

# Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC147478

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# **FCC Radio Test Report** FCC ID: 2AA5V-F4056591

## **Original Grant**

Report No. TB-FCC147478

Krischerco World-Wide Co. **Applicant** 

**Equipment Under Test (EUT)** 

WIRELESS SHOWER SPEAKER **EUT Name** 

F4056591 Model No.

PP#5268143 Series Model No.

**Brand Name** N/A

**Receipt Date** 2016-03-30

**Test Date** 2016-03-31 to 2016-04-08

**Issue Date** 2016-04-09

**Standards** FCC Part 15: 2015, Subpart C(15.247)

**Test Method** ANSI C63.10: 2013

**Conclusions PASS** 

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

The EUT technically complies with the FCC requirements

**Test/Witness Engineer** 

**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.

TB-RF-074-1.0

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## 1. General Information about EUT

#### 1.1 Client Information

**Applicant**: Krischerco World-Wide Co.

Address : 13/F-8, 155 Keelung Rd. Sec.1, Taipei, Taiwan

Manufacturer : SHENZHEN Moccer Industrial Co., Ltd

Address: 3F, 1st Building CaiFa Industrial Park, RenMing Rd., Guan Lan,

Shenzhen, China

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

<b>EUT Name</b>	:	WIRELESS SHOWER SP	EAKER		
Models No.		F4056591, PP#5268143			
Model Difference		All these models are identical in the same PCB, layout and electrical circuit, the only difference is model name for commercial.			
		Operation Frequency: Bluetooth 3.0: 2402~2480	MHz		
	6	Number of Channel:	Bluetooth:79 Channels see Note 3		
Product	À	Max Peak Output Power: Bluetooth: 4.543 dBm(8-DPSK)			
Description		Antenna Gain:	1.2 dBi PCB Antenna		
		Modulation Type:	GFSK 1Mbps(1 Mbps) π /4-DQPSK(2 Mbps) 8-DPSK(3 Mbps)		
Power Supply	:	DC Voltage supplied from Host System by USB cable.			
		DC power by Li-ion Battery.			
Power Rating	:	DC 5.0V by USB cable. DC 3.7V by 800mAh Li-ion Battery.			
ALL STATES					
Connecting I/O Port(S)	•	Please refer to the User's	Manual		

#### Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

#### (2) Channel List:

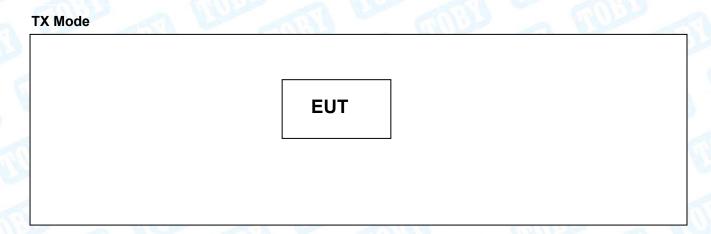
Bluetooth Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)		
00	2402	27	2429	54	2456		
01	2403	28	2430	55	2457		
02	2404	29	2431	56	2458		
03	2405	30	2432	57	2459		



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		6711111	7		
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
80	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454	Time I	
26	2428	53	2455	MUL	- NO

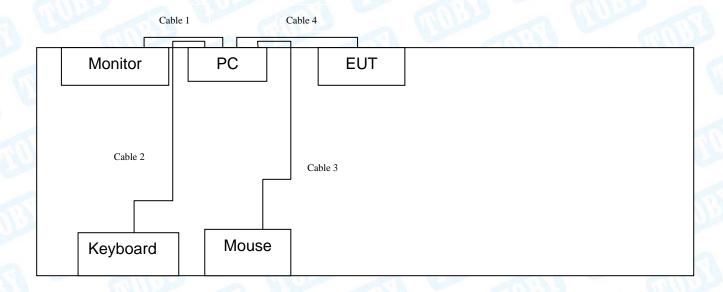
- (3) The Antenna information about the equipment is provided by the applicant.
- 1.3 Block Diagram Showing the Configuration of System Tested





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## **USB Charging with TX Mode**



## 1.4 Description of Support Units

Equipment Information							
Name	Model	FCC ID/DOC	Manufacturer	Used "√"			
LCD Monitor	E170Sc	DOC	DELL	<b>√</b>			
PC	OPTIPLEX380	DOC	DELL	<b>√</b>			
Keyboard	L100	DOC	DELL	<b>√</b>			
Mouse	M-UARDEL7	DOC	DELL	<b>√</b>			
		Cable Information	1				
Number	Shielded Type	Ferrite Core	Length	Note			
Cable 1	YES	YES	1.5M				
Cable 2	YES	YES	1.5M				
Cable 2	YES	NO	1.5M	M. D.			
Cable 3	NO	YES	0.8M				



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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	USB Charging with TX GFSK Mode					

For Radiated Test				
Final Test Mode	Description			
Mode 1	USB Charging with TX GFSK Mode			
Mode 2	TX Mode(GFSK) Channel 00/39/78			
Mode 3	TX Mode( π /4-DQPSK) Channel 00/39/78			
Mode 4	TX Mode(8-DPSK) Channel 00/39/78			
Mode 5	Hopping Mode(GFSK)			
Mode 6	Hopping Mode( π /4-DQPSK)			
Mode 7	Hopping Mode(8-DPSK)			

#### 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. We have pretested all the test mode above.

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:

TX Mode: GFSK (1 Mbps)
TX Mode: π /4-DQPSK (2 Mbps)
TX Mode: 8-DPSK (3Mbps)

(2) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane as the normal use. 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 Bluetooth mode.

Test Software Version	A	ppo Tech RF Control Kit \	/4.0
Frequency	2402 MHz	2441MHz	2480 MHz
GFSK	DEF	DEF	DEF
π /4-DQPSK	DEF	DEF	DEF
8-DPSK	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
201977	Level Accuracy:	4.00 40
Radiated Emission	9kHz to 30 MHz	±4.60 dB
Dedicted Emission	Level Accuracy:	. 4.40 dD
Radiated Emission	30MHz to 1000 MHz	±4.40 dB
Dadiated Emission	Level Accuracy:	. 4 20 dD
Radiated Emission	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.

#### 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.



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2. Test Summary

FCC Part 15 Subpart C(15.247)/ RSS 247 Issue 1						
Standard Section			1 1			
FCC	IC	Test Item	Judgment	Remark		
15.203	, C	Antenna Requirement	PASS	N/A		
15.207	RSS-GEN 7.2.2	Conducted Emission	PASS	N/A		
15.205	RSS-Gen 7.2.3	Restricted Bands	PASS	N/A		
15.247(a)(1)	RSS 247 5.1 (2)	Hopping Channel Separation	PASS	N/A		
15.247(a)(1)	RSS 247 5.1 (4)	Dwell Time	PASS	N/A		
15.247(b)(1)	RSS 247 5.4 (2)	Peak Output Power	PASS	N/A		
15.247(b)(1)	RSS 247 5.1 (4)	Number of Hopping Frequency	PASS	N/A		
15.247(c)	RSS 247 5.5	Radiated Spurious Emission	PASS	N/A		
15.247(a)	RSS 247 5.1 (1)	99% Occupied Bandwidth & 20dB Bandwidth	PASS	99%OBW GFSK:820.4154kHz π/4-DQPSK: 1166.00kHz 8-DPSK: 1150.70KHz		



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# 3. Test Equipment

Conducted Emission Test							
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date		
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Aug. 07, 2015	Aug. 06, 2016		
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Aug. 07, 2015	Aug. 06, 2016		
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Aug. 07, 2015	Aug. 06, 2016		
LISN	Rohde & Schwarz	ENV216	101131	Aug. 07, 2015	Aug. 06, 2016		
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date		
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.			
Spectrum Analyzer	Agilent	E4407B	MY45106456	Aug. 29, 2015	Aug. 28, 2016		
EMI Test Receiver	Rohde & Schwarz	ESCI	100010/007	Aug. 07, 2015	Aug. 06, 2016		
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar. 26, 2016	Mar. 25, 2017		
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar. 26, 2016	Mar. 25, 2017		
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar. 26, 2016	Mar. 25, 2017		
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar. 26, 2016	Mar. 25, 2017		
Pre-amplifier	Sonoma	310N	185903	Mar. 26, 2016	Mar. 25, 2017		
Pre-amplifier	HP	8447B	3008A00849	Mar. 26, 2016	Mar. 25, 2017		
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 26, 2016	Mar. 25, 2017		
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A		



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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

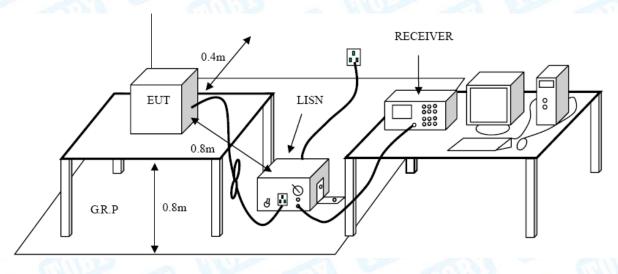
#### **Conducted Emission Test Limit**

Eroguopov	Maximum RF Line Voltage (dBμV)				
Frequency	Quasi-peak Level	Average Leve			
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 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

## 4.4 EUT Operating Mode

Please refer to the description of test mode.

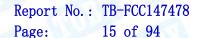
#### 4.5 Test Data

Test data please refer the following pages.



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:UT:	4 14 1 1	WIRELESS SHOWER SPEAKER  Model Nan			lame :	F40	)56591
emperature:	25 ℃			y: 55%	: 55%		
est Voltage:	AC 12	20V/60 Hz	Carrier S		- 01A	VI.	
erminal:	Line		13			. 6	
est Mode:	2 MHz	A V					
Remark:		worse case is			OHD		-
80.0 dBuV							
						QP: AVG:	_
						AVG:	_
6 ×						v	
MADAD	10 00 00	An always a	May may Ma	Laking a Million and the Laking and	ult Äh at atalok?	LndMM.	
30	$\sqrt{N}$	My min W.	10m, V.M. V.M.		<b>WATER AND A</b>	YTTERY YNDA	, Myh
VV	, (1) A M	AND	$\mathcal{M}(A)$	V "V W Y W		אוי יווי	pe
,	<u> </u>	, v	у ,	1 "	d I is addite	y	
							'  A1
200							
0.150	0.5		(MHz)	5			30.000
	0.5	Reading		_			30.000
	0.5 Freq.	Reading Level		5 Measure- ment	Limit	Over	30.000
0.150		_	Correct	Measure-		Over dB	30.000
0.150 No. Mk.	Freq.	Level	Correct Factor	Measure- ment	Limit	dB	
0.150 No. Mk.	Freq.	Level dBuV	Correct Factor	Measure- ment	Limit dBu√ 63.04	dB	Detector
0.150  No. Mk.  1 0 2 0	Freq. MHz	dBuV 36.23	Correct Factor dB	Measure- ment dBuV 46.25	Limit dBu√ 63.04	dB -16.79 -10.39	Detector
0.150  No. Mk.  1 0 2 0 3 0	Freq. MHz 0.2140	dBuV 36.23 32.63	Correct Factor dB 10.02 10.02	Measure- ment dBuV 46.25 42.65	dBu√ 63.04 53.04	dB -16.79 -10.39	Detector QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0	Freq. MHz 0.2140 0.2140 0.5540	dBuV 36.23 32.63 34.56	Correct Factor  dB  10.02  10.02  10.05	Measure- ment dBuV 46.25 42.65	dBuV 63.04 53.04 56.00	dB -16.79 -10.39 -11.39 -9.17	Detector QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0 5 1	Freq. MHz 0.2140 0.2140 0.5540	dBuV 36.23 32.63 34.56 26.78	Correct Factor  dB  10.02  10.02  10.05	Measure- ment dBuV 46.25 42.65 44.61 36.83	dBuV 63.04 53.04 56.00 46.00	dB -16.79 -10.39 -11.39 -9.17 -16.03	Detector QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0 5 1 6 1	Freq. MHz 0.2140 0.2140 0.5540 0.5540 0.4700	dBuV 36.23 32.63 34.56 26.78 29.91	Correct Factor  dB  10.02  10.02  10.05  10.05	Measure- ment dBuV 46.25 42.65 44.61 36.83 39.97	dBuV 63.04 53.04 56.00 46.00 46.00	dB -16.79 -10.39 -11.39 -9.17 -16.03	QP AVG QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0 5 1 6 1 7 2	Freq. MHz 0.2140 0.2140 0.5540 0.5540 0.4700	Level dBuV 36.23 32.63 34.56 26.78 29.91 24.42	Correct Factor  dB  10.02  10.02  10.05  10.05  10.06	Measure- ment  dBuV  46.25  42.65  44.61  36.83  39.97  34.48	dBuV 63.04 53.04 56.00 46.00 46.00	dB -16.79 -10.39 -11.39 -9.17 -16.03 -11.52 -18.27	QP AVG QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0 5 1 6 1 7 2 8 2	Freq. MHz 0.2140 0.2140 0.5540 0.5540 0.4700 0.4700 0.7540	Level  dBuV  36.23  32.63  34.56  26.78  29.91  24.42  27.70	Correct Factor  dB  10.02  10.02  10.05  10.05  10.06  10.06	Measure- ment  dBuV  46.25  42.65  44.61  36.83  39.97  34.48  37.73	63.04 53.04 56.00 46.00 56.00 46.00	dB -16.79 -10.39 -11.39 -9.17 -16.03 -11.52 -18.27	QP AVG QP AVG QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0 5 1 6 1 7 2 8 2 9 7	Freq. MHz 0.2140 0.2140 0.5540 0.5540 0.4700 0.4700 0.7540 0.7540 0.7540	Level  dBuV  36.23  32.63  34.56  26.78  29.91  24.42  27.70  22.55  31.94	Correct Factor  dB  10.02  10.05  10.05  10.06  10.06  10.03  10.03	Measure- ment  dBuV  46.25  42.65  44.61  36.83  39.97  34.48  37.73  32.58  42.00	63.04 53.04 56.00 46.00 56.00 46.00 46.00 60.00	dB -16.79 -10.39 -11.39 -9.17 -16.03 -11.52 -18.27 -13.42 -18.00	QP AVG QP AVG QP AVG QP AVG
0.150  No. Mk.  1 0 2 0 3 0 4 0 5 1 6 1 7 2 8 2 9 7 10 7	Freq. MHz 0.2140 0.2140 0.5540 0.5540 0.4700 0.4700 0.7540	Level  dBuV  36.23  32.63  34.56  26.78  29.91  24.42  27.70  22.55	Correct Factor  dB  10.02  10.02  10.05  10.05  10.06  10.06  10.03	Measure- ment  dBuV  46.25  42.65  44.61  36.83  39.97  34.48  37.73  32.58	Limit  dBu√  63.04  53.04  56.00  46.00  56.00  46.00  46.00  50.00	dB -16.79 -10.39 -11.39 -9.17 -16.03 -11.52 -18.27 -13.42	QP AVG QP AVG QP AVG





