



# FCC RF Test Report

**APPLICANT** : Luxottica Group S.p.A.  
**EQUIPMENT** : SMART GLASSES  
**BRAND NAME** : Ray-Ban Meta or Ray-Ban  
**MODEL NAME** : RW4006, RW4008, RW4009  
**FCC ID** : 2AYOA-4003  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System  
**TEST DATE(S)** : May 15, 2023 ~ Jun. 08, 2023

We, Sporton International Inc. (Shenzhen), 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. (Shenzhen), the test report shall not be reproduced except in full.

Jason Jia



Approved by: Jason Jia

**Sporton International Inc. (ShenZhen)**

**1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055**

**People's Republic of China**



# TABLE OF CONTENTS

**REVISION HISTORY..... 3**

**SUMMARY OF TEST RESULT ..... 4**

**1 GENERAL DESCRIPTION ..... 5**

    1.1 Applicant ..... 5

    1.2 Manufacturer ..... 5

    1.3 Product Feature of Equipment Under Test..... 5

    1.4 Product Specification of Equipment Under Test..... 6

    1.5 Modification of EUT ..... 6

    1.6 Testing Location ..... 7

    1.7 Test Software..... 7

    1.8 Applicable Standards..... 7

**2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST ..... 8**

    2.1 Carrier Frequency and Channel ..... 8

    2.2 Test Mode..... 9

    2.3 Connection Diagram of Test System ..... 10

    2.4 Support Unit used in test configuration and system ..... 11

    2.5 EUT Operation Test Setup ..... 11

    2.6 Measurement Results Explanation Example..... 11

**3 TEST RESULT ..... 12**

    3.1 6dB and 99% Bandwidth Measurement ..... 12

    3.2 Output Power Measurement..... 14

    3.3 Power Spectral Density Measurement ..... 15

    3.4 Conducted Band Edges and Spurious Emission Measurement ..... 17

    3.5 Radiated Band Edges and Spurious Emission Measurement ..... 52

    3.6 AC Conducted Emission Measurement..... 56

    3.7 Antenna Requirements ..... 58

**4 LIST OF MEASURING EQUIPMENT ..... 59**

**5 MEASUREMENT UNCERTAINTY ..... 60**

**APPENDIX A. CONDUCTED TEST RESULTS**

**APPENDIX B. AC CONDUCTED EMISSION TEST RESULT**

**APPENDIX C. RADIATED SPURIOUS EMISSION**

**APPENDIX D. DUTY CYCLE PLOTS**

**APPENDIX E. SETUP PHOTOGRAPHS**



### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR272102-02C	Rev. 01	Initial issue of report	Jul. 03, 2023
FR272102-02C	Rev. 02	Update Equipment name, Brand name and address of Applicant & Manufacturer	Jul. 26, 2023



### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 30dBc	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 2.09 dB at 2483.510 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 19.60 dB at 0.21 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

**Conformity Assessment Condition:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
- The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

**Disclaimer:**

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



# 1 General Description

## 1.1 Applicant

Luxottica Group S.p.A.  
Piazzale Cadorna 3 20123 Milan, Italy

## 1.2 Manufacturer

Luxottica Group S.p.A.  
Piazzale Cadorna 3 20123 Milan, Italy

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	SMART GLASSES
Brand Name	Ray-Ban Meta or Ray-Ban
Model Name	RW4006, RW4008, RW4009
FCC ID	2AYOA-4003
SN Code	Conducted: 2q37b1wf3j003b Conduction: 2Q37B1WF3J006G Radiation: 2Q37B1WF3J00BF
HW Version	EVT2
SW Version	12/SQ3A. 220605. 009. A1/49757590052300100:userdebug/test-keys
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.
- There are three types of EUT. The manufacturer declares that all the equipment and models share the same radio characteristics and Software/Firmware, the only differences between each of them are color of frames, lenses, and sizes which certainly do not affect the test results. Therefore, the test is mainly performed on the sample 1 as a representative for the others.

Sample	Model Name
Sample 1	RW4006
Sample 2	RW4008
Sample 3	RW4009

- This device supports four power states, as below,

Power State	Exposure Condition
A	Face-Worn
	Rest-on-Head
B	Rest-on- Shirt
	Pocketing



C	Pocketing/handheld(in Charging Case)
D	Free Space/Off Body

State C is higher conducted power has assessed to test.

### 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
<b>Tx/Rx Channel Frequency Range</b>	2412 MHz ~ 2472 MHz
<b>Maximum Output Power to antenna</b>	802.11b : 17.60 dBm (0.0575 W) 802.11g : 17.40 dBm (0.0550 W) 802.11n HT20 : 17.50 dBm (0.0562 W) 802.11n HT40 : 13.30 dBm (0.0214 W) 802.11ac VHT20 : 17.40 dBm (0.0550 W) 802.11ac VHT40 : 13.20 dBm (0.0209 W) 802.11ax HE20 : 17.60 dBm (0.0575 W) 802.11ax HE40 : 13.40 dBm (0.0219 W)
<b>99% Occupied Bandwidth</b>	802.11b : 13.34MHz 802.11g : 17.28MHz 802.11ax HE20 : 19.23MHz 802.11ax HE40 : 38.46MHz
<b>Antenna Type / Gain</b>	Inverted-F and folded monopole Antenna with gain -0.40 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: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)

**Note:**

1. For 802.11n HT20 / ac VHT20 / ax HE20 and 802.11n HT40 / ac VHT40 / ax HE40 mode, the whole testing have assessed 802.11ax HE20/HE40 by referring to their maximum output power.
2. 802.11ax support OFDMA full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH) test output power, the full RU power > partial RU, therefore the full RU perform full test to cover partial RU except for PSD/CSE/BE/RSE.

### 1.5 Modification of EUT

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



### 1.6 Testing Location

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

<b>Test Firm</b>	Sporton International Inc. (Shenzhen)		
<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 TEL: +86-755-86379589 FAX: +86-755-86379595		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	CO01-SZ TH01-SZ	CN1256	421272

<b>Test Firm</b>	Sporton International Inc. (Shenzhen)		
<b>Test Site 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 TEL: +86-755-33202398		
<b>Test Site No.</b>	<b>Sporton 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	Manufacturer	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 (Z 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. (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

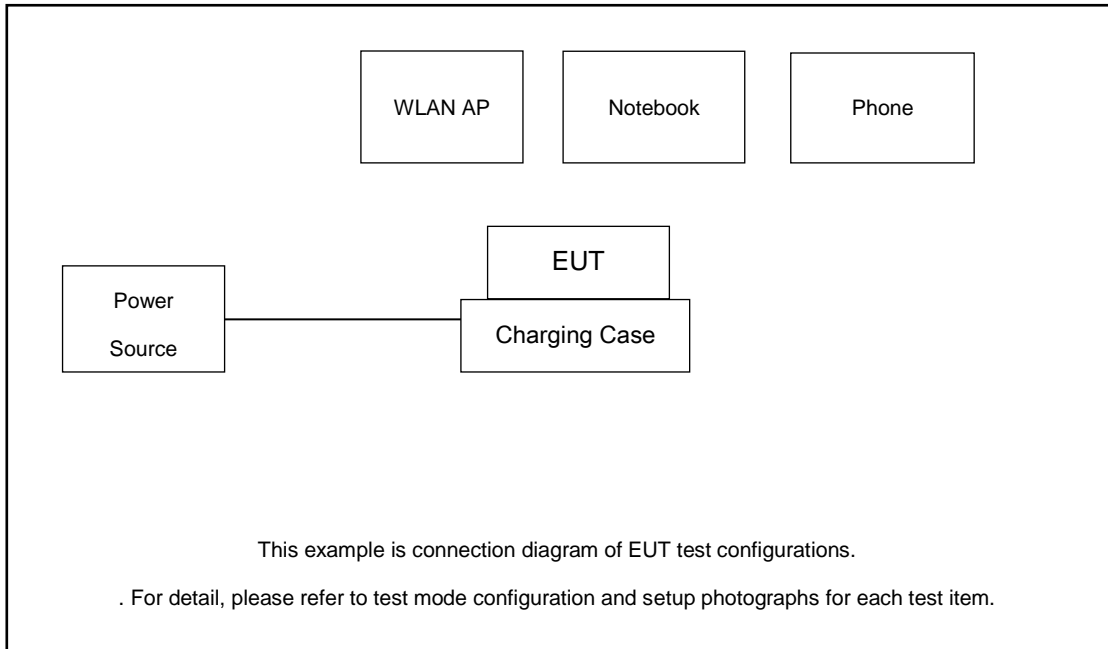
Final test modes are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11ax HE20	MCS0
802.11ax HE40	MCS0

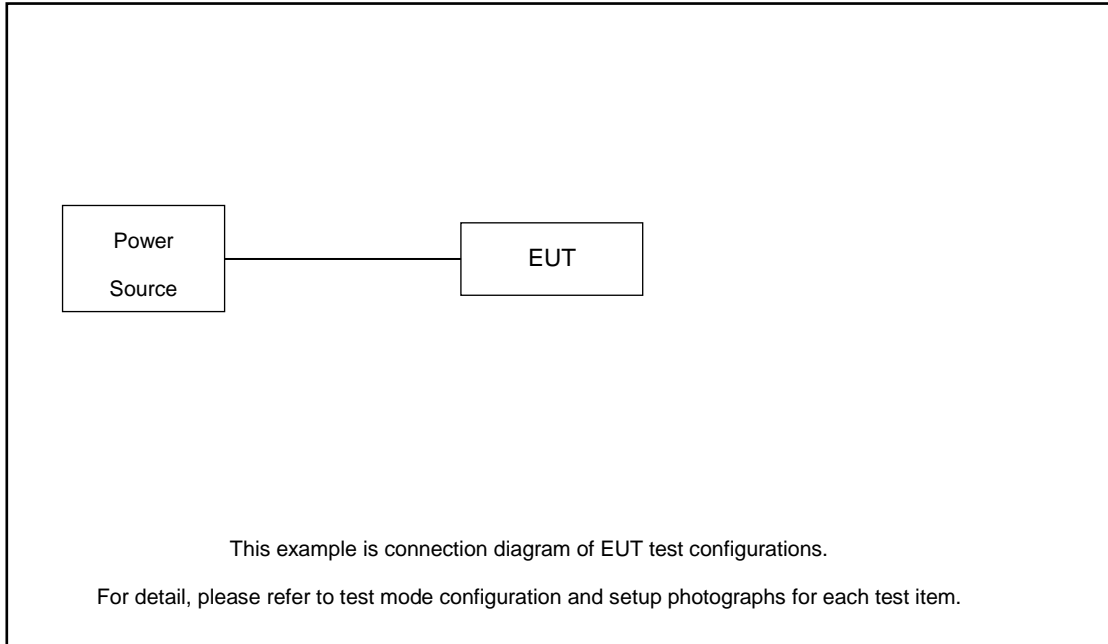
Test Cases	
<b>AC Conducted Emission</b>	Mode 1 :Bluetooth Link + WLAN Link (2.4G) + USB Cable (Type C) + Adapter
<b>Remark:</b> For Radiated Test Cases, The tests were performance with Power Source.	

## 2.3 Connection Diagram of Test System

AC Conducted Emission:



Radiated Emission:



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	N/A
2.	Notebook	DELL	Latitude3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Phone	Oneplus	NA	NA	NA	N/A
4.	Adapter	N/A	N/A	N/A	N/A	N/A
5.	USB Cable	N/A	N/A	N/A	N/A	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.

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 1.60 dB and 20dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 1.60 + 20 = 21.60 \text{ (dB)} \end{aligned}$$

### 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

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) = 1%~5% of OBW and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

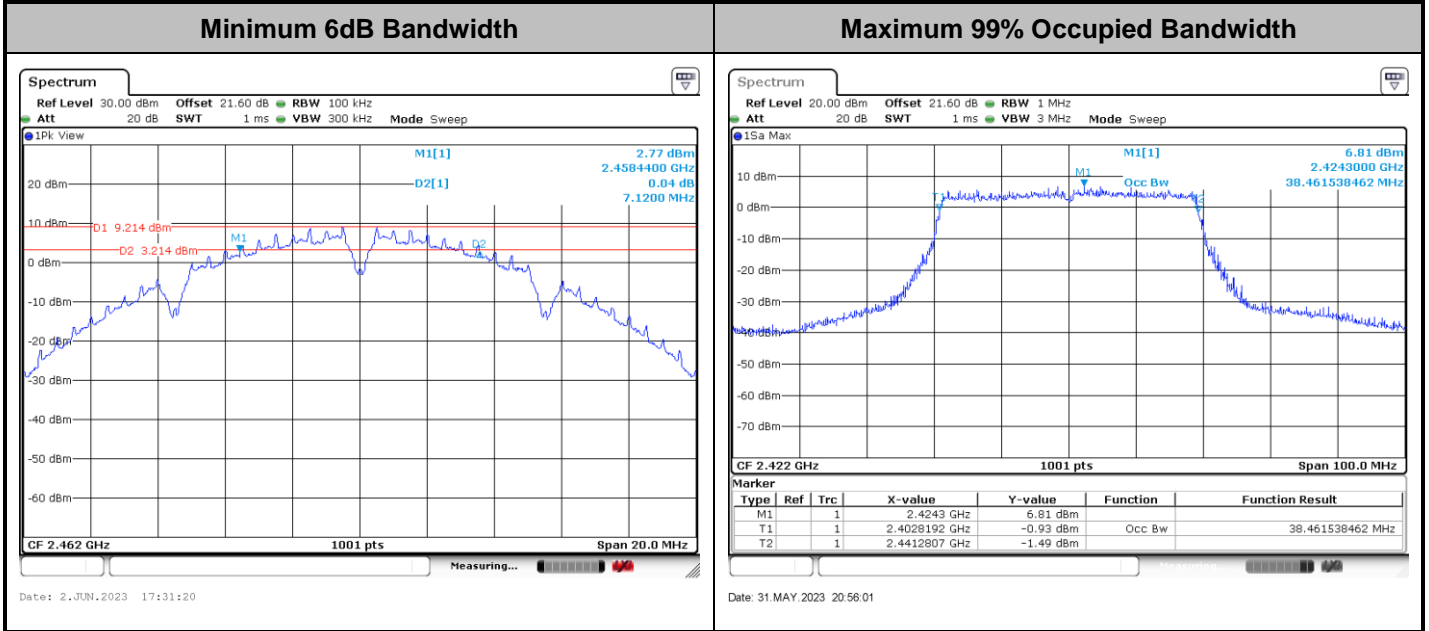
##### 3.1.4 Test Setup





### 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 output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the 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.

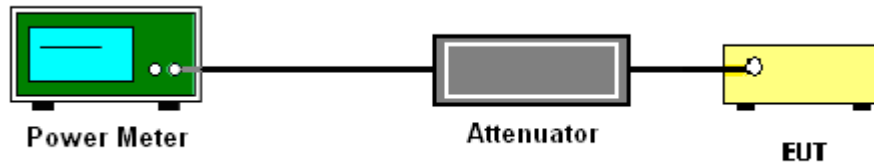
### 3.2.2 Measuring Instruments

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

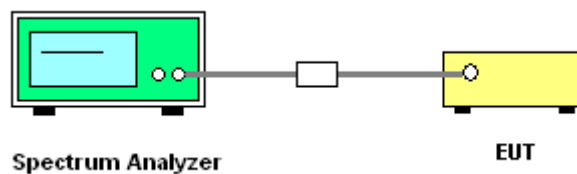
#### 3.3.2 Measuring Instruments

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.

