




Report No.: TW2412204-01E

Applicant: Topxgun (Nanjing) Robotics Co., Ltd.

Product: Agricultural unmanned aircraft

Model No.: 3WWDZ-50B

Trademark: 
拓 攻 机 器 人

Test Standards: FCC Part 15.247

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 15.247 for the evaluation of electromagnetic compatibility

Approved By

Terry Tang

Manager

Dated: January 17, 2025

Results appearing herein relate only to the sample tested
The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com



Special Statement:

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

CAB identifier: CN0033

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Test Report Conclusion

Content

1.0	General Details	4
1.1	Test Lab Details	4
1.2	Applicant Details	4
1.3	Description of EUT	4
1.4	Submitted Sample	5
1.5	Test Duration	5
1.6	Test Uncertainty	5
1.7	Test By	5
2.0	List of Measurement Equipment	6
3.0	Technical Details	15
3.1	Summary of Test Results	15
3.2	Test Standards	15
4.0	EUT Modification	15
5.0	Power Line Conducted Emission Test	16
5.1	Schematics of the Test	16
5.2	Test Method and Test Procedure	16
5.3	Configuration of the EUT	16
5.4	EUT Operating Condition	17
5.5	Conducted Emission Limit	17
5.6	Test Result	17
6.0	Radiated Emission test	18
6.1	Test Method and Test Procedure	18
6.2	Configuration of the EUT	19
6.3	EUT Operation Condition	19
6.4	Radiated Emission Limit	19
7.0	6dB Bandwidth Measurement	25
8.0	Maximum Output Power	40
9.0	Power Spectral Density Measurement	43
10.0	Out of Band Measurement	60
11.0	Antenna Requirement	109
12.0	FCC ID Label	110
13.0	Photo of Test Setup and EUT View	111

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1.0 General Details


1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.
Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China
Telephone: (755) 83448688
Fax: (755) 83442996
Site Listed with Federal Communications commission (FCC)
Registration Number: 744189
For 3m Anechoic Chamber
Site Listed with Industry Canada of Ottawa, Canada
Registration Number: IC: 5205A
For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: Topxgun (Nanjing) Robotics Co., Ltd.
Address: No.3118 Jiyin Avenue, Jiangning District, Naniing, China

1.3 Description of EUT

Product:	Agricultural unmanned aircraft
Manufacturer:	Topxgun (Nanjing) Robotics Co., Ltd.
Address:	No.3118 Jiyin Avenue, Jiangning District, Naniing, China
Trademark:	 拓攻® 机器人
Additional Trademark:	N/A
Model Number:	3WWDZ-50B
Additional Model Number:	N/A
Hardware Version:	13.06.10
Software Version:	7.09
Serial No.:	2523B23090019
Rating:	DC53.2V
Battery:	DC53.2V, 2pcs 20000mAh battery
Type of Modulation	IEEE 802.11b: DSSS (CCK, QPSK, DBPSK) IEEE 802.11g/n (HT20, HT40): OFDM (64QAM, 16QAM, QPSK, BPSK)
Frequency range	IEEE 802.11b/g/n (HT20): 2412-2462MHz; IEEE 802.11n HT40: 2422-2452MHz
Channel Spacing	5MHz for IEEE 802.11b/g/n (HT20, HT40)
Air Data Rate	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps

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IEEE 802.11n HT20/HT40: mcs0-mcs7
Frequency Selection By software
Channel Number IEEE 802.11b/g/n (HT20): 11 Channels;
IEEE 802.11n (HT40): 7 Channels;
Antenna: Dipole antennas with gain 3.30dBi Max for each one (Get from the antenna specification)
Remark: EUT supports IEEE 802.11b/g: SISO Mode and IEEE 802.11n (HT20/HT40): MIMO Mode

1.4 Submitted Sample: 1 Sample

1.5 Test Duration
2024-12-18 to 2025-01-16

1.6 Test Uncertainty
Conducted Emissions Uncertainty =3.6dB
Radiated Emissions below 1GHz Uncertainty =4.7dB
Radiated Emissions above 1GHz Uncertainty =6.0dB
Conducted Power Uncertainty =6.0dB
Occupied Channel Bandwidth Uncertainty =5%
Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

The sample tested by

A handwritten signature in black ink that reads "Andy Xing".

Print Name: Andy Xing

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2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2024-07-12	2025-07-11
LISN	R&S	EZH3-Z5	100294	2024-07-12	2025-07-11
LISN	R&S	EZH3-Z5	100253	2024-07-12	2025-07-11
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2024-07-12	2025-07-11
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2024-07-12	2025-07-11
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2025-07-17
Power meter	Anritsu	ML2487A	6K00003613	2024-07-12	2025-07-11
Power sensor	Anritsu	MA2491A	32263	2024-07-12	2025-07-11
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2024-07-12	2025-07-11
EMI Test Receiver	RS	ESCS 30	834115/006	2024-07-12	2025-07-11
Spectrum	HP/Agilent	E4407B	MY50441392	2024-07-12	2025-07-11
Spectrum	RS	FSP	1164.4391.38	2024-07-12	2025-07-11
RF Cable	Zhengdi	ZT26-NJ-NJ-8M/FA	--	2024-07-12	2025-07-11
RF Cable	Zhengdi	7m	--	2024-07-12	2025-07-11
Pre-Amplifier	Schwarebeck	BBV9743	#218	2024-07-12	2025-07-11
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2024-07-12	2025-07-11
LISN	SCHAFFNER	NNB42	00012	2024-07-12	2025-07-11
ESPI Test Receiver	R&S	ESPI 3	100379	2024-07-12	2025-07-11
LISN	R&S	EZH3-Z5	100294	2024-07-12	2025-07-11

2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

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3. DESCRIPTION OF TEST MODES

IEEE 802.11b, 802.11g, 802.11n (HT20) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2412
Middle	2437
High	2462

IEEE 802.11b mode: 1Mbps data rate (worst case) was chosen for full testing. IEEE 802.11g mode: 6Mbps data rate (worst case) was chosen for full testing. IEEE 802.11n (HT20) mode: 6.5Mbps (worst case) were chosen for full testing;

IEEE 802.11n (HT40) mode

The EUT had been tested under operating condition. There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2422
Middle	2437
High	2452

IEEE 802.11n (HT40) mode: mcs0 data rate (worst case) were chosen for full testing

Note: 1. During the test, the duty cycle was set up to >98%

2. During the radiated emissions test, for IEEE 802.11b/g SISO mode, ANT1 and ANT2 were tested and only the worst case was reported; MIMO mode was tested for IEEE 802.11n (HT20/HT40)

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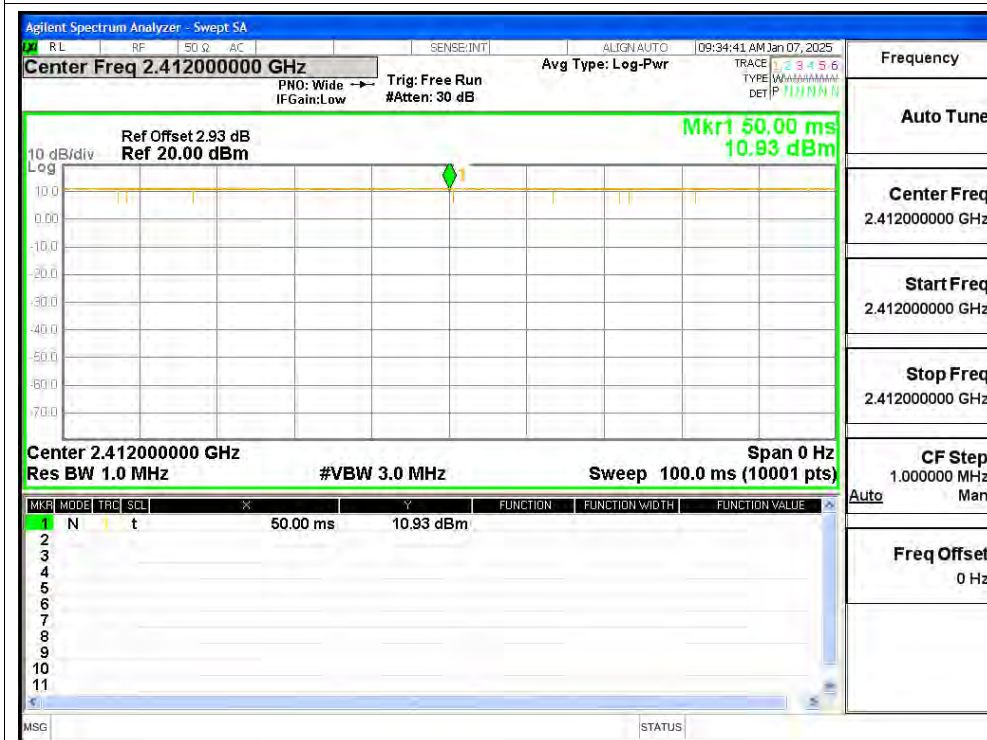


Duty Cycle

Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	b	2412	Ant1	100	0	0
		2437		100	0	0
		2462		100	0	0
	g	2412		100	0	0
		2437		100	0	0
		2462		100	0	0
	n20	2412		100	0	0
		2437		100	0	0
		2462		100	0	0
	n40	2422		100	0	0
		2437		100	0	0
		2452		100	0	0

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Duty Cycle NVNT b 2412MHz Ant1

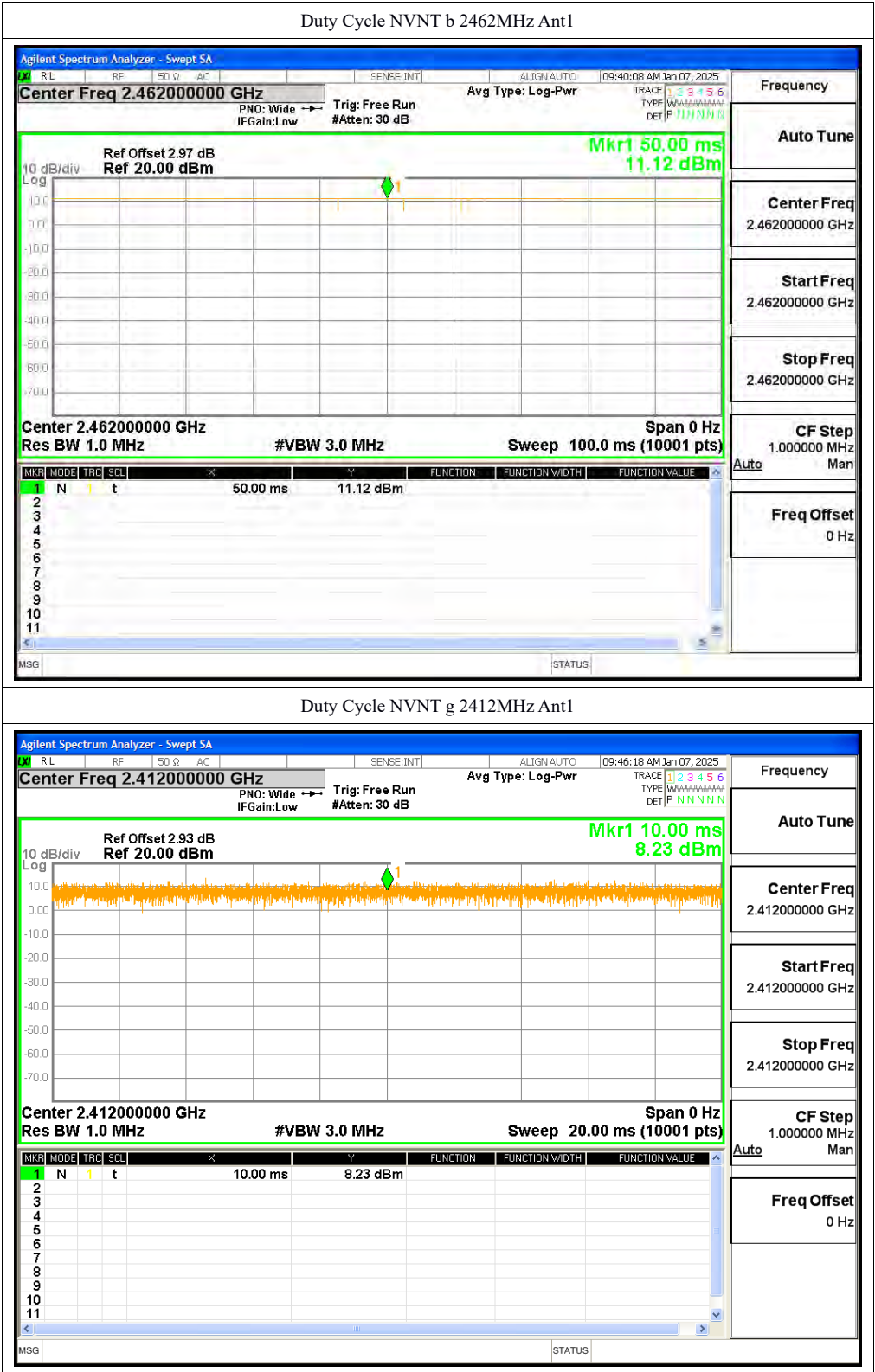


Duty Cycle NVNT b 2437MHz Ant1



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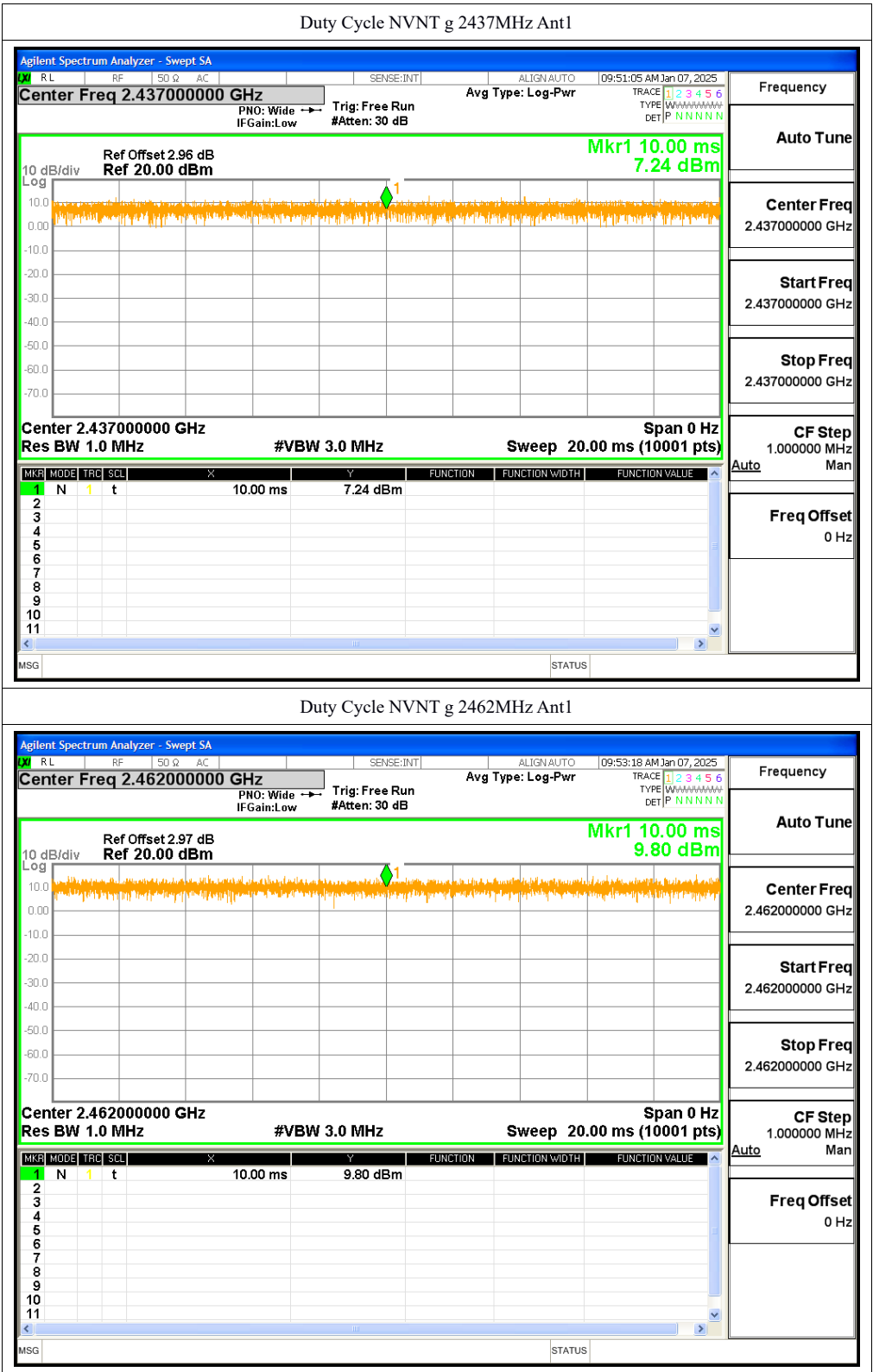
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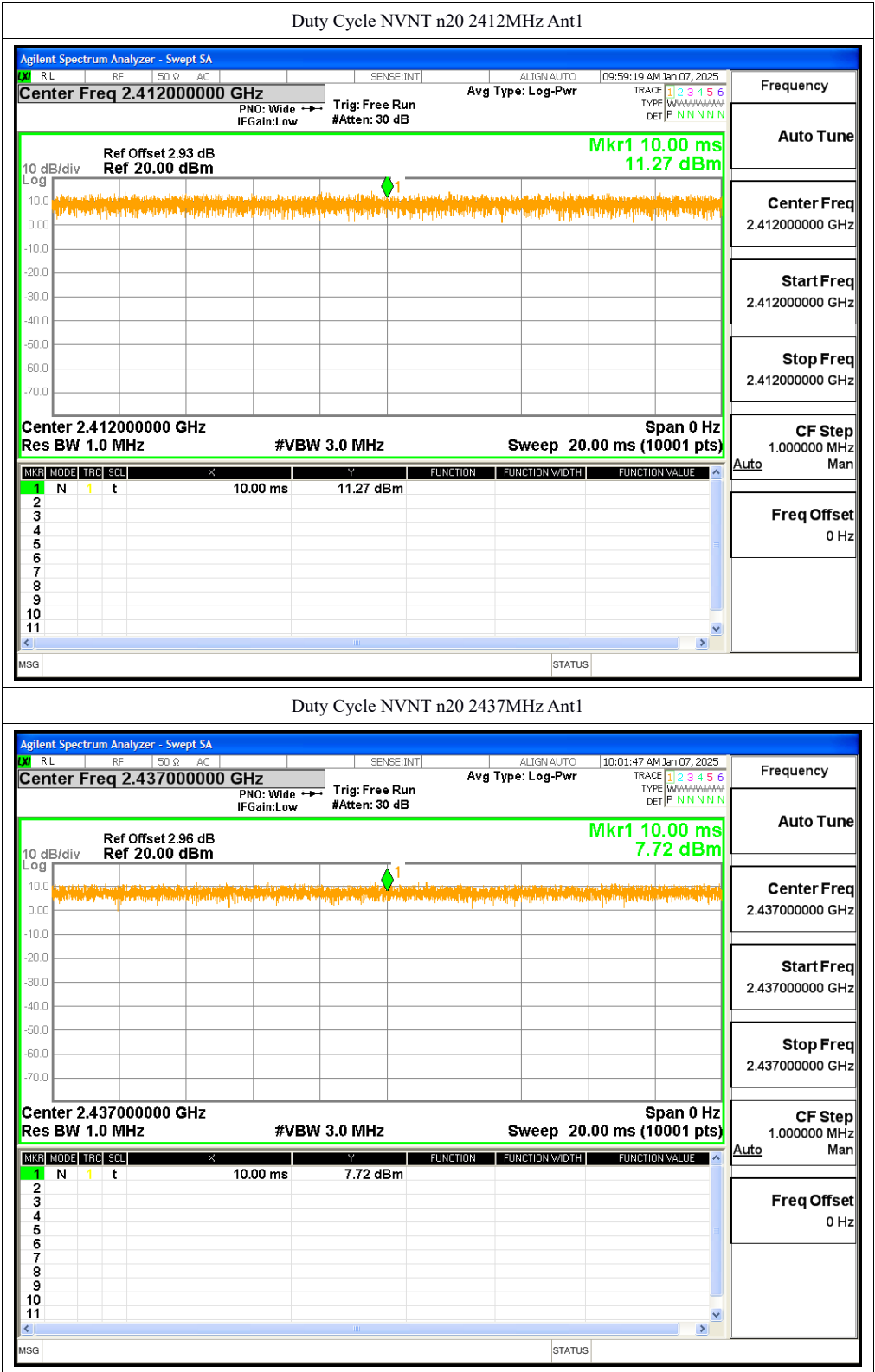
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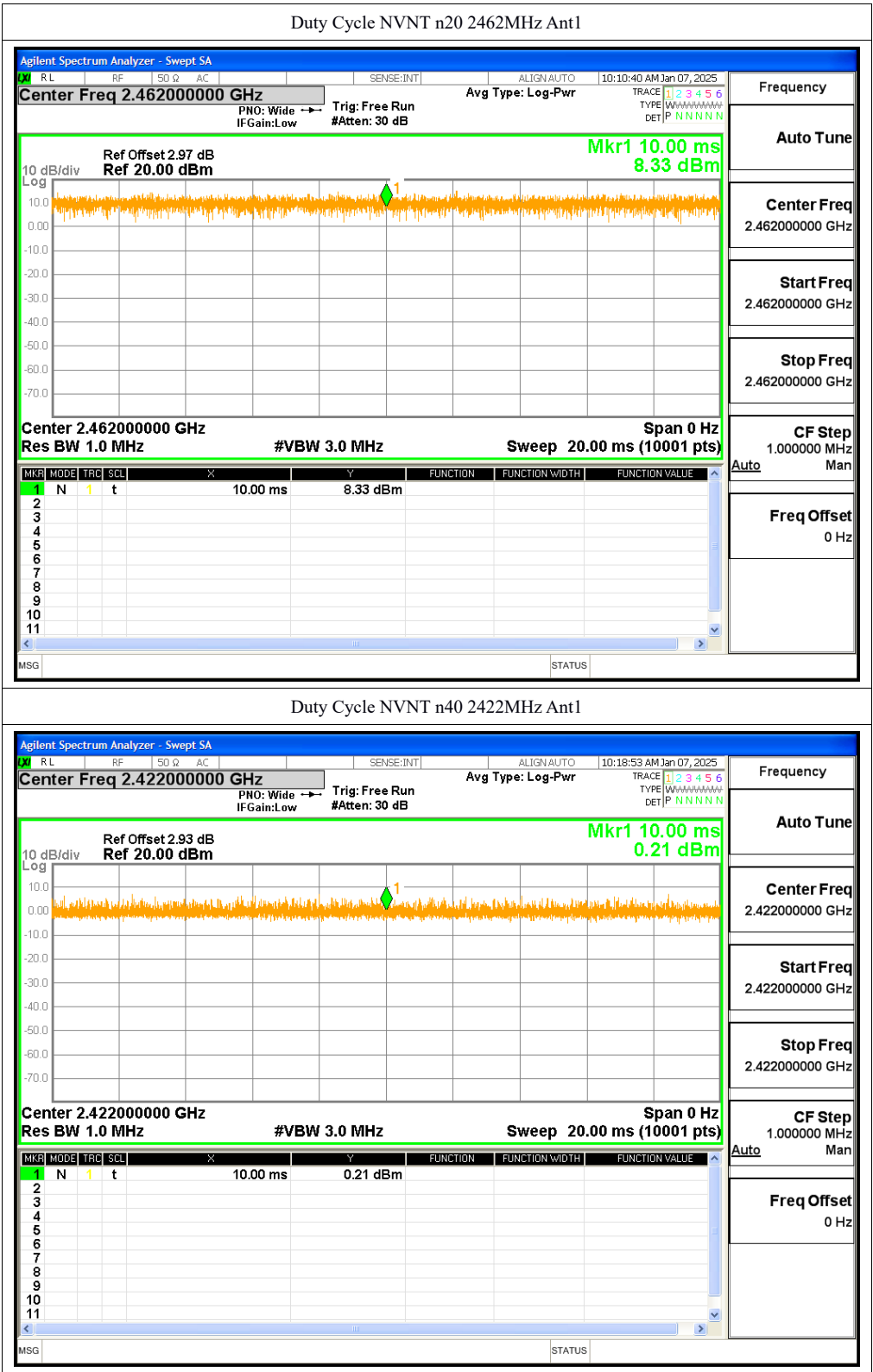
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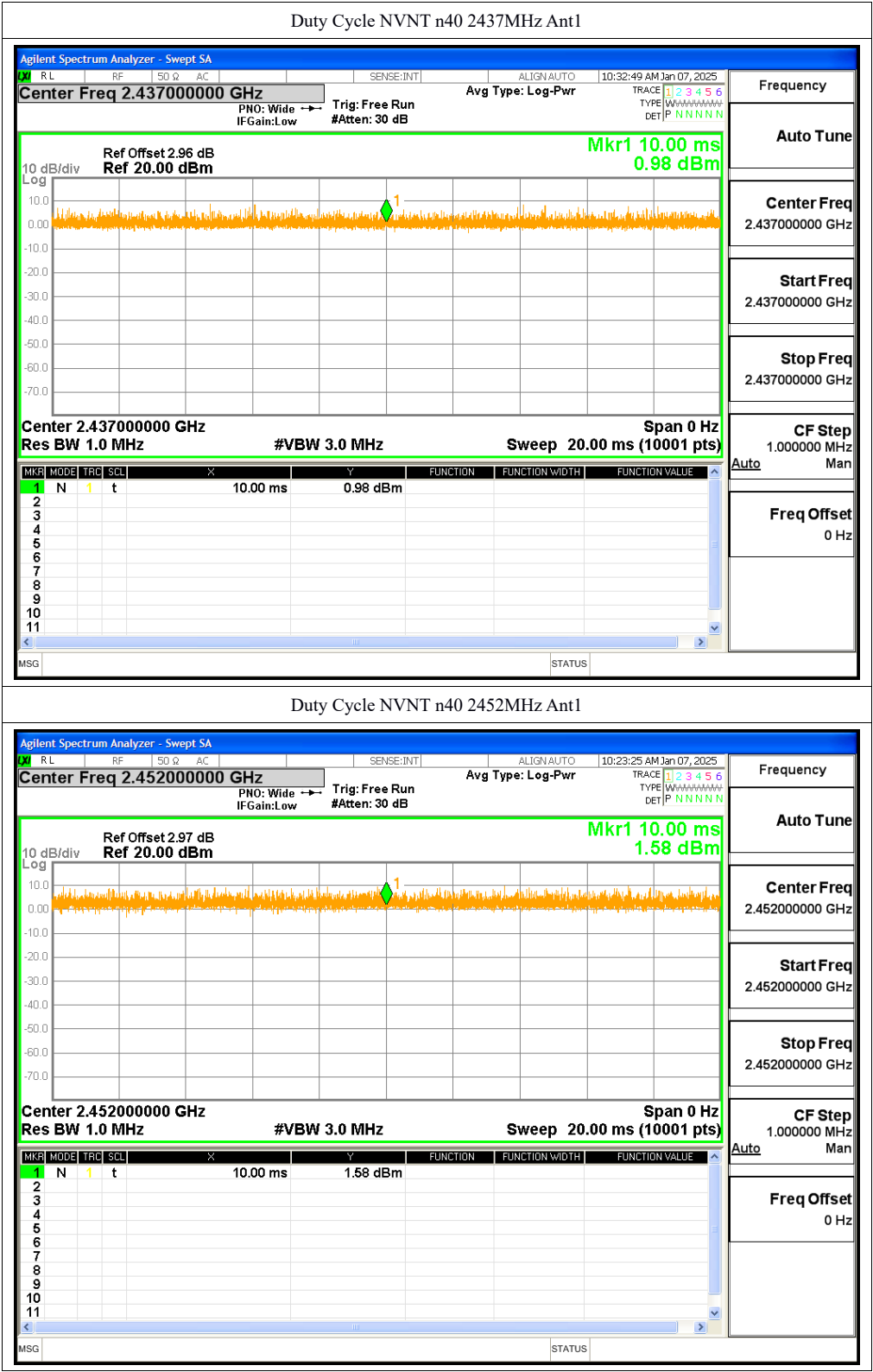
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3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:			
Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.203	Antenna Requirement	Pass	Complies
FCC Part 15, Paragraph 15.207	Conducted Emission Test	N/A	N/A
FCC Part 15 Subpart C Paragraph 15.247(a)(2) Limit	Spectrum bandwidth of a Orthogonal Frequency Division Multiplex System Limit: 6dB bandwidth > 500kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(b)	Maximum peak output power Limit: max. 30dBm	Pass	Complies
FCC Part 15, Paragraph 15.109, 15.205 & 15.209	Transmitter Radiated Emission Limit: Table 15.209	Pass	Complies
FCC Part 15, Paragraph 15.247(e)	Power Spectral Density Limit: max. 8dBm/3kHz	Pass	Complies
FCC Part 15, Paragraph 15.247(d)	Out of Band Emission and Restricted Band Radiation Limit: 20dB less than peak value of fundamental frequency Restricted band limit: Table 15.209	Pass	Complies

3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES.

