

# RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-216-RWD-022

Reception No. : 2104002367

Applicant : LG Electronics USA, Inc.

Address : 111 Sylvan Ave, North Building, Englewood Cliffs, New Jersey, United States

Manufacturer : LG Electronics Inc.

Address : 222 LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea

Type of Equipment : Bluetooth Earbud (Cradle)

FCC ID. : ZNFTONEFP9C

Model Name : TONE-FP9C

Multiple Model Name : Refer to the Clause 3.2

Serial number : N/A

Total page of Report : 77 pages (including this page)

Date of Incoming : May 17, 2021

Date of issue : June 16, 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.

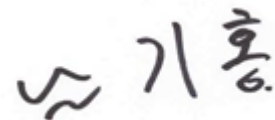
It is not a generally valid assessment of the features of the respective products of the mass-production.



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**Revision History**

| Rev. No. | Issue Report No. | Issued Date   | Revisions       | Section Affected |
|----------|------------------|---------------|-----------------|------------------|
| 0        | OT-216-RWD-022   | June 16, 2021 | Initial Release | All              |
|          |                  |               |                 |                  |
|          |                  |               |                 |                  |

## 1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA, Inc.

Address : 111 Sylvan Ave, North Building, Englewood Cliffs, New Jersey, United States

Contact Person : Dae Woong Kim / Director, Regulatory and Environmental Affairs

Telephone No. : 201-266-2215

FCC ID : ZNFTONEFP9C

Model Name : TONE-FP9C

Brand Name : LG

Serial Number : N/A

Date : June 16, 2021

|                                                         |                                                                                    |
|---------------------------------------------------------|------------------------------------------------------------------------------------|
| EQUIPMENT CLASS                                         | DSS – PART 15 SPREAD SPECTRUM TRANSMITTER                                          |
| E.U.T. DESCRIPTION                                      | Bluetooth Earbud (Cradle)                                                          |
| THIS REPORT CONCERNS                                    | Original Grant                                                                     |
| MEASUREMENT PROCEDURES                                  | ANSI C63.10: 2013                                                                  |
| 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<br>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) (1)       | Minimum 20 dB Bandwidth                             | Met the Limit / PASS   |
| 15.247 (a) (1)       | Carrier Frequency Separation                        | Met the Limit / PASS   |
| 15.247 (a) (1) (iii) | Minimum Number of Hopping Channels                  | Met the Limit / PASS   |
| 15.247 (a) (1) (iii) | Average Time of Occupancy                           | Met the Limit / PASS   |
| 15.247 (b) (1)       | 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   |
| 15.209               | Radiated Emission Limits, General Requirement       | Met the Limit / PASS   |
| 15.207               | Conducted Limits                                    | N/A (See Note)         |
| 15.203               | Antenna Requirement                                 | Met requirement / PASS |

Note. : This test is not performed because the EUT is operated by DC battery.

### 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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OTC-TRF-RF-001(0)

### 3. GENERAL INFORMATION

#### 3.1 Product Description

The LG Electronics USA, Inc., Model TONE-FP9C (referred to as the EUT in this report) is a Bluetooth Earbud (Cradle). The product specification described herein was obtained from product data sheet or user's manual.

|                                                           |        |                                                               |
|-----------------------------------------------------------|--------|---------------------------------------------------------------|
| Device Type                                               |        | Bluetooth Earbud (Cradle)                                     |
| Operating Frequency                                       |        | 2 402 MHz ~ 2 480 MHz                                         |
| RF Output Power                                           | 1 Mbps | 9.98 dBm                                                      |
|                                                           | 2 Mbps | 9.85 dBm                                                      |
|                                                           | 3 Mbps | 10.24 dBm                                                     |
| Number of Channel                                         |        | 79 Channels                                                   |
| Modulation Type                                           |        | GFSK for 1 Mbps, $\pi/4$ -DQPSK for 2 Mbps, 8-DPSK for 3 Mbps |
| Antenna Type                                              |        | Wire Antenna                                                  |
| Antenna Gain                                              |        | -3.0 dBi                                                      |
| List of each Osc. or crystal<br>Freq.(Freq. $\geq$ 1 MHz) |        | 40 MHz                                                        |
| Rated Supply Voltage                                      |        | DC 3.7 V                                                      |

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

-. The following lists consist of the added model and their differences.

| Model Name  | Differences                                                                                                             | Tested                              |
|-------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| TONE-FP9C   | Basic Model                                                                                                             | <input checked="" type="checkbox"/> |
| TONE-FP9WC  | This model is identical to the basic model except for the Color (White) and model name.                                 | <input type="checkbox"/>            |
| TONE-FP9EC  | This model is identical to the basic model except for the Color (Beige) and model name.                                 | <input type="checkbox"/>            |
| TONE-TFP9C  | This model is identical to the basic model except for the Marketing area (KOREA) and model name.                        | <input type="checkbox"/>            |
| TONE-TFP9WC | This model is identical to the basic model except for the Color(White), Marketing area (KOREA) and model name.          | <input type="checkbox"/>            |
| TONE-TFP9EC | This model is identical to the basic model except for the Color(Beige), Marketing area (KOREA) and model name.          | <input type="checkbox"/>            |
| TONE-UFP9C  | This model is identical to the basic model except for the Marketing area (United Kingdom) and model name.               | <input type="checkbox"/>            |
| TONE-UFP9WC | This model is identical to the basic model except for the Color(White), Marketing area (United Kingdom) and model name. | <input type="checkbox"/>            |
| TONE-UFP9EC | This model is identical to the basic model except for the Color(Beige), Marketing area (United Kingdom) and model name. | <input type="checkbox"/>            |
| TONE-DFP9C  | This model is identical to the basic model except for the Marketing area (Germany) and model name.                      | <input type="checkbox"/>            |
| TONE-DFP9WC | This model is identical to the basic model except for the Color(White), Marketing area (Germany) and model name.        | <input type="checkbox"/>            |
| TONE-DFP9EC | This model is identical to the basic model except for the Color(Beige), Marketing area (Germany) and model name.        | <input type="checkbox"/>            |
| TONE-FP9AC  | This model is identical to the basic model except for the Marketing area (Australia) and model name.                    | <input type="checkbox"/>            |
| TONE-FP9WAC | This model is identical to the basic model except for the Color(White), Marketing area (Australia) and model name.      | <input type="checkbox"/>            |
| TONE-FP9EAC | This model is identical to the basic model except for the Color(Beige), Marketing area (Australia) and model name.      | <input type="checkbox"/>            |

Note: 1. Applicant consigns only basic model to test. Therefore, this test report just guarantees the units, which have been tested.

2. The Applicant/manufacture is responsible for the compliance of all variants.

### 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  | LG Electronics Inc. | N/A               | N/A    |
| Battery     | LG Electronics Inc. | N/A               | 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 |
|-------------------|---------------------|---------------------------------|--------------|
| TONE-FP9C         | LG Electronics Inc. | Bluetooth Earbud (Cradle) (EUT) | -            |
| Ideapad 330-15IKB | Lenovo              | Notebook PC                     | EUT          |

### 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, 2 441 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     |
| 39      | 2 441     |
| 78      | 2 480     |

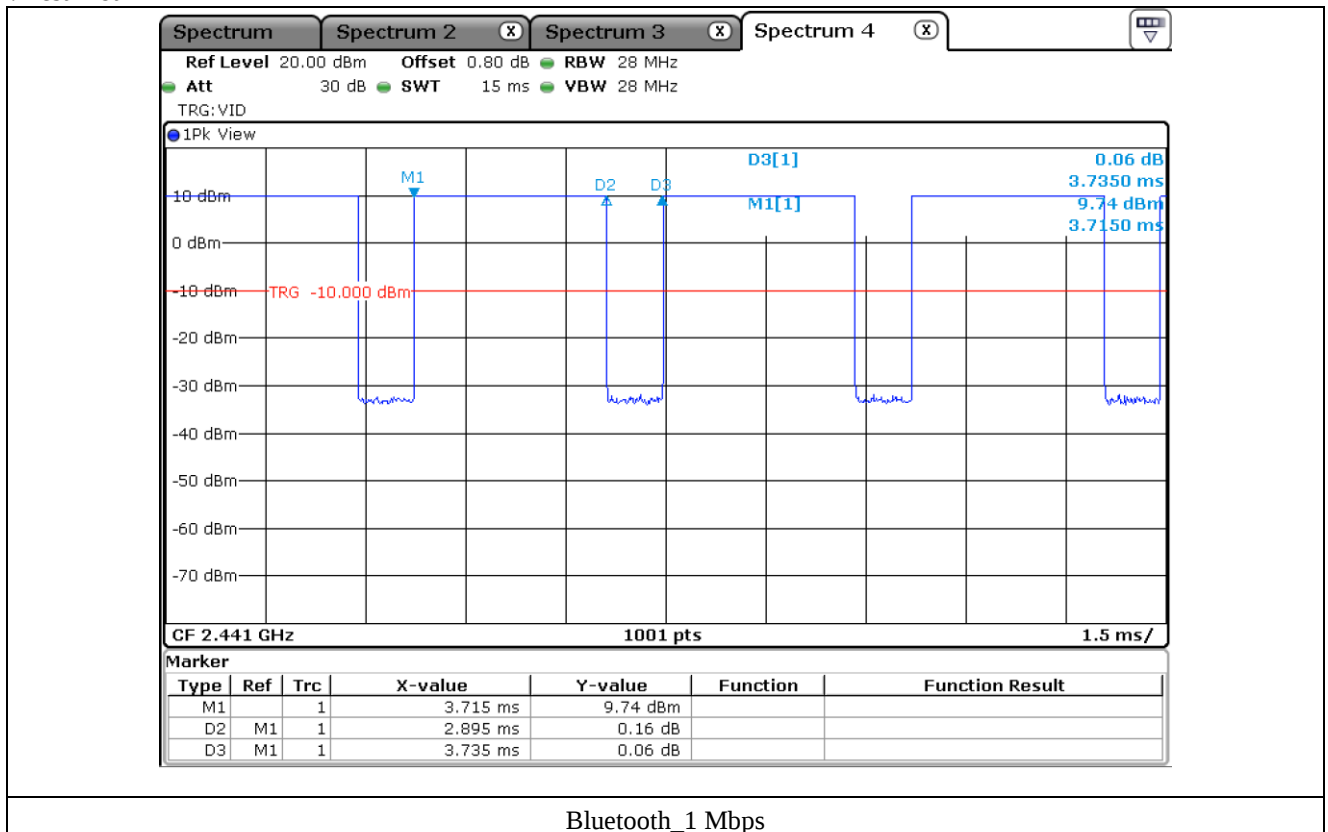
### -. Duty Cycle

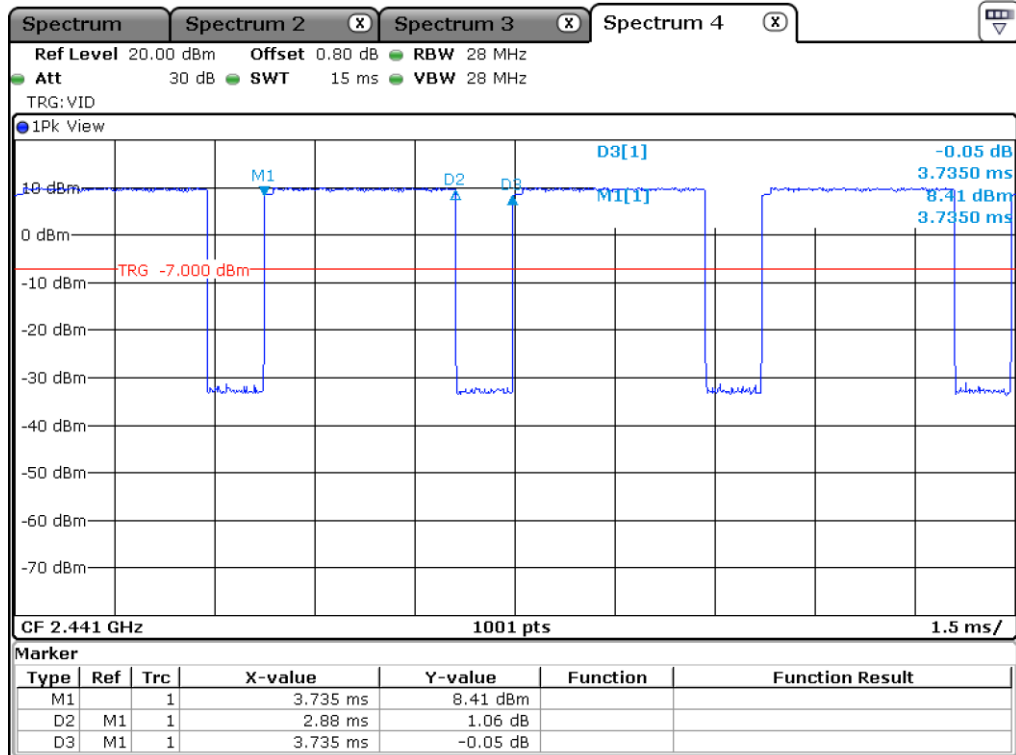
| Mode                    | Tx On Time<br>[ ms ] | Tx Off Time<br>[ ms ] | Duty Cycle<br>[ % ] | Correction Factor<br>[ dB ] |
|-------------------------|----------------------|-----------------------|---------------------|-----------------------------|
| Bluetooth<br>[ 1 Mbps ] | 2.895                | 0.84                  | 77.51               | 1.11                        |
| Bluetooth<br>[ 2 Mbps ] | 2.88                 | 0.855                 | 77.11               | 1.13                        |
| Bluetooth<br>[ 3 Mbps ] | 2.895                | 0.84                  | 77.51               | 1.11                        |

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

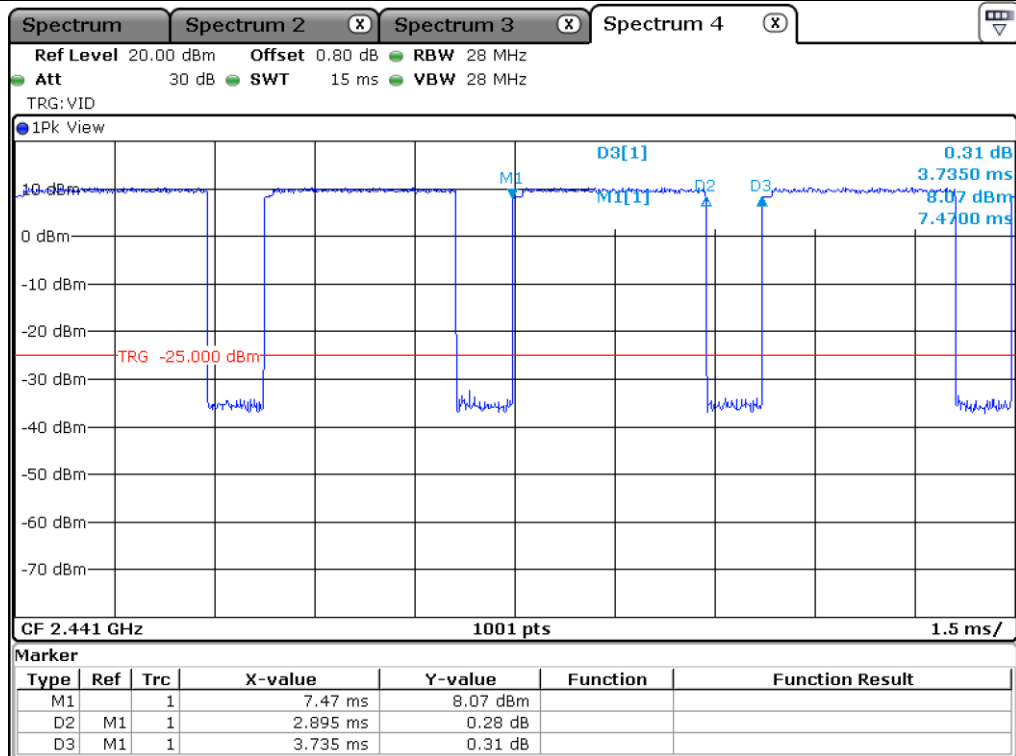
Correction Factor : 10 \* Log(1 / (Duty Cycle / 100))

### -. Test Plot





Bluetooth\_2 Mbps



Bluetooth\_3 Mbps

## 5.4 Configuration of Test System

**Line Conducted Test:** As the EUT is operated by DC battery, this test item is not requirement to be performed.

**Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 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 Wire 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) |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| This test is not performed because the EUT is wireless function does not work while charging mode. |                                                       |

### 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                                                     |

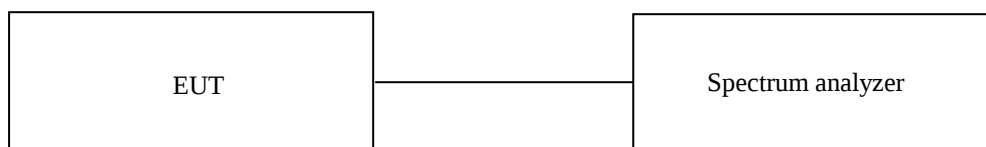
## 7. MINIMUM 20 dB BANDWIDTH

### 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 10 kHz and 20 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



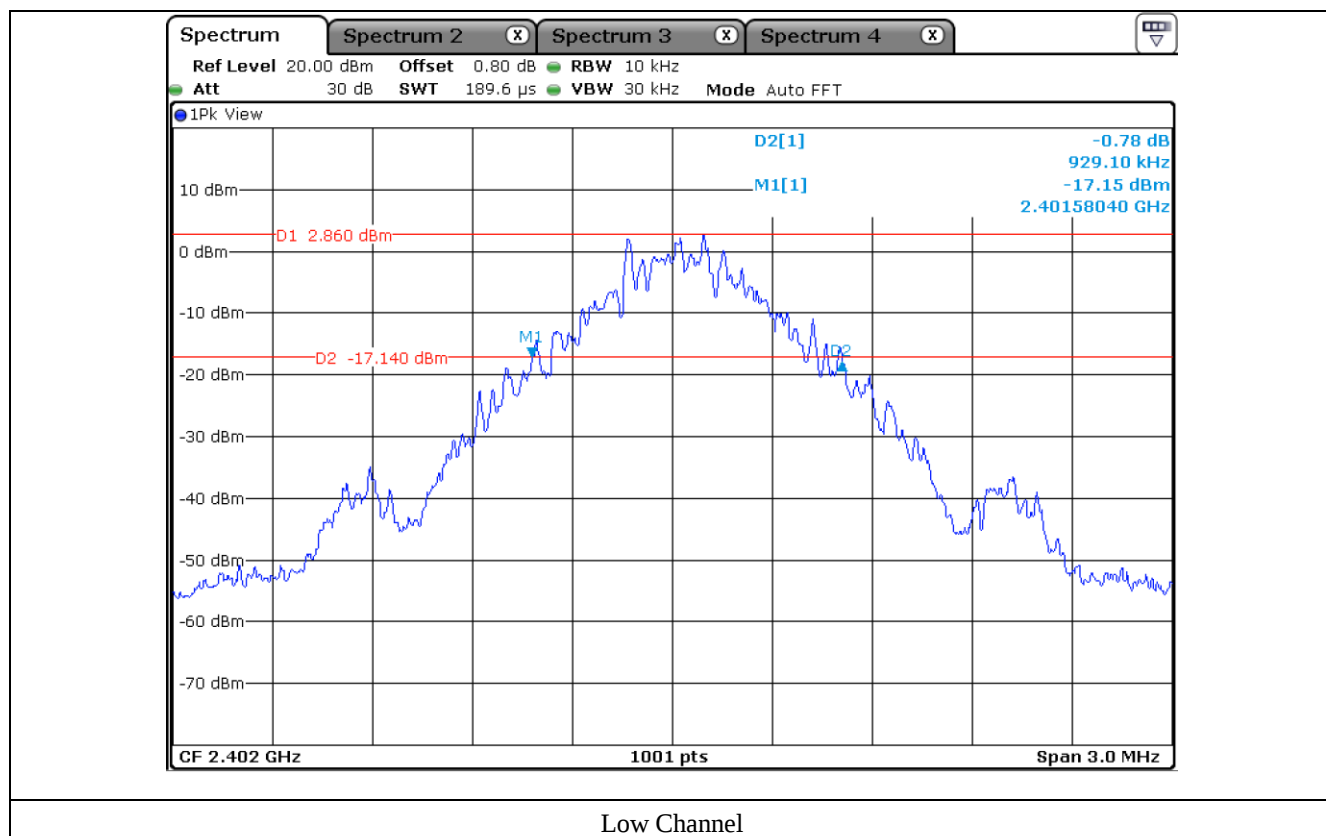
### 7.3 Test Date

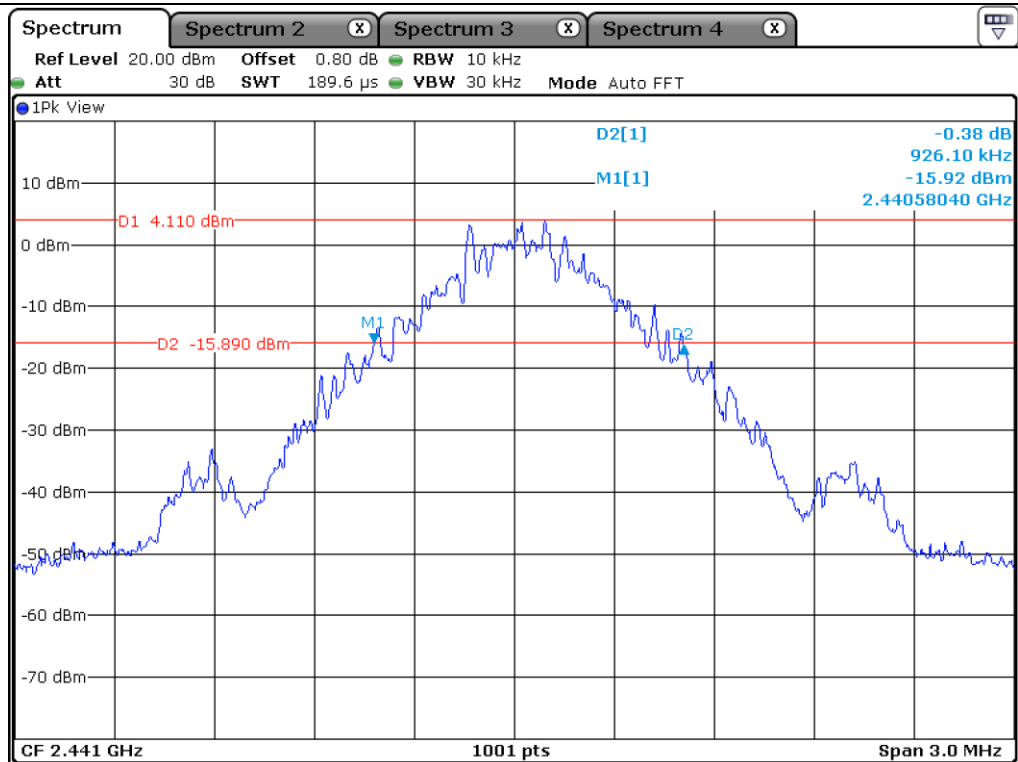
May 24, 2021 ~ June 04, 2021

## 7.4 Test data

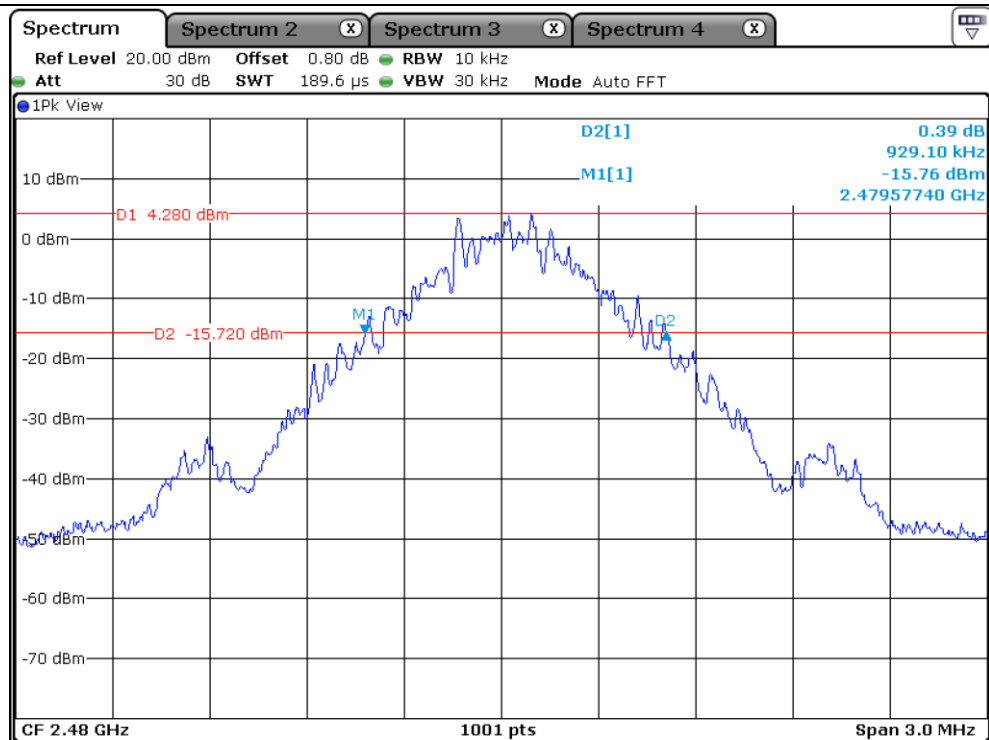
### 7.4.1 Test data for 1 Mbps

| CHANNEL | FREQUENCY (MHz) | 20 dB Bandwidth (kHz) |
|---------|-----------------|-----------------------|
| Low     | 2 402.00        | 929.10                |
| Middle  | 2 441.00        | 926.10                |
| High    | 2 480.00        | 929.10                |





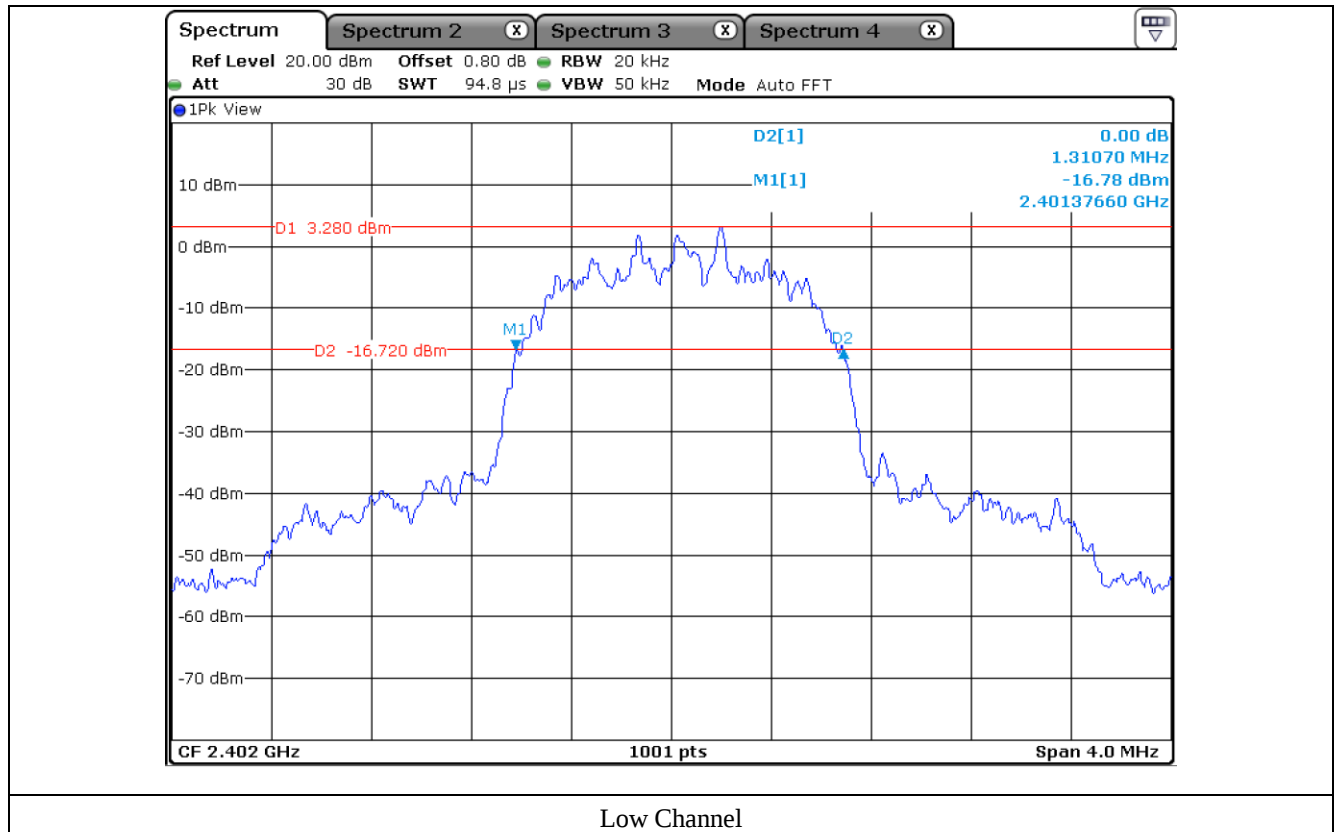
Middle Channel

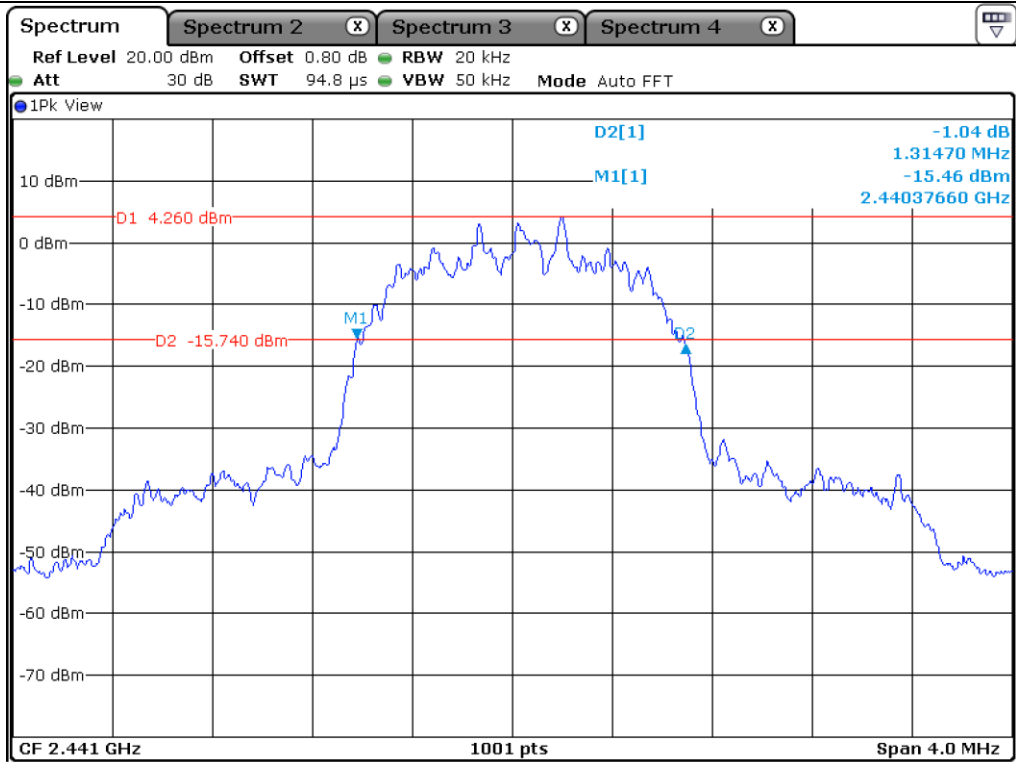


High Channel

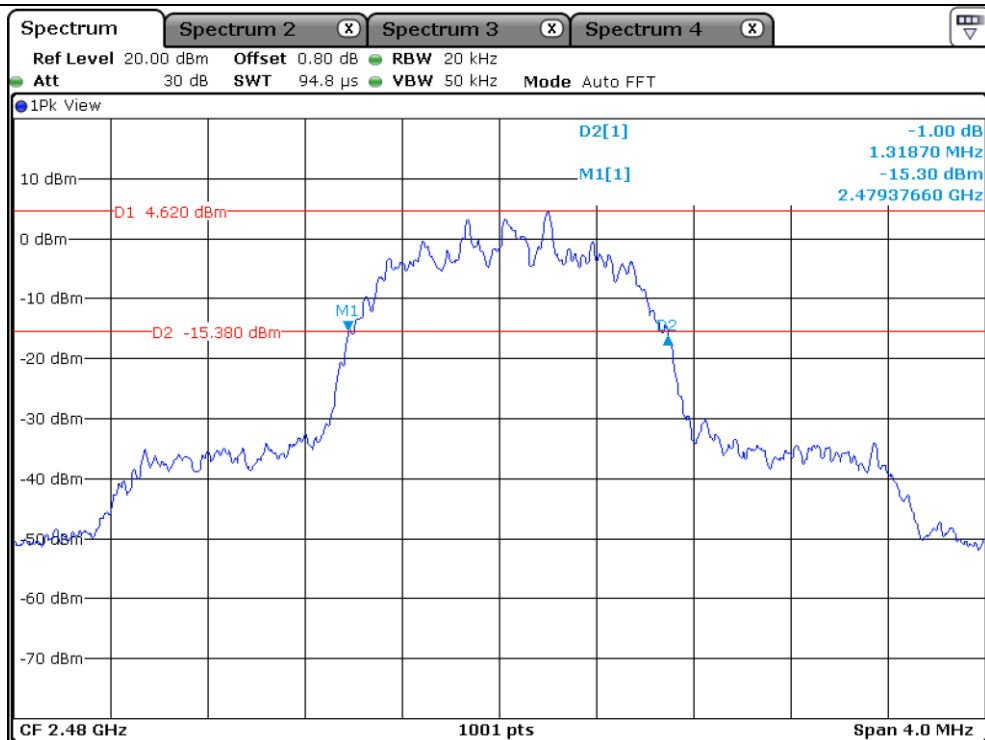
### 7.4.2 Test data for 2 Mbps

| CHANNEL | FREQUENCY (MHz) | 20 dB Bandwidth (kHz) |
|---------|-----------------|-----------------------|
| Low     | 2 402.00        | 1 310.70              |
| Middle  | 2 441.00        | 1 314.70              |
| High    | 2 480.00        | 1 318.70              |





