RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.225**
Product name	**QTAX56**
Model No.	**QTAX56**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by:

Kevin Tsai
Deputy Manager

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 29, 2020	Initial Issue	ALL	Allison Chen
01	October 15, 2020	See the following note Rev.(01)	P.4, P.A-1	Allison Chen

Rev.(01)
1. Added test period in section 1.1.
2. Modify test setup photo to conducted test.

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1 EUT DESCRIPTION

Applicant	Quanta Computer Inc.
Manufacturer	No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan
Equipment	Quanta Computer Inc.
Model Name	No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan
Model Discrepancy	N/A
Received Date	August 21, 2020
Date of Test	September 10 ~ 15, 2020
Power Supply	1. Powered from adapter Model No.: CYSM06-050120-UL Supplier: JIANGSU CHENYANG ELECTRON CO., LTD I/P: 100-240Vac, 50/60Hz, 0.2A O/P: 5Vdc, 1.2A 2. Powered from battery. (Lithium Polymer) Model No.: P0963, Supplier: EVE Rating: 3.85V / 495mAh / 1.91Wh
Frequency Range	13.56MHz
Modulation Technique	ASK
Number of Channels	1 Channel
Antenna Specification	Antenna type: Loop QPN: DQ60NFCF905 Description: ANTENNA NF-C-F9-R0-086 Mfr. Name: INPAQ Mfr. PN: NF-C-F9-R0-086

Remark:

1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

2. 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.

2.1 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.

2.2 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.

2.3 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.

2.3.1 The worst mode of measurement

AC Power Line Conducted Emission	
Test Condition	**AC Power line conducted emission for line and neutral**
Power supply Mode	**Mode 1: EUT power by Adapter** **Mode 2: EUT power by Battery**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **Mode 4**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: EUT power by Adapter**
Worst Mode	☒ **Mode 1** ☐ **Mode 2** ☐ **Mode 3** ☐ **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

3. TEST SUMMARY

FCC Standard Sec.	Chapter	Test Item	Result
15.203	2	Antenna Requirement	Pass
15.215	7.1	Occupied Bandwidth (99%) and 20dB Bandwidth	Pass
15.209	7.2	Radiated Emissions	Pass
15.225	7.3	Frequency Stability	Pass
15.207	7.4	AC Power-line Conducted Emission	Pass

4. INSTRUMENT CALIBRATION

4.1 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.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

RF Conducted Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Coaxial Cable	Woken	WC12	CC001	06/29/2020	06/28/2021
Coaxial Cable	Woken	WC12	CC003	06/29/2020	06/28/2021
Signal Analyzer	R&S	FSV 40	101073	09/25/2019	09/24/2020
Thermostatic/ Humidity Chamber	TAICHY	MHG-150LF	930619	10/04/2019	10/03/2020
Thermostatic/ Humidity Chamber	GWINSTEK	GTC-288MH-CC	TH160402	05/07/2020	05/06/2021
Software	N/A				

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Band Reject Filters	MICRO TRONICS	BRM 50702	120	02/25/2020	02/24/2021
Bilog Antenna	Sunol Sciences	JB3	A030105	07/24/2020	07/23/2021
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/25/2020	02/24/2021
Coaxial Cable	EMCI	EMC105	190914+25111	09/20/2019	09/19/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/15/2020	01/14/2021
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	10/04/2019	10/03/2020
Loop Ant	COM-POWER	AL-130	121051	03/27/2020	03/26/2021
Pre-Amplifier	EMEC	EM330	060609	02/25/2020	02/24/2021
Pre-Amplifier	HP	8449B	3008A00965	02/25/2020	02/24/2021
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	07/24/2020	07/23/2021
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				

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

AC line Conduction Test Room					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
CABLE	EMCI	CFD300-NL	CERF	06/29/2020	06/28/2021
EMI Test Receiver	R&S	ESCI	100064	07/17/2020	07/16/2021
LISN	SCHAFFNER	NNB 41	03/10013	02/13/2020	02/12/2021
Software	EZ-EMC(CCS-3A1-CE-Wugu)				

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

4.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

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

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

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.)

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

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10: 2013 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, bucolical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

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.”

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

No.	Equipment	Brand	Model	Series No.	FCC ID
1	DC Power Supplies	GW Instek	SPS-3610	GPE880163	N/A
2	NB(J)	TOSHIBA	PT345T-00L002	N/A	PD97260H

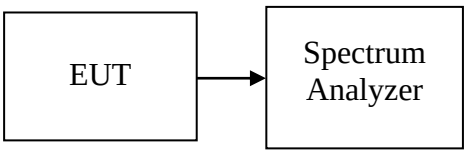
Remark:

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.

7. FCC PART 15.225 REQUIREMENTS

7.1 OCCUPIED BANDWIDTH(99%) AND 20DB 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=1kHz, VBW = 3kHz, Span = 10kHz, Sweep = auto.
4. Record the max. reading.

