

# RADIO PERFORMANCE TEST REPORT

**Test Report No.** : OT-21O-RWD-047  
**Reception No.** : 2110004560  
**Applicant** : Samsung Electronics Co Ltd  
**Address** : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States  
**Manufacturer** : Samsung Electronics Co Ltd  
**Address** : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Korea  
**Type of Equipment** : Wi-Fi/BT Transceiver  
**FCC ID.** : A3LWCB735M  
**Model Name** : WCB735M  
**Multiple Model Name** : N/A  
**Serial number** : N/A  
**Total page of Report** : 56 pages (including this page)  
**Date of Incoming** : October 07, 2021  
**Date of issue** : October 28, 2021

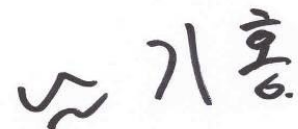
## SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.





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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

**Revision History**

| Rev. No. | Issue Report No. | Issued Date      | Revisions       | Section Affected |
|----------|------------------|------------------|-----------------|------------------|
| 0        | OT-21O-RWD-047   | October 28, 2021 | Initial Release | All              |
|          |                  |                  |                 |                  |
|          |                  |                  |                 |                  |

## 1. VERIFICATION OF COMPLIANCE

Applicant : Samsung Electronics Co Ltd

Address : 19 Chapin Rd., Building D, Pine Brook, New Jersey, 07058, United States

Contact Person : Jenni Chun / General Manager

Telephone No. : 973-808-6375

FCC ID : A3LWCB735M

Model Name : WCB735M

Brand Name : 

Serial Number : N/A

Date : October 28, 2021

|                                                         |                                                                                    |
|---------------------------------------------------------|------------------------------------------------------------------------------------|
| EQUIPMENT CLASS                                         | DTS – DIGITAL TRNSMISSION SYSTEM                                                   |
| E.U.T. DESCRIPTION                                      | Modular Transmitter, Wi-Fi/BT Transceiver                                          |
| THIS REPORT CONCERNS                                    | Original Grant                                                                     |
| MEASUREMENT PROCEDURES                                  | ANSI C63.10: 2020                                                                  |
| TYPE OF EQUIPMENT TESTED                                | Pre-Production                                                                     |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | Certification                                                                      |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | FCC PART 15 SUBPART C Section 15.247<br>KDB 558074 D01 15.247 Meas Guidance v05r02 |
| Modifications on the Equipment to Achieve<br>Compliance | None                                                                               |
| Final Test was Conducted On                             | 3 m, Semi Anechoic Chamber                                                         |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. TEST SUMMARY

### 2.1 Test items and results

| SECTION        | TEST ITEMS                                          | RESULTS                |
|----------------|-----------------------------------------------------|------------------------|
| 15.247 (a) (2) | Minimum 6 dB Bandwidth                              | Met the Limit / PASS   |
| 15.247 (b) (3) | Maximum Peak Conducted Output Power                 | Met the Limit / PASS   |
| 15.247 (d)     | 100 kHz Bandwidth Outside the Frequency Band        | Met the Limit / PASS   |
| 15.247 (d)     | Radiated Emission which fall in the Restricted Band | Met the Limit / PASS   |
| 15.247 (e)     | Peak Power Spectral Density                         | Met the Limit / PASS   |
| 15.209         | Radiated Emission Limits                            | Met the Limit / PASS   |
| 15.207         | Conducted Limits                                    | Met the Limit / PASS   |
| 15.203         | Antenna Requirement                                 | Met requirement / PASS |

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

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

Original submittal only

### 2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2020. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

### 2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea.

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The Samsung Electronics Co Ltd, Model WCB735M (referred to as the EUT in this report) is a Wi-Fi/BT Transceiver. The product specification described herein was obtained from product data sheet or user's manual.

|                        |                                       |                                                                              |
|------------------------|---------------------------------------|------------------------------------------------------------------------------|
| DEVICE TYPE            | Wi-Fi/BT Transceiver                  |                                                                              |
| Temperature Range      | -20 °C ~ 50 °C                        |                                                                              |
| OPERATING<br>FREQUENCY | Bluetooth LE                          | 2 402 MHz ~ 2 480 MHz                                                        |
|                        | Bluetooth                             | 2 402 MHz ~ 2 480 MHz                                                        |
|                        | WLAN 2.4 GHz                          | 2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))                                    |
|                        |                                       | 2 422 MHz ~ 2 462 MHz (802.11n(HT40))                                        |
|                        | WLAN<br>5 150 MHz ~<br>5 250 MHz Band | 5 180 MHz ~ 5 240 MHz (802.11a/n(HT20)/ac(VHT20))                            |
|                        |                                       | 5 190 MHz ~ 5 230 MHz (802.11n(HT40)/ac(VHT40))                              |
|                        |                                       | 5 210 MHz (802.11ac(VHT80))                                                  |
|                        | WLAN<br>5 250 MHz ~<br>5 350 MHz Band | 5 260 MHz ~ 5 320 MHz (802.11a/n(HT20)/ac(VHT20))                            |
|                        |                                       | 5 270 MHz ~ 5 310 MHz (802.11n(HT40)/ac(VHT40))                              |
|                        |                                       | 5 290 MHz (802.11ac(VHT80))                                                  |
|                        | WLAN<br>5 470 MHz ~<br>5 725 MHz Band | 5 500 MHz ~ 5 720 MHz (802.11a/n(HT20)/ac(VHT20))                            |
|                        |                                       | 5 510 MHz ~ 5 710 MHz (802.11n(HT40)/ac(VHT40))                              |
|                        |                                       | 5 530 MHz ~ 5 690 MHz (802.11ac(VHT80))                                      |
|                        | WLAN<br>5 725 MHz ~<br>5 850 MHz Band | 5 745 MHz ~ 5 825 MHz (802.11a/n(HT20)/ac(VHT20))                            |
|                        |                                       | 5 755 MHz ~ 5 795 MHz (802.11n(HT40)/ac(VHT40))                              |
|                        |                                       | 5 775 MHz (802.11ac(VHT80))                                                  |
| MODULATION<br>TYPE     | Bluetooth LE                          | GFSK for 1 Mbps / 2 Mbps                                                     |
|                        | Bluetooth                             | GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps                   |
|                        | WLAN 2.4 GHz                          | 802.11b:<br>DSSS Modulation(DBPSK/DQPSK/CCK)                                 |
|                        |                                       | 802.11g/n(HT20)/n(HT40):<br>OFDM Modulation(BPSK/QPSK/16QAM/64QAM)           |
|                        | WLAN 5 GHz                            | 802.11a/n(HT20)/n(HT40)/ac(VHT80):<br>OFDM Modulation(BPSK/QPSK/16QAM/64QAM) |

|                    |                                       |                  |                                                                                                       |
|--------------------|---------------------------------------|------------------|-------------------------------------------------------------------------------------------------------|
| RF OUTPUT<br>POWER | Bluetooth LE                          | 1 Mbps           | 11.26 dBm                                                                                             |
|                    |                                       | 2 Mbps           | 11.15 dBm                                                                                             |
|                    | Bluetooth                             | 1 Mbps           | 11.22 dBm                                                                                             |
|                    |                                       | 2 Mbps           | 11.05 dBm                                                                                             |
|                    |                                       | 3 Mbps           | 11.08 dBm                                                                                             |
|                    | WLAN 2.4 GHz                          | Antenna 0        | 16.69 dBm(802.11b)<br>12.83 dBm(802.11g)<br>12.70 dBm(802.11n_HT20)<br>10.93 dBm(802.11n_HT40)        |
|                    |                                       | Antenna 1        | 17.51 dBm(802.11b)<br>13.75 dBm(802.11g)<br>13.63 dBm(802.11n_HT20)<br>11.59 dBm(802.11n_HT40)        |
|                    |                                       | Multiple Antenna | 16.32 dBm(802.11g)<br>16.20 dBm(802.11n_HT20)<br>14.28 dBm(802.11n_HT40)                              |
|                    | WLAN<br>5 150 MHz ~<br>5 250 MHz Band | Antenna 0        | 12.39 dBm(802.11a)<br>12.48 dBm(802.11n_HT20)<br>10.15 dBm(802.11n_HT40)<br>8.75 dBm(802.11ac_VHT80)  |
|                    |                                       | Antenna 1        | 12.80 dBm(802.11a)<br>12.63 dBm(802.11n_HT20)<br>10.10 dBm(802.11n_HT40)<br>9.08 dBm(802.11ac_VHT80)  |
|                    |                                       | Multiple Antenna | 15.53 dBm(802.11a)<br>15.50 dBm(802.11n_HT20)<br>13.09 dBm(802.11n_HT40)<br>11.93 dBm(802.11ac_VHT80) |

|                    |                                       |                    |                                                                                                       |
|--------------------|---------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------|
| RF OUTPUT<br>POWER | WLAN<br>5 250 MHz ~<br>5 350 MHz Band | Antenna 0          | 12.47 dBm(802.11a)<br>12.35 dBm(802.11n_HT20)<br>11.08 dBm(802.11n_HT40)<br>7.81 dBm(802.11ac_VHT80)  |
|                    |                                       | Antenna 1          | 13.15 dBm(802.11a)<br>13.18 dBm(802.11n_HT20)<br>11.86 dBm(802.11n_HT40)<br>8.48 dBm(802.11ac_VHT80)  |
|                    |                                       | Multiple Antenna   | 15.83 dBm(802.11a)<br>15.80 dBm(802.11n_HT20)<br>14.50 dBm(802.11n_HT40)<br>11.17 dBm(802.11ac_VHT80) |
|                    | WLAN<br>5 470 MHz ~<br>5 725 MHz Band | Antenna 0          | 12.40 dBm(802.11a)<br>12.32 dBm(802.11n_HT20)<br>11.38 dBm(802.11n_HT40)<br>8.18 dBm(802.11ac_VHT80)  |
|                    |                                       | Antenna 0_Straddle | 9.55 dBm(802.11a)<br>9.78 dBm(802.11n_HT20)<br>9.69 dBm(802.11n_HT40)<br>5.92 dBm(802.11ac_VHT80)     |
|                    |                                       | Antenna 1          | 13.23 dBm(802.11a)<br>13.26 dBm(802.11n_HT20)<br>11.56 dBm(802.11n_HT40)<br>8.66 dBm(802.11ac_VHT80)  |
|                    |                                       | Antenna 1_Straddle | 11.34 dBm(802.11a)<br>10.85 dBm(802.11n_HT20)<br>10.66 dBm(802.11n_HT40)<br>6.74 dBm(802.11ac_VHT80)  |

|                    |                                       |                               |                                                                                                       |
|--------------------|---------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------|
| RF OUTPUT<br>POWER | WLAN<br>5 470 MHz ~<br>5 725 MHz Band | Multiple Antenna              | 15.77 dBm(802.11a)<br>15.73 dBm(802.11n_HT20)<br>14.48 dBm(802.11n_HT40)<br>11.44 dBm(802.11ac_VHT80) |
|                    |                                       | Multiple Antenna<br>_Straddle | 13.55 dBm(802.11a)<br>13.36 dBm(802.11n_HT20)<br>13.21 dBm(802.11n_HT40)<br>9.36 dBm(802.11ac_VHT80)  |
|                    | WLAN<br>5 725 MHz ~<br>5 850 MHz Band | Antenna 0                     | 11.78 dBm(802.11a)<br>11.93 dBm(802.11n_HT20)<br>11.13 dBm(802.11n_HT40)<br>10.55 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 0_Straddle            | 2.36 dBm(802.11a)<br>2.57 dBm(802.11n_HT20)<br>-2.23 dBm(802.11n_HT40)<br>-8.75 dBm(802.11ac_VHT80)   |
|                    |                                       | Antenna 1                     | 13.20 dBm(802.11a)<br>13.34 dBm(802.11n_HT20)<br>12.30 dBm(802.11n_HT40)<br>11.66 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 1_Straddle            | 3.84 dBm(802.11a)<br>3.43 dBm(802.11n_HT20)<br>-0.99 dBm(802.11n_HT40)<br>-7.34 dBm(802.11ac_VHT80)   |
|                    |                                       | Multiple Antenna              | 15.56 dBm(802.11a)<br>15.70 dBm(802.11n_HT20)<br>14.76 dBm(802.11n_HT40)<br>14.15 dBm(802.11ac_VHT80) |
|                    |                                       | Multiple Antenna<br>_Straddle | 6.17 dBm(802.11a)<br>6.03 dBm(802.11n_HT20)<br>1.44 dBm(802.11n_HT40)<br>-4.98 dBm(802.11ac_VHT80)    |

| ANTENNA TYPE                                          | Chip Antenna                  |                  |           |
|-------------------------------------------------------|-------------------------------|------------------|-----------|
| ANTENNA GAIN                                          | Bluetooth LE                  | 0.62 dBi         |           |
|                                                       | Bluetooth                     | 0.62 dBi         |           |
|                                                       | WLAN 2.4 GHz                  | Antenna 0        | -0.42 dBi |
|                                                       |                               | Antenna 1        | -1.71 dBi |
|                                                       |                               | Multiple Antenna | 1.99 dBi  |
|                                                       | 5 150 MHz ~<br>5 250 MHz Band | Antenna 0        | -0.72 dBi |
|                                                       |                               | Antenna 1        | 1.83 dBi  |
|                                                       |                               | Multiple Antenna | 3.75 dBi  |
|                                                       | 5 250 MHz ~<br>5 350 MHz Band | Antenna 0        | -0.80 dBi |
|                                                       |                               | Antenna 1        | 0.37 dBi  |
|                                                       |                               | Multiple Antenna | 2.83 dBi  |
|                                                       | 5 470 MHz ~<br>5 725 MHz Band | Antenna 0        | -1.33 dBi |
|                                                       |                               | Antenna 1        | -0.17 dBi |
|                                                       |                               | Multiple Antenna | 2.30 dBi  |
|                                                       | 5 725 MHz ~<br>5 850 MHz Band | Antenna 0        | -1.43 dBi |
|                                                       |                               | Antenna 1        | 0.26 dBi  |
|                                                       |                               | Multiple Antenna | 2.51 dBi  |
| List of each Osc. or crystal<br>Freq.(Freq. >= 1 MHz) |                               | 40 MHz           |           |

**3.2 Alternative type(s)/model(s); also covered by this test report.**

-, None

**4. EUT MODIFICATIONS**

-, None

## 5. SYSTEM TEST CONFIGURATION

### 5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

| DEVICE TYPE | MANUFACTURER               | MODEL/PART NUMBER | FCC ID |
|-------------|----------------------------|-------------------|--------|
| Main Board  | Samsung Electronics Co Ltd | M80B(V1.0)        | N/A    |

### 5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

| Model      | Manufacturer                             | Description                | Connected to |
|------------|------------------------------------------|----------------------------|--------------|
| WCB735M    | Samsung Electronics Co Ltd               | Wi-Fi/BT Transceiver (EUT) |              |
| HP Probook | HP                                       | Notebook PC                | EUT          |
| PPP009L-E  | LIE-ON TECHNOLOGY<br>(CHANGZHOU)CO.,LTD. | AC Adapter                 |              |

### 5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is "XY" axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

| Channel | Frequency |
|---------|-----------|
| 0       | 2 402     |
| 19      | 2 440     |
| 39      | 2 480     |

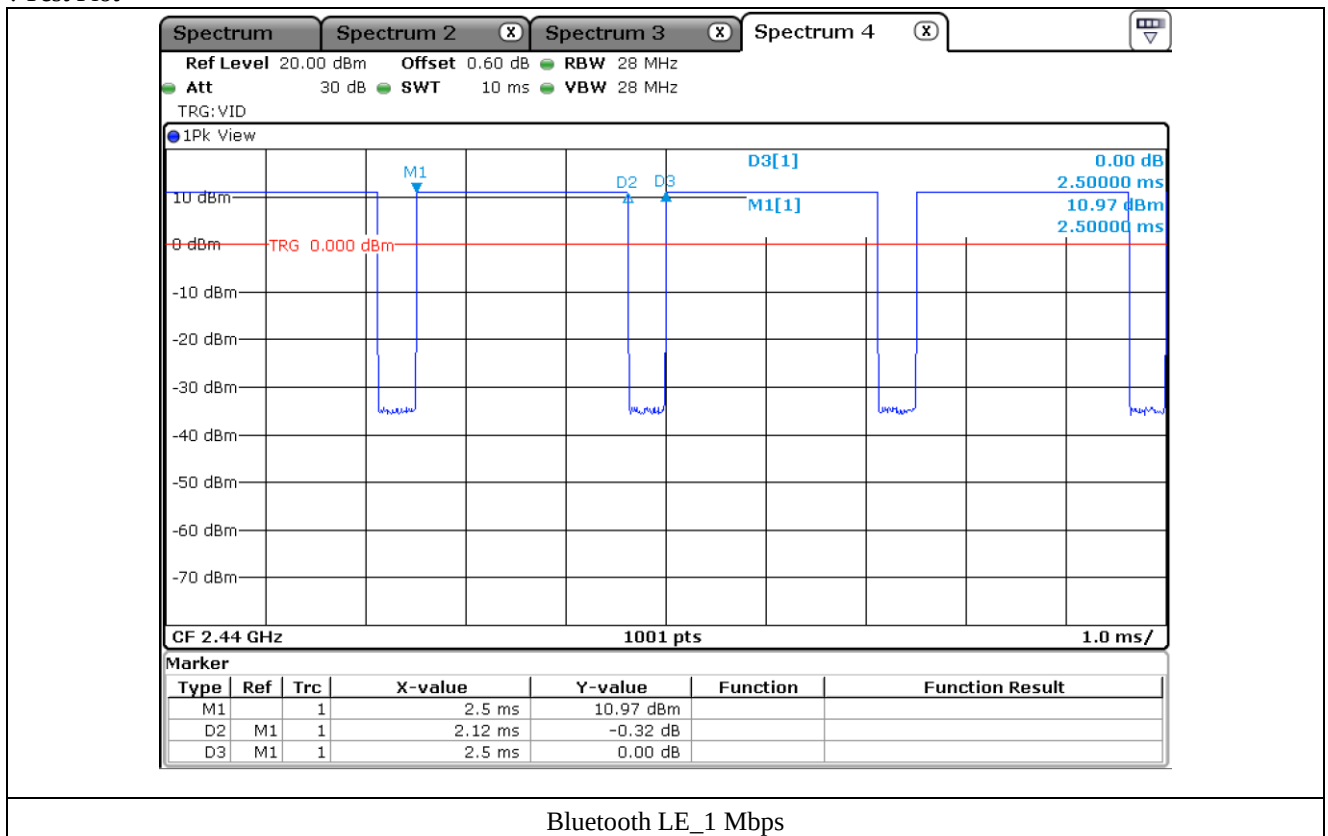
### -. Duty Cycle

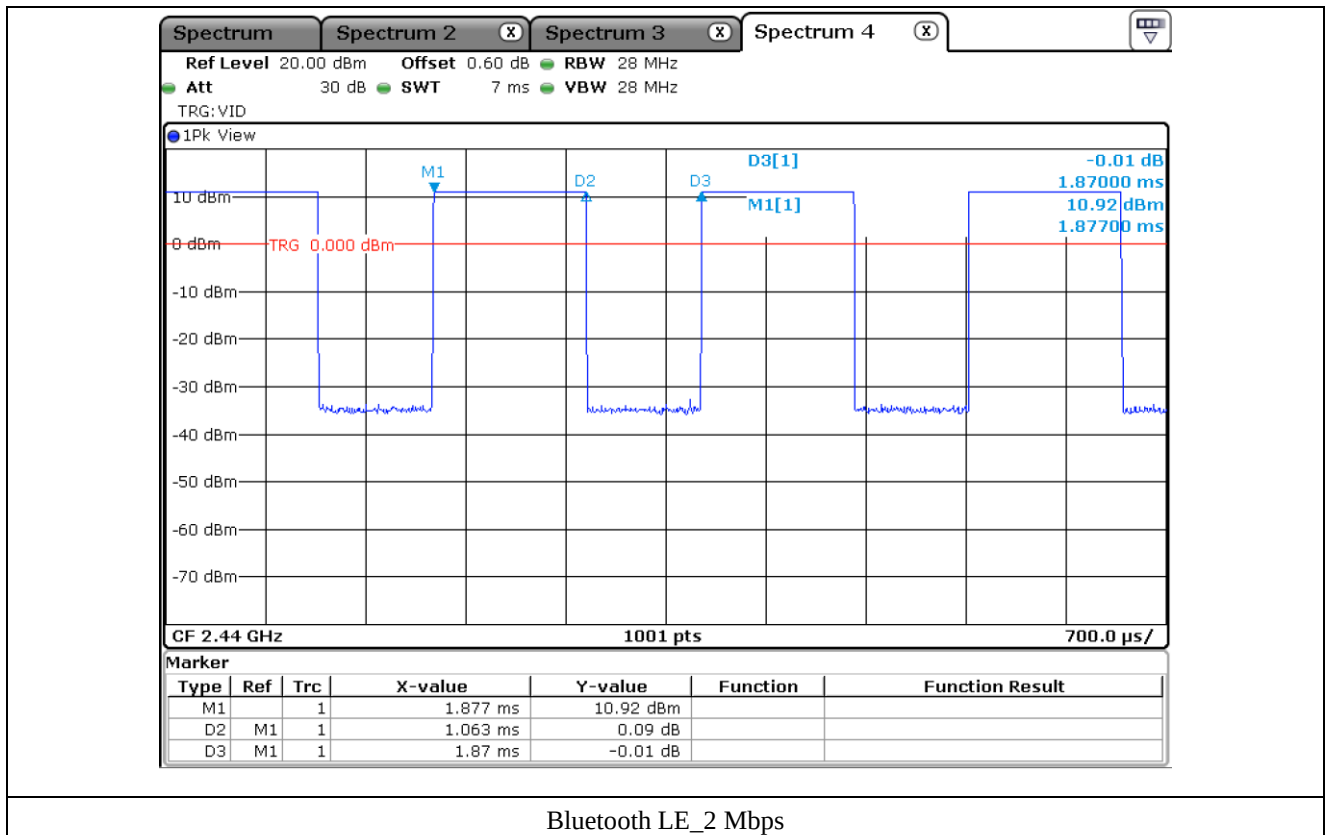
| Mode                       | Tx On Time<br>[ ms ] | Tx Off Time<br>[ ms ] | Duty Cycle<br>[ % ] | Correction Factor<br>[ dB ] |
|----------------------------|----------------------|-----------------------|---------------------|-----------------------------|
| Bluetooth LE<br>[ 1 Mbps ] | 2.12                 | 0.38                  | 84.80               | 0.72                        |
| Bluetooth LE<br>[ 2 Mbps ] | 1.063                | 0.807                 | 56.84               | 2.45                        |

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) \* 100

Correction Factor :  $10 * \log(1 / (\text{Duty Cycle} / 100))$

### -. Test Plot





## 5.4 Configuration of Test System

**Line Conducted Test:** The EUT was connected to USB and the power of USB was connected to Notebook PC. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2020 to determine the worse operating conditions.

