



# FCC RADIO TEST REPORT

FCC ID : A4RGQML3  
Equipment : Phone  
Applicant : Google LLC  
1600 Amphitheatre Parkway,  
Mountain View, California, 94043 USA  
Standard : FCC Part 15 Subpart C §15.247

The product was received on Mar. 17, 2022 and testing was performed from Mar. 29, 2022 to May 26, 2022. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

*Louis Wu*

Approved by: Louis Wu

**Sporton International Inc. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



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## History of this test report

| Report No.   | Version | Description             | Issue Date    |
|--------------|---------|-------------------------|---------------|
| FR1O2843-05A | 01      | Initial issue of report | Jun. 08, 2022 |
|              |         |                         |               |
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## Summary of Test Result

| Report Clause | Ref Std. Clause    | Test Items                                         | Result (PASS/FAIL) | Remark                                |
|---------------|--------------------|----------------------------------------------------|--------------------|---------------------------------------|
| 3.1           | 15.247(a)(1)       | Number of Channels                                 | Pass               | -                                     |
| 3.2           | 15.247(a)(1)       | Hopping Channel Separation                         | Pass               | -                                     |
| 3.3           | 15.247(a)(1)       | Dwell Time of Each Channel                         | Pass               | -                                     |
| 3.4           | 15.247(a)(1)       | 20dB Bandwidth                                     | Pass               | -                                     |
| 3.4           | 2.1049             | 99% Occupied Bandwidth                             | Reporting only     | -                                     |
| 3.5           | 15.247(b)(1)       | Peak Output Power                                  | Pass               | -                                     |
| 3.6           | 15.247(d)          | Conducted Band Edges                               | Pass               | -                                     |
| 3.7           | 15.247(d)          | Conducted Spurious Emission                        | Pass               | -                                     |
| 3.8           | 15.247(d)          | Radiated Band Edges and Radiated Spurious Emission | Pass               | 7.51 dB under the limit at 30.000 MHz |
| 3.9           | 15.207             | AC Conducted Emission                              | Pass               | 18.42 dB under the limit at 0.152 MHz |
| 3.10          | 15.203 & 15.247(b) | Antenna Requirement                                | Pass               | -                                     |

**Declaration of Conformity:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- The measurement uncertainty please refer to this report "Uncertainty of Evaluation".

**Comments and Explanations:**

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

**Reviewed by: William Chen**

**Report Producer: Rachel Hsieh**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Feature                 |                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment                       | Phone                                                                                                                                                                                           |
| FCC ID                          | A4RGQML3                                                                                                                                                                                        |
| EUT supports Radios application | GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/NFC/GNSS/<br>WPC/WPT<br>WLAN 11b/g/n HT20<br>WLAN 11a/n HT20/HT40<br>WLAN 11ac VHT20/VHT40/VHT80/VHT160<br>WLAN 11ax HE20/HE40/HE80/HE160<br>Bluetooth BR/EDR/LE |

**Remark:** The above EUT's information was declared by manufacturer.

| EUT Information List |                            |
|----------------------|----------------------------|
| S/N                  | Performed Test Item        |
| 23091FDH200043       | RF Conducted Measurement   |
| 23121FDH20000R       | Radiated Spurious Emission |
| 23121FDH20005C       | Conducted Emission         |

## 1.2 Product Specification of Equipment Under Test

| Product Specification is subject to this standard |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |  |        |        |           |   |   |                |   |   |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--|--------|--------|-----------|---|---|----------------|---|---|
| <b>Tx/Rx Frequency Range</b>                      | 2402 MHz ~ 2480 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |  |        |        |           |   |   |                |   |   |
| <b>Number of Channels</b>                         | 79                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |        |  |        |        |           |   |   |                |   |   |
| <b>Carrier Frequency of Each Channel</b>          | 2402+n*1 MHz; n=0~78                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |  |        |        |           |   |   |                |   |   |
| <b>Maximum Output Power to Antenna</b>            | <b>&lt;Ant. 4&gt;</b><br>Bluetooth BR(1Mbps) : 20.96 dBm (0.1247 W)<br>Bluetooth EDR (2Mbps) : 20.75 dBm (0.1189 W)<br>Bluetooth EDR (3Mbps) : 20.95 dBm (0.1245 W)<br><b>&lt;Ant. 3&gt;</b><br>Bluetooth BR(1Mbps) : 20.85 dBm (0.1216 W)<br>Bluetooth EDR (2Mbps) : 20.58 dBm (0.1143 W)<br>Bluetooth EDR (3Mbps) : 20.82 dBm (0.1208 W)<br><b>MIMO &lt;Ant. 4+3&gt;</b><br>Bluetooth BR(1Mbps) : 20.96 dBm (0.1247 W)<br>Bluetooth EDR (2Mbps) : 20.79 dBm (0.1199 W)<br>Bluetooth EDR (3Mbps) : 20.94 dBm (0.1242 W) |        |  |        |        |           |   |   |                |   |   |
| <b>99% Occupied Bandwidth</b>                     | <b>&lt;Ant. 4&gt;</b><br>Bluetooth BR(1Mbps) : 0.906 MHz<br>Bluetooth EDR (2Mbps) : 1.184 MHz<br>Bluetooth EDR (3Mbps) : 1.161 MHz<br><b>&lt;Ant. 3&gt;</b><br>Bluetooth BR(1Mbps) : 0.906 MHz<br>Bluetooth EDR (2Mbps) : 1.184 MHz<br>Bluetooth EDR (3Mbps) : 1.161 MHz<br><b>MIMO &lt;Ant. 4+3&gt;</b><br>Bluetooth BR(1Mbps) : 0.906 MHz<br>Bluetooth EDR (2Mbps) : 1.184 MHz<br>Bluetooth EDR (3Mbps) : 1.164 MHz                                                                                                    |        |  |        |        |           |   |   |                |   |   |
| <b>Antenna Type / Gain</b>                        | <b>&lt;Ant. 4&gt;</b> : IFA Antenna with gain -0.5 dBi<br><b>&lt;Ant. 3&gt;</b> : Loop Antenna with gain -1.5 dBi                                                                                                                                                                                                                                                                                                                                                                                                        |        |  |        |        |           |   |   |                |   |   |
| <b>Type of Modulation</b>                         | Bluetooth BR (1Mbps) : GFSK<br>Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK<br>Bluetooth EDR (3Mbps) : 8-DPSK                                                                                                                                                                                                                                                                                                                                                                                                                  |        |  |        |        |           |   |   |                |   |   |
| <b>Antenna Function Description</b>               | <table border="1"> <thead> <tr> <th></th><th>Ant. 4</th><th>Ant. 3</th></tr> </thead> <tbody> <tr> <td>Bluetooth</td><td>V</td><td>V</td></tr> <tr> <td>Bluetooth MIMO</td><td>V</td><td>V</td></tr> </tbody> </table>                                                                                                                                                                                                                                                                                                   |        |  | Ant. 4 | Ant. 3 | Bluetooth | V | V | Bluetooth MIMO | V | V |
|                                                   | Ant. 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Ant. 3 |  |        |        |           |   |   |                |   |   |
| Bluetooth                                         | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | V      |  |        |        |           |   |   |                |   |   |
| Bluetooth MIMO                                    | V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | V      |  |        |        |           |   |   |                |   |   |

**Remark:**

1. MIMO Ant. 4+3 Directional Gain is a calculated result from MIMO Ant. 4 and MIMO Ant. 3. The formula used in calculation is documented in section 3.10.
2. Power of MIMO Ant. 4 + Ant. 3 is a calculated result from sum of the power MIMO Ant. 4 and MIMO Ant. 3.
3. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

### 1.3 Modification of EUT

No modifications made to the EUT during the testing.

### 1.4 Testing Location

|                    |                                                                                                                           |
|--------------------|---------------------------------------------------------------------------------------------------------------------------|
| Test Site          | Sporton International Inc. EMC & Wireless Communications Laboratory                                                       |
| Test Site Location | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City 333, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| Test Site No.      | <b>Sporton Site No.</b><br>CO05-HY, 03CH07-HY                                                                             |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

|                    |                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Site          | Sporton International Inc. Wensan Laboratory                                                                                                     |
| Test Site Location | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City 333010, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| Test Site No.      | <b>Sporton Site No.</b><br>TH05-HY (TAF Code: 3786)                                                                                              |
| Remark             | The RF Conducted Measurement test item subcontracted to Sporton International Inc. Wensan Laboratory.                                            |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW3786

### 1.5 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.



## 2 Test Configuration of Equipment Under Test

### 2.1 Carrier Frequency Channel

| Frequency Band  | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) |
|-----------------|---------|----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 0       | 2402           | 27      | 2429           | 54      | 2456           |
|                 | 1       | 2403           | 28      | 2430           | 55      | 2457           |
|                 | 2       | 2404           | 29      | 2431           | 56      | 2458           |
|                 | 3       | 2405           | 30      | 2432           | 57      | 2459           |
|                 | 4       | 2406           | 31      | 2433           | 58      | 2460           |
|                 | 5       | 2407           | 32      | 2434           | 59      | 2461           |
|                 | 6       | 2408           | 33      | 2435           | 60      | 2462           |
|                 | 7       | 2409           | 34      | 2436           | 61      | 2463           |
|                 | 8       | 2410           | 35      | 2437           | 62      | 2464           |
|                 | 9       | 2411           | 36      | 2438           | 63      | 2465           |
|                 | 10      | 2412           | 37      | 2439           | 64      | 2466           |
|                 | 11      | 2413           | 38      | 2440           | 65      | 2467           |
|                 | 12      | 2414           | 39      | 2441           | 66      | 2468           |
|                 | 13      | 2415           | 40      | 2442           | 67      | 2469           |
|                 | 14      | 2416           | 41      | 2443           | 68      | 2470           |
|                 | 15      | 2417           | 42      | 2444           | 69      | 2471           |
|                 | 16      | 2418           | 43      | 2445           | 70      | 2472           |
|                 | 17      | 2419           | 44      | 2446           | 71      | 2473           |
|                 | 18      | 2420           | 45      | 2447           | 72      | 2474           |
|                 | 19      | 2421           | 46      | 2448           | 73      | 2475           |
|                 | 20      | 2422           | 47      | 2449           | 74      | 2476           |
|                 | 21      | 2423           | 48      | 2450           | 75      | 2477           |
|                 | 22      | 2424           | 49      | 2451           | 76      | 2478           |
|                 | 23      | 2425           | 50      | 2452           | 77      | 2479           |
|                 | 24      | 2426           | 51      | 2453           | 78      | 2480           |
|                 | 25      | 2427           | 52      | 2454           | -       | -              |
|                 | 26      | 2428           | 53      | 2455           | -       | -              |

## 2.2 Test Mode

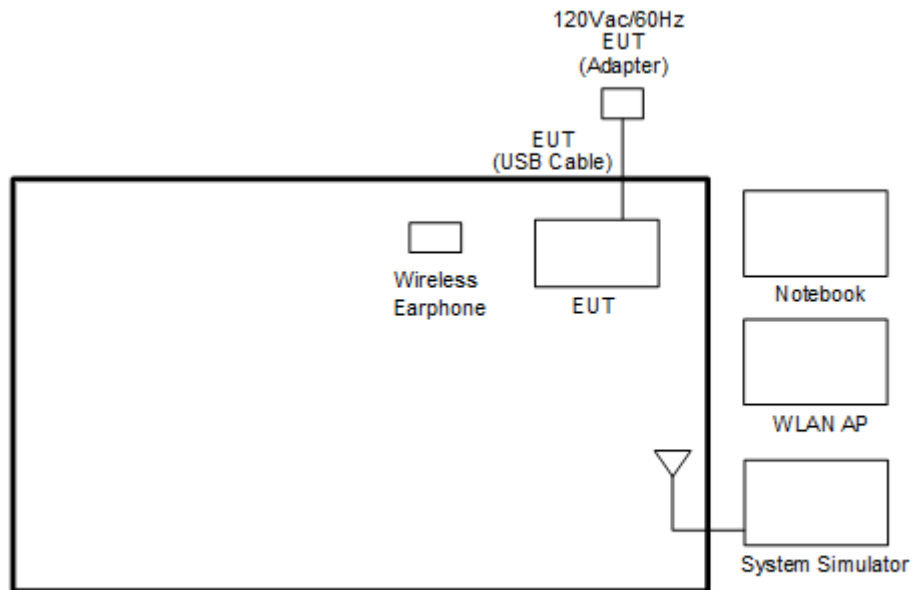
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape) and accessory (Adapter or Earphone), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find X plane with Adapter as worst plane, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

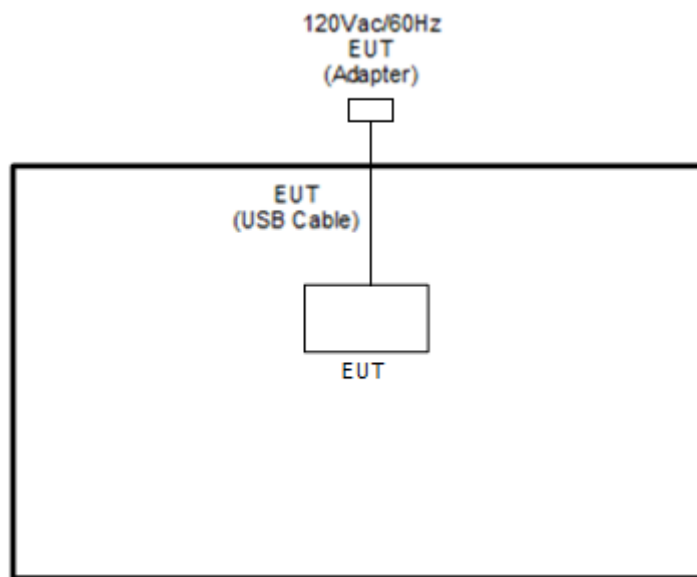
| Summary table of Test Cases                                                                                                                                                         |                                                                                                               |                                       |                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------------------|
| Test Item                                                                                                                                                                           | Data Rate / Modulation                                                                                        |                                       |                               |
| Conducted<br>Test Cases                                                                                                                                                             | Bluetooth BR 1Mbps<br>GFSK                                                                                    | Bluetooth EDR 2Mbps<br>$\pi/4$ -DQPSK | Bluetooth EDR 3Mbps<br>8-DPSK |
|                                                                                                                                                                                     | Mode 1: CH00_2402 MHz                                                                                         | Mode 4: CH00_2402 MHz                 | Mode 7: CH00_2402 MHz         |
|                                                                                                                                                                                     | Mode 2: CH39_2441 MHz                                                                                         | Mode 5: CH39_2441 MHz                 | Mode 8: CH39_2441 MHz         |
|                                                                                                                                                                                     | Mode 3: CH78_2480 MHz                                                                                         | Mode 6: CH78_2480 MHz                 | Mode 9: CH78_2480 MHz         |
| Radiated<br>Test Cases                                                                                                                                                              | Bluetooth BR 1Mbps GFSK / Bluetooth EDR 3Mbps 8-DPSK                                                          |                                       |                               |
|                                                                                                                                                                                     | Mode 1: CH00_2402 MHz                                                                                         |                                       |                               |
|                                                                                                                                                                                     | Mode 2: CH39_2441 MHz                                                                                         |                                       |                               |
|                                                                                                                                                                                     | Mode 3: CH78_2480 MHz                                                                                         |                                       |                               |
| AC Conducted<br>Emission                                                                                                                                                            | Mode 1 :GSM850 Idle + WLAN (2.4GHz) Link + Bluetooth Link + USB Cable 1<br>(Type C) (Charging from Adapter 2) |                                       |                               |
| Remark:                                                                                                                                                                             |                                                                                                               |                                       |                               |
| 1. For Radiated Test Cases, testing for BR and EDR modes are both performed.                                                                                                        |                                                                                                               |                                       |                               |
| 2. For Radiated Test Cases, the tests were performed with Adapter 2 and USB Cable 1.                                                                                                |                                                                                                               |                                       |                               |
| 3. During the preliminary test, both charging modes (Adapter mode and WPT Charging mode) were verified. It is determined that the adaptor mode is the worst case for official test. |                                                                                                               |                                       |                               |

