

EMC TEST REPORT

Applicant : Toast, Inc.
Address of Applicant : 401 Park Drive, Suite 801, Boston, MA 02215,
USA
Product Name : Toast Hub
Model No. : TH200
Standards : 47 CFR Part 15 Subpart B
ICES-003(Issue6,January 2016)
ANSI C63.4-2014
Date of Receipt : 2019-11-07
Date of Test : 2019-11-07~2019-11-19
Date of Issue : 2019-11-19

Compiled by:

Nancy

Reviewed by:

jesse

Approved by:

Guoyou Shi

REMARK:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

TABLE OF CONTENTS

REMARK:	1
1. GENERAL INFORMATION	3
1.1 TESTING LABORATORY	3
1.2 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
2. SUMMARY OF TEST RESULTS	4
2.1 TEST STANDARDS.....	4
2.2 TEST UNCERTAINTY.....	4
3. SYSTEM TEST CONFIGURATION	5
3.1 EUT TEST MODE	5
3.2 SUPPORT EQUIPMENT LIST AND DETAILS OF TEST EQUIPMENT	5
3.3 BLOCK DIAGRAM OF TEST SETUP	5
4. 47 CFR PART 15B & ICES-003 § CONDUCTED EMISSION (ANSI C63.4)	6
4.1 TEST SYSTEM DIAGRAM	6
4.2 EMI TEST SETUP	6
4.3 TEST EQUIPMENT LIST.....	6
4.4 TEST LIMIT	6
4.5 TEST PROCEDURE	7
4.6 TEST RECORD.....	8
5. 47 CFR PART 15B & ICES-003 § RADIATED EMISSION(ANSI C63.4)	10
5.1 TEST SYSTEM DIAGRAM	10
5.2 EMI TEST SETUP	11
5.3 TEST EQUIPMENT LIST.....	11
5.4 TEST LIMIT	11
5.5 TEST PROCEDURE	11
5.6 TEST RECORD.....	12

1. GENERAL INFORMATION

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Services (Shanghai) Co., Ltd.
Address	1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Product Description for Equipment under Test (EUT)

Product Name	Toast Hub
Brand Name	Toast
Model No.	TH200
Class type	Class B
Working Voltage	High 28V, Normal: 24 V,Low 20V
Wireless Description	N/A
Hardware version	CT541HB40D
Software version	N/A
Battery Description	N/A
FCC ID	2AMNG-TH200

2. SUMMARY OF TEST RESULTS

2.1 Test Standards

47 CFR Part 15 Subpart B ICES-003(Issue6,January 2016)		
Rule	Description	Results
§ FCC Part 15.107 § ICES-003 6.1	Conducted Emission	Compliance
§ FCC Part 15.109 § ICES-003 6.1	Radiated Emission	Compliance

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B (10-1-16 Edition)	PART 15—RADIO FREQUENCY DEVICES --Unintentional Radiators
2	ICES-003(Issue6,January 2016)	Information Technology Equipment(Including Digital Apparatus)—Limits and Methods of Measurement
3	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz

2.2 Test Uncertainty

Measurement	U cispr
Conducted disturbance at mains port (9 kHz to 30 MHz)	1.9 dB
Conducted disturbance at telecommunication port (150 kHz to 30 MHz)	1.9 dB
Radiated disturbance (30 MHz to 1000 MHz)	3.2 dB
Radiated disturbance (1 GHz to 18 GHz)	3.2 dB

Note :
All test items were verified and recorded according to the standards and without any addition/
deviation/exclusion during the test

3. SYSTEM TEST CONFIGURATION

3.1 EUT Test Mode

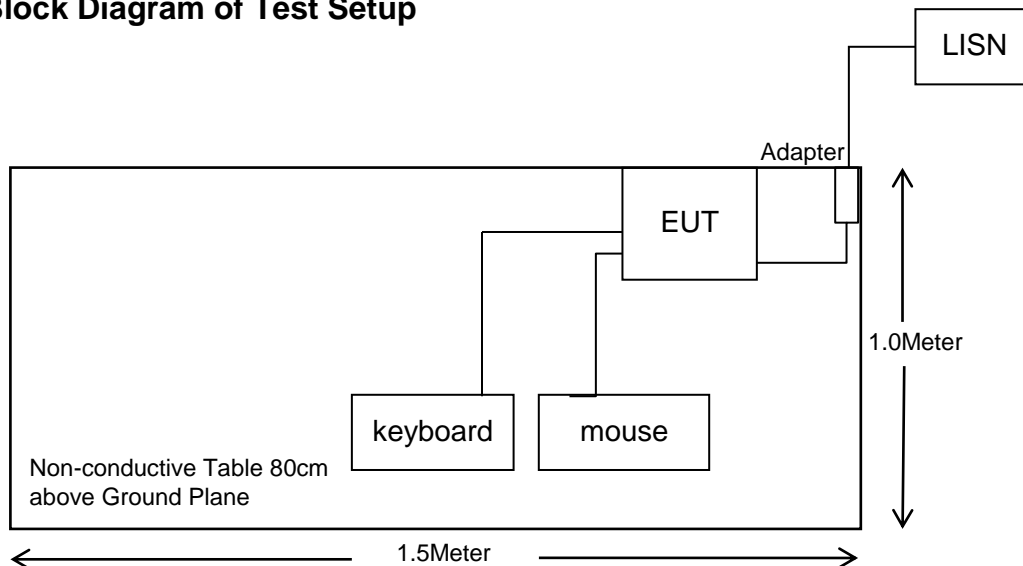
The system was configured for testing in a typical Mode(as normally used by a typical user).

