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# FCC 47 CFR PART 15 SUBPART C & INDUSTRY CANADA RSS-210

## **TEST REPORT**

For

#### **Tablet PC**

## Model No.:

Trade Name: ADVANTECH

Issued to

Advantech Co., Ltd.
No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114,
Taiwan, R.O.C.

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 7, 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. 除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。

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## **Revision History**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 7, 2021	Initial Issue	ALL	Doris Chu



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## 1. TEST RESULT CERTIFICATION

**Applicant:** Advantech Co., Ltd.

No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,

Taipei 114, Taiwan, R.O.C.

**Manufacturer:** Advantech Co., Ltd.

No. 1, Alley 20, Lane 26, Rueiguang Road, Neihu District,

Taipei 114, Taiwan, R.O.C.

**Equipment Under Test**: Tablet PC **Trade Name**: ADVANTECH

**Model No.:** FCC: AIM-75S-6; AIM-75H-6;

AIM75H-6XXXXXXXXXXXXXXXXXX (where "X" may be any

alphanumeric character, "-" or blank)

IC: AIM-75S-6; AIM-75H-6

Date of Test: March 23 ~ August 17, 2021

APPLICABLE STANDARDS					
STANDARD TEST RESULT					
FCC 47 CFR Part 15 Subpart C &	No non-compliance noted				
RSS-210 Issue 10 and RSS-GEN Issue 5	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:

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:

Kevin Tsai

**Deputy Manager** 

Compliance Certification Services Inc.

Konil Tson



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## 2. EUT DESCRIPTION

Product	Tablet PC			
Model No.	FCC: AIM-75S-6; AIM-75H-6; AIM-75S-6XXXXXXXXXXXXXXXXX; AIM-75H-6XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			
Model Discrepancy	Please see remark as below.			
Trade	ADVANTECH			
Received Date	November 2, 2020			
Power Supply	1. EUT Power by Adapter. (1) FSP / FSP045-A1BR			
Frequency Range	Rating: 3.8Vdc, 4900mAh, 18.62Wh 13.56MHz			
Modulation Technique	ASK			
Number of Channels	1 Channel			
Antenna Requirement	Antenna type: NFC Antenna YAGEO / ANTA0ZV14081NFCA8			
HW Version	AX2			
SW Version	0.3.6.9_20201021.021551			
EUT Serial #	200CT32E00162			
Module	NXP / PN7150			
Set up	Turn on the NFC mode, put on the proximity card to transmit the signal.			



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#### Remark:

- 1. For more details, 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.
- 3. Disclaimer: Variant information between/among model numbers / trademarks are provided by the applicant, test results of this report are applicable to the sample EUT received of main test model name.

4. Model Discrepancy:

i. Woder Discrepancy.		
Model	Adapter	Tablet color
AIM-75H-6	1. GlobTek, Inc / GTM96605-GEN2-A1-T2 I/P: 100-240VAC, 50-60Hz, 1.5A O/P: 5VDC, 4.6A; 5.8VDC, 4.6A; 9VDC, 4.4A; 12VDC, 4A; 15VDC, 3.6A; 20VDC, 3A 2. DELTA / MEA-045AA2C IP: 100-240V~1.0A Max. 50-60Hz O/P: 5VDC, 3A; 9VDC, 3A; 10VDC, 3A; 12VDC, 3A; 15VDC, 3A; 20VDC, 2.25A	White
AIM-75S-6	1. FSP / FSP045-A1BR I/P: 100-240VAC, 50-60Hz, 1.2A O/P: 5.0VDC, 3.0A 15.0W; 9.0VDC, 3.0A 27.0W; 12.0VDC, 3.0A 36.0W; 15.0VDC, 3.0A 45.0W; 20.0VDC, 2.25A 45.0W	Black
AIM-75S-6XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	XX; All the above models are identical except for the designatio XX; model numbers. The suffix of (where "X" may be any alphanumeric character, "-" or blank) on model number is	



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## 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
¹0.495 - 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		

<sup>&</sup>lt;sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>&</sup>lt;sup>2</sup> Above 38.6

<sup>(</sup>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.



