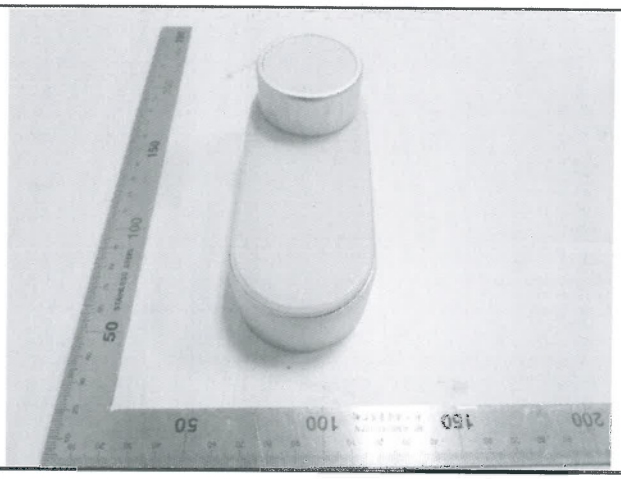
Prüfbericht-Nr.: *Test Report No.:*	**50068239 001**	**Auftrags-Nr.:** *Order No.:*	**154186596**	**Seite 1 von 29** *Page 1 of 29*
Kunden-Referenz-Nr.: *Client Reference No.:*	**60052183**	**Auftragsdatum:** *Order date:*	**06.28.2016**	
Auftraggeber: *Client:*	**Glue AB** c/o Epicenter, Malmskillnadsgatan 32, Stockholm, Sweden			
Prüfgegenstand: *Test item:*	**GLUE SMART LOCK**			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	**GL04A.CL; GL04A.CG; GL04A.CD** **FCC ID: 2AJLELOCKV2** **IC: 21878-LOCKV2**			
Auftrags-Inhalt: *Order content:*	**Complete test**			
Prüfgrundlage: *Test specification:*	**FCC CFR47 Part 15, Subpart C Section 15.247** **RSS-Gen Issue 4, November 2014** **RSS-247 Issue 2, February 2017** **ANSI C63.10: 2013** **KDB 558074 D01 DTS Meas Guidance v03r05**			

Wareneingangsdatum: *Date of receipt:*	**10.14.2016**
Prüfmuster-Nr.: *Test sample No.:*	**A000440500-006**
Prüfzeitraum: *Testing period:*	**10.29.2016 to 01.05.2017**
Ort der Prüfung: *Place of testing:*	**MRT Technology(Suzhou) Co., Ltd.**
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**
Prüfergebnis*: *Test result*:*	**Pass**



geprüft von / *tested by*:			**kontrolliert von** / *reviewed by*:		
03.04.2017	Elliot Zhang / Senior Project Engineer	Tonze Zhang	03.04.2017	Shi Li / Section Manager	SL
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT
RESULT: Pass

5.1.2 PEAK OUTPUT POWER
RESULT: Pass

5.1.3 6DB BANDWIDTH
RESULT: Pass

5.1.4 CONDUCTED SPURIOUS EMISSIONS
RESULT: Pass

5.1.5 POWER SPECTRAL DENSITY
RESULT: Pass

5.2.1 CONDUCTED EMISSION
RESULT: N/A

5.3.1 RADIATED SPURIOUS EMISSION
RESULT: Pass

Contents

1. General Remarks

1.1 Complementary Materials

Null.

2. Test Sites

2.1 Test Facilities

MRT Technology (Suzhou) Co., Ltd.

D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 809388.

The Industry Canada has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance. The description of the test facility is listed under chambers filing number 11384A.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radiated Test Equipments

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MY45300136	12.08.2017
EMI Test Receiver	R&S	ESR7	101209	11.03.2017
Preamplifier	Schwarzbeck	BBV 9721	9721-008	04.16.2017
Preamplifier	Agilent	83017A	MY53270040	03.29.2017
Loop Antenna	Schwarzbeck	FMZB1519	1519-041	12.14.2017
TRILOG Antenna	Schwarzbeck	VULB9162	9162-047	11.07.2017
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1167	11.07.2017
Broadband Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170549	01.04.2018
Digital Thermometer & Hygrometer	Minggao	N/A	N/A	11.30.2017

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MY52090106	05.08.2017
USB Wideband Power Sensor	Boonton	55006	8911	05.08.2017
Temperature/Humidity Meter	Yuhuaze	N/A	N/A	12.20.2017

2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

2.5 Measurement Uncertainty

Table 2: Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission	30MHz - 1GHz	±5.34dB
	> 1GHz	±5.40dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a Glue Smart Lock which support Bluetooth Low Energy, and it should only be used in conjunction with the Glue Wi-Fi Hub to ensure that the Glue Smart Lock will perform as designed, with maximum security and functionality.

The aim of this report is to evalute the RF characteristic of the Bluetooth Low Energy of Smart Lock.

For details refer to the User Manual and Circuit Diagram.

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Description of EUT	
Product Name:	GLUE SMART LOCK
Brand Name:	GLUE
Model No.:	GL04A.CL; GL04A.CG; GL04A.CD
Rated Voltage:	DC 6V (4x1.5V AA batteries)
Technical Specification of BLE	
Frequency Range:	2402 – 2480MHz
Modulation Type:	GFSK
Antenna Type:	PCB
Antenna Gain:	1.95 dBi

Note: There are three models in all, and all the three models are the same except the color, so the Model GL04A.CL was chosen for the test, and please refer to the table below for the difference of the three models.

Table 4: Models Difference Description

Model	Electronic	Plstic	Painting of thumbturn glass + front outer cover	Aluminum
GL04A.CL	Same for all	Same for all	White	Light
GL04A.CG				Gold
GL04A.CD			Dark	Dark

3.3 Independent Operation Modes

Table 5: Independent Operation Modes

Test Mode	Channel Number	Channel Frequency [MHz]
TM1	37	2402
TM2	38	2426
TM3	39	2480

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material
- PCB Layout
- Photo Document
- Circuit Diagram
- Instruction Manual
- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

4.3 Special Accessories and Auxiliary Equipment

Null.

4.4 Countermeasures to achieve EMC Compliance

Null.

