# FCC CERTIFICATION TEST REPORT

## FOR

| | | |
|---|---|---|
| **Applicant** | : | Retro Manufacturing, LLC |
| **Address** | : | 7470 Commercial Way, Henderson, NV 89011 USA |
| **Equipment under Test** | : | RADIO CONTROL BOX M1B RETRO SOUND |
| **Model No.** | : | MOTOR 1B, RetroRadio, Huntington, Apache, Redondo, Newport, Monterey, Santa Cruz, New York, Grand Prix, Denver, Daytona, Detroit, Wonder Bar 1, Wonder Bar 3 |
| **Trade Mark** | : | RetroSound, RetroRadio, Retro Manufacturing |
| **FCC ID** | : | 2AXWTMOTOR1B |
| **Manufacturer** | : | ACTION INDUSTRIES (M) SDN. BHD. |
| **Address** | : | 2480, TINGKAT PERUSAHAAN ENAM, PRAI FREE TRADE ZONE, 13600, PERAI, PENANG, MALAYSIA |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

**Add.:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

**Tel.:** +86-0769-38826678, **E-mail:** ddt@dgddt.com, http://www.dgddt.com

REPORT

# Table of Contents


Test report declares....4
1. Summary of Test Results.... 6
2. General Test Information .... 7
2.1. Description of EUT .... 7
2.2. Accessories of EUT .... 8
2.3. Assistant equipment used for test.... 8
2.4. Block diagram of EUT configuration for test.... 8
2.5. Deviations of test standard .... 8
2.6. Test environment conditions.... 9
2.7. Test laboratory .... 9
2.8. Measurement uncertainty .... 10
3. Equipment Used During Test.... 11
4. Maximum Peak Output Power .... 12
4.1. Block diagram of test setup .... 12
4.2. Limits .... 12
4.3. Test procedure .... 12
4.4. Test result.... 12
4.5. Original test data .... 13
5. 20dB Bandwidth .... 17
5.1. Block diagram of test setup .... 17
5.2. Limits .... 17
5.3. Test procedure .... 17
5.4. Test result.... 17
5.5. Original test data .... 18
6. Carrier Frequency Separation .... 22
6.1. Block diagram of test setup .... 22
6.2. Limits .... 22
6.3. Test procedure .... 22
6.4. Test result.... 22
6.5. Original test data .... 23
7. Number of Hopping Channel .... 25
7.1. Block diagram of test setup .... 25
7.2. Limits .... 25
7.3. Test procedure .... 25
7.4. Test result.... 25
7.5. Original test data .... 25

8. Dwell Time ..... 27
8.1. Block diagram of test setup ..... 27
8.2. Limits ..... 27
8.3. Test procedure ..... 27
8.4. Test result ..... 27
8.5. Original test data ..... 28
9. Band Edge Compliance (Conducted Method) ..... 35
9.1. Block diagram of test setup ..... 35
9.2. Limit ..... 35
9.3. Test result ..... 35
9.4. Original test data ..... 35
10. Radiated Emission ..... 40
10.1. Block diagram of test setup ..... 40
10.2. Limit ..... 41
10.3. Test procedure ..... 42
10.4. Test result ..... 44
11. RF Conducted Spurious Emissions ..... 59
11.1. Block diagram of test setup ..... 59
11.2. Limits ..... 59
11.3. Test procedure ..... 59
11.4. Test result ..... 60
11.5. Original test data ..... 60
12. Band Edge Compliance (Radiated Method) ..... 70
12.1. Block diagram of test setup ..... 70
12.2. Limit ..... 70
12.3. Test procedure ..... 70
12.4. Test result ..... 70
13. Antenna Requirements ..... 83
13.1. Limit ..... 83
13.2. Result ..... 83
14. Test Setup Photograph ..... 84
15. Photos of the EUT ..... 86

# Test Report Declare

| | | |
|---|---|---|
| **Applicant** | : | Retro Manufacturing, LLC |
| **Address** | : | 7470 Commercial Way, Henderson, NV 89011 USA |
| **Equipment under Test** | : | RADIO CONTROL BOX M1B RETRO SOUND |
| **Model No.** | : | MOTOR 1B, RetroRadio, Huntington, Apache, Redondo, Newport, Monterey, Santa Cruz, New York, Grand Prix, Denver, Daytona, Detroit, Wonder Bar 1, Wonder Bar 3 |
| **Trade Mark** | : | RetroSound, RetroRadio, Retro Manufacturing |
| **Manufacturer** | : | ACTION INDUSTRIES (M) SDN. BHD. |
| **Address** | : | 2480, TINGKAT PERUSAHAAN ENAM, PRAI FREE TRADE ZONE, 13600, PERAI, PENANG, MALAYSIA |

**Test Standard Used:**

FCC Rules and Regulations Part 15 Subpart C.

**Test Procedure Used:**

ANSI C63.10:2013.

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

| | | | |
|---|---|---|---|
| **Report No.:** | DDT-R21121405-2E01 | | |
| **Date of Receipt:** | Dec. 20, 2021 | **Date of Test:** | Dec. 20, 2021 ~ Jan. 10, 2022 |

***Prepared By:*** ***Approved By:***

Ben Jin

***Ben Jin/Engineer*** ***Damon Hu/EMC Manager***

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

# Revision History

| Rev. | Revisions | Issue Date | Revised By |
|---|---|---|---|
| --- | Initial issue | Jan. 10, 2022 | |
| | | | |

# 1. Summary of Test Results

| Description of Test Item | Standard | Results |
|---|---|---|
| Maximum Peak Output Power | FCC Part 15: 15.247(b)(1)<br>ANSI C63.10:2013 | Pass |
| 20dB Bandwidth and 99% Bandwidth | FCC Part 15: 15.215<br>ANSI C63.10:2013 | Pass |
| Carrier Frequency Separation | FCC Part 15: 15.247(a)(1)<br>ANSI C63.10:2013 | Pass |
| Number of Hopping Channel | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10:2013 | Pass |
| Dwell Time | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10:2013 | Pass |
| Radiated Emission | FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>ANSI C63.10:2013 | Pass |
| Band Edge Compliance | FCC Part 15: 15.247(d)<br>ANSI C63.10:2013 | Pass |
| Power Line Conducted Emissions | FCC Part 15: 15.207<br>ANSI C63.10:2013 | N/A |
| Antenna Requirement | FCC Part 15: 15.203 | Pass |
| Note: N/A is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device. | | |

# 2. General Test Information

## 2.1. Description of EUT

| | | |
|---|---|---|
| EUT* Name | : | RADIO CONTROL BOX M1B RETRO SOUND |
| Model Number | : | MOTOR 1B, RetroRadio, Huntington, Apache, Redondo, Newport, Monterey, Santa Cruz, New York, Grand Prix, Denver, Daytona, Detroit, Wonder Bar 1, Wonder Bar 3 |
| Model Difference | : | Products is same, for those different selling countries or brands will create different models name |
| EUT Function Description | : | Please reference user manual of this device |
| Power Supply | : | DC 12V |
| Radio Specification | : | Bluetooth V5.0 |
| Operation Frequency | : | 2402MHz-2480MHz |
| Modulation | : | GFSK, π/4-DQPSK, 8DPSK |
| Data Rate | : | 1 Mbps, 2 Mbps, 3 Mbps |
| Antenna Gain | : | Maximum PK gain: 0 dBi |
| Sample Type | : | Series production |
| Serial number | : | N/A |

Note: EUT is the ab. of equipment under test.

| Channel Information | | | | | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 0 | 2402 | 27 | 2429 | 54 | 2456 |
| 1 | 2403 | 28 | 2430 | 55 | 2457 |
| 2 | 2404 | 29 | 2431 | 56 | 2458 |
| 3 | 2405 | 30 | 2432 | 57 | 2459 |
| 4 | 2406 | 31 | 2433 | 58 | 2460 |
| 5 | 2407 | 32 | 2434 | 59 | 2461 |
| 6 | 2408 | 33 | 2435 | 60 | 2462 |
| 7 | 2409 | 34 | 2436 | 61 | 2463 |
| 8 | 2410 | 35 | 2437 | 62 | 2464 |
| 9 | 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 | |

## 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model Number | Description | Remark |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |

## 2.3. Assistant equipment used for test

| Assistant equipment | Manufacturer | Model number | Description | other |
|---|---|---|---|---|
| N/A | N/A | N/A | N/A | N/A |

## 2.4. Block diagram of EUT configuration for test

Test software: FrequencyTool_v0.3.0
The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

| Tested mode, channel, information | | | |
|---|---|---|---|
| Mode | Setting Tx Power | Channel | Frequency (MHz) |
| GFSK hopping on Tx mode | -2 | CH0 to CH78 | 2402 to 2480 |
| π/4-DQPSK hopping on Tx mode | -2 | CH0 to CH78 | 2402 to 2480 |
| 8DPSK hopping on Tx mode | -2 | CH0 to CH78 | 2402 to 2480 |
| GFSK hopping off Tx mode | -2 | CH0 | 2402 |
| | -2 | CH39 | 2441 |
| | -2 | CH78 | 2480 |
| π/4-DQPSK hopping off Tx mode | -2 | CH0 | 2402 |
| | -2 | CH39 | 2441 |
| | -2 | CH78 | 2480 |
| 8DPSK hopping off Tx mode | -2 | CH0 | 2402 |
| | -2 | CH39 | 2441 |
| | -2 | CH78 | 2480 |

## 2.5. Deviations of test standard

No deviation.

## 2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature range: | 21-25 ℃ |
| Humidity range: | 40-75% |
| Pressure range: | 86-106 kPa |

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, http://www.dgddt.com, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, G-20118

## 2.8. Measurement uncertainty

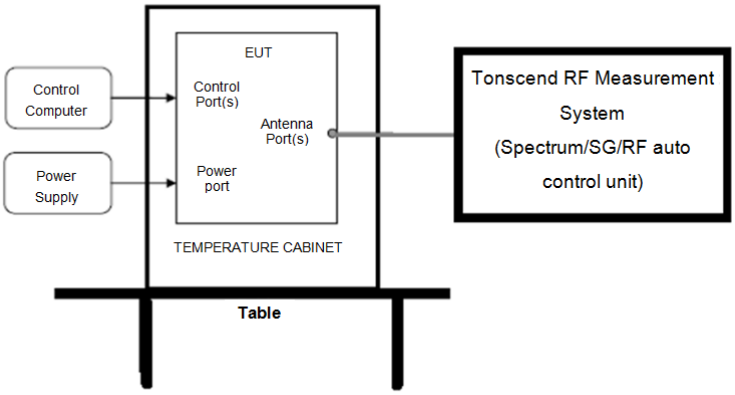
| Test Item | Uncertainty |
|---|---|
| Bandwidth | 1.1% |
| Peak Output Power (Conducted) (Spectrum Analyzer) | 0.86 dB (10 MHz ≤ f < 3.6 GHz); |
| | 1.38 dB (3.6 GHz ≤ f < 8 GHz) |
| Peak Output Power (Conducted) (Power Sensor) | 0.74 dB |
| Power Spectral Density | 0.74 dB (10 MHz ≤ f < 3.6 GHz); |
| | 1.38 dB (3.6 GHz ≤ f < 8 GHz) |
| Frequencies Stability | $6.7 \times 10^{-8}$ (Antenna couple method) |
| | $5.5 \times 10^{-8}$ (Conducted method) |
| Conducted Spurious Emissions | 0.86 dB (10 MHz ≤ f < 3.6 GHz); |
| | 1.40 dB (3.6 GHz ≤ f < 8 GHz) |
| | 1.66 dB (8 GHz≤ f < 22 GHz) |
| Uncertainty for Radio Frequency (RBW<20 Khz) | $3\times10^{-8}$ |
| Temperature | 0.4 ℃ |
| Humidity | 2 % |
| Uncertainty for Radiation Emission Test (9 kHz – 30 MHz) | 3.44 dB |
| Uncertainty for Radiation Emission Test (30 Mhz-1 Ghz) | 4.70 dB (Antenna Polarize: V) |
| | 4.84 dB (Antenna Polarize: H) |
| Uncertainty for Radiation Emission Test (1 Ghz-40 Ghz) | 4.10 dB (1-6 GHz) |
| | 4.40 dB (6 GHz-18 GHz) |
| | 3.54 dB (18 GHz-26 GHz) |
| | 4.30 dB (26 GHz-40 GHz) |
| Uncertainty for Power Line Conduction Emission Test | 3.32 dB (150 kHz-30 MHz) |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. | |

## 3. Equipment Used During Test

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|
| **☒RF Connected Test (Tonscend RF Measurement System 3#)** | | | | | |
| Signal analyzer | R&S | FSQ26 | 101272 | Jun. 01, 2021 | 1 Year |
| Wideband Radio Communication tester | R&S | CMW500 | 117491 | Jun. 01, 2021 | 1 Year |
| Vector Signal Generator | Agilent | N5182A | MY19060405 | Jun. 01, 2021 | 1 Year |
| Vector Signal Generator | Agilent | N5182A | MY48180912 | Jun. 01, 2021 | 1 Year |
| RF Control Unit | Tonsend | JS0806-2 | DDT-ZC01449 | Jun. 01, 2021 | 1 Year |
| Temp&Humi Programmable | ZHIXIANG | ZXGDJS-150L | ZX170110-A | Jun. 01, 2021 | 1 Year |
| Test Software | JS Tonscend | JS1120-3 | Ver.2.6.77.0518 | N/A | N/A |
| **☒Radiation 3#chamber** | | | | | |
| EMI Test Receiver | R&S | ESU | 100472 | Jun. 01, 2021 | 1 Year |
| Spectrum analyzer | Agilent | E4447A | MY50180031 | Jun. 01, 2021 | 1 Year |
| Active Loop antenna | Schwarzbeck | FMZB-1519 | 1519-038 | Sep. 19, 2021 | 1 Year |
| Trilog Broadband Antenna | Schwarzbeck | VULB 9163 | 01429 | Aug. 07, 2021 | 1 Year |
| Double Ridged Horn Antenna | Schwarzbeck | BBHA9120 | 02108 | Jul. 17, 2021 | 1 Year |
| Broad Band Horn Antenna | Schwarzbeck | BBHA 9170 | 790 | May 08, 2021 | 1 Year |
| Pre-amplifier | COM-POWER | PAM-118A | 18040084 | Sep. 02, 2021 | 1 Year |
| Pre-amplifier | COM-POWER | PAM-840A | 461369 | Mar. 15, 2021 | 1 Year |
| Test software | Audix | E3 | V 6.1.1.1 | N/A | N/A |

# 4. Maximum Peak Output Power

## 4.1. Block diagram of test setup




## 4.2. Limits

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

## 4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Measure the maximum conducted output power of EUT by spectrum analyzer with PK detector and RBW=3 MHz (above 20 dB bandwidth of measured signal), VBW=10 MHz

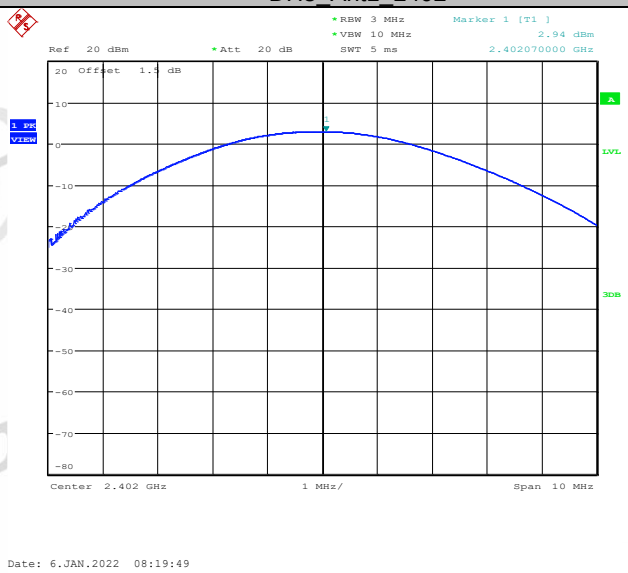
Note: The attenuator loss was inputted into spectrum analyzer as amplitude offset.

## 4.4. Test result

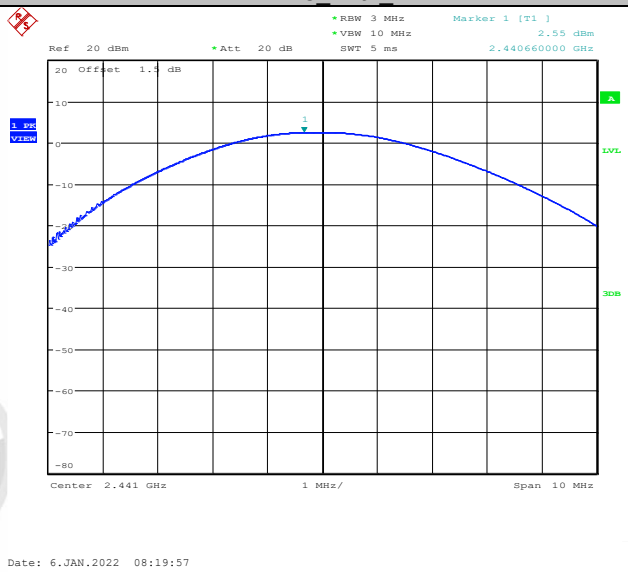
| Mode | Antenna | Freq. (MHz) | Conducted Output Power (dBm) | Limit (dBm) | Verdict |
|---|---|---|---|---|---|
| GFSK | ANT1 | 2402 | 2.94 | 21 | Pass |
| | ANT1 | 2441 | 2.55 | 21 | Pass |
| | ANT1 | 2480 | 1.37 | 21 | Pass |
| π/4-DQPSK | ANT1 | 2402 | 2.9 | 21 | Pass |
| | ANT1 | 2441 | 2.52 | 21 | Pass |
| | ANT1 | 2480 | 1.37 | 21 | Pass |
| 8DPSK | ANT1 | 2402 | 2.76 | 21 | Pass |
| | ANT1 | 2441 | 2.48 | 21 | Pass |
| | ANT1 | 2480 | 1.33 | 21 | Pass |

## 4.5. Original test data

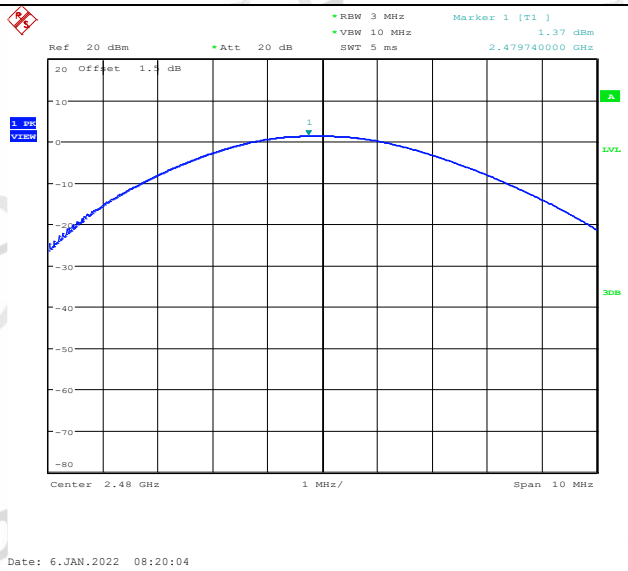
DH5_Ant1_2402



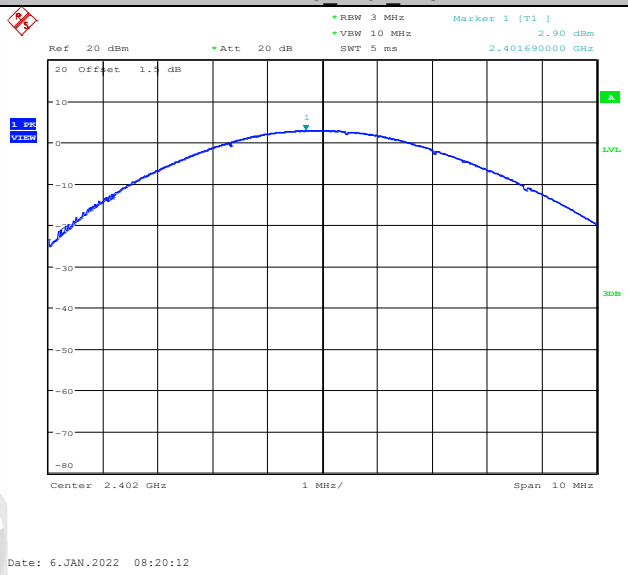

DH5_Ant1_2441



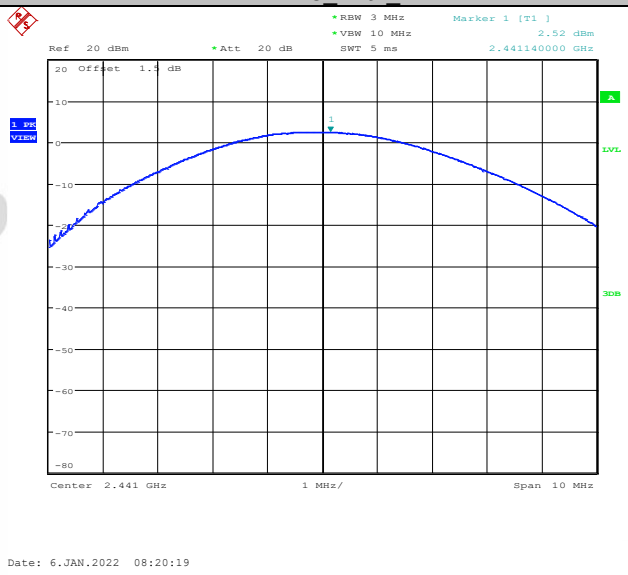

DH5_Ant1_2480



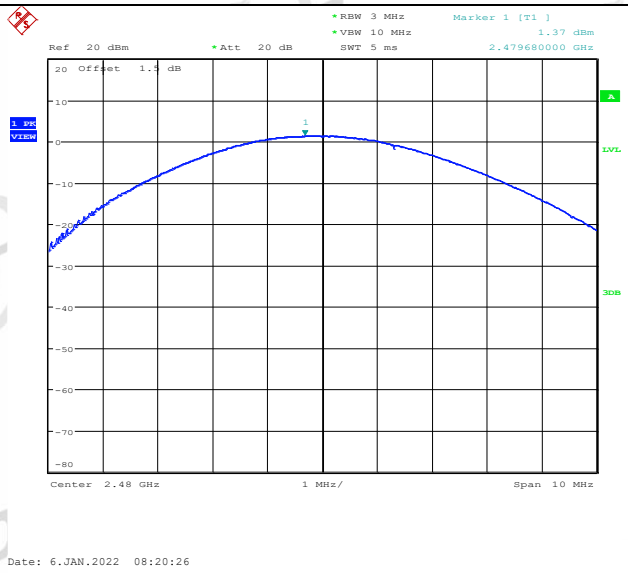

2DH5_Ant1_2402



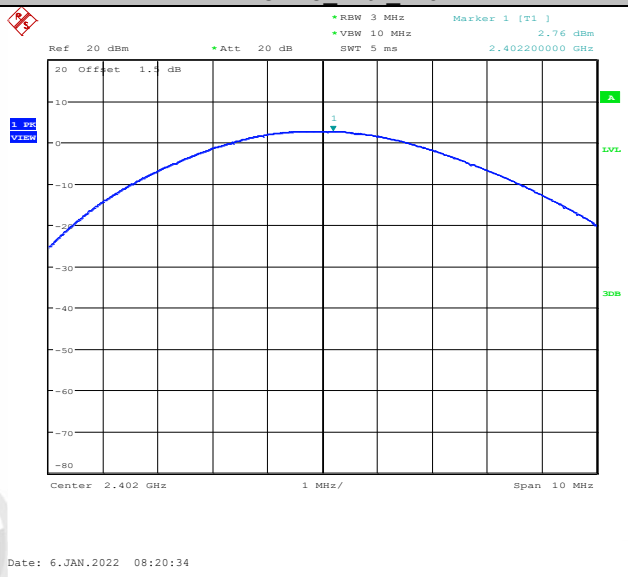

2DH5_Ant1_2441



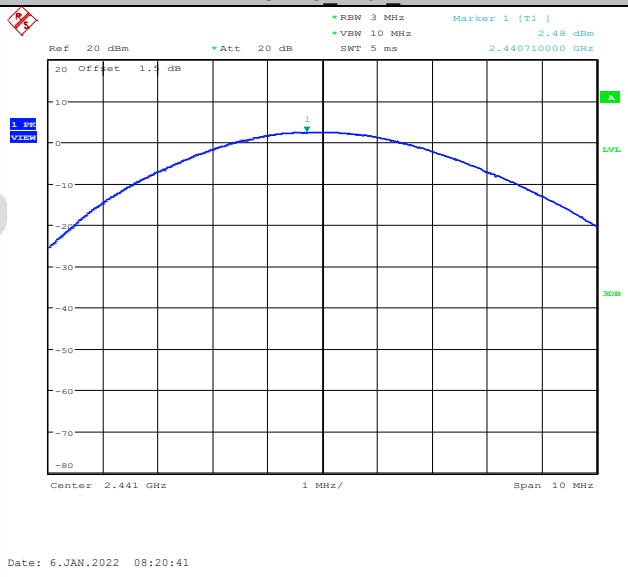

2DH5_Ant1_2480



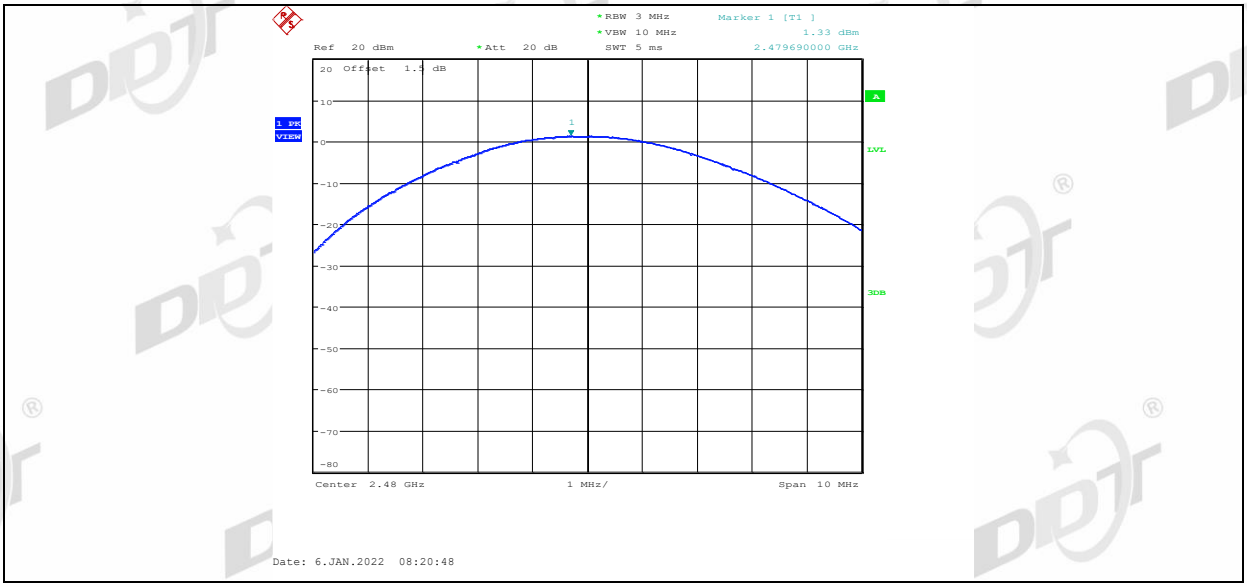

3DH5_Ant1_2402




3DH5_Ant1_2441




3DH5_Ant1_2480


RBW 3 MHz
VBW 10 MHz
SWT 5 ms
Marker 1 [T1 ]
1.33 dBm
2.479690000 GHz
Ref 20 dBm
Att 20 dB
Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
Center 2.48 GHz
1 MHz/
Span 10 MHz
Date: 6.JAN.2022 08:20:48

