



## FCC Part 15.247

### TEST REPORT

For

## Sabine Technologies Co., Ltd.

KeShi Bldg., Information Rd., Haidian District, Beijing, China

**FCC ID: 2AK54-SABINE-M700**

|   |                                  |
|---|----------------------------------|
| Report Type   | Original Report                  |
| Product Name:   | SOLO KTV                         |
| Model Name:   | Sabine-M700                      |
| Report Number :   | RLK191015001-00A                 |
| Report Date :   | 2019/11/10                       |
| Reviewed By :   | Flight Hsieh <i>Flight Hsieh</i> |
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*Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Linkou Laboratory)*

## Revision History

| Revision | Report Number    | Issue Date | Description     |
|----------|------------------|------------|-----------------|
| 1.0      | RLK191015001-00A | 2019/11/10 | Original Report |

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## 1 General Information

### 1.1 Product Description for Equipment under Test (EUT)

|                                      |  |
|--------------------------------------|--|
| <b>Applicant</b>                     | <b>Sabine Technologies Co., Ltd.</b><br>KeShi Bldg., Information Rd., Haidian District, Beijing, China |
| <b>Manufacturer</b>                  | <b>Sabine Technologies Co., Ltd.</b><br>KeShi Bldg., Information Rd., Haidian District, Beijing, China |
| <b>Brand Name</b>                    | <b>SABINETEK</b>   |
| <b>Product (Equipment)</b>           | <b>SOLO KTV</b>  |
| <b>Model Name</b>                    | <b>Sabine-M700</b>   |
| <b>Frequency Range</b>               | 2402 - 2480 MHz  |
| <b>Number of Channels</b>            | 79 Channels  |
| <b>Output Power</b>                  | BR-1Mbps: 10.82 dBm (0.0121 W)<br>EDR-2Mbps: 10.13 dBm (0.0103 W)<br>EDR-3Mbps: 10.15 dBm (0.0104 W)   |
| <b>Modulation Type</b>               | BR-1Mbps: GFSK<br>EDR-2Mbps: $\pi/4$ -DQPSK<br>EDR-3Mbps: 8-DPSK                                       |
| <b>Related Submittal(s)/Grant(s)</b> | <b>FCC Part 15.247 DTS with FCC ID : 2AK54-SABINE-M700</b>   |
| <b>Received Date</b>                 | Oct 15, 2019   |
| <b>Date of Test</b>                  | Oct 23, 2019 ~ Oct 30, 2019  |

\*All measurement and test data in this report was gathered from production sample serial number: 191015001 (Assigned by BACL, Linkou).

### 1.2 Operation Condition of EUT

|  |   |
|--|---|
| <b>Power Operation<br/>(Voltage Range)</b> | <input type="checkbox"/> AC 120 V/60 Hz<br><input type="checkbox"/> Adapter<br><input type="checkbox"/> By Power Cord.  |
|  | <input checked="" type="checkbox"/> DC Type<br><input type="checkbox"/> DC Power Supply: 5Vdc to connector port<br><input checked="" type="checkbox"/> Battery: 3.7 Vdc<br><input checked="" type="checkbox"/> External from USB Cable 5Vdc<br><input type="checkbox"/> External DC Adapter |
|  | <input type="checkbox"/> Host System  |

### 1.3 Objective and Test Methodology

**The Objective of this Test Report was to document the compliance of the Sabine Technologies Co., Ltd. Appliance (Model: Sabine-M700) to the requirements of the following Standards:**

- Part 2, Subpart J, Part 15, Subparts A and C, section 15.247 of the Federal Communication Commission's rules.
- ANSI C63.10-2013 of the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- KDB 558074 D01 15.247 Meas Guidance v05r02.

### 1.4 Measurement Uncertainty

| Parameter                        | Expanded Measurement uncertainty |
|----------------------------------|----------------------------------|
| RF output power                  | $\pm 1.488$ dB                   |
| Occupied Channel Bandwidth       | $\pm 453.927$ Hz                 |
| RF Conducted Emission test       | $\pm 2.77$ dB                    |
| AC Power Line Conducted Emission | $\pm 2.66$ dB                    |
| Radiated Below 1G                | $\pm 3.57$ dB                    |
| Radiated Above 1G                | $\pm 5.32$ dB                    |

### 1.5 Test Environments and Test information

| Item                            | Test Date               | Temperature (°C) | Relative Humidity (%) | Test Engineer |
|---------------------------------|-------------------------|------------------|-----------------------|---------------|
| Radiated Test (966A)            | 2019-10-25 - 2019-10-28 | 20.5             | 46-49                 | Leo Cheng     |
| Conduction Test (Conduction-01) | 2019-10-30              | 23.2             | 46                    | Zeus Chen     |
| Conducted Test (TH02)           | 2019-10-22 - 2019-10-23 | 23.4-24.8        | 56-57                 | Ethan Shao    |

### 1.6 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou Laboratory) to collect test data is located on

☒ No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.).

Bay Area Compliance Laboratories Corp. (Linkou Laboratory) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) by Mutual Recognition Agreement (MRA). 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. The FCC Registration No.: 0027578244. Designation No.: TW3546. The Test Firm Registration No.: 181430.

## 2 System Test Configuration

### 2.1 Description of Test Configuration

The system was configured for testing in testing mode which was provided by manufacturer.

No special accessory, No modification was made to the EUT and No special equipment used during test.

For BT (BR/EDR), there are totally 79 channels.

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 0       | 2402            | 39      | 2441            |
| 1       | 2403            | --      | --              |
| 2       | 2404            | --      | --              |
| 3       | 2405            | 76      | 2478            |
| --      | --              | 77      | 2479            |
| 38      | 2440            | 78      | 2480            |

For BLE: Channel 0, 39 and 78 were tested.

| Worst Case of Power Setting      |     |           |        |         |
|----------------------------------|-----|-----------|--------|---------|
| EUT Exercise Software            |     | BlueTest3 |        |         |
| Configuration                    | NTX | Low CH    | Mid CH | High CH |
| BR-1Mbps (GFSK) mode             | 1   | 120       | 120    | 120     |
| EDR-2Mbps ( $\pi/4$ -DQPSK) mode | 1   | 120       | 120    | 120     |
| EDR-3Mbps (8DPSK) mode           | 1   | 120       | 120    | 120     |

## 2.2 Support Equipment List and Details

| No. | Description         | Manufacturer | Model Number   |
|-----|---------------------|--------------|----------------|
| A   | Notebook            | DELL         | Latitude E6410 |
| B   | Adapter (for E6410) | DELL         | DA65NM111-00   |
| C   | Notebook            | DELL         | Latitude E5550 |
| D   | Adapter (for E5550) | DELL         | LA65NM130      |

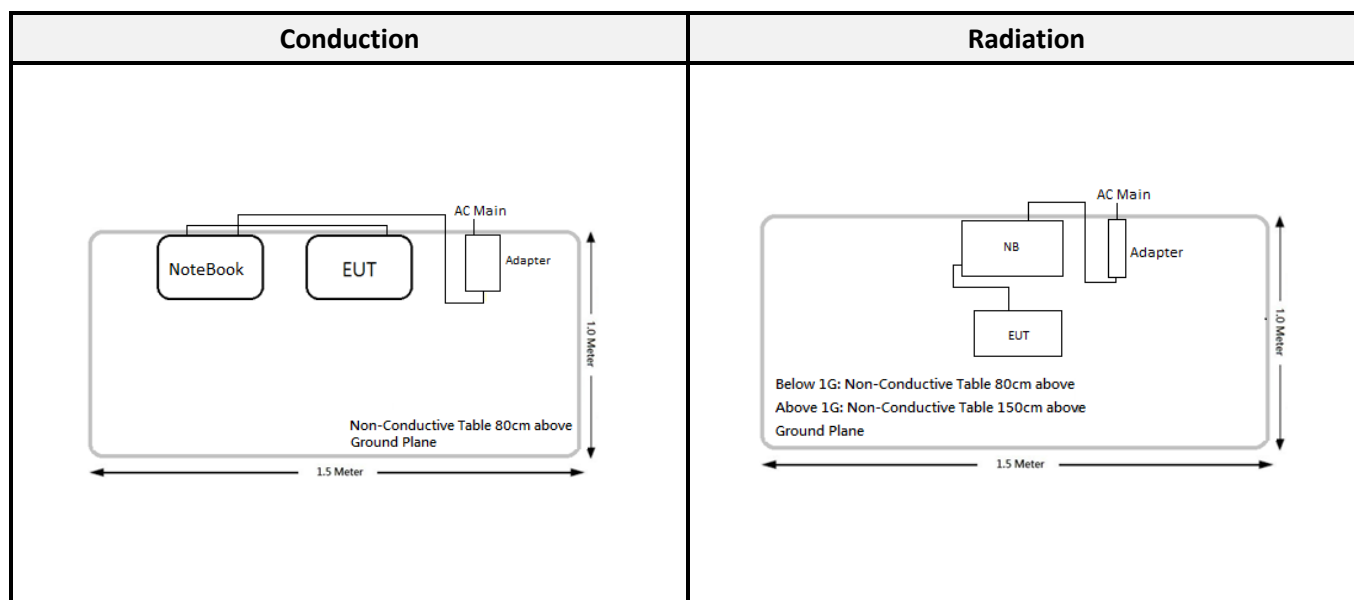
*Note:*

*No. A and B for Conducted and AC Line Test.*

*No. C and D for Radiated Test.*

| No. | Cable Description | Shielding Type | Length (m) | From | To |
|-----|-------------------|----------------|------------|------|----|
| 1   | USB Cable         | Non-Shielded   | 1.0        | EUT  | NB |

## 2.3 Block Diagram of Test Setup





### 3 Summary of Test Results

| FCC Rules                     | Description of Test                      | Result     |
|-------------------------------|--|------------|
| §15.247(i), §1.1307, § 2.1093 | RF Exposure                              | Compliance |
| §15.203                       | Antenna Requirement                      | Compliance |
| §15.207(a)                    | AC Line Conducted Emissions              | Compliance |
| §15.205, §15.209, §15.247(d)  | Spurious 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)(3)                 | Maximum Peak Output Power                | Compliance |
| §15.247(d)                    | 100 kHz Bandwidth of Frequency Band Edge | Compliance |

## 4 FCC §15.247(i), § 1.1307, § 2.1093 – RF Exposure

### 4.1 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 v06

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot$

$[V_f(\text{GHz})] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

1.  $f(\text{GHz})$  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. 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

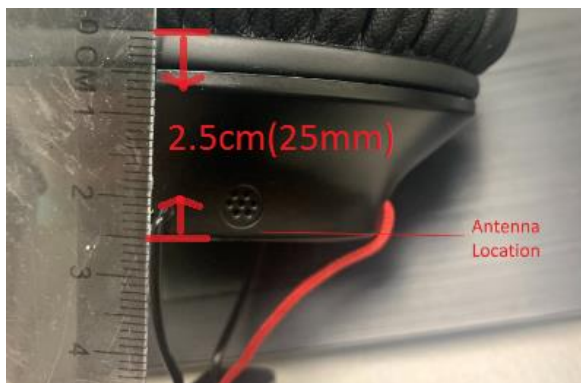
The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

### 4.2 RF Exposure Evaluation Result

#### RF Exposure Evaluation:

| Frequency (MHz) | Tunp-up Power |        | Evaluation Distance (mm) | SAR Exclusion Result | Extremity SAR Exclusion Limit (1g SAR) |
|-----------------|---------------|--------|--------------------------|----------------------|--|
|                 | (dBm)         | (mW)   |                          |                      |  |
| 2402-2480       | 11            | 12.589 | 25                       | 0.79                 | 3                                      |

**Result:** SAR evaluation is not necessary.



## 5 FCC §15.203 – Antenna Requirements

### 5.1 Applicable Standard

According to § 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 user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the 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 does not exceed 6dBi

### 5.2 Antenna List and Details

| Model | Antenna Type | Antenna Gain | Result     |
|-------|--------------|--------------|------------|
| 86V   | FPC Antenna  | 4.69 dBi     | Compliance |

*The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.*

## 6 FCC §15.207 - AC Line Conducted Emissions

### 6.1 Applicable Standard

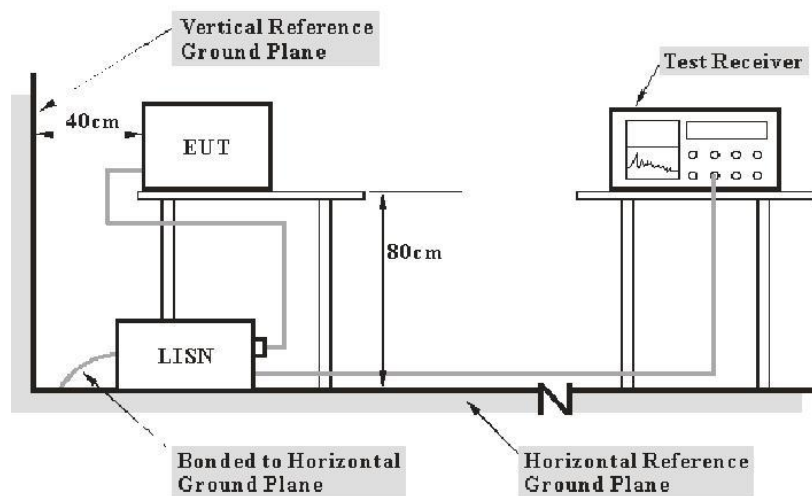
According to FCC §15.207,

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

| Frequency (MHz) | Conducted Limit (dBuV)     |                            |
|-----------------|----------------------------|----------------------------|
|                 | Quasi-Peak                 | Average                    |
| 0.15-0.5        | 66 to 56 <sup>Note 1</sup> | 56 to 46 <sup>Note 2</sup> |
| 0.5-5           | 56                         | 46                         |
| 5-30            | 60                         | 50                         |

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

### 6.2 EUT Setup and Test Procedure



- Note: 1. Support units were connected to second LISN.  
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

| Frequency Range  | Receiver RBW |
|------------------|--------------|
| 150 kHz - 30 MHz | 9 kHz        |

