

TEST REPORT

Report No.: SHE19110012-02HE

Date: 2019-11-19

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Applicant : Toast, Inc.
Address of Applicant : 401 Park Drive, Suite 801, Boston, MA 02215, USA

Product Name : Data Processing machine
Model No. : TT200/TK200
Sample No. : E19110012-02#01
FCC ID : 2AMNG-TT200
ISED Number : 23177-TT200

Standards : FCC CFR47 Part 15, Subpart C
RSS-Gen (Issue 5, March 2019)
RSS-247 (Issue 2, February 2017)

Date of Receipt : 2019-11-12
Date of Test : 2019-11-12 ~ 2019-11-18
Date of Issue : 2019-11-19

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.

Prepared by: Jennifer Zhou Reviewed by: Adrian Shi Approved by: Guoyou Chi
(Jennifer Zhou) (Adrian Shi) (Authorized signatory: Guoyou Chi)

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Revision Record			
Version	Date	Revisions	Revised By
1.0	2019-11-19	Original	--

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1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Services (Shanghai) Co., Ltd.
Address	155 Pingbei Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	Toast, Inc.
Address	401 Park Drive, Suite 801, Boston, MA 02215, USA
Contact Person	Mr James H Barber
Telephone	(562) 546-2272
Email	jbarber@toasttab.com

1.3 Details of EUT

Product Name	Data Processing machine
Brand Name	Toast
Model No.	TT200/TK200
FCC ID	2AMNG-TT200
ISED Number	23177-TT200
Mode of Operation	Bluetooth BR/EDR
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	79 (at intervals of 1 MHz)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Antenna Type	PIFA Antenna
Antenna Gain	1.92 dBi
Extreme Temperature Range	0°C ~ +55°C
Test Voltage	AC 24V

Note(s):

1. This test report is for approval of PCB and speaker change based on the original test report No. I19D00071-SRD01.
2. The details product change please refer to the document 'Product Change Description'.
3. Only additional test required in the product change list in this report.
4. The model TK200 is the same as TT200 except the attached base support, detail please refer to clause 5.1. So only tested model was TT200.

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1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
FCC PUBLIC NOTICE DA 00-705 (Mar.30, 2000)	Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
RSS-Gen (Issue 5, March 2019)	General Requirements for Compliance of Radio Apparatus
RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

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

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2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2020-07-28
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2020-06-24
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2020-06-19
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-19
V-network	SCHWARZBECK	NSLK 8127	8127-902	2020-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2020-08-22
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2020-06-06
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2020-06-06
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2020-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-26
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-08-28
Test Software	BL	BL410_E	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB

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3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH0)	2402MHz
The middle channel(CH39)	2441MHz
The Highest channel(CH78)	2480MHz

The basic operation modes are:

- A. On
 - 1. BR/EDR mode
 - a. Transmitting
 - i. Low Channel
 - ii. Middle Channel
 - iii. High Channel
 - iv. Hopping mode
 - b. Receiving
 - 2. Normal working with Bluetooth on
- B. Standby
- C. Off

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	/	RF Test Tool

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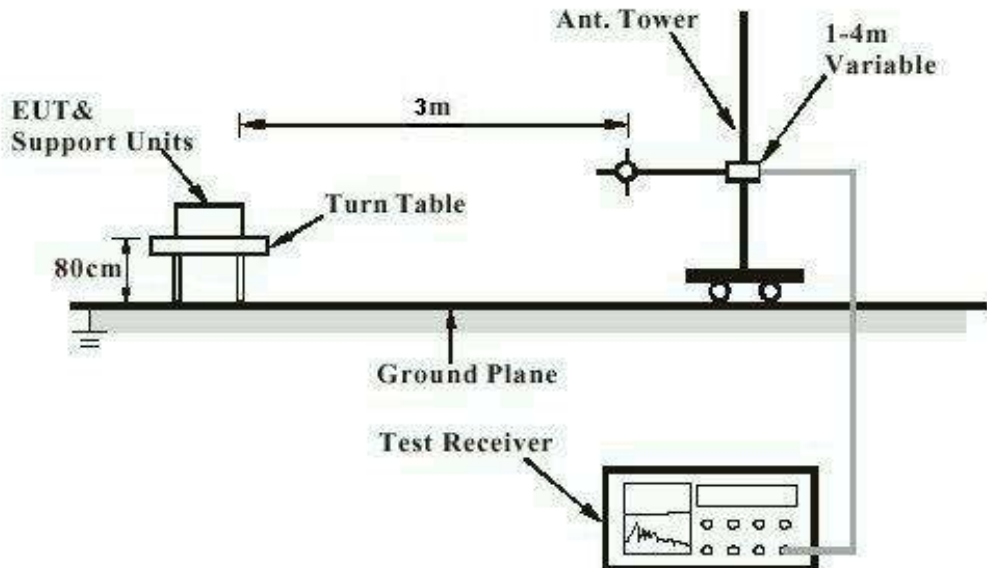
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3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