5. Test Results

5.1 Conducted Testing at Antenna Port

5.1.1 Antenna Requirement

RESULT: **Pass**

According to the manufacturer declared, the EUT has one PCB antenna, the directional gain of antenna is 1.95dBi and the PCB antenna is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Table 6: Antenna Requirement

FCC 15.203 – Antenna Requirement 1		
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Antenna type:	PCB Antenna
Verdict:	PASS	

FCC 15.204 – Antenna Requirement 2	
Requirement:	An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.
Results:	Only one integral antenna can be used
Verdict:	PASS

RSS-Gen 6.3 – External Control	
Requirement:	The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the limits prescribed in the applicable RSS.
Results:	The device does not have any transmitter external controls accessible to the user that can be adjusted and operated in violation of the limits of this standard.
Verdict:	PASS

RSS-Gen 8.3 – Antenna Requirement		
Requirement:	When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacture.	
Results:	a) Aennta type:	PCB Antenna
	b) Manufacture:	N/A
	c) Model No.:	N/A
	d) Gain with reference to an isotropic radiator:	1.95 dBi
Verdict:	PASS	

5.1.2 Peak Output Power

RESULT: **Pass**

Date of testing	:	10.29.2016
Test standard	:	FCC Part 15.247(b)(3) Clause 5.4(d) of RSS-247 Issue 2 February 2017
Test procedure	:	ANSI C63.10: 2013 Clause 9.1 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(b)(3) Clause 5.4(d) of RSS-247 Issue 2 February 2017
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	TM1 to TM3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 7: Peak Output Power

Mode	Antenna Gain [dBi]	CH.	Freq. [MHz]	Maximum Peak Conducted Output Power [dBm]	Peak Conducted Output Power Limit [dBm]	Maximum EIRP [dBm]	RSS-247 EIRP Limit [dBm]
TM1	1.95	37	2402	-1.21	30	0.74	36
TM2		38	2426	-1.38	30	0.57	36
TM3		**39**	**2480**	**-1.03**	**30**	**0.92**	**36**

5.1.3 6dB & 99% Bandwidth

RESULT: **Pass**

Date of testing	:	01.05.2017
Test standard	:	FCC Part 15.247(a)(2) Clause 5.2(a) of RSS-247 Issue 2 February 2017
Test procedure	:	ANSI C63.10: 2013 Clause 8 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(a)(2) Clause 5.2(a) of RSS-247 Issue 2 February 2017
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	TM1 to TM3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 8: 6dB & 99% Bandwidth

Mode	Frequency [MHz]	6dB Bandwidht [kHz]	99% Bandwidth [kHz]	Limit [kHz]
TM1	2402	640.1	1085.0	≥500
TM2	2426	641.4	1087.5	≥500
TM3	2480	643.4	1092.2	≥500

