

FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Tablet Computer

Model No.: MIT-W102

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 5, 2022

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	September 5, 2022	Initial Issue	ALL	Doris Chu

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Report No.: TMWK2206002568KR

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 Computer

Trade Name: ADVANTECH

Model No.: MIT-W102

Date of Test: July 20 ~ August 2, 2022

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	Compliance
Statements of Conformity	
Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.	

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.225.

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

Approved by:



Shawn Wu
Supervisor
Compliance Certification Services Inc.

2. EUT DESCRIPTION

Product	Tablet Computer
Model No.	MIT-W102
Model Discrepancy	N/A
Trade	ADVANTECH
Received Date	July 13, 20022
Power Supply	1. Power from Power Adapter. DELTA / MDS-060AAS19 B I/P: 100-250Vac, 50-60Hz, 1.5 ~ 0.75A O/P: 19V / 3.15A 2. Power from Battery 11.1Vdc, 2860mAH, 31.75Wh
Frequency Range	13.56MHz
Modulation Technique	ASK
Number of Channels	1 Channel
Antenna Requirement	Antenna type: Loop Antenna
HW Version	DMA-BA25 A102-2
SW Version	Microsoft Windows 10 2019 LTSC
NFC Module	Jogtek Corp / TM-007-MINI

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. TEST METHODOLOGY

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

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

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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

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

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

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

3.3 DESCRIPTION OF TEST MODES

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

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

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

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Power supply Mode	Mode 1: EUT+Dock(W102-Smal) power by Adapter Mode 2: EUT+Dock(W102-Large) power by Adapter
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Power supply Mode	Mode 1: EUT+Dock(W102-Smal) power by Adapter Mode 2: EUT+Dock(W102-Large) power by Adapter
Worst Mode	<input type="checkbox"/> Mode 1 <input checked="" type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

Remark:

1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Z-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.

4. TEST SUMMARY

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

5. INSTRUMENT CALIBRATION

5.1 MEASURING INSTRUMENT CALIBRATION

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

5.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

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

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB1	A052609	02/15/2022	02/14/2023
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/23/2022	02/22/2023
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	12/28/2021	12/27/2022
Loop Ant	COM-POWER	AL-130	121051	04/13/2022	04/12/2023
Pre-Amplifier	EMEC	EM330	060609	02/23/2022	02/22/2023
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	12/06/2021	12/05/2022
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

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

Remark:

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

5.3 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	± 2.1183
Channel Bandwidth	± 2.1863
Frequency Stability	± 2.0730
Radiated Emission_9kHz-30MHz	± 3.842
Radiated Emission_30MHz-200MHz	± 4.517
Radiated Emission_200MHz-1GHz	± 4.844

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

5.4 FACILITIES AND TEST LOCATION

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

CAB identifier: TW1309

Test site	Test Engineer	Remark
AC Conduction Room	Tony Chao	-
Radiation	Tony Chao	-
RF Conducted	Jack Chen	-

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

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

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

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	FCC ID
	N/A				

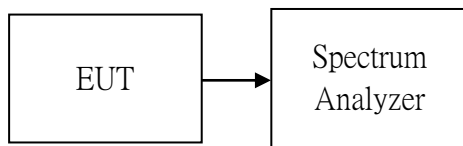
Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

Report No.: TMWK2206002568KR

7. FCC PART 15.225 REQUIREMENTS & RSS-210 REQUIREMENTS

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



TEST PROCEDURE

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

TEST RESULTS

No non-compliance noted.

