



FCC RF Test Report

FCC ID : UZ7ET45BA
EQUIPMENT : Tablet
BRAND NAME : Zebra
MODEL NAME : ET45BA
APPLICANT : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
MANUFACTURER : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System
TEST DATE(S) : Jun. 07, 2022 ~ Jul. 19, 2022

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

Jason Jia

Approved by: Jason Jia



Sporton International Inc. (Kunshan)

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People's Republic of China



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR230408C	Rev. 01	Initial issue of report	Aug. 04, 2022

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	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	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 1.13 dB at 2389.950 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.75 dB at 0.184 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits.

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 Product Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Brand Name	Zebra
Model Name	ET45BA
FCC ID	UZ7ET45BA
HW Version	EV2-2
SW Version	ET45USERDEBUG 11 11-10-12.00-RG-U00-PRD-GSE MXJ release-keys
MFD	12MAY22
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.

Specification of Accessory				
Battery	Brand Name	Zebra	Model Number	BT-000455

Supported Unit used in test configuration and system				
AC Adapter	Brand Name	Zebra	Part Number	PWR-WUA5V12W0US
Earphone 1	Brand Name	Zebra	Part Number	HDST-35MM-PTVP-01
Earphone 2	Brand Name	Zebra	Part Number	HDST-USBC-PTT1-01
USB Cable (Type C to Type A)	Brand Name	Zebra	Part Number	CBL-TC5X-USBC2A-01
Type C-Audio Cable (Type C to 3.5mm)	Brand Name	Zebra	Part Number	ADP-USBC-35MM1-01

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification				
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz			
Maximum (Peak) Output Power to antenna	MIMO <Ant.1+2> 802.11b : 26.78 dBm (0.4764 W) 802.11g : 28.87 dBm (0.7709 W) 802.11n HT20 : 28.58 dBm (0.7211 W) 802.11ac VHT20 : 28.58 dBm (0.7211 W) 802.11ax HE20 : 29.22 dBm (0.8356 W)			
99% Occupied Bandwidth	802.11b : 11.84 MHz 802.11g : 20.03 MHz 802.11ax HE20 : 19.78 MHz			
Antenna Type / Gain	Ant.1: IFA Antenna with gain 1.39 dBi Ant.2: IFA Antenna with gain 0.47 dBi Beamforming Gain : 3.95 dB			
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n/ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)			
Antenna Function Description		Ant. 1	Ant. 2	
	802.11 b/g/n/ac/ax SISO/MIMO	✓	✓	
	802.11 ax TXBF	✓	✓	

Note:

1. For WLAN SISO & MIMO (CDD) mode, the whole testing has assessed only MIMO mode by referring to the higher normal conducted power.
2. For 802.11n HT20 & 802.11ac VHT20 & 802.11ax HE20 mode, the whole testing have assessed only 802.11ax HE20 by referring to the higher output power.
3. WLAN 5G Ant. 1 / Ant. 2 corresponding to EUT Photo Ant. 6 / Ant. 7.
4. 802.11ax support Tx Beamforming mode.
5. 802.11ax support OFDMA full RU tone and partial RU tone, partial RU mode for non-beamforming only, the full RU power > partial RU, therefore the full RU perform full test and Partial RU verified power/PSD/RSE

1.3 Modification of EUT

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



1.4 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	CO01-KS 03CH05-KS TH01-KS	CN1257	314309

1.5 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.6 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
- 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. 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. (MHz)	Channel	Freq. (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.

MIMO Antenna

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

RSE Co-location
LTE Band 48C Link + 802.11g CH01(2412MHz) Tx

Test Cases	
AC Conducted Emission	Mode 1 :LTE Band 5 Idle + Bluetooth Link + WLAN Link (2.4G) + Battery(BT-000455) + USB Cable(CBL-TC5X-USBC2A-01) + Charging from AC Adapter (PWR-WUA5V12W0US)
Remark: - The AC Conduction and RSE are tested with accessories from the worst case of Part 15B report. - RSE Co-location modes are combination from the worst WLAN TX mode and WWAN Link mode.	



<802.11b>

Channel	Frequency(MHz)	ANT	Data Rate			
			1Mbps	2Mbps	5.5Mbps	11Mbps
CH 01	2412 MHz	Ant1+2	26.78	25.58	25.55	25.61
CH 06	2437 MHz	Ant1+2	26.71	-	-	-
CH 11	2462 MHz	Ant1+2	23.41	-	-	-

<802.11g>

Channel	Frequency(MHz)	ANT	Data Rate							
			6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 01	2412 MHz	Ant1+2	24.22	-	-	-	-	-	-	-
CH 02	2417 MHz	Ant1+2	28.42	-	-	-	-	-	-	-
CH 06	2437 MHz	Ant1+2	28.87	28.66	28.65	28.74	28.71	28.77	28.65	28.73
CH 09	2452 MHz	Ant1+2	28.46	-	-	-	-	-	-	-
CH 10	2457 MHz	Ant1+2	24.77	-	-	-	-	-	-	-
CH 11	2462 MHz	Ant1+2	23.28	-	-	-	-	-	-	-

<802.11n HT20>

Channel	Frequency(MHz)	ANT	Data Rate							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412 MHz	Ant1+2	23.27	-	-	-	-	-	-	-
CH 02	2417 MHz	Ant1+2	27.85	-	-	-	-	-	-	-
CH 06	2437 MHz	Ant1+2	28.58	28.36	28.30	28.29	28.15	28.21	28.23	28.17
CH 09	2452 MHz	Ant1+2	28.12	-	-	-	-	-	-	-
CH 10	2457 MHz	Ant1+2	27.13	-	-	-	-	-	-	-
CH 11	2462 MHz	Ant1+2	23.08	-	-	-	-	-	-	-

<802.11n VHT20>

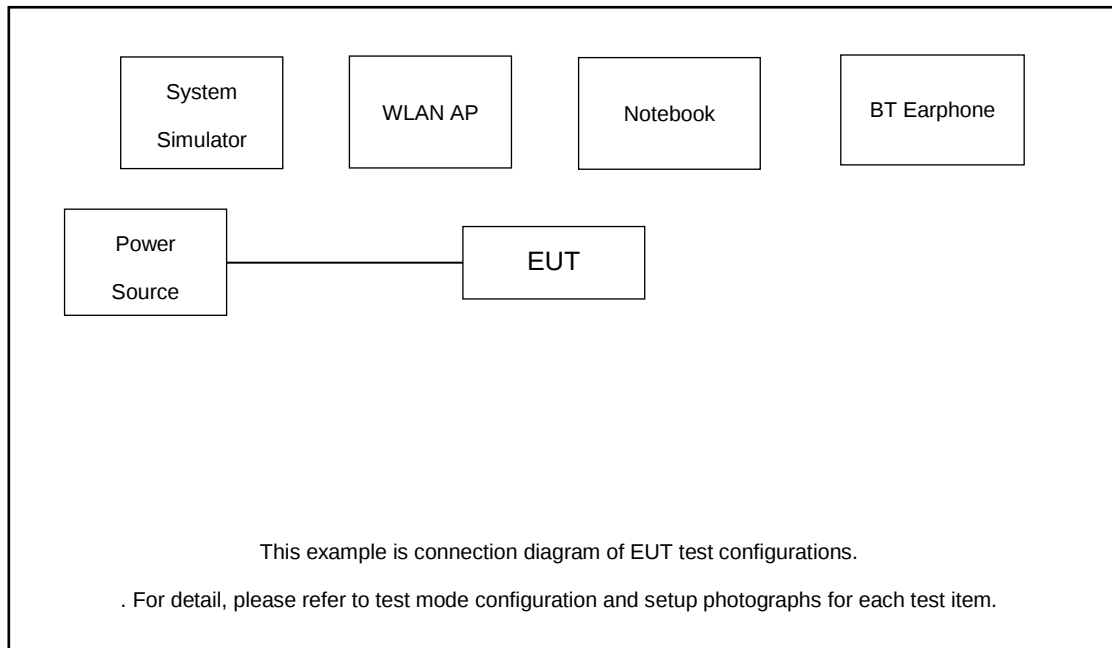
Channel	Frequency(MHz)	ANT	Data Rate								
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
CH 01	2412 MHz	Ant1+2	23.38	-	-	-	-	-	-	-	-
CH 02	2417 MHz	Ant1+2	27.96	-	-	-	-	-	-	-	-
CH 06	2437 MHz	Ant1+2	28.58	28.36	28.32	28.13	28.19	28.22	28.18	28.19	28.21
CH 09	2452 MHz	Ant1+2	28.09	-	-	-	-	-	-	-	-
CH 10	2457 MHz	Ant1+2	27.09	-	-	-	-	-	-	-	-
CH 11	2462 MHz	Ant1+2	23.22	-	-	-	-	-	-	-	-

<802.11n HE20>

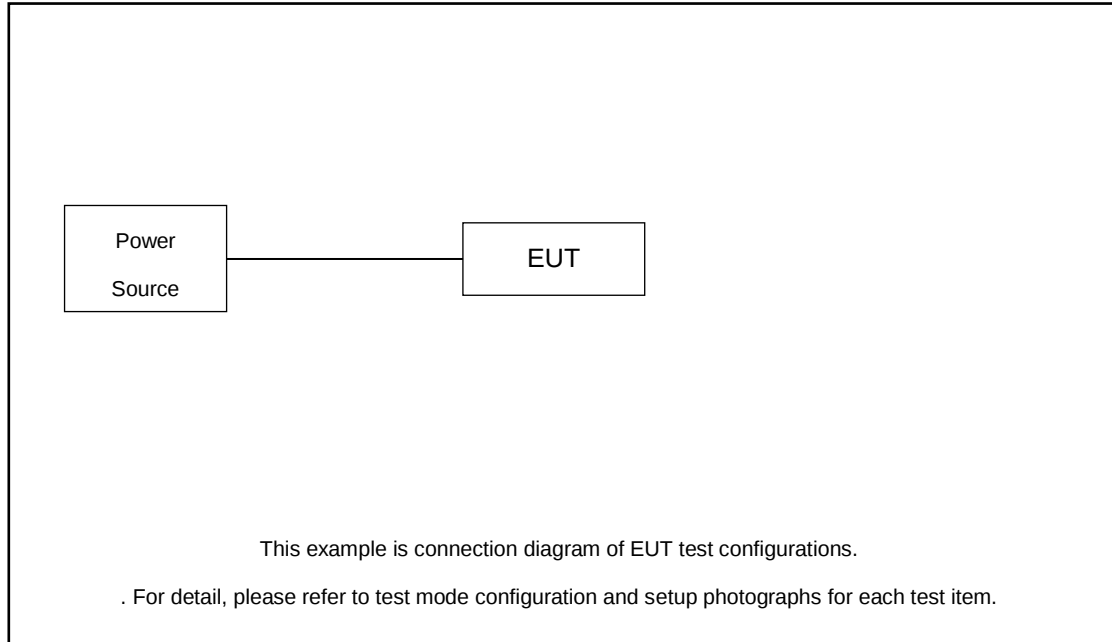
Channel	Frequency(MHz)	ANT	RU Config.	Data Rate											
				MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9	MCS10	MCS11
CH 01	2412 MHz	Ant1+2	Full	23.42	-	-	-	-	-	-	-	-	-	-	-
CH 02	2417 MHz	Ant1+2	Full	28.20	-	-	-	-	-	-	-	-	-	-	-
CH 06	2437 MHz	Ant1+2	Full	29.22	28.38	28.33	28.17	28.24	28.26	28.19	28.21	28.25	28.21	28.28	28.35
CH 09	2452 MHz	Ant1+2	Full	28.30	-	-	-	-	-	-	-	-	-	-	-
CH 10	2457 MHz	Ant1+2	Full	27.59	-	-	-	-	-	-	-	-	-	-	-
CH 11	2462 MHz	Ant1+2	Full	23.24	-	-	-	-	-	-	-	-	-	-	-

2.3 Connection Diagram of Test System

For Conducted Emission



For 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.	LTE Base Station	Anritus	MT8821C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	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 6.0 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 6.0 + 10 = 16.0 \text{ (dB)}
 \end{aligned}$$

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.

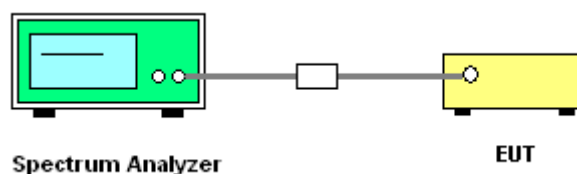
3.1.2 Measuring Instruments

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) = 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

2.4GHz Band MIMO										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant1	Ant2	Ant1	Ant2		
11b	1Mbps	2	1	2412	11.64	11.39	7.58	7.54	0.50	Pass
11b	1Mbps	2	6	2437	11.59	11.59	7.54	7.54	0.50	Pass
11b	1Mbps	2	11	2462	11.34	11.84	7.08	7.56	0.50	Pass
11g	6Mbps	2	1	2412	19.03	19.18	16.08	16.32	0.50	Pass
11g	6Mbps	2	2	2417	18.38	18.28	16.06	16.32	0.50	Pass
11g	6Mbps	2	6	2437	19.93	20.03	16.34	16.32	0.50	Pass
11g	6Mbps	2	9	2452	18.43	18.33	15.96	15.76	0.50	Pass
11g	6Mbps	2	10	2457	18.03	18.08	16.48	16.48	0.50	Pass
11g	6Mbps	2	11	2462	18.48	19.98	16.08	16.30	0.50	Pass
HE20	MCS0	2	1	2412	19.73	19.58	18.70	16.30	0.50	Pass
HE20	MCS0	2	2	2417	19.53	19.48	18.15	18.45	0.50	Pass
HE20	MCS0	2	6	2437	19.63	19.78	18.85	18.13	0.50	Pass
HE20	MCS0	2	9	2452	19.78	19.73	19.10	18.98	0.50	Pass
HE20	MCS0	2	10	2457	19.58	19.58	19.08	19.05	0.50	Pass
HE20	MCS0	2	11	2462	19.43	19.73	15.45	18.93	0.50	Pass

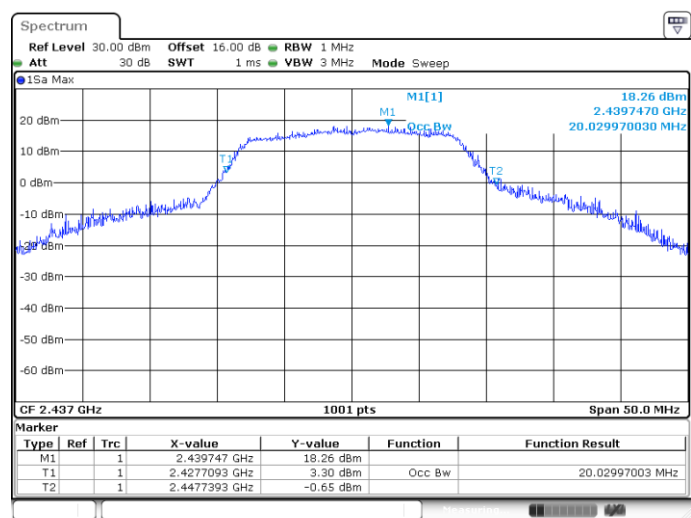
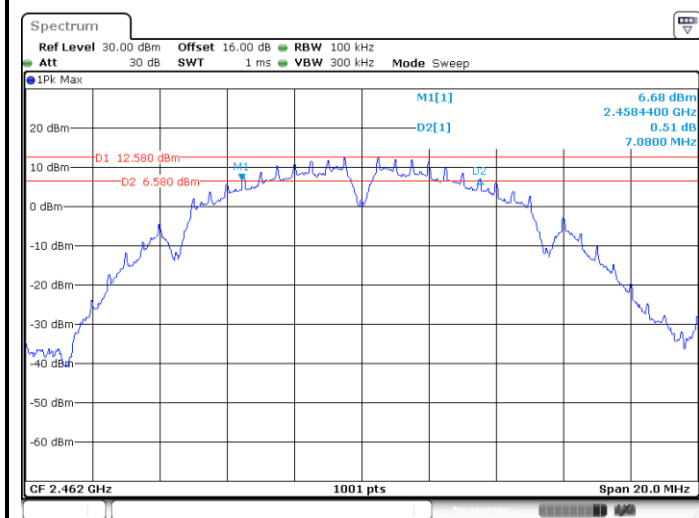
<Tx Beamforming Mode>

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2		
HE20	MCS0	2	1	2412	19.48	19.43	18.40	18.23	0.50	Pass
HE20	MCS0	2	2	2417	19.43	19.38	18.63	18.30	0.50	Pass
HE20	MCS0	2	6	2437	19.58	19.58	18.78	16.53	0.50	Pass
HE20	MCS0	2	10	2457	19.33	19.38	17.20	18.73	0.50	Pass
HE20	MCS0	2	11	2462	19.28	19.38	17.95	18.85	0.50	Pass



Minimum 6dB Bandwidth

Maximum 99% Occupied Bandwidth



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.

