FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

CruxCase LLC.

226 West 2230 North #226, Provo, UT 84604, USA

FCC ID: ZH9CR00X

April 26, 2011

This Report Concerns: Original Report	Equipment Type： Bluetooth Keyboard
Test Engineer:	Jack Liu
Report No.:	BST11040090Y-1ER-3
Receive EUT Date/Test Date:	April 21, 2011/ April 21-25, 2011
Reviewed By:	Christina
Prepared By:	**Shenzhen BST Technology Co.,Ltd.** 3F,Weames Technology Building, No. 10 Kefa Road,Science Park, Nanshan District,Shenzhen,Guangdong,China Tel: 0755-26747751～3 Fax: 0755-26747751～3 ext.826

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1. GENERAL INFORMATION

1.1. Report information

1.1.1.This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.

1.1.2.The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BST, unless the applicant has authorized BST in writing to do so.

Test Facility -
The test site used to collect the radiated data is located on the address of
emitel (Shenzhen) Limited
(FCC Registered Test Site Number: 746887) on
Building 2, 171 Meihua Road, Futian District, Shenzhen, 518049 China
The Test Site is constructed and calibrated to meet the FCC requirements.

1.2. Measurement Uncertainty

Available upon request.

2. PRODUCT DESCRIPTION

2.1. EUT Description

Applicant	:	CruxCase LLC.
Address	:	226 West 2230 North #226, Provo, UT 84604, USA
Manufacturer	:	Hong Kong Sinoband Group Co.,Ltd.
Address	:	13/F, Solar Silicon Valley, Yunfeng Rd, Dalang, Longhua, Baoan, Shenzhen, China
EUT Description	:	Bluetooth Keyboard
Trade Name	:	CRUX
Modulation	:	GFSK
Model Number	:	CR001, CR002
Antenna connected	:	PCB Antenna
Antenna gain	:	0dBi(2.4GHz)

2.2. Block Diagram of EUT Configuration

Figure 1 EUT Setup of TX mode

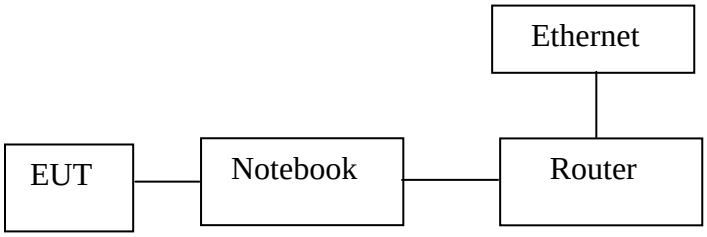


Figure 2 EUT Setup of Charging mode

2.3. Support Equipment List

Table 2 Ancillary Equipment

Name	Model No	S/N	Manufacturer	Used "√"
Notebook	PP10L	X1247 A01	DELL	√
Router	TL-WR841ND	09789401323	TP-LINK	√

2.4. Test Conditions

Temperature: 23~25℃
Relative Humidity: 50~63 %

3. FCC ID LABEL

FCC ID: ZH9CR00X

This device complies with Part 15 of the FCC Rules.Operation is subject to the following two conditions:
1.This device may not cause harmful interference, and
2.This device must accept any interference received,including interference that may cause undesired operation.

Label Location on EUT

EUT Bottom View/ FCC ID Label Location

4. TEST RESULTS SUMMARY

FCC 15 Subpart C,Paragraph 15.247

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b)(1)	Maximum Permissible Exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Radiated Emissions	Compliant
§15.247 (a)(1)	20 dB Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band Edges	Compliant

Modifications

No modification was made.

5. TEST EQUIPMENT USED

Equipment/Facilities	Manufacturer	Model #	Serial no.	Date of Cal.	Cal. Interval
Cable	Resenberger	N/A	NO.1	Mar 10，2011	1 Year
Cable	SCHWARZBECK	N/A	NO.2	Mar 10，2011	1 Year
Cable	SCHWARZBECK	N/A	NO.3	Mar 10，2011	1 Year
LISN	Rohde＆Schwarz	ESH3-Z5	100305	Mar 10，2011	1 Year
50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200283933	Mar 10，2011	1 Year
EMI Test Receiver	Rohde＆Schwarz	ESP13	100180	Oct.11,2010	1 Year
Spectrum Analyzer	Rohde＆Schwarz	FSP40	100273	Sep.10,2010	1 Year
3m Semi-Anechoic Chamber	Albatross Projects	9m×6m×6m	N/A	Feb.20,2011	1 Year
Signal Generator	FLUKE	PM5418 + Y/C	LO747012	Feb.20,2011	1 Year
Signal Generator	FLUKE	PM5418TX	LO738007	Feb.20,2011	1 Year
Loop Antenna	SCHWARZBECK	FMZB1516	113	Jan.30,2011	1 Year
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	9161-4079	Sep.22,2010	1 Year
Broad-Band Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-564	Sep.22,2010	1 Year
Ultra Broadband Antenna	Rohde＆Schwarz	HL-562	100110	June.15,2010	1 Year
AMN	Rohde＆Schwarz	ESH3-Z5	100196	Oct.11,2010	1 Year
AMN	Rohde＆Schwarz	ESH3-Z5	100197	Oct.11,2010	1 Year
Pulse Limiter	Rohde＆Schwarz	ESH3-Z2	N/A	N/A	N/A
Power Meter	Rohde＆Schwarz	NRVD	100041	Feb.20,2011	1 Year
EMI Test Receiver	Rohde＆Schwarz	ESCS30	100003	Feb.20,2011	1 Year
Coaxial Cable with N-connectors	SCHWARZBECK	AK9515H	95549	Sep.22,2010	1 Year
Radio Communication Test Set	Rohde＆Schwarz	CMS 54	846621/024	Feb.20,2011	1 Year
Modulation Analyzer	Hewlett-Packard	8901B	2303A00362	Feb.20,2011	1 Year
Absorbing clamp	Rohde＆Schwarz	MDS-21	N/A	Oct.11,2010	1 Year

6. SECTIONS 15.247 (I), 1.1307 (B) (1) - MaximuM Permissible exposure (MPE)

6.1. Standard Applicable

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3–3.0	614	1.63	*(100)	30
3.0–30	824/f	2.19/f	*(180/f2)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

6.2. Test Data

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$
S: Power density, in mW/cm^2
P: Power input to the antenna, in mW
G: numeric gain of the antenna
R: distance to the center of the antenna, in cm

Maximum peak output power at antenna input terminal (dBm):	-11.59
Maximum peak output power at antenna input terminal (mW):	0.069
Prediction distance (cm):	20
Prediction frequency (MHz):	2402
Antenna Gain, typical (dBi):	0
Maximum Antenna Gain (numeric):	1
Power density at predication frequency and distance (mW/cm^2):	0.000014
MPE limit for Occupational exposure at predication frequency (mW/cm^2):	1.0

6.3. Test Result

The device is compliant with the requirement MPE limit of General Population/Uncontrolled Exposure at predication frequency 1.0 mW/cm^2 .And the precaution is outlined in the user's manual to prevent to high level of RF energy.

7. SECTION 15.203 - ANTENNA REQUIREMENT

7.1. Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.2. Antenna Connector Construction

The antenna used in this product is PCB antenna. The antenna is permanently attached. Refer to the product photo.

8. SECTION 15.207 - CONDUCTED EMISSIONS

8.1. Applicable Standard

The specification used was with the FCC Part 15.207 limits.

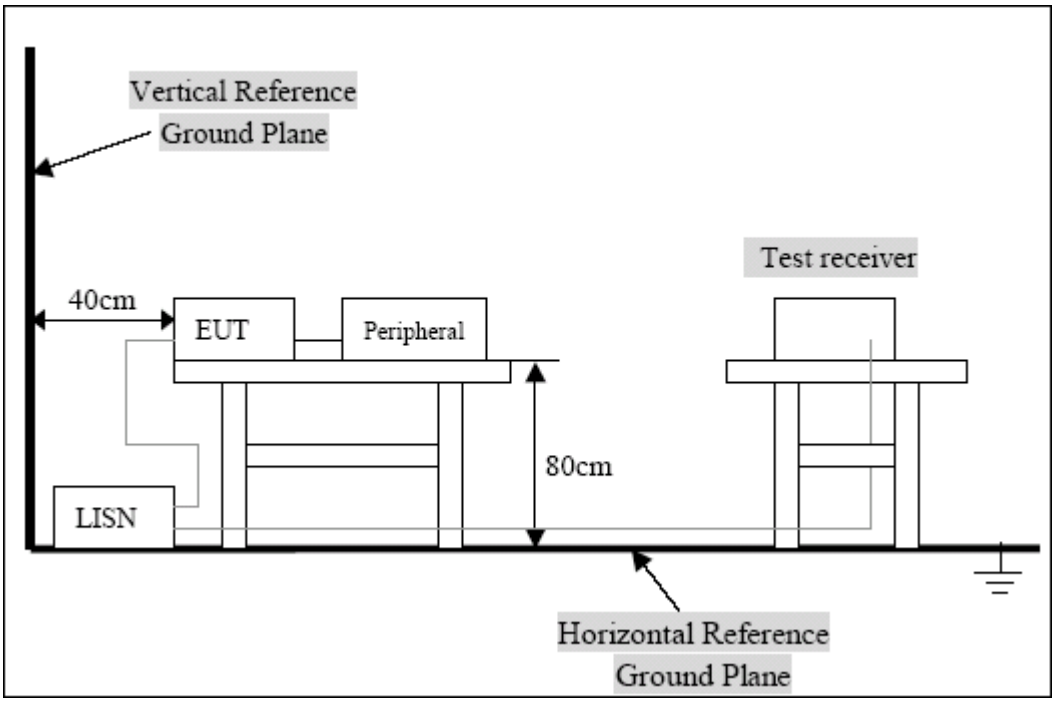
8.2. Test Procedure

During the conducted emission test, the EUT was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

8.3. Conducted Power line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHZ)	Class A QP/AV	Class B QP/AV
0.15-0.5	79/66	65-56/56-46
0.5-5.0	73/60	56-46
5.0-3.0	73/60	60-50

8.4. Block Diagram of Test Setup



8.5. Test Result

Pass

Date of Test:	April 22, 2011	Temperature:	25°C
EUT:	Bluetooth keyboard	Humidity:	52%
			DC 5V power by PC USB port
Model No.:	CR001	Power Supply:	PC power: AC120V/60Hz
Test Mode:	Charging	Test Engineer:	Jack Liu