TEST RESULTS

No non-compliance noted

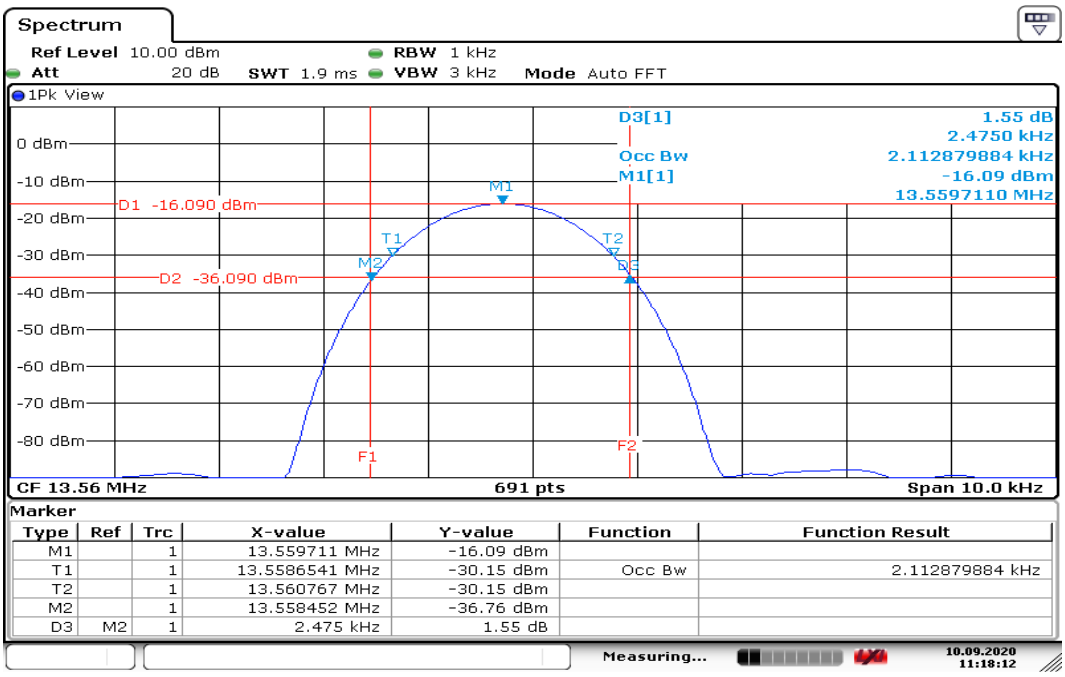
Temperature: 24℃ **Humidity:** 50% RH

Tested by: Jane Wang

Test Condition	Frequency(MHz)	Occupied Bandwidth 99% (kHz)	20 dB Bandwidth (kHz)
NFC	13.56	2.1128	2.475

Test Plot

20dB & 99%



Date: 10.SEP.2020 11:18:12

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.

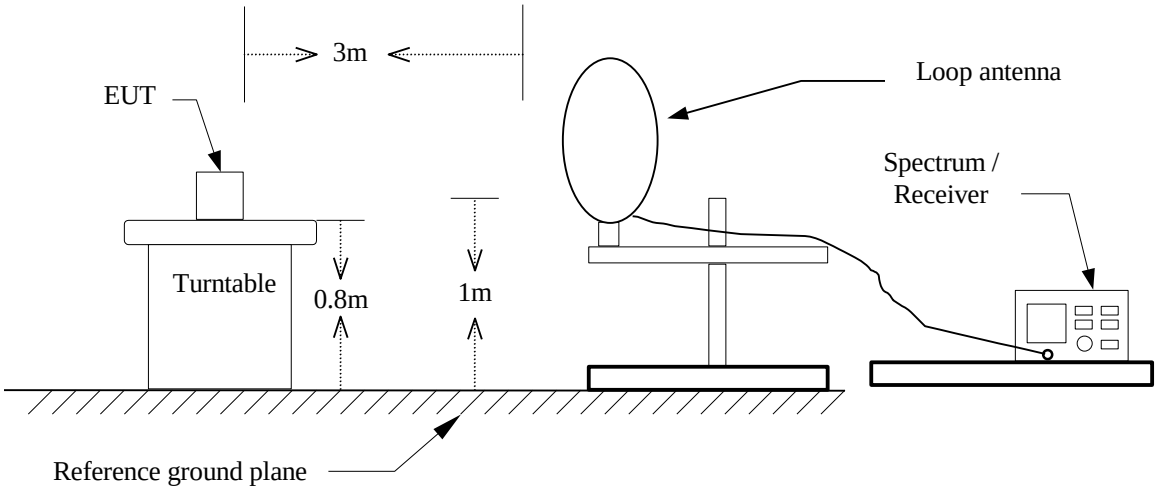
According to §15.225, except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

