

EMC TEST REPORT

Applicant : Toast, Inc.
Address of Applicant : 401 Park Drive, Suite 801, Boston, MA 02215,
USA
Product Name : Data Processing machine
Model No. : TT200;TK200
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

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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.

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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	Data Processing machine
Brand Name	Toast
Model No.	TT200/TK200
Class type	Class B
Working Voltage	High 28V, Normal: 24 V, Low 20V
Wireless Description	WIFI 2.4GHz(802.11 B,G,N20) WIFI 5G Band 1/4 (802.11a/802.11n 20MHz 40MHz /802.11ac(20MHz,40MHz,80MHz) Bluetooth4.2 BR/EDR/HS3.0/BLE4.0
Hardware version	CT541MB80C
Software version	1.2.6/121
FCC ID	2AMNG-TT200
IC number	23177-TT200
Differences description of Model	TT200 is a single-screen POS terminal, and TK200 is TT200 without bracket

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

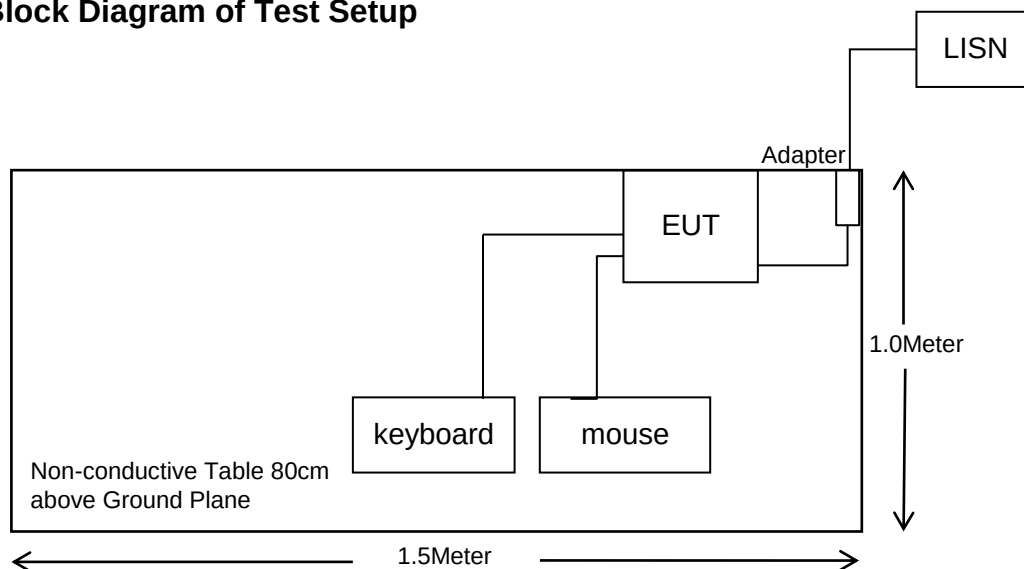
The system was configured for testing in a typical Mode(as normally used by a typical user).

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

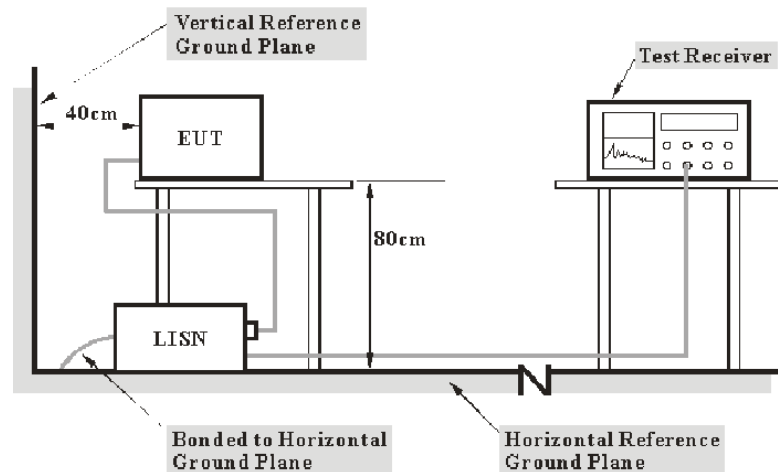
Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESPI3	100173	2019/6/19	2020/6/19
SCHWARZBECK	V-network	NSLK 8127	8127-902	2019/2/20	2020/2/20
R&S	EMI Test Receiver	ESR7	101911	2019/6/19	2020/6/19
Schwarzbeck	Antenna	VULB9163	9163-1037	2019/1/27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

