

Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC158914

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FCC Radio Test Report FCC ID: 2AFRJ-DESS1

Original Grant

Report No. TB-FCC158915

Applicant Noke

Equipment Under Test (EUT)

EUT Name Electric door strike lock controller

Model No. DESS₁

Serial Model No. N/A

NOKE **Brand Name**

Receipt Date 2018-03-27

2018-03-28 to 2018-04-08 **Test Date**

Issue Date 2018-04-09

: FCC Part 15: 2017, Subpart C(15.247) **Standards**

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

the report.

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

TB-RF-074-1.0

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Revision History

Report No.	Version	Description	Issued Date
TB-RF158914	Rev.01	Initial issue of report	2018-04-09
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1. General Information about EUT

1.1 Client Information

Applicant	:(Noke
Address	<u>}</u> :	2801 Thanksgiving Way, Ste 220 Lehi, UT 84043
Manufacturer	e 3	Mapleaf technology CO., LIMITED
Address		5B1003, Shengtaoshajunyuan, Baoan District, Shenzhen City, Guangdong, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	-	Electric door strike lock	controller				
Models No.		DESS1	DESS1				
Model Difference	:	: N/A					
The state of the s	3	Operation Frequency:	Bluetooth 4.2(BLE): 2402MHz~2480MHz				
		Number of Channel:	Bluetooth 4.2(BLE): 40 channels see note(3)				
Product	3 1	RF Output Power:	0.564 dBm Conducted Power(Module 1) 0.129 dBm Conducted Power(Module 2)				
Description		Antenna Gain:	0.5 dBi Internal Antenna				
	(3)	Modulation Type:	GFSK				
	Million	Bit Rate of Transmitter:	1Mbps(GFSK)				
Power Rating	İ	DC 3.6V 2800mAh by Li-ion Battery. DC 12V from DC port.					
Connecting I/O Port(S)	5	Please refer to the User	's Manual				
Remark: The EUT h	as tw	vo bluetooth Module (N52832), t	he one is for APP, the other one is for Networking.				

Note:

This Test Report is FCC Part 15.247 for 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.



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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

TX Mode	- CHILL		13	Will.	
		EUT			
	L		J		

1.4 Description of Support Units

The EUT has been test as an independent unit.

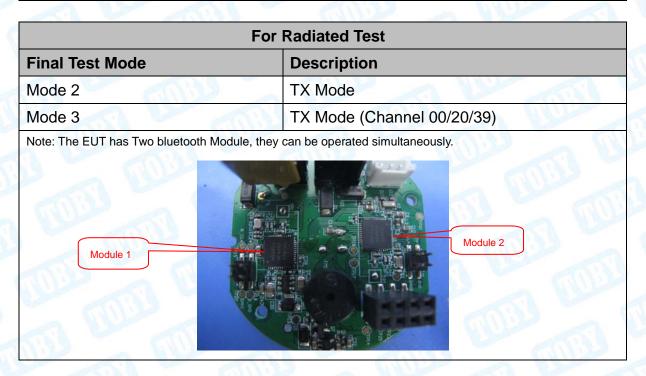


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1.5 Description of Test Mode

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	N/A						



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.



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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	MILE	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 _{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.42 dB ±3.42 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.40 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB



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1.8 Test Facility

The testing report were 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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2. Test Summary

FCC Part 15 Subpart C(15.247)/RSS 247 Issue 1							
Standard S	Section	Tool Home		Remark			
FCC	IC	Test Item	Judgment				
15.203		Antenna Requirement	PASS	N/A			
15.207(a)	RSS-GEN 7.2.4	Conducted Emission	N/A	(1)			
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, RSS 247 15.209&15.247(d) 5.5		Transmitter Radiated Spurious &Unwanted Emissions into Restricted Frequency	PASS	N/A			

Note: (1) The EUT is powered by Li-ion battery, no requirement for this test item. N/A is an abbreviation for Not Applicable.



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3. Test Equipment

Conducted Emiss	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. 21, 2017	Jul. 20, 2018
Radiation Emission	n 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	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 03, 2017	Jul. 02, 2018
Pre-amplifier	Sonoma	310N	185903	Mar.17, 2018	Mar. 16, 2019
Pre-amplifier	HP	8449B	3008A00849	Mar.17, 2018	Mar. 16, 2019
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar.17, 2018	Mar. 16, 2019
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Antenna Conduct	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
13 - 6	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO26	Oct. 26, 2017	Oct. 25, 2018
DE Dower Conser	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO29	Oct. 26, 2017	Oct. 25, 2018
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO31	Oct. 26, 2017	Oct. 25, 2018
	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO33	Oct. 26, 2017	Oct. 25, 2018



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4. Conducted Emission Test

4.1 Test Standard and Limit

4.1.1Test Standard FCC Part 15.207

4.1.2 Test Limit

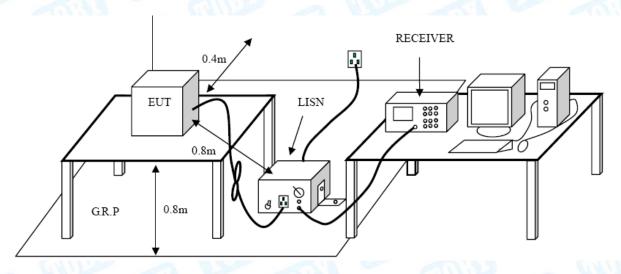
Conducted Emission Test Limit

Fragueney	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.



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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

The EUT is powered by battery, no requirement for this test item.



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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 Met	ers(at 3m)
(MHz)	Peak (dBuV/m)	Average (dBuV/m)
Above 1000	74	54

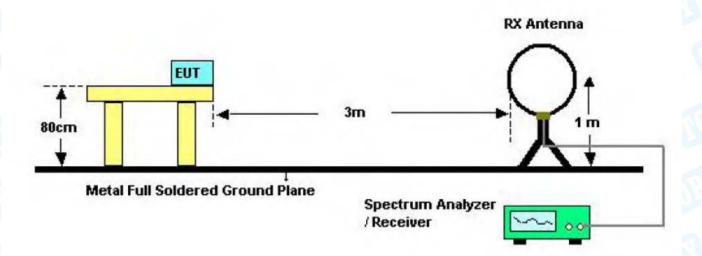
Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m)

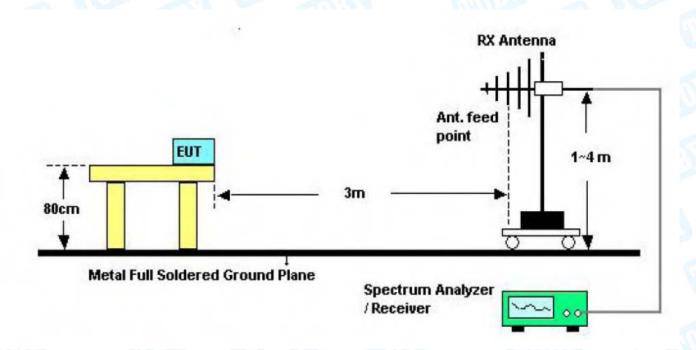


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5.2 Test Setup



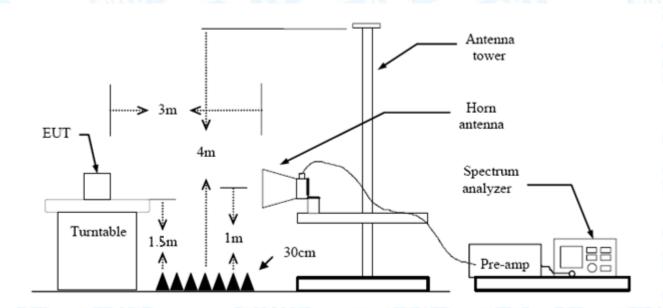
Below 30MHz Test Setup



Below 1000MHz Test Setup



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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 A.



