



# FCC RADIO TEST REPORT

**FCC ID** : A4RG9S9B  
**Equipment** : Phone  
**Model Name** : G9S9B  
**Applicant** : Google LLC  
1600 Amphitheatre Parkway,  
Mountain View, California, 94043 USA  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on Jun. 08, 2021 and testing was started from Jun. 09, 2021 and completed on Jul. 28, 2021. 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 of Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

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	Issued Date
FR0D2942-04C	01	Initial issue of report	Aug. 05, 2021



## 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)	Power Output Measurement	Pass	-
3.3	15.247(e)	Power Spectral Density	Pass	-
3.4	15.247(d)	Conducted Band Edges	Pass	-
		Conducted Spurious Emission	Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 1.80 dB at 2390.000 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 10.83 dB at 0.501 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	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.

**Reviewed by: William Chen**

**Report Producer: Celery Wei**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Phone
Model Name	G9S9B
FCC ID	A4RG9S9B
EUT supports Radios application	GSM/EGPRS/WCDM/HSPA/LTE/5G NR /NFC/GNSS/WPC/WPT WLAN 11b/g/n HT20 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

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

EUT Information List	
S/N	Performed Test Item
15211FDF60007M	RF Conducted Measurement
15201FDF60005H	Radiated Spurious Emission
15201FDF60009S	Conducted Emission

## 1.2 Product Specification of Equipment Under Test

Product Specification subjective to this standard							
<b>Tx/Rx Channel Frequency Range</b>	2412 MHz ~ 2472 MHz						
<b>Maximum (Average) Output Power to antenna</b>	<b>MIMO &lt;Ant. 4+3&gt;</b> 802.11b : 25.52 dBm (0.3565 W) 802.11g : 23.51 dBm (0.2244 W) 802.11n HT20 : 23.52 dBm (0.2249 W) 802.11 ac VHT20 : 23.42 dBm (0.2198 W) 802.11 ax HE20 : 23.32 dBm (0.2148 W)						
<b>99% Occupied Bandwidth</b>	<b>MIMO &lt;Ant. 4&gt;</b> 802.11b : 13.49 MHz 802.11g : 17.48 MHz 802.11n HT20 : 18.28 MHz <b>MIMO &lt;Ant. 3&gt;</b> 802.11b : 13.44 MHz 802.11g : 17.18 MHz 802.11n HT20 : 18.08 MHz						
<b>Antenna Type / Gain</b>	<b>&lt;Ant. 4&gt;</b> ILA Antenna with gain -1.2 dBi <b>&lt;Ant. 3&gt;</b> IFA Antenna with gain -1.1 dBi						
<b>Type of Modulation</b>	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) 802.11ax: OFDMA (BPSK/QPSK/16QAM/64QAM/256QAM/1024QAM)						
<b>Antenna Function for Transmitter</b>	<table border="1"> <thead> <tr> <th></th> <th>Ant. 4</th> <th>Ant. 3</th> </tr> </thead> <tbody> <tr> <td>802.11 b/g/n/ac/ax MIMO</td> <td>V</td> <td>V</td> </tr> </tbody> </table>		Ant. 4	Ant. 3	802.11 b/g/n/ac/ax MIMO	V	V
	Ant. 4	Ant. 3					
802.11 b/g/n/ac/ax MIMO	V	V					

**Remark:**

1. MIMO Ant. 4+3 is a calculated result from sum of the power MIMO Ant. 4 and MIMO Ant. 3.
2. 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 are made to the EUT during all test items.

### 1.4 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., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
<b>Test Site No.</b>	<b>Sporton Site No.</b> TH02-HY, CO05-HY

**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., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
<b>Test Site No.</b>	<b>Sporton Site No.</b> 03CH13-HY (TAF Code: 3786)
<b>Remark</b>	The Radiated Spurious Emissions 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 of 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 test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.



## 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). 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 X plane with Adapter as worst plane.
  
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	8	2447
	2	2417	9	2452
	3	2422	10	2457
	4	2427	11	2462
	5	2432	12	2467
	6	2437	13	2472
	7	2442		





## 2.2 Test Mode

This device support 26/52/106 tone RU.

The PSD of partial RU is reduced to be smaller than full RU according to TCB workshop interim guidance.

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

### MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11ac VHT20 (Covered by HT20)	MCS0
802.11ax HE20 (Covered by HT20)	MCS0

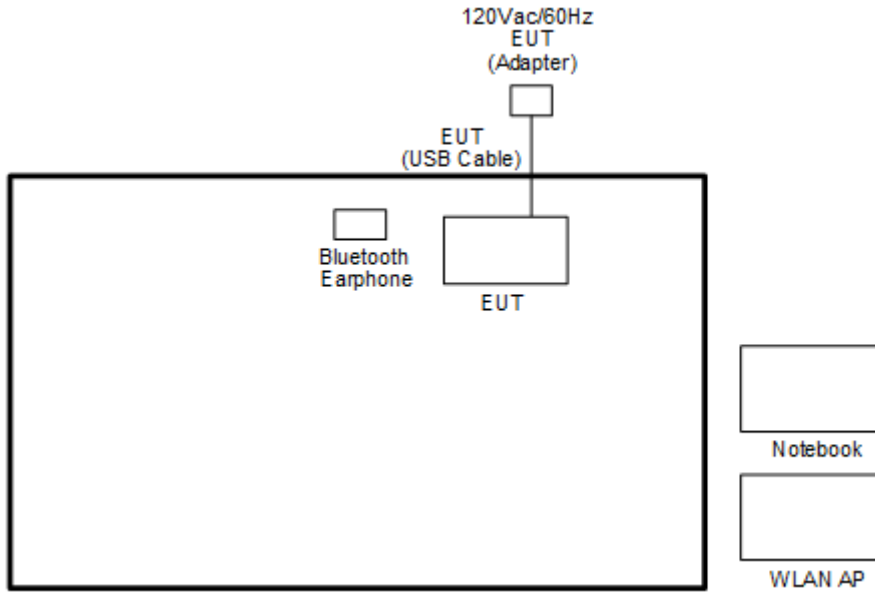
Test Cases	
<b>AC Conducted Emission</b>	Mode 1 :WLAN (2.4GHz) Link + Bluetooth Link + USB Cable 1 (Charging from AC Adapter 2)
<b>Remark:</b>	
<ol style="list-style-type: none"> <li>For Radiated Test Cases, the tests were performed with Adapter 2 and USB Cable 1.</li> <li>During the preliminary test, both charging modes (Adapter mode and WPC Charging mode) were verified. It is determined that the adaptor mode is the worst case for official test.</li> </ol>	

Ch. #	2400-2483.5 MHz		
	802.11b	802.11g	802.11n HT20
Low	01	01	01
Middle	06	06	06
High	11	11	11
	12	12	12
	13	13	13

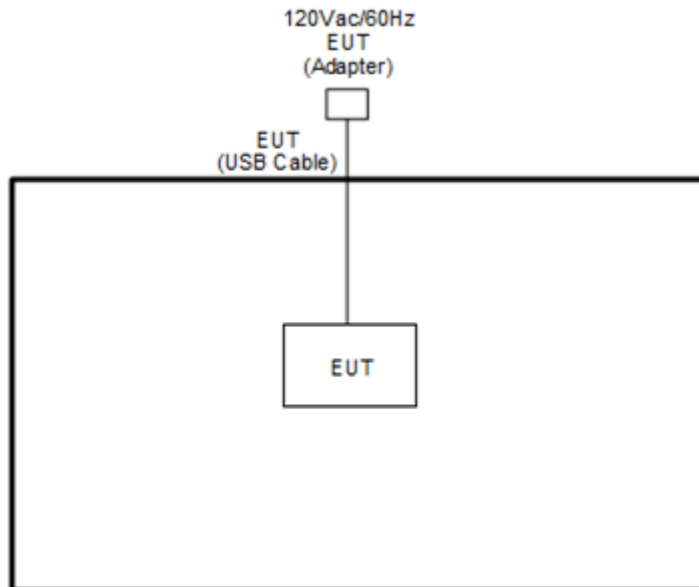
**Remark:** For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

## 2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<WLAN 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.	Bluetooth Earphone	Google	G1013	N/A	N/A	N/A
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
3.	Notebook	Dell	Latitude E3480	FCC DoC	N/A	AC I/P : Unshielded, 1.2m DC O/P : Shielded, 1.8m

## 2.5 EUT Operation Test Setup

The RF test items, utility “adb command V\_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.

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

*= 4.2 + 10 = 14.2 (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.

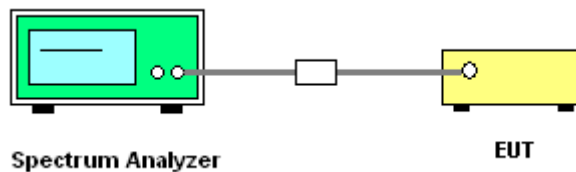
##### 3.1.2 Measuring Instruments

See list of measuring equipment of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was 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 6 dB 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.

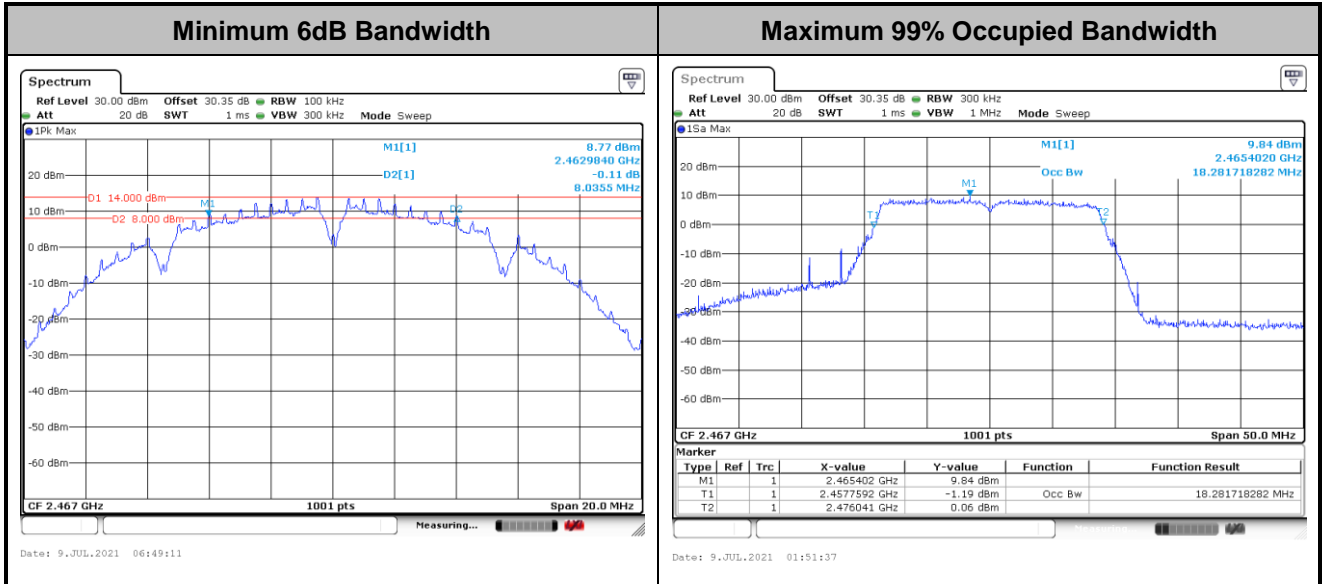
##### 3.1.4 Test Setup





### 3.1.5 Test Result of 6dB 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 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna with 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.

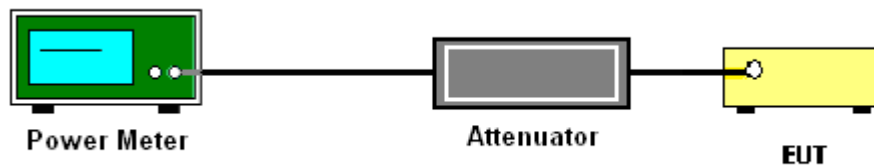
### 3.2.2 Measuring Instruments

See list of measuring equipment of 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 was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

### 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

See list of measuring equipment of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was 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. (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.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

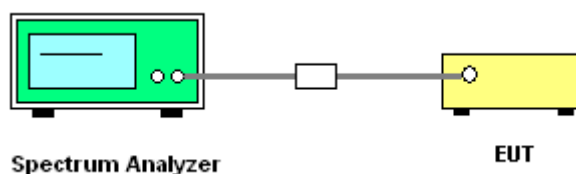
If measurements performed using method (2) plus  $10 \log(N)$  exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

Method (1): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

Method (2): Measure and add  $10 \log(N)$  dB, where N is the number of outputs. (N=2)

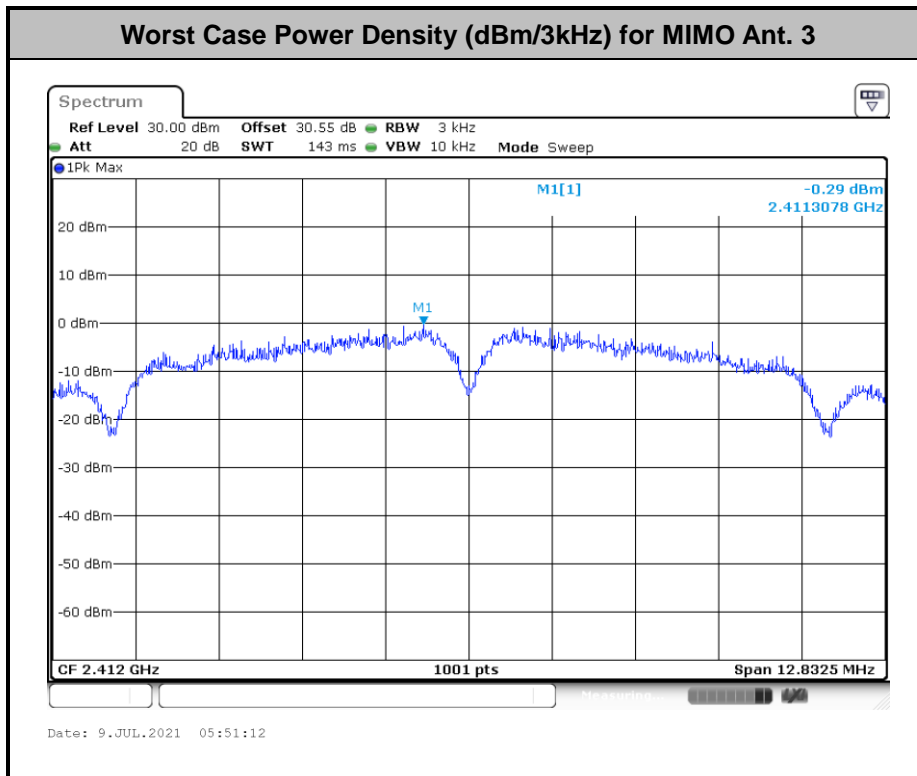
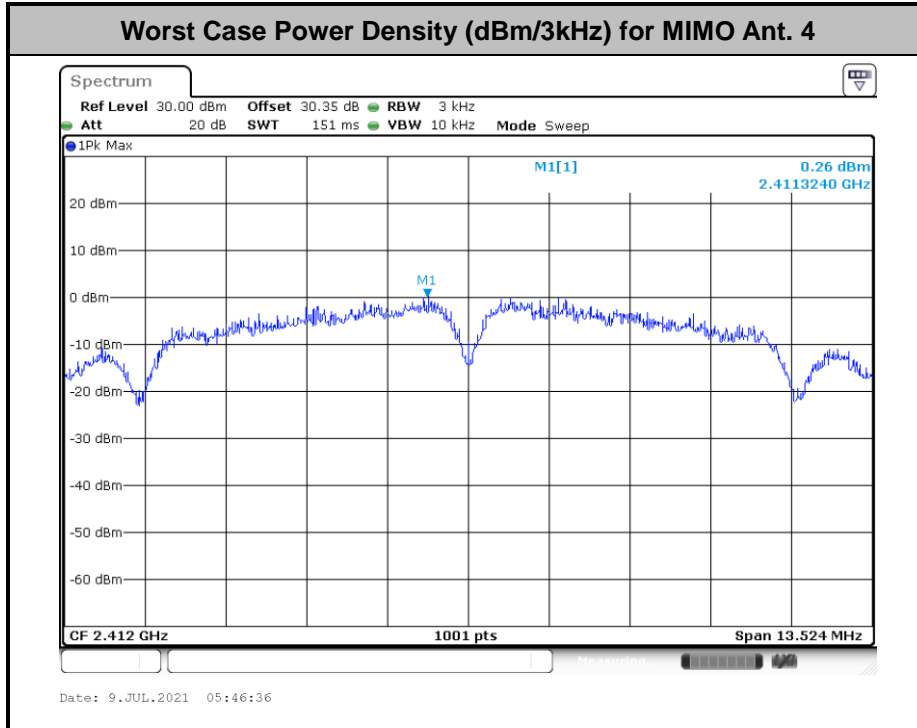
#### 3.3.4 Test Setup





### 3.3.5 Test Result of Power Spectral Density

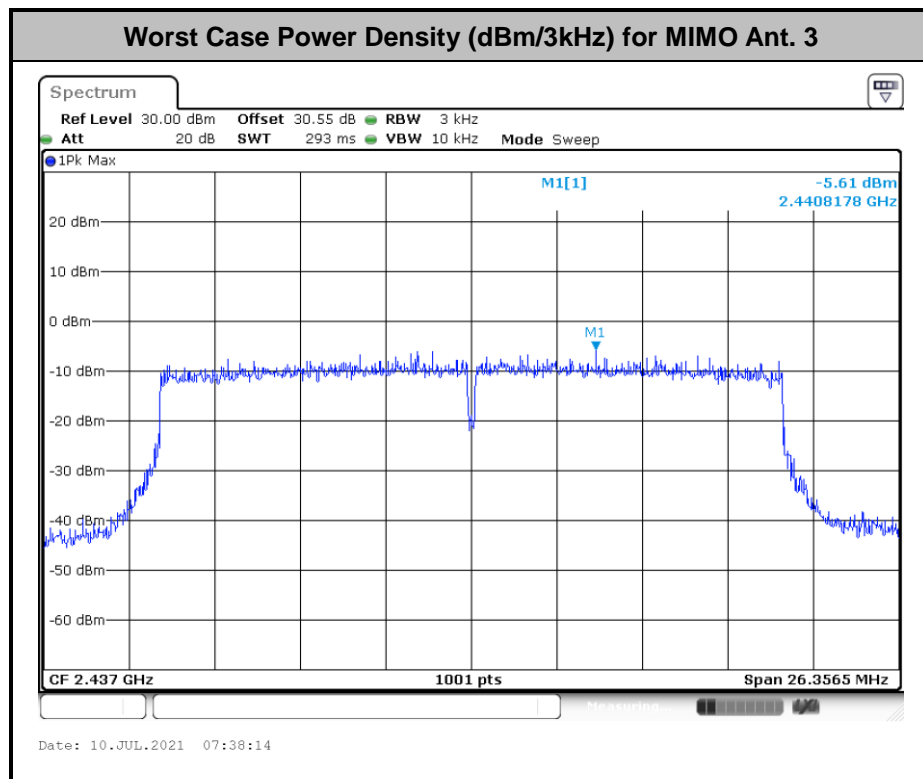
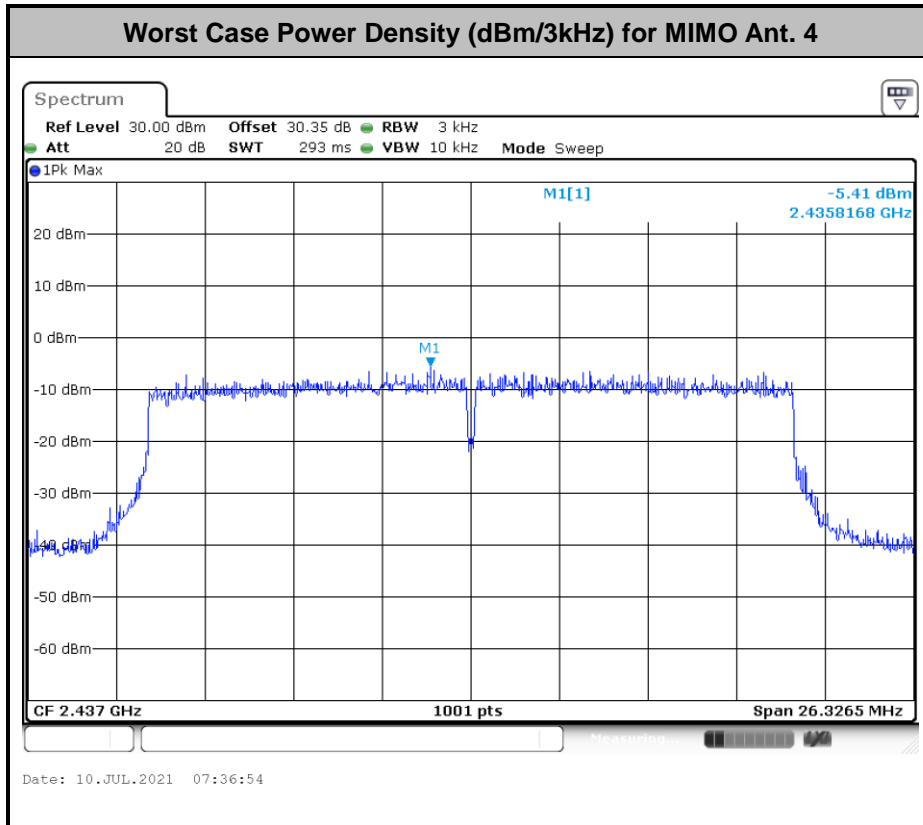
Please refer to Appendix A.