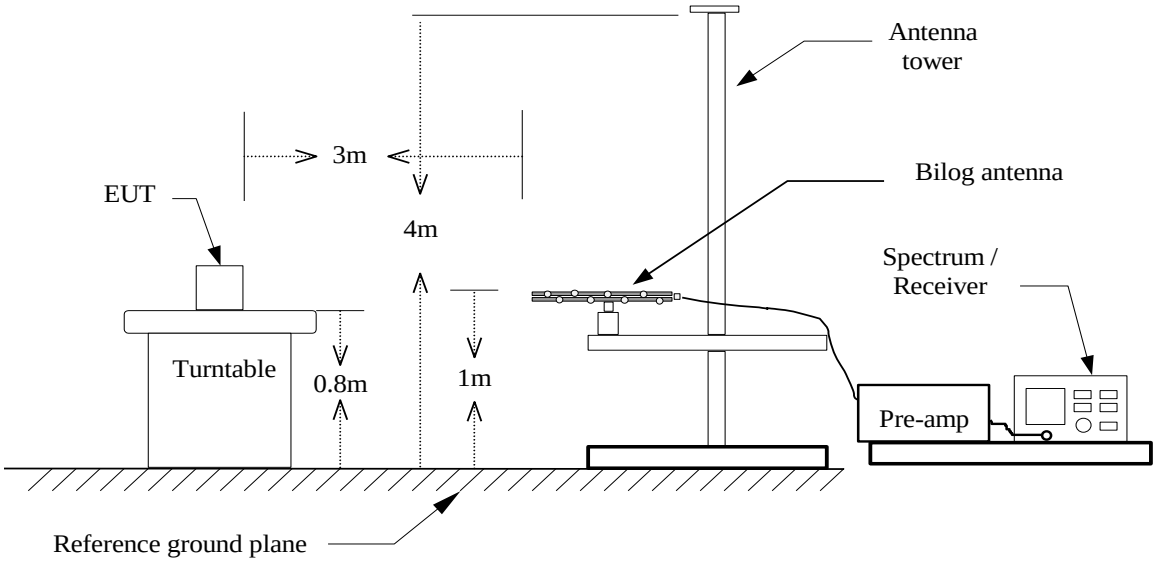
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this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

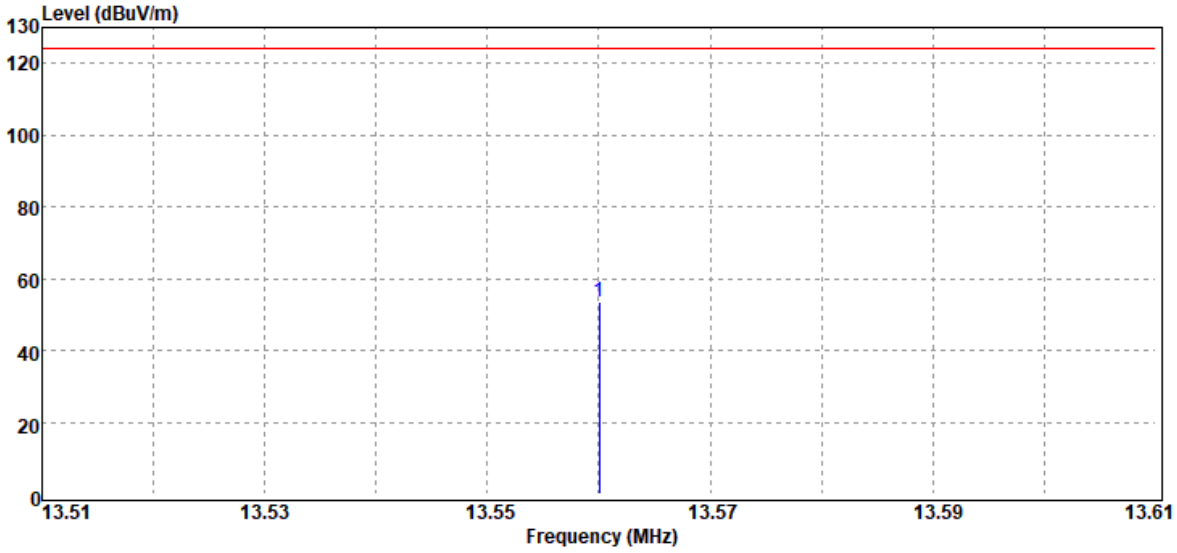
For 30MHz ~ 1GHz

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.

Test Result of Main

Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	19.3℃	**Tested by:**	Jerry Chang
Humidity:	53 % RH	**Polarity:**	Ver.