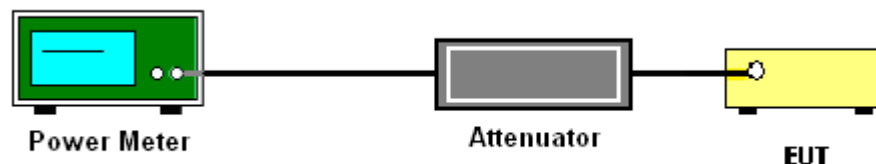
3.2.2 Measuring Instruments

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 11.9.2.3.1 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.
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 Peak Output Power

2.4GHz Band MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	23.41	24.11	26.78	30.00		1.39		28.17		36.00		Pass
11b	1Mbps	2	6	2437	23.58	23.81	26.71	30.00		1.39		28.10		36.00		Pass
11b	1Mbps	2	11	2462	20.12	20.66	23.41	30.00		1.39		24.80		36.00		Pass
11g	6Mbps	2	1	2412	21.40	21.02	24.22	30.00		1.39		25.61		36.00		Pass
11g	6Mbps	2	2	2417	24.88	25.88	28.42	30.00		1.39		29.81		36.00		Pass
11g	6Mbps	2	6	2437	25.80	25.92	28.87	30.00		1.39		30.26		36.00		Pass
11g	6Mbps	2	9	2452	25.55	25.34	28.46	30.00		1.39		29.85		36.00		Pass
11g	6Mbps	2	10	2457	21.55	21.96	24.77	30.00		1.39		26.16		36.00		Pass
11g	6Mbps	2	11	2462	20.18	20.36	23.28	30.00		1.39		24.67		36.00		Pass
HT20	MCS0	2	1	2412	20.35	20.16	23.27	30.00		1.39		24.66		36.00		Pass
HT20	MCS0	2	2	2417	24.88	24.79	27.85	30.00		1.39		29.24		36.00		Pass
HT20	MCS0	2	6	2437	25.51	25.62	28.58	30.00		1.39		29.97		36.00		Pass
HT20	MCS0	2	9	2452	25.07	25.14	28.12	30.00		1.39		29.51		36.00		Pass
HT20	MCS0	2	10	2457	24.12	24.11	27.13	30.00		1.39		28.52		36.00		Pass
HT20	MCS0	2	11	2462	20.02	20.11	23.08	30.00		1.39		24.47		36.00		Pass
VHT20	MCS0	2	1	2412	20.48	20.25	23.38	30.00		1.39		24.77		36.00		Pass
VHT20	MCS0	2	2	2417	24.99	24.91	27.96	30.00		1.39		29.35		36.00		Pass
VHT20	MCS0	2	6	2437	25.50	25.63	28.58	30.00		1.39		29.97		36.00		Pass
VHT20	MCS0	2	9	2452	25.05	25.11	28.09	30.00		1.39		29.48		36.00		Pass
VHT20	MCS0	2	10	2457	24.11	24.05	27.09	30.00		1.39		28.48		36.00		Pass
VHT20	MCS0	2	11	2462	20.08	20.33	23.22	30.00		1.39		24.61		36.00		Pass



2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	20.52	20.29	23.42	30.00		1.39		24.81		36.00		Pass
HE20	MCS0	2	1	2412	26/0	17.22	16.96	20.10	30.00		1.39		21.49		36.00		Pass
HE20	MCS0	2	1	2412	52/37	20.46	20.05	23.27	30.00		1.39		24.66		36.00		Pass
HE20	MCS0	2	1	2412	106/53	20.33	19.99	23.17	30.00		1.39		24.56		36.00		Pass
HE20	MCS0	2	2	2417	Full	25.11	25.26	28.20	30.00		1.39		29.59		36.00		Pass
HE20	MCS0	2	6	2437	Full	26.01	26.40	29.22	30.00		1.39		30.61		36.00		Pass
HE20	MCS0	2	6	2437	26/4	22.29	22.71	25.52	30.00		1.39		26.91		36.00		Pass
HE20	MCS0	2	6	2437	52/39	24.90	25.10	28.01	30.00		1.39		29.40		36.00		Pass
HE20	MCS0	2	6	2437	106/53	24.56	24.90	27.74	30.00		1.39		29.13		36.00		Pass
HE20	MCS0	2	9	2452	Full	25.33	25.25	28.30	30.00		1.39		29.69		36.00		Pass
HE20	MCS0	2	10	2457	Full	24.36	24.79	27.59	30.00		1.39		28.98		36.00		Pass
HE20	MCS0	2	11	2462	Full	20.11	20.35	23.24	30.00		1.39		24.63		36.00		Pass
HE20	MCS0	2	11	2462	26/8	17.44	17.38	20.42	30.00		1.39		21.81		36.00		Pass
HE20	MCS0	2	11	2462	52/40	18.25	18.67	21.48	30.00		1.39		22.87		36.00		Pass
HE20	MCS0	2	11	2462	106/54	19.55	19.43	22.50	30.00		1.39		23.89		36.00		Pass

<Tx Beamforming Mode>

2.4GHz Band																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)				Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					RU	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
HE20	MCS0	2	1	2412	FULL	20.22	20.18	23.21	30.00		3.95		27.16		36.00		Pass
HE20	MCS0	2	2	2417	FULL	25.50	26.01	28.77	30.00		3.95		32.73		36.00		Pass
HE20	MCS0	2	6	2437	FULL	24.07	26.01	28.16	30.00		3.95		32.11		36.00		Pass
HE20	MCS0	2	10	2457	FULL	26.01	26.00	29.02	30.00		3.95		32.97		36.00		Pass
HE20	MCS0	2	11	2462	FULL	20.16	19.98	23.08	30.00		3.95		27.03		36.00		Pass



3.2.6 Test Result of Average Output Power (Reporting Only)

2.4GHz Band MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	20.18	21.06	23.65	30.00		1.39		25.04		36.00		Pass
11b	1Mbps	2	6	2437	20.58	20.68	23.64	30.00		1.39		25.03		36.00		Pass
11b	1Mbps	2	11	2462	18.01	18.24	21.14	30.00		1.39		22.53		36.00		Pass
11g	6Mbps	2	1	2412	16.14	17.22	19.72	30.00		1.39		21.11		36.00		Pass
11g	6Mbps	2	2	2417	17.46	18.09	20.80	30.00		1.39		22.19		36.00		Pass
11g	6Mbps	2	6	2437	19.17	20.02	22.63	30.00		1.39		24.02		36.00		Pass
11g	6Mbps	2	9	2452	17.64	18.10	20.89	30.00		1.39		22.28		36.00		Pass
11g	6Mbps	2	10	2457	14.86	15.10	17.99	30.00		1.39		19.38		36.00		Pass
11g	6Mbps	2	11	2462	15.25	15.58	18.43	30.00		1.39		19.82		36.00		Pass
HT20	MCS0	2	1	2412	15.07	16.26	18.72	30.00		1.39		20.11		36.00		Pass
HT20	MCS0	2	2	2417	17.14	17.08	20.12	30.00		1.39		21.51		36.00		Pass
HT20	MCS0	2	6	2437	18.44	18.55	21.51	30.00		1.39		22.90		36.00		Pass
HT20	MCS0	2	9	2452	15.56	15.56	18.57	30.00		1.39		19.96		36.00		Pass
HT20	MCS0	2	10	2457	13.34	13.21	16.29	30.00		1.39		17.68		36.00		Pass
HT20	MCS0	2	11	2462	13.25	13.36	16.32	30.00		1.39		17.71		36.00		Pass
VHT20	MCS0	2	1	2412	15.14	16.14	18.68	30.00		1.39		20.07		36.00		Pass
VHT20	MCS0	2	2	2417	17.27	17.20	20.25	30.00		1.39		21.64		36.00		Pass
VHT20	MCS0	2	6	2437	18.48	18.60	21.55	30.00		1.39		22.94		36.00		Pass
VHT20	MCS0	2	9	2452	15.75	15.77	18.77	30.00		1.39		20.16		36.00		Pass
VHT20	MCS0	2	10	2457	13.53	13.33	16.44	30.00		1.39		17.83		36.00		Pass
VHT20	MCS0	2	11	2462	13.14	13.80	16.49	30.00		1.39		17.88		36.00		Pass



2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config	Average Conducted Power with duty factor (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	15.06	16.30	18.73	30.00		1.39		20.12		36.00		Pass
HE20	MCS0	2	1	2412	26/0	8.21	8.85	11.55	30.00		1.39		12.94		36.00		Pass
HE20	MCS0	2	1	2412	52/37	11.11	11.50	14.32	30.00		1.39		15.71		36.00		Pass
HE20	MCS0	2	1	2412	106/53	14.55	15.14	17.87	30.00		1.39		19.26		36.00		Pass
HE20	MCS0	2	2	2417	Full	17.26	17.33	20.31	30.00		1.39		21.70		36.00		Pass
HE20	MCS0	2	6	2437	Full	18.50	18.67	21.60	30.00		1.39		22.99		36.00		Pass
HE20	MCS0	2	6	2437	26/4	13.48	13.72	16.61	30.00		1.39		18.00		36.00		Pass
HE20	MCS0	2	6	2437	52/39	15.64	16.74	19.24	30.00		1.39		20.63		36.00		Pass
HE20	MCS0	2	6	2437	106/53	17.71	17.93	20.83	30.00		1.39		22.22		36.00		Pass
HE20	MCS0	2	9	2452	Full	15.86	15.78	18.83	30.00		1.39		20.22		36.00		Pass
HE20	MCS0	2	10	2457	Full	13.56	13.50	16.54	30.00		1.39		17.93		36.00		Pass
HE20	MCS0	2	11	2462	Full	13.25	13.77	16.53	30.00		1.39		17.92		36.00		Pass
HE20	MCS0	2	11	2462	26/8	6.69	7.08	9.90	30.00		1.39		11.29		36.00		Pass
HE20	MCS0	2	11	2462	52/40	9.33	9.62	12.49	30.00		1.39		13.88		36.00		Pass
HE20	MCS0	2	11	2462	106/54	13.05	13.12	16.10	30.00		1.39		17.49		36.00		Pass

<Tx Beamforming Mode>

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)			Average Conducted Power (dBm)		
					RU	Ant 1	Ant 2	Ant 1	Ant 2	SUM
HE20	MCS0	2	1	2412	FULL	3.33	3.54	15.49	15.82	18.67
HE20	MCS0	2	2	2417	FULL	3.33	3.54	17.39	18.18	20.81
HE20	MCS0	2	6	2437	FULL	3.33	3.54	18.41	18.19	21.31
HE20	MCS0	2	10	2457	FULL	3.33	3.54	17.86	18.28	21.09
HE20	MCS0	2	11	2462	FULL	3.33	3.54	13.27	13.69	16.50

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.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

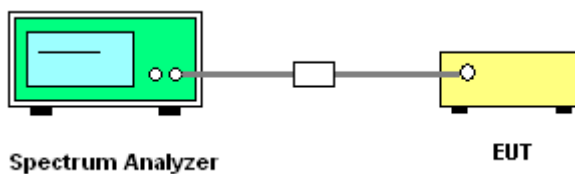
If measurements performed using method (2) plus $10 \log(N)$ exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

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

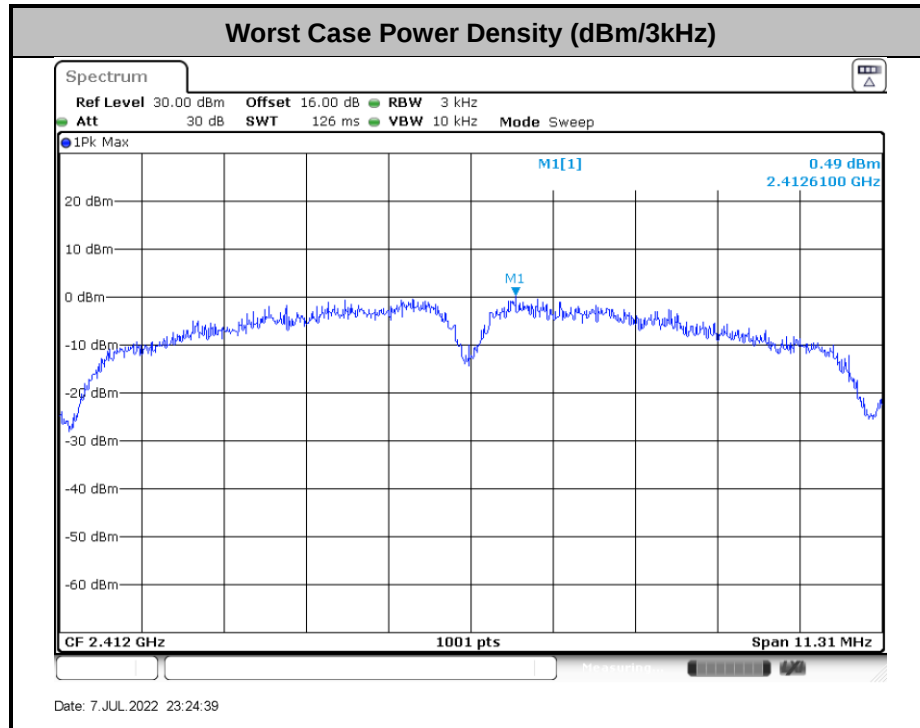
2.4GHz Band MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	-0.59	0.49	3.50	3.95		8.00		Pass
11b	1Mbps	2	6	2437	-0.41	0.13	3.14	3.95		8.00		Pass
11b	1Mbps	2	11	2462	-3.29	-3.71	-0.28	3.95		8.00		Pass
11g	6Mbps	2	1	2412	-7.83	-5.66	-2.65	3.95		8.00		Pass
11g	6Mbps	2	2	2417	-6.54	-7.33	-3.53	3.95		8.00		Pass
11g	6Mbps	2	6	2437	-3.82	-3.28	-0.27	3.95		8.00		Pass
11g	6Mbps	2	9	2452	-7.08	-6.03	-3.02	3.95		8.00		Pass
11g	6Mbps	2	10	2457	-9.54	-9.13	-6.12	3.95		8.00		Pass
11g	6Mbps	2	11	2462	-8.73	-8.98	-5.72	3.95		8.00		Pass



2.4GHz Band MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
						Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	-11.20	-7.51	-4.50	3.95		8.00		Pass
HE20	MCS0	2	1	2412	26/0	-9.12	-9.12	-6.11	3.95		8.00		Pass
HE20	MCS0	2	1	2412	52/37	-8.94	-8.94	-5.93	3.95		8.00		Pass
HE20	MCS0	2	1	2412	106/53	-8.99	-8.99	-5.98	3.95		8.00		Pass
HE20	MCS0	2	2	2417	Full	-7.56	-8.63	-4.55	3.95		8.00		Pass
HE20	MCS0	2	6	2437	Full	-4.84	-4.39	-1.38	3.95		8.00		Pass
HE20	MCS0	2	6	2437	26/4	-5.32	-4.82	-1.81	3.95		8.00		Pass
HE20	MCS0	2	6	2437	52/39	-5.38	-4.41	-1.40	3.95		8.00		Pass
HE20	MCS0	2	6	2437	106/53	-5.01	-5.45	-2.00	3.95		8.00		Pass
HE20	MCS0	2	9	2452	Full	-8.67	-9.74	-5.66	3.95		8.00		Pass
HE20	MCS0	2	10	2457	Full	-11.21	-12.51	-8.20	3.95		8.00		Pass
HE20	MCS0	2	11	2462	Full	-10.12	-10.75	-7.11	3.95		8.00		Pass
HE20	MCS0	2	11	2462	26/8	-10.53	-10.53	-7.52	3.95		8.00		Pass
HE20	MCS0	2	11	2462	52/40	-10.24	-10.24	-7.23	3.95		8.00		Pass
HE20	MCS0	2	11	2462	106/54	-10.66	-10.66	-7.65	3.95		8.00		Pass

<Tx Beamforming Mode>

2.4GHz Band													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)				DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					RU	Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
HE20	MCS0	2	1	2412	FULL	-9.10	-7.18	-4.17	3.95		8.00		Pass
HE20	MCS0	2	2	2417	FULL	-7.62	-6.96	-3.95	3.95		8.00		Pass
HE20	MCS0	2	6	2437	FULL	-7.87	-8.01	-4.86	3.95		8.00		Pass
HE20	MCS0	2	10	2457	FULL	-7.24	-7.08	-4.07	3.95		8.00		Pass
HE20	MCS0	2	11	2462	FULL	-12.50	-11.55	-8.54	3.95		8.00		Pass



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.

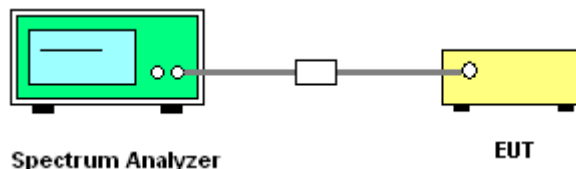
3.4.2 Measuring Instruments

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

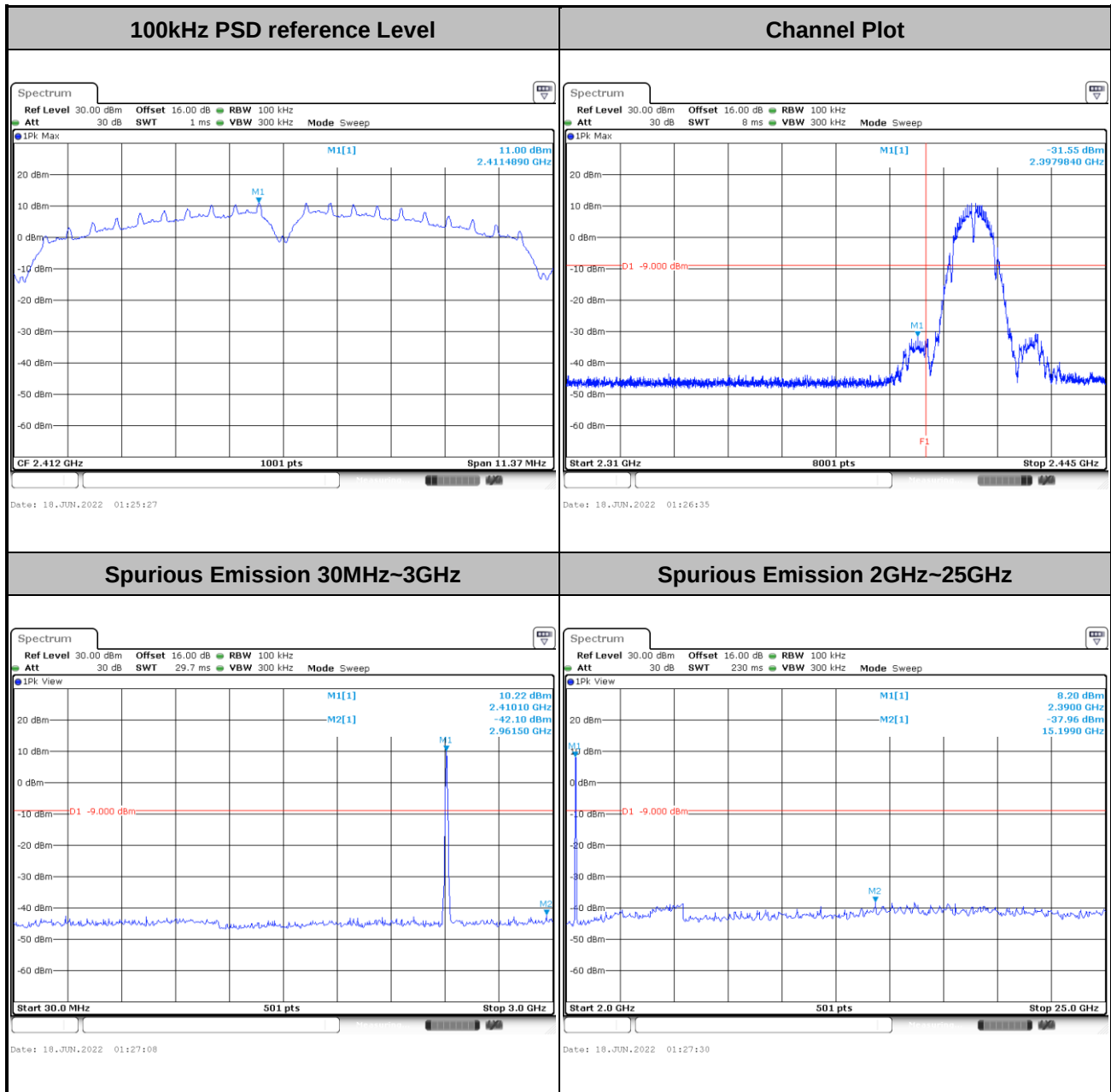


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer :	Jacob Zhang	Temperature :	21~25°C
		Relative Humidity :	51~54%

Number of TX = 2, Ant. 1 (Measured)

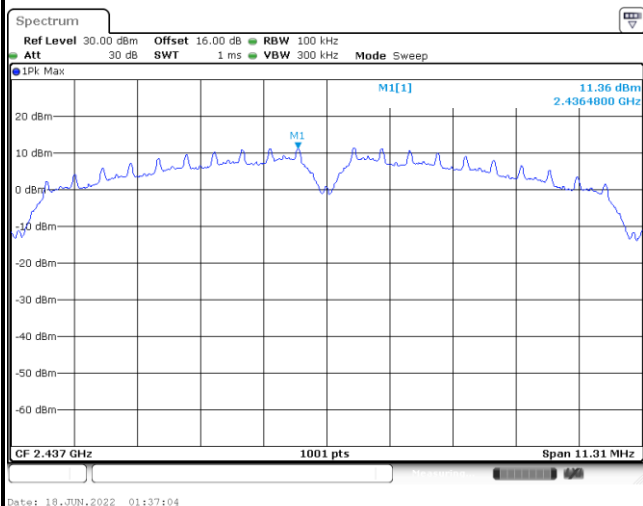
Test Mode :	802.11b	Test Channel :	01
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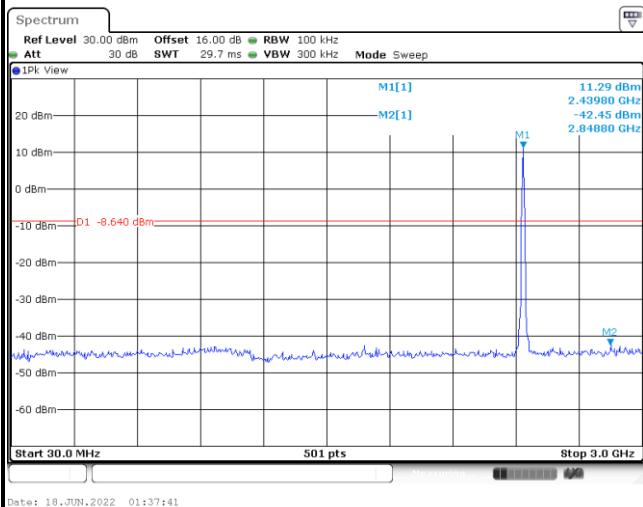


