

Shenzhen Toby Technology Co., Ltd.

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# FCC Radio Test Report FCC ID: 2ATHG-W1

**Original Grant** 

		Original Grant
Report No.	:	TB-FCC166981
Applicant	1	Weret AB
Equipment Under T	'est (E	:UT)
EUT Name		Weret Ocean
Model No.	:	W1
Series Model No.	69	N/A
Brand Name	1	Weret
Receipt Date	aBI	2019-06-25
Test Date	:	2019-06-26 to 2018-07-04
Issue Date	10	2019-07-05
Standards	1	FCC Part 15, Subpart C 15.247
Test Method	. :	ANSI C63.10: 2013
Conclusions	:	PASS

Jason

WAN SU fogla.

In the configuration tested, the EUT complied with the standards specified above,

Ivan Su OF

Rav Lai

**Test/Witness Engineer** 

**Engineer Supervisor** 

**Engineer Manager** 

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0



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# **Revision History**

Report No.	Version	Description	Issued Date
TB-FCC166981	Rev.01	Initial issue of report	2019-07-05
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# 1. General Information about EUT

### **1.1 Client Information**

Applicant		Weret AB		
Address	:	/O The Techno Creatives Geijersgatan 1B, SE41134		
Manufacturer	3	Dissa International Co., Limited		
Address		7th Floor, Baojiali Building, Gushu, Bao'an District, Shenzhen (518126), China.		

### 1.2 General Description of EUT (Equipment Under Test)

EUT Name		Weret Ocean		
Models No.		W1		
Model Difference	:	N/A		
		Operation Frequency:	Bluetooth V4.2: 2402~2480 MHz	
BUD .		Number of Channel:	Bluetooth: 40 Channels See Note 2	
Product Description		Max Peak Output Power:	-6.432dBm	
Description		Antenna Gain:	0dBi Internal Antenna	
		Modulation Type:	GFSK (1 Mbps)	
Power Rating	-	Input: DC 5V, 0.5A PD2430C, 3.7V, 75mAh, 40uA current consumption.		
Software Version		FW: 1.22, iOS App v0.2(b12), Android App v0.4		
Hardware Version	:	1.0 (RC1)		
Connecting I/O Port(S)		Please refer to the User's Manual		

This Test Report is FCC Part 15.247 for Bluetooth BLE, the test procedure follows the FCC KDB 558074 D01 v05r02.

- (1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- (2) Antenna information provided by the applicant.



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#### (3) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	39	2480
12	2426	26	2454		
13	2428	27	2456		

### 1.3 Block Diagram Showing the Configuration of System Tested

### Adapter + TX Mode

Adapter

— Wi

Cable 1

/ireless Charg	ger
EUT	

TX Mode



### 1.4 Description of Support Units

Equipment Information						
Name	Model	S/N	Manufacturer	Used "√"		
Wireless Charger	IC1		Weret AB	V		
Adapter	BSY02D050200V	<u></u>	BSY	V		
Cable Information						
Number	Shielded Type	Ferrite Core	Length	Note		
1	NO	NO	1m	1		

#### 1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test		
Final Test Mode	Description	
Mode 1	Charging+ TX Mode	

For Radiated Test		
Final Test Mode	Description	
Mode 2	TX Mode	
Mode 3	TX Mode (Channel 00/20/39)	

#### Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

- BLE Mode: GFSK Modulation Transmitting mode.
- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a portable unit; in normal use it was positioned on X-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.



### 1.6 Description of Test Software Setting

During testing channel& Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF setting.

Test Software Version	nRFgo Studio		
Frequency	2402 MHz	2442MHz	2480 MHz
BLE GFSK	DEF	DEF	DEF

#### 1.7 Measurement Uncertainty

The reported uncertainty of measurement y  $\pm$  U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U <sub>Lab</sub> )
	Level Accuracy:	
Conducted Emission	9kHz~150kHz	±3.42 dB
	150kHz to 30MHz	±3.42 dB
Radiated Emission	Level Accuracy:	±4.60 dB
Radiated Emission	9kHz to 30 MHz	±4.00 UB
Dedicted Emission	Level Accuracy:	±4.40 dB
Radiated Emission	30MHz to 1000 MHz	±4.40 0B
Dedicted Emission	Level Accuracy:	
Radiated Emission	Above 1000MHz	±4.20 dB



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#### 1.8 Test Facility

The testing was performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at:1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China.

At the time of testing, the following bodies accredited the Laboratory:

#### **CNAS (L5813)**

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

#### A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01.FCC Accredited Test Site Number: 854351.

#### IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.

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# 2. Test Summary

FCC Part 15 Subpart C(15.247)				
Standard Section FCC	Test Item	Judgment	Remark	
15.203	Antenna Requirement	PASS	N/A	
15.207(a)	Conducted Emission	PASS	N/A	
15.205&15.247(d)	Band-Edge & Unwanted Emissions into Restricted Frequency	PASS	N/A	
15.247(a)(2)	6dB Bandwidth	PASS	N/A	
15.247(b)(3)	Conducted Max Output Power	PASS	N/A	
15.247(e)	Power Spectral Density	PASS	N/A	
15.205, 15.209&15.247(d)	Transmitter Radiated Spurious &Unwanted Emissions into Restricted Frequency	PASS	N/A	