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## 3.3 RSS GEN SECTION 8.10 RESTRICTED BANDS OF OPERATIONS

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

- (a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
- (b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
- (c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7 – Restricted frequency bands Note 1						
MHz	MHz	MHz	GHz			
0.090 - 0.110 0.495 - 0.505 2.1735 - 2.1905 3.020 - 3.026 4.125 - 4.128 4.17725 - 4.17775 4.20725 - 4.20775 5.677 - 5.683 6.215 - 6.218 6.26775 - 6.26825	16.42 - 16.423 16.69475 - 16.69525 16.80425 - 16.80475 25.5 - 25.67 37.5 - 38.25 73 - 74.6 74.8 - 75.2 108 - 138 149.9 - 150.05 156.52475 -	608 - 614 960 - 1427 1435 - 1626.5 1645.5 - 1646.5 1660 - 1710 1718.8 - 1722.2 2200 - 2300 2310 - 2390 2483.5 - 2500 2655 - 2900	9.0 - 9.2 9.3 - 9.5 10.6 - 12.7 13.25 - 13.4 14.47 - 14.5 15.35 - 16.2 17.7 - 21.4 22.01 - 23.12 23.6 - 24.0 31.2 - 31.8			
6.31175 - 6.31225 8.291 - 8.294 8.362 - 8.366 8.37625 - 8.38675 8.41425 - 8.41475 12.29 - 12.293 12.51975 - 12.52025 12.57675 - 12.57725 13.36 - 13.41	156.52525 156.7 - 156.9 162.0125 - 167.17 167.72 - 173.2 240 – 285 322 - 335.4 399.9 - 410	3260 - 3267 3332 - 3339 3345.8 - 3358 3500 - 4400 4500 - 5150 5350 - 5460 7250 - 7750 8025 - 8500	36.43 - 36.5 Above 38.6			

**Note 1:** Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.



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## 3.4 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.

worst-case. Therefore, all testing was performed in 100 Kbps mode.						
AC Power Line Conducted Emission						
Test Condition	Test Condition AC Power line conducted emission for line and neutral					
Power supply Mode	Mode 1: EUT power by Adapter. (GlobTek) 120VAC Mode 2: EUT power by Adapter. (GlobTek) 240VAC Mode 3: EUT power by Adapter. (FSP) 120VAC Mode 4: EUT power by Adapter. (FSP) 240VAC Mode 5: EUT power by Adapter. (DELTA) 120VAC Mode 6: EUT power by Adapter. (DELTA) 240VAC					
Worst Mode	<ul><li>☐ Mode 1 ☐ Mode 2 ☒ Mode 3 ☒ Mode 4 ☐ Mode 5</li><li>☐ Mode 6</li></ul>					

Radiated Emission Measurement Above 1G			
Test Condition	Radiated Emission Above 1G		
	Mode 1: EUT power by Adapter. (GlobTek) Mode 2: EUT power by Adapter. (FSP) Mode 3: EUT power by Adapter. (DELTA) Mode 4: EUT power by Battery		
Worst Mode ☐ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4			
Worst Position	<ul> <li>□ Placed in fixed position.</li> <li>□ Placed in fixed position at X-Plane (E2-Plane)</li> <li>□ Placed in fixed position at Y-Plane (E1-Plane)</li> <li>□ Placed in fixed position at Z-Plane (H-Plane)</li> </ul>		

Radiated Emission Measurement Below 1G				
Test Condition	Radiated Emission Below 1G			
Power supply Mode	Mode 1: EUT power by Adapter. (GlobTek) Mode 2: EUT power by Adapter. (FSP) Mode 3: EUT power by Adapter. (DELTA) Mode 4: EUT power by Battery			
Worst Mode	☐ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4			

- 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.
- 3. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.



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## **4. TEST SUMMARY**

FCC Standard Sec.	IC Standard Sec.	Chapter	Test Item	Result
15.203	RSS-GEN Sec. 8.3	2	Antenna Requirement	Pass
15.215	RSS-210	8.1	8.1 Occupied Bandwidth (99%) and 20dB Bandwidth	
15.209	RSS-210	8.2	Radiated Emissions	
15.225	RSS-210	8.3	Frequency Stability	Pass
15.207	RSS-GEN Sec. 8.8	8.4	AC Power-line Conducted Emission	Pass



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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**

