FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

E-note device

Model No.: USMUK4

Brand Name: ITOCHU

Issued to

AIMobile Co., Ltd.
6F., No. 166, Sec.4, Chengde Rd., Shilin Dist., Taipei City 11167 , 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: September 2, 2022

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 2, 2022	Initial Issue	ALL	Allison Chen

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1. TEST RESULT CERTIFICATION

Applicant: AIMobile Co., Ltd.
6F., No. 166, Sec.4, Chengde Rd., Shilin Dist., Taipei City 11167 , Taiwan

Manufacturer: AIMobile Co., Ltd.
6F., No. 166, Sec.4, Chengde Rd., Shilin Dist., Taipei City 11167 , Taiwan

Equipment Under Test: E-note device

Brand Name: ITOCHU

Model No.: USMUK4

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C	Compliance
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:

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 tested as described in this report is in compliance with the requirements of FCC Rules Part 15.225.
The test results of this report relate only to the tested sample identified in this report.

Approved by:

Shawn Wu
Supervisor

2. EUT DESCRIPTION

2.1 EUT INFORMATION

Equipment	E-note device
Model Name	USMUK4
Model Discrepancy	N/A
Brand Name	ITOCHU
Received Date	July 19, 2022
Date of Test	August 1~12, 2022
Power Supply	1. Power from Host System. Rechargeable Li-Polymer Battery / LIS1633RDPCA Rating: 2000mAh, 7.4Wh 2. Power from Adapter.
Frequency Range	13.56MHz
Modulation Technique	ASK
Number of Channels	1 Channel

Remark:
1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

2.2 ANTENNA INFORMATION

Antenna Specification	☐ PIFA ☐ PCB ☐ Dipole ☒ Coil Antenna
Brand / Model	MAG.LAYERS / GMNA-323149-N00A1-IV002

Notes:
1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.225.

The tests documented in this report were performed in accordance with IC RSS-210, IC RSS-Gen, and ANSI C63.10: 2013

3.1 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.

3.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3.3 DESCRIPTION OF TEST MODES

The EUT had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

All modes and data rates were investigated and it was determined that ISO 14443A/B and ISO 18092 Type y, 106/212/424/848 kbps.

All data rates were investigated and it was determined that 106 Kbps was considered worst-case. Therefore, all testing was performed in 106 Kbps mode.

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Battery**
Worst Mode	☐ **Placed in fixed position.** ☐ **Placed in fixed position at X-Plane (E2-Plane)** ☒ **Placed in fixed position at Y-Plane (E1-Plane)** ☐ **Placed in fixed position at Z-Plane (H-Plane)**

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(Y-Plane) were recorded in this report

4. TEST SUMMARY

FCC Standard Sec.	Chapter	Test Item	Result
15.203	2	Antenna Requirement	Pass
15.215	8.1	Occupied Bandwidth (99%) and 20dB Bandwidth	Pass
15.209	8.2	Radiated Emissions	Pass
15.225	8.3	Frequency Stability	Pass
15.207	8.4	AC Power-line Conducted Emission	Pass

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

AC line Conduction Test Room					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
CABLE	EMCI	CFD300-NL	CERF	06/27/2022	06/26/2023
EMI Test Receiver	R&S	ESCI	100064	06/17/2022	06/16/2023
LISN	SCHAFFNER	NNB 41	03/10013	02/15/2022	02/14/2023
Software	EZ-EMC(CCS-3A1-CE-wugu)				

RF Conducted Test Site					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
EXA Signal Analyzer	KEYSIGHT	N9010B	MY55460167	09/07/2021	09/06/2022
Loop Probe	LANGER EMV-TECHNIK	RF-R 50-1	02-2644	01/24/2022	01/23/2023
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	09/17/2021	09/16/2022
Software	N/A				

3M 966 Chamber Test Site (Below 30MHz)					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	08/03/2022	08/02/2023
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/23/2022	02/22/2023
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	12/28/2021	12/27/2022
Loop Ant	COM-POWER	AL-130	121051	04/13/2022	04/12/2023
Pre-Amplifier	EMEC	EM330	060609	02/23/2022	02/22/2023
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	12/06/2021	12/05/2022
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 210616				

Remark:
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.1183
Channel Bandwidth	± 2.1863
Frequency Stability	± 2.0730
Radiated Emission_9kHz-30MHz	± 3.814
Radiated Emission_30MHz-200MHz	± 4.272
Radiated Emission_200MHz-1GHz	± 4.619
Radiated Emission_1GHz-6GHz	± 5.522
Radiated Emission_6GHz-18GHz	± 5.228
Radiated Emission_18GHz-26GHz	± 4.089
Radiated Emission_26GHz-40GHz	± 4.019

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

5.4 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)
CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Tony Chao	-
Radiation	Ray Li, Tony Chao	-
RF Conducted	David Li	-

Remark: The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

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

6.2 SUPPORT EQUIPMENT

Support Equipment						
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**	**IC**
1	Adapter	Alcatel	UC13US	N/A	N/A	N/A
2	NB(G)	Lenovo	IBM 1951	N/A	N/A	N/A

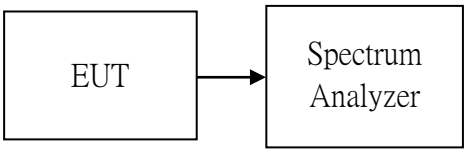
Remark:

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.

7. FCC PART 15.225 REQUIREMENTS

7.1 OCCUPIED BANDWIDTH(99%) AND 20 DB BANDWIDTH

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW & VBW. RBW shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth. VBW shall not be smaller than three times the RBW value.
4. Record the max. reading.

TEST RESULTS

Compliance.

Temperature:	26.4℃	**Test Date:**	August 1, 2022
Humidity:	50% RH	**Tested by:**	David Li

Test Condition	Frequency (MHz)	Occupied Bandwidth 99% (kHz)	20 dB Bandwidth (kHz)
NFC	13.56	2.407	2.724

Operation range	Frequency (MHz)	Limit (MHz)
Low	13.558538	>13.11
High	13.561262	<14.01

Test Plot

Occupied Bandwidth 99% & 20 dB Bandwidth

7.2 FUNDAMENTAL AND RADIATED EMISSIONS

LIMIT

According to §15.225

(a) The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts / meter at 30 meters.
(b) Within the bands 13.410 – 13.553 MHz and 13.567 -13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts / meter at 30 meters.
(c) Within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts / meter at 30 meters.
(d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz and shall not exceed the general radiated emission limits in §15.209.