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6. Restricted Bands Requirement

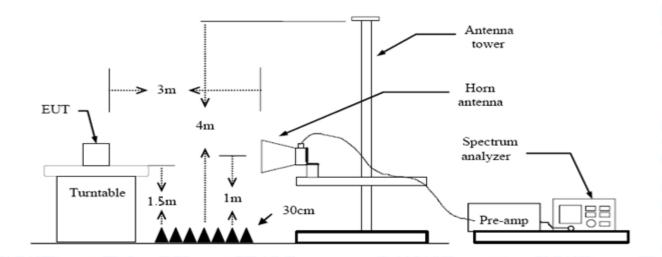
6.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.247(d) FCC Part 15.205

6.1.2 Test Limit

Restricted Frequency	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 B.



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7. Bandwidth Test

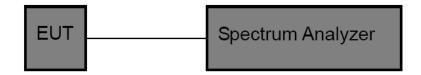
7.1 Test Standard and Limit

7.1.1 Test Standard FCC Part 15.247 (a)(2)

7.1.2 Test Limit

FCC Part 15 Subpart C(15.247)/RSS-247							
Test Item	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 C.



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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 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 D.



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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 E.



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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 0.5dBi, 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 Internal Antenna. It complies with the standard requirement.

Antenna Type					
The same of the sa	⊠Permanent attached antenna	RM.			
J. Kris	☐Unique connector antenna				
The state of the s	☐Professional installation antenna	M.			



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Attachment A-- 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:	25°C		Relative Hum	nuity.	55%	
Test Voltage:	DC 3.6V		11111111111111111111111111111111111111		Aller	
Ant. Pol.	Horizontal		Barrier and	11.11		177
Test Mode:	BLE TX 2402 Mod	1125		No.		16
Remark:	Only worse case is	s reported	7:25	_ [Allin	
80.0 dBuV/m						
				(RF)FCC 150	3M Radiation	
					Margin -6	dB
30						
				5	6 Harring Annual	antidophysion
1 *			3 4	mary responsibilities	feeble september	
mark home and how the form a some	2	aprophylikelphoperationshiples and had	3 4			
Abolin control	Were the state of					
20						
30.000 40 50	60 70 80	(MHz)	300	400 500	600 700	1000.00
	Reading	Correct	Measure-			
No. Mk.	Freq. Level	Factor	ment	Limit	Over	
	MHz dBuV	dB/m	dBuV/m	dBuV/m	dB	Detect
1 34	.0365 29.50	-15.95	13.55	40.00	-26.45	pea
2 81	.4970 29.09	-22.65	6.44	40.00	-33.56	pea
3 225	5.3080 29.86	-18.31	11.55	46.00	-34.45	pea
4 248	3.5519 29.51	-17.15	12.36	46.00	-33.64	pea
5 452	2.7197 29.31	-11.44	17.87	46.00	-28.13	peal
	5.8567 29.29	-5.42	23.87	46.00	-22.13	peal
6 * 696	20.20					



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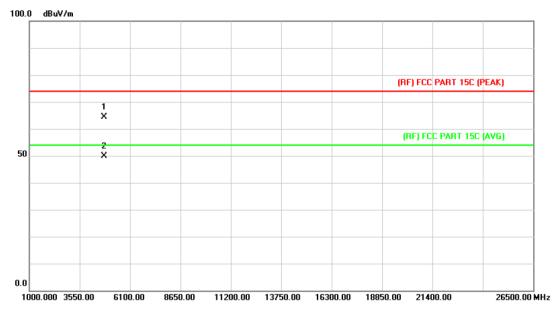
emperature:	ture: 25℃			Relative Humidity: 55%				
Test Voltage:	DC 3.6V							
Ant. Pol.	Vertical	Vertical						
Test Mode:	BLE TX	2402 Mod	е		IN			
Remark:	Only wo	rse case is	reported		2	a W	A STATE OF THE PARTY OF THE PAR	
80.0 dBuV/m								
					(RF)FCC 15	iC 3M Radiation		
						Margin -6	dB	
30					5	6		
					Ă	6 Xivilage Walder (al. Xivil	guddywld fellolydd	
1			3 X	4 Herrichaethraespelicherstell	NOW from Palifornia politica de la Maria	SAMPLE .		
What was the ship of the	www.whi.	many parting hipman	HAMAN MANAGERAL	March Could be controlled				
20 30.000 40 50	60 70	80	(MHz)	300	400 50	0 600 700	1000.000	
		D = = = !!	0	NA				
No. Mk. Fr	eq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
	Hz	dBuV		dBuV/m	dBuV/m	dB	Detector	
			dB/m					
1 36.1		27.74	-17.22	10.52	40.00	-29.48	peak	
2 67.4	382	28.79	-23.28	5.51	40.00	-34.49	peak	
3 166.6	6514	30.77	-20.21	10.56	43.50	-32.94	peak	
4 301.4	4224	29.35	-15.88	13.47	46.00	-32.53	peak	
5 * 478.8	8456	34.68	-10.73	23.95	46.00	-22.05	peak	
6 768.		29.55	-5.63	23.92	46.00	-22.08	peak	
700.	701	28.00	-5.05	25.82	70.00	-22.00	peak	
*:Maximum data x:	Over limit	!:over margin						



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Above 1GHz

Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	DC 3.6V						
Ant. Pol.	Horizontal						
Test Mode:	BLE Mode TX 2402 MHz(M	BLE Mode TX 2402 MHz(Module 1)					
Remark:	No report for the emission which more than 10 dB below the						
	prescribed limit.						

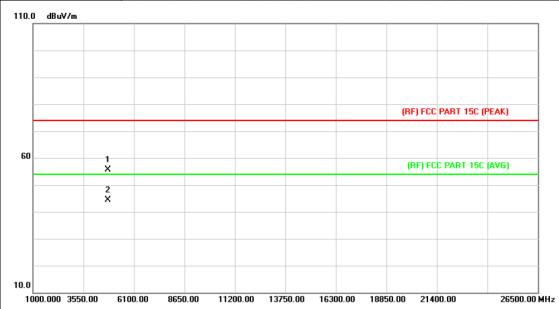


N	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1			4803.130	48.42	15.86	64.28	74.00	-9.72	peak
2		*	4804.030	34.11	15.87	49.98	54.00	-4.02	AVG



Page: 27 of 63

Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	DC 3.6V	TUVE						
Ant. Pol.	Vertical							
Test Mode:	BLE Mode TX 2402 MHz(N	Module 1)						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.							

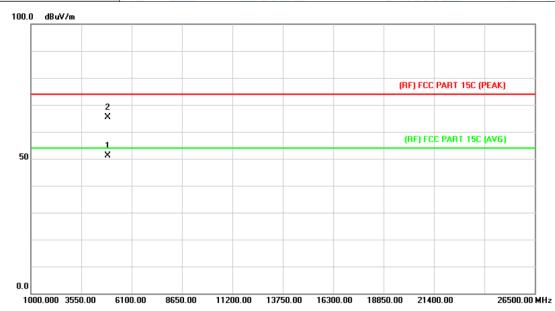


No	. Mk	. Freq.	Reading Correct Measure- Level Factor ment		Limit			
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.000	39.83	15.86	55.69	74.00	-18.31	peak
2	*	4801.142	28.50	15.85	44.35	54.00	-9.65	AVG



Page: 28 of 63

Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	DC 3.6V							
Ant. Pol.	Horizontal							
Test Mode:	BLE Mode TX 2442 MHz(M	odule 1)						
Remark:	Remark: No report for the emission which more than 10 dB below the prescribed limit.							



