

# RADIO PERFORMANCE TEST REPORT

**Test Report No.** : OT-21O-RWD-042  
**Reception No.** : 2110004559  
**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.** : A3LWCB734M  
**Model Name** : WCB734M  
**Multiple Model Name** : N/A  
**Serial number** : N/A  
**Total page of Report** : 181 pages (including this page)  
**Date of Incoming** : October 07, 2021  
**Date of issue** : October 27, 2021

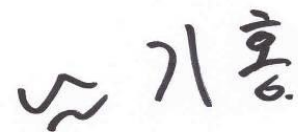
## SUMMARY

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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**Revision History**

| Rev. No. | Issue Report No. | Issued Date      | Revisions       | Section Affected |
|----------|------------------|------------------|-----------------|------------------|
| 0        | OT-21O-RWD-042   | October 27, 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 : A3LWCB734M  
 Model Name : WCB734M  
 Brand Name :   
 Serial Number : N/A  
 Date : October 27, 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: 2013                                                                  |
| TYPE OF EQUIPMENT TESTED                             | Pre-Production                                                                     |
| KIND OF EQUIPMENT AUTHORIZATION REQUESTED            | Certification                                                                      |
| EQUIPMENT WILL BE OPERATED 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 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 Conducted(average) 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: 2013. 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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### 3. GENERAL INFORMATION

#### 3.1 Product Description

The Samsung Electronics Co Ltd, Model WCB734M (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           | 11.02 dBm                                                                                             |
|                    |                                       | 2 Mbps           | 11.00 dBm                                                                                             |
|                    | Bluetooth                             | 1 Mbps           | 10.99 dBm                                                                                             |
|                    |                                       | 2 Mbps           | 10.64 dBm                                                                                             |
|                    |                                       | 3 Mbps           | 11.07 dBm                                                                                             |
|                    | WLAN 2.4 GHz                          | Antenna 0        | 17.16 dBm(802.11b)<br>11.97 dBm(802.11g)<br>11.69 dBm(802.11n_HT20)<br>9.80 dBm(802.11n_HT40)         |
|                    |                                       | Antenna 1        | 17.47 dBm(802.11b)<br>13.67 dBm(802.11g)<br>13.42 dBm(802.11n_HT20)<br>11.77 dBm(802.11n_HT40)        |
|                    |                                       | Multiple Antenna | 15.91 dBm(802.11g)<br>15.65 dBm(802.11n_HT20)<br>13.81 dBm(802.11n_HT40)                              |
|                    | WLAN<br>5 150 MHz ~<br>5 250 MHz Band | Antenna 0        | 10.89 dBm(802.11a)<br>10.72 dBm(802.11n_HT20)<br>10.18 dBm(802.11n_HT40)<br>9.15 dBm(802.11ac_VHT80)  |
|                    |                                       | Antenna 1        | 10.41 dBm(802.11a)<br>10.25 dBm(802.11n_HT20)<br>9.77 dBm(802.11n_HT40)<br>8.51 dBm(802.11ac_VHT80)   |
|                    |                                       | Multiple Antenna | 13.67 dBm(802.11a)<br>13.50 dBm(802.11n_HT20)<br>12.99 dBm(802.11n_HT40)<br>11.85 dBm(802.11ac_VHT80) |

|                    |                                       |                    |                                                                                                       |
|--------------------|---------------------------------------|--------------------|-------------------------------------------------------------------------------------------------------|
| RF OUTPUT<br>POWER | WLAN<br>5 250 MHz ~<br>5 350 MHz Band | Antenna 0          | 12.71 dBm(802.11a)<br>12.53 dBm(802.11n_HT20)<br>11.85 dBm(802.11n_HT40)<br>11.28 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 1          | 12.45 dBm(802.11a)<br>12.69 dBm(802.11n_HT20)<br>11.68 dBm(802.11n_HT40)<br>11.01 dBm(802.11ac_VHT80) |
|                    |                                       | Multiple Antenna   | 15.59 dBm(802.11a)<br>15.62 dBm(802.11n_HT20)<br>14.78 dBm(802.11n_HT40)<br>14.16 dBm(802.11ac_VHT80) |
|                    | WLAN<br>5 470 MHz ~<br>5 725 MHz Band | Antenna 0          | 12.95 dBm(802.11a)<br>12.75 dBm(802.11n_HT20)<br>12.13 dBm(802.11n_HT40)<br>11.55 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 0_Straddle | 11.73 dBm(802.11a)<br>11.66 dBm(802.11n_HT20)<br>12.67 dBm(802.11n_HT40)<br>14.19 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 1          | 12.30 dBm(802.11a)<br>12.62 dBm(802.11n_HT20)<br>11.25 dBm(802.11n_HT40)<br>11.08 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 1_Straddle | 12.44 dBm(802.11a)<br>12.31 dBm(802.11n_HT20)<br>13.61 dBm(802.11n_HT40)<br>13.72 dBm(802.11ac_VHT80) |

|                    |                                       |                               |                                                                                                       |
|--------------------|---------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------|
| RF OUTPUT<br>POWER | WLAN<br>5 470 MHz ~<br>5 725 MHz Band | Multiple Antenna              | 15.61 dBm(802.11a)<br>15.65 dBm(802.11n_HT20)<br>14.68 dBm(802.11n_HT40)<br>14.33 dBm(802.11ac_VHT80) |
|                    |                                       | Multiple Antenna<br>_Straddle | 15.11 dBm(802.11a)<br>15.01 dBm(802.11n_HT20)<br>16.18 dBm(802.11n_HT40)<br>16.97 dBm(802.11ac_VHT80) |
|                    | WLAN<br>5 725 MHz ~<br>5 850 MHz Band | Antenna 0                     | 12.46 dBm(802.11a)<br>12.30 dBm(802.11n_HT20)<br>11.48 dBm(802.11n_HT40)<br>11.73 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 0_Straddle            | 4.04 dBm(802.11a)<br>4.43 dBm(802.11n_HT20)<br>0.80 dBm(802.11n_HT40)<br>-0.62 dBm(802.11ac_VHT80)    |
|                    |                                       | Antenna 1                     | 12.55 dBm(802.11a)<br>12.46 dBm(802.11n_HT20)<br>11.66 dBm(802.11n_HT40)<br>11.69 dBm(802.11ac_VHT80) |
|                    |                                       | Antenna 1_Straddle            | 4.73 dBm(802.11a)<br>5.08 dBm(802.11n_HT20)<br>1.64 dBm(802.11n_HT40)<br>-1.20 dBm(802.11ac_VHT80)    |
|                    |                                       | Multiple Antenna              | 15.52 dBm(802.11a)<br>15.39 dBm(802.11n_HT20)<br>14.52 dBm(802.11n_HT40)<br>14.72 dBm(802.11ac_VHT80) |
|                    |                                       | Multiple Antenna<br>_Straddle | 7.41 dBm(802.11a)<br>7.78 dBm(802.11n_HT20)<br>4.25 dBm(802.11n_HT40)<br>2.11 dBm(802.11ac_VHT80)     |

| ANTENNA TYPE                                          | Chip Antenna                  |                  |           |
|-------------------------------------------------------|-------------------------------|------------------|-----------|
| ANTENNA GAIN                                          | Bluetooth LE                  | 1.57 dBi         |           |
|                                                       | Bluetooth                     | 1.57 dBi         |           |
|                                                       | WLAN 2.4 GHz                  | Antenna 0        | 1.9 dBi   |
|                                                       |                               | Antenna 1        | -1.38 dBi |
|                                                       |                               | Multiple Antenna | 3.57 dBi  |
|                                                       | 5 150 MHz ~<br>5 250 MHz Band | Antenna 0        | 1.62 dBi  |
|                                                       |                               | Antenna 1        | 1.93 dBi  |
|                                                       |                               | Multiple Antenna | 4.79 dBi  |
|                                                       | 5 250 MHz ~<br>5 350 MHz Band | Antenna 0        | 1.64 dBi  |
|                                                       |                               | Antenna 1        | 1.80 dBi  |
|                                                       |                               | Multiple Antenna | 4.73 dBi  |
|                                                       | 5 470 MHz ~<br>5 725 MHz Band | Antenna 0        | 1.48 dBi  |
|                                                       |                               | Antenna 1        | 1.66 dBi  |
|                                                       |                               | Multiple Antenna | 4.58 dBi  |
|                                                       | 5 725 MHz ~<br>5 850 MHz Band | Antenna 0        | 1.33 dBi  |
|                                                       |                               | Antenna 1        | -0.83 dBi |
|                                                       |                               | Multiple Antenna | 3.39 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 | HDWB-2295(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 |
|------------|------------------------------------------|----------------------------|--------------|
| WCB734M    | 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 mode is programmed.

-. Frequency / Channel Operations

| Channel | Frequency |
|---------|-----------|
| 1       | 2 412     |
| 2       | 2 417     |
| 3       | 2 422     |
| 4       | 2 427     |
| 5       | 2 432     |
| 6       | 2 437     |
| 7       | 2 442     |
| 8       | 2 447     |
| 9       | 2 452     |
| 10      | 2 457     |
| 11      | 2 462     |
| 12      | 2 467     |
| 13      | 2 472     |

| Modulation                    | DATA RATE  | OUTPUT POWER[dBm] |           |
|-------------------------------|------------|-------------------|-----------|
|                               |            | Antenna 0         | Antenna 1 |
| 802.11 b<br>(Low Channel)     | 1 Mbps     | 17.07             | 16.71     |
|                               | 2 Mbps     | 17.05             | 16.68     |
|                               | 5.5 Mbps   | 17.05             | 16.68     |
|                               | 11 Mbps    | 17.04             | 16.66     |
| 802.11 g<br>(Low Channel)     | 6 Mbps     | 11.96             | 13.67     |
|                               | 9 Mbps     | 11.95             | 13.65     |
|                               | 12 Mbps    | 11.93             | 13.63     |
|                               | 18 Mbps    | 11.93             | 13.62     |
|                               | 24 Mbps    | 11.89             | 13.60     |
|                               | 36 Mbps    | 11.54             | 13.06     |
|                               | 48 Mbps    | 10.58             | 12.19     |
|                               | 54 Mbps    | 10.56             | 12.15     |
| 802.11 HT 20<br>(Low Channel) | 6.5 Mbps   | 11.69             | 13.42     |
|                               | 13 Mbps    | 11.67             | 13.41     |
|                               | 19.5 Mbps  | 11.66             | 13.38     |
|                               | 26 Mbps    | 11.64             | 13.37     |
|                               | 39 Mbps    | 11.32             | 12.75     |
|                               | 52 Mbps    | 11.29             | 12.74     |
|                               | 58.5 Mbps  | 10.31             | 11.87     |
|                               | 65 Mbps    | 10.28             | 11.84     |
| 802.11 HT 40<br>(Low Channel) | 13.5 Mbps  | 9.55              | 13.20     |
|                               | 27 Mbps    | 9.54              | 13.17     |
|                               | 40.5 Mbps  | 9.51              | 13.16     |
|                               | 54 Mbps    | 9.51              | 13.14     |
|                               | 81 Mbps    | 9.09              | 12.56     |
|                               | 108 Mbps   | 9.05              | 12.54     |
|                               | 121.5 Mbps | 8.13              | 11.62     |
|                               | 135 Mbps   | 8.10              | 11.60     |

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.0/Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0/Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40.

-. 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.

| Modulation                       | DATA RATE  | OUTPUT POWER[dBm] |           |
|----------------------------------|------------|-------------------|-----------|
|                                  |            | Antenna 0         | Antenna 1 |
| 802.11 b<br>(Middle Channel)     | 1 Mbps     | 17.06             | 17.16     |
|                                  | 2 Mbps     | 17.04             | 17.13     |
|                                  | 5.5 Mbps   | 17.04             | 17.13     |
|                                  | 11 Mbps    | 17.03             | 17.11     |
| 802.11 g<br>(Middle Channel)     | 6 Mbps     | 11.92             | 13.38     |
|                                  | 9 Mbps     | 11.91             | 13.36     |
|                                  | 12 Mbps    | 11.89             | 13.34     |
|                                  | 18 Mbps    | 11.89             | 13.33     |
|                                  | 24 Mbps    | 11.85             | 13.31     |
|                                  | 36 Mbps    | 11.50             | 12.77     |
|                                  | 48 Mbps    | 10.54             | 11.90     |
|                                  | 54 Mbps    | 10.52             | 11.86     |
| 802.11 HT 20<br>(Middle Channel) | 6.5 Mbps   | 11.60             | 13.20     |
|                                  | 13 Mbps    | 11.58             | 13.19     |
|                                  | 19.5 Mbps  | 11.57             | 13.16     |
|                                  | 26 Mbps    | 11.55             | 13.15     |
|                                  | 39 Mbps    | 11.23             | 12.53     |
|                                  | 52 Mbps    | 11.20             | 12.52     |
|                                  | 58.5 Mbps  | 10.22             | 11.65     |
|                                  | 65 Mbps    | 10.19             | 11.62     |
| 802.11 HT 40<br>(Middle Channel) | 13.5 Mbps  | 9.75              | 11.55     |
|                                  | 27 Mbps    | 9.74              | 11.52     |
|                                  | 40.5 Mbps  | 9.71              | 11.51     |
|                                  | 54 Mbps    | 9.71              | 11.49     |
|                                  | 81 Mbps    | 9.29              | 10.91     |
|                                  | 108 Mbps   | 9.25              | 10.89     |
|                                  | 121.5 Mbps | 8.33              | 9.97      |
|                                  | 135 Mbps   | 8.30              | 9.95      |

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.0/Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0/Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40.

-. 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.

| Modulation                        | DATA RATE  | OUTPUT POWER[dBm] |           |
|-----------------------------------|------------|-------------------|-----------|
|                                   |            | Antenna 0         | Antenna 1 |
| 802.11 b<br>(High Channel_11)     | 1 Mbps     | 17.16             | 17.47     |
|                                   | 2 Mbps     | 17.14             | 17.44     |
|                                   | 5.5 Mbps   | 17.14             | 17.44     |
|                                   | 11 Mbps    | 17.13             | 17.42     |
| 802.11 g<br>(High Channel_11)     | 6 Mbps     | 11.97             | 13.03     |
|                                   | 9 Mbps     | 11.96             | 13.01     |
|                                   | 12 Mbps    | 11.94             | 12.99     |
|                                   | 18 Mbps    | 11.94             | 12.98     |
|                                   | 24 Mbps    | 11.90             | 12.96     |
|                                   | 36 Mbps    | 11.55             | 12.42     |
|                                   | 48 Mbps    | 10.59             | 11.55     |
|                                   | 54 Mbps    | 10.57             | 11.51     |
| 802.11 HT 20<br>(High Channel_11) | 6.5 Mbps   | 11.65             | 13.13     |
|                                   | 13 Mbps    | 11.63             | 13.12     |
|                                   | 19.5 Mbps  | 11.62             | 13.09     |
|                                   | 26 Mbps    | 11.60             | 13.08     |
|                                   | 39 Mbps    | 11.28             | 12.46     |
|                                   | 52 Mbps    | 11.25             | 12.45     |
|                                   | 58.5 Mbps  | 10.27             | 11.58     |
|                                   | 65 Mbps    | 10.24             | 11.55     |
| 802.11 HT 40<br>(High Channel_9)  | 13.5 Mbps  | 9.80              | 11.33     |
|                                   | 27 Mbps    | 9.79              | 11.30     |
|                                   | 40.5 Mbps  | 9.76              | 11.29     |
|                                   | 54 Mbps    | 9.76              | 11.27     |
|                                   | 81 Mbps    | 9.34              | 10.69     |
|                                   | 108 Mbps   | 9.30              | 10.67     |
|                                   | 121.5 Mbps | 8.38              | 9.75      |
|                                   | 135 Mbps   | 8.35              | 9.73      |

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.0/Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0/Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40.

-. 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.

| Modulation                        | DATA RATE  | OUTPUT POWER[dBm] |           |
|-----------------------------------|------------|-------------------|-----------|
|                                   |            | Antenna 0         | Antenna 1 |
| 802.11 b<br>(High Channel_12)     | 1 Mbps     | 14.55             | 16.00     |
|                                   | 2 Mbps     | 14.53             | 15.97     |
|                                   | 5.5 Mbps   | 14.53             | 15.97     |
|                                   | 11 Mbps    | 14.52             | 15.95     |
| 802.11 g<br>(High Channel_12)     | 6 Mbps     | 9.15              | 10.42     |
|                                   | 9 Mbps     | 9.14              | 10.40     |
|                                   | 12 Mbps    | 9.12              | 10.38     |
|                                   | 18 Mbps    | 9.12              | 10.37     |
|                                   | 24 Mbps    | 9.08              | 10.35     |
|                                   | 36 Mbps    | 8.73              | 9.81      |
|                                   | 48 Mbps    | 7.77              | 8.94      |
|                                   | 54 Mbps    | 7.75              | 8.90      |
| 802.11 HT 20<br>(High Channel_12) | 6.5 Mbps   | 8.94              | 10.33     |
|                                   | 13 Mbps    | 8.92              | 10.32     |
|                                   | 19.5 Mbps  | 8.91              | 10.29     |
|                                   | 26 Mbps    | 8.89              | 10.28     |
|                                   | 39 Mbps    | 8.57              | 9.66      |
|                                   | 52 Mbps    | 8.54              | 9.65      |
|                                   | 58.5 Mbps  | 7.56              | 8.78      |
|                                   | 65 Mbps    | 7.53              | 8.75      |
| 802.11 HT 40<br>(High Channel_10) | 13.5 Mbps  | 7.70              | 9.30      |
|                                   | 27 Mbps    | 7.69              | 9.27      |
|                                   | 40.5 Mbps  | 7.66              | 9.26      |
|                                   | 54 Mbps    | 7.66              | 9.24      |
|                                   | 81 Mbps    | 7.24              | 8.66      |
|                                   | 108 Mbps   | 7.20              | 8.64      |
|                                   | 121.5 Mbps | 6.28              | 7.72      |
|                                   | 135 Mbps   | 6.25              | 7.70      |

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.0/Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0/Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40.

-. 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.

| Modulation                        | DATA RATE  | OUTPUT POWER[dBm] |           |
|-----------------------------------|------------|-------------------|-----------|
|                                   |            | Antenna 0         | Antenna 1 |
| 802.11 b<br>(High Channel_13)     | 1 Mbps     | 11.83             | 13.20     |
|                                   | 2 Mbps     | 11.81             | 13.17     |
|                                   | 5.5 Mbps   | 11.81             | 13.17     |
|                                   | 11 Mbps    | 11.80             | 13.15     |
| 802.11 g<br>(High Channel_13)     | 6 Mbps     | 6.11              | 7.28      |
|                                   | 9 Mbps     | 6.10              | 7.26      |
|                                   | 12 Mbps    | 6.08              | 7.24      |
|                                   | 18 Mbps    | 6.08              | 7.23      |
|                                   | 24 Mbps    | 6.04              | 7.21      |
|                                   | 36 Mbps    | 5.69              | 6.67      |
|                                   | 48 Mbps    | 4.73              | 5.80      |
|                                   | 54 Mbps    | 4.71              | 5.76      |
| 802.11 HT 20<br>(High Channel_13) | 6.5 Mbps   | 5.98              | 7.15      |
|                                   | 13 Mbps    | 5.96              | 7.14      |
|                                   | 19.5 Mbps  | 5.95              | 7.11      |
|                                   | 26 Mbps    | 5.93              | 7.10      |
|                                   | 39 Mbps    | 5.61              | 6.48      |
|                                   | 52 Mbps    | 5.58              | 6.47      |
|                                   | 58.5 Mbps  | 4.60              | 5.60      |
|                                   | 65 Mbps    | 4.57              | 5.57      |
| 802.11 HT 40<br>(High Channel_11) | 13.5 Mbps  | 6.77              | 8.36      |
|                                   | 27 Mbps    | 6.76              | 8.33      |
|                                   | 40.5 Mbps  | 6.73              | 8.32      |
|                                   | 54 Mbps    | 6.73              | 8.30      |
|                                   | 81 Mbps    | 6.31              | 7.72      |
|                                   | 108 Mbps   | 6.27              | 7.70      |
|                                   | 121.5 Mbps | 5.35              | 6.78      |
|                                   | 135 Mbps   | 5.32              | 6.76      |

-. The worse case data rate for each modulation is determined 1 Mbps(Ant.0/Ant.1) for IEEE 802.11b, 6 Mbps(Ant.0/Ant.1) for IEEE 802.11g, 6.5 Mbps(Ant.0/Ant.1) for HT20, 13.5 Mbps(Ant.0/Ant.1) for HT40.

-. 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.

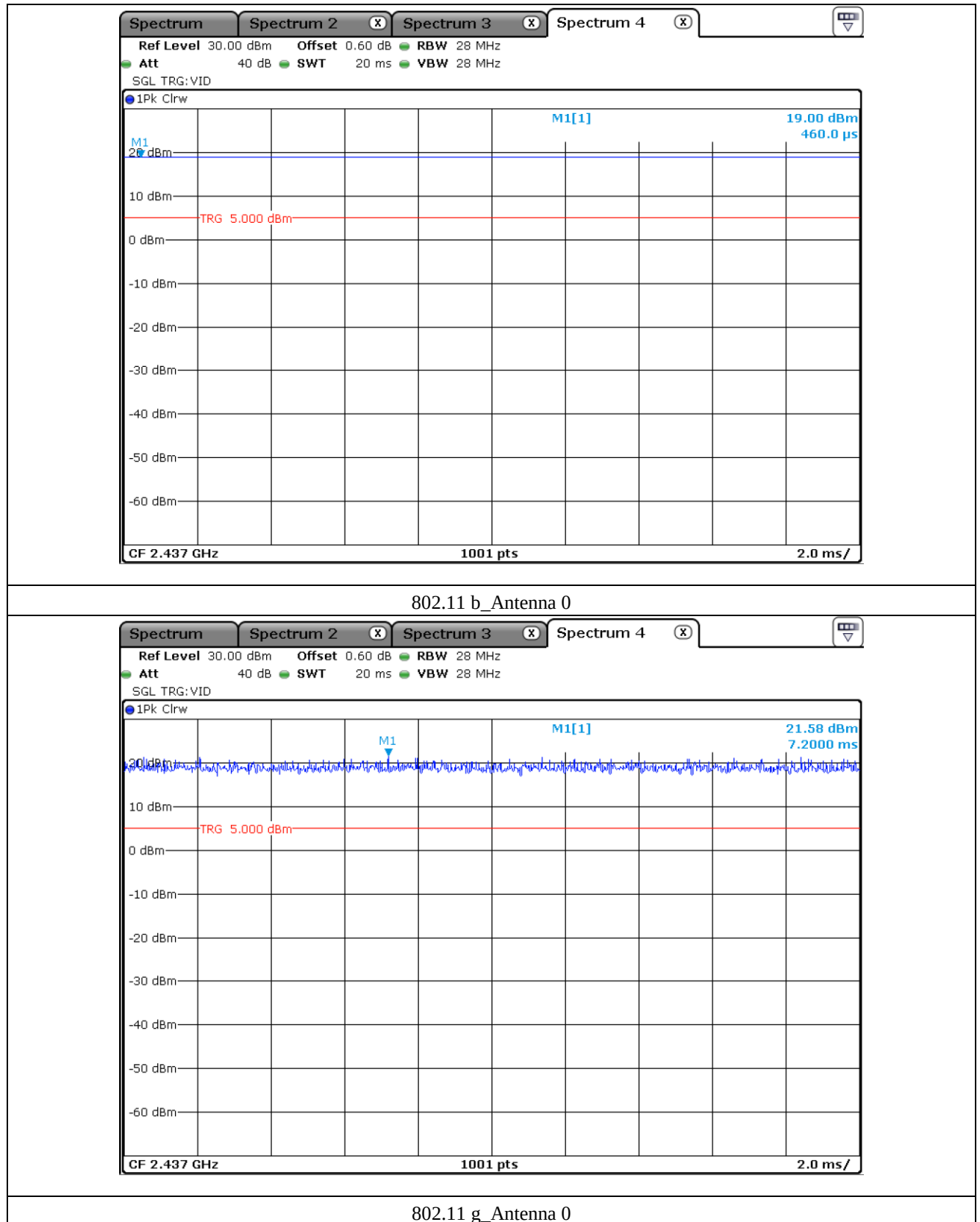
-. Duty Cycle

| Mode                   | Tx On Time<br>[ ms ] | Tx Off Time<br>[ ms ] | Duty Cycle<br>[ % ] | Correction Factor<br>[ dB ] |
|------------------------|----------------------|-----------------------|---------------------|-----------------------------|
| 802.11 b_Antenna 0     | -                    | -                     | 100.00              | -                           |
| 802.11 g_Antenna 0     | -                    | -                     | 100.00              | -                           |
| 802.11 HT 20_Antenna 0 | -                    | -                     | 100.00              | -                           |
| 802.11 HT 40_Antenna 0 | -                    | -                     | 100.00              | -                           |
| 802.11 b_Antenna 1     | -                    | -                     | 100.00              | -                           |
| 802.11 g_Antenna 1     | -                    | -                     | 100.00              | -                           |
| 802.11 HT 20_Antenna 1 | -                    | -                     | 100.00              | -                           |
| 802.11 HT 40_Antenna 1 | -                    | -                     | 100.00              | -                           |

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

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

-. Test Plot

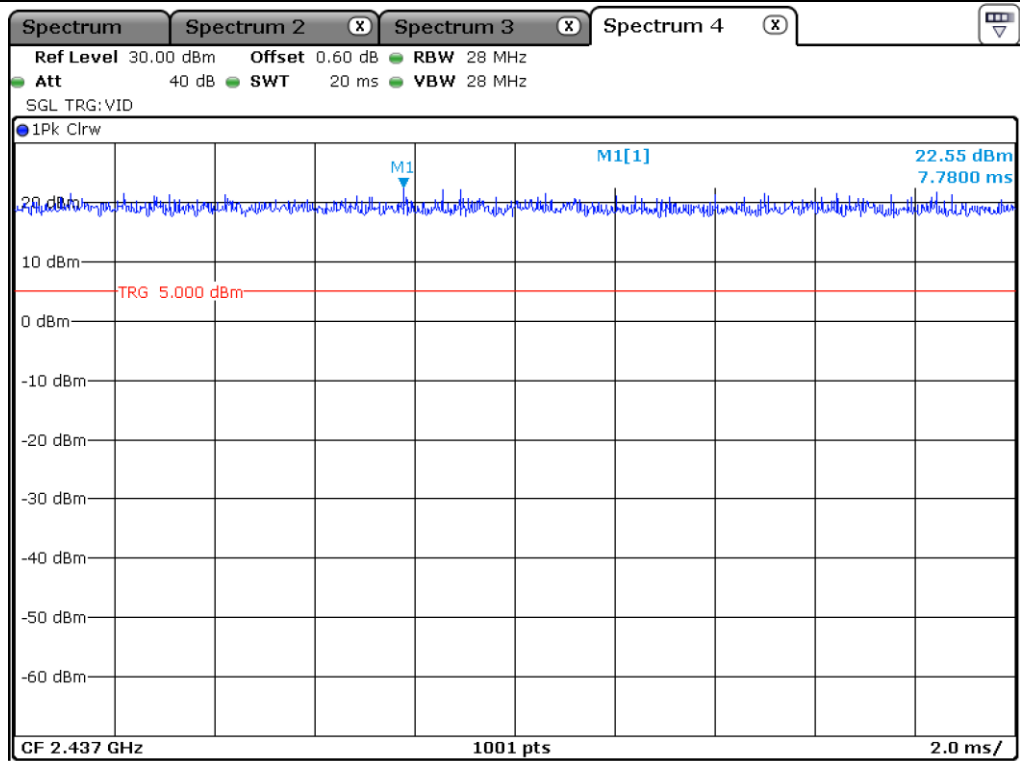


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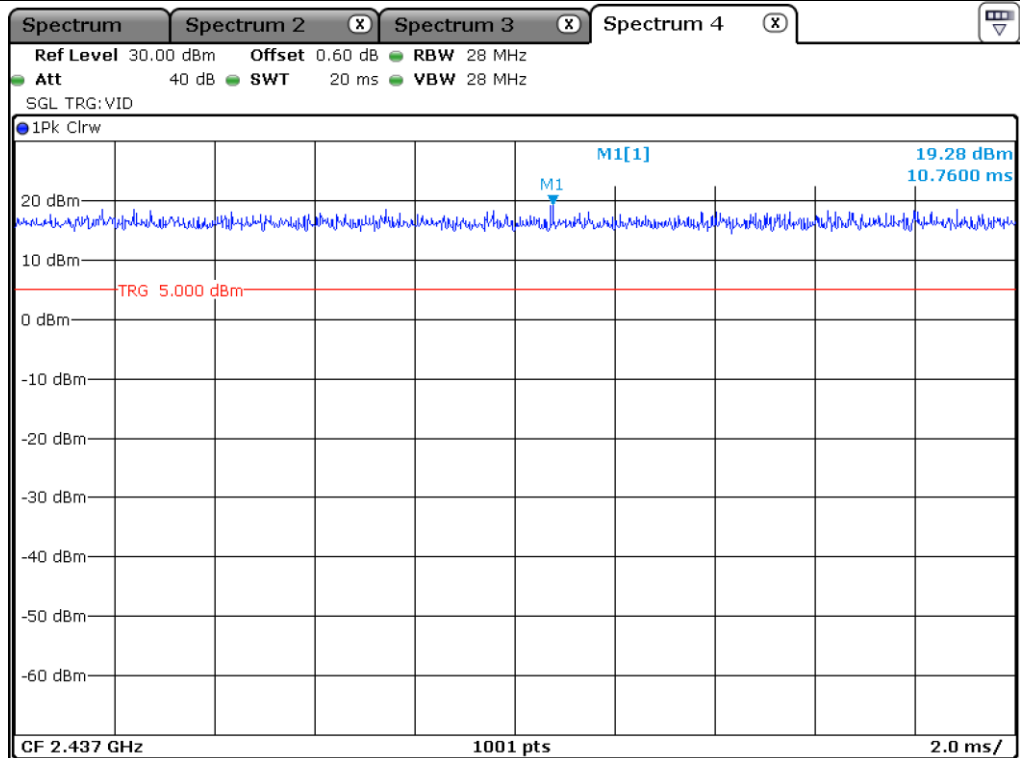
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802.11 HT 20\_Antenna 0