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4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Spurious Emission

RESULT:

PASS

Test standard	: FCC Part 15.247(d), 15.205, 15.209 RSS-247 5.5
Requirement	: ANSI C63.10-2013
Kind of test site	: 3m Semi-Anechoic Chamber

Test setup

Test Channel	: Low/Middle/High
Operation Mode	: A
Ambient temperature	: 25°C
Relative humidity	: 52%

Notes:

1. Test plots please refer to the annex document "EXHIBIT A of SHE19110012-02HE".
2. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
3. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
4. The EUT is working in the Normal link mode below 1 GHz.

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4.1.2 Band Edge (Restricted-band band-edge)

RESULT:

PASS

Test standard	: FCC Part 15.247(d), 15.205, 15.209 RSS-247 5.5
Requirement	: ANSI C63.10-2013
Kind of test site	: 3m Semi-Anechoic Chamber

Test setup

Test Channel	: Low/Middle/High
Operation Mode	: A.1
Ambient temperature	: 25°C
Relative humidity	: 52%

For details refer to following test plot.

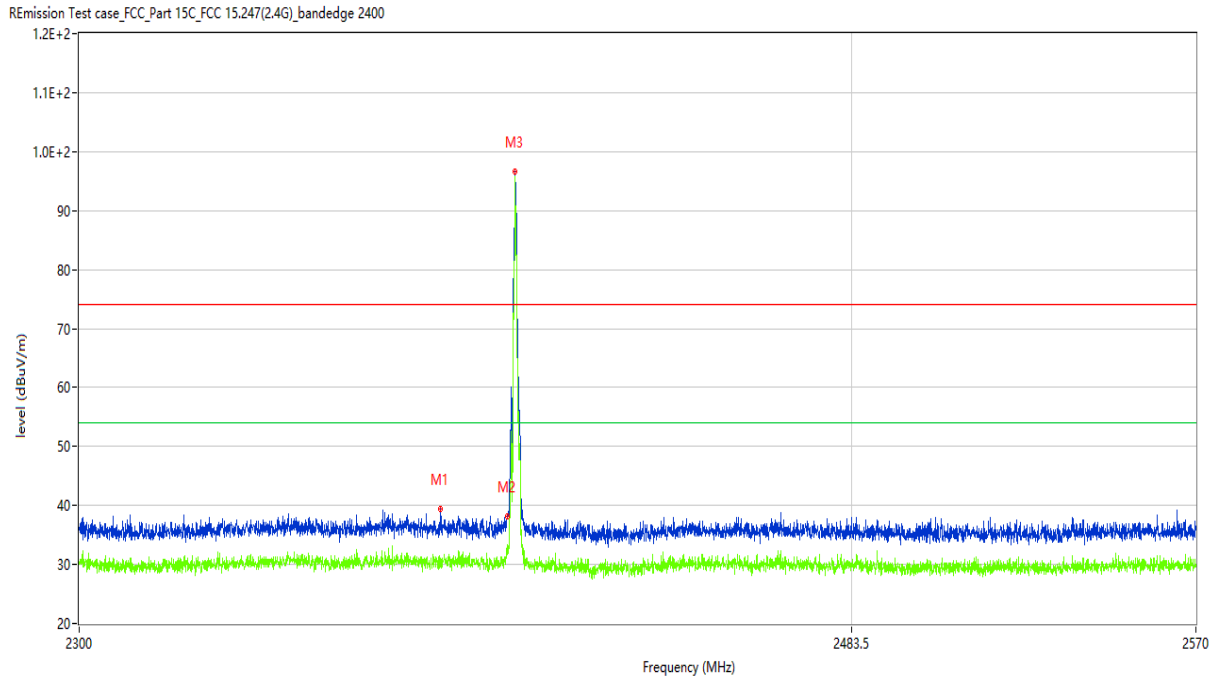
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Figure 1: Band Edge (Restricted-band band-edge), 2402MHz, GFSK
Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2384.151	39.43	-3.79	74.0	-34.57	Peak	65.20	100	Horizontal	Pass
1**	2384.151	31.03	-3.79	54.0	-22.97	AV	65.20	100	Horizontal	Pass
2	2400.000	38.17	-4.18	74.0	-35.83	Peak	1.20	100	H	Pass
2**	2400.000	32.01	-4.18	54.0	-21.99	AV	1.20	100	H	Pass
3	2401.765	96.53	-4.17	74.0	22.53	Peak	0.00	100	Horizontal	N/A
3**	2401.765	95.86	-4.17	54.0	41.86	AV	0.00	100	Horizontal	N/A

