

## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.247

Report Reference No.....: A160F16156-BLE

FCC ID.....: 2AHM6-AFL-151-0

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Date of issue.....: March14, 2016

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Testing Laboratory Name .....: Dongguan Dongdian Testing Service Co.,Ltd

Address .....: No.17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China

Applicant's name.....: Accompany

Address .....: 24L, East Building, Changxing Square, Taoyuan Road, Nantou Sub-district, Nanshan District, Shenzhen, China

Test specification .....

Standard .....: **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**

TRF Originator.....: Shenzhen CTL Electron Technology Co., Ltd.

Master TRF.....: Dated 2012-06

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Test item description .....: ASNAP

Trade Mark .....: ASNAP

Model/Type reference.....: AFL-151-0

Listed Models .....: /

Manufacturer .....: **Accompany**

Modulation Type.....: GFSK

Operation Frequency.....: From 2402MHz to 2480MHz

Rating .....: DC 3.70V

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

**TEST REPORT**

<b>Test Report No. :</b> <b>A160F16156-BLE</b>	March 14, 2016 Date of issue
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Equipment under Test        :        **ASNAP**

Model /Type                        :        AFL-151-0

Listed Models                        :        /

**Applicant**                                :        **Accompany**

Address                                        :        24L, East Building, Changxing Square, Taoyuan Road, Nantou  
Sub-district, Nanshan District, Shenzhen, China

**Manufacturer**                                :        **Accompany**

Address                                        :        24L, East Building, Changxing Square, Taoyuan Road, Nantou  
Sub-district, Nanshan District, Shenzhen, China

<b>Test Result:</b>	<b>PASS</b>
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

## Revision History

Revision	Issue Date	Revisions	Revised By
00	2016-03-14	Initial Issue	Andy Zhang

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## **1. TEST STANDARDS**

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

[KDB558074 D01 V03r04](#): Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

## 2. SUMMARY

### 2.1. General Remarks

Date of receipt of test sample	:	March 02, 2016
Testing commenced on	:	March 02, 2016
Testing concluded on	:	March 12, 2016

### 2.2. Product Description

The **Accompany's** Model: AFL-151-0 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	ASNAP
Model Number	AFL-151-0
FCC ID	2AHM6-AFL-151-0
Antenna Type	Internal
BT FCC Operation frequency	2402MHz-2480MHz
BT Modulation Type	GFSK
Bluetooth	Only supported BT 4.0
Power Supply	nominal: 3.70VDC

### 2.3. Equipment Under Test

#### Power supply system utilised

Power supply voltage	:	<input type="radio"/> 120V / 60 Hz	<input type="radio"/> 115V / 60Hz
		<input type="radio"/> 12 V DC	<input type="radio"/> 24 V DC
		<input checked="" type="radio"/> Other (specified in blank below)	

DC 3.70V

### 2.4. Short description of the Equipment under Test (EUT)

#### 2.4.1 General Description

AFL-151-0 is ASNAP with lower power Bluetooth technology (Bluetooth 4.0);

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

#### 2.4.2 Test Modes

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2
	Test Environment	NTNV
	EUT Configuration	GFSK_L, GFSK_M, GFSK_H
Maximum Peak Conducted Output Power	Measurement Method	FCC KDB 558074 §9.1.2
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	GFSK_L, GFSK_M, GFSK_H
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).
	Test Environment	NTNV
	EUT Configuration	GFSK_L, GFSK_M, GFSK_H
Unwanted Emissions into Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074 §11.0.
	Test Environment	NTNV

Unwanted Emissions into Restricted Frequency Bands (Conducted)	Test Setup	Test Setup 1
	EUT Configuration	GFSK_L, GFSK_M, GFSK_H
	Measurement Method	FCC KDB 558074§12.2, Conducted (antenna-port).
	Test Environment	NTNV
Unwanted Emissions into Restricted	EUT Configuration	GFSK_L, GFSK_M, GFSK_H
	Measurement Method	FCC KDB 558074§12.1, Radiated (cabinet/case emissions with Impedance matching for antenna-port).
	Test Environment	NTNV
	EUT Configuration	GFSK_L, GFSK_M, GFSK_H

### 2.4.3 Customized Configurations

#EUT Conf.	Signal Description	Operating Frequency
TM1_ Ch0	GFSK modulation	Ch No. 00/2402MHz
TM1_ Ch19	GFSK modulation	Ch No. 19/ 2440MHz
TM1_ Ch39	GFSK modulation	Ch No. 39/ 2480MHz

## 2.5. EUT operation mode

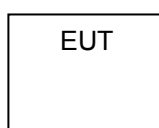
The application provider specific test software to control sample in continuous TX and RX by software for testing meet KDB558074 test requirement.

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 40 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel .

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

## 2.6. Block Diagram of Test Setup

Fig. 2-1 Configuration of Tested System



## 2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: 2AHM6-AFL-151-0** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.8. Modifications

No modifications were implemented to meet testing criteria.

## 2.9. NOTE

1. The values used in the test report maybe stringent than the declared.

Environment Parameter	Selected Values During Tests		
NTNV	Temperature	Voltage	Relative Humidity
	Ambient	3.70VDC	Ambient

2. The EUT is a ASNAP with lower power Bluetooth function, The functions of the EUT listed as below:

	Test Standards	Reference Report
Bluetooth-LE	FCC Part 15.247	A160F16156-BLE
RF Exposure Report	FCC Per 47 CFR 2.1093(d)	A160F16156-EMF



### 3. TEST ENVIRONMENT

#### 3.1. Address of the test laboratory

##### **Dongguan Dongdian Testing Service Co.,Ltd**

No.17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4, CISPR 22/EN 55022 and CISPR16-1-4:2010 SVSWR requirements.

#### 3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

##### **IC Registration No.: 10288A-1**

The 3m alternate test site of Dongguan Dongdian Testing Service Co.,Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 10288A-1 on May, 2012.

##### **FCC-Registration No.: 270092**

Dongguan Dongdian Testing Service 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. Registration 270092, Mar, 2015.

#### 3.3. Environmental conditions

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

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

#### 3.4. Test Description

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(1)	Spectrum bandwidth – 6 dB bandwidth	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(1)	Maximum output power	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	Band edge compliance conducted	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205	Band edge compliance radiated	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions conducted	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious	GFSK	<input checked="" type="checkbox"/> Lowest	GFSK	<input checked="" type="checkbox"/> Lowest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

	emissions radiated		<input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest		<input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest					
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a)	TX spurious Emissions radiated < 30 MHz	GFSK	-/-	GFSK	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	GFSK	-/-	GFSK	-/-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Not Applicable

Remark:

1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

### 3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028 “ Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics” and is documented in the Dongguan Dongdian Testing Service Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Dongguan Dongdian Testing Service Co.,Ltd is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.14 dB	(1)
Radiated Emission	1~18GHz	2.56 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	2.44 dB	(1)
Conducted Power	9KHz~18GHz	0.60 dB	(1)
Power Spectral Density	9KHz~18GHz	1.20 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	0.60 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	0.60 dB	(1)
Occuiped Bandwidth	9KHz~40GHz	±1%	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

### 3.6. Equipments Used during the Test

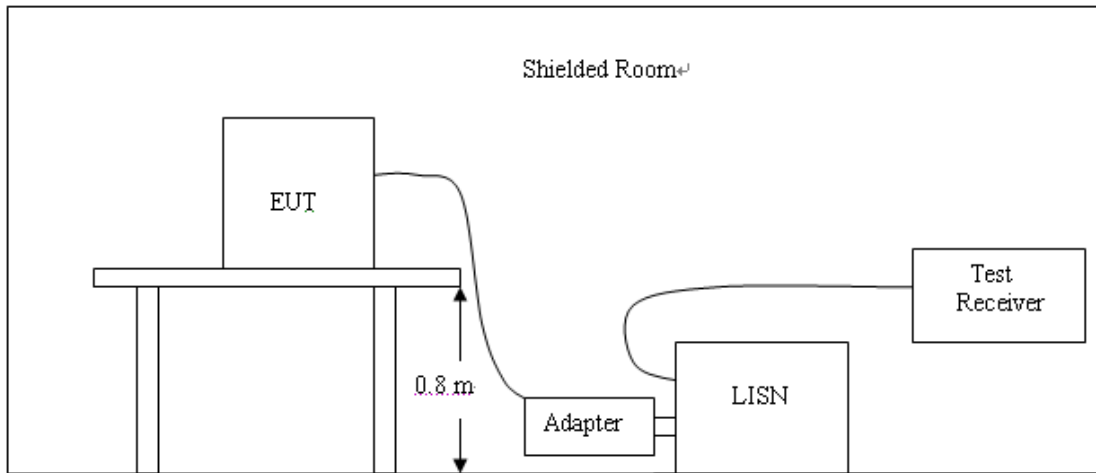
Radiated Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	462	2014/04/12	3 years
2	EMI TEST Receiver	Rohde&Schwarz	ESU8	100316	2015/10/21	1 years
3	EMI TEST Software	Audix	E3	6.111111	N/A	N/A
4	Horn Antennna	EMCO	3116	00060095	2014/04/12	3 years
5	Pre-Amplifer	Rohde&Schwarz	SCU-01	10049	2015/10/21	1 years
6	Pre-Amplifer	A.H.	PAM0-0118	360	2015/10/21	1 years
7	Pre-Amplifer	A.H.	PAM-1840VH	562	2015/10/21	1 years
8	Double Ridged Horn Antenna	Rohde&Schwarz	HF907	100265	2014/04/12	3 years
9	Active Loop Antenna	Schwarz beck	FMZB1519	0.38	2014/04/12	3 years
11	TURNTABLE	MATURO	TT2.0	----	N/A	N/A
12	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A	N/A
13	Spectrum Analyzer	Rohde&Schwarz	FSU26	1166.1660.26	2015/10/21	1 years

Maximum Peak Output Power / 6dB Bandwidth /Band Edge Compliance of RF Emission / Spurious RF Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum Analyzer	Agilent	N9020A	MY49100070	2015/10/21	1 years

## 4. TEST CONDITIONS AND RESULTS

### 4.1. AC Power Conducted Emission (Not Applicable)

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- 4 The EUT received DC5V power from PC, the adapter of PC received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

#### AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

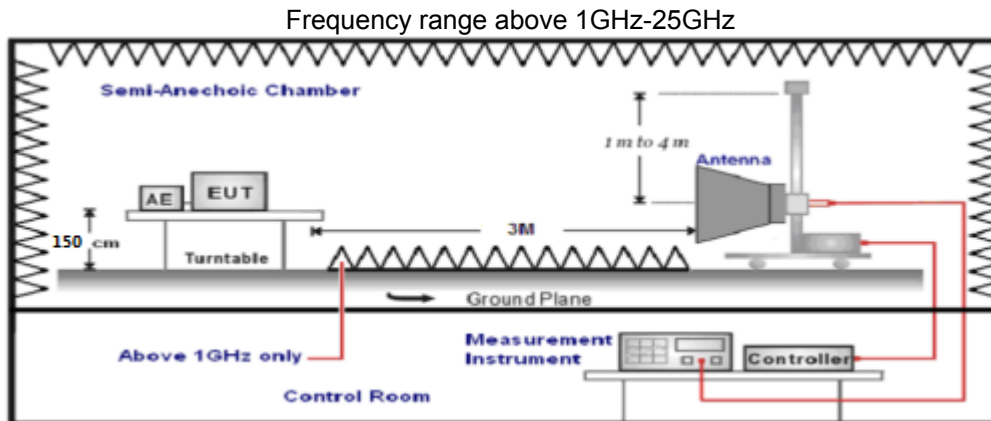
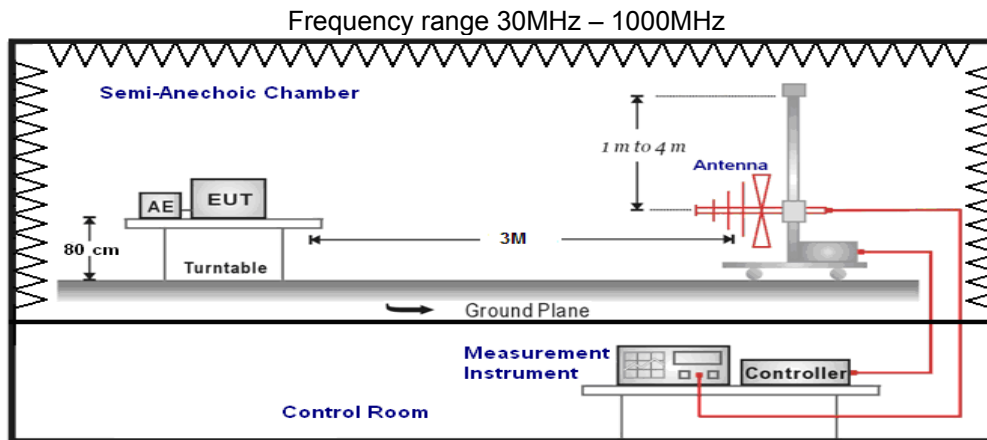
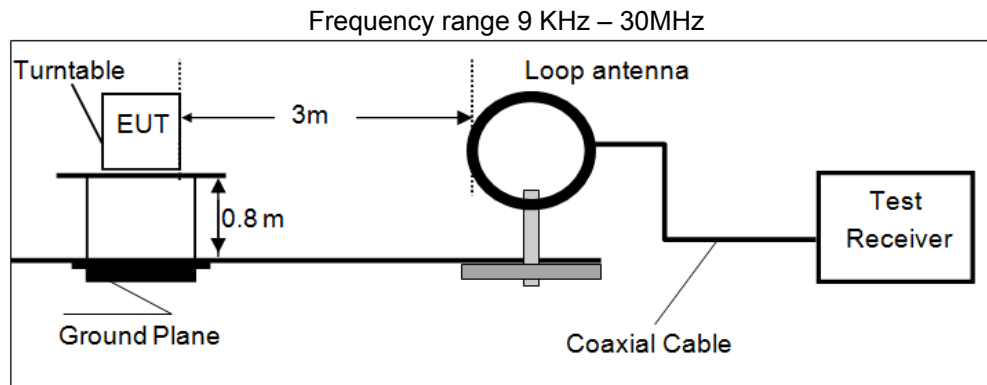
\* Decreasing linearly with the logarithm of the frequency

#### TEST RESULTS

**Not Applicable!!! (the sample was powered by battery)**

## 4.2. Radiated Emission

### TEST CONFIGURATION



### TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2480MHz. so radiated emission test frequency band from 9 KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3

18GHz-25GHz	Horn Antennna	1
-------------	---------------	---

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak
	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

More procudre as follows;

### 1) Sequence of testing 9 kHz to 30 MHz

#### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

#### Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.0 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

#### Final measurement:

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

### 2) Sequence of testing 30 MHz to 1 GHz

#### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

#### Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 4 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

#### Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

### 3) Sequence of testing 1 GHz to 18 GHz

#### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

#### Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

#### Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ( $\pm 45^\circ$ ) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

### 4) Sequence of testing above 18 GHz

#### Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 1 meter.
- The EUT was set into operation.

#### Premeasurement:

- The antenna is moved spherical over the EUT in different polarizations of the antenna.

#### Final measurement:

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

### Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

### **RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

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)

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	300	$20\log(2400/F(\text{KHz}))+80$	$2400/F(\text{KHz})$
0.49-1.705	30	$20\log(24000/F(\text{KHz}))+40$	$24000/F(\text{KHz})$
1.705-30	30	$20\log(30)+40$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

### **TEST RESULTS**

Remark:

1. The radiated measurement are performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test mode and channel.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4. We tested both battery powered and powered by adapter charging mode at three orientate ons, recorded worst case at powered by adapter charging mode.
5. "---" means not recorded as emission levels lower than limit.
6. Margin= Limit - Level

#### ***For 9KHz to 30MHz***

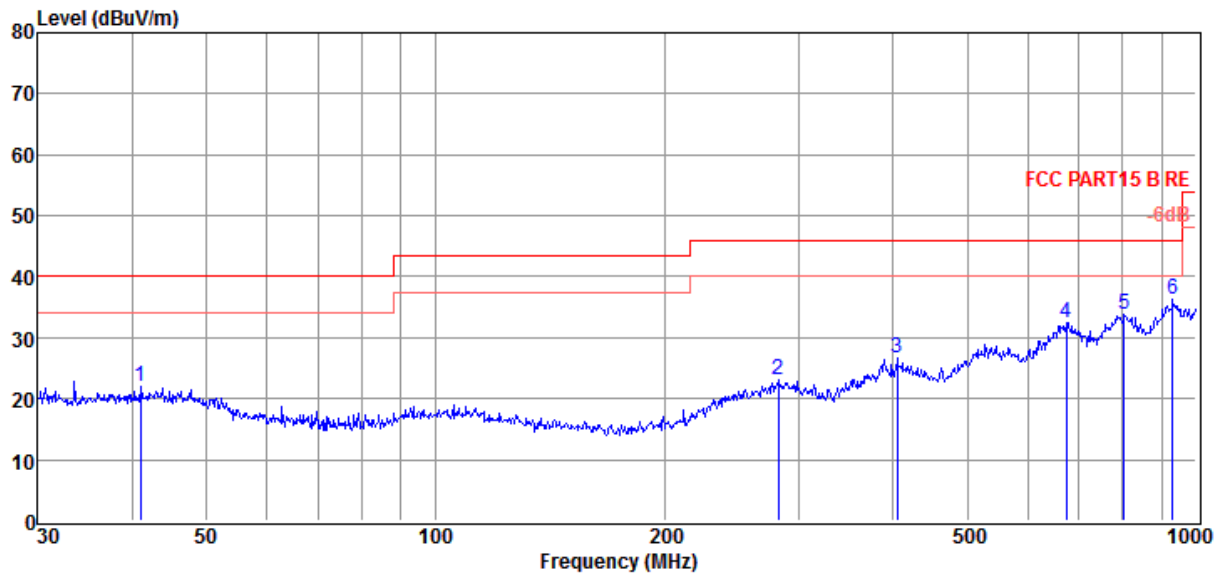
Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Over Limit (dB)	Detector
---	---	---	---	<b>QP</b>

Remark:

1. Over Limit = Emission level - Limit value
2. "---" states emission level at least lower than limit 20dB, so without recorded any values;



For 30MHz to 1000MHz

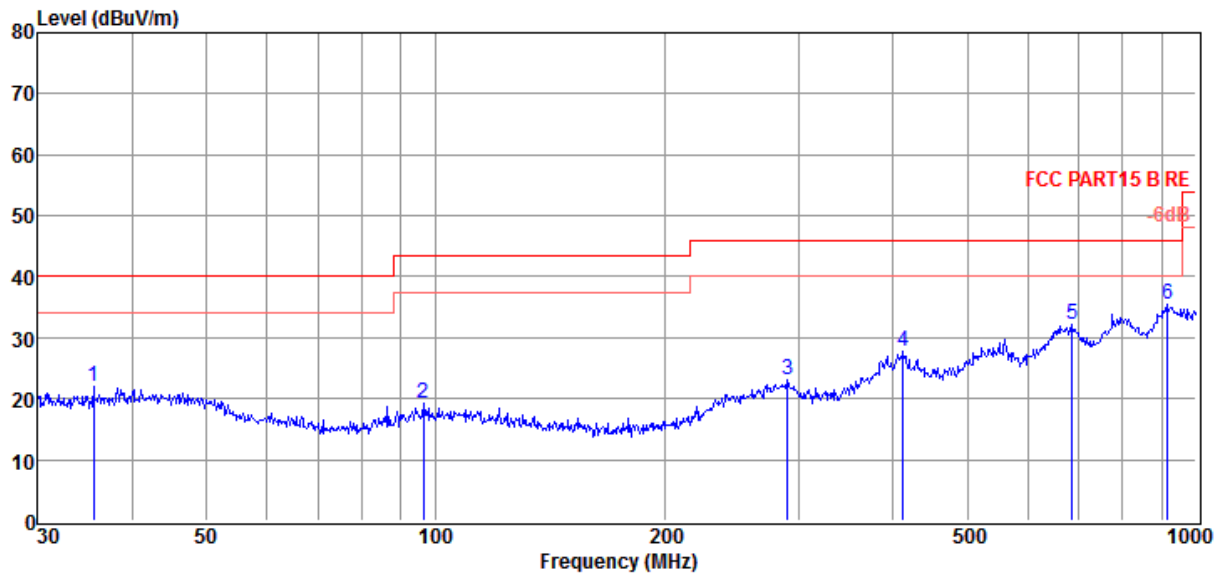


Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	40.99	4.82	13.30	3.80	21.92	40.00	-18.08	QP	HORIZONTAL
2	282.00	4.54	13.15	5.29	22.98	46.00	-23.02	QP	HORIZONTAL
3	404.67	5.45	15.33	5.82	26.60	46.00	-19.40	QP	HORIZONTAL
4	675.21	5.63	20.05	6.75	32.43	46.00	-13.57	QP	HORIZONTAL
5	804.60	5.30	21.50	7.13	33.93	46.00	-12.07	QP	HORIZONTAL
6	932.27	6.25	22.53	7.50	36.28	46.00	-9.72	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.



Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detecto r	Polarization
1	35.50	5.37	12.80	3.73	21.90	40.00	-18.10	QP	VERTICAL
2	96.44	5.15	9.85	4.27	19.27	43.50	-24.23	QP	VERTICAL
3	290.02	4.63	13.10	5.33	23.06	46.00	-22.94	QP	VERTICAL
4	411.82	6.44	15.40	5.84	27.68	46.00	-18.32	QP	VERTICAL
5	687.15	5.53	19.80	6.79	32.12	46.00	-13.88	QP	VERTICAL
6	916.07	5.37	22.62	7.46	35.45	46.00	-10.55	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

**For 1GHz to 25GHz****Low Channel @ Channel 0 @ 2402 MHz**

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4804.00	29.89	35.40	29.13	12.07	48.23	74.00	-25.77	Peak	Horizontal
1	4804.00	18.43	35.40	29.13	12.07	36.77	54.00	-17.23	AV <sup>[1]</sup>	Horizontal
2	7206.00	28.70	37.22	29.68	15.18	51.42	74.00	-22.58	Peak	Horizontal
2	7206.00	14.18	37.22	29.68	15.18	36.90	54.00	-17.10	AV <sup>[1]</sup>	Horizontal

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4804.00	26.03	35.40	29.13	12.07	44.37	74.00	-29.63	Peak	Vertical
1	4804.00	16.72	35.40	29.13	12.07	35.06	54.00	-18.94	AV <sup>[1]</sup>	Vertical
2	7206.00	26.09	37.22	29.68	15.18	48.81	74.00	-25.19	Peak	Vertical
2	7206.00	11.71	37.22	29.68	15.18	34.43	54.00	-19.57	AV <sup>[1]</sup>	Vertical

**Middle Channel @ Channel 19 @ 2440 MHz**

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4880.00	31.50	35.51	29.08	12.04	49.97	74.00	-24.03	Peak	Horizontal
1	4880.00	18.75	35.51	29.08	12.04	37.22	54.00	-16.78	AV <sup>[1]</sup>	Horizontal
2	7320.00	29.36	37.30	29.88	15.32	52.10	74.00	-21.90	Peak	Horizontal
2	7320.00	13.82	37.30	29.88	15.32	36.56	54.00	-17.44	AV <sup>[1]</sup>	Horizontal

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4880.00	26.68	35.51	29.08	12.04	45.15	74.00	-28.85	Peak	Vertical
1	4880.00	17.62	35.51	29.08	12.04	36.09	54.00	-17.91	AV <sup>[1]</sup>	Vertical
2	7320.00	27.26	37.30	29.88	15.32	50.00	74.00	-24.00	Peak	Vertical
2	7320.00	12.93	37.30	29.88	15.32	35.67	54.00	-18.33	AV <sup>[1]</sup>	Vertical

**High Channel @ Channel 39 @ 2480 MHz**

Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4960.00	26.93	35.64	29.04	12.02	45.55	74.00	-28.45	Peak	Horizontal
1	4960.00	14.09	35.64	29.04	12.02	32.71	54.00	-21.29	AV <sup>[1]</sup>	Horizontal
2	7440.00	26.82	37.37	30.12	15.60	49.67	74.00	-24.33	Peak	Horizontal
2	7440.00	10.17	37.37	30.12	15.60	33.02	54.00	-20.98	AV <sup>[1]</sup>	Horizontal

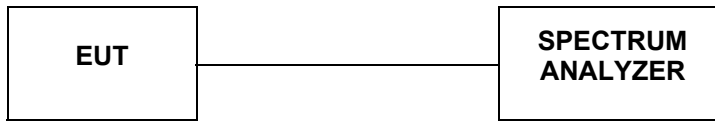
Item (Mark)	Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	4960.00	25.40	35.64	29.04	12.02	44.02	74.00	-29.98	Peak	Vertical
1	4960.00	12.27	35.64	29.04	12.02	30.89	54.00	-23.11	AV <sup>[1]</sup>	Vertical
2	7440.00	24.62	37.37	30.12	15.60	47.47	74.00	-26.53	Peak	Vertical
2	7440.00	10.13	37.37	30.12	15.60	32.98	54.00	-21.02	AV <sup>[1]</sup>	Vertical

**REMARKS:**

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. The other emission levels were very low against the limit.
3. Over Limit=Emission Level - Limit.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. Detector AV is setting spectrum/receiver. RBW=1MHz/VBW=10Hz/Sweep time=Auto/Detector=Peak;
6. Average values was add Duty Cycle factor;

### 4.3. Duty Cycle

#### TEST CONFIGURATION



#### LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternate procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle. Within this guidance document, the duty cycle refers to the fraction of time over which the transmitter is on and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than  $\pm 2$  percent, otherwise the duty cycle is considered to be non-constant.

#### TEST PROCEDURE

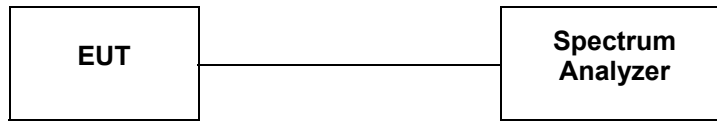
- a. A diode detector and an oscilloscope that together have sufficiently short response time to permit accurate measurements of the on and off times of the transmitted signal.
- b. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set  $RBW \geq OBW$  if possible; otherwise, set RBW to the largest available value. Set  $VBW \geq RBW$ . Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are  $> 50/T$  and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if  $T \leq 16.7$  microseconds.)

#### TEST RESULTS

The Manufacturer provide engineer mode `*#3646633#` cannot make BT-LE work at 100% continuous transmit;

#### 4.4. Maximum Peak Output Power

##### TEST CONFIGURATION



##### TEST PROCEDURE

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power, 9.1.1.

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq 3 \times$  RBW.
- c) Set span  $\geq 3 \times$  RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

##### LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

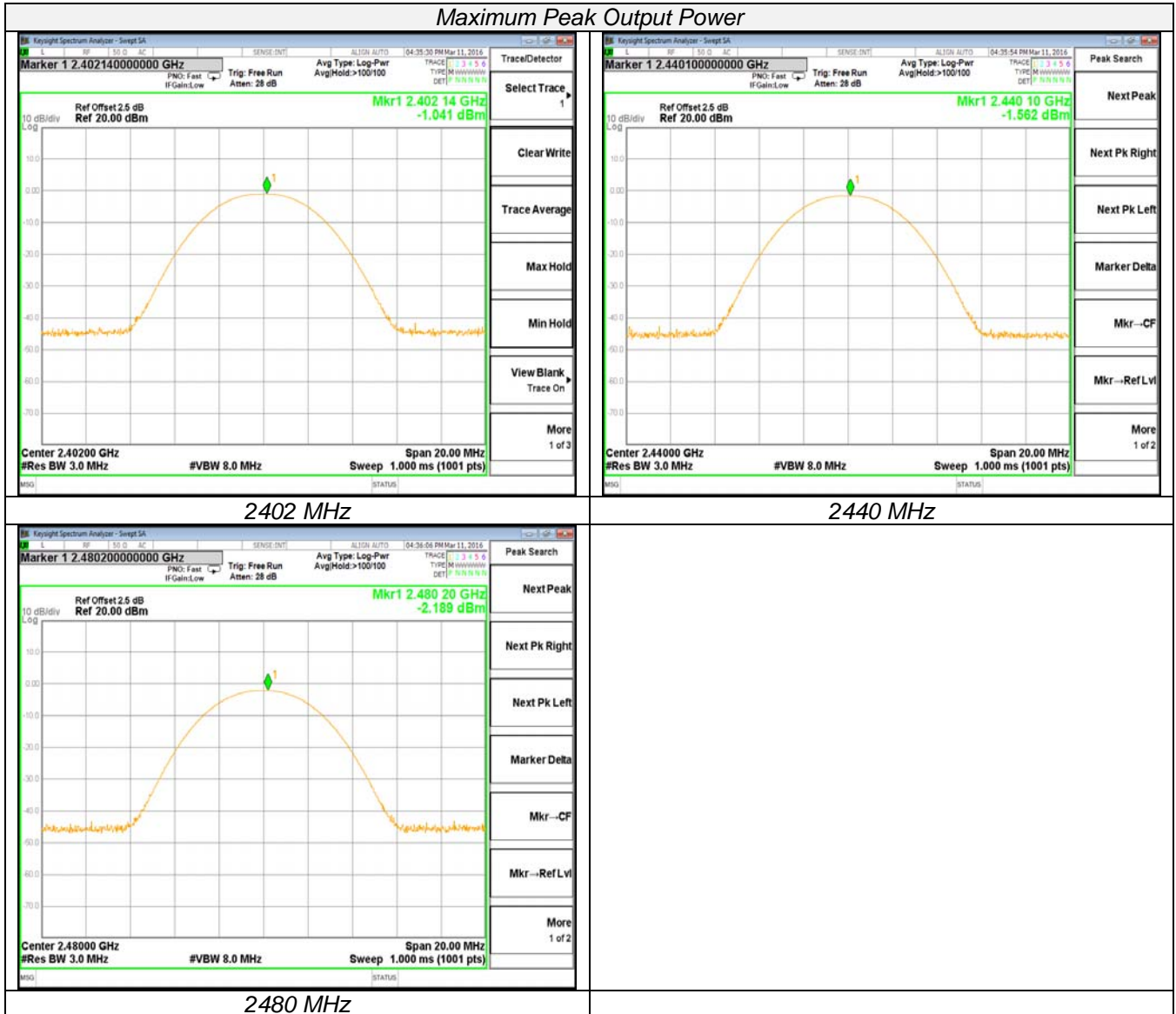
##### TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured Maximum Peak Power (dBm)	Limits (dBm)	Verdict
GFSK-BLE	0	2402	-1.041	30	PASS
	19	2440	-1.562		
	39	2480	-2.189		

Remark:

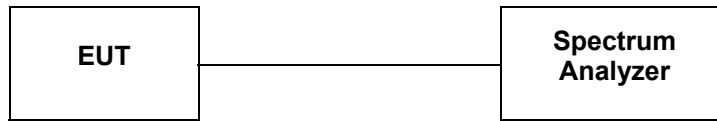
1. Test results including cable loss;
2. please refer to following plots;

## Maximum Peak Output Power



## 4.5. Power Spectral Density

### TEST CONFIGURATION



### TEST PROCEDURE

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW = 300 KHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8 dBm.

