



FCC ID: M82-AIM75W **Report No.:** T200522D10-RP6 IC: 9404A-AIM75W

Page: 1 / 36 Rev.: 00

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

TEST REPORT

For

Tablet PC

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: June 18, 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。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>http://www.sgs.com.tw/Terms-and-Conditions</u> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>http://www.sgs.com.tw/Terms-and-Conditions</u>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instruction, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced, except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City , Taiwan /新北市五股區五工六路 11 號 t:(886-2) 2299-9720 f:(886-2) 2299-9721 www.sgs.com.tw www.ccsrf.com



Page: 2 / 36 Rev.: 00

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 18, 2021	Initial Issue	ALL	Doris Chu



Page: 3 / 36 Rev.: 00

TABLE OF CONTENTS

1. TES	T RESULT CERTIFICATION4	
2. EUT	DESCRIPTION5	
3. TES	T METHODOLOGY7	
3.1 3.2 3.3 3.4	EUT CONFIGURATION	
4. TES	T SUMMARY10	
5. INST	RUMENT CALIBRATION11	
5.1 5.2 5.3	MEASURING INSTRUMENT CALIBRATION	1
6. FAC	ILITIES AND ACCREDITATIONS14	
6.1 6.2	FACILITIES	
7. SET	UP OF EQUIPMENT UNDER TEST15	
7.1 7.2	SETUP CONFIGURATION OF EUT	
8. FCC	PART 15.225 REQUIREMENTS & RSS-210 REQUIREMENTS16	
8.1 8.2 8.3 8.4	OCCUPIED BANDWIDTH(99%) AND 20 DB BANDWIDTH	1
APPENI	DIX A PHOTOGRAPHS OF TEST SETUPA-1	
APPENI	DIX 1 - PHOTOGRAPHS OF EUT	

APPENDIX 2 - RF EXPOSURE



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-2 ; AIM-75H-2 ; AIM-75S-2XXXXXXXXXXXXXXX ; AIM75S-2XXXXXXXXXXXXXXXX ; AIM-75H-2XXXXXXXXXXXXXXXX ; AIM75H-2XXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank)
	IC: AIM-75S-2 ; AIM-75H-2
Date of Test:	December 10, 2020 ~ April 22, 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:

Komil Ismi

Kevin Tsai Deputy Manager Compliance Certification Services Inc. Page: 4 / 36 Rev.: 00



2. EUT DESCRIPTION

Product	Tablet PC			
Model No.	FCC: AIM-75S-2 ; AIM-75H-2 ; AIM-75S-2XXXXXXXXXXXXXXXX ; AIM75S-2XXXXXXXXXXXXXXXX ; AIM-75H-2XXXXXXXXXXXXXXXX ; AIM75H-2XXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank) IC: AIM-75S-2 ; AIM-75H-2			
	Model	Adapter	Tablet color	
	AIM-75H-2	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		
Model Discrepancy	AIM-75S-2	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-2XXXXXXXXXXXXXXXXX XX; AIM75S-2XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	All the above models are identical except for the designation of model numbers. The suffix of (where "X" may be any alphanumeric character, "-" or blank) on model number is just for marketing purpose only.		
Trade	ADVANTECH			
Received Date	May 22, 2020			



Page: 6 / 36 Rev.: 00

Power Supply	 Power from Adapter. 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 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 Power from Battery. ADVANTECH / AIM-BAT-8 		
Frequency Range	13.56MHz		
Modulation Technique	ASK		
Number of Channels	1 Channel		
Antenna Requirement	Antenna type: NFC Antenna YAGEO / ANTA0ZV14081NFCA8		
EUT Serial #	200CT32E00140		
Set up	Turn on the NFC mode, put on the proximity card to transmit the signal.		

Remark:

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

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



Page: 7 / 36 Rev.: 00

Report No.: T200522D10-RP6

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 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 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	$\begin{array}{r} 16.42 - 16.423 \\ 16.69475 - 16.69525 \\ 16.80425 - 16.80475 \\ 25.5 - 25.67 \\ 37.5 - 38.25 \\ 73 - 74.6 \\ 74.8 - 75.2 \\ 108 - 138 \\ 149.9 - 150.05 \\ 156.52475 - \\ 156.52525 \\ 156.7 - 156.9 \\ 162.0125 - 167.17 \\ 167.72 - 173.2 \\ 240 - 285 \\ 322 - 335.4 \\ 399.9 - 410 \end{array}$	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 3260 - 3267 332 - 3339 3345.8 - 3358 3500 - 4400 4500 - 5150 5350 - 5460 7250 - 7750 8025 - 8500	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 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.



