

EMC TEST REPORT

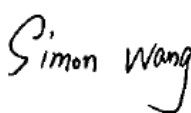

Applicant:	Thundercomm Technology Co., Ltd
Address:	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122

Manufacturer or Supplier:	Thundercomm Technology Co., Ltd
Address:	No. 107, Middle Datagu Road, Xiantao Street, Yubei District, Chongqing, China, 401122
Product:	TurboX CM2290-NA
Brand Name:	TURBOX
Model Name:	TurboX CM2290-NA
FCC ID:	2AOHHCM2290NA
Date of tests:	Apr. 07, 2023 ~ Apr. 26, 2023

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

- ☐ FCC Part 15, Subpart B, Class A
☒ FCC Part 15, Subpart B, Class B
☒ ANSI C63.4:2014

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
 Date: Apr. 26, 2023	 Date: Apr. 26, 2023

This report is governed by, and incorporates by reference, the Conditions of Testing as posted at the date of issuance of this report at <http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions/> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. Statements of conformity are based on simple acceptance criteria without taking measurement uncertainty into account, unless otherwise requested in writing. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

TABLE OF CONTENTS

RELEASE CONTROL RECORD	3
1 GENERAL INFORMATION.....	4
1.1 GENERAL DESCRIPTION OF EUT.....	4
1.2 SUMMARY OF TEST RESULTS	6
1.3 MEASUREMENT UNCERTAINTY	6
1.4 DESCRIPTION OF TEST MODES.....	7
1.5 DESCRIPTION OF SUPPORT UNITS.....	8
2 EMISSION TEST	9
2.1 CONDUCTED EMISSION MEASUREMENT.....	9
2.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	9
2.1.2 TEST INSTRUMENTS.....	9
2.1.3 TEST PROCEDURES	10
2.1.4 DEVIATION FROM TEST STANDARD	10
2.1.5 TEST SETUP.....	10
2.1.6 EUT OPERATING CONDITIONS	11
2.1.7 TEST RESULTS	12
2.2 RADIATED EMISSION MEASUREMENT.....	14
2.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT	14
2.2.2 TEST INSTRUMENTS.....	15
2.2.3 TEST PROCEDURE.....	16
2.2.4 DEVIATION FROM TEST STANDARD	17
2.2.5 TEST SETUP.....	18
2.2.6 EUT OPERATING CONDITIONS	18
2.2.7 TEST RESULTS	19
3 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	23

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
W7L-P23030025EM01	Original release	Apr. 26, 2023

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION OF EUT

PRODUCT	TurboX CM2290-NA	
BRAND NAME	TURBOX	
MODEL NAME	TurboX CM2290-NA	
NOMINAL VOLTAGE	EUT 4.0V	
MODULATION TYPE	BT_LE	GFSK
	Bluetooth	GFSK, $\pi/4$ -DQPSK, 8DPSK
	WLAN	DSSS, OFDM
	GPS/GALILEO/GLO NASS/BDS/SBAS	BPSK
	LTE	QPSK/16QAM/64QAM
OPERATING FREQUENCY	Bluetooth/BT_LE	2402MHz ~ 2480MHz
	WLAN	2412 ~ 2462MHz for 11b/g/n(HT20/HT40) 5180 ~ 5240MHz, 5260 ~ 5320 MHz, 5500 ~ 5720MHz, 5745 ~ 5825 MHz for 11a/ n(HT20)/ n(HT40) / ac(VHT20)/ ac(VHT40) / ac(VHT80)
	GPS/GALILEO/GLO NASS/BDS/SBAS	1559MHz ~ 1610MHz