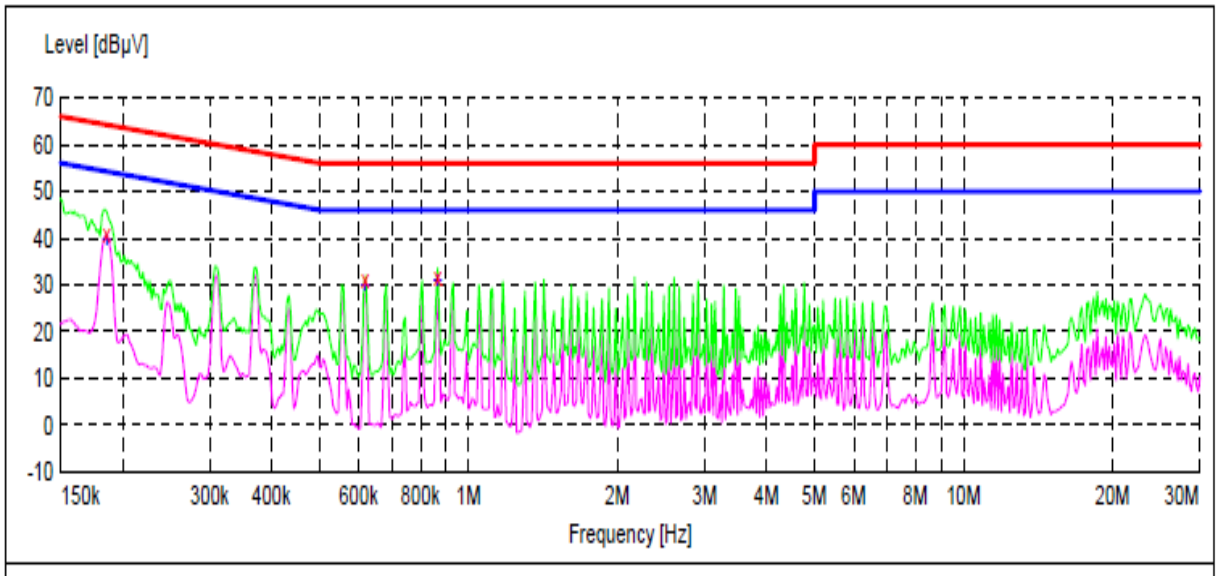
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.186000	41.10	11.2	64	23.1	QP	N	GND
0.618000	31.00	11.9	56	25.0	QP	N	GND
0.865500	32.00	11.9	56	24.0	QP	N	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.186000	39.90	11.2	54	14.3	AV	N	GND
0.618000	30.40	11.9	46	15.6	AV	N	GND
0.865500	31.10	11.9	46	14.9	AV	N	GND

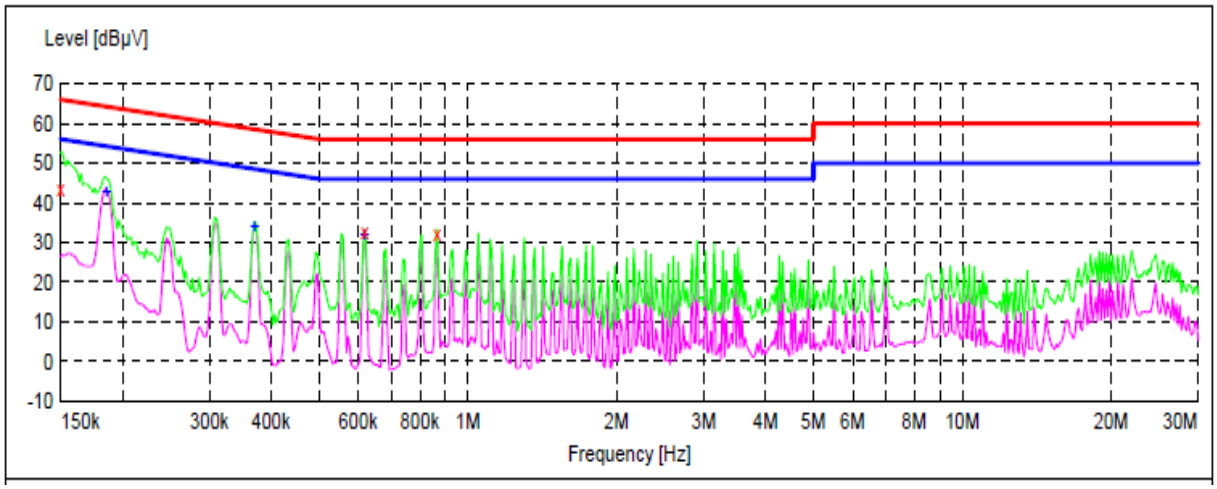
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	43.50	11.0	66	22.5	QP	L1	GND
0.618000	32.60	11.9	56	23.4	QP	L1	GND
0.865500	32.20	11.9	56	23.8	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.186000	43.00	11.2	54	11.2	AV	L1	GND
0.370500	34.50	11.8	49	14.0	AV	L1	GND
0.618000	32.40	11.9	46	13.6	AV	L1	GND

N line


Level [dBµV]
70
60
50
40
30
20
10
0
-10
150k
300k
400k
600k
800k
1M
2M
3M
4M
5M
6M
8M
10M
20M
30M
Frequency [Hz]

L Line


Level [dBµV]
70
60
50
40
30
20
10
0
-10
150k
300k
400k
600k
800k
1M
2M
3M
4M
5M
6M
8M
10M
20M
30M
Frequency [Hz]

9. SECTIONS 15.209, 15.205, 15.247(D) - RADIATED EMISSIONS

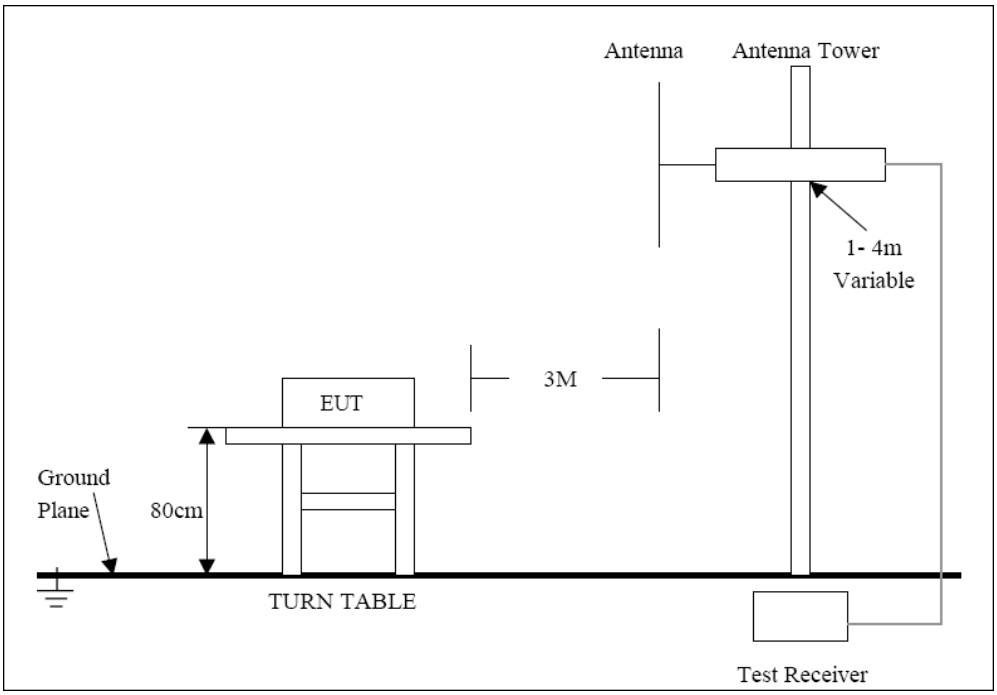
9.1. Test Equipment

Please refer to section 2 this report.

9.2. Test Procedure

The out of band emission tests were performed in the 3-meter chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part Subpart C limits. The EUT was tested in 3 orthogonal planes.

9.3. Radiated Test Setup



For the accrual test configuration,pleas refer to the related items-photos of Testing.

9.4. Radiated Emission Limit

Frequency (MHz)	Distance (m)	Field Strength (dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
ABOVE 960	3	54.0

9.5. Radiated Emission Test Result

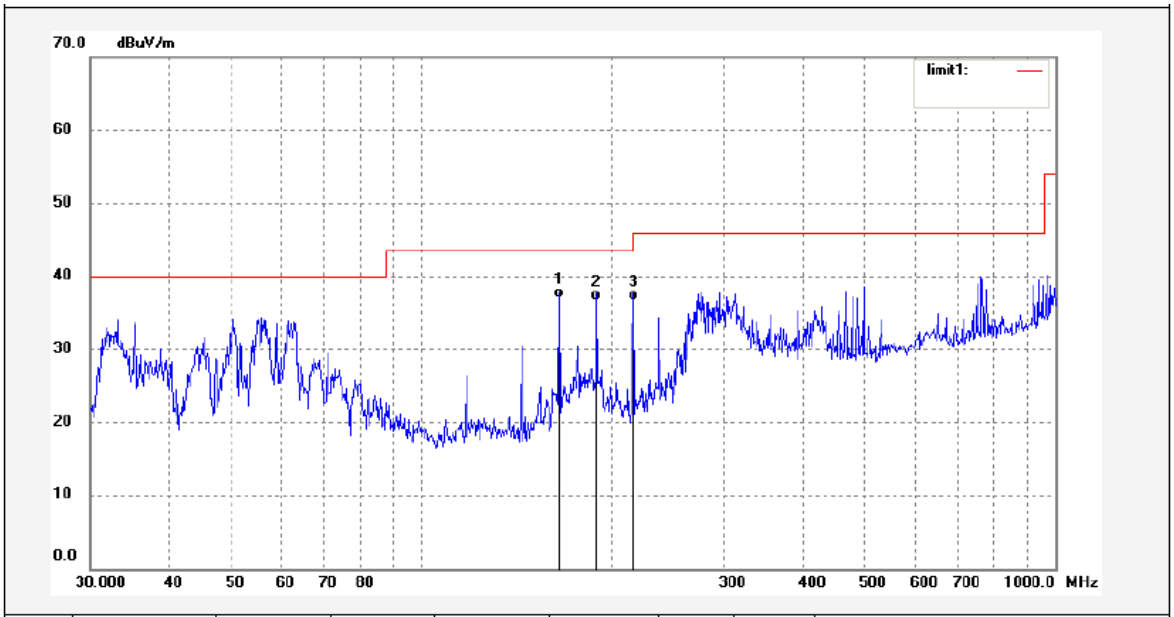
Pass

Date of Test:	April 23, 2011	Temperature:	25°C
EUT:	Bluetooth keyboard	Humidity:	52%
Model No.:	CR001	Power Supply:	DC 5V power by PC USB port PC power: AC120V/60Hz
Test Mode:	Charging	Test Engineer:	Jack Liu

Frequency (MHz)	Reading (dBμV/m)	Factor(dB) Corr.	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
	QP		QP	QP	QP	
165.8911	22.27	14.67	36.94	43.50	-6.56	Vertical
190.2075	21.85	14.87	36.72	43.50	-6.78	
215.8196	21.07	15.56	36.63	43.50	-6.87	
165.8910	22.33	14.67	37.00	43.50	-6.50	Horizontal
190.2074	21.82	14.87	36.69	43.50	-6.81	
215.8194	20.21	15.56	35.77	43.50	-7.73	

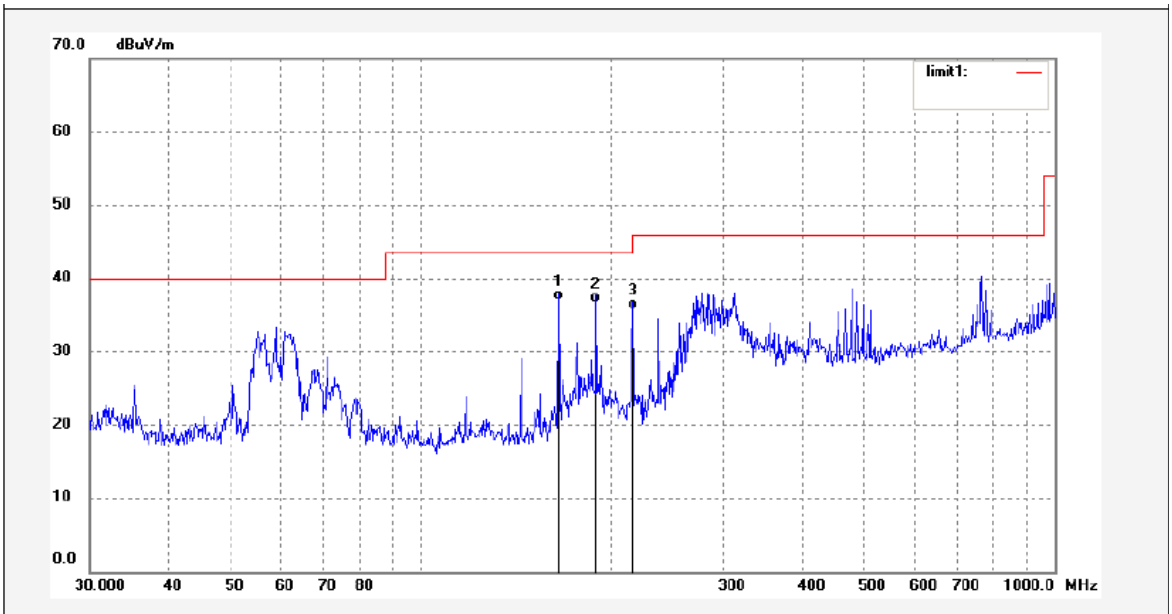
The spectral diagrams are attached as below display the measurement of peak values.