## 2.3 Connection Diagram of Test System

### <AC Conducted Emission Mode>



### <Bluetooth Tx Mode>



## 2.4 Support Unit used in test configuration and system

| Item | Equipment         | Brand Name | Model Name    | FCC ID                | Data Cable | Power Cord                                                 |
|------|-------------------|------------|---------------|-----------------------|------------|------------------------------------------------------------|
| 1.   | System Simulator  | Anritsu    | MT8820C       | N/A                   | N/A        | Unshielded, 1.8 m                                          |
| 2.   | Wireless Earphone | Google     | G1007/G1008   | A4RG1007/<br>A4RG1008 | N/A        | N/A                                                        |
| 3.   | WLAN AP           | ASUS       | RT-AC66U      | MSQ-RTAC66U           | N/A        | Unshielded, 1.8 m                                          |
| 4.   | Notebook          | DELL       | Latitude 3400 | FCC DoC               | N/A        | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |

## 2.5 EUT Operation Test Setup

The RF test items, utility “adb Command 1.0.36” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 4.2 + 10 = 14.2 \text{ (dB)}
 \end{aligned}$$

### 3 Test Result

#### 3.1 Number of Channel Measurement

##### 3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

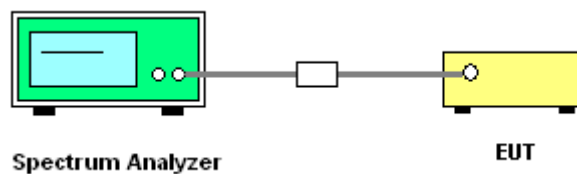
##### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

##### 3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation;  
RBW = 300 kHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

##### 3.1.4 Test Setup

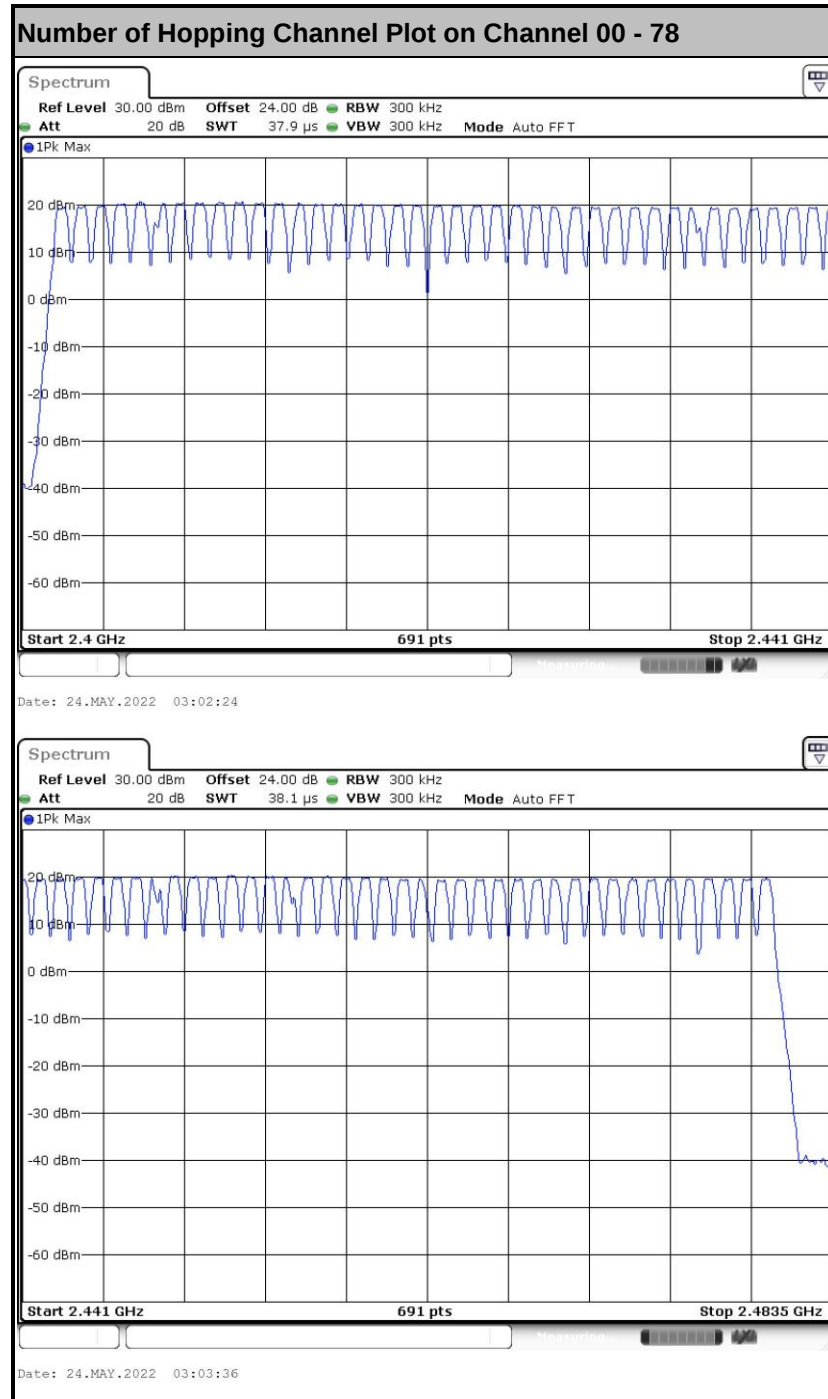




### 3.1.5 Test Result of Number of Hopping Frequency

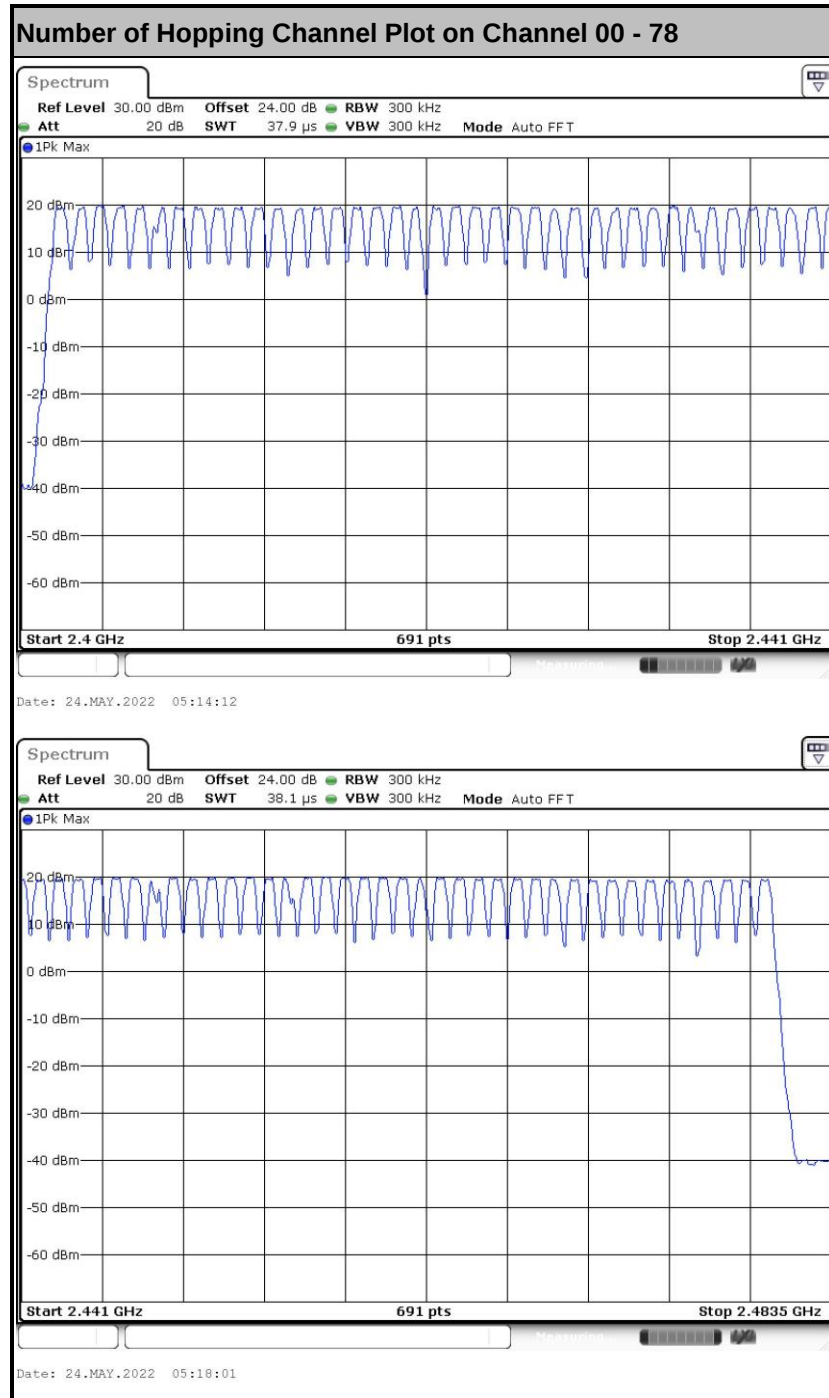
Please refer to Appendix A.

<Ant. 4>



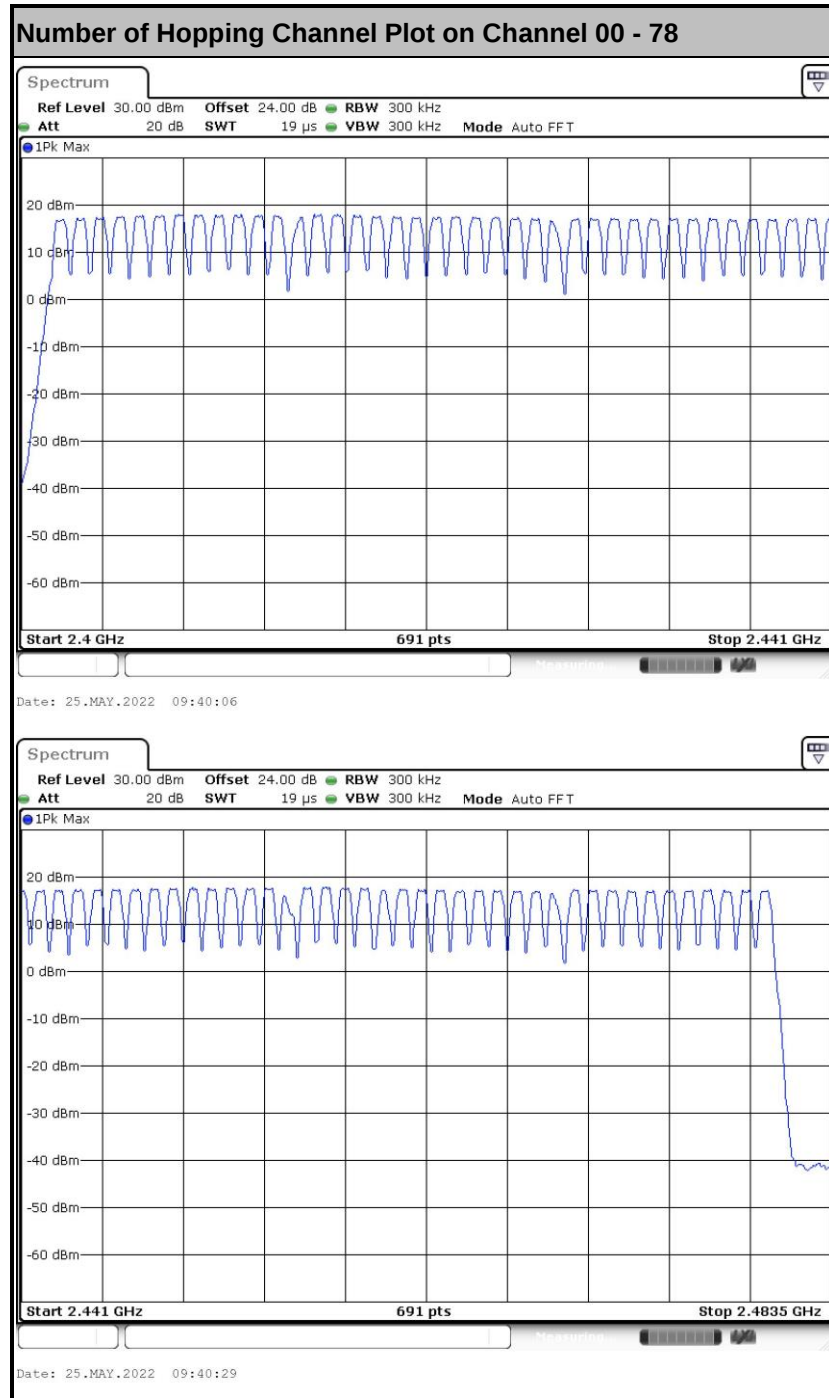


&lt;Ant. 3&gt;



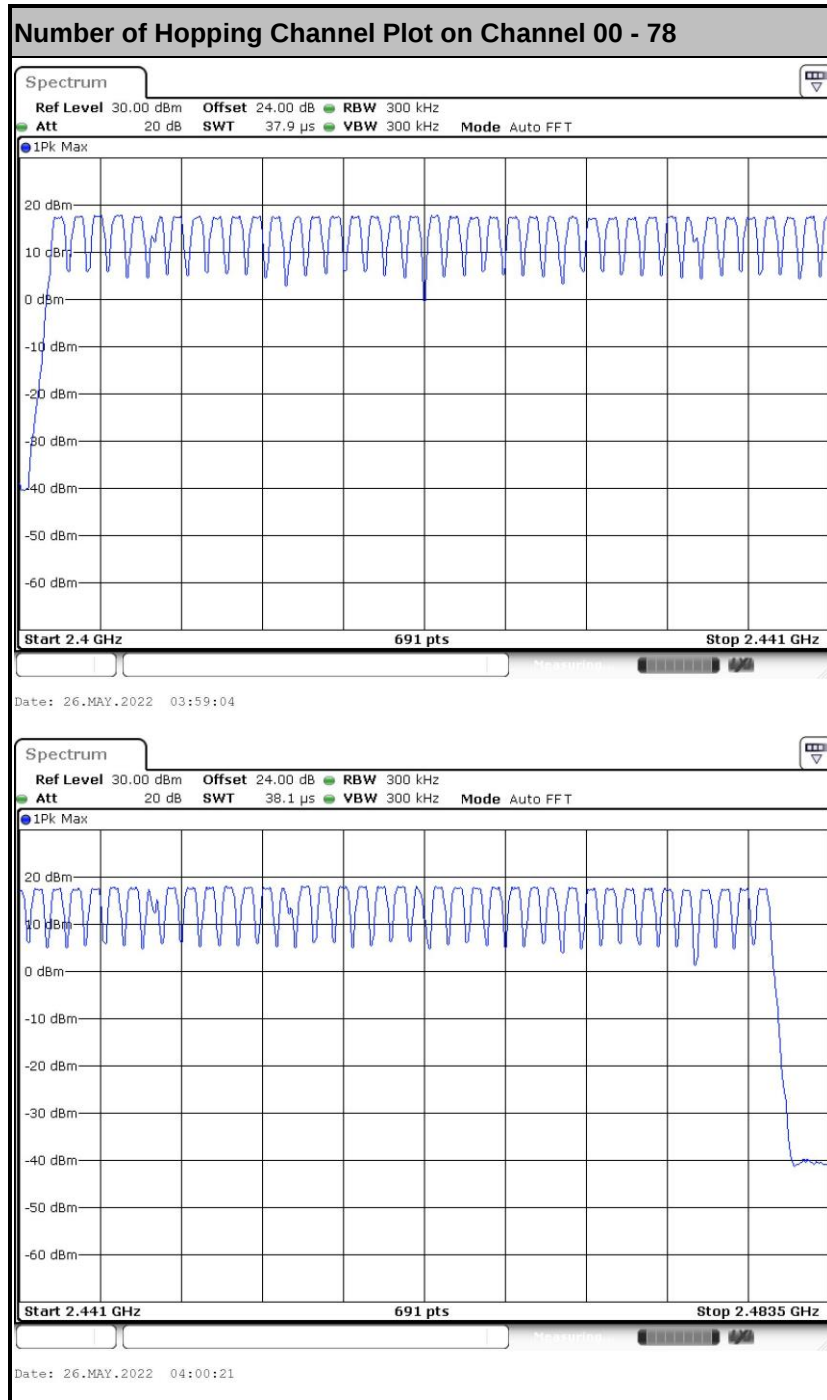


MIMO <Ant. 4>





## MIMO &lt;Ant. 3&gt;



## 3.2 Hopping Channel Separation Measurement

### 3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

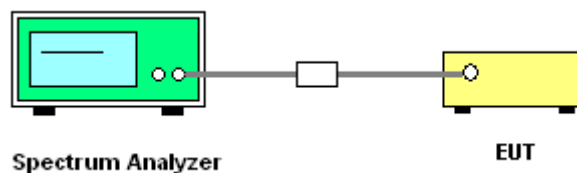
### 3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:  
Span = wide enough to capture the peaks of two adjacent channels;  
RBW = 300 kHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Hopping Channel Separation

