

FCC - TEST REPORT

Report Number : **709502307650-00B** Date of Issue: December 4, 2023

Model : RH50R

Product Type : RICO 2 THERMAL IMAGING SCOPE

Applicant : IRay Technology Co., Ltd.

Address : 11 Guiyang Street, YEDA, Yantai 264006, P.R. China

Manufacturer : IRay Technology Co., Ltd.

Address : 11 Guiyang Street, YEDA, Yantai 264006, P.R. China

Test Result : ☒ Positive ☐ Negative

Total pages including
Appendices : 67

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2 Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
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Shanghai 201108,
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Test Firm FCC
Registration
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Designation
number: CN1183

IC Company
Number: 31668

CAB identifier: CN0101

Telephone: +86 21 6141 0123
Fax: +86 21 6140 8600

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	RICO 2 THERMAL IMAGING SCOPE
Model no.:	RH50R
FCC ID:	2AYGT-4C-00
Rating:	3-4.2V DC (rechargeable lithium-ion battery) USB 5V input (type C)
RF Transmission Frequency:	For 802.11b/g/n-HT20: 2412~2462 MHz
No. of Operated Channel:	2.4GHz WIFI: 11 for 802.11b/802.11g/802.11(H20)
Modulation:	For 2.4GHz WIFI: Direct Sequence Spread Spectrum (DSSS) for 802.11b Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g/n

Channel list:

802.11b/g/n(HT20)			
Ch	Fre(MHz)	Ch	Fre(MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

Antenna Type:	FPC antenna
Antenna Gain:	3.5dBi
Description of the EUT:	The Equipment Under Test (EUT) is a RICO 2 THERMAL IMAGING SCOPE which support 2.4GHz Wi-Fi. We tested it and listed the worst data in this report.
Test sample no.:	SHA-762139-2 (RF radiated); SHA-762139-3 (RF conducted)

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.



4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2020.

5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	13-16	Site 1	☒	☐	☐
§15.247 (b) (1)	Conducted peak output power	17-29	Site 1	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	6dB bandwidth	30-33	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	34-37	Site 1	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	38-47	Site 1	☒	☐	☐
§15.247(d)	Band edge	48-54	Site 1	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	55-63	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses FPC antenna, which gain is 3.5dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AYGT-4C-00, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: October 19, 2023

Testing Start Date: October 19, 2023

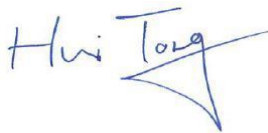
Testing End Date: November 23, 2023

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Reviewed by:

Prepared by:

Tested by:



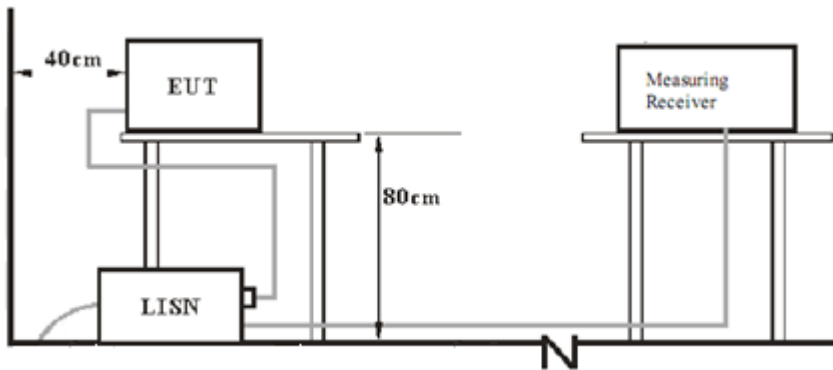
Hui TONG
Review Engineer

Jiaxi XU
Project Engineer

Cheng Huali
Test Engineer

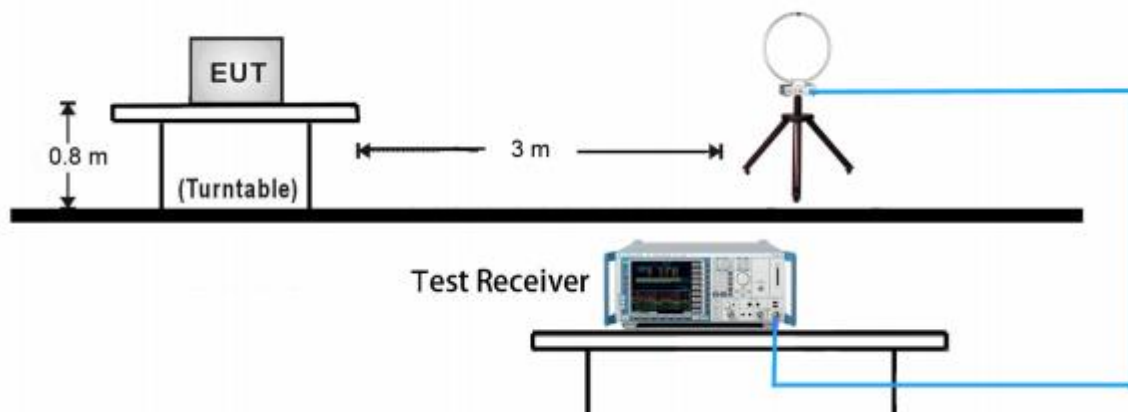
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