OPERATING FREQUENCY	LTE	1850.7MHz ~ 1909.3MHz (FOR LTE Band2) 1710.7MHz ~ 1754.3MHz (FOR LTE Band4) 824.7MHz ~ 848.3MHz (FOR LTE Band5) 2502.5MHz ~ 2567.5MHz (FOR LTE Band7) 699.7MHz ~ 715.3MHz (FOR LTE Band12) 779.5MHz ~ 784.5MHz (FOR LTE Band13) 790.5MHz ~ 795.5MHz (FOR LTE Band14) 706.5MHz ~ 713.5MHz (FOR LTE Band17) 1850.7MHz ~ 1914.3MHz (FOR LTE Band25) 814.7MHz ~ 848.3MHz (FOR LTE Band26) 2537.5MHz ~ 2652.5MHz (FOR LTE Band41) 1710.7MHz ~ 1779.3MHz (FOR LTE Band66) 665.5MHz ~ 695.5MHz (FOR LTE Band71)
HW VERSION	V06	
SW VERSION	FlatBuild_Turbox-CM2290_cm2290_la1.0.1.v.userdebug.20230301.1952	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	N/A	

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

List of Accessory:

ACCESSORIES	BRAND	MANUFACTURER	MODEL	SPECIFICATION
eMMC 1 (=ROM 1)	LONGSYS	LONGSYS	FEMDNN016G-58 A46	16GB
eMMC 2 (=ROM 2)	KINGSTON	KINGSTON	EMMC16G-TB29	16GB
RAM 1	MICRON	MICRON	MT53E512M32D1 ZW-046 WT:B	2GB
RAM 2	MICRON	MICRON	MT53D512M32D2 DS-053 WT:D	2GB

1.2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart B		
Standard Section	Test Item	Result
FCC Part 15, Subpart B, Class B ANSI C63.4:2014	Conducted Test	Compliance
	Radiated Emission Test (30MHz ~ 1GHz)	Compliance
	Radiated Emission Test (Above 1GHz)	Compliance

1.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz ~ 30MHz	±2.70dB
Radiated emissions	30MHz~1GHz	±4.98dB
	1GHz ~6GHz	±4.70dB
	6GHz ~18GHz	±4.60dB
	18GHz ~40GHz	±4.12dB

1.4 DESCRIPTION OF TEST MODES

Test Mode	Test Condition	
Radiated emission test		
1	LTE B5 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On + SD+ SIM	Sample1
2	LTE B12 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On + SD+ SIM	
3	LTE B13 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On+ SD+ SIM	
4	LTE B14 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On+ SD+ SIM	
5	LTE B17 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On + SD+ SIM	
6	LTE B26 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle + HDMI (Link to Screen) + MPG4+ SD+ SIM	
7	LTE B71 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Data Transmission (SD to EUT) + SD+ SIM+ USB Cable	
8	Worst case of 1-7	Sample2

Conducted emission test		
1	LTE B5 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On + SD+ SIM	Sample1
2	LTE B12 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On+ SD+ SIM	
3	LTE B13 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On + SD+ SIM	
4	LTE B14 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Camera On+ SD+ SIM	
5	LTE B17 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle + HDMI (Link to Screen) + Camera On+ SD+ SIM	
6	LTE B26 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + MPG4+ SD+ SIM	
7	LTE B71 Idle+ Adapter+ Speaker+ BT Idle+ WIFI Idle+ HDMI (Link to Screen) + Data Transmission (SD to EUT) + SD+ SIM+ USB Cable	
8	Worst case of 1-7	Sample2

NOTE:

1. For conducted emission test, Pre-scan all mode, mode 2 was the worst case and only this mode was presented in this report.
2. For radiated emission test, Pre-scan all mode, test mode 6 was the worst case and only this mode was presented in this report.

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

FOR ALL TESTS

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Laptop	Lenovo	Thinkpad L440	R90FTFKP	N/A
2	Flat Panel Monitor	DELL	U2417H	CN-02DH76-74445-722-BRML-A03	N/A
3	Micro SD	SAM SUNG	N/A	N/A	N/A
4	USB Cable	MI	N/A	N/A	N/A
5					
6	GPS Simulator+Antenna	TOJOIN	GNSS-5000A	E1-010-010119	N/A
7	Universal radio communication tester	Rohde&Schwarz	CMW500	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB Line: Shielded, Detachable 1m;
2	N/A
3	N/A
4	N/A

2 EMISSION TEST

2.1 CONDUCTED EMISSION MEASUREMENT

2.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: FCC PART 15, SUBPART B (SECTION: 15.107 A CLASS B)

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

TEST STANDARD: FCC PART 15, SUBPART B (SECTION: 15.107 B CLASS A)

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60

NOTE: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

2.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Feb. 14,23	Feb. 13,24
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Mar. 03,23	Mar. 02,24

NOTE: 1. The test was performed in CE shielded room.

