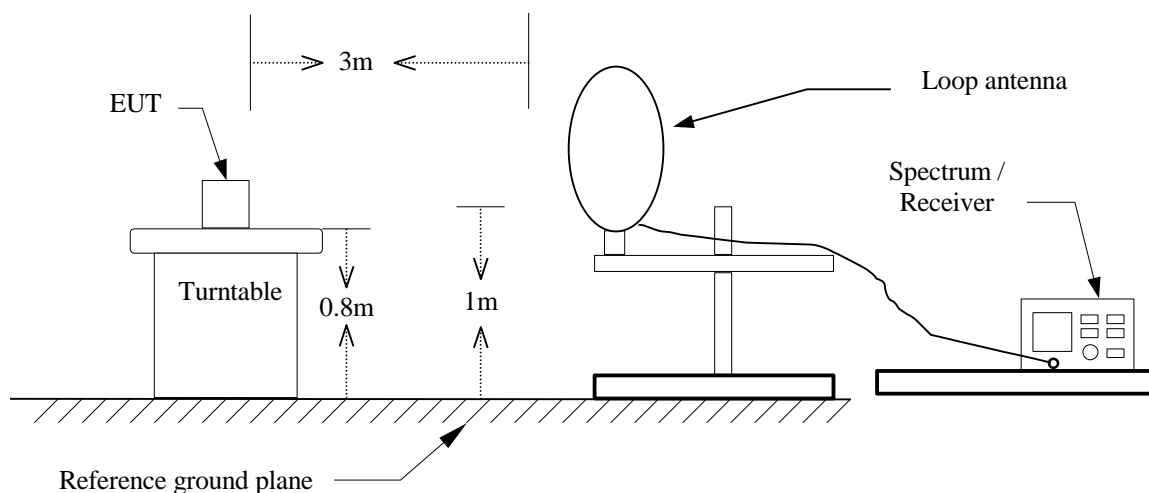
Notes:

$$90 \text{ pW/cm}^2 = \{ [(90/10^8) * 377]^{0.5} \} * 10^6 = 18420.10 \text{ uV/m}$$

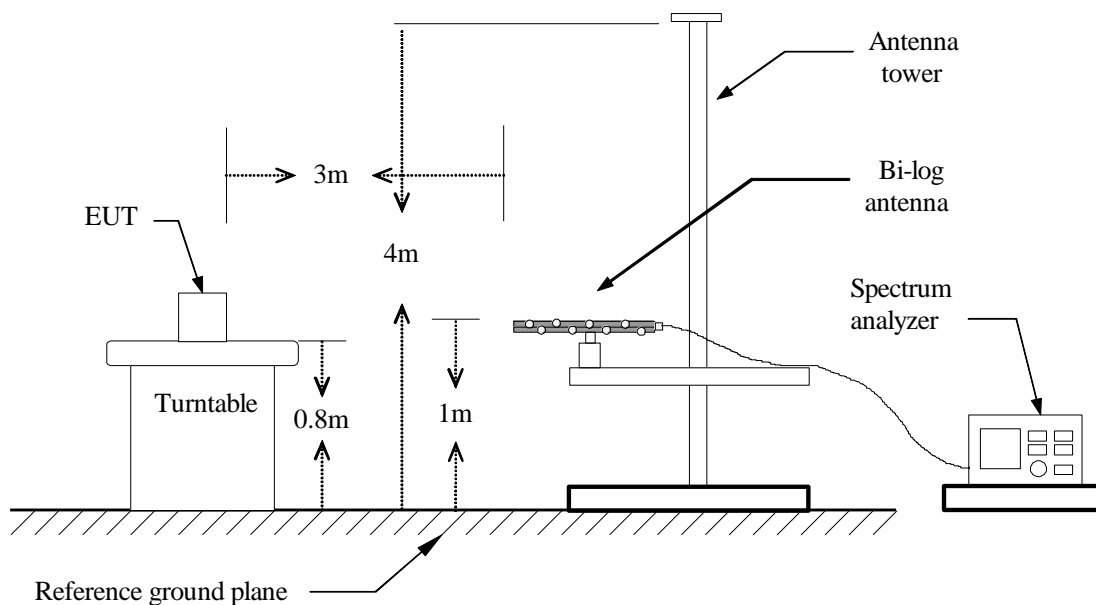
$$20\text{Log} (18420.0977196105) = 85.30 \text{ dBuV/m @ 3m}$$