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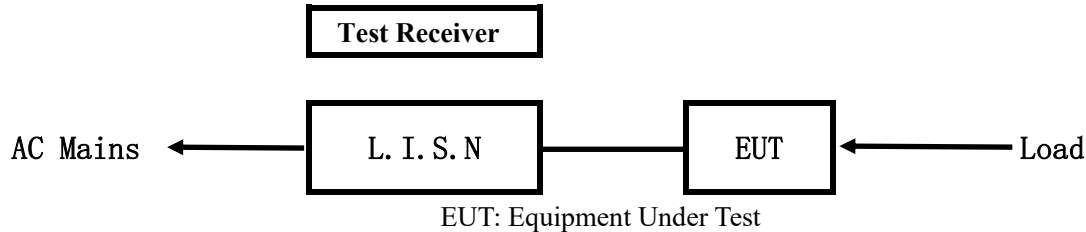
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5.0 Power Line Conducted Emission Test

5.1 Schematics of the test

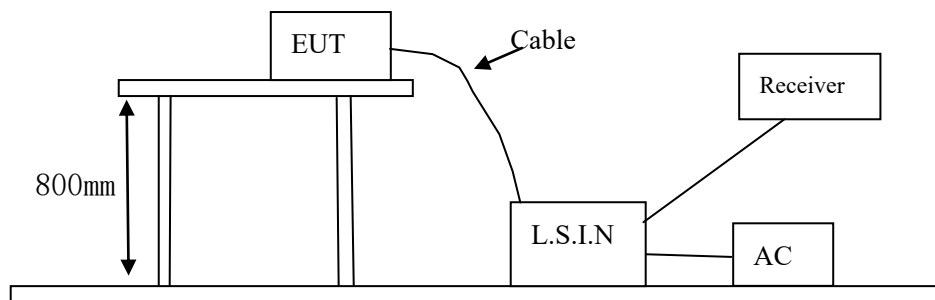


5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013. The Frequency spectrum from 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10 –2013.

Test Voltage: N/A

Block diagram of Test setup



5.3 Configuration of the EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
Agricultural unmanned aircraft	Topxgun (Nanjing) Robotics Co., Ltd.	3WWDZ-50B	2BCSK3WWDZ-50B

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
N/A	--	--	--	--

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5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

N/A

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

Note: EUT not directly or in-directly connected to the AC power source. so this test item not applicable.

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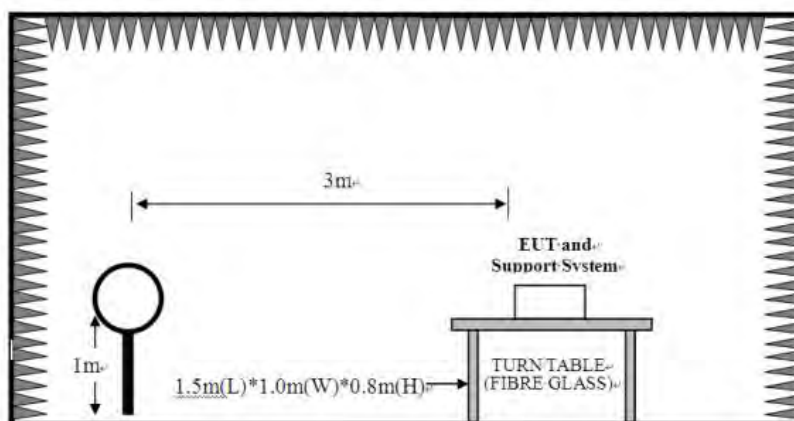
6 Radiated Emission Test

6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at Timeway EMC Laboratory. This site is on file with the FCC laboratory division, Registration No. 744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are Quasi-peak values with a resolution bandwidth of 120 kHz. For measurement above 1GHz, peak values with RBW=1MHz VBW=3MHz and PK detector. AV value with RBW=1MHz, VBW=3MHz and RMS detector. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a “QP” in the data table.
- (6) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



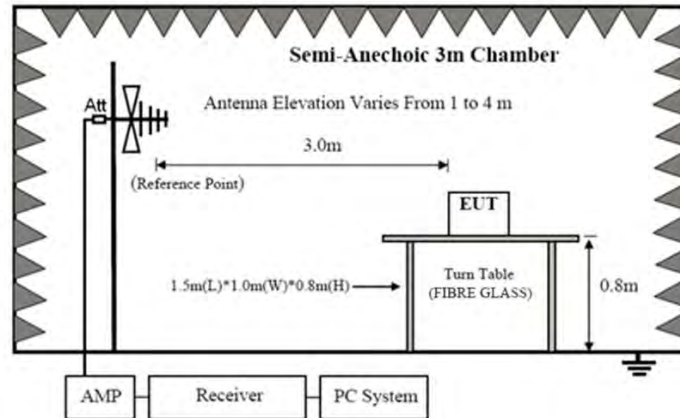
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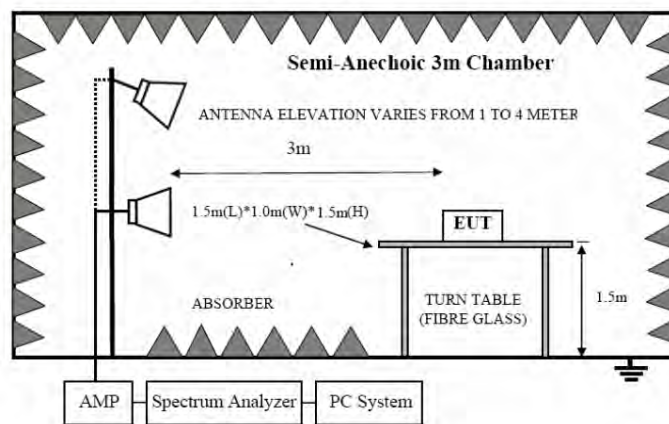
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For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



6.2 Configuration of The EUT

Same as section 5.3 of this report

6.3 EUT Operating Condition

Same as section 5.4 of this report.

6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

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Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
0.009-0.049	3	$20\log(2400/F(\text{kHz})) + 40\log(300/3)$
0.490-1.705	3	$20\log(24000/F(\text{kHz})) + 40\log(30/3)$
1.705-30	3	69.5
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
 4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz.As to 1G-25G, the final emission level got using PK. For fundamental measurement, PK detector used.
 5. For radiated emissions from 9kHz to 30MHz, the emission level is much less than the limit for more than 20dB. No necessary to take down the record.
 6. Batteries were fully charged during test.
 7. For IEEE 802.11b/g SISO mode, ANT1 and ANT2 were tested; MIMO mode was tested for IEEE 802.11n (HT20/HT40). In the test report, only the worst case was reported and 802.11g was the worst case.

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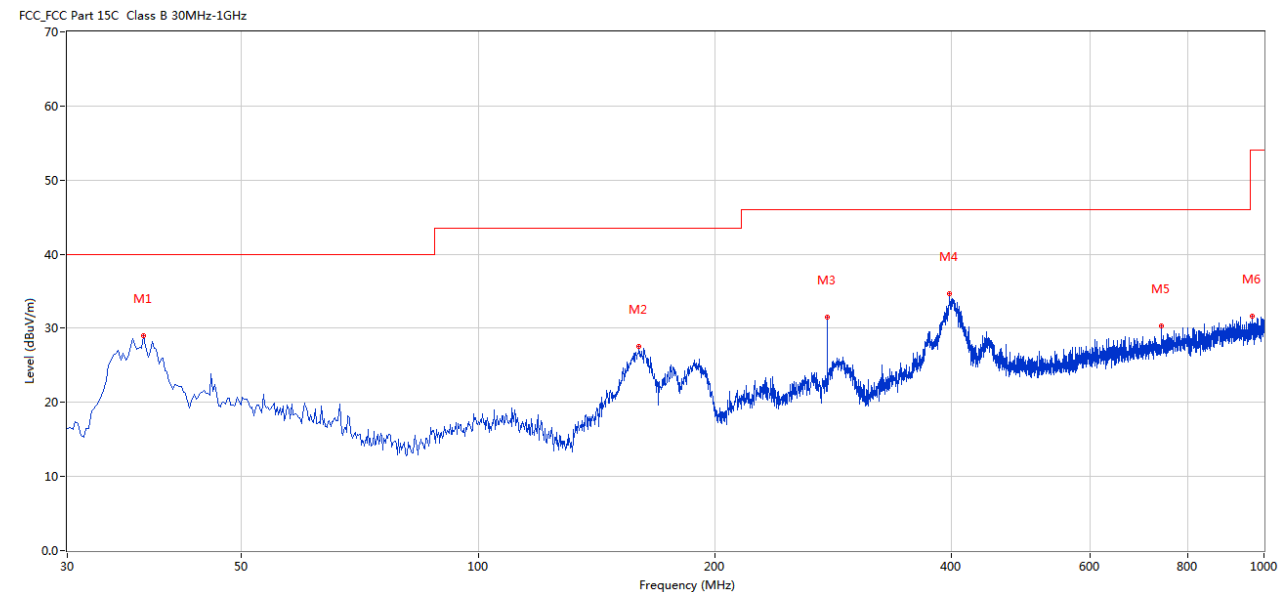


Test result
General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Horizontal (30MHz---1000MHz)

EUT set Condition: **Keep Transmitting**

Results: **Pass**



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	37.516	28.96	-12.95	40.0	11.04	Peak	7.00	100	Horizontal	Pass
2	160.190	27.58	-16.34	43.5	15.92	Peak	62.00	100	Horizontal	Pass
3	278.015	31.55	-11.55	46.0	14.45	Peak	94.00	100	Horizontal	Pass
4	398.023	34.73	-8.68	46.0	11.27	Peak	329.00	100	Horizontal	Pass
5	740.347	30.27	-3.49	46.0	15.73	Peak	36.00	100	Horizontal	Pass
6	966.786	31.64	-1.54	54.0	22.36	Peak	288.00	100	Horizontal	Pass

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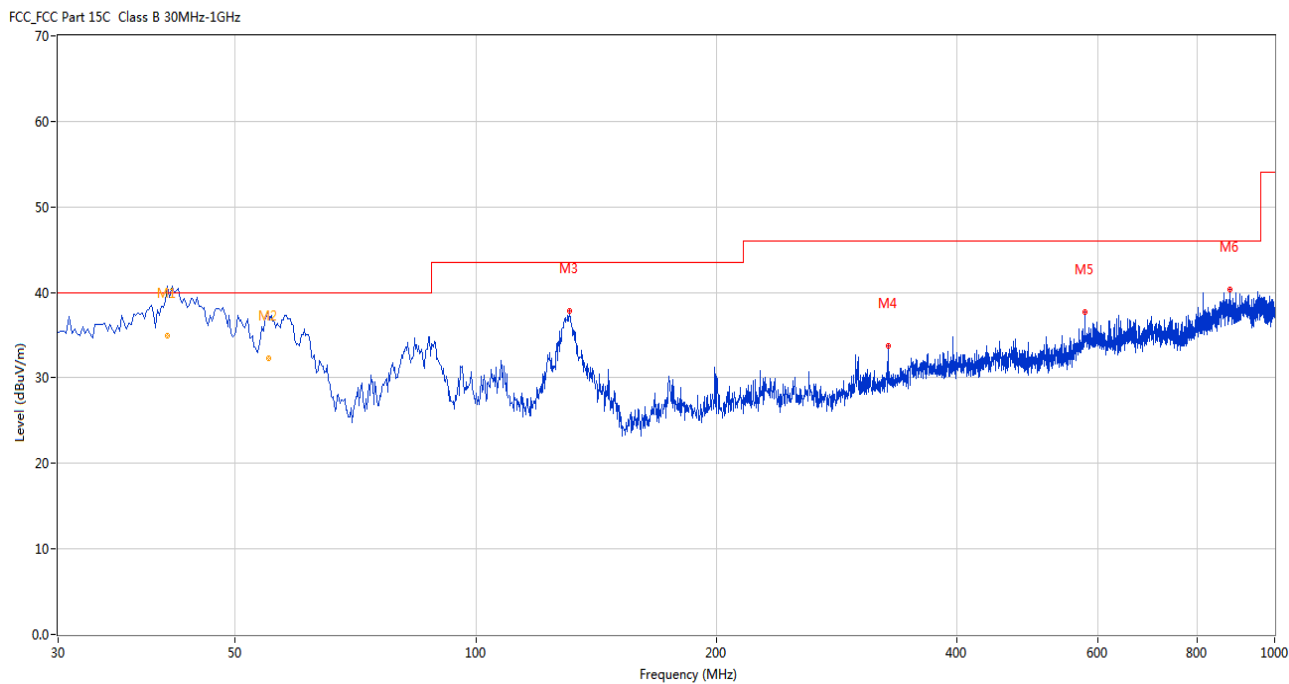


Test result
General Radiated Emission Data and Harmonics Radiated Emission Data

Radiated Emission In Vertical (30MHz----1000MHz)

EUT set Condition: **Keep Transmitting**

Results: **Pass**



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1*	41.152	34.90	-6.31	40.0	5.10	QP	131.00	100	Vertical	Pass
2*	54.971	32.34	-5.13	40.0	7.66	QP	52.00	100	Vertical	Pass
3	130.855	37.81	-8.67	43.5	5.69	Peak	321.00	100	Vertical	Pass
4	327.958	33.75	-3.38	46.0	12.25	Peak	257.00	100	Vertical	Pass
5	579.125	37.69	1.84	46.0	8.31	Peak	77.00	100	Vertical	Pass
6	878.780	40.33	5.14	46.0	5.67	Peak	200.00	100	Vertical	Pass

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Operation Mode: Transmitting under CH01 for 802.11g mode

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4824.00	63.6 (PK) / 46.2 (AV)	H	74(Peak)/ 54(AV)
4824.00	58.5 (PK) / 43.1 (AV)	V	74(Peak)/ 54(AV)
7236.00	--	H/V	74(Peak)/ 54(AV)
9648.00	--	H/V	74(Peak)/ 54(AV)
12060	--	H/V	74(Peak)/ 54(AV)
14472	--	H/V	74(Peak)/ 54(AV)
16884	--	H/V	74(Peak)/ 54(AV)
19296	--	H/V	74(Peak)/ 54(AV)
21708	--	H/V	74(Peak)/ 54(AV)
24120	--	H/V	74(Peak)/ 54(AV)

Operation Mode: Transmitting under CH06 for 802.11g mode

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4874.00	63.8 (PK)/ 46.7 (AV)	H	74(Peak)/ 54(AV)
4874.00	57.3 (PK)/ 43.2 (AV)	V	74(Peak)/ 54(AV)
7311.00	--	H/V	74(Peak)/ 54(AV)
9748.00	--	H/V	74(Peak)/ 54(AV)
12185	--	H/V	74(Peak)/ 54(AV)
14622	--	H/V	74(Peak)/ 54(AV)
17059	--	H/V	74(Peak)/ 54(AV)
19496	--	H/V	74(Peak)/ 54(AV)
21933	--	H/V	74(Peak)/ 54(AV)
24370	--	H/V	74(Peak)/ 54(AV)

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Operation Mode: Transmitting under CH11 for 802.11g mode

Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
4924	63.1 (PK)/ 45.8 (AV)	H	74(Peak)/ 54(AV)
4924	57.9 (PK)/ 42.6 (AV)	V	74(Peak)/ 54(AV)
7368	--	H/V	74(Peak)/ 54(AV)
9848	--	H/V	74(Peak)/ 54(AV)
12310	--	H/V	74(Peak)/ 54(AV)
14772	--	H/V	74(Peak)/ 54(AV)
17234	--	H/V	74(Peak)/ 54(AV)
19696	--	H/V	74(Peak)/ 54(AV)
22158	--	H/V	74(Peak)/ 54(AV)
24620	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

3. For 802.11g mode at 6Mbps

4. For radiated Emissions from 18-25GHz and below 30MHz, it is only the floor noise and less than the limit for more than 20dB. No necessary to take down.

5. Note: the final peak measurement results less than the AV limit. No necessary to take down the final AV measurement result

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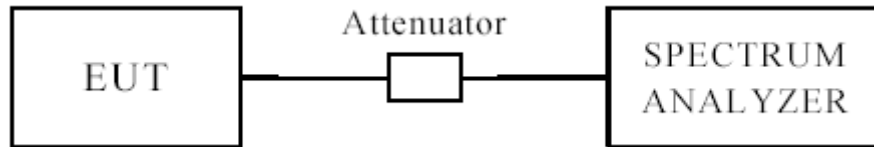
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7.0 6dB Bandwidth Measurement

7.1 Test Setup



7.2 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is >500 kHz

7.3 Test Procedure

1. Set resolution bandwidth (RBW) = 100 kHz
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.4 Test Result

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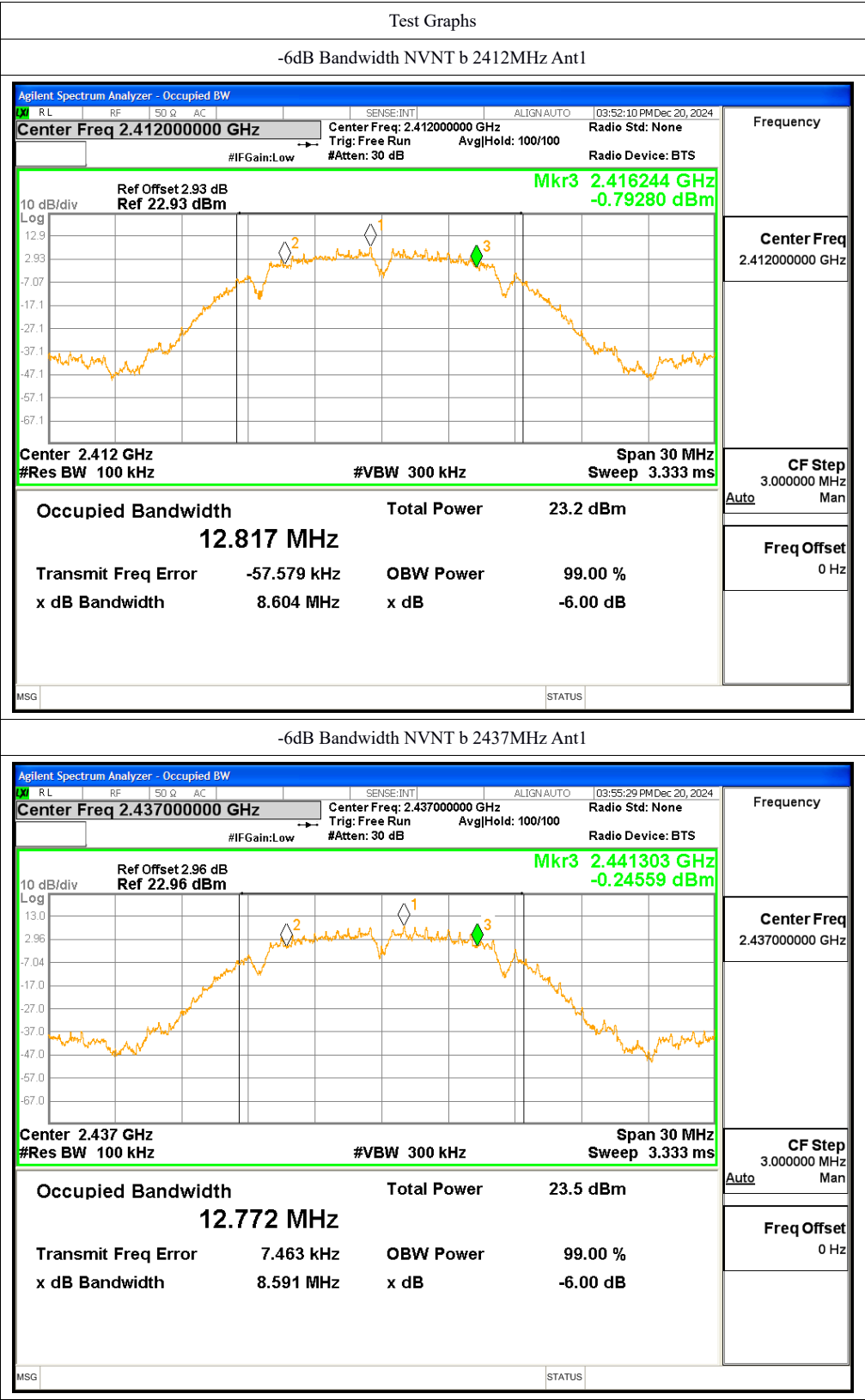


6dB Occupied Bandwidth

Ant 1

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant1	8.604	0.5	Pass
		2437		8.591	0.5	Pass
		2462		9.064	0.5	Pass
	g	2412		12.264	0.5	Pass
		2437		13.179	0.5	Pass
		2462		13.79	0.5	Pass
	n20	2412		15.614	0.5	Pass
		2437		15.123	0.5	Pass
		2462		12.302	0.5	Pass
	n40	2422		17.443	0.5	Pass
		2437		36.478	0.5	Pass
		2452		30.667	0.5	Pass

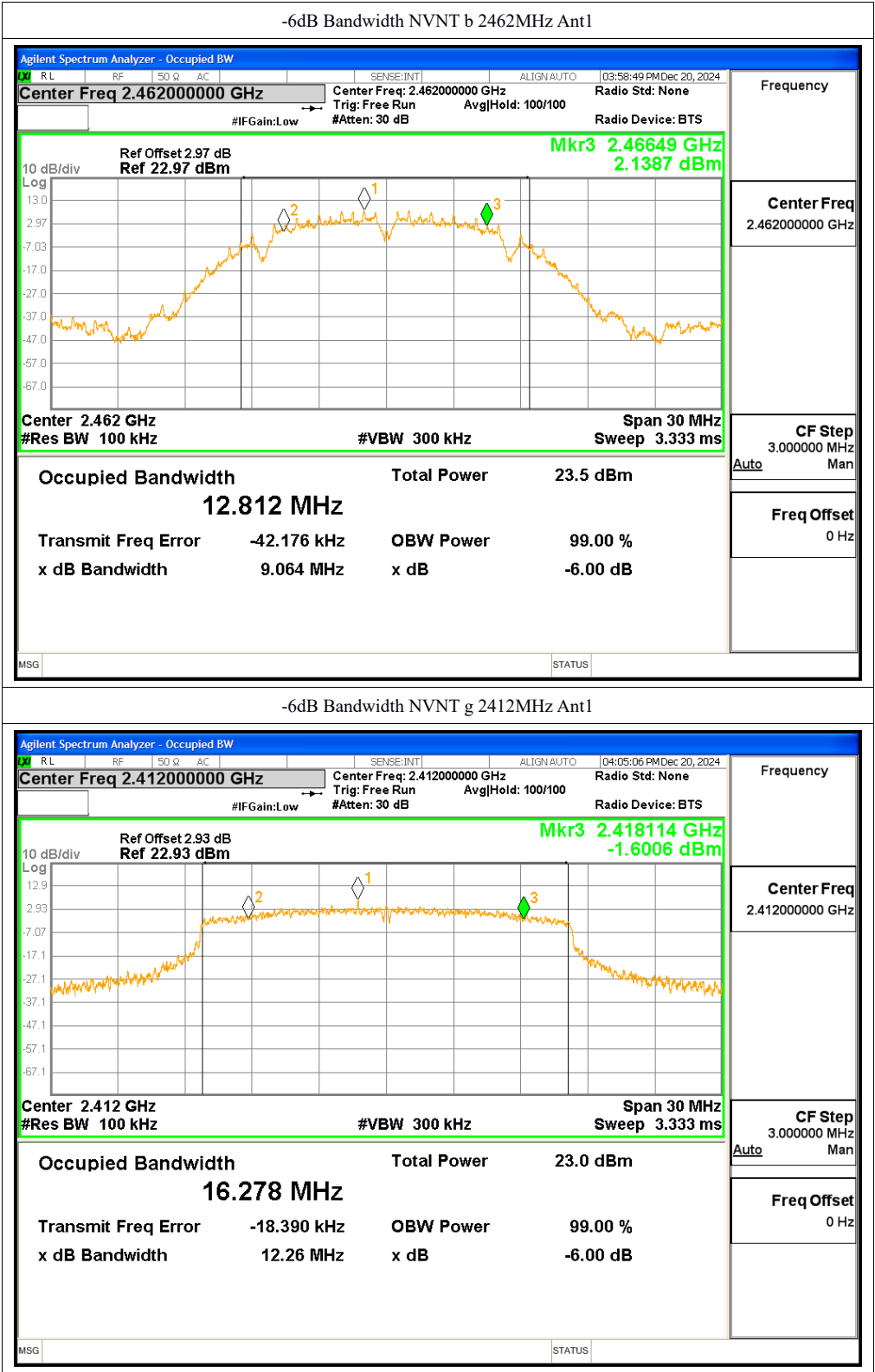
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Agilent Spectrum Analyzer - Occupied BW

