# FCC PART 15.247
# TEST REPORT

For

# Zeeva International Limited

Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong

## FCC ID: 2ADM5-HP-0333

| Report Type: | Product Type: |
|---|---|
| Original Report | BT WIRELESS CHARGING HP AST |

| | |
|---|---|
| **Report Number:** | SZ3210315-06759E-00 |
| **Report Date:** | 2021-03-31 |
| **Reviewed By:** | Jimmy Xiao RF Engineer |
| **Prepared By:** | Bay Area Compliance Laboratories Corp. (Shenzhen)<br>5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China<br>Tel: +86-755-33320018<br>Fax: +86-755-33320008<br>www.baclcorp.com.cn |

**Note:** This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

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# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

| | |
|---|---|
| Product | BT WIRELESS CHARGING HP AST |
| Tested Model | HP-0333 |
| UPC | 1922343750086 |
| SKU | 3810047 |
| Frequency Range | Bluetooth: 2402-2480MHz |
| Maximum conducted Peak output power | Bluetooth: 0.52dBm |
| Modulation Technique | Bluetooth: GFSK, π/4-DQPSK, 8DPSK |
| Antenna Specification* | -0.68 dBi(It is provided by the applicant) |
| Voltage Range | DC3.7V from battery |
| Date of Test | 2021-03-19 to 2021-03-24 |
| Sample number | SZ3210315-06759E-RF –S1 (Assigned by BACL, Shenzhen) |
| Received date | 2021-03-15 |
| Sample/EUT Status | Good condition |

## Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209 and 15.247 rules.

## Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

For Radiated Emissions testing, please refer to DA 00-705 Released March 30, 2000, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## Measurement Uncertainty

| Parameter | | Uncertainty |
|---|---|---|
| Occupied Channel Bandwidth | | ±5% |
| RF Output Power with Power meter | | ±0.73dB |
| RF conducted test with spectrum | | ±1.6dB |
| AC Power Lines Conducted Emissions | | ±1.95dB |
| Emissions, Radiated | Below 1GHz | ±4.75dB |
| | Above 1GHz | ±4.88dB |
| Temperature | | ±1℃ |
| Humidity | | ±6% |
| Supply voltages | | ±0.4% |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in an engineering mode.

## EUT Exercise Software

"FCC_assist_1.0.2.2"* software was used to the EUT tested and power level is default which was provided by the applicant.

## Special Accessories

No special accessory.

## Equipment Modifications

No modification was made to the EUT tested.

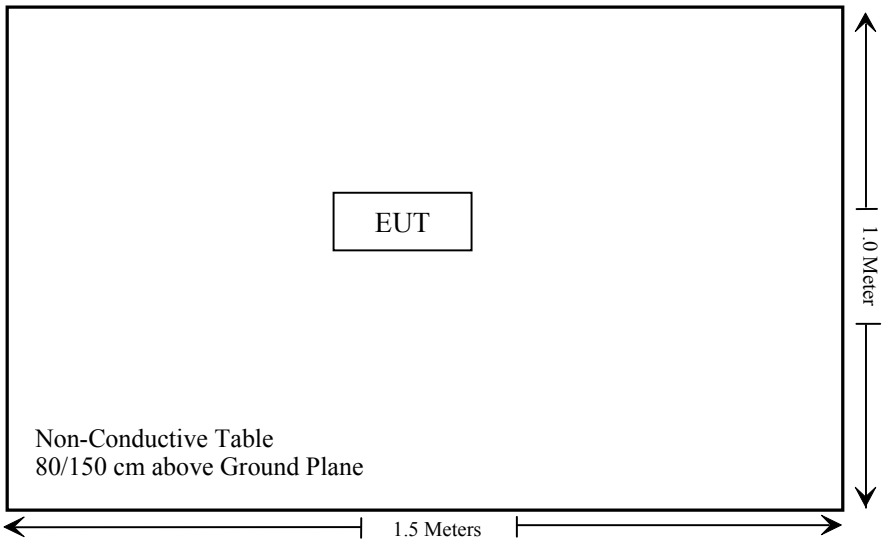
## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| / | / | / | / |

## External I/O Cable

| Cable Description | Length (m) | From Port | To |
|---|---|---|---|
| / | / | / | / |

**Block Diagram of Test Setup**



# SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Result |
|---|---|---|
| §15.247 (i), §1.1307 (b) (1)& §2.1093 | RF Exposure | Compliance |
| §15.203 | Antenna Requirement | Compliance |
| §15.207(a) | AC Line Conducted Emissions | Not Applicable |
| §15.205, §15.209 & §15.247(d) | Radiated Emissions | Compliance |
| §15.247(a)(1) | 20 dB Emission Bandwidth | Compliance |
| §15.247(a)(1) | Channel Separation Test | Compliance |
| §15.247(a)(1)(iii) | Time of Occupancy (Dwell Time) | Compliance |
| §15.247(a)(1)(iii) | Quantity of hopping channel Test | Compliance |
| §15.247(b)(1) | Peak Output Power Measurement | Compliance |
| §15.247(d) | Band edges | Compliance |

Not Applicable: It is powered by the battery when normal operation.

# TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| **Radiated Emission Test** | | | | | |
| R&S | EMI Test Receiver | ESR3 | 102455 | 2020/08/04 | 2021/08/03 |
| Sonoma instrument | Pre-amplifier | 310 N | 186238 | 2020/08/04 | 2021/08/03 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-2 | 2020/12/22 | 2023/12/21 |
| Unknown | Cable 2 | RF Cable 2 | F-03-EM197 | 2020/11/29 | 2021/11/28 |
| Unknown | Cable | Chamber Cable 1 | F-03-EM236 | 2020/11/29 | 2021/11/28 |
| Rohde & Schwarz | Auto test software | EMC 32 | V9.10 | NCR | NCR |
| Rohde & Schwarz | Spectrum Analyzer | FSV40-N | 102259 | 2020/08/04 | 2021/08/03 |
| COM-POWER | Pre-amplifier | PA-122 | 181919 | 2020/11/29 | 2021/11/28 |
| Quinstar | Amplifier | QLW-18405536-J0 | 15964001002 | 2020/11/29 | 2021/11/28 |
| Sunol Sciences | Horn Antenna | 3115 | 9107-3694 | 2021/01/15 | 2024/01/14 |
| Insulted Wire Inc. | RF Cable | SPS-2503-3150 | 02222010 | 2020/11/29 | 2021/11/28 |
| Unknown | RF Cable | W1101-EQ1 OUT | F-19-EM005 | 2020/11/29 | 2021/11/28 |
| SNSD | Band Reject filter | BSF2402-2480MN-0898-001 | 2.4G filter | 2020/04/20 | 2021/04/20 |
| Ducommun Technolagies | Horn antenna | ARH-4223-02 | 1007726-02 1304 | 2020/12/06 | 2023/12/05 |
| **RF Conducted Test** | | | | | |
| Rohde & Schwarz | Signal and Spectrum Analyzer | FSV40 | 101473 | 2020/08/04 | 2021/08/03 |
| Tonscend Corporation | RF control Unit | JS0806-2 | 19D8060154 | 2020/08/04 | 2021/08/03 |
| Unknown | RF Cable | Unknown | 2301 276 | 2020/11/29 | 2021/11/28 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# FCC§15.247 (i), §1.1307 (b) (1) &§2.1093 – RF EXPOSURE

## Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

**For worst case:**

| Frequency (MHz) | Maximum Tune-up power | | Calculated Distance (mm) | Calculated Value | Threshold (1-g SAR) | SAR Test Exclusion |
|---|---|---|---|---|---|---|
| | (dBm) | (mW) | | | | |
| 2402-2480 | 1.0 | 1.26 | 5 | 0.4 | 3.0 | **Yes** |

**Result: No Standalone SAR test is required**

# FCC §15.203 – ANTENNA REQUIREMENT

## Applicable Standard

According to FCC § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

## Antenna Connector Construction

The EUT has an internal PCB antenna arrangement, which was permanently attached and the antenna gain is -0.68 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

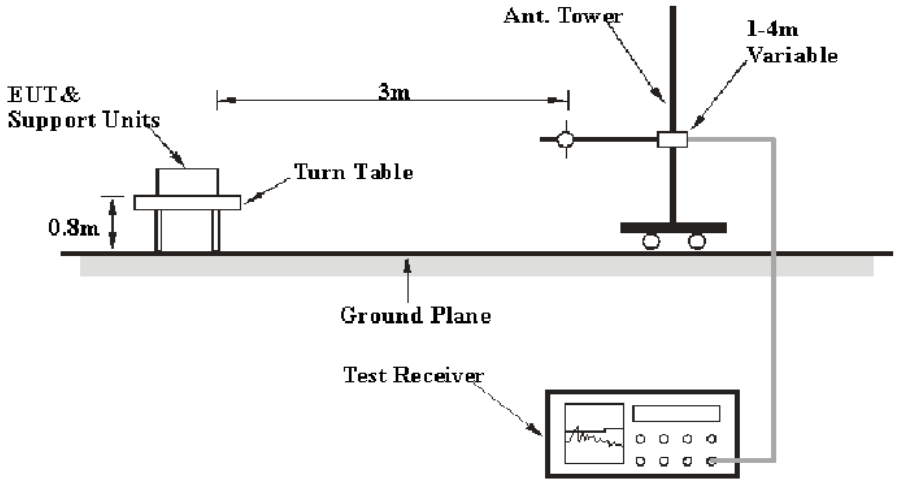
# FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

## Applicable Standard

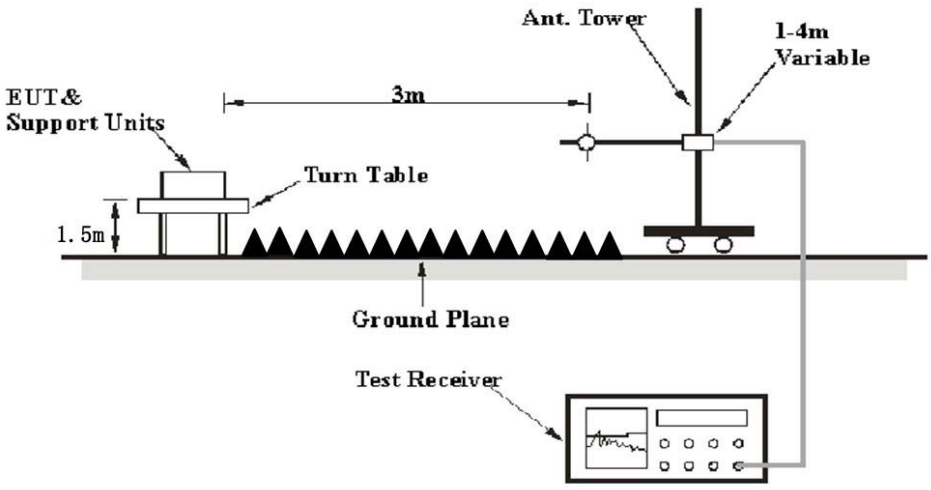
FCC §15.205; §15.209; §15.247(d)

## EUT Setup

**Below 1 GHz:**




**Above 1GHz:**




The radiated emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

## EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, according to the DA 00-705 Released March 30, 2000, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Measurement |
|---|---|---|---|---|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz | 120 kHz | QP |
| Above 1 GHz | 1 MHz | 3 MHz | / | PK |
| | 1 MHz | 10 Hz | / | Average |

## Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

## Test Data

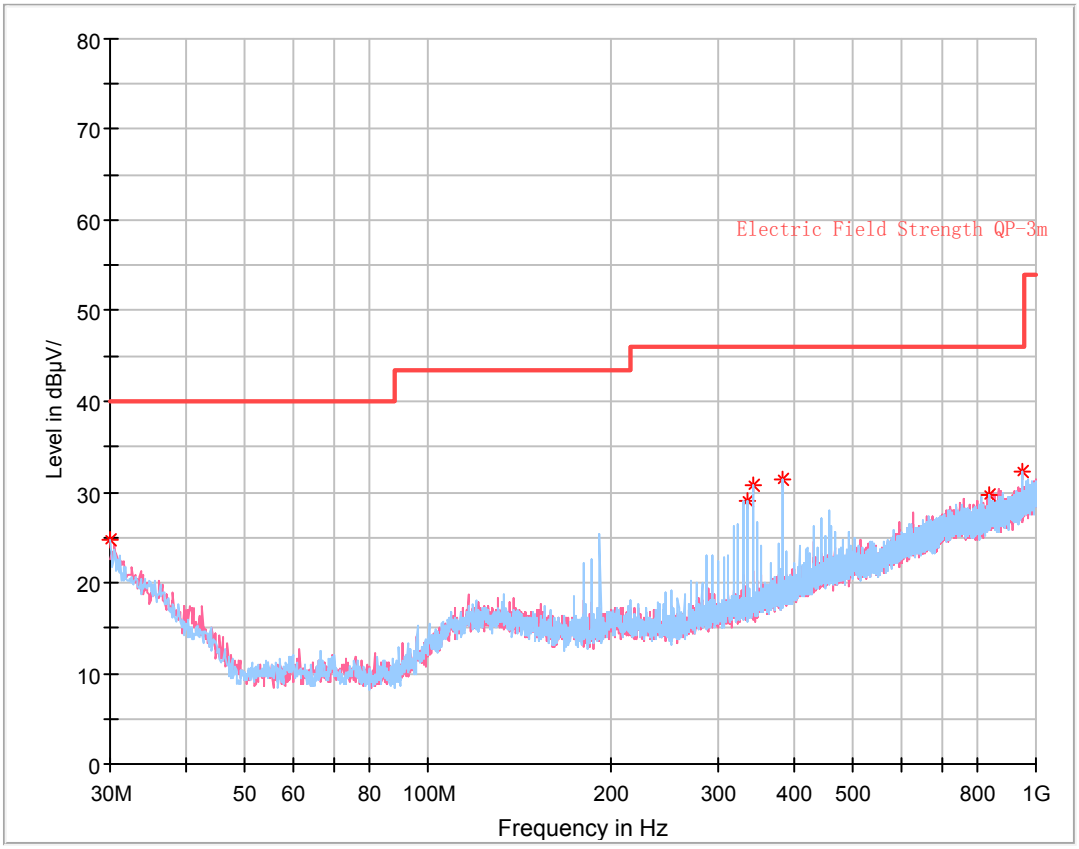
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24~24.8℃ |
| **Relative Humidity:** | 51~54% |
| **ATM Pressure:** | 101.1~101.2 kPa |