<For 802.11ax mode>



## 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.

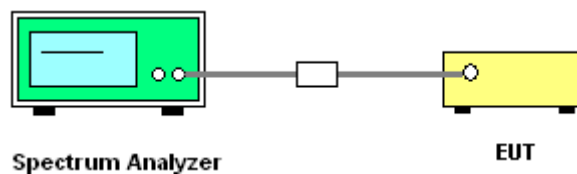
### 3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

### 3.4.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
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 the maximum power setting and enable the EUT to 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



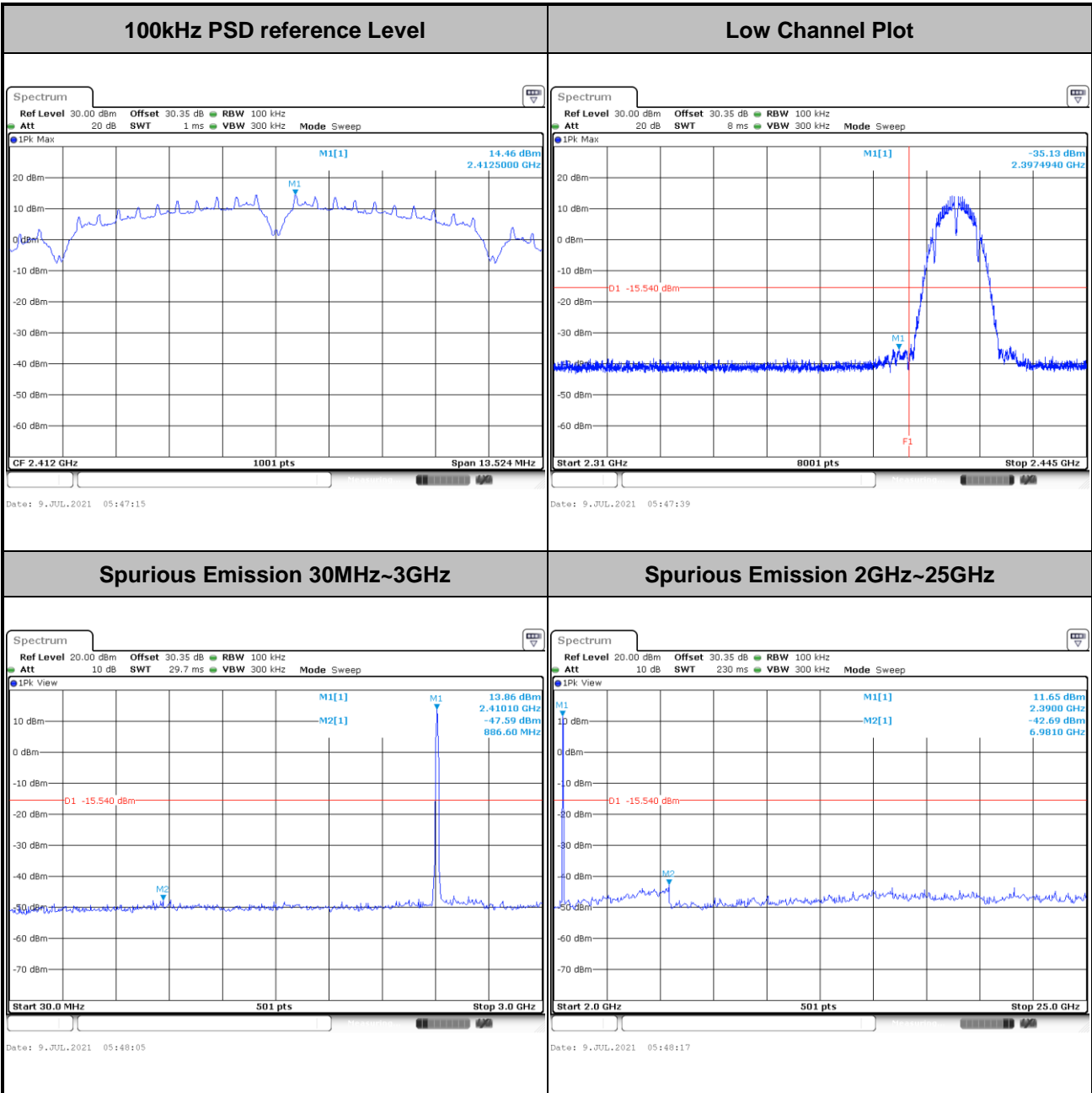


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer : Shiming Liu	Temperature :	22.5~25.2°C
	Relative Humidity :	49.1~58.7%

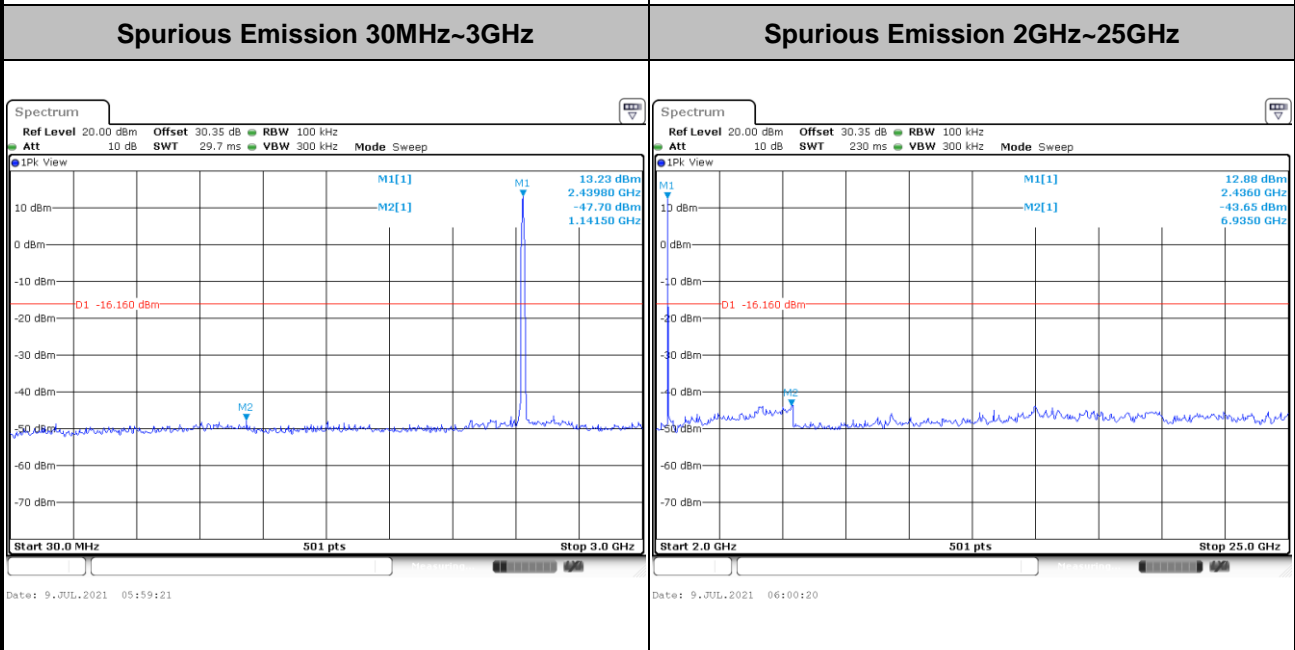
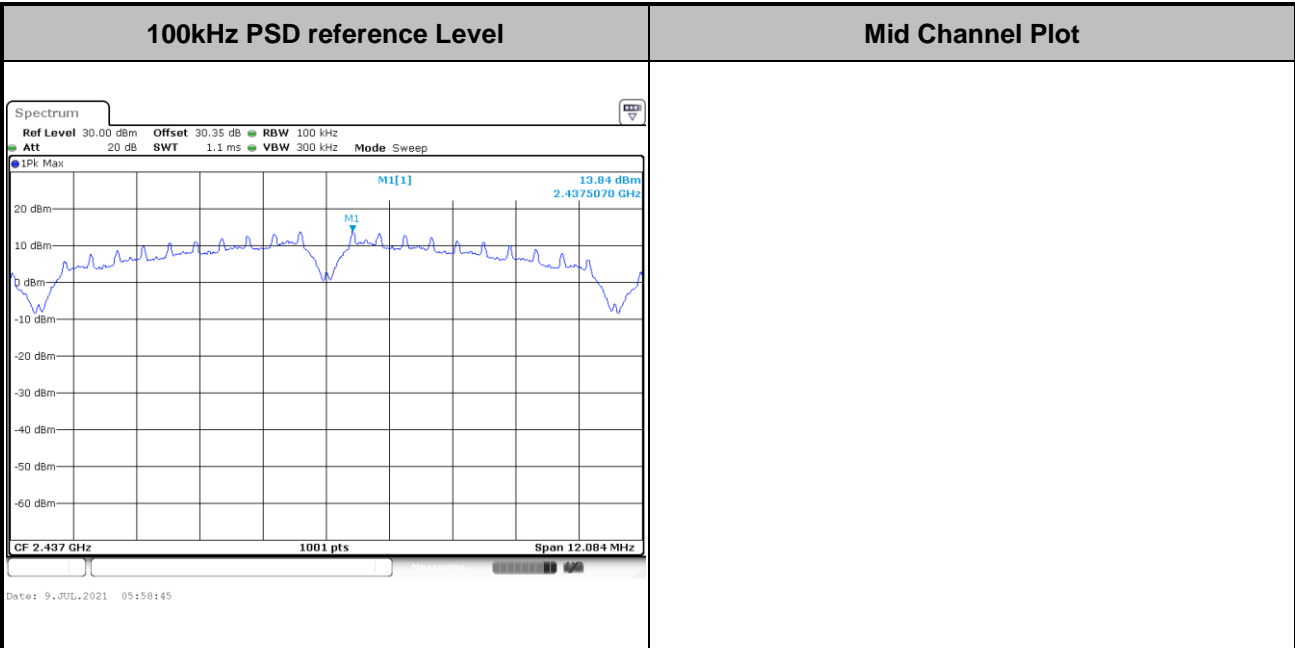
Number of TX = 2, Ant. 4 (Measured)

Test Mode :	802.11b	Test Channel :	01
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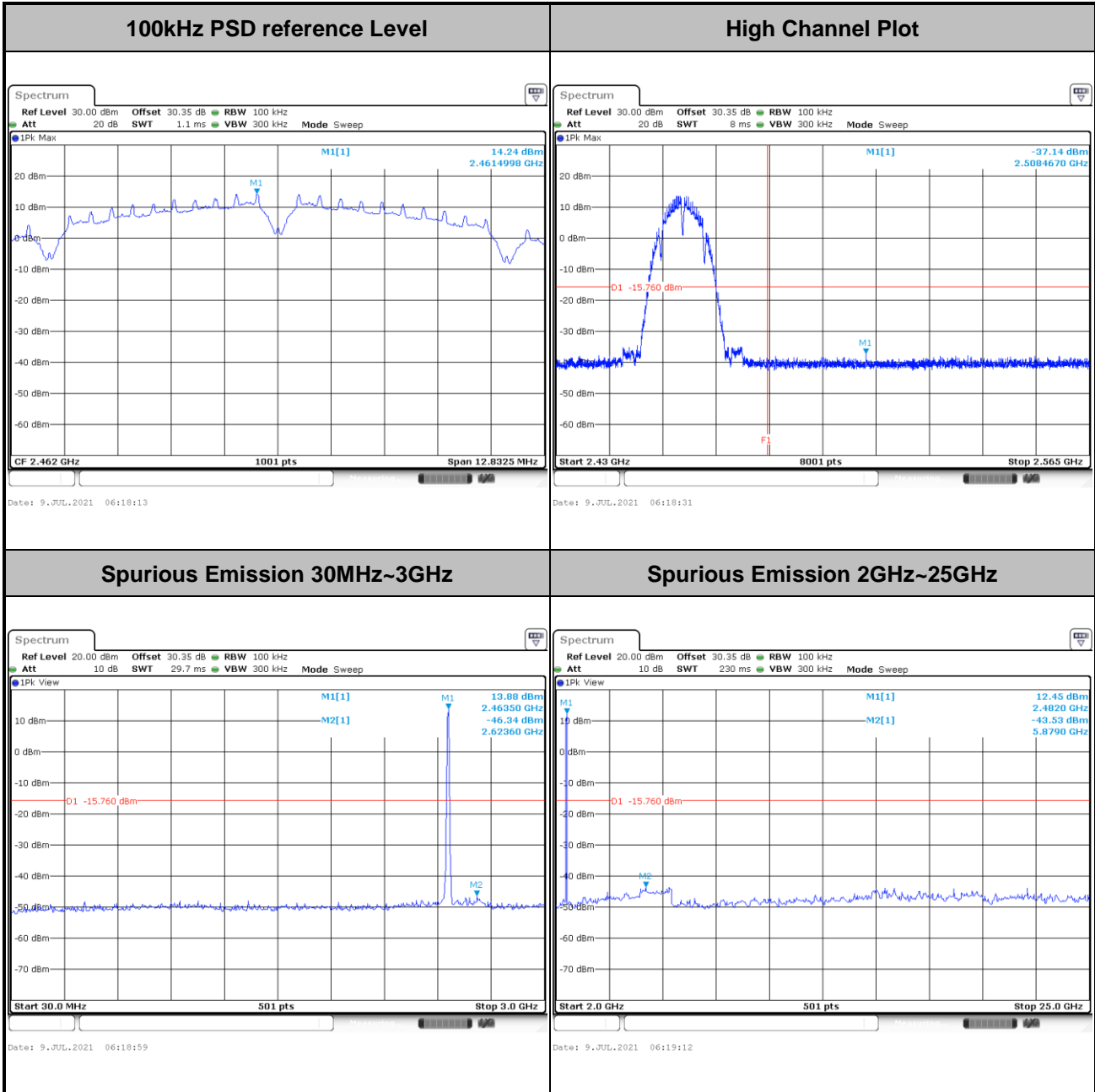


Test Mode :	802.11b	Test Channel :	06
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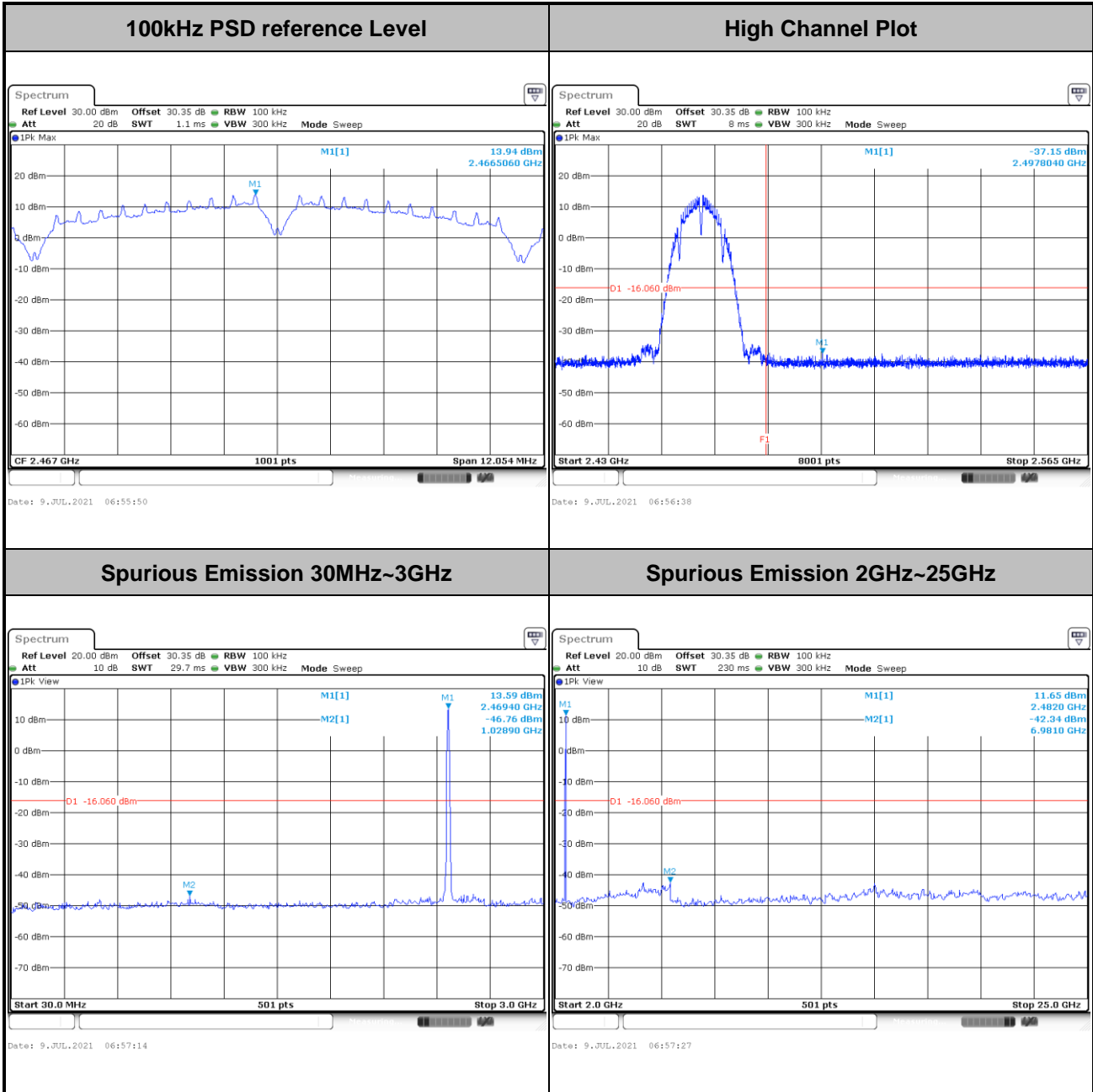