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

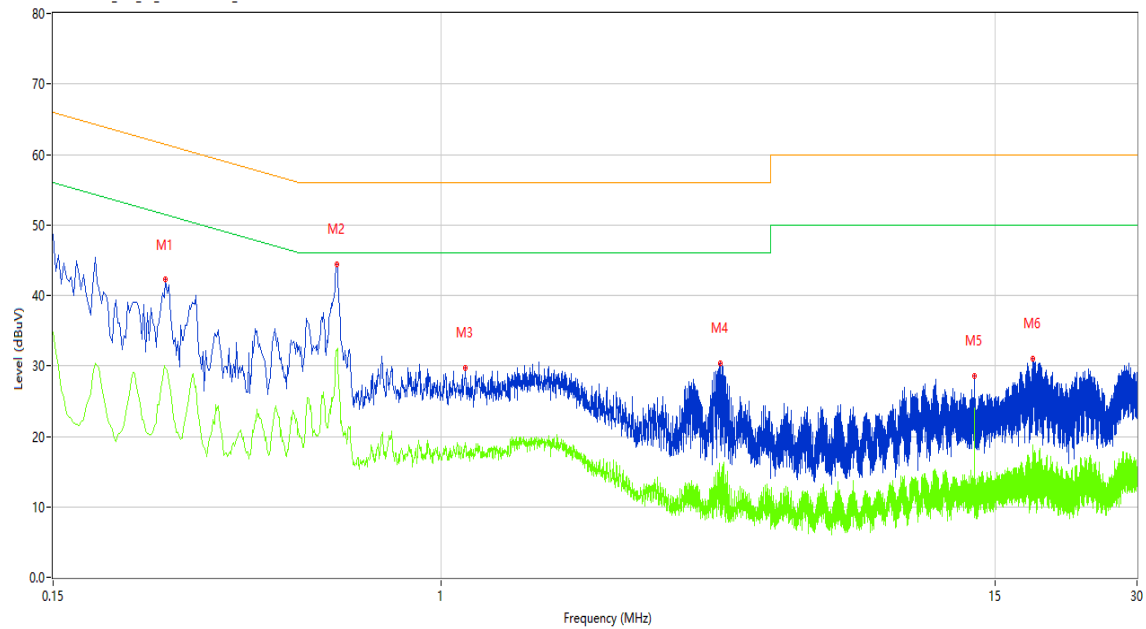
Note : Margin just showing the least value of QP and AV

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

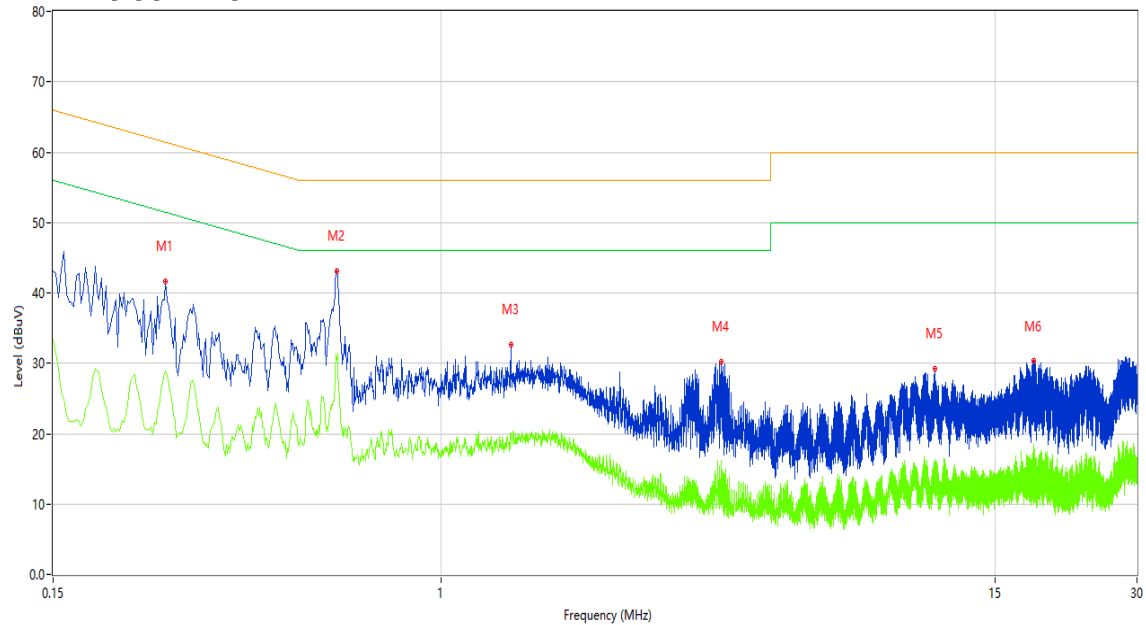
Model : TT200

CEmission 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	0.260	42.21	10.14	61.43	-19.22	Peak	L	Pass
1**	0.260	29.73	10.14	51.43	-21.70	AV	L	Pass
2	0.600	45.20	10.15	56.00	-10.80	Peak	L	Pass
2*	0.600	42.60	10.15	56.00	-13.40	QP	L	Pass
2**	0.600	32.09	10.15	46.00	-13.91	AV	L	Pass
3	1.126	29.76	10.16	56.00	-26.24	Peak	L	Pass
3**	1.126	19.09	10.16	46.00	-26.91	AV	L	Pass
4	3.906	30.37	10.24	56.00	-25.63	Peak	L	Pass
4**	3.906	14.28	10.24	46.00	-31.72	AV	L	Pass
5	13.558	28.55	10.45	60.00	-31.45	Peak	L	Pass
5**	13.558	23.94	10.45	50.00	-26.06	AV	L	Pass
6	18.064	30.99	10.49	60.00	-29.01	Peak	L	Pass
6**	18.064	18.70	10.49	50.00	-31.30	AV	L	Pass

