

Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC158738 Page: 1 of 46

# FCC Radio Test Report FCC ID: 2APC6-CAT

#### **Original Grant**

Report No.	TB-FCC158738				
Applicant	Aries Manufacturing A division of Boss Tech Product	ts Inc.			
Equipment Under Test (EUT)					
EUT Name	Bluetooth Speaker				
Model No.	CAT-BT-MINISPK				
Serial Model No.	N/A				
Brand Name	CAT				
Receipt Date	2018-03-19				
Test Date	2018-03-20 to 2018-03-29				
Issue Date	2018-03-30				
Standards	FCC Part 15: 2016, Subpart C(15.247)				
Test Method	ANSI C63.10: 2013				
Conclusions	PASS				

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

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.



# Contents

CON	TENTS	2
1.	GENERAL INFORMATION ABOUT EUT	4
	1.1 Client Information	5
	1.2 General Description of EUT (Equipment Under Test)	
	1.3 Block Diagram Showing the Configuration of System Tested	6
	1.4 Description of Support Units	7
	1.5 Description of Test Mode	7
	1.6 Description of Test Software Setting	8
	1.7 Measurement Uncertainty	8
	1.8 Test Facility	9
2.	TEST SUMMARY	10
3.	TEST EQUIPMENT	11
4.	CONDUCTED EMISSION TEST	12
	4.1 Test Standard and Limit	12
	4.2 Test Setup	
	4.3 Test Procedure	
	4.4 EUT Operating Mode	13
	4.5 Test Da5ta	13
5.	RADIATED EMISSION TEST	14
	5.1 Test Standard and Limit	14
	5.2 Test Setup	
	5.3 Test Procedure	
	5.4 EUT Operating Condition	17
	5.5 Test Data	17
6.	RESTRICTED BANDS REQUIREMENT	18
	6.1 Test Standard and Limit	18
	6.2 Test Setup	18
	6.3 Test Procedure	
	6.4 EUT Operating Condition	19
	6.5 Test Data	19
7.	BANDWIDTH TEST	20
	7.1 Test Standard and Limit	
	7.2 Test Setup	20
	7.3 Test Procedure	
	7.4 EUT Operating Condition	20
	7.5 Test Data	20
8.	PEAK OUTPUT POWER TEST	21
	8.1 Test Standard and Limit	21
	8.2 Test Setup	



	8.3 Test Procedure	21
	8.4 EUT Operating Condition	
	8.5 Test Data	
9.	POWER SPECTRAL DENSITY TEST	
	9.1 Test Standard and Limit	
	9.2 Test Setup	
	9.3 Test Procedure	
	9.4 EUT Operating Condition	
	9.5 Test Data	
10.	ANTENNA REQUIREMENT	23
	10.1 Standard Requirement	23
	10.2 Antenna Connected Construction	
	10.3 Result	23
ATTA	ACHMENT A CONDUCTED EMISSION TEST DATA	
ATTA	ACHMENT B RADIATED EMISSION TEST DATA	
ATTA	ACHMENT C RESTRICTED BANDS REQUIREMENT TEST DATA	
ATTA	ACHMENT D BANDWIDTH TEST DATA	41
ATTA	ACHMENT E PEAK OUTPUT POWER TEST DATA	43
ATTA	ACHMENT F POWER SPECTRAL DENSITY TEST DATA	45



Report No.: TB-FCC158738 Page: 4 of 46

# **Revision History**

Report No.	Version	Description	Issued Date
TB-RF158738	Rev.01	Initial issue of report	2018-03-29
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### 1. General Information about EUT

#### 1.1 Client Information

Applicant		Aries Manufacturing A division of Boss Tech Products Inc.		
Address	:	1580 S. Milwaukee Ave. Suite 103, Libertyville, IL 60048, USA		
Manufacturer	6	LTX Electronics Co., Limited.		
Address		No.12, 1st Road BeiAn, Huangjiang Town, Dongguan, Guangdong, China		

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

EUT Name		Bluetooth Speaker	Bluetooth Speaker			
Models No.		CAT-BT-MINISPK				
	. e	Operation Frequency:	Bluetooth 4.2(BLE): 2402MHz~2480MHz			
		Number of Channel:	Bluetooth 4.2(BLE): 40 channels see note(3)			
Product		RF Output Power:	2.311dBm Conducted Power			
Description	S . C	Antenna Gain:	2dBi PCB Antenna			
		Modulation Type:	GFSK			
		Bit Rate of Transmitter:	1Mbps(GFSK)			
Power Supply	20	DC Voltage Supply from USB Port.				
	-	DC Supply by the Li-ion	Battery.			
Power Rating		DC 5.0 V from the USB Cable.				
		DC 3.7V by 600mAh Li-i	ion Battery.			
Software Version	:	V1.0	V1.0			
Hardware Version		V1.2				
Connecting I/O Port(S)		Please refer to the User's Manual				

#### Note:

This Test Report is FCC Part 15.247 for Bluetooth BLE, the test procedure follows the FCC KDB 558074 D01 DTS Means Guidance v04.

- (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.
- (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

### Charging + TX Mode

	Adapter		EUT				
TX Mod	e	BU	A ROD	Em	Club	TOPY	
		((1))					213
			EUT				



#### 1.4 Description of Support Units

Equipment Information						
Name	Used "√"					
UDB				NOD Y		
		Cable Information				
Number	Shielded Type	Ferrite Core	Length	Note		
Cable 1	NO	NO	0.6M			

#### 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					
3	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	FCCAssist_2.4.exe				
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
	9kHz to 30 MHz	±4.00 0B
Padiated Emission	Level Accuracy:	±4.40 dB
Radiated Emission	30MHz to 1000 MHz	±4.40 dB
Dedicted Emission	Level Accuracy:	14.20 dP
Radiated Emission	Above 1000MHz	±4.20 dB



Report No.: TB-FCC158738 Page: 9 of 46

#### 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.

#### 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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Report No.: TB-FCC158738 Page: 10 of 46