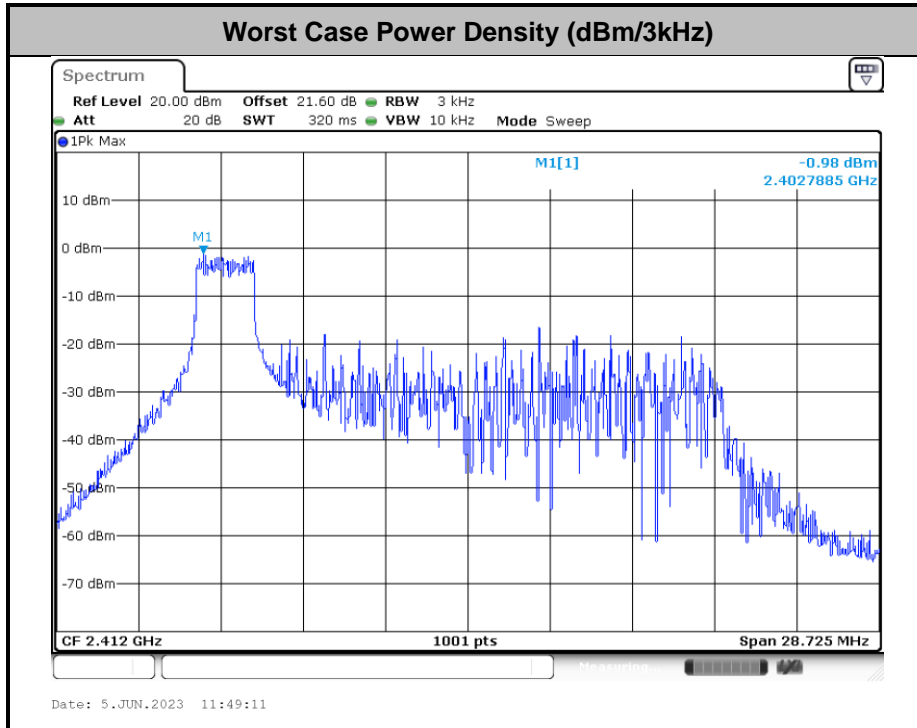
#### 3.3.4 Test Setup





### 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 11.11
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

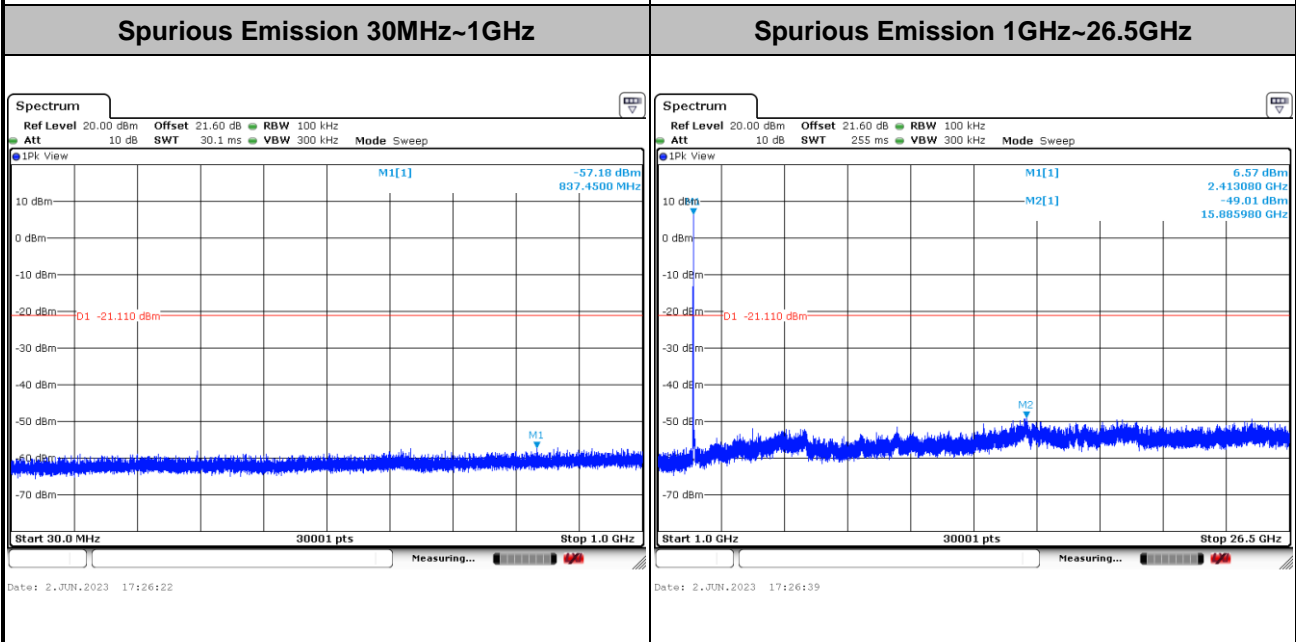
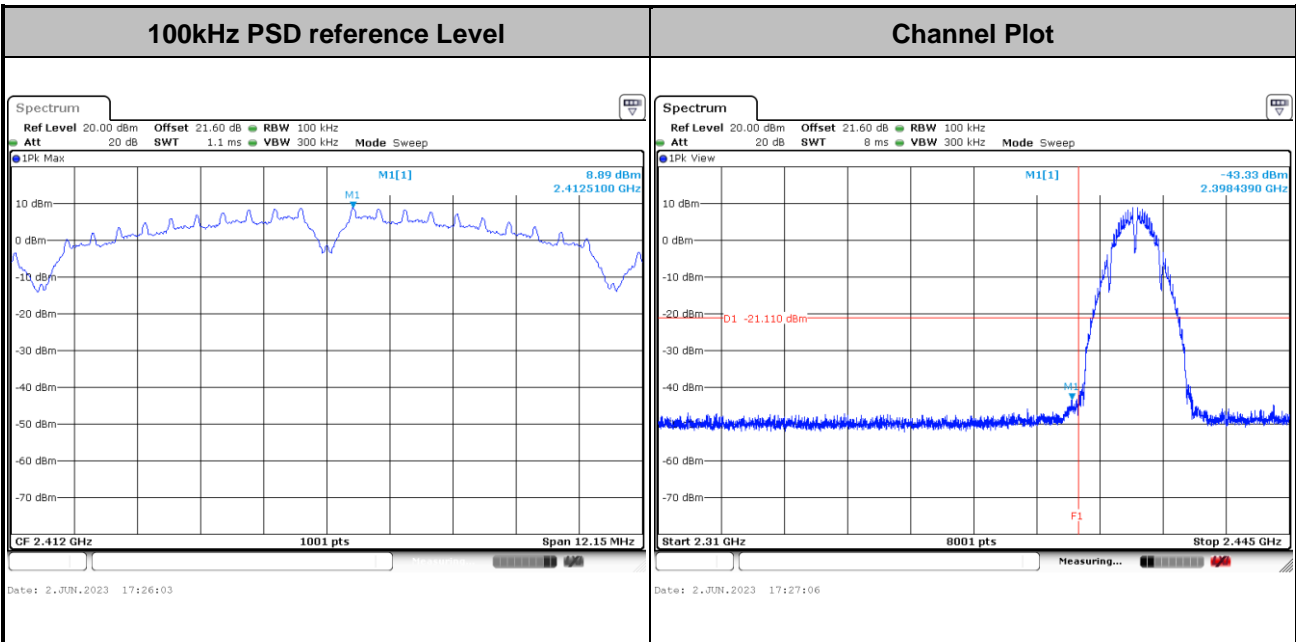




### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

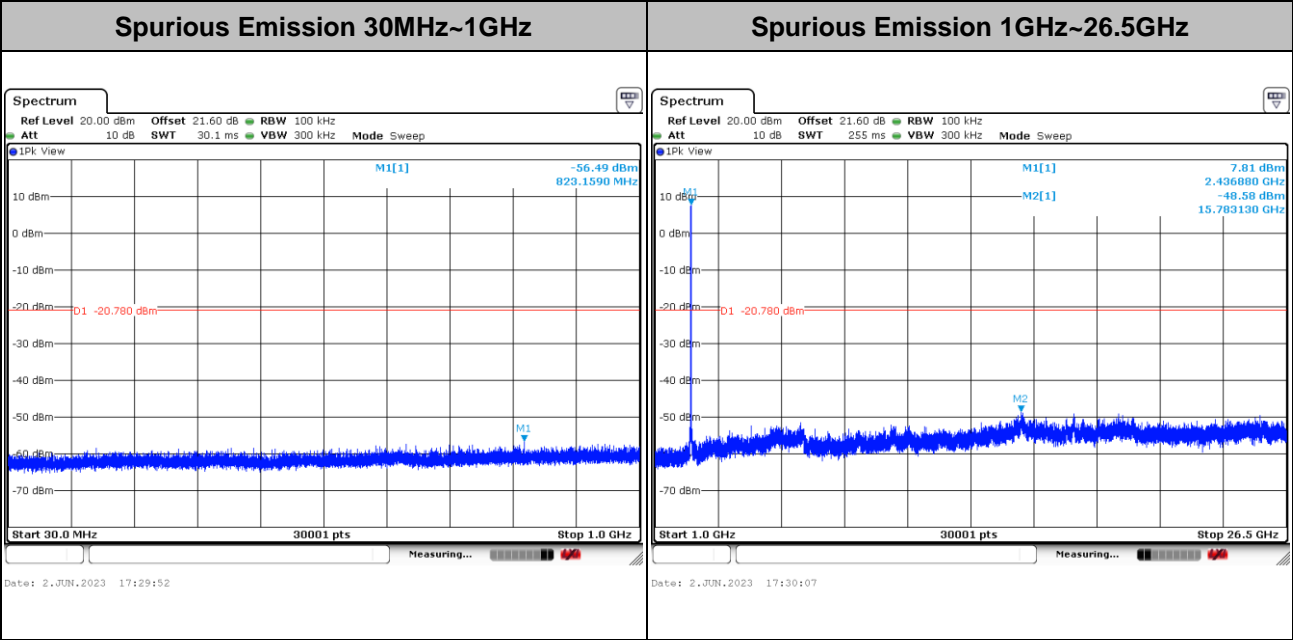
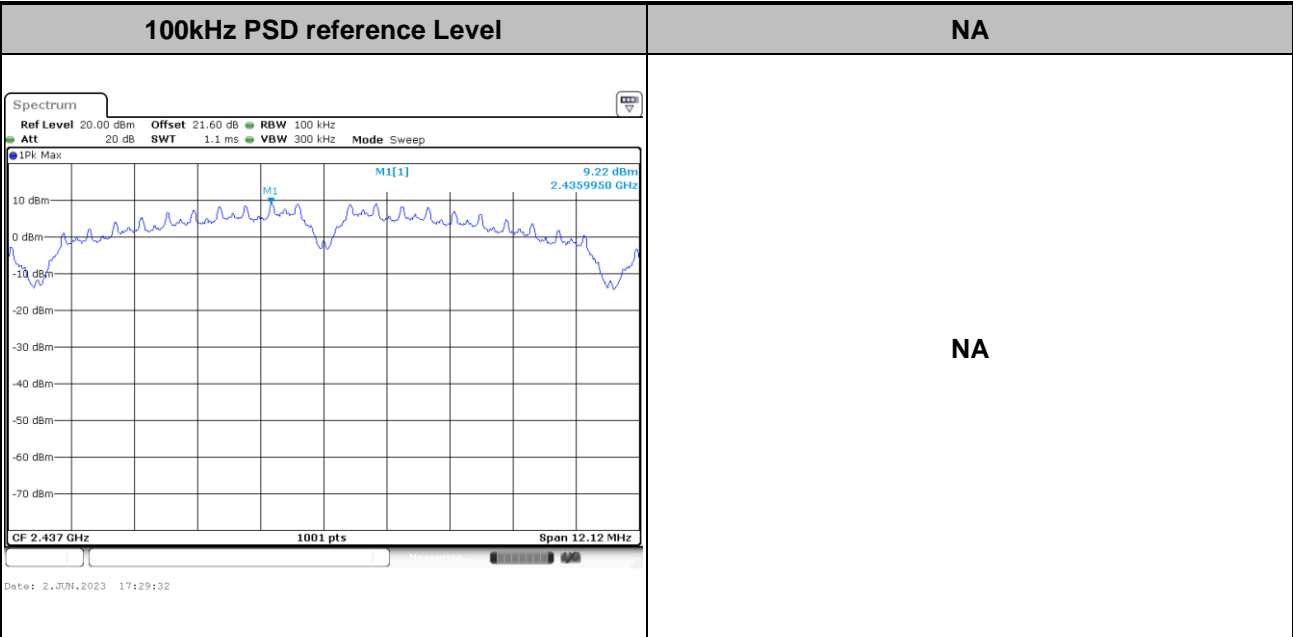
Test Engineer : Chen Ran	Temperature : 24~26°C
	Relative Humidity : 50~53%

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



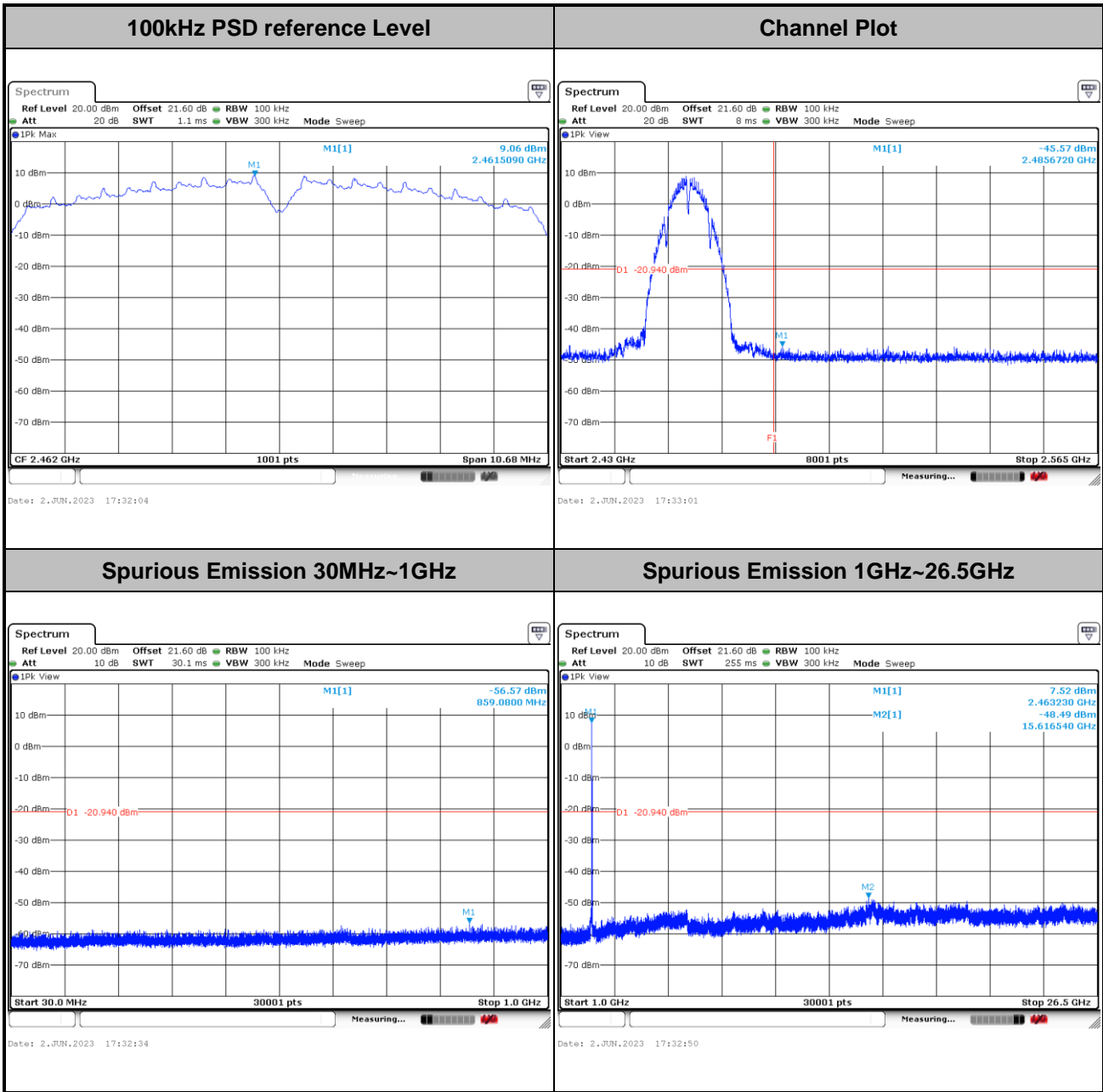


Test Mode :	802.11b	Test Channel :	06
-------------	---------	----------------	----



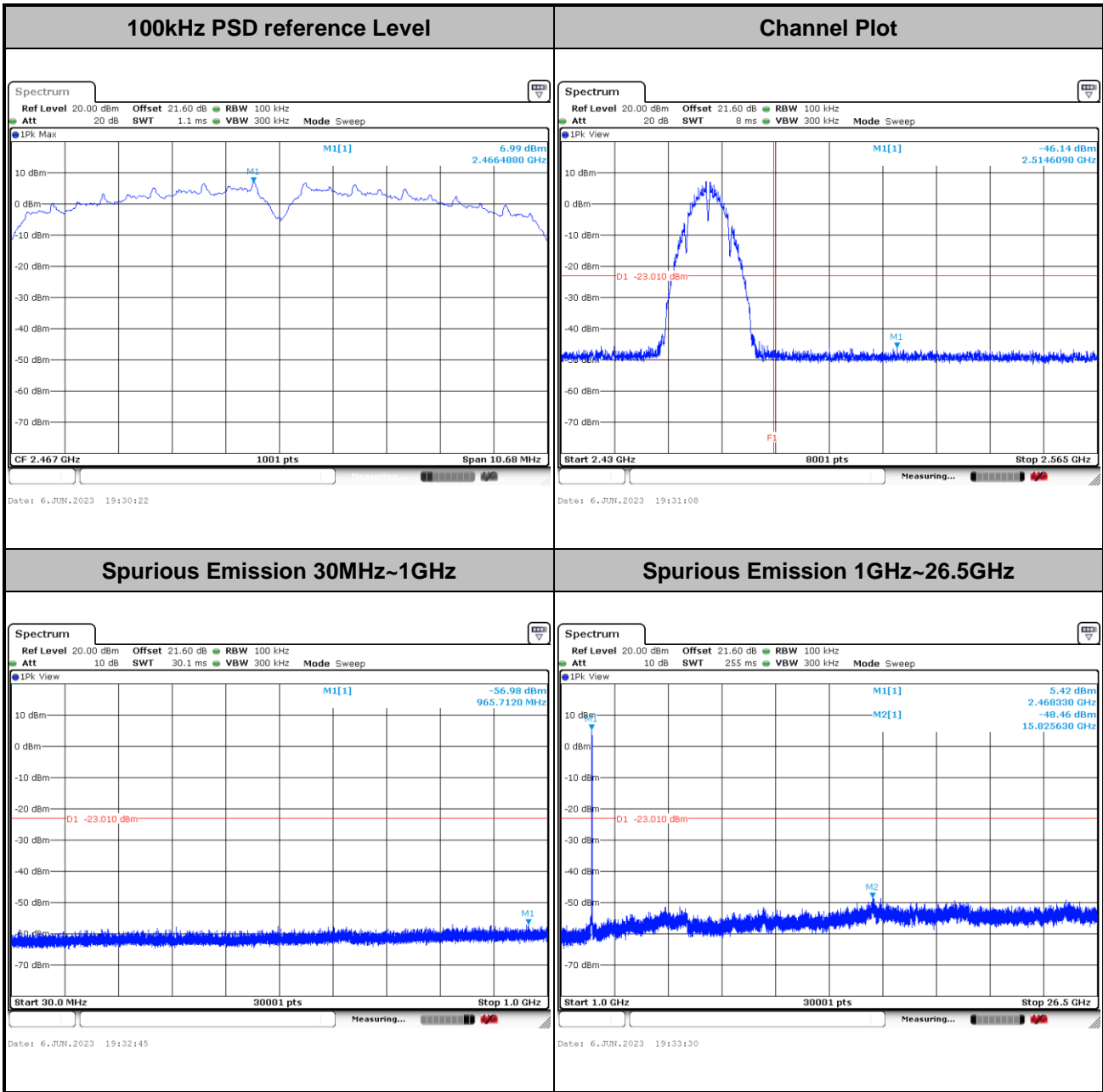


Test Mode :	802.11b	Test Channel :	11
-------------	---------	----------------	----



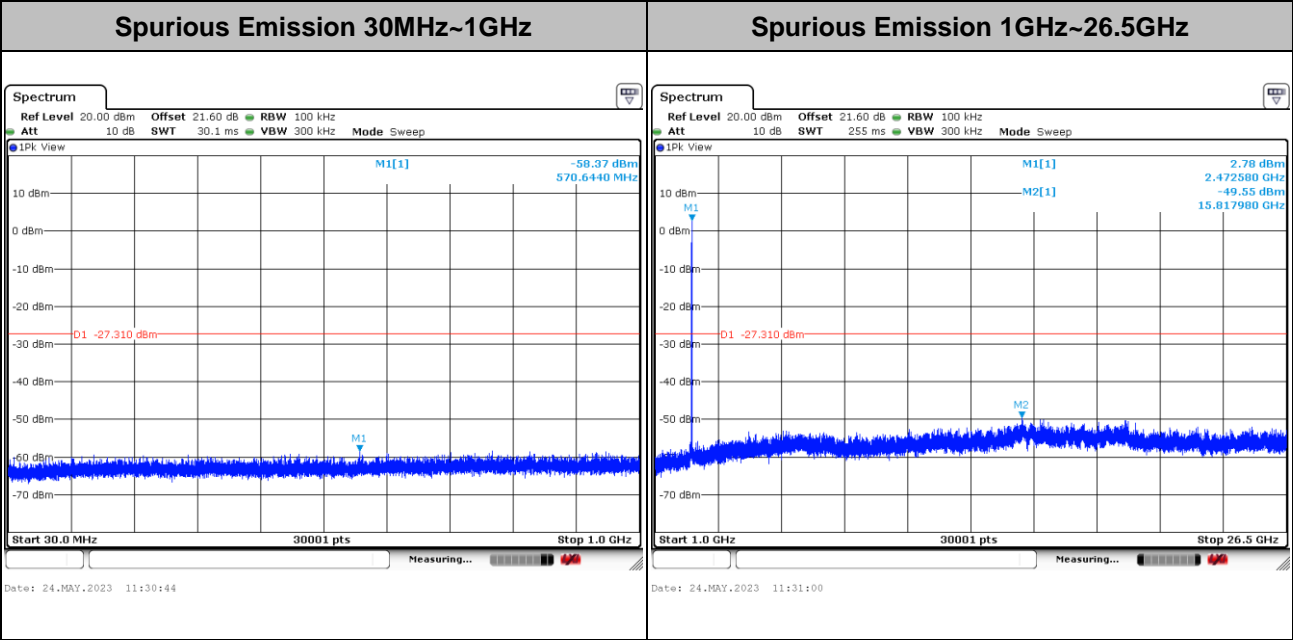
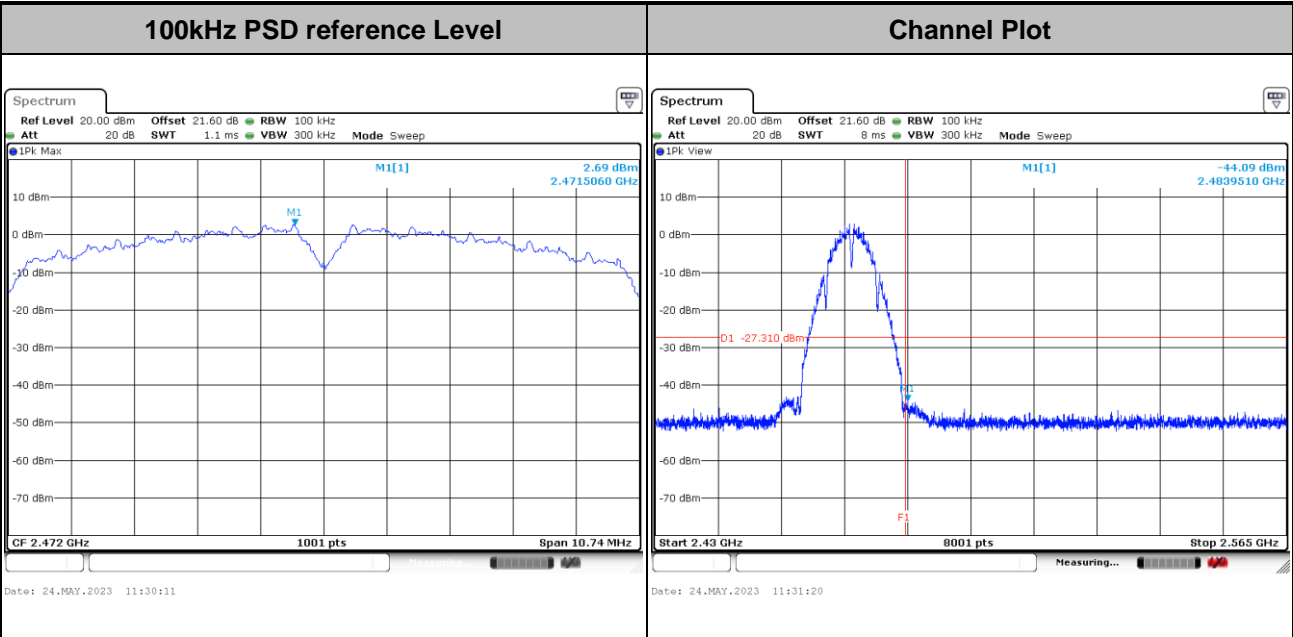