# 5. 20dB Bandwidth

## 5.1. Block diagram of test setup

Same as section 4.1

## 5.2. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

## 5.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

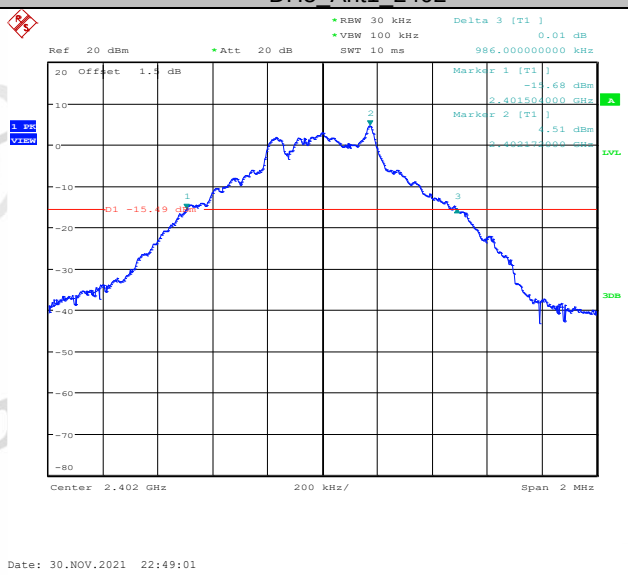
(2) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 kHz RBW and 100 kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

## 5.4. Test result

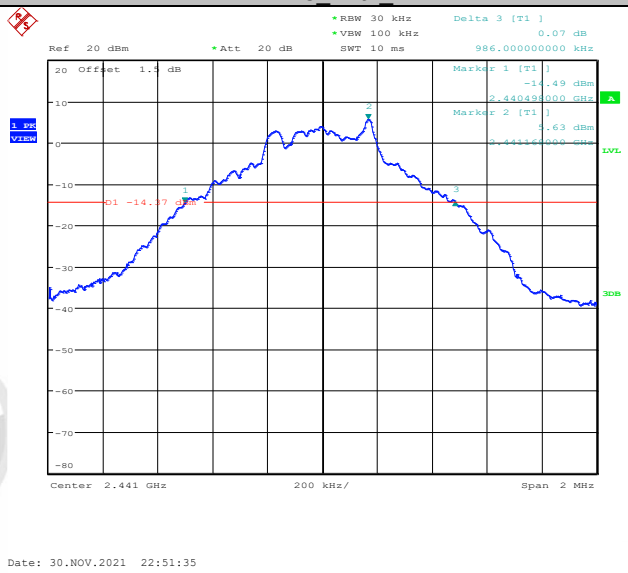
| Mode | Freq. (MHz) | 20 dB bandwidth Result (MHz) | Verdict |
|---|---|---|---|
| GFSK | 2402 | 0.99 | Pass |
| | 2441 | 0.99 | Pass |
| | 2480 | 0.99 | Pass |
| π/4-DQPSK | 2402 | 1.31 | Pass |
| | 2441 | 1.31 | Pass |
| | 2480 | 1.31 | Pass |
| 8DPSK | 2402 | 1.30 | Pass |
| | 2441 | 1.30 | Pass |
| | 2480 | 1.30 | Pass |

## 5.5. Original test data

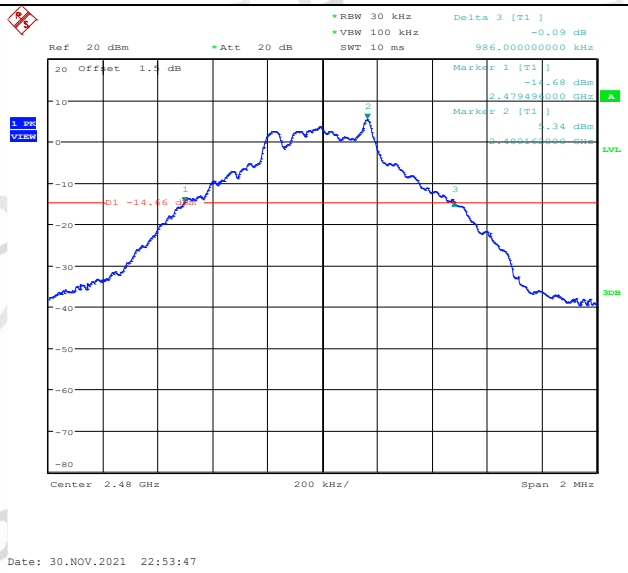
DH5_Ant1_2402



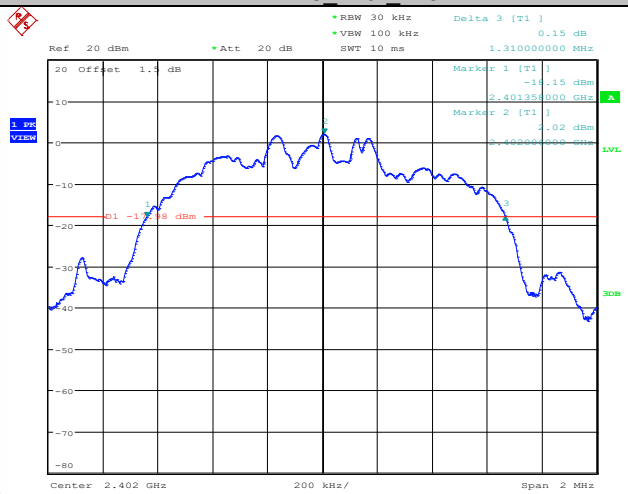

DH5_Ant1_2441



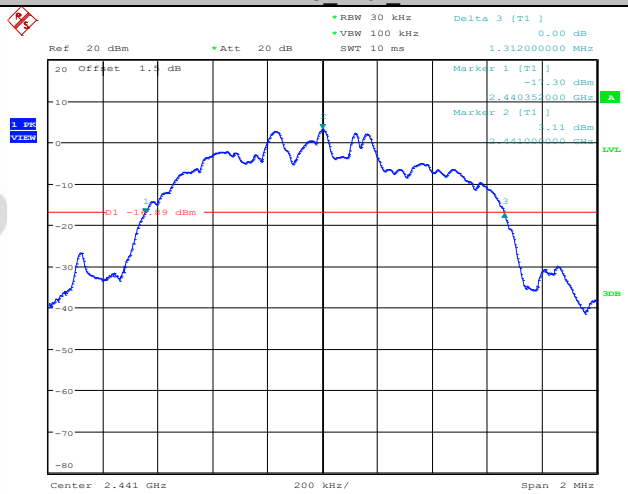

DH5_Ant1_2480



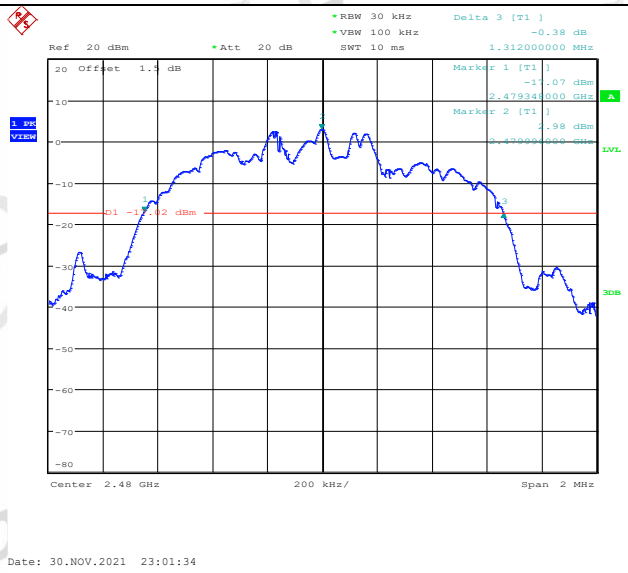

2DH5_Ant1_2402



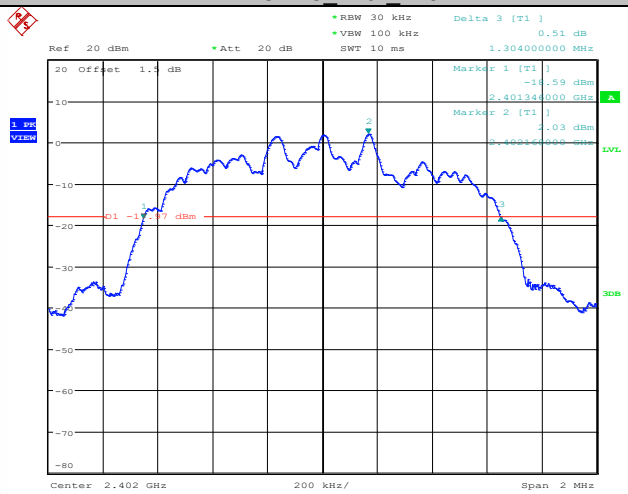

2DH5_Ant1_2441



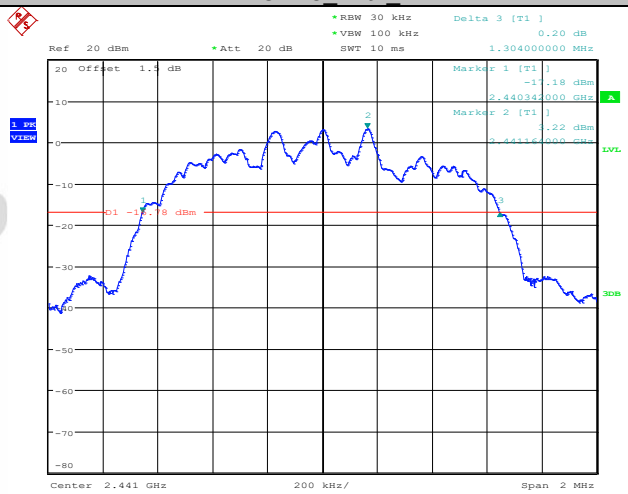

2DH5_Ant1_2480



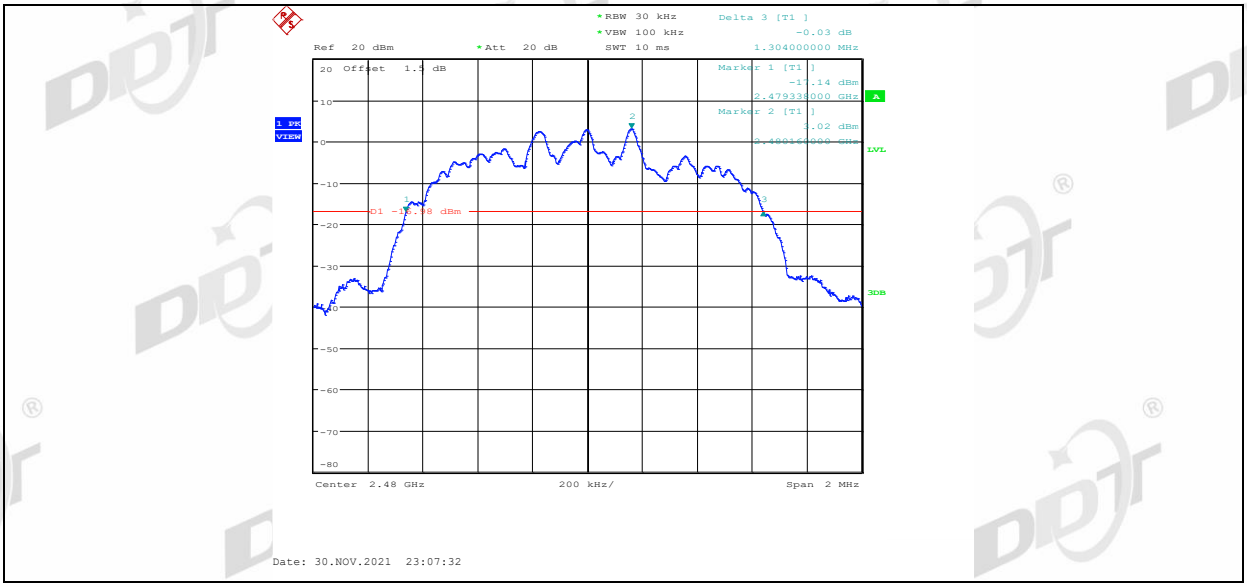

3DH5_Ant1_2402




3DH5_Ant1_2441




3DH5_Ant1_2480


RBW 30 kHz
VBW 100 kHz
SWT 10 ms
Delta 3 [T1 ]
-0.03 dB
1.304000000 MHz
Ref 20 dBm
Att 20 dB
Offset 1.5 dB
Marker 1 [T1 ]
-17.14 dBm
2.479338000 GHz
Marker 2 [T1 ]
3.02 dBm
2.480160000 GHz
D1 -18.98 dBm
Center 2.48 GHz
200 kHz/
Span 2 MHz
Date: 30.NOV.2021 23:07:32

# 6. Carrier Frequency Separation

## 6.1. Block diagram of test setup

Same as section 4.1

## 6.2. Limits

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

## 6.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

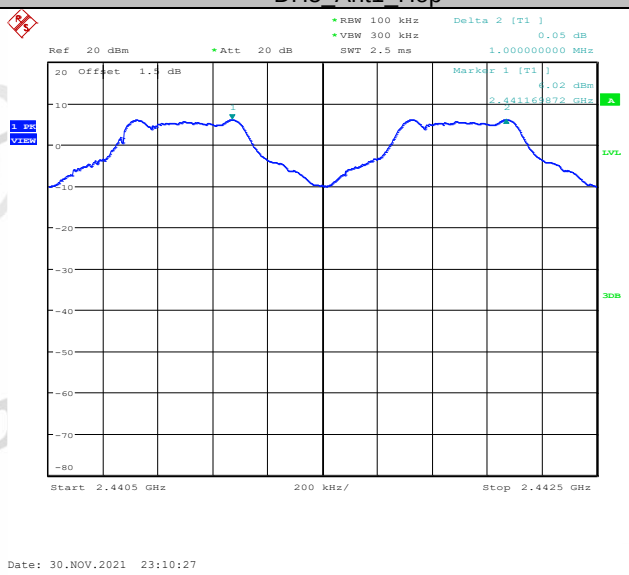
(2) The carrier frequency was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW.

## 6.4. Test result

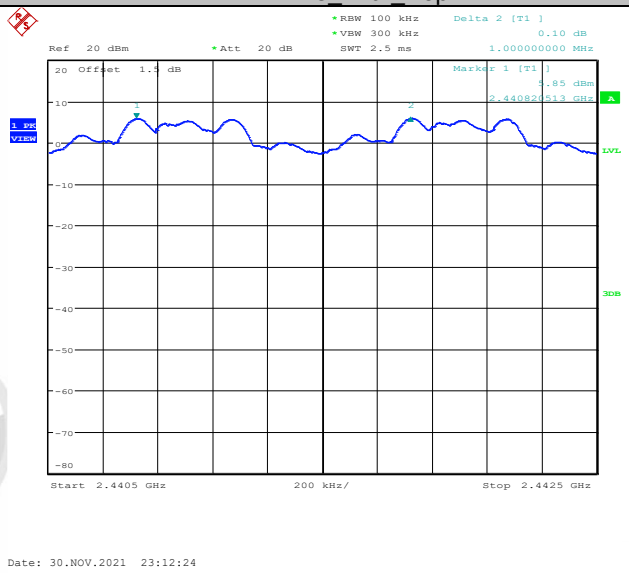
| Mode | Channel separation (MHz) | 20dB bandwidth (MHz) (worse case) | Limit (MHz) 2/3 of 20dB bandwidth | Verdict |
|---|---|---|---|---|
| GFSK | 1.000 | 0.990 | ≥0.660 | Pass |
| π/4-DQPSK | 1.000 | 1.310 | ≥0.873 | Pass |
| 8DPSK | 0.990 | 1.300 | ≥0.867 | Pass |

## 6.5. Original test data

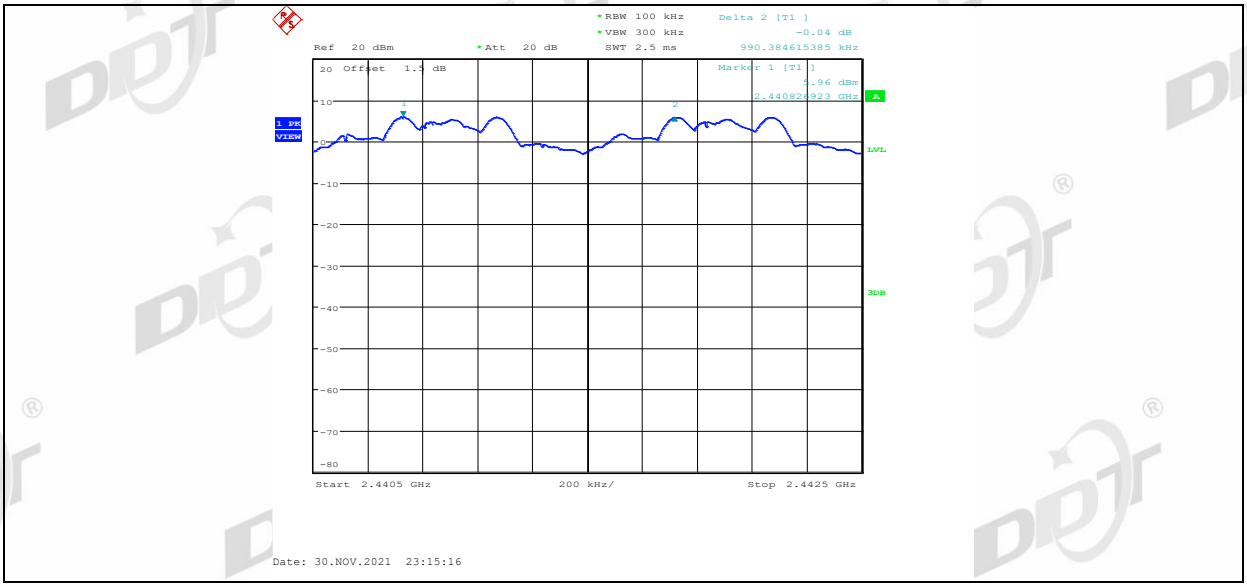
DH5_Ant1_Hop




2DH5_Ant1_Hop




3DH5_Ant1_Hop


RBW 100 kHz
VBW 300 kHz
SWT 2.5 ms
Delta 2 [T1 ]
-0.04 dB
990.384615385 kHz
Ref 20 dBm
Att 20 dB
Offset 1.5 dB
Marker 1 [T1 ]
5.96 dBm
2.440824923 GHz
1 PK VIEW
A
LVL
3DB
Start 2.4405 GHz
200 kHz/
Stop 2.4425 GHz
Date: 30.NOV.2021 23:15:16

# 7. Number of Hopping Channel

## 7.1. Block diagram of test setup

Same as section 4.1

## 7.2. Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

## 7.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

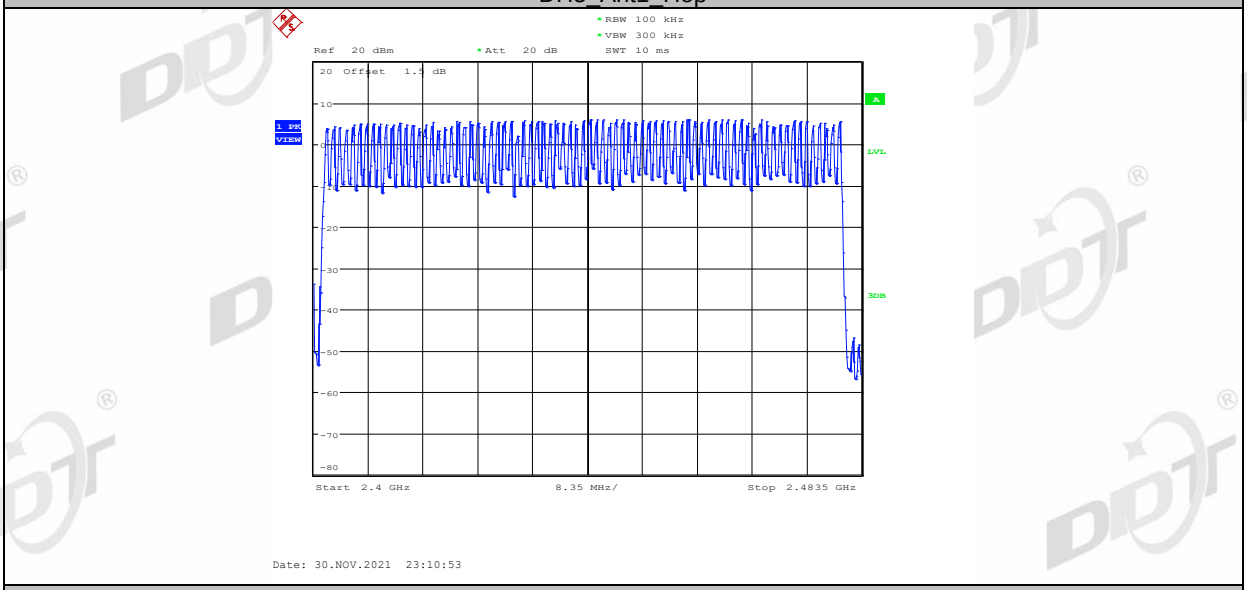
(2) The number of hopping channels was measured by spectrum analyzer with 100 kHz RBW and 300 kHz VBW.

## 7.4. Test result

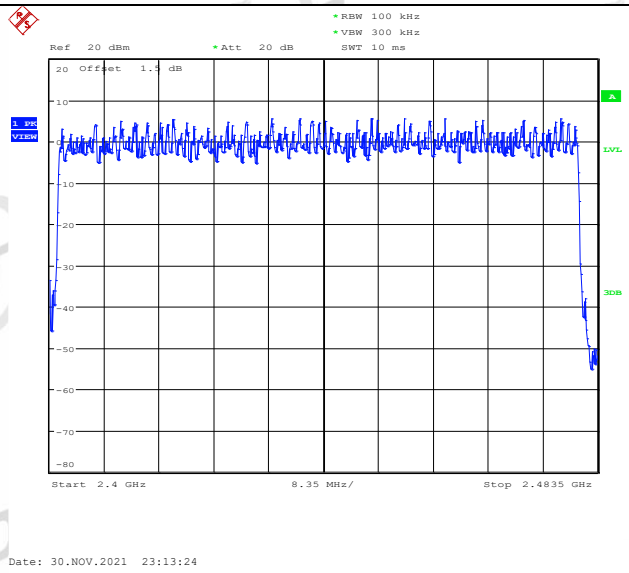
| Mode | Number of hopping channels | Limit | Verdict |
|---|---|---|---|
| GFSK | 79 | >15 | Pass |
| π/4-DQPSK | 79 | >15 | Pass |
| 8DPSK | 79 | >15 | Pass |

## 7.5. Original test data

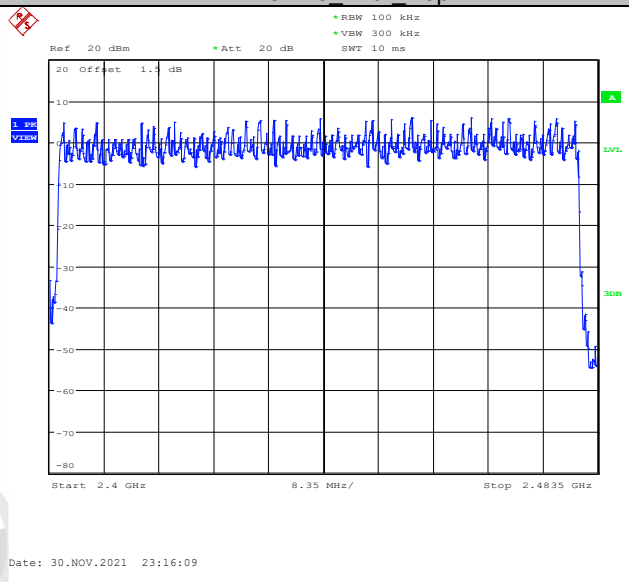
DH5_Ant1_Hop




2DH5_Ant1_Hop




3DH5_Ant1_Hop



# 8. Dwell Time

## 8.1. Block diagram of test setup

Same as section 4.1

## 8.2. Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

## 8.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

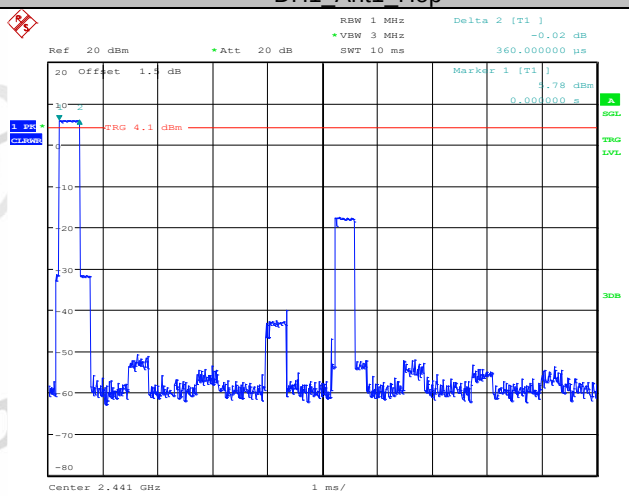
(3) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula Dwell time = total hops *pulse's on time.