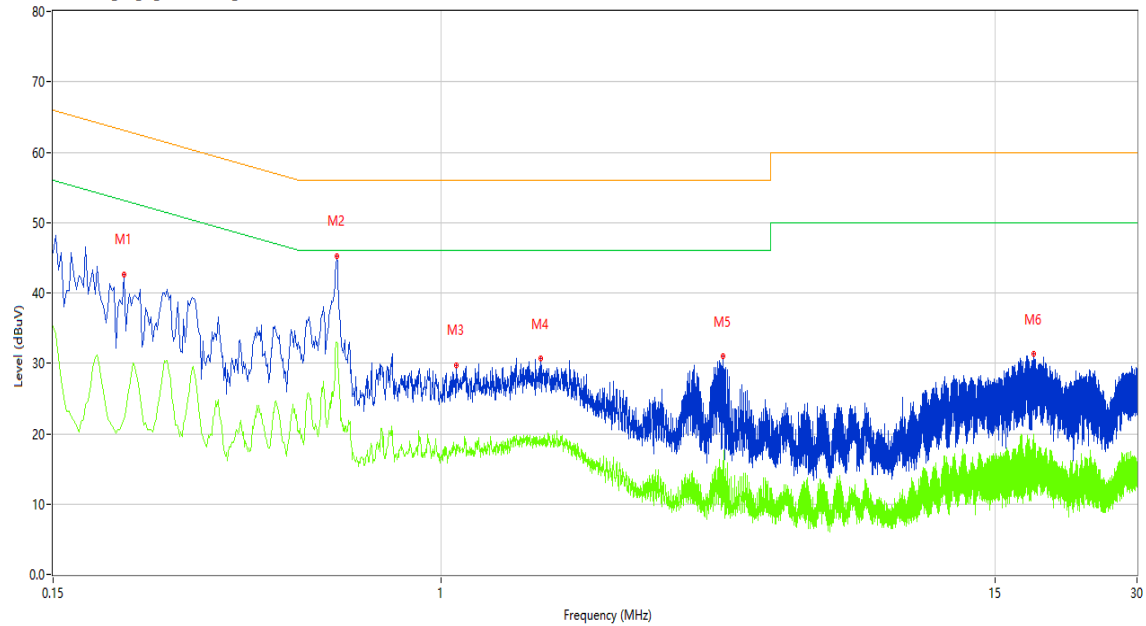
CEmission Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.260	41.62	10.14	61.43	-19.81	Peak	N	Pass
1**	0.260	28.95	10.14	51.43	-22.48	AV	N	Pass
2	0.600	44.29	10.15	56.00	-11.71	Peak	N	Pass
2*	0.600	41.64	10.15	56.00	-14.36	QP	N	Pass
2**	0.600	30.47	10.15	46.00	-15.53	AV	N	Pass
3	1.408	32.71	10.16	56.00	-23.29	Peak	N	Pass
3**	1.408	19.61	10.16	46.00	-26.39	AV	N	Pass
4	3.934	30.26	10.24	56.00	-25.74	Peak	N	Pass
4**	3.934	15.77	10.24	46.00	-30.23	AV	N	Pass
5	11.170	29.23	10.45	60.00	-30.77	Peak	N	Pass
5**	11.170	15.79	10.45	50.00	-34.21	AV	N	Pass
6	18.094	30.36	10.49	60.00	-29.64	Peak	N	Pass
6**	18.094	18.48	10.49	50.00	-31.52	AV	N	Pass