Test Mode :	802.11b	Test Channel :	12
-------------	---------	----------------	----



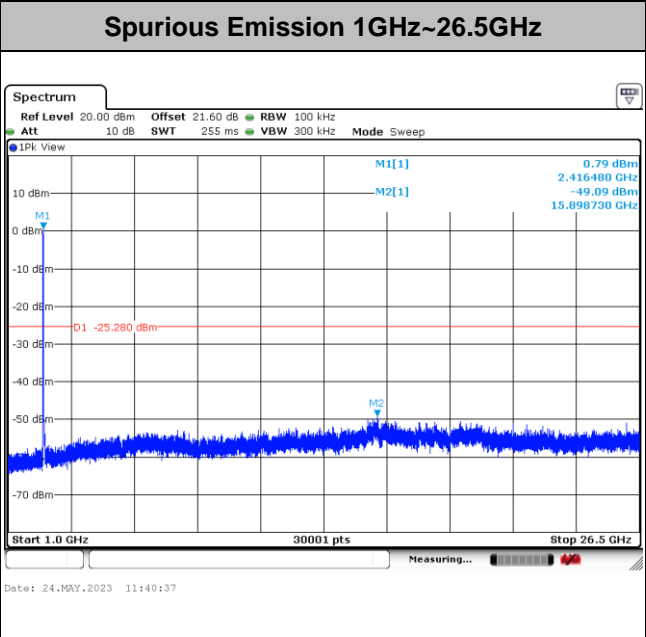
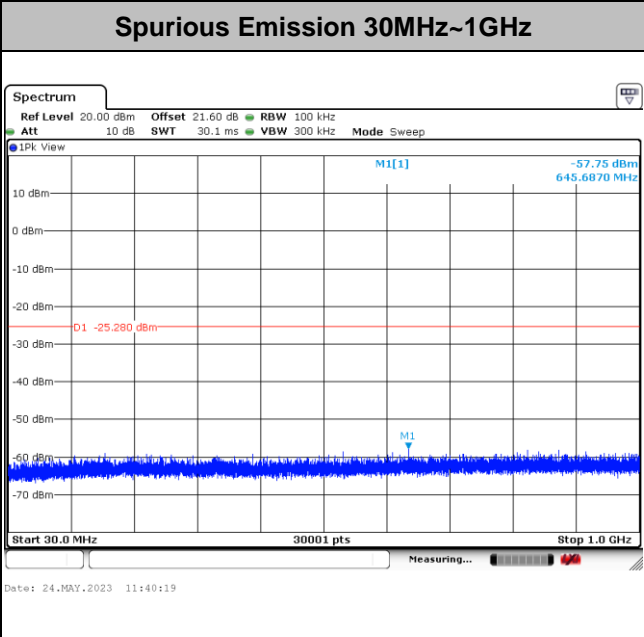
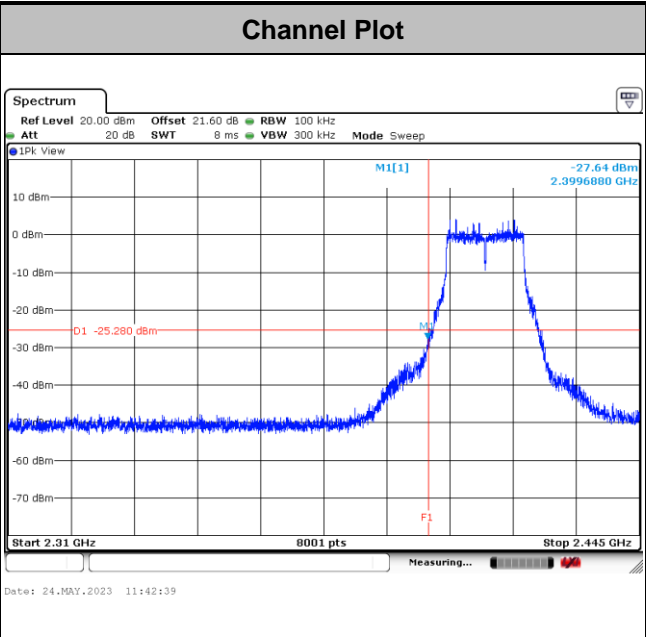
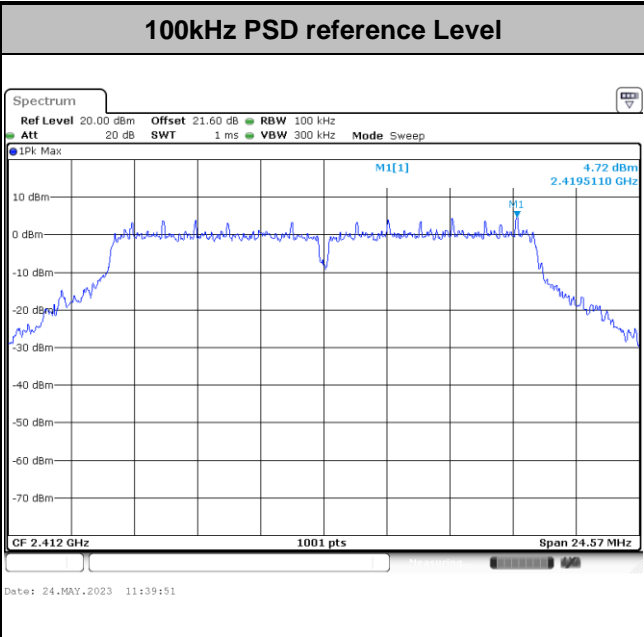


Test Mode :	802.11b	Test Channel :	13
-------------	---------	----------------	----



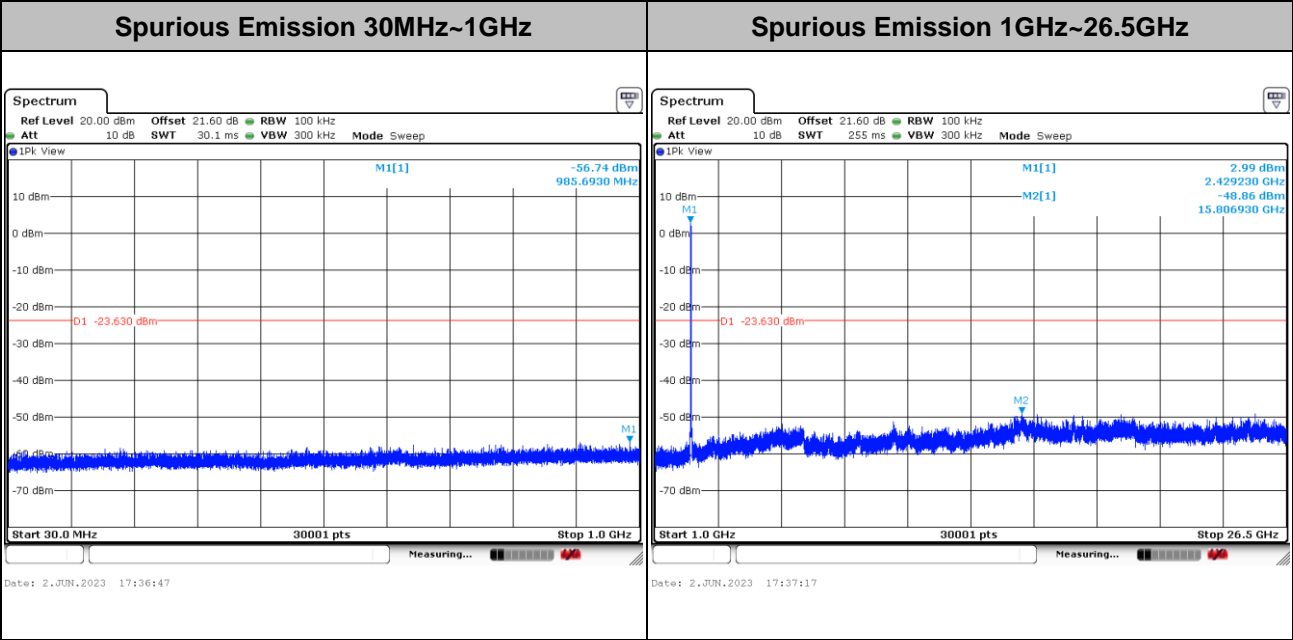
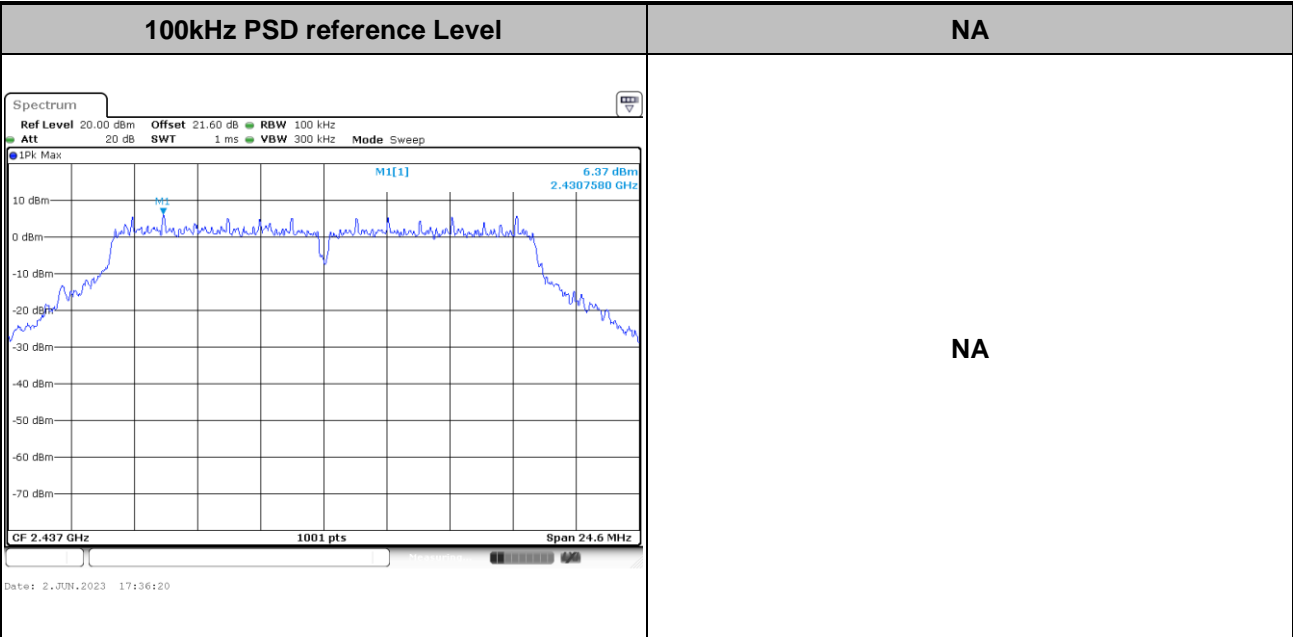


Test Mode : 802.11g Test Channel : 01





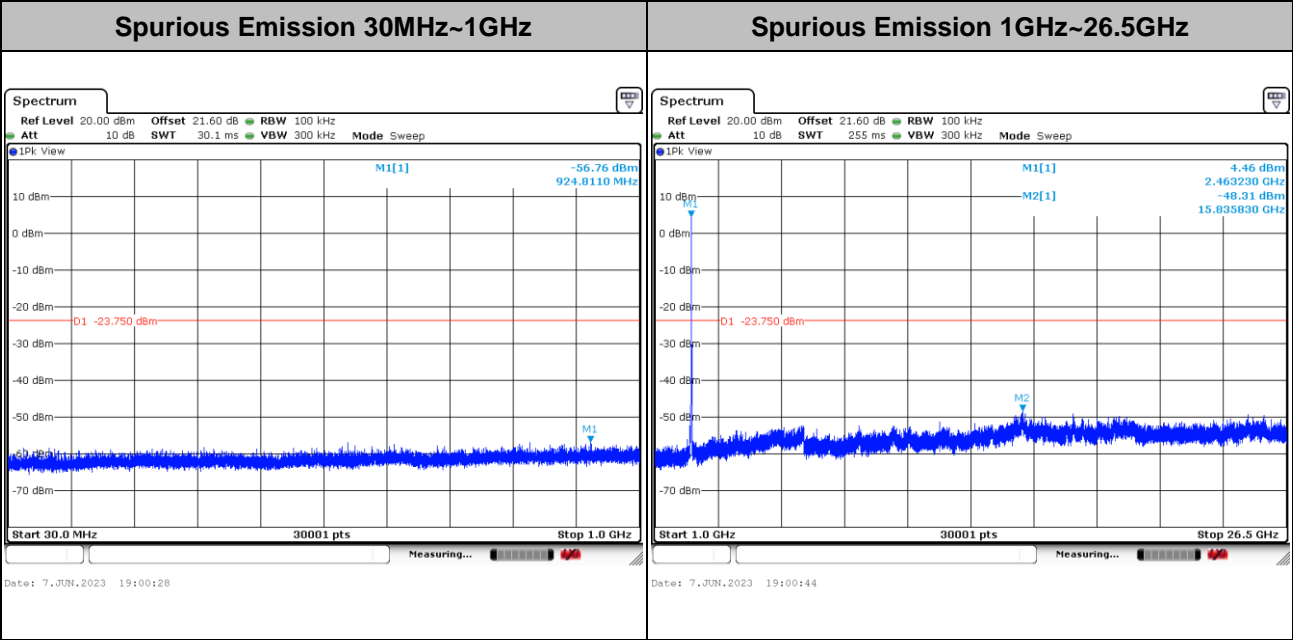
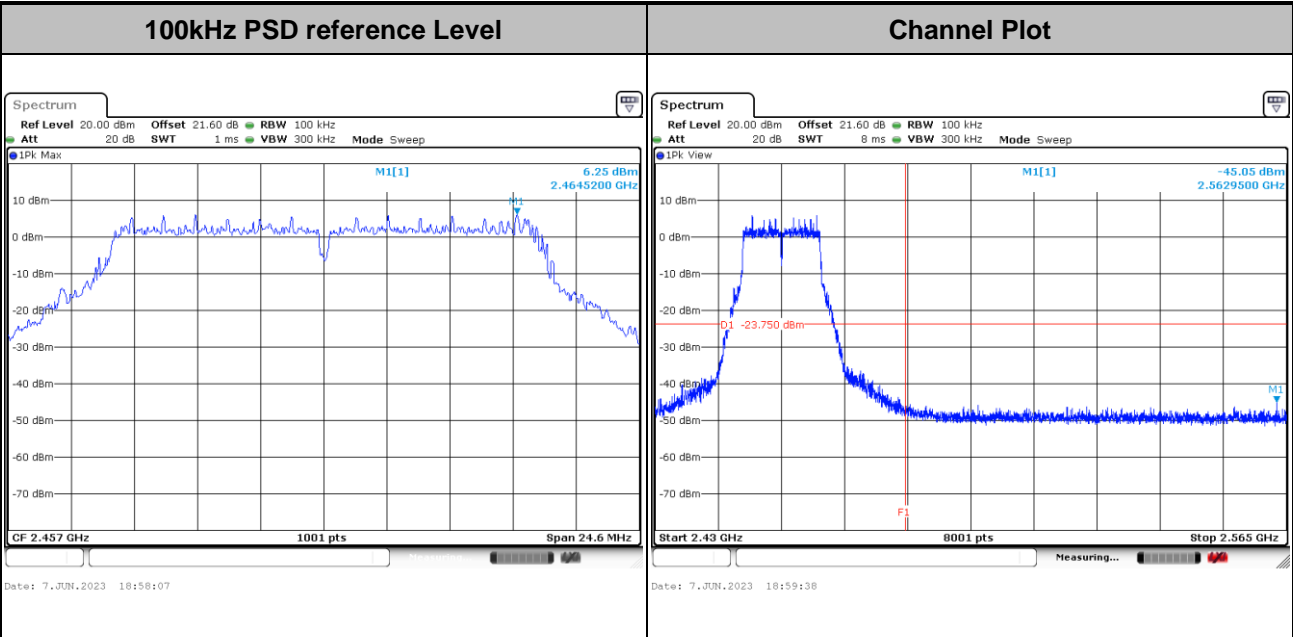
Test Mode :	802.11g	Test Channel :	06
-------------	---------	----------------	----