	The state of the s						
	RF Conducted Test Site						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due		
Coaxial Cable	Woken	WC12	CC003	06/29/2020	06/28/2021		
Signal Analyzer	R&S	FSV 40	101073	09/17/2020	09/16/2021		
Power Meter	Anritsu	ML2487A	6K00003260	05/21/2020	05/20/2021		
Power Seneor	Anritsu	MA2490A	032910	05/21/2020	05/20/2021		
EXA Signal Analyzer	KEYSIGHT	N9010B	MY55460167	09/07/2020	09/06/2021		
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	09/24/2020	09/23/2021		
Software			N/A				

	3	M 966 Chamber	Test Site		
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	07/24/2020	07/23/2021
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/24/2021	02/23/2022
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/06/2021	01/05/2022
Loop Ant	COM-POWER	AL-130	121051	03/26/2021	03/25/2022
Pre-Amplifier	EMEC	EM330	060609	02/24/2021	02/23/2022
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		

	Cond	ducted Emission	Room		
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration 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)		



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TOST date for April 20	,				
	Cond	ducted Emission	Room		
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration 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	02/02/2021	02/01/2022
Software		EZ-EMC(CC	CS-3A1-CE-wugu)	)	

Test date for August 17, 2021

	,				
RF Conducted Test Site					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Signal Analyzer	R&S	FSV 40	101073	09/16/2020	09/15/2021
Software			N/A		

#### Remark:

1. Each piece of equipment is scheduled for calibration once a year.

2. N.C.R. = No Calibration Request.



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## **5.3 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 / 9K~30M	+/- 2.30
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.



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## 6. FACILITIES AND ACCREDITATIONS

## **6.1 FACILITIES**

All measurement facilities used to collect the measurement da	ata are located at
<ul> <li>No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Tai</li> <li>Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029</li> </ul>	wan, R.O.C.
No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiw	/an. (R.O.C.)

Tel: 886-2-2299-9720 / Fax: 886-2-2299-9721, CAB identifier: TW1309

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

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."



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## 7. SETUP OF EQUIPMENT UNDER TEST

## 7.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix A 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

- 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.

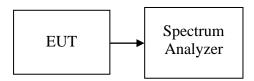


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# 8. FCC PART 15.225 REQUIREMENTS & RSS-210 REQUIREMENTS

# 8.1 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**

No non-compliance noted.

**Temperature:** 23.5°C **Humidity:** 53% RH

**Tested by:** Dally Hong **Test date:** August 17, 2021

Test Condition	Frequency(MHz)	Occupied Bandwidth 99% (kHz)	20 dB Bandwidth (kHz)
NFC	13.56	2.269	2.82



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#### **Test Plot**

## 20 dB Bandwidth



Occupied Bandwidth 99%





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## 8.2 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

<sup>\*\*</sup> 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.



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## According to RSS 210 §B.6

The field strength of any emission shall not exceed the following limits:

- (a) 15.848 mV/m (84 dBµV/m) at30 m, within the band 13.553-13.567 MHz;
- (b) 334  $\mu$ V/m (50.5 dB $\mu$ V/m) at 30 m,within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;
- (c)  $106 \,\mu\text{V/m}$  (40.5 dB $\mu\text{V/m}$ ) at 30 m,within the bands 13.110-13.410 MHz and 13.710-14.010 MHz; and
- (d) RSS-Gen general field strength limits for frequencies outside the band 13.110-14.010 MHz.

## **Below 30 MHz**

Frequency	Magnetic field strength (H-Field) (μΑ/m)	Measurement Distance (metres)
9-490 kHz Note 1	6.37/F (F in kHz)	300
490-1,705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

## **Above 30 MHz**

Frequency	Field strength (μV/m at 3 m)
30-88	100
88-216	150
216-960	200
Above 960	500

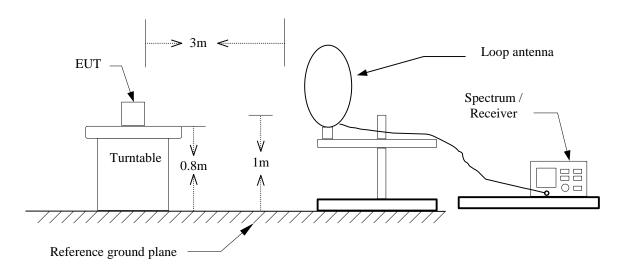


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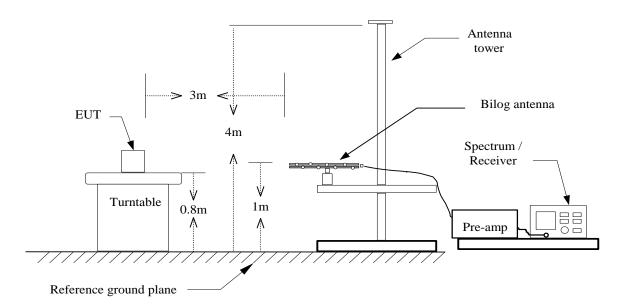
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## **Test Configuration**