Temperature: 26.2°C

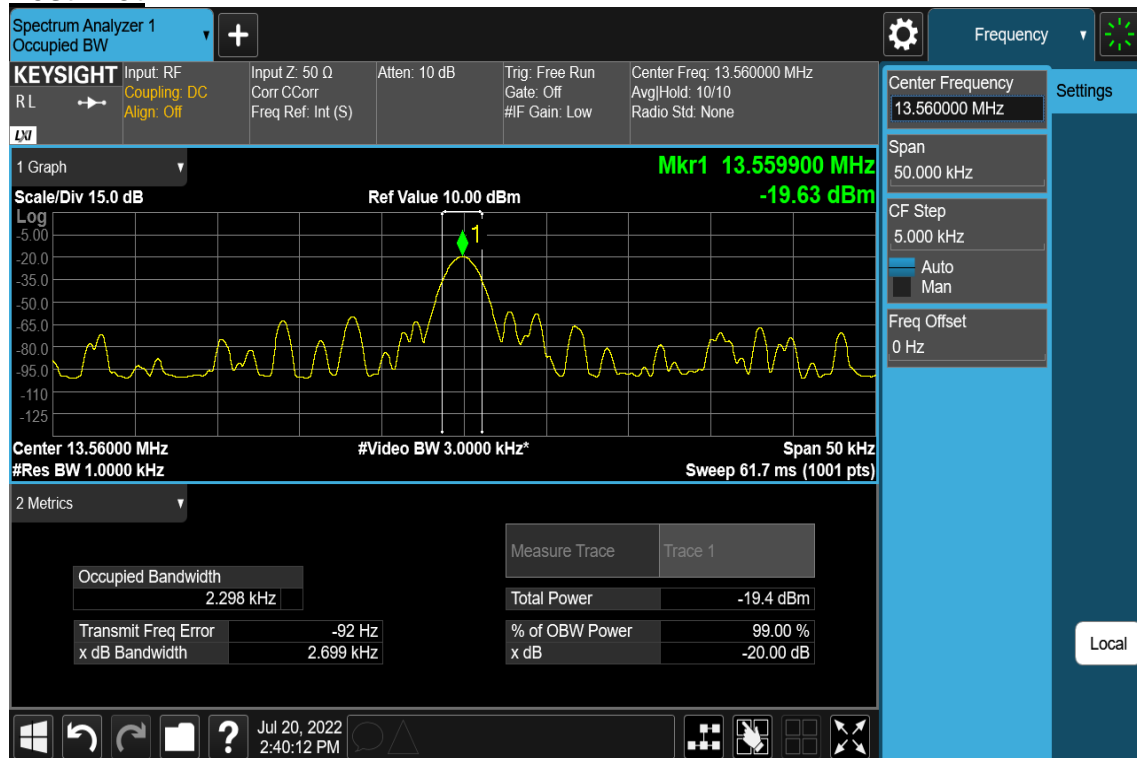
Humidity: 53% RH

Tested by: Jack Chen

Test Date: July 20, 2022

Test Condition	Frequency(MHz)	Occupied Bandwidth 99% (kHz)	20 dB Bandwidth (kHz)
NFC	13.56	2.298	2.699

Test Plot



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.

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) at 30 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 µV/m (40.5 dBµV/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

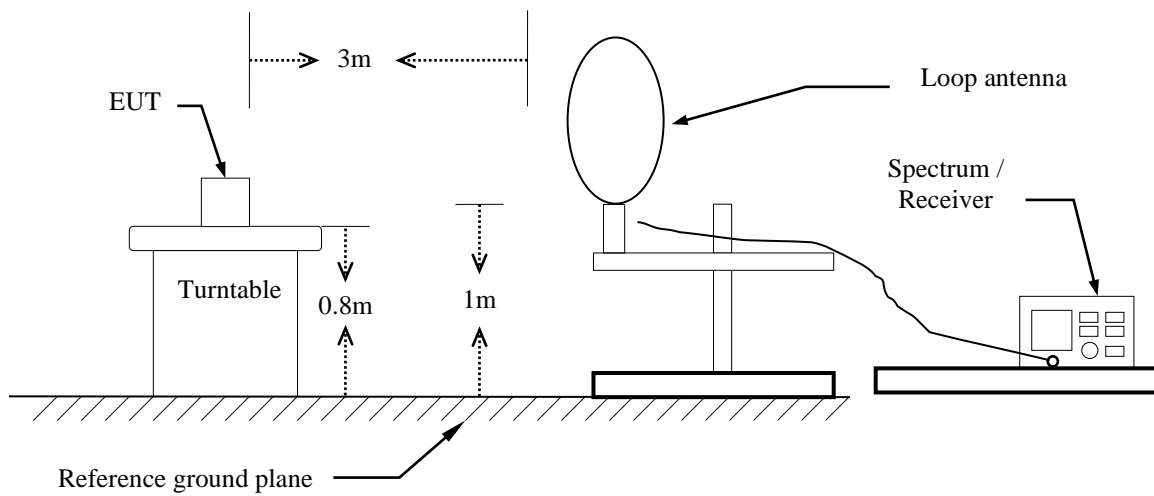
Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Above 30 MHz