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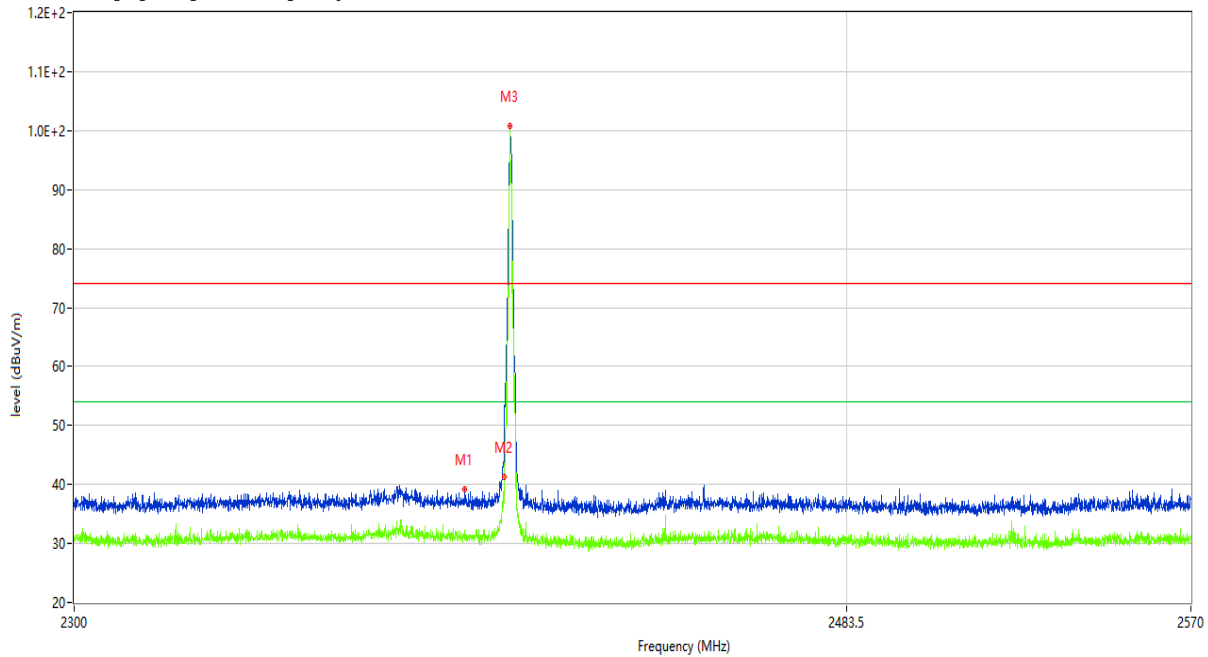
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Vertical

REmission Test case_FCC_Part 15C_FCC 15.247(2.4G)_bandedge 2400



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2391.102	39.12	-3.81	74.0	-34.88	Peak	125.80	100	Vertical	Pass
1**	2391.102	32.30	-3.81	54.0	-21.70	AV	125.80	100	Vertical	Pass
2	2400.000	41.53	-4.18	74.0	-32.47	Peak	137.90	100	V	Pass
2**	2400.000	35.70	-4.18	54.0	-18.30	AV	137.90	100	V	Pass
3	2401.765	100.88	-4.17	74.0	26.88	Peak	10.40	100	Vertical	N/A
3**	2401.765	100.11	-4.17	54.0	46.11	AV	10.40	100	Vertical	N/A

