



# RF TEST REPORT

**Report No.:** SET2018-07886

**Product Name:** Painobook

**FCC ID:** 2AQBQ-PEGLEG

**Model No. :** PegLeg v3.4

**Applicant:** Novalia Limited

**Address:** Ground Floor Regent House, 133 Station Road, Impington, CB24 9NP, UK

**Dates of Testing:** 06/25/2018 — 06/26/2018

**Issued by:** CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

**Lab Location:** Building 28/29, East of Shigu Xili Industrial Zone, Nanshan District Shenzhen, Guangdong 518055, China

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## Test Report

**Product Name** ..... : Painobook

**Brand Name** ..... : Novalia

**Trade Name** ..... : Novalia

**Applicant** ..... : Novalia Limited

**Applicant Address** ..... : Ground Floor Regent House, 133 Station Road,  
Impington, CB24 9NP, UK

**Manufacturer** ..... : Novalia Limited

**Manufacturer Address** ..... : Ground Floor Regent House, 133 Station Road,  
Impington, CB24 9NP, UK

**Test Standards** ..... : 47 CFR Part 15 Subpart C: Radio Frequency Devices  
ANSI C63.10-2013: American National Standard for  
Testing Unlicensed Wireless Devices

**Test Result** ..... : PASS

**Tested by** ..... :

2018.06.26

Shallwe Yang, Test Engineer

**Reviewed by** ..... :

2018.06.26

Zhu Qi, Senior Engineer

**Approved by** ..... :

2018.06.26

Smart Li, Manager

## TABLE OF CONTENTS

<b>RF TEST REPORT .....</b>	<b>1</b>
<b>1. GENERAL INFORMATION .....</b>	<b>4</b>
1.1. EUT Description .....	4
1.2. Test Standards and Results.....	5
1.3. Table for Supporting Units.....	6
1.4. Facilities and Accreditations .....	7
<b>2. 47 CFR PART 15C REQUIREMENTS.....</b>	<b>8</b>
2.1. Antenna requirement.....	8
2.2. Peak Output Power.....	9
2.3. 6dB Bandwidth .....	10
2.4. Conducted Band Edges and Spurious Emissions.....	11
2.5. Power spectral density (PSD) .....	13
2.6. Radiated Band Edge and Spurious Emission.....	15
<b>3. LIST OF MEASURING EQUIPMENT .....</b>	<b>23</b>
<b>APPENDIX A .....</b>	<b>24</b>

Change History		
Issue	Date	Reason for change
1.0	2018.06.26	First edition

## 1. General Information

### 1.1. EUT Description

EUT Type	Painobook	
Hardware Version	PegLeg v3.4	
Software Version	midi_config_v_0_21	
EUT supports Radios application	Bluetooth LE V4.2	
Frequency Range	Bluetooth LE V4.2	2402MHz~2480MHz
Channel Number	Bluetooth LE V4.2	40
Modulation Type	Bluetooth LE V4.2	GFSK
Module Host	DIY book	
Antenna Type	Internal antenna	
Antenna Gain	2.5dBi	

Note 1: The EUT is a Painobook, it contain Bluetooth LEV4.2 Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth 4.2 is  $F(\text{MHz})=2402+2*n$  ( $0 \leq n \leq 39$ ). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 20(2442MHz) and 39 (2480MHz).

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 3: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

## 1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C (Bluetooth, 2.4GHz ISM band radiators) for the EUT FCC Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart C 2017	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section in CFR 47	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.247(b)	Peak Output Power	PASS
3	15.247(a)	Bandwidth	PASS
4	15.247(d)	Conducted Band Edges and Spurious Emission	PASS
5	15.247(e)	Power spectral density (PSD)	PASS
6	15.207	Conducted Emission	N.A(note)
7	15.209 15.247(d)	Radiated Band Edges and Spurious Emission	PASS

Note: The EUT is powered by DC 3.3V

The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10-2013.

These RF tests were performed according to the method of measurements prescribed in KDB 558074D01 v04.

### 40 channels are provided for Bluetooth LE

Channel	Frequency(MHz)	Channel	Frequency(MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464



12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

Bluetooth LE	Test Items	Modulation	Channel
	Peak Conducted Output Power Power Spectral Density 6dB Bandwidth Conducted and Spurious Emission Radiated and Spurious Emission	GFSK	0/20/39
	Band Edge	GFSK	0/39

### 1.3. Table for Supporting Units

No.	Equipment	Brand Name	Model Name	Manufacturer	Serial No.	Note
1	Notebook	DELL	PP11L	DELL	H5914A03	FCC DOC



## 1.4. Facilities and Accreditations

### 1.4.1. Facilities

#### **CNAS-Lab Code: L1659**

CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

#### **FCC-Registration No.: CN5031**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN5031, valid time is until December 31, 2018.

#### **ISED Registration: 11185A-1**

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Aug. 03, 2019.

#### **NVLAP Lab Code: 201008-0**

CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.

### 1.4.2. Test Environment Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15°C - 35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

## 2. 47 CFR Part 15C Requirements

### 2.1. Antenna requirement

#### 2.1.1. Applicable Standard

According to FCC 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.

And according to FCC 47 CFR Section 15.247(c), if 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 6dBi.

#### 2.1.2. Antenna Information

**Antenna Category:** Internal antenna

An Internal antenna was soldered to the antenna port of EUT

**Antenna General Information:**

No.	EUT	Ant. Type	Gain(dBi)
1	Painobook	PCB	2.5

#### 2.1.3. Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.



## 2.2. Peak Output Power

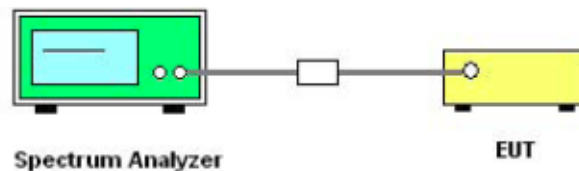
### 2.2.1. Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

### 2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.2.3. Test Setup



### 2.2.4. Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB 558074D01 v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.  
The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings: Span = the frequency band of operation;  
 $RBW \geq 100\text{KHz}$ ;  $VBW \geq RBW$ ; Sweep = auto; Detector function = peak; Trace = max hold.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Measure the conducted output power and record the results in the test report.