Page: 9 / 36 Rev.: 00

Report No.: T200522D10-RP6

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.

AC Power Line Conducted Emission			
Test ConditionAC 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		
Worst Mode	Mode 1 Mode 2 Mode 3 Mode 4		

Radiated Emission Measurement Above 1G			
Test Condition	Radiated Emission Above 1G		
	Mode 1: EUT power by Adapter. (GlobTek)		
Power supply Mode	Mode 2: EUT power by Adapter. (FSP)		
	Mode 3: EUT power by Battery		
Worst Mode	🔲 Mode 1 🖂 Mode 2 🗌 Mode 3 🗌 Mode 4		
	Placed in fixed position.		
Morat Desition	Placed in fixed position at X-Plane (E2-Plane)		
worst Position	Placed in fixed position at Y-Plane (E1-Plane)		
	Placed in fixed position at Z-Plane (H-Plane)		

Radiated Emission Measurement Below 1G				
Test Condition Radiated Emission Below 1G				
Power supply Mode	Mode 1: EUT power by Adapter. (GlobTek) Mode 2: EUT power by Adapter. (FSP) Mode 3: EUT power by Battery			
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(X-Plane) were recorded in this report



Page: 10 / 36 Rev.: 00

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	Occupied Bandwidth (99%) and 20dB Bandwidth	Pass
15.209	RSS-210	8.2	Radiated Emissions	Pass
15.225	RSS-210	8.3	Frequency Stability	Pass
15.207	RSS-GEN Sec. 8.8	8.4	AC Power-line Conducted Emission	Pass



Page: 11 / 36 Rev.: 00

Report No.: T200522D10-RP6

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

RF Conducted Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Coaxial Cable	Woken	WC12	CC003	06/29/2020	06/28/2021
EXA Signal Analyzer	KEYSIGHT	N9010B	MY55460167	09/07/2020	09/06/2021
Power Meter	Anritsu	ML2487A	6K00003260	05/21/2020	05/20/2021
Power Seneor	Anritsu	MA2490A	032910	05/21/2020	05/20/2021
Thermostatic/Humidity Chamber	TAICHY	MHG-150LF	930619	09/24/2020	09/23/2021
Software	N/A				

Test date for December 10, 2020

3M 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	02/25/2020	02/24/2021
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/15/2020	01/14/2021
Loop Ant	COM-POWER	AL-130	121051	03/27/2020	03/26/2021
Pre-Amplifier	EMEC	EM330	060609	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				



Page: 12 / 36 Rev.: 00

Test date for April 22, 2021

3M 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	04/07/2021	04/06/2022
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	6.11-20180413		

Test date for January 5, 2021

Conducted Emission Room						
Name of Equipment	Manufacturer Model Serial Number Calibration Calibr Date Dute <					
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)					

Test date for April 15, 2021

Conducted Emission Room							
Name of Equipment	Manufacturer	Manufacturer Model Serial Number Calibration Calibration Date 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(CCS-3A1-CE)						

Remark:

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

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



Page: 13 / 36 Rev.: 00

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.



Page: 14 / 36 Rev.: 00

6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C. Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.) Tel: 886-2-2299-9720 / Fax: 886-2-2299-9721, 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."



Page: 15 / 36 Rev.: 00

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
	N/A				

- 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.



Page: 16 / 36 Rev.: 00

8. FCC PART 15.225 REQUIREMENTS & RSS-210 REQUIREMENTS

8.1 OCCUPIED BANDWIDTH(99%) AND 20 dB BANDWIDTH TEST CONFIGURATION

EUT Spectrum Analyzer

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 ℃	Humidity:	51% RH
Tested by:	Rick Lee	Test Date:	April 15, 2021

Test Condition	Frequency(MHz)	Occupied Bandwidth 99% (kHz)	20 dB Bandwidth (kHz)
NFC	13.56	260.492	81.0



Page: 17 / 36 Rev.: 00

Test Plot

20dB & 99% Bandwidth



Date: 15.APR.2021 15:16:33



Page: 18 / 36 Rev.: 00

Report No.: T200522D10-RP6

8.2 FUNDAMENTAL AND RADIATED EMISSIONS

<u>LIMIT</u>

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.



Page: 19 / 36 Rev.: 00

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 µV/m (50.5 dBµV/m) at 30 m,within the bands 13.410-13.553 MHz and 13.567-13.710 MHz;
- (c) 106 $\mu V/m$ (40.5 dB $\mu V/m$) 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) (µA/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



Page: 20 / 36 Rev.: 00

Test Configuration

9kHz ~ 30MHz









Page: 21 / 36 Rev.: 00

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.
- 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.