Vertical Polarization



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	165.8911	22.27	14.67	36.94	43.50	-6.56	QP	
2	190.2075	21.85	14.87	36.72	43.50	-6.78	QP	
3	215.8196	21.07	15.56	36.63	43.50	-6.87	QP	

Horizontal Polarization



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	165.8910	22.33	14.67	37.00	43.50	-6.50	QP	
2	190.2074	21.82	14.87	36.69	43.50	-6.81	QP	
3	215.8194	20.21	15.56	35.77	43.50	-7.73	QP	

Date of Test:	April 23, 2011	Temperature:	25°C
EUT:	Bluetooth keyboard	Humidity:	52%
Model No.:	CR001	Power Supply:	DC 3.7V
Test Mode:	Bluetooth TX 2402MHz	Test Engineer:	Jack Liu

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBμV/m)	Factor Corr. (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
	QP		QP	QP	QP	
51.4960	18.07	14.40	32.47	40.00	-7.53	Vertical
96.6484	19.11	13.89	33.00	43.50	-10.50	Vertical
145.2760	21.43	14.48	35.91	43.50	-7.59	Vertical
145.2760	17.01	14.48	31.49	43.50	-12.01	Horizontal
431.7932	13.08	22.96	36.04	46.00	-9.96	Horizontal
499.2379	11.48	23.99	35.47	46.00	-10.53	Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBμV/m)		Factor Corr. (dB)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2400.000	50.21	53.59	-7.46	42.75	46.13	54	74	-11.25	-27.87	Vertical
2402.030	86.21	89.69	-7.45	78.76	82.24	-	-	-	-	Vertical
*4804.044	50.42	54.84	-0.30	50.12	54.54	54	74	-3.88	-19.46	Vertical
2400.000	46.61	49.92	-7.46	39.15	42.46	54	74	-14.85	-31.54	Horizontal
2402.030	82.33	85.68	-7.45	74.88	78.23	-	-	-	-	Horizontal
*4804.044	49.17	53.46	-0.30	48.87	53.16	54	74	-5.13	-20.84	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.

2. *: Denotes restricted band of operation.

Date of Test:	April 23, 2011	Temperature:	25°C
EUT:	Bluetooth keyboard	Humidity:	52%
Model No.:	CR001	Power Supply:	DC 3.7V
Test Mode:	Bluetooth TX 2441MHz	Test Engineer:	Jack Liu

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBμV/m)	Factor Corr. (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
	QP		QP	QP	QP	
43.2305	14.48	16.83	31.31	40.00	-8.69	Vertical
96.6484	18.96	13.89	32.85	43.50	-10.65	Vertical
145.2760	22.67	14.48	37.15	43.50	-6.35	Vertical
145.2760	18.85	14.48	33.33	43.50	-10.17	Horizontal
431.7933	13.74	22.96	36.70	46.00	-9.30	Horizontal
499.2379	11.62	23.99	35.61	46.00	-10.39	Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBμV/m)		Factor Corr. (dB)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2.441.030	82.75	86.22	-7.35	75.40	78.87	-	-	-	-	Vertical
*4882.04	49.96	54.42	0.14	50.10	54.56	54	74	-3.90	-19.4	Vertical
2.441.030	82.94	86.20	-7.35	75.59	78.85	-	-	-	-	Horizontal
*4882.04	48.51	53.19	0.14	48.65	53.33	54	74	-5.35	-20.6	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.

2. *: Denotes restricted band of operation.

Date of Test:	April 23, 2011	Temperature:	25°C
EUT:	Bluetooth keyboard	Humidity:	52%
Model No.:	CR001	Power Supply:	DC 3.7V
Test Mode:	Bluetooth TX 2480MHz	Test Engineer:	Jack Liu

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBμV/m)	Factor Corr. (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Polarization
	QP		QP	QP	QP	
96.1485	19.33	13.88	33.21	43.50	-10.29	Vertical
145.2760	20.13	14.48	34.61	43.50	-8.89	Vertical
151.9955	18.56	14.54	33.10	43.50	-10.40	Vertical
155.7427	17.38	14.57	31.95	43.50	-11.55	Horizontal
158.9289	17.64	14.59	32.23	43.50	-11.27	Horizontal
431.7932	14.45	22.96	37.41	46.00	-8.59	Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBμV/m)		Factor Corr. (dB)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2.480.000	85.38	88.53	-7.37	78.01	81.16	-	-	-	-	Vertical
2483.500	40.11	43.37	-7.37	32.74	36.00	54	74	-21.2	-38.0	Vertical
*4960.00	49.17	53.46	0.52	49.69	53.98	54	74	-4.31	-20.0	Vertical
2.480.000	83.34	86.49	-7.37	75.97	79.12	-	-	-	-	Horizontal
2483.500	38.31	41.57	-7.37	30.94	34.20	54	74	-23.0	-39.8	Horizontal
*4960.00	48.41	52.83	0.52	48.93	53.35	54	74	-5.07	-20.6	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.

2. *: Denotes restricted band of operation.

10. SECTION 15.247(A) (1) – CHANNEL SEPARATION TEST

10.1. Test Equipment

Please refer to section 2 this report.

10.2.Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another truce
3. Measure the channel separation.

10.3.Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

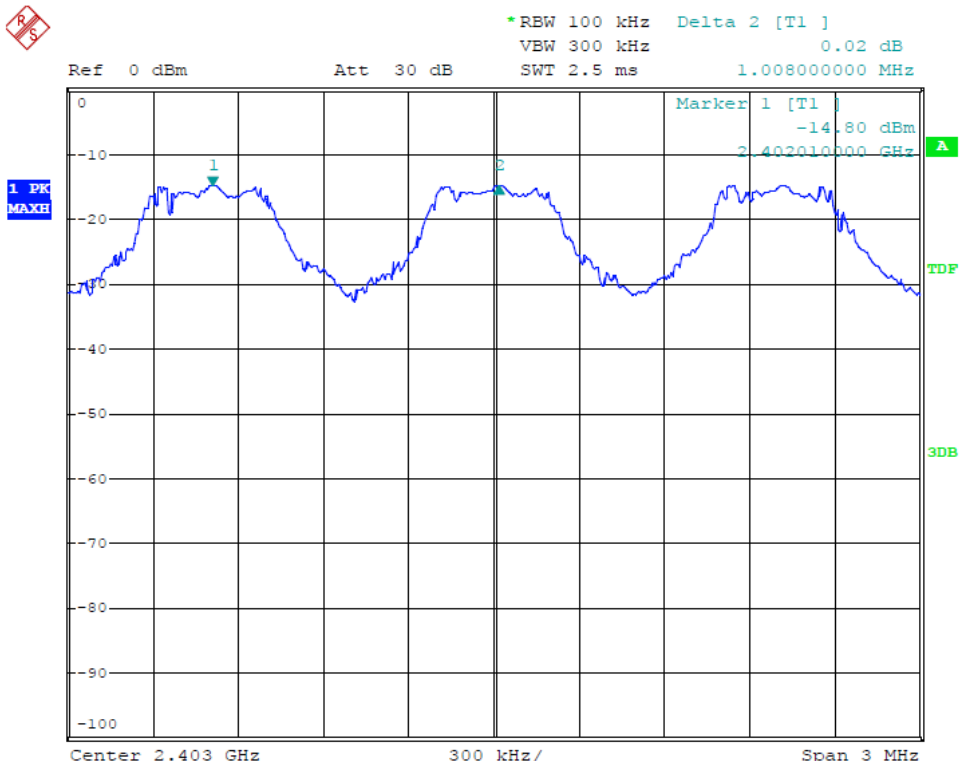
10.4. Test Result:

Pass.

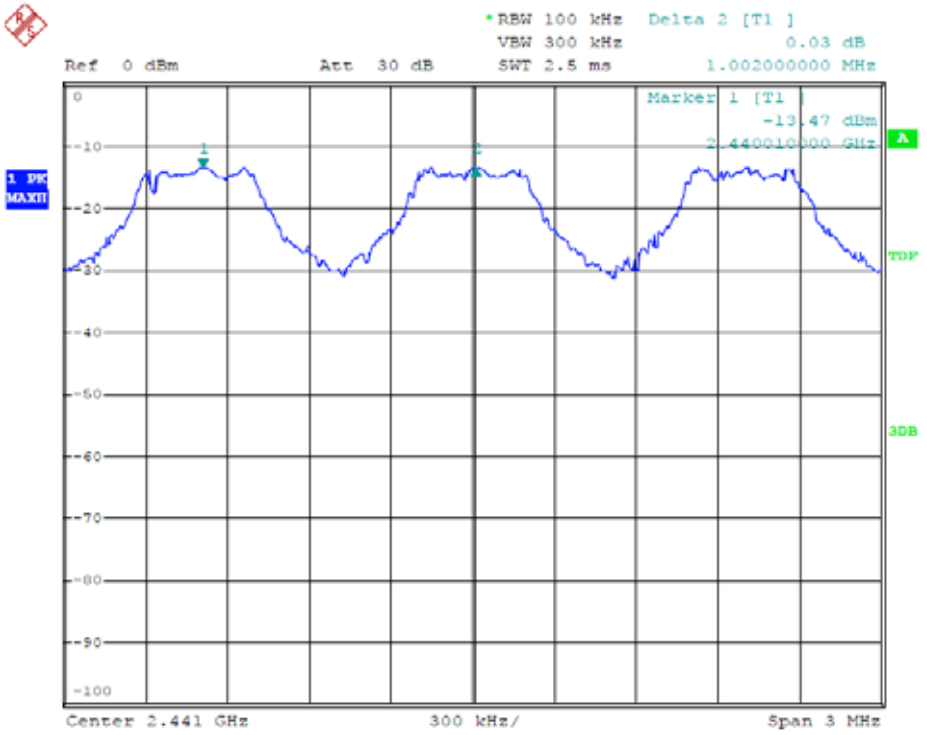
Channel	Channel Frequency (MHz)	Channel separation (MHz)	Limit
Low	2402	1.008	> the 20dB Bandwidth or 25kHz (whichever is greater)
Middle	2441	1.002	> the 20dB Bandwidth or 25kHz (whichever is greater)
High	2480	1.002	> the 20dB Bandwidth or 25kHz (whichever is greater)

The spectrum analyzer plots are attached as below.

