



# FCC RADIO TEST REPORT

**FCC ID** : XRAFB423  
**Equipment** : Wireless Device  
**Brand Name** : Fitbit  
**Model Name** : FB423  
**Applicant** : Fitbit, LLC  
199 Fremont Street, 14th Floor, San Francisco, CA 94105 USA  
**Manufacturer** : Fitbit, LLC  
199 Fremont Street, 14th Floor, San Francisco, CA 94105 USA  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Jun. 08, 2022 and testing was performed from Jun. 08, 2022 to Aug. 09, 2022. We, Sporton International Inc. Wensan 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. Wensan Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

**Sporton International Inc. Wensan Laboratory**

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)



## Table of Contents

|  |           |
|--|-----------|
| History of this test report.....                                 | 3         |
| Summary of Test Result.....                                      | 4         |
| <b>1 General Description.....</b>                                | <b>5</b>  |
| 1.1 Product Feature of Equipment Under Test.....                 | 5         |
| 1.2 Modification of EUT .....                                    | 5         |
| 1.3 Testing Location .....                                       | 6         |
| 1.4 Applicable Standards.....                                    | 6         |
| <b>2 Test Configuration of Equipment Under Test.....</b>         | <b>7</b>  |
| 2.1 Carrier Frequency Channel .....                              | 7         |
| 2.2 Test Mode.....   | 8         |
| 2.3 Connection Diagram of Test System.....                       | 9         |
| 2.4 Support Unit used in test configuration and system .....     | 9         |
| 2.5 EUT Operation Test Setup .....                               | 9         |
| 2.6 Measurement Results Explanation Example.....                 | 10        |
| <b>3 Test Result.....</b>  | <b>11</b> |
| 3.1 6dB and 99% Bandwidth Measurement .....                      | 11        |
| 3.2 Output Power Measurement.....                                | 16        |
| 3.3 Power Spectral Density Measurement .....                     | 17        |
| 3.4 Conducted Band Edges and Spurious Emission Measurement ..... | 22        |
| 3.5 Radiated Band Edges and Spurious Emission Measurement .....  | 28        |
| 3.6 AC Conducted Emission Measurement.....                       | 32        |
| 3.7 Antenna Requirements .....                                   | 34        |
| <b>4 List of Measuring Equipment .....</b>                       | <b>35</b> |
| <b>5 Uncertainty of Evaluation.....</b>                          | <b>37</b> |
| <b>Appendix A. Conducted Test Results</b>                        |           |
| <b>Appendix B. AC Conducted Emission Test Result</b>             |           |
| <b>Appendix C. Radiated Spurious Emission</b>                    |           |
| <b>Appendix D. Radiated Spurious Emission Plots</b>              |           |
| <b>Appendix E. Duty Cycle Plots</b>                              |           |





## Summary of Test Result

| Report Clause | Ref Std. Clause    | Test Items                                 | Result (PASS/FAIL) | Remark                                  |
|---------------|--------------------|--|--------------------|---|
| 3.1           | 15.247(a)(2)       | 6dB Bandwidth                              | Pass               | -                                       |
| 3.1           | 2.1049             | 99% Occupied Bandwidth                     | Reporting only     | -                                       |
| 3.2           | 15.247(b)(3)       | Output Power                               | Pass               | -                                       |
| 3.3           | 15.247(e)          | Power Spectral Density                     | Pass               | -                                       |
| 3.4           | 15.247(d)          | Conducted Band Edges and Spurious Emission | Pass               | -                                       |
| 3.5           | 15.247(d)          | Radiated Band Edges and Spurious Emission  | Pass               | 7.78 dB under the limit at 2483.600 MHz |
| 3.6           | 15.207             | AC Conducted Emission                      | Pass               | 19.53 dB under the limit at 1.379 MHz   |
| 3.7           | 15.203 & 15.247(b) | Antenna Requirement                        | Pass               | -                                       |

**Declaration of Conformity:**

1. 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.
2. 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: Yun Huang**

**Report Producer: Michelle Chen**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Bluetooth-LE, NFC and GNSS.

| Product Feature |   |
|-----------------|---|
| Sample 1        | with battery (VDL)  |
| Sample 2        | with battery (ATL)  |
| Sample 3        | with battery (Highpower)  |
| HW version      | FF1b  |
| SW version      | 57.4001.115.47  |
| Antenna Type    | Bluetooth-LE: Slot Antenna<br>GPS / Glonass: Slot Antenna<br>NFC: 3-turn coil Antenna |

| Antenna information   |                 |      |
|-----------------------|-----------------|------|
| 2400 MHz ~ 2483.5 MHz | Peak Gain (dBi) | -5.3 |

**Remark:** The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

## 1.2 Modification of EUT

No modifications made to the EUT during the testing.