Test Mode :	802.11b	Test Channel :	06
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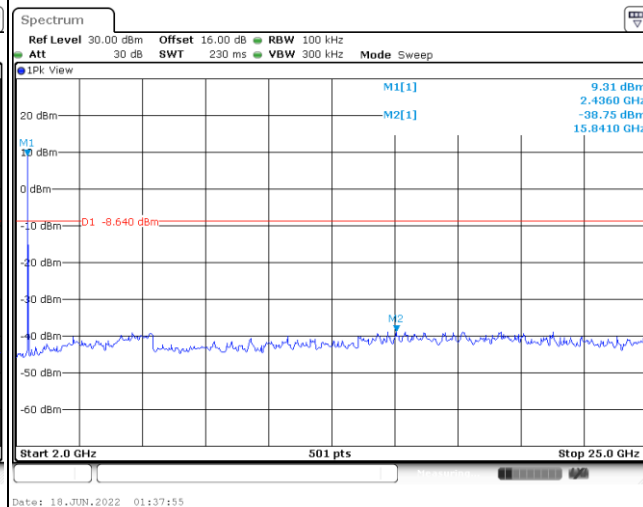
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

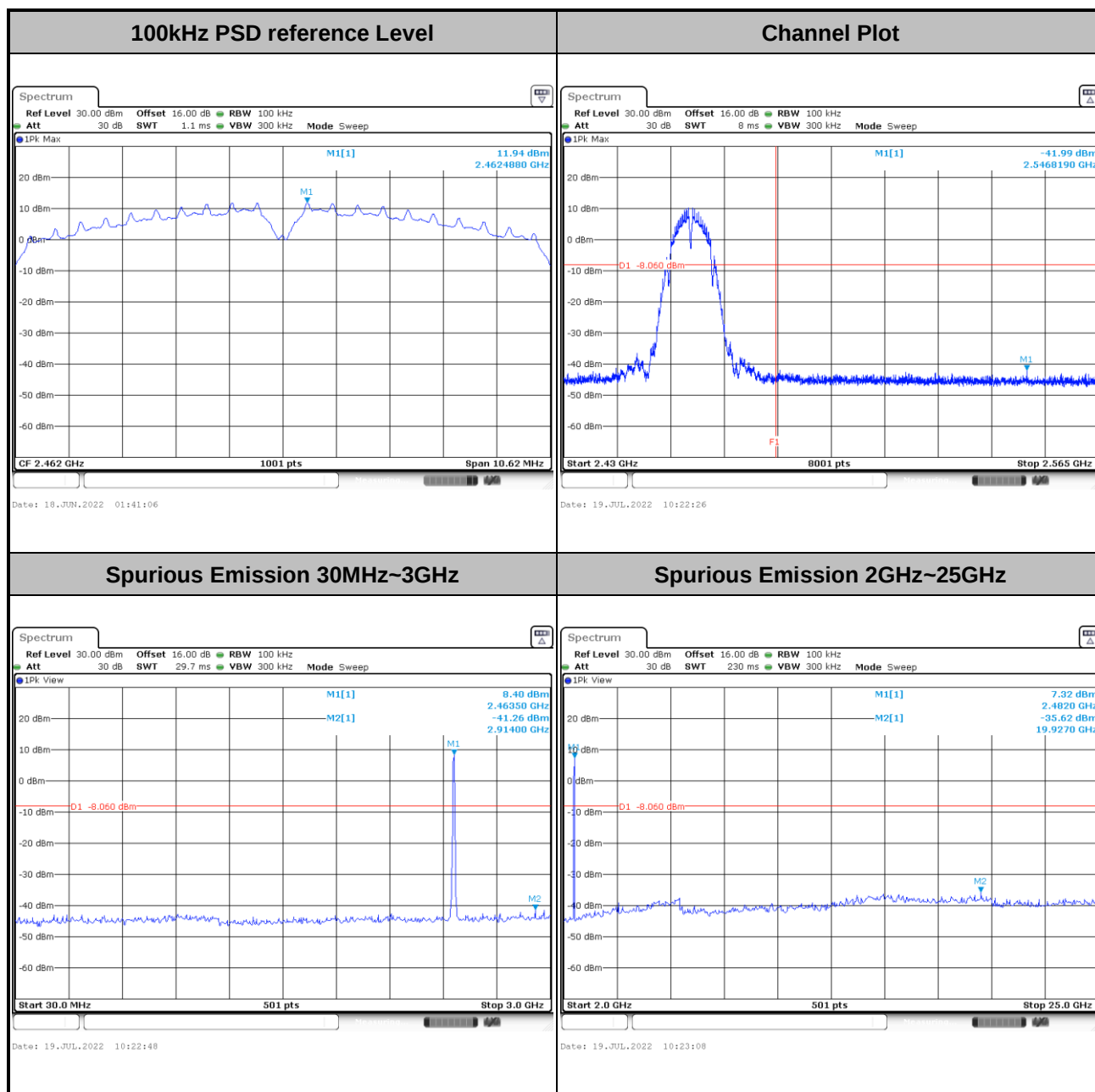


Spurious Emission 2GHz~25GHz





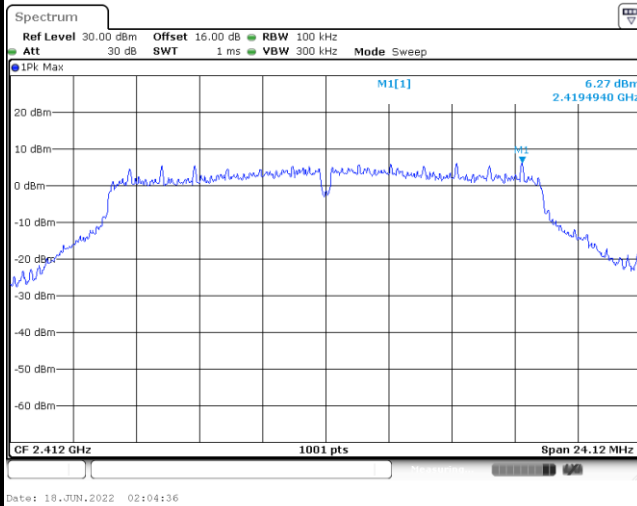
Test Mode :	802.11b	Test Channel :	11
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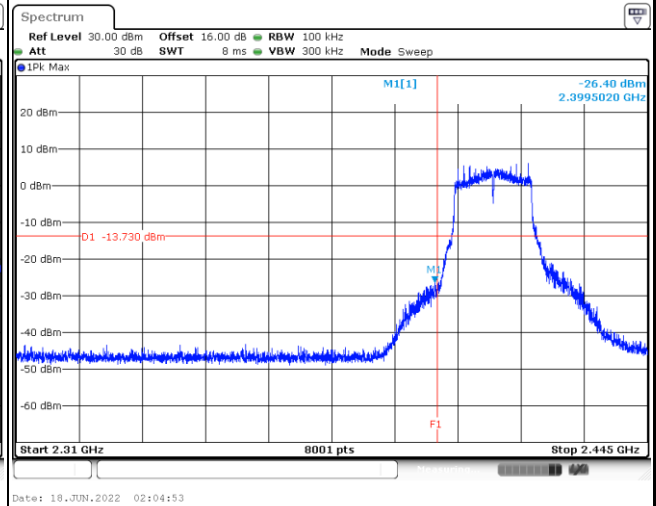


Test Mode :	802.11g	Test Channel :	01
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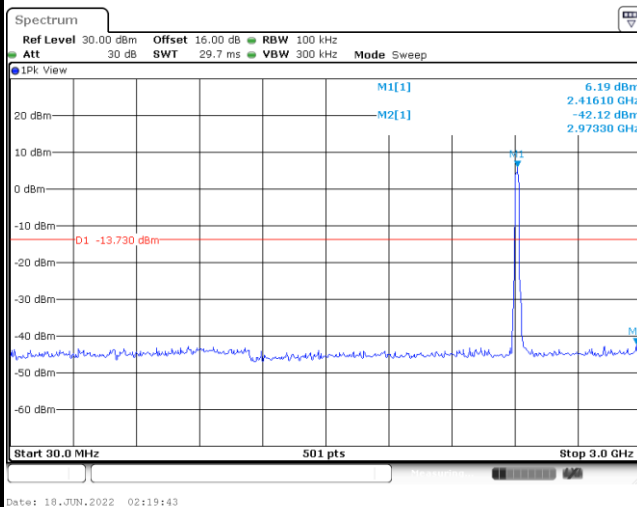
100kHz PSD reference Level



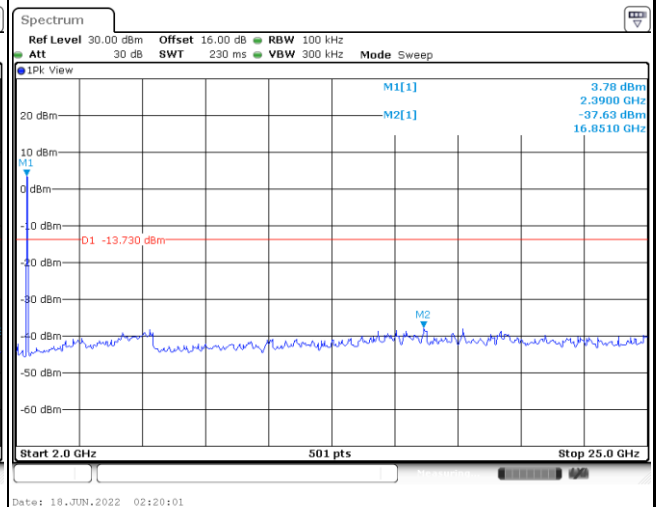
Channel Plot



Spurious Emission 30MHz~3GHz



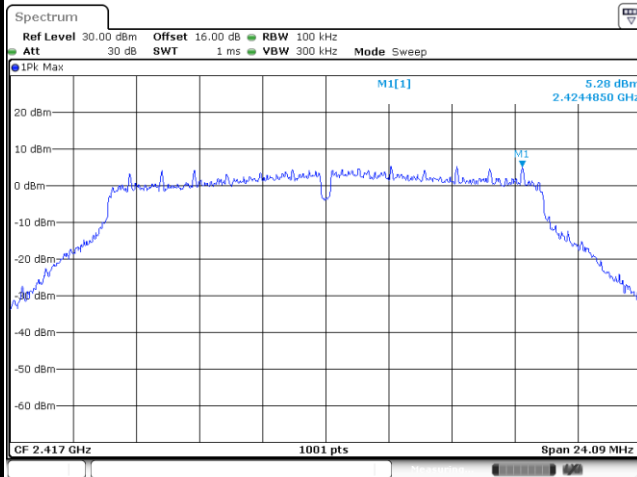
Spurious Emission 2GHz~25GHz





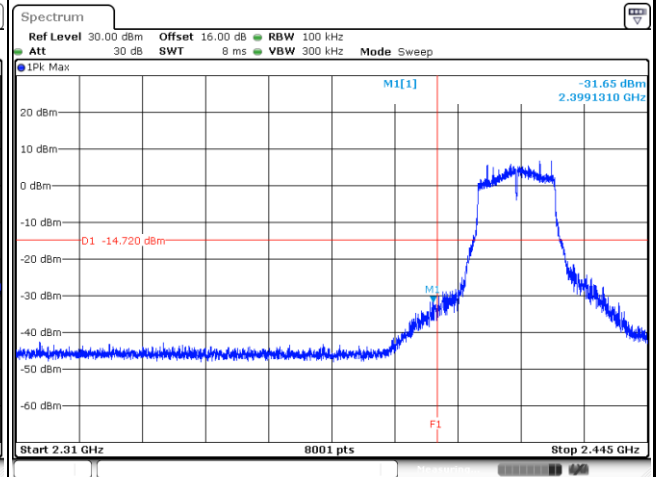
Test Mode :	802.11g	Test Channel :	02
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100kHz PSD reference Level



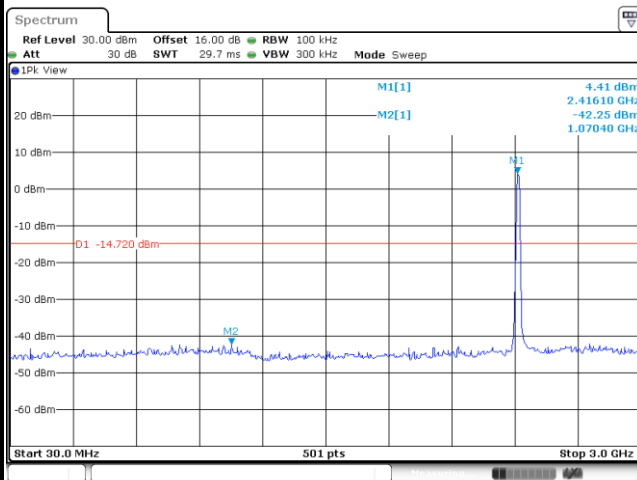
Date: 28 JUN 2022 15:17:13

Channel Plot



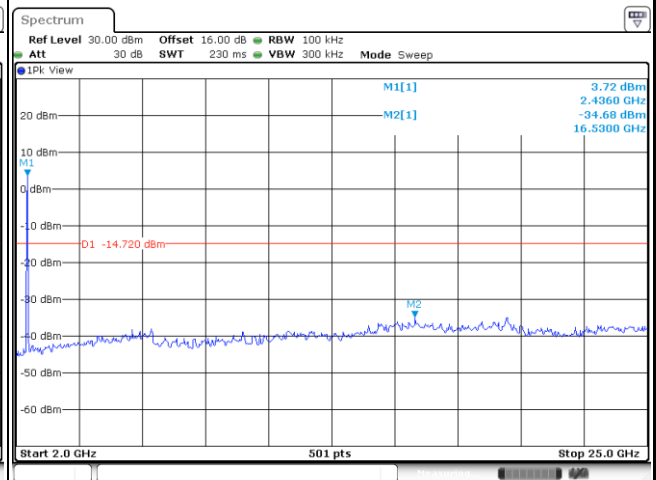
Date: 28 JUN 2022 19:00:45

Spurious Emission 30MHz~3GHz



Date: 28 JUN 2022 15:17:34

Spurious Emission 2GHz~25GHz

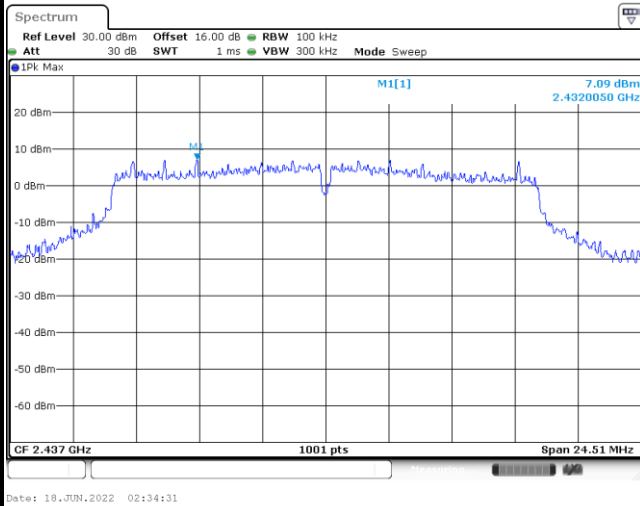


Date: 28 JUN 2022 15:17:54

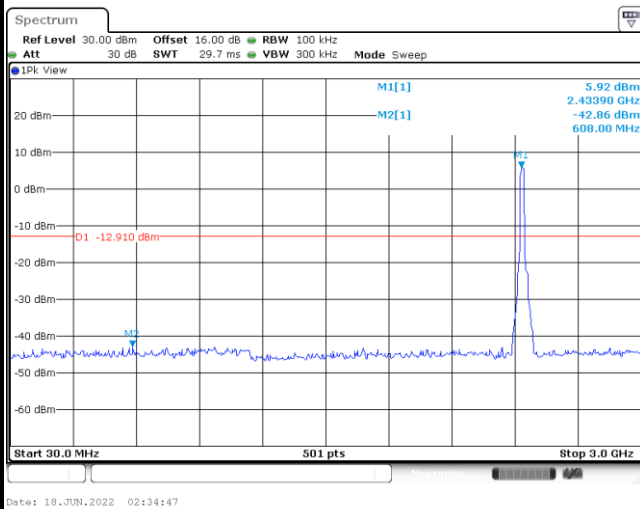


Test Mode :	802.11g	Test Channel :	06
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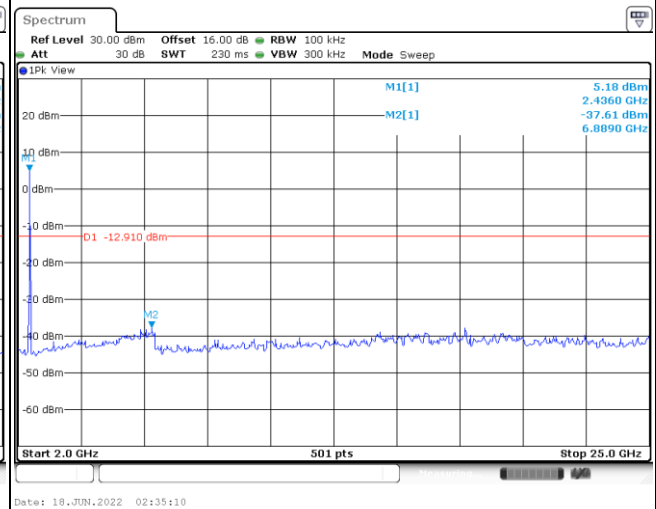
100kHz PSD reference Level