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2020 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

## 5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### Antenna Construction:

The antenna of the EUT is a Chip Antenna on the main board in the EUT, so no consideration of replacement by the user.

## 6. PRELIMINARY TEST

### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode    | The Worse operating condition (Please check one only) |
|-------------------|-------------------------------------------------------|
| Transmitting Mode | X                                                     |

### 6.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

| Operation Mode    | The Worse operating condition (Please check one only) |
|-------------------|-------------------------------------------------------|
| Transmitting Mode | X                                                     |

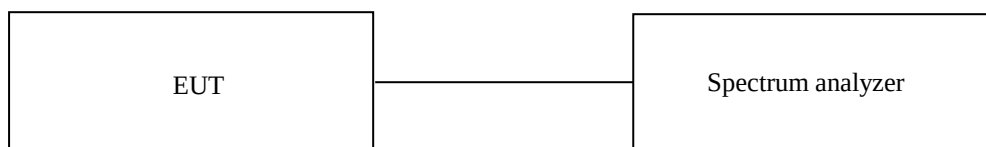
## 7. MINIMUM 6 dB BANDWIDTH

### 7.1 Operating environment

Temperature : 22 °C  
Relative humidity : 46 % R.H.

### 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



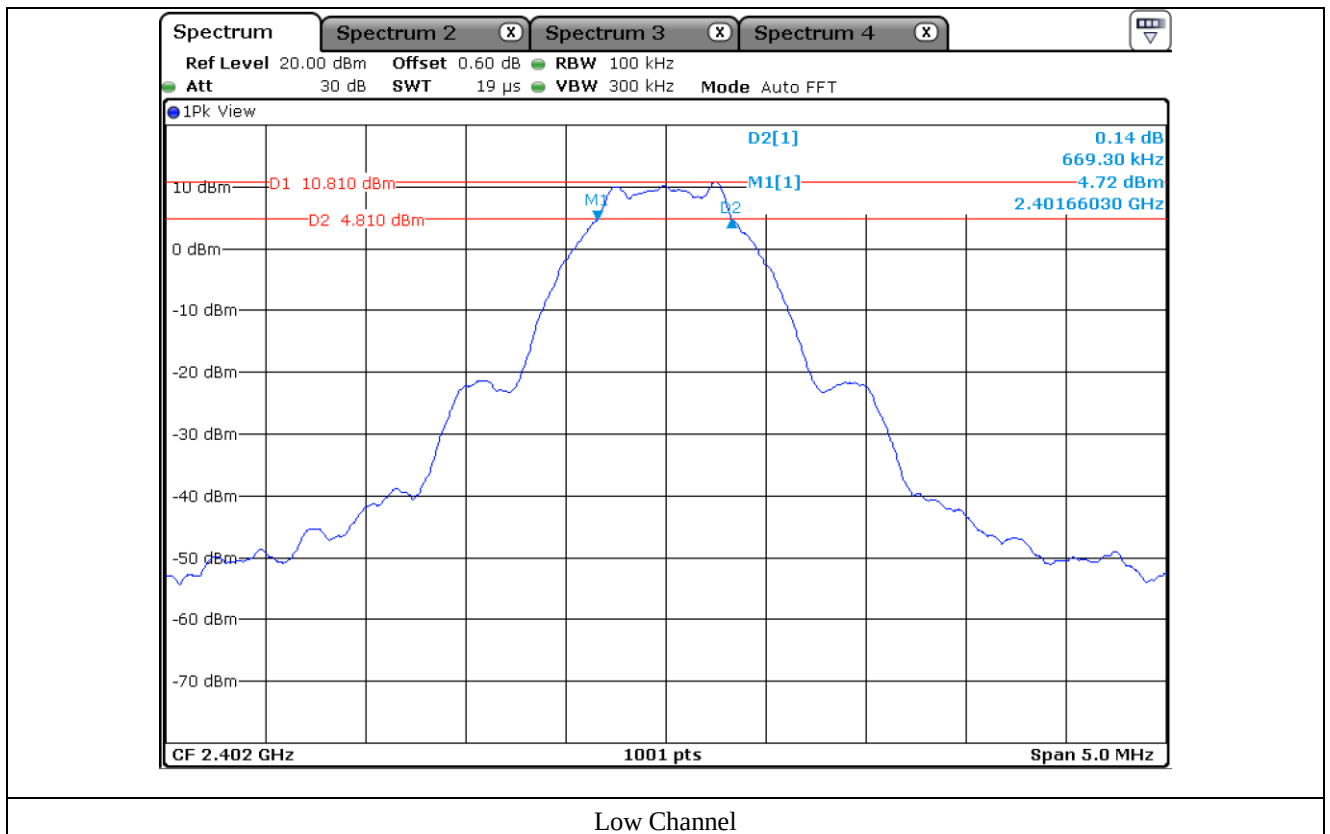
### 7.3 Test Date

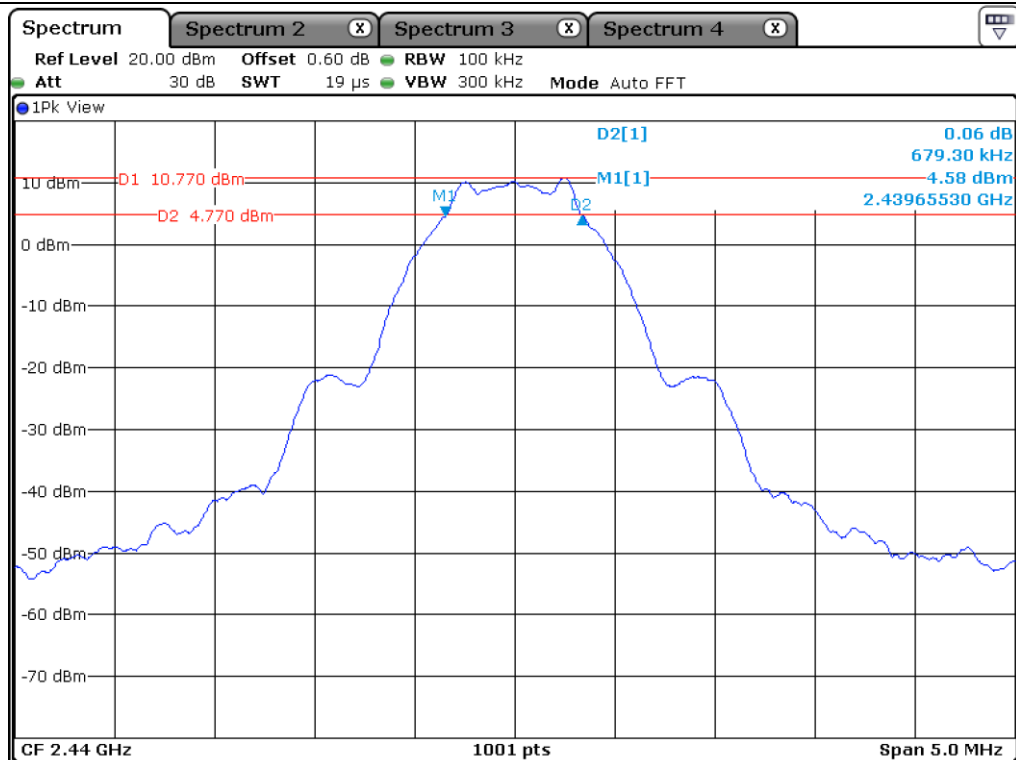
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#### 7.4 Test data for 1 Mbps

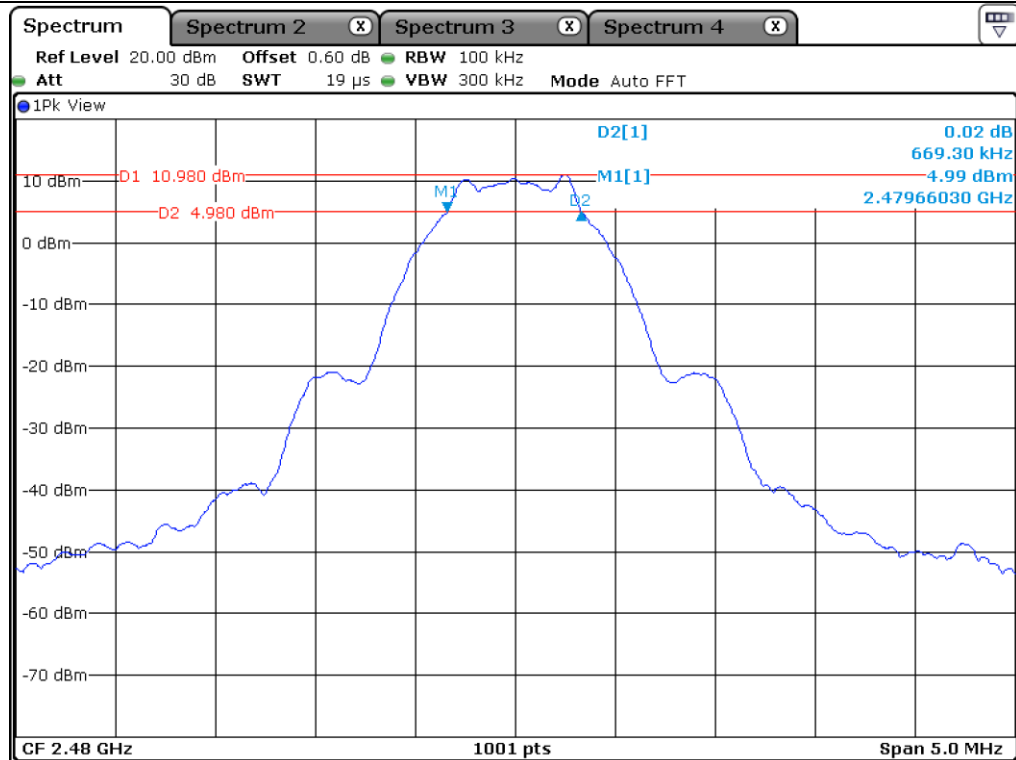
| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (kHz) | LIMIT (kHz) | MARGIN (kHz) |
|---------|----------------|----------------------|-------------|--------------|
| Low     | 2 402.00       | 669.30               | 500.00      | 169.30       |
| Middle  | 2 440.00       | 679.30               | 500.00      | 179.30       |
| High    | 2 480.00       | 669.30               | 500.00      | 169.30       |

Remark. Margin = Measured Value - Limit





Middle Channel

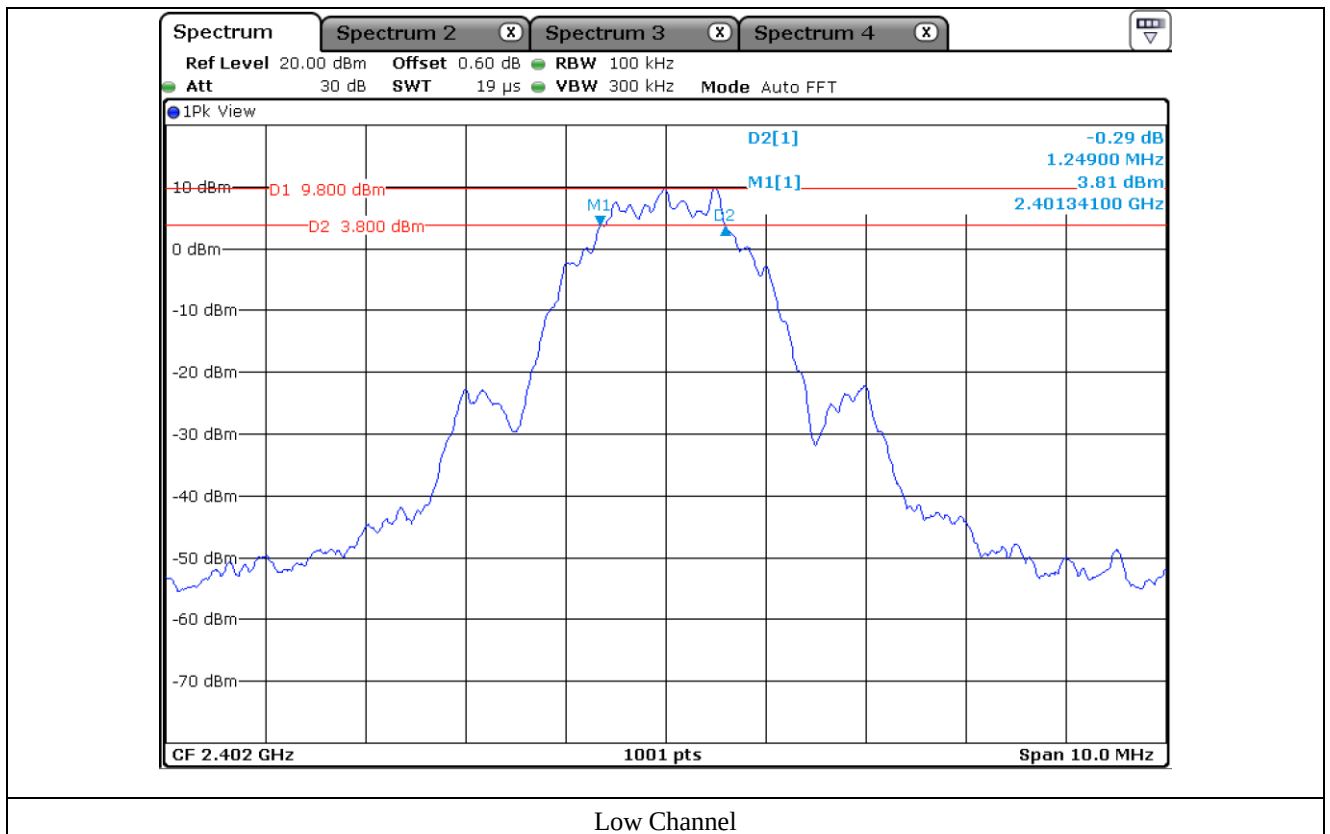


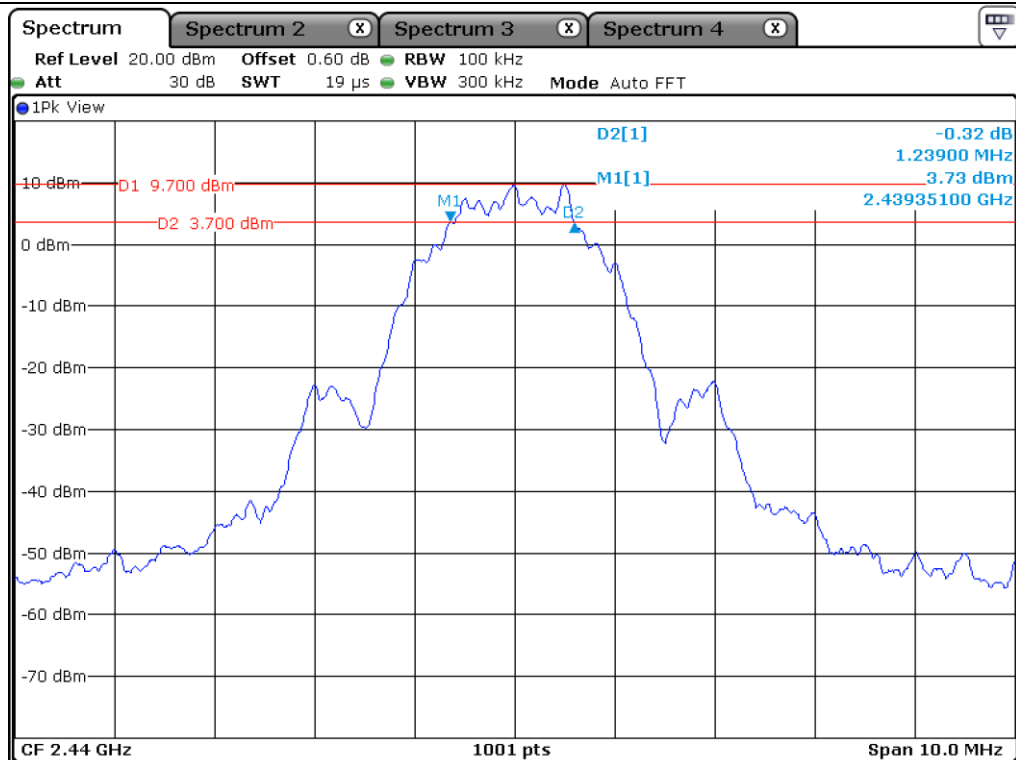
High Channel

### 7.5 Test data for 2 Mbps

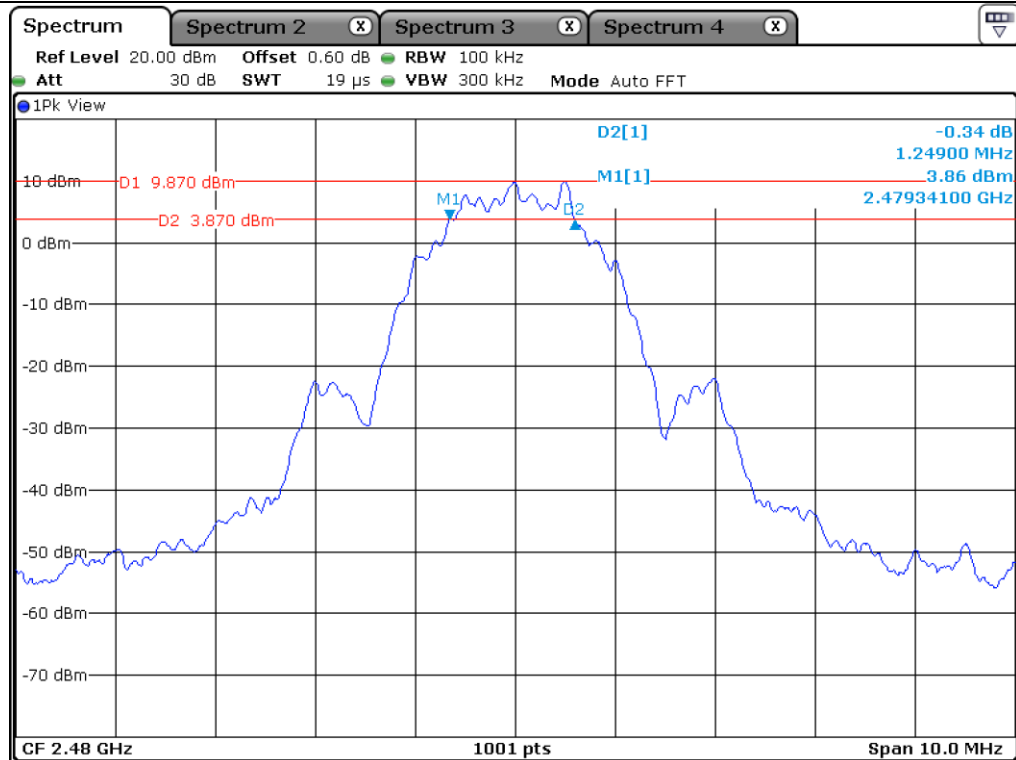
| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (kHz) | LIMIT (kHz) | MARGIN (kHz) |
|---------|----------------|----------------------|-------------|--------------|
| Low     | 2 402.00       | 1 249.00             | 500.00      | 749.00       |
| Middle  | 2 440.00       | 1 239.00             | 500.00      | 739.00       |
| High    | 2 480.00       | 1 249.00             | 500.00      | 749.00       |

Remark. Margin = Measured Value - Limit





Middle Channel



High Channel

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## 8. MAXIMUM PEAK OUTPUT POWER

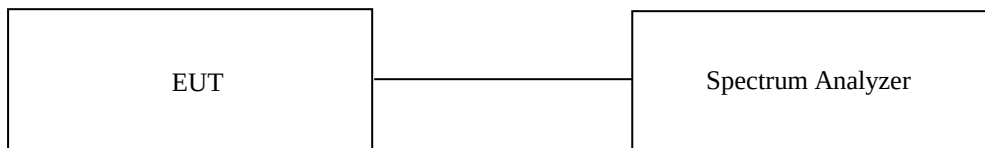
### 8.1 Operating environment

Temperature : 22 °C  
Relative humidity : 46 % R.H.