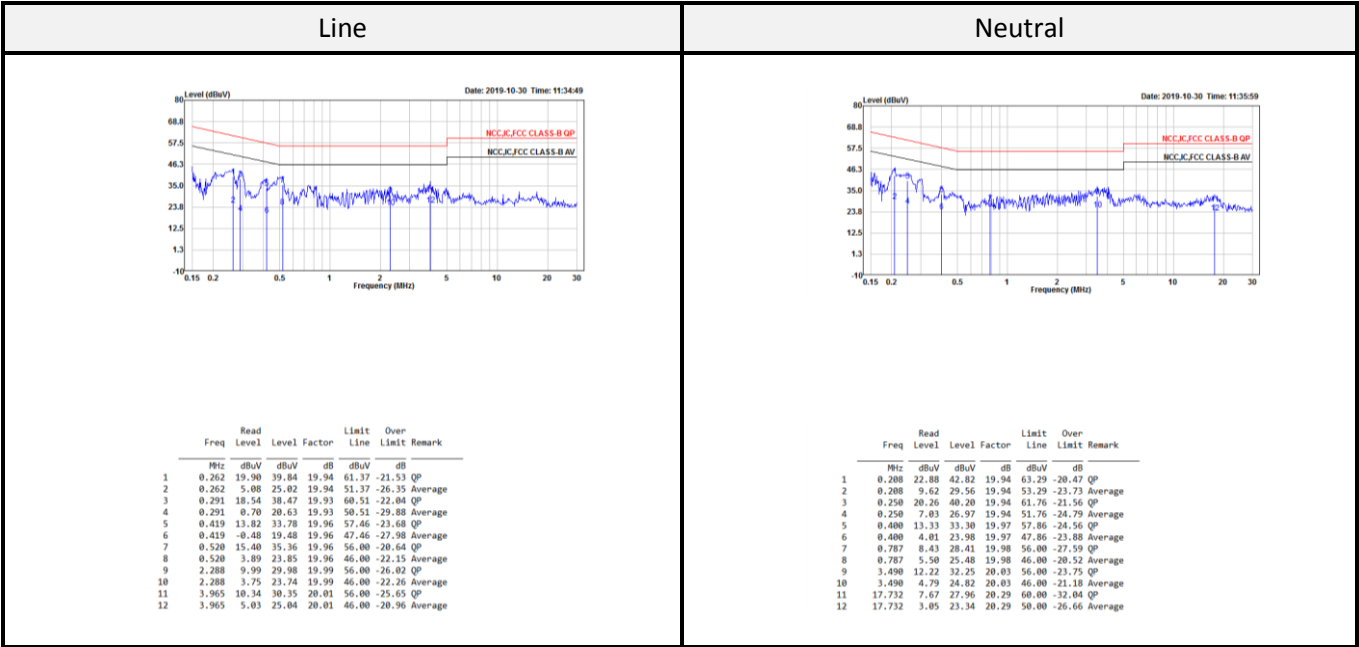
During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

### 6.3 Test Equipment List and Details

| Description                             | Manufacture     | Model                | Serial No. | Cal. Date. | Cal. Due.  |
|---|-----------------|----------------------|------------|------------|------------|
| AC Line Conduction Room (Conduction-01) |                 |                      |            |            |            |
| Two-Line V-Network                      | Rohde & Schwarz | ENV216               | 100010     | 2019/09/02 | 2020/09/01 |
| Pulse Limiter                           | SCHWARZBECK     | VSTD 9561-F          | 00432      | 2019/08/28 | 2020/08/27 |
| ESR EMI Test Receiver                   | Rohde & Schwarz | ESR3                 | 102430     | 2019/03/27 | 2020/03/26 |
| RF Cable                                | EMCI            | EMCCFD300-BM-BM-8000 | 180526     | 2019/08/08 | 2020/08/07 |
| Software                                | Audix           | e3 v9                | E3LK-03    | N.C.R      | N.C.R      |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

6.4 Test Data and Test Plot



Transmit mode.

Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

## 7 FCC §15.209, §15.205, §15.247(d) – Spurious Emissions

### 7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1MHz.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz               | MHz                 | MHz           | GHz         |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110       | 13.36-13.41         | 399.9-410     | 4.5-5.15    |
| 0.495-0.505       | 16.42-16.423        | 608-614       | 5.35-5.46   |
| 2.1735-2.1905     | 16.69475-16.69525   | 960-1240      | 7.25-7.75   |
| 4.125-4.128       | 25.5-25.67          | 1300-1427     | 8.025-8.5   |
| 4.17725-4.17775   | 37.5-38.25          | 1435-1626.5   | 9.0-9.2     |
| 4.20725-4.20775   | 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     | Above 38.6  |

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

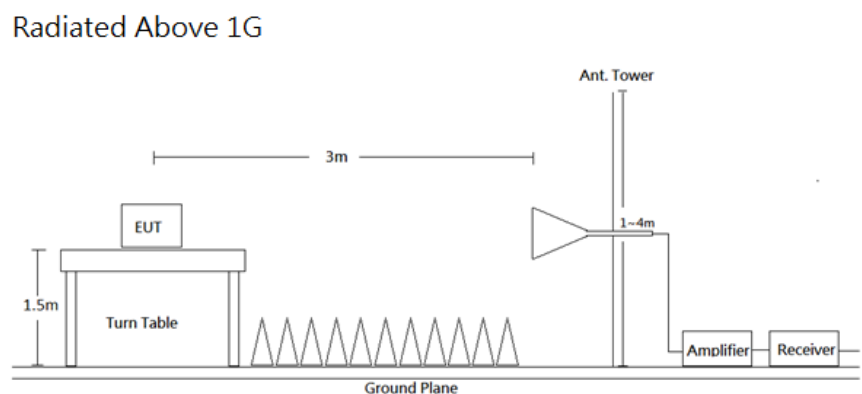
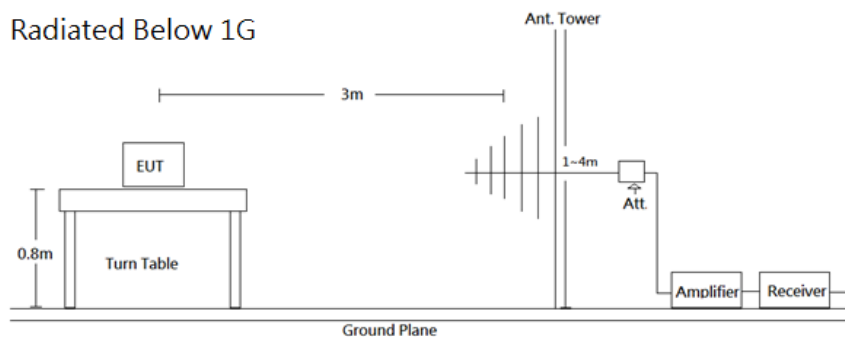
| Frequency (MHz) | Field Strength (micro volts/meter) | Measurement Distance (meters) |
|-----------------|------------------------------------|-------------------------------|
| 0.009 - 0.490   | 2400/F(kHz)                        | 300                           |
| 0.490 - 1.705   | 24000/F(kHz)                       | 30                            |
| 1.705 - 30.0    | 30                                 | 30                            |
| 30 - 88         | 100**                              | 3                             |
| 88 - 216        | 150**                              | 3                             |
| 216 - 960       | 200**                              | 3                             |
| Above 960       | 500                                | 3                             |

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d) 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 20dB. 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).



## 7.2 EUT Setup and Test Procedure



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

| Frequency Range | RBW     | VBW   | Duty cycle | Measurement method |
|-----------------|---------|-------|------------|--------------------|
| 30-1000 MHz     | 120 kHz | /     | -          | QP                 |
| Above 1 GHz     | 1 MHz   | 3 MHz | -          | PK                 |
|                 | 1 MHz   | 10 Hz | >98%       | Ave                |

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations. All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

### 7.3 Test Equipment List and Details

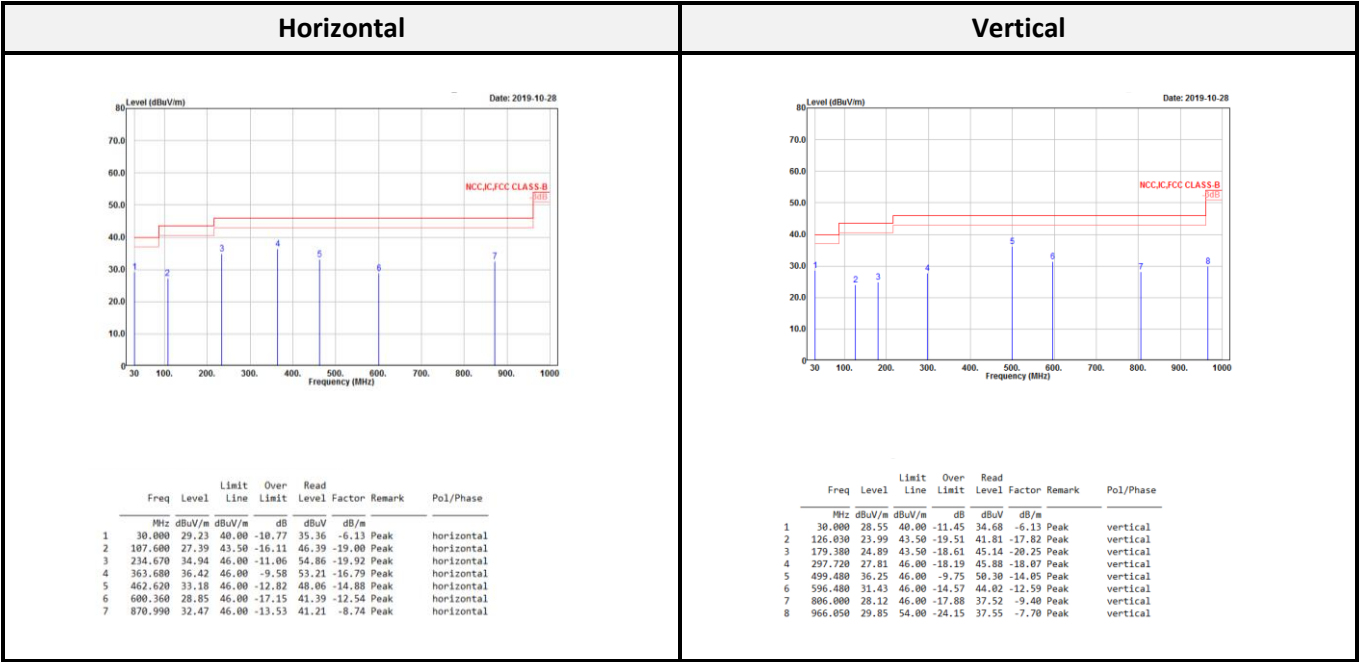
| Description                     | Manufacture                 | Model                 | Serial No.           | Cal. Date. | Cal. Due.  |
|---------------------------------|-----------------------------|-----------------------|----------------------|------------|------------|
| <b>Radiation 3M Room (966A)</b> |                             |                       |                      |            |            |
| Active Loop                     | EMCO                        | 6502                  | 0001-3322            | 2019/03/15 | 2020/03/14 |
| Bilog Antenna/6 dB Attenuator   | SUNOL SCIENCES & EMEC /EMCI | JB3/N-6-06            | A111513/AT-N0668     | 2019/03/29 | 2020/03/28 |
| Signal and Spectrum Analyzer    | Rohde & Schwarz             | FSV40                 | 101434               | 2019/04/17 | 2020/04/16 |
| Horn Antenna                    | ETS-Lindgren                | 3115                  | 00109141             | 2019/07/05 | 2020/07/04 |
| Horn Antenna                    | ETS-Lindgren                | 3160-09               | 00123852             | 2019/07/11 | 2020/07/10 |
| Preamplifier                    | A.H. Systems                | PAM-1840VH            | 174                  | 2019/02/18 | 2020/02/17 |
| Preamplifier                    | A.H. Systems                | PAM-0118              | 478                  | 2019/03/28 | 2020/03/27 |
| Microflex Cable (1m)            | EMCI                        | EMC106-SM-SM-2000     | 180515               | 2019/08/07 | 2020/08/06 |
| Microflex Cable (2m)            | MTJ                         | H0919                 | 00000-MT28A-100      | 2019/08/07 | 2020/08/06 |
| Microflex Cable (8m)            | UTIFLEX                     | UFA210A-1-3149-300300 | MFR 64639 232490-001 | 2019/08/07 | 2020/08/06 |
| Turn Table                      | Chaintek                    | T-200-S-1             | 003501               | N.C.R      | N.C.R      |
| Antenna Tower                   | Chaintek                    | MBD-400-1             | 003504               | N.C.R      | N.C.R      |
| Controller                      | Chaintek                    | 3000-1                | 003507               | N.C.R      | N.C.R      |
| Software                        | Audix                       | e3 v9                 | E3LK-01              | N.C.R      | N.C.R      |
| <b>Conducted Room(TH-02)</b>    |                             |                       |                      |            |            |
| Signal Analyzer 40GHZ           | Rohde & Schwarz             | FSV40-N               | 102248               | 2019/09/11 | 2020/09/10 |
| Cable                           | MTJ                         | MT40S                 | 620620-MT40S-100     | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

7.4 Radiated Emission Test Plot and Data

Transmitting mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

Below 1G (30 MHz-1 GHz) test the worst power with USB mode.



Level = Read Level + Factor

Over Limit = Level – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

**Above 1G (1 GHz-26.5 GHz)****BR-1Mbps mode:**

| Low CH     |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 2354.300   | 36.03  | 54.00      | -17.97     | 43.76      | -7.73  | Average | 2343.500  | 36.04  | 54.00      | -17.96     | 43.80      | -7.76  | Average |
| 2354.300   | 50.80  | 74.00      | -23.20     | 58.53      | -7.73  | Peak    | 2343.500  | 50.55  | 74.00      | -23.45     | 58.31      | -7.76  | Peak    |
| 2402.300   | 80.78  |            |            | 88.40      | -7.62  | Average | 2402.300  | 83.66  |            |            | 91.28      | -7.62  | Average |
| 2402.300   | 92.99  |            |            | 100.61     | -7.62  | Peak    | 2402.300  | 96.54  |            |            | 104.16     | -7.62  | Peak    |
| 4804.000   | 45.81  | 54.00      | -8.19      | 45.21      | 0.60   | Average | 4804.000  | 46.36  | 54.00      | -7.64      | 45.74      | 0.62   | Average |
| 4804.000   | 54.36  | 74.00      | -19.64     | 53.76      | 0.60   | Peak    | 4804.000  | 54.90  | 74.00      | -19.10     | 54.28      | 0.62   | Peak    |
| 7206.000   | 46.15  | 54.00      | -7.85      | 40.89      | 5.26   | Average | 7206.000  | 44.42  | 54.00      | -9.58      | 39.16      | 5.26   | Average |
| 7206.000   | 56.02  | 74.00      | -17.98     | 50.76      | 5.26   | Peak    | 7206.000  | 54.83  | 74.00      | -19.17     | 49.57      | 5.26   | Peak    |
| 12010.000  | 46.21  | 54.00      | -7.79      | 34.60      | 11.61  | Average | 12010.000 | 45.11  | 54.00      | -8.89      | 33.50      | 11.61  | Average |
| 12010.000  | 59.38  | 74.00      | -14.62     | 47.77      | 11.61  | Peak    | 12010.000 | 58.84  | 74.00      | -15.16     | 47.23      | 11.61  | Peak    |