## 8.4. Test result

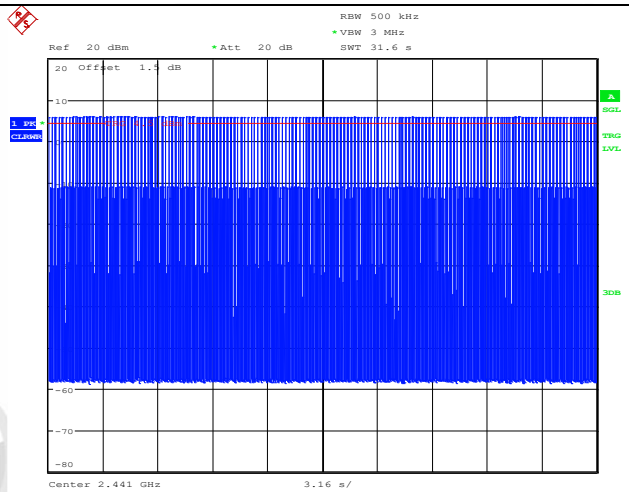
| Mode | Dwell time (s) | Pulse's on time (ms) | Total hops | Limit | Verdict |
|---|---|---|---|---|---|
| DH1 | 0.113 | 0.36 | 314 | <400ms | Pass |
| DH3 | 0.279 | 1.63 | 171 | <400ms | Pass |
| DH5 | 0.327 | 2.89 | 113 | <400ms | Pass |
| 2DH1 | 0.116 | 0.37 | 313 | <400ms | Pass |
| 2DH3 | 0.289 | 1.63 | 177 | <400ms | Pass |
| 2DH5 | 0.302 | 2.88 | 105 | <400ms | Pass |
| 3DH1 | 0.112 | 0.36 | 312 | <400ms | Pass |
| 3DH3 | 0.282 | 1.63 | 173 | <400ms | Pass |
| 3DH5 | 0.305 | 2.88 | 106 | <400ms | Pass |
| Note: Dwell time = total hops *pulse's on time. | | | | | |

## 8.5. Original test data

DH1_Ant1_Hop

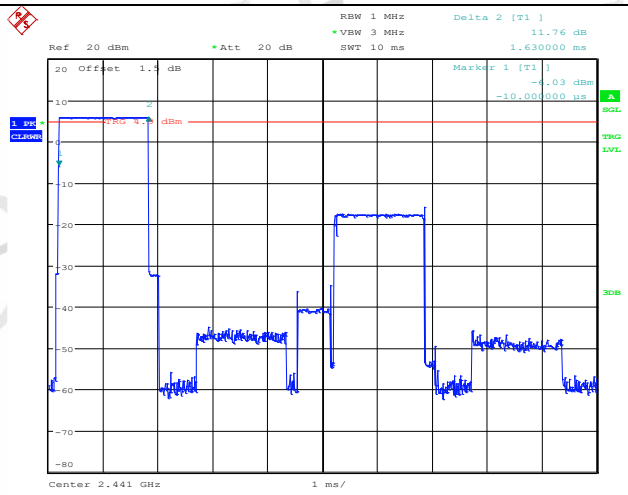



Date: 30.NOV.2021 23:25:41

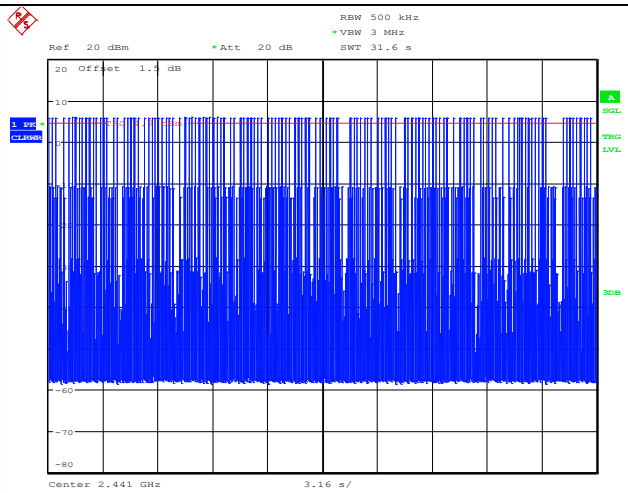



Date: 30.NOV.2021 23:26:26

DH3_Ant1_Hop

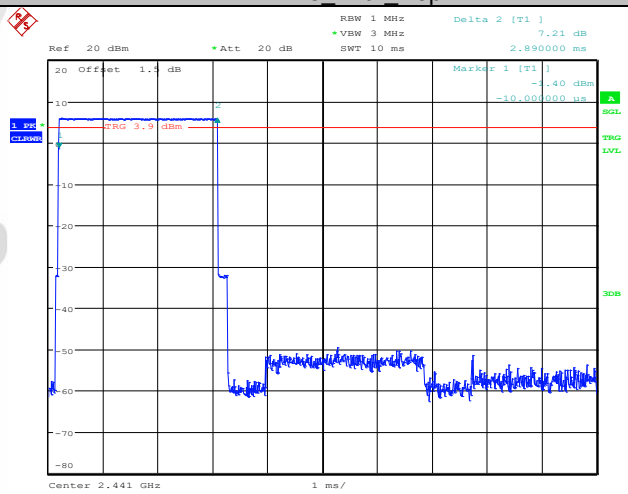



Date: 30.NOV.2021 23:26:49

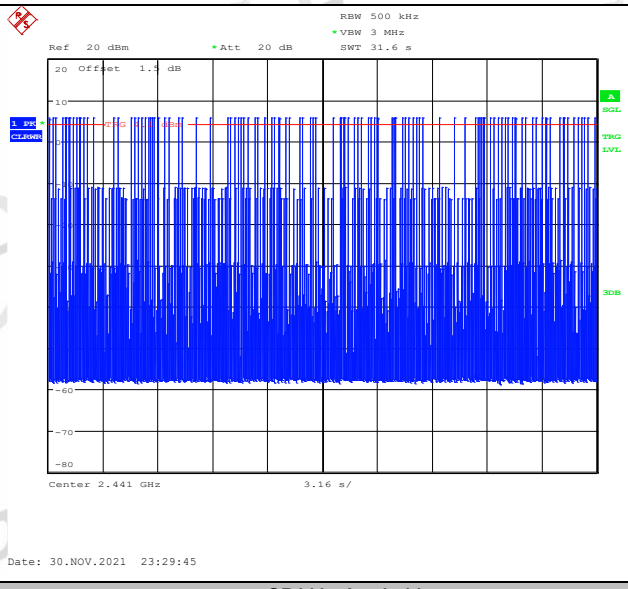



Date: 30.NOV.2021 23:28:02

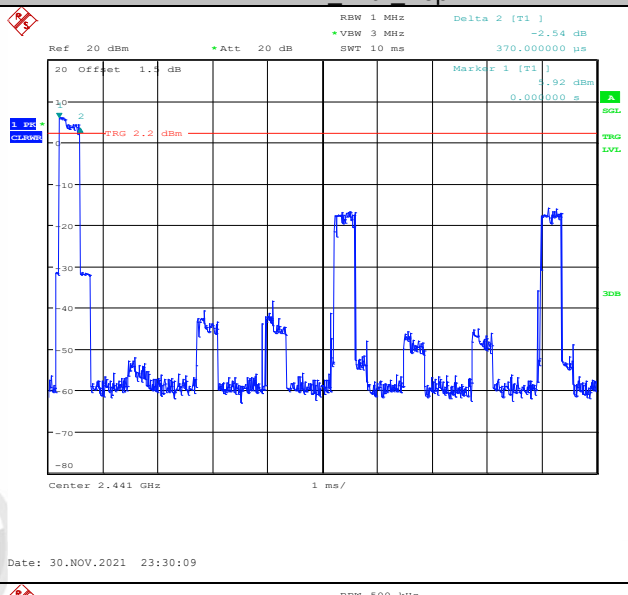
DH5_Ant1_Hop

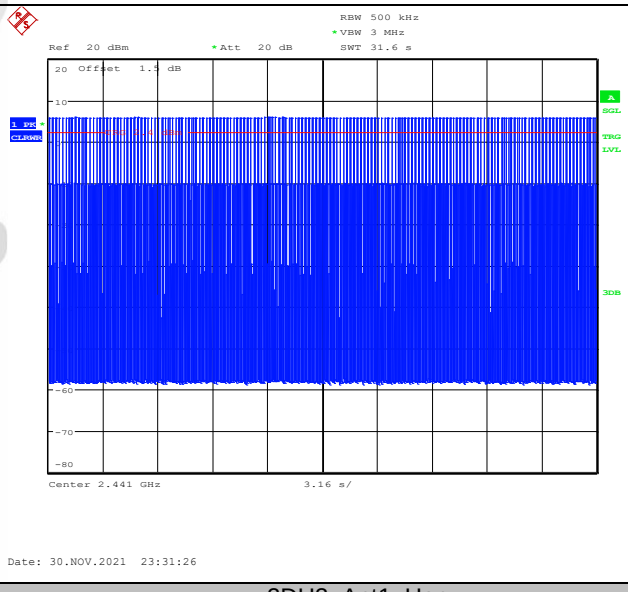



Date: 30.NOV.2021 23:28:25

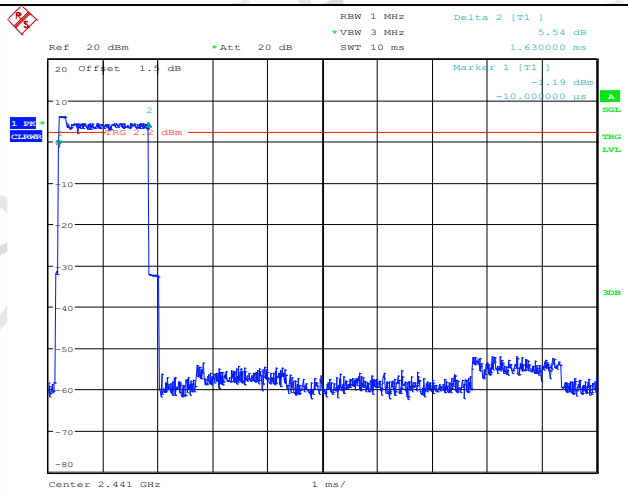



2DH1_Ant1_Hop

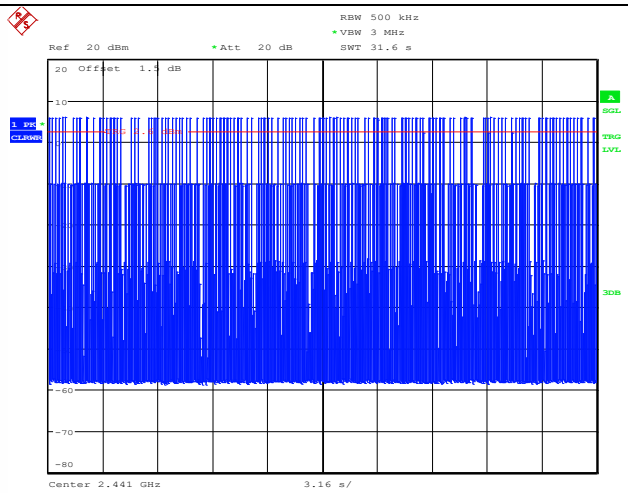



2DH3_Ant1_Hop

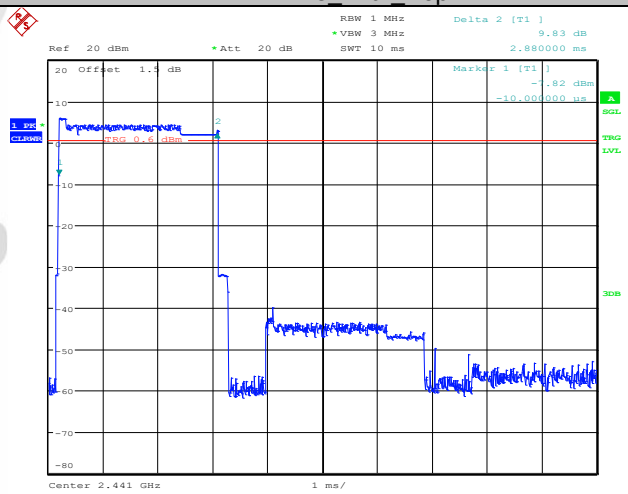



Date: 30.NOV.2021 23:31:49

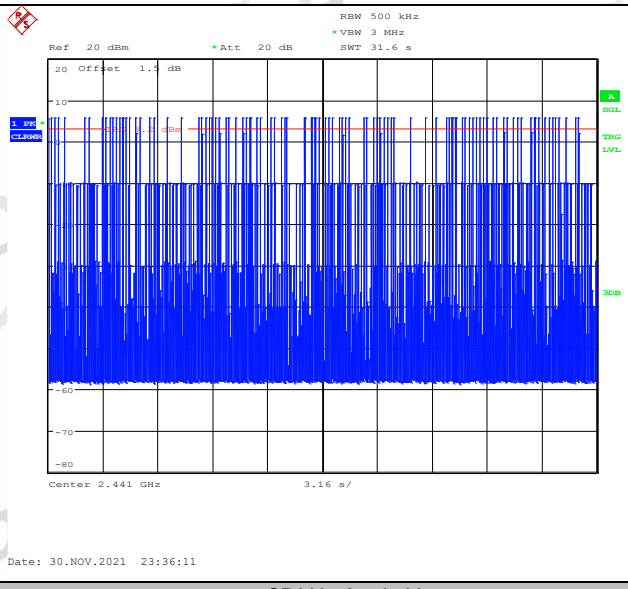



Date: 30.NOV.2021 23:33:21

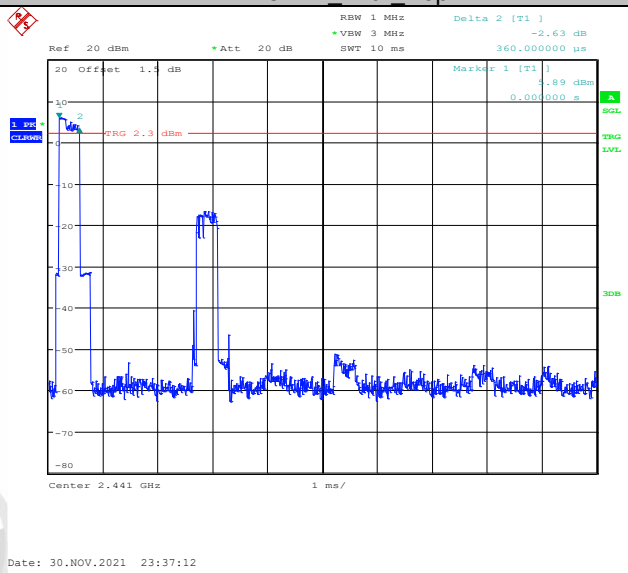
2DH5_Ant1_Hop

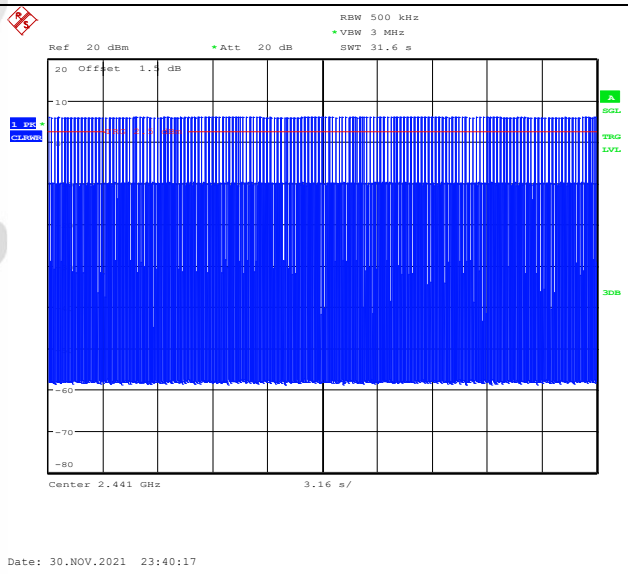



Date: 30.NOV.2021 23:33:48

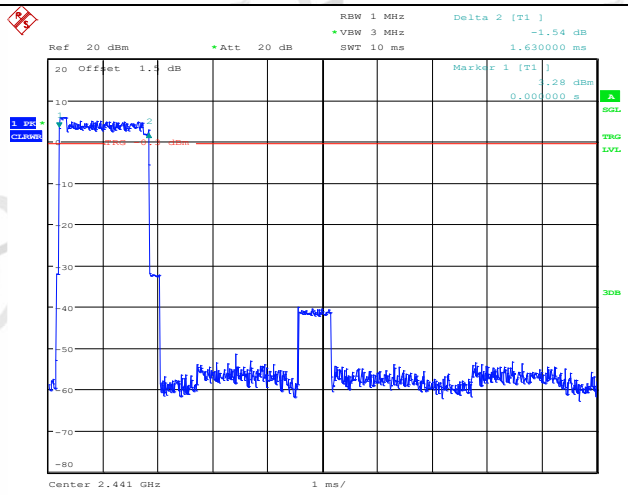



3DH1_Ant1_Hop

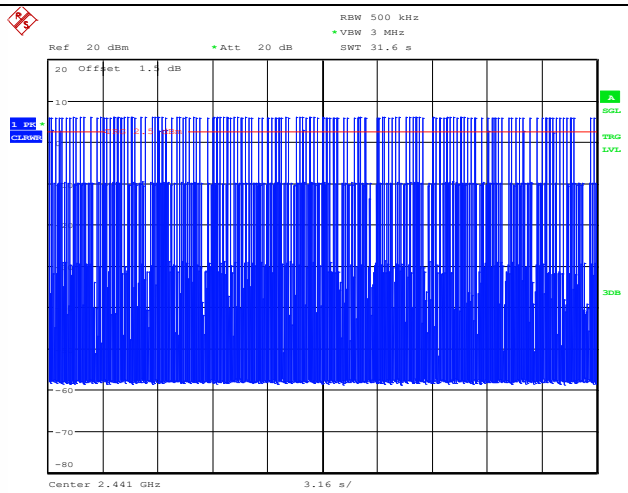



3DH3_Ant1_Hop

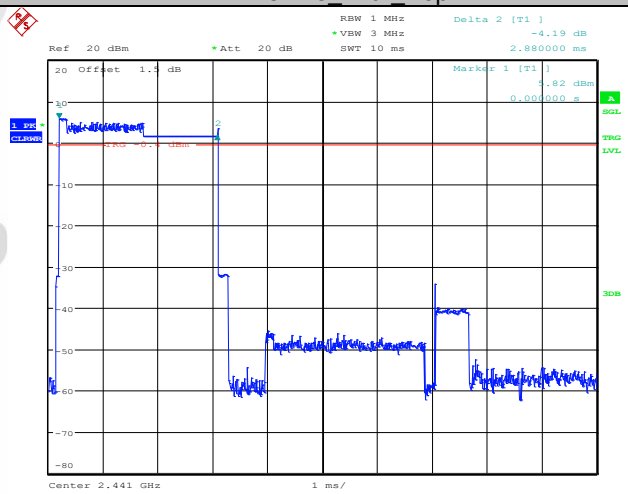



Date: 30.NOV.2021 23:40:46

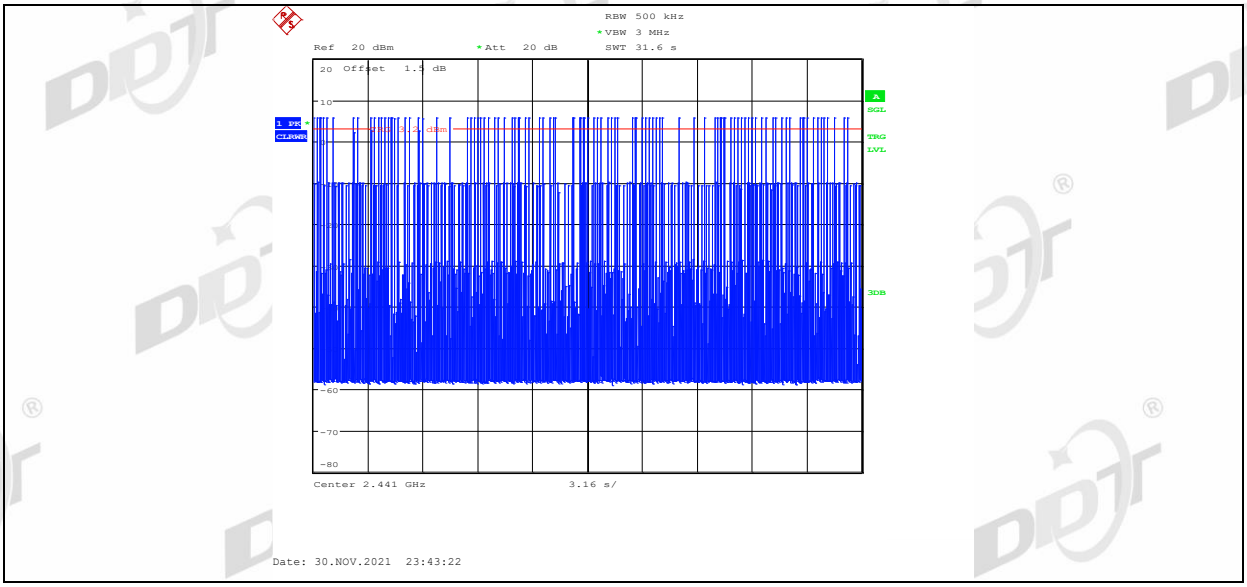



Date: 30.NOV.2021 23:41:47

3DH5_Ant1_Hop




Date: 30.NOV.2021 23:42:11


RBW 500 kHz
VBW 3 MHz
Ref 20 dBm
Att 20 dB
SWT 31.6 s
Offset 1.5 dB
1 RMS
CLRWR
A
SGL
TRG
LVL
3DB
Center 2.441 GHz
3.16 s/
Date: 30.NOV.2021 23:43:22

# 9. Band Edge Compliance (Conducted Method)

## 9.1. Block diagram of test setup

Same as section 4.1

## 9.2. Limit

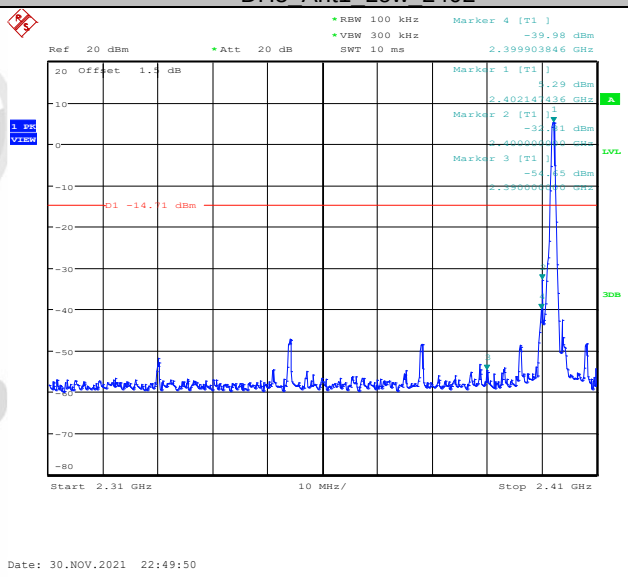
All restriction band should comply with 15.209, other emission should be at least 20dB below the fundamental.