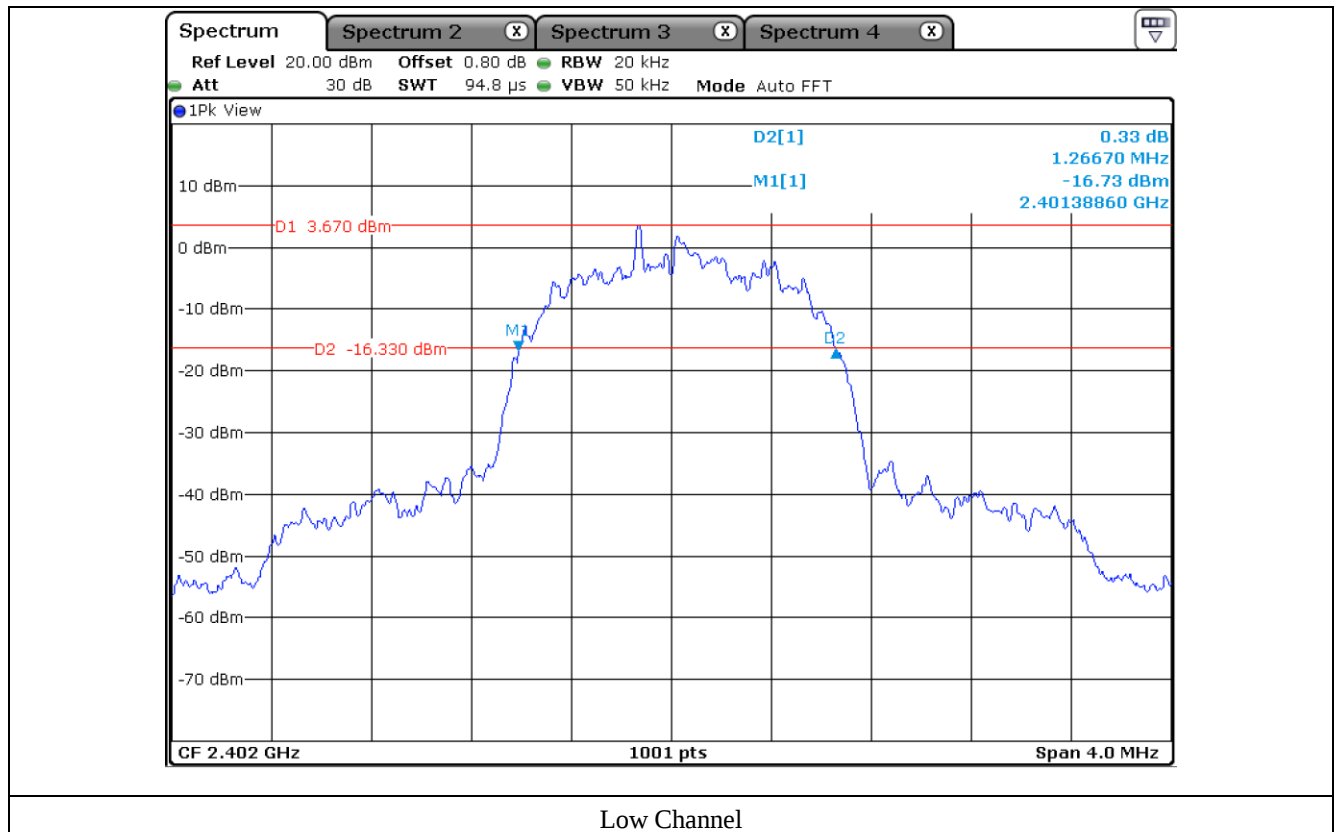
Middle Channel

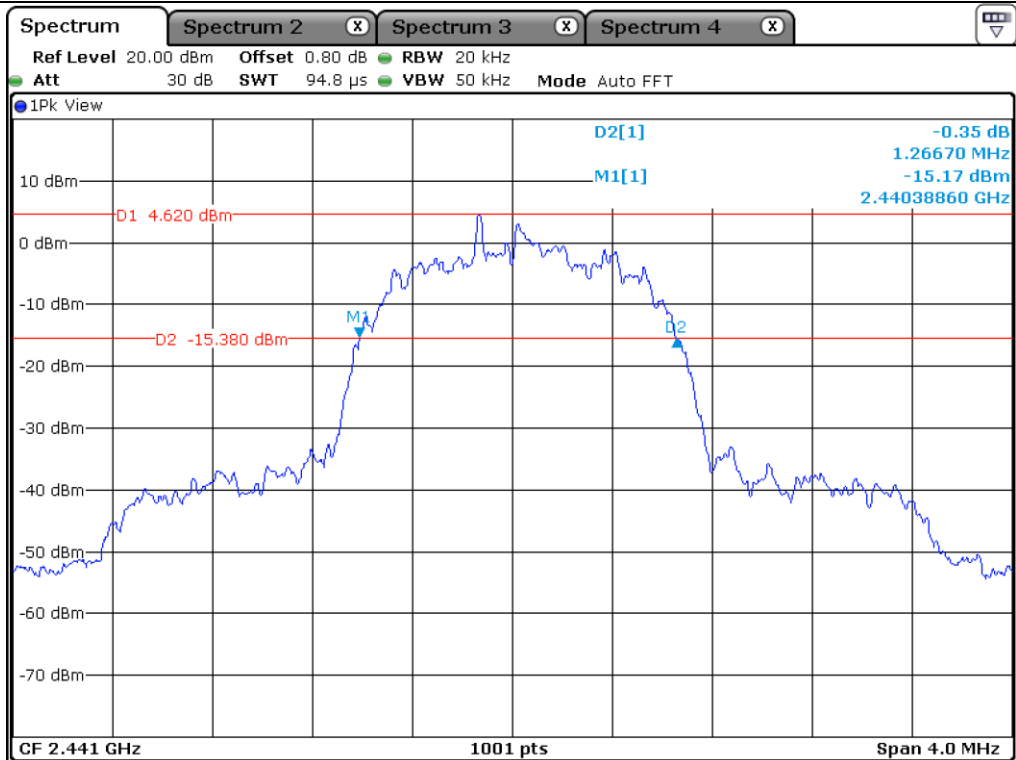


High Channel

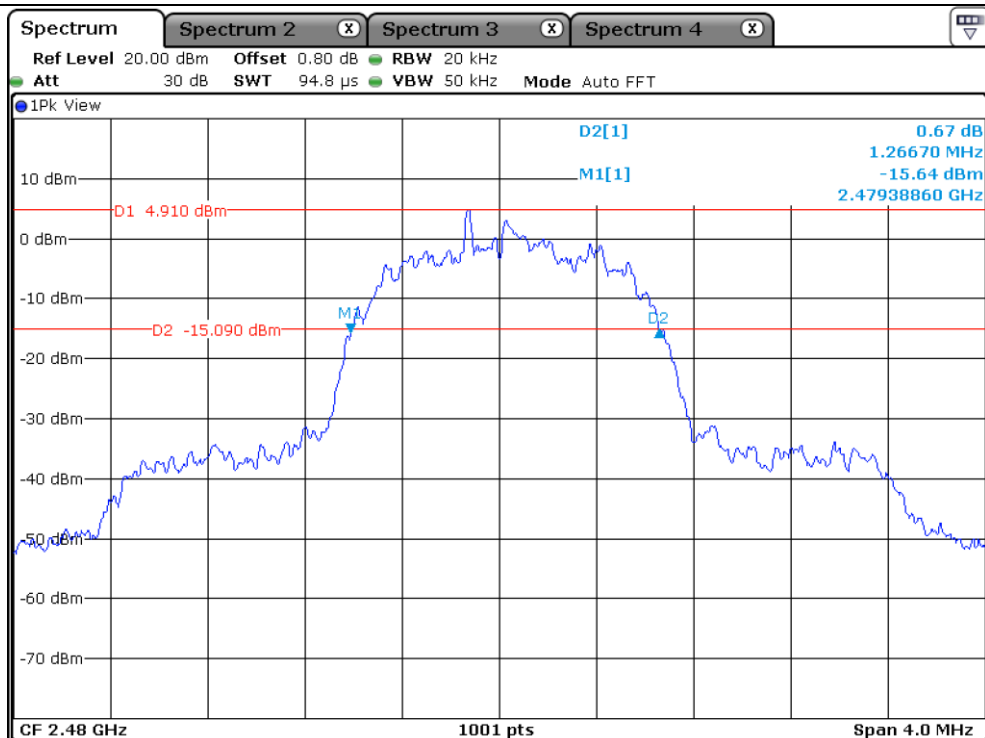
### 7.4.3 Test data for 3 Mbps

| CHANNEL | FREQUENCY (MHz) | 20 dB Bandwidth (kHz) |
|---------|-----------------|-----------------------|
| Low     | 2 402.00        | 1 266.70              |
| Middle  | 2 441.00        | 1 266.70              |
| High    | 2 480.00        | 1 266.70              |





Middle Channel



High Channel

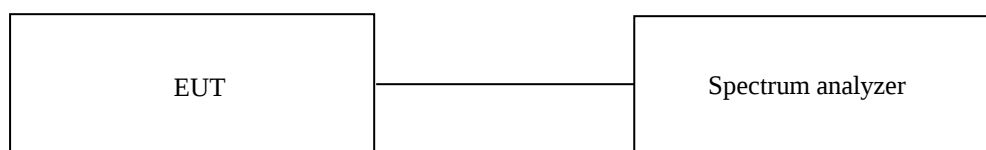
## 8. HOPPING FREQUENCY SEPARATION

### 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 frequency span is set to 10 MHz. The analyzer is set to peak hold then a pseudo-random hopping sequence of the transmitter is captured. The mark delta function was used to measure the frequency separation between two adjacent hopping channels.



### 8.3 Test Date

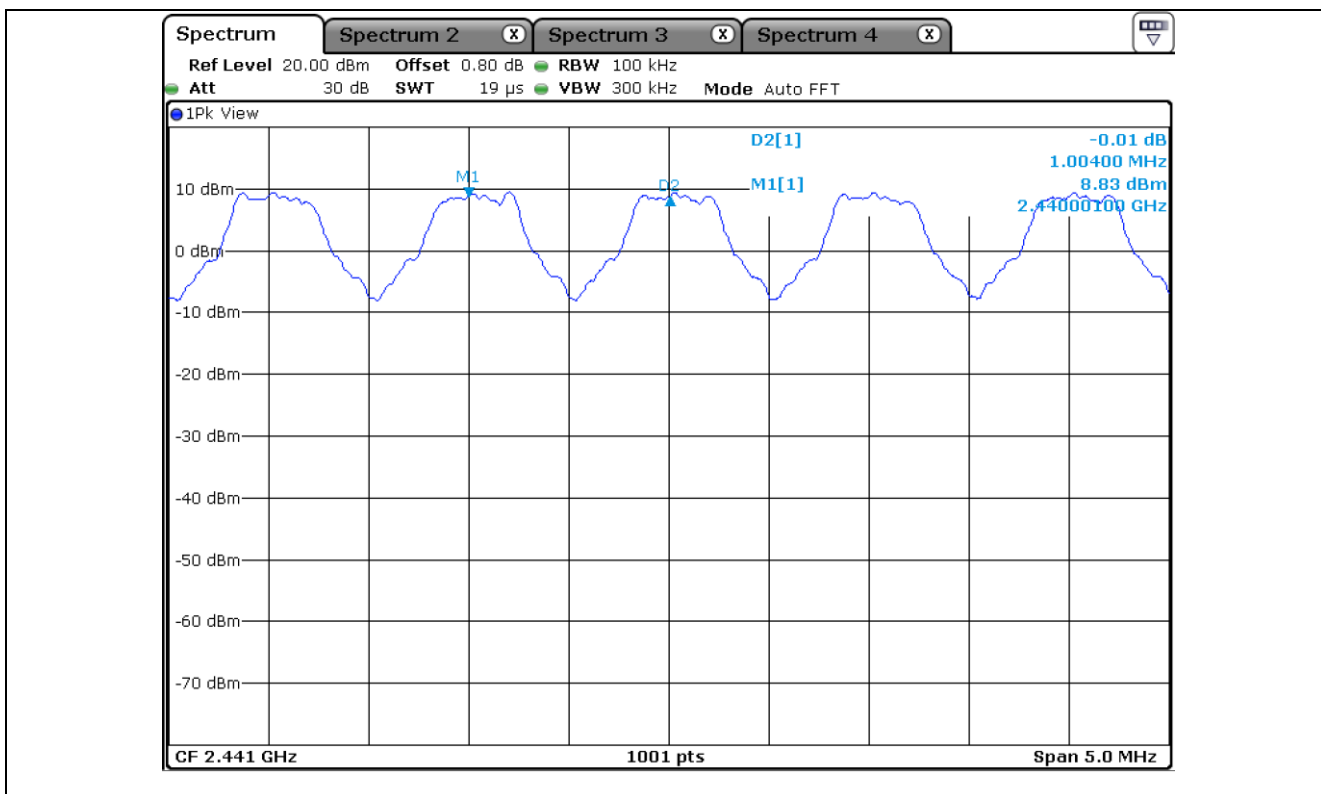
May 24, 2021 ~ June 04, 2021

## 8.4 Test data

### 8.4.1 Test data for 1 Mbps

-. Test Result : Pass

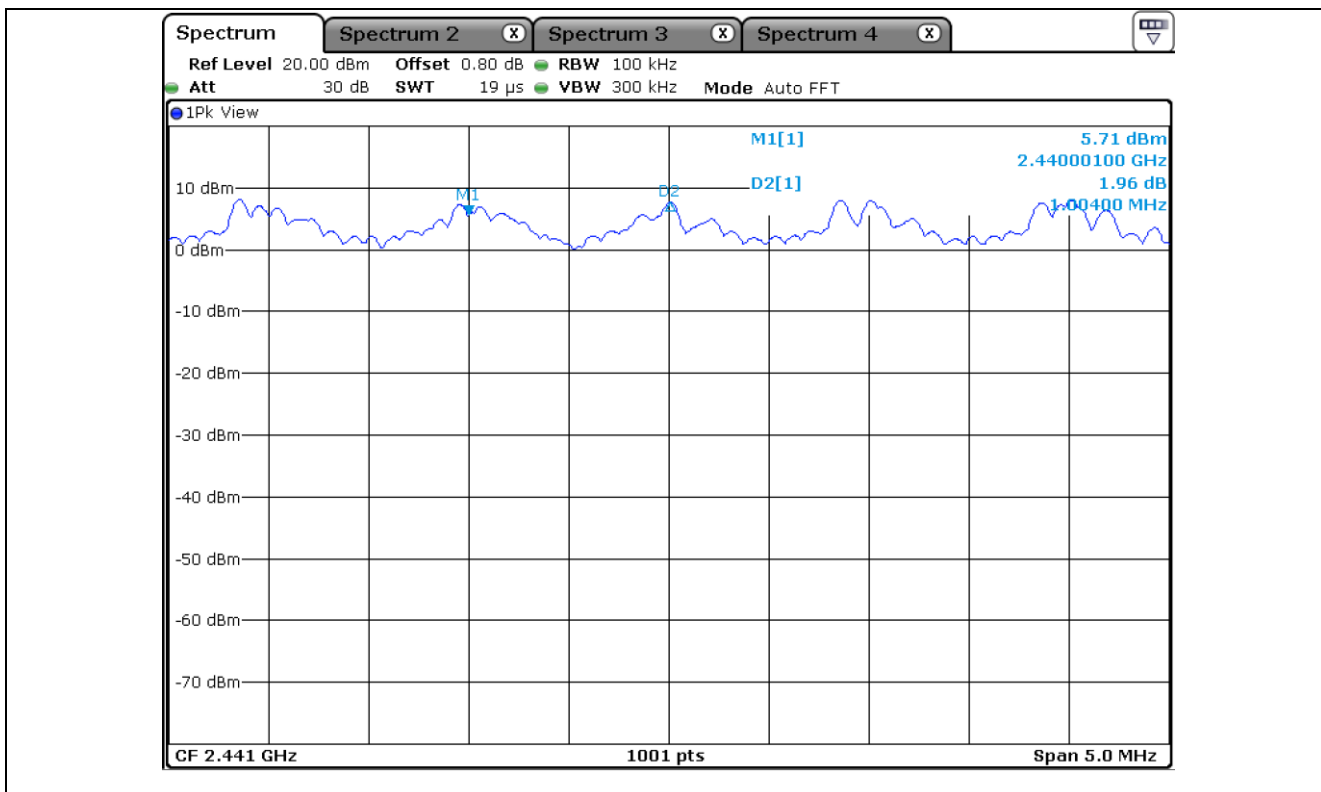
| Measured Value (kHz) | Two-third of 20 dB Bandwidth (kHz) | Limit                                |
|----------------------|------------------------------------|--------------------------------------|
| 1 004.00             | 617.40                             | Separated by a minimum of 617.40 kHz |



## 8.4.2 Test data for 2 Mbps

-. Test Result : Pass

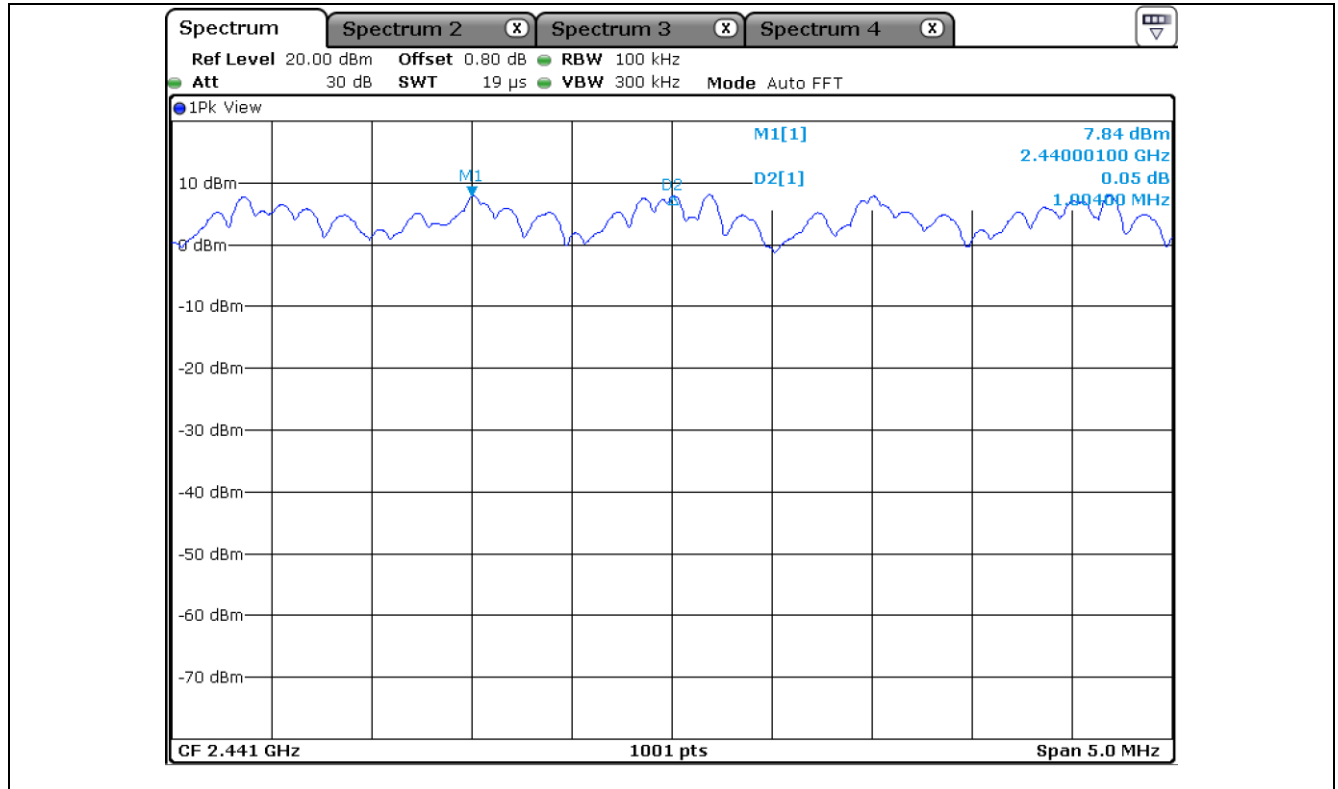
| Measured Value (kHz) | Two-third of 20 dB Bandwidth (kHz) | Limit                                |
|----------------------|------------------------------------|--------------------------------------|
| 1 004.00             | 876.47                             | Separated by a minimum of 876.47 kHz |



### 8.4.3 Test data for 3 Mbps

-. Test Result : Pass

| Measured Value (kHz) | Two-third of 20 dB Bandwidth (kHz) | Limit                                |
|----------------------|------------------------------------|--------------------------------------|
| 1 004.00             | 844.47                             | Separated by a minimum of 844.47 kHz |



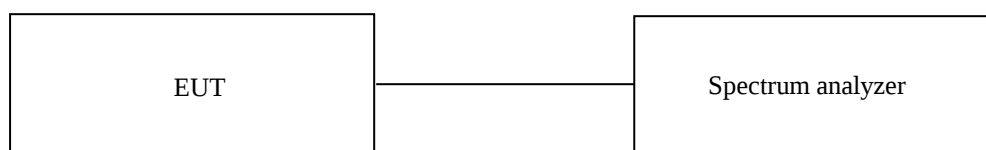
## 9. NUMBER OF HOPPING CHANNELS

### 9.1 Operating environment

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

### 9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The frequency span is set to 100 MHz and the resolution bandwidth is set to 100 kHz. The analyzer is set to peak hold and then complete pseudo-random hopping sequence of the transmitter is captured.



### 9.3 Test Date

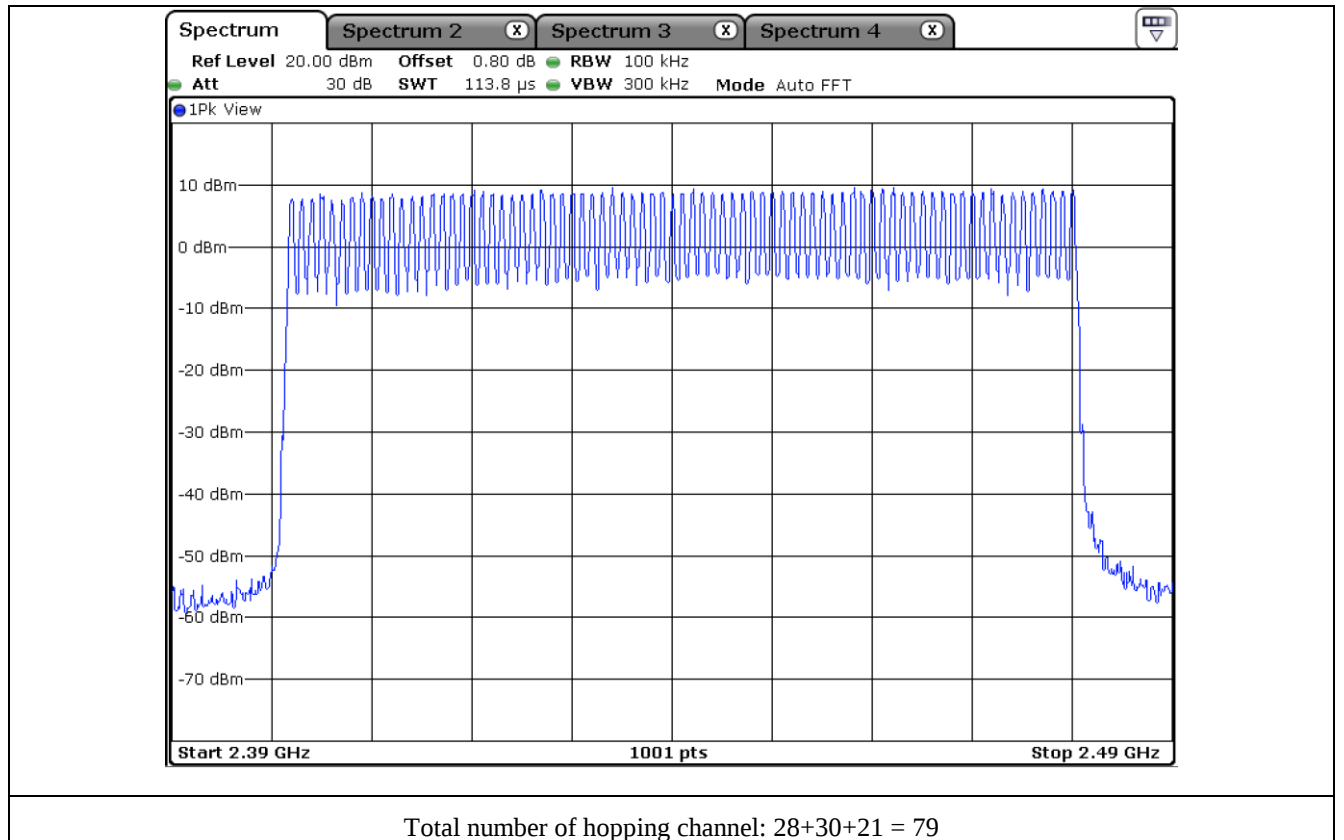
May 24, 2021 ~ June 04, 2021

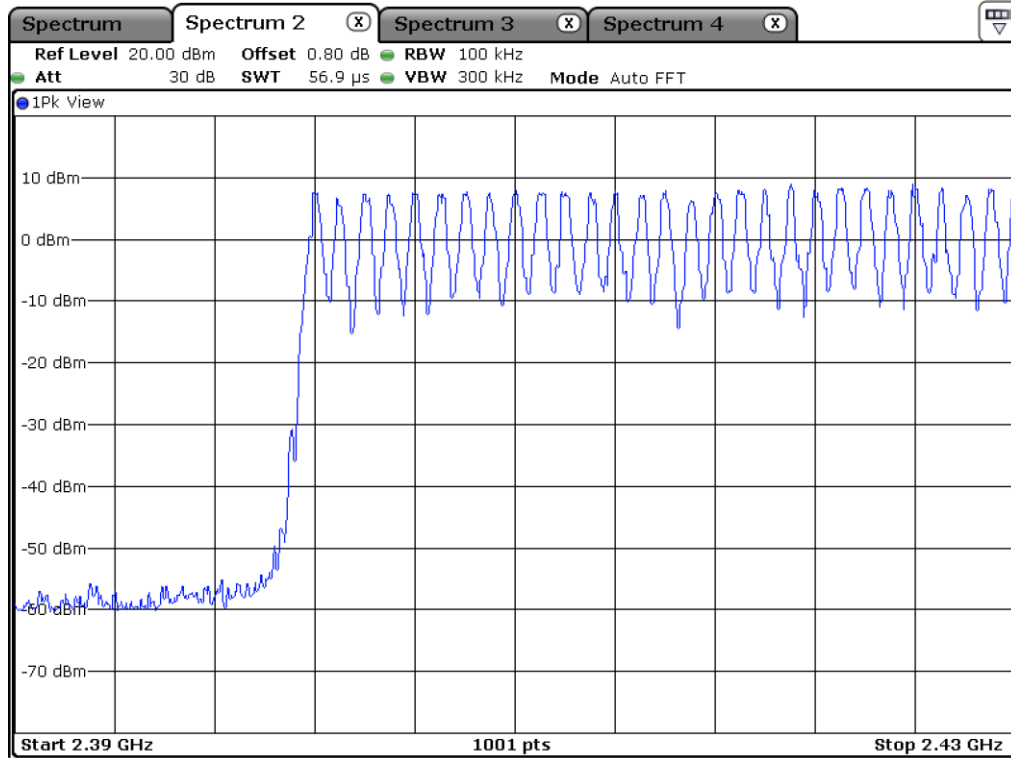
## 9.4 Test data

### 9.4.1 Test data for 1 Mbps

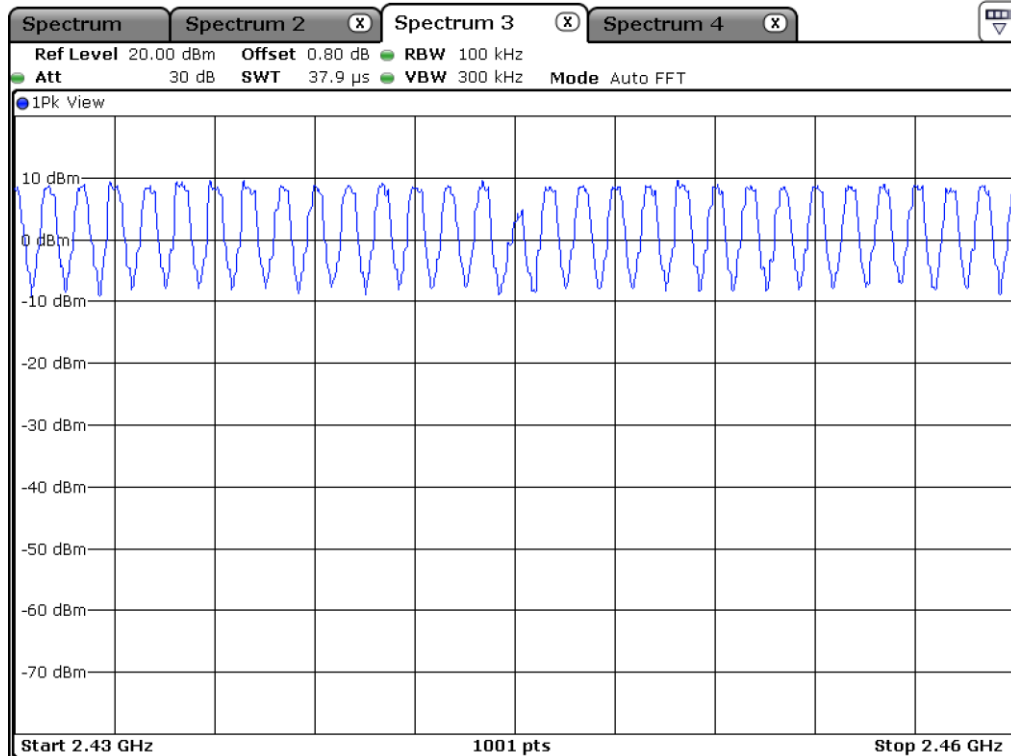
-. Test Result : Pass

| Data Transfer Rate | Measured value (Number) | Limit (Number) | Margin (Number) |
|--------------------|-------------------------|----------------|-----------------|
| 1 Mbps             | 79                      | Minimum of 15  | 64              |