**WIRELESS SHOWER** F4056591 EUT: **Model Name: SPEAKER 25** ℃ Temperature: **Relative Humidity:** 55% AC 120V/60 Hz **Test Voltage:** Terminal: Neutral Test Mode: USB Charging with TX GFSK Mode 2402 MHz Remark: Only worse case is reported 80.0 dBuV QP: AVG: 0.5 (MHz) 30.000 0.150 Reading Correct Measure-Limit Over No. Mk. Freq. Level Factor ment MHz dBuV dΒ dBuV dBuV dΒ Detector 43.99 QP 33.87 10.12 64.76 -20.77 1 0.1740 2 0.1740 33.24 10.12 43.36 54.76 -11.40 AVG 3 0.5540 35.55 10.02 45.57 56.00 -10.43 QΡ 4 0.5540 27.79 10.02 37.81 46.00 -8.19 AVG 1.5339 29.83 56.00 -16.06 QΡ 5 10.11 39.94 46.00 -12.29 6 1.5339 23.60 10.11 33.71 AVG 7 3.2620 28.40 38.46 56.00 -17.54 QΡ 10.06 46.00 -12.48 8 3.2620 23.46 10.06 33.52 AVG 7.1020 32.02 10.06 42.08 60.00 -17.92 QΡ 9 7.1020 10 26.90 10.06 36.96 50.00 -13.04 AVG QΡ 11 14.9060 33.54 10.06 43.60 60.00 -16.40 12 14.9060 32.47 10.06 42.53 50.00 -7.47 AVG **Emission Level= Read Level+ Correct Factor** 





**WIRELESS SHOWER** EUT: F4056591 **Model Name: SPEAKER 25** ℃ 55% Temperature: **Relative Humidity:** AC 240V/60 Hz **Test Voltage:** Terminal: Line Test Mode: USB Charging with TX GFSK Mode 2402 MHz Remark: Only worse case is reported 80.0 dBu∀ QP: AVG: -20 0.150 0.5 (MHz) 30.000 Correct Reading Measure-Limit Over No. Mk. Freq. Level Factor ment MHz dΒ dBuV dΒ dBuV dBuV Detector 1 0.2100 36.69 10.02 46.71 63.20 -16.49 QΡ 0.2100 10.02 43.19 53.20 -10.01 AVG 2 33.17 3 0.2779 33.42 10.02 43.44 60.88 -17.44 QΡ 0.2779 AVG 4 27.85 10.02 37.87 50.88 -13.01 0.5780 5 31.81 10.06 41.87 56.00 -14.13 QΡ 0.5780 46.00 -12.58 23.36 10.06 33.42 AVG 6 7 1.6100 28.39 10.06 38.45 56.00 -17.55 QΡ 8 1.6100 22.05 10.06 32.11 46.00 -13.89 AVG 9 2.7980 25.19 10.03 35.22 56.00 -20.78 QΡ 2.7980 46.00 -14.23 10 21.74 10.03 31.77 AVG 5.2540 60.00 -24.10 QΡ 11 25.93 9.97 35.90 12 5.2540 22.66 32.63 50.00 -17.37 AVG 9.97 **Emission Level= Read Level+ Correct Factor** 





**WIRELESS SHOWER** EUT: F4056591 **Model Name: SPEAKER 25** ℃ Temperature: **Relative Humidity:** 55% AC 240V/60 Hz **Test Voltage:** Terminal: Neutral Test Mode: USB Charging with TX GFSK Mode 2402 MHz Remark: Only worse case is reported 80.0 dBuV AVG: -20 (MHz) 30.000 0.150 Reading Correct Measure-Limit Over No. Mk. Freq. Level Factor ment MHz dBuV dΒ dBuV dBuV dB Detector 10.12 43.13 -20.07 1 0.2100 33.01 63.20 QΡ 2 0.2100 31.33 10.12 41.45 53.20 -11.75 AVG 3 0.5540 10.02 56.00 -10.54 QΡ 35.44 45.46 0.5540 10.02 46.00 -7.92 AVG 4 28.06 38.08 5 1.6220 28.33 10.10 38.43 56.00 -17.57 QΡ 1.6220 46.00 -14.17 6 21.73 10.10 31.83 AVG 7 2.1900 28.71 56.00 -17.23 QΡ 10.06 38.77 8 2.1900 22.88 10.06 32.94 46.00 -13.06 AVG 56.00 -20.29 QΡ 9 4.7900 25.65 10.06 35.71 4.7900 21.89 10.06 31.95 46.00 -14.05 AVG 10 QP 11 5.3340 25.25 10.06 35.31 60.00 -24.69 AVG 12 5.3340 21.60 10.06 31.66 50.00 -18.34 **Emission Level= Read Level+ Correct Factor** 



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## 5. Radiated Emission Test

## 5.1 Test Standard and Limit

5.1.1 Test Standard FCC Part 15.209

5.1.2 Test Limit

#### Radiated Emission Limit (9 kHz~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	Class B (dBuV/m)(at 3m)				
(MHz)	Peak	Average			
Above 1000	74	54			

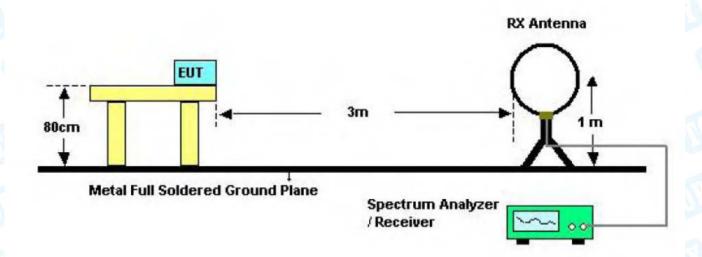
#### Note:

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

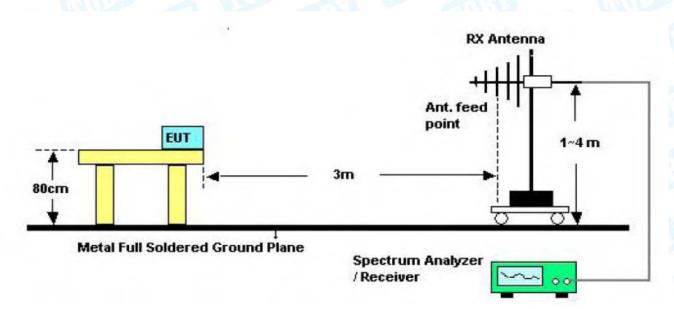


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## 5.2 Test Setup



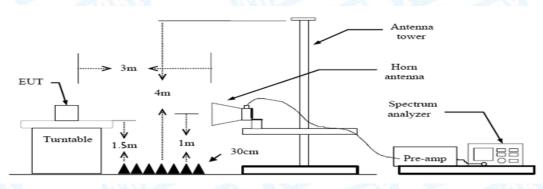
Bellow 30MHz Test Setup



**Bellow 1000MHz Test Setup** 



Report No.: TB-FCC147478 Page: 20 of 94



**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 in TX mode.

#### 5.5 Test Data

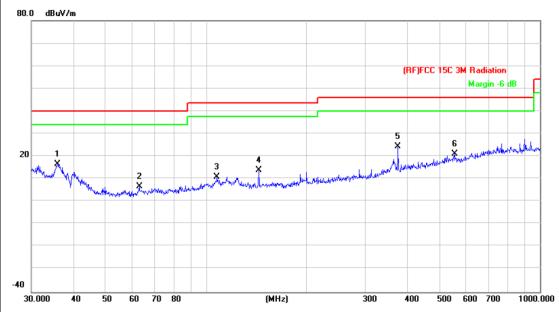
Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=1 kHz with Peak Detector for Average Values.

Test data please refer the following pages.



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 5V		
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2402MHz	V. S.	
Remark:	Only worse case is reported		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		35.8746	34.20	-17.60	16.60	40.00	-23.40	peak
2		63.0916	30.88	-24.25	6.63	40.00	-33.37	peak
3		107.8877	32.60	-21.86	10.74	43.50	-32.76	peak
4		143.8295	35.55	-21.67	13.88	43.50	-29.62	peak
5	*	375.9385	38.78	-14.40	24.38	46.00	-21.62	peak
6		554.8254	31.19	-10.13	21.06	46.00	-24.94	peak

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



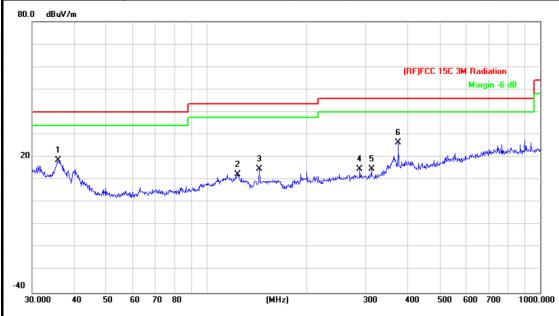
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UT:		SS SHOWE	R	Model Nam	e :	F4056591	
	SPEAKE	<del>I</del> R		Delether Henridten			MAP
emperature:	25 ℃	ARTH		Relative Hu	ımidity:	55%	
est Voltage:	DC 5V		W. College		1 80		
nt. Pol.	Vertical				2	- 01	11
est Mode:		SK Mode 24				7	- 6
lemark:	Only wo	orse case is	s reported		MADE		
80.0 dBuV/m							
					(RF)FCC 1	5C 3M Radiation	
						Margin -6	dB ☐
1 X					6		
20 2 ×	3	A Love Market	5 X		A James of April 1984	sequent in the state of the second	All Kashalanderse
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, my	appropriate to the second						
40 30.000 40 50	60 70	80	(MHz)	300	400 50	0 600 700	1000.000
		Reading	Correct	Measure-			
No Mk F	rea	_	Factor		Limit	Over	
	req.	Level	Factor	ment	Limit dRu\//m	Over	Dotocto
N	ИHz	Level dBuV	dB/m	ment dBuV/m	dBuV/m	dB	
1 * 36.0	ИНZ 6375	dBuV 44.46	dB/m -18.07	ment dBuV/m 26.39	dBuV/m 40.00	dB -13.61	peak
1 * 36.0	ИHz	Level dBuV	dB/m	ment dBuV/m	dBuV/m	dB	peak
1 * 36.0 2 45.5	ИНZ 6375	dBuV 44.46	dB/m -18.07	ment dBuV/m 26.39	dBuV/m 40.00	dB -13.61	peak peak
1 * 36.0 2 45.3 3 65.	MHz 6375 5348	dBuV 44.46 38.40	dB/m -18.07 -22.51	ment dBuV/m 26.39 15.89	dBuV/m 40.00 40.00	dB -13.61 -24.11	peak peak peak
1 * 36.0 2 45.5 3 65.6 4 88.3	6375 5348 1145 3421	dBuV 44.46 38.40 36.75 38.44	dB/m -18.07 -22.51 -24.06 -22.79	ment dBuV/m 26.39 15.89 12.69 15.65	dBuV/m 40.00 40.00 40.00 43.50	dB -13.61 -24.11 -27.31 -27.85	peak peak peak peak
1 * 36.0 2 45.3 3 65.4 4 88.3 5 122.	6375 5348 1145 3421 .8340	dBuV 44.46 38.40 36.75 38.44 42.94	dB/m -18.07 -22.51 -24.06 -22.79 -22.41	ment dBuV/m 26.39 15.89 12.69 15.65 20.53	dBuV/m 40.00 40.00 40.00 43.50 43.50	dB -13.61 -24.11 -27.31 -27.85 -22.97	peak peak peak peak peak
1 * 36.0 2 45.3 3 65.4 4 88.3 5 122.	6375 5348 1145 3421	dBuV 44.46 38.40 36.75 38.44	dB/m -18.07 -22.51 -24.06 -22.79	ment dBuV/m 26.39 15.89 12.69 15.65	dBuV/m 40.00 40.00 40.00 43.50	dB -13.61 -24.11 -27.31 -27.85 -22.97	peak peak peak peak peak
1 * 36.0 2 45.3 3 65.4 4 88.3 5 122.6	6375 5348 1145 3421 .8340	dBuV 44.46 38.40 36.75 38.44 42.94	dB/m -18.07 -22.51 -24.06 -22.79 -22.41	ment dBuV/m 26.39 15.89 12.69 15.65 20.53	dBuV/m 40.00 40.00 40.00 43.50 43.50	dB -13.61 -24.11 -27.31 -27.85 -22.97	peak peak peak peak peak



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 5V	D N	
Ant. Pol.	Horizontal		
Test Mode:	TX π/4-DQPSK Mode 240	2MHz	
Remark:	Only worse case is reported		
80.0 dBuV/m			



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		35.8746	36.20	-17.60	18.60	40.00	-21.40	peak
2		123.6984	34.88	-22.39	12.49	43.50	-31.01	peak
3		143.8291	36.55	-21.67	14.88	43.50	-28.62	peak
4		287.9904	32.09	-17.32	14.77	46.00	-31.23	peak
5		312.1792	31.38	-16.63	14.75	46.00	-31.25	peak
6	*	375.9384	40.78	-14.40	26.38	46.00	-19.62	peak