N	o. Mk	. Freq.	Reading Correct Measu Freq. Level Factor men			Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4885.000	34.60	16.55	51.15	54.00	-2.85	AVG
2		4883.062	48.91	16.54	65.45	74.00	-8.55	peak



Page: 29 of 63

Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	DC 3.6V	TULL					
Ant. Pol.	Vertical						
Test Mode:	BLE Mode TX 2442 MHz(M	odule 1)	TO THE				
Remark: No report for the emission which more than 10 dB below the prescribed limit.							



1	No. Mk.		Freq.	Reading Correct Measur Level Factor ment			Limit		
			MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4884.656	34.61	16.55	51.16	54.00	-2.84	AVG
2			4884.036	48.62	16.54	65.16	74.00	-8.84	peak



Page: 30 of 63

Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	DC 3.6V	THE						
Ant. Pol.	Horizontal							
Test Mode:	BLE Mode TX 2480 MHz(Mo	BLE Mode TX 2480 MHz(Module 1)						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.							

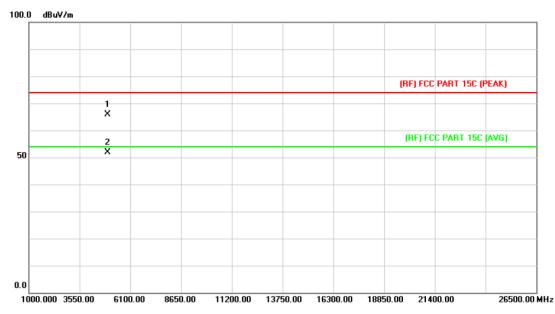


No	o. Mk. Freq.		Reading Correct Mo Level Factor			Limit	Over		
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector	
1		4959.738	48.51	17.19	65.70	74.00	-8.30	peak	
2	*	4960.738	34.58	17.19	51.77	54.00	-2.23	AVG	



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Temperature:	25℃	Relative Humidity:	55%						
Test Voltage:	DC 3.6V	OC 3.6V							
Ant. Pol.	Vertical								
Test Mode:	BLE Mode TX 2480 MHz(Mo	odule 1)							
Remark:	No report for the emission which more than 10 dB below the prescribed limit.								



N	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.366	48.76	17.19	65.95	74.00	-8.05	peak
2	*	4959.284	34.60	17.19	51.79	54.00	-2.21	AVG



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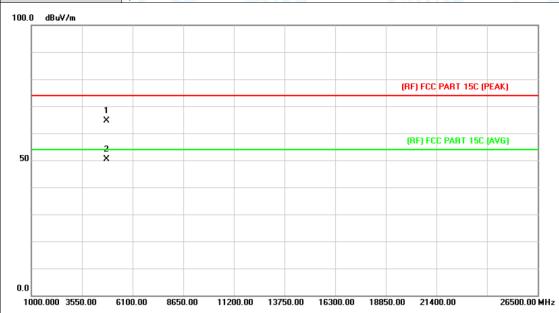
Гет	perature:		25℃			Rel	ative Hum	idity:	55%	
Test	Voltage:	1	DC 3.6V	DC 3.6V						
۹nt.	Pol.		Horizont	tal		TO I		Call	133	
Test	Mode:		BLE Mo	de TX 2	402 MHz	z(Module	2)	63		
Ren	nark:		No repo prescrib		emissio	n which	more than	10 dB	below the	A STATE OF THE PARTY OF THE PAR
100.0	dBuV/m									
								(RF) FCC F	PART 15C (PEAK)	
	1	ı								
	>	ζ						(DE) FOR	DIDT 450 (MIC)	
50	5							(HF) FCC	PART 15C (AVG)	-
30	,	ς								
0.0										
	00.000 3550.00	610	00.00 865	0.00 112	00.00 137	'50.00 163	00.00 18850.	00 21400	100 200	00.00 M

No. Mk.		Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4803.336	48.36	15.86	64.22	74.00	-9.78	peak
2			4804.172	34.00	15.87	49.87	54.00	-4.13	AVG



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25℃	Relative Humidity:	55%				
DC 3.6V						
Vertical						
BLE Mode TX 2402 MHz	BLE Mode TX 2402 MHz(Module 2)					
No report for the emission which more than 10 dB below the prescribed limit.						
	DC 3.6V Vertical BLE Mode TX 2402 MHz No report for the emissio	DC 3.6V Vertical BLE Mode TX 2402 MHz(Module 2) No report for the emission which more than 10 dB				

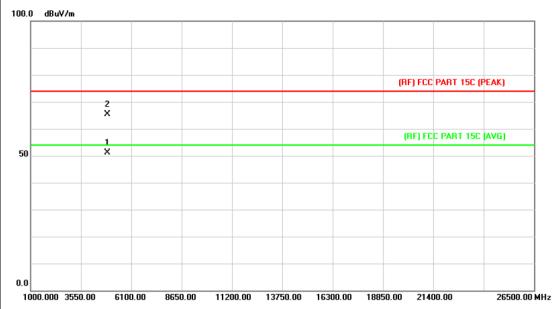


No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4804.082	48.87	15.87	64.74	74.00	-9.26	peak
2	*	4804.132	34.41	15.87	50.28	54.00	-3.72	AVG



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Temperature:	25℃	Relative Humidity:	55%			
Test Voltage:	DC 3.6V	Million				
Ant. Pol.	Horizontal					
Test Mode:	BLE Mode TX 2442 MHz(Module 2)					
Remark:	No report for the emission which more than 10 dB below the					
	prescribed limit.					



N	o. M	k. Freq.	_	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4884.516	34.59	16.55	51.14	54.00	-2.86	AVG
2		4884.264	48.79	16.55	65.34	74.00	-8.66	peak



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Temperature:	25℃	Relative Humidity:	55%			
Test Voltage:	DC 3.6V	TUDE				
Ant. Pol.	Vertical					
Test Mode:	BLE Mode TX 2442 MHz(Module 2)					
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

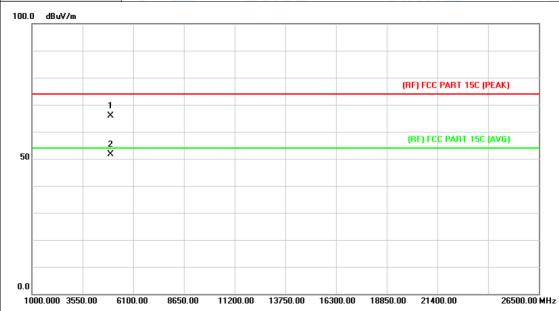


1	No. M	k. Freq.	_	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4884.940	34.55	16.55	51.10	74.00	-2.90	AVG
2	*	4883.500	49.31	16.54	65.85	74.00	-8.15	peak



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25℃	Relative Humidity:	55%			
DC 3.6V	MULL				
Horizontal		11333			
BLE Mode TX 2480 MHz(Module 2)					
No report for the emission which more than 10 dB below the prescribed limit.					
	DC 3.6V Horizontal BLE Mode TX 2480 MHz(Mo	DC 3.6V Horizontal BLE Mode TX 2480 MHz(Module 2) No report for the emission which more than 10 dB			

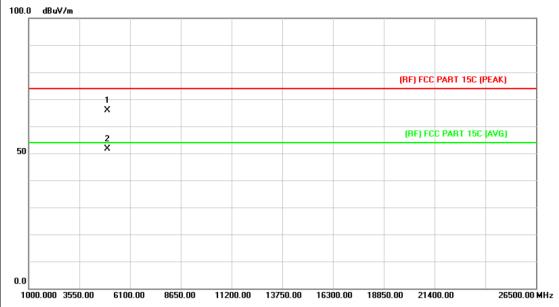


No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4960.950	48.76	17.19	65.95	74.00	-8.05	peak
2	*	4960.980	34.54	17.19	51.73	54.00	-2.27	AVG



