# FCC Radio Test Report

## *FCC ID: 2AI2I-MAGBY01*

### Original Grant

| | | |
|---|---|---|
| **Report No.** | : | TB-FCC148839 |
| **Applicant** | : | iVue Pty Ltd |
| **Equipment Under Test (EUT)** | | |
| **EUT Name** | : | Wireless Waterproof Speaker |
| **Model No.** | : | MagBy01 |
| **Series Model No.** | : | MagBBy01 |
| **Brand Name** | : | Magtunes |
| **Receipt Date** | : | 2016-07-01 |
| **Test Date** | : | 2016-07-02 to 2016-07-06 |
| **Issue Date** | : | 2016-07-07 |
| **Standards** | : | FCC Part 15: 2015, Subpart C(15.247) |
| **Test Method** | : | ANSI C63.10: 2013 |
| **Conclusions** | : | **PASS**<br>In the configuration tested, the EUT complied with the standards specified above,<br>The EUT technically complies with the FCC requirements |
| **Test/Witness Engineer** | : | IVAN SU |
| **Approved& Authorized** | : | Ray Lai |

SHENZHEN TOBY TECHNOLOGY CO., LTD. TOBY

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 Data ..... 12
5. RADIATED EMISSION TEST ..... 15
5.1 Test Standard and Limit ..... 15
5.2 Test Setup ..... 16
5.3 Test Procedure ..... 17
5.4 EUT Operating Condition ..... 17
6. RESTRICTED BANDS REQUIREMENT ..... 36
6.1 Test Standard and Limit ..... 36
6.2 Test Setup ..... 36
6.3 Test Procedure ..... 36
6.4 EUT Operating Condition ..... 37
6.4 Test Data ..... 37
7. NUMBER OF HOPPING CHANNEL ..... 50
7.1 Test Standard and Limit ..... 50
7.2 Test Setup ..... 50
7.3 Test Procedure ..... 50
7.4 EUT Operating Condition ..... 50
7.5 Test Data ..... 50
8. AVERAGE TIME OF OCCUPANCY ..... 52
8.1 Test Standard and Limit ..... 52
8.2 Test Setup ..... 52
8.3 Test Procedure ..... 52

8.4 EUT Operating Condition ..... 52
8.5 Test Data ..... 53
**9. CHANNEL SEPARATION AND BANDWIDTH TEST ..... 71**
9.1 Test Standard and Limit ..... 71
9.2 Test Setup ..... 71
9.3 Test Procedure ..... 71
9.4 EUT Operating Condition ..... 71
9.5 Test Data ..... 72
**10. PEAK OUTPUT POWER TEST ..... 84**
10.1 Test Standard and Limit ..... 84
10.2 Test Setup ..... 84
10.3 Test Procedure ..... 84
10.4 EUT Operating Condition ..... 84
10.5 Test Data ..... 85
**11. ANTENNA REQUIREMENT ..... 91**
11.1 Standard Requirement ..... 91
11.2 Antenna Connected Construction ..... 91

# 1. General Information about EUT

## 1.1 Client Information

| | | |
|---|---|---|
| **Applicant** | : | iVue Pty Ltd |
| **Address** | : | 79 Britannia Road, Castle Hill, NSW 2154, Sydney, Australia |
| **Manufacturer** | : | David Hao |
| **Address** | : | 4F, B7 Building, Hengfeng industrial City, Hezhou Village, Xixiang Town, Bao'an District, Shenzhen City, China |

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

| | | | |
|---|---|---|---|
| **EUT Name** | : | Wireless Waterproof Speaker | |
| **Models No.** | : | MagBy01, MagBBy01 | |
| **Model Difference** | : | All these models are identical in the same PCB, layout and electrical circuit, the only difference is model name for commercial. | |
| **Product Description** | : | Operation Frequency:<br>Bluetooth4.0(2.1+EDR/3.0) : 2402~2480MHz | |
| | | Number of Channel: | Bluetooth:79 Channels **See Note 2** |
| | | Max Peak Output Power: | Bluetooth: 4.682 dBm(GFSK) |
| | | Antenna Gain: | 0.5 dBi PCB Antenna |
| | | Modulation Type: | GFSK 1Mbps(1 Mbps)<br>π/4-DQPSK(2 Mbps)<br>8-DPSK(3 Mbps) |
| **Power Supply** | : | DC Voltage supplied from Host System by USB cable.<br>DC power by Li-ion Battery. | |
| **Power Rating** | : | DC 5.0V by USB cable.<br>DC 3.7V by 4400mAh Li-ion Battery. | |
| **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:

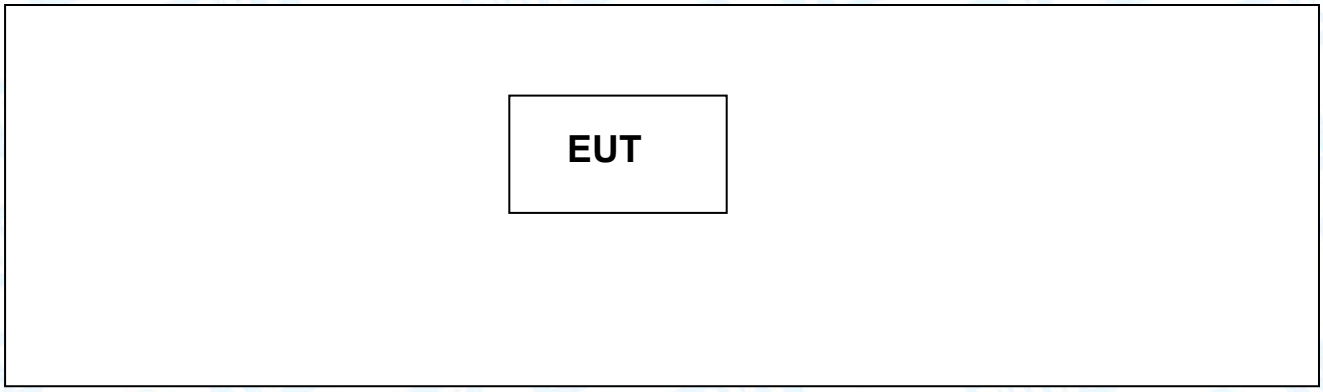
| **Bluetooth Channel List** | | | | | |
|---|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **Channel** | **Frequency (MHz)** | **Channel** | **Frequency (MHz)** |
| **00** | **2402** | 27 | 2429 | 54 | 2456 |
| 01 | 2403 | 28 | 2430 | 55 | 2457 |
| 02 | 2404 | 29 | 2431 | 56 | 2458 |
|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

| | | | | | |
|---|---|---|---|---|---|
| 04 | 2406 | 31 | 2433 | 58 | 2460 |
| 05 | 2407 | 32 | 2434 | 59 | 2461 |
| 06 | 2408 | 33 | 2435 | 60 | 2462 |
| 07 | 2409 | 34 | 2436 | 61 | 2463 |
| 08 | 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 | | |
| 26 | 2428 | 53 | 2455 | | |

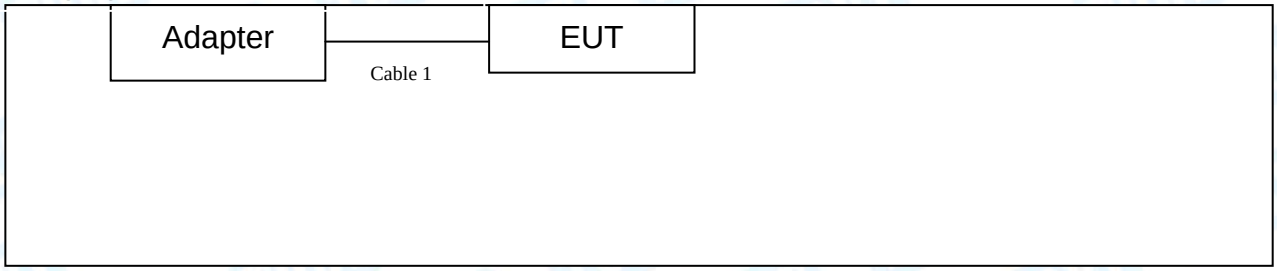
(3) The Antenna information about the equipment is provided by the applicant.

## 1.3 Block Diagram Showing the Configuration of System Tested

**TX Mode**



**Charging with TX Mode**




## 1.4 Description of Support Units

| Equipment Information | | | | |
|---|---|---|---|---|
| **Name** | **Model** | **FCC ID/DOC** | **Manufacturer** | **Used "√"** |
| AC/DC Adapter | TEKA012 | ----- | TEKA | √ |
| **Cable Information** | | | | |
| **Number** | **Shielded Type** | **Ferrite Core** | **Length** | **Note** |
| Cable 1 | NO | NO | 1.0M | **Accessorise** |

## 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.

## 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** | **Realtek Bluetooth MP** | | |
|---|---|---|---|
| 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 ± 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:<br>9kHz~150kHz<br>150kHz to 30MHz | <br>±3.42 dB<br>±3.42 dB |
| Radiated Emission | Level Accuracy:<br>9kHz to 30 MHz | ±4.60 dB |
| Radiated Emission | Level Accuracy:<br>30MHz to 1000 MHz | ±4.40 dB |
| Radiated Emission | Level Accuracy:<br>Above 1000MHz | ±4.20 dB |

## 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.

# 2. Test Summary

| FCC Part 15 Subpart C(15.247)/ RSS 247 Issue 1 | | | | |
|---|---|---|---|---|
| **Standard Section** | | **Test Item** | **Judgment** | **Remark** |
| **FCC** | **IC** | | | |
| 15.203 | | 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<br>GFSK:857.81kHz<br>π/4-DQPSK: 1077.01kHz<br>8-DPSK: 1077.21KHz |
| **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 | 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. 08, 2015 | Aug. 07, 2016 |
| **Radiation Emission Test** | | | | | |
| **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Cal.** | **Cal. Due Date** |
| Spectrum Analyzer | Agilent | E4407B | MY45106456 | Aug. 07, 2015 | Aug. 06, 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 |
| **Antenna Conducted Emission** | | | | | |
| **Equipment** | **Manufacturer** | **Model No.** | **Serial No.** | **Last Cal.** | **Cal. Due Date** |
| Spectrum Analyzer | Agilent | E4407B | MY45106456 | Aug. 07, 2015 | Aug. 06, 2016 |
| EMI Test Receiver | Rohde & Schwarz | ESCI | 100010/007 | Aug. 07, 2015 | Aug. 06, 2016 |
| Power Meter | Anritsu | ML2495A | 25406005 | Aug.07, 2015 | Aug.06, 2016 |
| Power Sensor | Anritsu | ML2411B | 25406005 | Aug.07, 2015 | Aug.06, 2016 |

# 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 |

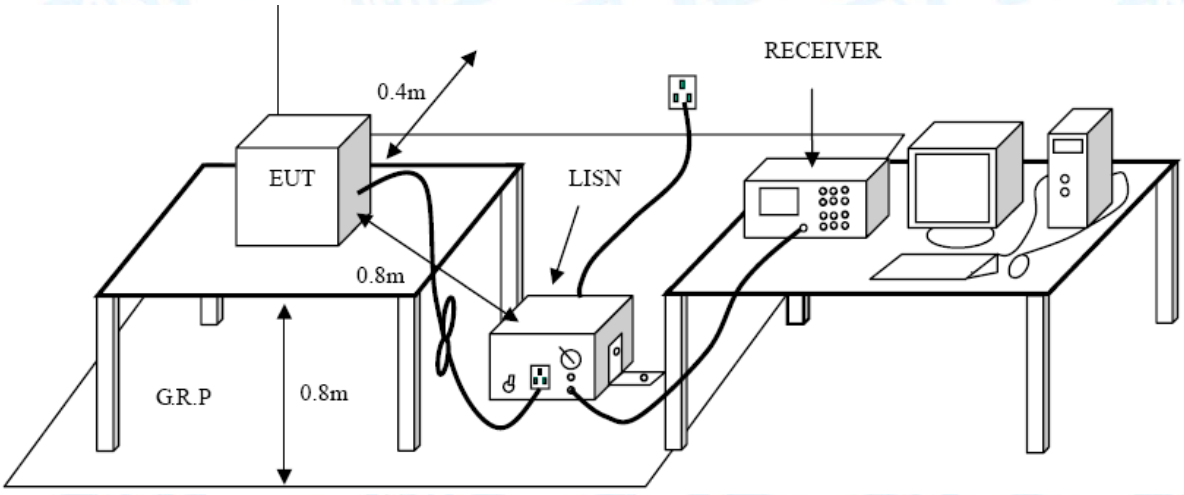
Notes:

(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 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

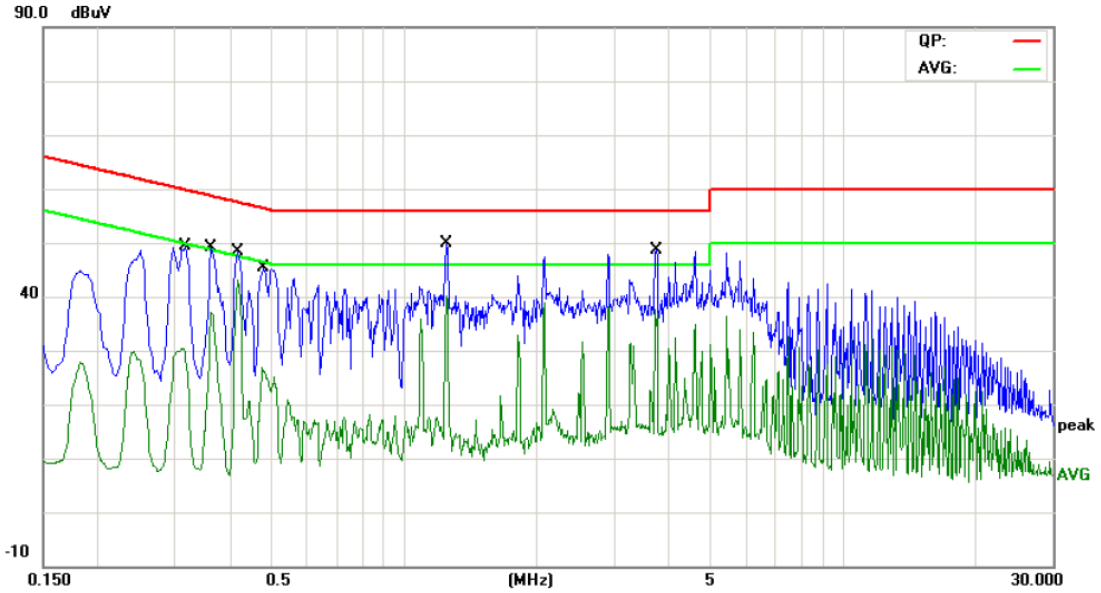
## 4.4 EUT Operating Mode

Please refer to the description of test mode.

## 4.5 Test Data

Test data please refer the following pages.

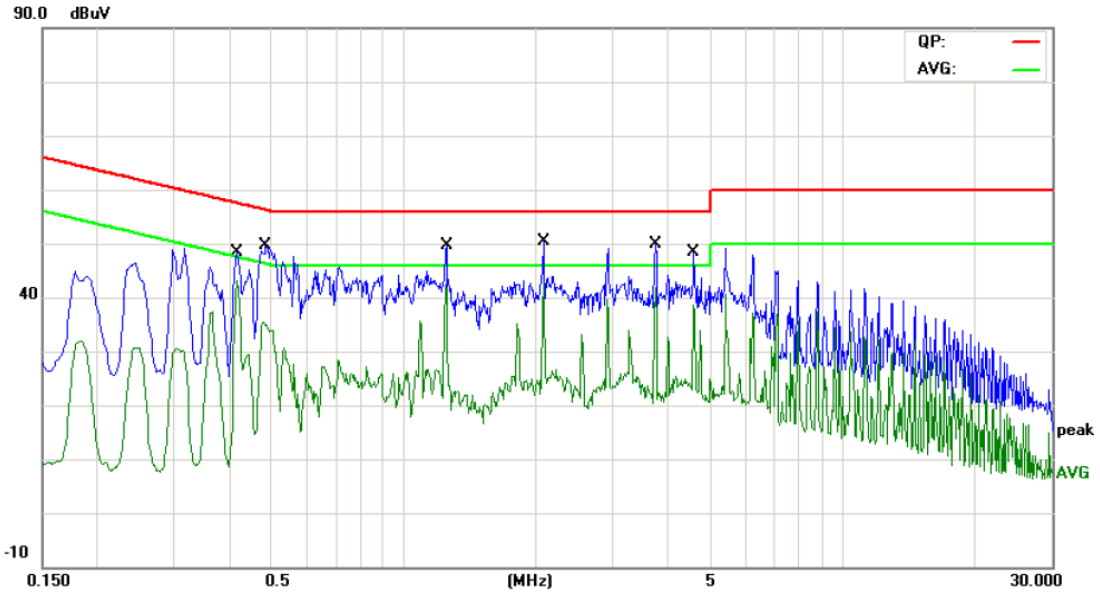
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | AC 120V/60 Hz | | |
| Terminal: | Line | | |
| Test Mode: | Charging with TX GFSK Mode 2402 MHz | | |
| Remark: | Only worse case is reported | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.3180 | 34.19 | 10.02 | 44.21 | 59.76 | -15.55 | QP |
| 2 | | 0.3180 | 15.15 | 10.02 | 25.17 | 49.76 | -24.59 | AVG |
| 3 | | 0.3620 | 32.58 | 10.02 | 42.60 | 58.68 | -16.08 | QP |
| 4 | | 0.3620 | 25.54 | 10.02 | 35.56 | 48.68 | -13.12 | AVG |
| 5 | | 0.4180 | 36.70 | 10.02 | 46.72 | 57.49 | -10.77 | QP |
| 6 | * | 0.4180 | 32.66 | 10.02 | 42.68 | 47.49 | -4.81 | AVG |
| 7 | | 0.4780 | 30.91 | 10.02 | 40.93 | 56.37 | -15.44 | QP |
| 8 | | 0.4780 | 15.36 | 10.02 | 25.38 | 46.37 | -20.99 | AVG |
| 9 | | 1.2460 | 24.56 | 10.06 | 34.62 | 56.00 | -21.38 | QP |
| 10 | | 1.2460 | 11.99 | 10.06 | 22.05 | 46.00 | -23.95 | AVG |
| 11 | | 3.7420 | 27.93 | 10.00 | 37.93 | 56.00 | -18.07 | QP |
| 12 | | 3.7420 | 18.98 | 10.00 | 28.98 | 46.00 | -17.02 | AVG |

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | AC 120V/60 Hz | | |
| Terminal: | Neutral | | |
| Test Mode: | Charging with 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 | | 0.4180 | 35.05 | 10.05 | 45.10 | 57.49 | -12.39 | QP |
| 2 | * | 0.4180 | 32.78 | 10.05 | 42.83 | 47.49 | -4.66 | AVG |
| 3 | | 0.4860 | 36.02 | 10.02 | 46.04 | 56.24 | -10.20 | QP |
| 4 | | 0.4860 | 24.08 | 10.02 | 34.10 | 46.24 | -12.14 | AVG |
| 5 | | 1.2500 | 32.80 | 10.13 | 42.93 | 56.00 | -13.07 | QP |
| 6 | | 1.2500 | 27.02 | 10.13 | 37.15 | 46.00 | -8.85 | AVG |
| 7 | | 2.0780 | 26.03 | 10.06 | 36.09 | 56.00 | -19.91 | QP |
| 8 | | 2.0780 | 15.19 | 10.06 | 25.25 | 46.00 | -20.75 | AVG |
| 9 | | 3.7420 | 22.67 | 10.06 | 32.73 | 56.00 | -23.27 | QP |
| 10 | | 3.7420 | 11.06 | 10.06 | 21.12 | 46.00 | -24.88 | AVG |
| 11 | | 4.5739 | 22.11 | 10.06 | 32.17 | 56.00 | -23.83 | QP |
| 12 | | 4.5739 | 10.83 | 10.06 | 20.89 | 46.00 | -25.11 | AVG |

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

# 5. Radiated Emission Test

## 5.1 Test Standard and Limit

5.1.1 Test Standard

FCC Part 15.209

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)**

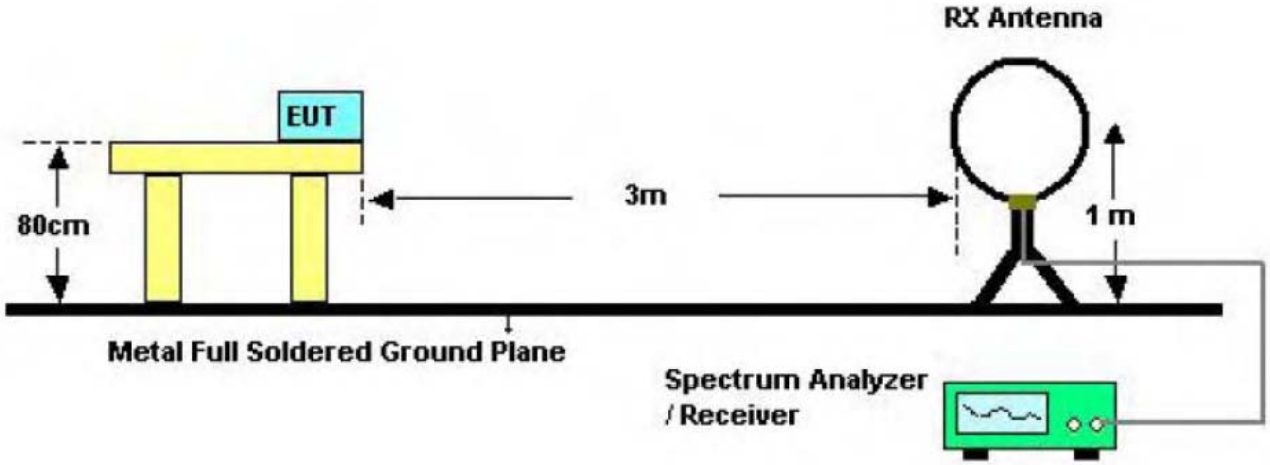
| Frequency (MHz) | Class B (dBuV/m)(at 3m) | |
|---|---|---|
| | Peak | Average |
| Above 1000 | 74 | 54 |

**Note:**

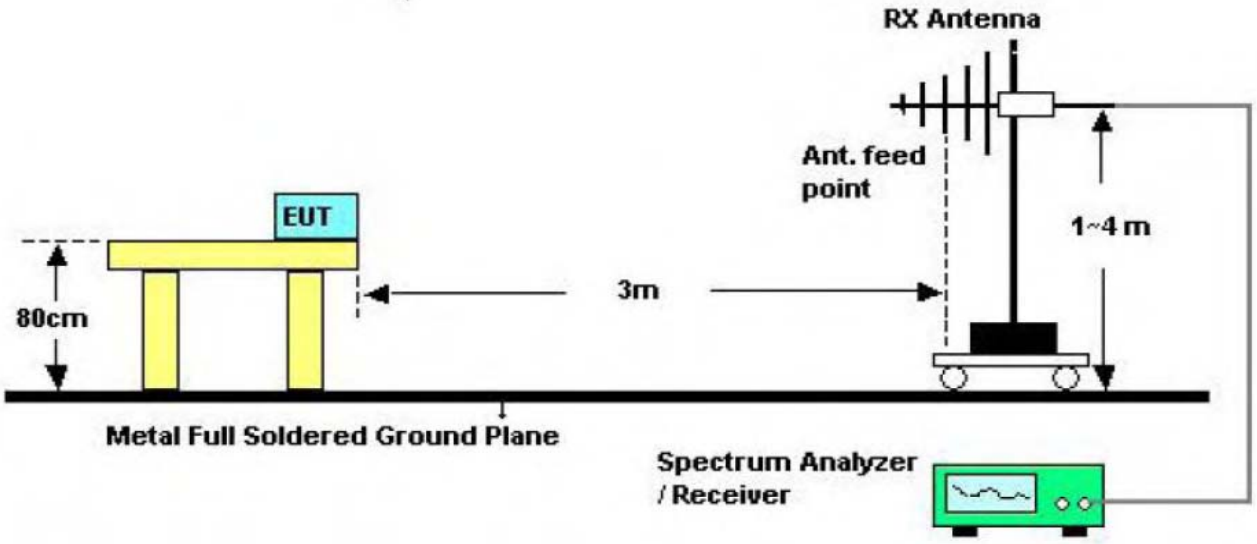
(1) The tighter limit applies at the band edges.

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

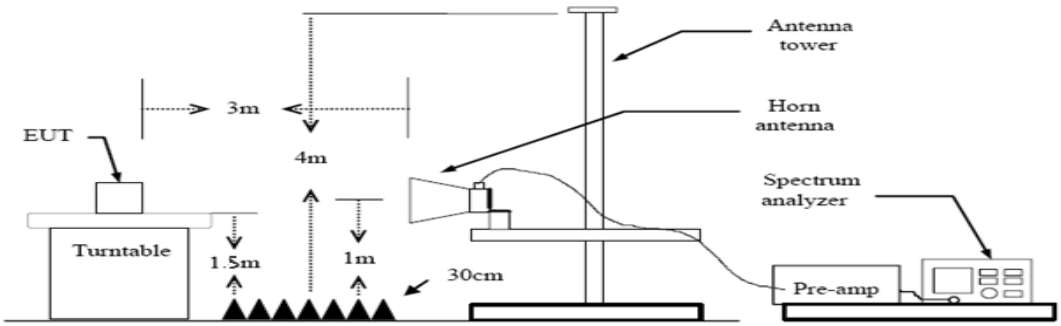
## 5.2 Test Setup




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

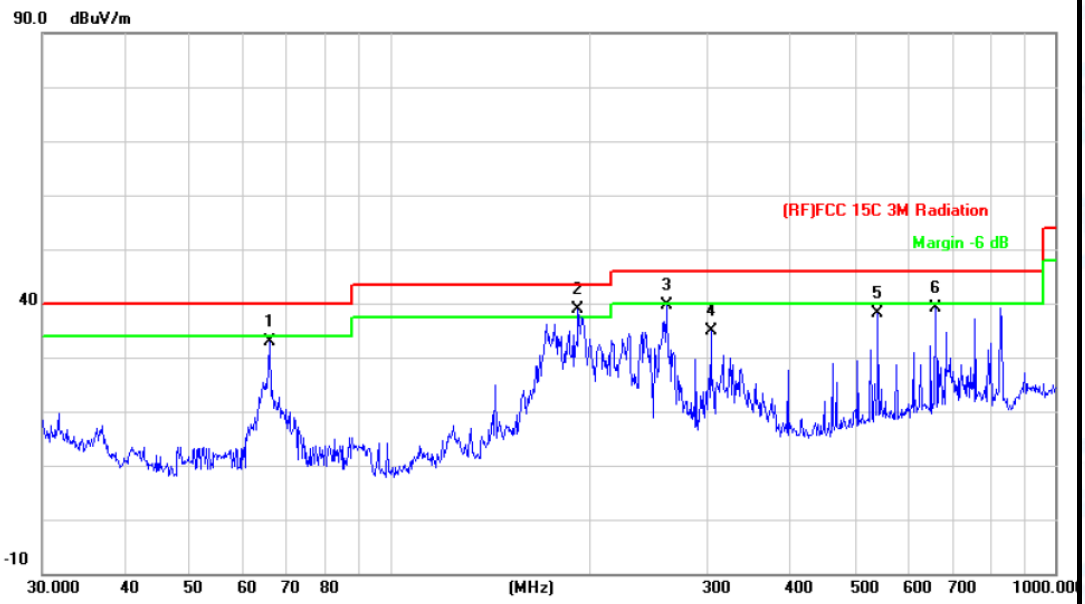
The Equipment Under Test was set to Continual Transmitting in maximum power in TX mode.