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



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EUT	Г:		1747	ELESS AKER	SHOW	ER	Model Name :			F4056591			3	
Tem	nperatu	ıre:	25	$^{\circ}$ C			Relative Humidity:			55%				
Tes	t Volta	ge:	DC	5V		CIVI)	353	_	117				1	3
Ant	. Pol.		Vert	ical	<b>C</b>	1		N			- 6		1	
Tes	t Mode	:	TX	π <b>/4-</b> D	QPSK	Mode 240	2MHz		1					e
Ren	nark:		Only	wors	e case	is reported		· W	M				A	N
80.0	O dBuV/m	1												
									(RF)FCC	15C 3			JID.	٦
											Marg	jin -6	aB	Ħ
			_	—-Г										4
	1					_		5 X				6		Н
20	<u> </u>			2		3 X 4 X				4. 16.4.61	JAN!	Ň <sub>W</sub> L	WWH	my
	A COL	h/A	Α.	J. William	Mary Mary Market		Jan	العالم العالم المعالى	Manadopal	Mentalente	W			
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			1							-	-	-		
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	0.000 4	0 50	60	70 80		(MHz)	3	300	400	500	600	700	100	00.000
	0.000 4		60		ading	(MHz)	Measure	e-					100	00.000
30	0.000 4 No. Mi	10 50	60 eq.	Rea	ading			e-	400		600 Ove		100	00.000
30		10 50 K. Fr		Rea Le	_	Correct	Measure	e- Li		(				00.000 ector
30		10 50 K. Fr	<b>eq</b> . Hz	Rea Le	evel	Correct Factor	Measure ment	e- Li	imit	) n	Ove	er	Dete	
30	No. Mi	60 50 K. Fr	eq. Hz 375	Rea Le	evel BuV	Correct Factor	Measure ment	e- Li dl	imit BuV/n	n ) -	Ove dB	er 11	Dete	ector
N 1	No. Mi	60 50 K. Fr MI 36.6	eq. Hz 375 421	Rea Le dl	evel BuV 1.96	Correct Factor dB/m -18.07	Measure ment dBuV/m 26.89	e- Li dli 4	imit BuV/m	) -	Ove	er 11 85	Dete	ector eak

375.9384

701.7607

5

6

**Emission Level= Read Level+ Correct Factor** 

41.95

32.87

-14.40

-6.88

27.55

25.99

-18.45

-20.01

peak

peak

46.00

46.00

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



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EUT:	WIRE	LESS SHOWE	R	Model Nam	e:	F4056591		
Temperature:				Relative Hu	midity:	55%		
Test Voltage:	DC 5	SV .	THE STATE OF	<u>)</u>	NA			
Ant. Pol.	Horiz	contal	100		9		100	
Test Mode:	TX 8	-DPSK Mode	e 2402MHz	Millian		M Co		
Remark:	Only	worse case	is reported		CHIL		A	
80.0 dBuV/m								
					(DE)ECC	15C 3M Radiation		
					(HF)FCC	Margin -6	dB [	
					6			
20 1 X	2		3	5 4 X	Maria Lagran	inthropograpio in the later with the	المسألية المالية	
WHIT MAY THE	manana X	1	at of the second	X may may mark the world	Ptil n. and by "Inned	Landsoffer Chr. John		
		James Market Color						
30.000 40	50 60 70	0 80	(MHz)	300	400 5	500 600 700	1000.00	
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		
TVO. TVIIX.	MHz	dBu∀	dB/m	dBuV/m	dBuV/m		Detect	
1 3	35.8746	36.70	-17.60	19.10	40.00	-20.90	peal	
	6.0340	38.25	-23.98	14.27	40.00	-25.73	peal	
	43.8291	37.05	-21.67	15.38	43.50	-28.12	peal	
	99.9856	34.31	-20.39	13.92	43.50		peal	
	87.9904	35.59	-17.32	18.27	46.00		peal	
	01.330 <del>4</del>	40.78	-14.40	26.38	46.00		pea	
	75.9384			/n 3X	40 UU	-19.62	neal	



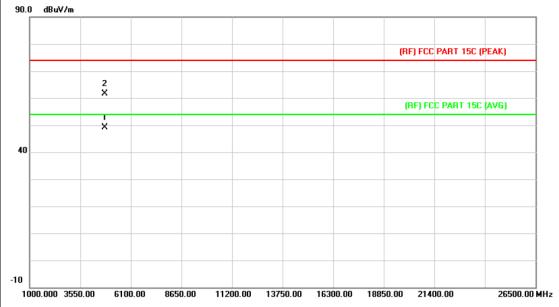
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EUT:	WIRELESS SHOW SPEAKER	ER	Model Name	e :	F4056591	
Temperature:	25 °C		Relative Hu	midity:	55%	Co.
Test Voltage:	DC 5V	Carl.		N.H.		
Ant. Pol.	Vertical	11311			(7)	1100
Test Mode:	TX 8-DPSK Mod	le 2402MHz	6100		A W	
Remark:	Only worse case			CHIE!		
80.0 dBuV/m						V B
20 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 60 70 80	4 5 X X X X X X X X X X X X X X X X X X	300		Margin -6	dB
				400 30	000 100	1000.000
No. Mk. Fr	Reading eq. Level	Correct Factor	Measure-	Limit	Over	
MI	<u> </u>		ment dBuV/m	dBuV/m	dB	Detector
1 * 36.6		dB/m -18.07	25.89		-14.11	
2 45.5		-22.51	16.89	40.00	-23.11	peak
						peak
3 85.5		-22.95	16.16	40.00	-23.84	peak
4 122.8		-22.41	21.03	43.50	-22.47	peak
5 143.8		-21.67	18.14	43.50	-25.36	peak
6 375.9	9384 37.45	-14.40	23.05	46.00	-22.95	peak
	Over limit !:over margin					



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Horizontal				
Test Mode:	TX GFSK Mode 2402MHz	A VIII			
Remark: No report for the emission which more than 10 dB below the prescribed limit.			3 below the		

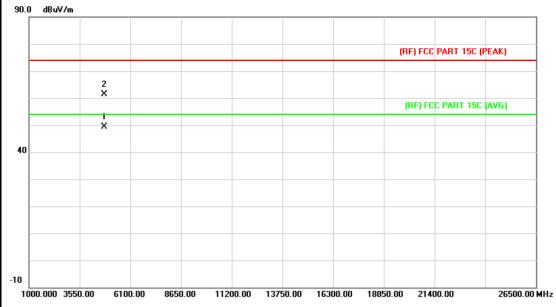


N	lo. Mi	c. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4803.943	35.63	13.44	49.07	54.00	-4.93	AVG
2		4804.027	48.18	13.44	61.62	74.00	-12.38	peak



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Vertical	- Till			
Test Mode:	TX GFSK Mode 2402MHz	1			
Remark:	Remark: No report for the emission which more than 10 dB below the prescribed limit.				

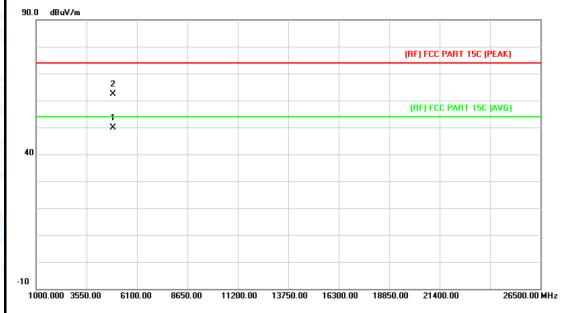


No. Mk.		c. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4804.066	35.95	13.44	49.39	54.00	-4.61	AVG
2		4804.102	48.04	13.44	61.48	74.00	-12.52	peak



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 5V					
Ant. Pol.	Horizontal					
Test Mode:	TX GFSK Mode 2441MHz	1 US				
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

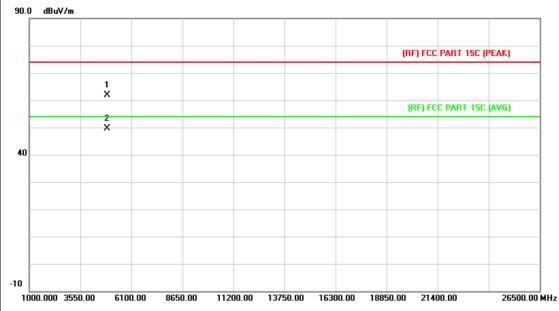


No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4881.832	35.86	13.90	49.76	54.00	-4.24	AVG
2		4882.750	48.59	13.90	62.49	74.00	-11.51	peak



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EUT:	WIRELESS SHOWER SPEAKER  Model Name:		F4056591		
Temperature: 25 °C		Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Vertical				
Test Mode:	TX GFSK Mode 2441MHz	A VIII			
Remark:	No report for the emission which more than 10 dB below the prescribed limit.				

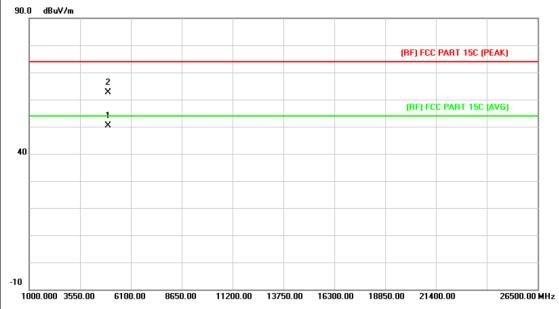


No	. Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.772	48.07	13.90	61.97	74.00	-12.03	peak
2	*	4881.844	35.72	13.90	49.62	54.00	-4.38	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :				
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 5V					
Ant. Pol.	Horizontal					
Test Mode:	TX GFSK Mode 2480MHz	a US	51			
Remark: No report for the emission which more than 10 dB below the prescribed limit.						

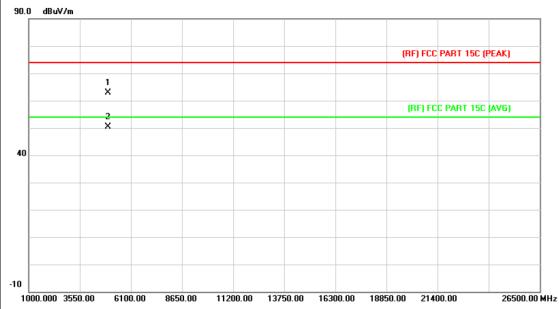


No	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4959.952	36.14	14.36	50.50	54.00	-3.50	AVG
2		4960.309	48.27	14.36	62.63	74.00	-11.37	peak



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Vertical				
Test Mode:	TX GFSK Mode 2480MHz	VIII TO			
Remark: No report for the emission which more than 10 dB below the prescribed limit.			below the		

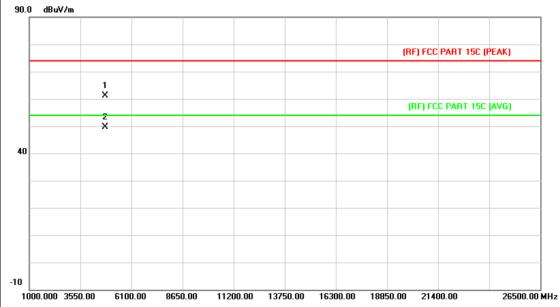


١	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1			4959.649	48.57	14.36	62.93	74.00	-11.07	peak
2		*	4960.063	35.99	14.36	50.35	54.00	-3.65	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 5V					
Ant. Pol.	Horizontal					
Test Mode:	TX 8-DPSK Mode 2402MHz					
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

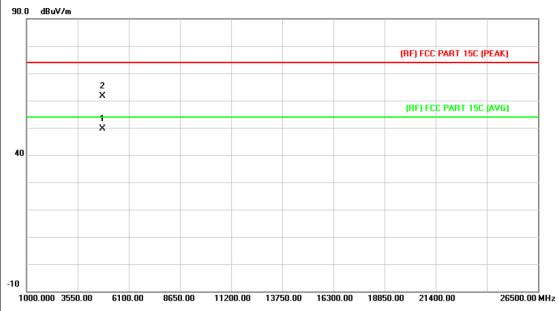


No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.889	47.61	13.44	61.05	74.00	-12.95	peak
2	*	4804.102	36.31	13.44	49.75	54.00	-4.25	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591				
Temperature:	25 ℃	Relative Humidity:	55%				
Test Voltage:	DC 5V						
Ant. Pol.	Vertical						
Test Mode:	TX 8-DPSK Mode 2402MHz						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

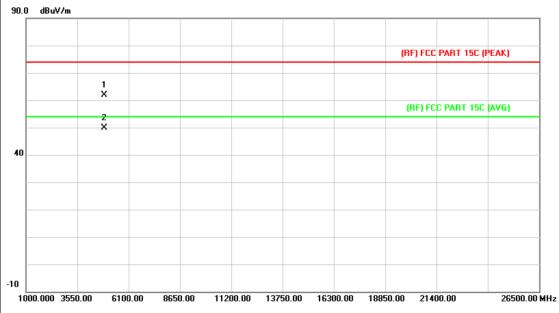


N	lo.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	,	*	4803.958	36.07	13.44	49.51	54.00	-4.49	AVG
2			4804.207	48.29	13.44	61.73	74.00	-12.27	peak



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 5V					
Ant. Pol.	Horizontal					
Test Mode:	TX 8-DPSK Mode 2441MHz					
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

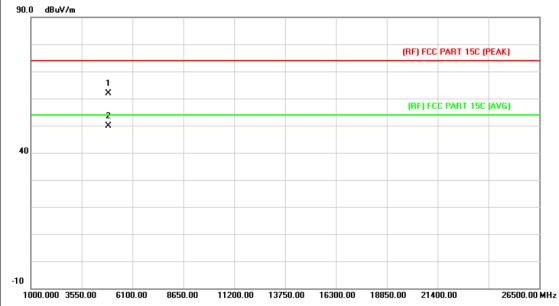


No	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.838	48.10	13.90	62.00	74.00	-12.00	peak
2	*	4882.009	35.97	13.90	49.87	54.00	-4.13	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 5V					
Ant. Pol.	Vertical					
Test Mode:	TX 8-DPSK Mode 2441MHz					
Remark:	No report for the emission which more than 10 dB below the prescribed limit.					