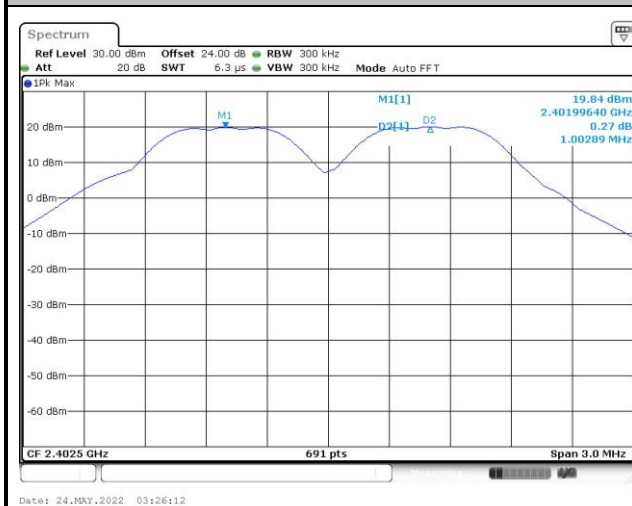
Please refer to Appendix A.



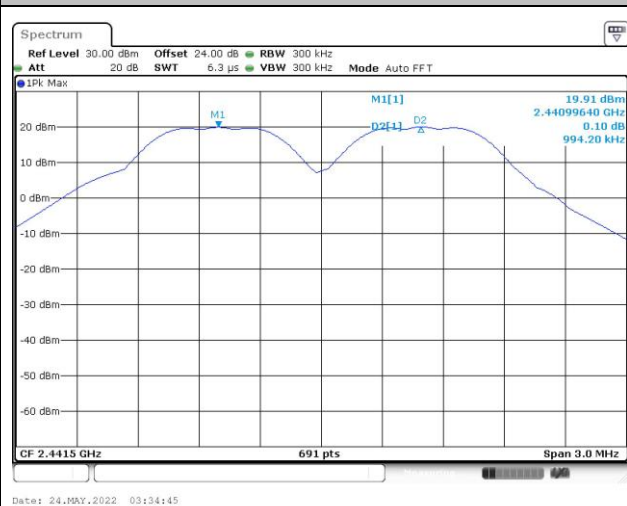
&lt;Ant. 4&gt;

&lt;1Mbps&gt;

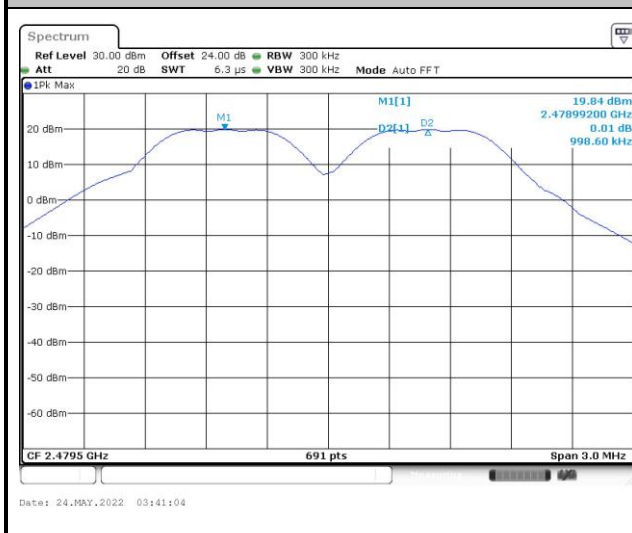
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

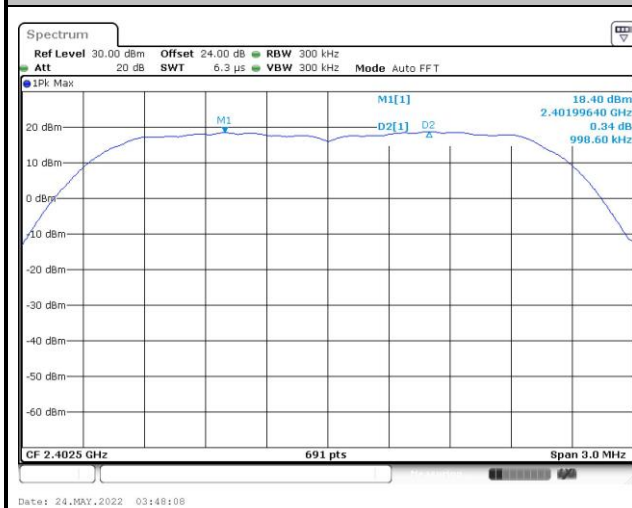


N/A

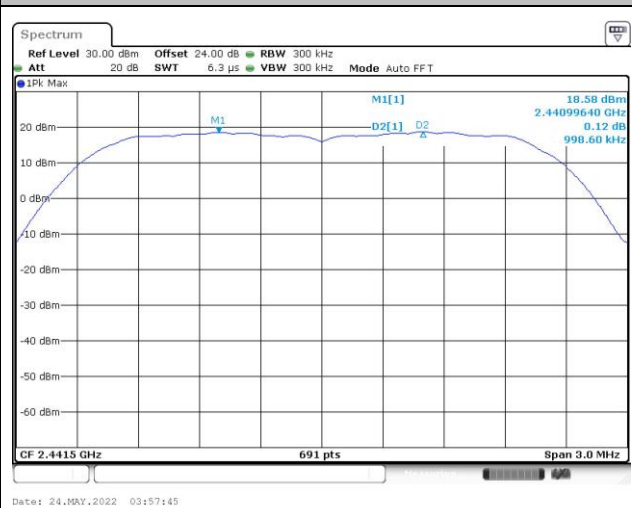


&lt;2Mbps&gt;

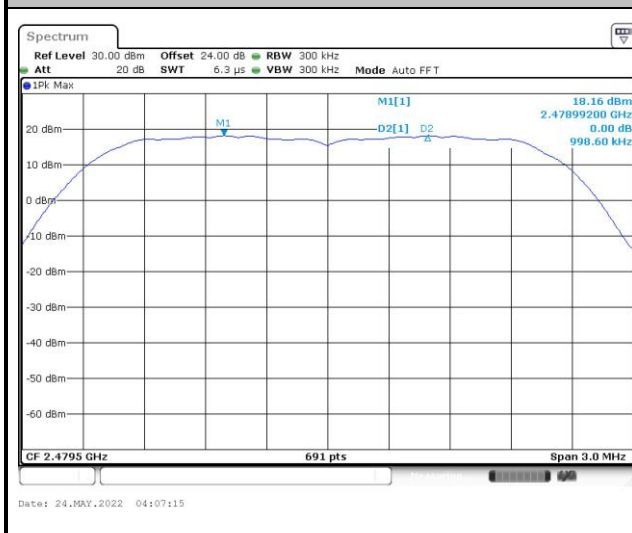
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

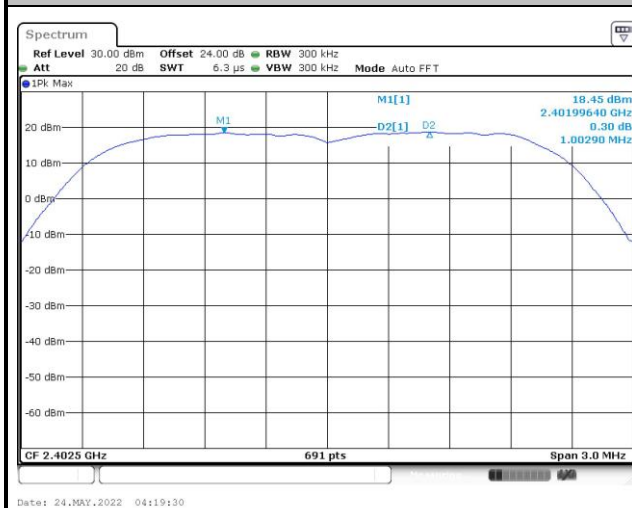


N/A

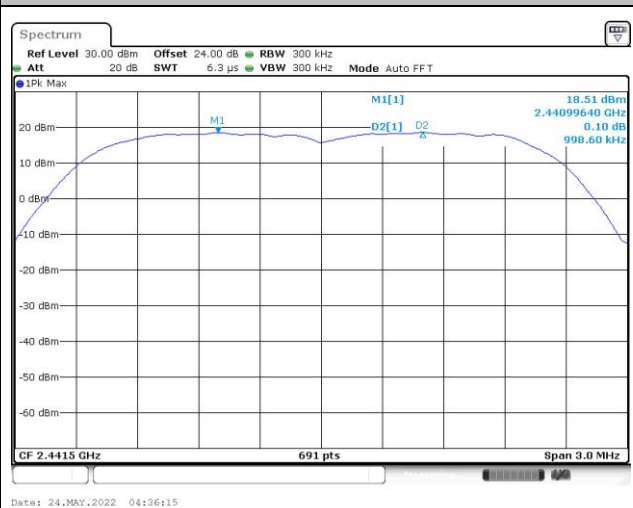


&lt;3Mbps&gt;

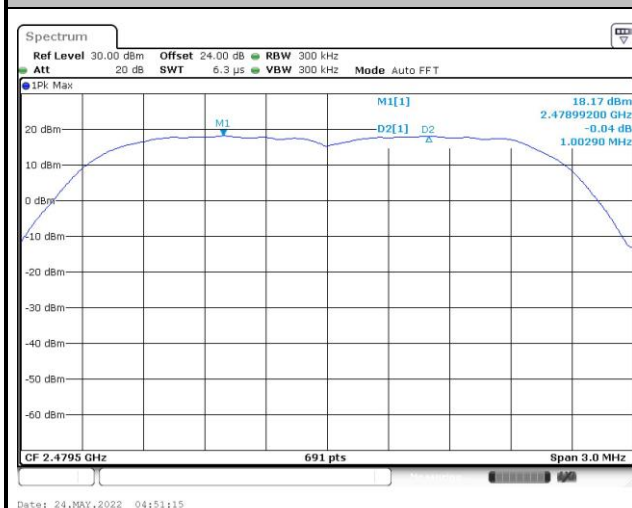
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



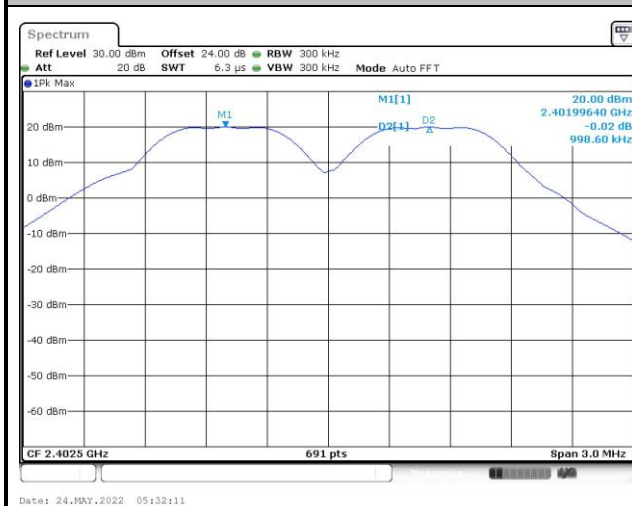
N/A



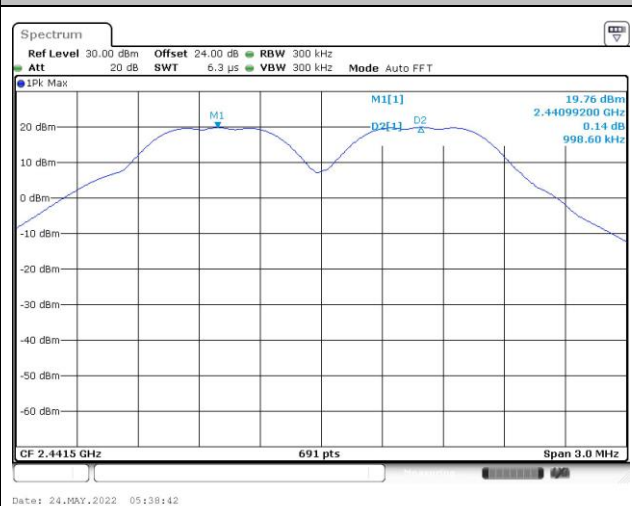
&lt;Ant. 3&gt;

&lt;1Mbps&gt;

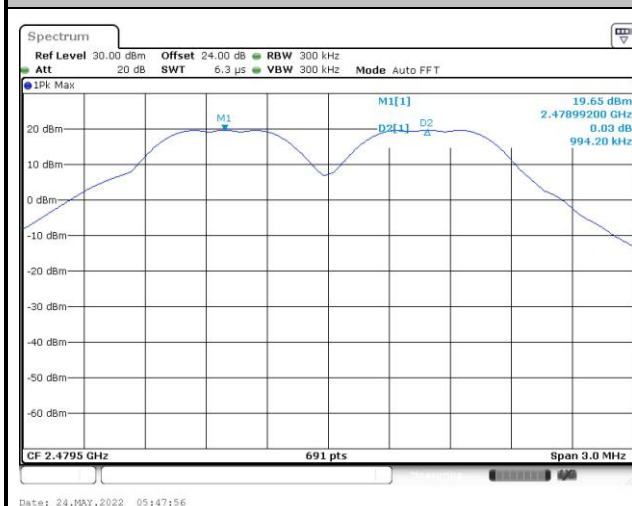
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