Figure 1: 6dB & 99% Bandwidth, TM1

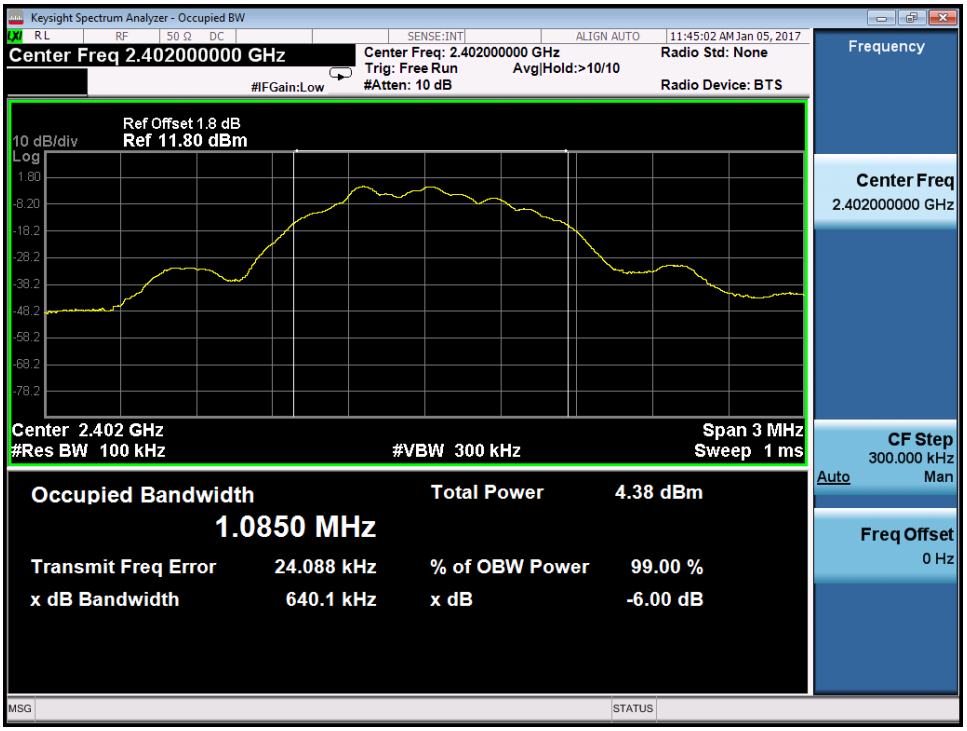


Figure 2: 6dB & 99% Bandwidth, TM2

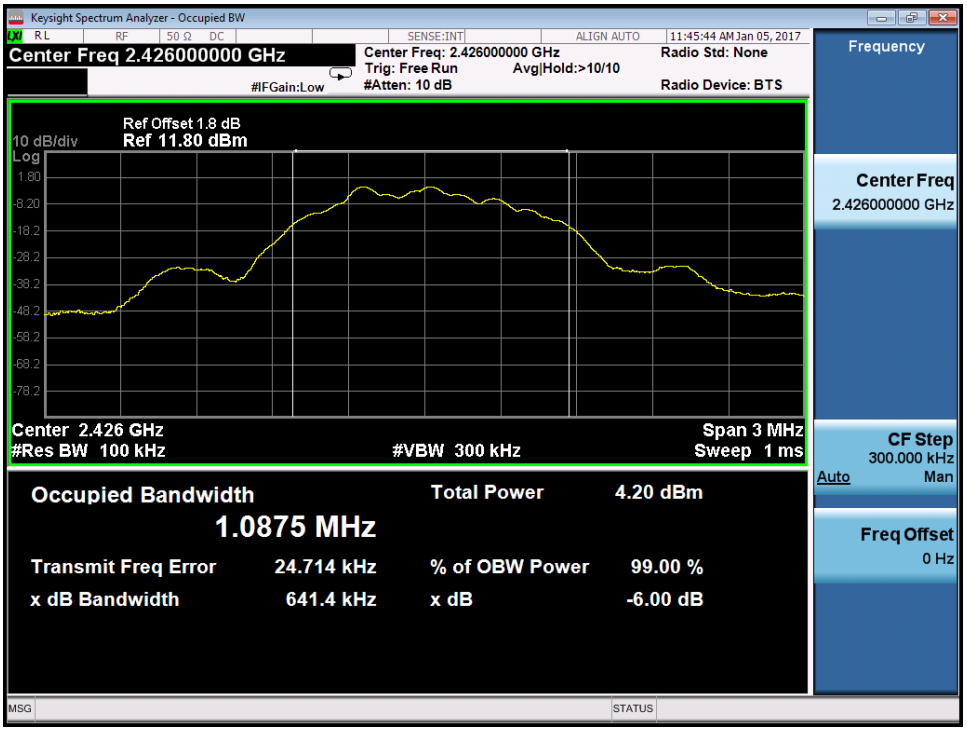
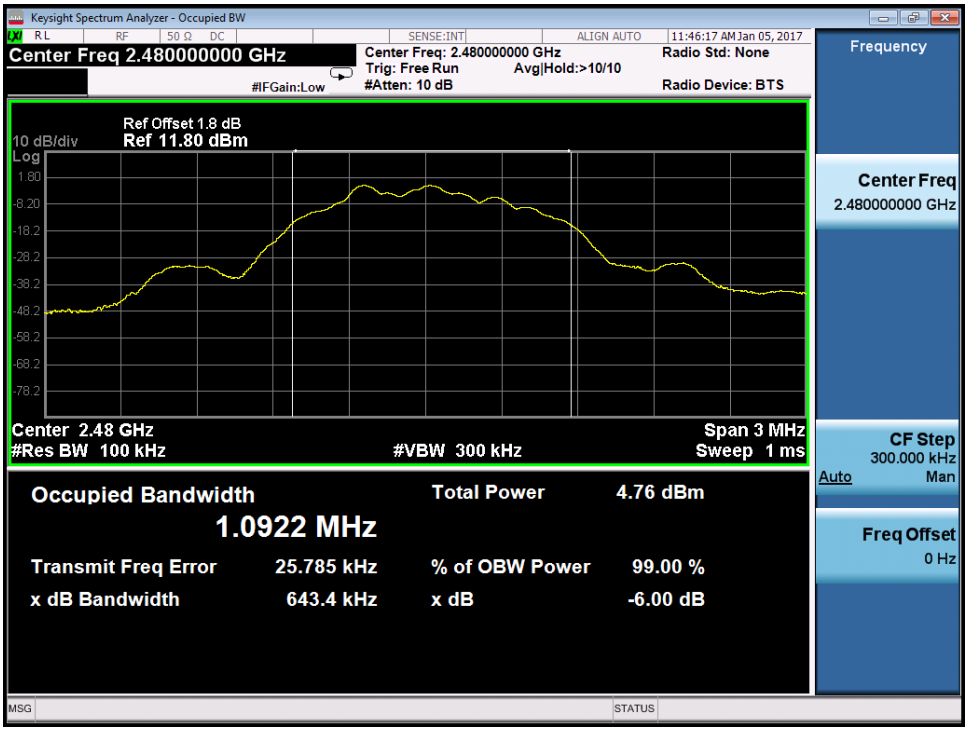


Figure 3: 6dB & 99% Bandwidth, TM3



5.1.4 Conducted Spurious Emissions

RESULT: **Pass**

Date of testing	:	01.05.2017
Test standard	:	FCC Part 15.247(d) Clause 5.5 of RSS-247 Issue 2 February 2017
Test procedure	:	ANSI C63.10: 2013 Clause 11&12 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(d) Clause 5.5 of RSS-247 Issue 2 February 2017
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	TM1 to TM3
Ambient temperature	:	25°C
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Figure 4: Conducted Spurious Emission, TM1