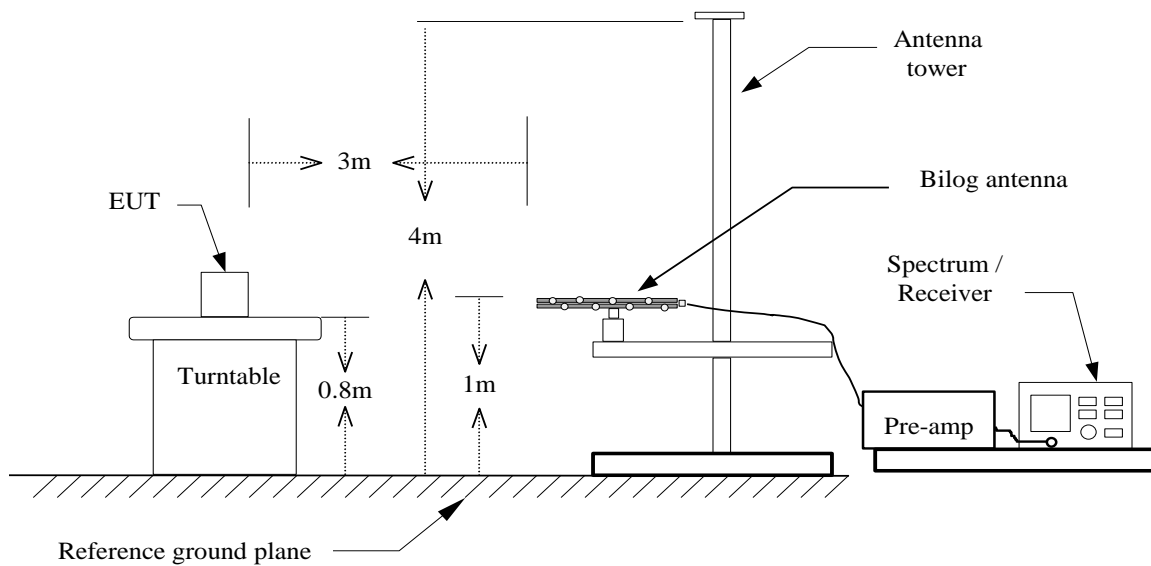
Frequency	Field strength (µV/m at 3 m)
30-88	100
88-216	150
216-960	200
Above 960	500

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.

Mode 2-Dock(W102-Large)

Operation Mode: TX mode

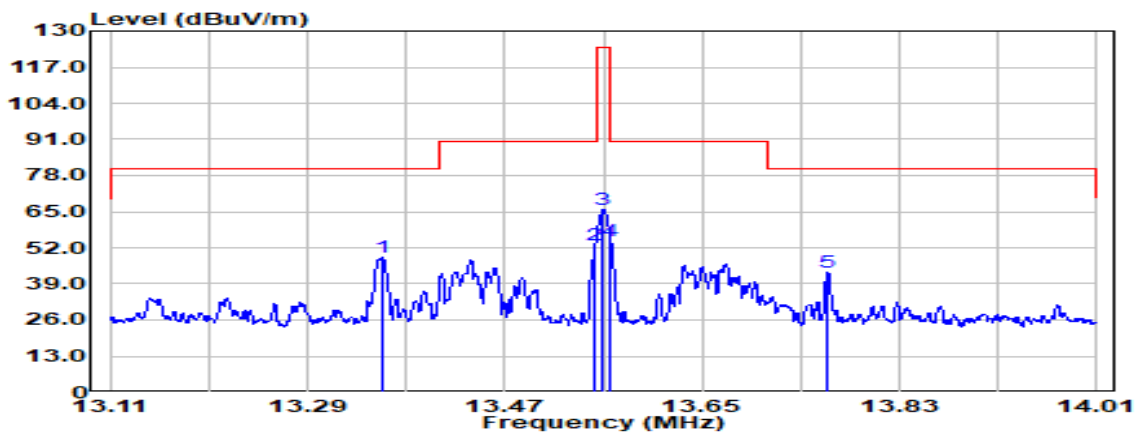
Test Date: August 2, 2022

Temperature: 24.1°C

Tested by: Tony Chao

Humidity: 65 % RH

Polarity: Hor.