| Middle CH  |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 2386.472   | 36.23  | 54.00      | -17.77     | 43.87      | -7.64  | Average | 2341.702  | 36.54  | 54.00      | -17.46     | 44.31      | -7.77  | Average |
| 2386.472   | 50.03  | 74.00      | -23.97     | 57.67      | -7.64  | Peak    | 2341.702  | 49.86  | 74.00      | -24.14     | 57.63      | -7.77  | Peak    |
| 2441.164   | 82.41  |            |            | 89.93      | -7.52  | Average | 2440.922  | 85.87  |            |            | 93.39      | -7.52  | Average |
| 2441.164   | 94.95  |            |            | 102.47     | -7.52  | Peak    | 2440.922  | 99.27  |            |            | 106.79     | -7.52  | Peak    |
| 2518.362   | 38.44  | 54.00      | -15.56     | 45.71      | -7.27  | Average | 2545.466  | 39.92  | 54.00      | -14.08     | 47.08      | -7.16  | Average |
| 2518.362   | 51.61  | 74.00      | -22.39     | 58.88      | -7.27  | Peak    | 2545.466  | 51.82  | 74.00      | -22.18     | 58.98      | -7.16  | Peak    |
| 4882.000   | 52.27  | 54.00      | -1.73      | 51.47      | 0.80   | Average | 4882.000  | 51.77  | 54.00      | -2.23      | 50.97      | 0.80   | Average |
| 4882.000   | 60.81  | 74.00      | -13.19     | 60.01      | 0.80   | Peak    | 4882.000  | 60.33  | 74.00      | -13.67     | 59.53      | 0.80   | Peak    |
| 7323.000   | 50.25  | 54.00      | -3.75      | 44.53      | 5.72   | Average | 7323.000  | 52.83  | 54.00      | -1.17      | 47.11      | 5.72   | Average |
| 7323.000   | 60.15  | 74.00      | -13.85     | 54.43      | 5.72   | Peak    | 7323.000  | 58.43  | 74.00      | -15.57     | 52.71      | 5.72   | Peak    |
| 12205.000  | 45.14  | 54.00      | -8.86      | 33.45      | 11.69  | Average | 12205.000 | 44.14  | 54.00      | -9.86      | 32.45      | 11.69  | Average |
| 12205.000  | 58.90  | 74.00      | -15.10     | 47.21      | 11.69  | Peak    | 12205.000 | 57.79  | 74.00      | -16.21     | 46.10      | 11.69  | Peak    |

| High CH    |        |            |            |            |        |         |           |        |            |            |            |        |         |
|------------|--------|------------|------------|------------|--------|---------|-----------|--------|------------|------------|------------|--------|---------|
| Horizontal |        |            |            |            |        |         | Vertical  |        |            |            |            |        |         |
| Freq       | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  | Freq      | Level  | Limit Line | Over Limit | Read Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         | MHz       | dBuV/m | dBuV/m     | dB         | dBuV       | dB/m   |         |
| 2480.168   | 84.00  |            |            | 91.35      | -7.35  | Average | 2480.168  | 87.22  |            |            | 94.57      | -7.35  | Average |
| 2480.168   | 96.68  |            |            | 104.03     | -7.35  | Peak    | 2480.168  | 100.65 |            |            | 108.00     | -7.35  | Peak    |
| 2518.380   | 38.57  | 54.00      | -15.43     | 45.84      | -7.27  | Average | 2483.500  | 39.96  | 54.00      | -14.04     | 47.30      | -7.34  | Average |
| 2518.380   | 52.79  | 74.00      | -21.21     | 60.06      | -7.27  | Peak    | 2483.500  | 51.82  | 74.00      | -22.18     | 59.16      | -7.34  | Peak    |
| 4960.000   | 53.32  | 54.00      | -0.68      | 52.50      | 0.82   | Average | 4960.000  | 51.48  | 54.00      | -2.52      | 50.66      | 0.82   | Average |
| 4960.000   | 63.04  | 74.00      | -10.96     | 62.22      | 0.82   | Peak    | 4960.000  | 60.12  | 74.00      | -13.88     | 59.30      | 0.82   | Peak    |
| 7440.000   | 49.71  | 54.00      | -4.29      | 43.66      | 6.05   | Average | 7440.000  | 51.39  | 54.00      | -2.61      | 45.34      | 6.05   | Average |
| 7440.000   | 59.73  | 74.00      | -14.27     | 53.68      | 6.05   | Peak    | 7440.000  | 58.57  | 74.00      | -15.43     | 52.52      | 6.05   | Peak    |
| 12400.000  | 45.99  | 54.00      | -8.01      | 34.49      | 11.50  | Average | 12400.000 | 44.94  | 54.00      | -9.06      | 33.44      | 11.50  | Average |
| 12400.000  | 59.38  | 74.00      | -14.62     | 47.88      | 11.50  | Peak    | 12400.000 | 58.70  | 74.00      | -15.30     | 47.20      | 11.50  | Peak    |

**EDR-2Mbps mode:**

| Low CH     |        |               |               |               |        |         |          |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 2363.900   | 36.07  | 54.00         | -17.93        | 43.76         | -7.69  | Average | 2340.400 | 36.01  | 54.00         | -17.99        | 43.78         | -7.77  | Average |
| 2363.900   | 50.68  | 74.00         | -23.32        | 58.37         | -7.69  | Peak    | 2340.400 | 50.58  | 74.00         | -23.42        | 58.35         | -7.77  | Peak    |
| 2401.900   | 78.02  |               |               | 85.64         | -7.62  | Average | 2401.900 | 80.43  |               |               | 88.05         | -7.62  | Average |
| 2401.900   | 92.14  |               |               | 99.76         | -7.62  | Peak    | 2401.900 | 95.14  |               |               | 102.76        | -7.62  | Peak    |
| 4804.000   | 43.60  | 54.00         | -10.40        | 43.00         | 0.60   | Average | 4804.000 | 43.90  | 54.00         | -10.10        | 43.28         | 0.62   | Average |
| 4804.000   | 54.49  | 74.00         | -19.51        | 53.89         | 0.60   | Peak    | 4804.000 | 54.99  | 74.00         | -19.01        | 54.37         | 0.62   | Peak    |
| 7206.000   | 45.43  | 54.00         | -8.57         | 40.17         | 5.26   | Average | 7206.000 | 43.14  | 54.00         | -10.86        | 37.88         | 5.26   | Average |
| 7206.000   | 56.36  | 74.00         | -17.64        | 51.10         | 5.26   | Peak    | 7206.000 | 54.52  | 74.00         | -19.48        | 49.26         | 5.26   | Peak    |

| Middle CH  |        |               |               |               |        |         |          |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 2354.286   | 36.11  | 54.00         | -17.89        | 43.84         | -7.73  | Average | 2319.922 | 36.15  | 54.00         | -17.85        | 43.96         | -7.81  | Average |
| 2354.286   | 50.02  | 74.00         | -23.98        | 57.75         | -7.73  | Peak    | 2319.922 | 50.18  | 74.00         | -23.82        | 57.99         | -7.81  | Peak    |
| 2440.922   | 79.59  |               |               | 87.11         | -7.52  | Average | 2440.922 | 83.01  |               |               | 90.53         | -7.52  | Average |
| 2440.922   | 93.82  |               |               | 101.34        | -7.52  | Peak    | 2440.922 | 98.02  |               |               | 105.54        | -7.52  | Peak    |
| 2519.572   | 38.36  | 54.00         | -15.64        | 45.62         | -7.26  | Average | 2545.466 | 39.47  | 54.00         | -14.53        | 46.63         | -7.16  | Average |
| 2519.572   | 50.98  | 74.00         | -23.02        | 58.24         | -7.26  | Peak    | 2545.466 | 52.23  | 74.00         | -21.77        | 59.39         | -7.16  | Peak    |
| 4882.000   | 47.39  | 54.00         | -6.61         | 46.59         | 0.80   | Average | 4882.000 | 45.92  | 54.00         | -8.08         | 45.12         | 0.80   | Average |
| 4882.000   | 58.28  | 74.00         | -15.72        | 57.48         | 0.80   | Peak    | 4882.000 | 56.59  | 74.00         | -17.41        | 55.79         | 0.80   | Peak    |
| 7323.000   | 43.16  | 54.00         | -10.84        | 37.44         | 5.72   | Average | 7323.000 | 42.56  | 54.00         | -11.44        | 36.84         | 5.72   | Average |
| 7323.000   | 54.83  | 74.00         | -19.17        | 49.11         | 5.72   | Peak    | 7323.000 | 54.61  | 74.00         | -19.39        | 48.89         | 5.72   | Peak    |

| High CH    |        |               |               |               |        |         |          |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 2479.840   | 81.75  |               |               | 89.10         | -7.35  | Average | 2479.840 | 84.69  |               |               | 92.04         | -7.35  | Average |
| 2479.840   | 96.09  |               |               | 103.44        | -7.35  | Peak    | 2479.840 | 99.79  |               |               | 107.14        | -7.35  | Peak    |
| 2483.500   | 41.09  | 54.00         | -12.91        | 48.43         | -7.34  | Average | 2483.500 | 43.09  | 54.00         | -10.91        | 50.43         | -7.34  | Average |
| 2483.500   | 57.49  | 74.00         | -16.51        | 64.83         | -7.34  | Peak    | 2483.500 | 61.72  | 74.00         | -12.28        | 69.06         | -7.34  | Peak    |
| 4960.000   | 49.33  | 54.00         | -4.67         | 48.51         | 0.82   | Average | 4960.000 | 46.94  | 54.00         | -7.06         | 46.12         | 0.82   | Average |
| 4960.000   | 60.28  | 74.00         | -13.72        | 59.46         | 0.82   | Peak    | 4960.000 | 57.69  | 74.00         | -16.31        | 56.87         | 0.82   | Peak    |
| 7440.000   | 44.51  | 54.00         | -9.49         | 38.46         | 6.05   | Average | 7440.000 | 44.61  | 54.00         | -9.39         | 38.56         | 6.05   | Average |
| 7440.000   | 56.42  | 74.00         | -17.58        | 50.37         | 6.05   | Peak    | 7440.000 | 56.39  | 74.00         | -17.61        | 50.34         | 6.05   | Peak    |

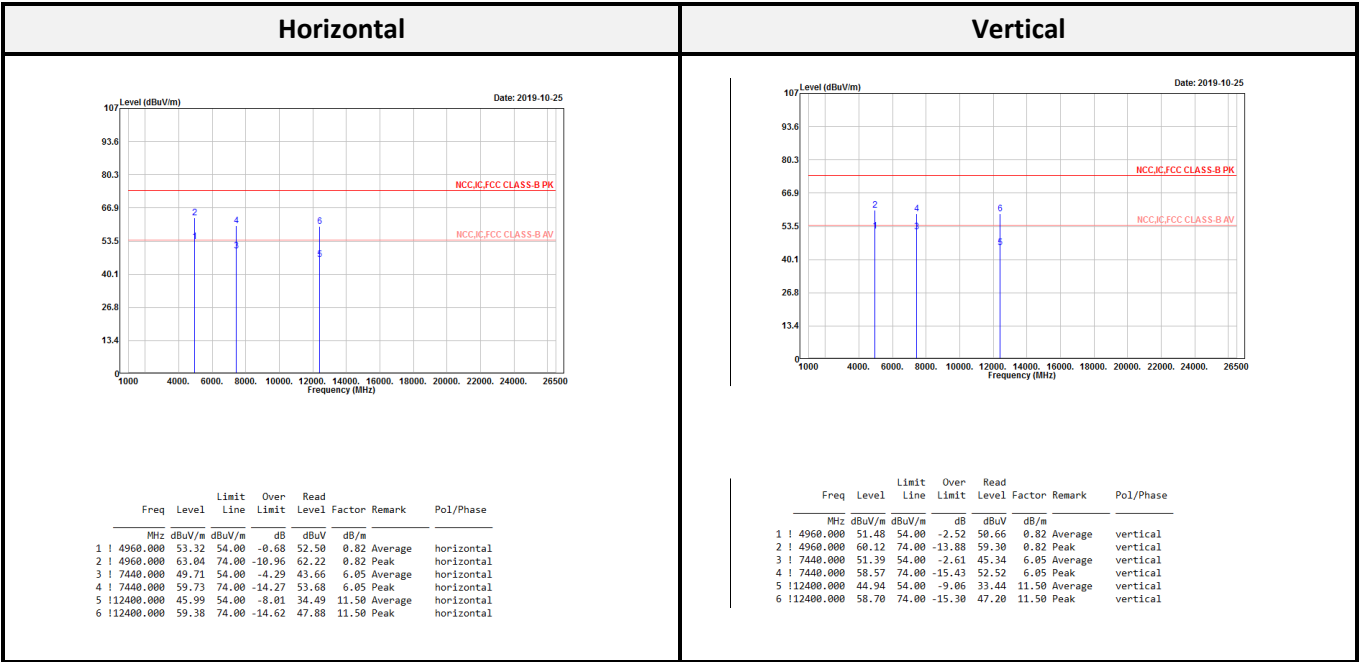
**EDR-3Mbps mode (8-DPSK):**

| Low CH     |        |               |               |               |        |         |          |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 2389.900   | 36.16  | 54.00         | -17.84        | 43.79         | -7.63  | Average | 2368.600 | 36.11  | 54.00         | -17.89        | 43.79         | -7.68  | Average |
| 2389.900   | 50.96  | 74.00         | -23.04        | 58.59         | -7.63  | Peak    | 2368.600 | 50.80  | 74.00         | -23.20        | 58.48         | -7.68  | Peak    |
| 2402.100   | 77.11  |               |               | 84.73         | -7.62  | Average | 2402.100 | 79.85  |               |               | 87.47         | -7.62  | Average |
| 2402.100   | 91.17  |               |               | 98.79         | -7.62  | Peak    | 2402.100 | 94.64  |               |               | 102.26        | -7.62  | Peak    |
| 4804.000   | 46.04  | 54.00         | -7.96         | 45.44         | 0.60   | Average | 4804.000 | 43.59  | 54.00         | -10.41        | 42.99         | 0.60   | Average |
| 4804.000   | 56.68  | 74.00         | -17.32        | 56.08         | 0.60   | Peak    | 4804.000 | 54.20  | 74.00         | -19.80        | 53.60         | 0.60   | Peak    |
| 7206.000   | 43.84  | 54.00         | -10.16        | 38.58         | 5.26   | Average | 7206.000 | 42.09  | 54.00         | -11.91        | 36.83         | 5.26   | Average |
| 7206.000   | 56.36  | 74.00         | -17.64        | 51.10         | 5.26   | Peak    | 7206.000 | 54.47  | 74.00         | -19.53        | 49.21         | 5.26   | Peak    |