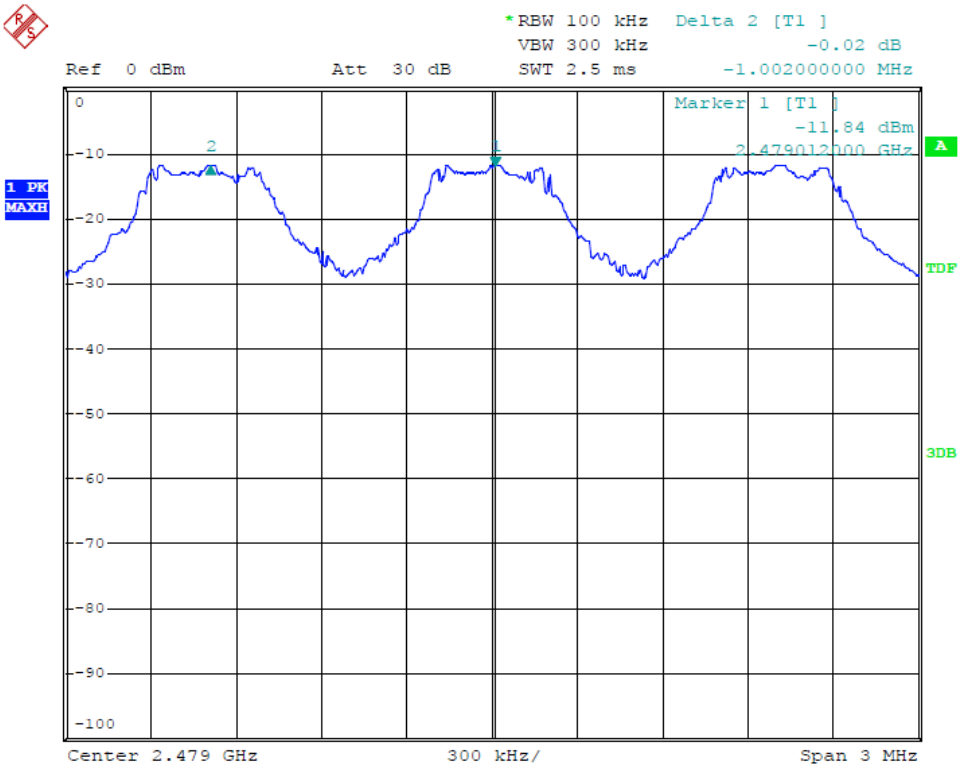
Low Channel



Middle Channel



High Channel



11. SECTION 15.247(A) (1) –20DB BANWIDTH TESTING

11.1. Test Equipment

Please refer to Section 2 this report.

11.2.Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

11.3.Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

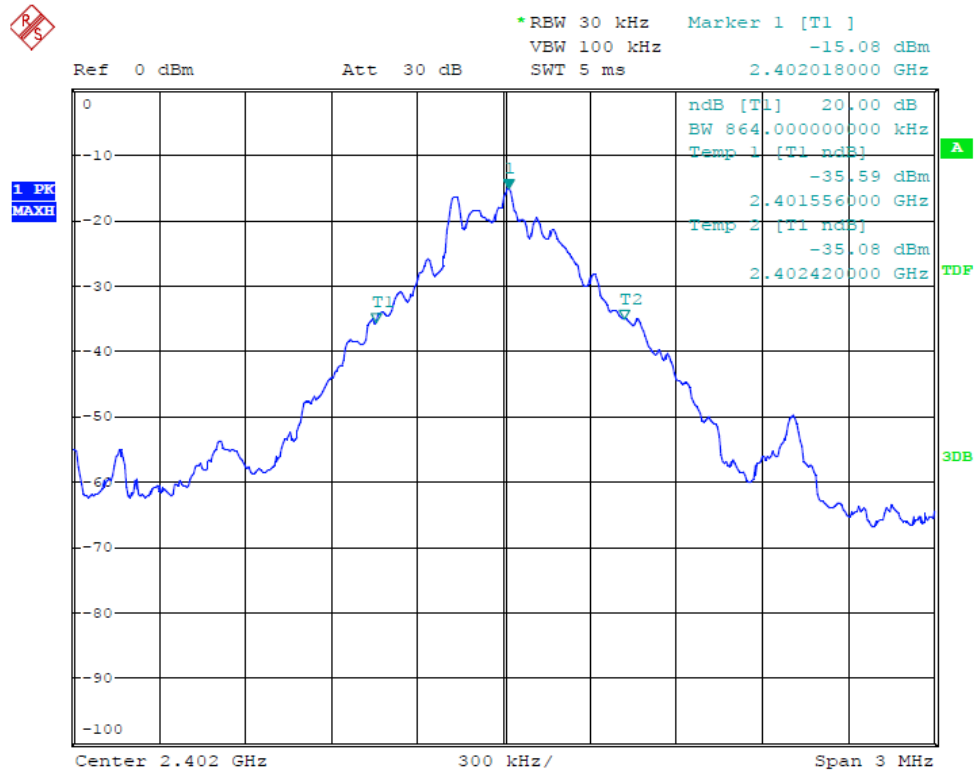
11.4. Test Result:

Pass.

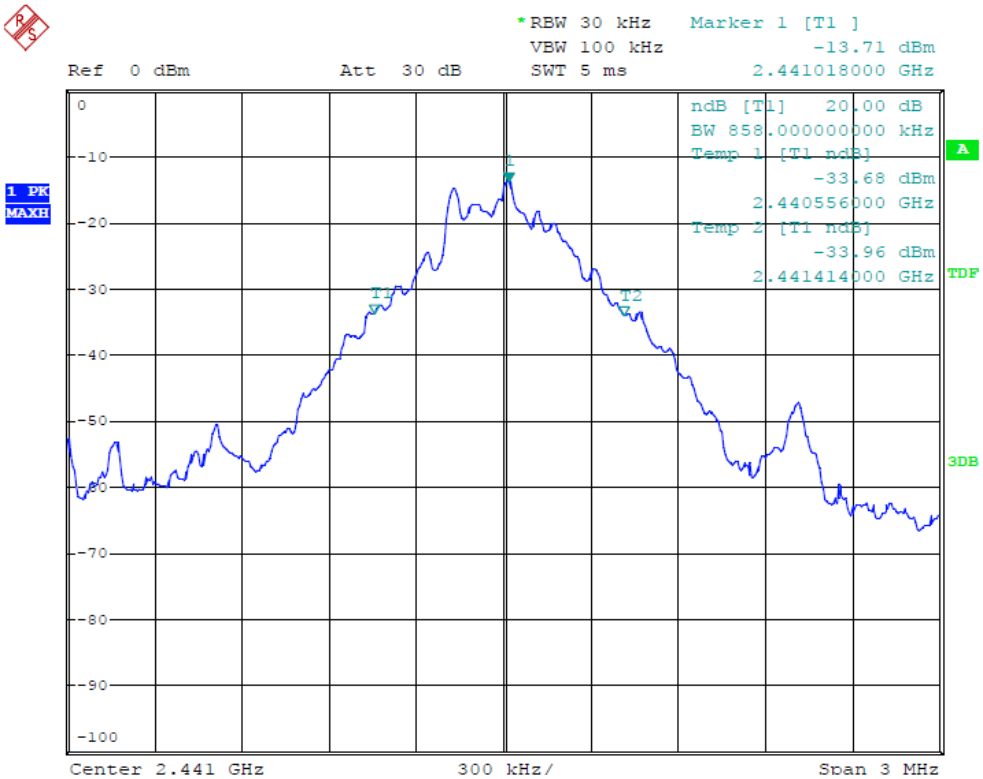
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
Low	2402	0.864	---
Middle	2441	0.858	---
High	2480	0.870	---

The spectrum analyzer plots are attached as below.

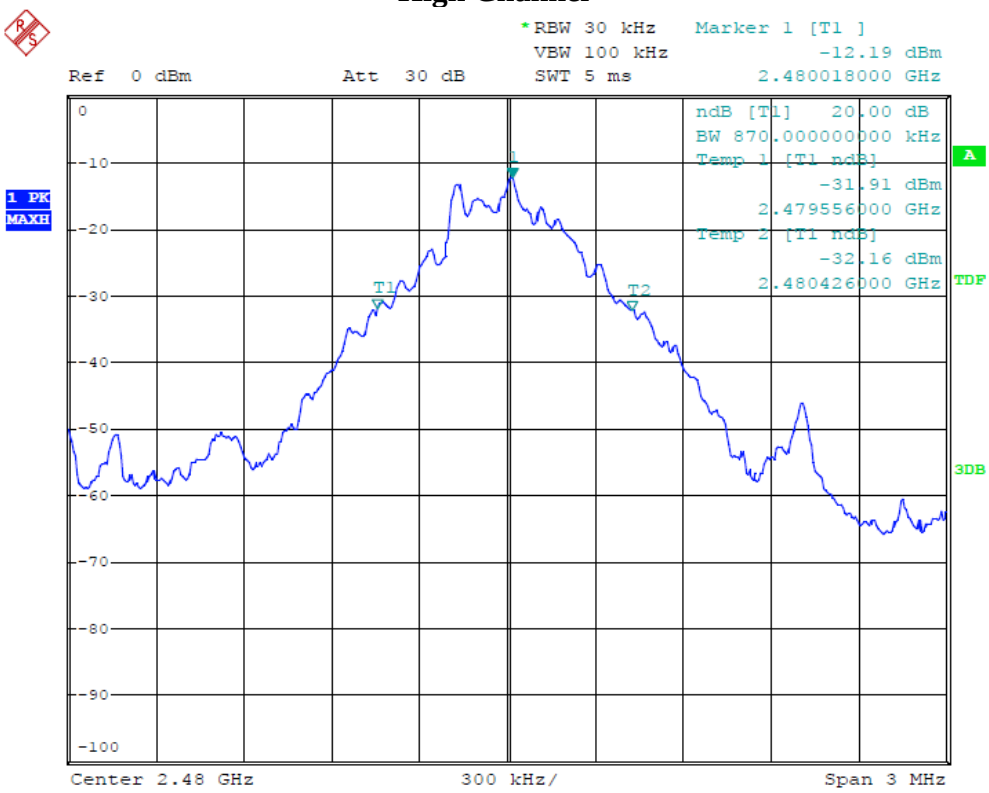
Low Channel



Middle Channel



High Channel



12. SECTION 15.247(A) (1) (III)-QUANTITY OF HOPPING CHANNEL TEST

12.1. Test Equipment

Please refer to Section 2 this report.

12.2. Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in hopping mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

12.3.Applicable Standard

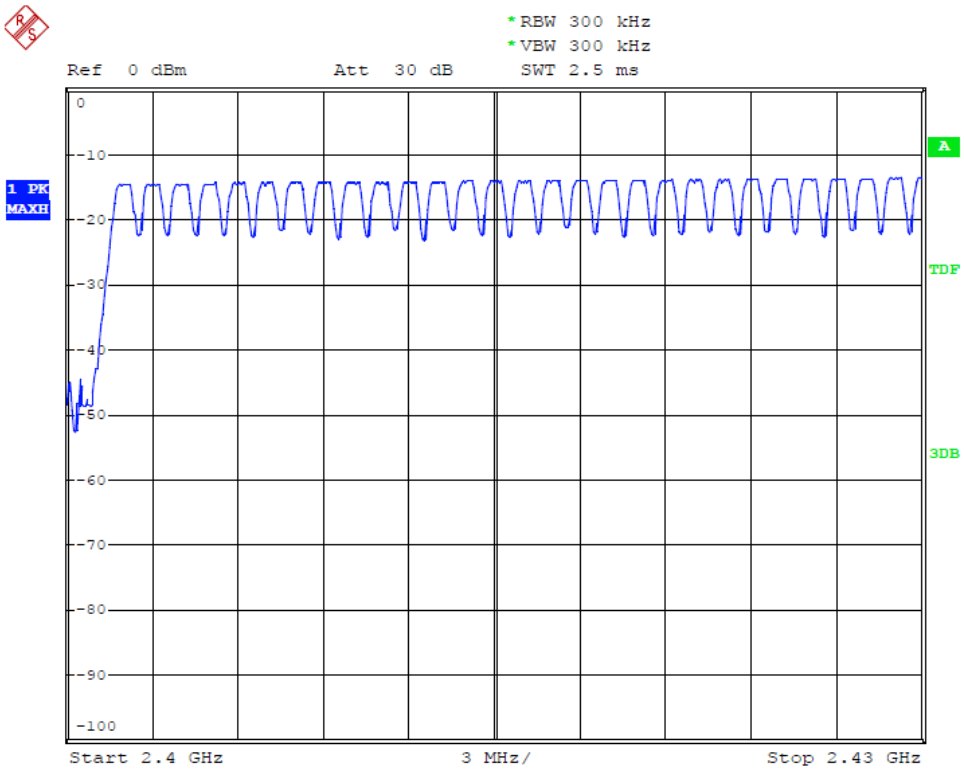
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