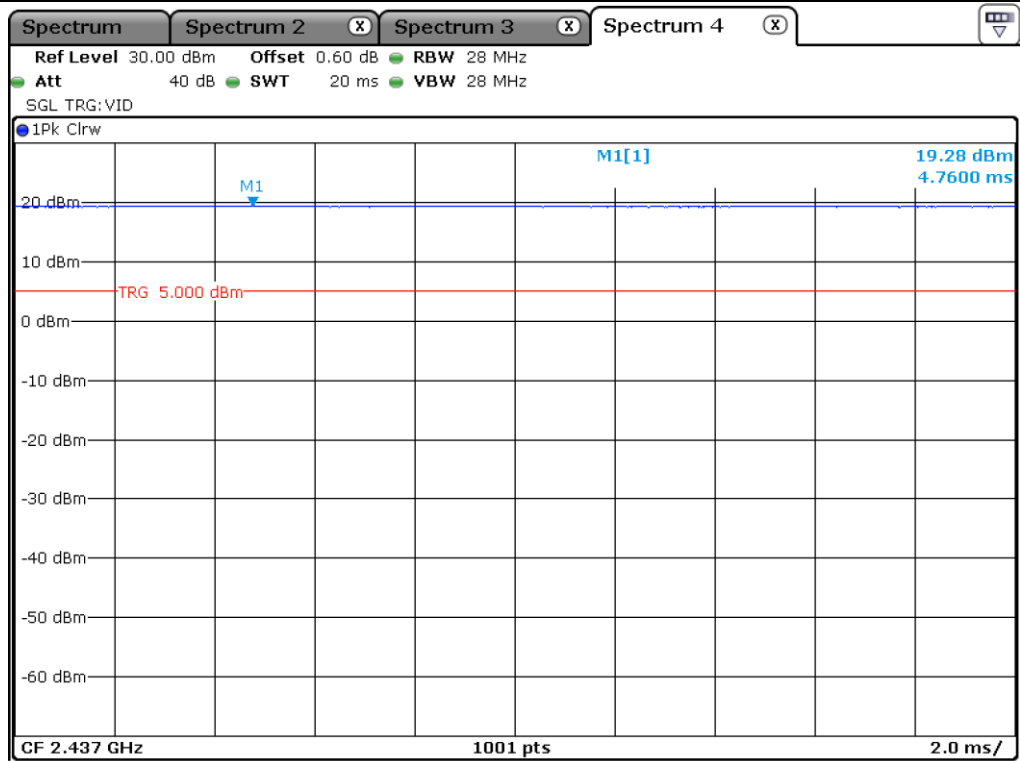
802.11 HT 40\_Antenna 0

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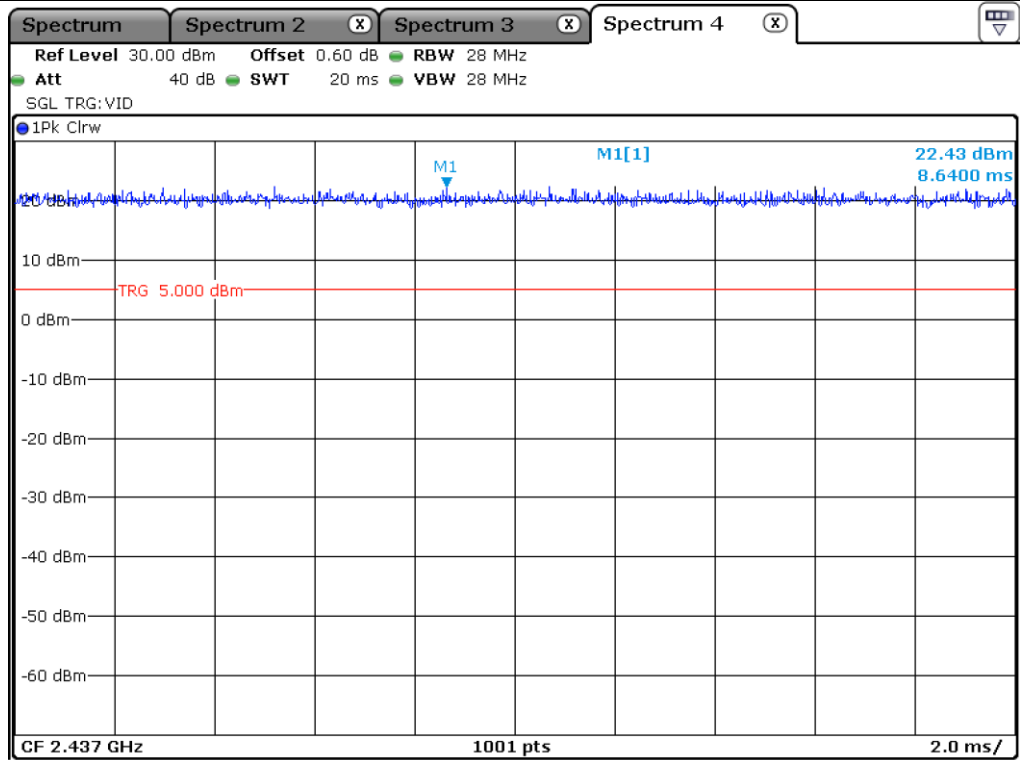
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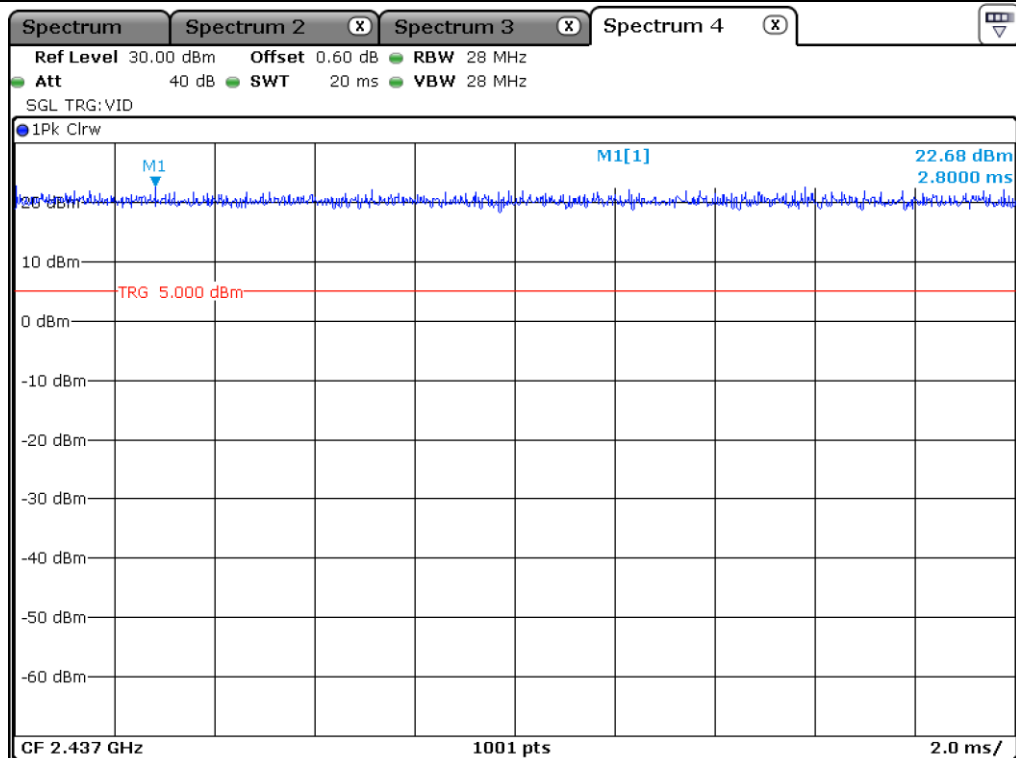
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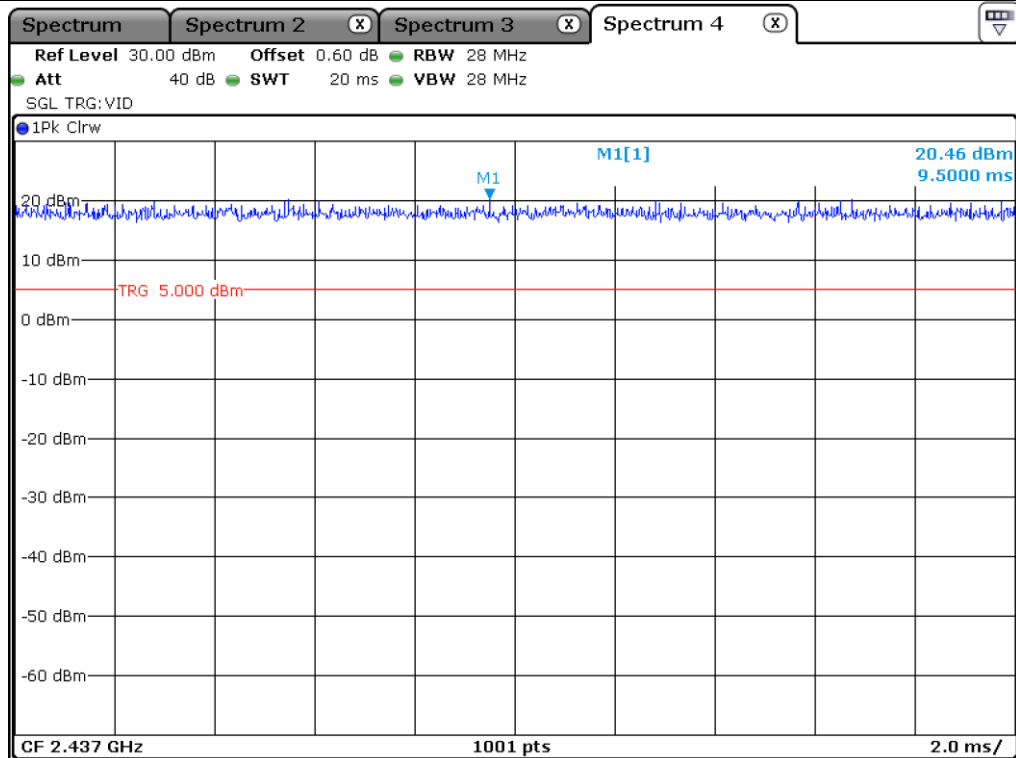
802.11 b\_Antenna 1



802.11 g\_Antenna 1



802.11 HT 20\_Antenna 1



802.11 HT 40\_Antenna 1

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## 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 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                                                     |

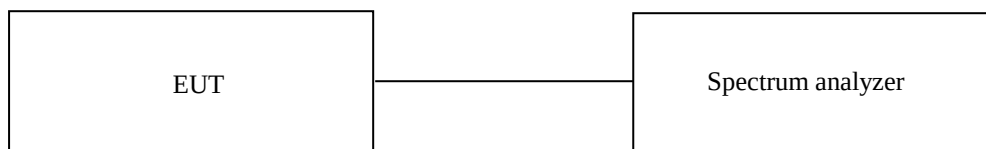
## 7. MINIMUM 6 dB BANDWIDTH

### 7.1 Operating environment

Temperature : 23 °C  
Relative humidity : 45 % 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

October 07, 2021 ~ October 20, 2021

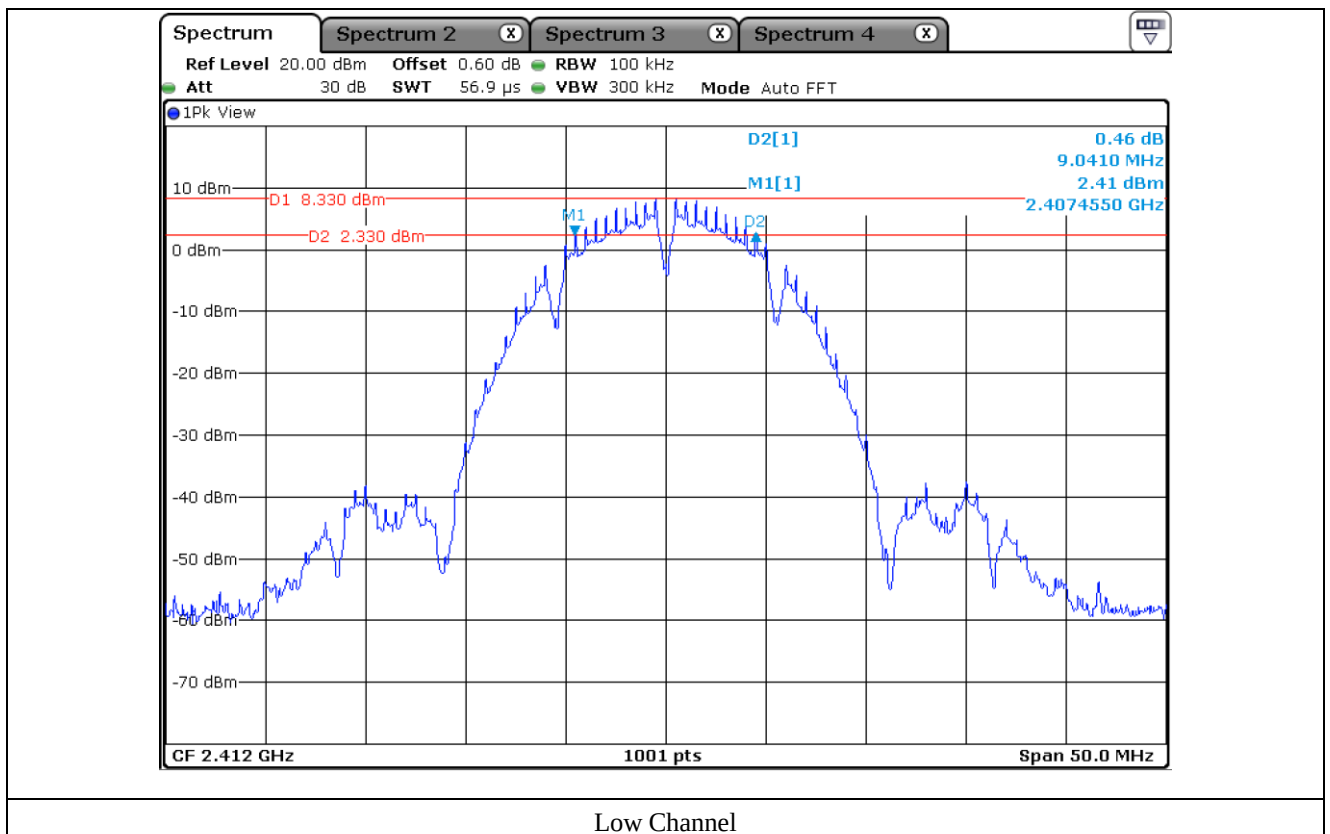
## 7.4 Test data for 802.11b WLAN Mode

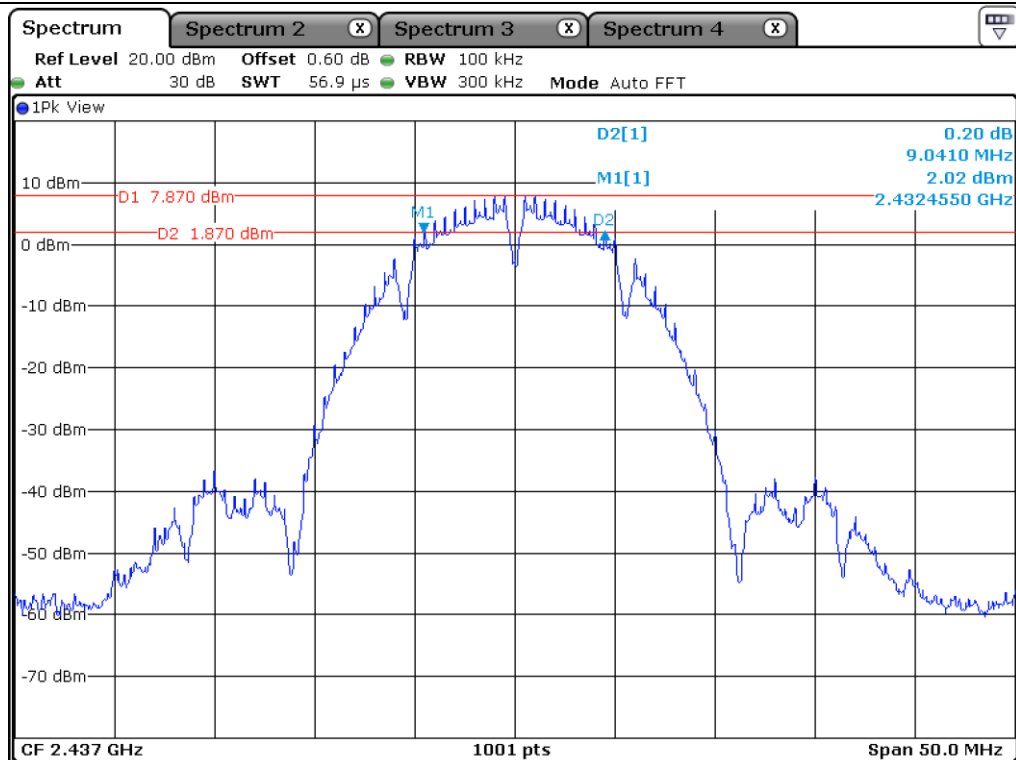
### 7.4.1 Test data for Antenna 0

-. Test Result : Pass

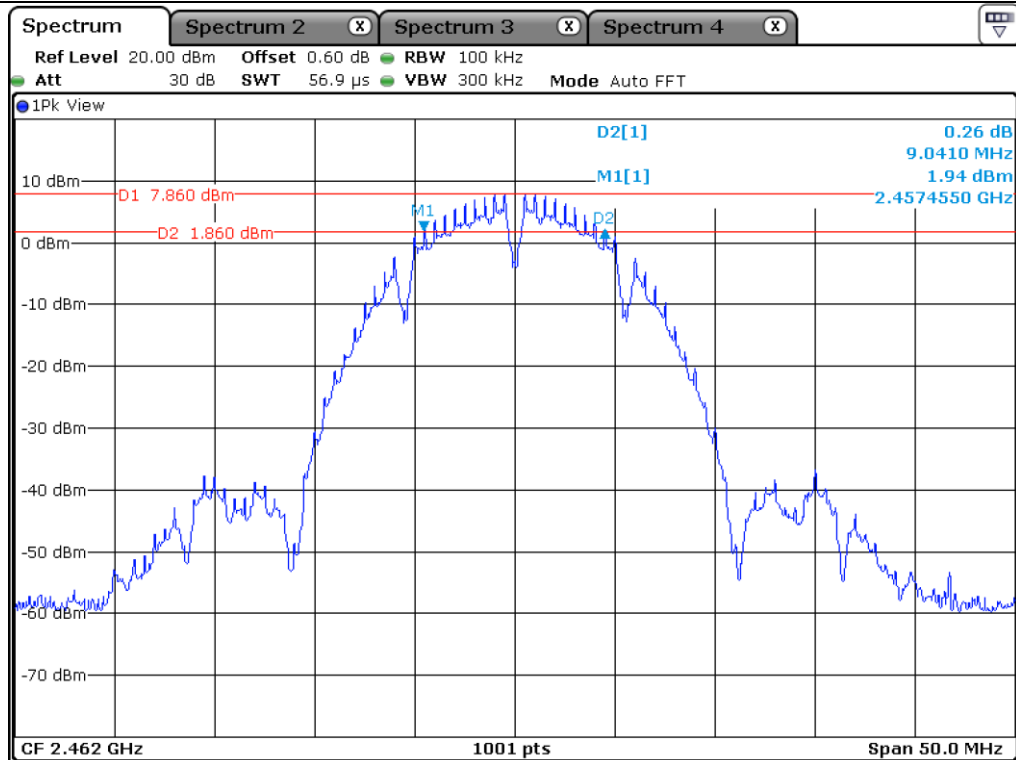
| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 412.00           | 9.04                    | 0.50           | 8.54            |
| Middle  | 2 437.00           | 9.04                    | 0.50           | 8.54            |
| High 11 | 2 462.00           | 9.04                    | 0.50           | 8.54            |
| High 12 | 2 467.00           | 9.04                    | 0.50           | 8.54            |
| High 13 | 2 472.00           | 9.04                    | 0.50           | 8.54            |

Remark. Margin = Measured Value - Limit





Middle Channel



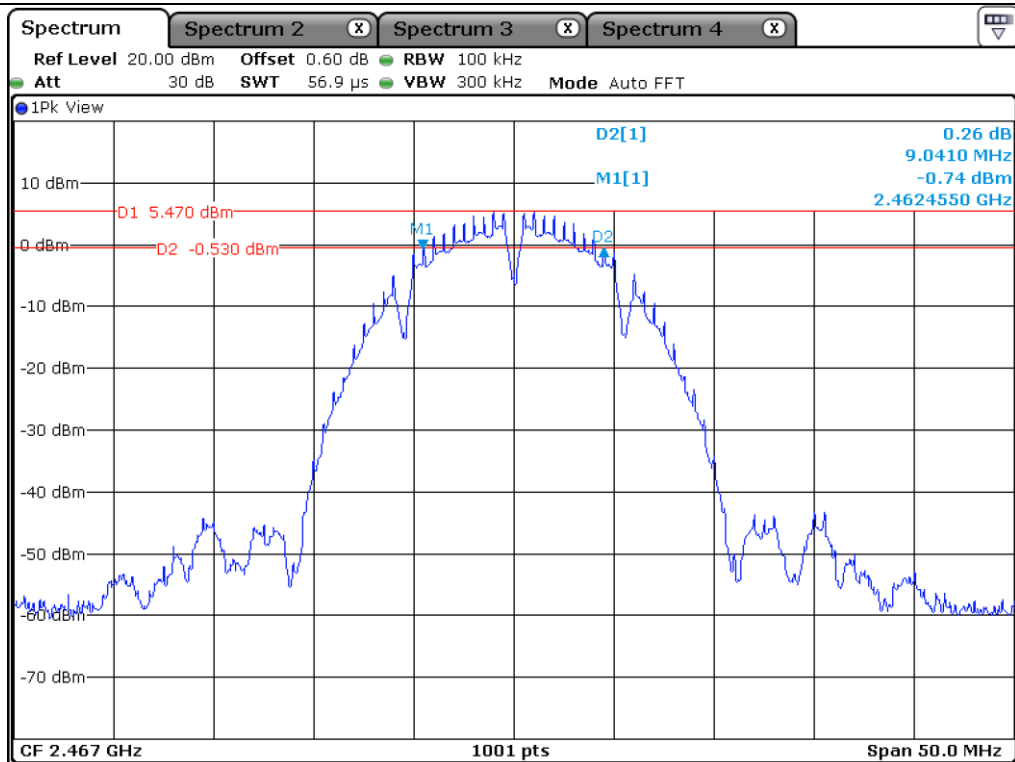
High Channel 11

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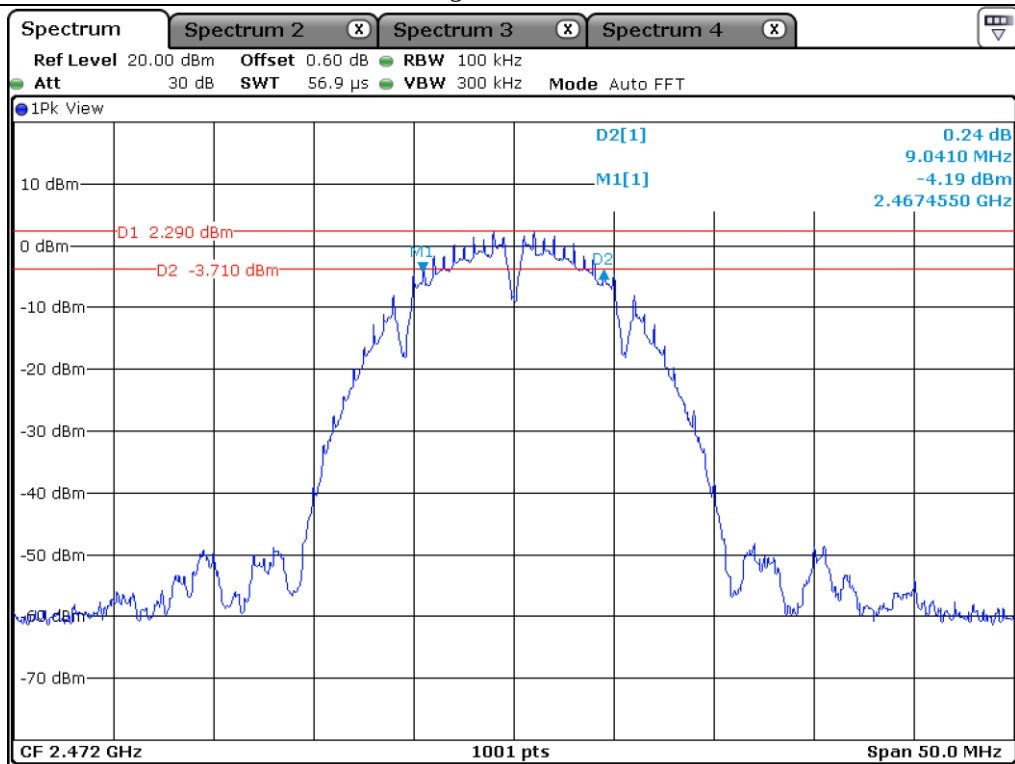
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High Channel 12