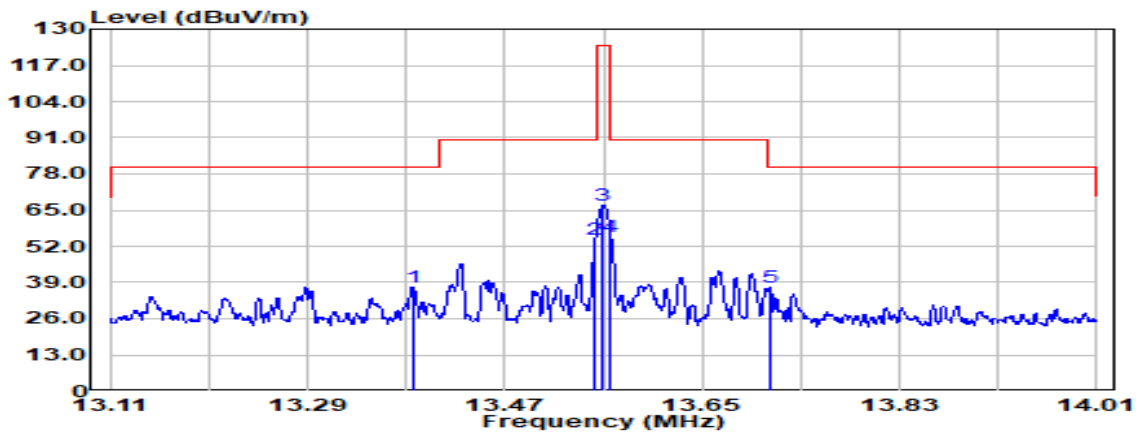


No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
1	13.358	Peak	33.22	15.15	48.37	80.51	-32.13
2	13.553	Peak	37.69	15.15	52.84	90.47	-37.63
3	13.560	Peak	50.36	15.15	65.51	124.00	-58.49
4	13.567	Peak	39.24	15.15	54.39	90.47	-36.08
5	13.765	Peak	27.85	15.15	43.00	80.51	-37.50

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit (@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
 490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40*Log (30 meters/3 meters)
 1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Operation Mode: TX mode **Test Date:** August 2, 2022
Temperature: 24.1°C **Tested by:** Tony Chao
Humidity: 65 % 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	13.386	Peak	22.07	15.15	37.22	80.51	-43.29
2	13.553	Peak	39.13	15.15	54.28	90.47	-36.19
3	13.560	Peak	51.77	15.15	66.92	124.00	-57.08
4	13.567	Peak	40.51	15.15	55.66	90.47	-34.81
5	13.712	Peak	21.89	15.15	37.05	80.51	-43.46

Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
4. 9kHz to 490kHz Limit (@3m) = 2400(F/kHz)+ 40*Log (300 meters/3 meters)
 490kHz to 1.705MHz Limit (@3m) = 2400(F/kHz)+ 40*Log (30 meters/3 meters)
 1.705MHz to 30MHz Limit (@3m) = 30 + 40*Log (30 meters/3 meters)

Operation Mode: TX mode **Test Date:** August 2, 2022
Temperature: 24.1°C **Tested by:** Tony Chao
Humidity: 65 % RH **Polarity:** Ground



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	13.358	Peak	13.37	15.15	28.52	80.51	-51.99
2	13.553	Peak	28.48	15.15	43.64	90.47	-46.83
3	13.560	Peak	40.82	15.15	55.97	124.00	-68.03
4	13.567	Peak	29.61	15.15	44.76	90.47	-45.71
5	13.766	Peak	17.97	15.15	33.12	80.51	-47.38

Remark:

5. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
6. 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.
7. Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).
8. 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)

Mode 2-Dock(W102-Large)