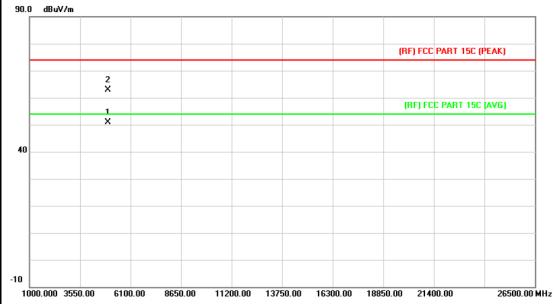


No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.649	47.90	13.90	61.80	74.00	-12.20	peak
2	*	4882.126	36.02	13.90	49.92	54.00	-4.08	AVG



Page: 37 of 94

EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591			
Temperature:	25 ℃	Relative Humidity:	55%			
Test Voltage:	DC 5V					
Ant. Pol.	Horizontal					
Test Mode:	TX 8-DPSK Mode 2480MH	Hz				
Remark:	No report for the emission prescribed limit.	No report for the emission which more than 10 dB below the				

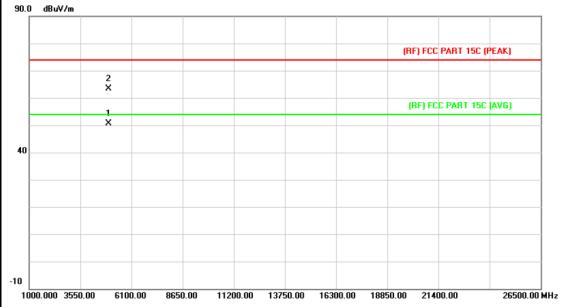


No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4960.057	36.46	14.36	50.82	54.00	-3.18	AVG
2		4960.270	48.54	14.36	62.90	74.00	-11.10	peak



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Vertical				
Test Mode:	TX 8-DPSK Mode 2480MHz	The same of the sa			
Remark:	No report for the emission w prescribed limit.	hich more than 10 dB	below the		



N	o. M	k. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4960.006	36.28	14.36	50.64	54.00	-3.36	AVG
2		4960.069	48.94	14.36	63.30	74.00	-10.70	peak



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# 6. Restricted Bands Requirement

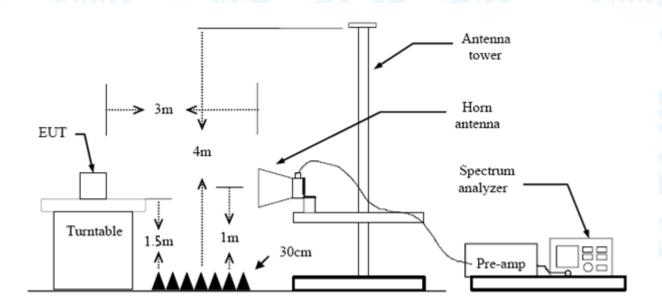
#### 6.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.209 FCC Part 15.205

6.1.2 Test Limit

Restricted Frequency	Class B (dE	BuV/m)(at 3m)
Band (MHz)	Peak	Average
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.



Report No.: TB-FCC147478
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(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.

#### 6.4 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=1 KHz with Peak Detector for Average Values.

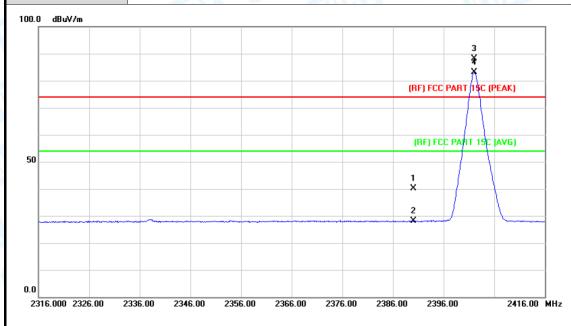
All restriction bands have been tested, only the worst case is reported.



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### (1) Radiation Test

EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 5V		
Ant. Pol.	Horizontal	W. Comment	
Test Mode:	TX GFSK Mode 2402MHz		
Remark:	N/A		



No.	. Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	39.41	0.77	40.18	74.00	-33.82	peak
2		2390.000	27.26	0.77	28.03	54.00	-25.97	AVG
3	Χ	2402.000	87.39	0.82	88.21	Fundamental	Frequency	peak
4	*	2402.100	82.20	0.82	83.02	Fundamental	Frequency	AVG



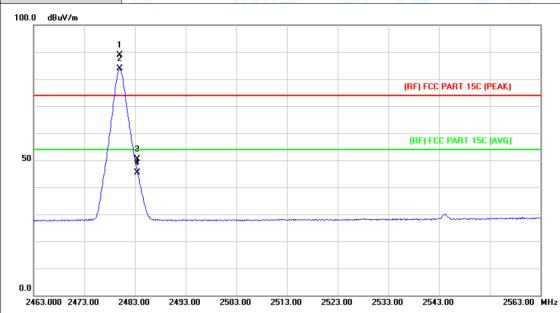
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EUT				LESS SHOW	ER	Model Na	me :	F4056591		
	•		SPEA		7.7	model ita			MAR	
Tem	peratu	e:	25 °C			Relative I	Humidity:	55%		
<b>Test</b>	Voltag	e:	DC 5	SV .	6711		a W			
۱nt.	Pol.		Verti	cal			19			
est	Mode:		TX G	FSK Mode	2402MHz	I Albert				
Rem	nark:		N/A			)	all in			
100.0	dBuV/m									
								3		
							(RF) FCC	PART 15C (PEAK	)	
							(DE) FOR	PART 15C (AVG	,	
50							(RF) FCL	PART TOU LAVE	,	
							1			
							×	/ \		
							2 X			
0.0										
23	16.000 232	6.00 2	336.00		66.00 2366.00		2386.00 2396.	.00 2	416.00 MH	
N	o. Mk.	Fre	eq.	Reading Level	Correct Factor	Measure ment	- Limit	Over		
		MH	Z	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detecto	
								04.00		
1		2390.	000	38.54	0.77	39.31	74.00	-34.69	pear	
1				38.54 27.13	0.77 0.77	39.31 27.90	74.00 54.00	-34.69	peak AVG	
	X	2390.	000				54.00		•	



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EUT:	WIRELESS SHOWER	Model Name :	F4056591
Temperature:	SPEAKER 25 ℃		
Test Voltage:	DC 5V	Troiding Trainialty	55%
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2480 MHz	The same of the sa	
Remark:	N/A		
100.0 10.41			

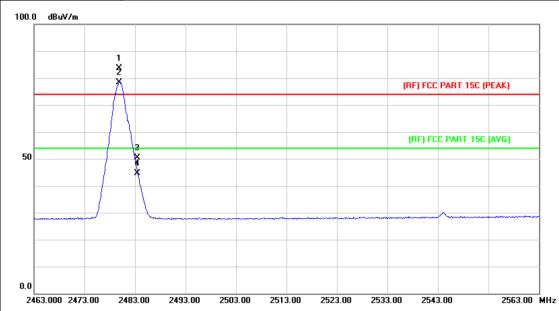


No. Mk. F		c. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2480.000	87.79	1.15	88.94	Fundamental I	requency	peak
2	*	2480.000	82.66	1.15	83.81	Fundamental I	Frequency	AVG
3		2483.500	49.24	1.17	50.41	74.00	-23.59	peak
4		2483.500	44.27	1.17	45.44	54.00	-8.56	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 5V		
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2480 MHz	The same of the sa	
Remark:	N/A		
			·

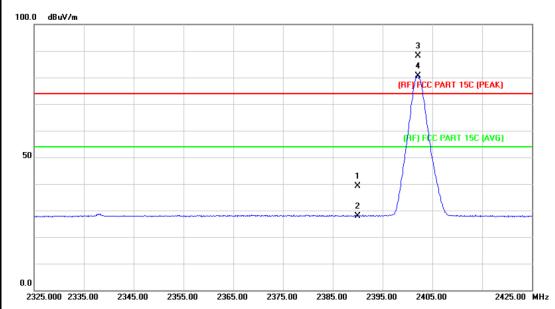


No	o. Mk	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.900	82.59	1.15	83.74	Fundamental	Frequency	peak
2	*	2479.900	77.20	1.15	78.35	Fundamental	Frequency	AVG
3		2483.500	49.23	1.17	50.40	74.00	-23.60	peak
4		2483.500	43.51	1.17	44.68	54.00	-9.32	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	<b>25</b> ℃	Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Horizontal				
Test Mode:	TX 8-DPSK Mode 2402MHz				
Remark:	N/A	and and			



No.	Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	38.31	0.77	39.08	74.00	-34.92	peak
2		2390.000	27.15	0.77	27.92	54.00	-26.08	AVG
3	Χ	2402.100	87.39	0.82	88.21	Fundamenta	l Frequency	peak
4	*	2402.100	79.89	0.82	80.71	Fundamenta	I Frequency	AVG



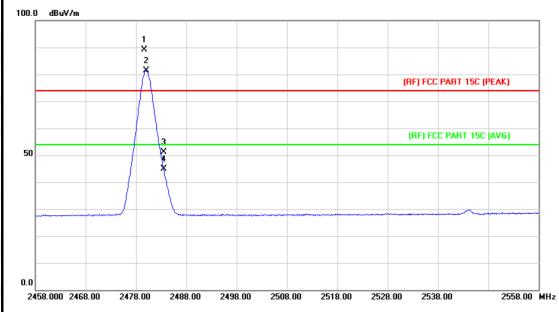
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WIRELESS SHOWER SPEAKER		Model Name :		:	F4056591					
Гет	peratu	re:	25 °C	C	130	Relati	ve Hum	idity:	55%	
Test	Voltag	e:	DC 5	5V	67	11000		a V	W.	
۱nt.	Pol.		Verti	cal	10	1				Miles
Гest	Mode:		TX 8	-DPSK Mod	de 2402	ИНz	177		ALL V	
Rem	nark:		N/A		MIN'	33		OTT	ر ملا	1
100.0	dBuV/m									
Ì								3 X		
									CC PART 15C (PEA	K)
50								(KF)	FCC PART 15C (AV	<u> </u>
							1			
							×			
							2 X		\	
-										
0.0										
23	25.000 233	5.00 2	345.00	2355.00 23	65.00 23	75.00 23	85.00 23	395.00 2	405.00	2425.00 MH
N	lo. Mk.	Fre	eq.	Reading Level	Corre Fact		easure- nent	Limit	Over	
		MH	łz	dBuV	dB/m	n d	BuV/m	dBuV	/m dB	Detecto
1		2390.	000	37.78	0.77	7 3	38.55	74.0	0 -35.45	peak
2		2390.	000	27.23	0.77	7 2	28.00	54.0	0 -26.00	AVG
3	X	2402.	100	83.43	0.82	2 8	34.25	Fundam	ental Frequency	, peak
	*	2402.		77.24	0.82	-	78.06		ental Frequency	, AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591				
Temperature:	25 ℃	Relative Humidity:	55%				
Test Voltage:	DC 5V	DC 5V					
Ant. Pol.	Horizontal						
Test Mode:	TX 8-DPSK Mode 2480	MHz	51				
Remark:	N/A						
100.0 dBuV/m	1						

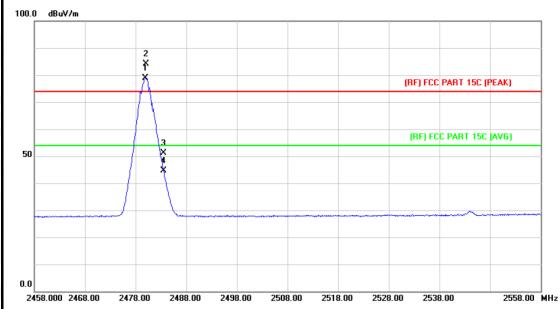


No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.700	88.02	1.15	89.17	Fundamental	Frequency	peak
2	*	2480.000	80.24	1.15	81.39	Fundamental	Frequency	AVG
3		2483.500	49.90	1.17	51.07	74.00	-22.93	peak
4		2483.500	43.64	1.17	44.81	54.00	-9.19	AVG



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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	<b>25</b> ℃	Relative Humidity:	55%		
Test Voltage:	DC 5V				
Ant. Pol.	Vertical				
Test Mode:	TX 8-DPSK Mode 2480MHz				
Remark:	N/A				



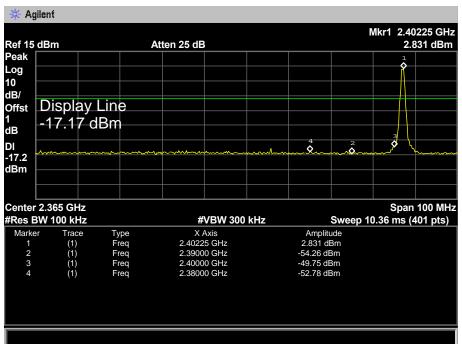
No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2479.900	77.74	1.15	78.89	Fundamental	Frequency	AVG
2	X	2480.100	83.09	1.15	84.24	Fundamental I	Frequency	peak
3		2483.500	49.87	1.17	51.04	74.00	-22.96	peak
4		2483.500	43.42	1.17	44.59	54.00	-9.41	AVG

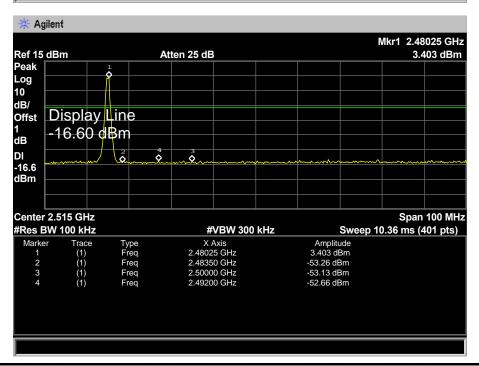




(2) Conducted Test

EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	25 ℃	Relative Humidity:	55%		
Test Voltage:	DC 3.7V				
Test Mode:	TX GFSK Mode 2402MHz / 2480 MHz				
Remark:	N/A				



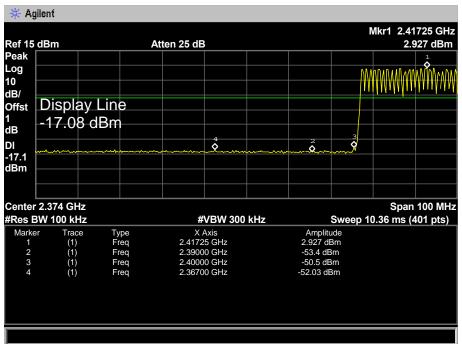


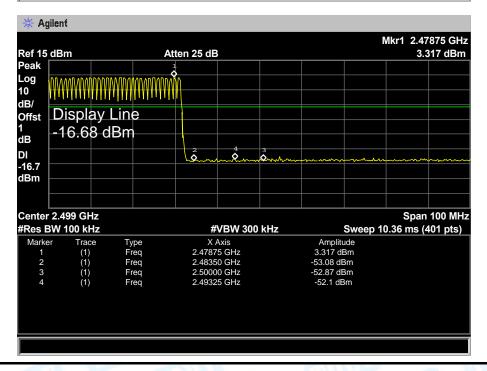


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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591		
Temperature:	<b>25</b> ℃	Relative Humidity:	55%		
Test Voltage:	DC 3.7V				
Test Mode:	GFSK Hopping Mode				
Remark:	N/A	1			

