FCC Radio Test Report

FCC ID: 2ANO3-P2

Original Grant

Report No.	:	TB-FCC155886
Applicant	:	ShenZhen SHIDU Digital Technolgy Co.,Ltd
Equipment Under Test (EUT)		
EUT Name	:	Bluetooth speaker
Model No.	:	P2
Serial Model No.	:	SD-T1, SD-T3, SD-T4, SD-T6, SD-T7, SD-T8, P3, P5, P6, P7
Brand Name	:	SHIDU
Receipt Date	:	2017-06-01
Test Date	:	2017-06-02 to 2017-06-12
Issue Date	:	2017-06-13
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	:	IVAN SU
Approved& Authorized	:	

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.

1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, China
Tel: +86 75526509301 Fax: +86 75526509195

Contents

CONTENTS 2
1. GENERAL INFORMATION ABOUT EUT 4
1.1 Client Information 4
1.2 General Description of EUT (Equipment Under Test) 4
1.3 Block Diagram Showing the Configuration of System Tested 5
1.4 Description of Support Units 6
1.5 Description of Test Mode 6
1.6 Description of Test Software Setting 7
1.7 Measurement Uncertainty 7
1.8 Test Facility 8
2. TEST SUMMARY 9
3. TEST EQUIPMENT 10
4. CONDUCTED EMISSION TEST 11
4.1 Test Standard and Limit 11
4.2 Test Setup 11
4.3 Test Procedure 11
4.4 EUT Operating Mode 12
4.5 Test Da5ta 12
5. RADIATED EMISSION TEST 17
5.1 Test Standard and Limit 17
5.2 Test Setup 18
5.3 Test Procedure 19
5.4 EUT Operating Condition 20
5.5 Test Data 20
6. RESTRICTED BANDS REQUIREMENT 29
6.1 Test Standard and Limit 29
6.2 Test Setup 29
6.3 Test Procedure 29
6.4 EUT Operating Condition 30
6.5 Test Data 30
7. BANDWIDTH TEST 36
7.1 Test Standard and Limit 36
7.2 Test Setup 36
7.3 Test Procedure 36
7.4 EUT Operating Condition 36
7.5 Test Data 37
8. PEAK OUTPUT POWER TEST 39
8.1 Test Standard and Limit 39
8.2 Test Setup 39

8.3 Test Procedure 39
8.4 EUT Operating Condition 39
8.5 Test Data 40
9. POWER SPECTRAL DENSITY TEST 42
9.1 Test Standard and Limit 42
9.2 Test Setup 42
9.3 Test Procedure 42
9.4 EUT Operating Condition 42
9.5 Test Data 43
10. ANTENNA REQUIREMENT 45
10.1 Standard Requirement 45
10.2 Antenna Connected Construction 45
10.3 Result 45

1. General Information about EUT

1.1 Client Information

Applicant	:	ShenZhen SHIDU Digital Technolgy Co.,Ltd
Address	:	F6, Zhaofeng, Hangkong Rd, Bao'an, Shenzhen, China
Manufacturer	:	ShenZhen SHIDU Digital Technolgy Co.,Ltd
Address	:	F6, Zhaofeng, Hangkong Rd, Bao'an, Shenzhen, China

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Bluetooth Speaker	
Models No.	:	P2, SD-T1, SD-T3, SD-T4, SD-T6, SD-T7, SD-T8, P3, P5, P6, P7	
Model Difference	:	All models are identical in the same PCB layout interior structure and electrical circuits, The only difference is appearance color.	
Product Description	:	Operation Frequency:	Bluetooth 4.0(BLE): 2402MHz~2480MHz
		Number of Channel:	Bluetooth 4.0(BLE): 40 channels **see note(3)**
		RF Output Power:	3.738dBm Conducted Power
		Antenna Gain:	1.2dBi PCB Antenna
		Modulation Type:	GFSK
		Bit Rate of Transmitter:	1Mbps(GFSK)
Power Supply	:	DC Voltage supplied by USB cable DC Voltage supplied by Li-ion battery	
Power Rating	:	DC 5.0V by USB cable DC 3.7V by 1500mAh Li-ion battery	
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.

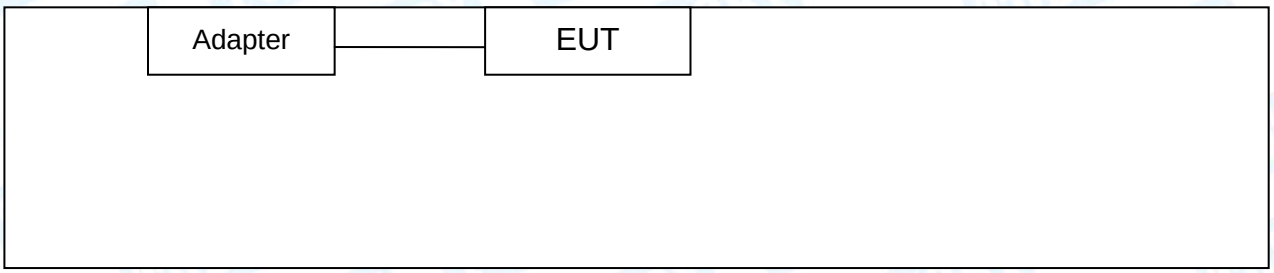
(2) Antenna information provided by the applicant.

(3) Channel List:

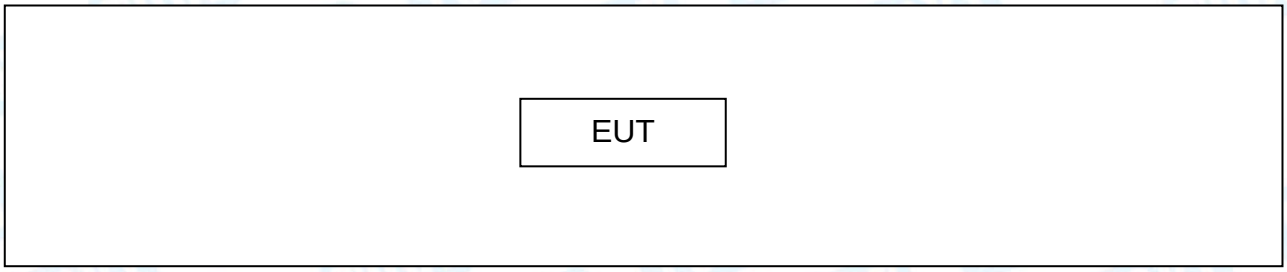
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	19	2440	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	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



TX Mode



1.4 Description of Support Units

Equipment Information				
Name	**Model**	**FCC ID/VOC**	**Manufacturer**	**Used "√"**
AC/DC Adapter	A16-502000	---	AOHAI	√
Adapter Input:100-240V 50/60Hz 0.5A Output:5V/2A				
Cable Information				
Number	**Shielded Type**	**Ferrite Core**	**Length**	**Note**
Cable 1	YES	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	
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	**FCC.exe**		
Frequency	2402 MHz	2442MHz	2480 MHz
BLE GFSK	DEF	DEF	DEF

1.7 Measurement Uncertainty

The reported uncertainty of measurement y ± 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

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.

FCC List No.: (811562)
The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

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.

2. Test Summary

FCC Part 15 Subpart C(15.247)/RSS 247 Issue 2				
Standard Section		Test Item	Judgment	Remark
FCC	IC			
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
Note: N/A is an abbreviation for Not Applicable.				

3. Test Equipment

Conducted Emission Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Due Date**
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 21, 2016	Jul. 20, 2017
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 21, 2016	Jul. 20, 2017
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 21, 2016	Jul. 20, 2017
LISN	Rohde & Schwarz	ENV216	101131	Jul. 21, 2016	Jul. 20, 2017
Radiation Emission Test					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 21, 2016	Jul. 20, 2017
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 21, 2016	Jul. 20, 2017
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.25, 2017	Mar. 24, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar.25, 2017	Mar. 24, 2018
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.24, 2017	Mar. 23, 2018
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar.24, 2017	Mar. 23, 2018
Loop Antenna	Laplace instrument	RF300	0701	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	Sonoma	310N	185903	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	HP	8449B	3008A00849	Mar.25, 2017	Mar. 24, 2018
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar.24, 2017	Mar. 23, 2018
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Antenna Conducted Emission					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Cal. Due Date**
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 21, 2016	Jul. 20, 2017
Spectrum Analyzer	Rohde & Schwarz	ESCI	100010/007	Jul. 21, 2016	Jul. 20, 2017
Power Meter	Anritsu	ML2495A	25406005	Jul. 21, 2016	Jul. 20, 2017
Power Sensor	Anritsu	ML2411B	25406005	Jul. 21, 2016	Jul. 20, 2017

4. Conducted Emission Test

4.1 Test Standard and Limit

4.1.1Test Standard

FCC Part 15.207

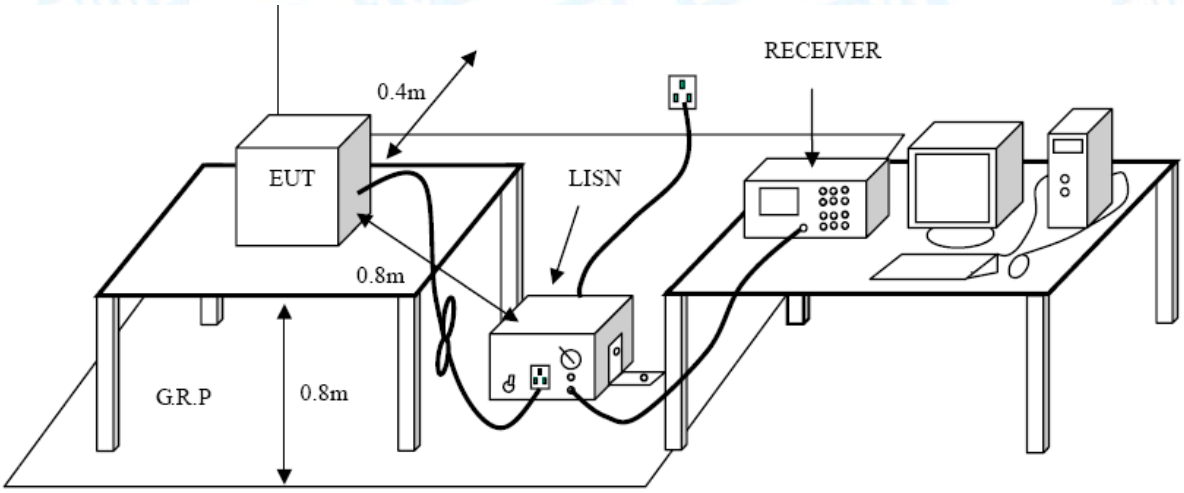
4.1.2 Test Limit

Conducted Emission Test Limit

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

Notes:
(1) *Decreasing linearly with logarithm of the frequency.
(2) The lower limit shall apply at the transition frequencies.
(3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2 Test Setup



4.3 Test Procedure

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

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

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

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

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

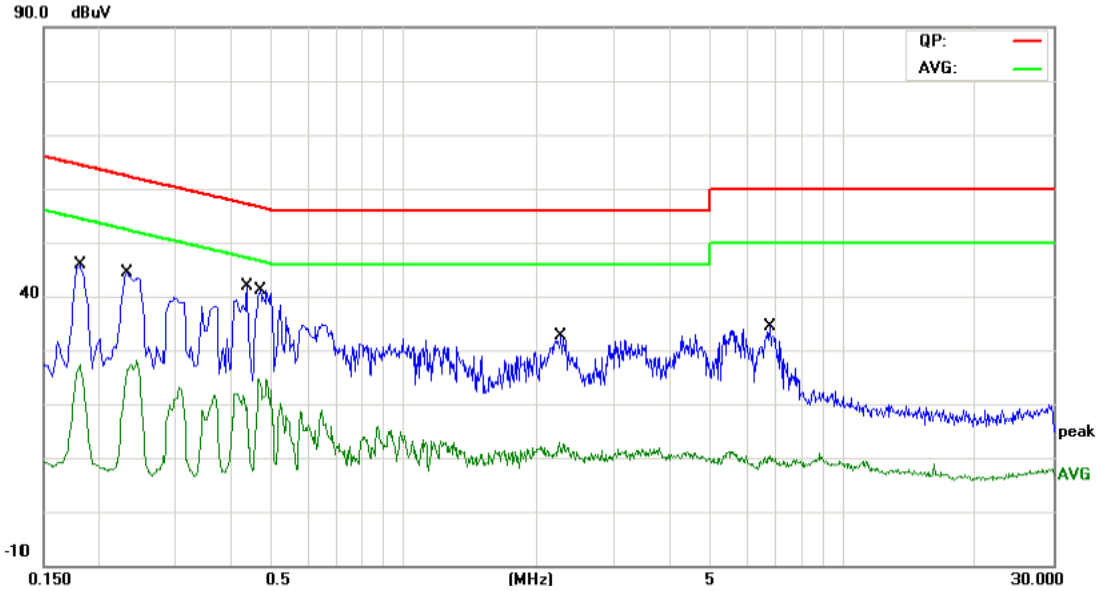
4.4 EUT Operating Mode

Please refer to the description of test mode.