RL

RF

50 Ω

AC

SENSE:INT

ALIGN: AUTO

04:05:06 PM Dec 20, 2024

Center Freq 2.412000000 GHz

Center Freq: 2.412000000 GHz

Radio Std: None

#IFGain: Low

Trig: Free Run

Avg/Hold: 100/100

Radio Device: BTS

Ref Offset 2.93 dB

Ref 22.93 dBm

Mkr3 2.418114 GHz

-1.6006 dBm

Center 2.412 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 30 MHz

Sweep 3.333 ms

Occupied Bandwidth

16.278 MHz

Total Power

23.0 dBm

Transmit Freq Error

-18.390 kHz

OBW Power

99.00 %

x dB Bandwidth

12.26 MHz

x dB

-6.00 dB

MSG

STATUS

Frequency

Center Freq

2.412000000 GHz

CF Step

3.000000 MHz

Auto

Man

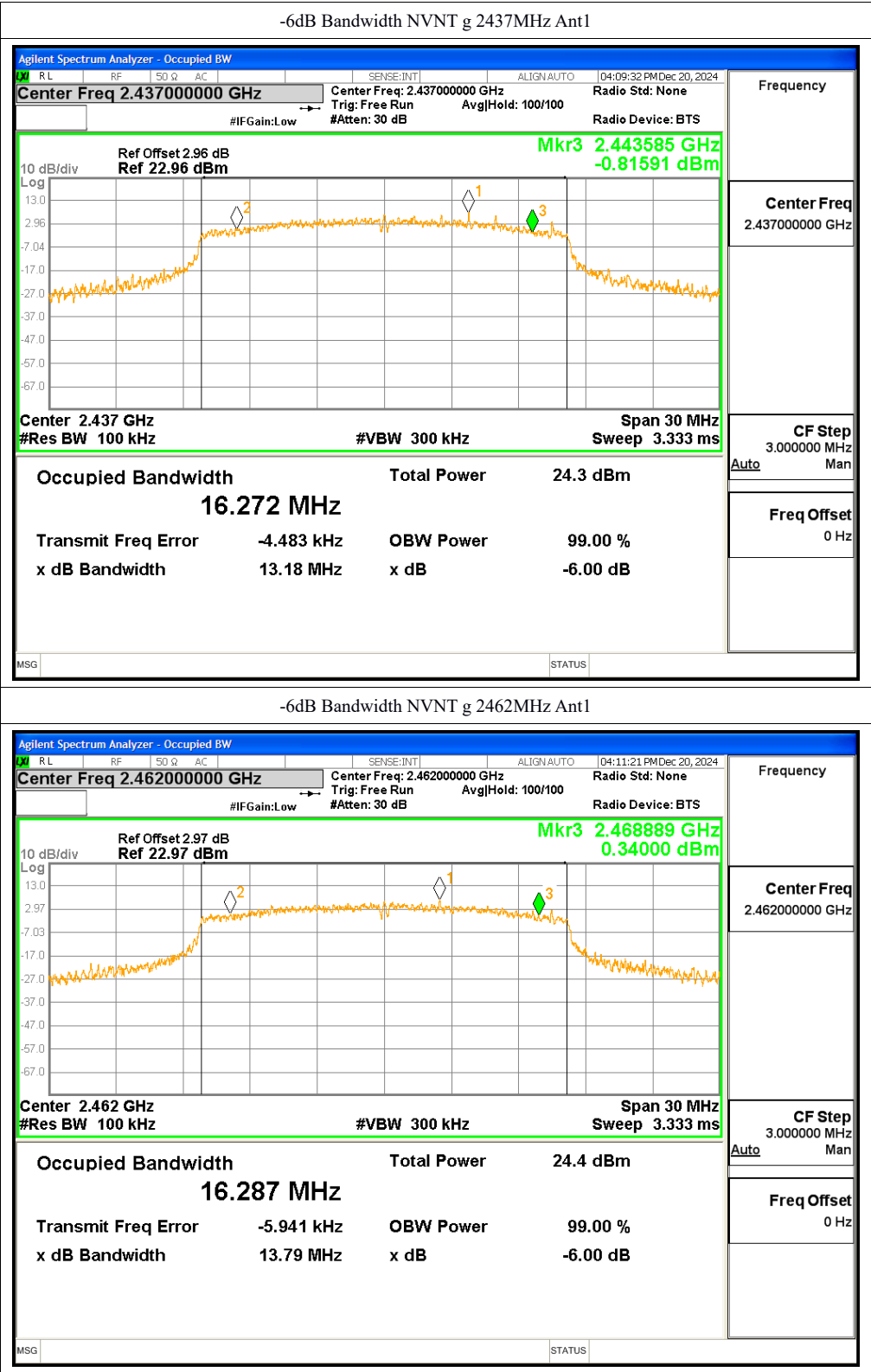
Freq Offset

0 Hz

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Agilent Spectrum Analyzer - Occupied BW

RL

RF

50 Ω

AC

SENSE:INT

ALIGN: AUTO

04:11:21 PM Dec 20, 2024

Center Freq 2.462000000 GHz

Center Freq: 2.462000000 GHz

Radio Std: None

#IFGain: Low

Trig: Free Run

Avg/Hold: 100/100

Radio Device: BTS

Ref Offset 2.97 dB

Ref 22.97 dBm

Mkr3 2.468889 GHz

0.34000 dBm

Center 2.462 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 30 MHz

Sweep 3.333 ms

Occupied Bandwidth

16.287 MHz

Total Power

24.4 dBm

Transmit Freq Error

-5.941 kHz

OBW Power

99.00 %

x dB Bandwidth

13.79 MHz

x dB

-6.00 dB

Frequency

Center Freq

2.462000000 GHz

CF Step

3.000000 MHz

Auto

Man

Freq Offset

0 Hz

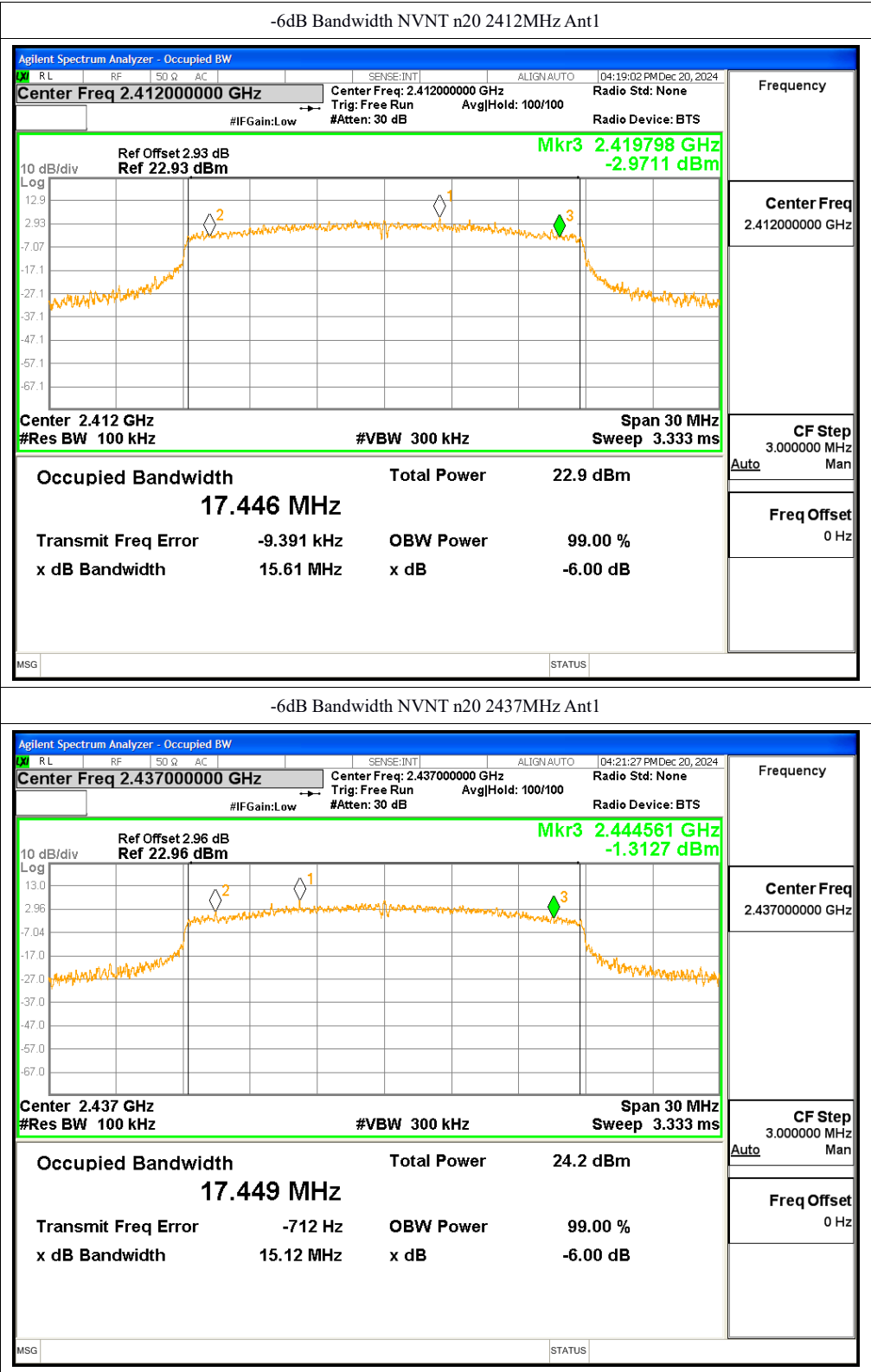
MSG

STATUS

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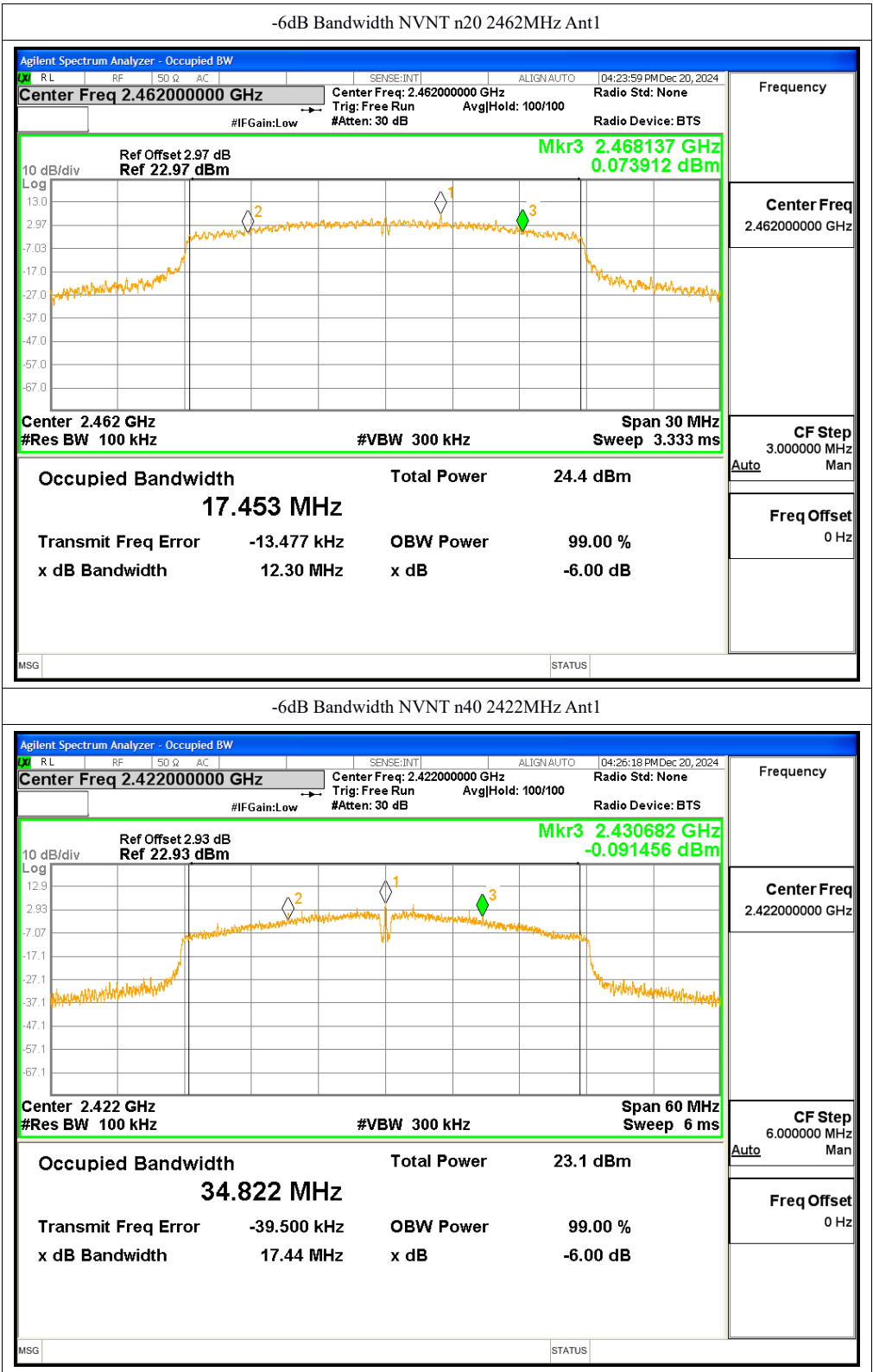
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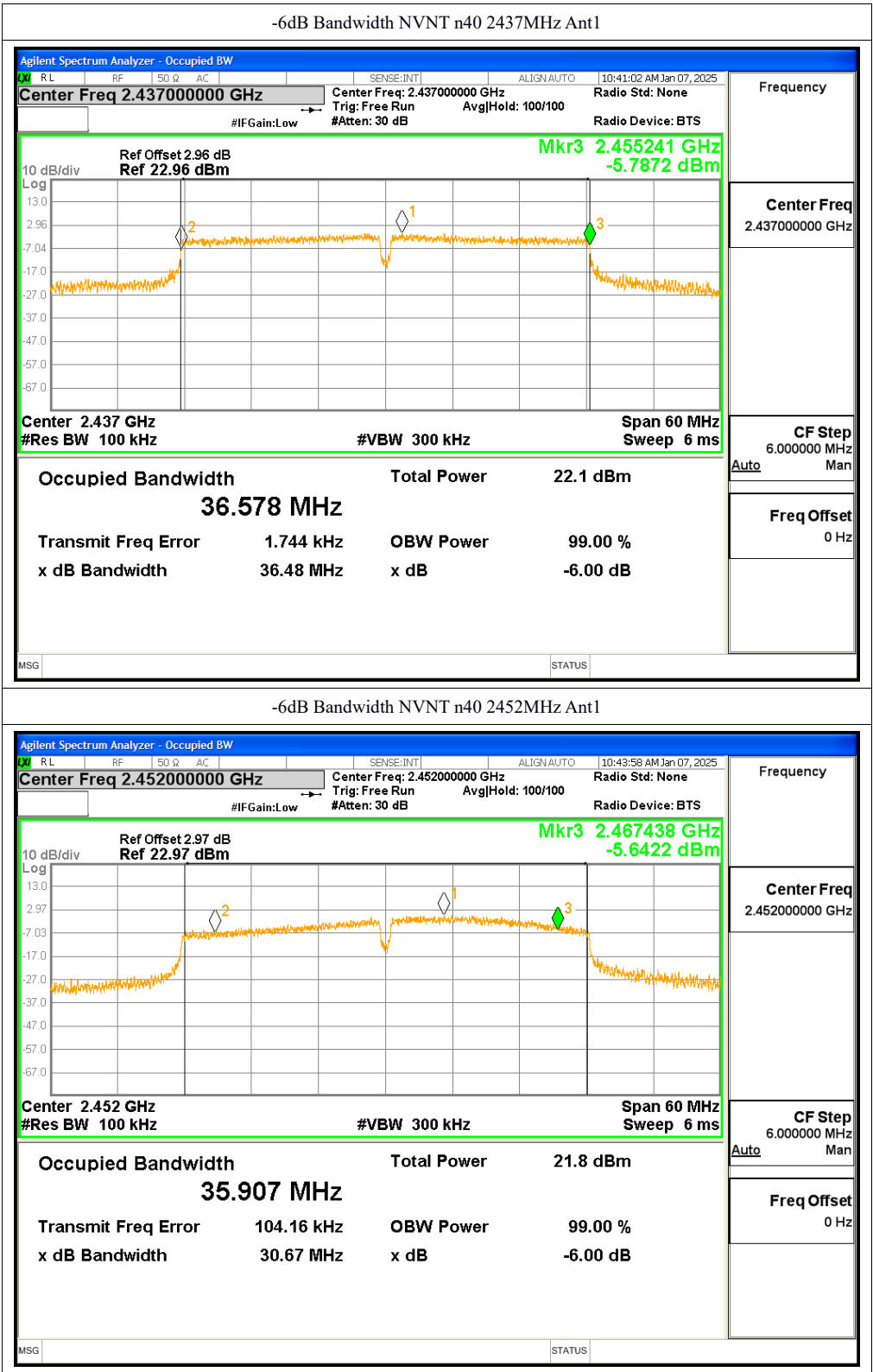
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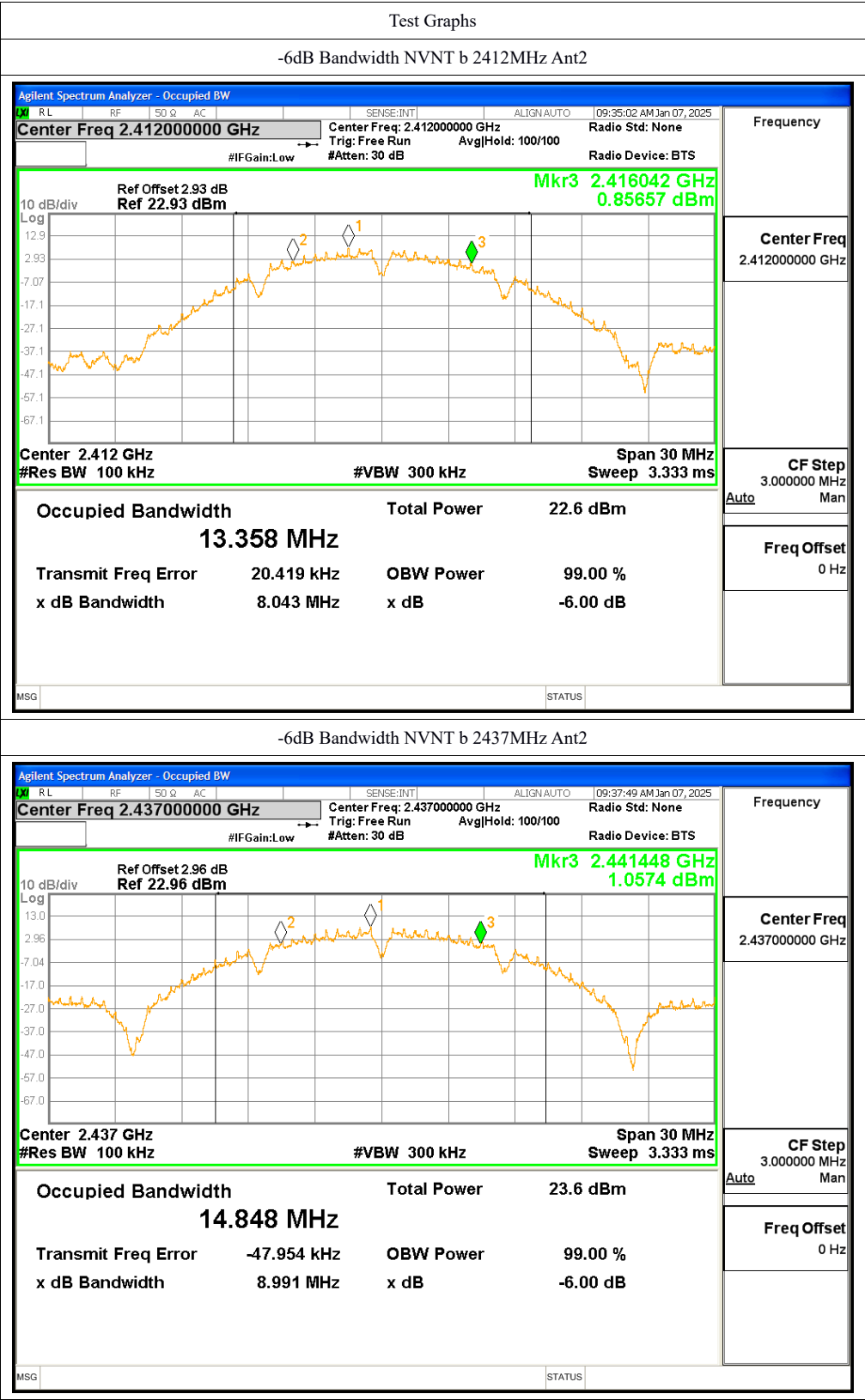
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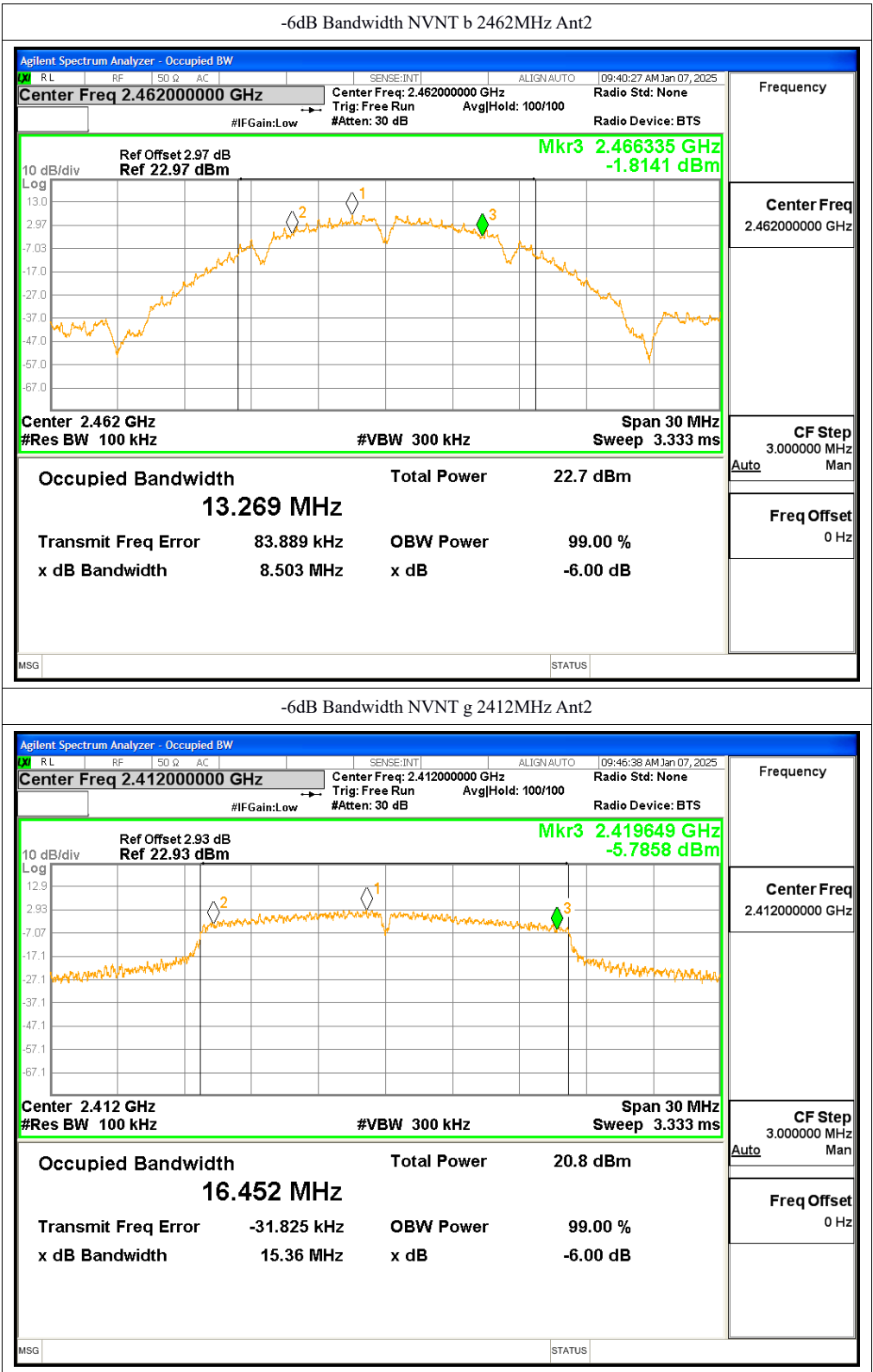


Ant 2 Power

Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant2	8.043	0.5	Pass
		2437		8.991	0.5	Pass
		2462		8.503	0.5	Pass
	g	2412		15.361	0.5	Pass
		2437		16.407	0.5	Pass
		2462		16.294	0.5	Pass
	n20	2412		16.913	0.5	Pass
		2437		17.629	0.5	Pass
		2462		16.731	0.5	Pass
	n40	2422		28.444	0.5	Pass
		2437		36.477	0.5	Pass
		2452		27.225	0.5	Pass

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Agilent Spectrum Analyzer - Occupied BW

