



**CFR 47 FCC PART 15 SUBPART C,
ISED RSS-247 ISSUE 3 (DSS)**

TEST REPORT

For

PORTABLE BLUETOOTH SPEAKERS

MODEL NUMBER: MS62133, M220

REPORT NUMBER: E04A25041187F00601

ISSUE DATE: May 14, 2025

FCC ID: 2AVD2-MS62133

IC: 28087-MS62133

Prepared for

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Prepared by

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**This report is based on a single evaluation of the submitted sample(s) of the above
mentioned product, it does not imply an assessment of the production of the products.**

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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	May 14, 2025	Initial Issue	

Summary of Test Results

Test Item	Clause	Limit/Requirement	Result
Antenna Requirement	N/A	FCC Part 15.203/15.247 (c) RSS-Gen Issue 5, Clause 6.8	Pass
AC Power Line Conducted Emission	ANSI C63.10-2013 Clause 6.2	FCC Part 15.207 RSS-GEN Clause 8.8	Pass
Conducted Output Power	ANSI C63.10-2013 Clause 7.8.5	FCC Part 15.247 (b)(1) RSS-247 Clause 5.4 (b)	Pass
20 dB Bandwidth and 99% Occupied Bandwidth	ANSI C63.10-2013 Clause 6.9.2	FCC Part 15.247 (a)(1) RSS-247 Clause 5.1 (a) ISED RSS-Gen Clause 6.7	Pass
Carrier Hopping Channel Separation	ANSI C63.10-2013 Clause 7.8.2	FCC Part 15.247 (a)(1) RSS-247 Clause 5.1(b)	Pass
Number of Hopping Frequency	ANSI C63.10-2013 Clause 7.8.3	FCC Part 15.247 (b)(1) RSS-247 Clause 5.1(d)	Pass
Time of Occupancy (Dwell Time)	ANSI C63.10-2013 Clause 7.8.4	FCC Part 15.247 (a)(1) RSS-247 Clause 5.1(d)	Pass
Conducted Bandedge and Spurious Emission	ANSI C63.10-2013 Clause 6.10.4 & Clause 7.8.8	FCC Part 15.247(d) RSS-247 Clause 5.5	Pass
Radiated Band edge and Spurious Emission	ANSI C63.10-2013 Clause 6.3 & 6.5 & 6.6	FCC Part 15.205/15.209 RSS-247 Clause 5.5 RSS-GEN Clause 6.13/8.9/8.10	Pass
Duty Cycle	ANSI C63.10-2013, Clause 11.6	None; for reporting purposes only.	Pass

*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

*The measurement result for the sample received is <Pass> according to <CFR 47 FCC PART 15 SUBPART C, ISED RSS-247 ISSUE 3 (DSS)> when <Accuracy Method> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: Shenzhen Monster Creative Technology Co., Ltd.
Address: Room 1602, Building A, Fencheng Zhigu Building, Xixiang Street,
Bao 'an District, Shenzhen, Guangdong, 518126, China

Manufacturer Information

Company Name: Shenzhen Monster Creative Technology Co., Ltd.
Address: Room 1602, Building A, Fencheng Zhigu Building, Xixiang Street,
Bao 'an District, Shenzhen, Guangdong, 518126, China

EUT Information

Product Description: PORTABLE BLUETOOTH SPEAKERS
Model: MS62133
Series Model: M220
Brand: MONSTER
Sample Received Date: April 29, 2025
Sample Status: Normal
Sample ID: A25041187 002
Date of Tested: April 29, 2025 to May 14, 2025

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 FCC PART 15 SUBPART C, ISED RSS-247 ISSUE 3 (DSS)	Pass

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2. TEST METHODOLOGY

All tests were performed in accordance with the standard CFR 47 FCC PART 15 SUBPART C, ISED RSS-247 ISSUE 3 (DSS)

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	A2LA (Certificate No.: 6947.01) Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. FCC (FCC Designation No.: CN1343) Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules ISED (Company No.: 30714) Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.
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Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People's Republic of China, 523808

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Items	k	Uncertainty
DTS Bandwidth	1.96	±9.2 PPM
20dB Emission Bandwidth	1.96	±9.2 PPM
Carrier Frequency Separation	1.96	±9.2 PPM
Time of Occupancy	1.96	±0.57%
Conducted Output Power	1.96	±1.5 dB
Power Spectral Density Level	1.96	±1.9 dB
Conducted Spurious Emission	1.96	9 kHz-30 MHz: ± 0.95 dB 30 MHz-1 GHz: ± 1.5 dB 1GHz-12.75GHz: ± 1.8 dB 12.75 GHz-26.5 GHz: ± 2.1dB
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.		

Test Item	Measurement Frequency Range	K	U(dB)
Conducted emissions from the AC mains power ports (AMN)	150 kHz ~ 30 MHz	2	3.37
Radiated emissions	9 kHz ~ 30 MHz	2	4.16
Radiated emissions	30 MHz ~ 1 GHz	2	3.79
Radiated emissions	1 GHz ~ 18 GHz	2	5.62
Radiated emissions	18 GHz ~ 40 GHz	2	5.54
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name		PORTABLE BLUETOOTH SPEAKERS
Model		MS62133
Series Model		M220
Model Difference		Note: Only model differences.
Hardware Version		V1.0
Software Version		V16
Ratings		5V = 2A
Power Supply	DC	5V
	Battery	DC 11.1V 4900mAh, 54.39Wh

Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth V5.3
Bluetooth Mode:	Bluetooth BR + EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8DPSK
Number of Channels:	79
Channel Separation:	1 MHz
Maximum Peak Power:	2.60 dBm
Antenna Type:	PCB Antenna
Antenna Gain:	-0.69 dBi
Normal Test Voltage:	5 Vdc
EUT Test software:	FCC_assist_1.0.2.2.exe
Note:	1. The Antenna Gain was provided by customer, and this information may affect the validity of the results, customer should be responsible for this. 2. Apply for ISED certification only for the main test model: MS62133, without series models.

5.2. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469

08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	/	/

5.3. MAXIMUM EIRP

Test Mode	Frequency (MHz)	Channel Number	Maximum Peak Output Power (dBm)	Maximum EIRP (dBm)
GFSK	2402 ~ 2480	0-78[79]	1.37	0.68
$\pi/4$ -DQPSK	2402 ~ 2480	0-78[79]	2.18	1.49
8DPSK	2402 ~ 2480	0-78[79]	2.60	1.91

5.4. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
$\pi/4$ -DQPSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz
8DPSK	CH 0(Low Channel), CH 39(MID Channel), CH 78(High Channel)	2402 MHz, 2441 MHz, 2480 MHz

Note: The hop is hopping mode.

PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting (Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
$\pi/4$ -DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679
8DPSK	3-DH1	83
	3-DH3	552
	3-DH5	1021

5.5. THE WORSE CASE POWER SETTING PARAMETER

WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BR	FHSS	GFSK	1Mbit/s
EDR	FHSS	$\pi/4$ -DQPSK	2Mbit/s
EDR	FHSS	8DPSK	3Mbit/s

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		FCC_assist_1.0.2.2.exe		
Modulation Type	Transmit Antenna Number	Test Software setting value		
		CH 00	CH 39	CH 78
GFSK	1	5	5	5
$\pi/4$ -DQPSK	1	5	5	5
8DPSK	1	5	5	5

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2402-2480	PCB	-0.69

Test Mode	Transmit and Receive Mode	Description
GFSK	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
$\pi/4$ -DQPSK	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.
8DPSK	☒ 1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.

5.7. EUT ACCESSORY

Cable	
Accessory:	USB cable
Model No.:	/
Description:	USB Type-C Plug Cable

Cable Type:	Unshielded without ferrite
Length:	1.03 Meter

5.8. SUPPORT UNITS FOR SYSTEM TEST

The following support units or accessories were used to form a representative test configuration during the tests.

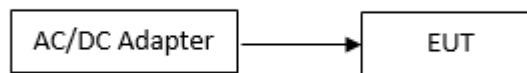
Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Laptop	Lenovo	Thinkpad T14	PF-3EAKYR	GTG Support
E-2	Adapter	Xiaomi	MDY-11-EX	N/A	GTG Support
E-3	Serial Port Tool	N/A	N/A	N/A	GTG Support

The following cables were used to form a representative test configuration during the tests.

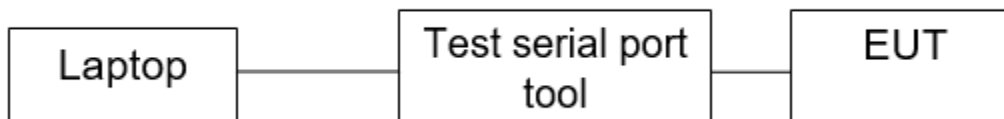
Item	Type of cable	Shielded Type	Ferrite Core	Length
C-1	USB cable	Unshielded	without ferrite	1.0 m
C-2	Dupont cable	Unshielded	without ferrite	0.6 m

5.9. SETUP DIAGRAM

AC Power Line Conducted Emission:



Radiated emissions:



6. MEASURING EQUIPMENT AND SOFTWARE USED

Test Equipment of Conducted RF					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51285127	2024/09/14	2025/09/13
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2024/09/14	2025/09/13
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2024/09/14	2025/09/13
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2024/09/14	2025/09/13
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2024/09/14	2025/09/13
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2024/09/14	2025/09/13
temperature humidity chamber	Espec	SH-241	SH-241-2014	2024/09/14	2025/09/13
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

Test Equipment of Radiated emissions below 1GHz					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESC13	101409	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2024/09/14	2025/09/13
Pre-Amplifier	HzEMC	HPA-9K0130	HYPA21001	2024/09/14	2025/09/13
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243651	2025/02/22	2028/02/21
Loop Antenna	ETS	6502	00243668	2025/02/22	2028/02/21
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2024/09/14	2025/09/13
Pre-Amplifier	HzEMC	HPA-1G1850	HYPA21003	2024/09/14	2025/09/13
Horn antenna	ETS	3117	00246069	2025/02/22	2028/02/21
Pre-Amplifier	HzEMC	HPA-184057	HYPA21004	2024/09/14	2025/09/13

Horn antenna	ETS	3116C	00246265	2025/02/22	2028/02/21
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

Test Equipment of Conducted emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Shielded Room	CHENG YU	8m*5m*4m	N/A	2022/10/29	2025/10/28
EMI Test Receiver	Rohde & Schwarz	ESR3	102647	2024/09/14	2025/09/13
LISN/AMN	Rohde & Schwarz	ENV216	102843	2024/09/14	2025/09/13
NNLK 8129 RC	Schwarzbeck	NNLK 8129 RC	5046	2024/09/14	2025/09/13
Test Software	Farad	EZ-EMC (Ver. EMC-con-3A1 1+)	N/A	N/A	N/A

7. ANTENNA PORT TEST RESULTS

7.1. CONDUCTED OUTPUT POWER

LIMITS

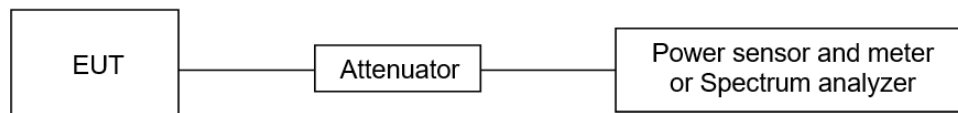
CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 3			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3) ISED RSS-247 5.4 (d)	Peak Conduct Output Power	1 watt or 30 dBm	2400-2483.5

TEST PROCEDURE

Connect the EUT to a low loss RF cable from the antenna port to the power sensor and meter or Spectrum analyzer (video bandwidth is greater than the occupied bandwidth).