Test Mode :	802.11b	Test Channel :	11
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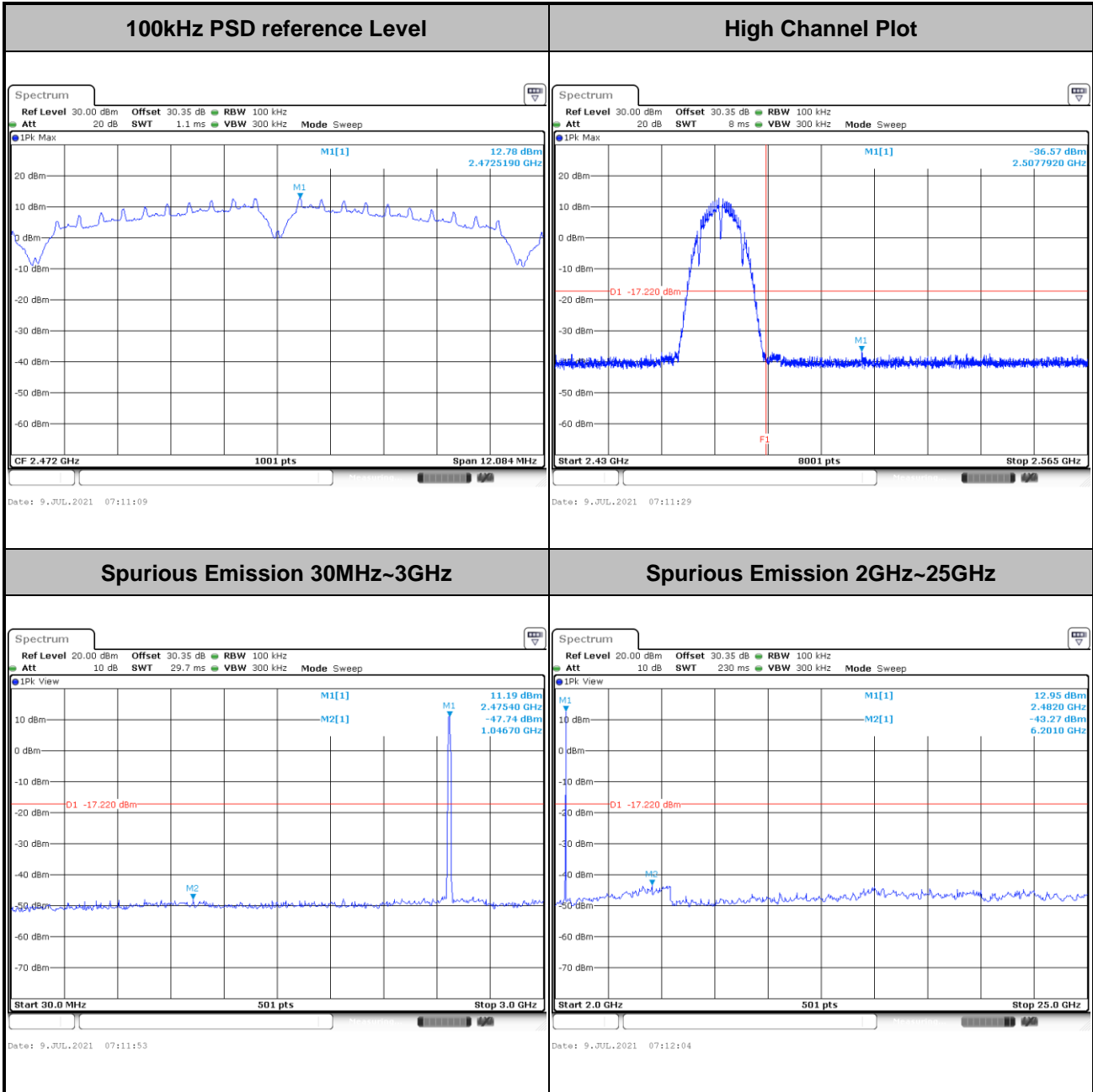


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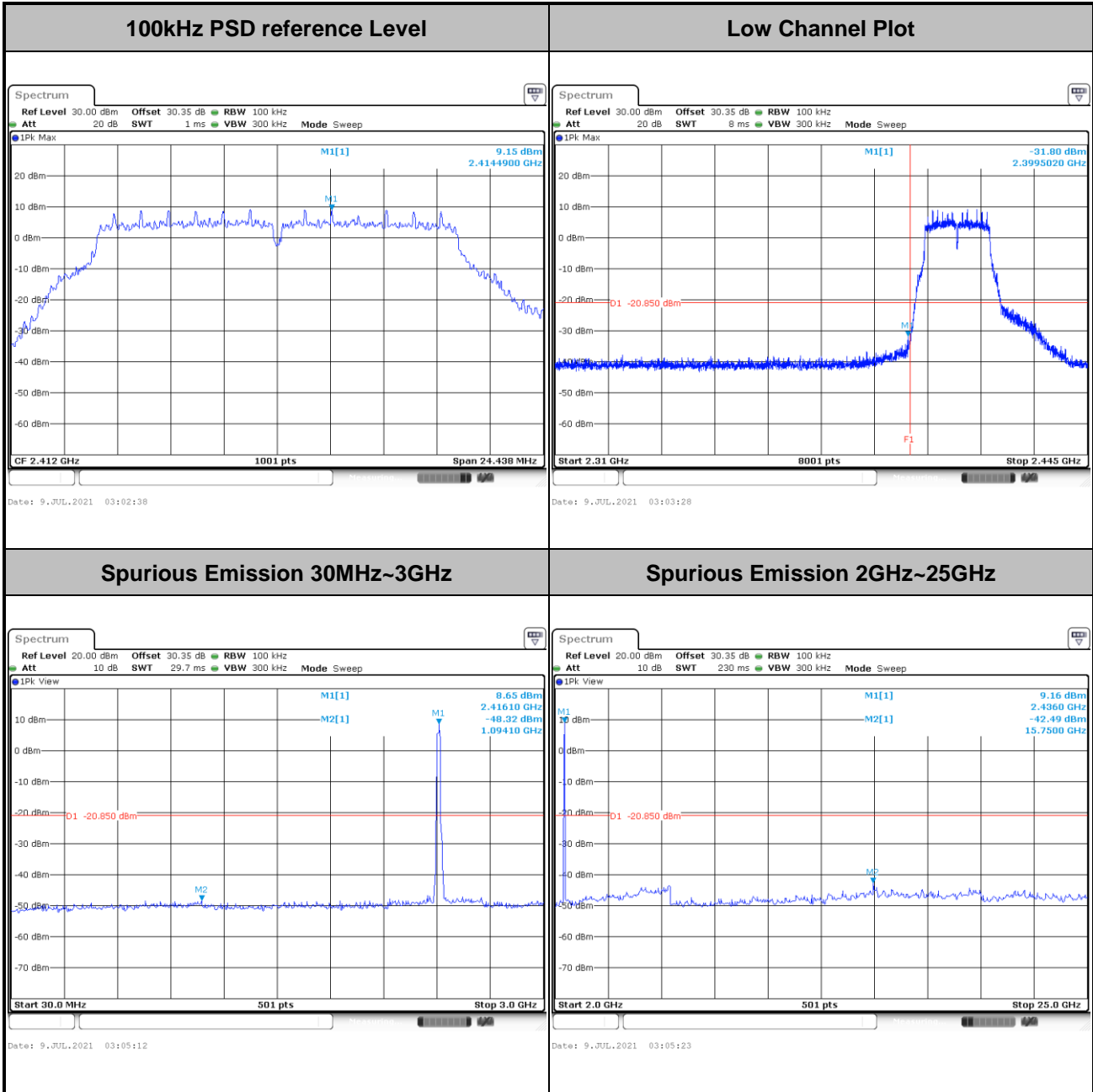


Test Mode :	802.11b	Test Channel :	13
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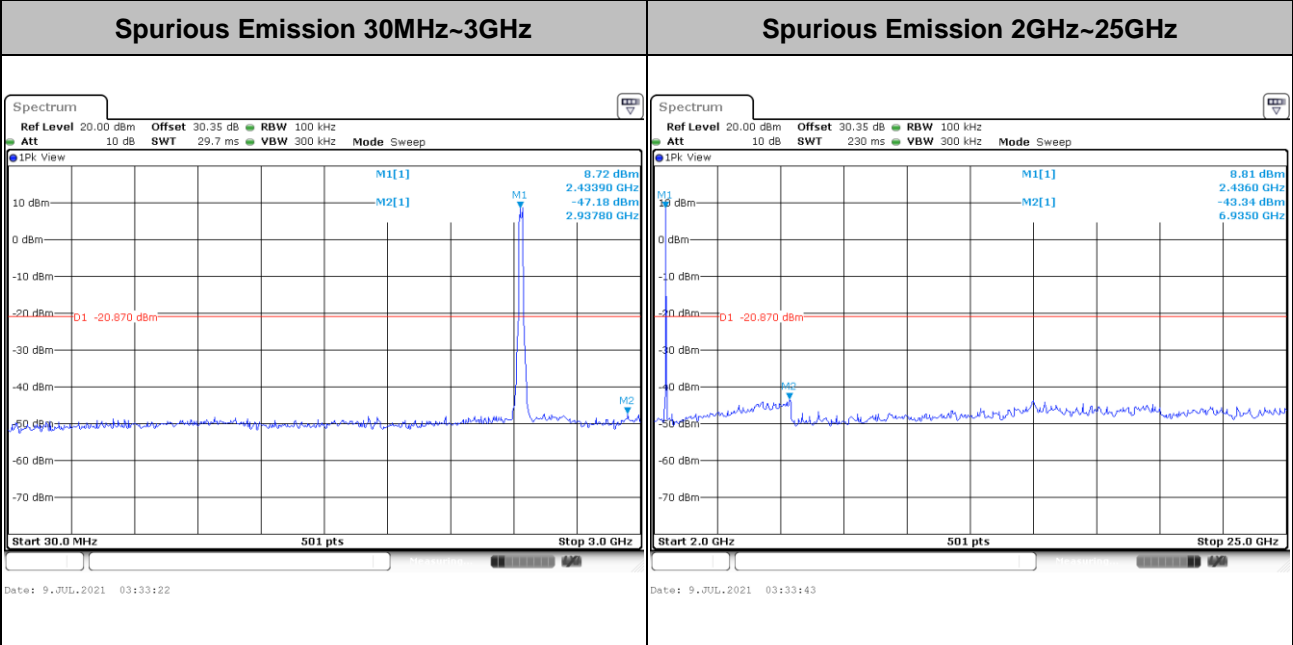
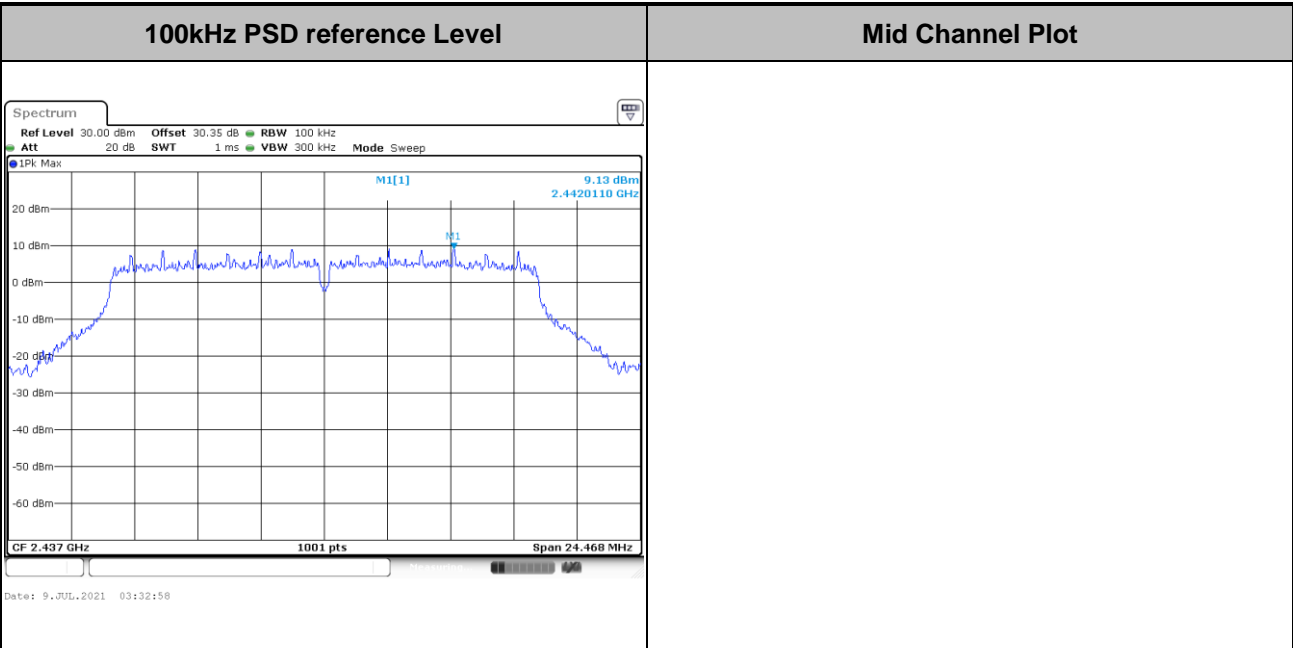
Test Mode :	802.11g	Test Channel :	01
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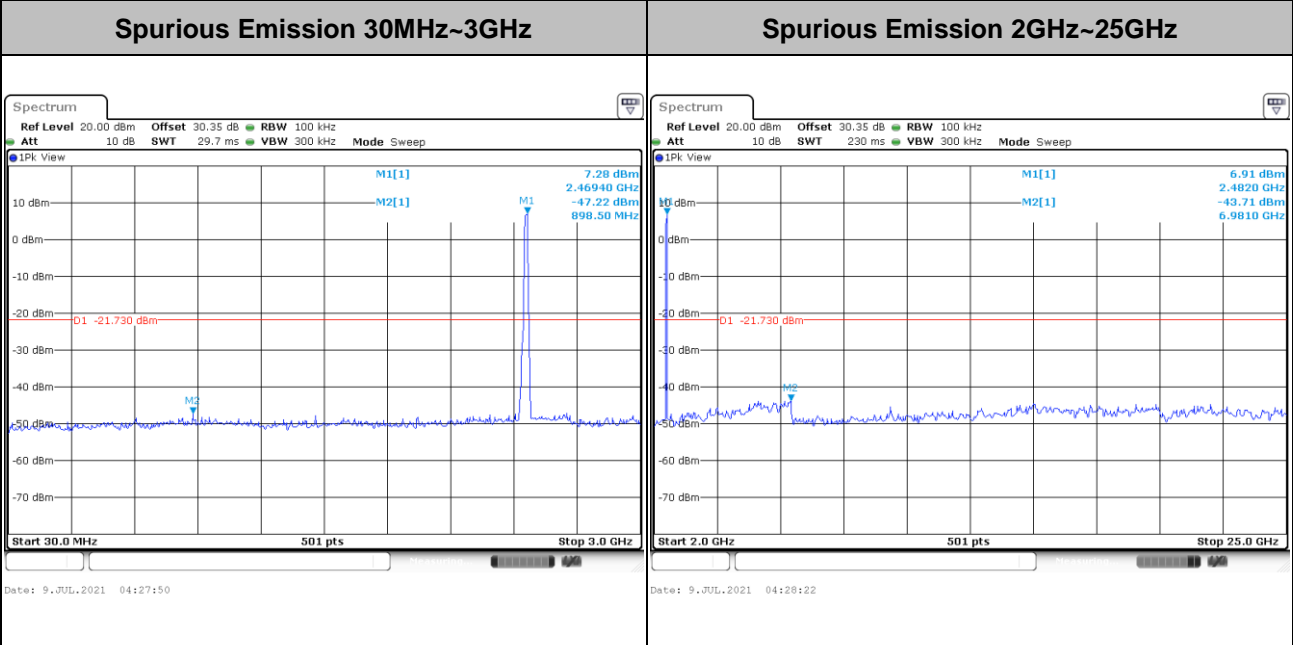
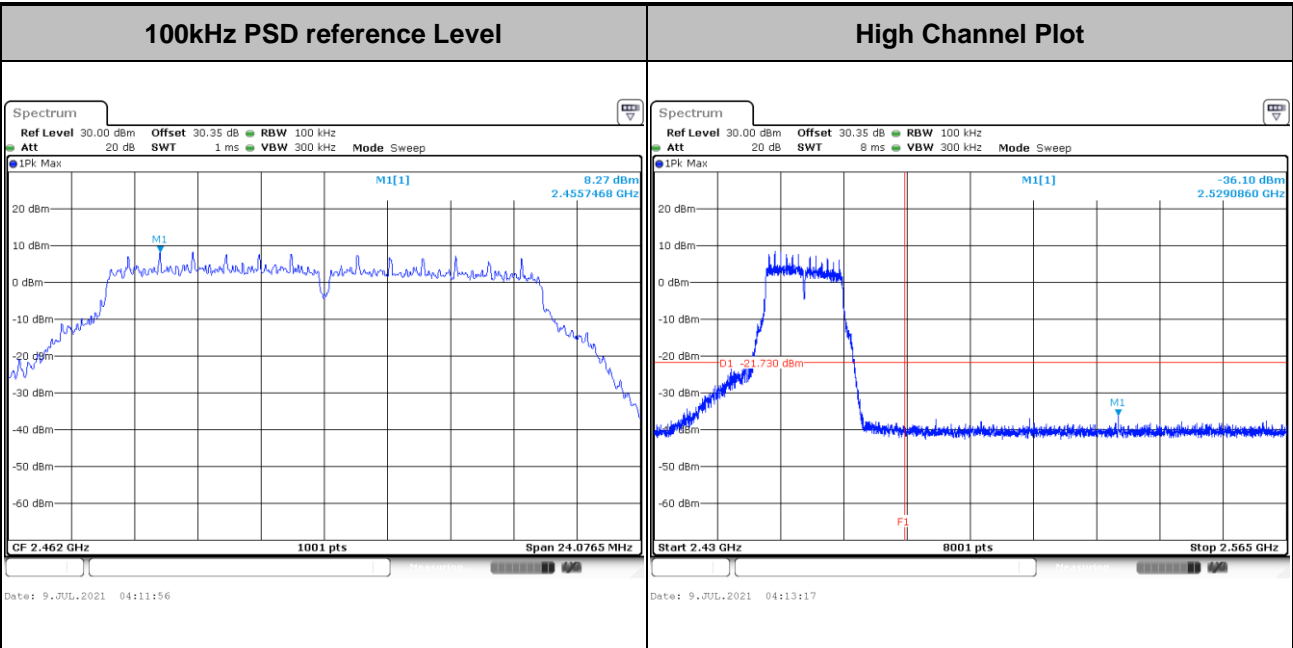