RL

RF

50 Ω

AC

SENSE:INT

ALIGN: AUTO

09:46:38 AM Jan 07, 2025

Center Freq 2.412000000 GHz

Center Freq: 2.412000000 GHz

Trig: Free Run

Avg/Hold: 100/100

Radio Std: None

#IFGain: Low

#Atten: 30 dB

Radio Device: BTS

10 dB/div

Log

Ref Offset 2.93 dB

Ref 22.93 dBm

Mkr3 2.419649 GHz

-5.7858 dBm

Center 2.412 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 30 MHz

Sweep 3.333 ms

Occupied Bandwidth

16.452 MHz

Total Power

20.8 dBm

Transmit Freq Error

-31.825 kHz

OBW Power

99.00 %

x dB Bandwidth

15.36 MHz

x dB

-6.00 dB

Frequency

Center Freq

2.412000000 GHz

CF Step

3.000000 MHz

Auto

Man

Freq Offset

0 Hz

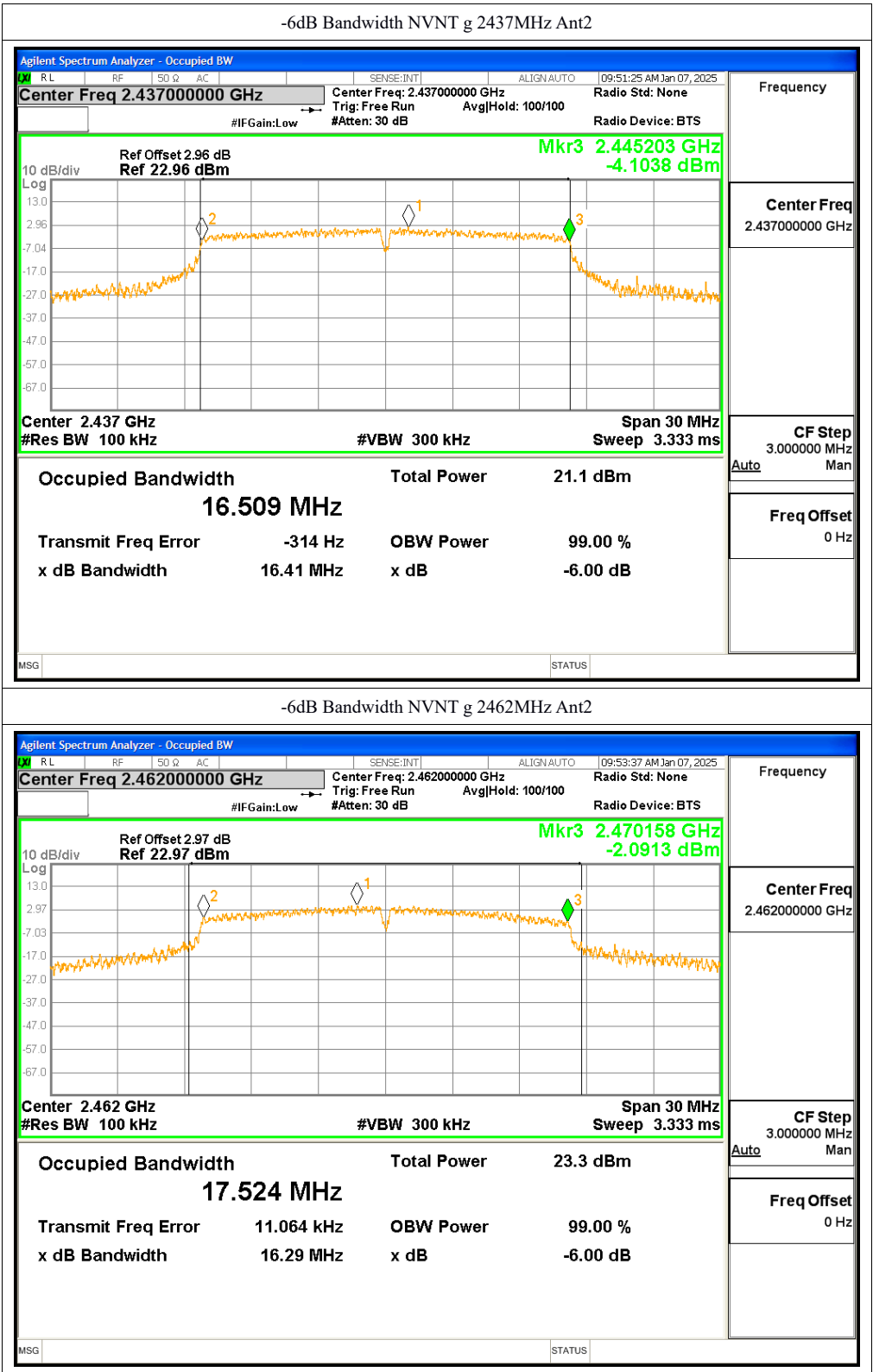
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STATUS

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Agilent Spectrum Analyzer - Occupied BW

RL

RF

50 Ω

AC

SENSE:INT

ALIGN: AUTO

09:53:37 AM Jan 07, 2025

Center Freq 2.462000000 GHz

Center Freq: 2.462000000 GHz

Radio Std: None

#IFGain: Low

Trig: Free Run

Avg/Hold: 100/100

Radio Device: BTS

Ref Offset 2.97 dB

Ref 22.97 dBm

Mkr3 2.470158 GHz

-2.0913 dBm

Center 2.462 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 30 MHz

Sweep 3.333 ms

Occupied Bandwidth

17.524 MHz

Total Power

23.3 dBm

Transmit Freq Error

11.064 kHz

OBW Power

99.00 %

x dB Bandwidth

16.29 MHz

x dB

-6.00 dB

MSG

STATUS

Frequency

Center Freq

2.462000000 GHz

CF Step

3.000000 MHz

Auto

Man

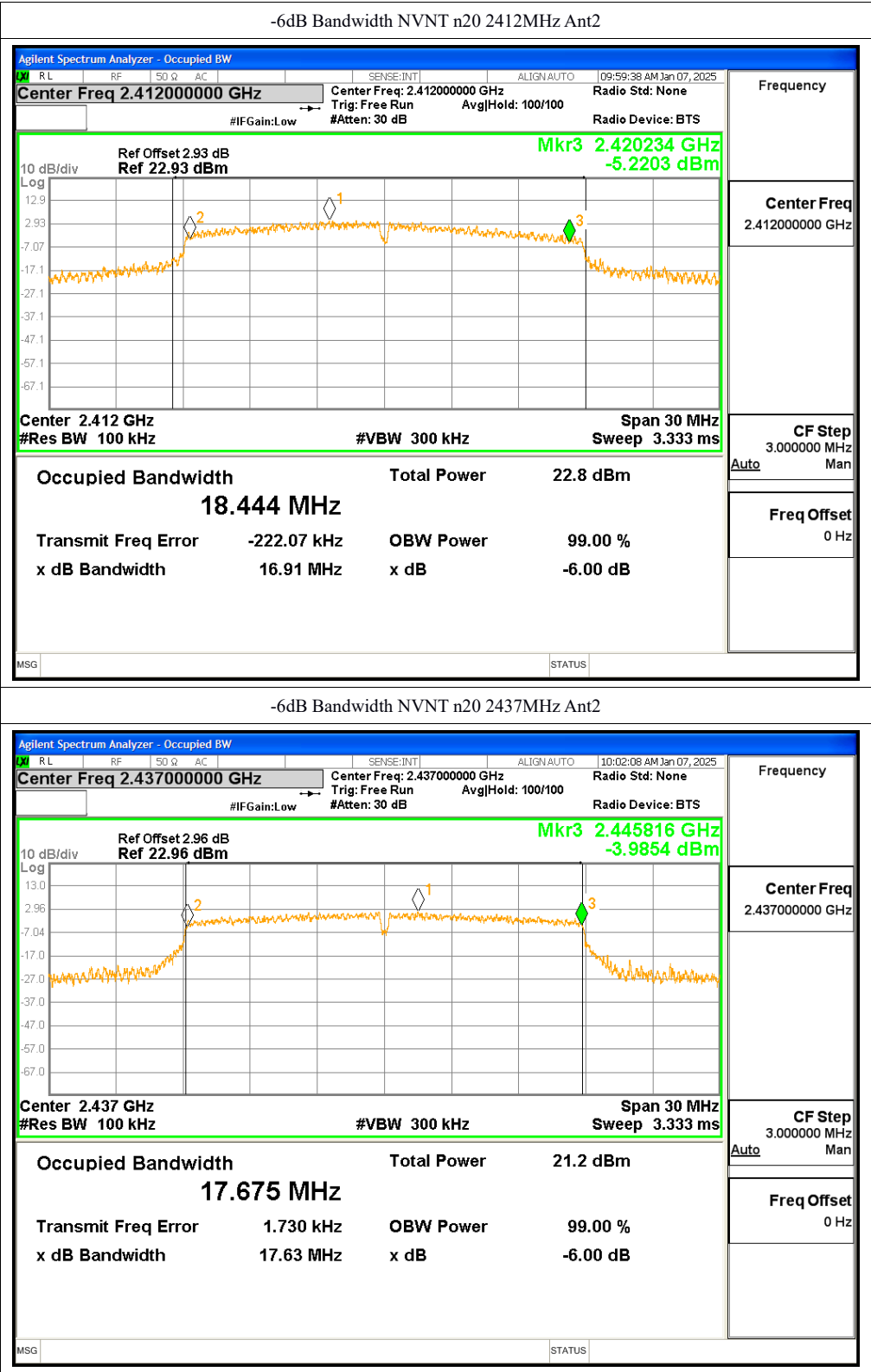
Freq Offset

0 Hz

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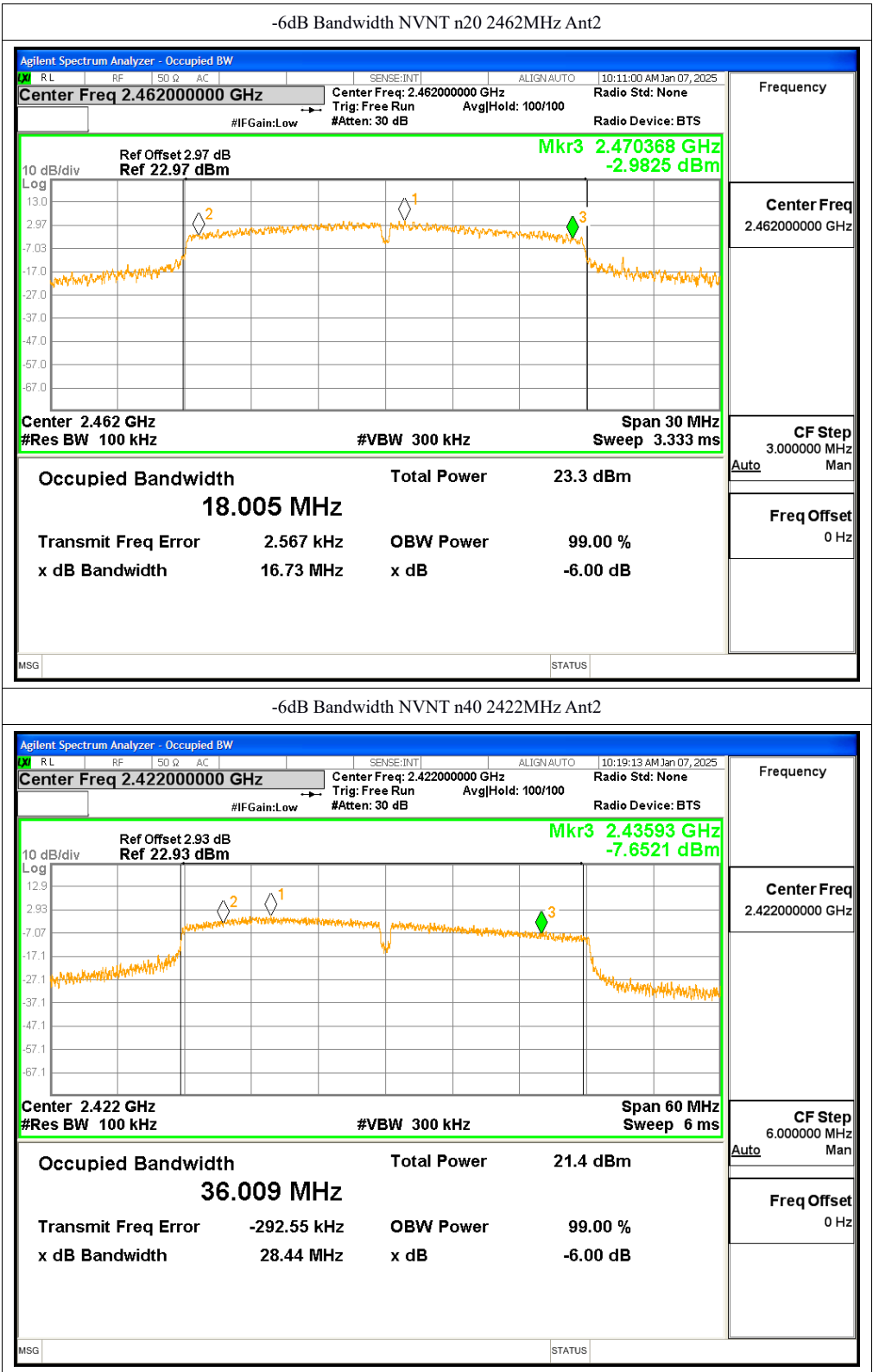
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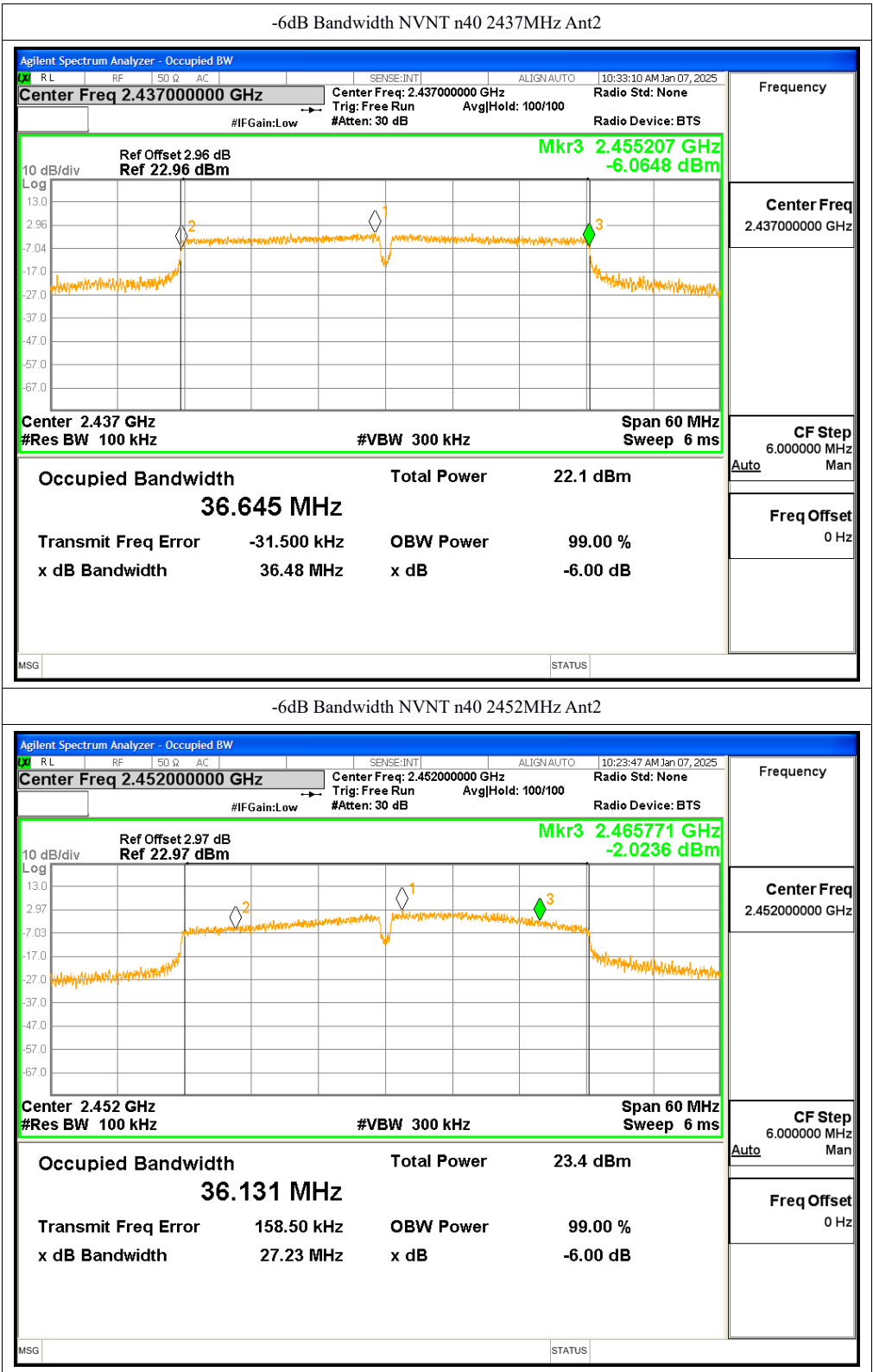
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Agilent Spectrum Analyzer - Occupied BW

RL

RF

50 Ω

AC

SENSE:INT

ALIGN: AUTO

10:23:47 AM Jan 07, 2025

Center Freq 2.452000000 GHz

Center Freq: 2.452000000 GHz

Radio Std: None

#IF Gain: Low

Trig: Free Run

Avg/Hold: 100/100

Radio Device: BTS

Ref Offset 2.97 dB

Ref 22.97 dBm

Mkr3 2.465771 GHz

-2.0236 dBm

Center 2.452 GHz

#Res BW 100 kHz

#VBW 300 kHz

Span 60 MHz

Sweep 6 ms

Occupied Bandwidth

Total Power

23.4 dBm

36.131 MHz

Transmit Freq Error

158.50 kHz

OBW Power

99.00 %

x dB Bandwidth

27.23 MHz

x dB

-6.00 dB

Frequency

Center Freq

2.452000000 GHz

CF Step

6.000000 MHz

Auto

Man

Freq Offset

0 Hz

MSG

STATUS

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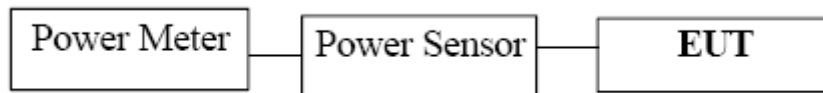
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8. Maximum Output Power

8.1 Test Setup



8.2 Limits of Maximum Output Power

The Maximum Output Power Measurement is 30dBm.

8.3 Test Procedure

The RF power output was measured with a Power meter connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate centre frequency.

Note: The PK power was measured

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8.4 Test Results

Ant 1

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	17.38	0	17.38	30	Pass
		2437		17.55	0	17.55	30	Pass
		2462		17.32	0	17.32	30	Pass
	g	2412		17.39	0	17.39	30	Pass
		2437		18.77	0	18.77	30	Pass
		2462		18.65	0	18.65	30	Pass
	n20	2412		17.32	0	17.32	30	Pass
		2437		18.66	0	18.66	30	Pass
		2462		18.54	0	18.54	30	Pass
	n40	2422		17.45	0	17.45	30	Pass
		2437		16.1	0	16.1	30	Pass
		2452		15.49	0	15.49	30	Pass

Ant 2

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant2	16.3	0	16.3	30	Pass
		2437		16.85	0	16.85	30	Pass
		2462		15.88	0	15.88	30	Pass
	g	2412		15.28	0	15.28	30	Pass
		2437		15.21	0	15.21	30	Pass
		2462		16.99	0	16.99	30	Pass
	n20	2412		16.86	0	16.86	30	Pass
		2437		15.35	0	15.35	30	Pass
		2462		16.9	0	16.9	30	Pass
	n40	2422		15.52	0	15.52	30	Pass
		2437		16.2	0	16.2	30	Pass
		2452		17.03	0	17.03	30	Pass

Note: 1. The result basic equation calculation as follow:

$$\text{Power Output} = \text{Power Reading} + \text{Cable loss} + \text{Attenuator}$$

2. The worse case was recorded

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EUT	Agricultural unmanned aircraft				Model	3WWDZ-50B		
Mode	802.11n (HT20)				Test Voltage	DC53.2V		
Temperature	24 deg. C,				Humidity	56% RH		
Channel	Frequency (MHz)	Ant 1 Power		Ant 2 Power		Total Max. Power Output -MIMO (dBm)	Power Limit (dBm)	Pass/ Fail
		dBm	mW	dBm	mW			
1	2412	17.32	53.95	16.86	48.53	20.11	30	Pass
6	2437	18.66	73.45	15.35	34.28	20.32	30	Pass
11	2462	18.54	71.45	16.90	48.98	20.81	30	Pass

Note: 1. At final test to get the worst-case emission at mcs0 of 11n HT20 for CH01, CH06 and CH11

2. The result basic equation calculation as follow:

Power Output = Power Reading + Cable loss + Attenuator

3. The worse case was recorded

EUT	Agricultural unmanned aircraft				Model	3WWDZ-50B		
Mode	802.11n (HT40)				Test Voltage	DC53.2V		
Temperature	24 deg. C,				Humidity	56% RH		
Channel	Frequency (MHz)	Ant 1 Power		Ant 2 Power		Total Max. Power Output-MIMO (dBm)	Power Limit (dBm)	Pass/ Fail
		dBm	mW	dBm	mW			
3	2422	17.45	55.59	15.52	35.65	19.60	30	Pass
6	2437	16.10	40.74	16.20	41.69	19.16	30	Pass
9	2452	15.49	35.40	17.03	50.47	19.34	30	Pass

Note: 1. At final test to get the worst-case emission at mcs0 of 11n HT40 for CH03, CH06 and CH09

2. The result basic equation calculation as follow:

Power Output = Power Reading + Cable loss + Attenuator

3. The worse case was recorded

The report refers only to the sample tested and does not apply to the bulk.

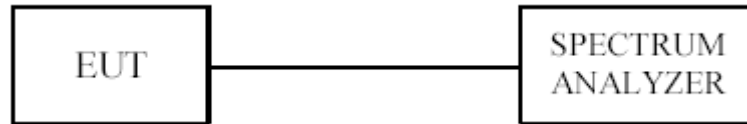
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9. Power Spectral Density Measurement

9.1 Test Setup



9.2 Limits of Power Spectral Density Measurement

The Maximum Power Spectral Density Measurement is 8dBm/3kHz.

9.3 Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 3 kHz.
3. Set the VBW \geq 10 kHz.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be \leq 8 dBm/3kHz.

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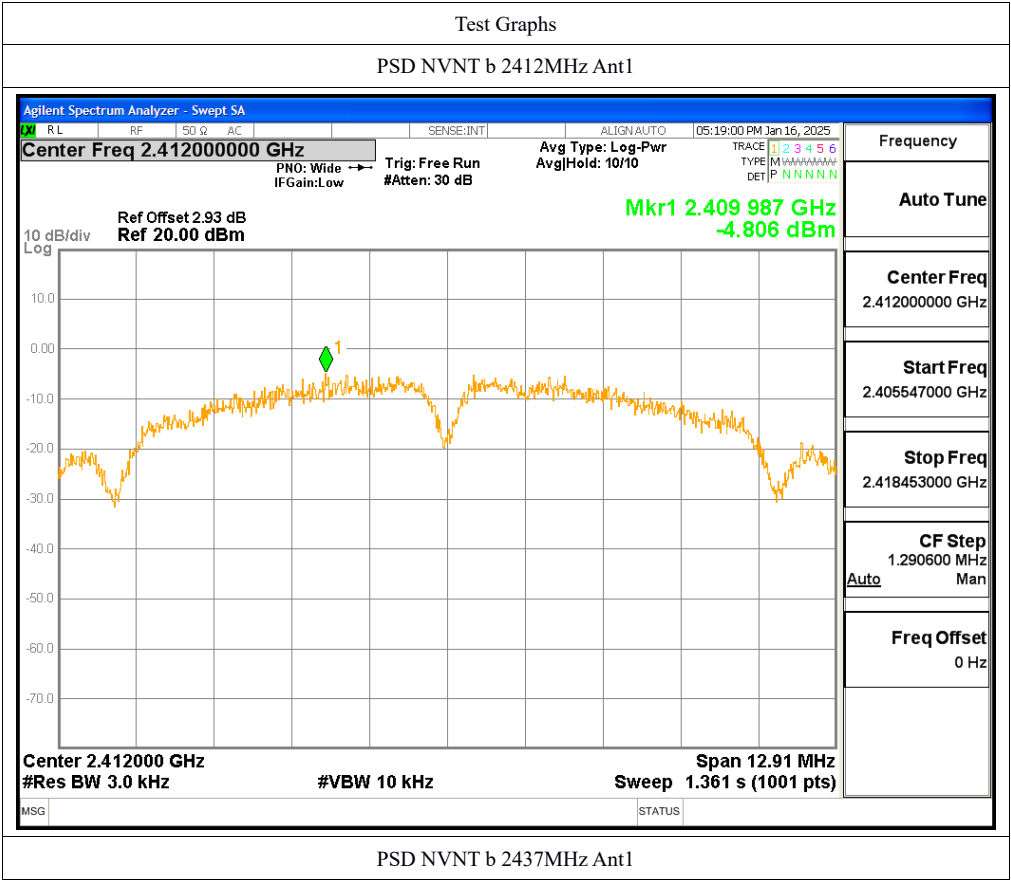


9.4Test Result

Ant 1

Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3kHz)	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	b	2412	Ant1	-4.81	0	-4.81	8	Pass
		2437		-4.35	0	-4.35	8	Pass
		2462		-2.58	0	-2.58	8	Pass
	g	2412		-7.92	0	-7.92	8	Pass
		2437		-7.81	0	-7.81	8	Pass
		2462		-6.78	0	-6.78	8	Pass
	n20	2412		-7.35	0	-7.35	8	Pass
		2437		-7.54	0	-7.54	8	Pass
		2462		-7.66	0	-7.66	8	Pass
	n40	2422		-9.12	0	-9.12	8	Pass
		2437		-9.55	0	-9.55	8	Pass
		2452		-10.3	0	-10.3	8	Pass