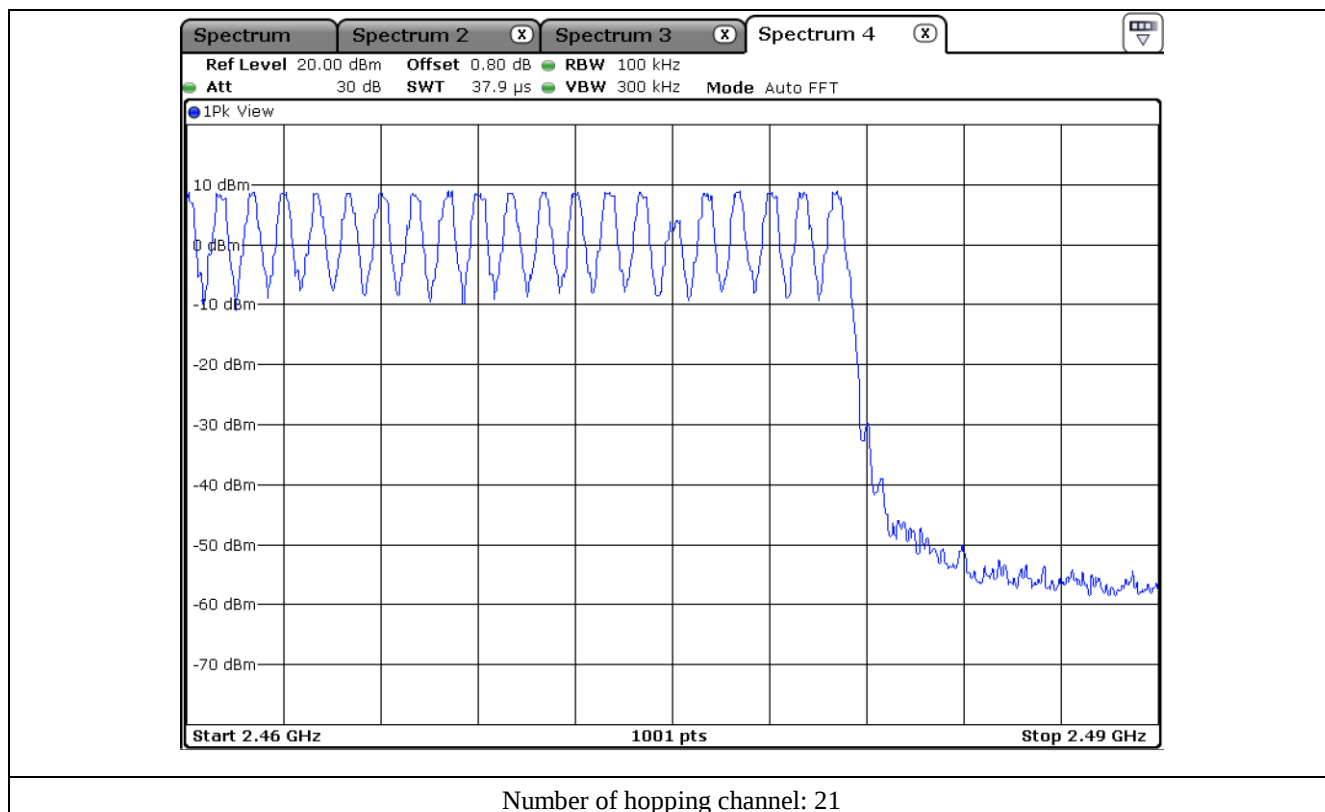




Number of hopping channel: 28



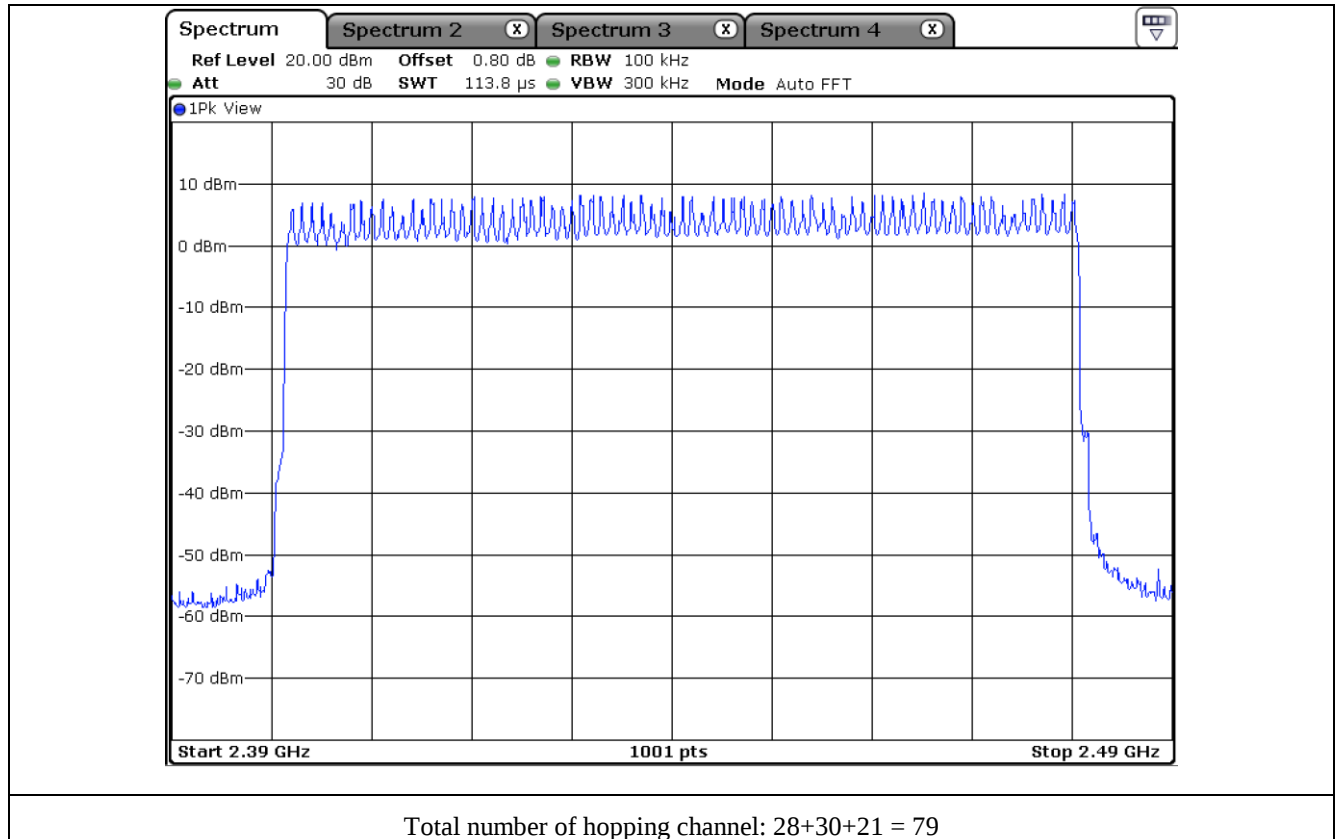
Number of hopping channel: 30

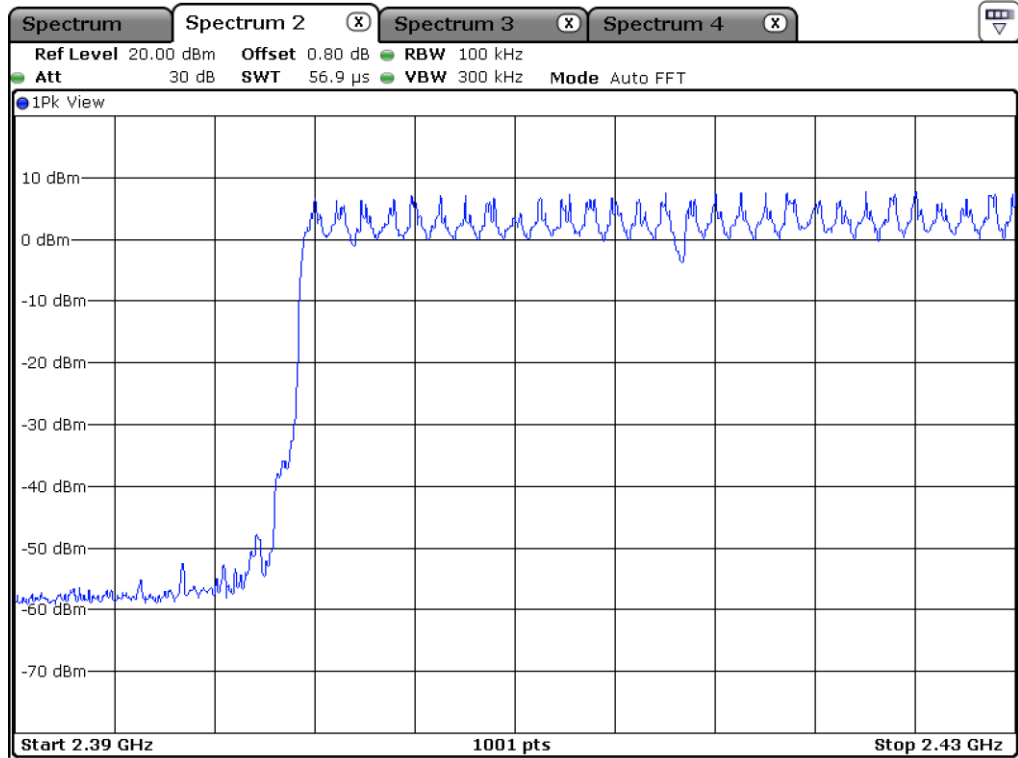


## 9.4.2 Test data for 2 Mbps

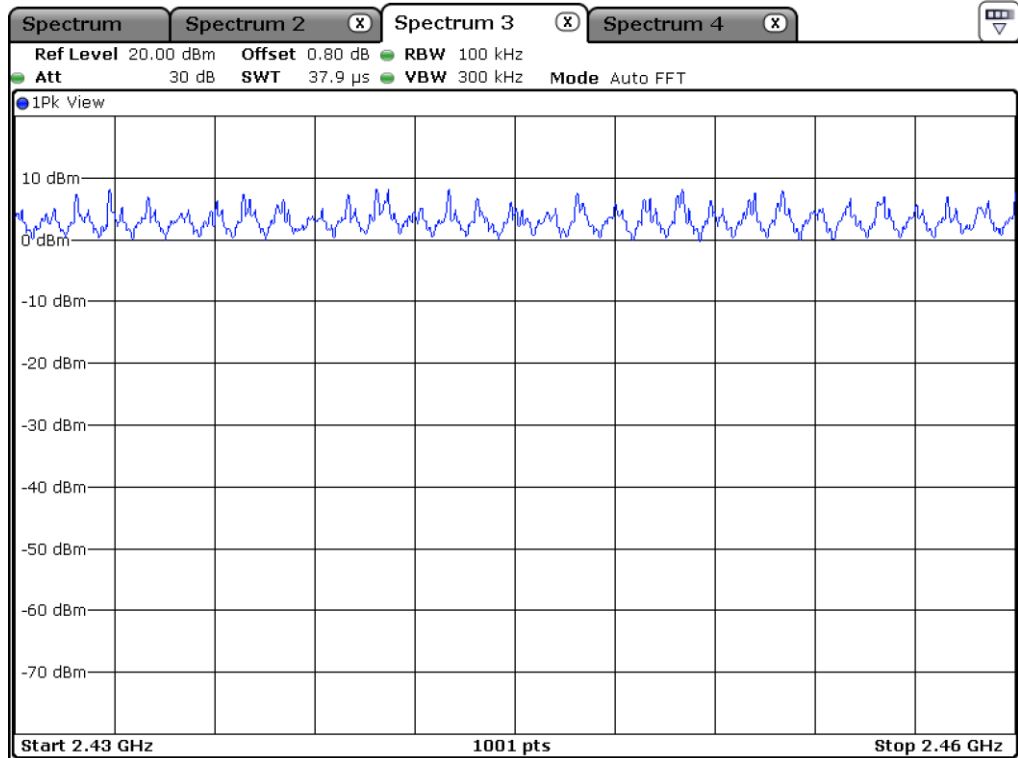
-. Test Result : Pass

| Data Transfer Rate | Measured value (Number) | Limit (Number) | Margin (Number) |
|--------------------|-------------------------|----------------|-----------------|
| 2 Mbps             | 79                      | Minimum of 15  | 64              |

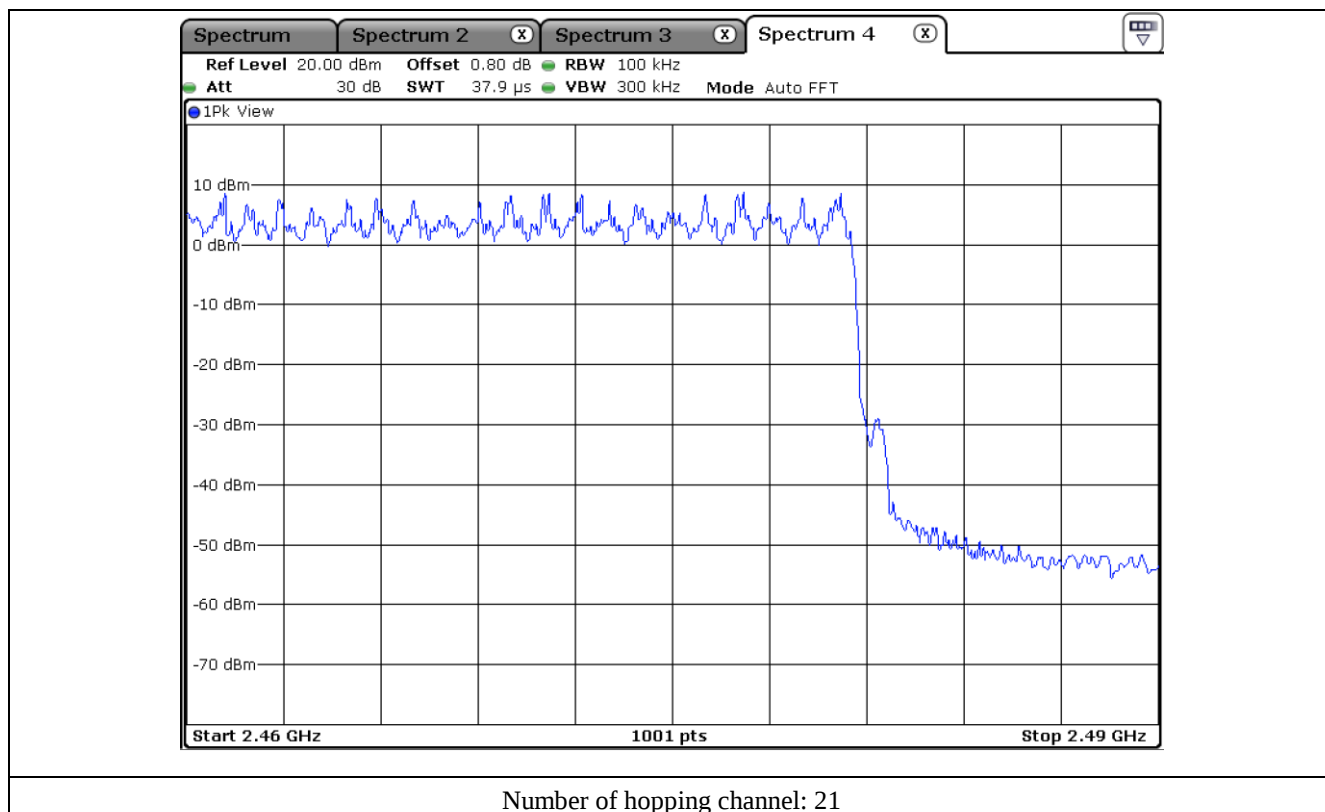




Number of hopping channel: 28



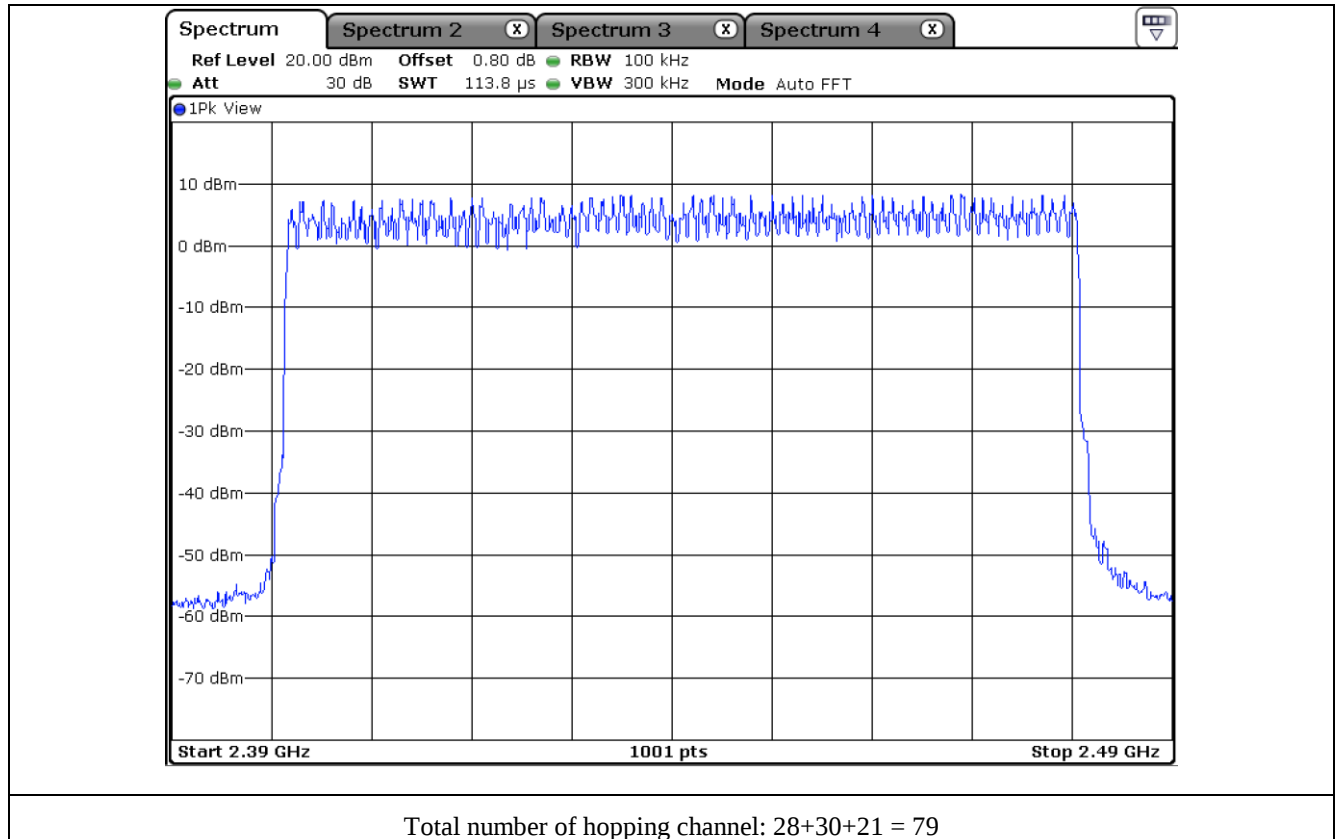
Number of hopping channel: 30

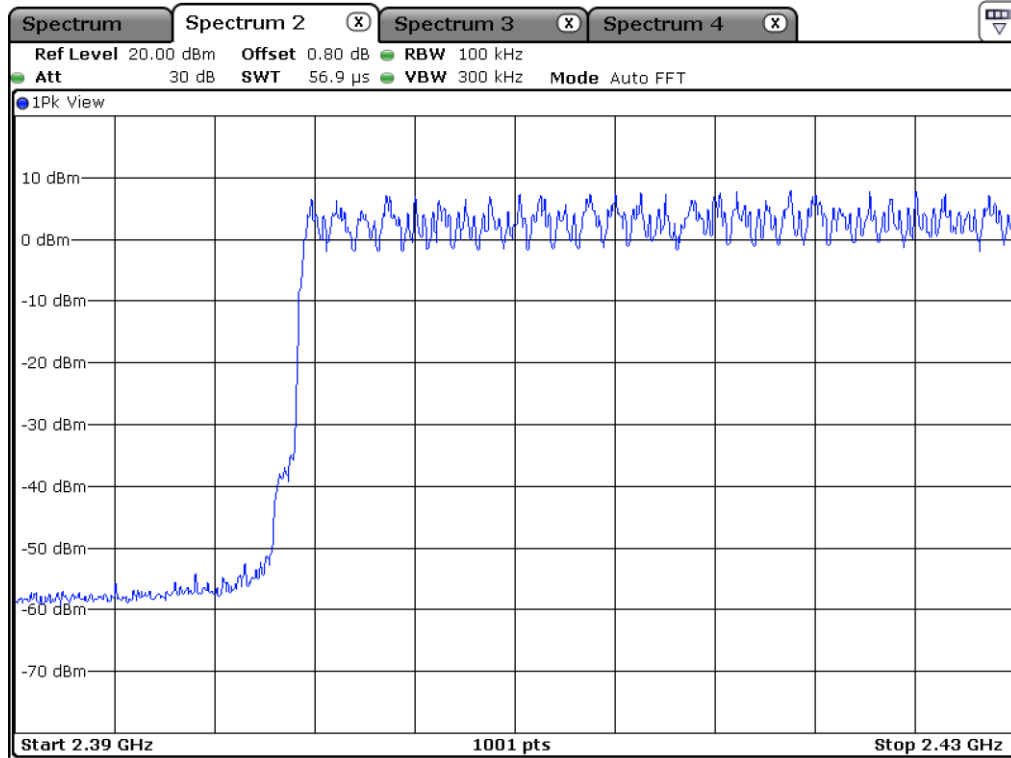


### 9.4.3 Test data for 3 Mbps

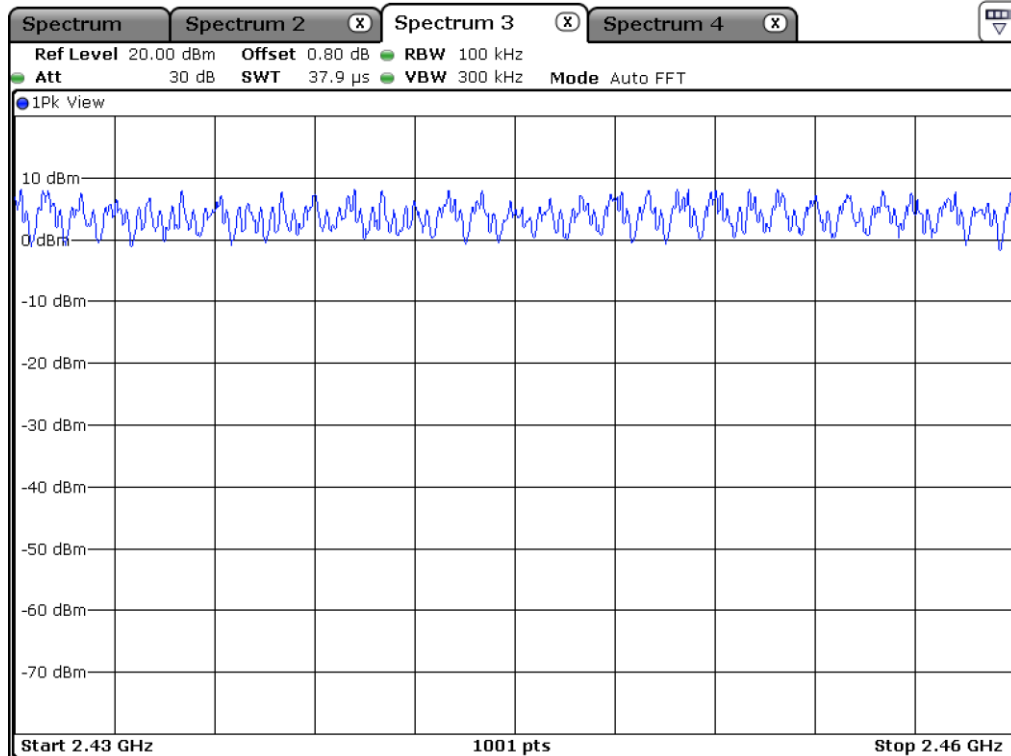
-. Test Result : Pass

| Data Transfer Rate | Measured value (Number) | Limit (Number) | Margin (Number) |
|--------------------|-------------------------|----------------|-----------------|
| 3 Mbps             | 79                      | Minimum of 15  | 64              |

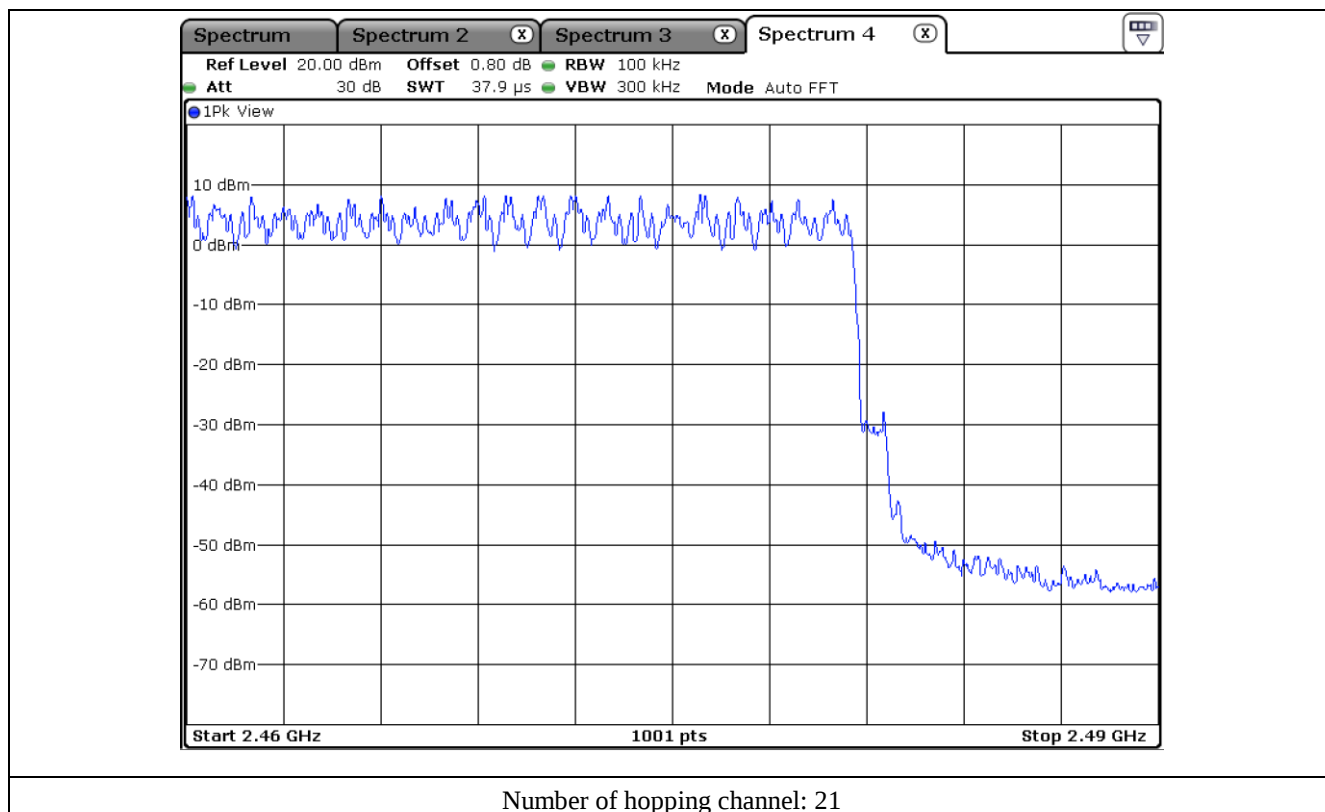




Number of hopping channel: 28



Number of hopping channel: 30



## 10. TIME OF OCCUPANCY

### 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 transmitter is set to operate in its normal frequency hopping mode. The center frequency of the spectrum analyzer is set to one of hopping channels near the center of the operating band and span is set to zero Hz. The sweep time is set to display one complete pulse. The mark delta function is used to measure the duration of the pulses.



### 10.3 Test Date

May 24, 2021 ~ June 04, 2021

## 10.4 Test data

### 10.4.1 Test data for 1 Mbps

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625  $\mu$ s with 79 channels.

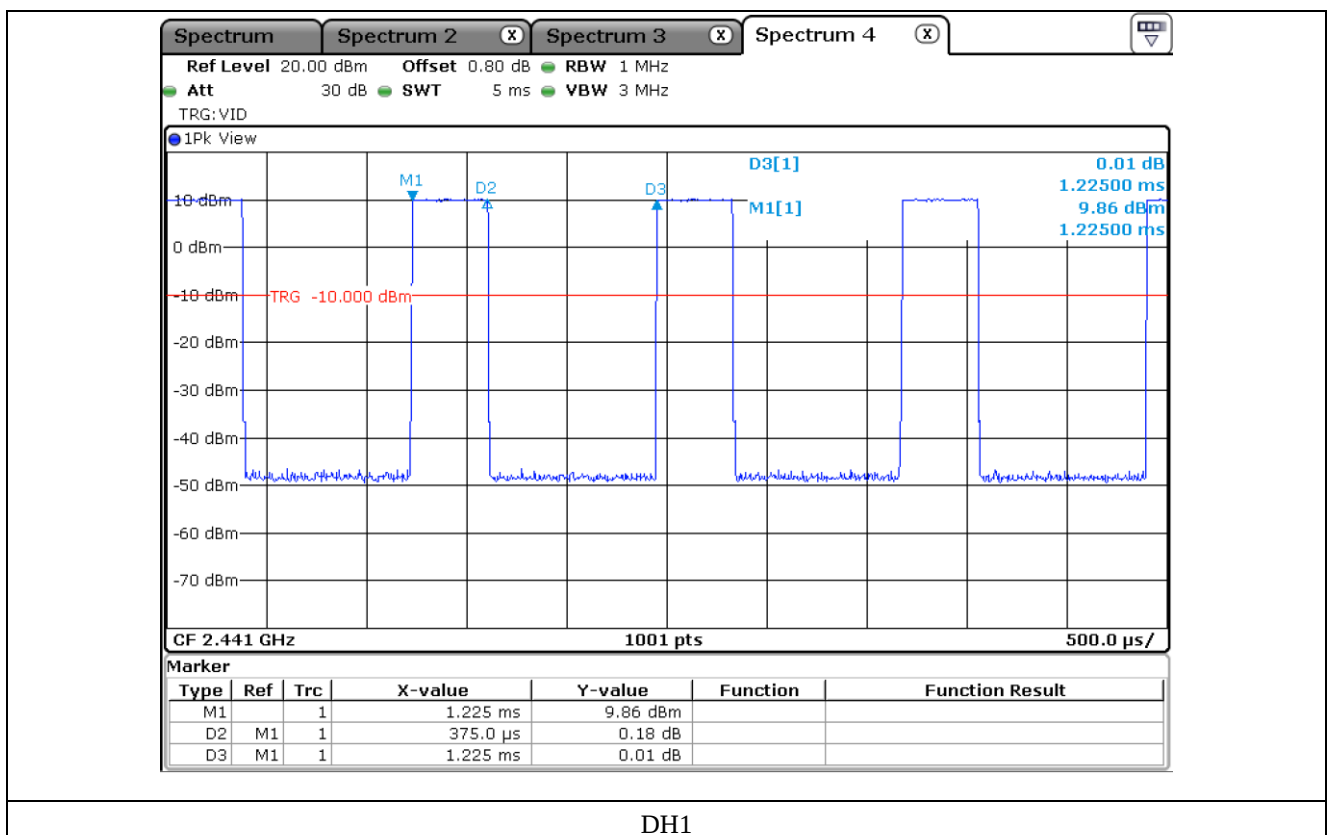
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So, The EUT has each channel for 10.13 times per second ( $= 1\,600/2/79$ ) for DH1, and 5.06 times ( $= 1\,600/4/79$ ) for DH3, and 3.38 times ( $= 1\,600/6/79$ ) for DH5.