# 2. Test Summary

Standard Section				Domork
FCC	IC	Test Item	Judgment	Remark
15.203		Antenna Requirement	PASS	N/A
15.207(a)	RSS-GEN 7.2.4	Conducted Emission	PASS	N/A
15.205&15.247(d)	RSS-GEN 7.2.2	Band-Edge & Unwanted Emissions into Restricted Frequency	PASS	N/A
15.247(a)(2)	RSS 247 5.2 (1)	6dB Bandwidth	PASS	N/A
15.247(b)(3)	RSS 247 5.4 (4)	Conducted Max Output Power	PASS	N/A
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	PASS	N/A
15.205, 15.209&15.247(d)	RSS 247 5.5	Transmitter Radiated Spurious &Unwanted Emissions into Restricted Frequency	PASS	N/A



# 3. Test Equipment

<b>Conducted Emiss</b>	ion Test				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 20, 2017	Jul. 19, 2018
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 20, 2017	Jul. 19, 2018
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 20, 2017	Jul. 19, 2018
LISN	Rohde & Schwarz	ENV216	101131	Jul. 20, 2017	Jul. 19, 2018
Radiation Emissio	on Test	-	-	-	-
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 20, 2017	Jul. 19, 2018
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 20, 2017	Jul. 19, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.16, 2018	Mar. 15, 2019
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar.16, 2018	Mar. 15, 2019
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.16, 2018	Mar. 15, 2019
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar.16, 2018	Mar. 15, 2019
Loop Antenna	Laplace instrument	RF300	0701	Mar.16, 2018	Mar. 15, 2019
Pre-amplifier	Sonoma	310N	185903	Mar.16, 2018	Mar. 15, 2019
Pre-amplifier	HP	8449B	3008A00849	Mar.16, 2018	Mar. 15, 2019
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar.16, 2018	Mar. 15, 2019
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. 20, 2017	Jul. 19, 2018
Spectrum Analyzer	Rohde & Schwarz	ESCI	100010/007	Jul. 20, 2017	Jul. 19, 2018
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Oct. 26, 2017	Oct. 25, 2018
Vector Signal Generator	Agilent	N5182A	MY50141294	Oct. 26, 2017	Oct. 25, 2018
Analog Signal Generator	Agilent	N5181A	MY50141953	Oct. 26, 2017	Oct. 25, 2018
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO26	Oct. 26, 2017	Oct. 25, 2018
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO29	Oct. 26, 2017	Oct. 25, 2018
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO31	Oct. 26, 2017	Oct. 25, 2018
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO33	Oct. 26, 2017	Oct. 25, 2018



### 4. Conducted Emission Test

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

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

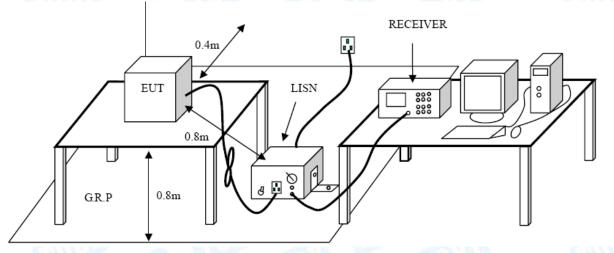
Notes:

(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 Da5ta

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

#### Note:

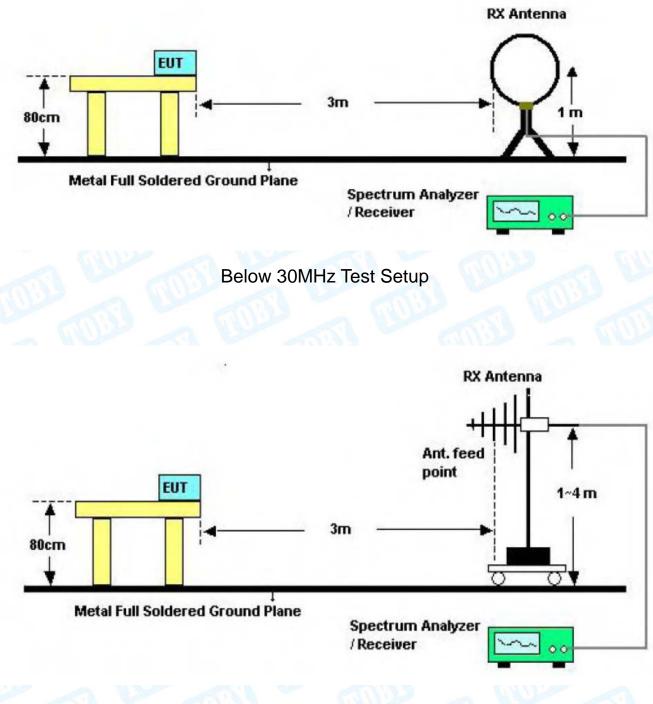
(1) The tighter limit applies at the band edges.

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



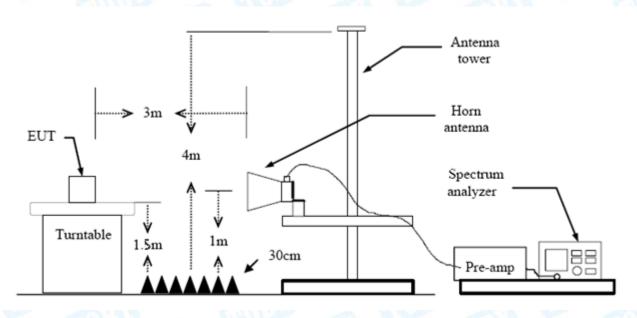
Report No.: TB-FCC158738 Page: 15 of 46

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.



Report No.: TB-FCC158738 Page: 17 of 46

#### 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.

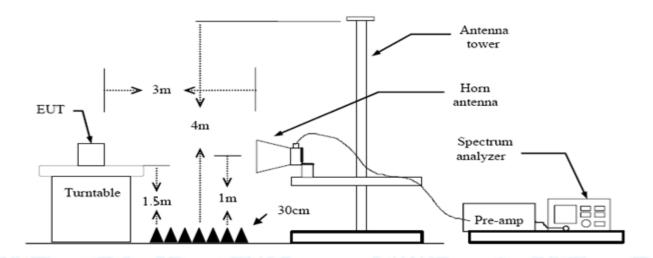


### 6. Restricted Bands Requirement

- 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 Band (MHz)	Distance Meters(at 3m)	
	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



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.

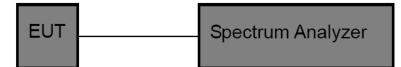


### 7. Bandwidth Test

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

FCC 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.