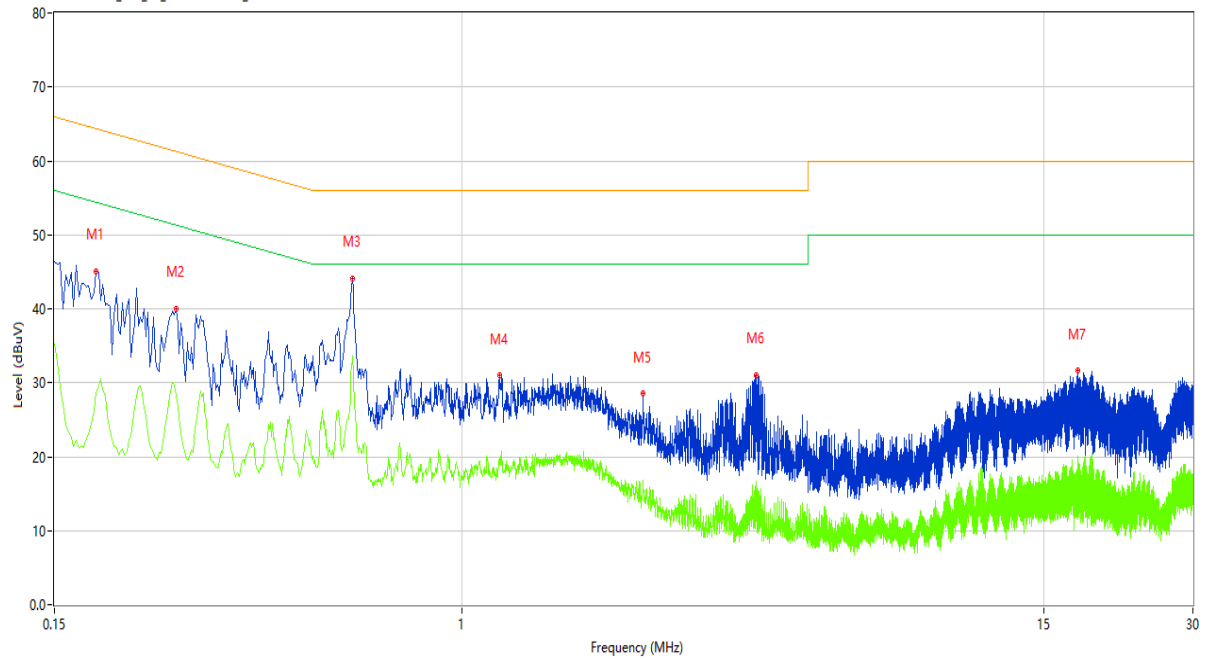
Model : TK200

CEmission 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	0.212	42.54	10.14	63.13	-20.59	Peak	L	Pass
1**	0.212	22.00	10.14	53.13	-31.13	AV	L	Pass
2	0.600	45.30	10.15	56.00	-10.70	Peak	L	Pass
2**	0.600	33.02	10.15	46.00	-12.98	AV	L	Pass
3	1.078	29.73	10.15	56.00	-26.27	Peak	L	Pass
3**	1.078	18.46	10.15	46.00	-27.54	AV	L	Pass
4	1.624	30.76	10.17	56.00	-25.24	Peak	L	Pass
4**	1.624	18.57	10.17	46.00	-27.43	AV	L	Pass
5	3.972	31.09	10.25	56.00	-24.91	Peak	L	Pass
5**	3.972	16.14	10.25	46.00	-29.86	AV	L	Pass
6	18.132	31.29	10.49	60.00	-28.71	Peak	L	Pass
6**	18.132	19.94	10.49	50.00	-30.06	AV	L	Pass