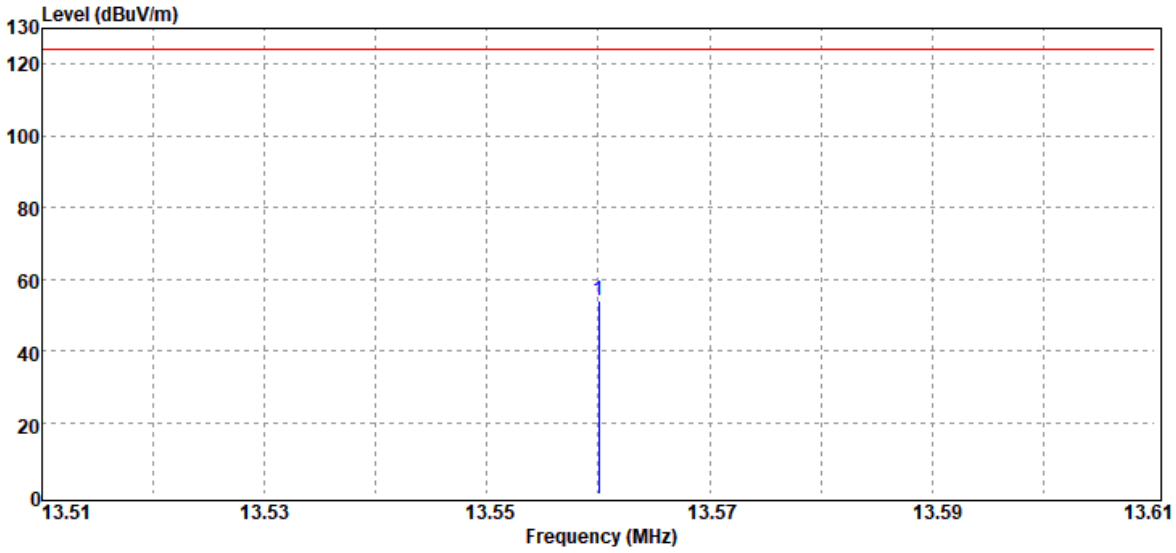
No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	13.56	Peak	38.17	15.34	53.51	124.00	-70.49

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).

Test Result of Main

Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	19.3℃	**Tested by:**	Jerry Chang
Humidity:	53 % RH	**Polarity:**	Hor.



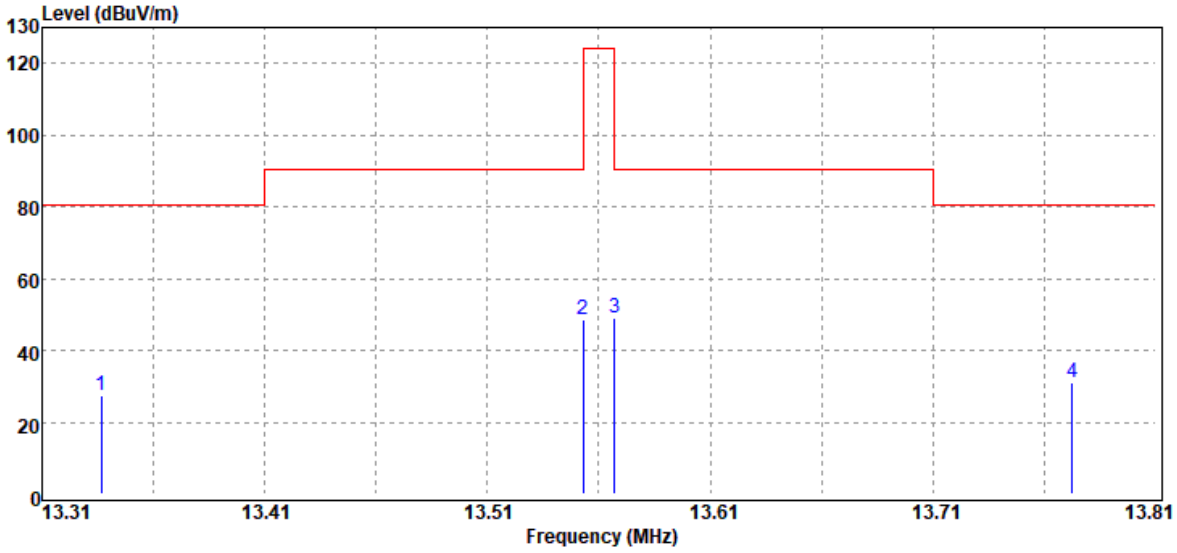
No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	13.56	Peak	38.67	15.34	54.01	124.00	-69.99

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).

Test Result of Mask

Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	19.3℃	**Tested by:**	Jerry Chang
Humidity:	53 % RH	**Polarity:**	Ver.