### 2.2.5. Test Result

Please refer to Appendix A for detail

## 2.3. 6dB Bandwidth

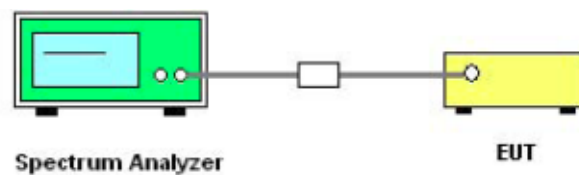
### 2.3.1. Limit of 6dB Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

### 2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.3.3. Test Setup



### 2.3.4. Test Procedures

1. The testing follows FCC KDB 558074D01 v04.

2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

3. Set to the maximum power setting and enable the EUT transmit continuously.

4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz.

Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.

5. Measure and record the results in the test report.

### 2.3.5. Test Results of 6dB Bandwidth

Please refer to Appendix A for detail

## 2.4. Conducted Band Edges and Spurious Emissions

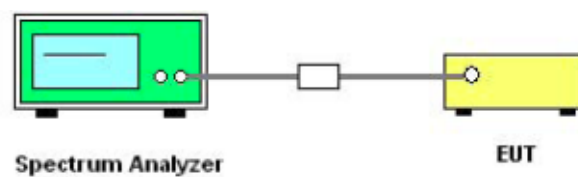
### 2.4.1. Limit of Conducted Band Edges and Spurious Emissions

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

### 2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.4.3. Test Setup



### 2.4.4. Test Procedure

1. The testing follows FCC KDB 558074D01 v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.  
The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.



#### **2.4.5. Test Results of Conducted Band Edges**

Please refer to Appendix A for detail

## 2.5. Power spectral density (PSD)

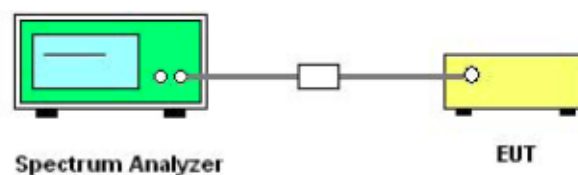
### 2.5.1. Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

### 2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.5.3. Test Setup



### 2.5.4. Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB 558074D01 v04.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

### **2.5.5. Test Results of Power spectral density**

Please refer to Appendix A for detail

## 2.6. Radiated Band Edge and Spurious Emission

### 2.6.1. Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

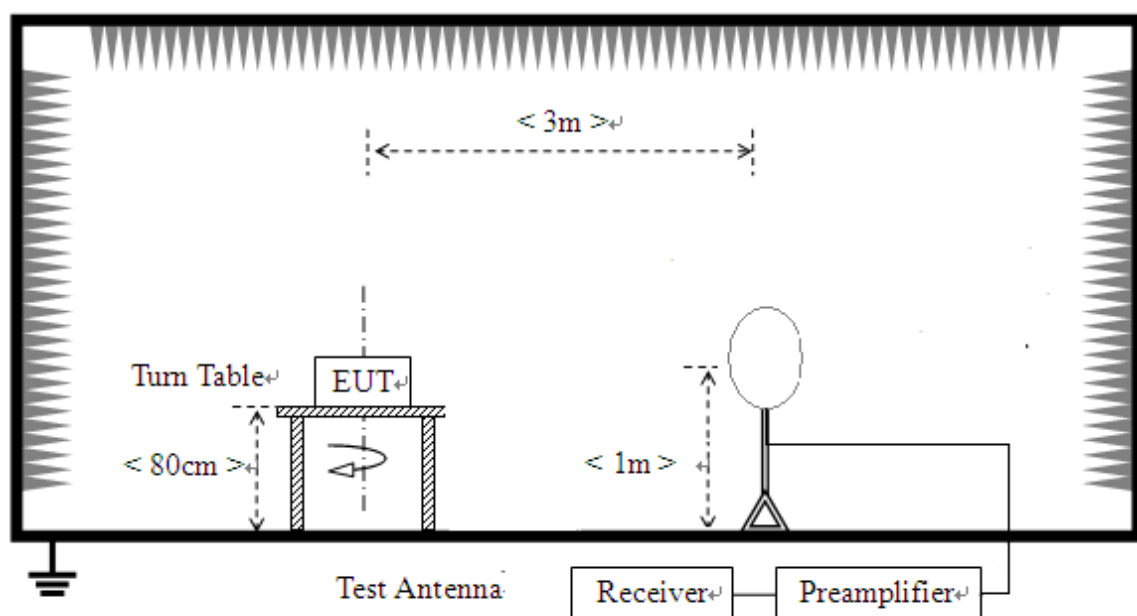
Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ )	Measurement Distance (m)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

### 2.6.2. Measuring Instruments

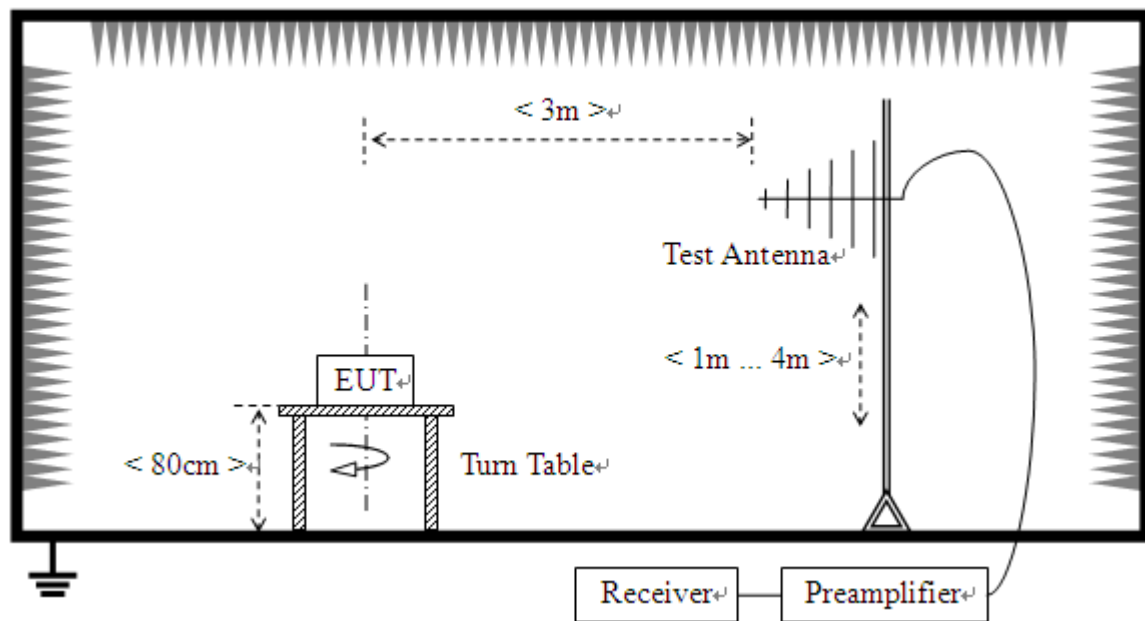
The measuring equipment is listed in the section 3 of this test report.