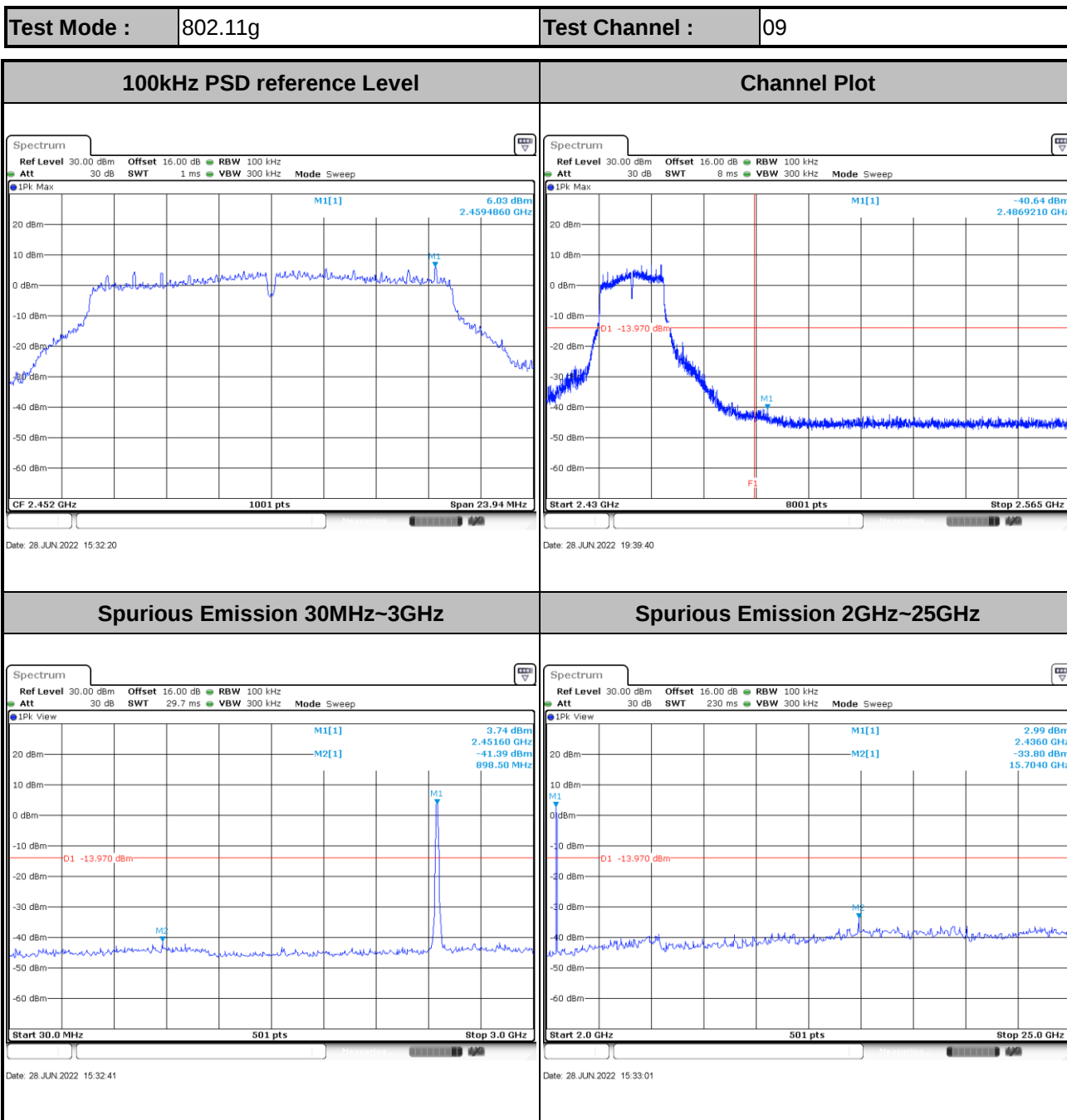


Spurious Emission 30MHz~3GHz



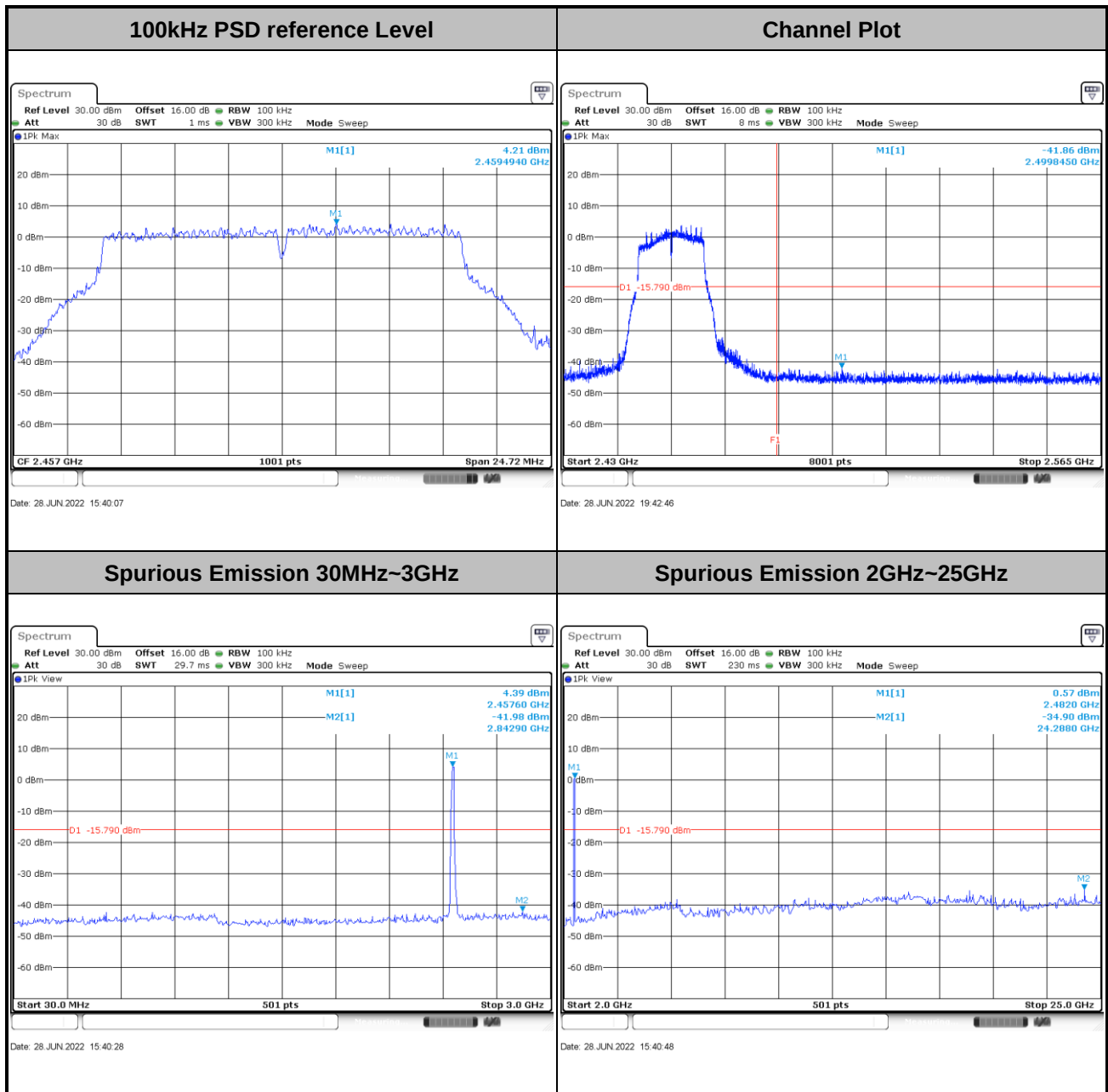
Spurious Emission 2GHz~25GHz





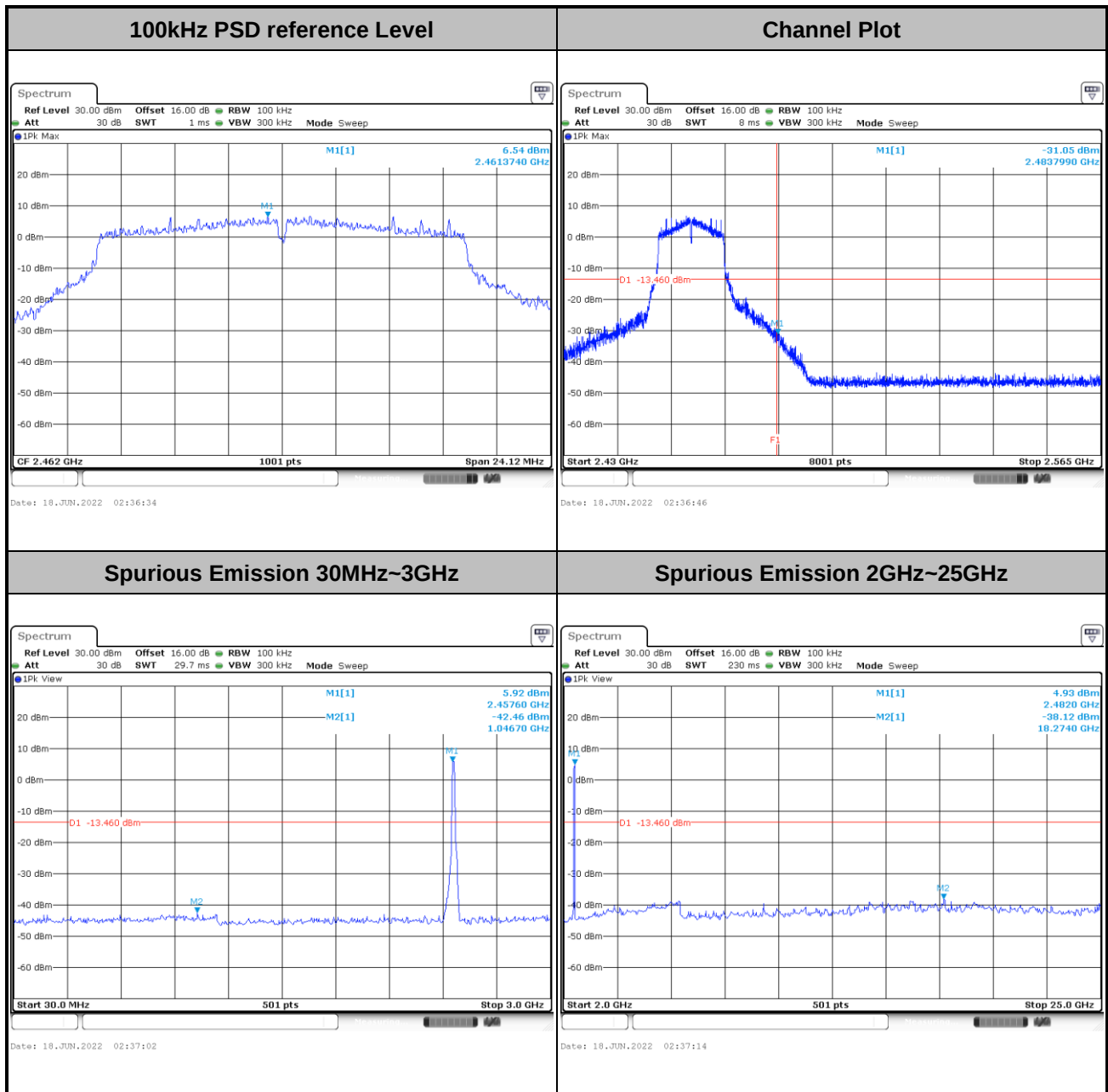


Test Mode :	802.11g	Test Channel :	10
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Test Mode :	802.11g	Test Channel :	11
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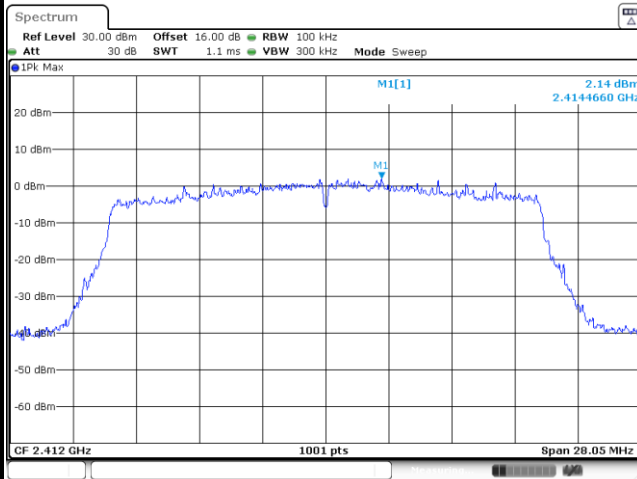




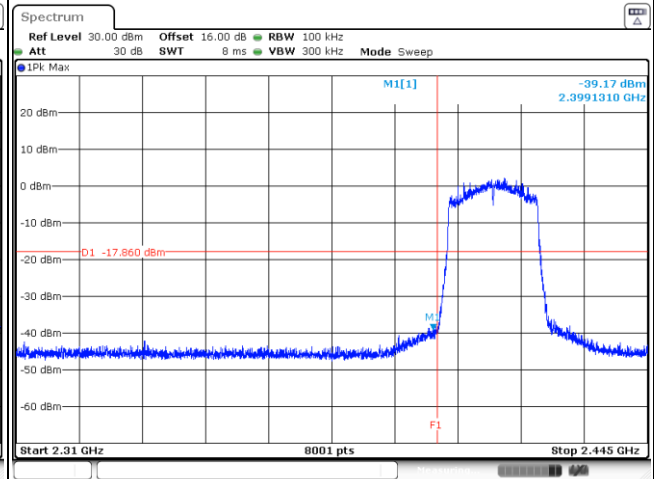
Test Mode : 802.11ax HE20

Test Channel : 01

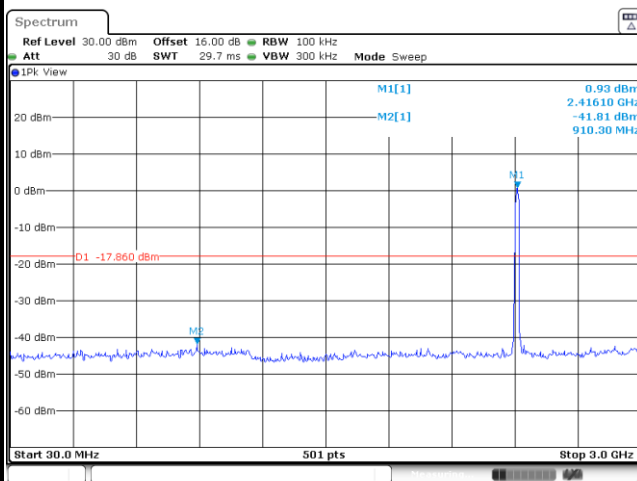
100kHz PSD reference Level



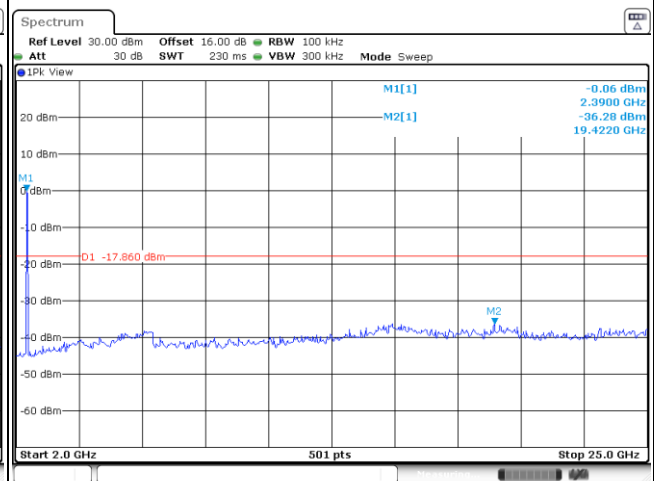
Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

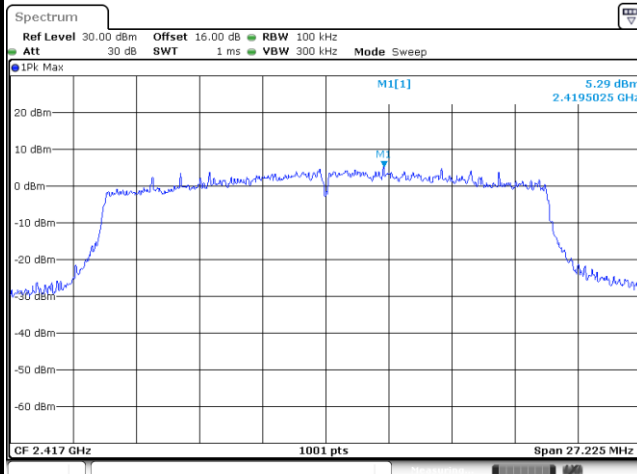




Test Mode : 802.11ax HE20

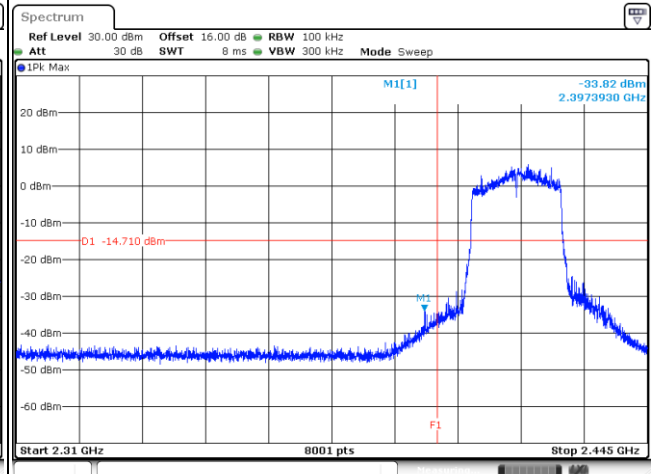
Test Channel : 02

100kHz PSD reference Level



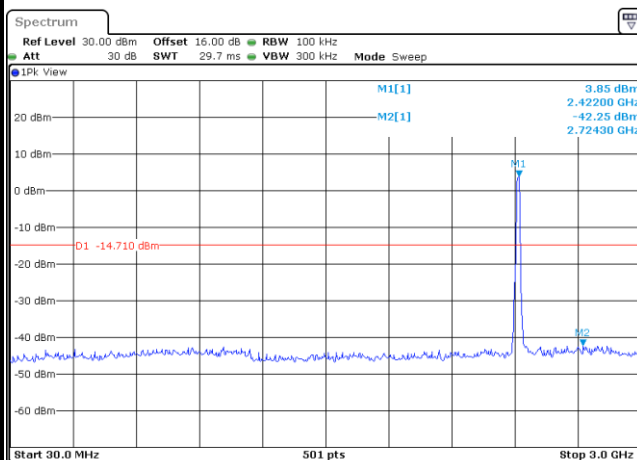
Date: 28 JUN 2022 15:54:20

Channel Plot



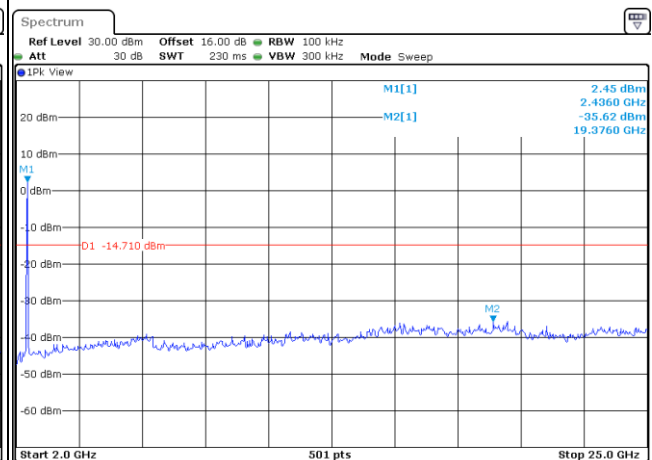
Date: 28 JUN 2022 19:48:50

Spurious Emission 30MHz~3GHz



Date: 28 JUN 2022 15:54:41

Spurious Emission 2GHz~25GHz

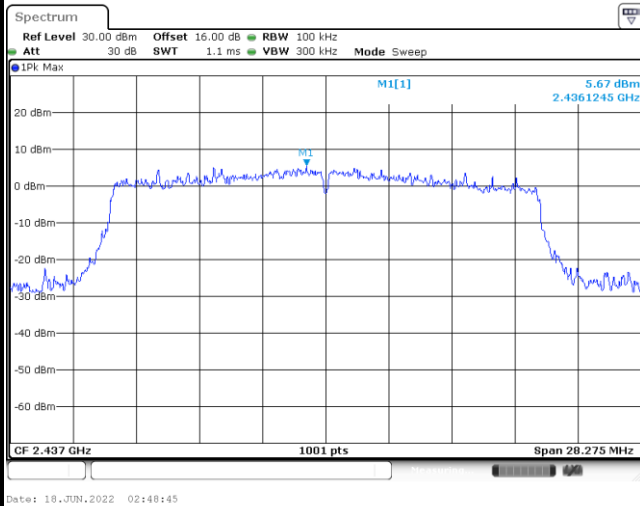


Date: 28 JUN 2022 15:55:02

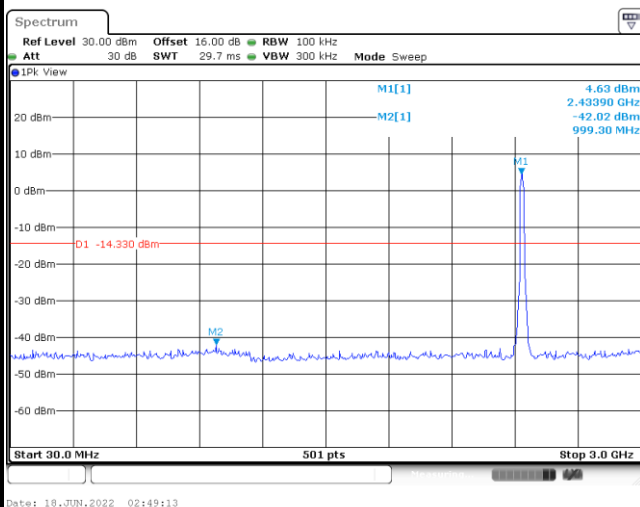


Test Mode :	802.11ax HE20	Test Channel :	06
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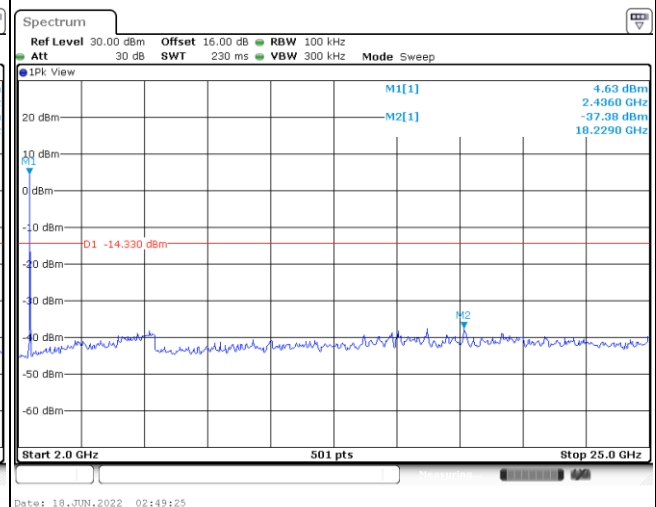
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