| Middle CH  |        |               |               |               |        |         |          |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 2358.400   | 36.03  | 54.00         | -17.97        | 43.74         | -7.71  | Average | 2378.244 | 36.34  | 54.00         | -17.66        | 43.98         | -7.64  | Average |
| 2358.400   | 50.86  | 74.00         | -23.14        | 58.57         | -7.71  | Peak    | 2378.244 | 50.35  | 74.00         | -23.65        | 57.99         | -7.64  | Peak    |
| 2440.922   | 80.02  |               |               | 87.54         | -7.52  | Average | 2440.922 | 82.97  |               |               | 90.49         | -7.52  | Average |
| 2440.922   | 94.58  |               |               | 102.10        | -7.52  | Peak    | 2440.922 | 98.23  |               |               | 105.75        | -7.52  | Peak    |
| 2519.330   | 37.94  | 54.00         | -16.06        | 45.20         | -7.26  | Average | 2545.708 | 39.60  | 54.00         | -14.40        | 46.75         | -7.15  | Average |
| 2519.330   | 50.87  | 74.00         | -23.13        | 58.13         | -7.26  | Peak    | 2545.708 | 51.50  | 74.00         | -22.50        | 58.65         | -7.15  | Peak    |
| 4882.000   | 48.00  | 54.00         | -6.00         | 47.20         | 0.80   | Average | 4882.000 | 45.65  | 54.00         | -8.35         | 44.85         | 0.80   | Average |
| 4882.000   | 58.92  | 74.00         | -15.08        | 58.12         | 0.80   | Peak    | 4882.000 | 56.76  | 74.00         | -17.24        | 55.96         | 0.80   | Peak    |
| 7323.000   | 43.51  | 54.00         | -10.49        | 37.79         | 5.72   | Average | 7323.000 | 41.43  | 54.00         | -12.57        | 35.71         | 5.72   | Average |
| 7323.000   | 56.49  | 74.00         | -17.51        | 50.77         | 5.72   | Peak    | 7323.000 | 54.69  | 74.00         | -19.31        | 48.97         | 5.72   | Peak    |

| High CH    |        |               |               |               |        |         |          |        |               |               |               |        |         |
|------------|--------|---------------|---------------|---------------|--------|---------|----------|--------|---------------|---------------|---------------|--------|---------|
| Horizontal |        |               |               |               |        |         | Vertical |        |               |               |               |        |         |
| Freq       | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | Factor | Remark  |
| MHz        | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB/m   |         |
| 2480.168   | 81.60  |               |               | 88.95         | -7.35  | Average | 2479.840 | 84.91  |               |               | 92.26         | -7.35  | Average |
| 2480.168   | 96.07  |               |               | 103.42        | -7.35  | Peak    | 2479.840 | 100.32 |               |               | 107.67        | -7.35  | Peak    |
| 2483.500   | 41.17  | 54.00         | -12.83        | 48.51         | -7.34  | Average | 2483.500 | 43.28  | 54.00         | -10.72        | 50.62         | -7.34  | Average |
| 2483.500   | 58.07  | 74.00         | -15.93        | 65.41         | -7.34  | Peak    | 2483.500 | 61.17  | 74.00         | -12.83        | 68.51         | -7.34  | Peak    |
| 4960.000   | 48.45  | 54.00         | -5.55         | 47.63         | 0.82   | Average | 4960.000 | 46.68  | 54.00         | -7.32         | 45.86         | 0.82   | Average |
| 4960.000   | 59.25  | 74.00         | -14.75        | 58.43         | 0.82   | Peak    | 4960.000 | 57.52  | 74.00         | -16.48        | 56.70         | 0.82   | Peak    |
| 7440.000   | 43.48  | 54.00         | -10.52        | 37.43         | 6.05   | Average | 7440.000 | 41.62  | 54.00         | -12.38        | 35.57         | 6.05   | Average |
| 7440.000   | 55.96  | 74.00         | -18.04        | 49.91         | 6.05   | Peak    | 7440.000 | 54.39  | 74.00         | -19.61        | 48.34         | 6.05   | Peak    |

Above 1G (1 GHz-26.5 GHz): The worst mode



$Level = Read\ Level + Factor$

$Over\ Limit = Level - Limit$

$Correct\ Factor = Antenna\ Factor + Cable\ Loss - Amplifier\ Gain$

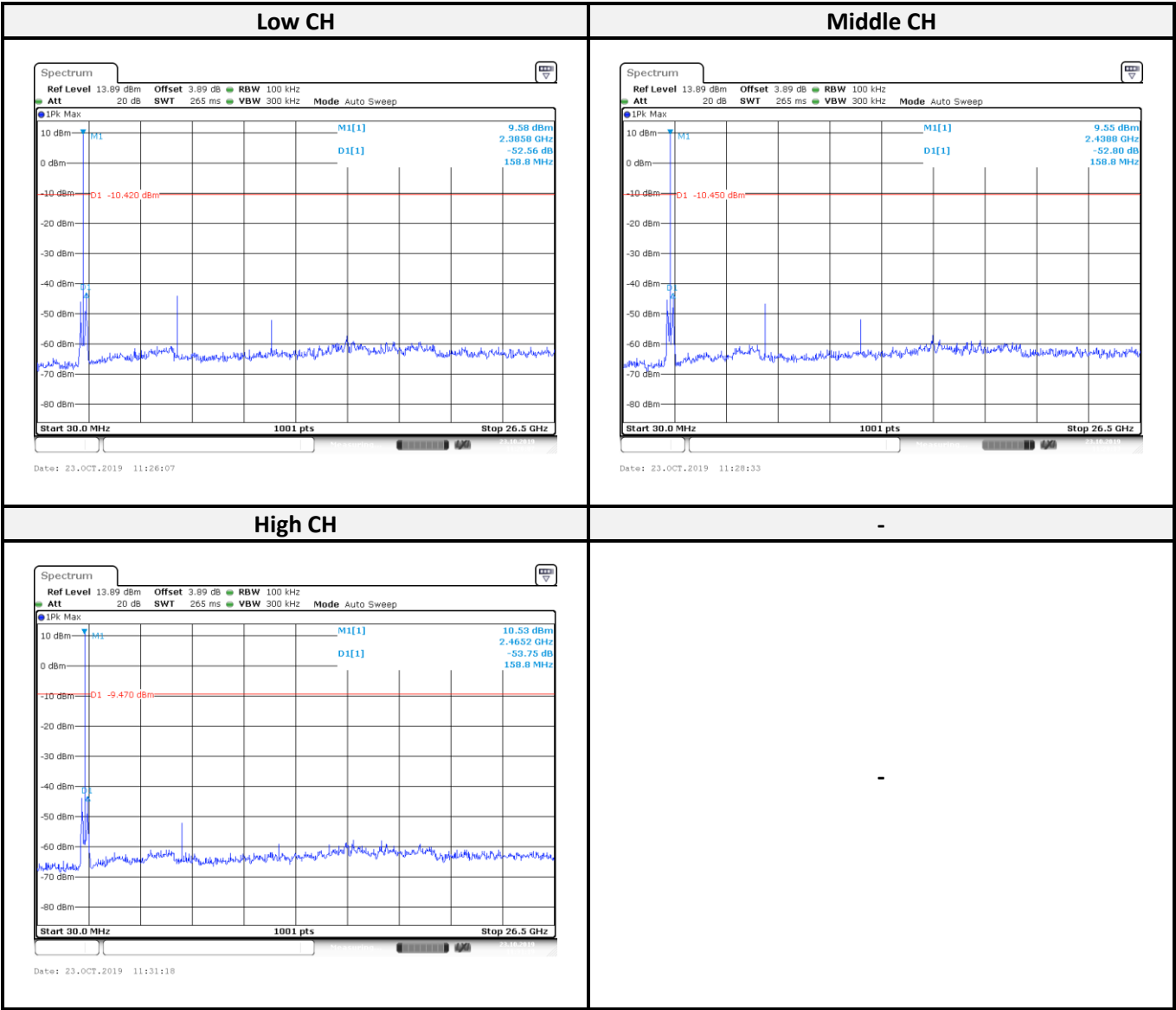
Spurious emissions more than 20 dB below the limit were not reported

**Conducted Spurious Emissions:**

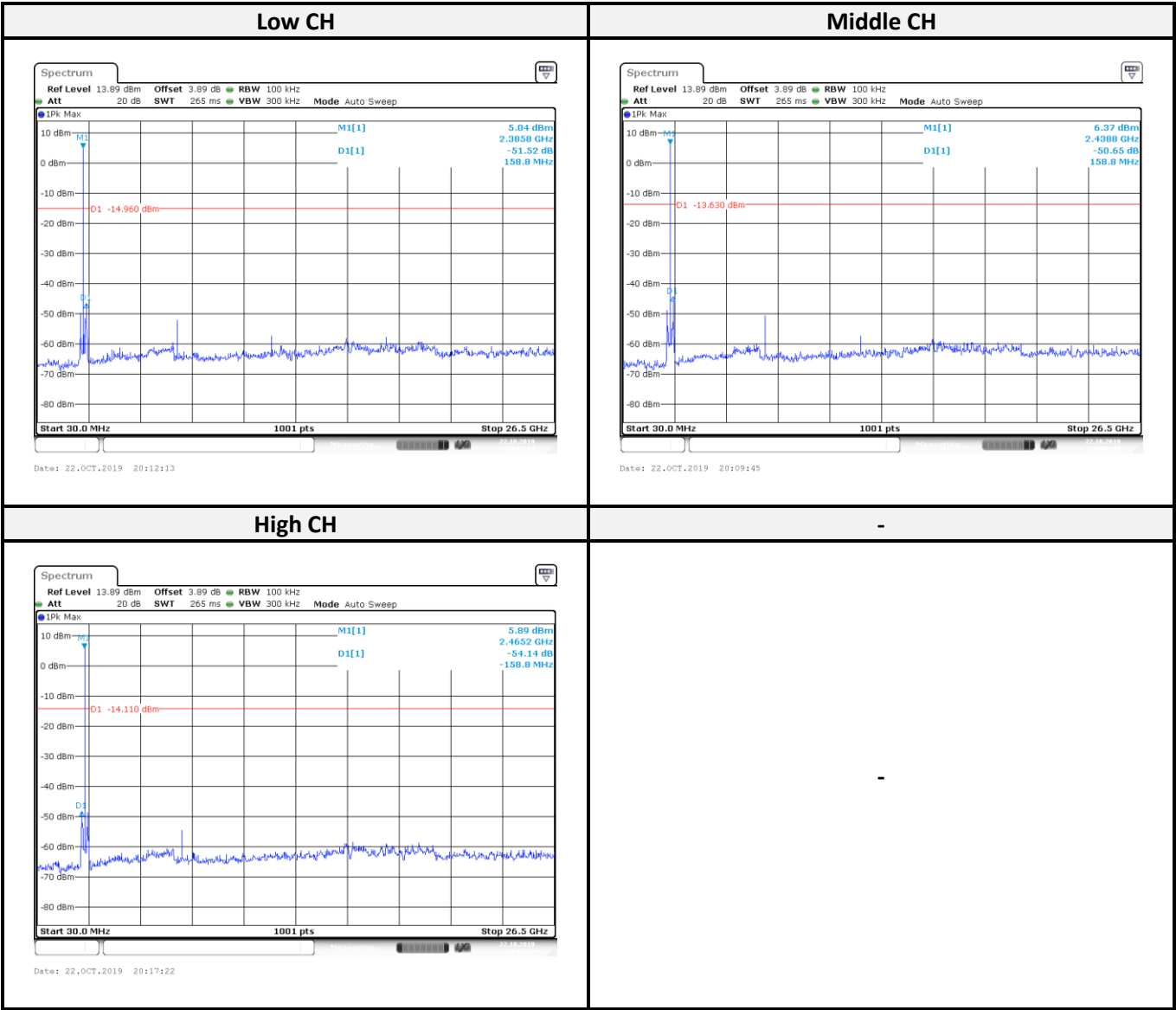
| Channel                          | Frequency (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Result     |
|----------------------------------|-----------------|-----------------------------------|-------------|------------|
| BR-1Mbps mode (GFSK)             |                 |                                   |             |            |
| Low                              | 2402            | 52.56                             | ≥ 20        | Compliance |
| Mid                              | 2441            | 52.80                             | ≥ 20        | Compliance |
| High                             | 2480            | 53.75                             | ≥ 20        | Compliance |
| EDR-2Mbps mode ( $\pi/4$ -DQPSK) |                 |                                   |             |            |
| Low                              | 2402            | 51.52                             | ≥ 20        | Compliance |
| Mid                              | 2441            | 50.65                             | ≥ 20        | Compliance |
| High                             | 2480            | 54.14                             | ≥ 20        | Compliance |
| EDR-3Mbps mode (8DPSK)           |                 |                                   |             |            |
| Low                              | 2402            | 56.48                             | ≥ 20        | Compliance |
| Mid                              | 2441            | 52.83                             | ≥ 20        | Compliance |
| High                             | 2480            | 52.02                             | ≥ 20        | Compliance |



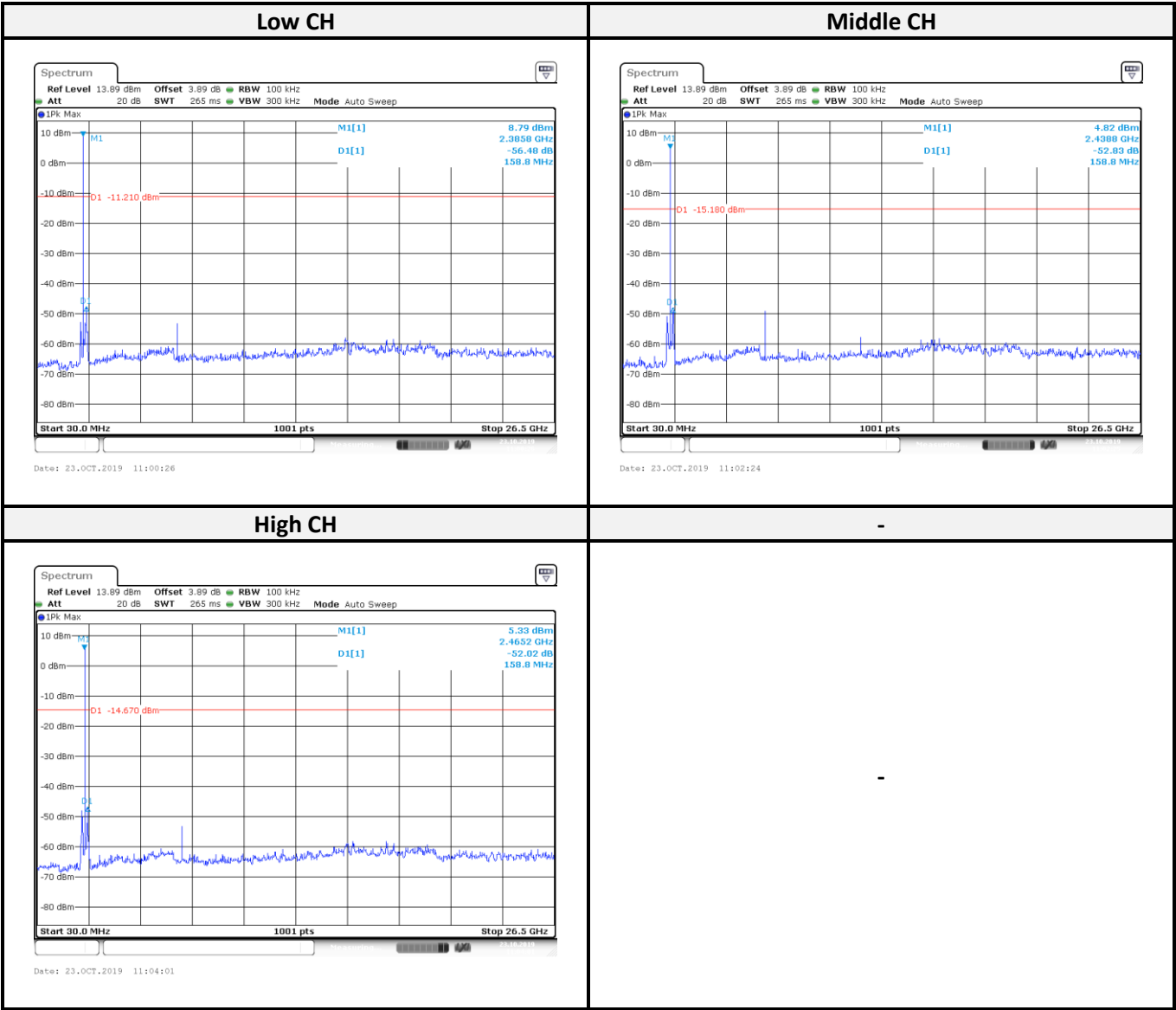
BR-1Mbps mode:



EDR-2Mbps mode:



EDR-3Mbps mode:



## 8 FCC §15.247(a)(1) – 20 dB Emission Bandwidth

### 8.1 Applicable Standard

According to FCC §15.247(a) (1) the maximum 20 dB bandwidth of the hopping channel shall be presented.

