



# FCC RF Test Report

**APPLICANT** : OnePlus Technology (Shenzhen) Co., Ltd.  
**EQUIPMENT** : Smart Phone  
**BRAND NAME** : ONEPLUS  
**MODEL NAME** : DE2118, DE2117  
**FCC ID** : 2ABZ2-EF000  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

The product was received on Jan. 05, 2021 and testing was completed on Feb. 27, 2021. We, Sporton International (Shenzhen) Inc., 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 of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager



**Sportun International (ShenZhen) Inc.**

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518055 People's Republic of China**



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## REVISION HISTORY



## SUMMARY OF TEST RESULT

| Report Section | FCC Rule           | Description  | Limit                   | Result | Remark                              |
|----------------|--------------------|--|-------------------------|--------|-------------------------------------|
| 3.1            | 15.247(a)(2)       | 6dB Bandwidth                                      | $\geq 0.5\text{MHz}$    | Pass   | -                                   |
| 3.1            | -                  | 99% Bandwidth                                      | -                       | Pass   | -                                   |
| 3.2            | 15.247(b)          | Power Output Measurement                           | $\leq 30\text{dBm}$     | Pass   | -                                   |
| 3.3            | 15.247(e)          | Power Spectral Density                             | $\leq 8\text{dBm/3kHz}$ | Pass   | -                                   |
| 3.4            | 15.247(d)          | Conducted Band Edges                               | $\leq 20\text{dBc}$     | Pass   | -                                   |
|                |                    | Conducted Spurious Emission                        |                         | Pass   | -                                   |
| 3.5            | 15.247(d)          | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d)   | Pass   | Under limit 3.01 dB at 4874.000 MHz |
| 3.6            | 15.207             | AC Conducted Emission                              | 15.207(a)               | Pass   | Under limit 8.50 dB at 0.410 MHz    |
| 3.7            | 15.203 & 15.247(b) | Antenna Requirement                                | N/A                     | Pass   | -                                   |

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



## 1 General Description

### 1.1 Applicant

OnePlus Technology (Shenzhen) Co., Ltd.

18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, China.

### 1.2 Manufacturer

OnePlus Technology (Shenzhen) Co., Ltd.

18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, China.

### 1.3 Product Feature of Equipment Under Test

| Product Feature                 |   |
|---------------------------------|---|
| Equipment                       | Smart Phone   |
| Brand Name                      | ONEPLUS   |
| Model Name                      | DE2118, DE2117  |
| FCC ID                          | 2ABZ2-EF000   |
| EUT supports Radios application | GSM/WCDMA/LTE/5G NR<br>WLAN 2.4GHz 802.11b/g/n/ac<br>HT20/HT40/VHT20/VHT40<br>WLAN 5GHz 802.11a/n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>Bluetooth BR / EDR / LE / ANT+<br>GNSS/NFC |
| IMEI Code                       | Conducted: 990017690032178<br>Conduction: 990017690042235<br>Radiation: 990017690039447   |
| HW Version                      | 10  |
| SW Version                      | 11.0.1.1.DE18CB   |
| EUT Stage                       | Identical Prototype   |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



## 1.4 Product Specification of Equipment Under Test

| Standards-related Product Specification       |  |
|---|--|
| <b>Tx/Rx Channel Frequency Range</b>          | 2412 MHz ~ 2462 MHz  |
| <b>Maximum (Peak) Output Power to antenna</b> | 802.11b : 22.33 dBm (0.1710 W)<br>802.11g : 24.00 dBm (0.2512 W)<br>802.11n HT20 : 24.02 dBm (0.2523 W)<br>802.11n HT40 : 22.56 dBm (0.1803 W)<br>802.11ac VHT20 : 24.00 dBm (0.2512 W)<br>802.11ac VHT40 : 22.43 dBm (0.1750 W) |
| <b>99% Occupied Bandwidth</b>                 | 802.11b : 14.14MHz<br>802.11g : 17.33MHz<br>802.11n HT20 : 18.58MHz<br>802.11n HT40 : 36.56MHz   |
| <b>Antenna Type / Gain</b>                    | Loop Antenna type with gain -2.0 dBi   |
| <b>Type of Modulation</b>                     | 802.11b : DSSS (DBPSK / DQPSK / CCK)<br>802.11g/n/ac: OFDM (BPSK / QPSK / 16QAM / 64QAM/ 256QAM)   |

**Remark:** For 802.11n HT20 / ac VHT20 and 802.11n HT40 / ac VHT40 mode, the whole testing have assessed only 802.11n HT20/ HT40 by referring to their maximum conducted power.

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6 Testing Location

Sportun International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

|                           |   |                            |                                       |
|---------------------------|---|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sportun International (Shenzhen) Inc.   |                            |                                       |
| <b>Test Site Location</b> | 1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China<br>TEL: +86-755-86379589<br>FAX: +86-755-86379595 |                            |                                       |
| <b>Test Site No.</b>      | <b>Sportun Site No.</b>   | <b>FCC Designation No.</b> | <b>FCC Test Firm Registration No.</b> |
|                           | CO01-SZ<br>TH01-SZ  | CN1256                     | 421272                                |



|                      |   |                            |                                       |
|----------------------|---|----------------------------|---------------------------------------|
| <b>Test Firm</b>     | Sportun International (Shenzhen) Inc.   |                            |                                       |
| <b>Test Location</b> | 101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103<br>TEL: +86-755-33202398 |                            |                                       |
| <b>Test Site No.</b> | <b>Sportun Site No.</b>   | <b>FCC Designation No.</b> | <b>FCC Test Firm Registration No.</b> |
|                      | 03CH03-SZ   | CN1256                     | 421272                                |

## 1.7 Test Software

| Item | Site      | Manufacture | Name | Version     |
|------|-----------|-------------|------|-------------|
| 1.   | 03CH03-SZ | AUDIX       | E3   | 6.2009-8-24 |
| 2.   | CO01-SZ   | AUDIX       | E3   | 6.120613b   |

## 1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. 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

- 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, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

| Frequency Band  | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) |
|-----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 1       | 2412           | 7       | 2442           |
|                 | 2       | 2417           | 8       | 2447           |
|                 | 3       | 2422           | 9       | 2452           |
|                 | 4       | 2427           | 10      | 2457           |
|                 | 5       | 2432           | 11      | 2462           |
|                 | 6       | 2437           |         |                |