### 2.6.3. Test Setup

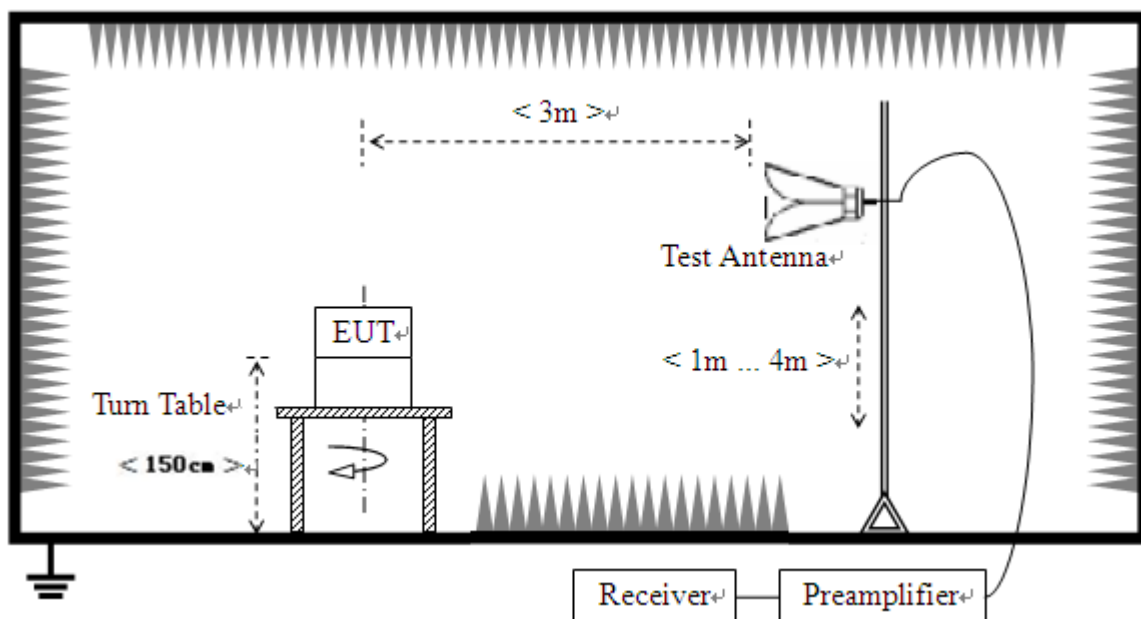
For radiated emissions from 9 KHz to 30 MHz



### For radiated emissions from 30MHz to 1GHz



### For radiated emissions above 1GHz





#### 2.6.4. Test Procedures

1. The EUT was placed on the top of a rotating table 0.8m below 1GHz and 1.5 m above 1GHz above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported.  
  
Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### NOTE:

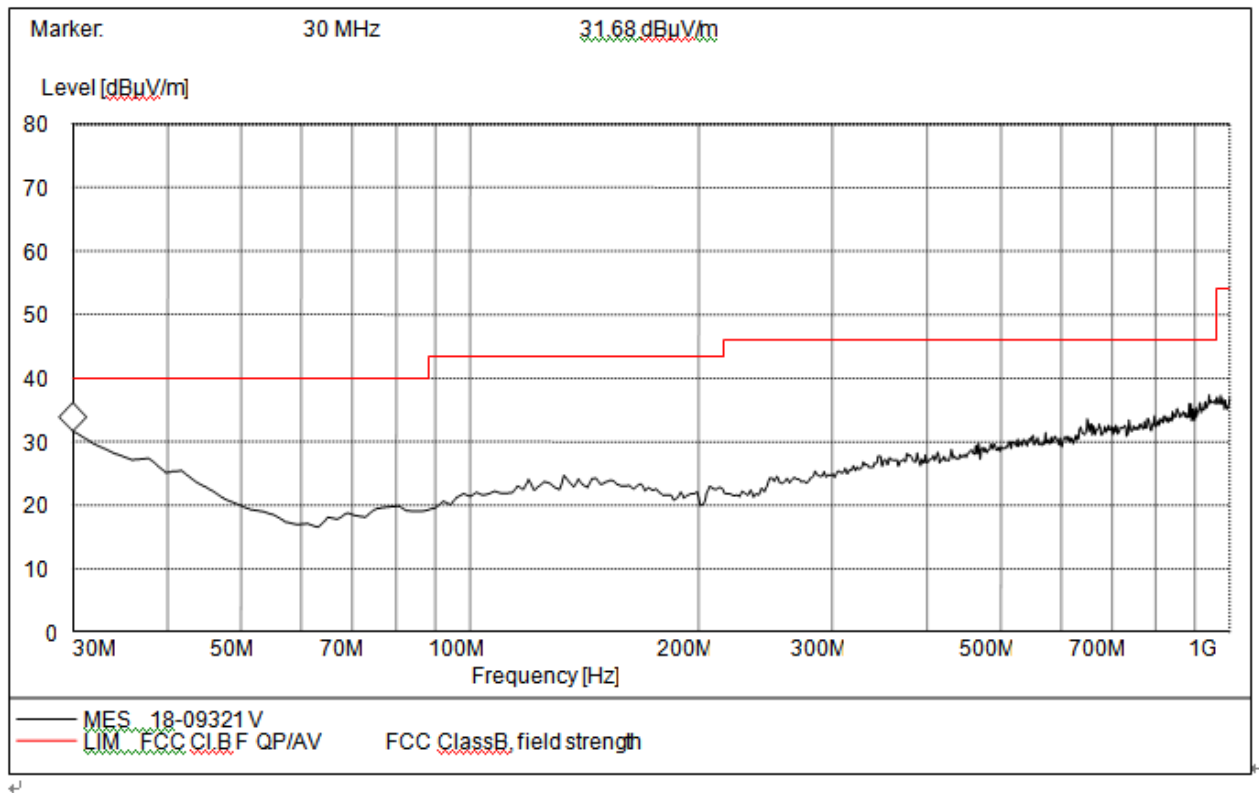
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