4.5 Test Da5ta

Test data please refer the following pages.

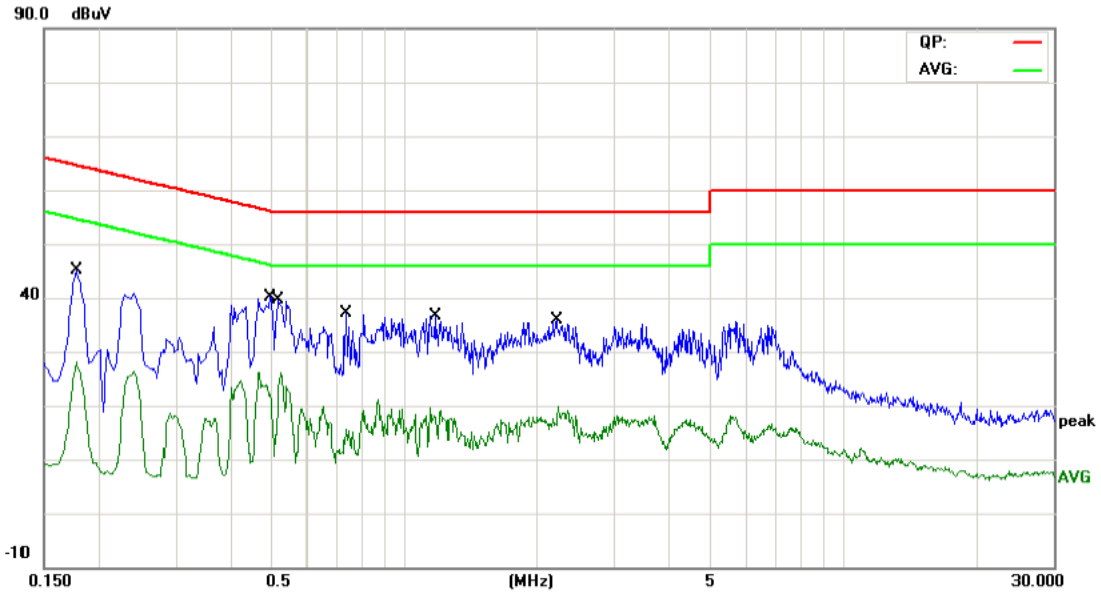
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120V/60 Hz		
Terminal:	Line		
Test Mode:	TX GFSK Mode 2402 MHz		
Remark:	Only worse case is reported		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1819	32.09	9.58	41.67	64.39	-22.72	QP
2		0.1819	15.73	9.58	25.31	54.39	-29.08	AVG
3		0.2340	30.35	9.58	39.93	62.30	-22.37	QP
4		0.2340	14.19	9.58	23.77	52.30	-28.53	AVG
5		0.4380	23.81	9.60	33.41	57.10	-23.69	QP
6		0.4380	7.75	9.60	17.35	47.10	-29.75	AVG
7	*	0.4700	25.75	9.60	35.35	56.51	-21.16	QP
8		0.4700	10.48	9.60	20.08	46.51	-26.43	AVG
9		2.2820	10.91	9.62	20.53	56.00	-35.47	QP
10		2.2820	0.21	9.62	9.83	46.00	-36.17	AVG
11		6.7940	12.41	9.85	22.26	60.00	-37.74	QP
12		6.7940	-0.99	9.85	8.86	50.00	-41.14	AVG

Emission Level= Read Level+ Correct Factor

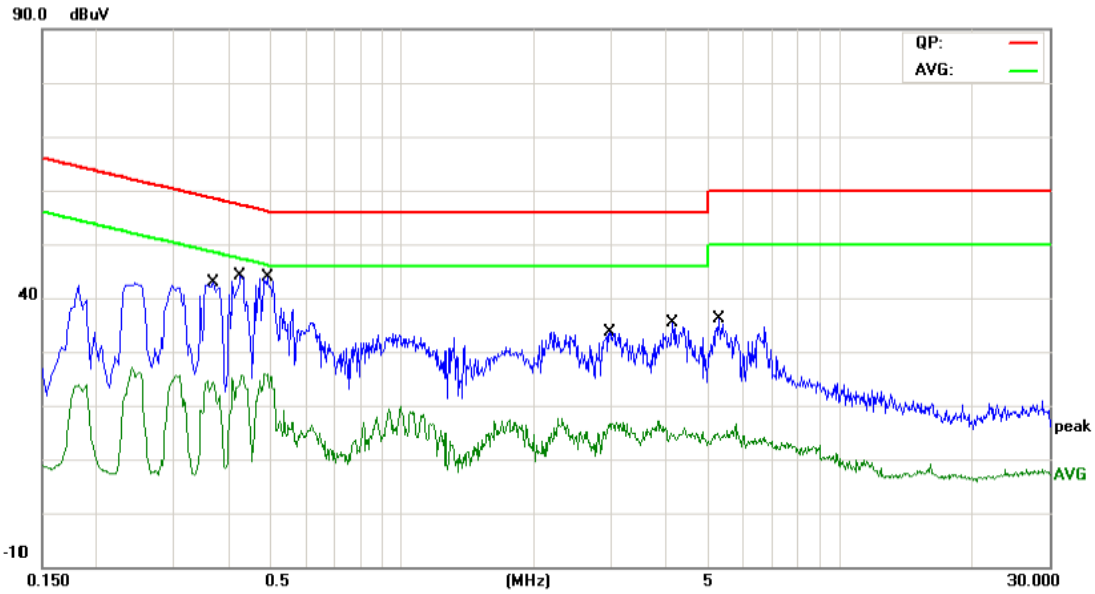
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120V/60 Hz		
Terminal:	Neutral		
Test Mode:	TX GFSK Mode 2402 MHz		
Remark:	Only worse case is reported		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1780	31.24	9.65	40.89	64.57	-23.68	QP
2		0.1780	17.42	9.65	27.07	54.57	-27.50	AVG
3	*	0.4940	28.14	9.58	37.72	56.10	-18.38	QP
4		0.4940	13.49	9.58	23.07	46.10	-23.03	AVG
5		0.5180	27.98	9.58	37.56	56.00	-18.44	QP
6		0.5180	12.83	9.58	22.41	46.00	-23.59	AVG
7		0.7340	15.92	9.59	25.51	56.00	-30.49	QP
8		0.7340	2.26	9.59	11.85	46.00	-34.15	AVG
9		1.1780	20.82	9.59	30.41	56.00	-25.59	QP
10		1.1780	7.69	9.59	17.28	46.00	-28.72	AVG
11		2.2139	18.64	9.62	28.26	56.00	-27.74	QP
12		2.2139	6.63	9.62	16.25	46.00	-29.75	AVG

Emission Level= Read Level+ Correct Factor

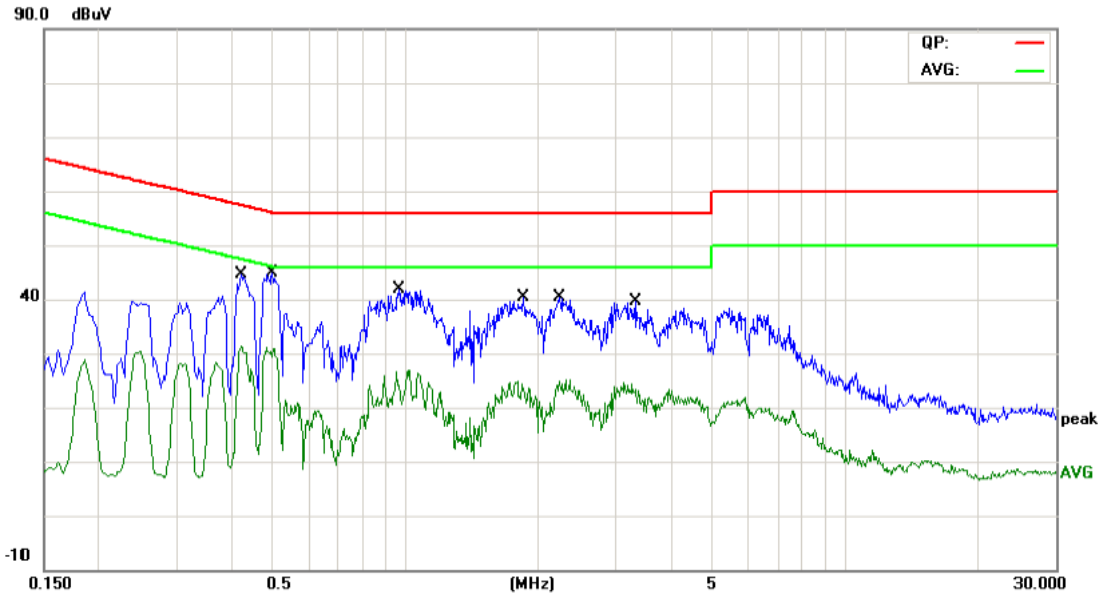
EUT:	Bluetooth Speaker	Model:	P2
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 240V/60 Hz		
Terminal:	Line		
Test Mode:	TX GFSK Mode 2402 MHz		
Remark:	Only worse case is reported		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.3700	28.70	9.60	38.30	58.50	-20.20	QP
2		0.3700	13.76	9.60	23.36	48.50	-25.14	AVG
3		0.4260	30.26	9.60	39.86	57.33	-17.47	QP
4		0.4260	15.19	9.60	24.79	47.33	-22.54	AVG
5	*	0.4940	30.44	9.60	40.04	56.10	-16.06	QP
6		0.4940	15.11	9.60	24.71	46.10	-21.39	AVG
7		2.9620	13.79	9.64	23.43	56.00	-32.57	QP
8		2.9620	3.77	9.64	13.41	46.00	-32.59	AVG
9		4.1380	16.97	9.69	26.66	56.00	-29.34	QP
10		4.1380	4.45	9.69	14.14	46.00	-31.86	AVG
11		5.2980	14.89	9.76	24.65	60.00	-35.35	QP
12		5.2980	3.05	9.76	12.81	50.00	-37.19	AVG