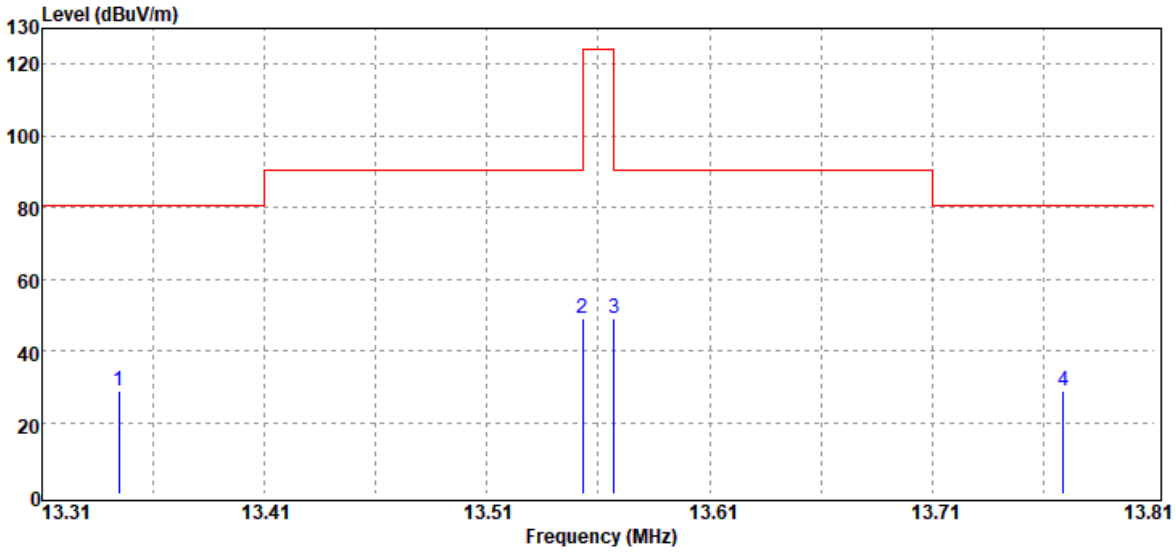
No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	13.34	Peak	12.05	15.35	27.40	80.54	-53.14
2	13.55	Peak	33.23	15.34	48.57	90.47	-41.90
3	13.57	Peak	33.62	15.34	48.96	90.47	-41.51
4	13.77	Peak	15.81	15.33	31.14	80.50	-49.36

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).

Test Result of Mask

Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	19.3℃	**Tested by:**	Jerry Chang
Humidity:	53 % RH	**Polarity:**	Hor.



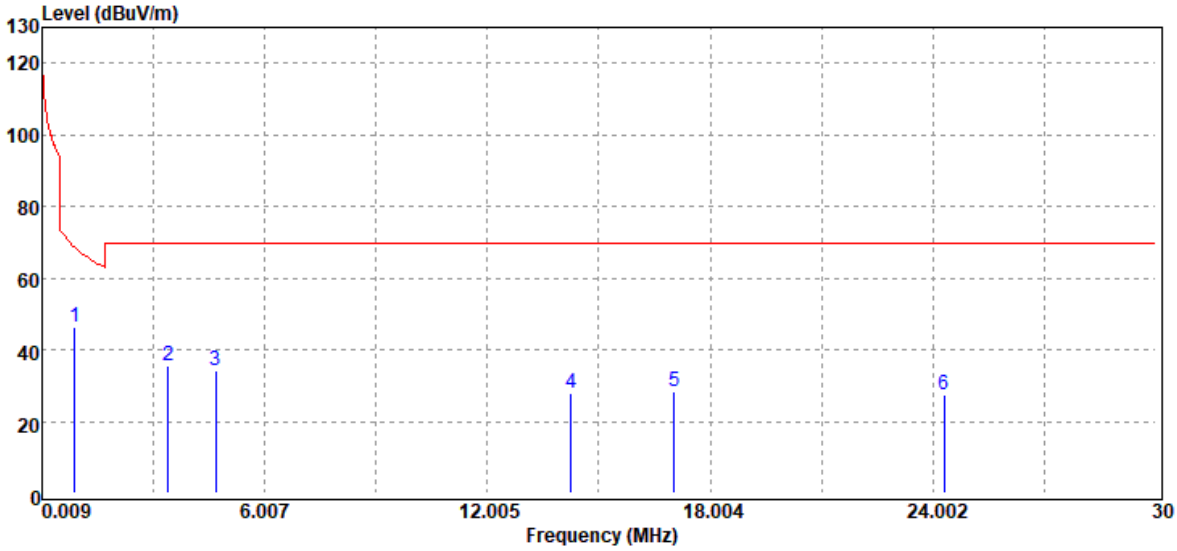
No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	13.35	Peak	13.44	15.35	28.79	80.54	-51.75
2	13.55	Peak	33.81	15.34	49.15	90.47	-41.32
3	13.57	Peak	33.70	15.34	49.04	90.47	-41.43
4	13.77	Peak	13.36	15.33	28.69	80.50	-51.81

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).