## 9.3. Test result

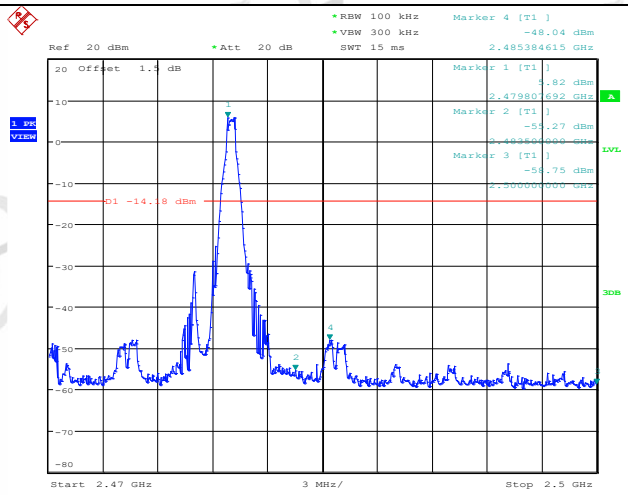
| Mode | Freq. (MHz) | Verdict |
|---|---|---|
| GFSK | Hopping off 2402 | Pass |
| | Hopping off 2480 | Pass |
| | Hopping on | Pass |
| π/4-DQPSK | Hopping off 2402 | Pass |
| | Hopping off 2480 | Pass |
| | Hopping on | Pass |
| 8DPSK | Hopping off 2402 | Pass |
| | Hopping off 2480 | Pass |
| | Hopping on | Pass |

## 9.4. Original test data

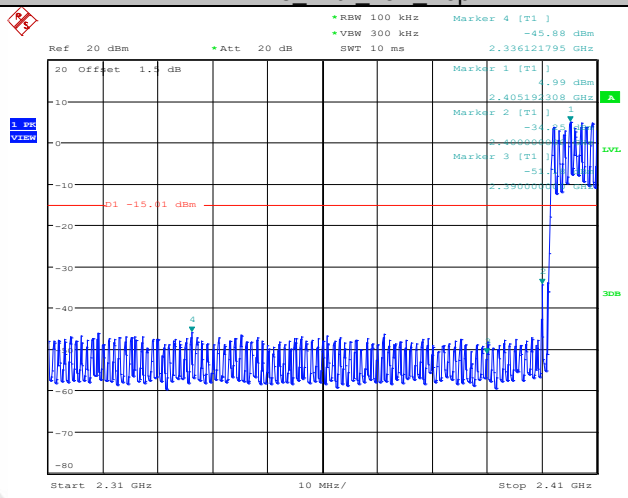
DH5_Ant1_Low_2402



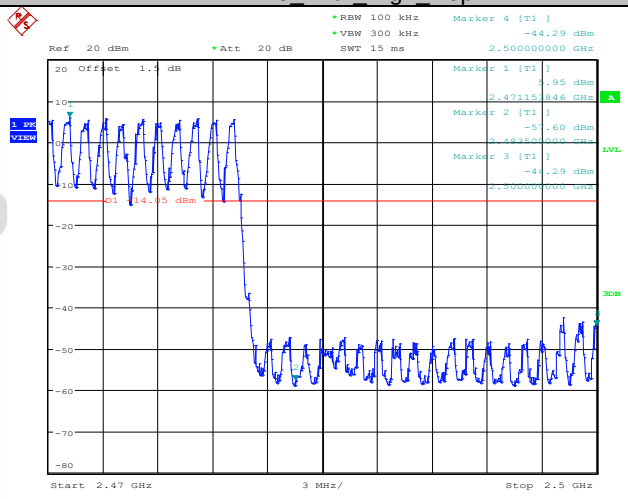

DH5_Ant1_High_2480



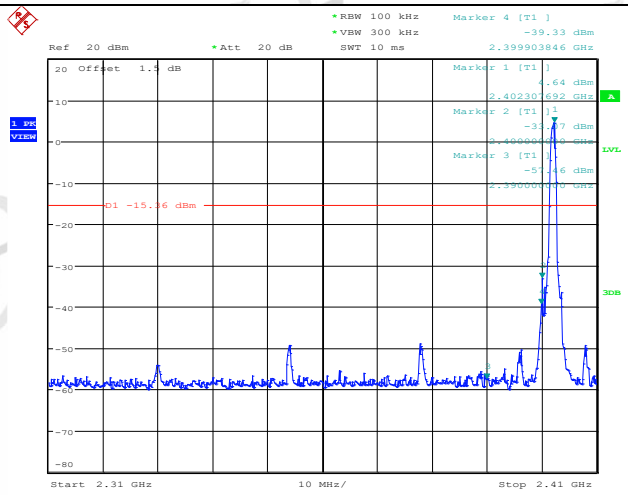

DH5_Ant1_Low_Hop




DH5_Ant1_High_Hop

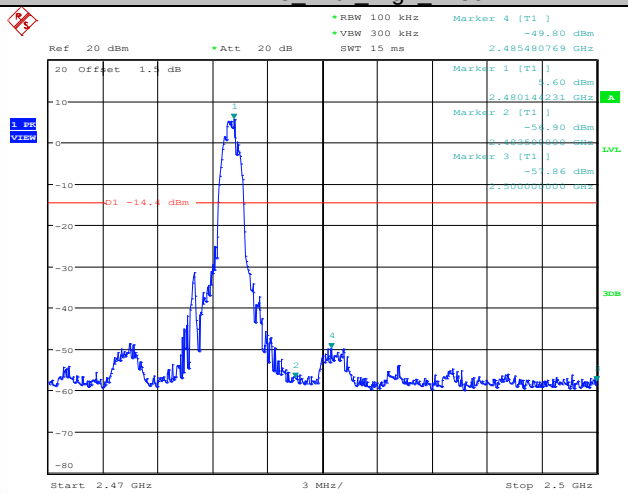



2DH5_Ant1_Low_2402



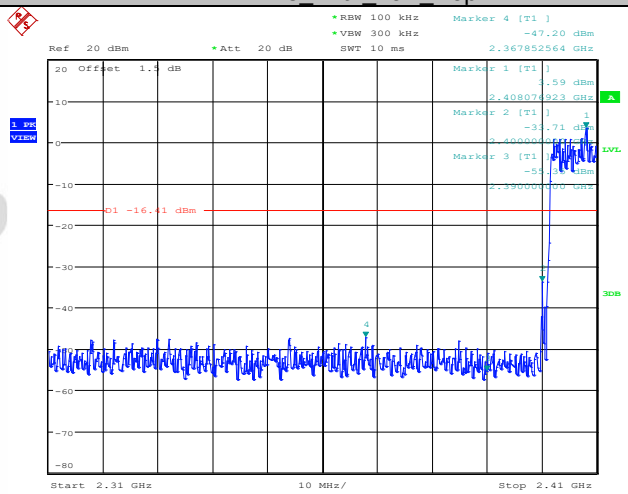

Date: 30.NOV.2021 22:57:40

2DH5_Ant1_High_2480



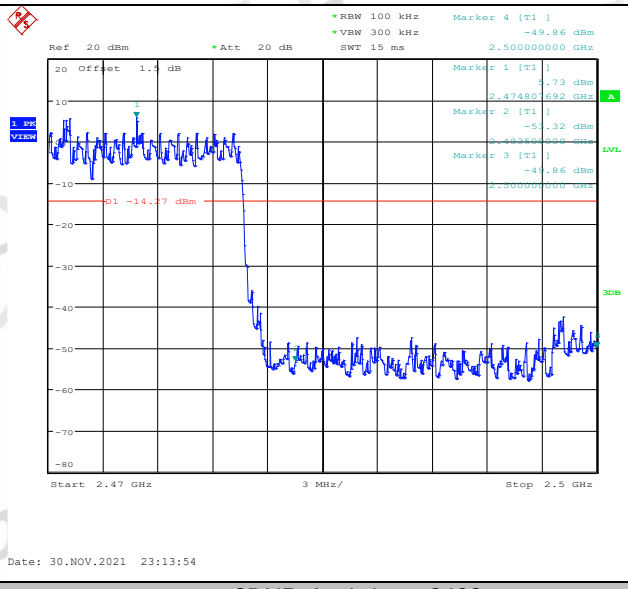

Date: 30.NOV.2021 23:02:31

2DH5_Ant1_Low_Hop

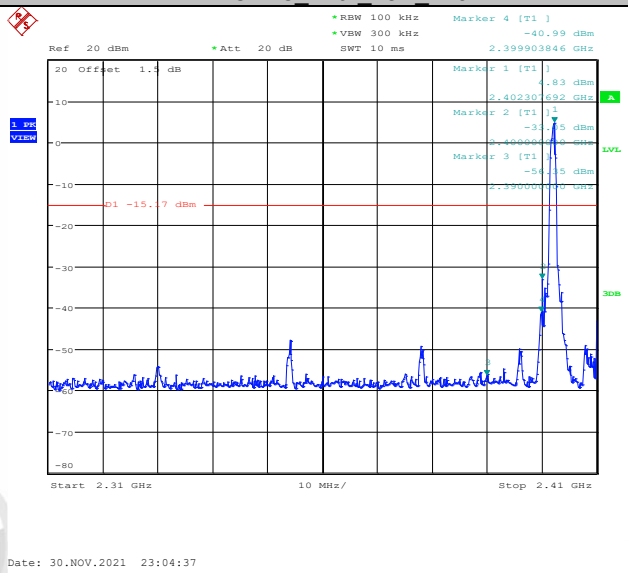



Date: 30.NOV.2021 23:14:13

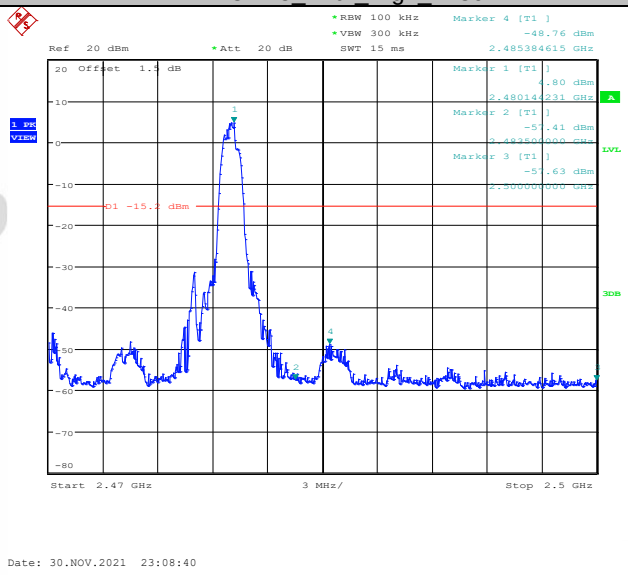
2DH5_Ant1_High_Hop



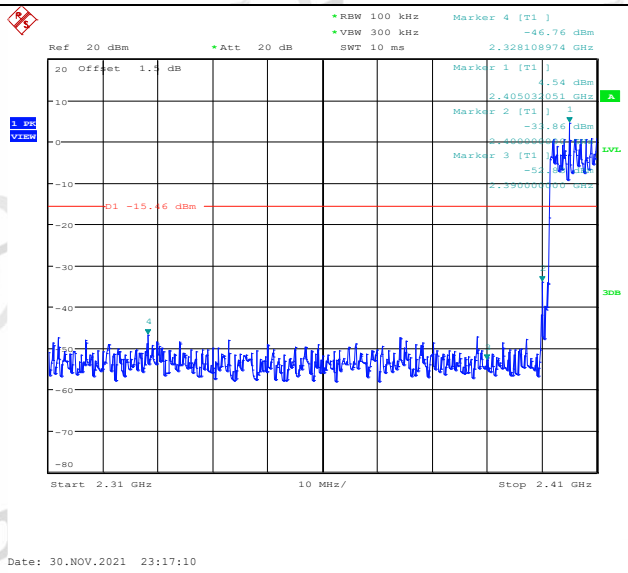

3DH5_Ant1_Low_2402



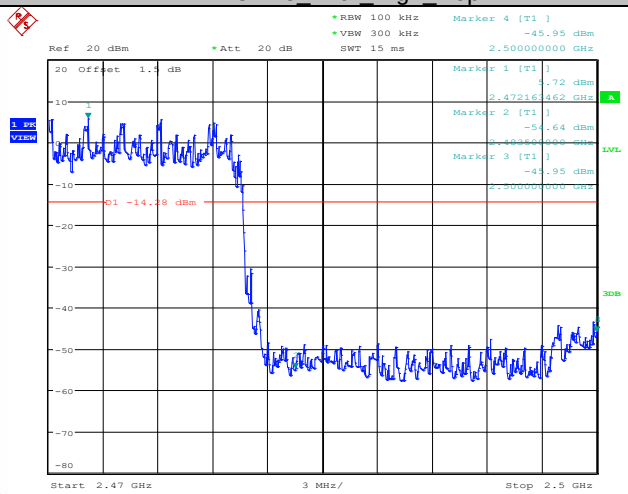

3DH5_Ant1_High_2480




3DH5_Ant1_Low_Hop



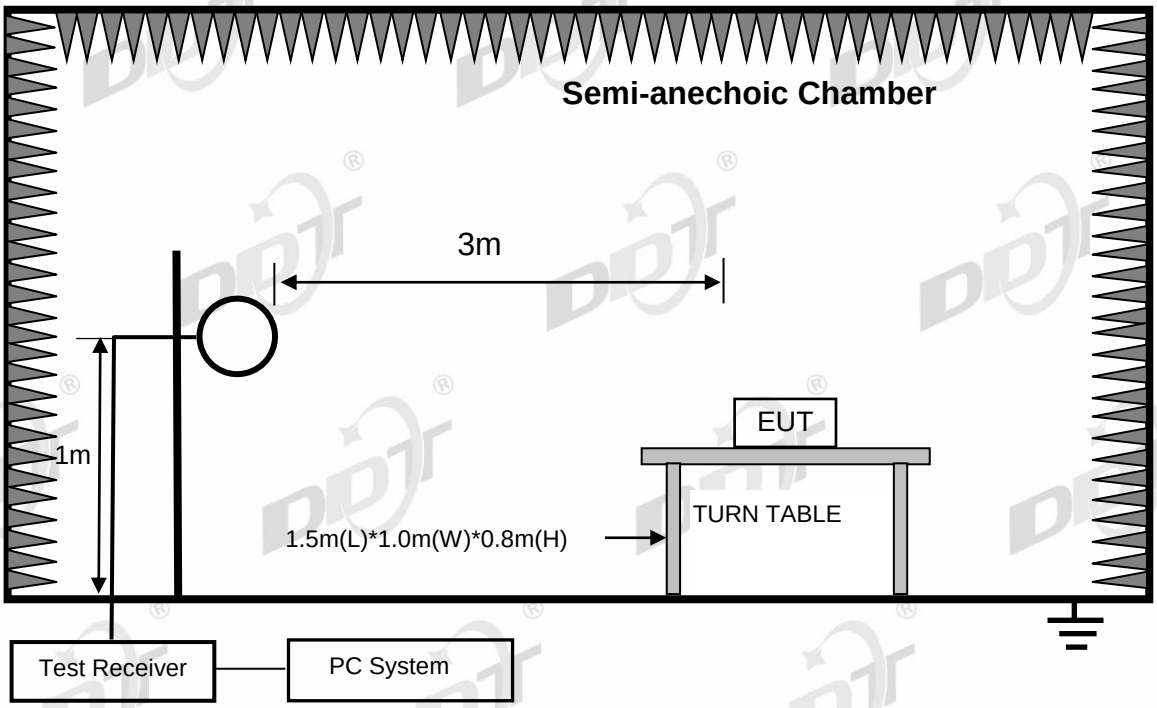

3DH5_Ant1_High_Hop



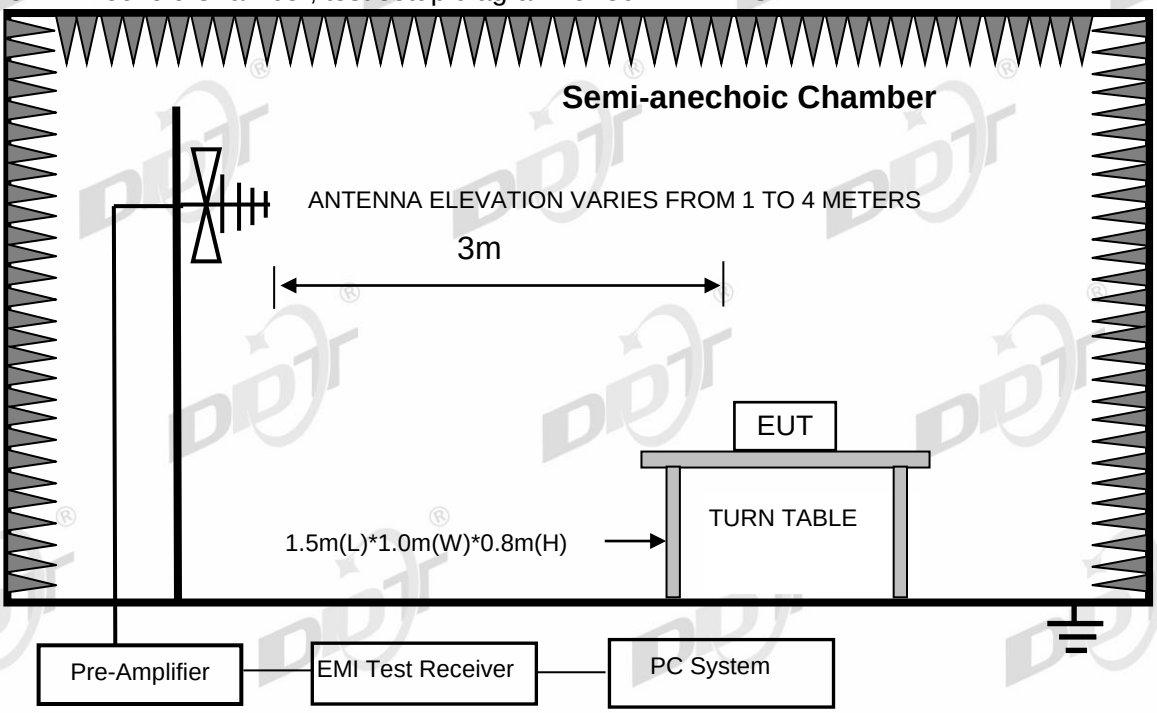
# 10. Radiated Emission

## 10.1. Block diagram of test setup

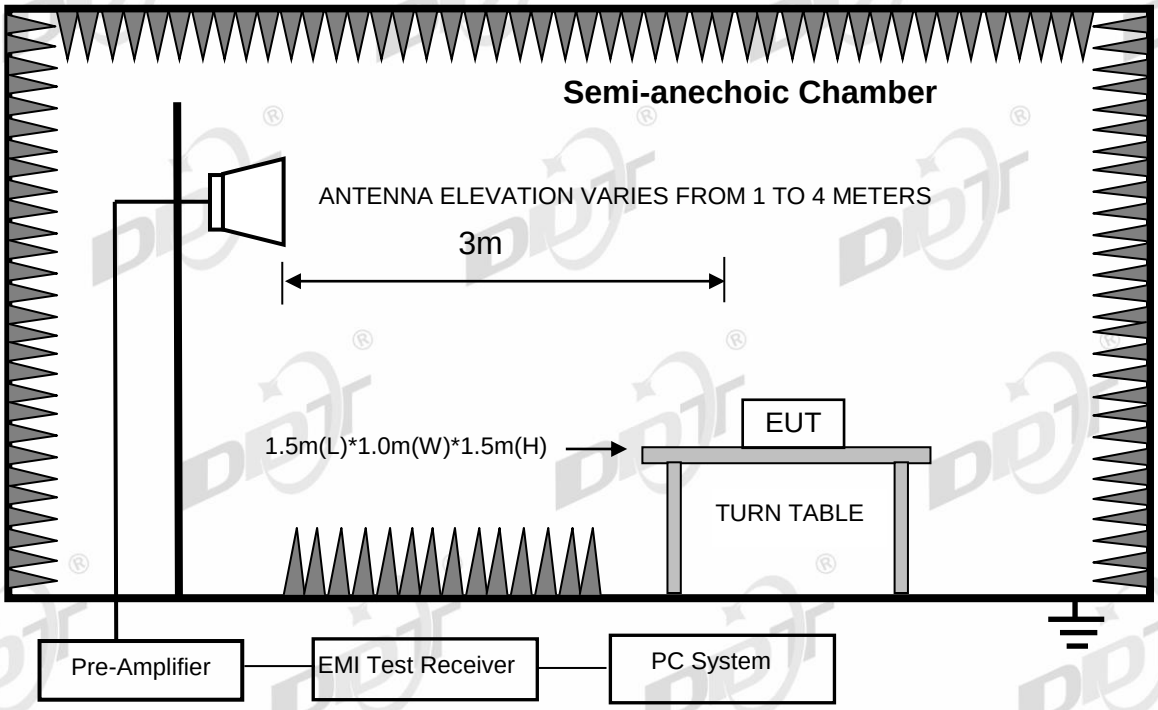
In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:




In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:




Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

## 10.2. Limit

(1) FCC 15.205 Restricted frequency band

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| [1]0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.1772&4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.2072&4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | ([2]) |
| 13.36-13.41 | | | |

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

(2) FCC 15.209 Limit

| Frequency (MHz) | Measurement distance (meters) | Field strength limit | |
|---|---|---|---|
| | | μV/m | dB(μV)/m |
| 0.009 ~ 0.490 | 300 | 2400/F(kHz) | 67.6-20log(F) |
| 0.490 ~ 1.705 | 30 | 24000/F(kHz) | 87.6-20log(F) |
| 1.705 ~ 30.0 | 30 | 30 | 29.54 |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) | |

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$Limit_{3m}(dBuV/m)= Limit_{30m}(dBuV/m) + 40Log(30m/3m)$$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions or comply with 15.209 limits.

## 10.3. Test procedure

(1) EUT was placed on a non-metallic table, 10 mm above the ground plane inside a semi-anechoic chamber for below 1G and 10 mm above the ground plane inside a fully-anechoic chamber for above 1G.

(2) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

| Test frequency range | Test antenna used | Test antenna distance |
|---|---|---|
| 9kHz-30MHz | Active Loop antenna | 3m |
| 30MHz-1GHz | Trilog Broadband Antenna | 3m |
| 1GHz-18GHz | Double Ridged Horn Antenna(1GHz-18GHz) | 3m |
| 18GHz-40GHz | Horn Antenna(18GHz-40GHz) | 1m |

According ANSI C63.10:2013 clause 6.4.4.2 and 6,5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also

be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m (Except loop antenna, it's fixed 1m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18 GHz to 25 GHz, so below final test was performed with frequency range from 9 kHz to 18 GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(5) The emissions from 9 kHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90 kHz, 110-490 kHz, for emissions from 9 kHz-90 kHz,110 kHz-490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW.

| Frequency band | RBW |
|---|---|
| 9 kHz-150 kHz | 200 Hz |
| 150 kHz-30 MHz | 9 kHz |
| 30 MHz-1 GHz | 120 kHz |

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; according ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.

(8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

## 10.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits.

Note1: According exploratory test no any obvious emission was detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz.

Note2: For emissions below 1GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in GFSK, Tx 2402 MHz mode.

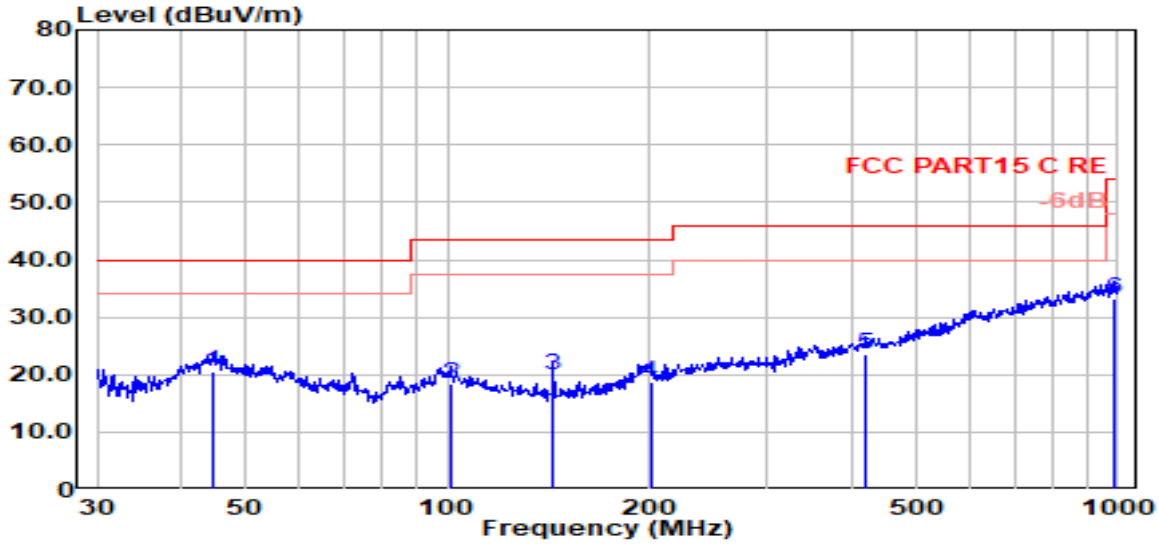
Note3: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Note4: 30MHz~25GHz: (Scan with GFSK, π/4-DQPSK, 8DPSK, the worst case is GFSK Mode)

## Radiated Emission Test (below 1GHz)

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC BELOW 1G MOTOR 1B\FCC BELOW 1G_00001.EMI | |
| **Test Date** | : 2021-12-28 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.1°,Humi:45.8%,Press:100.6kPa | **Antenna/Distance** | : VLUB 9163 3#/3m/Vertical |
| **Memo** | : BT | | |

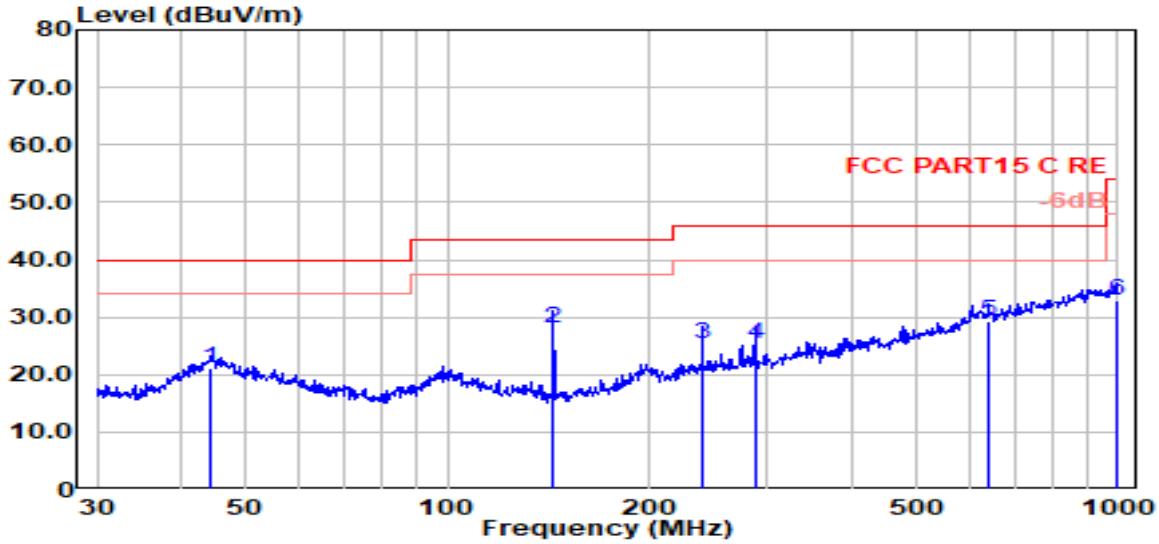



| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 44.74 | 1.82 | 15.07 | 3.62 | 20.52 | 40.00 | -19.48 | QP | Vertical |
| 2 | 100.93 | 2.71 | 11.59 | 3.98 | 18.29 | 43.50 | -25.21 | QP | Vertical |
| 3 | 143.83 | 7.98 | 7.80 | 4.19 | 19.96 | 43.50 | -23.54 | QP | Vertical |
| 4 | 200.69 | 2.61 | 11.75 | 4.45 | 18.81 | 43.50 | -24.69 | QP | Vertical |
| 5 | 422.06 | 2.42 | 15.94 | 5.22 | 23.58 | 46.00 | -22.42 | QP | Vertical |
| 6 | 989.54 | 3.90 | 22.40 | 6.78 | 33.09 | 54.00 | -20.91 | QP | Vertical |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC BELOW 1G MOTOR 1B\FCC BELOW 1G_00002.EMI | |
| **Test Date** | : 2021-12-28 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.1°,Humi:45.8%,Press:100.6kPa | **Antenna/Distance** | : VLUB 9163 3#/3m/Horizontal |
| **Memo** | : BT | | |