Emission Level= Read Level+ Correct Factor

EUT:	Bluetooth Speaker	Model:	P2
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 240V/60 Hz		
Terminal:	Neutral		
Test Mode:	TX GFSK Mode 2402 MHz		
Remark:	Only worse case is reported		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.4220	31.55	9.60	41.15	57.41	-16.26	QP
2		0.4220	20.20	9.60	29.80	47.41	-17.61	AVG
3	*	0.4980	32.26	9.60	41.86	56.03	-14.17	QP
4		0.4980	20.05	9.60	29.65	46.03	-16.38	AVG
5		0.9660	28.85	9.60	38.45	56.00	-17.55	QP
6		0.9660	16.14	9.60	25.74	46.00	-20.26	AVG
7		1.8580	25.67	9.61	35.28	56.00	-20.72	QP
8		1.8580	14.13	9.61	23.74	46.00	-22.26	AVG
9		2.2460	26.14	9.62	35.76	56.00	-20.24	QP
10		2.2460	12.55	9.62	22.17	46.00	-23.83	AVG
11		3.3300	23.66	9.66	33.32	56.00	-22.68	QP
12		3.3300	13.12	9.66	22.78	46.00	-23.22	AVG

Emission Level= Read Level+ Correct Factor

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)

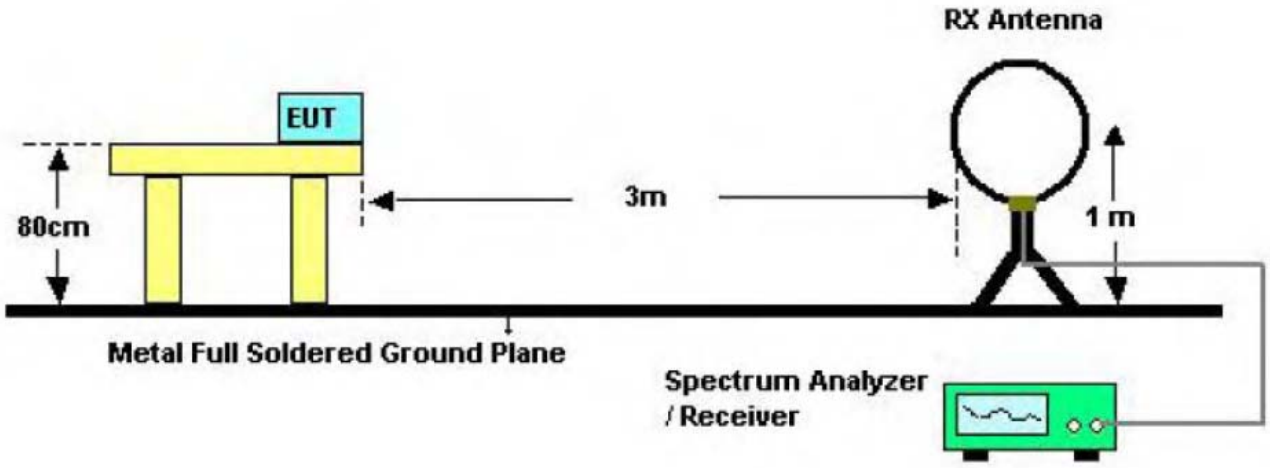
Frequency (MHz)	Distance Meters(at 3m)	
	Peak (dBuV/m)	Average (dBuV/m)
Above 1000	74	54

Note:

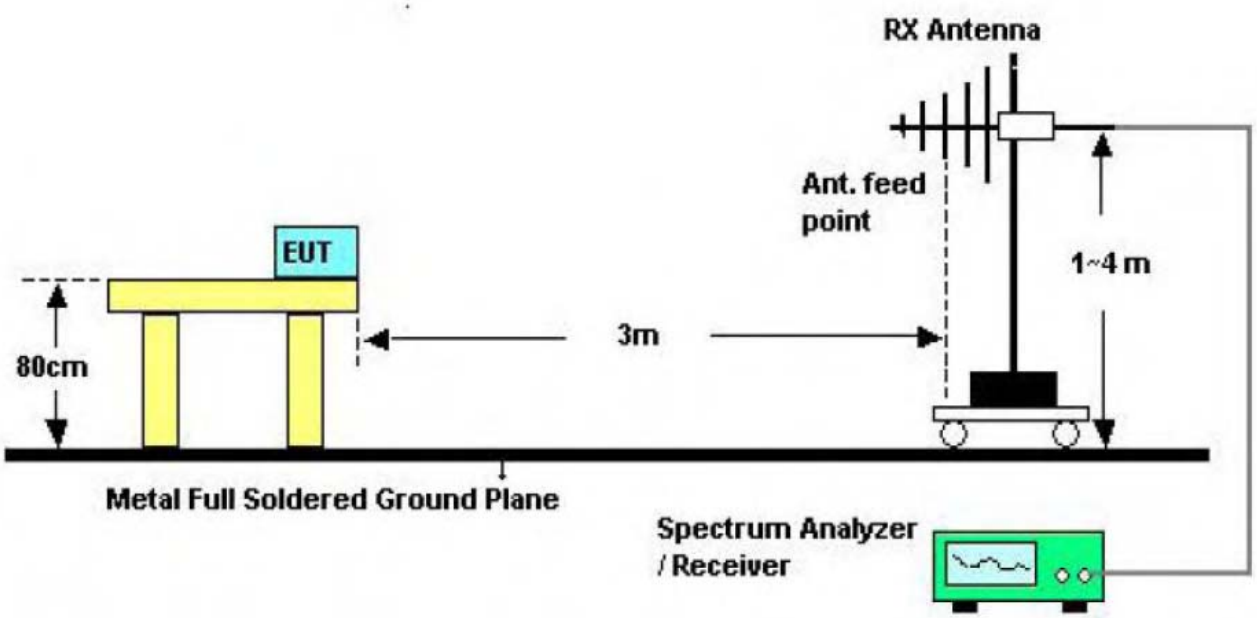
(1) The tighter limit applies at the band edges.

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

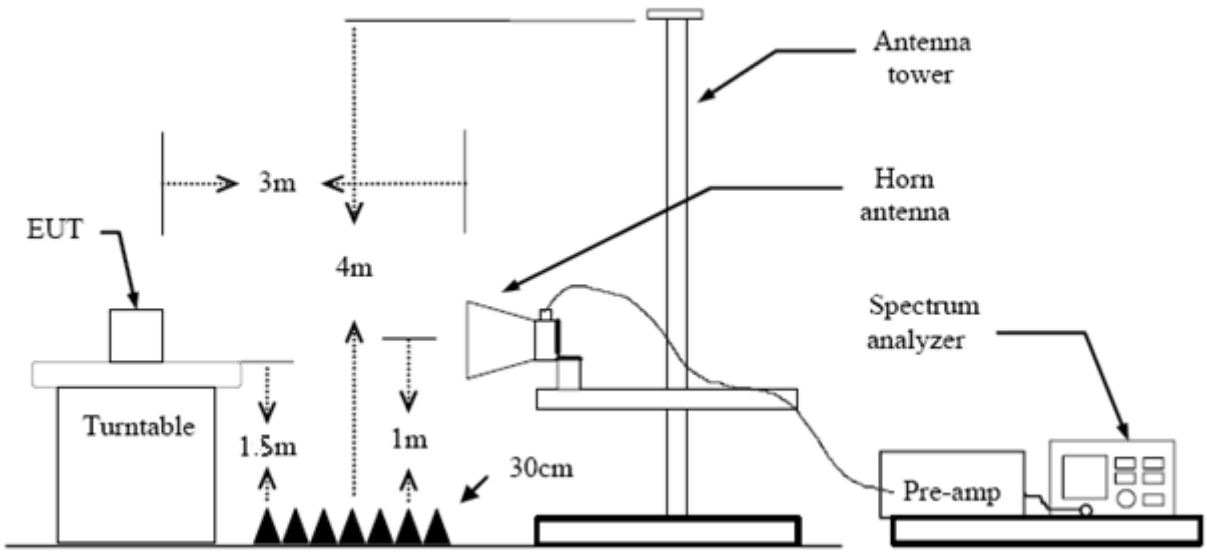
5.2 Test Setup



Below 30MHz 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.

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.

Test data please refer the following pages.

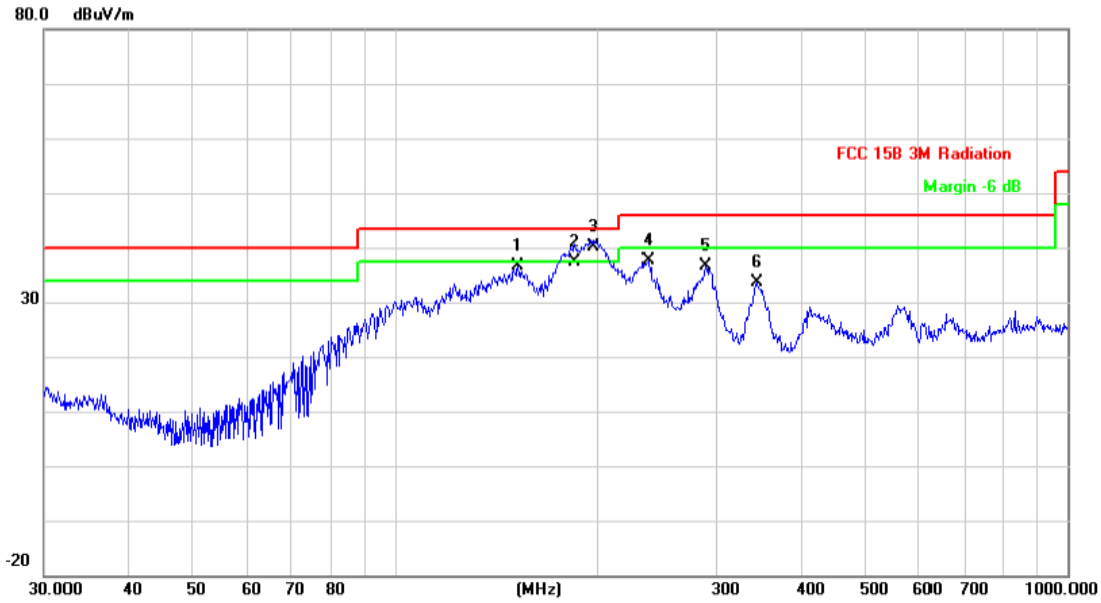
9 KHz~30 MHz

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

EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE TX 2402 Mode		
Remark:	Only worse case is reported		

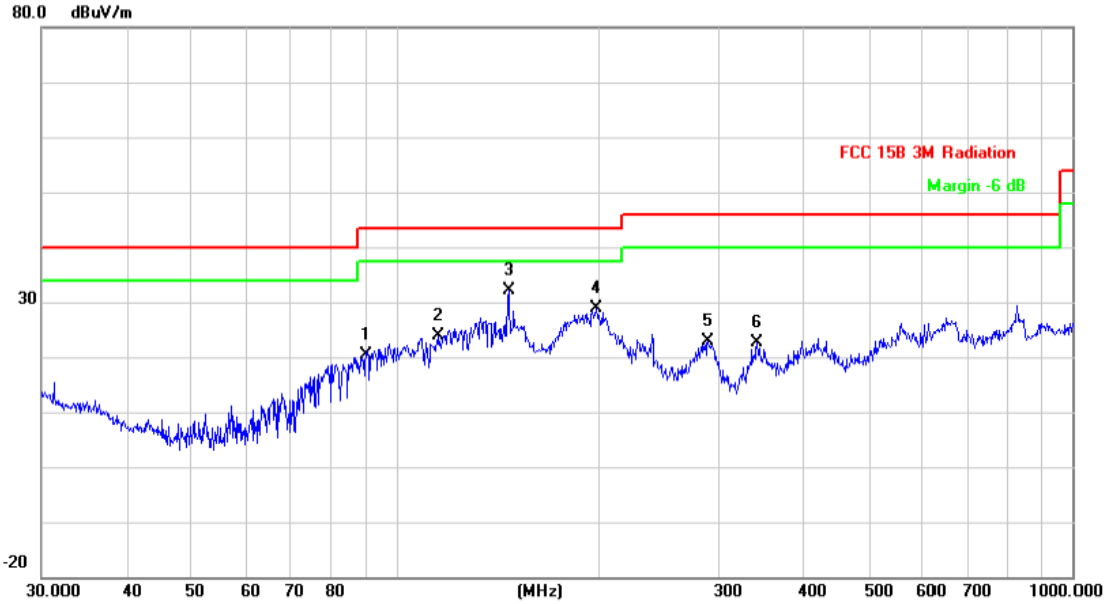


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		151.5972	57.14	-20.62	36.52	43.50	-6.98	QP
2		184.4898	57.46	-20.16	37.30	43.50	-6.20	QP
3	*	196.5098	60.05	-19.95	40.10	43.50	-3.40	QP
4		237.4760	55.57	-18.03	37.54	46.00	-8.46	QP
5		289.0021	53.09	-16.52	36.57	46.00	-9.43	QP
6		345.5952	47.72	-14.08	33.64	46.00	-12.36	QP