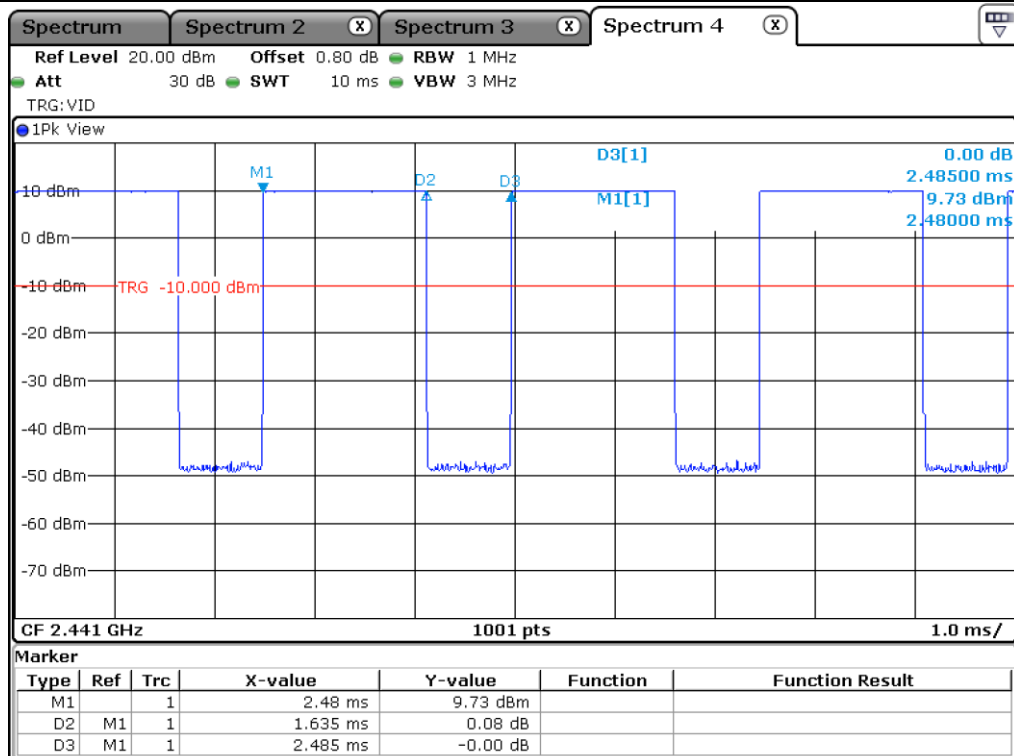
| Packet Type | Pulse Time (ms) | Hops per second with channels | Period Time (ms) | Total Dwell Time (ms) | Limit (ms) | Test Result |
|-------------|-----------------|-------------------------------|------------------|-----------------------|------------|-------------|
| DH1         | 0.375           | 10.13                         | 31.60            | 120.04                | 400.00     | PASS        |
| DH3         | 1.635           | 5.06                          | 31.60            | 261.43                | 400.00     |             |
| DH5         | 2.895           | 3.38                          | 31.60            | 309.21                | 400.00     |             |

Total dwell time is calculated as following.

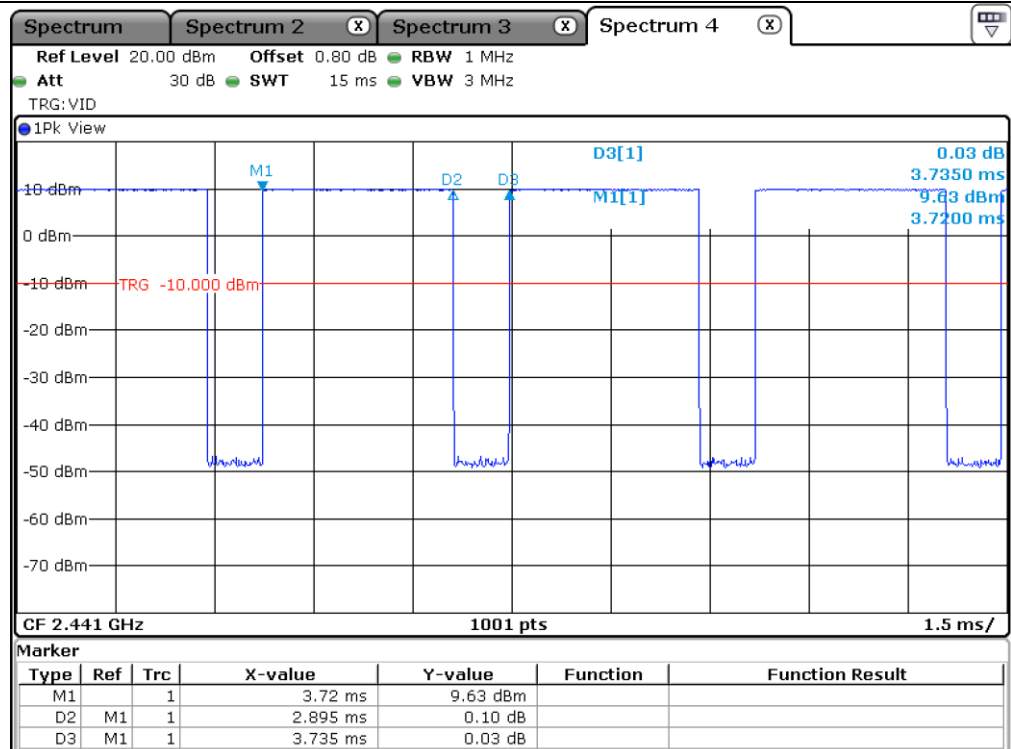
Total Dwell Time = Pulse time \* Hops per second with channels \* period time

Remark: See next page for an overview sweep performed with peak detector.





DH3



DH5

### 10.4.2 Test data for 2 Mbps

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625  $\mu$ s with 79 channels.

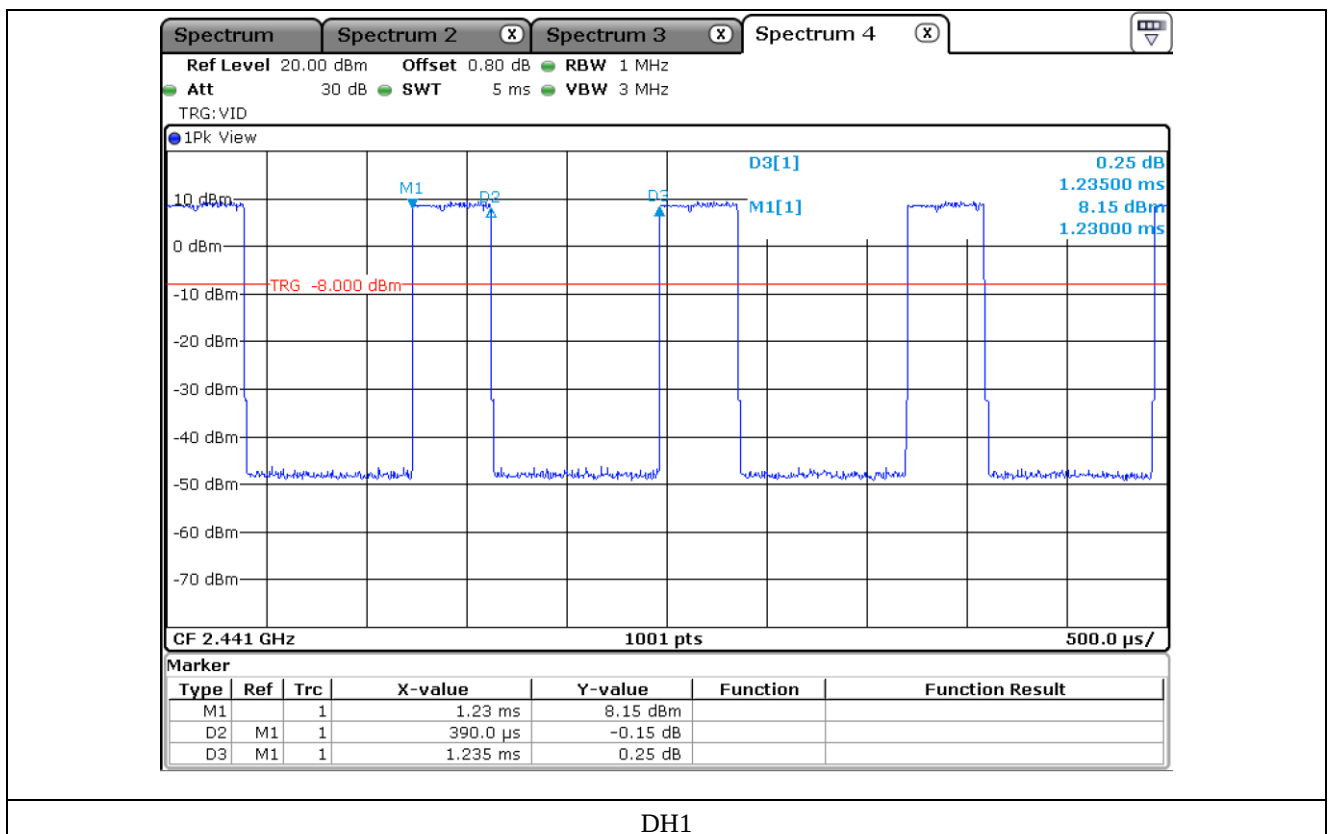
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So, The EUT has each channel for 10.13 times per second ( $= 1\,600/2/79$ ) for DH1, and 5.06 times ( $= 1\,600/4/79$ ) for DH3, and 3.38 times ( $= 1\,600/6/79$ ) for DH5.

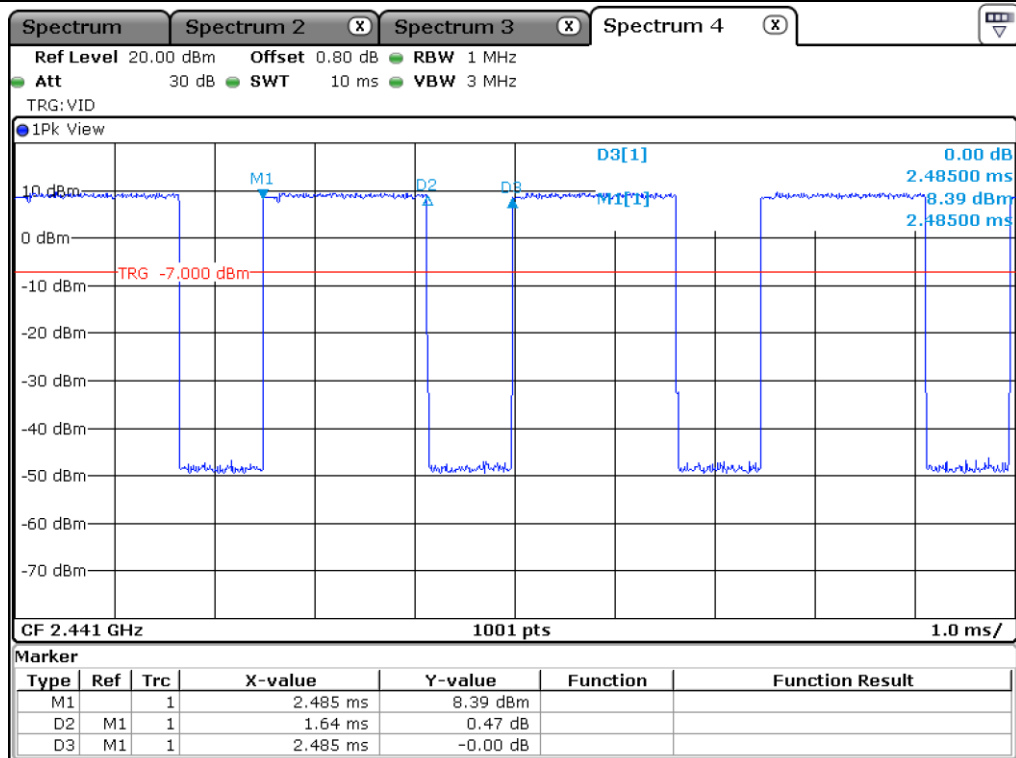
| Packet Type | Pulse Time (ms) | Hops per second with channels | Period Time (ms) | Total Dwell Time (ms) | Limit (ms) | Test Result |
|-------------|-----------------|-------------------------------|------------------|-----------------------|------------|-------------|
| DH1         | 0.390           | 10.13                         | 31.60            | 124.84                | 400.00     | PASS        |
| DH3         | 1.640           | 5.06                          | 31.60            | 262.23                | 400.00     |             |
| DH5         | 2.880           | 3.38                          | 31.60            | 307.61                | 400.00     |             |

Total dwell time is calculated as following.

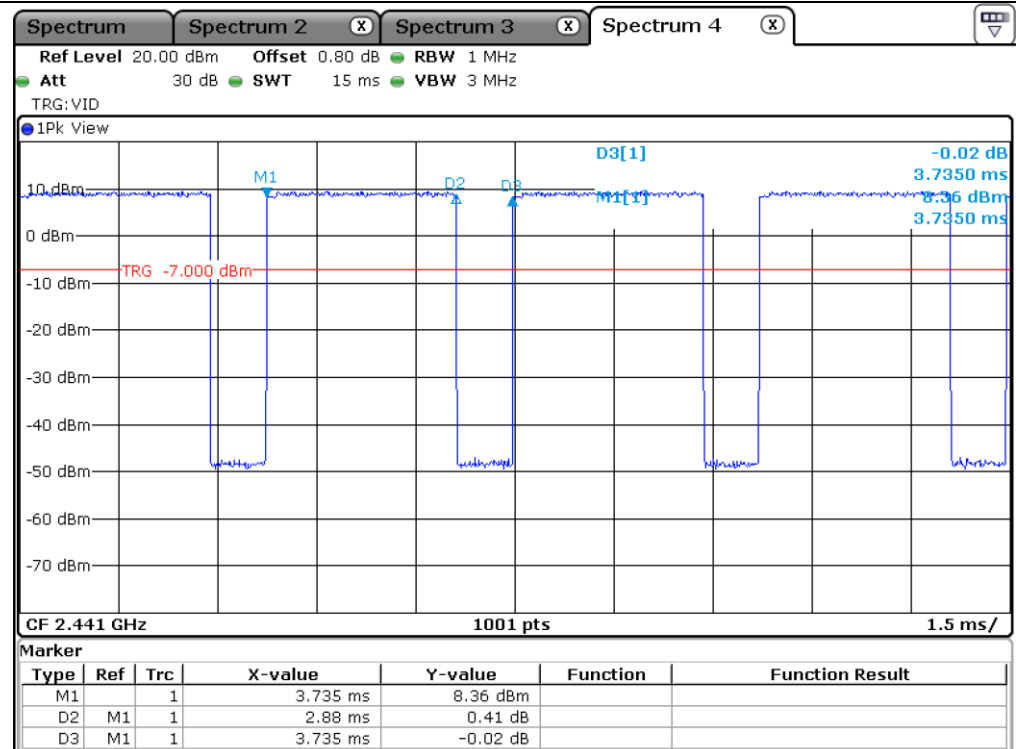
Total Dwell Time = Pulse time \* Hops per second with channels \* period time

Remark: See next page for an overview sweep performed with peak detector.





### DH3



### DH5

### 10.4.3 Test data for 3 Mbps

The system makes worst case 1 600 hops per second or 1 time slot has a length of 625  $\mu$ s with 79 channels.

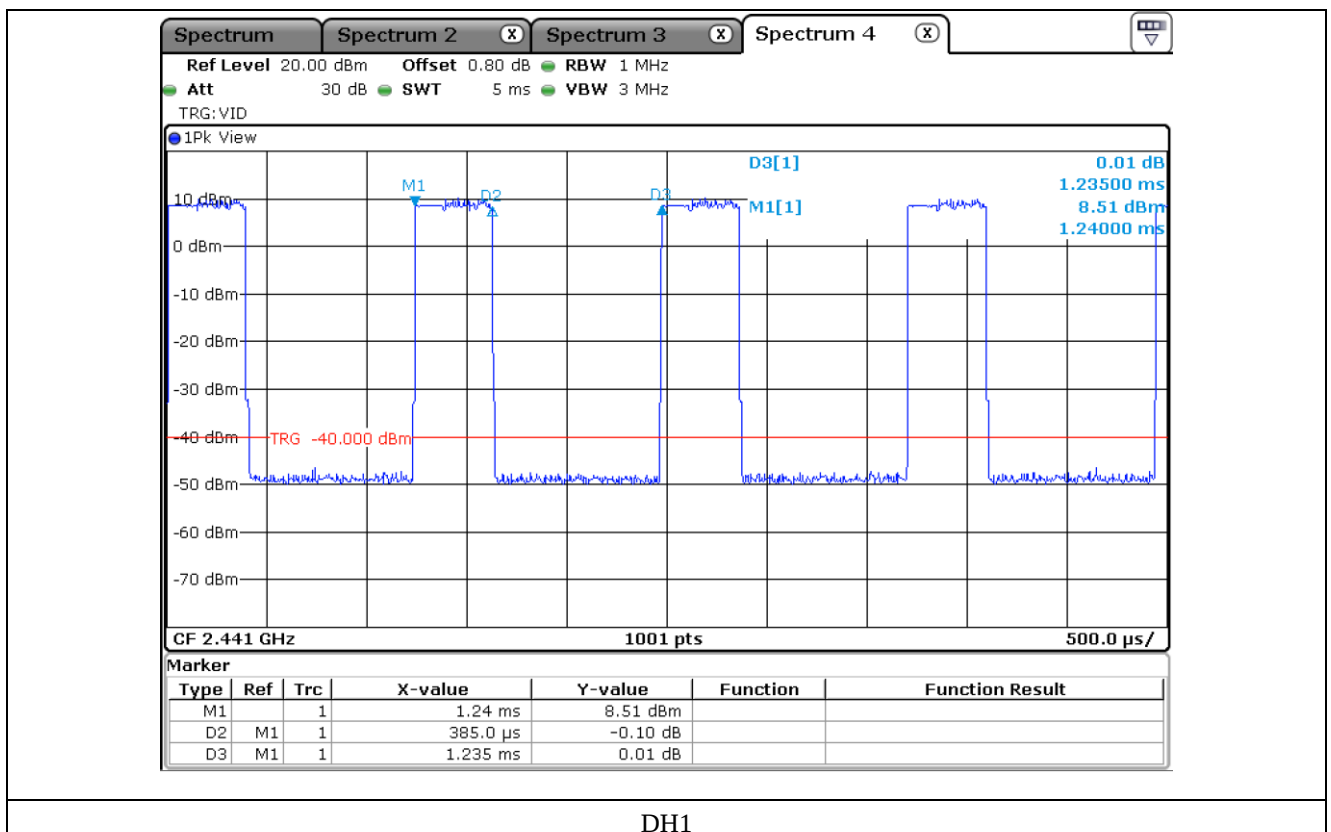
For DH1 packet type, the EUT needs 1 time slot for transmitting and 1 time slot for receiving and for DH3 packet type, the EUT needs 3 times slots for transmitting and 1 time slot for receiving, and DH5 packet needs 5 times slots for transmitting and 1 time slot for receiving. So, The EUT has each channel for 10.13 times per second ( $= 1\,600/2/79$ ) for DH1, and 5.06 times ( $= 1\,600/4/79$ ) for DH3, and 3.38 times ( $= 1\,600/6/79$ ) for DH5.

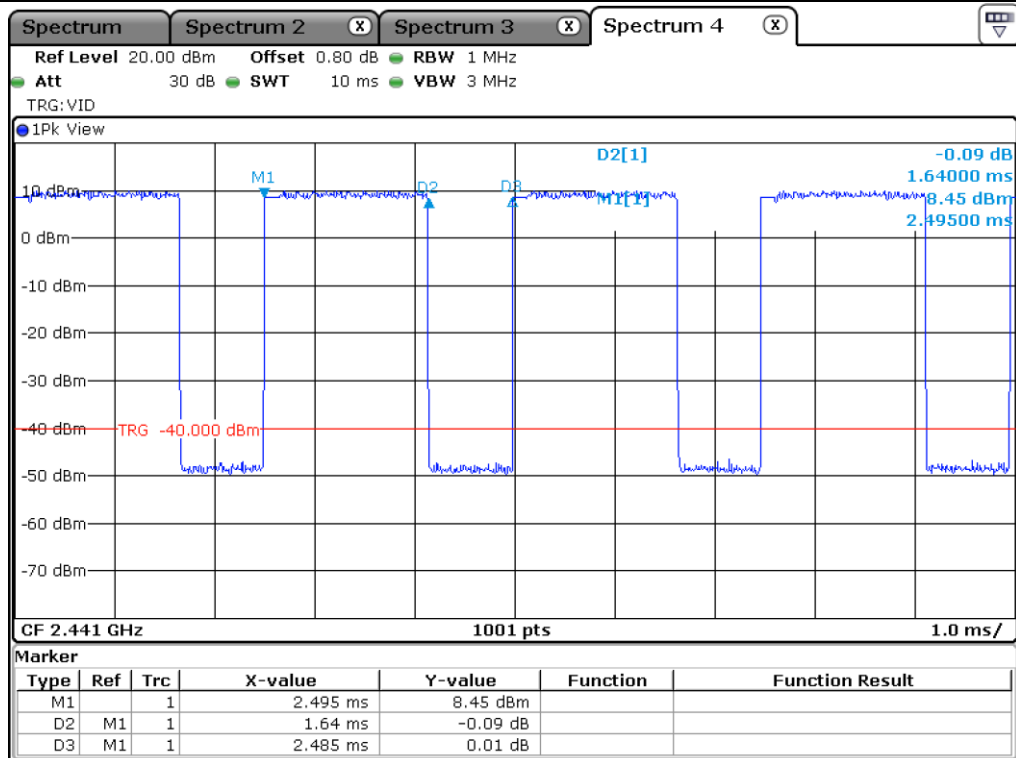
| Packet Type | Pulse Time (ms) | Hops per second with channels | Period Time (ms) | Total Dwell Time (ms) | Limit (ms) | Test Result |
|-------------|-----------------|-------------------------------|------------------|-----------------------|------------|-------------|
| DH1         | 0.385           | 10.13                         | 31.60            | 123.24                | 400.00     | PASS        |
| DH3         | 1.640           | 5.06                          | 31.60            | 262.23                | 400.00     |             |
| DH5         | 2.895           | 3.38                          | 31.60            | 309.21                | 400.00     |             |

Total dwell time is calculated as following.

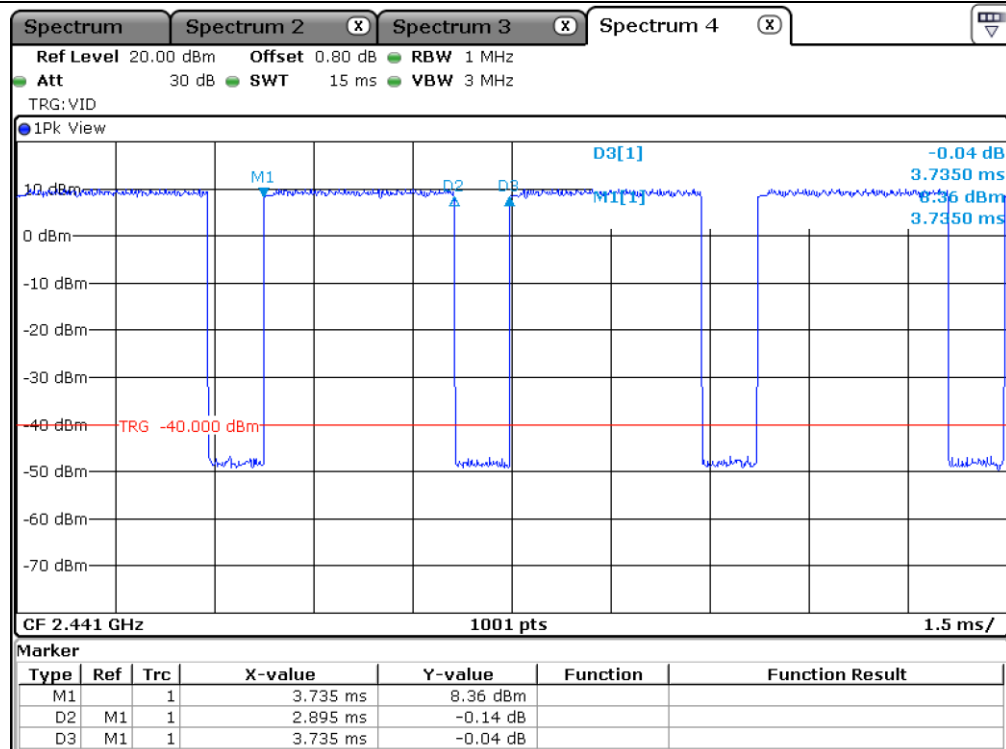
Total Dwell Time = Pulse time \* Hops per second with channels \* period time

Remark: See next page for an overview sweep performed with peak detector.





DH3



DH5

## 11. MAXIMUM PEAK OUTPUT POWER

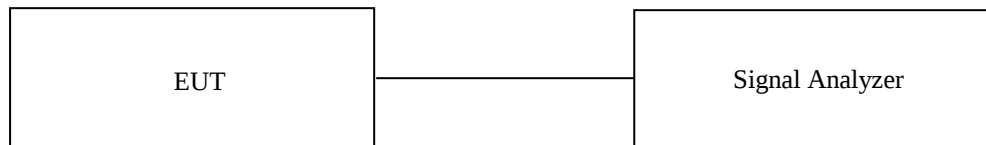
### 11.1 Operating environment

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

### 11.2 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.



### 11.3 Test Date

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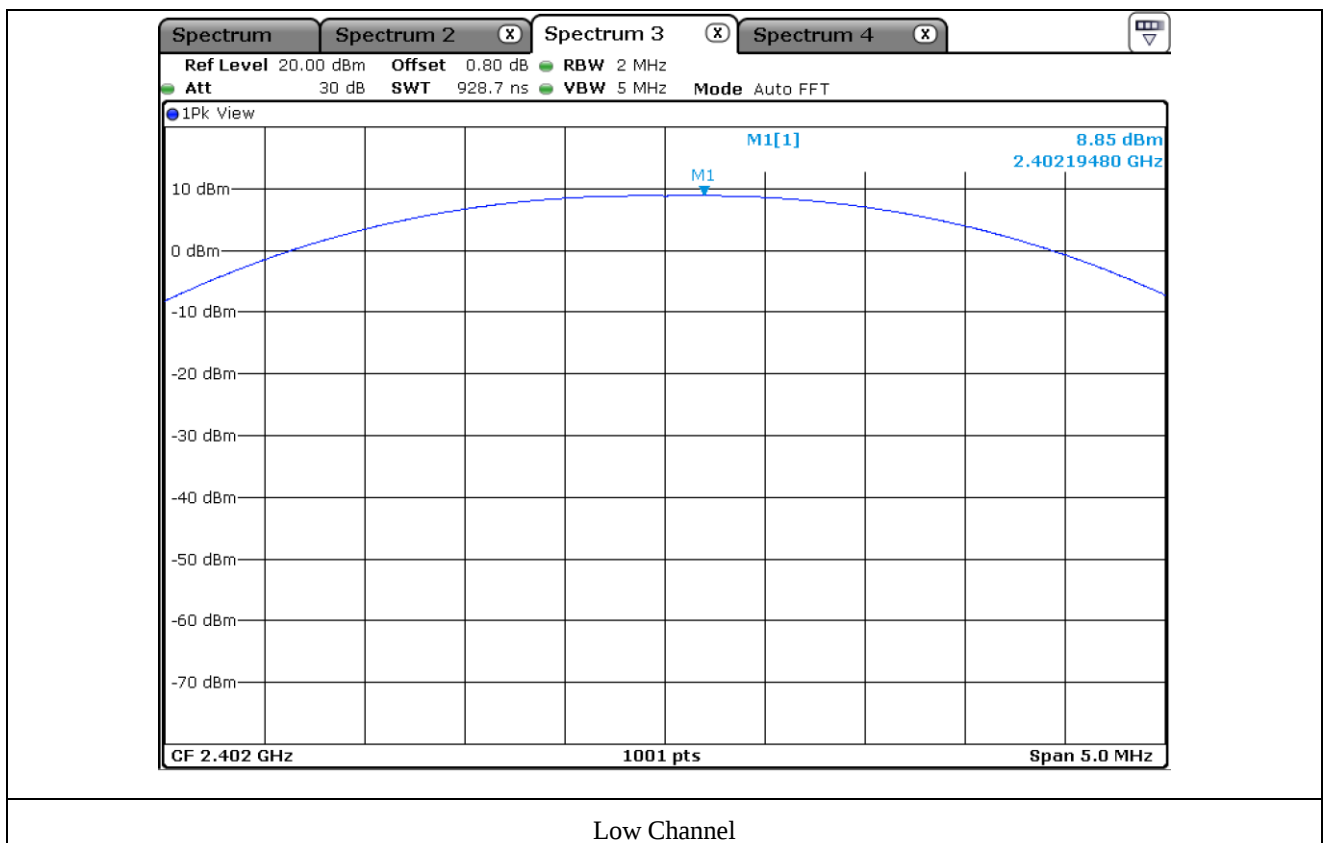
## 11.4 Test data

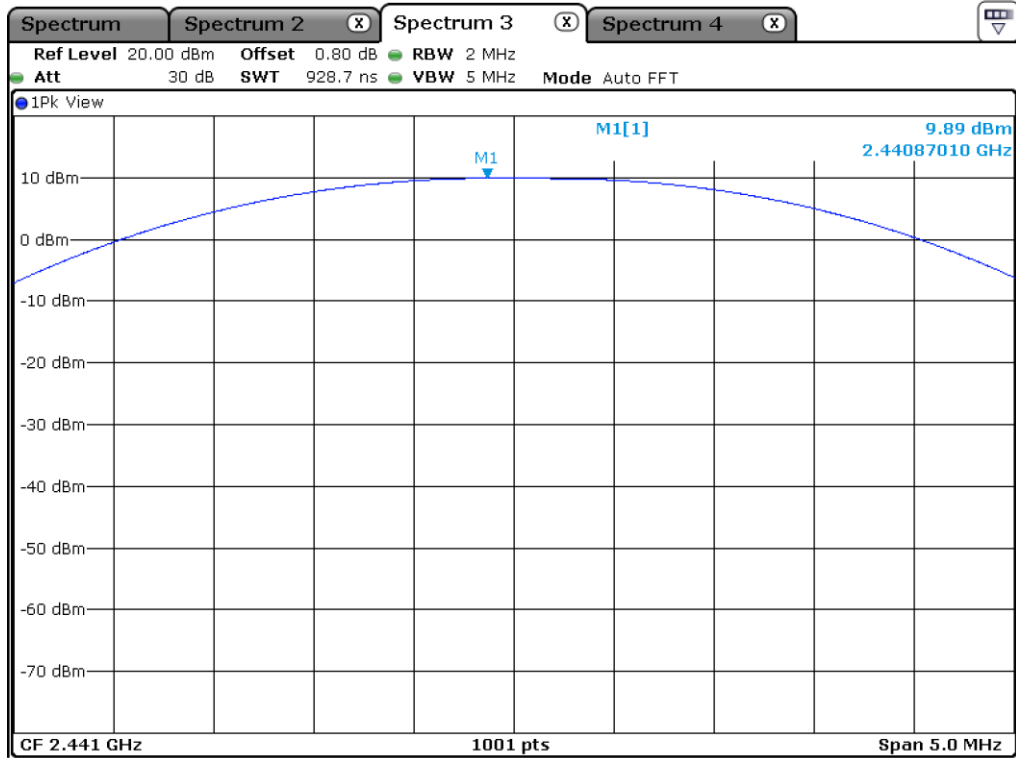
### 11.4.1 Test data for 1 Mbps

-. Test Result : Pass

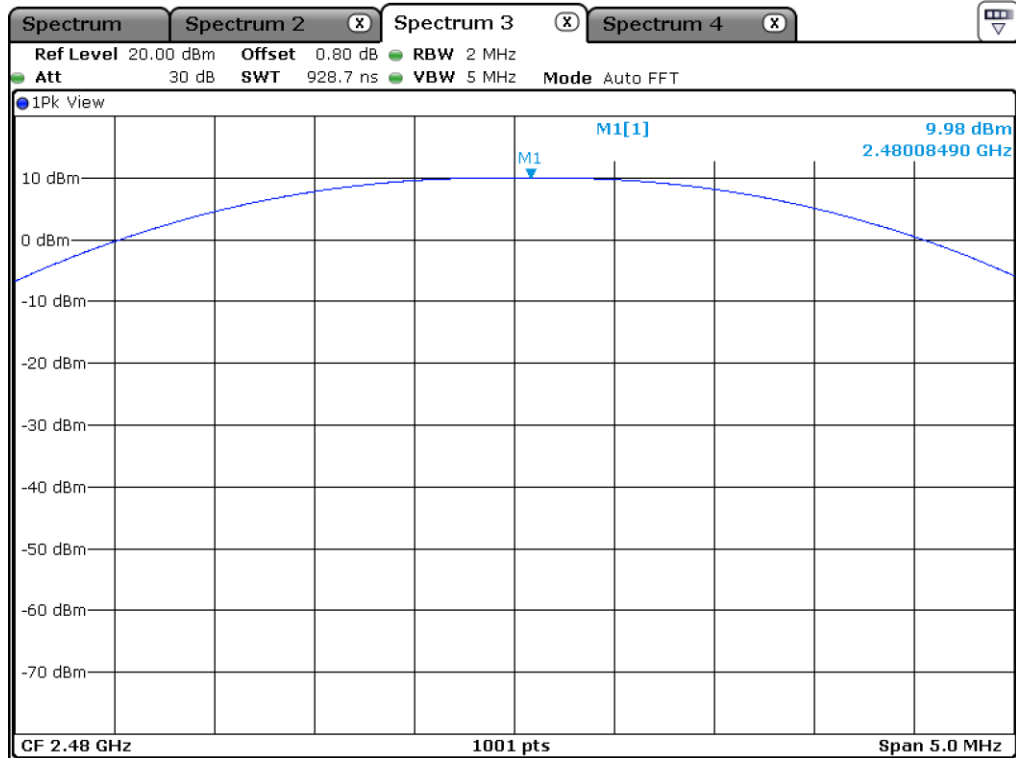
| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 402.00           | 8.85                    | 21.00          | 12.15          |
| MIDDLE  | 2 441.00           | 9.89                    | 21.00          | 11.11          |
| HIGH    | 2 480.00           | 9.98                    | 21.00          | 11.02          |