## 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.

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX GFSK Mode 2402MHz | | |
| Remark: | Only worse case is reported | | |

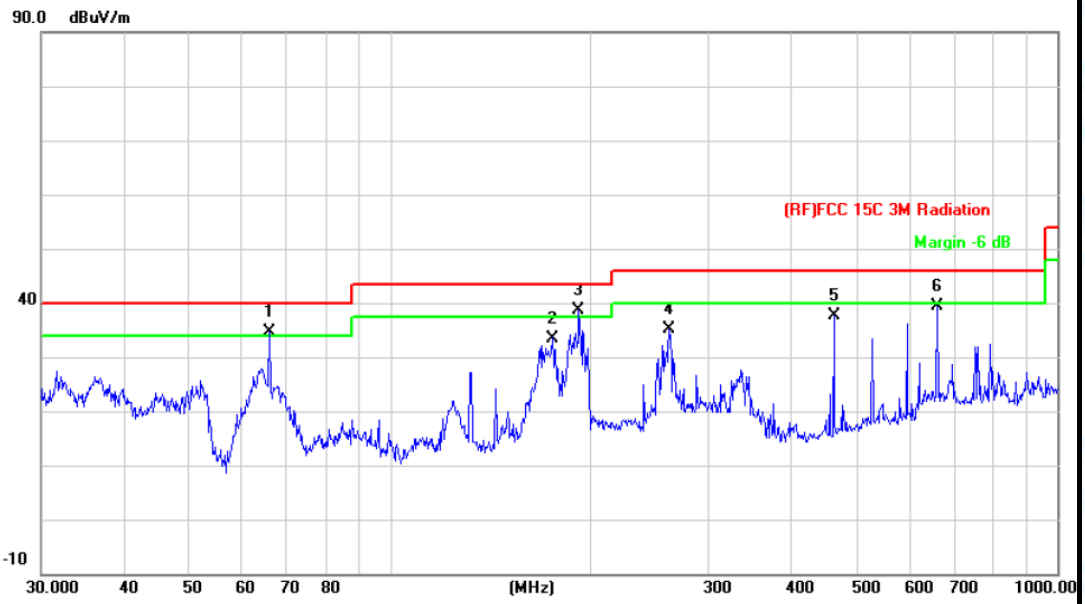



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 66.0340 | 56.82 | -23.98 | 32.84 | 40.00 | -7.16 | peak |
| 2 | * | 191.7450 | 59.75 | -20.81 | 38.94 | 43.50 | -4.56 | peak |
| 3 | | 260.1444 | 57.51 | -17.90 | 39.61 | 46.00 | -6.39 | peak |
| 4 | | 303.5437 | 51.92 | -16.95 | 34.97 | 46.00 | -11.03 | peak |
| 5 | | 541.3723 | 48.34 | -10.13 | 38.21 | 46.00 | -7.79 | peak |
| 6 | | 661.1503 | 47.29 | -8.21 | 39.08 | 46.00 | -6.92 | peak |

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

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX GFSK Mode 2402MHz | | |
| Remark: | Only worse case is reported | | |

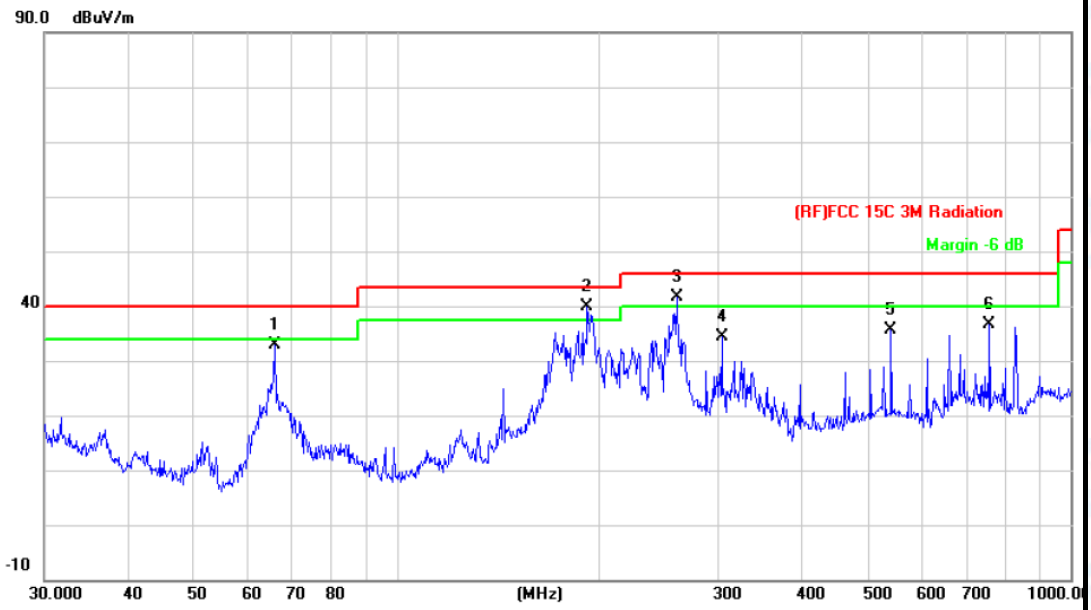



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | ! | 66.0340 | 58.56 | -23.98 | 34.58 | 40.00 | -5.42 | peak |
| 2 | | 175.0365 | 54.38 | -20.88 | 33.50 | 43.50 | -10.00 | peak |
| 3 | * | 191.7450 | 59.38 | -20.81 | 38.57 | 43.50 | -4.93 | peak |
| 4 | | 261.9753 | 53.08 | -17.86 | 35.22 | 46.00 | -10.78 | peak |
| 5 | | 462.3455 | 49.65 | -12.03 | 37.62 | 46.00 | -8.38 | peak |
| 6 | | 661.1503 | 47.67 | -8.21 | 39.46 | 46.00 | -6.54 | peak |

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

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX π/4-DQPSK Mode 2402MHz | | |
| Remark: | Only worse case is reported | | |

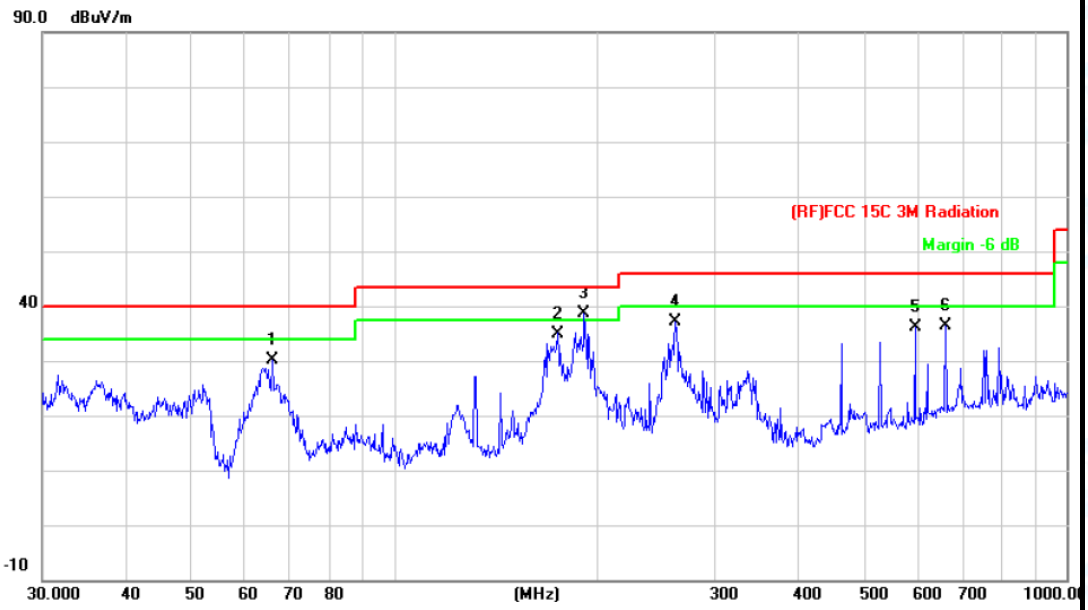



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 66.0340 | 56.82 | -23.98 | 32.84 | 40.00 | -7.16 | peak |
| 2 | * | 191.7450 | 60.75 | -20.81 | 39.94 | 43.50 | -3.56 | peak |
| 3 | ! | 260.1444 | 59.51 | -17.90 | 41.61 | 46.00 | -4.39 | peak |
| 4 | | 303.5437 | 51.42 | -16.95 | 34.47 | 46.00 | -11.53 | peak |
| 5 | | 541.3721 | 45.84 | -10.13 | 35.71 | 46.00 | -10.29 | peak |
| 6 | | 758.0407 | 43.60 | -6.96 | 36.64 | 46.00 | -9.36 | peak |

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

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX π/4-DQPSK Mode 2402MHz | | |
| Remark: | Only worse case is reported | | |

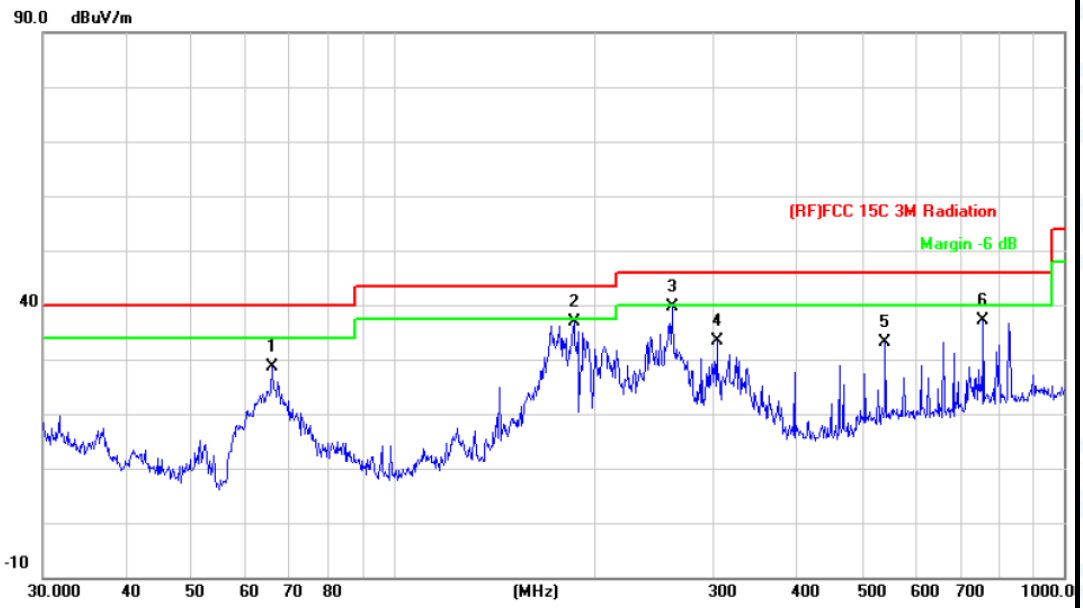



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 66.0340 | 54.06 | -23.98 | 30.08 | 40.00 | -9.92 | peak |
| 2 | | 175.0365 | 55.88 | -20.88 | 35.00 | 43.50 | -8.50 | peak |
| 3 | * | 191.7450 | 59.38 | -20.81 | 38.57 | 43.50 | -4.93 | peak |
| 4 | | 261.9753 | 55.08 | -17.86 | 37.22 | 46.00 | -8.78 | peak |
| 5 | | 595.1326 | 45.73 | -9.59 | 36.14 | 46.00 | -9.86 | peak |
| 6 | | 661.1503 | 44.67 | -8.21 | 36.46 | 46.00 | -9.54 | peak |

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

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz | | |
| Remark: | Only worse case is reported | | |

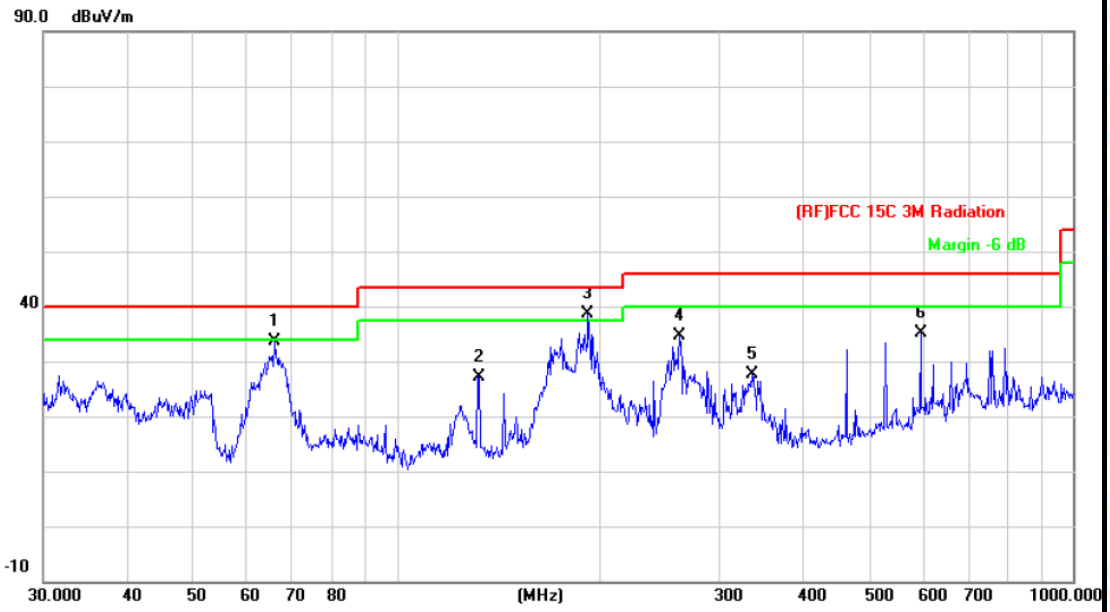



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 65.8031 | 52.56 | -23.99 | 28.57 | 40.00 | -11.43 | peak |
| 2 | | 185.7880 | 57.70 | -20.76 | 36.94 | 43.50 | -6.56 | peak |
| 3 | * | 260.1444 | 57.51 | -17.90 | 39.61 | 46.00 | -6.39 | peak |
| 4 | | 303.5437 | 50.42 | -16.95 | 33.47 | 46.00 | -12.53 | peak |
| 5 | | 541.3721 | 43.34 | -10.13 | 33.21 | 46.00 | -12.79 | peak |
| 6 | | 758.0407 | 44.10 | -6.96 | 37.14 | 46.00 | -8.86 | peak |

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

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz | | |
| Remark: | Only worse case is reported | | |

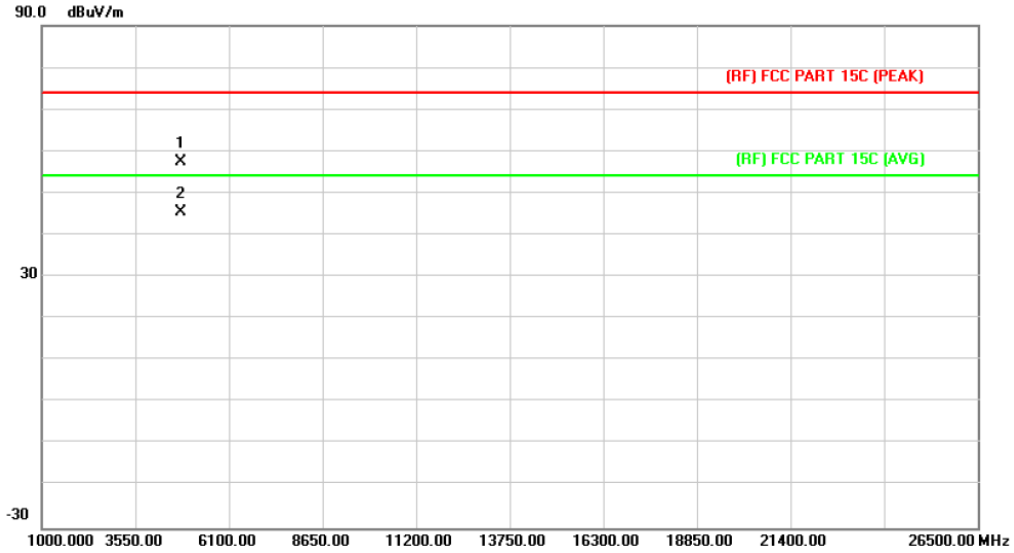



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 66.0340 | 57.56 | -23.98 | 33.58 | 40.00 | -6.42 | peak |
| 2 | | 132.2204 | 49.28 | -22.13 | 27.15 | 43.50 | -16.35 | peak |
| 3 | * | 191.7450 | 59.38 | -20.81 | 38.57 | 43.50 | -4.93 | peak |
| 4 | | 261.9753 | 52.58 | -17.86 | 34.72 | 46.00 | -11.28 | peak |
| 5 | | 334.8589 | 43.19 | -15.54 | 27.65 | 46.00 | -18.35 | peak |
| 6 | | 595.1326 | 44.73 | -9.59 | 35.14 | 46.00 | -10.86 | peak |

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

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

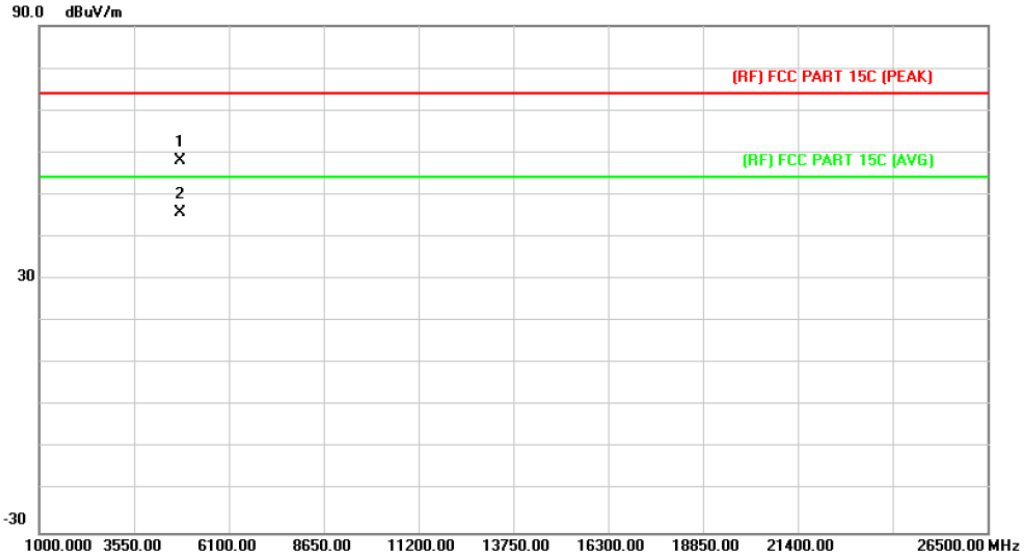
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX GFSK Mode 2402MHz | | |
| Remark: | No report for the emission which more than 10 dB below 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 | | 4803.253 | 43.88 | 13.44 | 57.32 | 74.00 | -16.68 | peak |
| 2 | * | 4804.123 | 31.87 | 13.44 | 45.31 | 54.00 | -8.69 | AVG |

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

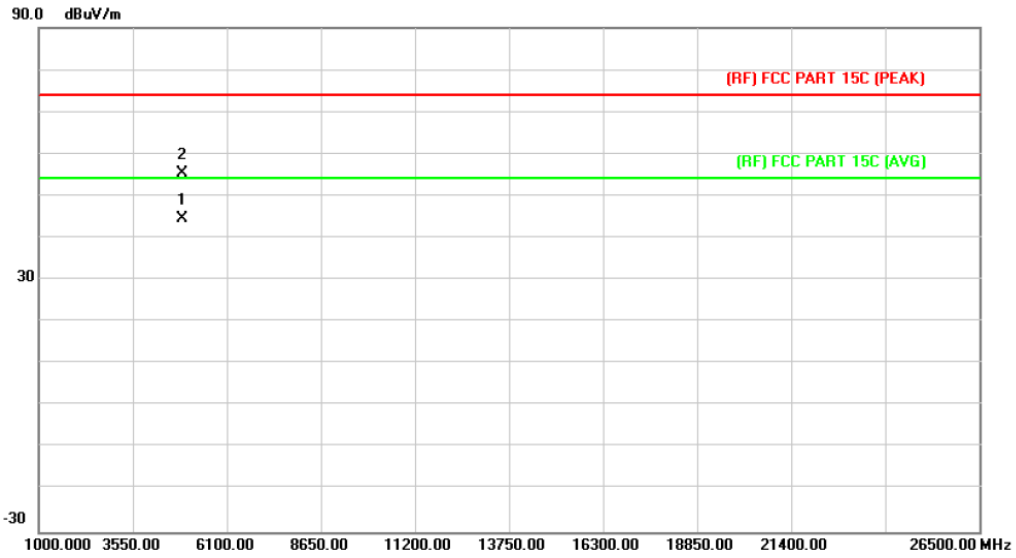
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX GFSK Mode 2402MHz | | |
| Remark: | No report for the emission which more than 10 dB below 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 | | 4803.787 | 44.76 | 13.44 | 58.20 | 74.00 | -15.80 | peak |
| 2 | * | 4803.907 | 32.23 | 13.44 | 45.67 | 54.00 | -8.33 | AVG |

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

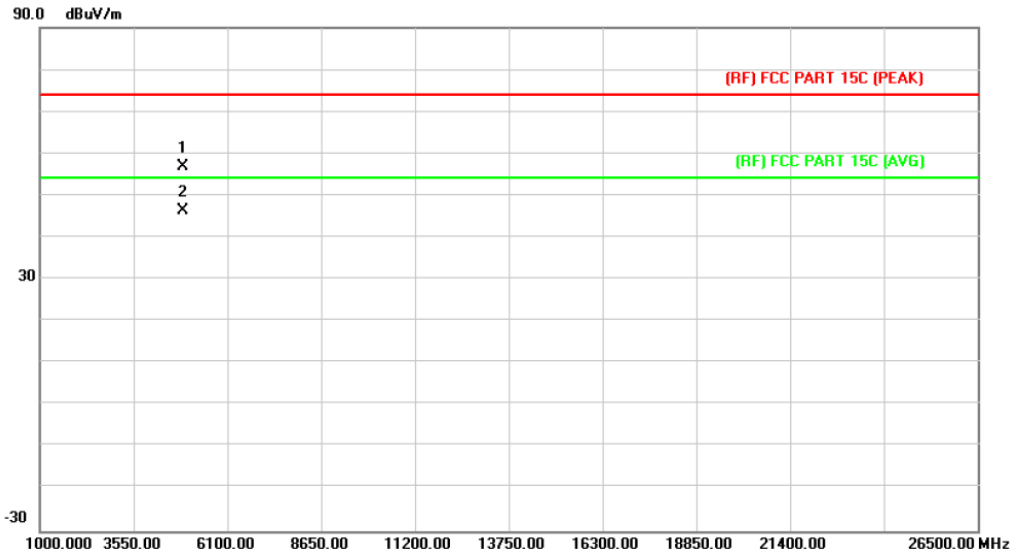
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX GFSK Mode 2441MHz | | |
| Remark: | No report for the emission which more than 10 dB below 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 | * | 4880.620 | 30.80 | 13.89 | 44.69 | 54.00 | -9.31 | AVG |
| 2 | | 4882.531 | 41.48 | 13.90 | 55.38 | 74.00 | -18.62 | peak |

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

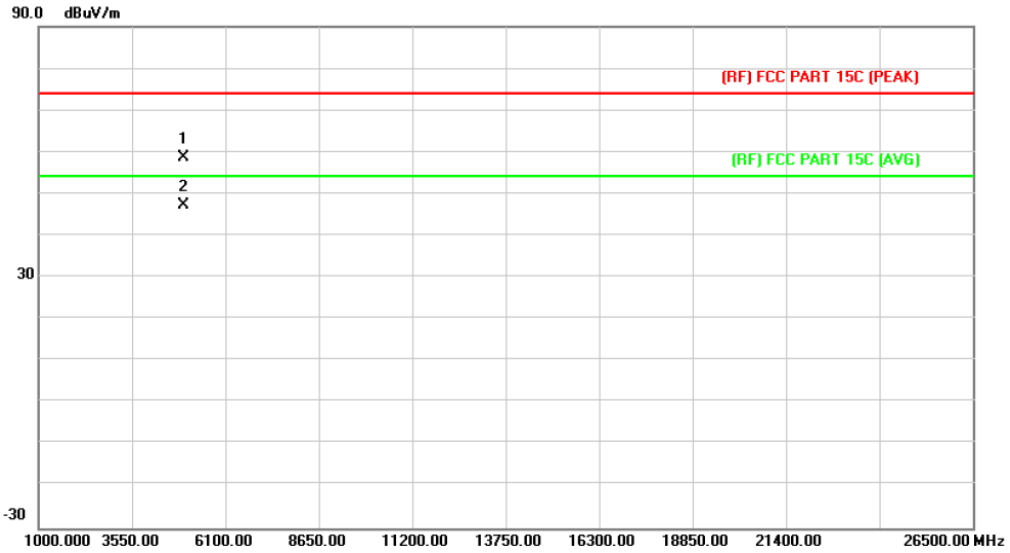
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX GFSK Mode 2441MHz | | |
| Remark: | No report for the emission which more than 10 dB below 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 | | 4881.352 | 43.08 | 13.90 | 56.98 | 74.00 | -17.02 | peak |
| 2 | * | 4882.312 | 32.42 | 13.90 | 46.32 | 54.00 | -7.68 | AVG |

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

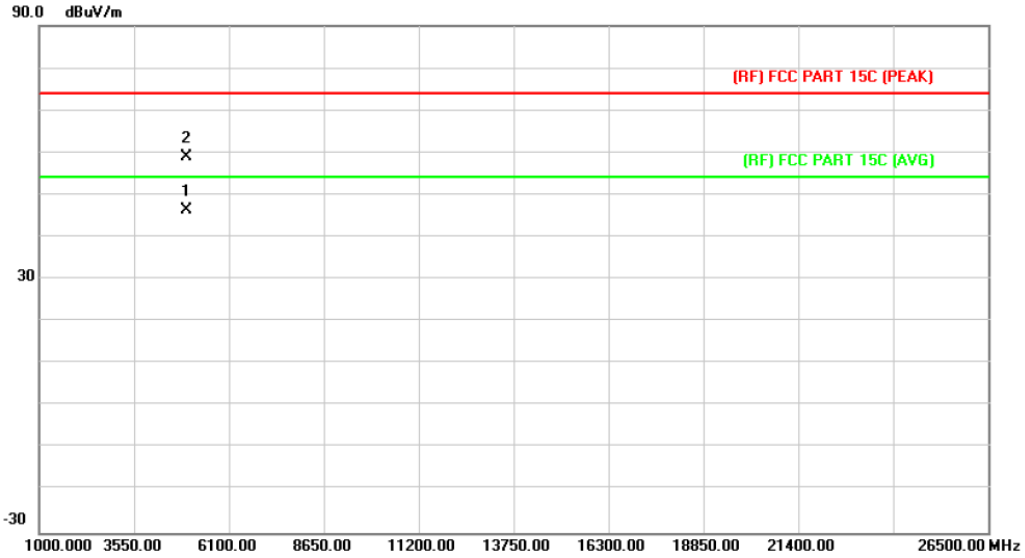
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX GFSK Mode 2480MHz | | |
| Remark: | No report for the emission which more than 10 dB below 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 | | 4959.445 | 44.31 | 14.36 | 58.67 | 74.00 | -15.33 | peak |
| 2 | * | 4960.804 | 32.94 | 14.36 | 47.30 | 54.00 | -6.70 | AVG |

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

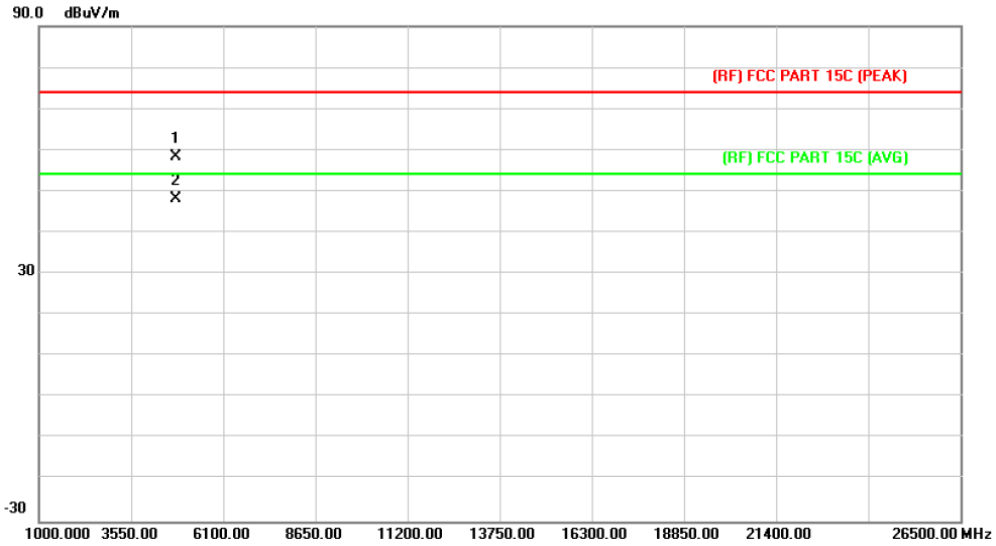
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX GFSK Mode 2480MHz | | |
| Remark: | No report for the emission which more than 10 dB below 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 | * | 4959.743 | 31.85 | 14.36 | 46.21 | 54.00 | -7.79 | AVG |
| 2 | | 4960.493 | 44.57 | 14.36 | 58.93 | 74.00 | -15.07 | peak |

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

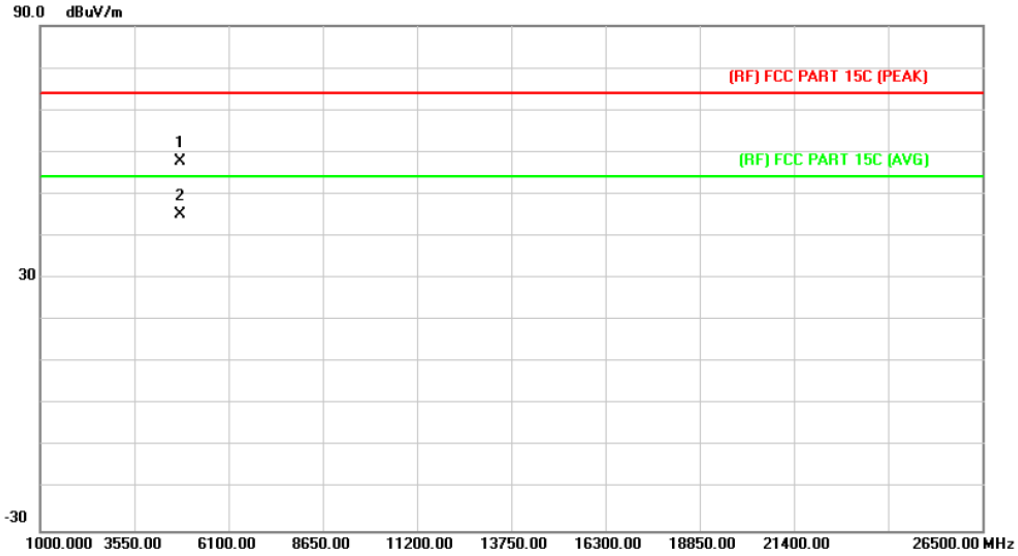
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz | | |
| Remark: | No report for the emission which more than 10 dB below the prescribed limit. | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4803.649 | 44.87 | 13.44 | 58.31 | 74.00 | -15.69 | peak |
| 2 | * | 4803.881 | 34.68 | 13.44 | 48.12 | 54.00 | -5.88 | AVG |

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

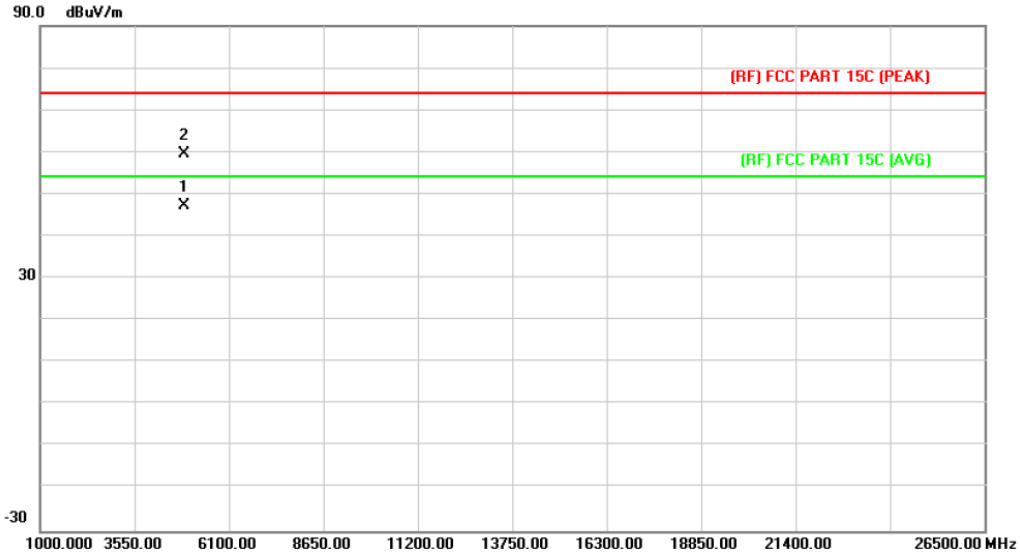
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz | | |
| Remark: | No report for the emission which more than 10 dB below the prescribed limit. | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4804.017 | 44.24 | 13.44 | 57.68 | 74.00 | -16.32 | peak |
| 2 | * | 4804.457 | 31.77 | 13.44 | 45.21 | 54.00 | -8.79 | AVG |

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

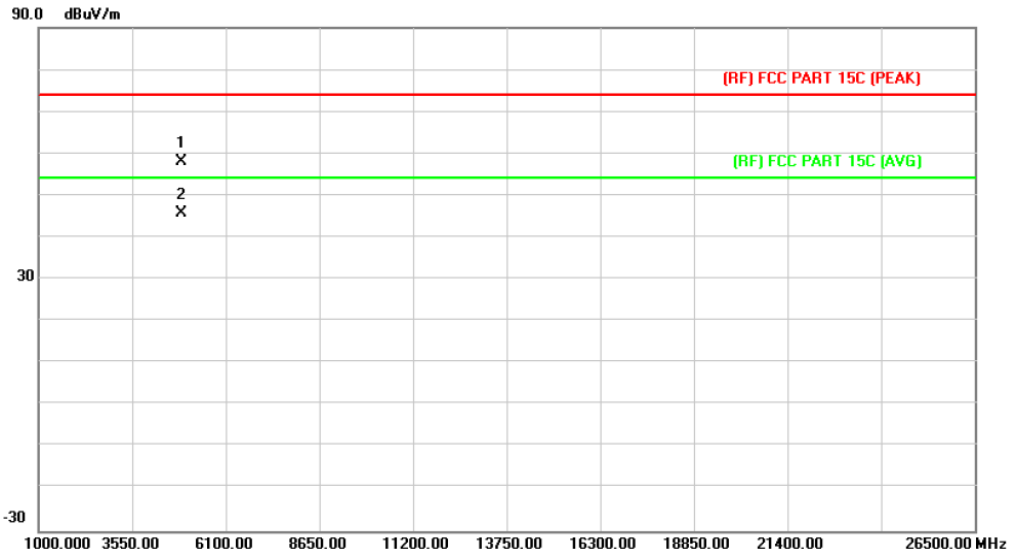
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX 8-DPSK Mode 2441MHz | | |
| Remark: | No report for the emission which more than 10 dB below the prescribed limit. | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | * | 4881.511 | 33.41 | 13.90 | 47.31 | 54.00 | -6.69 | AVG |
| 2 | | 4882.130 | 45.71 | 13.90 | 59.61 | 74.00 | -14.39 | peak |

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

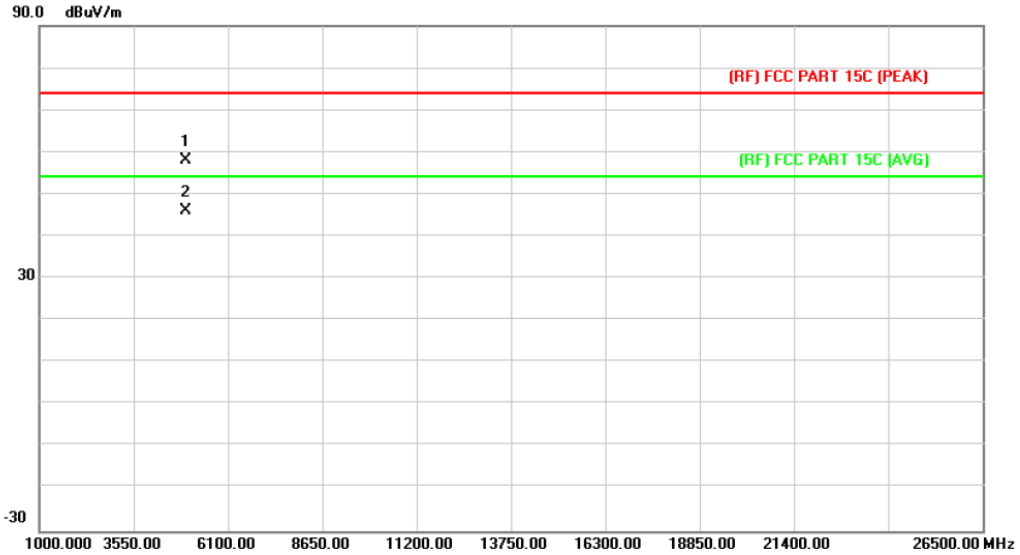
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX 8-DPSK Mode 2441MHz | | |
| Remark: | No report for the emission which more than 10 dB below the prescribed limit. | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 4881.649 | 44.09 | 13.90 | 57.99 | 74.00 | -16.01 | peak |
| 2 | * | 4882.188 | 31.79 | 13.90 | 45.69 | 54.00 | -8.31 | AVG |