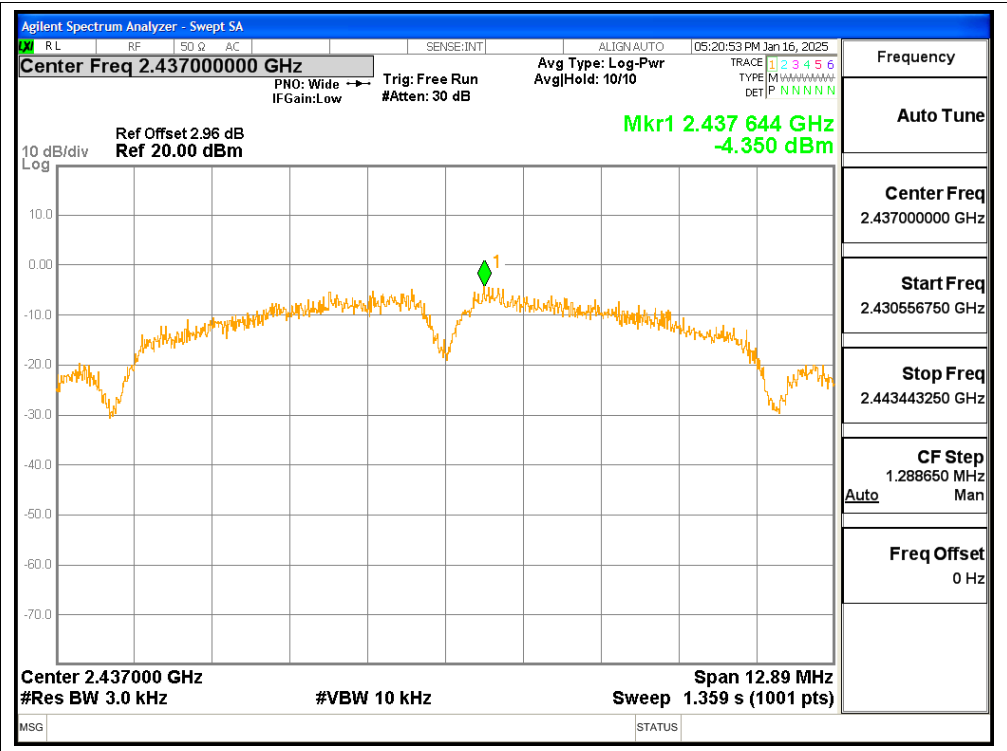
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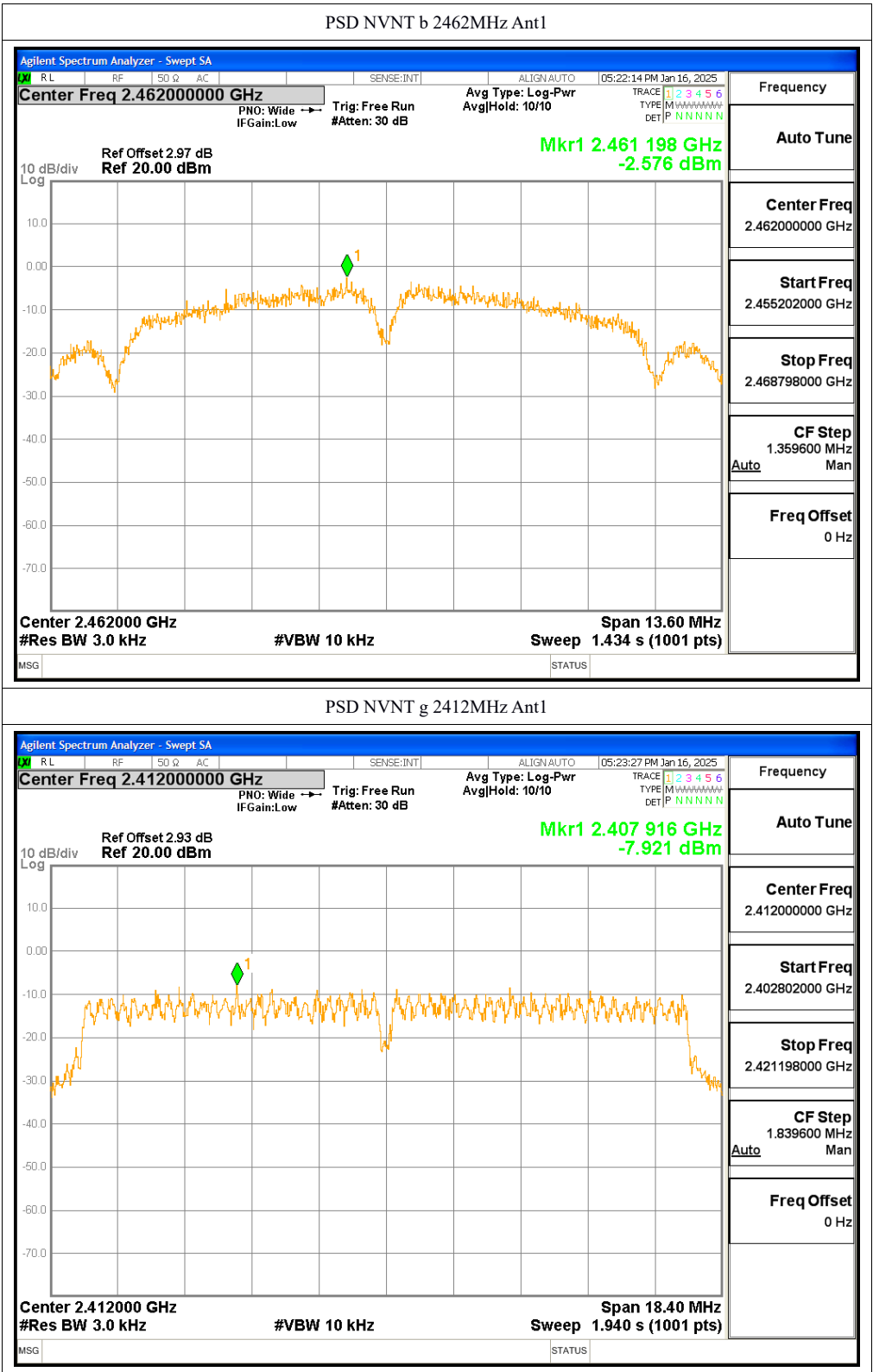
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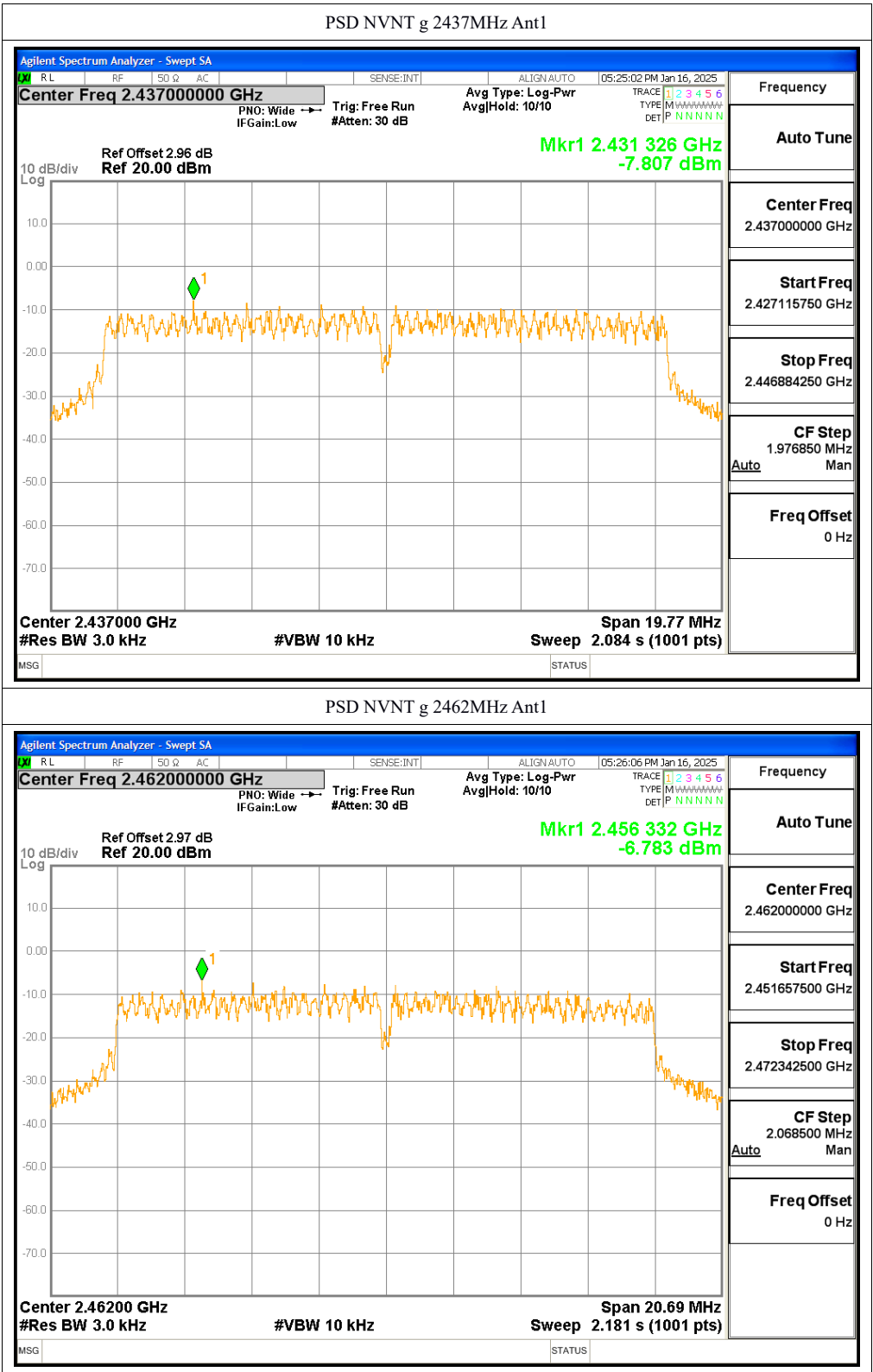
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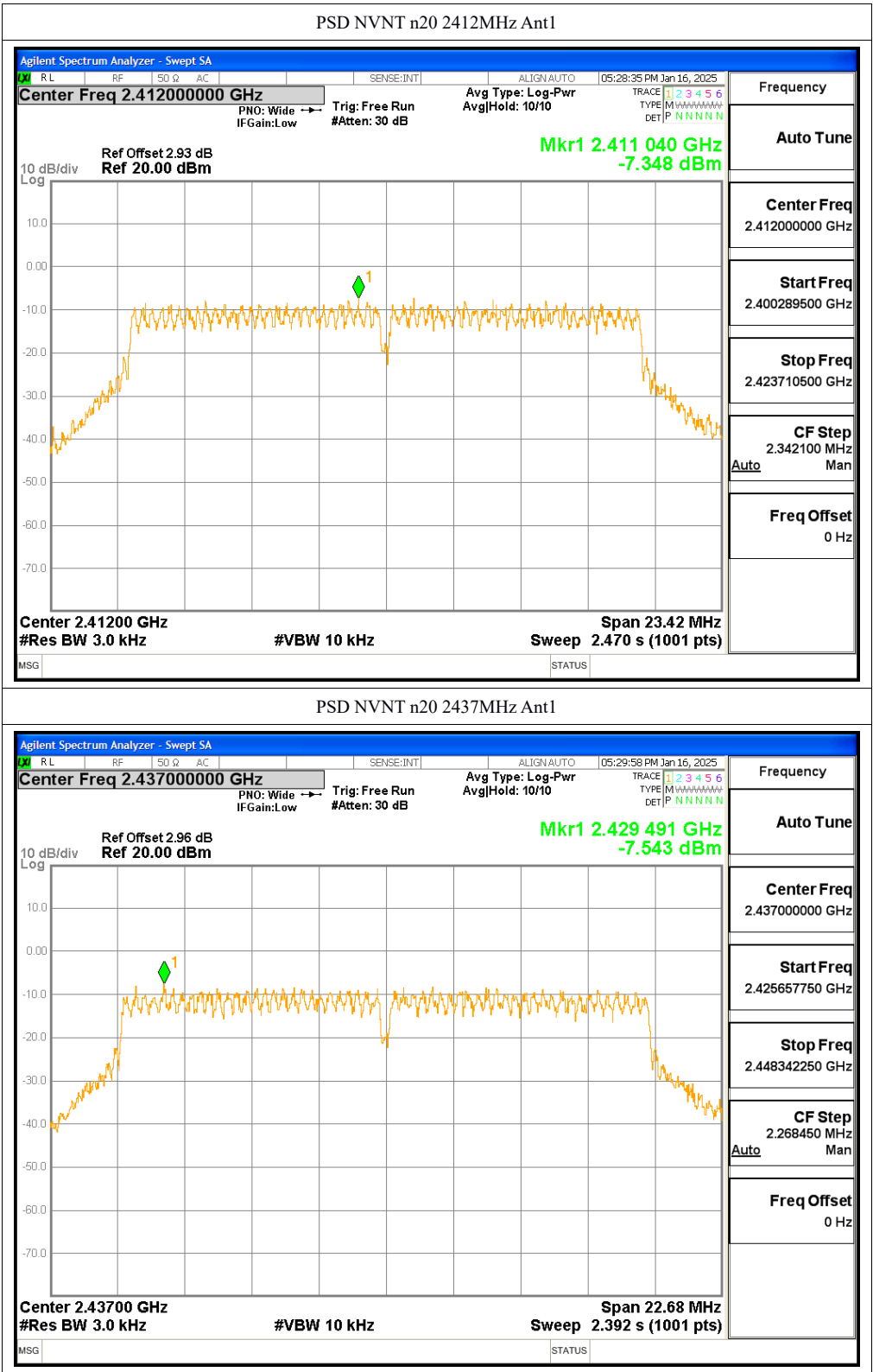
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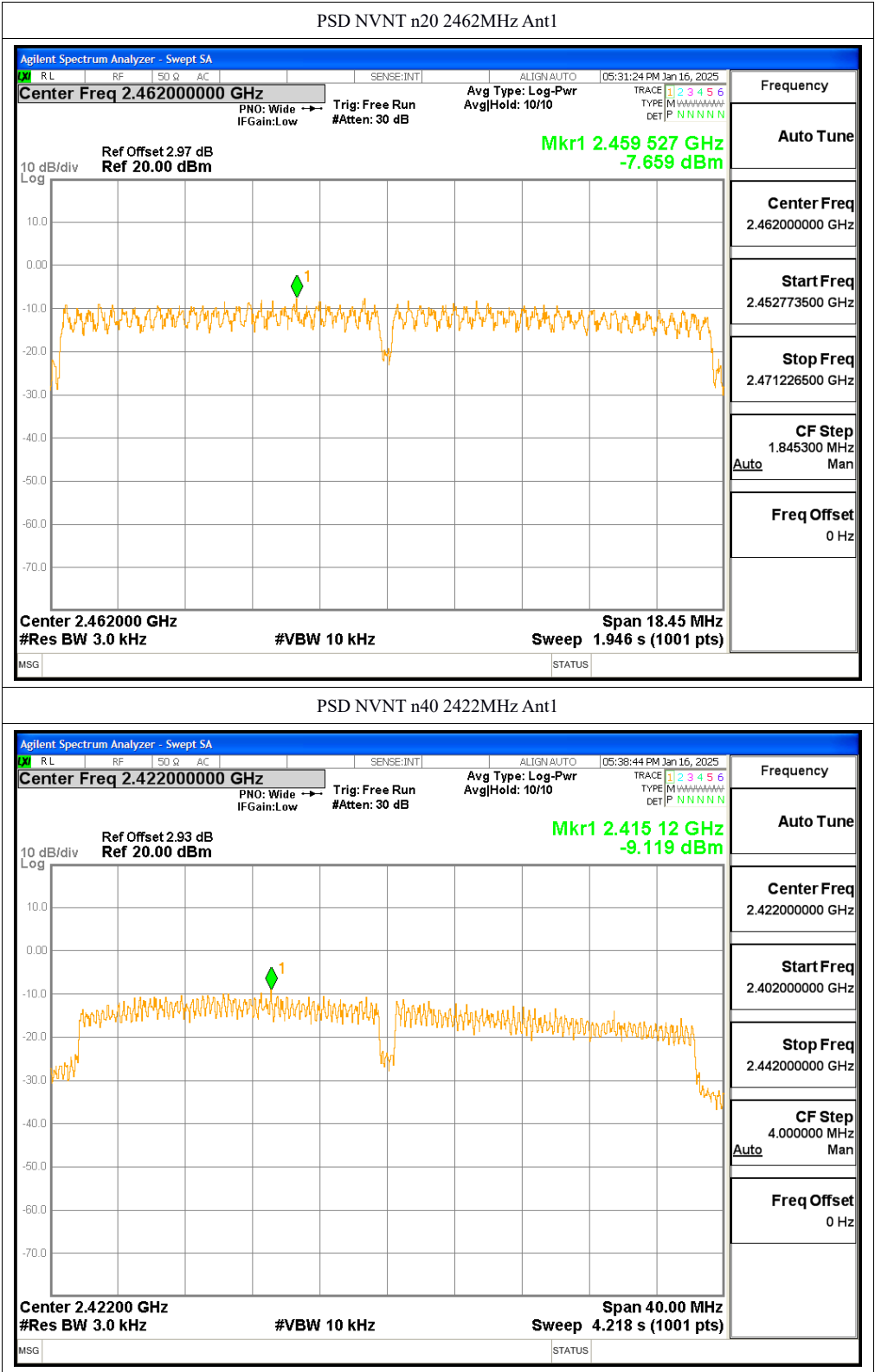
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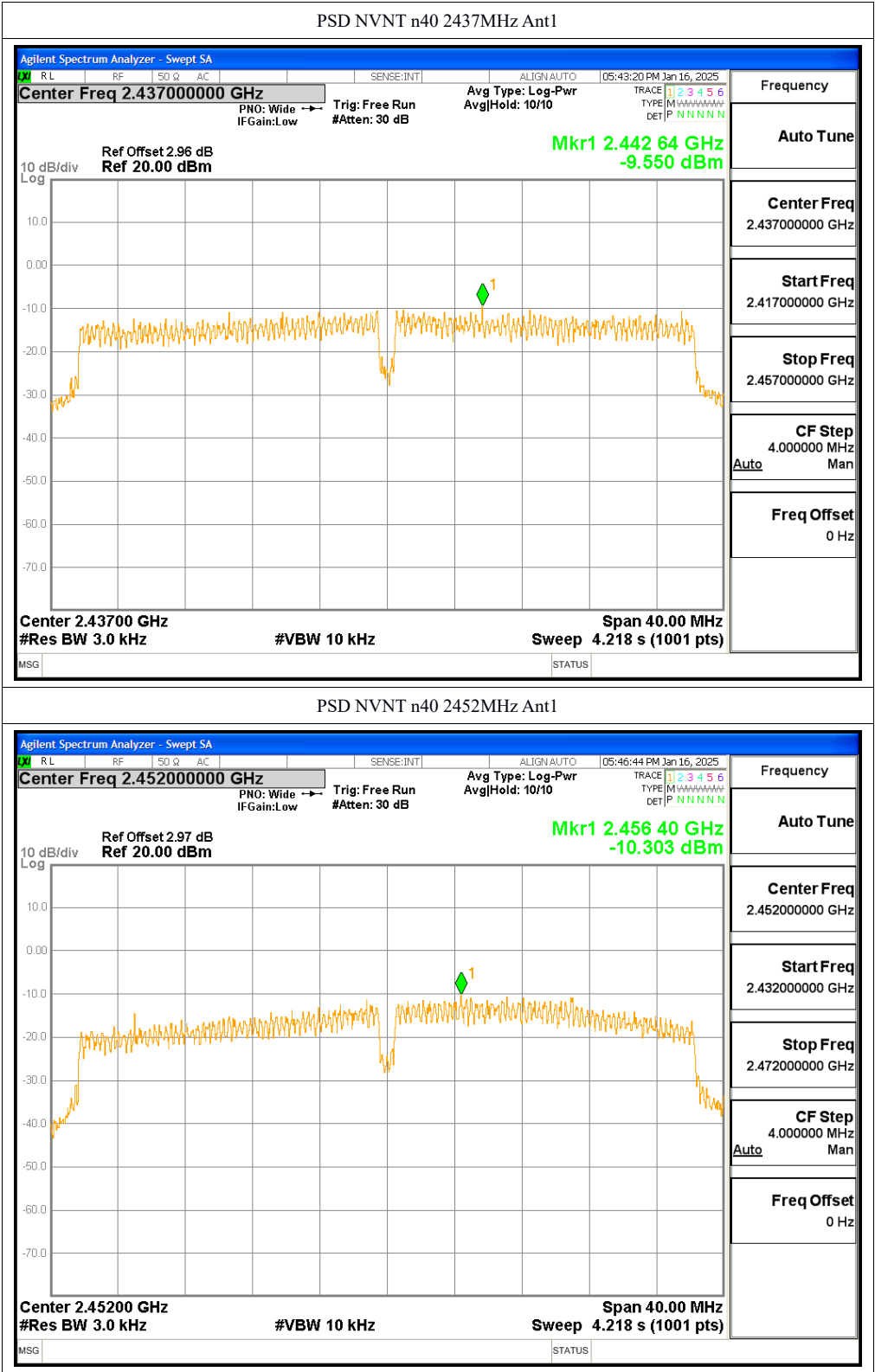
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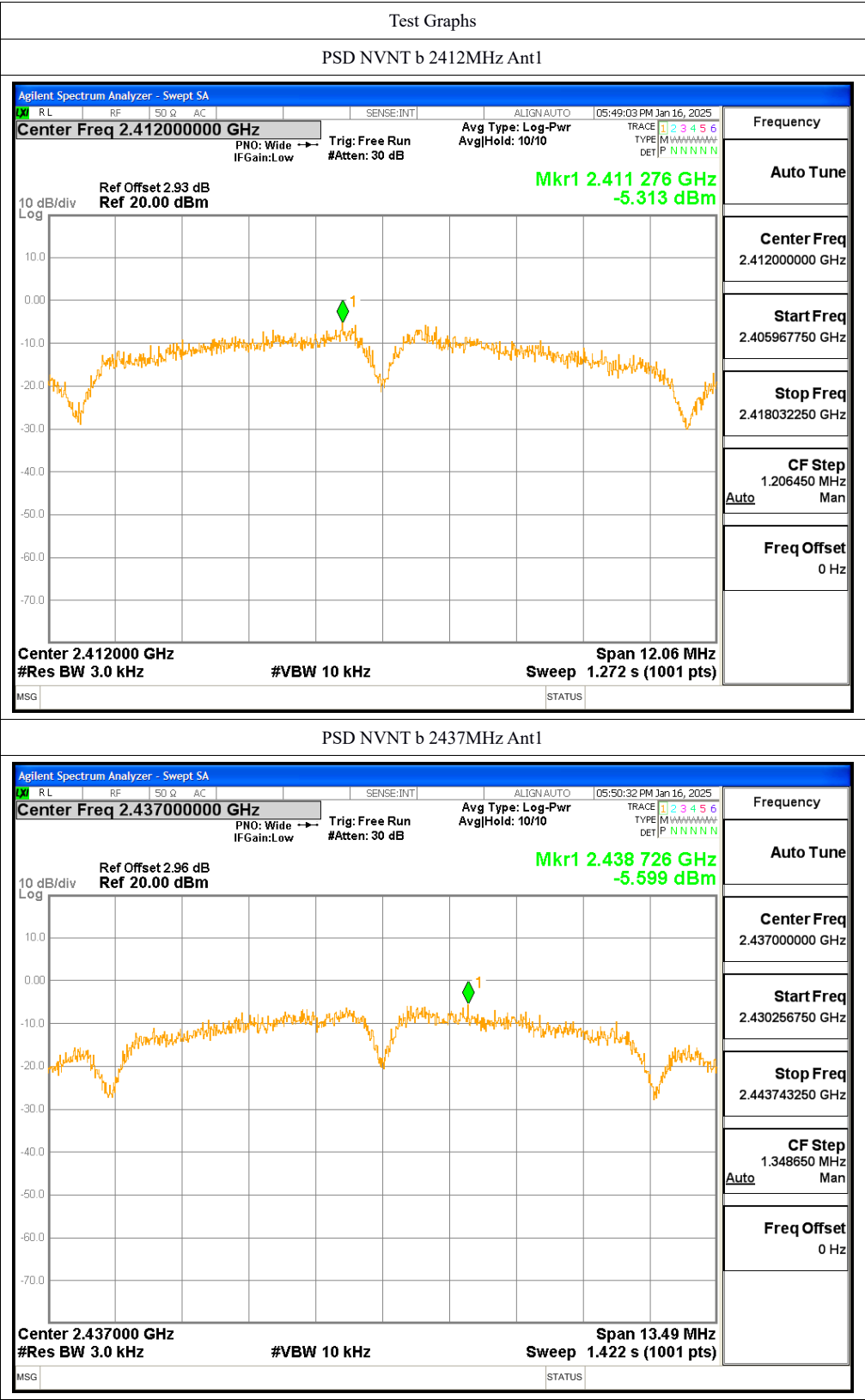
Ant 2

Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3kHz)	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	b	2412	Ant1	-5.31	0	-5.31	8	Pass
		2437		-5.6	0	-5.6	8	Pass
		2462		-4.62	0	-4.62	8	Pass
	g	2412		-8.11	0	-8.11	8	Pass
		2437		-8.98	0	-8.98	8	Pass
		2462		-7.12	0	-7.12	8	Pass
	n20	2412		-7.03	0	-7.03	8	Pass
		2437		-8.88	0	-8.88	8	Pass
		2462		-7.02	0	-7.02	8	Pass
	n40	2422		-11.38	0	-11.38	8	Pass
		2437		-11.73	0	-11.73	8	Pass
		2452		-9.74	0	-9.74	8	Pass