Test Mode :	802.11g	Test Channel :	06
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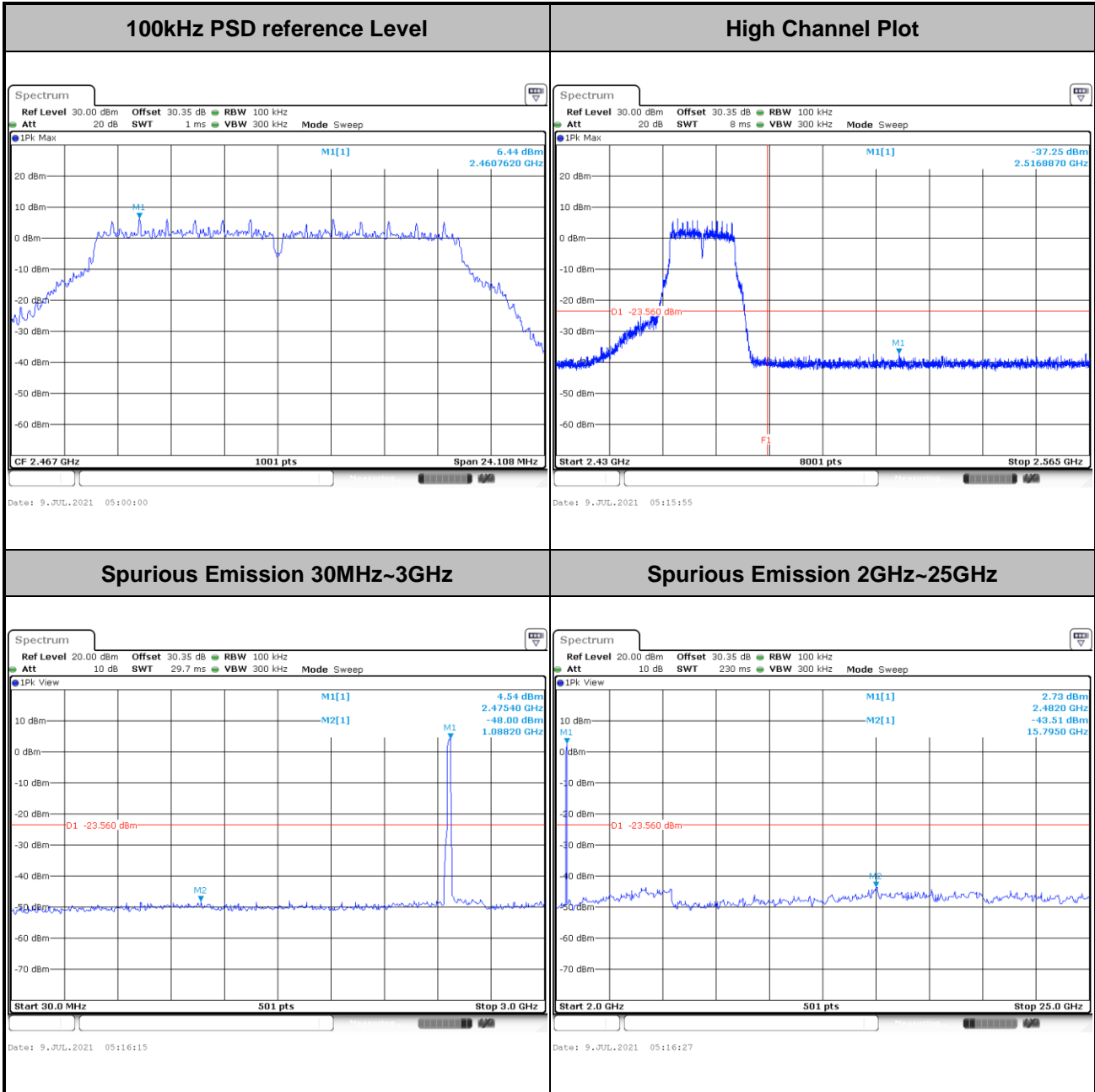


Test Mode :	802.11g	Test Channel :	11
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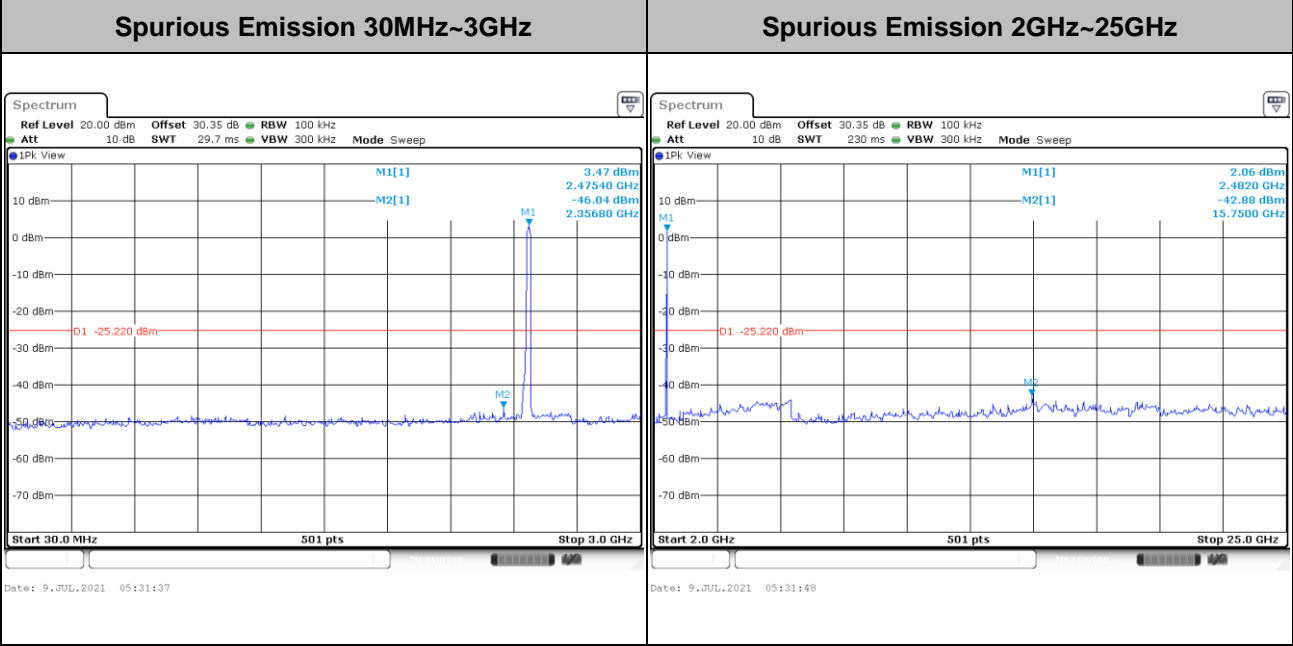
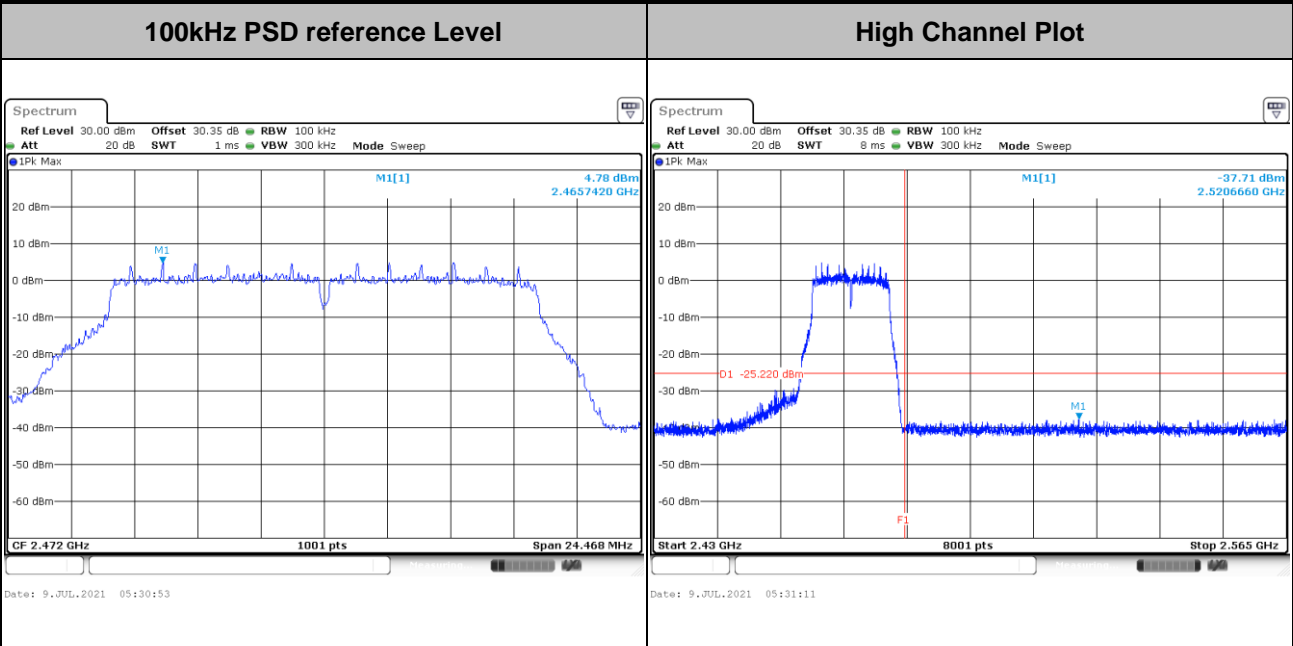


Test Mode :	802.11g	Test Channel :	12
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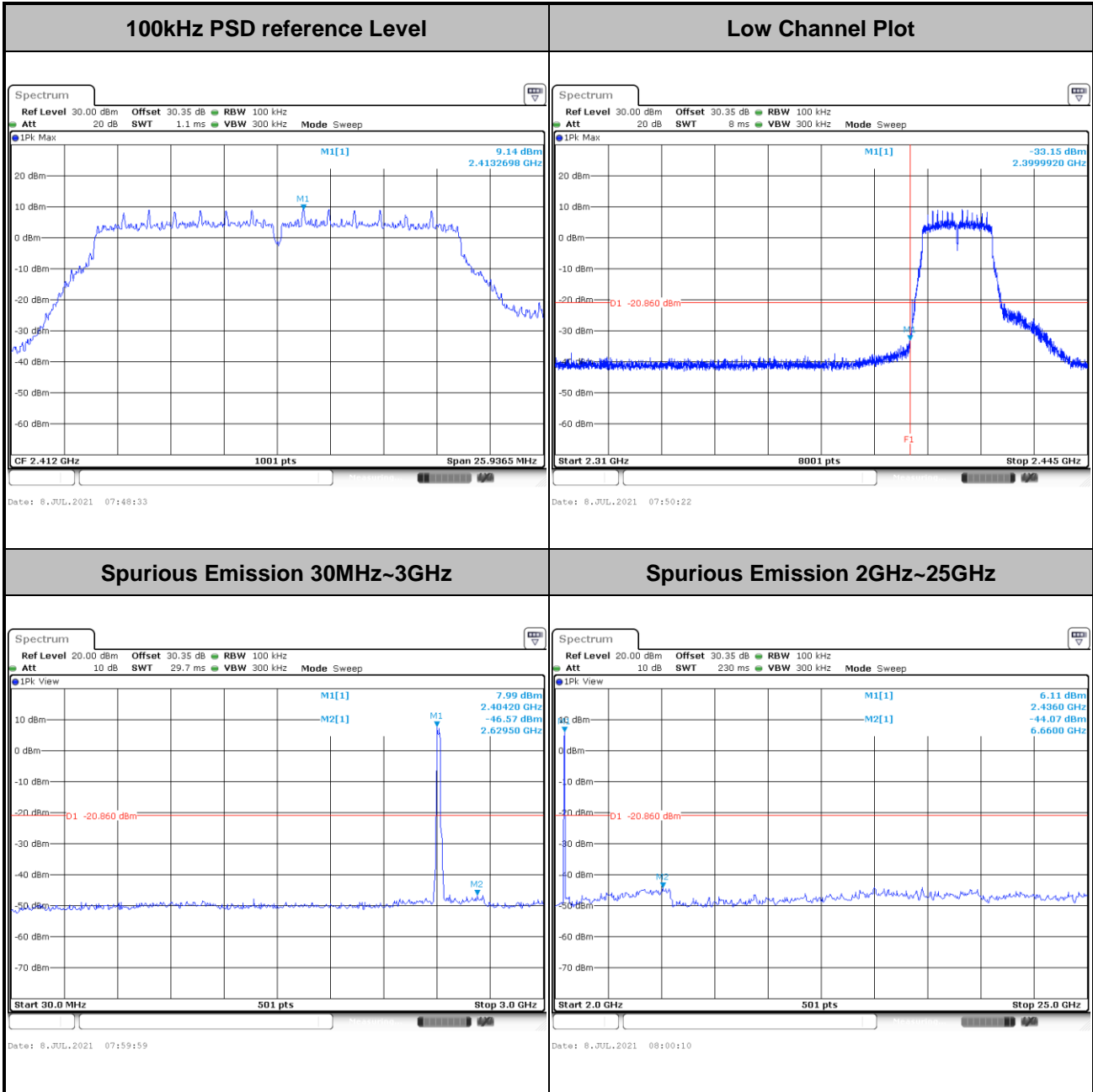


Test Mode :	802.11g	Test Channel :	13
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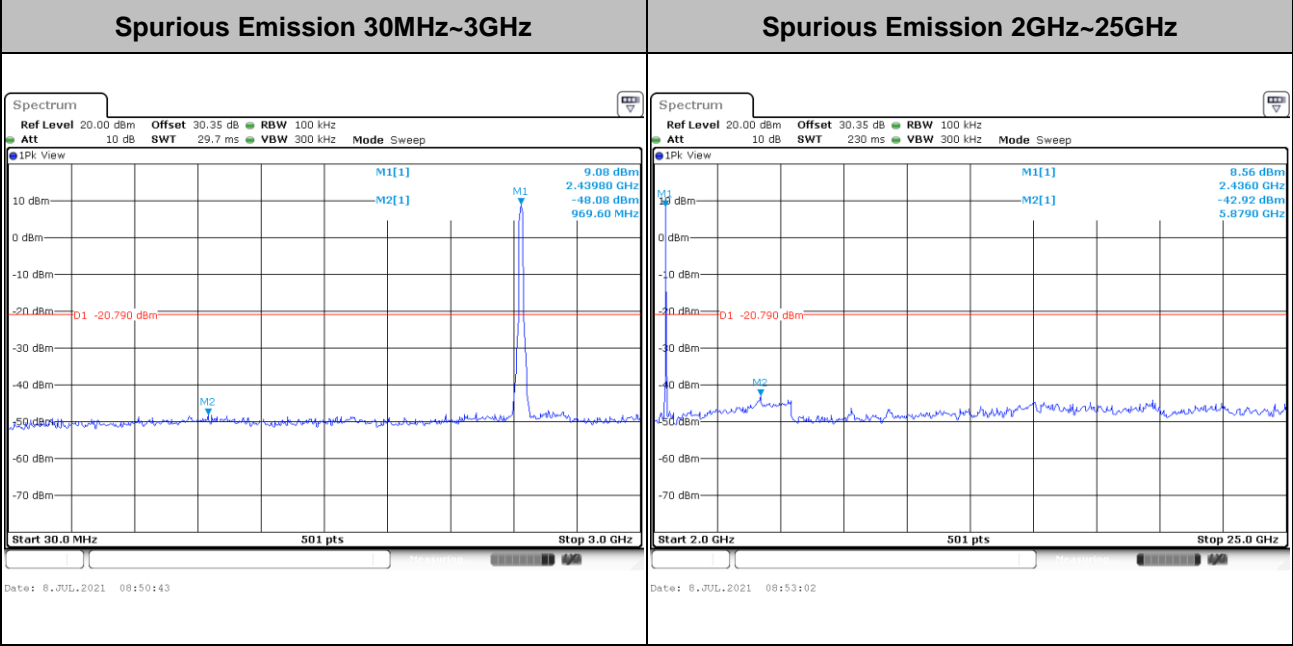
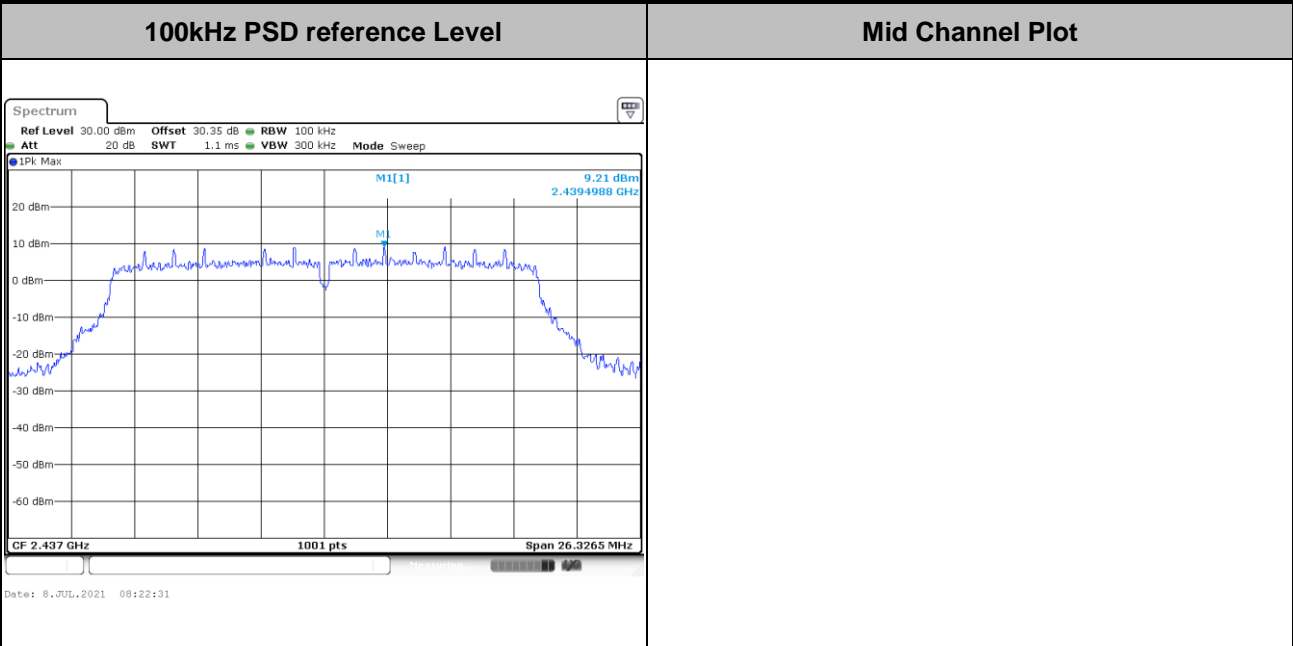