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





Middle Channel



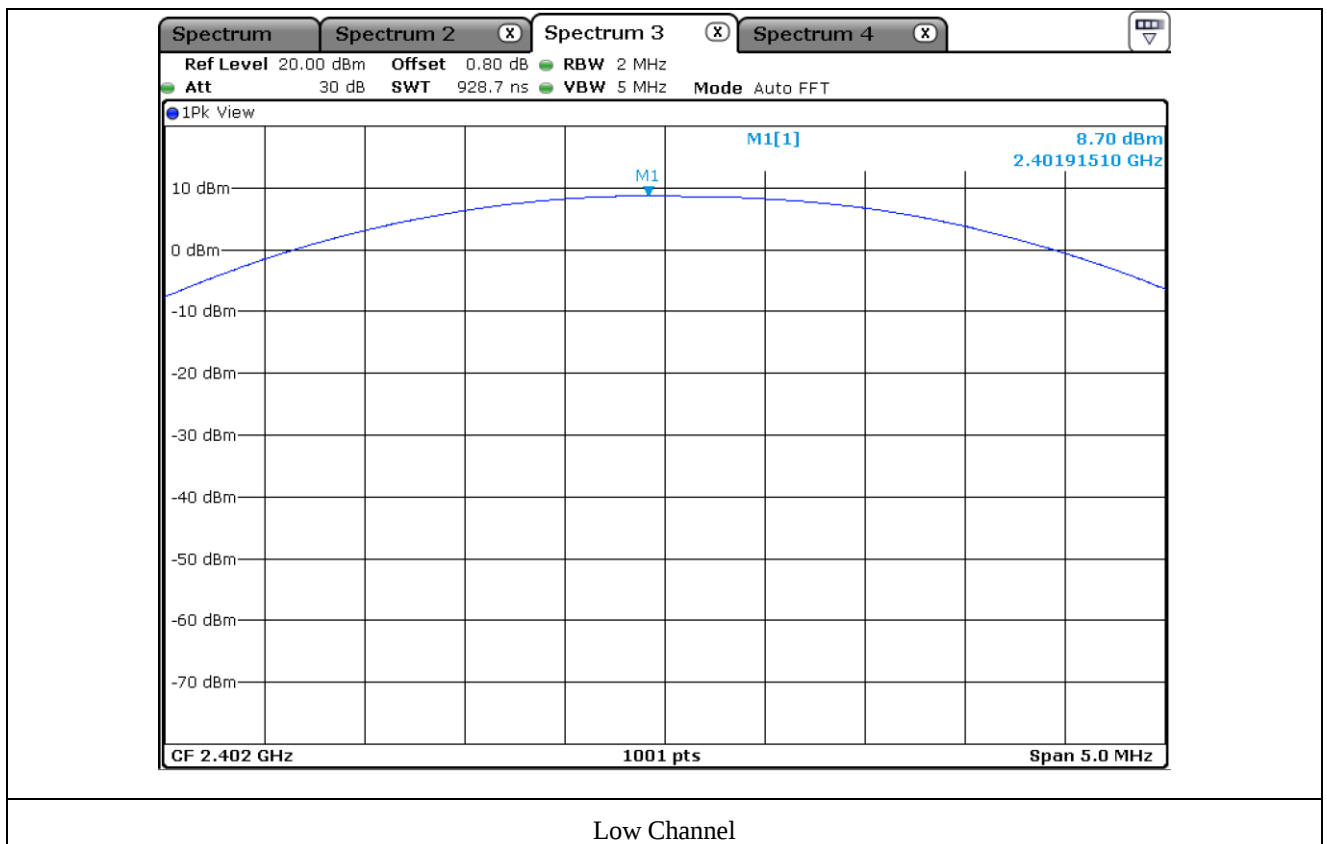
High Channel

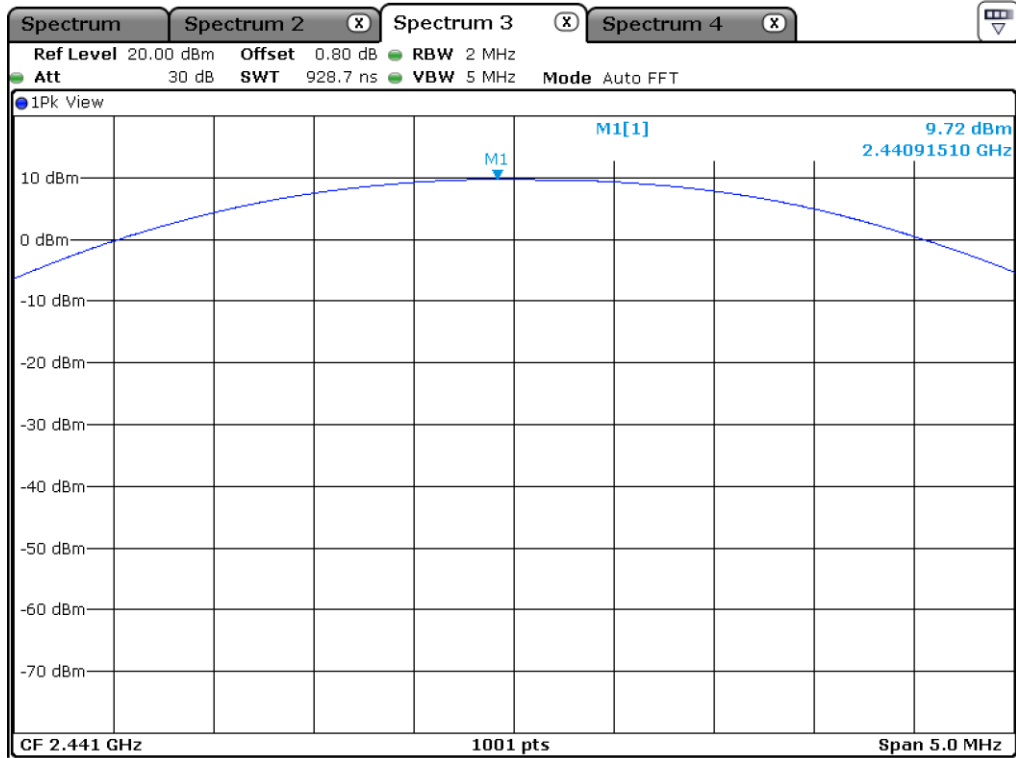
### 11.4.2 Test data for 2 Mbps

-. Test Result : Pass

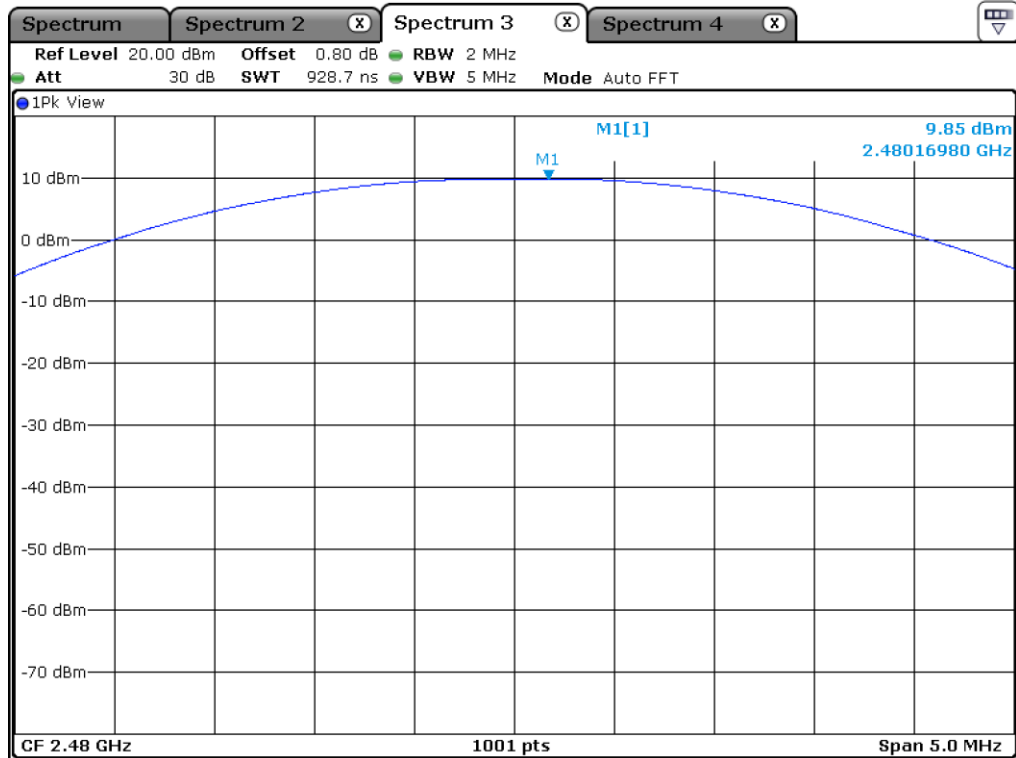
| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 402.00           | 8.70                    | 21.00          | 12.30          |
| MIDDLE  | 2 441.00           | 9.72                    | 21.00          | 11.28          |
| HIGH    | 2 480.00           | 9.85                    | 21.00          | 11.15          |

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





Middle Channel



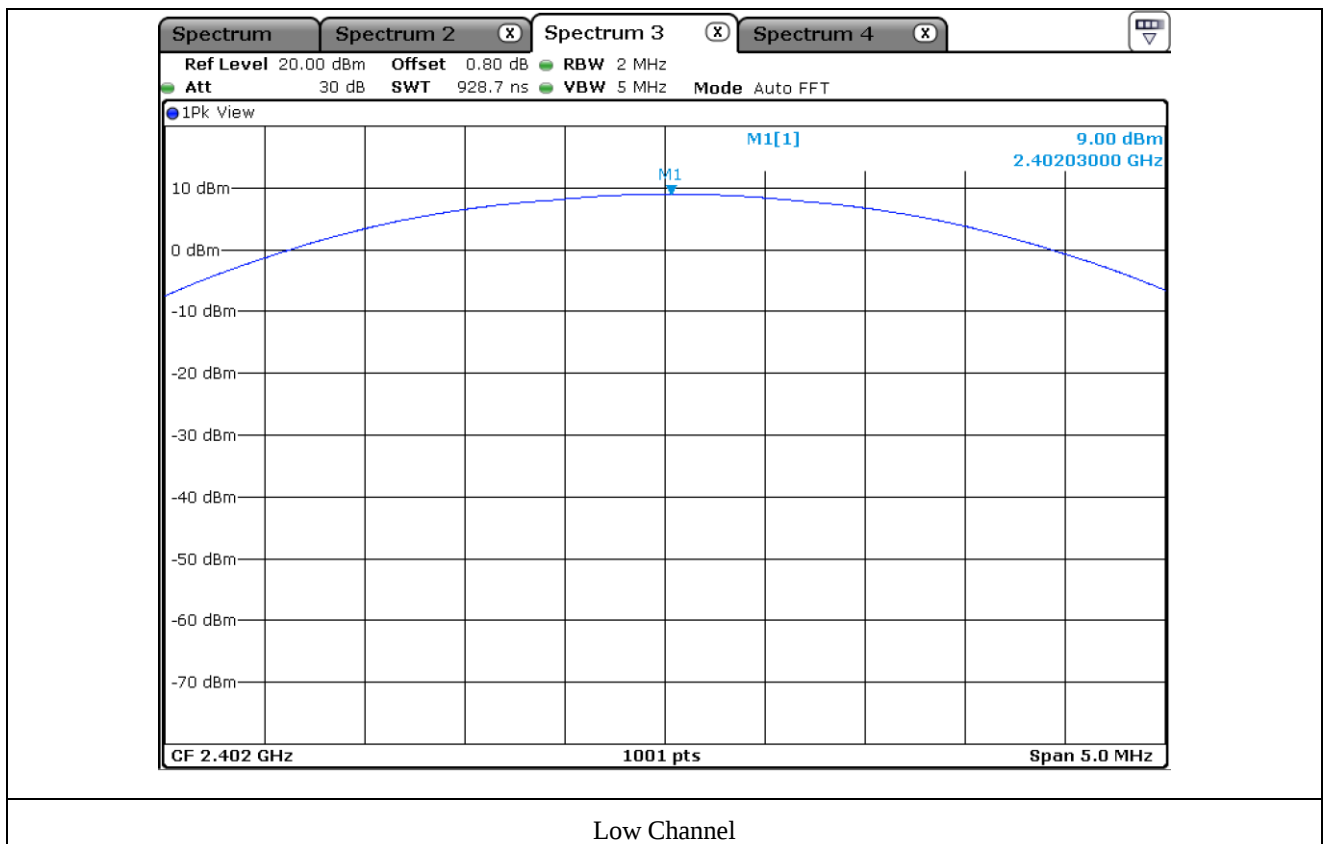
High Channel

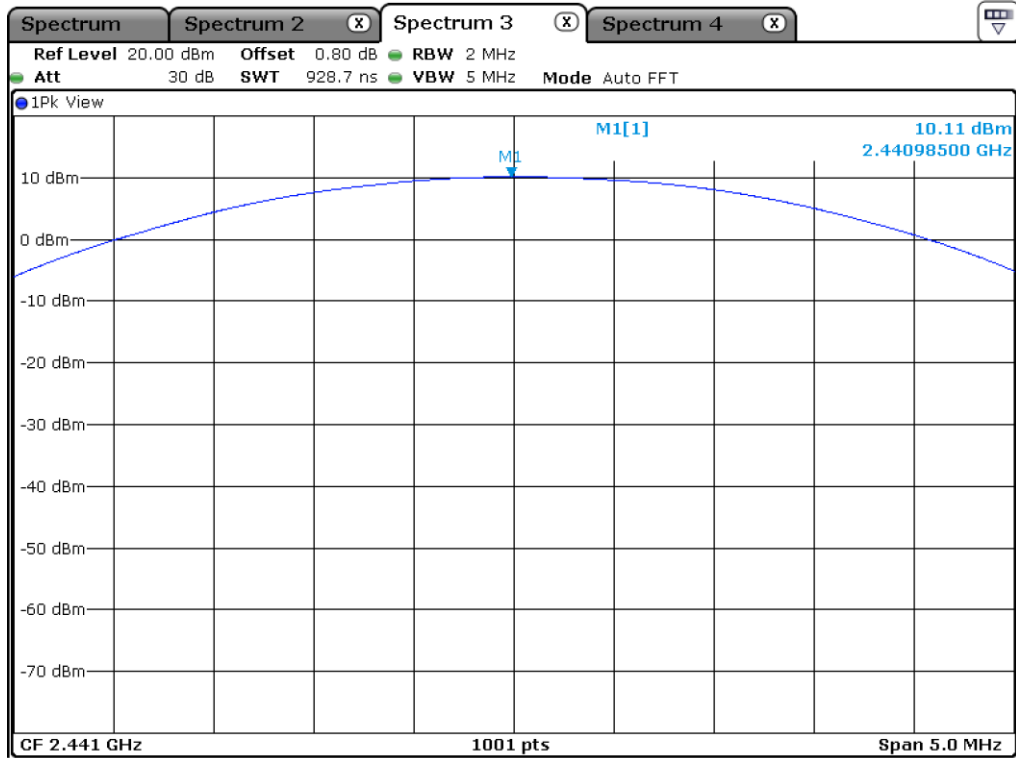
### 11.4.3 Test data for 3 Mbps

-. Test Result : Pass

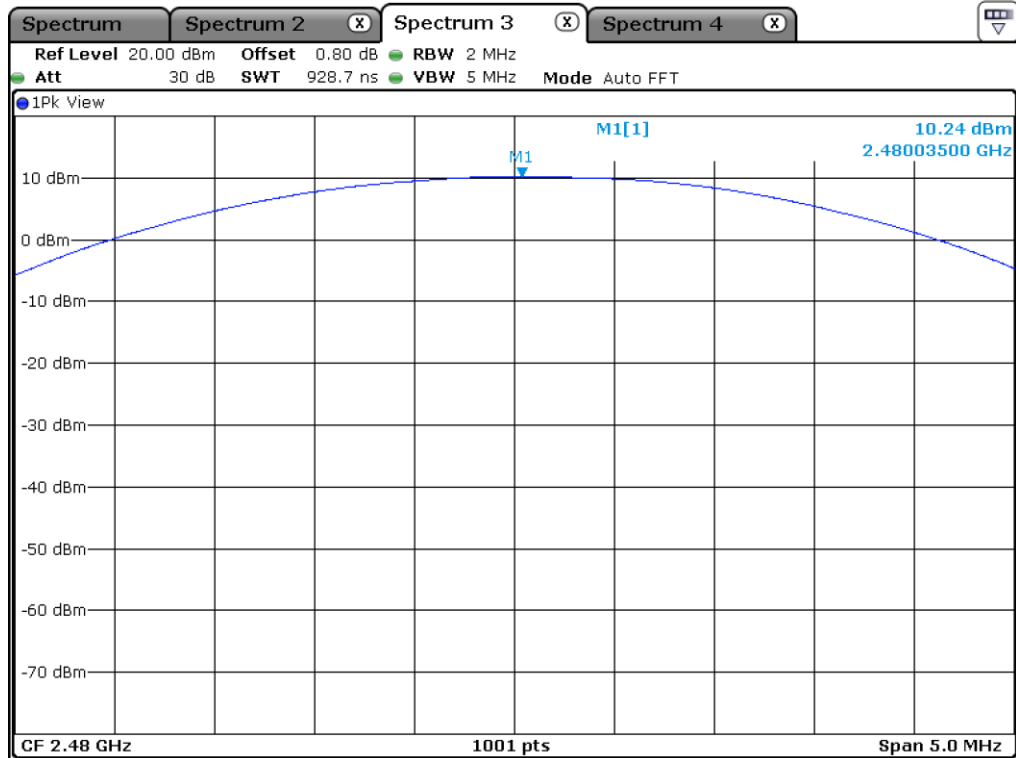
| CHANNEL | FREQUENCY<br>(MHz) | MEASURED VALUE<br>(dBm) | LIMIT<br>(dBm) | MARGIN<br>(dB) |
|---------|--------------------|-------------------------|----------------|----------------|
| LOW     | 2 402.00           | 9.00                    | 21.00          | 12.00          |
| MIDDLE  | 2 441.00           | 10.11                   | 21.00          | 10.89          |
| HIGH    | 2 480.00           | 10.24                   | 21.00          | 10.76          |

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





### Middle Channel



### High Channel

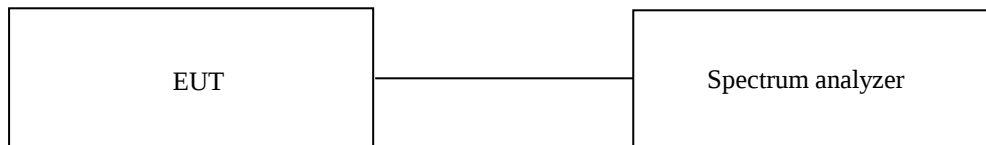
## 12. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 12.1 Operating environment

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

### 12.2 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.



### 12.3 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.

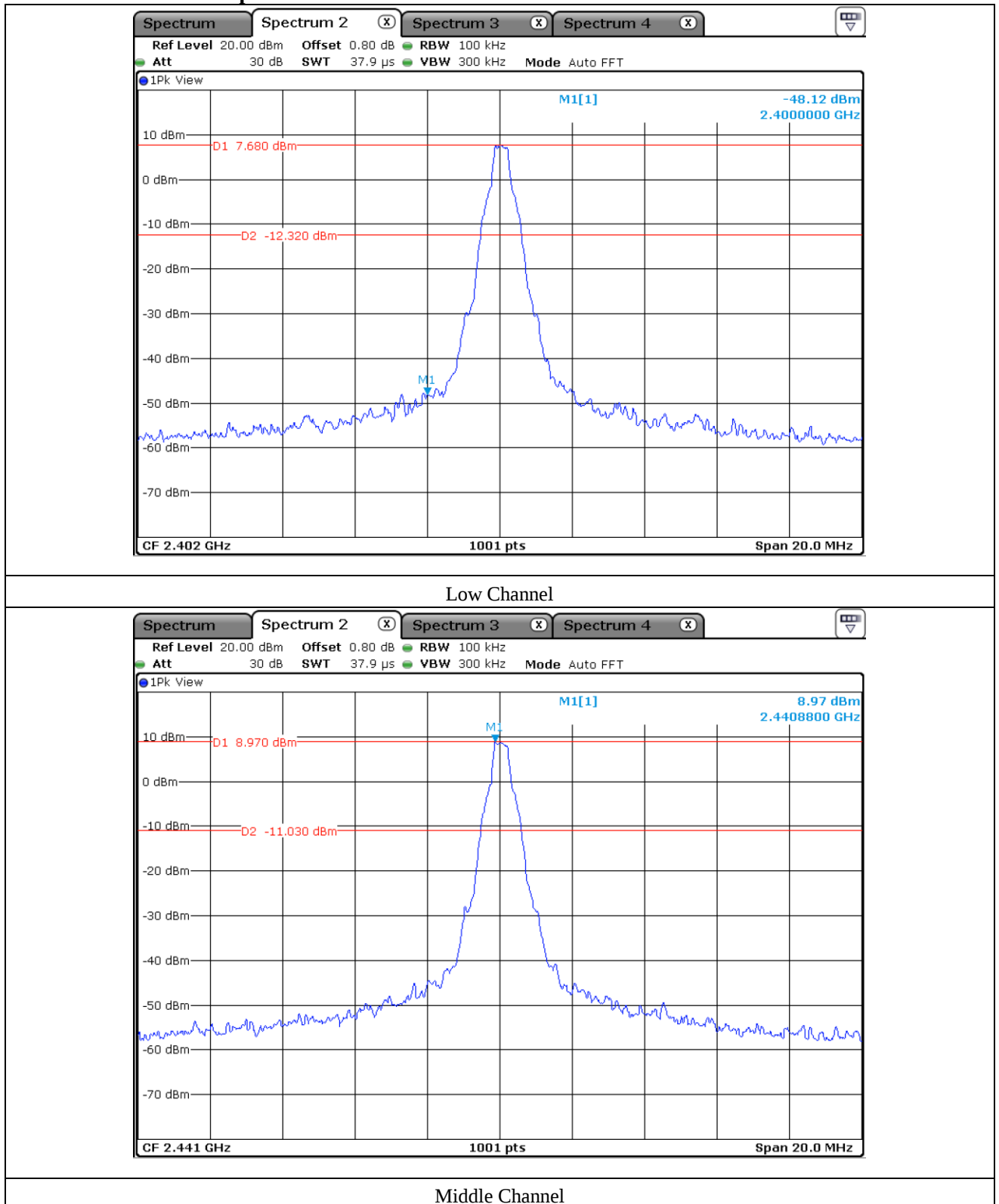
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal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

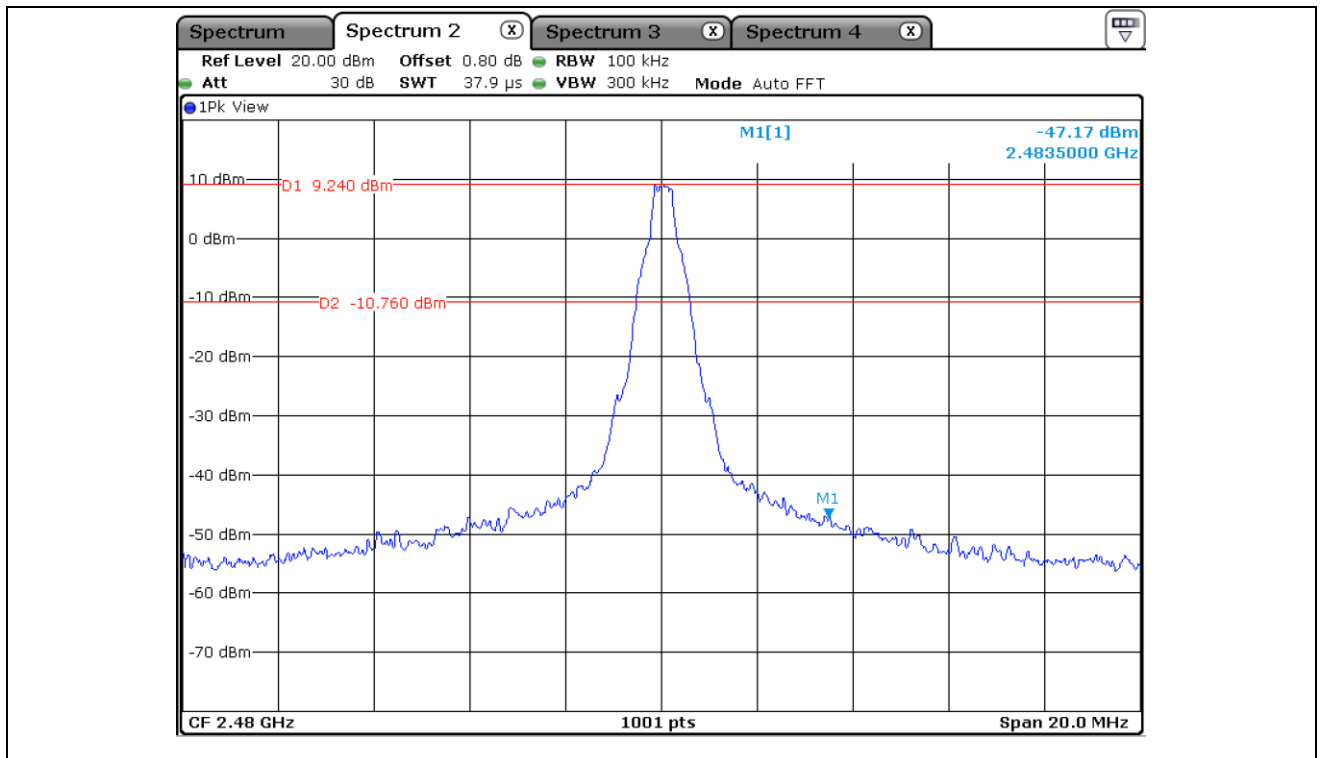
### 12.4 Test Date

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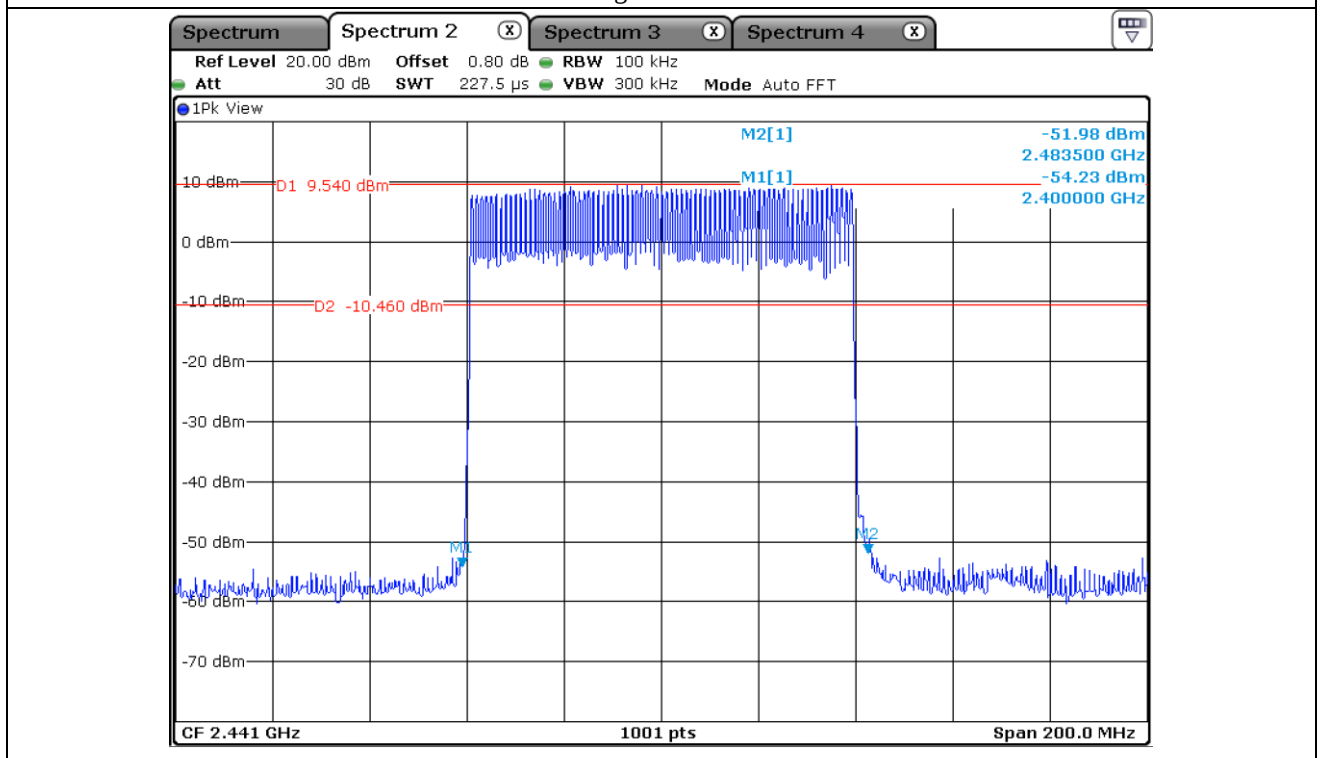
## 12.5 Test data for conducted emission