3.2 Support Equipment List and Details of test Equipment

Manufacturer	Description	Model	Serial Number
Dell	Mouse	MS116P	N/A
Dell	keyboard	KB216T	N/A
Manufacturer	Description	Length(m)	I/O Port
N/A	N/A	N/A	N/A

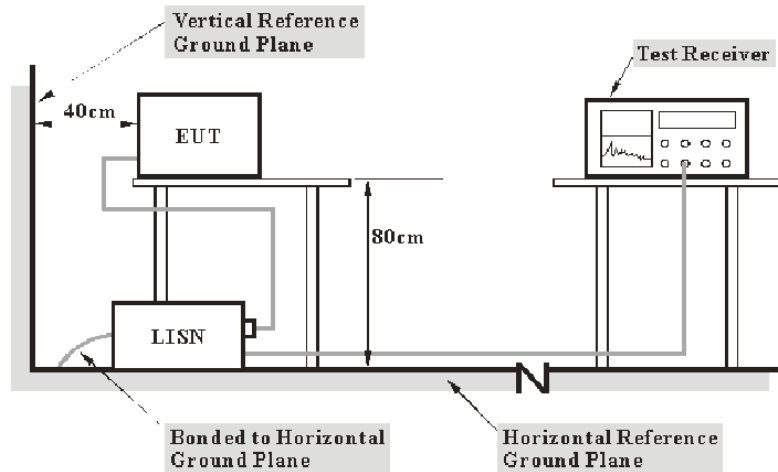
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI3	100173	2019/6/19	2020/6/19
SCHWARZBECK	V-network	NSLK 8127	8127-902	2019/2/20	2020/2/20
R&S	EMI Test Receiver	ESR7	101911	2019/6/19	2020/6/19
Schwarzbeck	Antenna	VULB9163	9163-1037	2019/1/27	2020/1/27
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1775	2019/7/26	2020/7/26

3.3 Block Diagram of Test Setup



4. 47 CFR Part 15B & ICES-003 § CONDUCTED EMISSION (ANSI C63.4)

4.1 Test System Diagram



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

4.2 EMI Test Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

4.3 Test Equipment List

Manufacturer	Description	Model	Serial Number	Test use
R&S	EMI Test Receiver	ESPI3	100173	<input checked="" type="checkbox"/>
TESQ	V-network	NSLK 8127	8127-902	<input checked="" type="checkbox"/>

4.4 Test Limit

Frequency Range	Limit	
	Quasi-peak (dBµV)	Average (dBµV)
0.15MHz – 0.50MHz	66-56	56-46
0.50MHz – 5MHz	56	46
5MHz – 30MHz	60	50

4.5 Test Procedure

EUT was connected to the outlet of the LISN.
The LISN was bounded to ground.

Measurement was carried out in a stable mode of operation, which means with a stable light output.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the Quasi-peak and average detection mode.

Factor & Margin Calculation

The factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 3dB means the emission is 3 dB below the limit. The equation for margin calculation is as follows:

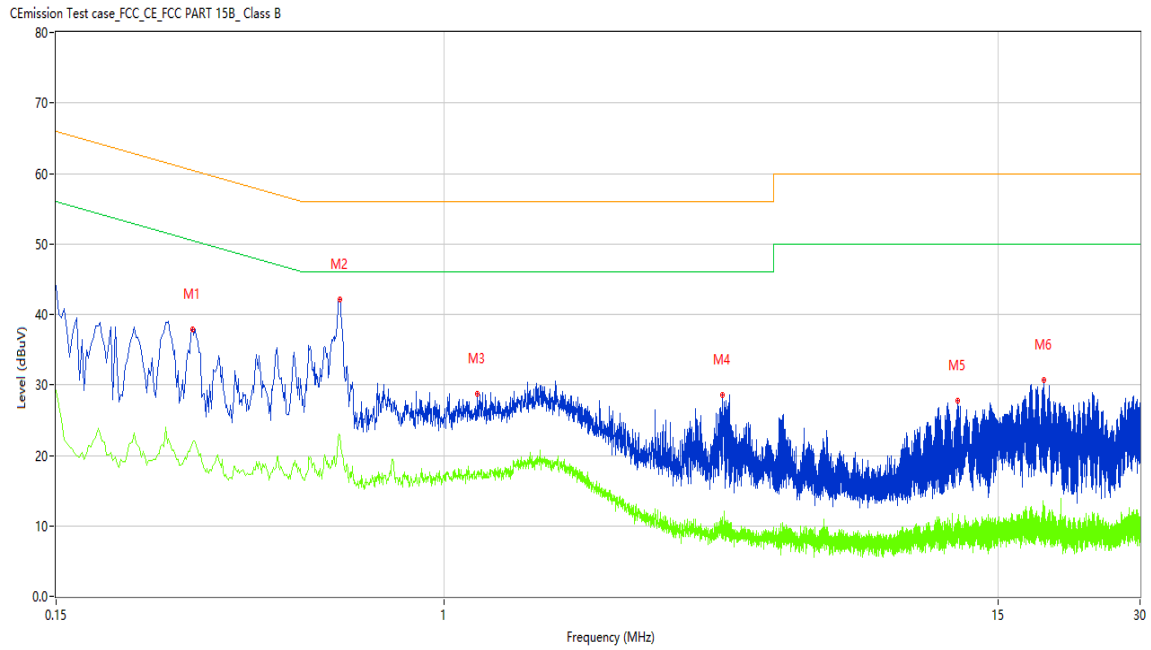
Q-peak Level / Average Level = Reading + Factor

Margin = QP Limit –Q-peak Level or Margin = AV Limit –Average Level

Note : Margin just showing the least value of QP and AV

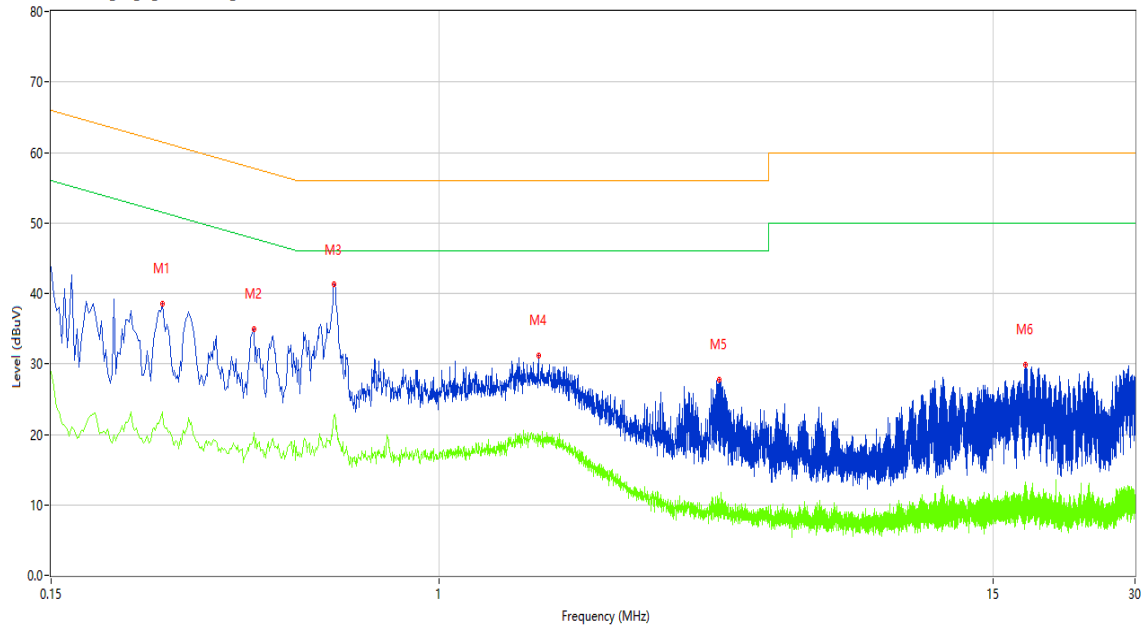
Frequency (MHz)	Peak Level (dBuV)	Q-peak Level (dBuV)	Average Level (dBuV)	Factor (dB)	QP Limit (dBuV)	AV Limit (dBuV)	Margin (dB)	Line	Verdict
--------------------	----------------------	------------------------	-------------------------	-------------	--------------------	--------------------	-------------	------	---------