Measure peak emission level, the indicated level is the peak output power, after any corrections for external attenuators and cables.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.2. 20 DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 3			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a)	20 dB Bandwidth	None; for reporting purposes only.	2400-2483.5
ISED RSS-Gen Clause 6.7	99 % Occupied Bandwidth	None; for reporting purposes only.	2400-2483.5

TEST PROCEDURE

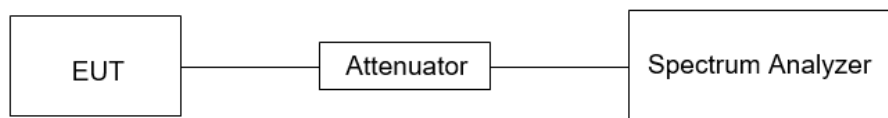
Refer to ANSI C63.10-2013 clause 6.9.2.

Connect the EUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	For 20 dB Bandwidth: 1 % to 5 % of the 20 dB bandwidth For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 20 dB Bandwidth: approximately 3×RBW For 99 % Occupied Bandwidth: ≥ 3×RBW
Span	Approximately 2 to 3 times the 20dB bandwidth
Trace	Max hold
Sweep	Auto couple

a) Use the occupied bandwidth function of the instrument, allow the trace to stabilize and report the measured 99 % occupied bandwidth and 20 dB Bandwidth.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.3. CARRIER HOPPING CHANNEL SEPARATION

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISSED RSS-247 ISSUE 3			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) ISED RSS-247 Clause 5.1 (b)	Carrier Frequency Separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel.	2400-2483.5

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.2.

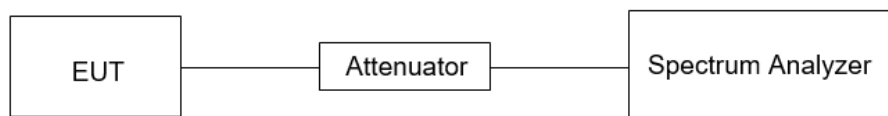
Connect the EUT to the spectrum analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW	≥RBW
Trace	Max hold
Sweep time	Auto couple

Allow the trace to stabilize and use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Compliance of an EUT with the appropriate regulatory limit shall be determined.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.4. NUMBER OF HOPPING FREQUENCY

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 3		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	Number of Hopping Frequency	at least 15 hopping channels

TEST PROCEDURE

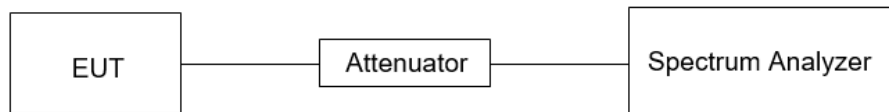
Refer to ANSI C63.10-2013 clause 7.8.3.

Connect the EUT to the spectrum Analyzer and use the following settings:

Detector	Peak
RBW	To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW	≥RBW
Span	The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
Trace	Max hold
Sweep time	Auto couple

Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer, count the quantity of peaks to get the number of hopping channels.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.5. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 3		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	Time of Occupancy (Dwell Time)	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed.

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.4.

Connect the EUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	Zero span, centered on a hopping channel
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel

Use the marker-delta function to determine the transmit time per hop (Burst Width). If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

For FHSS Mode (79 Channel):

DH1/3DH1 Dwell Time: $\text{Burst Width} * (1600/2) * 31.6 / (\text{channel number})$

DH3/3DH3 Dwell Time: $\text{Burst Width} * (1600/4) * 31.6 / (\text{channel number})$

DH5/3DH5 Dwell Time: $\text{Burst Width} * (1600/6) * 31.6 / (\text{channel number})$

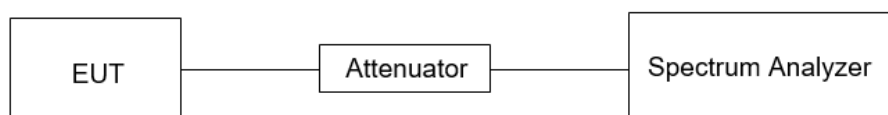
For AFHSS Mode (20 Channel):

DH1/3DH1 Dwell Time: $\text{Burst Width} * (1600/2) * 8 / (\text{channel number})$

DH3/3DH3 Dwell Time: $\text{Burst Width} * (1600/4) * 8 / (\text{channel number})$

DH5/3DH5 Dwell Time: $\text{Burst Width} * (1600/6) * 8 / (\text{channel number})$

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.6. CONDUCTED BANDEDGE AND SPURIOUS EMISSION

LIMITS

CFR 47 FCC Part15 (15.247), Subpart C ISED RSS-247 ISSUE 3		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d) ISED RSS-247 5.5	Conducted Spurious Emission	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 7.8.6 and 7.8.8.

Connect the EUT to the spectrum analyser and use the following settings for reference level measurement:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

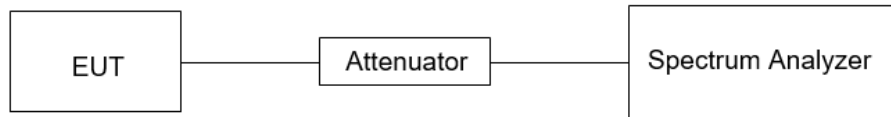
Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.

Change the settings for emission level measurement:

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	$\geq 3 \times \text{RBW}$
measurement points	$\geq \text{span}/\text{RBW}$
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

7.7. DUTY CYCLE

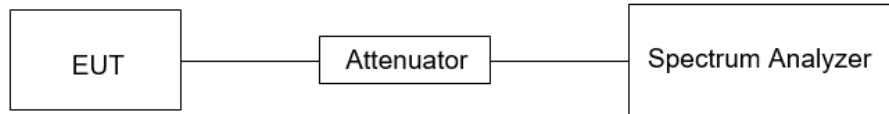
LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Refer to ANSI C63.10-2013 Zero – Span Spectrum Analyzer method.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.8°C	Relative Humidity	59%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section "Test Data" - Appendix A

8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz-1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz		
Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement distance (m)
9 - 490 kHz ^{Note 1}	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

ISED Restricted bands please refer to ISED RSS-GEN Clause 8.10

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.028	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

FCC Restricted bands of operation refer to FCC §15.205 (a):

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

Note: ¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6c

TEST PROCEDURE

Below 30 MHz

TRF No.: 04-E001-0B

Global Testing , Great Quality.

The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.
2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.
5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.
6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.
7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω . For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to $Y-51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 80 cm above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

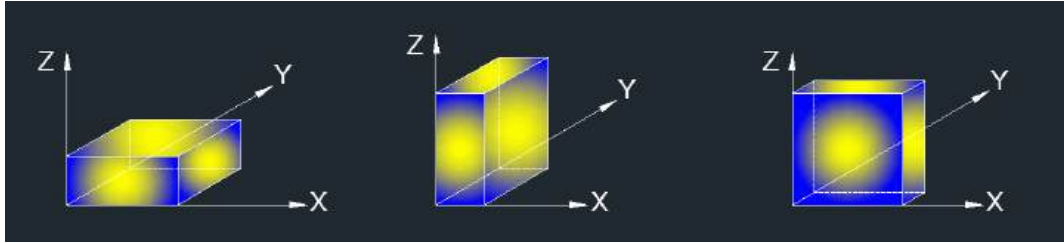
Above 1 GHz

The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. The EUT was placed on a turntable with 1.5 m above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

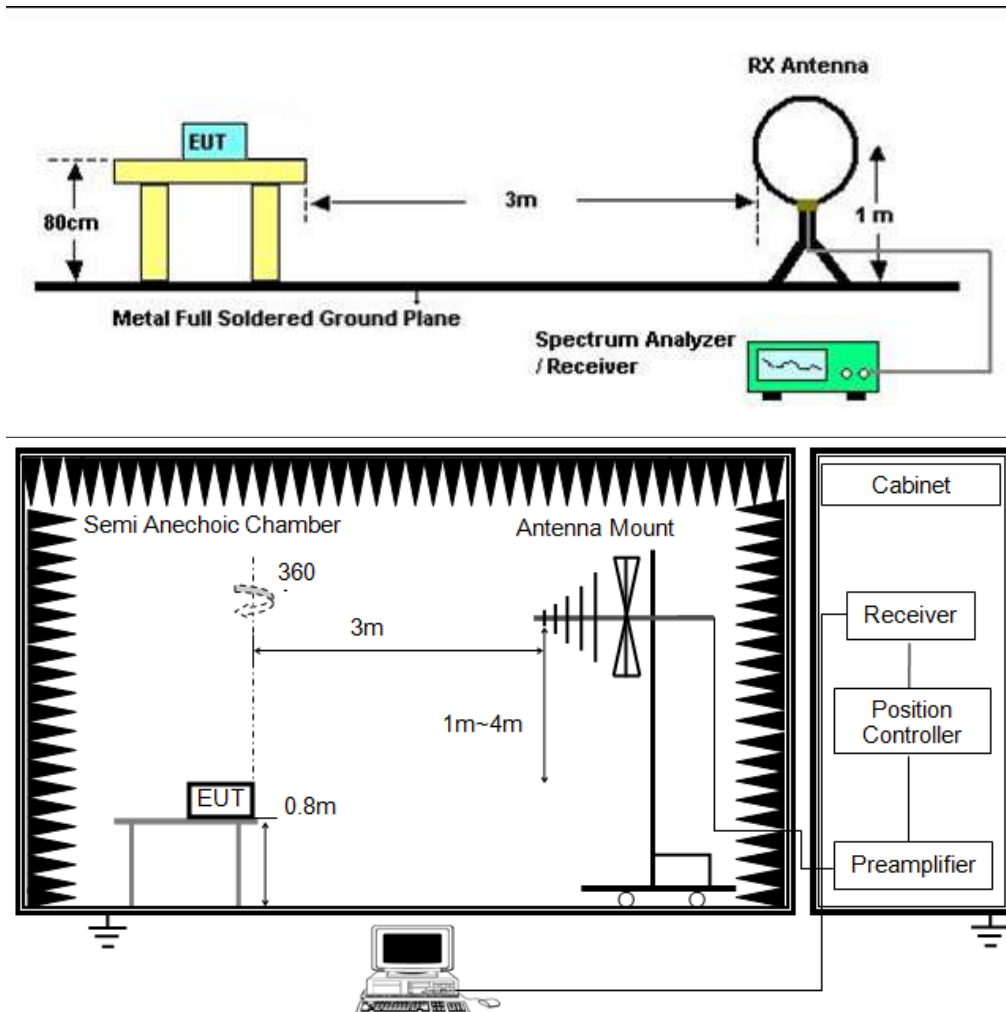
X axis, Y axis, Z axis positions:

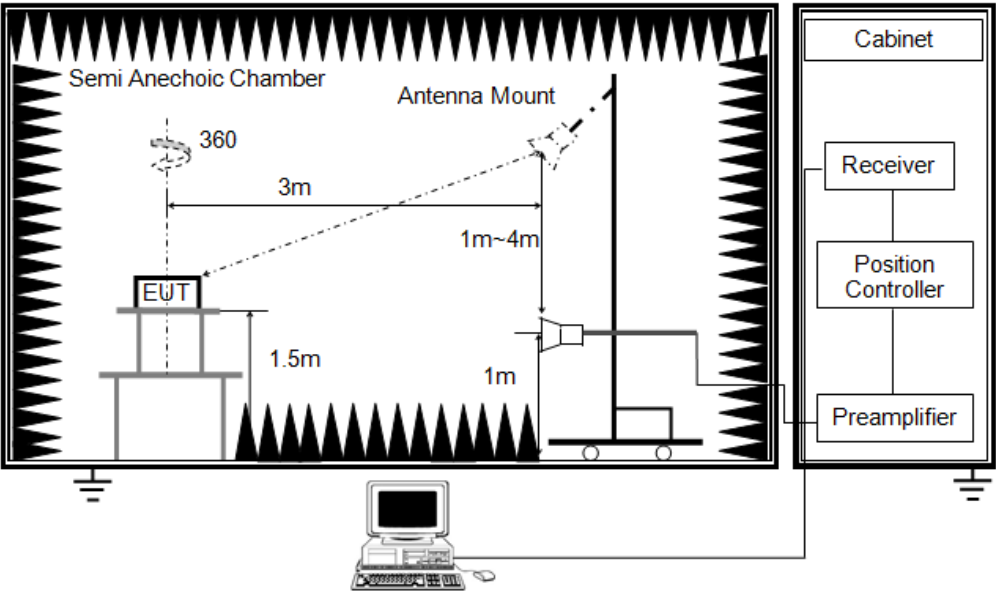


Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

TEST SETUP





TEST ENVIRONMENT

Temperature	24.2℃	Relative Humidity	55%
Atmosphere Pressure	101kPa		

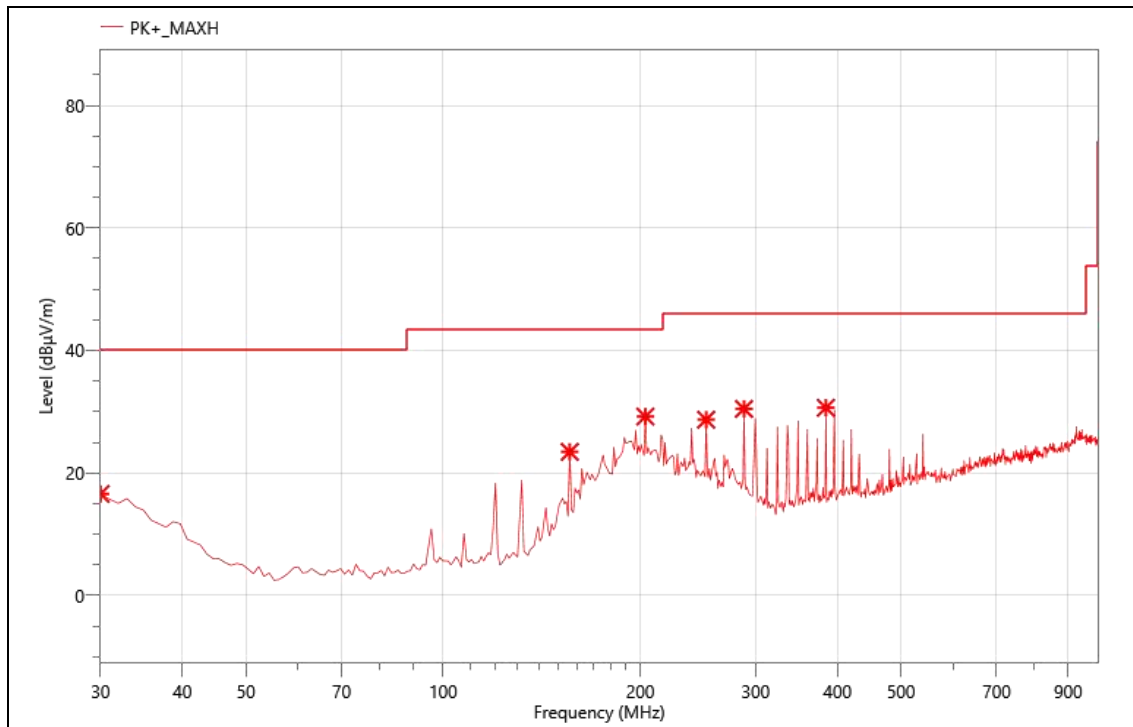
TEST RESULTS

8.1. RADIATED BAND EDGE AND SPURIOUS EMISSION

Undesirable radiated Spurious Emission below 1GHz (30MHz to 1GHz)

All modes have been tested and the worst result as bellow:

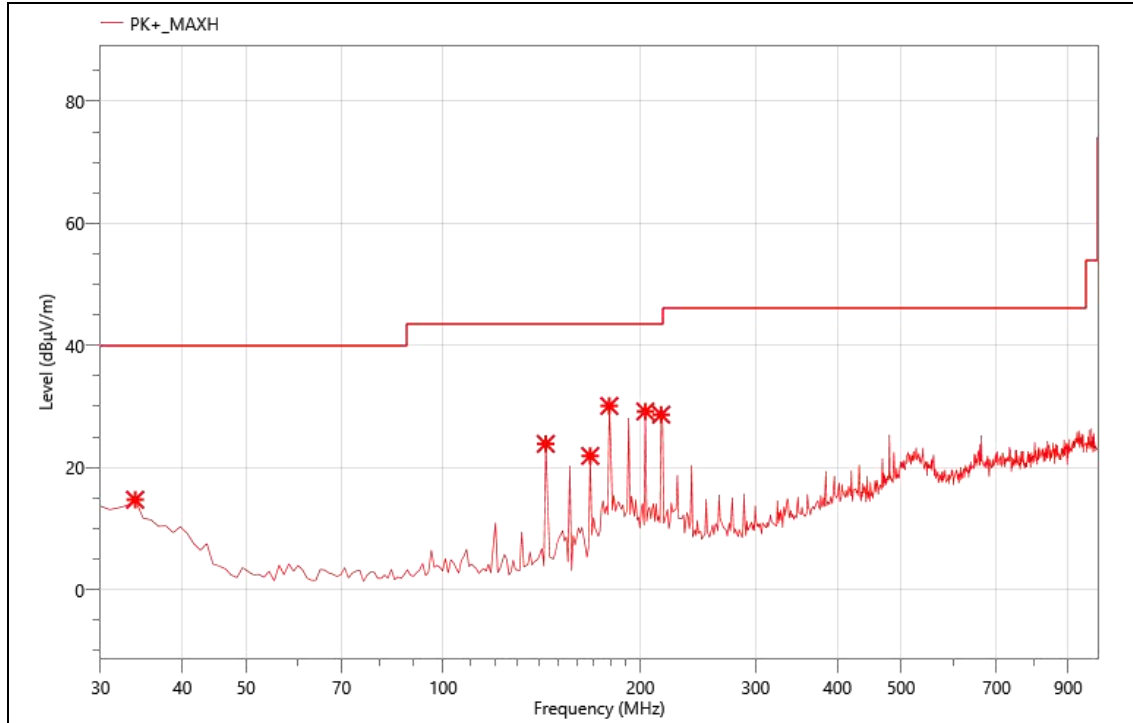
Mode:	3DH5 2402
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	30.000	30.85	-14.27	16.58	40.00	23.42	PK+	H
2	156.100	44.69	-21.24	23.45	43.50	20.05	PK+	H
3	203.630	51.03	-21.82	29.21	43.50	14.29	PK+	H
4	252.130	47.69	-18.99	28.70	46.00	17.30	PK+	H
5	288.020	49.94	-19.48	30.46	46.00	15.54	PK+	H
6	384.050	45.32	-14.68	30.64	46.00	15.36	PK+	H

Mode:	3DH5 2402
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



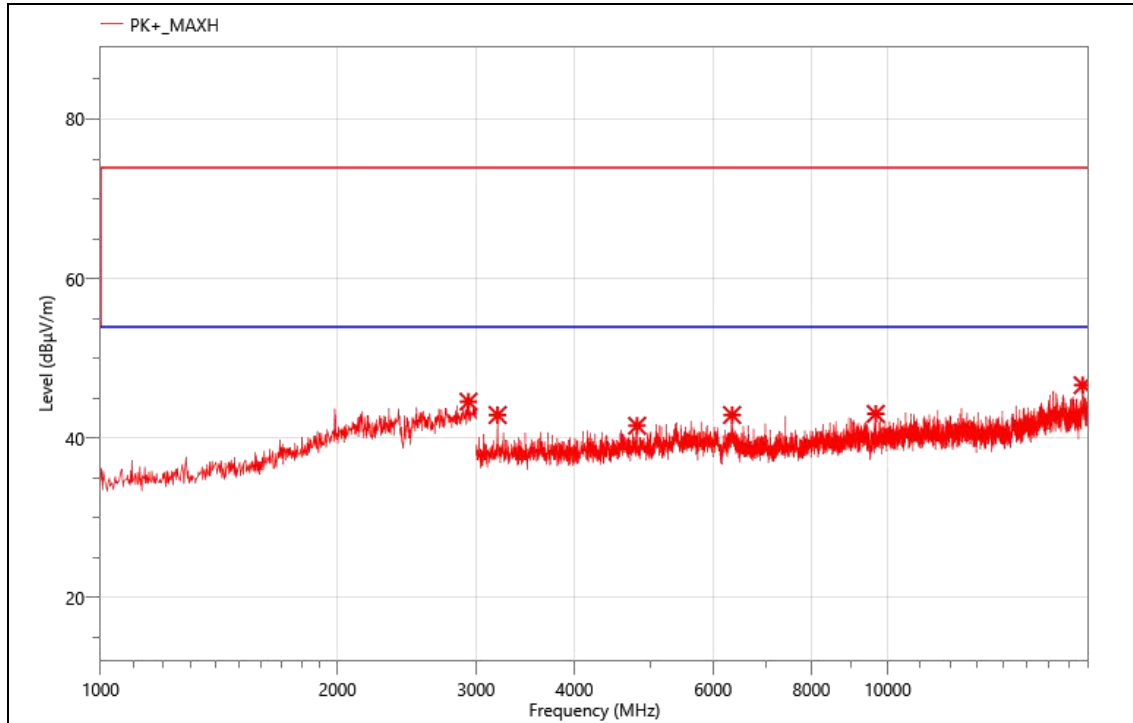
Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	33.880	31.21	-16.49	14.72	40.00	25.28	PK+	V
2	143.490	47.39	-23.52	23.87	43.50	19.63	PK+	V
3	167.740	44.59	-22.7	21.89	43.50	21.61	PK+	V
4	179.380	52.23	-22.15	30.08	43.50	13.42	PK+	V
5	203.630	51.00	-21.82	29.18	43.50	14.32	PK+	V
6	215.270	49.65	-21	28.65	43.50	14.85	PK+	V