### 12.5.1 Test data for 1 Mbps

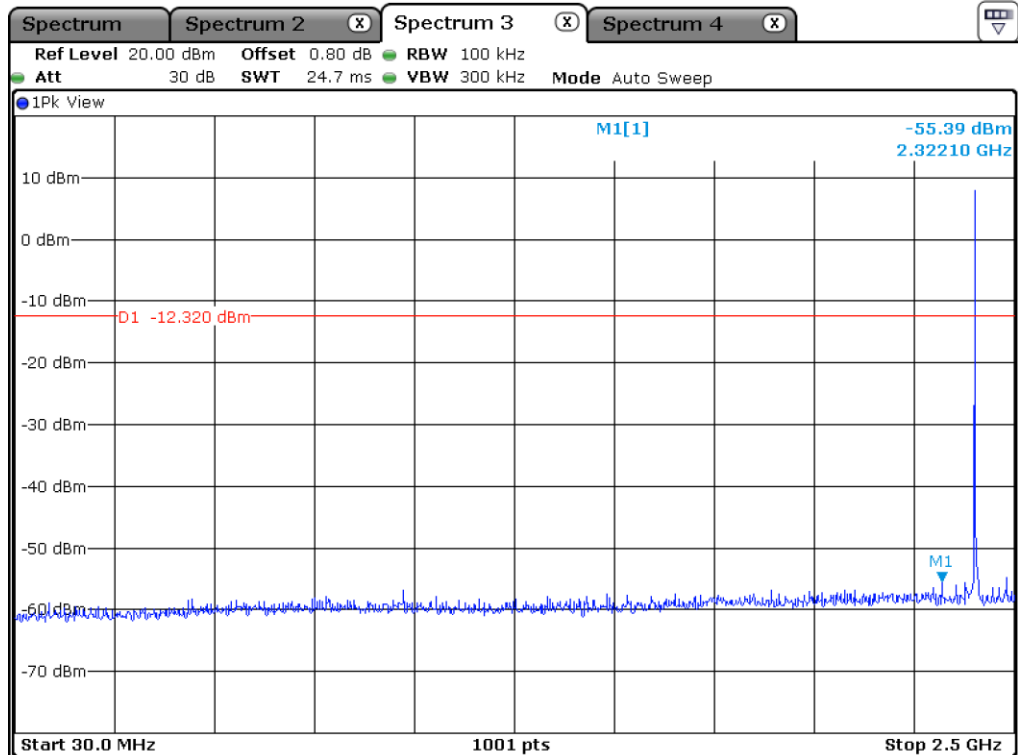




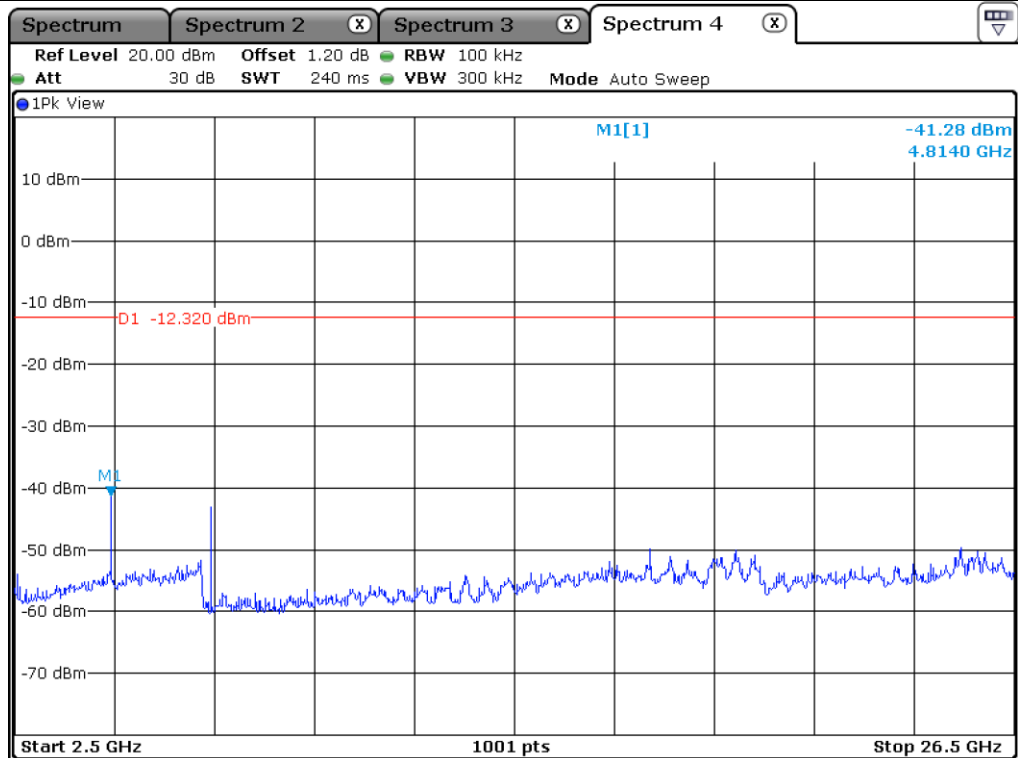
High Channel



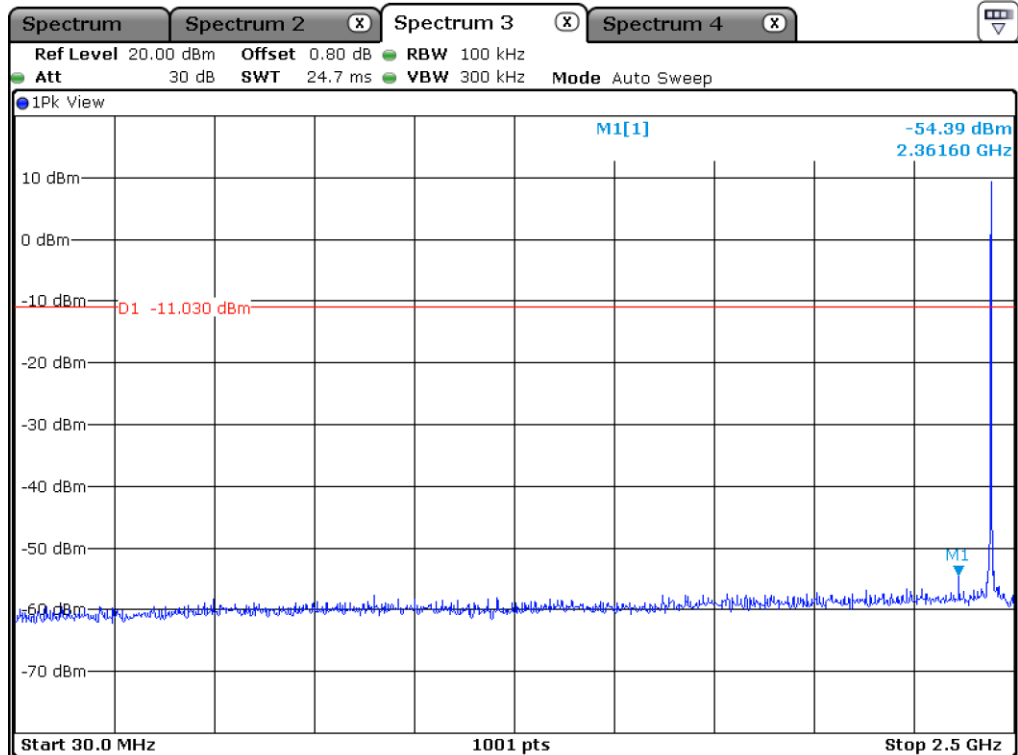
Hopping Mode



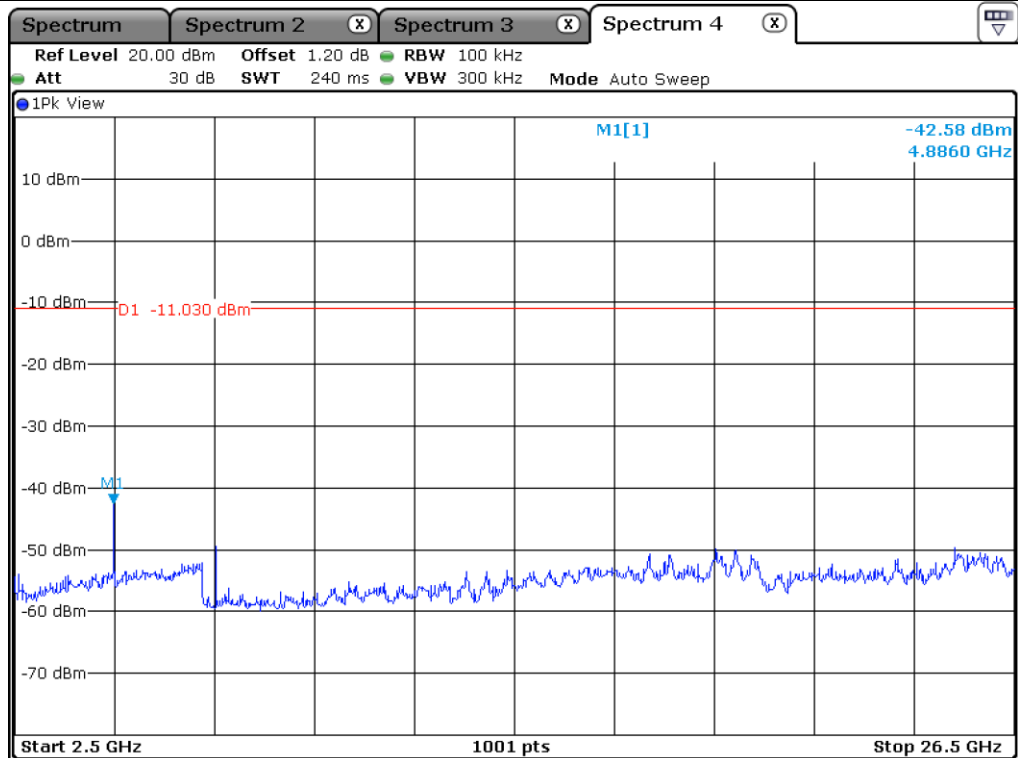
Low Channel



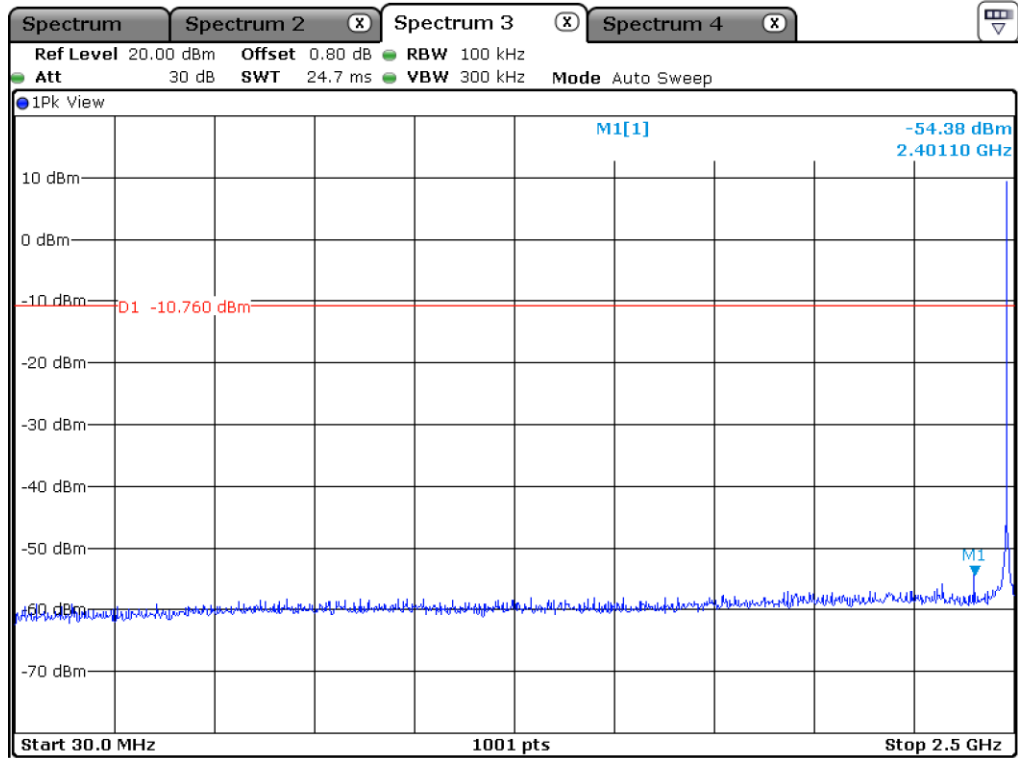
Low Channel



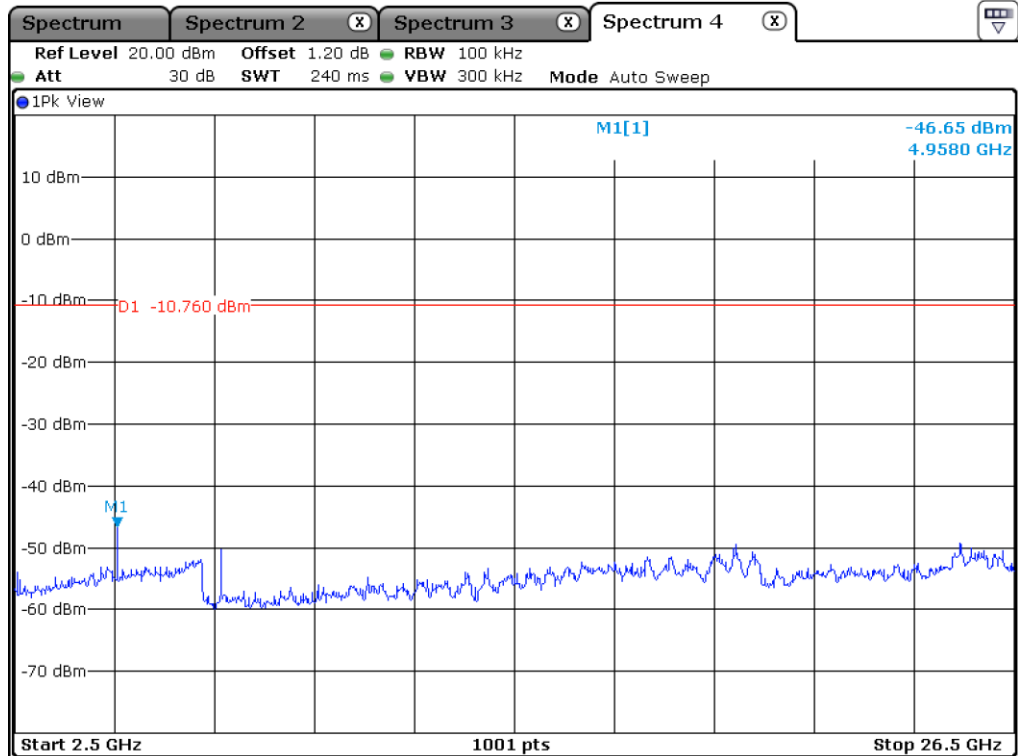
Middle Channel



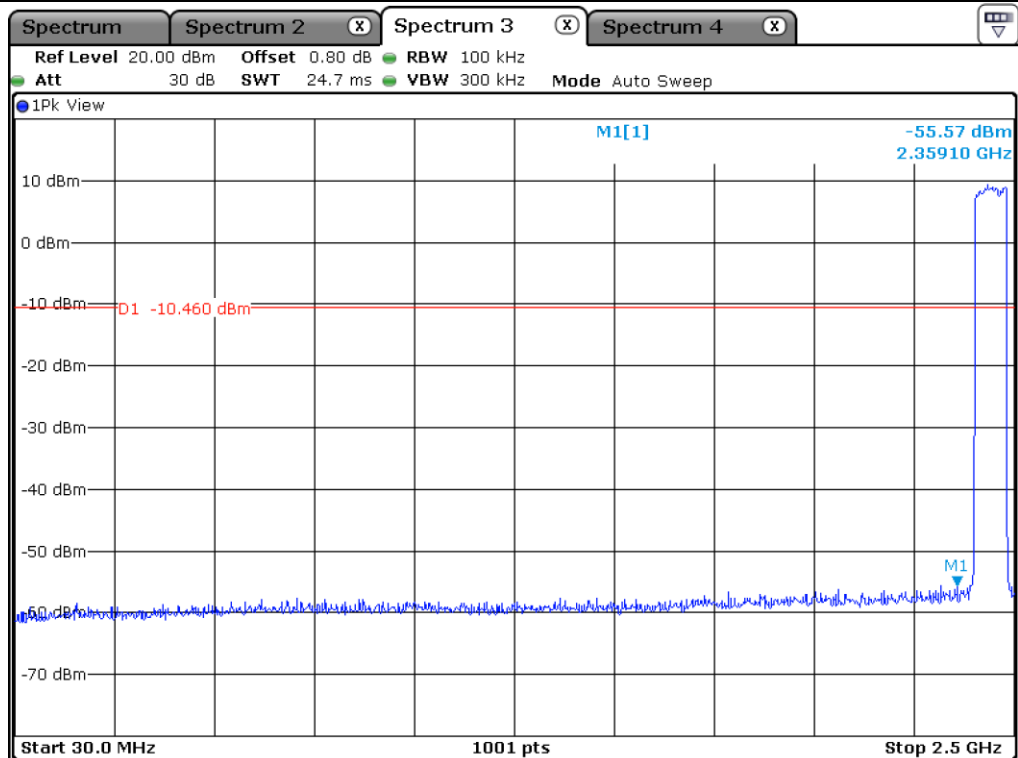
Middle Channel



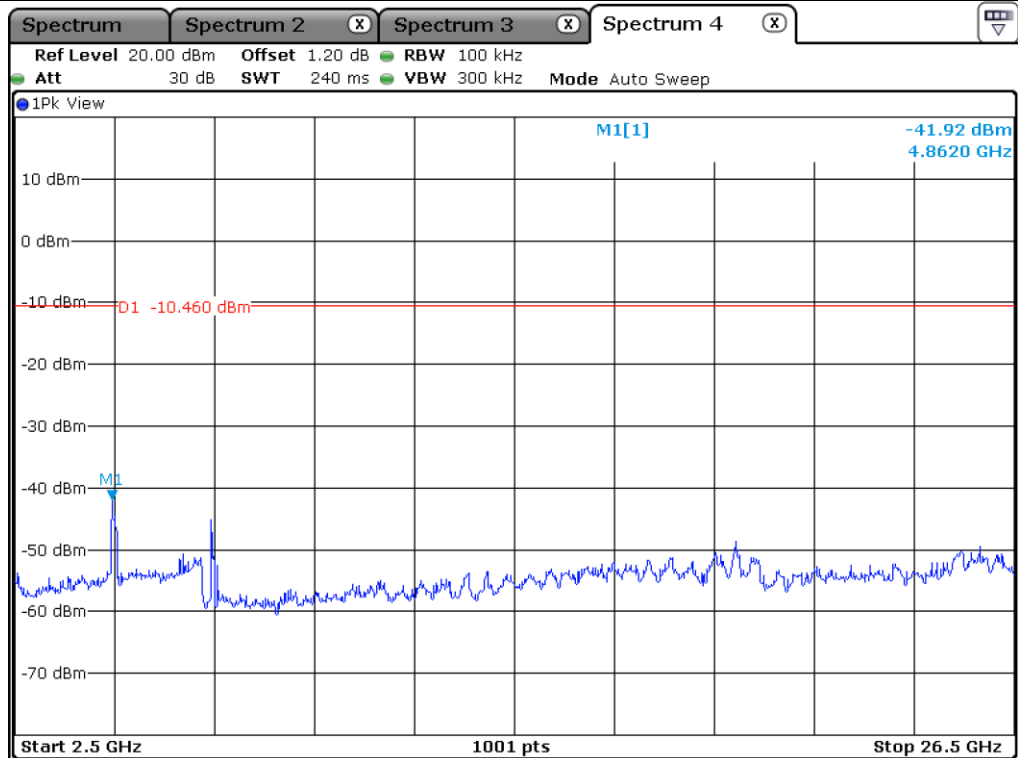
### High Channel



### High Channel

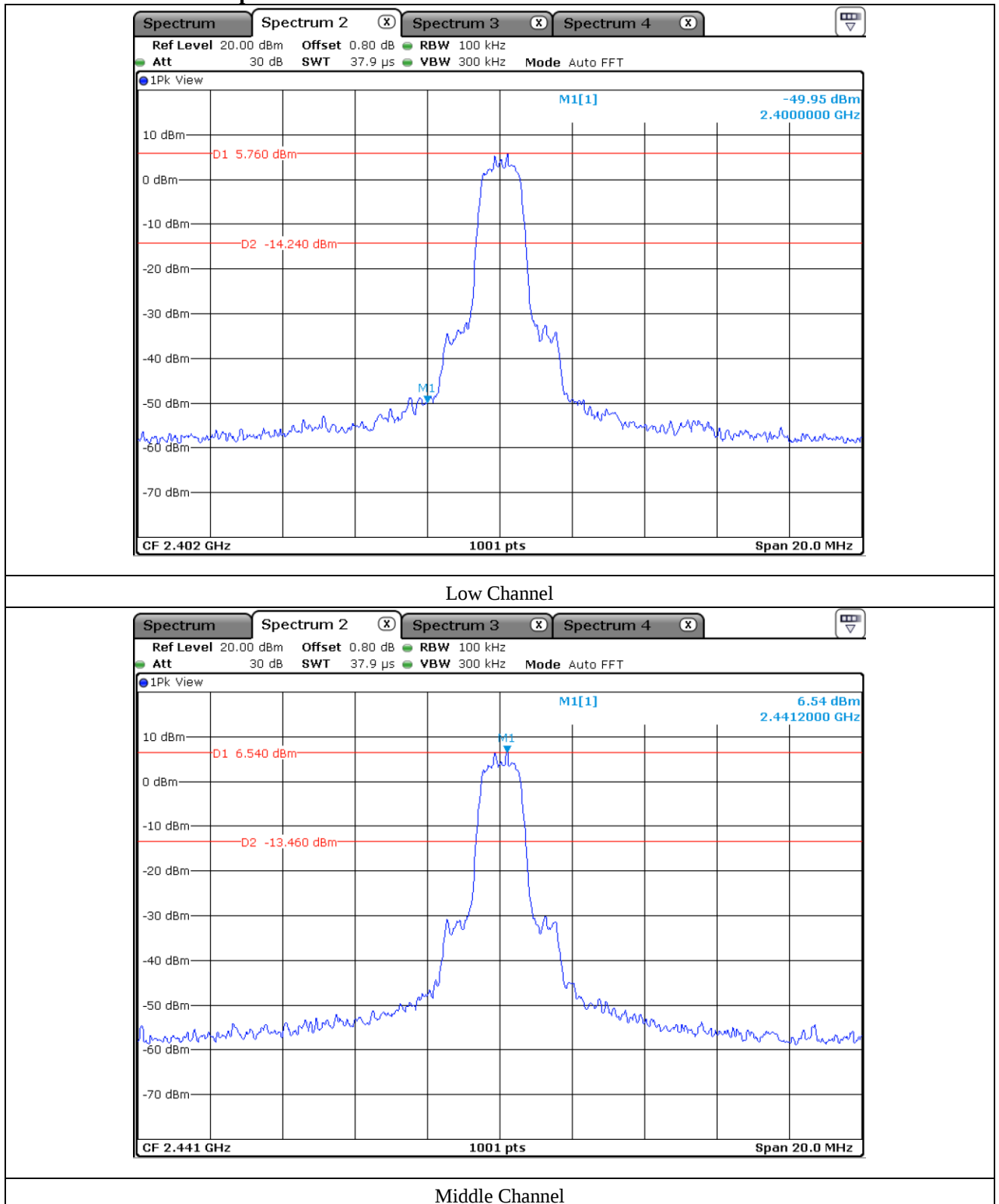


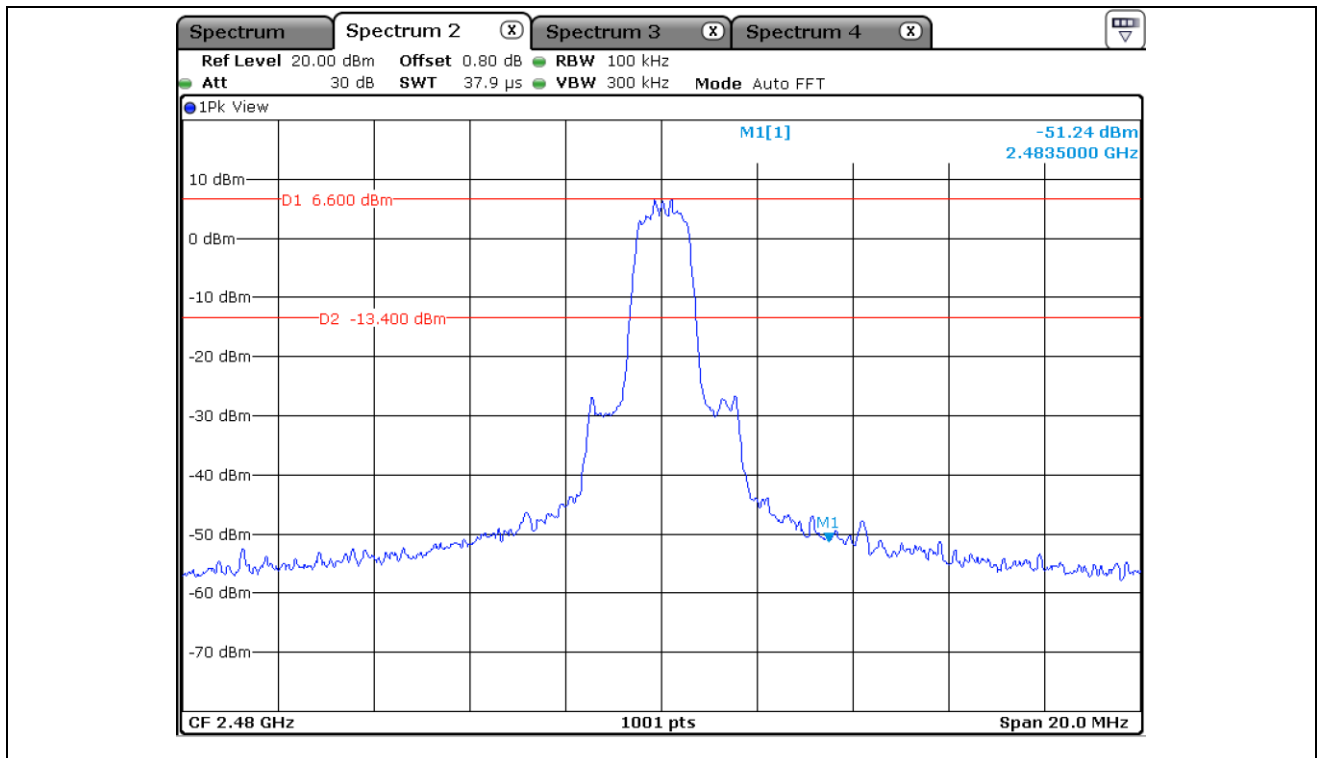
### Hopping Mode



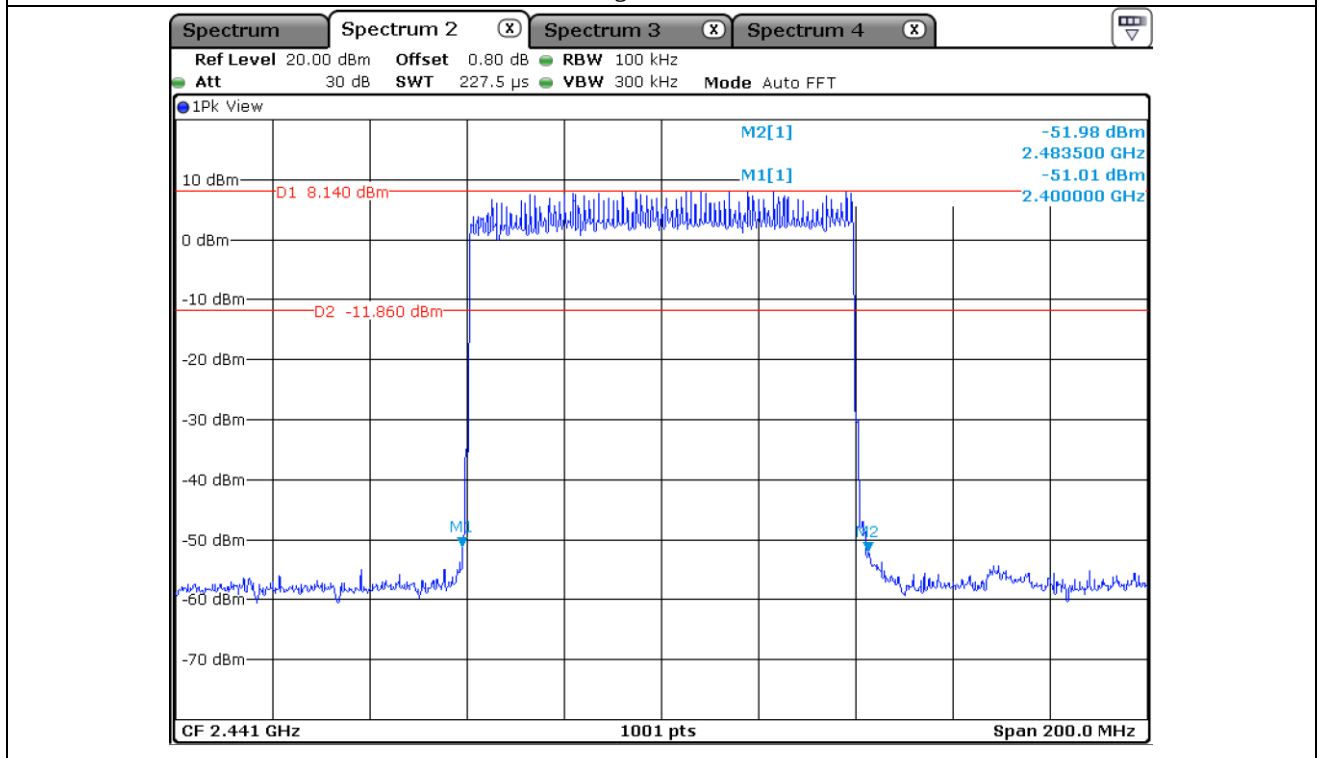
### Hopping Mode

## 12.5.2 Test data for 2 Mbps

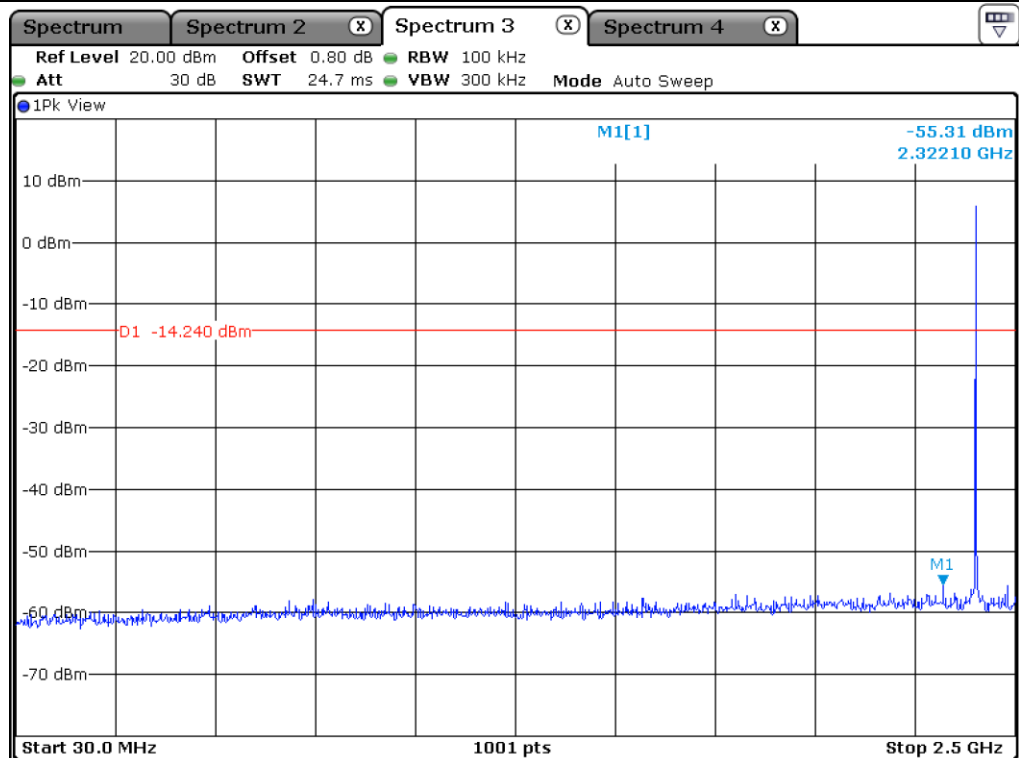




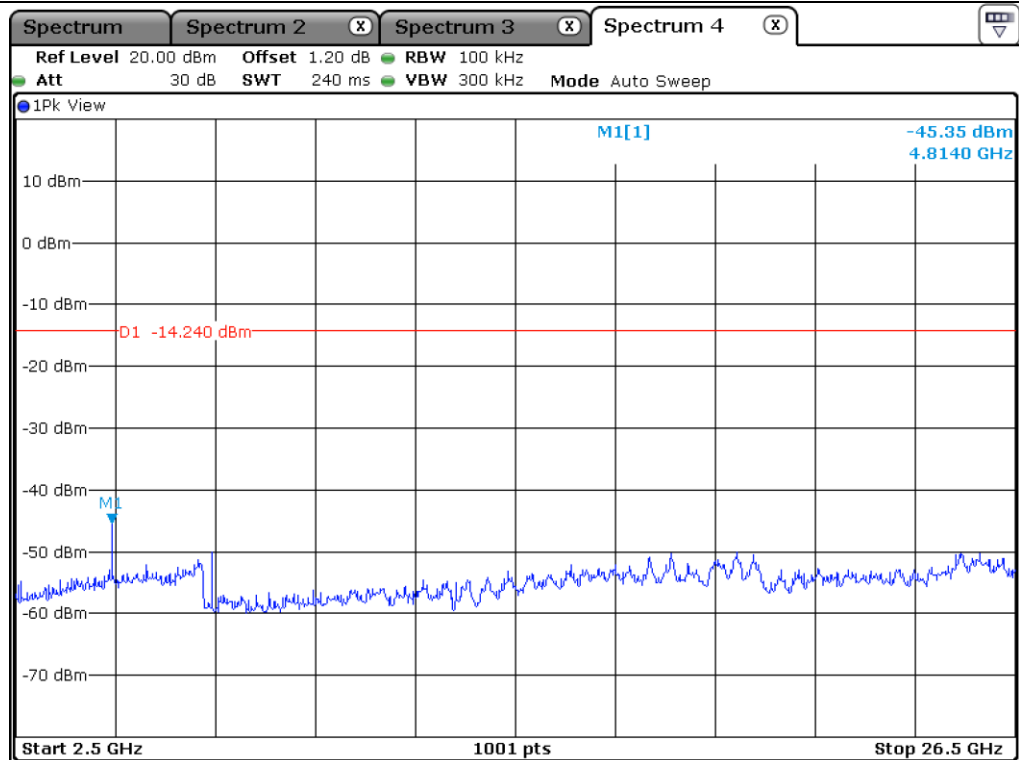
### High Channel



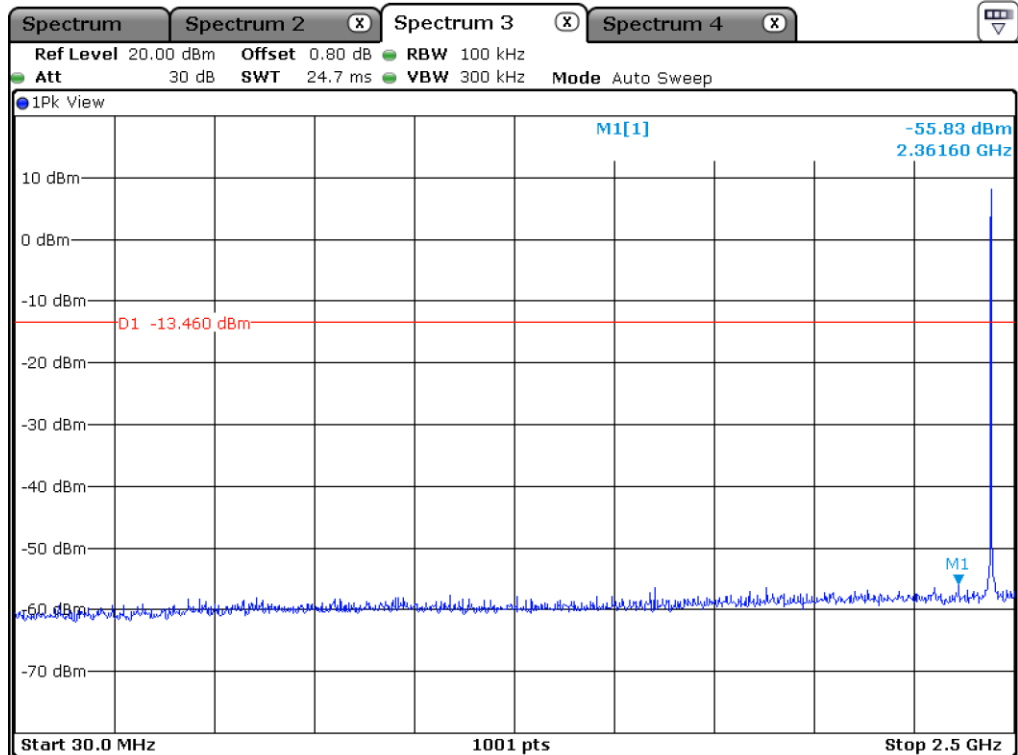
### Hopping Mode



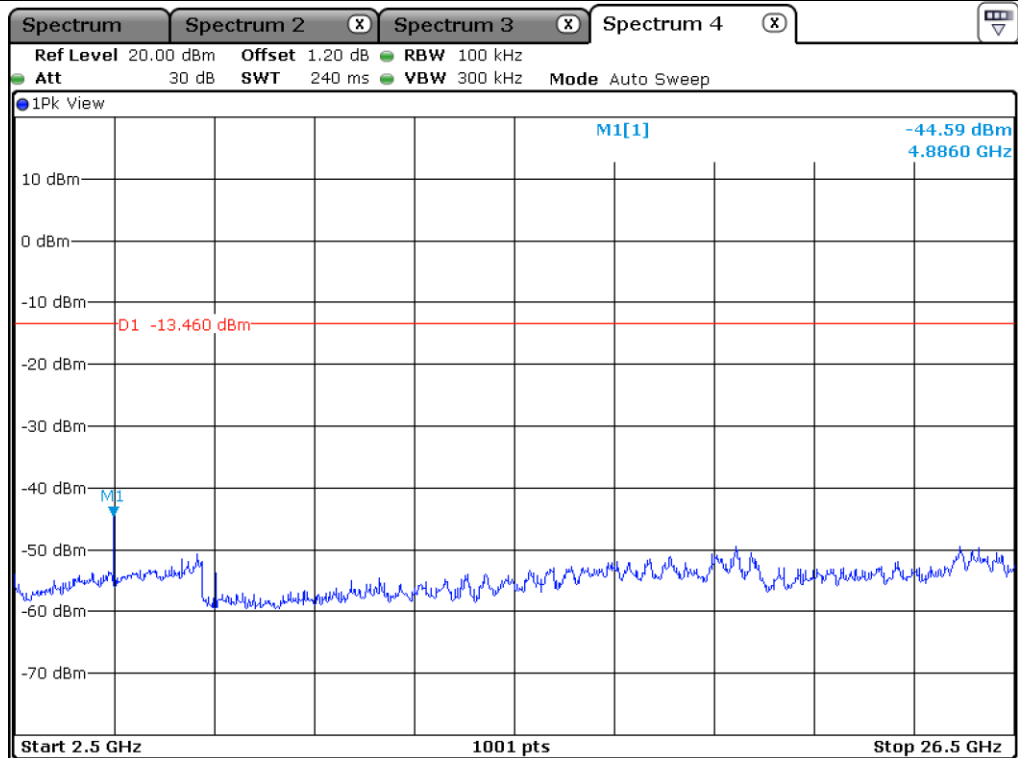
### Low Channel



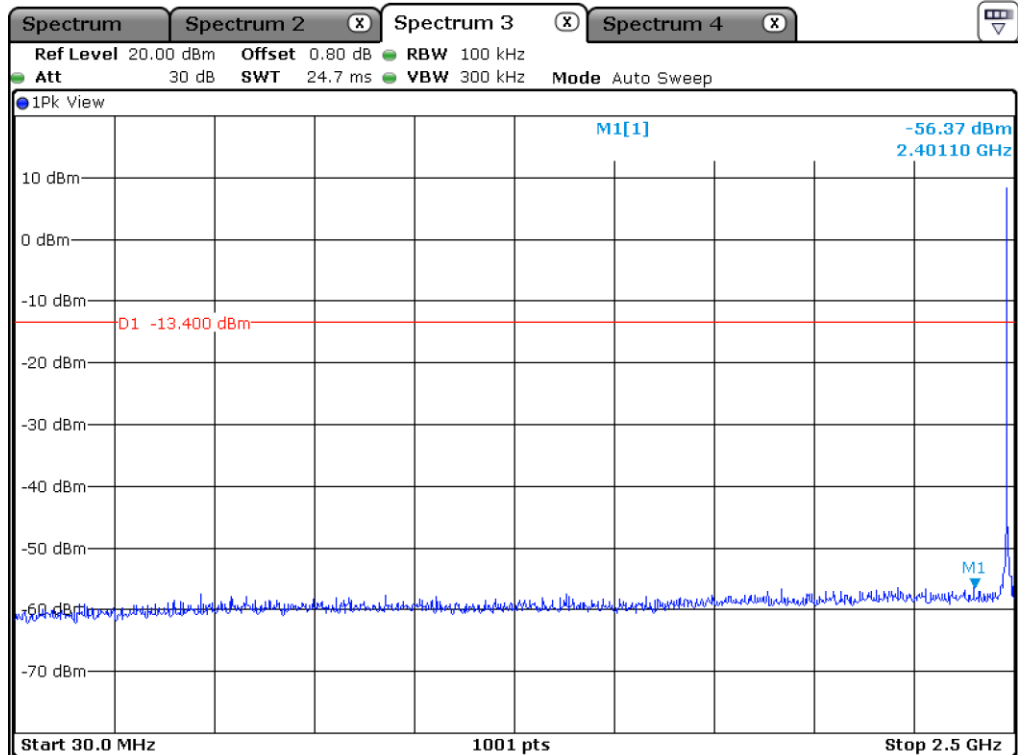
### Low Channel



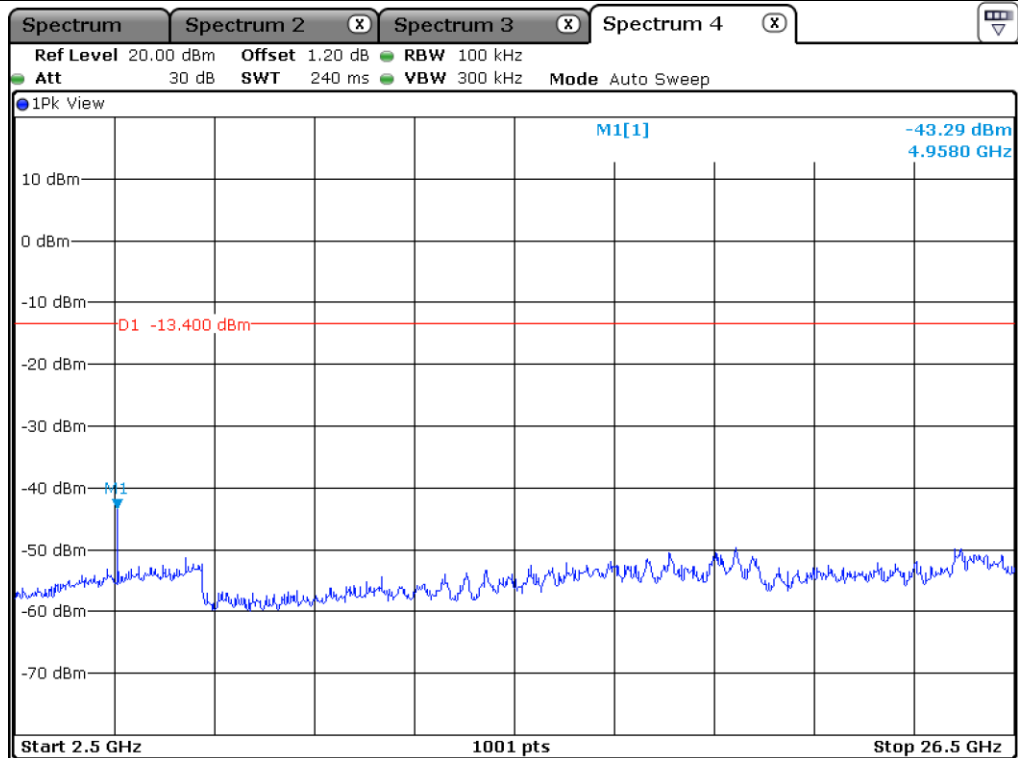
Middle Channel



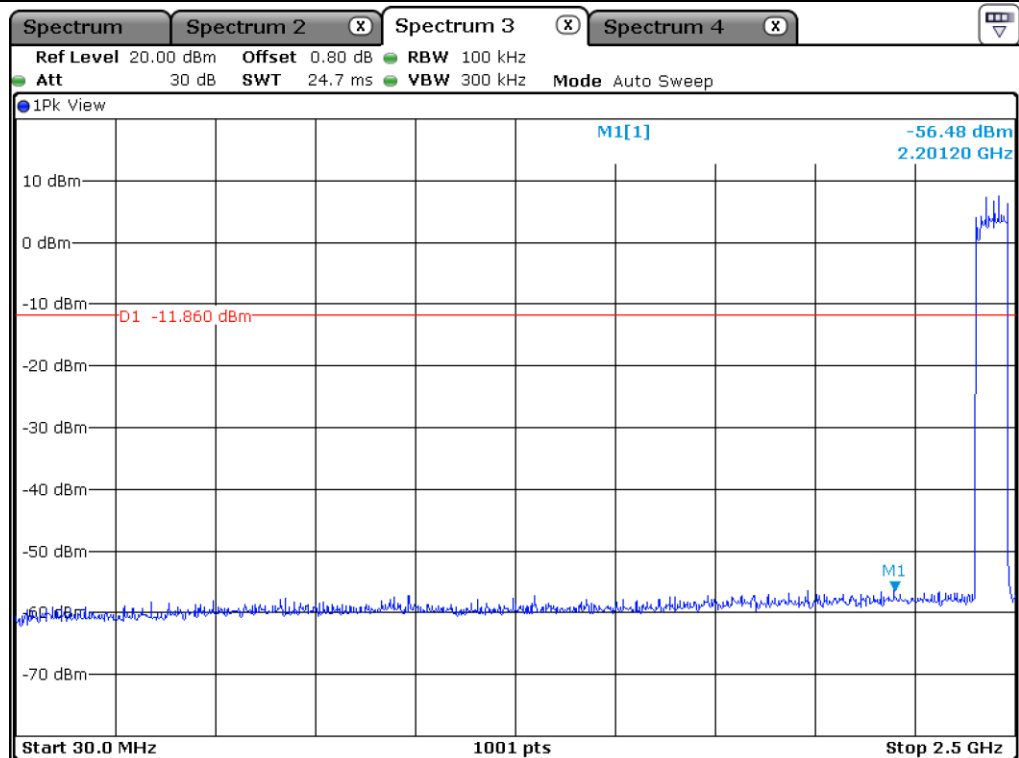
Middle Channel



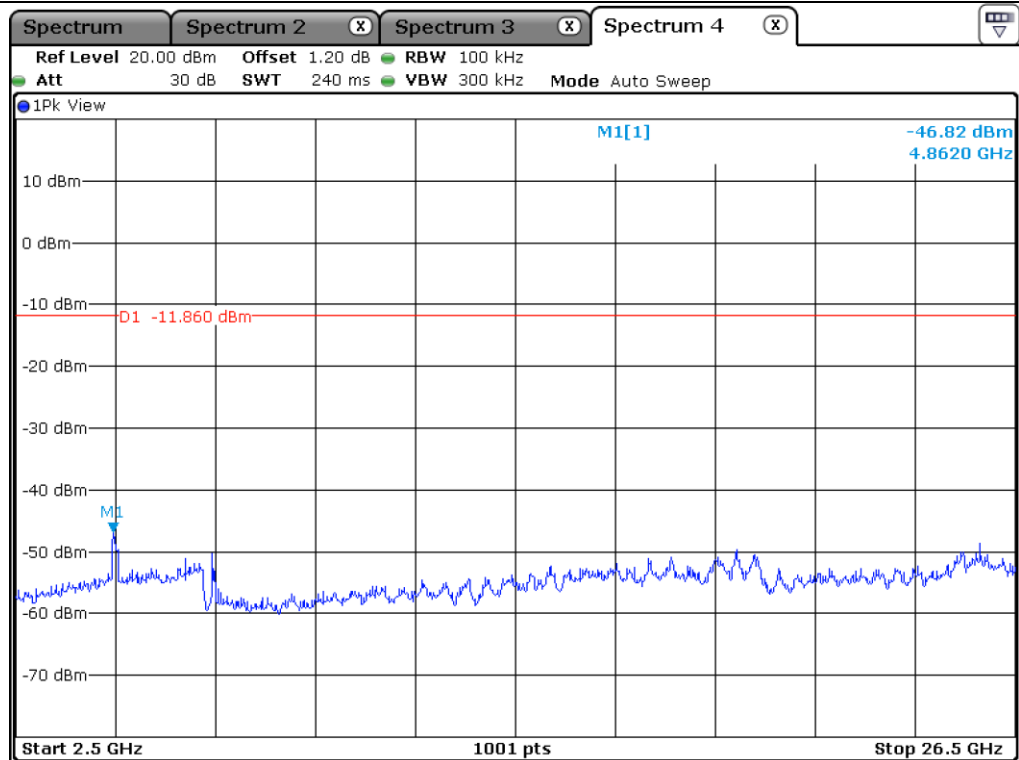
### High Channel



### High Channel

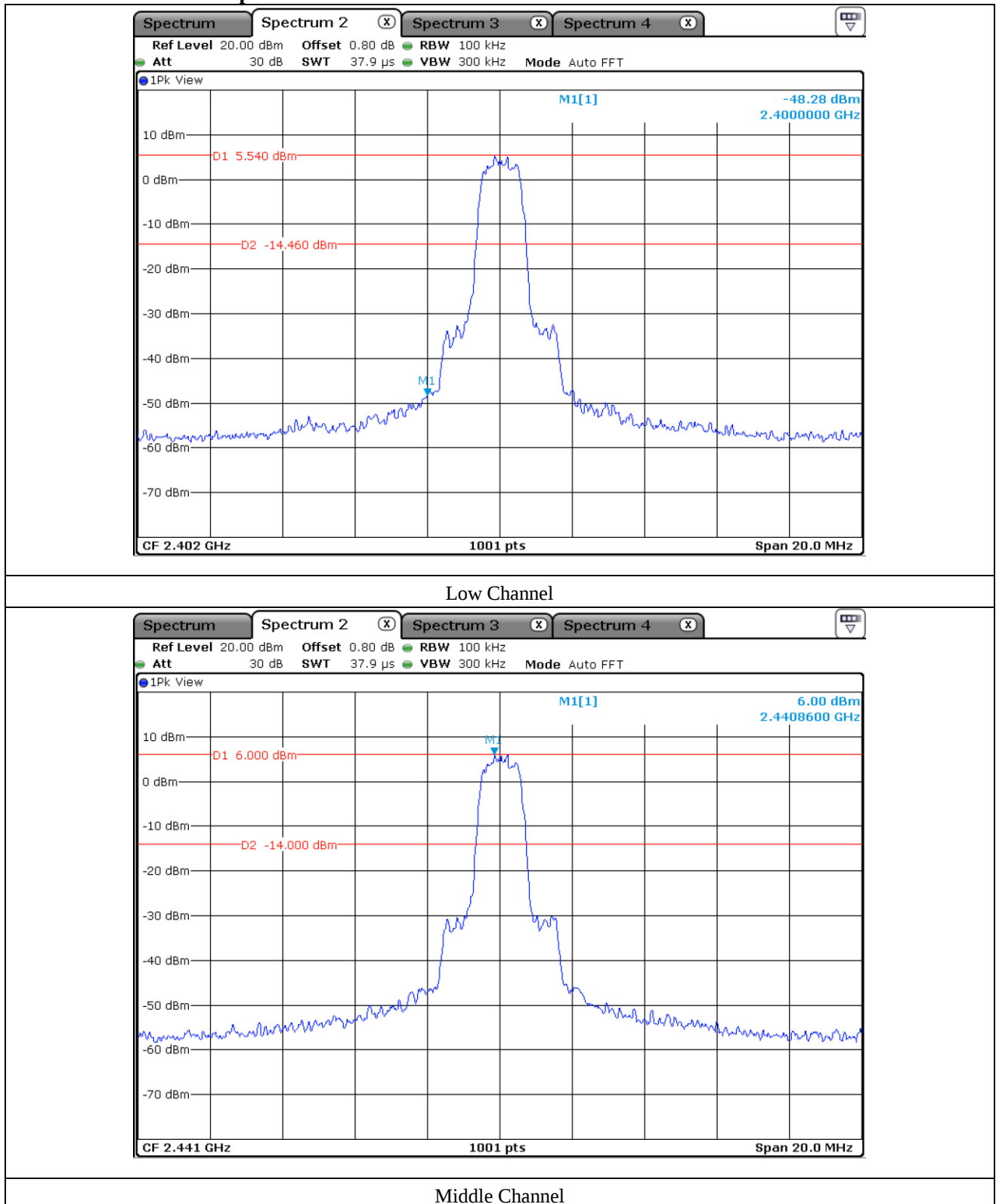


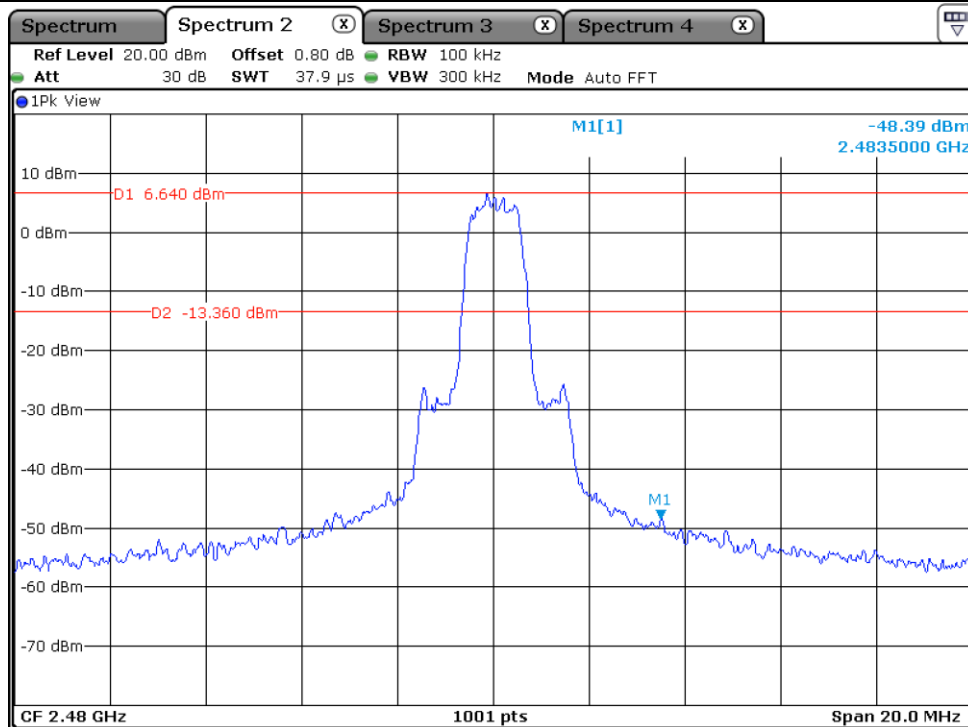
### Hopping Mode



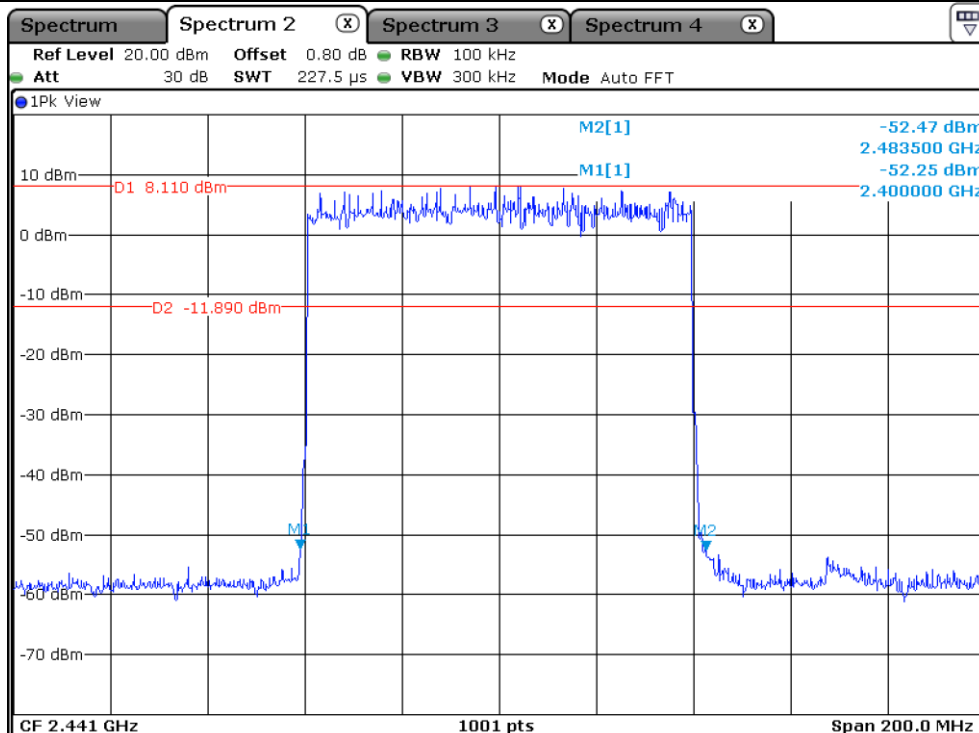
### Hopping Mode

### 12.5.3 Test data for 3 Mbps

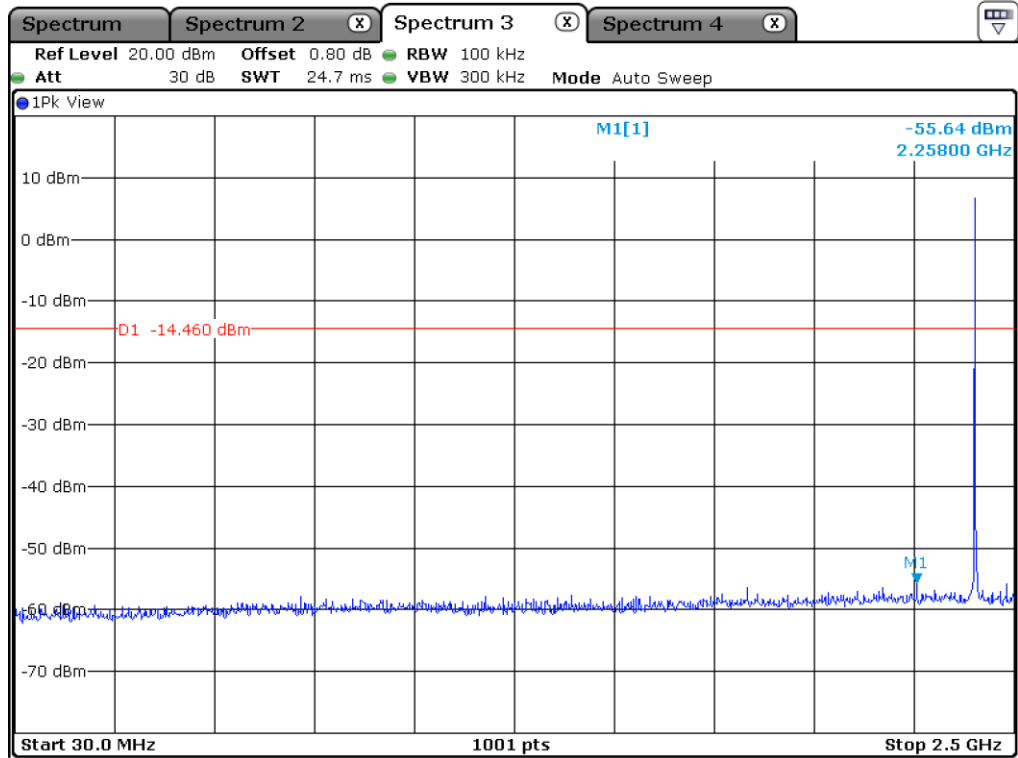




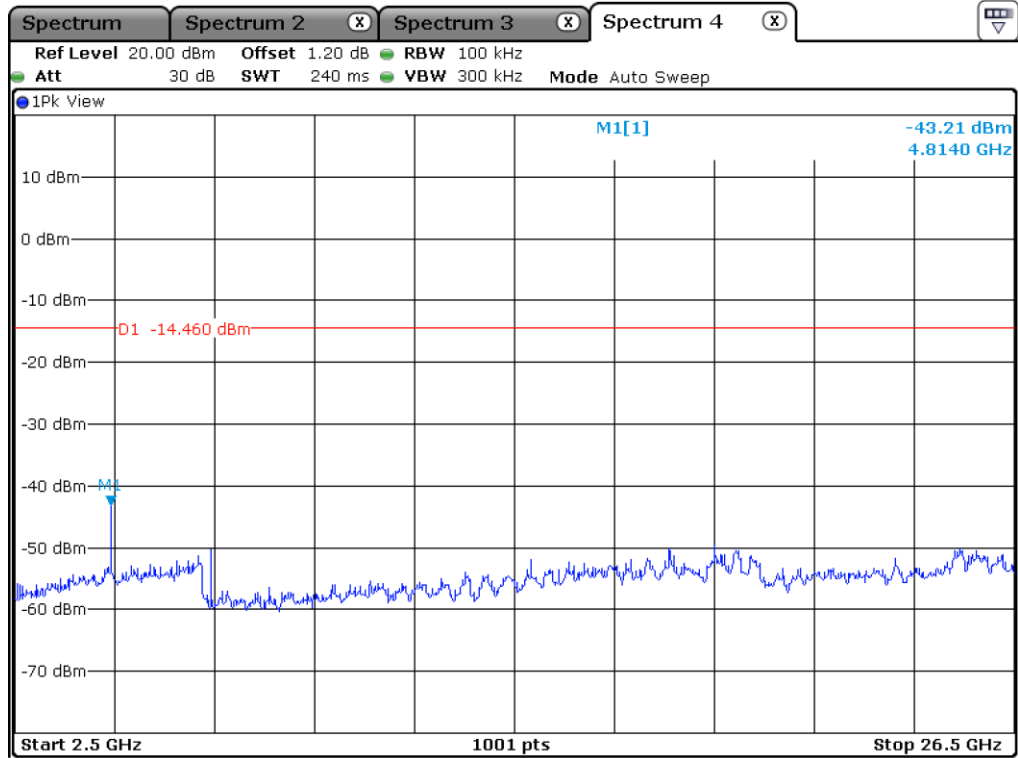
### High Channel



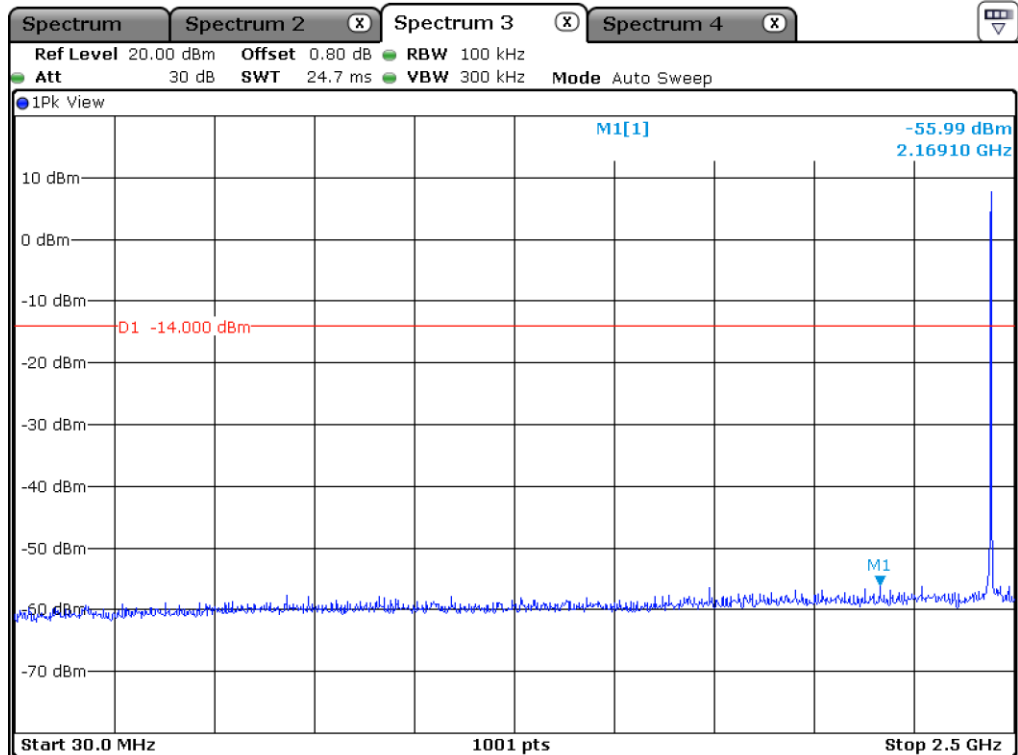
### Hopping Mode



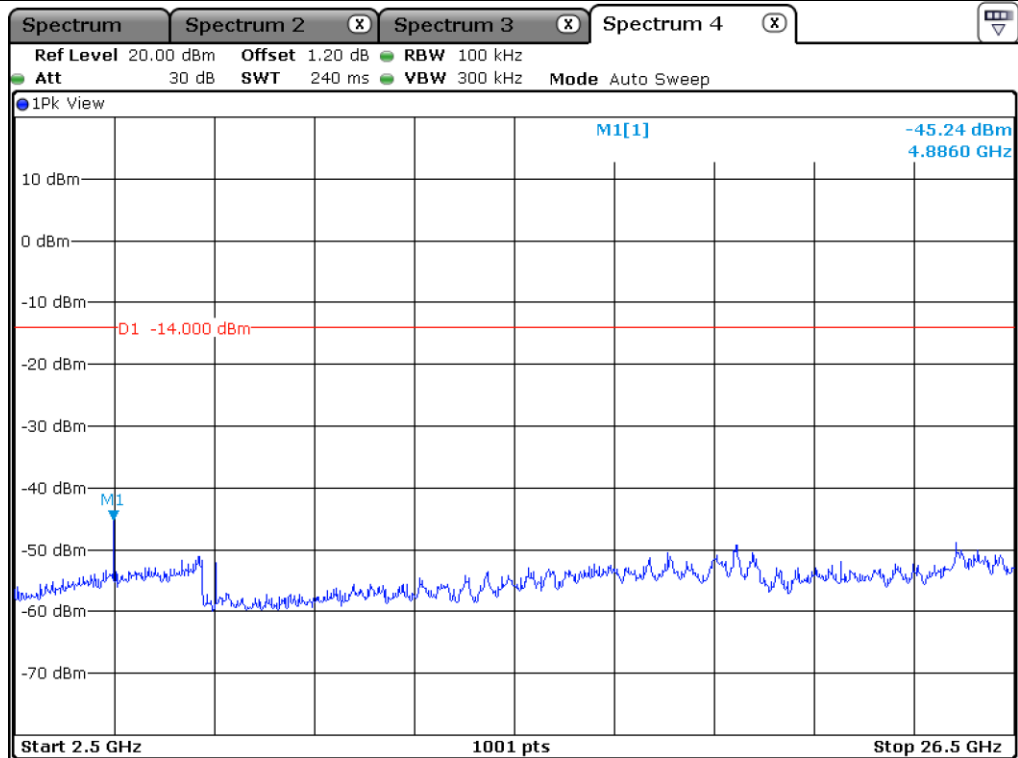
Low Channel



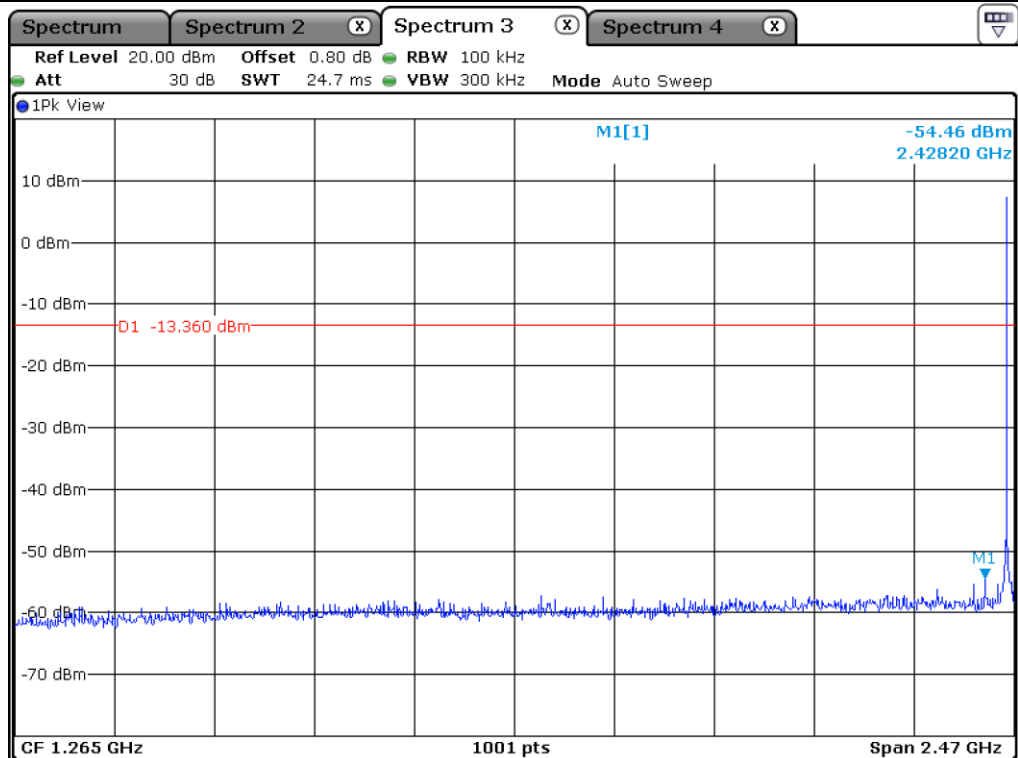
Low Channel



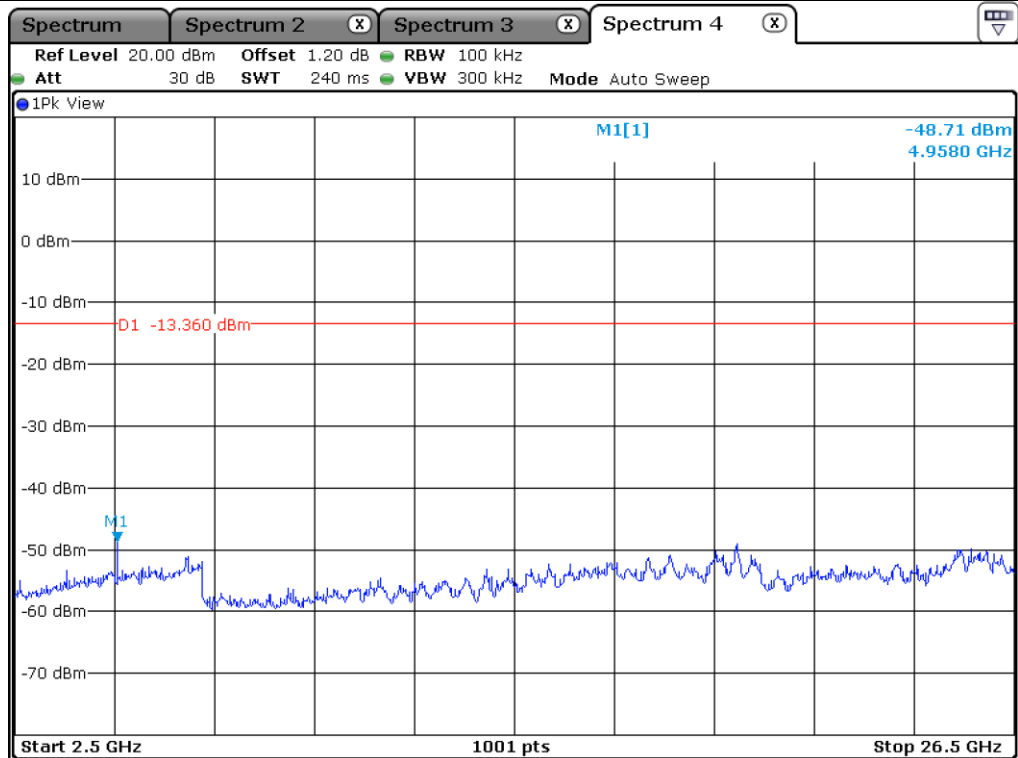
Middle Channel



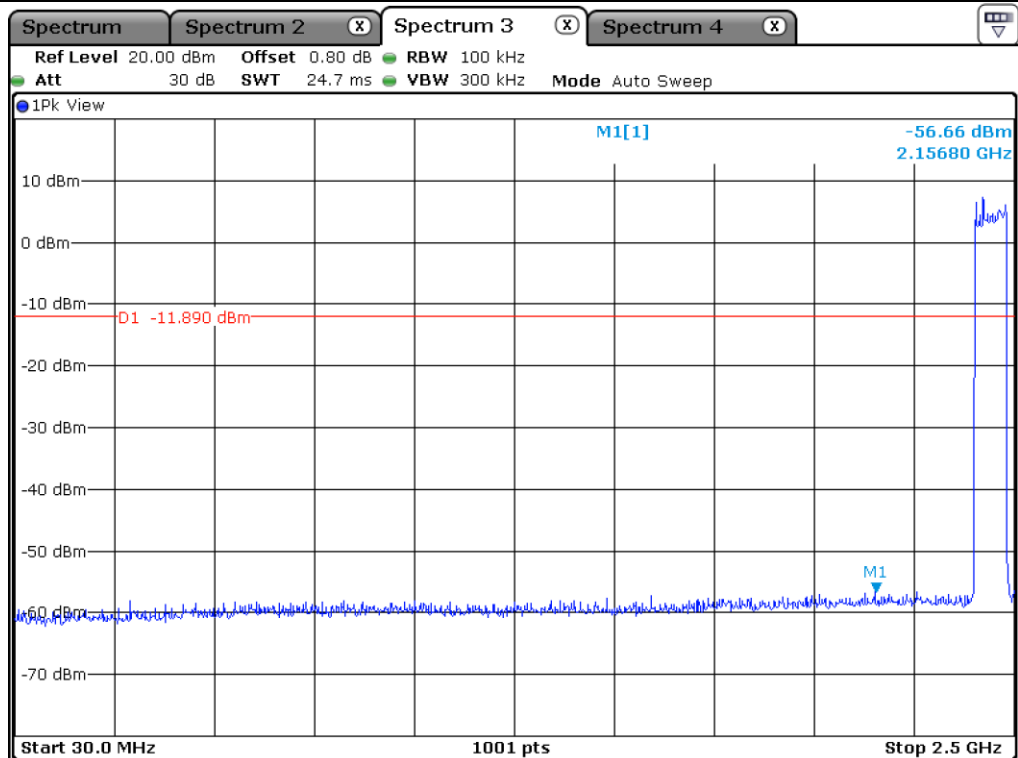
Middle Channel



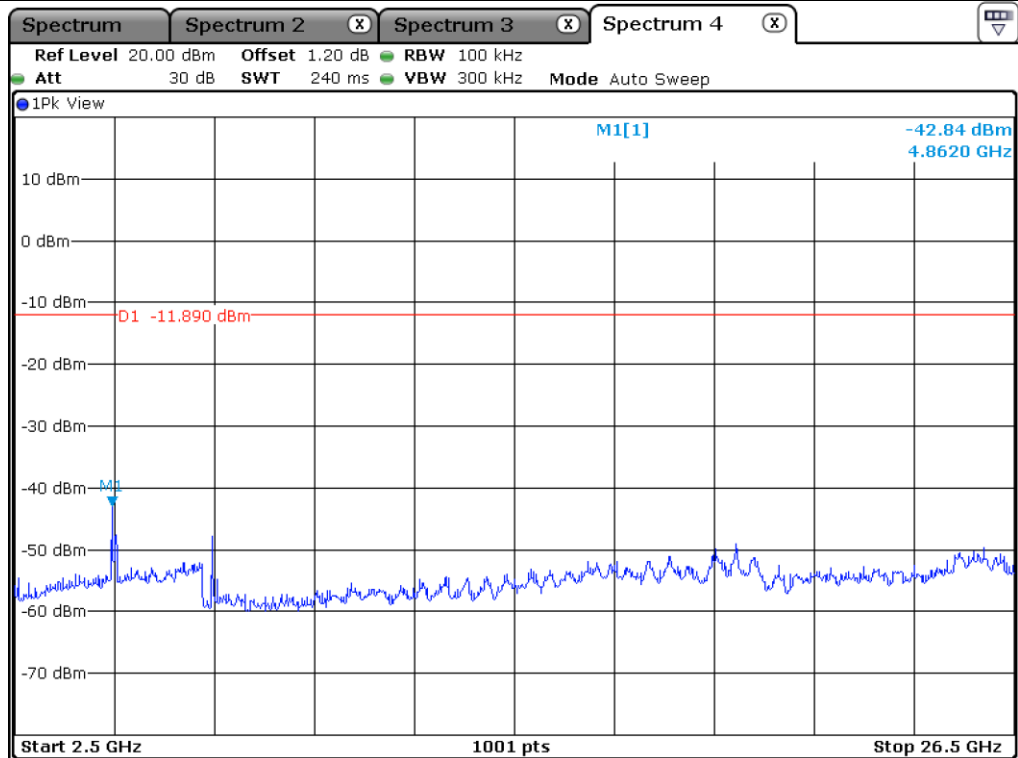
### High Channel



### High Channel



### Hopping Mode



### Hopping Mode

## 12.6 Test data for Transmitting mode radiated emission

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

#### 12.6.1.1 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 : 77.51 %
- 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>  |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 327.72                          | 54.42             | Peak             | H                  | 28.30          | 8.20          | 46.15       | -                      | 44.77             | 74.00              | 29.23          |
| 2 321.82                          | 43.82             | Average          | H                  | 28.30          | 8.20          | 46.15       | 1.11                   | 35.28             | 54.00              | 18.72          |
| 2 341.15                          | 53.80             | Peak             | V                  | 28.30          | 8.20          | 46.15       | -                      | 44.15             | 74.00              | 29.85          |
| 2 322.00                          | 43.63             | Average          | V                  | 28.30          | 8.20          | 46.15       | 1.11                   | 35.09             | 54.00              | 18.91          |
| <b>Test Data for High Channel</b> |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 484.04                          | 55.34             | Peak             | H                  | 28.70          | 8.33          | 46.06       | -                      | 46.31             | 74.00              | 27.69          |
| 2 483.50                          | 45.19             | Average          | H                  | 28.70          | 8.33          | 46.06       | 1.11                   | 37.27             | 54.00              | 16.73          |
| 2 484.55                          | 55.18             | Peak             | V                  | 28.70          | 8.33          | 46.06       | -                      | 46.15             | 74.00              | 27.85          |
| 2 483.50                          | 45.21             | Average          | V                  | 28.70          | 8.33          | 46.06       | 1.11                   | 37.29             | 54.00              | 16.71          |

Tabulated test data for Restricted Band

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

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

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

### 12.6.1.2 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 : 77.11 %
- . 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>  |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 385.74                          | 53.34             | Peak             | H                  | 28.30          | 8.20          | 46.15       | -                      | 43.69             | 74.00              | 30.31          |
| 2 336.47                          | 43.84             | Average          | H                  | 28.30          | 8.20          | 46.15       | 1.13                   | 35.32             | 54.00              | 18.68          |
| 2 339.53                          | 53.85             | Peak             | V                  | 28.30          | 8.20          | 46.15       | -                      | 44.20             | 74.00              | 29.80          |
| 2 338.00                          | 44.16             | Average          | V                  | 28.30          | 8.20          | 46.15       | 1.13                   | 35.64             | 54.00              | 18.36          |
| <b>Test Data for High Channel</b> |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 485.12                          | 54.23             | Peak             | H                  | 28.70          | 8.33          | 46.06       | -                      | 45.20             | 74.00              | 28.80          |
| 2 483.50                          | 44.56             | Average          | H                  | 28.70          | 8.33          | 46.06       | 1.13                   | 36.66             | 54.00              | 17.34          |
| 2 486.03                          | 54.07             | Peak             | V                  | 28.70          | 8.33          | 46.06       | -                      | 45.04             | 74.00              | 28.96          |
| 2 483.50                          | 44.44             | Average          | V                  | 28.70          | 8.33          | 46.06       | 1.13                   | 36.54             | 54.00              | 17.46          |

Tabulated test data for Restricted Band

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

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

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

### 12.6.1.3 Test data for 3 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 : 77.51 %
- . 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>  |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 355.71                          | 53.32             | Peak             | H                  | 28.30          | 8.20          | 46.15       | -                      | 43.67             | 74.00              | 30.33          |
| 2 390.00                          | 43.49             | Average          | H                  | 28.30          | 8.20          | 46.15       | 1.11                   | 34.95             | 54.00              | 19.05          |
| 2 325.86                          | 53.70             | Peak             | V                  | 28.30          | 8.20          | 46.15       | -                      | 44.05             | 74.00              | 29.95          |