*The testing was performed by Kilroy on 2021-03-19 for below 1GHz and Alan He on 2021-03-24 for above 1GHz.*

*EUT operation mode: Transmitting*

**30 MHz~1 GHz:** *(the worst case is 8DPSK Mode, Low channel)*




## Critical_Freqs

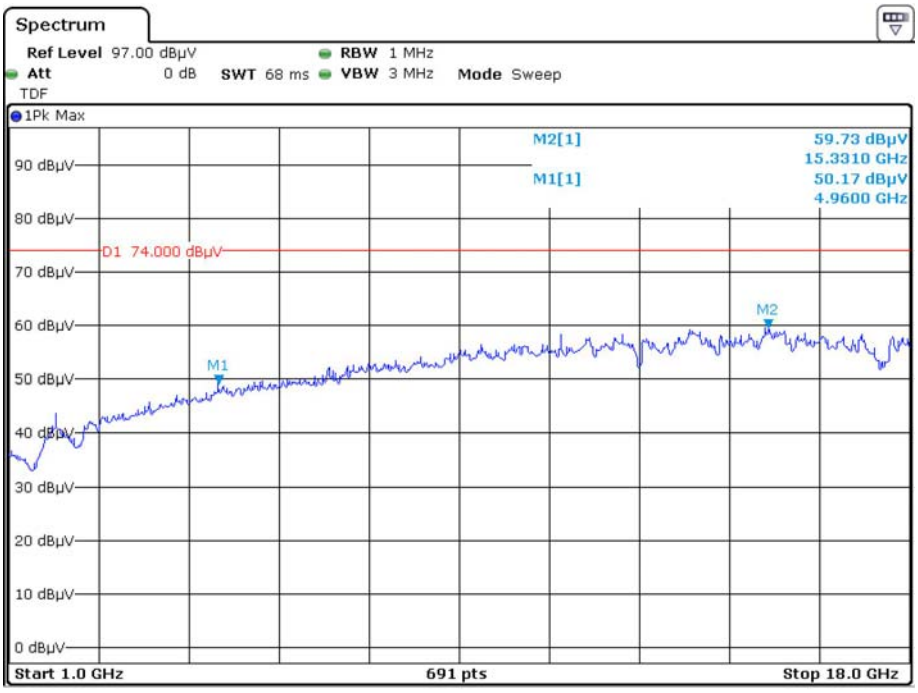
| Frequency (MHz) | MaxPeak (dB µ | Limit (dB µ | Margin (dB) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|---|---|---|---|---|---|---|---|
| 30.000000 | 24.63 | 40.00 | 15.37 | 100.0 | H | 326.0 | -3.5 |
| 335.913750 | 29.03 | 46.00 | 16.97 | 100.0 | H | 274.0 | -9.2 |
| 341.976250 | 30.82 | 46.00 | 15.18 | 100.0 | H | 274.0 | -9.0 |
| 383.928750 | 31.41 | 46.00 | 14.59 | 100.0 | H | 274.0 | -7.8 |
| 835.342500 | 29.72 | 46.00 | 16.28 | 200.0 | H | 95.0 | 0.0 |
| 947.741250 | 32.23 | 46.00 | 13.77 | 100.0 | H | 91.0 | 1.6 |

**1 GHz - 25 GHz:** (*Scan with GFSK, π/4-DQPSK, 8DPSK mode, the worst case is 8DPSK Mode*)

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| | Reading (dBμV) | PK/QP/Ave. | | Height (m) | Polar (H/V) | | | | |
| Low Channel (2402 MHz) | | | | | | | | | |
| 2372.00 | 28.28 | PK | 209 | 1.2 | H | 31.87 | 60.15 | 74 | 13.85 |
| 2372.00 | 13.53 | Ave. | 209 | 1.2 | H | 31.87 | 45.40 | 54 | 8.60 |
| 2497.93 | 28.61 | PK | 24 | 1.4 | H | 32.13 | 60.74 | 74 | 13.26 |
| 2497.93 | 13.64 | Ave. | 24 | 1.4 | H | 32.13 | 45.77 | 54 | 8.23 |
| 4804.00 | 48.20 | PK | 58 | 1.5 | H | 6.28 | 54.48 | 74 | 19.52 |
| 4804.00 | 40.02 | Ave. | 58 | 1.5 | H | 6.28 | 46.30 | 54 | 7.70 |
| Middle Channel (2441 MHz) | | | | | | | | | |
| 4882.00 | 47.83 | PK | 84 | 2.1 | H | 6.76 | 54.59 | 74 | 19.41 |
| 4882.00 | 39.65 | Ave. | 84 | 2.1 | H | 6.76 | 46.41 | 54 | 7.59 |
| High Channel (2480 MHz) | | | | | | | | | |
| 2352.66 | 28.66 | PK | 216 | 1.3 | H | 31.77 | 60.43 | 74 | 13.57 |
| 2352.66 | 13.53 | Ave. | 216 | 1.3 | H | 31.77 | 45.30 | 54 | 8.70 |
| 2487.25 | 31.82 | PK | 148 | 1.3 | H | 32.13 | 63.95 | 74 | 10.05 |
| 2487.25 | 14.39 | Ave. | 148 | 1.3 | H | 32.13 | 46.52 | 54 | 7.48 |
| 4960.00 | 47.91 | PK | 235 | 1.4 | H | 6.80 | 54.71 | 74 | 19.29 |
| 4960.00 | 39.79 | Ave. | 235 | 1.4 | H | 6.80 | 46.59 | 54 | 7.41 |

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.

**Pre-scan with High channel Peak**
**Horizontal**

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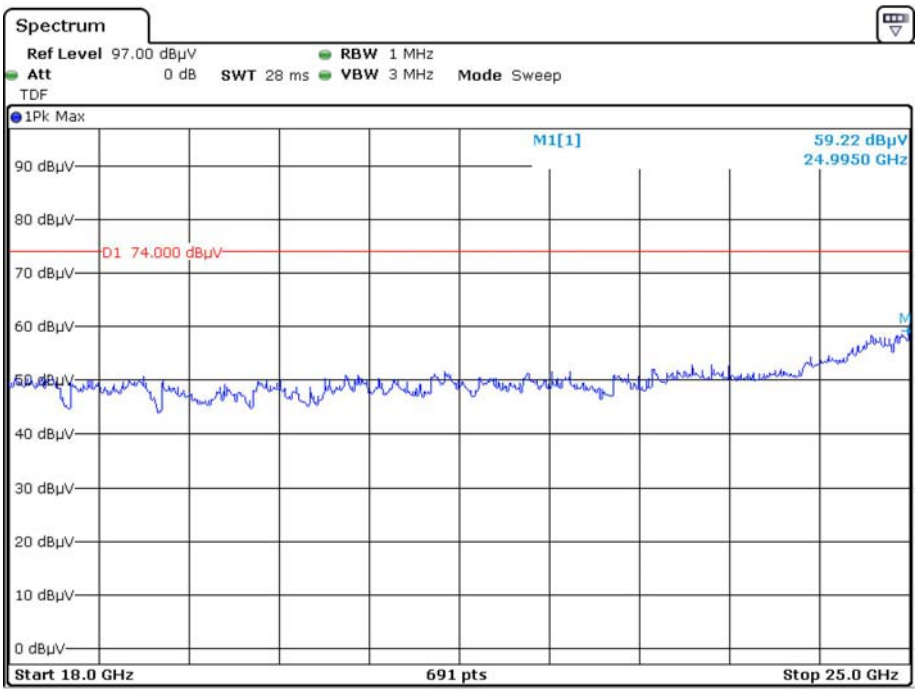


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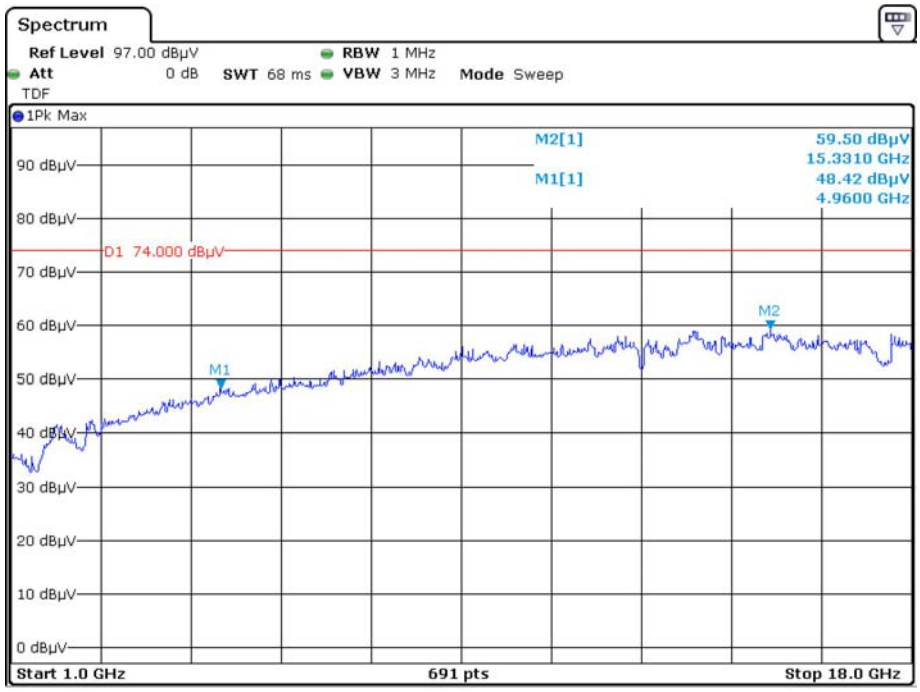
**Vertical**

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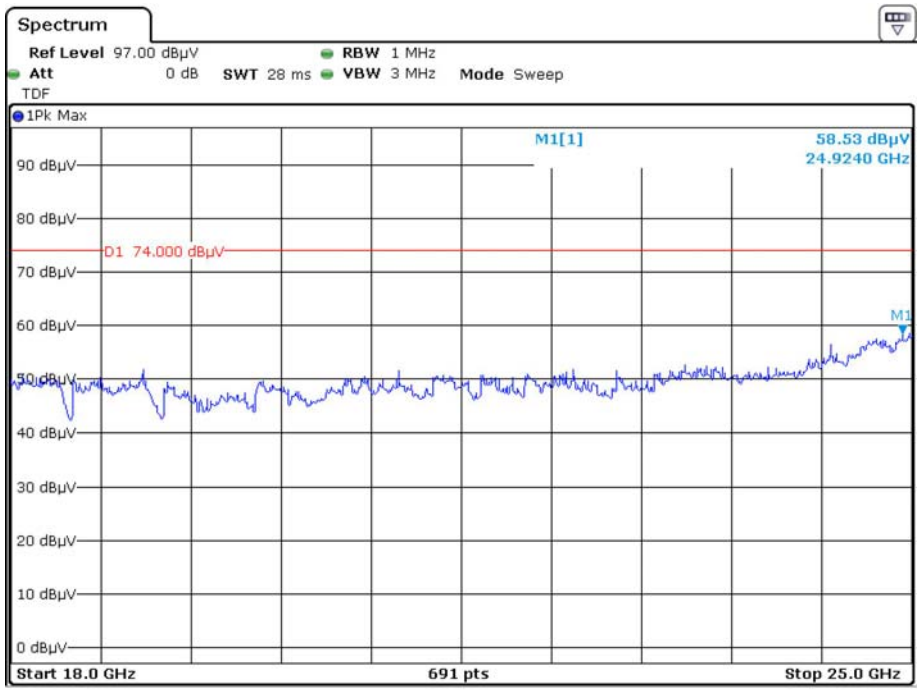