4.6 Test Record



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.292	37.96	10.14	60.47	-22.51	Peak	L	Pass
1**	0.292	21.67	10.14	50.47	-28.80	AV	L	Pass
2	0.600	52.84	20.14	56.00	-3.16	Peak	L	Pass
2*	0.600	48.82	20.14	56.00	-7.18	QP	L	Pass
2**	0.600	32.80	20.14	46.00	-13.20	AV	L	Pass
3	1.178	28.73	10.16	56.00	-27.27	Peak	L	Pass
3**	1.178	17.40	10.16	46.00	-28.60	AV	L	Pass
4	3.892	28.57	10.24	56.00	-27.43	Peak	L	Pass
4**	3.892	11.23	10.24	46.00	-34.77	AV	L	Pass
5	12.302	27.73	10.46	60.00	-32.27	Peak	L	Pass
5**	12.302	9.91	10.46	50.00	-40.09	AV	L	Pass
6	18.744	30.62	10.45	60.00	-29.38	Peak	L	Pass
6**	18.744	12.94	10.45	50.00	-37.06	AV	L	Pass

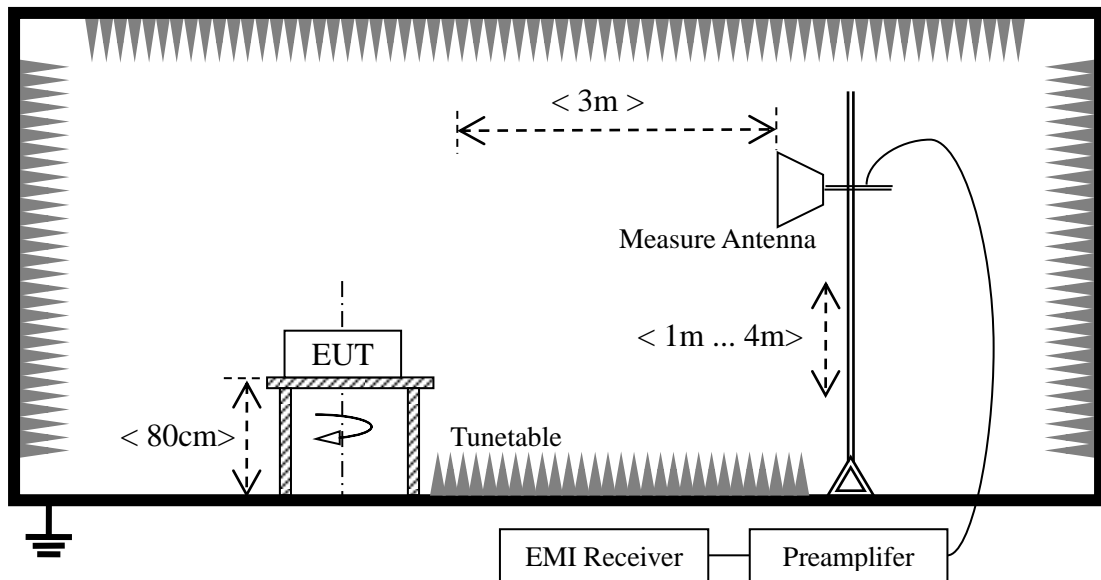
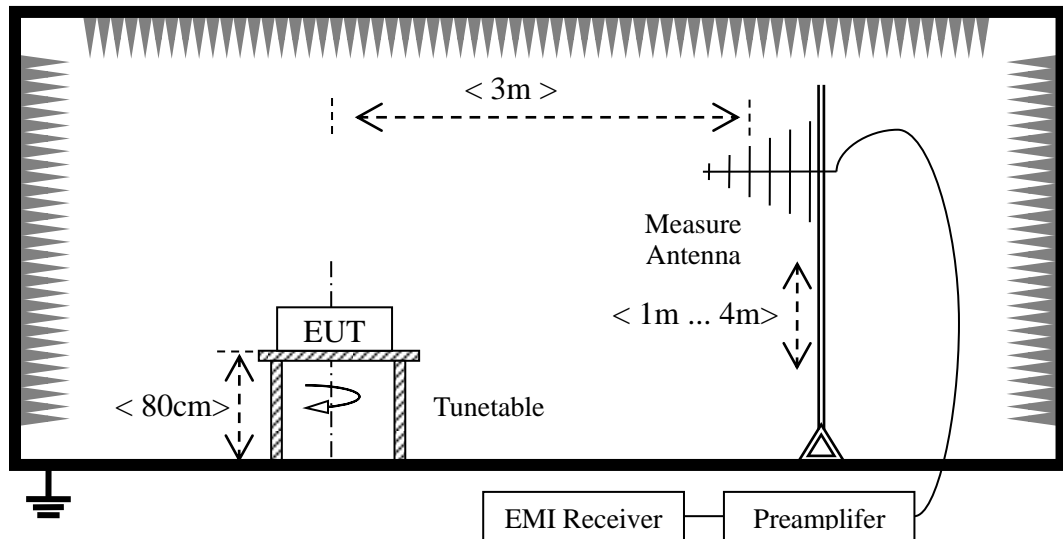
CÉmission Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.258	38.59	10.14	61.50	-22.91	Peak	N	Pass
1**	0.258	23.13	10.14	51.50	-28.37	AV	N	Pass
2	0.404	34.94	10.15	57.77	-22.83	Peak	N	Pass
2**	0.404	20.18	10.15	47.77	-27.59	AV	N	Pass
3	0.598	42.31	10.15	56.00	-13.69	Peak	N	Pass
3*	0.598	38.10	10.15	56.00	-17.90	QP	N	Pass
3**	0.598	22.49	10.15	46.00	-23.51	AV	N	Pass
4	1.628	31.25	10.17	56.00	-24.75	Peak	N	Pass
4**	1.628	19.00	10.17	46.00	-27.00	AV	N	Pass
5	3.930	27.74	10.24	56.00	-28.26	Peak	N	Pass
5**	3.930	10.93	10.24	46.00	-35.07	AV	N	Pass
6	17.596	29.85	10.47	60.00	-30.15	Peak	N	Pass
6**	17.596	13.30	10.47	50.00	-36.70	AV	N	Pass