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

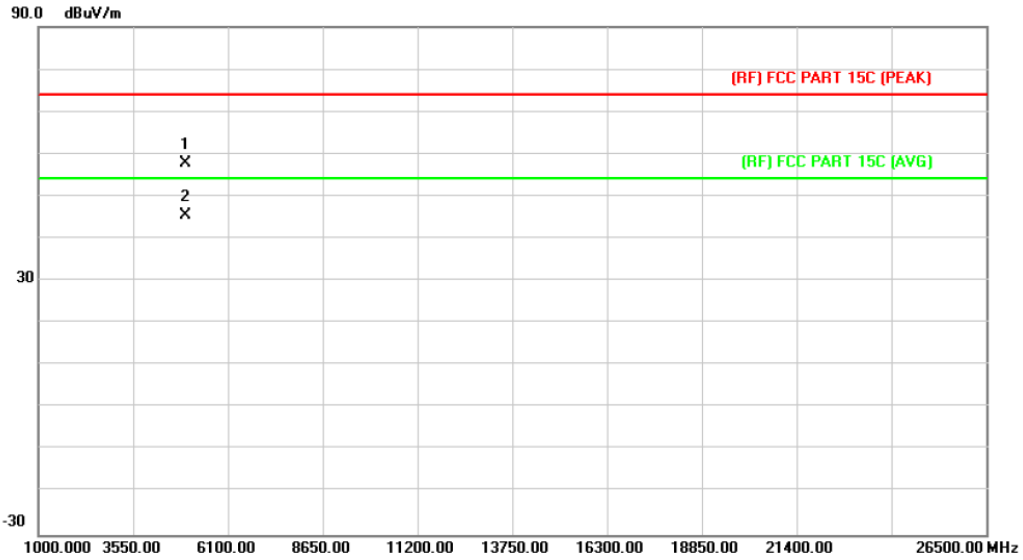
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX 8-DPSK Mode 2480MHz | | |
| Remark: | No report for the emission which more than 10 dB 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 | | 4959.699 | 43.62 | 14.36 | 57.98 | 74.00 | -16.02 | peak |
| 2 | * | 4960.430 | 31.65 | 14.36 | 46.01 | 54.00 | -7.99 | AVG |

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX 8-DPSK Mode 2480MHz | | |
| 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 | | 4959.754 | 43.52 | 14.36 | 57.88 | 74.00 | -16.12 | peak |
| 2 | * | 4960.147 | 31.10 | 14.36 | 45.46 | 54.00 | -8.54 | AVG |

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

# 6. Restricted Bands Requirement

## 6.1 Test Standard and Limit

### 6.1.1 Test Standard

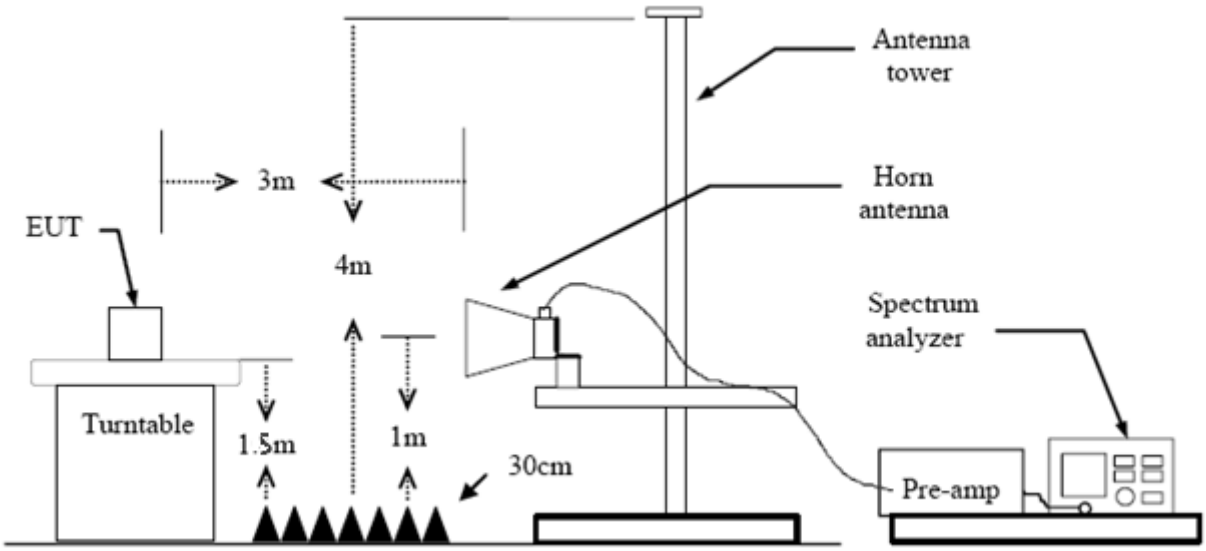
FCC Part 15.209

FCC Part 15.205

### 6.1.2 Test Limit

| Restricted Frequency Band (MHz) | Class B (dBuV/m)(at 3m) | |
|---|---|---|
| | Peak | Average |
| 2310 ~2390 | 74 | 54 |
| 2483.5 ~2500 | 74 | 54 |
| **Note: All restriction bands have been tested, only the worst case is reported.** | | |

## 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.

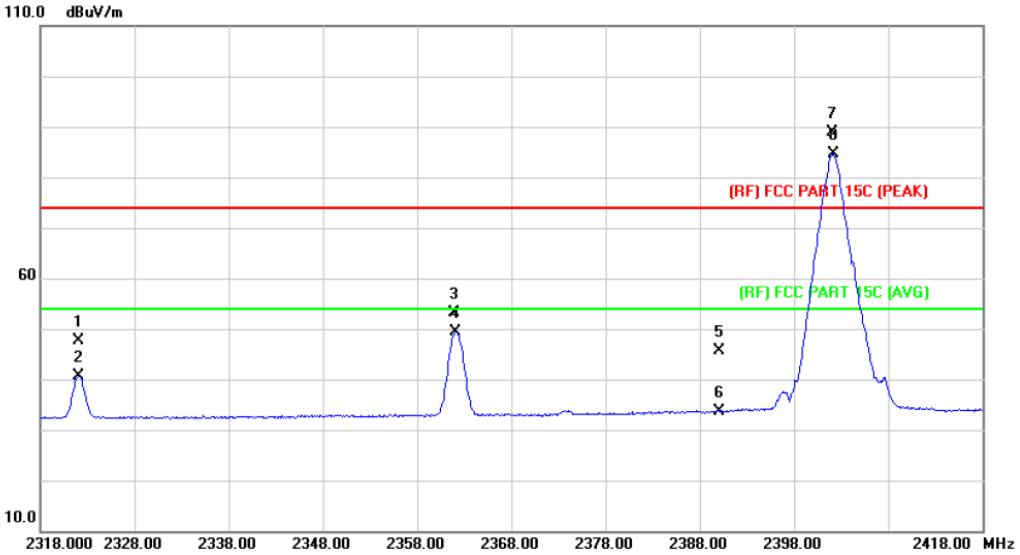
## 6.4 Test Data

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.

## (1) Radiation Test

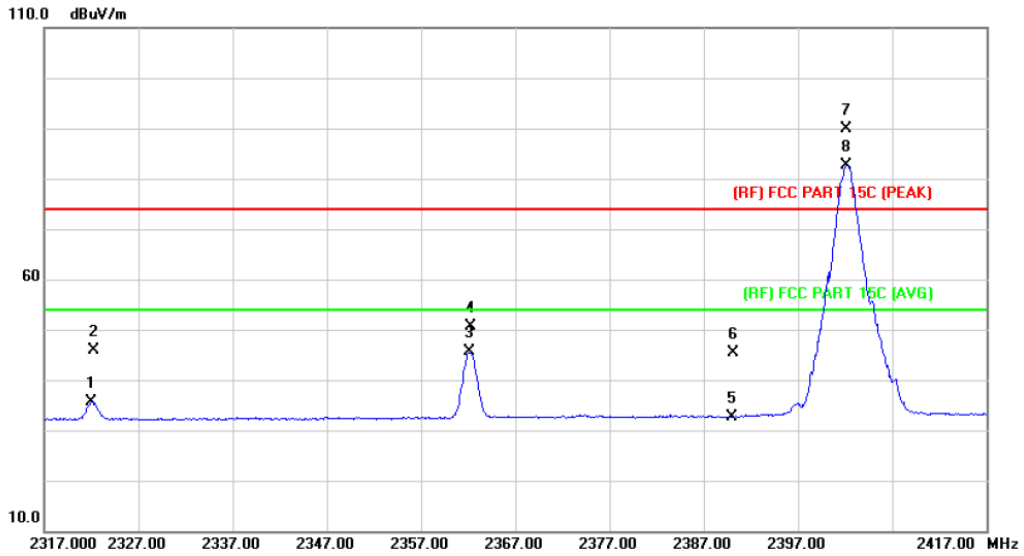
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX GFSK Mode 2402MHz | | |
| Remark: | N/A | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 2322.100 | 47.24 | 0.48 | 47.72 | 74.00 | -26.28 | peak |
| 2 | | 2322.100 | 40.25 | 0.48 | 40.73 | 54.00 | -13.27 | AVG |
| 3 | | 2361.900 | 52.47 | 0.65 | 53.12 | 74.00 | -20.88 | peak |
| 4 | | 2362.100 | 48.84 | 0.65 | 49.49 | 54.00 | -4.51 | AVG |
| 5 | | 2390.000 | 44.82 | 0.77 | 45.59 | 74.00 | -28.41 | peak |
| 6 | | 2390.000 | 32.94 | 0.77 | 33.71 | 54.00 | -20.29 | AVG |
| 7 | X | 2402.000 | 88.18 | 0.82 | 89.00 | Fundamental Frequency | | peak |
| 8 | * | 2402.200 | 83.86 | 0.82 | 84.68 | Fundamental Frequency | | AVG |

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

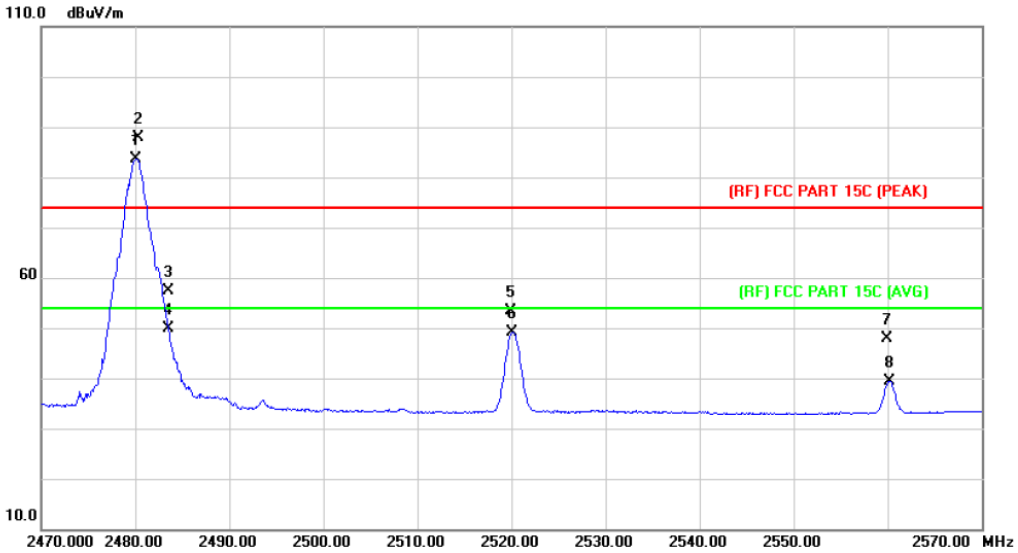
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX GFSK Mode 2402MHz | | |
| Remark: | N/A | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 2322.000 | 35.18 | 0.48 | 35.66 | 54.00 | -18.34 | AVG |
| 2 | | 2322.300 | 45.46 | 0.48 | 45.94 | 74.00 | -28.06 | peak |
| 3 | | 2362.200 | 44.94 | 0.65 | 45.59 | 54.00 | -8.41 | AVG |
| 4 | | 2362.300 | 50.10 | 0.65 | 50.75 | 74.00 | -23.25 | peak |
| 5 | | 2390.000 | 31.89 | 0.77 | 32.66 | 54.00 | -21.34 | AVG |
| 6 | | 2390.100 | 44.66 | 0.77 | 45.43 | 74.00 | -28.57 | peak |
| 7 | X | 2402.200 | 89.18 | 0.82 | 90.00 | Fundamental Frequency | | peak |
| 8 | * | 2402.200 | 81.81 | 0.82 | 82.63 | Fundamental Frequency | | AVG |

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

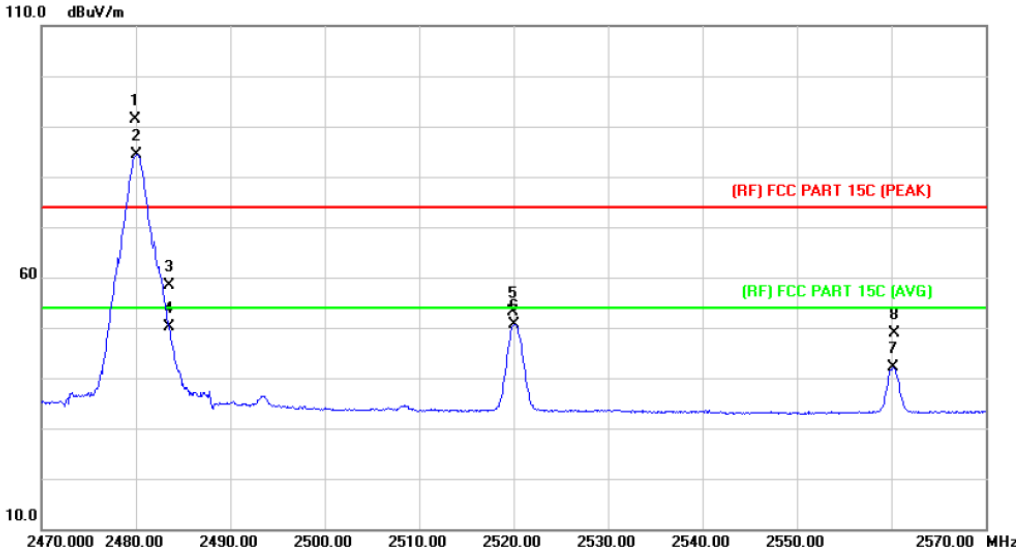
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX GFSK Mode 2480 MHz | | |
| Remark: | N/A | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | * | 2480.100 | 82.49 | 1.15 | 83.64 | Fundamental Frequency | | AVG |
| 2 | X | 2480.300 | 86.85 | 1.15 | 88.00 | Fundamental Frequency | | peak |
| 3 | | 2483.500 | 56.17 | 1.17 | 57.34 | 74.00 | -16.66 | peak |
| 4 | | 2483.500 | 48.72 | 1.17 | 49.89 | 54.00 | -4.11 | AVG |
| 5 | | 2519.900 | 52.06 | 1.36 | 53.42 | 74.00 | -20.58 | peak |
| 6 | | 2520.100 | 47.77 | 1.36 | 49.13 | 54.00 | -4.87 | AVG |
| 7 | | 2559.900 | 46.25 | 1.59 | 47.84 | 74.00 | -26.16 | peak |
| 8 | | 2560.200 | 37.86 | 1.60 | 39.46 | 54.00 | -14.54 | AVG |

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

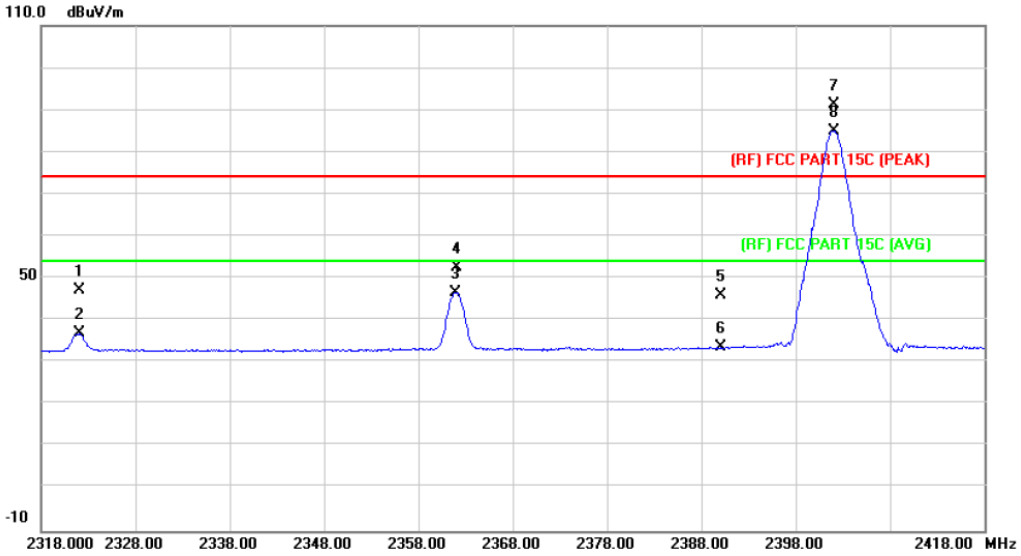
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX GFSK Mode 2480 MHz | | |
| Remark: | N/A | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | X | 2479.900 | 90.21 | 1.15 | 91.36 | Fundamental Frequency | | peak |
| 2 | * | 2480.100 | 83.27 | 1.15 | 84.42 | Fundamental Frequency | | AVG |
| 3 | | 2483.500 | 57.21 | 1.17 | 58.38 | 74.00 | -15.62 | peak |
| 4 | | 2483.500 | 48.98 | 1.17 | 50.15 | 54.00 | -3.85 | AVG |
| 5 | | 2519.900 | 51.86 | 1.36 | 53.22 | 74.00 | -20.78 | peak |
| 6 | | 2520.100 | 49.34 | 1.36 | 50.70 | 54.00 | -3.30 | AVG |
| 7 | | 2560.200 | 40.43 | 1.60 | 42.03 | 54.00 | -11.97 | AVG |
| 8 | | 2560.300 | 47.35 | 1.60 | 48.95 | 74.00 | -25.05 | peak |

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

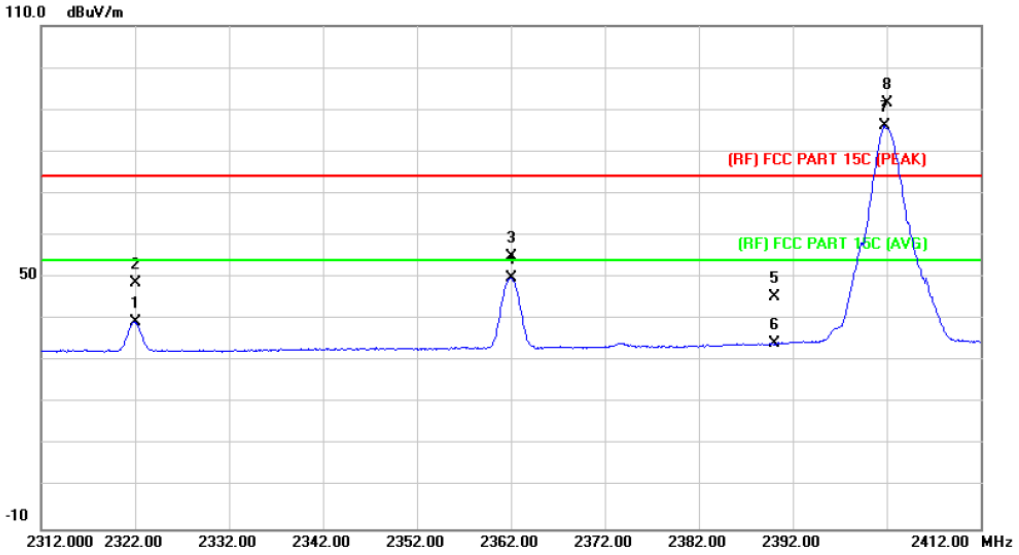
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz | | |
| Remark: | N/A | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 2322.000 | 46.81 | 0.48 | 47.29 | 74.00 | -26.71 | peak |
| 2 | | 2322.100 | 36.39 | 0.48 | 36.87 | 54.00 | -17.13 | AVG |
| 3 | | 2361.900 | 45.97 | 0.65 | 46.62 | 54.00 | -7.38 | AVG |
| 4 | | 2362.000 | 51.93 | 0.65 | 52.58 | 74.00 | -21.42 | peak |
| 5 | | 2390.000 | 45.15 | 0.77 | 45.92 | 74.00 | -28.08 | peak |
| 6 | | 2390.000 | 32.77 | 0.77 | 33.54 | 54.00 | -20.46 | AVG |
| 7 | X | 2402.000 | 90.42 | 0.82 | 91.24 | Fundamental Frequency | | peak |
| 8 | * | 2402.000 | 84.19 | 0.82 | 85.01 | Fundamental Frequency | | AVG |

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

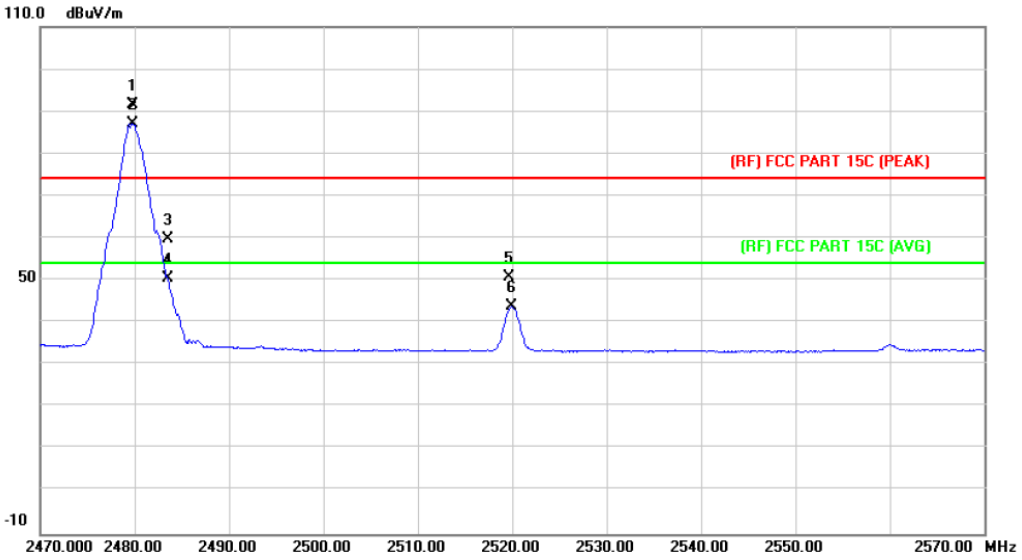
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz | | |
| Remark: | N/A | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 2322.000 | 38.87 | 0.48 | 39.35 | 54.00 | -14.65 | AVG |
| 2 | | 2322.100 | 48.24 | 0.48 | 48.72 | 74.00 | -25.28 | peak |
| 3 | | 2362.000 | 54.41 | 0.65 | 55.06 | 74.00 | -18.94 | peak |
| 4 | | 2362.000 | 49.17 | 0.65 | 49.82 | 54.00 | -4.18 | AVG |
| 5 | | 2390.000 | 44.52 | 0.77 | 45.29 | 74.00 | -28.71 | peak |
| 6 | | 2390.000 | 33.36 | 0.77 | 34.13 | Fundamental Frequency | | AVG |
| 7 | * | 2401.800 | 85.43 | 0.82 | 86.25 | Fundamental Frequency | | AVG |
| 8 | X | 2402.000 | 90.87 | 0.82 | 91.69 | 74.00 | 17.69 | peak |

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

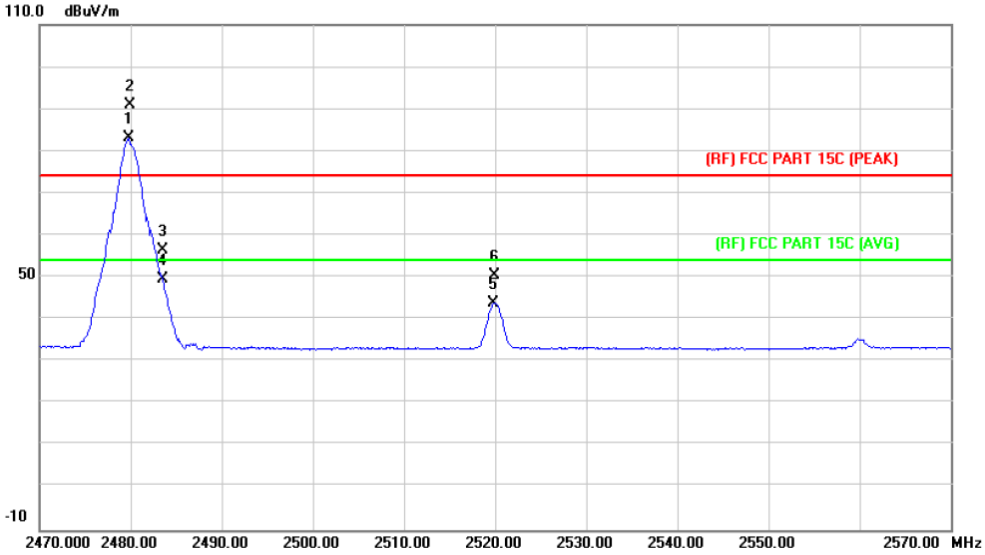
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Horizontal | | |
| Test Mode: | TX 8-DPSK Mode 2480MHz | | |
| Remark: | N/A | | |




| 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 | 90.48 | 1.15 | 91.63 | Fundamental Frequency | | peak |
| 2 | * | 2479.800 | 85.98 | 1.15 | 87.13 | Fundamental Frequency | | AVG |
| 3 | | 2483.500 | 58.73 | 1.17 | 59.90 | 74.00 | -14.10 | peak |
| 4 | | 2483.500 | 49.41 | 1.17 | 50.58 | 54.00 | -3.42 | AVG |
| 5 | | 2519.700 | 49.32 | 1.36 | 50.68 | 74.00 | -23.32 | peak |
| 6 | | 2519.900 | 42.34 | 1.36 | 43.70 | 54.00 | -10.30 | AVG |

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

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Ant. Pol. | Vertical | | |
| Test Mode: | TX 8-DPSK Mode 2480MHz | | |
| Remark: | N/A | | |

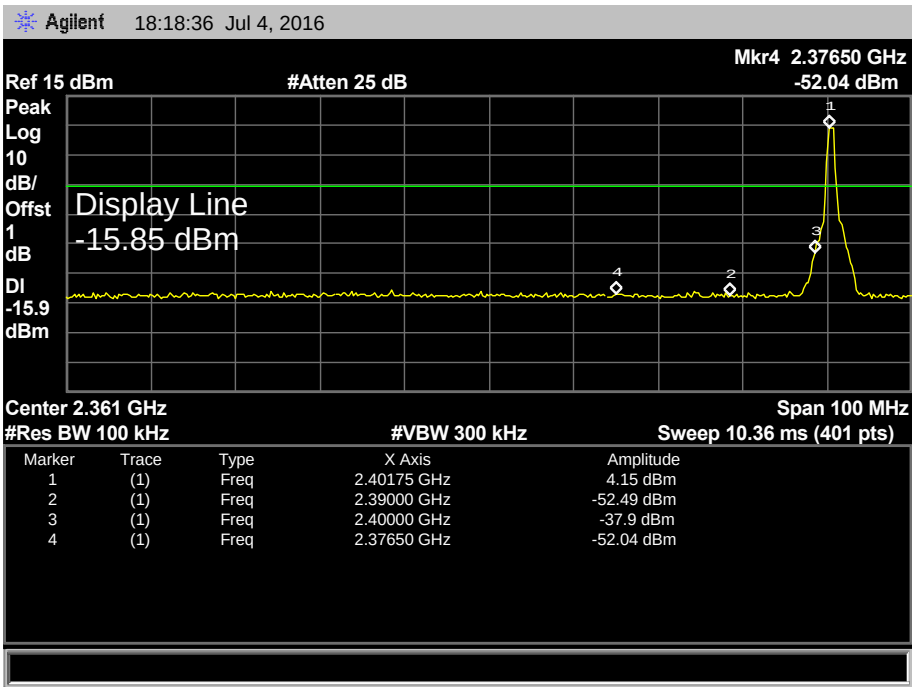


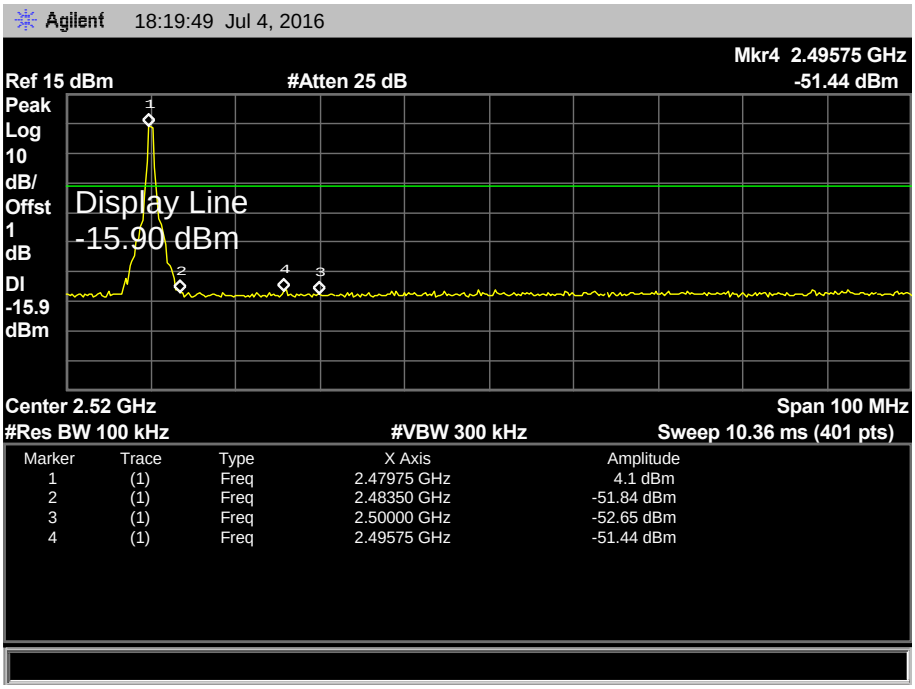

| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | * | 2479.800 | 81.88 | 1.15 | 83.03 | Fundamental Frequency | | AVG |
| 2 | X | 2479.900 | 89.70 | 1.15 | 90.85 | Fundamental Frequency | | peak |
| 3 | | 2483.500 | 55.36 | 1.17 | 56.53 | 74.00 | -17.47 | peak |
| 4 | | 2483.500 | 48.45 | 1.17 | 49.62 | 54.00 | -4.38 | AVG |
| 5 | | 2519.800 | 42.53 | 1.36 | 43.89 | 54.00 | -10.11 | AVG |
| 6 | | 2519.900 | 49.22 | 1.36 | 50.58 | 74.00 | -23.42 | peak |