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

Emission Level= Read Level+ Correct Factor

EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE TX 2402 Mode		
Remark:	Only worse case is reported		



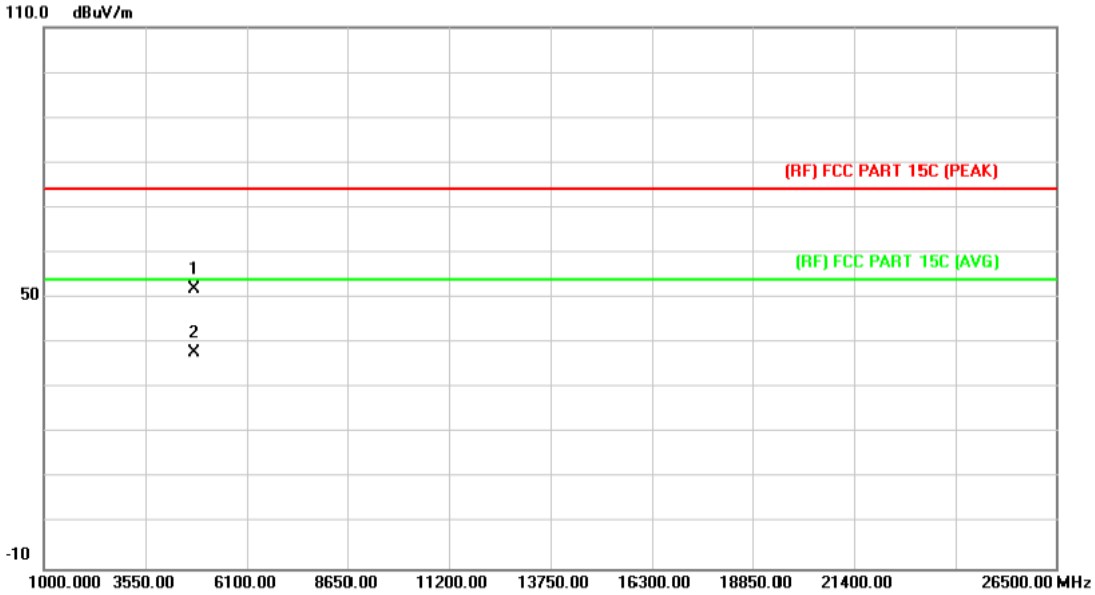
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		90.2205	42.62	-22.27	20.35	43.50	-23.15	QP
2		115.7256	45.59	-21.78	23.81	43.50	-19.69	QP
3	*	146.3735	53.13	-21.03	32.10	43.50	-11.40	QP
4		197.8928	48.70	-19.87	28.83	43.50	-14.67	QP
5		289.0021	39.38	-16.52	22.86	46.00	-23.14	QP
6		341.9786	36.84	-14.30	22.54	46.00	-23.46	QP

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

Emission Level= Read Level+ Correct Factor

Above 1GHz

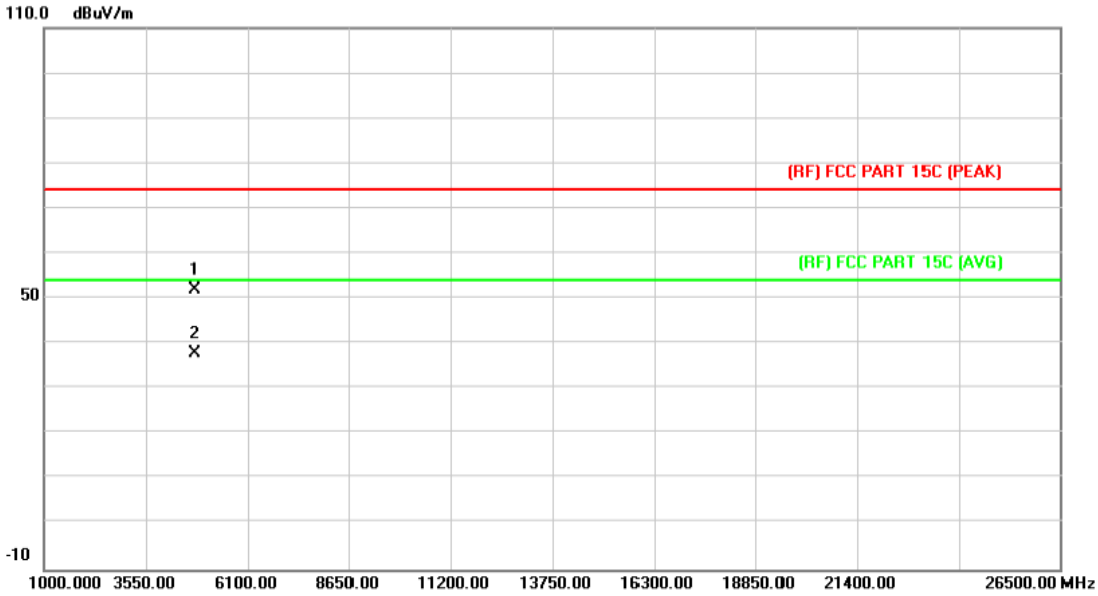
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.370	37.16	14.75	51.91	74.00	-22.09	peak
2	*	4804.858	23.23	14.75	37.98	54.00	-16.02	AVG

Emission Level= Read Level+ Correct Factor

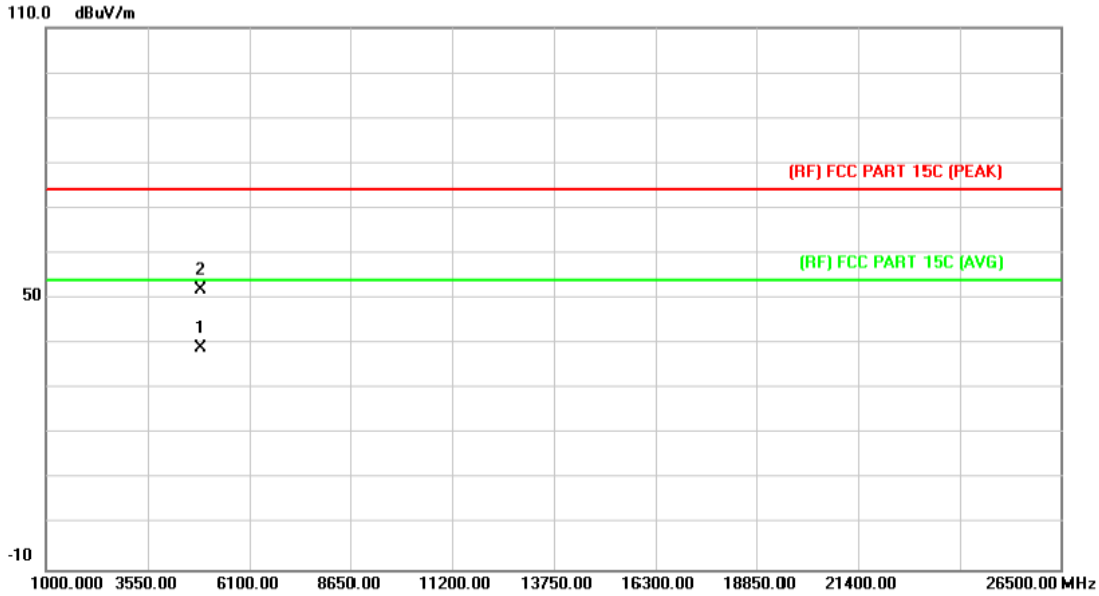
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.186	37.06	14.75	51.81	74.00	-22.19	peak
2	*	4803.186	23.17	14.75	37.92	54.00	-16.08	AVG

Emission Level= Read Level+ Correct Factor

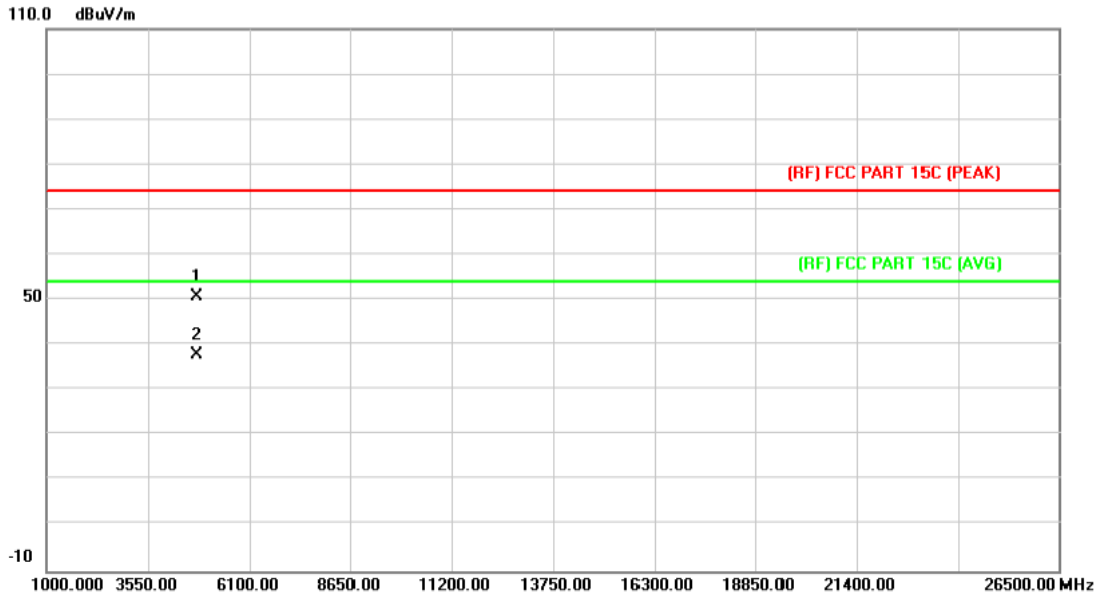
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2442 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4884.434	23.82	15.29	39.11	54.00	-14.89	AVG
2		4884.730	36.80	15.29	52.09	74.00	-21.91	peak