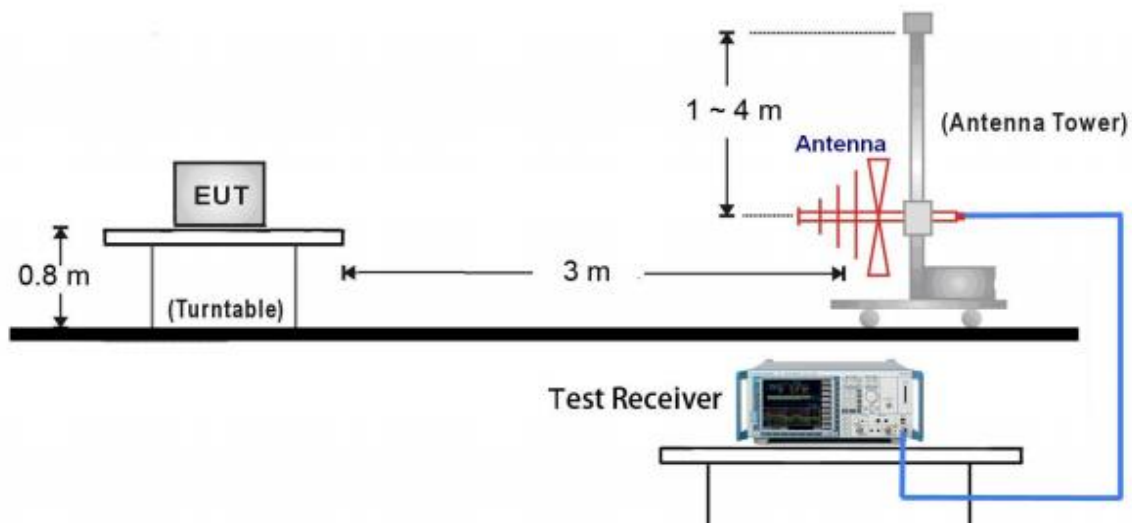


7.2 Radiated test setups

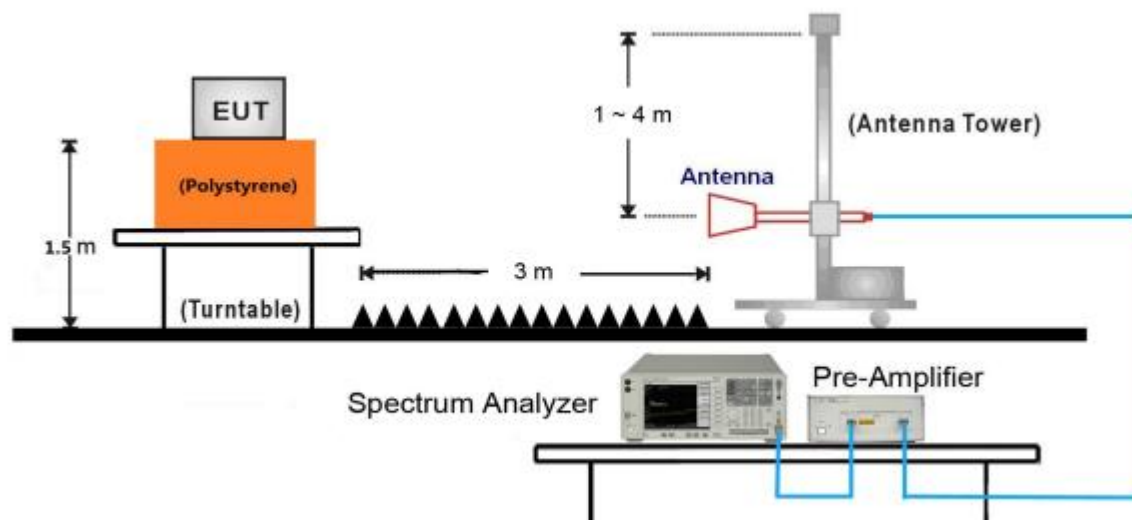
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:

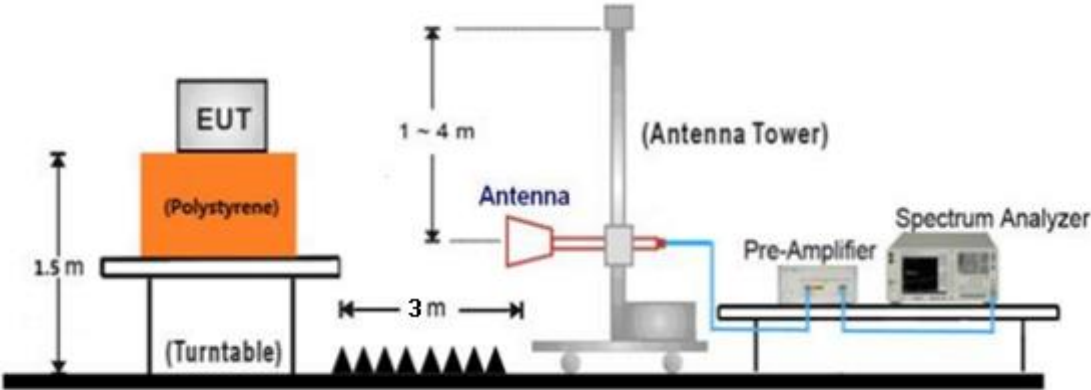


1GHz ~ 18GHz Test Setup:

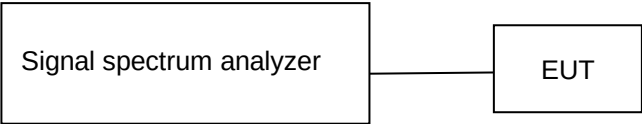




18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	E470	PF-OU5TS7 17/09
AC/DC adapter	SHENZHEN KEYU POWER	KA12C-0502000US	N/A

Test software: adb commend

Test Mode Applicability and Tested Channel Detail:

Mode	Tested Channel	Data Rate (Mbps)	Modulation	(Power level setting
802.11b	1	1	CCK	13
	6	1	CCK	13
	11	1	CCK	13
802.11g	1	6	OFDM	13
	6	6	OFDM	13
	11	6	OFDM	13
802.11n HT20	1	MCS0	OFDM	13
	6	MCS0	OFDM	13
	11	MCS0	OFDM	13

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

Conducted Emission

150k-30MHz Conducted Emission Test

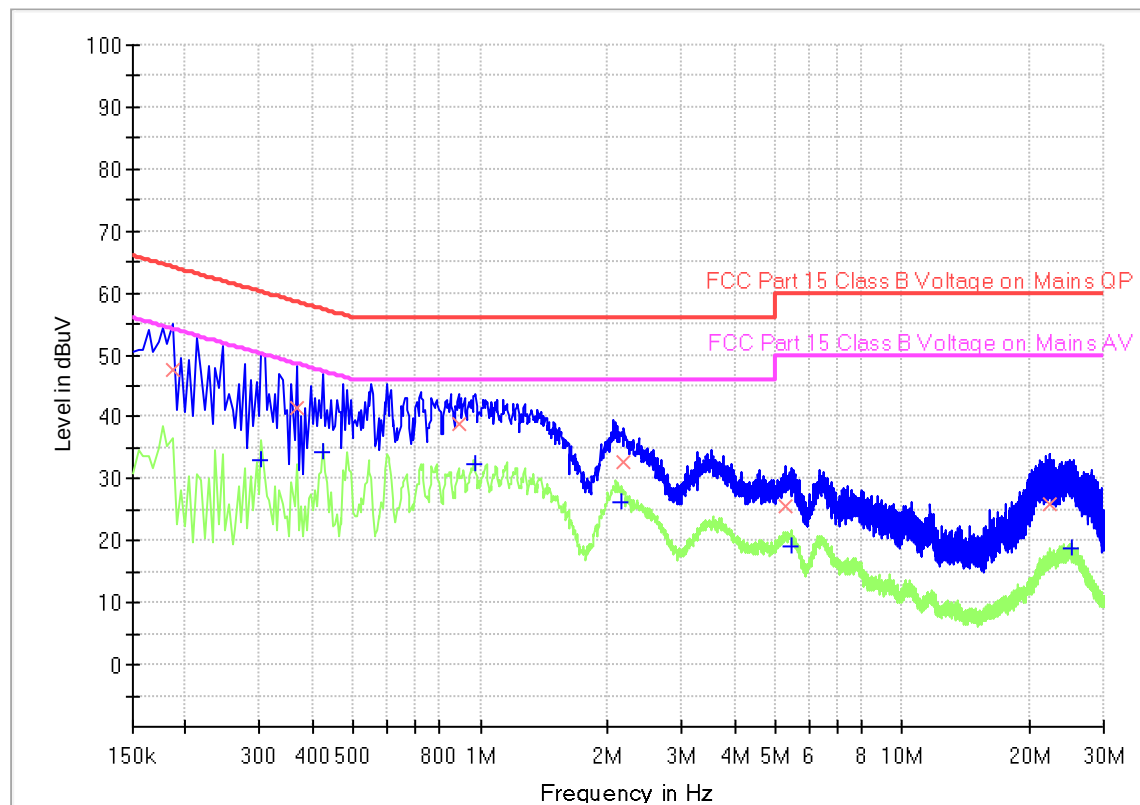
EUT Information

EUT Name: RICO 2 THERMAL IMAGING SCOPE
 Model: RH50R
 Client: IRay Technology Co., Ltd
 Op Cond: Transmitting, 802.11g_TX_2462MHz, AC 120V/60Hz, T20.2, H42.1%, P102.3kPa
 Operator: Cheng Huali
 Standard: FCC Part 15.207(a)
 Comment: Phase L
 Sample No.: SHA-762139-2