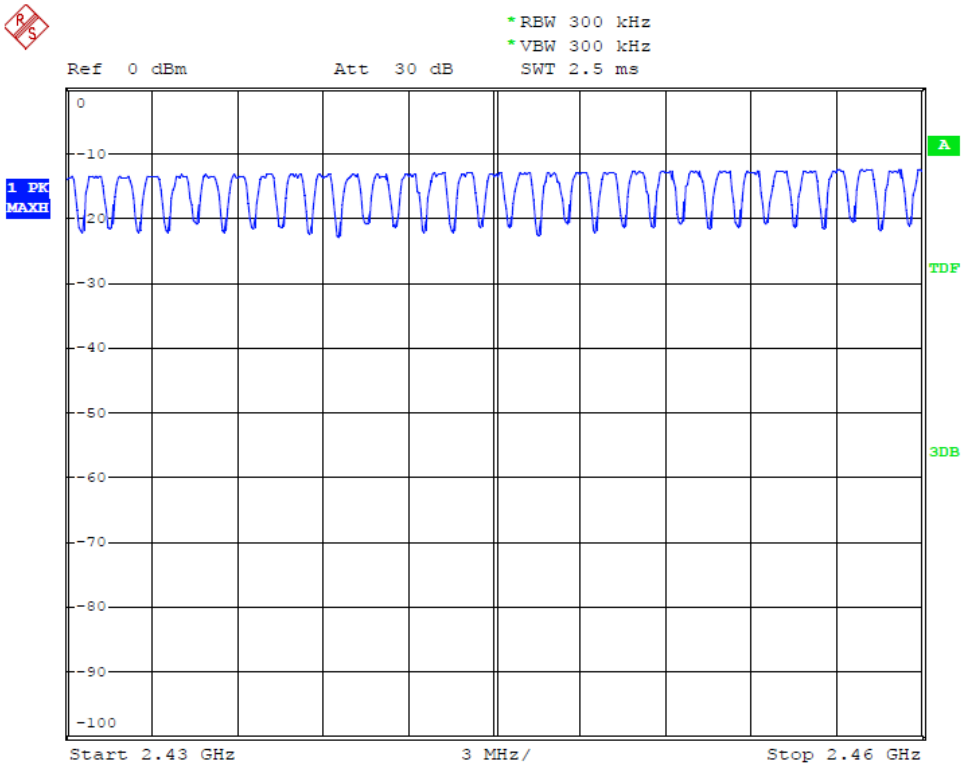
12.4. Test Result:

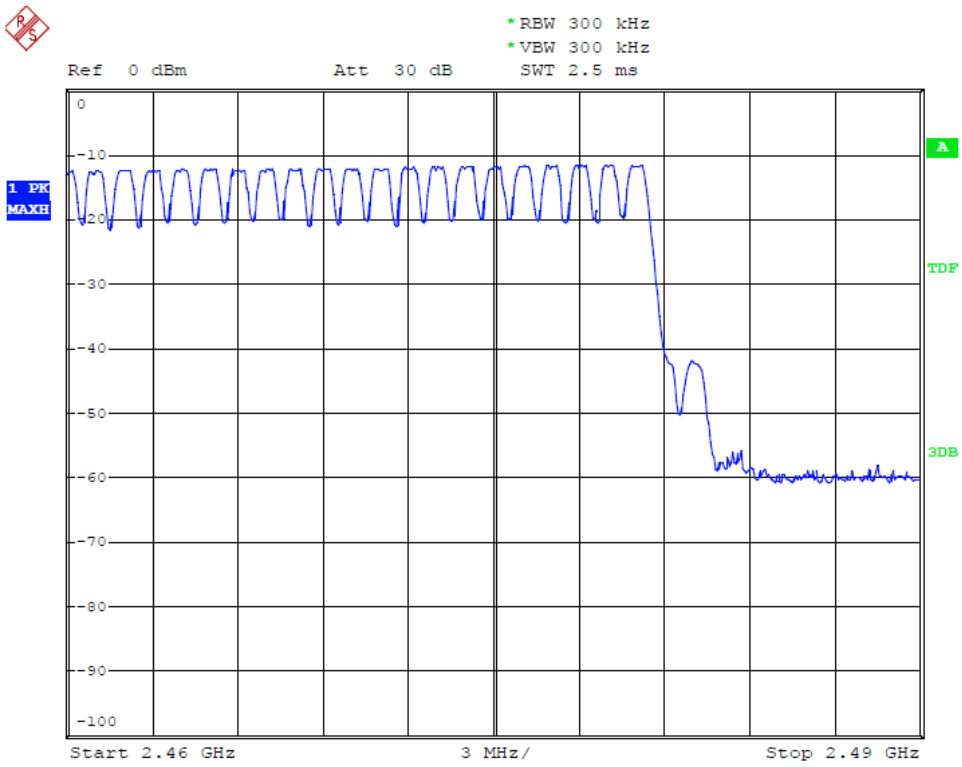
Pass.

	Measurement result (CH)	Limit (CH)
Total number of hopping channel	79	>15

The spectrum analyzer plots are attached as below.


*RBW 300 kHz
*VBW 300 kHz
Ref 0 dBm
Att 30 dB
SWT 2.5 ms
1 PK MAXH
A
TDF
3DB
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Start 2.4 GHz
3 MHz/
Stop 2.43 GHz


*RBW 300 kHz
*VBW 300 kHz
Ref 0 dBm
Att 30 dB
SWT 2.5 ms
1 PK MAXH
A
TDF
3DB
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Start 2.43 GHz
3 MHz/
Stop 2.46 GHz


*RBW 300 kHz
*VBW 300 kHz
Ref 0 dBm
Att 30 dB
SWT 2.5 ms
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
1 PK
MAXH
A
TDF
3DB
Start 2.46 GHz
3 MHz/
Stop 2.49 GHz

13. SECTION 15.247(A) (1) (III)- TIME OF OCCUPANCY (DWELL TIME)

13.1. Test Equipment

Please refer to Section 2 this report.

13.2. Test Procedure

1. The transmitter output was connected to the spectrum analyzer through a low loss cable.
2. Set center frequency of spectrum analyzer = operating frequency.
3. Set the spectrum analyzer as RBW=100kHz, VBW=300kHz, Span=0Hz, Adjust Sweep=1s. Get the burst (in 1 sec.).
4. Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz, Adjust Sweep=2ms. Get the pulse time.
5. Repeat above procedures until all frequency measured were complete.

13.3. Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

13.4. Test Result:

Pass.

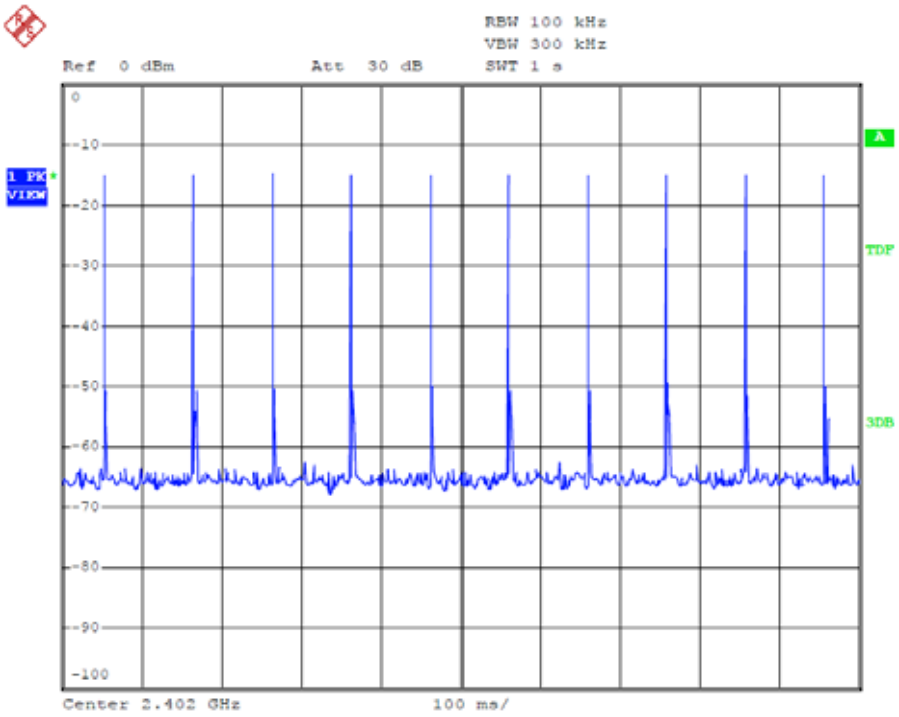
A period transmit time = 0.4 × 79 = 31.6

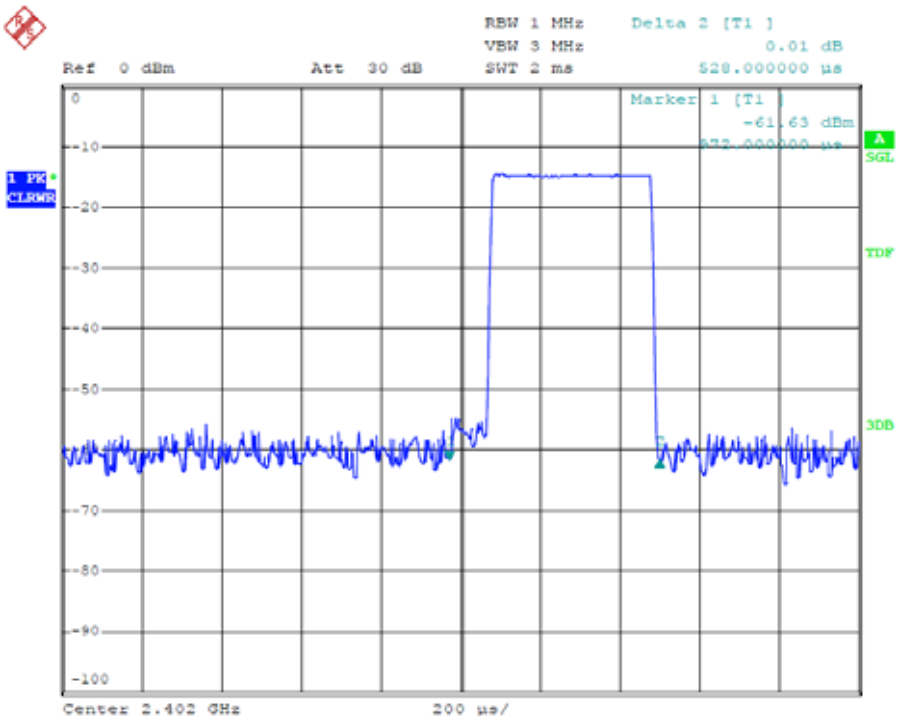
Dwell time = pulse time × burst (in 1 sec.)×31.6

Channel	Channel Frequency (MHz)	Pulse Time (ms)	Burst (in 1 sec.)	Dwell Time (ms)	Limit (ms)
Low	2402	0.528	10	166.85	400
Middle	2441	0.524	10	165.58	400
High	2480	0.524	10	165.58	400