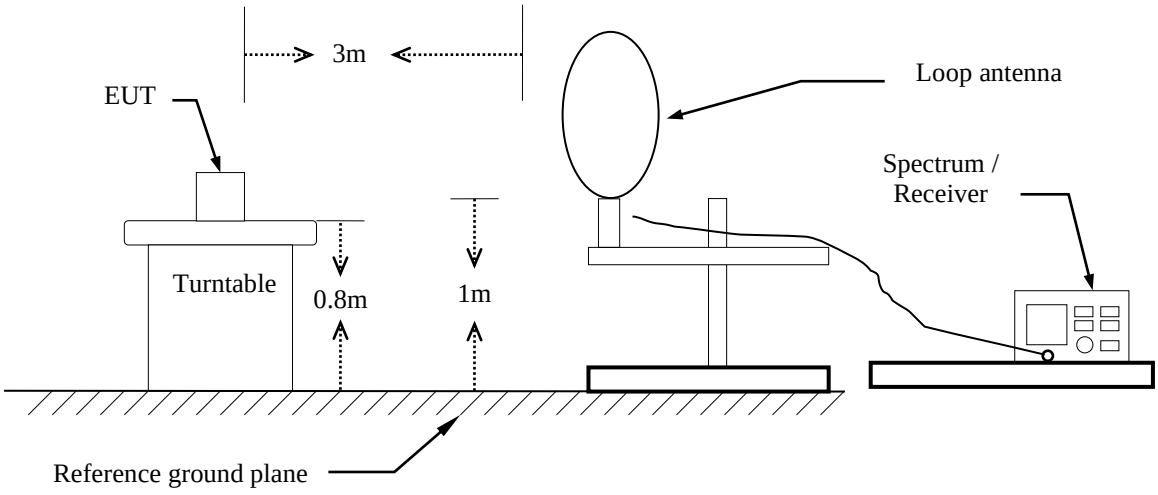
According to §15.225, except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meter)
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

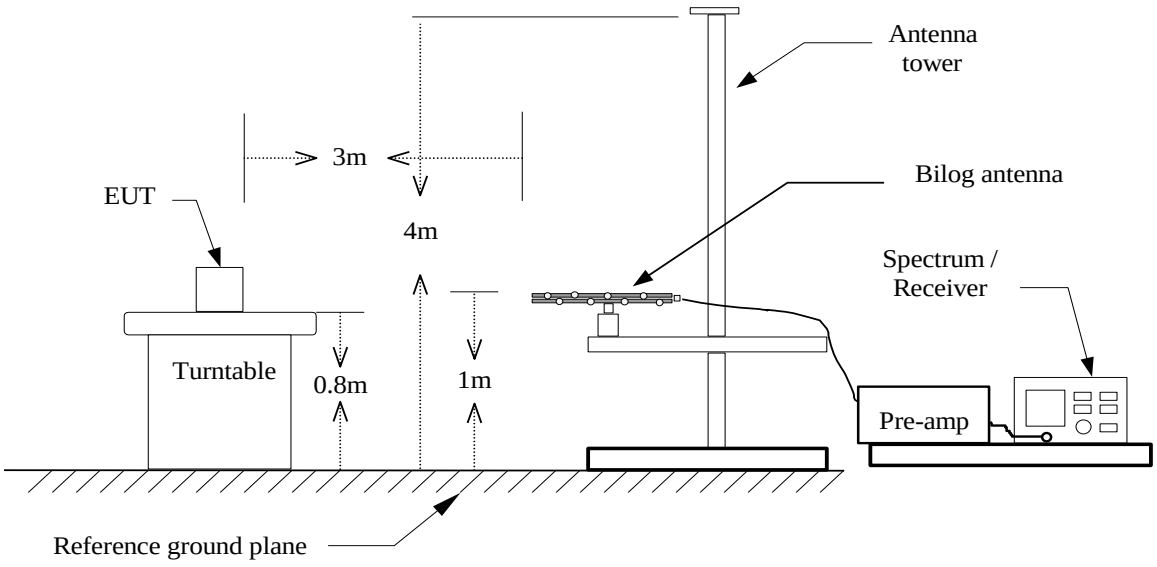
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Test Configuration

9kHz ~ 30MHz



30MHz ~ 1GHz



TEST PROCEDURE

For 9kHz ~ 30MHz

1. The EUT is placed on a turntable, which is 0.8m 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, The center of the loop shall be 1 m above the ground then to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Set the spectrum analyzer in the following setting as:
   9KHz-490KHz : RBW=200Hz / VBW=1kHz / Sweep=AUTO
   490KHz-30MHz : RBW=10kHz / VBW=30kHz / Sweep=AUTO
6. Repeat above procedures until the measurements for all frequencies are complete.

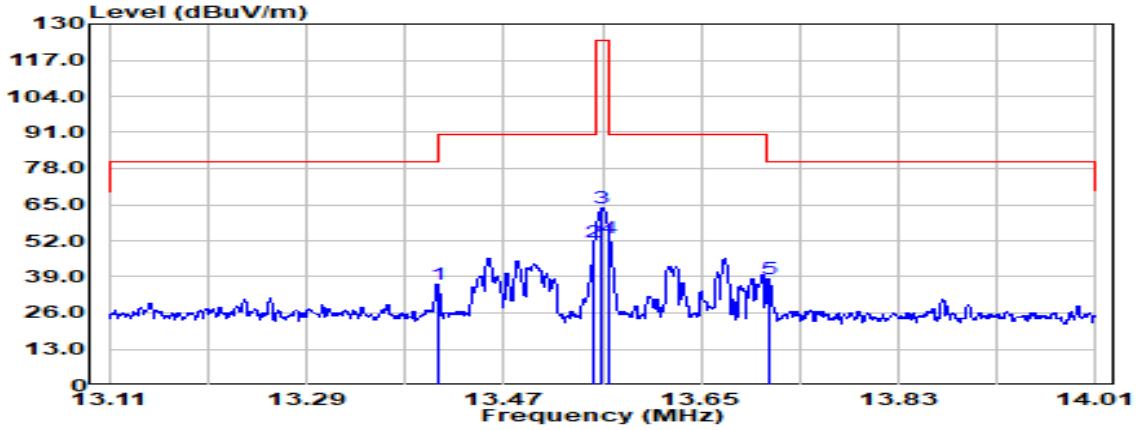
For 30MHz ~ 1GHz

1. The EUT is placed on a turntable, which is 0.8m 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 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:
   RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

Remark :

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Operation Mode: Mask
Polarity: Ver.
Temperature: 24.5℃
Test Date: August 12, 2022
Humidity: 63% RH
Tested by: Tony Chao