Undesirable radiated Spurious Emission Above 1GHz (1GHz to 40GHz)

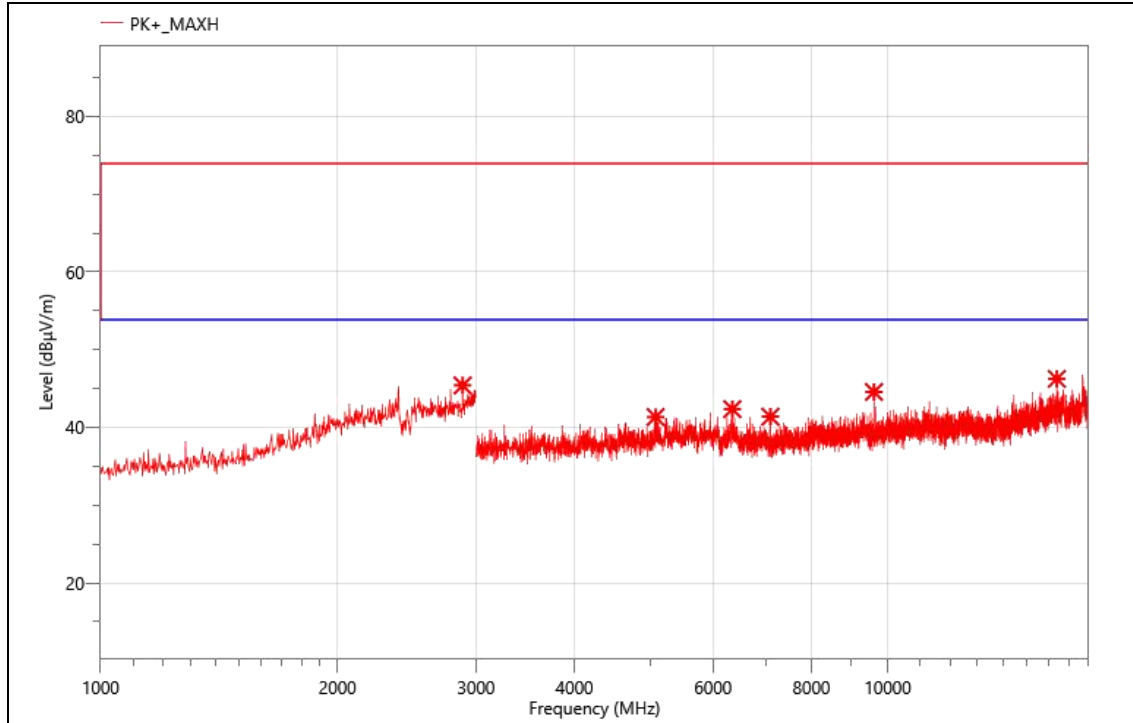
All modes have been tested and the worst result as bellow:

Mode:	3DH5 2402
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa

**Critical_Freqs**

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2934.000	52.08	-7.51	44.57	74.00	29.43	PK+	V
2	3195.000	57.69	-14.8	42.89	74.00	31.11	PK+	V
3	4804.500	52.88	-11.34	41.54	74.00	32.46	PK+	V
4	6343.500	50.87	-7.98	42.89	74.00	31.11	PK+	V
5	9657.000	49.71	-6.67	43.04	74.00	30.96	PK+	V
6	17689.500	46.39	0.24	46.63	74.00	27.37	PK+	V

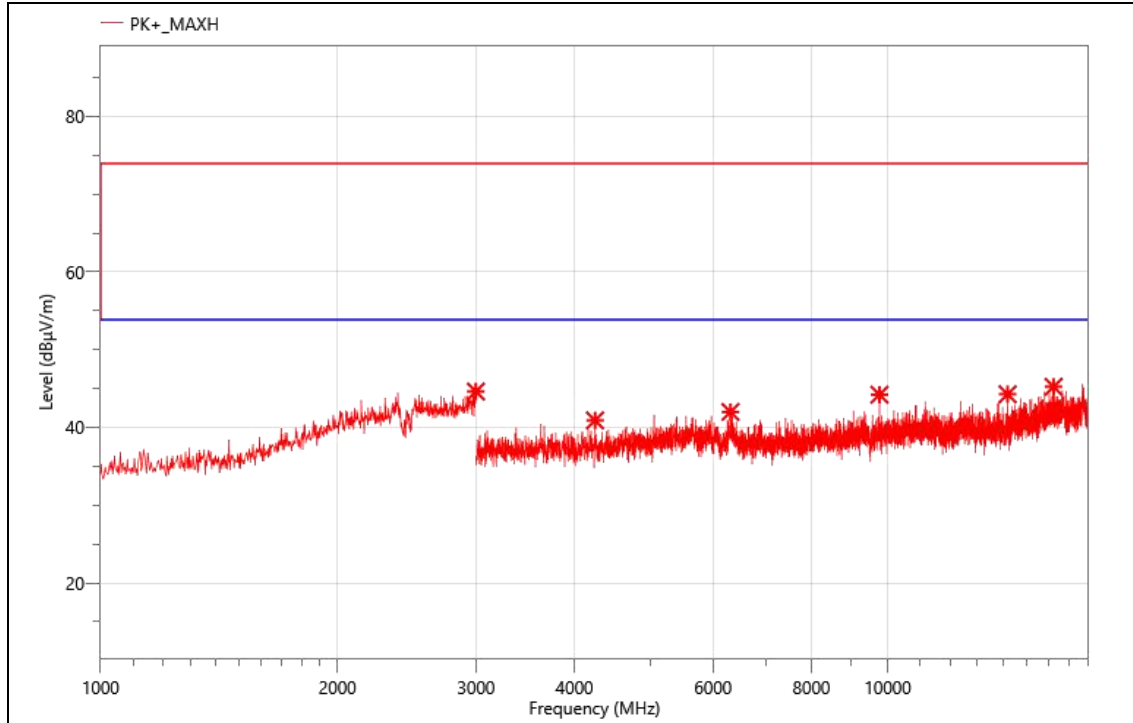
Mode:	3DH5 2402
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2884.000	53.64	-8.23	45.41	74.00	28.59	PK+	H
2	5071.500	51.79	-10.45	41.34	74.00	32.66	PK+	H
3	6348.000	50.31	-7.96	42.35	74.00	31.65	PK+	H
4	7096.500	49.43	-8.04	41.39	74.00	32.61	PK+	H
5	9607.500	51.63	-7.06	44.57	74.00	29.43	PK+	H
6	16399.500	47.40	-1.15	46.25	74.00	27.75	PK+	H

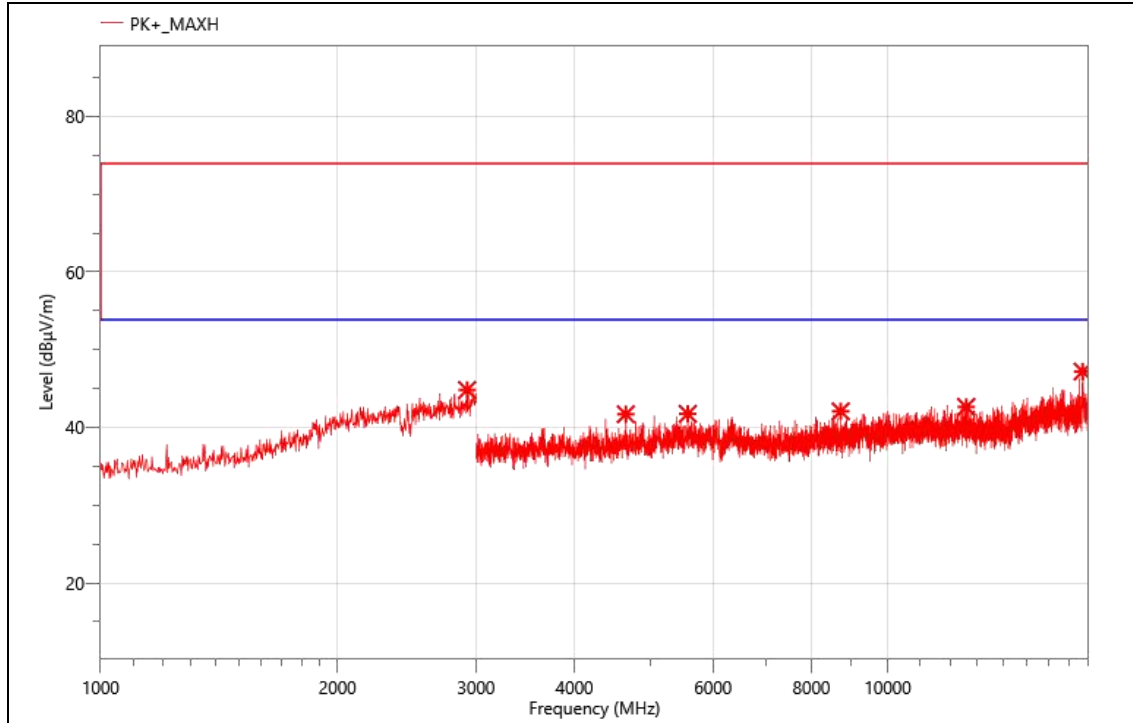
Mode:	3DH5 2441
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2998.000	51.63	-7.01	44.62	74.00	29.38	PK+	H
2	4248.000	53.39	-12.48	40.91	74.00	33.09	PK+	H
3	6313.500	49.61	-7.62	41.99	74.00	32.01	PK+	H
4	9763.500	51.18	-6.97	44.21	74.00	29.79	PK+	H
5	14200.500	47.56	-3.29	44.27	74.00	29.73	PK+	H
6	16246.500	45.76	-0.53	45.23	74.00	28.77	PK+	H