| 2 336.29                          | 43.85             | Average          | V                  | 28.30          | 8.20          | 46.15       | 1.11                   | 35.31             | 54.00              | 18.69          |
| <b>Test Data for High Channel</b> |                   |                  |                    |                |               |             |                        |                   |                    |                |
| 2 483.78                          | 53.39             | Peak             | H                  | 28.70          | 8.33          | 46.06       | -                      | 44.36             | 74.00              | 29.64          |
| 2 483.50                          | 44.38             | Average          | H                  | 28.70          | 8.33          | 46.06       | 1.11                   | 36.46             | 54.00              | 17.54          |
| 2 483.76                          | 53.52             | Peak             | V                  | 28.70          | 8.33          | 46.06       | -                      | 44.49             | 74.00              | 29.51          |
| 2 483.50                          | 44.39             | Average          | V                  | 28.70          | 8.33          | 46.06       | 1.11                   | 36.47             | 54.00              | 17.53          |

Tabulated test data for Restricted Band

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

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

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

## 12.6.3 Spurious & Harmonic Radiated Emission above 1 GHz

### 12.6.3.1 Test data for 1 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,  
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band  
100 kHz 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 : 77.51 %
- 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                            | 52.37          | Peak          | H               | 33.40       | 11.21      | 45.73    | -                | 51.25          | 74.00           | 22.75       |
| 4 804.00                            | 43.43          | Average       | H               | 33.40       | 11.21      | 45.73    | 1.11             | 43.42          | 54.00           | 10.58       |
| 4 804.00                            | 53.83          | Peak          | V               | 33.40       | 11.21      | 45.73    | -                | 52.71          | 74.00           | 21.29       |
| 4 804.00                            | 45.52          | Average       | V               | 33.40       | 11.21      | 45.73    | 1.11             | 45.51          | 54.00           | 8.49        |
| <b>Test Data for Middle Channel</b> |                |               |                 |             |            |          |                  |                |                 |             |
| 4 882.00                            | 51.63          | Peak          | H               | 33.50       | 11.23      | 45.80    | -                | 50.56          | 74.00           | 23.44       |
| 4 882.00                            | 41.87          | Average       | H               | 33.50       | 11.23      | 45.80    | 1.11             | 41.91          | 54.00           | 12.09       |
| 4 882.00                            | 52.95          | Peak          | V               | 33.50       | 11.23      | 45.80    | -                | 51.88          | 74.00           | 22.12       |
| 4 882.00                            | 43.90          | Average       | V               | 33.50       | 11.23      | 45.80    | 1.11             | 43.94          | 54.00           | 10.06       |
| <b>Test Data for High Channel</b>   |                |               |                 |             |            |          |                  |                |                 |             |
| 4 960.00                            | 50.49          | Peak          | H               | 33.40       | 11.31      | 45.89    | -                | 49.31          | 74.00           | 24.69       |
| 4 960.00                            | 40.62          | Average       | H               | 33.40       | 11.31      | 45.89    | 1.11             | 40.55          | 54.00           | 13.45       |
| 4 960.00                            | 51.54          | Peak          | V               | 33.40       | 11.31      | 45.89    | -                | 50.36          | 74.00           | 23.64       |
| 4 960.00                            | 42.28          | Average       | V               | 33.40       | 11.31      | 45.89    | 1.11             | 42.21          | 54.00           | 11.79       |

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

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

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

### 12.6.3.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,  
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band  
100 kHz 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 : 77.11 %
- 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                            | 52.04          | Peak          | H               | 33.40       | 11.21      | 45.73    | -                | 50.92          | 74.00           | 23.08       |
| 4 804.00                            | 41.90          | Average       | H               | 33.40       | 11.21      | 45.73    | 1.13             | 41.91          | 54.00           | 12.09       |
| 4 804.00                            | 53.11          | Peak          | V               | 33.40       | 11.21      | 45.73    | -                | 51.99          | 74.00           | 22.01       |
| 4 804.00                            | 43.02          | Average       | V               | 33.40       | 11.21      | 45.73    | 1.13             | 43.03          | 54.00           | 10.97       |
| <b>Test Data for Middle Channel</b> |                |               |                 |             |            |          |                  |                |                 |             |
| 4 882.00                            | 51.26          | Peak          | H               | 33.50       | 11.23      | 45.80    | -                | 50.19          | 74.00           | 23.81       |
| 4 882.00                            | 41.37          | Average       | H               | 33.50       | 11.23      | 45.80    | 1.13             | 41.43          | 54.00           | 12.57       |
| 4 882.00                            | 52.26          | Peak          | V               | 33.50       | 11.23      | 45.80    | -                | 51.19          | 74.00           | 22.81       |
| 4 882.00                            | 42.31          | Average       | V               | 33.50       | 11.23      | 45.80    | 1.13             | 42.37          | 54.00           | 11.63       |
| <b>Test Data for High Channel</b>   |                |               |                 |             |            |          |                  |                |                 |             |
| 4 960.00                            | 50.82          | Peak          | H               | 33.40       | 11.31      | 45.89    | -                | 49.64          | 74.00           | 24.36       |
| 4 960.00                            | 40.39          | Average       | H               | 33.40       | 11.31      | 45.89    | 1.13             | 40.34          | 54.00           | 13.66       |
| 4 960.00                            | 51.34          | Peak          | V               | 33.40       | 11.31      | 45.89    | -                | 50.16          | 74.00           | 23.84       |