9kHz ~ 30MHz

Operation Mode: TX mode

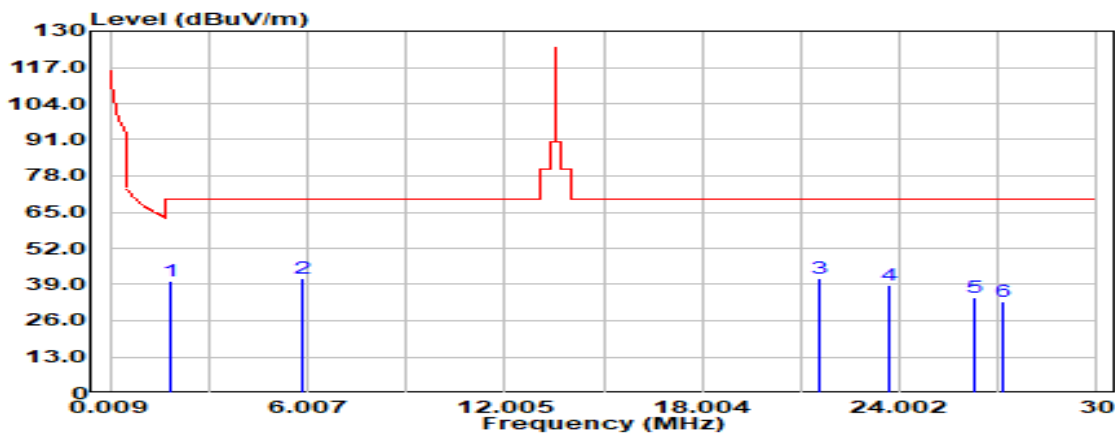
Test Date: August 2, 2022

Temperature: 24.1°C

Tested by: Tony Chao

Humidity: 65 % RH

Polarity: Ver.



No.	Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
1	1.828	Peak	26.74	13.71	40.45	69.54	-29.09
2	5.827	Peak	26.86	14.32	41.18	69.54	-28.36
3	21.588	Peak	25.95	15.02	40.98	69.54	-28.56
4	23.720	Peak	24.01	14.65	38.66	69.54	-30.88
5	26.293	Peak	20.33	14.19	34.52	69.54	-35.02
6	27.122	Peak	18.61	14.03	32.65	69.54	-36.89

Remark:

- 9kHz to 490kHz Limit (@3m) = $2400(F/kHz) + 40 * \text{Log}(300 \text{ meters}/3 \text{ meters})$
 490kHz to 1.705MHz Limit (@3m) = $2400(F/kHz) + 40 * \text{Log}(30 \text{ meters}/3 \text{ meters})$
 1.705MHz to 30MHz Limit (@3m) = $30 + 40 * \text{Log}(30 \text{ meters}/3 \text{ meters})$

Mode 2-Dock(W102-Large)

30MHz ~ 1GHz

Operation Mode: TX mode

Test Date: August 2, 2022

Temperature: 24.1°C

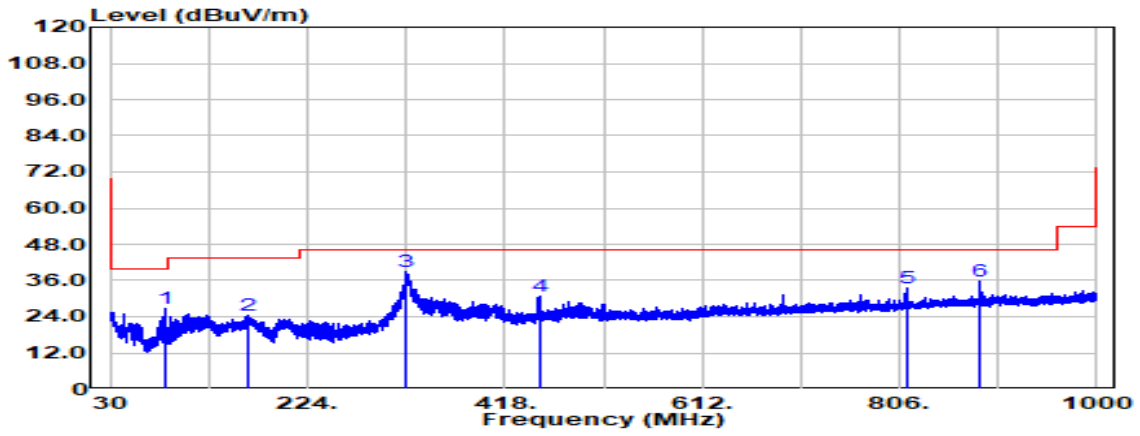
Tested by: Tony Chao

Humidity: 65 % RH

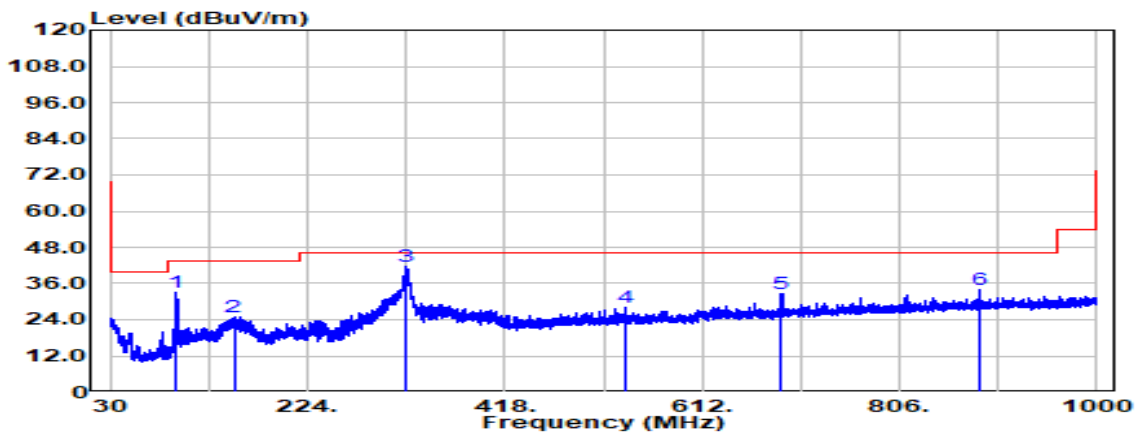
Polarity: Ver. / Hor.

Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB	Polarity
83.956	Peak	42.88	-16.19	26.69	40.00	-13.31	V
164.588	Peak	35.59	-11.07	24.52	43.50	-18.98	V
321.728	Peak	47.56	-8.60	38.96	46.00	-7.04	V
451.829	Peak	35.56	-4.90	30.65	46.00	-15.35	V
813.396	Peak	32.09	1.25	33.34	46.00	-12.66	V
884.449	Peak	33.76	1.91	35.68	46.00	-10.32	V
94.020	Peak	48.03	-14.78	33.25	43.50	-10.25	H
151.735	Peak	35.71	-10.67	25.04	43.50	-18.46	H
320.636	Peak	50.47	-8.62	41.84	46.00	-4.16	H
537.674	Peak	31.42	-3.23	28.19	46.00	-17.81	H
690.328	Peak	33.43	-0.68	32.76	46.00	-13.24	H
884.449	Peak	31.86	1.91	33.78	46.00	-12.22	H

Vertical



Horizontal



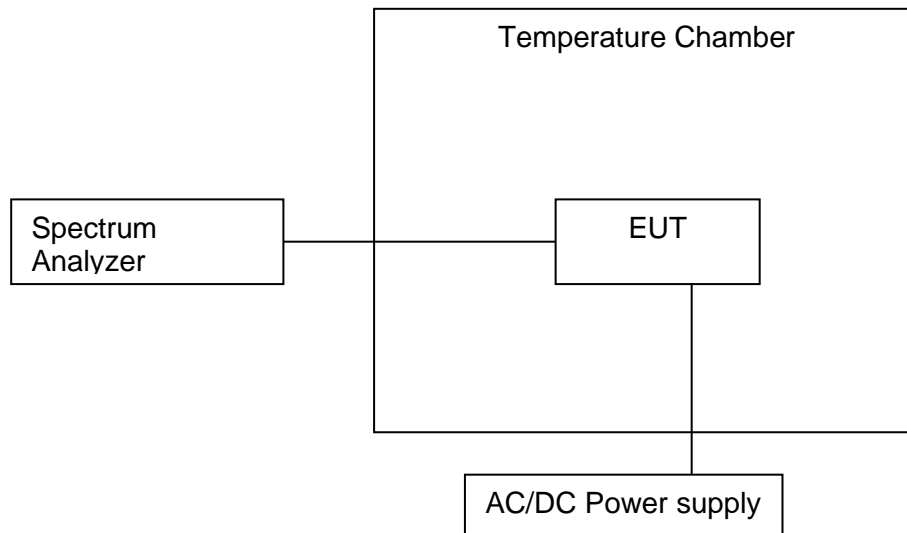
7.3 FREQUENCY STABILITY

LIMIT

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

Test Configuration

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



TEST PROCEDURE

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

TEST RESULTS

No non-compliance noted.

Temperature: 26.2°C

Humidity: 53% RH

Tested by: Jack Chen

Test Date: July 20, 2022

TEST DATA

Startup				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
120	-20	13.55988	-120.00	+/- 1356
120	-10	13.55983	-170.00	+/- 1356
120	0	13.55996	-40.00	+/- 1356
120	10	13.55995	-50.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
120	30	13.55985	-150.00	+/- 1356
120	40	13.55988	-120.00	+/- 1356
120	50	13.55991	-90.00	+/- 1356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
250	20	13.55983	-170.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
100	20	13.55989	-110.00	+/- 1356