### 8.2 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.

### 8.3 Test Equipment List and Details

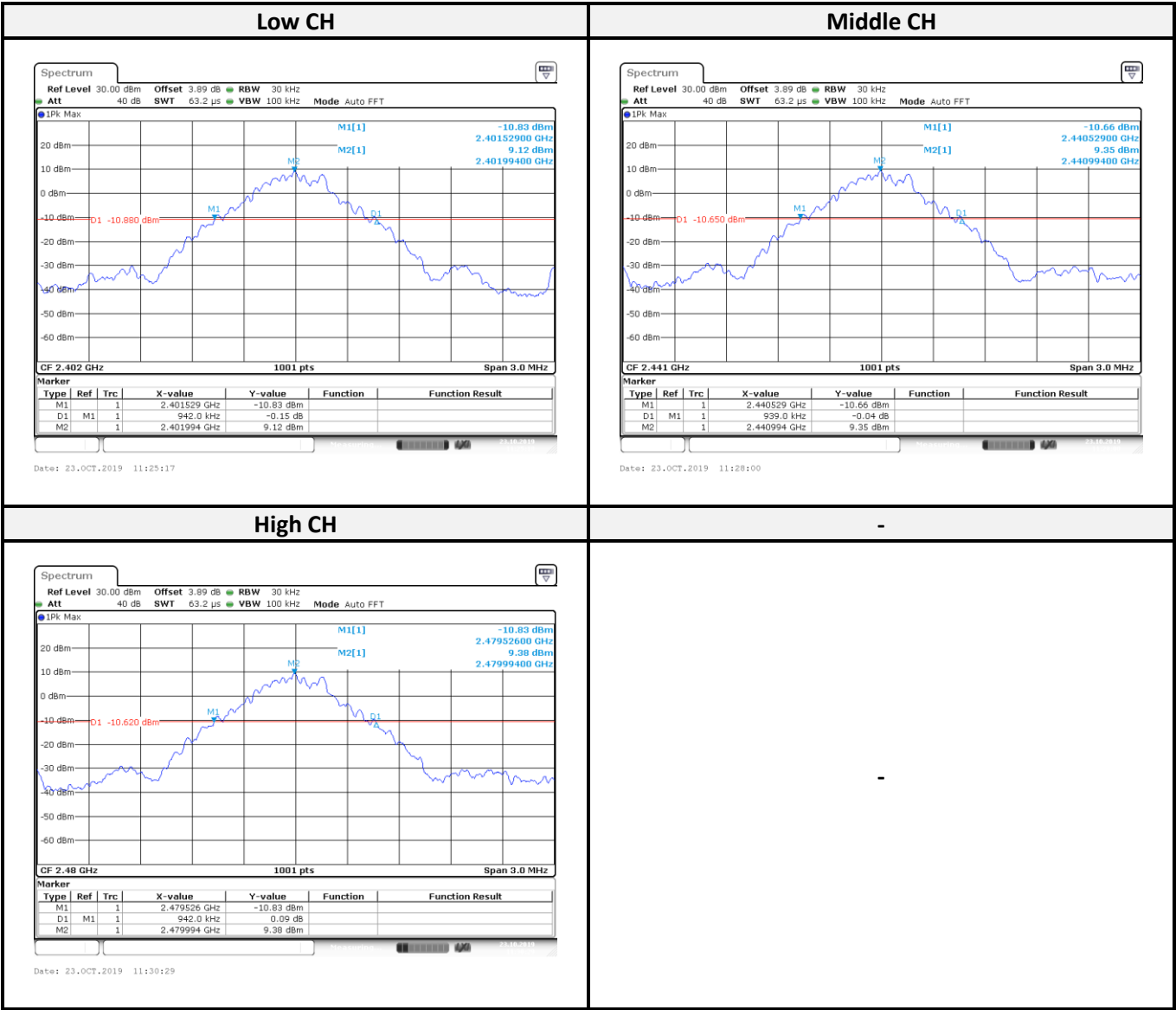
| Description           | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|---------|------------------|------------|------------|
| Conducted Room(TH-02) |                 |         |                  |            |            |
| Signal Analyzer 40GHZ | Rohde & Schwarz | FSV40-N | 102248           | 2019/09/11 | 2020/09/10 |
| Cable                 | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

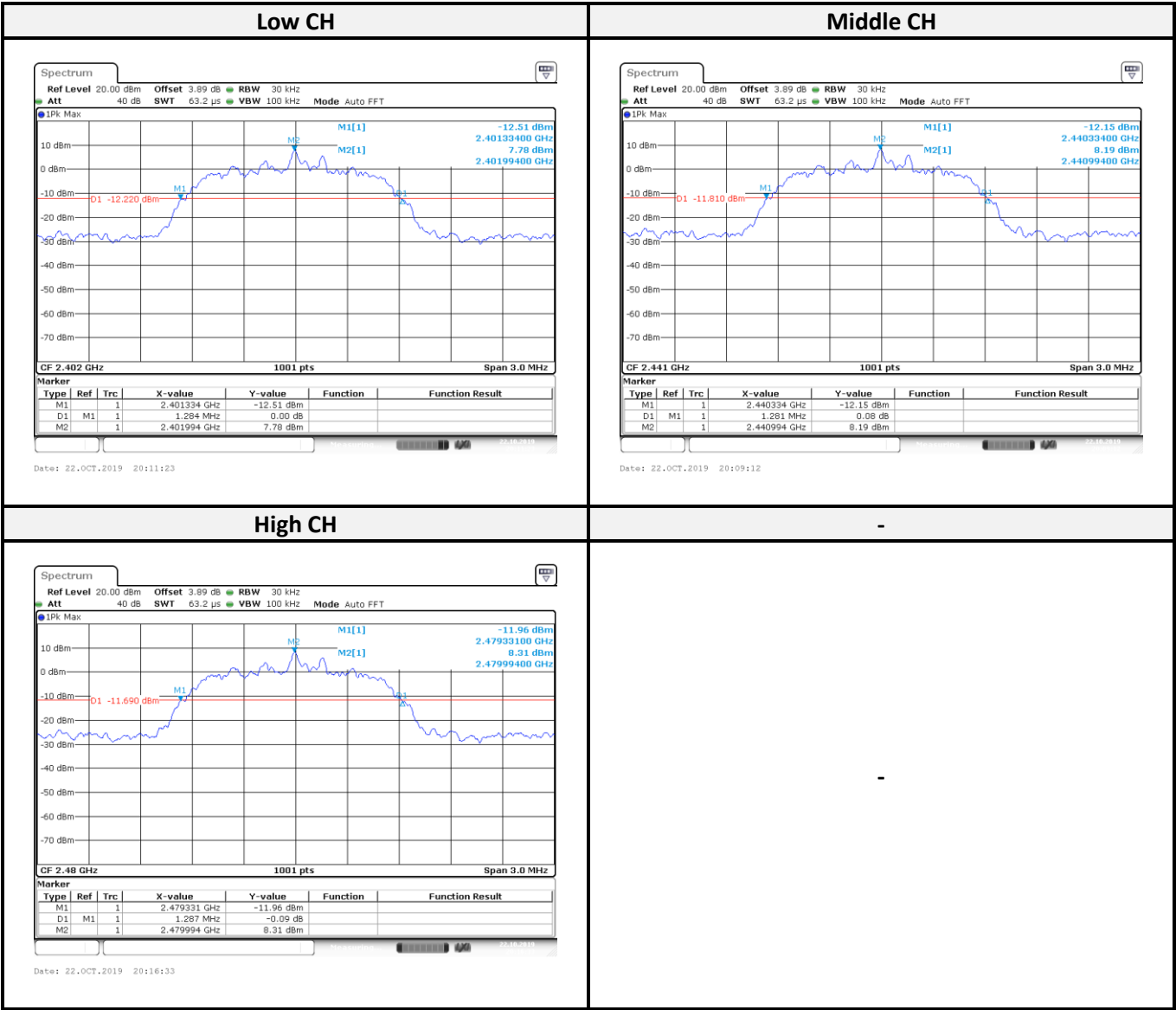
## 8.4 Test Results

| Channel                          | Frequency<br>(MHz) | 20 dB Bandwidth<br>(MHz) |
|----------------------------------|--------------------|--------------------------|
| BR-1Mbps Mode (GFSK)             |                    |                          |
| Low                              | 2402               | 0.9420                   |
| Middle                           | 2441               | 0.9390                   |
| High                             | 2480               | 0.9420                   |
| EDR-2Mbps Mode ( $\pi/4$ -DQPSK) |                    |                          |
| Low                              | 2402               | 1.2840                   |
| Middle                           | 2441               | 1.2810                   |
| High                             | 2480               | 1.2870                   |
| EDR-3Mbps Mode (8DPSK)           |                    |                          |
| Low                              | 2402               | 1.2660                   |
| Middle                           | 2441               | 1.2630                   |
| High                             | 2480               | 1.2690                   |

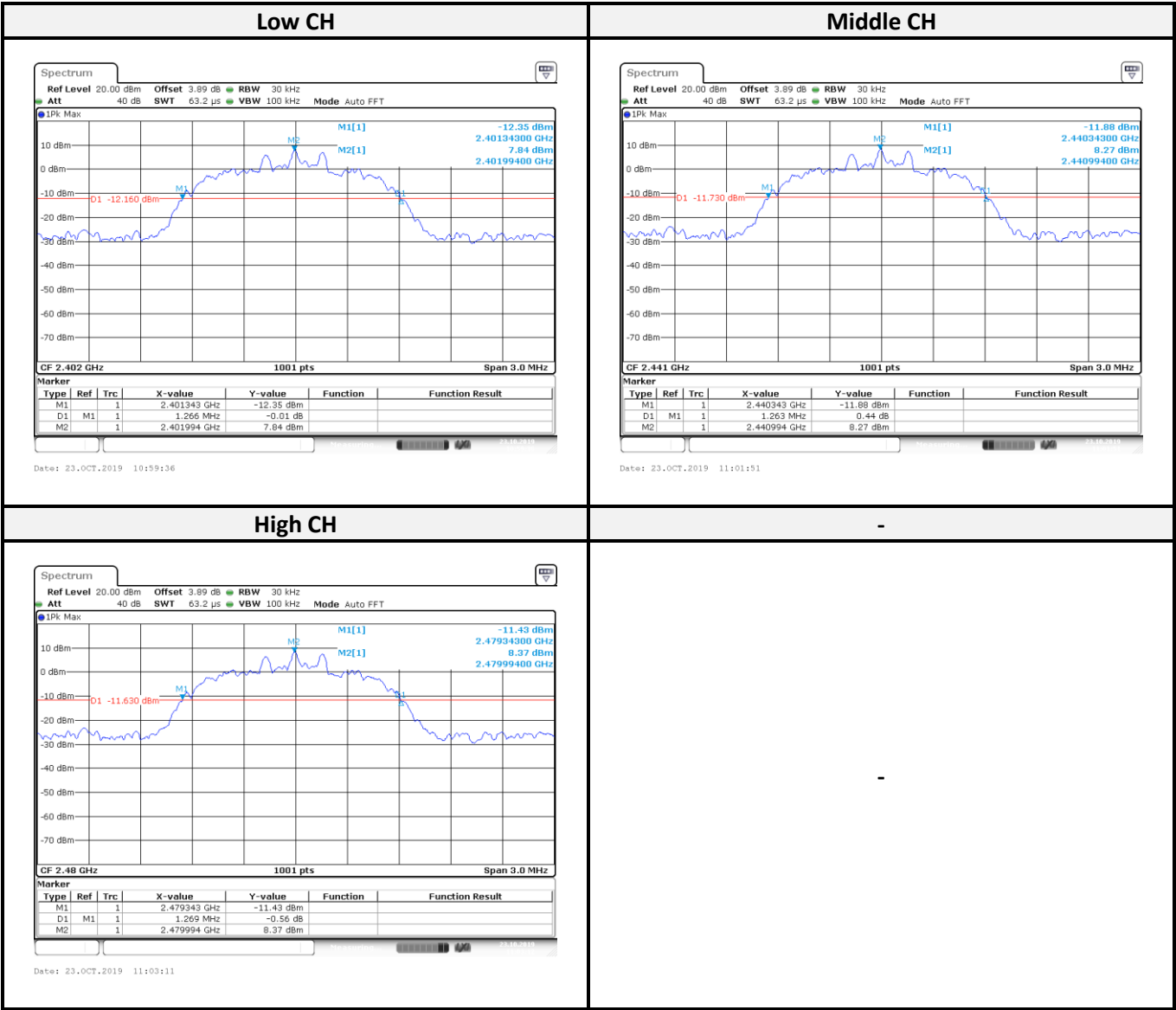
BR-1Mbps mode:



EDR-2Mbps Mode:



EDR-3Mbps Mode:





## 9 FCC §15.247(a)(1) – Channel Separation Test

### 9.1 Applicable Standard

According to FCC §15.247(a) (1): Frequency hopping systems shall have hopping 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.