2.1.3 TEST PROCEDURES

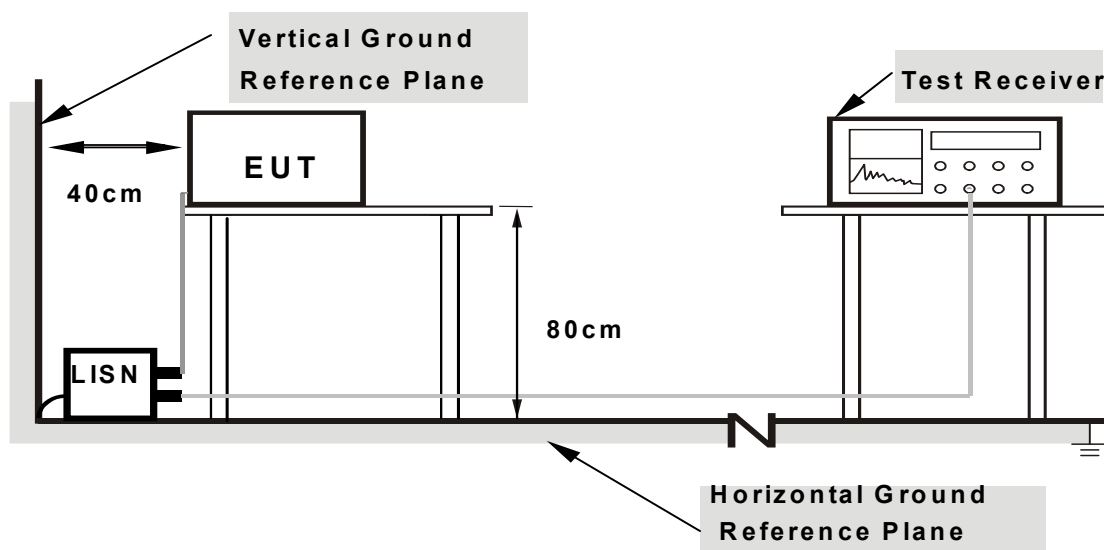
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

2.1.4 DEVIATION FROM TEST STANDARD

No deviation.

2.1.5 TEST SETUP



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the attached file (Test Setup Photo).

2.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the use type described in the manufacturer's specifications or the user's manual.

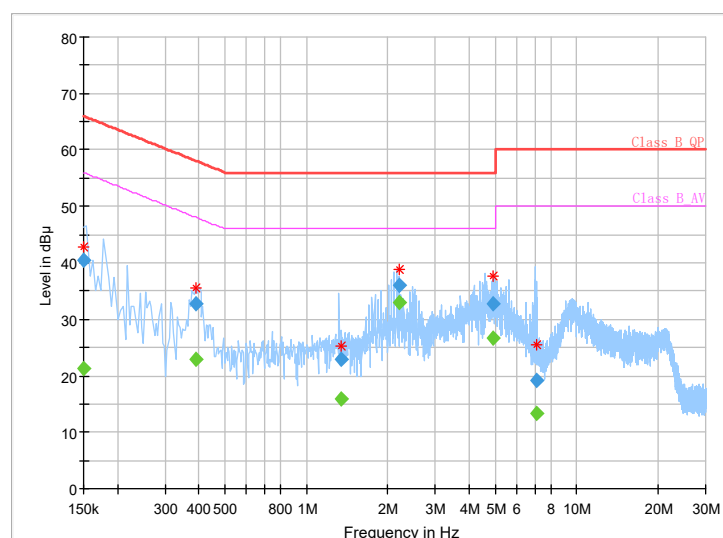
2.1.7 TEST RESULTS

TEST VOLTAGE	EUT 4.0V	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 51%RH	TESTED BY	Carl xie