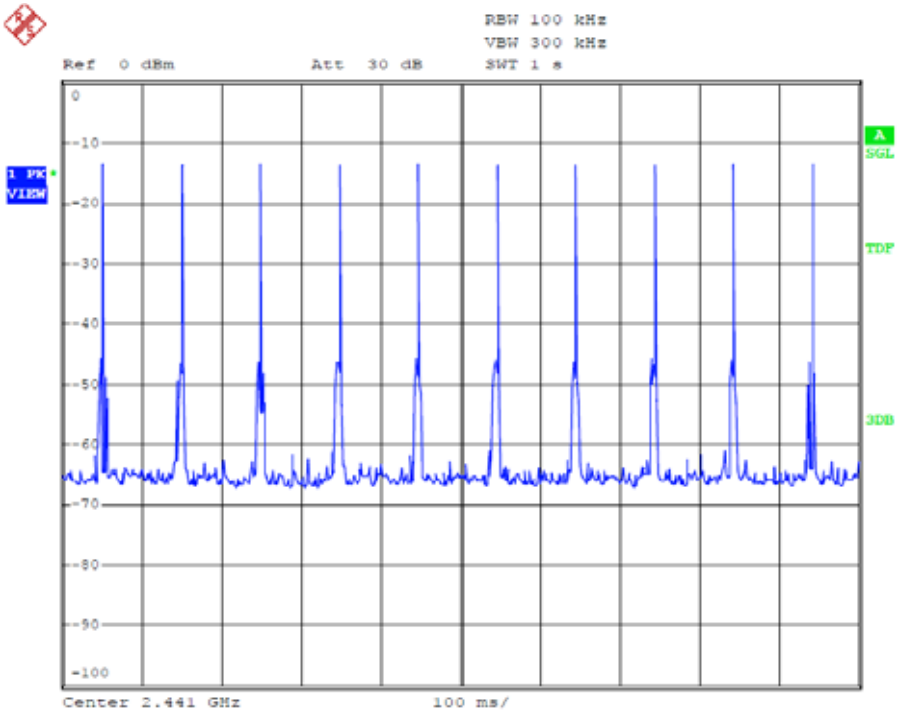
The spectrum analyzer plots are attached as below.

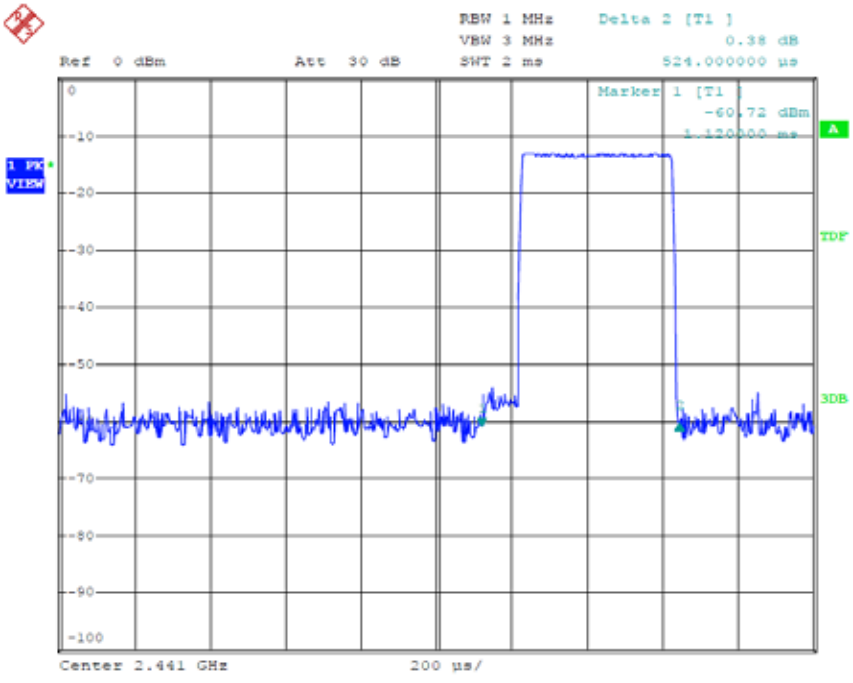
Low Channel


RBW 100 kHz
VBW 300 kHz
Ref 0 dBm
Att 30 dB
SWT 1 s
1 PK VIEW
A
TDF
3DB
Center 2.402 GHz
100 ms/

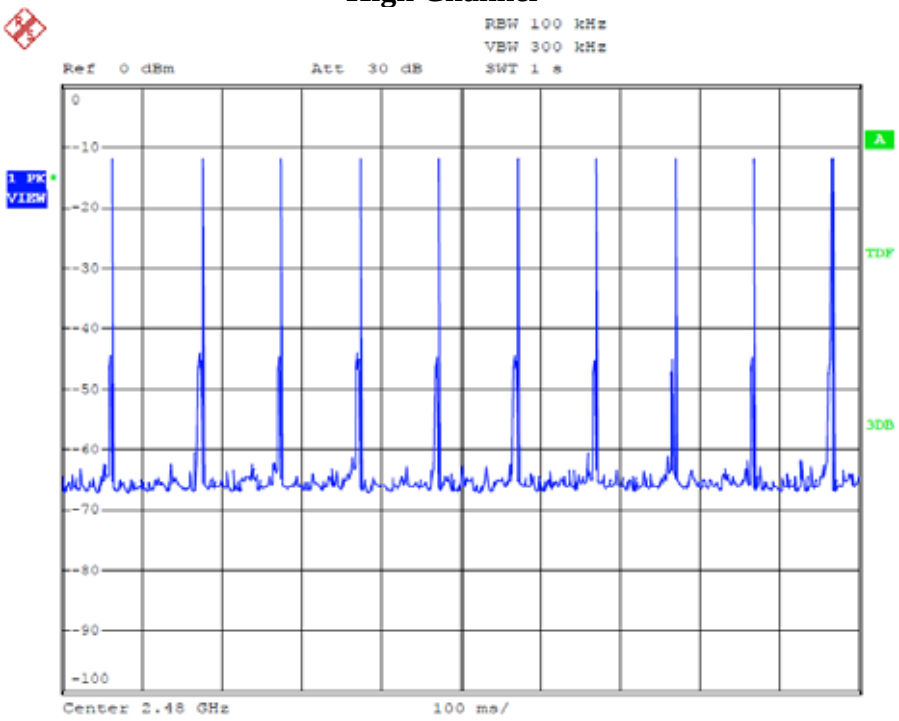

RBW 1 MHz
Delta 2 [T1]
VBW 3 MHz
0.01 dB
Ref 0 dBm
Att 30 dB
SWT 2 ms
528.000000 µs
Marker 1 [T1]
-61.63 dBm
1 PK CLRWR
A
SGL
TDF
3DB
Center 2.402 GHz
200 µs/

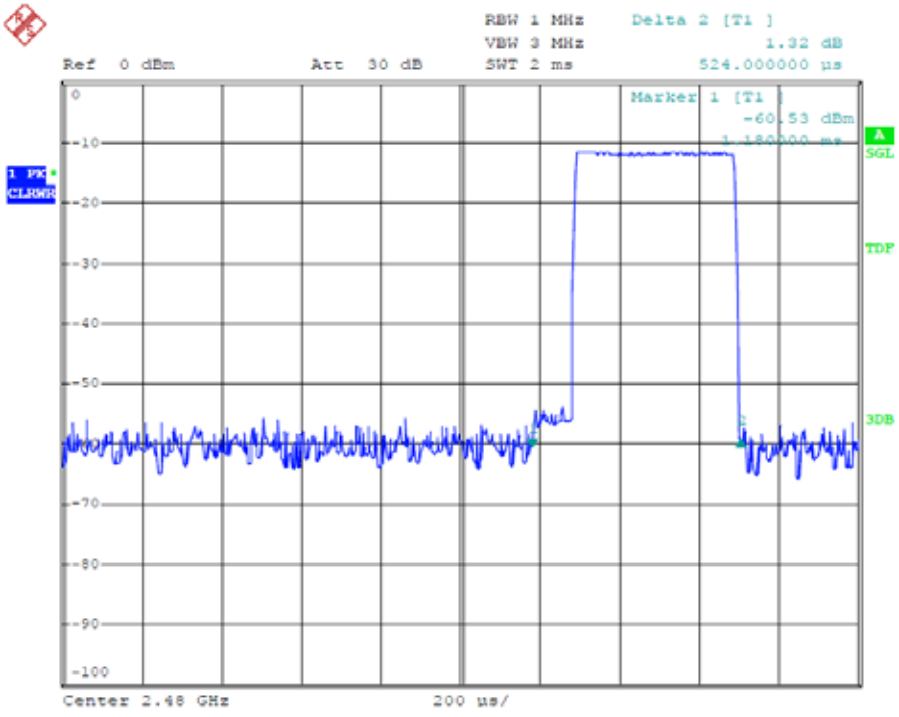
Middle Channel





High Channel





14. SECTION 15.247(B) (1) - Maximum Peak Output Power

14.1. Test Equipment

Please refer to Section 2 this report.

14.2.Test Procedure

1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.
4. Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode.
5. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run".
6. Trace average 100 traces in power averaging mode.
7. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