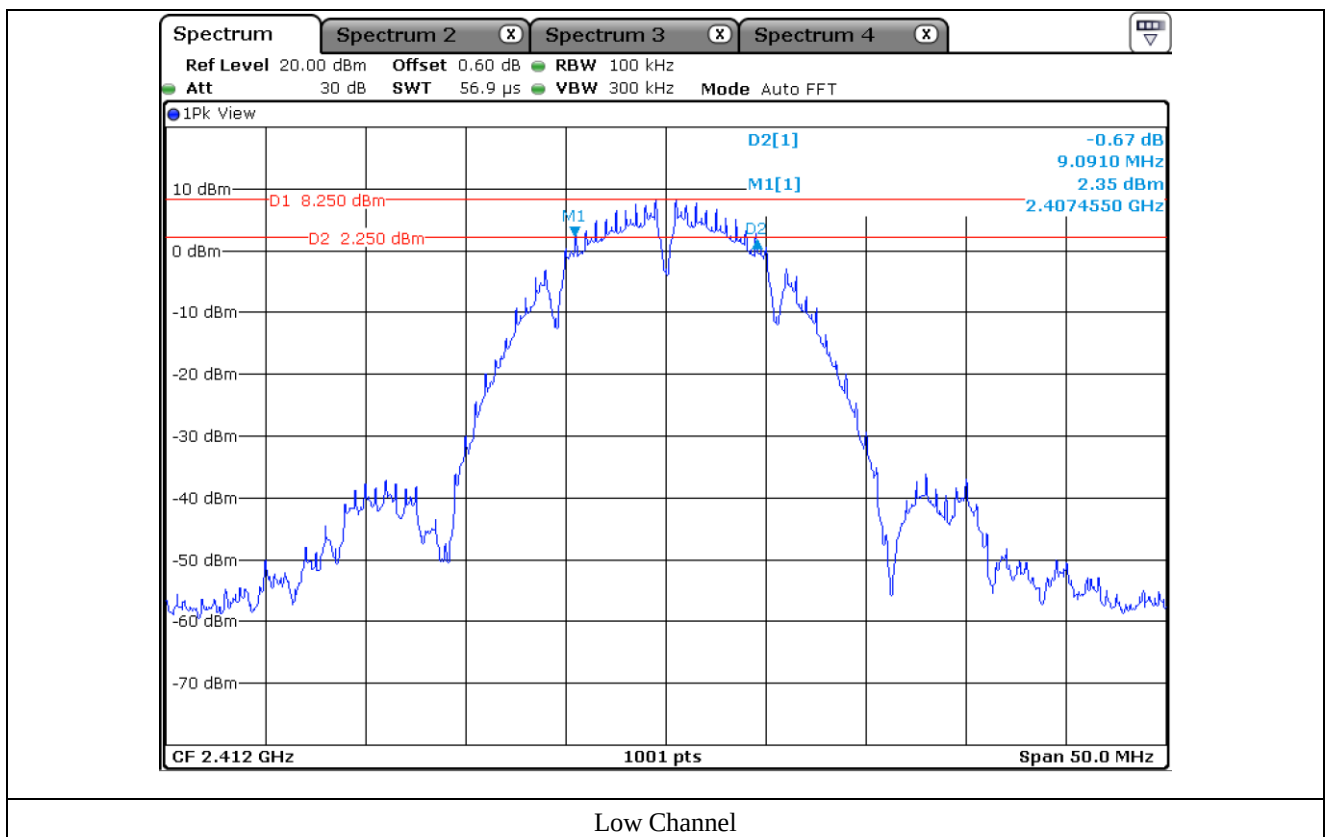
High Channel 13

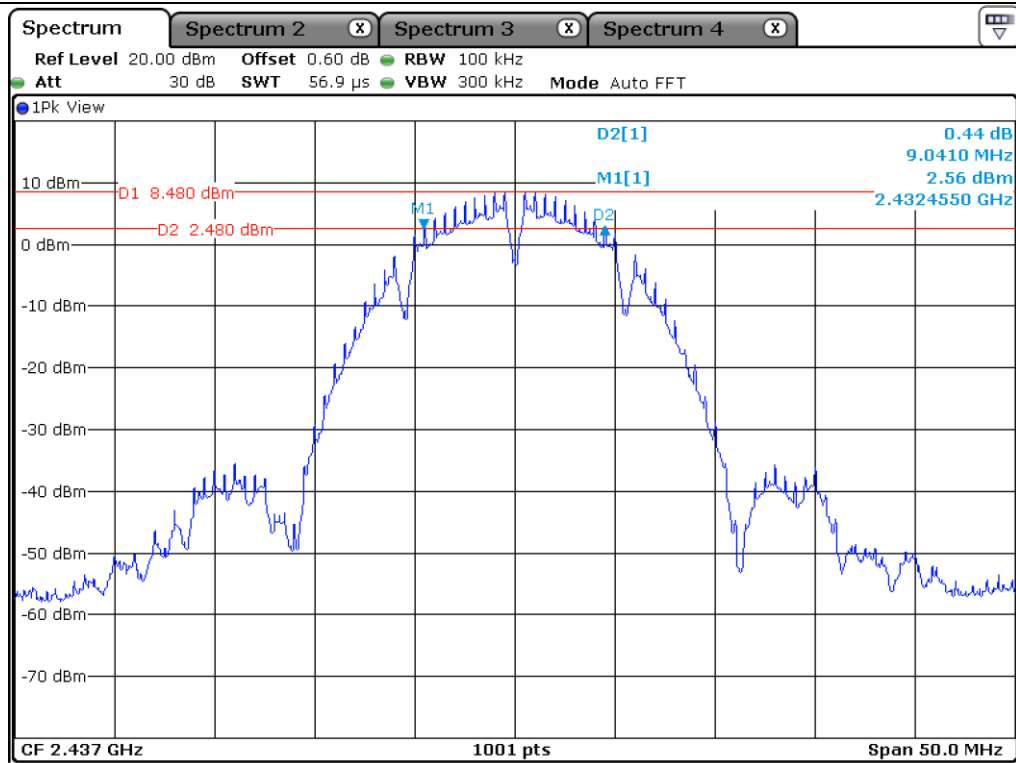
## 7.4.2 Test data for Antenna 1

-. Test Result : Pass

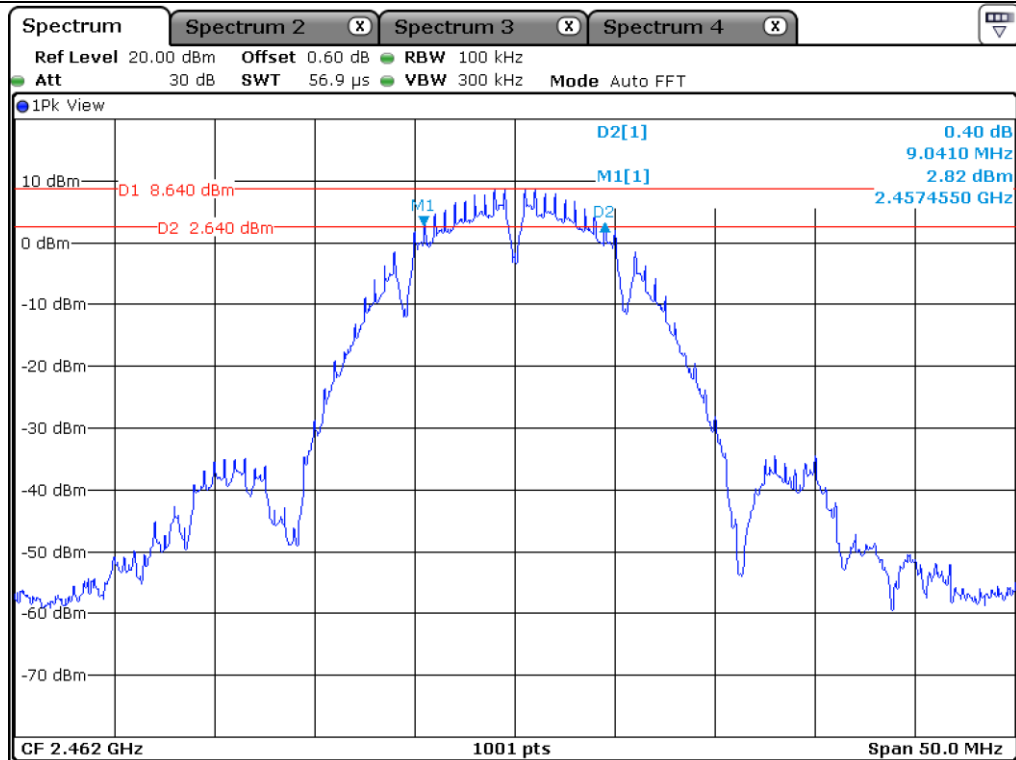
| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 412.00           | 9.09                    | 0.50           | 8.59            |
| Middle  | 2 437.00           | 9.04                    | 0.50           | 8.54            |
| High 11 | 2 462.00           | 9.04                    | 0.50           | 8.54            |
| High 12 | 2 467.00           | 9.09                    | 0.50           | 8.59            |
| High 13 | 2 472.00           | 9.09                    | 0.50           | 8.59            |

Remark. Margin = Measured Value - Limit





Middle Channel



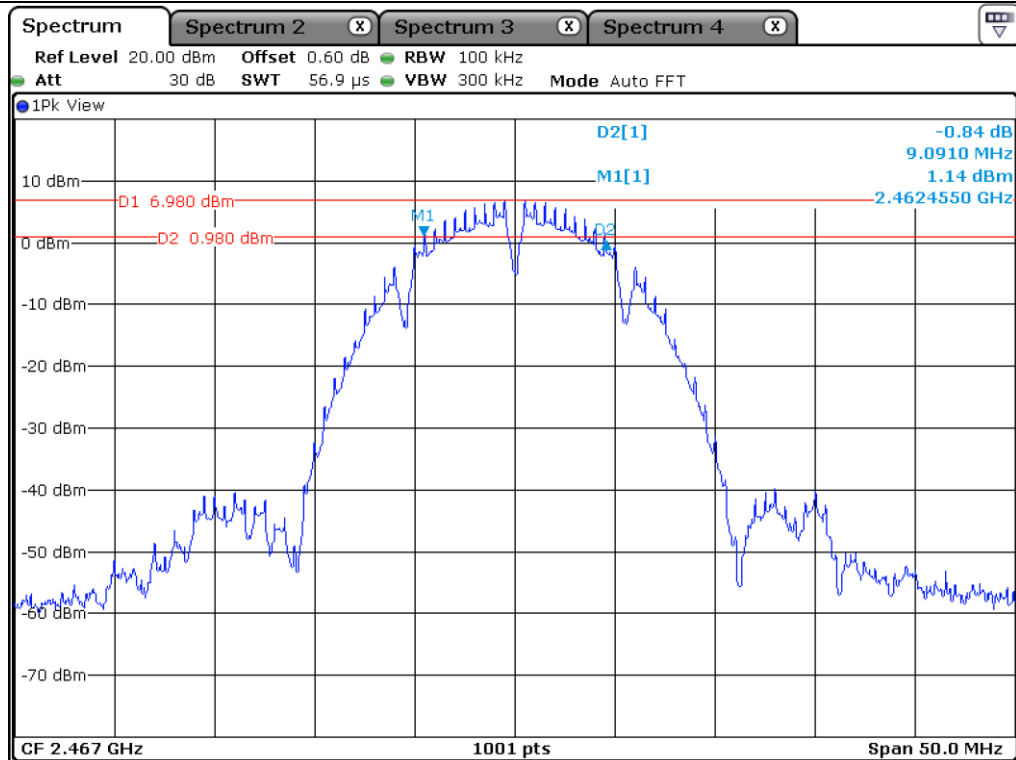
High Channel 11

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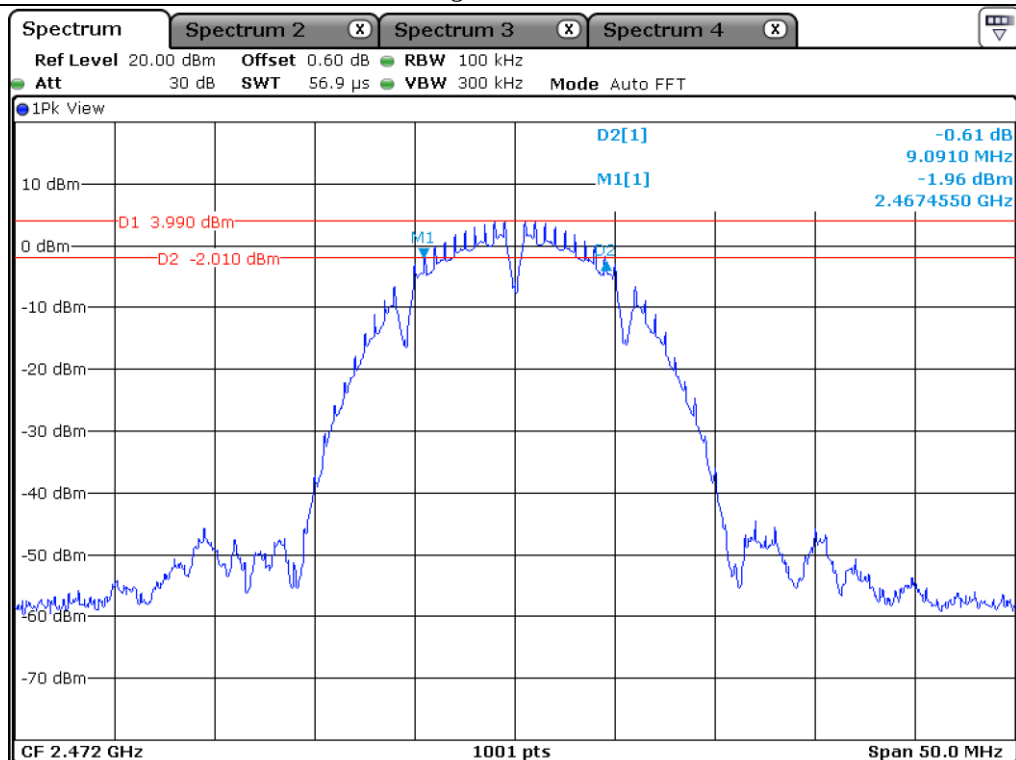
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High Channel 12



High Channel 13

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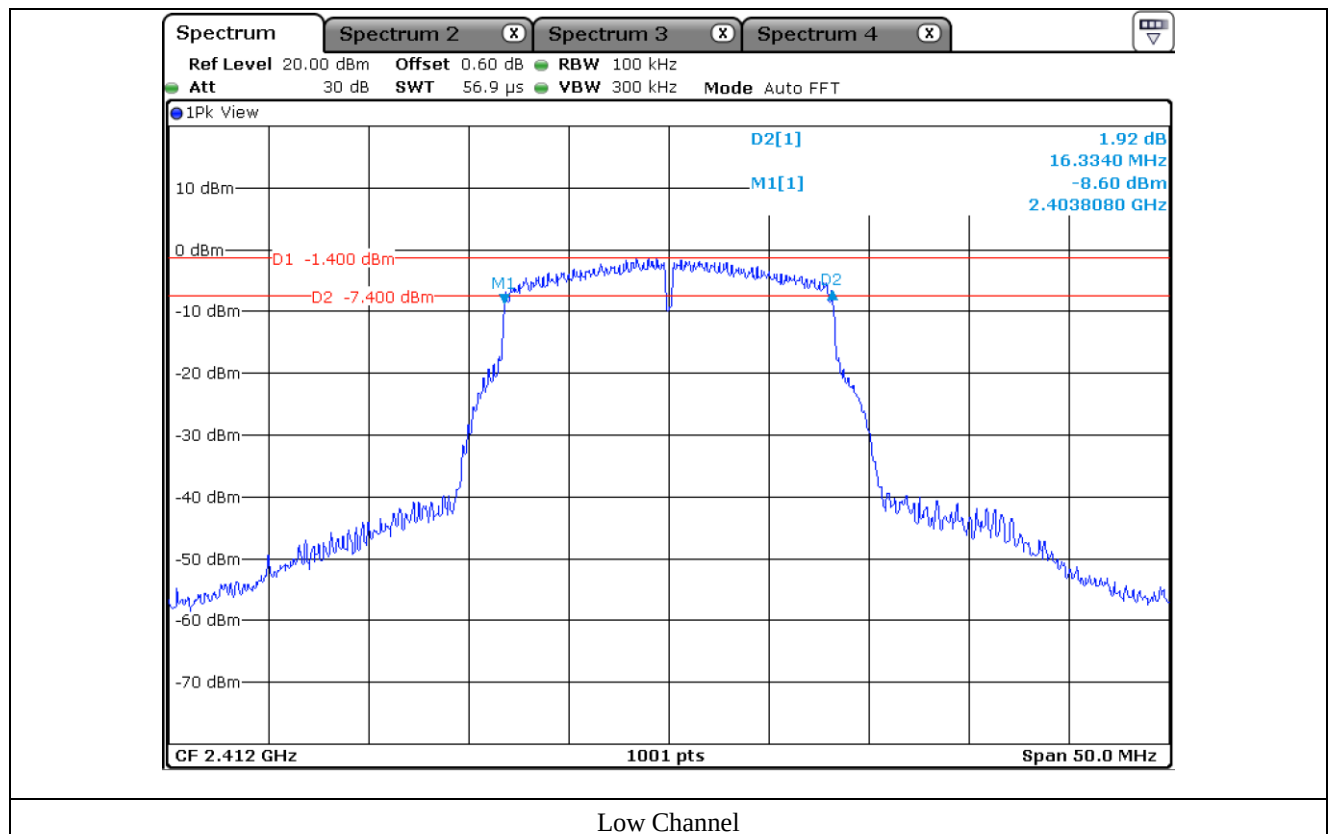
## 7.5 Test data for 802.11g WLAN Mode

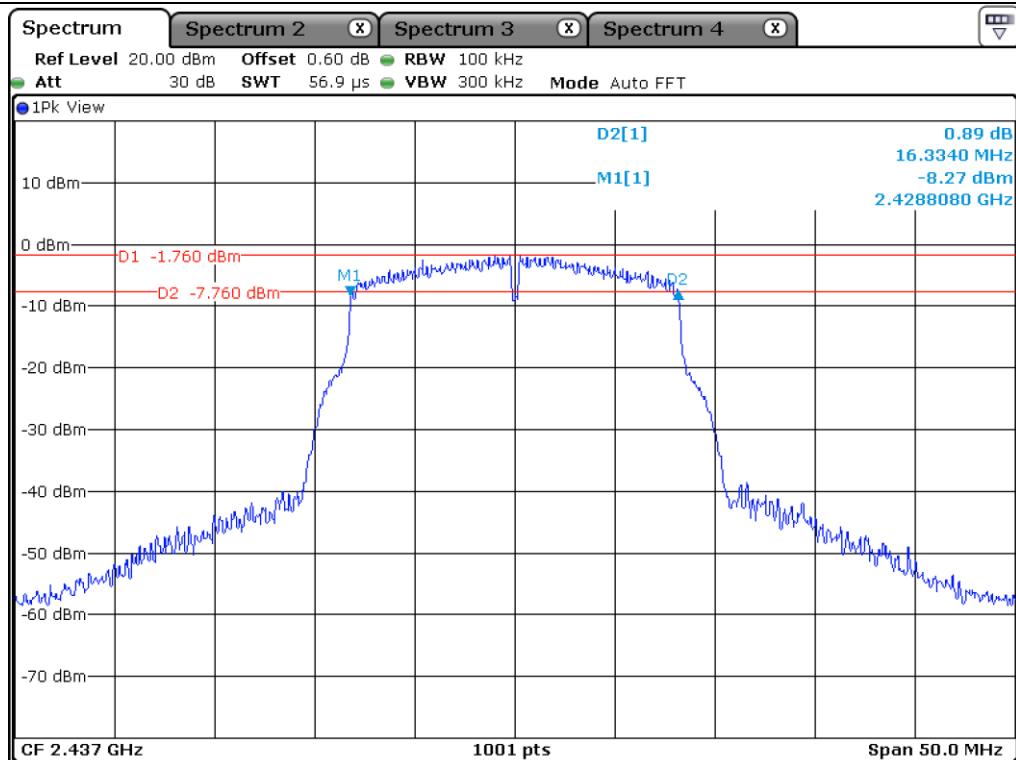
### 7.5.1 Test data for Antenna 0

-. Test Result : Pass

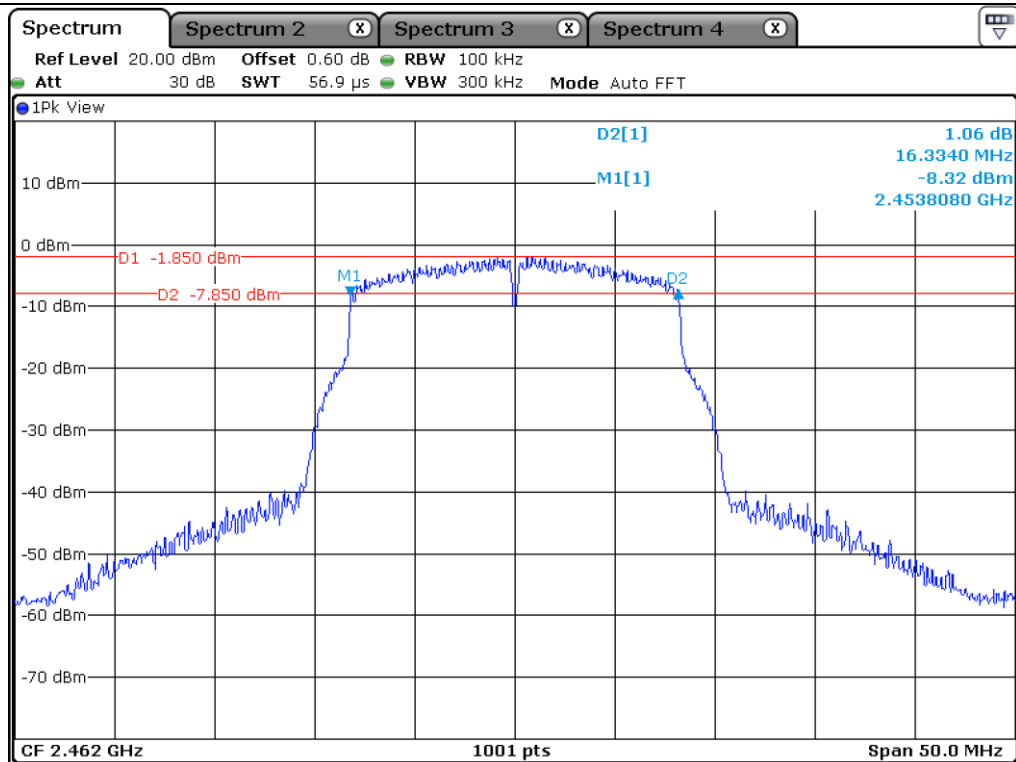
| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 412.00           | 16.33                   | 0.50           | 15.83           |
| Middle  | 2 437.00           | 16.33                   | 0.50           | 15.83           |
| High 11 | 2 462.00           | 16.33                   | 0.50           | 15.83           |
| High 12 | 2 467.00           | 16.33                   | 0.50           | 15.83           |
| High 13 | 2 472.00           | 16.33                   | 0.50           | 15.83           |

Remark. Margin = Measured Value - Limit





Middle Channel



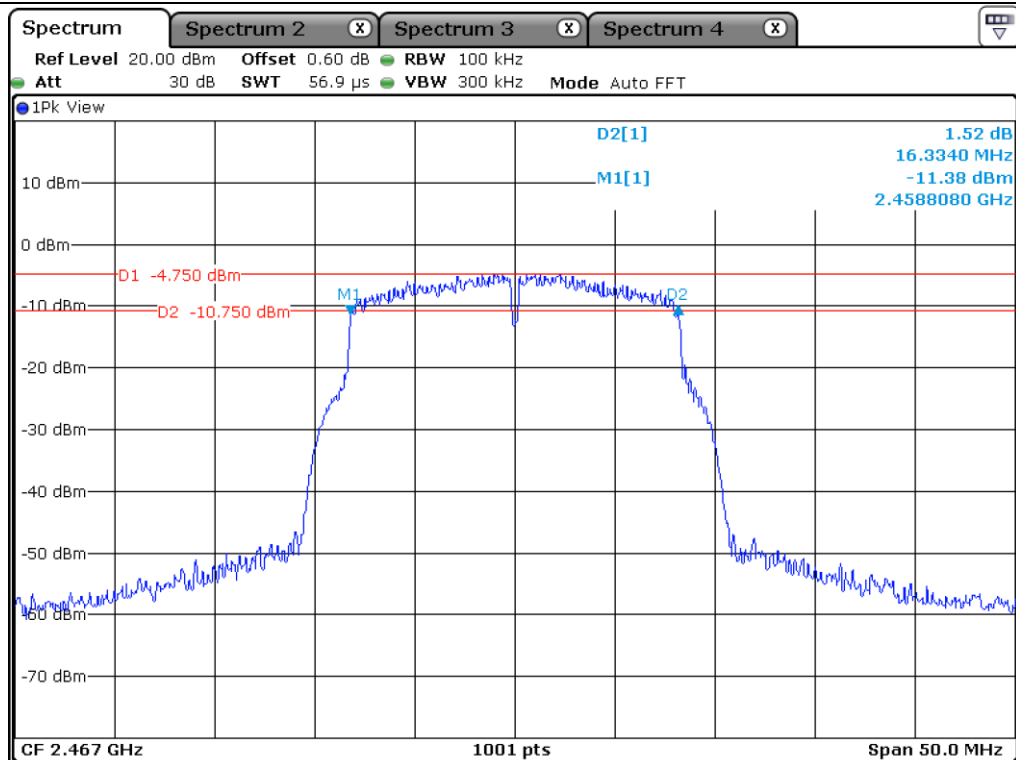
High Channel 11

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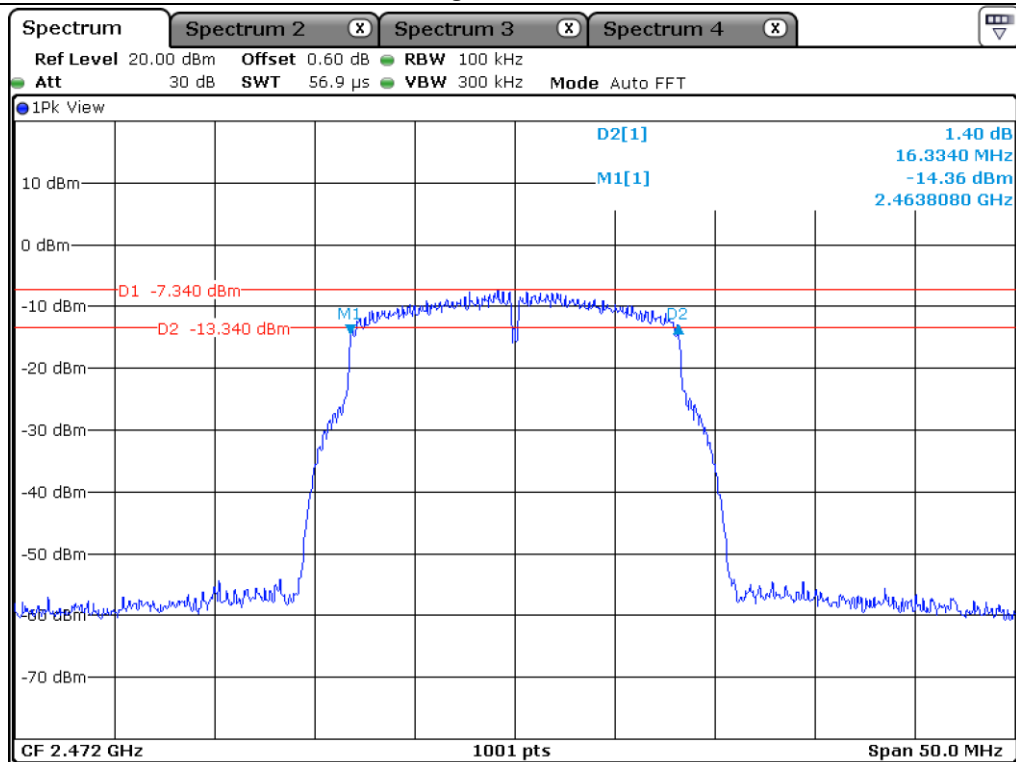
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High Channel 12



High Channel 13

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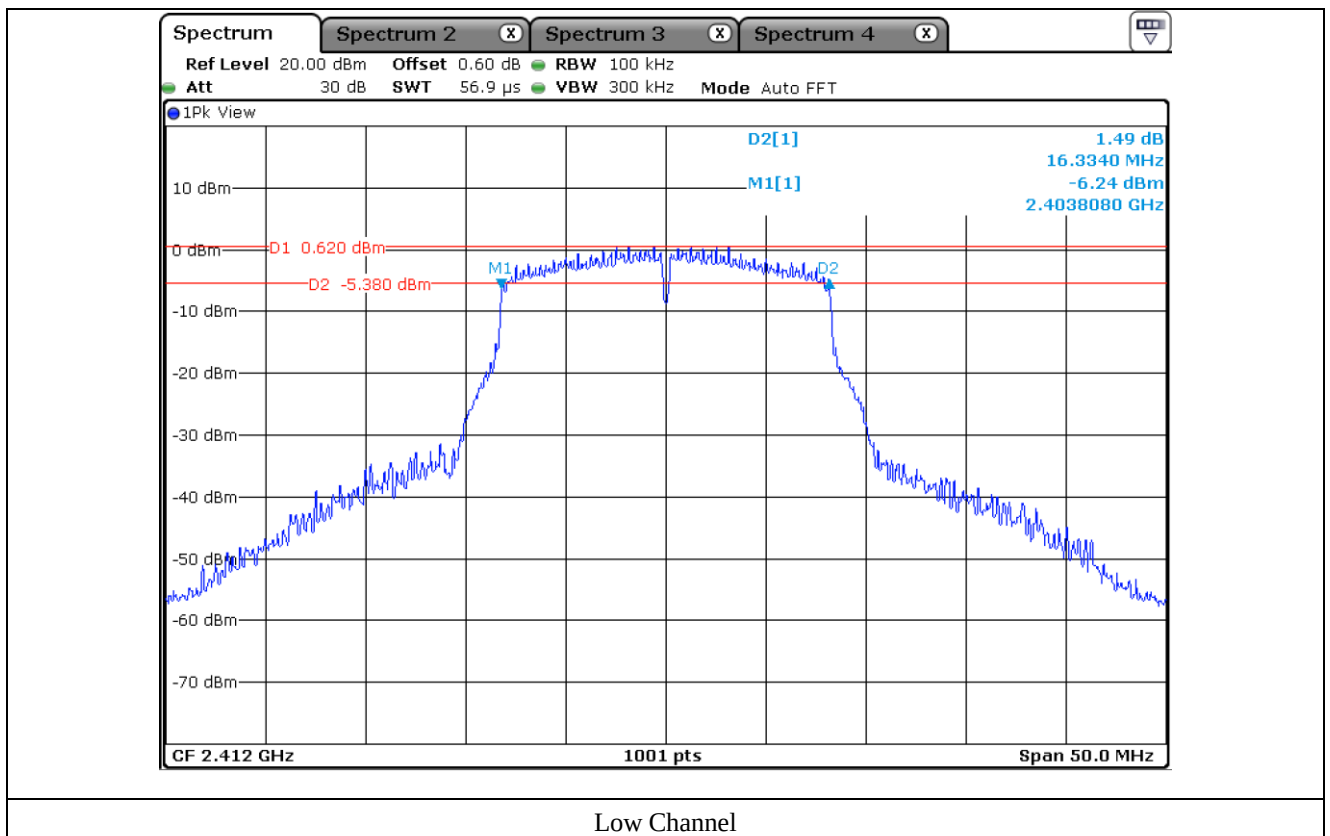
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## 7.5.2 Test data for Antenna 1