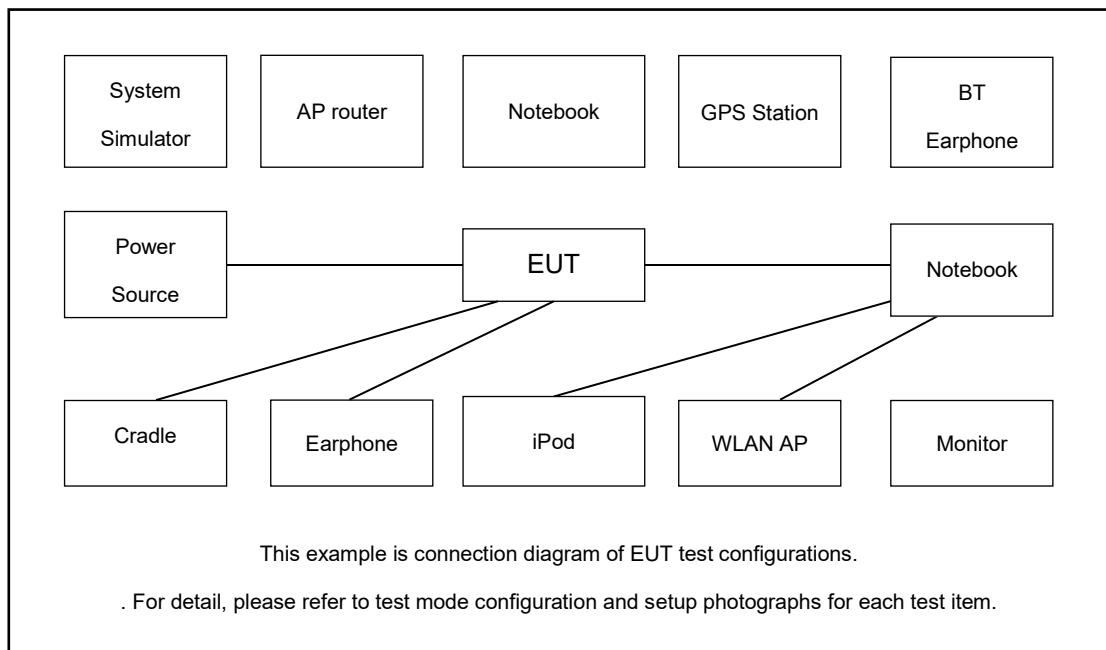
## 2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

| Modulation   | Data Rate |
|--------------|-----------|
| 802.11b      | 1 Mbps    |
| 802.11g      | 6 Mbps    |
| 802.11n HT20 | MCS0      |
| 802.11n HT40 | MCS0      |

| Test Cases   |   |
|--|---|
| AC Conducted Emission  | Mode 1 :GSM 850 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable(Charging from Adapter2) + Earphone + Battery |
| Remark: For Radiated Test Cases, The tests were performed with Adapter 2, Earphone, Battery and USB Cable. |   |

## 2.3 Connection Diagram of Test System





## 2.4 Support Unit used in test configuration and system

| Item | Equipment          | Trade Name | Model Name | FCC ID      | Data Cable     | Power Cord   |
|------|--------------------|------------|------------|-------------|----------------|--|
| 1.   | Base Station       | Anritsu    | MT8820C    | N/A         | N/A            | Unshielded, 1.8m                                     |
| 2.   | Bluetooth Earphone | Samsung    | EO-MG900   | N/A         | N/A            | N/A  |
| 3.   | WLAN AP            | D-Link     | DIR-820L   | KA2IR820LA1 | N/A            | Unshielded, 1.8m                                     |
| 4.   | Notebook           | Lenovo     | E540       | FCC DoC     | N/A            | AC I/P : Unshielded, 1.2m<br>DC O/P : Shielded, 1.8m |
| 5.   | Earphone           | Apple      | MC690ZP/A  | N/A         | Shielded, 1.0m | N/A  |

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

## 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 1.2 dB and 20dB attenuator.

*Offset(dB) = RF cable loss(dB) + attenuator factor(dB).*

= 1.2 + 20 = 21.2 (dB)

### 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.

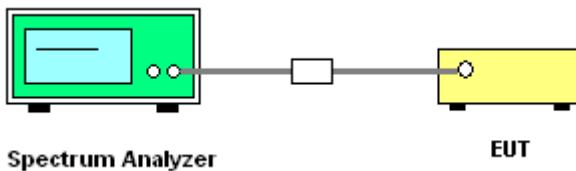
##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedures

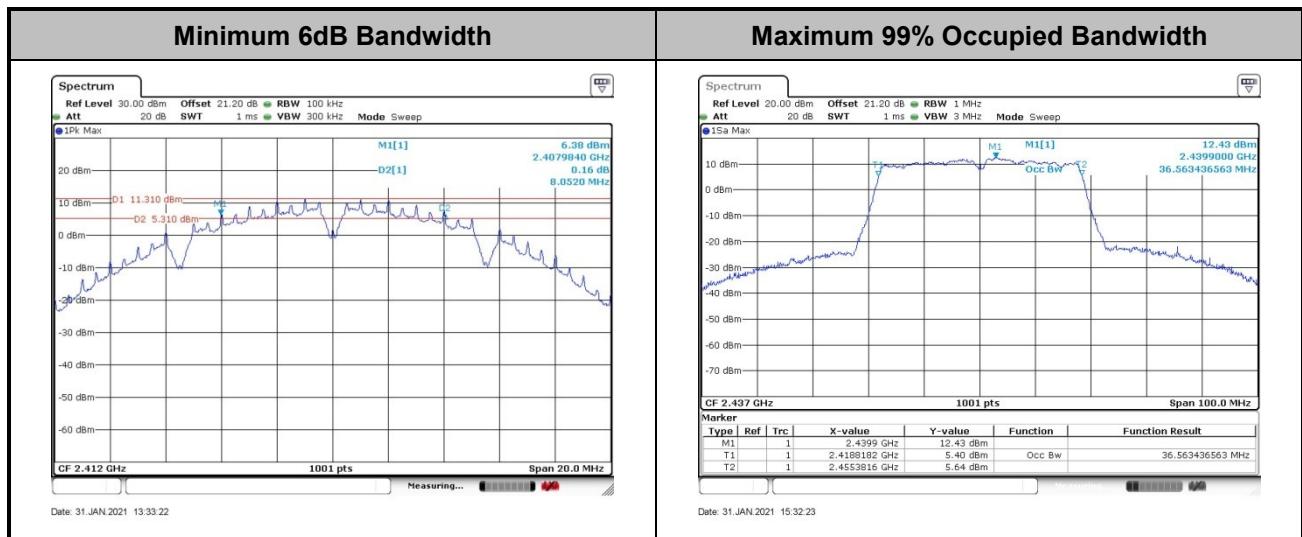
1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement 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 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup



### 3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.



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 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi 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 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

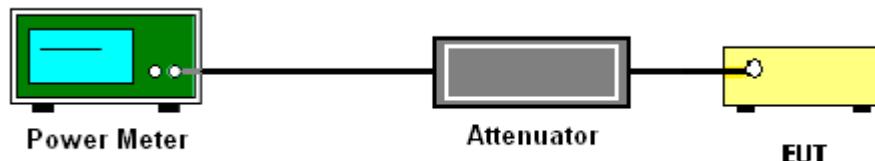
### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

### 3.2.6 Test Result of Average output Power (Reporting Only)

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 8dBm in any 3kHz band at any time interval of continuous transmission.