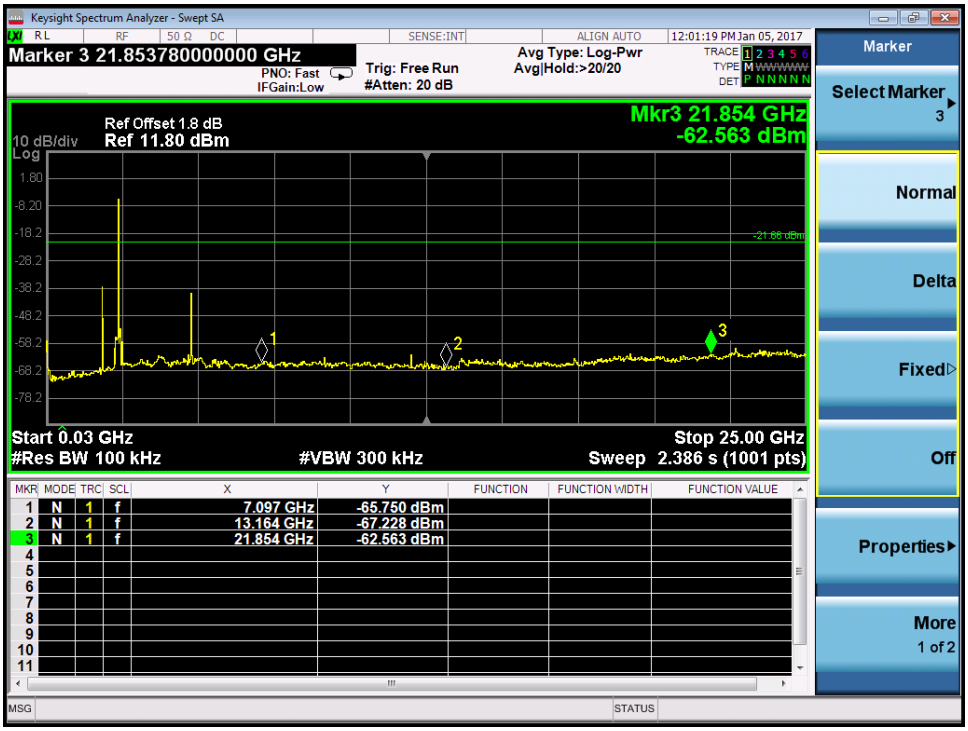


Figure 5: Conducted Spurious Emission, TM2

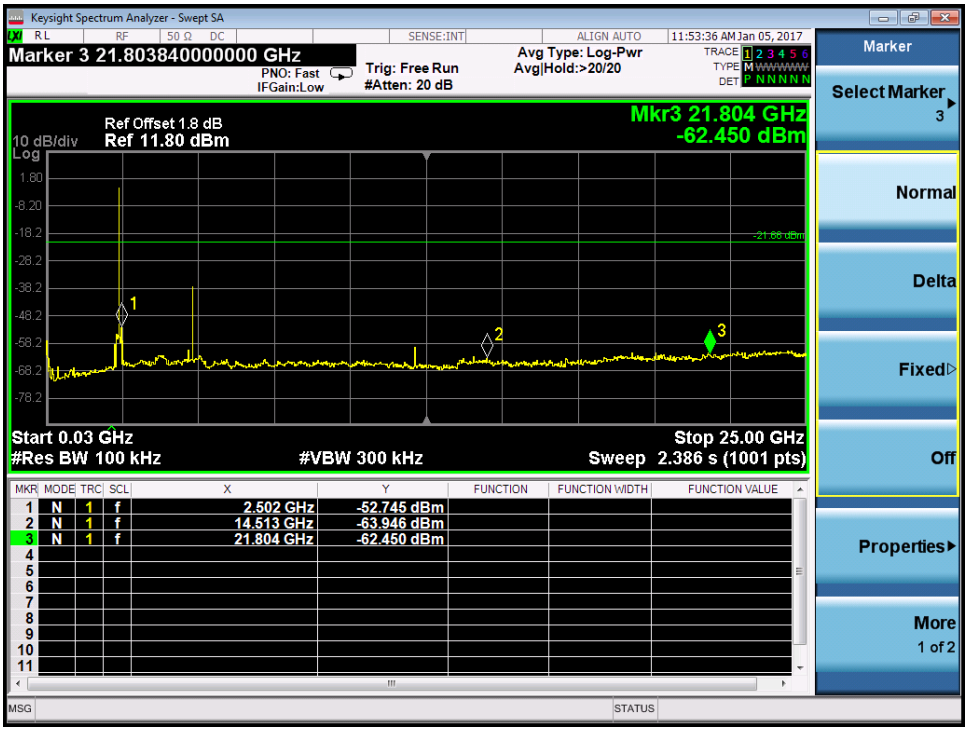


Figure 6: Conducted Spurious Emission, TM3

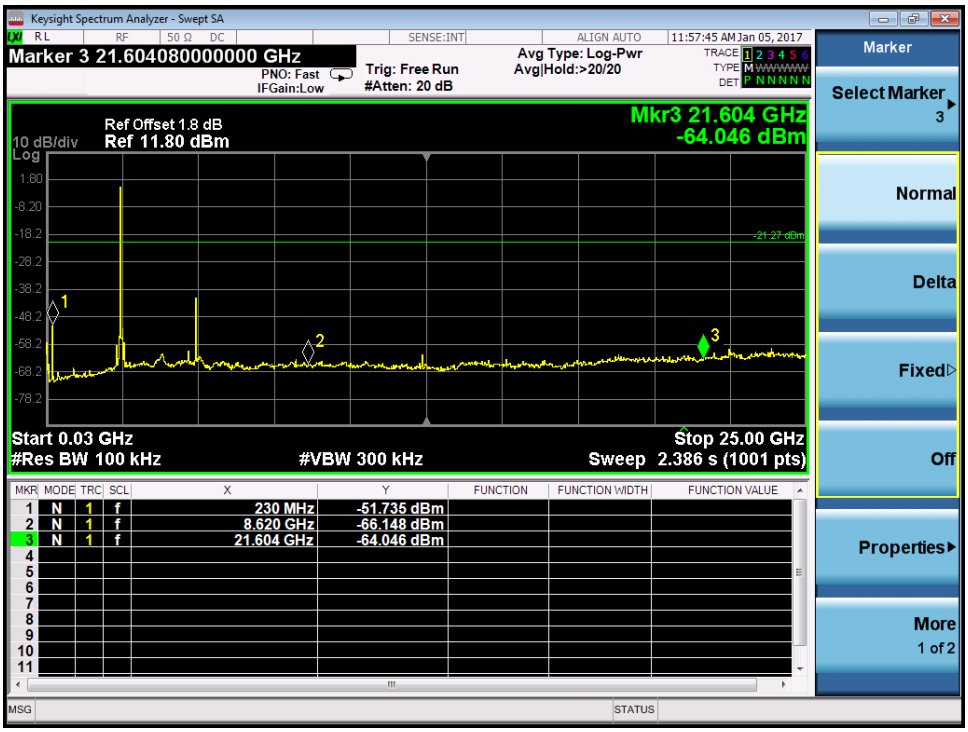


Figure 7: Conducted Bandedge, TM1

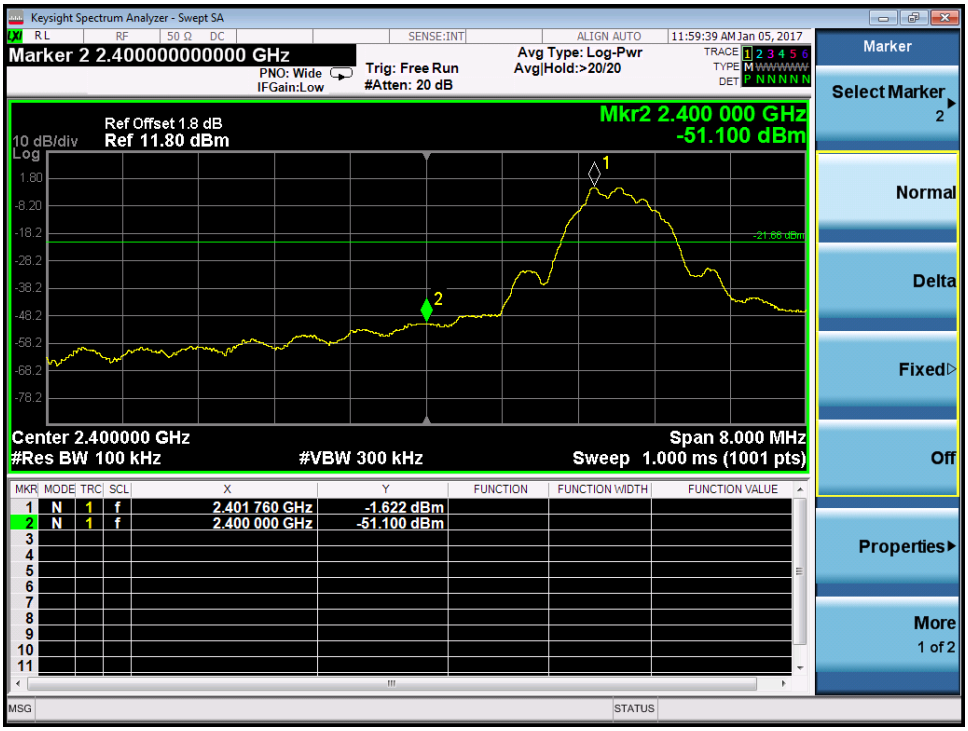


Figure 8: Conducted Bandedge, TM3

5.1.5 Power Spectral Density

RESULT: **Pass**

Date of testing	:	01.05.2017
Test standard	:	FCC Part 15.247(e) Clause 5.2(b) of RSS-247 Issue 2 February 2017
Test procedure	:	ANSI C63.10: 2013 Clause 10 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(e) Clause 5.2(b) of RSS-247 Issue 2 February 2017
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	TM1 to TM3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