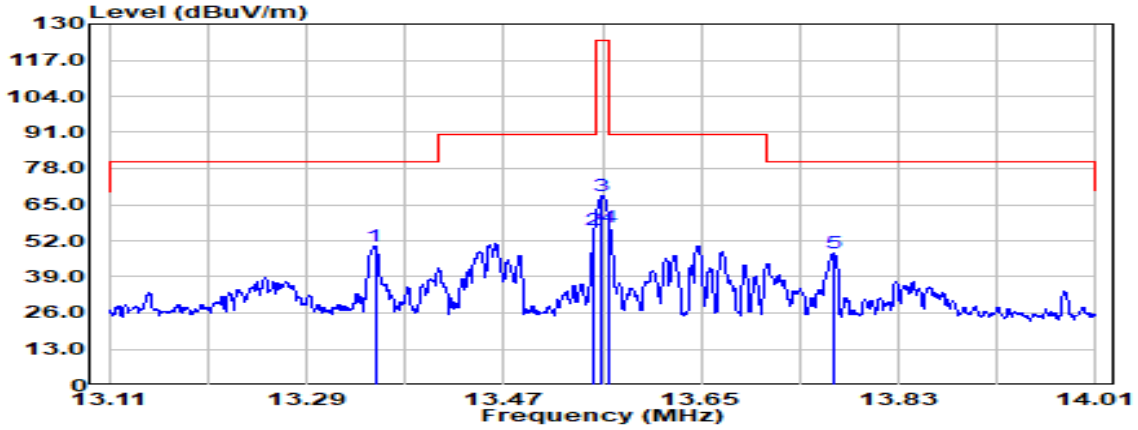


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
13.409	Peak	21.15	15.15	36.30	80.51	-44.20
13.553	Peak	36.23	15.15	51.38	90.47	-39.09
13.560	Peak	48.86	15.15	64.01	124.00	-59.99
13.567	Peak	37.61	15.15	52.76	90.47	-37.71
13.712	Peak	23.20	15.15	38.36	80.51	-42.15

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. 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.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Operation Mode: Mask
Polarity: Hor.
Temperature: 24.5℃
Test Date: August 12, 2022
Humidity: 63% RH
Tested by: Tony Chao



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
13.353	Peak	35.13	15.15	50.28	80.51	-30.23
13.553	Peak	40.54	15.15	55.69	90.47	-34.78
13.560	Peak	53.20	15.15	68.35	124.00	-55.65
13.567	Peak	41.73	15.15	56.88	90.47	-33.59
13.771	Peak	32.32	15.16	47.47	80.51	-33.03

Remark:
1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. 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.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

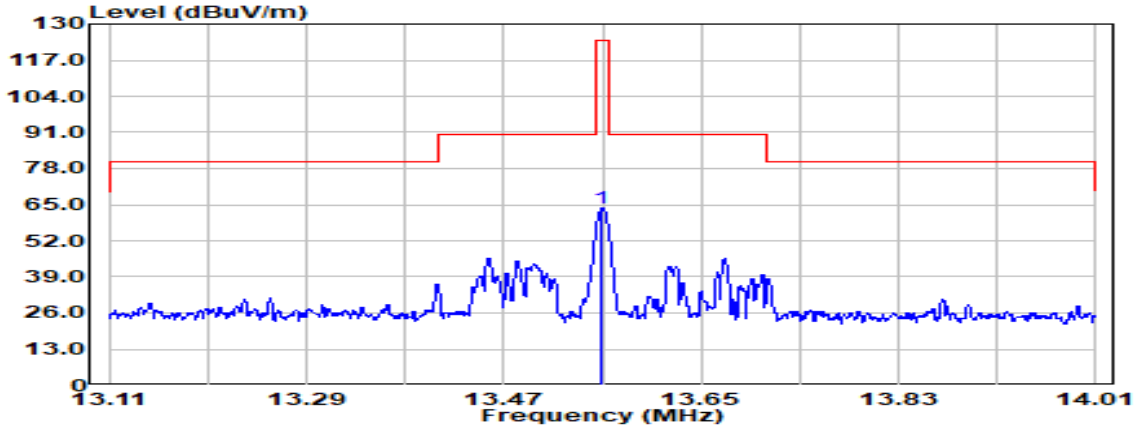
Operation Mode: Mask
Polarity: Ground
Temperature: 24.5℃
Test Date: August 12, 2022
Humidity: 63% RH
Tested by: Tony Chao

Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
13.350	Peak	19.78	15.15	34.93	80.51	-45.58
13.553	Peak	26.85	15.15	42.00	90.47	-48.47
13.560	Peak	39.12	15.15	54.27	124.00	-69.73
13.567	Peak	28.11	15.15	43.26	90.47	-47.21
13.770	Peak	19.88	15.16	35.03	80.51	-45.47

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. 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.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Operation Mode: Main
Polarity: Ver.
Temperature: 24.5℃
Test Date: August 12, 2022
Humidity: 63% RH
Tested by: Tony Chao

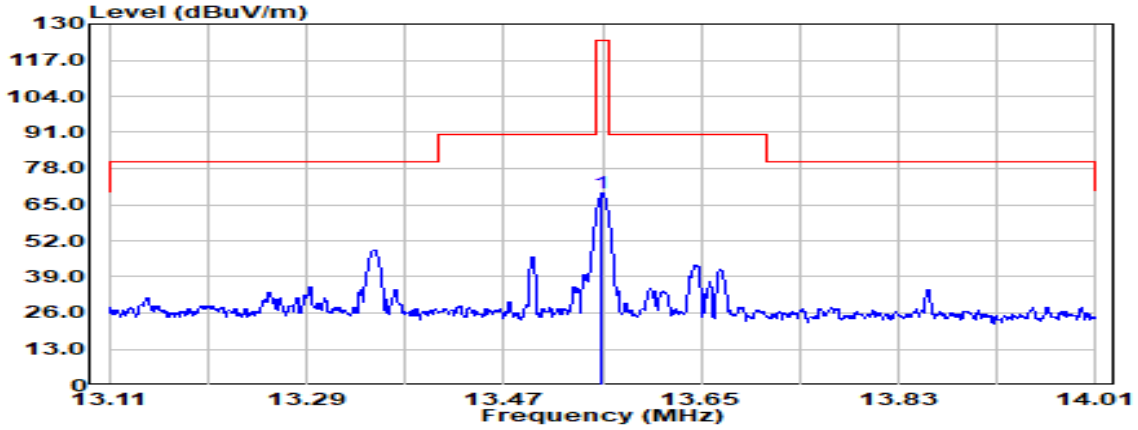


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
13.560	Peak	48.86	15.15	64.01	124.00	-59.99

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. 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.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Operation Mode:	Main	**Polarity:**	Horizontal
Temperature:	24.5℃	**Test Date:**	August 12, 2022
Humidity:	63% RH	**Tested by:**	Tony Chao