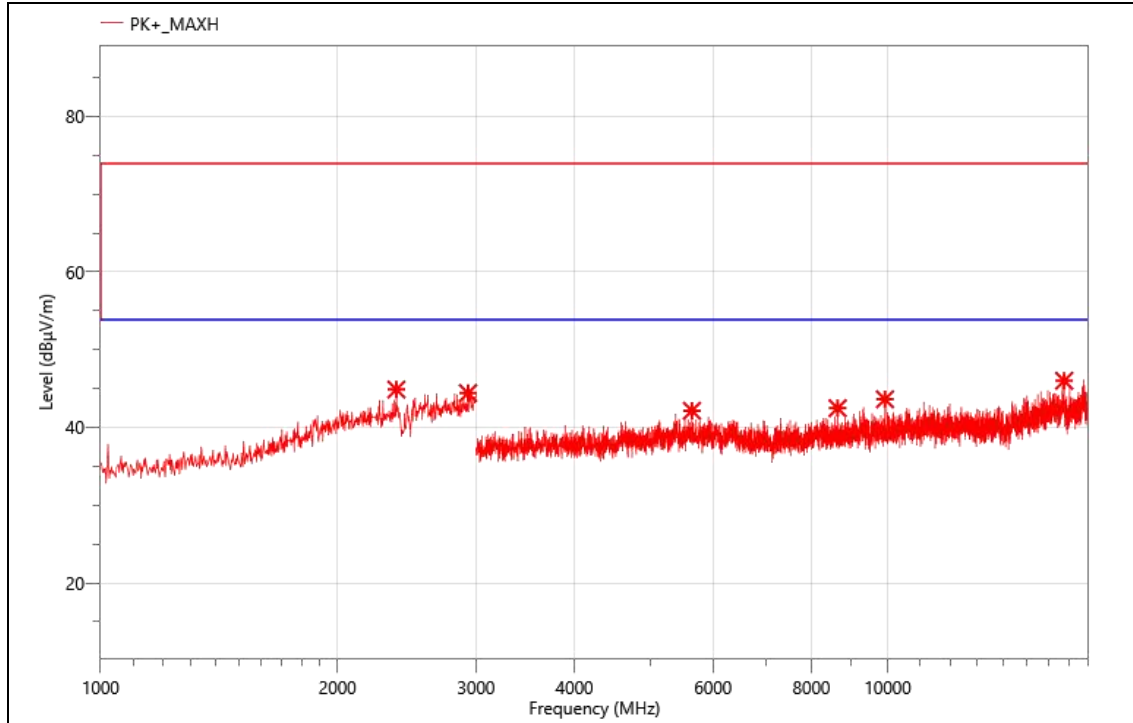
Mode:	3DH5 2441
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2922.000	52.42	-7.6	44.82	74.00	29.18	PK+	V
2	4648.500	53.33	-11.63	41.70	74.00	32.30	PK+	V
3	5572.500	51.01	-9.26	41.75	74.00	32.25	PK+	V
4	8715.000	50.19	-8.11	42.08	74.00	31.92	PK+	V
5	12582.000	47.01	-4.37	42.64	74.00	31.36	PK+	V
6	17685.000	46.93	0.26	47.19	74.00	26.81	PK+	V

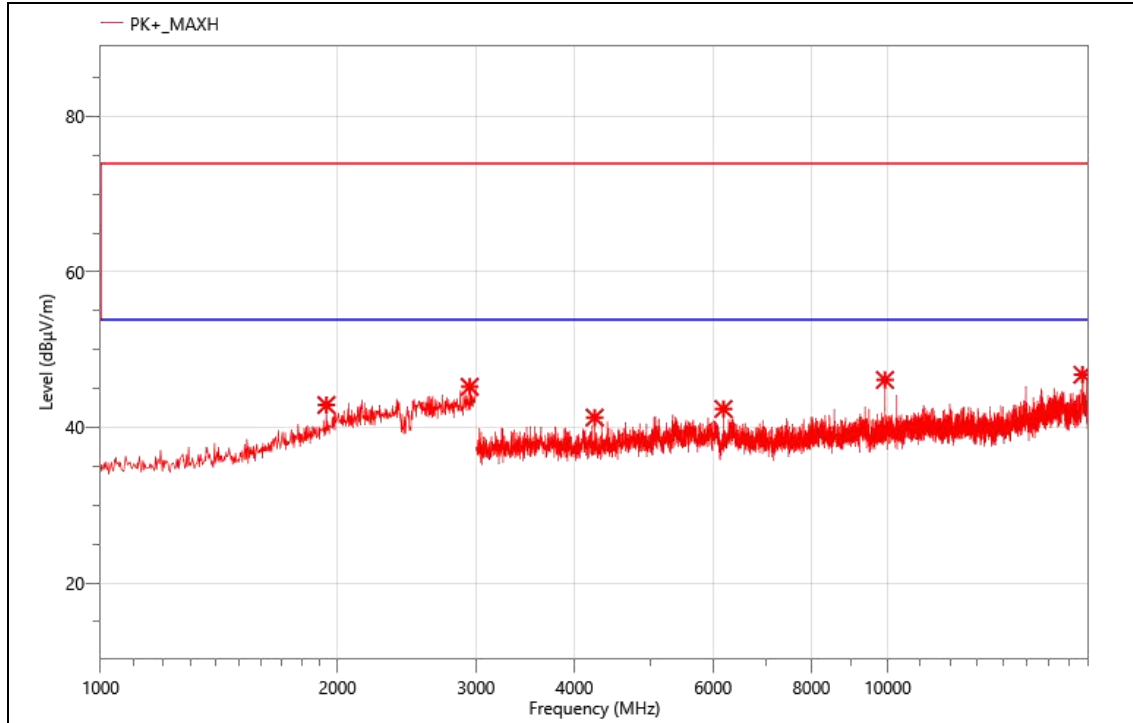
Mode:	3DH5 2480
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2376.000	53.38	-8.5	44.88	74.00	29.12	PK+	V
2	2930.000	51.96	-7.54	44.42	74.00	29.58	PK+	V
3	5640.000	51.32	-9.18	42.14	74.00	31.86	PK+	V
4	8637.000	50.56	-8.08	42.48	74.00	31.52	PK+	V
5	9919.500	49.97	-6.35	43.62	74.00	30.38	PK+	V
6	16758.000	47.15	-1.15	46.00	74.00	28.00	PK+	V

Mode:	3DH5 2480
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	1936.000	52.73	-9.85	42.88	74.00	31.12	PK+	H
2	2944.000	52.69	-7.46	45.23	74.00	28.77	PK+	H
3	4243.500	53.80	-12.53	41.27	74.00	32.73	PK+	H
4	6186.000	50.69	-8.31	42.38	74.00	31.62	PK+	H
5	9919.500	52.46	-6.35	46.11	74.00	27.89	PK+	H
6	17679.000	46.49	0.29	46.78	74.00	27.22	PK+	H

Note:

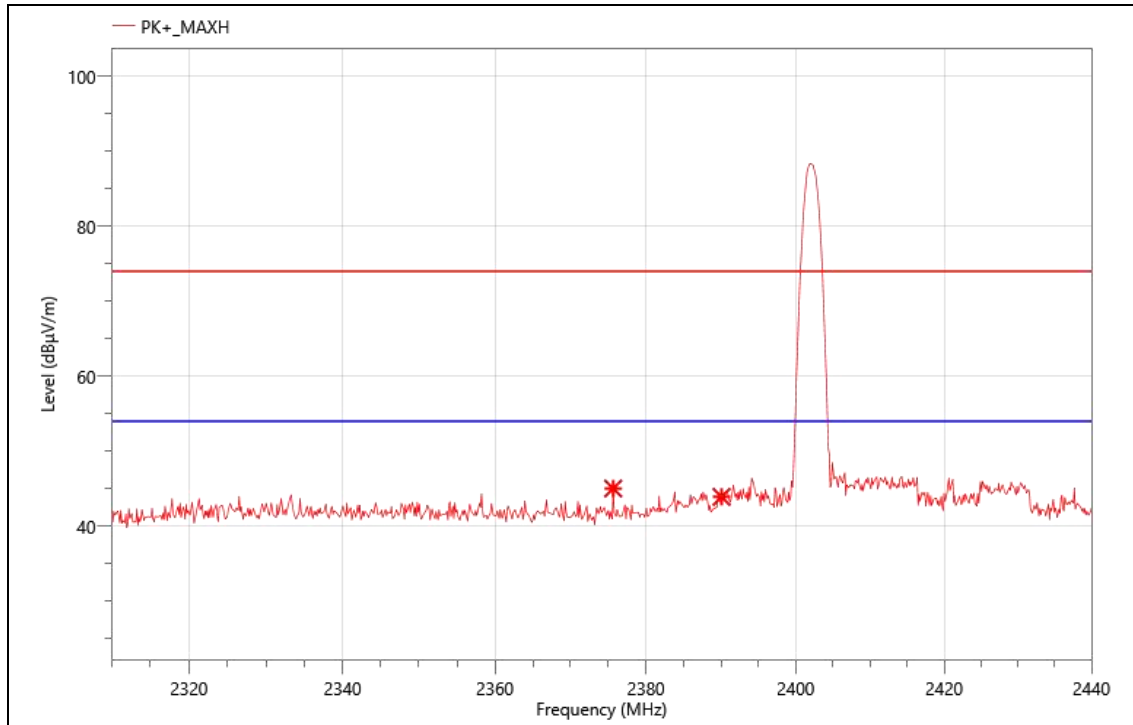
1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

For the frequency above 18 GHz, a pre-scan was performed, and the result was 20 dB lower than the limit line, the test data was not shown in the report.

Band Edge

All modes have been tested and the worst result as bellow:

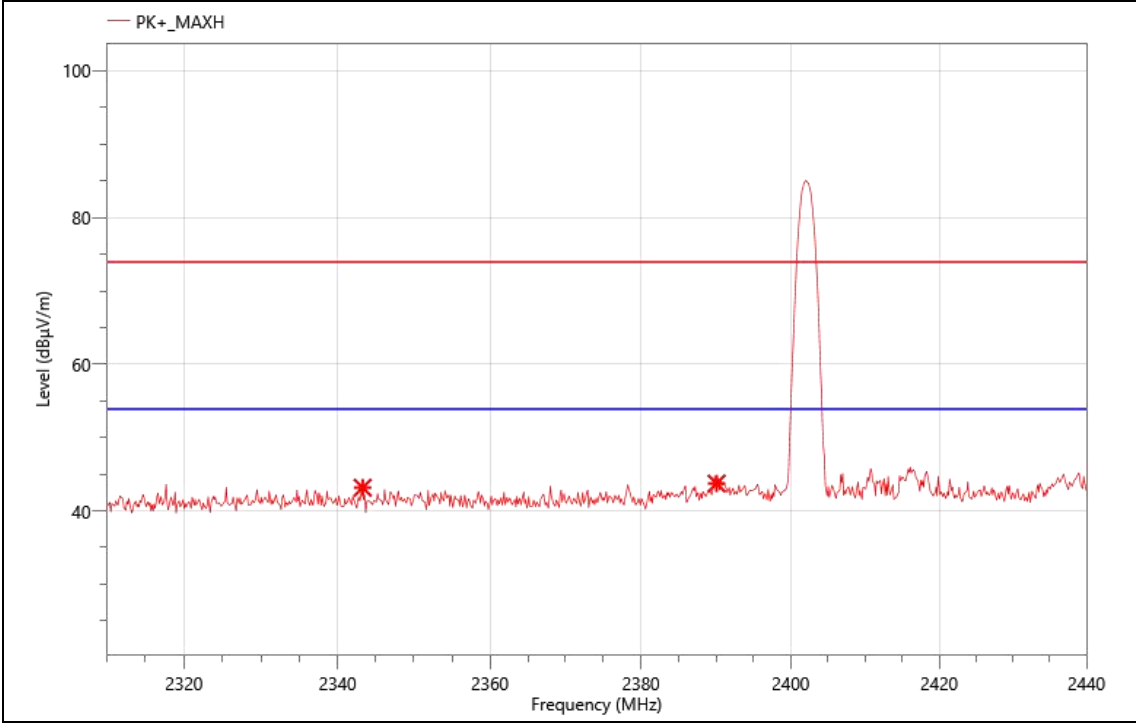
Mode:	3DH5 2402
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2375.650	22.46	22.57	45.03	74.00	28.97	PK+	H
2	2390.080	21.19	22.72	43.91	74.00	30.09	PK+	H

