

**FCC Part 15.249**  
**RSS-GEN ISSUE 5 February 2021 AMENDMENT 2**  
**RSS-210, ISSUE 10, April 2020 AMENDMENT**  
**TEST REPORT**

For

**Keeson Technology Corporation Limited**

No. 195, Yuanfeng East Road, Wangjiangjing, Xiuzhou District, Jiaxing City, China 314000

**FCC ID: 2AK23-RF402B**  
**IC: 22406-RF402B**

**Report Type:**  
Original Report

**Product Type:**  
Remote Control

**Report Producer :** Coco Lin

**Report Number :** RXZ220616003RF01

**Report Date :** 2022-07-21

**Reviewed By:** Andy Shih

*Andy Shih*

**Prepared By:** Bay Area Compliance Laboratories Corp.

(New Taipei Laboratory)

70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,

New Taipei City 22183, Taiwan, R.O.C.

Tel: +886 (2) 2647 6898

Fax: +886 (2) 2647 6895

[www.bacl.com.tw](http://www.bacl.com.tw)

## Revision History

| Revision | No.          | Report Number    | Issue Date | Description     | Author/<br>Revised by |
|----------|--------------|------------------|------------|-----------------|-----------------------|
| 0.0      | RXZ220616003 | RXZ220616003RF01 | 2022-07-21 | Original Report | Coco Lin              |

## **TABLE OF CONTENTS**

|          |                                                                                                                    |           |
|----------|--------------------------------------------------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>General Information .....</b>                                                                                   | <b>4</b>  |
| 1.1      | Product Description for Equipment under Test (EUT) .....                                                           | 4         |
| 1.2      | Objective .....                                                                                                    | 5         |
| 1.3      | Related Submittal(s)/Grant(s).....                                                                                 | 5         |
| 1.4      | Test Methodology.....                                                                                              | 5         |
| 1.5      | Statement.....                                                                                                     | 5         |
| 1.6      | Measurement Uncertainty .....                                                                                      | 6         |
| 1.7      | Environmental Conditions.....                                                                                      | 6         |
| 1.8      | Test Facility .....                                                                                                | 6         |
| <b>2</b> | <b>System Test Configuration .....</b>                                                                             | <b>7</b>  |
| 2.1      | Description of Test Configuration.....                                                                             | 7         |
| 2.2      | Equipment Modifications .....                                                                                      | 7         |
| 2.3      | EUT Exercise Software .....                                                                                        | 7         |
| 2.4      | Support Equipment List and Details.....                                                                            | 7         |
| 2.5      | External Cable List and Details.....                                                                               | 7         |
| 2.6      | Block Diagram of Test Setup .....                                                                                  | 8         |
| <b>3</b> | <b>Summary of Test Results .....</b>                                                                               | <b>9</b>  |
| <b>4</b> | <b>Test Equipment List and Details.....</b>                                                                        | <b>10</b> |
| <b>5</b> | <b>RSS-102 § 2.5.1 – EXEMPTION LIMITS FROM ROUTINE EVALUATION – SAR<br/>EVALUATION.....</b>                        | <b>11</b> |
| 5.1      | Applicable Standard .....                                                                                          | 11        |
| 5.2      | Calculated Data: .....                                                                                             | 12        |
| <b>6</b> | <b>FCC §15.203 &amp; RSS-GEN CLAUSE 6.8 – Antenna Requirements .....</b>                                           | <b>13</b> |
| 6.1      | Applicable Standard .....                                                                                          | 13        |
| 6.2      | Antenna Information .....                                                                                          | 13        |
| <b>7</b> | <b>FCC §15.209, §15.205 , §15.249 &amp; RSS-210 ANNEX B.10, RSS-GEN CLAUSE 8.10 -<br/>Radiated Emissions .....</b> | <b>14</b> |
| 7.1      | Applicable Standard .....                                                                                          | 14        |
| 7.2      | EUT Setup .....                                                                                                    | 15        |
| 7.3      | EMI Test Receiver & Spectrum Analyzer Setup.....                                                                   | 15        |
| 7.4      | Test Procedure .....                                                                                               | 16        |
| 7.5      | Corrected Factor & Margin Calculation.....                                                                         | 16        |
| 7.6      | Test Results Summary.....                                                                                          | 16        |
| 7.7      | Test Results .....                                                                                                 | 17        |
| <b>8</b> | <b>FCC §15.215(c) &amp; RSS-GEN CLAUSE 6.7 – 20 dB Bandwidth Testing and 99%<br/>OCCUPIED BANDWIDTH .....</b>      | <b>21</b> |
| 8.1      | Applicable Standard .....                                                                                          | 21        |
| 8.2      | Test Procedure .....                                                                                               | 22        |
| 8.3      | Test Results .....                                                                                                 | 22        |

# 1 General Information

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

|                                    |                                                                                                                                                                                                                                                        |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicant                          | Keeson Technology Corporation Limited                                                                                                                                                                                                                  |
|                                    | No. 195, Yuanfeng East Road, Wangjiangjing, Xiuzhou District, Jiaxing City, China 314000                                                                                                                                                               |
| Manufacturer                       | Keeson Technology Corporation Limited                                                                                                                                                                                                                  |
|                                    | No. 195, Yuanfeng East Road, Wangjiangjing, Xiuzhou District, Jiaxing City, China 314000                                                                                                                                                               |
| Brand(Trade) Name                  | N/A                                                                                                                                                                                                                                                    |
| Product (Equipment)                | Remote Control                                                                                                                                                                                                                                         |
| Main Model Name (HVIN)             | RF402B                                                                                                                                                                                                                                                 |
| Frequency Range                    | 2403-2480 MHz                                                                                                                                                                                                                                          |
| Antenna Specification              | PCB Antenna / 1 dBi                                                                                                                                                                                                                                    |
| Power Operation<br>(Voltage Range) | <input type="checkbox"/> AC 120V/60Hz<br><input type="checkbox"/> Adapter I/P:<br><input type="checkbox"/> By AC Power Cord<br><input type="checkbox"/> PoE                                                                                            |
|                                    | <input checked="" type="checkbox"/> DC Type<br><input checked="" type="checkbox"/> 3Vdc from Battery*2<br><input type="checkbox"/> DC Power Supply<br><input type="checkbox"/> External from USB Cable<br><input type="checkbox"/> External DC Adapter |
|                                    | <input type="checkbox"/> Host System                                                                                                                                                                                                                   |
|                                    |                                                                                                                                                                                                                                                        |
| Received Date                      | Jun. 17, 2022                                                                                                                                                                                                                                          |
| Date of Test                       | Jun. 22, 2022 ~ Jun. 25, 2022                                                                                                                                                                                                                          |

*\*All measurement and test data in this report was gathered from production sample serial number:*

*RXZ220616003-01 (Assigned by BACL, New Taipei Laboratory).*

## 1.2 Objective

This report is prepared on behalf of *Keeson Technology Corporation Limited* in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commission's rules, and RSS-210, Issue 10, April 2020 Amendment of the Innovation, Science and Economic Development Canada, and RSS-Gen Issue 5, February 2021 Amendment 2, General Requirements for Compliance of Radio Apparatus.