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Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	DC 3.6V	MUDE	
Ant. Pol.	Vertical	31	133
Test Mode:	BLE Mode TX 2480 MHz(I	Module 2)	
Remark:	No report for the emission prescribed limit.	which more than 10 dB	below the
400.0 10.111			



No.	Mk.	Freq.			Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.192	48.70	17.19	65.89	74.00	-8.11	peak
2	*	4960.496	34.54	17.19	51.73	54.00	-2.27	AVG

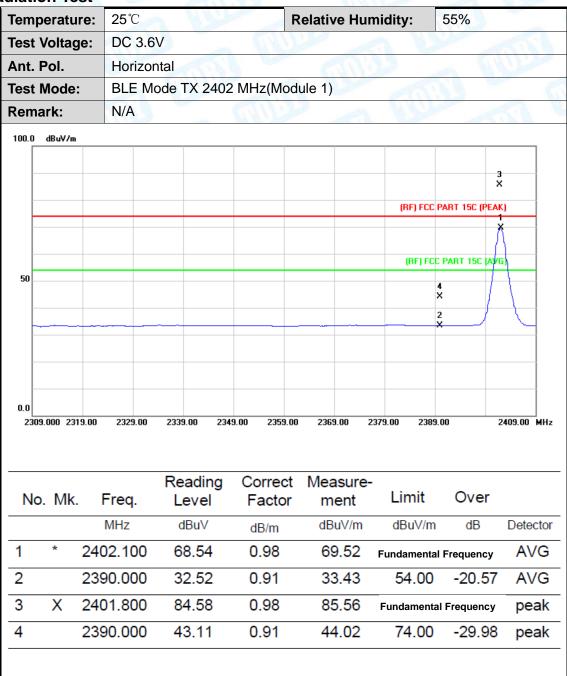
Emission Level= Read Level+ Correct Factor



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Attachment B-- Restricted Bands Requirement Test Data

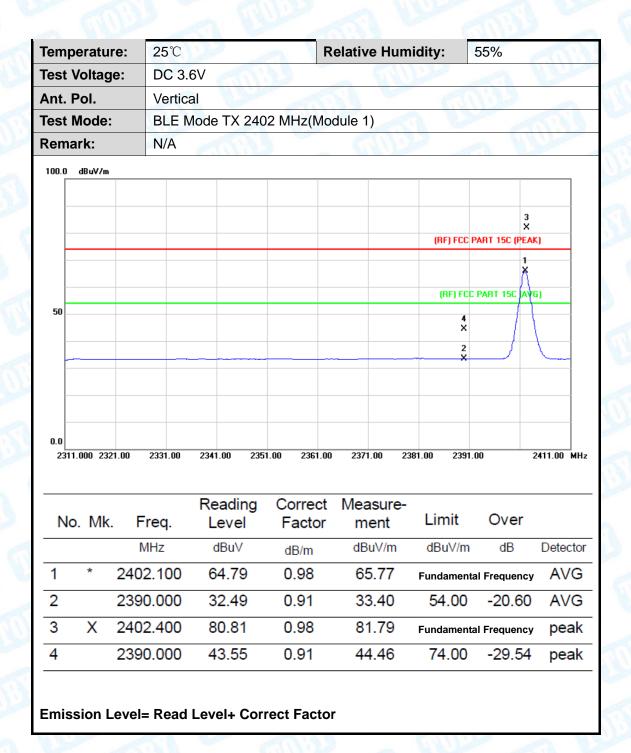
(1) Radiation Test



Emission Level= Read Level+ Correct Factor

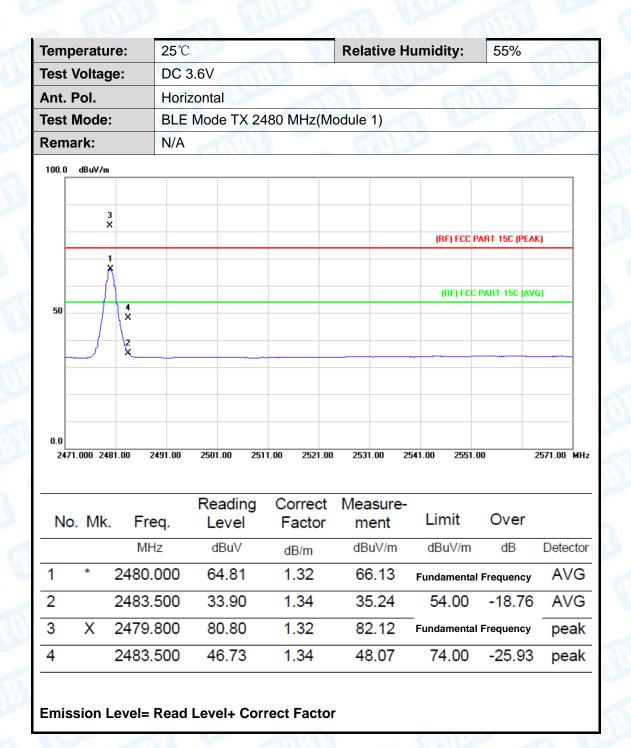


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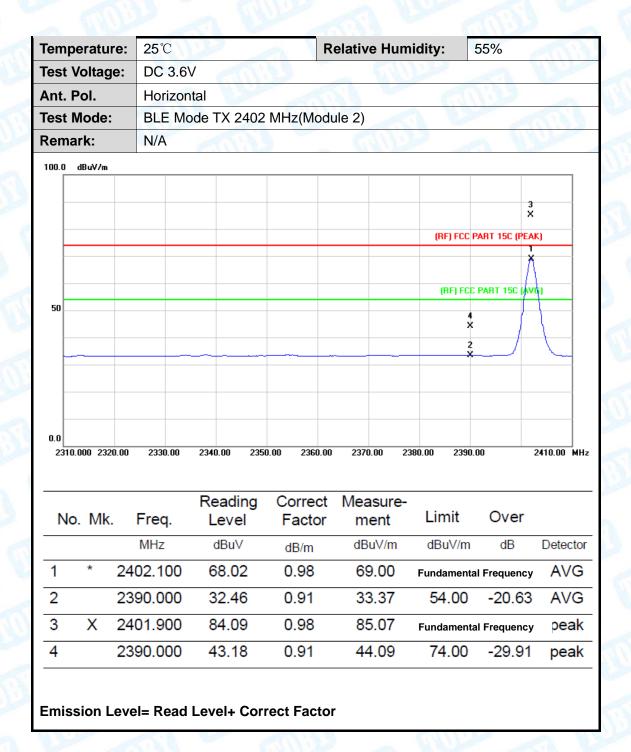
Test Volt	age:	DC 3.	6V							
Ant. Pol.		Vertic		7				P	17:33	
Test Mod	le:			X 2480	MHz(I	Module 1	1)			
Remark:		N/A				6	SCIII.		5 E	W.
100.0 dBuV	/m		P. A.A.							
	2									
	3 X							(DE) ECC	PART 15C (PE	AVI
								(RF) FCC	PART TOU (PE	AKJ
	Ϋ́									
	f							(RF) FC	C PART 15C (A	(VG)
50	4 ×									
	2									
	2									
0.0										
2471.000	2481.00	2491.00	2501.00	2511.00	252	1.00 253	1.00 254	1.00 255	1.00	2571.00 MH:

N	lo. Mk	c. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2480.000	64.14	1.32	65.46	Fundamental	Frequency	AVG
2		2483.500	33.70	1.34	35.04	54.00	-18.96	AVG
3	X	2480.300	80.13	1.32	81.45	Fundamental	Frequency	peak
4		2483.500	46.78	1.34	48.12	74.00	-25.88	peak