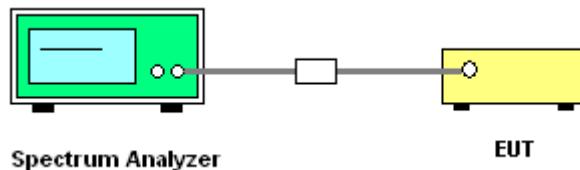
#### 3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

#### 3.3.3 Test Procedures

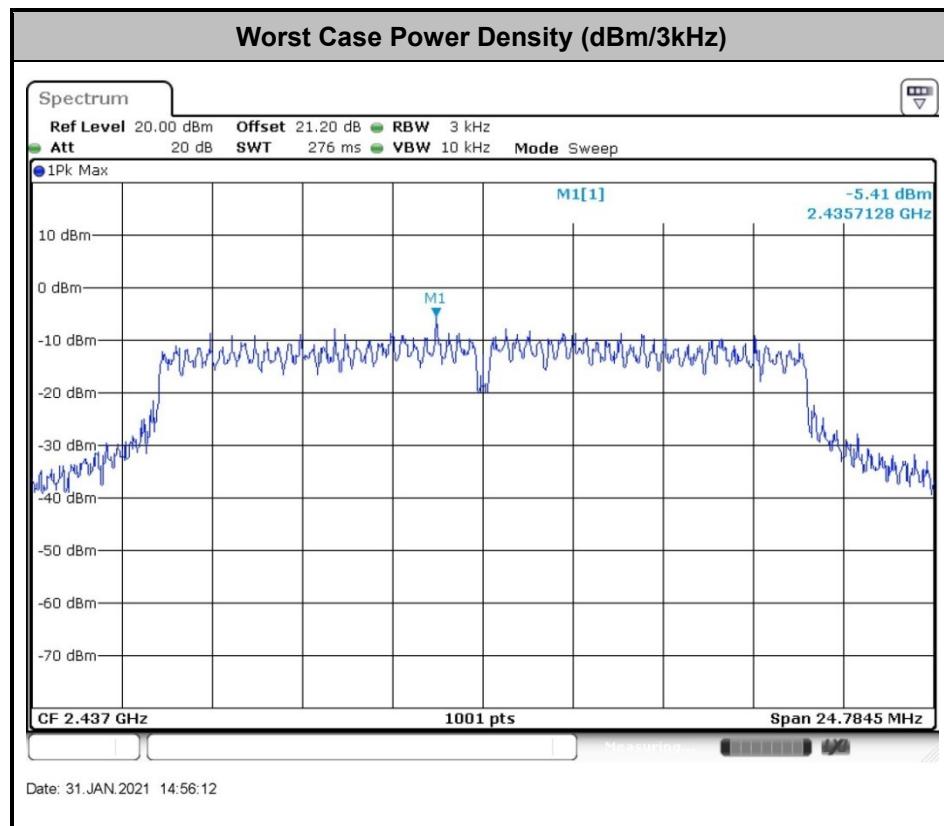
1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT 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. (6dB 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.

### 3.3.4 Test Setup



### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



## 3.4 Conducted Band Edges and Spurious Emission Measurement

### 3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

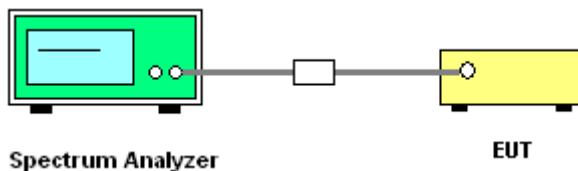
### 3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.13
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.4.4 Test Setup