### 8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to  $\geq$  DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



### 8.3 Test Date

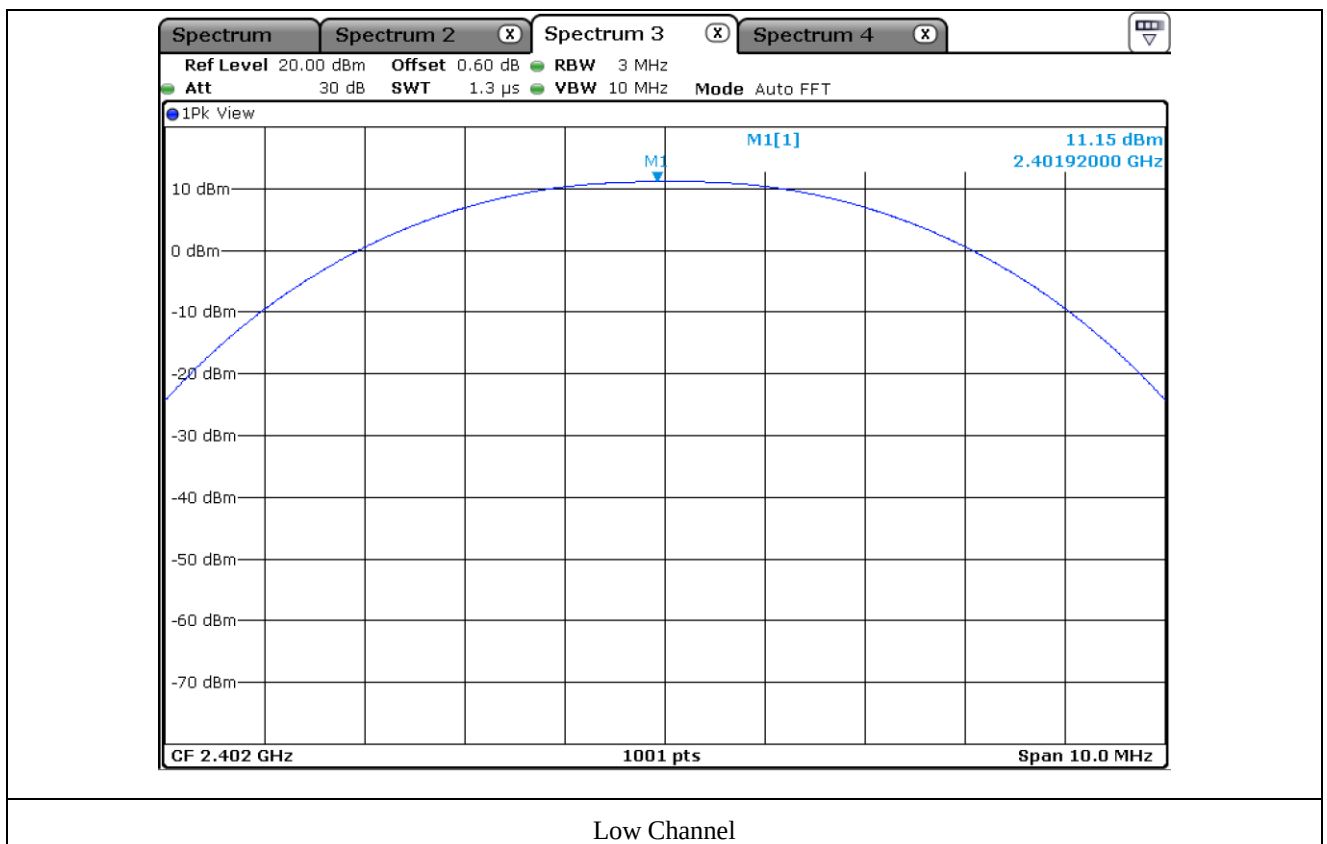
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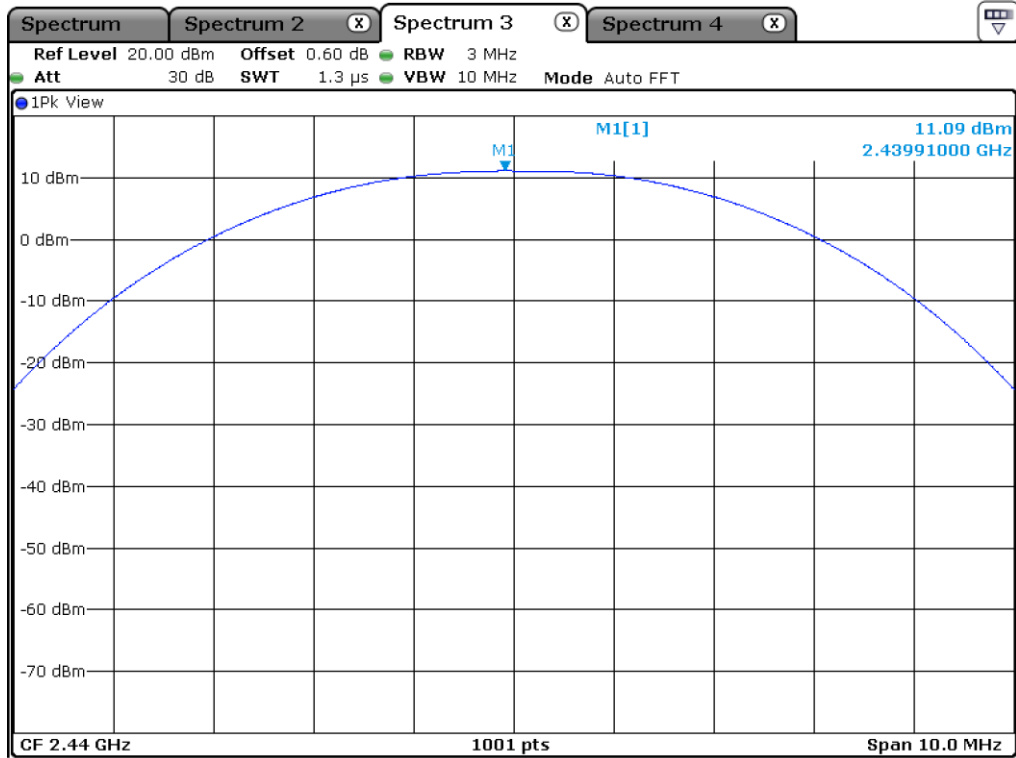
## 8.4 Test data for 1 Mbps

-. Test Result : Pass

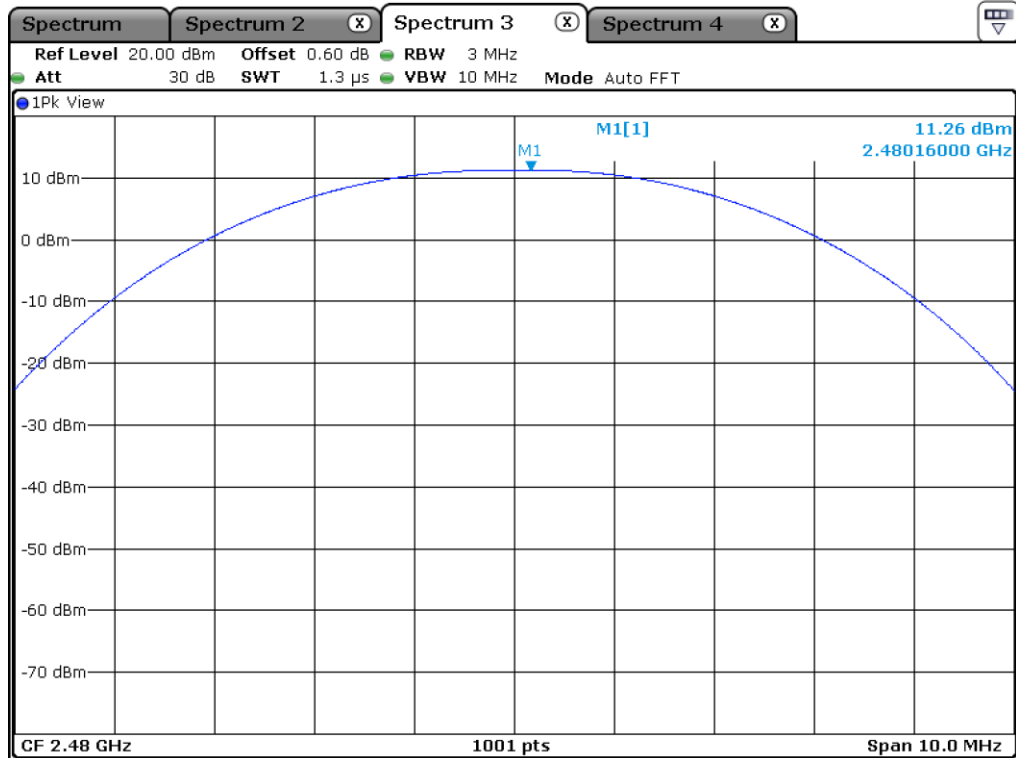
| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 402.00           | 11.15                   | 30.00          | 18.85          |
| MIDDLE  | 2 440.00           | 11.09                   | 30.00          | 18.91          |
| HIGH    | 2 480.00           | 11.26                   | 30.00          | 18.74          |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)





Middle Channel



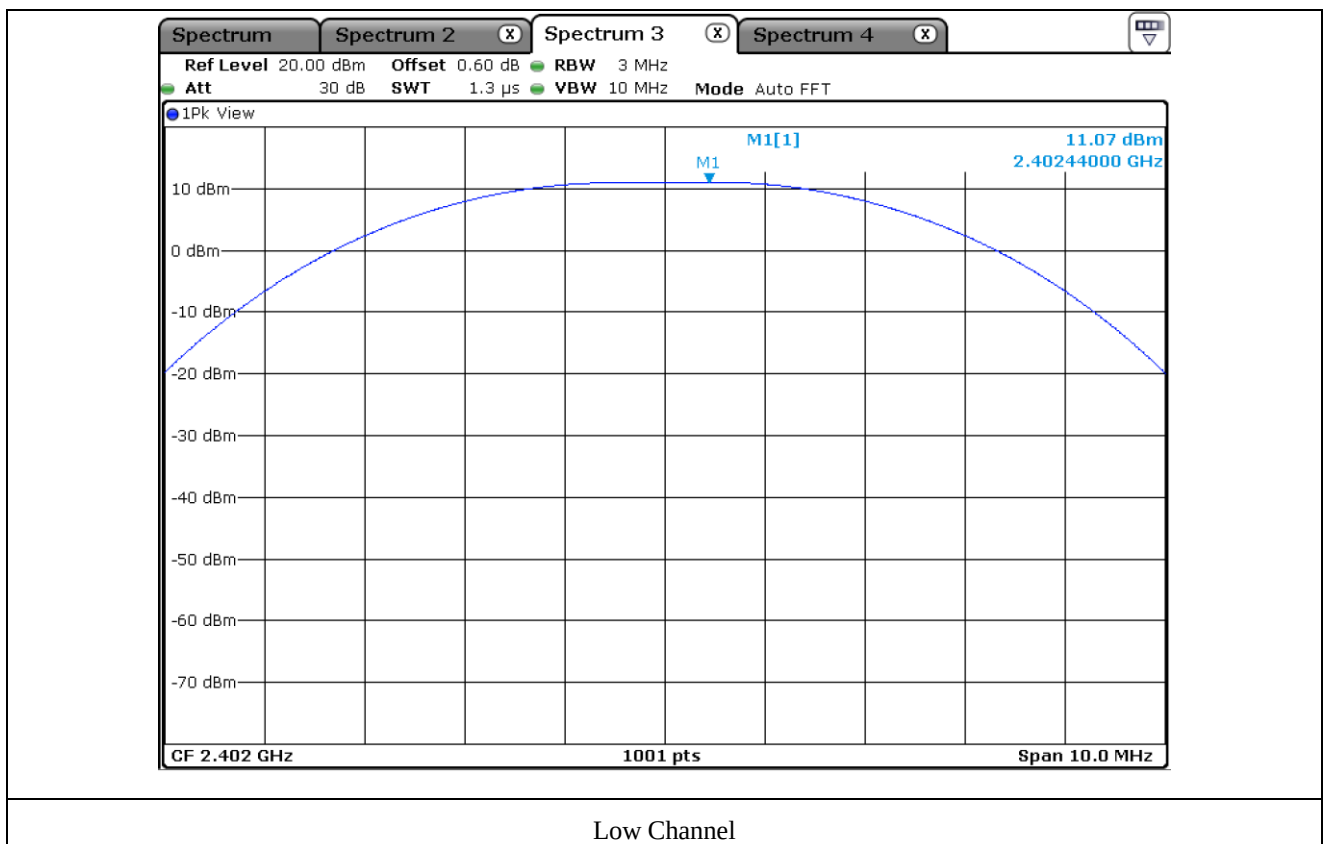
High Channel

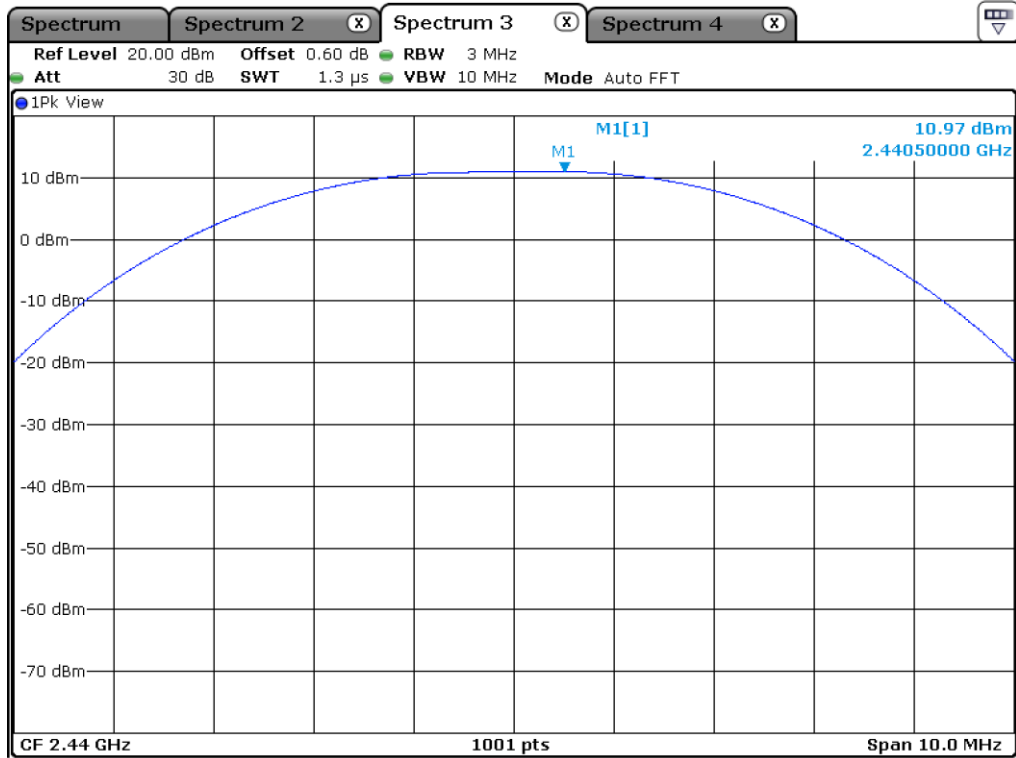
## 8.5 Test data for 2 Mbps

-. Test Result : Pass

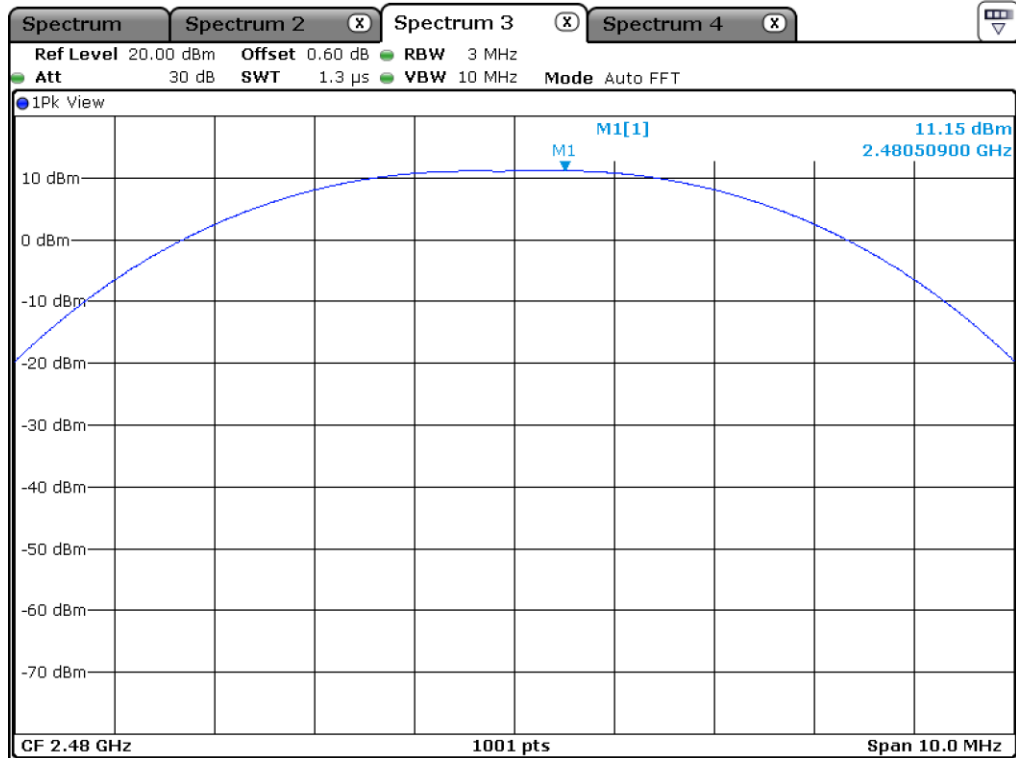
| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 402.00           | 11.07                   | 30.00          | 18.93          |
| MIDDLE  | 2 440.00           | 10.97                   | 30.00          | 19.03          |
| HIGH    | 2 480.00           | 11.15                   | 30.00          | 18.85          |

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)





Middle Channel



High Channel

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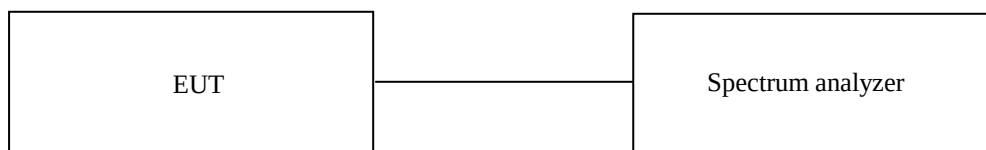
## 9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 9.1 Operating environment

Temperature : 22 °C  
Relative humidity : 46 % R.H.