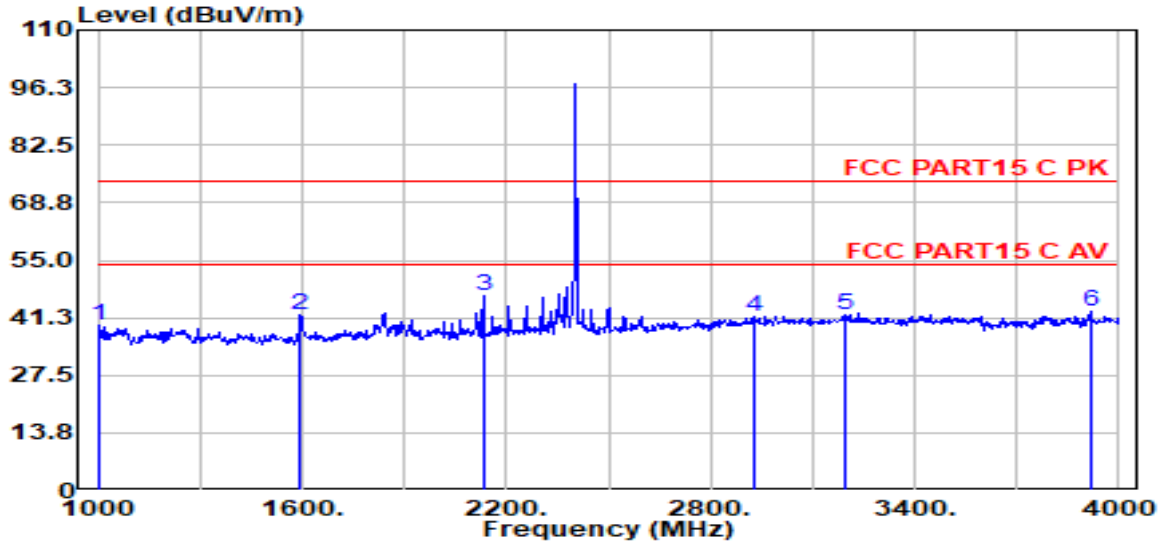

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 44.43 | 2.51 | 15.04 | 3.62 | 21.17 | 40.00 | -18.83 | QP | Horizontal |
| 2 | 143.83 | 15.96 | 7.80 | 4.19 | 27.95 | 43.50 | -15.55 | QP | Horizontal |
| 3 | 239.99 | 8.41 | 12.50 | 4.60 | 25.51 | 46.00 | -20.49 | QP | Horizontal |
| 4 | 287.99 | 7.49 | 13.00 | 4.78 | 25.27 | 46.00 | -20.73 | QP | Horizontal |
| 5 | 640.61 | 4.37 | 19.01 | 5.84 | 29.22 | 46.00 | -16.78 | QP | Horizontal |
| 6 | 993.01 | 3.68 | 22.40 | 6.80 | 32.88 | 54.00 | -21.12 | QP | Horizontal |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

## Radiated Emission test (above 1GHz)

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00015.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2402 | | |



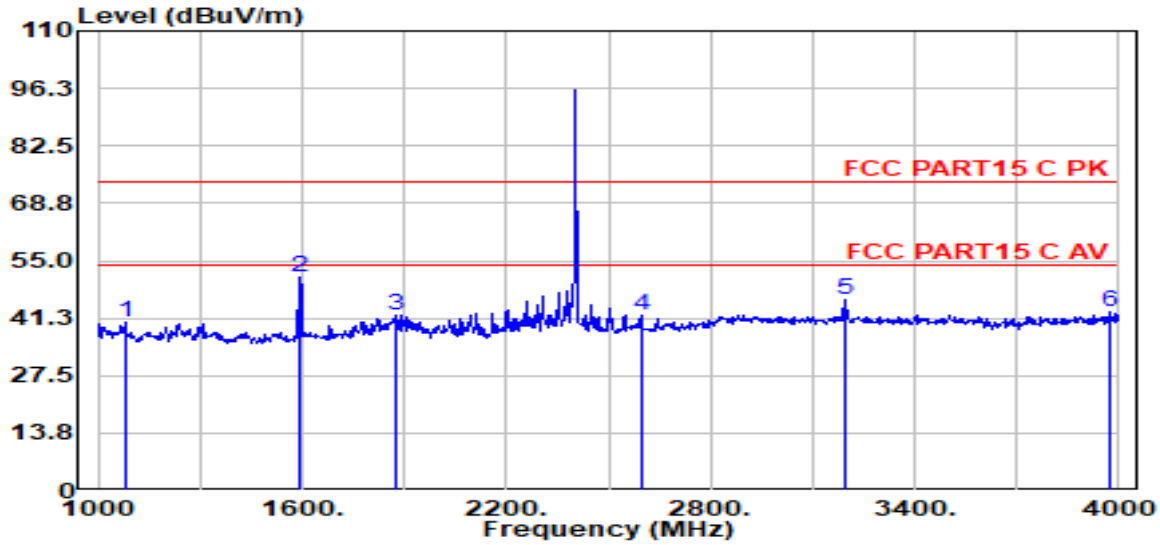

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1006.00 | 49.60 | 25.50 | 2.32 | 37.91 | 39.50 | 74.00 | -34.50 | Peak | Horizontal |
| 2 | 1594.00 | 52.02 | 25.64 | 2.96 | 38.79 | 41.83 | 74.00 | -32.17 | Peak | Horizontal |
| 3 | 2134.00 | 55.57 | 26.94 | 3.51 | 39.47 | 46.56 | 74.00 | -27.44 | Peak | Horizontal |
| 4 | 2926.00 | 48.16 | 29.22 | 4.18 | 39.86 | 41.69 | 74.00 | -32.31 | Peak | Horizontal |
| 5 | 3193.00 | 48.10 | 29.46 | 4.36 | 39.96 | 41.97 | 74.00 | -32.03 | Peak | Horizontal |
| 6 | 3916.00 | 47.15 | 30.81 | 4.80 | 40.17 | 42.59 | 74.00 | -31.41 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00016.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2402 | | |



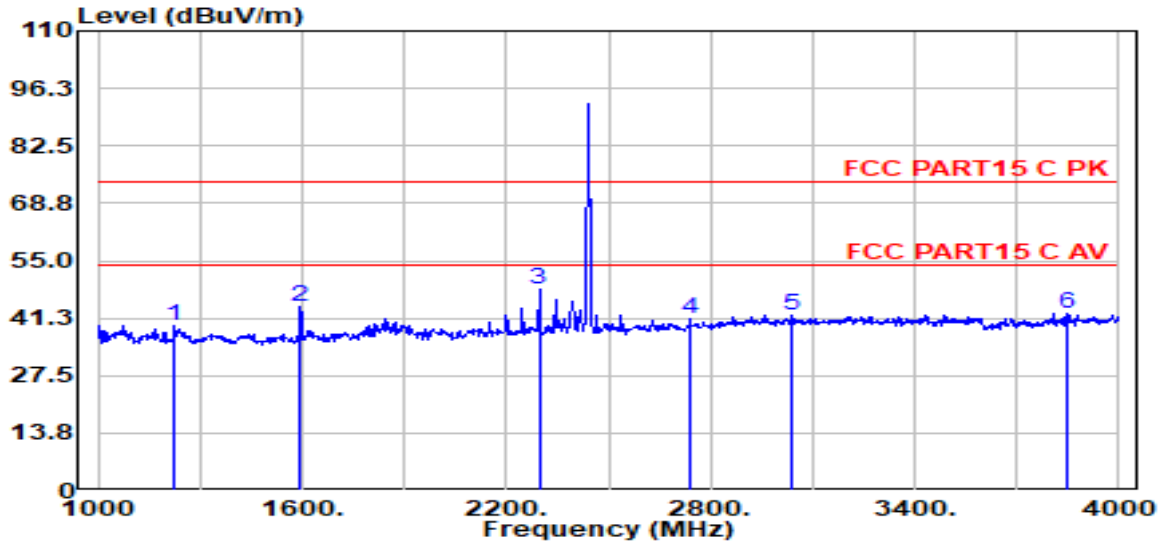

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1078.00 | 50.49 | 25.48 | 2.40 | 38.02 | 40.35 | 74.00 | -33.65 | Peak | Vertical |
| 2 | 1594.00 | 61.25 | 25.64 | 2.96 | 38.79 | 51.06 | 74.00 | -22.94 | Peak | Vertical |
| 3 | 1873.00 | 51.62 | 26.37 | 3.26 | 39.21 | 42.04 | 74.00 | -31.96 | Peak | Vertical |
| 4 | 2596.00 | 49.76 | 27.96 | 3.90 | 39.70 | 41.92 | 74.00 | -32.08 | Peak | Vertical |
| 5 | 3199.00 | 51.96 | 29.46 | 4.36 | 39.96 | 45.82 | 74.00 | -28.18 | Peak | Vertical |
| 6 | 3976.00 | 46.99 | 31.02 | 4.84 | 40.19 | 42.65 | 74.00 | -31.35 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00013.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2441 | | |



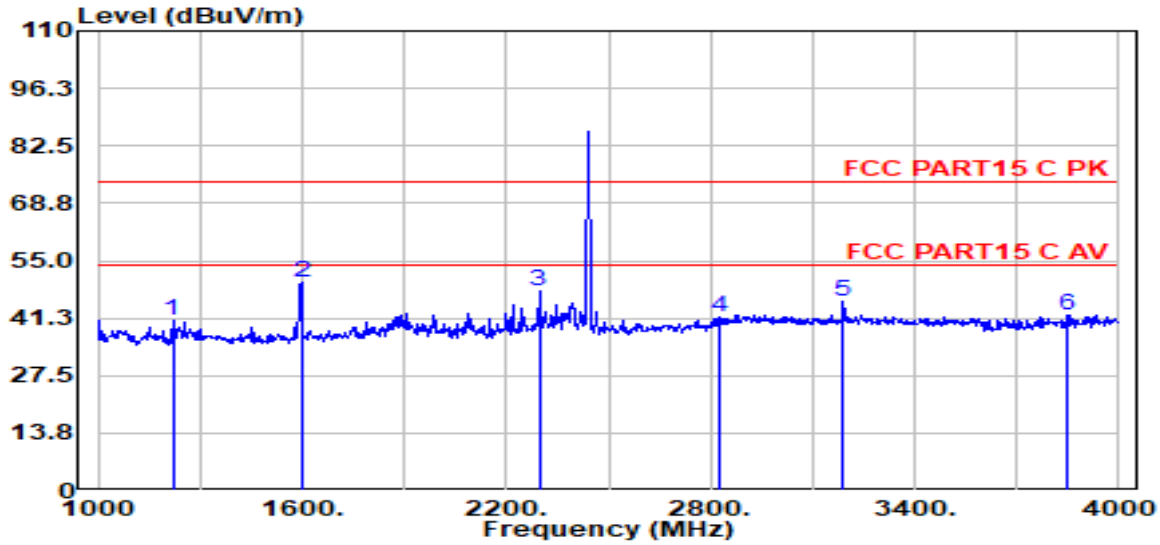

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1222.00 | 49.67 | 25.46 | 2.55 | 38.23 | 39.44 | 74.00 | -34.56 | Peak | Horizontal |
| 2 | 1594.00 | 54.33 | 25.64 | 2.96 | 38.79 | 44.14 | 74.00 | -29.86 | Peak | Horizontal |
| 3 | 2296.00 | 56.96 | 27.23 | 3.65 | 39.55 | 48.30 | 74.00 | -25.70 | Peak | Horizontal |
| 4 | 2740.00 | 48.26 | 28.51 | 4.02 | 39.77 | 41.02 | 74.00 | -32.98 | Peak | Horizontal |
| 5 | 3040.00 | 47.98 | 29.49 | 4.26 | 39.91 | 41.82 | 74.00 | -32.18 | Peak | Horizontal |
| 6 | 3850.00 | 47.26 | 30.59 | 4.76 | 40.16 | 42.45 | 74.00 | -31.55 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00014.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2441 | | |



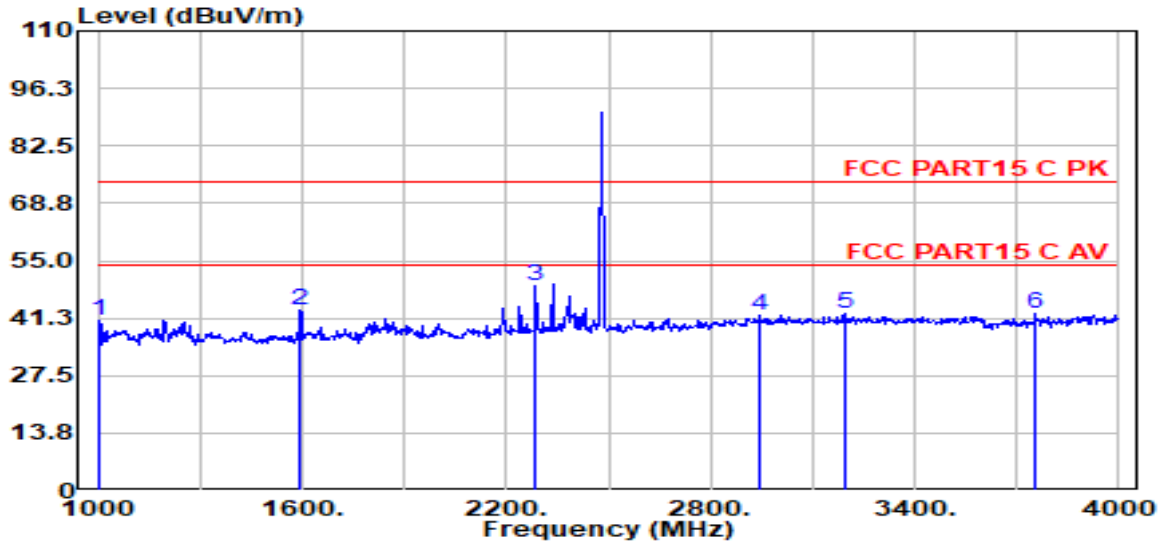

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1219.00 | 50.97 | 25.46 | 2.55 | 38.23 | 40.74 | 74.00 | -33.26 | Peak | Vertical |
| 2 | 1597.00 | 60.12 | 25.65 | 2.96 | 38.80 | 49.93 | 74.00 | -24.07 | Peak | Vertical |
| 3 | 2296.00 | 56.20 | 27.23 | 3.65 | 39.55 | 47.54 | 74.00 | -26.46 | Peak | Vertical |
| 4 | 2830.00 | 48.51 | 28.85 | 4.10 | 39.82 | 41.65 | 74.00 | -32.35 | Peak | Vertical |
| 5 | 3187.00 | 51.50 | 29.46 | 4.35 | 39.96 | 45.36 | 74.00 | -28.64 | Peak | Vertical |
| 6 | 3847.00 | 46.64 | 30.58 | 4.76 | 40.15 | 41.82 | 74.00 | -32.18 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00017.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2480 | | |



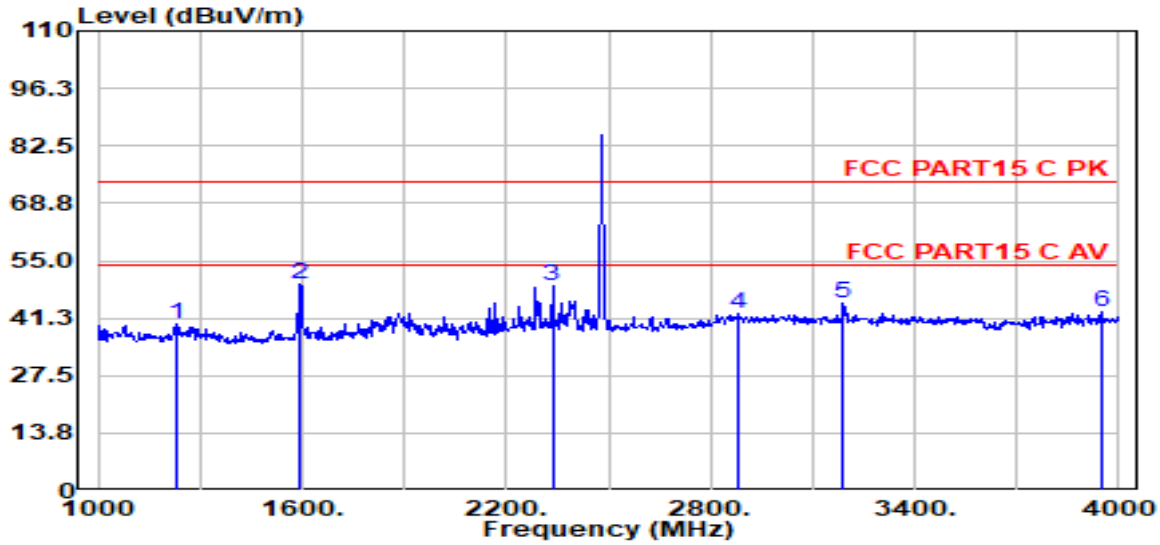

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1006.00 | 50.95 | 25.50 | 2.32 | 37.91 | 40.86 | 74.00 | -33.14 | Peak | Horizontal |
| 2 | 1594.00 | 53.16 | 25.64 | 2.96 | 38.79 | 42.97 | 74.00 | -31.03 | Peak | Horizontal |
| 3 | 2287.00 | 57.52 | 27.22 | 3.64 | 39.54 | 48.83 | 74.00 | -25.17 | Peak | Horizontal |
| 4 | 2944.00 | 48.16 | 29.29 | 4.19 | 39.87 | 41.77 | 74.00 | -32.23 | Peak | Horizontal |
| 5 | 3193.00 | 48.68 | 29.46 | 4.36 | 39.96 | 42.54 | 74.00 | -31.46 | Peak | Horizontal |
| 6 | 3757.00 | 47.34 | 30.27 | 4.70 | 40.13 | 42.19 | 74.00 | -31.81 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00018.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2480 | | |



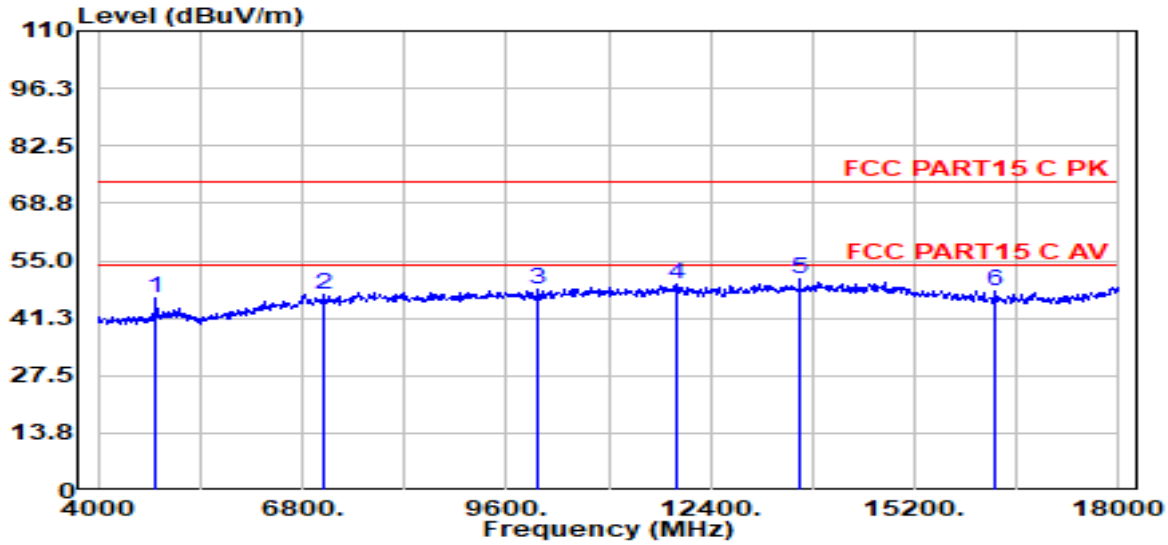

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1234.00 | 50.20 | 25.45 | 2.57 | 38.25 | 39.97 | 74.00 | -34.03 | Peak | Vertical |
| 2 | 1594.00 | 59.59 | 25.64 | 2.96 | 38.79 | 49.40 | 74.00 | -24.60 | Peak | Vertical |
| 3 | 2335.00 | 57.39 | 27.30 | 3.68 | 39.57 | 48.80 | 74.00 | -25.20 | Peak | Vertical |
| 4 | 2881.00 | 48.92 | 29.05 | 4.14 | 39.84 | 42.27 | 74.00 | -31.73 | Peak | Vertical |
| 5 | 3190.00 | 51.04 | 29.46 | 4.36 | 39.96 | 44.90 | 74.00 | -29.10 | Peak | Vertical |
| 6 | 3952.00 | 46.99 | 30.94 | 4.82 | 40.19 | 42.56 | 74.00 | -31.44 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00025.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.6°,Humi:46.9%,Press:100.5kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2402 | | |



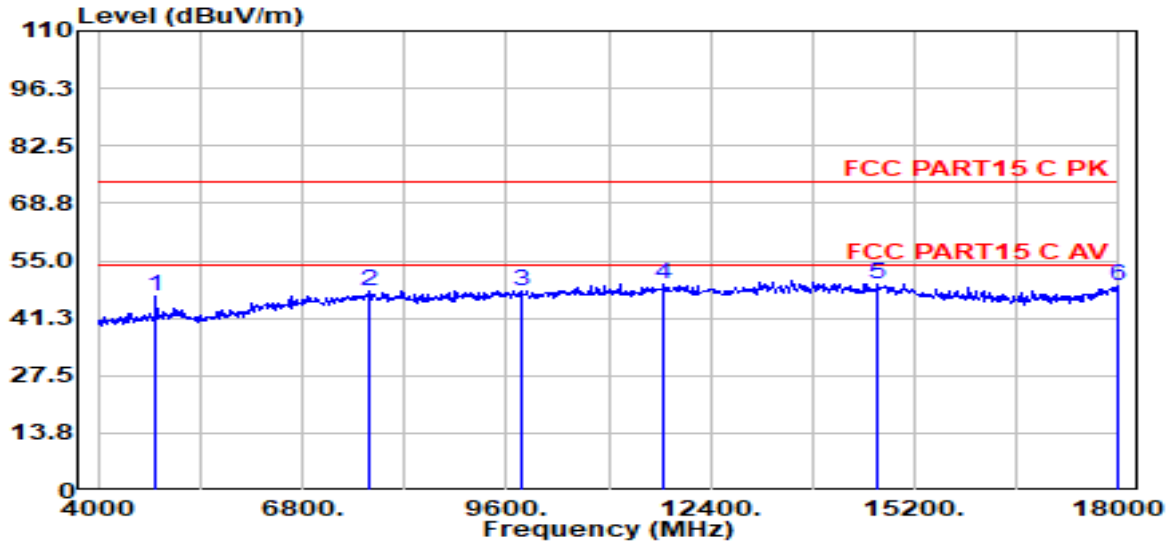

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4798.00 | 51.47 | 32.45 | 2.47 | 40.36 | 46.03 | 74.00 | -27.97 | Peak | Horizontal |
| 2 | 7108.00 | 47.49 | 36.09 | 3.05 | 39.71 | 46.91 | 74.00 | -27.09 | Peak | Horizontal |
| 3 | 10034.00 | 46.51 | 38.44 | 3.67 | 40.59 | 48.04 | 74.00 | -25.96 | Peak | Horizontal |
| 4 | 11924.00 | 46.39 | 39.17 | 4.04 | 40.11 | 49.49 | 74.00 | -24.51 | Peak | Horizontal |
| 5 | 13618.00 | 46.38 | 39.98 | 4.12 | 39.97 | 50.50 | 74.00 | -23.50 | Peak | Horizontal |
| 6 | 16292.00 | 45.14 | 37.90 | 4.68 | 39.96 | 47.76 | 74.00 | -26.24 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00026.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.6°,Humi:46.9%,Press:100.5kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2402 | | |



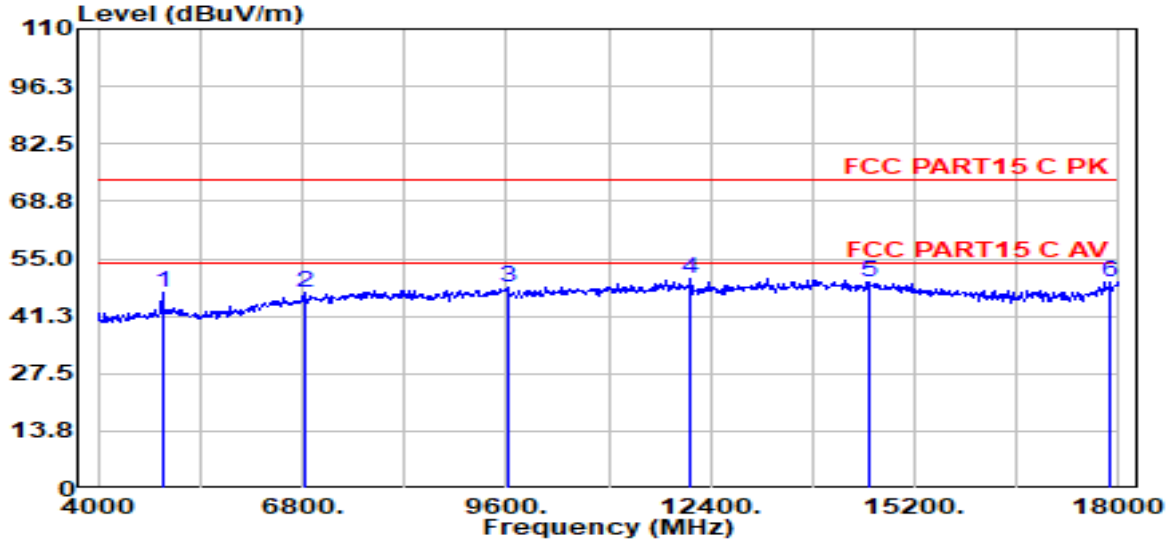

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4798.00 | 51.85 | 32.45 | 2.47 | 40.36 | 46.41 | 74.00 | -27.59 | Peak | Vertical |
| 2 | 7710.00 | 47.79 | 36.65 | 3.16 | 39.77 | 47.83 | 74.00 | -26.17 | Peak | Vertical |
| 3 | 9796.00 | 46.19 | 38.52 | 3.65 | 40.46 | 47.90 | 74.00 | -26.10 | Peak | Vertical |
| 4 | 11770.00 | 46.40 | 39.11 | 4.01 | 40.12 | 49.40 | 74.00 | -24.60 | Peak | Vertical |
| 5 | 14682.00 | 45.09 | 39.75 | 4.39 | 39.63 | 49.60 | 74.00 | -24.40 | Peak | Vertical |
| 6 | 17972.00 | 42.53 | 42.33 | 4.95 | 40.68 | 49.13 | 74.00 | -24.87 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00027.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.6°,Humi:46.9%,Press:100.5kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2441 | | |