# 3. Test Equipment

Conducted Emissi	on Test				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul.18, 2018	Jul. 17, 2019
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul.18, 2018	Jul. 17, 2019
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul.18, 2018	Jul. 17, 2019
LISN	Rohde & Schwarz	ENV216	101131	Jul.18, 2018	Jul. 17, 2019
Radiation Emissio	n Test				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul.18, 2018	Jul. 17, 2019
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul.18, 2018	Jul. 17, 2019
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Jan. 27, 2019	Jan. 26, 2020
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Jan. 27, 2019	Jan. 26, 2020
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.03, 2019	Mar. 02, 2020
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar.03, 2019	Mar. 02, 2020
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul.18, 2018	Jul. 17, 2019
Pre-amplifier	Sonoma	310N	185903	Mar.04, 2019	Mar. 03, 2020
Pre-amplifier	HP	8449B	3008A00849	Mar.03, 2019	Mar. 02, 2020
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar.03, 2019	Mar. 02, 2020
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Antenna Conducte	ed Emission				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul.18, 2018	Jul. 17, 2019
Spectrum Analyzer	Rohde & Schwarz	ESCI	100010/007	Jul.18, 2018	Jul. 17, 2019
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Sep. 15, 2018	Sep. 14, 2019
Vector Signal Generator	Agilent	N5182A	MY50141294	Sep. 15, 2018	Sep. 14, 2019
Analog Signal Generator	Agilent	N5181A	MY50141953	Sep. 15, 2018	Sep. 14, 2019
all the	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO26	Sep. 15, 2018	Sep. 14, 2019
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO29	Sep. 15, 2018	Sep. 14, 2019
	DARE !! Instruments	RadiPowerRPR3006W	17100015SNO31	Sep. 15, 2018	Sep. 14, 2019
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO33	Sep. 15, 2018	Sep. 14, 2019



# 4. Conducted Emission Test

- 4.1 Test Standard and Limit
  - 4.1.1Test Standard FCC Part 15.207
  - 4.1.2 Test Limit

Conducted	Emission	<b>Test Lin</b>	nit

Frequency	Maximum RF Line Voltage (dBµV)		
	Quasi-peak Level	Average Level	
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *	
500kHz~5MHz	56	46	
5MHz~30MHz	60	50	

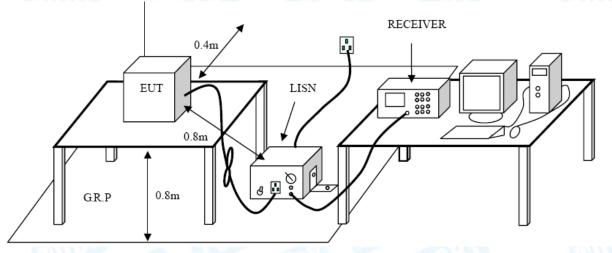
Notes:

(1) \*Decreasing linearly with logarithm of the frequency.

(2) The lower limit shall apply at the transition frequencies.

(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2 Test Setup



### 4.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.



I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis.

The bandwidth of EMI test receiver is set at 9 kHz, and the test frequency band is from 0.15MHz to 30MHz.

4.4 EUT Operating Mode

Please refer to the description of test mode.

4.5 Test Data

Please refer to the Attachment A.



# 5. Radiated Emission Test

- 5.1 Test Standard and Limit
  - 5.1.1 Test Standard
    - FCC Part 15.247(d)
  - 5.1.2 Test Limit

#### Radiated Emission Limits (9kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

#### Radiated Emission Limit (Above 1000MHz)

Frequency	Distance Meters(at 3m)		
(MHz)	Peak (dBuV/m)	Average (dBuV/m)	
Above 1000	74	54	

#### Note:

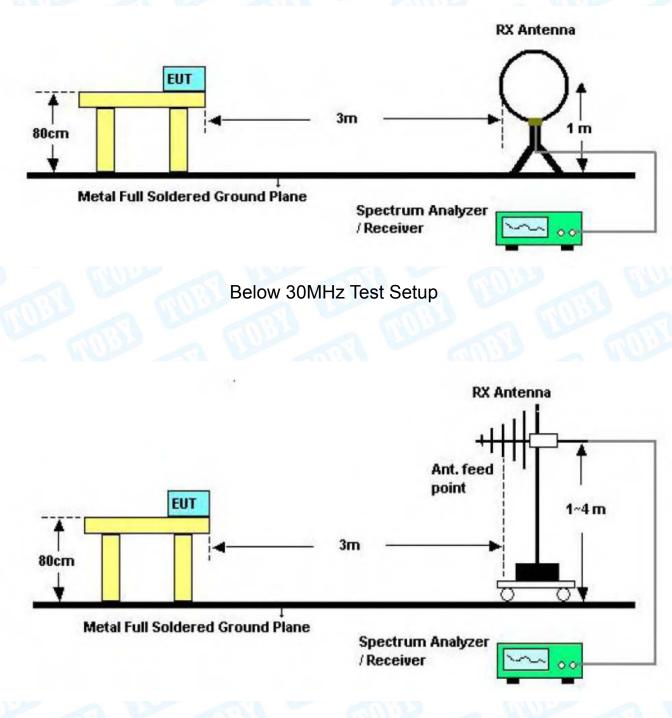
(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m)



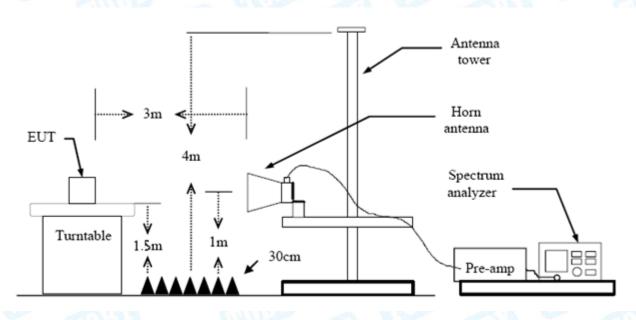
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5.2 Test Setup



Below 1000MHz Test Setup





Above 1GHz Test Setup

#### 5.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.



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### 5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

### 5.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

Please refer to the Attachment B.