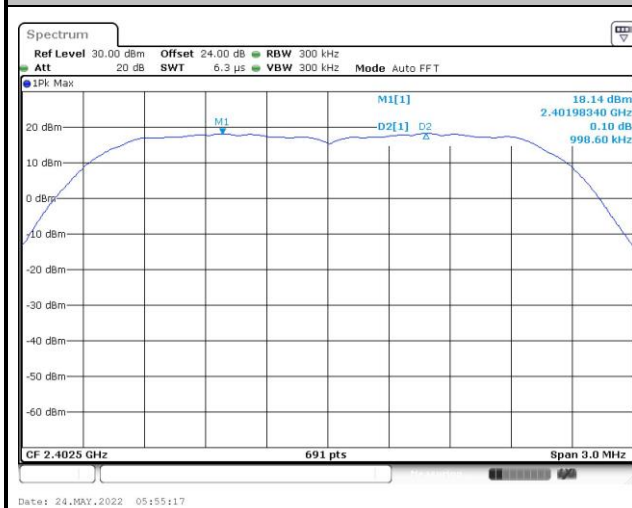


N/A

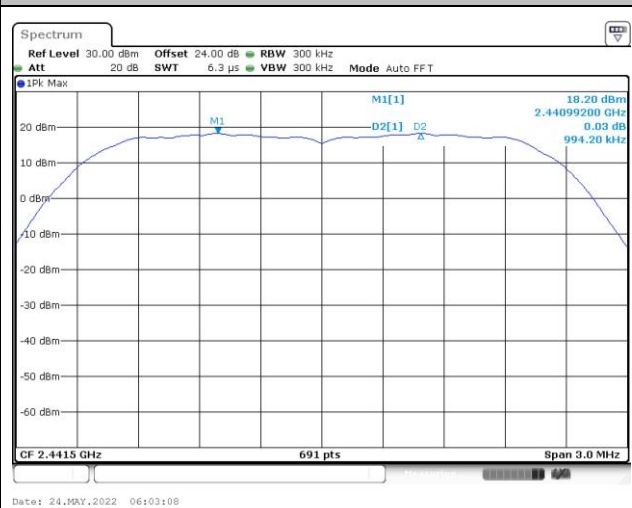


&lt;2Mbps&gt;

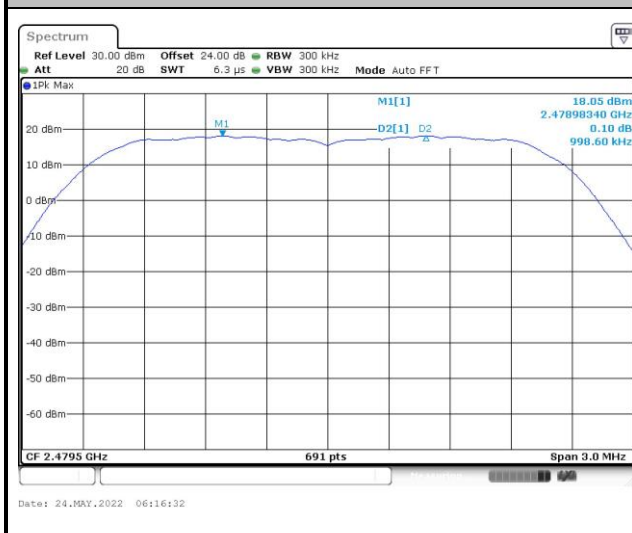
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

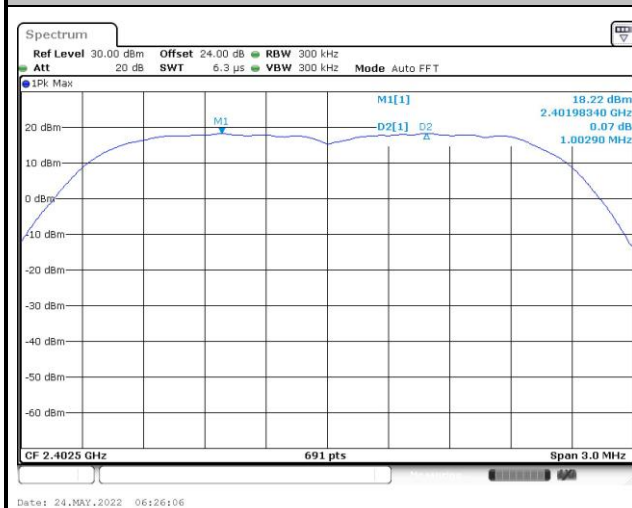


N/A

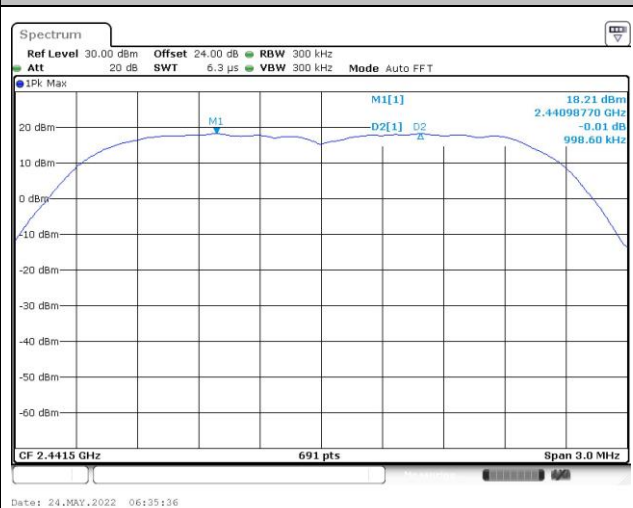


&lt;3Mbps&gt;

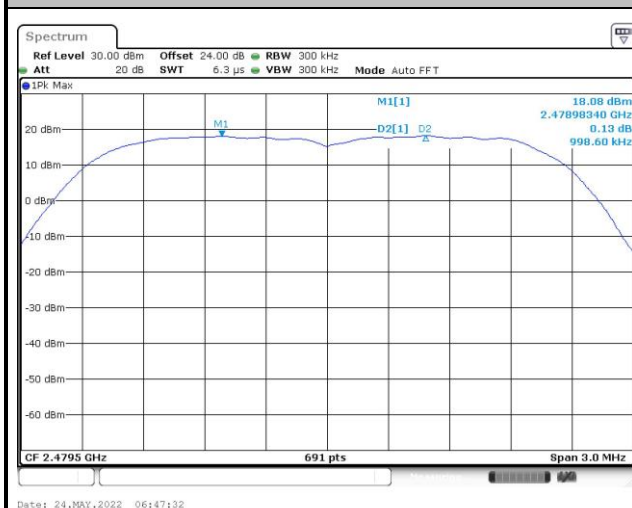
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



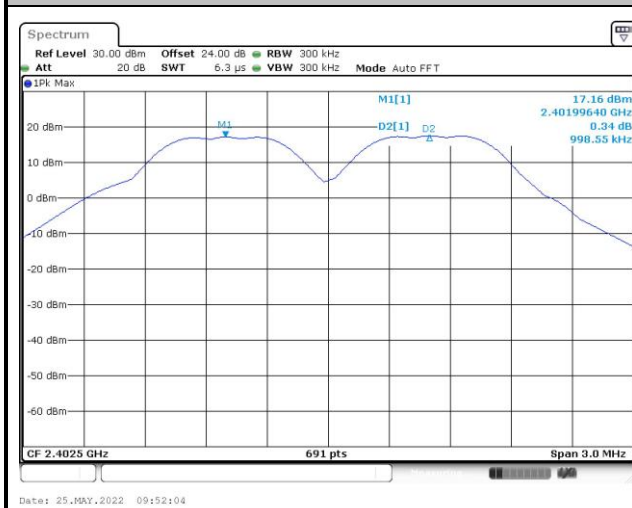
N/A



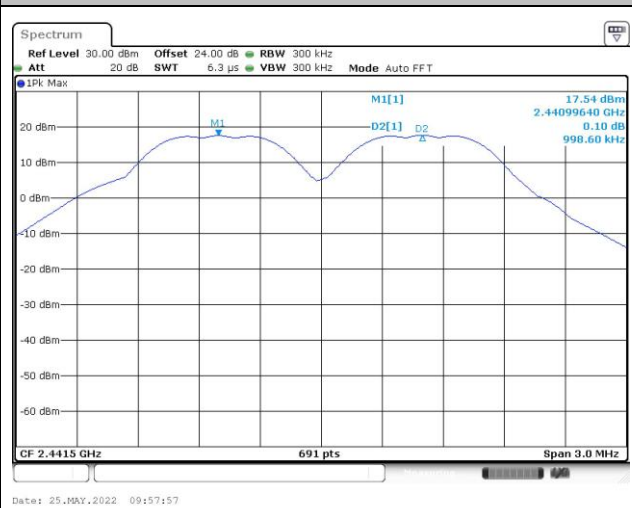
MIMO &lt;Ant. 4&gt;

&lt;1Mbps&gt;

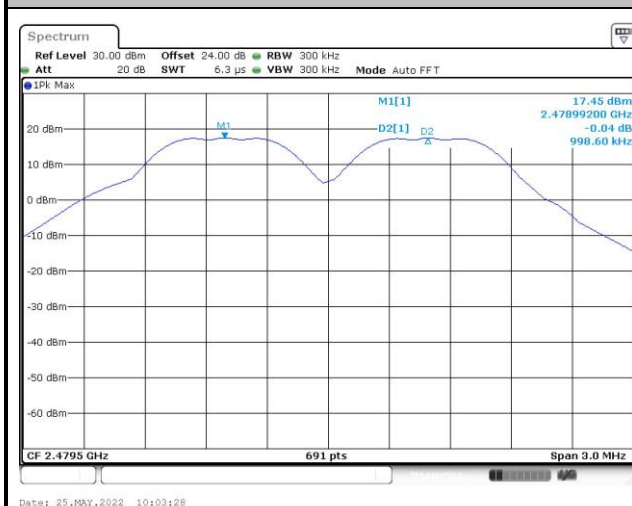
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

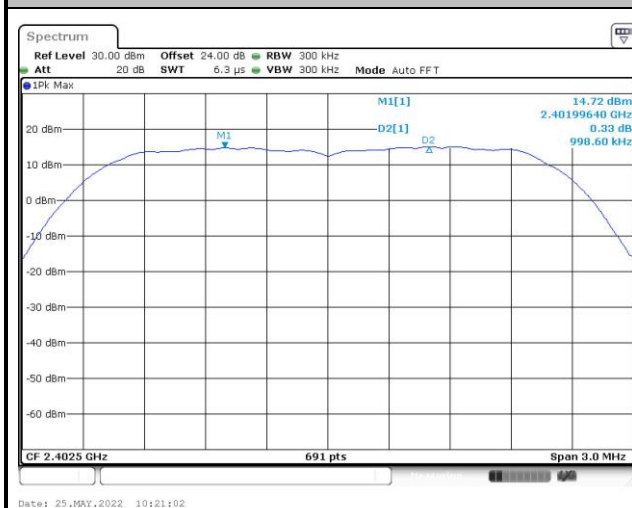


N/A

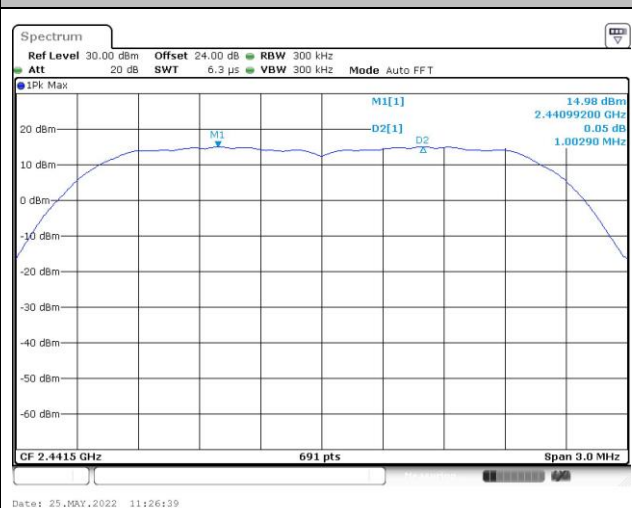


&lt;2Mbps&gt;

Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

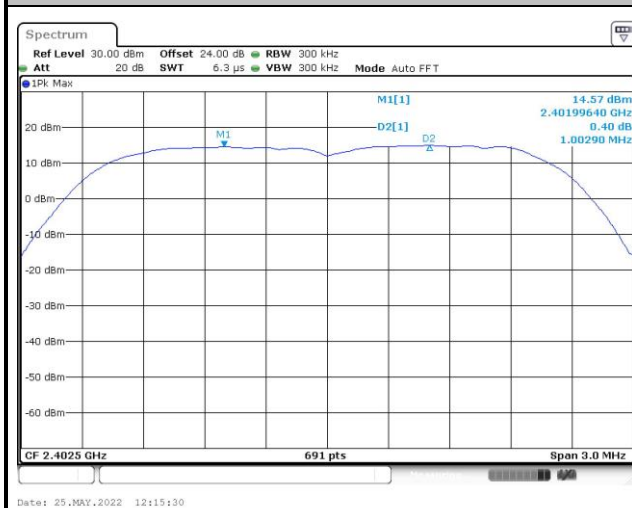


N/A

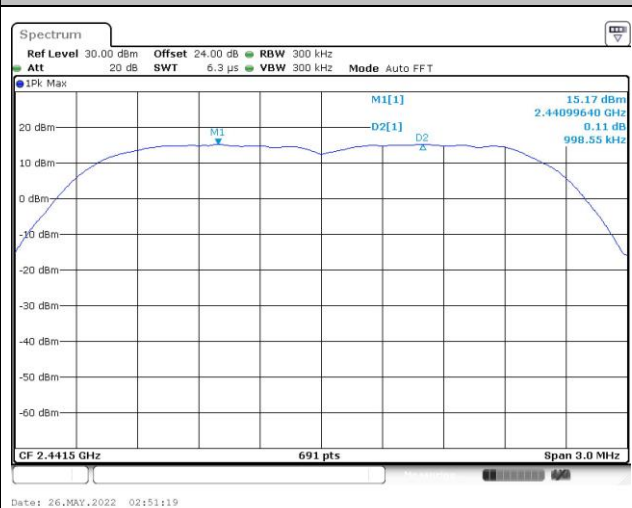


&lt;3Mbps&gt;

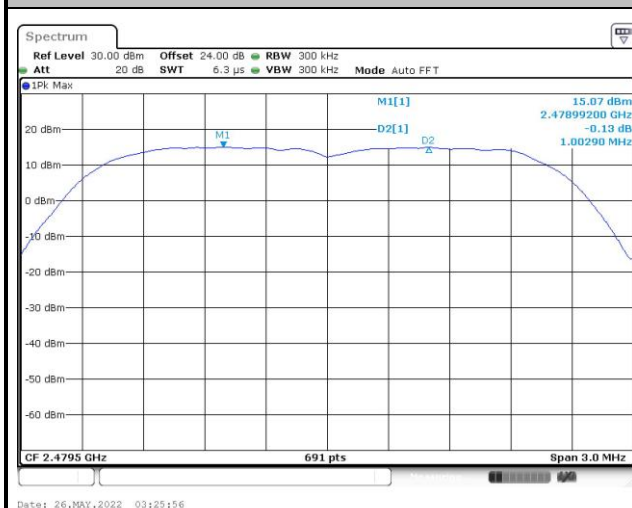
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



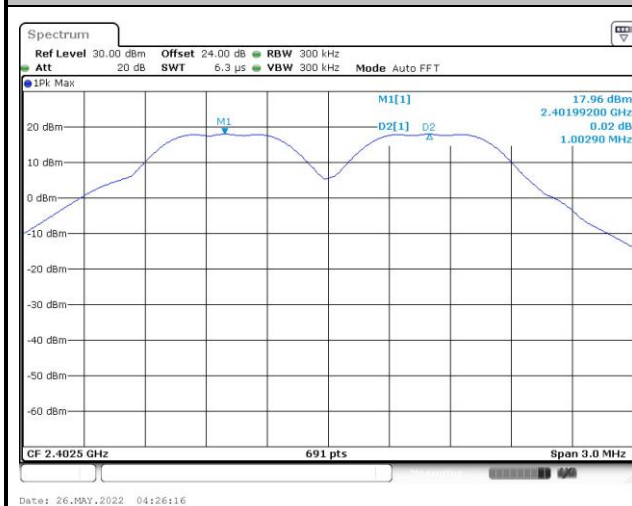
N/A



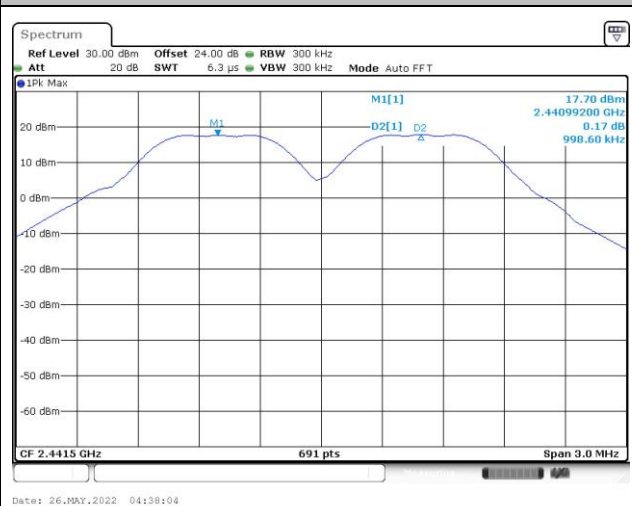
MIMO &lt;Ant. 3&gt;