### 9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.



### 9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

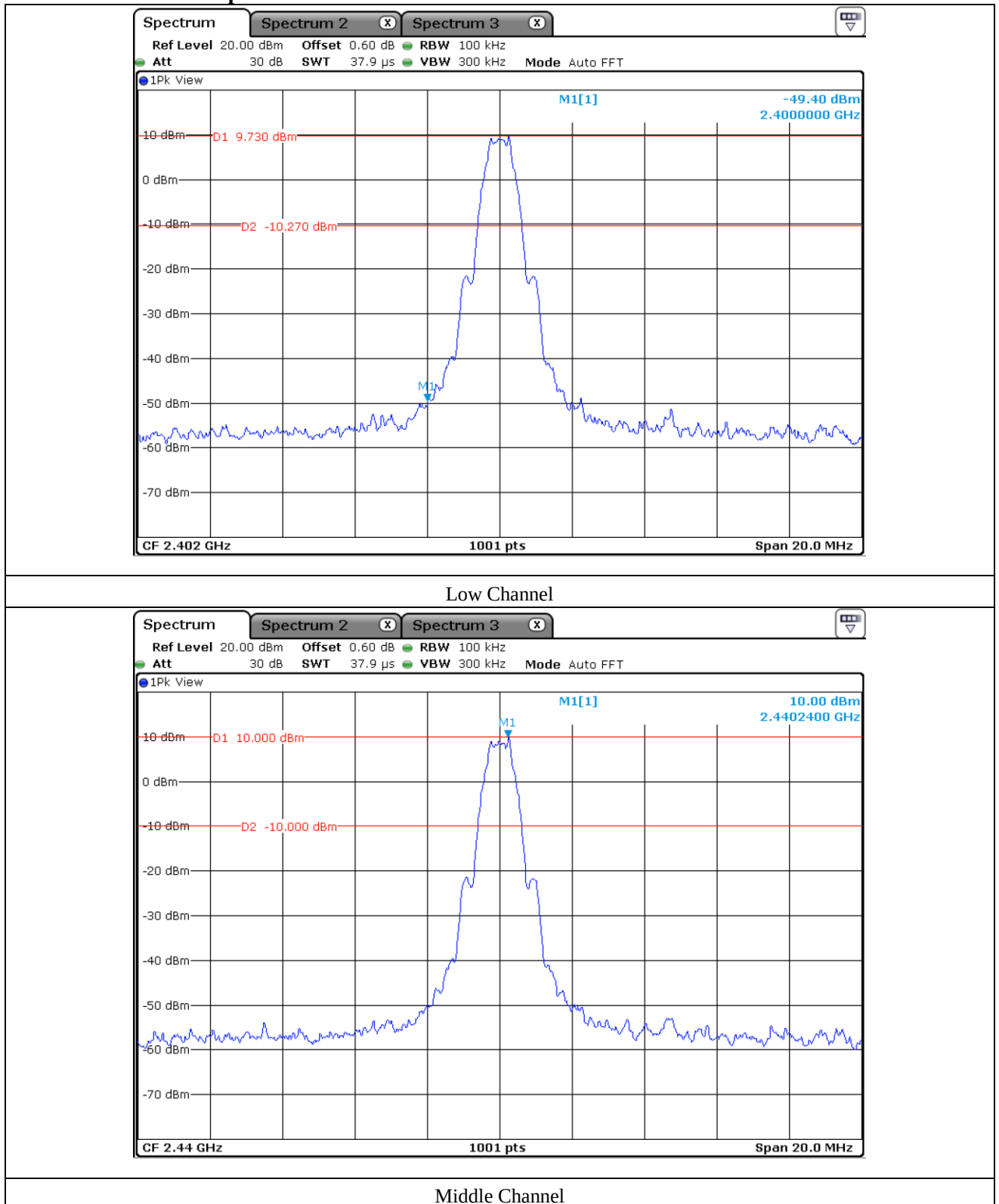
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

### 9.4 Test Date

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## 9.5 Test data for conducted emission

### 9.5.1 Test data for 1 Mbps

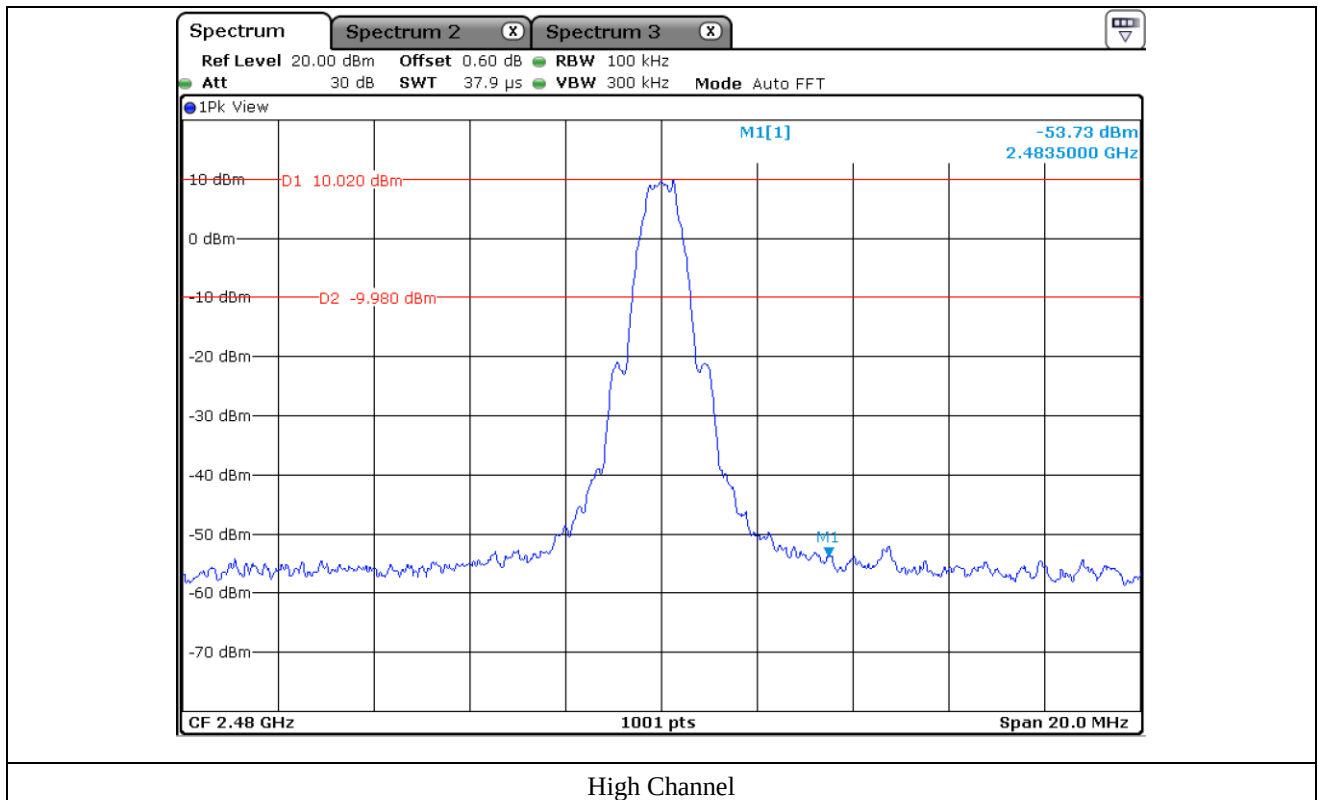


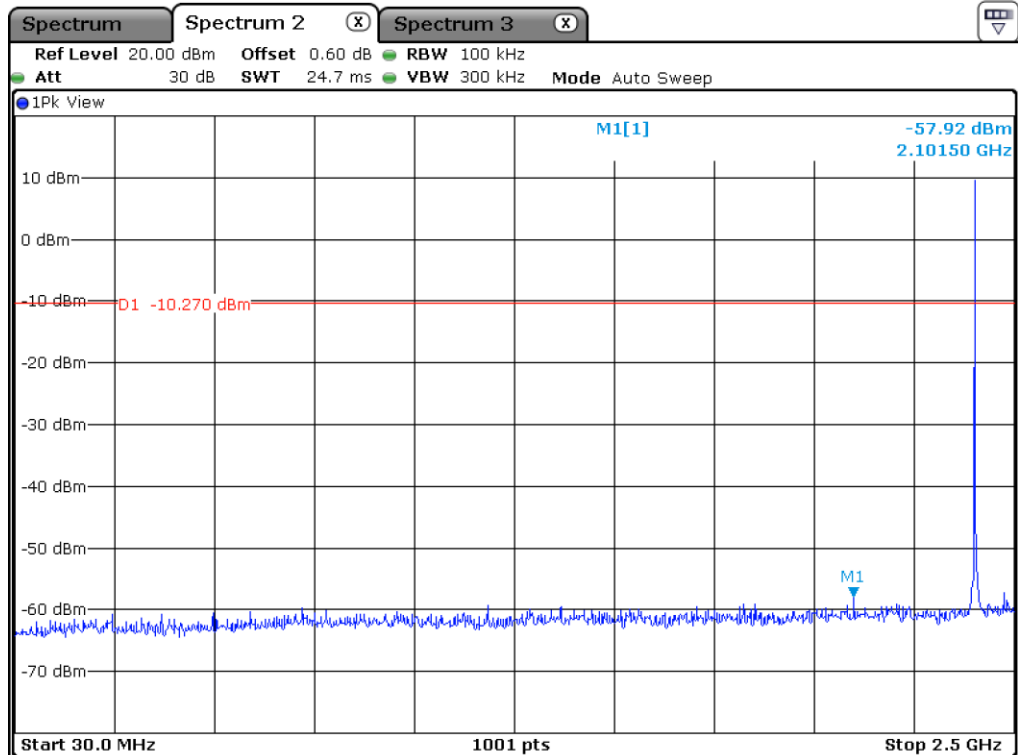
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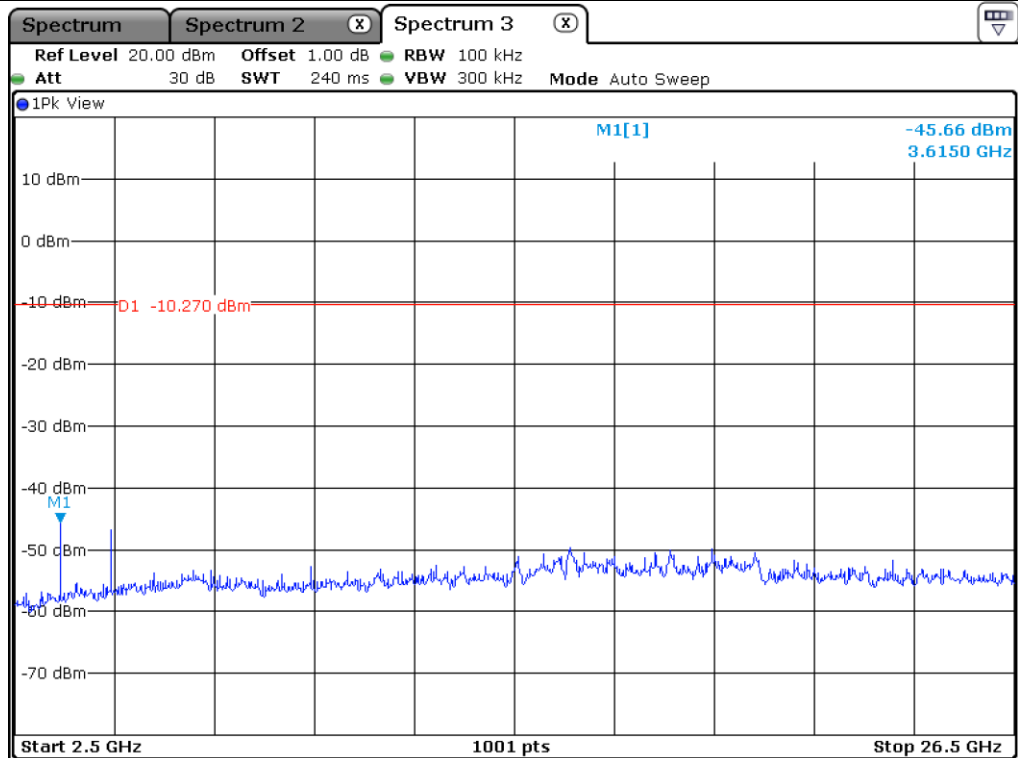
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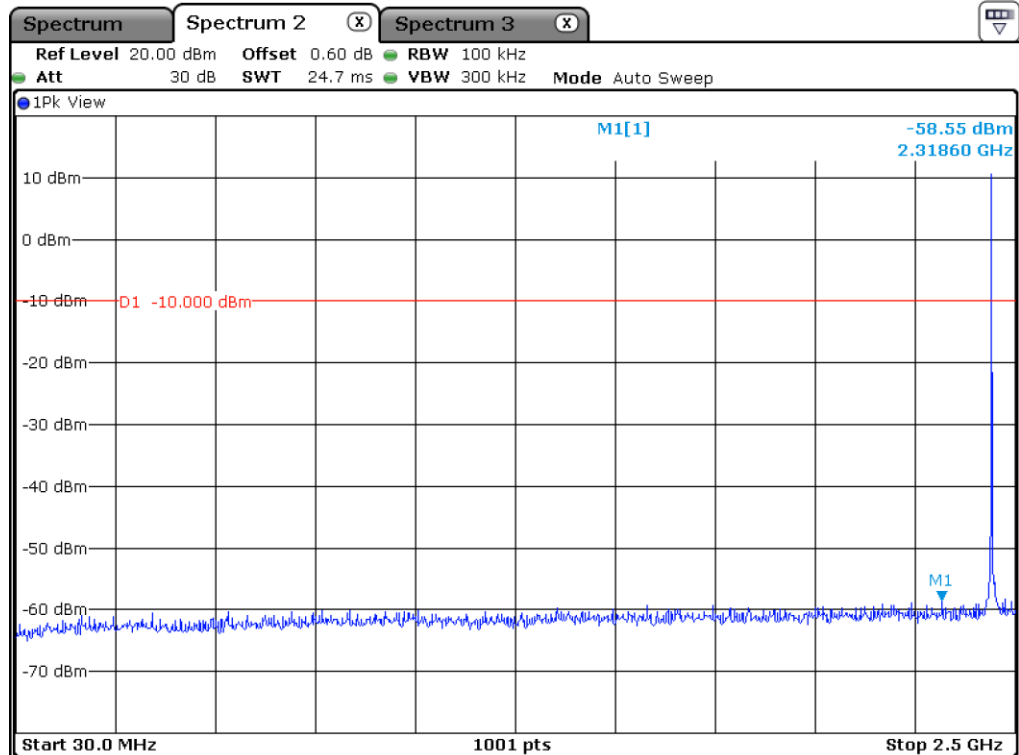




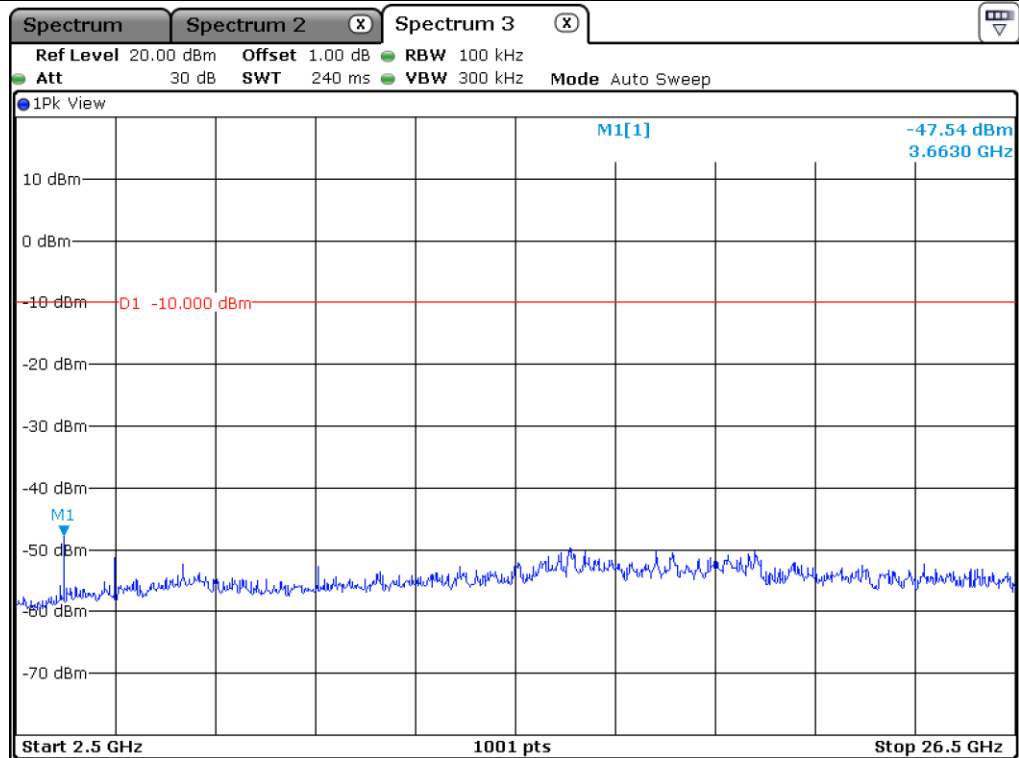
Low Channel



Low Channel



Middle Channel



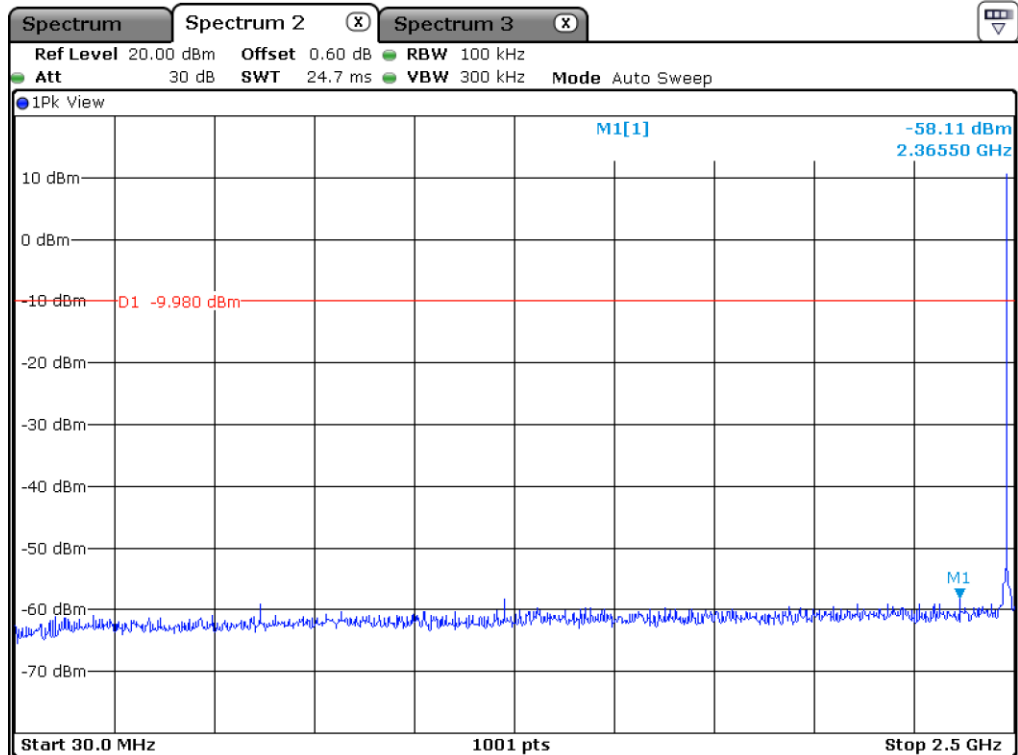
Middle Channel

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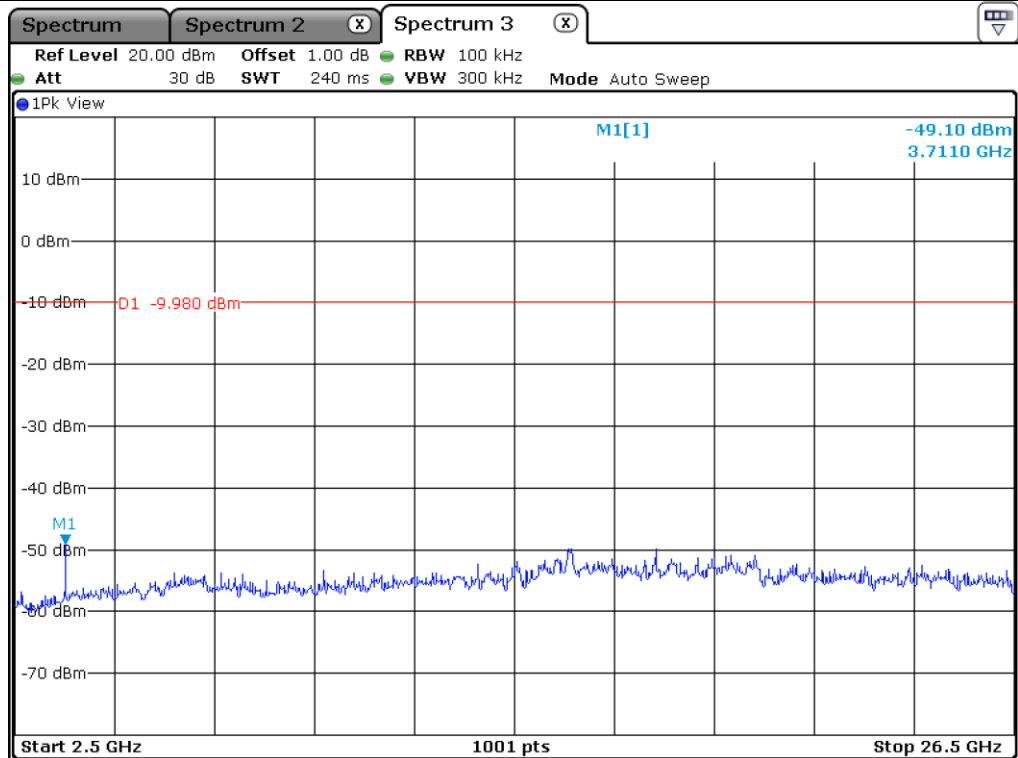
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### High Channel