2 minutes				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
120	-20	13.55996	-40.00	+/- 1356
120	-10	13.55991	-90.00	+/- 1356
120	0	13.55988	-120.00	+/- 1356
120	10	13.55983	-170.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
120	30	13.55985	-150.00	+/- 1356
120	40	13.55988	-120.00	+/- 1356
120	50	13.55986	-140.00	+/- 1356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
250	20	13.55988	-120.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
100	20	13.55989	-110.00	+/- 1356

5 minutes				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
120	-20	13.55991	-90.00	+/- 1356
120	-10	13.55988	-120.00	+/- 1356
120	0	13.55993	-70.00	+/- 1356
120	10	13.55989	-110.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
120	30	13.55986	-140.00	+/- 1356
120	40	13.55988	-120.00	+/- 1356
120	50	13.55989	-110.00	+/- 1356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
250	20	13.55993	-70.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
100	20	13.55988	-120.00	+/- 1356

10 minutes				
A. Temperature Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
120	-20	13.55988	-120.00	+/- 1356
120	-10	13.55986	-140.00	+/- 1356
120	0	13.55995	-50.00	+/- 1356
120	10	13.55987	-130.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
120	30	13.55986	-140.00	+/- 1356
120	40	13.55989	-110.00	+/- 1356
120	50	13.55988	-120.00	+/- 1356
B. Supply Voltage Variation				
Power Supply	Environment	Frequency	Delta (kHz)	Limit (kHz)
Vdc	Temperature (°C)	(MHz)		
250	20	13.55985	-150.00	+/- 1356
120	20	13.55990	-100.00	+/- 1356
100	20	13.55989	-110.00	+/- 1356

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 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 (MHz)	Limits (dB μ V)	
	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

Operation Mode: Mode 1

Test Date: July 25, 2022

Temperature: 24.3°C

Tested by: Tony Chao

Humidity: 52% RH

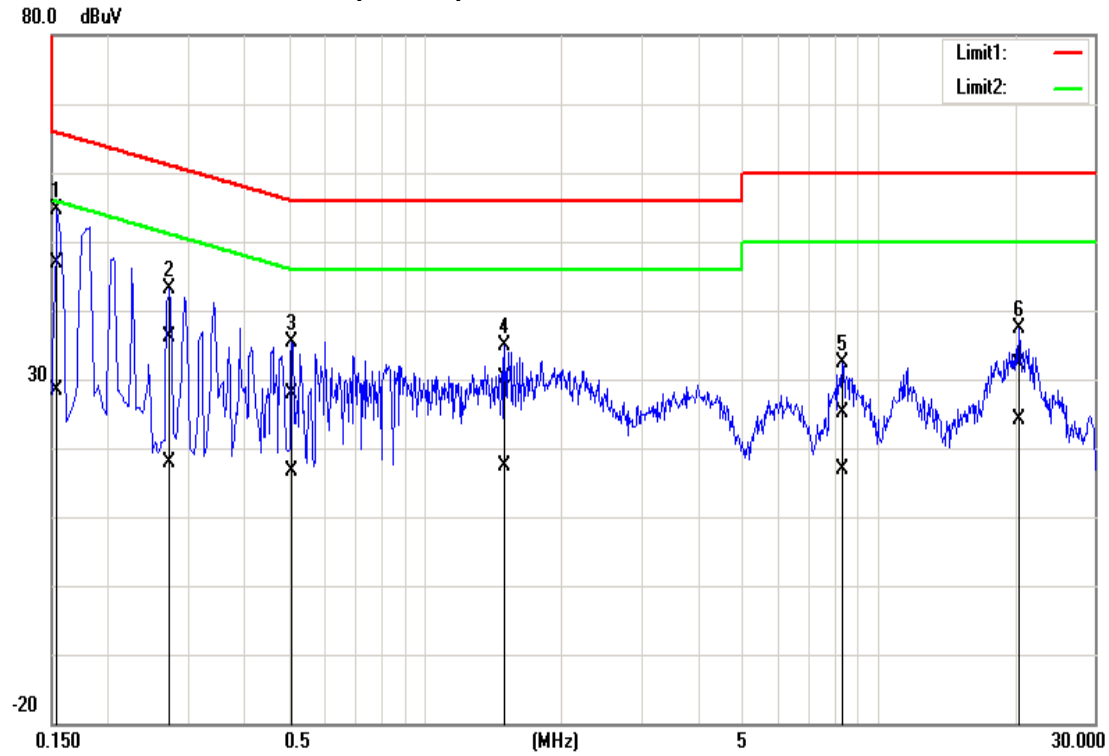
Freq. (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB/m)	QP Result (dBuV/m)	AV Result (dBuV/m)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.1540	36.68	18.28	10.17	46.85	28.45	65.78	55.78	-18.93	-27.33	L1
0.2740	25.93	7.67	10.18	36.11	17.85	61.00	51.00	-24.89	-33.15	L1
0.5100	17.63	6.35	10.19	27.82	16.54	56.00	46.00	-28.18	-29.46	L1
1.5020	19.94	7.13	10.24	30.18	17.37	56.00	46.00	-25.82	-28.63	L1
8.3380	14.85	6.60	10.34	25.19	16.94	60.00	50.00	-34.81	-33.06	L1
20.4020	21.66	13.84	10.36	32.02	24.20	60.00	50.00	-27.98	-25.80	L1
0.1660	40.96	23.91	10.17	51.13	34.08	65.16	55.16	-14.03	-21.08	N
0.2860	25.03	6.14	10.17	35.20	16.31	60.64	50.64	-25.44	-34.33	N
0.7060	14.89	5.69	10.20	25.09	15.89	56.00	46.00	-30.91	-30.11	N
1.8100	23.06	18.68	10.23	33.29	28.91	56.00	46.00	-22.71	-17.09	N
6.9660	12.84	4.53	10.31	23.15	14.84	60.00	50.00	-36.85	-35.16	N
20.3140	21.28	12.24	10.42	31.70	22.66	60.00	50.00	-28.30	-27.34	N