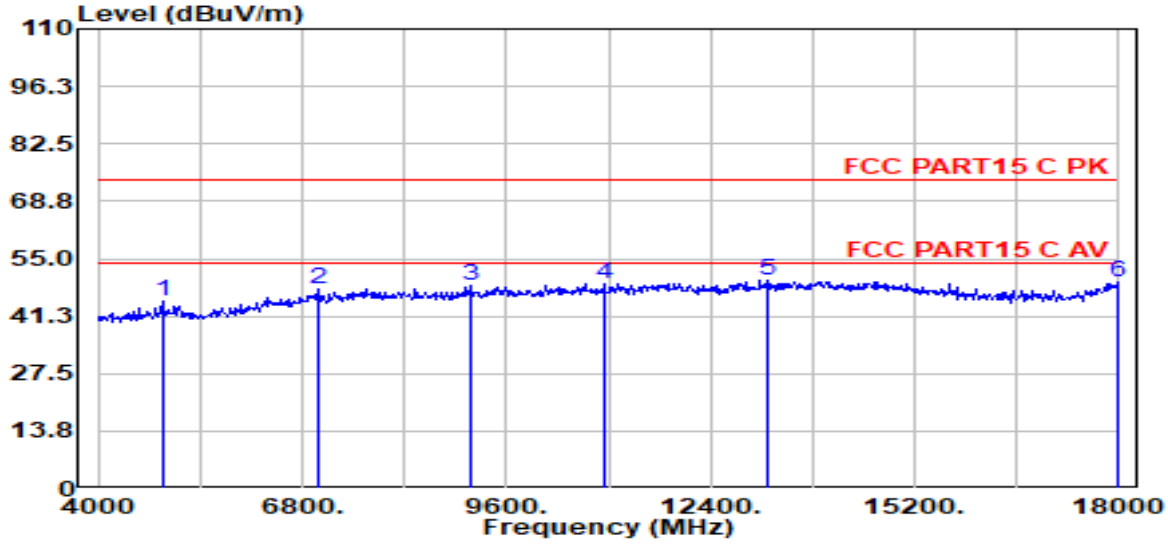

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4882.00 | 52.04 | 32.72 | 2.50 | 40.38 | 46.88 | 74.00 | -27.12 | Peak | Horizontal |
| 2 | 6828.00 | 48.11 | 35.72 | 3.11 | 39.84 | 47.11 | 74.00 | -26.89 | Peak | Horizontal |
| 3 | 9614.00 | 46.10 | 38.63 | 3.63 | 40.33 | 48.03 | 74.00 | -25.97 | Peak | Horizontal |
| 4 | 12134.00 | 47.37 | 39.15 | 3.96 | 40.14 | 50.33 | 74.00 | -23.67 | Peak | Horizontal |
| 5 | 14570.00 | 44.97 | 39.84 | 4.37 | 39.64 | 49.54 | 74.00 | -24.46 | Peak | Horizontal |
| 6 | 17888.00 | 43.18 | 41.81 | 4.93 | 40.63 | 49.28 | 74.00 | -24.72 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00028.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.6°,Humi:46.9%,Press:100.5kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2441 | | |



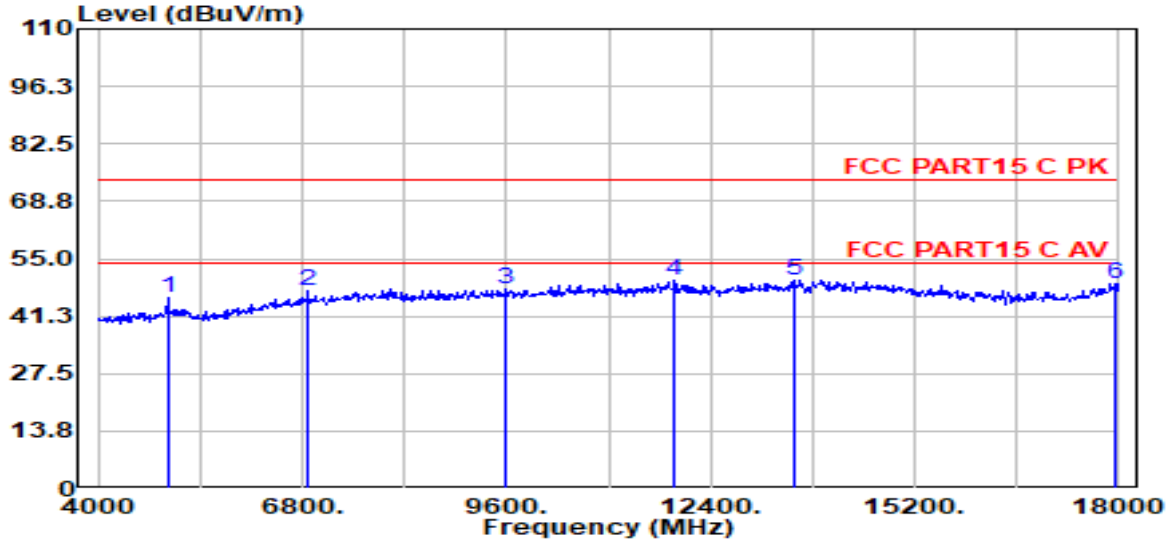

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4882.00 | 49.97 | 32.72 | 2.50 | 40.38 | 44.81 | 74.00 | -29.19 | Peak | Vertical |
| 2 | 7038.00 | 48.31 | 36.03 | 3.03 | 39.70 | 47.66 | 74.00 | -26.34 | Peak | Vertical |
| 3 | 9124.00 | 46.58 | 38.40 | 3.40 | 39.99 | 48.39 | 74.00 | -25.61 | Peak | Vertical |
| 4 | 10930.00 | 46.31 | 39.26 | 3.78 | 40.23 | 49.12 | 74.00 | -24.88 | Peak | Vertical |
| 5 | 13170.00 | 46.11 | 39.74 | 4.26 | 40.28 | 49.82 | 74.00 | -24.18 | Peak | Vertical |
| 6 | 17972.00 | 42.95 | 42.33 | 4.95 | 40.68 | 49.54 | 74.00 | -24.46 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00029.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.6°,Humi:46.9%,Press:100.5kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2480 | | |



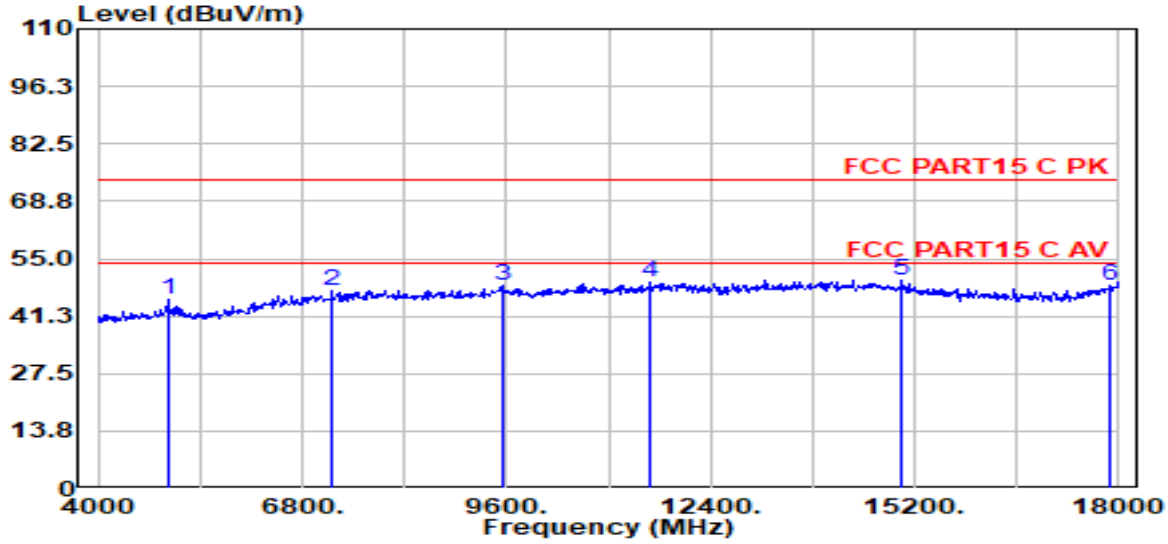

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4952.00 | 50.69 | 32.95 | 2.52 | 40.39 | 45.77 | 74.00 | -28.23 | Peak | Horizontal |
| 2 | 6870.00 | 48.21 | 35.79 | 3.09 | 39.80 | 47.28 | 74.00 | -26.72 | Peak | Horizontal |
| 3 | 9600.00 | 45.70 | 38.64 | 3.63 | 40.32 | 47.65 | 74.00 | -26.35 | Peak | Horizontal |
| 4 | 11896.00 | 46.93 | 39.16 | 4.03 | 40.11 | 50.01 | 74.00 | -23.99 | Peak | Horizontal |
| 5 | 13548.00 | 45.63 | 39.99 | 4.04 | 40.02 | 49.65 | 74.00 | -24.35 | Peak | Horizontal |
| 6 | 17958.00 | 42.37 | 42.24 | 4.95 | 40.67 | 48.88 | 74.00 | -25.12 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00030.EMI | |
| **Test Date** | : 2022-01-06 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:22.6°,Humi:46.9%,Press:100.5kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2480 | | |




| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4952.00 | 50.21 | 32.95 | 2.52 | 40.39 | 45.29 | 74.00 | -28.71 | Peak | Vertical |
| 2 | 7206.00 | 47.71 | 36.16 | 3.07 | 39.72 | 47.23 | 74.00 | -26.77 | Peak | Vertical |
| 3 | 9558.00 | 46.44 | 38.67 | 3.63 | 40.29 | 48.44 | 74.00 | -25.56 | Peak | Vertical |
| 4 | 11574.00 | 46.37 | 39.03 | 3.98 | 40.14 | 49.24 | 74.00 | -24.76 | Peak | Vertical |
| 5 | 15032.00 | 45.52 | 39.46 | 4.48 | 39.61 | 49.84 | 74.00 | -24.16 | Peak | Vertical |
| 6 | 17888.00 | 42.52 | 41.81 | 4.93 | 40.63 | 48.62 | 74.00 | -25.38 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# 11. RF Conducted Spurious Emissions

## 11.1. Block diagram of test setup

Same as section 4.1

## 11.2. Limits

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

## 11.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) Establish a reference level by using the following procedure:

| | |
|---|---|
| Center frequency | Test frequency |
| RBW: | 100 kHz |
| VBW: | 300 kHz |
| Span | Wide enough to capture the peak level of the in-band emission |
| Detector Mode: | Peak |
| Sweep time: | auto |
| Trace mode | Max hold |

(3) Allow the trace to stabilize, use the peak marker function to determine the maximum peak power level to establish the reference level.

(4) Set the spectrum analyzer as follows:

| | |
|---|---|
| RBW: | 100 kHz |
| VBW: | 300 kHz |
| Span | Encompass frequency range to be measured |
| Number of measurement points | ≥span/RBW |
| Detector Mode: | Peak |
| Sweep time: | auto |
| Trace mode | Max hold |

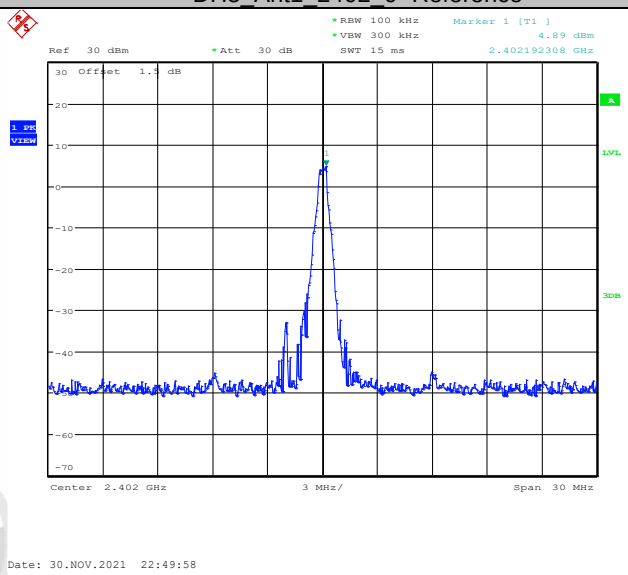
(5) Allow the trace to stabilize, use the peak marker function to determine the maximum amplitude of all unwanted emissions outside of the authorized frequency band

## 11.4. Test result

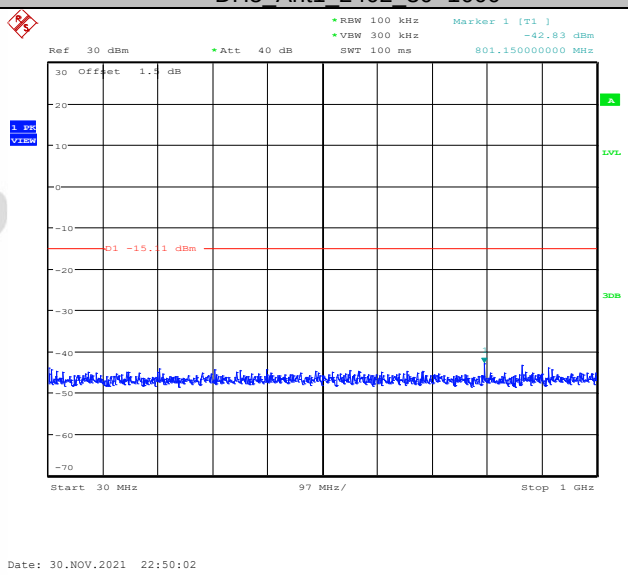
| Mode | Freq. (MHz) | Verdict |
|---|---|---|
| GFSK | Hopping off 2402 | Pass |
| | Hopping off 2441 | Pass |
| | Hopping off 2480 | Pass |
| π/4-DQPSK | Hopping off 2402 | Pass |
| | Hopping off 2441 | Pass |
| | Hopping off 2480 | Pass |
| 8DPSK | Hopping off 2402 | Pass |
| | Hopping off 2441 | Pass |
| | Hopping off 2480 | Pass |