### 1.3 Testing Location

|                           |   |
|---------------------------|---|
| <b>Test Site</b>          | Sporton International Inc. EMC & Wireless Communications Laboratory   |
| <b>Test Site Location</b> | 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 |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b><br>CO05-HY (TAF Code: 1190)   |
| <b>Remark</b>             | The Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory.    |

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

|                           |  |
|---------------------------|--|
| <b>Test Site</b>          | Sporton International Inc. Wensan Laboratory   |
| <b>Test Site Location</b> | 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 |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b><br>TH05-HY, 03CH12-HY  |

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

FCC designation No.: TW1190 and TW3786

### 1.4 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
- ♦ 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.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 2 Test Configuration of Equipment Under Test

### 2.1 Carrier Frequency Channel

| Frequency Band  | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|-------------|---------|-------------|
| 2400-2483.5 MHz | 0       | 2402        | 21      | 2444        |
|                 | 1       | 2404        | 22      | 2446        |
|                 | 2       | 2406        | 23      | 2448        |
|                 | 3       | 2408        | 24      | 2450        |
|                 | 4       | 2410        | 25      | 2452        |
|                 | 5       | 2412        | 26      | 2454        |
|                 | 6       | 2414        | 27      | 2456        |
|                 | 7       | 2416        | 28      | 2458        |
|                 | 8       | 2418        | 29      | 2460        |
|                 | 9       | 2420        | 30      | 2462        |
|                 | 10      | 2422        | 31      | 2464        |
|                 | 11      | 2424        | 32      | 2466        |
|                 | 12      | 2426        | 33      | 2468        |
|                 | 13      | 2428        | 34      | 2470        |
|                 | 14      | 2430        | 35      | 2472        |
|                 | 15      | 2432        | 36      | 2474        |
|                 | 16      | 2434        | 37      | 2476        |
|                 | 17      | 2436        | 38      | 2478        |
|                 | 18      | 2438        | 39      | 2480        |
|                 | 19      | 2440        | -       | -           |
| 20              | 2442    | -           | -       |             |



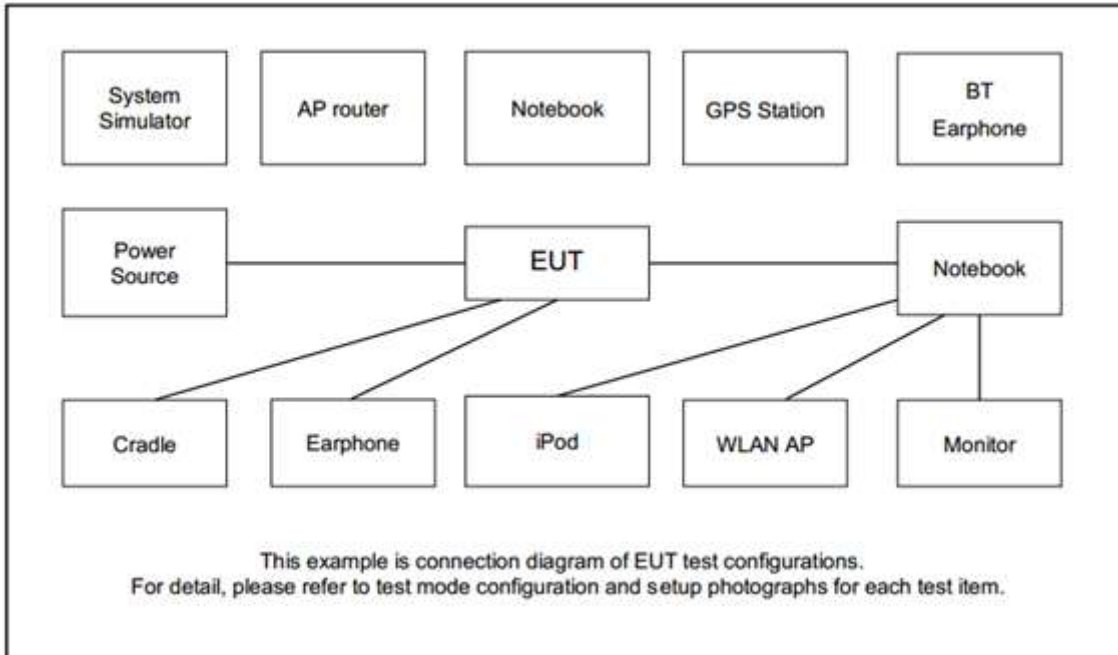
### 2.2 Test Mode

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 adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Y plane as worst plane.

| Summary table of Test Cases   |   |
|---|---|
| Test Item   | Data Rate / Modulation  |
| <b>Conducted Test Cases</b>   | <b>Bluetooth – LE / GFSK</b>  |
|   | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps  |
|   | Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps  |
|   | Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps  |
|   | Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps  |
|   | Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps  |
|   | Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps  |
| <b>Radiated Test Cases</b>  | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps  |
|   | Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps  |
|   | Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps  |
|   | Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps  |
|   | Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps  |
|   | Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps  |
| <b>AC Conducted Emission</b>  | Mode 1: Bluetooth Link with Mobile Phone + Wristband + Battery + USB Cable (Charging from Adapter) for Sample 1 |
|   | Mode 2: Bluetooth Link with Mobile Phone + Wristband + Battery + USB Cable (Charging from Adapter) for Sample 2 |
|   | Mode 3: Bluetooth Link with Mobile Phone + Wristband + Battery + USB Cable (Charging from Adapter) for Sample 3 |
| <b>Remark:</b>  |   |
| 1. The worst case of Conducted Emission is mode 2; only the test data of it was reported. |   |
| 2. For Radiated Test Cases, the tests were performed with Sample 3.                       |   |