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
 Receiver: [ESR 3]
 Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.186000	47.63	---	64.21	16.58	1000.0	9.000	L1	19.4
0.303000	---	33.05	50.16	17.11	1000.0	9.000	L1	19.5
0.366000	41.36	---	58.59	17.23	1000.0	9.000	L1	19.5
0.424500	---	34.31	47.36	13.05	1000.0	9.000	L1	19.5
0.888000	38.97	---	56.00	17.03	1000.0	9.000	L1	19.5
0.969000	---	32.28	46.00	13.72	1000.0	9.000	L1	19.5
2.157000	---	26.09	46.00	19.91	1000.0	9.000	L1	19.5
2.188500	32.72	---	56.00	23.28	1000.0	9.000	L1	19.5
5.266500	25.50	---	60.00	34.50	1000.0	9.000	L1	19.6
5.433000	---	19.17	50.00	30.83	1000.0	9.000	L1	19.6
22.290000	25.80	---	60.00	34.20	1000.0	9.000	L1	20.7
25.066500	---	18.68	50.00	31.32	1000.0	9.000	L1	20.9

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

150k-30MHz Conducted Emission Test

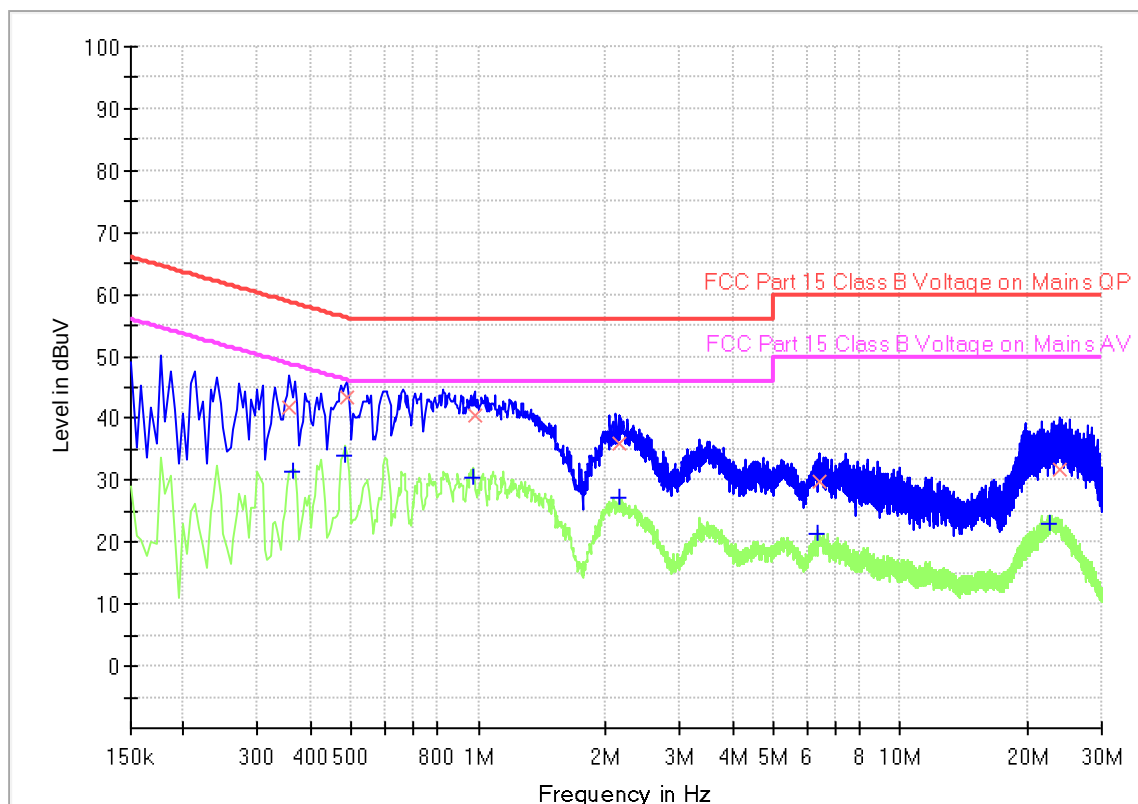
EUT Information

EUT Name: RICO 2 THERMAL IMAGING SCOPE
 Model: RH50R
 Client: IRay Technology Co., Ltd
 Op Cond: Transmitting, 802.11g_TX_2462MHz, AC 120V/60Hz, T20.2, H42.1%,
 Operator: Cheng Huali
 Standard: FCC Part 15.207(a)
 Comment: Phase N
 Sample No.: SHA-762139-2

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
 Receiver: [ESR 3]
 Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.357000	41.88	---	58.80	16.92	1000.0	9.000	N	19.5
0.361500	---	31.52	48.69	17.17	1000.0	9.000	N	19.5
0.483000	---	34.02	46.29	12.27	1000.0	9.000	N	19.5
0.487500	43.28	---	56.21	12.93	1000.0	9.000	N	19.5
0.973500	---	30.57	46.00	15.43	1000.0	9.000	N	19.5
0.978000	40.58	---	56.00	15.42	1000.0	9.000	N	19.5
2.148000	---	27.22	46.00	18.78	1000.0	9.000	N	19.5
2.157000	35.94	---	56.00	20.06	1000.0	9.000	N	19.5
6.391500	---	21.32	50.00	28.68	1000.0	9.000	N	19.6
6.418500	29.72	---	60.00	30.28	1000.0	9.000	N	19.6
22.524000	---	23.15	50.00	26.85	1000.0	9.000	N	20.5
23.847000	31.60	---	60.00	28.40	1000.0	9.000	N	20.5

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

9.2 Conducted peak(average) output power

Test Method

1. Measure the duty cycle D of the transmitter output signal.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
4. Set VBW $\geq [3 \times \text{RBW}]$.
5. Number of points in sweep $\geq [2 \times \text{span} / \text{RBW}]$. (This gives bin-to-bin spacing $\leq \text{RBW} / 2$, so that narrowband signals are not lost between frequency bins.)
6. Sweep time = auto.
7. Detector = RMS (i.e., power averaging), if available. Otherwise, use the sample detector mode.
8. Do not use sweep triggering. Allow the sweep to "free run."
9. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.
10. Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
11. Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission).