### LIMIT

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

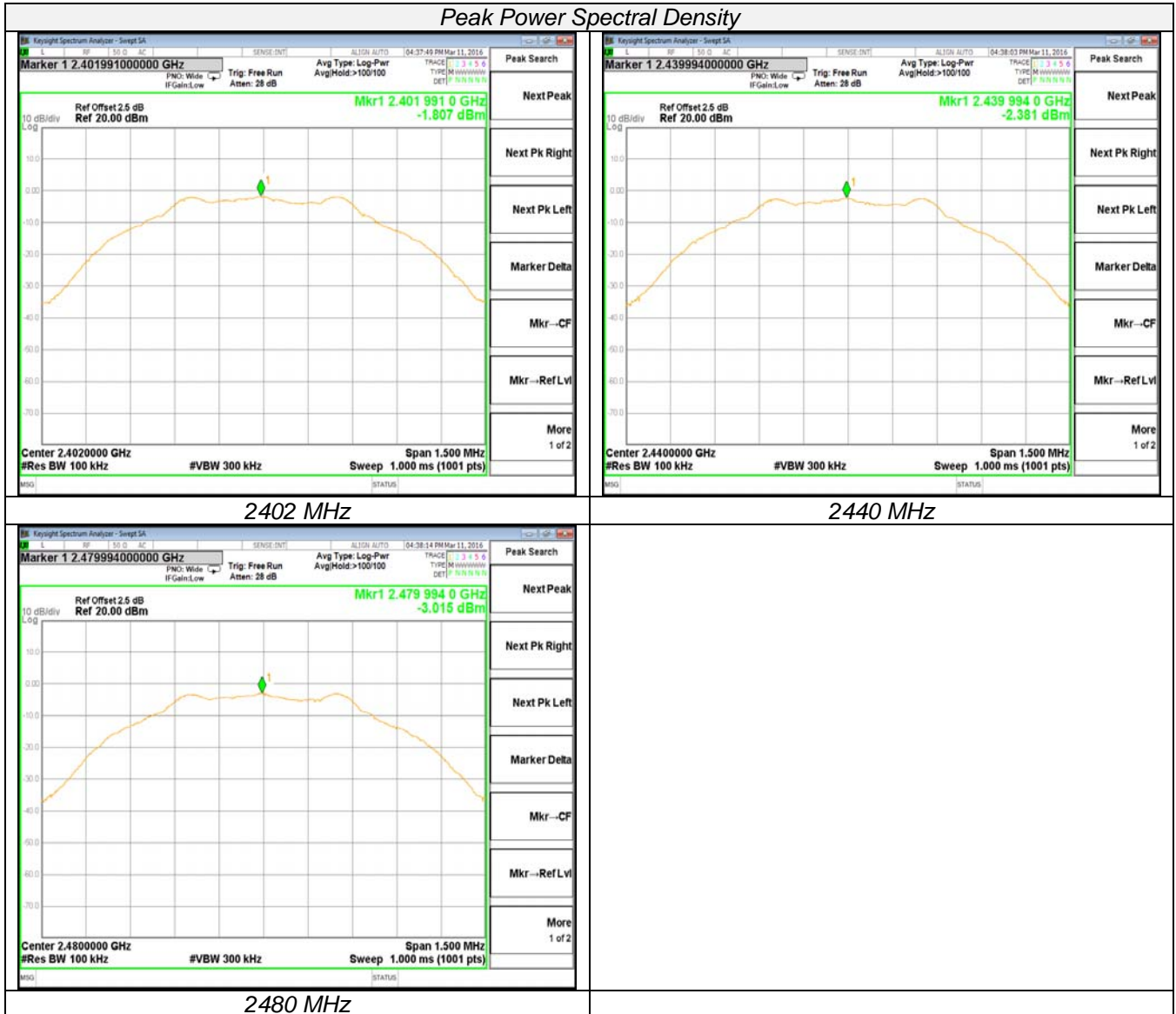
### TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured Peak Power Spectral Density (dBm/100KHz)	Limits (dBm/3KHz)	Verdict
GFSK-BLE	0	2402	-1.807	8	PASS
	19	2440	-2.381		
	39	2480	-3.015		

Remark:

1. Test results including cable loss;
2. please refer to following plots;

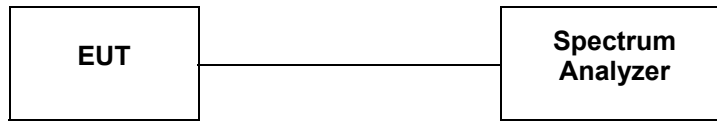
## Peak Power Spectral Density





#### 4.6. 6dB Bandwidth

##### TEST CONFIGURATION



##### TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

##### LIMIT

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

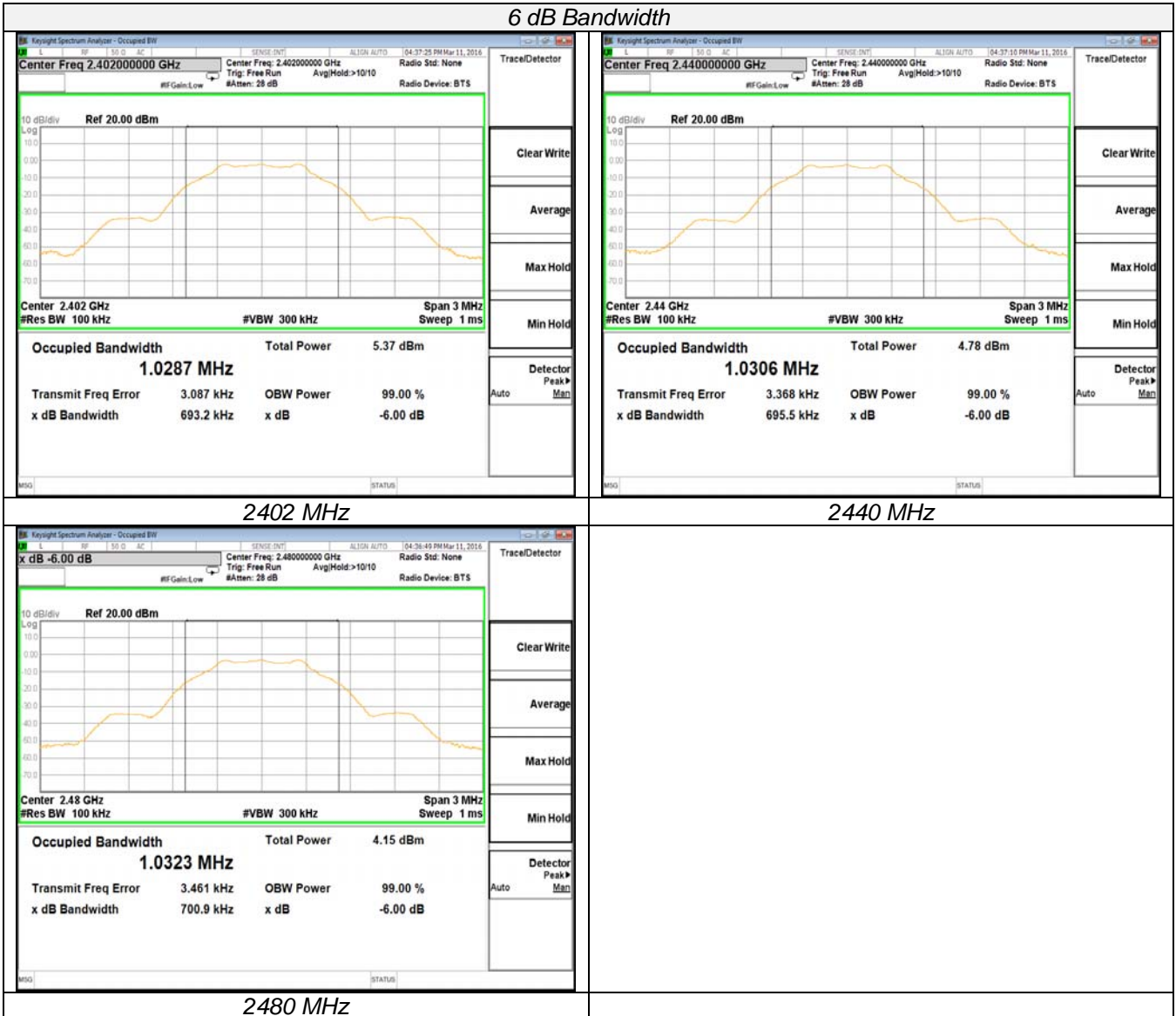
##### TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Measured 6 dB Bandwidth (MHz)	Limits (MHz)	Verdict
GFSK-BLE	0	2402	0.6932	$\geq 0.5000$	PASS
	19	2440	0.6955		
	39	2480	0.7009		

Remark:

1. Test results including cable loss;
2. please refer to following plots;

## 6 dB Bandwidth

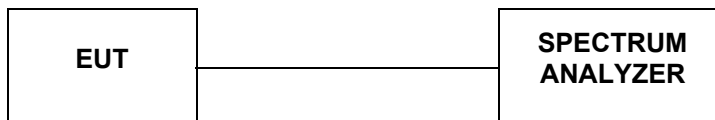


## 4.7. Band-edge measurements for radiated emissions

### TEST REQUIREMENT

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)).

### TEST CONFIGURATION



### TEST PROCEDURE

According to KDB 558074 D01 V03 for Antenna-port conducted measurement. Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=10Hz for Peak detector.
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.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7. Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8. Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies  $\leq 30$  MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies  $> 1000$  MHz).
9. For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10. Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:  

$$E = \text{EIRP} - 20\log D + 104.8$$

where:

E = electric field strength in dB $\mu$ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

11. Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12. Compare the resultant electric field strength level to the applicable regulatory limit.
13. Perform radiated spurious emission test dures until all measured frequencies were complete.

**LIMIT**

Below -20dB of the highest emission level in operating band.

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)