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	21.40	56.00	34.60	L1	ON	9.7
0.150000	40.46	---	66.00	25.54	L1	ON	9.7
0.392000	---	22.94	48.02	25.08	L1	ON	9.7
0.392000	32.85	---	58.02	25.17	L1	ON	9.7
1.348000	---	15.94	46.00	30.06	L1	ON	9.7
1.348000	22.92	---	56.00	33.08	L1	ON	9.7
2.196000	---	32.87	46.00	13.13	L1	ON	9.7
2.196000	35.96	---	56.00	20.04	L1	ON	9.7
4.888000	---	26.59	46.00	19.41	L1	ON	9.7
4.888000	32.78	---	56.00	23.22	L1	ON	9.7
7.072000	---	13.29	50.00	36.71	L1	ON	9.7
7.072000	19.20	---	60.00	40.80	L1	ON	9.7

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Limit value - Emission level
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

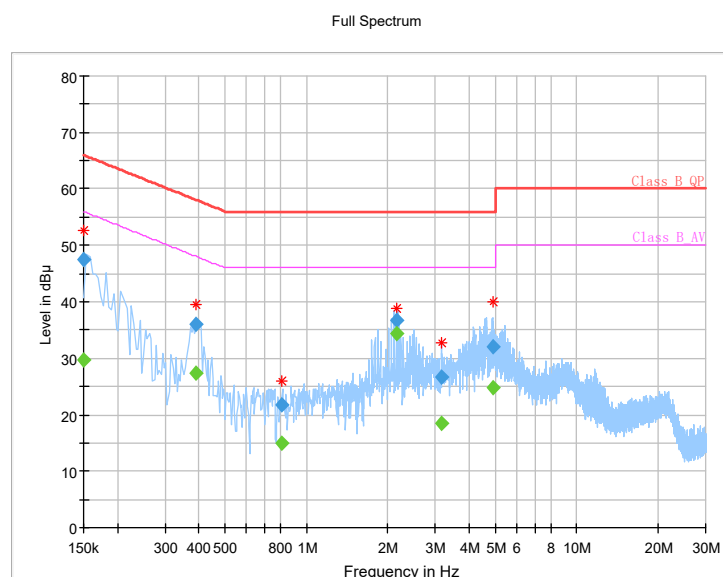
Full Spectrum



TEST VOLTAGE	EUT 4.0V	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 51%RH	TESTED BY	Carl xie

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	29.79	56.00	26.21	N	ON	9.7
0.150000	47.59	---	66.00	18.41	N	ON	9.7
0.392000	---	27.44	48.02	20.58	N	ON	9.7
0.392000	36.04	---	58.02	21.98	N	ON	9.7
0.810000	---	14.97	46.00	31.03	N	ON	9.7
0.810000	21.65	---	56.00	34.35	N	ON	9.7
2.150000	---	34.34	46.00	11.66	N	ON	9.8
2.150000	36.75	---	56.00	19.25	N	ON	9.8
3.168000	---	18.49	46.00	27.51	N	ON	9.8
3.168000	26.67	---	56.00	29.33	N	ON	9.8
4.884000	---	24.81	46.00	21.19	N	ON	9.8
4.884000	32.10	---	56.00	23.90	N	ON	9.8

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Limit value - Emission level
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.



2.2 RADIATED EMISSION MEASUREMENT

2.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: FCC PART 15, SUBPART B (SECTION: 15.109)

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 3 meters (dB μ V/m)		
Frequencies (MHz)	FCC 15B, Class A	FCC 15B, Class B
30-88	49	40
88-216	53.5	43.5
216-960	56	46
960-1000	59.5	54
Above 1000	Avg: 59.5 Peak: 79.5	Avg: 54 Peak: 74

Frequency Range (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40GHz, whichever is lower

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
 3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
 4. QP detector shall be applied if not specified.