Test Mode :	802.11n HT20	Test Channel :	01
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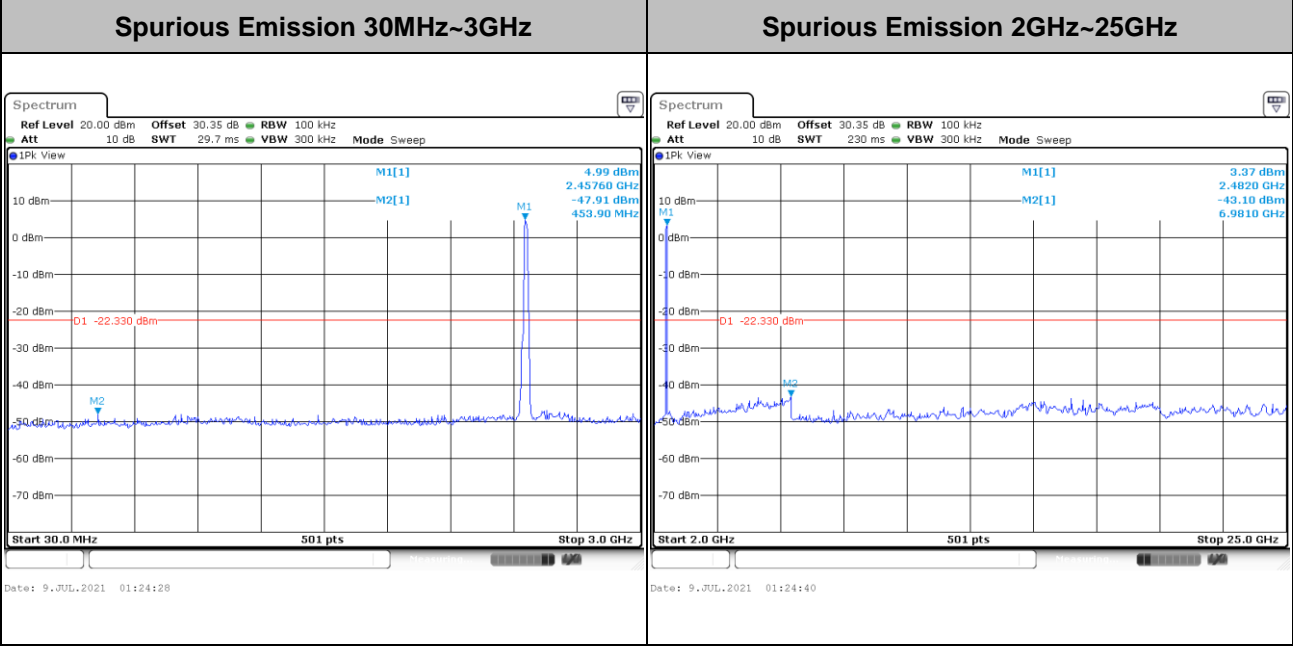
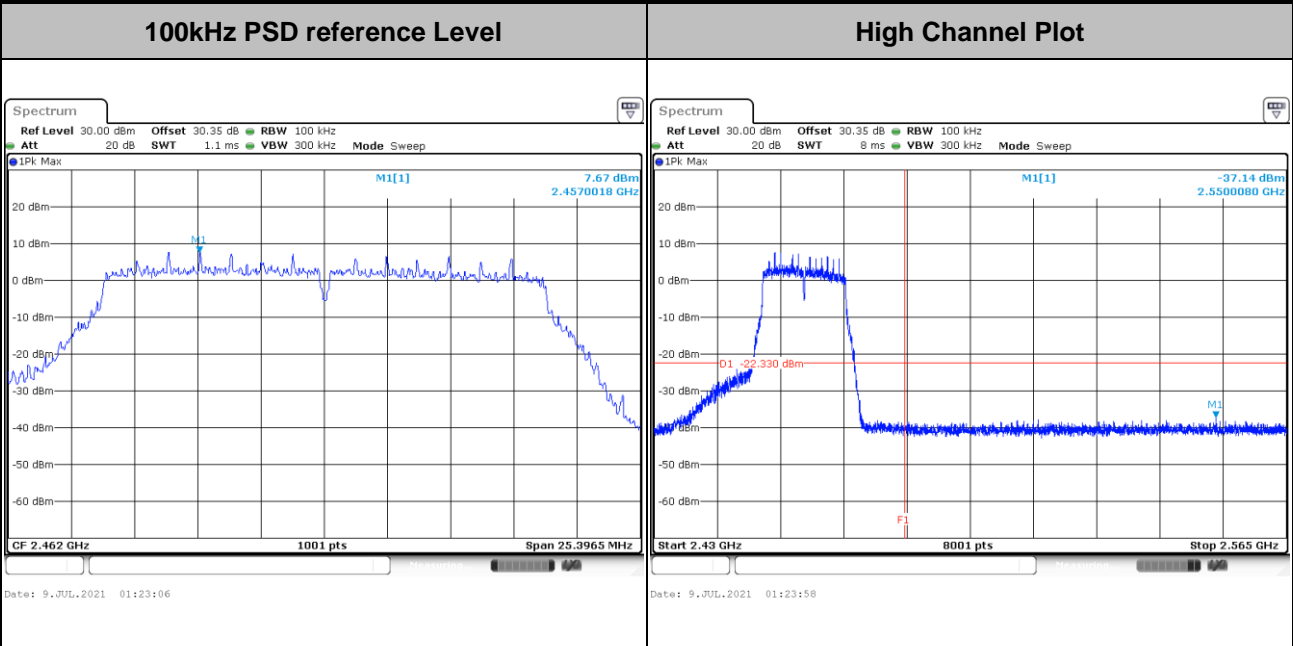


Test Mode :	802.11n HT20	Test Channel :	06
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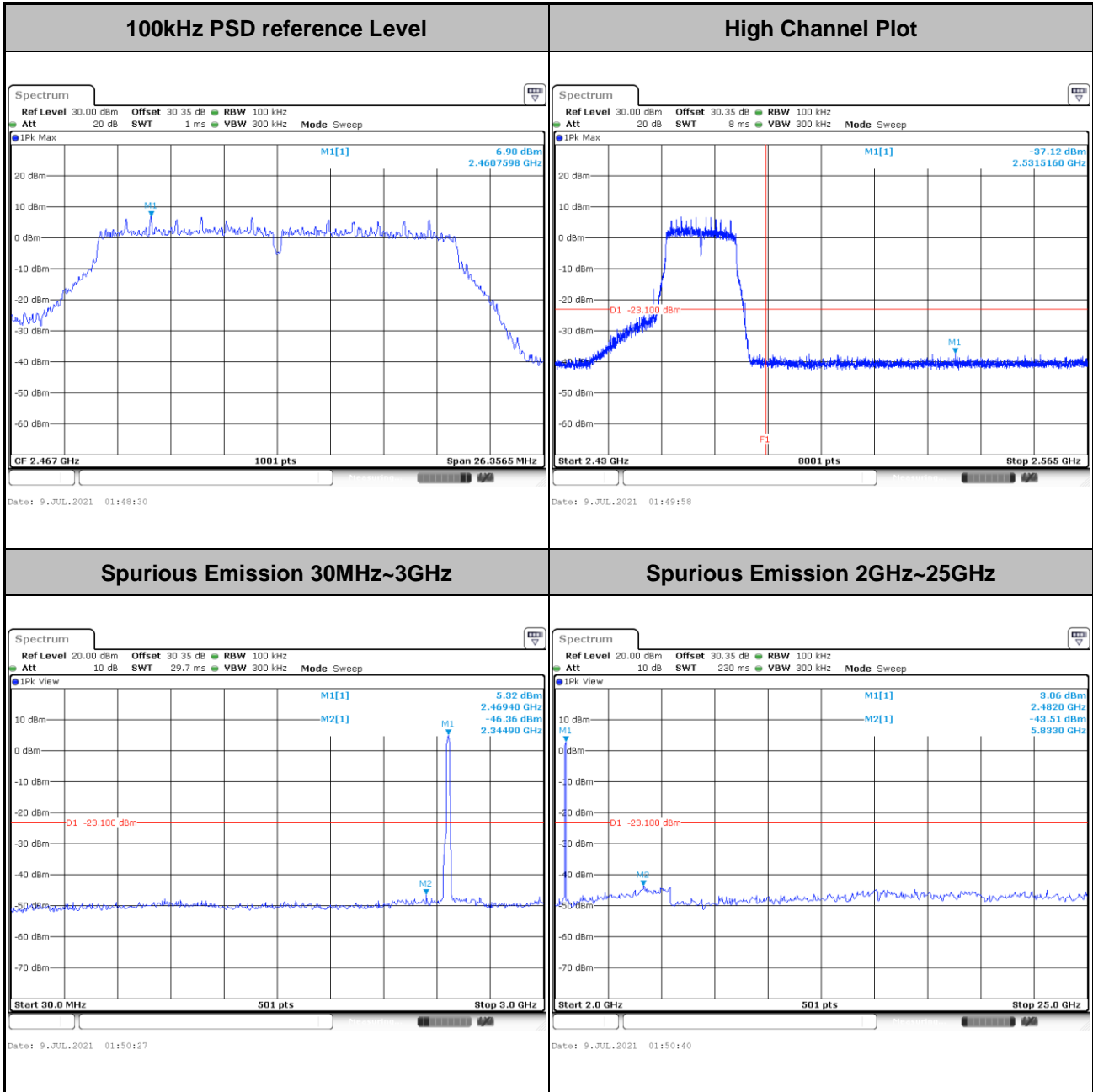


Test Mode :	802.11n HT20	Test Channel :	11
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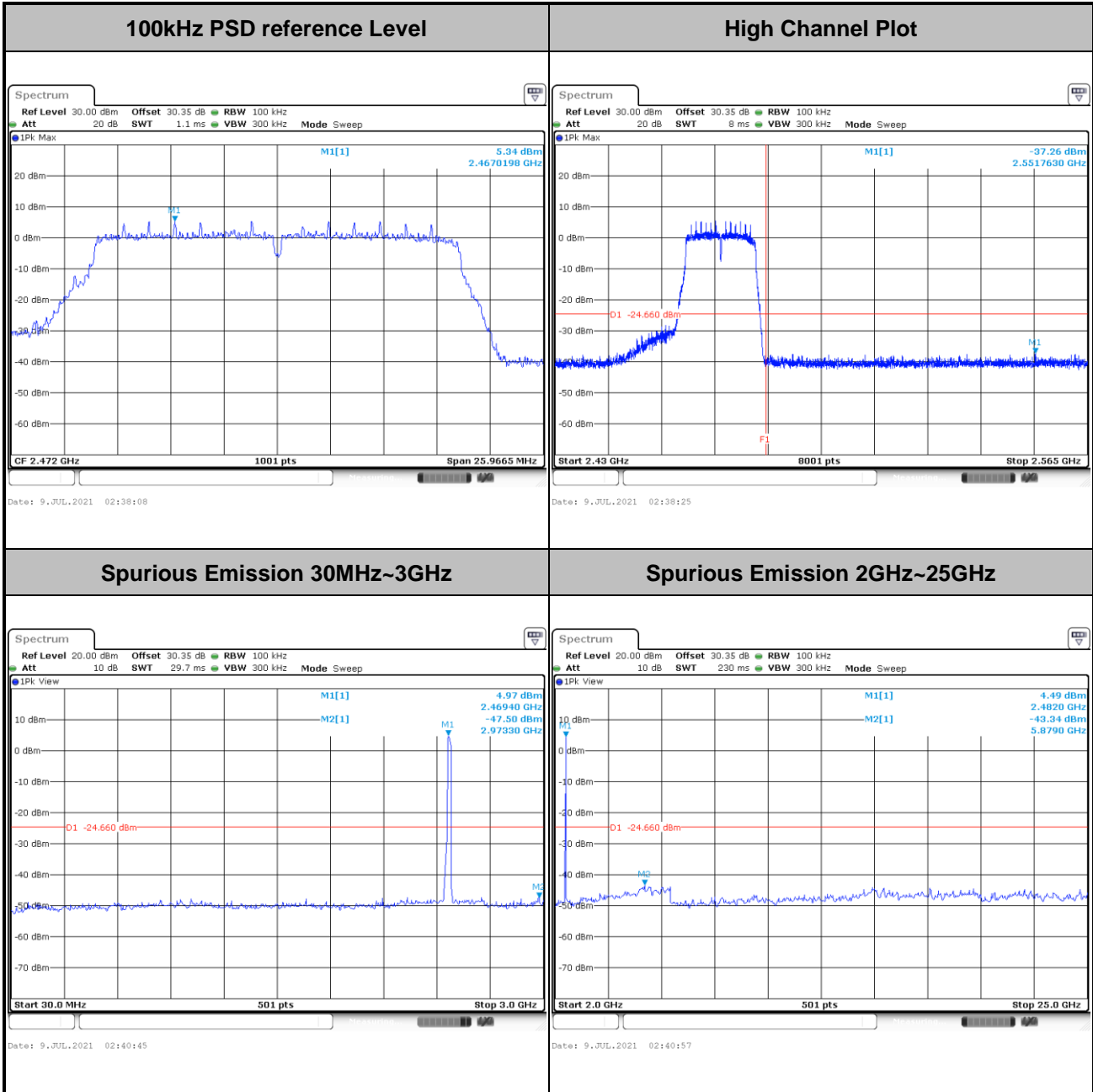
Test Mode :	802.11n HT20	Test Channel :	12
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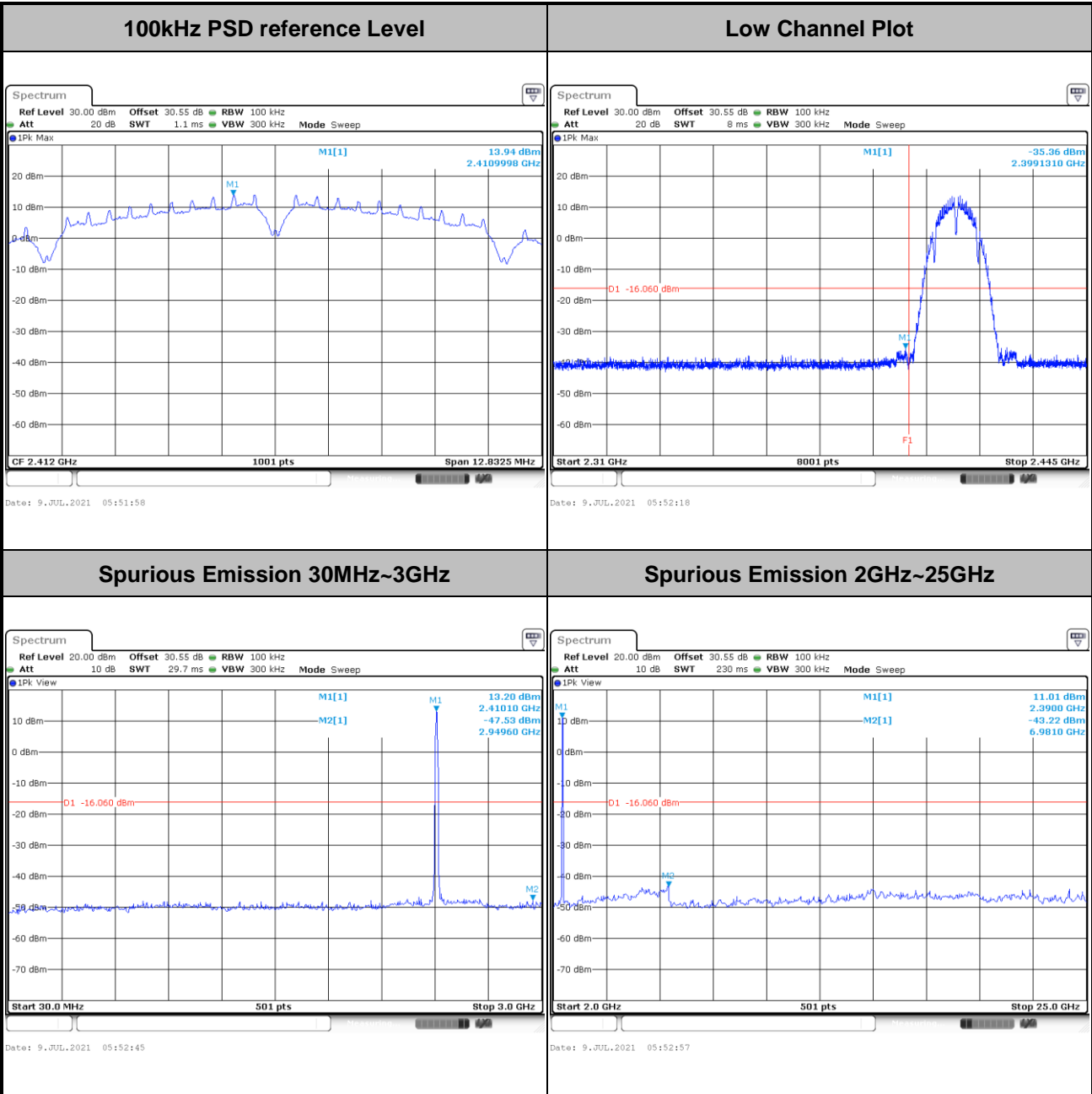
Test Mode :	802.11n HT20	Test Channel :	13
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Number of TX = 2, Ant. 3 (Measured)

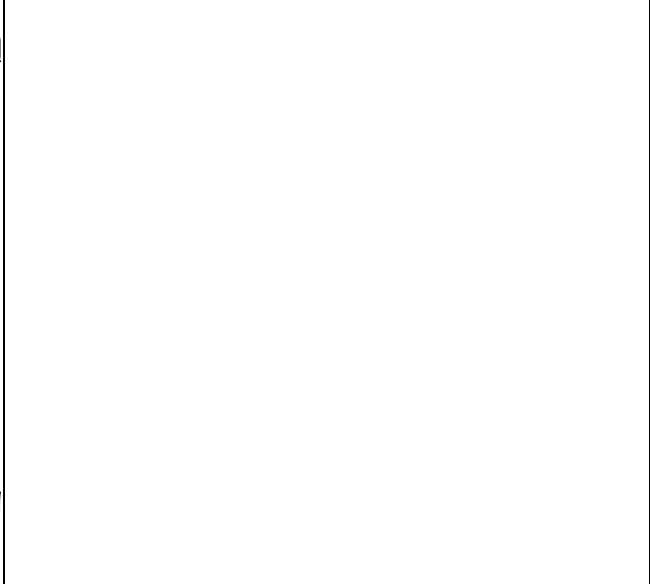
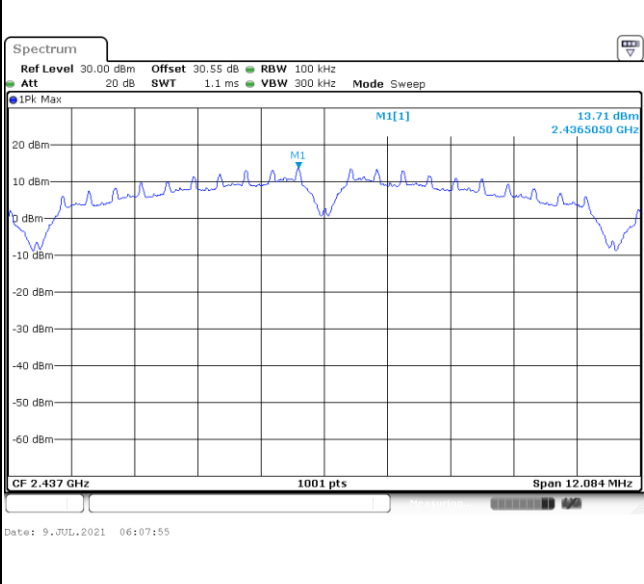
Test Mode :	802.11b	Test Channel :	01
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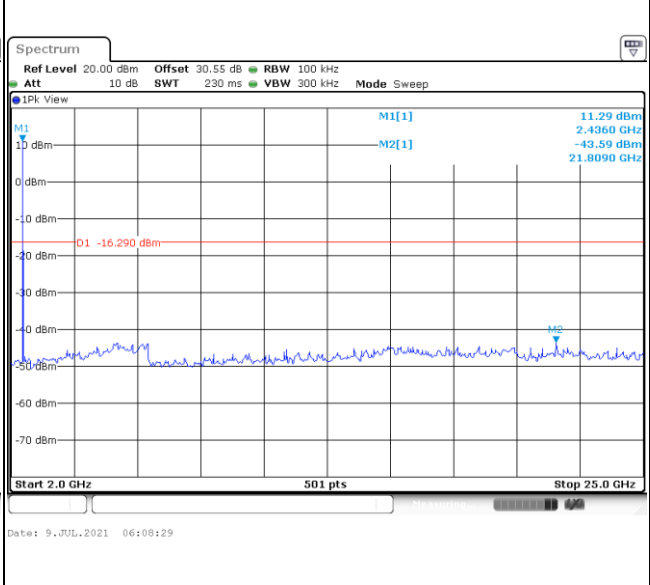
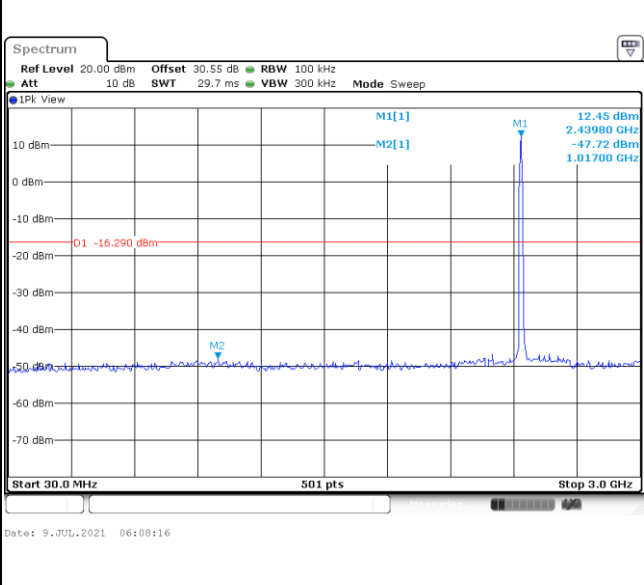