5. 47 CFR Part 15B & ICES-003 § RADIATED EMISSION(ANSI C63.4)

5.1 Test System Diagram



5.2 EMI Test Setup

The system was investigated from 30 MHz to 6000 MHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz – 1000 MHz	120 kHz	300 kHz	120kHz	QP
1000MHz-6000MHz	1MHz	3MHz/10Hz	/	PK/AV

5.3 Test Equipment List

Manufacturer	Description	Model	Serial Number	Test use
R&S	EMI Test Receiver	ESR7	101911	<input checked="" type="checkbox"/>
Schwarzbeck	Antenna	VULB9163	9163-1037	<input checked="" type="checkbox"/>
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1775	<input checked="" type="checkbox"/>

5.4 Test Limit

Frequency Range	Limit(3m distance)
	Quasi-peak
30MHz – 88MHz	40 dB μ V/m
88MHz – 216MHz	43.5 dB μ V/m
216 MHz -960 MHz	46 dB μ V/m
Above 960MHz	54 dB μ V/m

5.5 Test Procedure

For the radiated emissions test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode.

Factor & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Reading. The basic equation is as follows:

Peak Level / Q-peak Level /Average Level = Reading + Antenna Factor + Cable Loss - Amplifier Gain

Factor = Antenna Factor + Cable Loss - Amplifier Gain

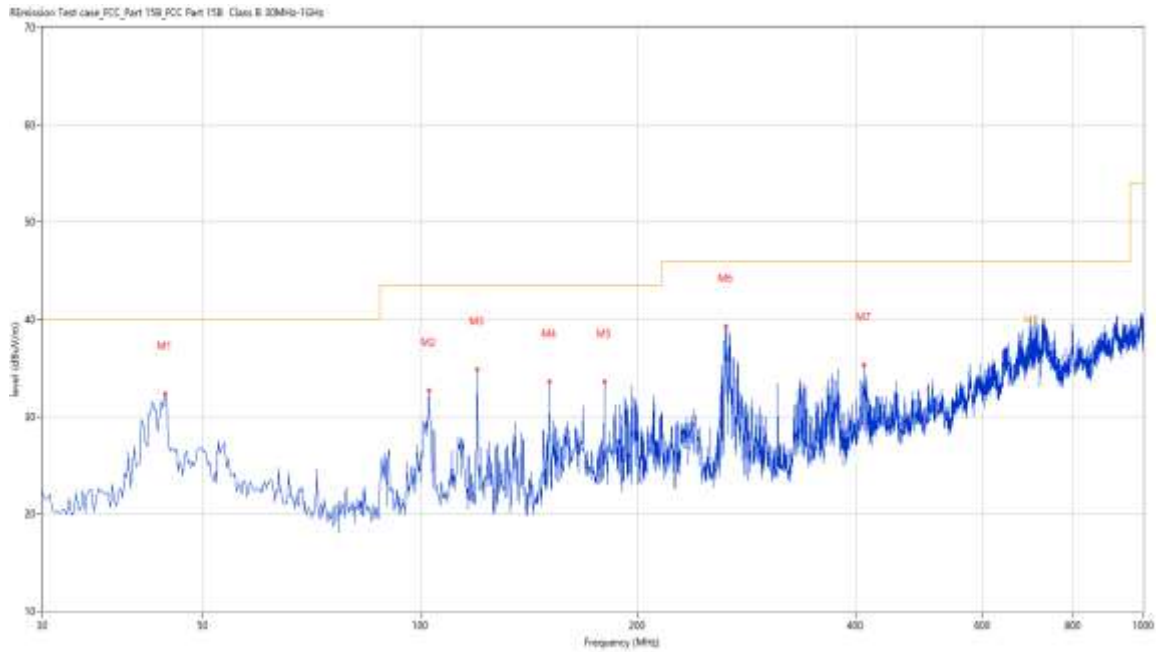
The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 3 dB means the emission is 3 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{QP Limit} - \text{Q-peak Level} \text{ or } \text{Margin} = \text{AV Limit} - \text{Average Level}$$