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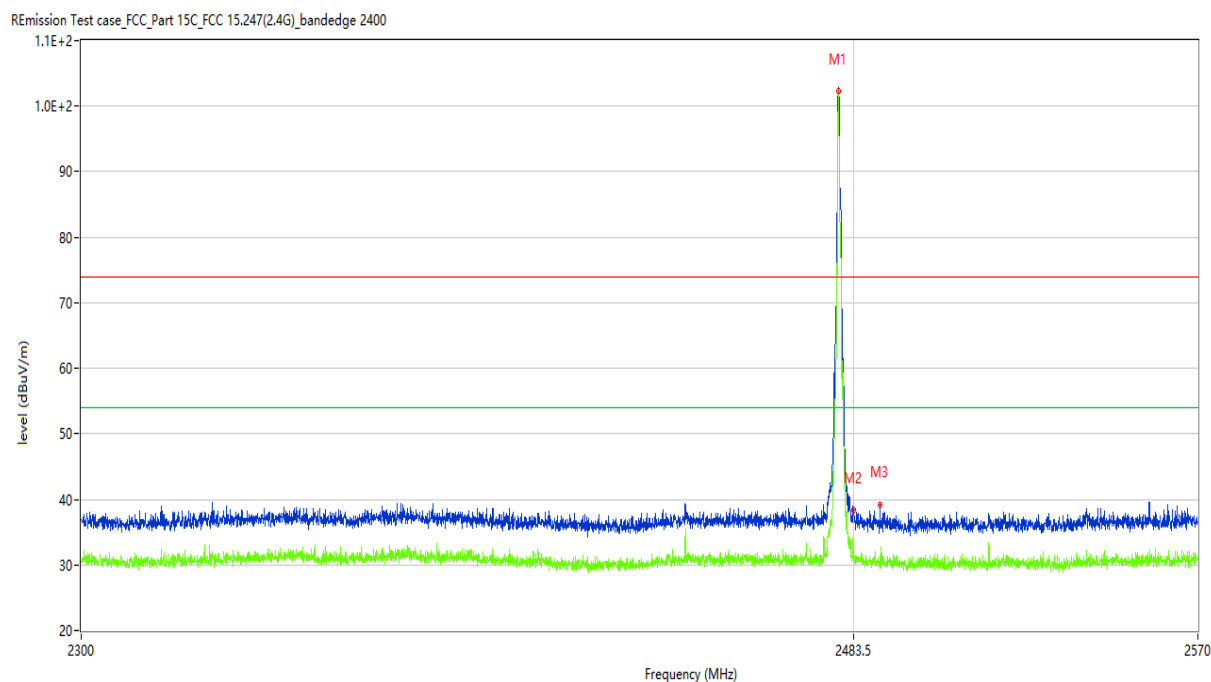
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Figure 2: Band Edge (Restricted-band band-edge), 2480MHz, GFSK

Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2479.775	102.83	-3.76	74.0	28.83	Peak	111.00	100	Horizontal	N/A
1**	2479.775	102.22	-3.76	54.0	48.22	AV	111.00	100	Horizontal	N/A
2	2483.500	38.35	-3.87	74.0	-35.65	Peak	125.39	100	H	Pass
2**	2483.500	30.76	-3.87	54.0	-23.24	AV	125.39	100	H	Pass
3	2490.032	39.24	-4.08	74.0	-34.76	Peak	85.30	100	Horizontal	Pass
3**	2490.032	31.19	-4.08	54.0	-22.81	AV	85.30	100	Horizontal	Pass

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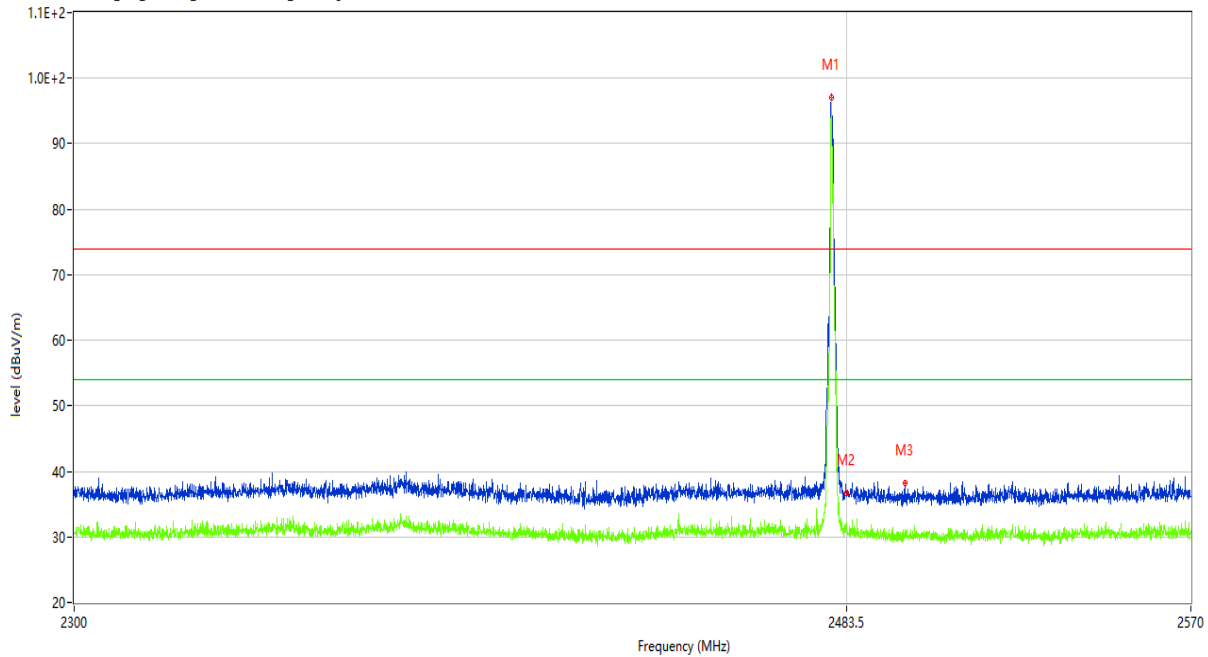
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No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2479.775	97.59	-3.76	74.0	23.59	Peak	144.10	100	Vertical	N/A
1**	2479.775	96.99	-3.76	54.0	42.99	AV	144.10	100	Vertical	N/A
2	2483.500	36.60	-3.87	74.0	-37.40	Peak	142.05	100	V	Pass
2**	2483.500	31.52	-3.87	54.0	-22.48	AV	142.05	100	V	Pass
3	2497.928	38.31	-4.36	74.0	-35.69	Peak	45.80	100	Vertical	Pass
3**	2497.928	31.10	-4.36	54.0	-22.90	AV	45.80	100	Vertical	Pass