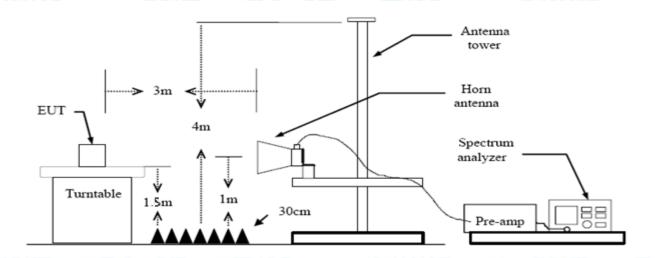


## 6. Restricted Bands and Band-edge test

- 6.1 Test Standard and Limit
  - 6.1.1 Test Standard
    - FCC Part 15.247(d) FCC Part 15.205
  - 6.1.2 Test Limit

Restricted Frequency	Distance Meters(at 3m)	
Band (MHz)	Peak (dBuV/m)	Average (dBuV/m)
2310 ~2390	74	54
2483.5 ~2500	74	54

### 6.2 Test Setup



### 6.3 Test Procedure

- (1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector



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mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

6.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

6.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values. Please refer to the Attachment C.

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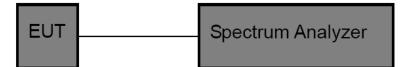


# 7. Bandwidth Test

- 7.1 Test Standard and Limit
  - 7.1.1 Test Standard
    - FCC Part 15.247 (a)(2)
  - 7.1.2 Test Limit

FCC	FCC Part 15 Subpart C(15.247)/RSS-247			
Test Item	Limit	Frequency Range(MHz)		
Bandwidth	>=500 KHz (6dB bandwidth)	2400~2483.5		

7.2 Test Setup



### 7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) The bandwidth is measured at an amplitude level reduced 6dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
- (3)Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:100 kHz, and Video Bandwidth:300 kHz, Detector: Peak, Sweep Time set auto.

### 7.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, middle and high channel for the test.

7.5 Test Data

Please refer to the Attachment D.

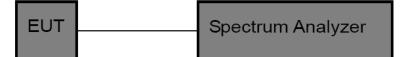


### 8. Peak Output Power Test

- 8.1 Test Standard and Limit
  - 8.1.1 Test Standard
    - FCC Part 15.247 (b)(3)
  - 8.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-247		
Test Item	Limit	Frequency Range(MHz)
Peak Output Power	1 Watt or 30 dBm	2400~2483.5

#### 8.2 Test Setup



### 8.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement is according to section 9.1.1 of KDB 558074 D01 v05r02.

- (1) Set the RBW≥DTS Bandwidth
- (2) Set VBW≥3\*RBW
- (3) Set Span≥3\*RBW
- (4) Sweep time=auto
- (5) Detector= peak
- (6) Trace mode= maxhold.
- (7) Allow trace to fully stabilize, and then use peak marker function to determine the peak amplitude level.

### 8.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

### 8.5 Test Data

Please refer to the Attachment E.

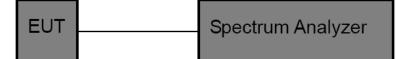


# 9. Power Spectral Density Test

- 9.1 Test Standard and Limit
  - 9.1.1 Test Standard
    - FCC Part 15.247 (e)
  - 9.1.2 Test Limit

FCC Part 15 Subpart C(15.247)									
Test Item	Limit	Frequency Range(MHz)							
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5							

#### 9.2 Test Setup



### 9.3 Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.2 of KDB D01 v05r02.

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Set analyser center frequency to DTS channel center frequency.
- (3) Set the span to 1.5 times the DTS bandwidth.
- (4) Set the RBW to: 3 kHz
- (5) Set the VBW to: 10 kHz
- (6) Detector: peak
- (7) Sweep time: auto
- (8) Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

### 9.4 EUT Operating Condition

The EUT was set to continuously transmitting in each mode and low, Middle and high channel for the test.

#### 9.5 Test Data

Please refer to the Attachment F.



### 10. Antenna Requirement

#### 10.1 Standard Requirement

#### 10.1.1 Standard

FCC Part 15.203

#### 10.1.2 Requirement

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 use of a standard antenna jack or electrical connector is prohibited.

#### 10.2 Antenna Connected Construction

The gains of the antenna used for transmitting is 0dBi, and the antenna de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

#### 10.3 Result

The EUT antenna is Internal Antenna. It complies with the standard requirement.

Antenna Type
Permanent attached antenna
Unique connector antenna
Professional installation antenna



# **Attachment A-- Conducted Emission Test Data**

Remark: All channels have been tested and Shows only the worst channels.