## 1.3 Related Submittal(s)/Grant(s)

N/A.

## 1.4 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, and RSS-210, Issue 10, April 2020 Amendment of the Innovation, Science and Economic Development Canada, and RSS-Gen Issue 5, February 2021 Amendment 2, General Requirements for Compliance of Radio Apparatus.

## 1.5 Statement

Decision Rule: No, (The test results do not include MU judgment)

It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (New Taipei Laboratory).

Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

The determination of the test results does not require consideration of the uncertainty of the measurement, unless the assessment is required by customer agreement, regulation or standard document specification.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is not responsible for the authenticity of the information provided by the applicant that affects the test results.

**1.6 Measurement Uncertainty**

| Parameter                     |               | Uncertainty  |
|-------------------------------|---------------|--------------|
| Emissions Bandwidth           |               | +/- 0.35 MHz |
| Unwanted Emissions, conducted |               | +/- 1.69 dBm |
| Emissions, radiated           | 30 MHz~1GHz   | +/- 5.22 dB  |
|                               | 1 GHz~18 GHz  | +/- 6.12 dB  |
|                               | 18 GHz~40 GHz | +/- 4.99 dB  |
| Temperature                   |               | +/- 1.27 °C  |
| Humidity                      |               | +/- 3 %      |

**1.7 Environmental Conditions**

| Test Site                    | Test Date           | Temperature (°C) | Relative Humidity (%) | ATM Pressure (hPa) | Test Engineer |
|------------------------------|---------------------|------------------|-----------------------|--------------------|---------------|
| Radiation Spurious Emissions | 2022/6/22~2022/6/25 | 21.7~23.2        | 61~64                 | 1010               | Aaron Pan     |
| Emission Bandwidth           | 2022/6/25           | 25.1             | 52                    | 1010               | David Hsu     |

**1.8 Test Facility**

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

☒ 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Bay Area Compliance Laboratories Corp. (New Taipei Laboratory) is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3732) and the FCC designation No.TW3732 under the Mutual Recognition Agreement (MRA) in FCC Test.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: TW3732.

## 2 System Test Configuration

### 2.1 Description of Test Configuration

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

The engineering mode was configured the system transmitting with maximum power.

The device employs 78 Channels as below table:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1       | 2403            | 40      | 2442            |
| 2       | 2404            | ...     | ...             |
| ...     | ...             | ...     | ...             |
| 38      | 2440            | 77      | 2479            |
| 39      | 2441            | 78      | 2480            |

Tested with channel 1, 40 and 78.

### 2.2 Equipment Modifications

No modification was made to the EUT.

### 2.3 EUT Exercise Software

Use the buttons on the remote control to switch the test channel.

| Test Frequency      | 2403 MHz | 2442 MHz | 2480 MHz |
|---------------------|----------|----------|----------|
| Power Level Setting | Default  | Default  | Default  |

### 2.4 Support Equipment List and Details

N/A

### 2.5 External Cable List and Details

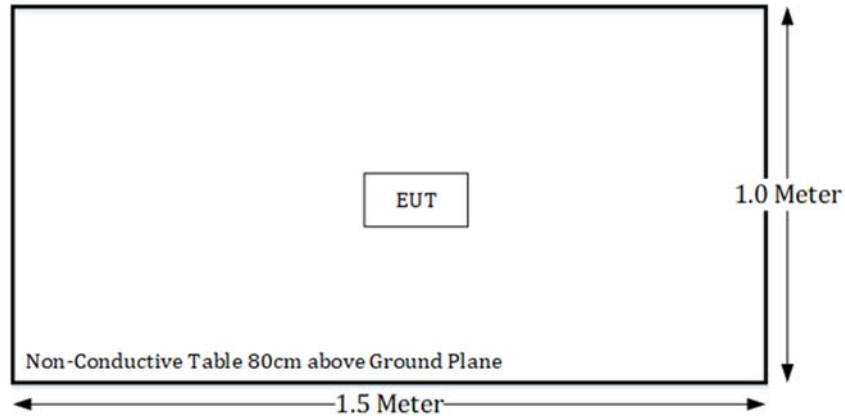
N/A

## 2.6 Block Diagram of Test Setup

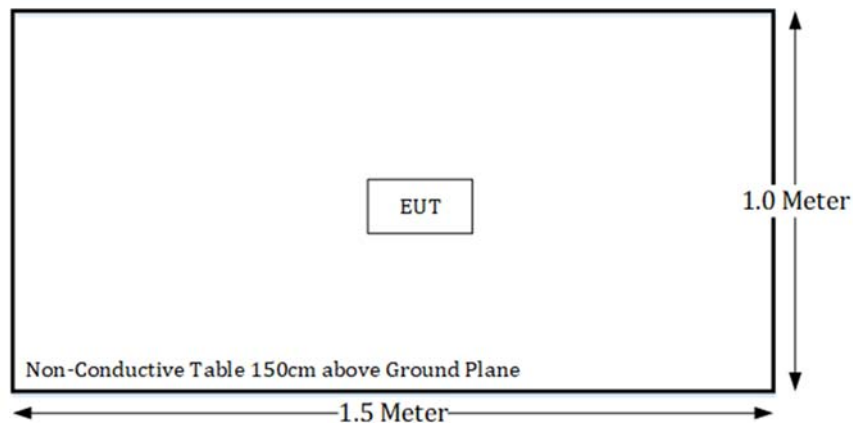
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

### Radiation:

Below 1GHz:



Above 1GHz:



### 3 Summary of Test Results

| FCC Rules                                                              | Description of Test                                     | Results        |
|------------------------------------------------------------------------|---------------------------------------------------------|----------------|
| RSS-102 Clause 2.5.1                                                   | Exemption Limits From Routine Evaluation-SAR Evaluation | Compliance     |
| §15.203<br>RSS-GEN Clause 6.8                                          | Antenna Requirement                                     | Compliance     |
| §15.207 (a)<br>RSS-Gen Clause 8.8                                      | AC Line Conducted Emissions                             | Not applicable |
| §15.205, §15.209, §15.249<br>RSS-210 Annex B.10<br>RSS-Gen Clause 8.10 | Radiated Emissions                                      | Compliance     |
| §15.215 (c)<br>RSS-Gen Clause 6.7                                      | 20 dB Emission Bandwidth<br>99% Occupied Bandwidth      | Compliance     |

Not applicable: The EUT is powered by batteries.