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

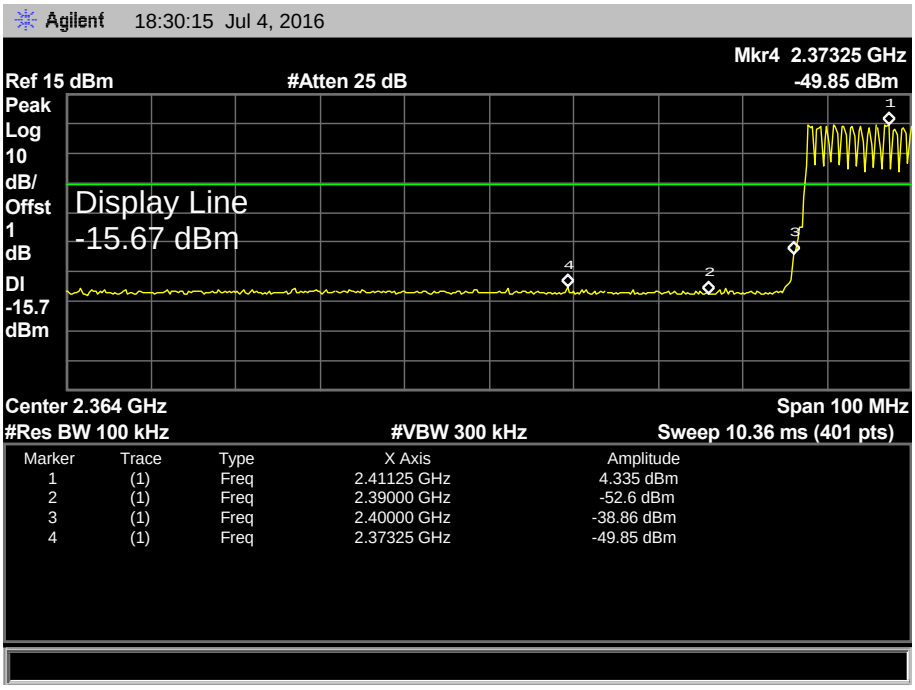
## (2) Conducted Test

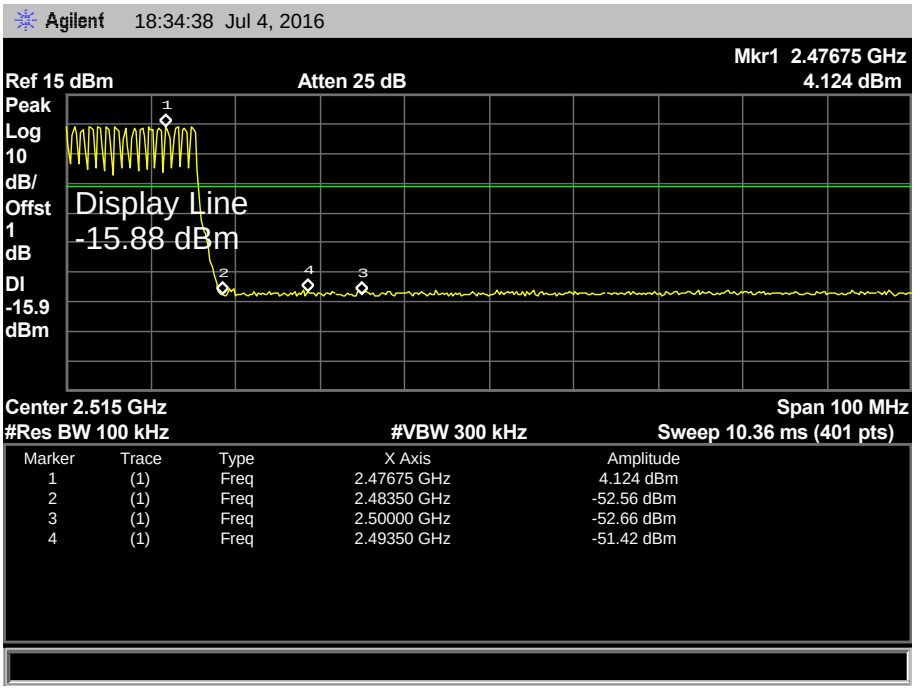
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX GFSK Mode 2402MHz / 2480 MHz | | |
| Remark: | N/A | | |



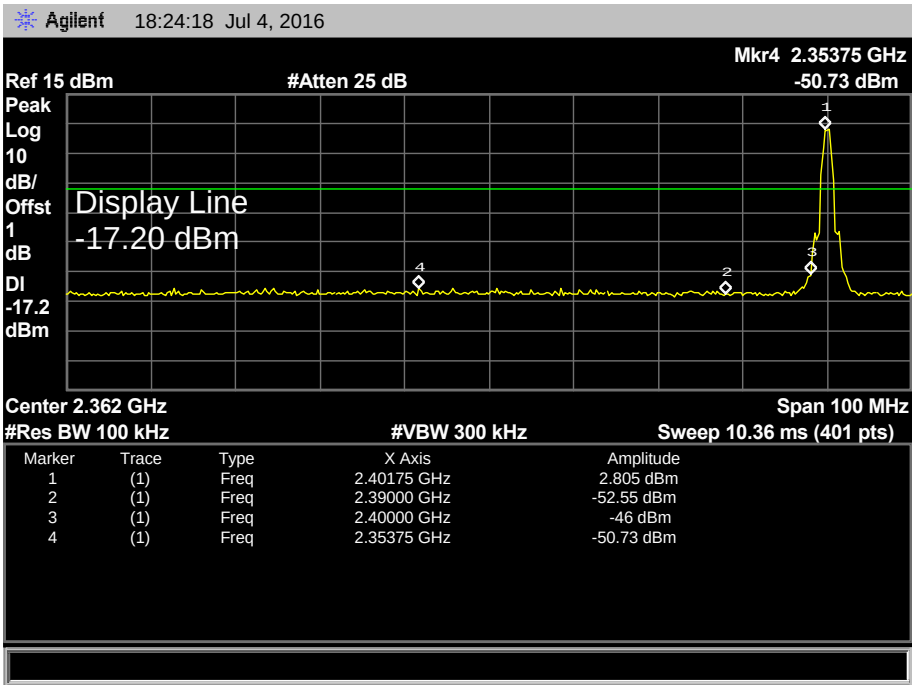



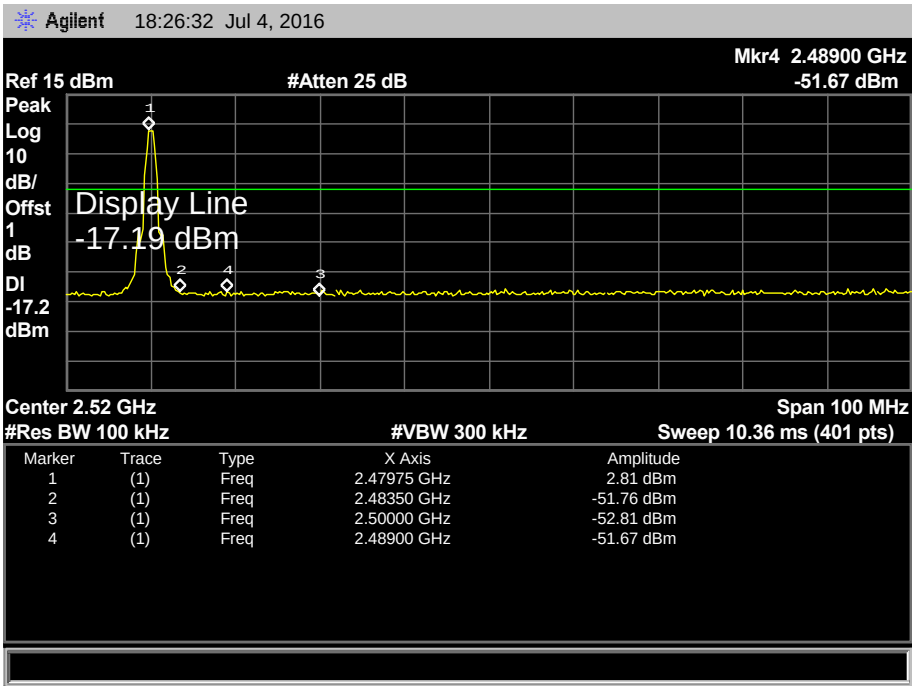
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | GFSK Hopping Mode | | |
| Remark: | N/A | | |



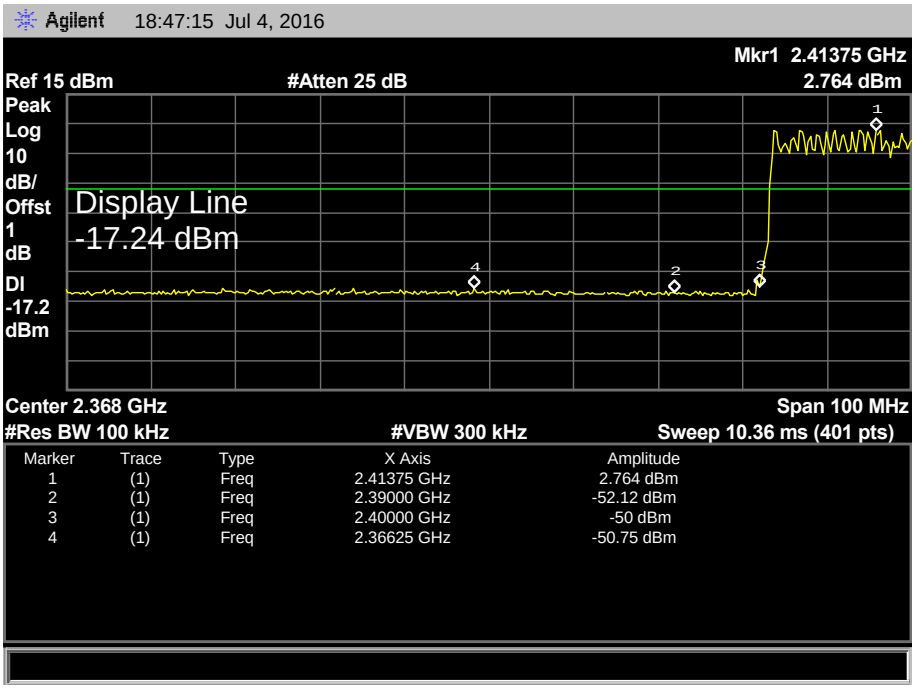



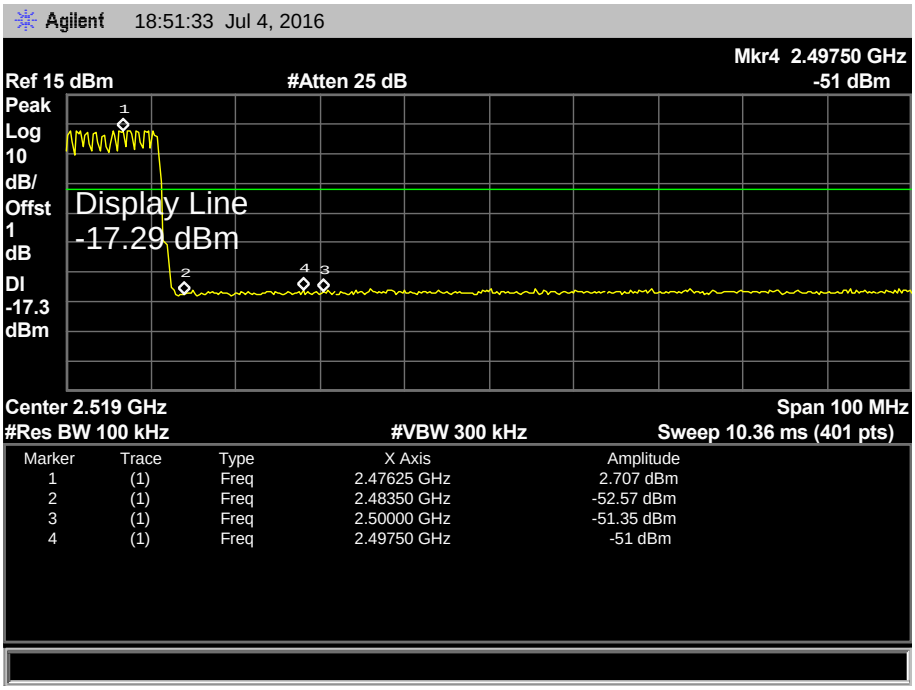
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX 8-DPSK Mode 2402MHz / 2480 MHz | | |
| Remark: | N/A | | |



| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | 8-DPSK Hopping Mode | | |
| Remark: | N/A | | |



# 7. Number of Hopping Channel

## 7.1 Test Standard and Limit

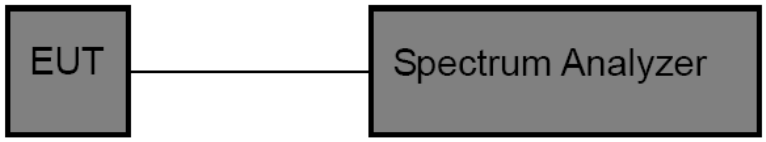
6.1.1 Test Standard

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

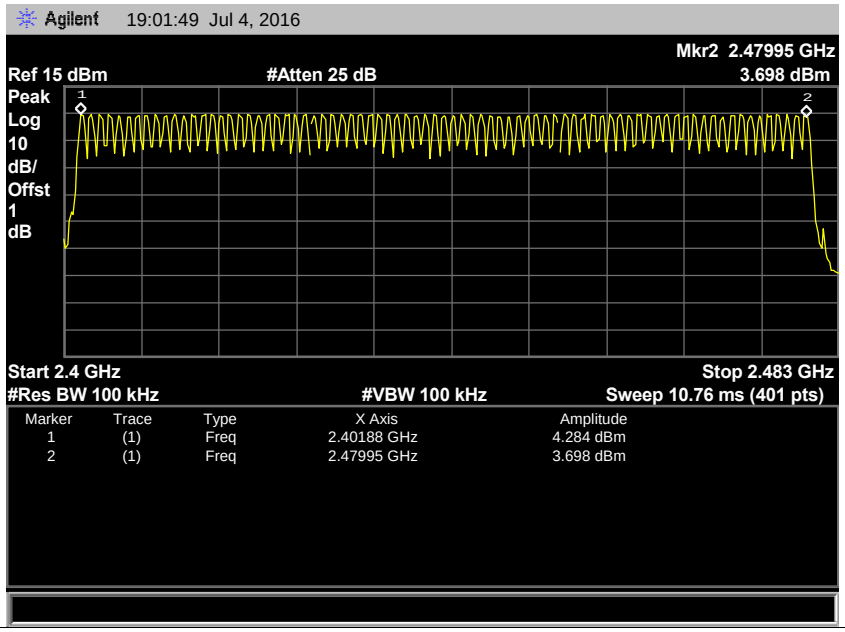
The EUT was set to the Hopping Mode by the Customer.

## 7.5 Test Data

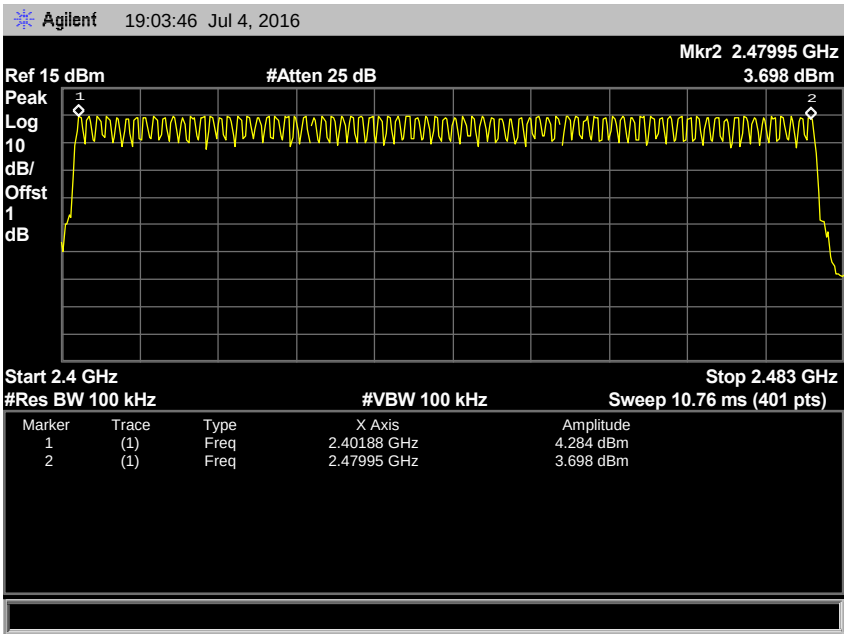
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (GFSK/8-DPSK) | | |

| Frequency Range | Quantity of Hopping Channel | Limit |
|---|---|---|
| 2402MHz~2480MHz | 79 | >15 |
| | 79 | |

**GFSK Mode**




**8-DPSK Mode**



# 8. Average Time of Occupancy

## 8.1 Test Standard and Limit

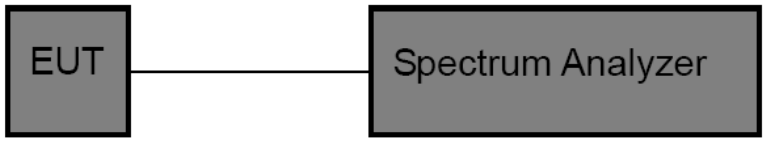
8.1.1 Test Standard

FCC Part 15.247 (a)(1)

8.1.2 Test Limit

| Section | Test Item | Limit |
|---|---|---|
| 15.247(a)(1)/ RSS-210 Annex 8(A8.1d) | Average Time of 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 average time of occupancy on any channel within the Period can be calculated with formulas:
{Total of Dwell} = {Pulse Time} * (1600 / X) / {Number of Hopping Frequency} * {Period}
{Period} = 0.4s * {Number of Hopping Frequency}

**Note: X=2 or 4 or 6 (1DH1=2, 1DH3=4, 1DH5=6. 2DH1=2, 2DH3=4, 2DH5=6. 3DH1=2,3DH3=4, 3DH5=6)**

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

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

## 8.5 Test Data

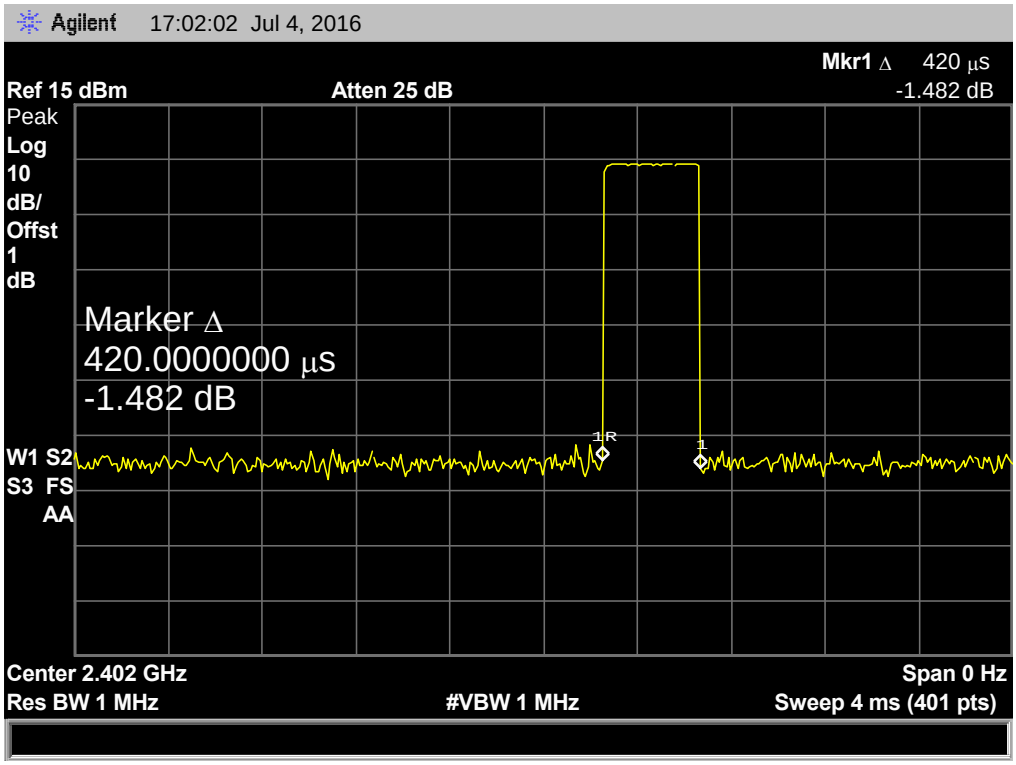
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (GFSK DH1) | | |

| Channel (MHz) | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|---|---|---|---|---|---|
| 2402 | 0.420 | 134.40 | 31.60 | 400 | PASS |
| 2441 | 0.420 | 134.40 | | | |
| 2480 | 0.420 | 134.40 | | | |

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 2 ÷ 79) ×31.6

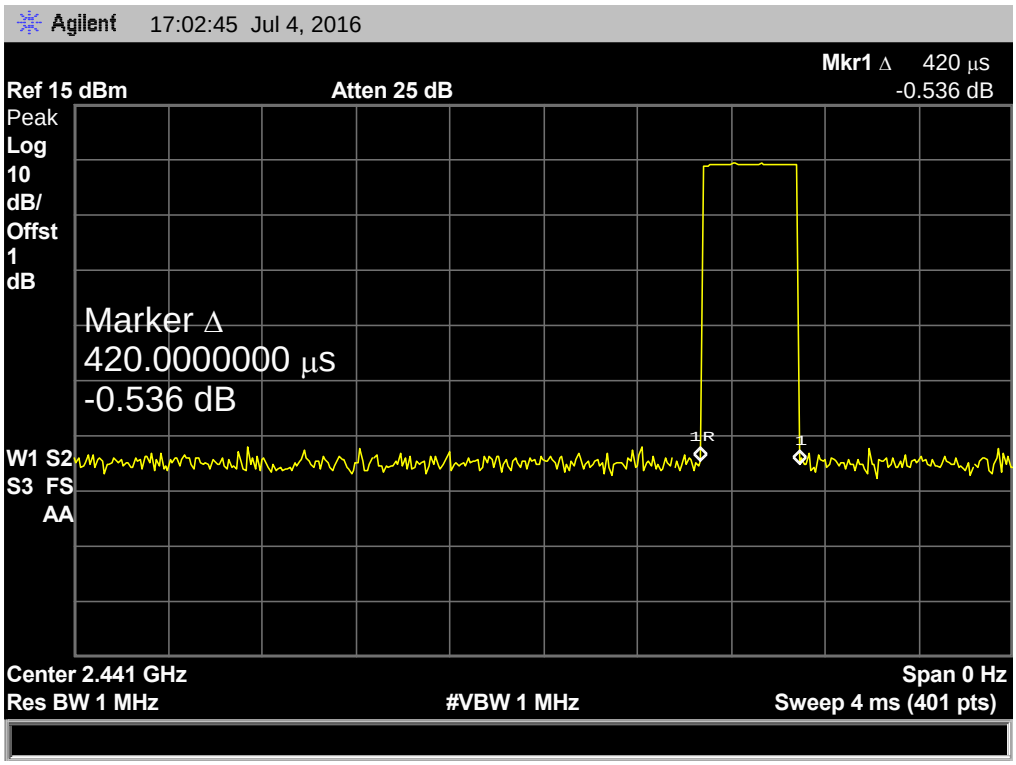
**GFSK Hopping Mode DH1**

**2402 MHz**



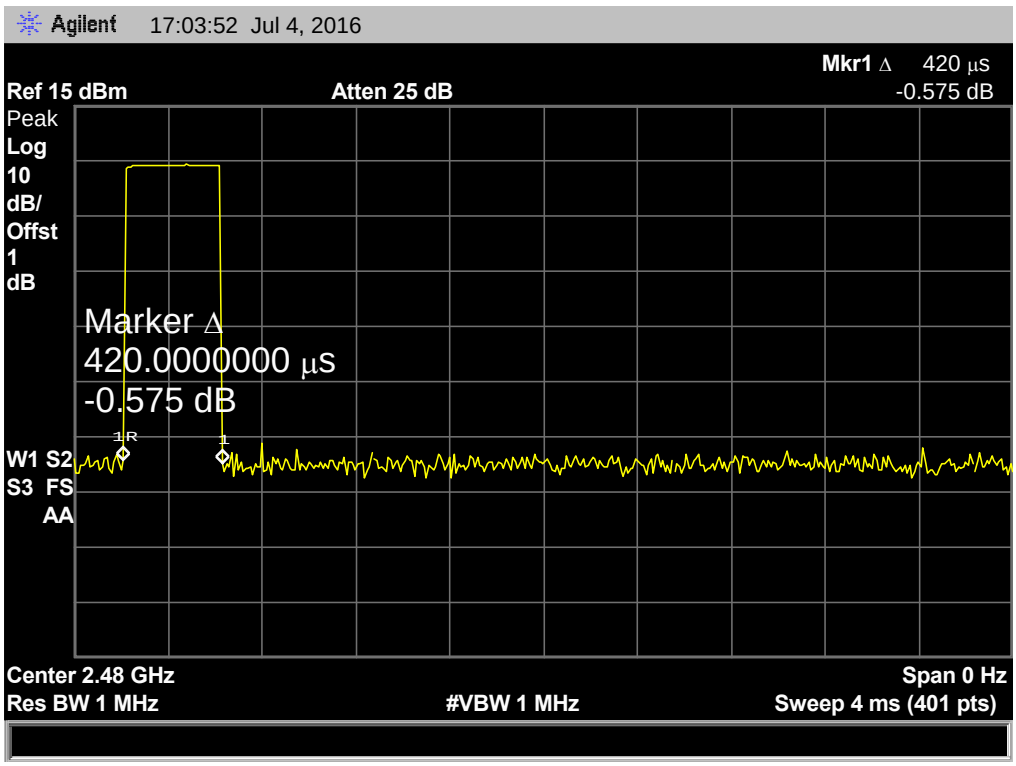
**GFSK Hopping Mode DH1**

**2441 MHz**




**GFSK Hopping Mode DH1**

**2480 MHz**



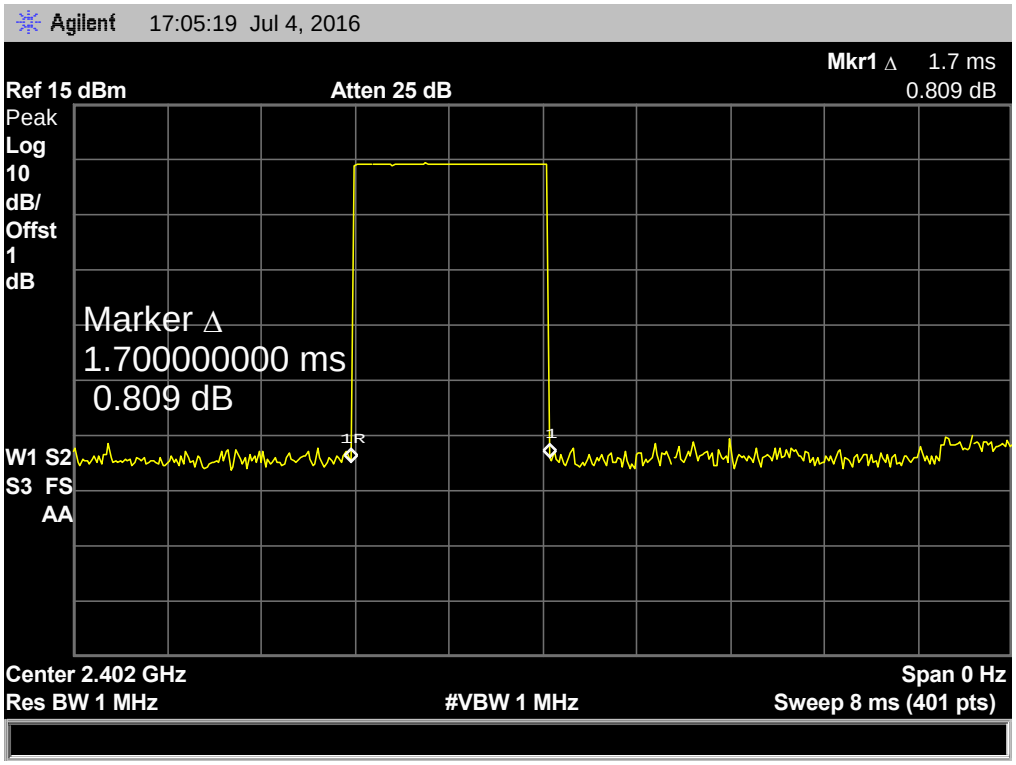
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (GFSK DH3) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 4 ÷ 79) ×31.6

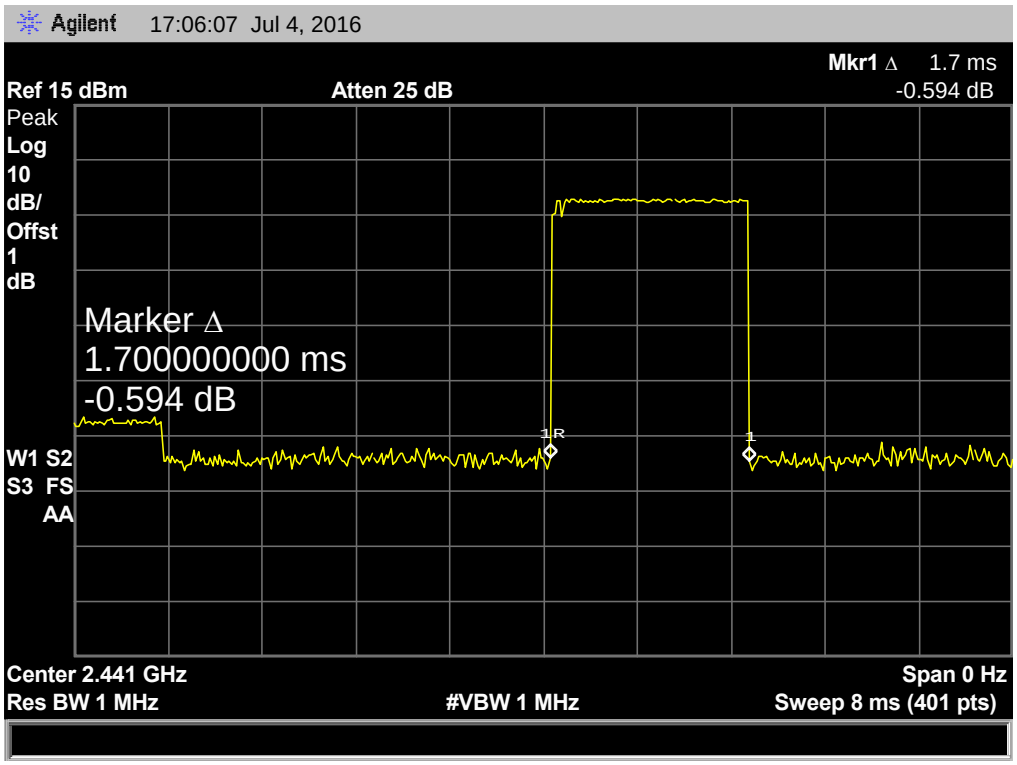
**GFSK Hopping Mode DH3**

**2402 MHz**



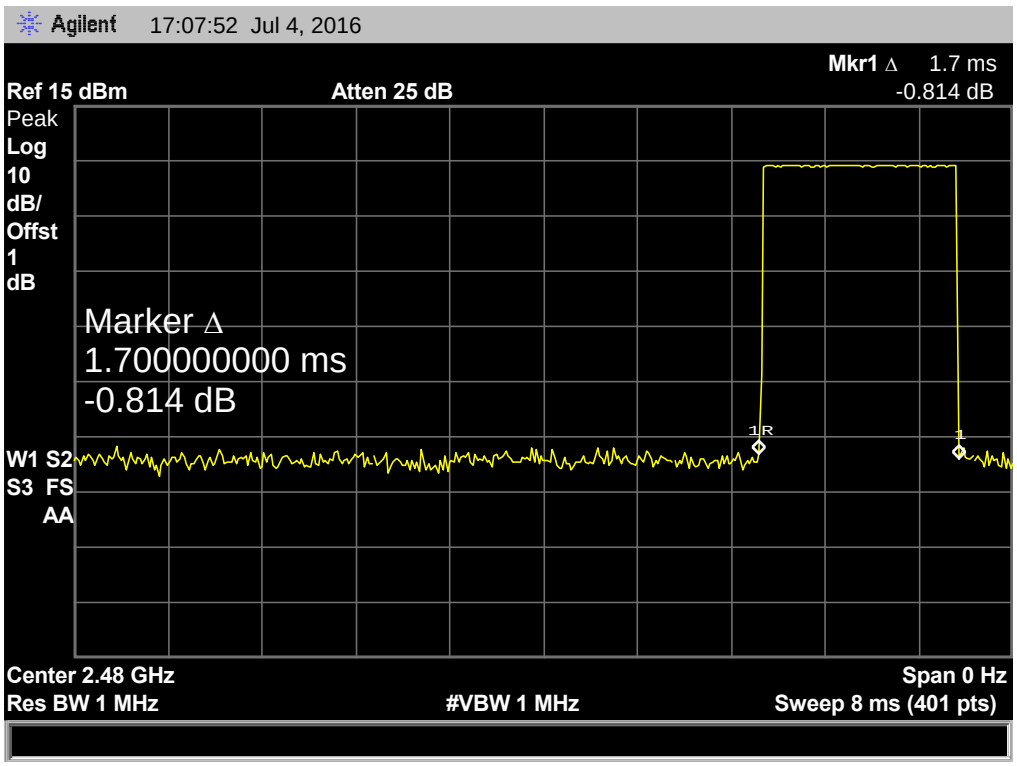
**GFSK Hopping Mode DH3**

**2441 MHz**




**GFSK Hopping Mode DH3**

**2480 MHz**



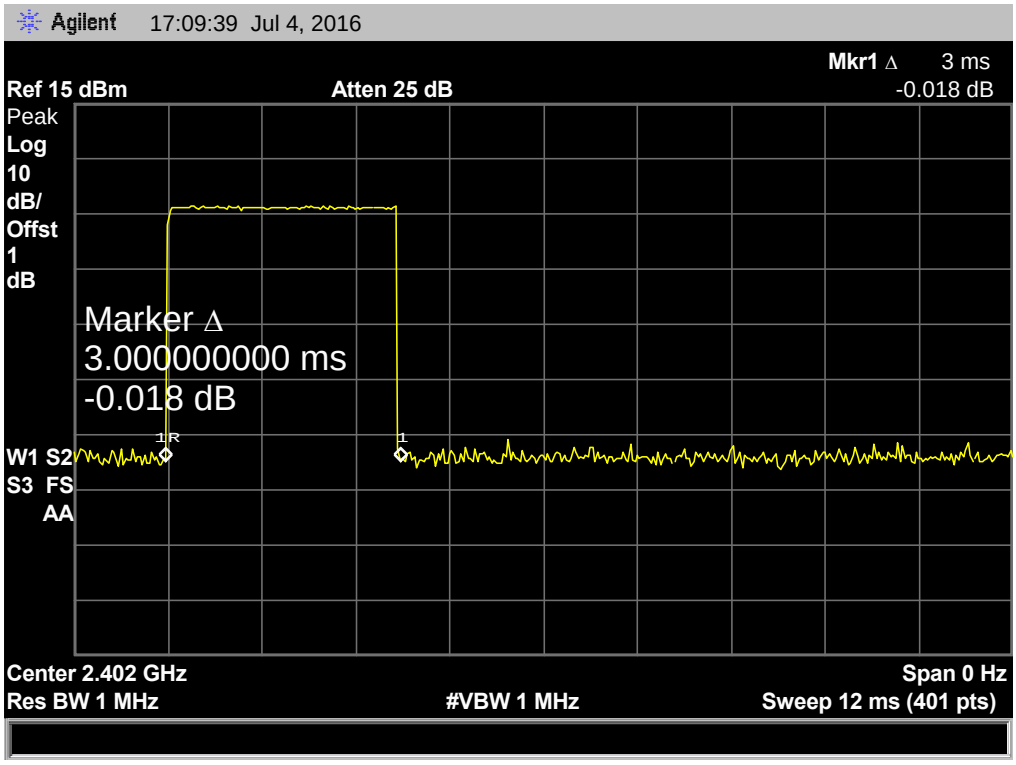
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (GFSK DH5) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6