2.2.2 TEST INSTRUMENTS

Frequency range below 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May. 19,20	May. 18,23
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Mar. 05,23	Mar. 04,24
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 17,23	Feb. 16,24
Signal Pre-Amplifier	EMSI	EMC 9135	980249	May.12,22	May.11,23
E3 Test Software	E3	V 9.160323	N/A	N/A	N/A

Frequency range above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May. 19,20	May. 18,23
Horn Antenna	ETS-LINDGREN	3117	00168728	Mar. 05,23	Mar. 04,24
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Sep.04, 22	Sep.03, 23
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 17,23	Feb. 16,24
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	May.12,22	May.11,23
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Feb. 17,23	Feb. 16,24
E3 Test Software	E3	V 9.160323	N/A	N/A	N/A

NOTE: 1. The test was performed in 3m chamber.
2. The FCC Site Registration No. is 525120; The Designation No. is CN1171.

2.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

The basic test procedure was in accordance with ANSI C63.4:2014 (section 12).

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
3. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
4. $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier).
5. $\text{Margin value} = \text{Emission level} - \text{Limit value}$.

<Frequency Range above 1GHz>

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter fully-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz

NOTE:

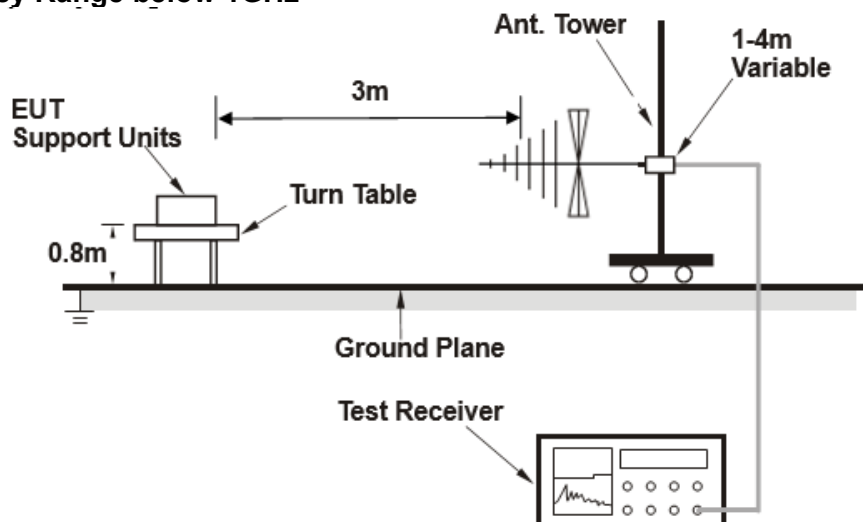
- The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth of test receiver/spectrum analyzer is 1Hz for Average detection (AV) at frequency above 1GHz.
- For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
- $\text{Emission level(dBuV/m)} = \text{Raw Value(dBuV)} + \text{Correction Factor(dB/m)}$
- $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)}$ (if the raw value not contains the amplifier);
- $\text{Correction Factor(dB/m)} = \text{Antenna Factor (dB/m)} + \text{Cable Factor (dB)} - \text{Amplifier Gain(dB)}$ (if the raw value contains the amplifier)
- $\text{Margin value} = \text{Emission level} - \text{Limit value}.$