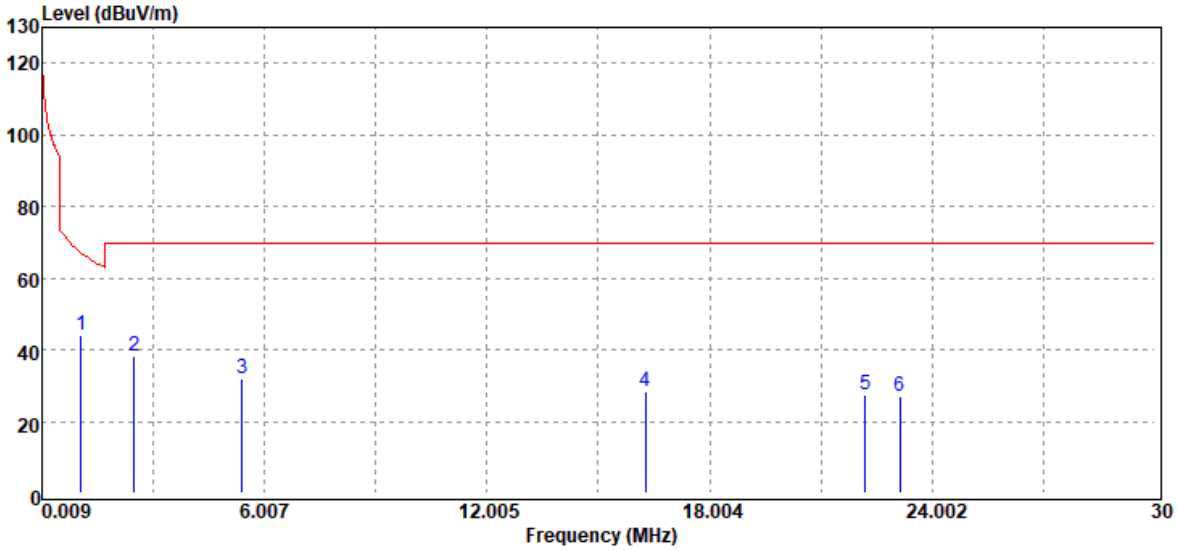
9kHz ~ 30MHz

Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	19.3℃	**Tested by:**	Jerry Chang
Humidity:	53 % RH	**Polarity:**	Ver.



No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	0.88	Peak	32.58	13.95	46.53	68.73	-22.20
2	3.40	Peak	21.02	14.39	35.41	69.54	-34.13
3	4.69	Peak	19.47	14.84	34.31	69.54	-35.23
4	14.26	Peak	12.52	15.30	27.82	69.54	-41.72
5	17.04	Peak	13.09	15.19	28.28	69.54	-41.26
6	24.30	Peak	13.14	14.08	27.22	69.54	-42.32

Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	19.3℃	**Tested by:**	Jerry Chang
Humidity:	53 % RH	**Polarity:**	Hor.



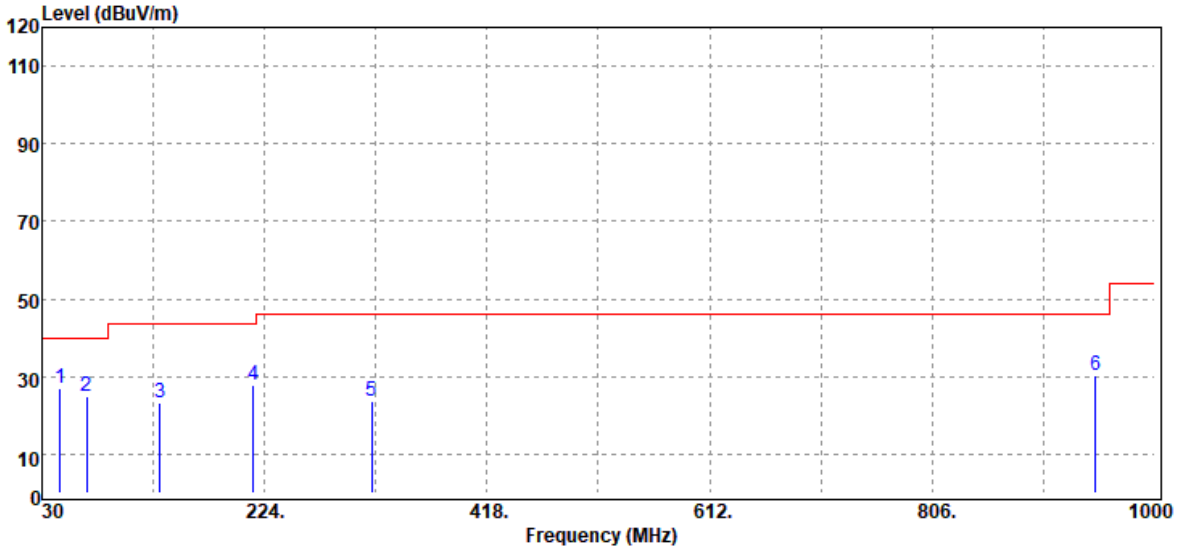
No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	1.06	Peak	30.16	13.99	44.15	67.11	-22.96
2	2.50	Peak	24.12	14.18	38.30	69.54	-31.24
3	5.41	Peak	17.03	15.00	32.03	69.54	-37.51
4	16.26	Peak	13.09	15.22	28.31	69.54	-41.23
5	22.20	Peak	12.72	14.55	27.27	69.54	-42.27
6	23.13	Peak	12.79	14.34	27.13	69.54	-42.41