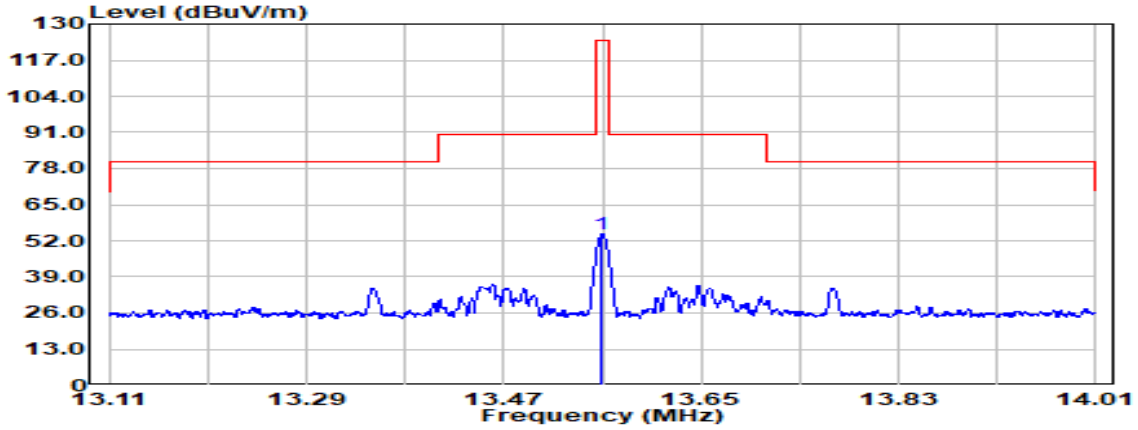


Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
13.560	Peak	53.80	15.15	68.95	124.00	-55.05

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. 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.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Operation Mode:	Main	**Polarity:**	Ground
Temperature:	24.5℃	**Test Date:**	August 12, 2022
Humidity:	63% RH	**Tested by:**	Tony Chao



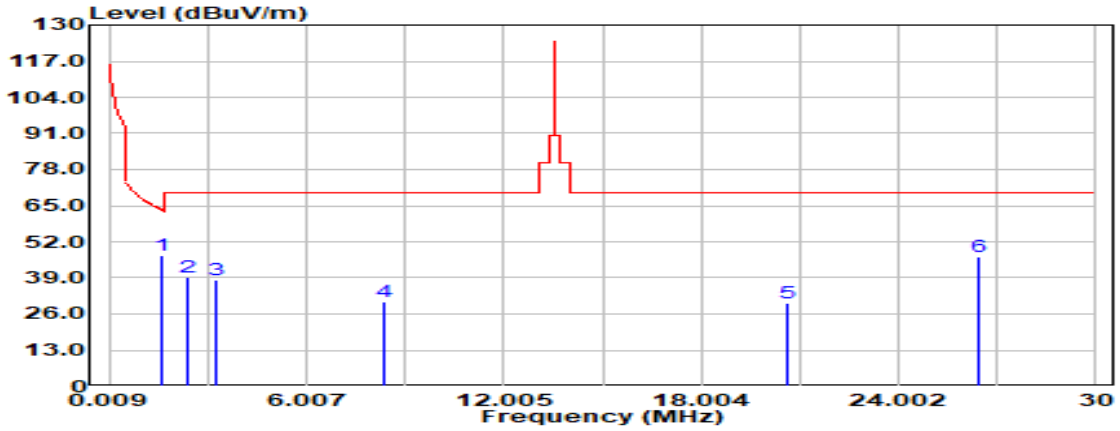
Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
13.560	Peak	39.12	15.15	54.27	124.00	-69.73

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. 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.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

9kHz ~ 30MHz

Operation Mode:	TX mode	**Polarity:**	Vertical
Temperature:	24.5℃	**Test Date:**	August 12, 2022
Humidity:	63% RH	**Tested by:**	Tony Chao



Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)
1.619	Peak	33.31	13.68	46.99	63.42	-16.43
2.371	Peak	25.52	13.77	39.29	69.54	-30.25
3.266	Peak	24.41	13.89	38.30	69.54	-31.24
8.377	Peak	15.43	14.78	30.21	69.54	-39.33
20.603	Peak	14.89	15.19	30.09	69.54	-39.45
26.472	Peak	32.43	14.15	46.58	69.54	-22.96

Remark:

1. 9kHz to 490kHz Limit(@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 24000(F/kHz)+ 40*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

30MHz ~ 1GHz

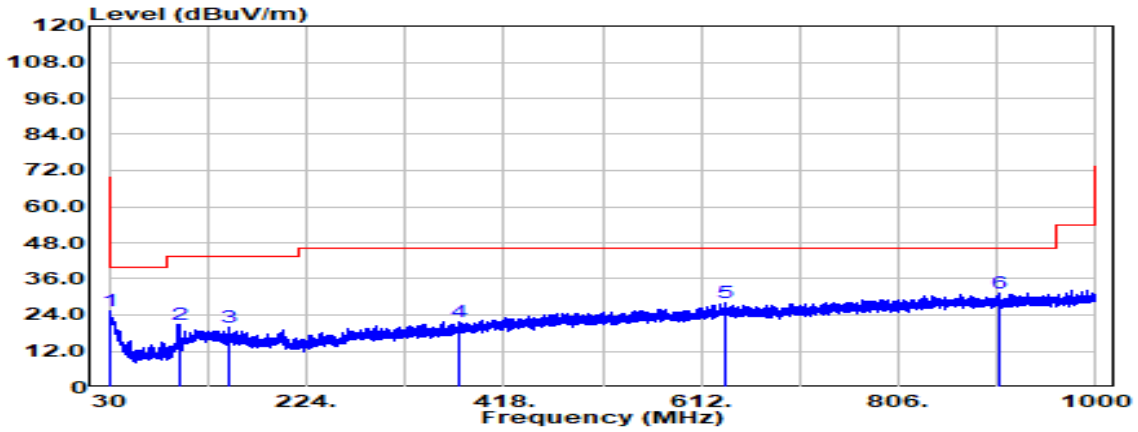
Operation Mode: TX mode **Polarity:** Ver. / Hor.