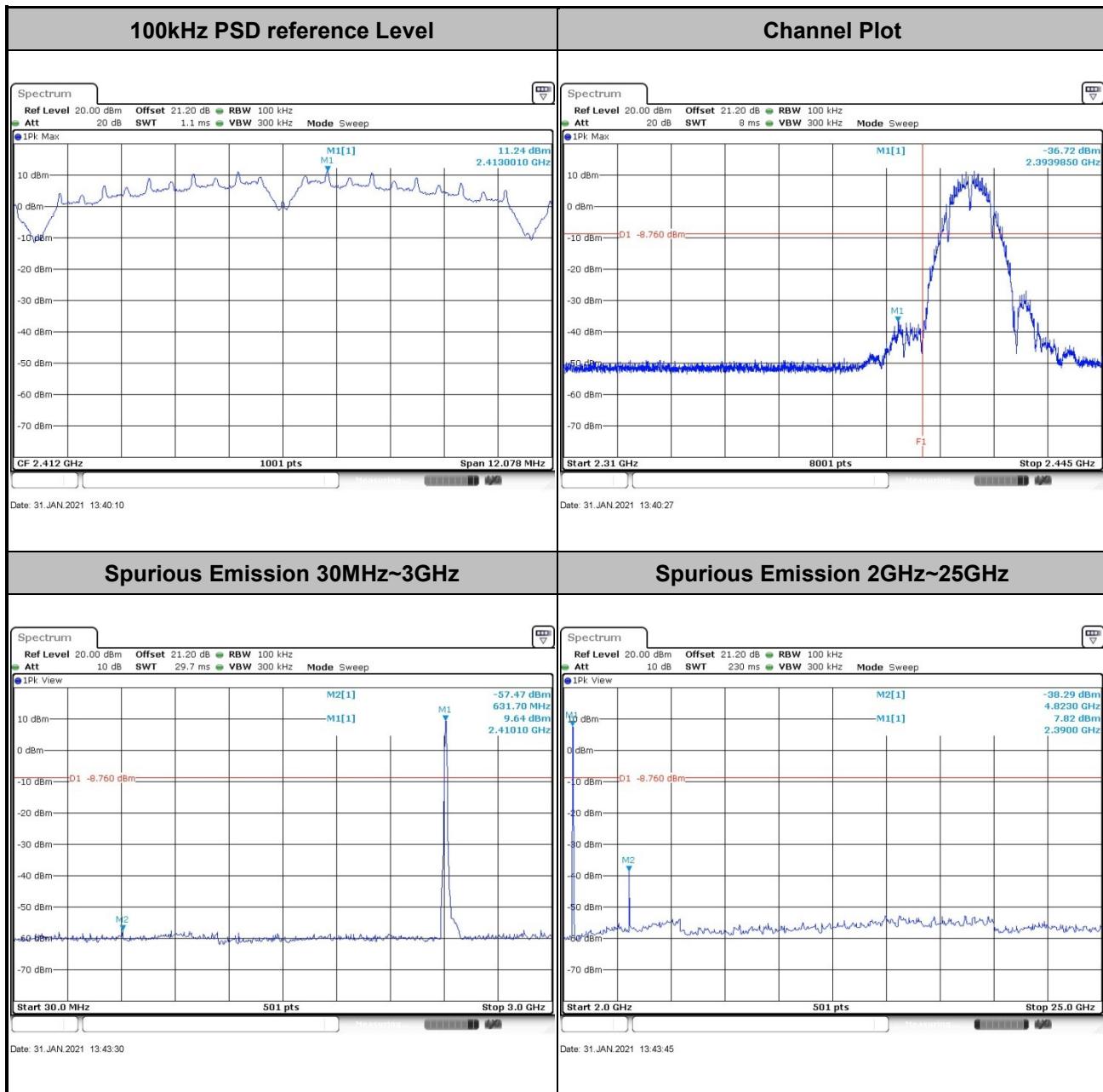




### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

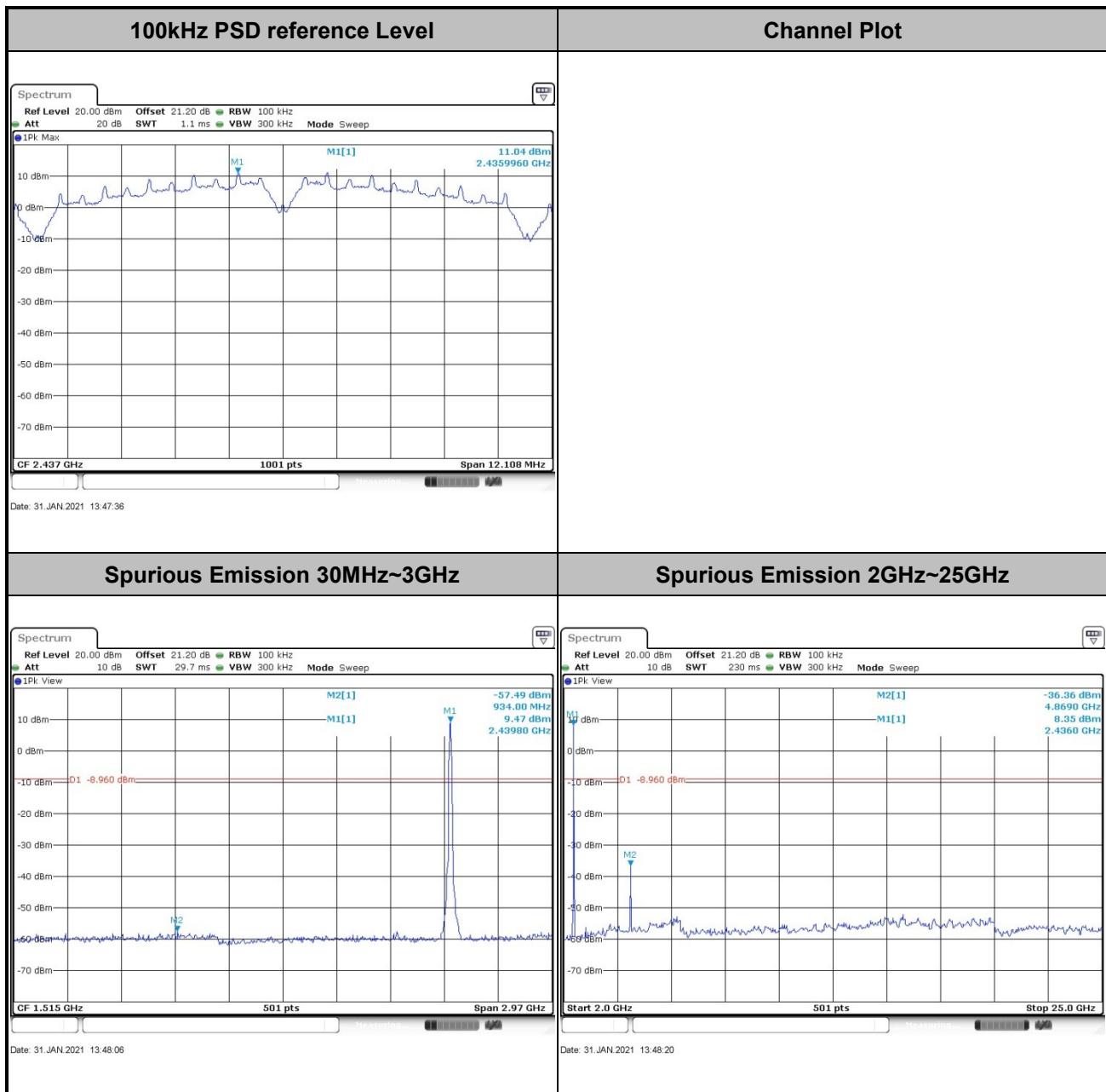
|                 |             |                     |         |
|-----------------|-------------|---------------------|---------|
| Test Engineer : | Liu Qiu Qiu | Temperature :       | 21~25°C |
|                 |             | Relative Humidity : | 51~54%  |