Emission Level= Read Level+ Correct Factor

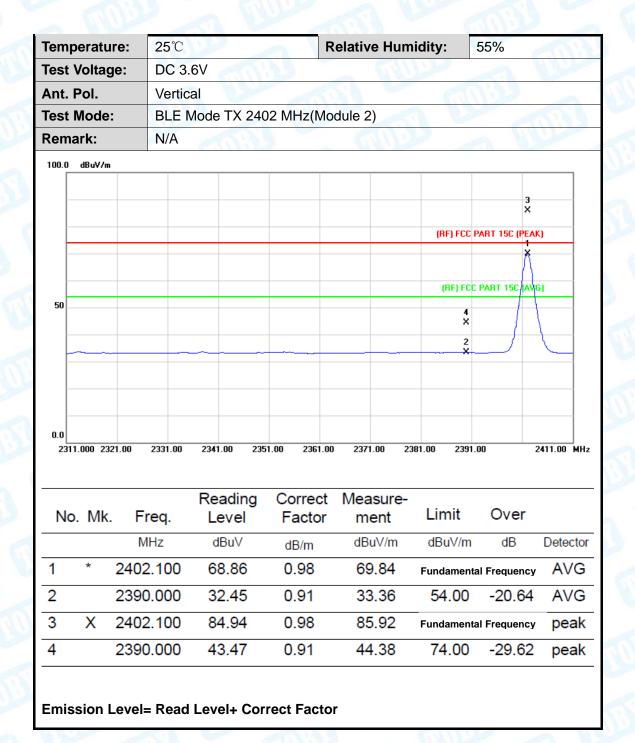


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Tem	peratu	re:	25℃			1	1/1/2	Rela	ative I	Humi	dity:	55%	4	1
Tes	t Voltag	je:	DC 3	3.6V		M			EII.		9			
Ant	. Pol.		Hori	zonta			4	818			Tim	1323		A
Tes	t Mode		BLE	Mode	e TX 2	2480 N	ИHz(M	odule	2)	1	60			
Ren	nark:		N/A		417	5		6	1115			a W		
100.0) dBuV/m													_
	X 3									O	RF) FCC PA	ART 15C (PEAK	g	
	1 X										(RF) FCC I	PART 15C (AVE	i)	
50		4 ×												
		2 X												-
														-
0.0														
24	72.000 248	2.00 2	492.00	2502.0	00 25	12.00	2522.00	2532	2.00 2	2542.00	2552.0	10 2	572.00	МН
					ading		rrect		asure			0		
N	o. Mk.				vel	F	actor		ent		mit	Over		
		MH	Z	dE	∃uV	d	B/m	dB	BuV/m	d	BuV/m	dB	Det	tecto
4	*	2480.	000	59).72	1	.32	6	1.04	Fund	lamental	Frequency	A	VC
1		2483.	500	32	2.69	1	.34	34	4.03	5	4.00	-19.97	Α	VC
							22	7(6.99	— Fund	lamontal	Frequency	n	eal
2	X	2479.	800	75	.67	1	.32	/ (0.99	i unc	iaiiieiiiai	rrequericy	Р	Ca



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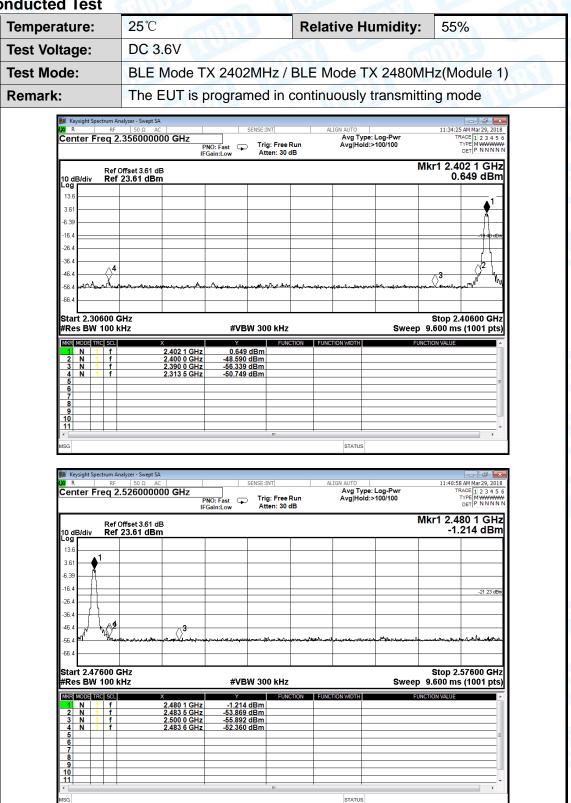
Tempe	eratur	e:	25°	С	3		. 1	Re	lativ	e Hum	nidity:	55%	1	P
Test V	oltag	e:	DC	3.6V	600					6111	111		R.R.	
Ant. P	ol.		Ver	tical	67			6			Cal	11:35		A.
Test N	/lode:		BLE	E Mod	e TX 2	480 N	ЛHz(ľ	Mod	ule 2	2)		400		
Rema	rk:		N/A	1		833			6	1110			ALL S	
100.0	dBuV/m													_
50	,	4 ×										PART 15C (PE		
0.0 2470.0	000 2480	0.00	2490.0	00 250	00.00	2510.00	252	0.00	2530).00 2!	540.00 255	D. 00	2570.00	мн
No	. Mk.	F	req.		eadin Level	_	Corre Fact			asure- nent	Limit	Over		
		ı	MHz		dBuV		dB/m		dE	BuV/m	dBuV/n	n dB	Dete	ecto
1	*	248	0.00	0	68.02		1.32		6	9.34	Fundament	al Frequency	Α'	VG
2		248	3.50	0	34.89		1.34		3	6.23	54.00	-17.7	7 A	VG
3	X	248	0.00	0	84.08		1.32		8	5.40	Fundament	al Frequency	pe	eak
4		248	3.50	0	52.59		1.34		5	3.93	74.00	-20.0	7 pe	eak

Emission Level= Read Level+ Correct Factor



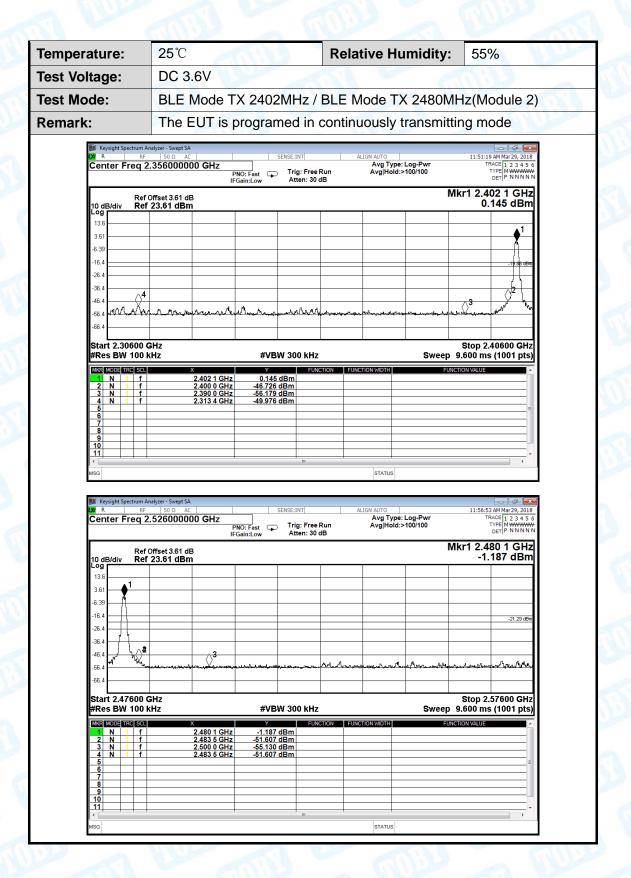
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(2) Conducted Test