Limits

According to §15.247 (b) (1) conducted peak (average) output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 1	≤ 30

Test result as below table

802.11b

Frequency (MHz)	Duty cycle Factor (dB)	Conducted Power (dBm)	Total Power(average) (dBm)	Result
Low channel 2412MHz	0	11.98	11.98	Pass
Middle channel 2437MHz	0	12.22	12.22	Pass
High channel 2462MHz	0	12.54	12.54	Pass

802.11g

Frequency (MHz)	Duty cycle Factor (dB)	Conducted Power (dBm)	Total Power(average) (dBm)	Result
Low channel 2412MHz	1.94	10.72	12.66	Pass
Middle channel 2437MHz	1.95	10.89	12.84	Pass
High channel 2462MHz	1.95	11.23	13.18	Pass

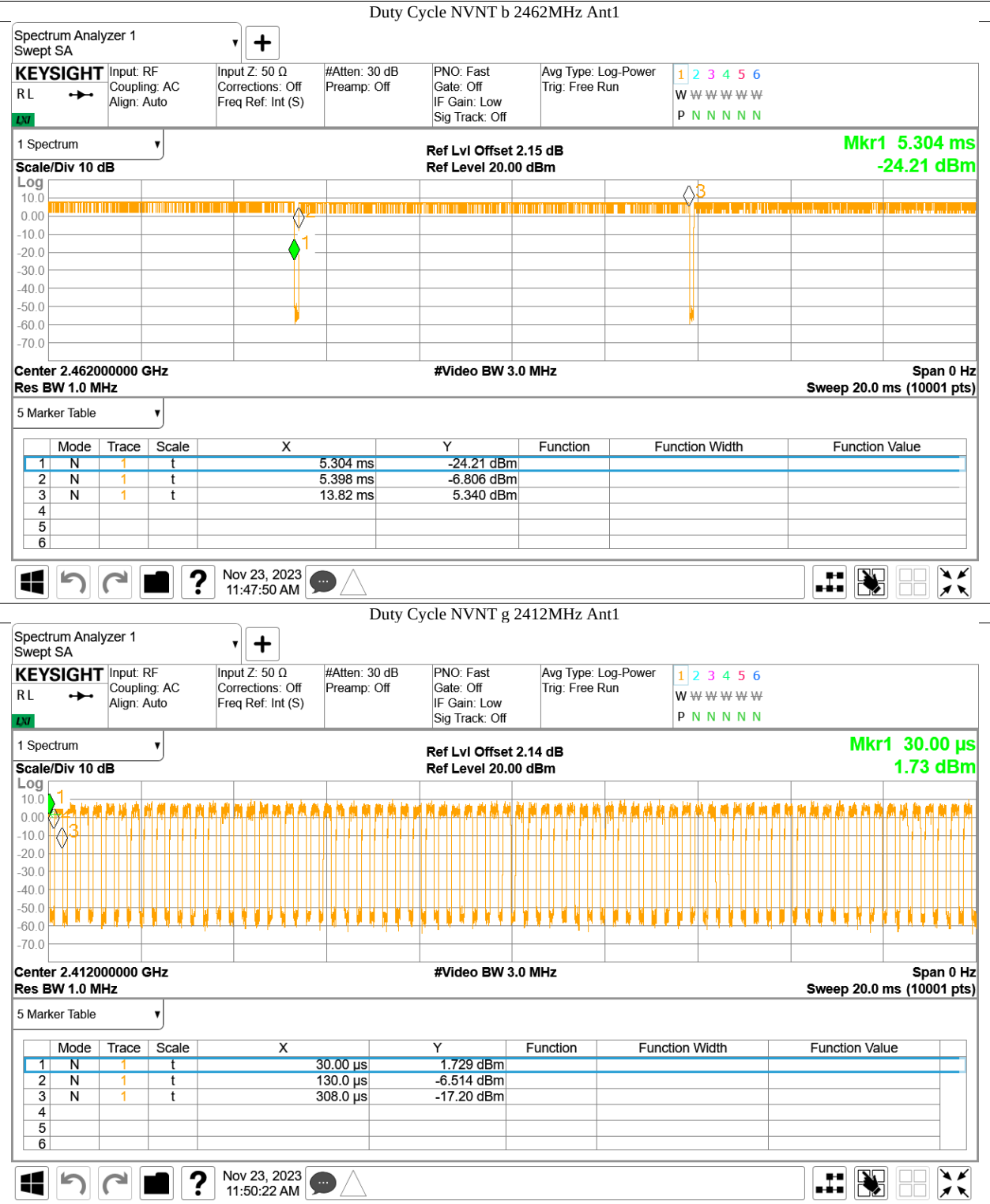
802.11n(HT20)

Frequency (MHz)	Duty cycle Factor (dB)	Conducted Power (dBm)	Total Power(average) (dBm)	Result
Low channel 2412MHz	2.07	10.53	12.60	Pass
Middle channel 2437MHz	2.01	10.81	12.82	Pass
High channel 2462MHz	2.01	11.14	13.15	Pass



Duty Cycle

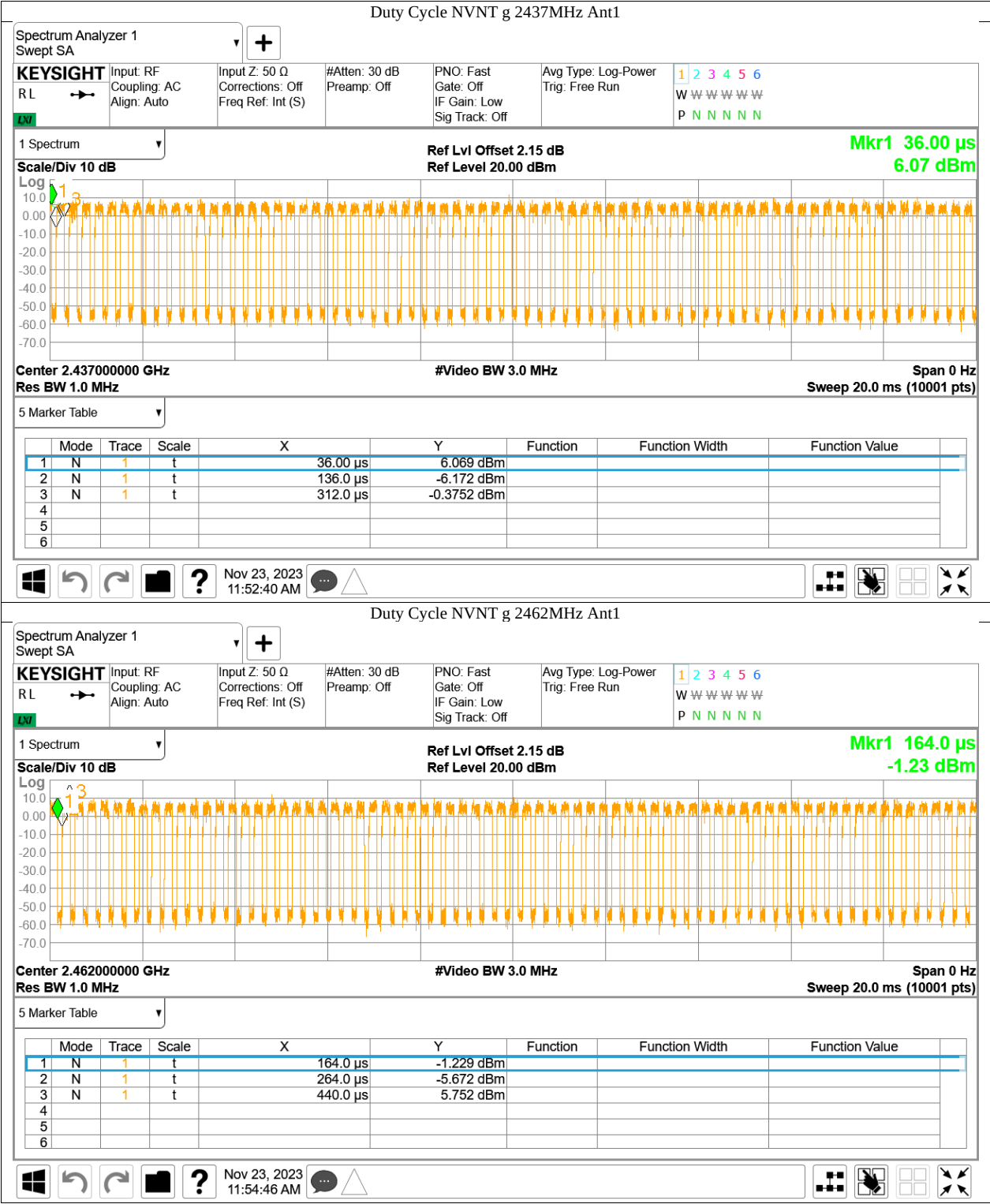
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)
NVNT	b	2412	Ant1	98.9	0
NVNT	b	2437	Ant1	98.87	0
NVNT	b	2462	Ant1	98.9	0
NVNT	g	2412	Ant1	64.03	1.94
NVNT	g	2437	Ant1	63.77	1.95
NVNT	g	2462	Ant1	63.77	1.95
NVNT	n20	2412	Ant1	62.12	2.07
NVNT	n20	2437	Ant1	62.88	2.01
NVNT	n20	2462	Ant1	62.88	2.01