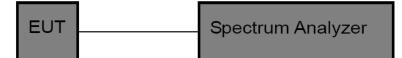


### 8. Peak Output Power Test

- 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(M		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 DTS Meas Guidance v04.

- (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.

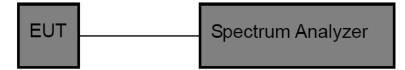


### 9. Power Spectral Density Test

- 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 558074 D01 DTS Meas Guidance v04.

- (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 directional gains of the antenna used for transmitting is 2dBi, 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 a PCB Antenna. It complies with the standard requirement.

	Antenna Type
	Permanent attached antenna
2 1	Unique connector antenna
	Professional installation antenna

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

TOBY

Temperature:	<b>25</b> ℃		Relative	Humidity:	55%	
Test Voltage:	AC 120	√/60 Hz		6	Can.	
Terminal:	Line		UP			1820
Test Mode:	BLE TX	2402 Mode			<u>a 1</u>	New York
Remark:	Only wo	orse case is repo	orted	-		
80.0 dBuV 30 X X X 30 -20 0.150	M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.				OP: AVG:	
No. Mk. F		eading Cor Level Fa	rect Meas ctor me		Over	
Ν	ИHz	dBuV dE				
4 0.4		abav at	B dBu	V dBuV	dB	Detector
1 0.1	1500		B dBu 58 37.5			Detector QP
		27.94 9.		52 <u>65.9</u> 9	9 -28.47	QP
2 0.1	1500	27.94 9. 13.46 9.	58 37.5	52 65.99 04 55.99	) -28.47 ) -32.95	
2 0.1 3 0.1	1500 1740	27.94     9.       13.46     9.       25.65     9.	58 37.5 58 23.0	52         65.99           64         55.99           23         64.76	) -28.47 ) -32.95	QP AVG
2 0.1 3 0.1 4 0.1	1500 1740 1740	27.94     9.       13.46     9.       25.65     9.       12.26     9.	58 37.5 58 23.0 58 35.2	52         65.99           64         55.99           64         64.76           64         54.76	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> </ul>	QP AVG QP
2     0.1       3     0.1       4     0.1       5     0.1	1500 1740 1740 1940	27.94       9.         13.46       9.         25.65       9.         12.26       9.         27.94       9.	58         37.5           58         23.0           58         35.2           58         21.8	52         65.99           54         55.99           53         64.76           54         54.76           52         63.86	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> <li>-32.92</li> </ul>	QP AVG QP AVG
2     0.1       3     0.1       4     0.1       5     0.1       6     0.1	1500 1740 1740 1940 1940	27.94       9.         13.46       9.         25.65       9.         12.26       9.         27.94       9.         13.53       9.	58       37.5         58       23.0         58       35.2         58       21.8         58       37.5	52         65.99           54         55.99           53         64.76           54         54.76           52         63.86           11         53.86	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> <li>-32.92</li> <li>-32.92</li> <li>-26.34</li> </ul>	QP AVC QP AVC QP
2     0.1       3     0.1       4     0.1       5     0.1       6     0.1       7     0.2	1500 1740 1740 1940 1940 2220	27.94       9.         13.46       9.         25.65       9.         12.26       9.         27.94       9.         27.94       9.         25.65       9.         25.93       9.	58       37.5         58       23.0         58       35.2         58       21.8         58       37.5         58       23.1	52         65.99           52         65.99           54         55.99           53         64.76           54         54.76           52         63.86           11         53.86           51         62.74	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> <li>-32.92</li> <li>-32.92</li> <li>-26.34</li> <li>-30.75</li> </ul>	QP AVC QP AVC QP AVC QP
2     0.1       3     0.1       4     0.1       5     0.1       6     0.1       7     0.2       8     0.2	1500 1740 1740 1940 2220 2220	27.94       9.3         13.46       9.3         25.65       9.3         12.26       9.3         27.94       9.3         13.53       9.3         25.93       9.3         12.54       9.3	58       37.5         58       23.0         58       35.2         58       21.8         58       37.5         58       37.5         58       23.1         58       23.1         58       35.5	52         65.99           54         55.99           53         64.76           54         54.76           52         63.86           11         53.86           51         62.74           52         52.74	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> <li>-32.92</li> <li>-32.92</li> <li>-32.92</li> <li>-32.92</li> <li>-30.75</li> <li>-27.23</li> </ul>	QP AVC QP AVC QP AVC QP AVC
2     0.1       3     0.1       4     0.1       5     0.1       6     0.1       7     0.2       8     0.2       9     0.2	1500 1740 1740 1940 2220 2220 2420	27.94       9.3         13.46       9.3         25.65       9.3         12.26       9.3         27.94       9.3         13.53       9.3         13.53       9.3         12.26       9.3         13.53       9.3         25.93       9.3         12.54       9.3         23.50       9.3	58       37.5         58       23.0         58       35.2         58       21.8         58       37.5         58       23.1         58       35.5         58       23.1         58       35.5         58       22.1	52         65.99           52         65.99           53         64.76           54         54.76           52         63.86           51         53.86           51         62.74           52         52.74           58         62.02	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> <li>-32.92</li> <li>-32.92</li> <li>-32.92</li> <li>-30.75</li> <li>-27.23</li> <li>-30.62</li> </ul>	QP AV( QP AV( QP AV( QP AV( QP
2       0.1         3       0.1         4       0.1         5       0.1         6       0.1         7       0.2         8       0.2         9       0.2         10       0.2	1500 1740 1740 1940 2220 2220 2420 2420	27.94       9.3         13.46       9.3         25.65       9.3         12.26       9.3         27.94       9.3         13.53       9.3         13.53       9.3         12.54       9.3         12.54       9.3         12.54       9.3         11.14       9.3	58       37.5         58       23.0         58       35.2         58       21.8         58       27.5         58       23.1         58       25.5         58       25.5         58       22.1         58       22.1         58       33.0	52         65.99           52         65.99           54         55.99           53         64.76           54         54.76           52         63.86           51         52.74           52         52.74           58         62.02           72         52.02	<ul> <li>-28.47</li> <li>-32.95</li> <li>-29.53</li> <li>-32.92</li> <li>-32.92</li> <li>-32.92</li> <li>-30.75</li> <li>-27.23</li> <li>-30.62</li> <li>-28.94</li> </ul>	QP AVC QP AVC QP AVC