### High Channel

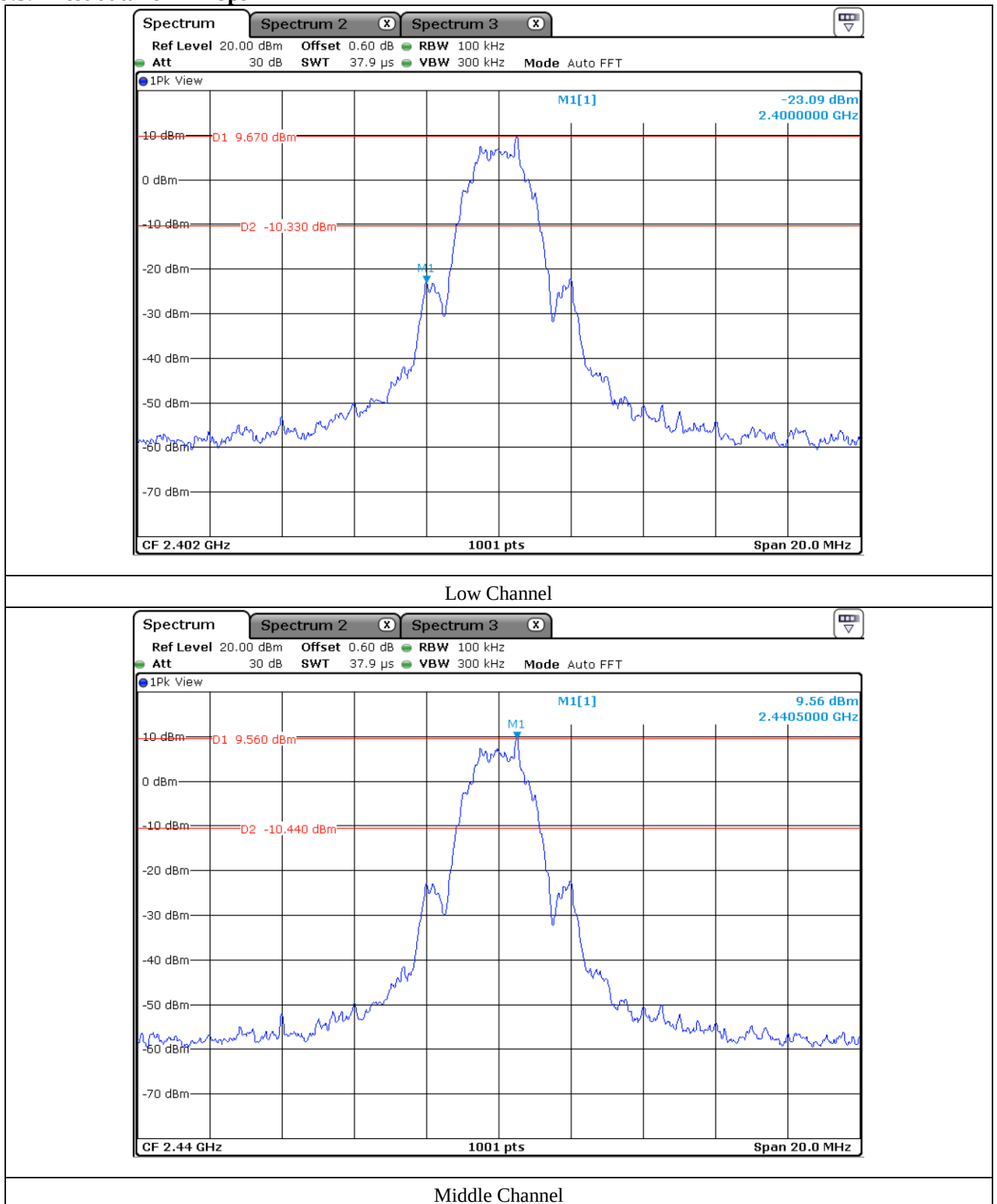
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## 9.5.2 Test data for 2 Mbps

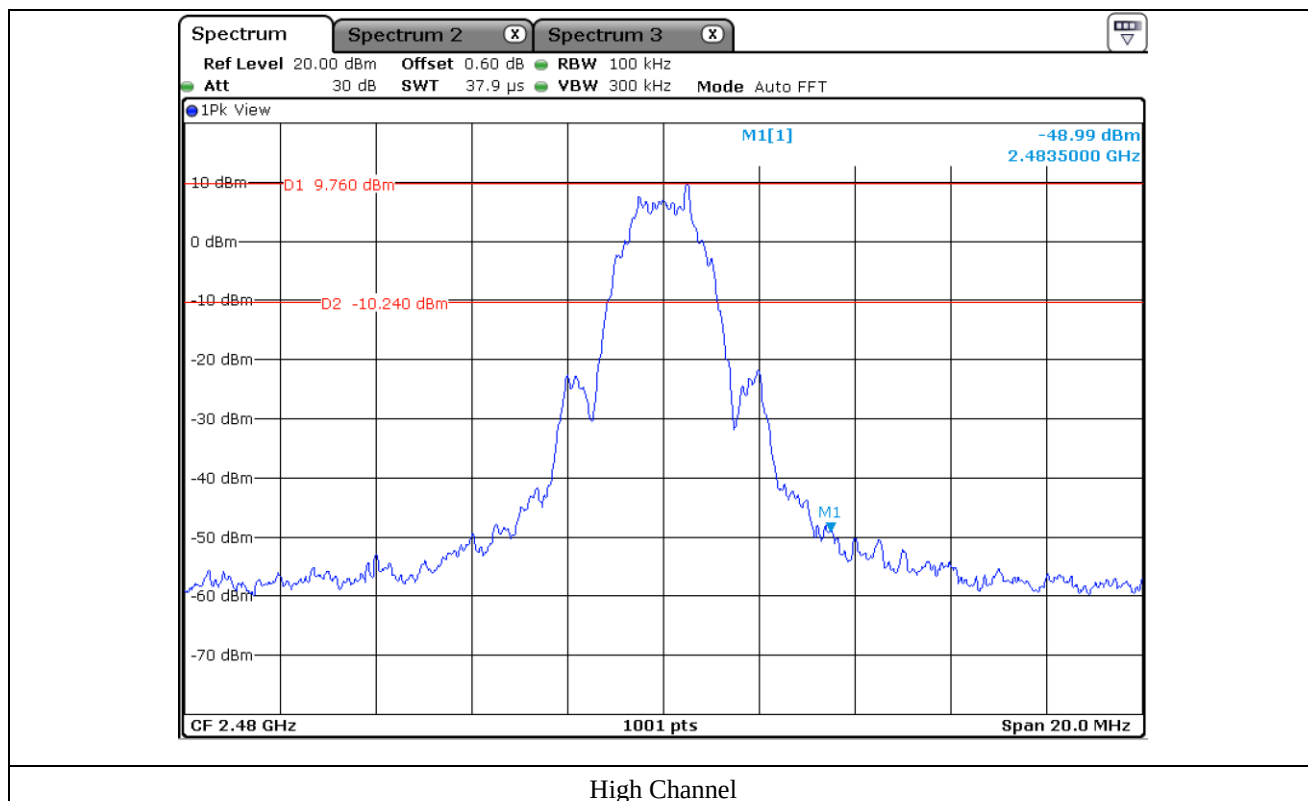


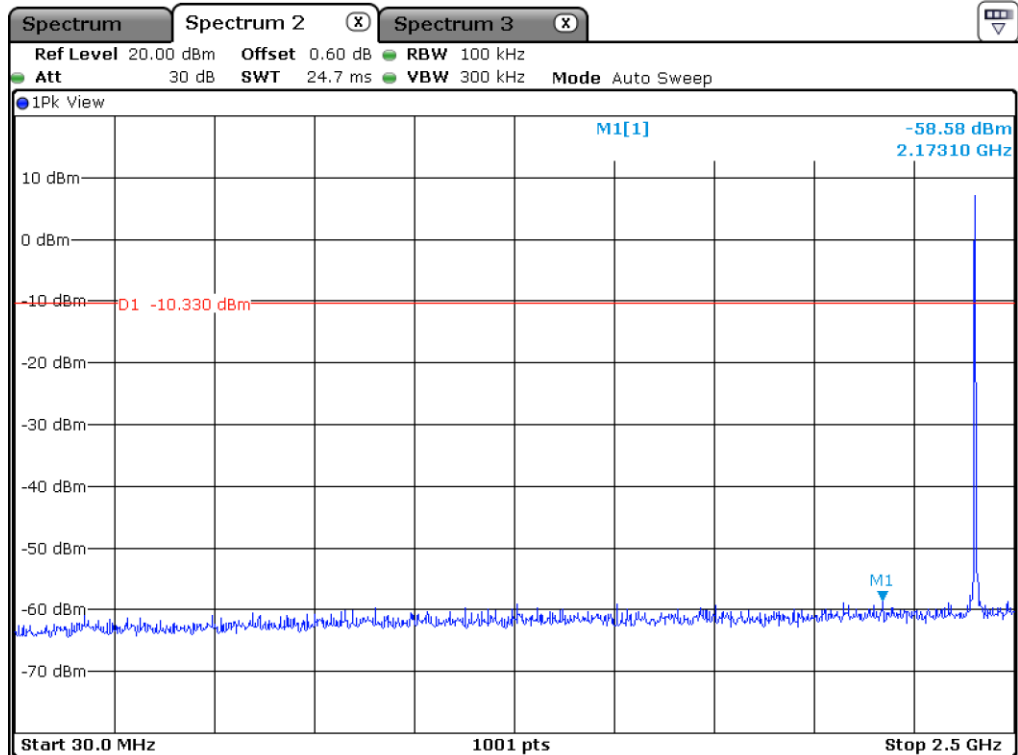
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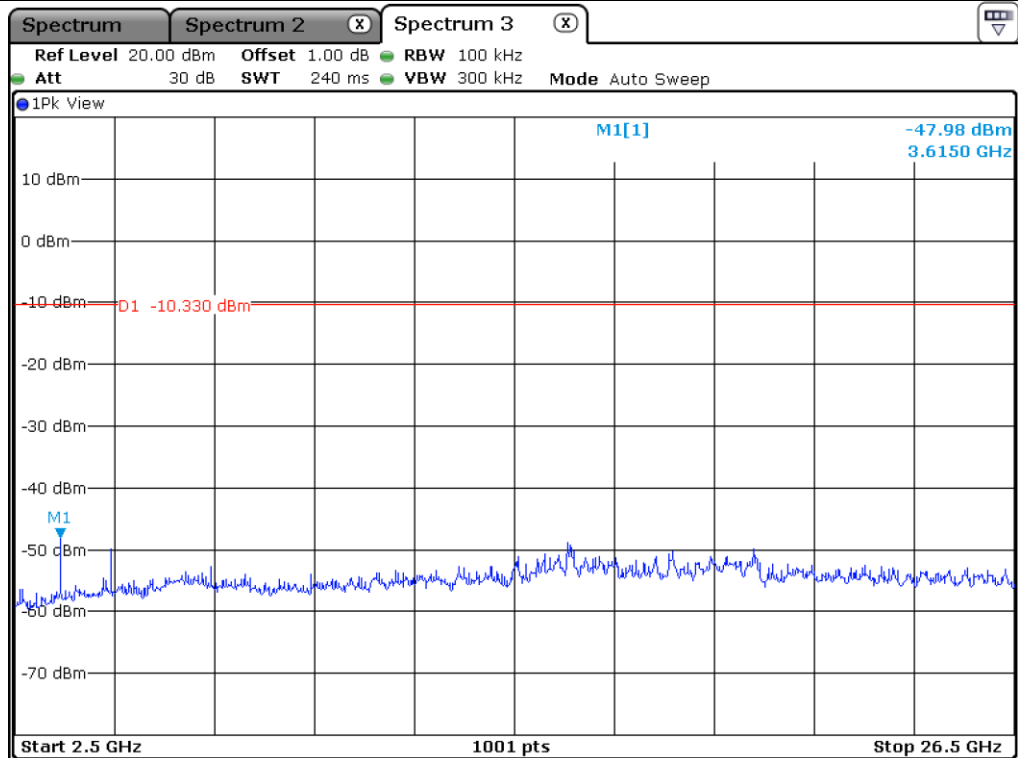
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Low Channel



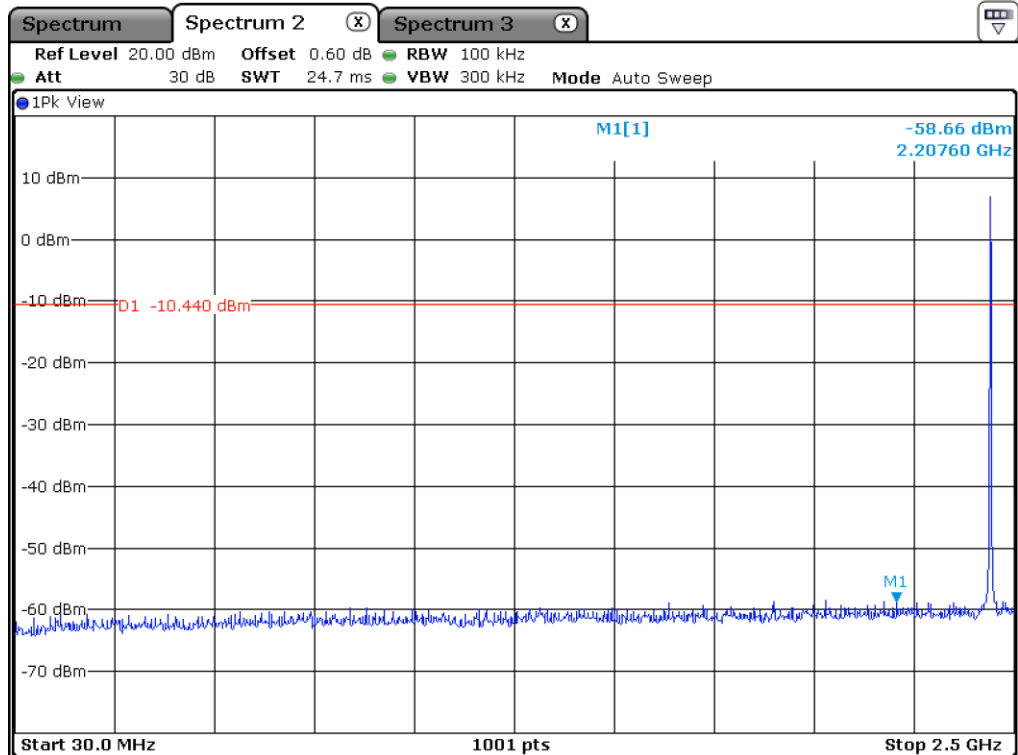
Low Channel

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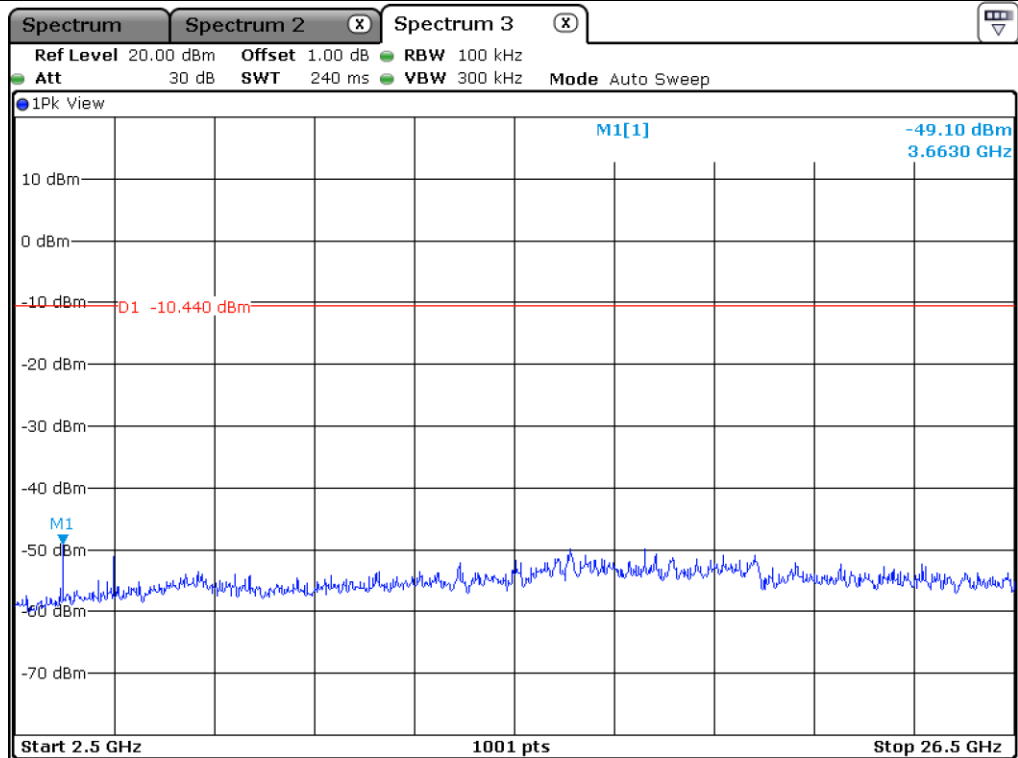
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Middle Channel



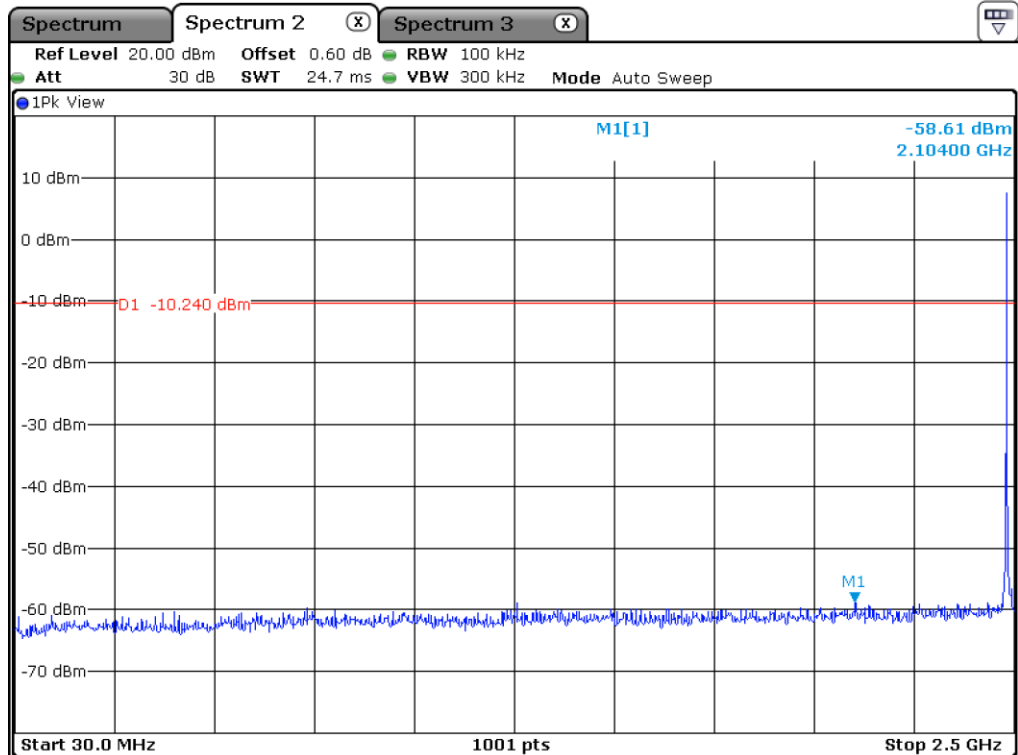
Middle Channel

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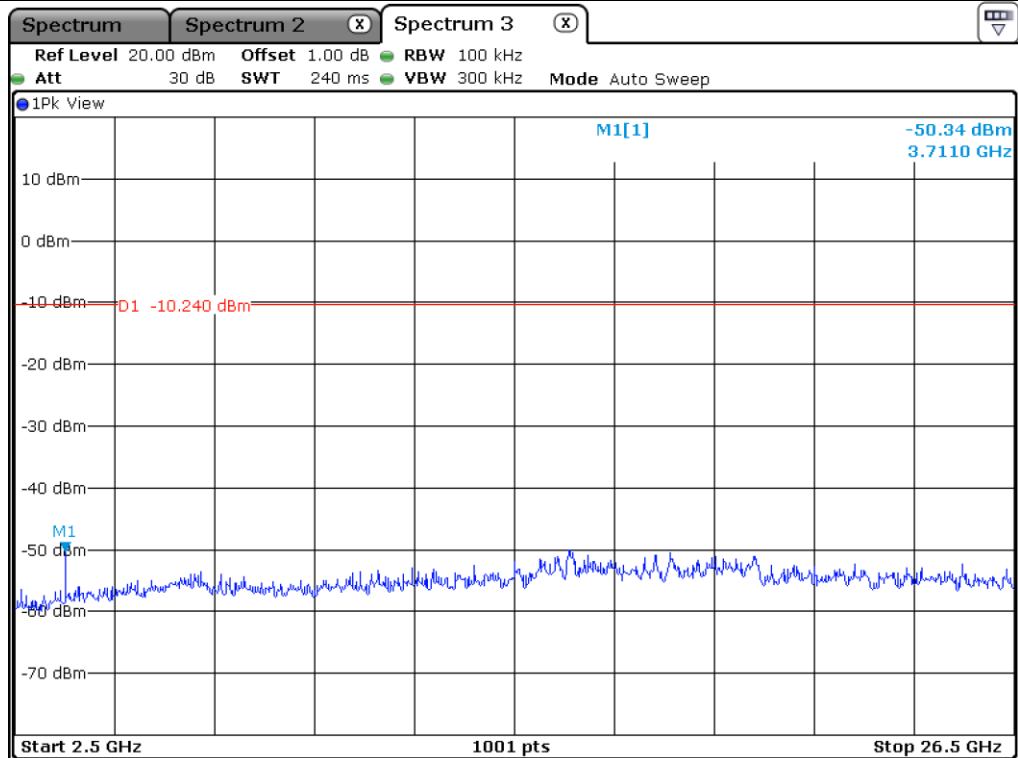
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### High Channel