Spectrum Analyzer 1
Swept SA

KEYSIGHT Input: RF Input Z: 50 Ω #Atten: 30 dB PNO: Fast Avg Type: Log-Power
RL Coupling: AC Corrections: Off Preamp: Off Gate: Off Trig: Free Run
Align: Auto Freq Ref: Int (S)

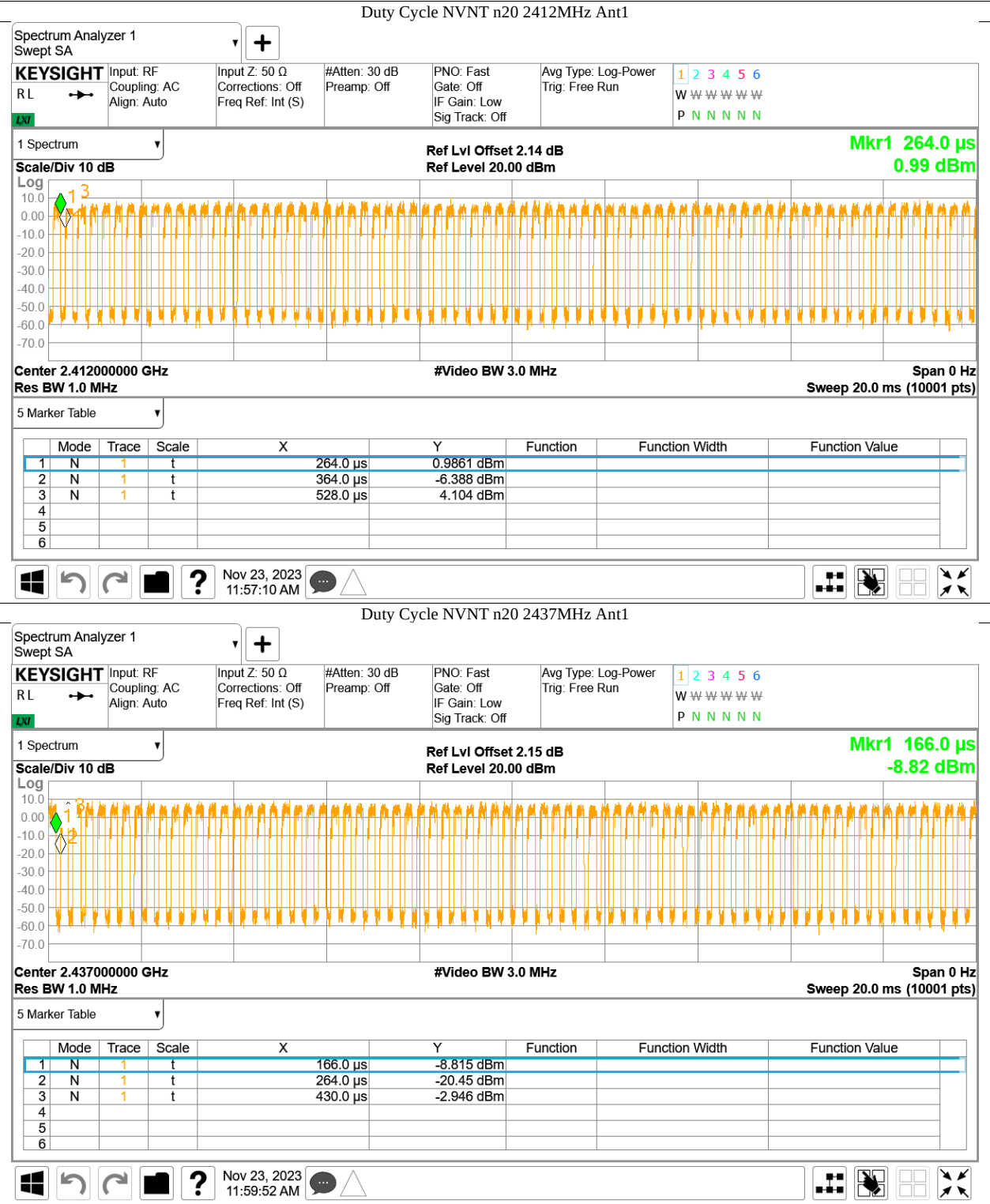
1 2 3 4 5 6
W W W W W W
P N N N N N



Spectrum Analyzer 1
Sweep SA

KEYSIGHT Input: RF Input Z: 50 Ω #Atten: 30 dB PNO: Fast Avg Type: Log-Power
RL Coupling: AC Corrections: Off Preamp: Off Gate: Off Trig: Free Run
Align: Auto Freq Ref: Int (S)