Test Mode :	802.11b	Test Channel :	06
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<b>100kHz PSD reference Level</b>	<b>Mid Channel Plot</b>
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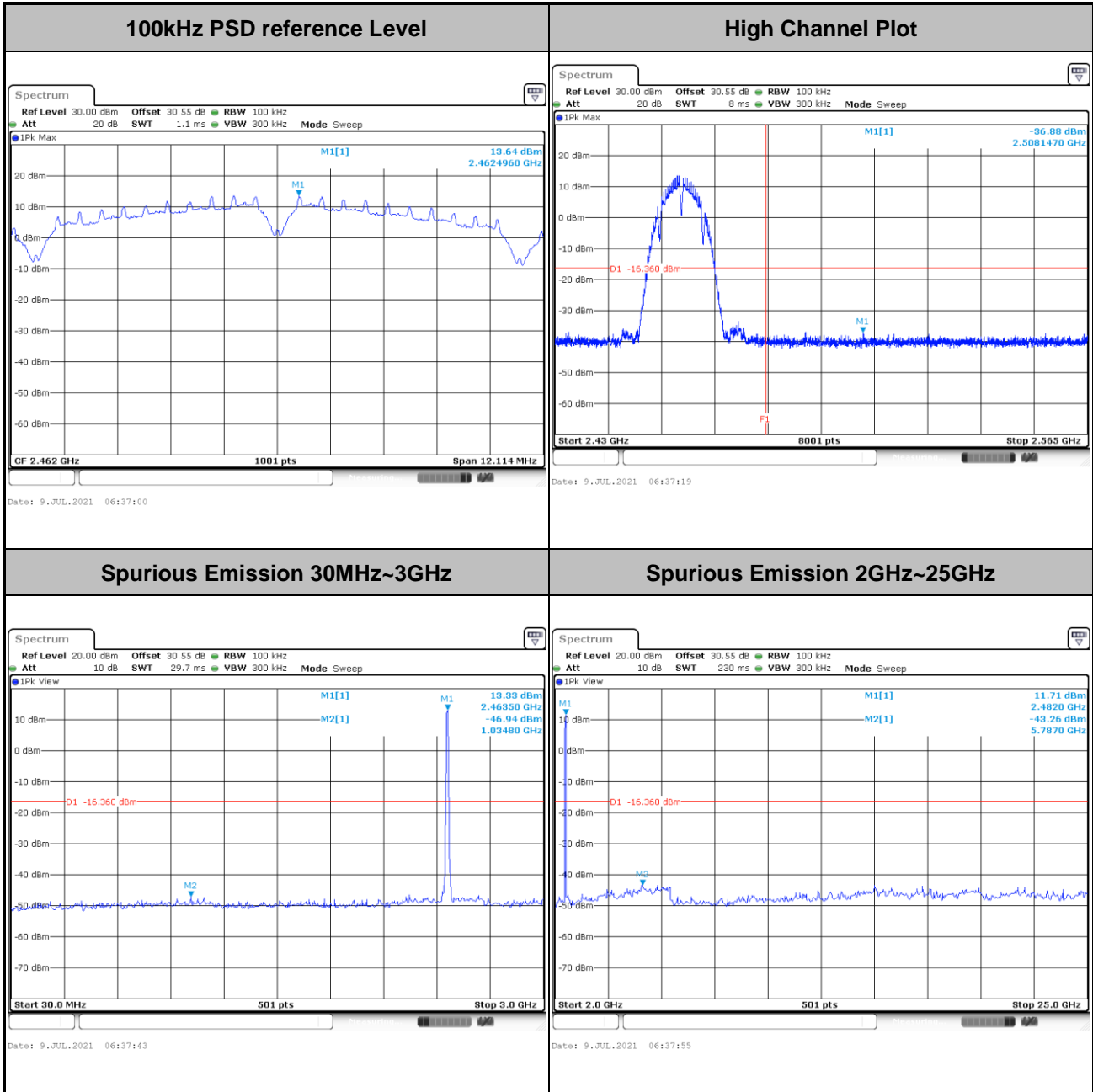


<b>Spurious Emission 30MHz~3GHz</b>	<b>Spurious Emission 2GHz~25GHz</b>
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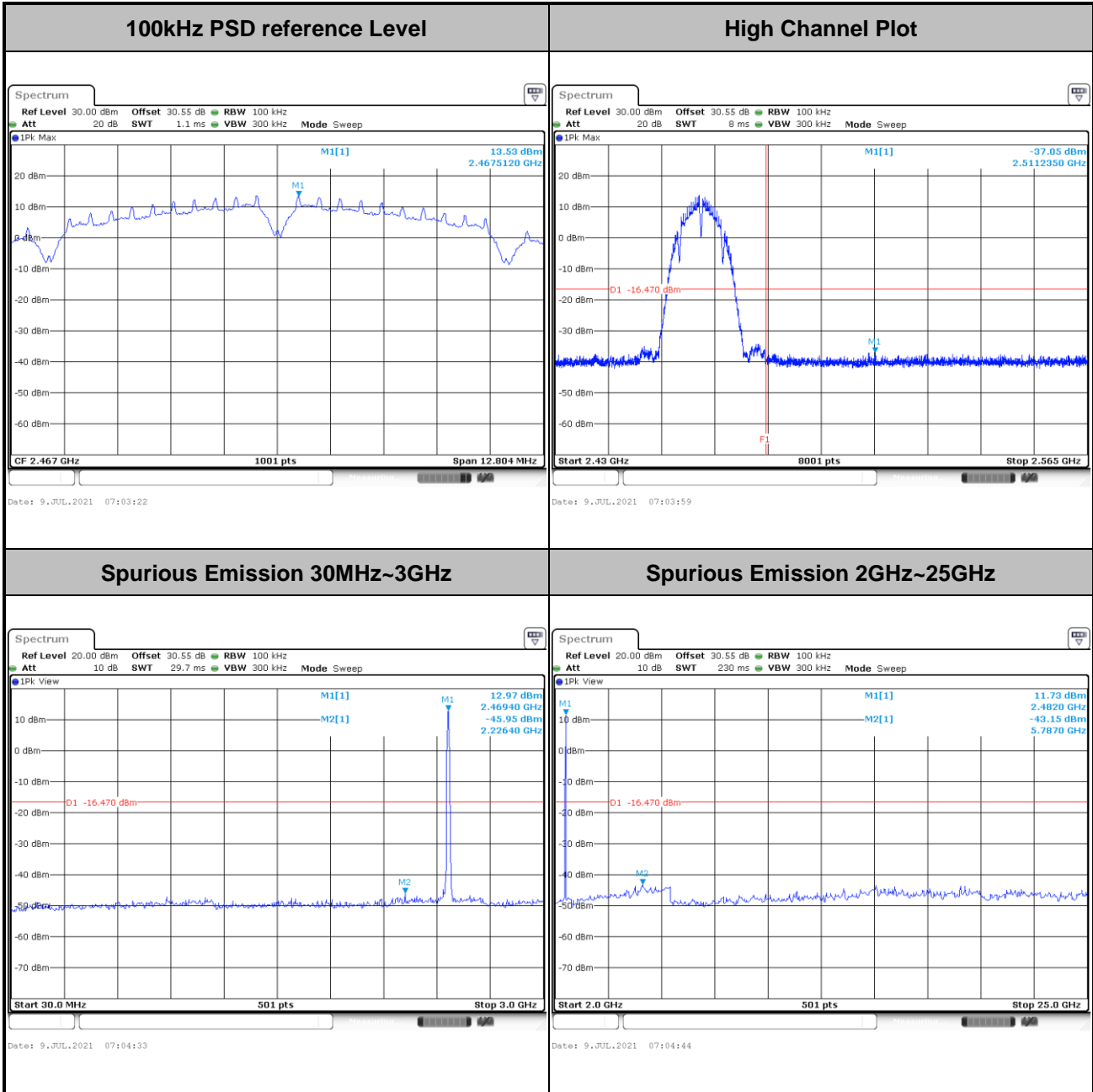


Test Mode :	802.11b	Test Channel :	11
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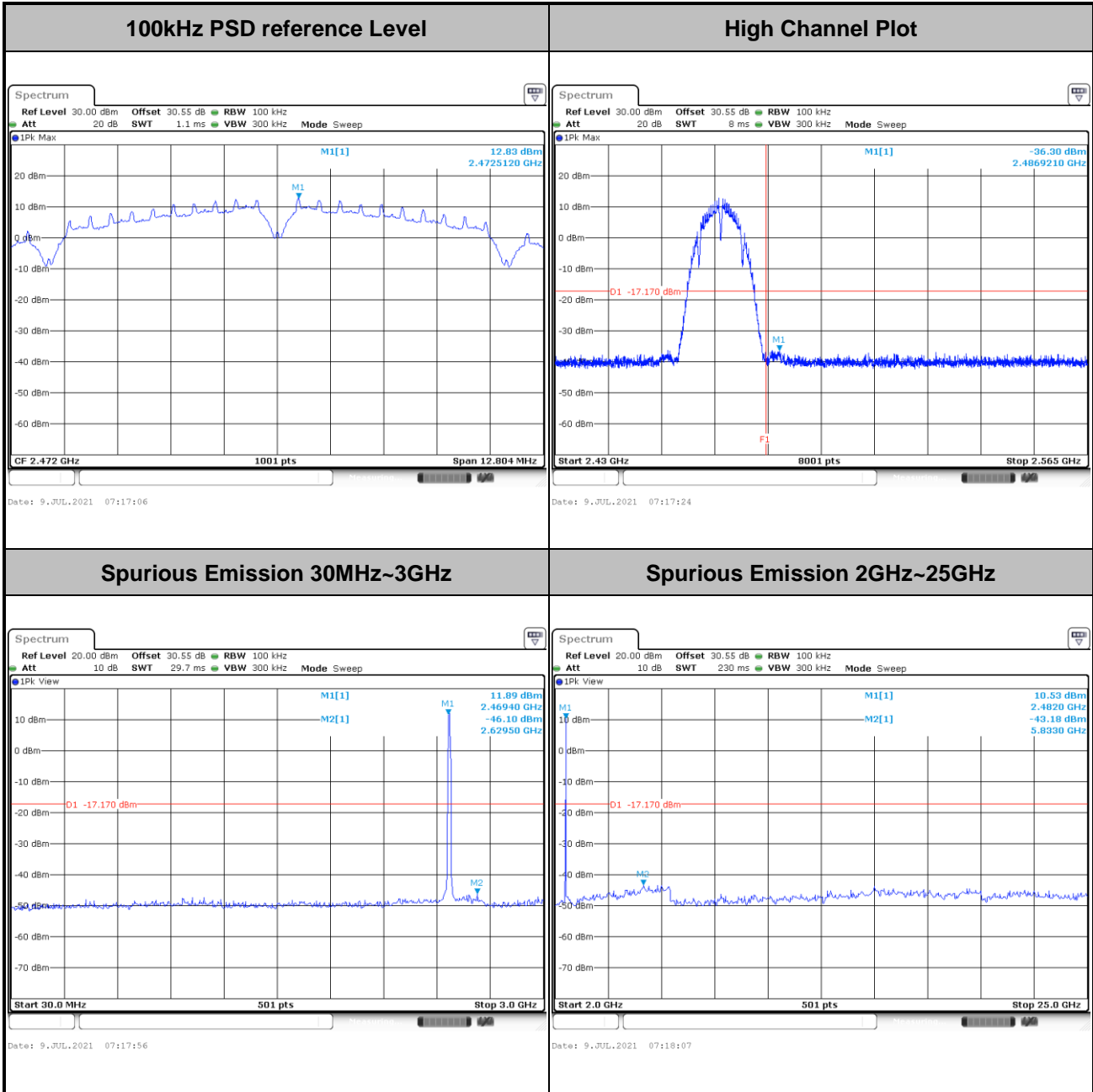


Test Mode :	802.11b	Test Channel :	12
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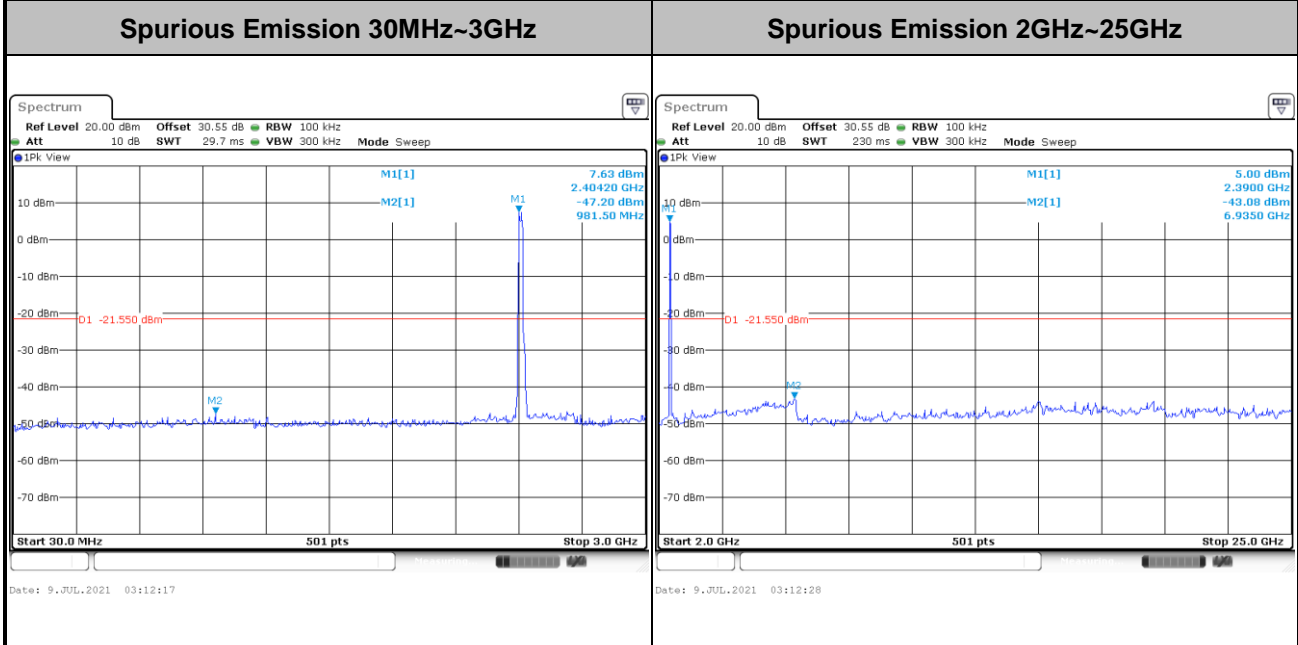
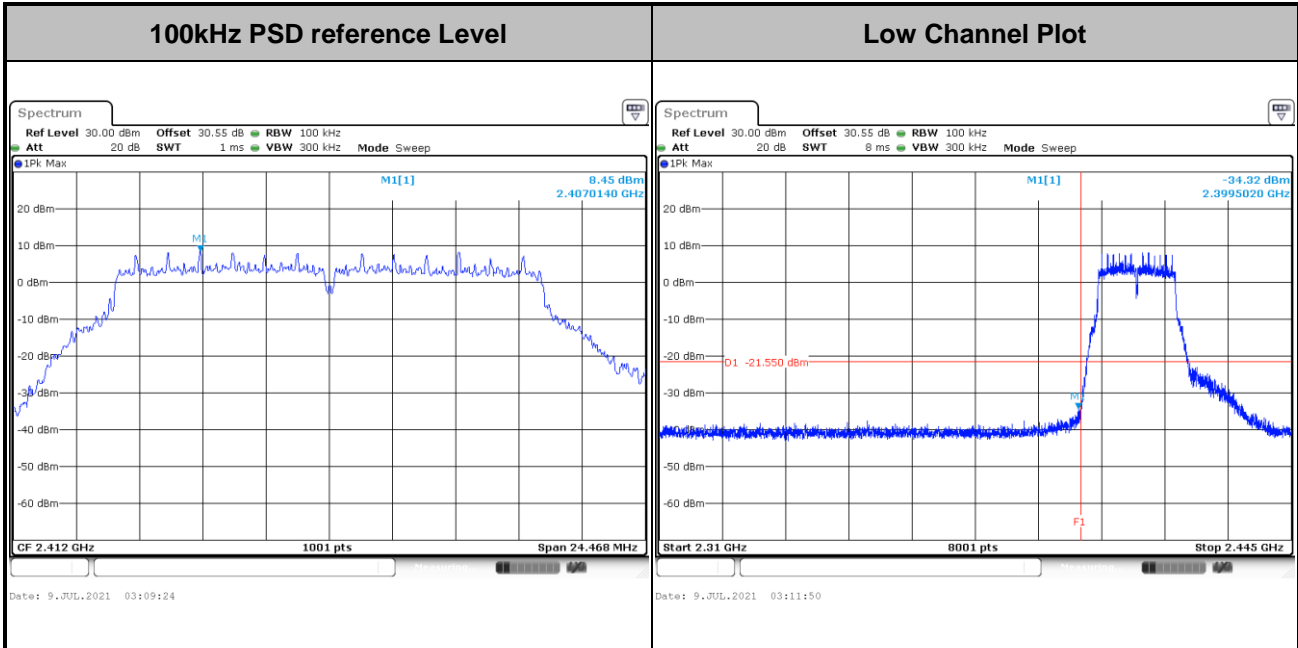