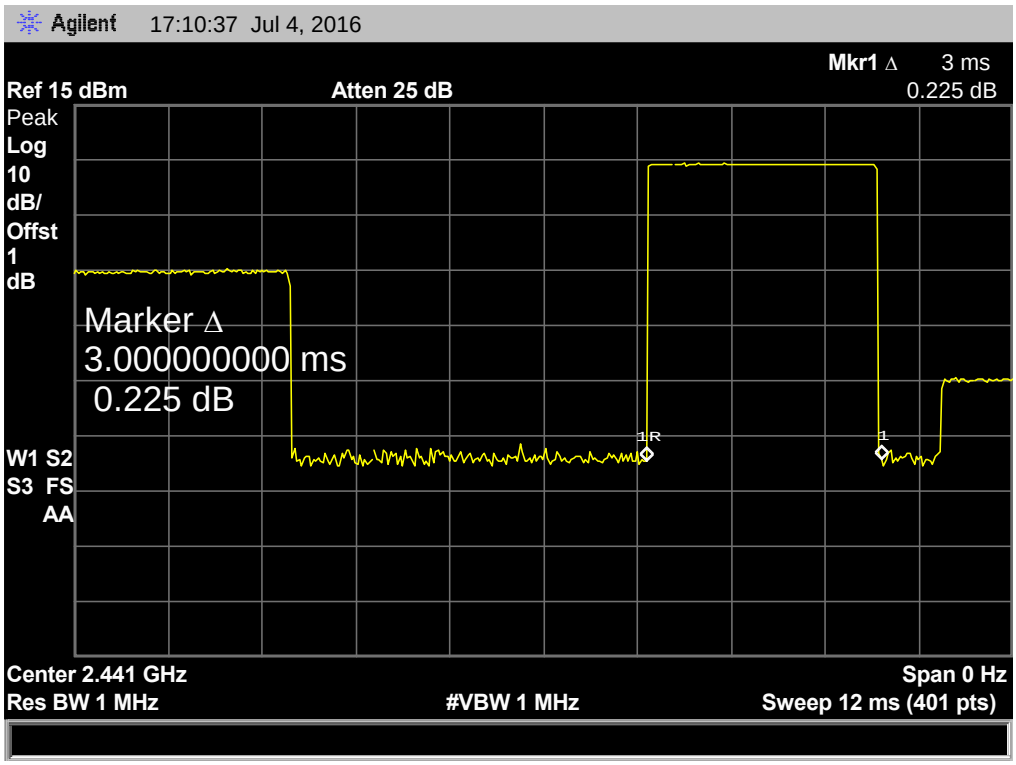
**GFSK Hopping Mode DH5**

**2402 MHz**



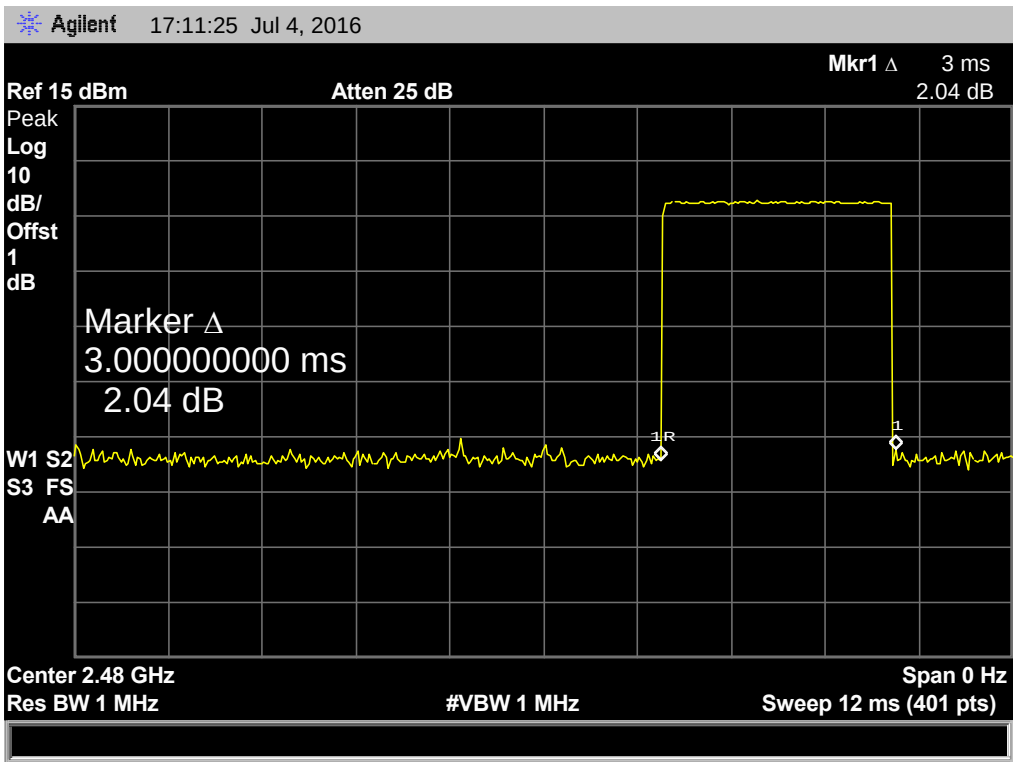
**GFSK Hopping Mode DH5**

**2441 MHz**




**GFSK Hopping Mode DH5**

**2480 MHz**



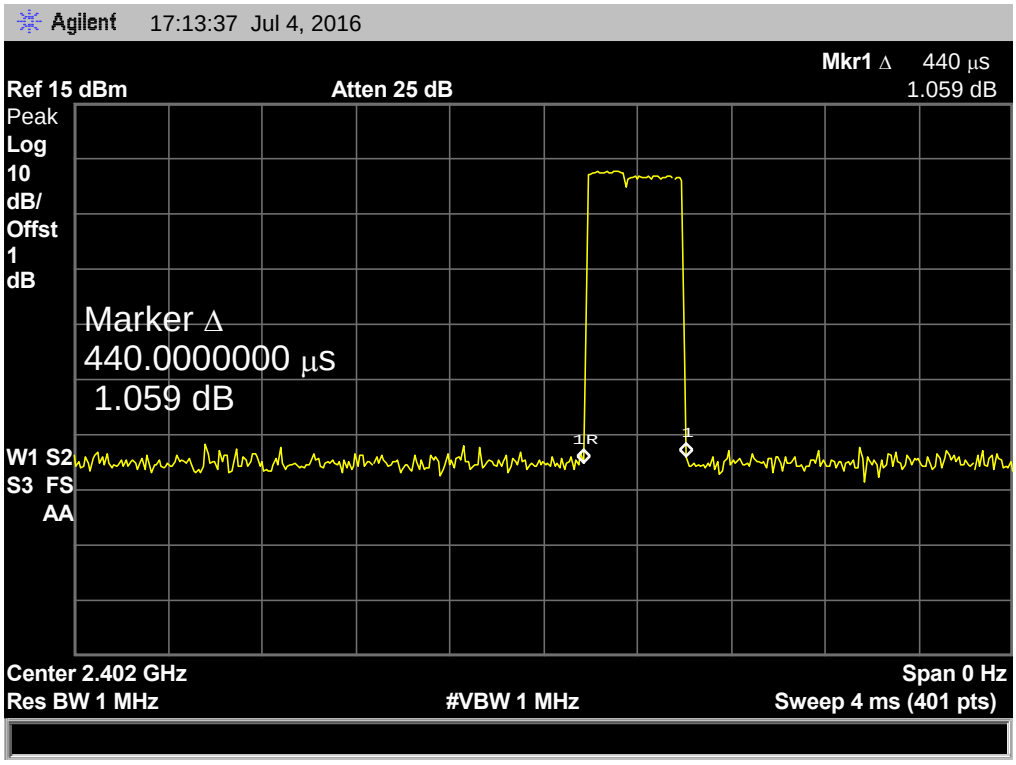
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (π/4-DQPSK DH1) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 2 ÷ 79) ×31.6

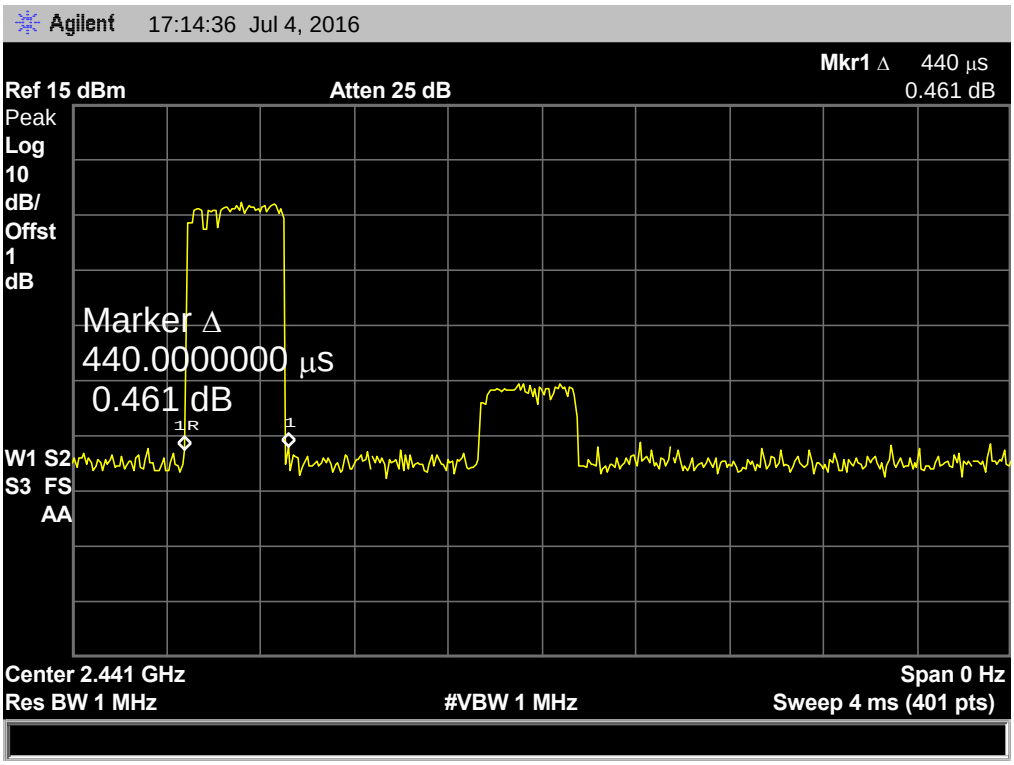
**π/4-DQPSK Hopping Mode DH1**

**2402 MHz**



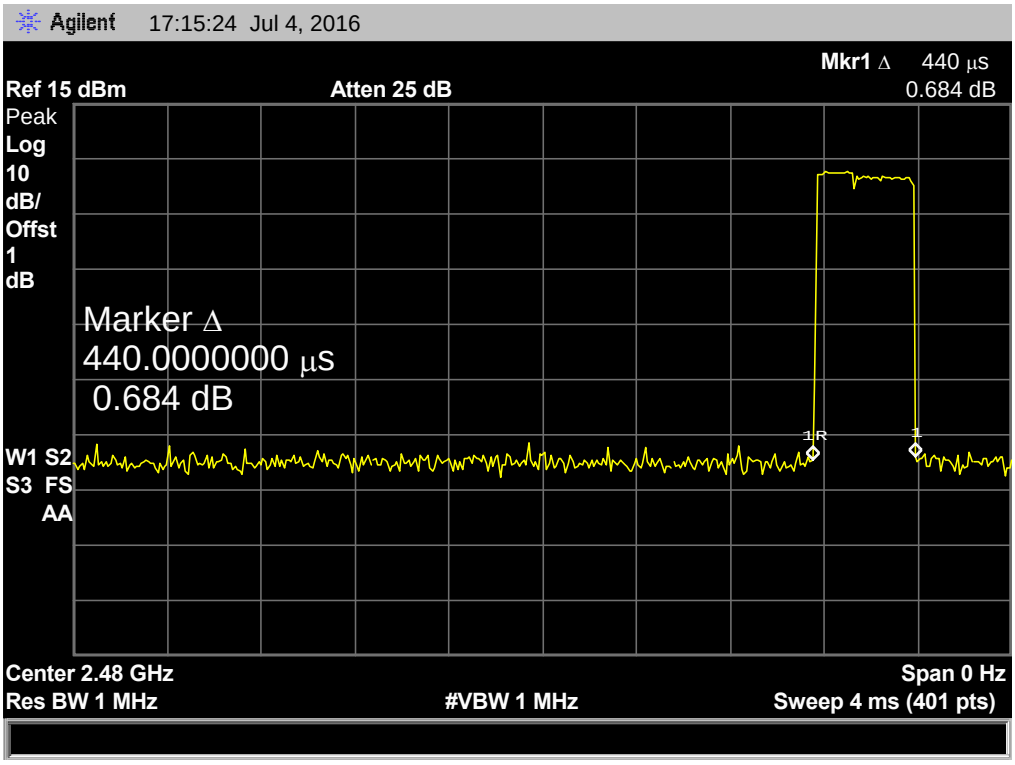
π /4-DQPSK Hopping Mode DH1

2441 MHz




π /4-DQPSK Hopping Mode DH1

2480 MHz



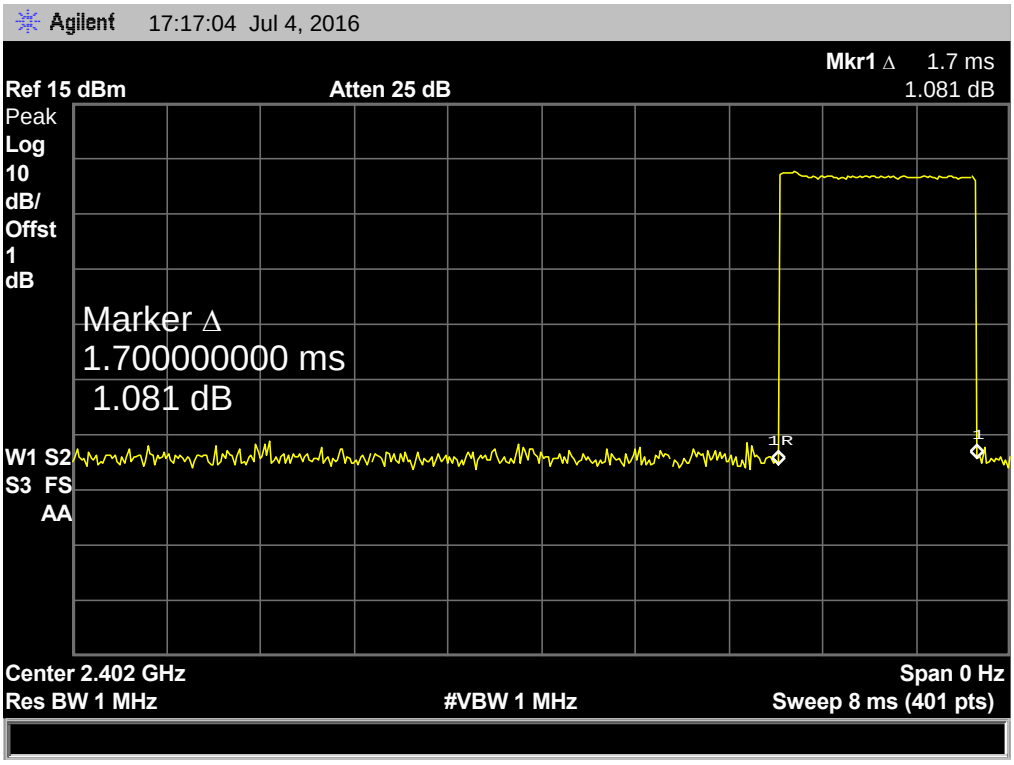
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (π/4-DQPSK DH3) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 4 ÷ 79) ×31.6

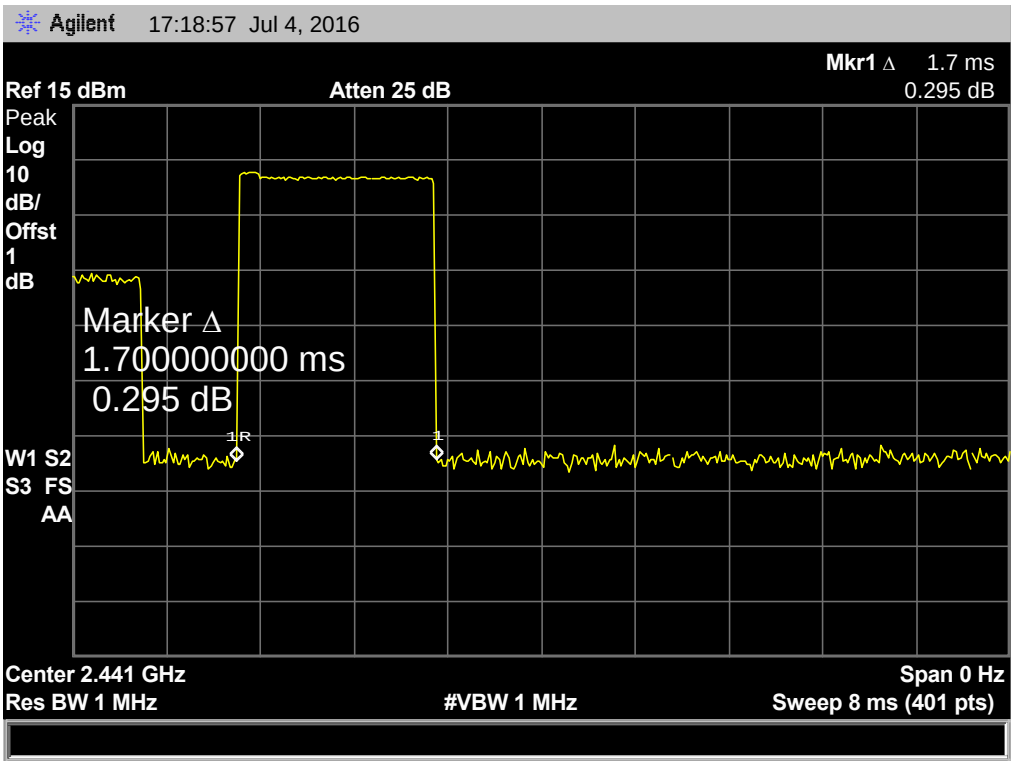
**π/4-DQPSK Hopping Mode DH3**

**2402 MHz**



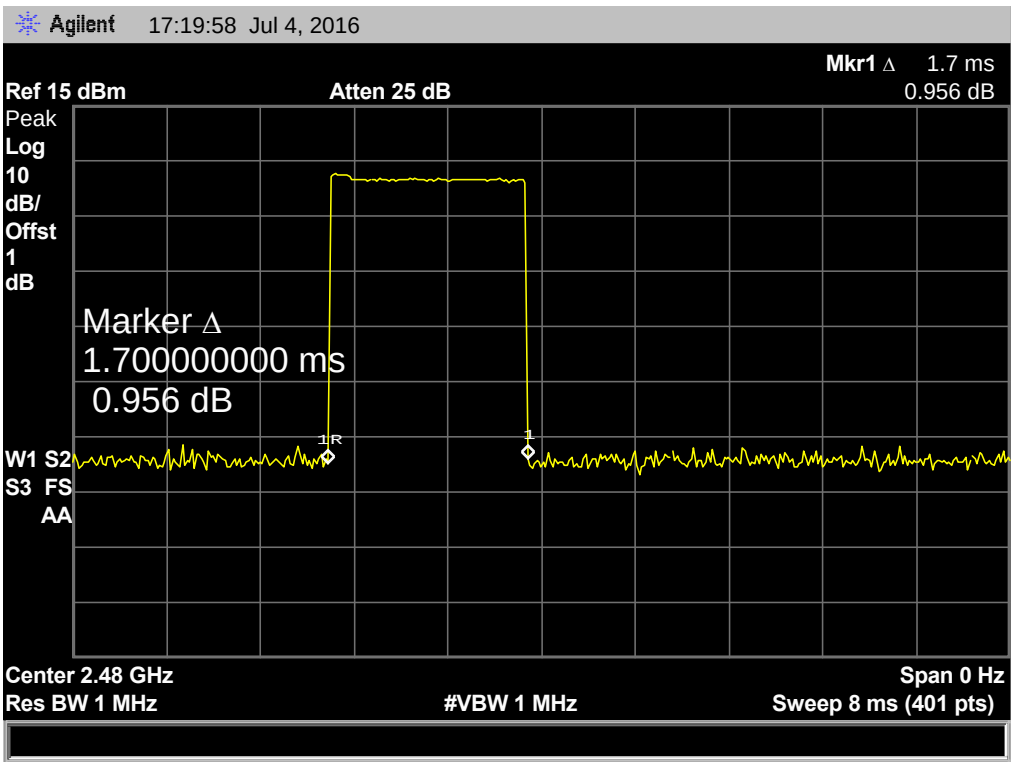
π /4-DQPSK Hopping Mode DH3

2441 MHz




π /4-DQPSK Hopping Mode DH3

2480 MHz



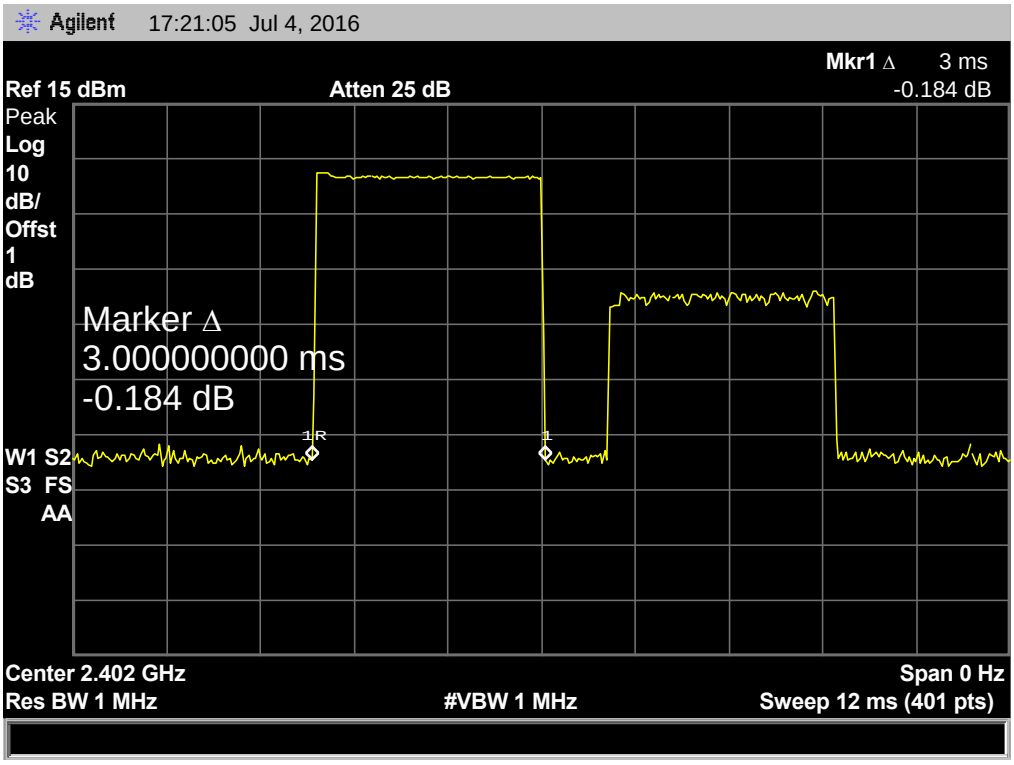
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (π/4-DQPSK DH5) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6

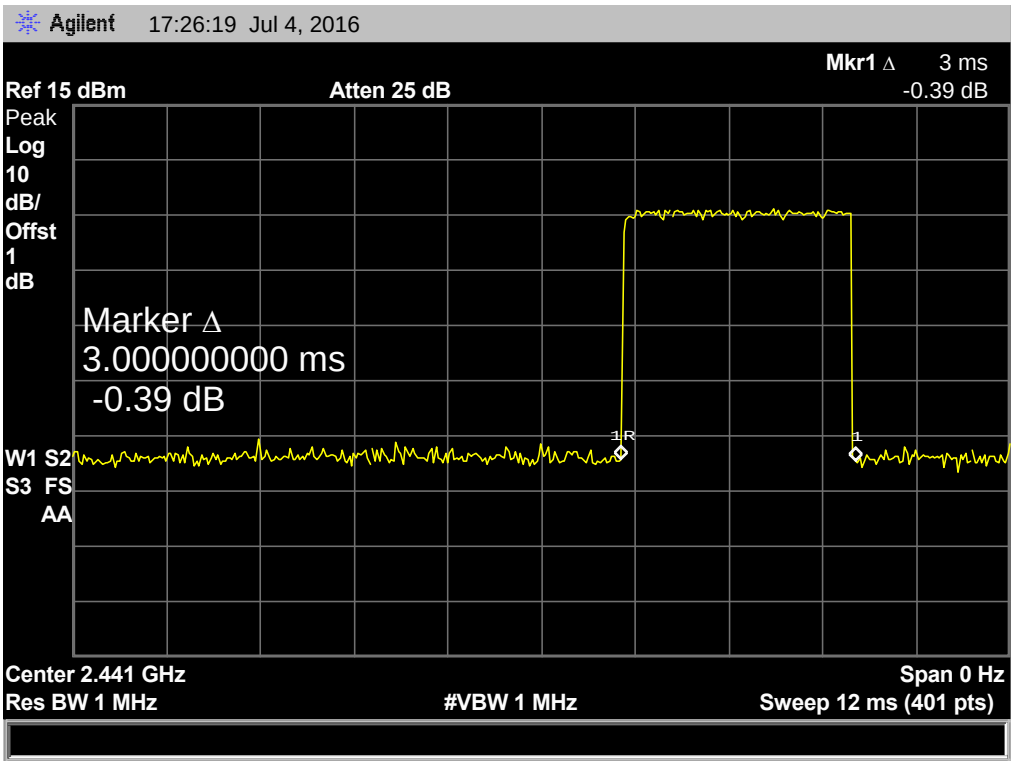
**π/4-DQPSK Hopping Mode DH5**

**2402 MHz**



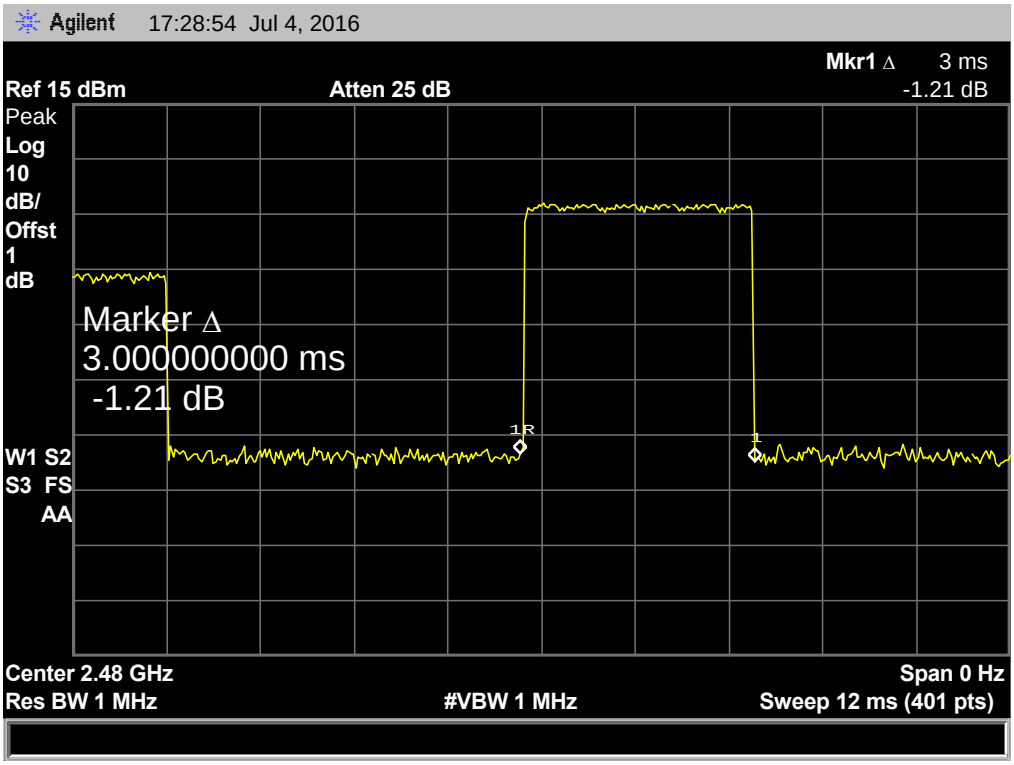
π /4-DQPSK Hopping Mode DH5

2441 MHz




π /4-DQPSK Hopping Mode DH5

2480 MHz



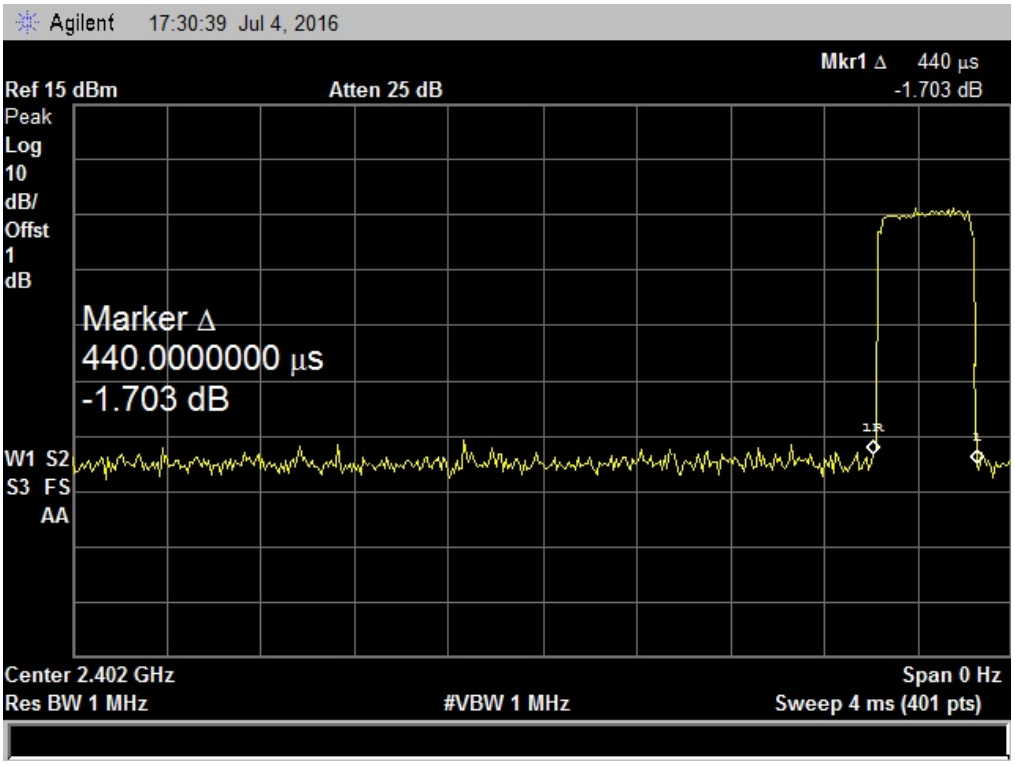
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (8-DPSK DH1) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 2 ÷ 79) ×31.6