### 2.3 Connection Diagram of Test System



### 2.4 Support Unit used in test configuration and system

| Item | Equipment    | Brand Name | Model Name      | FCC ID     | Data Cable | Power Cord |
|------|--------------|------------|-----------------|------------|------------|------------|
| 1.   | Mobile Phone | SAMSUNG    | SM-A730F/DS     | A3LSMA730F | N/A        | N/A        |
| 2.   | Adapter      | DVE        | DSA-5PFM-05 FUS | FCC DoC    | N/A        | N/A        |
| 3.   | Adapter      | ASUS       | A172-050200U-US | N/A        | N/A        | N/A        |
| 4.   | Phone        | Apple      | 5C              | N/A        | N/A        | N/A        |

### 2.5 EUT Operation Test Setup

The RF test items, utility “TERA TERM v.4.95” 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 6dB and 99% Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

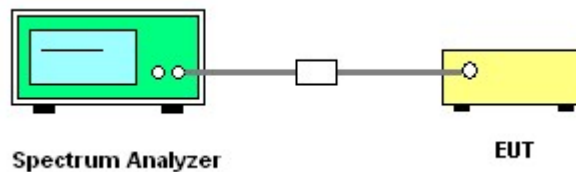
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
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. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW)  $\geq 3 * RBW$ .
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup

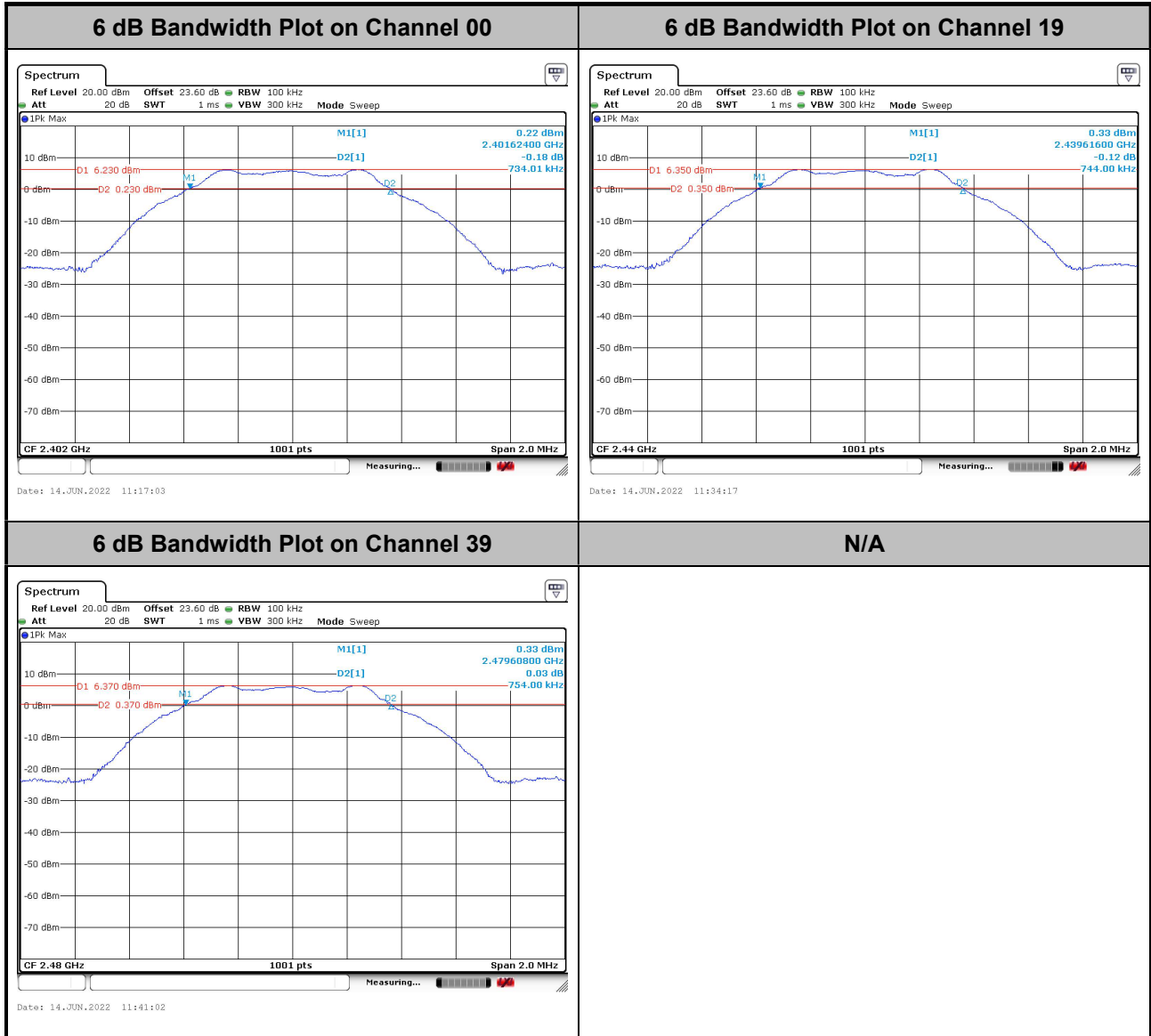




### 3.1.5 Test Result of 6dB Bandwidth

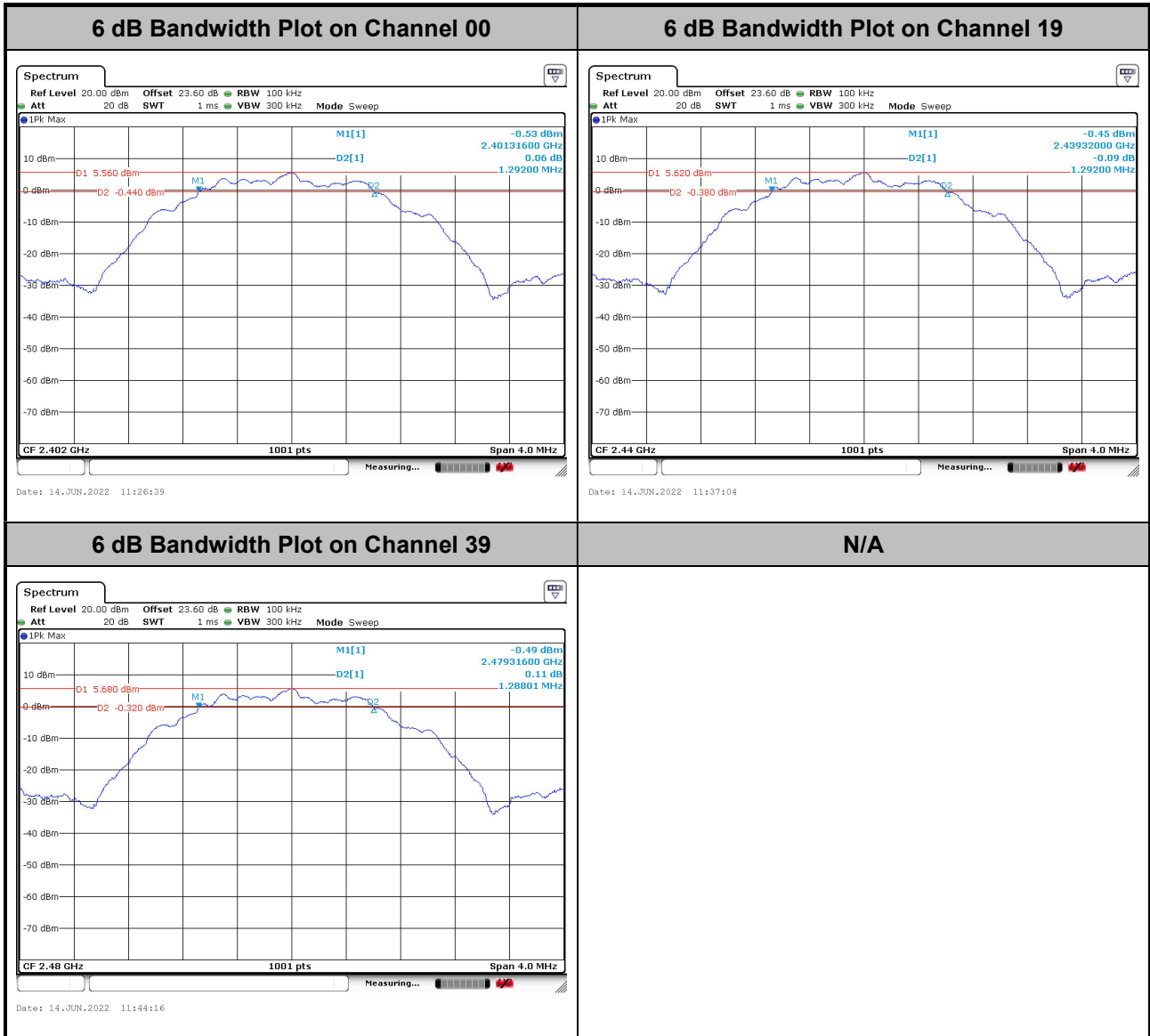
Please refer to Appendix A.