TOBY









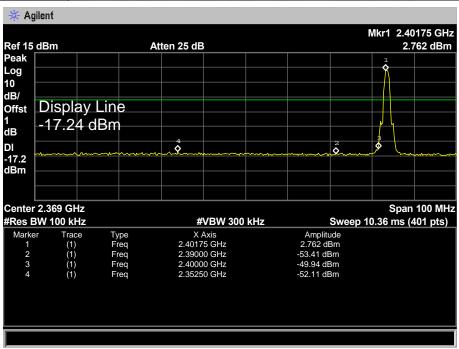
EUT: WIRELESS SHOWER SPEAKER Model Name: F4056591

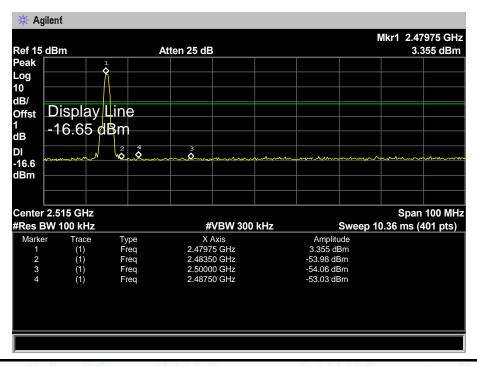
Temperature: 25 °C Relative Humidity: 55%

Test Voltage: DC 3.7V

Test Mode: TX 8-DPSK Mode 2402MHz / 2480 MHz

Remark: N/A







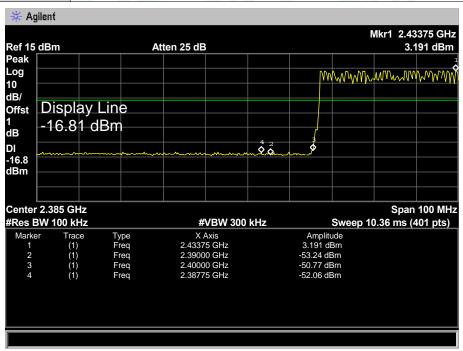
EUT: WIRELESS SHOWER SPEAKER Model Name: F4056591

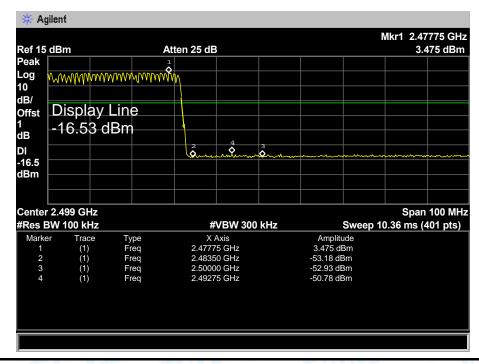
Temperature: 25 ℃ Relative Humidity: 55%

Test Voltage: DC 3.7V

Test Mode: 8-DPSK Hopping Mode

Remark: N/A







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# 7. Number of Hopping Channel

#### 7.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.247 (a)(1)

6.1.2 Test Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

### 7.2 Test Setup



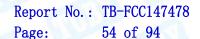
#### 7.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=100 KHz, VBW=100 KHz, Sweep time= Auto.

### 7.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

### 7.5 Test Data





EUT: WIRELESS SHOWER SPEAKER Model Name: F4056591

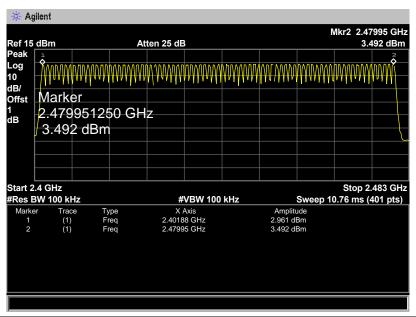
Temperature: 25 ℃ Relative Humidity: 55%

Test Voltage: DC 3.7V

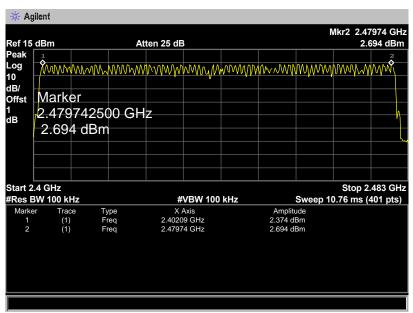
Test Mode: Hopping Mode (GFSK/8-DPSK)

Frequency Range	Quantity of Hopping Channel	Limit
2402MHz~2480MHz	79	<b>&gt;4</b> E
2402WH2~2400WH2	79	>15

#### **GFSK Mode**



#### 8-DPSK Mode





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# 8. Average Time of Occupancy

#### 8.1 Test Standard and Limit

8.1.1 Test Standard FCC Part 15.247 (a)(1)

8.1.2 Test Limit

Section	Test Item	Limit
15.247(a)(1)/ RSS-210	Average Time of	0.4.000
Annex 8(A8.1d)	Occupancy	0.4 sec

### 8.2 Test Setup



#### 8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=1MHz.
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the center frequency on any frequency would be measure and set the frequency span to zero.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.

#### 8.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

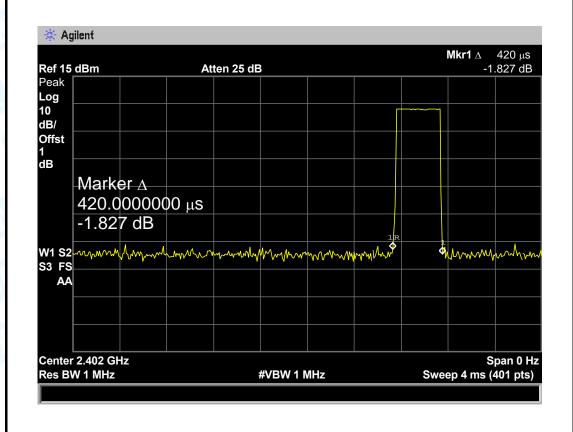


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### 8.5 Test Data

EUT: WIRELESS SPEAKER		Model Name	į	F4056591
25 ℃	The Collins	Relative Humidity:		55%
DC 3.7V			THUE:	
Hopping	Mode (GFSK DH	1)		13
Pulse Time (ms)	Total of Dwell (ms)	Period Time (s)	Limit (ms)	Result
0.420	134.40			
0.420	134.40	31.60	400	PASS
0.430	137.60			
	SPEAKER  25 °C  DC 3.7V  Hopping I  Pulse Time (ms)  0.420  0.420	25 °C  DC 3.7V  Hopping Mode (GFSK DH  Pulse Time (ms) (ms)  0.420 134.40  0.420 134.40	SPEAKER       Model Name         25 °C       Relative Hum         DC 3.7V       Hopping Mode (GFSK DH1)         Pulse Time (ms) (ms) (ms) (s)       Period Time (s)         0.420 134.40       31.60	SPEAKER   Model Name :

#### **GFSK Hopping Mode DH1**





Span 0 Hz

Sweep 4 ms (401 pts)



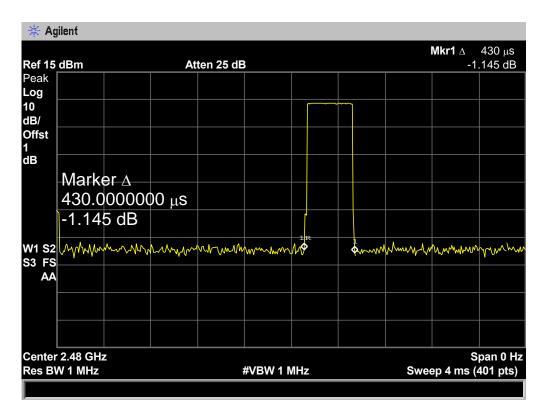
Center 2.441 GHz

Res BW 1 MHz

**GFSK Hopping Mode DH1** 2441 MHz 🔆 Agilent Mkr1  $\Delta$ 420 μs -0.22 dB Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Offst 1 dB Marker ∆ 420.0000000 μs -0.22 dB www.hyhrdymhm. \$ who properly was the way to be a few of the property of the W1 S2 S3 FS AA

**GFSK Hopping Mode DH1** 

#VBW 1 MHz



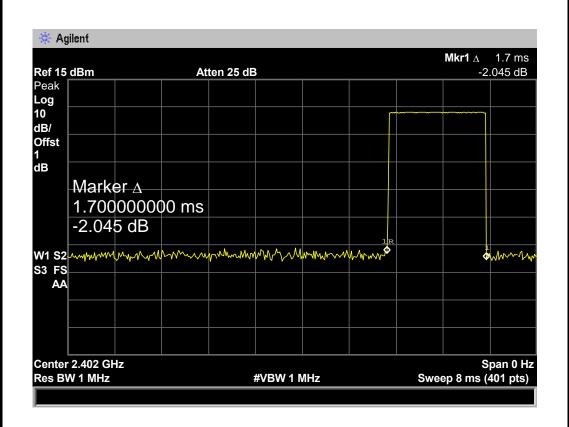


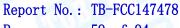
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EUT: WIRELESS SHOWER SPEAKER		Model Name	:	F4056591		
Temperature:		25 ℃	A LOTTON	Relative Hum	idity:	55%
Test Voltage:		DC 3.7V	THE STATE OF THE S	ور الزان	N. W.	
Test Mode:		Hopping N	Mode (GFSK DH	3)	3	
Channel	Pu	lse Time	Total of Dwell	Period Time	Limit	Posult

Channel	Pulse Time	Total of Dwell	Period Time	Limit	Result
(MHz)	(ms)	(ms)	(s)	(ms)	Result
2402	1.700	272.00			
2441	1.700	272.00	31.60	400	PASS
2480	1.700	272.00			

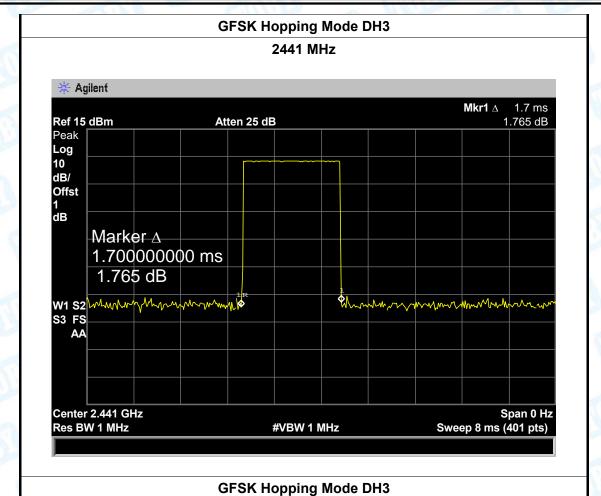
#### **GFSK Hopping Mode DH3**

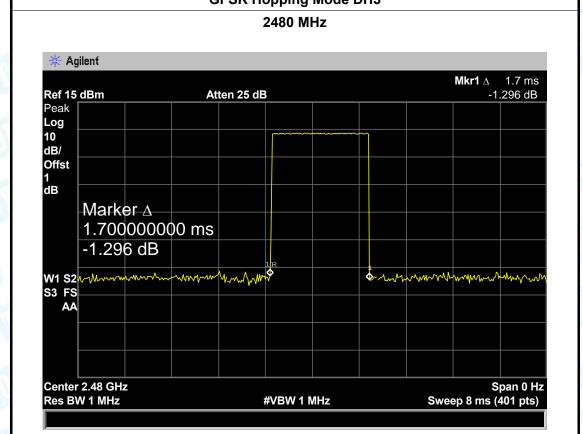






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2441

2480

Report No.: TB-FCC147478

**PASS** 

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EUT:		WIRELESS SPEAKER	SHOWER	Model Name	:	F4056591
Temperature:		25 ℃		Relative Hum	idity:	55%
Test Voltage:		DC 3.7V		مر الال	J. A.R.	
Test Mode:		Hopping N	Mode (GFSK DH	5)	3	CHILLIAN TO SERVICE
Channel	Pu	lse Time	Total of Dwell	Period Time	Limit	Result
(MHz)		(ms)	(ms)	(s)	(ms)	Nesuit
2402		3.000	320.00			

## GFSK Hopping Mode DH5

320.00

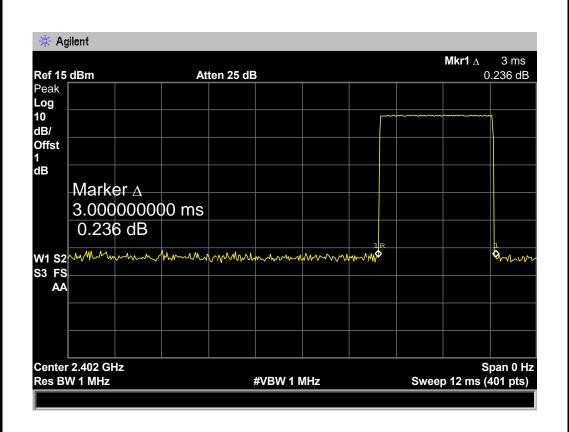
320.00

31.60

400

3.000

3.000



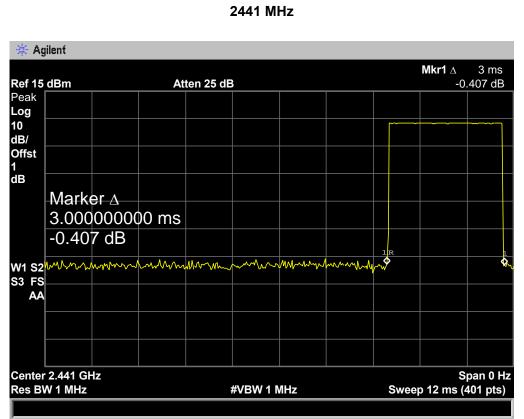




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GFSK Hopping Mode DH5

2441 MHz



### **GFSK Hopping Mode DH5** 2480 MHz \* Agilent Mkr1 A 3 ms Ref 15 dBm Atten 25 dB -1.574 dB Peak Log 10 dB/ Offst 1 dB Marker A 3.000000000 ms -1.574 dB W1 S2 M S3 FS the same of the sa AΑ Center 2.48 GHz Span 0 Hz Res BW 1 MHz #VBW 1 MHz Sweep 12 ms (401 pts)



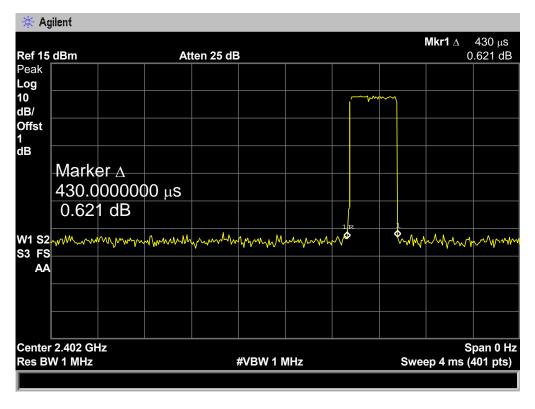
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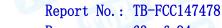
EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		
Test Mode:	Hopping Mode ( $\pi$ /4-DOP	SK DH1)	