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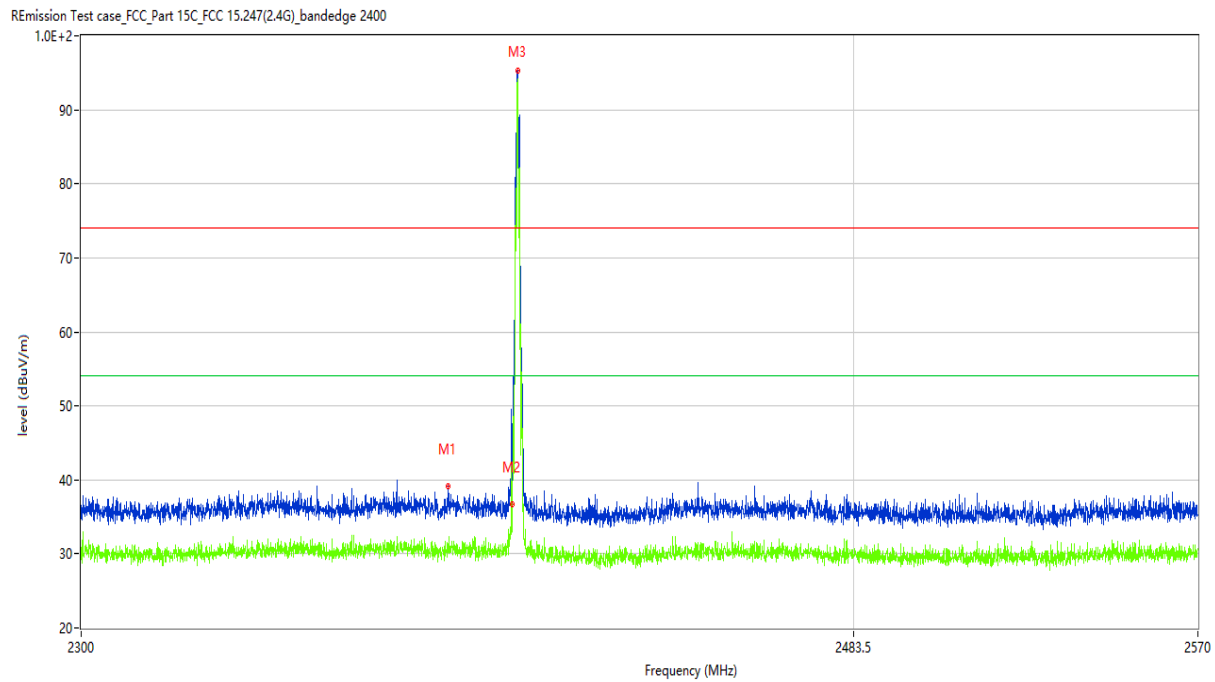
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Figure 3: Band Edge (Restricted-band band-edge), 2402MHz, 8-DPSK

Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2385.366	39.13	-3.78	74.0	-34.87	Peak	358.70	100	Horizontal	Pass
1**	2385.366	31.33	-3.78	54.0	-22.67	AV	358.70	100	Horizontal	Pass
2	2400.000	36.73	-4.18	74.0	-37.27	Peak	294.93	100	H	Pass
2**	2400.000	31.27	-4.18	54.0	-22.73	AV	294.93	100	H	Pass
3	2401.967	95.37	-4.17	74.0	21.37	Peak	281.00	100	Horizontal	N/A
3**	2401.967	94.21	-4.17	54.0	40.21	AV	281.00	100	Horizontal	N/A