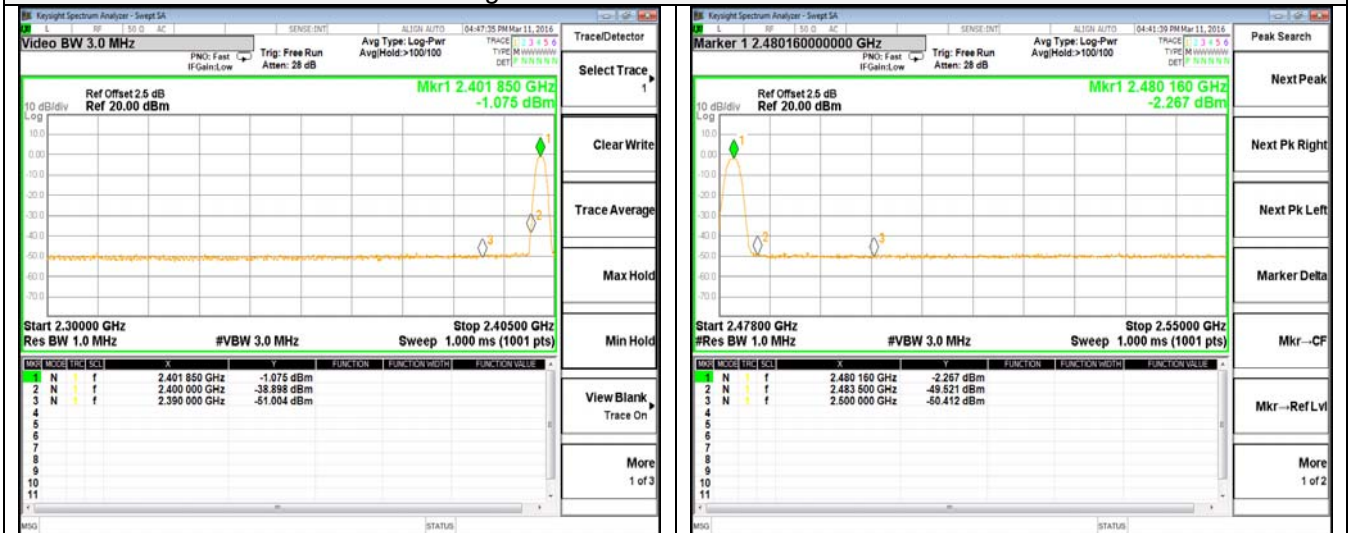
**TEST RESULTS**

<b>GFSK – BLE</b>							
<b>Frequency (MHz)</b>	<b>Conducted Power (dBm)</b>	<b>Antenna Gain (dBi)</b>	<b>Ground Reflection Factor (dB)</b>	<b>Covert Radiated E Level At 3m (dBuV/m)</b>	<b>Detector</b>	<b>Limit (dBuV/m)</b>	<b>Verdict</b>
2390.000	-51.004	0.00	0.00	46.256	Peak	74.00	PASS
2390.000	-61.669	0.00	0.00	35.591	AV	54.00	PASS
2401.850	-1.075	0.00	0.00	96.185	Peak	---	PASS
2401.850	-25.046	0.00	0.00	72.214	AV	---	PASS
2480.160	-2.267	0.00	0.00	94.993	Peak	---	PASS
2480.160	-25.924	0.00	0.00	71.336	AV	---	PASS
2483.500	-49.521	0.00	0.00	47.739	Peak	74.00	PASS
2483.500	-61.616	0.00	0.00	35.644	AV	54.00	PASS

Remark:

1. Test results including cable loss;
2. “---“ means that the fundamental frequency not for 15.209 limits requirement.
3. please refer to following plots;

### Band-edge measurements for radiated emissions



2402 MHz – Peak



2402 MHz – Average

2480 MHz – Peak



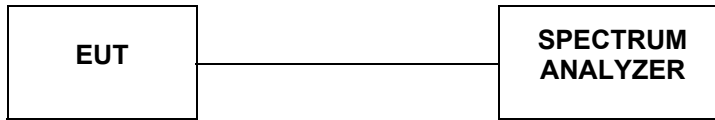
2480 MHz – Average

#### 4.8. Band-edge measurements for RF conducted emissions

##### LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

##### TEST CONFIGURATION



##### TEST PROCEDURE

According to KDB 558074 D01 V03 for Antenna-port conducted measurement.

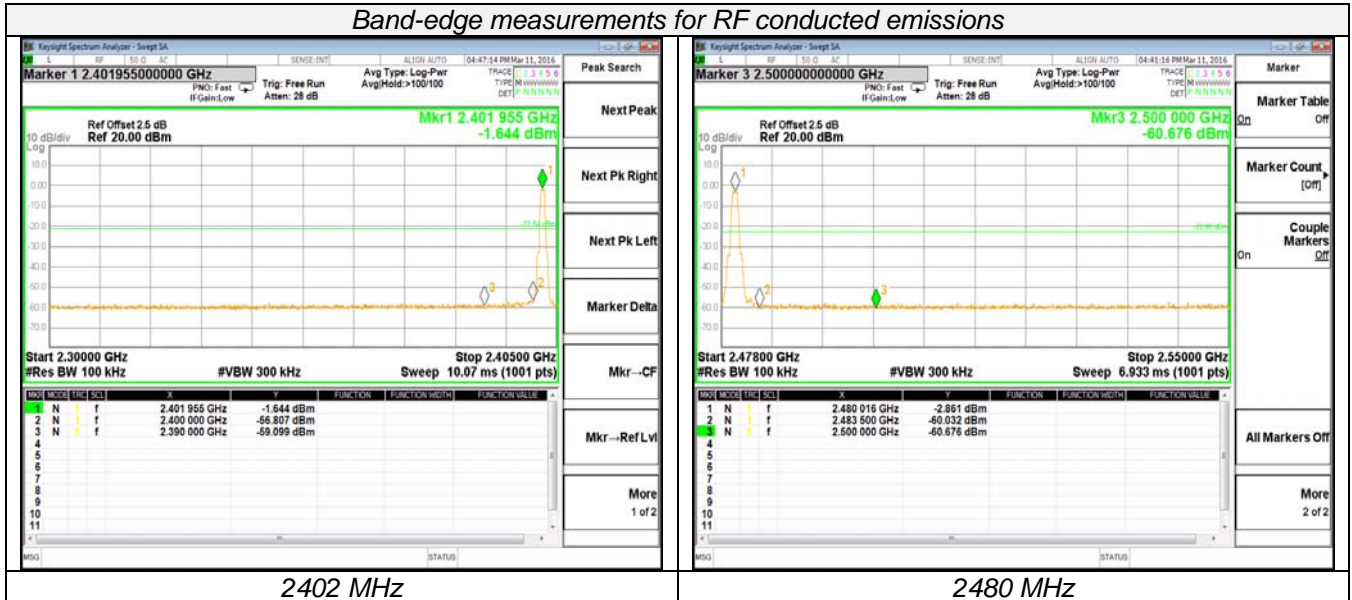
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge,
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.
6. Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).

##### TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Conductd Band-edge Emission (dBc)	Limits (dBc)	Verdict
GFSK-BLE	0	2402	<-20dBc	-20	PASS
	39	2480	<-20dBc	-20	

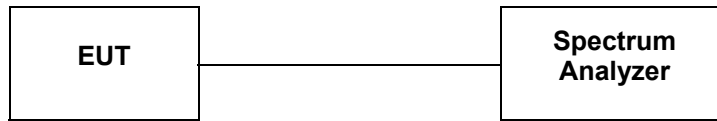
Remark:

1. Test results including cable loss;
2. “---” means that the fundamental frequency not for 15.209 limits requirement.
3. please refer to following plots;

*Band-edge measurements for RF conducted emissions*

## 4.9. Spurious RF Conducted Emission

### TEST CONFIGURATION



### TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength, and measure frequency range from 9KHz to 26.5GHz.

### LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

### TEST RESULTS

Test Mode	Channel	Frequency (MHz)	Spurious RF Conducted Emission (dBc)	Limits (dBc)	Verdict
GFSL-BLE	0	2402	<-20dBc	-20	PASS
	19	2440	<-20dBc	-20	
	39	2480	<-20dBc	-20	

Remark:

1. Test results including cable loss;
2. “---“ means that the fundamental frequency not for 15.209 limits requirement.
3. please refer to following plots;