Emission Level= Read Level+ Correct Factor

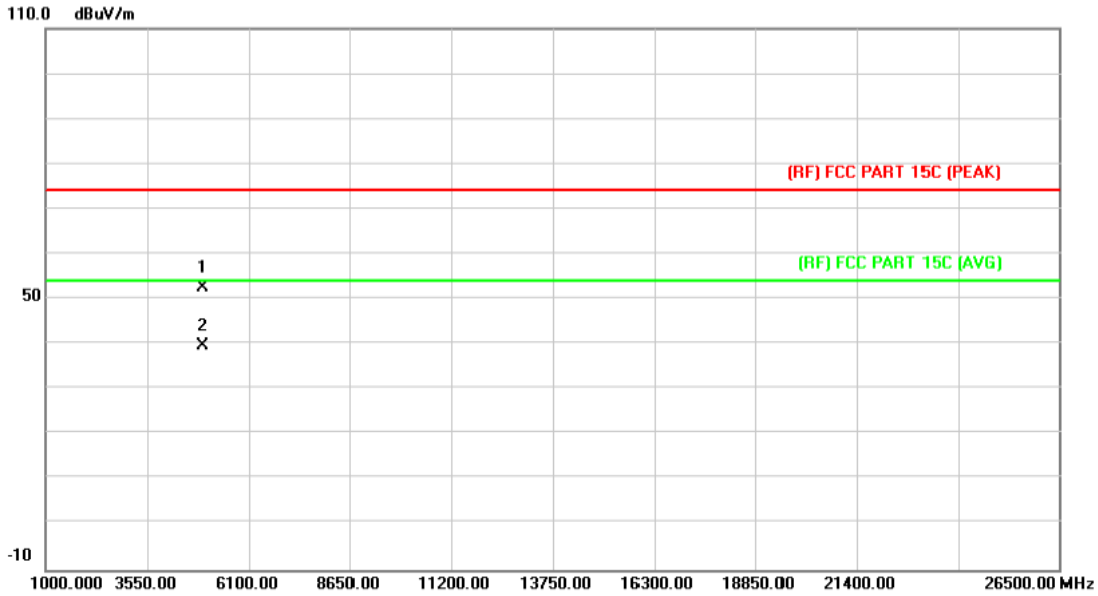
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2442 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.266	36.05	14.75	50.80	74.00	-23.20	peak
2	*	4804.960	23.22	14.75	37.97	54.00	-16.03	AVG

Emission Level= Read Level+ Correct Factor

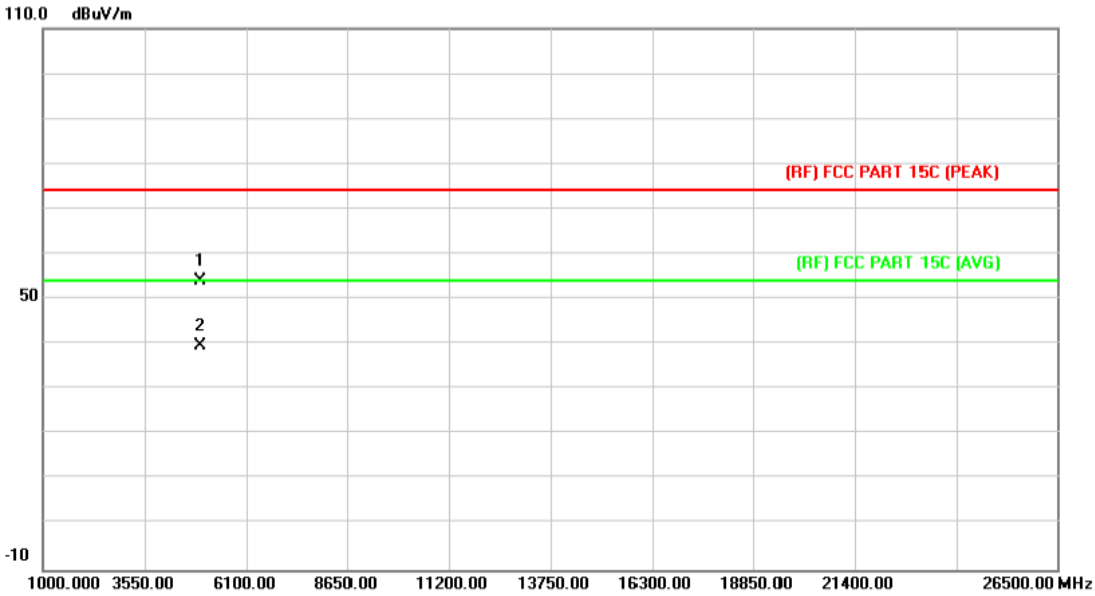
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.102	36.81	15.79	52.60	74.00	-21.40	peak
2	*	4960.454	23.82	15.79	39.61	54.00	-14.39	AVG

Emission Level= Read Level+ Correct Factor

EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	No report for the emission which more than 10 dB below the prescribed limit.		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.130	38.15	15.79	53.94	74.00	-20.06	peak
2	*	4959.344	23.83	15.79	39.62	54.00	-14.38	AVG

Emission Level= Read Level+ Correct Factor

6. Restricted Bands Requirement

6.1 Test Standard and Limit

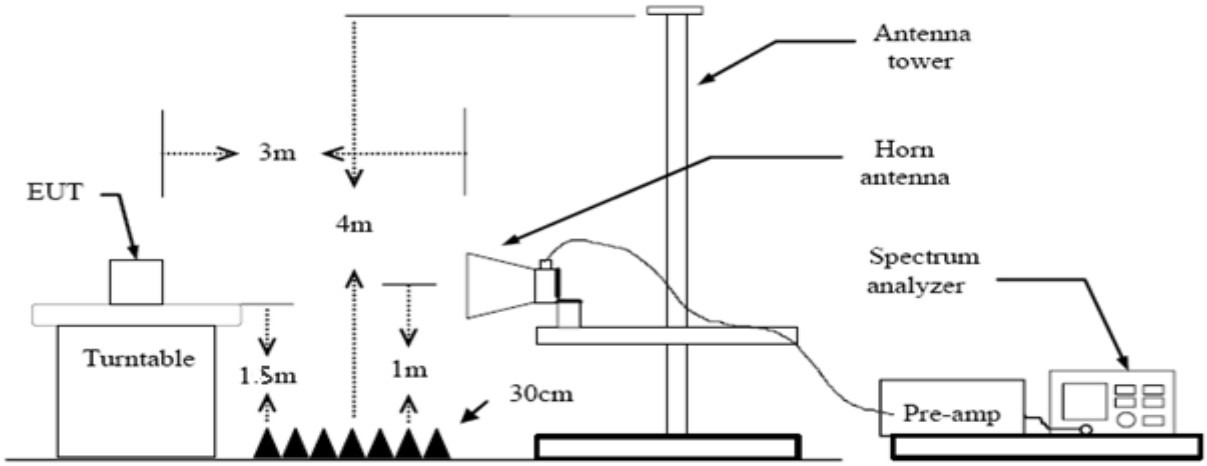
6.1.1 Test Standard

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.

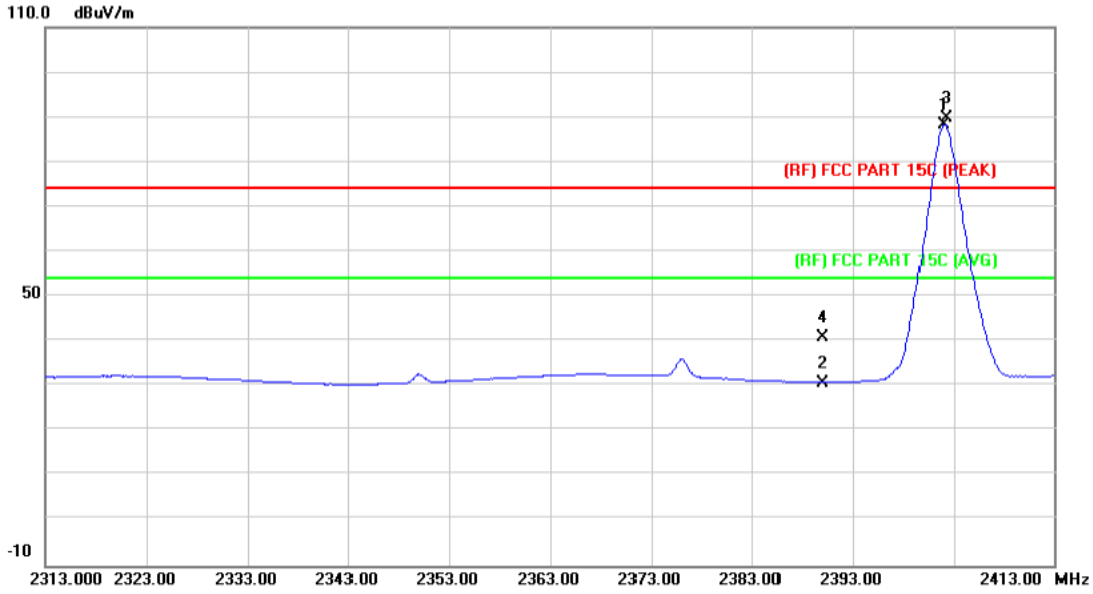
6.5 Test Data

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.

Test data please refer the following pages.

(1) Radiation Test

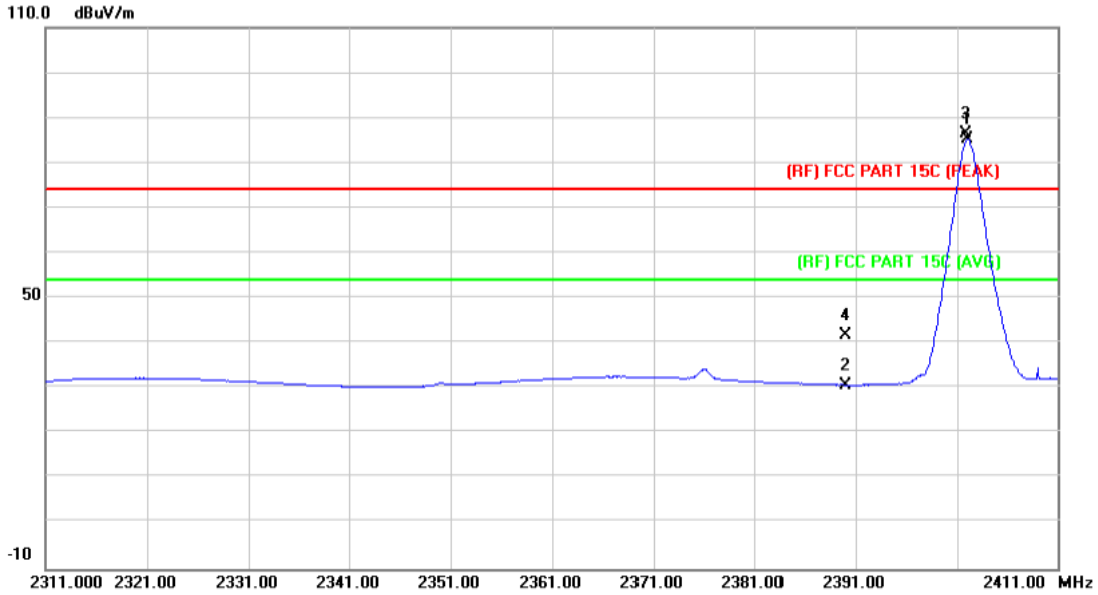
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	40.21	0.71	40.92	74.00	-33.08	peak
2		2390.000	30.09	0.71	30.80	54.00	-23.20	AVG
3	*	2402.000	87.62	0.77	88.39	Fundamental Frequency		AVG
4	X	2402.300	88.86	0.77	89.63	Fundamental Frequency		peak