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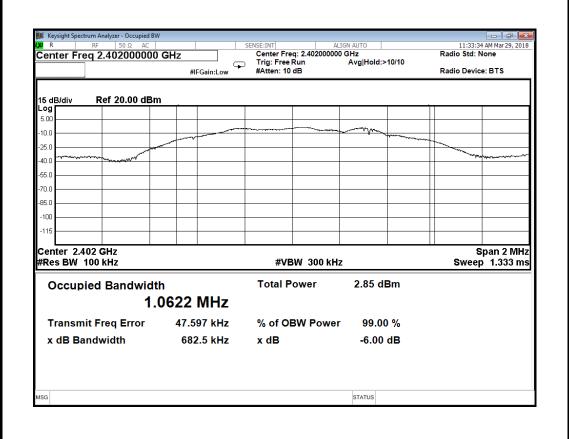


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Attachment C-- Bandwidth Test Data

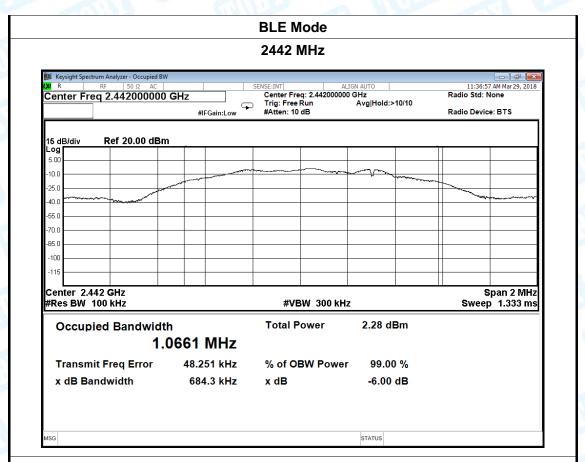
Temperature:	25 ℃		Relative Humidity:	55%
Test Voltage:	DC 3	.6V		7:33
Test Mode:	BLE	TX Mode(Module 1)		
Channel freque	ncy	6dB Bandwidth	99% Bandwidth	Limit
(MHz)		(kHz)	(kHz)	(kHz)
0.400				
2402		682.50	1062.20	
2402		682.50 684.30	1062.20 1066.10	>=500
-				>=500

BLE Mode

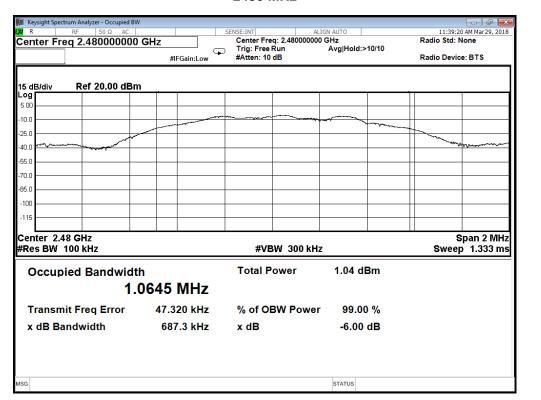




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BLE Mode

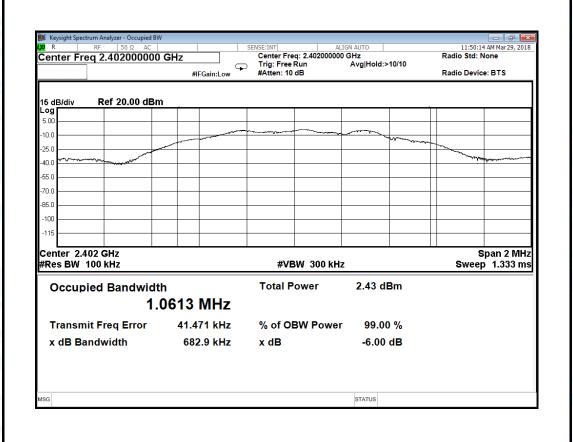




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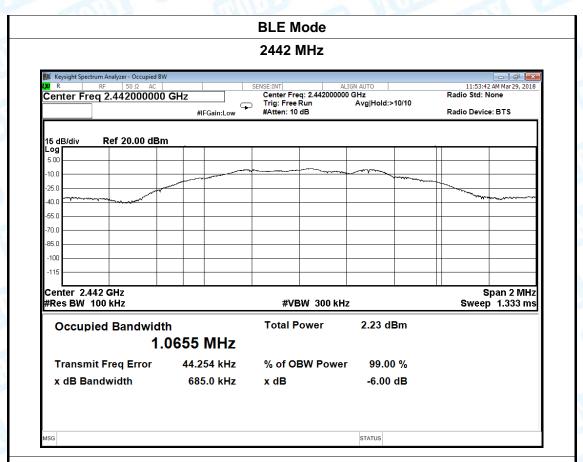
Temperature:	25℃		Relative Humidity:	55%
Test Voltage:	DC 3	3.6V	Will Draw	ALL VILLE
Test Mode:	BLE	TX Mode(Module 2)		W.33
Channel freque	ency	6dB Bandwidth	99% Bandwidth	Limit
(MHz)		(kHz)	(kHz)	(kHz)
2402		682.90	1061.30	
2442		685.00	1065.50	>=500
2480		684.70	1065.20	
				•

BLE Mode

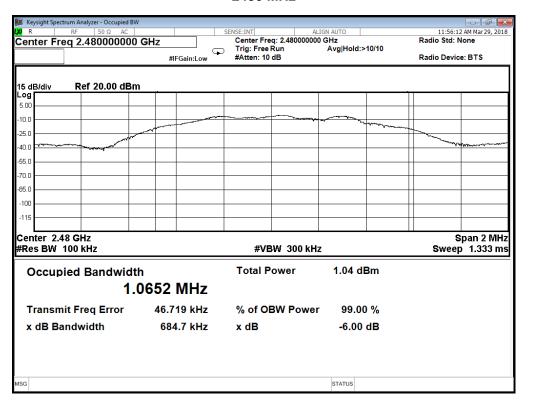




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BLE Mode



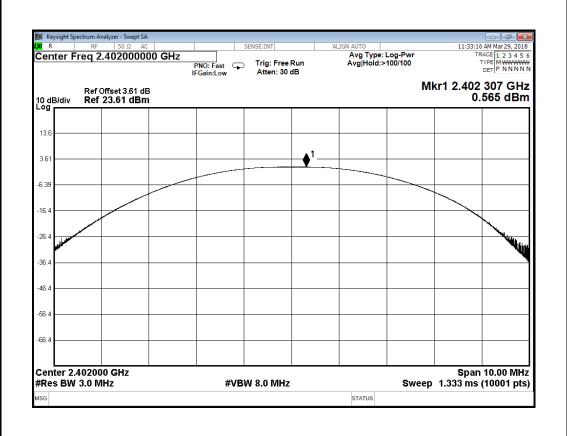


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Attachment D-- Peak Output Power Test Data