2.2.4 DEVIATION FROM TEST STANDARD

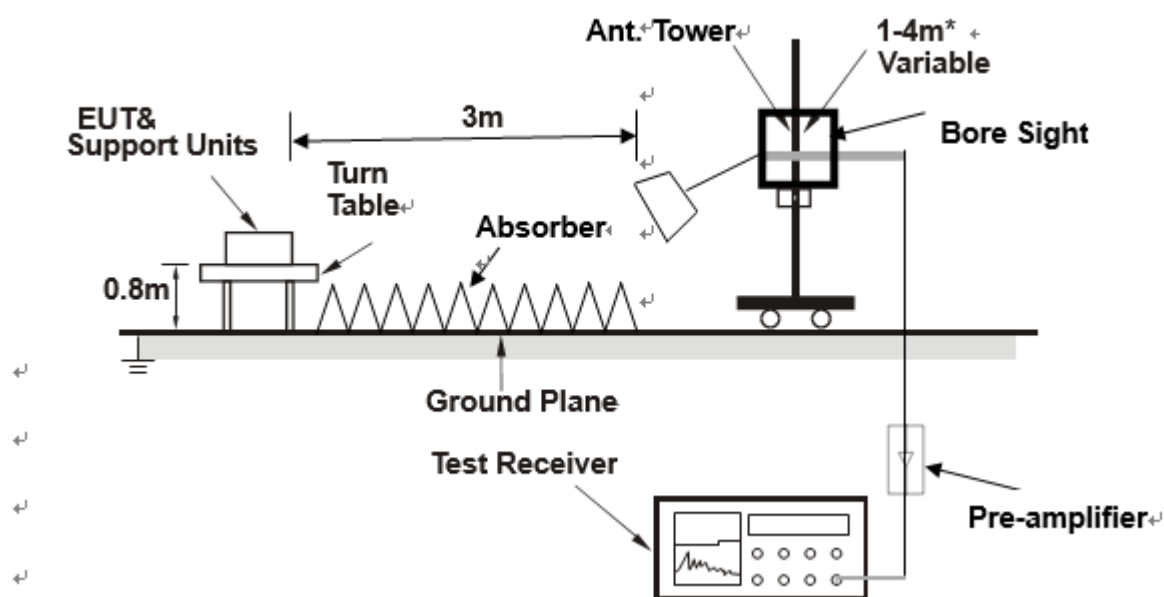
No deviation.

2.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



Note: Above 1G is a directional antenna

depends on the EUT height and the antenna 3dB bandwidth both, refer to section 7.3 of CISPR 16-2-3.

2.2.6 EUT OPERATING CONDITIONS

Same as item 2.1.6.

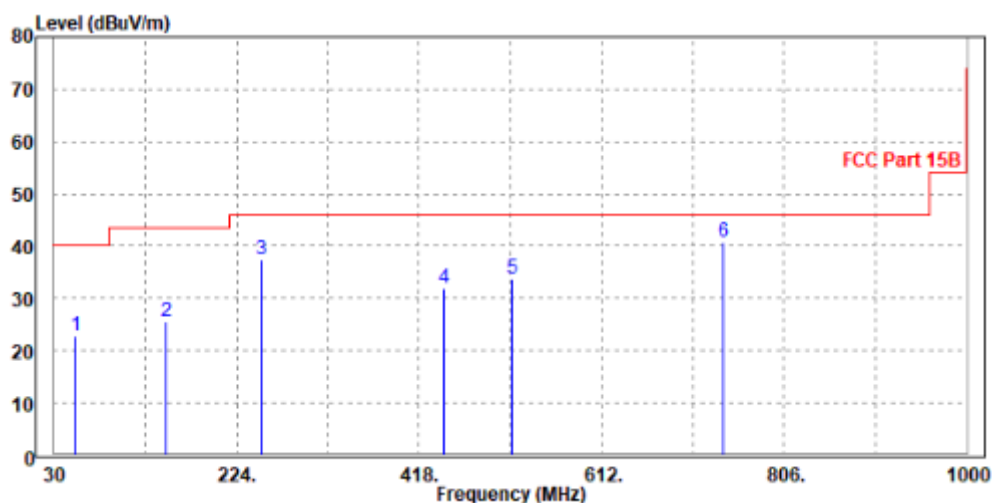
2.2.7 TEST RESULTS

TEST VOLTAGE	EUT 4.0V	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

	Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
	MHz	dBuV/m	dBuV	dBuV/m	dB	dB/m		
1	52.310	22.69	49.30	40.00	-17.31	-26.61	Peak	Horizontal
2	148.340	25.44	51.76	43.50	-18.06	-26.32	Peak	Horizontal
3	250.190	37.47	59.41	46.00	-8.53	-21.94	Peak	Horizontal
4	444.190	32.05	50.38	46.00	-13.95	-18.33	Peak	Horizontal
5	515.970	33.64	50.69	46.00	-12.36	-17.05	Peak	Horizontal
6 PP	741.010	40.68	54.44	46.00	-5.32	-13.76	Peak	Horizontal

- REMARKS:**
1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)- Amplifier Gain
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.