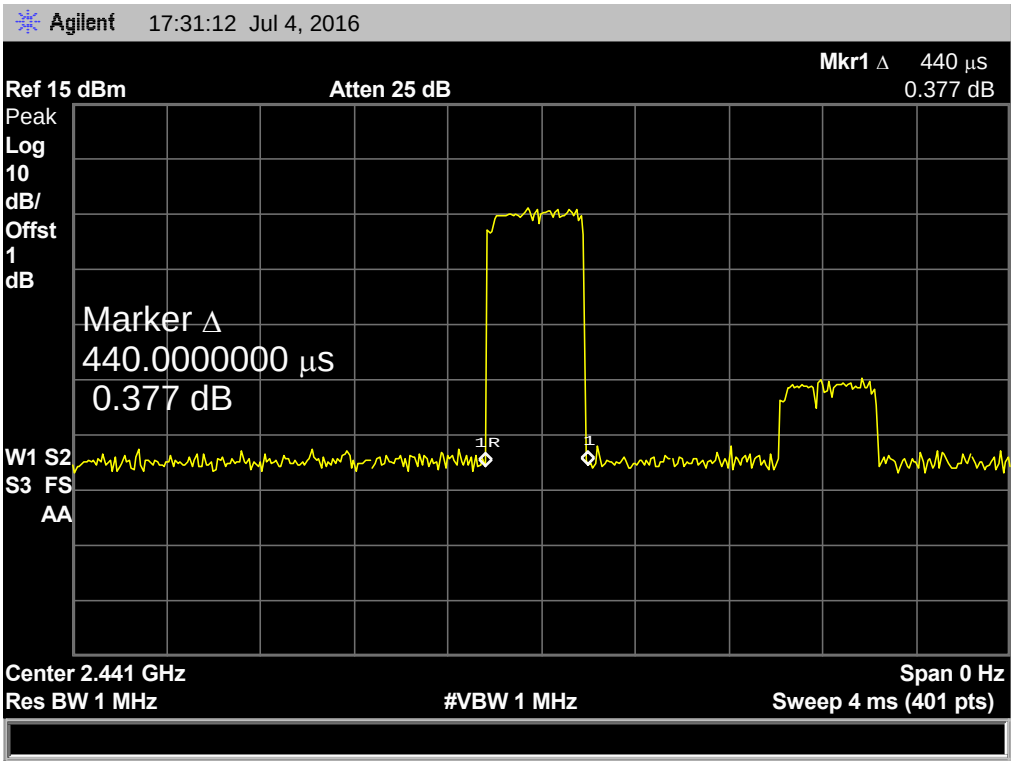
**8-DPSK Hopping Mode DH1**

**2402 MHz**



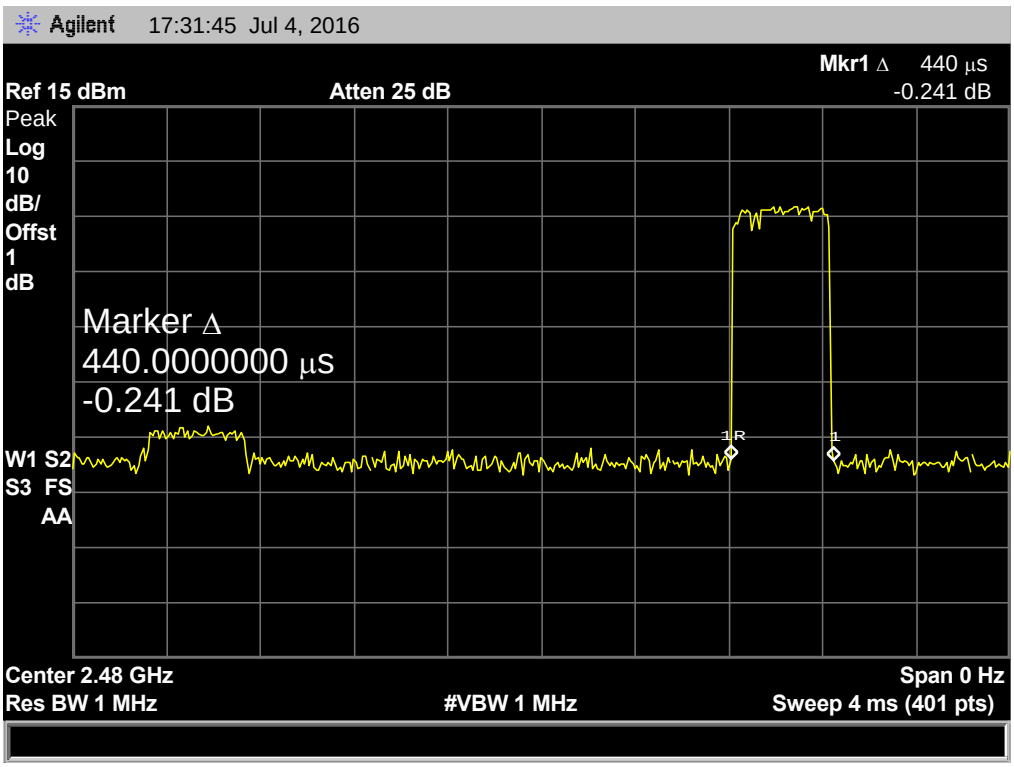
**8-DPSK Hopping Mode DH1**

**2441 MHz**




**8-DPSK Hopping Mode DH1**

**2480 MHz**



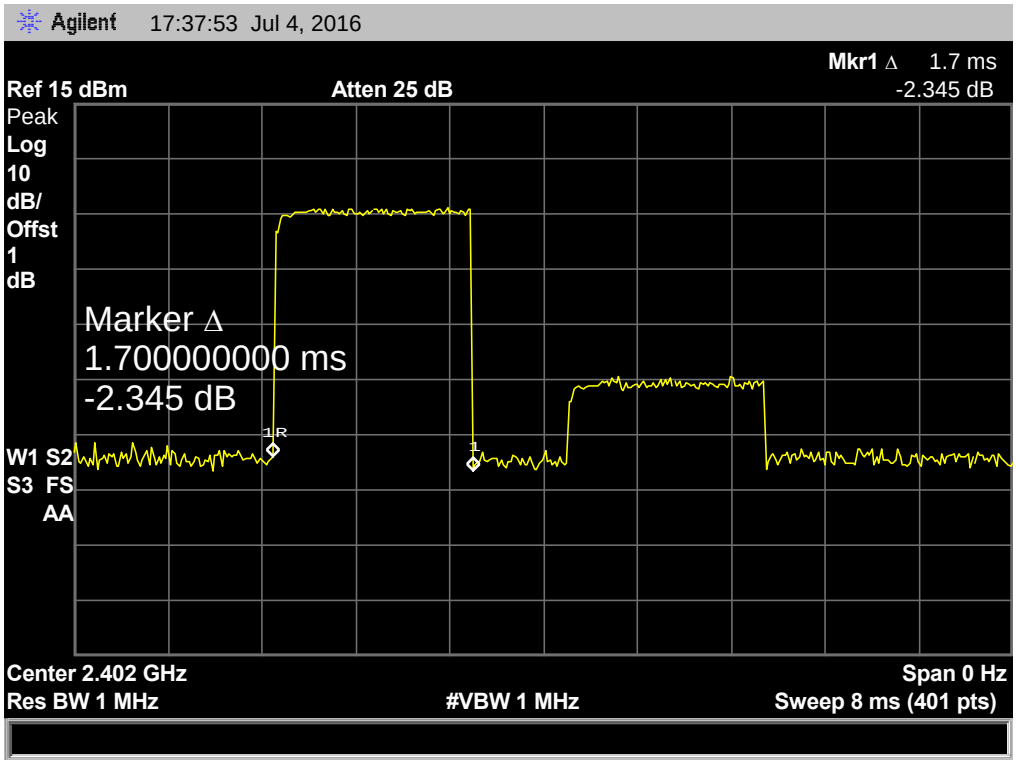
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (8-DPSK DH3) | | |

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

Note: Dwell time=Pulse Time (ms) × (1600 ÷ 4 ÷ 79) ×31.6

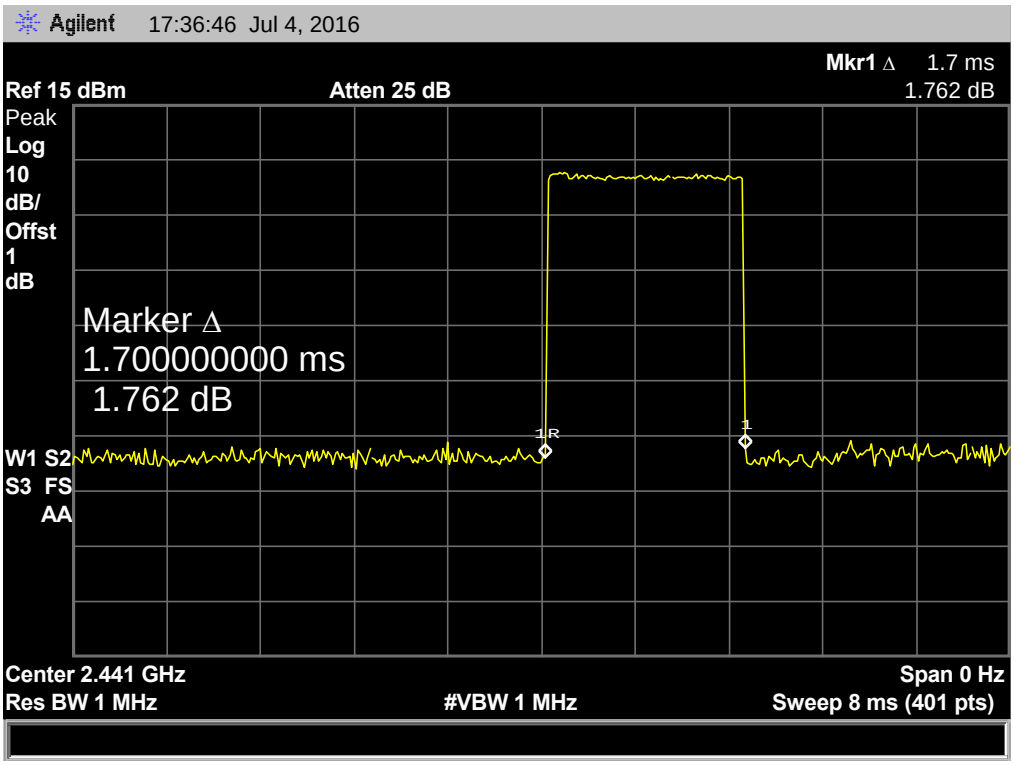
**8-DPSK Hopping Mode DH3**

**2402 MHz**



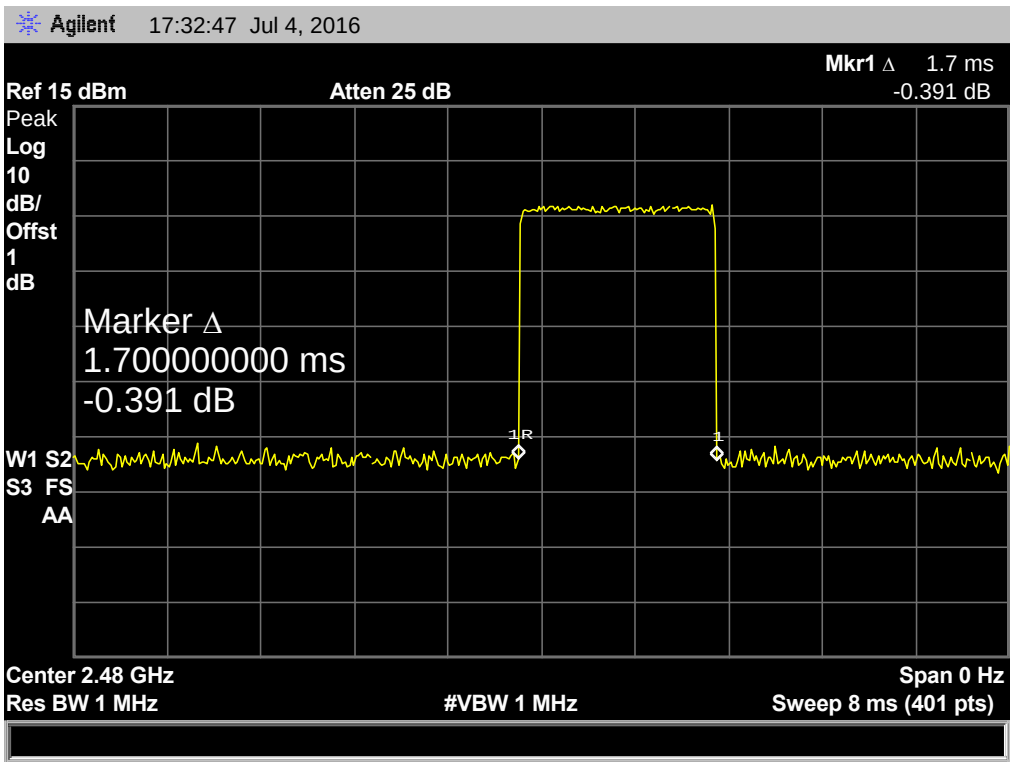
**8-DPSK Hopping Mode DH3**

**2441 MHz**




**8-DPSK Hopping Mode DH3**

**2480 MHz**



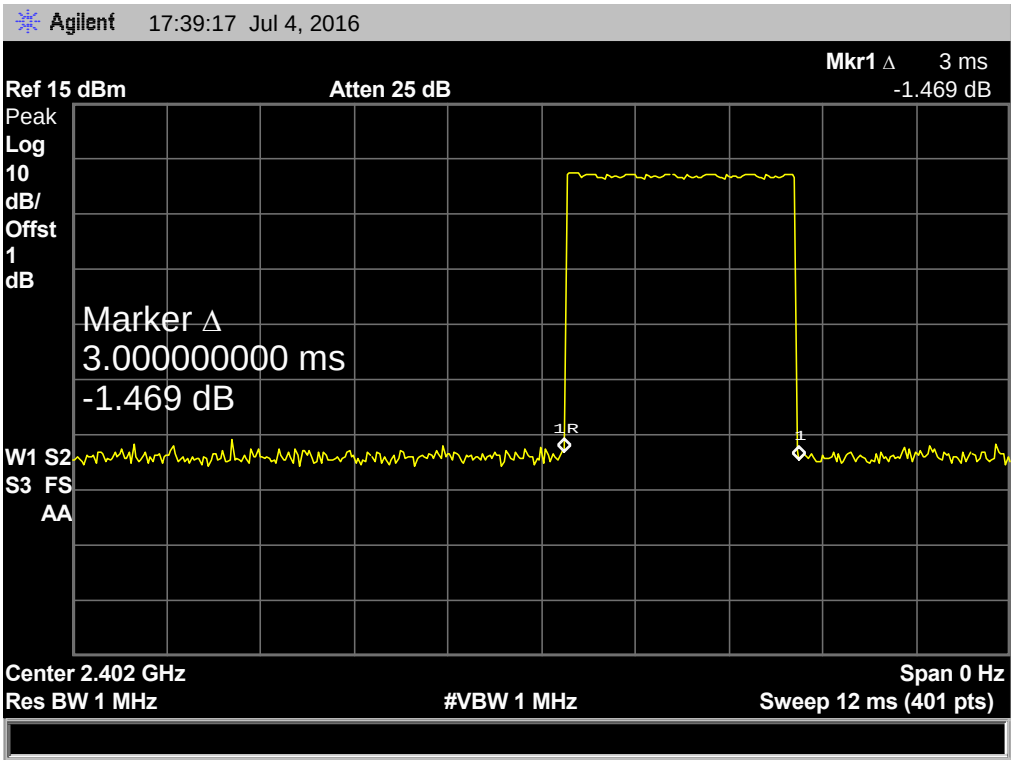
| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (8-DPSK DH5) | | |

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

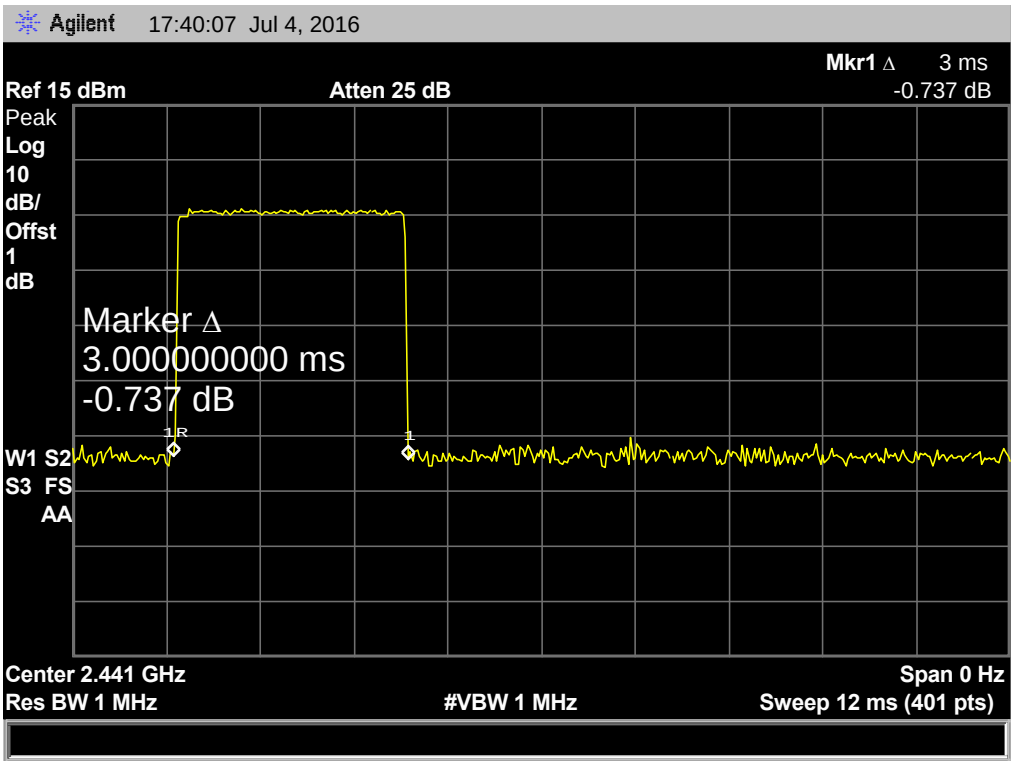
Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6

**8-DPSK Hopping Mode DH5**

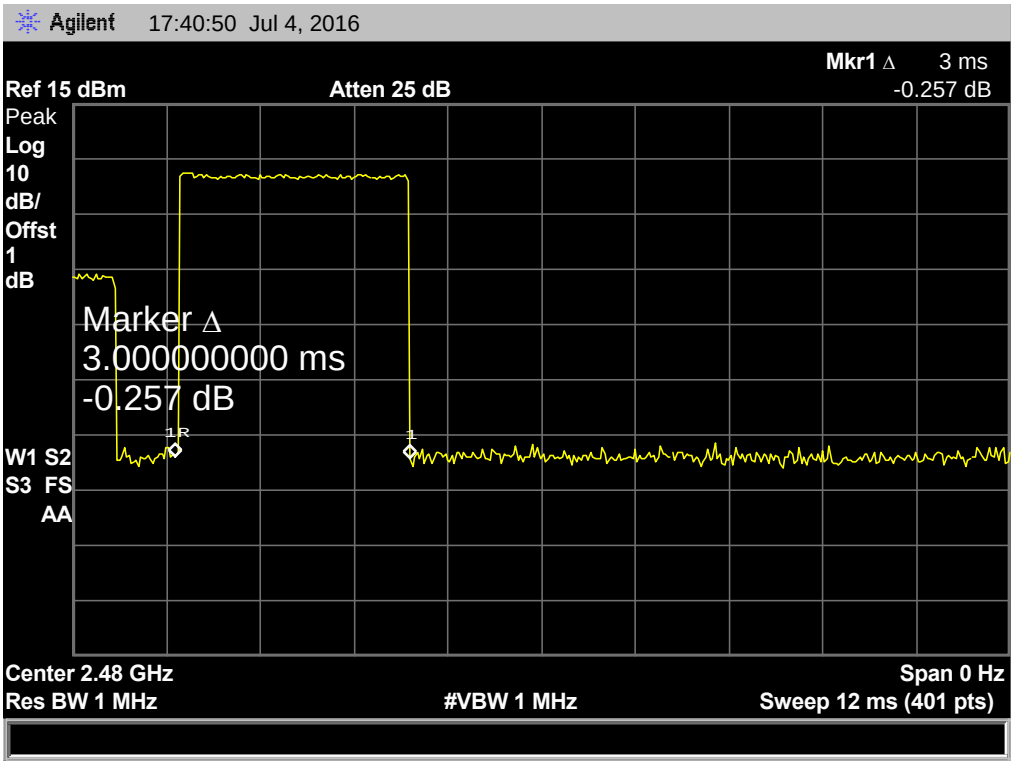
**2402 MHz**



| 8-DPSK Hopping Mode DH5 |
|---|
| 2441 MHz |




| 8-DPSK Hopping Mode DH5 |
|---|
| 2480 MHz |



# 9. Channel Separation and Bandwidth Test

## 9.1 Test Standard and Limit

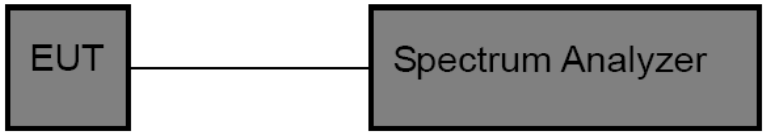
9.1.1 Test Standard

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.

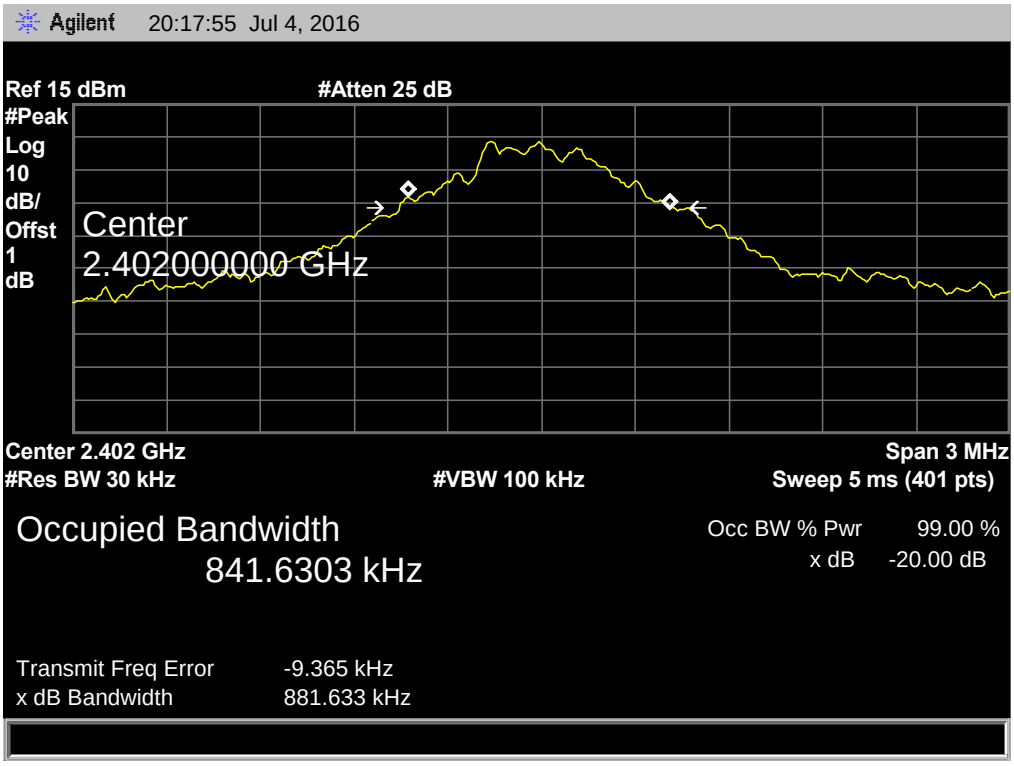
## 9.5 Test Data

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX Mode (GFSK) | | |

| Channel frequency (MHz) | 99% OBW (kHz) | 20dB Bandwidth (kHz) | 20dB Bandwidth *2/3 (kHz) |
|---|---|---|---|
| 2402 | 841.6303 | 881.633 | |
| 2441 | 836.8144 | 916.583 | |
| 2480 | 837.1496 | 854.001 | |

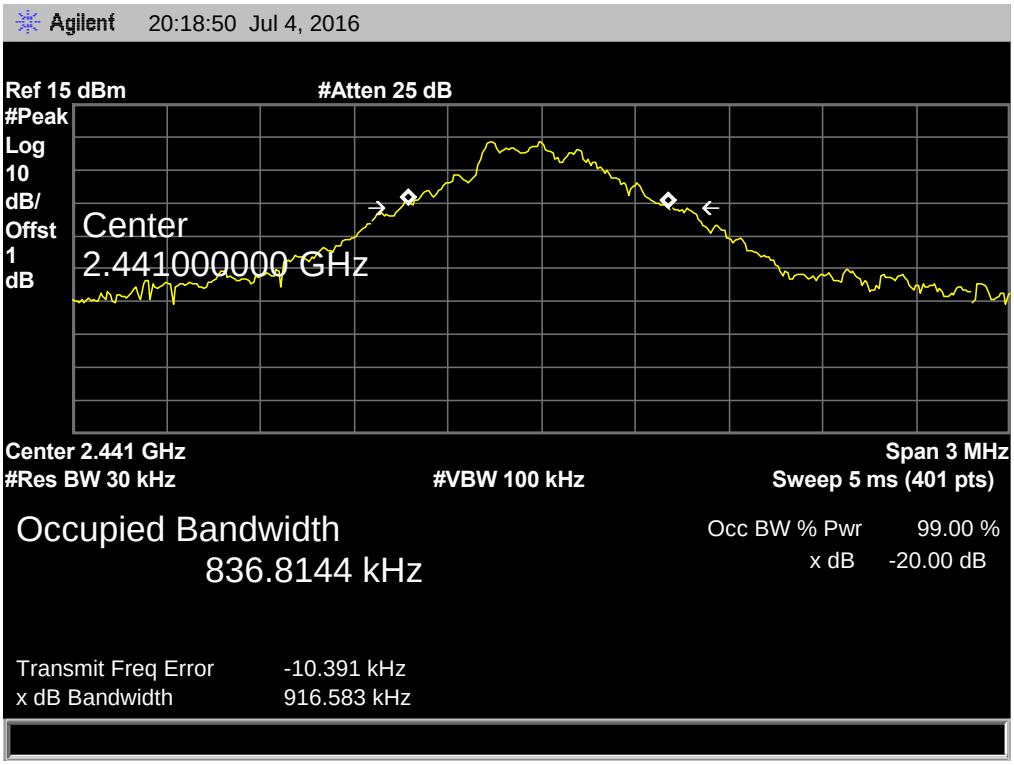
**GFSK TX Mode**

**2402 MHz**



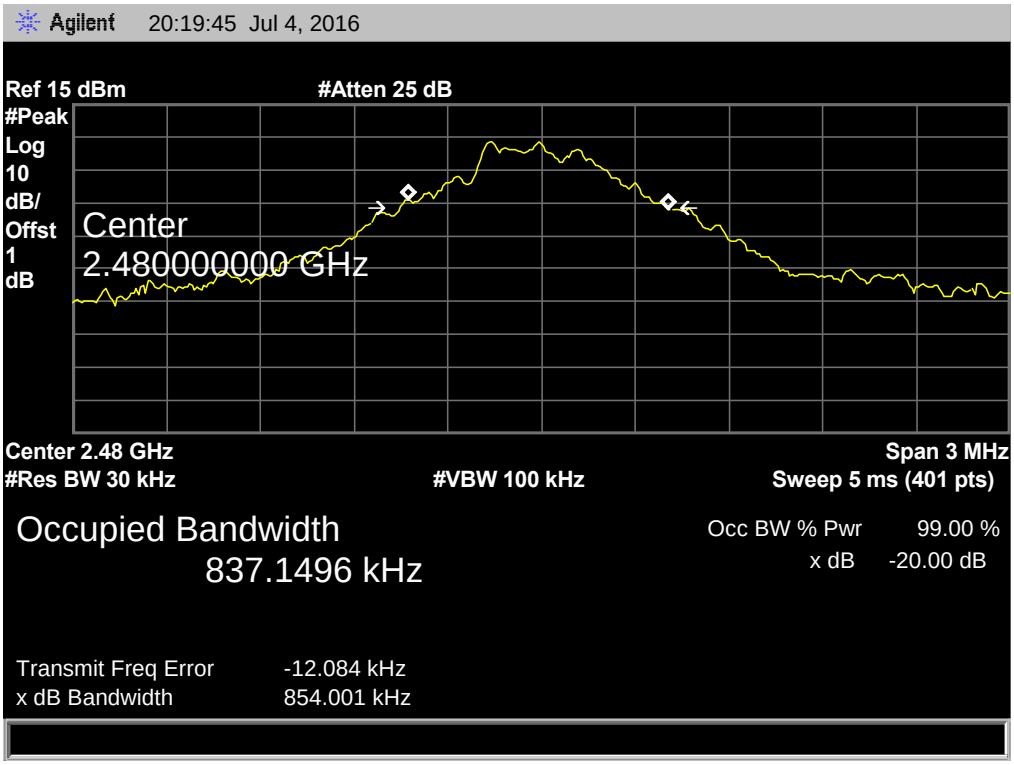
**GFSK TX Mode**

**2441 MHz**




**GFSK TX Mode**

**2480 MHz**

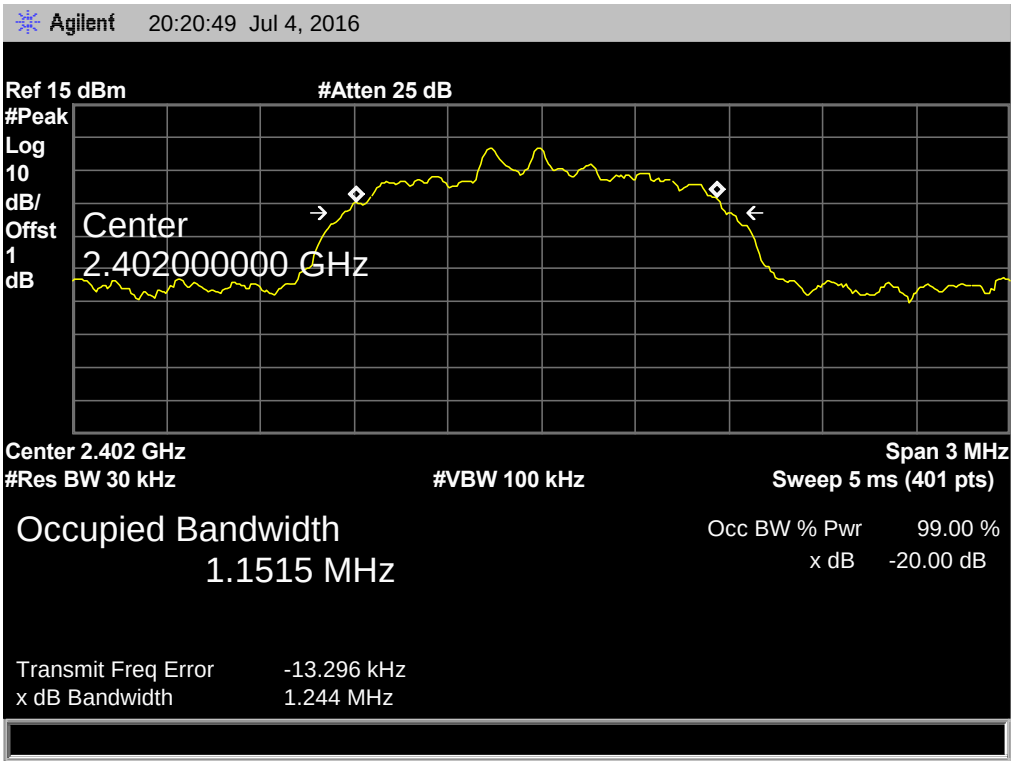


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX Mode ( π /4-DQPSK) | | |

| Channel frequency (MHz) | 99% OBW (kHz) | 20dB Bandwidth (kHz) | 20dB Bandwidth *2/3 (kHz) |
|---|---|---|---|
| 2402 | 1151.50 | 1244.00 | 829.33 |
| 2441 | 1131.00 | 1213.00 | 808.67 |
| 2480 | 1130.10 | 1217.00 | 811.33 |