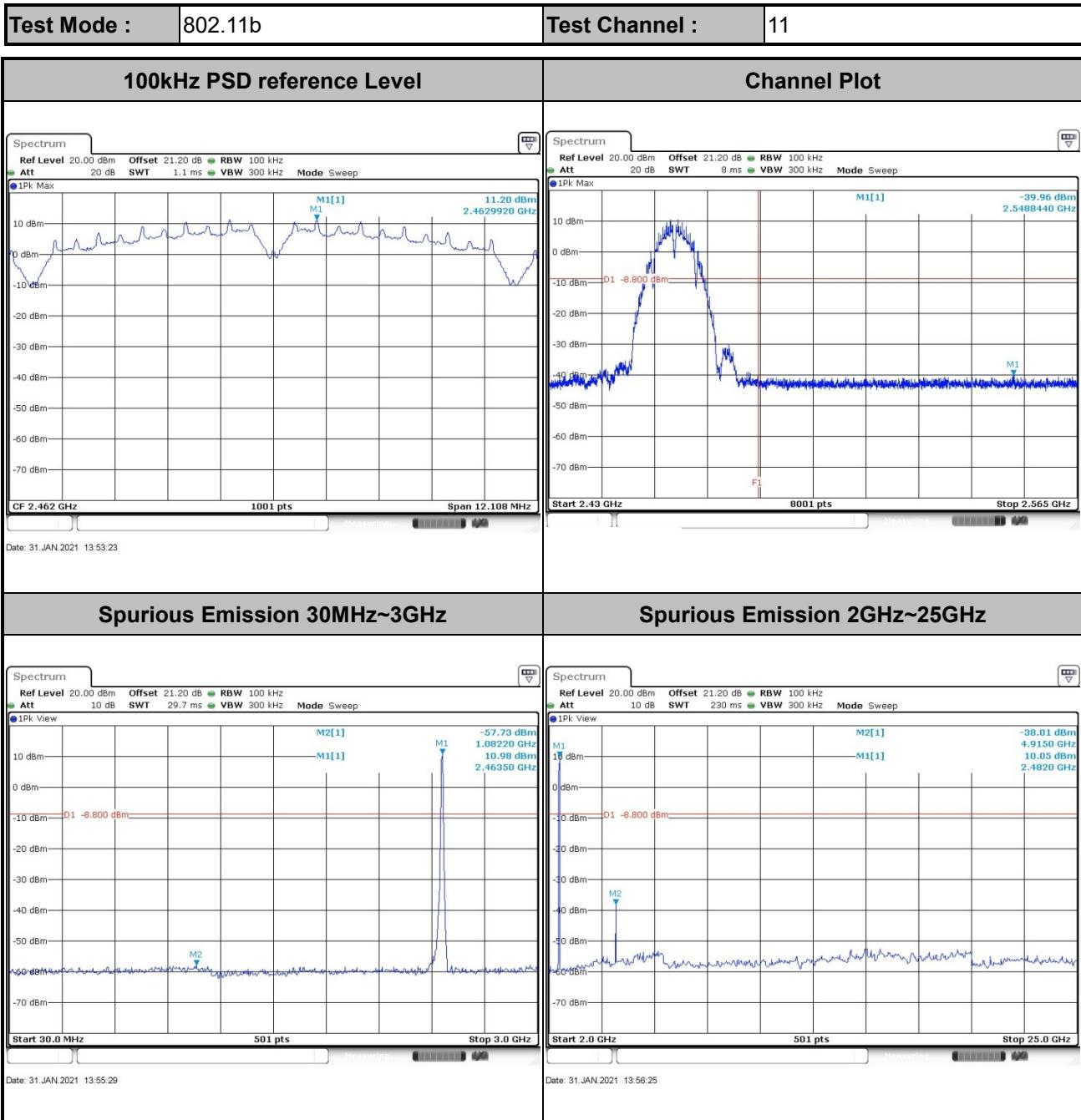
|             |         |                |    |
|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 01 |
|-------------|---------|----------------|----|





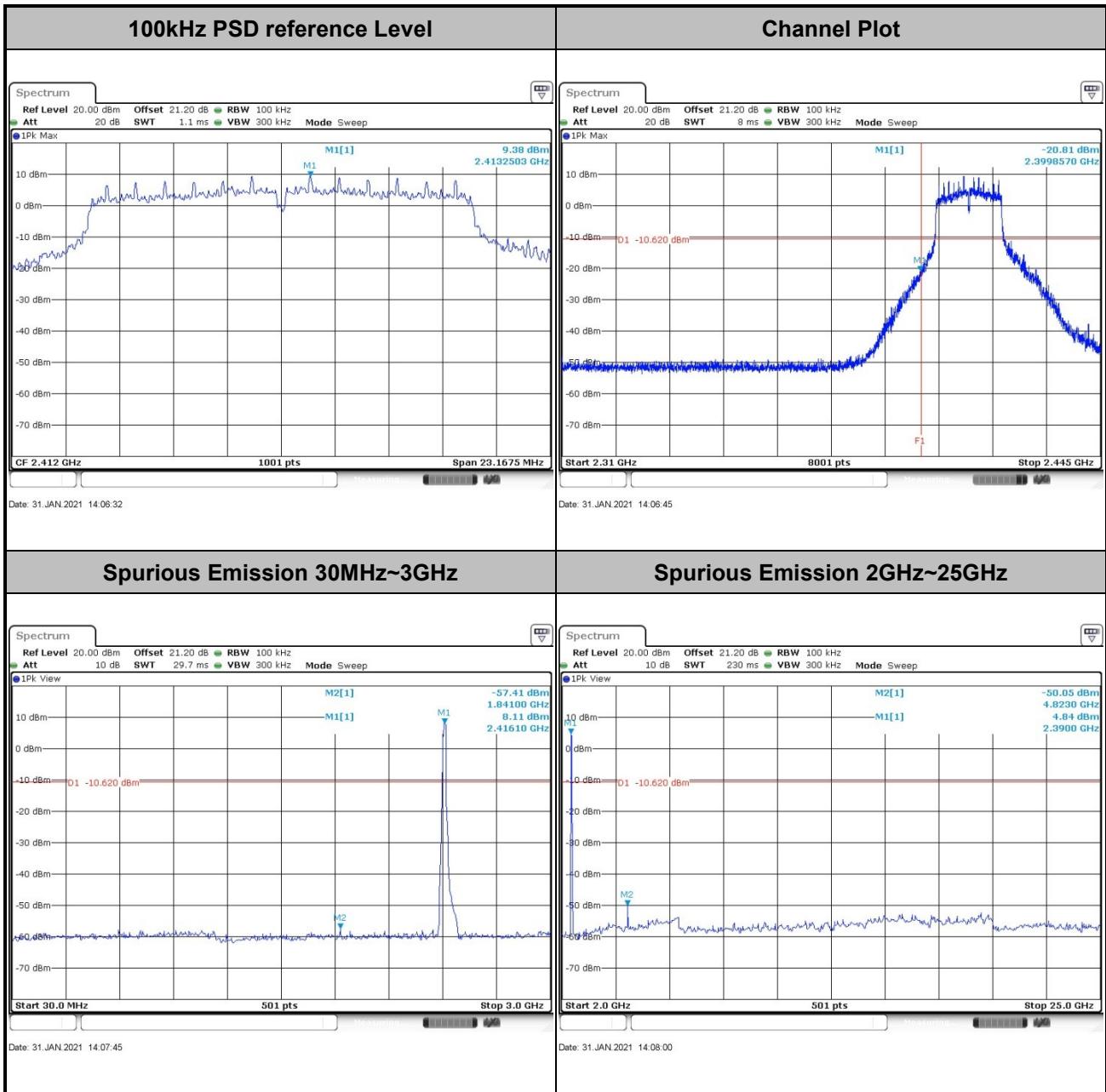
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|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 06 |
|-------------|---------|----------------|----|