### High Channel

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## 9.6 Test data for radiated emission

### 9.6.1 Radiated Emission which fall in the Restricted Band

#### 9.6.1.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Measurement distance : 3 m
- . Duty Cycle : 84.80 %
- . Result : PASSED

| Frequency<br>(MHz)                | Reading<br>(dBμV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | AMP<br>Gain | Duty<br>Factor<br>(dB) | Total<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|-----------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|------------------------|-------------------|--------------------|----------------|
| <b>Test Data for Low Channel</b>  |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 390.00                          | 52.66             | Peak             | H                  | 27.50          | 8.20          | 45.79       | -                      | 42.57             | 74.00              | 31.43          |
| 2 390.00                          | 43.07             | Average          | H                  | 27.50          | 8.20          | 45.79       | 0.72                   | 33.70             | 54.00              | 20.30          |
| 2 388.92                          | 51.54             | Peak             | V                  | 27.50          | 8.20          | 45.79       | -                      | 41.45             | 74.00              | 32.55          |
| 2 390.00                          | 42.50             | Average          | V                  | 27.50          | 8.20          | 45.79       | 0.72                   | 33.13             | 54.00              | 20.87          |
| <b>Test Data for High Channel</b> |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 483.50                          | 56.34             | Peak             | H                  | 27.30          | 8.33          | 45.79       | -                      | 46.18             | 74.00              | 27.82          |
| 2 483.50                          | 46.52             | Average          | H                  | 27.30          | 8.33          | 45.79       | 0.72                   | 37.08             | 54.00              | 16.92          |
| 2 483.50                          | 55.78             | Peak             | V                  | 27.30          | 8.33          | 45.79       | -                      | 45.62             | 74.00              | 28.38          |
| 2 483.50                          | 45.62             | Average          | V                  | 27.30          | 8.33          | 45.79       | 0.72                   | 36.18             | 54.00              | 17.82          |

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

### 9.6.1.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 56.84 %
- Result : PASSED

| Frequency<br>(MHz)                | Reading<br>(dBμV) | Detector<br>Mode | Ant. Pol.<br>(H/V) | Ant.<br>Factor | Cable<br>Loss | AMP<br>Gain | Duty<br>Factor<br>(dB) | Total<br>(dBμV/m) | Limits<br>(dBμV/m) | Margin<br>(dB) |
|-----------------------------------|-------------------|------------------|--------------------|----------------|---------------|-------------|------------------------|-------------------|--------------------|----------------|
| <b>Test Data for Low Channel</b>  |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 389.55                          | 52.50             | Peak             | H                  | 27.50          | 8.20          | 45.79       | -                      | 42.41             | 74.00              | 31.59          |
| 2 390.00                          | 42.77             | Average          | H                  | 27.50          | 8.20          | 45.79       | 2.45                   | 35.13             | 54.00              | 18.87          |
| 2 389.01                          | 52.16             | Peak             | V                  | 27.50          | 8.20          | 45.79       | -                      | 42.07             | 74.00              | 31.93          |
| 2 390.00                          | 42.09             | Average          | V                  | 27.50          | 8.20          | 45.79       | 2.45                   | 34.45             | 54.00              | 19.55          |
| <b>Test Data for High Channel</b> |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 483.50                          | 59.37             | Peak             | H                  | 27.30          | 8.33          | 45.79       | -                      | 49.21             | 74.00              | 24.79          |
| 2 483.50                          | 50.73             | Average          | H                  | 27.30          | 8.33          | 45.79       | 2.45                   | 43.02             | 54.00              | 10.98          |
| 2 483.50                          | 58.65             | Peak             | V                  | 27.30          | 8.33          | 45.79       | -                      | 48.49             | 74.00              | 25.51          |
| 2 483.50                          | 50.11             | Average          | V                  | 27.30          | 8.33          | 45.79       | 2.45                   | 42.40             | 54.00              | 11.60          |

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

## 9.6.2 Spurious & Harmonic Radiated Emission

### 9.6.2.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
1 MHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : 84.80 %
- . Result : PASSED

| Frequency (MHz)                     | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | AMP Gain | Duty Factor (dB) | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|-------------------------------------|----------------|---------------|-----------------|-------------|------------|----------|------------------|----------------|-----------------|-------------|
| <b>Test Data for Low Channel</b>    |                |               |                 |             |            |          |                  |                |                 |             |
| 4 804.00                            | 49.55          | Peak          | H               | 31.10       | 11.19      | 45.10    | -                | 46.74          | 74.00           | 27.26       |
| 4 804.00                            | 39.26          | Average       | H               | 31.10       | 11.19      | 45.10    | 0.72             | 37.17          | 54.00           | 16.83       |
| 4 804.00                            | 49.44          | Peak          | V               | 31.10       | 11.19      | 45.10    | -                | 46.63          | 74.00           | 27.37       |
| 4 804.00                            | 39.23          | Average       | V               | 31.10       | 11.19      | 45.10    | 0.72             | 37.14          | 54.00           | 16.86       |
| <b>Test Data for Middle Channel</b> |                |               |                 |             |            |          |                  |                |                 |             |
| 4 880.00                            | 49.49          | Peak          | H               | 31.10       | 11.24      | 45.10    | -                | 46.73          | 74.00           | 27.27       |
| 4 880.00                            | 39.30          | Average       | H               | 31.10       | 11.24      | 45.10    | 0.72             | 37.26          | 54.00           | 16.74       |
| 4 880.00                            | 49.47          | Peak          | V               | 31.10       | 11.24      | 45.10    | -                | 46.71          | 74.00           | 27.29       |
| 4 880.00                            | 39.22          | Average       | V               | 31.10       | 11.24      | 45.10    | 0.72             | 37.18          | 54.00           | 16.82       |
| <b>Test Data for High Channel</b>   |                |               |                 |             |            |          |                  |                |                 |             |
| 4 960.00                            | 49.54          | Peak          | H               | 31.20       | 11.33      | 45.03    | -                | 47.04          | 74.00           | 26.96       |
| 4 960.00                            | 39.29          | Average       | H               | 31.20       | 11.33      | 45.03    | 0.72             | 37.51          | 54.00           | 16.49       |
| 4 960.00                            | 49.41          | Peak          | V               | 31.20       | 11.33      | 45.03    | -                | 46.91          | 74.00           | 27.09       |
| 4 960.00                            | 39.26          | Average       | V               | 31.20       | 11.33      | 45.03    | 0.72             | 37.48          | 54.00           | 16.52       |

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

### 9.6.2.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,  
1 MHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 56.84 %
- Result : PASSED

| Frequency (MHz)                     | Reading (dBμV) | Detector Mode | Ant. Pol. (H/V) | Ant. Factor | Cable Loss | AMP Gain | Duty Factor (dB) | Total (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|-------------------------------------|----------------|---------------|-----------------|-------------|------------|----------|------------------|----------------|-----------------|-------------|
| <b>Test Data for Low Channel</b>    |                |               |                 |             |            |          |                  |                |                 |             |
| 4 804.00                            | 49.51          | Peak          | H               | 31.10       | 11.19      | 45.10    | -                | 46.70          | 74.00           | 27.30       |
| 4 804.00                            | 39.43          | Average       | H               | 31.10       | 11.19      | 45.10    | 2.45             | 39.07          | 54.00           | 14.93       |
| 4 804.00                            | 49.24          | Peak          | V               | 31.10       | 11.19      | 45.10    | -                | 46.43          | 74.00           | 27.57       |
| 4 804.00                            | 39.30          | Average       | V               | 31.10       | 11.19      | 45.10    | 2.45             | 38.94          | 54.00           | 15.06       |
| <b>Test Data for Middle Channel</b> |                |               |                 |             |            |          |                  |                |                 |             |
| 4 880.00                            | 49.47          | Peak          | H               | 31.10       | 11.24      | 45.10    | -                | 46.71          | 74.00           | 27.29       |
| 4 880.00                            | 39.17          | Average       | H               | 31.10       | 11.24      | 45.10    | 2.45             | 38.86          | 54.00           | 15.14       |
| 4 880.00                            | 49.36          | Peak          | V               | 31.10       | 11.24      | 45.10    | -                | 46.60          | 74.00           | 27.40       |
| 4 880.00                            | 39.21          | Average       | V               | 31.10       | 11.24      | 45.10    | 2.45             | 38.90          | 54.00           | 15.10       |
| <b>Test Data for High Channel</b>   |                |               |                 |             |            |          |                  |                |                 |             |
| 4 960.00                            | 49.41          | Peak          | H               | 31.20       | 11.33      | 45.03    | -                | 46.91          | 74.00           | 27.09       |
| 4 960.00                            | 39.17          | Average       | H               | 31.20       | 11.33      | 45.03    | 2.45             | 39.12          | 54.00           | 14.88       |
| 4 960.00                            | 49.39          | Peak          | V               | 31.20       | 11.33      | 45.03    | -                | 46.89          | 74.00           | 27.11       |
| 4 960.00                            | 39.20          | Average       | V               | 31.20       | 11.33      | 45.03    | 2.45             | 39.15          | 54.00           | 14.85       |

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

## 10. PEAK POWER SPECTRAL DENSITY

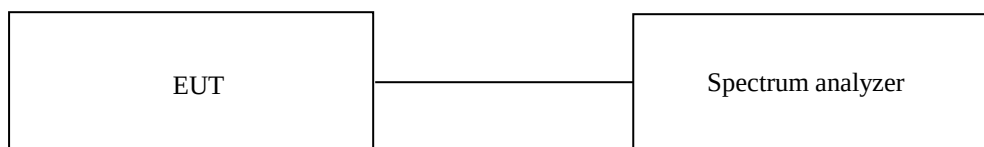
### 10.1 Operating environment

Temperature : 22 °C  
Relative humidity : 46 % R.H.

### 10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ , the video bandwidth is set to 3 times the resolution bandwidth.



### 10.3 Test Date

October 07, 2021 ~ October 20, 2021

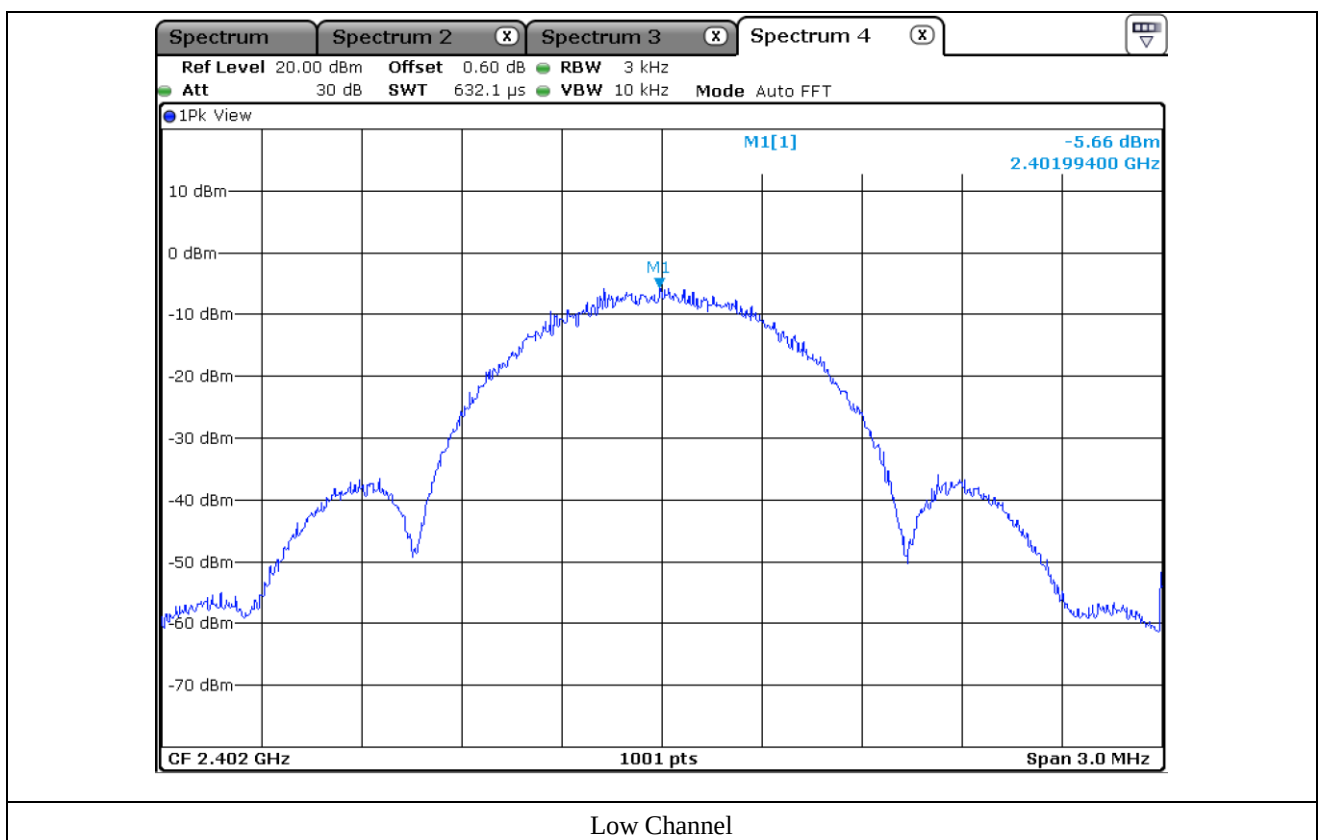
#### 10.4 Test data for 1 Mbps

-. Test Result : Pass

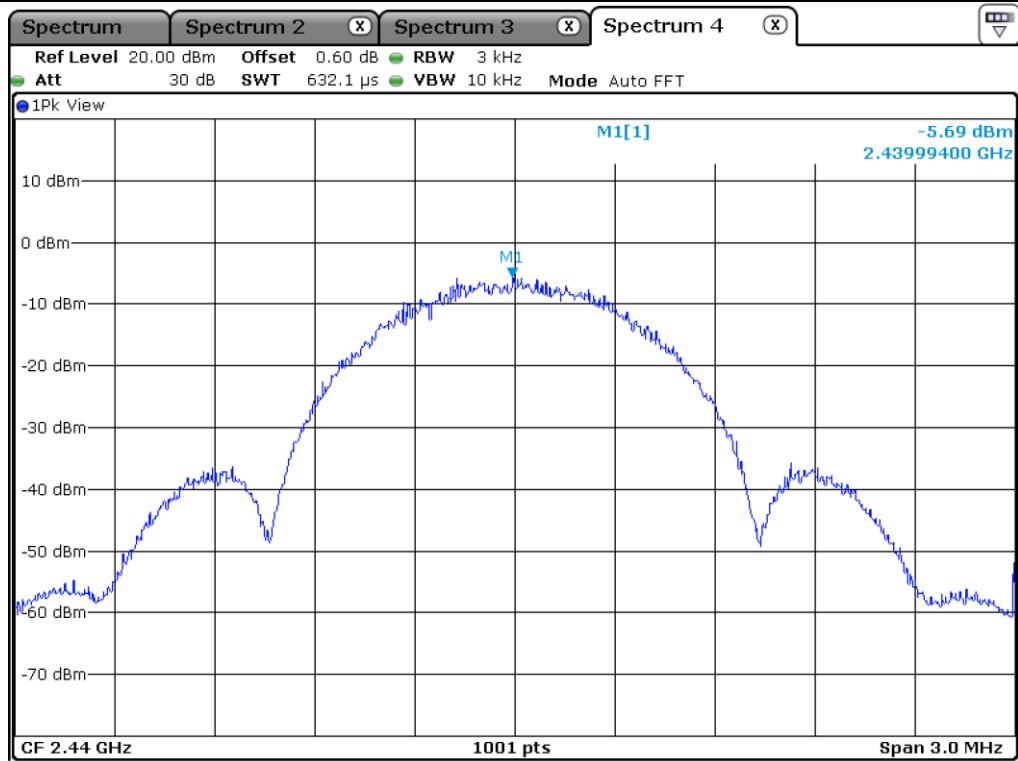
-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---------|----------------|----------------------|-------------|-------------|
| Low     | 2 402.00       | -5.66                | 8.00        | 13.66       |
| Middle  | 2 440.00       | -5.69                | 8.00        | 13.69       |
| High    | 2 480.00       | -5.54                | 8.00        | 13.54       |