14.3.Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

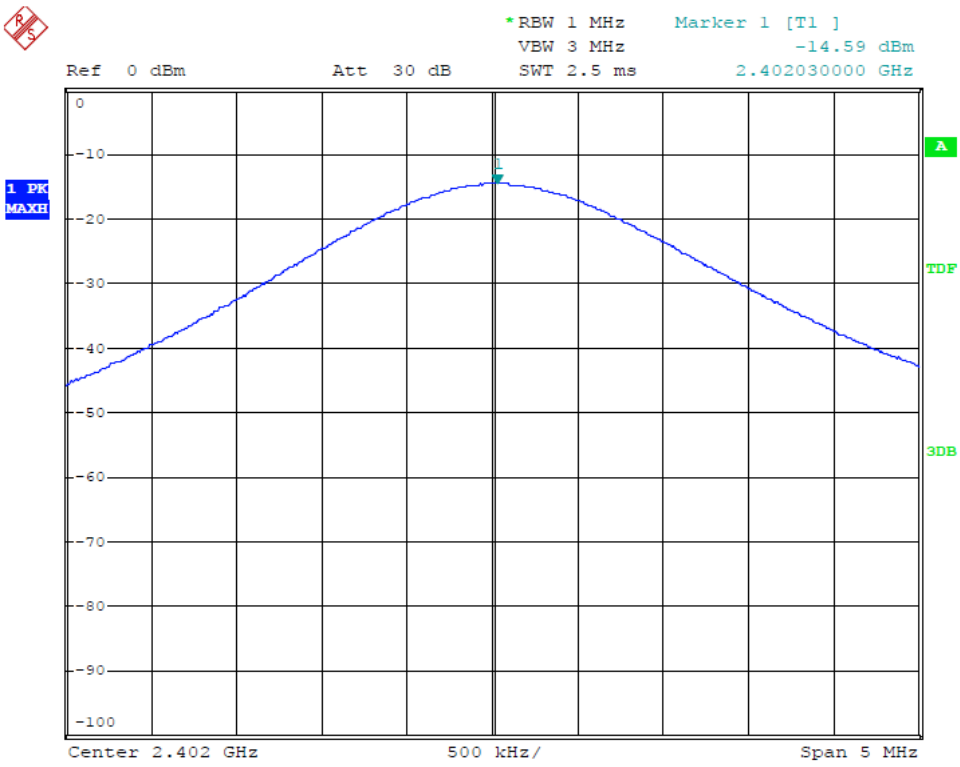
14.4. Test Result

Pass

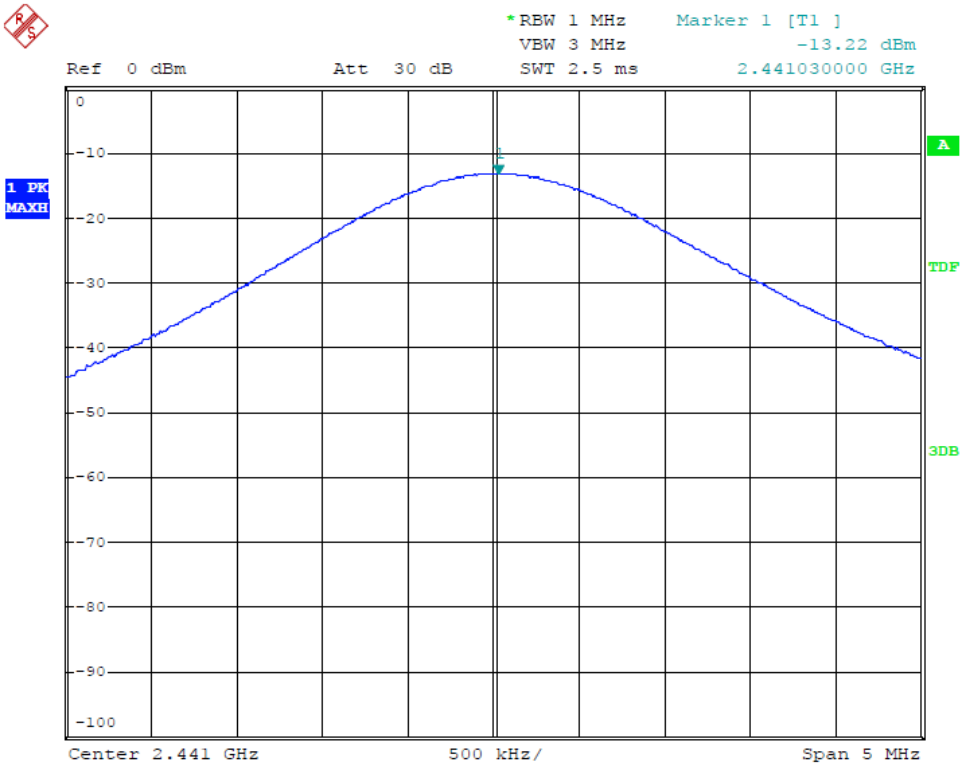
Channel	Frequency (MHz)	Peak Output Power (dBm)	Peak Output Power (mW)	Limits dBm / W
Low	2402	-14.59	0.035	30 dBm / 1 W
Middle	2441	-13.22	0.048	30 dBm / 1 W
High	2480	-11.59	0.069	30 dBm / 1 W

The spectrum analyzer plots are attached as below.

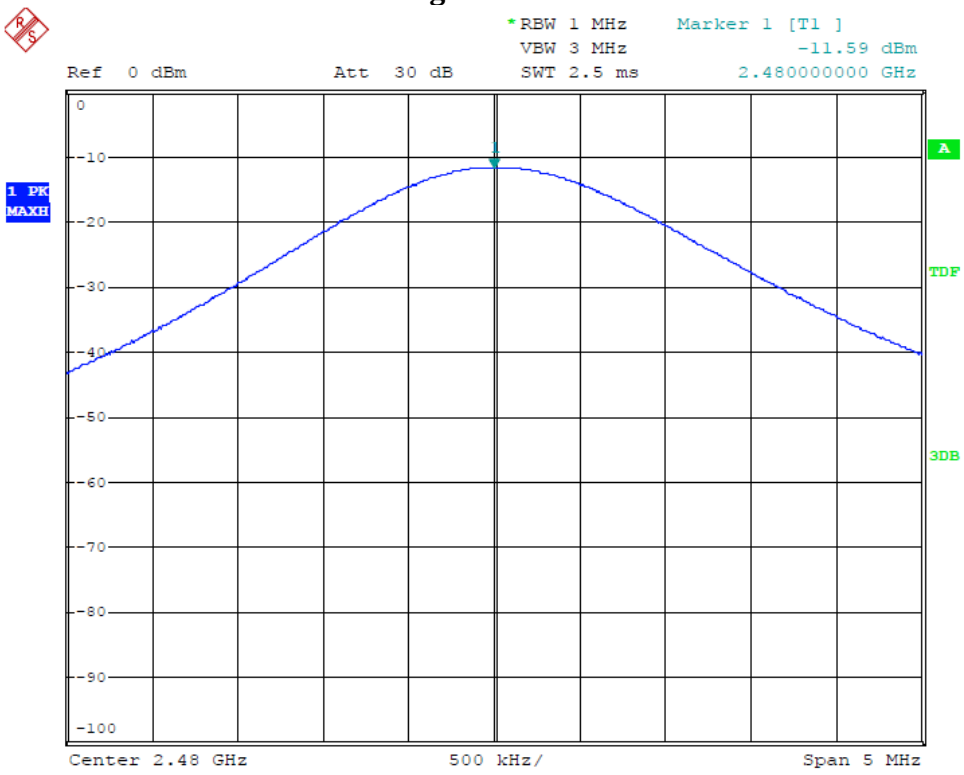
Low Channel



Middle Channel



High Channel



15. SECTION 15.247(D) –Band Edge

15.1.Test Equipment

Please refer to Section 2 this report.

15.2.Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
Note: For Rdstricted Band
RBW=1MHz
VBW=1 MHz
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

15.3.Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

15.4.Test Result

Pass

Conducted test

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
2402	35.99	> 20dBc
2480	45.86	> 20dBc

The spectrum analyzer plots are attached as below.

Radiated test

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

TX 2402MHz

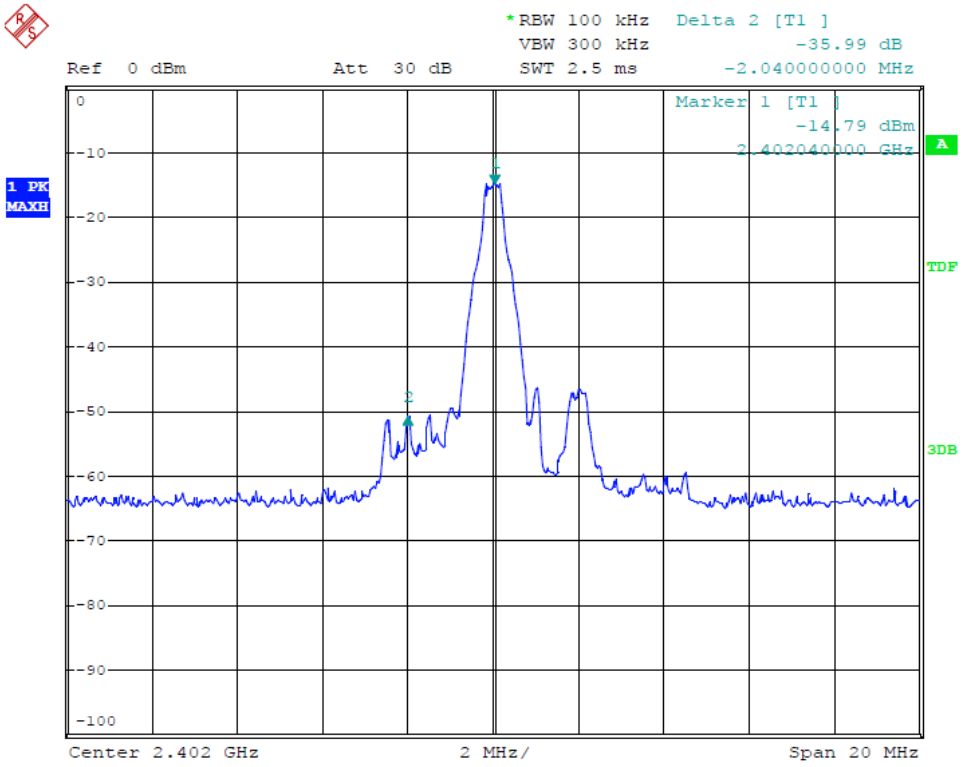
Frequency (MHz)	Reading(dBμV/m)		Factor Corr. (dB)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
-	-	-	-	-	-	-	-	-	-	Vertical
-	-	-	-	-	-	-	-	-	-	Horizontal

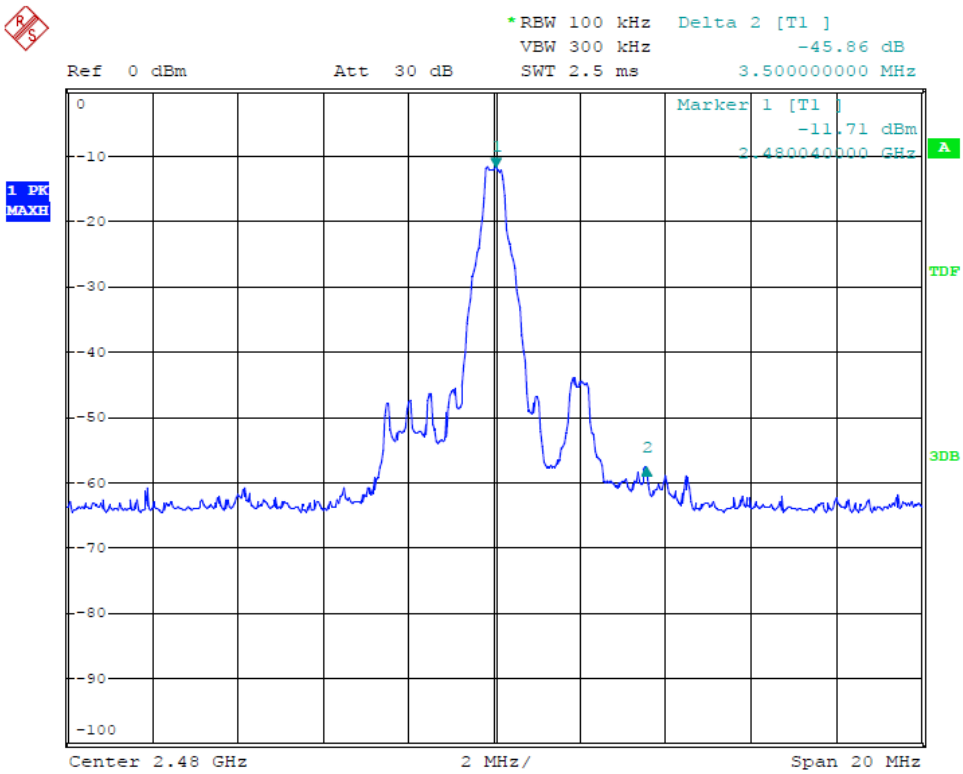
TX 2480MHz

Frequency (MHz)	Reading(dBμV/m)		Factor Corr. (dB)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
-	-	-	-	-	-	-	-	-	-	Vertical
-	-	-	-	-	-	-	-	-	-	Horizontal

Emissions attenuated more than 20 dB below the permissible value are not reported.