-. Test Result : Pass

| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 412.00           | 16.33                   | 0.50           | 15.83           |
| Middle  | 2 437.00           | 16.33                   | 0.50           | 15.83           |
| High 11 | 2 462.00           | 16.33                   | 0.50           | 15.83           |
| High 12 | 2 467.00           | 16.28                   | 0.50           | 15.78           |
| High 13 | 2 472.00           | 16.33                   | 0.50           | 15.83           |

Remark. Margin = Measured Value – Limit

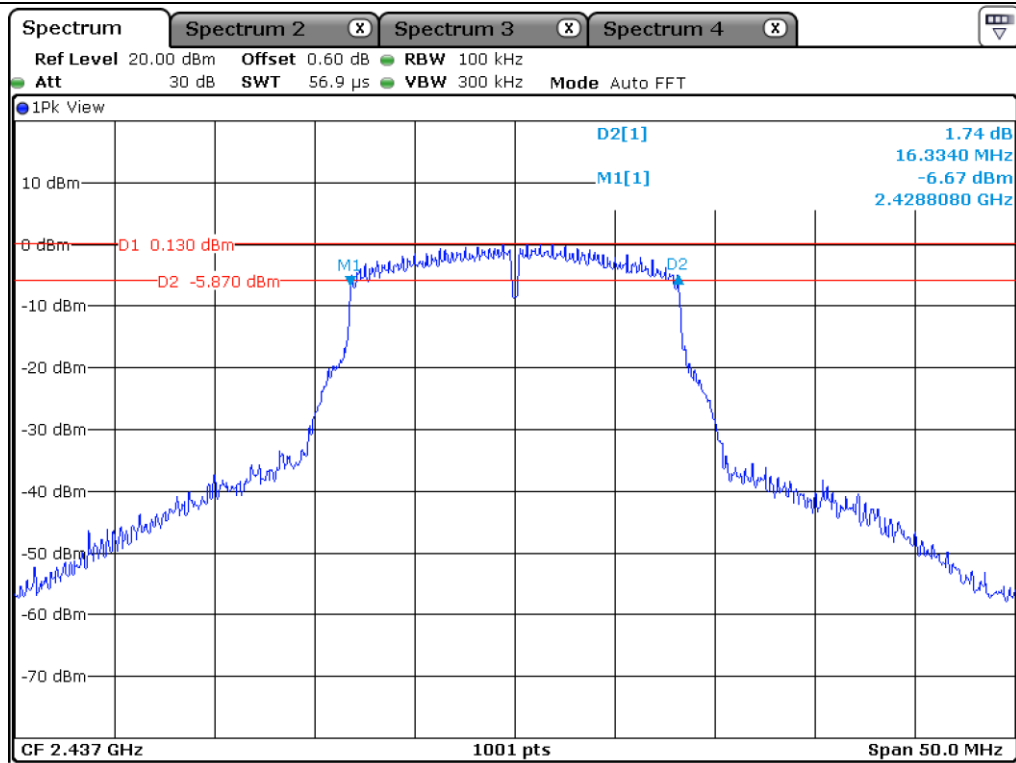


This Report is not correlated with the authentication of KOLAS

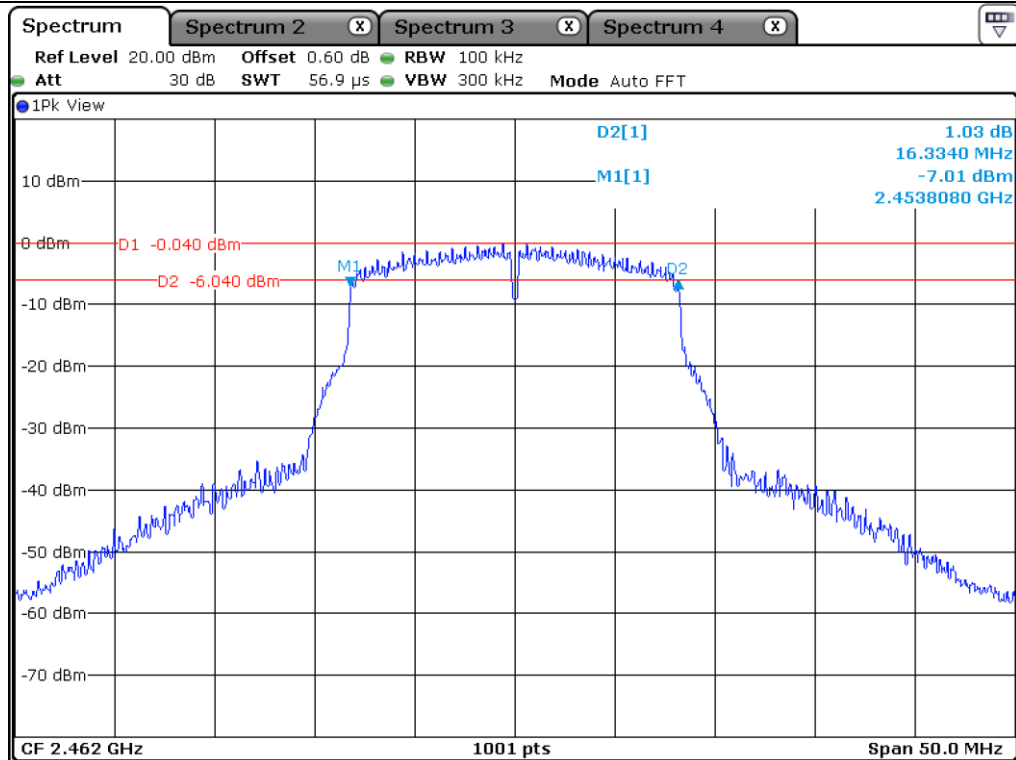
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Middle Channel



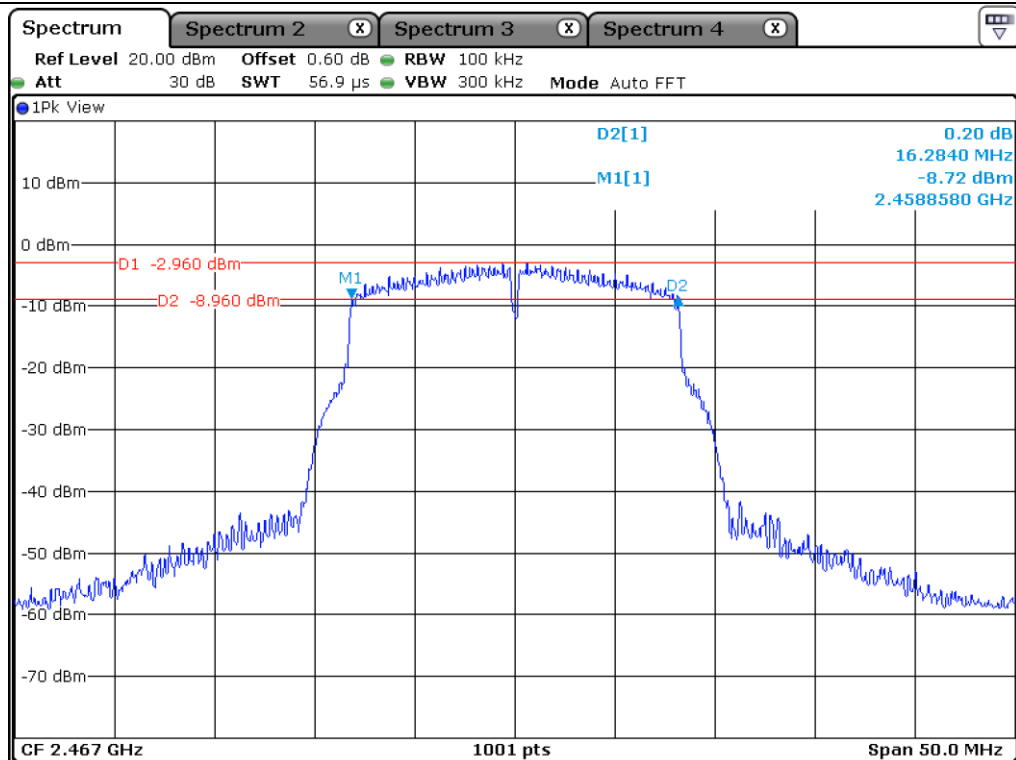
High Channel 11

This Report is not correlated with the authentication of KOLAS

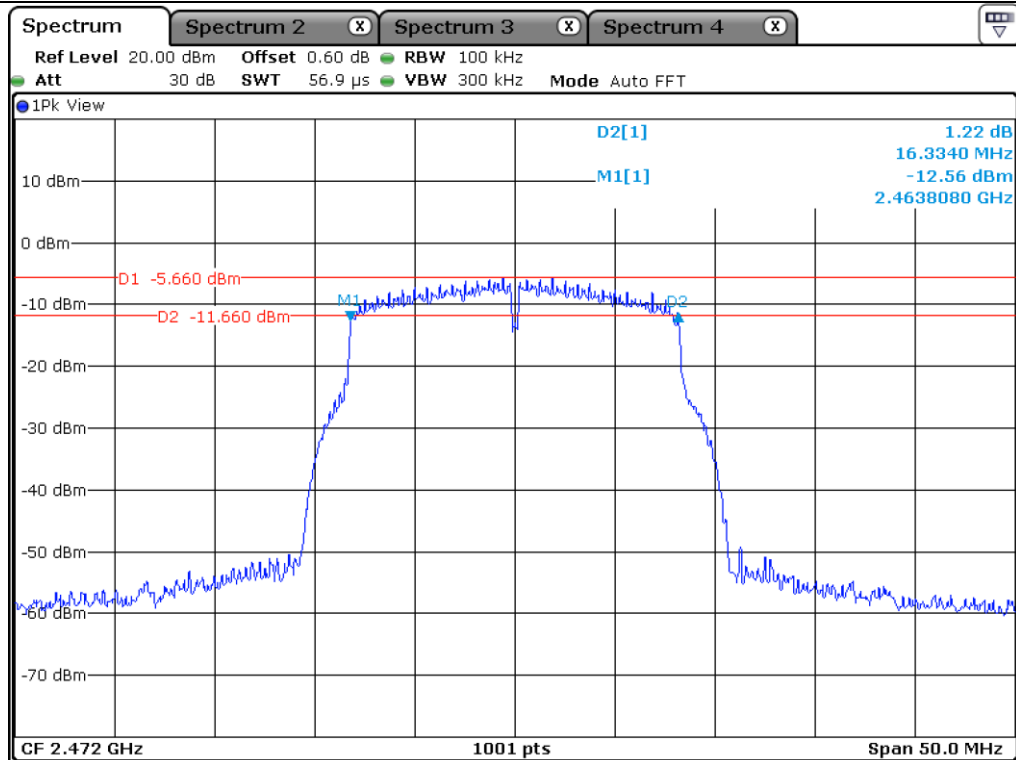
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High Channel 12



High Channel 13

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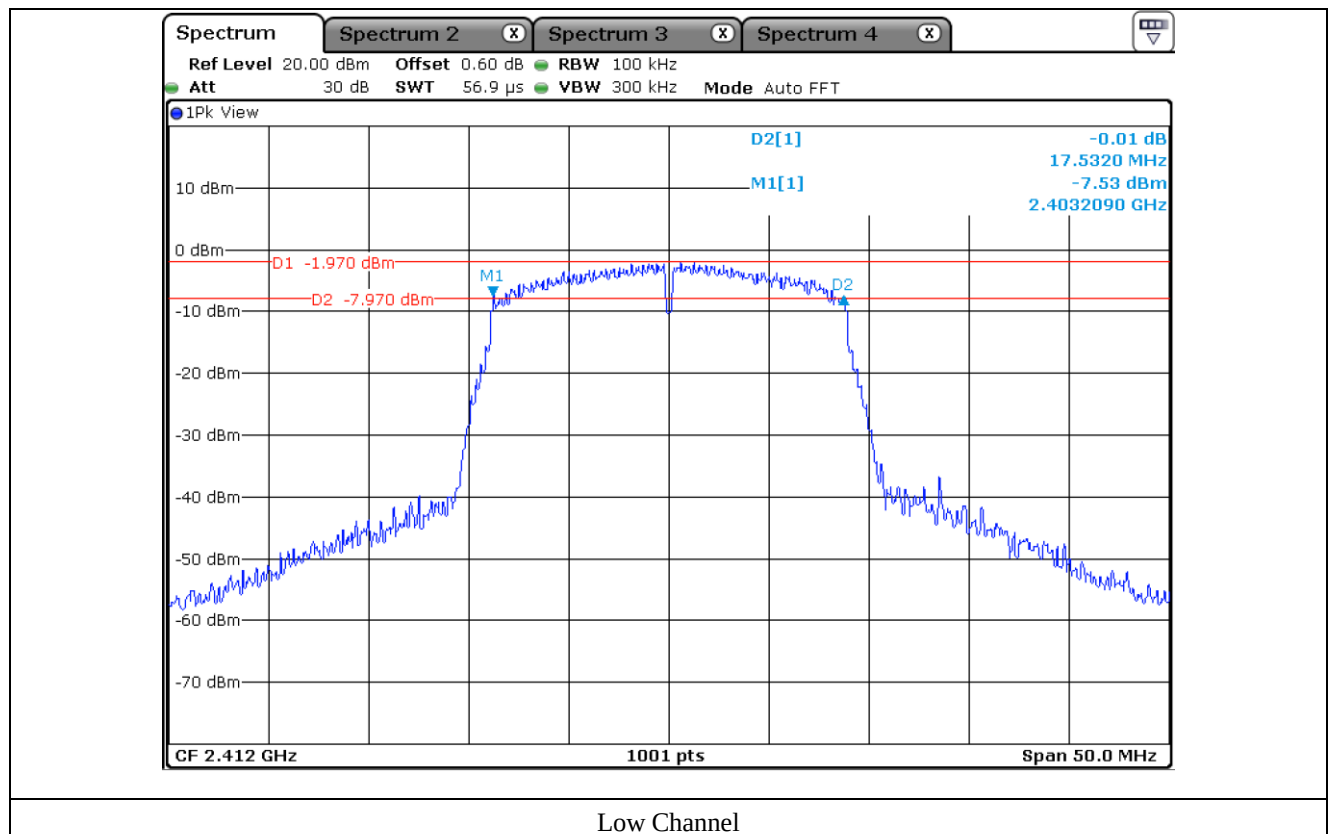
## 7.6 Test data for 802.11n\_HT20 WLAN Mode

### 7.6.1 Test data for Antenna 0

-. Test Result : Pass

| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 412.00           | 17.53                   | 0.50           | 17.03           |
| Middle  | 2 437.00           | 17.53                   | 0.50           | 17.03           |
| High 11 | 2 462.00           | 17.53                   | 0.50           | 17.03           |
| High 12 | 2 467.00           | 17.58                   | 0.50           | 17.08           |
| High 13 | 2 472.00           | 17.53                   | 0.50           | 17.03           |

Remark. Margin = Measured Value - Limit

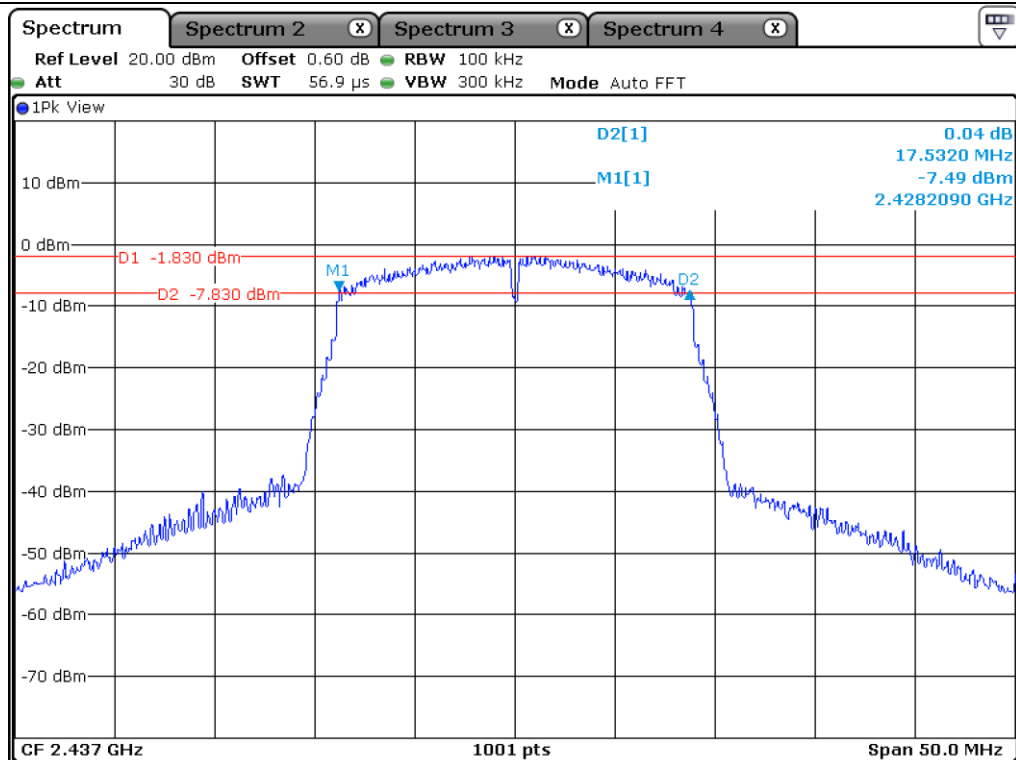


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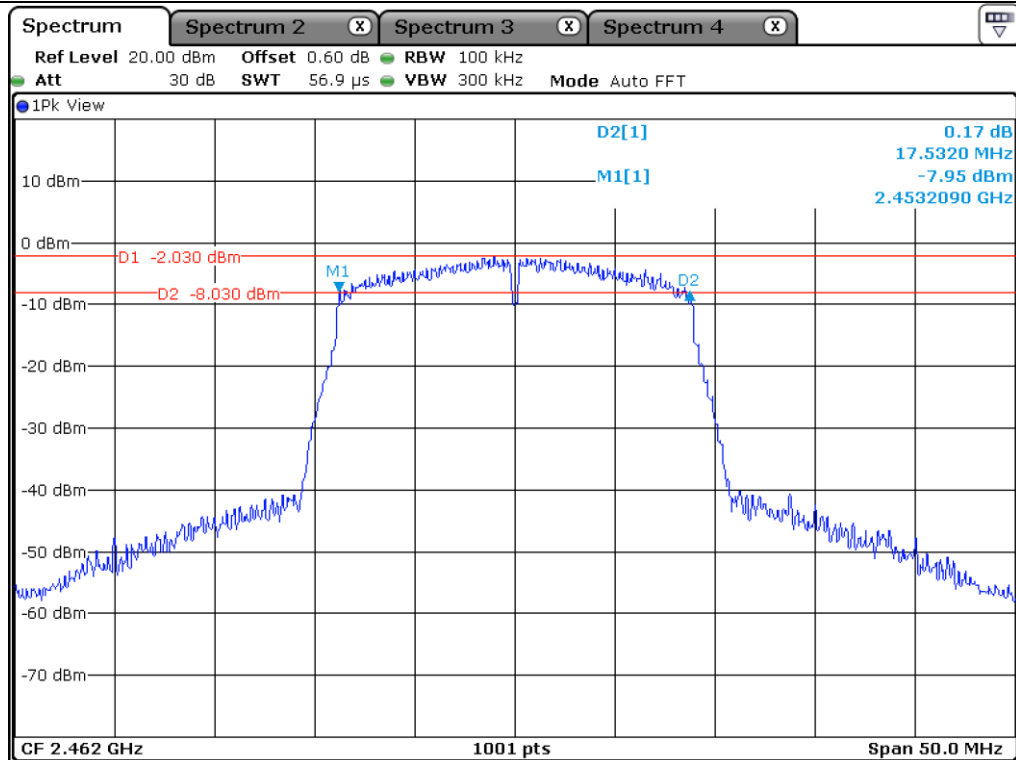
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Middle Channel



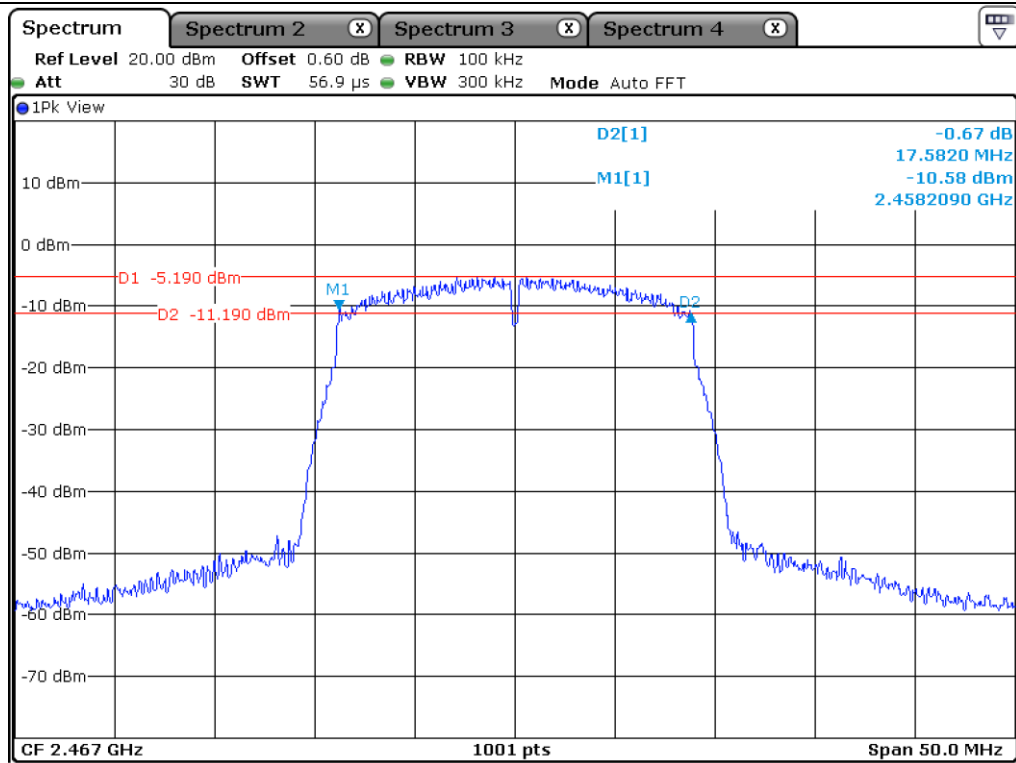
High Channel 11

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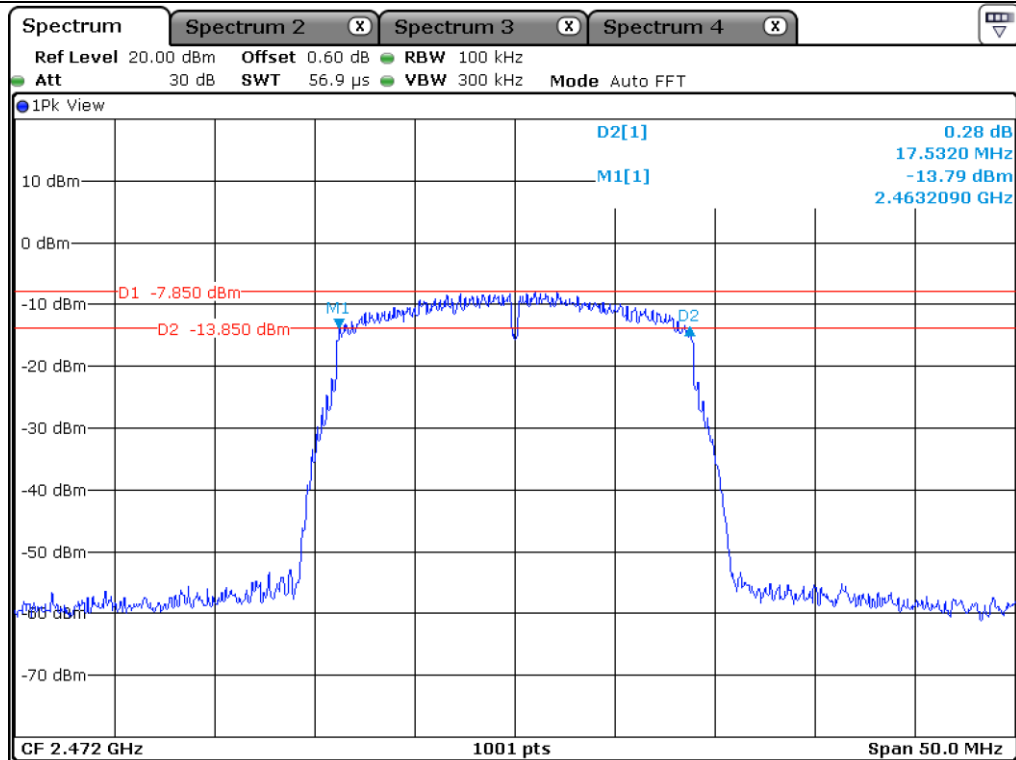
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High Channel 12



High Channel 13

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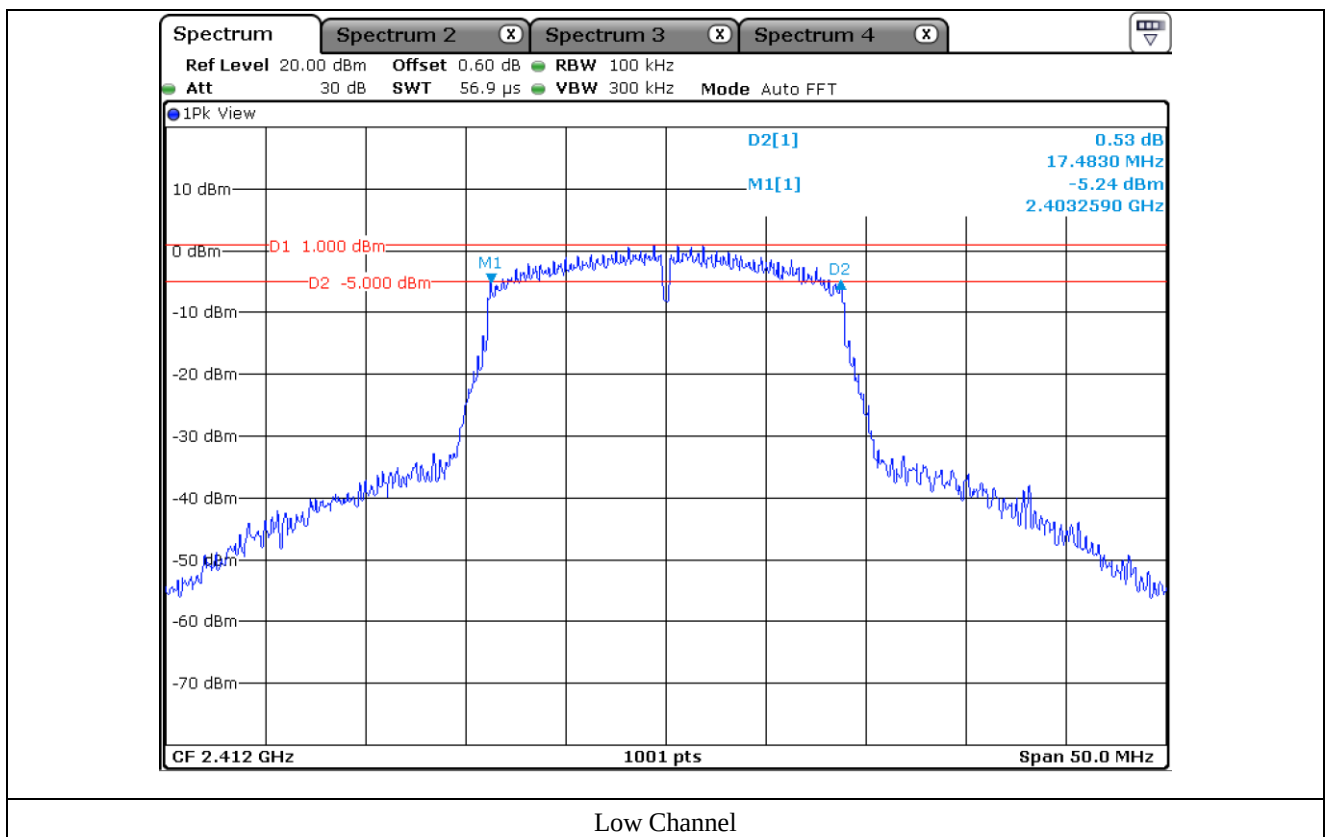
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