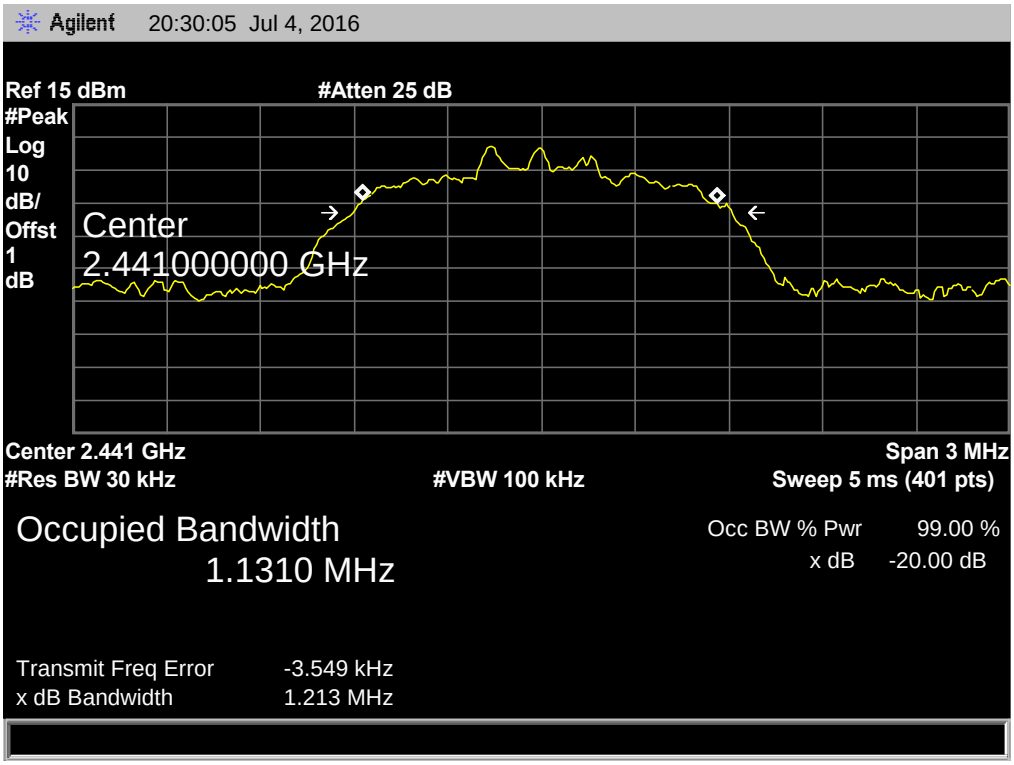
**π /4-DQPSK TX Mode**

**2402 MHz**



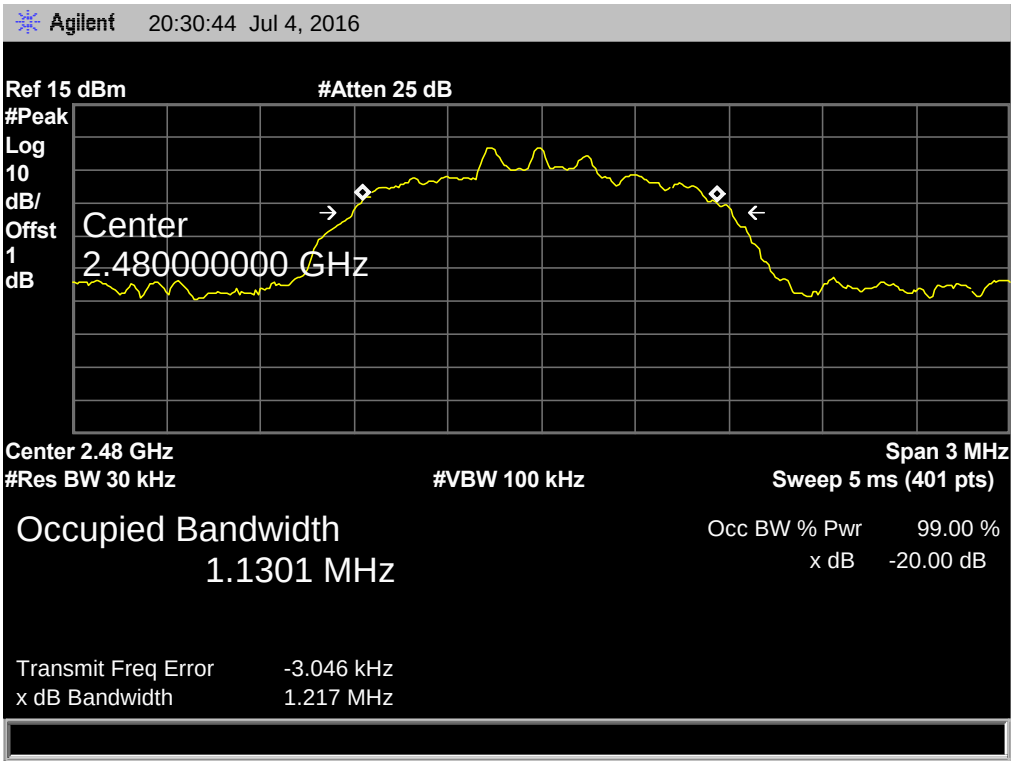
π/4-DQPSK TX Mode

2441 MHz




π/4-DQPSK TX Mode

2480 MHz

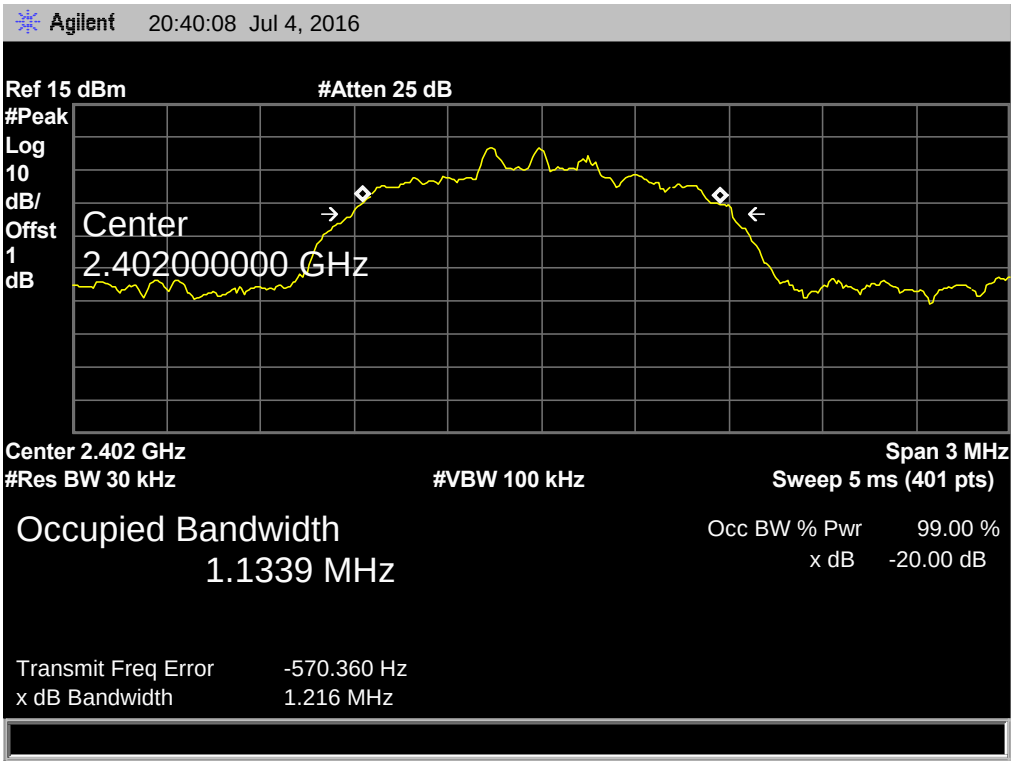


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX Mode (8-DPSK) | | |

| Channel frequency (MHz) | 99% OBW (kHz) | 20dB Bandwidth (kHz) | 20dB Bandwidth *2/3 (kHz) |
|---|---|---|---|
| 2402 | 1133.90 | 1216.00 | 810.67 |
| 2441 | 1131.80 | 1218.00 | 812.00 |
| 2480 | 1127.00 | 1218.00 | 812.00 |

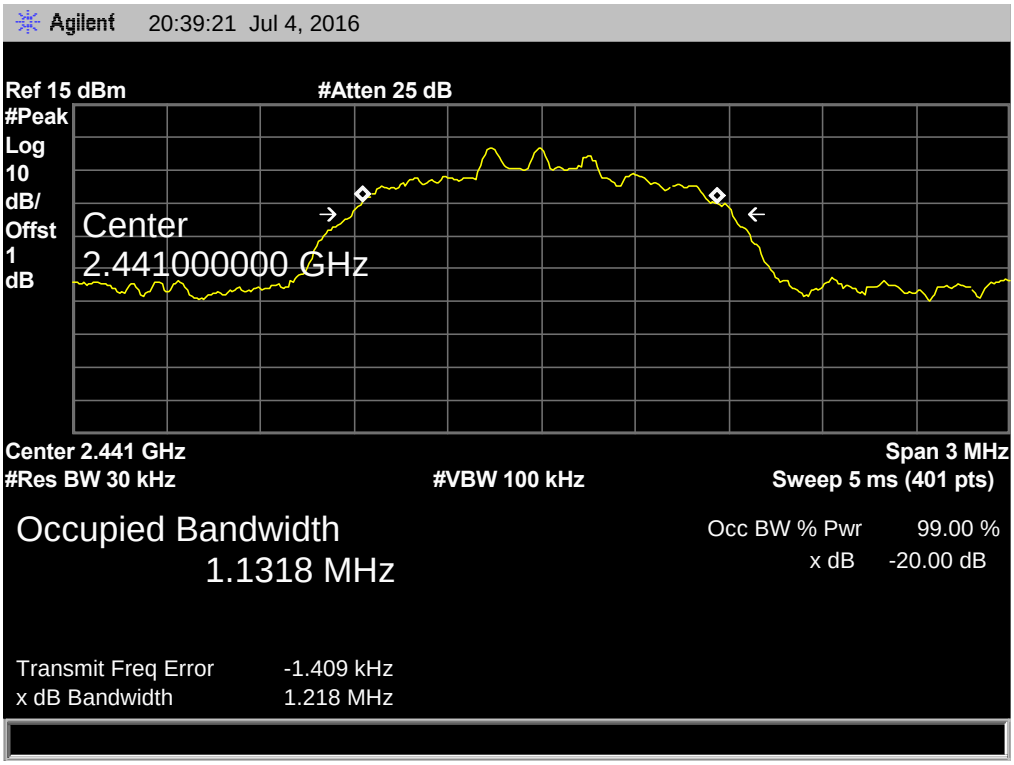
**8-DPSK TX Mode**

**2402 MHz**



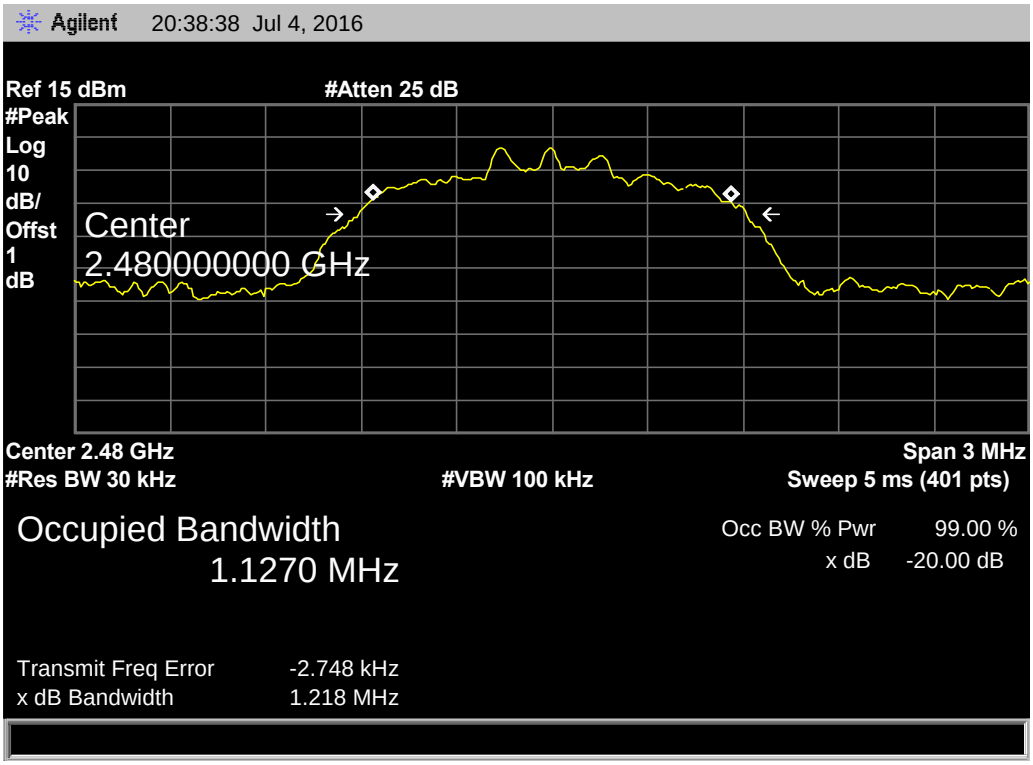
**8-DPSK TX Mode**

**2441 MHz**




**8-DPSK TX Mode**

**2480 MHz**

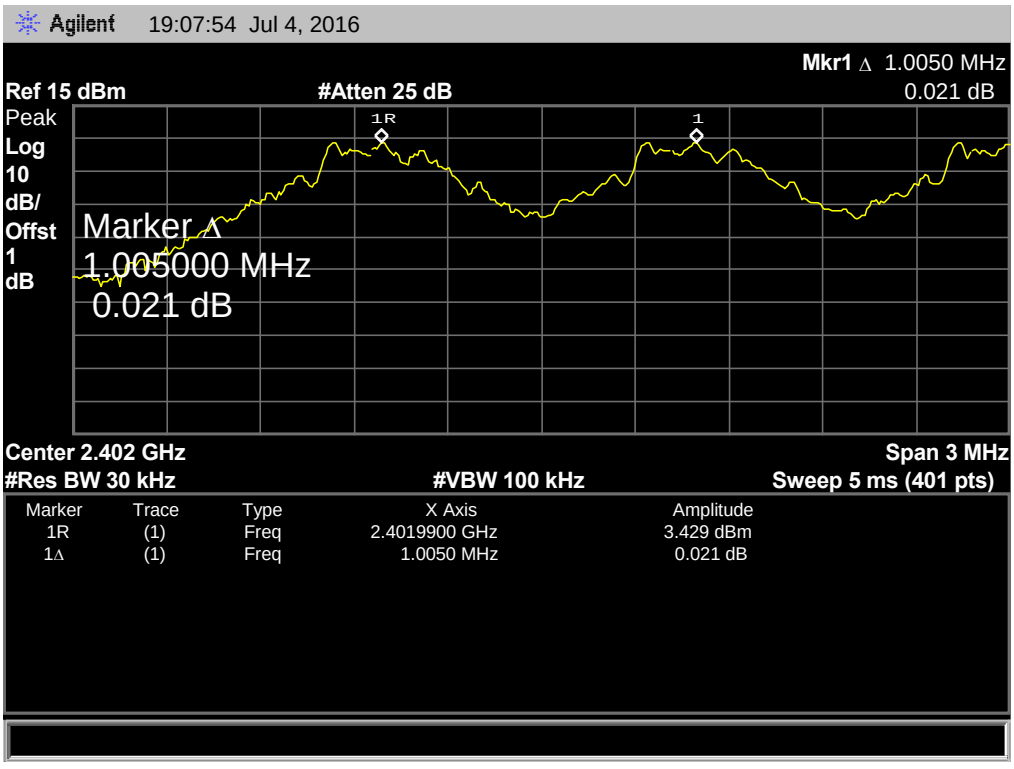


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (GFSK) | | |

| Channel frequency (MHz) | Separation Read Value (kHz) | Separation Limit (kHz) |
|---|---|---|
| 2402 | 1005.00 | 881.633 |
| 2441 | 1005.00 | 916.583 |
| 2480 | 1005.00 | 854.001 |

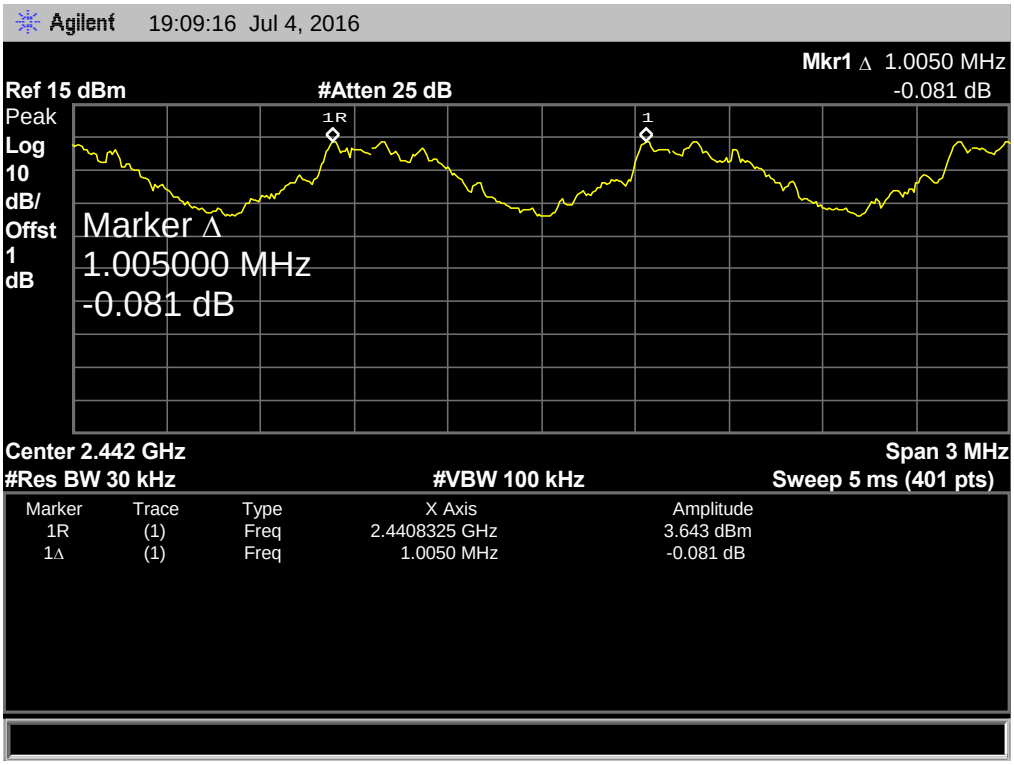
**GFSK Hopping Mode**

**2402 MHz**



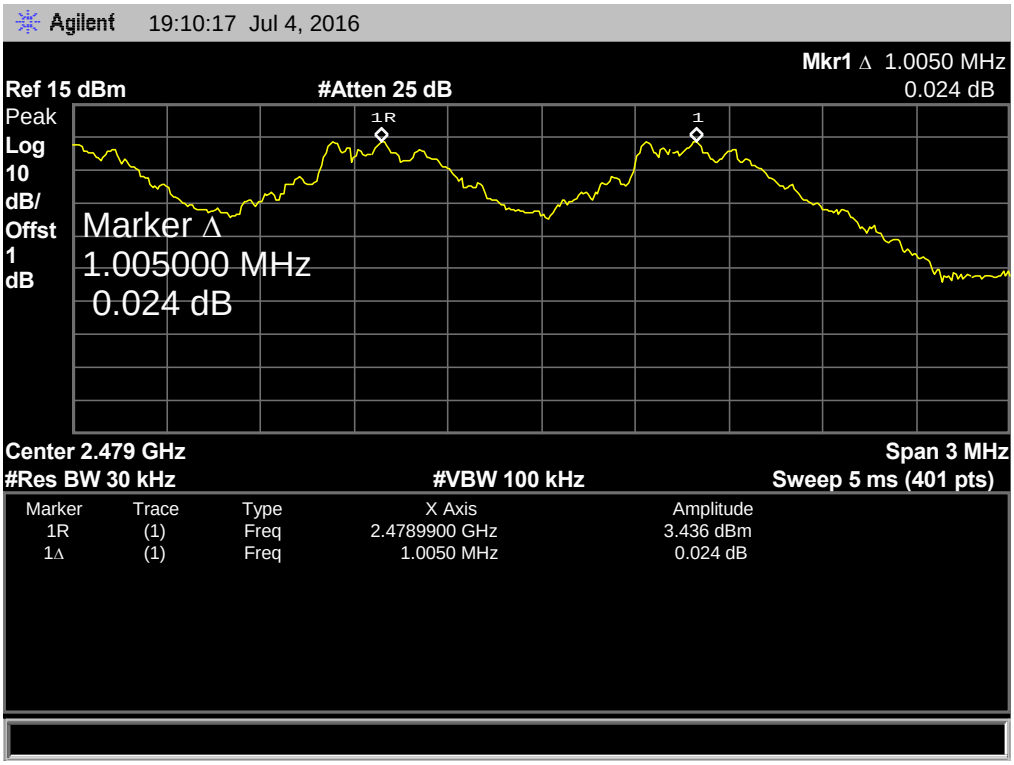
**GFSK Hopping Mode**

**2441 MHz**




**GFSK Hopping Mode**

**2480 MHz**

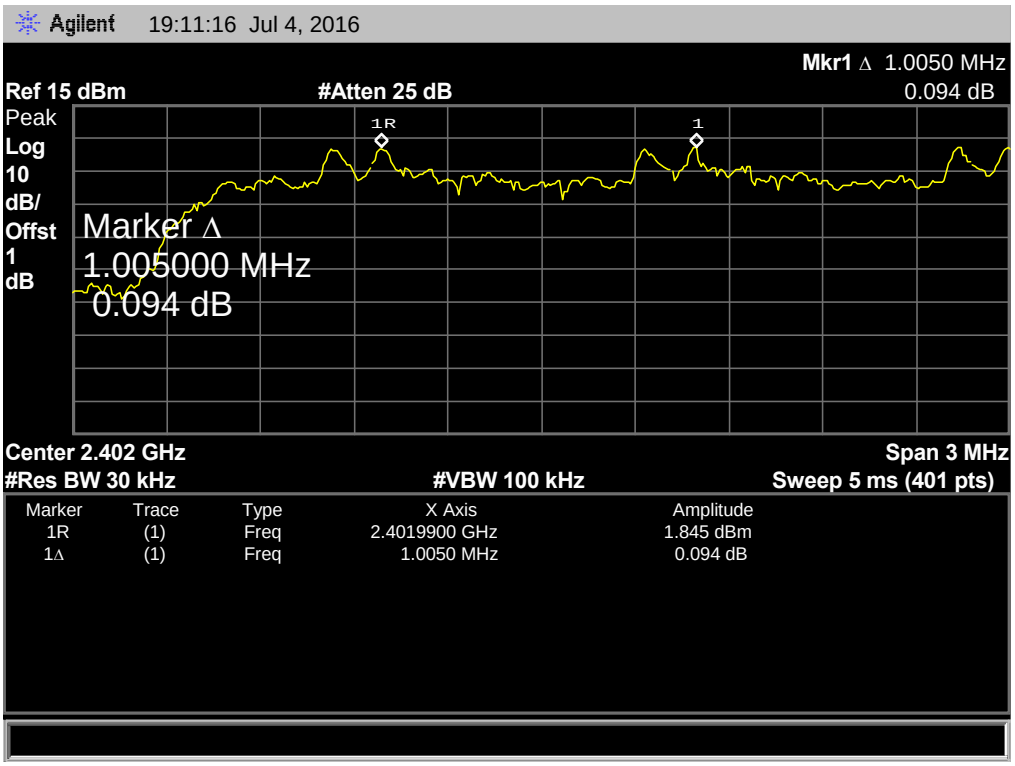


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (π/4-DQPSK) | | |

| Channel frequency (MHz) | Separation Read Value (kHz) | Separation Limit (kHz) |
|---|---|---|
| 2402 | 1027.50 | 829.33 |
| 2441 | 1027.50 | 808.67 |
| 2480 | 1005.00 | 811.33 |

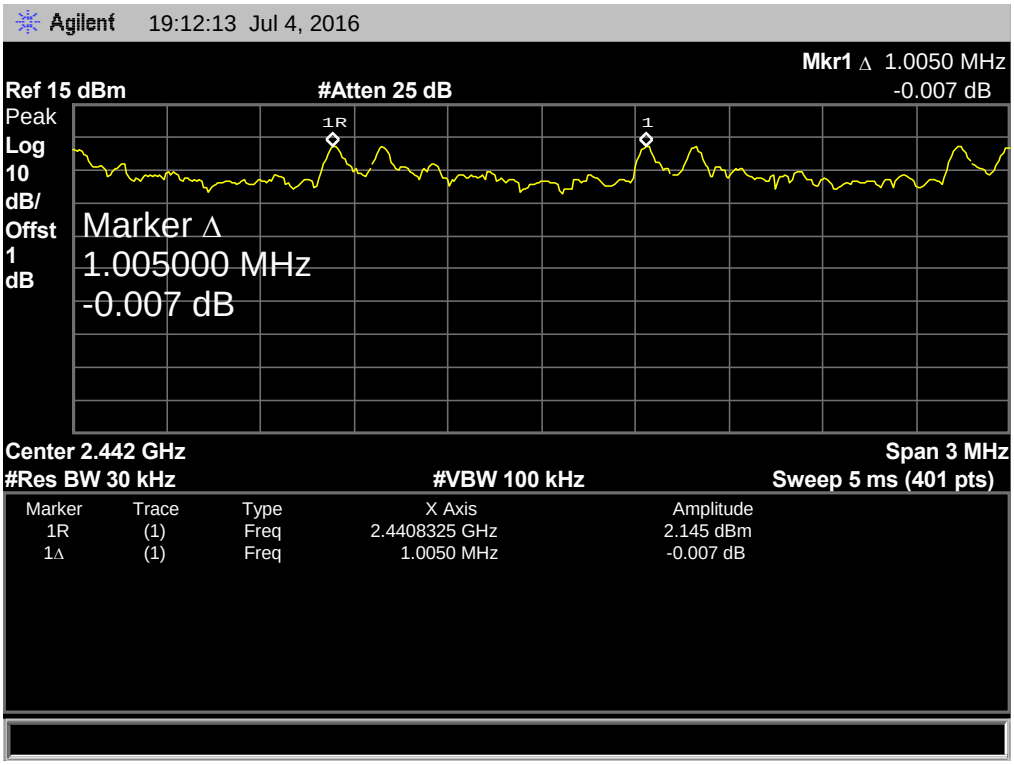
**π/4-DQPSK Hopping Mode**

**2402 MHz**



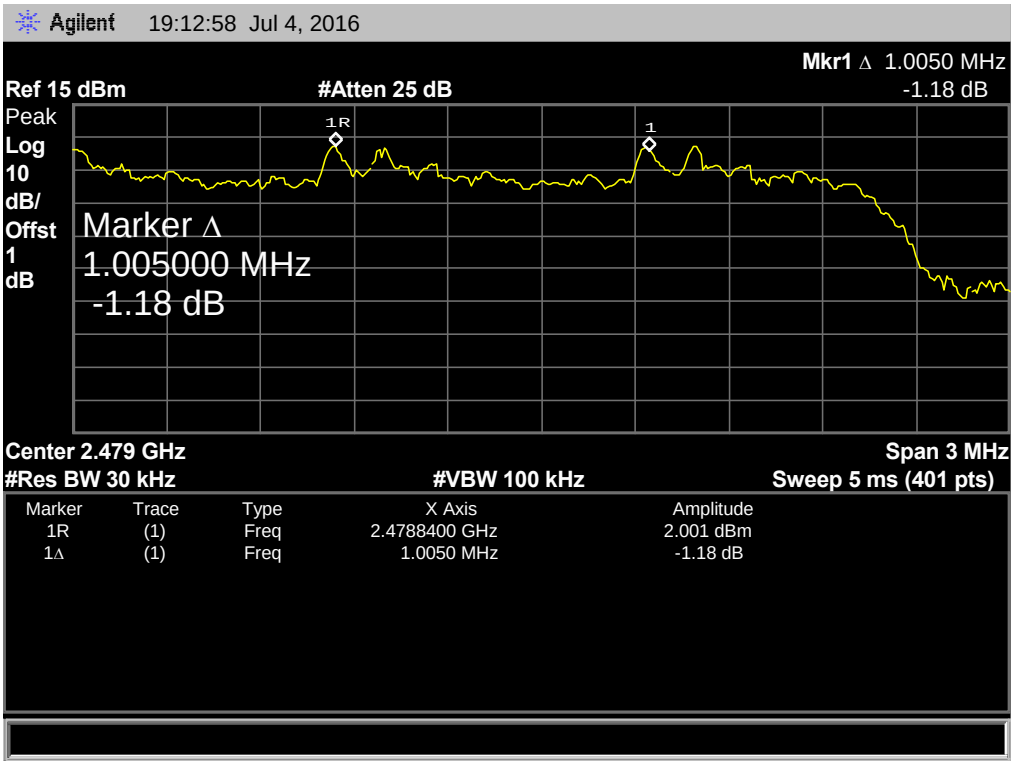
π /4-DQPSK Hopping Mode

2441 MHz




π /4-DQPSK Hopping Mode

2480 MHz

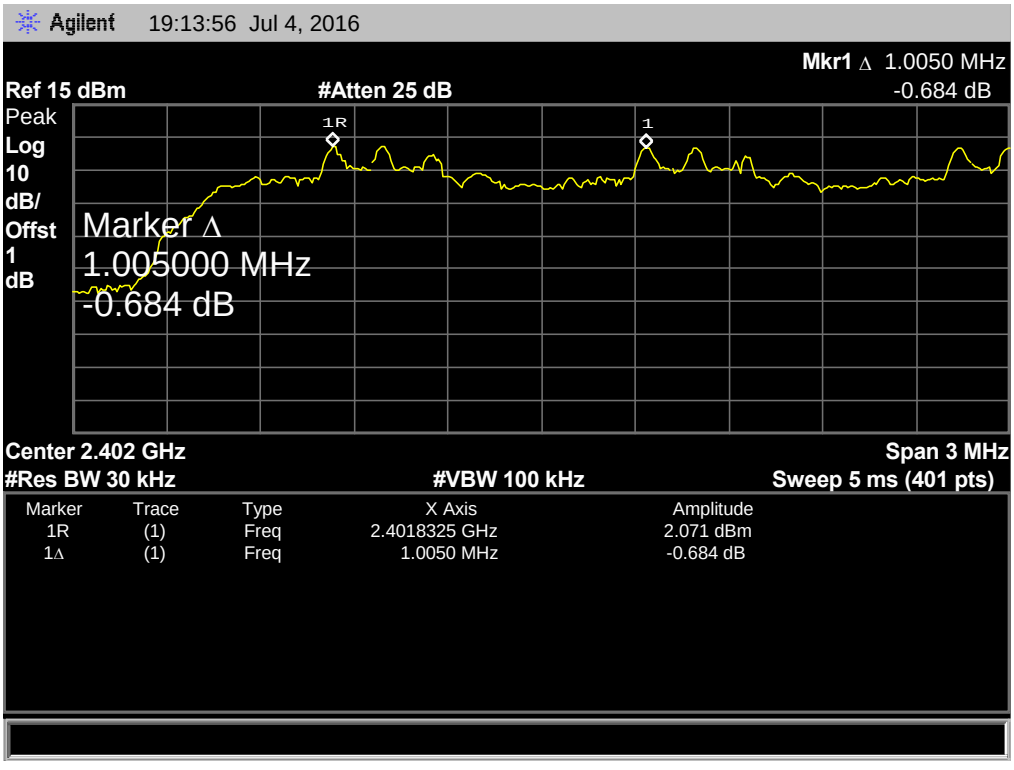


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | Hopping Mode (8-DPSK) | | |

| Channel frequency (MHz) | Separation Read Value (kHz) | Separation Limit (kHz) |
|---|---|---|
| 2402 | 1005.00 | 810.67 |
| 2441 | 1005.00 | 812.00 |
| 2480 | 1005.00 | 812.00 |