## 2.6.5. Test Results of Radiated Band Edge and Spurious Emission

### For 9KHz to 30MHz

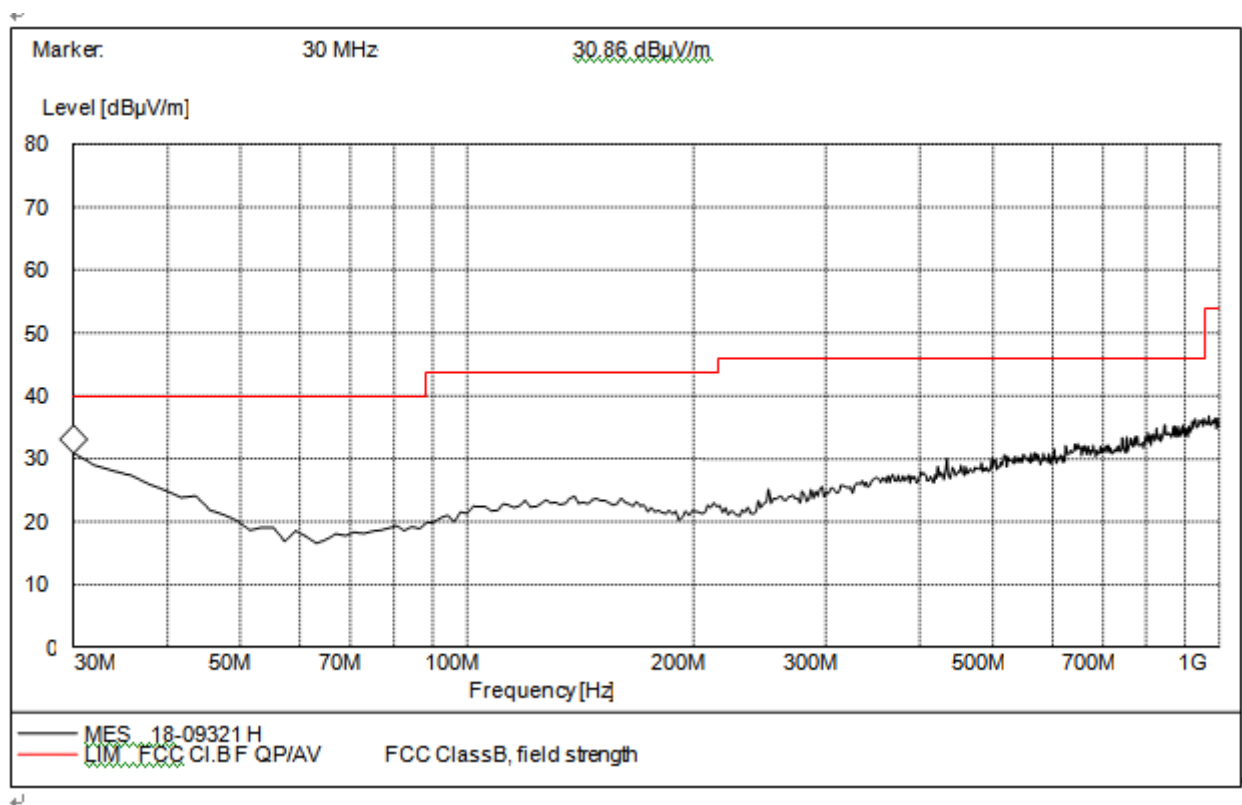
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

### For 30MHz to 1000 MHz



Plot A: 30MHz to 1GHz, Antenna Vertical

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB $\mu$ V/m)	Antenna	Verdict
30	31.68	120.000	100.0	43.5	Vertical	Pass



Plot B: 30MHz to 1GHz, Antenna Horizontal

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Antenna height (cm)	Limit (dB μ V/m)	Antenna	Verdict
30	30.86	120.000	100.0	43.5	Horizontal	Pass

**For 1GHz to 25GHz****ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (0CH\_2402MHz)**

No.	Fre. (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Cab. Loss (dB)	Ant. Factor (dB)	Pre. Amp. (dB)	Cor. Factor (dB/m)
1	1200	35.56	PK	74	-38.44	1.50H	90	36.06	1.8	29.6	31.9	-0.5
2	1200	28.91	AV	54	-25.09	1.50H	90	29.41	1.8	29.6	31.9	-0.5
3	2390	42.10	PK	74	-31.9	1.44H	120	40.8	5.2	28.6	32.5	1.3
4	2390	35.12	AV	54	-18.88	1.39H	120	33.82	5.2	28.6	32.5	1.3
5	4804	65.36	PK	74	-8.64	1.47 H	90	58.96	7.4	30.4	31.4	6.4
6	4804	51.52	AV	54	-2.48	1.53 H	90	45.12	7.4	30.4	31.4	6.4

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (0CH 2402MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Cab. Loss (dB)	Ant. Factor (dB)	Pre. Amp. (dB)	Cor. Factor (dB/m)
1	1200	38.15	PK	74	-35.85	1.50 V	180	38.75	1.8	29.5	31.9	-0.6
2	1200	31.65	AV	54	-22.35	1.50 V	180	32.25	1.8	29.5	31.9	-0.6
3	2390	37.73	PK	74	-36.27	1.43 V	57	36.43	5.2	28.6	32.5	1.3
4	2390	31.08	AV	54	-22.92	1.48 V	57	29.78	5.2	28.6	32.5	1.3
5	4804	54.75	PK	74	-19.25	1.64 V	218	48.35	7.4	30.4	31.4	6.4
6	4804	41.97	AV	54	-12.03	1.40 V	218	35.57	7.4	30.4	31.4	6.4

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (19CH\_2440MHz)**

No.	Fre. (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Cab. Loss (dB)	Ant. Factor (dB)	Pre. Amp. (dB)	Cor. Factor (dB/m)
1	1200.95	37.58	PK	74	-36.42	1.50 H	100	38.18	1.8	29.5	31.9	-0.6
2	1200.95	31.33	AV	54	-22.67	1.50 H	100	31.93	1.8	29.5	31.9	-0.6
3	2997.63	51.34	PK	74	-22.66	1.80 H	150	46.59	6.2	30.05	31.5	4.75
4	2997.63	45.25	AV	54	-8.75	1.80 H	150	40.5	6.2	30.05	31.5	4.75
5	4880	63.16	PK	74	-10.84	1.50 H	160	56.76	6.7	31.2	31.5	6.4
6	4880	50.56	AV	54	-3.44	1.50 H	160	44.16	6.7	31.2	31.5	6.4