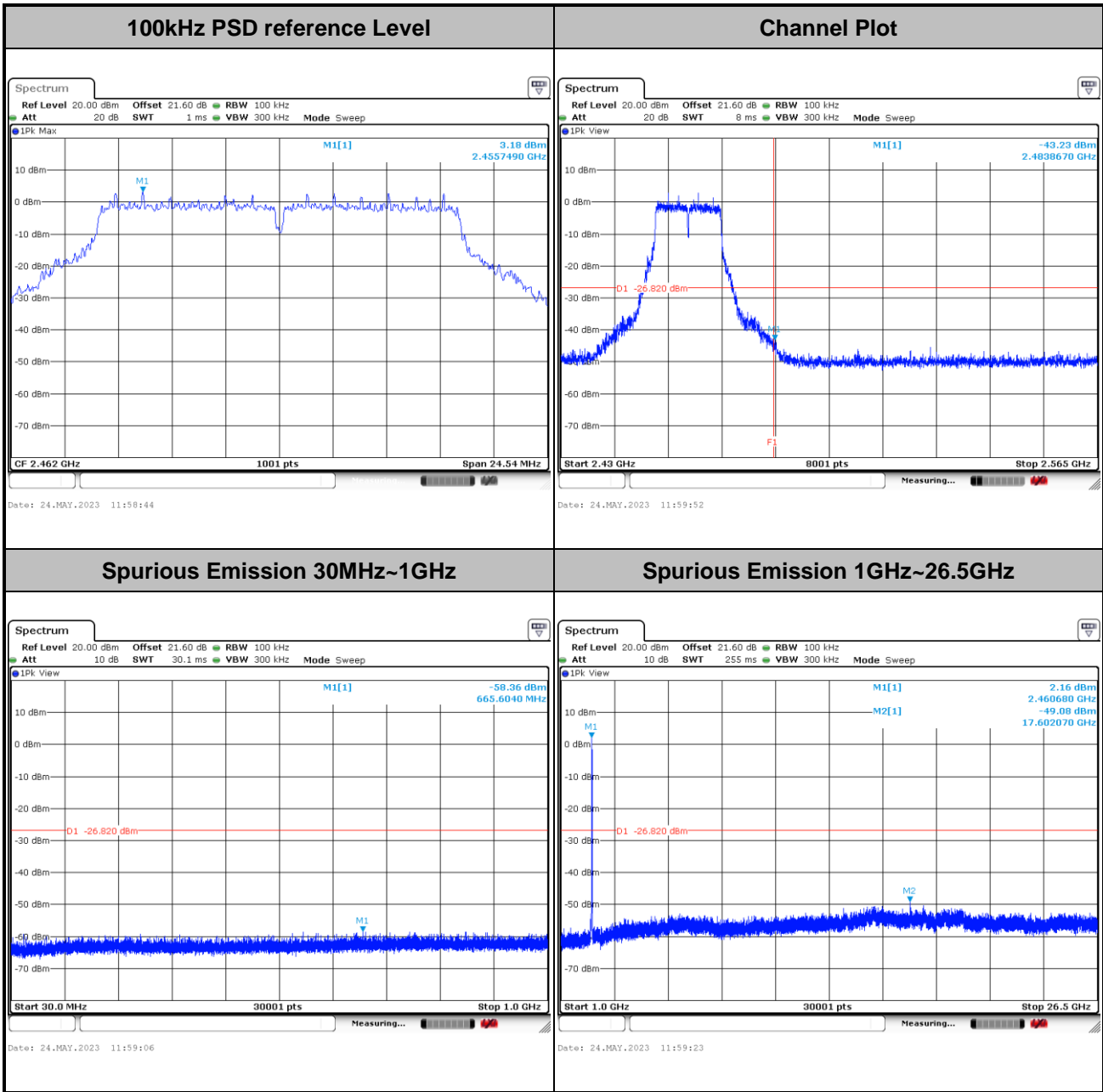


Test Mode : 802.11g Test Channel : 10



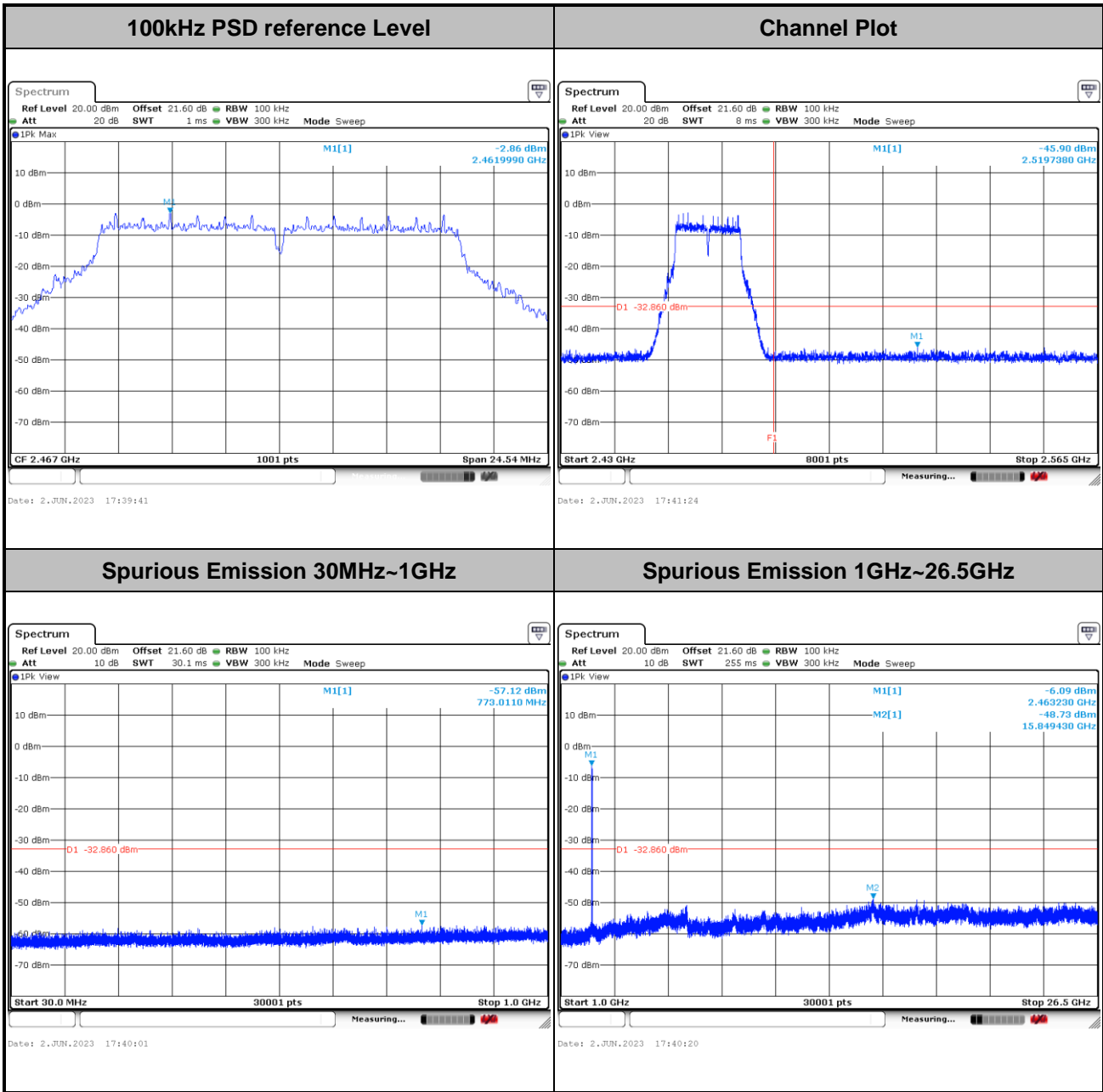


Test Mode :	802.11g	Test Channel :	11
-------------	---------	----------------	----



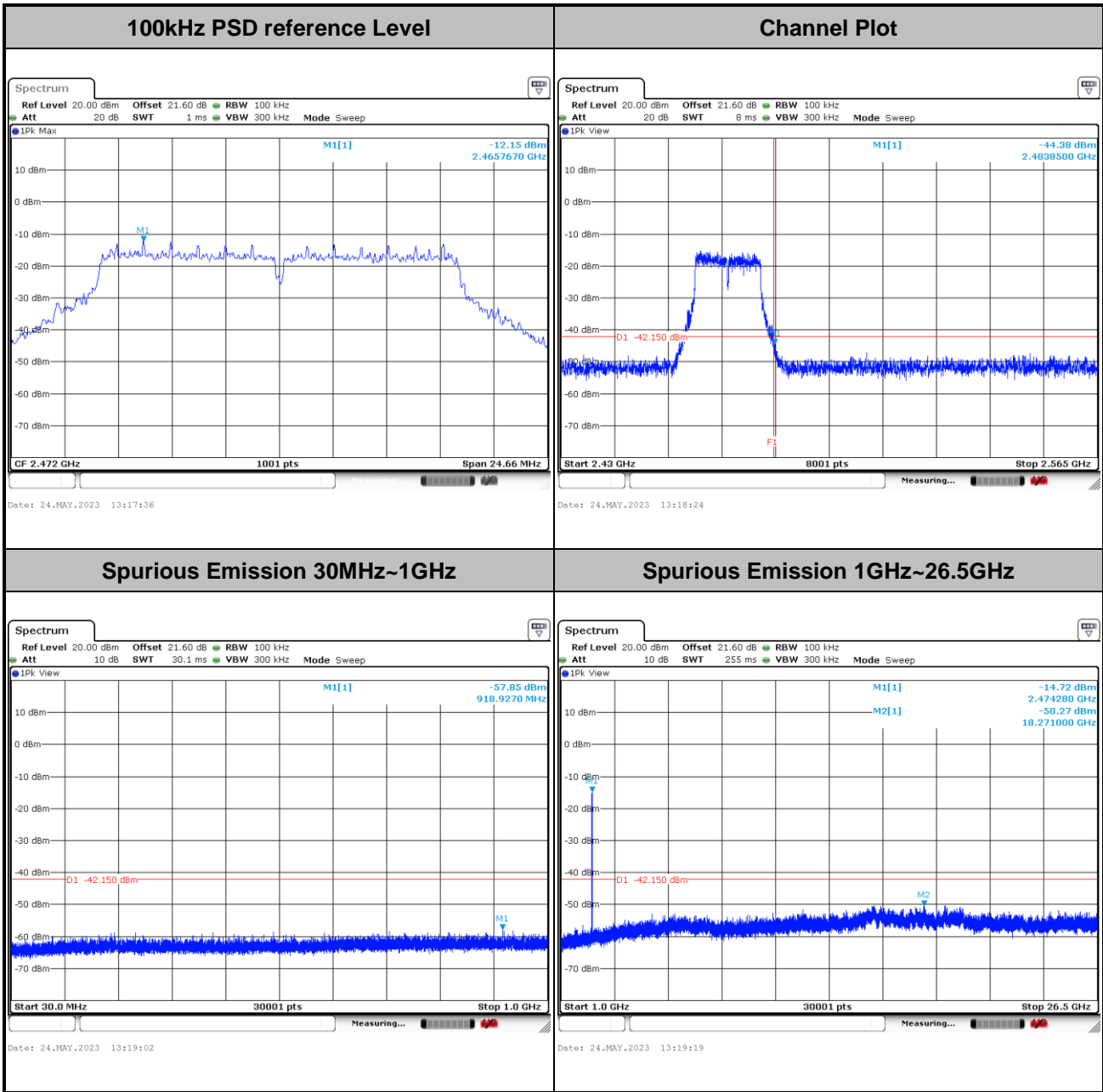


Test Mode :	802.11g	Test Channel :	12
-------------	---------	----------------	----



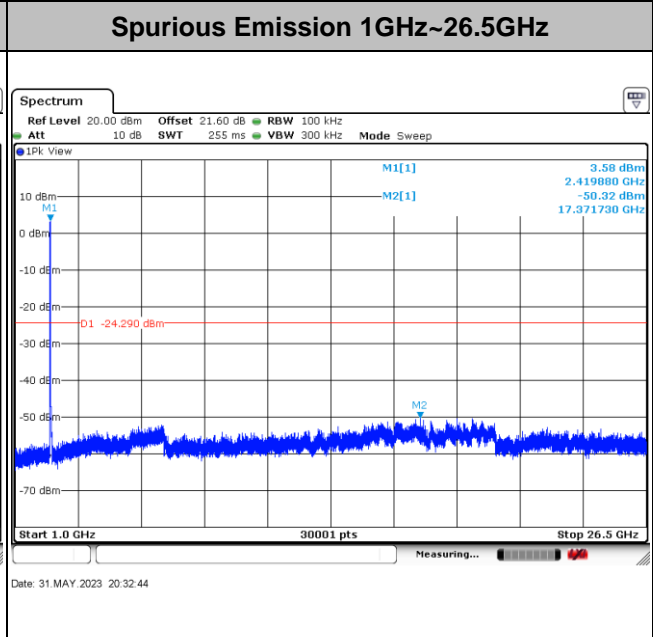
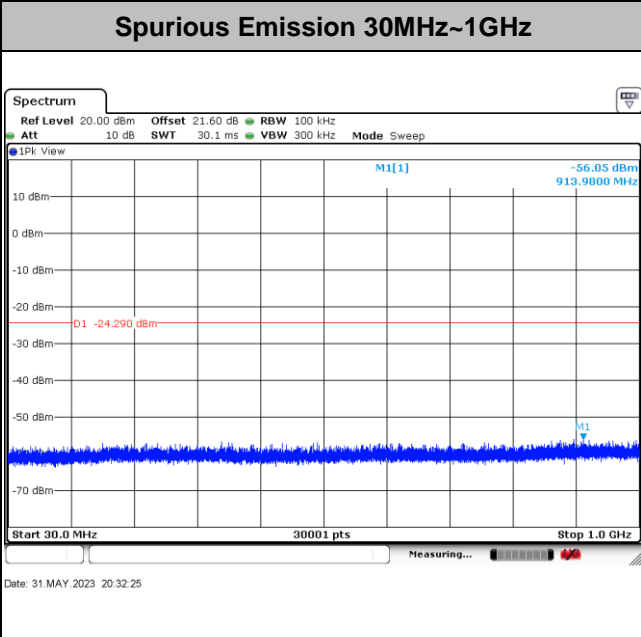
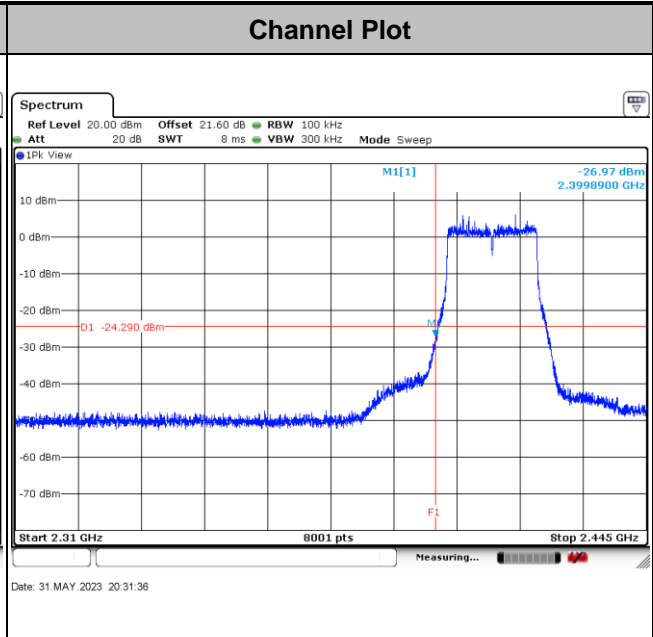
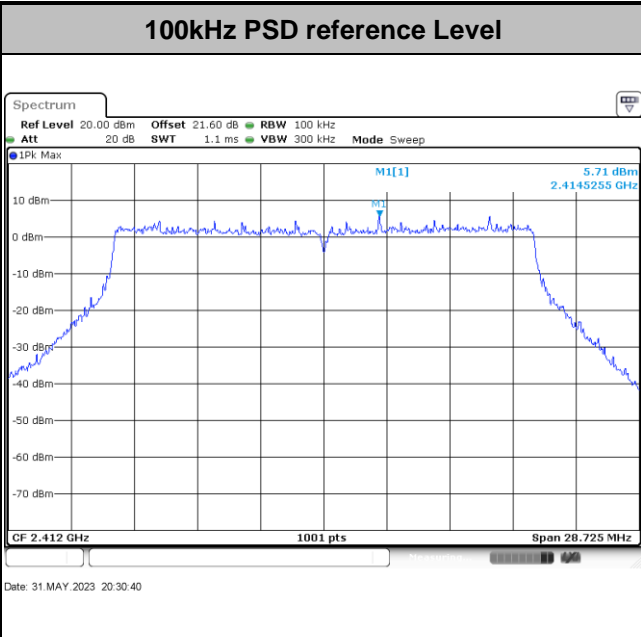


Test Mode :	802.11g	Test Channel :	13
-------------	---------	----------------	----



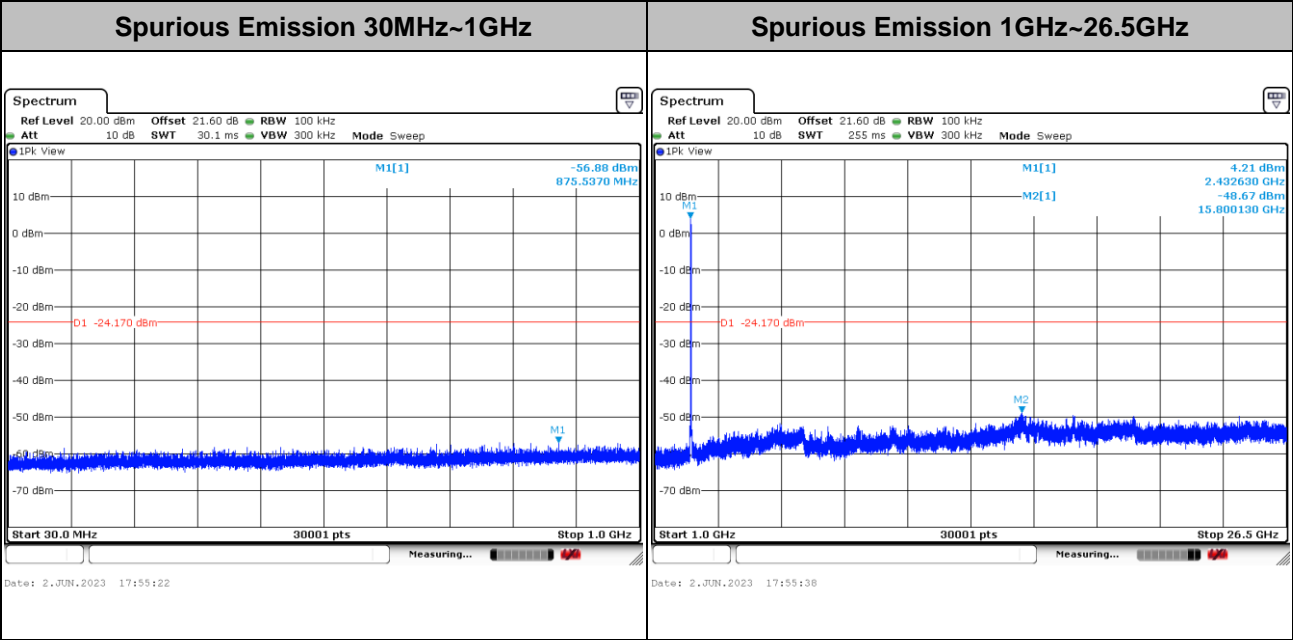
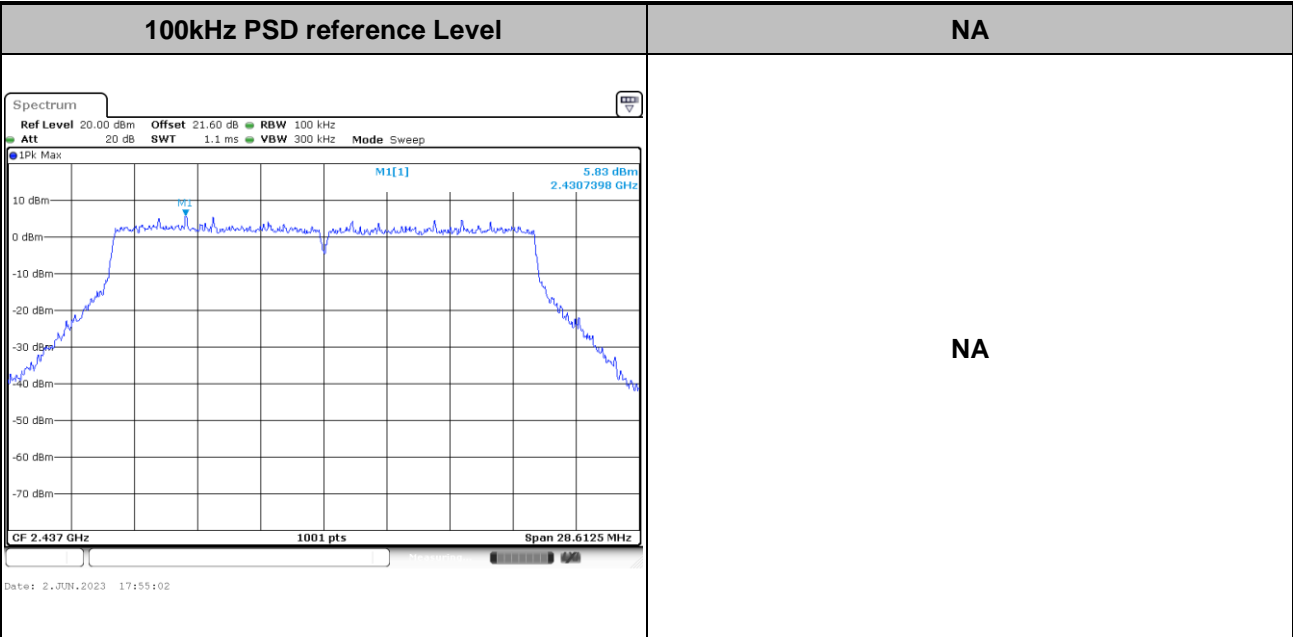