Temperature:	<b>25</b> ℃	<b>Relative Humidity:</b>	55%
Fest Voltage:	AC 120V/60Hz	TUP A	1
Ferminal:	Line	any	A GUL
fest Mode:	BLE Mode 2402Mhz	2 4 1	RI
Remark:	Only worse case is rep	ported.	
90.0 dBuV			QP: AVG:
40 × ×	mm Marshallan John good way		AVG

No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	0.1660	22.67	9.70	32.37	65.15	-32.78	QP
2	0.1660	9.94	9.70	19.64	55.15	-35.51	AVG
3	0.1980	20.30	9.72	30.02	63.69	-33.67	QP
4	0.1980	9.42	9.72	19.14	53.69	-34.55	AVG
5	0.2180	24.97	9.72	34.69	62.89	-28.20	QP
6	0.2180	18.07	9.72	27.79	52.89	-25.10	AVG
7	0.4540	20.79	9.78	30.57	56.80	-26.23	QP
8 *	0.4540	17.98	9.78	27.76	46.80	-19.04	AVG
9	3.9460	10.77	9.89	20.66	56.00	-35.34	QP
10	3.9460	5.73	9.89	15.62	46.00	-30.38	AVG
11	5.3940	10.13	9.93	20.06	60.00	-39.94	QP
12	5.3940	5.47	9.93	15.40	50.00	-34.60	AVG



Temperature	e: 25 °C		Re	elative Humi	dity:	55%	
Fest Voltage	»: AC 1	20V/60Hz				-	V
Terminal:	Neut	ral	-		m		
Test Mode:		Mode 2402M					A BL
Remark:	Only	worse case	is reported.	MUP	2	2	Nu.
90.0 dBvV						QP: AVG:	
-10 0.150	0.5		Angeneric and		, and a constant of the second s		peak AVG 30.000
		Reading	Correct	Measure-			
No. Mk.	Freq.	Level	Factor	ment	Limit	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detecto
1	0.2180	24.93	9.72	34.65	62.89	-28.24	QP
2	0.2180	17.64	9.72	27.36	52.89	-25.53	AVG
3	0.4740	14.54	9.78	24.32	56.44	-32.12	QP
4	0.4740	7.47	9.78	17.25	46.44	-29.19	AVG
5	2.3820	18.11	9.87	27.98	56.00	-28.02	QP
6	2.3820	13.27	9.87	23.14	46.00	-22.86	AVG
7	5.4180	22.45	9.93	32.38	60.00	-27.62	QP
8 *	5.4180	17.42	9.93	27.35		-22.65	
	11.4900	20.89	10.06	30.95		-29.05	
	11.4900	13.66	10.06	23.72		-26.28	
10		20.46					
		211/16	10.06	30.52	60.00	-29.48	QP
11 2	20.3700 20.3700	11.98	10.06	22.04		-27.96	AVG



# **Attachment B-- Radiated Emission Test Data**

#### 9 KHz~30 MHz

From 9 KHz to 30 MHz: Conclusion: PASS

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

#### 30MHz~1GHz

Temperature:	<b>25</b> ℃	Rela	ative Humidity	: 55°	%	
Fest Voltage:	DC 3.7V	6		~ 5	NUM	1
Ant. Pol.	Horizontal		-01	20.1		60
est Mode:	BLE TX 2402 Mc	de	2 914		201	
Remark:	Only worse case	is reported	19	611	192	
80.0 dBu¥/m	-					
			(B	F)FCC 15C 3M	Radiation	
					Margin -6 d	▫╴[
		ſ				
30						
				5 ×	mont	6 X
1 ×			3	an march	AMAN AND AND AND AND AND AND AND AND AND A	-
it may		2 martine	man			_
-20						
30.000 40 5	50 60 70 80	(MHz)	300 40	0 500 (	600 700	1000.

No.	Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		32.1795	28.65	-14.65	14.00	40.00	-26.00	QP
2		147.4036	28.88	-21.70	7.18	43.50	-36.32	QP
3		263.8190	30.02	-16.75	13.27	46.00	-32.73	QP
4		416.1791	29.02	-11.99	17.03	46.00	-28.97	QP
5		586.8437	31.02	-8.34	22.68	46.00	-23.32	QP
6	*	938.8326	28.85	-3.38	25.47	46.00	-20.53	QP

\*:Maximum data x:Over limit !:over margin



emperature:	<b>25</b> ℃		R	elative H	umidit	y:	55%	, D		
est Voltage:	DC 3.7	/	B. C.	- 5		2	~		22	
Ant. Pol.	Vertical	A.S.	-	21		Gal		3		
est Mode:	BLE TX	2402 Mc	ode			6		1		
Remark:	Only wo	orse case	is reported	1100	DS.		-	112	MR.	
80.0 dBuV/m										
										1
						(RF)FCC	15C 3M	Radiation		Ł
								Margin -6	dB [	
				+-1						
30								5	6	1
1				2	3	4	man	man	un an	ł
Manna				2	manten	Mar and a				L
1 Manutana	nharman		marganethick	MAN A.						
										1
		+								ł
0 30.000 40 50	) 60 70	80	(MHz)		300	400	500 E	<u>500</u> 700	1000.	] 00
00.000 40 50		00	(1112)		000	100			.000	