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (19CH\_2440MHz)**

No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Cab. Loss (dB)	Ant. Factor (dB)	Pre. Amp. (dB)	Cor. Factor (dB/m)
1	1200.05	37.74	PK	74	-36.26	1.50 V	200	38.34	1.8	29.5	31.9	-0.6
2	1200.05	31.56	AV	54	-22.44	1.50 V	200	32.16	1.8	29.5	31.9	-0.6
3	2997.63	50.37	PK	74	-23.63	1.66 V	120	45.62	6.2	30.05	31.5	4.75
4	2997.63	43.77	AV	54	-10.23	1.45 V	120	39.02	6.2	30.05	31.5	4.75
5	7320	55.96	PK	74	-18.04	1.38 V	270	49.56	6.7	31.2	31.5	6.4
6	7320	44.12	AV	54	-9.88	1.20 V	270	37.72	6.7	31.2	31.5	6.4

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (39CH\_2480MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Cab. Loss (dB)	Ant. Factor (dB)	Pre. Amp. (dB)	Cor. Factor (dB/m)
1	2483.5	60.9	PK	74	-13.10	1.50 H	70	57.5	5.7	29.5	31.8	3.4
2	2483.5	41.48	AV	54	-12.52	1.48 H	70	38.08	5.7	29.5	31.8	3.4
3	4960	63.38	PK	74	-10.62	1.20 H	90	57.83	7	30.05	31.5	5.55
4	4960	49.80	AV	54	-4.2.0	1.20 H	90	44.25	7	30.05	31.5	5.55
5	7440	48.89	PK	74	-25.11	1.07 H	120	33.69	16	31.2	32	15.2
6	7440	41.91	AV	54	-12.09	1.51 H	120	26.71	16	31.2	32	15.2

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (39CH\_2480MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Cab. Loss (dB)	Ant. Factor (dB)	Pre. Amp. (dB)	Cor. Factor (dB/m)
1	2483.5	51.97	PK	74	-22.03	1.50 V	30	48.57	5.7	29.5	31.8	3.4
2	2483.5	44.82	AV	54	-9.18	1.50 V	30	41.42	5.7	29.5	31.8	3.4
3	4960	39.72	PK	74	-34.28	1.41 V	180	34.17	7	30.05	31.5	5.55
4	4960	29.55	AV	54	-24.45	1.39 V	180	24	7	30.05	31.5	5.55
5	7440	53.28	PK	74	-20.72	1.45 V	170	38.08	16	31.2	32	15.2
6	7440	41.23	AV	54	-12.77	1.44 V	170	26.03	16	31.2	32	15.2

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)  
- Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level - Limit value
5. " \* ": Fundamental frequency.

### 3. List of measuring equipment

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal
1	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	11/12/2017
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	11/12/2017
3	EMI TEST Software	Audix	E3	N/A	N/A
4	TURNTABLE	ETS	2088	2149	N/A
5	ANTENNA MAST	ETS	2075	2346	N/A
6	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A
7	HORNANTENNA	ShwarzBeck	9120D	1011	11/12/2017
8	Amplifer	Sonoma	310N	E009-13	11/12/2017
9	JS amplifer	Rohde&Schwarz	JS4-00101800-28-5A	F201504	11/12/2017
10	High pass filter	Compliance Direction systems	BSU-6	34202	11/12/2017
11	HORNANTENNA	ShwarzBeck	9120D	1012	11/12/2017
12	Amplifer	Compliance Direction systems	PAP1-4060	120	11/12/2017
13	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	11/12/2017
14	TURNTABLE	MATURO	TT2.0	----	N/A
15	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
16	Horn Antenna	SCHWARZBECK	BBHA9170	25841	11/12/2017
17	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	11/12/2017
18	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	11/12/2017
19	Spectrum Analyzer	Keysight	N9030A	ATO-67098	10/09/2017
20	Power Meter	Anritsu	ML2480B	100798	11/12/2017
21	Power Sensor	Anritsu	MA2411B	100258	11/12/2017

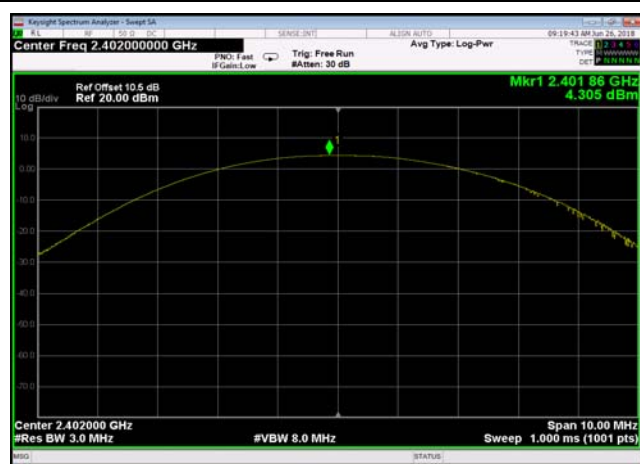


## Appendix A

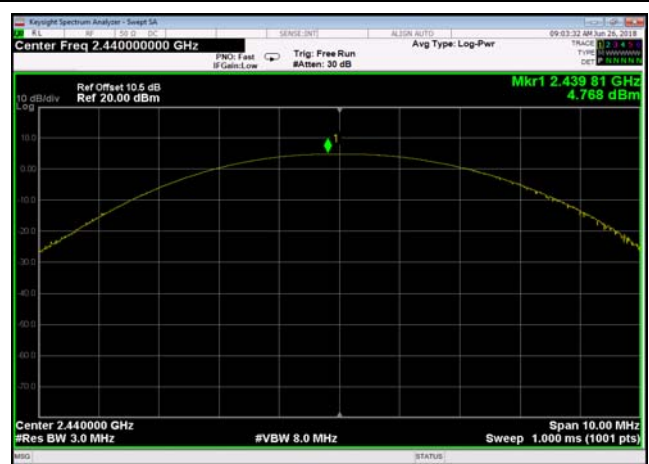
### Peak Output Power Test Result and Data

Test Frequency	Power(dBm)	Limit(dBm)	Result
2402	4.305	30	Pass
2440	4.768	30	Pass
2480	4.644	30	Pass