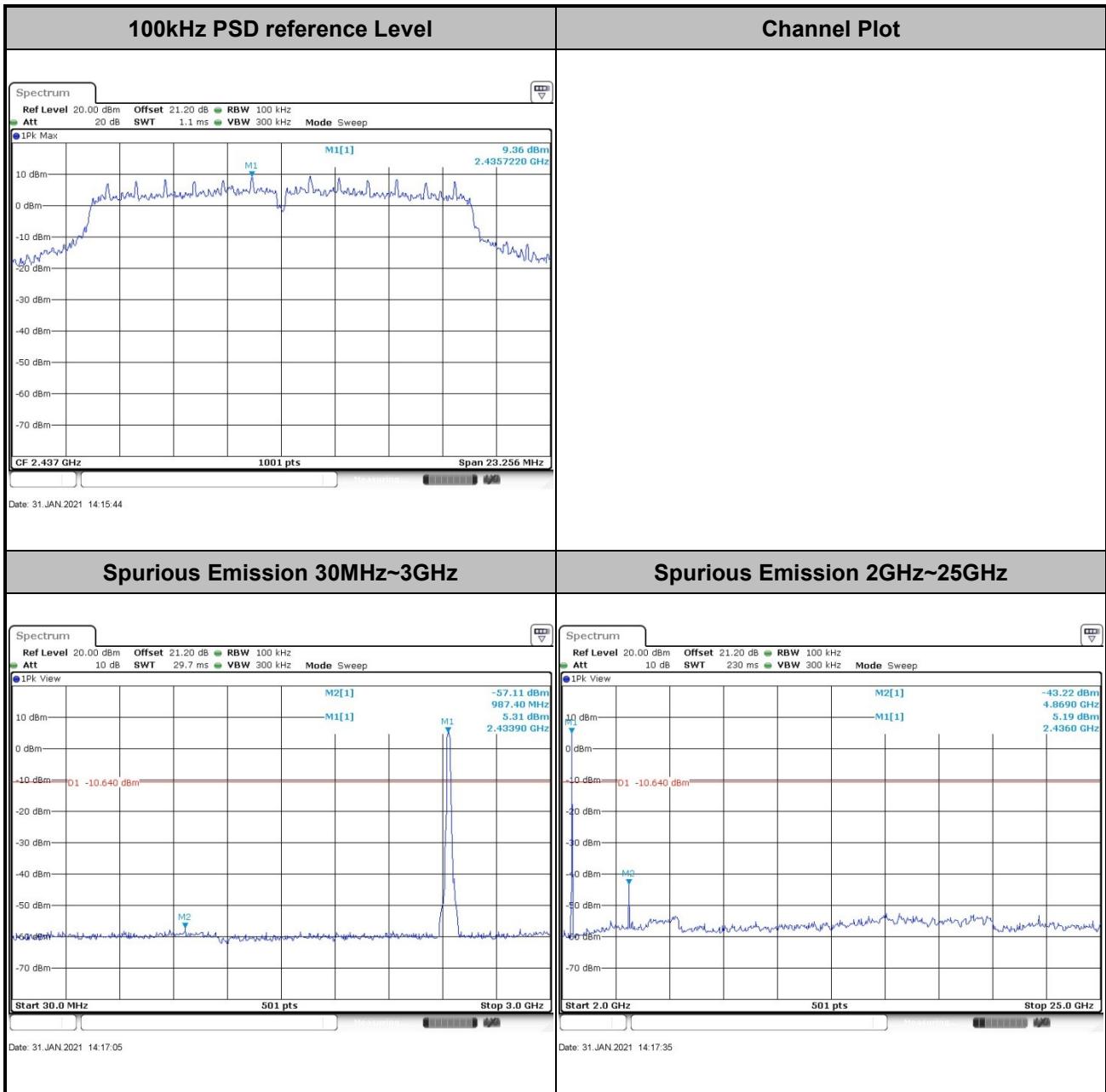


|             |         |                |    |
|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 01 |
|-------------|---------|----------------|----|



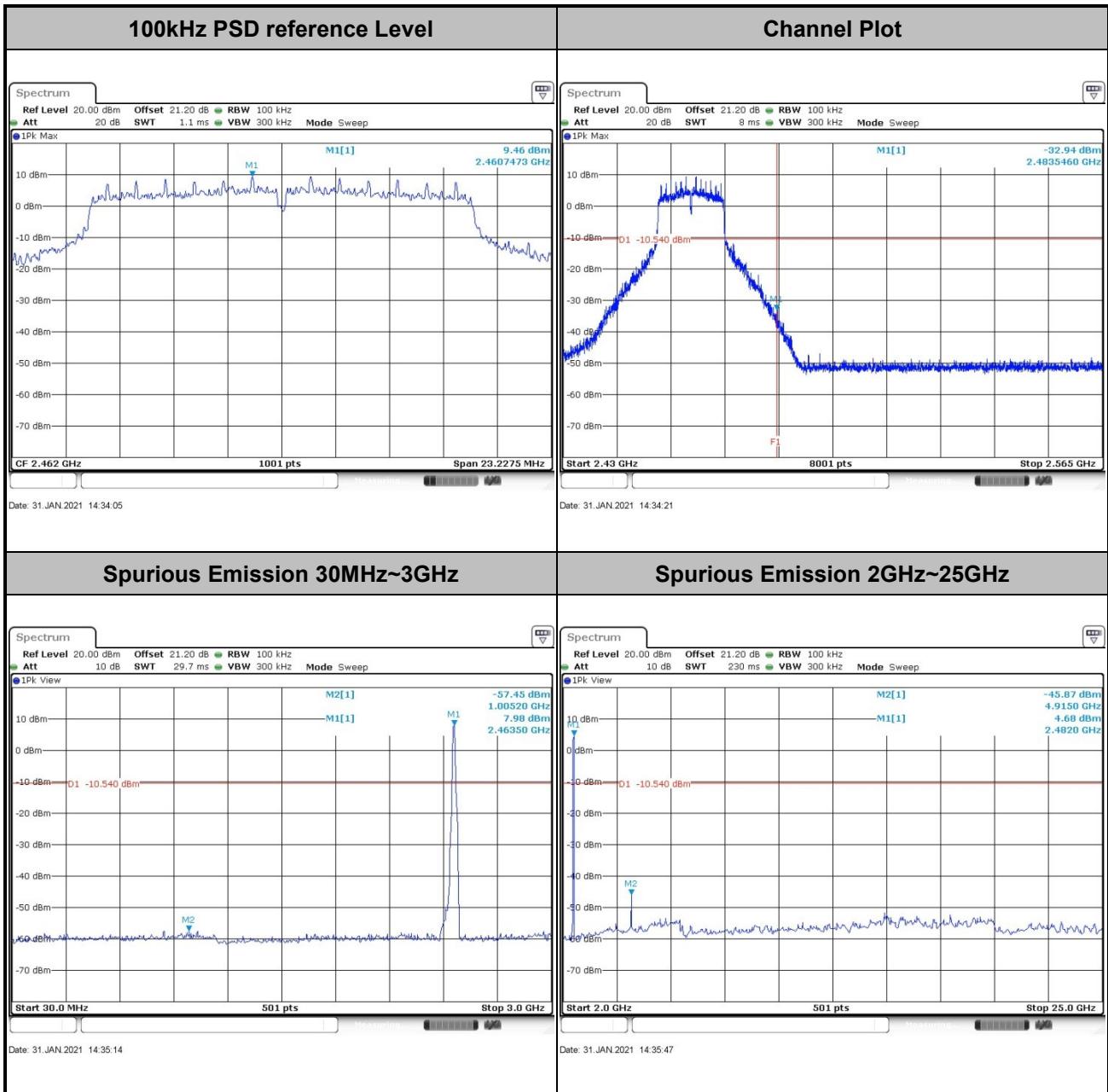


|             |         |                |    |
|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 06 |
|-------------|---------|----------------|----|