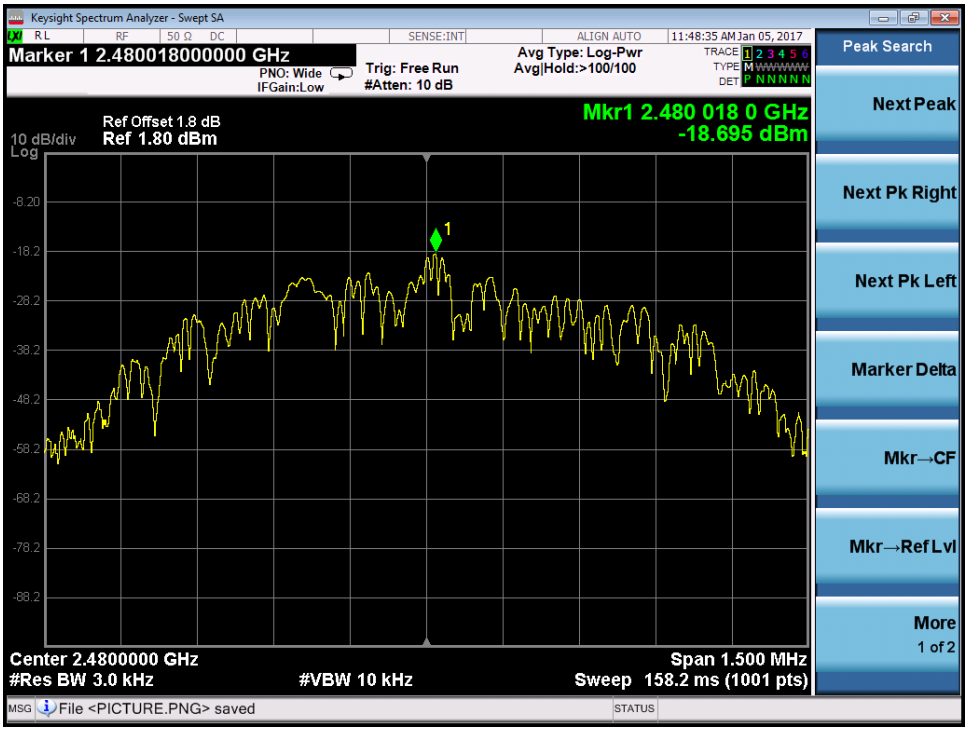
Table 9: Power Spectral Density

Mode	Frequency [MHz]	Result [dBm/3kHz]	Limit [dBm/3kHz]
TM1	2402	-19.162	≥8
TM2	2426	-19.324	≥8
TM3	2480	-18.695	≥8

Figure 9: Power Spectral Density, TM1

Figure 10: Power Spectral Density, TM2

Figure 11: Power Spectral Density, TM3



5.2 Emission in the Frequency Range up to 30MHz

5.2.1 Conducted Emission

RESULT: **N/A**

Date of testing	:	N/A
Test standard	:	FCC Part 15.207 (a) Clause 8.8 of RSS-Gen Issue 4, November 2014
Test procedure	:	ANSI C63.10: 2013
Limit	:	FCC Part 15.207(a) Clause 8.8 of RSS-Gen Issue 4, November 2014
Kind of test site	:	Shielded room

Note: This test is not required since the EUT is powered by the batteries.

5.3 Emission in the Frequency Range above 30MHz

5.3.1 Radiated Spurious Emission

RESULT: **Pass**

Date of testing	:	12.02.2016
Test standard	:	FCC Part 15.247(d) Clause 5.5 of RSS-247 Issue 2 February 2017
Test procedure	:	ANSI C63.10: 2013 Clause 11&12 of KDB 558074 D01 v03r05
Limit	:	FCC Part 15.247(d) FCC Part 15.209(a) Clause 5.5 of RSS-247 Issue 2 February 2017 Clause 8.9 of RSS-Gen Issue 4 November 2014
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	TM1 to TM3
Ambient temperature	:	25℃
Relative humidity	:	52%
Atmospheric pressure	:	101kPa

Table 10: Radiated Spurious Emission, below 1GHz

Mode	Freq. [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type	Ant. Pol.
TM3	481.535	21.449	3.421	-24.551	46.000	18.028	PK	H
	734.220	25.971	3.907	-20.029	46.000	22.064	PK	H
	100.810	16.763	3.678	-26.737	43.500	13.085	PK	V
	320.030	22.168	7.079	-23.832	46.000	15.088	PK	V

Note:
The radiated emission below 30MHz are very low, so they are not shown in this report.
All the three channels have been evaluated, only the worst case was shown on the table above.

Table 11: Radiated Spurious Emission, above 1GHz

Mode	Freq. [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type	Ant. Pol.
TM1	4808.000	46.999	50.997	-27.001	74.000	-3.998	PK	H
	9041.000	36.279	33.658	-37.721	74.000	2.622	PK	H
	4808.000	45.092	49.090	-28.908	74.000	-3.998	PK	V
	7536.500	35.904	33.253	-38.096	74.000	2.651	PK	V
TM2	4850.500	45.533	49.623	-28.467	74.000	-4.090	PK	H
	7383.500	36.432	34.015	-37.568	74.000	2.417	PK	H
	4850.500	41.341	45.431	-32.659	74.000	-4.090	PK	V
	7647.000	36.783	34.638	-37.217	74.000	2.145	PK	V
TM3	4961.000	41.489	45.758	-32.511	74.000	-4.269	PK	H
	7451.500	36.630	34.029	-37.370	74.000	2.601	PK	H
	4961.000	34.930	39.199	-39.070	74.000	-4.269	PK	V
	7324.000	35.926	33.652	-38.074	74.000	2.274	PK	V