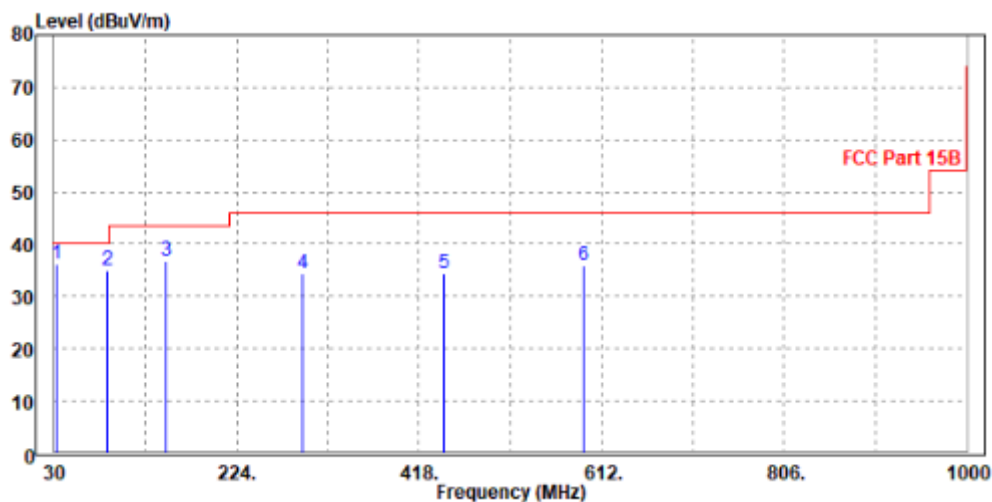


TEST VOLTAGE	EUT 4.0V	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70% RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak , 120 kHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

		Freq	Level	Read Level	Limit Line	Over Limit	Factor	Remark	Pol/Phase
		MHz	dBuV/m	dBuV	dBuV/m	dB	dB/m		
1	PP	32.910	36.07	54.31	40.00	-3.93	-18.24	Peak	Vertical
2		86.260	35.12	63.33	40.00	-4.88	-28.21	Peak	Vertical
3		148.340	36.85	62.54	43.50	-6.65	-25.69	Peak	Vertical
4		294.810	34.42	55.93	46.00	-11.58	-21.51	Peak	Vertical
5		444.190	34.24	52.74	46.00	-11.76	-18.50	Peak	Vertical
6		592.600	35.83	51.86	46.00	-10.17	-16.03	Peak	Vertical

- REMARKS:**
1. Emission level(dBuV/m)=Read Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) -Amplifier Gain
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.