Temperature: 24.1℃ **Test Date:** August 12, 2022

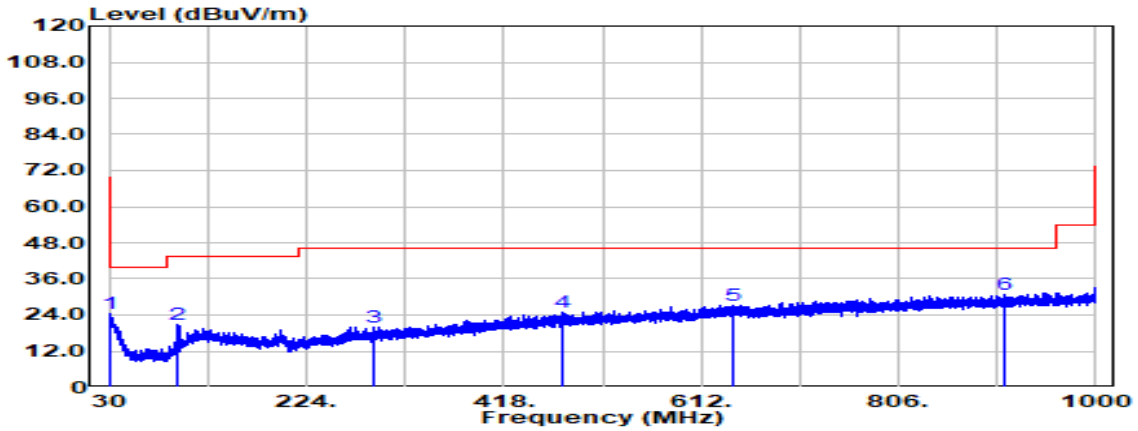
Humidity: 62% RH **Tested by:** Ray Li

Freq. (MHz)	Detector Mode (PK/QP/AV)	Spectrum Reading Level (dBµV)	Factor (dB)	Actual FS (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)	Polarity (V/H)
30.364	Peak	28.80	-3.48	25.33	40.00	-14.67	V
98.385	Peak	34.30	-13.54	20.75	43.50	-22.75	V
146.885	Peak	30.14	-10.37	19.76	43.50	-23.74	V
373.986	Peak	28.79	-7.02	21.77	46.00	-24.23	V
635.159	Peak	28.97	-1.04	27.93	46.00	-18.07	V
904.576	Peak	28.86	2.37	31.23	46.00	-14.77	V
30.243	Peak	27.84	-3.39	24.45	40.00	-15.55	H
98.264	Peak	34.62	-13.58	21.04	43.50	-22.46	H
288.990	Peak	28.88	-8.98	19.90	46.00	-26.10	H
475.958	Peak	28.84	-3.91	24.93	46.00	-21.07	H
642.434	Peak	28.35	-0.98	27.38	46.00	-18.62	H
909.790	Peak	28.10	2.53	30.64	46.00	-15.36	H

Vertical



Horizontal



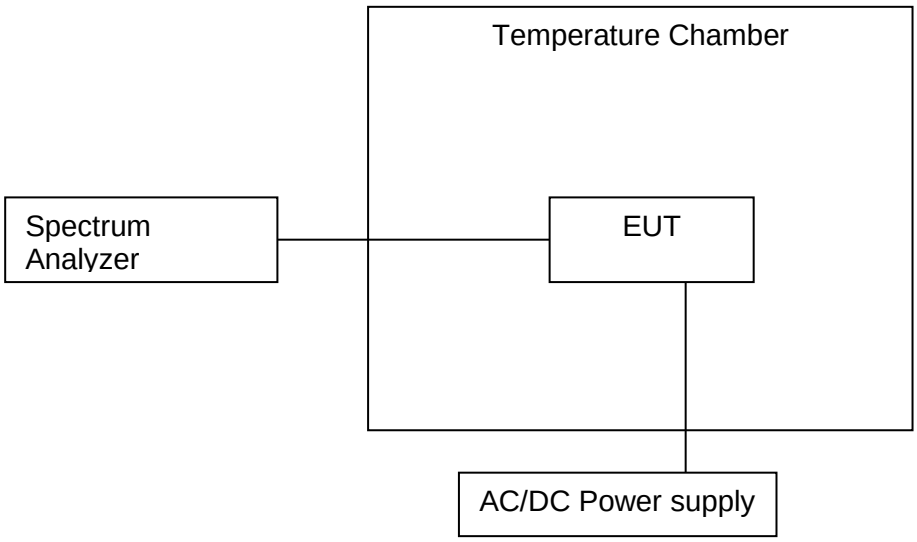
7.3 FREQUENCY STABILITY

LIMIT

According to §15.225(e) and RSS-210, B.6,
The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Configuration

Temperature and Voltage Measurement (under normal and extreme test conditions)



TEST PROCEDURE

1. Turn the EUT off, and place it inside the environmental temperature chamber.
2. Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
3. Set the spectrum analyzer as RBW=1kHz, VBW = RBW, Span = 200kHz, Sweep = auto.
4. Turn the EUT on and record the operating frequency at startup and two, five, and ten minutes after the EUT is energized.
5. Switch off the EUT and Lower the chamber temperature by not more than 10 °C and allow the temperature inside the chamber to stabilize.
6. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
7. Repeat step 4 through step 6 down to the lowest specified temperature.

TEST RESULTS

Compliance.

Temperature: 26.4℃ **Test Date:** August 1, 2022

Humidity: 50% RH **Tested by:** David Li

TEST DATA

Startup				
A. Temperature Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
9	-20	13.559899	-101.00	+/- 1.356
9	-10	13.5599005	-99.50	+/- 1.356
9	0	13.559905	-95.00	+/- 1.356
9	10	13.5599045	-95.50	+/- 1.356
9	20	13.559904	-96.00	+/- 1.356
9	30	13.5599065	-93.50	+/- 1.356
9	40	13.5599085	-91.50	+/- 1.356
9	50	13.5598985	-101.50	+/- 1.356
B. Supply Voltage Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
12	20	13.559896	-104.00	+/- 1.356
9	20	13.559904	-96.00	+/- 1.356
5	20	13.559906	-94.00	+/- 1.356

2 minutes				
A. Temperature Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
9	-20	13.559896	-104.00	+/- 1.356
9	-10	13.559902	-98.00	+/- 1.356
9	0	13.559897	-103.00	+/- 1.356
9	10	13.5598972	-102.80	+/- 1.356
9	20	13.5598995	-100.50	+/- 1.356
9	30	13.5598985	-101.50	+/- 1.356
9	40	13.5599	-100.00	+/- 1.356
9	50	13.5598987	-101.30	+/- 1.356
B. Supply Voltage Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
12	20	13.559899	-101.00	+/- 1.356
9	20	13.559904	-96.00	+/- 1.356
5	20	13.55993	-70.00	+/- 1.356

5 minutes				
A. Temperature Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
9	-20	13.559903	-97.00	+/- 1.356
9	-10	13.5598975	-102.50	+/- 1.356
9	0	13.559944	-56.00	+/- 1.356
9	10	13.5597115	-288.50	+/- 1.356
9	20	13.559946	-54.00	+/- 1.356
9	30	13.5598975	-102.50	+/- 1.356
9	40	13.5599005	-99.50	+/- 1.356
9	50	13.5598975	-102.50	+/- 1.356
B. Supply Voltage Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
12	20	13.5598978	-102.20	+/- 1.356
9	20	13.559904	-96.00	+/- 1.356
5	20	13.559903	-97.00	+/- 1.356

10 minutes				
A. Temperature Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
9	-20	13.559797	-203.00	+/- 1.356
9	-10	13.5598984	-101.60	+/- 1.356
9	0	13.5598992	-100.80	+/- 1.356
9	10	13.5598995	-100.50	+/- 1.356
9	20	13.559901	-99.00	+/- 1.356
9	30	13.5599025	-97.50	+/- 1.356
9	40	13.5599018	-98.20	+/- 1.356
9	50	13.5599009	-99.10	+/- 1.356
B. Supply Voltage Variation				
Power Supply	**Environment**	**Frequency**	**Delta (kHz)**	**Limit (kHz)**
Vdc	**Temperature (℃)**	**(MHz)**		
12	20	13.559898	-102.00	+/- 1.356
9	20	13.559904	-96.00	+/- 1.356
5	20	13.5598976	-102.40	+/- 1.356