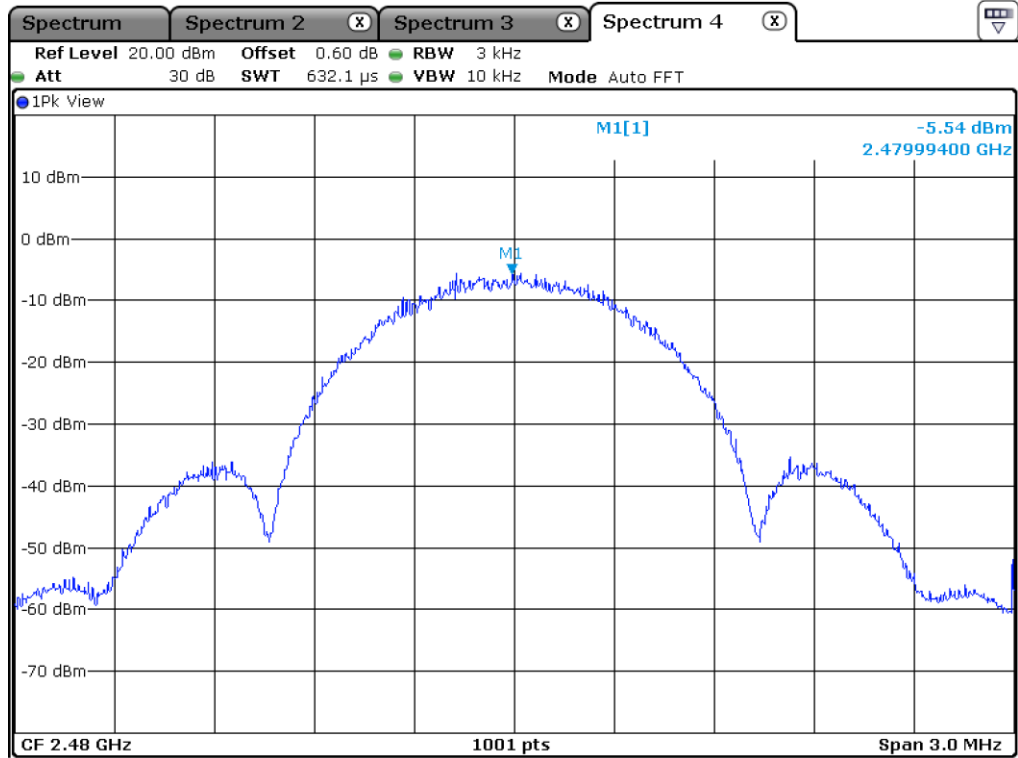
Remark. Margin = Limit – Measured value



Low Channel



Middle Channel



High Channel

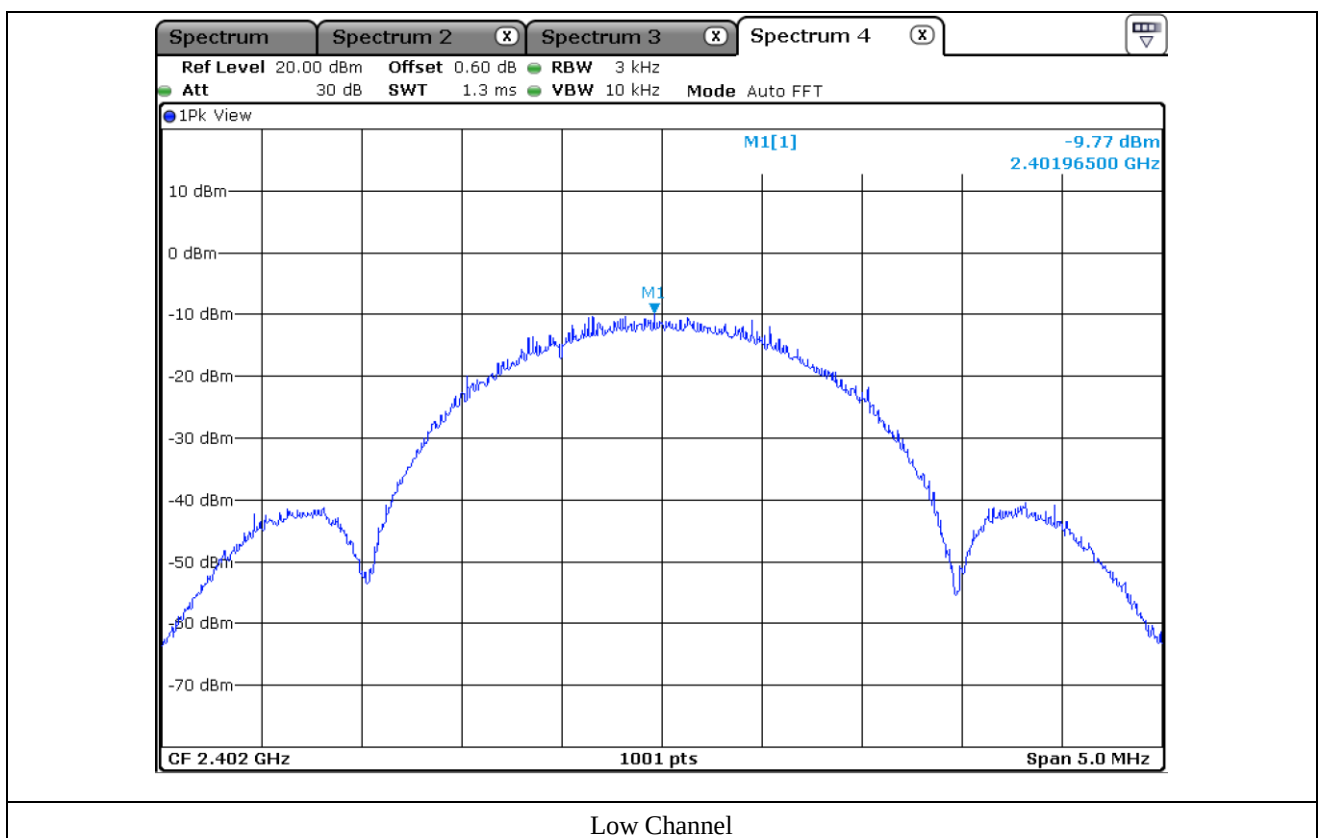
### 10.5 Test data for 2 Mbps

-. Test Result : Pass

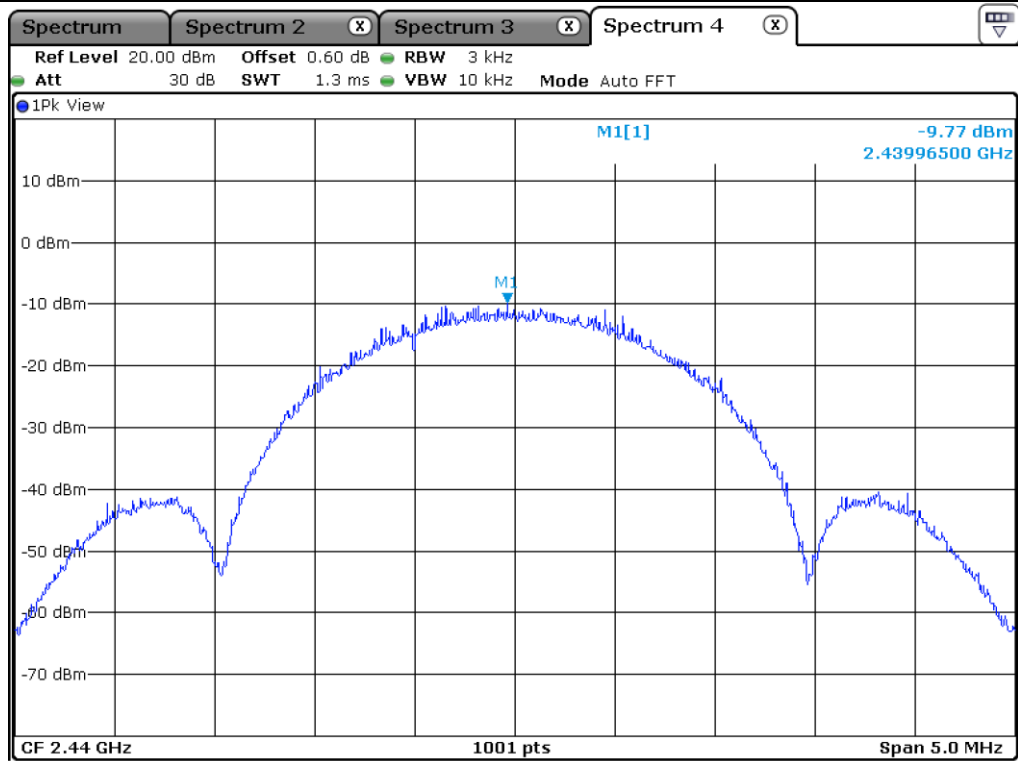
-. Operating Condition : Continuous transmitting mode

| CHANNEL | FREQUENCY(MHz) | MEASURED VALUE (dBm) | LIMIT (dBm) | MARGIN (dB) |
|---------|----------------|----------------------|-------------|-------------|
| Low     | 2 402.00       | -9.77                | 8.00        | 17.77       |
| Middle  | 2 440.00       | -9.77                | 8.00        | 17.77       |
| High    | 2 480.00       | -9.25                | 8.00        | 17.25       |

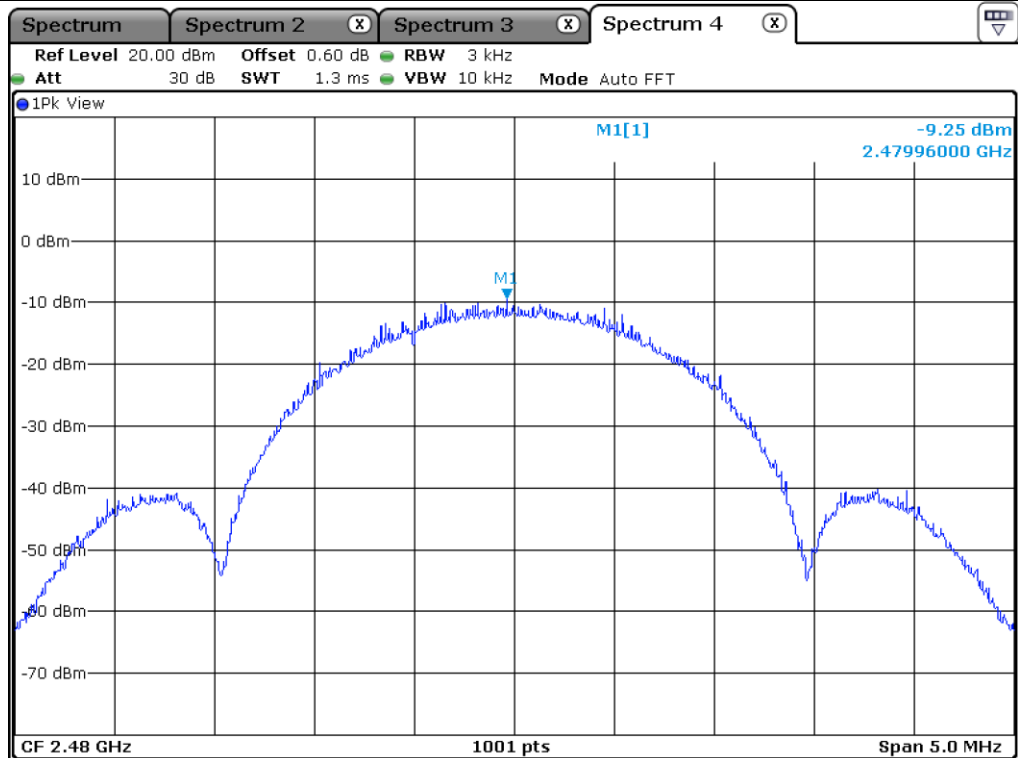
Remark. Margin = Limit – Measured value



Low Channel



Middle Channel



High Channel

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## 11. RADIATED EMISSION TEST

### 11.1 Operating environment

Temperature : 22 °C  
Relative humidity : 46 % R.H.

### 11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

### 11.3 Test Date

October 07, 2021 ~ October 20, 2021

## 11.4 Test data for 30 MHz ~ 1 000 MHz

### 11.4.1 Test data for Bluetooth LE

Humidity Level : 46 % R.H.

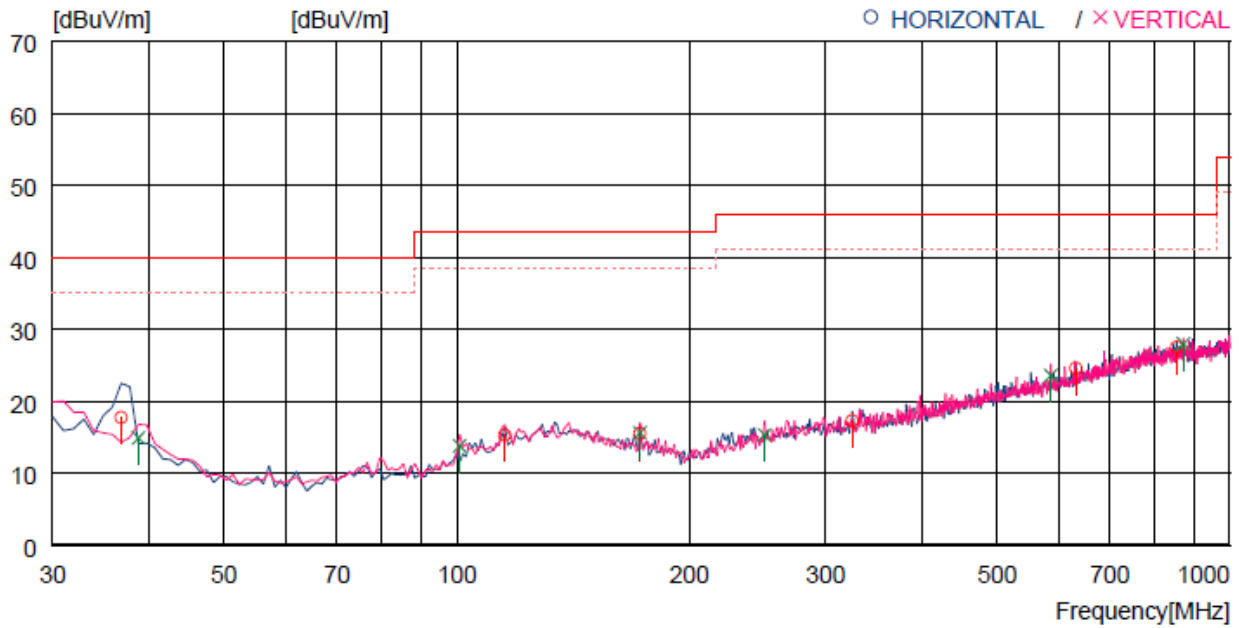
Temperature: 22 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



| No.                  | FREQ    | READING | ANT  | LOSS | GAIN | RESULT   | LIMIT    | MARGIN | ANTENNA | TABLE |
|----------------------|---------|---------|------|------|------|----------|----------|--------|---------|-------|
|                      | [MHz]   | [dBuV]  | [dB] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB]   | [cm]    | [DEG] |
| ---- Horizontal ---- |         |         |      |      |      |          |          |        |         |       |
| 1                    | 36.790  | 29.9    | 18.5 | 1.3  | 32.0 | 17.7     | 40.0     | 22.3   | 100     | 349   |
| 2                    | 115.360 | 27.6    | 17.8 | 1.9  | 32.0 | 15.3     | 43.5     | 28.2   | 100     | 349   |
| 3                    | 172.590 | 28.1    | 17.1 | 2.3  | 32.0 | 15.5     | 43.5     | 28.0   | 100     | 342   |
| 4                    | 324.880 | 26.6    | 19.6 | 3.1  | 32.0 | 17.3     | 46.0     | 28.7   | 100     | 185   |
| 5                    | 632.367 | 28.0    | 24.7 | 4.3  | 32.4 | 24.6     | 46.0     | 21.4   | 100     | 333   |
| 6                    | 853.520 | 26.9    | 27.3 | 5.1  | 31.8 | 27.5     | 46.0     | 18.5   | 100     | 349   |
| ---- Vertical ----   |         |         |      |      |      |          |          |        |         |       |
| 7                    | 38.730  | 27.8    | 17.8 | 1.3  | 32.0 | 14.9     | 40.0     | 25.1   | 100     | 89    |
| 8                    | 100.810 | 28.6    | 15.4 | 1.8  | 32.0 | 13.8     | 43.5     | 29.7   | 100     | 89    |
| 9                    | 172.590 | 28.2    | 17.1 | 2.3  | 32.0 | 15.6     | 43.5     | 27.9   | 100     | 334   |
| 10                   | 250.190 | 26.7    | 17.8 | 2.8  | 32.0 | 15.3     | 46.0     | 30.7   | 100     | 89    |
| 11                   | 586.778 | 27.7    | 24.1 | 4.2  | 32.4 | 23.6     | 46.0     | 22.4   | 100     | 356   |
| 12                   | 870.980 | 27.2    | 27.4 | 5.2  | 31.8 | 28.0     | 46.0     | 18.0   | 100     | 334   |

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#### 11.4.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

Humidity Level : 46 % R.H.

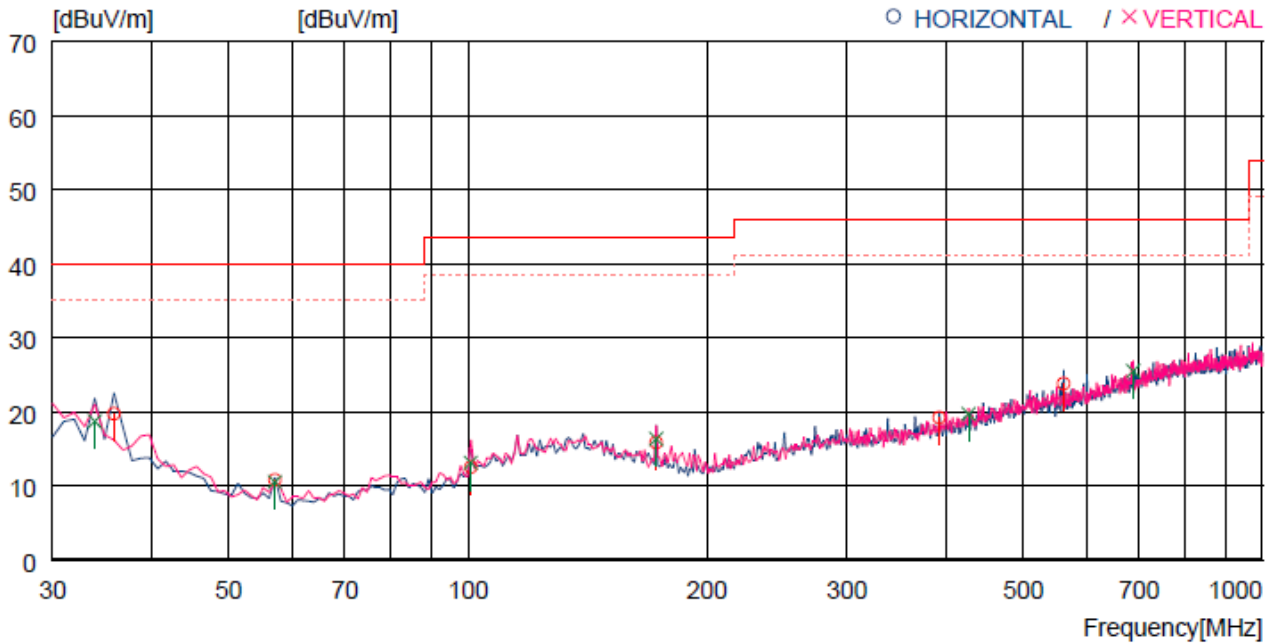
Temperature: 22 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : Wi-Fi/BT Transceiver

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



| No.                    | FREQ    | READING | ANT  | LOSS | GAIN | RESULT   | LIMIT    | MARGIN | ANTENNA | TABLE |
|------------------------|---------|---------|------|------|------|----------|----------|--------|---------|-------|
|                        | [MHz]   | [dBuV]  | [dB] | [dB] | [dB] | [dBuV/m] | [dBuV/m] | [dB]   | [cm]    | [DEG] |
| ----- Horizontal ----- |         |         |      |      |      |          |          |        |         |       |
| 1                      | 35.820  | 31.6    | 18.8 | 1.3  | 32.0 | 19.7     | 40.0     | 20.3   | 100     | 246   |
| 2                      | 57.160  | 29.0    | 12.4 | 1.5  | 32.1 | 10.8     | 40.0     | 29.2   | 100     | 220   |
| 3                      | 100.810 | 27.3    | 15.4 | 1.8  | 32.0 | 12.5     | 43.5     | 31.0   | 100     | 220   |
| 4                      | 172.590 | 28.4    | 17.1 | 2.3  | 32.0 | 15.8     | 43.5     | 27.7   | 100     | 311   |
| 5                      | 391.810 | 27.3    | 20.6 | 3.4  | 32.1 | 19.2     | 46.0     | 26.8   | 100     | 343   |
| 6                      | 562.529 | 28.3    | 23.8 | 4.1  | 32.4 | 23.8     | 46.0     | 22.2   | 100     | 253   |
| ----- Vertical -----   |         |         |      |      |      |          |          |        |         |       |
| 7                      | 33.880  | 30.0    | 19.5 | 1.2  | 32.0 | 18.7     | 40.0     | 21.3   | 100     | 77    |
| 8                      | 57.160  | 28.7    | 12.4 | 1.5  | 32.1 | 10.5     | 40.0     | 29.5   | 100     | 8     |
| 9                      | 100.810 | 27.9    | 15.4 | 1.8  | 32.0 | 13.1     | 43.5     | 30.4   | 100     | 45    |
| 10                     | 172.590 | 28.9    | 17.1 | 2.3  | 32.0 | 16.3     | 43.5     | 27.2   | 100     | 68    |
| 11                     | 426.731 | 27.0    | 21.3 | 3.6  | 32.2 | 19.7     | 46.0     | 26.3   | 100     | 8     |
| 12                     | 687.655 | 27.8    | 25.4 | 4.6  | 32.3 | 25.5     | 46.0     | 20.5   | 100     | 8     |

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### 11.5 Test data for Below 30 MHz

- . Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- . Frequency range : 9 kHz ~ 30 MHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

| Frequency (MHz)                                                                | Reading (dBμV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|--------------------------------------------------------------------------------|----------------|-----------------|-----------------|-----------|--------------------|------------|------------------------|-----------------|-------------|
| Emission from the EUT more than 20 dB below the limit in each frequency range. |                |                 |                 |           |                    |            |                        |                 |             |

### 11.6 Test data for above 1 GHz

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode  
1 MHz and RMS Detector for Average Mode
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Operating mode : Transmitting mode

| Frequency (MHz)                                                                | Reading (dBμV) | Ant. Pol. (H/V) | Ant. Height (m) | Angle (°) | Ant. Factor (dB/m) | Cable Loss | Emission Level(dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|--------------------------------------------------------------------------------|----------------|-----------------|-----------------|-----------|--------------------|------------|------------------------|-----------------|-------------|
| Emission from the EUT more than 20 dB below the limit in each frequency range. |                |                 |                 |           |                    |            |                        |                 |             |

## 12. CONDUCTED EMISSION TEST

### 12.1 Operating environment

Temperature : 22 °C  
Relative humidity : 46 % R.H.