| 4 960.00                            | 41.25          | Average       | V               | 33.40       | 11.31      | 45.89    | 1.13             | 41.20          | 54.00           | 12.80       |

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

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss - Amp Gain + Duty Factor

### 12.6.3.3 Test data for 3 Mbps

- . Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,  
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band  
100 kHz 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 : 77.51 %
- . 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                            | 52.08          | Peak          | H               | 33.40       | 11.21      | 45.73    | -                | 50.96          | 74.00           | 23.04       |
| 4 804.00                            | 42.04          | Average       | H               | 33.40       | 11.21      | 45.73    | 1.11             | 42.03          | 54.00           | 11.97       |
| 4 804.00                            | 53.08          | Peak          | V               | 33.40       | 11.21      | 45.73    | -                | 51.96          | 74.00           | 22.04       |
| 4 804.00                            | 43.13          | Average       | V               | 33.40       | 11.21      | 45.73    | 1.11             | 43.12          | 54.00           | 10.88       |
| <b>Test Data for Middle Channel</b> |                |               |                 |             |            |          |                  |                |                 |             |
| 4 882.00                            | 51.37          | Peak          | H               | 33.50       | 11.23      | 45.80    | -                | 50.30          | 74.00           | 23.70       |
| 4 882.00                            | 41.49          | Average       | H               | 33.50       | 11.23      | 45.80    | 1.11             | 41.53          | 54.00           | 12.47       |
| 4 882.00                            | 52.40          | Peak          | V               | 33.50       | 11.23      | 45.80    | -                | 51.33          | 74.00           | 22.67       |
| 4 882.00                            | 42.42          | Average       | V               | 33.50       | 11.23      | 45.80    | 1.11             | 42.46          | 54.00           | 11.54       |
| <b>Test Data for High Channel</b>   |                |               |                 |             |            |          |                  |                |                 |             |
| 4 960.00                            | 50.91          | Peak          | H               | 33.40       | 11.31      | 45.89    | -                | 49.73          | 74.00           | 24.27       |
| 4 960.00                            | 40.56          | Average       | H               | 33.40       | 11.31      | 45.89    | 1.11             | 40.49          | 54.00           | 13.51       |
| 4 960.00                            | 51.62          | Peak          | V               | 33.40       | 11.31      | 45.89    | -                | 50.44          | 74.00           | 23.56       |
| 4 960.00                            | 41.27          | Average       | V               | 33.40       | 11.31      | 45.89    | 1.11             | 41.20          | 54.00           | 12.80       |

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

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

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

## 13. RADIATED EMISSION TEST

### 13.1 Operating environment

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

### 13.2 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.

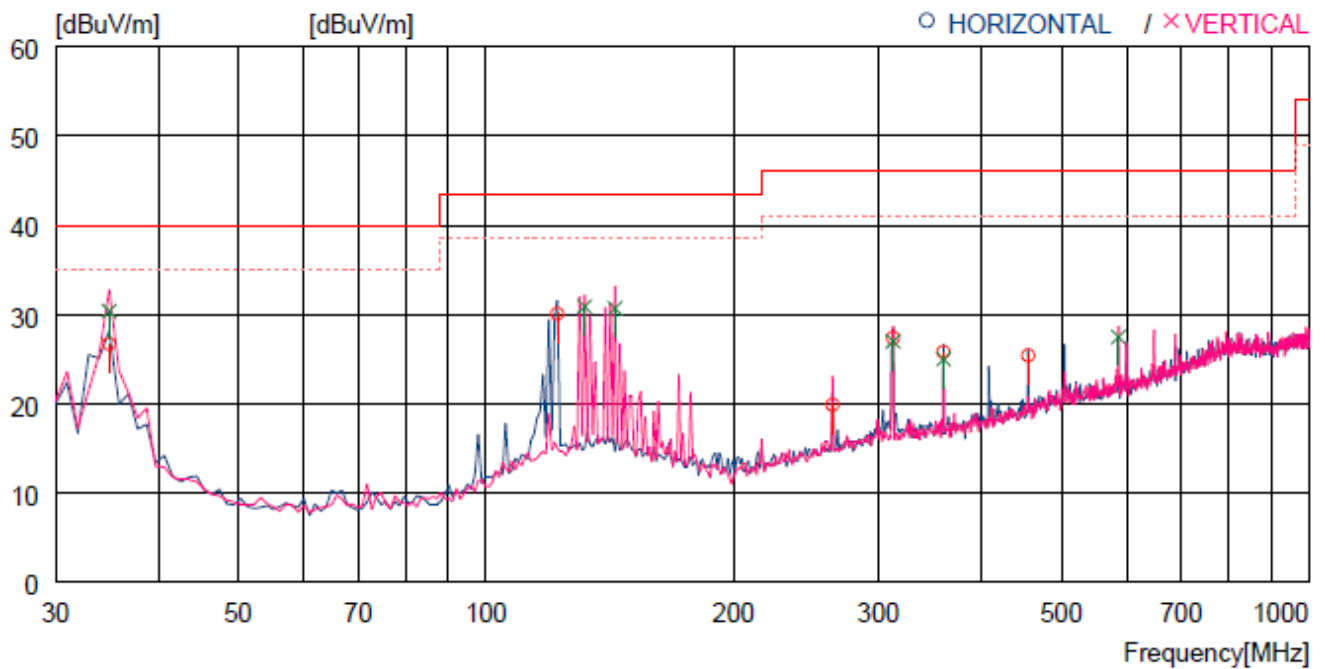
### 13.3 Test Date

May 24, 2021 ~ June 04, 2021

## 13.4 Test data

### 13.4.1 Test data for 30 MHz ~ 1000 MHz

- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 3 m



| 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                    | 34.850  | 38.9    | 19.2 | 0.6  | 32.0 | 26.7     | 40.0     | 13.3   | 100     | 359   |
| 2                    | 122.150 | 42.1    | 18.7 | 1.3  | 32.0 | 30.1     | 43.5     | 13.4   | 400     | 0     |
| 3                    | 263.770 | 31.8    | 18.2 | 1.9  | 32.0 | 19.9     | 46.0     | 26.1   | 200     | 264   |
| 4                    | 312.270 | 37.9    | 19.4 | 2.1  | 32.0 | 27.4     | 46.0     | 18.6   | 100     | 359   |
| 5                    | 359.800 | 35.6    | 20.1 | 2.2  | 32.1 | 25.8     | 46.0     | 20.2   | 100     | 359   |
| 6                    | 455.831 | 33.0    | 22.0 | 2.6  | 32.2 | 25.4     | 46.0     | 20.6   | 100     | 359   |
| ---- Vertical ----   |         |         |      |      |      |          |          |        |         |       |
| 7                    | 34.850  | 42.6    | 19.2 | 0.6  | 32.0 | 30.4     | 40.0     | 9.6    | 100     | 215   |
| 8                    | 131.850 | 42.5    | 19.1 | 1.3  | 32.0 | 30.9     | 43.5     | 12.6   | 400     | 359   |
| 9                    | 143.490 | 42.1    | 19.2 | 1.4  | 32.0 | 30.7     | 43.5     | 12.8   | 300     | 0     |
| 10                   | 312.270 | 37.5    | 19.4 | 2.1  | 32.0 | 27.0     | 46.0     | 19.0   | 200     | 49    |
| 11                   | 359.800 | 34.8    | 20.1 | 2.2  | 32.1 | 25.0     | 46.0     | 21.0   | 200     | 359   |
| 12                   | 586.778 | 32.9    | 24.1 | 2.9  | 32.4 | 27.5     | 46.0     | 18.5   | 200     | 359   |

### 13.4.2 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

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

### 13.4.3 Test data for above 1 GHz

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

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

## 14. LIST OF TEST EQUIPMENT

| Model Number | Manufacturer         | Description                | Serial Number         | Last Cal.(Interval) |
|--------------|----------------------|----------------------------|-----------------------|---------------------|
| FSV40-N      | Rohde & Schwarz      | Signal Analyzer            | 101457                | Apr. 16, 2021 (1Y)  |
| ESR7         | Rohde & Schwarz      | EMI Test Receiver          | 102190                | Oct. 14, 2020 (1Y)  |
| 310N         | Sonoma Instrument    | AMPLIFIER                  | 392756                | Oct. 16, 2020 (1Y)  |
| PAM-840A     | Com-Power            | Pre-Amplifer               | 461339                | Oct. 16, 2020 (1Y)  |
| PAM-118A     | Com-Power            | Pre-Amplifer               | 18040081              | Oct. 12, 2020 (1Y)  |
| DT2000-2t    | Innco Systems GmbH   | Turn Table                 | N/A                   | N/A                 |
| CO3000       | Innco Systems GmbH   | Controller                 | 1026/40960617/P       | N/A                 |
| MA-4640-XPET | Innco Systems GmbH   | Antenna Master             | MA4640/652/43100318/P | N/A                 |
| HLP-2008     | TDK RF Solutions     | Hybrid Antenna             | 131316                | Feb. 27, 2020 (2Y)  |
| BBHA9170     | Schwarzbeck          | Horn Antenna               | BBHA9170178           | Jan. 07, 2021(1Y)   |
| AH-118       | Com-Power            | Horn Antenna               | 10050061              | Oct. 15, 2020 (1Y)  |
| FMZB 1513    | Schwarzbeck          | Loop Antenna               | 1513-235              | Mar. 24, 2020(2Y)   |
| HPF 3GHz     | Rohde & Schwarz      | High Pass Filter (1-3 GHz) | N/A                   | Feb. 08, 2021 (1Y)  |
| GP-4303D     | LG Precision Co.,Ltd | DC POWER SUPPLY            | 5071069               | Jan. 06, 2021 (1Y)  |