7.4 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

***** Decreases with the logarithm of the frequency.

TEST PROCEDURE

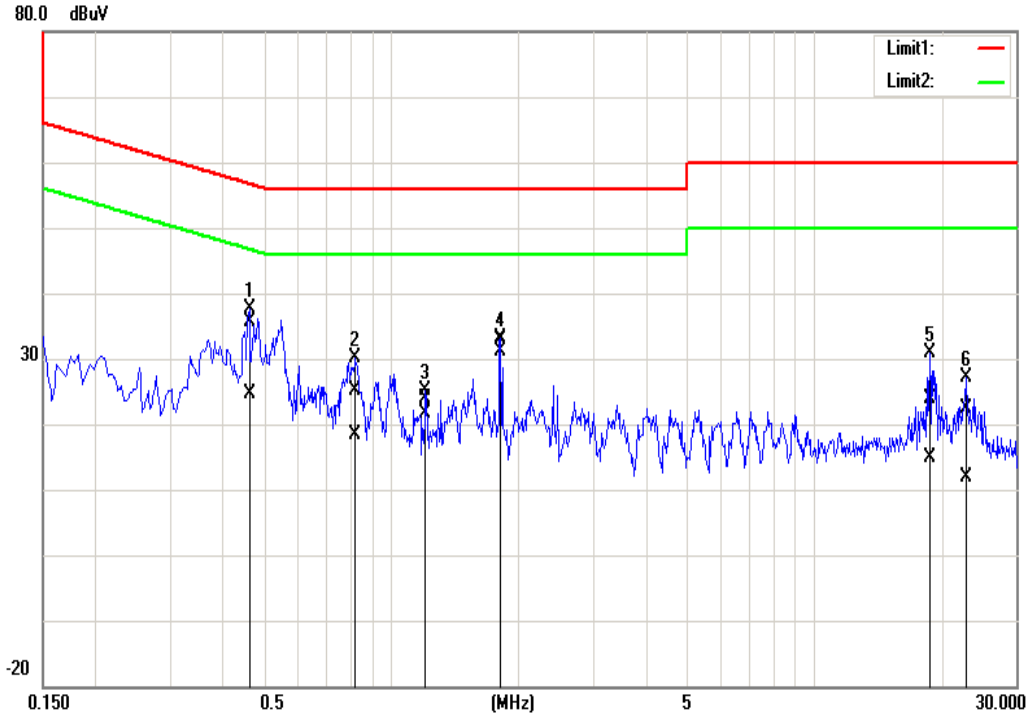
1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

Pass.

Test Data

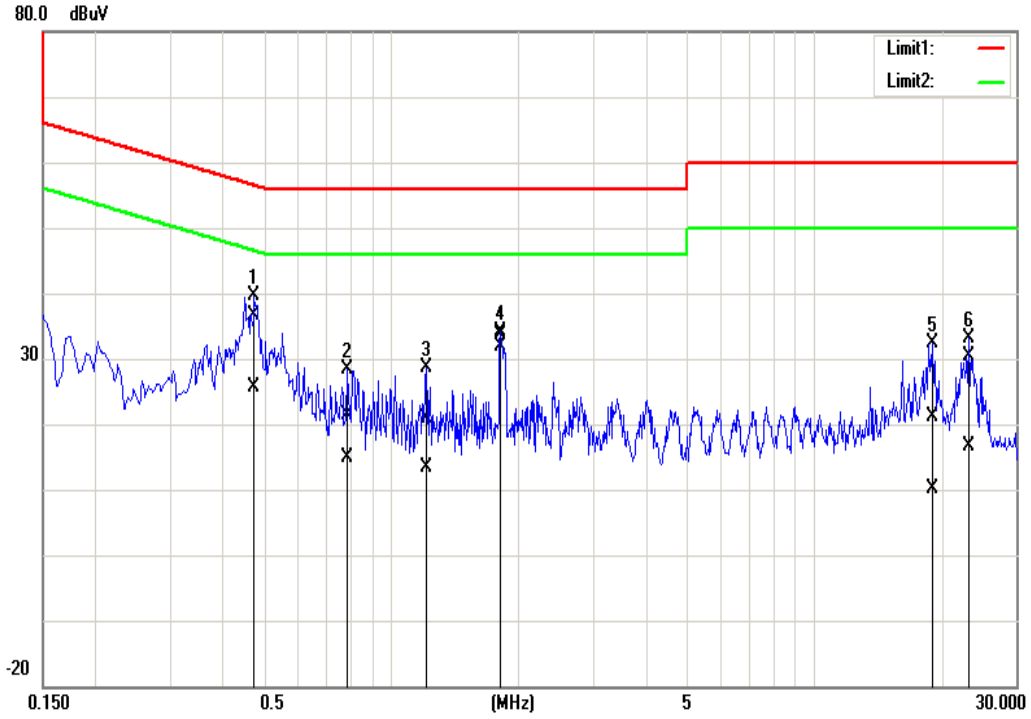
Test Mode:	Mode 1-1%	Temp/Hum	25.9(℃)/ 50%RH
Phase:	Line	Test Date	August 11, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.4620	25.50	14.54	10.19	35.69	24.73	56.66	46.66	-20.97	-21.93	Pass
0.8260	14.86	8.24	10.21	25.07	18.45	56.00	46.00	-30.93	-27.55	Pass
1.2060	13.74	11.48	10.22	23.96	21.70	56.00	46.00	-32.04	-24.30	Pass
1.8100	22.60	20.99	10.25	32.85	31.24	56.00	46.00	-23.15	-14.76	Pass
18.8020	13.62	4.61	10.37	23.99	14.98	60.00	50.00	-36.01	-35.02	Pass
22.8380	12.08	1.52	10.29	22.37	11.81	60.00	50.00	-37.63	-38.19	Pass

Note: Correction factor = LISN loss + Cable loss.