### 12.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50  $\Omega$  / 50  $\mu$ H + 5  $\Omega$  Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

### 12.3 Test Date

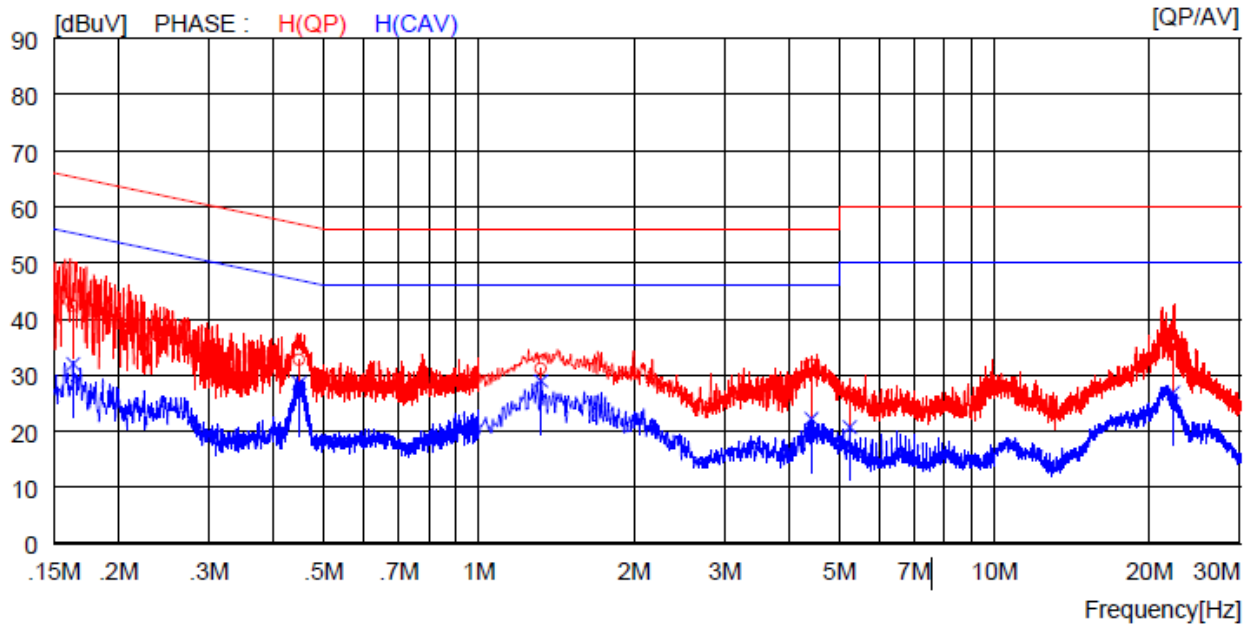
October 07, 2021 ~ October 20, 2021

## 12.4 Test data

### 12.4.1 Test data for Bluetooth LE

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : LIVE LINE

LIMIT : EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Quasi-Peak Limits (Mains Ports)  
EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Average Limits (Mains Ports)



| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE   |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |         |
| 1  | 0.16300       | 32.4         | ----         | 10.0             | 42.4         | ----         | 65.3         | ----         | 22.9         | ----         | H (QP)  |
| 2  | 0.44800       | 22.7         | ----         | 10.0             | 32.7         | ----         | 56.9         | ----         | 24.2         | ----         | H (QP)  |
| 3  | 1.32000       | 21.0         | ----         | 10.1             | 31.1         | ----         | 56.0         | ----         | 24.9         | ----         | H (QP)  |
| 4  | 4.42000       | 21.7         | ----         | 10.1             | 31.8         | ----         | 56.0         | ----         | 24.2         | ----         | H (QP)  |
| 5  | 5.24000       | 16.4         | ----         | 10.2             | 26.6         | ----         | 60.0         | ----         | 33.4         | ----         | H (QP)  |
| 6  | 22.27000      | 25.1         | ----         | 10.4             | 35.5         | ----         | 60.0         | ----         | 24.5         | ----         | H (QP)  |
| 7  | 0.16300       | ----         | 22.0         | 10.0             | ----         | 32.0         | ----         | 55.3         | ----         | 23.3         | H (CAV) |
| 8  | 0.44800       | ----         | 18.6         | 10.0             | ----         | 28.6         | ----         | 46.9         | ----         | 18.3         | H (CAV) |
| 9  | 1.32000       | ----         | 18.9         | 10.1             | ----         | 29.0         | ----         | 46.0         | ----         | 17.0         | H (CAV) |
| 10 | 4.42000       | ----         | 12.1         | 10.1             | ----         | 22.2         | ----         | 46.0         | ----         | 23.8         | H (CAV) |
| 11 | 5.24000       | ----         | 10.5         | 10.2             | ----         | 20.7         | ----         | 50.0         | ----         | 29.3         | H (CAV) |
| 12 | 22.27000      | ----         | 16.5         | 10.4             | ----         | 26.9         | ----         | 50.0         | ----         | 23.1         | H (CAV) |

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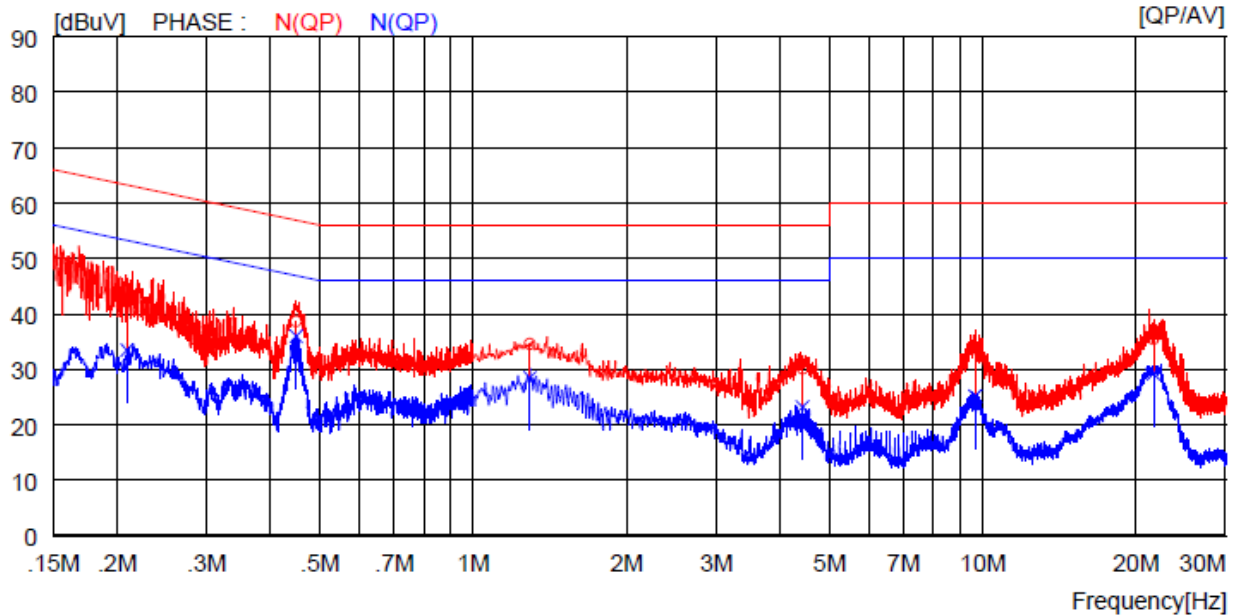
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-. Tested Line : NEUTRAL LINE

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

LIMIT : EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Quasi-Peak Limits (Mains Ports)  
EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Average Limits (Mains Ports)

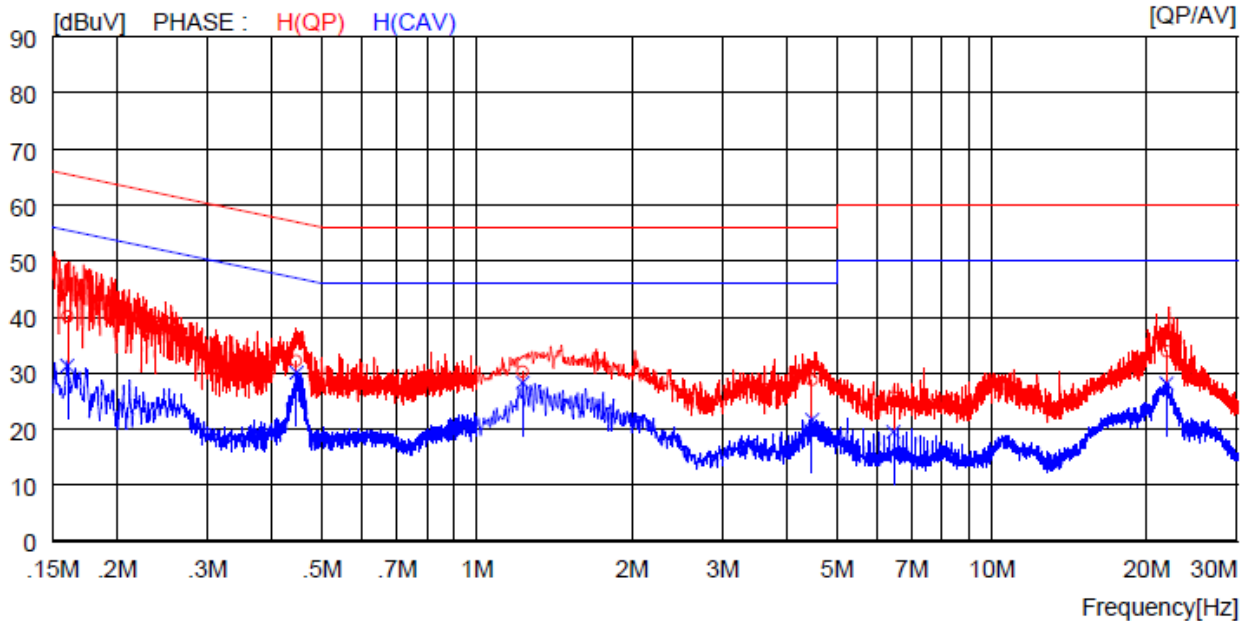


| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE   |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |         |
| 1  | 0.20900       | 33.0         | ----         | 10.0             | 43.0         | ----         | 63.2         | ----         | 20.2         | ----         | N (QP)  |
| 2  | 0.44900       | 28.7         | ----         | 10.0             | 38.7         | ----         | 56.9         | ----         | 18.2         | ----         | N (QP)  |
| 3  | 1.29200       | 24.5         | ----         | 10.1             | 34.6         | ----         | 56.0         | ----         | 21.4         | ----         | N (QP)  |
| 4  | 4.43600       | 20.0         | ----         | 10.1             | 30.1         | ----         | 56.0         | ----         | 25.9         | ----         | N (QP)  |
| 5  | 9.67500       | 23.5         | ----         | 10.2             | 33.7         | ----         | 60.0         | ----         | 26.3         | ----         | N (QP)  |
| 6  | 21.66000      | 25.0         | ----         | 10.4             | 35.4         | ----         | 60.0         | ----         | 24.6         | ----         | N (QP)  |
| 7  | 0.20900       | ----         | 23.5         | 10.0             | ----         | 33.5         | ----         | 53.2         | ----         | 19.7         | N (CAV) |
| 8  | 0.44900       | ----         | 26.0         | 10.0             | ----         | 36.0         | ----         | 46.9         | ----         | 10.9         | N (CAV) |
| 9  | 1.29200       | ----         | 18.4         | 10.1             | ----         | 28.5         | ----         | 46.0         | ----         | 17.5         | N (CAV) |
| 10 | 4.43600       | ----         | 13.1         | 10.1             | ----         | 23.2         | ----         | 46.0         | ----         | 22.8         | N (CAV) |
| 11 | 9.67500       | ----         | 15.0         | 10.2             | ----         | 25.2         | ----         | 50.0         | ----         | 24.8         | N (CAV) |
| 12 | 21.66000      | ----         | 18.9         | 10.4             | ----         | 29.3         | ----         | 50.0         | ----         | 20.7         | N (CAV) |

## 12.4.2 Test data for Intermodulation Mode(Bluetooth LE + WLAN 2.4 GHz + WLAN 5 GHz)

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : LIVE LINE

LIMIT : EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Quasi-Peak Limits (Mains Ports)  
EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Average Limits (Mains Ports)



| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE   |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |         |
| 1  | 0.16000       | 30.1         | ----         | 10.0             | 40.1         | ----         | 65.5         | ----         | 25.4         | ----         | H (QP)  |
| 2  | 0.44600       | 22.2         | ----         | 10.0             | 32.2         | ----         | 56.9         | ----         | 24.7         | ----         | H (QP)  |
| 3  | 1.22800       | 20.1         | ----         | 10.1             | 30.2         | ----         | 56.0         | ----         | 25.8         | ----         | H (QP)  |
| 4  | 4.48000       | 18.7         | ----         | 10.1             | 28.8         | ----         | 56.0         | ----         | 27.2         | ----         | H (QP)  |
| 5  | 6.45000       | 15.5         | ----         | 10.2             | 25.7         | ----         | 60.0         | ----         | 34.3         | ----         | H (QP)  |
| 6  | 21.89000      | 23.5         | ----         | 10.4             | 33.9         | ----         | 60.0         | ----         | 26.2         | ----         | H (QP)  |
| 7  | 0.16000       | ----         | 21.3         | 10.0             | ----         | 31.3         | ----         | 55.5         | ----         | 24.2         | H (CAV) |
| 8  | 0.44600       | ----         | 20.1         | 10.0             | ----         | 30.1         | ----         | 46.9         | ----         | 16.8         | H (CAV) |
| 9  | 1.22800       | ----         | 18.2         | 10.1             | ----         | 28.3         | ----         | 46.0         | ----         | 17.7         | H (CAV) |
| 10 | 4.48000       | ----         | 11.6         | 10.1             | ----         | 21.7         | ----         | 46.0         | ----         | 24.3         | H (CAV) |
| 11 | 6.45000       | ----         | 9.3          | 10.2             | ----         | 19.5         | ----         | 50.0         | ----         | 30.5         | H (CAV) |
| 12 | 21.89000      | ----         | 17.7         | 10.4             | ----         | 28.1         | ----         | 50.0         | ----         | 21.9         | H (CAV) |

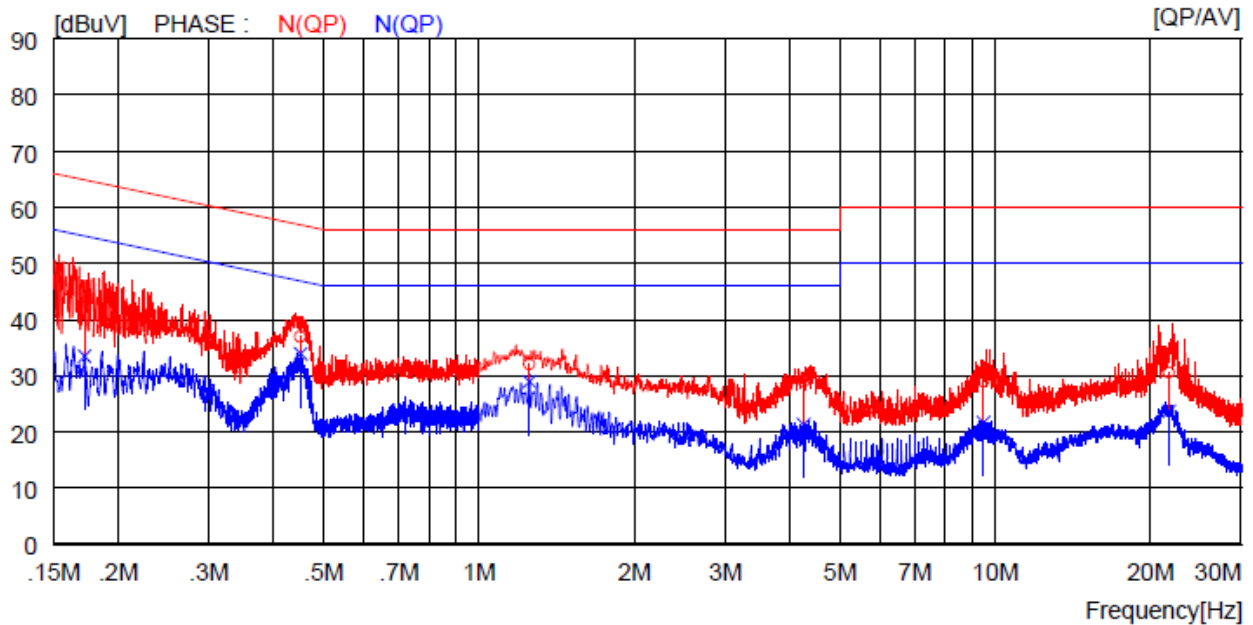
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OTC-TRF-RF-001(0)

-. Tested Line : NEUTRAL LINE

LIMIT : EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Quasi-Peak Limits (Mains Ports)  
EN.KN.FCC.VCCI\_CISPR Pub.22 Class B, Average Limits (Mains Ports)



| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE  |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |        |
| 1  | 0.17200       | 32.2         | ----         | 10.0             | 42.2         | ----         | 64.9         | ----         | 22.7         | ----         | N(QP)  |
| 2  | 0.45100       | 26.9         | ----         | 10.0             | 36.9         | ----         | 56.9         | ----         | 20.0         | ----         | N(QP)  |
| 3  | 1.25200       | 22.0         | ----         | 10.1             | 32.1         | ----         | 56.0         | ----         | 23.9         | ----         | N(QP)  |
| 4  | 4.26000       | 18.9         | ----         | 10.1             | 29.0         | ----         | 56.0         | ----         | 27.0         | ----         | N(QP)  |
| 5  | 9.49000       | 18.8         | ----         | 10.2             | 29.0         | ----         | 60.0         | ----         | 31.0         | ----         | N(QP)  |
| 6  | 21.73000      | 20.2         | ----         | 10.4             | 30.6         | ----         | 60.0         | ----         | 29.4         | ----         | N(QP)  |
| 7  | 0.17200       | ----         | 23.5         | 10.0             | ----         | 33.5         | ----         | 54.9         | ----         | 21.4         | N(CAV) |
| 8  | 0.45100       | ----         | 23.9         | 10.0             | ----         | 33.9         | ----         | 46.9         | ----         | 13.0         | N(CAV) |
| 9  | 1.25200       | ----         | 18.9         | 10.1             | ----         | 29.0         | ----         | 46.0         | ----         | 17.0         | N(CAV) |
| 10 | 4.26000       | ----         | 11.2         | 10.1             | ----         | 21.3         | ----         | 46.0         | ----         | 24.7         | N(CAV) |
| 11 | 9.49000       | ----         | 11.5         | 10.2             | ----         | 21.7         | ----         | 50.0         | ----         | 28.3         | N(CAV) |
| 12 | 21.73000      | ----         | 13.3         | 10.4             | ----         | 23.7         | ----         | 50.0         | ----         | 26.3         | N(CAV) |

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

### 13. LIST OF TEST EQUIPMENT

| Model Number | Manufacturer      | Description       | Serial Number | Last Cal.(Interval) |
|--------------|-------------------|-------------------|---------------|---------------------|
| FSV40-N      | Rohde & Schwarz   | Signal Analyzer   | 102177        | Apr. 16, 2021 (1Y)  |
| ESW 44       | Rohde & Schwarz   | EMI Test Receiver | 101851        | Mar. 23, 2021 (1Y)  |
| 310N         | Sonoma Instrument | Pre-Amplifier     | 392756        | Oct. 14, 2021 (1Y)  |
| SCU18        | Rohde & Schwarz   | Pre-Amplifier     | 102266        | Jul. 14, 2021 (1Y)  |
| PAM-840A     | Com-Power         | Pre-Amplifier     | 461339        | Oct. 12, 2021 (1Y)  |
| DT3000-3t    | Innco System      | Turn Table        | DT3000/093    | N/A                 |
| MA-4000XPET  | Innco System      | Antenna Master    | MA4000/509    | N/A                 |
| FMZB 1513    | Schwarzbeck       | Loop Antenna      | 1513-235      | Mar. 24, 2020 (2Y)  |
| HLP-2008     | TDK               | Hybrid Antenna    | 131316        | Feb. 27, 2020 (2Y)  |
| BBHA9120D    | Schwarzbeck       | Horn Antenna      | 9120D-1366    | Jul. 20, 2021 (1Y)  |
| BBHA9170     | Schwarzbeck       | Horn Antenna      | BBHA9170178   | Jan. 07, 2021(1Y)   |
| HPF 3GHz     | Rohde & Schwarz   | High Pass Filter  | N/A           | Feb. 08, 2021 (1Y)  |
| ESCI         | Rohde & Schwarz   | EMI TEST RECEIVER | 101012        | Oct. 20, 2021 (1Y)  |
| NSLK8126     | Schwarzbeck       | AMN               | 8126-404      | Mar. 16, 2021 (1Y)  |
| ESH3-Z2      | Rohde & Schwarz   | PULSE LIMITER     | 100655        | Mar. 15, 2021 (1Y)  |

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