### 9.2 Test Procedure

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\approx$  30% of the channel spacing, adjust as necessary to best identify the center of each individual channel. Video (or Average) Bandwidth (VBW)  $\geq$  RBW. Sweep = auto

Detector function = peak Trace = max hold

### 9.3 Test Equipment List and Details

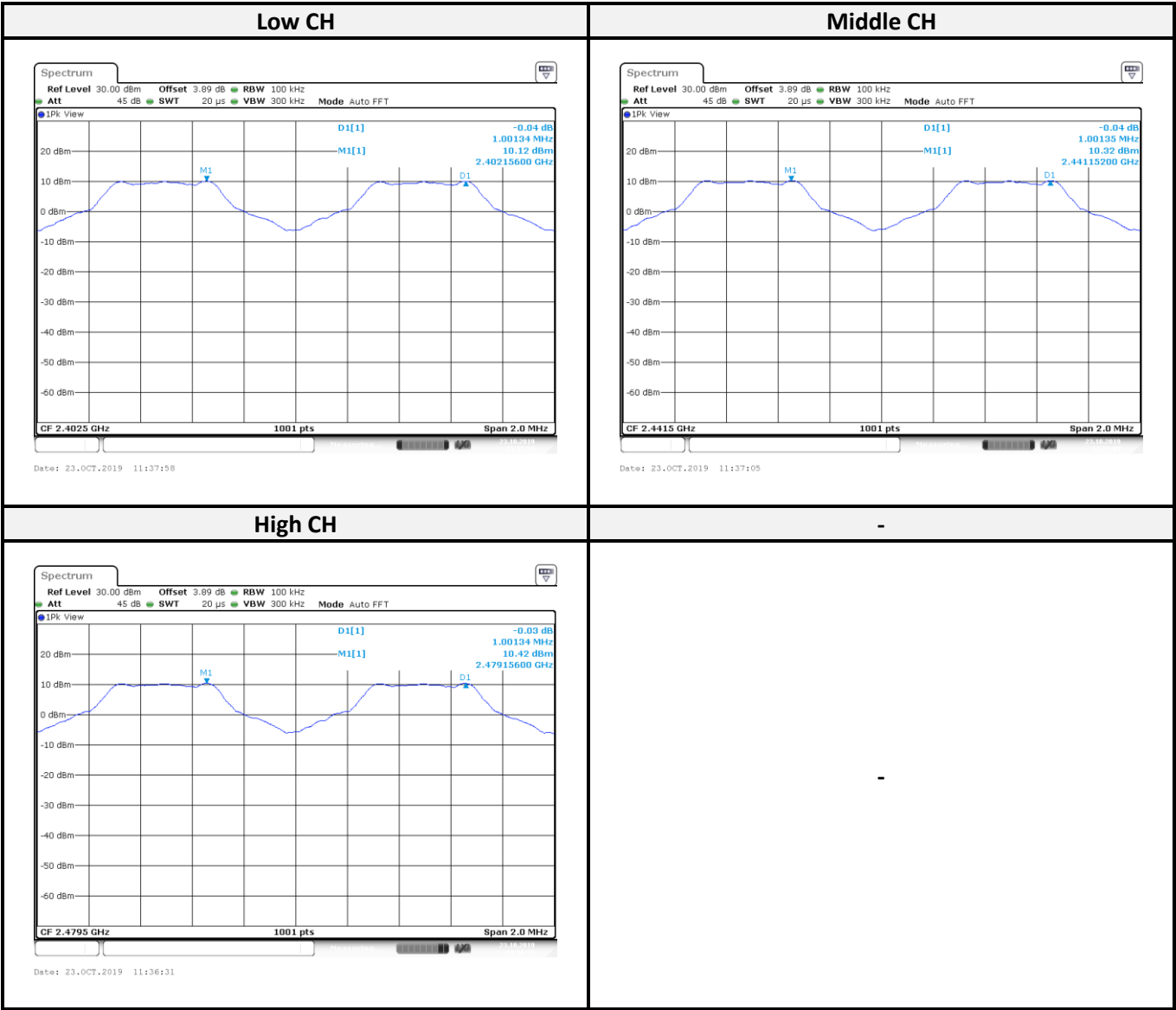
| Description           | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|---------|------------------|------------|------------|
| Conducted Room(TH-02) |                 |         |                  |            |            |
| Signal Analyzer 40GHZ | Rohde & Schwarz | FSV40-N | 102248           | 2019/09/11 | 2020/09/10 |
| Cable                 | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

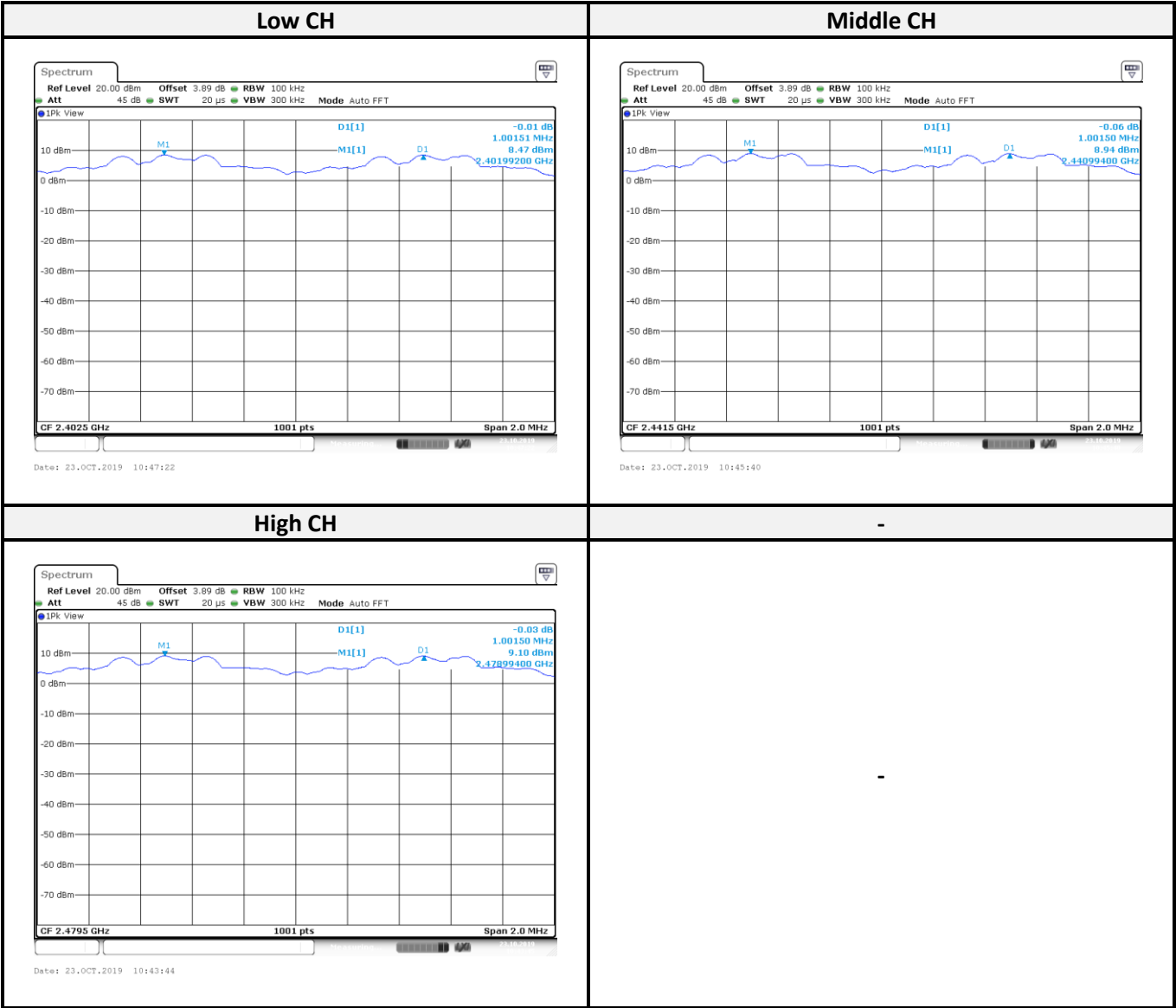
## 9.4 Test Results

| Channel  | Frequency (MHz) | Channel Separation (MHz) | 20 dBc BW (MHz) | Limit Two-thirds of the 20 dB bandwidth (MHz) | Result     |
|--|-----------------|--------------------------|-----------------|---|------------|
| <b>BR-1Mbps mode (GFSK)</b>                      |                 |                          |                 |   |            |
| Low  | 2402            | 1.00134                  | 0.9420          | 0.628   | Compliance |
| Middle   | 2441            | 1.00135                  | 0.9390          | 0.626   | Compliance |
| High   | 2480            | 1.00134                  | 0.9420          | 0.628   | Compliance |
| <b>EDR-2Mbps mode (<math>\pi/4</math>-DQPSK)</b> |                 |                          |                 |   |            |
| Low  | 2402            | 1.00151                  | 1.2840          | 0.856   | Compliance |
| Middle   | 2441            | 1.00150                  | 1.2810          | 0.854   | Compliance |
| High   | 2480            | 1.00150                  | 1.2870          | 0.858   | Compliance |
| <b>EDR-3Mbps mode (8DPSK)</b>                    |                 |                          |                 |   |            |
| Low  | 2402            | 1.00167                  | 1.2660          | 0.844   | Compliance |
| Middle   | 2441            | 1.00167                  | 1.2630          | 0.842   | Compliance |
| High   | 2480            | 1.00168                  | 1.2690          | 0.846   | Compliance |

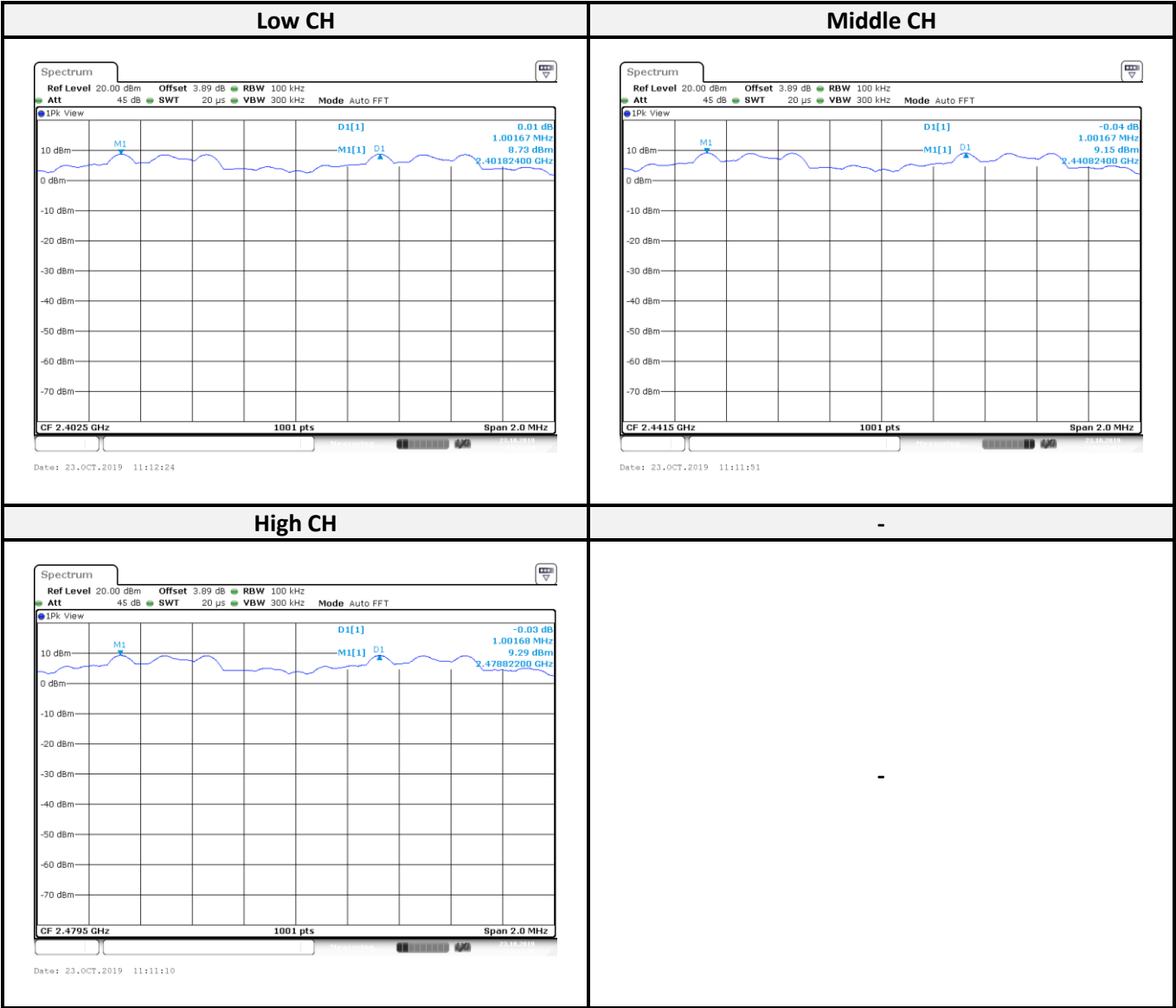
BR-1Mbps mode:



EDR-2Mbps mode:



EDR-3Mbps mode:



## 10 FCC §15.247(a)(1)(iii) – Time of Occupancy (Dwell Time)

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### 10.1 Applicable Standard

According to FCC §15.247(a)(1)(iii),

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.

### 10.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel

RBW  $\leq$  channel spacing and where possible RBW should be set  $\gg 1/T$ , where T is the expected dwell time per channel

Sweep = as necessary to capture the entire dwell time per hopping channel Detector function = peak

Trace = max hold

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements.

Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) x (period specified in the requirements / analyzer sweep time)

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

### 10.3 Test Equipment List and Details

| Description           | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|---------|------------------|------------|------------|
| Conducted Room(TH-02) |                 |         |                  |            |            |
| Signal Analyzer 40GHZ | Rohde & Schwarz | FSV40-N | 102248           | 2019/09/11 | 2020/09/10 |
| Cable                 | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

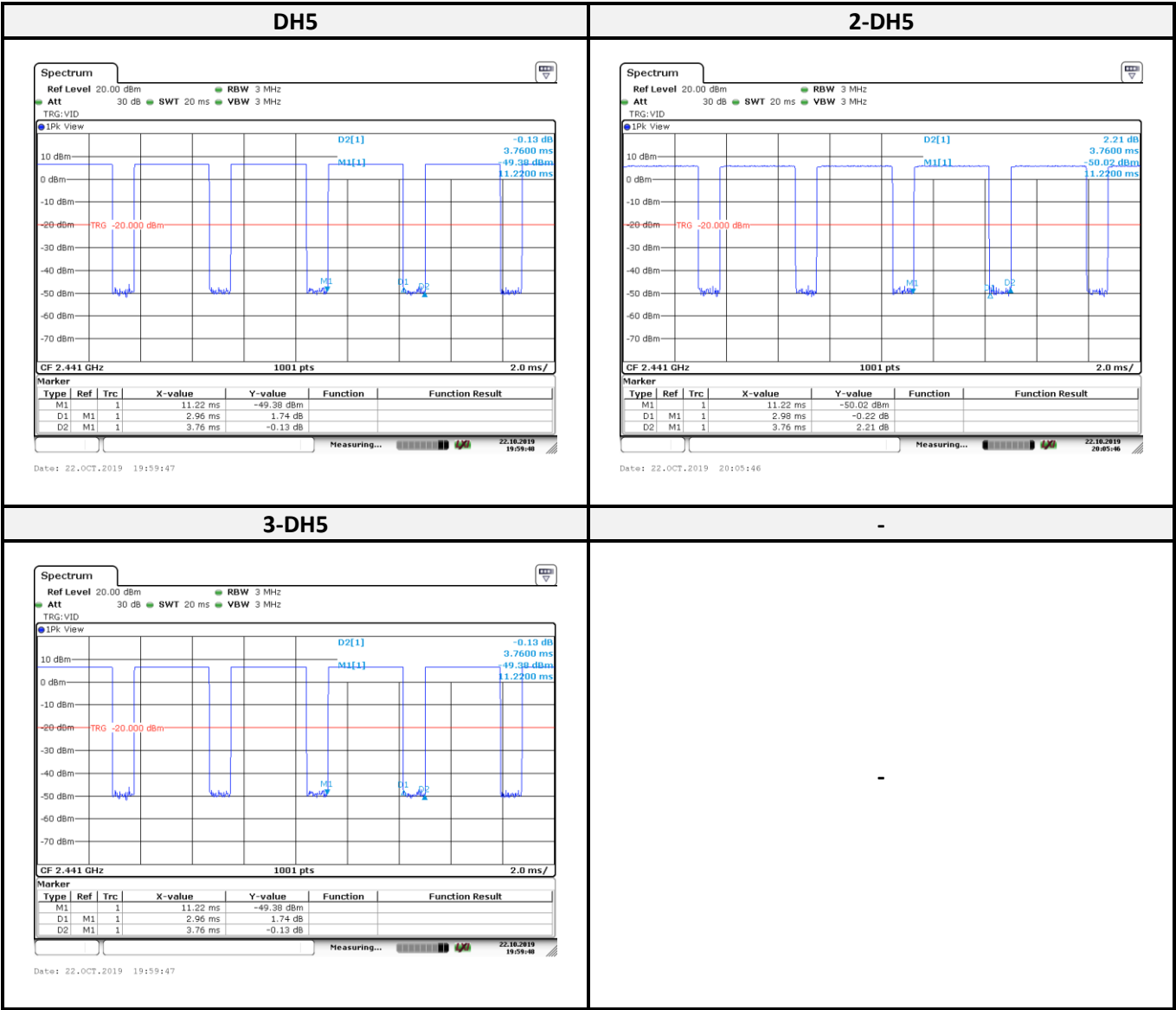
### 10.4 Test Results

| Time of Occupancy (Dwell Time) Result |                         |                                     |                                |                       |
|---------------------------------------|-------------------------|-------------------------------------|--------------------------------|-----------------------|
| Modulation Mode                       | Pulse Time per Hop (ms) | Number of Pulse in<br>[0.4 x N sec] | Dwell Time in<br>[0.4 x N sec] | Dwell Time Limits (s) |
|                                       |                         | (s)                                 | (s)                            |                       |
| BR-1Mbps mode (GFSK)                  | 2.96                    | 106.7                               | 0.316                          | 0.4                   |
| EDR-2Mbps mode ( $\pi/4$ -DQPSK)      | 2.98                    | 106.7                               | 0.318                          | 0.4                   |
| EDR-3Mbps mode (8DPSK)                | 2.96                    | 106.7                               | 0.316                          | 0.4                   |

\*Number of Pulse in [0.4 x N sec] =  $1600/79/6 \times (0.4 \times 79)$

\*Dwell Time in [0.4 x N sec] = (Pulse Time \* Number of Pulse in [0.4 x N sec])/1000

\* Bluetooth ACL packets can be 1, 3, or 5 time slots. The DH1 packet can cover a single time slot. The DH3 packet can cover up to 3 time slots. The DH5 packet can cover up to 5 time slots. Operate DH5 at maximum dwell time and maximum duty cycle. A maximum length packet has duration of 5 time slots. The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.





## 11 FCC §15.247(a)(1)(iii) –Quantity of hopping channel Test

### 11.1 Applicable Standard

According to FCC §15.247(a)(1)(iii),

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.

### 11.2 Test Procedure

Span = the frequency band of operation.

RBW < 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller VBW ≥ RBW.

Sweep = auto. Detector function = peak Trace = max hold.

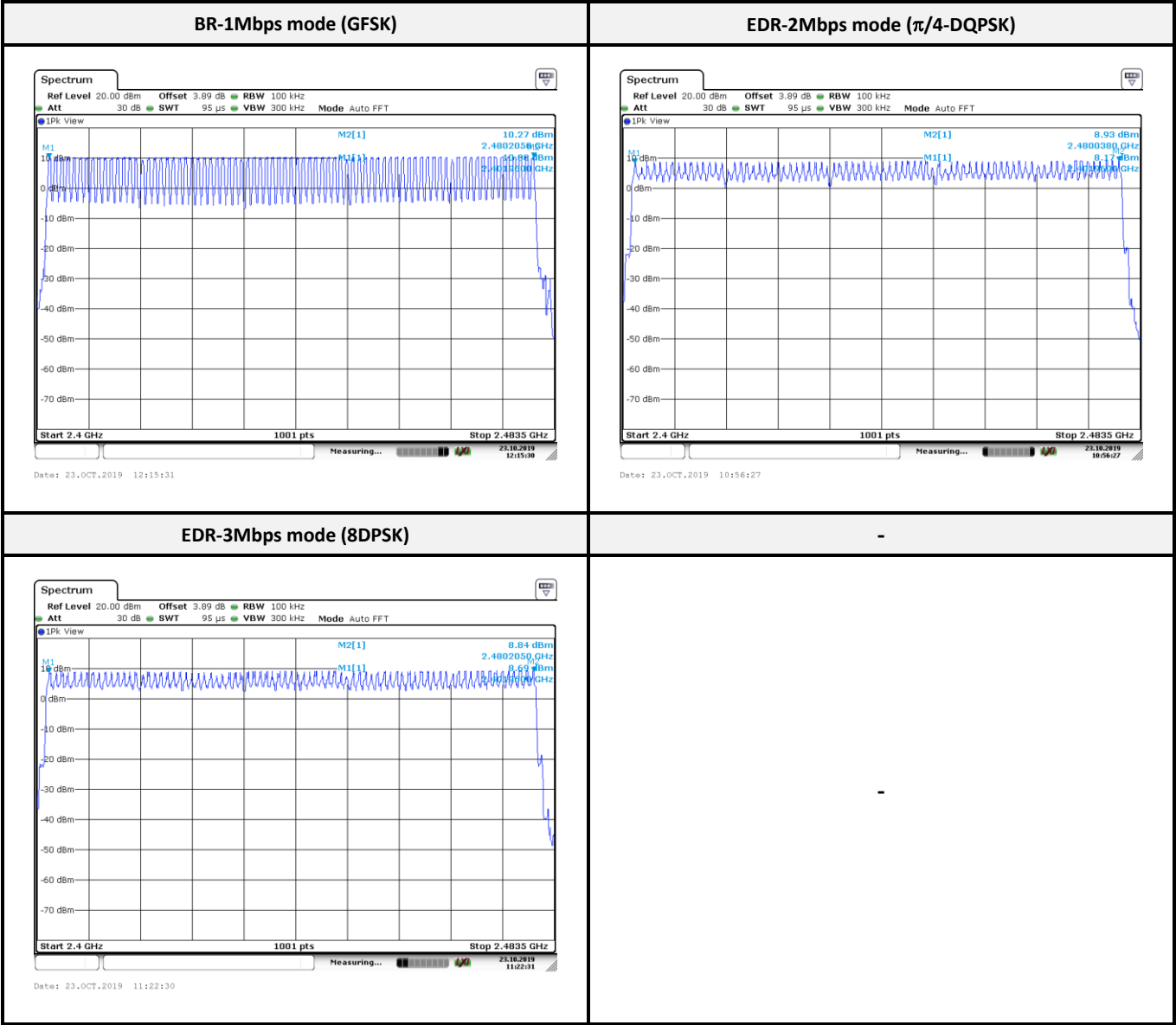
### 11.3 Test Equipment List and Details

| Description           | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|---------|------------------|------------|------------|
| Conducted Room(TH-02) |                 |         |                  |            |            |
| Signal Analyzer 40GHZ | Rohde & Schwarz | FSV40-N | 102248           | 2019/09/11 | 2020/09/10 |
| Cable                 | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

11.4 Test Results

| Mode           | Frequency Range (MHz) | Number of Hopping Channel | Limit (CH) | Result     |
|----------------|-----------------------|---------------------------|------------|------------|
| BR-1Mbps mode  | 2402-2480             | 79                        | >15        | Compliance |
| EDR-2Mbps mode | 2402-2480             | 79                        | >15        | Compliance |
| EDR-3Mbps mode | 2402-2480             | 79                        | >15        | Compliance |



## 12 FCC §15.247(b)(1) – Maximum Output Power

### 12.1 Applicable Standard

According to FCC §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. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 12.2 Test Procedure

Place the EUT on a bench and set it in transmitting mode.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Power sensor.

### 12.3 Test Equipment List and Details

| Description           | Manufacture | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-------------|---------|------------------|------------|------------|
| Conducted Room(TH-02) |             |         |                  |            |            |
| Power Sensor          | Agilent     | U2021XA | MY54250014       | 2019/03/06 | 2020/03/05 |
| Cable                 | MTJ         | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

## 12.4 Test Results

| Channel                          | Frequency (MHz) | Maximum Peak Output Power (dBm) | Maximum Peak Output Power (W) | Limit (dBm) | Result     |
|----------------------------------|-----------------|---------------------------------|-------------------------------|-------------|------------|
| BR-1Mbps mode (GFSK)             |                 |                                 |                               |             |            |
| Low                              | 2402            | 10.62                           | 0.0115                        | 21          | Compliance |
| Middle                           | 2441            | 10.82                           | 0.0121                        | 21          | Compliance |
| High                             | 2480            | 10.81                           | 0.0121                        | 21          | Compliance |
| EDR-2Mbps mode ( $\pi/4$ -DQPSK) |                 |                                 |                               |             |            |
| Low                              | 2402            | 9.81                            | 0.0096                        | 21          | Compliance |
| Middle                           | 2441            | 10.06                           | 0.0101                        | 21          | Compliance |
| High                             | 2480            | 10.13                           | 0.0103                        | 21          | Compliance |
| EDR-3Mbps mode (8DPSK)           |                 |                                 |                               |             |            |
| Low                              | 2402            | 9.81                            | 0.0096                        | 21          | Compliance |
| Middle                           | 2441            | 10.06                           | 0.0101                        | 21          | Compliance |
| High                             | 2480            | 10.15                           | 0.0104                        | 21          | Compliance |

### 13 FCC §15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

#### 13.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c)

#### 13.2 Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.

RBW = 100 kHz VBW = 300 kHz.

Sweep = coupled. Detector function = peak Trace = max hold.

#### 13.3 Test Equipment List and Details

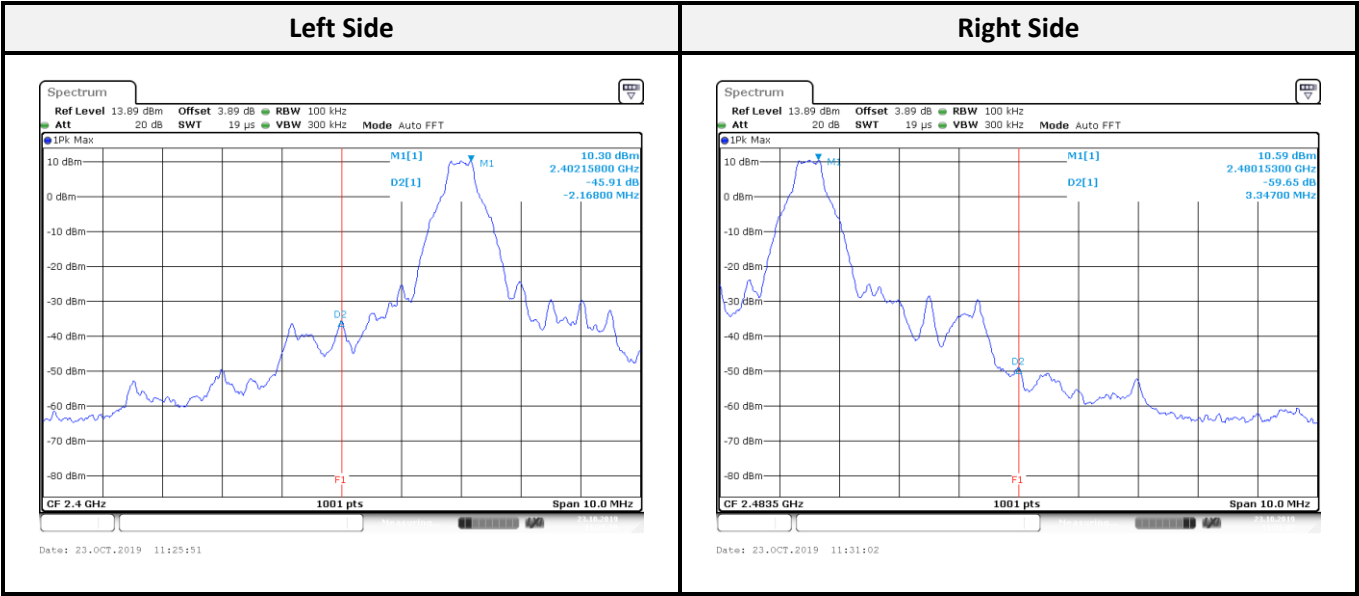
| Description           | Manufacture     | Model   | Serial No.       | Cal. Date. | Cal. Due.  |
|-----------------------|-----------------|---------|------------------|------------|------------|
| Conducted Room(TH-02) |                 |         |                  |            |            |
| Signal Analyzer 40GHZ | Rohde & Schwarz | FSV40-N | 102248           | 2019/09/11 | 2020/09/10 |
| Cable                 | MTJ             | MT40S   | 620620-MT40S-100 | 2018/12/28 | 2019/12/27 |