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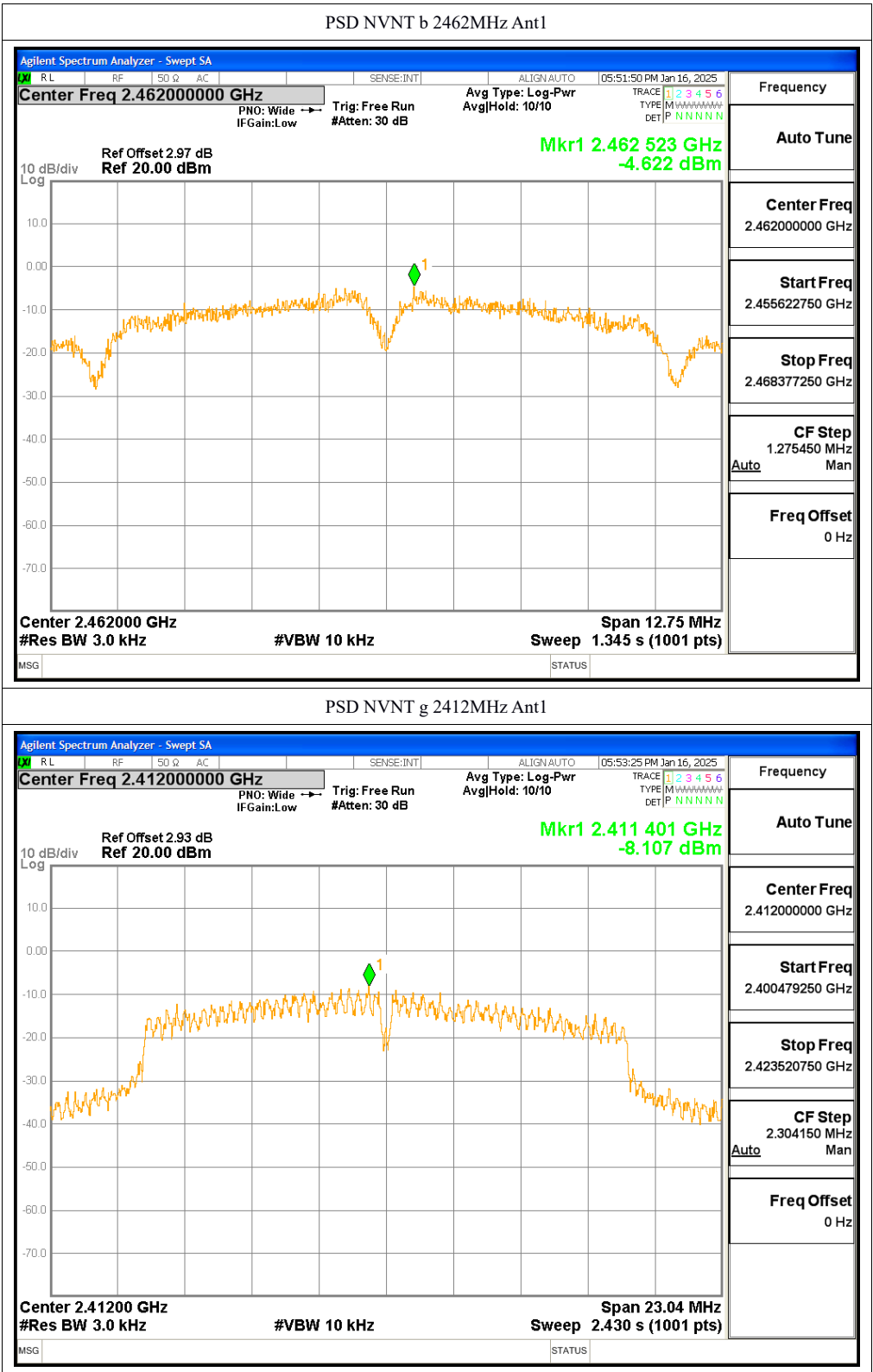
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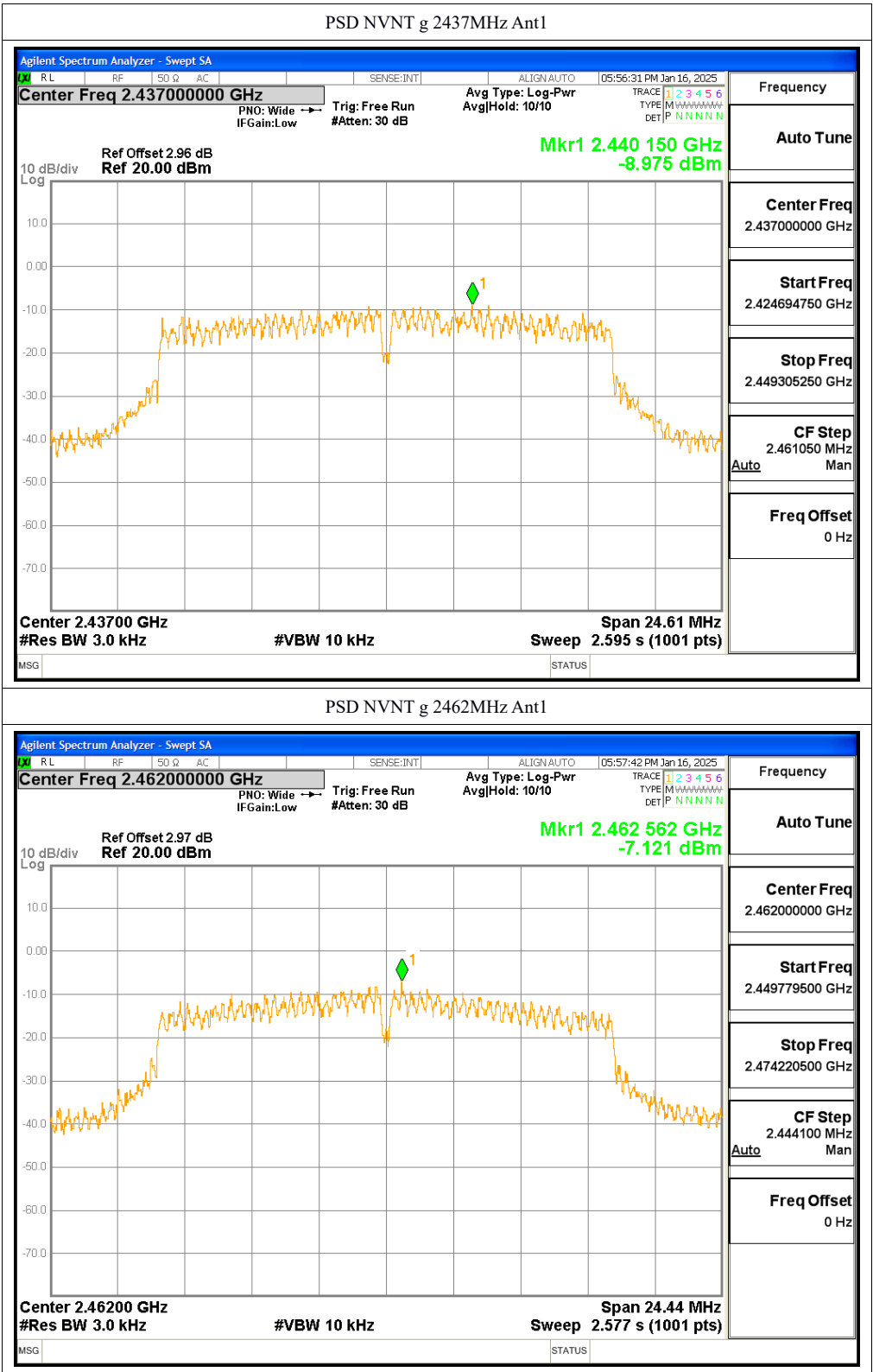
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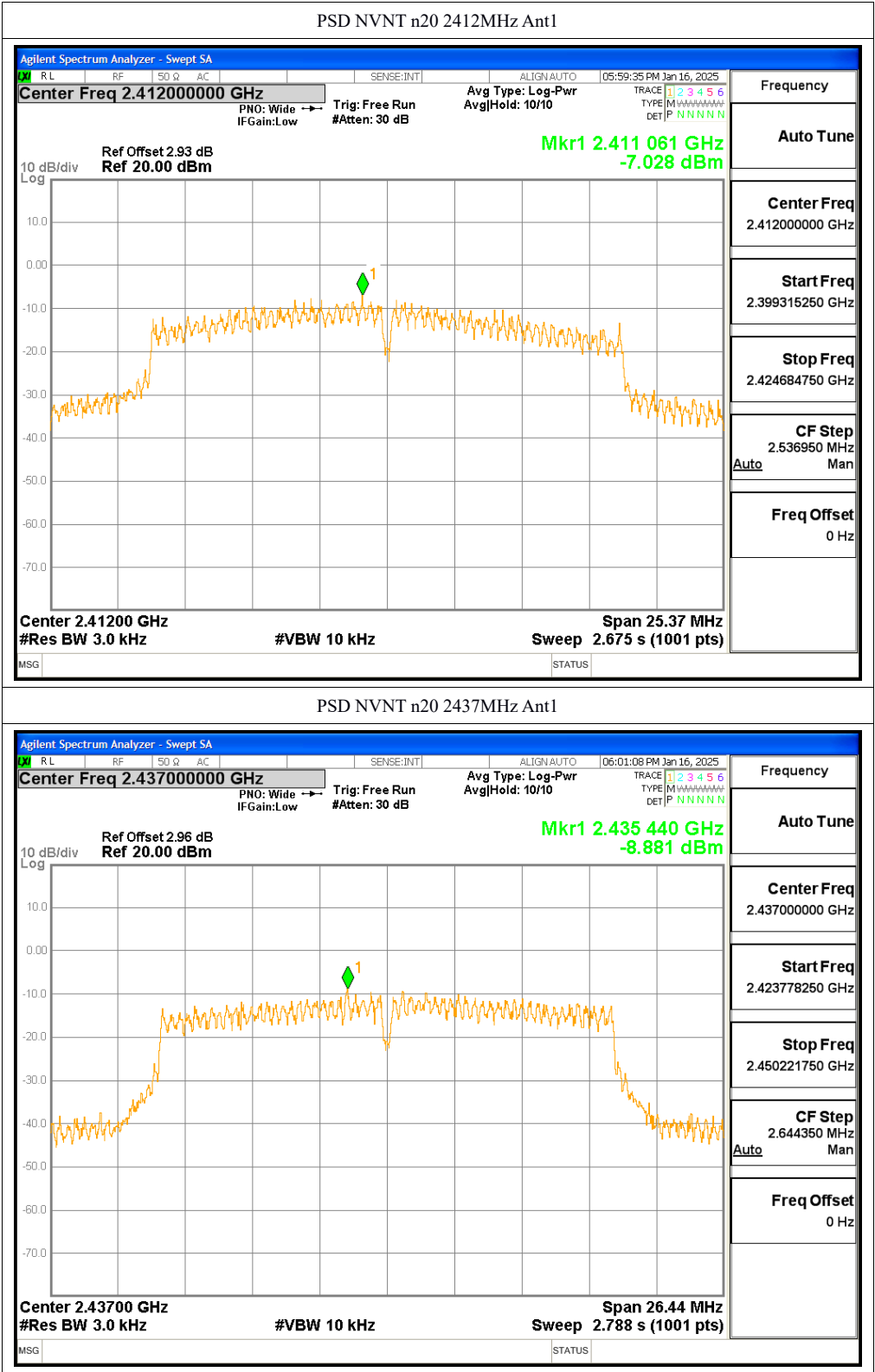
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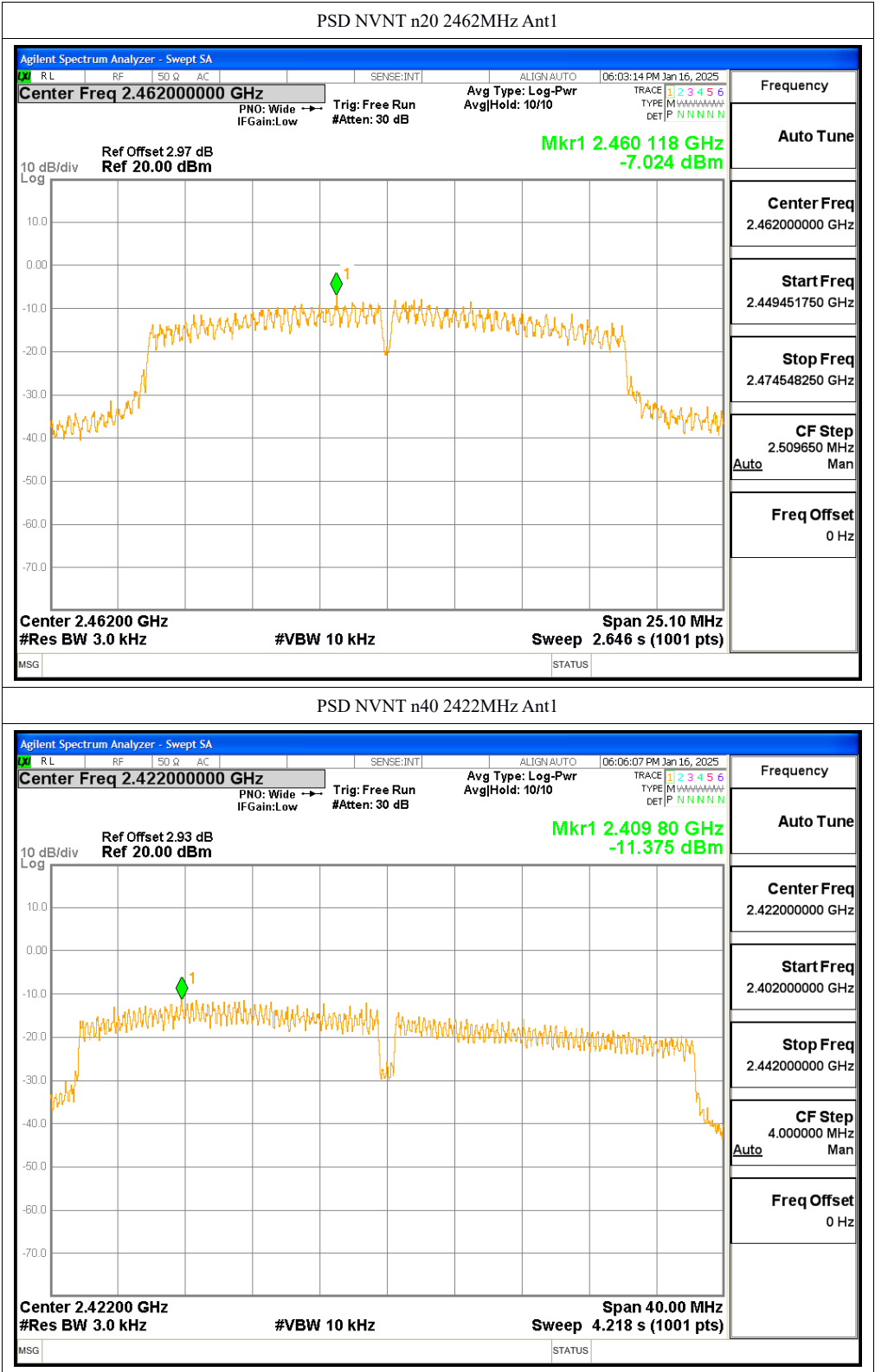
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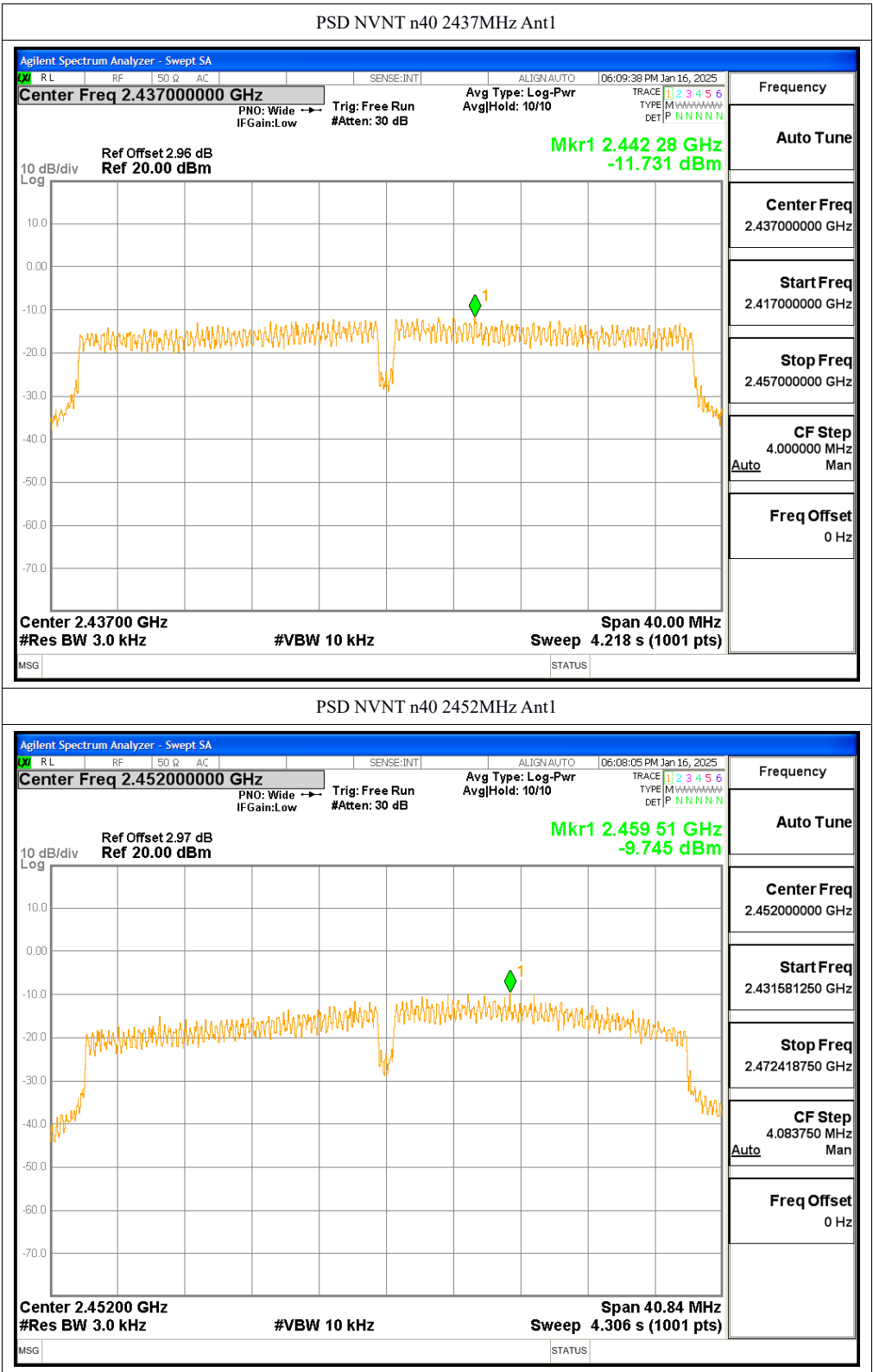
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EUT	Agricultural unmanned aircraft			Model	3WWDZ-50B	
Mode	802.11n (HT20)			Test Voltage	DC53.2V	
Temperature	24 deg. C,			Humidity	56% RH	
Channel	Frequency (MHz)	Ant 1 Power Spectral Density	Ant 2 Power Spectral Density	Total Power Spectral Density-MIMO (dBm/3kHz)	Limit (dBm/3kHz)	Pass/ Fail
		dBm/3kHz	dBm/3kHz			
1	2412	-7.35	-7.03	-4.18	8	Pass
6	2437	-7.54	-8.88	-5.15	8	Pass
11	2462	-7.66	-7.02	-4.32	8	Pass

EUT	Agricultural unmanned aircraft			Model	3WWDZ-50B	
Mode	802.11n (HT40)			Test Voltage	DC53.2V	
Temperature	24 deg. C,			Humidity	56% RH	
Channel	Frequency (MHz)	Ant 1 Power Spectral Density	Ant 2 Power Spectral Density	Total Power Spectral Density-MIMO (dBm/3kHz)	Limit (dBm/3kHz)	Pass/ Fail
		dBm/3kHz	dBm/3kHz			
3	2422	-9.12	-11.38	-7.09	8	Pass
6	2437	-9.55	-11.73	-7.49	8	Pass
9	2452	-10.3	-9.74	-7.00	8	Pass

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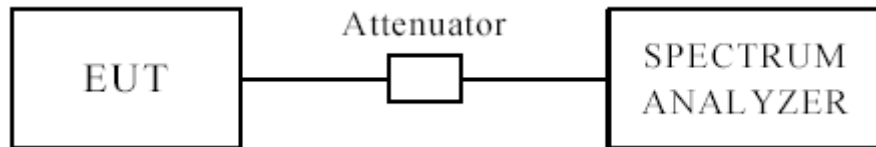
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10 Out of Band Measurement

10.1 Test Setup for band edge



The restricted band requirement based on radiated emission test; please see the clause 6 for the test setup

10.2 Limits of Out of Band Emissions Measurement

1. Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

10.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of radiated emission test. (Peak values with RBW=VBW=1MHz and PK detector. AV value with RBW=1MHz, VBW=10Hz and PK detector)

For bandage test, the spectrum set as follows: RBW=100, VBW=300 kHz. A conducted measurement used

10.4 Test Result

Please see next pages

Note: 1. For band-edge measurement, the frequency from 30MHz-25GHz was tested. And It met the FCC rule.
2. Ant 1 and Ant 2 transmitting Simultaneously

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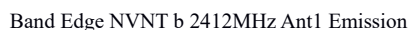
Band Edge

Ant 1

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant1	-46.05	-20	Pass
		2462		-59.36	-20	Pass
	g	2412		-30.01	-20	Pass
		2462		-44.83	-20	Pass
	n20	2412		-30.76	-20	Pass
		2462		-44.43	-20	Pass
	n40	2422		-33.08	-20	Pass
		2452		-27.12	-20	Pass

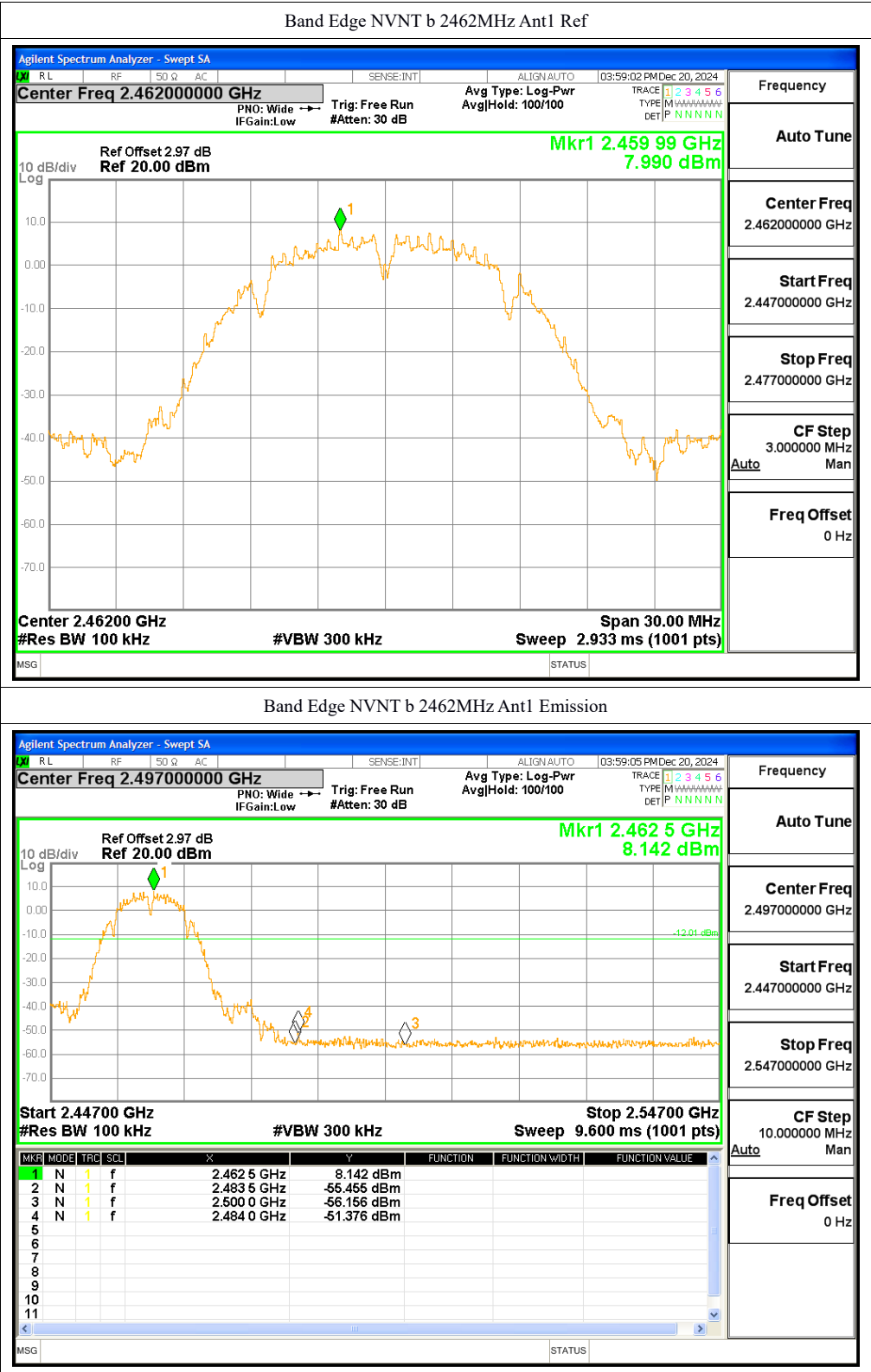
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Band Edge NVNT b 2412MHz Ant1 Ref