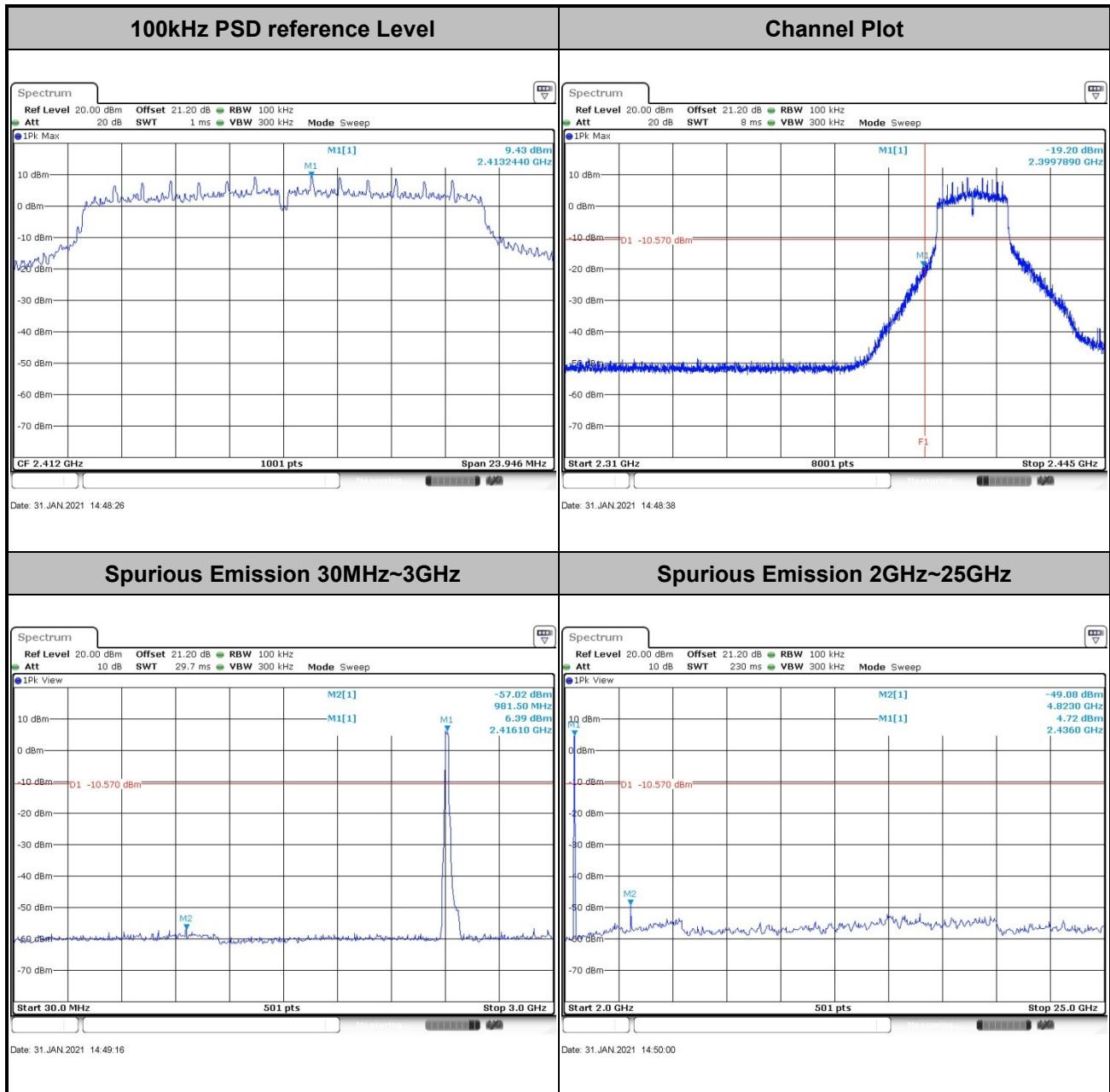


|             |         |                |    |
|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 11 |
|-------------|---------|----------------|----|