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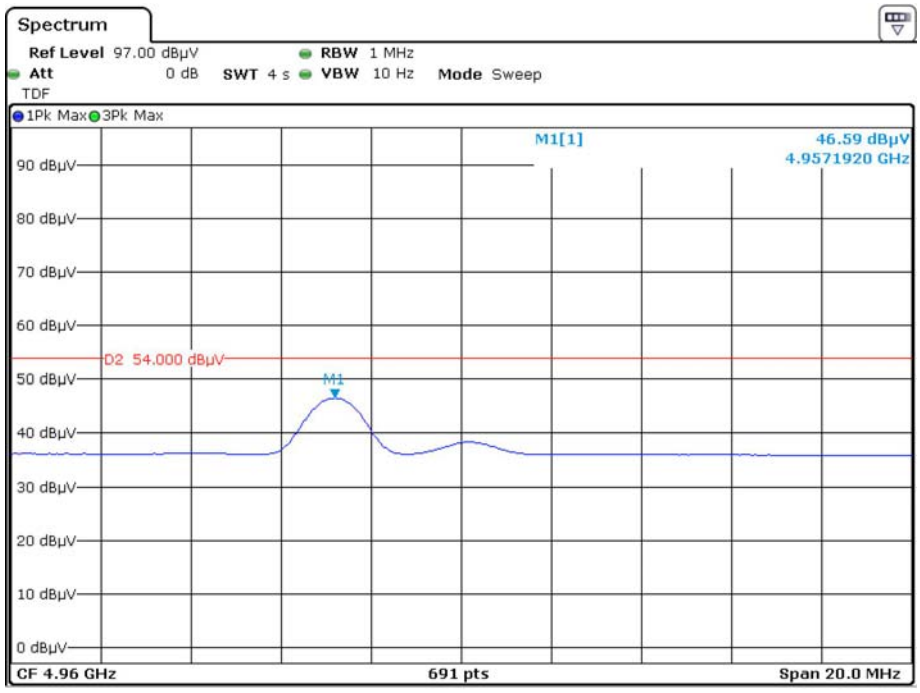
**Average**
**Horizontal**

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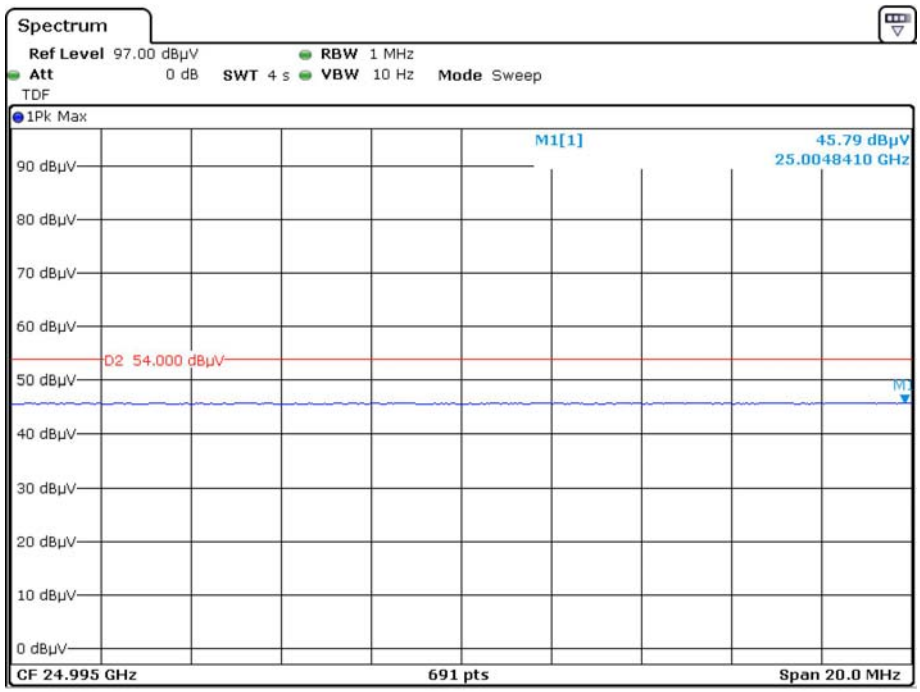
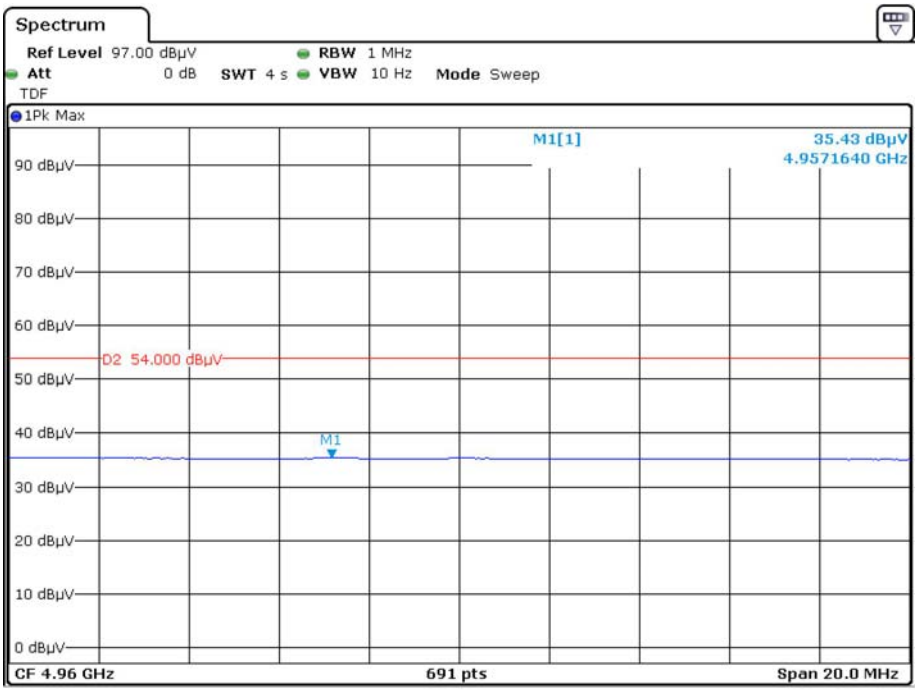



Date: 24.MAR.2021 10:15:14

**Vertical**

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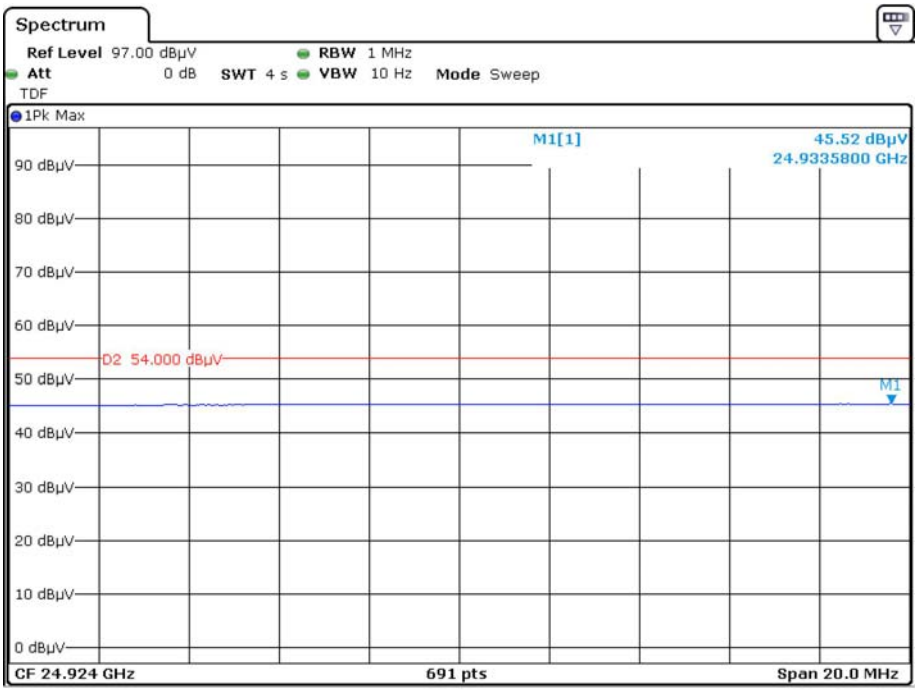



Date: 24.MAR.2021 10:05:55

# FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

## Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

## Test Procedure

1. Set the EUT in transmitting mode, maxhold the channel.
2. Set the adjacent channel of the EUT and maxhold another trace.
3. Measure the channel separation.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bravo Zhao on 2021-03-23.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

## Applicable Standard

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.

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bravo Zhao on 2021-03-23.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

## Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bravo Zhao on 2021-03-23.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

## Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

## Test Procedure

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bravo Zhao on 2021-03-23.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

## Applicable Standard

According to §15.247(b) (1), 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. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

## Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bravo Zhao on 2021-03-23.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# FCC §15.247(d) - BAND EDGES TESTING

## Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

## Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 24 ℃ |
| **Relative Humidity:** | 56 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Bravo Zhao on 2021-03-23.*

*EUT operation mode: Transmitting*

Test Result: Compliant. Please refer to the Appendix.

# APPENDIX

## AppendixA: 20 dB Emission Bandwidth

### Test Result

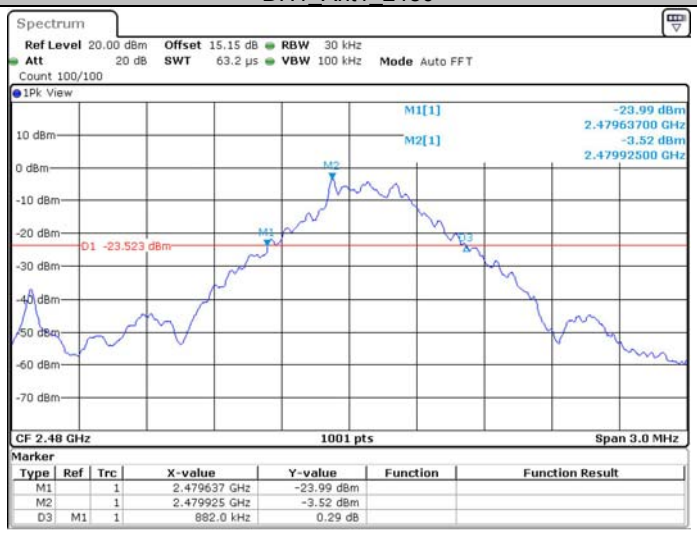
| TestMode | Antenna | Channel | 20dB EBW[MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| DH1 | Ant1 | 2402 | 0.882 | --- | PASS |
| | | 2441 | 0.882 | --- | PASS |
| | | 2480 | 0.882 | --- | PASS |
| 2DH1 | Ant1 | 2402 | 1.251 | --- | PASS |
| | | 2441 | 1.254 | --- | PASS |
| | | 2480 | 1.248 | --- | PASS |
| 3DH1 | Ant1 | 2402 | 1.218 | --- | PASS |
| | | 2441 | 1.215 | --- | PASS |
| | | 2480 | 1.218 | --- | PASS |

## Test Graphs

DH1_Ant1_2402

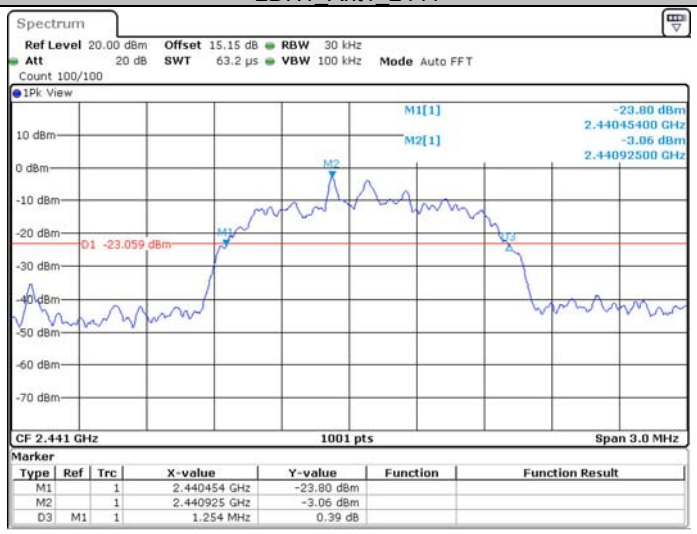

DH1_Ant1_2441

DH1_Ant1_2480




2DH1_Ant1_2402

2DH1_Ant1_2441




2DH1_Ant1_2480

3DH1_Ant1_2402


3DH1_Ant1_2441

3DH1_Ant1_2480

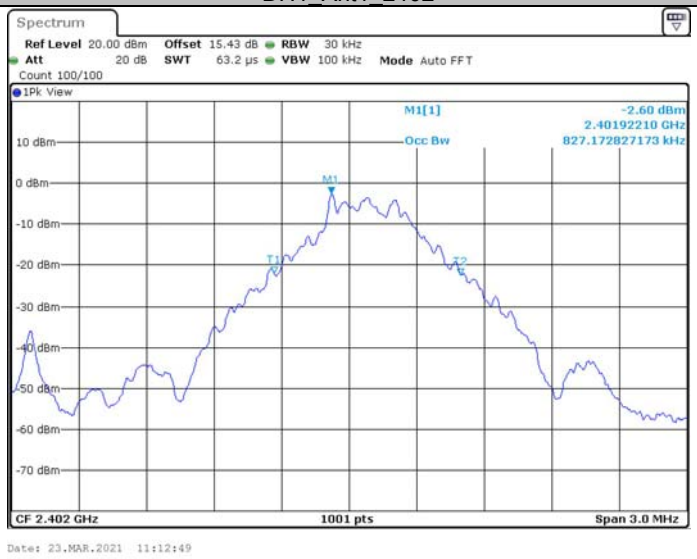
# AppendixB: Occupied Channel Bandwidth

## Test Result

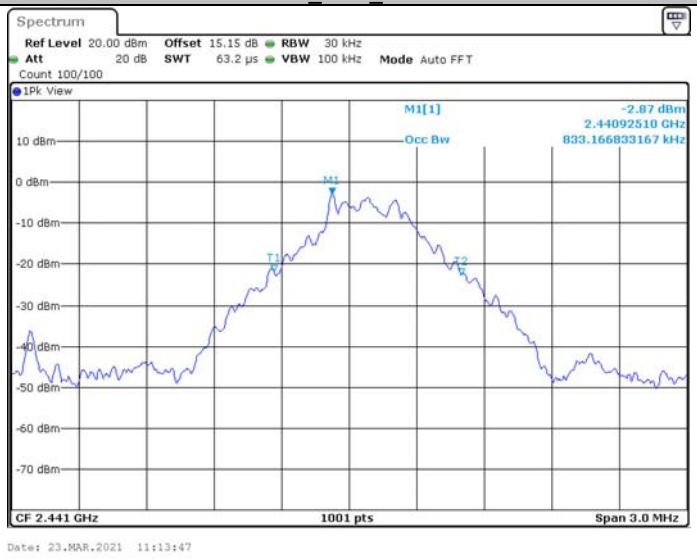
| TestMode | Antenna | Channel | OCB [MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| DH1 | Ant1 | 2402 | 0.827 | --- | PASS |
| | | 2441 | 0.833 | --- | PASS |
| | | 2480 | 0.827 | --- | PASS |
| 2DH1 | Ant1 | 2402 | 1.166 | --- | PASS |
| | | 2441 | 1.172 | --- | PASS |
| | | 2480 | 1.169 | --- | PASS |
| 3DH1 | Ant1 | 2402 | 1.157 | --- | PASS |
| | | 2441 | 1.160 | --- | PASS |
| | | 2480 | 1.157 | --- | PASS |