<1Mbps>





<2Mbps>

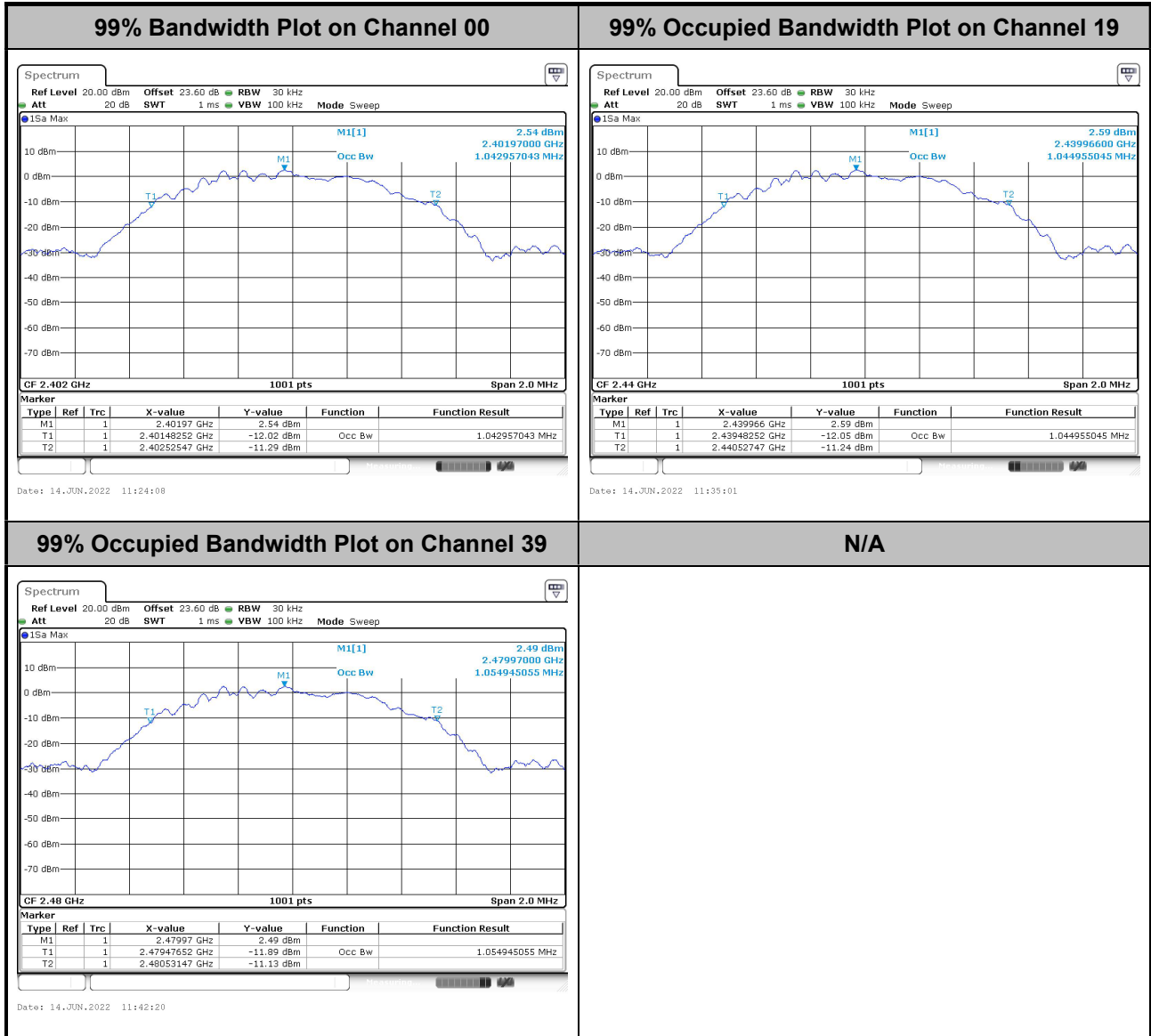




### 3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

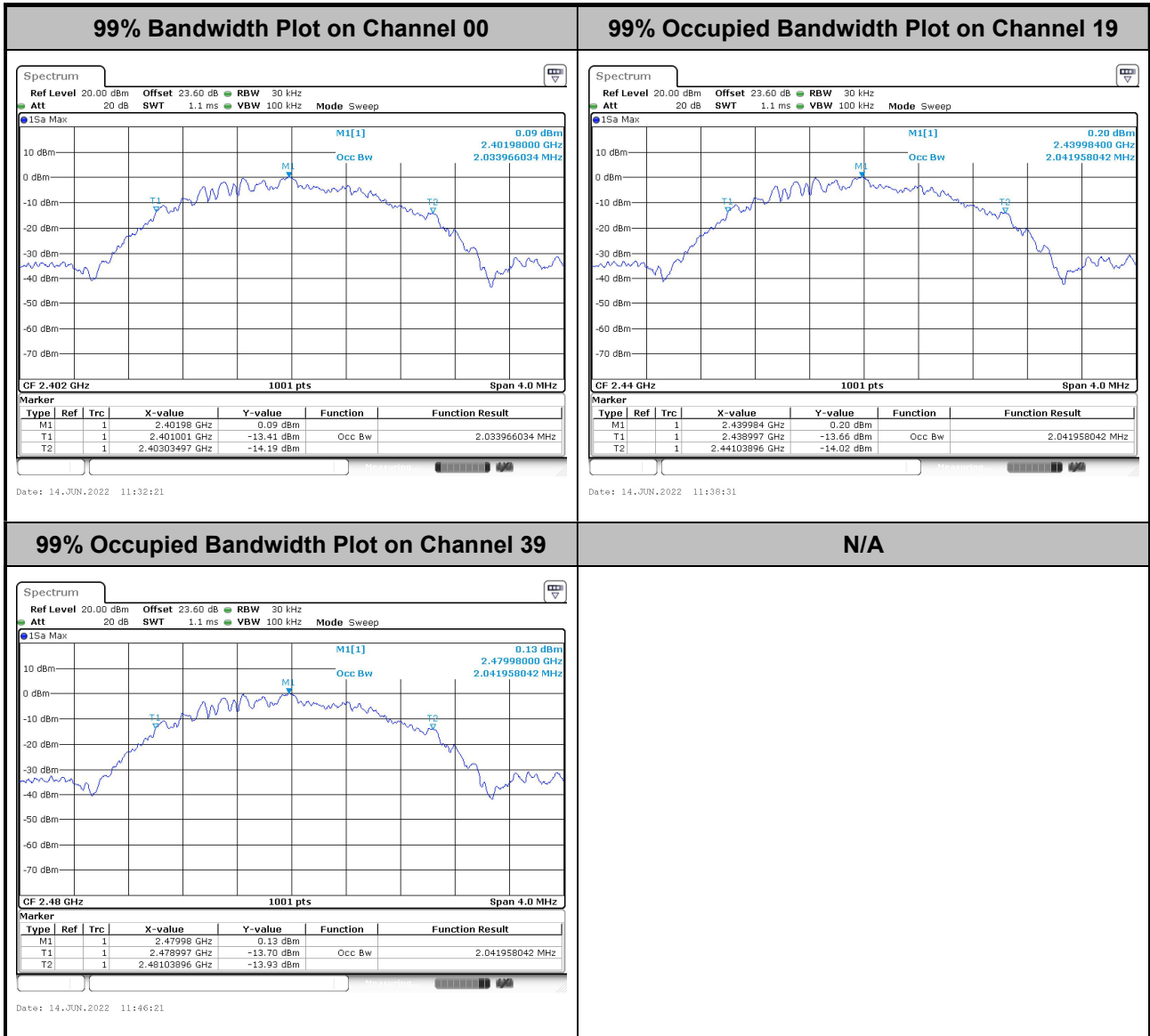
<1Mbps>



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



<2Mbps>



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

## 3.2 Output Power Measurement

### 3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

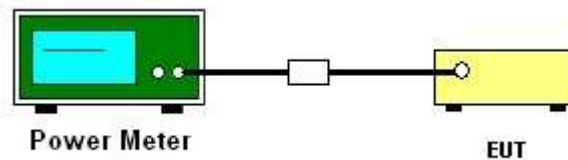
### 3.2.2 Measuring Instruments

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

### 3.2.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator.
3. The path loss is compensated to the results for each measurement.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Average Output Power

Please refer to Appendix A.



### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

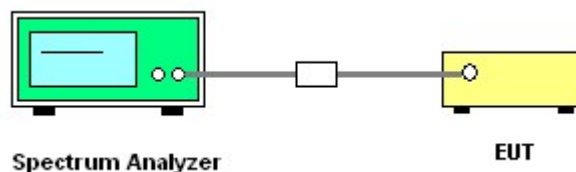
#### 3.3.2 Measuring Instruments

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

#### 3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
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. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth (VBW) = 10 kHz. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6 dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100 kHz is a reference level and is used as 20 dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