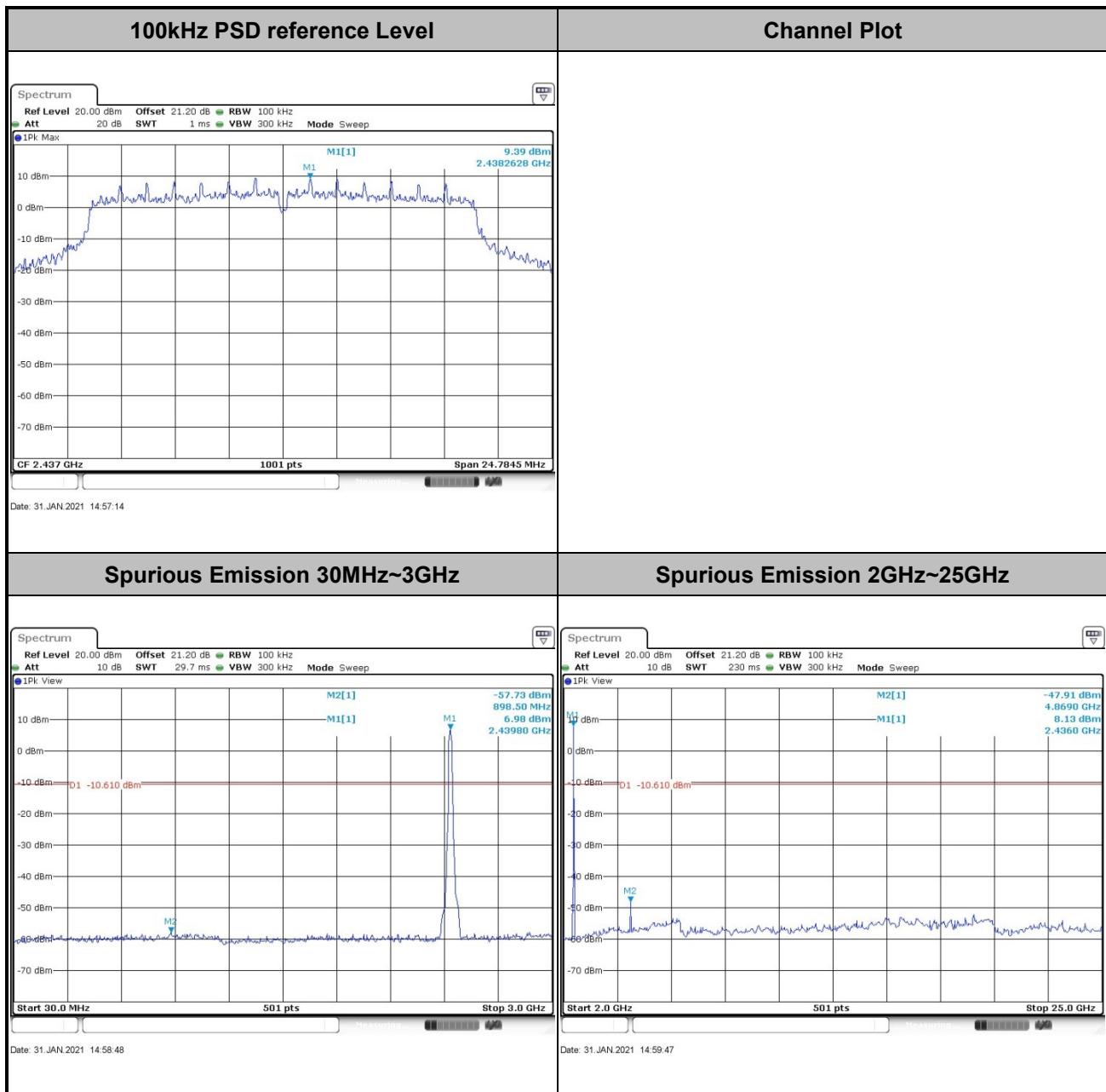


|             |              |                |    |
|-------------|--------------|----------------|----|
| Test Mode : | 802.11n HT20 | Test Channel : | 01 |
|-------------|--------------|----------------|----|



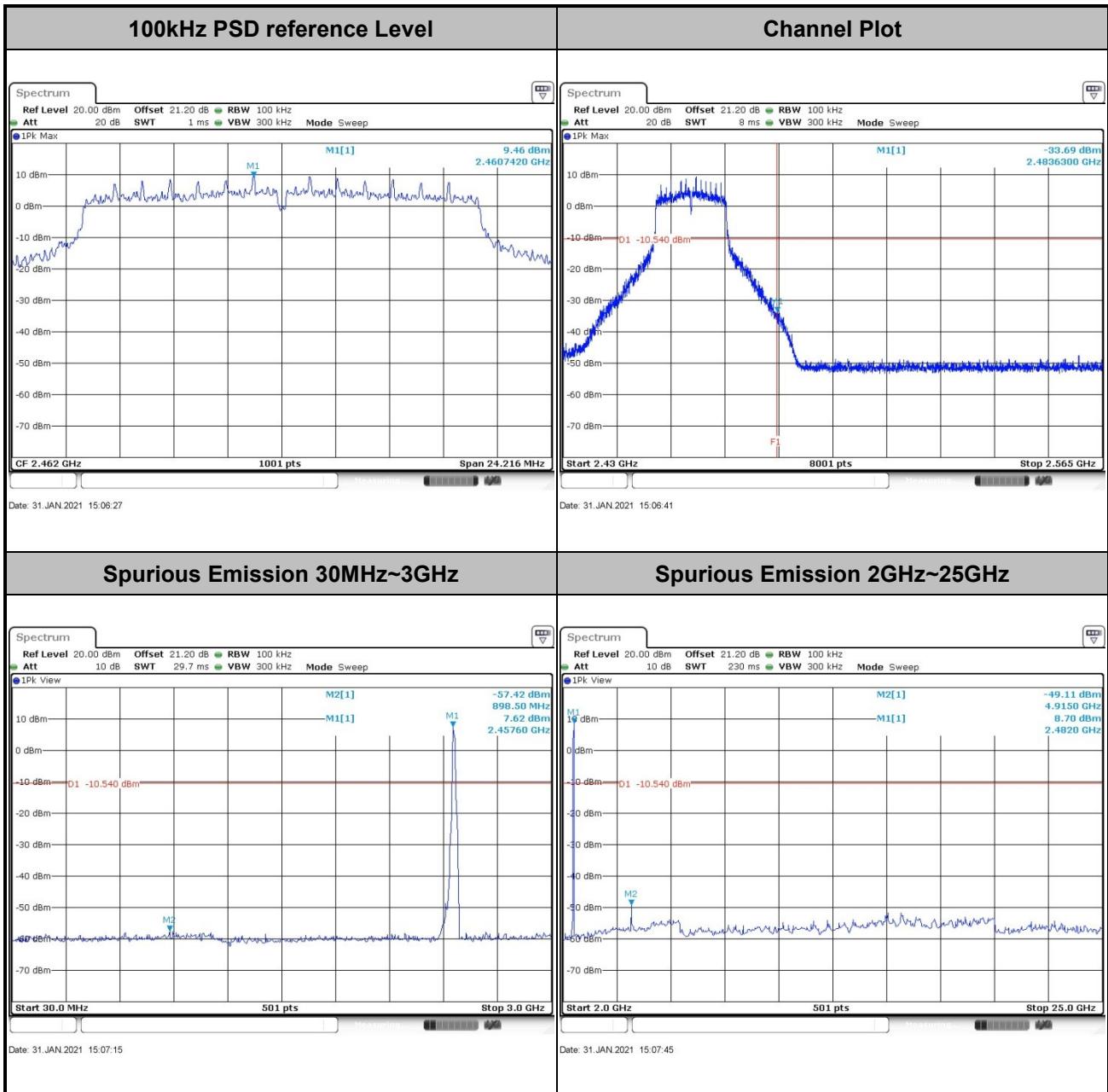


|             |              |                |    |
|-------------|--------------|----------------|----|
| Test Mode : | 802.11n HT20 | Test Channel : | 06 |
|-------------|--------------|----------------|----|





|             |              |                |    |
|-------------|--------------|----------------|----|
| Test Mode : | 802.11n HT20 | Test Channel : | 11 |
|-------------|--------------|----------------|----|





|             |              |                |    |
|-------------|--------------|----------------|----|
| Test Mode : | 802.11n HT40 | Test Channel : | 03 |
|-------------|--------------|----------------|----|