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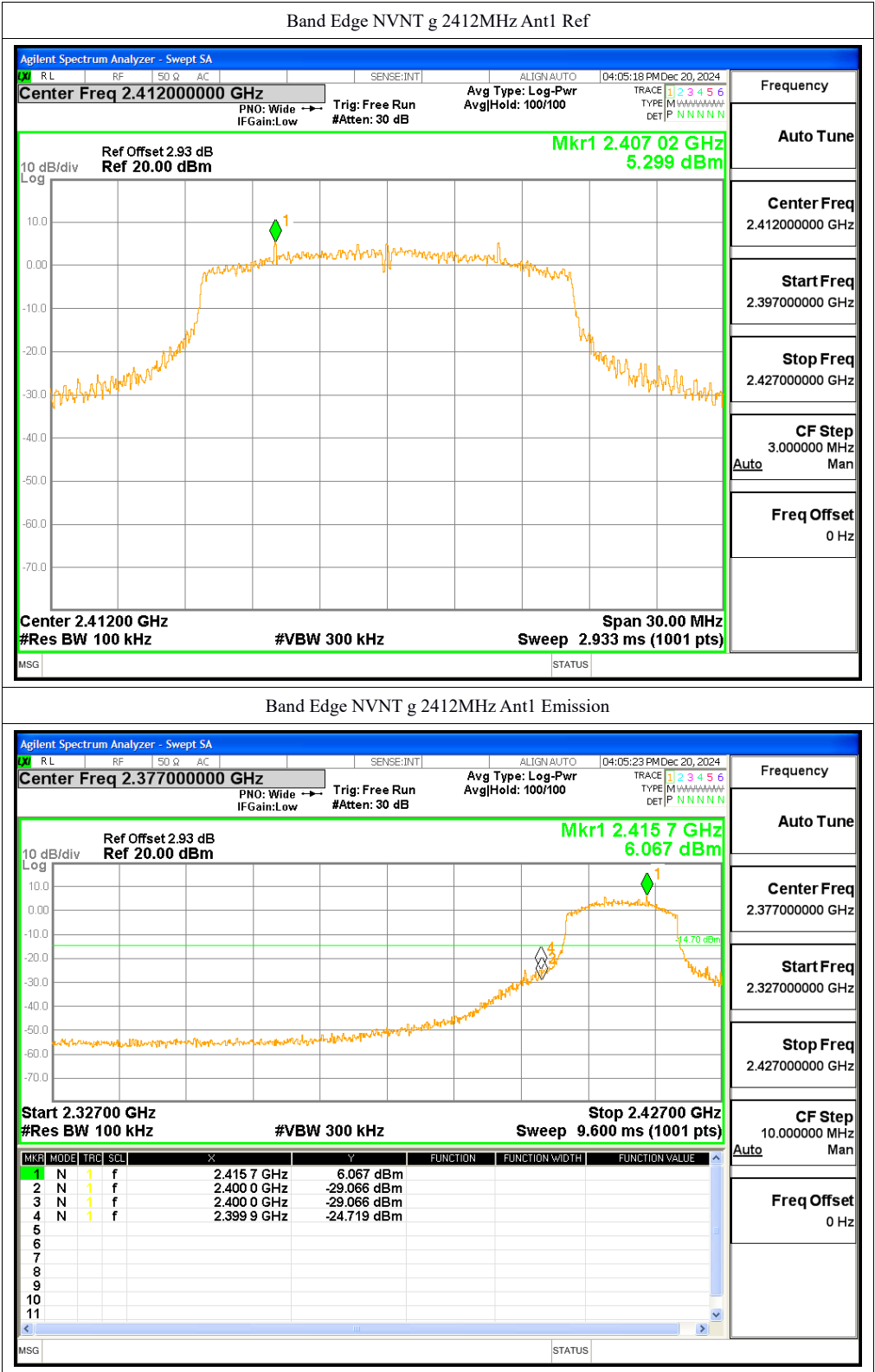
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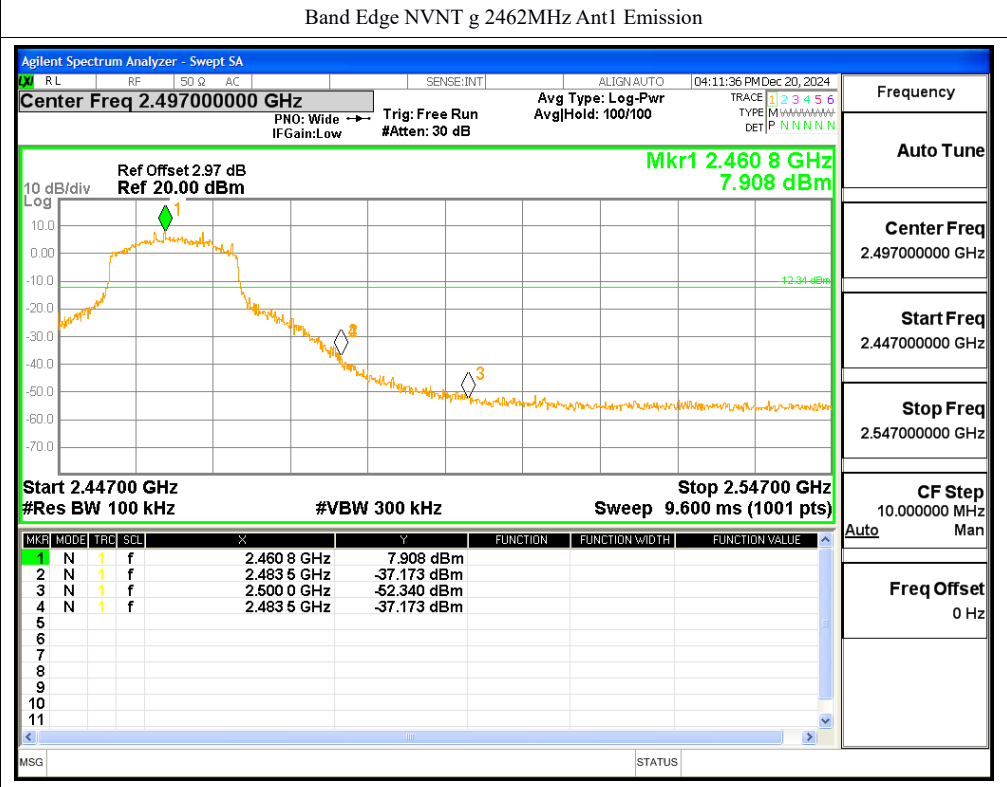
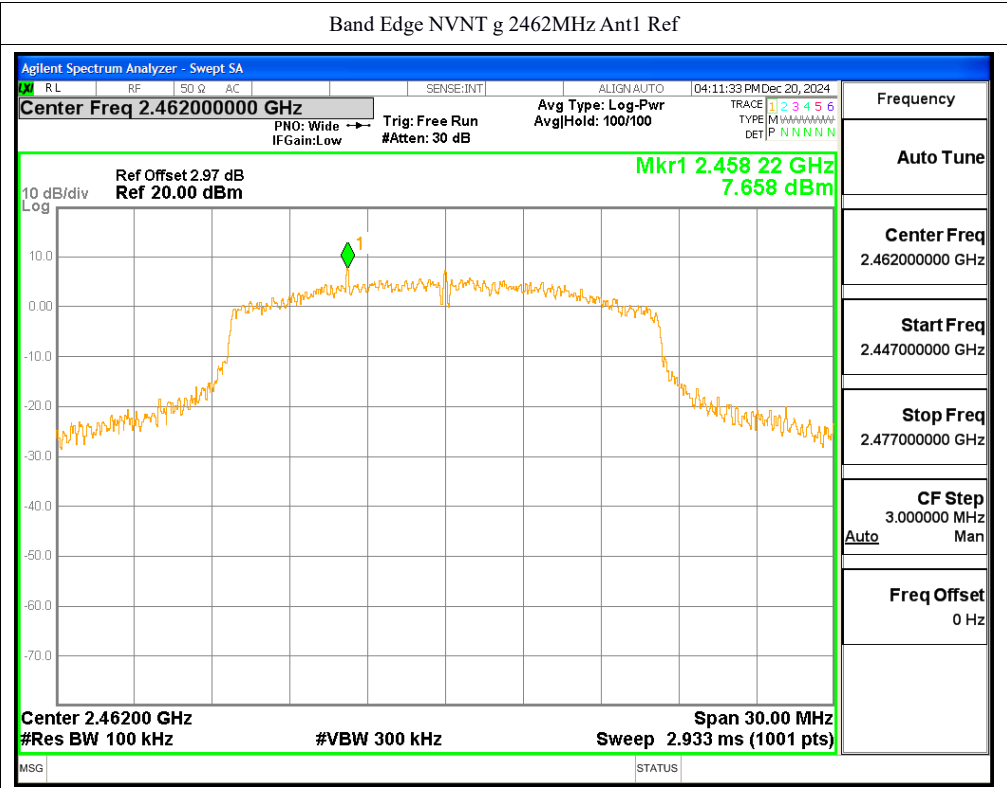
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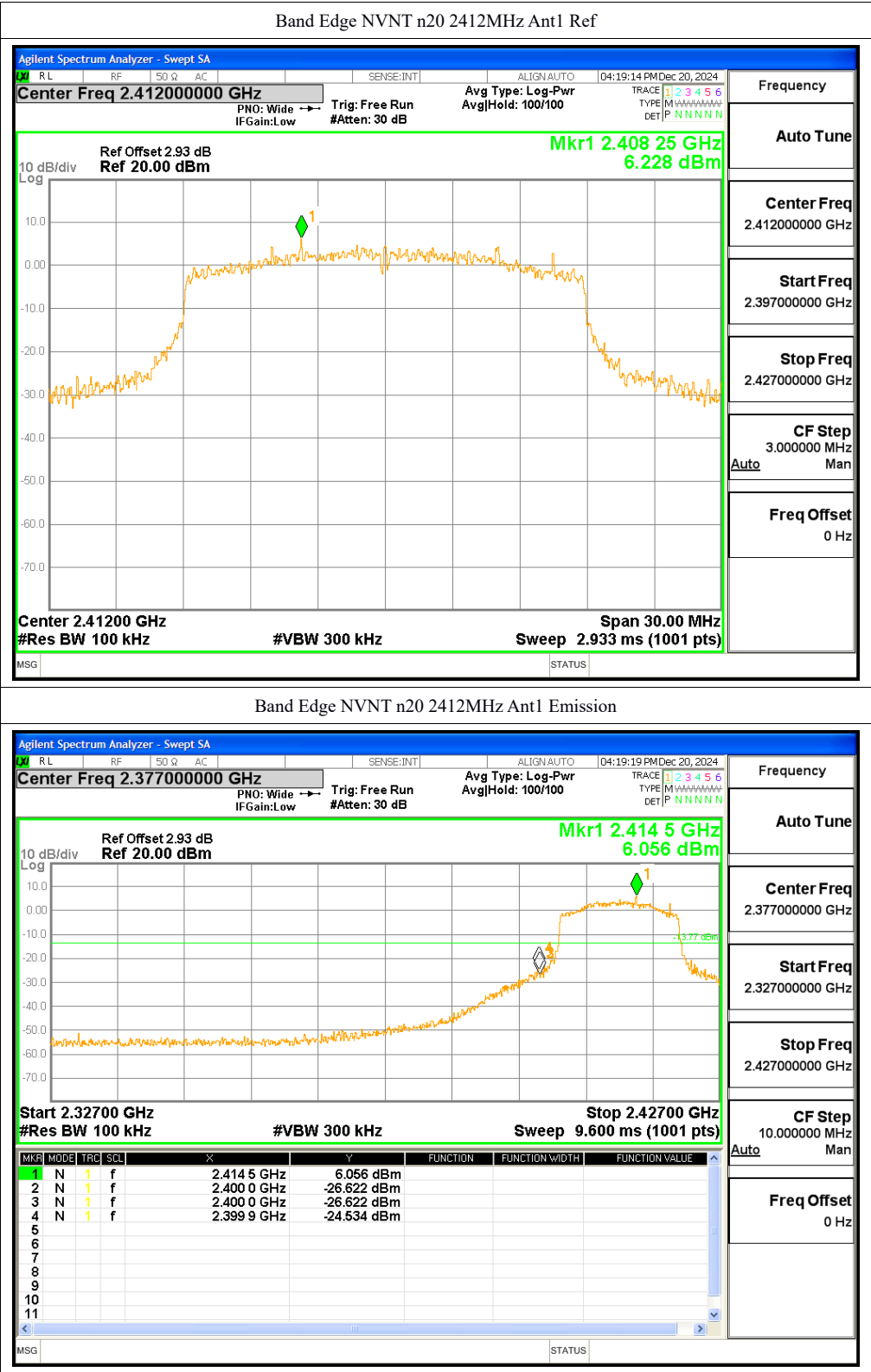
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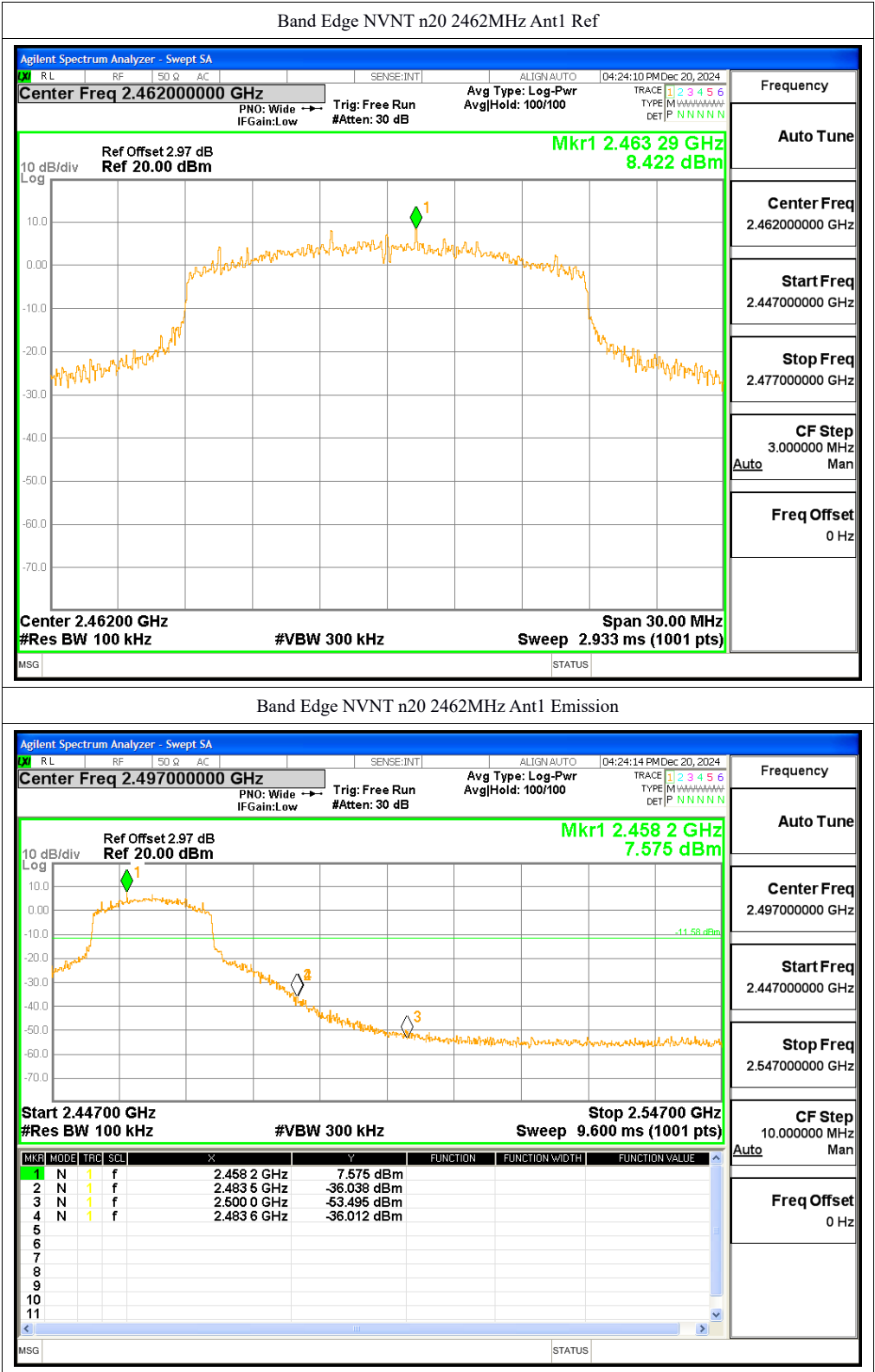
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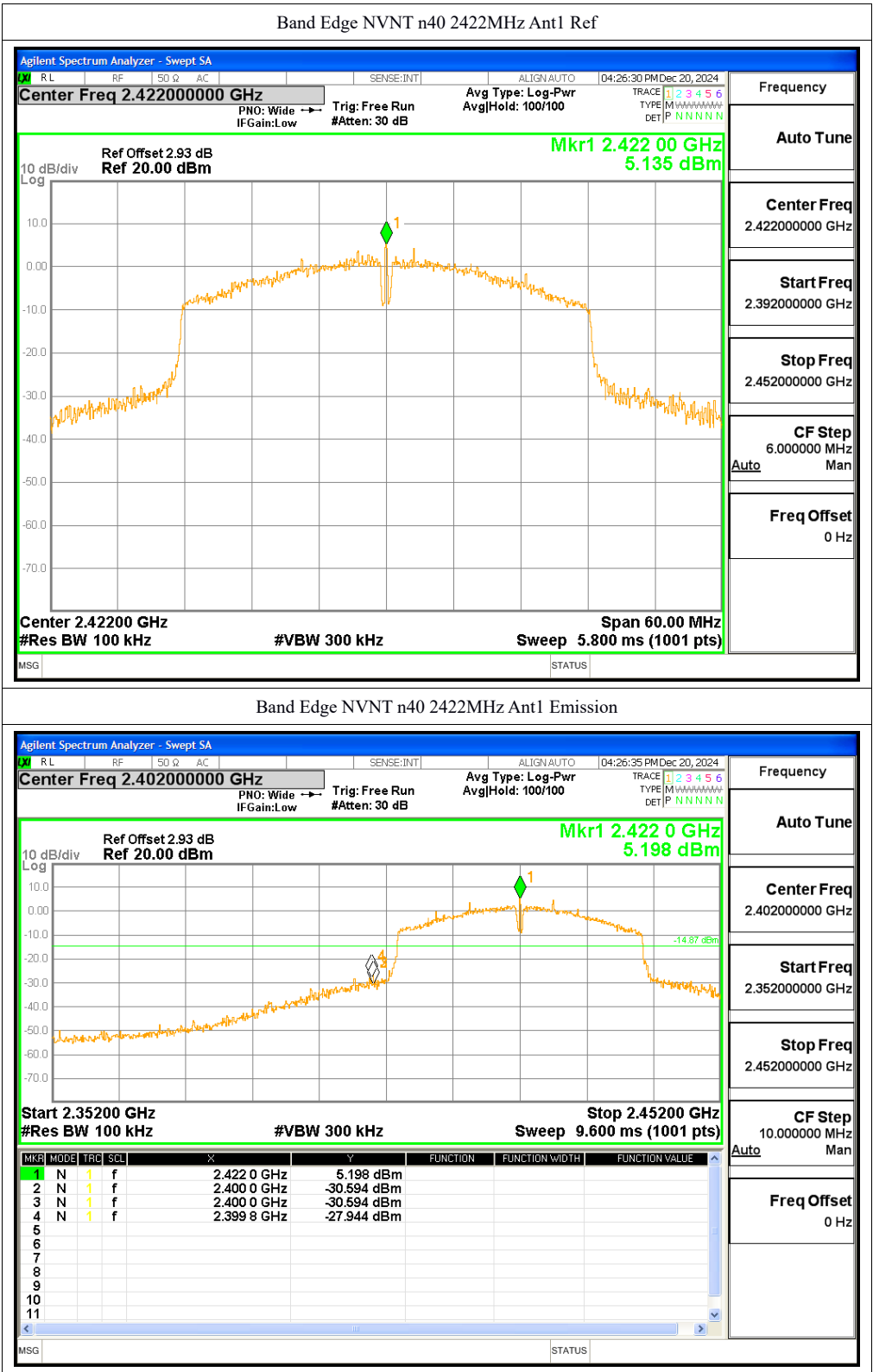
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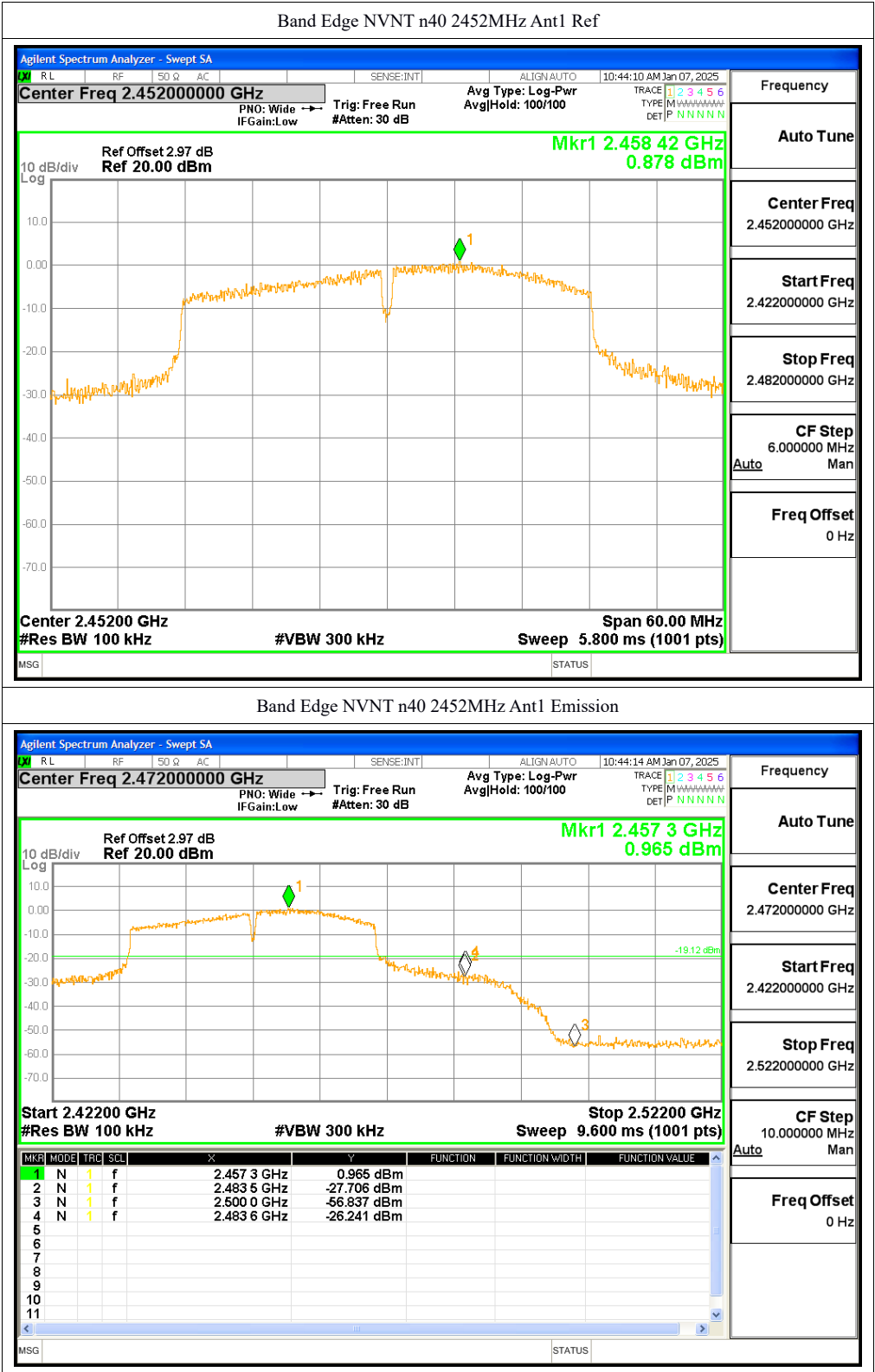
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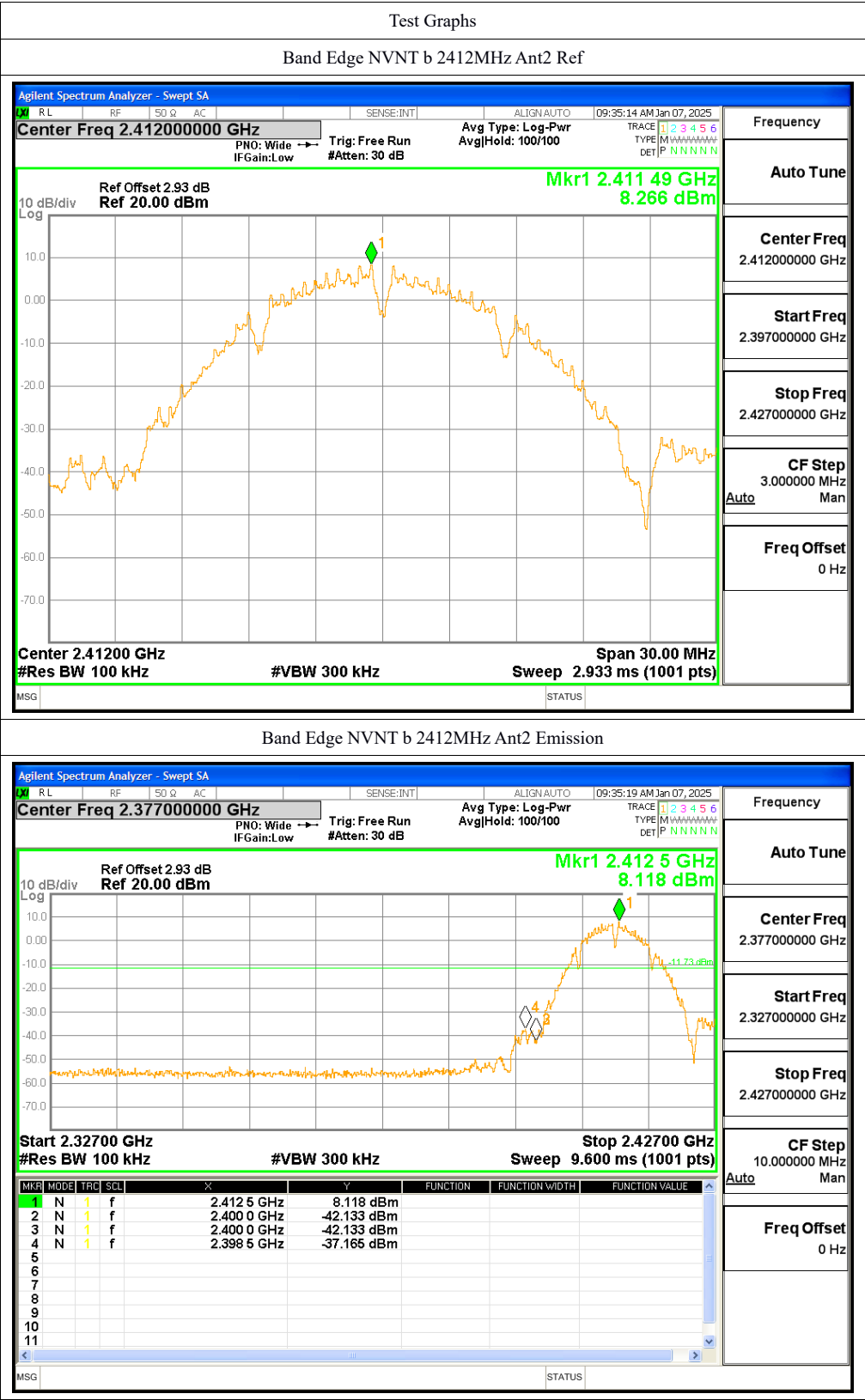
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Ant 2

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant2	-45.43	-20	Pass
		2462		-56.89	-20	Pass
	g	2412		-23.19	-20	Pass
		2462		-32.19	-20	Pass
	n20	2412		-20.64	-20	Pass
		2462		-29.71	-20	Pass
	n40	2422		-20.77	-20	Pass
		2452		-24.57	-20	Pass