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		32.4059	29.18	-14.82	14.36	40.00	-25.64	QP
2		242.5253	27.83	-17.48	10.35	46.00	-35.65	QP
3		354.1831	27.77	-14.20	13.57	46.00	-32.43	QP
4		478.8456	27.25	-10.97	16.28	46.00	-29.72	QP
5		699.3046	28.15	-6.61	21.54	46.00	-24.46	QP
6	*	900.1474	26.61	-3.54	23.07	46.00	-22.93	QP
-								

<sup>\*:</sup>Maximum data x:Over limit !:over margin

# TOBY

### Above 1GHz

Tem	nperatu	re:	<b>25</b> ℃				Re	lative H	umidity:	55%	
Tes	t Voltag	ge:	DC 3	8.7V	110		~	188		120	
Ant	. Pol.		Horiz	zontal		no.	197		19		~
Tes	t Mode	:	BLE	Mode T	X 240	2 MHz		-			
Ren	nark:			eport for cribed lir		mission	which	more th	nan 10 dB	below the	
90.0	) dBu∀/m										
									(RF) FCC	Part 15C (Peak	()
		1 X							(RF) FCC	PART 15C (AVG	i)
40		2 X									
-10	00.000 35	50.00 6	100.00	8650.00	11200.	00 13750	1.00 16	300.00 18	3850.00 2140	0.00 2	26500.00 MI
	No. MI	k. Fr	eq.	Readi Leve	-	Correc Facto		easure- nent	Limit	Over	
		М	Hz	dBu\	/	dB/m	d	BuV/m	dBuV/m	dB	Detecto
1		4804	.222	42.8	4	14.44	ţ	57.28	74.00	-16.72	peal
2	*	4804	116	31.4	5	14.44		45.89	54.00	-8.11	AVG



ſen	nperatu	re:	<b>25</b> ℃				Relat	ive Hur	nidity:	55%	
Tes	t Voltag	e:	DC 3	.7V	19	5		19	2		
Ant	. Pol.		Verti	cal		1	112		6	681	
Tes	t Mode:		BLE	Mode T	X 2402	2 MHz		-			21
Ren	nark:			eport for cribed lir		nissior	n which	more th	an 10 dE	3 below the	U.S.
90.	D dBuV/m										
									(RF) FC	C PART 15C (PEAK	)
		2 X									
		X 1							(RF) F	CC PART 15C (AVG	i)
40		×									
10											
-10											
10	00.000 355	0.00 6	100.00	8650.00	11200.0	1375	0.00 163	00.00 188	850.00 214	00.00 2	6500.00 MI
1	No. Mk	. Fr	eq.	Readi Leve	-	Corre Facto		asure- nent	Limit	Over	
		M	Ηz	dBu\	/	dB/m	dl	BuV/m	dBuV/	m dB	Detect
1	*	4803	.846	32.6	4	14.44	4	7.08	54.0	-6.92	AVG
2		4803	.984	43.0	1	14.44	4 5	7.45	74.0	0 -16.55	pea



			-	10	6	· · ·	-			11120	-
Terr	peratu	re:	<b>25</b> ℃	202		a		Relativ	e Humidity:	55%	
Test	t Voltag	je:	DC 3.	7V	1	2		- S	N. S.		
Ant	. Pol.		Horizo	ontal	100	1	5		6	139	
Test	t Mode	:	BLE N	/lode T>	< 244	42 MHz	22				
Ren	nark:			port for ribed lin		emissio	n wl	hich mor	re than 10 dB		5
90.0	D dBuV/m										
									(RF) FCC	PART 15C (PEAK)	
		1 X							(0.5) 555	PART 15C (AVG)	
		2								PART ISC (AVG)	
40		×									
-10 1(	00.000 35	50.00 6	100.00	8650.00	11200	.00 1375	50.00	16300.00	18850.00 2140	0.00 26	500.00 MHz
N	lo. Mk	- En	eq.	Readii Leve		Corre Fact		Measu		Over	
	NU. IVIK		· ·								Datastar
		M		dBu∨		dB/m		dBuV/			Detector
1		4883	.936	42.84		14.68	8	57.5	2 74.00		peak
2	*	4884	.330	31.8	5	14.68	В	46.5	3 54.00	-7.47	AVG



1

2

-7.94

-16.56

54.00

74.00

AVG

peak

Гетре	rature:		<b>25</b> ℃					Rela	ative H	umidity:	55%	
Test Vo	oltage:		DC 3	3.7V	10.			_	611	1000		1000
Ant. Po	ol.		Verti	cal	20	-	5			G	132	
lest M	ode:		BLE	Mode	TX 24	42 MH	z		~		-	S.R.L
Remar	k:			eport fo		emissio	on wl	nich i	more th	nan 10 dB	below the	e
90.0 dB	3uV/m											
										(RF) FCC F	Part 15C (Pe/	AK)
		2 X								(RF) FCC	PART 15C (AV	/6)
40		1 X										
10								1000				
1000.00	0 3550.00	610	0.00	8650.00	1120	0.00 137	50.00	1630	0.00 18	850.00 21400	1.00	26500.00 MH;
No.	Mk.	Fre	eq.	Read Lev		Corre Fact			asure- ient	Limit	Over	