Emission Level= Read Level+ Correct Factor

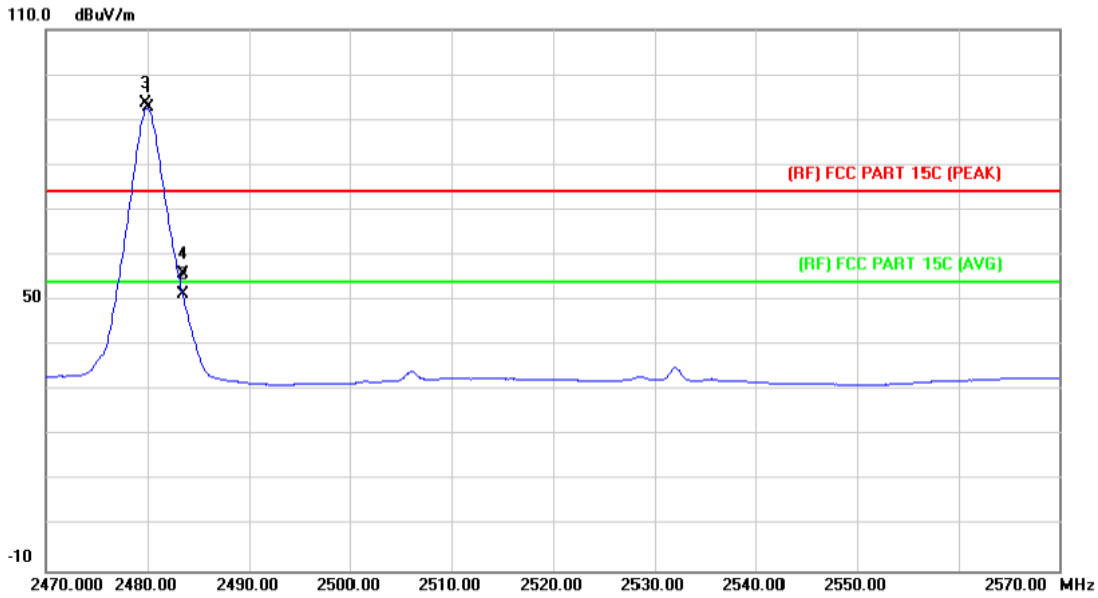
EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2402 MHz		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2402.000	84.42	0.77	85.19	Fundamental Frequency		AVG
2		2390.000	30.05	0.71	30.76	54.00	-23.24	AVG
3	X	2401.900	85.65	0.77	86.42	Fundamental Frequency		peak
4		2390.000	41.12	0.71	41.83	74.00	-32.17	peak

Emission Level= Read Level+ Correct Factor

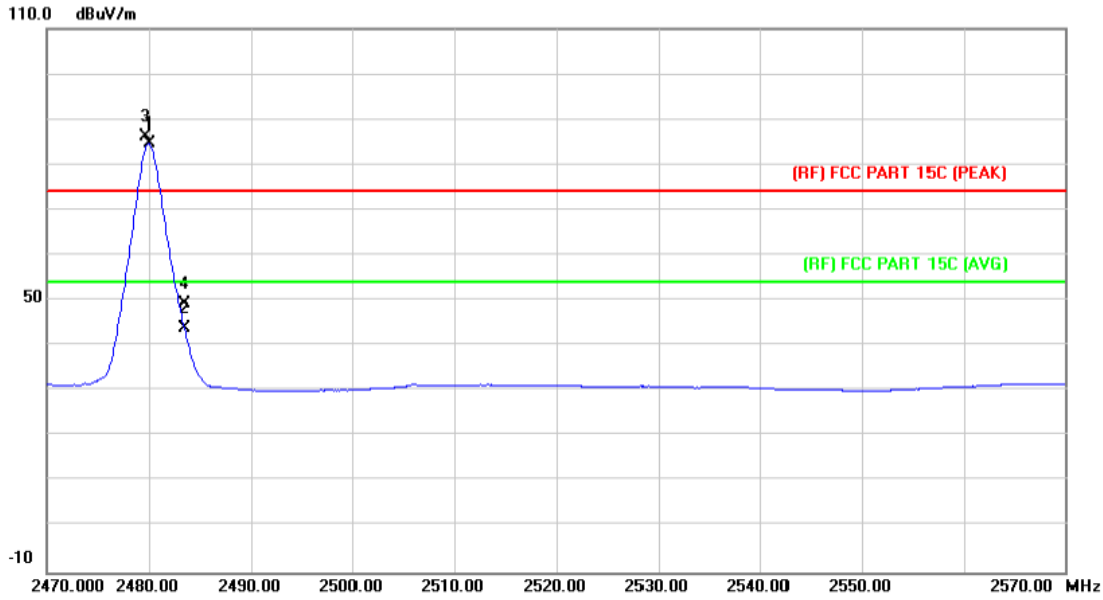
EUT:	Bluetooth Speaker	Model:	P2
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Horizontal		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	N/A		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2479.800	92.57	1.09	93.66	Fundamental Frequency		peak
2	*	2480.000	91.53	1.09	92.62	Fundamental Frequency		AVG
3		2483.500	54.88	1.11	55.99	74.00	-18.01	peak
4		2483.500	50.12	1.11	51.23	54.00	-2.77	AVG

Emission Level= Read Level+ Correct Factor

EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Ant. Pol.	Vertical		
Test Mode:	BLE Mode TX 2480 MHz		
Remark:	N/A		

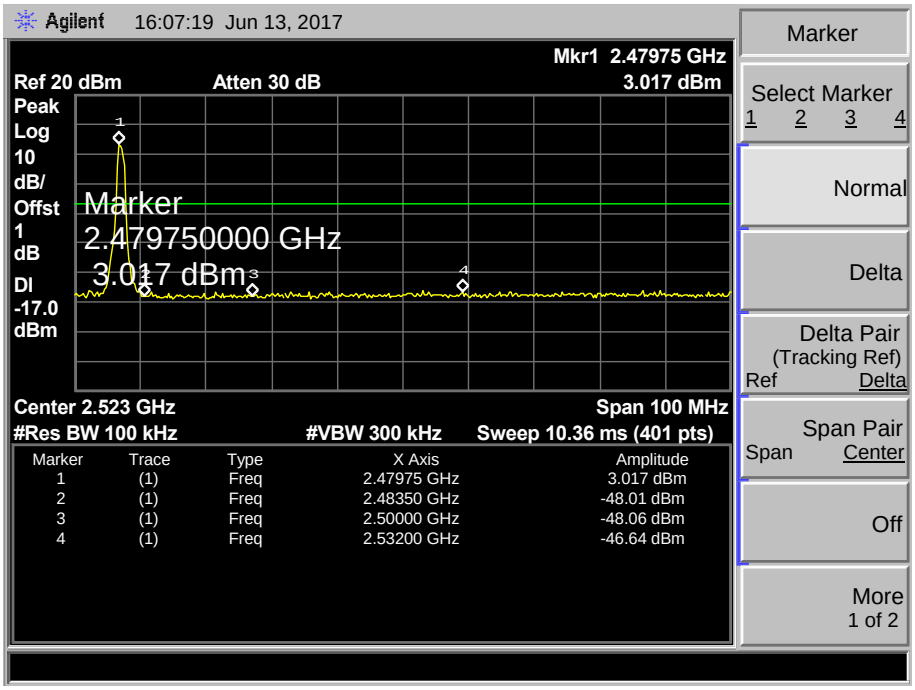


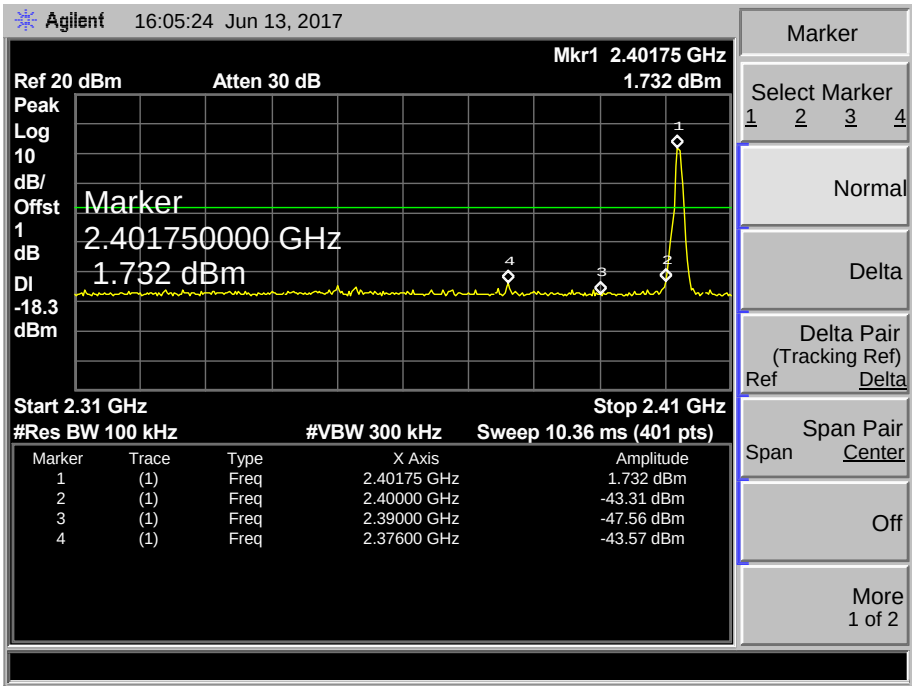
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2480.000	83.43	1.09	84.52	Fundamental Frequency		AVG
2		2483.500	42.74	1.11	43.85	54.00	-10.15	AVG
3	X	2479.700	85.08	1.09	86.17	Fundamental Frequency		peak
4		2483.500	48.19	1.11	49.30	74.00	-24.70	peak

Emission Level= Read Level+ Correct Factor

(2) Conducted Test

EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Test Mode:	BLE Mode TX 2402MHz / BLE Mode TX 2480MHz		
Remark:	The EUT is programed in continuously transmitting mode		





7. Bandwidth Test

7.1 Test Standard and Limit

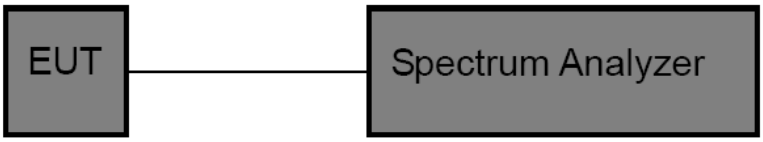
7.1.1 Test Standard

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.

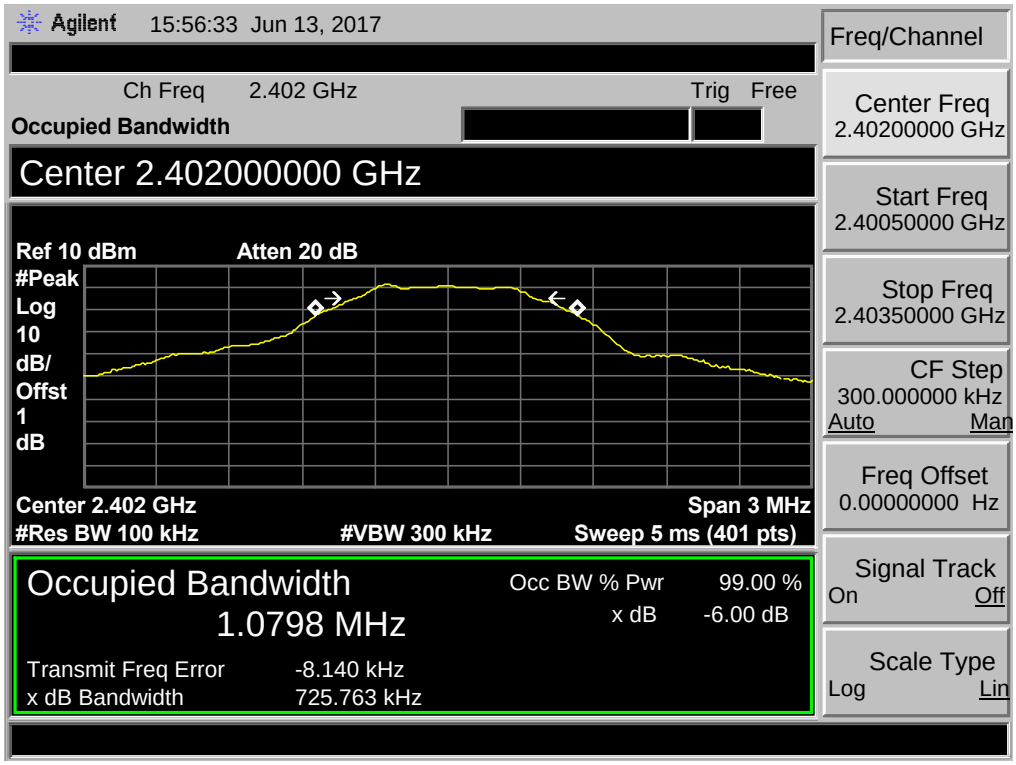
7.5 Test Data

EUT:	Bluetooth Speaker	Model:	P2
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120/60Hz		
Test Mode:	BLE TX Mode		