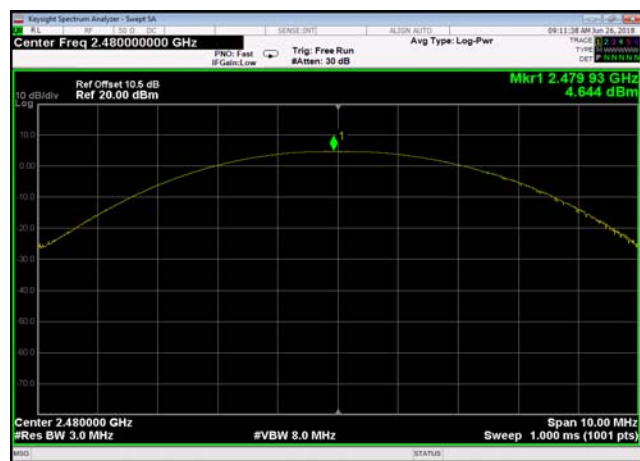
Output Power: 2402MHz



Output Power: 2440MHz



Output Power: 2480MHz







## Power Spectral Density Test Result and Data

Test Frequency	PSD(dBm/3KHz)	Limit(dBm/3KHz)	Result
2402	-5.750	8	Pass
2440	-4.432	8	Pass
2480	-5.168	8	Pass

Power spectral density: 2402MHz



Power spectral density: 2440MHz



Power spectral density: 2480MHz

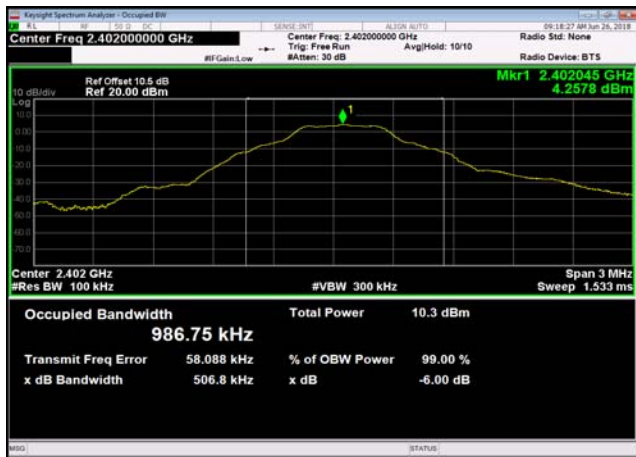




## 6dB Band Width Test Result and Data

Test Frequency	Occupy Bandwidth(KHz)	Min Limit(kHz)	Result
2402	506.813	500	Pass
2440	509.058	500	Pass
2480	505.711	500	Pass

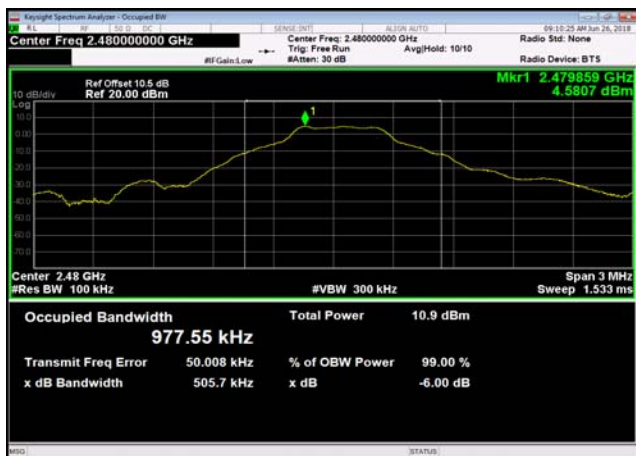
6dB Bandwidth: 2402MHz



6dB Bandwidth: 2440MHz



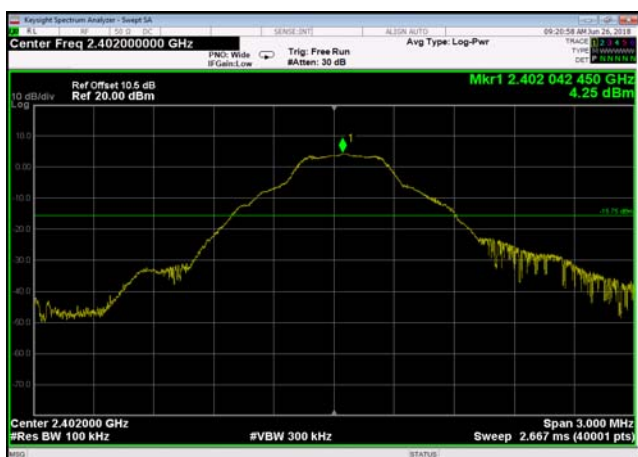
6dB Bandwidth: 2480MHz



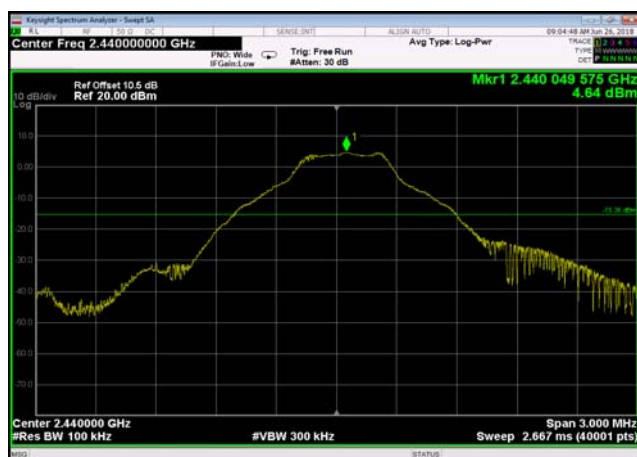
**Conducted Band Edges and Spurious Emissions  
Test Result and Data**

BLE Transmitter Spurious Emission			
Test Frequency(MHz)	Test Range(MHz~MHz)	Power(dBm)	Result
2402	10000MHz~25000MHz	-41.45	Pass
2402	2500MHz~10000MHz	-43.46	Pass
2402	30MHz~2310MHz	-39.14	Pass
2402	Band Edge	-42.07	Pass
2402	Reference Level	-15.75	Pass
2440	10000MHz~25000MHz	-41.32	Pass
2440	2500MHz~10000MHz	-43.40	Pass
2440	30MHz~2310MHz	-44.92	Pass
2440	Reference Level	-15.36	Pass
2480	10000MHz~25000MHz	-40.77	Pass
2480	2500MHz~10000MHz	-43.47	Pass
2480	30MHz~2310MHz	-44.35	Pass
2480	Band Edge	-35.76	Pass
2480	Reference Level	-15.44	Pass