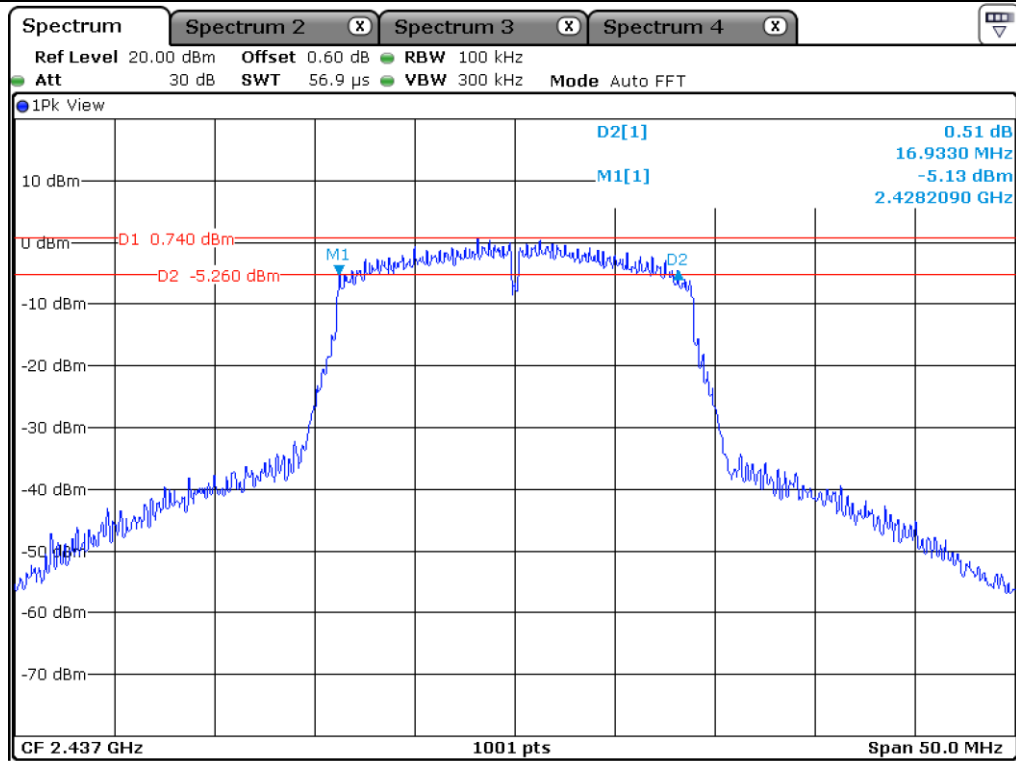
## 7.6.2 Test data for Antenna 1

-. Test Result : Pass

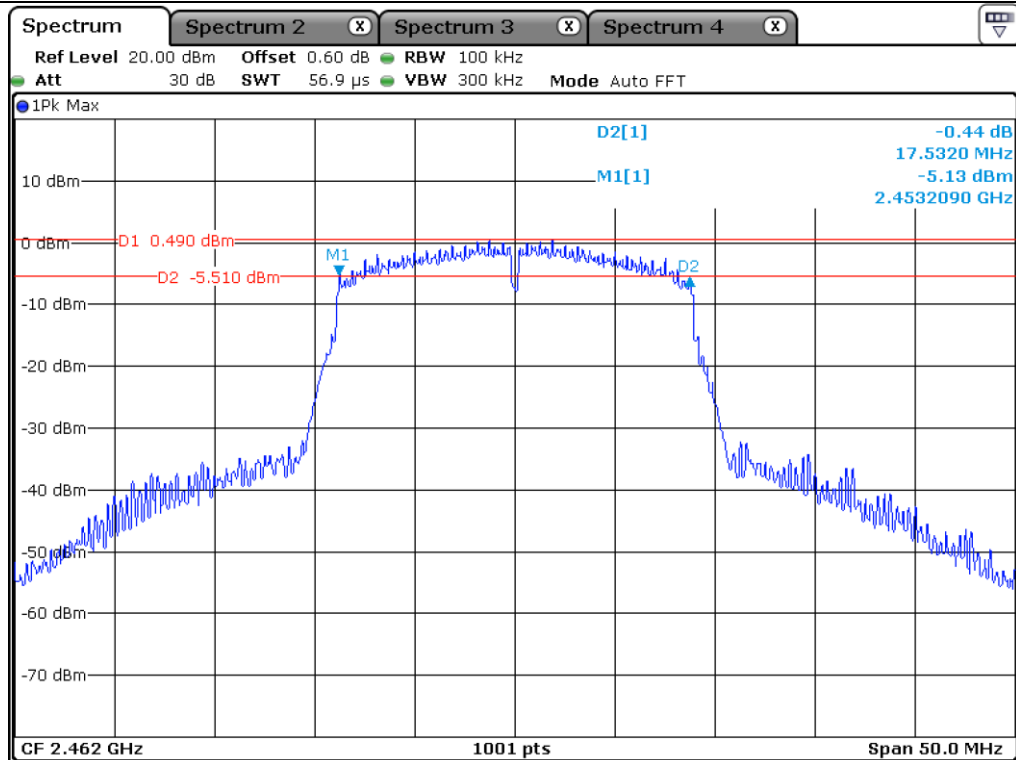
| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 412.00           | 17.48                   | 0.50           | 16.98           |
| Middle  | 2 437.00           | 16.93                   | 0.50           | 16.43           |
| High 11 | 2 462.00           | 17.53                   | 0.50           | 17.03           |
| High 12 | 2 467.00           | 17.53                   | 0.50           | 17.03           |
| High 13 | 2 472.00           | 17.53                   | 0.50           | 17.03           |

Remark. Margin = Measured Value - Limit





Middle Channel



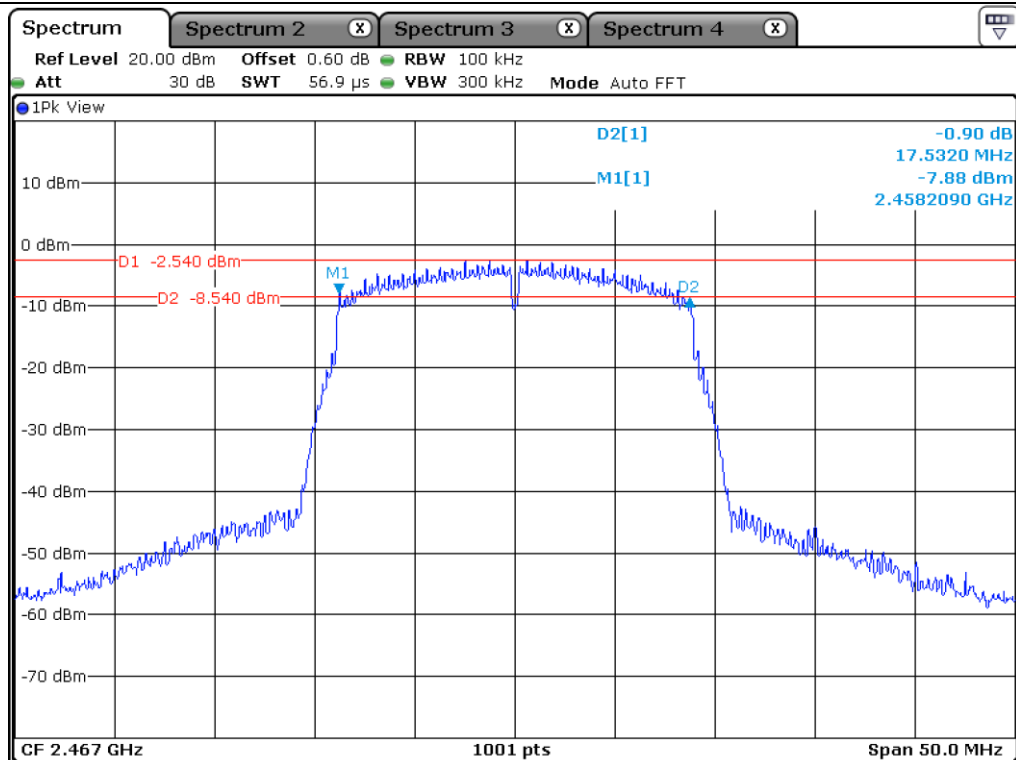
High Channel 11

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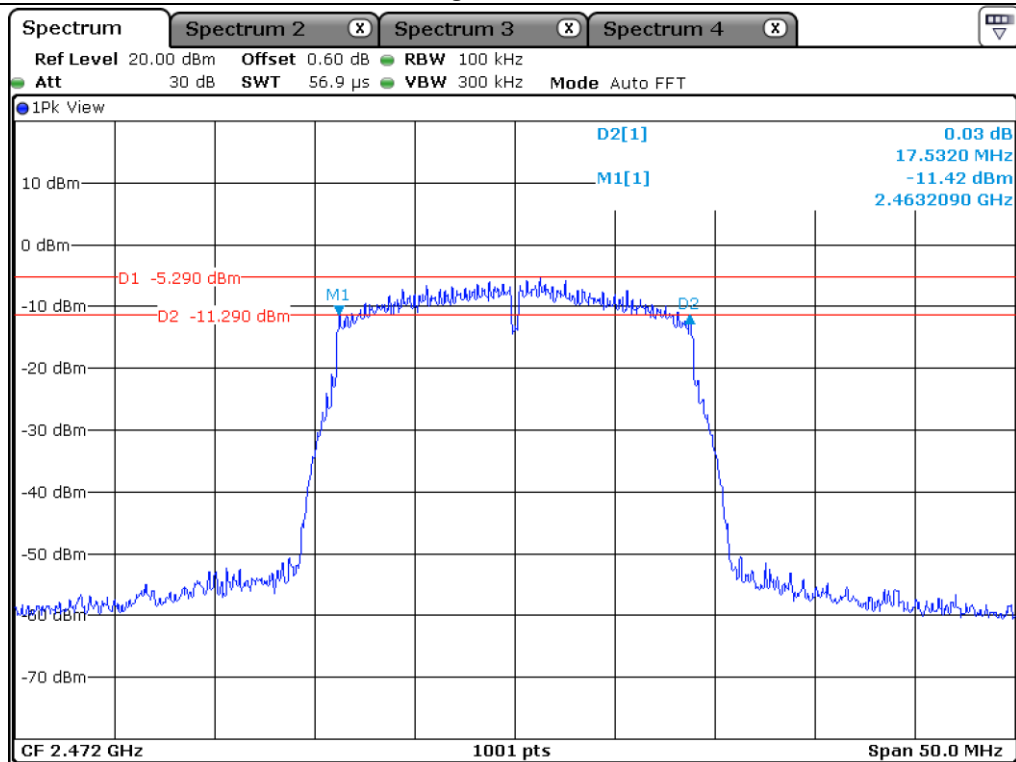
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High Channel 12



High Channel 13

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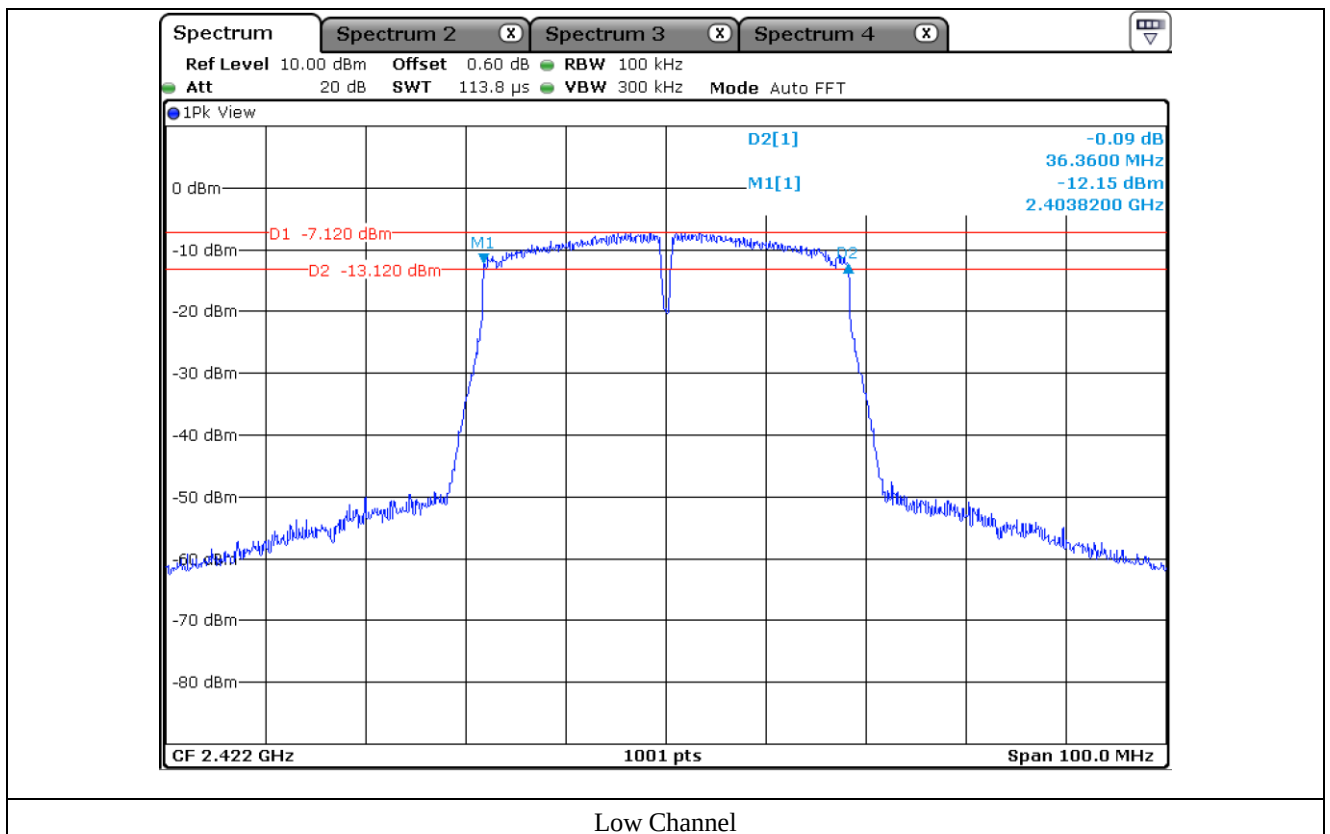
## 7.7 Test data for 802.11n\_HT40 WLAN Mode

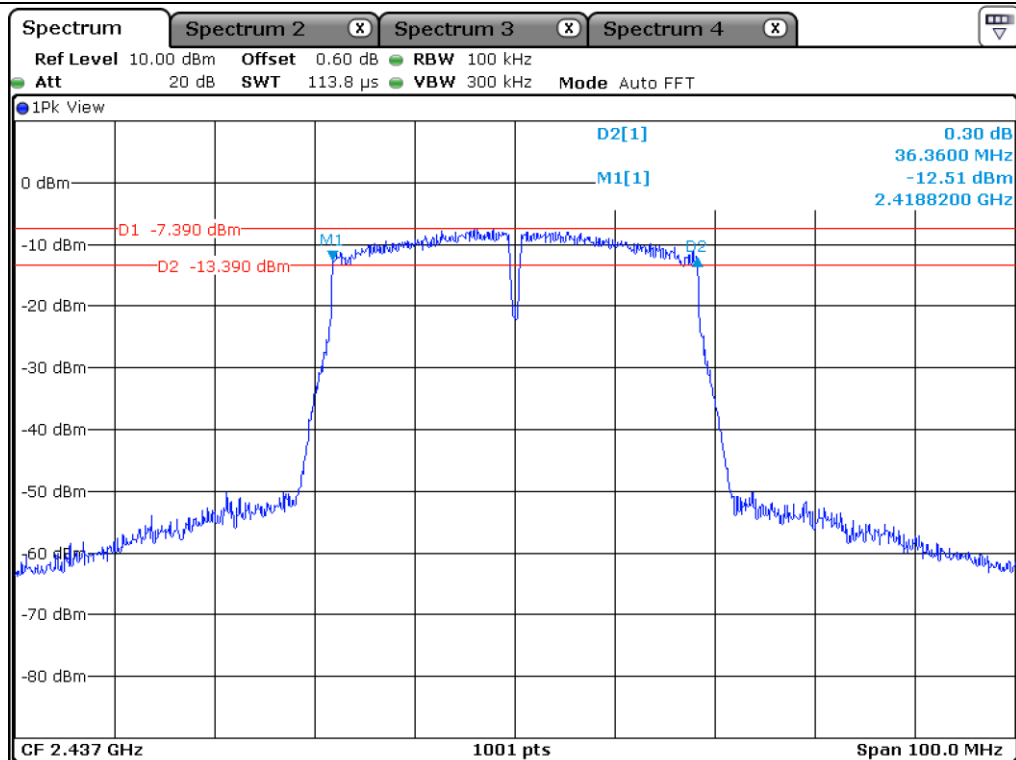
### 7.7.1 Test data for Antenna 0

-. Test Result : Pass

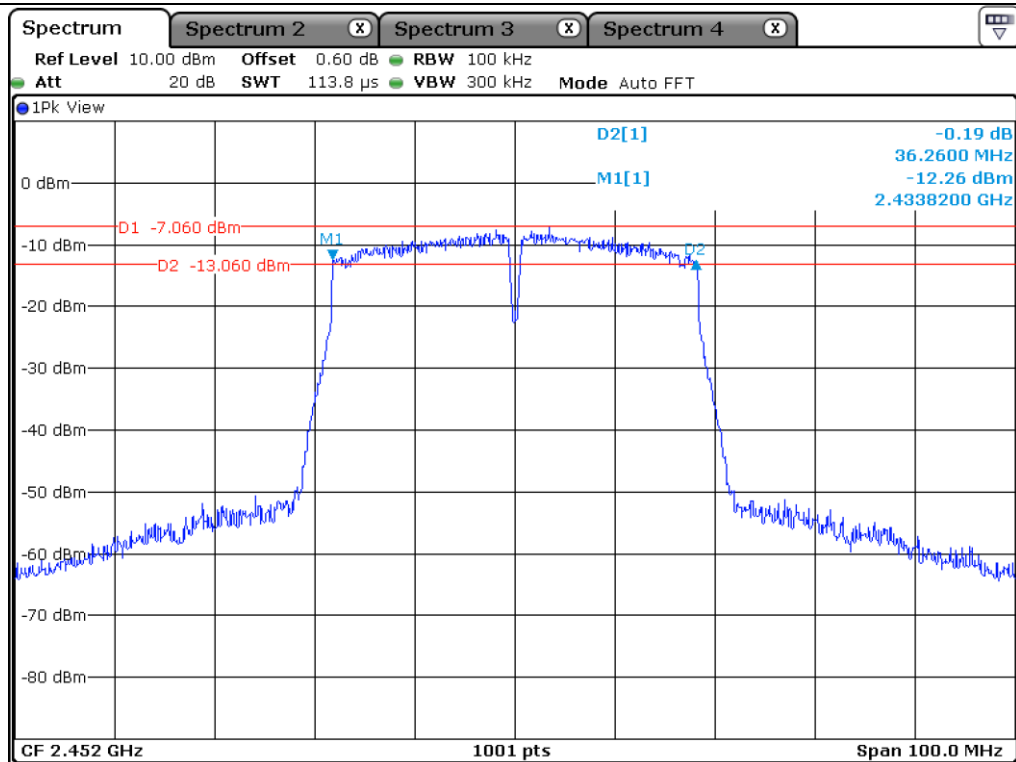
| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 422.00           | 36.36                   | 0.50           | 35.86           |
| Middle  | 2 437.00           | 36.36                   | 0.50           | 35.86           |
| High 9  | 2 452.00           | 36.26                   | 0.50           | 35.76           |
| High 10 | 2 457.00           | 36.36                   | 0.50           | 35.86           |
| High 11 | 2 462.00           | 36.36                   | 0.50           | 35.86           |

Remark. Margin = Measured Value - Limit





Middle Channel



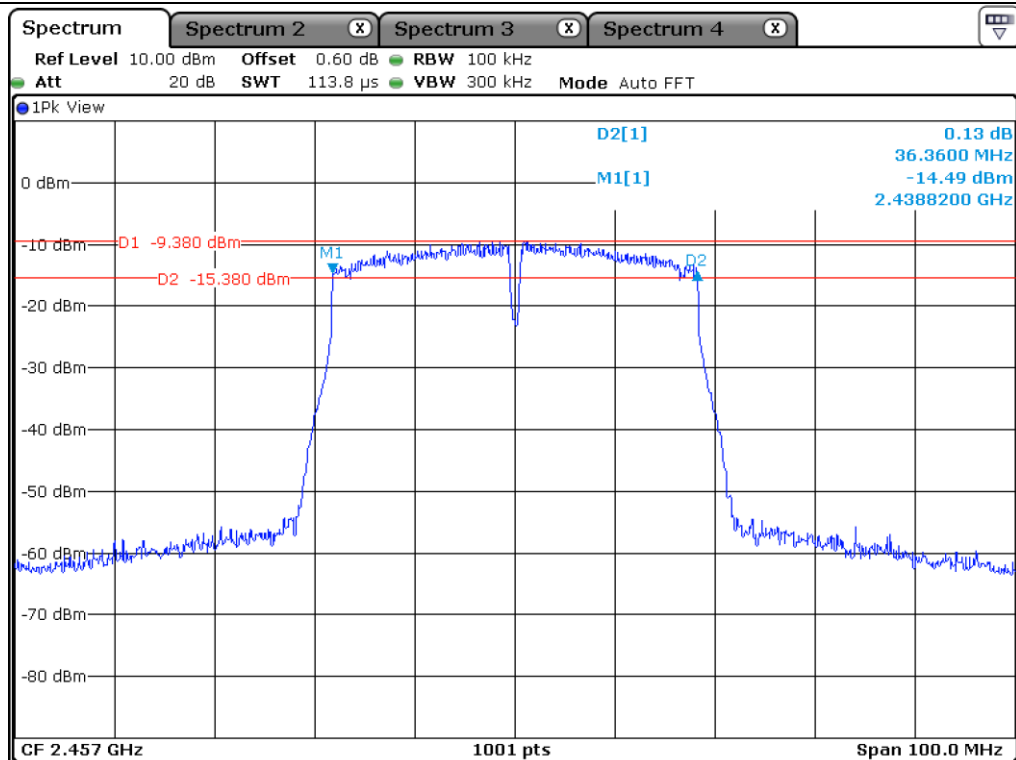
High Channel 9

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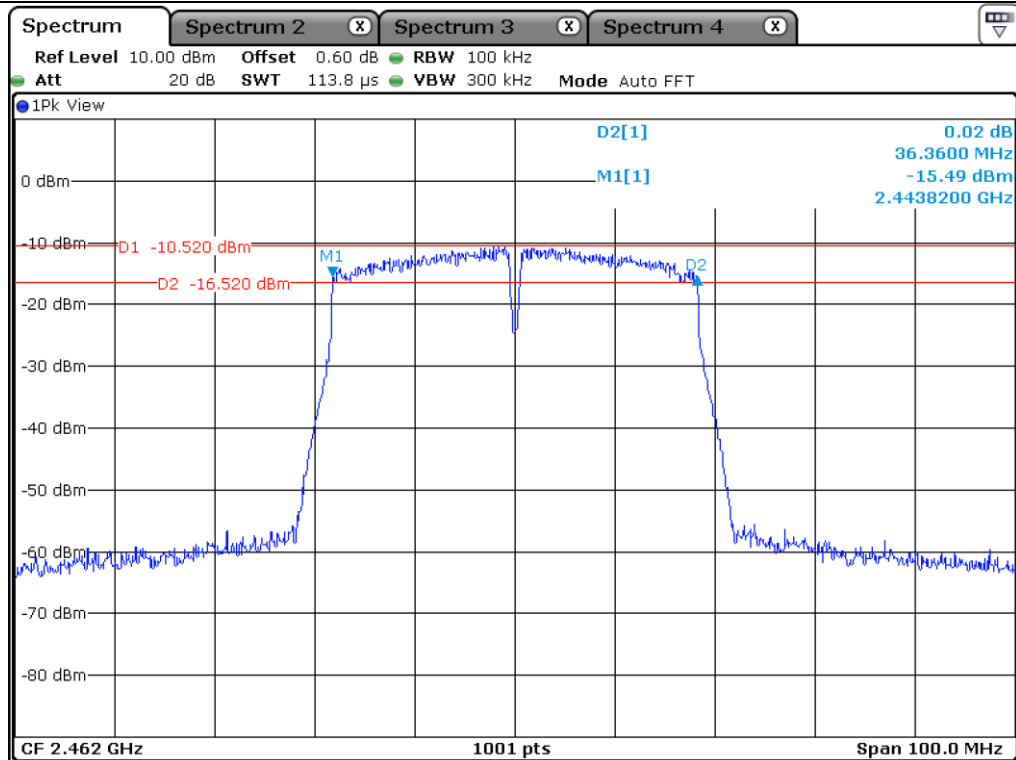
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High Channel 10



High Channel 11

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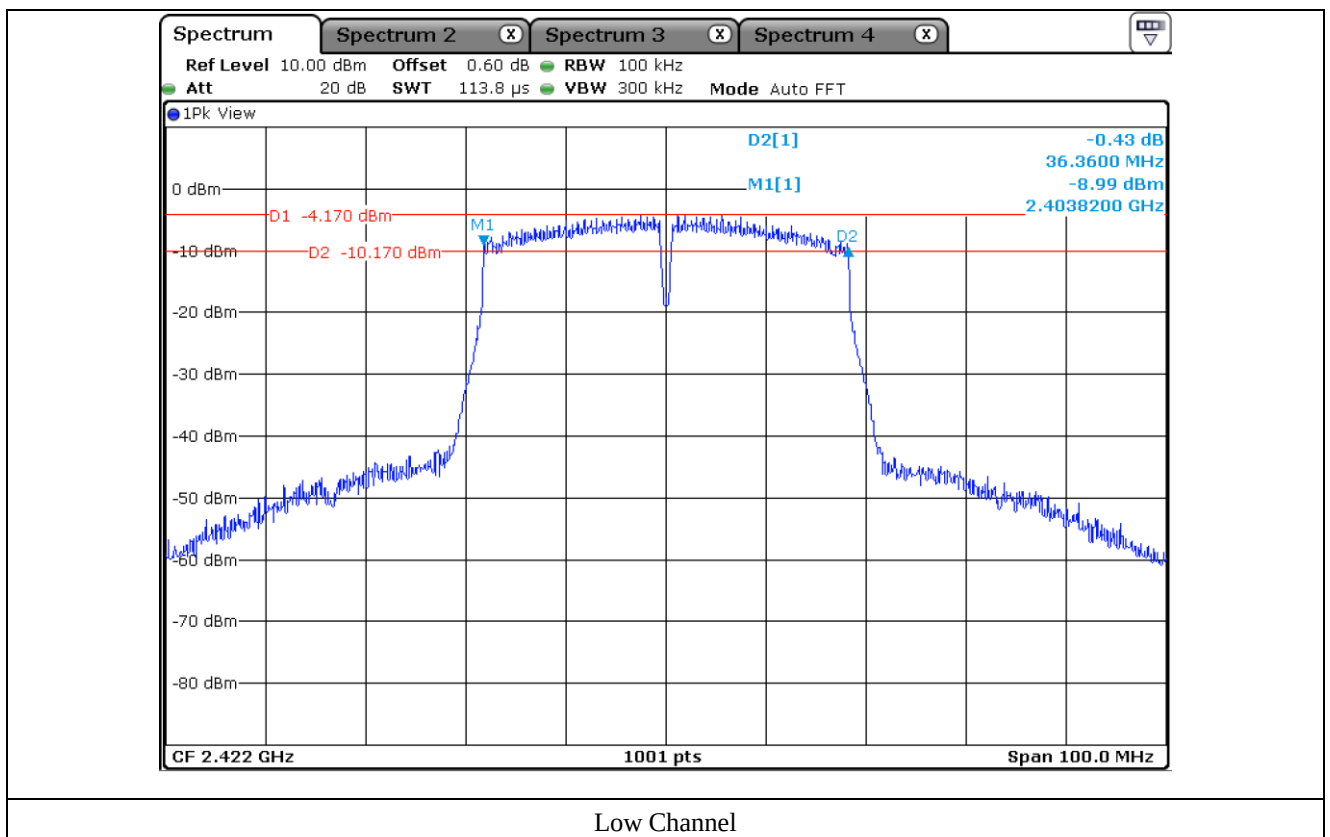
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### 7.7.2 Test data for Antenna 1