**\*Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

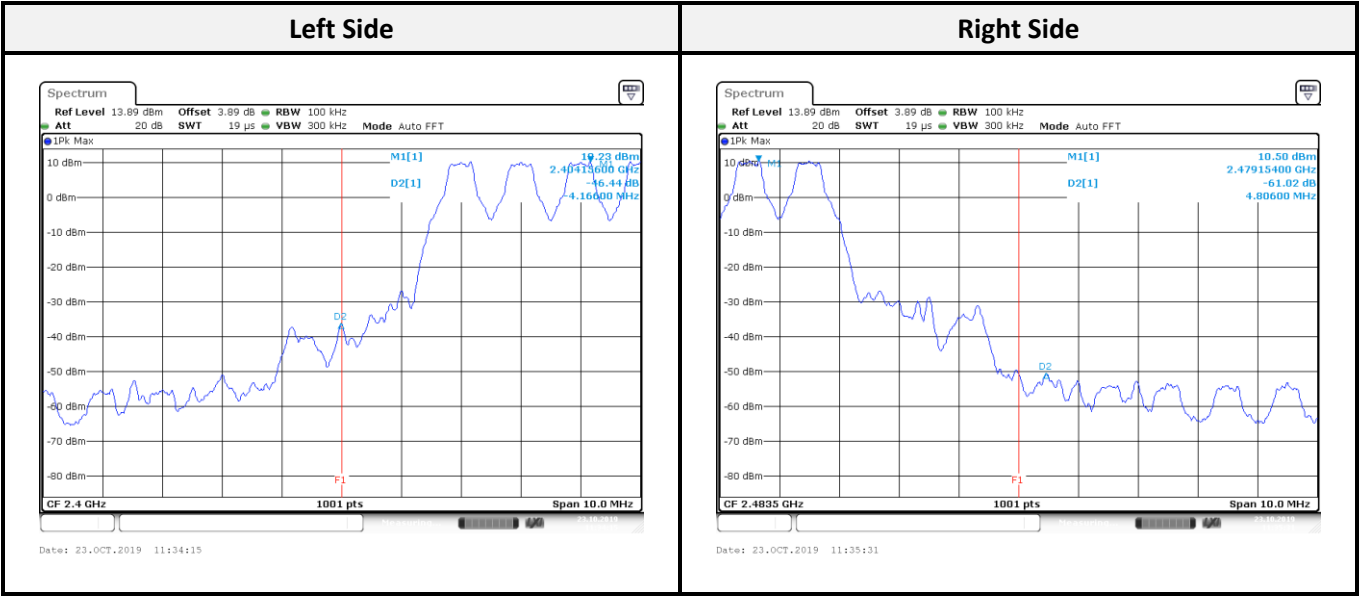
**13.4 Test Results**

| Channel                       | Frequency (MHz) | Delta Peak to Band Emission (dBc) | Limit (dBc) | Result     |
|-------------------------------|-----------------|-----------------------------------|-------------|------------|
| <b>BR-1Mbps mode</b>          |                 |                                   |             |            |
| Low                           | 2402            | 45.91                             | $\geq 20$   | Compliance |
| High                          | 2480            | 59.65                             | $\geq 20$   | Compliance |
| <b>BR-1Mbps Hopping mode</b>  |                 |                                   |             |            |
| Low                           | 2402            | 46.44                             | $\geq 20$   | Compliance |
| High                          | 2480            | 61.02                             | $\geq 20$   | Compliance |
| <b>EDR-2Mbps mode</b>         |                 |                                   |             |            |
| Low                           | 2402            | 40.58                             | $\geq 20$   | Compliance |
| High                          | 2480            | 58.86                             | $\geq 20$   | Compliance |
| <b>EDR-2Mbps Hopping mode</b> |                 |                                   |             |            |
| Low                           | 2402            | 40.81                             | $\geq 20$   | Compliance |
| High                          | 2480            | 59.19                             | $\geq 20$   | Compliance |
| <b>EDR-3Mbps mode</b>         |                 |                                   |             |            |
| Low                           | 2402            | 40.43                             | $\geq 20$   | Compliance |
| High                          | 2480            | 56.28                             | $\geq 20$   | Compliance |
| <b>EDR-3Mbps Hopping mode</b> |                 |                                   |             |            |
| Low                           | 2402            | 41.14                             | $\geq 20$   | Compliance |
| High                          | 2480            | 55.68                             | $\geq 20$   | Compliance |

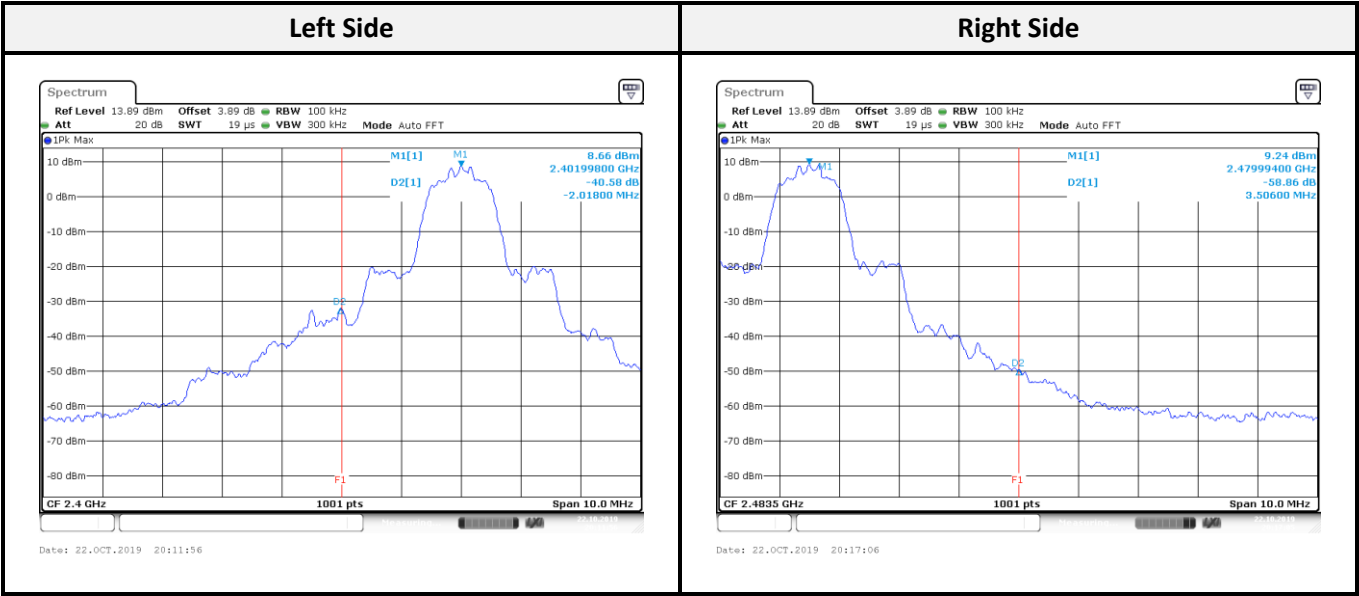
BR-1Mbps mode:



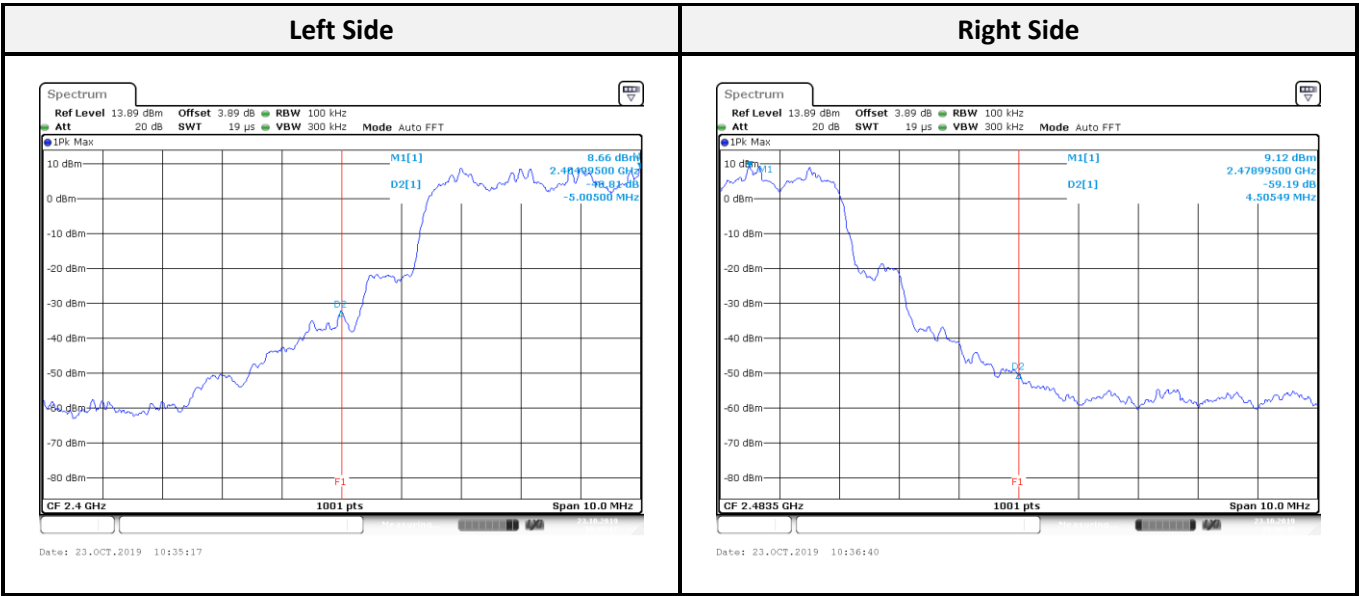
BR-1Mbps Hopping mode:



EDR-2Mbps mode:

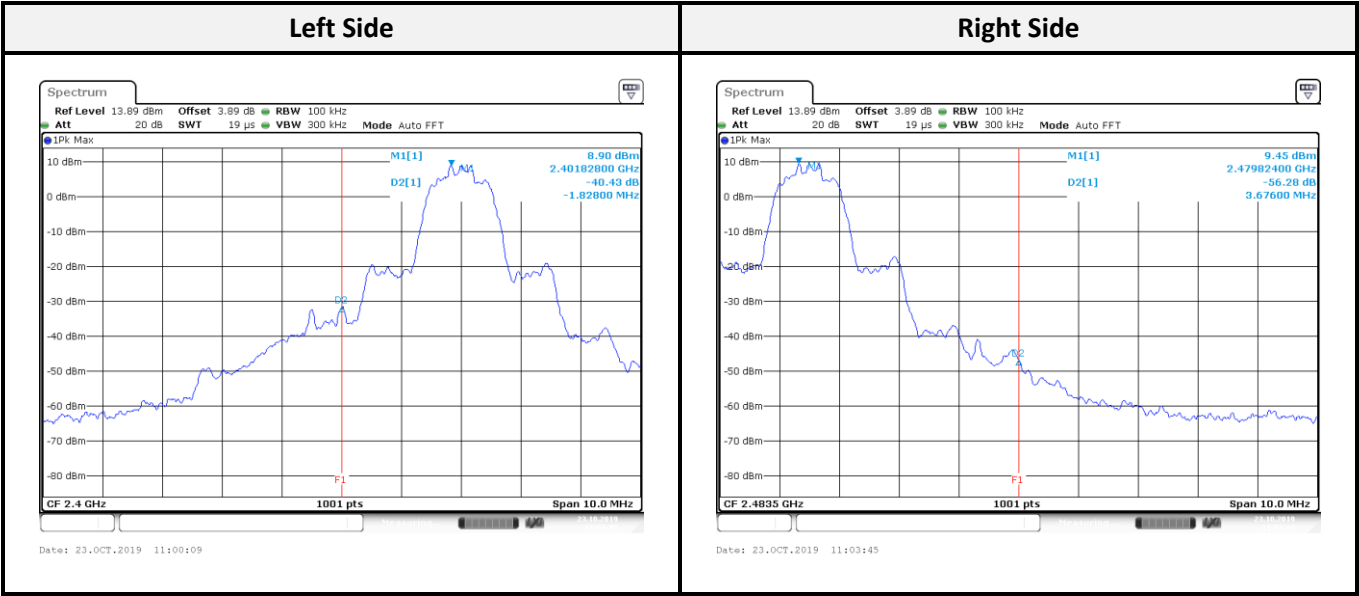


EDR-2Mbps Hopping mode:

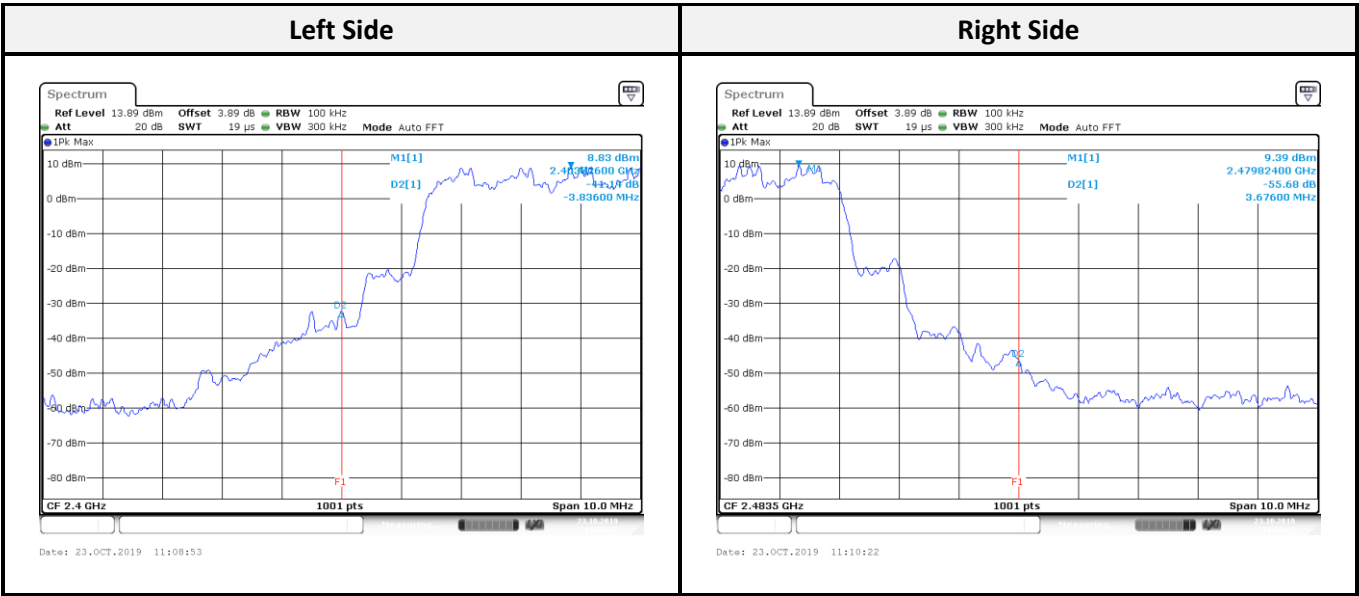




EDR-3Mbps mode:



EDR-3Mbps Hopping mode:



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