Test Mode :	802.11b	Test Channel :	13
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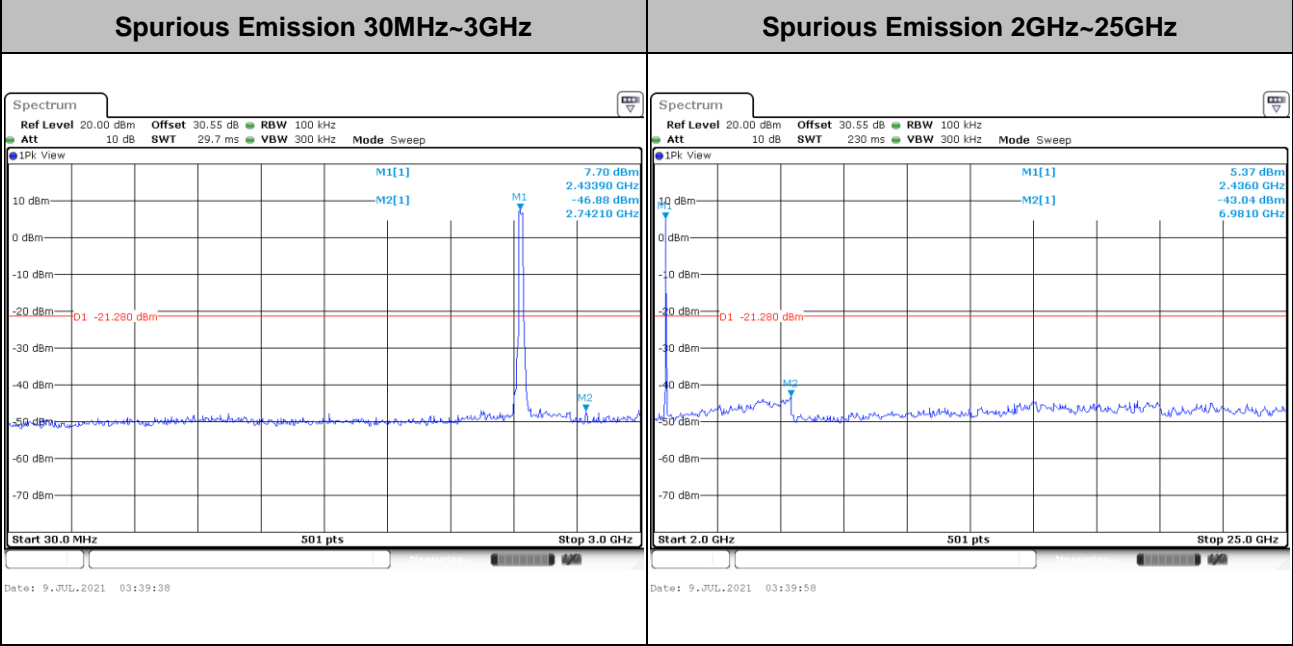
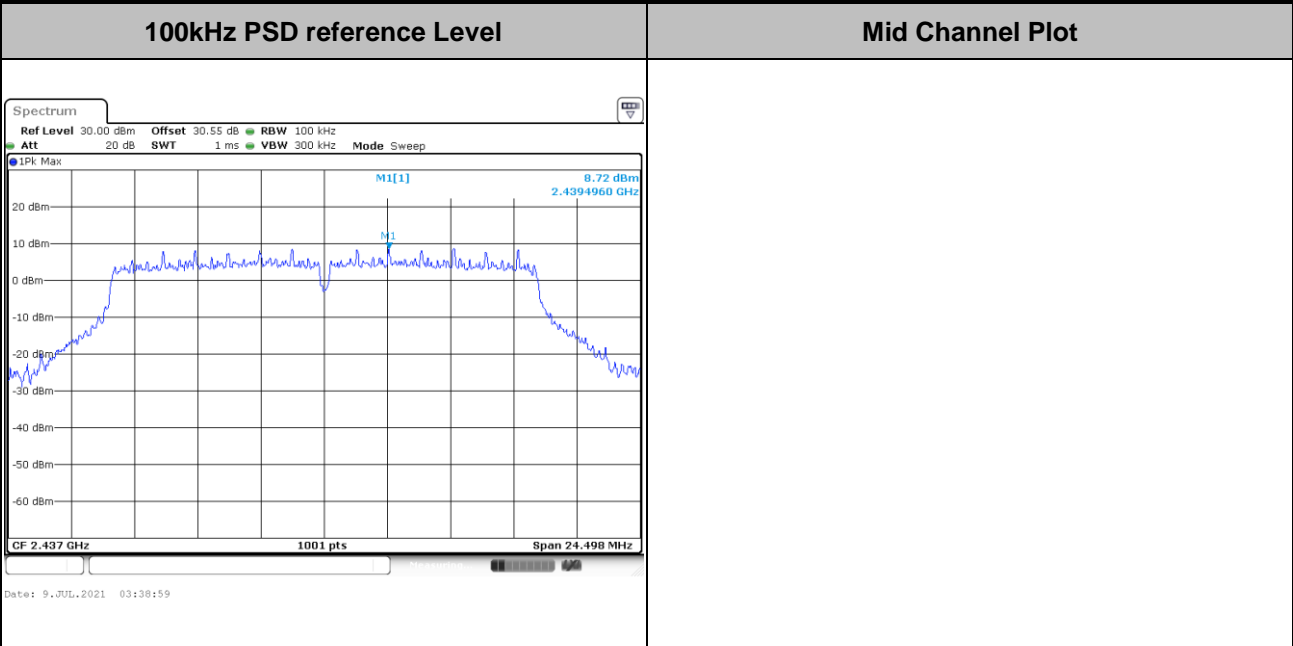


Test Mode :	802.11g	Test Channel :	01
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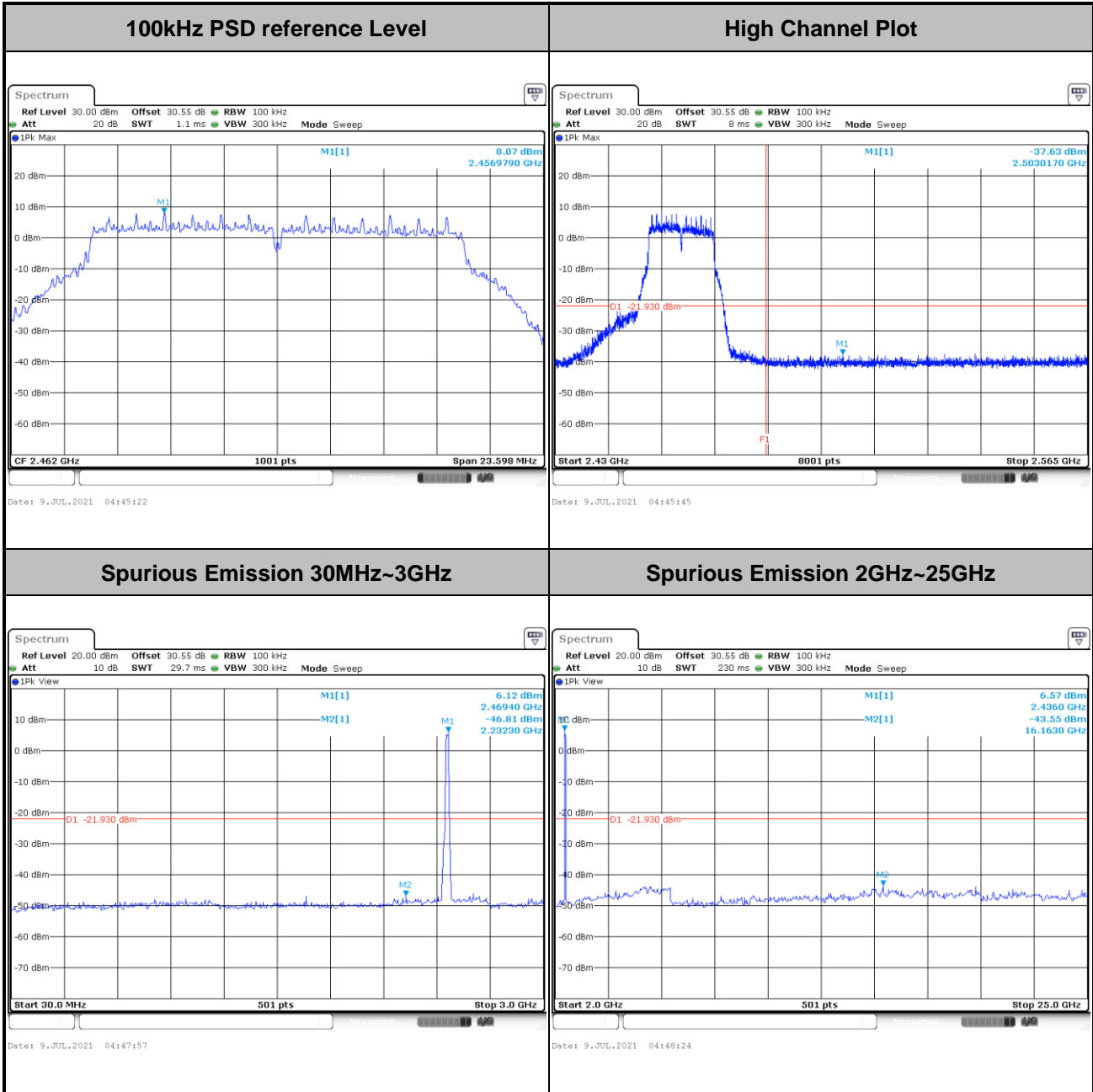
Test Mode :	802.11g	Test Channel :	06
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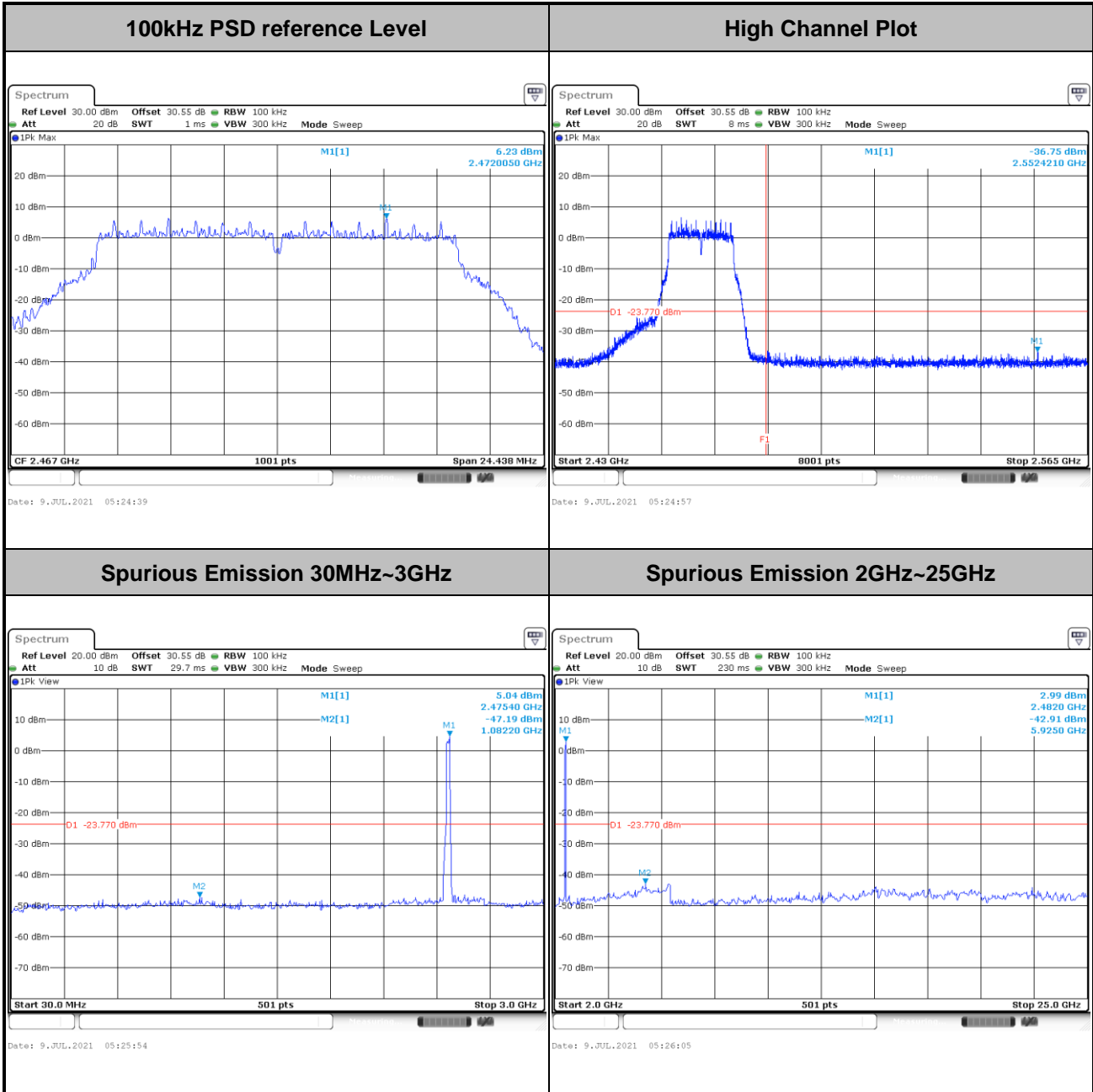


Test Mode :	802.11g	Test Channel :	11
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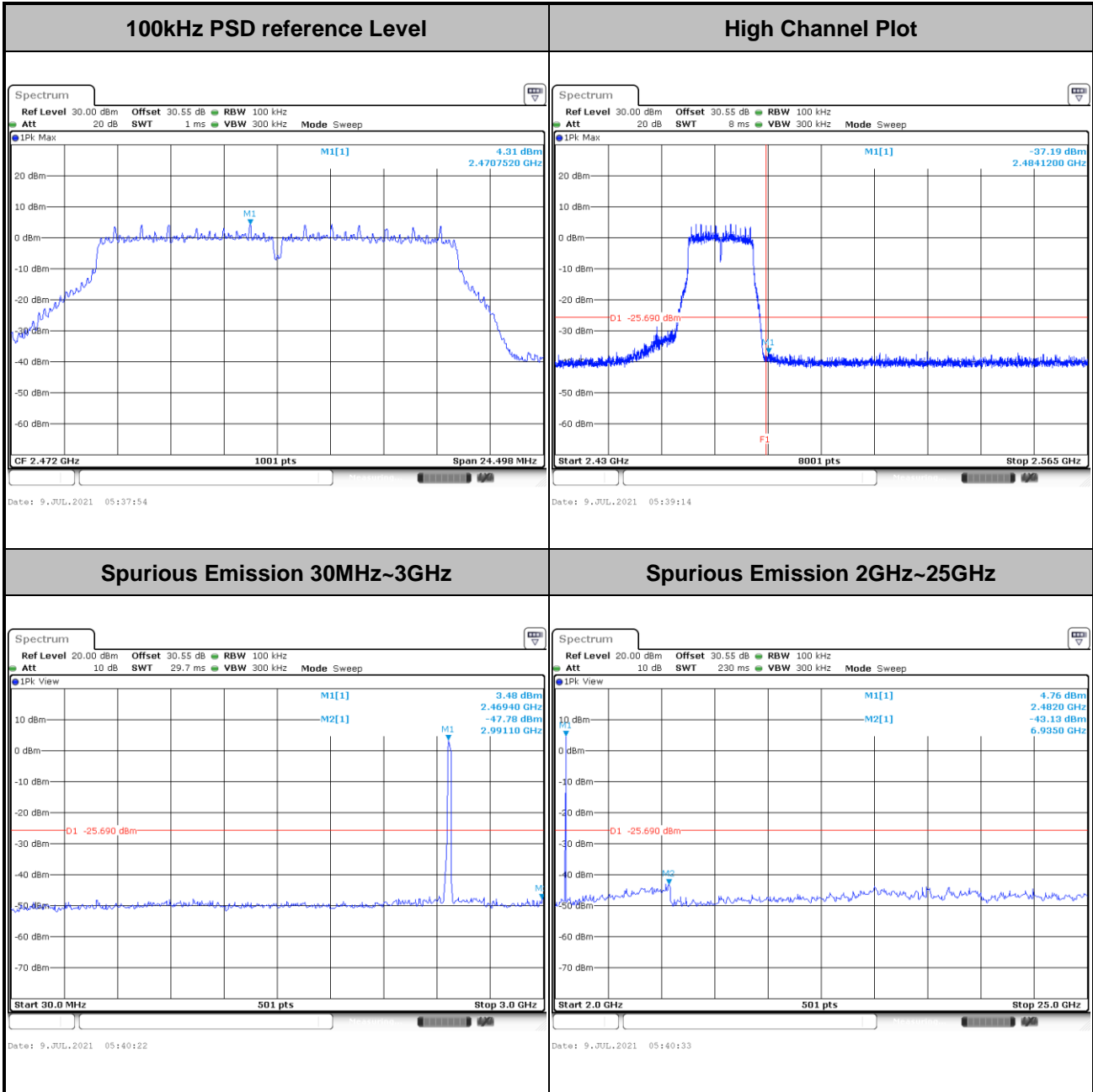