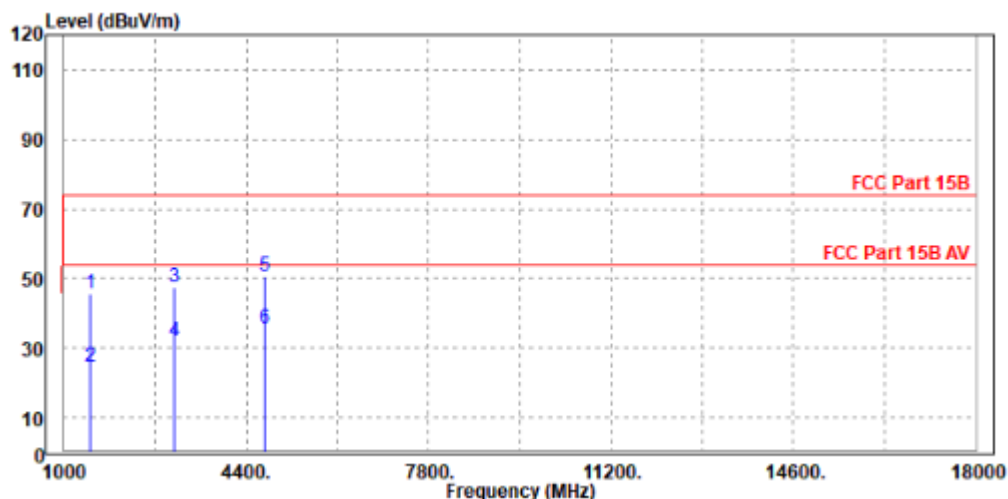


TEST VOLTAGE	EUT 4.0V	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1476	45.73	57.29	74	-28.27	29.76	4.8	46.12	100	10	Peak
1476	24.77	36.33	54	-29.23	29.76	4.8	46.12	100	10	Average
3057	47.31	49.59	74	-26.69	36.35	7.06	45.69	120	39	Peak
3057	32.01	34.29	54	-21.99	36.35	7.06	45.69	120	39	Average
4740	50.47	49.3	74	-23.53	36.69	9.95	45.47	100	300	Peak
4740	35.53	34.36	54	-18.47	36.69	9.95	45.47	100	300	Average

REMARKS:

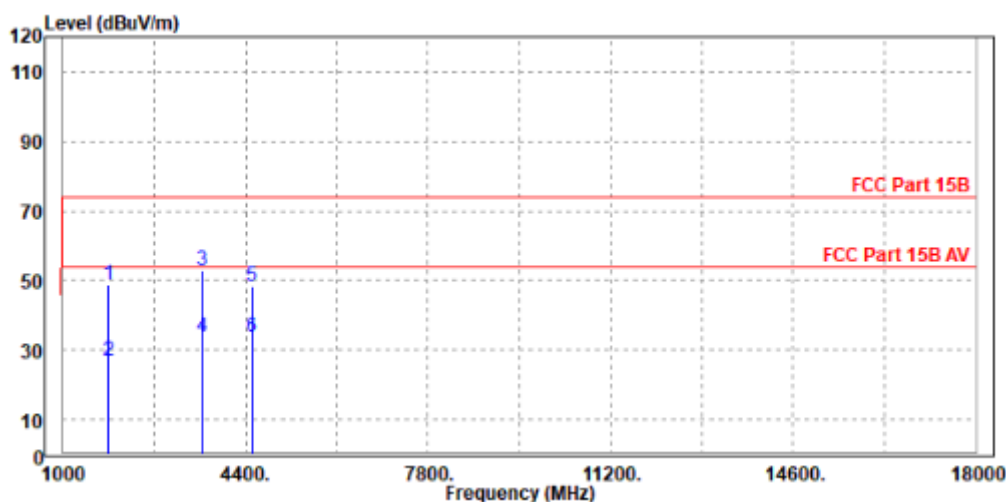
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 1GHz to 5th harmonic of the highest frequency or 40GHz, whichever is lower .For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
4. Only emissions significantly above equipment noise floor are reported.



TEST VOLTAGE	EUT 4.0V	FREQUENCY RANGE	1-18 GHz
ENVIRONMENTAL CONDITIONS	23deg. C, 70 %RH	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak/Average, 1 MHz
TESTED BY	Jace Hu		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
1833	48.93	58.38	74	-25.07	31.3	5.38	46.13	100	40	Peak
1833	27.13	36.58	54	-26.87	31.3	5.38	46.13	100	40	Average
3601	52.7	56.08	74	-21.3	34.2	7.93	45.51	100	55	Peak
3601	33.94	37.32	54	-20.06	34.2	7.93	45.51	100	55	Average
4519	48.47	48.88	74	-25.53	35.1	9.93	45.44	100	360	Peak
4519	33.86	34.27	54	-20.14	35.1	9.93	45.44	100	360	Average

- REMARKS:**
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
 2. Negative sign (-) in the margin column signify levels below the limit.
 3. Frequency range scanned: 1GHz to 5th harmonic of the highest frequency or 40GHz, whichever is lower .For frequency above 18GHz, the emission was tested 20db below the limit so the data not recorded in the sheet.
 4. Only emissions significantly above equipment noise floor are reported.



3 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---