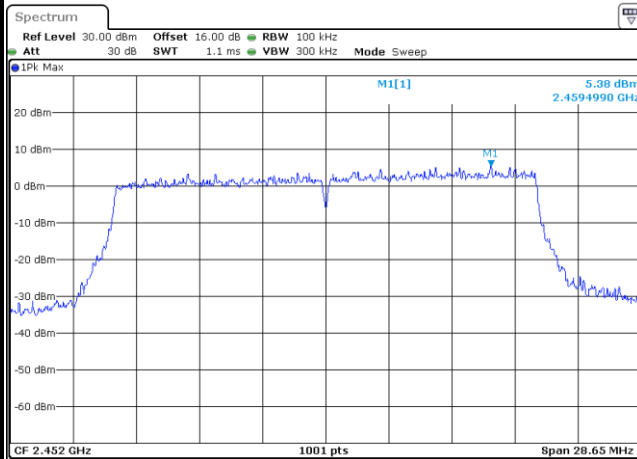




Test Mode : 802.11ax HE20

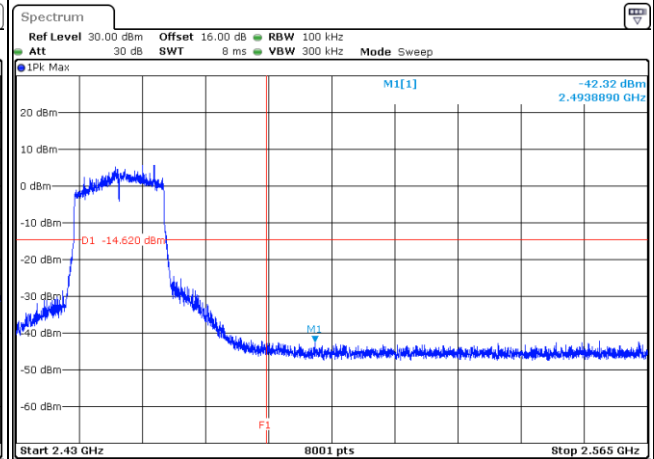
Test Channel : 09

100kHz PSD reference Level



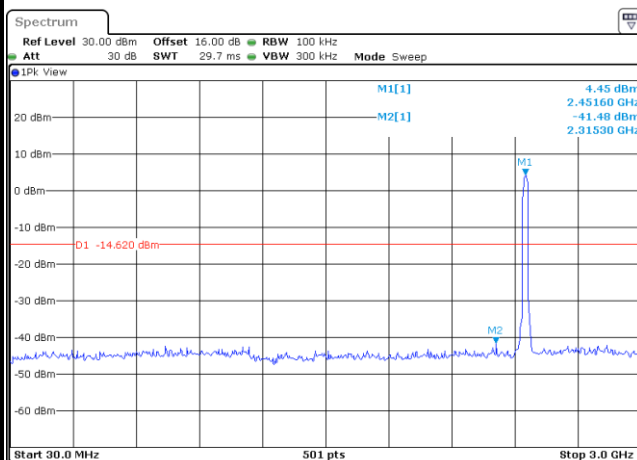
Date: 28 JUN 2022 16:12:51

Channel Plot



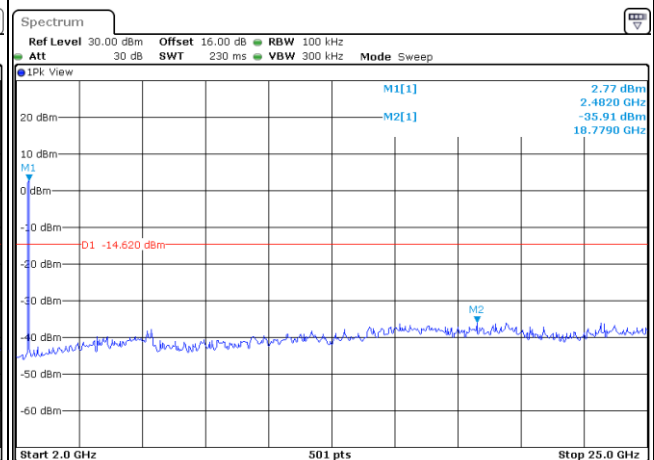
Date: 28 JUN 2022 19:50:58

Spurious Emission 30MHz~3GHz



Date: 28 JUN 2022 16:13:12

Spurious Emission 2GHz~25GHz



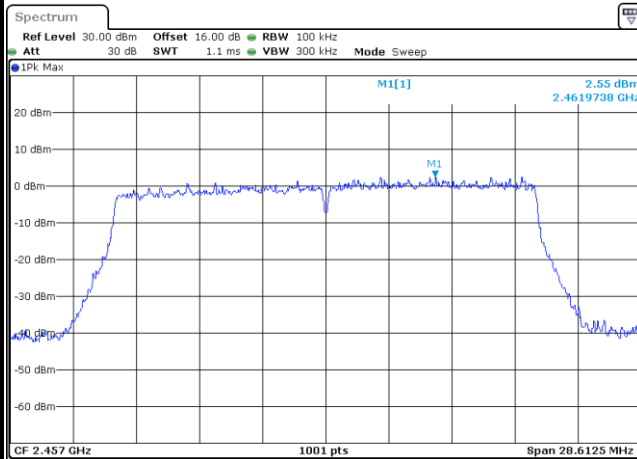
Date: 28 JUN 2022 16:13:32



Test Mode : 802.11ax HE20

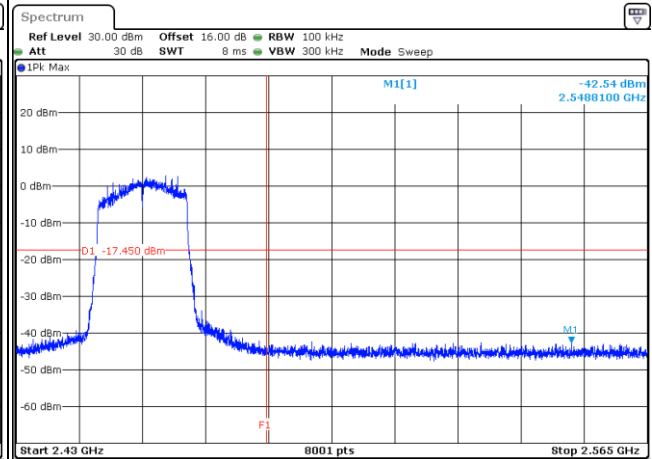
Test Channel : 10

100kHz PSD reference Level



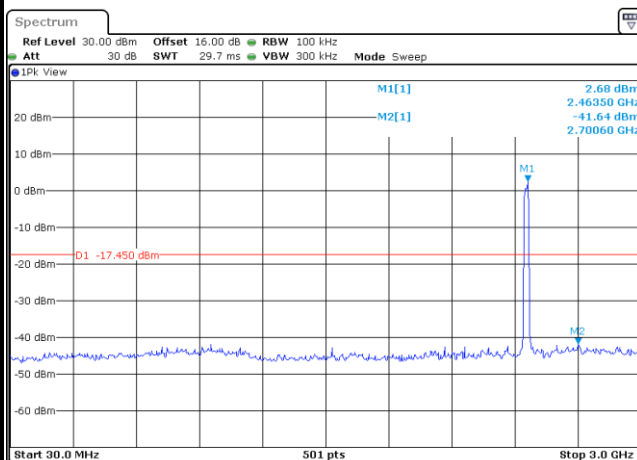
Date: 28 JUN 2022 16:16:28

Channel Plot



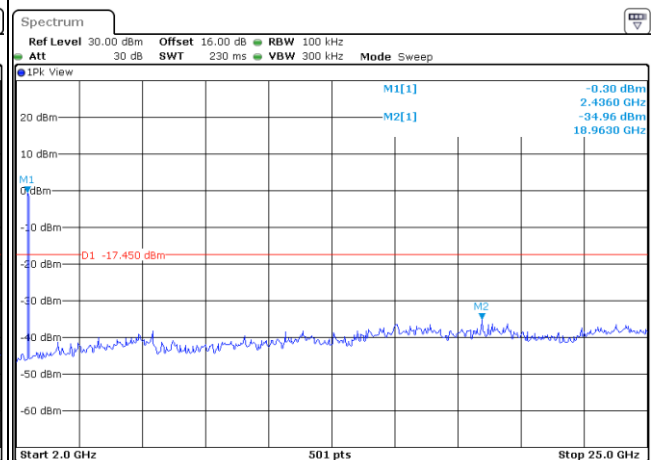
Date: 28 JUN 2022 19:52:55

Spurious Emission 30MHz~3GHz

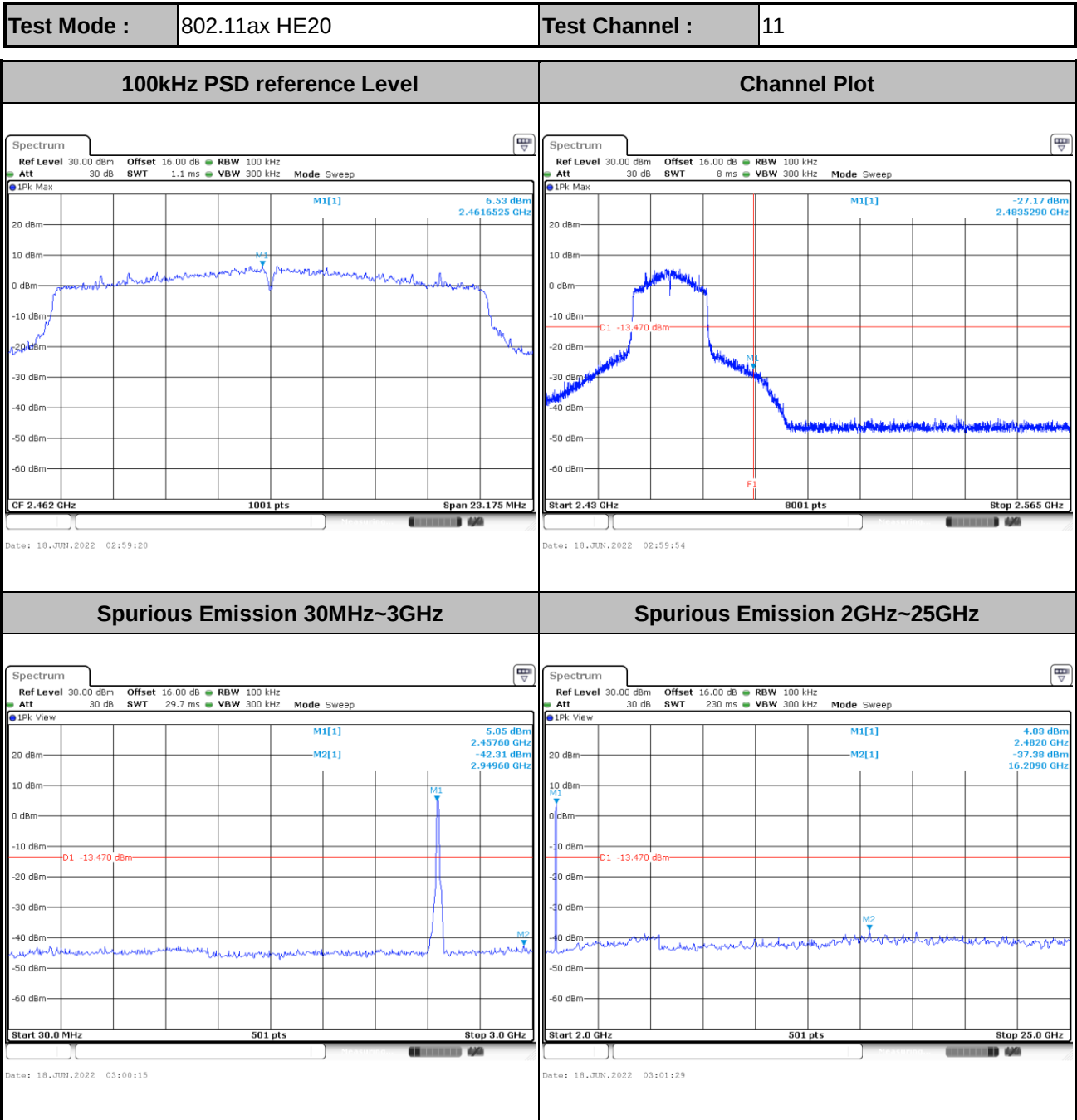


Date: 28 JUN 2022 16:16:49

Spurious Emission 2GHz~25GHz

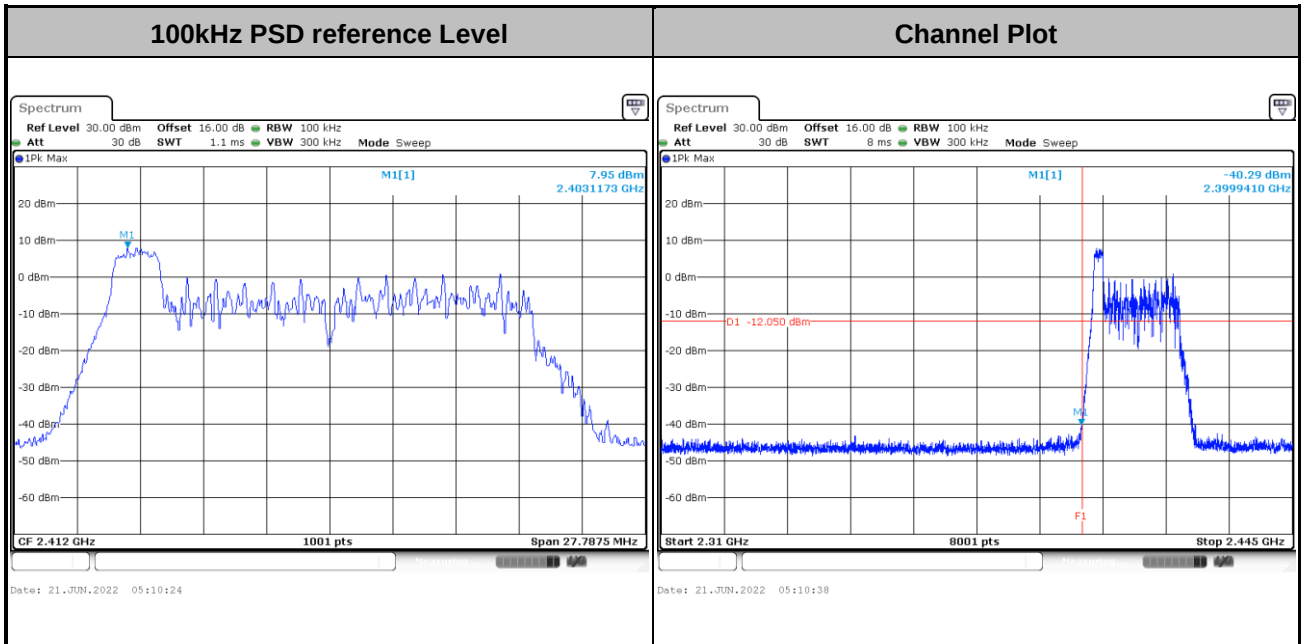


Date: 28 JUN 2022 16:17:09

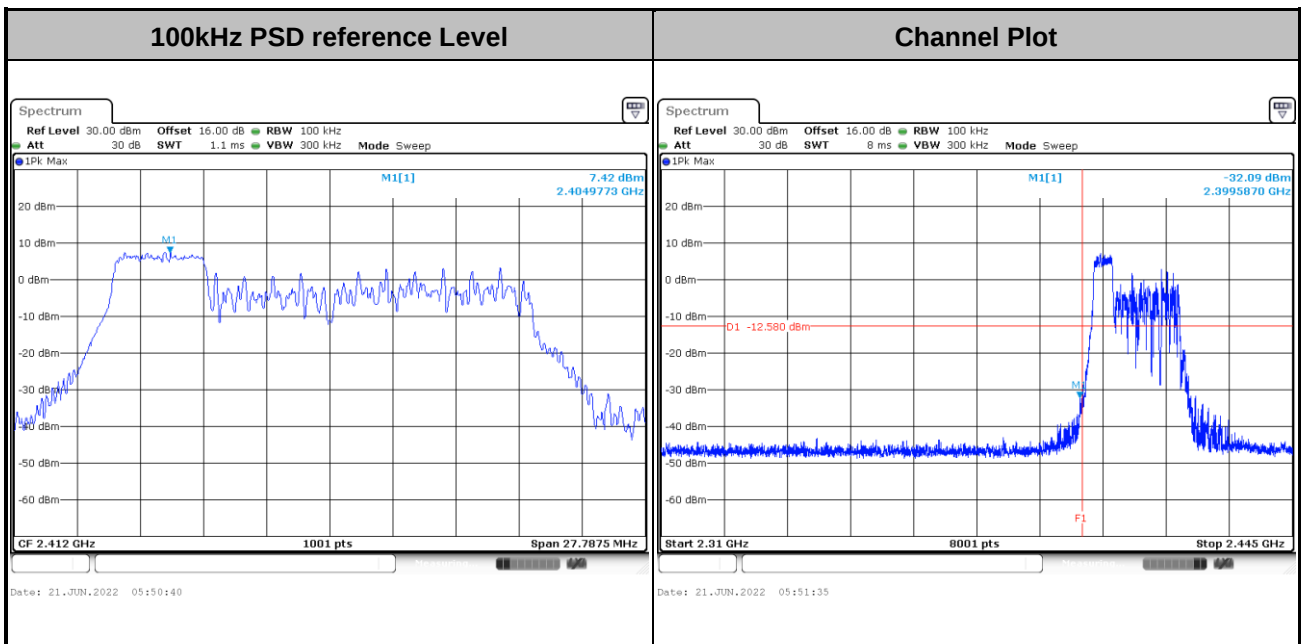