&lt;1Mbps&gt;

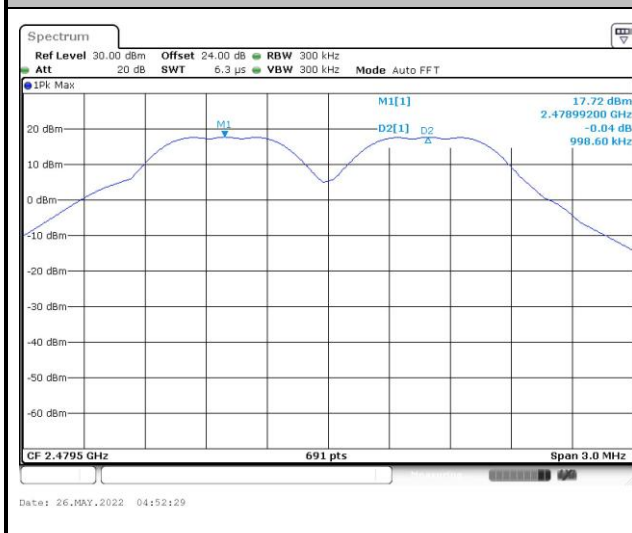
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

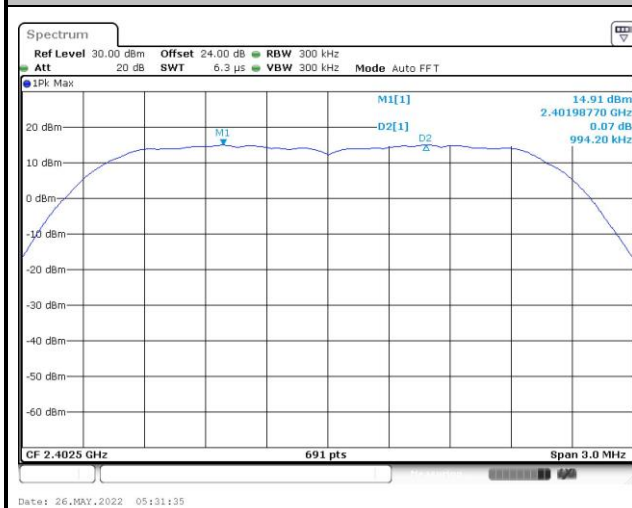


N/A

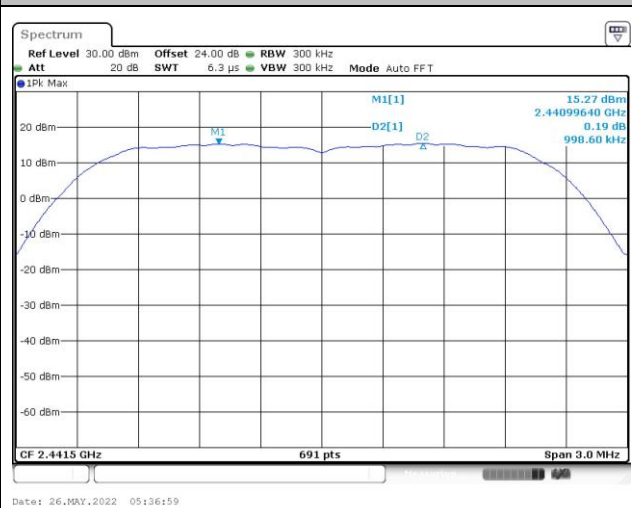


&lt;2Mbps&gt;

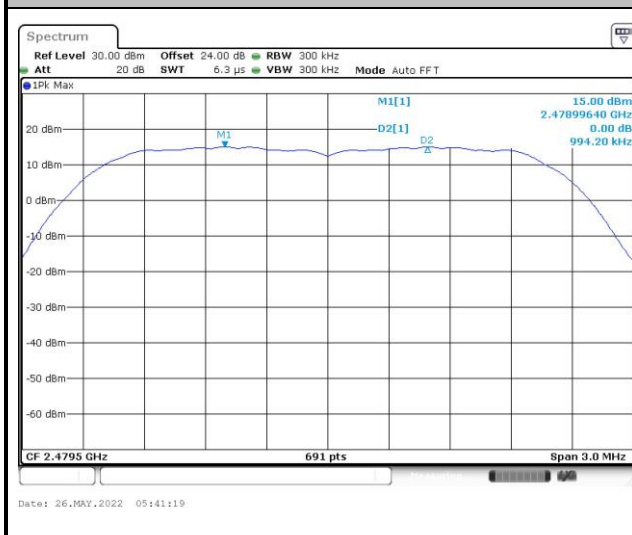
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78

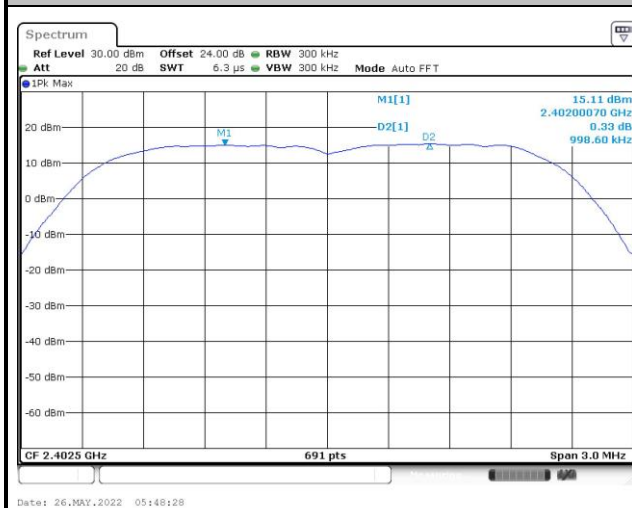


N/A

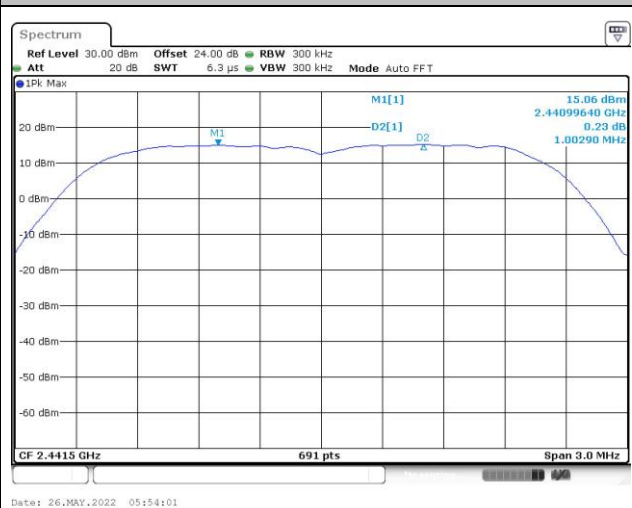


&lt;3Mbps&gt;

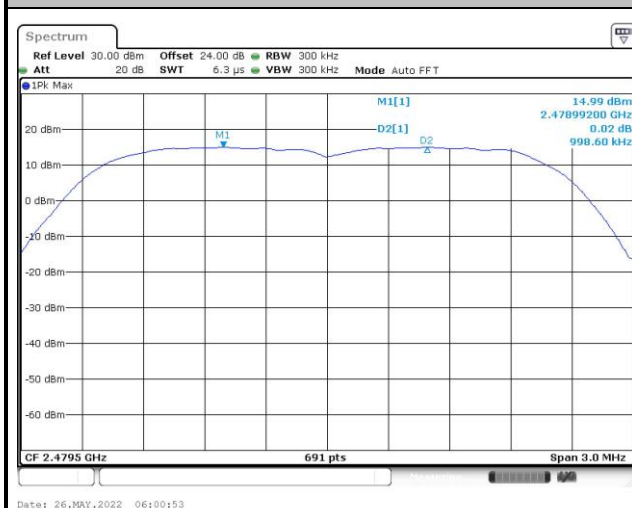
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



N/A

### 3.3 Dwell Time Measurement

#### 3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

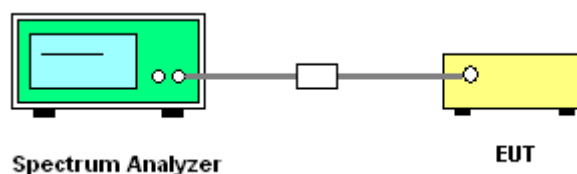
#### 3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW  $\geq$  RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

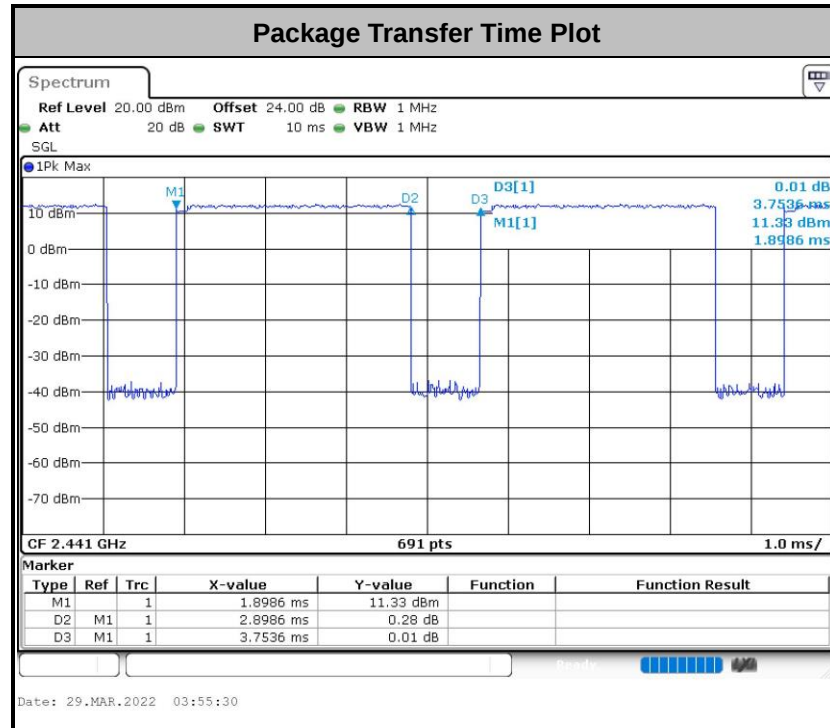
#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

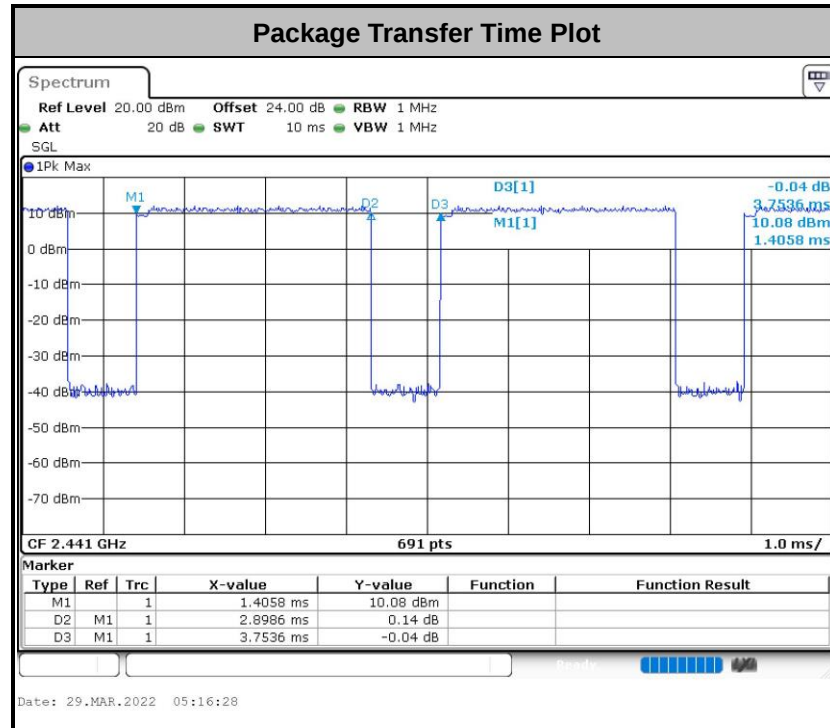
<Ant. 4>



**Remark:**

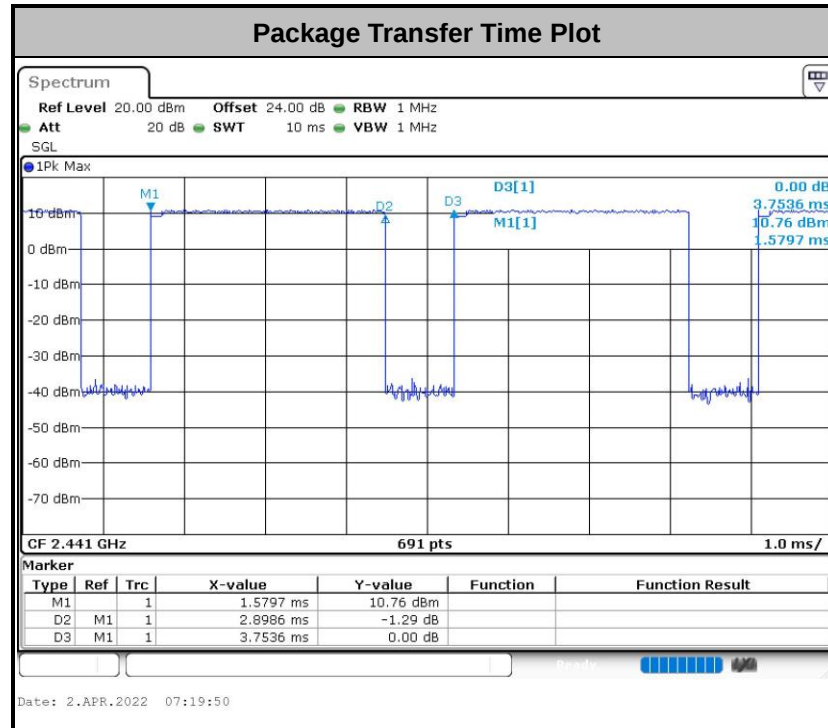
1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate  $(1600 / 6 / 79)$  in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$  hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate  $(800 / 6 / 20)$  in Occupancy Time Limit  $(0.4 \times 20)$  (s), Hops Over Occupancy Time comes to  $(800 / 6 / 20) \times (0.4 \times 20) = 53.33$  hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