Temperature	e: 25	°C		Relative H	umidity:	55%	
Test Voltage	: AC	2 120V/60 Hz			L'HA	-	A CONTRACT
Terminal:	Ne	utral	-	81		130	
Test Mode:	BL	E TX 2402 M	ode				GR1
Remark:	Or	ly worse case	is reported		2		
80.0 dBuV							
						QP: AVG:	
30 X X X X	MMM	van Matritan de Mader van Millan was de Mader	allelatellarinensilvend <sup>hee</sup> ren andlittelannensilvend <sup>hee</sup> ren	Munaman	and a star and a star	New part of the Mark	u
-20	0.	5 Reading	(MHz) Correct	5 Measure-			30.000
-20	Freq.	5	(MHz)	5	Limit	Over	

INO. IVIK.	Freq.	Level	Factor	ment	LIIIII	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	0.1500	29.15	9.64	38.79	65.99	-27.20	QP
2	0.1500	14.66	9.64	24.30	55.99	-31.69	AVG
3	0.1700	29.58	9.64	39.22	64.96	-25.74	QP
4	0.1700	15.21	9.64	24.85	54.96	-30.11	AVG
5	0.1940	28.14	9.65	37.79	63.86	-26.07	QP
6	0.1940	14.51	9.65	24.16	53.86	-29.70	AVG
7	0.2220	26.13	9.63	35.76	62.74	-26.98	QP
8	0.2220	13.81	9.63	23.44	52.74	-29.30	AVG
9	0.2460	24.93	9.61	34.54	61.89	-27.35	QP
10	0.2460	13.52	9.61	23.13	51.89	-28.76	AVG
11	0.4900	22.44	9.58	32.02	56.17	-24.15	QP
12 *	0.4900	18.56	9.58	28.14	46.17	-18.03	AVG
	-						· · · · · · · · · · · · · · · · · · ·



Temperature:	<b>25</b> ℃		F	Relative Hun	nidity:	55%	
Test Voltage:	AC 24	0V/60 Hz		- 40	No.	-	A CONTRACT
Terminal:	Line		-		(A)	201	
Test Mode:	BLE T	X 2402 Mod	le			0	ARL.
Remark:	Only v	vorse case is	s reported	mile	2	$\sim$	
80.0 dBuV						QP:	
						AVG:	_
20 DAAAAAAAA	. x.						
30 M/ M/M/M/	Mar Mullims	when which have a start when	an and the state of the state o	month the for the second	mul mark	Monanden and	
mandin	m Aller Work	with which we wanted	the grand and a second and a		man manage	and the second	
0.150	0.5		(MHz)	5			30.000
		Reading	Correct	Measure-			
No. Mk.	Freq.	Level	Factor	ment	Limit	Over	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detecto
1 0	.4260	15.55	9.60	25.15	57.33	-32.18	QP
2 0	.4260	11.99	9.60	21.59	47.33	-25.74	AVG
3 0	.4860	19.60	9.60	29.20	56.24	-27.04	QP
4 * 0	.4860	17.56	9.60	27.16	46.24	-19.08	AVG
5 0	.4980	14.65	9.60	24.25	56.03	-31.78	QP
	.4980	10.85	9.60	20.45		-25.58	AVG
	.0540	10.30	9.60	19.90		-36.10	QP
	.0540	5.33	9.60	14.93		-31.07	AVG
	.4500	10.84	9.71	20.55		-35.45	QP
						-30.21	
	.4500	6.08	9.71	15.79			AVG
	50.40	40.00	0.74	00.04			
11 4	.5340	10.33 5.68	9.71	20.04		-35.96 -30.61	QP AVG



Temperature	: 25	°C		Relative Hu	imidity:	55%	
Test Voltage	: AC	240V/60 Hz		- AU		-	1 Por
Terminal:	Ne	eutral	-		100	201	
Test Mode:	BL	E TX 2402 M	ode			0	
Remark:	Or	nly worse case	e is reported	MAD	2	2	
80.0 dBuV						QP: AVG:	
30 MMM	WWW WW	WHWWWWWWWWWWWWWW	Mana and M	MM m MM m m m	and and the state of the state	alog forglor segrated	peal
-20		Reading	(MHz) Correct	5 Measure-	Limit	Over	30.000
No. Mk.	Freq. MHz	Level dBuV	Factor dB	dBuV	dBuV	Over dB	Detector
1	0.4820	20.34	9.58	29.92		-26.38	QP
-	0.4820	13.67	9.58	23.25	46.30	-20.30	AVG
	0.4940	20.33	9.58	29.91		-26.19	QP
	0.4940	14.46	9.58	24.04		-22.06	AVG
	1.0420	9.34	9.59	18.93		-37.07	QP
6	1.0420	5.06	9.59	14.65	46.00	-31.35	AVG
7	1.2420	13.17	9.59	22.76	56.00	-33.24	QP
8	1.2420	8.03	9.59	17.62	46.00	-28.38	AVG
	1.3020	12.70	9.60	22.30	56.00	-33.70	QP
9					40.00	20.02	AVG
	1.3020	7.38	9.60	16.98	46.00	-29.02	AVG
10		7.38 11.61	9.60 9.61	16.98 21.22		-29.02	QP



### **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

Ten	nperat	ure:	2	2 <b>5℃</b>				Callin	Relative	Hum	iditv		5	5%		
	t Volta			_	8.7V	2	1						-			
	t. Pol.	<u> </u>	ŀ	loriz	zonta	al			1 Star		1	51				223
Tes	t Mod	e:	E	BLE	тх :	240	)2 N	Node	-	8		/		1	3	
Rer	nark:		C	Dnly	wor	se	cas	se is reported	Can .				5	0		1
80.	0 dBuV∕r	m														
30		mum	h.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	n litter				3 5 X X 1 X X X X	6 X		)FCC	15C 3	M Rac Mar	liatior gin -6	L   d
	0.000	40 !	50	60	70 8	0		(MHz)		300	40	0	500	600	700	1000.000
N	lo. Mł	с. I	Free	<b>q</b> .			din vel		Measur ment		Lim	it	(	Dve	r	
			MHz	2		dB	uV	dB/m	dBuV/n	n	dBu	V/m		dB		Detector
1		143	8.82	95		56.	.45	-20.74	35.71		43.	50		-7.7	9	QP
2		167	.82	43		56.	.36	-20.21	36.15	5	43.	50		-7.3	5	QP
3	*	191	.74	50		58.	42	-19.62	38.80	)	43.	50		4.7	0	QP
4	İ	216	6.02	40		58.	.85	-18.75	40.10	)	46.	00		-5.9	0	QP
5		239	9.98	74	;	56.	.04	-17.77	38.27	7	46.	00		-7.7	3	QP
6	ļ	287	7.99	04	;	56.	71	-16.39	40.32	2	46.	00		-5.6	8	QP