## Test Graphs

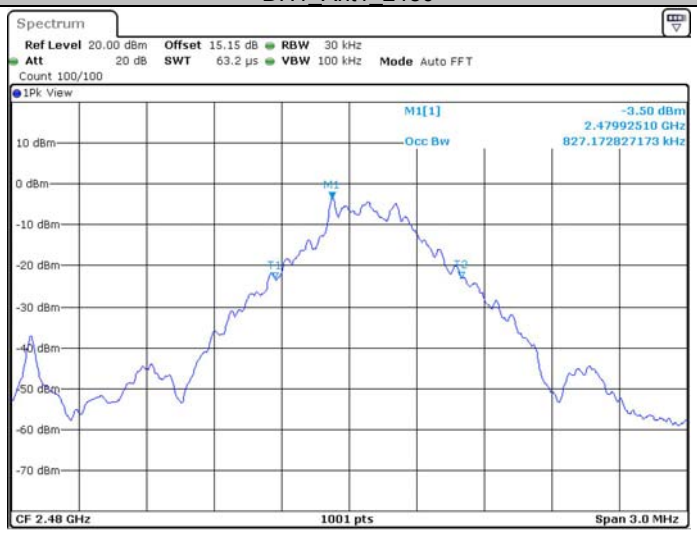
DH1_Ant1_2402



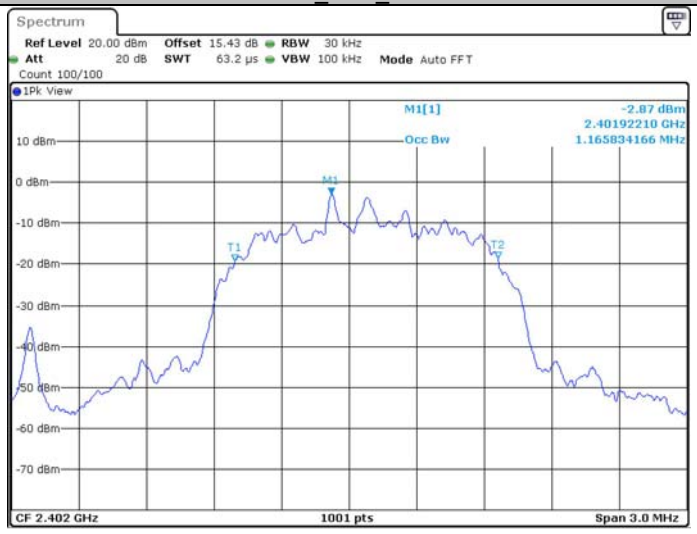

DH1_Ant1_2441



DH1_Ant1_2480



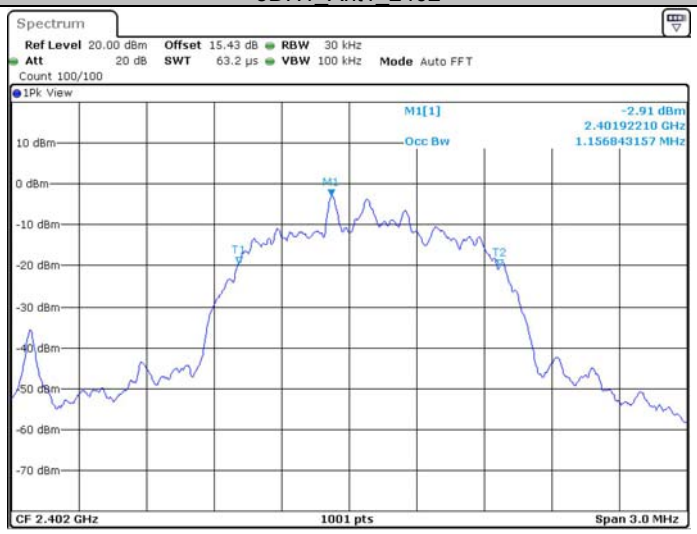

2DH1_Ant1_2402



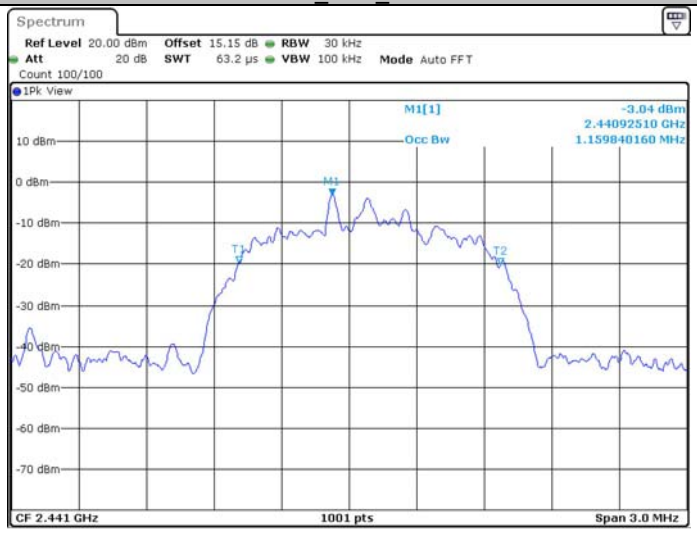
2DH1_Ant1_2441


2DH1_Ant1_2480

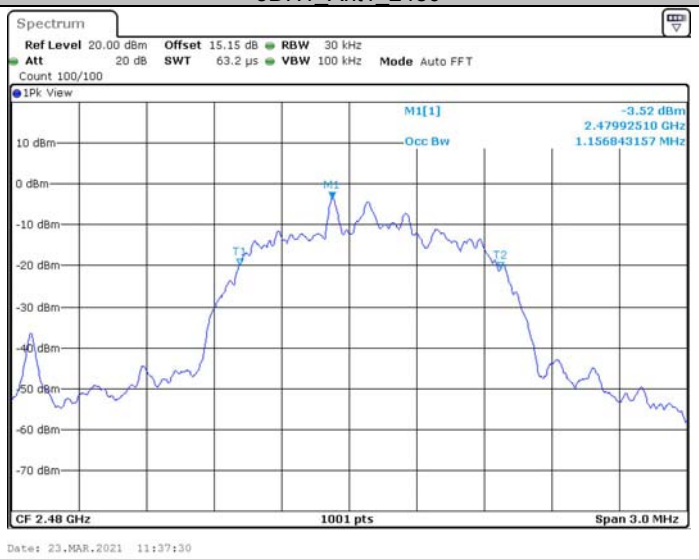
3DH1_Ant1_2402




3DH1_Ant1_2441



3DH1_Ant1_2480



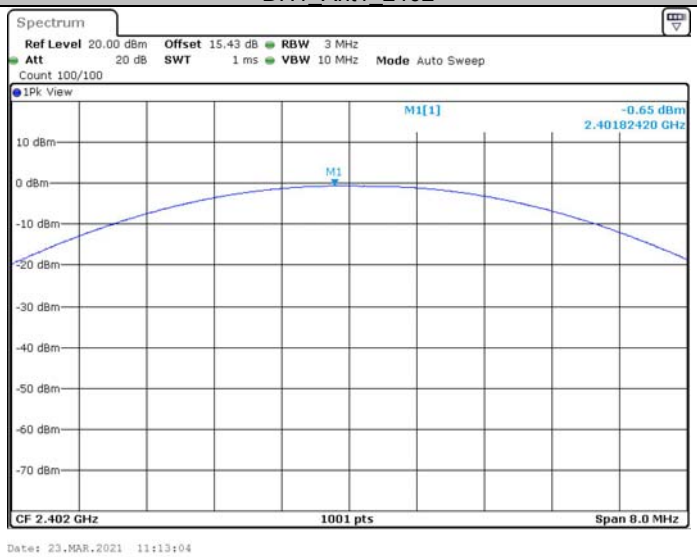
## AppendixC: Maximum conducted Peak output power

### Test Result

| TestMode | Antenna | Channel | Result[dBm] | Limit[dBm] | Verdict |
|---|---|---|---|---|---|
| DH1 | Ant1 | 2402 | -0.65 | <=20.97 | PASS |
| | | 2441 | -0.68 | <=20.97 | PASS |
| | | 2480 | -1.48 | <=20.97 | PASS |
| 2DH1 | Ant1 | 2402 | -0.05 | <=20.97 | PASS |
| | | 2441 | -0.08 | <=20.97 | PASS |
| | | 2480 | -0.64 | <=20.97 | PASS |
| 3DH1 | Ant1 | 2402 | 0.52 | <=20.97 | PASS |
| | | 2441 | 0.48 | <=20.97 | PASS |
| | | 2480 | -0.11 | <=20.97 | PASS |