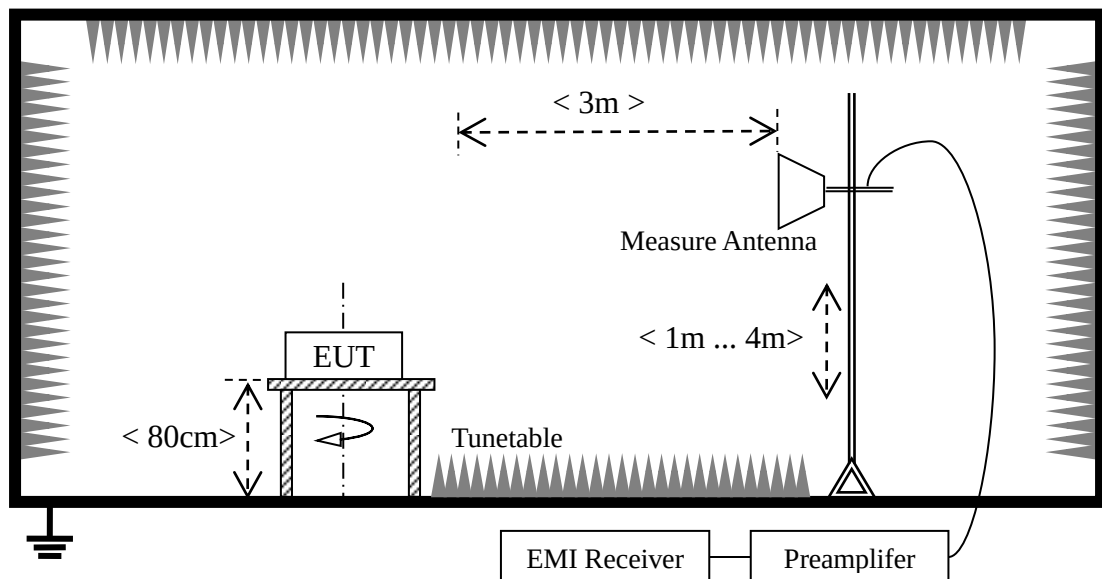
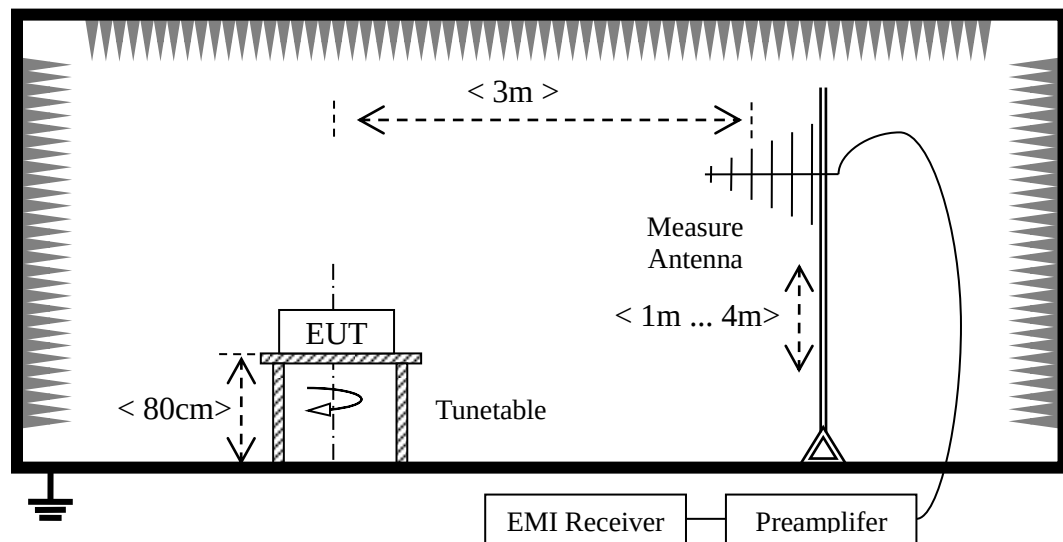
CEmission Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.182	45.00	10.15	64.39	-19.39	Peak	N	Pass
1**	0.182	28.79	10.15	54.39	-25.60	AV	N	Pass
2	0.264	39.99	10.14	61.30	-21.31	Peak	N	Pass
2**	0.264	28.25	10.14	51.30	-23.05	AV	N	Pass
3	0.600	45.33	10.15	56.00	-10.67	Peak	N	Pass
3*	0.600	43.54	10.15	56.00	-12.46	QP	N	Pass
3**	0.600	33.69	10.15	46.00	-12.31	AV	N	Pass
4	1.190	30.99	10.16	56.00	-25.01	Peak	N	Pass
4**	1.190	19.78	10.16	46.00	-26.22	AV	N	Pass
5	2.320	28.54	10.19	56.00	-27.46	Peak	N	Pass
5**	2.320	16.81	10.19	46.00	-29.19	AV	N	Pass
6	3.936	30.97	10.24	56.00	-25.03	Peak	N	Pass
6**	3.936	16.62	10.24	46.00	-29.38	AV	N	Pass
7	17.576	31.66	10.47	60.00	-28.34	Peak	N	Pass
7**	17.576	19.27	10.47	50.00	-30.73	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	☒
Schwarzbeck	Antenna	VULB9163	9163-1037	☒
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1775	☒

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

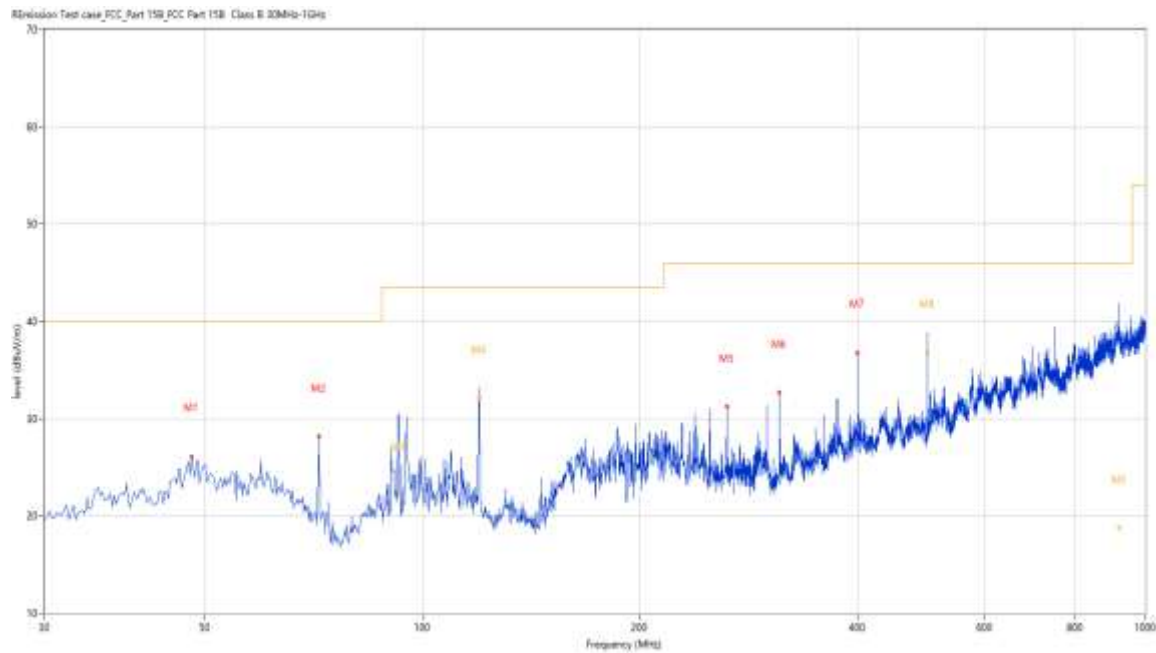
The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 3 dB means the emission is 3 dB below the limit. The equation for margin calculation is as follows:

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

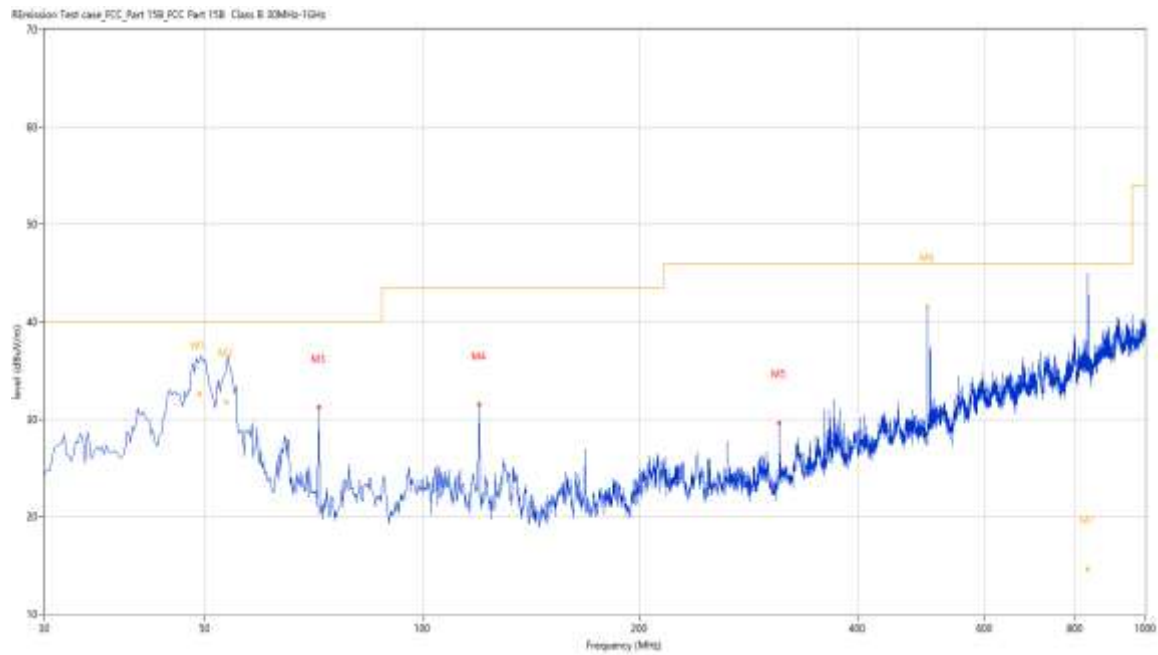
Note : Margin just showing the least value of QP and AV

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
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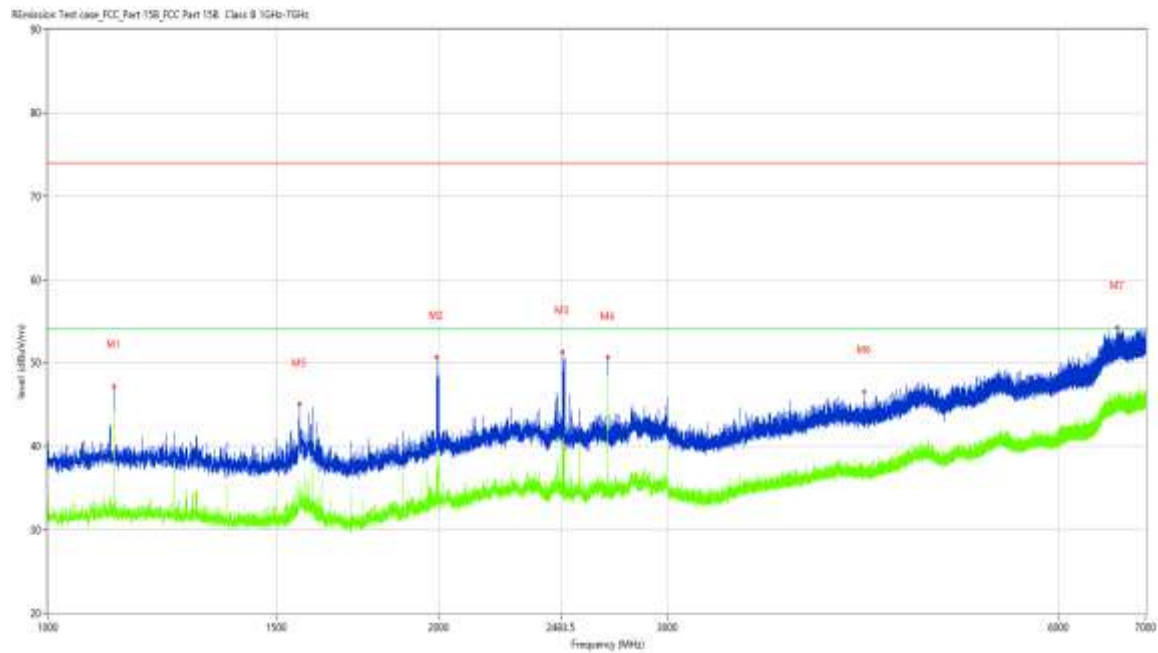
5.6 Test Record