## 4 Test Equipment List and Details

| Description                        | Manufacturer                   | Model                    | Serial Number     | Calibration Date | Calibration Due Date |
|------------------------------------|--------------------------------|--------------------------|-------------------|------------------|----------------------|
| Radiation 3M Room (966-A)          |                                |                          |                   |                  |                      |
| Bilog Antenna with 6 dB Attenuator | SUNOL SCIENCES & MINI-CIRCUITS | JB6/UNAT-6+              | A050115/1554_2_01 | 2022/2/14        | 2023/2/13            |
| Horn Antenna                       | EMCO                           | SAS-571                  | 1020              | 2022/5/25        | 2023/5/24            |
| Horn Antenna                       | ETS-Lindgren                   | 3116                     | 62638             | 2021/8/11        | 2022/8/10            |
| Preamplifier                       | Sonoma                         | 310N                     | 130602            | 2022/6/16        | 2023/6/15            |
| Preamplifier                       | A.H. system Inc.               | PAM-0118P                | 466               | 2021/11/4        | 2022/11/3            |
| Microwave Preamplifier             | EM Electronics Corporation     | EM18G40G                 | 60656             | 2021/12/27       | 2022/12/26           |
| Spectrum Analyzer                  | Rohde & Schwarz                | FSV40                    | 101435            | 2022/1/13        | 2023/1/12            |
| EMI Test Receiver                  | Rohde & Schwarz                | ESR7                     | 101419            | 2021/11/9        | 2022/11/8            |
| Micro flex Cable                   | UTIFLEX                        | UFB197C-1-2362-70U-70U   | 225757-001        | 2022/1/24        | 2023/1/23            |
| Coaxial Cable                      | COMMATE                        | PEWC                     | 8Dr               | 2021/12/24       | 2022/12/23           |
| Coaxial Cable                      | UTIFLEX                        | UFB311A-Q-1440-300300    | 220490-006        | 2022/1/24        | 2023/1/23            |
| Coaxial Cable                      | JUNFLON                        | J12J102248-00-B-5        | AUG-07-15-044     | 2021/12/24       | 2022/12/23           |
| Cable                              | EMC                            | EMC105-SM-SM-10000       | 201003            | 2022/1/24        | 2023/1/23            |
| Coaxial Cable                      | ROSNOL                         | K1K50-UP0264-K1K50-450CM | 160309-1          | 2022/1/24        | 2023/1/23            |
| Coaxial Cable                      | ROSNOL                         | K1K50-UP0264-K1K50-50CM  | 15120-1           | 2022/1/18        | 2023/1/17            |
| Software                           | Audix                          | e3                       | 18621a bacl       | N.C.R            | N.C.R                |
| Conducted Room                     |                                |                          |                   |                  |                      |
| Spectrum Analyzer                  | Rohde & Schwarz                | FSV40                    | 101140            | 2022/2/18        | 2023/2/17            |
| Cable                              | UTIFLEX                        | UFA210A                  | 9435              | 2021/10/5        | 2022/10/4            |

**\*Statement of Traceability:** BACL Corp. attests that all of the calibrations on the equipment items listed above were traceable to the SI System of Units via the R.O.C. Center for Measurement Standards of the Electronics Testing Center, Taiwan (ETC) or to another internationally recognized National Metrology Institute (NMI), and were compliant with the current Taiwan Accreditation Foundation (TAF) requirements

## 5 RSS-102 § 2.5.1 – EXEMPTION LIMITS FROM ROUTINE EVALUATION – SAR EVALUATION

### 5.1 Applicable Standard

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

| Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance |                       |               |               |               |               |
|--------------------------------------------------------------------------------------------------------------|-----------------------|---------------|---------------|---------------|---------------|
| Frequency (MHz)                                                                                              | Exemption Limits (mW) |               |               |               |               |
|                                                                                                              | At separation         | At separation | At separation | At separation | At separation |
|                                                                                                              | distance of           | distance of   | distance of   | distance of   | distance of   |
|                                                                                                              | ≤5 mm                 | 10 mm         | 15 mm         | 20 mm         | 25 mm         |
| ≤300                                                                                                         | 71 mW                 | 101 mW        | 132 mW        | 162 mW        | 193 mW        |
| 450                                                                                                          | 52 mW                 | 70 mW         | 88 mW         | 106 mW        | 123 mW        |
| 835                                                                                                          | 17 mW                 | 30 mW         | 42 mW         | 55 mW         | 67 mW         |
| 1900                                                                                                         | 7 mW                  | 10 mW         | 18 mW         | 34 mW         | 60 mW         |
| 2450                                                                                                         | 4 mW                  | 7 mW          | 15 mW         | 30 mW         | 52 mW         |
| 3500                                                                                                         | 2 mW                  | 6 mW          | 16 mW         | 32 mW         | 55 mW         |
| 5800                                                                                                         | 1 mW                  | 6 mW          | 15 mW         | 27 mW         | 41 mW         |
| Frequency (MHz)                                                                                              | Exemption Limits (mW) |               |               |               |               |
|                                                                                                              | At separation         | At separation | At separation | At separation | At separation |
|                                                                                                              | distance of           | distance of   | distance of   | distance of   | distance of   |
|                                                                                                              | 30 mm                 | 35 mm         | 40 mm         | 45 mm         | ≥50 mm        |
| ≤300                                                                                                         | 223 mW                | 254 mW        | 284 mW        | 315 mW        | 345 mW        |
| 450                                                                                                          | 141 mW                | 159 mW        | 177 mW        | 195 mW        | 213 mW        |
| 835                                                                                                          | 80 mW                 | 92 mW         | 105 mW        | 117 mW        | 130 mW        |
| 1900                                                                                                         | 99 mW                 | 153 mW        | 225 mW        | 316 mW        | 431 mW        |
| 2450                                                                                                         | 83 mW                 | 123 mW        | 173 mW        | 235 mW        | 309 mW        |
| 3500                                                                                                         | 86 mW                 | 124 mW        | 170 mW        | 225 mW        | 290 mW        |
| 5800                                                                                                         | 56 mW                 | 71 mW         | 85 mW         | 97 mW         | 106 mW        |

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5.

If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required. For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

**5.2 Calculated Data:**

According to Table 1, for the separation distance is less than or equal to 5 mm, the exemption limit for 2450MHz is 4mW and the exemption limit for 3500MHz is 2mW, so the exemption limit for 2480MHz =  $2\text{mW} + (3500\text{MHz} - 2480\text{MHz}) * (4\text{mW} - 2\text{mW}) / (3500\text{MHz} - 2450\text{MHz}) = 3.94 \text{ mW}$

For limb-worn devices exemption limits:  $3.94 \times 2.5 = 9.85 \text{ mW}$

Exemption from Routine Evaluation Limit is:

EIRP =  $90.70 \text{ dB}\mu\text{V/m} - 95.2 = -4.5 \text{ dBm}$

Tune-up power =  $-4 \text{ dBm} = 0.4 \text{ mW} < 9.85 \text{ mW}$

**Result:** The device meets the exemption requirement.

## 6 FCC §15.203 & RSS-GEN CLAUSE 6.8 – Antenna Requirements

### 6.1 Applicable Standard

For intentional device, 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.