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



									1100	
Ten	nperat	ure:	<b>25℃</b>	100			Relative Hu	midity:	55%	
Tes	t Volta	ige:	DC :	3.7V	1					
Ant	t. Pol.		Verti	cal		-	21	6	C C I M	
Tes	t Mod	e:	BLE	TX 240	02 Mc	ode		<u>a</u> v	2	
Rer	mark:		Only	worse	case	is reported				2
80.	0 dBuV/	m								
30		1 hornal MI	MM		Man.	1 militari	2		C 15C 3M Radiatio	G dB
-20 3(	0.000	40 50	D 60	70 80		(MHz)	:	300 400	500 600 700	1000.000
N	lo. Mk	κ. F	req.		ding vel	Correct Factor		)- Limit	Over	
		Ν	ЛНz	dB	uV	dB/m	dBuV/m	dBuV/r	m dB	Detector
1		48.	8429	47	.16	-23.32	23.84	40.00	0 -16.16	QP
2	*	191.	7450	56	.06	-19.62	36.44	43.50	0 -7.06	QP
3		336.	0352	45	.48	-14.67	30.81	46.00	0 -15.19	QP
4		383.	.9318	43	.53	-12.30	31.23	46.00	-14.77	QP
5		408.	.9460	42	.48	-11.34	31.14	46.00	-14.86	QP
6		504.	7062	39	.36	-9.66	29.70	46.00	0 -16.30	QP

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

# TOBY

#### Above 1GHz

emperature:		<b>25°</b> ℃					Rela	ative Hu	midity:	55%		
est Voltage:		DC 3	.7V	1142		-	-	186		1200		
nt. Pol.		Horiz	onta		0	1	28		12	0.95	-	3
est Mode:		BLE	Mode	e TX 24	102 N	IHz		2			905	2
emark:				for the d limit.	emis	sion	which I	more that	an 10 dE	below	the	
100.0 dBu¥/m												_
	2 X									C PART 150		
50	1 X								(RF) F	CC PART 15	ic (AVG)	
												-
0.0	<b>C</b>	100.00	8650	00 11	200.00	13750	00 102	00.00 18	850.00 214	100.00	26500.00	

No.	Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4802.500	33.41	13.57	46.98	54.00	-7.02	AVG
2		4804.885	47.65	13.59	61.24	74.00	-12.76	peak



DC 3.7V Vertical	A CHI	مر	
		1	
BLE Mode TX 2402	2 MHz		
No report for the er prescribed limit.	nission which more th	nan 10 dE	below the
		(RF) FC	PART 15C (PEAK)
		(RF) FC	C PART 15C (AVG)
			prescribed limit.

N	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4802.659	33.42	13.57	46.99	54.00	-7.01	AVG
2		4803.421	47.26	13.59	60.85	74.00	-13.15	peak



Ten	nperature	<b>e</b> :	<b>25</b> ℃			<b>Relative Humidity:</b>	55%				
Tes	t Voltage	:	DC 3.7\			AUDE					
4nt	. Pol.		Horizon	tal	-		<b>URN</b>				
Tes	t Mode:		BLE Mode TX 2442 MHz								
Remark:				No report for the emission which more than 10 dB below the prescribed limit.							
100.0	0 dBuV/m										
						(RF) FC	C PART 15C (PEAK)				
		1									
		×				(BE) E	CC PART 15C (AVG)				
50		2									
		x									
0.0											

No	. Mk	Freq.			Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4884.645	48.13	14.00	62.13	74.00	-11.87	peak
2	*	4885.500	33.92	14.00	47.92	54.00	-6.08	AVG



em	perature:		<b>25</b> ℃				Relat	ive Humidity:	55%	
Test	Voltage:		DC 3.1	7V	27.0	3		RUPS		Contraction of the second
Ant.	Pol.		Vertica	al			120	61	0.22	-
Test	Mode:		BLE M	lode T	X 244	2 MHz			-	
Rem	nark:		No rep prescr			mission	which m	ore than 10 dl	B below the	
100.0	dBuV/m		P. 000.							
[										
-										
								(RF) FC	C PART 15C (PEAK	<b>(</b> ]
		2 X								
		1						(BF) F	CC PART 15C (AVC	i)
50		x								
0.0	0.000 3550.00		100.00	8650.00	11200	.00 1375	).00 16300.	.00 18850.00 21	400.00 2	26500.00 MI

No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4884.711			47.98	54.00	-6.02	AVG
2		4885.374	47.96	14.00	61.96	74.00	-12.04	peak



emp	perature		<b>25℃</b>					Rela	ative Hu	midity:	55%		
'est '	Voltage:		DC	3.7V	en l	161		-	40	1	à	A CONTRACT	S
nt. I	Pol.		Hori	zonta	al		1	182			192		
est l	Mode:		BLE	Mod	de TX d	2480 N	ЛНz		~			19 A	
Rema	ark:				t for th ed limit		ssion	which	more that	an 10 dB	below th	Ie	
00.0	dBu¥/m												
										(RF) FCC	PART 15C (F	PEAK)	
		1 X											
										(RF) FC	C PART 15C	(AVG)	
50		2 X											
0.0													
1000	0.000 3550.0	0 6	100.00	8650	0.00 1	1200.00	13750	0.00 163	00.00 188	50.00 2140	0.00	26500.00	MH:

No	. Mk.	Freq.			Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4958.566	48.55	14.37	62.92	74.00	-11.08	peak
2	*	4960.078	33.92	14.38	48.30	54.00	-5.70	AVG