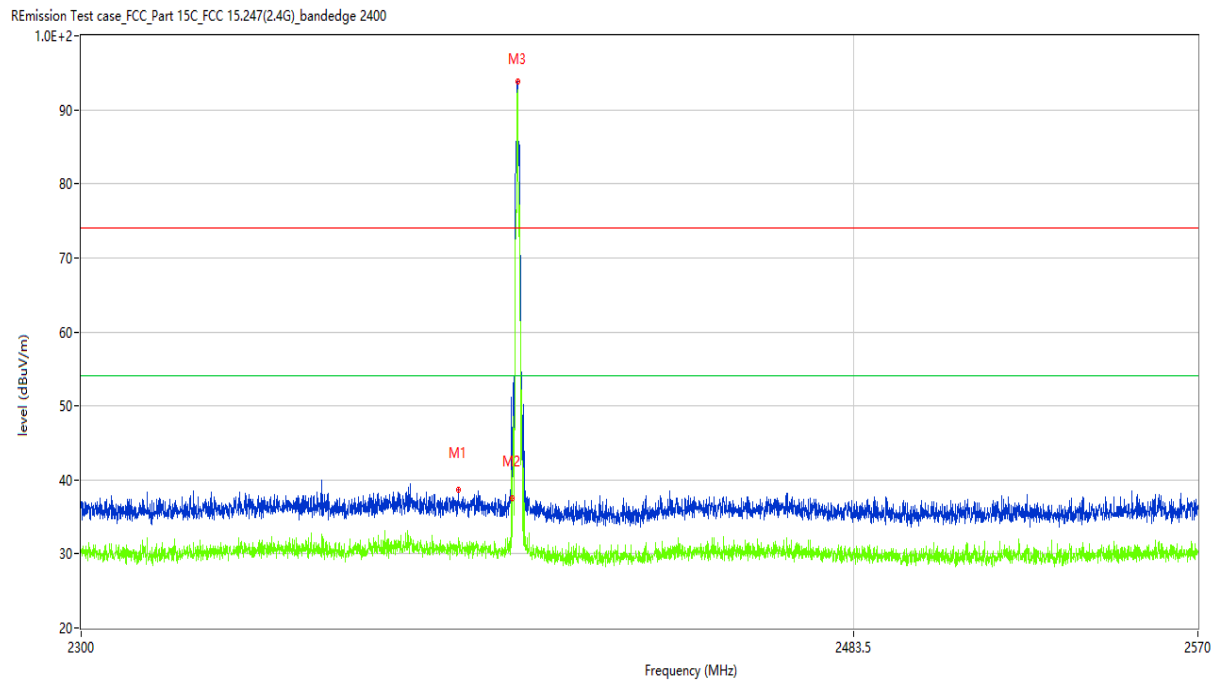
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No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2387.796	38.72	-3.77	74.0	-35.28	Peak	3.50	100	Vertical	Pass
1**	2387.796	31.82	-3.77	54.0	-22.18	AV	3.50	100	Vertical	Pass
2	2400.000	37.57	-4.18	74.0	-36.43	Peak	85.95	100	V	Pass
2**	2400.000	30.90	-4.18	54.0	-23.10	AV	85.95	100	V	Pass
3	2401.967	93.84	-4.17	74.0	19.84	Peak	10.10	100	Vertical	N/A
3**	2401.967	92.67	-4.17	54.0	38.67	AV	10.10	100	Vertical	N/A

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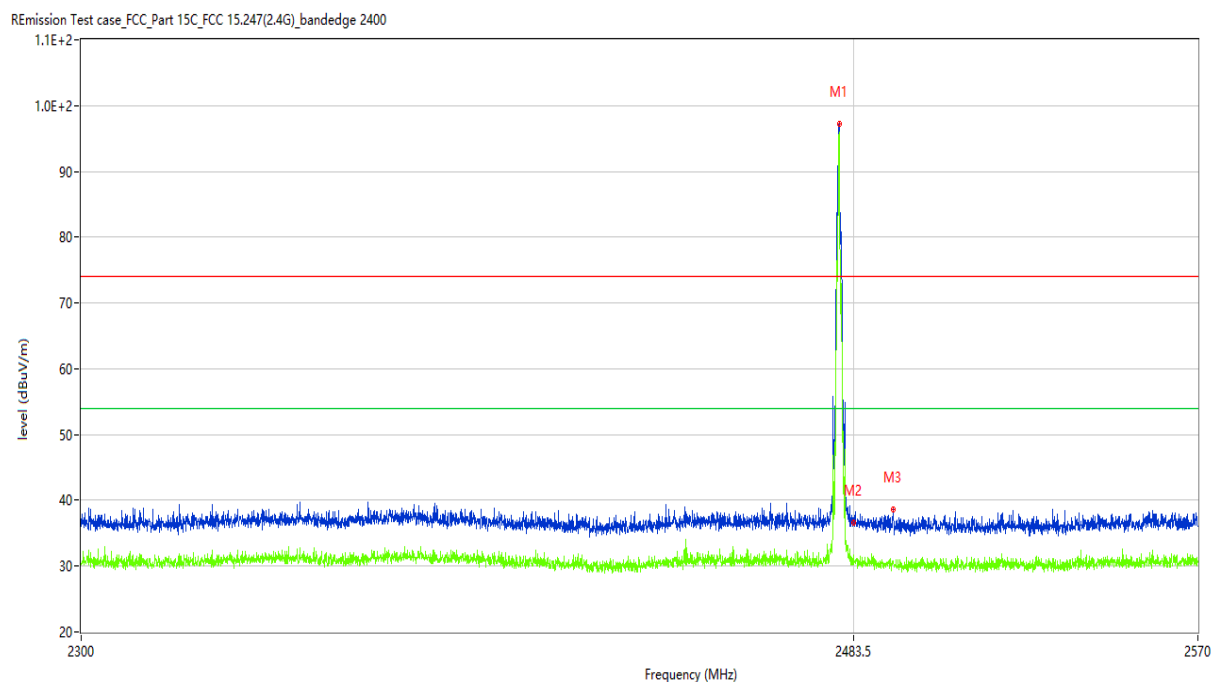
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Figure 4: Band Edge (Restricted-band band-edge), 2480MHz, 8-DPSK

Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2479.978	97.18	-3.76	74.0	23.18	Peak	119.50	100	Horizontal	N/A
1**	2479.978	95.91	-3.76	54.0	41.91	AV	119.50	100	Horizontal	N/A
2	2483.500	36.75	-3.87	74.0	-37.25	Peak	135.67	100	H	Pass
2**	2483.500	30.52	-3.87	54.0	-23.48	AV	135.67	100	H	Pass
3	2493.339	38.53	-4.20	74.0	-35.47	Peak	199.20	100	Horizontal	Pass
3**	2493.339	30.47	-4.20	54.0	-23.53	AV	199.20	100	Horizontal	Pass

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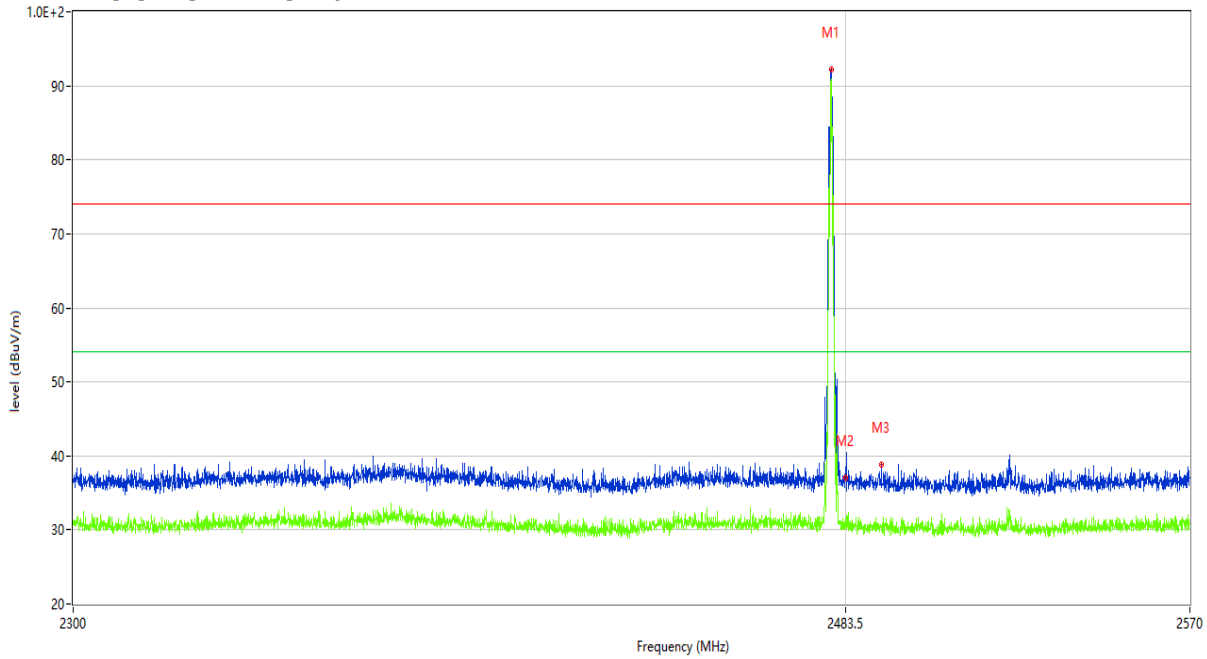
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No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2479.978	92.24	-3.76	74.0	18.24	Peak	136.30	100	Vertical	N/A
1**	2479.978	90.98	-3.76	54.0	36.98	AV	136.30	100	Vertical	N/A
2	2483.500	37.06	-3.87	74.0	-36.94	Peak	264.20	100	V	Pass
2**	2483.500	30.87	-3.87	54.0	-23.13	AV	264.20	100	V	Pass
3	2492.394	38.77	-4.16	74.0	-35.23	Peak	127.40	100	Vertical	Pass
3**	2492.394	30.49	-4.16	54.0	-23.51	AV	127.40	100	Vertical	Pass