31.38

42.76

14.68

14.68

46.06

57.44

Emission Level= Read Level+ Correct Factor

4883.892

4884.224



Tem	peratur	e:	<b>25°</b> ℃			Relative H	lumidity:	55%	
Test	t Voltage	e:	DC 3	.7V		110 -			
Ant	. Pol.		Horiz	ontal	-	20 -	100	182	
Test	t Mode:		BLE	Mode TX 2	2480 MHz			4	
Ren	nark:			port for th		which more t	han 10 dB	below the	
90.0	dBuV/m								
							(05) 55	C PART 15C (PI	
							(NF) FC		
		1 X					(BE) E	CC PART 15C (/	AVG1
		2							
40		×							
-10									
10	00.000 3550	).00 6	100.00	8650.00	11200.00 13750	0.00 16300.00	18850.00 214	400.00	26500.00
				Reading			- Limit	Over	
	No. Mk.		eq.	Level	Factor				Detector
_			Hz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4960		42.77	14.86	57.63	74.00	-16.37	peak
2	*	4960	.278	31.49	14.86	46.35	54.00	-7.65	AVG



Гетр	eratur	e:	<b>25°</b> ℃					Relati	ve Hu	imidity:	55%	
Fest V	/oltag	e:	DC 3	8.7V				_ (	$U/\rho$	22		
Ant. F	Pol.		Verti	cal		-	5	1.1	-	Ga	132	
Fest N	Node:		BLE	Mode	TX 24	80 MH	z		~			201
Rema	rk:			eport fo cribed		emissio	on wł	nich mo	ore that		3 below the	
90.0	dBuV/m											
										(BF) FC(	C PART 15C (PEA	KI
										()		,
_		1 X								(RF) FO	CC PART 15C (AV	6)
		2 X										
40												
-10												
	000 3550	.00 6	100.00	8650.00	1120	0.00 137	750.00	16300.0	0 188	50.00 214	00.00	26500.00 MH
				_		_						
No	. Mk.	Fr	eq.	Read Lev	_	Corre Fact		Meas mei		Limit	Over	
		M	Ηz	dBu	١V	dB/m	1	dBu\	//m	dBuV/r	n dB	Detecto
1		4960	.038	43.	37	14.8	6	58.2	23	74.00	) -15.77	peak
2	*	4960	130	31.	53	14.8	6	46.3	39	54.00	) -7.61	AVG



# **Attachment C-- Restricted Bands Requirement Test Data**

Temperature:	<b>25</b> ℃	N.S.	Relative I	Humidity:	55%			
Test Voltage:	DC 3.7V							
Ant. Pol.	Horizontal							
Test Mode:	BLE Mode	TX 2402 MHz	s v	-01	31			
Remark:	N/A		100	2 3				
100.0 dBu∀/m								
				(RF) FC	C PART 15C (PEAK)			
					X			
					$\square$			
50				(RF) I	FCC PART 15C (AVG)			
					1 X			
					2			
					× \			
0.0								
2311.000 2321.00	2331.00 234	1.00 2351.00	2361.00 2371.00	2381.00 23	91.00 2411			

Ν	lo. M	k. Freq.	Level	Factor	ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	41.17	2.71	43.88	74.00	-30.12	peak
2		2390.000	29.12	2.71	31.83	54.00	-22.17	AVG
3	Х	2402.000	72.03	2.74	74.77	Fundamental	Frequency	peak
4	*	2402.200	68.69	2.74	71.43	Fundamental	Frequency	AVG



emperature:	<b>25</b> ℃		Rel	ative Humidity:	55%				
est Voltage:	DC 3.	7V		AUD	-	100			
Ant. Pol.	Vertica	al	-		14000				
est Mode:	BLE	Node TX 240	2 MHz			197			
Remark:	N/A	(Mar)							
100.0 dBuV/m	·								
				(BI	F) FCC PART 15C	(PEAK)			
						х Х			
					RF) FCC PART 150				
50						1			
					×	$  \langle   \rangle$			
					2				
0.0									

No	. Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	41.79	2.71	44.50	74.00	-29.50	peak
2		2390.000	29.02	2.71	31.73	54.00	-22.27	AVG
3	*	2402.000	65.80	2.74	68.54	Fundamental F	requency	AVG
4		2402.400	69.16	2.74	71.90	Fundamental F	requency	peak



Temperature:	<b>25</b> ℃	Relative Humidity:	55%						
est Voltage:	DC 3.7V	AUL -							
Ant. Pol.	Horizontal	Horizontal BLE Mode TX 2480 MHz N/A							
fest Mode:	BLE Mode TX 2480 M	MHz							
Remark:	N/A	The second							
100.0 dBu¥/m									
1 22		(RF) FCC P	ART 15C (PEAK)						
Ň									
50 3			PART 15C (AVG)						
×									
X									
0.0									

N	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2479.600	73.60	3.15	76.75	Fundamental Frequency		peak
2	*	2480.000	70.01	3.15	73.16	Fundamental F	requency	AVG
3		2483.500	43.86	3.17	47.03	74.00	-26.97	peak
4		2483.500	31.72	3.17	34.89	54.00	-19.11	AVG