1 2 3 4 5 6
W W W W W W
P N N N N N



Spectrum Analyzer 1
Swept SA

KEYSIGHT

RL →

Input: RF
Coupling: AC
Align: Auto

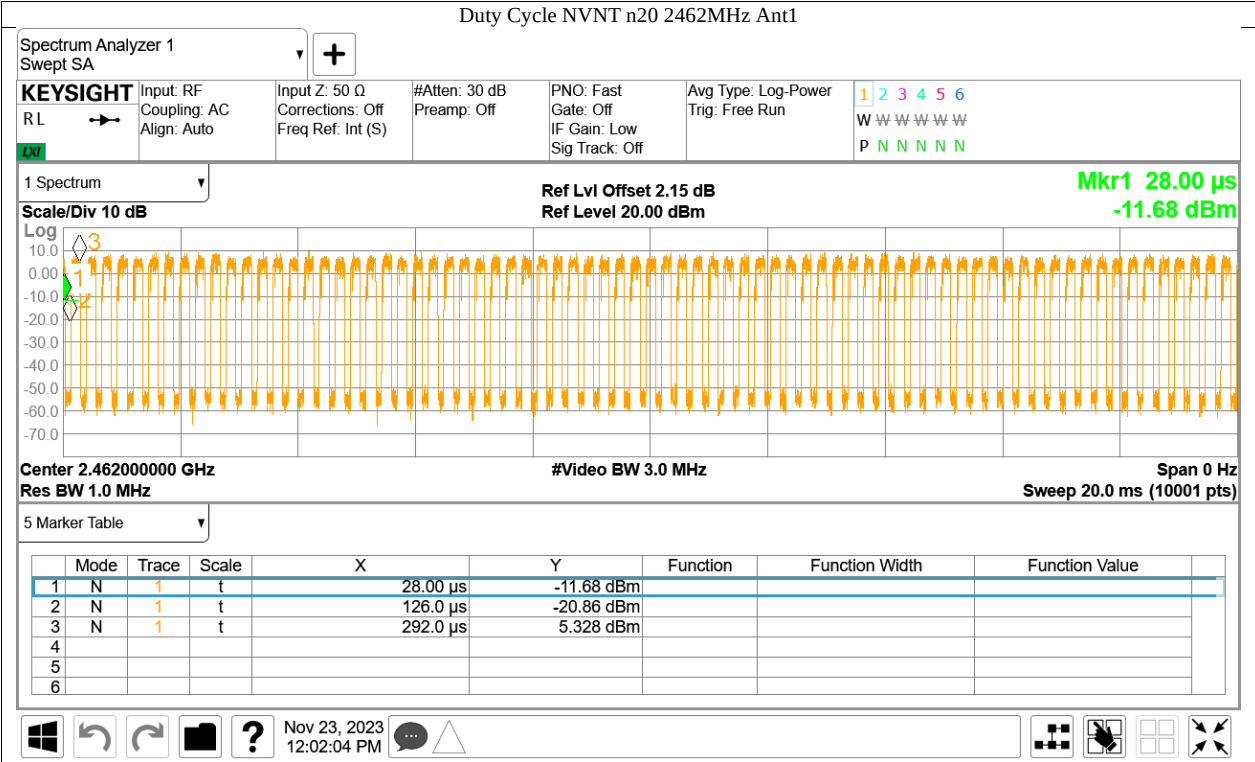
Input Z: 50 Ω
Corrections: Off
Freq Ref: Int (S)