-. Test Result : Pass

| CHANNEL | FREQUENCY<br>(MHz) | 6 dB Bandwidth<br>(MHz) | LIMIT<br>(MHz) | Margin<br>(MHz) |
|---------|--------------------|-------------------------|----------------|-----------------|
| Low     | 2 422.00           | 36.36                   | 0.50           | 35.86           |
| Middle  | 2 437.00           | 36.36                   | 0.50           | 35.86           |
| High 9  | 2 452.00           | 36.36                   | 0.50           | 35.86           |
| High 10 | 2 457.00           | 36.36                   | 0.50           | 35.86           |
| High 11 | 2 462.00           | 36.36                   | 0.50           | 35.86           |

Remark. Margin = Measured Value - Limit

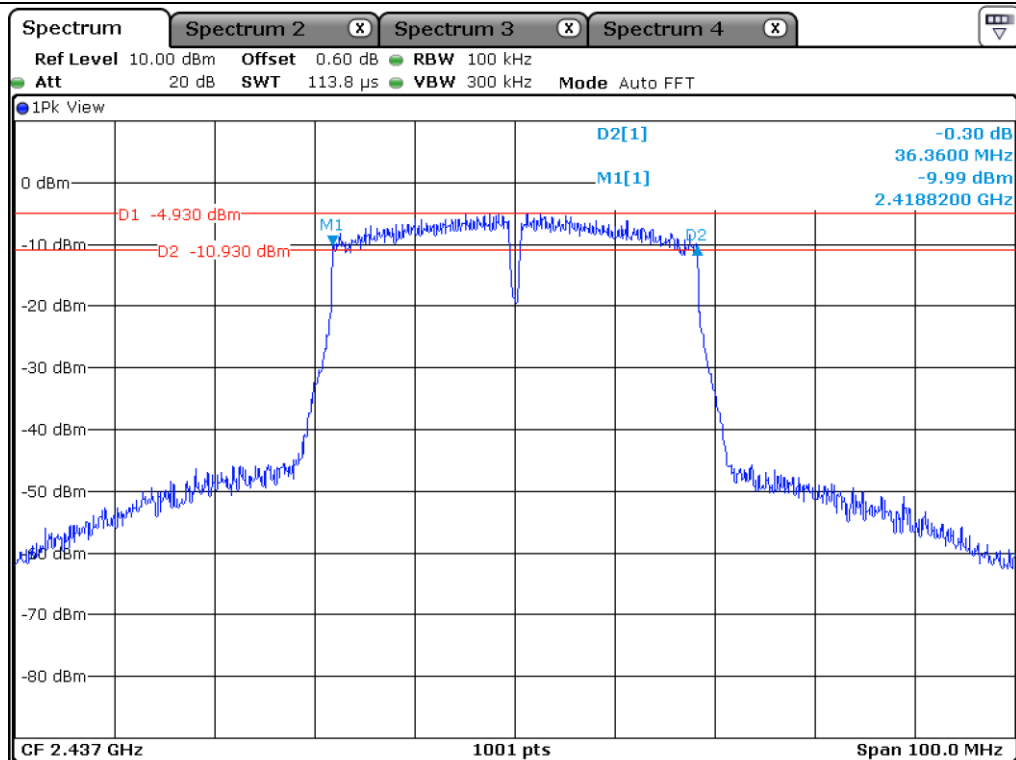


This Report is not correlated with the authentication of KOLAS

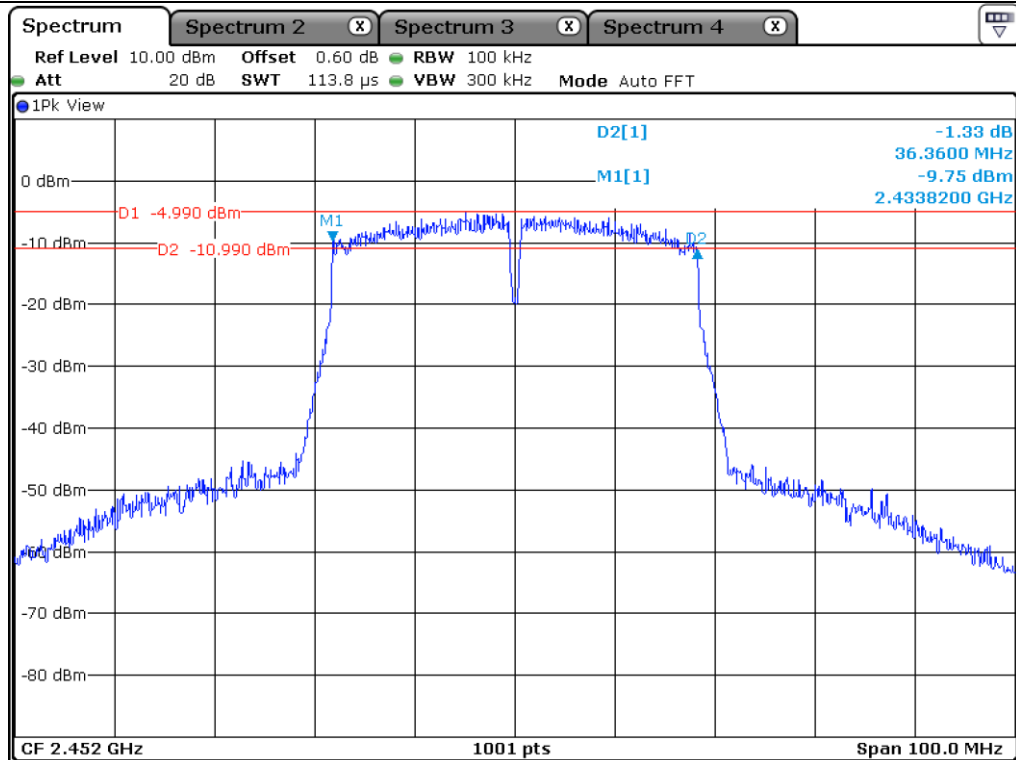
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Middle Channel



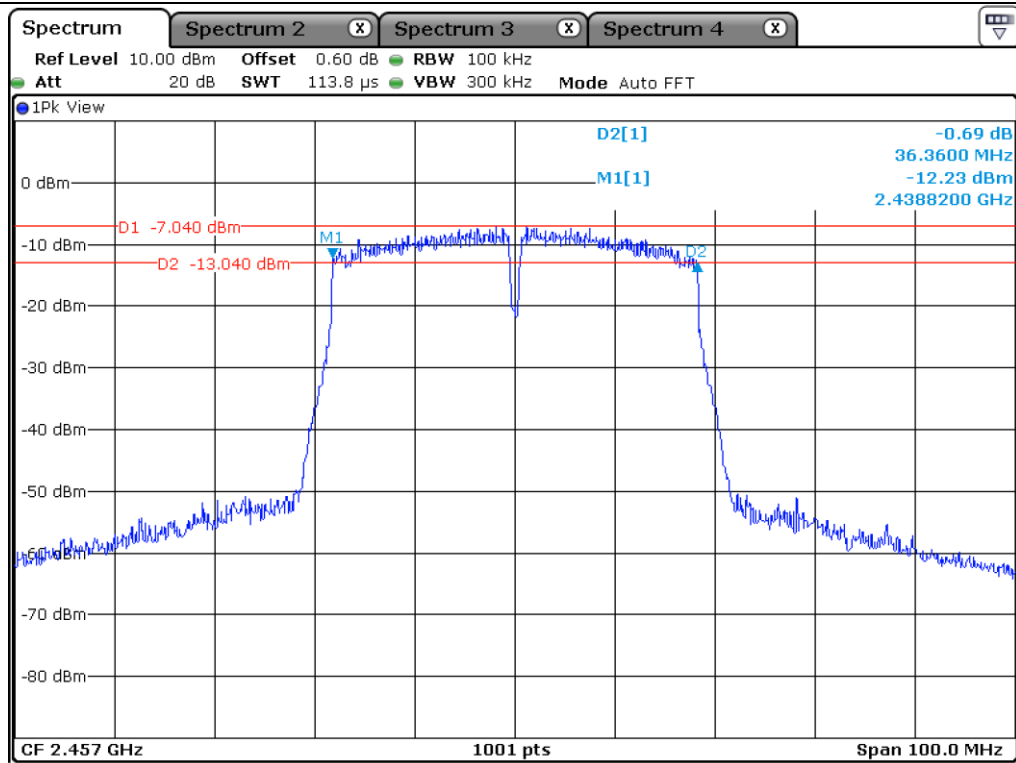
High Channel 9

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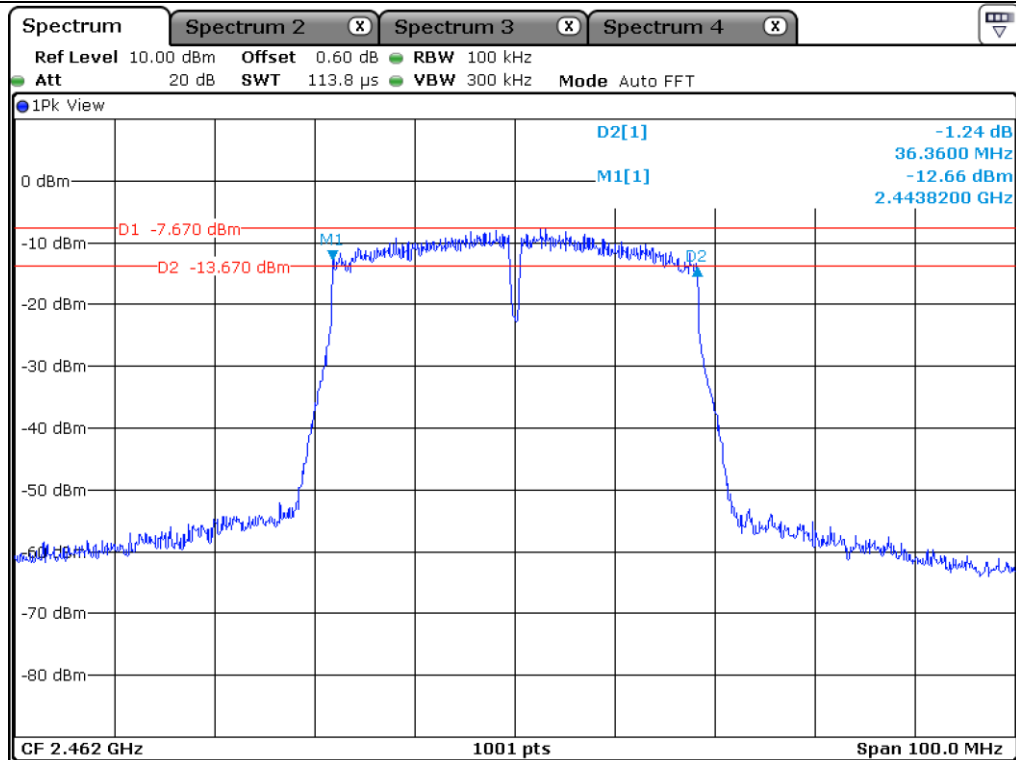
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High Channel 10



High Channel 11

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## 8. MAXIMUM CONDUCTED (AVERAGE) OUTPUT POWER

### 8.1 Operating environment

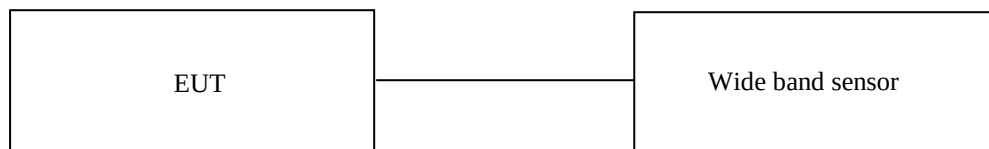
Temperature : 23 ° C  
Relative humidity : 45 % R.H.

### 8.2 Test set-up

The maximum peak output power was measured with the wide band sensor connected to the antenna output of the EUT.

The Wide Band Sensor is measured when the EUT is transmitting at the appropriate center frequency its maximum power control level as described in Section 8.3(558074 D01 15.247 Meas Guidance v05r02).

Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.



### 8.3 Test Date

October 07, 2021 ~ October 20, 2021

## 8.4 Test data for 802.11b WLAN Mode

### 8.4.1 Test data for Antenna 0

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 17.07                   | 30.00          | 12.93          |
| MIDDLE  | 2 437.00           | 17.06                   | 30.00          | 12.94          |
| HIGH 11 | 2 462.00           | 17.16                   | 30.00          | 12.84          |
| HIGH 12 | 2 467.00           | 14.55                   | 30.00          | 15.45          |
| HIGH 13 | 2 472.00           | 11.83                   | 30.00          | 18.17          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.4.2 Test data for Antenna 1

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 16.71                   | 30.00          | 13.29          |
| MIDDLE  | 2 442.00           | 17.16                   | 30.00          | 12.84          |
| HIGH 11 | 2 462.00           | 17.47                   | 30.00          | 12.53          |
| HIGH 12 | 2 467.00           | 16.00                   | 30.00          | 14.00          |
| HIGH 13 | 2 472.00           | 13.20                   | 30.00          | 16.80          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

## 8.5 Test data for 802.11g WLAN Mode

### 8.5.1 Test data for Antenna 0

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 11.96                   | 30.00          | 18.04          |
| MIDDLE  | 2 442.00           | 11.92                   | 30.00          | 18.08          |
| HIGH 11 | 2 462.00           | 11.97                   | 30.00          | 18.03          |
| HIGH 12 | 2 467.00           | 9.15                    | 30.00          | 20.85          |
| HIGH 13 | 2 472.00           | 6.11                    | 30.00          | 23.89          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.5.2 Test data for Antenna 1

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 13.67                   | 30.00          | 16.33          |
| MIDDLE  | 2 442.00           | 13.38                   | 30.00          | 16.62          |
| HIGH 11 | 2 462.00           | 13.03                   | 30.00          | 16.97          |
| HIGH 12 | 2 467.00           | 10.42                   | 30.00          | 19.58          |
| HIGH 13 | 2 472.00           | 7.28                    | 30.00          | 22.72          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.5.3 Test data for Multiple Transmit

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 15.91                   | 30.00          | 14.09          |
| MIDDLE  | 2 437.00           | 15.72                   | 30.00          | 14.28          |
| HIGH 11 | 2 462.00           | 15.54                   | 30.00          | 14.46          |
| HIGH 12 | 2 467.00           | 12.84                   | 30.00          | 17.16          |
| HIGH 13 | 2 472.00           | 9.74                    | 30.00          | 20.26          |

Remark 1 : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

Remark 2 : Calculated Output Power=  $10\log(10(\text{Antenna0 Output Power}/10)+10(\text{Antenna1 Output Power}/10))$

Remark 3 : Directional gain =  $10*\log[(10G0/20+10G1/20)2/N]$  dBi

## 8.6 Test data for 802.11n\_HT20 WLAN Mode

### 8.6.1 Test data for Antenna 0

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 11.69                   | 30.00          | 18.31          |
| MIDDLE  | 2 442.00           | 11.60                   | 30.00          | 18.40          |
| HIGH 11 | 2 462.00           | 11.65                   | 30.00          | 18.35          |
| HIGH 12 | 2 467.00           | 8.94                    | 30.00          | 21.06          |
| HIGH 13 | 2 472.00           | 5.98                    | 30.00          | 24.02          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.6.2 Test data for Antenna 1

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 13.42                   | 30.00          | 16.58          |
| MIDDLE  | 2 437.00           | 13.20                   | 30.00          | 16.80          |
| HIGH 11 | 2 462.00           | 13.13                   | 30.00          | 16.87          |
| HIGH 12 | 2 467.00           | 10.33                   | 30.00          | 19.67          |
| HIGH 13 | 2 472.00           | 7.15                    | 30.00          | 22.85          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.6.3 Test data for Multiple Transmit

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 412.00           | 15.65                   | 30.00          | 14.35          |
| MIDDLE  | 2 437.00           | 15.48                   | 30.00          | 14.52          |
| HIGH 11 | 2 462.00           | 15.46                   | 30.00          | 14.54          |
| HIGH 12 | 2 467.00           | 12.70                   | 30.00          | 17.30          |
| HIGH 13 | 2 472.00           | 9.61                    | 30.00          | 20.39          |

Remark 1 : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

Remark 2 : Calculated Output Power=  $10\log(10^{(\text{Antenna0 Output Power}/10)} + 10^{(\text{Antenna1 Output Power}/10)})$

Remark 3 : Directional gain =  $10*\log[(10^{G0/20} + 10^{G1/20})^2/N]$  dBi

## 8.7 Test data for 802.11n\_HT40 WLAN Mode

### 8.7.1 Test data for Antenna 0

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 422.00           | 9.55                    | 30.00          | 20.45          |
| MIDDLE  | 2 442.00           | 9.75                    | 30.00          | 20.25          |
| HIGH 9  | 2 452.00           | 9.80                    | 30.00          | 20.20          |
| HIGH 10 | 2 457.00           | 7.70                    | 30.00          | 22.30          |
| HIGH 11 | 2 462.00           | 6.77                    | 30.00          | 23.23          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.7.2 Test data for Antenna 1

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 422.00           | 11.77                   | 30.00          | 18.23          |
| MIDDLE  | 2 437.00           | 11.55                   | 30.00          | 18.45          |
| HIGH 9  | 2 452.00           | 11.33                   | 30.00          | 18.67          |
| HIGH 10 | 2 457.00           | 9.30                    | 30.00          | 20.70          |
| HIGH 11 | 2 462.00           | 8.36                    | 30.00          | 21.64          |

Remark : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

### 8.7.3 Test data for Multiple Transmit

-. Test Result : Pass

-. Duty Cycle : > 98 %

| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 422.00           | 13.81                   | 30.00          | 16.19          |
| MIDDLE  | 2 437.00           | 13.75                   | 30.00          | 16.25          |
| HIGH 9  | 2 452.00           | 13.64                   | 30.00          | 16.36          |
| HIGH 10 | 2 457.00           | 11.58                   | 30.00          | 18.42          |
| HIGH 11 | 2 462.00           | 10.65                   | 30.00          | 19.35          |

Remark 1 : Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

Remark 2 : Calculated Output Power=  $10\log (10^{(\text{Antenna0 Output Power}/10)}+10^{(\text{Antenna1 Output Power}/10)})$

Remark 3 : Directional gain =  $10*\log[(10^{G0/20}+10^{G1/20})^2/N]$  dBi

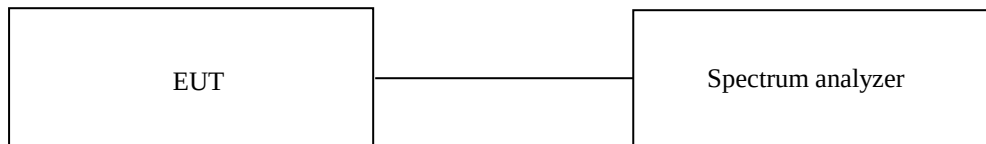
## 9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 9.1 Operating environment

Temperature : 23 ° C  
Relative humidity : 45 % R.H.

### 9.2 Test set-up for conducted measurement

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

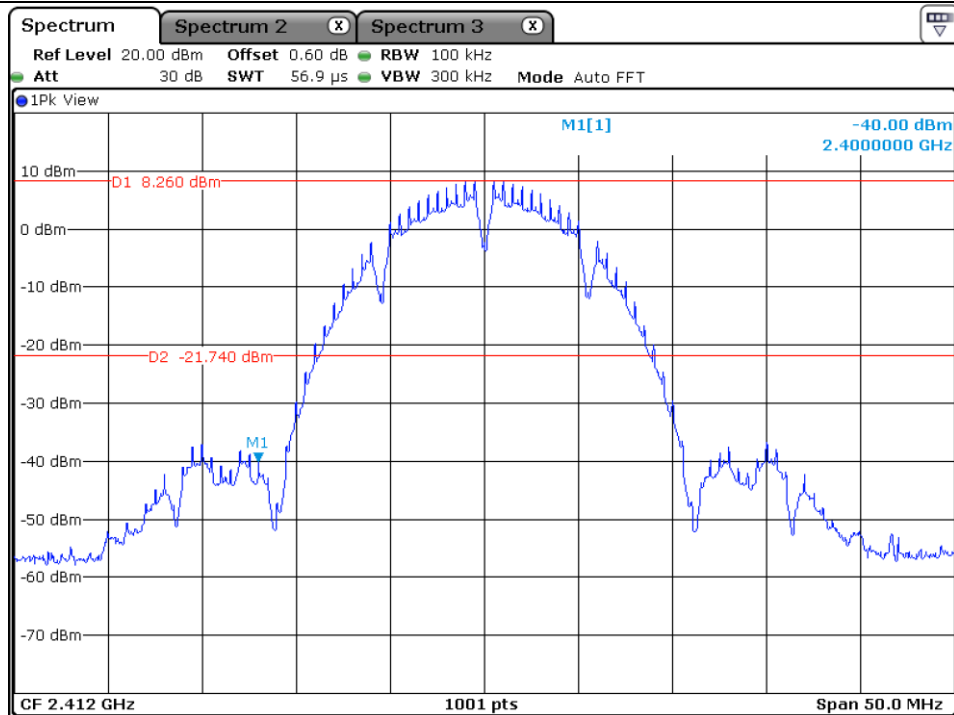
### 9.4 Test Date

October 07, 2021 ~ October 20, 2021

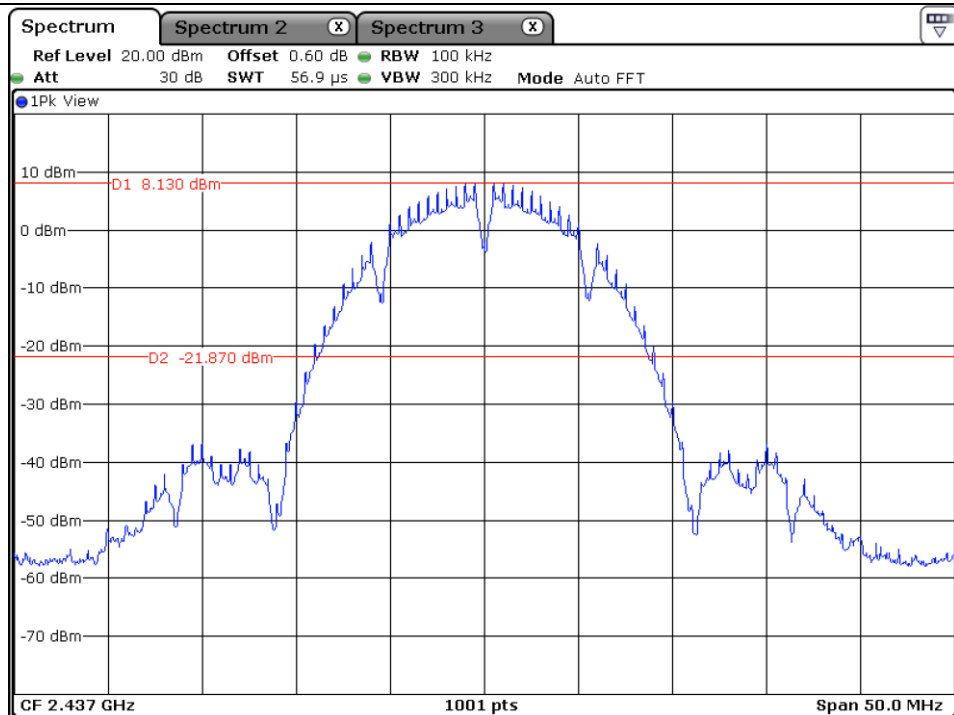
## 9.5 Test data for conducted emission

### 9.5.1 Test data for 802.11b WLAN Mode

#### 9.5.1.1 Test data for Antenna 0



Low Channel



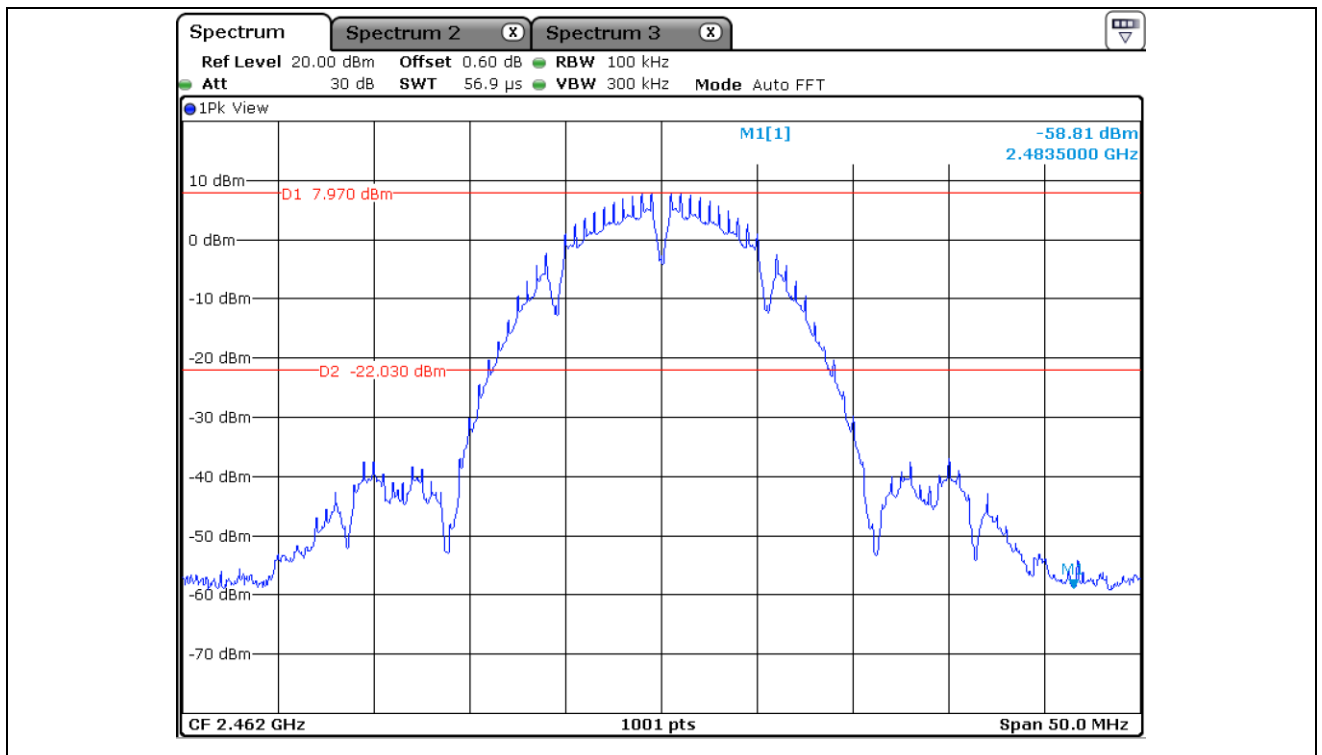
Middle Channel

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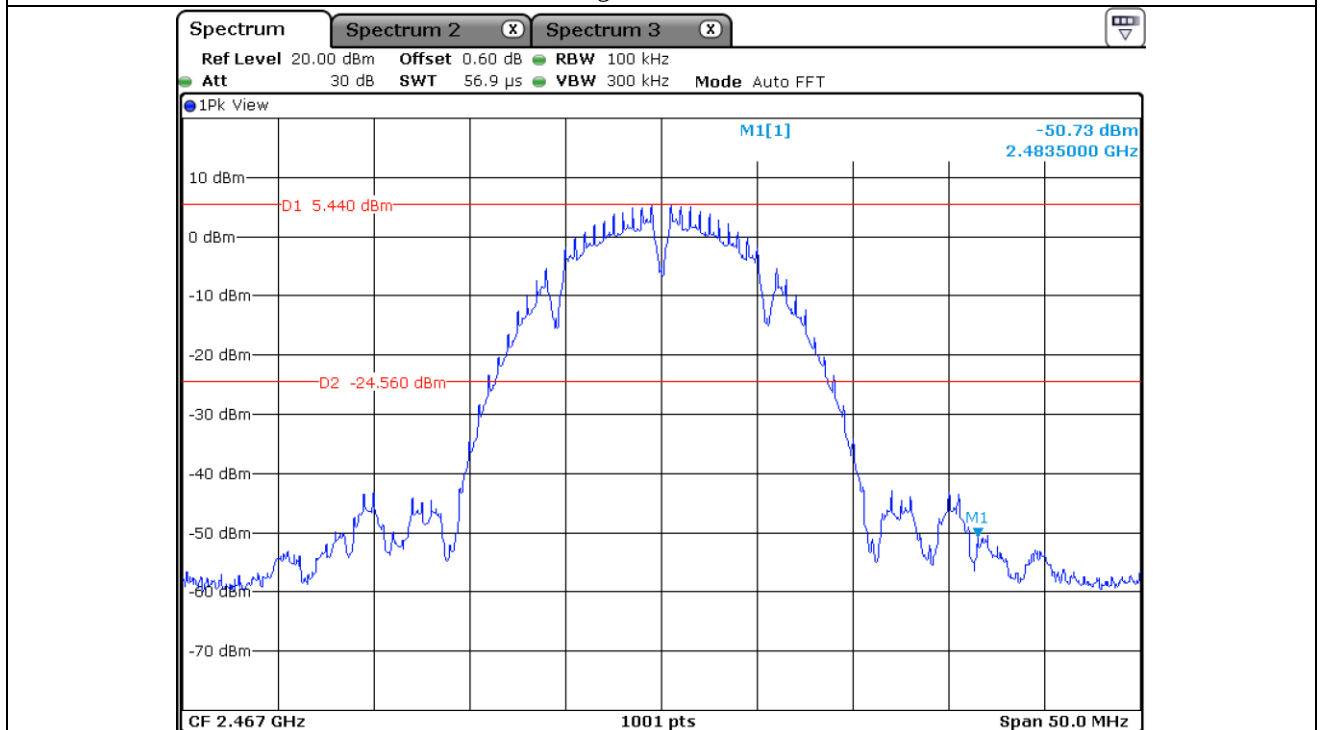
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High Channel 11