## Spurious RF conducted emissions

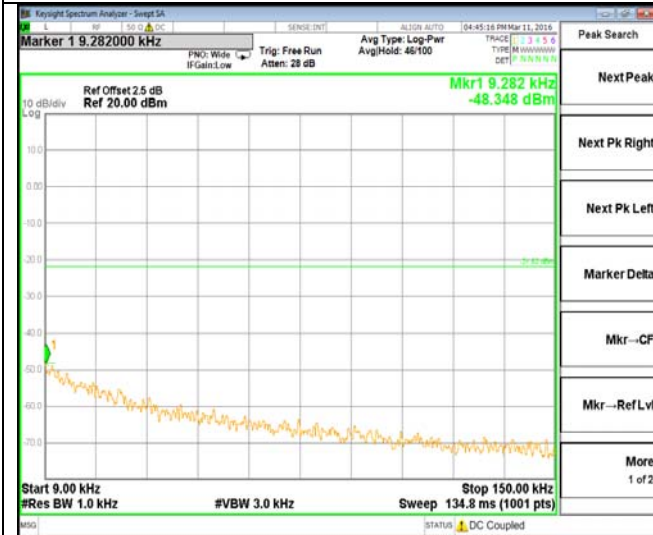
2402 MHz



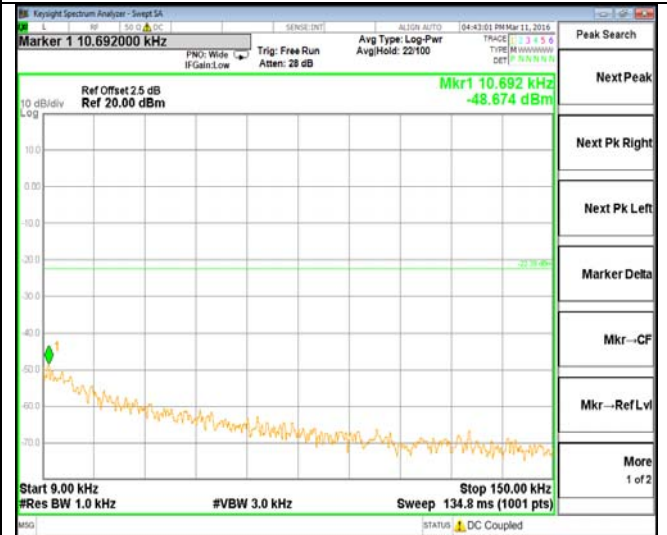
2440 MHz



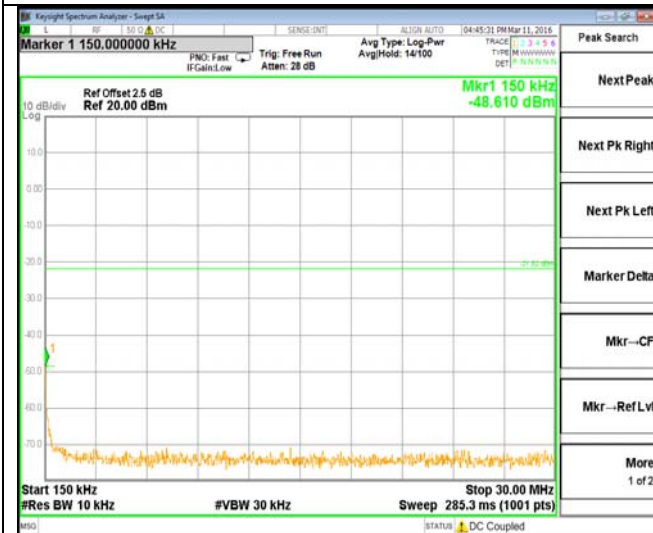
2400.5 MHz – 2403.5 MHz



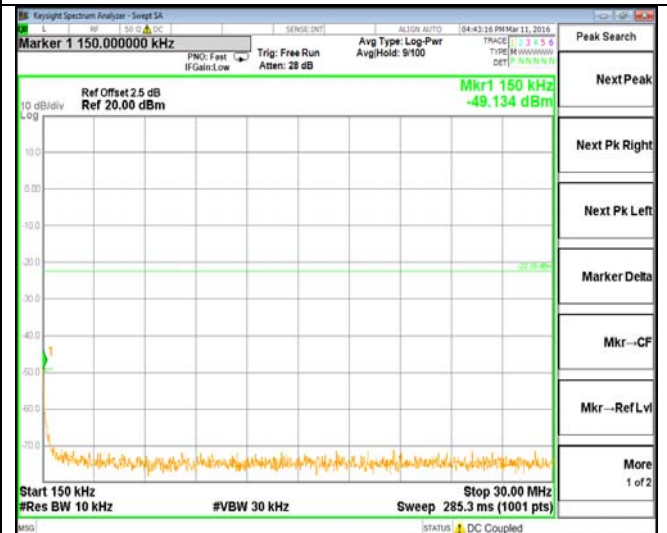
2400.5 MHz – 2403.5 MHz



9 KHz – 150 KHz



9 KHz – 150 KHz

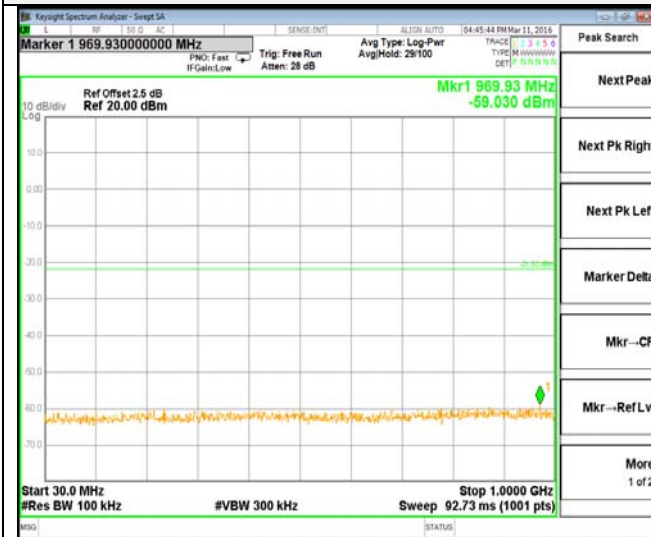


150 KHz – 30 MHz

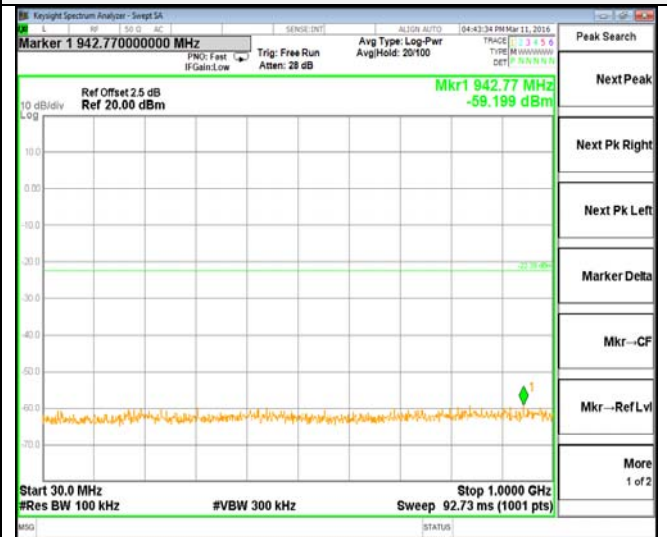
150 KHz – 30 MHz

## Spurious RF conducted emissions

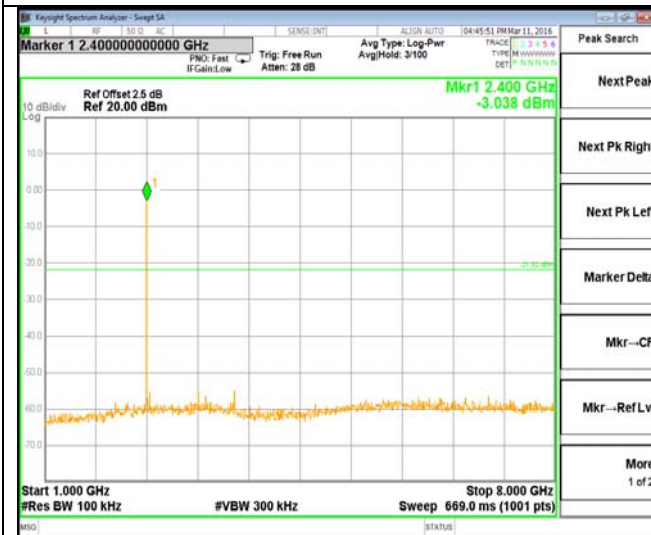
2402 MHz



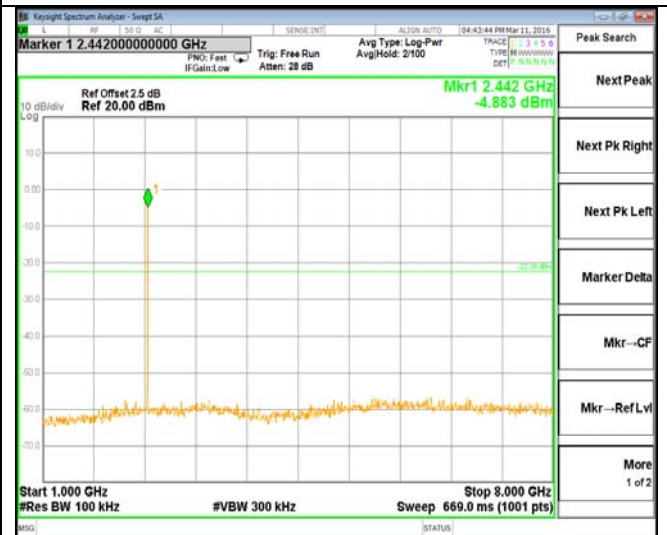
2440 MHz



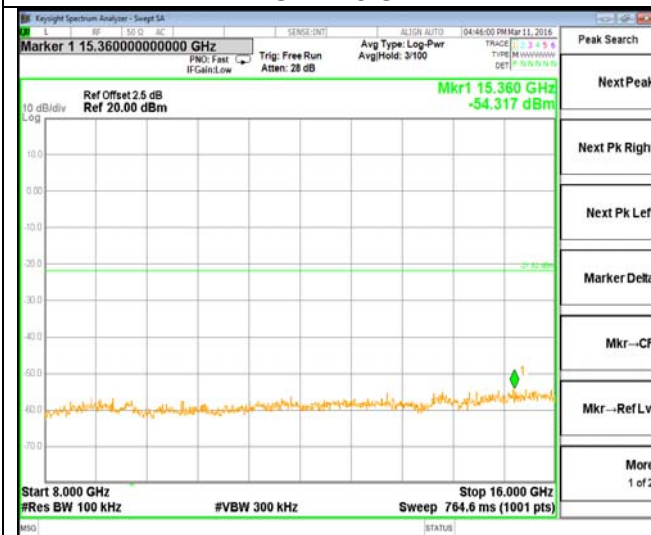
30 MHz – 1000 MHz



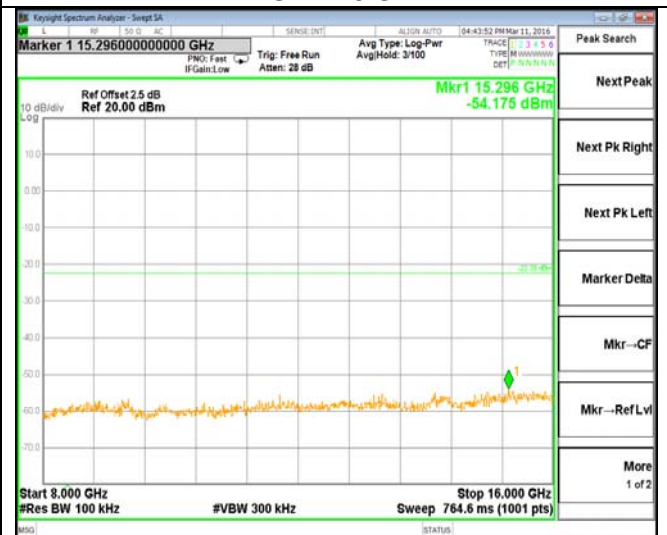
30 MHz – 1000 MHz



1 GHz – 8 GHz



1 GHz – 8 GHz

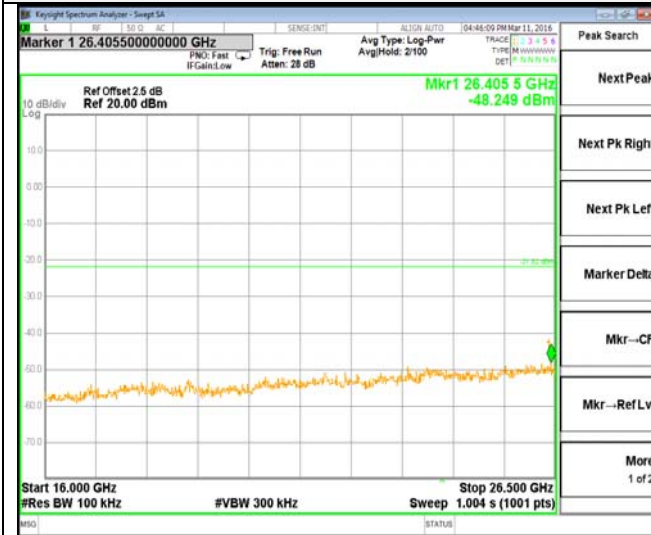


8 GHz – 16 GHz

18 GHz – 16 GHz

## Spurious RF conducted emissions

2402 MHz



2440 MHz



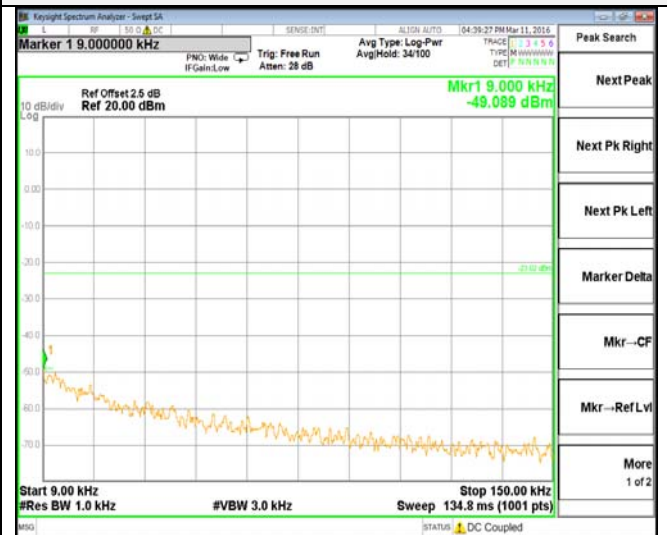
16 GHz – 26.5 GHz

2480 MHz

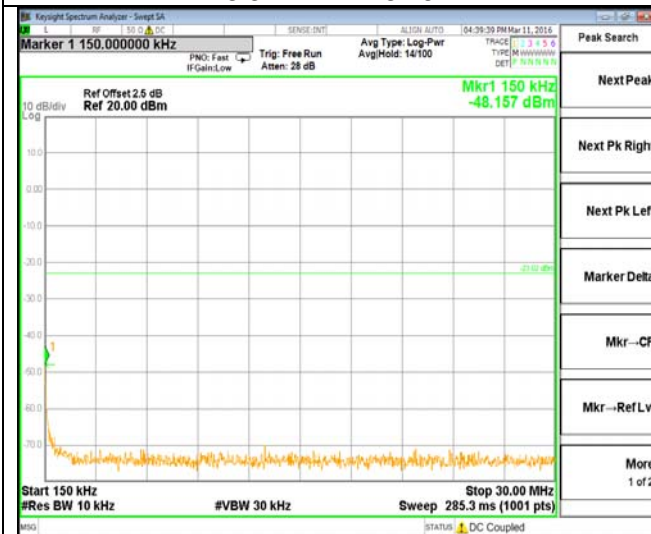


16 GHz – 26.5 GHz

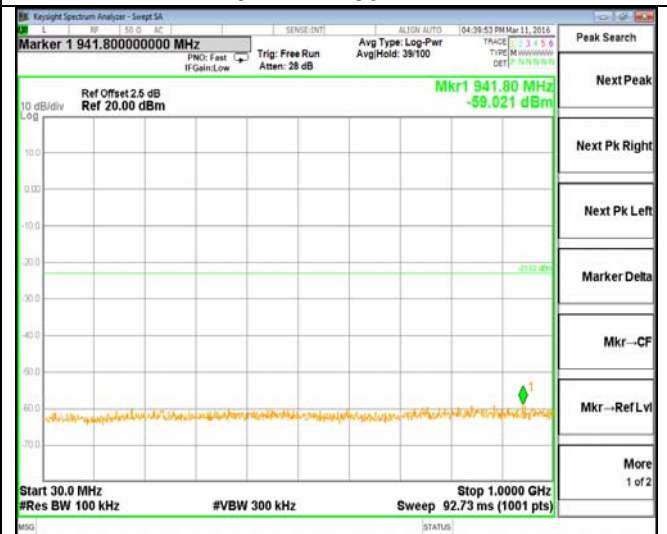
2480 MHz



2478.5 MHz – 2481.5 MHz



9 KHz – 150 KHz

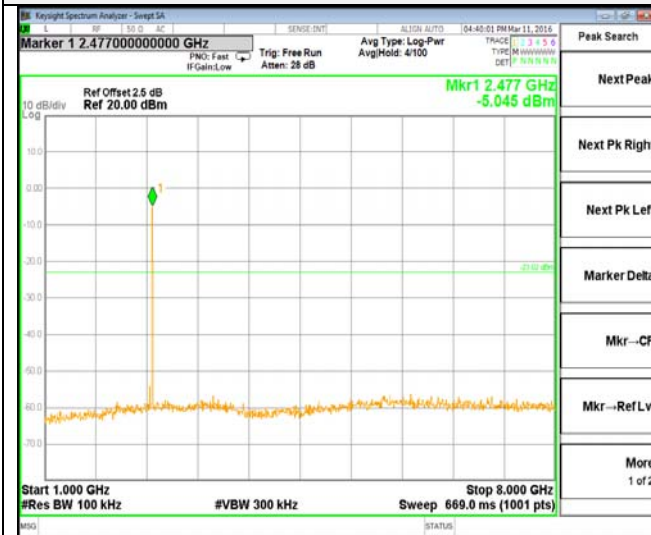


150 KHz – 30 MHz

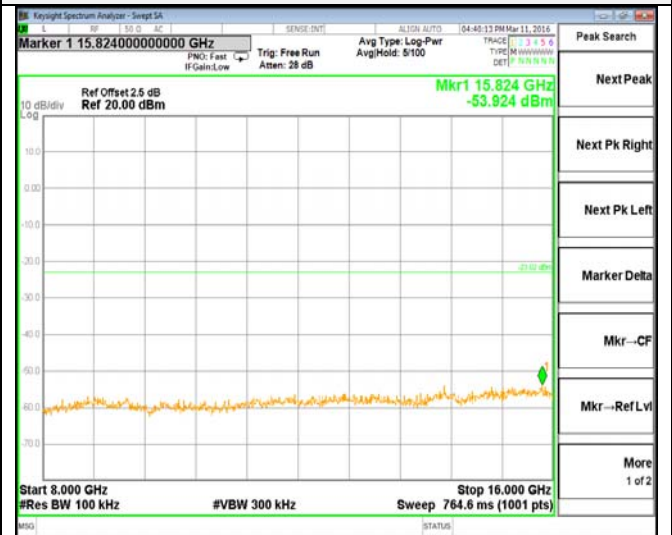
30 MHz – 1000 MHz