Channel frequency (MHz)	6dB Bandwidth (kHz)	99% Bandwidth (kHz)	Limit (kHz)
2402	725.763	1079.8	>=500
2442	722.330	1078.9	
2480	723.858	1075.8	

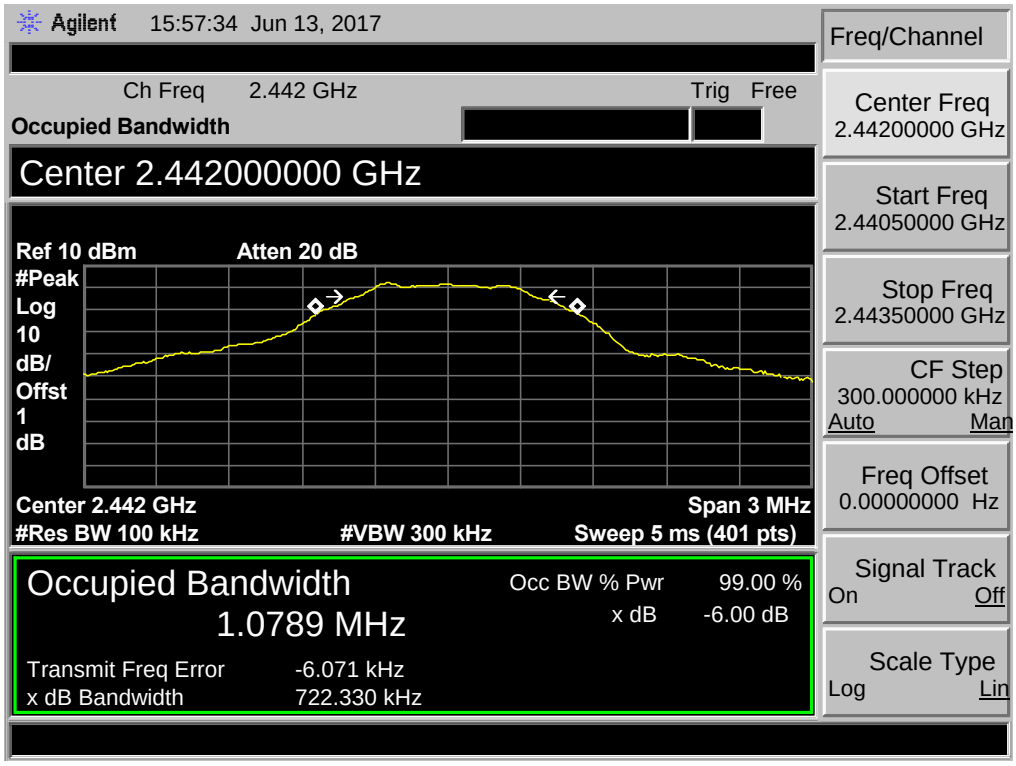
BLE Mode

2402 MHz



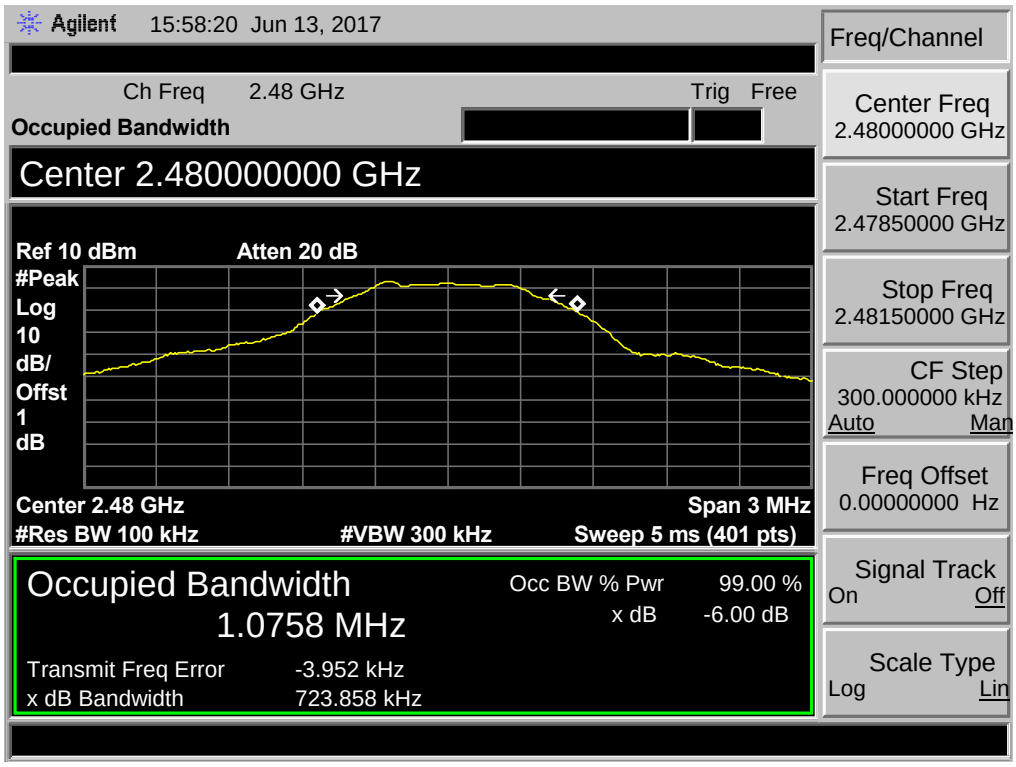
BLE Mode

2442 MHz



BLE Mode

2480 MHz



8. Peak Output Power Test

8.1 Test Standard and Limit

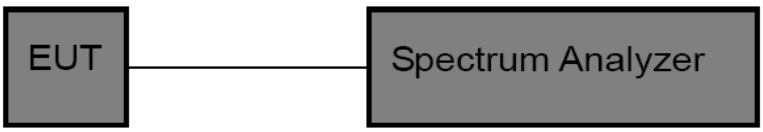
8.1.1 Test Standard

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.

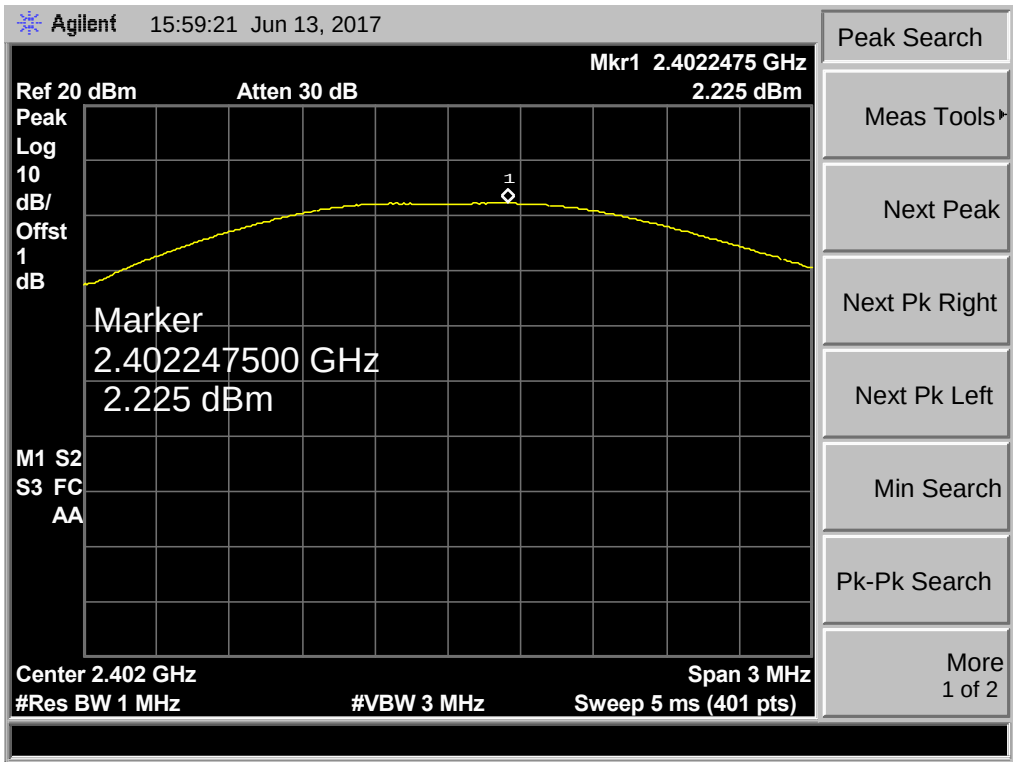
8.5 Test Data

EUT:	Bluetooth Speaker	Model:	P2
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120/60Hz		
Test Mode:	BLE TX Mode		

Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	2.225	30
2442	2.911	
2480	3.738	