<Ant. 3>

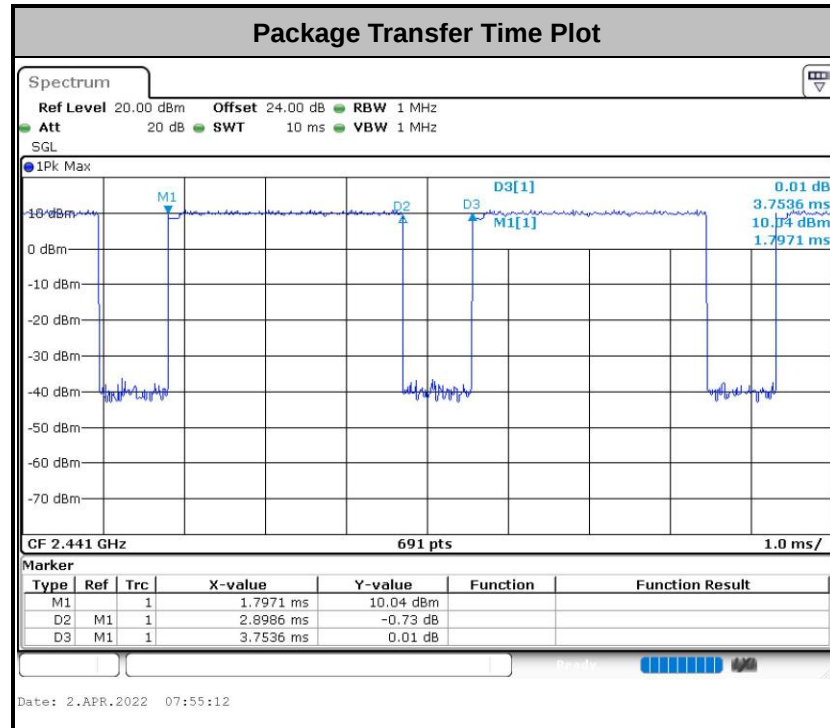


**Remark:**

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate  $(1600 / 6 / 79)$  in Occupancy Time Limit  $(0.4 \times 79)$  (s), Hops Over Occupancy Time comes to  $(1600 / 6 / 79) \times (0.4 \times 79) = 106.67$  hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate  $(800 / 6 / 20)$  in Occupancy Time Limit  $(0.4 \times 20)$  (s), Hops Over Occupancy Time comes to  $(800 / 6 / 20) \times (0.4 \times 20) = 53.33$  hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

**MIMO <Ant. 4>**

**Remark:**

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

**MIMO <Ant. 3>**

**Remark:**

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

### 3.4 20dB and 99% Bandwidth Measurement

#### 3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

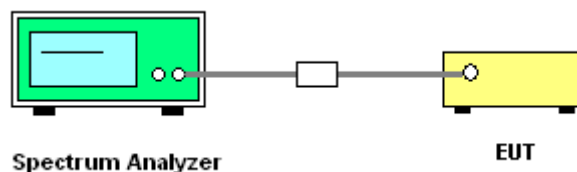
#### 3.4.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Use the following spectrum analyzer settings for 20 dB Bandwidth measurement.  
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;  
RBW  $\geq$  1% of the 20 dB bandwidth; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak;  
Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.  
Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;  
RBW  $\geq$  1-5% of the 99% bandwidth; VBW  $\geq$  3 \* RBW; Sweep = auto; Detector function = peak;  
Trace = max hold.
6. Measure and record the results in the test report.

#### 3.4.4 Test Setup



#### 3.4.5 Test Result of 20dB Bandwidth

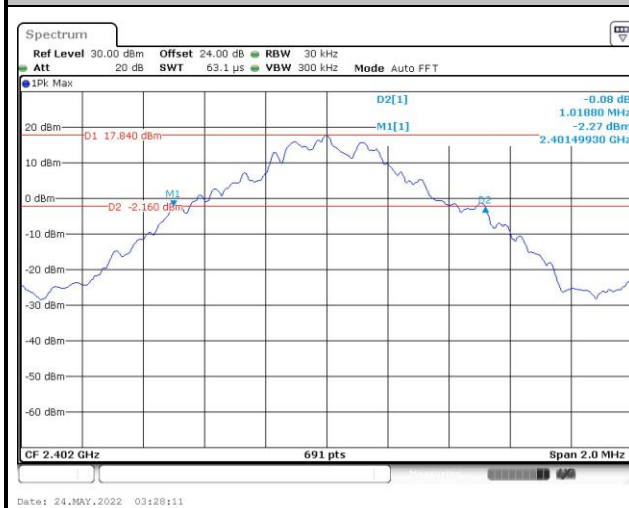
Please refer to Appendix A.



&lt;Ant. 4&gt;

&lt;1Mbps&gt;

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

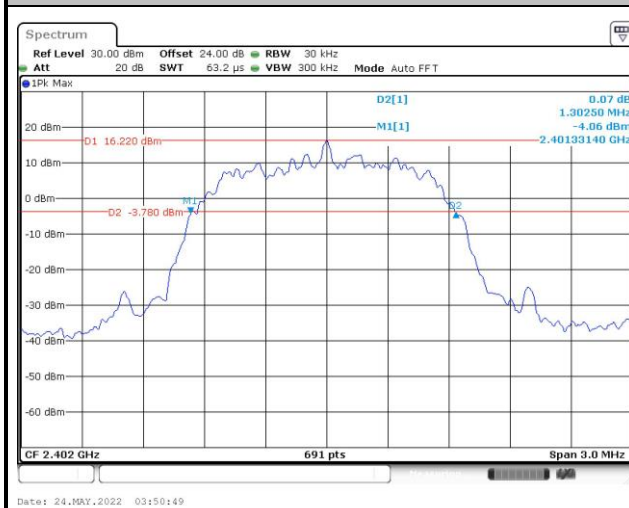


N/A

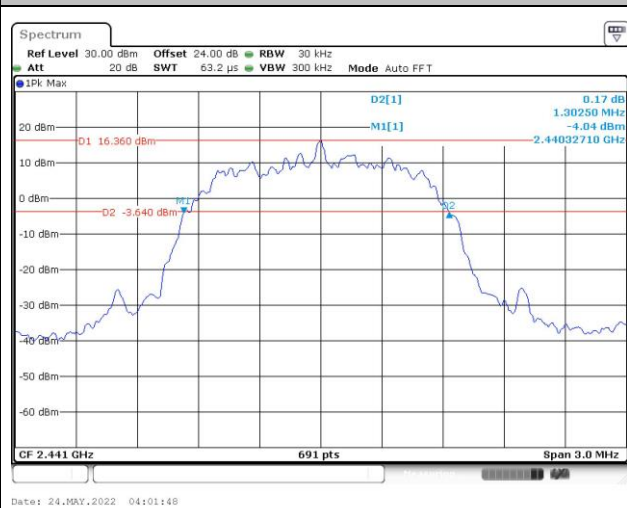


&lt;2Mbps&gt;

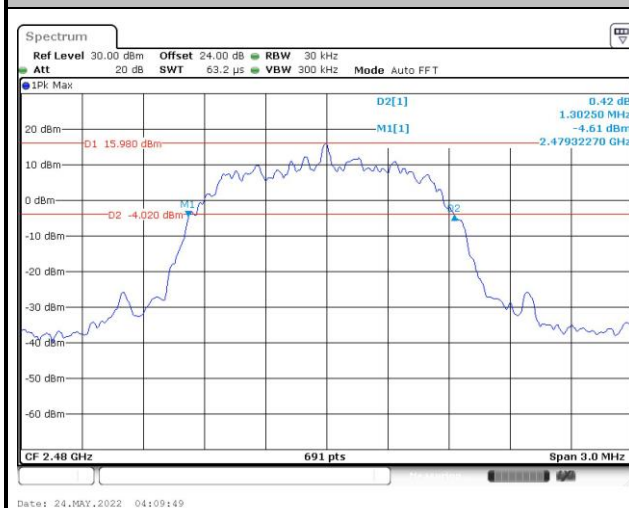
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

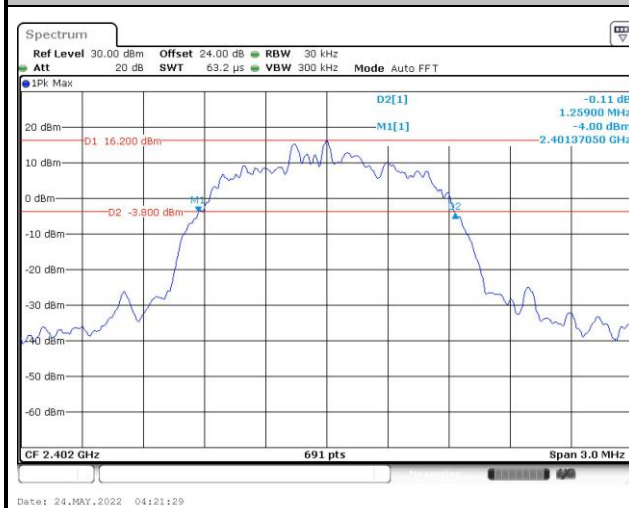


N/A

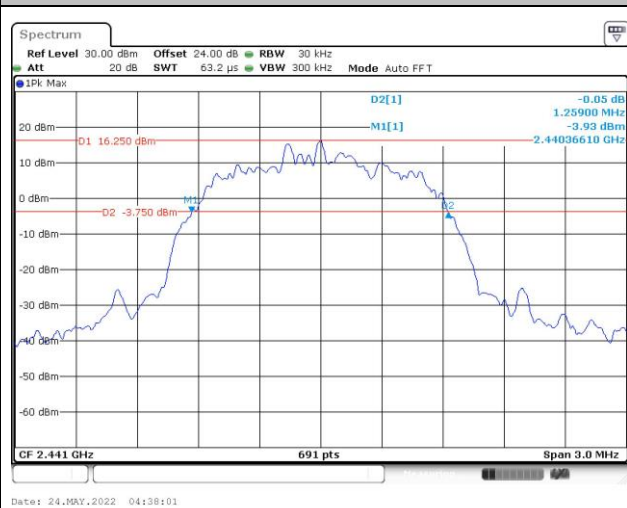


&lt;3Mbps&gt;

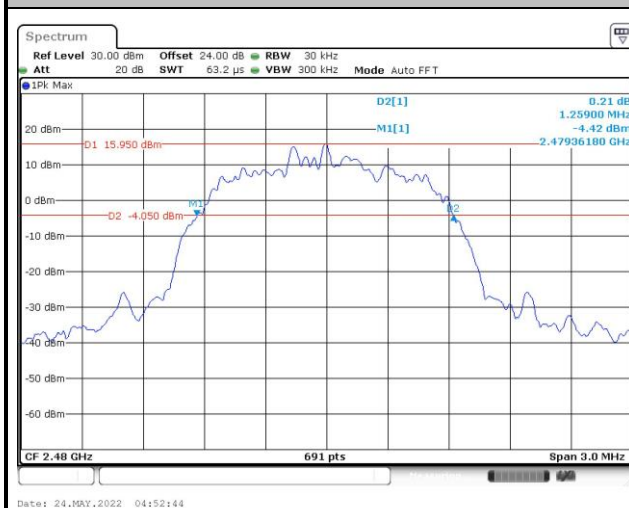
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



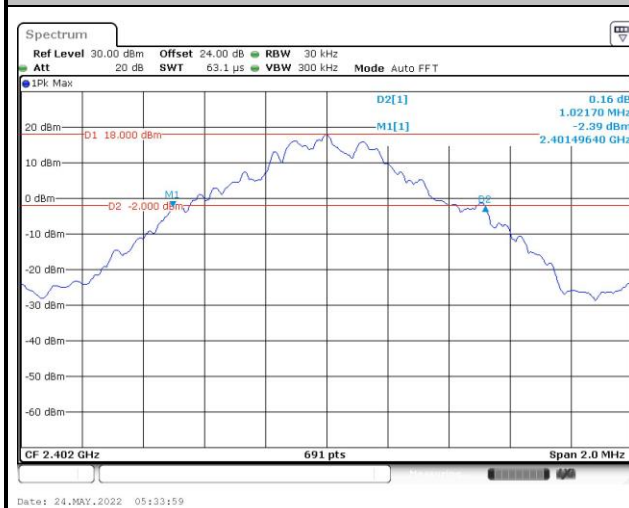
N/A



&lt;Ant. 3&gt;

&lt;1Mbps&gt;

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

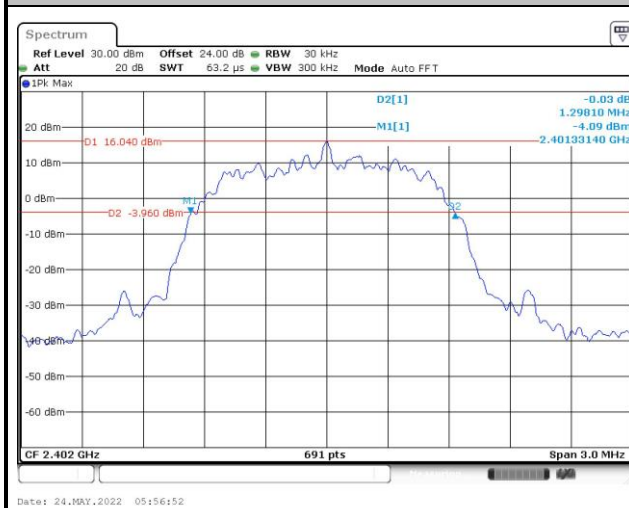


N/A

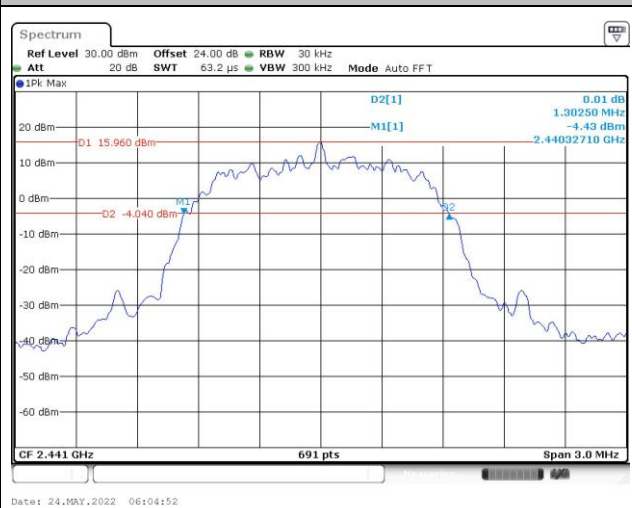


&lt;2Mbps&gt;

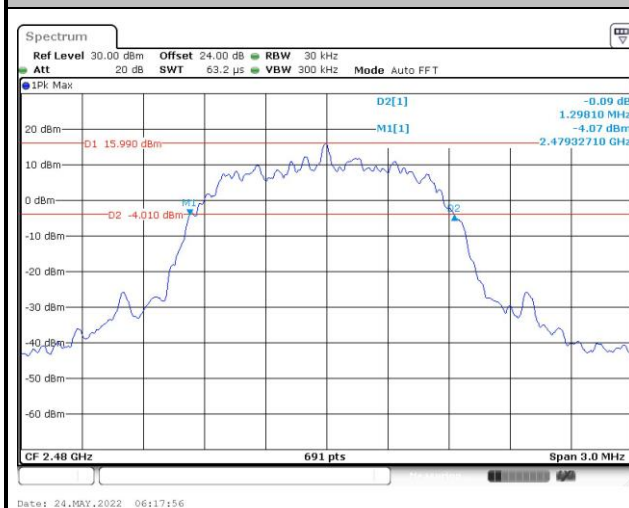
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