Figure 12: Radiated Restricted Band Edge, TM1, Horizontal, PK

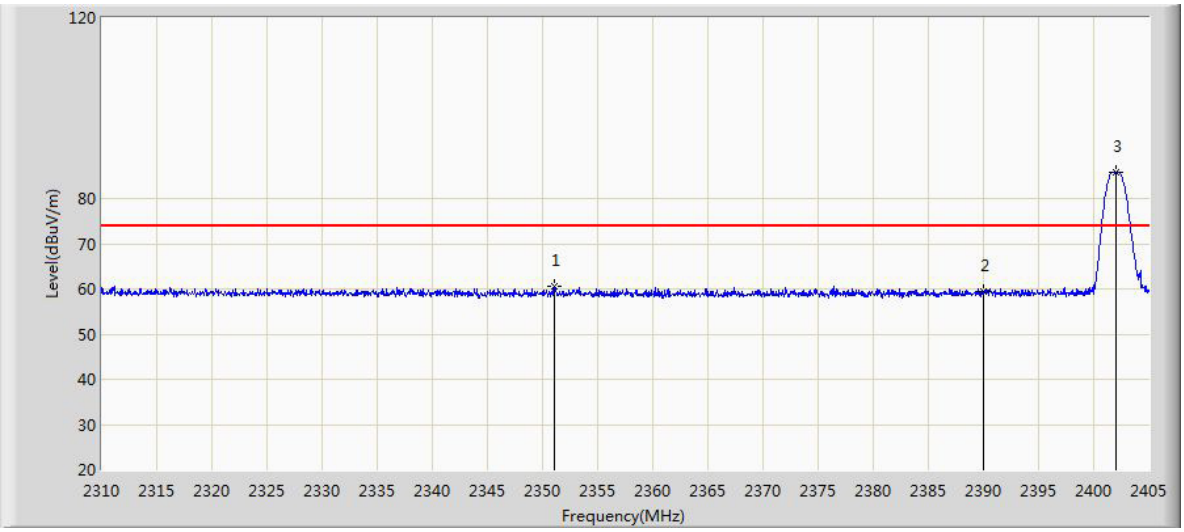


Table 12: Radiated Restricted Band Edge, TM1, Horizontal, PK,

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2351.040	60.593	28.318	-13.407	74.000	32.276	PK
2390.000	59.283	27.005	-14.717	74.000	32.278	PK
2402.008	85.877	53.604	N/A	N/A	32.274	PK

Figure 13: Radiated Restricted Band Edge, TM1, Horizontal, AV

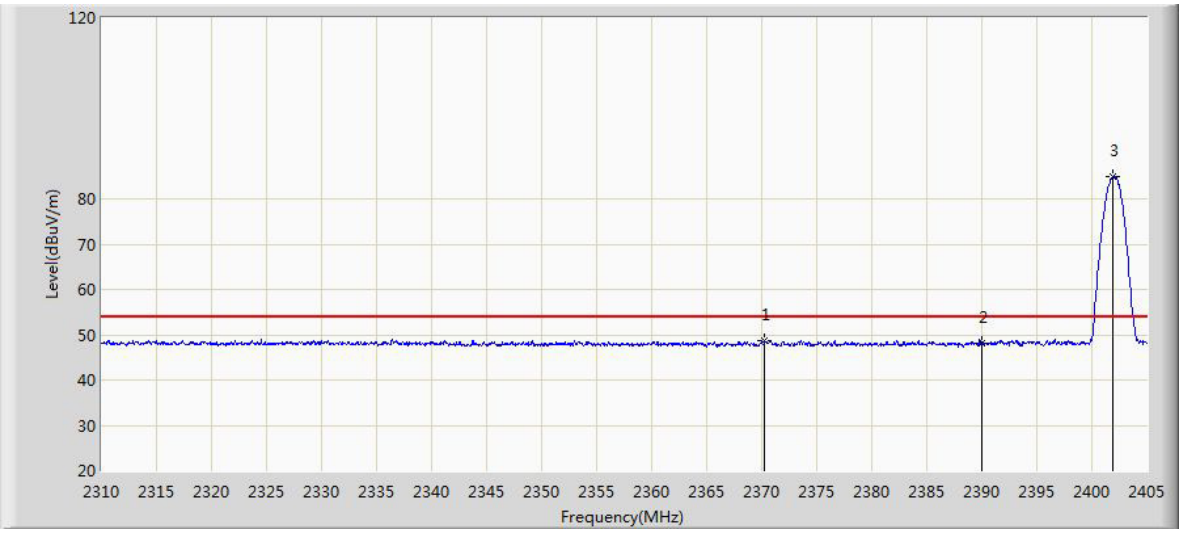


Table 13: Radiated Restricted Band Edge, TM1, Horizontal, AV,

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2370.230	48.746	16.522	-5.254	54.000	32.223	AV
2390.000	48.109	15.830	-5.891	54.000	32.278	AV
2401.960	84.834	52.560	N/A	N/A	32.274	AV

Figure 14: Radiated Restricted Band Edge, TM1, Vertical, PK

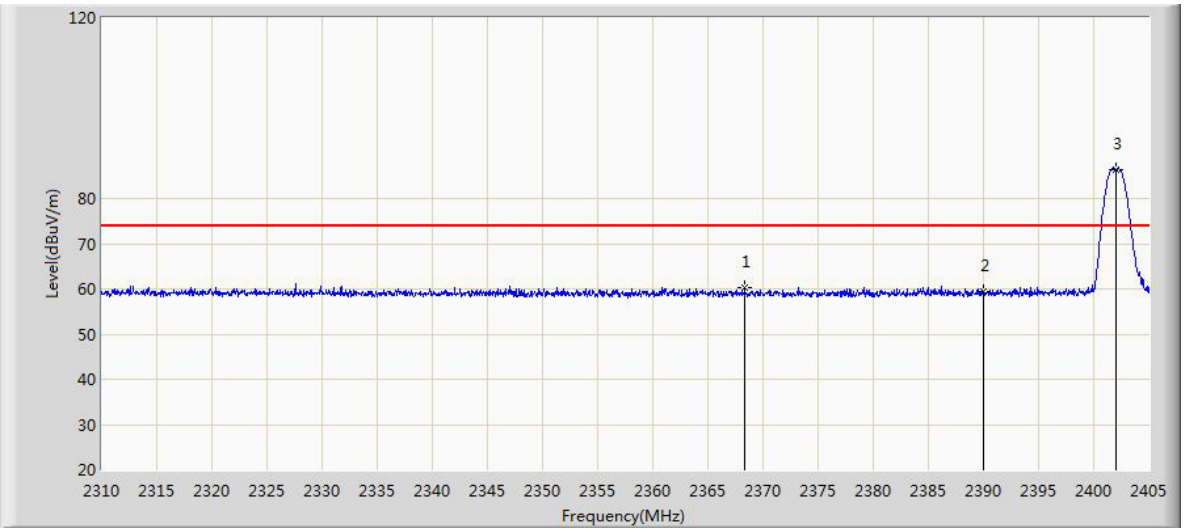


Table 14: Radiated Restricted Band Edge, TM1, Vertical, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2368.330	60.291	28.065	-13.709	74.000	32.228	PK
2390.000	59.345	27.067	-14.655	74.000	32.278	PK
2402.008	86.517	54.245	N/A	N/A	32.274	PK