## Spurious RF conducted emissions

2480 MHz



2480 MHz



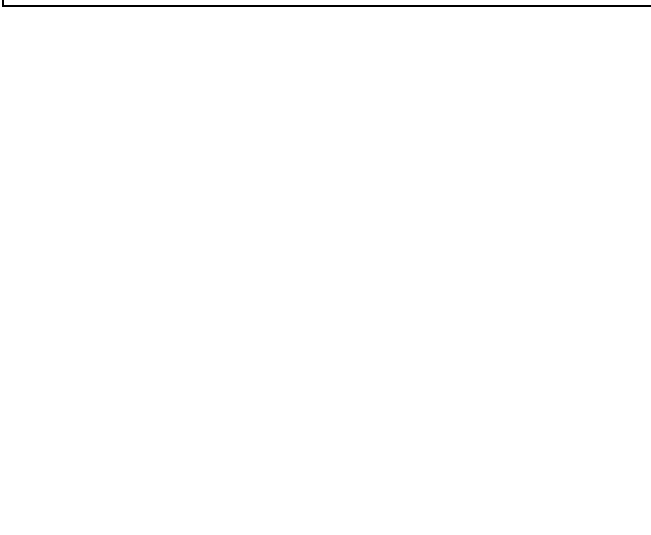
1 GHz – 8 GHz



8 GHz – 16 GHz



16 GHz – 26.5 GHz



## 4.10. Antenna Requirement

### Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

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.

### Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Conducted power refer ANSI C63.10 :2009 Section 11.9 Output power test procedure for DTS devices

Radiated power refer to ANSI C63.10 :2009 Section 6.6.4 Radiated emissions tests.

### Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

### Limits

FCC	IC
Antenna Gain	
6 dBi	

### Results

T <sub>nom</sub>	V <sub>nom</sub>	Lowest Channel 2402 MHz	Middle Channel 2440 MHz	Highest Channel 2480 MHz
Conducted power [dBm] Measured with GFSK modulation		-1.041	-1.562	-2.189
Radiated power [dBm] Measured with GFSK modulation		-2.181	-1.788	-3.551
Gain [dBi] Calculated		-1.140	-0.226	-1.362
Measurement uncertainty		± 0.60 dB (cond.) / ± 2.56 dB (rad.)		

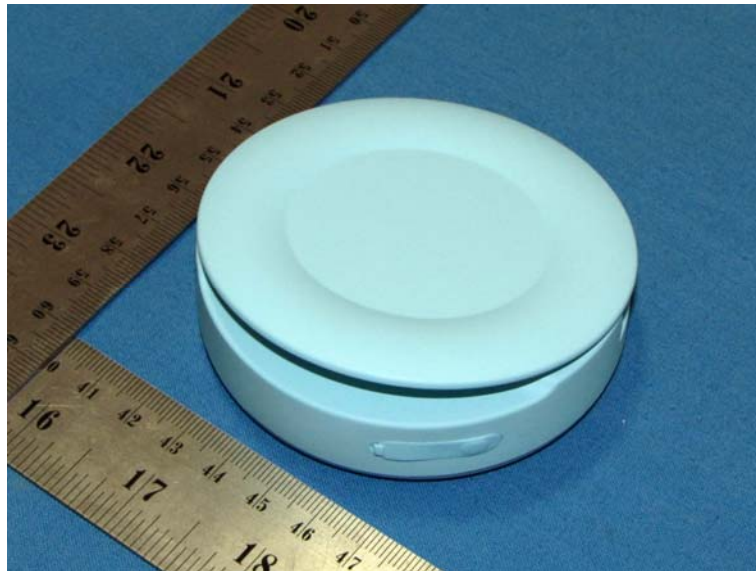


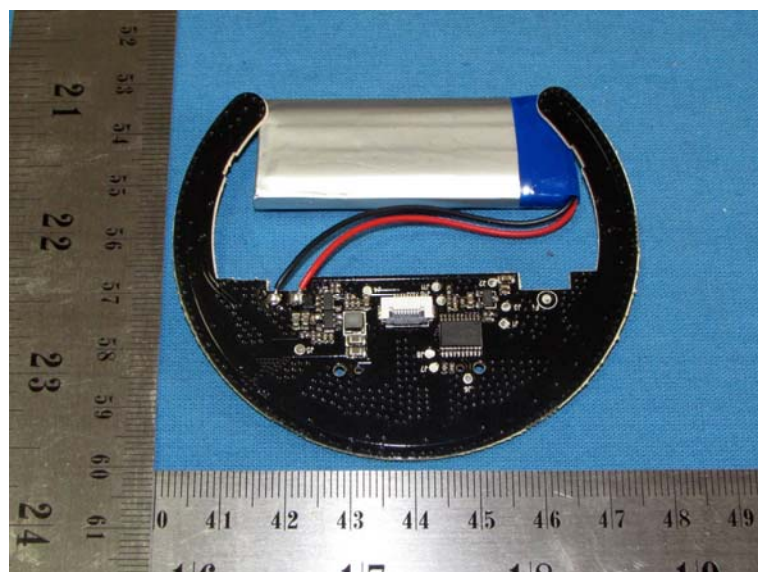
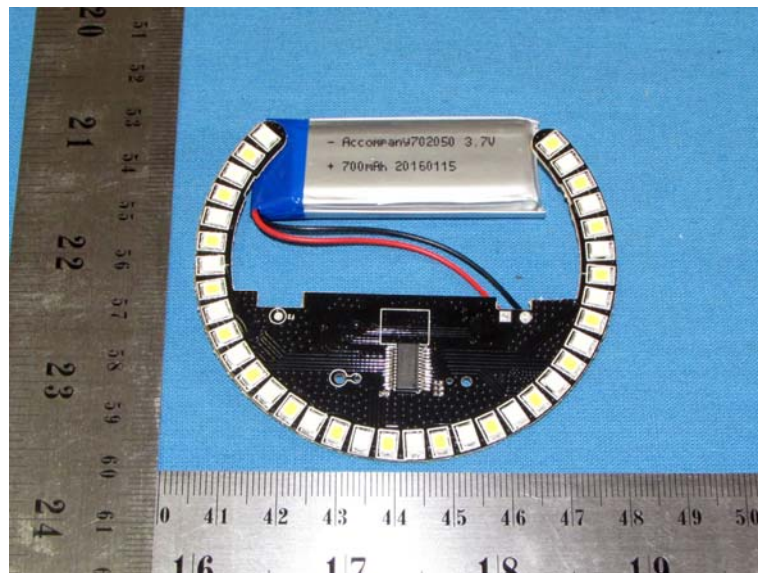
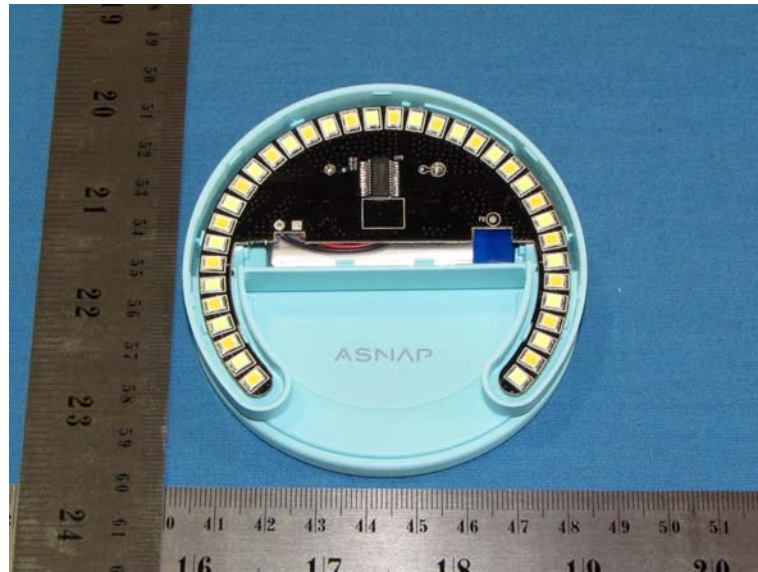
## 5. Test Setup Photos of the EUT