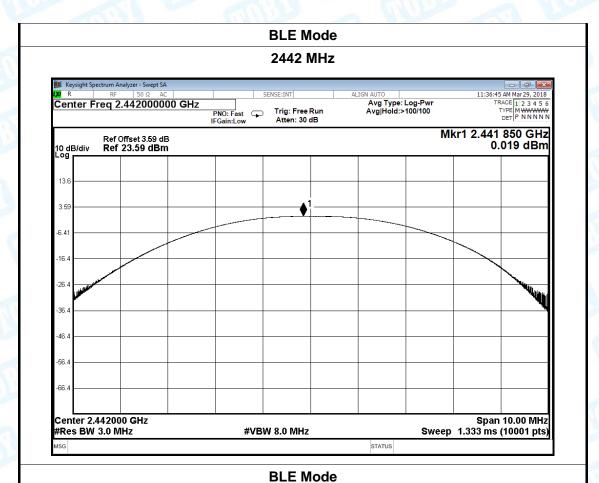
Temperature:	25℃		Relative Humid	lity:	55%
Test Voltage:	DC 3.6V	A STATE OF THE PARTY OF THE PAR	5	65	7133
Test Mode:	BLE TX N	Mode(Module 1)			
Channel frequen	cy (MHz)	Test Res	ult (dBm)		Limit (dBm)
2402		0.5	65		
2442		0.0	19		30
2480		-1.2	241		
		BLE	Mode		

BLE Mode





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2480 MHz Keysight Spectrum Analyzer - Swept SA Center Freq 2.480000000 GHz Trig: Free Run Atten: 30 dB PNO: Fast IFGain:Low Mkr1 2.479 964 GHz -1.241 dBm Ref Offset 3.61 dB Ref 23.61 dBm 13.8 3.6 -6.39 16.4 -26. 36. -56. Center 2.480000 GHz #Res BW 3.0 MHz Span 10.00 MHz Sweep 1.333 ms (10001 pts) **#VBW 8.0 MHz** STATUS

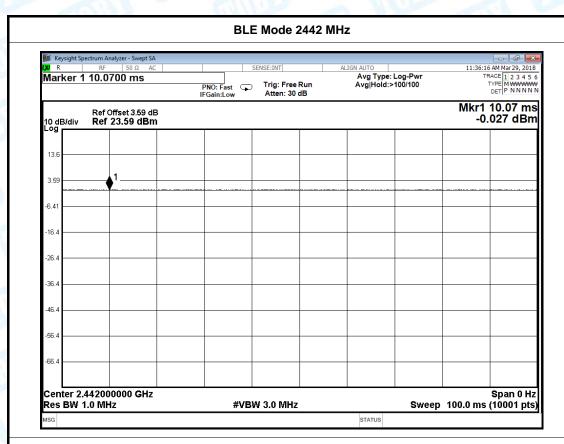


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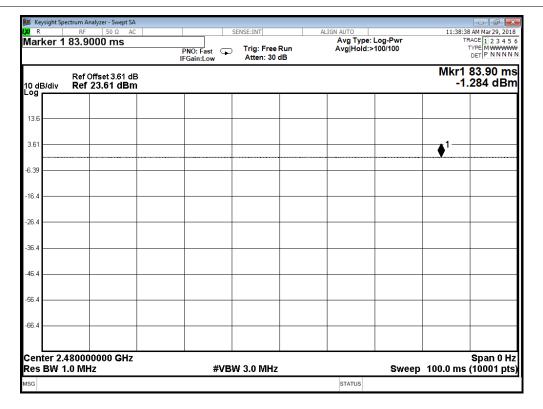
			Outy Cyc	le		
Mode	Channe	I frequency	(MHz)		Test l	Result
		2402				
BLE		2442			>9	8%
		2480				
se see belov	w plots					
		BLE	Mode 2402	2 MHz		
Keysight Spectrum A		- CI	ENSE:INT	ALIGN AUTO		11:32:53 AM Mar 29, 201
Marker 1 34.9		PNO: Fast	Trig: Free Run	Aug Type: Avg Hold:>		TRACE 1 2 3 4 5 TYPE M WWWW DET P NNNN
	Offset 3.61 dB 23.61 dBm					Mkr1 34.90 ms 0.543 dBn
13.6						
3.61		→ 1				
-6.39						
-16.4						
-26.4					I	1
-36.4						
-36.4						
-36.4						



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-36.4 -46.4 -56.4

Center 2.402000 GHz #Res BW 3.0 MHz Report No.: TB-FCC158914

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Span 10.00 MHz Sweep 1.333 ms (10001 pts)

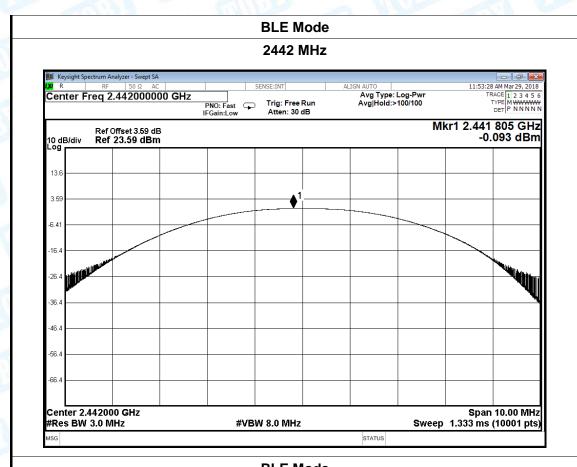
STATUS

emperature:	25℃	Relative Hum	idity: 55%
est Voltage:	DC 3.6V		
est Mode:	BLE TX M	lode(Module 2)	
hannel freque	ncy (MHz)	Test Result (dBm)	Limit (dBm)
2402		0.129	
2442		-0.093	30
2480		-1.233	
		BLE Mode	
		2402 MHz	
Keysight Spectrum Analyz R RF Center Freq 2.40	50 Ω AC	2402 MHz	DET P N N N N N
Center Freq 2.40	50 Ω AC	2402 MHz SENSE:INT ALIGN AUTO Avg Type Avg Type Avg Hybrid Avg Hybrid	11:49:47 AM Mar 29, 2018 e: Log-Pwr TRACE 1 2 3 4 5 6 >100/100 TYPE M WWWWW
Center Freq 2.40 Ref Offs 10 dB/div Ref 23.	50 Ω AC 20000000 GHz et 3.61 dB	2402 MHz SENSE:INT ALIGN AUTO Avg Type Avg Type Avg Hybrid Avg Hybrid	11:49:47 AM Mar 29, 2018 11:49:47 AM Mar 29, 2018 11:40:47 AM Mar 2

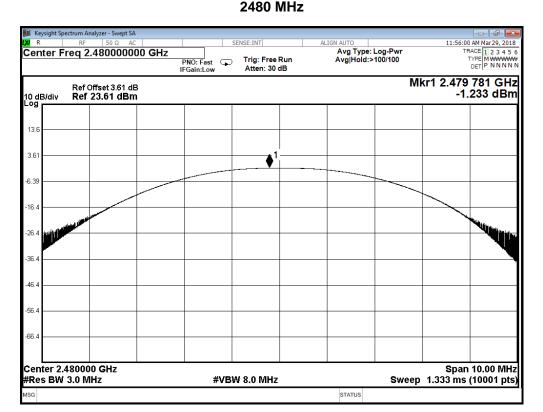
#VBW 8.0 MHz



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BLE Mode





-56.4 -66.4

Center 2.402000000 GHz Res BW 1.0 MHz Report No.: TB-FCC158914

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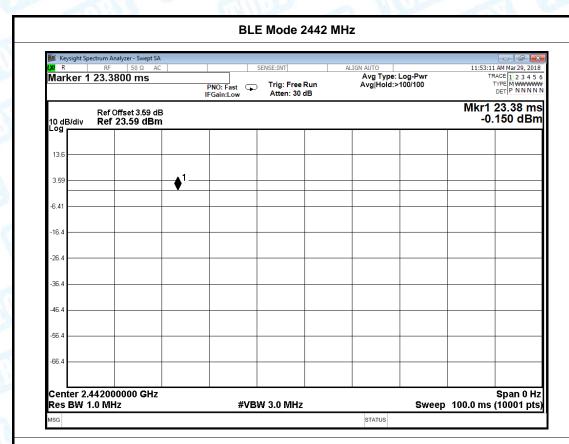
Span 0 Hz Sweep 100.0 ms (10001 pts)