According to RSS-Gen §6.8, The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

*This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.*

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

### 6.2 Antenna Information

| Type        | Antenna Gain | Input impedance |
|-------------|--------------|-----------------|
| PCB Antenna | 1 dBi        | 50Ω             |

**Result:** Compliance.

## 7 FCC §15.209, §15.205 , §15.249 & RSS-210 ANNEX B.10, RSS-GEN CLAUSE 8.10 - Radiated Emissions

### 7.1 Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| Fundamental frequency | Field strength of fundamental<br>(millivolts/meter) | Field strength of harmonics<br>(microvolts/meter) |
|-----------------------|-----------------------------------------------------|---------------------------------------------------|
| 920-928 MHz           | 50                                                  | 500                                               |
| 2400-2483.5 MHz       | 50                                                  | 500                                               |
| 5725-5875 MHz         | 50                                                  | 500                                               |
| 24.0-24.25 GHz        | 250                                                 | 2500                                              |

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

According to RSS-210 Issue 10 Clause Annex B B.10 (a): The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.

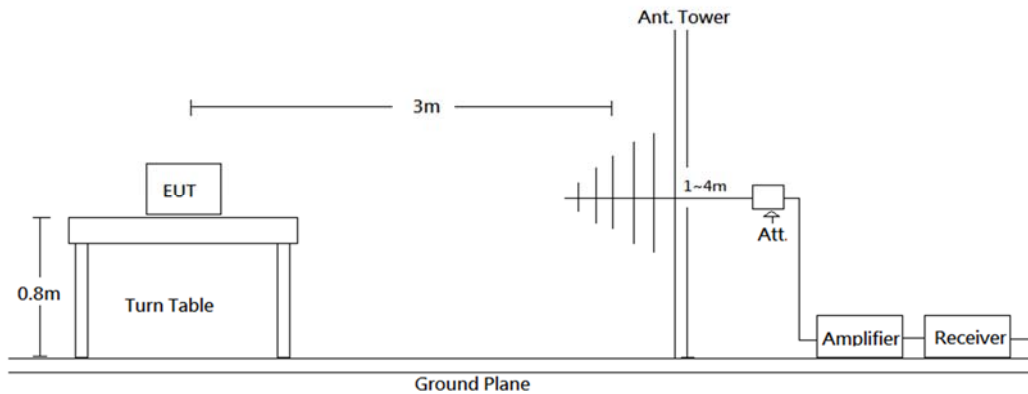
According to RSS-210 Issue 10 Clause Annex B B.10 (b): Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-GEN Issue 5, whichever is less stringent.

| Field strength limits at various frequencies |                       |                    |
|----------------------------------------------|-----------------------|--------------------|
| Fundamental frequency                        | Field strength (mV/m) |                    |
|                                              | Fundamental emissions | Harmonic emissions |
| 920-928 MHz                                  | 50                    | 0.5                |
| 2400-2483.5 MHz                              | 50                    | 0.5                |
| 5725-5875 MHz                                | 50                    | 0.5                |
| 24.0-24.25 GHz                               | 250                   | 2.5                |

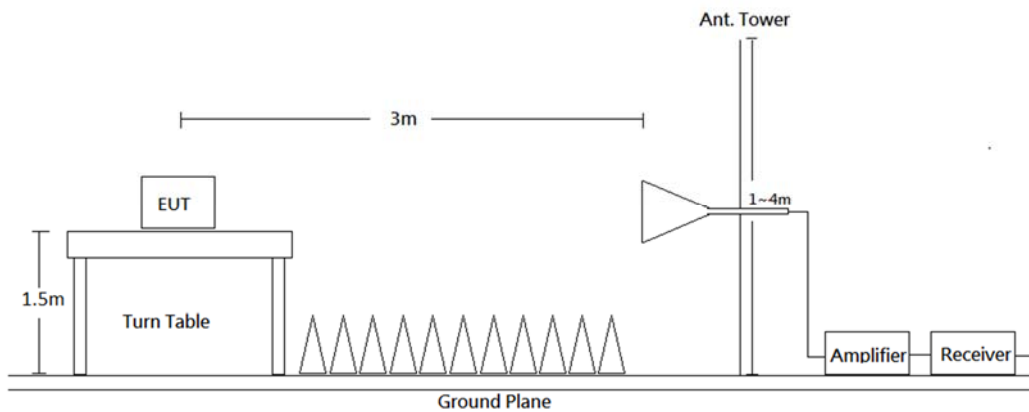
As per RSS-210 Issue 10 Clause Annex B B.10, Field strength limits are specified at a distance of 3 meters.

## 7.2 EUT Setup

Below 1 GHz:



Above 1 GHz:



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 15.205, FCC 15.209, FCC 15.249 and RSS-GEN, RSS-210 limits.

## 7.3 EMI Test Receiver & Spectrum Analyzer Setup

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:

| Frequency Range | RBW     | VBW     | Measurement method |
|-----------------|---------|---------|--------------------|
| 30-1000 MHz     | 120 kHz | 300 kHz | QP                 |
| Above 1 GHz     | 1 MHz   | 3 MHz   | PK                 |
|                 | 1 MHz   | 3 MHz   | Ave                |

## 7.4 Test Procedure

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.

## 7.5 Corrected Factor & Margin Calculation

The Correct Factor 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:

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

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

$$\text{Margin} = \text{Result} - \text{Limit}$$

## 7.6 Test Results Summary

According to the data in the following table, the EUT complied with the FCC 15.205, FCC 15.209, FCC 15.249 and RSS-210, RSS-Gen.