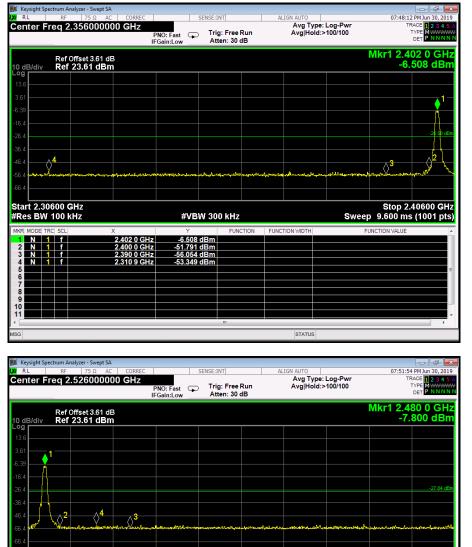
Tempe	rature:	<b>25℃</b>				Relativ	/e Humi	dity:	55%	
est Vo	oltage:	DC 3	8.7V	ant	3	-	11	200	-	19
Ant. Po	ol.	Verti	cal	1990	-	21		101	660	
est Mo	ode:	BLE	Mode 7	X 2480	) MHz	1	~		-	6
Remarl	k:	N/A		18						
100.0 d	lBuV/m									
	1 X2							(RF) FCC	PART 15C (PEA	(K)
	Ň									
	-							(RF) FC	C PART 15C (AV	/G)
50	3									
	×									
	J X							~		
0.0										
	00 2482.00	2492.00	2502.0	0 2512.	00 252	2.00 2532	2.00 2542	2.00 2552	2.00	2572.00

N	o. Mł	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2479.600	71.91	3.15	75.06	Fundamental	Frequency	peak
2	*	2480.000	68.45	3.15	71.60	Fundamental	Frequency	AVG
3		2483.500	41.37	3.17	44.54	74.00	-29.46	peak
4		2483.500	31.05	3.17	34.22	54.00	-19.78	AVG



### (2) Conducted Band Edge Test

Temperature:	<b>25</b> ℃	<b>Relative Humidity:</b>	55%						
Test Voltage:	DC 3.7V								
Test Mode:	BLE Mode TX 2402MHz /	BLE Mode TX 2402MHz / BLE Mode TX 2480MHz							
Remark:	The EUT is programed in continuously transmitting mode								



-36.4 -46.4 -56.4 -66.4	alland		¢2	4	Mar Daulara	hatymagedl ffylwetwerge	ant-sport-s	-ll-al-aut	alpothine methy	وربارحيليه		ul Maralumet	sponetad	to jugo geteri	all markers	naypar-lydopaath	
#Re	Start 2.47600 GHz Stop 2.57600 GHz   #Res BW 100 kHz #VBW 300 kHz Sweep 9.600 ms (1001 pts)																
MKR	MODE	TRC	SCL	>	2.480 0 GHz	-7.800	dDee	FUNC	TION	FUNCT	ION WIDTH			UNCTION	VALUE		<b>^</b>
2	N		f		2.480 0 GHZ 2.483 5 GHZ	-7.800											
3	Ň	1	f		2.500 0 GHz	-56.224	dBm										
4	Ν	1	f		2.492 1 GHz	-53.186	dBm										
5		<u> </u>															Ξ
6		<u> </u>															
8		F															
9																	
10																	_
11																	-
•	_	_	_				_	m		_						F.	
MSG	SG STATUS																

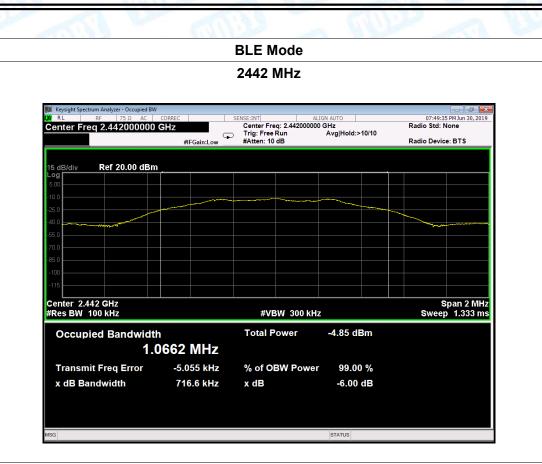
# Attachment D-- Bandwidth Test Data

Temperature:25°C		(B)	Relative Humidity:	55%					
Test Voltage:	DC 3	3.7V	et in						
Test Mode: BLE		TX Mode							
Channel frequency		6dB Bandwidth	99% Bandwidth	Limit					
(MHz)		(kHz)	(kHz) (kHz)						
2402	686.2		1062.3						
2442		716.6	1066.2	>=500					
2480		689.2	1068.2						
	BLE Mode								

2402 MHz

RL RF 75 Ω AC   enter Freq 2.402000000	GHz	Center Freq: 2.4020000	LIGN AUTO 10 GHz Avg Hold:>10/10	07:47:36 PM Jun 30, 20: Radio Std: None
	#IFGain:Low	#Atten: 10 dB	Anglitola.2 Torre	Radio Device: BTS
0 dB/div Ref 20.00 dBm	1			
og				
0.0				
).00				
0.0				
0.0				
0.0				
0.0				- marine
0.0				
0.0				
ro.o				
enter 2.402 GHz Res BW 100 kHz		#VBW 300 kH	7	Span 2 MH Sweep 1.333 m
		#1511 000 km		0400p 1.000 m
Occupied Bandwidt	h	Total Power	-3.96 dBm	
1.0	0623 MHz			
Transmit Freq Error	-3.963 kHz	% of OBW Powe	r 99.00 %	
x dB Bandwidth	686.2 kHz	x dB	-6.00 dB	
G			STATUS	