Test Configuration

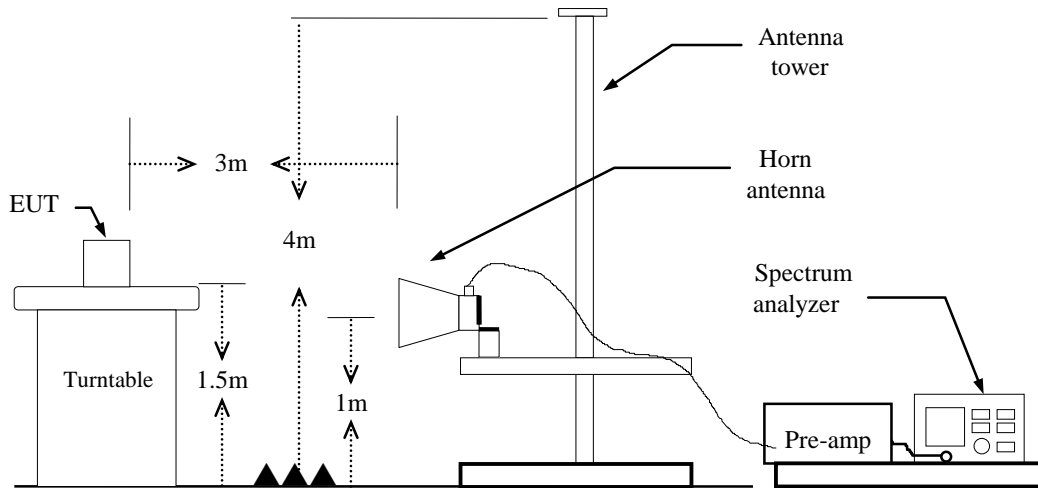
9kHz ~ 30MHz



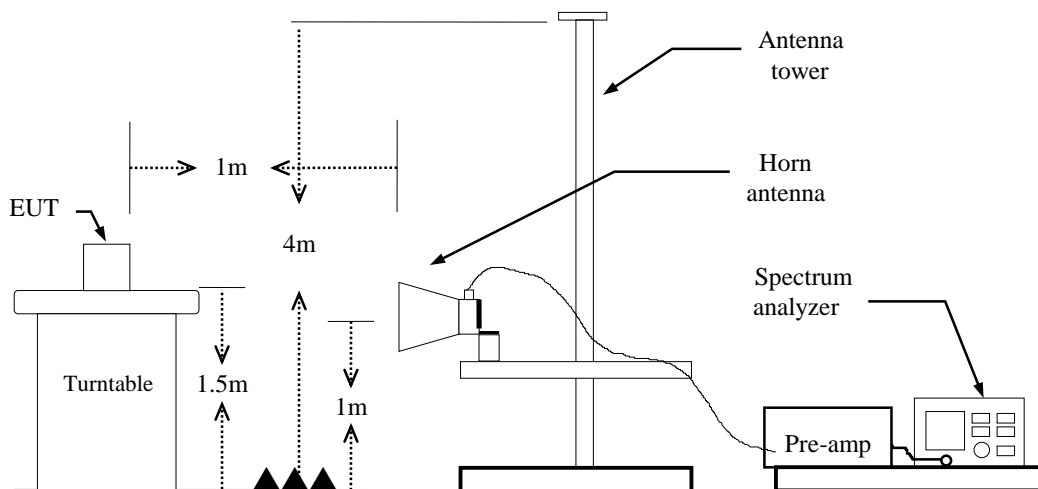
30MHz ~ 1 GHz



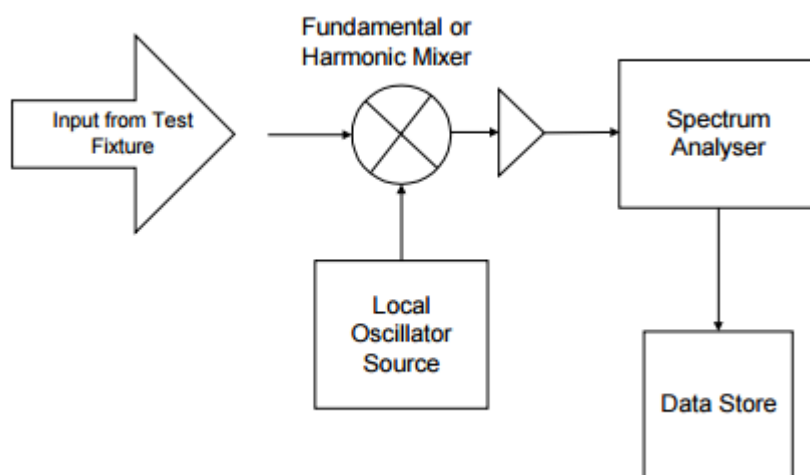
Above 1 GHz ~ 18GHz



18GHz ~ 40GHz



Above 40 GHz



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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:

For PEAK:

RBW = 1 MHz, VBW= 3 MHz,

Detector = Peak, Trace mode = max hold, Sweep = AUTO.

For RMS:

RBW = 1 MHz, VBW= 3 MHz,

Detector = RMS, Trace mode = max hold, Sweep = AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

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Below 1 GHz

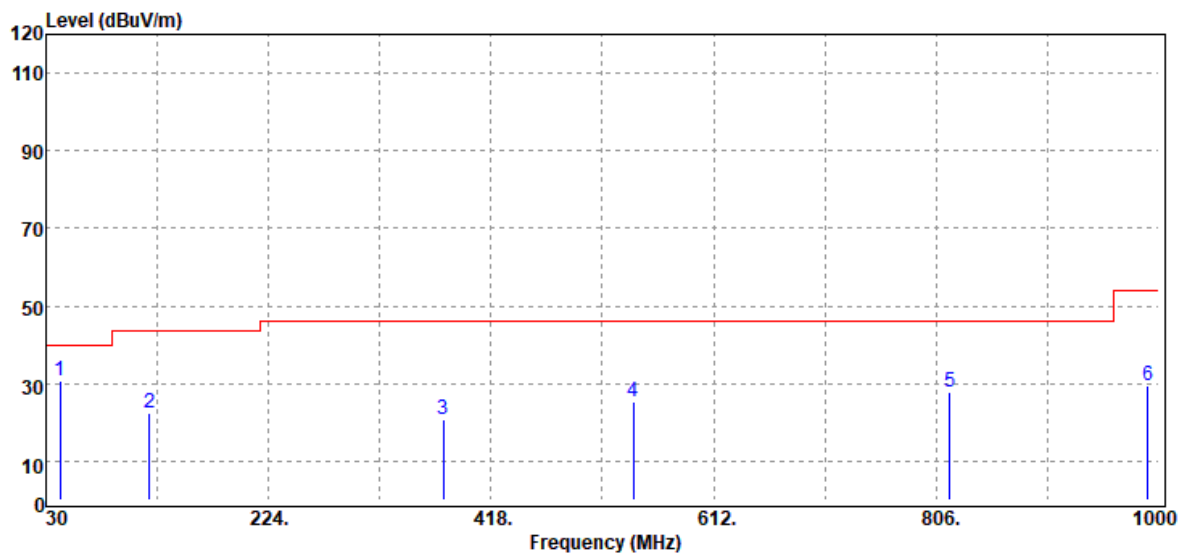
Operation Mode: TX CH Mid **Polarity:** Ver. / Hor.
Temperature: 21.4°C **Test Date:** September 13, 2021
Humidity: 59% RH **Tested by:** Ray Li

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)
42.61	Peak	42.07	-11.45	30.62	40.00	-9.38	V
120.21	Peak	31.73	-9.19	22.54	43.50	-20.96	V
376.29	Peak	27.46	-6.85	20.61	46.00	-25.39	V
542.16	Peak	28.07	-2.74	25.33	46.00	-20.67	V
817.64	Peak	26.11	1.88	27.99	46.00	-18.01	V
990.30	Peak	24.99	4.46	29.45	54.00	-24.55	V
100.81	Peak	31.93	-12.50	19.43	43.50	-24.07	H
175.50	Peak	35.54	-11.31	24.23	43.50	-19.27	H
225.94	Peak	34.76	-11.61	23.15	46.00	-22.85	H
539.25	Peak	26.68	-2.73	23.95	46.00	-22.05	H
846.74	Peak	25.72	2.24	27.96	46.00	-18.04	H
959.26	Peak	25.53	3.83	29.36	46.00	-16.64	H

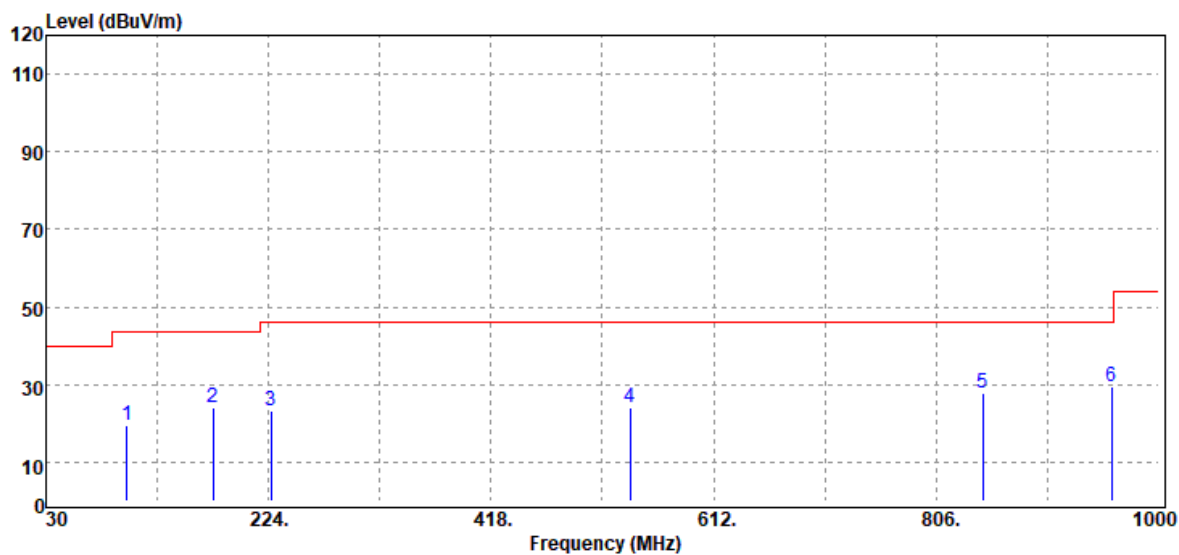
Remark:

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



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Above 1 GHz

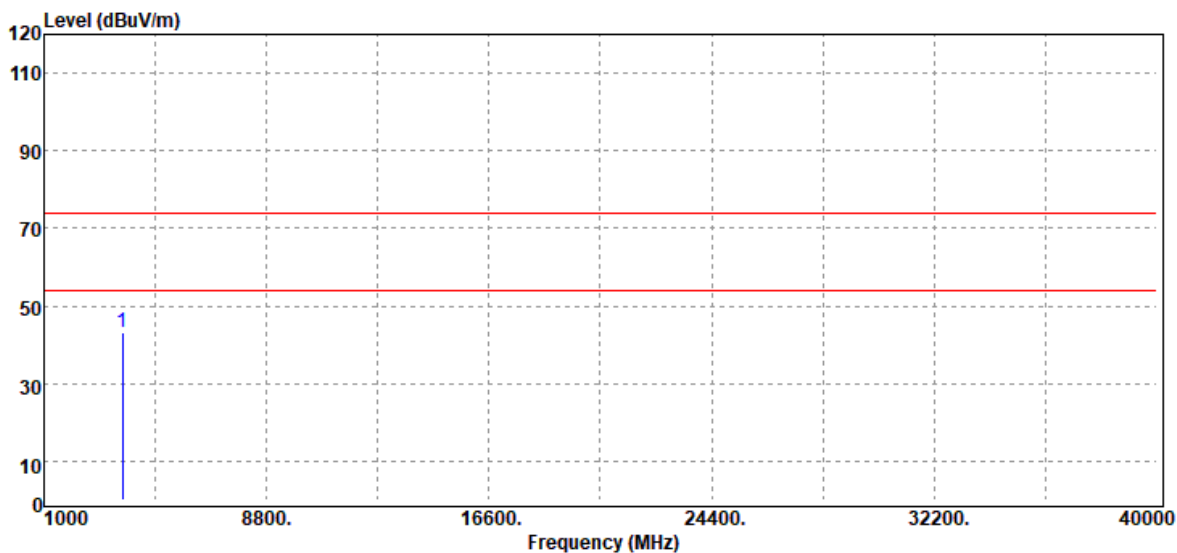
Operation Mode: TX CH Mid **Polarity:** Ver. / Hor.
Temperature: 21.4°C **Test Date:** September 13, 2021
Humidity: 59% RH **Tested by:** Ray Li

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB	Ant. Pol. (H/V)
3754.80	Peak	33.49	9.61	43.10	74.00	-30.90	V
N/A							
3747.70	Peak	34.28	9.74	44.02	74.00	-29.98	H
N/A							

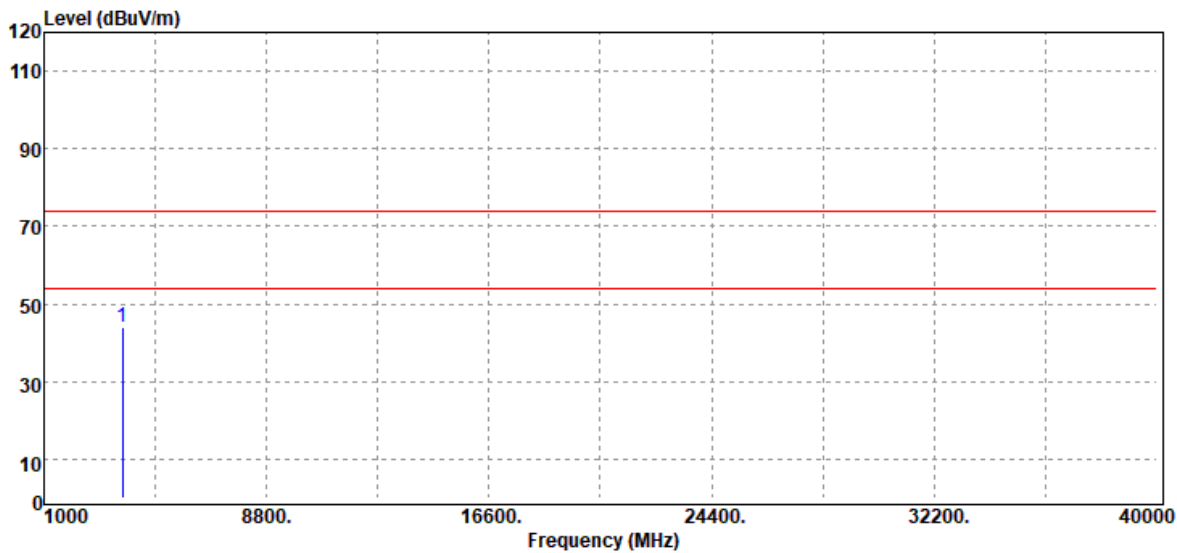
Remark:

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



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40GHz-50 GHz

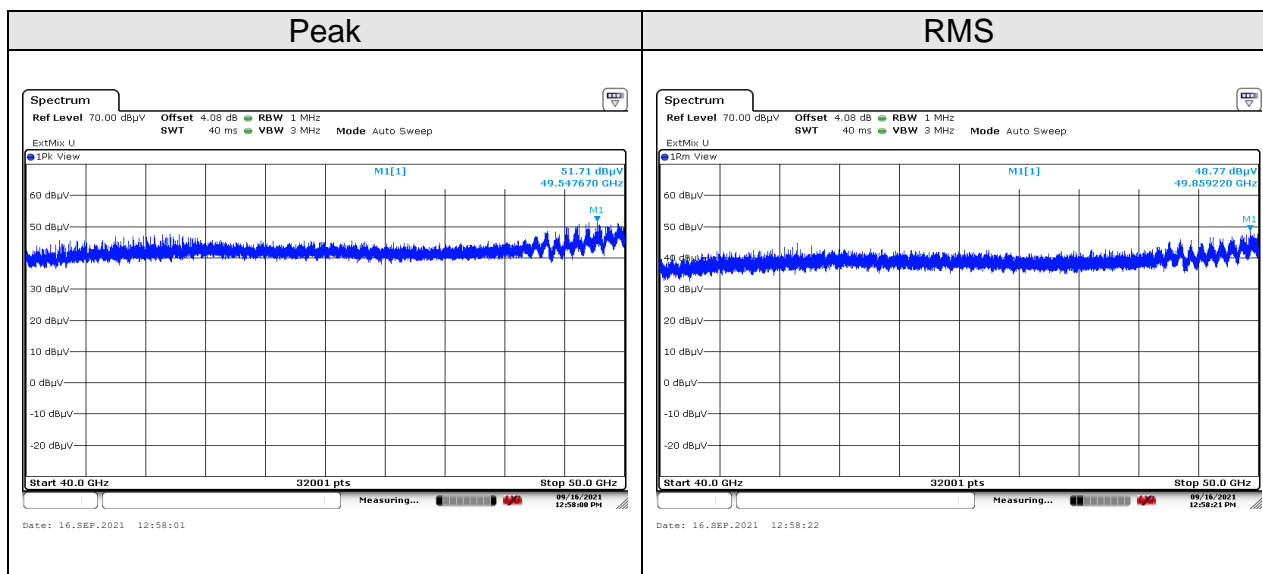
Operation Mode: Test Mode

Temperature: 22.4~23.3°C

Humidity: 45~59% RH

Test date: September 16, 2021

Tested by: Ray Li



Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
49.54767	51.71	42.86	1	94.57	< 114.84	Peak
49.85922	48.77	42.89	1	91.66	< 94.84	RMS

Remark:

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

2. 40GHz~200GHz Limit :

@ 3m Limit

$$\{ [(90/10^8) * 377] ^{0.5} \} * 10^6 = 18420.0977196105 \text{ uV/m}$$

$$20\text{Log} (18420.0977196105) = 85.30 \text{ dBuV}$$

@ 1m Limit = 85.30 + 20*Log (3/1) = 94.84 dBuV/m

@ 0.5m Limit = 85.30 + 20*Log (3/0.5) = 100.86 dBuV/m

@ 0.4m Limit = 85.30 + 20*Log (3/0.4) = 102.80 dBuV/m

@ 0.3m Limit = 85.30 + 20*Log (3/0.3) = 105.30 dBuV/m

@ 0.2m Limit = 85.30 + 20*Log (3/0.2) = 108.82 dBuV/m

@ 0.1m Limit = 85.30 + 20*Log (3/0.1) = 114.84 dBuV/m

3. Based on FCC part15.35(b), the PK limit is the average limit increased by 20dB

Report No.: TMWK2109000557KR

50GHz-75 GHz

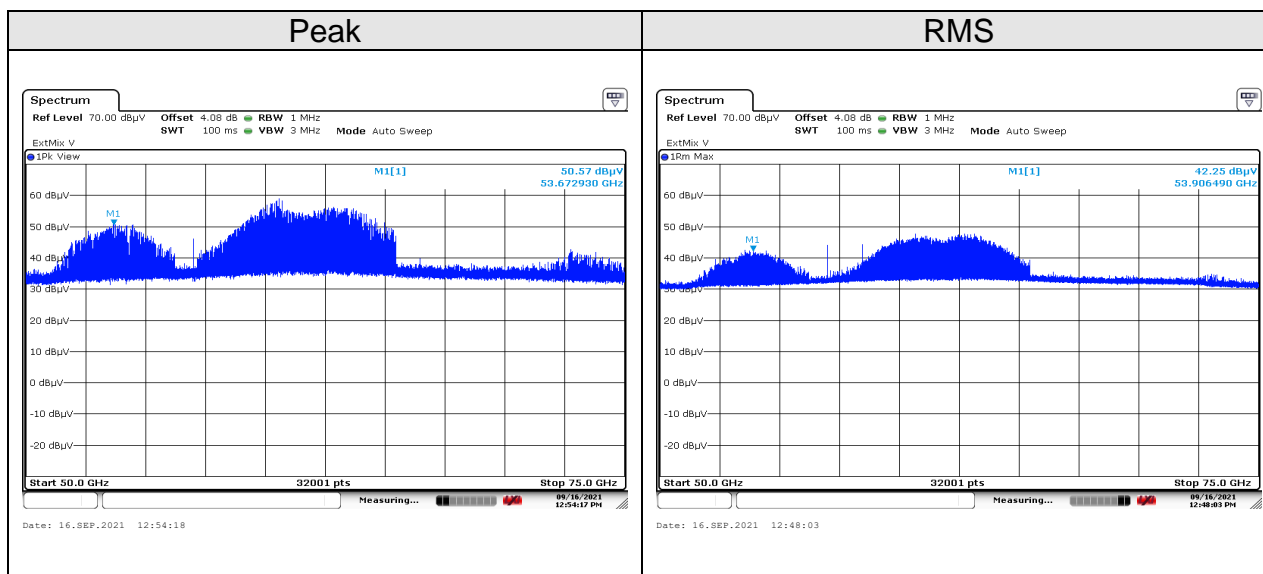
Operation Mode: Test Mode

Temperature: 22.4~23.3°C

Humidity: 45~59% RH

Test date: September 16, 2021

Tested by: Ray Li



Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
53.67293	50.57	39.89	1	90.46	< 114.84	Peak
53.90649	42.25	39.99	1	82.24	< 94.84	RMS

Remark:

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

2. 40GHz~200GHz Limit :