## Test Graphs

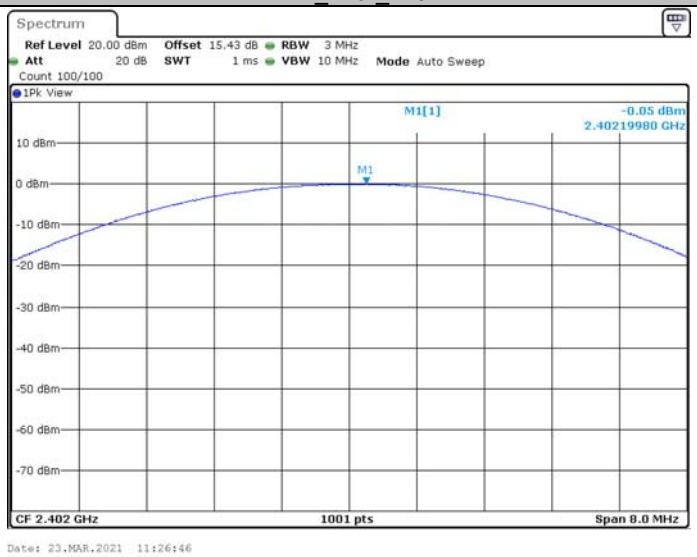
DH1_Ant1_2402



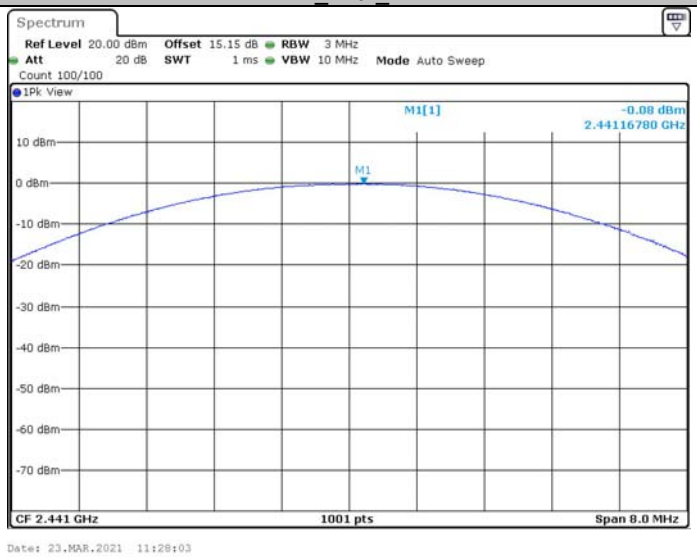

DH1_Ant1_2441

DH1_Ant1_2480

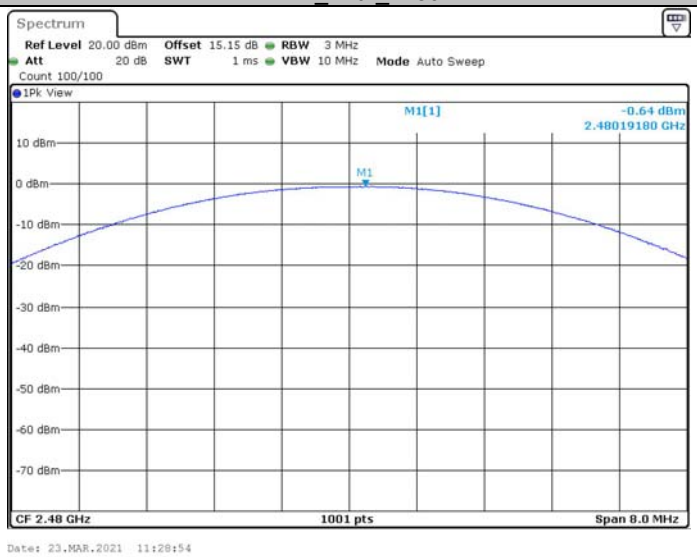

2DH1_Ant1_2402

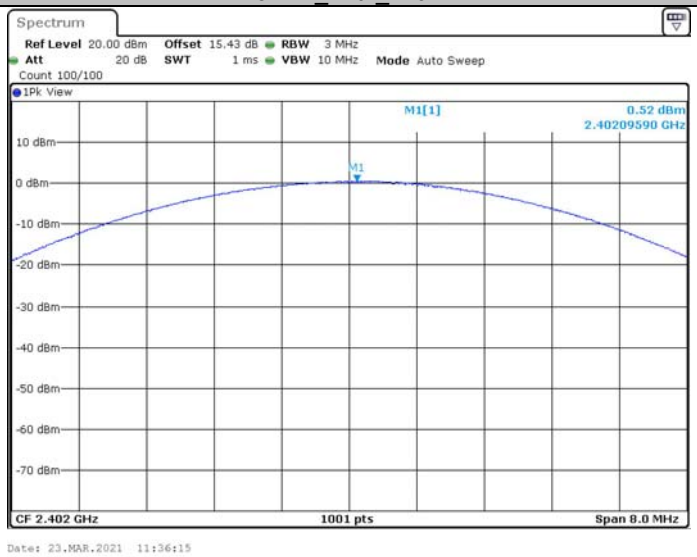


2DH1_Ant1_2441

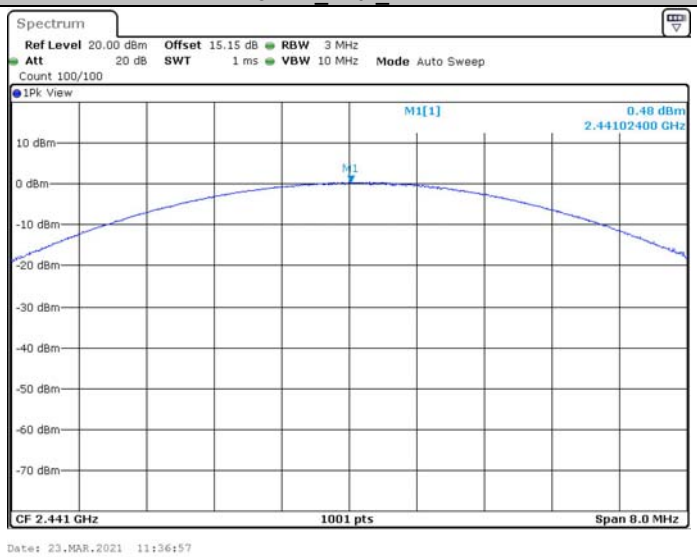



2DH1_Ant1_2480

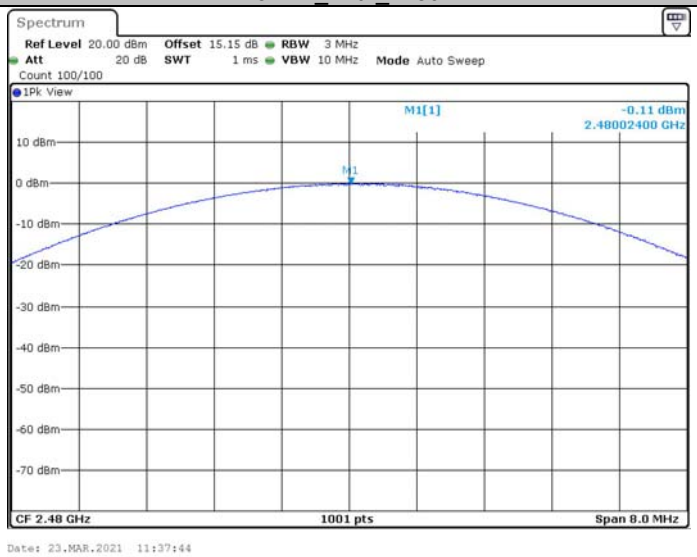


| 3DH1_Ant1_2402 |
| --- |
|  |



| 3DH1_Ant1_2441 |
| --- |
|  |

3DH1_Ant1_2480



## AppendixD: Carrier frequency separation

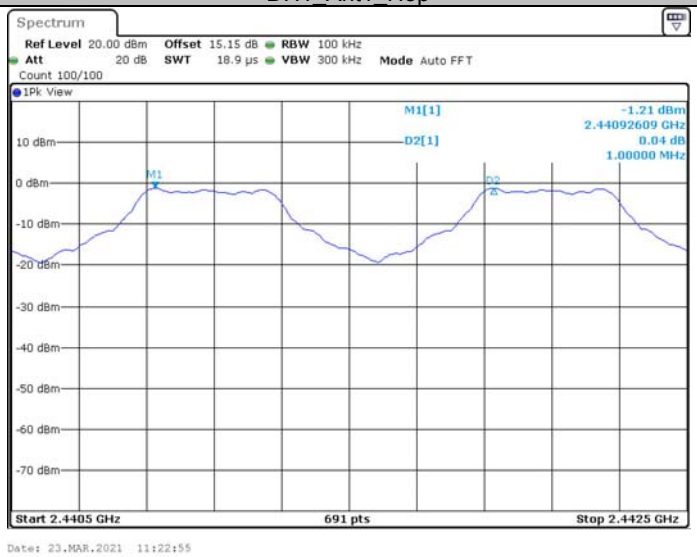
### Test Result

| TestMode | Antenna | Channel | Result[MHz] | Limit[MHz] | Verdict |
|---|---|---|---|---|---|
| DH1 | Ant1 | Hop | 1.000 | >=0.588 | PASS |
| 2DH1 | Ant1 | Hop | 1.000 | >=0.836 | PASS |
| 3DH1 | Ant1 | Hop | 1.003 | >=0.810 | PASS |

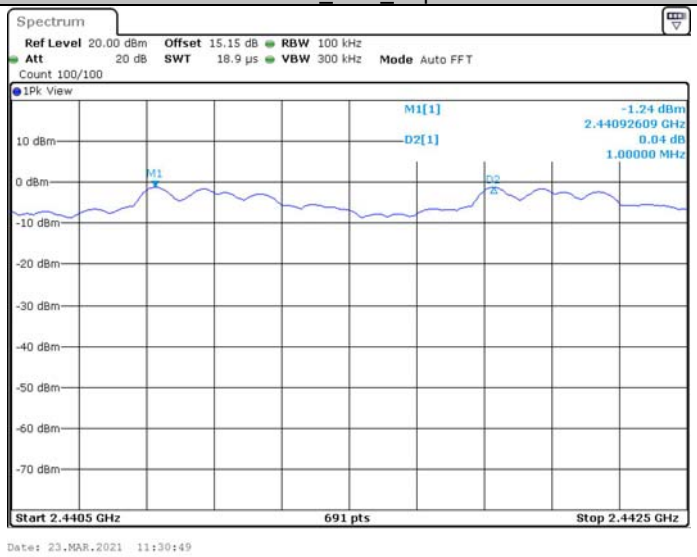
Note: the limit = (2/3) * 20dB bandwidth

## Test Graphs

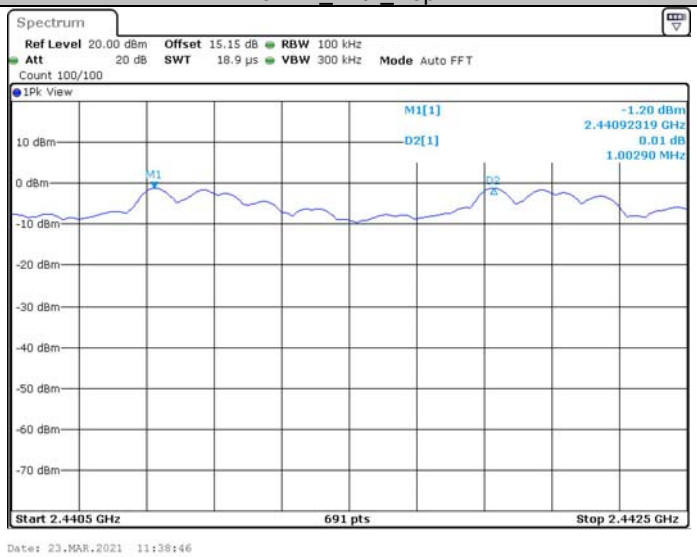
DH1_Ant1_Hop




2DH1_Ant1_Hop



3DH1_Ant1_Hop



## AppendixE: Time of occupancy

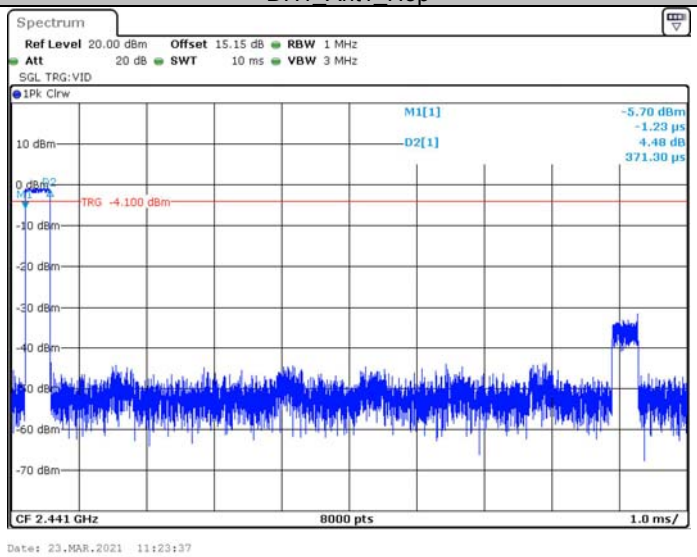
### Test Result

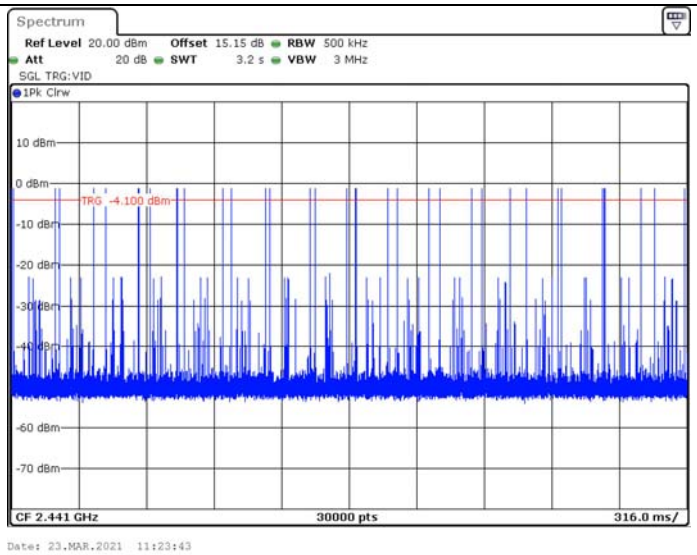
| Test Mode | Antenna | Channel | BurstWidth [ms] | TotalHops [Num] | Result[s] | Limit[s] | Verdict |
|---|---|---|---|---|---|---|---|
| DH1 | Ant1 | Hop | 0.37 | 330 | 0.123 | <=0.4 | PASS |
| DH3 | Ant1 | Hop | 1.62 | 130 | 0.211 | <=0.4 | PASS |
| DH5 | Ant1 | Hop | 2.86 | 110 | 0.315 | <=0.4 | PASS |
| 2DH1 | Ant1 | Hop | 0.38 | 330 | 0.126 | <=0.4 | PASS |
| 2DH3 | Ant1 | Hop | 1.63 | 150 | 0.244 | <=0.4 | PASS |
| 2DH5 | Ant1 | Hop | 2.87 | 100 | 0.287 | <=0.4 | PASS |
| 3DH1 | Ant1 | Hop | 0.38 | 320 | 0.122 | <=0.4 | PASS |
| 3DH3 | Ant1 | Hop | 1.63 | 130 | 0.211 | <=0.4 | PASS |
| 3DH5 | Ant1 | Hop | 2.87 | 120 | 0.344 | <=0.4 | PASS |

Note 1：A period time=0.4*79=31.6(S), Result=BurstWidth*Totalhops
Note 2: Totalhops=Hopping Number in 3.16s*10
Note 3: Hopping Number in 3.16s=Total of highest signals in 3.16s (Second high signals were other channel)