## 11.5. Original test data

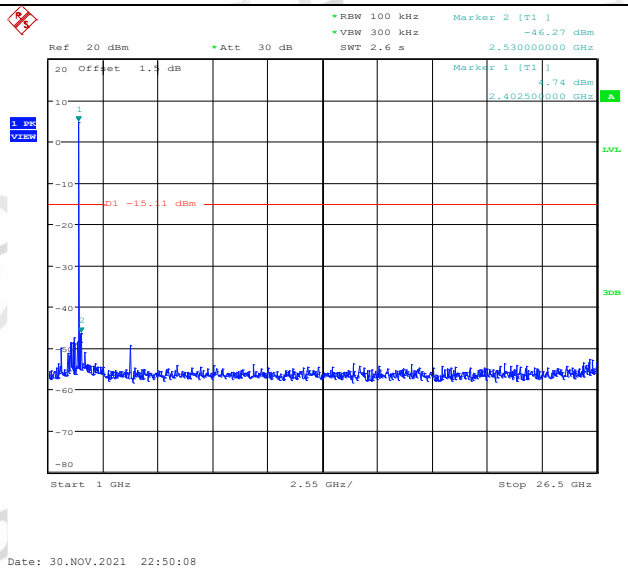
DH5_Ant1_2402_0~Reference



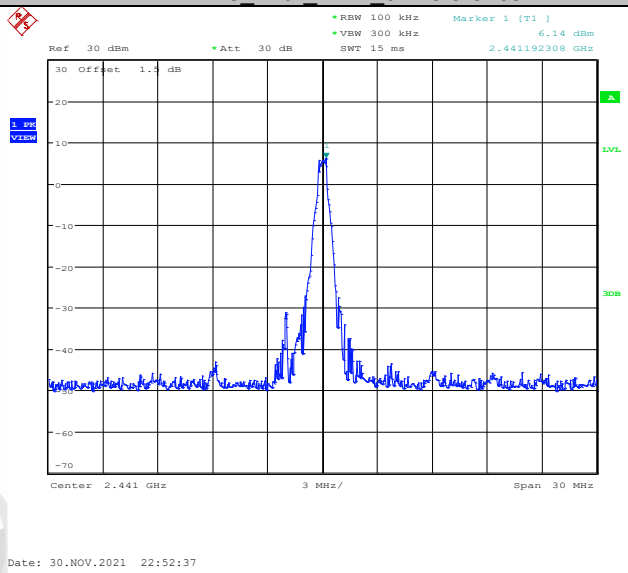

DH5_Ant1_2402_30~1000



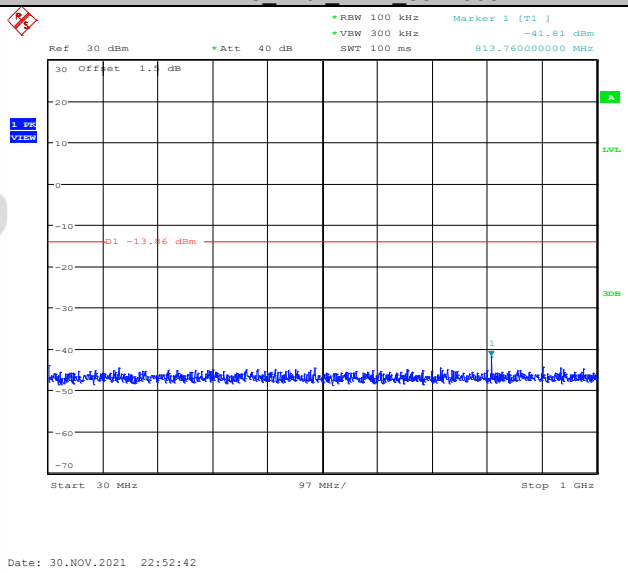

DH5_Ant1_2402_1000~26500



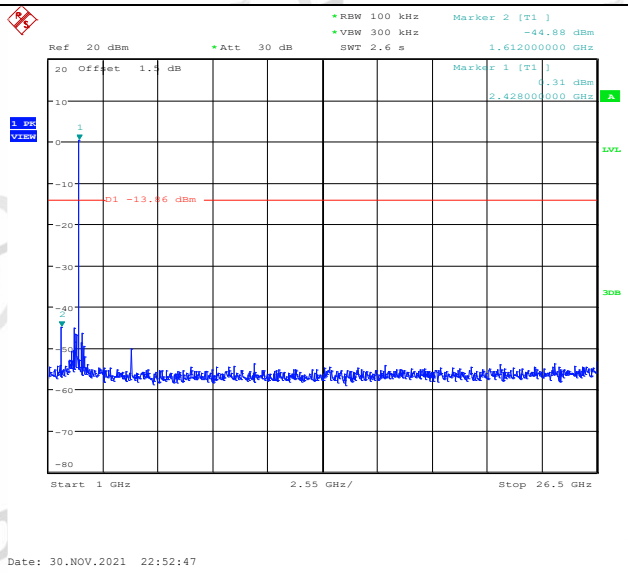

DH5_Ant1_2441_0~Reference



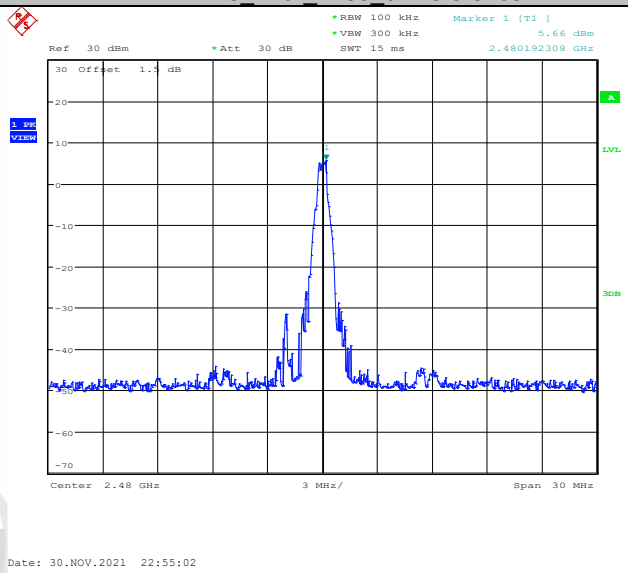

DH5_Ant1_2441_30~1000



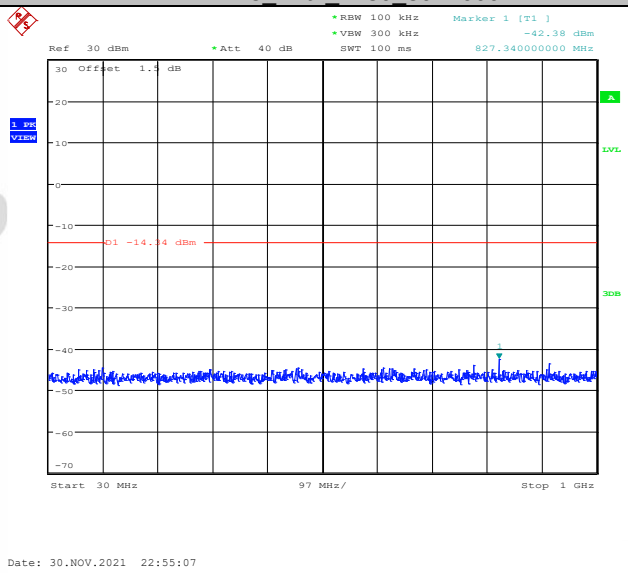

DH5_Ant1_2441_1000~26500



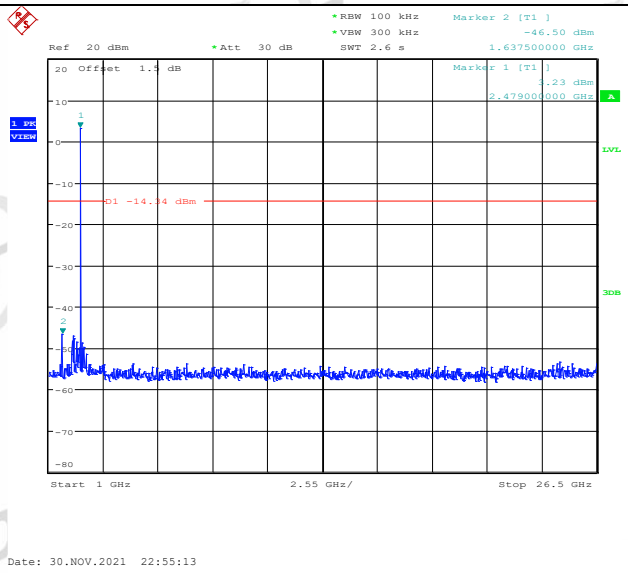

DH5_Ant1_2480_0~Reference



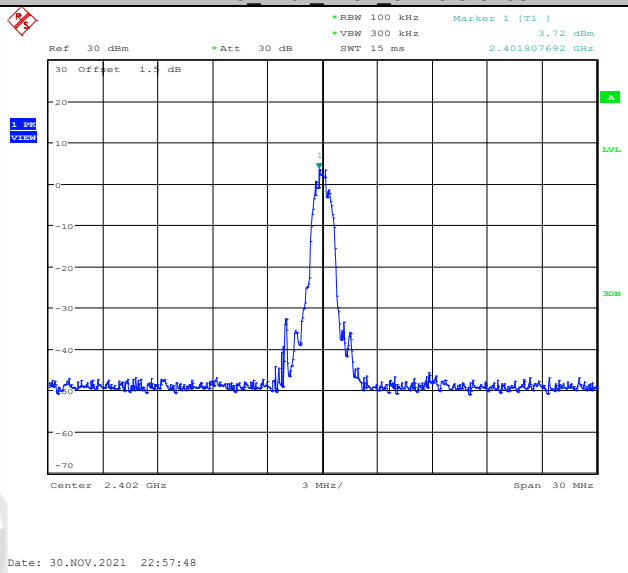

DH5_Ant1_2480_30~1000



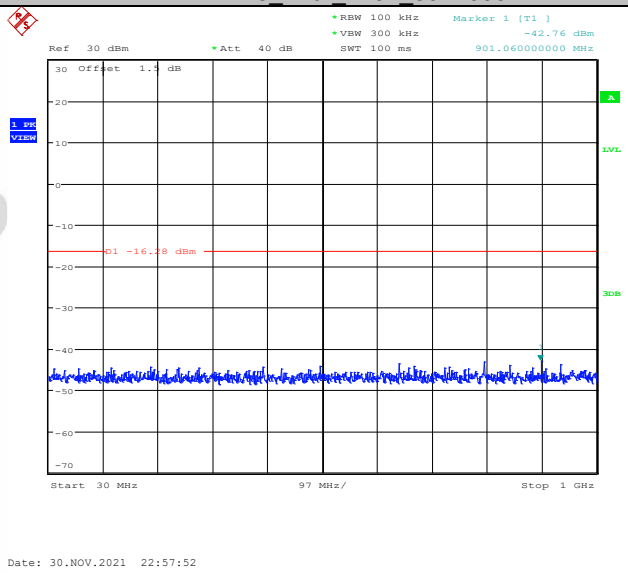

DH5_Ant1_2480_1000~26500



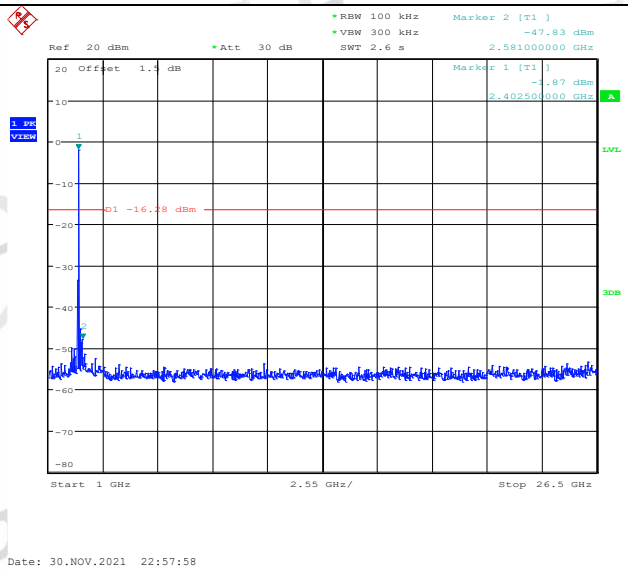

2DH5_Ant1_2402_0~Reference



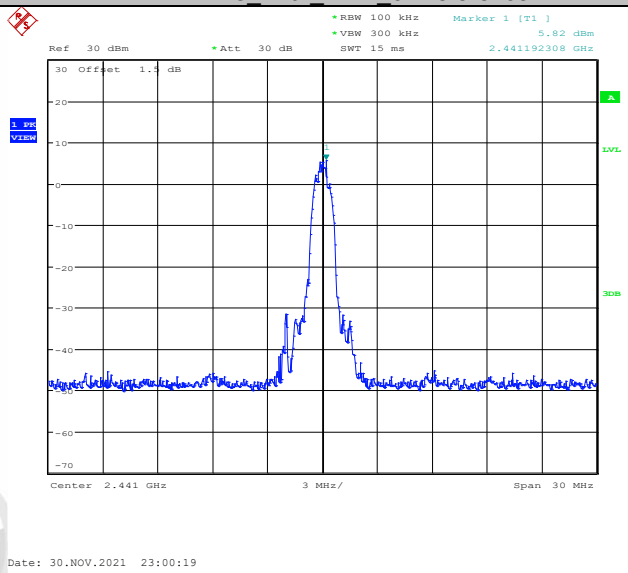

2DH5_Ant1_2402_30~1000



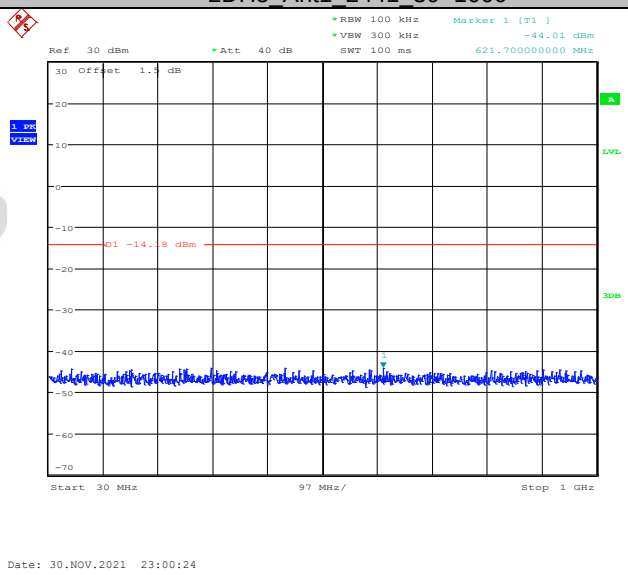

2DH5_Ant1_2402_1000~26500



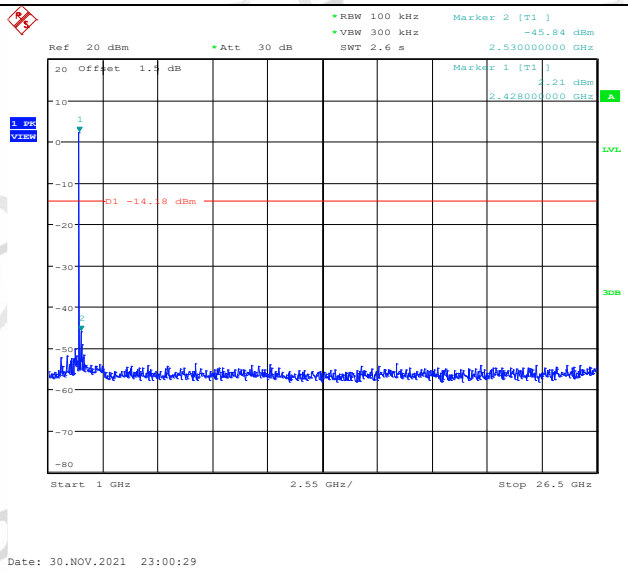

2DH5_Ant1_2441_0~Reference



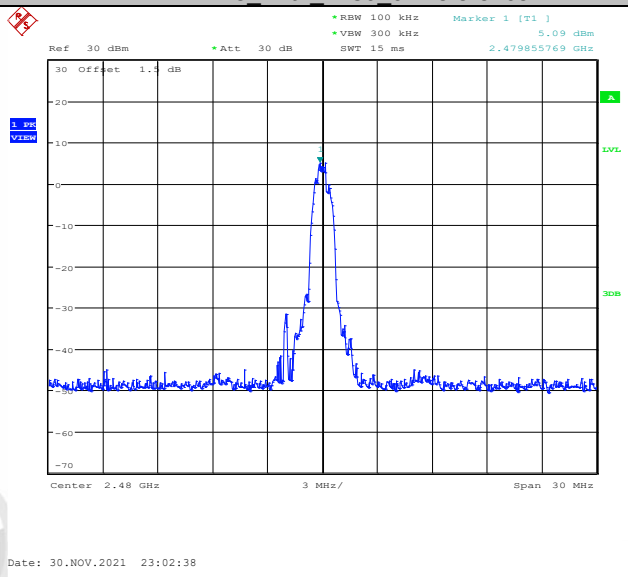

2DH5_Ant1_2441_30~1000



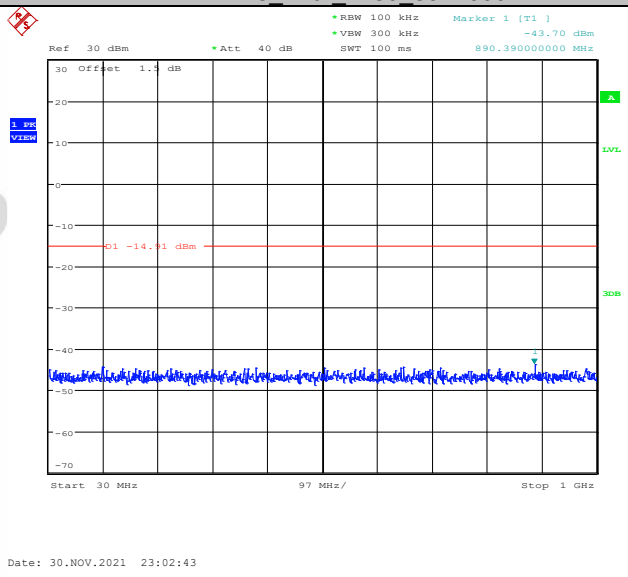

2DH5_Ant1_2441_1000~26500



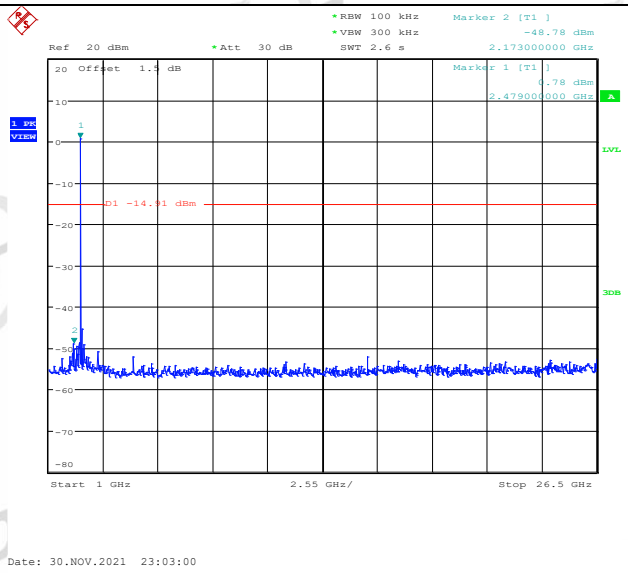

2DH5_Ant1_2480_0~Reference



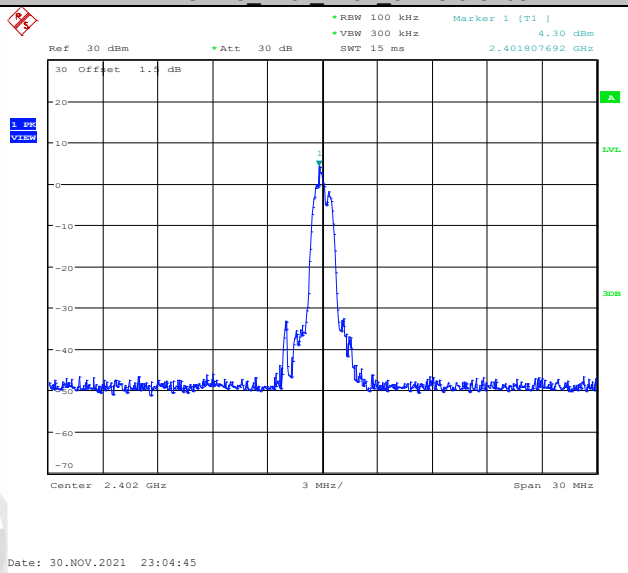

2DH5_Ant1_2480_30~1000



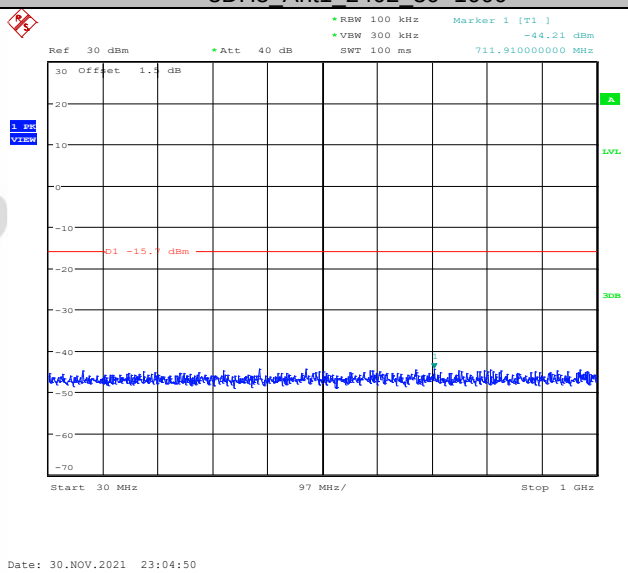

2DH5_Ant1_2480_1000~26500



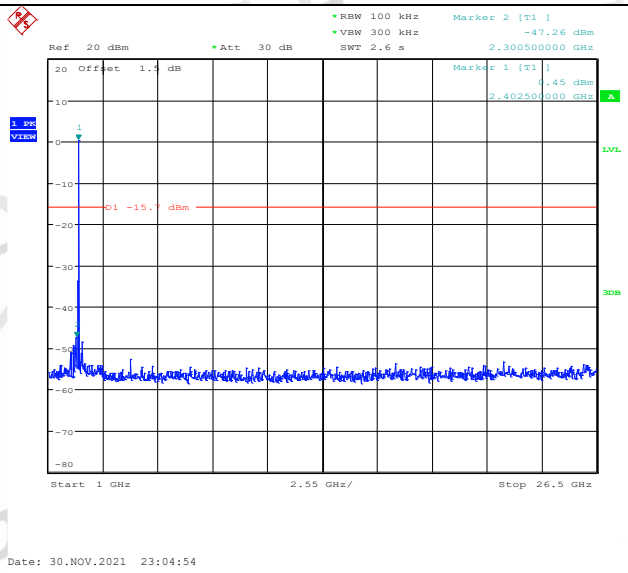

3DH5_Ant1_2402_0~Reference



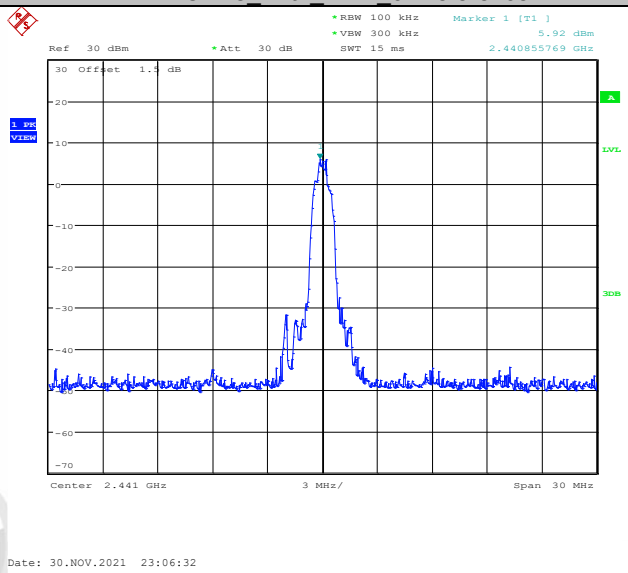

3DH5_Ant1_2402_30~1000



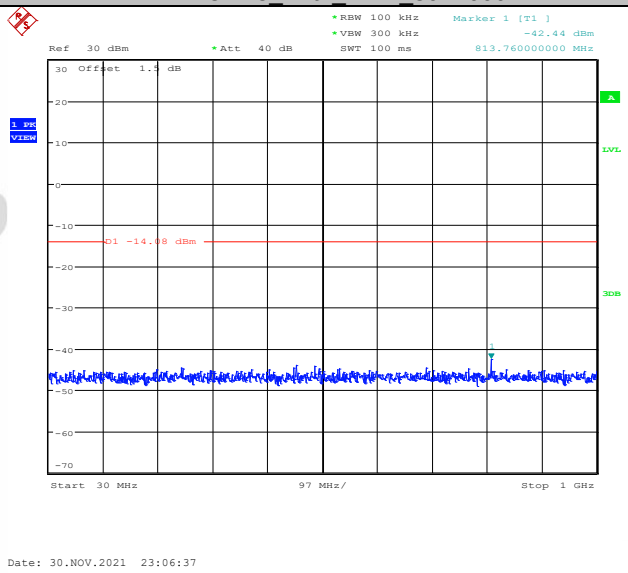

3DH5_Ant1_2402_1000~26500



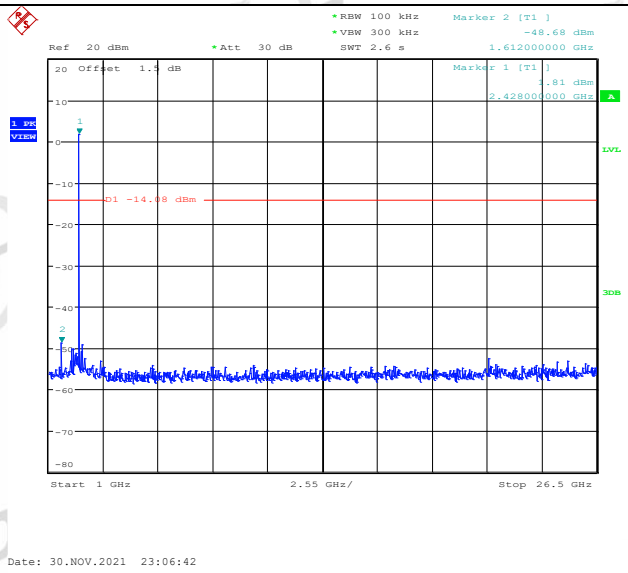

3DH5_Ant1_2441_0~Reference



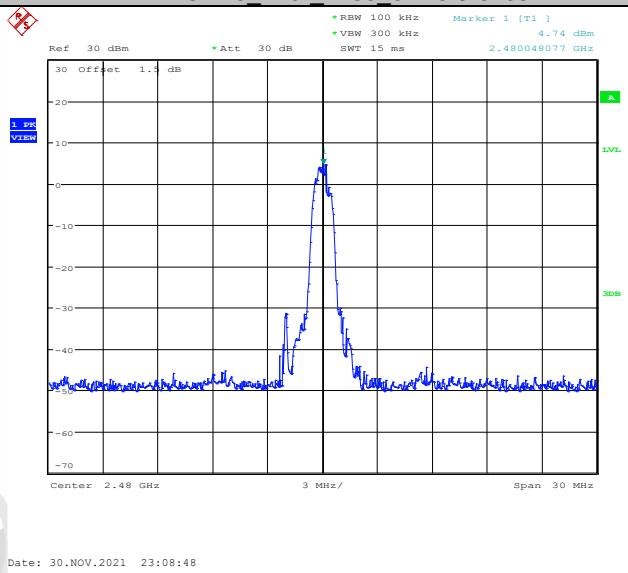

3DH5_Ant1_2441_30~1000



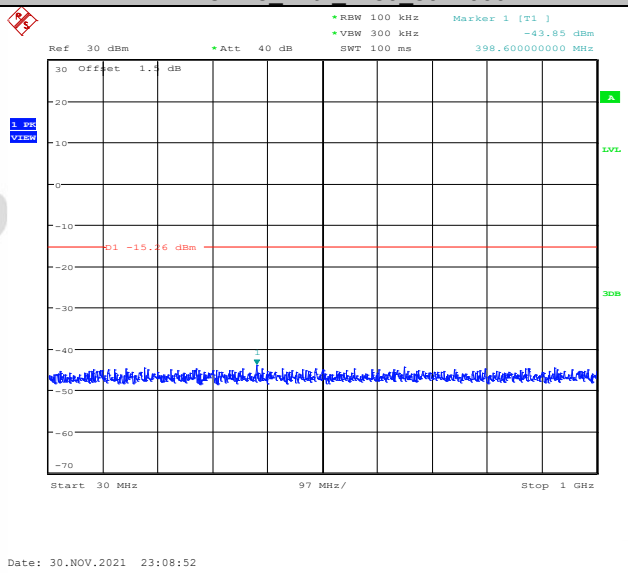

3DH5_Ant1_2441_1000~26500



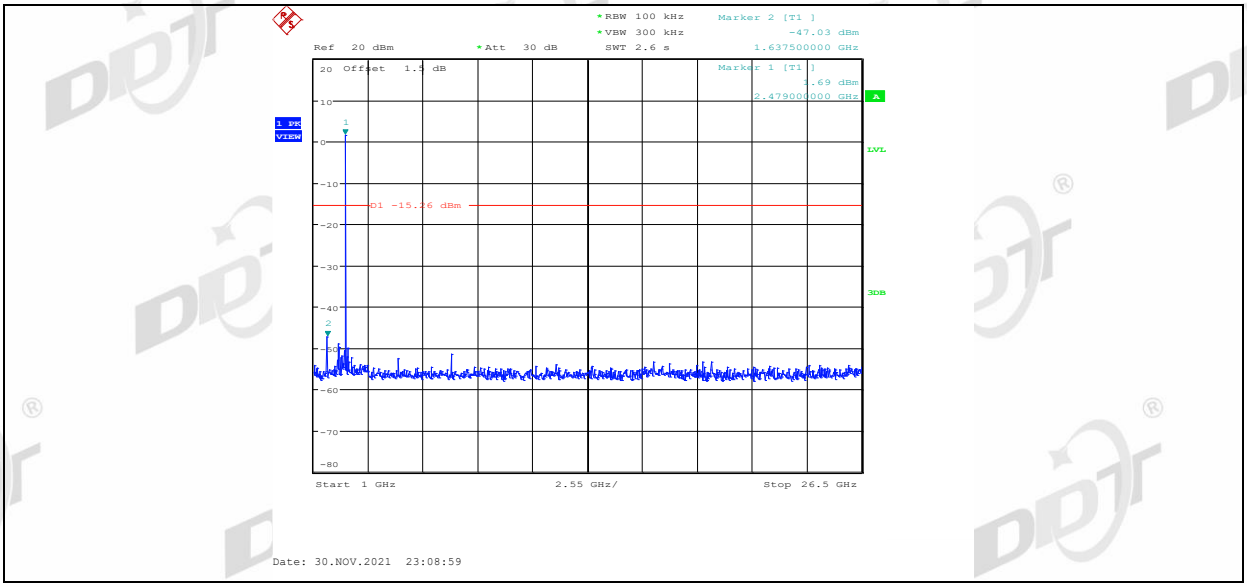

3DH5_Ant1_2480_0~Reference




3DH5_Ant1_2480_30~1000

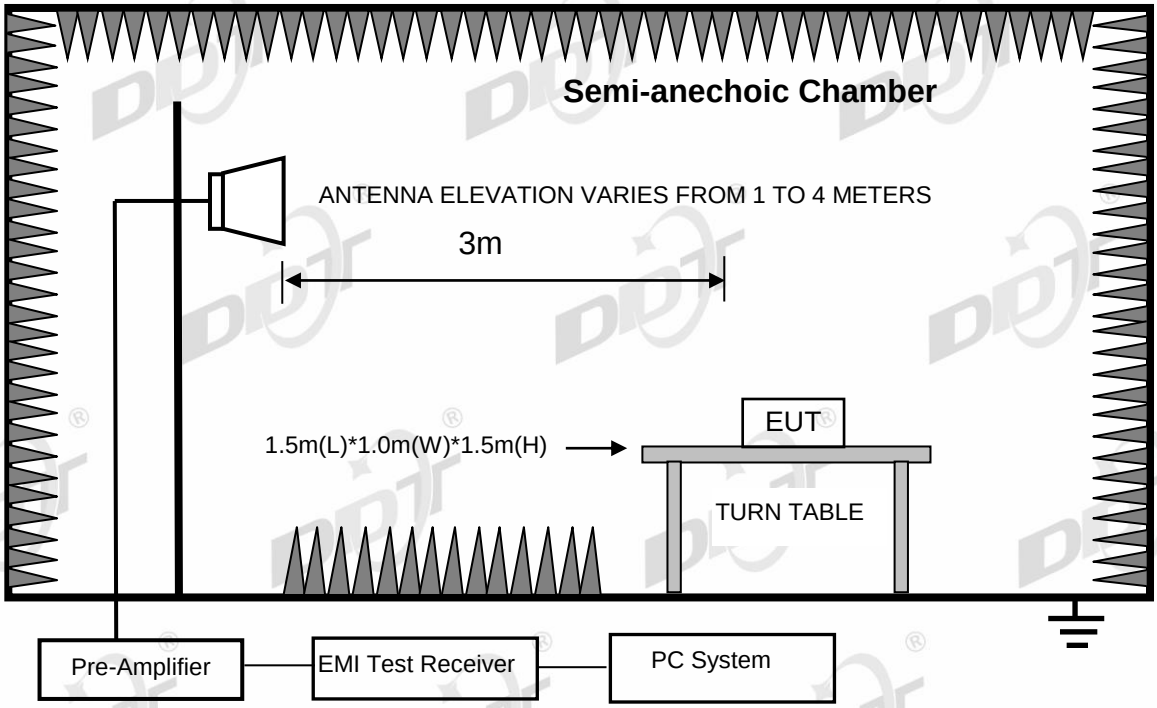



3DH5_Ant1_2480_1000~26500


RBW 100 kHz
VBW 300 kHz
SWT 2.6 s
Marker 2 [T1 ]
-47.03 dBm
1.637500000 GHz
Ref 20 dBm
Att 30 dB
20 Offset 1.5 dB
Marker 1 [T1 ]
1.69 dBm
2.479000000 GHz
1 PK VIEW
A
LVL
3DB
D1 -15.26 dBm
Start 1 GHz
2.55 GHz/
Stop 26.5 GHz
Date: 30.NOV.2021 23:08:59

# 12. Band Edge Compliance (Radiated Method)

## 12.1. Block diagram of test setup




## 12.2. Limit

All restriction band should comply with 15.209 and RSS-Gen section 8.9 limits, other emission should be at least 20 dB below the fundamental.

## 12.3. Test procedure

Same with clause 10.3 except change investigated frequency range from 2310 MHz to 2410 MHz and 2475 MHz to 2500 MHz.

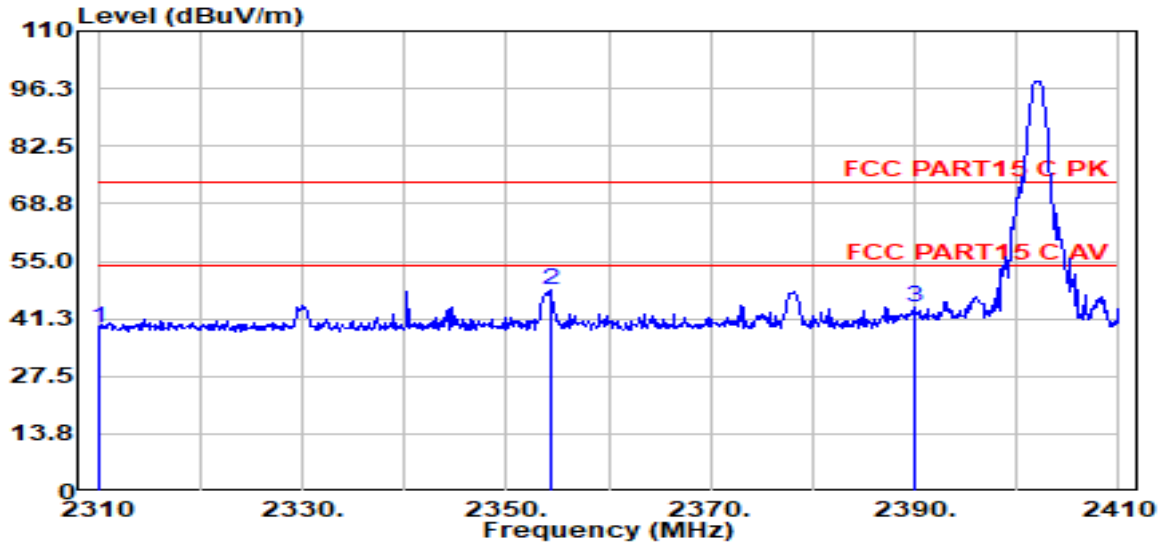
Remark: All restriction band have been tested, and only the worst case is shown in report.