@ 3m Limit

$$\{ [(90/10^8) * 377] ^{0.5} \} * 10^6 = 18420.0977196105 \text{ uV/m}$$

$$20\text{Log} (18420.0977196105) = 85.30 \text{ dBuV}$$

@ 1m Limit = 85.30 + 20*Log (3/1) = 94.84 dBuV/m

@ 0.5m Limit = 85.30 + 20*Log (3/0.5) = 100.86 dBuV/m

@ 0.4m Limit = 85.30 + 20*Log (3/0.4) = 102.80 dBuV/m

@ 0.3m Limit = 85.30 + 20*Log (3/0.3) = 105.30 dBuV/m

@ 0.2m Limit = 85.30 + 20*Log (3/0.2) = 108.82 dBuV/m

@ 0.1m Limit = 85.30 + 20*Log (3/0.1) = 114.84 dBuV/m

3. Based on FCC part15.35(b), the PK limit is the average limit increased by 20dB

Report No.: TMWK2109000557KR

75GHz-110 GHz

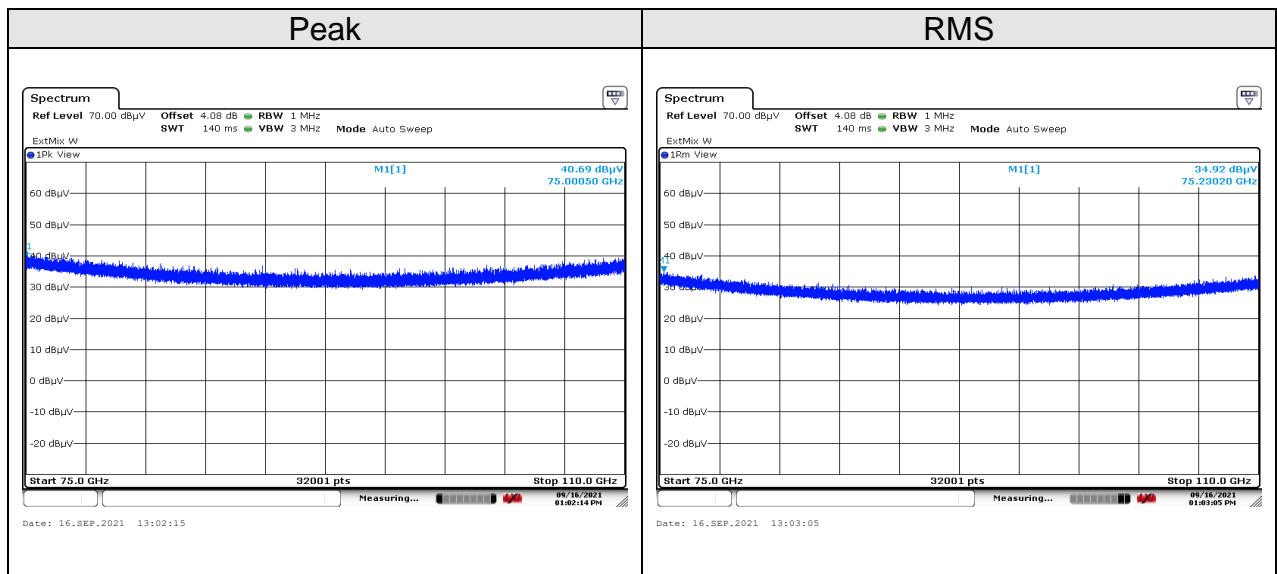
Operation Mode: Test Mode

Temperature: 22.4~23.3°C

Test date: September 16, 2021

Humidity: 45~59% RH

Tested by: Ray Li



Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
75.0005	40.69	44.90	1	85.59	< 114.84	Peak
75.2302	34.92	44.93	1	79.85	< 94.84	RMS

Remark:

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

2. 40GHz~200GHz Limit :

@ 3m Limit

$$\{ [(90/10^8) * 377]^{\wedge}0.5 \} * 10^6 = 18420.0977196105 \text{ uV/m}$$

$$20\text{Log}(18420.0977196105) = 85.30 \text{ dBuV}$$

@ 1m Limit = 85.30 + 20*Log(3/1) = 94.84 dBuV/m

@ 0.5m Limit = 85.30 + 20*Log(3/0.5) = 100.86 dBuV/m

@ 0.4m Limit = 85.30 + 20*Log(3/0.4) = 102.80 dBuV/m

@ 0.3m Limit = 85.30 + 20*Log(3/0.3) = 105.30 dBuV/m

@ 0.2m Limit = 85.30 + 20*Log(3/0.2) = 108.82 dBuV/m

@ 0.1m Limit = 85.30 + 20*Log(3/0.1) = 114.84 dBuV/m

3. Based on FCC part15.35(b), the PK limit is the average limit increased by 20dB

Report No.: TMWK2109000557KR

110GHz-140 GHz

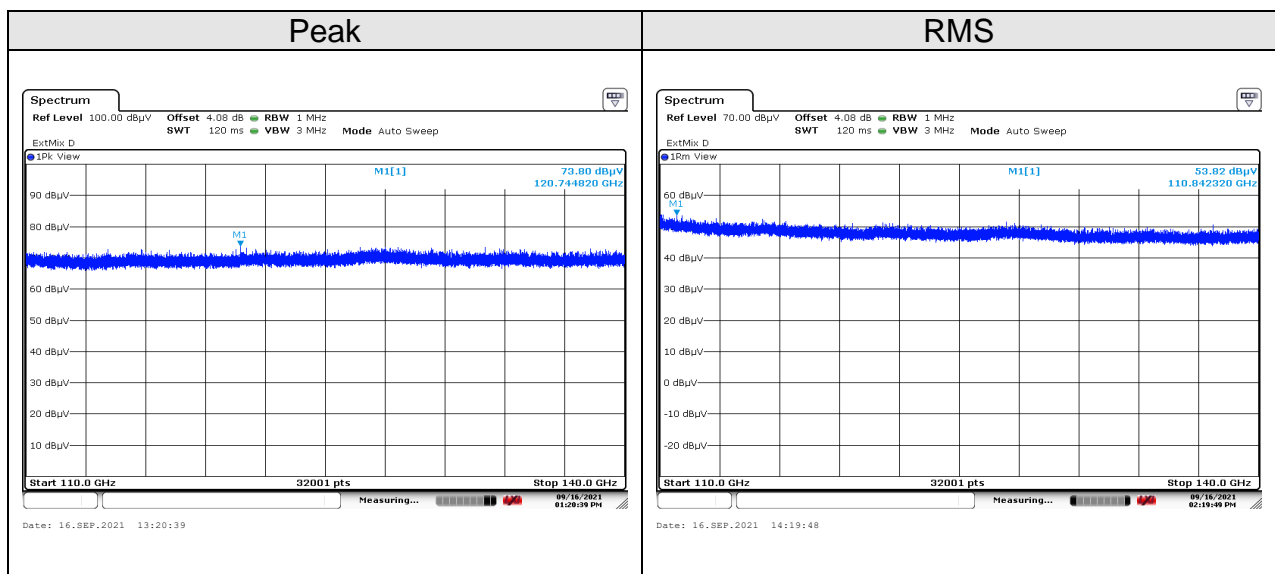
Operation Mode: Test Mode

Temperature: 22.4~23.3°C

Humidity: 45~59% RH

Test date: September 16, 2021

Tested by: Ray Li



Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
120.74482	73.8	50.47	0.3	124.27	< 125.3	Peak
110.84232	53.82	50.41	0.3	104.23	< 105.3	RMS

Remark:

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

2. 40GHz~200GHz Limit :