30MHz ~ 1GHz

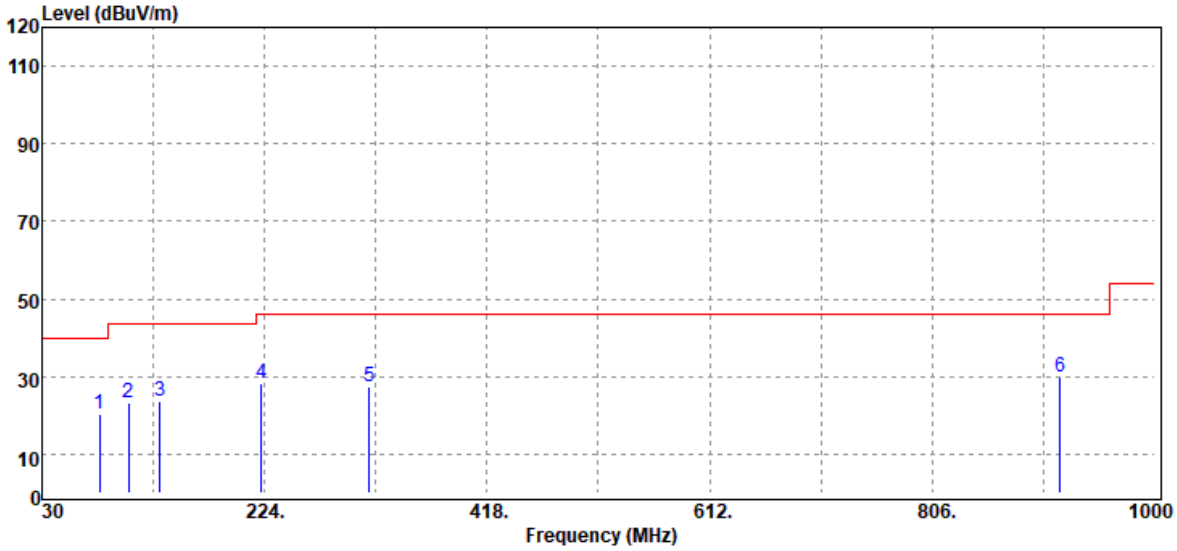
Operation Mode:	TX mode	**Test Date:**	September 11, 2020
Temperature:	22°C	**Tested by:**	Jerry Chang
Humidity:	63% RH	**Polarity:**	Ver. / Hor.

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB	Polarity
45.52	Peak	40.26	-13.37	26.89	40.00	-13.11	V
68.80	Peak	40.05	-15.06	24.99	40.00	-15.01	V
132.82	Peak	32.49	-9.33	23.16	43.50	-20.34	V
214.30	Peak	39.68	-11.92	27.76	43.50	-15.74	V
317.12	Peak	31.59	-7.92	23.67	46.00	-22.33	V
948.59	Peak	25.87	4.34	30.21	46.00	-15.79	V
80.44	Peak	36.00	-15.47	20.53	40.00	-19.47	H
105.66	Peak	34.57	-11.23	23.34	43.50	-20.16	H
132.82	Peak	33.07	-9.33	23.74	43.50	-19.76	H
221.09	Peak	40.09	-11.69	28.40	46.00	-17.60	H
315.18	Peak	35.29	-7.94	27.35	46.00	-18.65	H
917.55	Peak	26.69	3.23	29.92	46.00	-16.08	H

Vertical



Horizontal



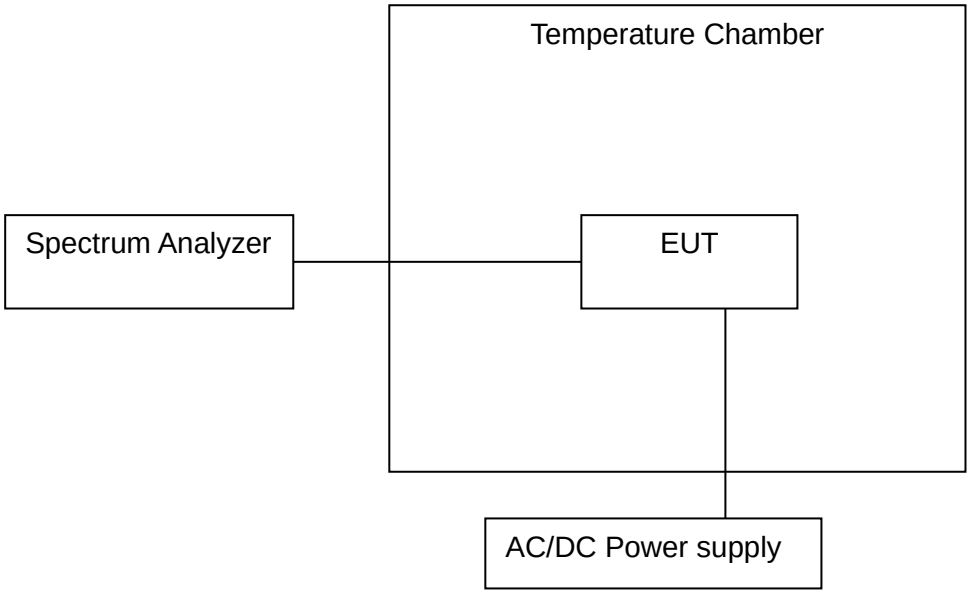
7.3 FREQUENCY STABILITY

LIMIT

According to §15.225(e), the frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –10 degrees to +40 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

No non-compliance noted.