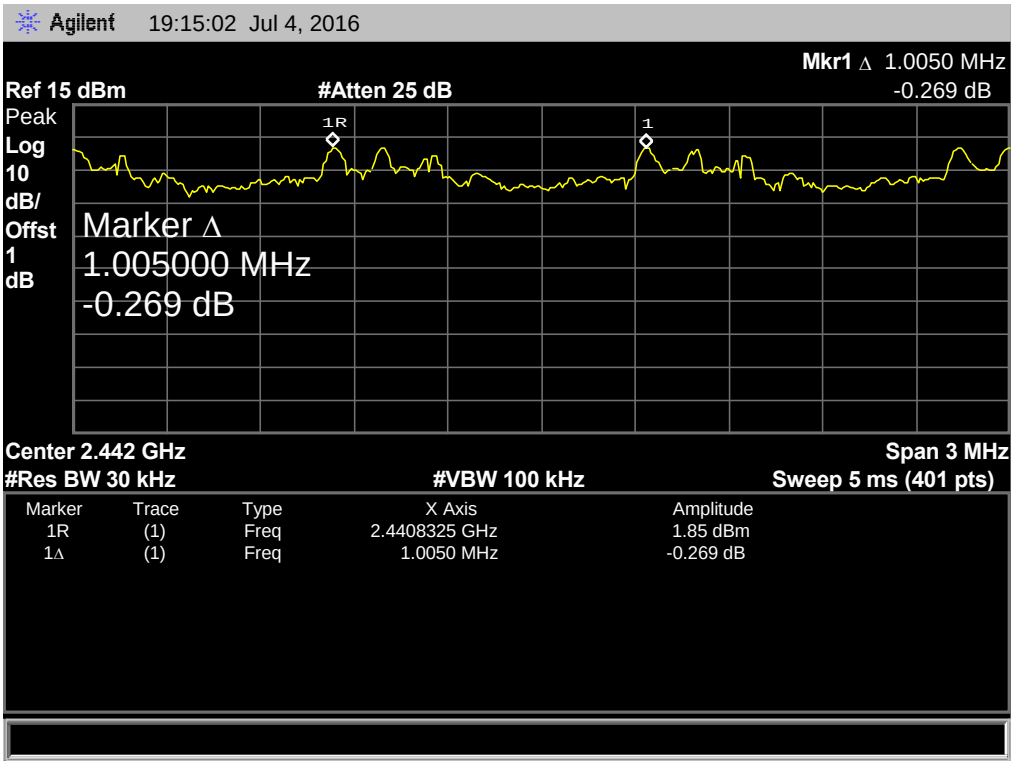
**8-DPSK Hopping Mode**

**2402 MHz**



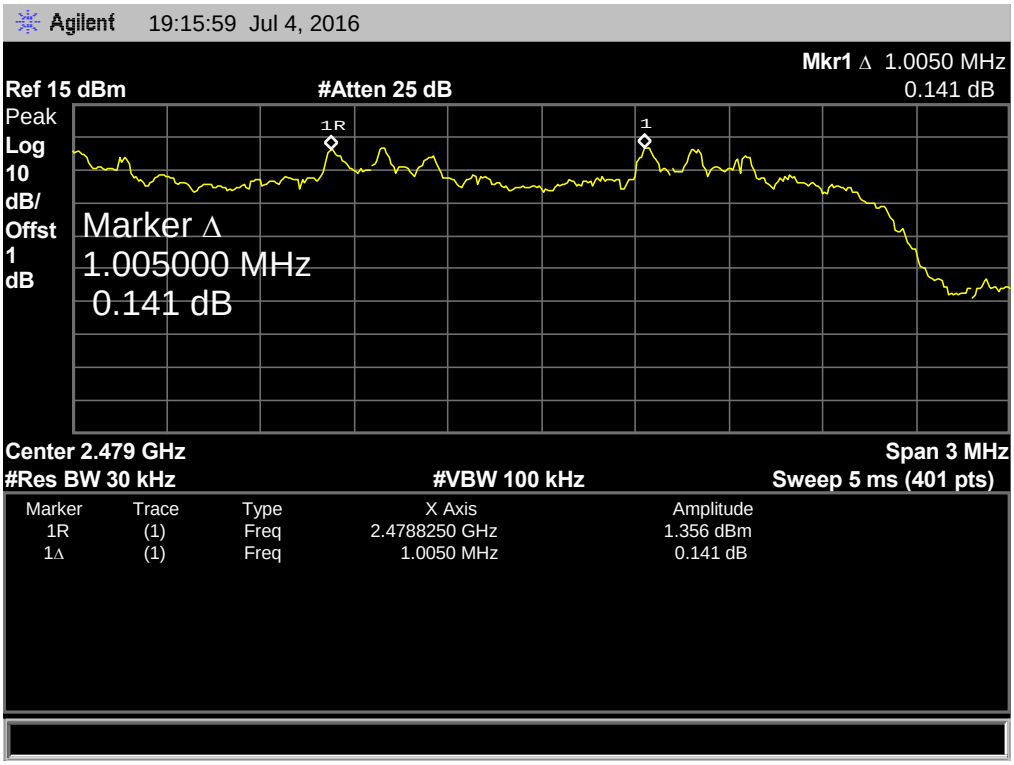
**8-DPSK Hopping Mode**

**2441 MHz**




**8-DPSK Hopping Mode**

**2480 MHz**



# 10. Peak Output Power Test

## 10.1 Test Standard and Limit

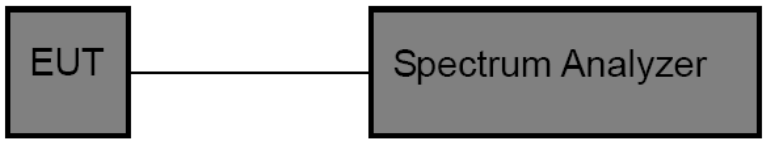
### 10.1.1 Test Standard

FCC Part 15.247 (b) (1)

### 10.1.2 Test Limit

| Test Item | Limit | Frequency Range(MHz) |
|---|---|---|
| Peak Output Power | Hopping Channels>75<br>Power<1W(30dBm)<br>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.

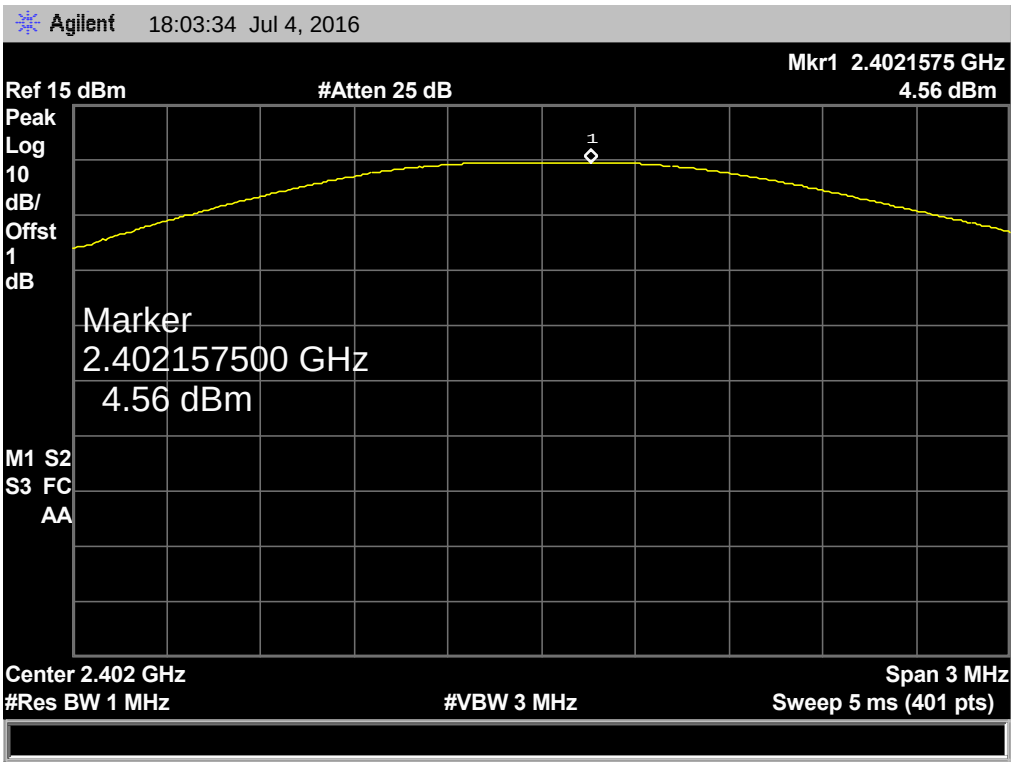
## 10.5 Test Data

| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX Mode (GFSK) | | |

| Channel frequency (MHz) | Test Result (dBm) | Limit (dBm) |
|---|---|---|
| 2402 | 4.560 | 30 |
| 2441 | 4.682 | |
| 2480 | 4.533 | |

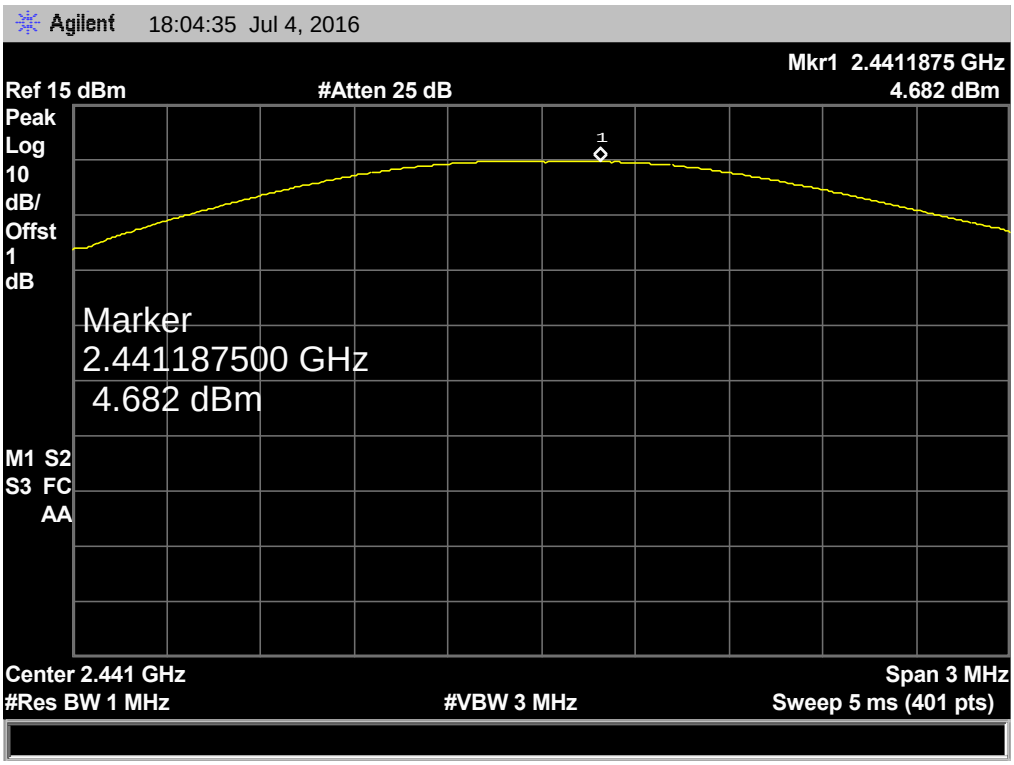
**GFSK TX Mode**

**2402 MHz**



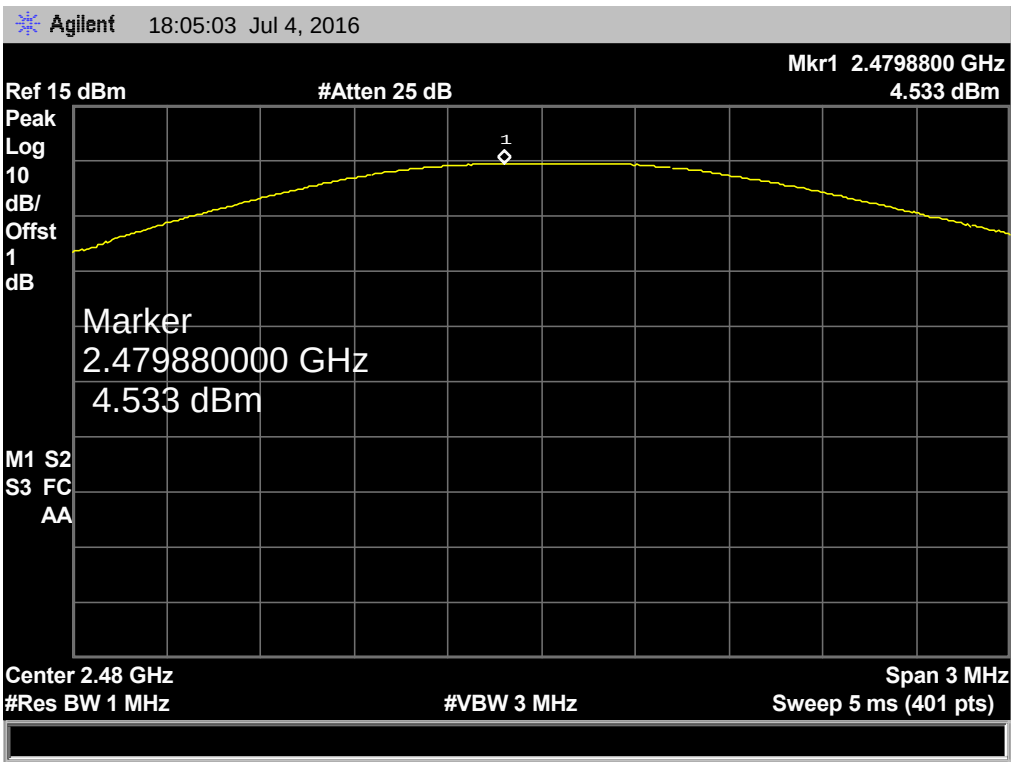
**GFSK TX Mode**

**2441 MHz**




**GFSK TX Mode**

**2480 MHz**

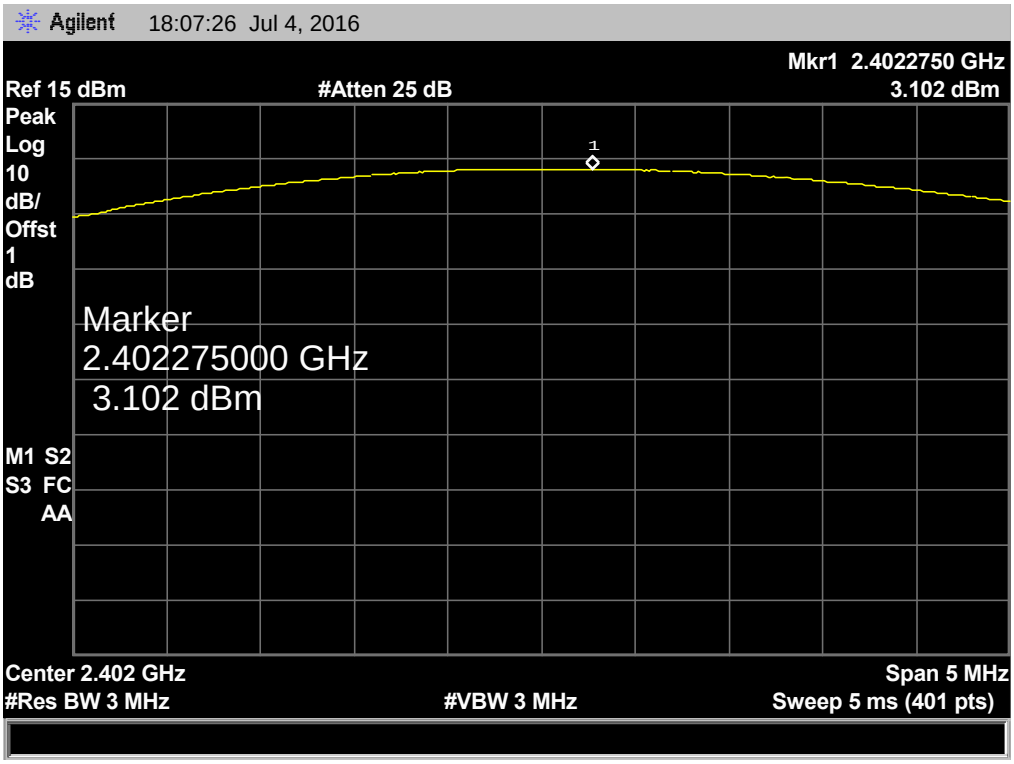


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX Mode ( π /4-DQPSK) | | |

| Channel frequency (MHz) | Test Result (dBm) | Limit (dBm) |
|---|---|---|
| 2402 | 3.102 | 21 |
| 2441 | 3.242 | |
| 2480 | 3.158 | |

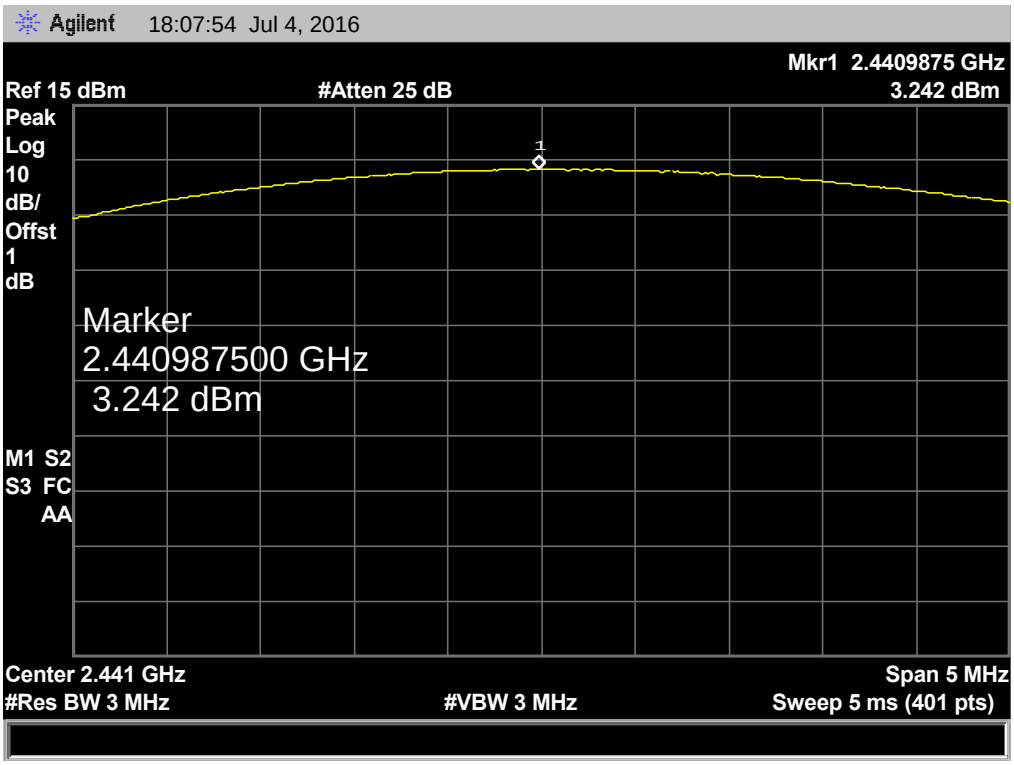
**π /4-DQPSK TX Mode**

**2402 MHz**



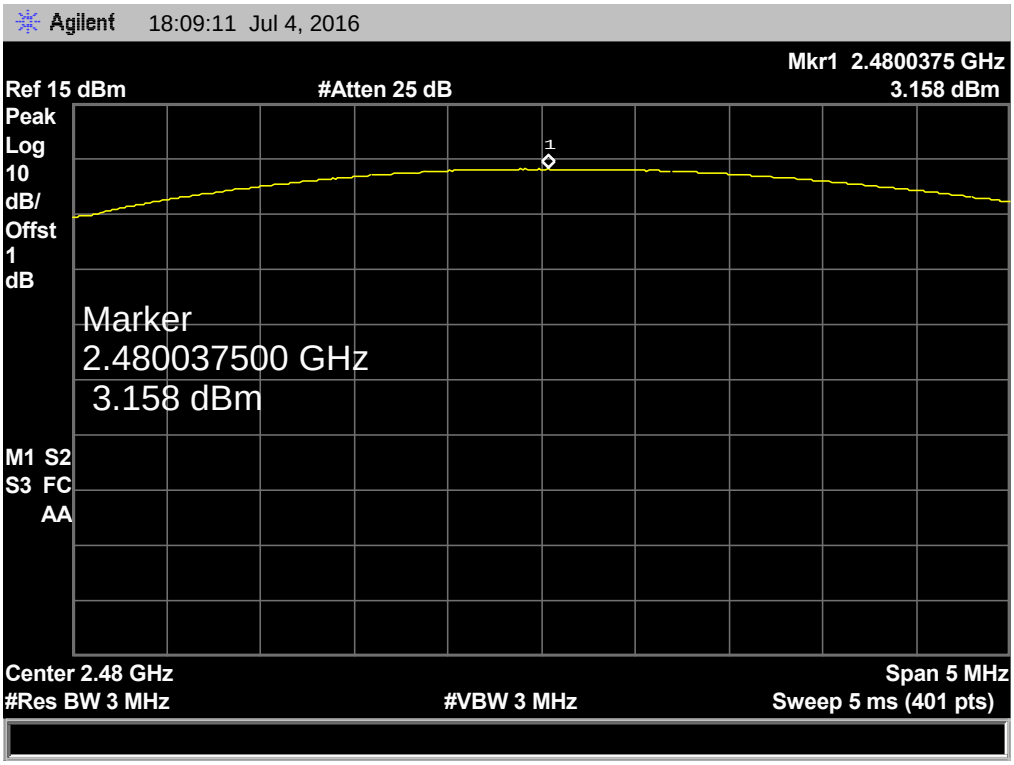
π/4-DQPSK TX Mode

2441 MHz




π/4-DQPSK TX Mode

2480 MHz

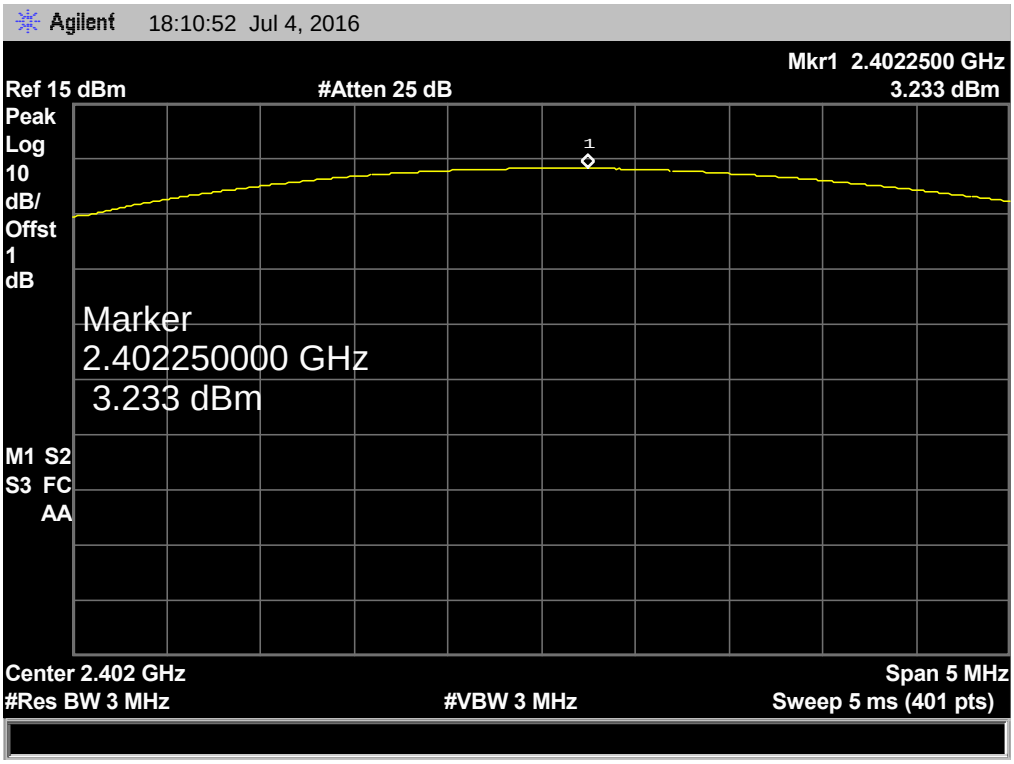


| EUT: | Wireless Waterproof Speaker | Model Name : | MagBy01 |
|---|---|---|---|
| Temperature: | 25 ℃ | Relative Humidity: | 55% |
| Test Voltage: | DC 3.7V | | |
| Test Mode: | TX Mode (8-DPSK) | | |

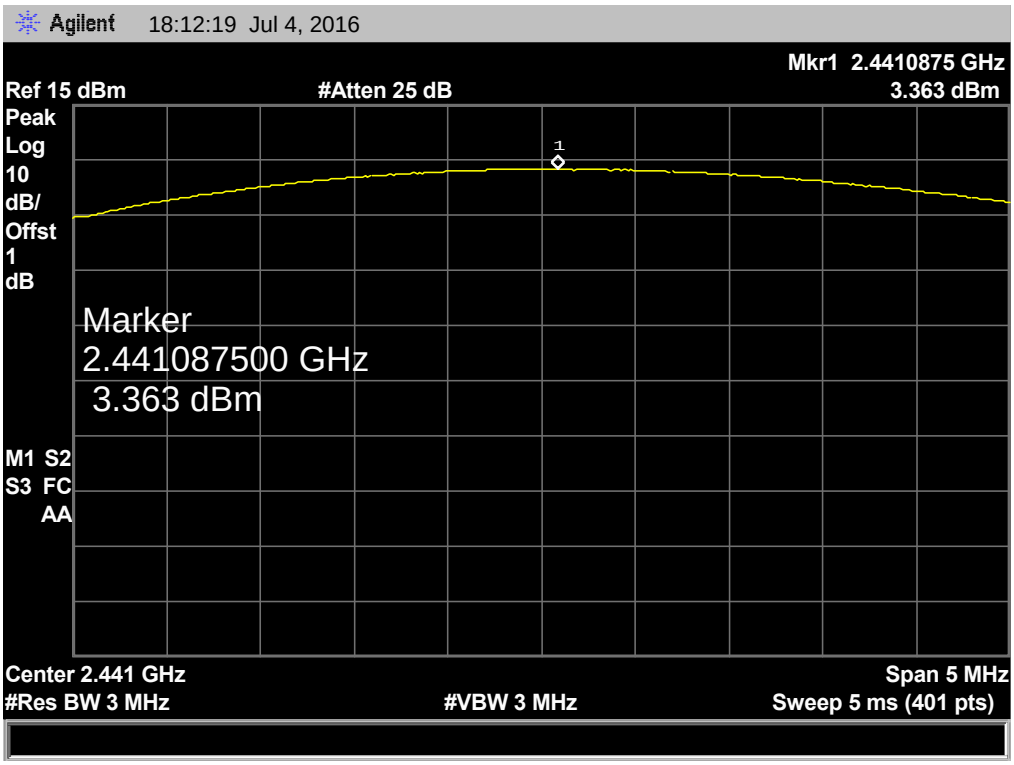
| Channel frequency (MHz) | Test Result (dBm) | Limit (dBm) |
|---|---|---|
| 2402 | 3.233 | 21 |
| 2441 | 3.363 | |
| 2480 | 3.252 | |

**8-DPSK TX Mode**

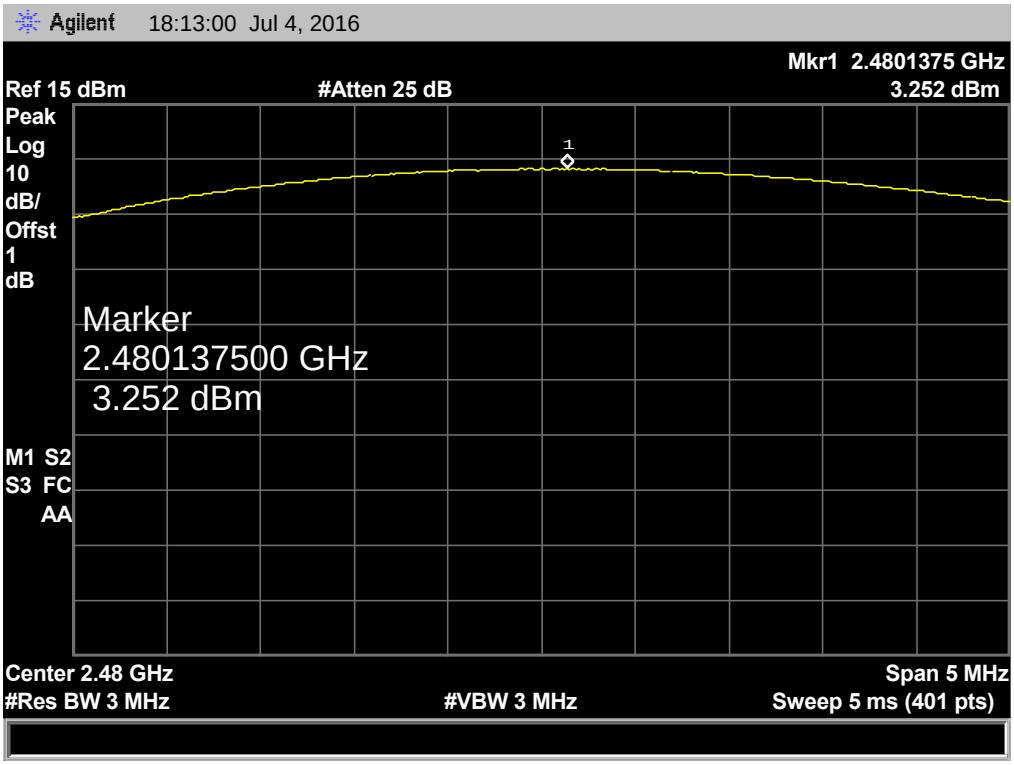
**2402 MHz**



| 8-DPSK TX Mode |
| --- |
| 2441 MHz |




| 8-DPSK TX Mode |
| --- |
| 2480 MHz |



# 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 0.5 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 |
| --- |
| ☑ Permanent attached antenna |
| ☐ Unique connector antenna |
| ☐ Professional installation antenna |