Tempera	ture:	<b>25</b> ℃		Rela	ative Humidity:	55%
Test Volt	age:	DC 3.7V	6110		AULE	
Ant. Pol.		Vertical	C.	1800	Gal	1839
Test Mod	de:	BLE Mod	de TX 2480	MHz		-
Remark:		No repor prescribe		ssion which	more than 10 dB	below the
100.0 dBu\	//m					
					(RF) FCC	PART 15C (PEAK)
	2					
	×				(BF) FC	PART 15C (AVG)
50	1 X					
0.0						

No	. Mk	. Freq.			Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4958.500	33.90	14.37	48.27	54.00	-5.73	AVG
2		4960.429	48.61	14.38	62.99	74.00	-11.01	peak



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

Temperate	ure: 25℃		F	Relative Hum	idity:	55%	
Test Volta	ge: DC 3.7	٧V	UM .	2			5
Ant. Pol.	Horizo	ntal		d nm	5	- G1	2
Test Mode	e: BLE M	ode TX 2402	2 MHz		-01		
Remark:	N/A		CIND		All have		
100.0 dBuV/r	m						
						4	
						×	
					(RF) FCC	PART 15C (PEAK	3
					(RF) FC	C PART 15C AVG	<u>)</u>
50					1		
					×	-	
					2 ————————————————————————————————————	$\mathcal{N}$	$\searrow$
0.0							
2312.000 2	322.00 2332.00	2342.00 23	52.00 2362.00	2372.00 23	82.00 2392	.00 2	412.00
		Reading	Correct	Measure-			
No. Mk	. Freq.	Level	Factor	ment	Limit	Over	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Det
1	2390.000	43.74	-0.13	43.61	74.00	-30.39	р
2	2390.000	31.46	-0.13	31.33	54.00	-22.67	А
3 *	2402.000	73.81	-0.05	73.76	Fundament	tal Frequency	Α
0							



emp	peratu	re:	<b>25℃</b>	195			Relativ	ve Hum	nidity:	55%	-	PA.
	Voltag		DC 3	5.7V	-	55		61				
Ant. I			Vertic		839		12	-	a	CER		_
	Mode	-			+ TX 24	02 MHz		-	aU		-	
Rema	ark:		N/A		-		6			~ ~		-
100.0	dBu∀/m											
Γ										4		1
-		-								a a a a a a a a a a a a a a a a a a a		
									(BE) ECC	PART 15C (PEA		
									(nr) i cc	PART TOULT	ukj	
									(RF) FC	C PART 15¢ (A)	/@)	
50									1		$\rightarrow$	
									×			
L				$\mathcal{A}$					2 			
												1
						_						
-						_						
0.0			0001.00				1 00 003	21 00 0	201 00 000	1.00	2111.00	]
2311	.000 232	1.00	2331.00	2341	.00 233	51.00 236	1.00 237	71.00 23	381.00 239 <sup>.</sup>	1.00	2411.00	Mr
No	. Mk.	E			ading	Correc		asure-	Limit	Over		
NO.	. IVIK.		req.		evel	Facto		nent				
		M	lHz	d	BuV	dB/m	dB	BuV/m	dBuV/m	n dB	Detec	cto
1		2390	0.000	44	4.76	-0.13	4/	4.63	74.00	-29.37	pea	ak
		2390	0.000	32	2.68	-0.13	32	2.55	54.00	-21.45	AV	'G
2								F 00	<u> </u>		, AV	G
2 3	*	2402	2.100	85	5.73	-0.05	8:	5.68	Fundamen	tal Frequency		C



Temperature:	<b>25</b> ℃			Relative H	umidity:	55%	11
Test Voltage:	DC 3.7V	an B					Les C
Ant. Pol.	Horizont	al	-		nn.	132	
Test Mode:	BLE Mo	de TX 248	0 MHz				
Remark:	N/A			MUD	2		UL -
100.0 dBuV/m							
50 2 X X 4 X 4 X 4 X						ART 15C (PEA	
0.0							
2472.000 2482.00	Re	ading (		2532.00 2 Measure- ment	542.00 2552.0 Limit	Over	2572.00 MHz
l	MHz d	BuV	dB/m	dBuV/m	dBuV/m	dB	Detector
		BuV 1.51	dB/m 0.34	dBuV/m 81.85	dBuV/m Fundamental		Detector AVG
1 * 248	80.000 8					Frequency	
1 * 248 2 X 248	80.000 8 80.200 8	1.51	0.34	81.85	Fundamental	Frequency	AVG



4

			1	5										-
Tem	peratu	re:	<b>25</b> ℃	DB	1	a	Re	lativ	e Hui	midity	:	55%	-0	
Test	Voltag	e:	DC 3	.7V					24				S.	
Ant.	Pol.		Vertic	cal			0				(III)	132		
Test	Mode:		BLE	Mode	TX 248	0 MHz	1			2	6	-	1	
Rem	ark:		N/A	A	19.			5	100	180	-			
100.0	dBuV/m													
50		3										PART 15C (PE/		
0.0														
247	72.000 248	2.00	2492.00	2502.0		2.00 2523		2532		2542.00	2552.	00	2572.00	MHz
No	. Mk.	Fr	eq.	Rea Lev	ding vel	Correc Facto			sure ent		mit	Over		
		Mł	Ηz	dB	uV	dB/m		dBu	uV/m	dB	8uV/m	dB	Dete	ctor
1	*	2480	.000	85.	.76	0.34		86	6.10	Fund	amental	Frequency	AV	'G
2	X	2480	.200	89.	.73	0.34		90	.07	Fund	amental	l Frequency	pea	ak
3	:	2483	.500	53.	.22	0.36		53	.58	74	4.00	-20.42	pea	ak