Figure 15: Radiated Restricted Band Edge, TM1, Vertical, AV

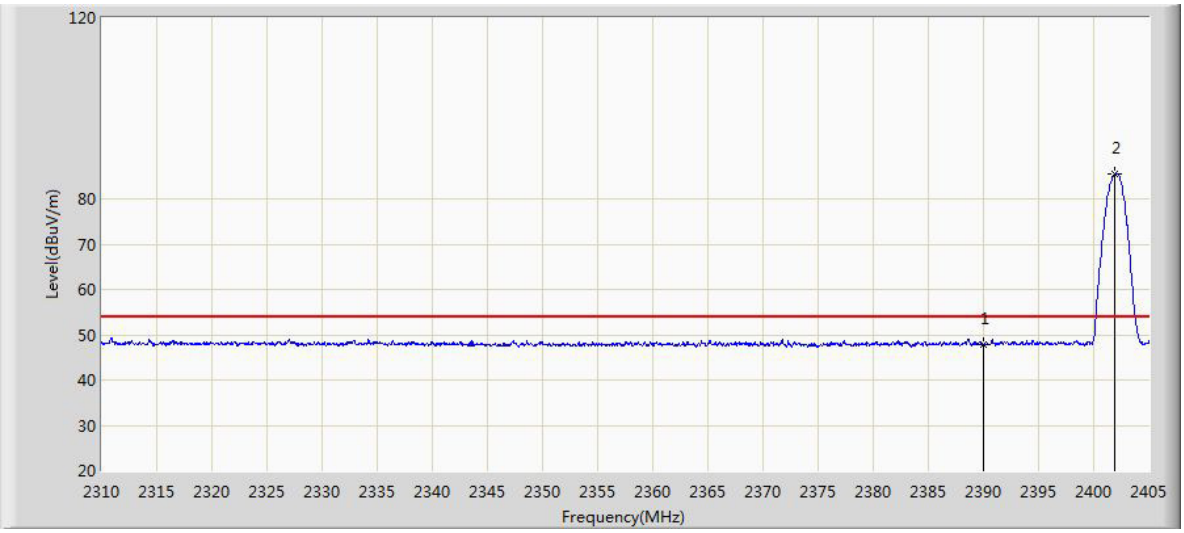


Table 15: Radiated Restricted Band Edge, TM1, Vertical, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2390.000	47.765	15.487	-6.235	54.000	32.278	AV
2401.913	85.501	53.226	N/A	N/A	32.274	AV

Figure 16: Radiated Restricted Band Edge, TM3, Horizontal, PK

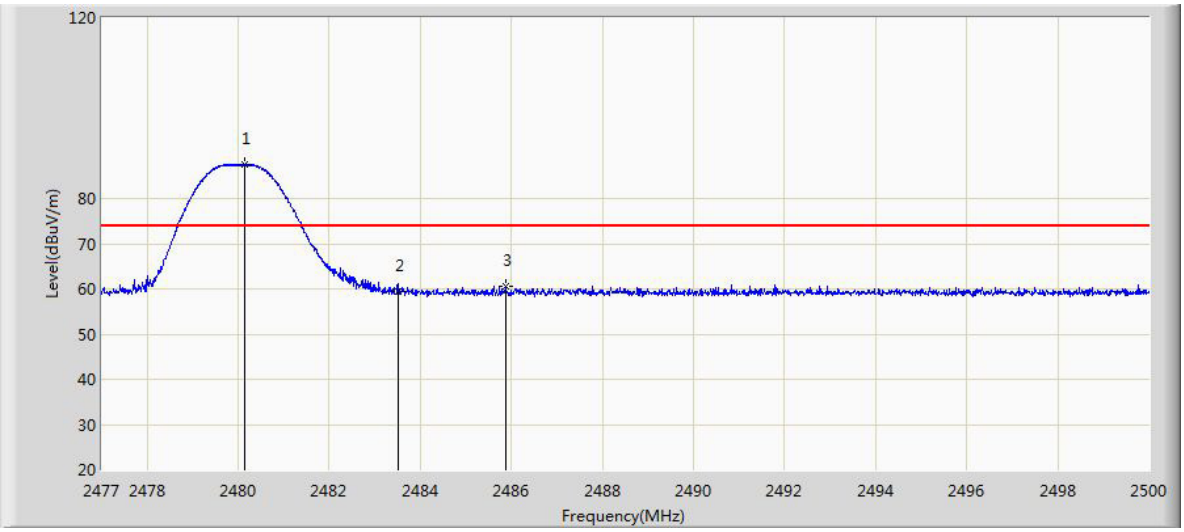


Table 16: Radiated Restricted Band Edge, TM3, Horizontal, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2480.139	87.429	55.167	N/A	N/A	32.270	PK
2483.500	59.555	27.274	-14.445	74.000	32.282	PK
2485.866	60.592	28.367	-13.408	74.000	32.289	PK