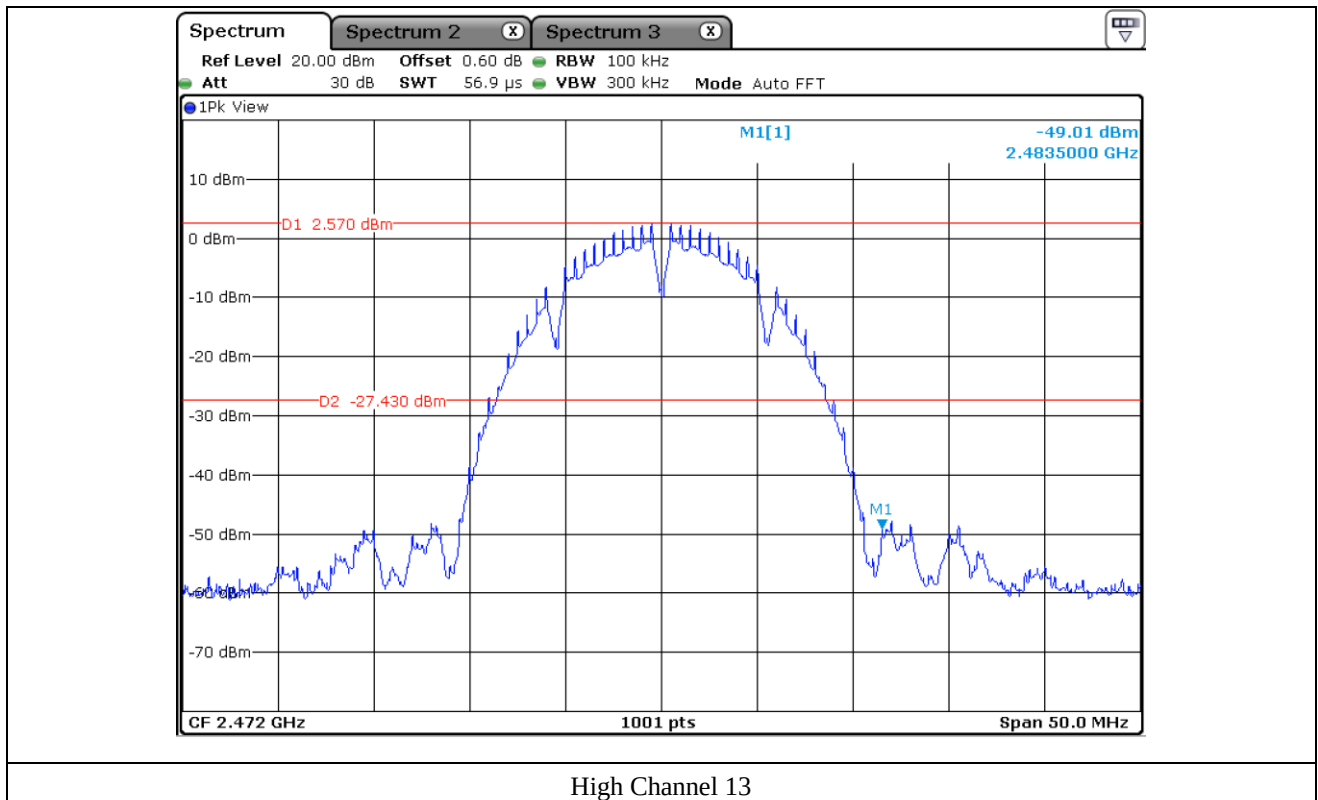
High Channel 12

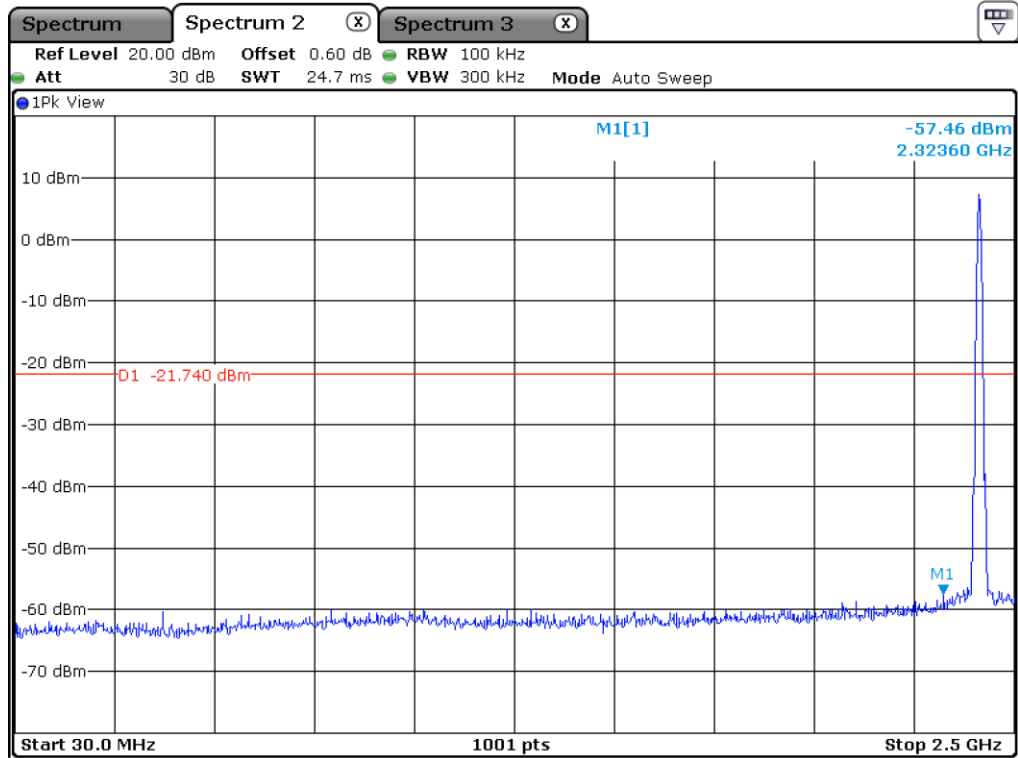
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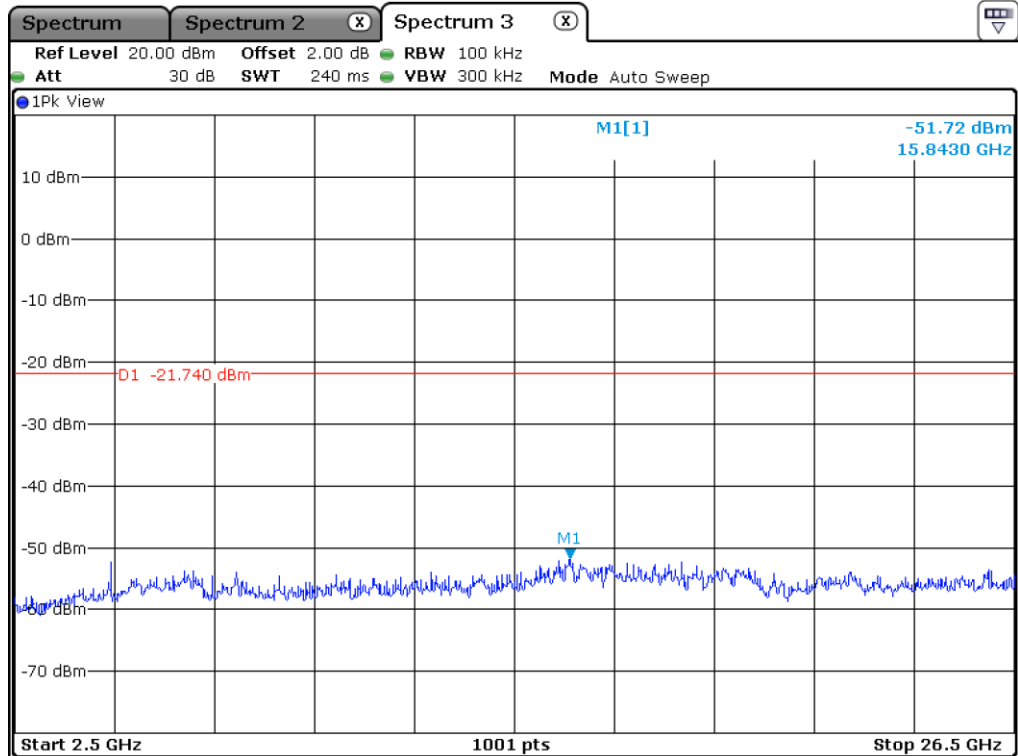
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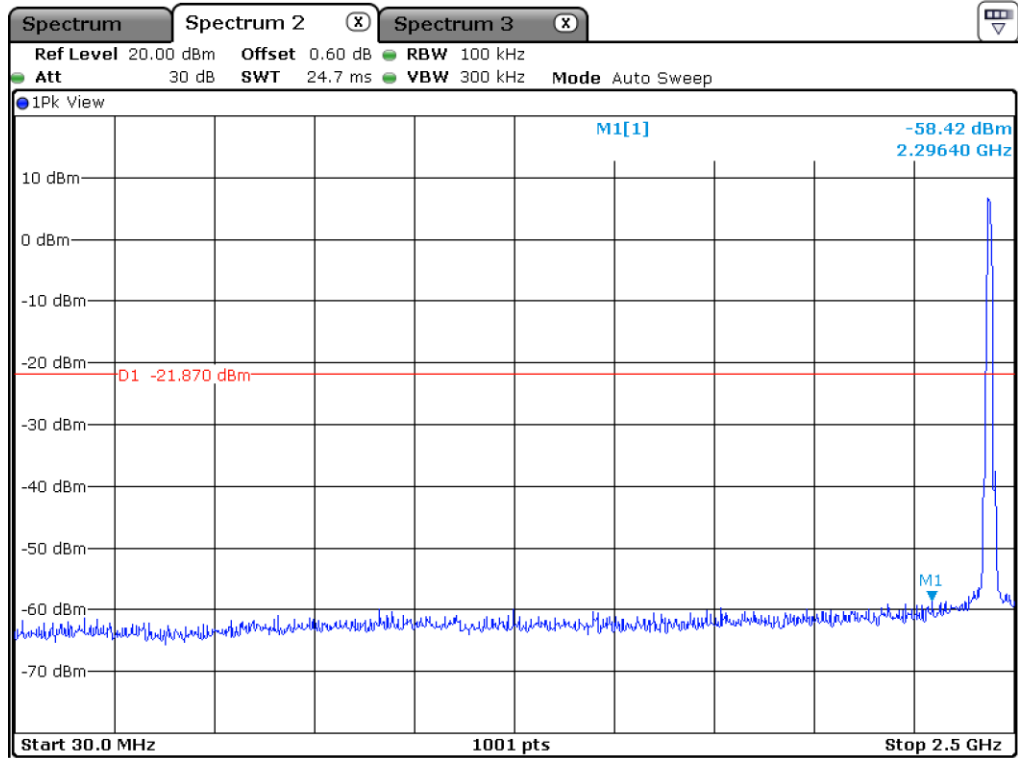




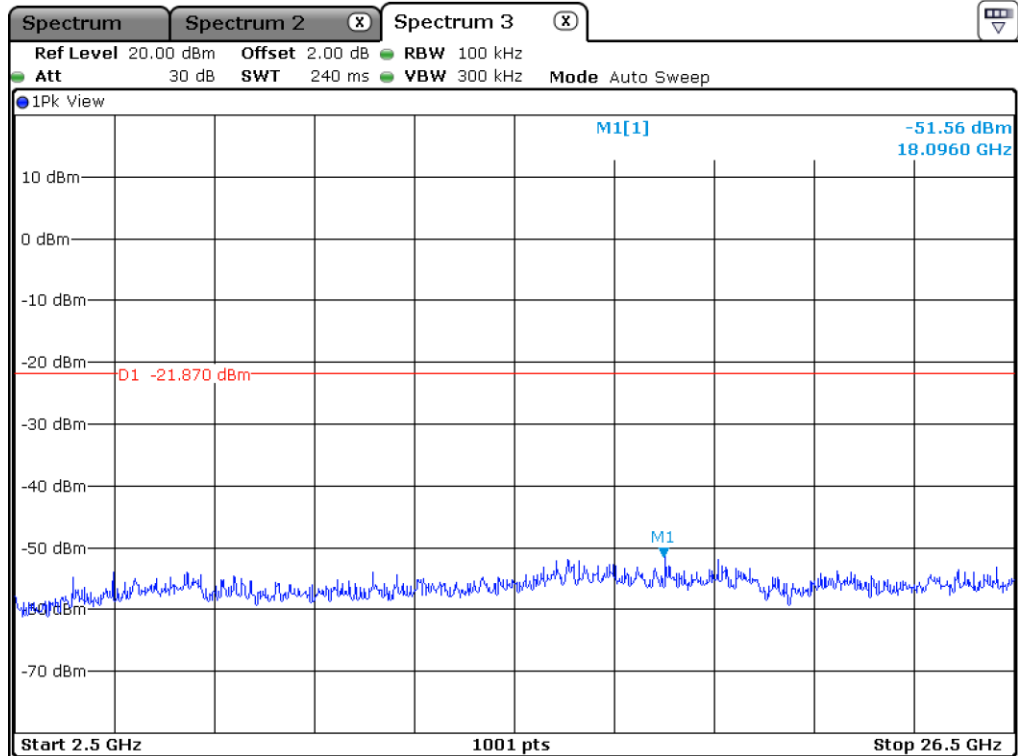
Low Channel



Low Channel



Middle Channel



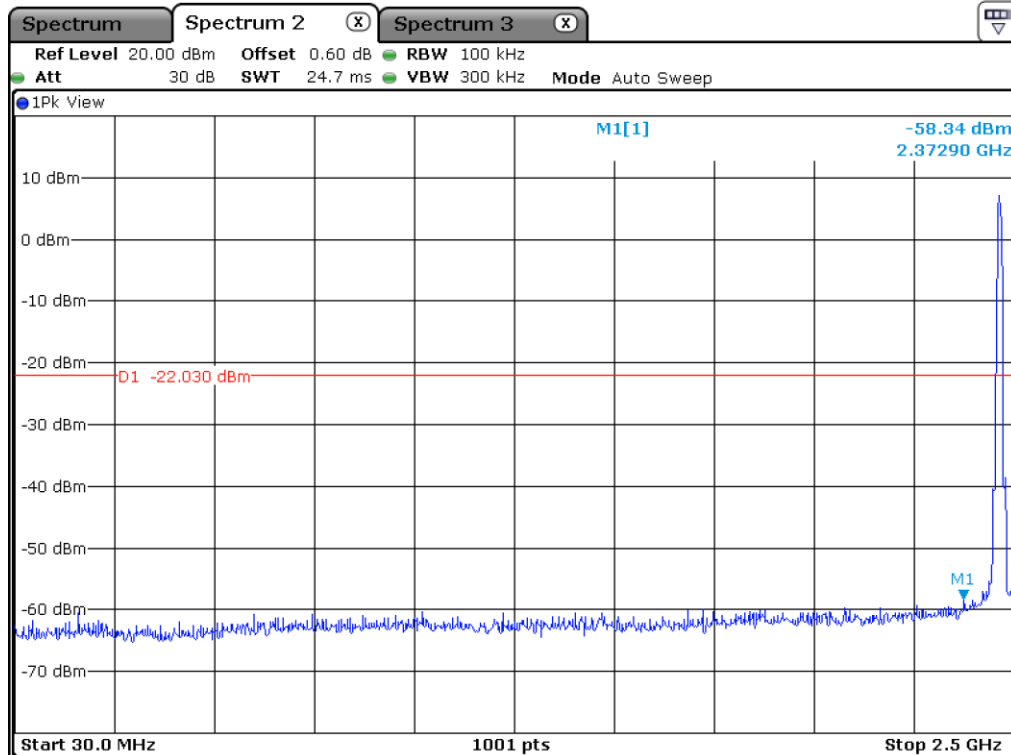
Middle Channel

This Report is not correlated with the authentication of KOLAS

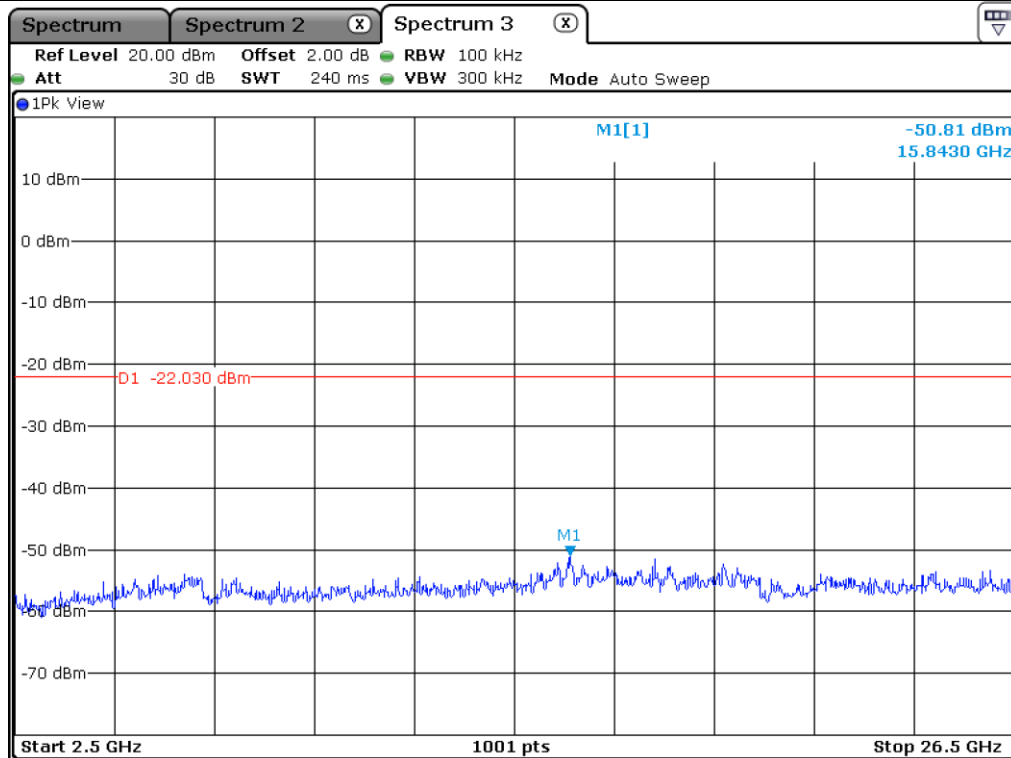
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High Channel 11



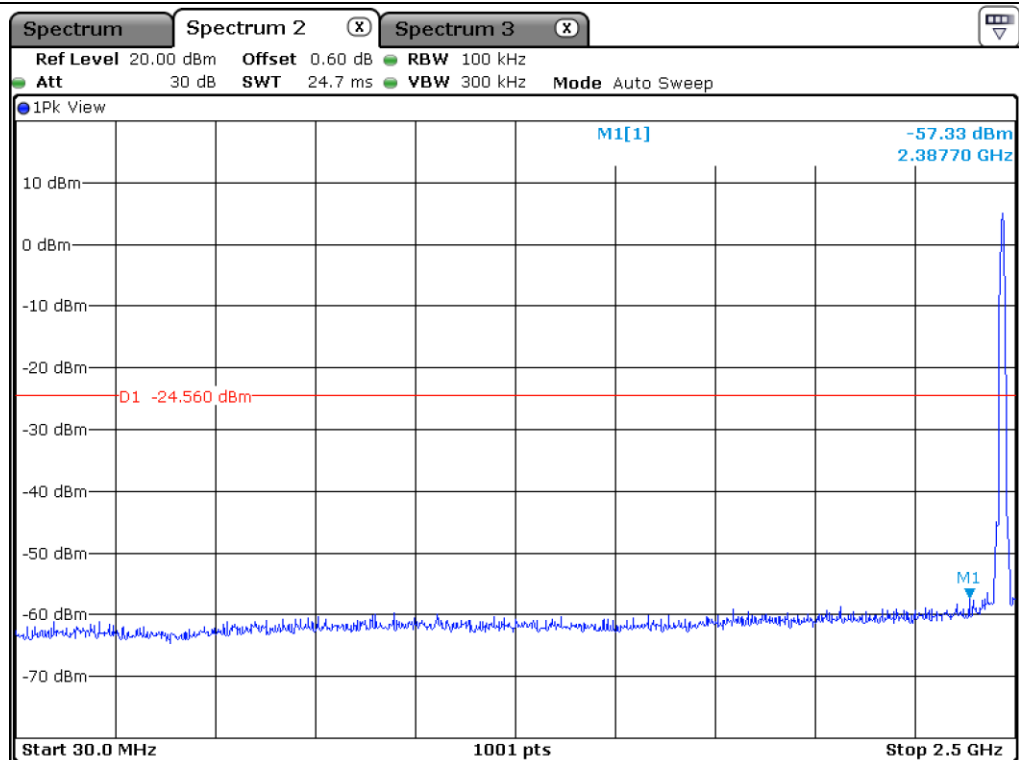
High Channel 11

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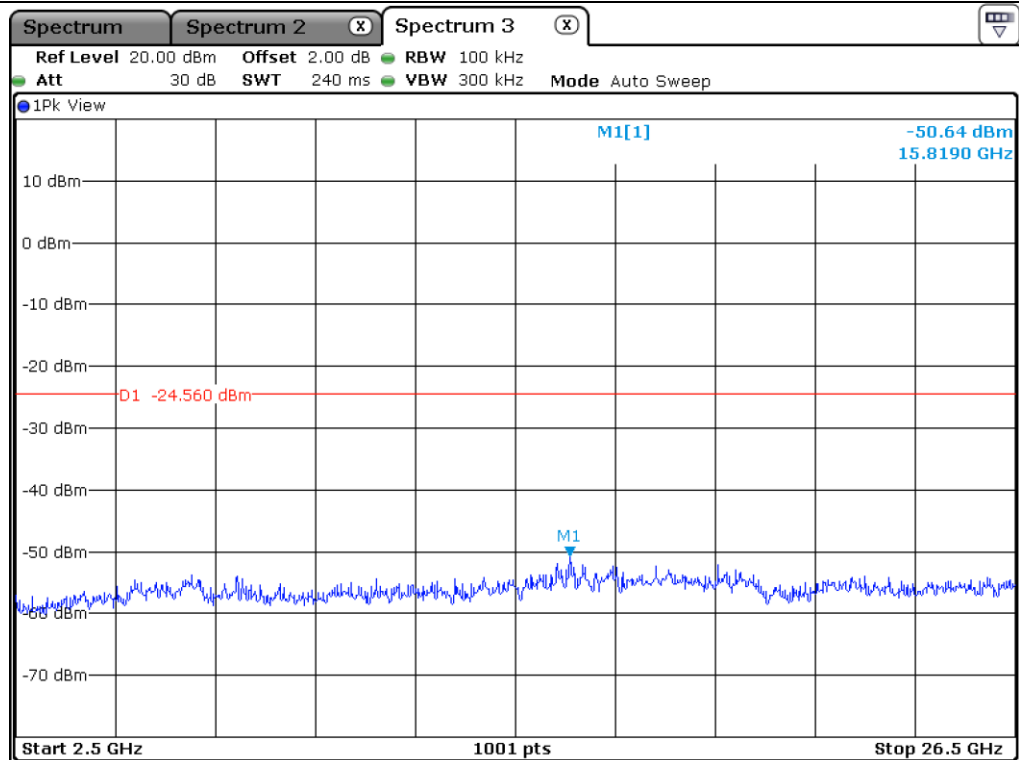
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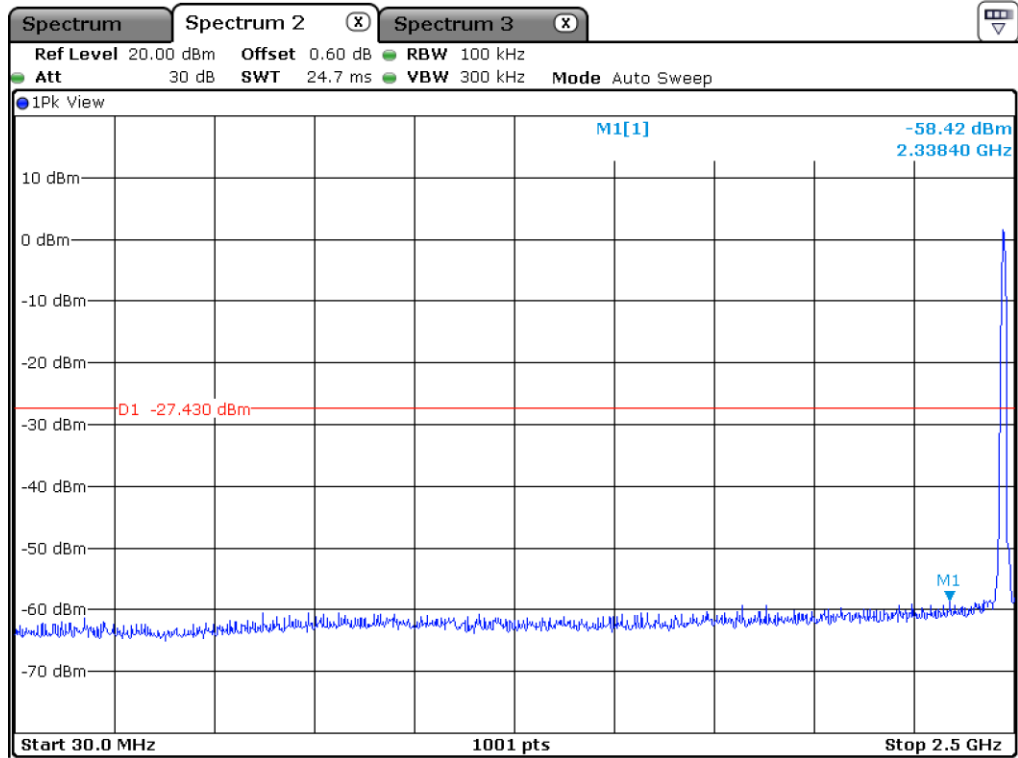
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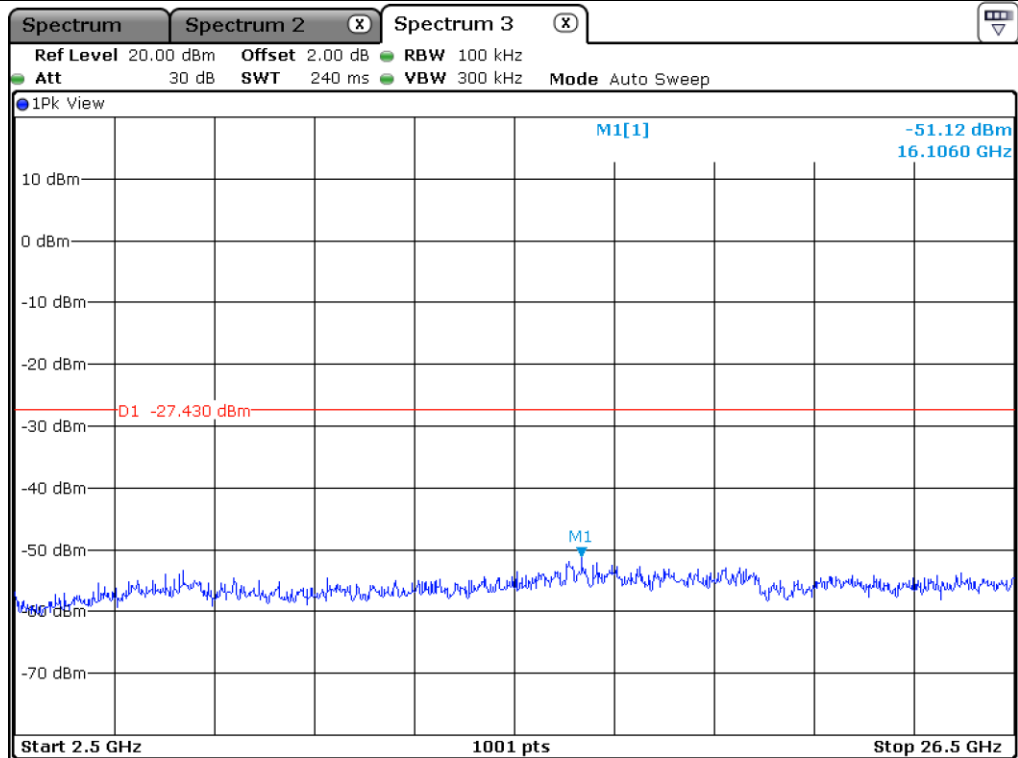
High Channel 12