		Duty Cy	cle	
Mode	Channel	frequency (MHz)	Test	Result
		2402		
BLE		2442	>9	8%
		2480		
se see belo	ow plots			
		BLE Mode 24	02 MHz	
Marker 1 33	8500 ms	PNO: Fast Trig: Free Ru IFGain:Low Atten: 30 dB	Avg Type: Log-Pwr n Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P NNNN
10 dB/div Re	f Offset 3.61 dB ef 23.61 dBm			
				Mkr1 33.85 ms 0.079 dBm
10 dB/div Re		↓ 1		
10 dB/div Re		↓ 1		
10 dB/div R4		♦ ¹		

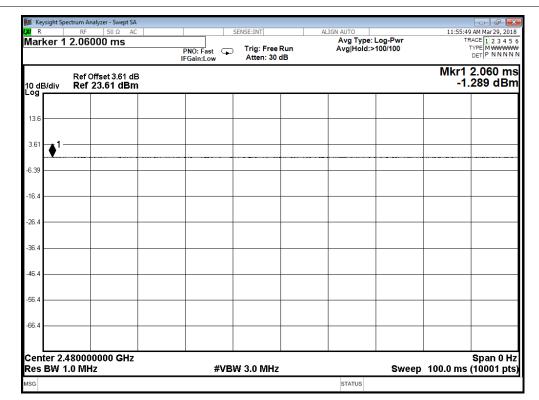
#VBW 3.0 MHz



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BLE Mode 2480 MHz





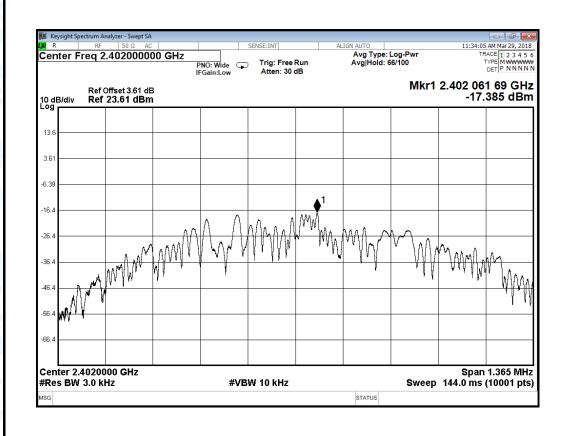
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Attachment E-- Power Spectral Density Test Data

Temperature:	25℃		Relative Hu	midity:	55%	AMIL
Test Voltage:	DC 3.6V					
Test Mode: BLE TX Mode(Module 1)						
Channel Frequency		Power D	ensity	Limi	t	Popult

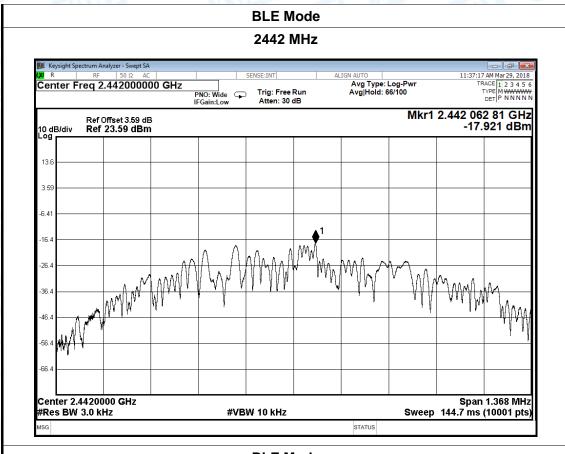
Channel Frequency (MHz)	Power Density (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
2402	-17.385		
2442	-17.921	8	PASS
2480	-19.198		

BLE Mode

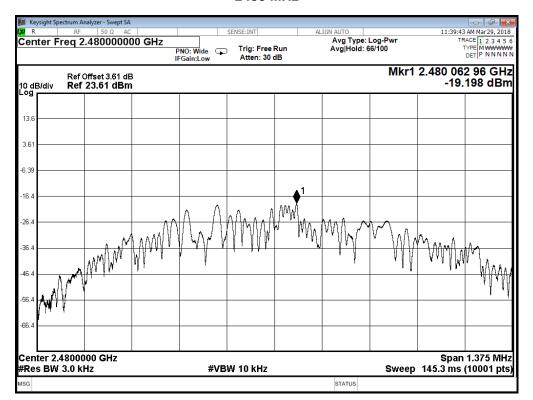




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BLE Mode





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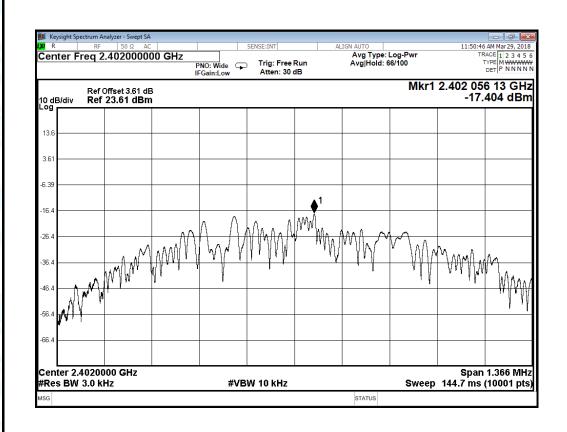
Temperature:	25℃	S. See	Relative Humidity:			55%		
Test Voltage:	DC 3.6V		Marie Land					
Test Mode:	BLE TX N	BLE TX Mode(Module 2)						
Channel Frequency		Power Density		Limit		Result		
(MHz)		(dBm/3 kHz)		(dBm/3 k	(Hz)	Result		

 Channel Frequency (MHz)
 Power Density (dBm/3 kHz)
 Limit (dBm/3 kHz)
 Result

 2402
 -17.404
 8
 PASS

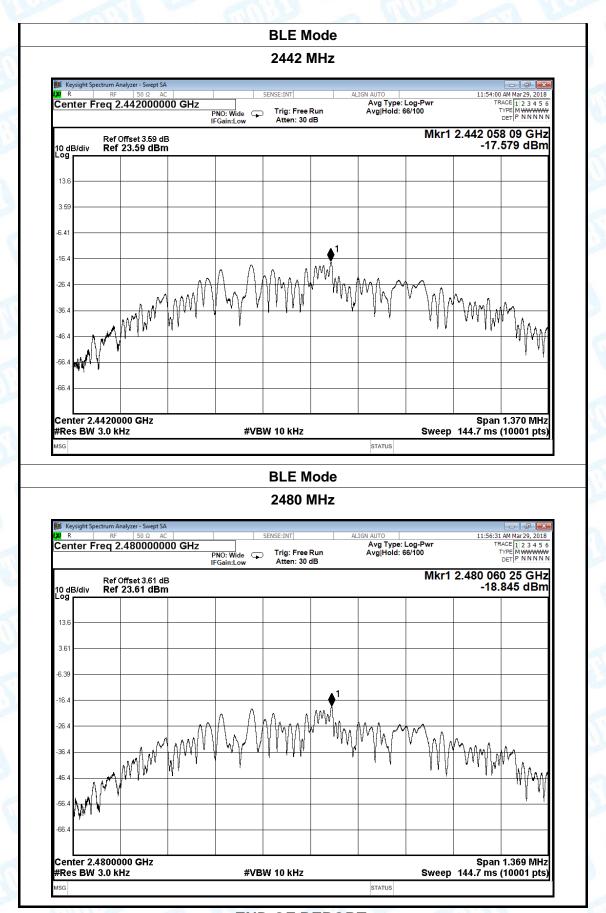
 2480
 -18.845
 PASS

BLE Mode





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