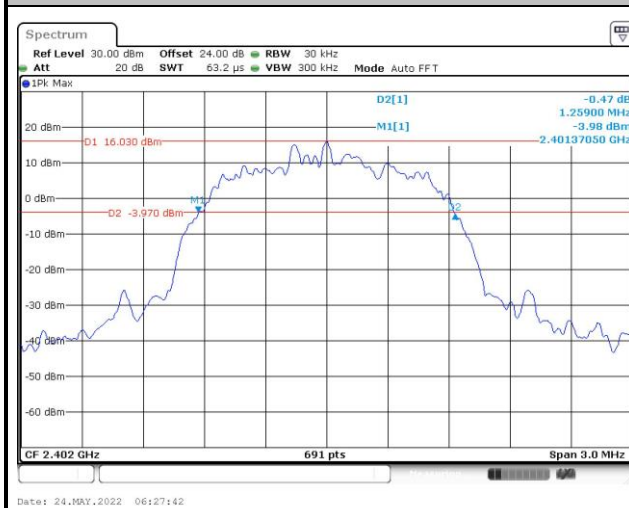


N/A

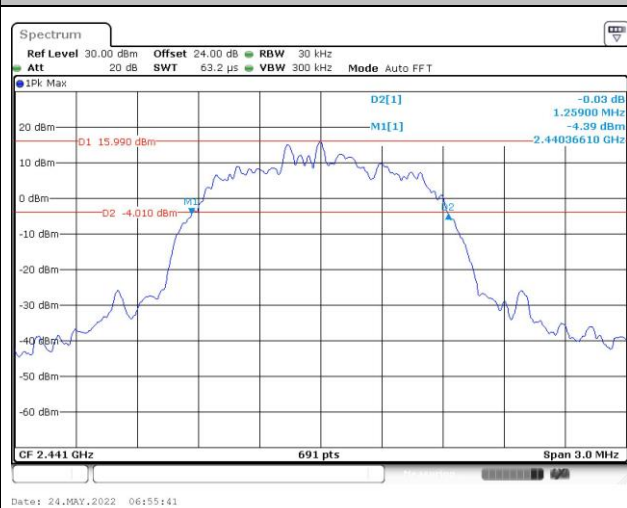


&lt;3Mbps&gt;

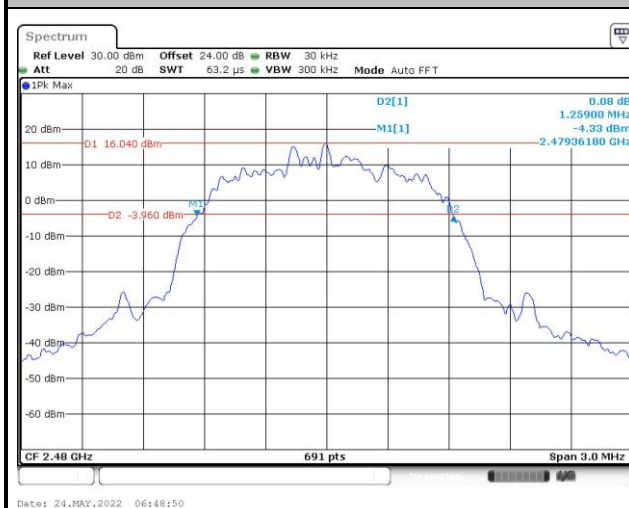
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



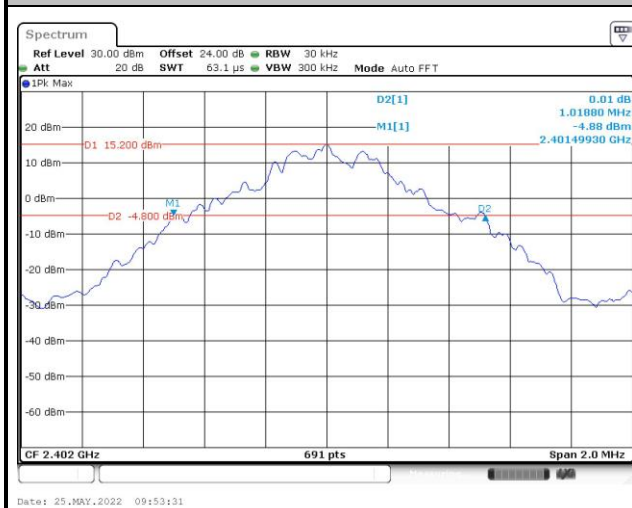
N/A



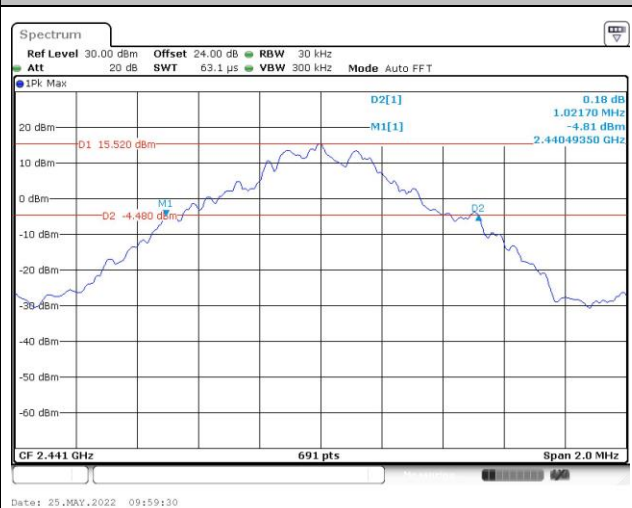
MIMO &lt;Ant. 4&gt;

&lt;1Mbps&gt;

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



N/A

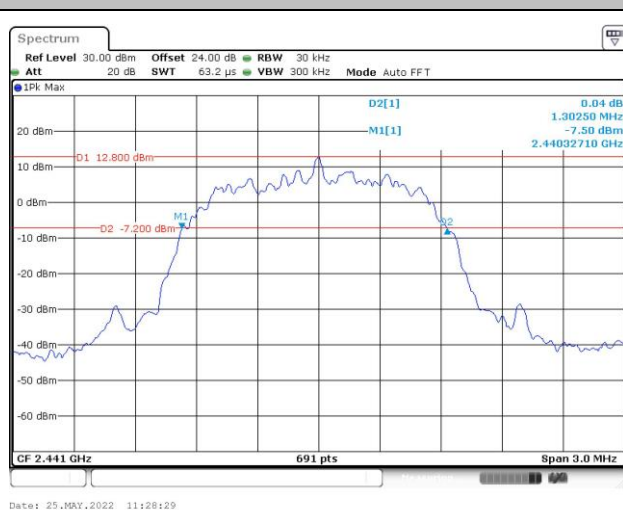


&lt;2Mbps&gt;

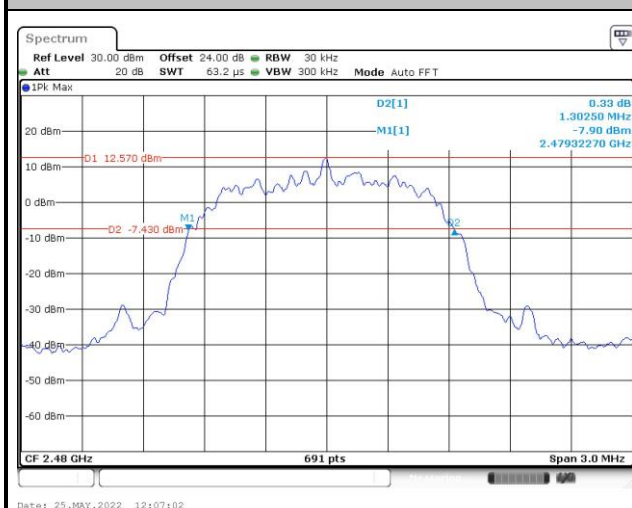
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



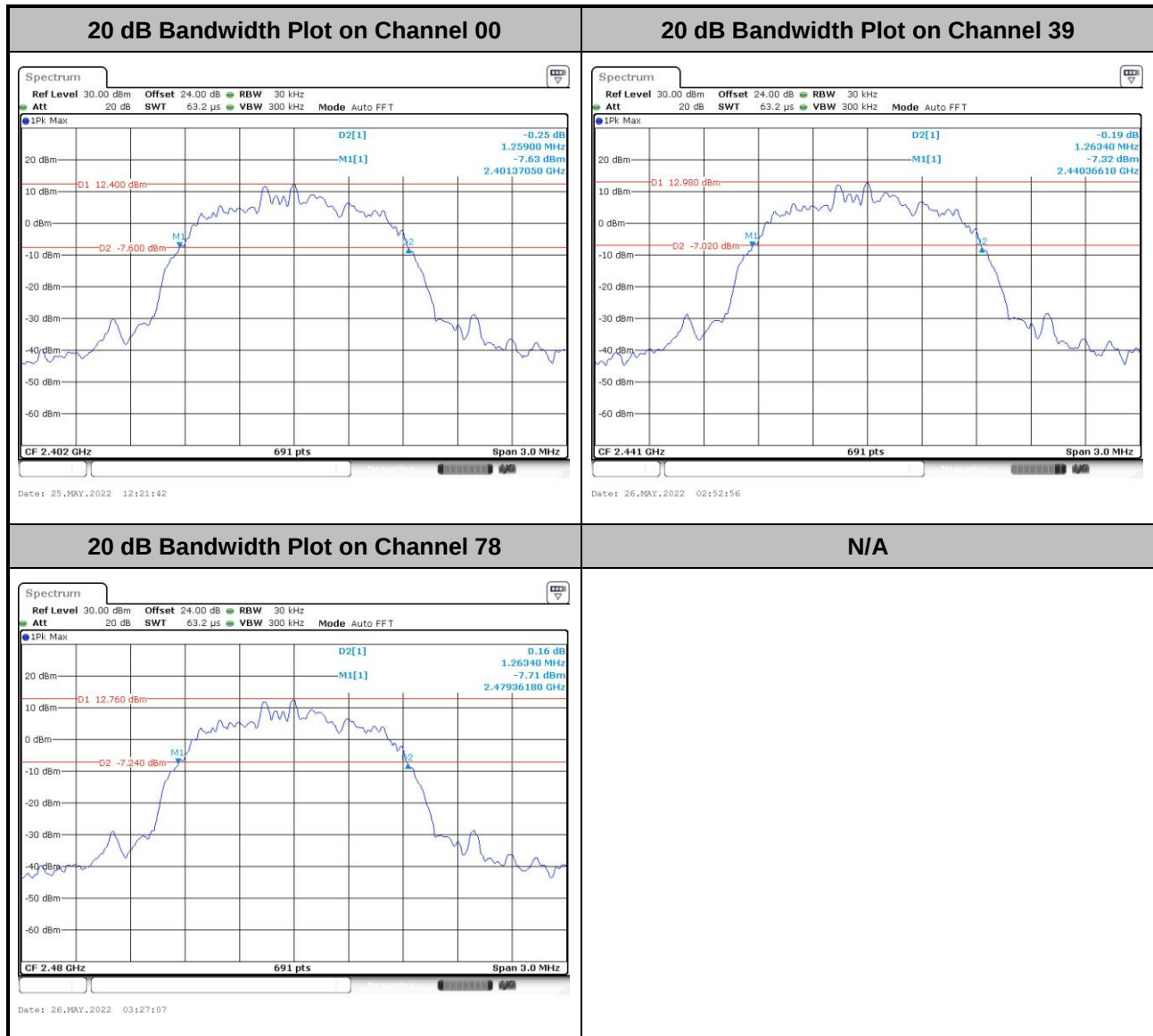
20 dB Bandwidth Plot on Channel 78



N/A



&lt;3Mbps&gt;





MIMO &lt;Ant. 3&gt;

&lt;1Mbps&gt;

20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78

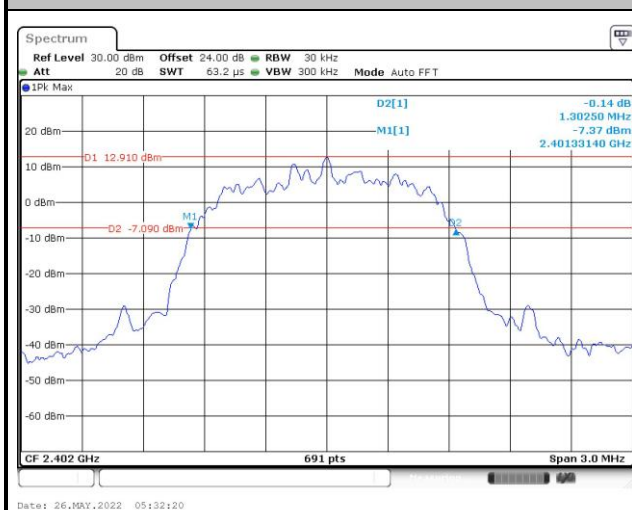


N/A



&lt;2Mbps&gt;

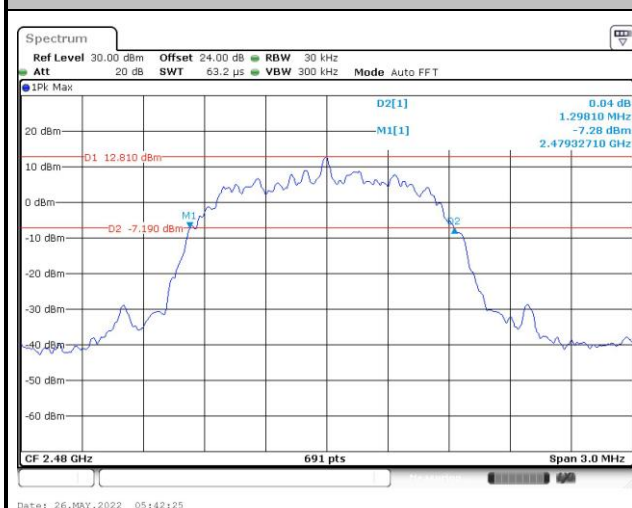
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



N/A



&lt;3Mbps&gt;