@ 3m Limit

$$\{ [(90/10^8) * 377] ^{0.5} \} * 10^6 = 18420.0977196105 \text{ uV/m}$$

$$20\text{Log} (18420.0977196105) = 85.30 \text{ dBuV}$$

@ 1m Limit = 85.30 + 20*Log (3/1) = 94.84 dBuV/m

@ 0.5m Limit = 85.30 + 20*Log (3/0.5) = 100.86 dBuV/m

@ 0.4m Limit = 85.30 + 20*Log (3/0.4) = 102.80 dBuV/m

@ 0.3m Limit = 85.30 + 20*Log (3/0.3) = 105.30 dBuV/m

@ 0.2m Limit = 85.30 + 20*Log (3/0.2) = 108.82 dBuV/m

@ 0.1m Limit = 85.30 + 20*Log (3/0.1) = 114.84 dBuV/m

3. Based on FCC part15.35(b), the PK limit is the average limit increased by 20dB

Report No.: TMWK2109000557KR

140GHz-200 GHz

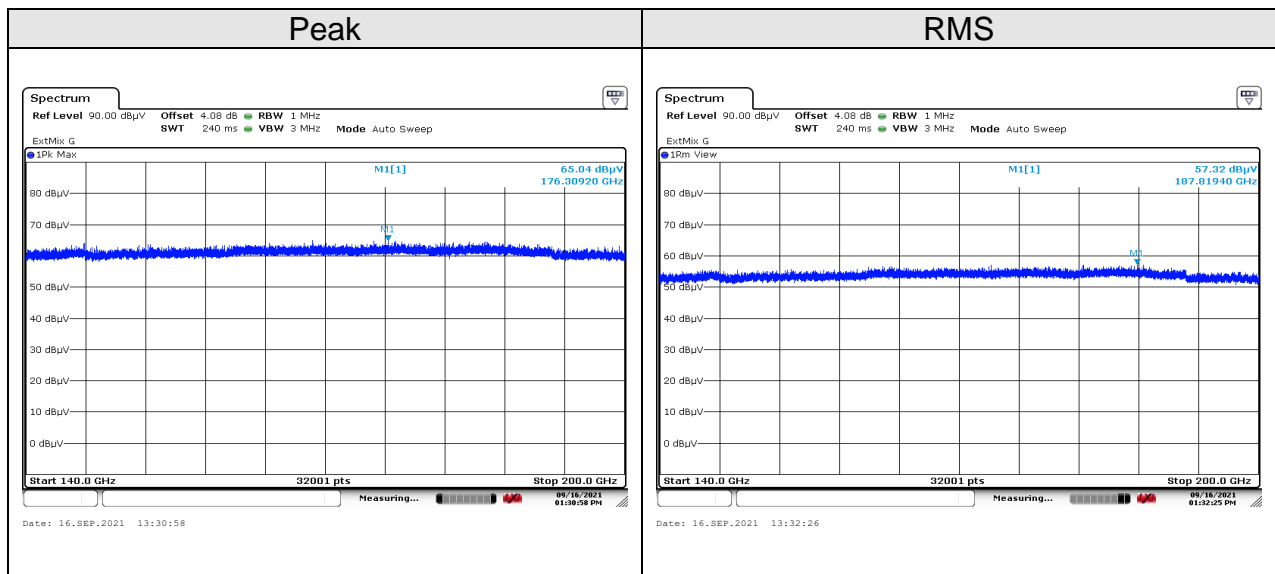
Operation Mode: Test Mode

Temperature: 22.4~23.3°C

Humidity: 45~59% RH

Test date: September 16, 2021

Tested by: Ray Li



Frequency (GHz)	Spectrum Reading (dBuV)	Antenna Factor (dB/m)	Distance (m)	dBuV/m	Limit (dBuV/m)	Detector
176.3092	65.04	52.83	0.1	117.87	< 134.84	Peak
187.8194	57.32	53.19	0.1	110.51	< 114.84	RMS

Remark:

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

2. 40GHz~200GHz Limit :

@ 3m Limit

$$\{ [(90/10^8) * 377]^2 * 10^6 \} = 18420.0977196105 \text{ uV/m}$$

$$20\text{Log}(18420.0977196105) = 85.30 \text{ dBuV}$$

@ 1m Limit = 85.30 + 20*Log(3/1) = 94.84 dBuV/m

@ 0.5m Limit = 85.30 + 20*Log(3/0.5) = 100.86 dBuV/m

@ 0.4m Limit = 85.30 + 20*Log(3/0.4) = 102.80 dBuV/m

@ 0.3m Limit = 85.30 + 20*Log(3/0.3) = 105.30 dBuV/m

@ 0.2m Limit = 85.30 + 20*Log(3/0.2) = 108.82 dBuV/m

@ 0.1m Limit = 85.30 + 20*Log(3/0.1) = 114.84 dBuV/m

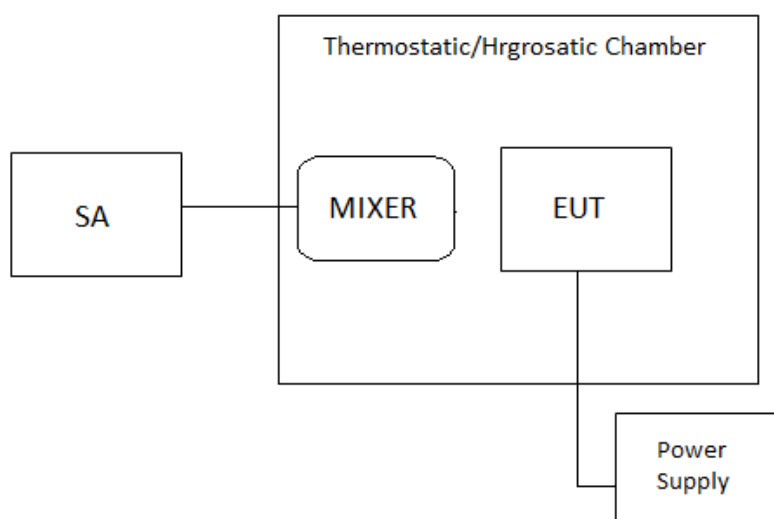
3. Based on FCC part15.35(b), the PK limit is the average limit increased by 20dB

8.3 FREQUENCY STABILITY

LIMIT

According to FCC 15.255(f), 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 -20°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 $+50^{\circ}\text{C}$ reached.

Report No.: TMWK2109000557KR

TEST RESULTS

No non-compliance noted.