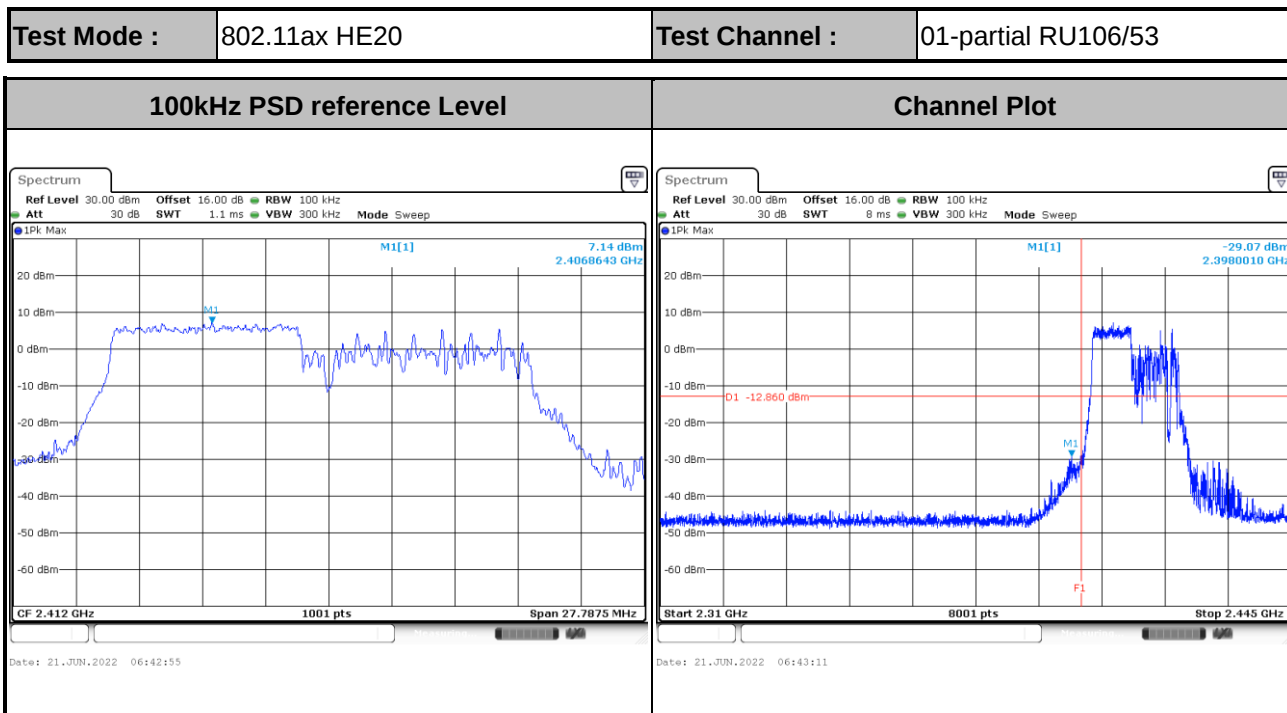


Test Mode :	802.11ax HE20	Test Channel :	01-partial RU26/0
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Test Mode :	802.11ax HE20	Test Channel :	01-partial RU52/37
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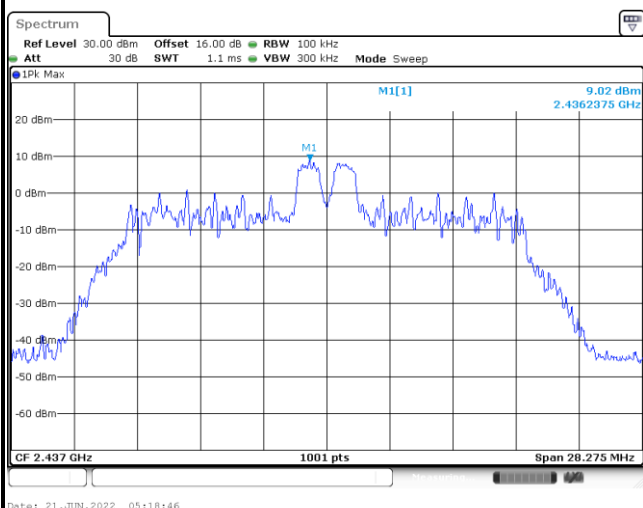






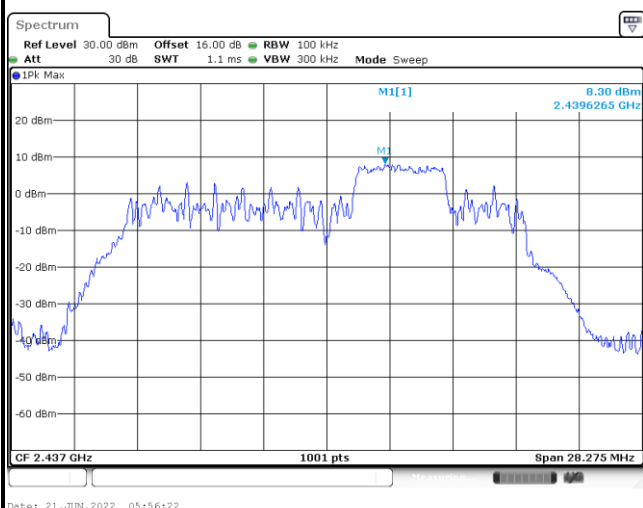
Test Mode :	802.11ax HE20	Test Channel :	06-partial RU26/4
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100kHz PSD reference Level



Test Mode :	802.11ax HE20	Test Channel :	06-partial RU52/39
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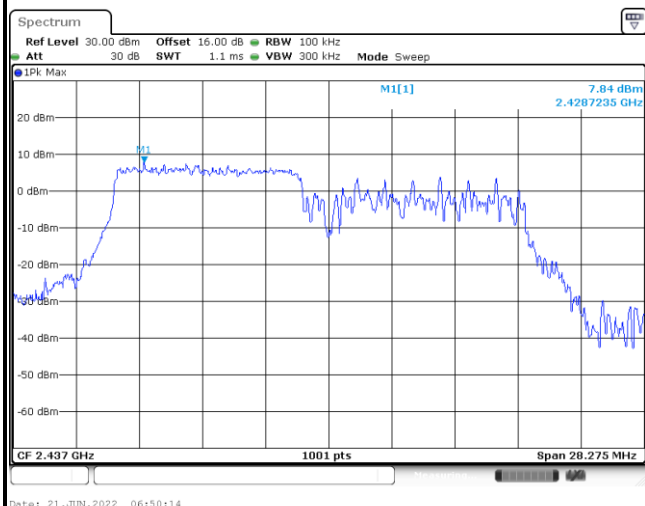
100kHz PSD reference Level

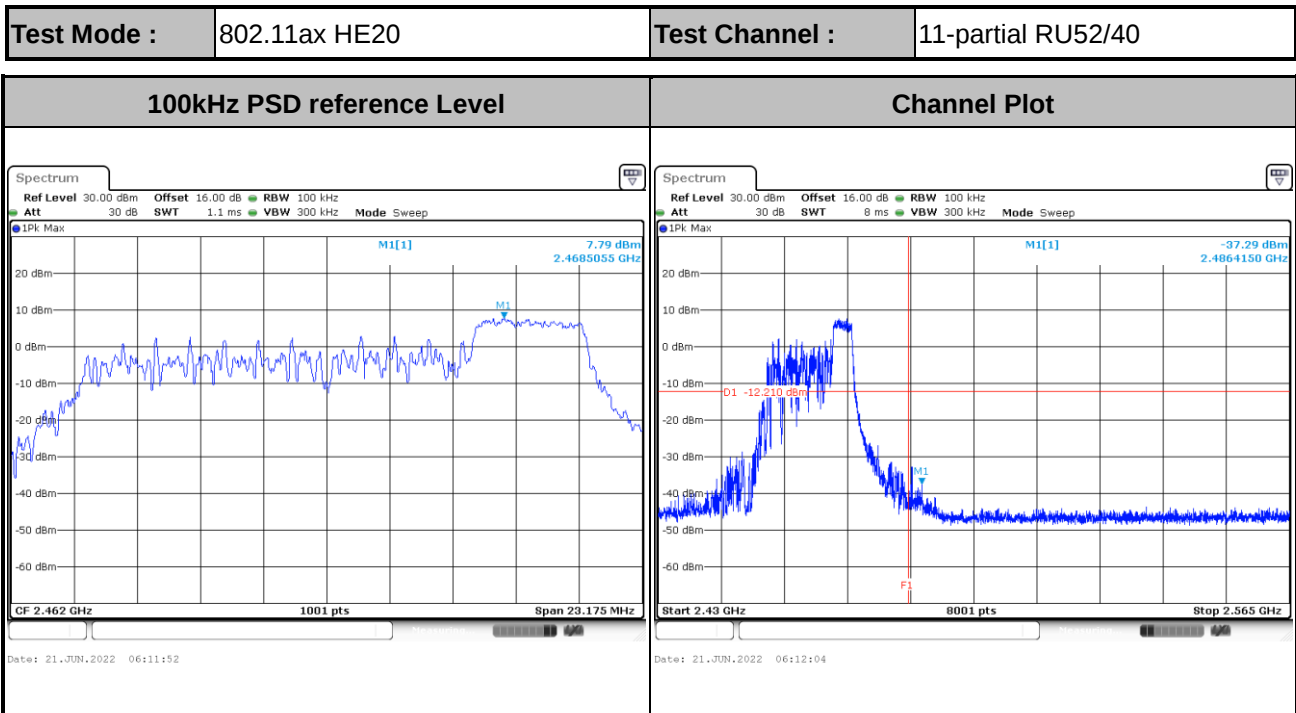
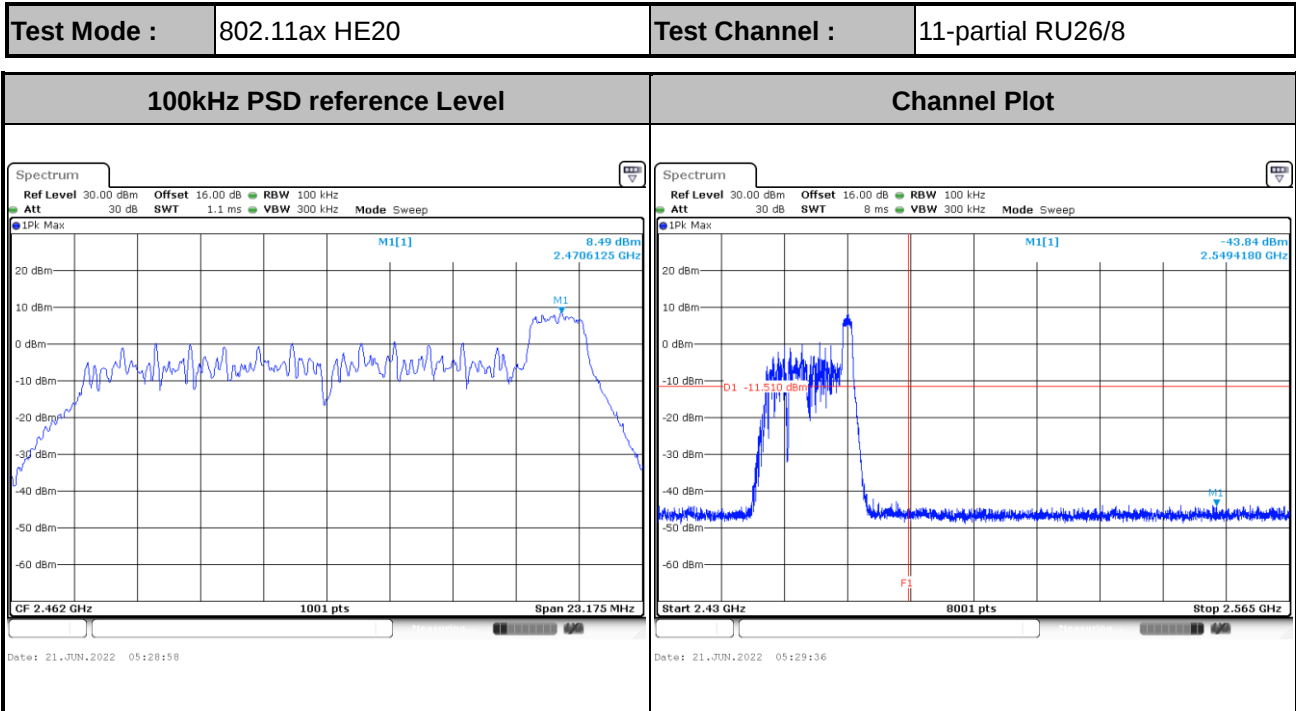


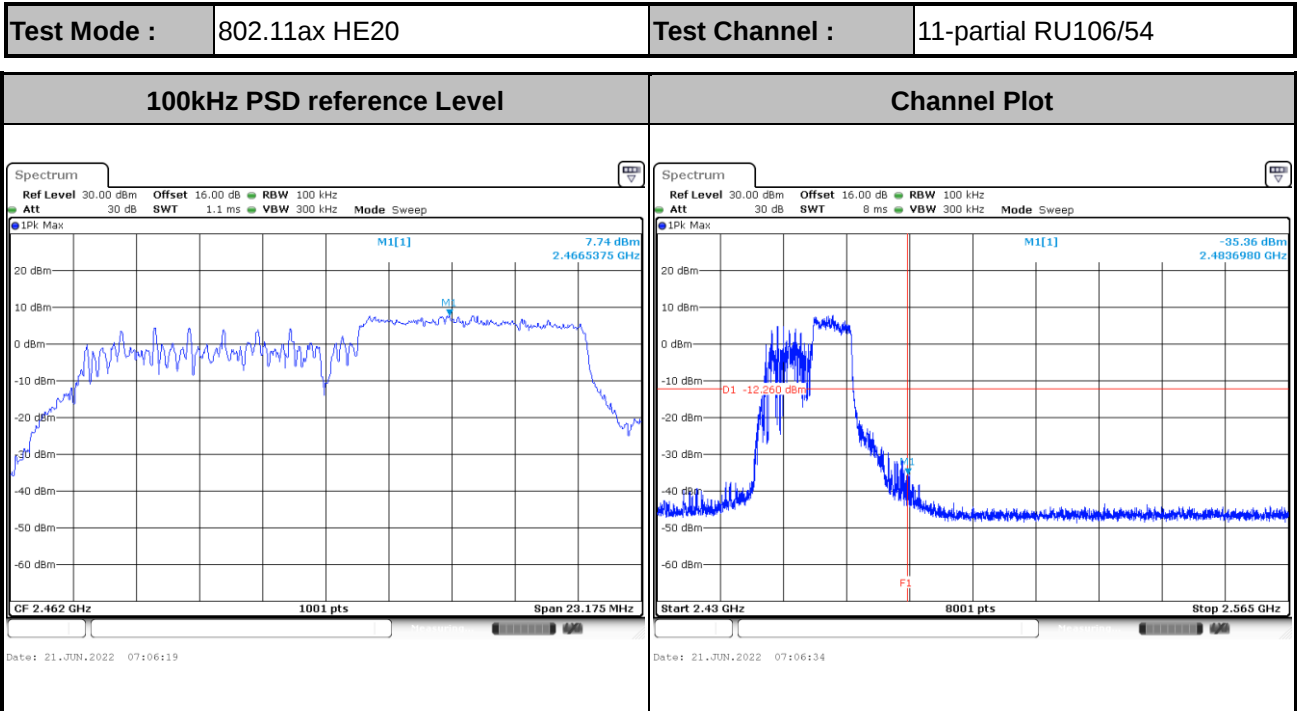


Test Mode :	802.11ax HE20	Test Channel :	06-partial RU106/53
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100kHz PSD reference Level



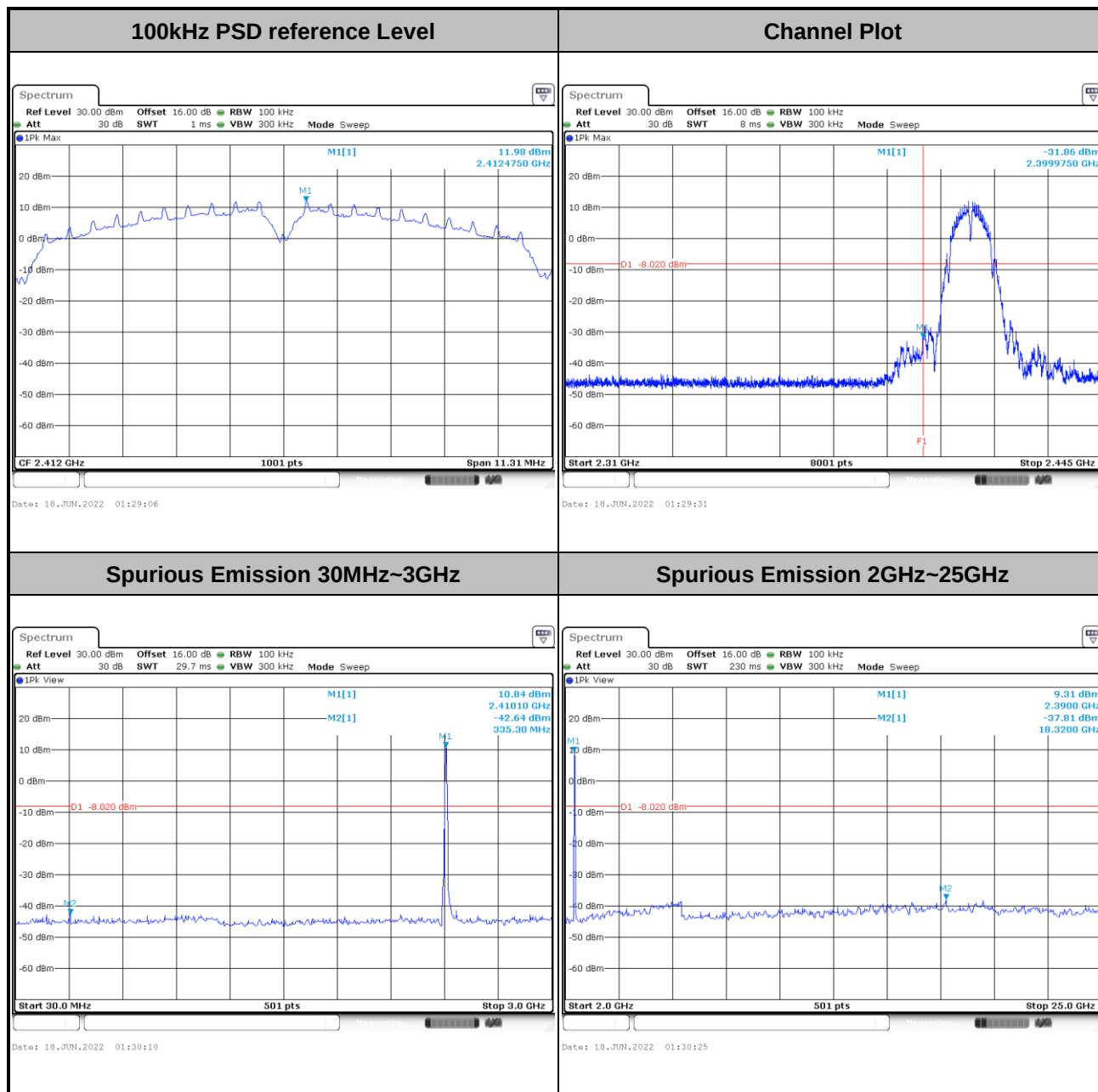






Number of TX = 2, Ant. 2 (Measured)