Test Mode : 802.11ax HE20 Test Channel : 01



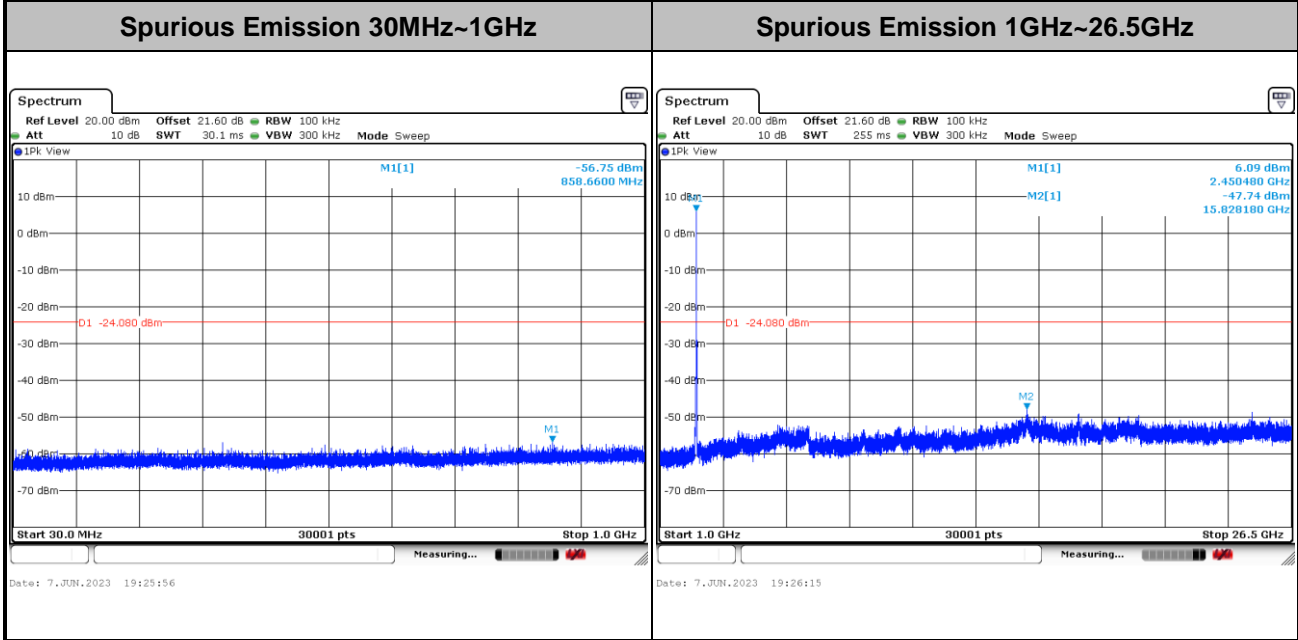
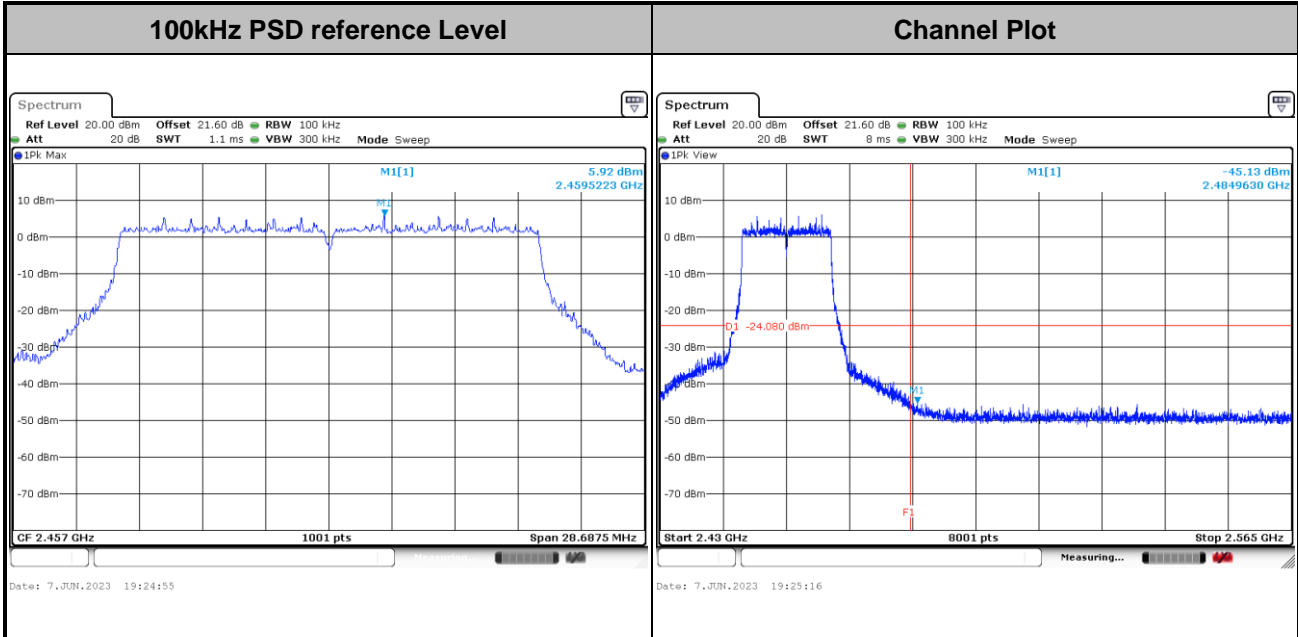


Test Mode :	802.11ax HE20	Test Channel :	06
-------------	---------------	----------------	----



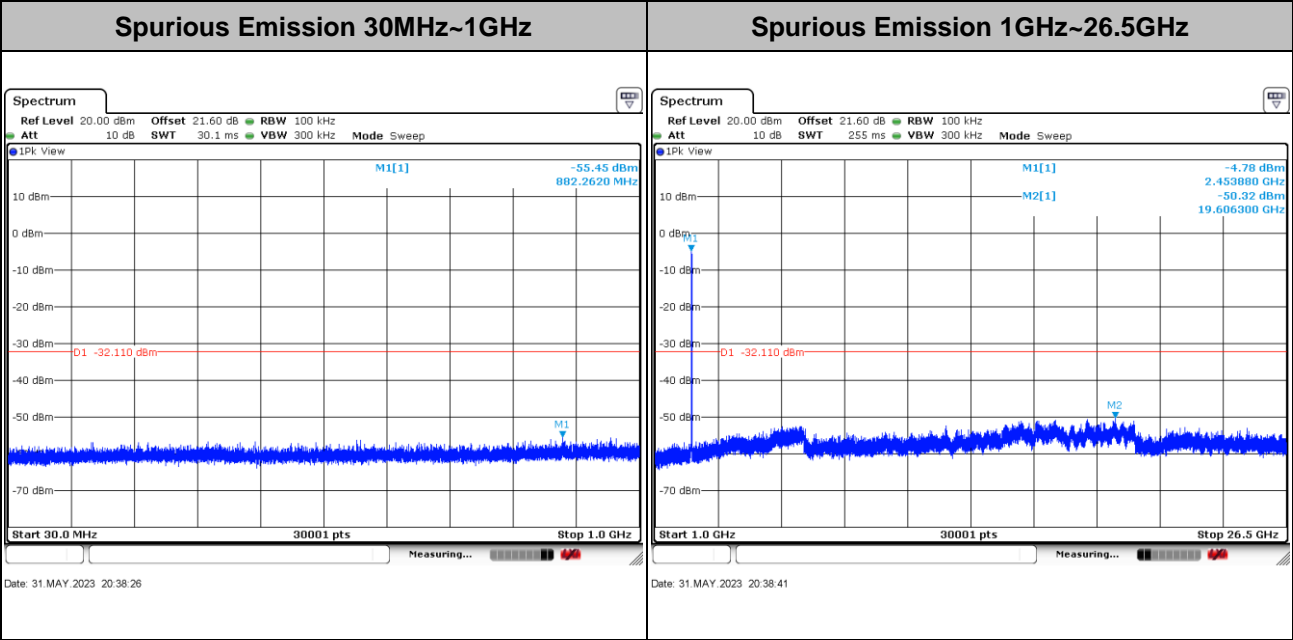
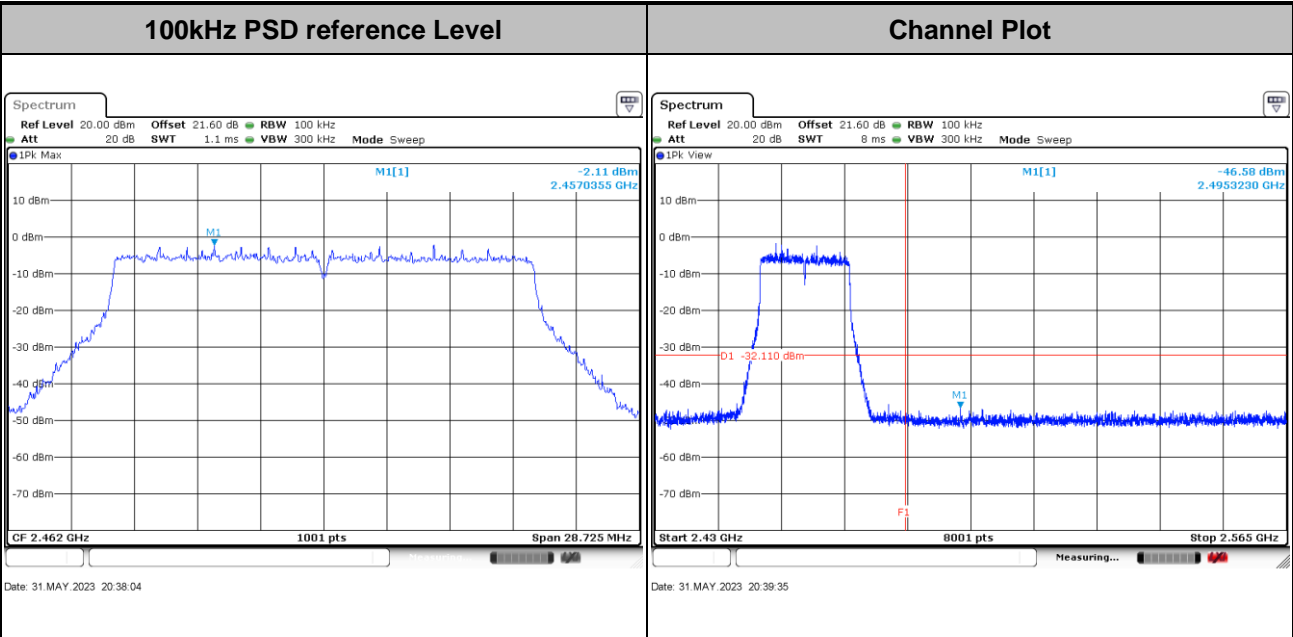


Test Mode :	802.11ax HE20	Test Channel :	10
-------------	---------------	----------------	----





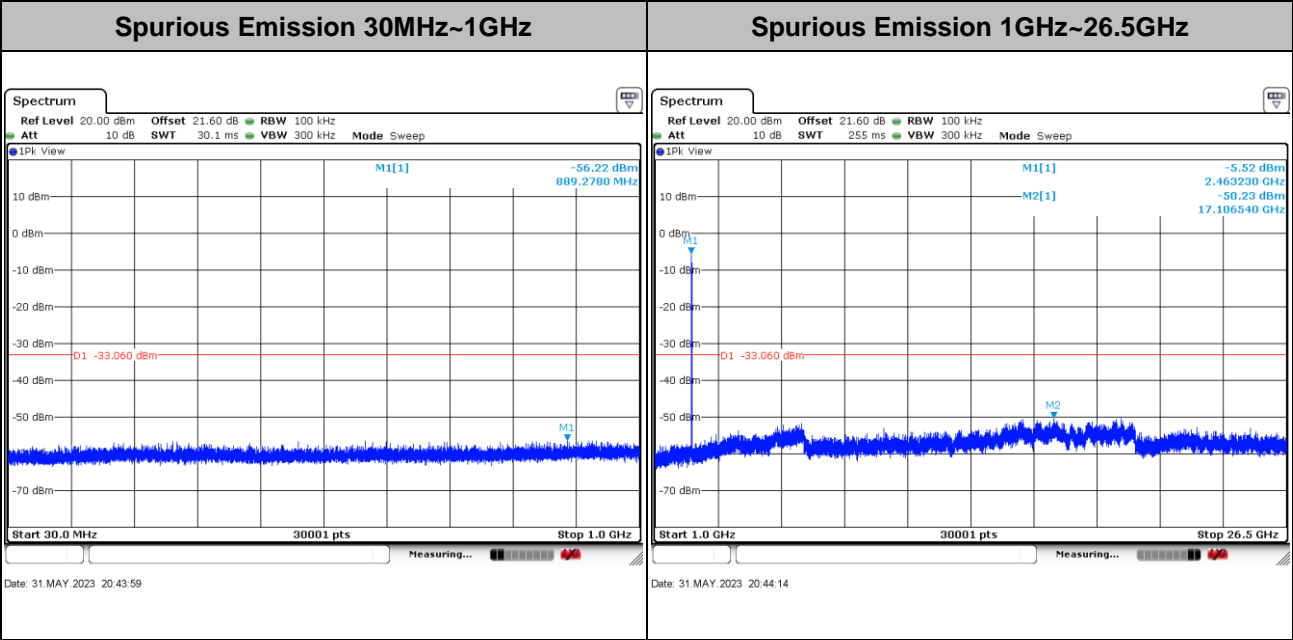
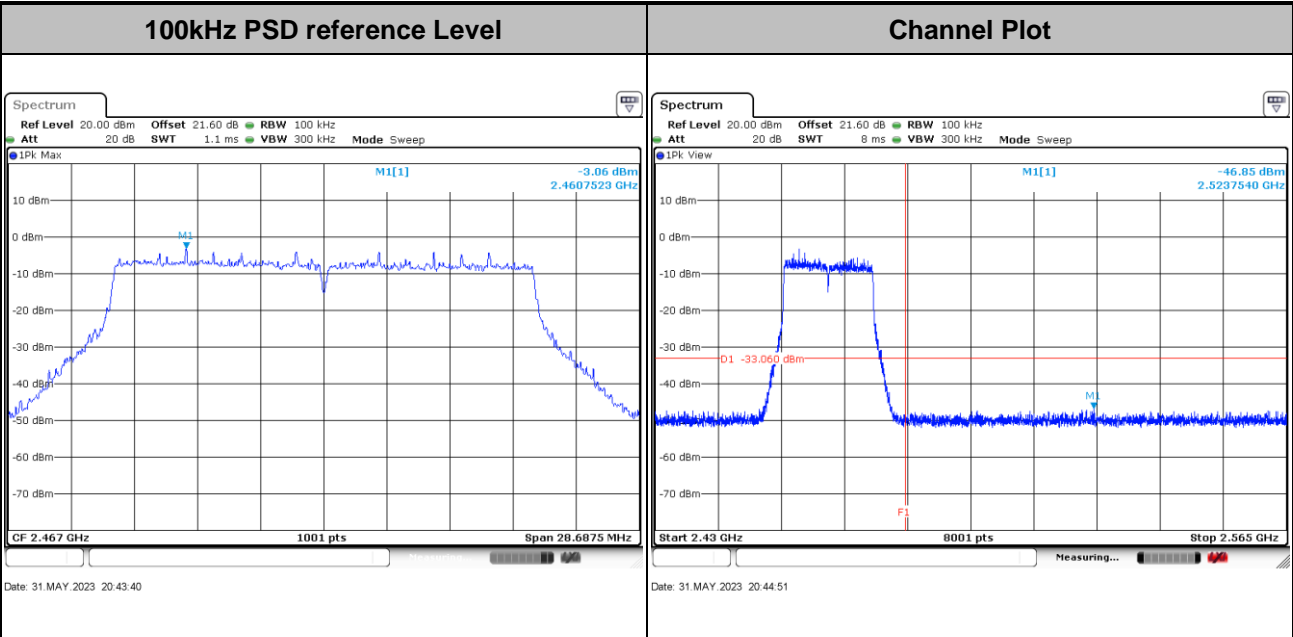
Test Mode :	802.11ax HE20	Test Channel :	11
-------------	---------------	----------------	----





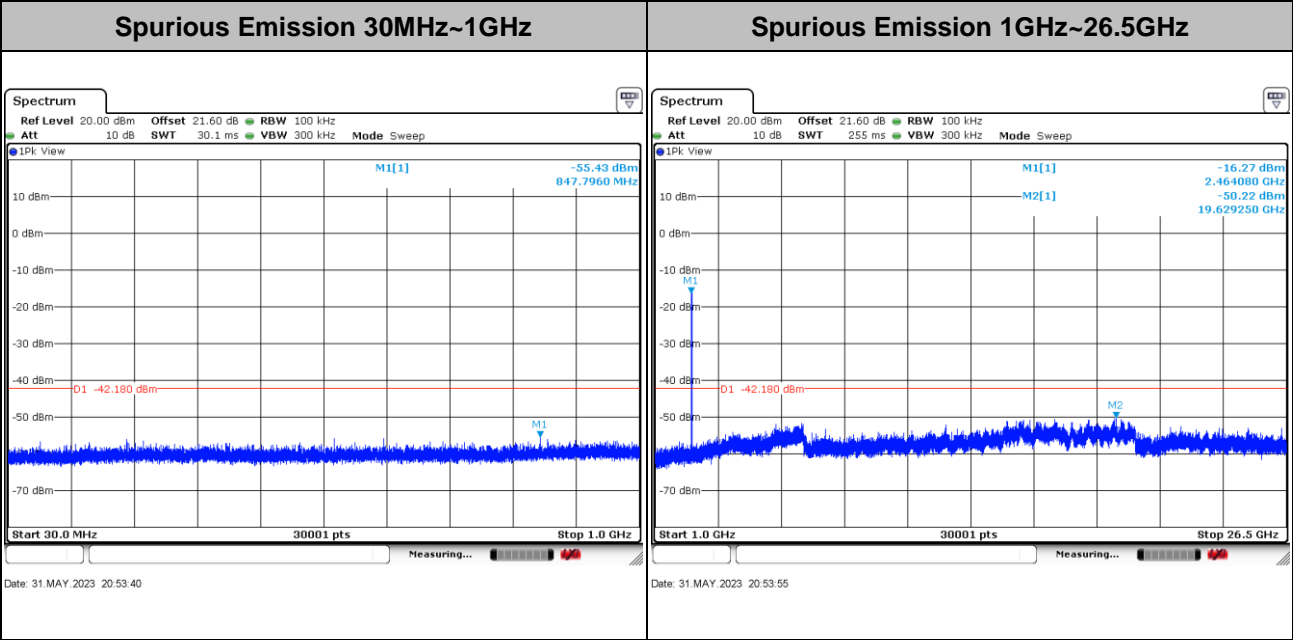
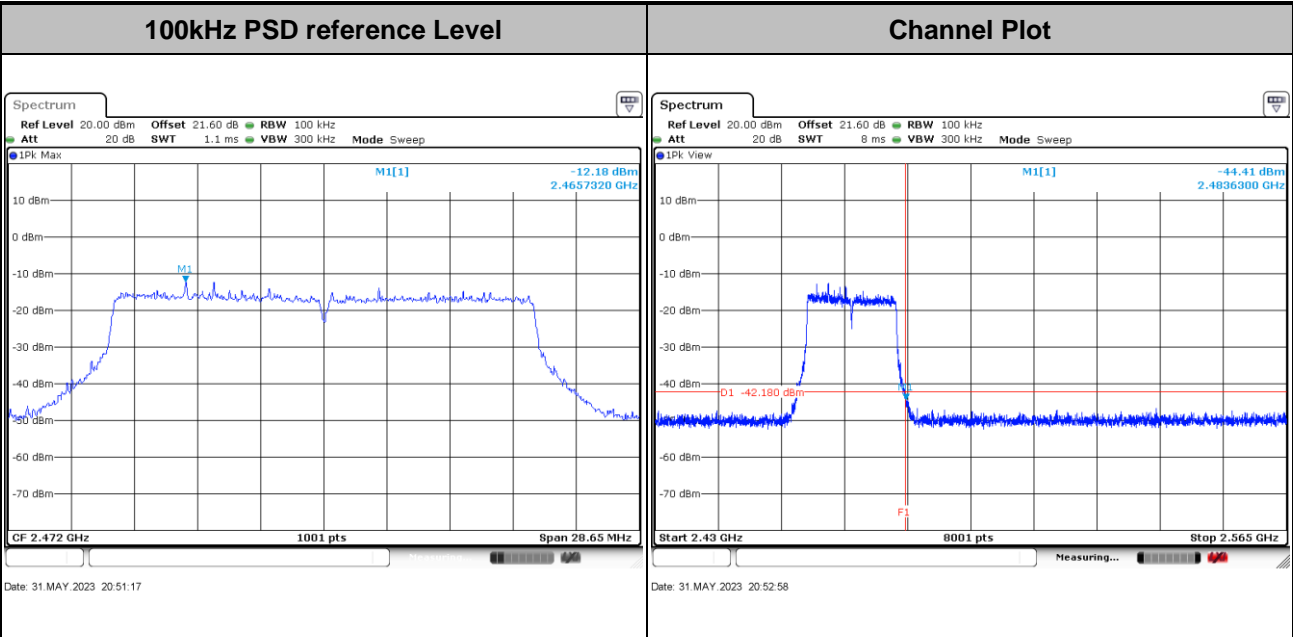