## 9kHz ~ 30MHz



## 30MHz ~ 1GHz





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## **TEST PROCEDURE**

#### For 9kHz ~ 30MHz

1. The EUT is placed on a turntable, which is 0.8m above ground plane.

- 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.
- 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.
- 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.
- 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.

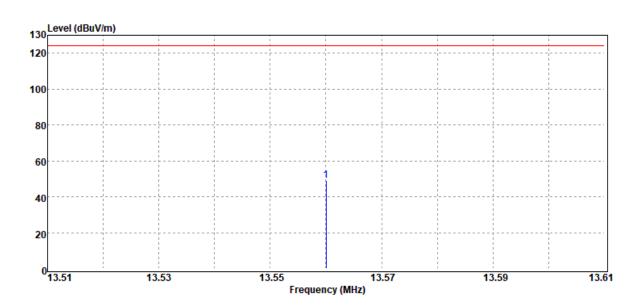


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Operation Mode: TX mode Test Date: April 8, 2021

Temperature:23.9°CTested by:Ray LiHumidity:53 % RHPolarity:Ver.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB

- 1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
- 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) = 2400(F/kHz)+ 40\*Log (30 meters/3 meters) 1.705MHz to 30MHz Limit (@3m) = 30 + 40\*Log (30 meters/3 meters)

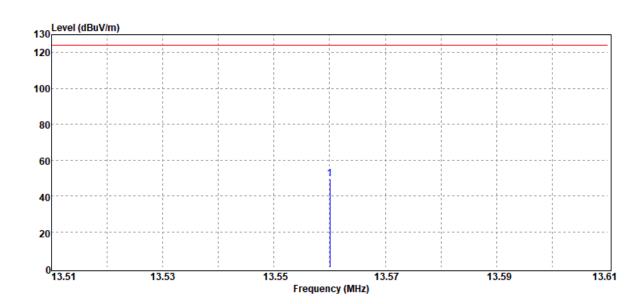


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Operation Mode: TX mode Test Date: April 8, 2021

Temperature:23.9°CTested by:Ray LiHumidity:53 % RHPolarity:Hor.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
1	13.56	Peak	34.05	15.34	49.39	124.00	-74.61

- Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
- 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) = 2400(F/kHz)+ 40\*Log (30 meters/3 meters) 1.705MHz to 30MHz Limit (@3m) = 30 + 40\*Log (30 meters/3 meters)



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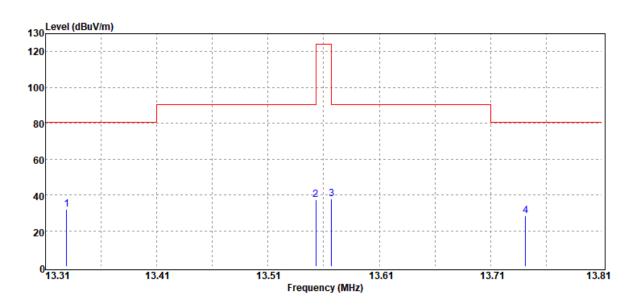
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**Test Result of Mask** 

Operation Mode: TX mode Test Date: April 8, 2021

**Temperature:** 23.9°C **Tested by:** Ray Li

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



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
1	13.33	Peak	16.50	15.35	31.85	80.54	-48.69
2	13.55	Peak	21.89	15.34	37.23	90.47	-53.24
3	13.57	Peak	22.56	15.34	37.90	90.47	-52.57
4	13.74	Peak	12.87	15.32	28.19	80.50	-52.31

- 1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
- 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 to 490kHz Limit(@3m) = 2400(F/kHz)+ 40\*Log (300 meters/3 meters)
   490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40\*Log (30 meters/3 meters)
   1.705MHz to 30MHz Limit (@3m) = 30 + 40\*Log (30 meters/3 meters)