High Channel 12

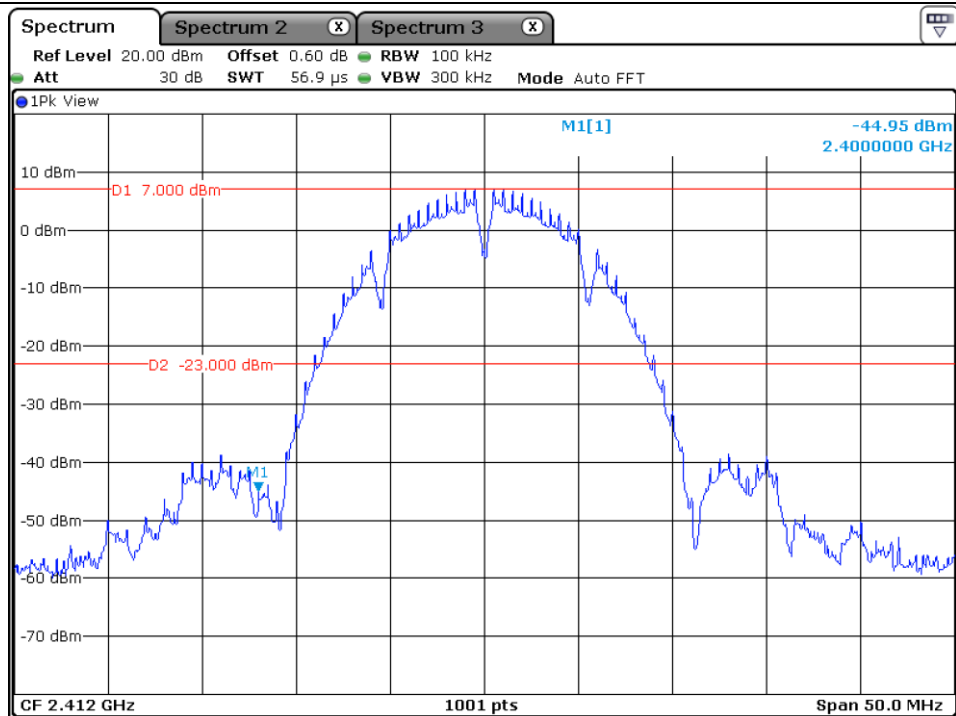


High Channel 13

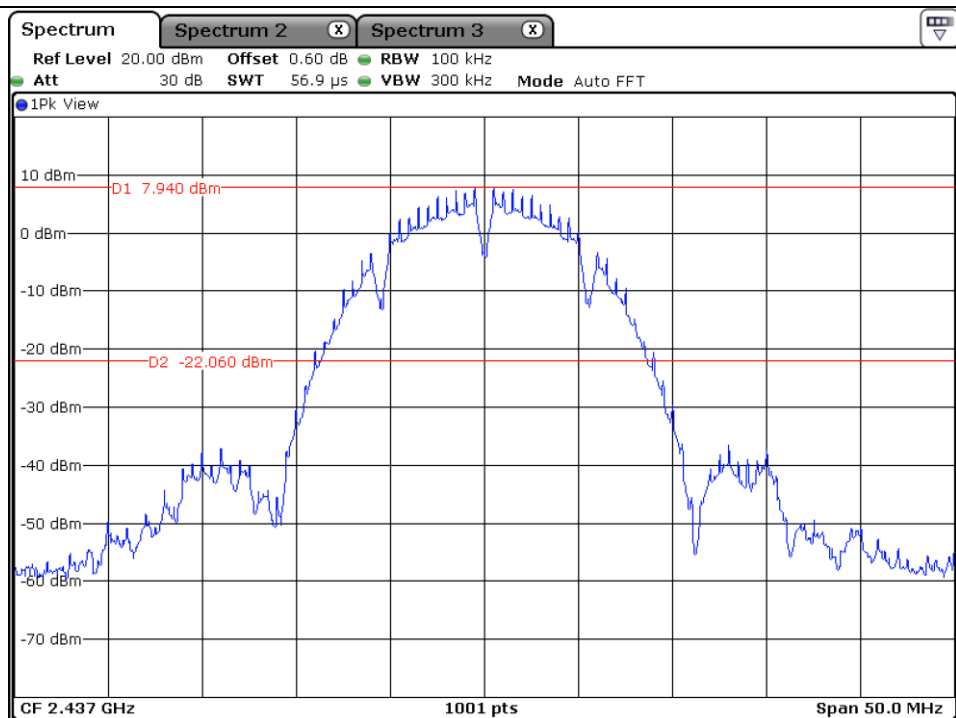


High Channel 13

### 9.5.1.2 Test data for Antenna 1



Low Channel



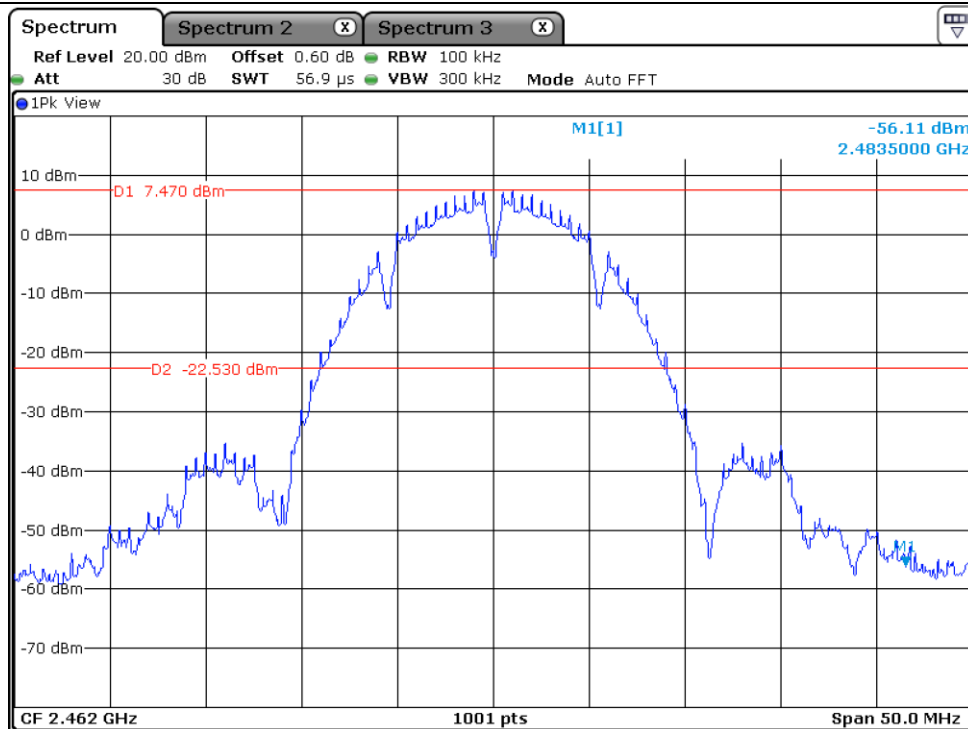
Middle Channel

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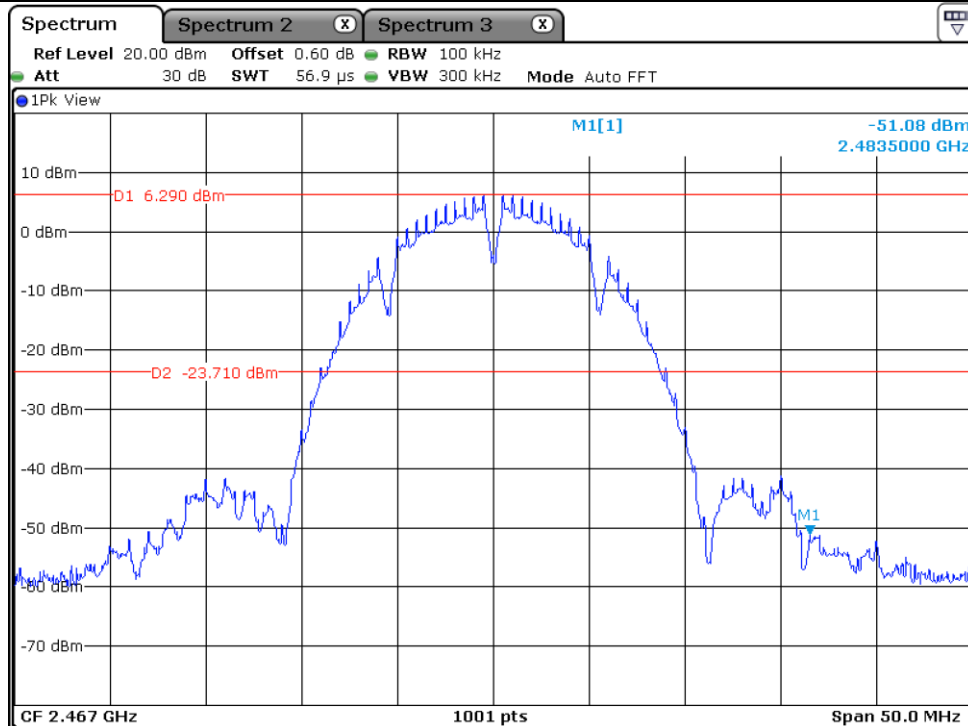
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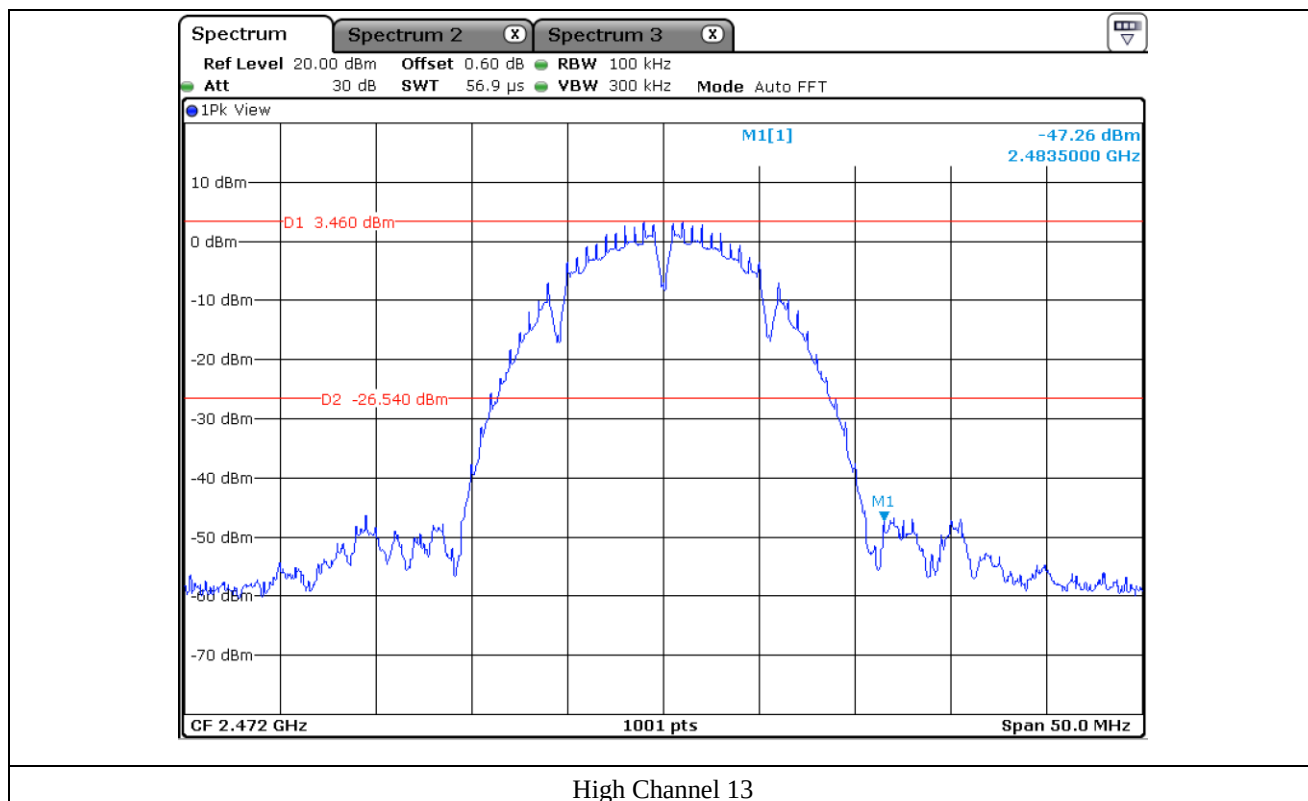
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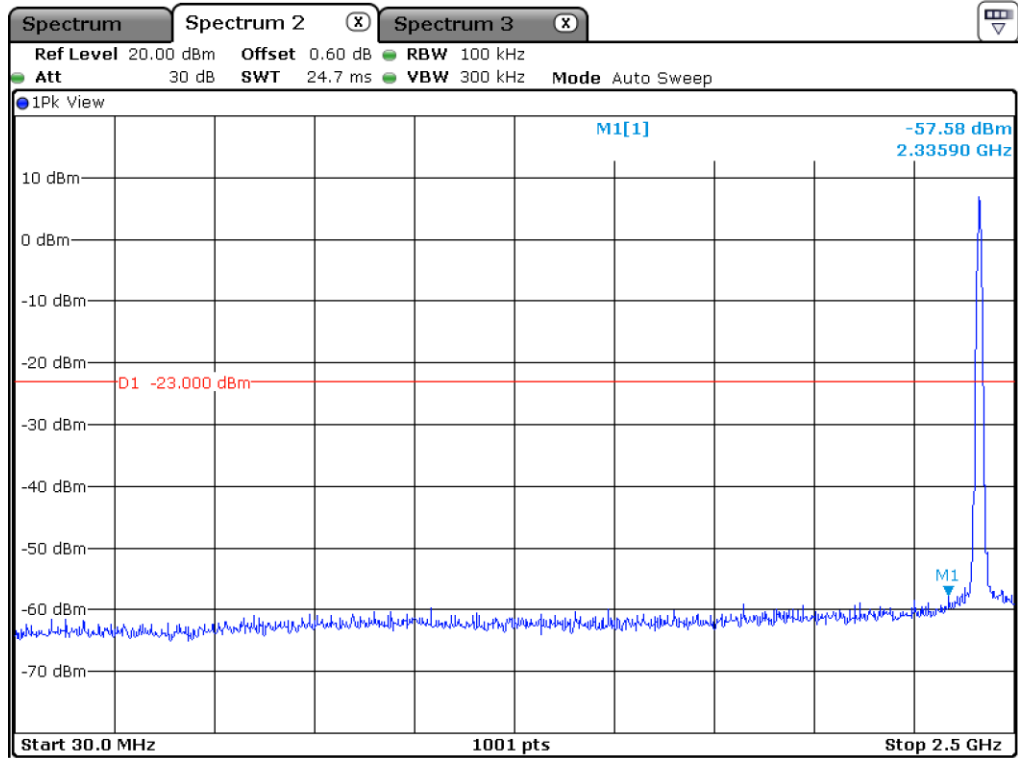
High Channel 11



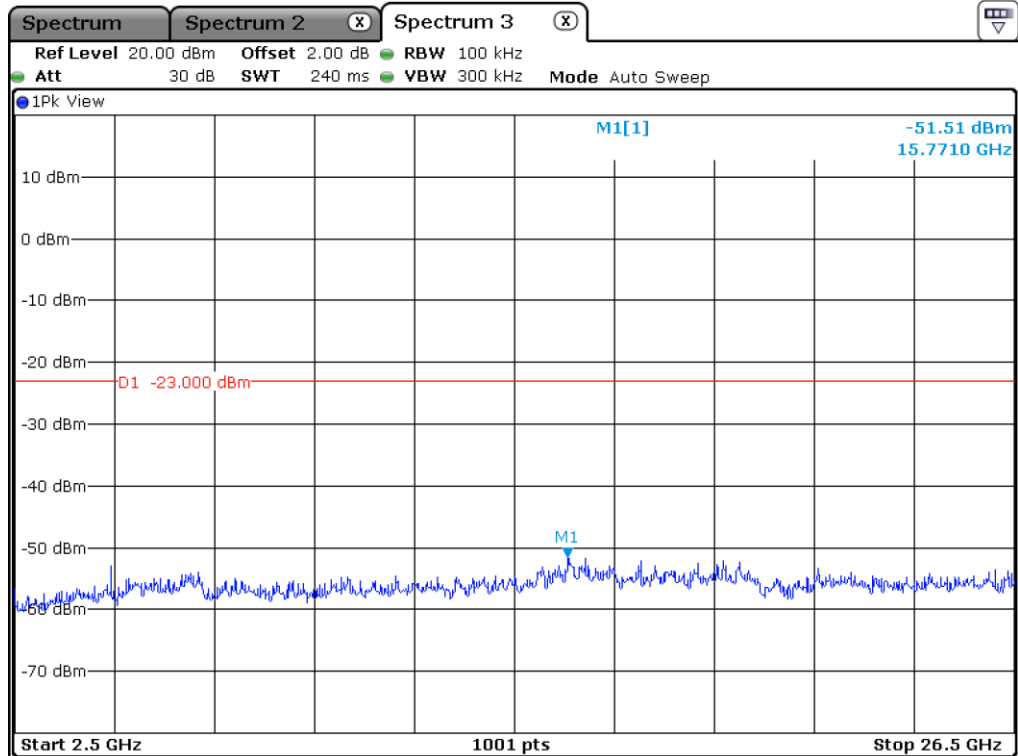
High Channel 12



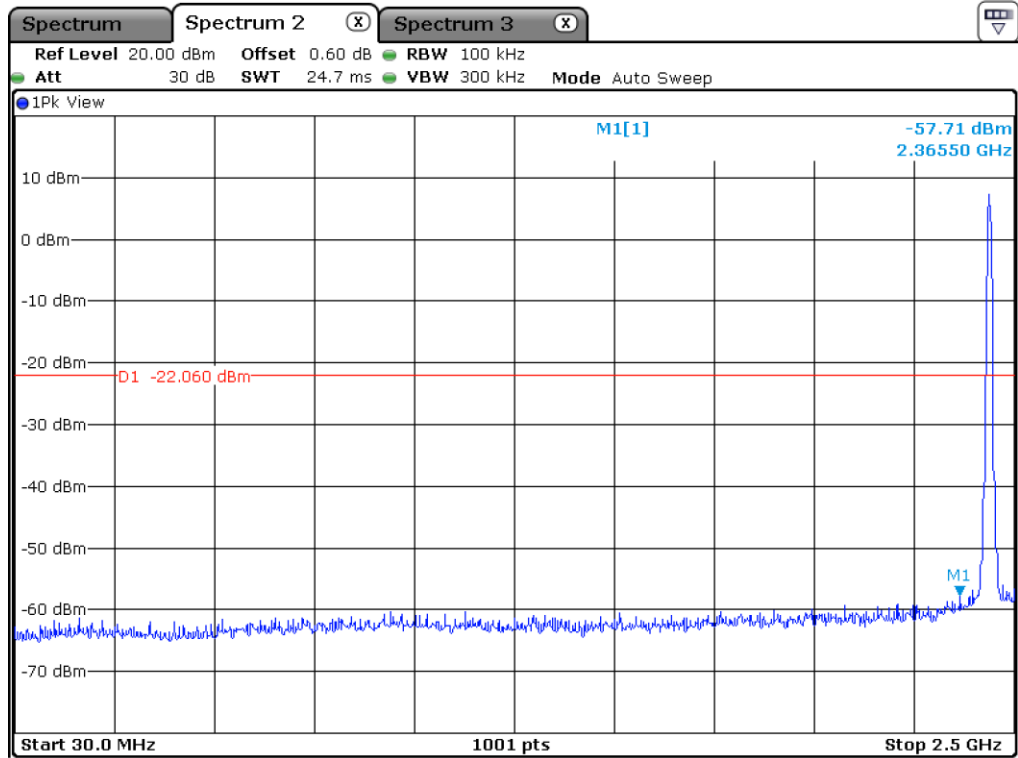
High Channel 13



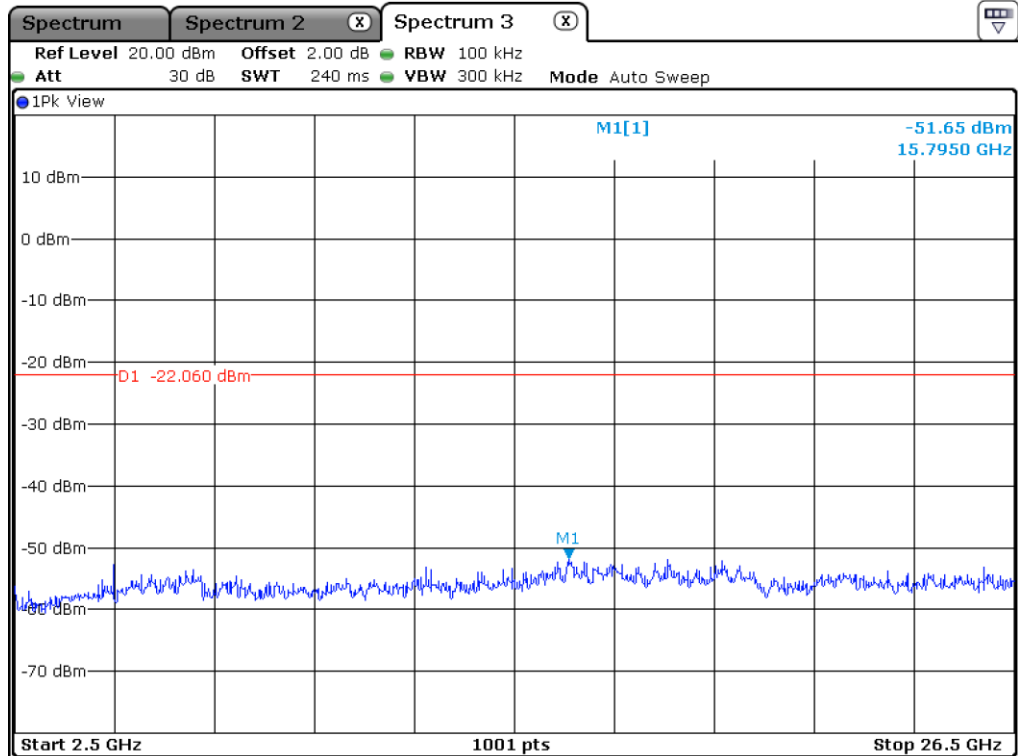
Low Channel



Low Channel



Middle Channel



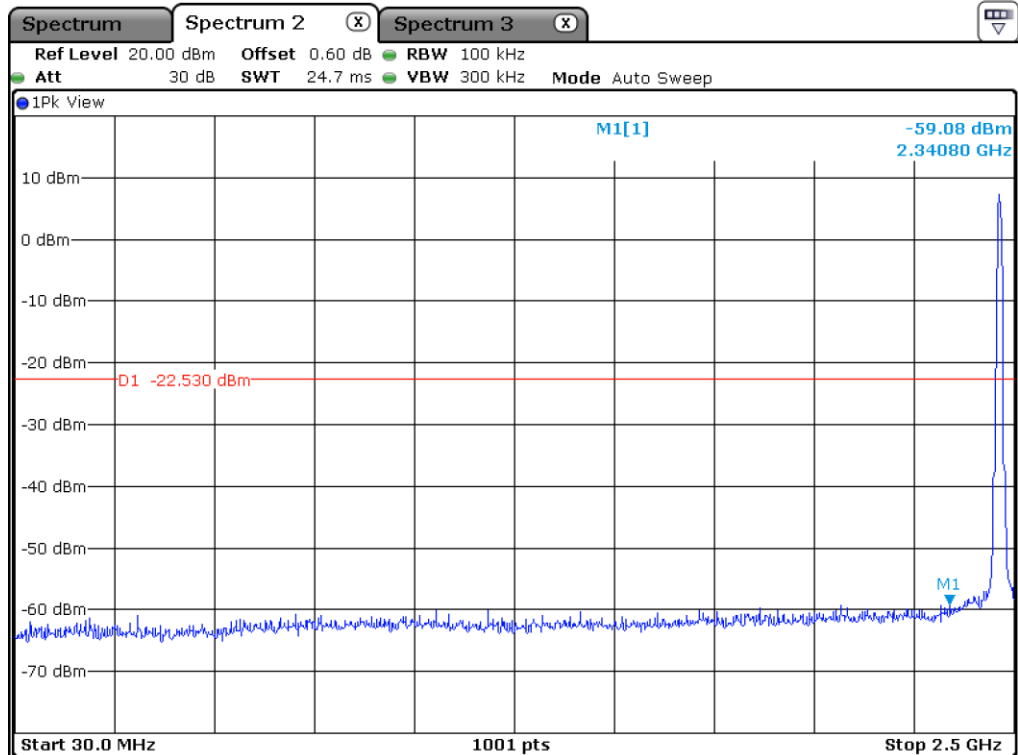
Middle Channel

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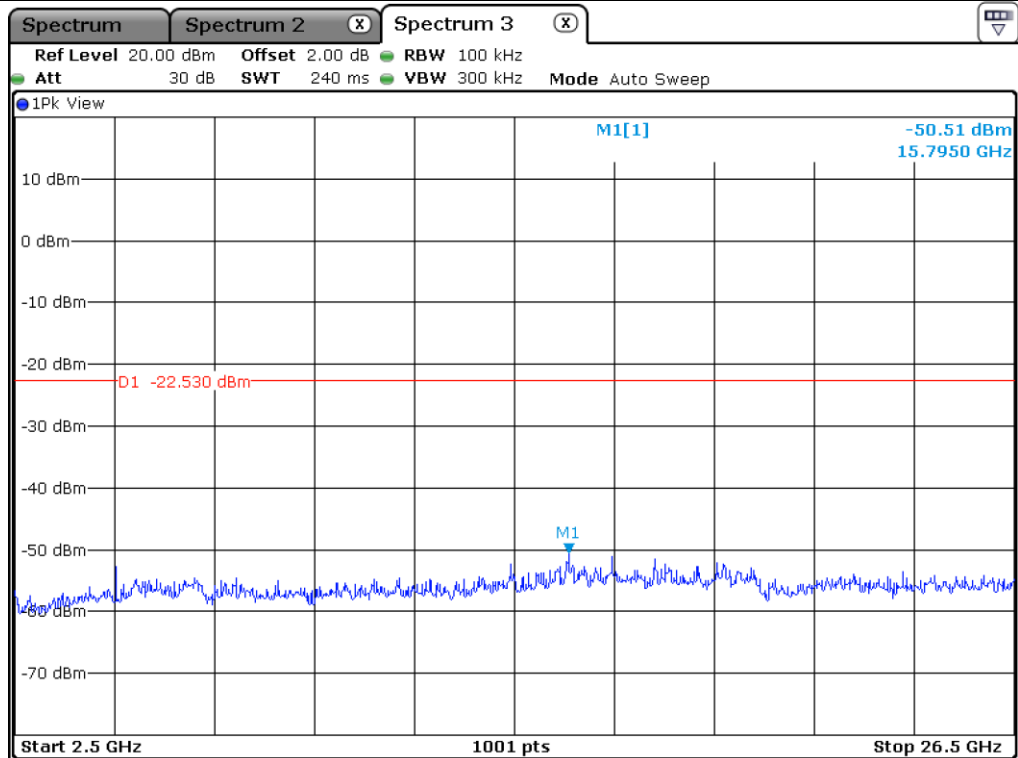
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High Channel 11



High Channel 11

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