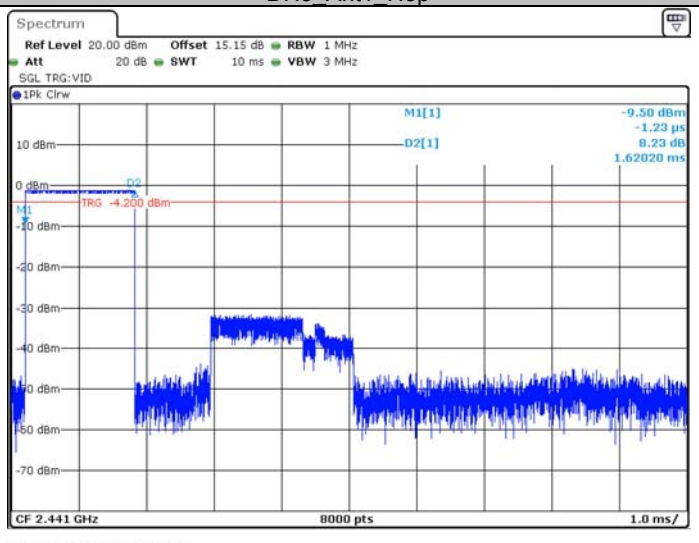
## Test Graphs

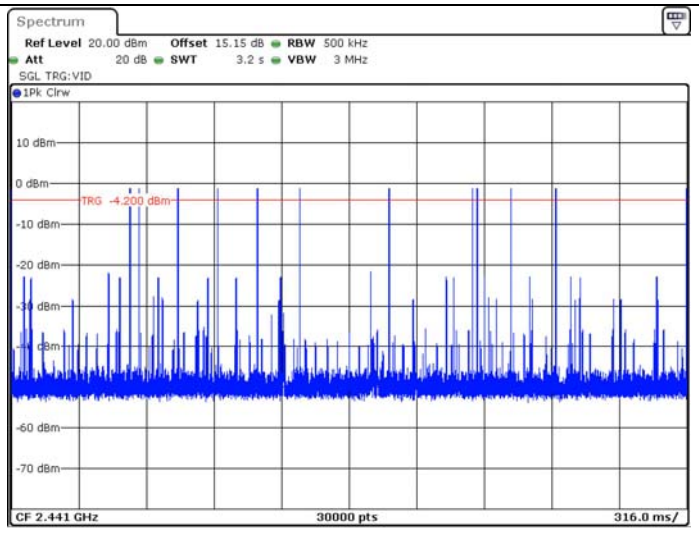
DH1_Ant1_Hop



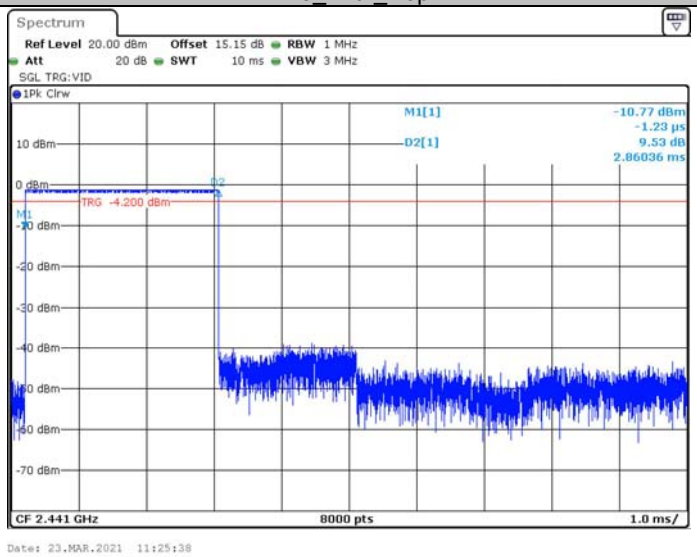



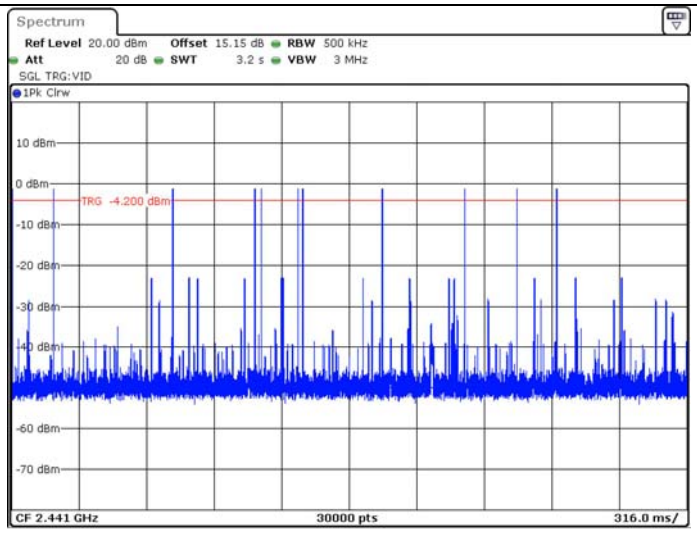
DH3_Ant1_Hop

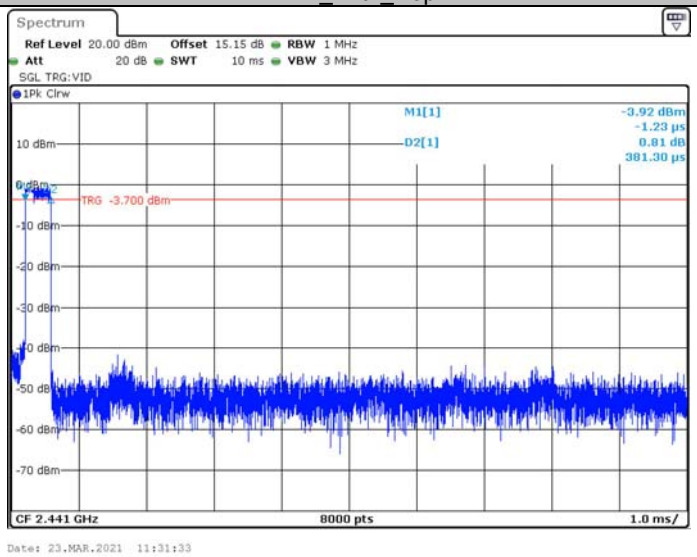
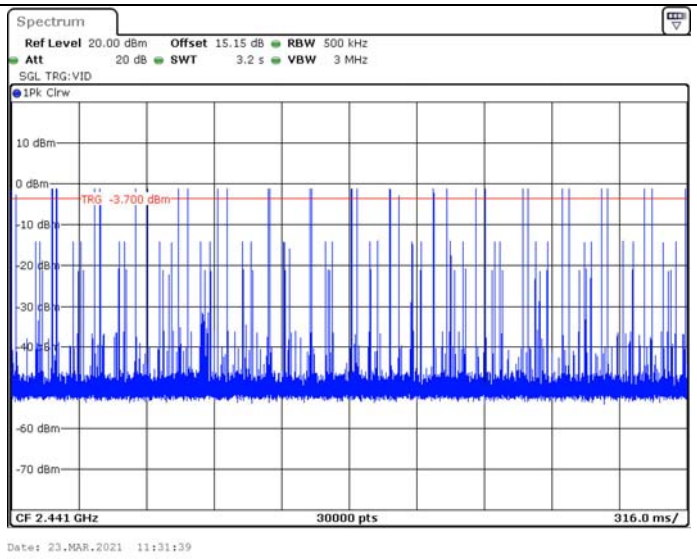

Spectrum
Ref Level 20.00 dBm Offset 15.15 dB RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
SGL TRG:VID
1Pk Clrw
M1[1] -9.50 dBm
-1.23 µs
D2[1] 8.23 dB
1.62020 ms
10 dBm
0 dBm
TRG -4.200 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
CF 2.441 GHz
8000 pts
1.0 ms/
Date: 23.MAR.2021 11:25:01

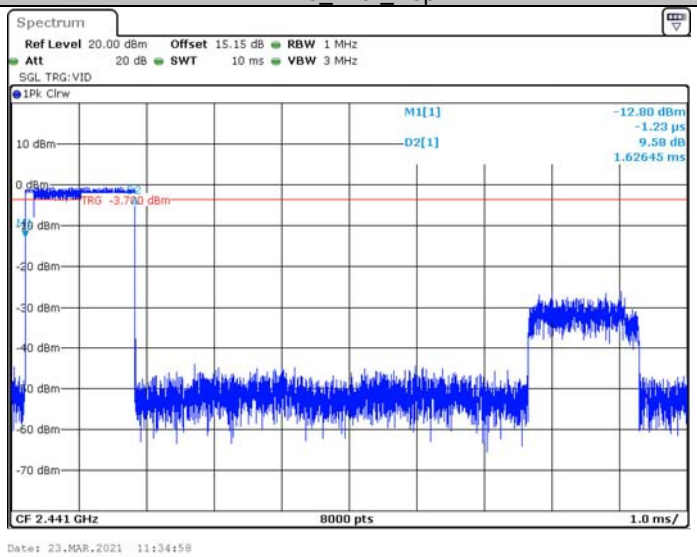
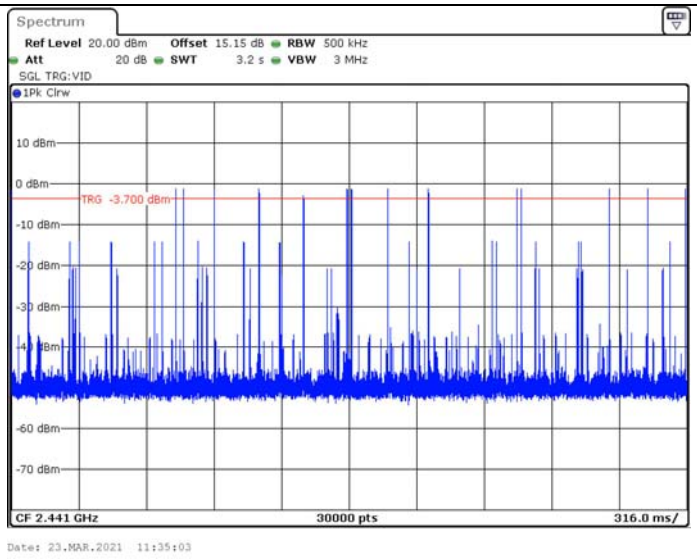

Spectrum
Ref Level 20.00 dBm Offset 15.15 dB RBW 500 kHz
Att 20 dB SWT 3.2 s VBW 3 MHz
SGL TRG:VID
1Pk Clrw
10 dBm
0 dBm
TRG -4.200 dBm
-10 dBm
-20 dBm
-60 dBm
-70 dBm
CF 2.441 GHz
30000 pts
316.0 ms/
Date: 23.MAR.2021 11:25:06

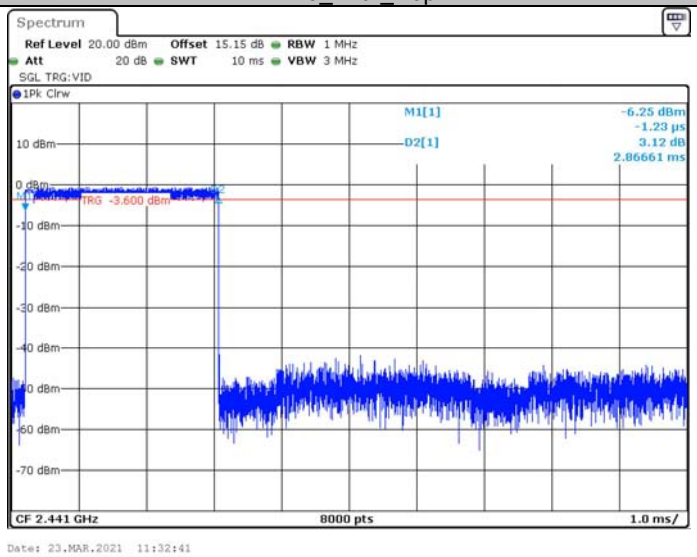
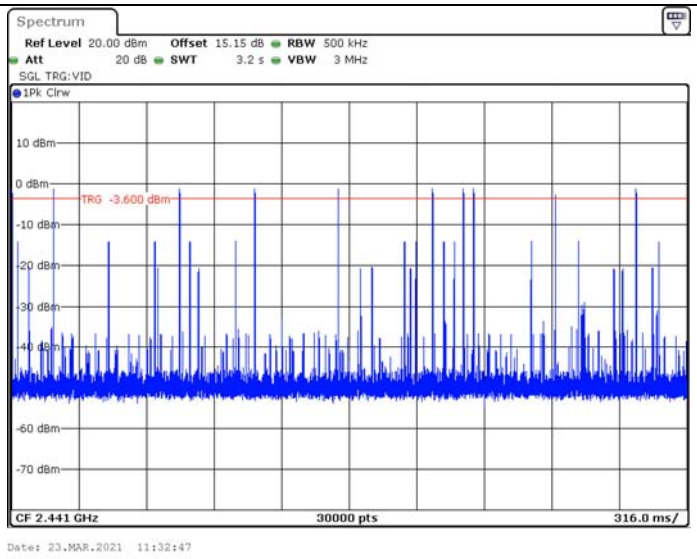
DH5_Ant1_Hop