Test Mode :	802.11ax HE20	Test Channel :	12
-------------	---------------	----------------	----



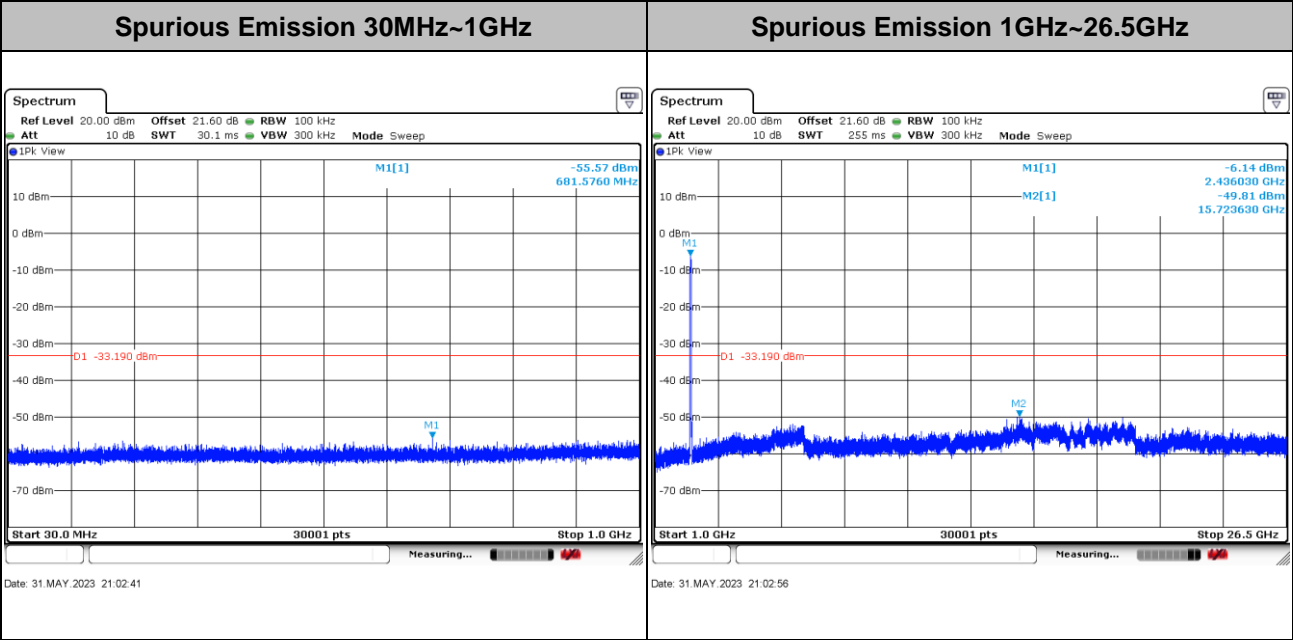
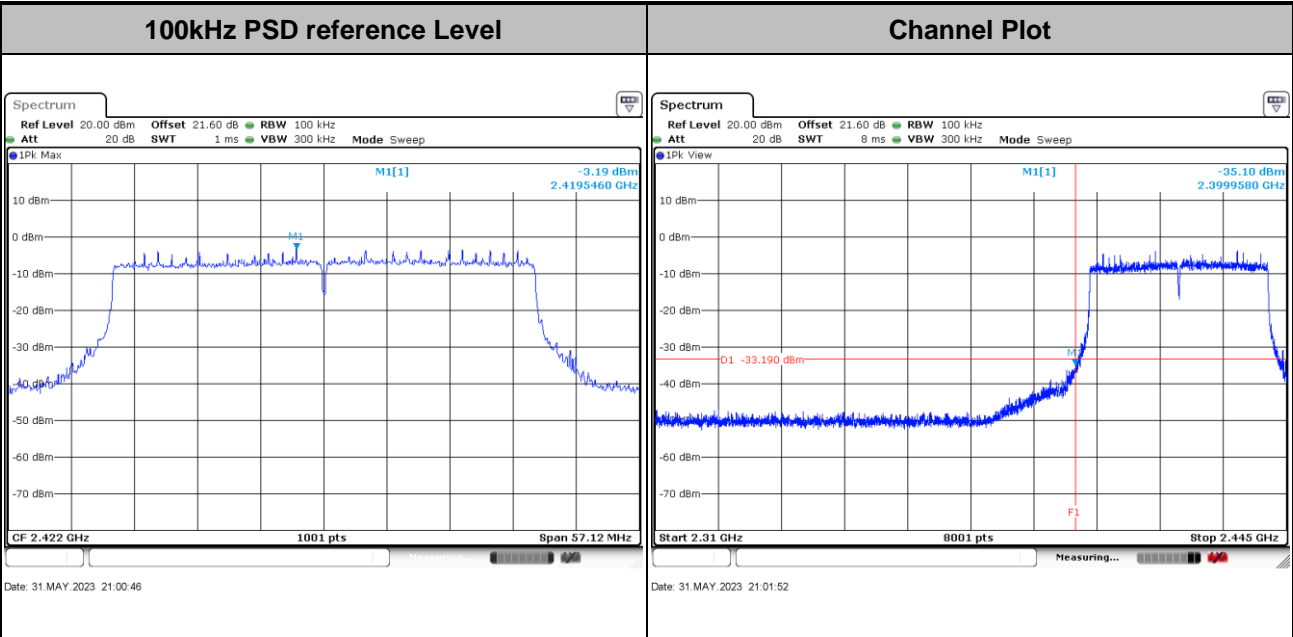


Test Mode :	802.11ax HE20	Test Channel :	13
-------------	---------------	----------------	----



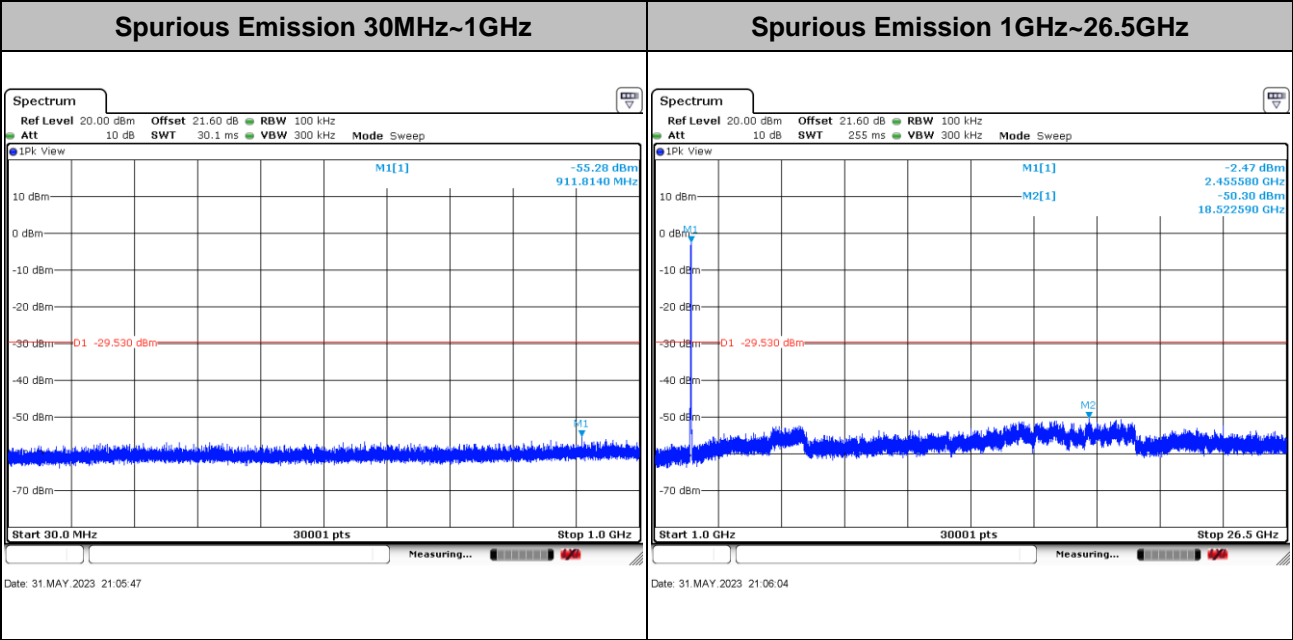
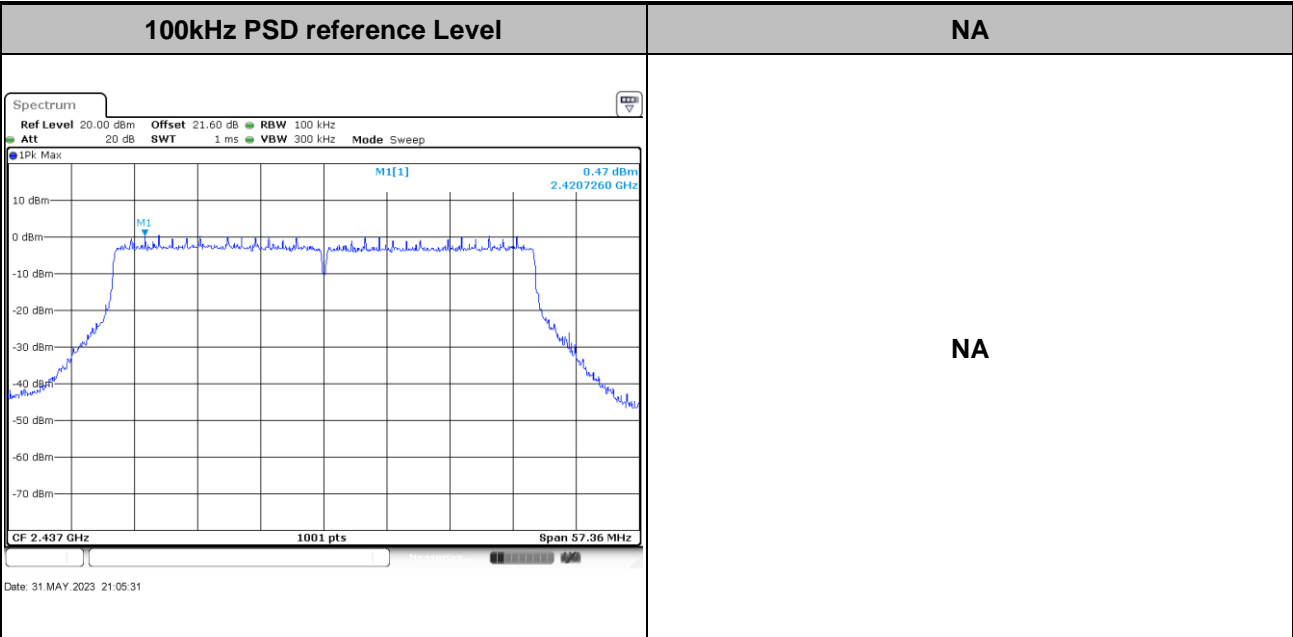


Test Mode :	802.11ax HE40	Test Channel :	03
-------------	---------------	----------------	----



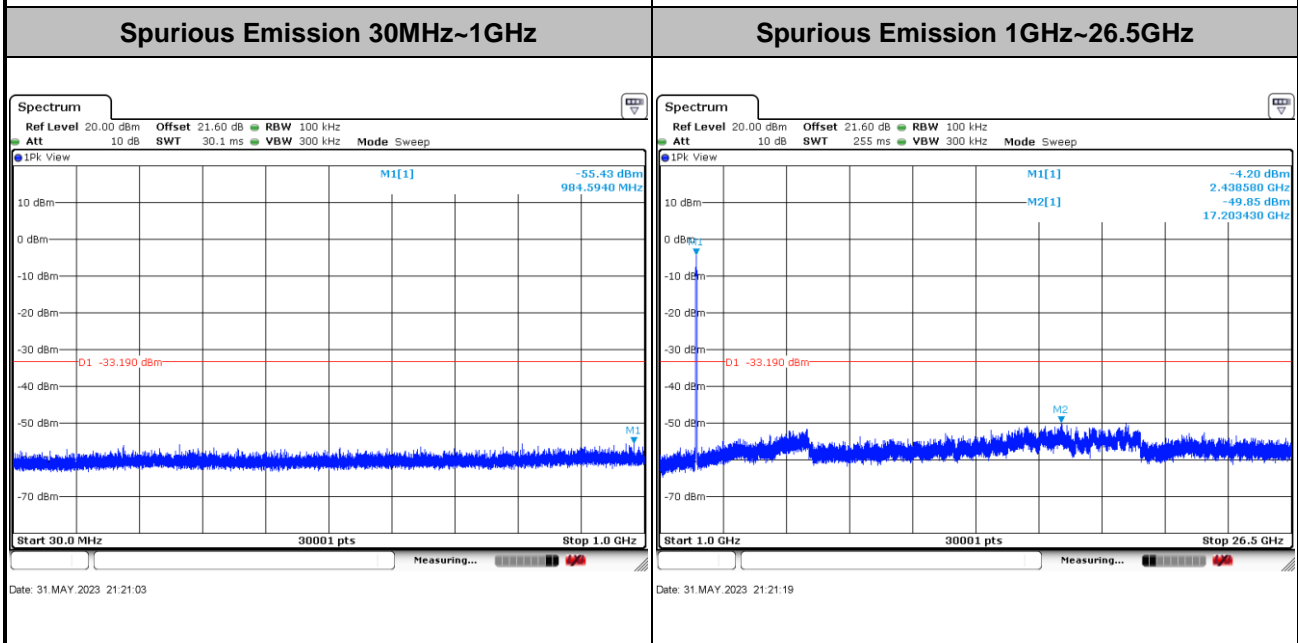
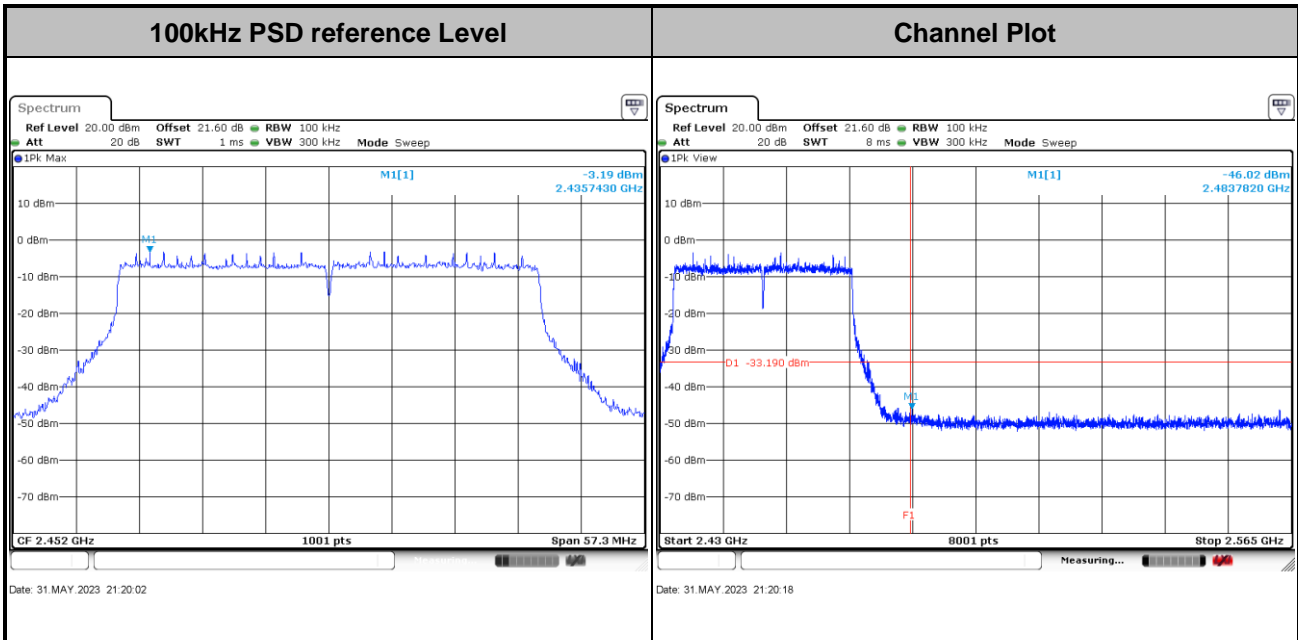


Test Mode :	802.11ax HE40	Test Channel :	06
-------------	---------------	----------------	----