Page: 22 / 36 Rev.: 00

Operation Mode:	TX mode	Test Date:	December 10, 2020
Temperature:	20.9°C	Tested by:	Jerry Chang
Humidity:	70 % RH	Polarity:	Ver.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1	13.56	Peak	36.88	15.34	52.22	124.00	-71.78

- 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)



Page: 23 / 36 Rev.: 00

Operation Mode:	TX mode	Test Date:	December 10, 2020
Temperature:	20.9°C	Tested by:	Jerry Chang
Humidity:	70 % RH	Polarity:	Hor.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1	13.56	Peak	34.09	15.34	49.43	124.00	-74.57

- 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)



Page: 24 / 36 Rev.: 00

Test Result of Mask

Operation Mode:	TX mode	Test Date:	December 10, 2020
Temperature:	20.9°C	Tested by:	Jerry Chang
Humidity:	70 % RH	Polarity:	Ver.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1	13.35	Peak	13.24	15.35	28.59	80.54	-51.95
2	13.55	Peak	22.35	15.34	37.69	90.47	-52.78
3	13.57	Peak	25.48	15.34	40.82	90.47	-49.65
4	13.79	Peak	11.58	15.33	26.91	80.50	-53.59

- 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)



Page: 25 / 36 Rev.: 00

Test Result of Mask

Operation Mode:	TX mode	Test Date:	December 10, 2020
Temperature:	20.9°C	Tested by:	Jerry Chang
Humidity:	70 % RH	Polarity:	Hor.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1	13.35	Peak	12.14	15.35	27.49	80.54	-53.05
2	13.55	Peak	24.69	15.34	40.03	90.47	-50.44
3	13.57	Peak	24.20	15.34	39.54	90.47	-50.93
4	13.79	Peak	11.95	15.33	27.28	80.50	-53.22

- 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)



Page: 26 / 36 Rev.: 00

9kHz ~ 30MHz

Operation Mode:	TX mode	Test Date:	December 10, 2020
Temperature:	20.9°C	Tested by:	Jerry Chang
Humidity:	70 % RH	Polarity:	Ver.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1	1.63	Peak	24.79	14.08	38.87	63.37	-24.50
2	5.71	Peak	18.33	15.05	33.38	69.54	-36.16
3	7.57	Peak	16.21	15.30	31.51	69.54	-38.03
4	15.09	Peak	13.10	15.26	28.36	69.54	-41.18
5	22.20	Peak	13.90	14.55	28.45	69.54	-41.09
6	26.85	Peak	20.76	13.57	34.33	69.54	-35.21

Remark:

 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)



Page: 27 / 36 Rev.: 00

Operation Mode:	TX mode	Test Date:	December 10, 2020
Temperature:	20.9°C	Tested by:	Jerry Chang
Humidity:	70 % RH	Polarity:	Hor.



No.	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1	1.30	Peak	27.68	14.04	41.72	65.34	-23.62
2	5.47	Peak	18.98	15.01	33.99	69.54	-35.55
3	8.32	Peak	15.05	15.39	30.44	69.54	-39.10
4	17.25	Peak	12.17	15.18	27.35	69.54	-42.19
5	26.49	Peak	21.01	13.64	34.65	69.54	-34.89
6	27.15	Peak	21.07	13.51	34.58	69.54	-34.96

Remark:

 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)



Page: 28 / 36 Rev.: 00

$30MHz \sim 1GHz$

Operation Mode:	TX mode 1	Test Date:	April 22, 2021
Temperature:	22.1°C	Tested by:	Ray Li
Humidity:	51 % RH	Polarity:	Ver. / Hor.

Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	Polarity
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
49.40	Peak	52.74	-14.88	37.86	40.00	-2.14	V
165.80	Peak	38.05	-10.24	27.81	43.50	-15.69	V
238.55	Peak	38.07	-10.35	27.72	46.00	-18.28	V
478.14	Peak	31.66	-2.90	28.76	46.00	-17.24	V
846.74	Peak	26.22	3.16	29.38	46.00	-16.62	V
983.51	Peak	24.83	5.38	30.21	54.00	-23.79	V
104.69	Peak	37.93	-11.05	26.88	43.50	-16.62	Н
119.24	Peak	37.22	-8.96	28.26	43.50	-15.24	Н
238.55	Peak	37.55	-10.35	27.20	46.00	-18.80	Н
478.14	Peak	32.39	-2.90	29.49	46.00	-16.51	Н
847.71	Peak	25.33	3.25	28.58	46.00	-17.42	Н
982.54	Peak	25.39	5.52	30.91	54.00	-23.09	Н



Page: 29 / 36 Rev.: 00

Vertical



Horizontal





Page: 30 / 36 Rev.: 00

Report No.: T200522D10-RP6

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.