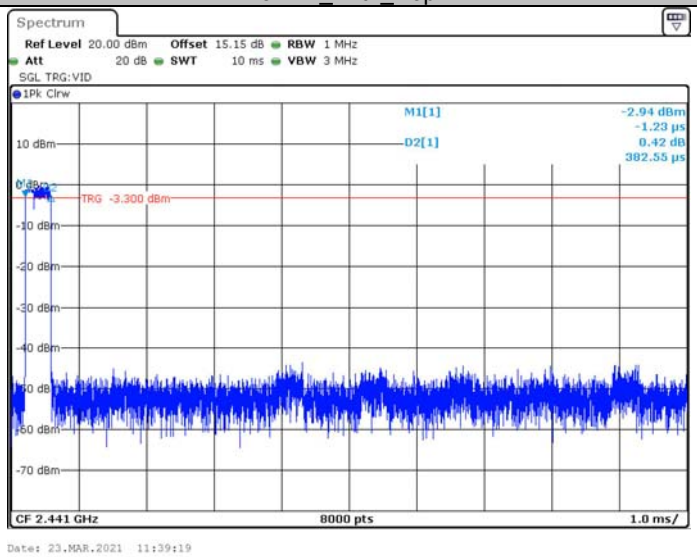
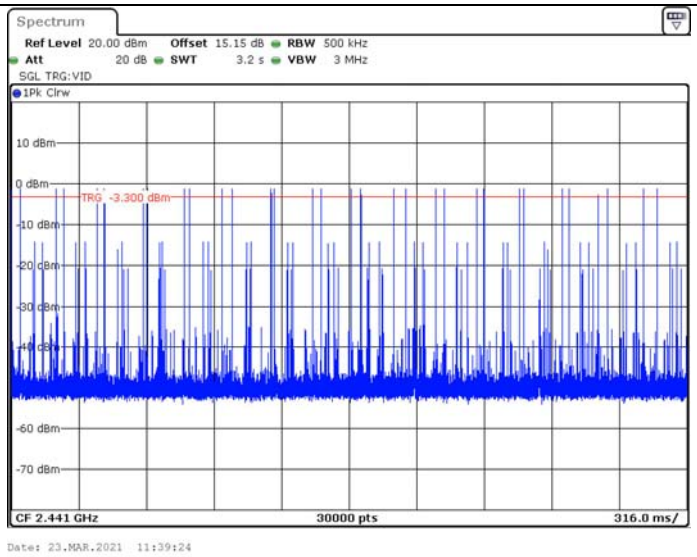

Spectrum
Ref Level 20.00 dBm Offset 15.15 dB RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
SGL TRG:VID
1Pk Clrw
M1[1] -10.77 dBm
-1.23 µs
D2[1] 9.53 dB
2.86036 ms
10 dBm
0 dBm
TRG -4.200 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-70 dBm
CF 2.441 GHz
8000 pts
1.0 ms/
Date: 23.MAR.2021 11:25:38

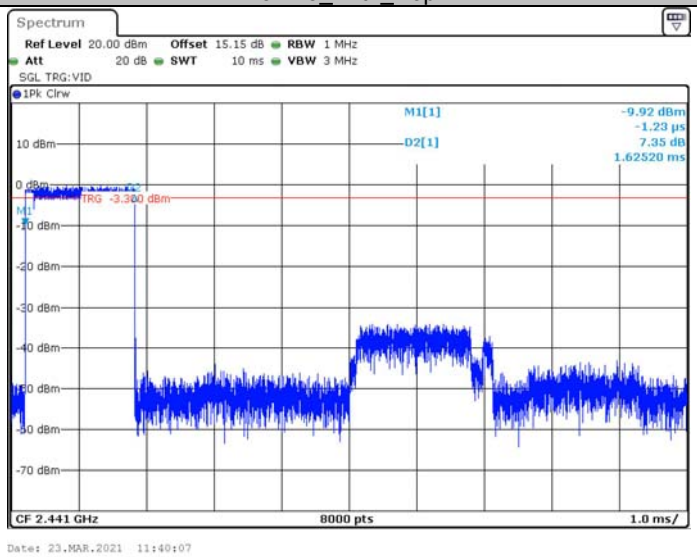
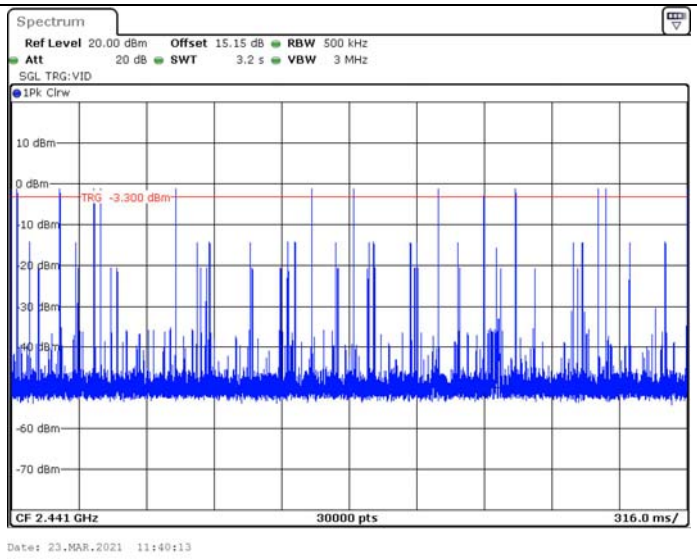

Spectrum
Ref Level 20.00 dBm Offset 15.15 dB RBW 500 kHz
Att 20 dB SWT 3.2 s VBW 3 MHz
SGL TRG:VID
1Pk Clrw
10 dBm
0 dBm
TRG -4.200 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-60 dBm
-70 dBm
CF 2.441 GHz
30000 pts
316.0 ms/
Date: 23.MAR.2021 11:25:43

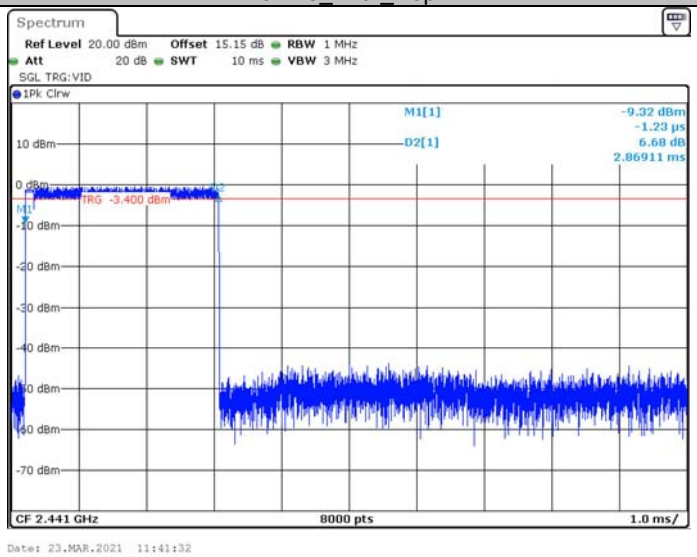
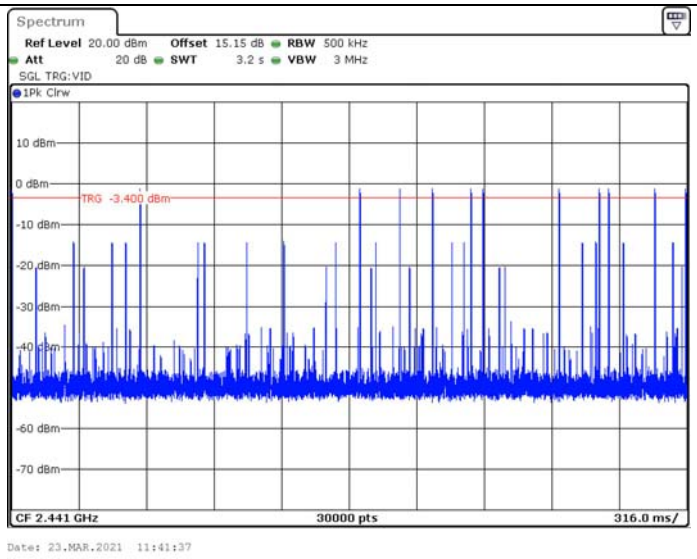
| 2DH1_Ant1_Hop |
| --- |
|  |
|  |

| 2DH3_Ant1_Hop |
| --- |
|  |
|  |

| 2DH5_Ant1_Hop |
| --- |
|  |
|  |

| 3DH1_Ant1_Hop |
| --- |
|  |
|  |

| 3DH3_Ant1_Hop |
| --- |
|  |
|  |

| 3DH5_Ant1_Hop |
| --- |
|  |
|  |

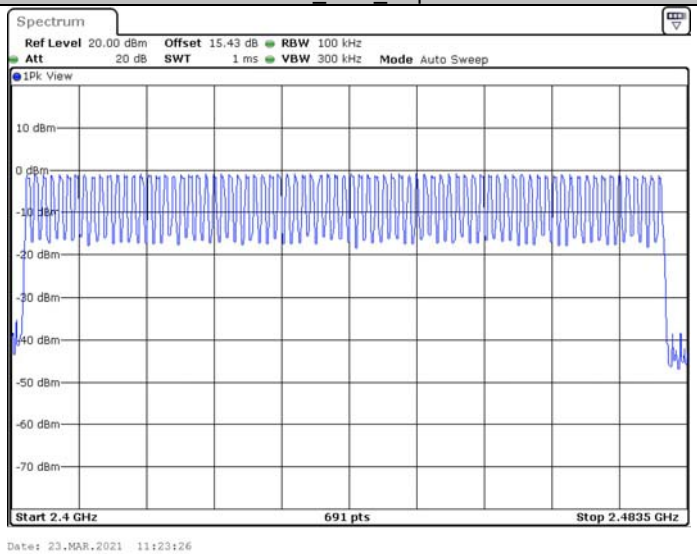
## AppendixF: Number of hopping channels

### Test Result

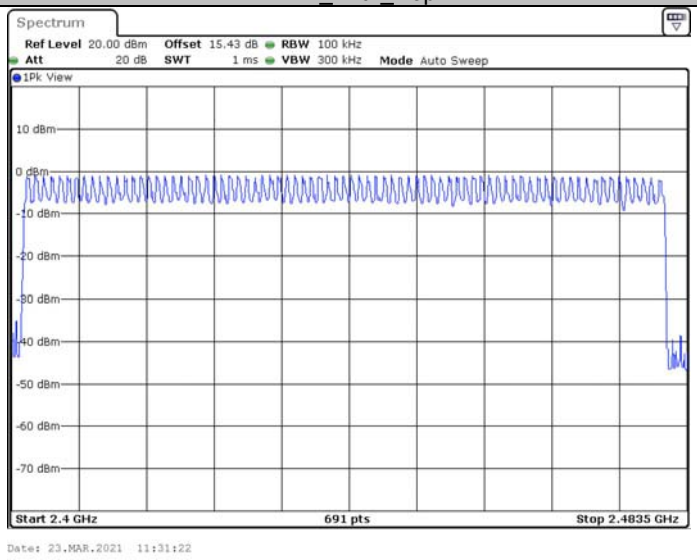
| Test Mode | Antenna | Channel | Result[Num] | Limit[Num] | Verdict |
|---|---|---|---|---|---|
| DH1 | Ant1 | Hop | 79 | >=15 | PASS |
| 2DH1 | Ant1 | Hop | 79 | >=15 | PASS |
| 3DH1 | Ant1 | Hop | 79 | >=15 | PASS |