TEST DATA

Temperature: 24℃ **Humidity:** 50% RH

Tested by: Jane Wang **Test Date:** September 10, 2020

Condition			Frequency Error (ppm)									
Temperature(℃) / Test Voltage	Modulation Mode	Test Freq.	0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	Limit (ppm)	Result
			Normal									
$T_{25°C}$Vmax	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
$T_{25°C}$Vmin	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
			Extreme									
$T_{50°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
$T_{40°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		
$T_{30°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
$T_{20°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
$T_{10°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
$T_{0°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
$T_{-10°C}$Vnom	CW	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass

Note: ppm = (measurement frequency-center frequency)/center frequency*1000000

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

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Operation Mode:	NFC Mode 1	**Test Date:**	September 15, 2020
Temperature:	24°C	**Tested by:**	Rick Lee
Humidity:	50% RH		

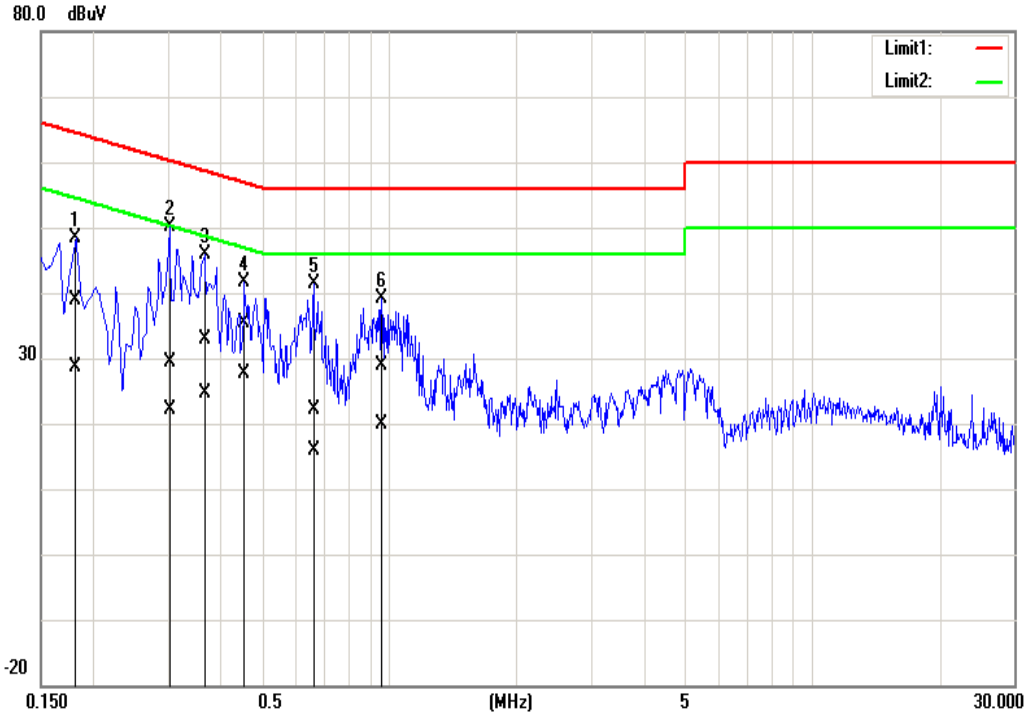
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1820	28.73	18.45	10.21	38.94	28.66	64.39	54.39	-25.45	-25.73	L1
0.3020	19.06	11.92	10.22	29.28	22.14	60.19	50.19	-30.91	-28.05	L1
0.3660	22.75	14.51	10.22	32.97	24.73	58.59	48.59	-25.62	-23.86	L1
0.4540	25.25	17.34	10.22	35.47	27.56	56.80	46.80	-21.33	-19.24	L1
0.6620	12.01	5.78	10.22	22.23	16.00	56.00	46.00	-33.77	-30.00	L1
0.9620	18.54	9.73	10.24	28.78	19.97	56.00	46.00	-27.22	-26.03	L1
0.1500	31.91	21.37	10.18	42.09	31.55	66.00	56.00	-23.91	-24.45	N
0.1700	28.89	19.90	10.18	39.07	30.08	64.96	54.96	-25.89	-24.88	N
0.1900	27.75	19.53	10.19	37.94	29.72	64.04	54.04	-26.10	-24.32	N
0.2900	19.81	11.02	10.19	30.00	21.21	60.52	50.52	-30.52	-29.31	N
0.3140	19.42	13.06	10.19	29.61	23.25	59.86	49.86	-30.25	-26.61	N
0.3620	23.77	14.63	10.19	33.96	24.82	58.68	48.68	-24.72	-23.86	N

Remark:

1. The measuring frequencies range between 0.15 MHz and 30 MHz.
2. The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.
4. L1 = Line One (Live Line) / N = Line Two (Neutral Line)
5. "-" means Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

Test Plots

Conducted emissions (Line 1)



Conducted emissions (Line 2)

- End of Test Report -