Figure 17: Radiated Restricted Band Edge, TM3, Horizontal, AV

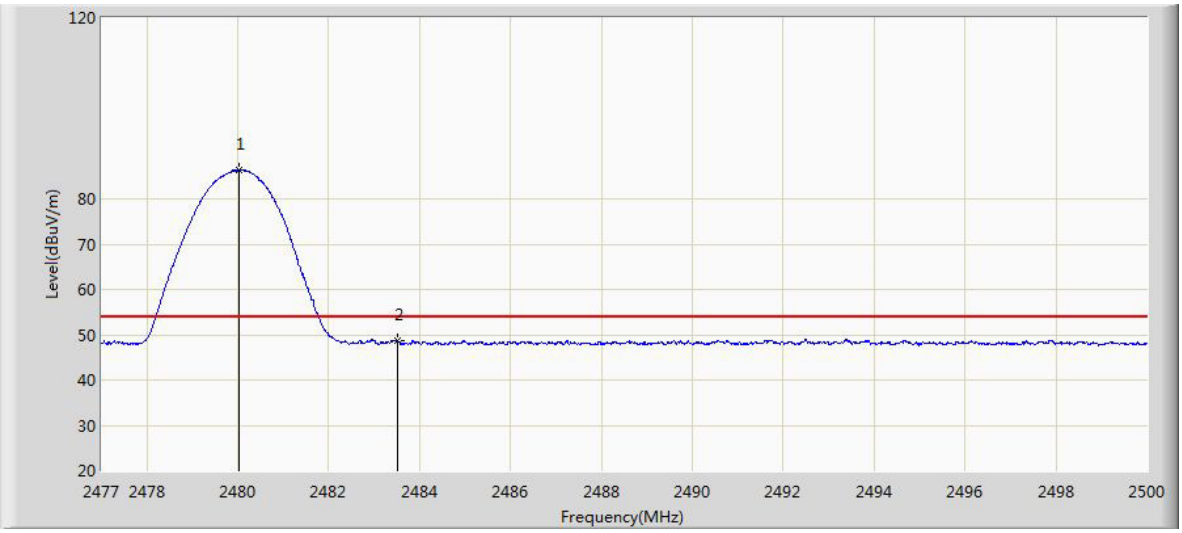


Table 17: Radiated Restricted Band Edge, TM3, Horizontal, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2480.024	86.257	53.986	N/A	N/A	32.269	AV
2483.500	48.634	16.353	-5.366	54.000	32.282	AV

Figure 18: Radiated Restricted Band Edge, TM3, Vertical, PK

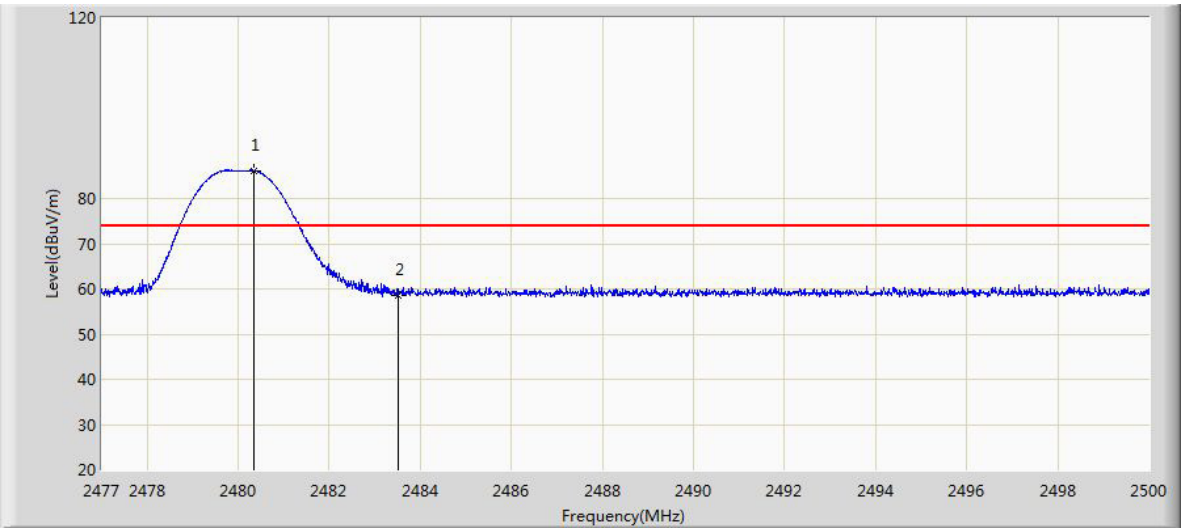


Table 18: Radiated Restricted Band Edge, TM3, Vertical, PK

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2480.346	86.186	53.922	N/A	N/A	32.270	PK
2483.500	58.601	26.320	-15.399	74.000	32.282	PK

Figure 19: Radiated Restricted Band Edge, TM3, Vertical, AV

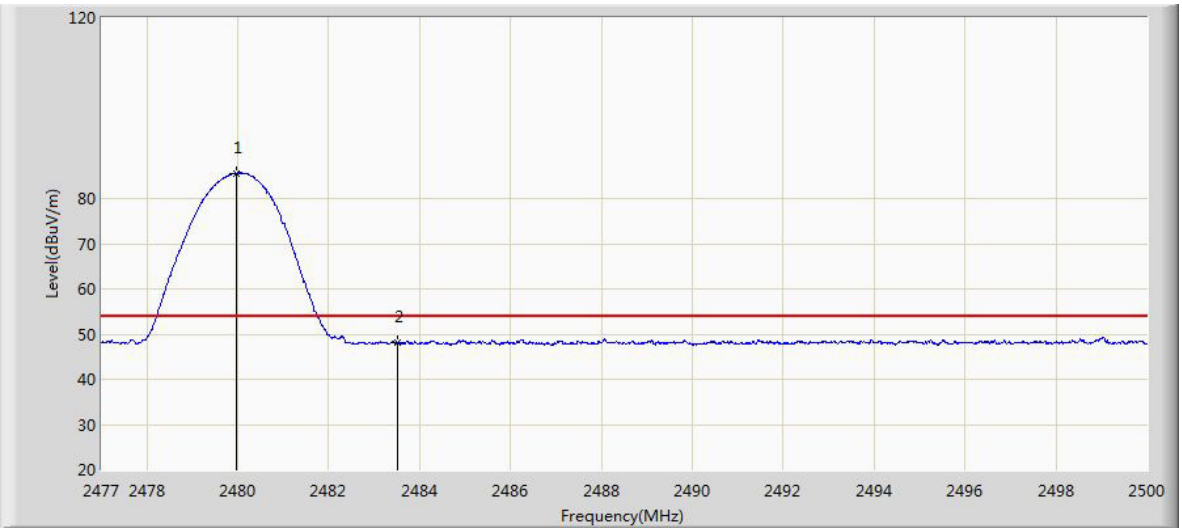


Table 19: Radiated Restricted Band Edge, TM3, Vertical, AV

Frequency [MHz]	Measure Level [dBuV/m]	Reading Level [dBuV]	Over Limit [dB]	Limit [dBuV/m]	Factor [dB]	Type
2479.956	85.561	53.292	N/A	N/A	32.269	AV
2483.500	48.002	15.721	-5.998	54.000	32.282	AV

6. List of Tables

7. List of Figures