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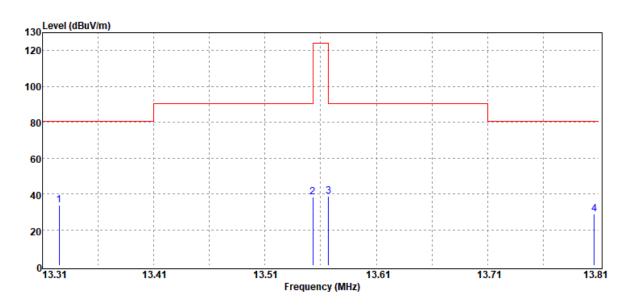
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**Test Result of Mask** 

Operation Mode: TX mode Test Date: April 8, 2021

**Temperature:** 23.9°C **Tested by:** Ray Li

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



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dΒμV/m	dB
1	13.33	Peak	18.17	15.35	33.52	80.54	-47.02
2	13.55	Peak	23.09	15.34	38.43	90.47	-52.04
3	13.57	Peak	23.23	15.34	38.57	90.47	-51.90
4	13.81	Peak	13.39	15.33	28.72	80.50	-51.78

- Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
- 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) = 2400(F/kHz)+ 40\*Log (30 meters/3 meters) 1.705MHz to 30MHz Limit (@3m) = 30 + 40\*Log (30 meters/3 meters)



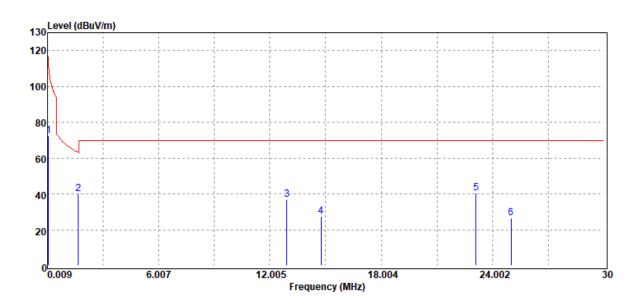
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9kHz ~ 30MHz

Operation Mode: TX mode Test Date: April 8, 2021

**Temperature:** 23.9°C **Tested by:** Ray Li **Humidity:** 53 % RH **Polarity:** Ver.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
1	0.07	Peak	58.73	13.53	72.26	110.83	-38.57
2	1.66	Peak	25.84	14.08	39.92	63.21	-23.29
3	12.91	Peak	21.49	15.37	36.86	69.54	-32.68
4	14.77	Peak	12.05	15.28	27.33	69.54	-42.21
5	23.10	Peak	26.15	14.35	40.50	69.54	-29.04
6	24.99	Peak	12.71	13.94	26.65	69.54	-42.89

## Remark:

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

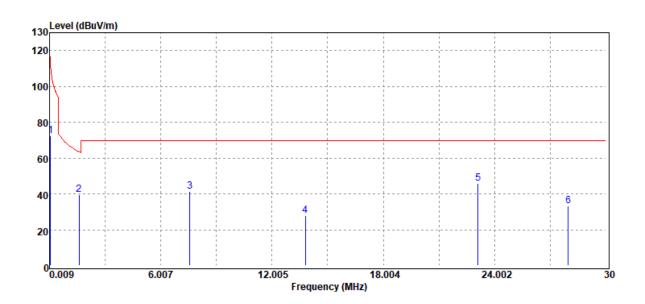


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Operation Mode: TX mode Test Date: April 8, 2021

Temperature:23.9°CTested by:Ray LiHumidity:53 % RHPolarity:Hor.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dΒμV	dB	dBµV/m	dBµV/m	dB
1	0.07	Peak	58.87	13.53	72.40	110.83	-38.43
2	1.60	Peak	25.54	14.08	39.62	63.53	-23.91
3	7.57	Peak	26.11	15.30	41.41	69.54	-28.13
4	13.81	Peak	12.39	15.33	27.72	69.54	-41.82
5	23.10	Peak	31.46	14.35	45.81	69.54	-23.73
6	27.96	Peak	19.84	13.36	33.20	69.54	-36.34

## Remark:

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



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30MHz ~ 1GHz

Operation Mode: TX mode Test Date: March 23, 2021

**Temperature:** 21.9°C **Tested by:** Ray Li

Humidity: 68 % RH Polarity: Ver. / Hor.