## 12.4. Test result

Pass. (See below detailed test result)
Remark: hopping on and hopping off mode all have been test, hopping off mode is worse and reported only, the worst case recorded in this report.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00001.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2402 | | |



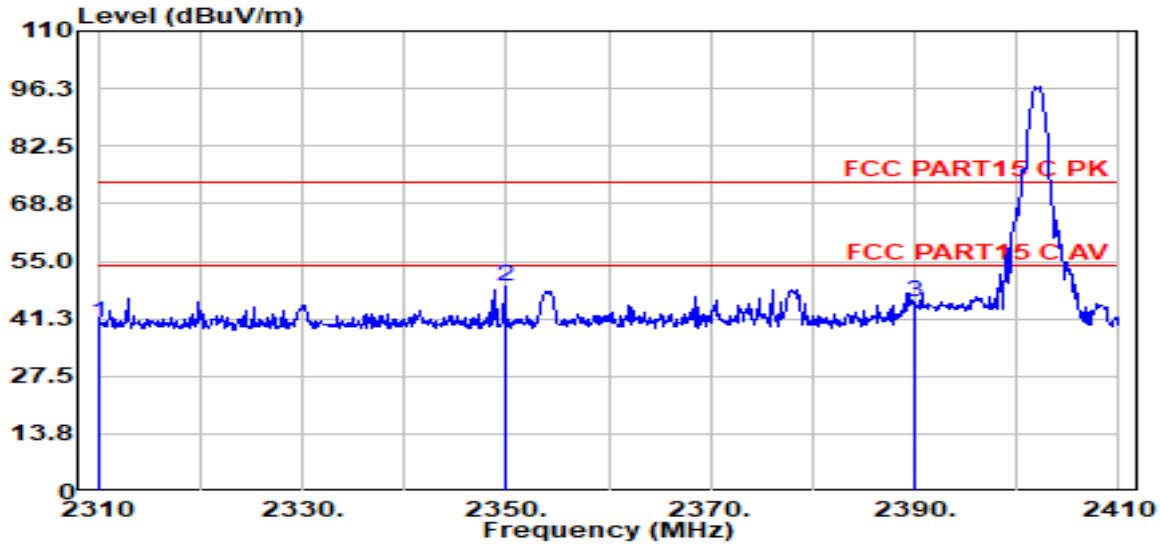

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.00 | 47.50 | 27.26 | 3.66 | 39.56 | 38.86 | 74.00 | -35.14 | Peak | Horizontal |
| 2 | 2354.30 | 56.60 | 27.34 | 3.70 | 39.58 | 48.06 | 74.00 | -25.94 | Peak | Horizontal |
| 3 | 2390.00 | 52.58 | 27.40 | 3.73 | 39.60 | 44.12 | 74.00 | -29.88 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00002.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2402 | | |



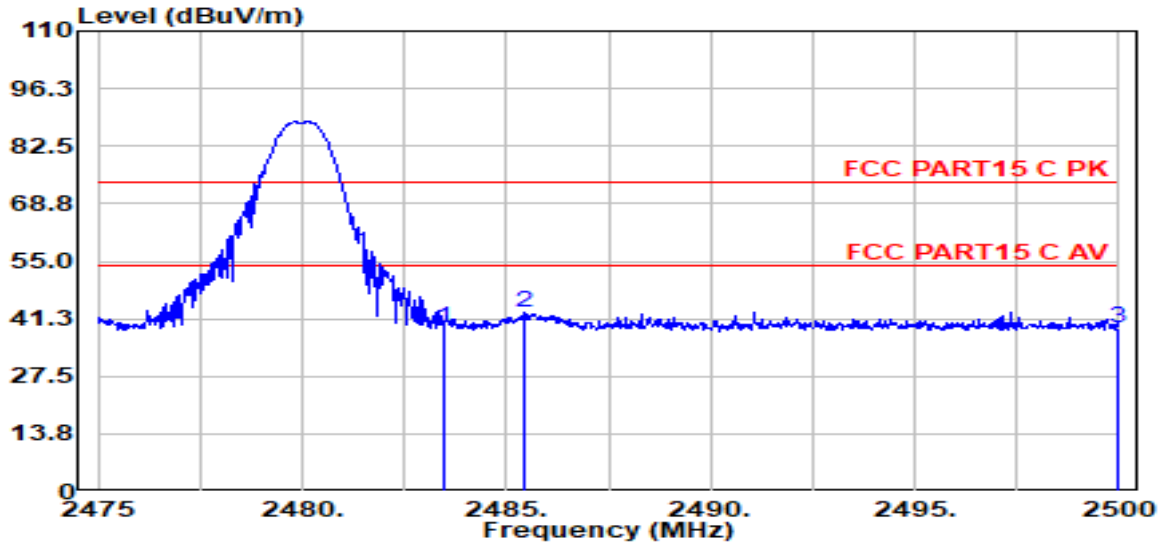

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.00 | 48.95 | 27.26 | 3.66 | 39.56 | 40.32 | 74.00 | -33.68 | Peak | Vertical |
| 2 | 2349.80 | 57.68 | 27.33 | 3.69 | 39.57 | 49.13 | 74.00 | -24.87 | Peak | Vertical |
| 3 | 2390.00 | 53.57 | 27.40 | 3.73 | 39.60 | 45.10 | 74.00 | -28.90 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00003.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : DH5 2480 | | |



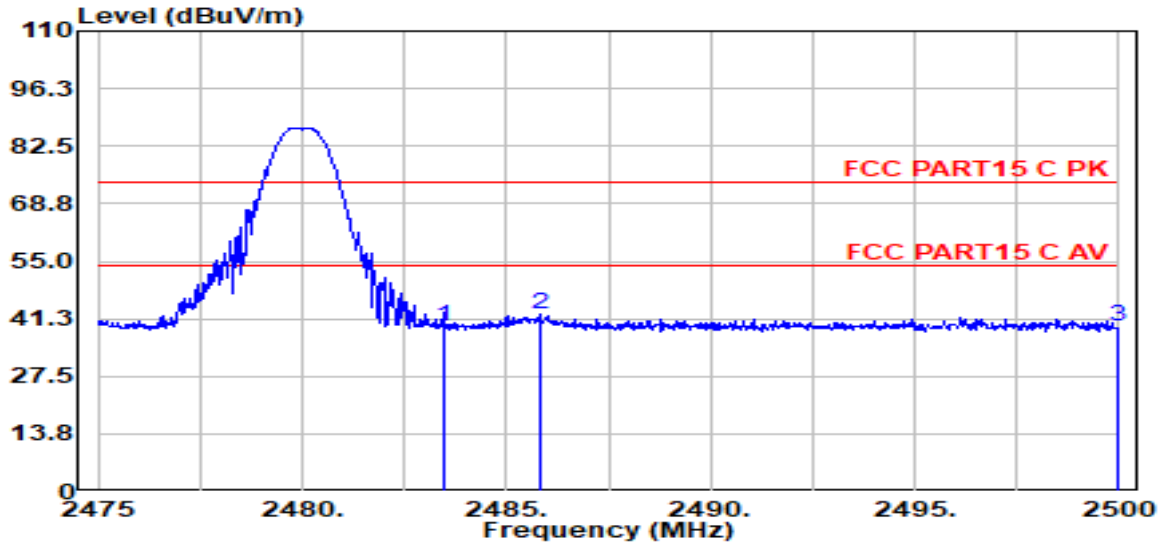

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 47.44 | 27.57 | 3.81 | 39.64 | 39.17 | 74.00 | -34.83 | Peak | Horizontal |
| 2 | 2485.45 | 51.04 | 27.57 | 3.81 | 39.64 | 42.78 | 74.00 | -31.22 | Peak | Horizontal |
| 3 | 2500.00 | 47.44 | 27.60 | 3.82 | 39.65 | 39.21 | 74.00 | -34.79 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00004.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : DH5 2480 | | |



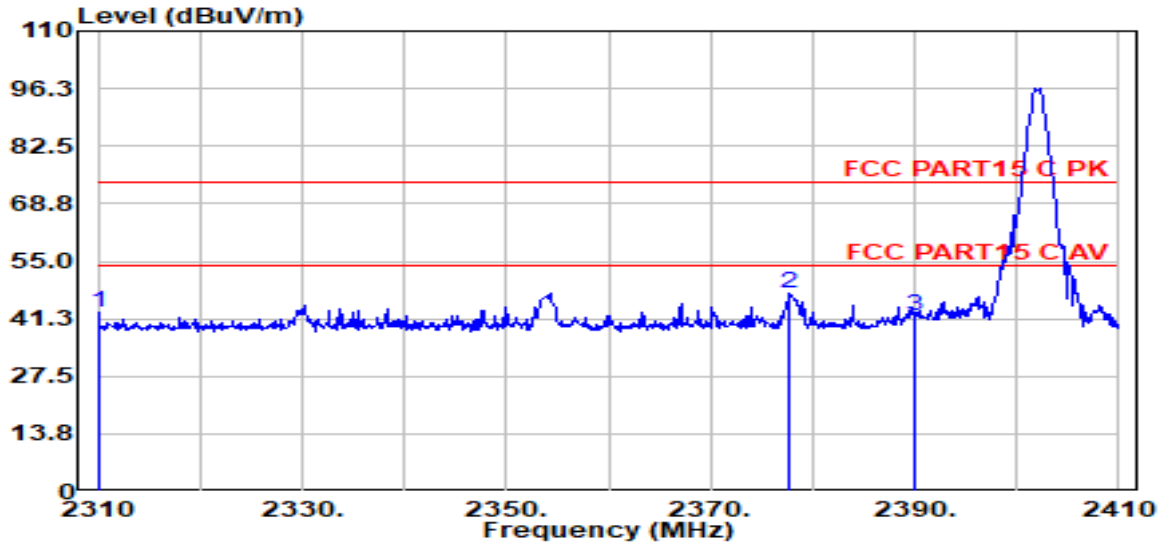

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 47.70 | 27.57 | 3.81 | 39.64 | 39.44 | 74.00 | -34.56 | Peak | Vertical |
| 2 | 2485.83 | 50.49 | 27.57 | 3.81 | 39.64 | 42.23 | 74.00 | -31.77 | Peak | Vertical |
| 3 | 2500.00 | 47.56 | 27.60 | 3.82 | 39.65 | 39.33 | 74.00 | -34.67 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00007.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : 2DH5 2402 | | |



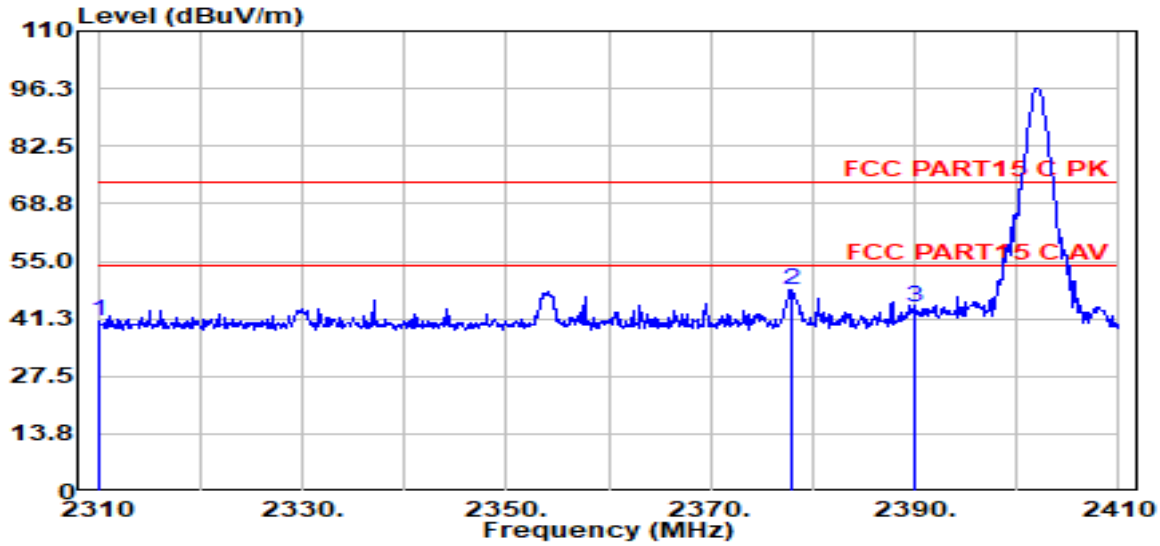

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.00 | 51.20 | 27.26 | 3.66 | 39.56 | 42.57 | 74.00 | -31.43 | Peak | Horizontal |
| 2 | 2377.80 | 55.62 | 27.38 | 3.72 | 39.59 | 47.13 | 74.00 | -26.87 | Peak | Horizontal |
| 3 | 2390.00 | 50.28 | 27.40 | 3.73 | 39.60 | 41.82 | 74.00 | -32.18 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00008.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : 2DH5 2402 | | |




| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.00 | 49.42 | 27.26 | 3.66 | 39.56 | 40.78 | 74.00 | -33.22 | Peak | Vertical |
| 2 | 2378.00 | 56.56 | 27.38 | 3.72 | 39.59 | 48.07 | 74.00 | -25.93 | Peak | Vertical |
| 3 | 2390.00 | 52.27 | 27.40 | 3.73 | 39.60 | 43.81 | 74.00 | -30.19 | Peak | Vertical |

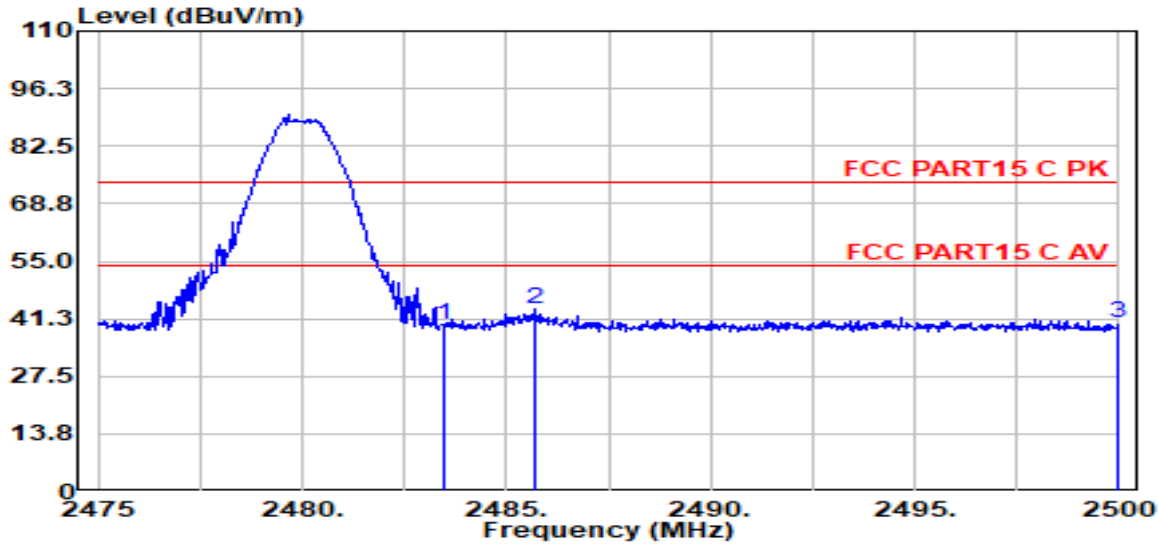
Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00005.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : 2DH5 2480 | | |



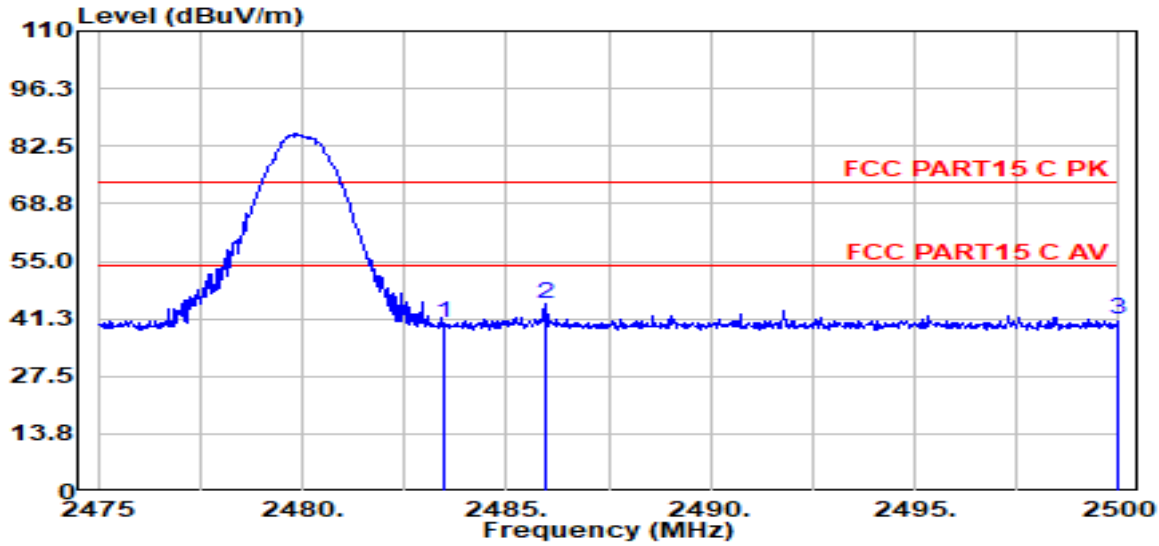

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 48.00 | 27.57 | 3.81 | 39.64 | 39.73 | 74.00 | -34.27 | Peak | Horizontal |
| 2 | 2485.68 | 51.64 | 27.57 | 3.81 | 39.64 | 43.38 | 74.00 | -30.62 | Peak | Horizontal |
| 3 | 2500.00 | 48.37 | 27.60 | 3.82 | 39.65 | 40.14 | 74.00 | -33.86 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00006.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : 2DH5 2480 | | |



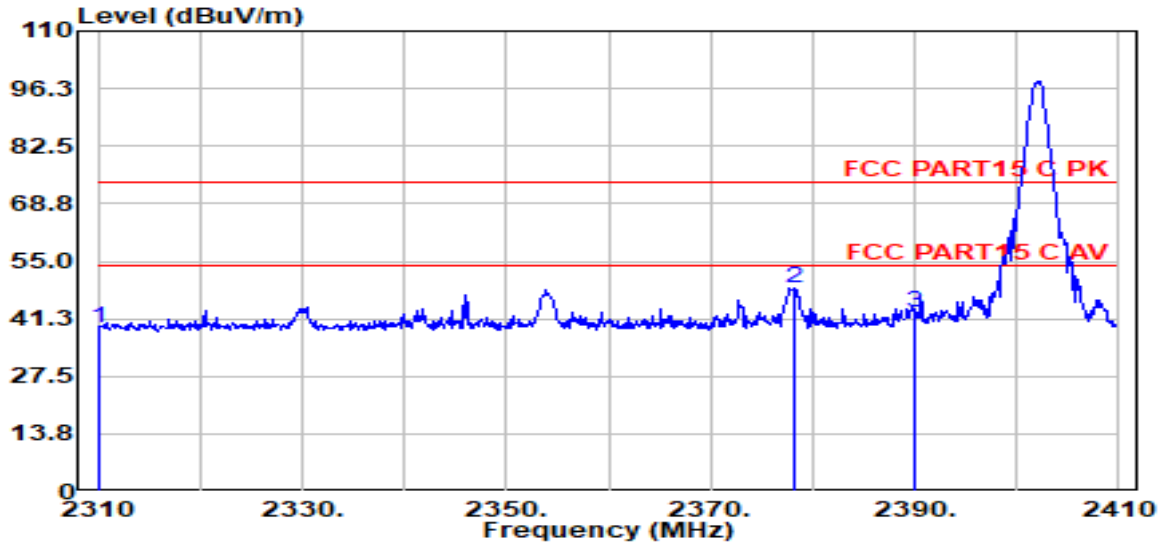

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 48.35 | 27.57 | 3.81 | 39.64 | 40.09 | 74.00 | -33.91 | Peak | Vertical |
| 2 | 2485.98 | 53.06 | 27.57 | 3.81 | 39.64 | 44.80 | 74.00 | -29.20 | Peak | Vertical |
| 3 | 2500.00 | 49.24 | 27.60 | 3.82 | 39.65 | 41.01 | 74.00 | -32.99 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00009.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : 3DH5 2402 | | |



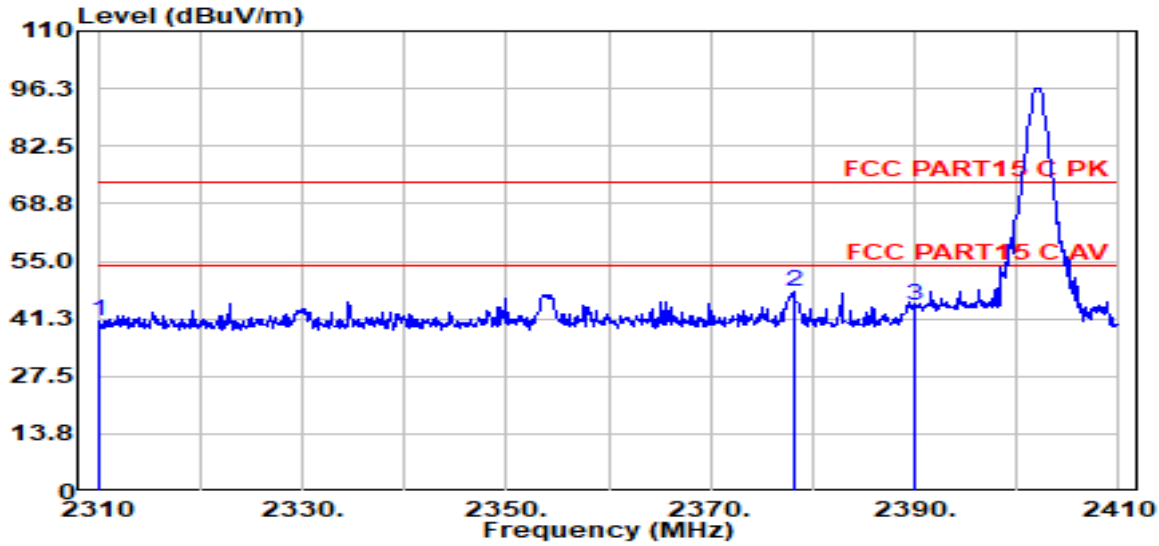

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.00 | 47.65 | 27.26 | 3.66 | 39.56 | 39.02 | 74.00 | -34.98 | Peak | Horizontal |
| 2 | 2378.20 | 57.25 | 27.38 | 3.72 | 39.59 | 48.76 | 74.00 | -25.24 | Peak | Horizontal |
| 3 | 2390.00 | 51.08 | 27.40 | 3.73 | 39.60 | 42.62 | 74.00 | -31.38 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00010.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : 3DH5 2402 | | |



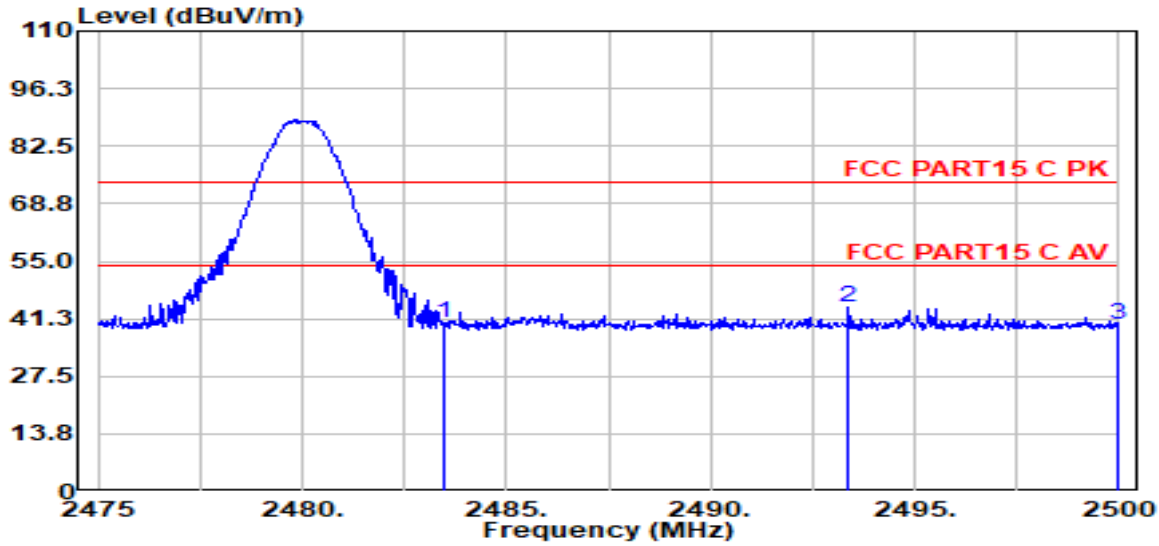

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2310.00 | 49.27 | 27.26 | 3.66 | 39.56 | 40.63 | 74.00 | -33.37 | Peak | Vertical |
| 2 | 2378.10 | 56.11 | 27.38 | 3.72 | 39.59 | 47.62 | 74.00 | -26.38 | Peak | Vertical |
| 3 | 2390.00 | 52.79 | 27.40 | 3.73 | 39.60 | 44.32 | 74.00 | -29.68 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00011.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Horizontal |
| **Memo** | : 3DH5 2480 | | |



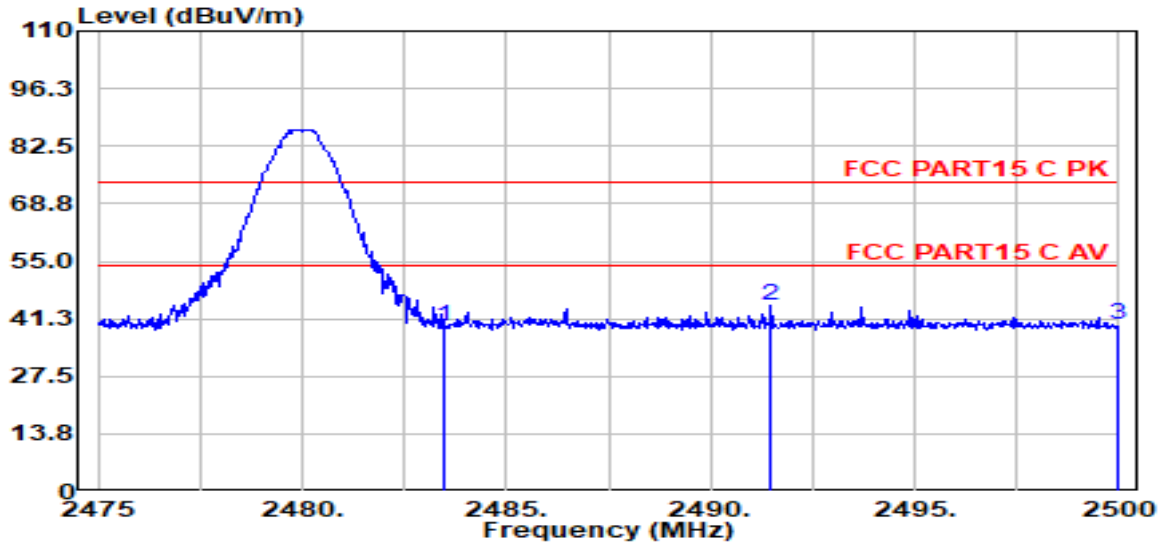

| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 48.54 | 27.57 | 3.81 | 39.64 | 40.28 | 74.00 | -33.72 | Peak | Horizontal |
| 2 | 2493.38 | 52.42 | 27.59 | 3.81 | 39.65 | 44.18 | 74.00 | -29.82 | Peak | Horizontal |
| 3 | 2500.00 | 48.17 | 27.60 | 3.82 | 39.65 | 39.94 | 74.00 | -34.06 | Peak | Horizontal |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# TR-4-E-009 Radiated Emission Test Result

| | | | |
|---|---|---|---|
| **Test Site** | : DDT 3m Chamber 3# | D:\2021 report data\Q21121405-2E\FCC ABOVE 1G MOTOR 1B\FCC ABOVE 1G_00012.EMI | |
| **Test Date** | : 2021-12-29 | **Tested By** | : James Gan |
| **EUT** | : RADIO CONTROL BOX M1B RETRO SOUND | **Model Number** | : MOTOR 1B |
| **Power Supply** | : DC 12V | **Test Mode** | : Tx Mode |
| **Condition** | : Temp:21.9°,Humi:47.1%,Press:100.3kPa | **Antenna/Distance** | : 2021 BBHA 9120D 3# NEW/3m/Vertical |
| **Memo** | : 3DH5 2480 | | |




| Item (Mark) | Freq. (MHz) | Read Level (dBµV) | Antenna Factor (dB/m) | Cable Loss dB | PRM Factor (dB) | Result Level (dBµV/m) | Limit Line (dBµV/m) | Over Limit (dB) | Detector | Polarization |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2483.50 | 47.61 | 27.57 | 3.81 | 39.64 | 39.35 | 74.00 | -34.65 | Peak | Vertical |
| 2 | 2491.48 | 52.59 | 27.58 | 3.81 | 39.65 | 44.34 | 74.00 | -29.66 | Peak | Vertical |
| 3 | 2500.00 | 47.91 | 27.60 | 3.82 | 39.65 | 39.68 | 74.00 | -34.32 | Peak | Vertical |

Note:

1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

# 13. Antenna Requirements

## 13.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 13.2. Result

There is no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain is 0 dBi.