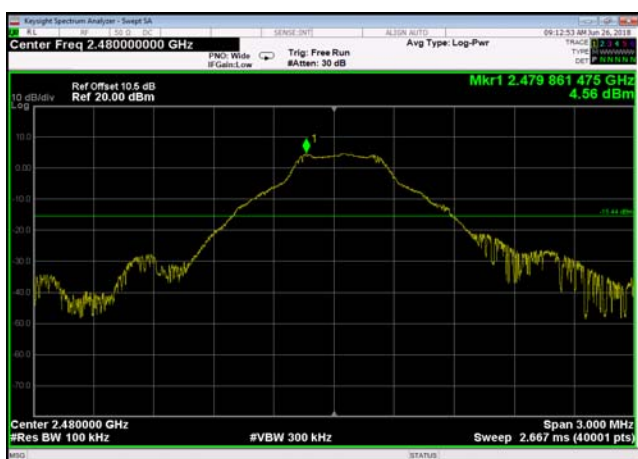
,Plot ,1Transmitter Spurious Emission  
: 2402,Reference Level



,Plot ,1Transmitter Spurious Emission  
: 2440,Reference Level



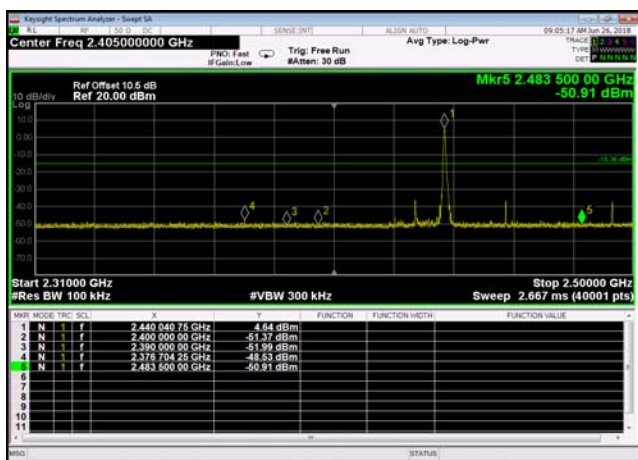
,Plot ,1Transmitter Spurious Emission  
: 2480,Reference Level



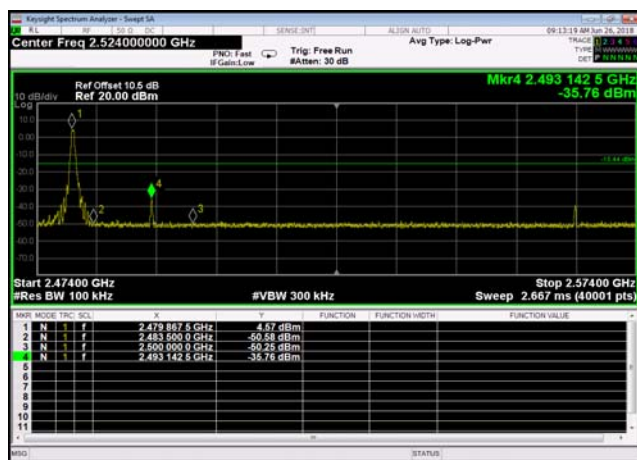
,Plot ,2Conducted Emission: 2402  
,Band Edge



,Plot ,2Conducted Emission: 2440  
,Band Edge

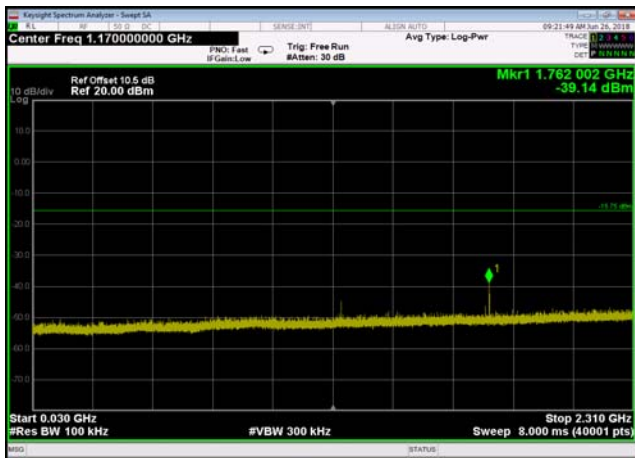


,Plot ,2Conducted Emission: 2480  
,Band Edge

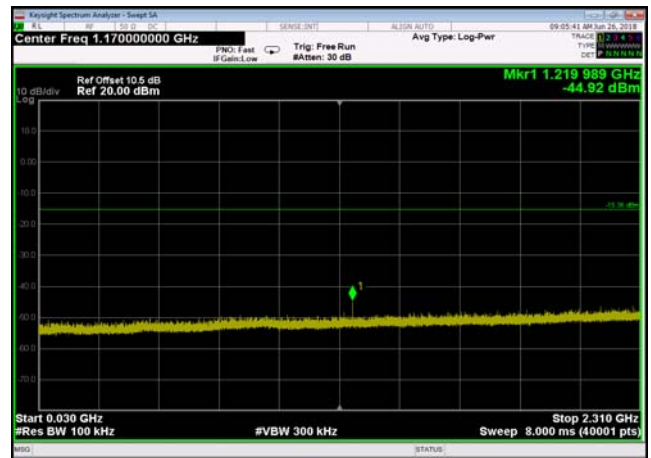




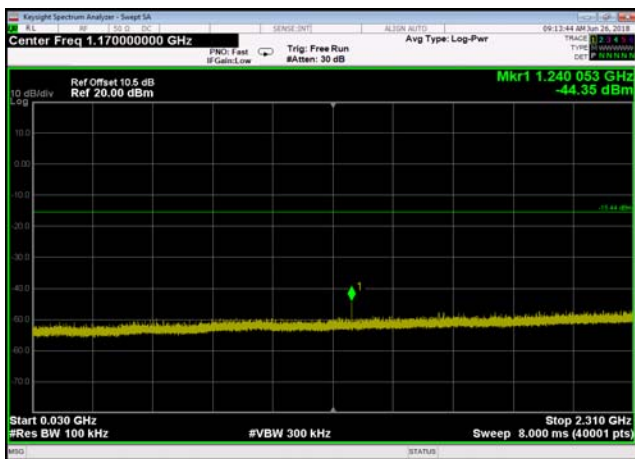
,Plot ,3Transmitter Spurious Emission  
: 2402,30MHz~2310MHz