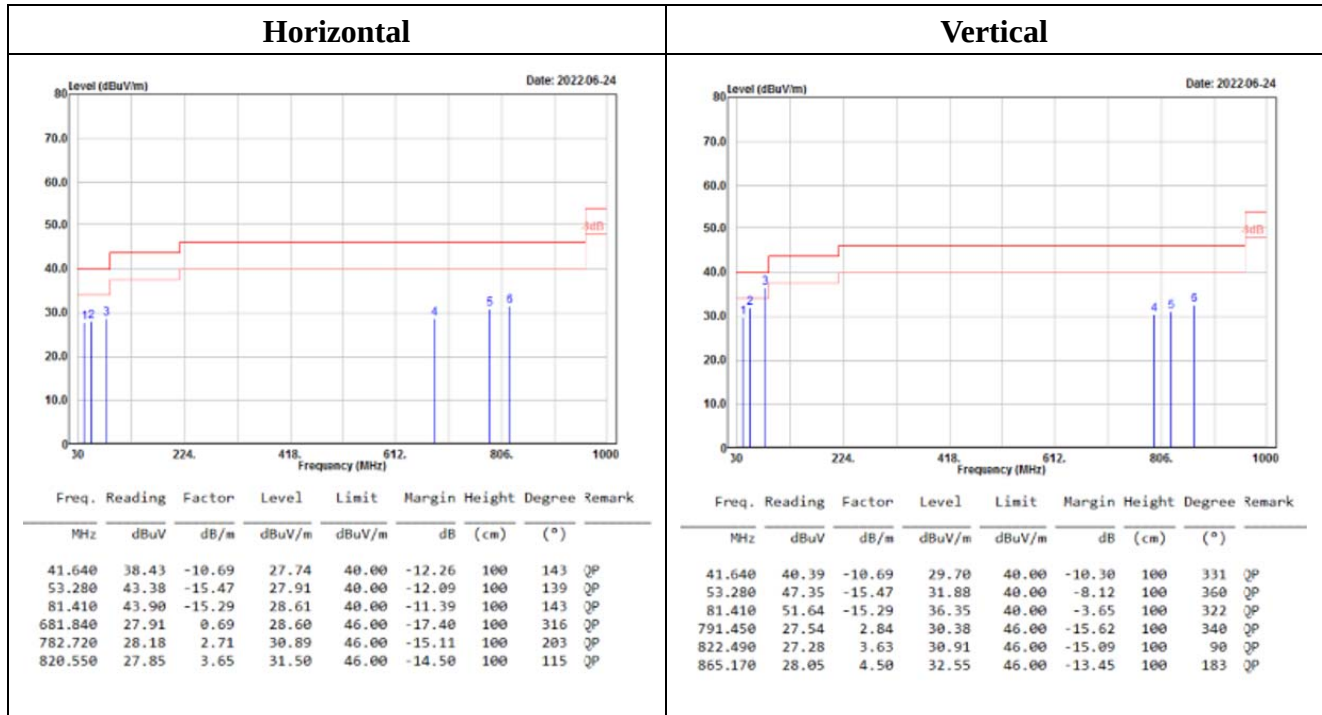
## 7.7 Test Results

### Test Mode: Transmitting

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

(worst case is low channel)

30MHz-1GHz:



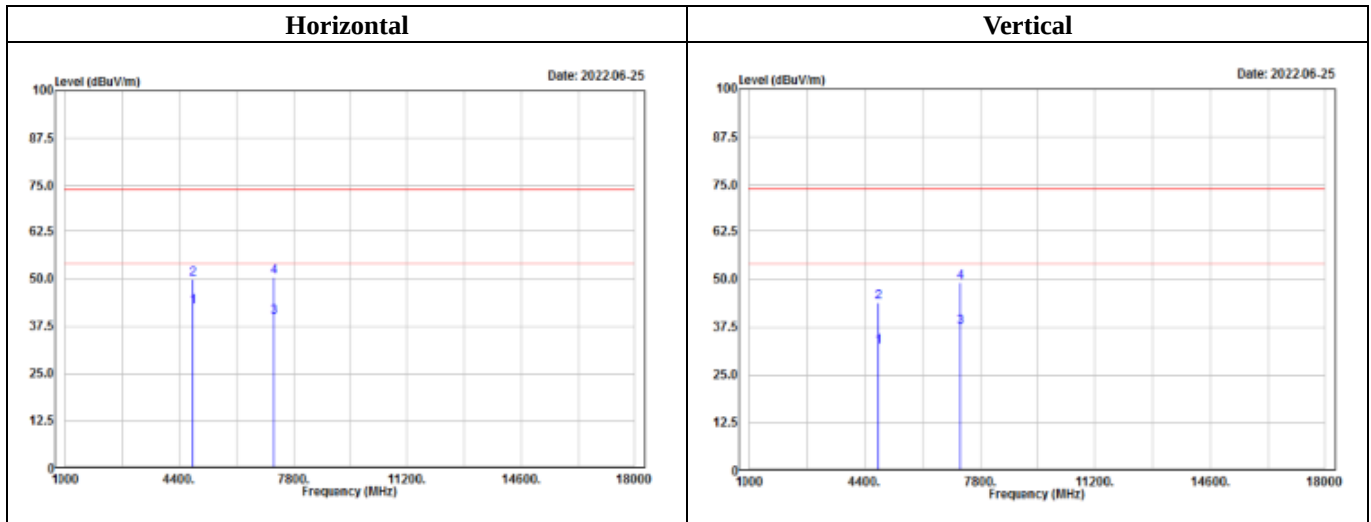
Level (Result) = Reading + Factor.

Margin = Level – Limit.

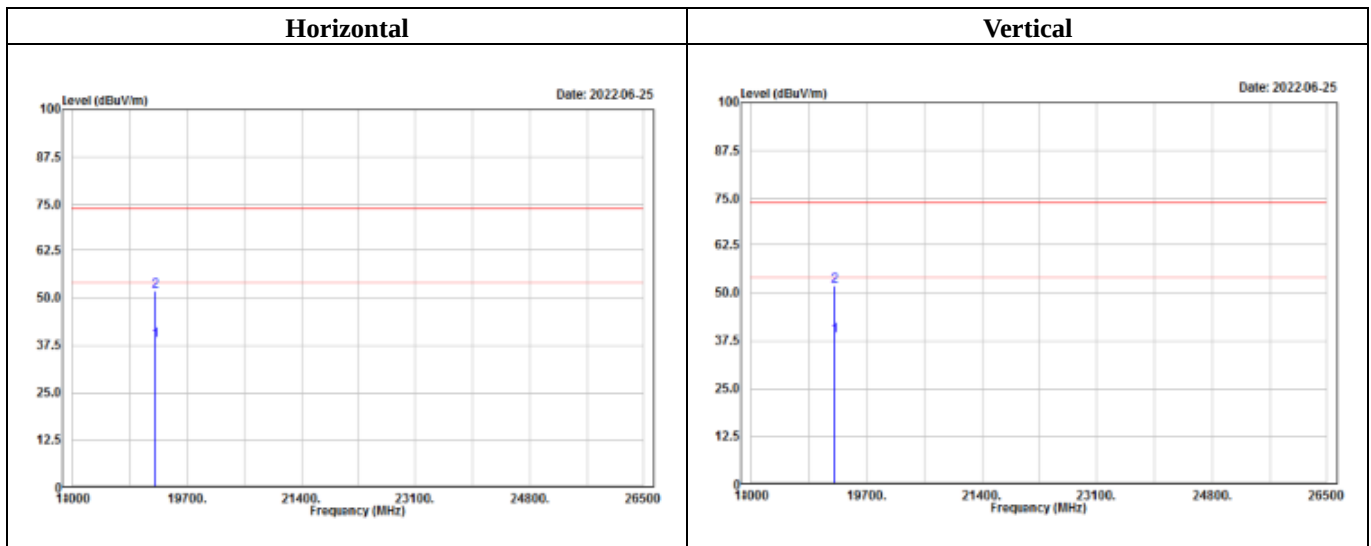
Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

1GHz-18GHz:



18GHz-26.5GHz:



**Above 1GHz****Horizontal**

| <b>Low channel</b>    |         |        |        |        |        |        |        |         |
|-----------------------|---------|--------|--------|--------|--------|--------|--------|---------|
| Freq.                 | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz                   | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 2339.070              | 62.68   | -9.79  | 52.89  | 54.00  | -1.11  | 128    | 227    | Average |
| 2339.070              | 66.82   | -9.79  | 57.03  | 74.00  | -16.97 | 128    | 227    | Peak    |
| 2400.000              | 41.81   | -9.55  | 32.26  | 54.00  | -21.74 | 128    | 227    | Average |
| 2400.000              | 64.76   | -9.55  | 55.21  | 74.00  | -18.79 | 128    | 227    | Peak    |
| 2403.000              | 97.02   | -9.54  | 87.48  | 94.00  | -6.52  | 128    | 227    | Average |
| 2403.000              | 100.24  | -9.54  | 90.70  | 114.00 | -23.30 | 128    | 227    | Peak    |
| Freq.                 | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz                   | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 4806.000              | 44.95   | -2.47  | 42.48  | 54.00  | -11.52 | 121    | 20     | Average |
| 4806.000              | 52.41   | -2.47  | 49.94  | 74.00  | -24.06 | 121    | 20     | Peak    |
| 7209.000              | 36.92   | 3.05   | 39.97  | 54.00  | -14.03 | 104    | 64     | Average |
| 7209.000              | 47.23   | 3.05   | 50.28  | 74.00  | -23.72 | 104    | 64     | Peak    |
| <b>Middle channel</b> |         |        |        |        |        |        |        |         |
| Freq.                 | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz                   | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 2442.000              | 94.67   | -9.35  | 85.32  | 94.00  | -8.68  | 129    | 229    | Average |
| 2442.000              | 97.80   | -9.35  | 88.45  | 114.00 | -25.55 | 129    | 229    | Peak    |
| Freq.                 | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz                   | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 4884.000              | 43.87   | -2.23  | 41.64  | 54.00  | -12.36 | 138    | 136    | Average |
| 4884.000              | 51.38   | -2.23  | 49.15  | 74.00  | -24.85 | 138    | 136    | Peak    |
| 7326.000              | 30.47   | 3.34   | 33.81  | 54.00  | -20.19 | 148    | 240    | Average |
| 7326.000              | 43.72   | 3.34   | 47.06  | 74.00  | -26.94 | 148    | 240    | Peak    |
| <b>High channel</b>   |         |        |        |        |        |        |        |         |
| Freq.                 | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz                   | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 2480.000              | 93.29   | -8.87  | 84.42  | 94.00  | -9.58  | 109    | 219    | Average |
| 2480.000              | 96.34   | -8.87  | 87.47  | 114.00 | -26.53 | 109    | 219    | Peak    |
| 2483.660              | 41.69   | -8.82  | 32.87  | 54.00  | -21.13 | 109    | 219    | Average |
| 2483.660              | 59.71   | -8.82  | 50.89  | 74.00  | -23.11 | 109    | 219    | Peak    |
| Freq.                 | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz                   | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 4960.000              | 45.39   | -2.04  | 43.35  | 54.00  | -10.65 | 115    | 173    | Average |
| 4960.000              | 51.32   | -2.04  | 49.28  | 74.00  | -24.72 | 115    | 173    | Peak    |
| 7440.000              | 35.72   | 3.38   | 39.10  | 54.00  | -14.90 | 104    | 39     | Average |
| 7440.000              | 46.41   | 3.38   | 49.79  | 74.00  | -24.21 | 104    | 39     | Peak    |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

# Vertical

| Low channel    |         |        |        |        |        |        |        |         |
|----------------|---------|--------|--------|--------|--------|--------|--------|---------|
| Freq.          | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz            | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 2339.260       | 44.59   | -9.79  | 34.80  | 54.00  | -19.20 | 155    | 296    | Average |
| 2339.260       | 56.43   | -9.79  | 46.64  | 74.00  | -27.36 | 155    | 296    | Peak    |
| 2400.000       | 40.77   | -9.55  | 31.22  | 54.00  | -22.78 | 155    | 296    | Average |
| 2400.000       | 53.17   | -9.55  | 43.62  | 74.00  | -30.38 | 155    | 296    | Peak    |
| 2403.000       | 81.80   | -9.54  | 72.26  | 94.00  | -21.74 | 155    | 296    | Average |
| 2403.000       | 84.52   | -9.54  | 74.98  | 114.00 | -39.02 | 155    | 296    | Peak    |
| Freq.          | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz            | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 4806.000       | 34.82   | -2.47  | 32.35  | 54.00  | -21.65 | 112    | 176    | Average |
| 4806.000       | 46.39   | -2.47  | 43.92  | 74.00  | -30.08 | 112    | 176    | Peak    |
| 7209.000       | 34.48   | 3.05   | 37.53  | 54.00  | -16.47 | 101    | 98     | Average |
| 7209.000       | 45.93   | 3.05   | 48.98  | 74.00  | -25.02 | 101    | 98     | Peak    |
| Middle channel |         |        |        |        |        |        |        |         |
| Freq.          | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz            | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 2442.000       | 87.62   | -9.35  | 78.27  | 94.00  | -15.73 | 238    | 176    | Average |
| 2442.000       | 90.41   | -9.35  | 81.06  | 114.00 | -32.94 | 238    | 176    | Peak    |
| Freq.          | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz            | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 4884.000       | 32.46   | -2.23  | 30.23  | 54.00  | -23.77 | 123    | 73     | Average |
| 4884.000       | 46.09   | -2.23  | 43.86  | 74.00  | -30.14 | 123    | 73     | Peak    |
| 7326.000       | 29.72   | 3.34   | 33.06  | 54.00  | -20.94 | 147    | 209    | Average |
| 7326.000       | 43.62   | 3.34   | 46.96  | 74.00  | -27.04 | 147    | 209    | Peak    |
| High channel   |         |        |        |        |        |        |        |         |
| Freq.          | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz            | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 2480.000       | 78.37   | -8.87  | 69.50  | 94.00  | -24.50 | 111    | 124    | Average |
| 2480.000       | 80.95   | -8.87  | 72.08  | 114.00 | -41.92 | 111    | 124    | Peak    |
| 2497.720       | 41.07   | -8.60  | 32.47  | 54.00  | -21.53 | 111    | 124    | Average |
| 2497.720       | 56.76   | -8.60  | 48.16  | 74.00  | -25.84 | 111    | 124    | Peak    |
| Freq.          | Reading | Factor | Level  | Limit  | Margin | Height | Degree | Remark  |
| MHz            | dBuV    | dB/m   | dBuV/m | dBuV/m | dB     | (cm)   | (°)    |         |
| 4960.000       | 36.98   | -2.04  | 34.94  | 54.00  | -19.06 | 192    | 345    | Average |
| 4960.000       | 47.41   | -2.04  | 45.37  | 74.00  | -28.63 | 192    | 345    | Peak    |
| 7440.000       | 32.01   | 3.38   | 35.39  | 54.00  | -18.61 | 101    | 335    | Average |
| 7440.000       | 44.81   | 3.38   | 48.19  | 74.00  | -25.81 | 101    | 335    | Peak    |

Level (Result) = Reading + Factor.

Margin = Level – Limit.

Factor = Antenna Factor + Cable Loss – Amplifier Gain.

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

## **8 FCC §15.215(c) & RSS-GEN CLAUSE 6.7 – 20 dB Bandwidth Testing and 99% OCCUPIED BANDWIDTH**

### **8.1 Applicable Standard**

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

According to RSS-Gen Clause 6.7:

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum inband power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth: The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span. The detector of the spectrum analyzer shall be set to “Sample” .

However, a peak, or peak hold,

may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.