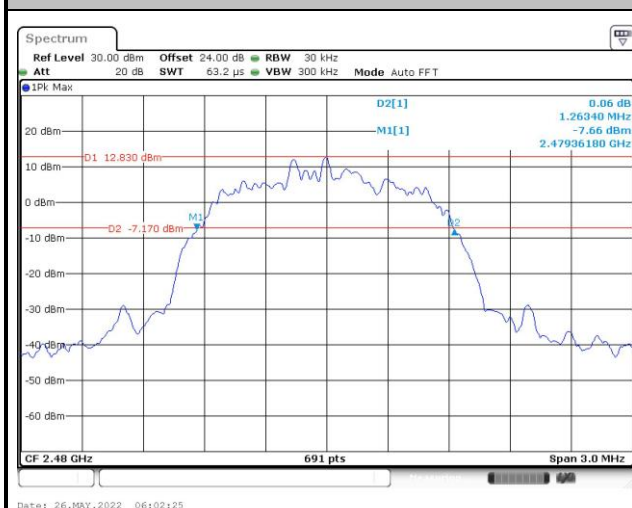
20 dB Bandwidth Plot on Channel 00



20 dB Bandwidth Plot on Channel 39



20 dB Bandwidth Plot on Channel 78



N/A

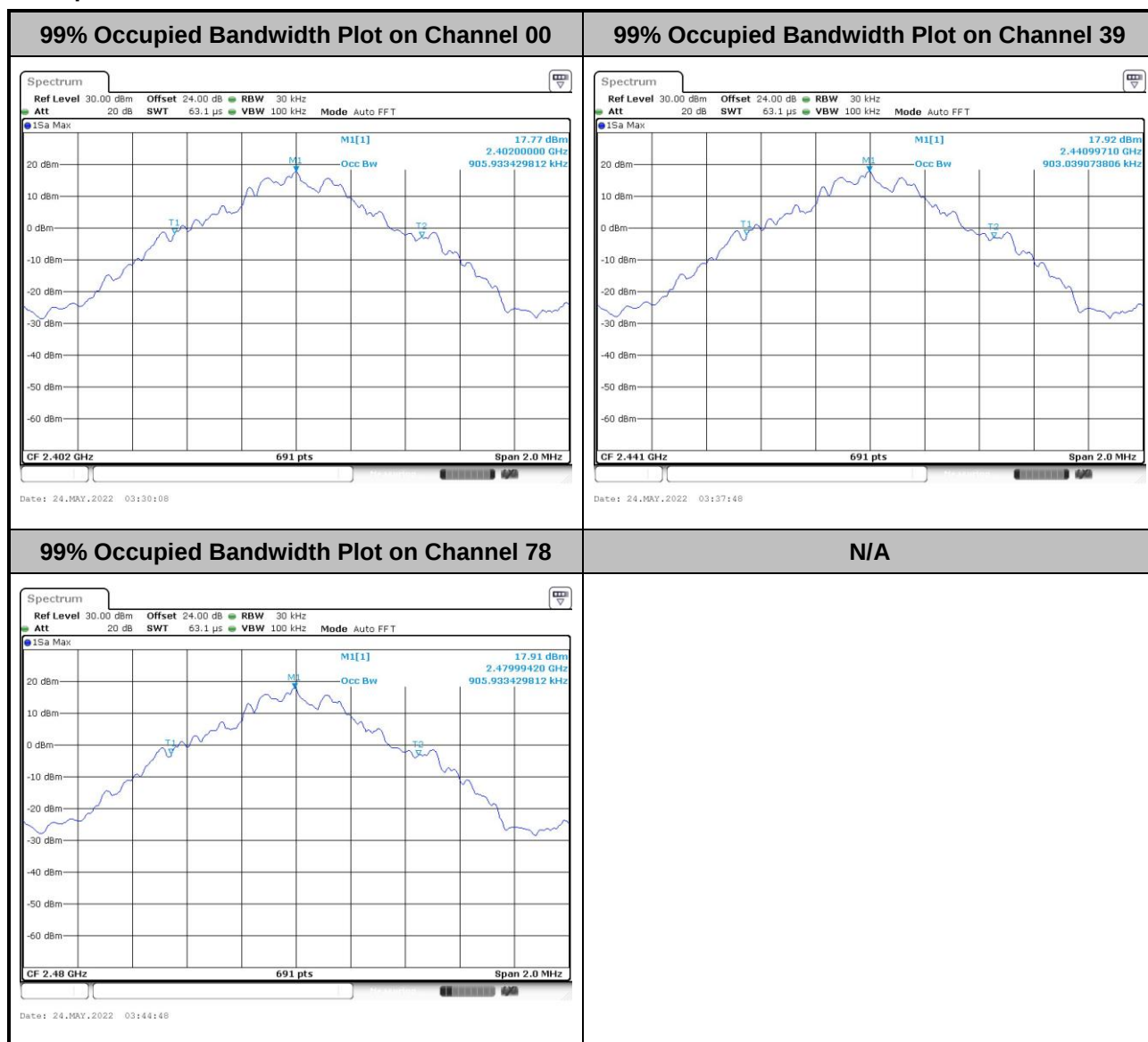


### 3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

<Ant. 4>

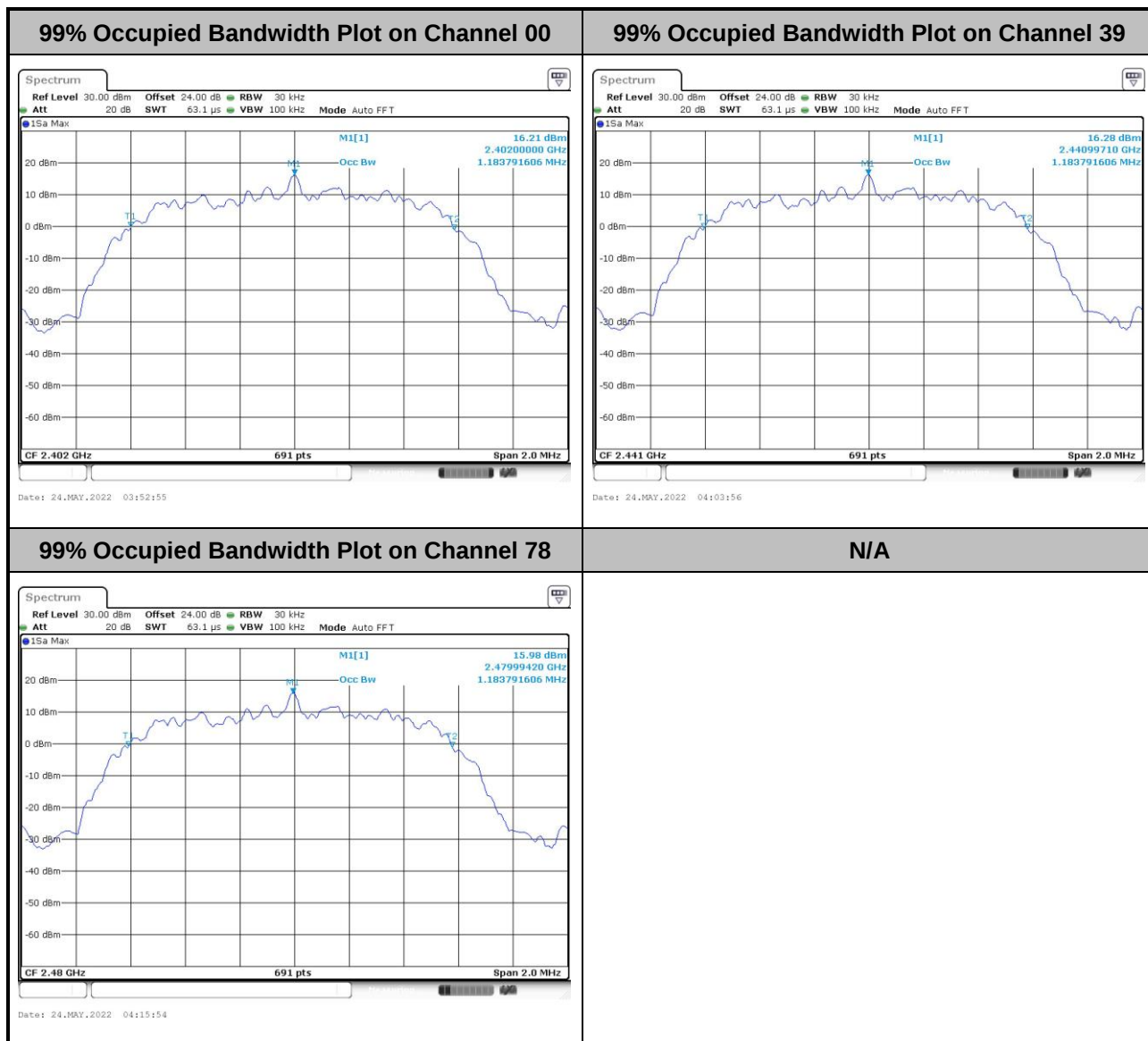
<1Mbps>



**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



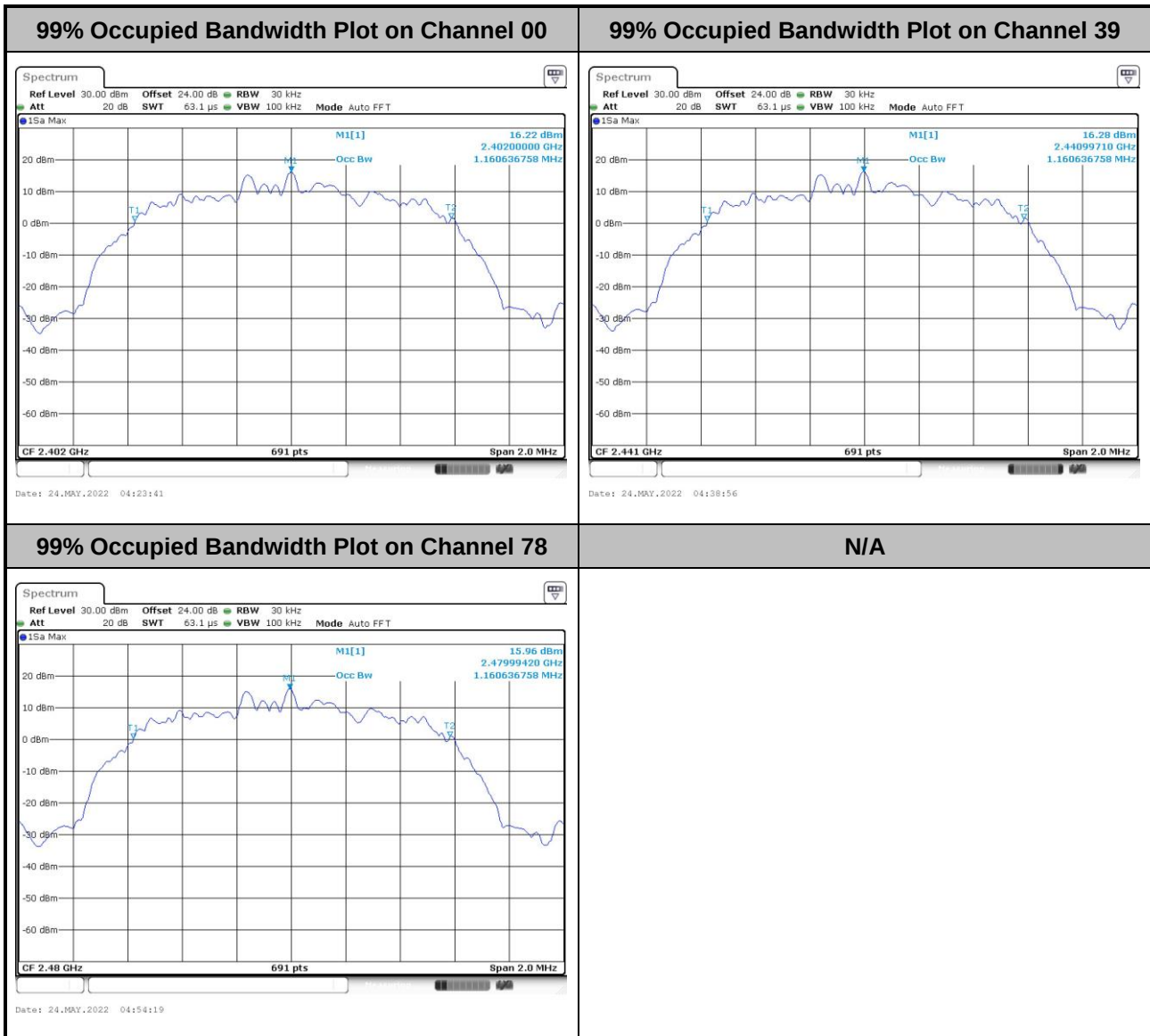
&lt;2Mbps&gt;



**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



&lt;3Mbps&gt;



**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



&lt;Ant. 3&gt;

&lt;1Mbps&gt;

99% Occupied Bandwidth Plot on Channel 00



99% Occupied Bandwidth Plot on Channel 39



99% Occupied Bandwidth Plot on Channel 78



N/A

**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



&lt;2Mbps&gt;

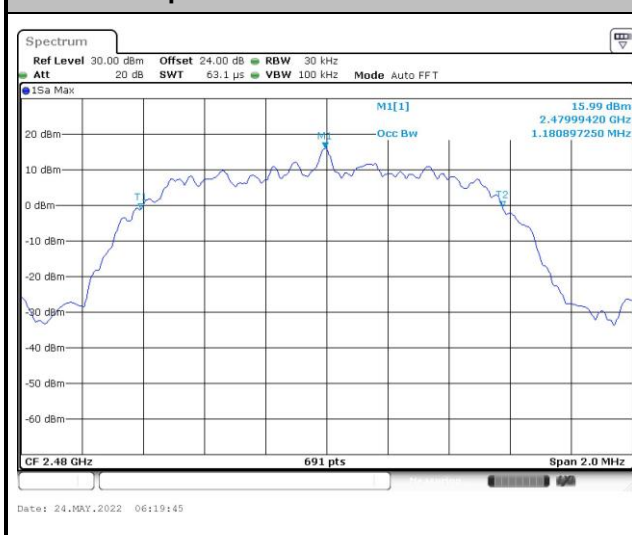
99% Occupied Bandwidth Plot on Channel 00



99% Occupied Bandwidth Plot on Channel 39



99% Occupied Bandwidth Plot on Channel 78

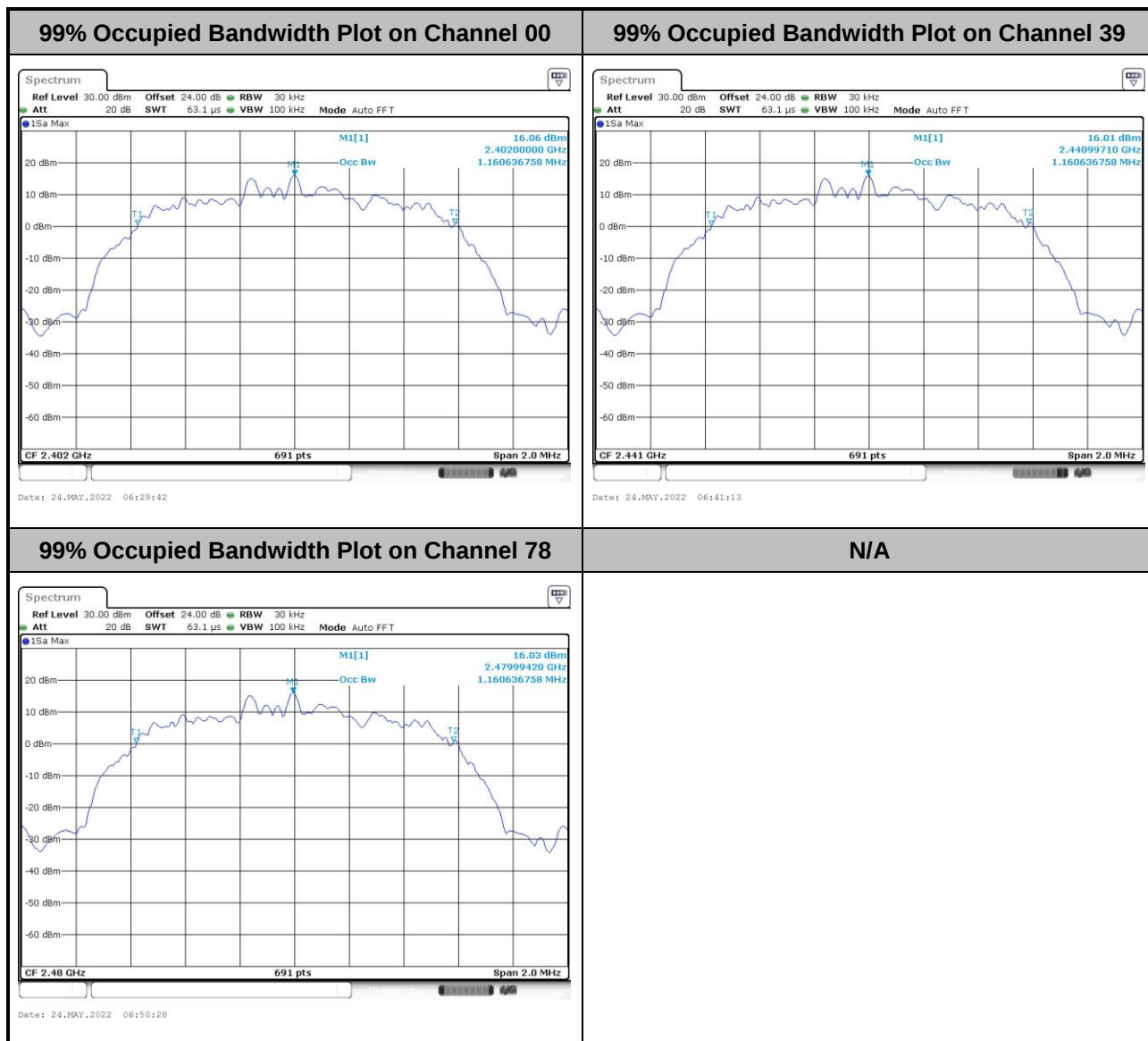


N/A

**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



&lt;3Mbps&gt;



**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.