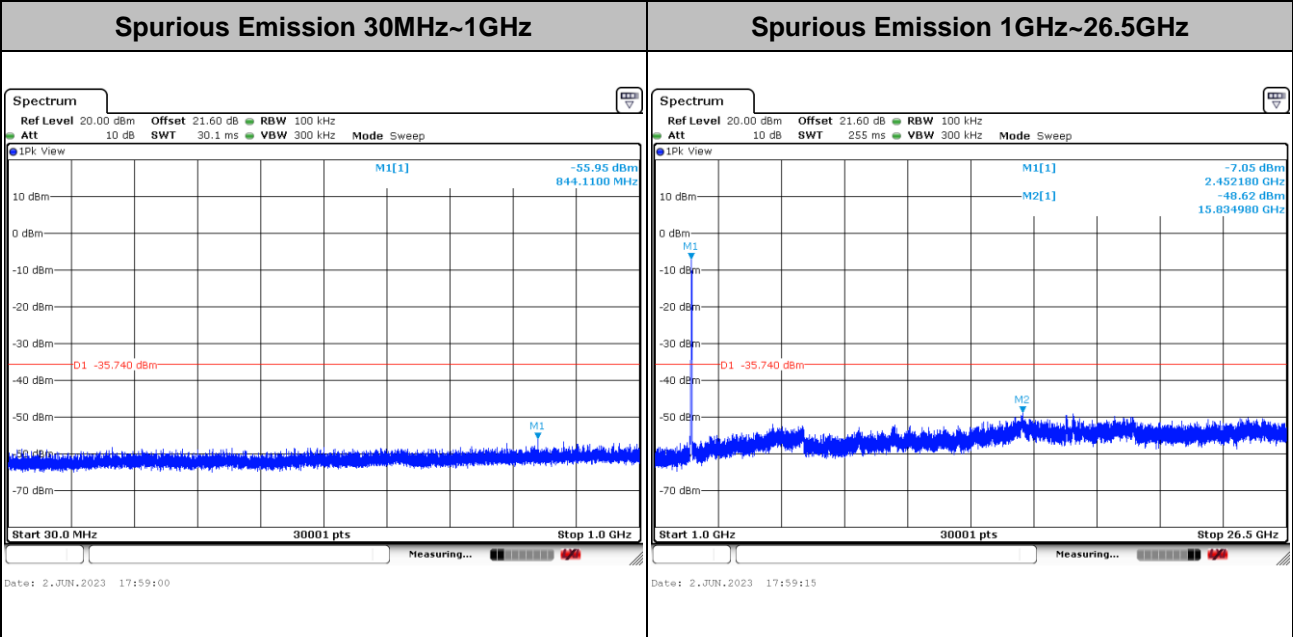
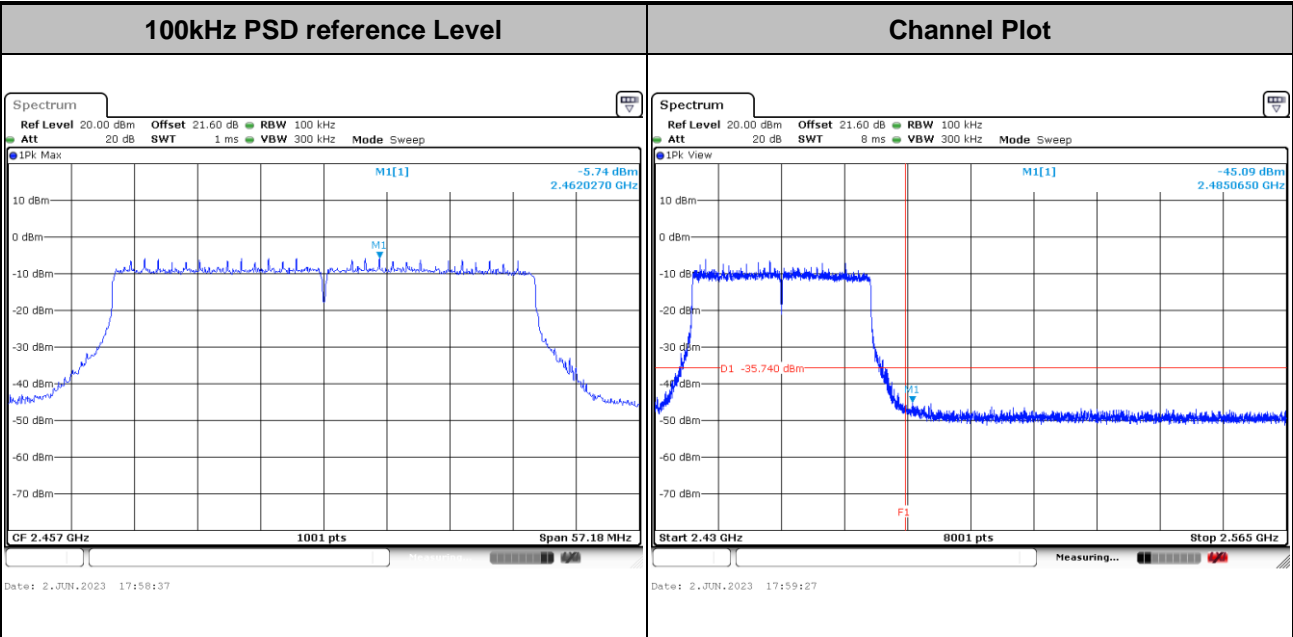


Test Mode :	802.11ax HE40	Test Channel :	09
-------------	---------------	----------------	----



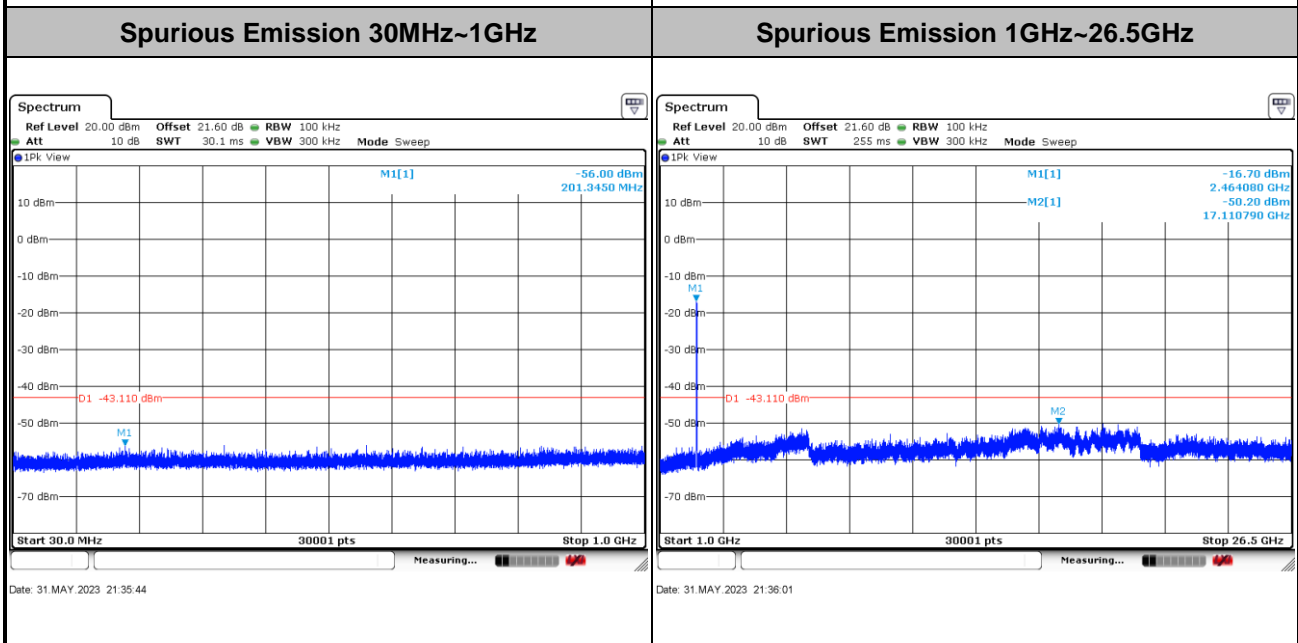
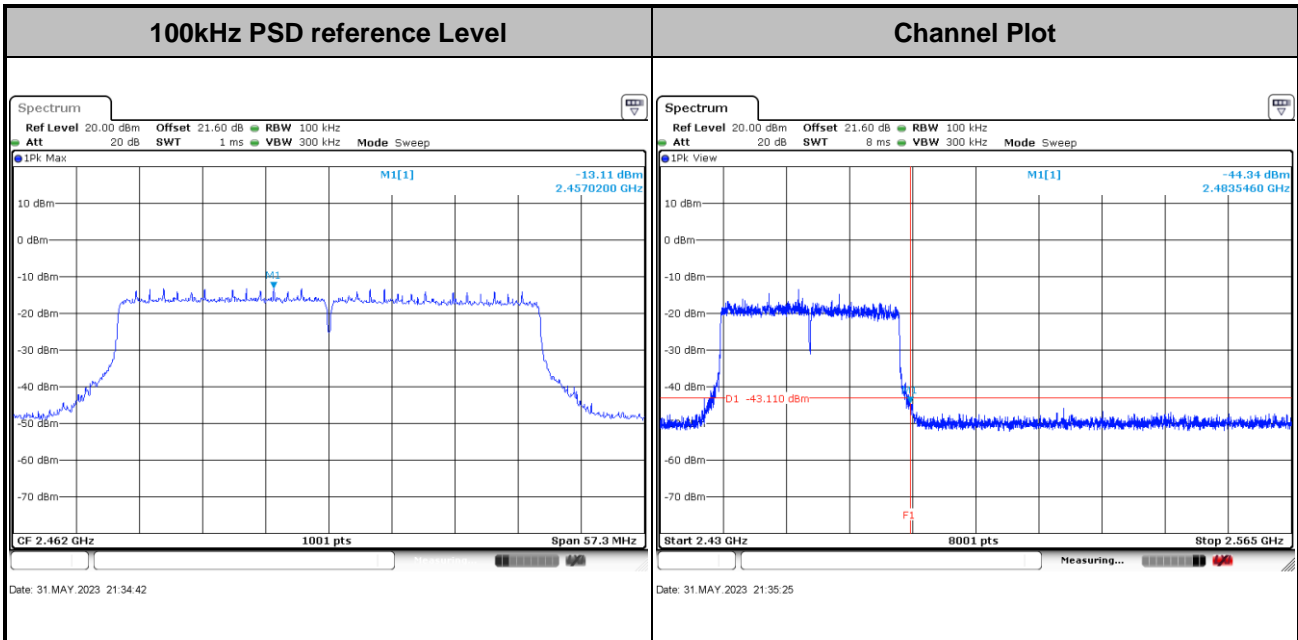


Test Mode :	802.11ax HE40	Test Channel :	10
-------------	---------------	----------------	----





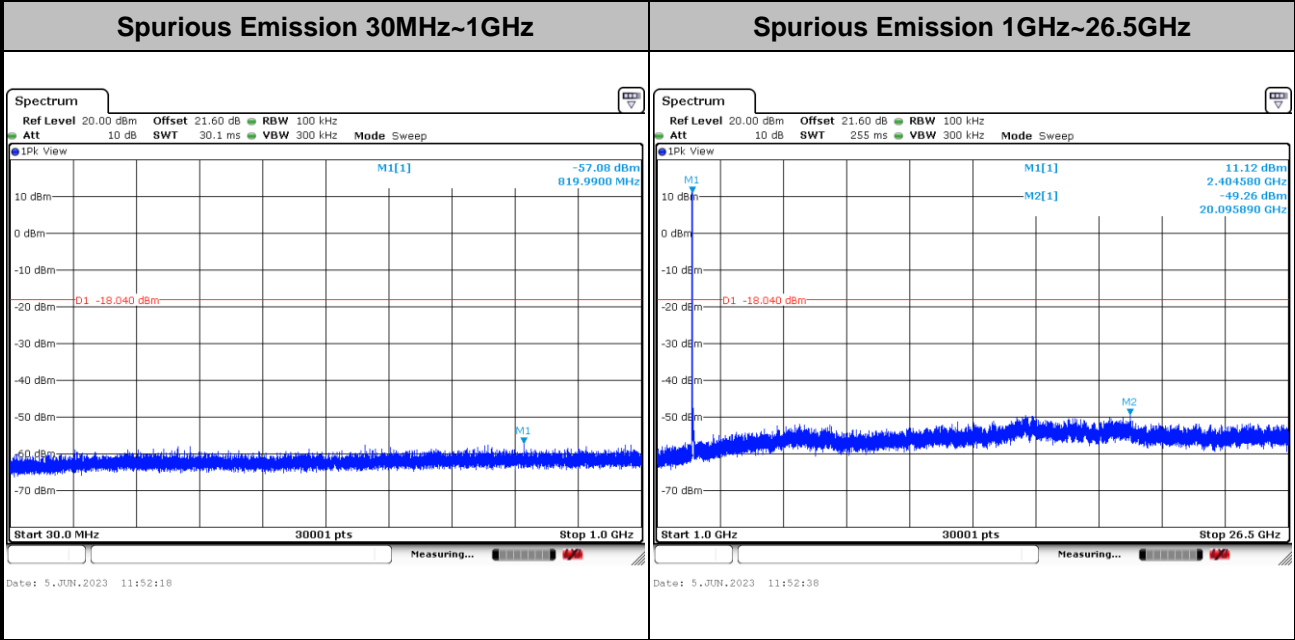
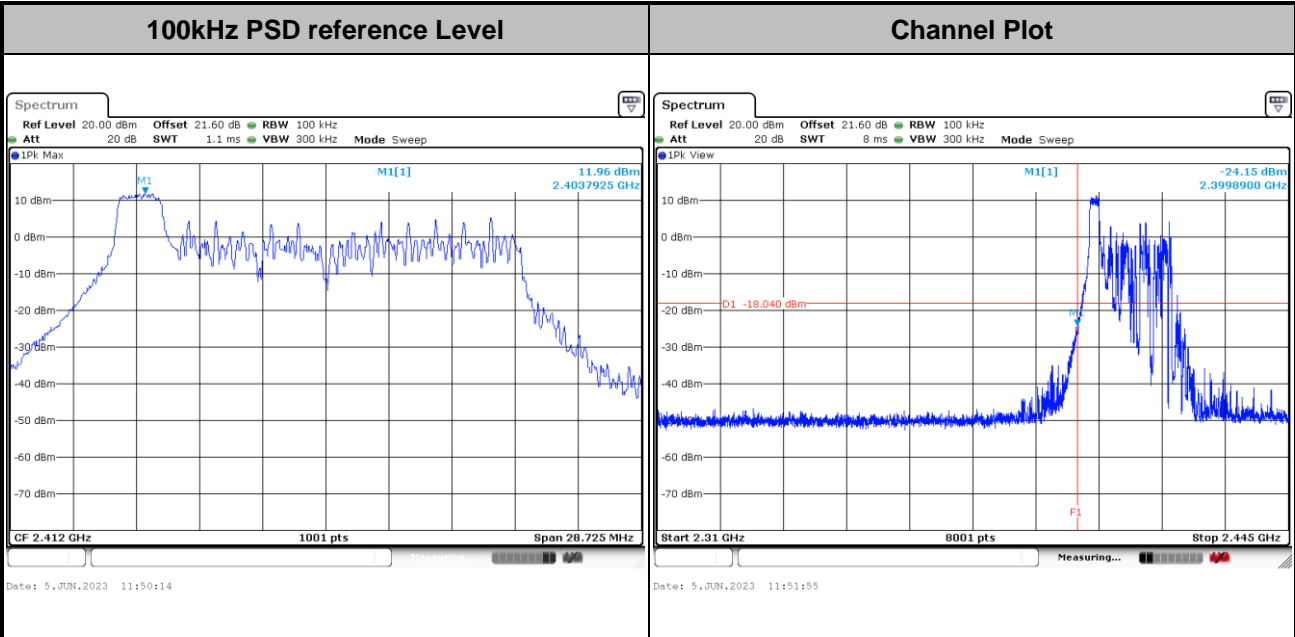
Test Mode :	802.11ax HE40	Test Channel :	11
-------------	---------------	----------------	----





<Partial RU>

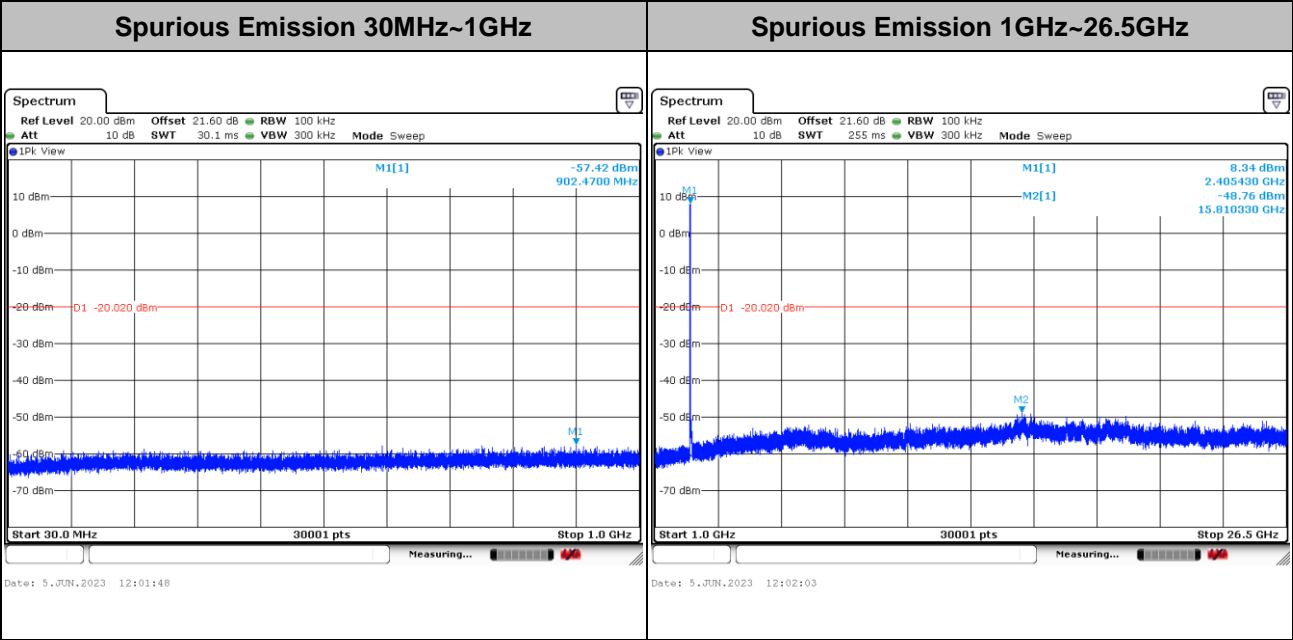
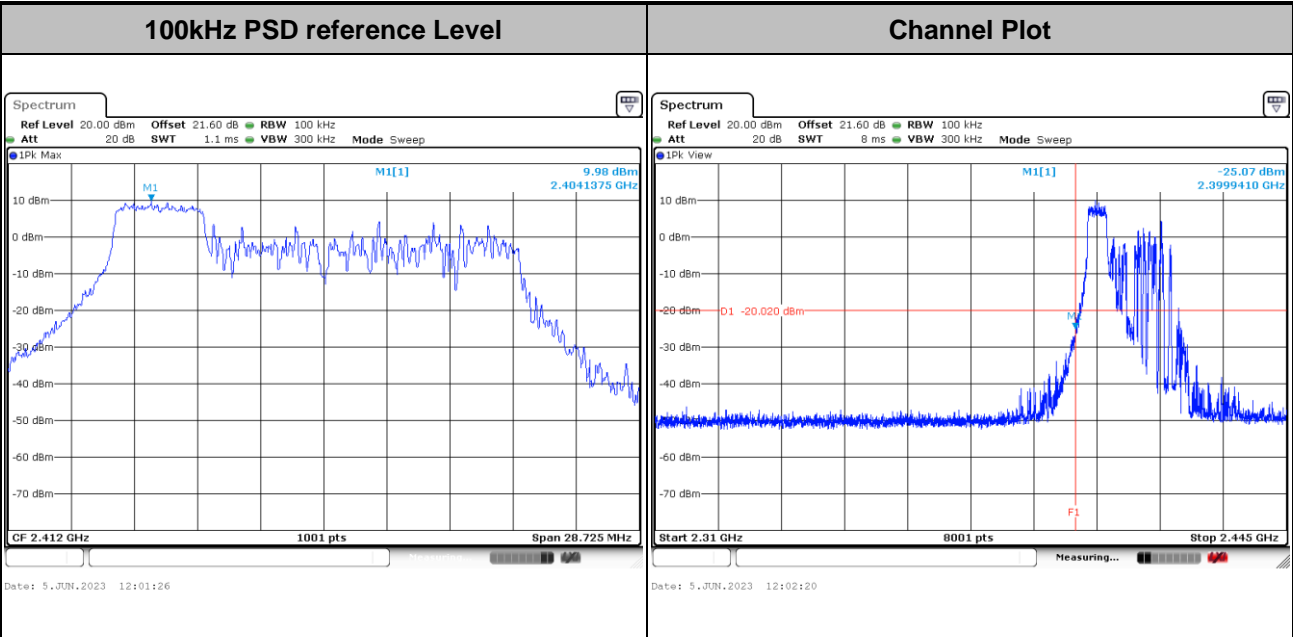
Test Mode :	802.11ax HE20	Test Channel :	01-RU26/0
-------------	---------------	----------------	-----------