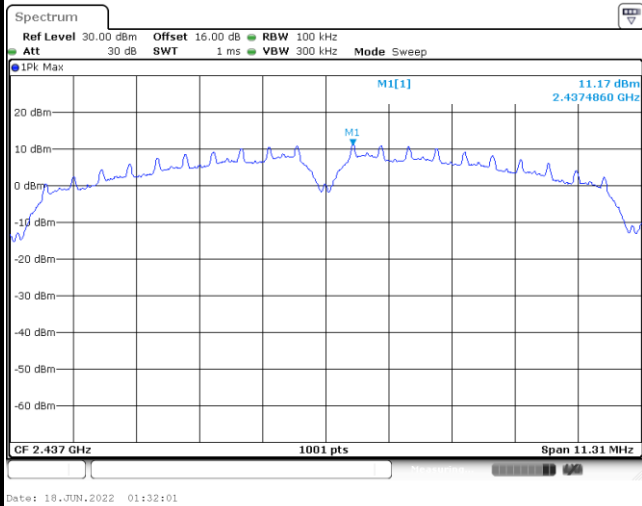
Test Mode :	802.11b	Test Channel :	01
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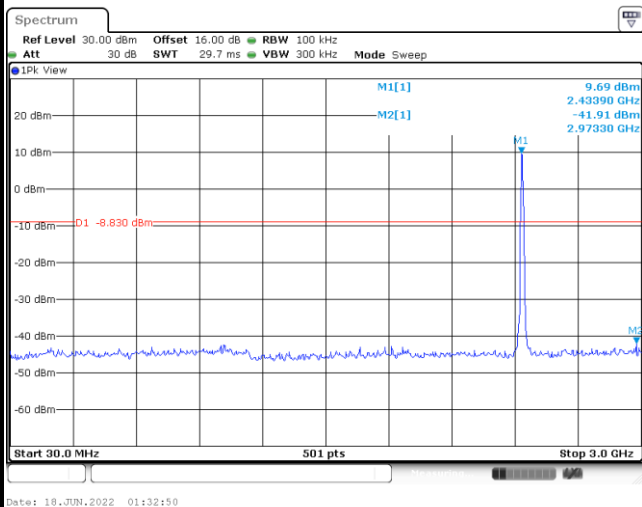


Test Mode :	802.11b	Test Channel :	06
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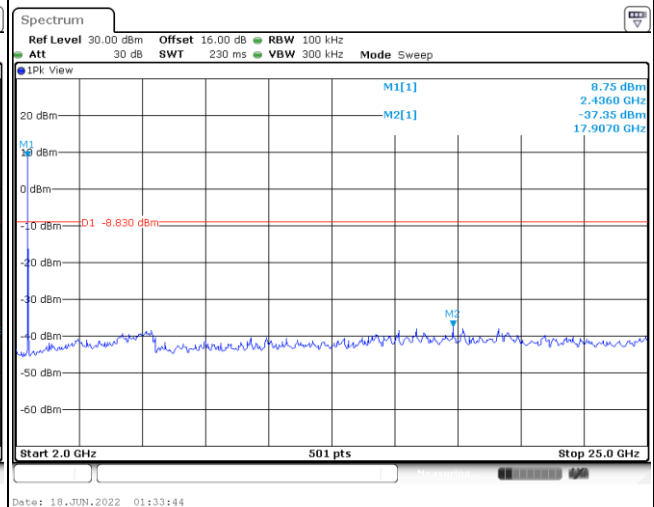
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

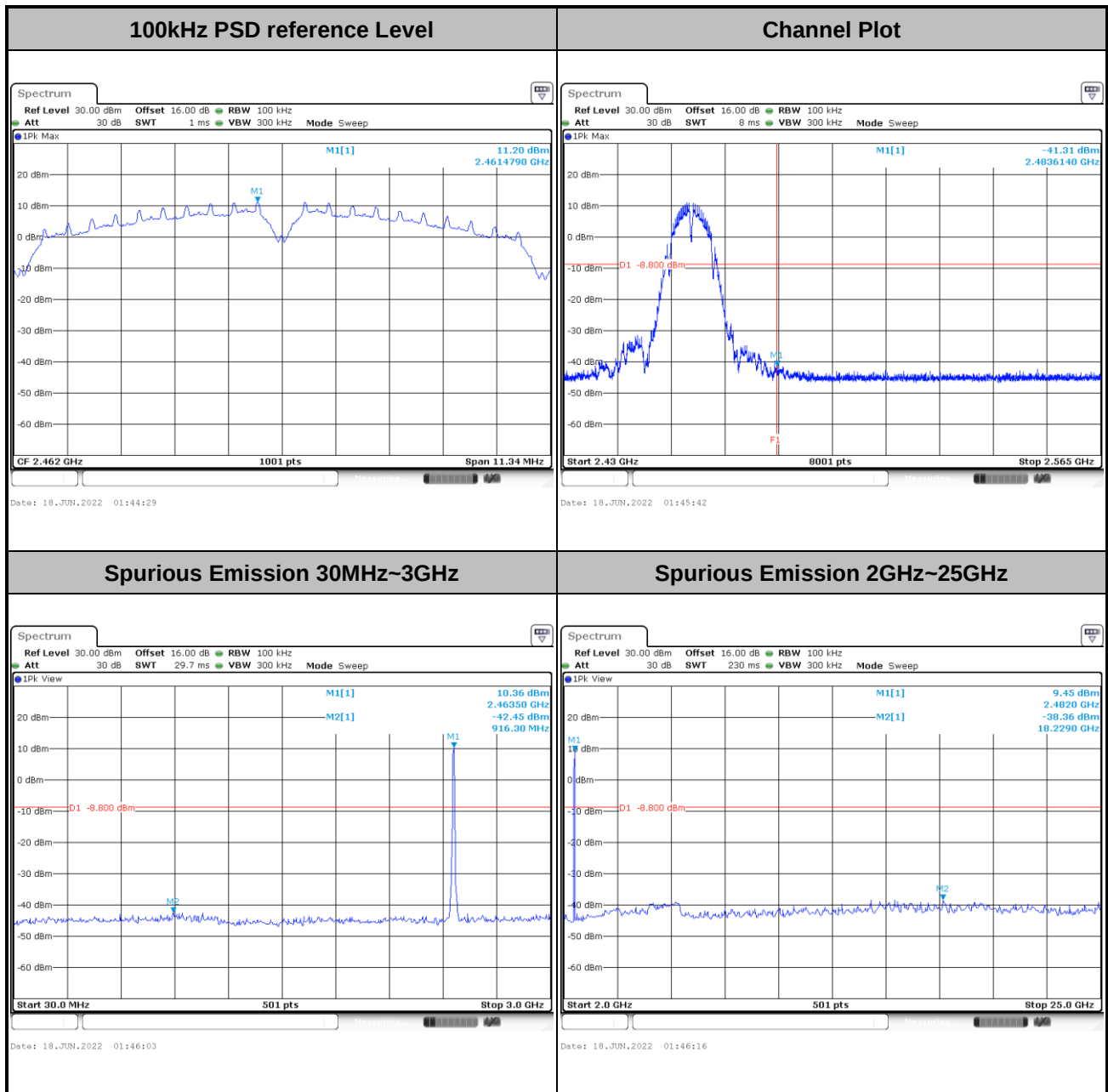


Spurious Emission 2GHz~25GHz





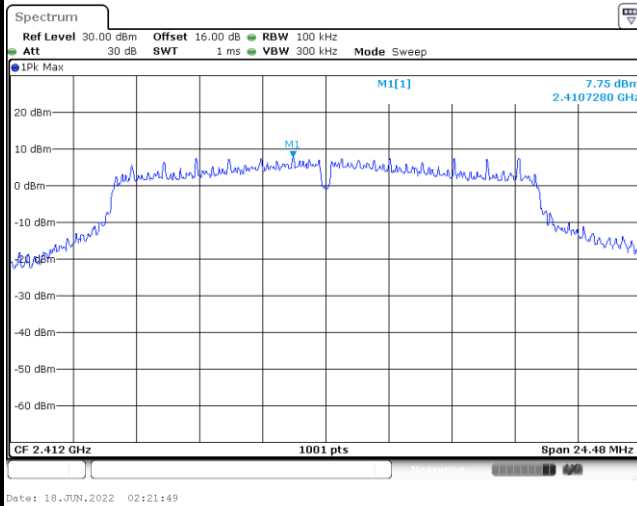
Test Mode :	802.11b	Test Channel :	11
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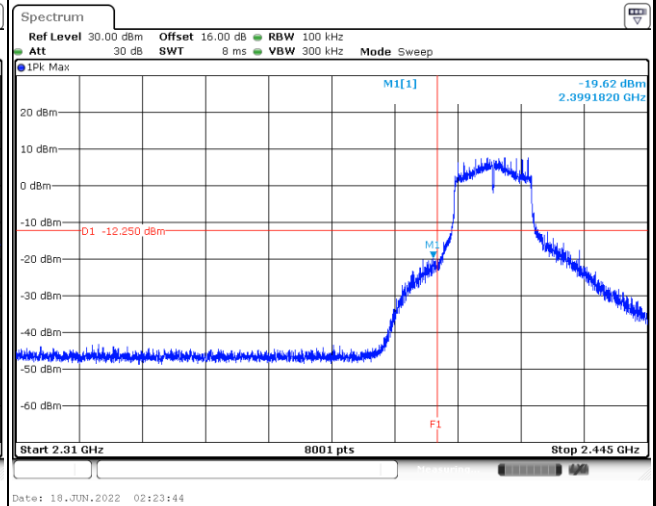


Test Mode :	802.11g	Test Channel :	01
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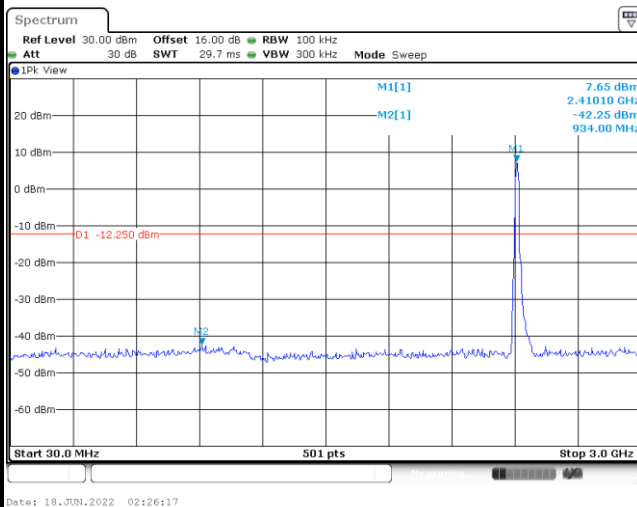
100kHz PSD reference Level



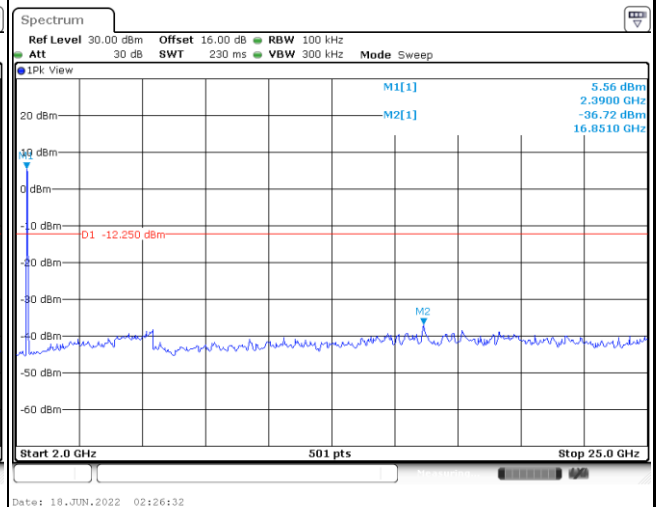
Channel Plot



Spurious Emission 30MHz~3GHz

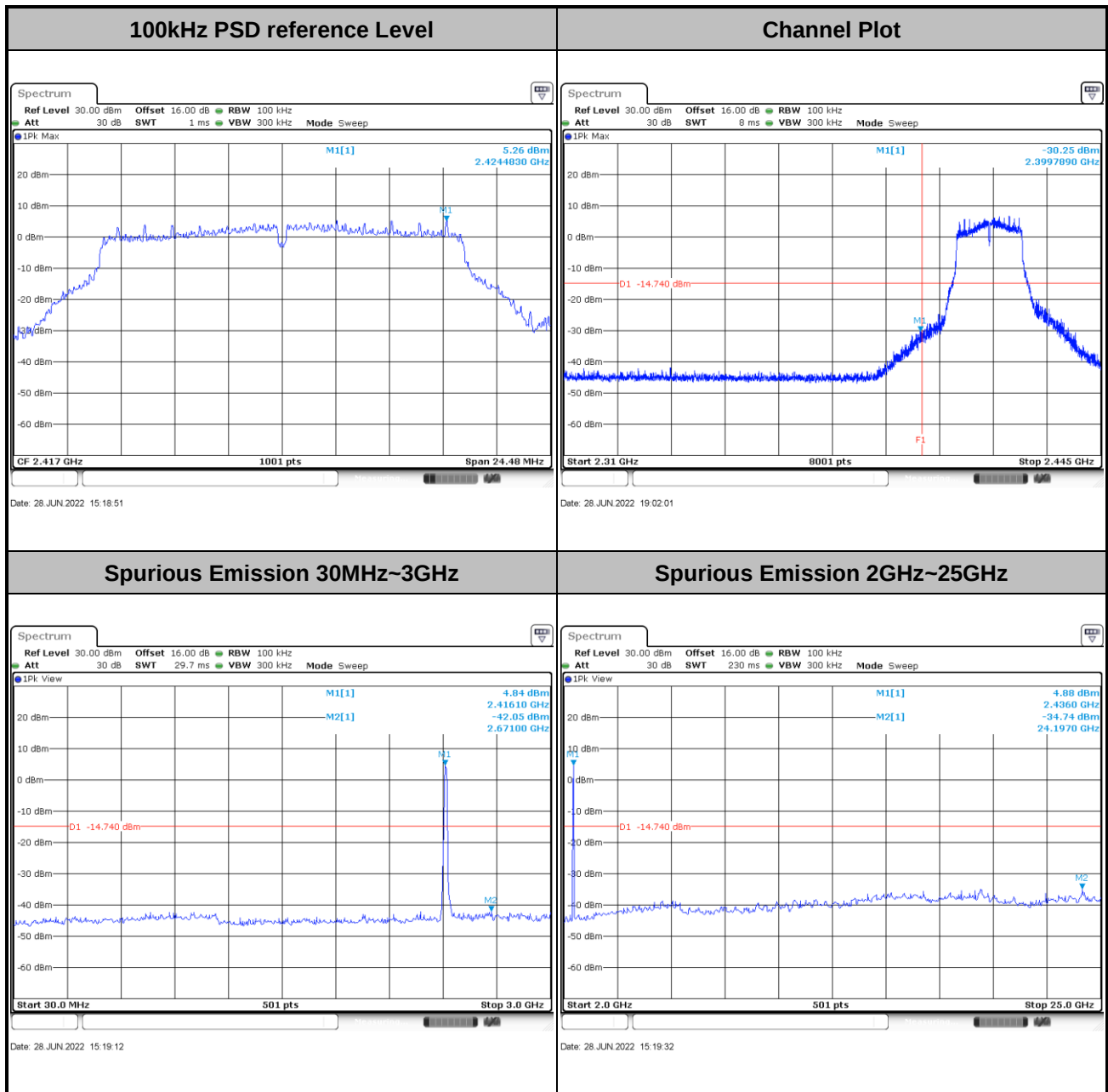


Spurious Emission 2GHz~25GHz





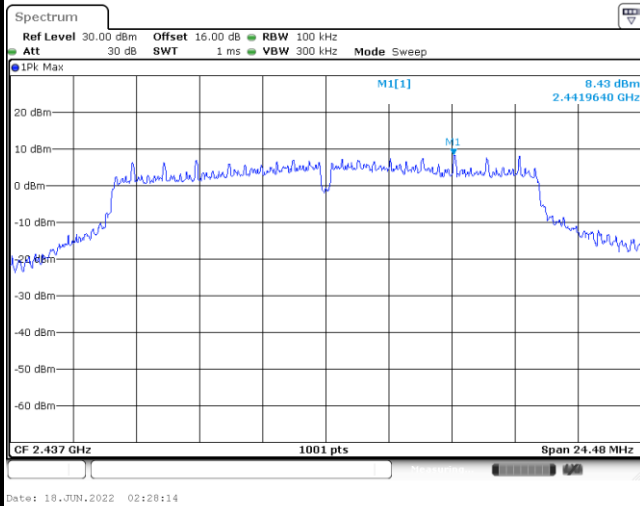
Test Mode :	802.11g	Test Channel :	02
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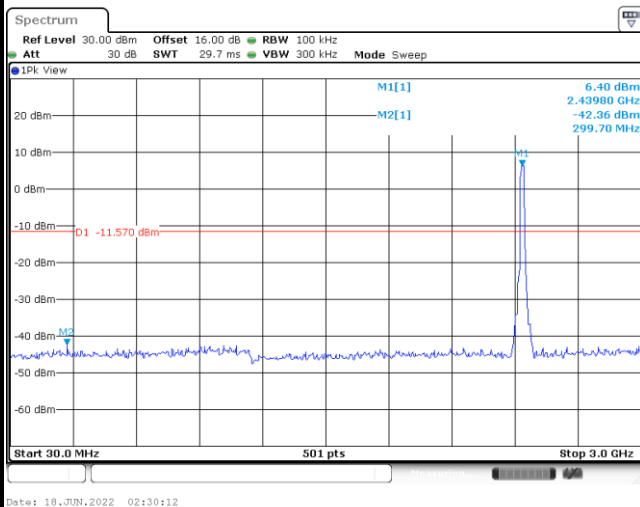


Test Mode :	802.11g	Test Channel :	06
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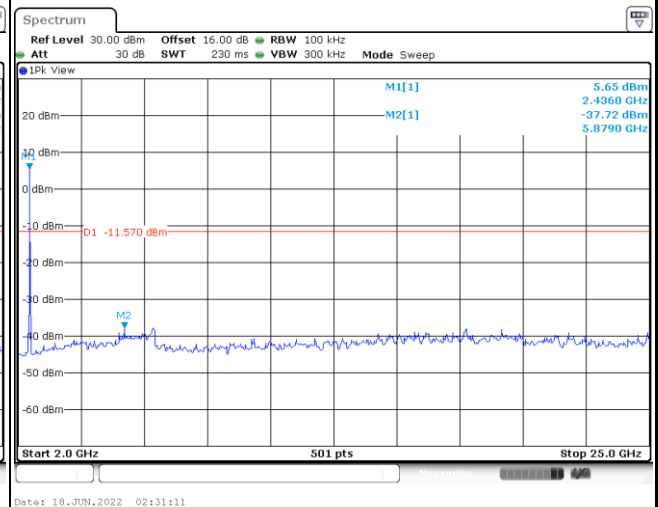
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