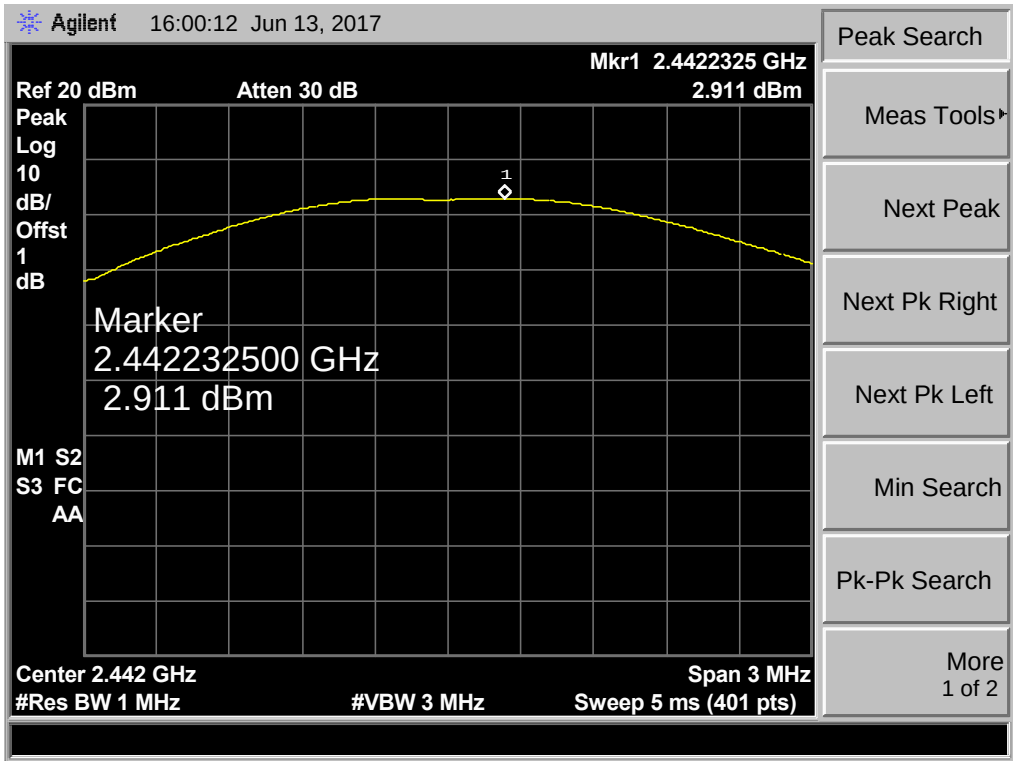
BLE Mode

2402 MHz



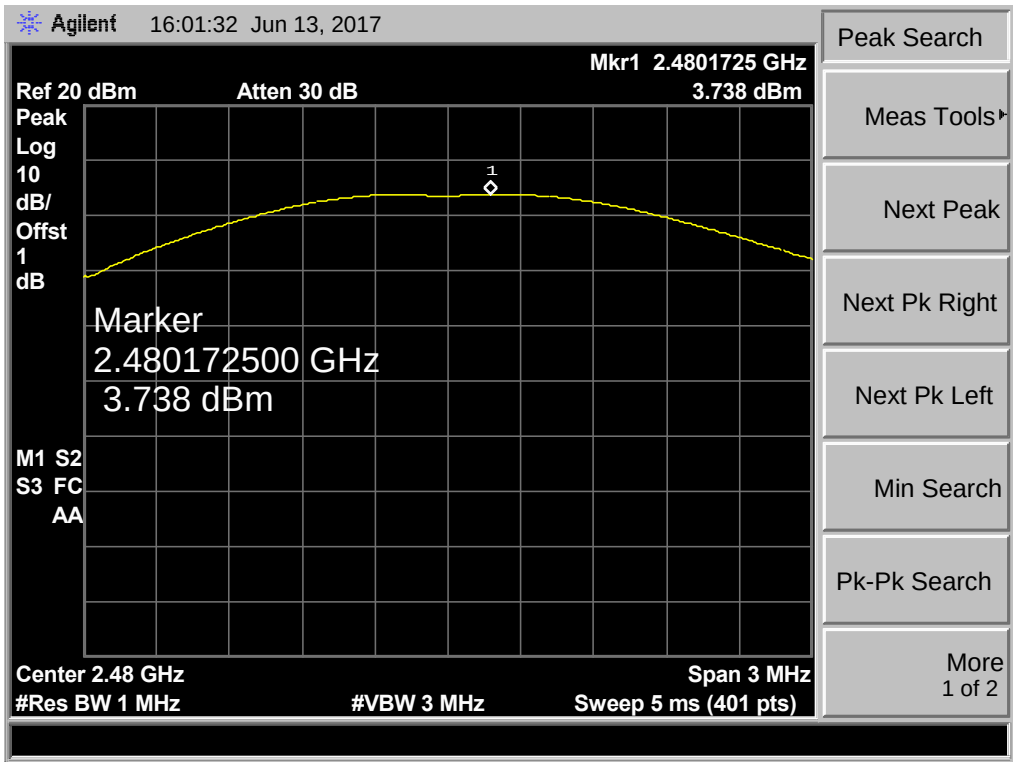
BLE Mode

2442 MHz



BLE Mode

2480 MHz



9. Power Spectral Density Test

9.1 Test Standard and Limit

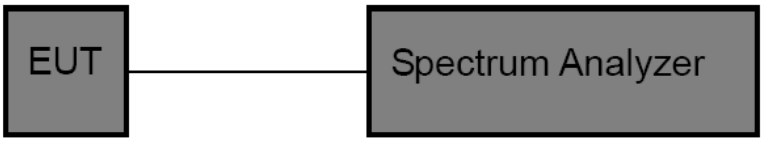
9.1.1 Test Standard

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.

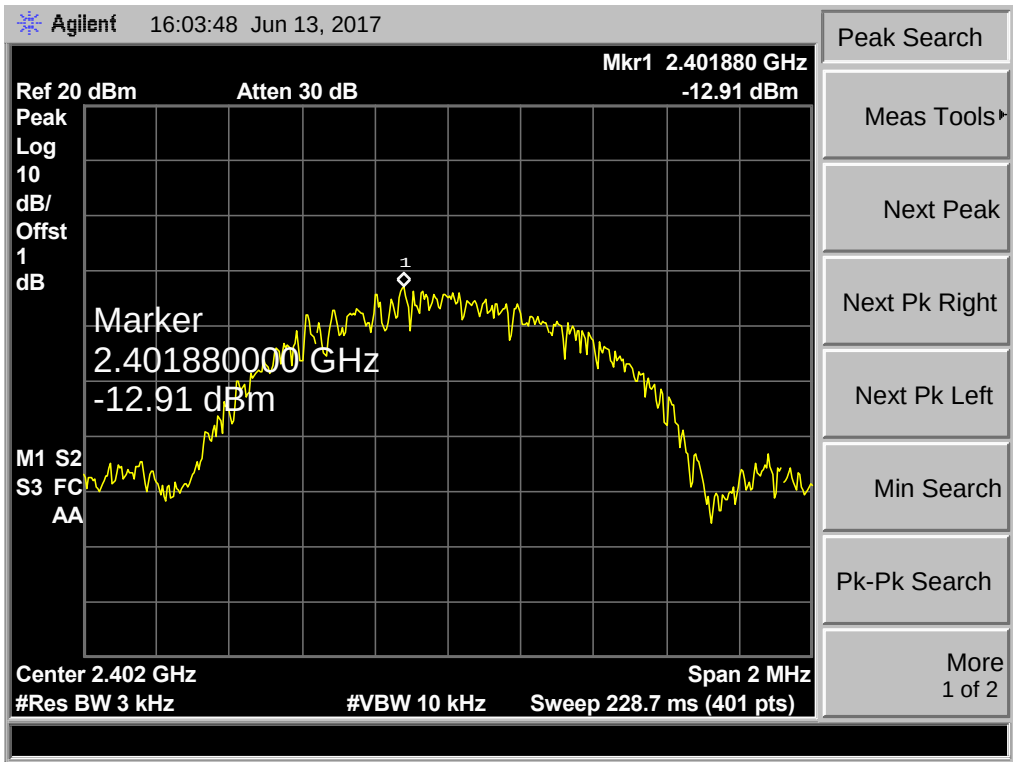
9.5 Test Data

EUT:	Bluetooth Speaker	**Model:**	P2
Temperature:	25℃	**Relative Humidity:**	55%
Test Voltage:	AC 120/60Hz		
Test Mode:	BLE TX Mode		

Channel Frequency (MHz)	Power Density (dBm)	Limit (dBm)	Result
2402	-12.91	8	PASS
2442	-12.06		
2480	-11.35		

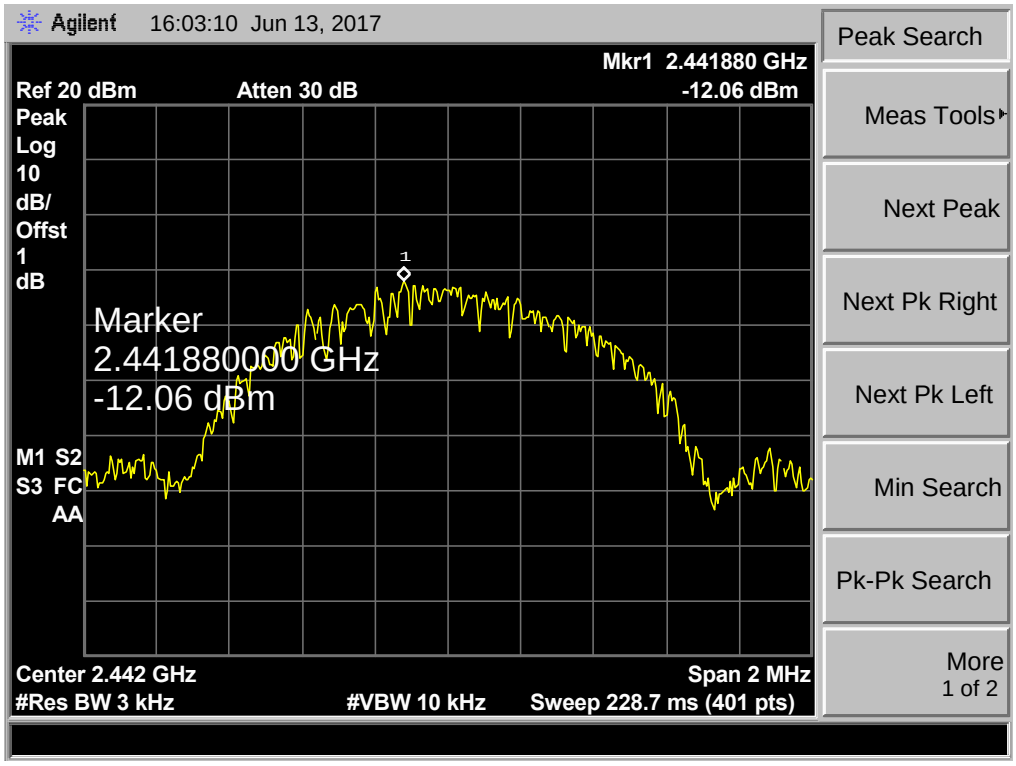
BLE Mode

2402 MHz



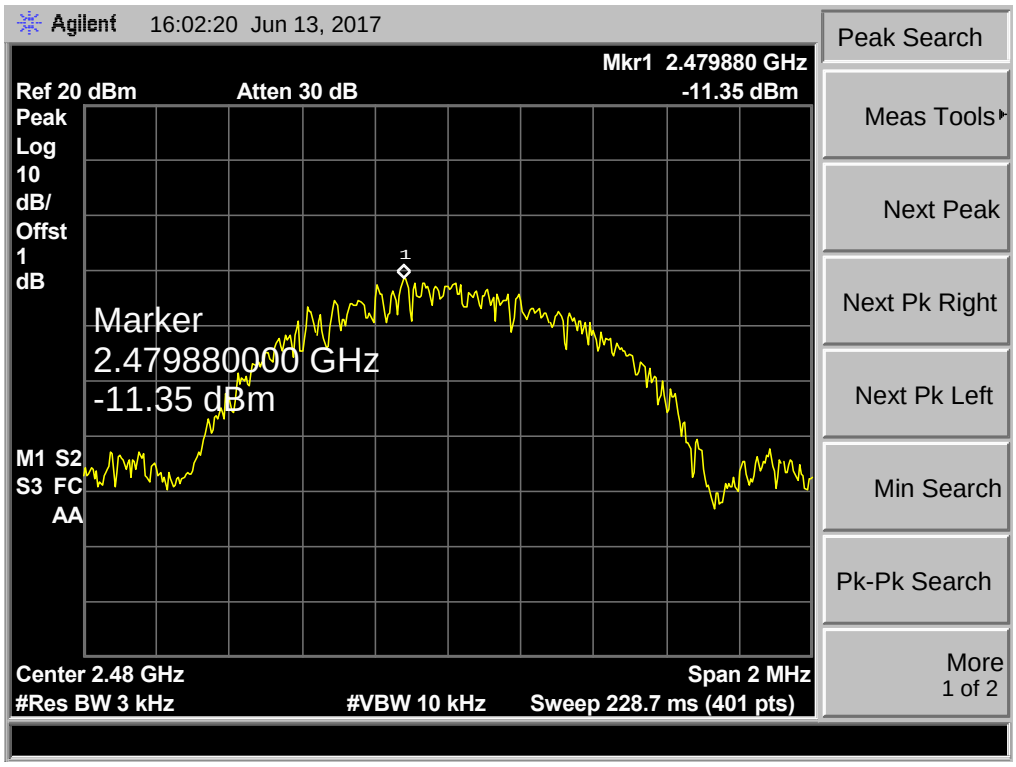
BLE Mode

2442 MHz



BLE Mode

2480 MHz



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 1.2dBi, 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
☐Unique connector antenna
☐Professional installation antenna

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