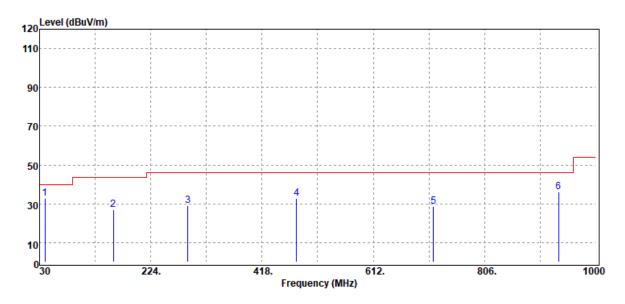
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	Polarity
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dΒμV	dB	dBμV/m	dBµV/m	dB	
39.70	Peak	42.47	-9.65	32.82	40.00	-7.18	V
159.01	Peak	37.10	-10.31	26.79	43.50	-16.71	V
288.99	Peak	37.97	-8.72	29.25	46.00	-16.75	V
478.14	Peak	36.33	-3.40	32.93	46.00	-13.07	V
716.76	Peak	28.10	0.38	28.48	46.00	-17.52	V
935.01	Peak	32.70	3.62	36.32	46.00	-9.68	V
93.05	Peak	48.58	-14.93	33.65	43.50	-9.85	Н
160.95	Peak	38.52	-10.40	28.12	43.50	-15.38	Η
231.76	Peak	43.61	-11.15	32.46	46.00	-13.54	Н
478.14	Peak	34.94	-3.40	31.54	46.00	-14.46	Н
847.71	Peak	25.66	2.49	28.15	46.00	-17.85	Н
930.16	Peak	26.07	3.56	29.63	46.00	-16.37	Н



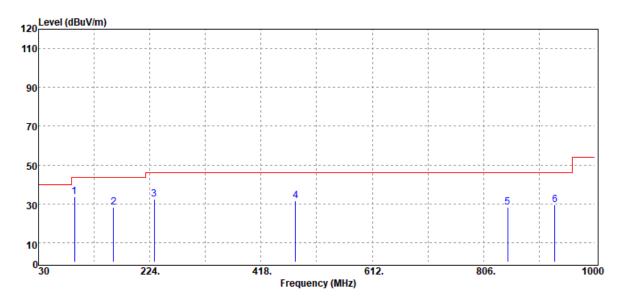
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## **Vertical**



## Horizontal





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#### 8.3 FREQUENCY STABILITY

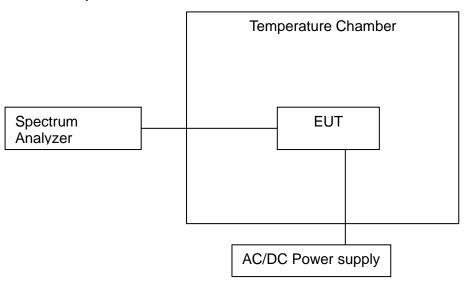
## **LIMIT**

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.



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## **TEST RESULTS**

No non-compliance noted.

**Temperature:**  $21.9^{\circ}$ C **Humidity:** 58% RH

Tested by: Dally Hong Test Date: April 21, 2021

## **TEST DATA**

	Condition					Frequency	Error (p	pm)				
Temperature	Modulation Mode	Test Freq.	0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min	Limit (ppm)	
					Normal							
T <sub>20°C</sub> Vmax	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	400	Pass
T <sub>20°C</sub> Vmin	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
					Extreme						•	
T <sub>60°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T50°cVnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T40°cVnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T <sub>30°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T <sub>20°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
T <sub>10°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T <sub>0°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T <sub>-10°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T <sub>-20°C</sub> Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass

Remark: Vnom: 3.8Vdc Vmax: 4.37Vdc Vmin: 3.23Vdc



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## 8.4 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  $\mu$ H/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 (dΒμV)					
(IVITZ)	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				

<sup>\*</sup> 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.