Temperature: 22.4~23.3°C

Test date: September 13~14, 2021

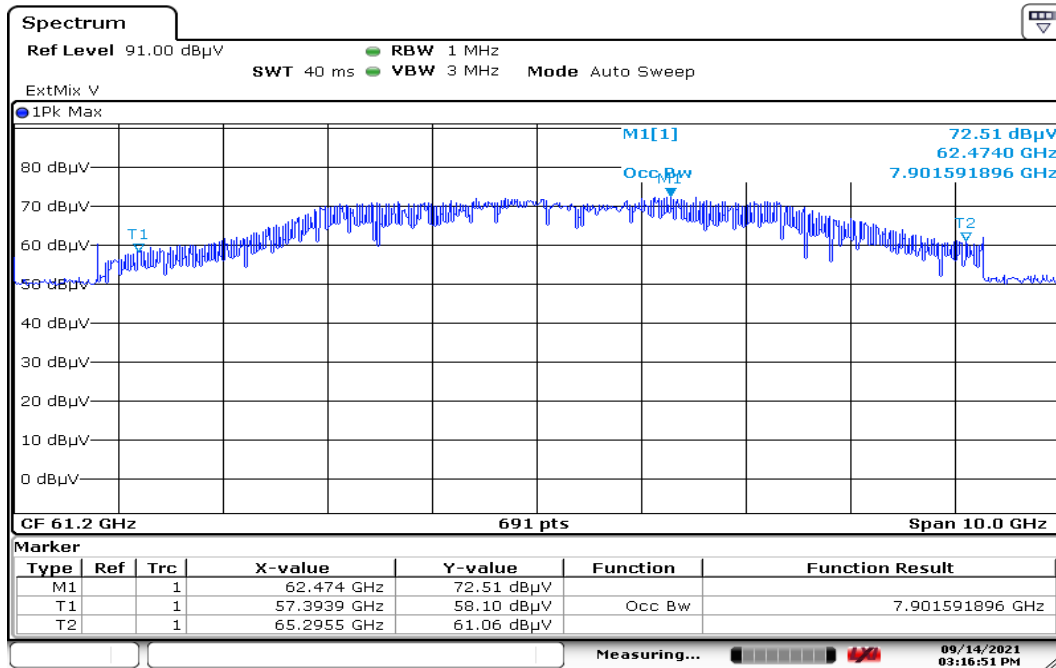
Humidity: 45~59% RH

Tested by: Ray Li

Operating Frequency				
Mode	FL (GHz)	FH (GHz)	Limit Range(GHz)	Test Result
Tnom Vnom (20°C 5VDC)	57.3939	65.2955	57-71	Pass
Tmax Vmax (50°C 5.75VDC)	57.5097	65.2087		Pass
Tmax Vmin (50°C 4.25VDC)	57.4373	65.1653		Pass
Tmin Vmax (-20°C 5.75VDC)	57.8136	65.3679		Pass
Tmin Vmin (-20°C 4.25VDC)	57.611	65.2955		Pass