The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

## 8.2 Test Procedure

20dB bandwidth test:

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.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

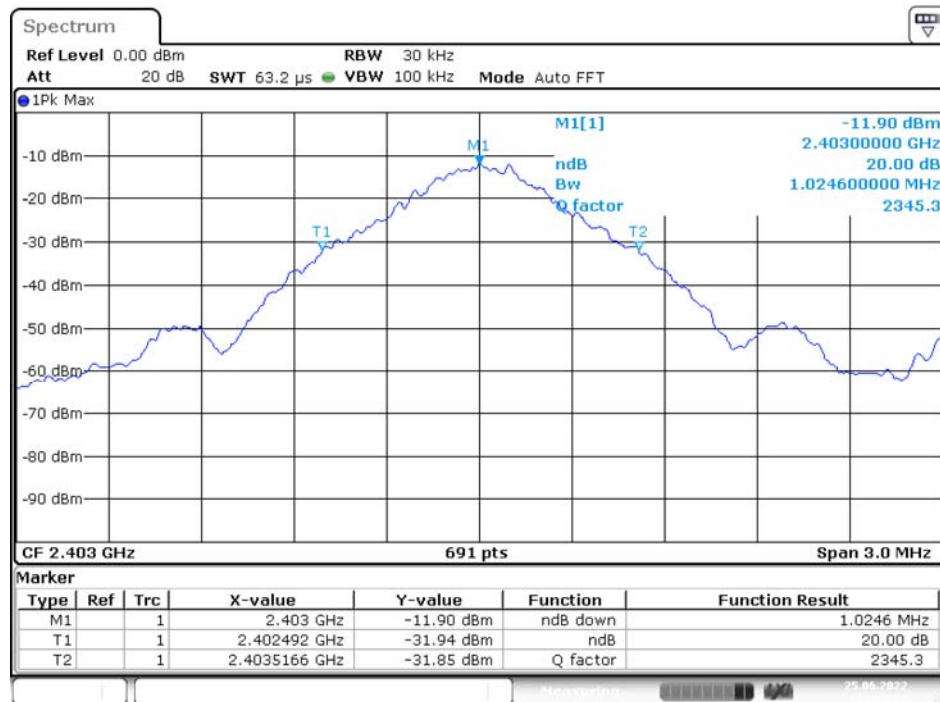
## 8.3 Test Results

| Channel | Frequency<br>(MHz) | 20 dB Emission<br>Bandwidth<br>(kHz) | 99 % Occupied<br>Bandwidth<br>(kHz) |
|---------|--------------------|--------------------------------------|-------------------------------------|
| Low     | 2403               | 1025                                 | 920.4                               |
| Middle  | 2442               | 1042                                 | 933.4                               |
| High    | 2480               | 981                                  | 920.4                               |