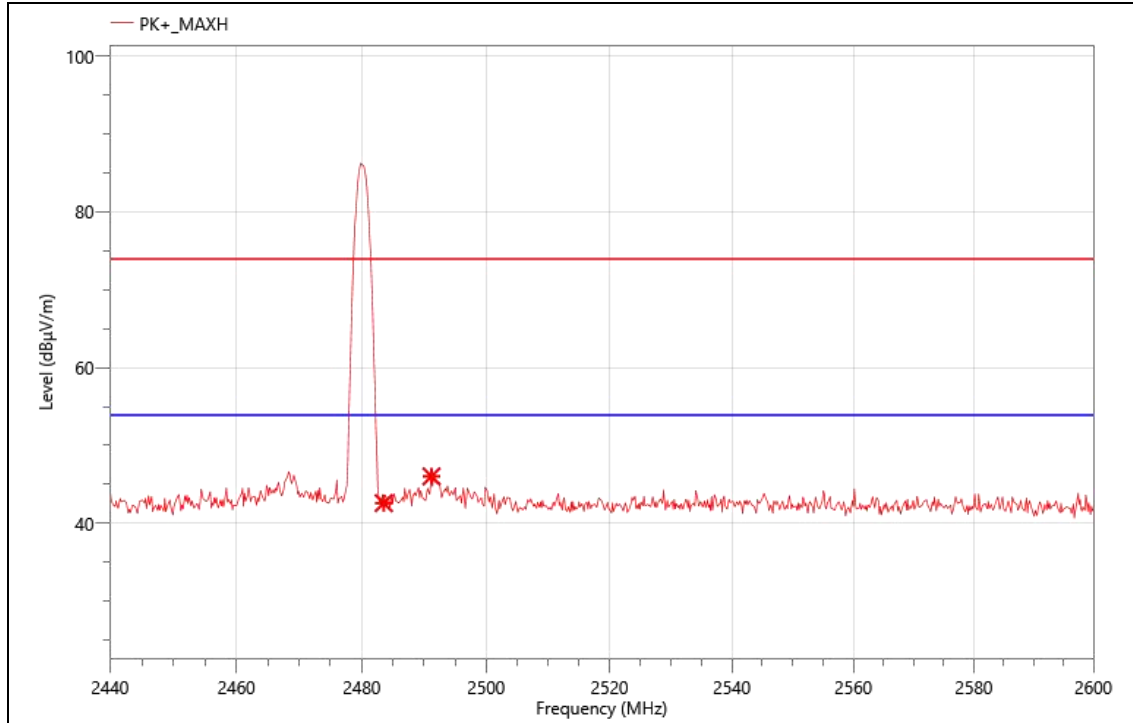
Mode:	3DH5 2402
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	2343.280	20.48	22.68	43.16	74.00	30.84	PK+	V
2	2390.080	21.01	22.72	43.73	74.00	30.27	PK+	V

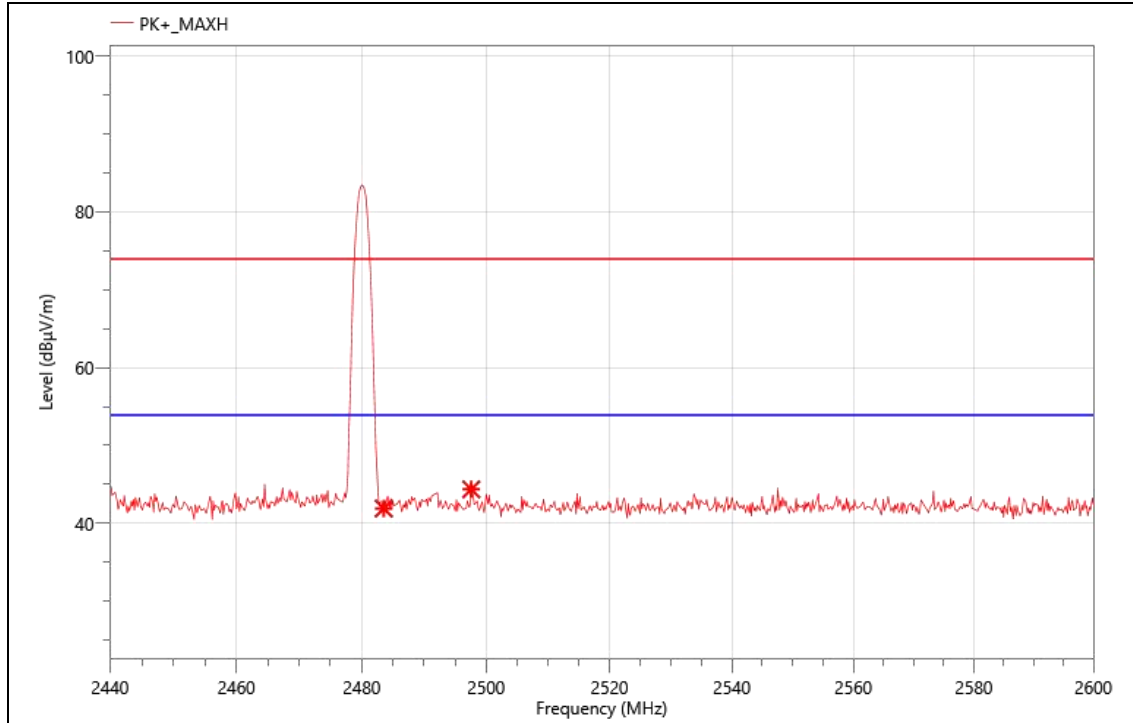
Mode:	3DH5 2480
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2483.520	19.45	23.15	42.60	74.00	31.40	PK+	H
2	2491.200	22.90	23.13	46.03	74.00	27.97	PK+	H

Mode:	3DH5 2480
Power:	DC 5V
TE:	Big
Date	2025/04/10
T/A/P	24.2°C/55%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBμV)	Corr. (dB)	Meas. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Det.	Pol.
1	2483.520	18.75	23.15	41.90	74.00	32.10	PK+	V
2	2497.600	21.25	23.12	44.37	74.00	29.63	PK+	V

Note:

1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

9. ANTENNA REQUIREMENT

REQUIREMENT

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Standard	Requirement
RSS-Gen issue 5 6.8.	The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list. For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below). When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested. For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location: This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

	Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.
--	---

DESCRIPTION

Pass.

10. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

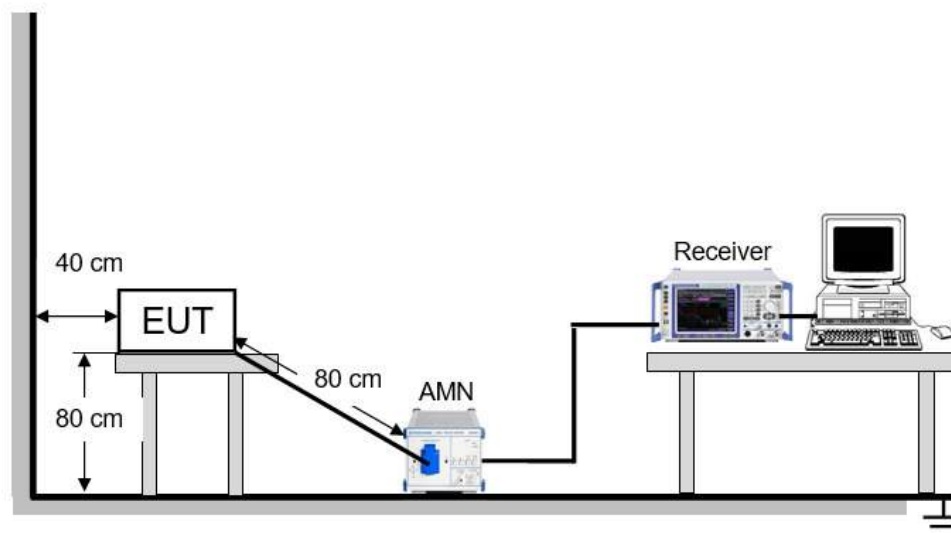
TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 6.2.

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver is used to test the emissions from the AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

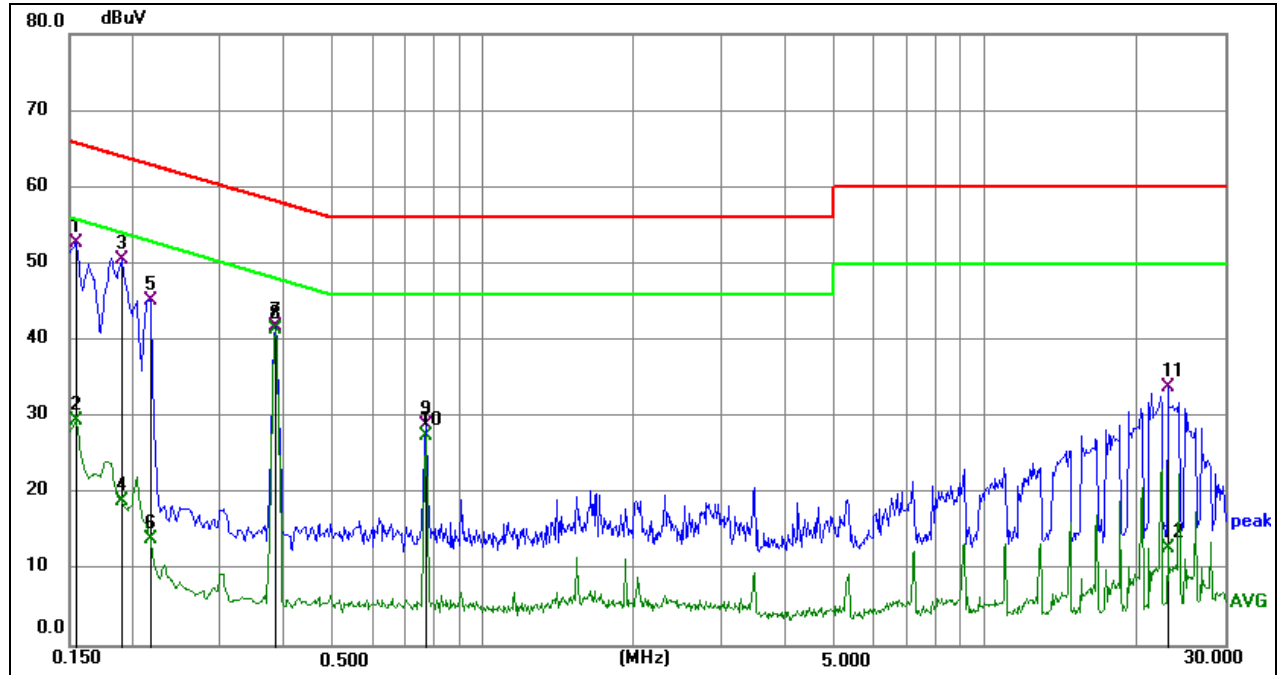
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST SETUP