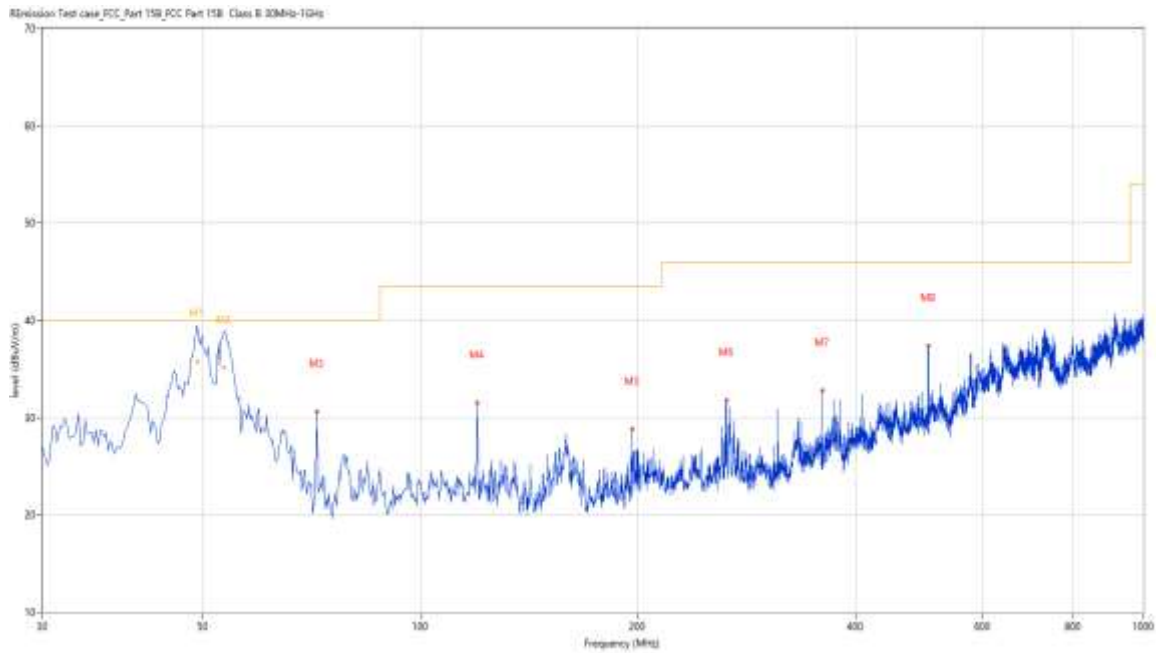
Note : Margin just showing the least value of QP and AV

Frequency (MHz)	Peak Level (dBuV/m)	Q-peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Table (o)	Height (cm)	ANT	Verdict
-----------------	---------------------	-----------------------	------------------------	-------------	-------------------	-------------------	-------------------	-------------	-----------	-------------	-----	---------