Hopping Mode (π/4-DQPSK DH1)

Channel	Pulse Time	Total of Dwell	Period Time	Limit	Popult
(MHz)	(ms)	(ms)	(s)	(ms)	Result
2402	0.430	137.60			
2441	0.440	140.80	31.60	400	PASS
2480	0.440	140.80			

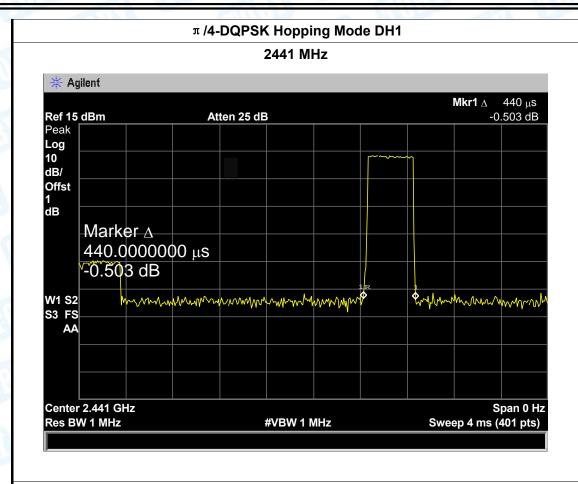
#### $\pi$ /4-DQPSK Hopping Mode DH1



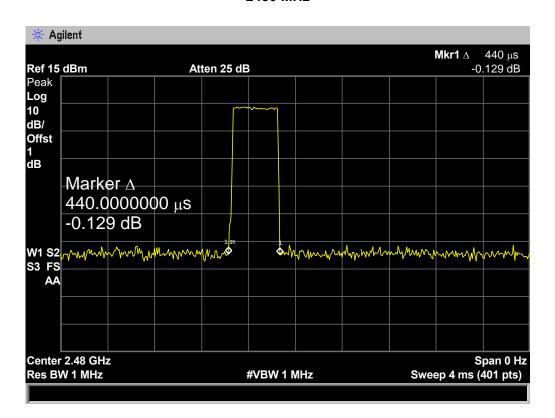




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#### π /4-DQPSK Hopping Mode DH1



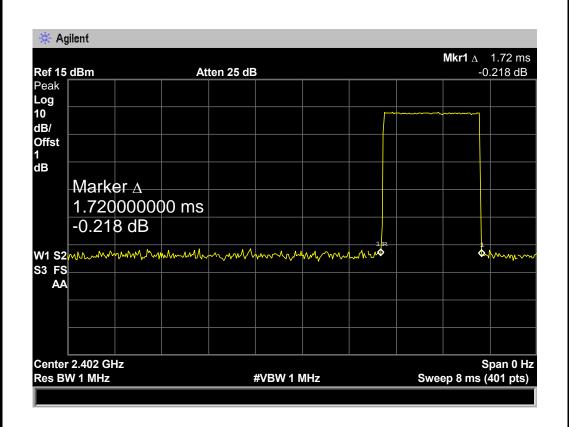


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Channal	D	la a Tima	Total of Dwell	Davied Time	Limit	
Test Mode:		Hopping N	Mode (π/4-DQP	SK DH3)	3	THE PERSON NAMED IN
Test Voltage:		DC 3.7V	THE STATE OF	مر الالا	N. W.	
Temperature:		25 ℃	THE PERSON NAMED IN	Relative Hum	idity:	55%
EUT:		WIRELESS SPEAKER	SHOWER	Model Name	:	F4056591

Channel	Pulse Time	Total of Dwell	Period Time	Limit	Popult
(MHz)	(ms)	(ms)	(s)	(ms)	Result
2402	1.720	275.20			
2441	1.700	272.00	31.60 400	PASS	
2480	1.720	275.20			

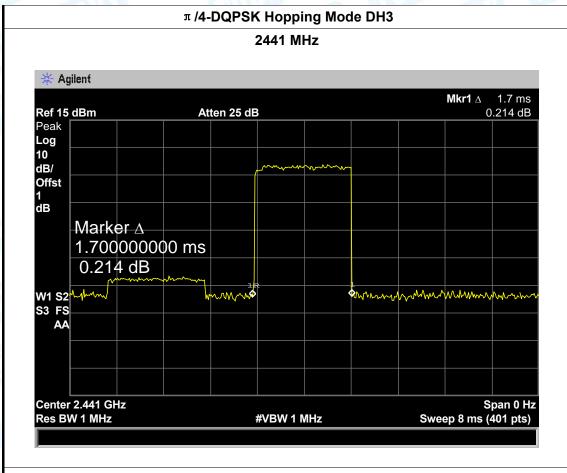
#### $\pi$ /4-DQPSK Hopping Mode DH3





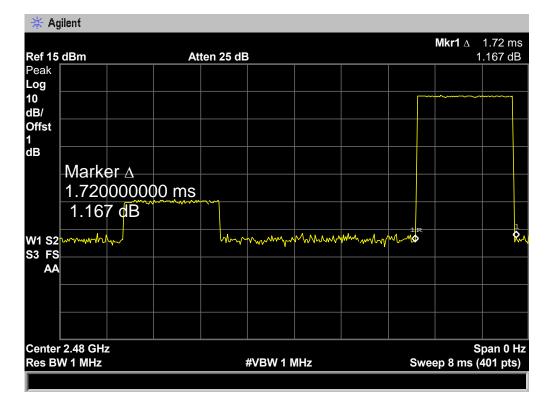


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 $\pi$  /4-DQPSK Hopping Mode DH3





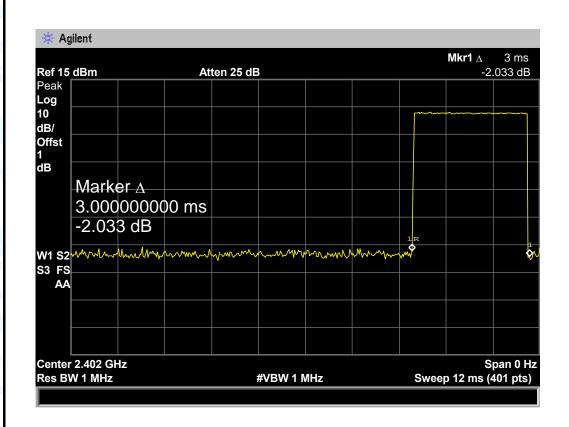


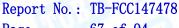
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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V	The second	
Test Mode:	Hopping Mode (π/4-DQP	SK DH5)	
Channel	Pulse Time	Period Time Limit	Posult

Channel	Pulse Time	Total of Dwell	Period Time	Limit	Result
(MHz)	(ms)	(ms)	(s)	(ms)	Result
2402	3.000	320.00			
2441	3.000	320.00	31.60	400	PASS
2480	3.000	320.00			

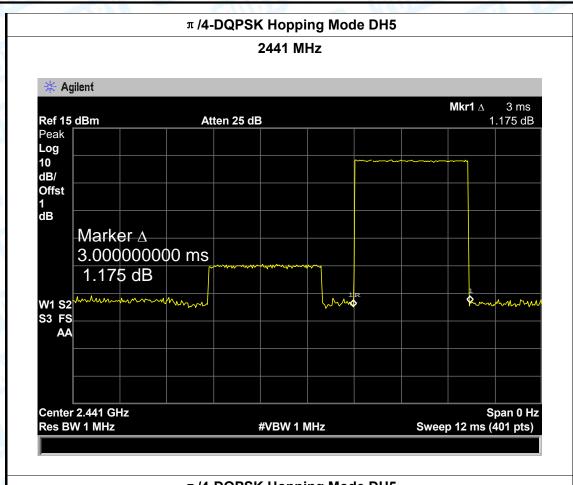
#### $\pi$ /4-DQPSK Hopping Mode DH5

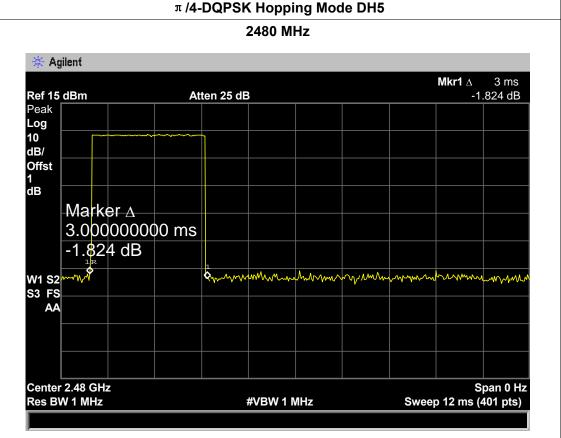






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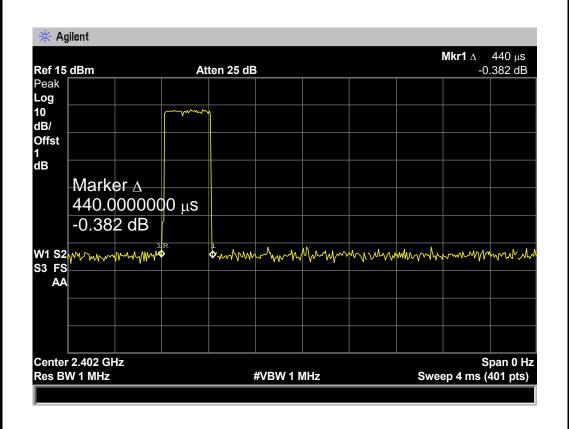


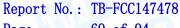


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EUT:		WIRELESS SPEAKER	SHOWER	Model Name :		F4056591
Temperature:		25 ℃		Relative Hum	idity:	55%
Test Voltage:	: DC 3.7V			13.3		
Test Mode:		Hopping I	Mode (8-DPSK D	H1)	I WILL	
Channel	Pu	Ise Time	Total of Dwell	Period Time	Limit	Result
(MHz)		(ms)	(ms)	(s)	(ms)	Result
2402		0.440	140.80			
2441		0.430	137.60	31.60	400	PASS
2480		0.430	137.60			

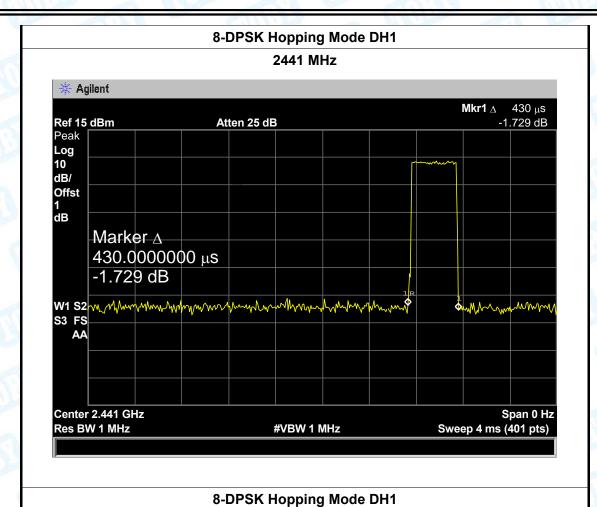
#### 8-DPSK Hopping Mode DH1

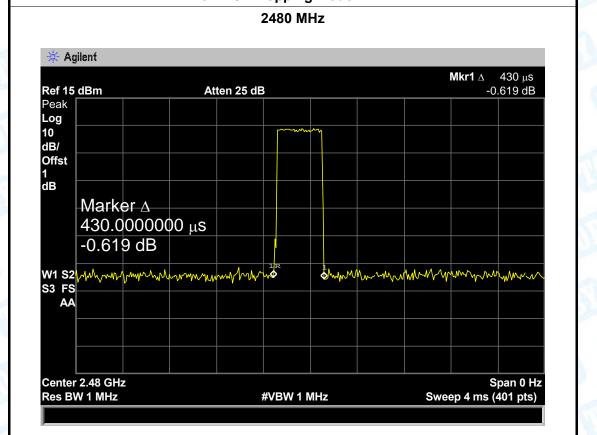






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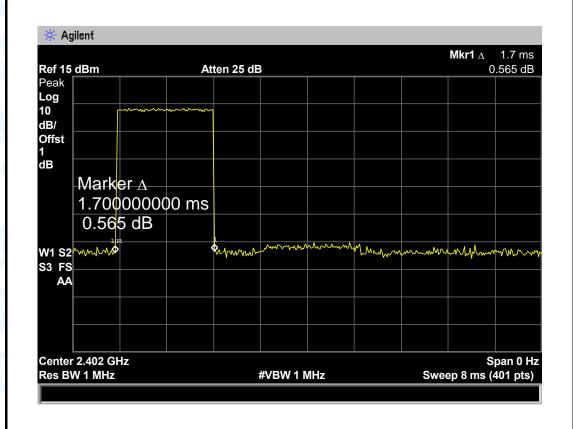


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Channel	Pu	leo Timo	Total of Dwell	Pariod Time	Limit		
Test Mode:		Hopping I	Mode (8-DPSK D	H3)	3		
Test Voltage:		DC 3.7V	The same	مر الان			
Temperature:		25 ℃	THE PARTY OF	Relative Hum	idity:	55%	
EUT:		WIRELESS SPEAKER	SHOWER	Model Name		F4056591	3

Channel	Pulse Time	Total of Dwell	Period Time	Limit	Popult		
(MHz)	(ms)	(ms)	(s)	(ms)	Result		
2402	1.700	272.00					
2441	1.700	272.00	31.60	400	PASS		
2480	1.700	272.00					

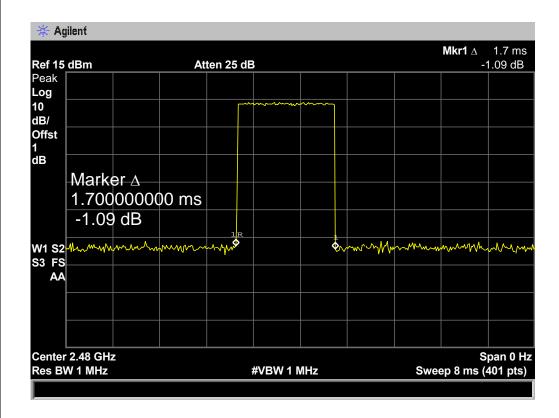
#### 8-DPSK Hopping Mode DH3







8-DPSK Hopping Mode DH3 2441 MHz 🔆 Agilent **Mkr1**  $\Delta$  1.7 ms -0.766 dB Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Offst 1 dB Marker ∆ 1.700000000 ms -0.766 dB whankhonyhmann www. W1 S2 S3 FS AA Center 2.441 GHz Span 0 Hz Res BW 1 MHz #VBW 1 MHz Sweep 8 ms (401 pts) 8-DPSK Hopping Mode DH3