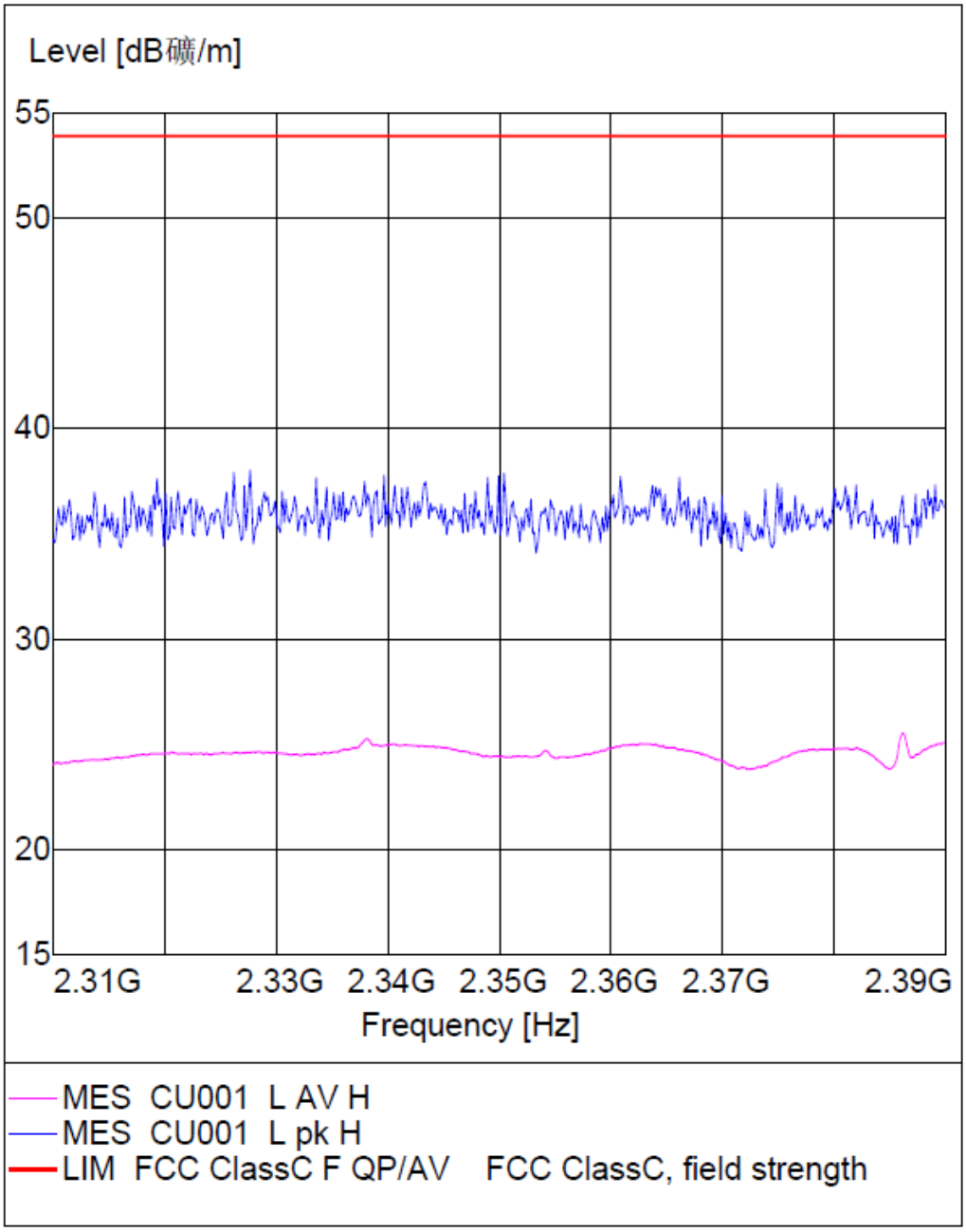
The spectral diagrams are attached as below display the measurement of peak values.


*RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 2 [T1]
-35.99 dB
-2.040000000 MHz
Ref 0 dBm
Att 30 dB
Marker 1 [T1]
-14.79 dBm
2.402040000 GHz
1 PK
MAXH
A
TDF
3DB
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 2.402 GHz
2 MHz/
Span 20 MHz


*RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 2 [T1]
-45.86 dB
3.500000000 MHz
Ref 0 dBm
Att 30 dB
Marker 1 [T1]
-11.71 dBm
2.480040000 GHz
1 PK
MAXH
A
TDF
3DB
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
Center 2.48 GHz
2 MHz/
Span 20 MHz

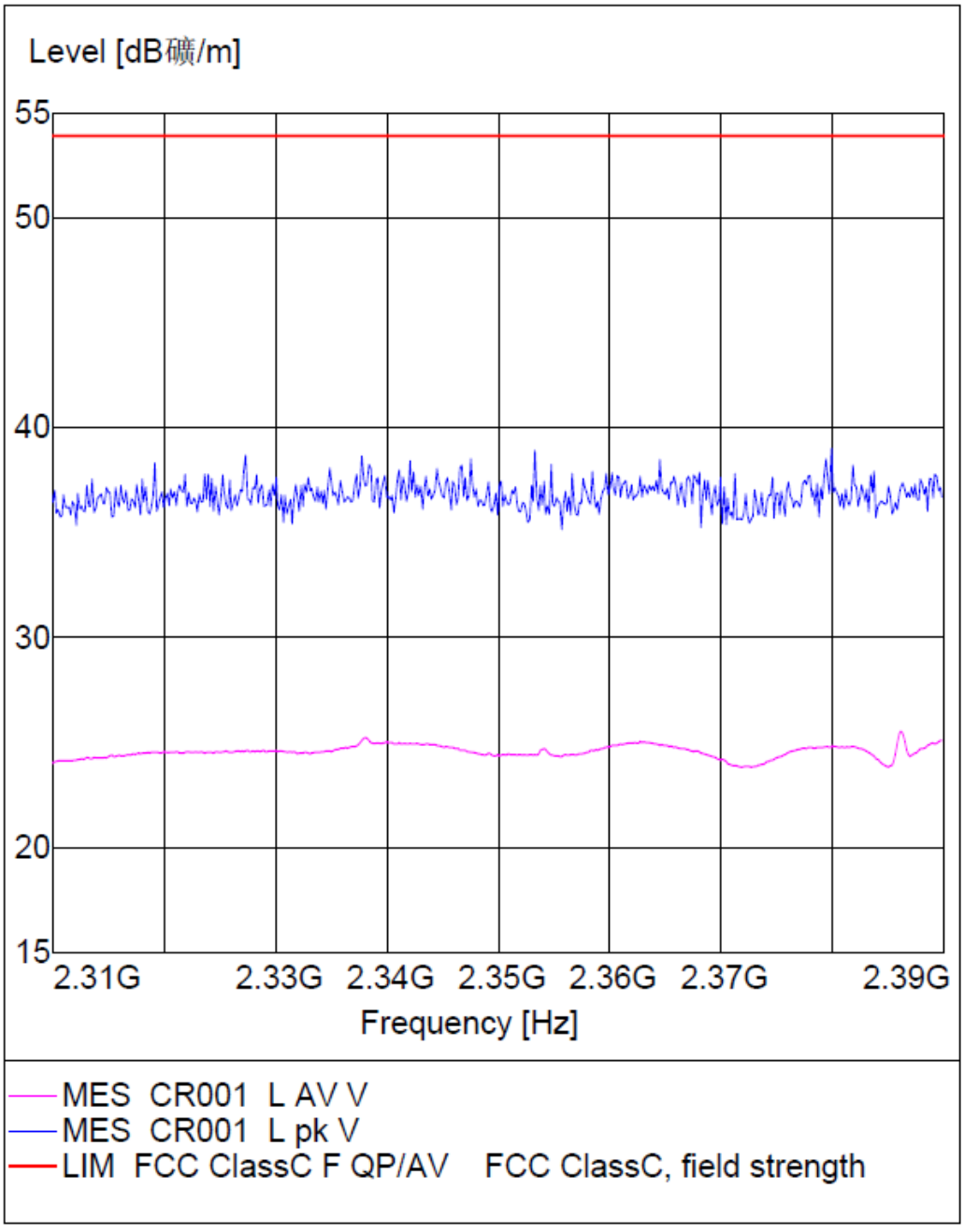
RADIATED EMISSION

EUT: CR001
Manufacturer:
Operating Condition: TX 2402MHz
Test Specification: Horizontal



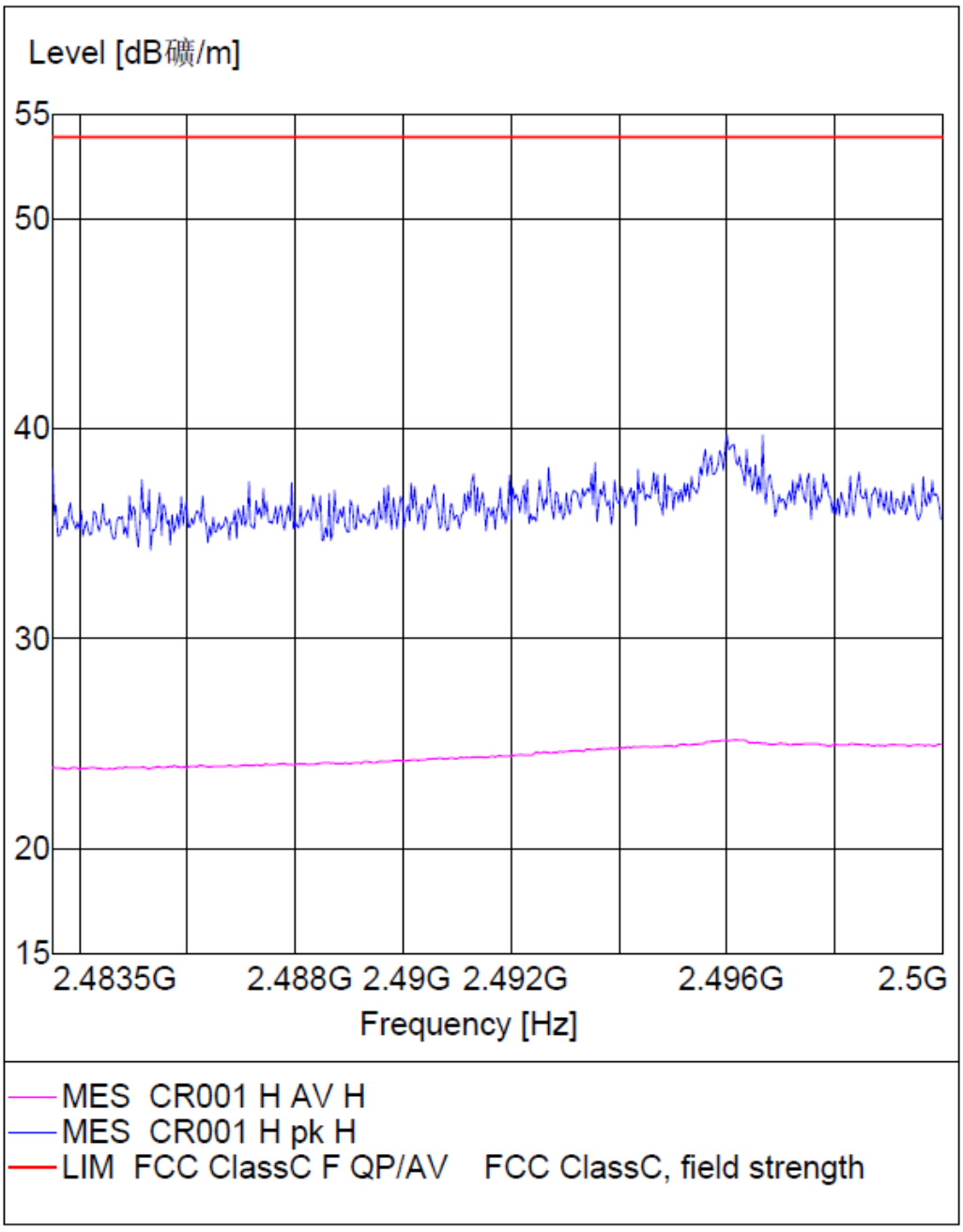
RADIATED EMISSION

EUT: CR001
Manufacturer:
Operating Condition: TX 2402MHz
Test Specification: Vertical



RADIATED EMISSION

EUT: CR001
Manufacturer:
Operating Condition: TX 2480MHz
Test Specification: HORIZONTAL



RADIATED EMISSION

EUT: CR001
Manufacturer:
Operating Condition: TX 2480MHz
Test Specification: Vertical