#### 3.3.4 Test Setup



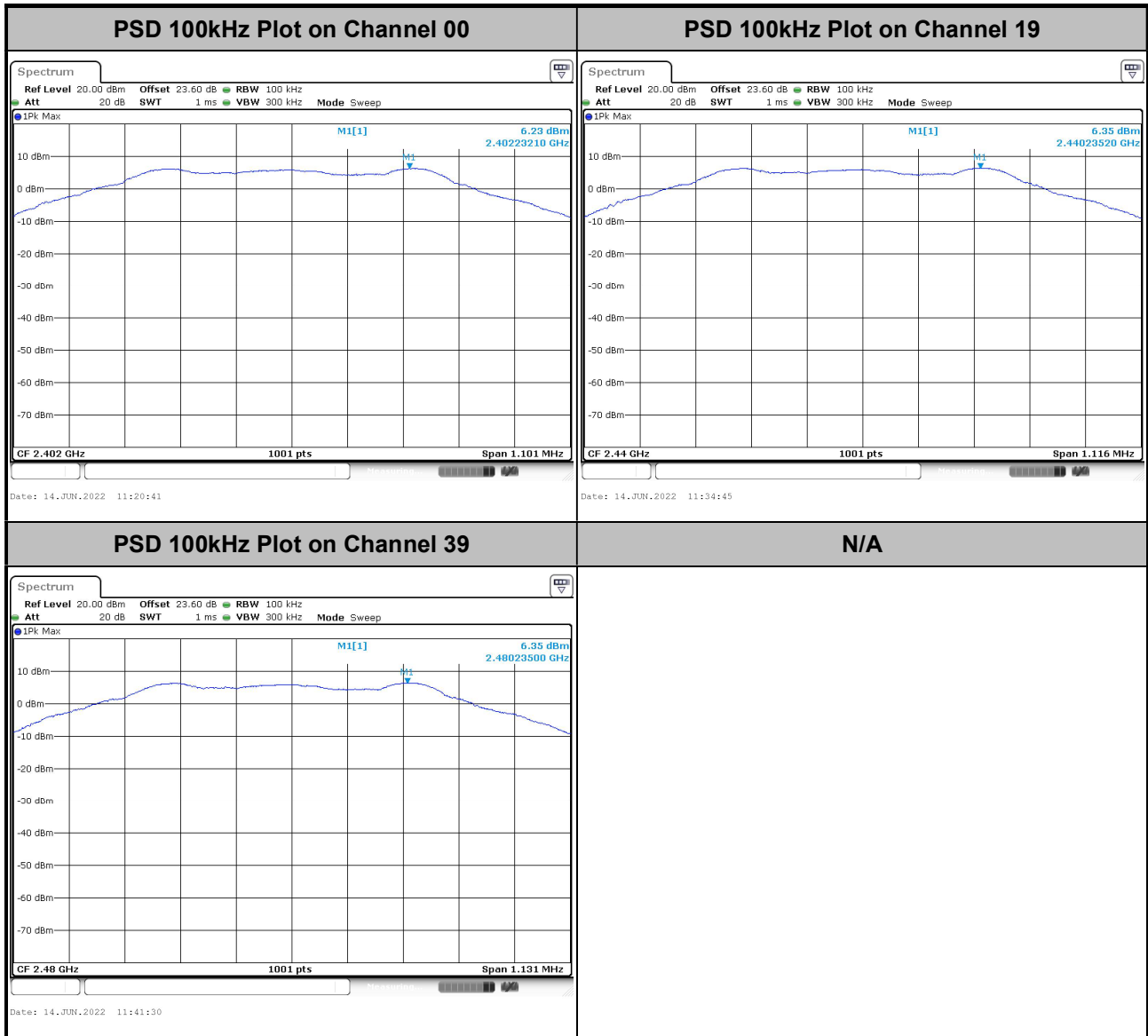
#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



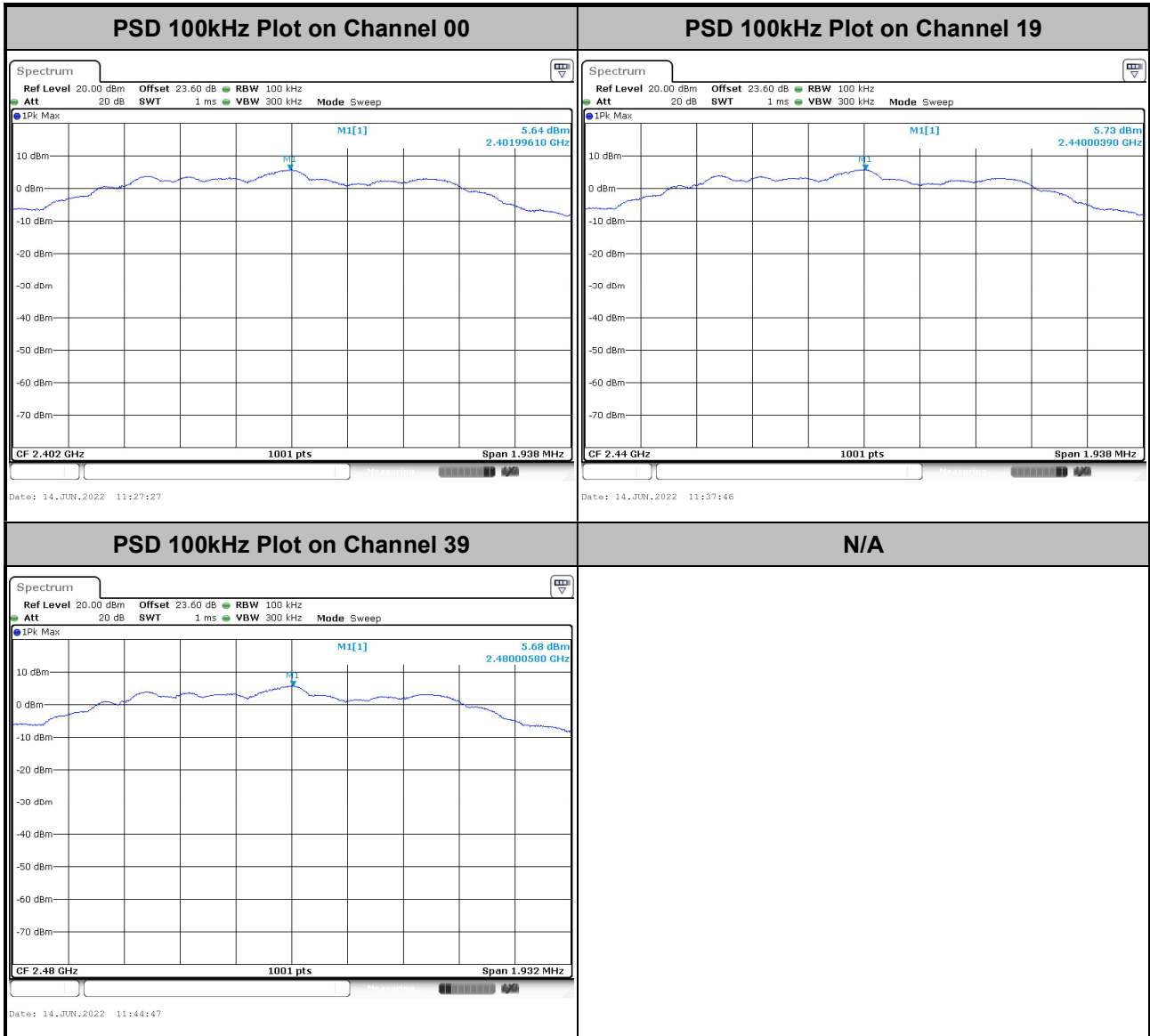
### 3.3.6 Test Result of Power Spectral Density Plots (100kHz)