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Figure 5: Band Edge (Restricted-band band-edge), Hopping Mode, GFSK
Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2390.000	37.15	-3.76	74.0	-36.85	Peak	145.09	100	H	Pass
1**	2390.000	30.95	-3.76	54.0	-23.05	AV	145.09	100	H	Pass
2	2400.000	36.57	-4.18	74.0	-37.43	Peak	184.95	100	H	Pass
2**	2400.000	31.13	-4.18	54.0	-22.87	AV	184.95	100	H	Pass
3	2483.500	35.75	-3.87	74.0	-38.25	Peak	171.22	100	H	Pass
3**	2483.500	29.63	-3.87	54.0	-24.37	AV	171.22	100	H	Pass
4	2486.403	38.26	-3.96	74.0	-35.74	Peak	0.60	100	Horizontal	Pass
4**	2486.403	30.41	-3.96	54.0	-23.59	AV	0.60	100	Horizontal	Pass

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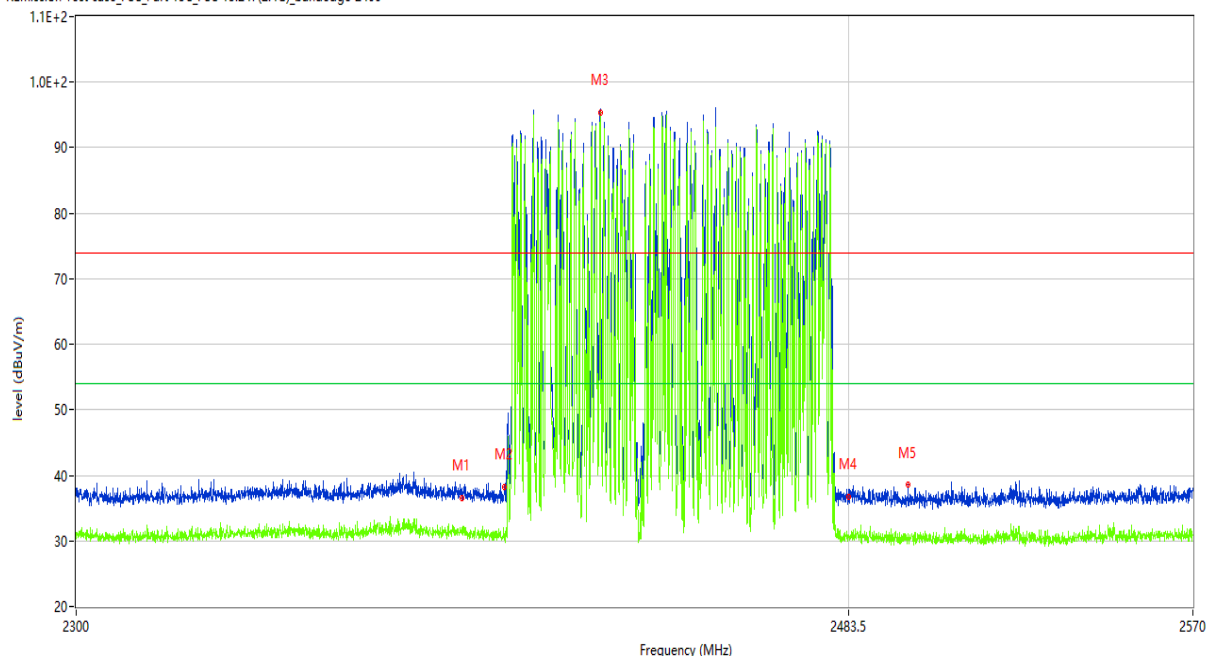
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No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	2390.000	36.74	-3.76	74.0	-37.26	Peak	355.24	100	V	Pass
1**	2390.000	31.80	-3.76	54.0	-22.20	AV	355.24	100	V	Pass
2	2400.000	38.21	-4.18	74.0	-35.79	Peak	159.66	100	V	Pass
2**	2400.000	30.97	-4.18	54.0	-23.03	AV	159.66	100	V	Pass
3	2422.954	96.00	-4.30	74.0	22.00	Peak	267.60	100	Vertical	N/A
3**	2422.954	95.43	-4.30	54.0	41.43	AV	267.60	100	Vertical	N/A
4	2483.500	36.96	-3.87	74.0	-37.04	Peak	182.16	100	V	Pass
4**	2483.500	30.82	-3.87	54.0	-23.18	AV	182.16	100	V	Pass
5	2498.265	38.53	-4.37	74.0	-35.47	Peak	0.70	100	Vertical	Pass
5**	2498.265	31.10	-4.37	54.0	-22.90	AV	0.70	100	Vertical	Pass

Note:

Only shows the worst case results on hopping mode.

End of the report