#### BLE Mode

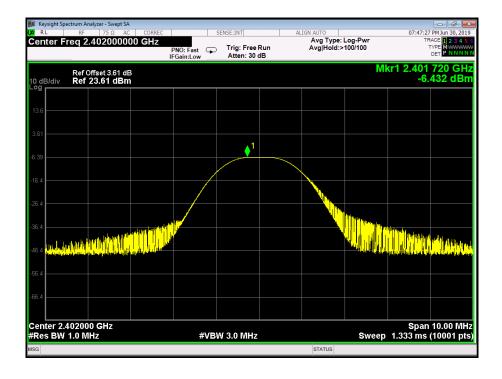
#### 2480 MHz

Keysight Spectrum Analyzer - Occupied BW   RL RF 75 Ω AC	CORREC	SENSE:INT	ALIGN AUTO	07:51:18 PM Jun 30, 201
enter Freq 2.480000000		Center Freq: 2.4800000		Radio Std: None
	#IFGain:Low	#Atten: 10 db		Radio Device. B13
dB/div Ref 20.00 dBm				
00				
5.0				
	1			
and the second s				And the second s
.0				
.0				
5.0				
•••				
15				
				0
enter  2.48 GHz Res BW  100 kHz		#VBW 300 kl	47	Span 2 MH: Sweep 1.333 m
		#VDVV JUOKI		Sweep 1.555 III
Occupied Bandwidth	า	Total Power	-5.37 dBm	
	0682 MHz			
1.0				
Transmit Freq Error	-4.348 kHz	% of OBW Powe	er 99.00 %	
x dB Bandwidth	689.2 kHz	x dB	-6.00 dB	
	003.2 KHZ	X UD	-0.00 UB	

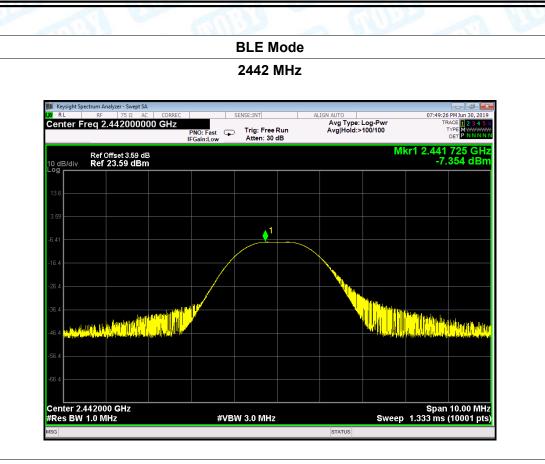


# **Attachment E-- Peak Output Power Test Data**

Temperature:	<b>25</b> ℃		Relative Humidity:	55%	
Test Voltage:	DC 3.7V			Can Land	
Test Mode:	BLE TX N	lode			
Channel frequer	ncy (MHz)	Test Resu	Limit (dBm)		
2402		-6.432			
2442		-7.354		30	
2480		-7.792			
		BLE N	lode		
		2402 I	MHz		

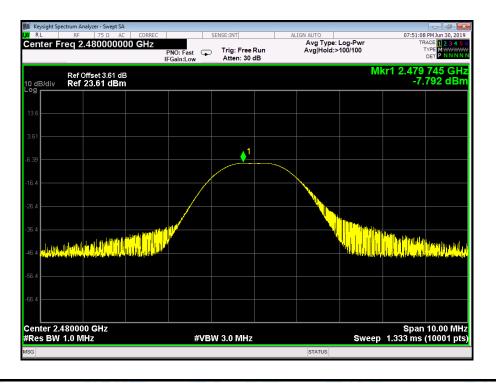






### BLE Mode

2480 MHz

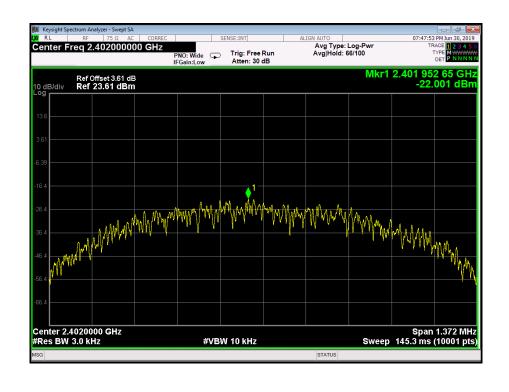


# **Attachment F-- Power Spectral Density Test Data**

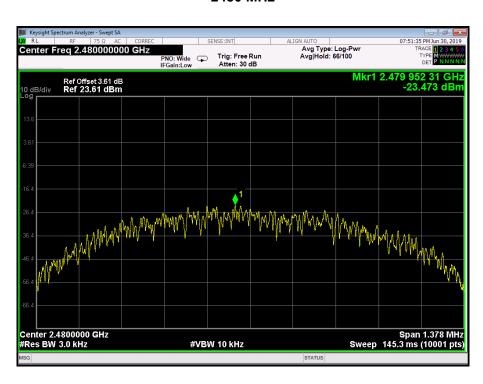
TOBY

Temperature:	<b>25</b> ℃	Relative Humidity:			NUL -	
Test Voltage:	DC 3.7V	61	111			
Test Mode:	BLE TX N	lode	AU		1100	
Channel Frequency		Power Density	Lim	it	Result	
(MHz)		(dBm/3KHz)	3KHz) (dBm/3KHz)		Nesult	
2402		-22.001		8 PA		
2442		-23.010	8			
2480		-23.473	23.473			
		BLE Mode				

2402 MHz







#### BLE Mode 2480 MHz