#Atten: 30 dB
Preamp: Off

PNO: Fast
Gate: Off
IF Gain: Low
Sig Track: Off

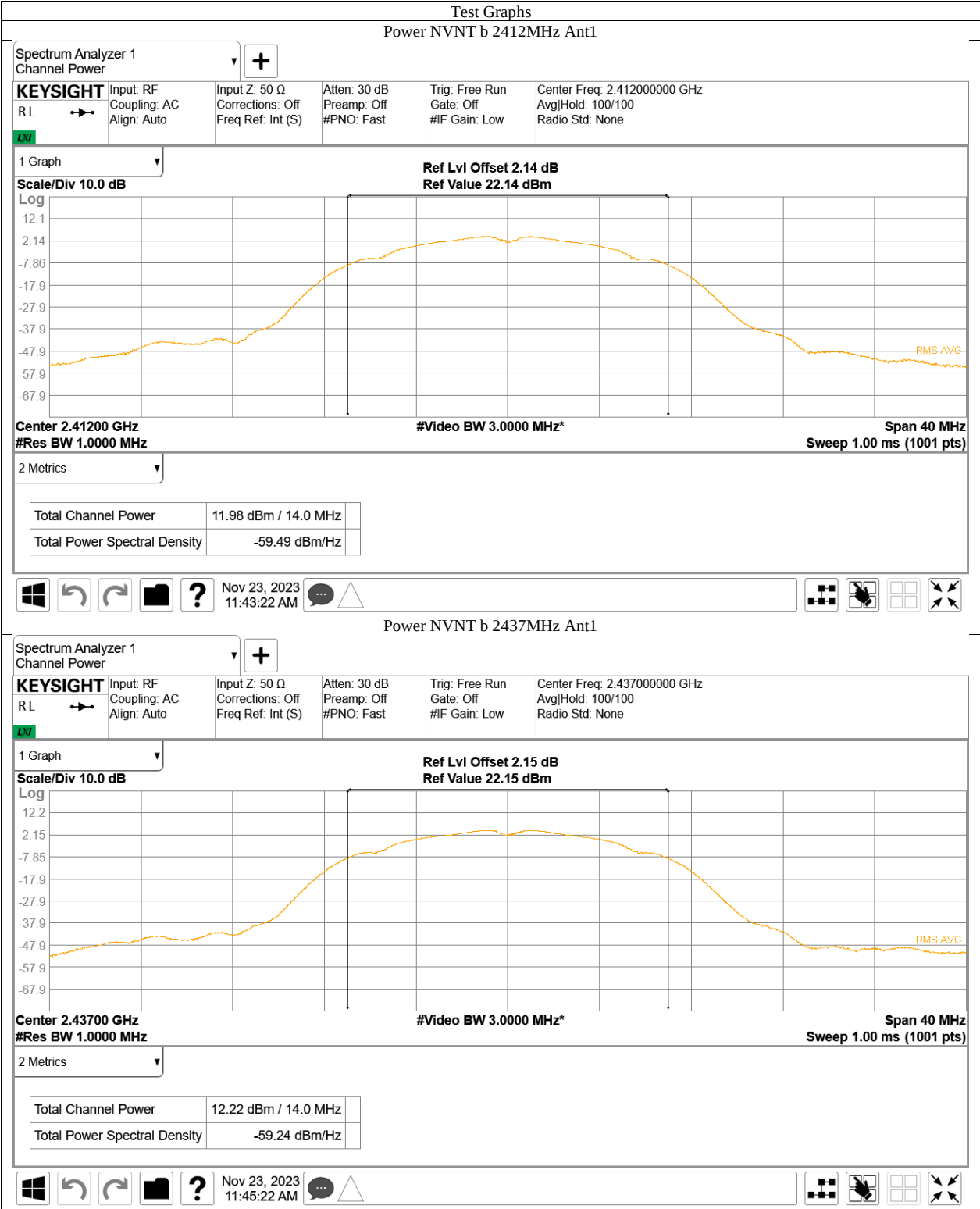
Avg Type: Log-Power
Trig: Free Run

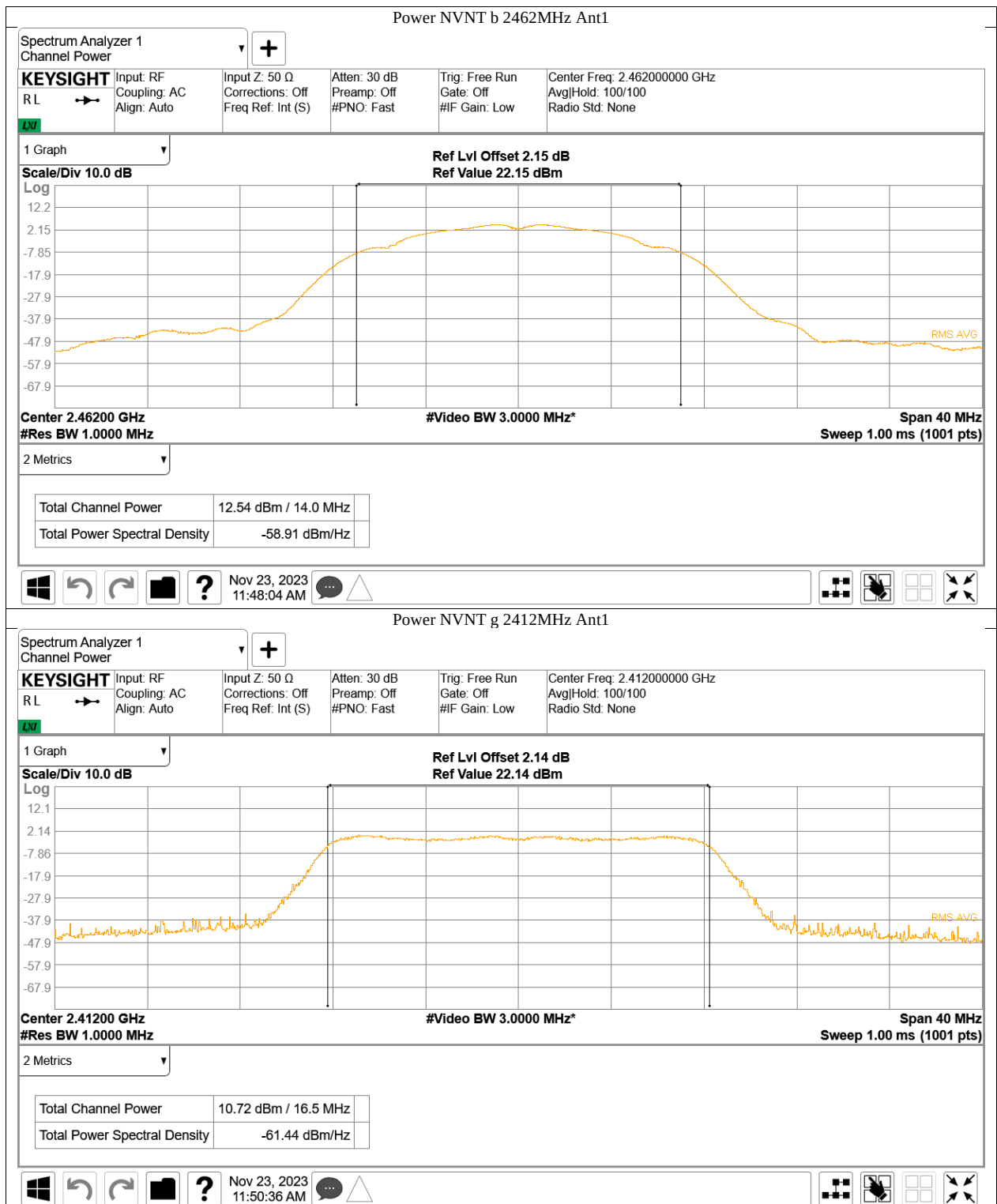
1 2 3 4 5 6
W W W W W W
P N N N N N

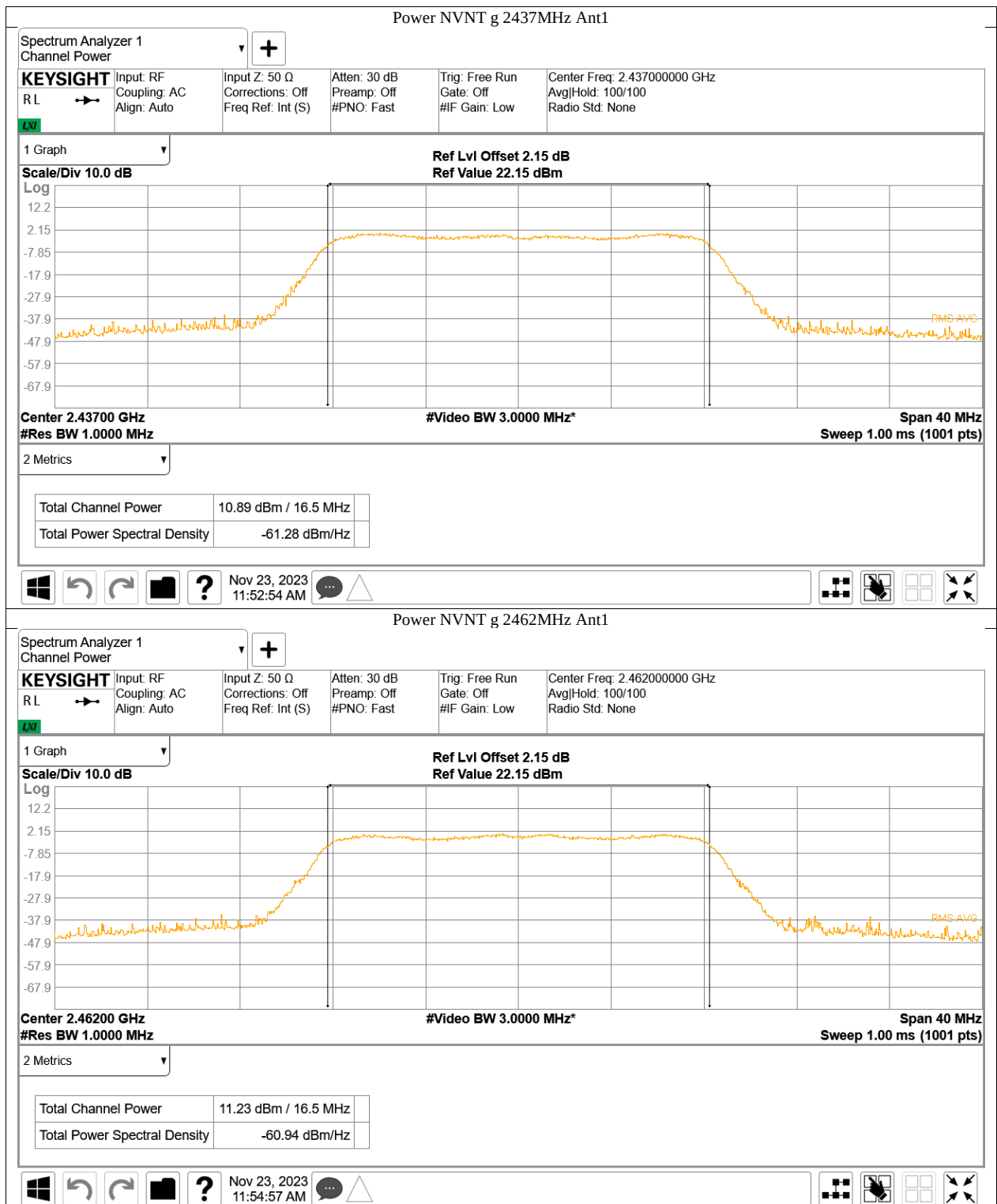


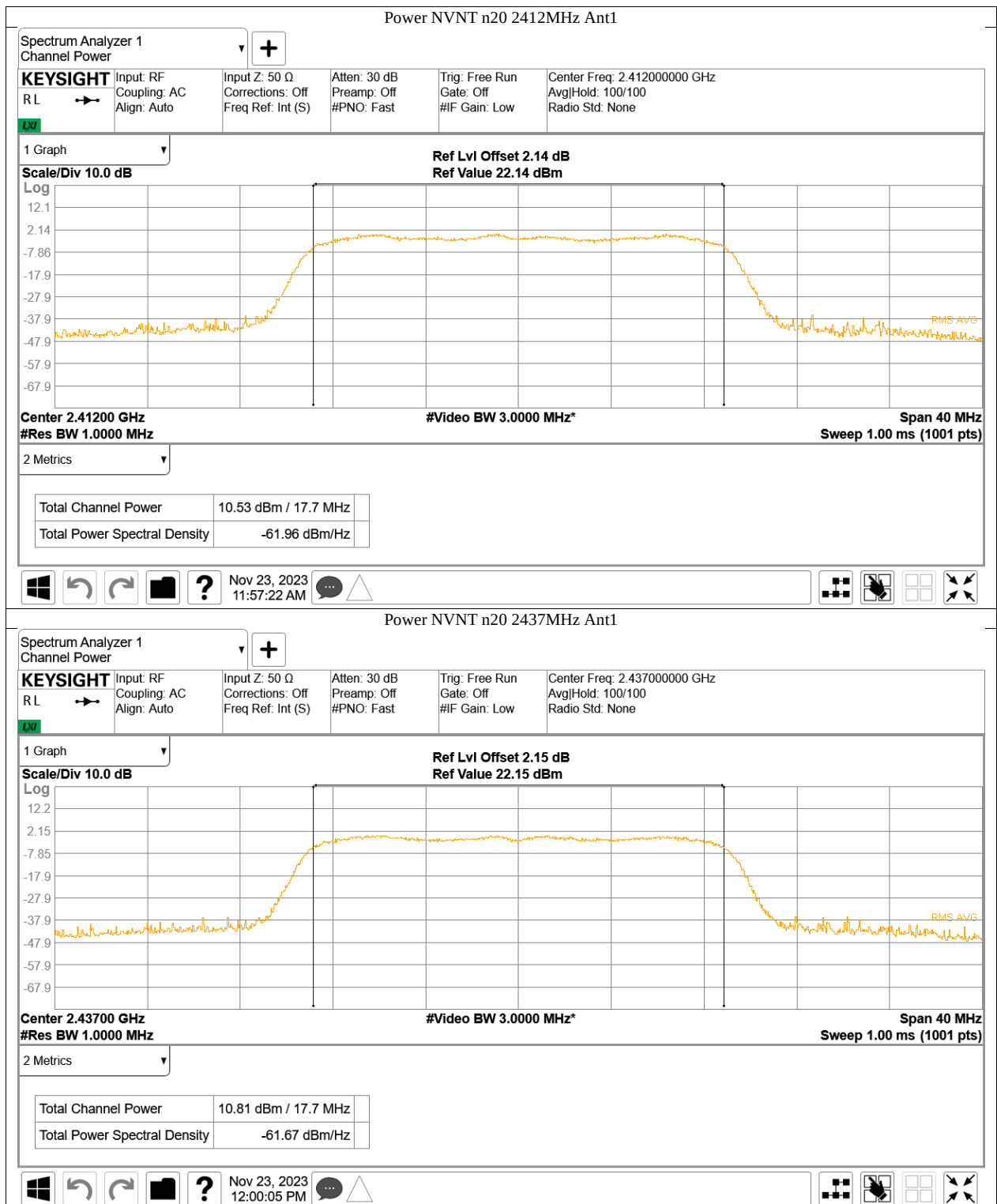


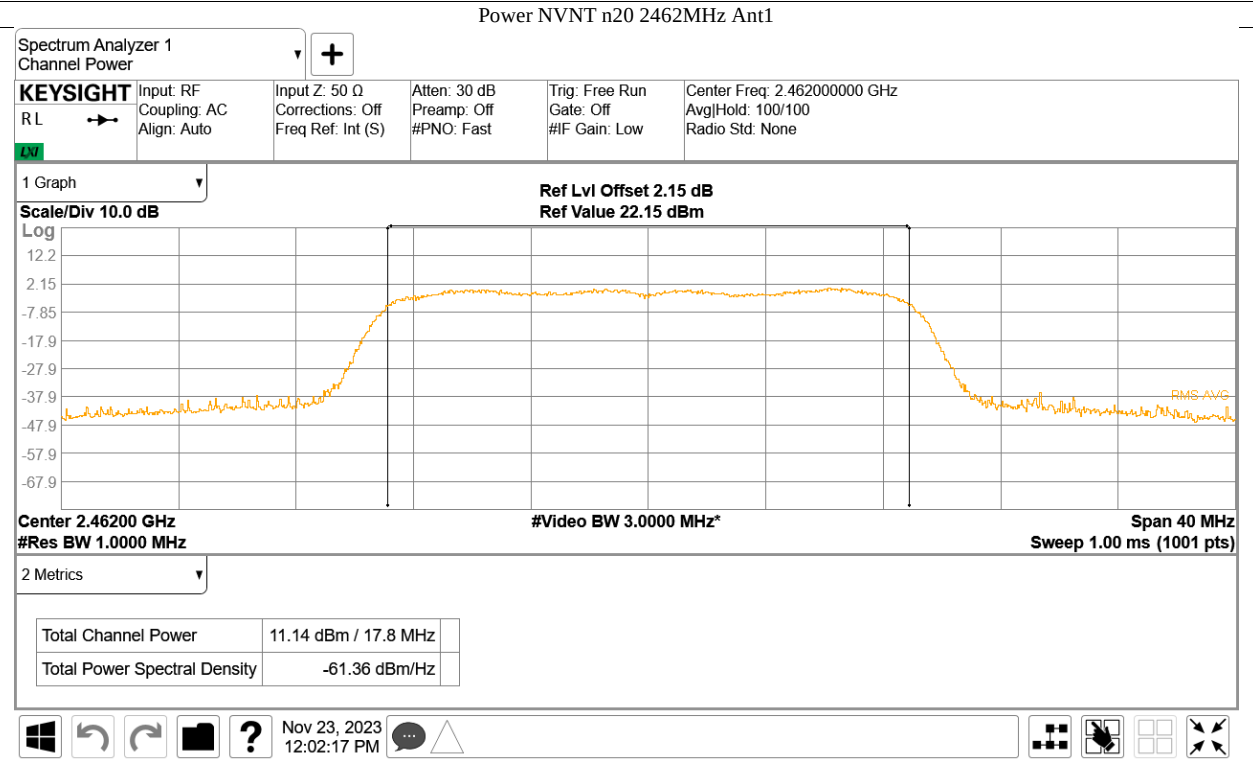
Conducted power













9.3 6dB bandwidth

Test Method

- 1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
- 3. Use the following spectrum analyzer settings:
RBW=100KHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 4. Use the automatic bandwidth measurement capability of an instrument, use the X dB bandwidth mode with X set to 6 dB.
- 5. Allow the trace to stabilize, record the 6 dB Bandwidth value.

Limit

Limit [kHz]

≥500

Test result

Test Mode	Frequency MHz	6dB bandwidth (MHz)		Result
		result	limit	verdict
802.11b	2412	8.056	≥0.5	Pass
	2437	9.053	≥0.5	Pass
	2462	8.533	≥0.5	Pass
802.11g	2412	16.337	≥0.5	Pass
	2437	16.345	≥0.5	Pass
	2462	16.231	≥0.5	Pass
802.11n(HT20)	2412	17.531	≥0.5	Pass
	2437	17.588	≥0.5	Pass
	2462	17.688	≥0.5	Pass