Please refer to the following plots

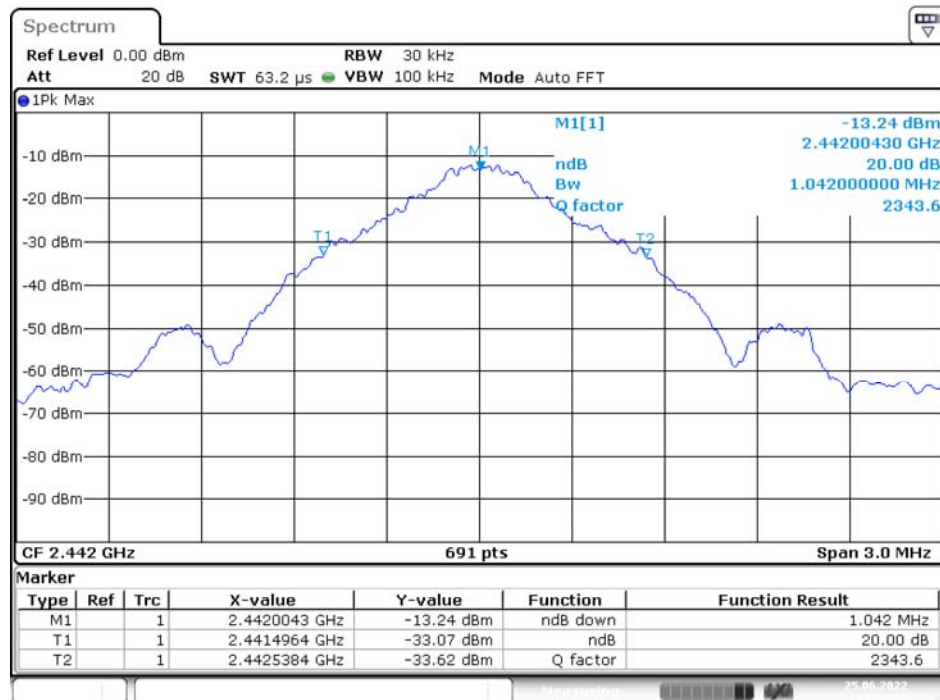
## 20 dB Emission Bandwidth

### Low Channel



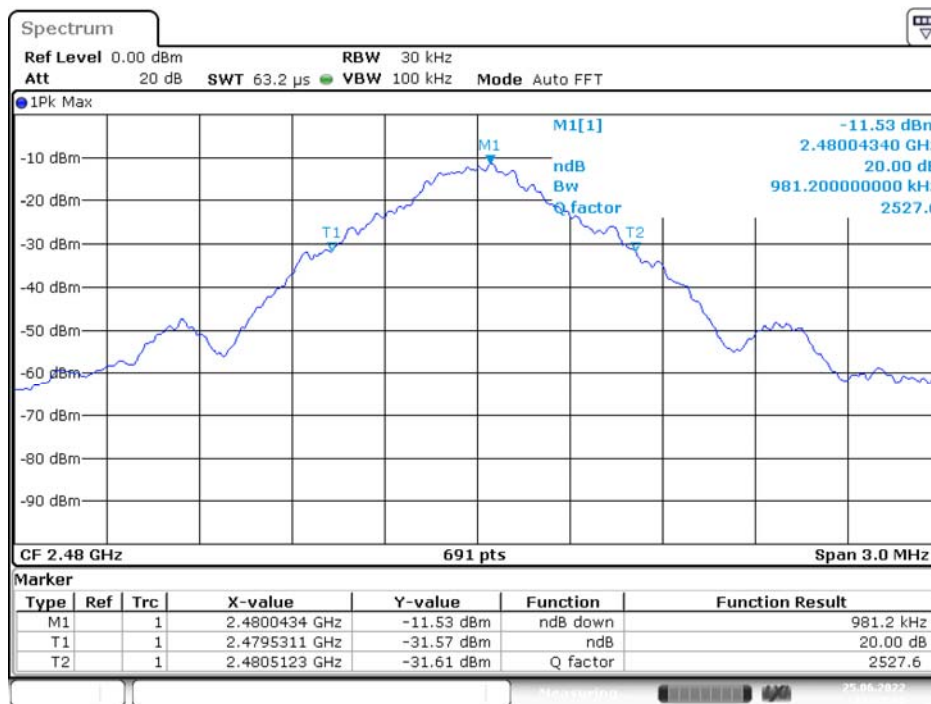
Date: 25.JUN.2022 11:31:33

### Middle Channel



Date: 25.JUN.2022 11:32:23

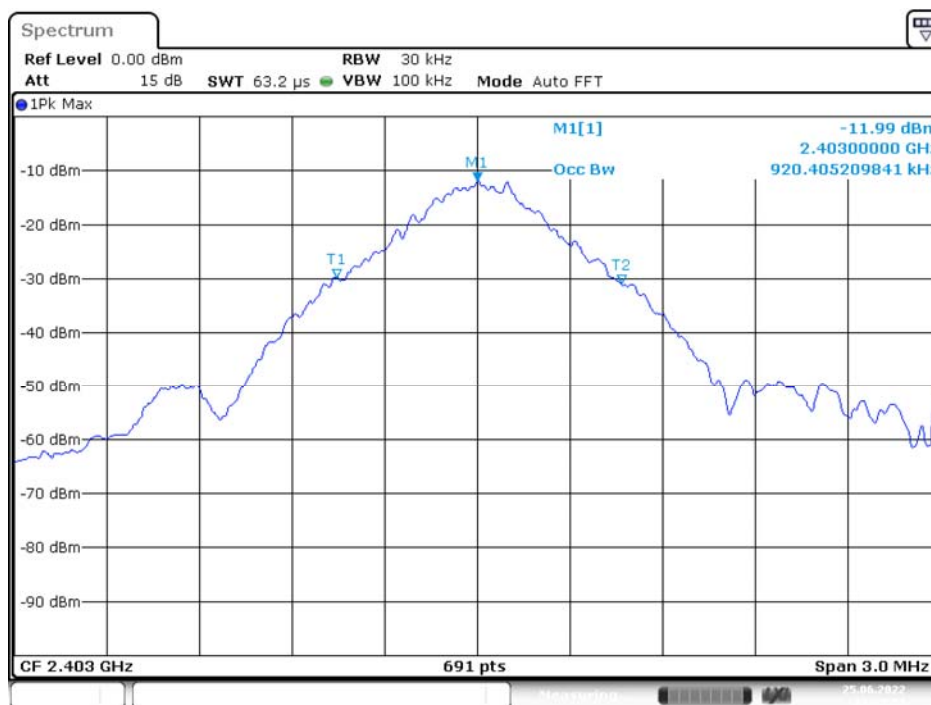
## High Channel



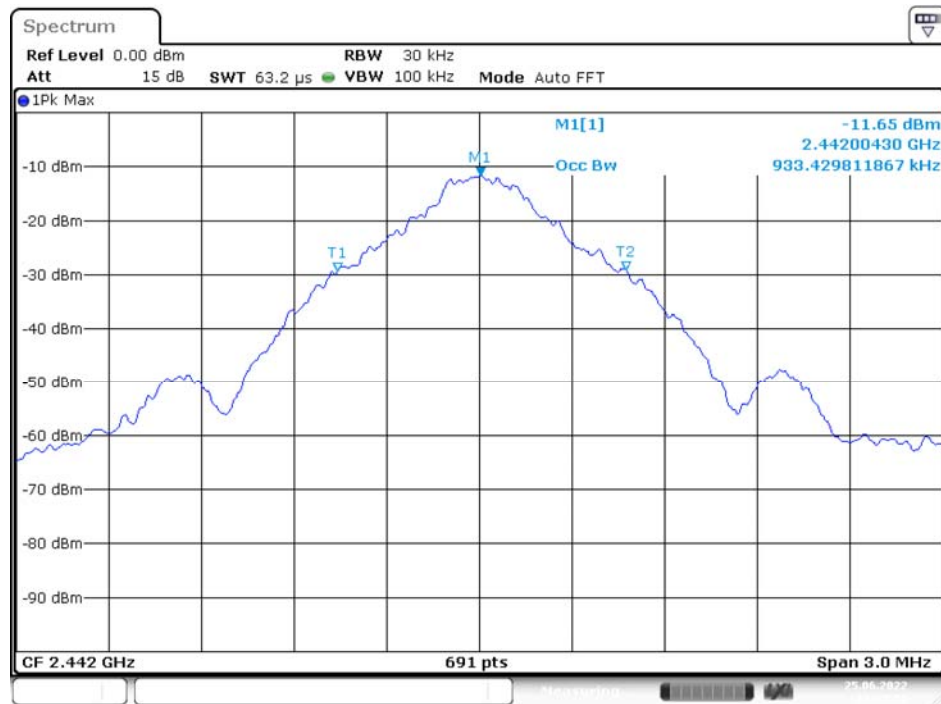
Date: 25. JUN 2022 11:33:42

## 99% Occupied Bandwidth

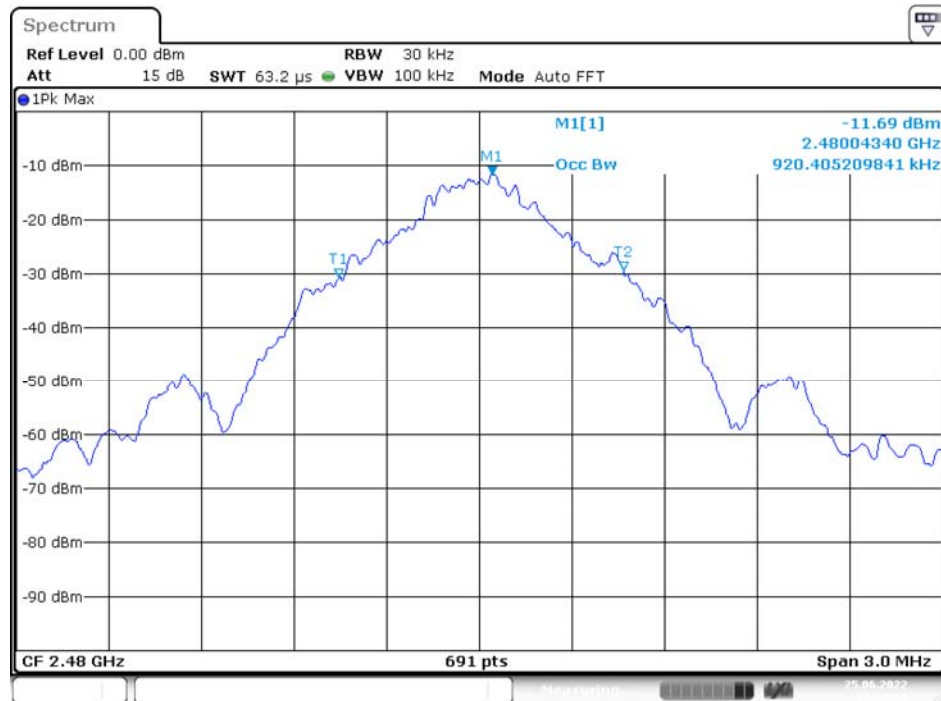
## Low Channel



Date: 25. JUN 2022 11:31:02

**Middle Channel**

Date: 25 JUN 2022 11:32:50

**High Channel**

Date: 25 JUN 2022 11:33:14

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