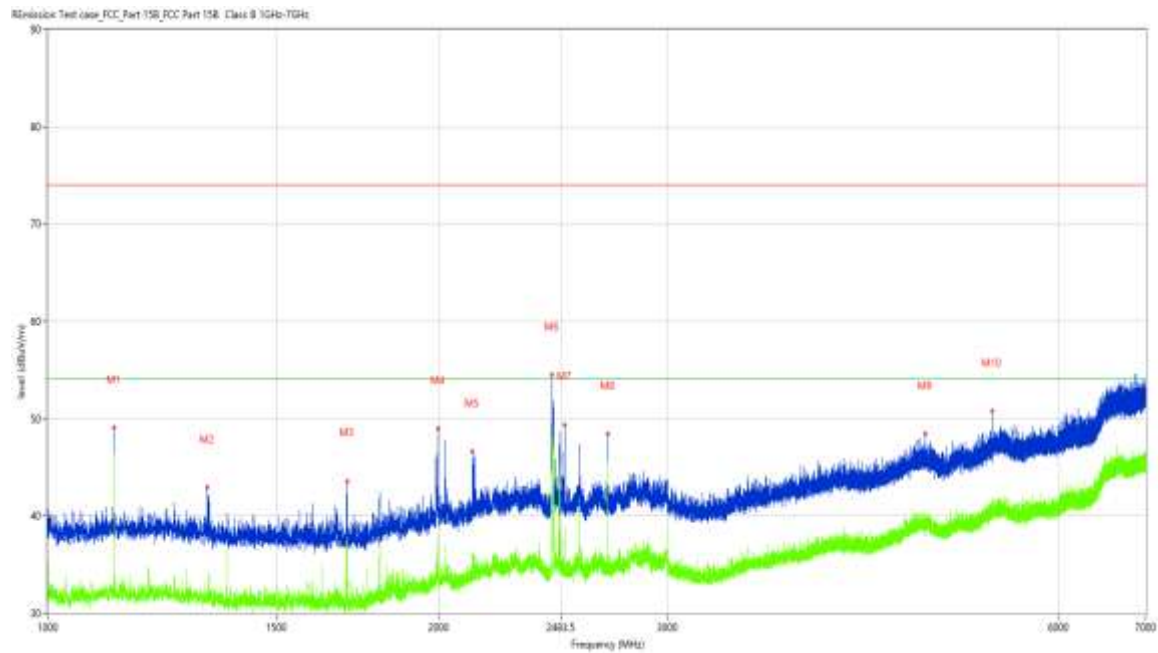
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	47.941	26.12	-23.67	40.0	-13.88	Peak	241.50	200	Horizontal	Pass
2	71.942	28.14	-28.50	40.0	-11.86	Peak	110.50	200	Horizontal	Pass
3	92.756	29.83	-27.44	43.5	-13.67	Peak	219.90	300	Horizontal	Pass
3*	92.756	22.07	-27.44	43.5	-21.43	QP	219.90	300	Horizontal	Pass
4	120.002	34.47	-27.10	43.5	-9.03	Peak	167.40	199	Horizontal	Pass
4*	120.002	32.14	-27.10	43.5	-11.36	QP	167.40	199	Horizontal	Pass
5	263.954	31.19	-24.89	46.0	-14.81	Peak	98.70	100	Horizontal	Pass
6	311.957	32.68	-24.18	46.0	-13.32	Peak	124.70	100	Horizontal	Pass
7	399.963	36.79	-21.34	46.0	-9.21	Peak	115.80	100	Horizontal	Pass
8	499.998	38.82	-20.12	46.0	-7.18	Peak	0.00	100	Horizontal	Pass
8*	499.998	36.72	-20.12	46.0	-9.28	QP	0.00	100	Horizontal	Pass
9	919.713	25.01	-10.33	46.0	-20.99	Peak	0.00	199	Horizontal	Pass
9*	919.713	18.74	-10.33	46.0	-27.26	QP	0.00	199	Horizontal	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	49.156	39.08	-24.05	40.0	-0.92	Peak	73.70	108	Vertical	Pass
1*	49.156	32.60	-24.05	40.0	-7.40	QP	73.70	108	Vertical	Pass
2	53.555	38.43	-25.32	40.0	-1.57	Peak	54.70	178	Vertical	Pass
2*	53.555	31.82	-25.32	40.0	-8.18	QP	54.70	178	Vertical	Pass
3	71.942	31.25	-28.50	40.0	-8.75	Peak	187.20	100	Vertical	Pass
4	119.945	31.46	-27.10	43.5	-12.04	Peak	195.80	100	Vertical	Pass
5	311.957	29.65	-24.18	46.0	-16.35	Peak	291.90	200	Vertical	Pass
6	499.998	44.57	-20.12	46.0	-1.43	Peak	248.30	151	Vertical	Pass
6*	499.998	41.56	-20.12	46.0	-4.44	QP	248.30	151	Vertical	Pass
7	833.104	21.37	-13.29	46.0	-24.63	Peak	360.00	264	Vertical	Pass
7*	833.104	14.61	-13.29	46.0	-31.39	QP	360.00	264	Vertical	Pass