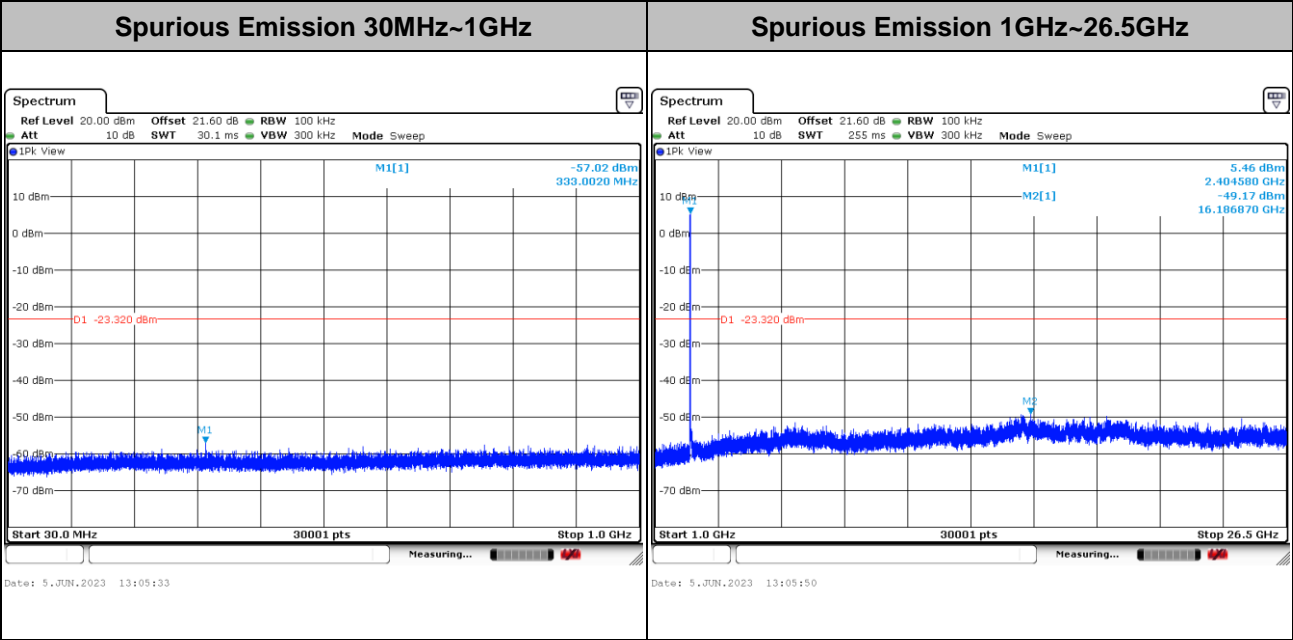
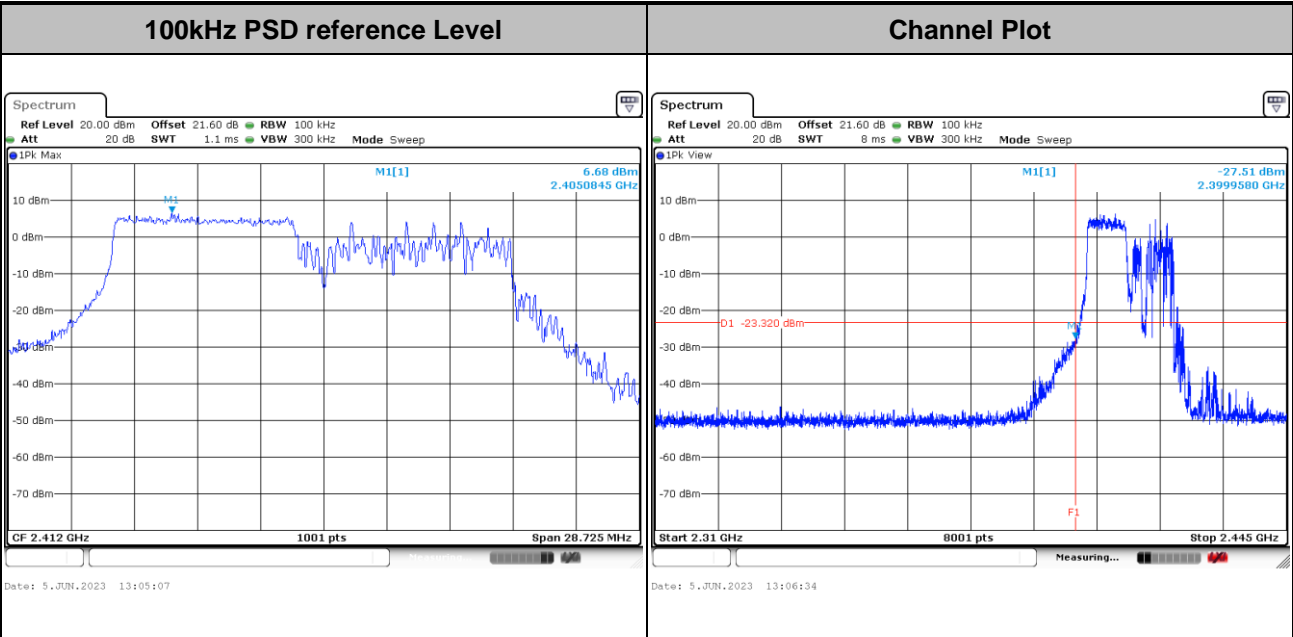


Test Mode : 802.11ax HE20 Test Channel : 01-RU52/37



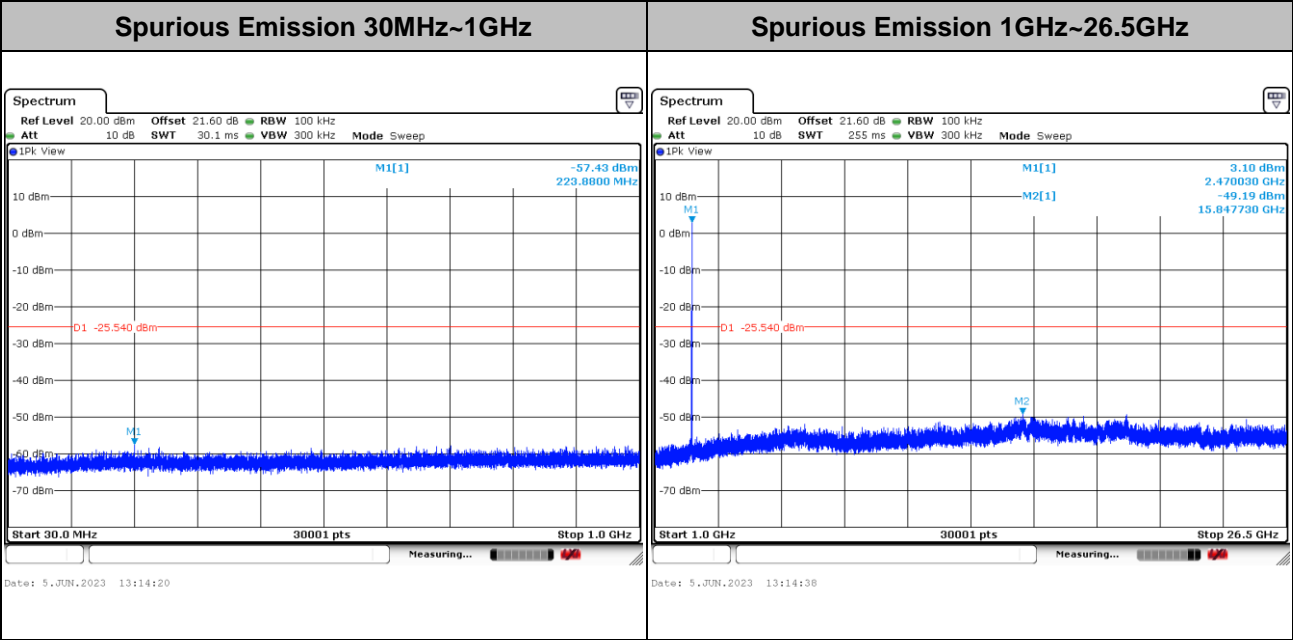
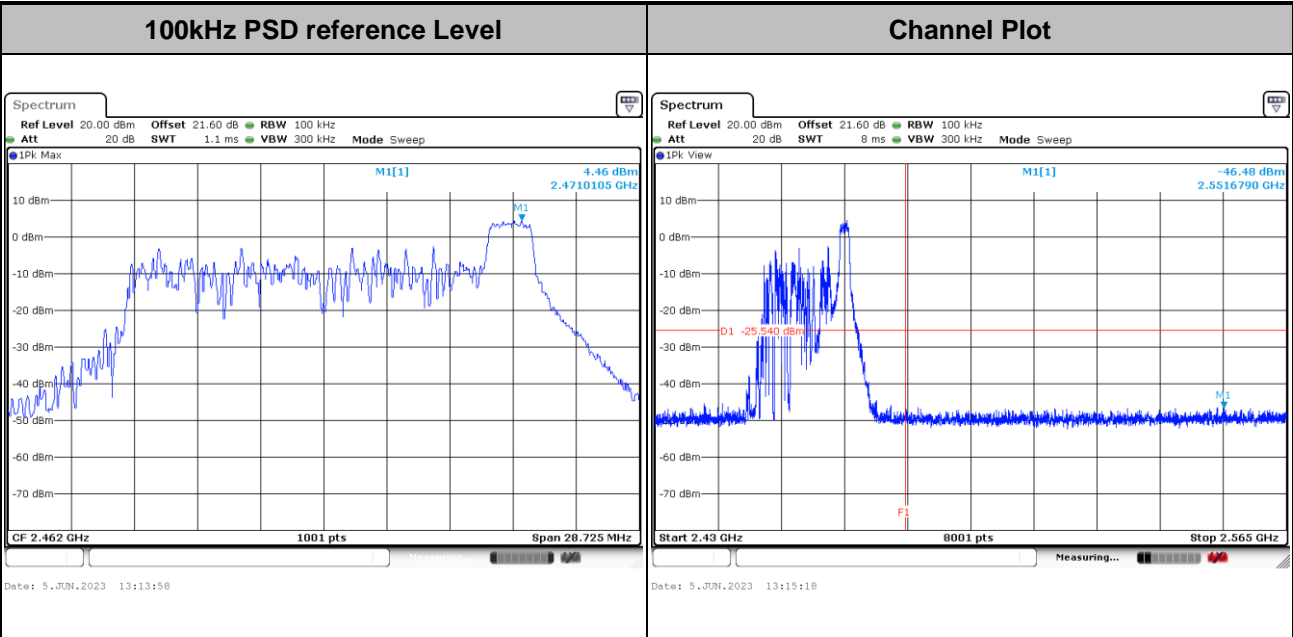


Test Mode :	802.11ax HE20	Test Channel :	01-RU106/53
-------------	---------------	----------------	-------------



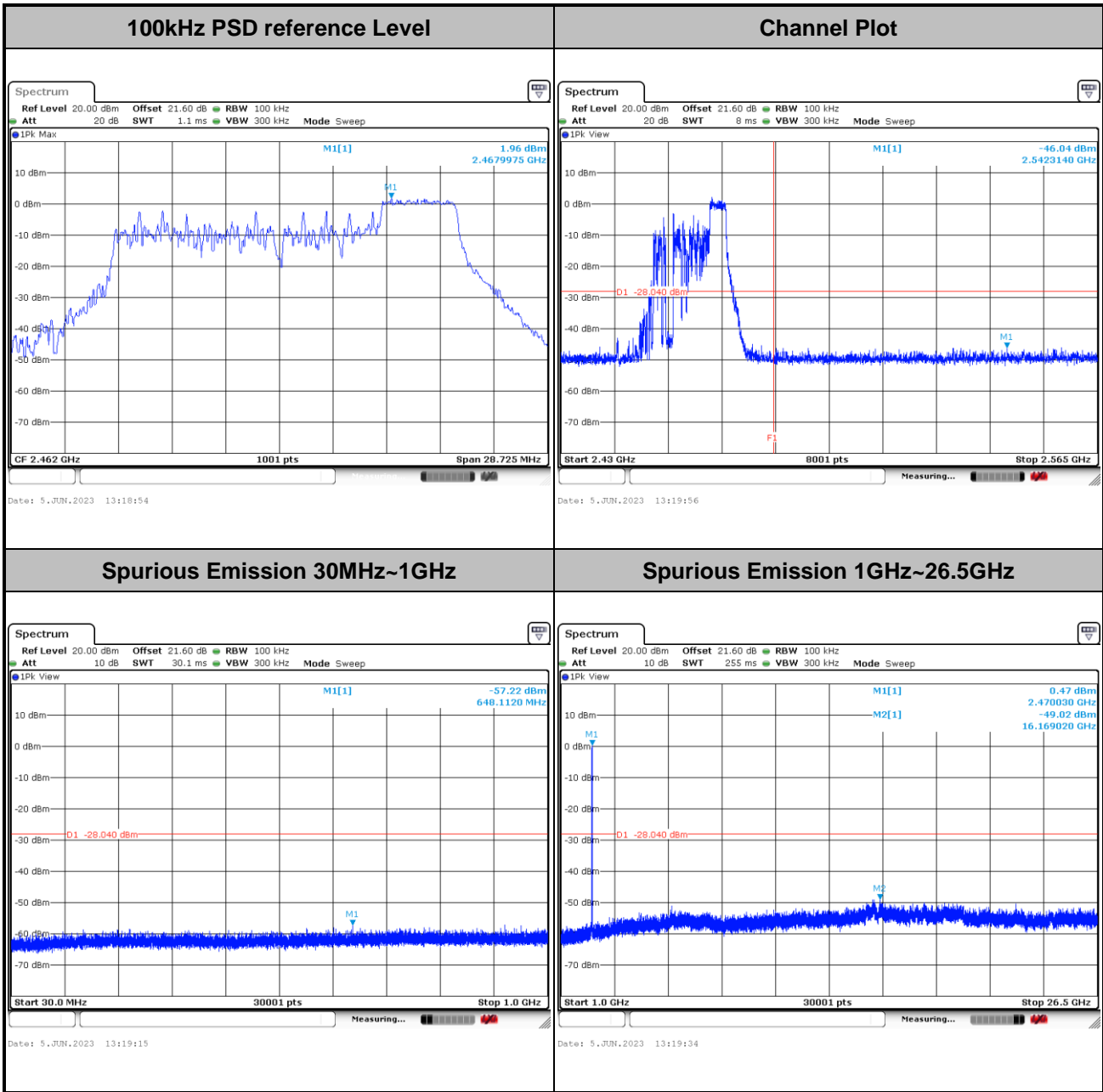


Test Mode :	802.11ax HE20	Test Channel :	11-RU26/8
-------------	---------------	----------------	-----------



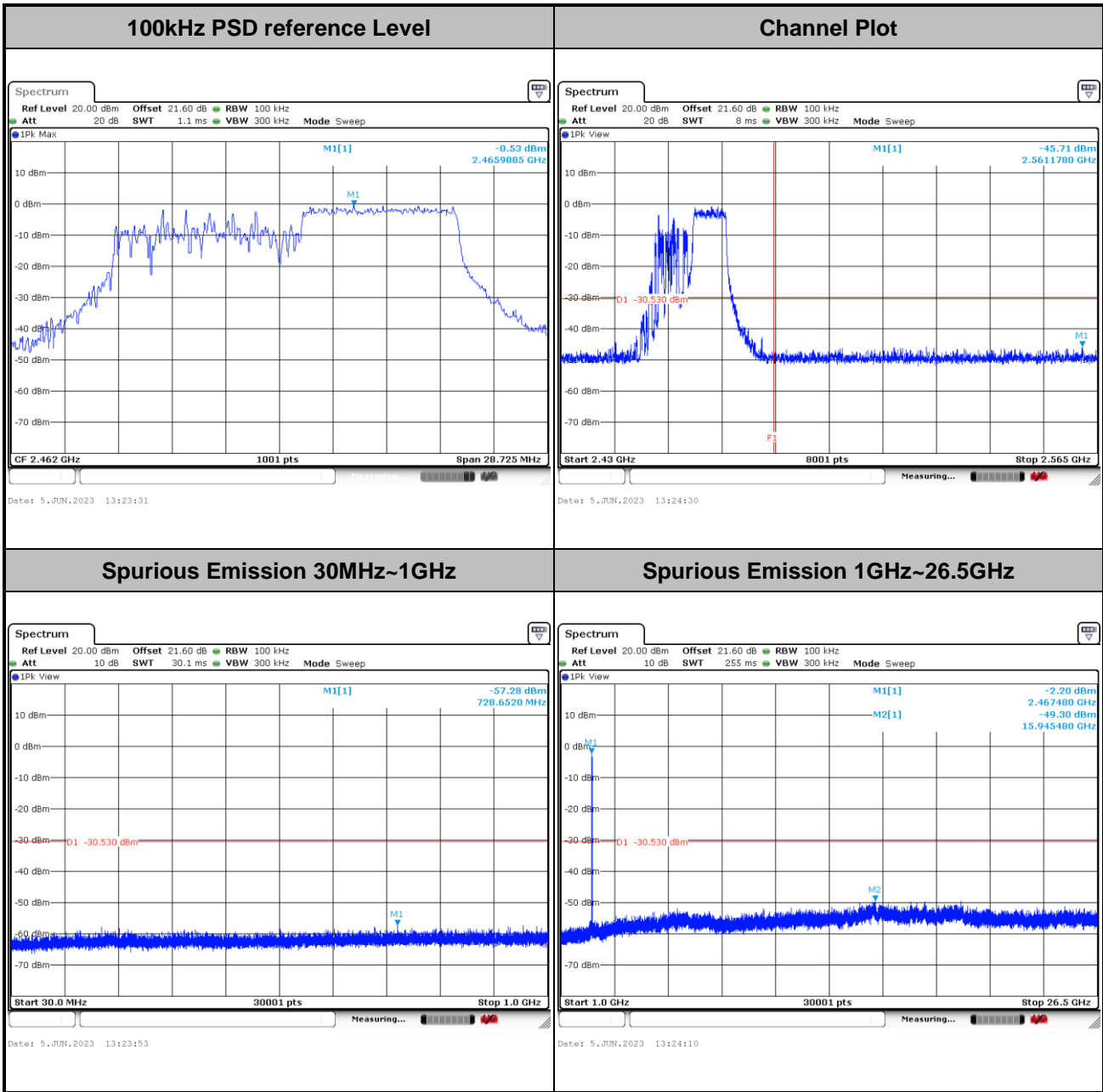


Test Mode :	802.11ax HE20	Test Channel :	11-RU52/40
-------------	---------------	----------------	------------





Test Mode :	802.11ax HE20	Test Channel :	11-RU106/54
-------------	---------------	----------------	-------------





Test Mode :	802.11ax HE20	Test Channel :	12-RU26/8
-------------	---------------	----------------	-----------