<1Mbps>





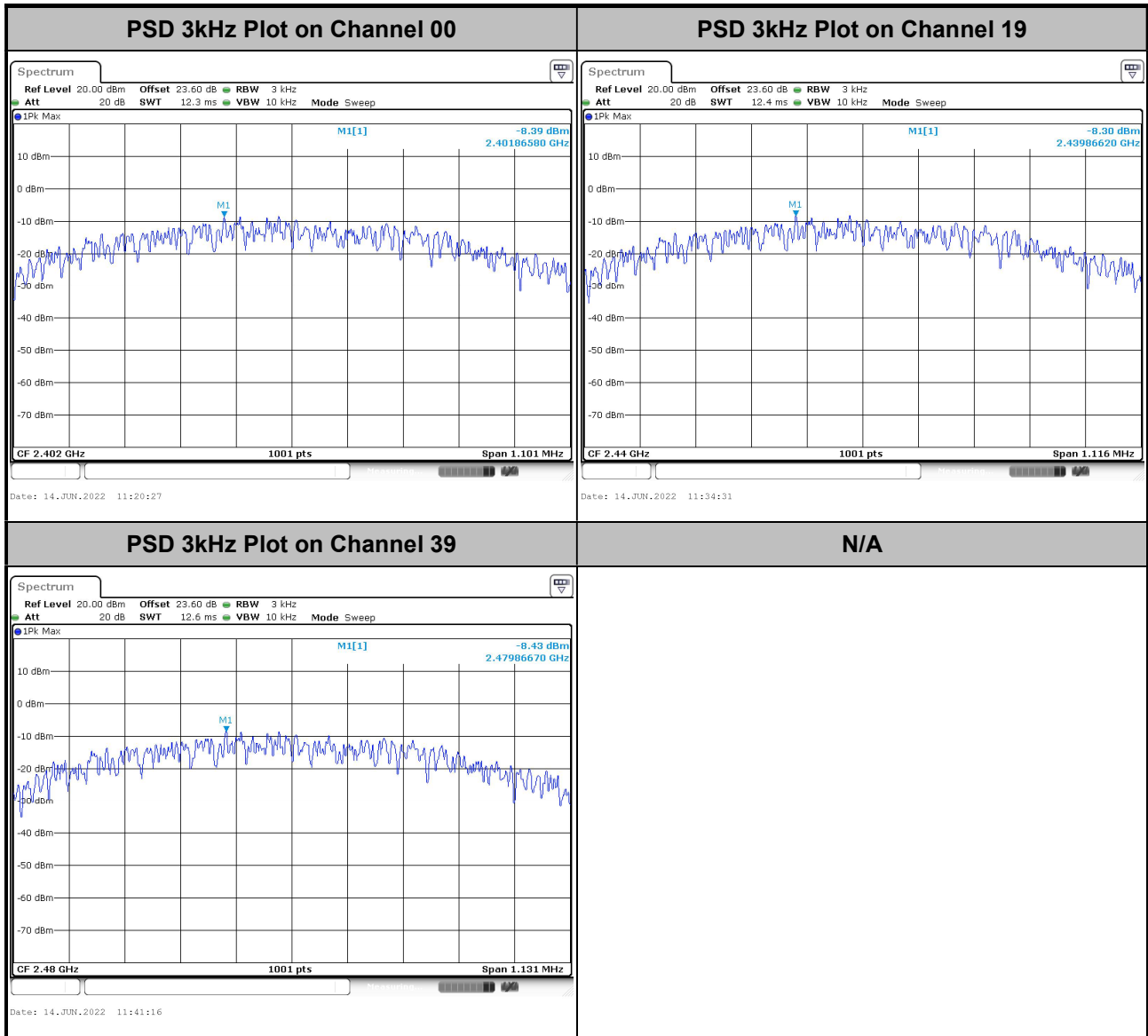
<2Mbps>





### 3.3.7 Test Result of Power Spectral Density Plots (3kHz)

<1Mbps>





<2Mbps>