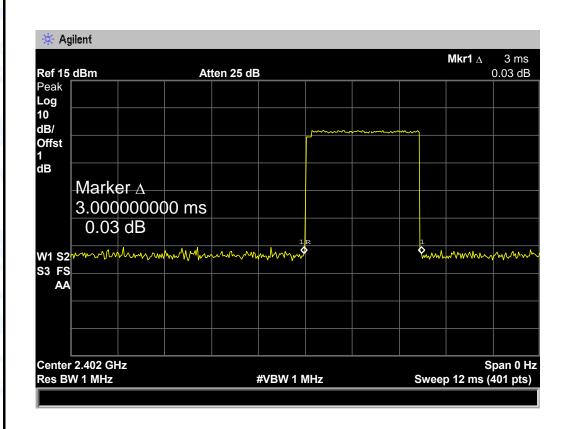


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Channel	Puls	e Time	Total of Dwell	Period Time	Limit		
Test Mode:	ŀ	Hopping Mode (8-DPSK DH5)					
Test Voltage:		DC 3.7V					
Temperature:		25 ℃		Relative Humidity:		55%	
EUT:		WIRELESS SHOWER SPEAKER		Model Name :		F4056591	

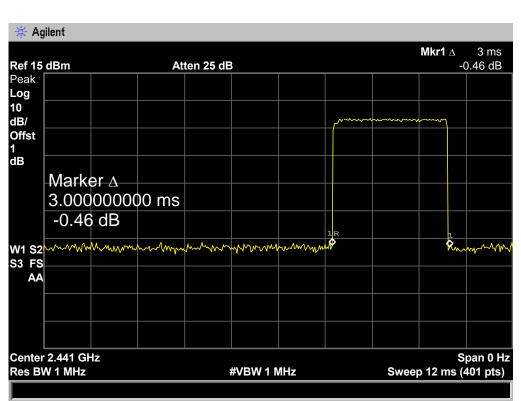
Channel	Pulse Time	Total of Dwell	Period Time	Limit	Popult	
(MHz)	(ms)	(ms)	(s)	(ms)	Result	
2402	3.000	320.00				
2441	3.000	320.00	31.60	400	PASS	
2480	3.000	320.00				

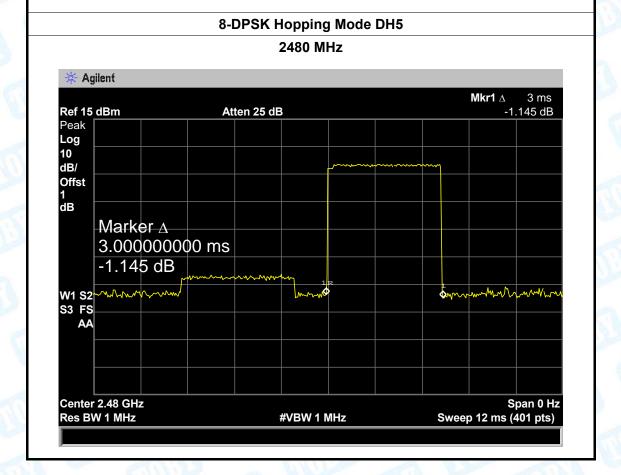
#### 8-DPSK Hopping Mode DH5













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9. Channel Separation and Bandwidth Test

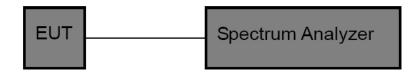
#### 9.1 Test Standard and Limit

9.1.1 Test Standard FCC Part 15.247

9.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	<=1 MHz (20dB bandwidth)	2400~2483.5
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5

# 9.2 Test Setup



# 9.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Channel Separation: RBW=30 kHz, VBW=100 kHz.

Bandwidth: RBW=30 kHz, VBW=100 kHz.

- (3) The bandwidth is measured at an amplitude level reduced 20dB 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.
  - (4) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:30 kHz, and Video Bandwidth:100 kHz. Sweep Time set auto.

# 9.4 EUT Operating Condition

The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Bandwidth Test.

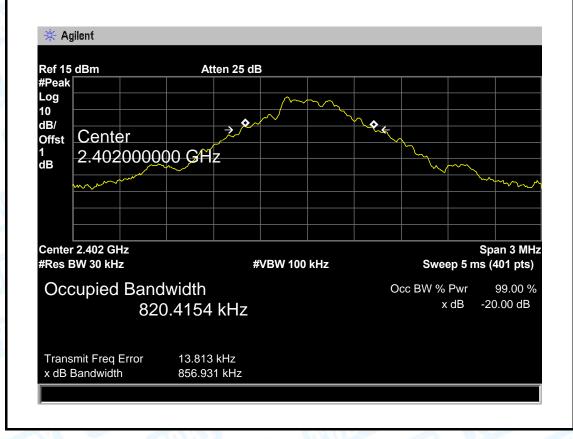


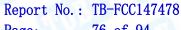
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## 9.5 Test Data

EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V	COLUMN TO THE PARTY OF THE PART	A PIUL
Test Mode:	TX Mode (GFSK)		
Channel frequence (MHz)	99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)
2402	820.4154	856.931	
2441	817.2926	854.060	
2480	818.6371	855.380	

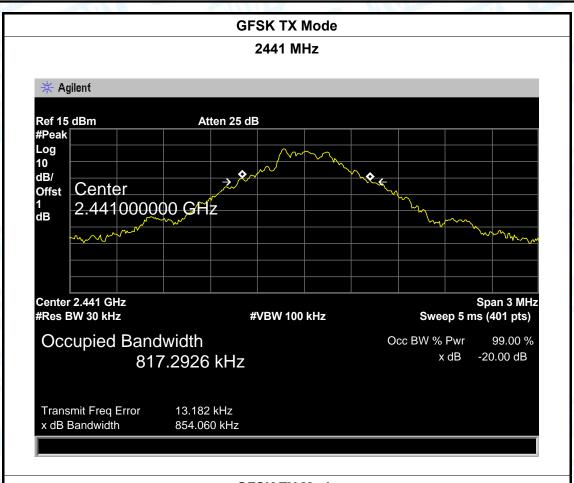
#### **GFSK TX Mode**



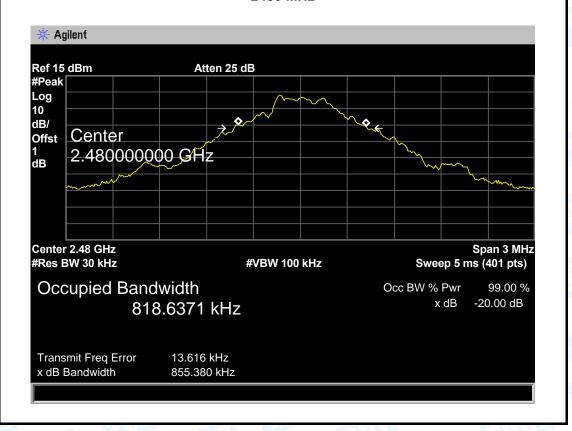




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# **GFSK TX Mode** 2480 MHz





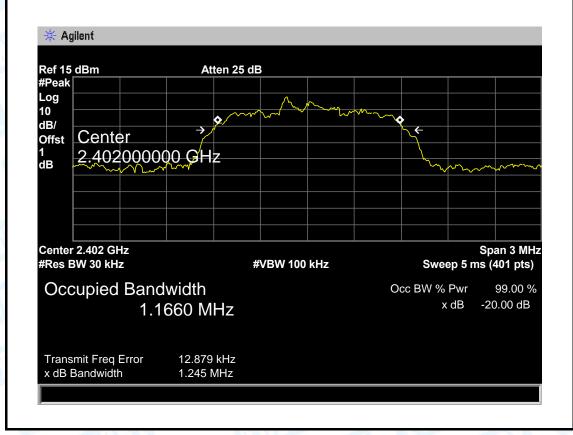
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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591	
Temperature:	25 ℃	Relative Humidity:	55%	
Test Voltage:	DC 3.7V			

Test Mode: ΤΧ Mode ( π /4-DQPSK)

Channel frequency	99% OBW	20dB Bandwidth	20dB Bandwidth *2/3
(MHz)	(kHz)	(kHz)	(kHz)
2402	1166.00	1245.00	830.00
2441	1160.80	1254.00	836.00
2480	1163.20	1253.00	835.33

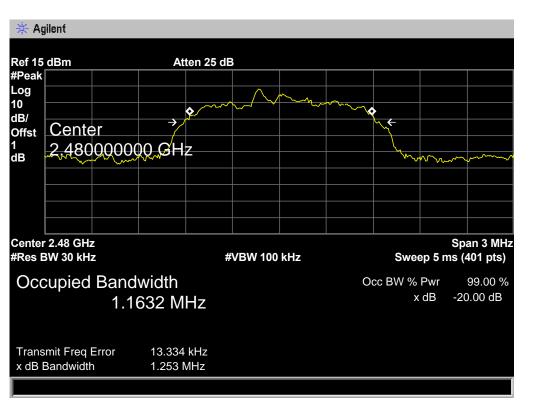
#### π/4-DQPSK TX Mode







π/4-DQPSK TX Mode 2441 MHz \* Agilent Ref 15 dBm Atten 25 dB #Peak Log 10 dB/ offst Center 2,441000000 GHz 1 dB Center 2.441 GHz Span 3 MHz #Res BW 30 kHz **#VBW 100 kHz** Sweep 5 ms (401 pts) Occupied Bandwidth 99.00 % Occ BW % Pwr x dB -20.00 dB 1.1608 MHz Transmit Freq Error 10.055 kHz x dB Bandwidth 1.254 MHz π/4-DQPSK TX Mode 2480 MHz # Agilent





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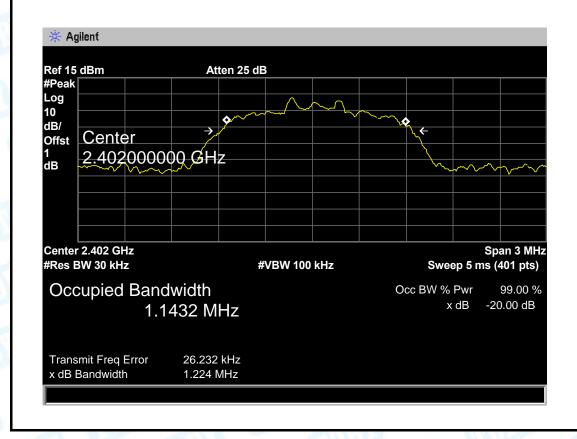
EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		

Test Voltage: DC 3.7V

Test Mode: TX Mode (8-DPSK)

Channel frequency (MHz)	99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)
2402	1143.00	1224.00	816.00
2441	1149.10	1226.00	817.33
2480	1150.70	1224.00	816.00

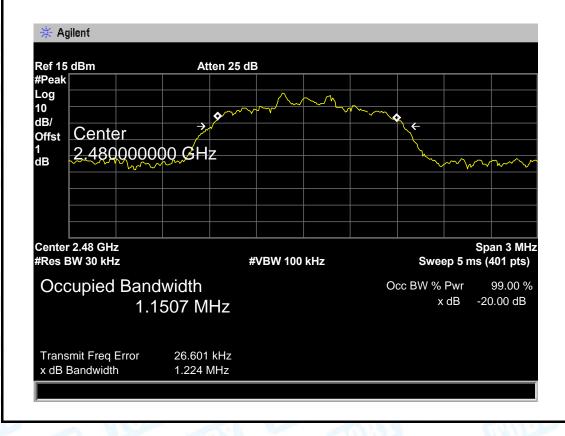
#### 8-DPSK TX Mode







8-DPSK TX Mode 2441 MHz \* Agilent Ref 15 dBm Atten 25 dB #Peak Log 10 dB/ Center Offst 2,441000000 GHz 1 dB Center 2.441 GHz Span 3 MHz #Res BW 30 kHz **#VBW 100 kHz** Sweep 5 ms (401 pts) Occupied Bandwidth 99.00 % Occ BW % Pwr x dB -20.00 dB 1.1491 MHz Transmit Freq Error 26.493 kHz x dB Bandwidth 1.226 MHz 8-DPSK TX Mode





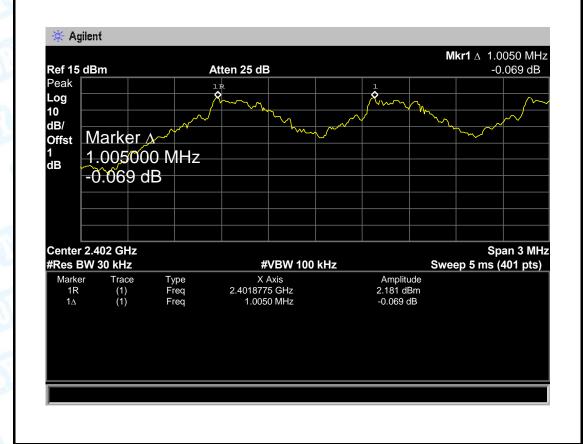
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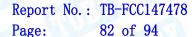
EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		

Test Mode: Hopping Mode (GFSK)

11 0 ( )							
Channel frequency	Separation Read Value	Separation Limit					
(MHz)	(kHz)	(kHz)					
2402	1005.00	856.931					
2441	1005.00	854.060					
2480	1005.00	855.380					

### **GFSK Hopping Mode**

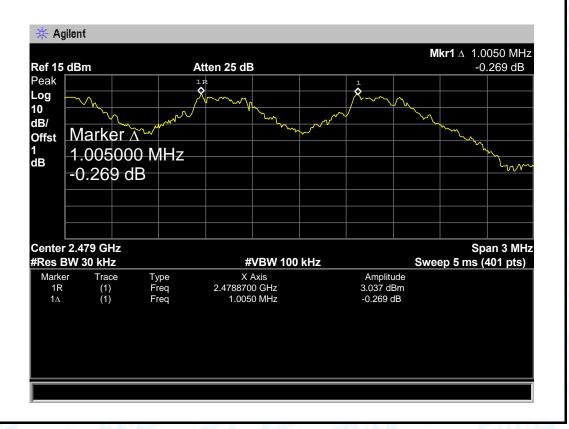






**GFSK Hopping Mode** 2441 MHz \* Agilent Mkr1 A 1.0050 MHz -0.82 dB Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Marker Offst 1.005000 MHz dΒ -0.82 dB Center 2.442 GHz Span 3 MHz #Res BW 30 kHz **#VBW 100 kHz** Sweep 5 ms (401 pts) Type Freq Freq X Axis 2.4408850 GHz Amplitude (1) (1) 1.85 dBm 1.0050 MHz -0.82 dB