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1124.734	47.24	-6.98	74.0	-26.76	Peak	349.70	100	Horizontal	Pass
1**	1124.734	43.97	-6.98	54.0	-10.03	AV	349.70	100	Horizontal	Pass
2	1991.876	50.73	-6.13	74.0	-23.27	Peak	38.60	100	Horizontal	Pass
2**	1991.876	39.65	-6.13	54.0	-14.35	AV	38.60	100	Horizontal	Pass
3	2488.814	51.33	-4.04	74.0	-22.67	Peak	331.60	100	Horizontal	Pass
3**	2488.814	39.90	-4.04	54.0	-14.10	AV	331.60	100	Horizontal	Pass
4	2699.788	50.65	-4.08	74.0	-23.35	Peak	356.00	100	Horizontal	Pass
4**	2699.788	48.46	-4.08	54.0	-5.54	AV	356.00	100	Horizontal	Pass
5	1561.930	45.05	-8.69	74.0	-28.95	Peak	53.90	100	Horizontal	Pass
5**	1561.930	35.84	-8.69	54.0	-18.16	AV	53.90	100	Horizontal	Pass
6	4251.219	46.58	-0.04	74.0	-27.42	Peak	40.60	100	Horizontal	Pass
6**	4251.219	36.88	-0.04	54.0	-17.12	AV	40.60	100	Horizontal	Pass
7	6661.167	54.28	5.70	74.0	-19.72	Peak	313.20	100	Horizontal	Pass
7**	6661.167	45.42	5.70	54.0	-8.58	AV	313.20	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	1124.984	49.05	-6.98	74.0	-24.95	Peak	350.90	100	Vertical	Pass
1**	1124.984	46.35	-6.98	54.0	-7.65	AV	350.90	100	Vertical	Pass
2	1326.959	42.89	-7.85	74.0	-31.11	Peak	124.50	100	Vertical	Pass
2**	1326.959	32.49	-7.85	54.0	-21.51	AV	124.50	100	Vertical	Pass
3	1700.162	43.59	-8.70	74.0	-30.41	Peak	115.60	100	Vertical	Pass
3**	1700.162	34.62	-8.70	54.0	-19.38	AV	115.60	100	Vertical	Pass
4	1998.125	48.96	-6.18	74.0	-25.04	Peak	287.40	100	Vertical	Pass
4**	1998.125	37.80	-6.18	54.0	-16.20	AV	287.40	100	Vertical	Pass
5	2123.610	46.59	-5.23	74.0	-27.41	Peak	208.80	100	Vertical	Pass
5**	2123.610	36.44	-5.23	54.0	-17.56	AV	208.80	100	Vertical	Pass
6	2445.319	54.48	-4.01	74.0	-19.52	Peak	350.90	100	Vertical	Pass
6**	2445.319	48.16	-4.01	54.0	-5.84	AV	350.90	100	Vertical	Pass
7	2499.563	49.38	-4.41	74.0	-24.62	Peak	67.40	100	Vertical	Pass
7**	2499.563	38.82	-4.41	54.0	-15.18	AV	67.40	100	Vertical	Pass
8	2699.788	48.41	-4.08	74.0	-25.59	Peak	353.80	100	Vertical	Pass
8**	2699.788	45.54	-4.08	54.0	-8.46	AV	353.80	100	Vertical	Pass
9	4735.658	48.41	1.00	74.0	-25.59	Peak	151.40	100	Vertical	Pass
9**	4735.658	39.76	1.00	54.0	-14.24	AV	151.40	100	Vertical	Pass
10	5333.333	50.75	1.46	74.0	-23.25	Peak	30.50	100	Vertical	Pass
10**	5333.333	40.90	1.46	54.0	-13.10	AV	30.50	100	Vertical	Pass

END OF REPORT