Report No.: TMWK2109000557KR

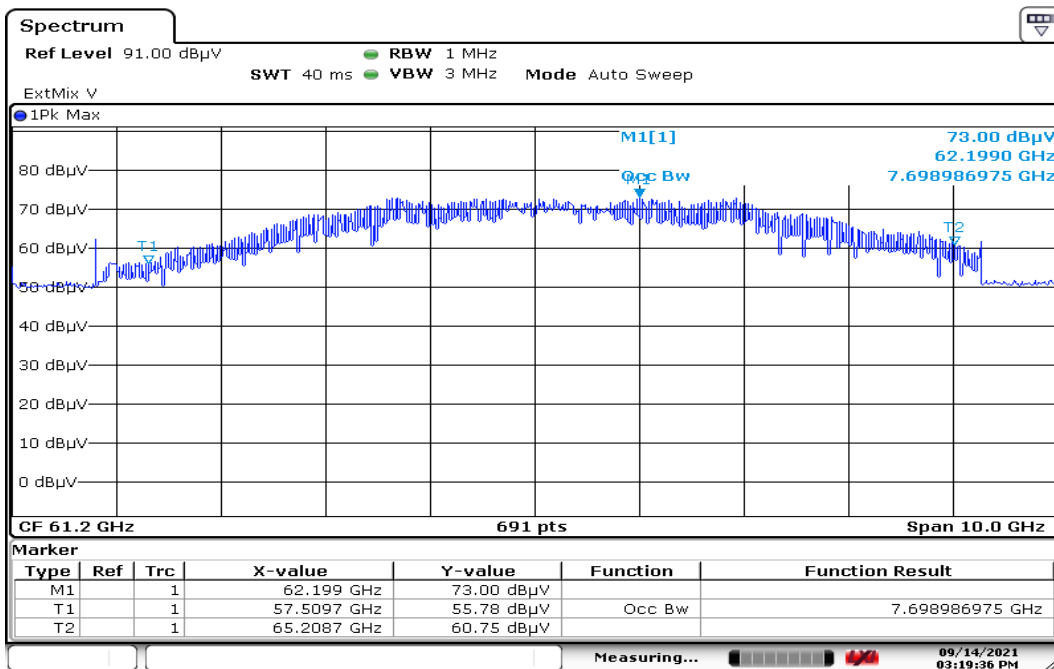
Test Plot 20°C / 5V



Date: 14.SEP.2021 15:16:51

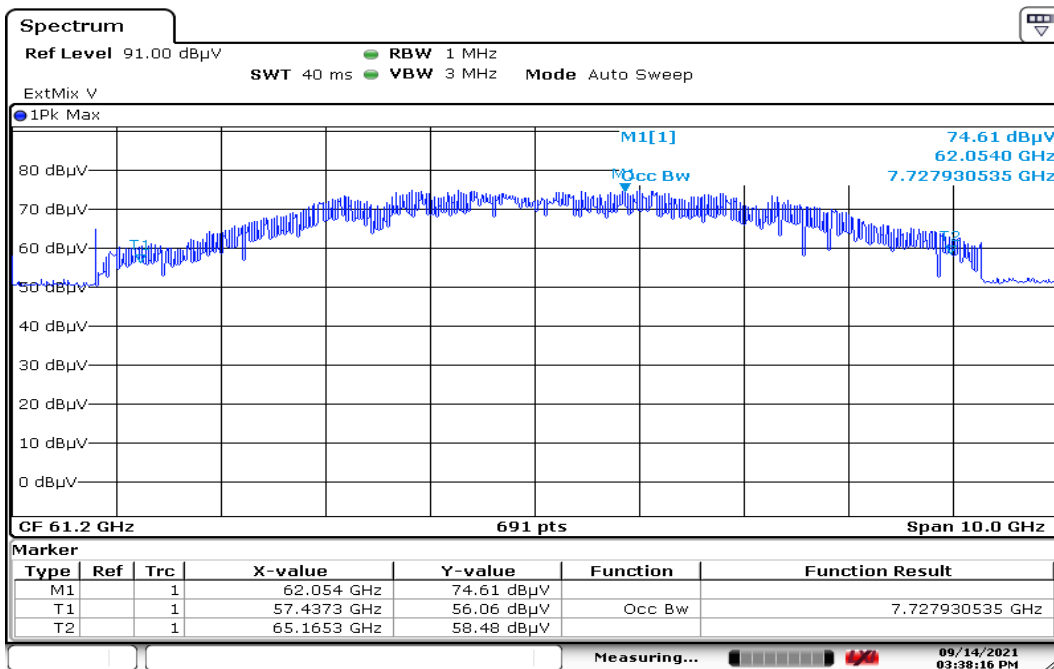
Report No.: TMWK2109000557KR

85°C / 5.75V



Date: 14.SEP.2021 15:19:35

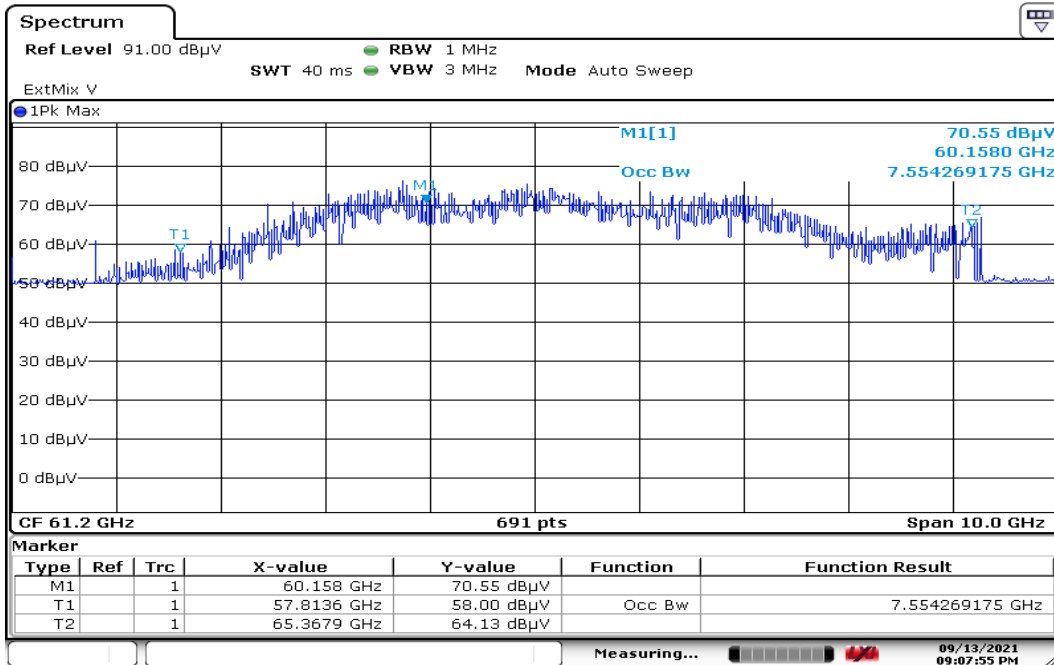
85°C / 4.25V



Date: 14.SEP.2021 15:38:17

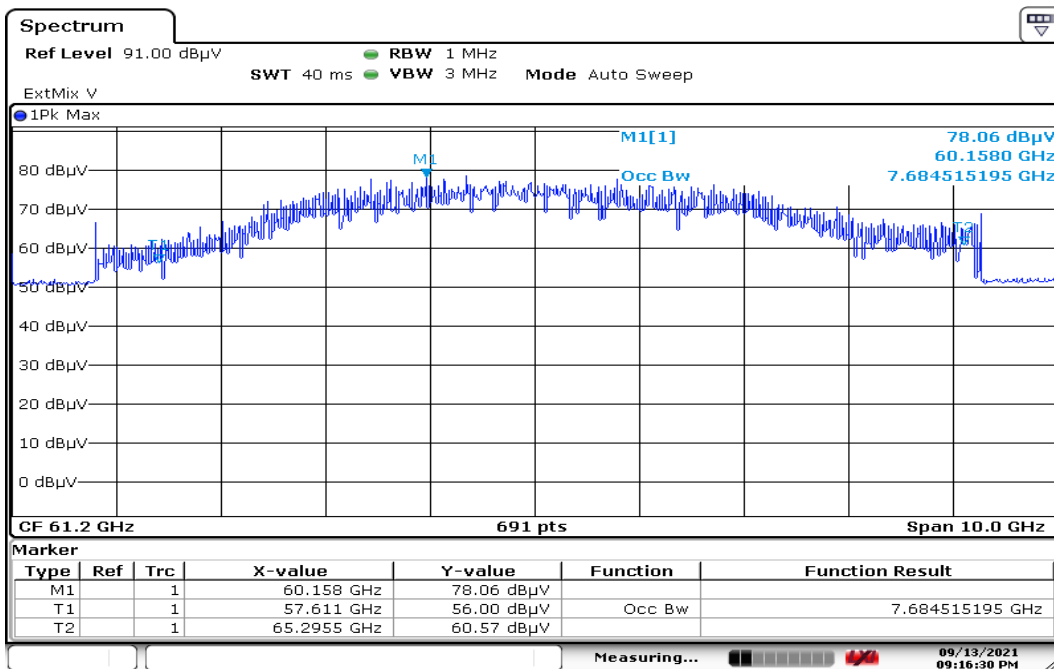
Report No.: TMWK2109000557KR

0°C / 5.75V



Date: 13.SEP.2021 21:07:55

0°C / 4.25V



Date: 13.SEP.2021 21:16:31

Report No.: TMWK2109000557KR

8.4 EMISSION BANDWIDTH

LIMIT

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through § 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

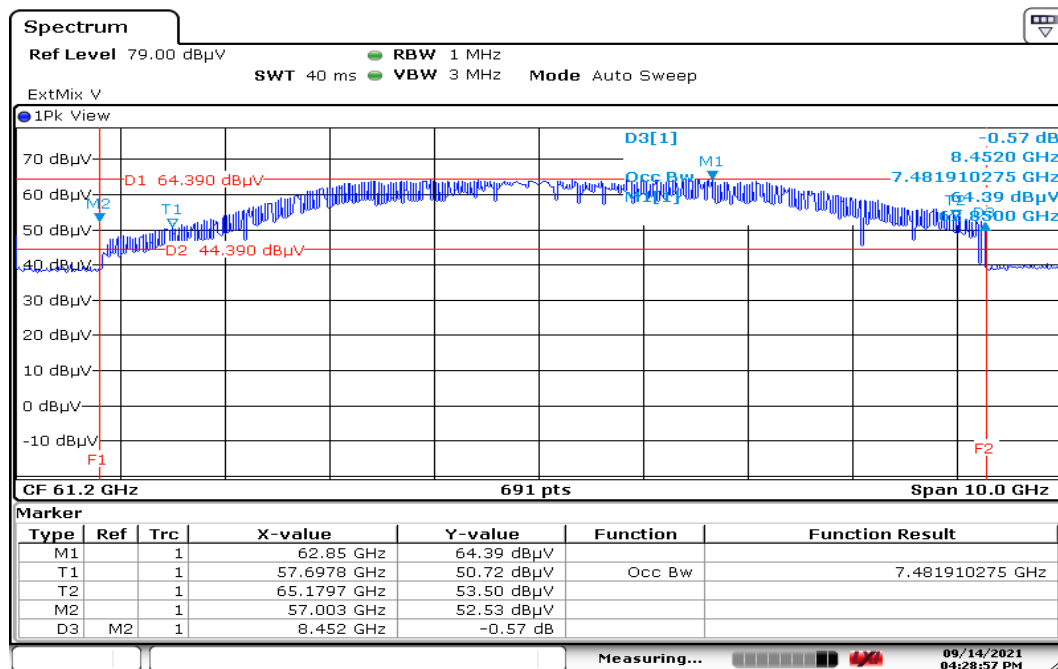
TEST PROCEDURE

The measurements are based on ANSI C63.10-2013

TEST RESULTS

No non-compliance noted.

Temperature: 22.4~23.3°C Test date: September 14, 2021
Humidity: 45~59% RH Tested by: Ray Li



Date: 14.SEP.2021 16:28:58

- End of Test Report -