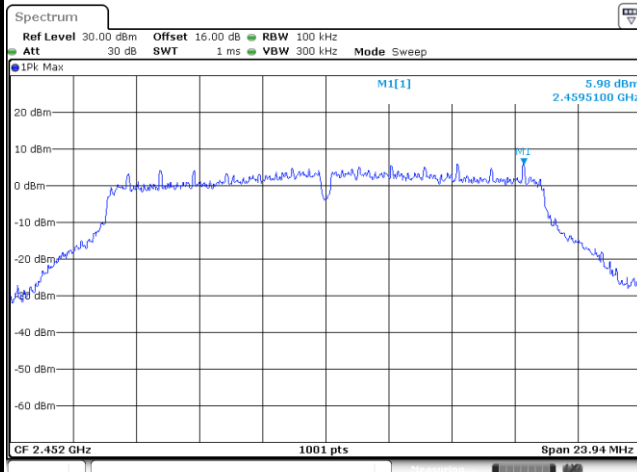




Test Mode : 802.11g

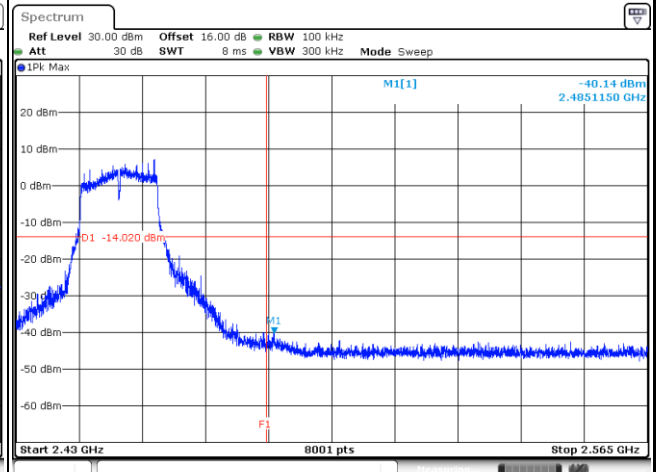
Test Channel : 09

100kHz PSD reference Level



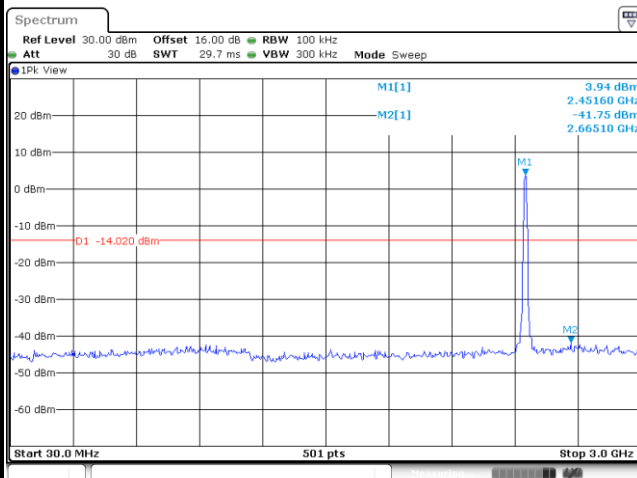
Date: 28 JUN 2022 15:33:21

Channel Plot



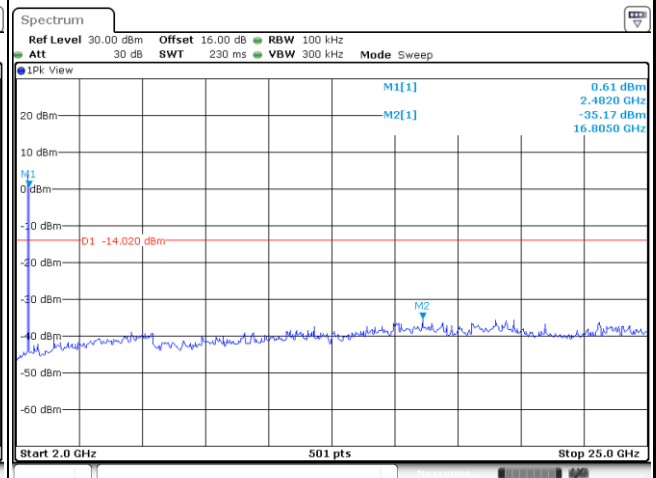
Date: 28 JUN 2022 19:40:33

Spurious Emission 30MHz~3GHz

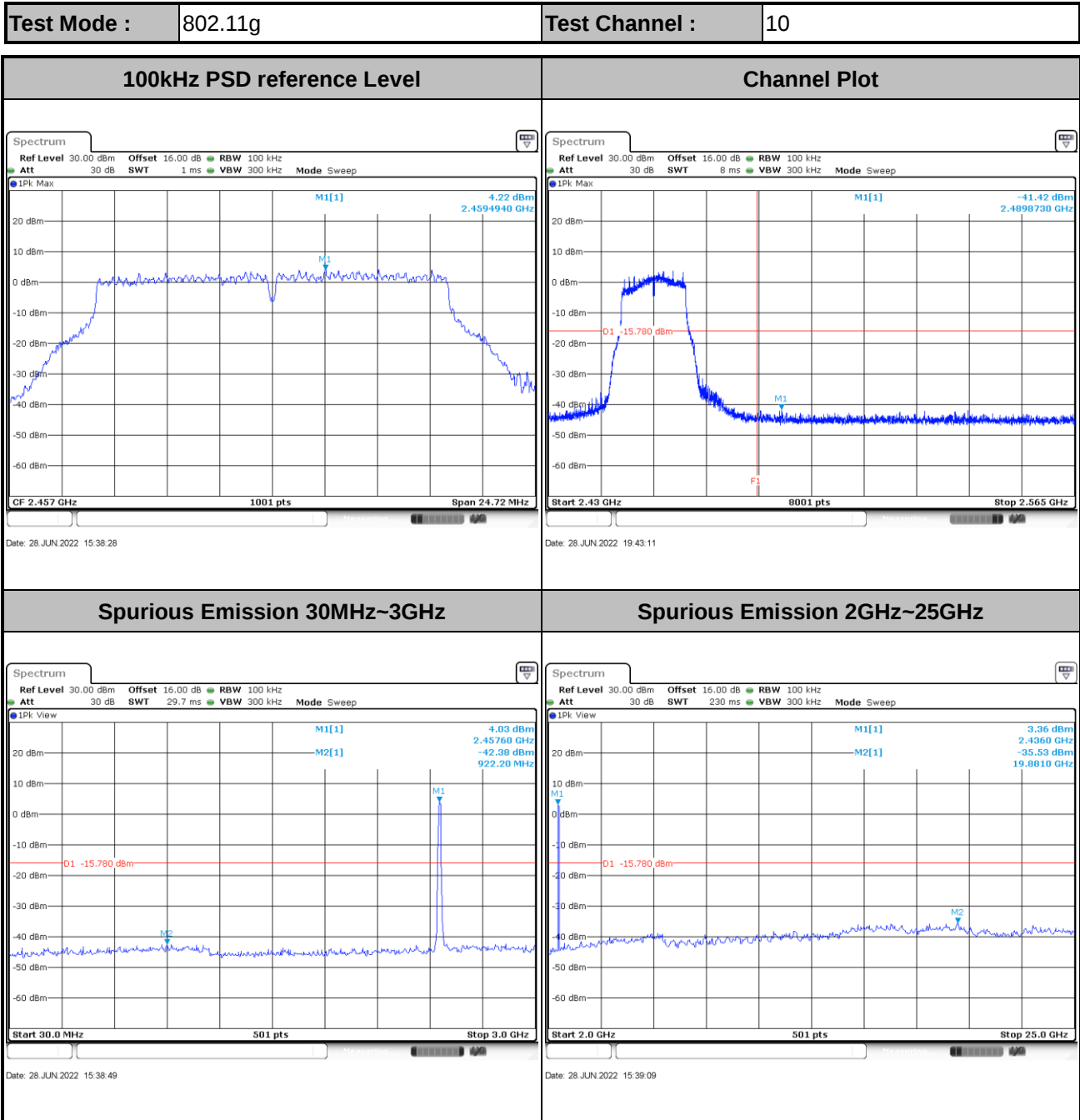


Date: 28 JUN 2022 15:33:42

Spurious Emission 2GHz~25GHz

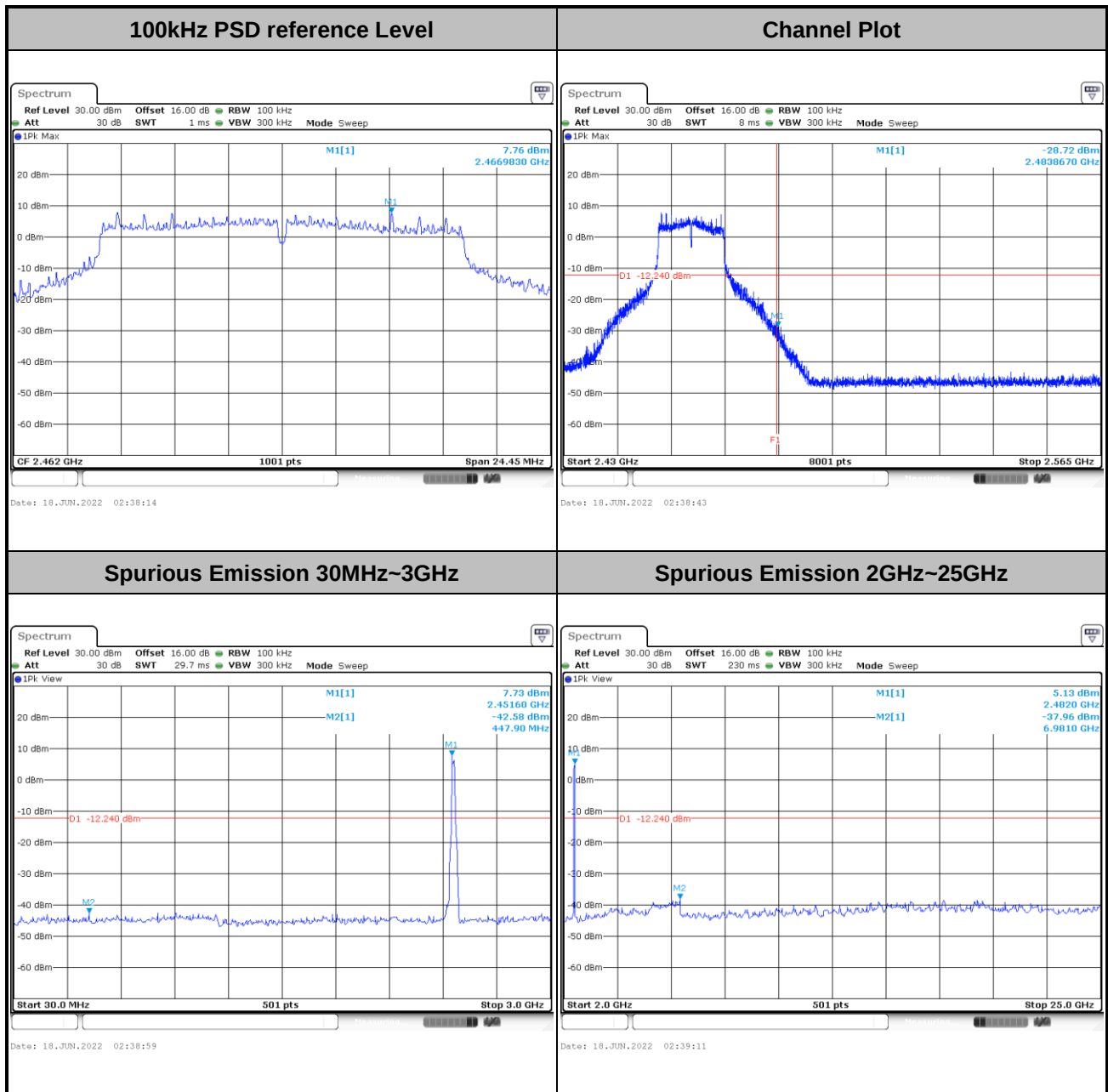


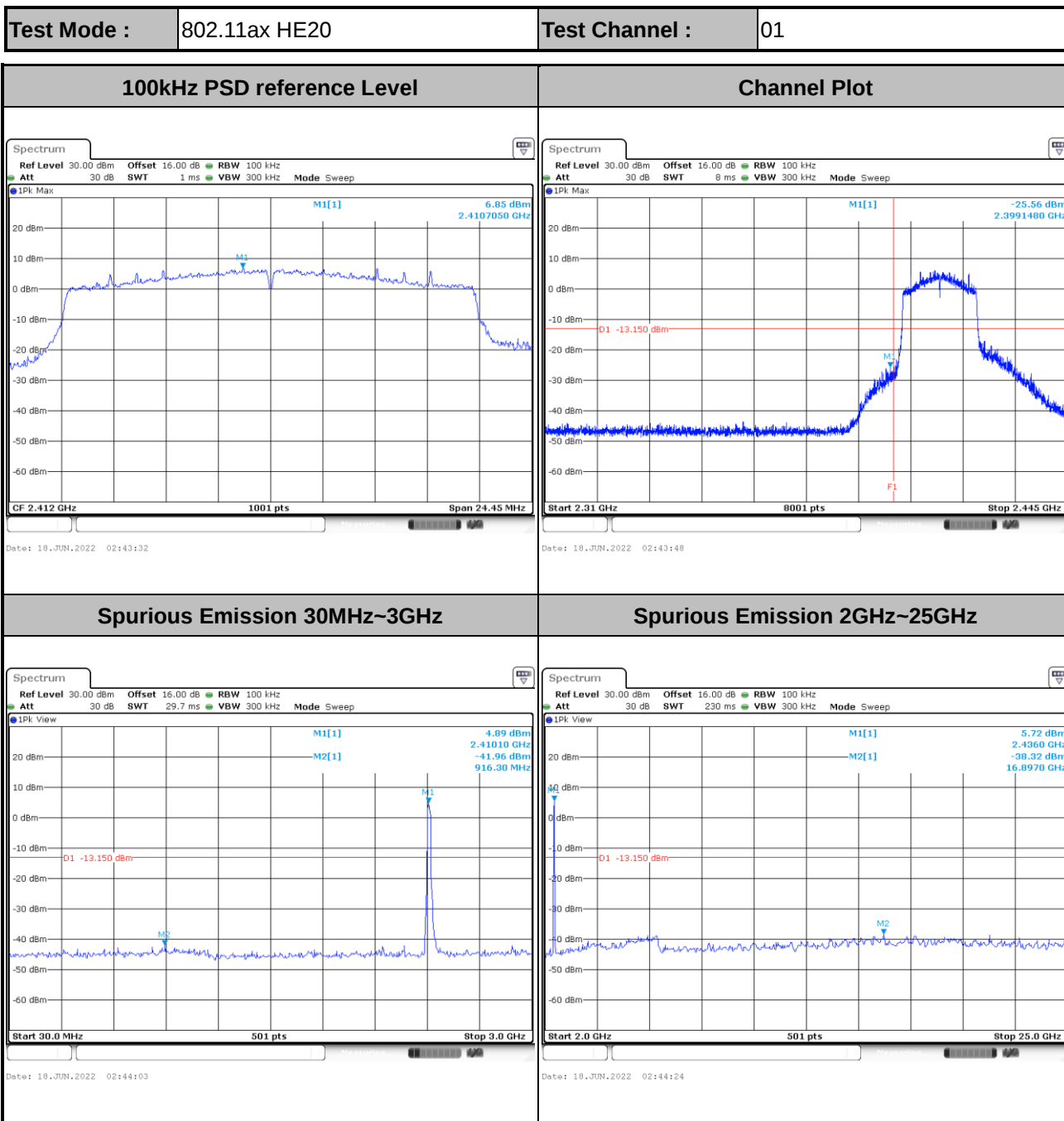
Date: 28 JUN 2022 15:34:03





Test Mode :	802.11g	Test Channel :	11
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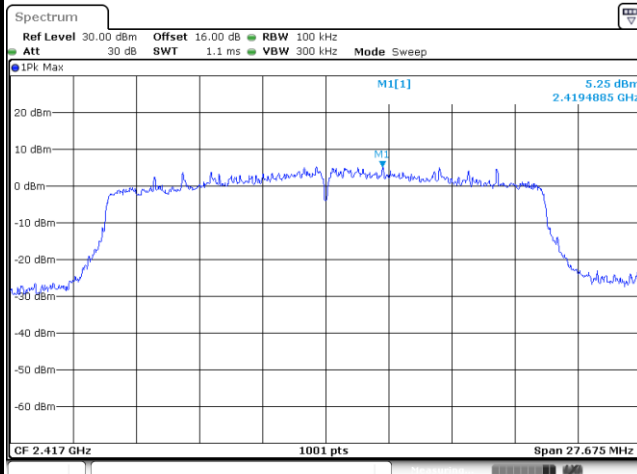




Test Mode : 802.11ax HE20

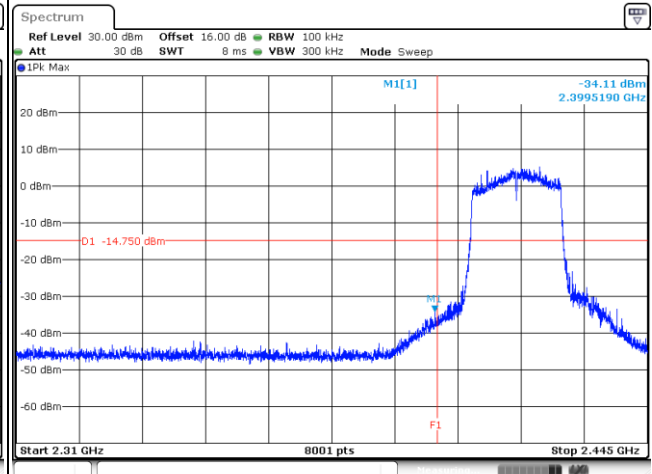
Test Channel : 02

100kHz PSD reference Level



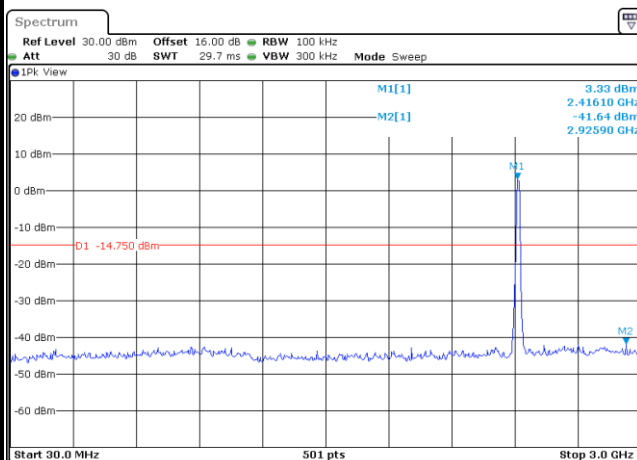
Date: 28 JUN 2022 15:55:59

Channel Plot



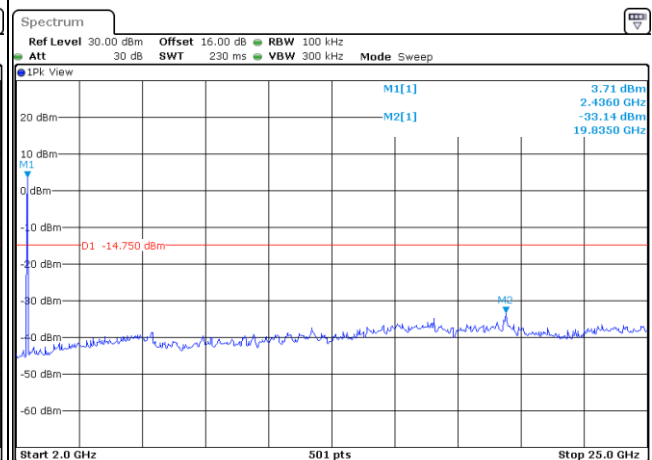
Date: 28 JUN 2022 19:49:23

Spurious Emission 30MHz~3GHz



Date: 28 JUN 2022 15:56:20

Spurious Emission 2GHz~25GHz



Date: 28 JUN 2022 15:56:40