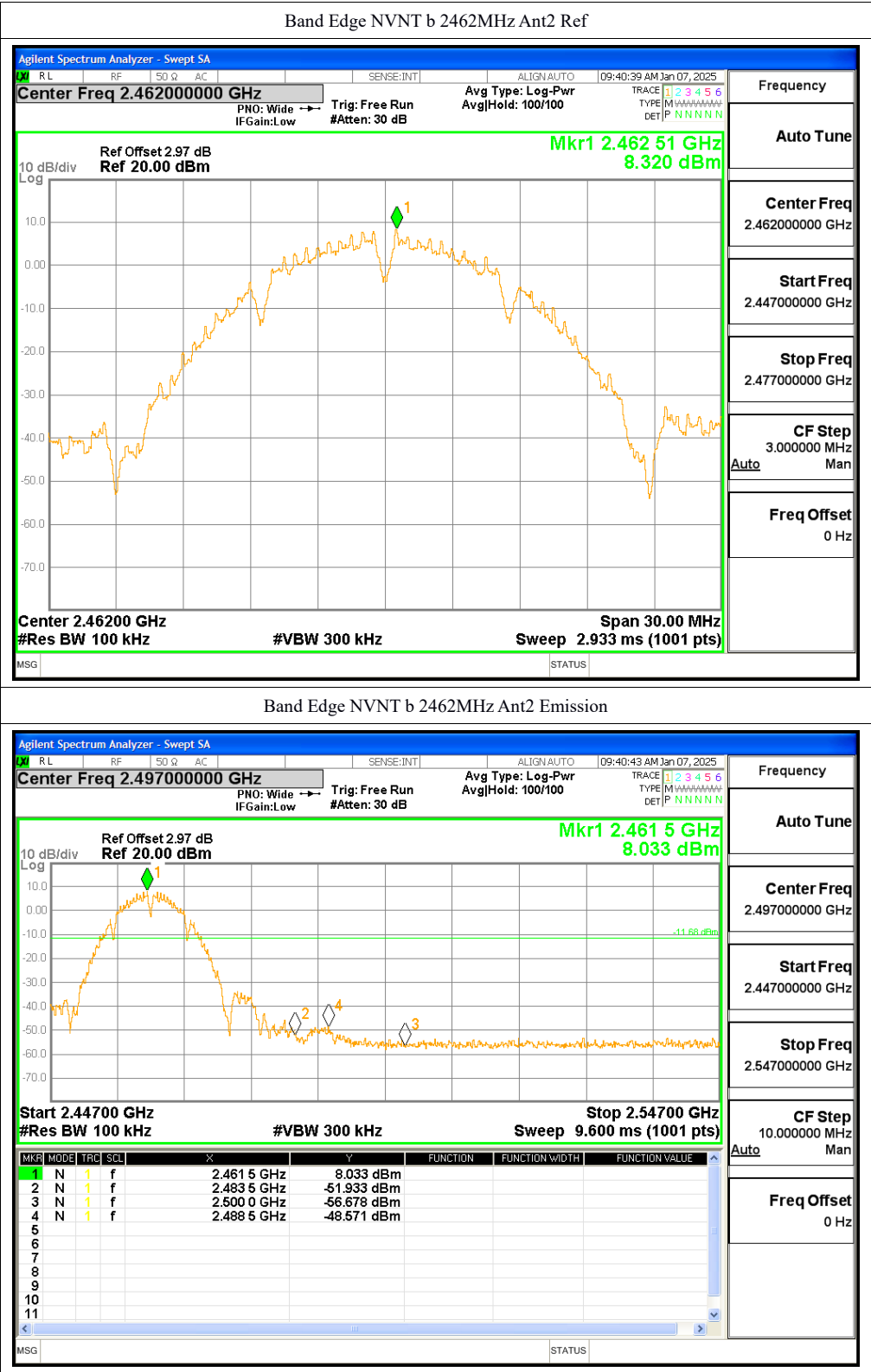
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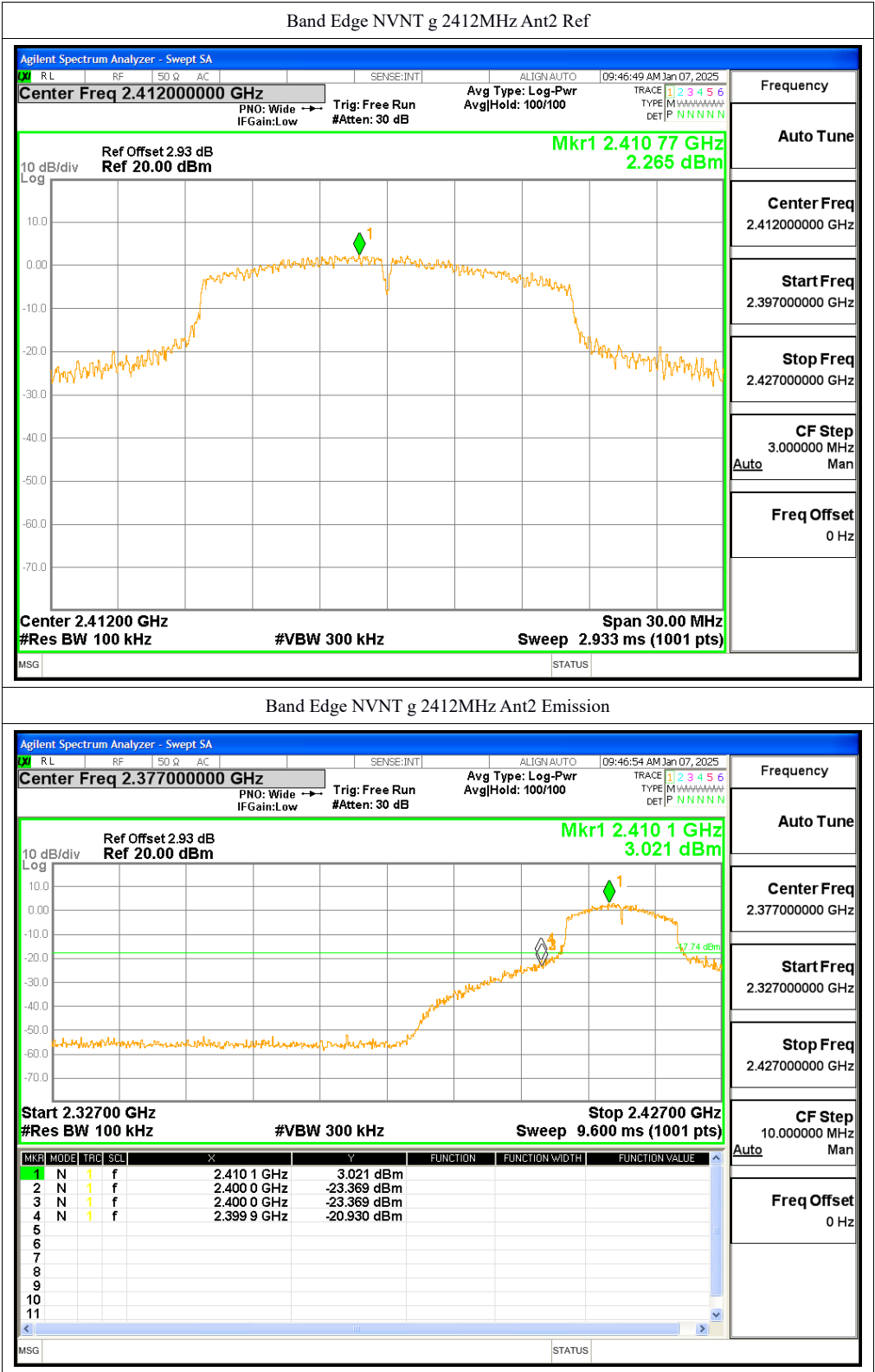
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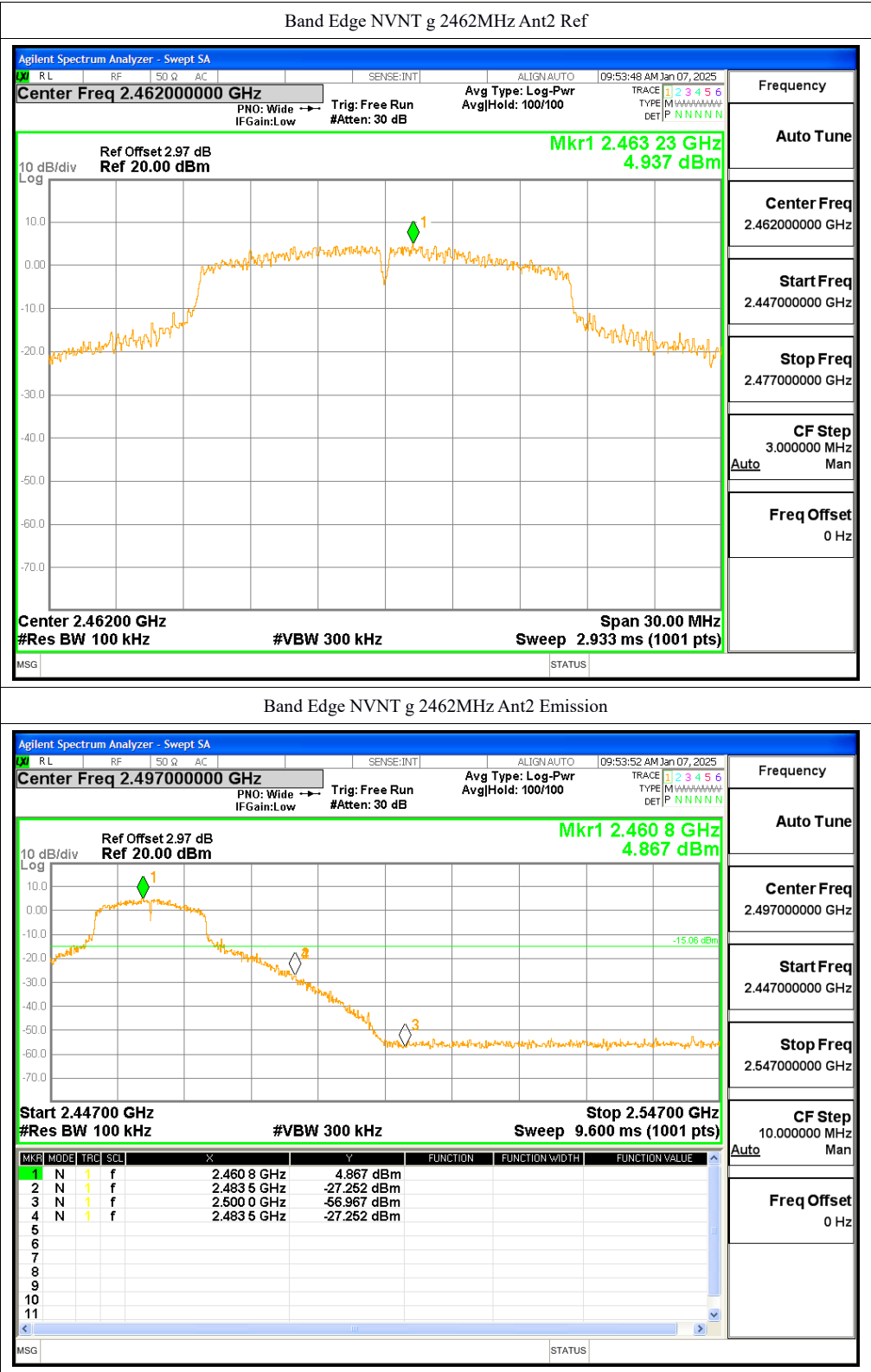
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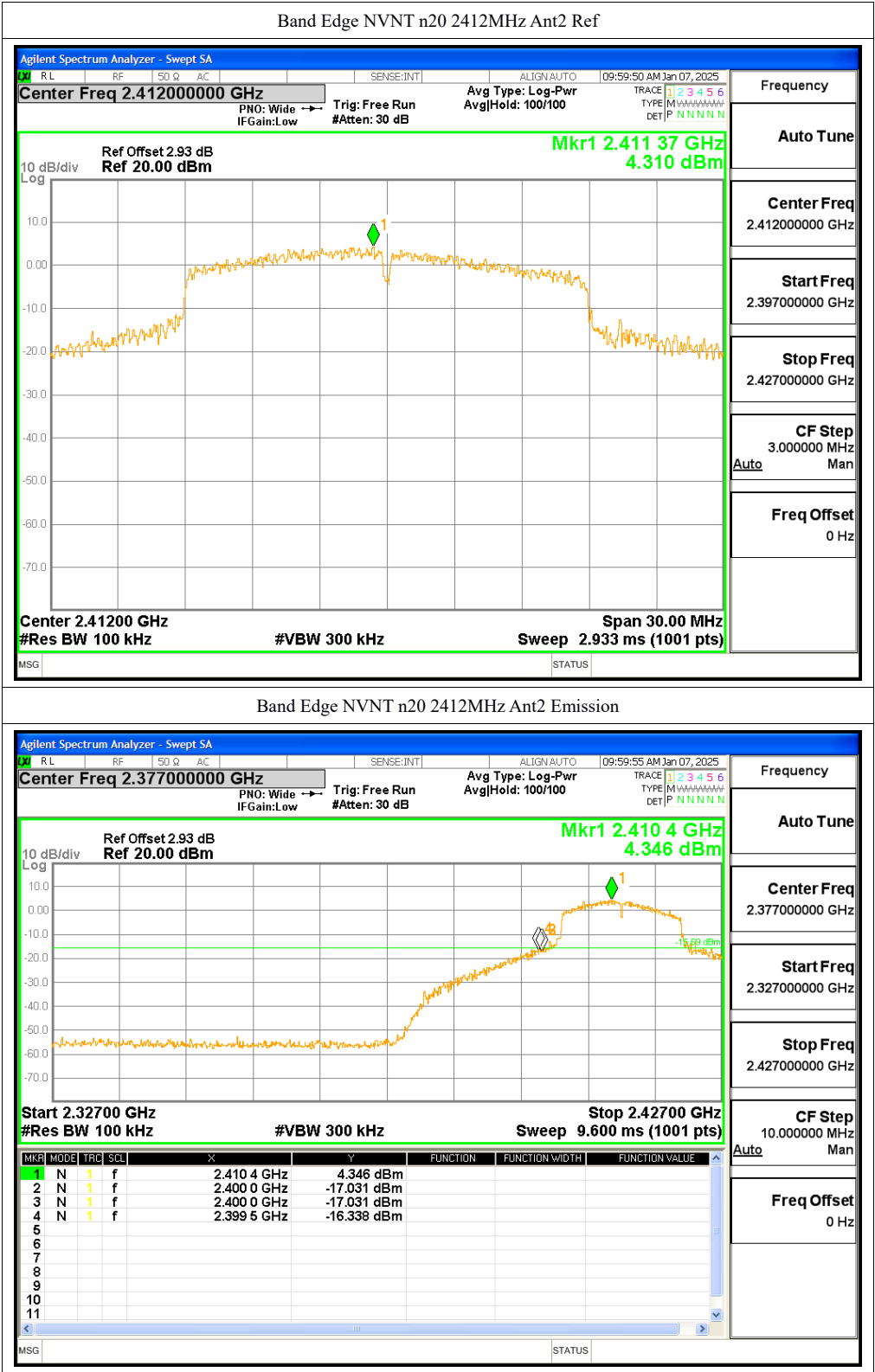
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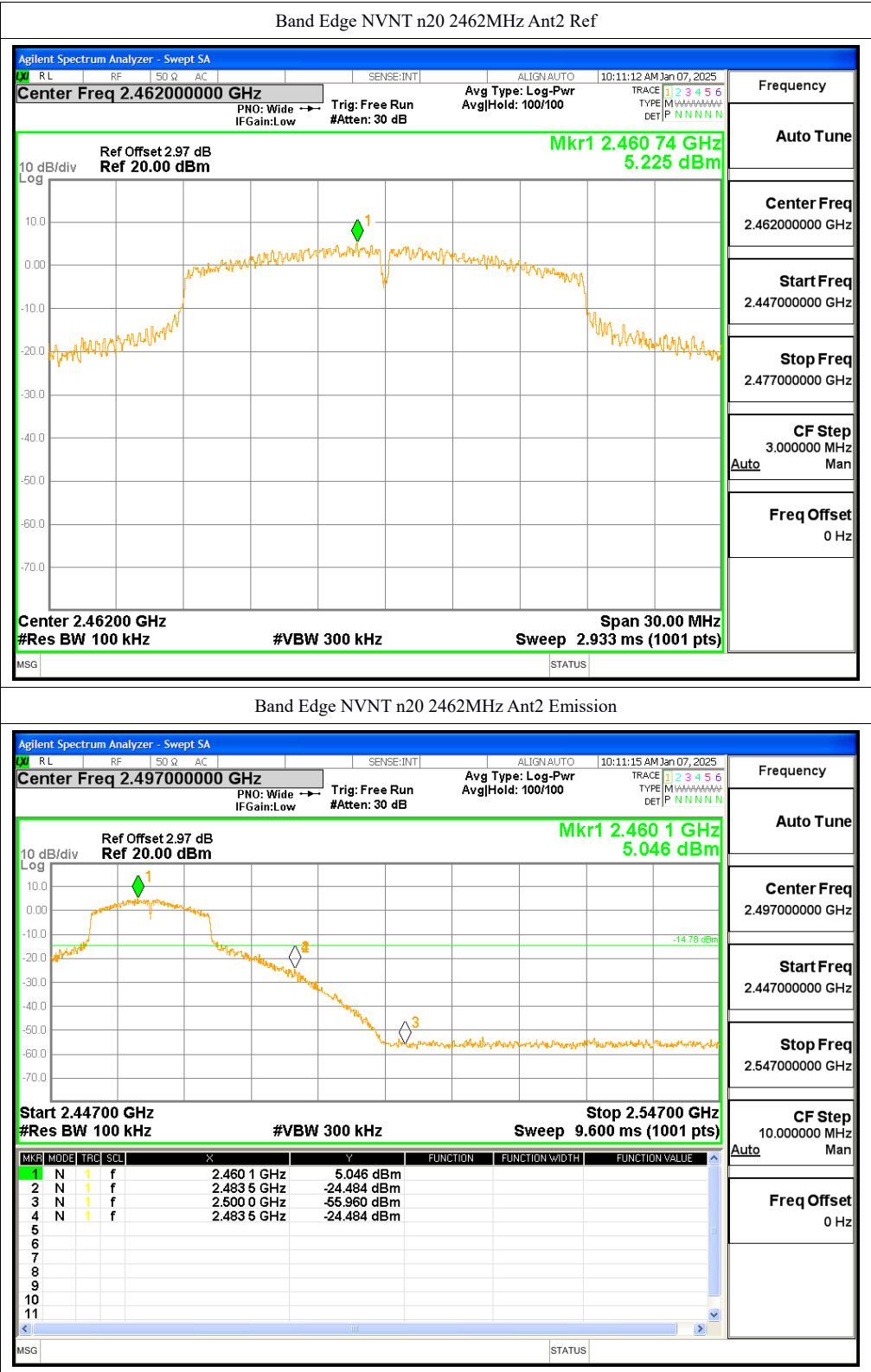
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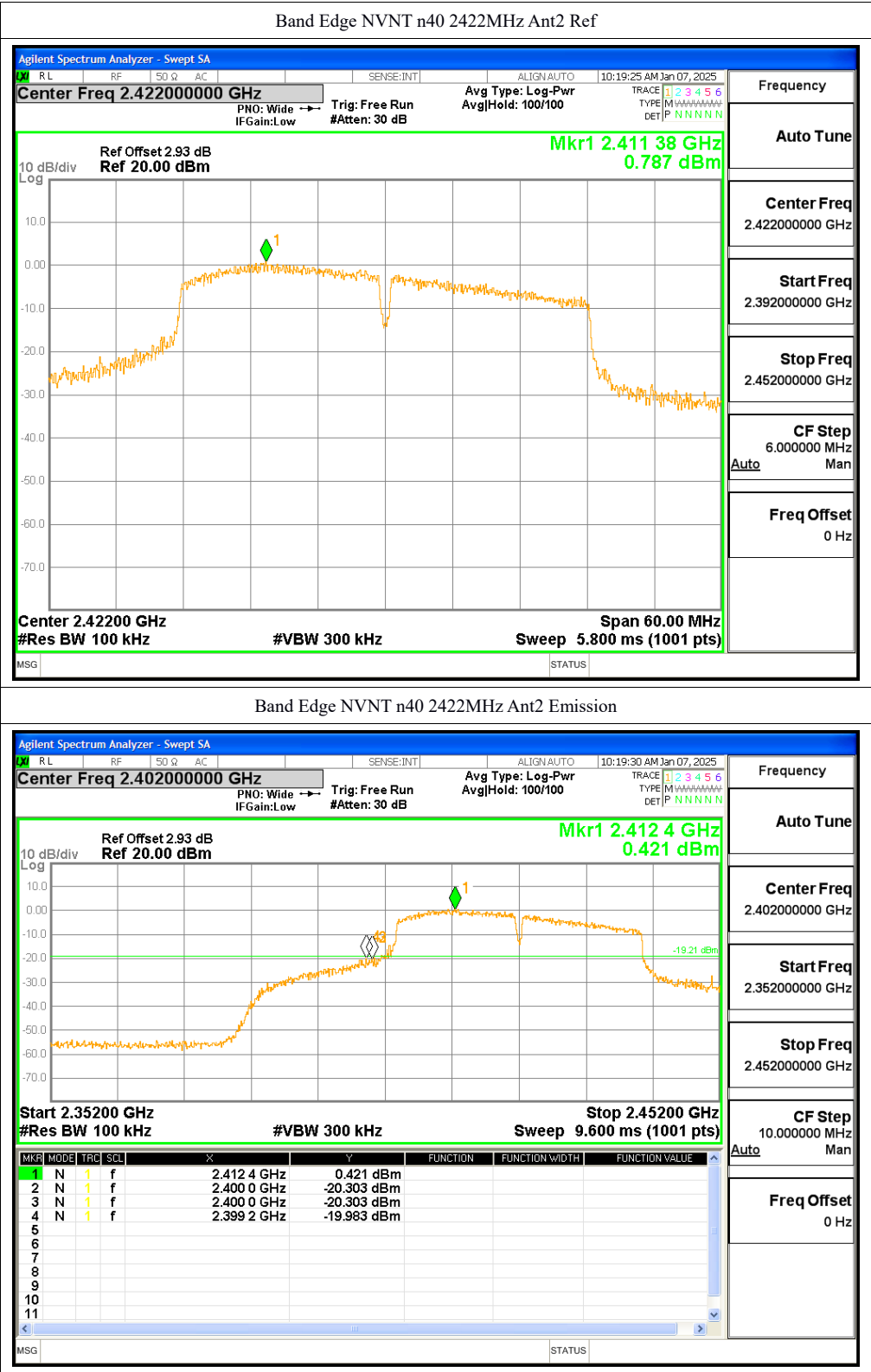
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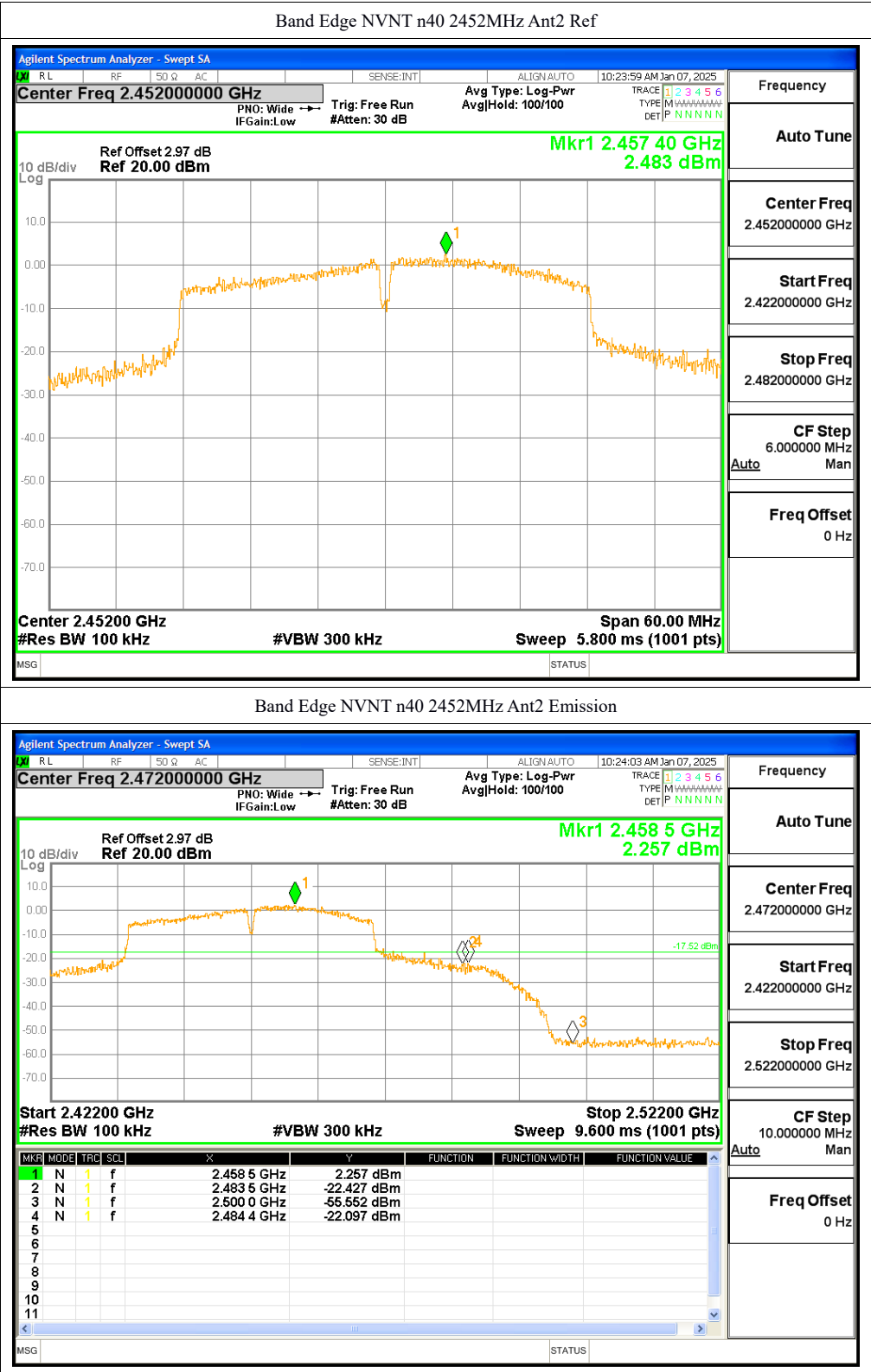
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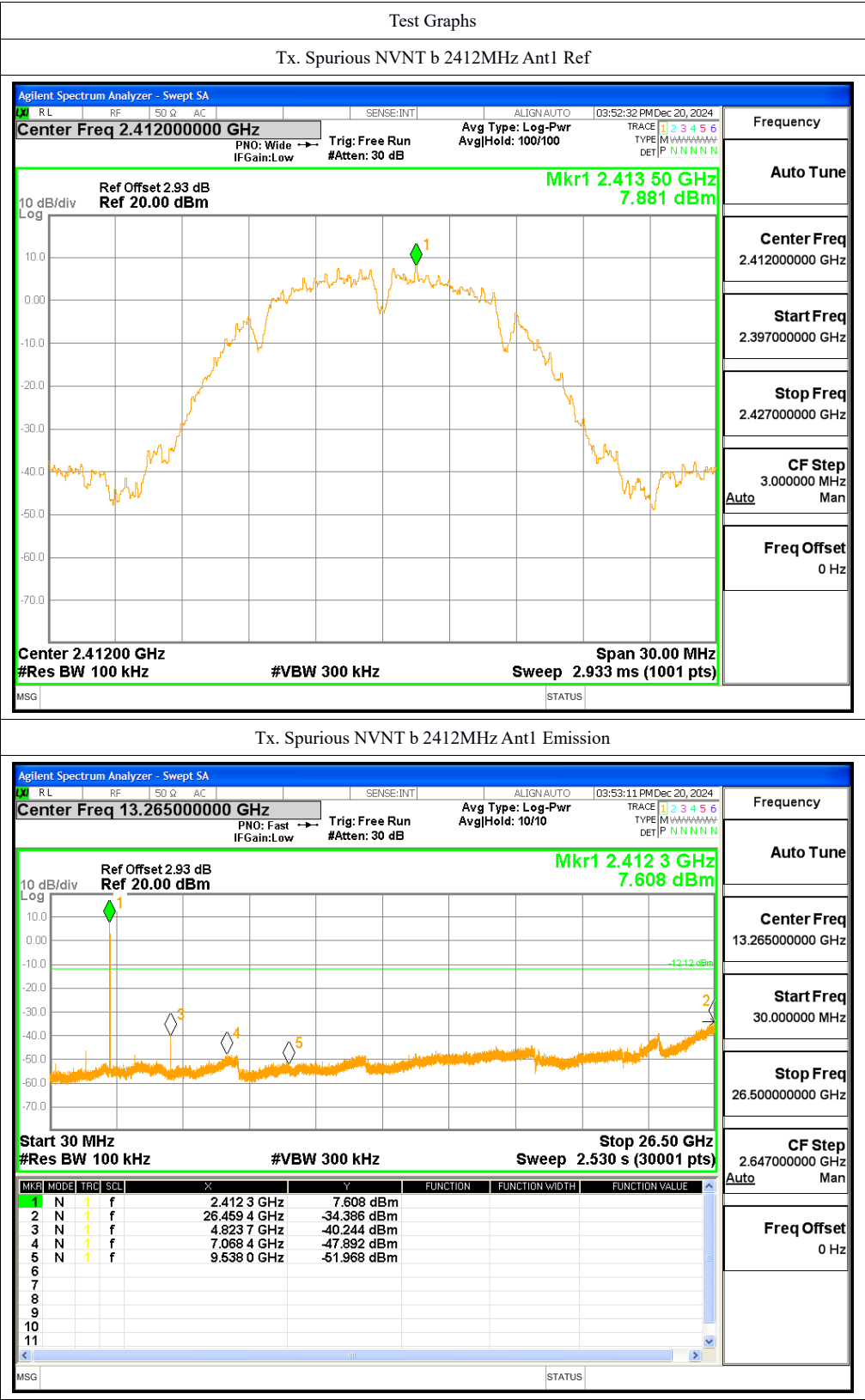


Conducted RF Spurious Emission

Ant 1

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant1	-42.26	-20	Pass
		2437		-41.8	-20	Pass
		2462		-42.45	-20	Pass
	g	2412		-41.44	-20	Pass
		2437		-41.68	-20	Pass
		2462		-41.47	-20	Pass
	n20	2412		-40.45	-20	Pass
		2437		-42.07	-20	Pass
		2462		-42.82	-20	Pass
	n40	2422		-40.24	-20	Pass
		2437		-27.97	-20	Pass
		2452		-27.48	-20	Pass

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