Test Mode :	802.11g	Test Channel :	12
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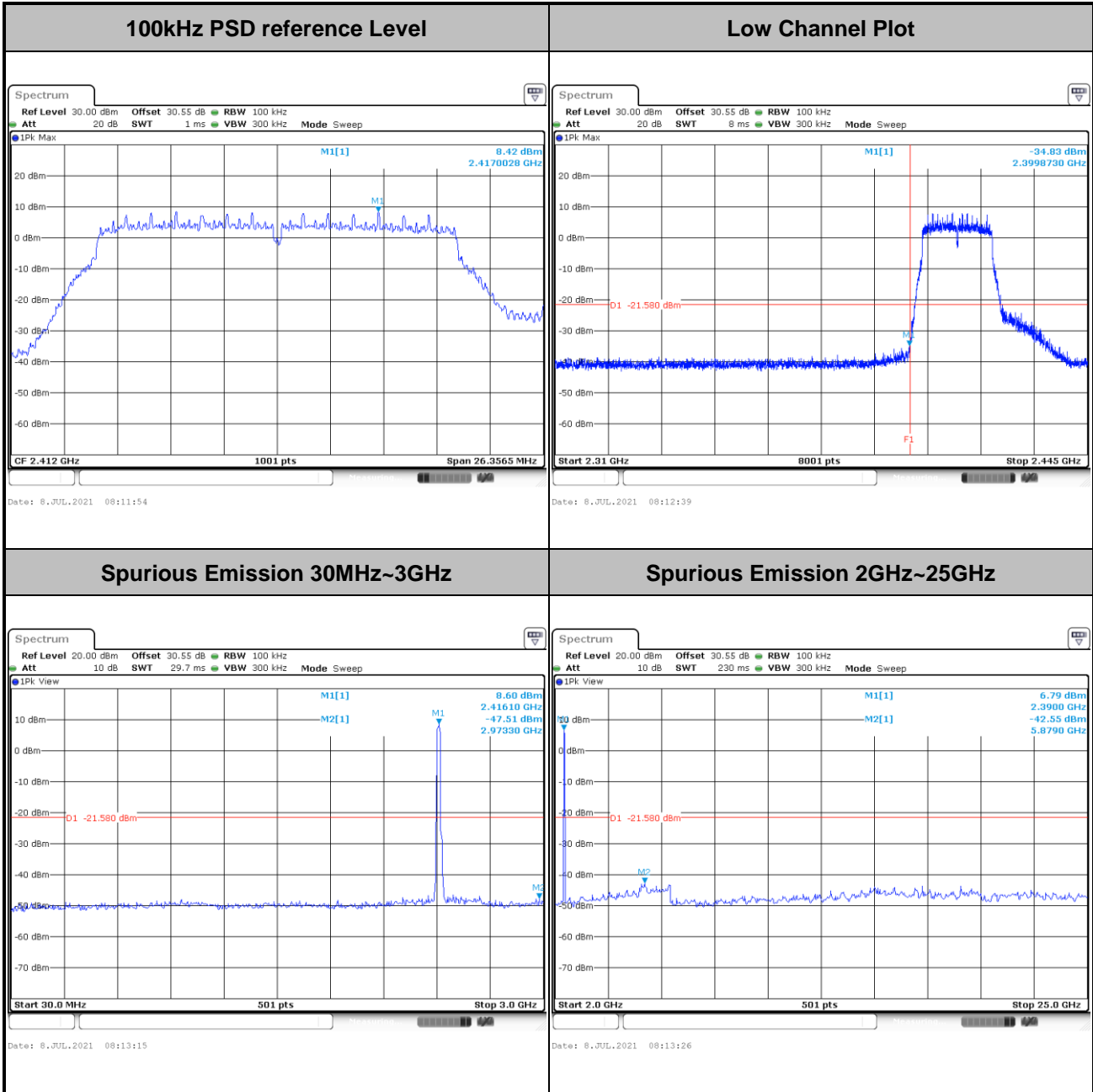


Test Mode :	802.11g	Test Channel :	13
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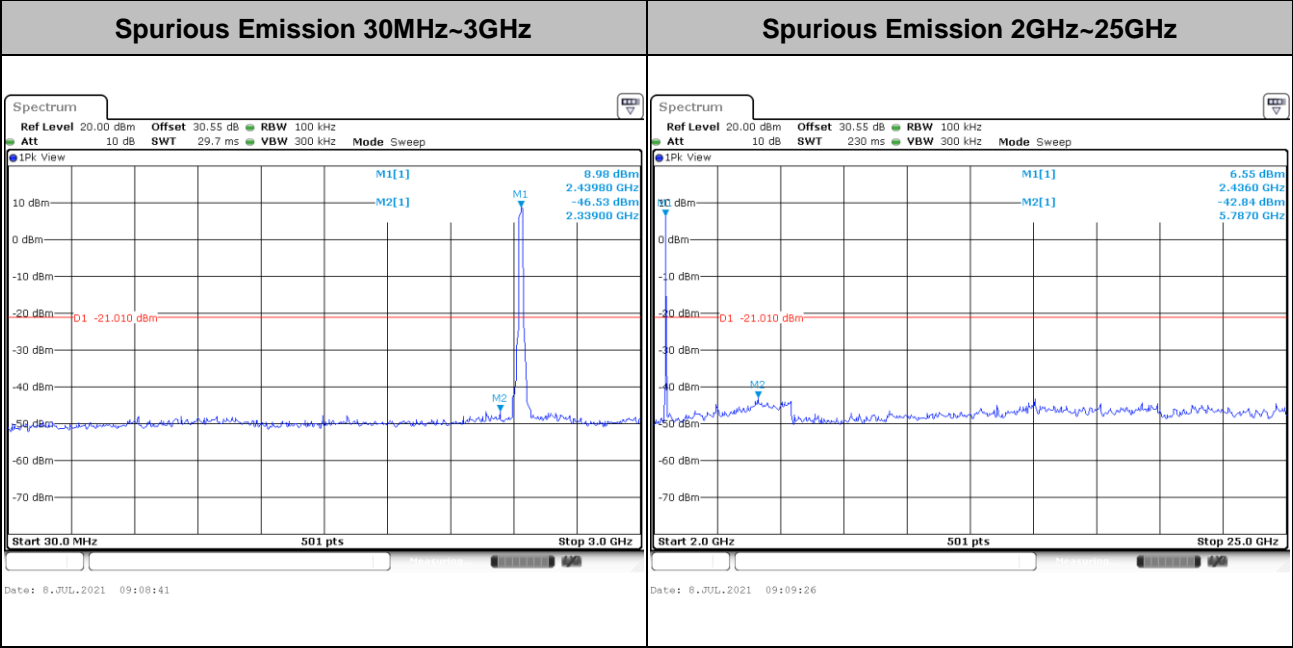
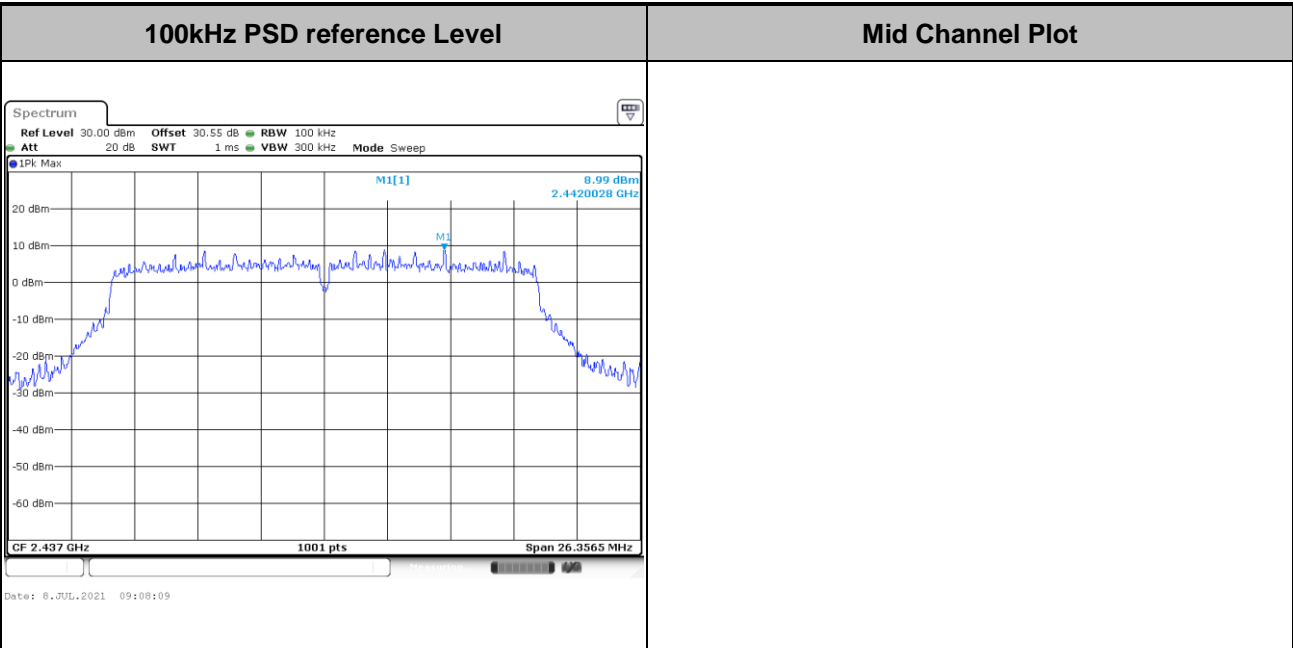


Test Mode :	802.11n HT20	Test Channel :	01
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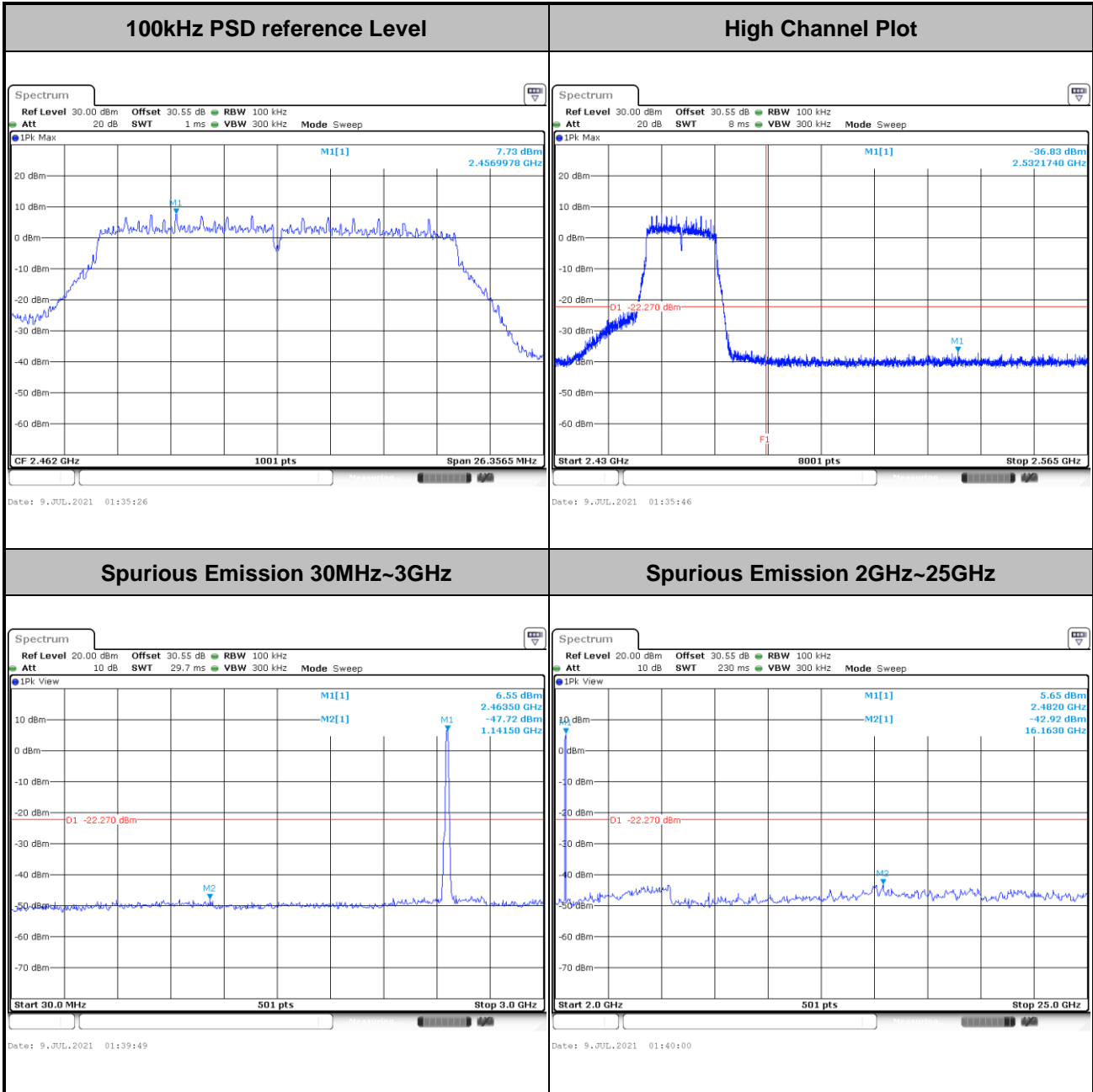


<b>Test Mode :</b>	802.11n HT20	<b>Test Channel :</b>	06
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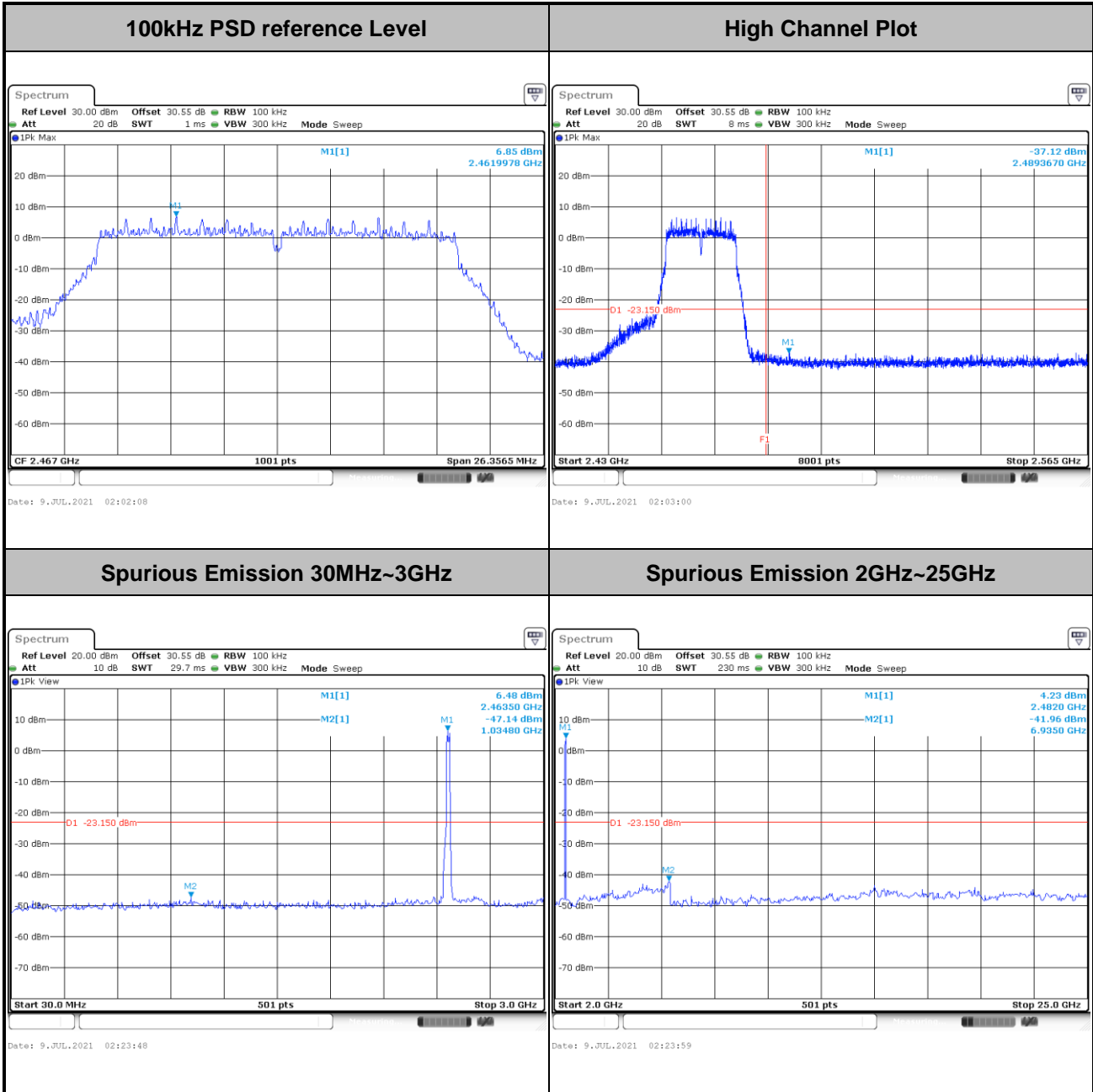


Test Mode :	802.11n HT20	Test Channel :	11
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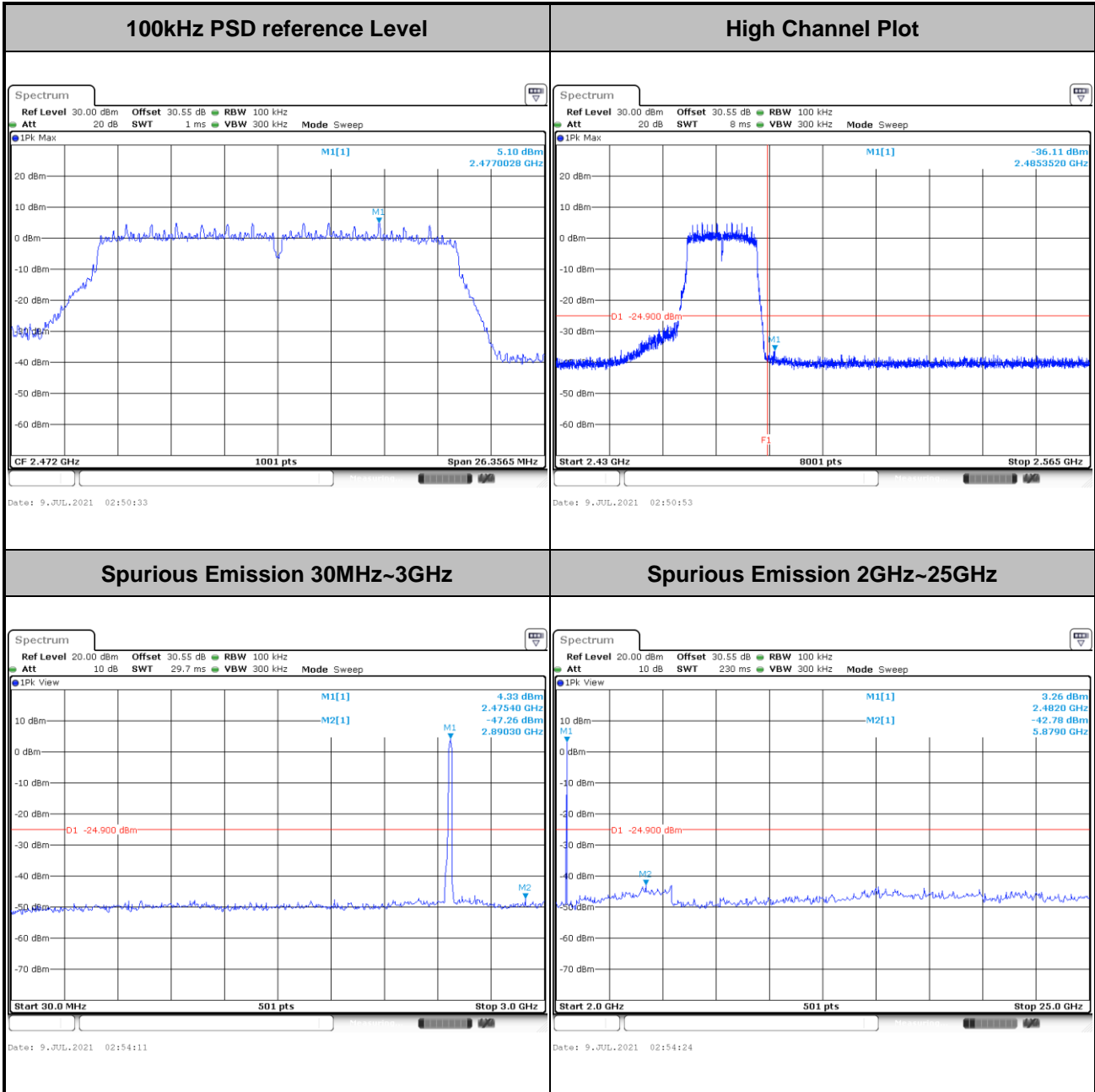


Test Mode :	802.11n HT20	Test Channel :	12
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Test Mode :	802.11n HT20	Test Channel :	13
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### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

#### 3.5.2 Measuring Instruments

See list of measuring equipment of this test report.