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## **TEST RESULTS**

Operation Mode: Mode 3 Test Date: April 23, 2021

Temperature: 22.5°C Tested by: Jerry Chang

Humidity: 54% 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
0.1660	34.45	19.36	10.29	44.74	29.65	65.16	55.16	-20.42	-25.51	L1
0.1860	32.04	19.31	10.29	42.33	29.60	64.21	54.21	-21.88	-24.61	L1
0.2100	29.48	19.85	10.29	39.77	30.14	63.21	53.21	-23.44	-23.07	L1
0.4820	22.64	16.77	10.29	32.93	27.06	56.30	46.30	-23.37	-19.24	L1
0.9220	18.15	12.08	10.31	28.46	22.39	56.00	46.00	-27.54	-23.61	L1
8.5460	17.75	10.16	10.43	28.18	20.59	60.00	50.00	-31.82	-29.41	L1
0.1500	35.70	19.46	10.26	45.96	29.72	66.00	56.00	-20.04	-26.28	N
0.1700	33.34	19.05	10.26	43.60	29.31	64.96	54.96	-21.36	-25.65	N
0.1780	31.15	20.63	10.26	41.41	30.89	64.58	54.58	-23.17	-23.69	N
0.2020	28.10	16.43	10.26	38.36	26.69	63.53	53.53	-25.17	-26.84	N
0.2260	26.79	19.18	10.26	37.05	29.44	62.60	52.60	-25.55	-23.16	N
0.4580	24.92	18.69	10.26	35.18	28.95	56.73	46.73	-21.55	-17.78	N

- 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) / L2 = Line Two (Neutral Line)
- 5. "-" means Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
- 6. Correction factor = LISN loss + Cable loss.



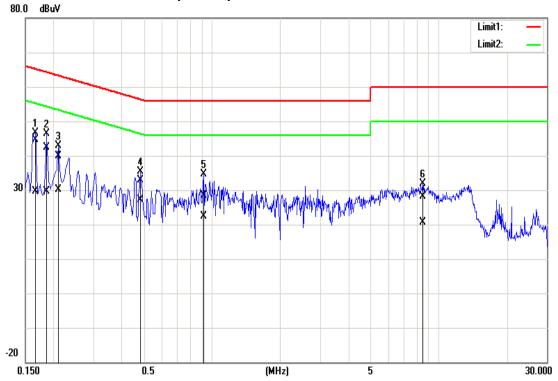
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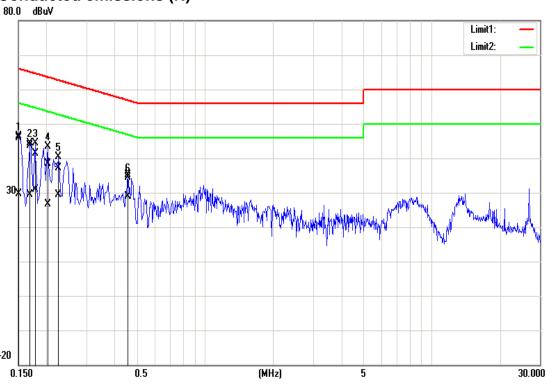
## **Test Plots**

## Conducted emissions (Line 1)

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## Conducted emissions (N)





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Operation Mode: Mode 4 Test Date: April 23, 2021

Temperature: 22.5°C Tested by: Jerry Chang

Humidity: 54% RH

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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
0.1539	28.23	13.62	10.29	38.52	23.91	65.78	55.79	-27.26	-31.88	L1
0.1940	22.05	8.41	10.29	32.34	18.70	63.86	53.86	-31.52	-35.16	L1
0.4660	22.48	12.27	10.29	32.77	22.56	56.58	46.58	-23.81	-24.02	L1
0.4900	19.31	11.05	10.29	29.60	21.34	56.17	46.17	-26.57	-24.83	L1
3.8980	15.09	8.53	10.37	25.46	18.90	56.00	46.00	-30.54	-27.10	L1
17.9580	17.79	17.02	10.44	28.23	27.46	60.00	50.00	-31.77	-22.54	L1
0.1700	25.77	6.90	10.26	36.03	17.16	64.96	54.96	-28.93	-37.80	N
0.1940	24.10	8.25	10.26	34.36	18.51	63.86	53.86	-29.50	-35.35	N
0.2180	20.79	7.30	10.26	31.05	17.56	62.89	52.89	-31.84	-35.33	N
0.4780	24.51	14.04	10.26	34.77	24.30	56.37	46.37	-21.60	-22.07	N
13.5620	31.01	19.18	10.45	41.46	29.63	60.00	50.00	-18.54	-20.37	N
17.9580	18.46	17.27	10.47	28.93	27.74	60.00	50.00	-31.07	-22.26	N

- 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) / L2 = Line Two (Neutral Line)
  - 5. "-" means Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  - 6. Correction factor = LISN loss + Cable loss.



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## **Test Plots**

## Conducted emissions (Line 1)

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