# GFSK Hopping Mode 2480 MHz





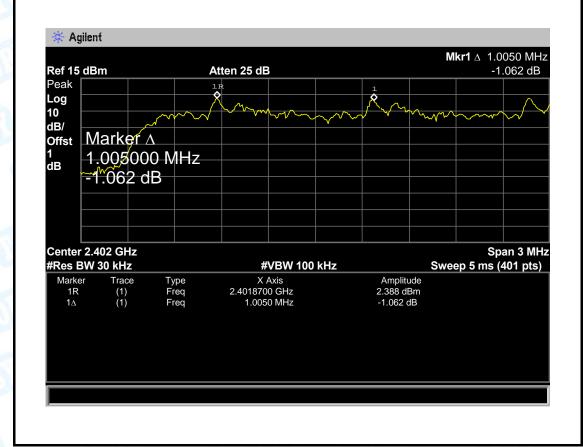
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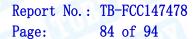
EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		

Test Mode: Hopping Mode ( π /4-DQPSK)

Channel frequency	Separation Read Value	Separation Limit
(MHz)	(kHz)	(kHz)
2402	1005.00	830.00
2441	1005.00	836.00
2480	1005.00	835.33

### π /4-DQPSK Hopping Mode







π /4-DQPSK Hopping Mode 2441 MHz \* Agilent **Mkr1** △ 1.0050 MHz -2.178 dB Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Marker ∧ Offst 1.005000 MHz 1 dB -2.178 dB Center 2.442 GHz #Res BW 30 kHz Span 3 MHz **#VBW 100 kHz** Sweep 5 ms (401 pts) Amplitude 2.805 dBm -2.178 dB Type Freq Freq X Axis 2.4408700 GHz (1) (1) 1.0050 MHz

# <sup>≖</sup> /4-DQPSK Hopping Mode 2480 MHz

# Mkr1 Δ 1.0050 MHz Ref 15 dBm Atten 25 dB -0.345 dB Peak Log 10 dB/ Offst 1 .005000 MHz -0.345 dB Center 2.479 GHz #VBW 100 kHz Sweep 5 ms (401 pts)

Center	2.479 GI	Ηz							Sp	an 3 MHz
#Res E	3W 30 kH	z		#	<b>VBW 100</b>	kHz		Swe	ep 5 ms (4	401 pts)
Marke	er Trad	ce Ty	/ре	X	Axis		Amplitu	ıde		
1R	(1)	) Fi	eq	2.478870	0 GHz		3.037 df	3m		
1∆	(1)	Fi	eq	1.005	0 MHz		-0.345 c	lΒ		

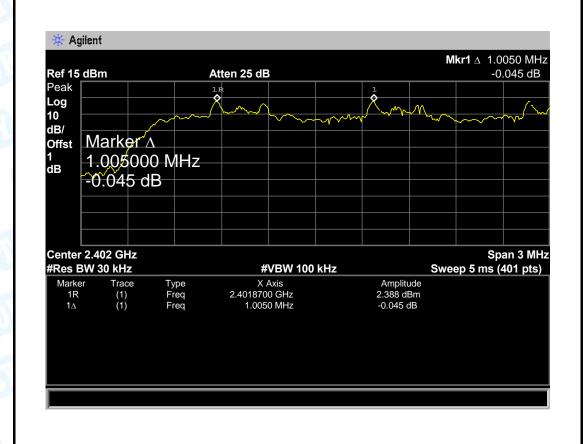


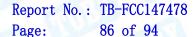
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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		
Test Mode:	Hopping Mode (8-DPSK)		

11 0 '		
Channel frequency	Separation Read Value	Separation Limit
(MHz)	(kHz)	(kHz)
2402	1005.00	816.00
2441	1005.00	817.33
2480	1005.00	816.00

### 8-DPSK Hopping Mode

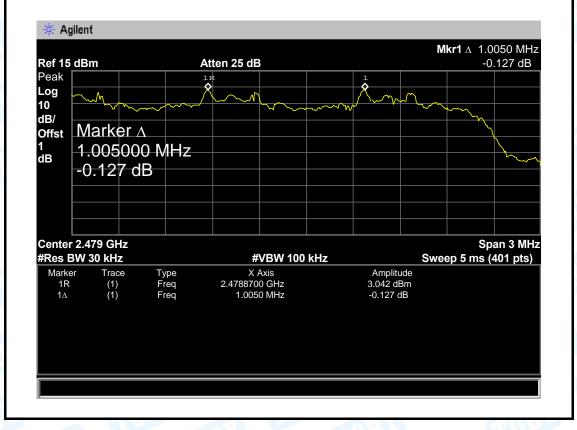






8-DPSK Hopping Mode 2441 MHz \* Agilent **Mkr1** △ 1.0050 MHz -0.371 dB Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Marker ∧ Offst 1.005000 MHz dΒ -0.371 dB Center 2.442 GHz Span 3 MHz #Res BW 30 kHz **#VBW 100 kHz** Sweep 5 ms (401 pts) Type Freq Freq X Axis 2.4408700 GHz Amplitude 2.781 dBm -0.371 dB (1) (1) 1.0050 MHz

# 8-DPSK Hopping Mode 2480 MHz





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# 10. Peak Output Power Test

## 10.1 Test Standard and Limit

10.1.1 Test Standard FCC Part 15.247 (b) (1)

10.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125 mW(21dBm)	2400~2483.5

# 10.2 Test Setup



## 10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Peak Detector: RBW=1 MHz, VBW=3 MHz for bandwidth less than 1MHz. RBW=3 MHz, VBW=3 MHz for bandwidth more than 1MHz.

# 10.4 EUT Operating Condition

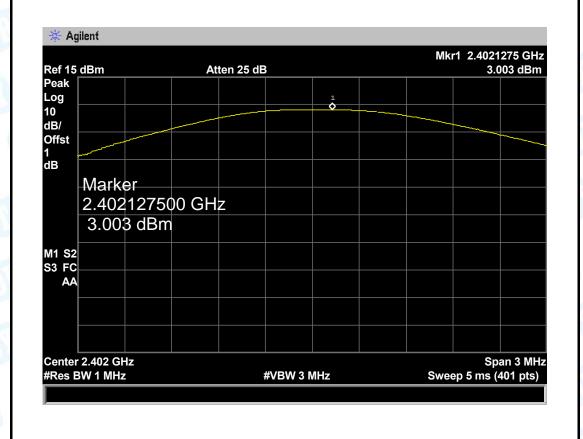
The EUT was set to continuously transmitting in the max power during the test.

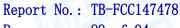


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# 10.5 Test Data

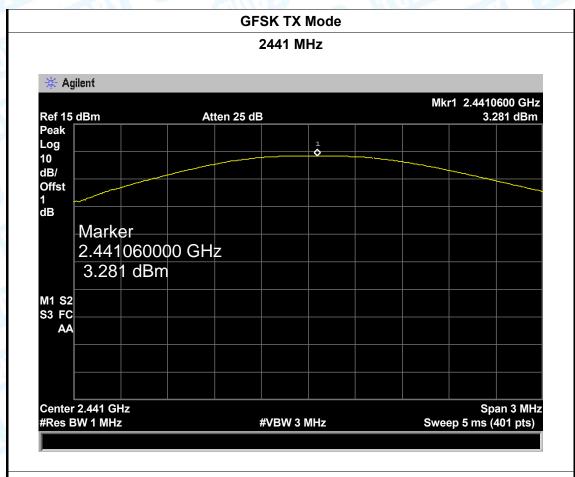
			- N.A. Villa V. Rant		
EUT:	WIRELESS SPEAKER	SHOWER	Model Name	:	F4056591
Temperature:	25 ℃		Relative Hun	nidity:	55%
Test Voltage:	DC 3.7V		U		
Test Mode:	TX Mode	(GFSK)			To The second
Channel frequen	cy (MHz)	Test Result	(dBm)	L	imit (dBm)
2402		3.003			
2441		3.281			30
2480		3.519			
		GFSK TX I	Mode		



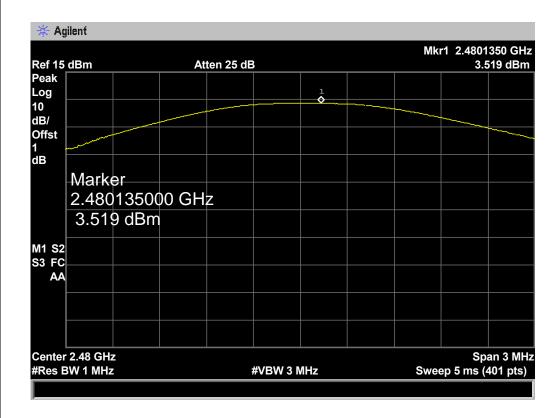




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# **GFSK TX Mode**





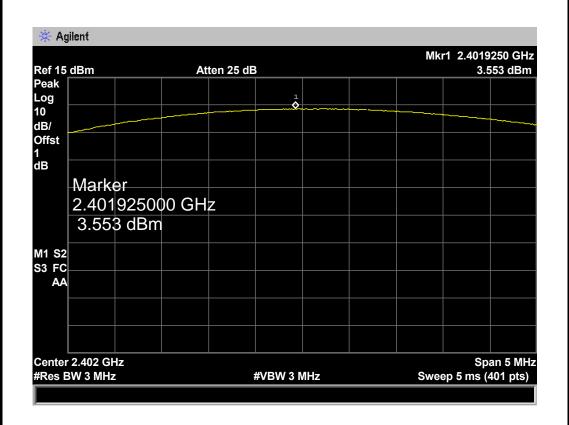
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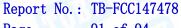
EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V		

Test Mode: ΤΧ Mode ( π /4-DQPSK)

Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	3.553	
2441	3.844	21
2480	4.083	

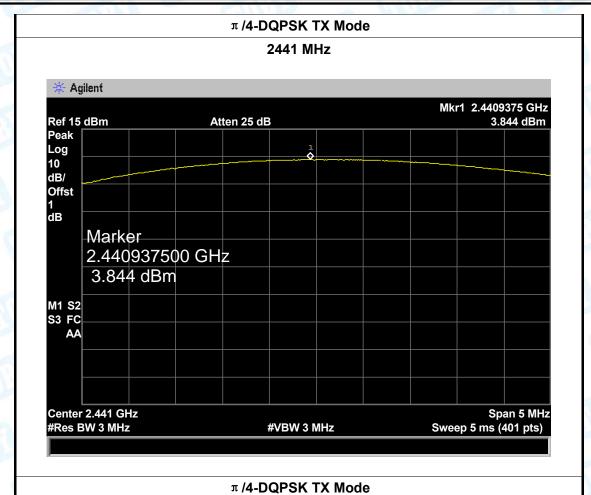
#### π /4-DQPSK TX Mode

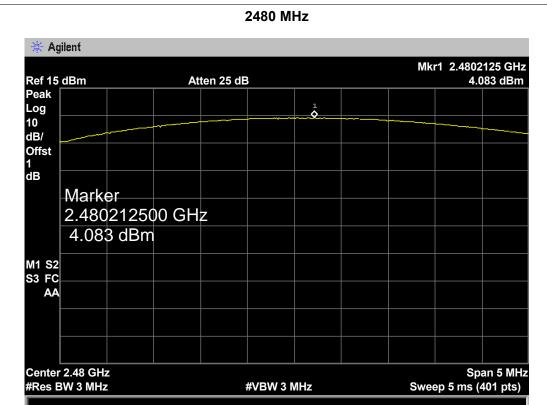






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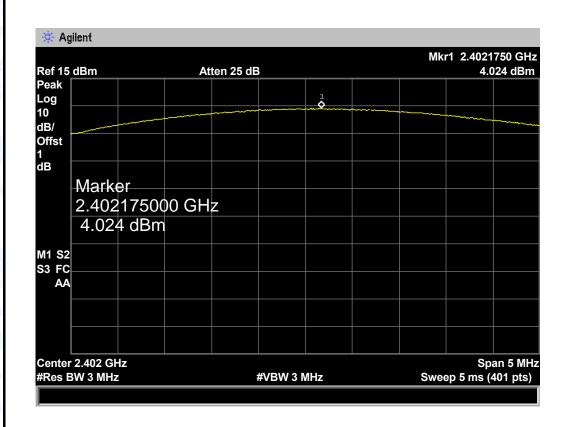
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EUT:	WIRELESS SHOWER SPEAKER	Model Name :	F4056591
Temperature:	25 ℃	Relative Humidity:	55%
Test Voltage:	DC 3.7V	THE STATE OF THE	

TX Mode (8-DPSK) Test Mode:

Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
2402	4.024	
2441	4.340	21
2480	4.543	

#### 8-DPSK TX Mode







8-DPSK TX Mode 2441 MHz 🔆 Agilent Mkr1 2.4411375 GHz 4.34 dBm Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Offst 1 dB Marker 2.441137500 GHz 4.34 dBm M1 S2 S3 FC AA Center 2.441 GHz Span 5 MHz #Res BW 3 MHz #VBW 3 MHz Sweep 5 ms (401 pts) 8-DPSK TX Mode 2480 MHz

\* Agilent Mkr1 2.4801375 GHz 4.543 dBm Ref 15 dBm Atten 25 dB Peak Log 10 dB/ Offst 1 dB Marker 2.480137500 GHz 4.543 dBm M1 S2 S3 FC AΑ Span 5 MHz Center 2.48 GHz #Res BW 3 MHz #VBW 3 MHz Sweep 5 ms (401 pts)



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# 11. Antenna Requirement

# 11.1 Standard Requirement

11.1.1 Standard FCC Part 15.203

### 11.1.2 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.

## 11.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 1.2 dBi, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

The EUT antenna is a PCB antenna. It complies with the standard requirement.

Antenna Type	
Esta	✓ Permanent attached antenna
	□ Unique connector antenna
A.	☐ Professional installation antenna