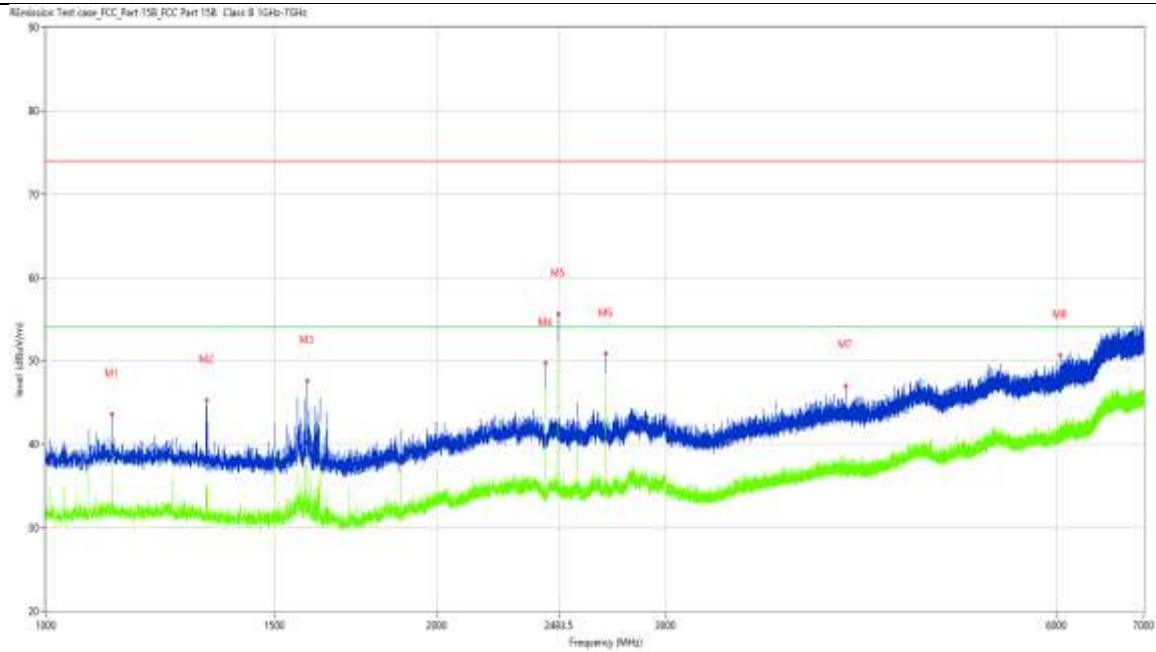
5.6 Test Record



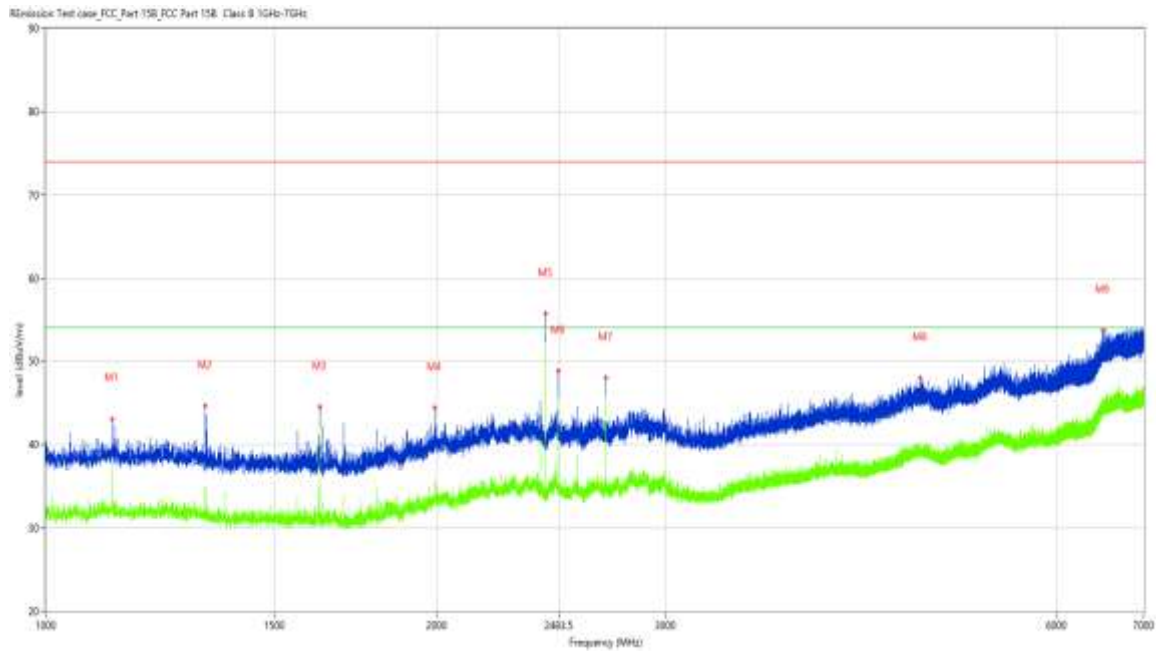
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	44.304	32.30	-25.29	40.0	-7.70	Peak	144.80	200	Horizontal	Pass
2	102.732	32.67	-26.78	43.5	-10.83	Peak	360.00	200	Horizontal	Pass
3	119.945	34.86	-27.10	43.5	-8.64	Peak	109.50	200	Horizontal	Pass
4	150.977	33.55	-28.42	43.5	-9.95	Peak	360.00	200	Horizontal	Pass
5	179.828	33.55	-28.12	43.5	-9.95	Peak	360.00	200	Horizontal	Pass
6	264.439	39.24	-24.87	46.0	-6.76	Peak	340.80	100	Horizontal	Pass
7	410.630	35.31	-21.08	46.0	-10.69	Peak	0.70	100	Horizontal	Pass
8	700.822	39.75	-15.48	46.0	-6.25	Peak	271.60	108	Horizontal	Pass
8*	700.822	34.98	-15.48	46.0	-11.02	QP	271.60	108	Horizontal	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	49.163	39.49	-23.97	40.0	-0.51	Peak	0.00	100	Vertical	Pass
1*	49.163	35.79	-23.97	40.0	-4.21	QP	0.00	100	Vertical	Pass
2	53.540	39.01	-25.24	40.0	-0.99	Peak	336.30	100	Vertical	Pass
2*	53.540	35.08	-25.24	40.0	-4.92	QP	336.30	100	Vertical	Pass
3	71.942	30.57	-28.50	40.0	-9.43	Peak	310.20	100	Vertical	Pass
4	119.945	31.48	-27.10	43.5	-12.02	Peak	192.20	100	Vertical	Pass
5	196.556	28.77	-27.68	43.5	-14.73	Peak	203.60	200	Vertical	Pass
6	265.166	31.75	-24.85	46.0	-14.25	Peak	148.30	100	Vertical	Pass
7	359.960	32.74	-23.76	46.0	-13.26	Peak	134.90	100	Vertical	Pass
8	503.969	37.39	-19.17	46.0	-8.61	Peak	56.40	100	Vertical	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1124.984	43.56	-6.98	74.0	-30.44	Peak	359.00	100	Horizontal	Pass
1**	1124.984	38.84	-6.98	54.0	-15.16	AV	359.00	100	Horizontal	Pass
2	1329.959	45.31	-7.88	74.0	-28.69	Peak	151.00	100	Horizontal	Pass
2**	1329.959	35.27	-7.88	54.0	-18.73	AV	151.00	100	Horizontal	Pass
3	1590.176	47.57	-8.69	74.0	-26.43	Peak	19.80	100	Horizontal	Pass
3**	1590.176	37.50	-8.69	54.0	-16.50	AV	19.80	100	Horizontal	Pass