## Test Graphs

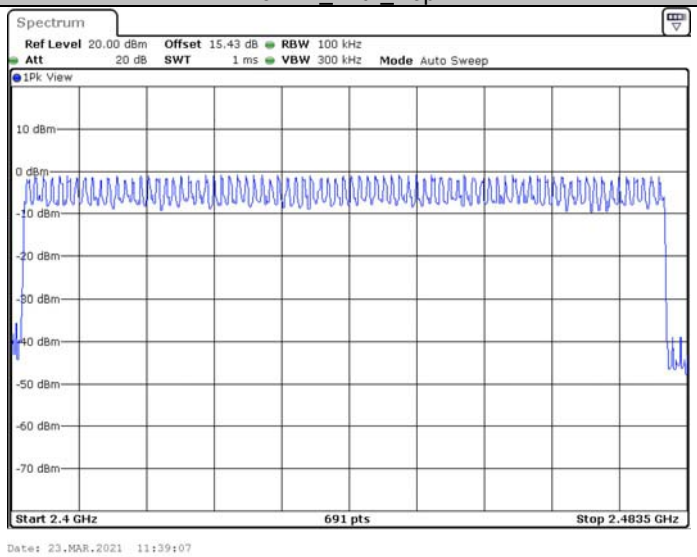
DH1_Ant1_Hop




2DH1_Ant1_Hop



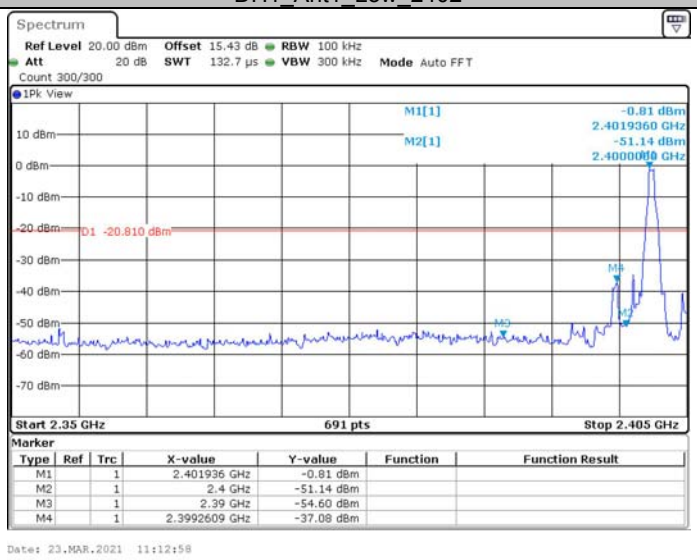
3DH1_Ant1_Hop



## AppendixG:Band edge measurements

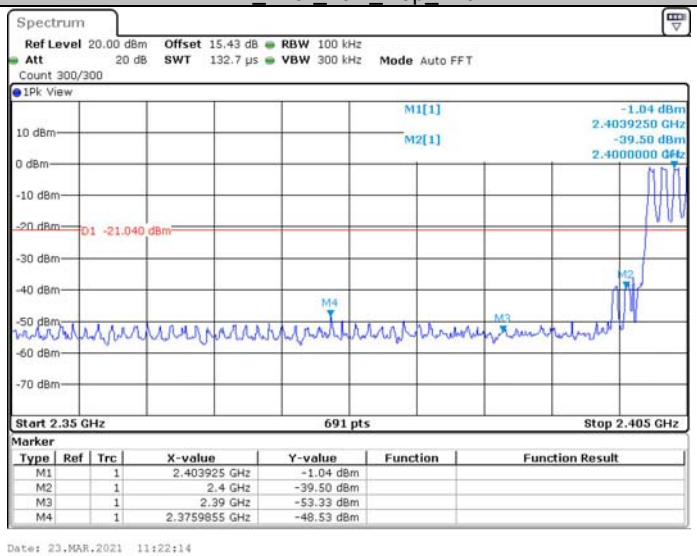
### Test Graphs

DH1_Ant1_Low_2402

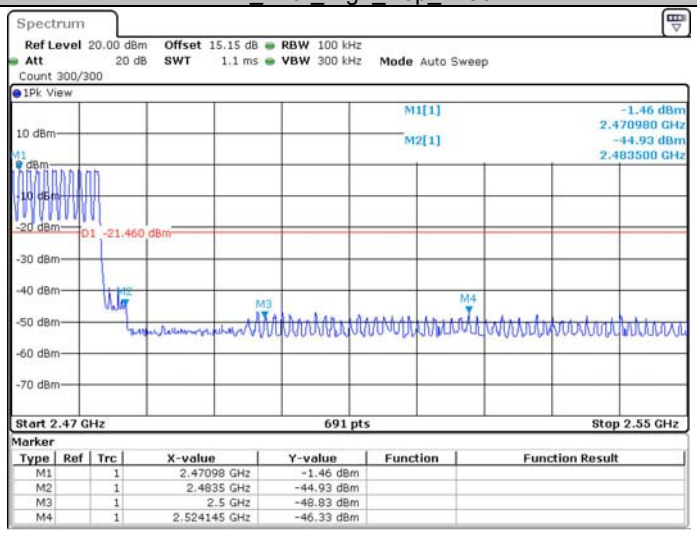



DH1_Ant1_High_2480

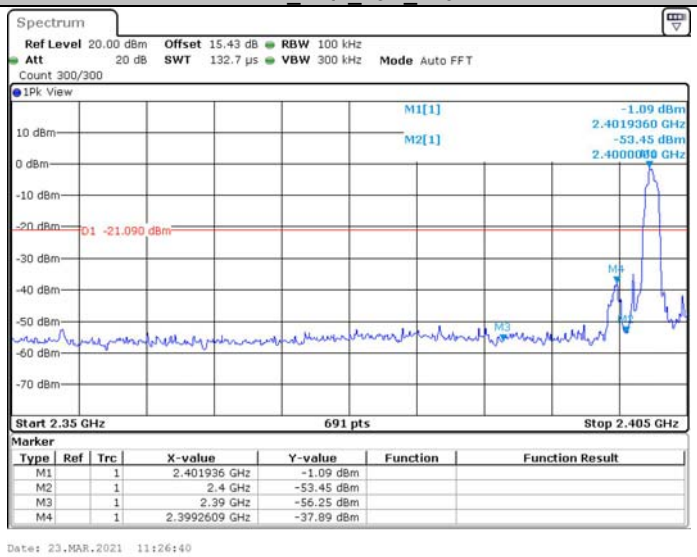
DH1_Ant1_Low_Hop_2402




DH1_Ant1_High_Hop_2480



2DH1_Ant1_Low_2402

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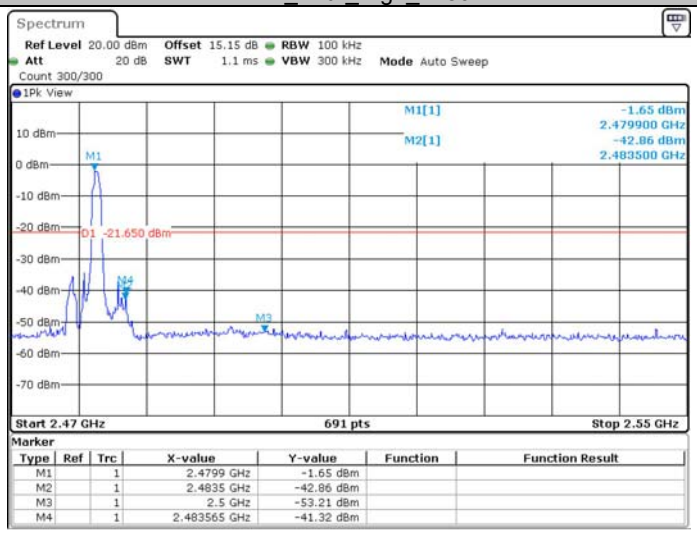

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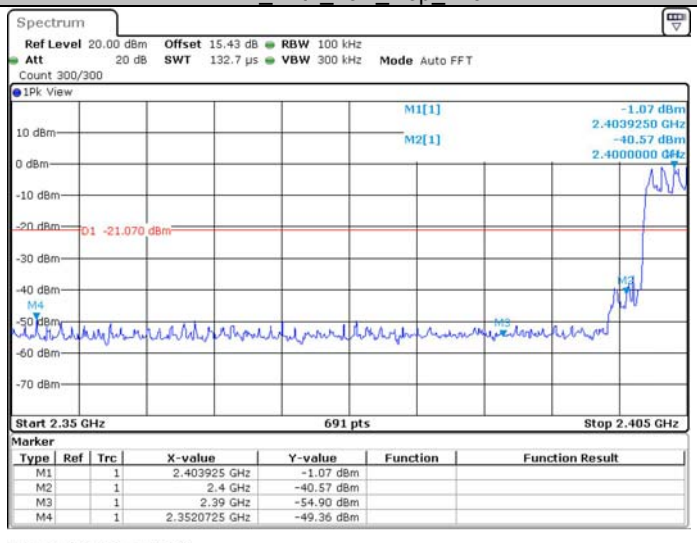


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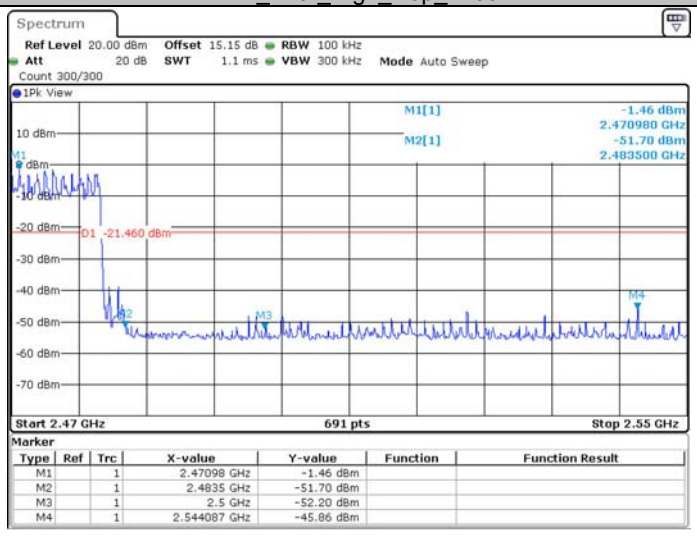
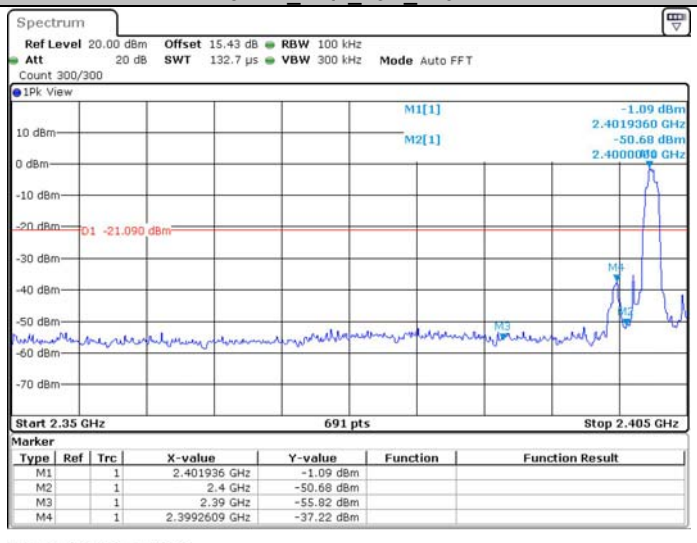


3DH1_Ant1_Low_2402

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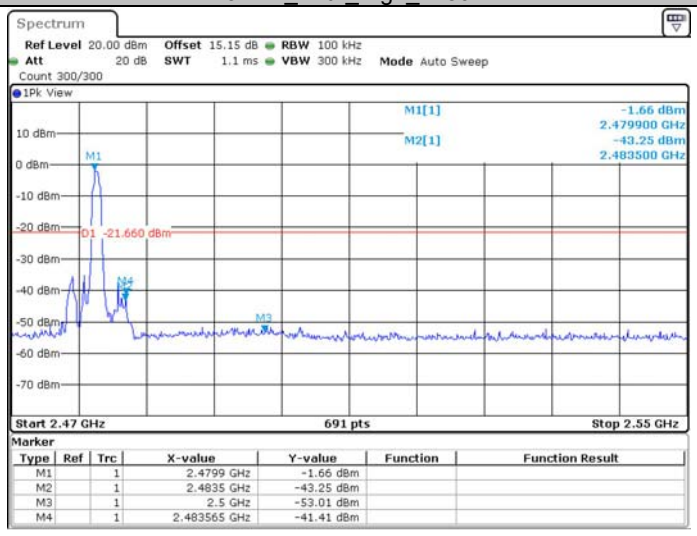

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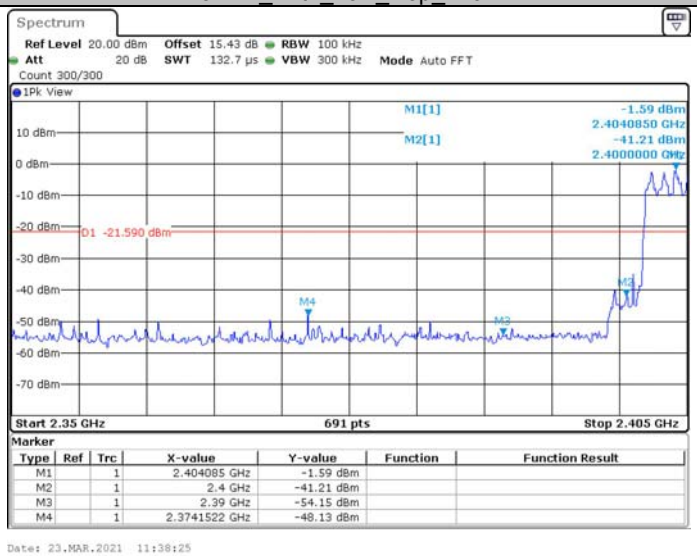
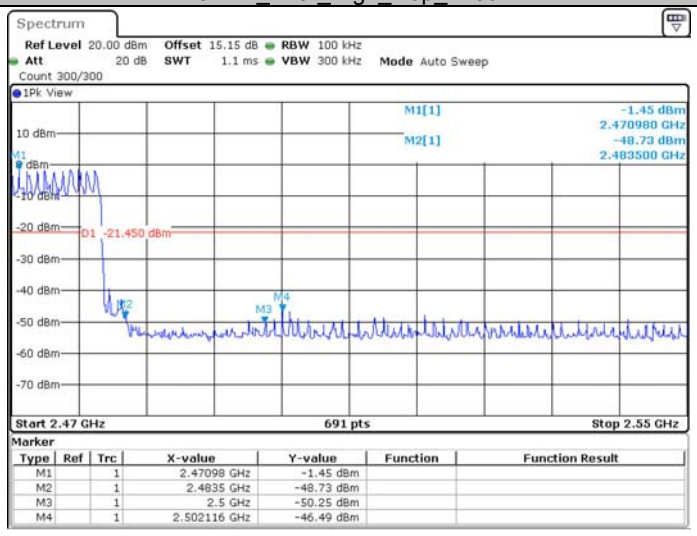



3DH1_Ant1_High_Hop_2480




******* END OF REPORT *******