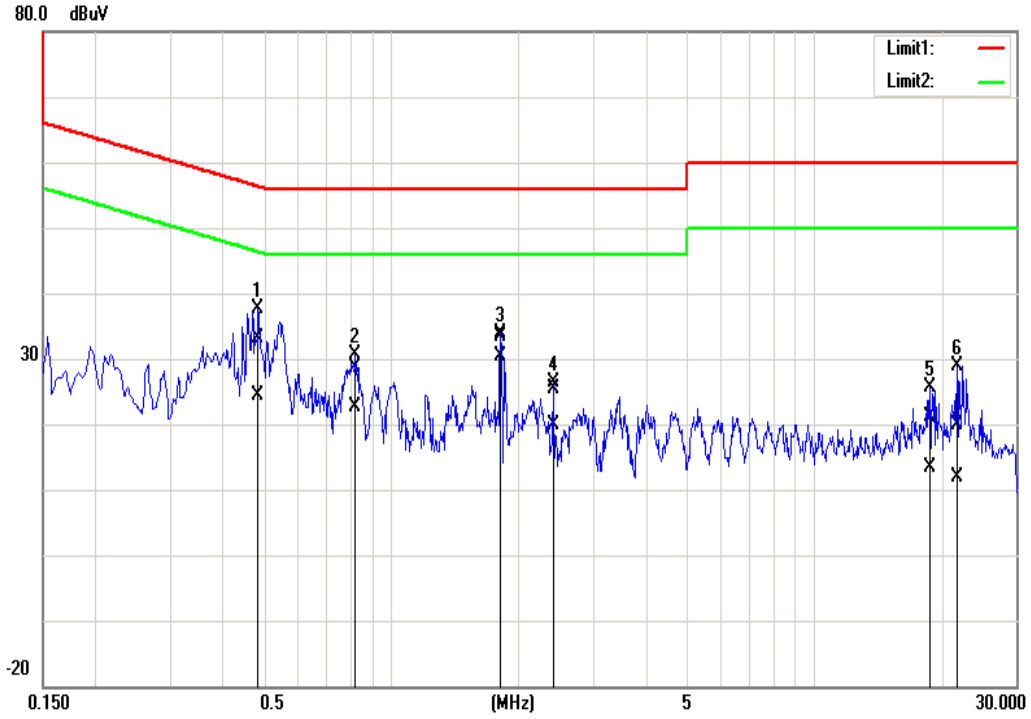
Test Mode:	Mode 1-1%	Temp/Hum	25.9(℃)/ 50%RH
Phase:	Neutral	Test Date	August 11, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.4740	26.37	15.37	10.18	36.55	25.55	56.44	46.44	-19.89	-20.89	Pass
0.7860	11.10	4.71	10.20	21.30	14.91	56.00	46.00	-34.70	-31.09	Pass
1.2140	10.68	3.13	10.21	20.89	13.34	56.00	46.00	-35.11	-32.66	Pass
1.8100	23.32	21.74	10.23	33.55	31.97	56.00	46.00	-22.45	-14.03	Pass
19.0580	10.64	-0.29	10.40	21.04	10.11	60.00	50.00	-38.96	-39.89	Pass
23.1580	19.98	6.27	10.47	30.45	16.74	60.00	50.00	-29.55	-33.26	Pass

Note: Correction factor = LISN loss + Cable loss.

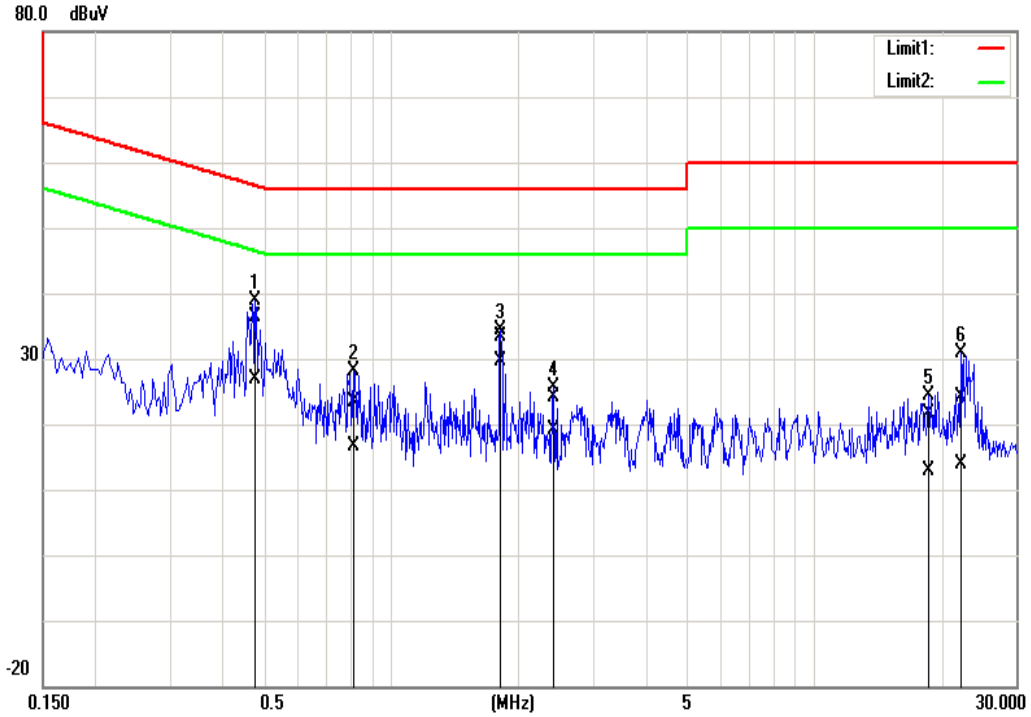
Test Mode:	Mode 1-50%	Temp/Hum	25.9(℃)/ 50%RH
Phase:	Line	Test Date	August 11, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.4860	22.92	14.10	10.19	33.11	24.29	56.24	46.24	-23.13	-21.95	Pass
0.8260	18.37	12.47	10.21	28.58	22.68	56.00	46.00	-27.42	-23.32	Pass
1.8100	23.14	20.25	10.25	33.39	30.50	56.00	46.00	-22.61	-15.50	Pass
2.4140	15.23	9.61	10.26	25.49	19.87	56.00	46.00	-30.51	-26.13	Pass
18.7940	10.69	3.02	10.37	21.06	13.39	60.00	50.00	-38.94	-36.61	Pass
21.7820	9.46	1.58	10.31	19.77	11.89	60.00	50.00	-40.23	-38.11	Pass

Note: Correction factor = LISN loss + Cable loss.