TEST ENVIRONMENT

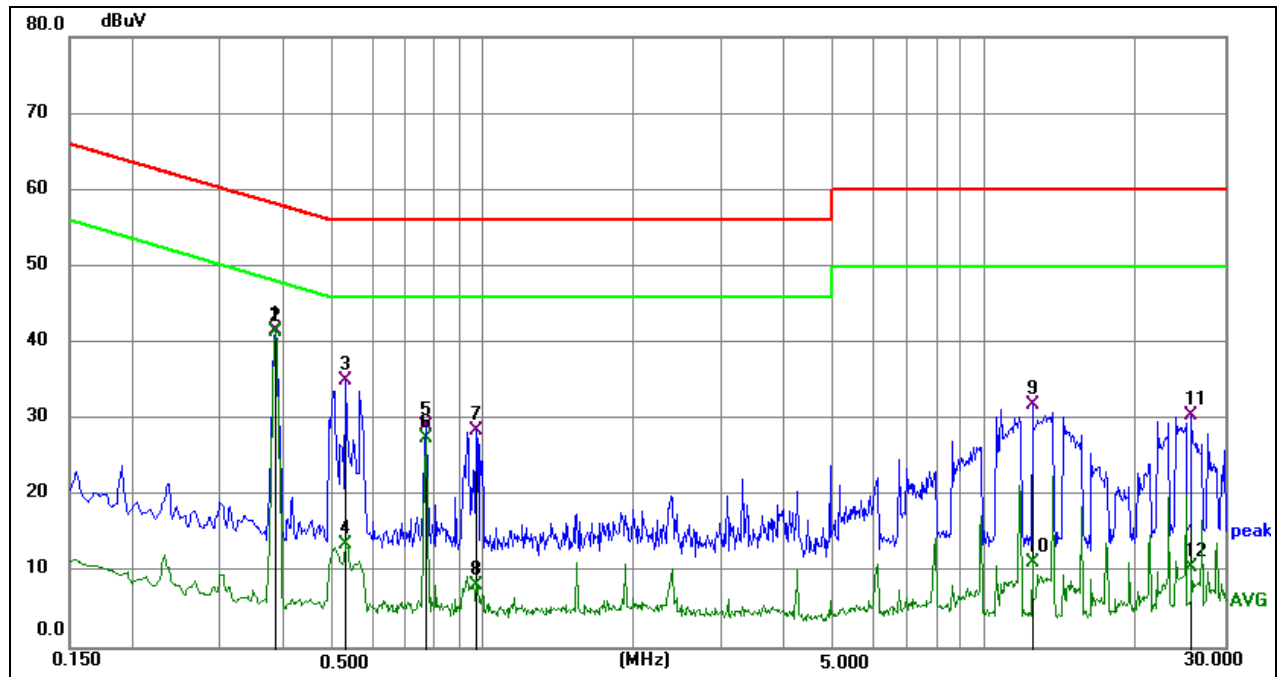
Temperature	26°C	Relative Humidity	57%
Atmosphere Pressure	100kPa		

TEST RESULTS

Phase: L1

Mode: BT

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1545	43.07	9.71	52.78	65.75	-12.97	QP
2	0.1545	19.72	9.71	29.43	55.75	-26.32	AVG
3	0.1905	40.78	9.71	50.49	64.01	-13.52	QP
4	0.1905	9.17	9.71	18.88	54.01	-35.13	AVG
5	0.2175	35.44	9.72	45.16	62.91	-17.75	QP
6	0.2175	4.19	9.72	13.91	52.91	-39.00	AVG
7	0.3840	31.98	9.78	41.76	58.19	-16.43	QP
8	0.3840	31.66	9.78	41.44	48.19	-6.75	AVG
9	0.7710	19.06	9.81	28.87	56.00	-27.13	QP
10	0.7710	17.70	9.81	27.51	46.00	-18.49	AVG
11	23.1225	23.58	10.17	33.75	60.00	-26.25	QP
12	23.1225	2.68	10.17	12.85	50.00	-37.15	AVG



Phase: N

Mode: BT

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3840	31.91	9.76	41.67	58.19	-16.52	QP
2	0.3840	31.63	9.76	41.39	48.19	-6.80	AVG
3	0.5325	25.39	9.74	35.13	56.00	-20.87	QP
4	0.5325	3.77	9.74	13.51	46.00	-32.49	AVG
5	0.7710	19.35	9.83	29.18	56.00	-26.82	QP
6	0.7710	17.76	9.83	27.59	46.00	-18.41	AVG
7	0.9735	18.61	9.84	28.45	56.00	-27.55	QP
8	0.9735	-1.58	9.84	8.26	46.00	-37.74	AVG
9	12.4395	21.87	9.97	31.84	60.00	-28.16	QP
10	12.4395	1.25	9.97	11.22	50.00	-38.78	AVG
11	25.8134	20.35	10.16	30.51	60.00	-29.49	QP
12	25.8134	0.52	10.16	10.68	50.00	-39.32	AVG

Note: 1. Result = Reading + Correct Factor.

2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).

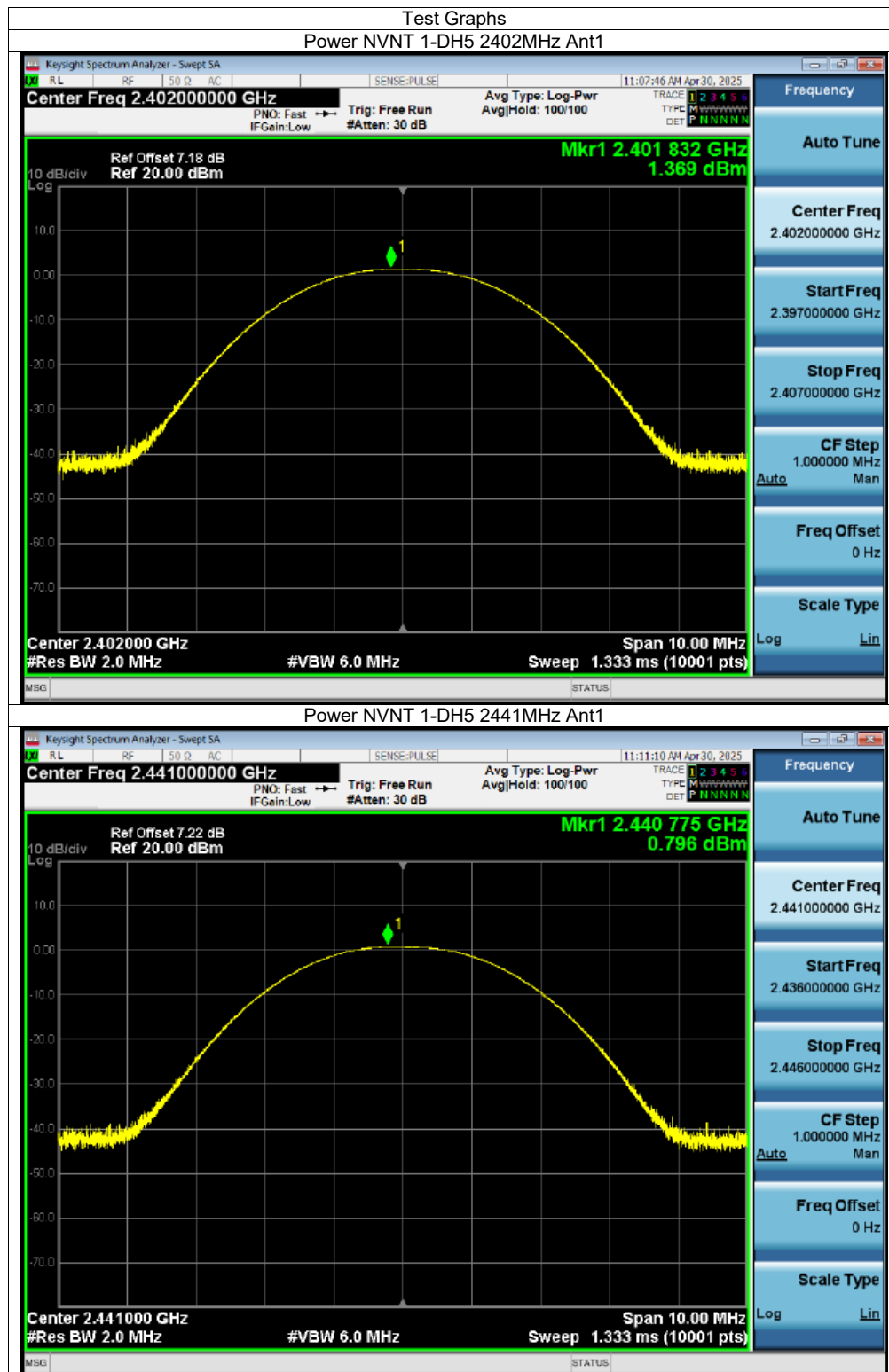
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