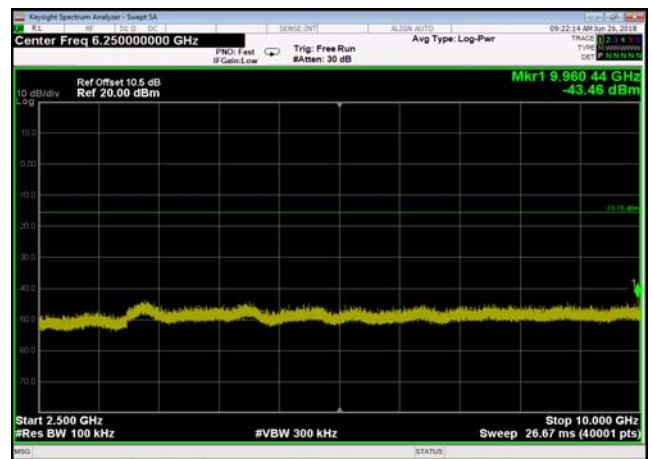
,Plot ,3Transmitter Spurious Emission  
: 2440,30MHz~2310MHz



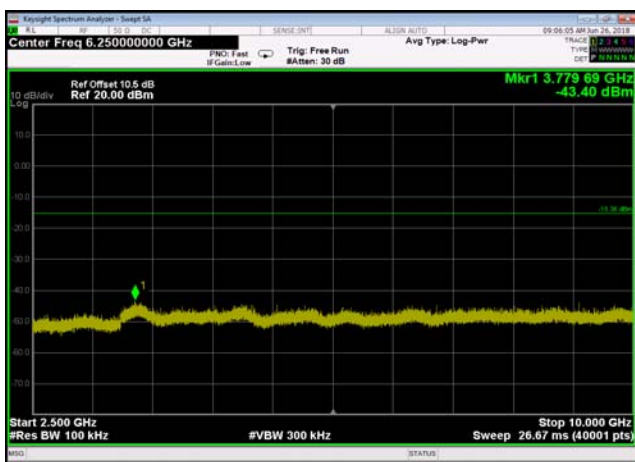
,Plot ,3Transmitter Spurious Emission  
: 2480,30MHz~2310MHz



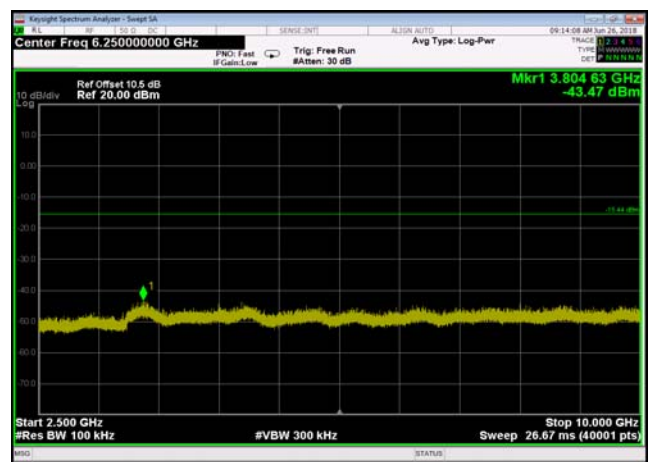
,Plot ,4Transmitter Spurious Emission  
: 2402,2500MHz~10000MHz



,Plot ,4Transmitter Spurious Emission  
: 2440,2500MHz~10000MHz

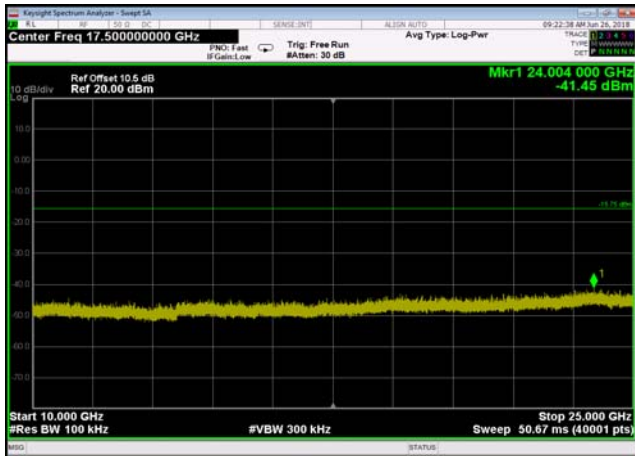


,Plot ,4Transmitter Spurious Emission  
: 2480,2500MHz~10000MHz

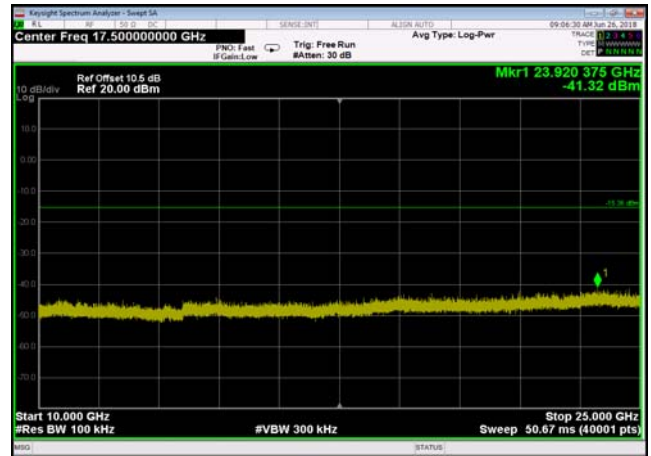




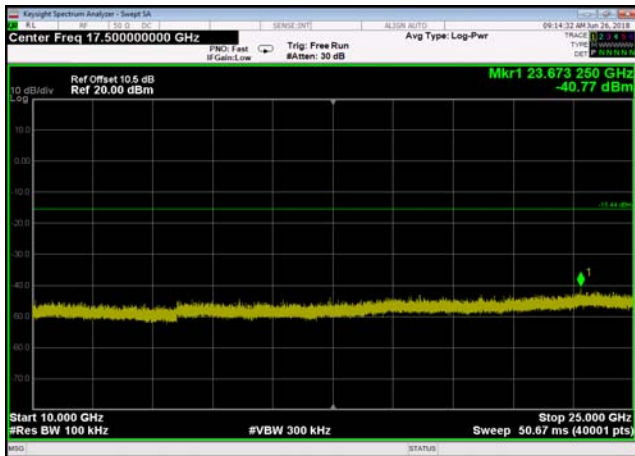
,Plot ,5Transmitter Spurious Emission  
: 2402,10000MHz~25000MHz



,Plot ,5Transmitter Spurious Emission  
: 2440,10000MHz~25000MHz



,Plot ,5Transmitter Spurious Emission  
: 2480,10000MHz~25000MHz



\*\* END OF REPORT \*\*