Emission Level= Read Level+ Correct Factor

45.22

0.36

45.58

2483.500

-8.42

AVG

54.00



#### (2) Conducted Test

mperature:	<b>25</b> ℃	Relative Humidity	: 55%
st Voltage:	DC 3.7V		1111
t Mode:	BLE Mode TX 2402M	Hz / BLE Mode TX 2480	MHz
mark:	The EUT is programe	d in continuously transmi	tting mode
💓 Keysight Spectrum	Analyzer - Swept SA		- 6 <b>-</b>
	F         50 Ω         AC         SENSE           2.356000000 GHz         Image: All the sense         Image: All the sense         Image: All the sense	E:INT ALIGN AUTO Avg Type: Log-Pwr rig: Free Run Avg Hold:>100/100	02:50:38 PM Mar 20, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N
	IFGain:Low	Atten: 30 dB	Mkr1 2.402 0 GHz
Re 10 dB/div Re Log	ef Offset 3.61 dB ef 23.61 dBm		2.202 dBm
3.6			∳ <sup>1</sup>
-6.39			
-16.4			-17.80 dBm
-36.4	<b>↓</b>		$\sim$
-56.4 <b>-56.4</b>	mones more who was a more the work dynamics	connection of the state of the	marken my h
-66.4			
Start 2.30600 #Res BW 100		00 kHz Swee	Stop 2.40600 GHz p 9.600 ms (1001 pts)
MKR MODE TRC SC	2.402 0 GHz 2.202 dBn	n	UNCTION VALUE
2 N 1 f 3 N 1 f 4 N 1 f	2.300 0 GHz -54.893 dBn 2.338 0 GHz -54.893 dBn 2.338 0 GHz -46.771 dBn	n	
5 6 7			
8 <b>9 9 1</b> 0			
MSG		STATUS	
💓 Keysight Spectrum	n Analyzer - Swept SA NF 50 Ω AC SENSE	E:INT ALIGN AUTO	02:56:22 PM Mar 20, 2018
	2.526000000 GHz	Avg Type: Log-Pwr rig: Free Run Avg Hold:>100/100 Atten: 30 dB	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET PNNNN
	IFGain:Low F		Mkr1 2.480 0 GHz
10 dB/div Re	IFGain:Low 4 ef Offset 3.61 dB ef 23.61 dBm		Mkr1 2.480 0 GHz 0.645 dBm
Re 10 dB/div Re	IFGain:Low F		
10 dB/div Re Log 13.6 -6.39	IFGain:Low F		0.645 dBm
10 dB/div Re 136 3.61	IFGain:Low F		
10 dB/div Re 10 dB/div Re 13.6 -6.39	IFGein:Low _ A		0.645 dBm
10 dB/div Re Log 13.6 3.6 -6.39 -15.4 -26.4 -36.4 -6.4	ef Offset 3.61 dB ef 23.61 dB	State of the second state	0.645 dBm
13 6 3 61 -6.39 -16.4 -36.4 -66.4	IFGein:Low 4		0.645 dBm
10 dB/div Re 10 dB/div Re 13.6 3.61 -6.39 -16.4 -26.4 -36.4 -65.4 -75.	IFGain:Low A	чала по	0.645 dBm
10 dB/dlv Re 13 6 3 61 -6 39 -16 4 -26 4 -36 4 -66 4 Start 2.47600 #Res BW 100 #Res BW 100 #Res BW 100 #Ref TRC SC	IFGein:Low A	Construction of the second sec	0.645 dBm
10 dB/div Re Log 13.6 3.61 -6.3 -15.4 -26.4 -36.4 -36.4 -7.4 -7.6 -7.4 -7.4 -7.6 -7.4 -	IFGein:Low         P           of Offset 3.61 dB            of Offset 3.6	100 KHZ Swee	0.645 dBm
10 dB/div Re 13 6 3 61 -6.39 -16 4 -26 4 -26 4 -26 4 -26 4 -26 4 -26 4 -66 4 -66 4 -66 4 -66 4 -66 4 -66 4 -66 4 -66 4 -66 4 -76 - -76	IFGein:Low         P           of Offset 3.61 dB            of Offset 3.6	100 KHZ Swee	0.645 dBm
10 dB/div Re 10 dB/div Re 13.6 3.6 3.6 4.5 4.5 4.6 4.6 4.6 5 tart 2.47600 #Res BW 100 MRR MODE TRCI SC 1 N 1 f 3 N 1 f 5 d N 1 f 5 d 1 d 5 d 5 d 1 d 5 d 1 d 5 d 1 d 5 d 1 d 5 d 5 d 1 d 5 d 5 d 1 d 5 d 1 d 5 d 5 d 5 d 5 d 5 d 5 d 5 d 5	IFGein:Low         P           of Offset 3.61 dB            of Offset 3.6	100 KHZ Swee	0.645 dBm
10 dE/div Re 13.6 3.61 4.39 -16.4 -36.4 -36.4 -46.4 -57.4 -57.4	IFGein:Low         P           of Offset 3.61 dB            of Offset 3.6	100 KHZ Swee	0.645 dBm

## Attachment D-- Bandwidth Test Data

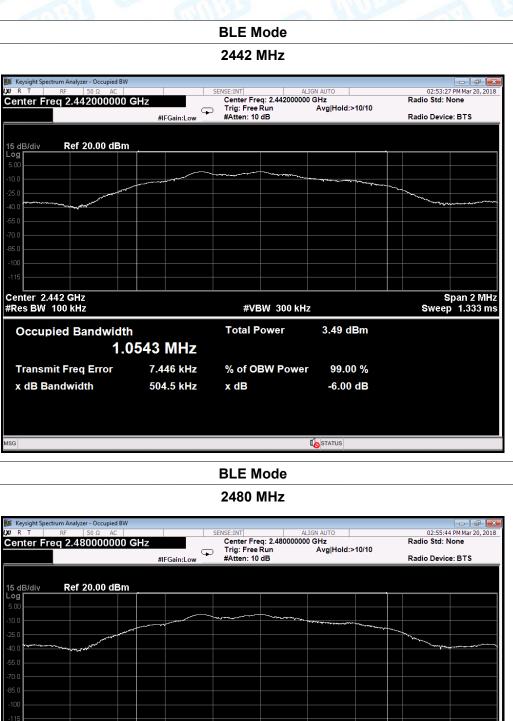
Temperature:	<b>25</b> ℃		Relative Humidity:	55%		
Test Voltage:	DC 3	DC 3.7V				
Test Mode:	BLE	BLE TX Mode				
Channel frequency		6dB Bandwidth	99% Bandwidth	Limit		
(MHz)		(kHz)	(kHz)	(kHz)		
2402		500.2 1055.1				
2442		504.5	1054.3	>=500		
2480		508.2 1055.7				
BLE Mode						