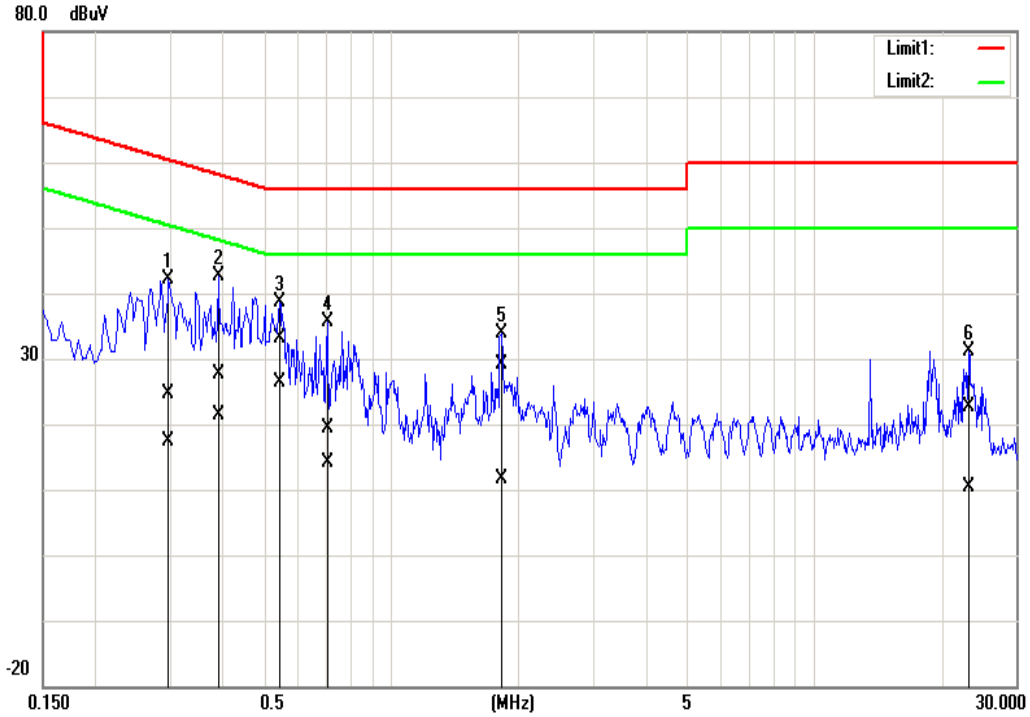
Test Mode:	Mode 1-50%	Temp/Hum	25.9(℃)/ 50%RH
Phase:	Neutral	Test Date	August 11, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.4780	26.32	16.64	10.18	36.50	26.82	56.37	46.37	-19.87	-19.55	Pass
0.8140	13.12	6.43	10.20	23.32	16.63	56.00	46.00	-32.68	-29.37	Pass
1.8140	23.08	19.47	10.23	33.31	29.70	56.00	46.00	-22.69	-16.30	Pass
2.4180	14.01	8.83	10.24	24.25	19.07	56.00	46.00	-31.75	-26.93	Pass
18.6300	11.19	2.56	10.40	21.59	12.96	60.00	50.00	-38.41	-37.04	Pass
22.2140	13.73	3.45	10.45	24.18	13.90	60.00	50.00	-35.82	-36.10	Pass

Note: Correction factor = LISN loss + Cable loss.

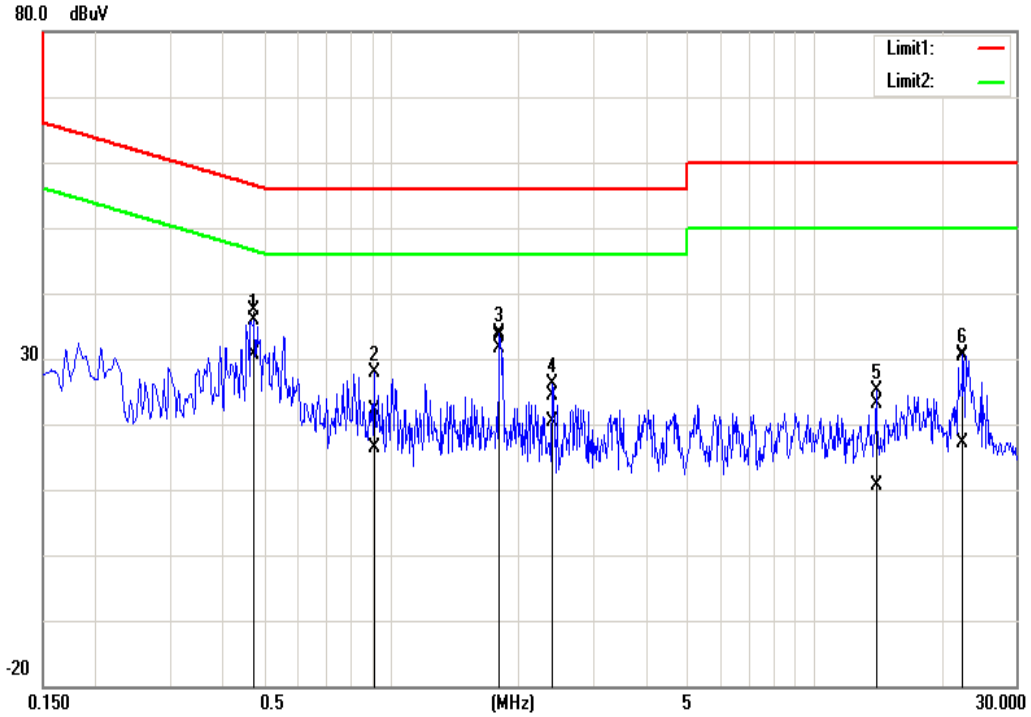
Test Mode:	Mode 1-99%	Temp/Hum	25.9(℃)/ 50%RH
Phase:	Line	Test Date	August 11, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.2980	14.42	7.28	10.18	24.60	17.46	60.30	50.30	-35.70	-32.84	Pass
0.3900	17.50	11.31	10.19	27.69	21.50	58.06	48.06	-30.37	-26.56	Pass
0.5460	23.03	16.27	10.19	33.22	26.46	56.00	46.00	-22.78	-19.54	Pass
0.7060	9.23	3.93	10.21	19.44	14.14	56.00	46.00	-36.56	-31.86	Pass
1.8260	18.80	1.45	10.25	29.05	11.70	56.00	46.00	-26.95	-34.30	Pass
23.2500	12.35	0.02	10.28	22.63	10.30	60.00	50.00	-37.37	-39.70	Pass

Note: Correction factor = LISN loss + Cable loss.

Test Mode:	Mode 1-99%	Temp/Hum	25.9(℃)/ 50%RH
Phase:	Neutral	Test Date	August 11, 2022
Test Voltage:	120Vac, 60Hz	Test Engineer	Tony Chao



Frequency (MHz)	Quasi Peak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	Quasi Peak result (dBuV)	Average result (dBuV)	Quasi Peak limit (dBuV)	Average limit (dBuV)	Quasi Peak margin (dB)	Average margin (dB)	Remark
0.4740	27.23	20.48	10.18	37.41	30.66	56.44	46.44	-19.03	-15.78	Pass
0.9100	11.97	6.30	10.20	22.17	16.50	56.00	46.00	-33.83	-29.50	Pass
1.8060	23.08	21.44	10.23	33.31	31.67	56.00	46.00	-22.69	-14.33	Pass
2.4060	14.16	10.21	10.24	24.40	20.45	56.00	46.00	-31.60	-25.55	Pass
14.0100	12.63	0.22	10.38	23.01	10.60	60.00	50.00	-36.99	-39.40	Pass
22.4660	19.89	6.71	10.45	30.34	17.16	60.00	50.00	-29.66	-32.84	Pass

Note: Correction factor = LISN loss + Cable loss.

- End of Test Report -