Page: 31 / 36 Rev.: 00

TEST RESULTS

No non-compliance noted.

Temperature:	18.9 ℃	Humidity:	50% RH
Tested by:	Rick Lee	Test Date:	January 14, 2021

TEST DATA

	Condition		Frequency Error (ppm)									
Temperature	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 _{20°C} Vmax	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
T _{20°C} Vmin	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
					Extreme							
T60∘cVnom	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 _{30°C} Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T _{20°C} Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	100	Pass
T _{10°C} Vnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T₀∘cVnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00		Pass
T-10°cVnom	ASK	13.56	13.560000	13.560000	13.560000	13.560000	0.00	0.00	0.00	0.00	1	Pass
T-20°CVnom	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



Page: 32 / 36 Rev.: 00

Report No.: T200522D10-RP6

8.4 POWERLINE CONDUCTED EMISSIONS

<u>LIMIT</u>

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 μ 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	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.



Page: 33 / 36 Rev.: 00

TEST RESULTS

Operation Mode:	Mode 3	Test Date:	January 05, 2021
Temperature:	20°C	Tested by:	Jerry Chang
Humidity:	63% 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
0.1780	32.49	18.32	10.21	42.70	28.53	64.58	54.58	-21.88	-26.05	L1
0.4860	21.56	11.41	10.22	31.78	21.63	56.24	46.24	-24.46	-24.61	L1
0.9460	16.24	9.75	10.24	26.48	19.99	56.00	46.00	-29.52	-26.01	L1
13.5420	16.04	8.19	10.39	26.43	18.58	60.00	50.00	-33.57	-31.42	L1
23.9500	29.07	27.79	10.31	39.38	38.10	60.00	50.00	-20.62	-11.90	L1
26.9420	32.28	28.83	10.24	42.52	39.07	60.00	50.00	-17.48	-10.93	L1
0.1780	29.33	17.37	10.19	39.52	27.56	64.58	54.58	-25.06	-27.02	Ν
0.2020	26.17	18.07	10.19	36.36	28.26	63.53	53.53	-27.17	-25.27	Ν
0.2260	23.32	14.33	10.19	33.51	24.52	62.60	52.60	-29.09	-28.08	Ν
0.4780	24.19	16.71	10.19	34.38	26.90	56.37	46.37	-21.99	-19.47	Ν
23.9500	28.56	27.28	10.51	39.07	37.79	60.00	50.00	-20.93	-12.21	Ν
26.9420	33.02	29.81	10.59	43.61	40.40	60.00	50.00	-16.39	-9.60	Ν

- 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.



Page: 34 / 36 Rev.: 00

Test Plots

Conducted emissions (Line 1)

80.0 dBuV



Conducted emissions (N)

80.0 dBuV





Page: 35 / 36 Rev.: 00

Operation Mode:	Mode 4	Test Date:	April 15, 2021
Temperature:	23°C	Tested by:	Dally Hong
Humidity:	51% 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
0.1780	19.49	5.60	10.29	29.78	15.89	64.58	54.58	-34.80	-38.69	L1
0.4660	21.35	11.12	10.29	31.64	21.41	56.58	46.58	-24.94	-25.17	L1
0.5100	21.78	13.09	10.29	32.07	23.38	56.00	46.00	-23.93	-22.62	L1
0.6020	27.89	22.15	10.29	38.18	32.44	56.00	46.00	-17.82	-13.56	L1
3.1220	14.53	2.99	10.34	24.87	13.33	56.00	46.00	-31.13	-32.67	L1
17.9580	20.74	20.41	10.44	31.18	30.85	60.00	50.00	-28.82	-19.15	L1
0.1540	26.22	16.12	10.26	36.48	26.38	65.78	55.78	-29.30	-29.40	Ν
0.4660	23.98	16.43	10.26	34.24	26.69	56.58	46.58	-22.34	-19.89	Ν
0.5260	16.70	10.85	10.26	26.96	21.11	56.00	46.00	-29.04	-24.89	Ν
0.5500	14.69	8.17	10.26	24.95	18.43	56.00	46.00	-31.05	-27.57	Ν
0.6060	22.23	17.65	10.26	32.49	27.91	56.00	46.00	-23.51	-18.09	Ν
17.9620	16.65	15.97	10.47	27.12	26.44	60.00	50.00	-32.88	-23.56	Ν

- 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.



Test Plots



80.0 dBuV



Page: 36 / 36 Rev.: 00