Remark:

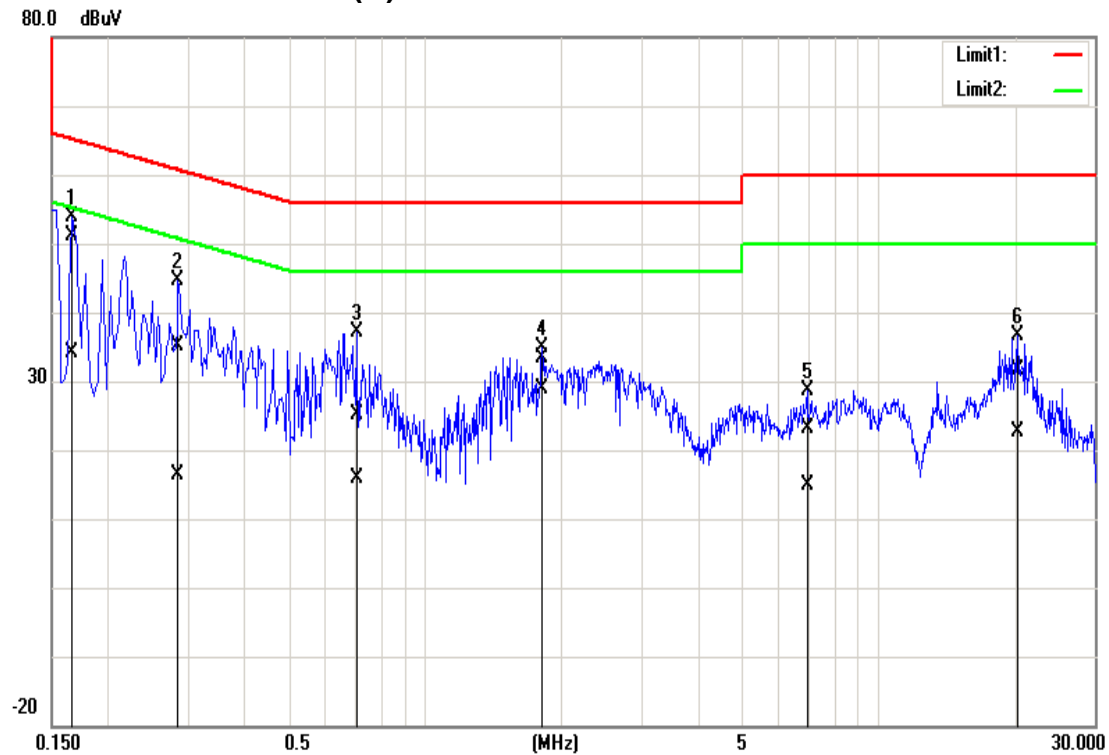
1. The measuring frequencies range between 0.15 MHz and 30 MHz.
2. The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.
3. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10kHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.
4. L1 = Line One (Live Line) / 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

Conducted emissions (Line 1)



Conducted emissions (N)



- End of Test Report -