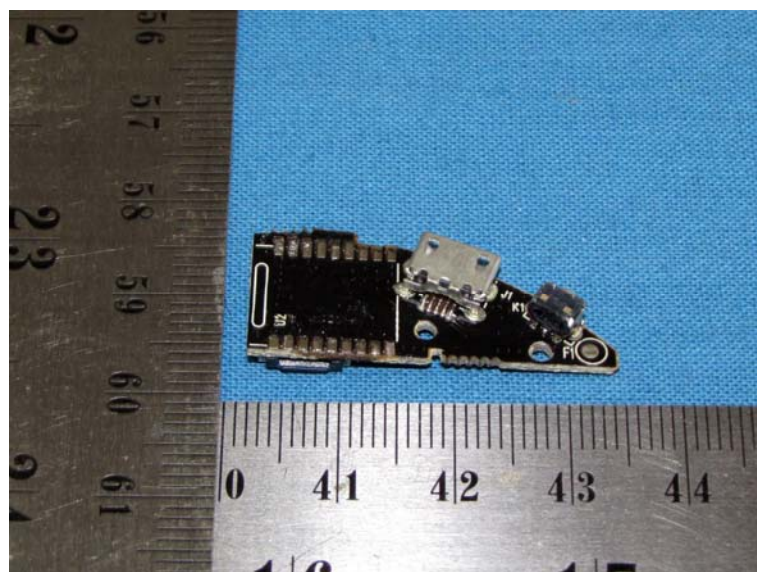
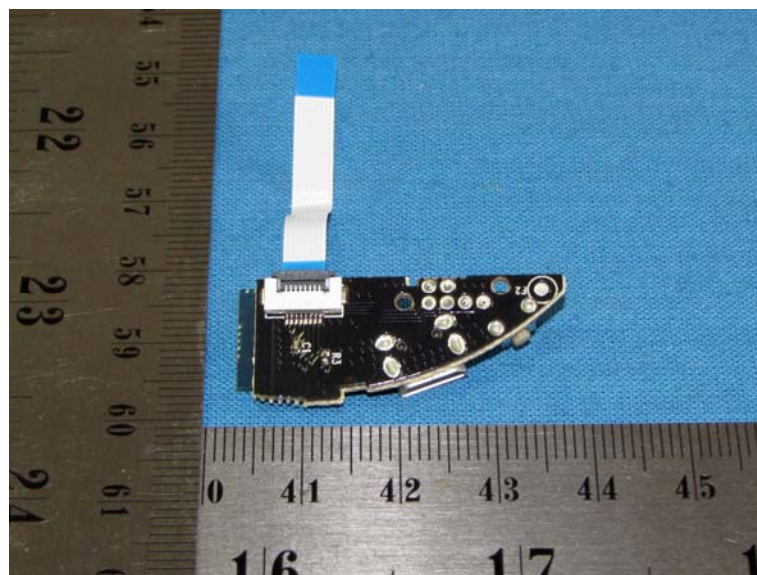
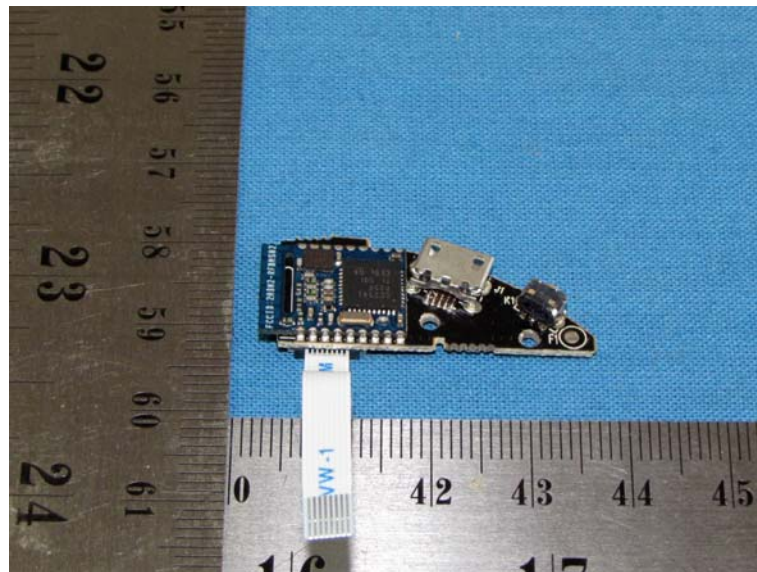
## 6. External and Internal Photos of the EUT

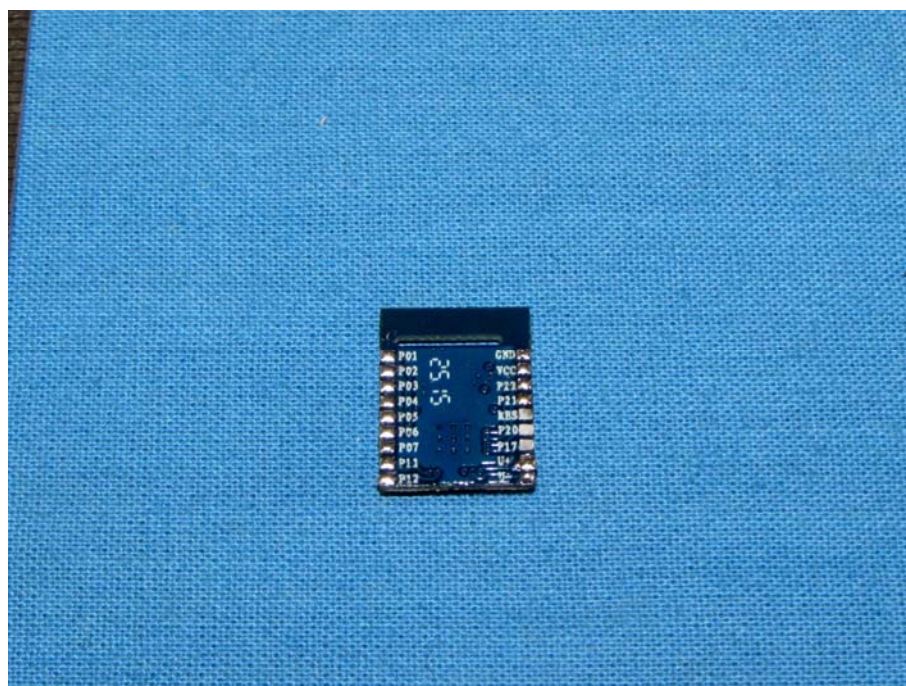
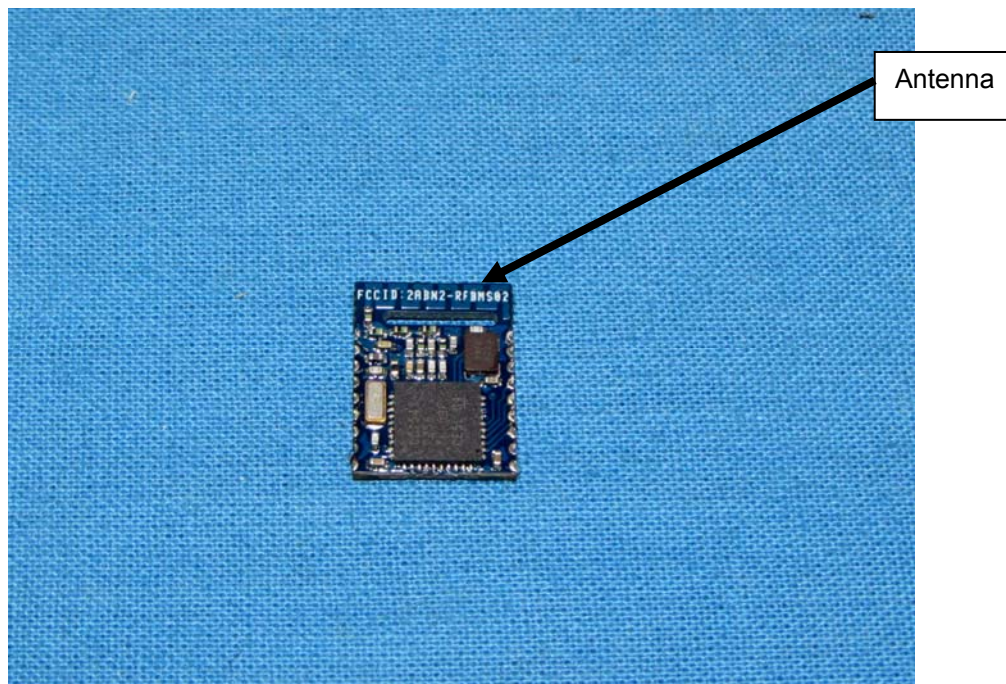
### External Photos



**Internal Photos**







.....End of Report.....