2402 MHz

K R T RF 50 Ω AC		SENSE:INT ALI	GN AUTO	02:49:57 PM Mar 20, 201	
Center Freq 2.402000000	GHz	Center Freq: 2.40200000		Radio Std: None	
		Trig: Free Run Avg Hold:>10/10			
	#IFGain:Low	#Atten: 10 dB		Radio Device: BTS	
15 dB/div Ref 20.00 dBm					
_og					
5.00					
10.0	and the second s	13 (* // m <sub>burn</sub>			
25.0				- monore	
40.0 marine and the second sec				Mary marker and the second	
55.0					
70.0					
85.0					
-100					
-115					
Center 2.402 GHz				Span 2 MH	
#Res BW 100 kHz		#VBW 300 kHz		Sweep 1.333 m	
Occupied Bandwidth	1	Total Power	3.85 dBm		
1.0	)551 MHz				
Transmit Freq Error	7.613 kHz	% of OBW Power	99.00 %		
x dB Bandwidth	500.2 kHz	x dB	-6.00 dB		
	500.2 KHZ		-0.00 uD		
ISG			STATUS		



ISG

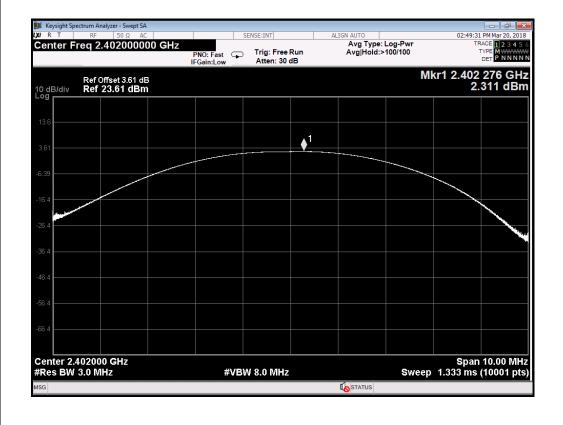


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**I**STATUS

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

Temperature:	<b>25</b> ℃	Relative H	Relative Humidity:		
Test Voltage:	DC 3.7V				
Test Mode:	BLE TX Mode				
Channel frequency (MHz)		Test Result (dBm)		Limit (dBm)	
2402		2.311			
2442		1.966	30		
2480		0.727			
		BLE Mode	L		
		2402 MHz			





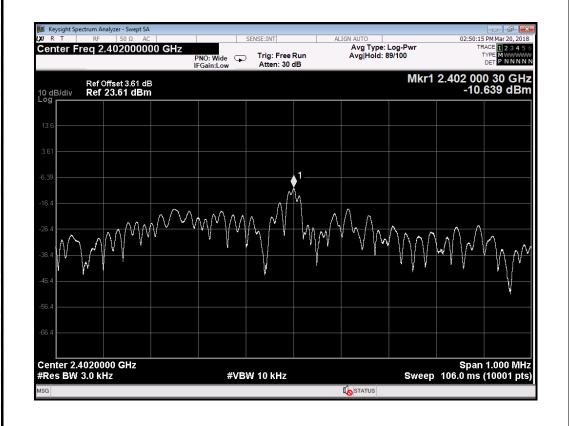
**BLE Mode** 2442 MHz Keysight Spectrum Analyzer - Swept SA 02:53:16 PM Mar 20, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWW DET P N N N N N Avg Type: Log-Pwi Avg|Hold:>100/100 Center Freq 2.442000000 GHz PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB Mkr1 2.442 289 GHz 1.966 dBm Ref Offset 3.59 dB Ref 23.59 dBm 10 dB/div Log ♦1 Center 2.442000 GHz #Res BW 3.0 MHz Span 10.00 MHz Sweep 1.333 ms (10001 pts) #VBW 8.0 MHz **I**STATUS **BLE Mode** 2480 MHz Keysight Spectrum Analyzer - Swept SA 02:55:33 PM Mar 20, 2018 Center Freq 2.480000000 GHz TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNNN Avg Type: Log-Pwi Avg|Hold:>100/100 PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB Mkr1 2.480 266 GHz 0.727 dBm Ref Offset 3.61 dB Ref 23.61 dBm 10 dB/div Log Span 10.00 MHz Sweep 1.333 ms (10001 pts) Center 2.480000 GHz #Res BW 3.0 MHz #VBW 8.0 MHz **I**STATUS

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

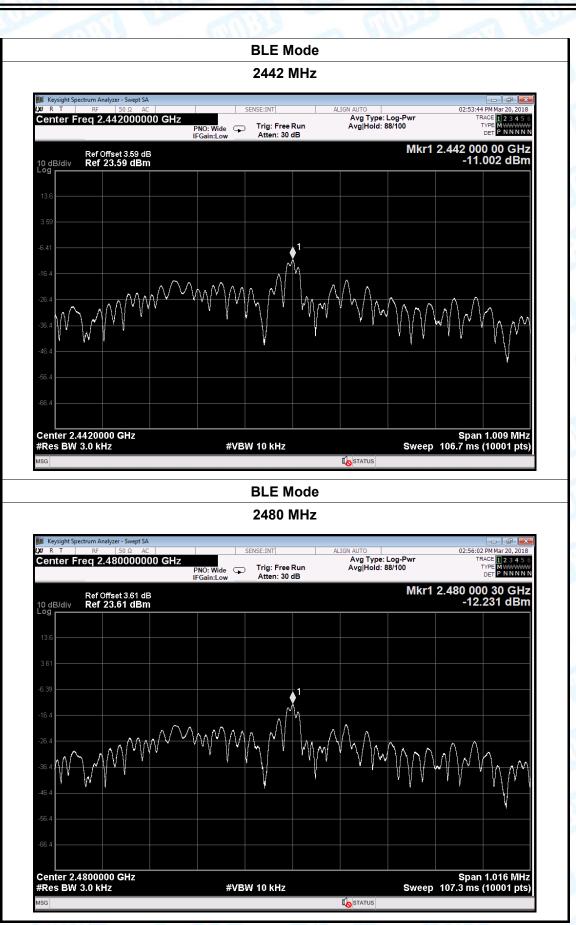
TOBY

Temperature:	<b>25</b> ℃	Relative	Relative Humidity:		ALC: N	
Test Voltage:	DC 3.7V		GI	532		
Test Mode:	BLE TX Mode					
Channel Frequency		Power Density		nit Becult		
(MHz)		(dBm)	(dBm)		Result	
2402		-10.639				
2442		-11.002	8	8 PA		
2480		-12.231				
		BLE Mode		,		

2402 MHz







-----END OF REPORT-----