4	2426.072	49.72	-4.47	74.0	-24.28	Peak	26.00	100	Horizontal	Pass
4**	2426.072	45.46	-4.47	54.0	-8.54	AV	26.00	100	Horizontal	Pass
5	2479.815	55.63	-3.76	74.0	-18.37	Peak	338.30	100	Horizontal	Pass
5**	2479.815	52.11	-3.76	54.0	-1.89	AV	338.30	100	Horizontal	Pass
6	2699.788	50.84	-4.08	74.0	-23.16	Peak	344.20	100	Horizontal	Pass
6**	2699.788	48.47	-4.08	54.0	-5.53	AV	344.20	100	Horizontal	Pass
7	4130.109	47.02	-0.04	74.0	-26.98	Peak	202.70	100	Horizontal	Pass
7**	4130.109	38.12	-0.04	54.0	-15.88	AV	202.70	100	Horizontal	Pass
8	6034.121	50.65	2.67	74.0	-23.35	Peak	88.10	100	Horizontal	Pass
8**	6034.121	41.29	2.67	54.0	-12.71	AV	88.10	100	Horizontal	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1124.734	43.14	-6.98	74.0	-30.86	Peak	238.40	100	Vertical	Pass
1**	1124.734	36.82	-6.98	54.0	-17.18	AV	238.40	100	Vertical	Pass
2	1326.959	44.65	-7.85	74.0	-29.35	Peak	116.70	100	Vertical	Pass
2**	1326.959	35.01	-7.85	54.0	-18.99	AV	116.70	100	Vertical	Pass
3	1624.922	44.51	-8.67	74.0	-29.49	Peak	0.00	100	Vertical	Pass
3**	1624.922	41.89	-8.67	54.0	-12.11	AV	0.00	100	Vertical	Pass
4	1991.126	44.44	-6.12	74.0	-29.56	Peak	86.60	100	Vertical	Pass
4**	1991.126	35.74	-6.12	54.0	-18.26	AV	86.60	100	Vertical	Pass
5	2425.572	55.74	-4.44	74.0	-18.26	Peak	241.60	100	Vertical	Pass
5**	2425.572	51.27	-4.44	54.0	-2.73	AV	241.60	100	Vertical	Pass
6	2479.815	48.88	-3.76	74.0	-25.12	Peak	207.80	100	Vertical	Pass
6**	2479.815	45.58	-3.76	54.0	-8.42	AV	207.80	100	Vertical	Pass
7	2699.788	48.05	-4.08	74.0	-25.95	Peak	50.70	100	Vertical	Pass
7**	2699.788	45.80	-4.08	54.0	-8.20	AV	50.70	100	Vertical	Pass
8	4708.661	48.00	0.97	74.0	-26.00	Peak	207.40	100	Vertical	Pass
8**	4708.661	39.02	0.97	54.0	-14.98	AV	207.40	100	Vertical	Pass
9	6513.686	53.73	5.24	74.0	-20.27	Peak	291.50	100	Vertical	Pass
9**	6513.686	44.63	5.24	54.0	-9.37	AV	291.50	100	Vertical	Pass

END OF REPORT