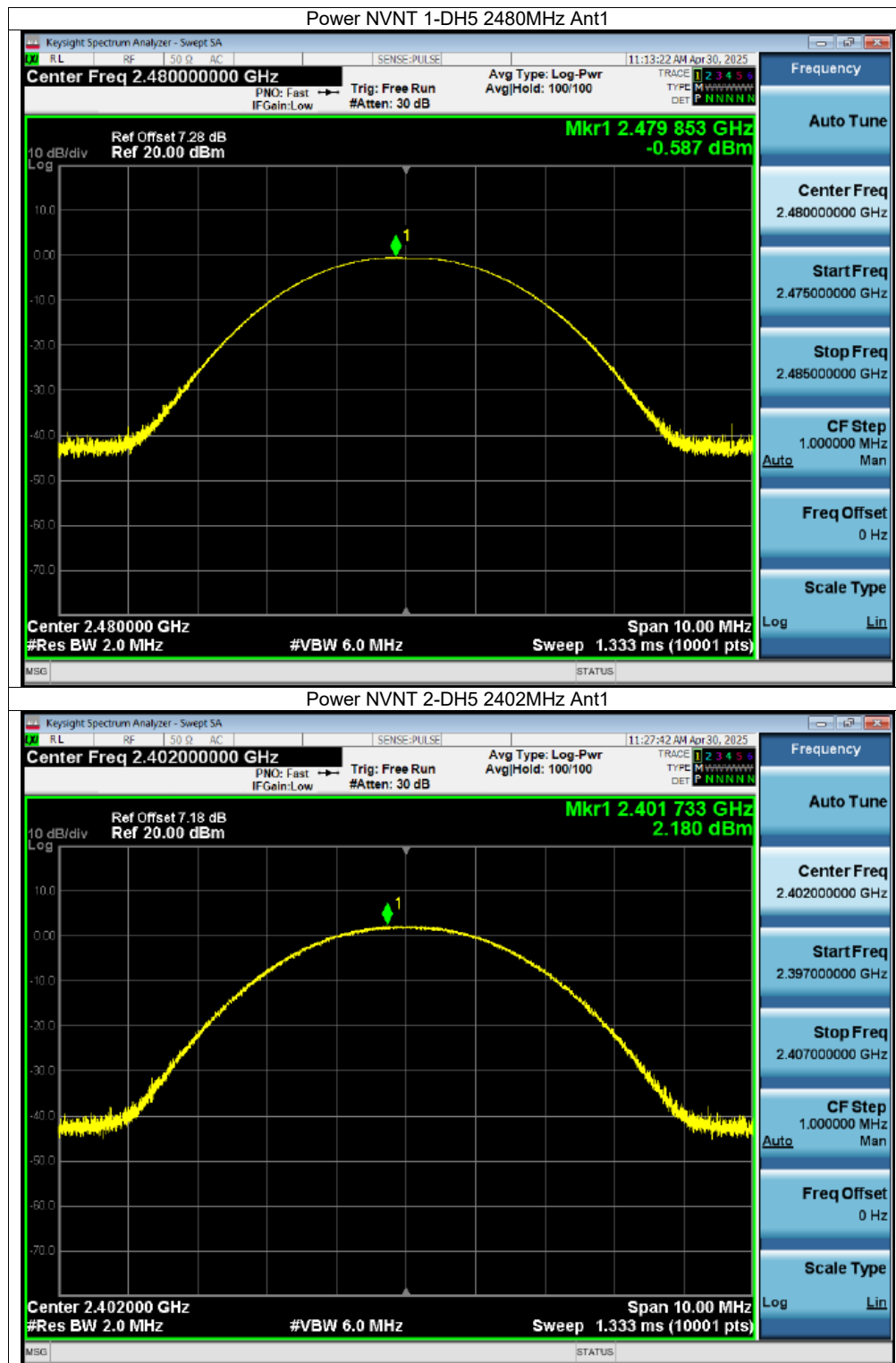
11. TEST DATA - Appendix A

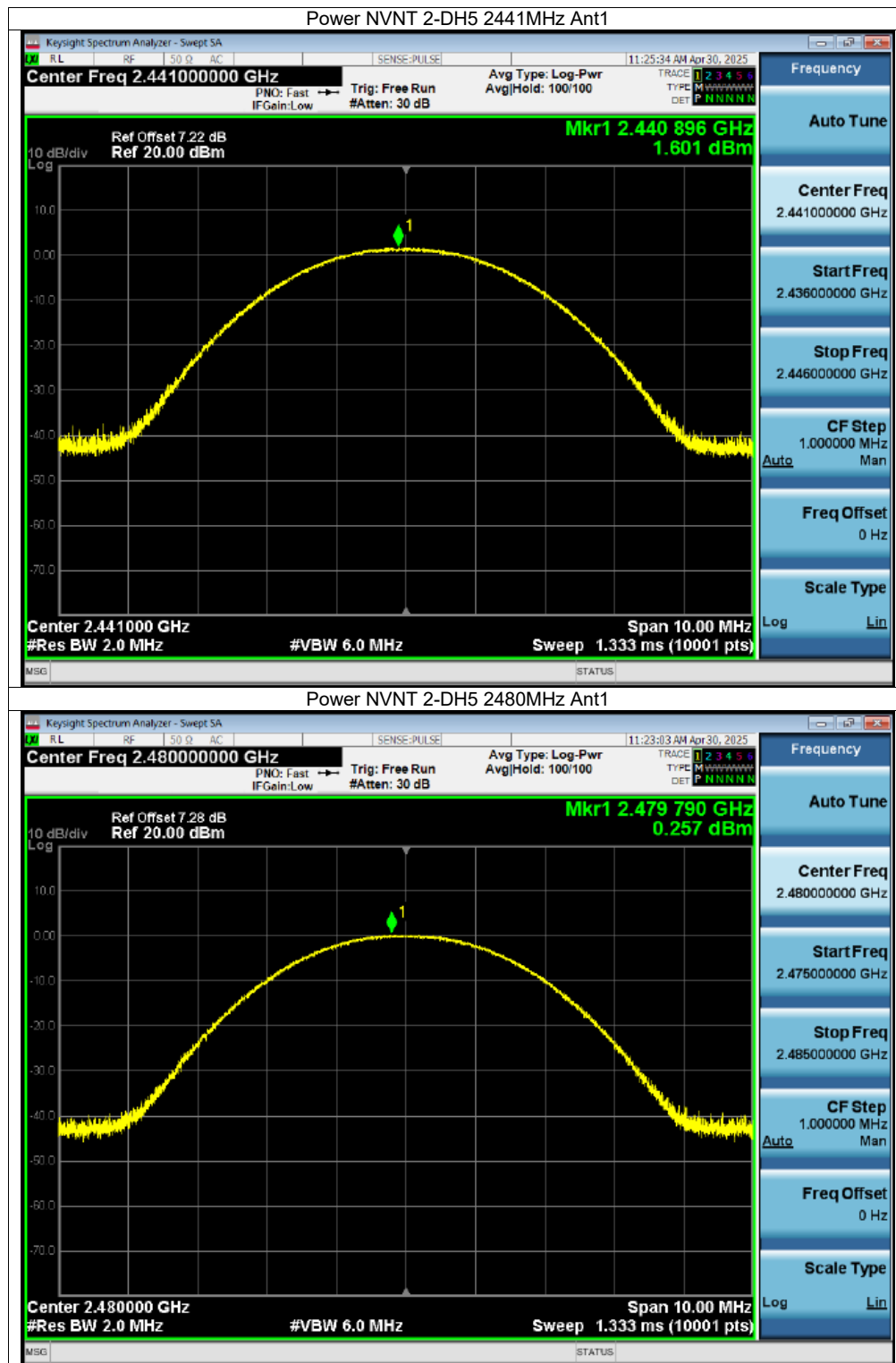
Maximum Conducted Output Power

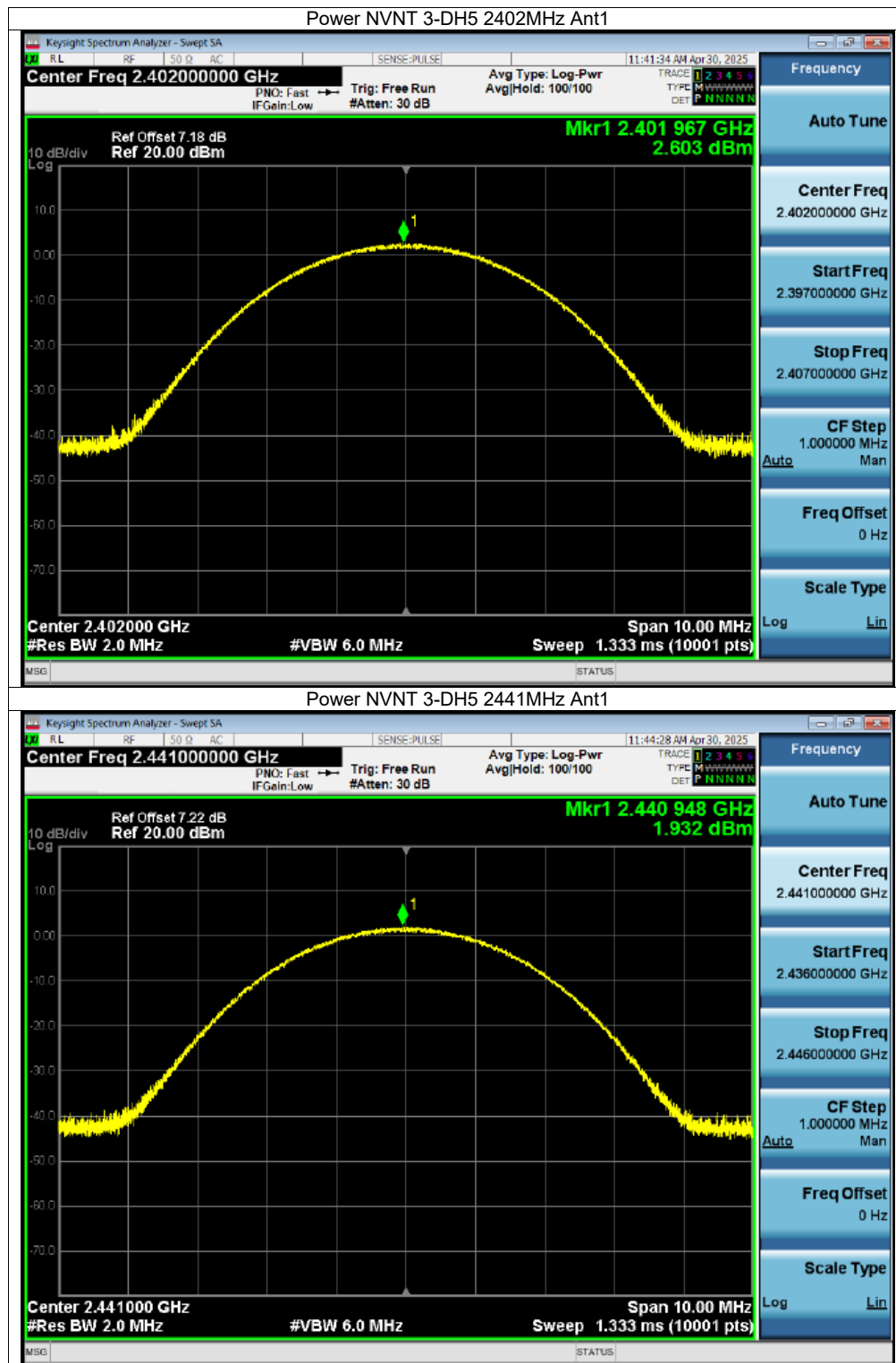
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH5	2402	Ant1	1.37	21	Pass
NVNT	1-DH5	2441	Ant1	0.8	21	Pass
NVNT	1-DH5	2480	Ant1	-0.59	21	Pass
NVNT	2-DH5	2402	Ant1	2.18	21	Pass
NVNT	2-DH5	2441	Ant1	1.6	21	Pass
NVNT	2-DH5	2480	Ant1	0.26	21	Pass
NVNT	3-DH5	2402	Ant1	2.6	21	Pass
NVNT	3-DH5	2441	Ant1	1.93	21	Pass
NVNT	3-DH5	2480	Ant1	0.51	21	Pass

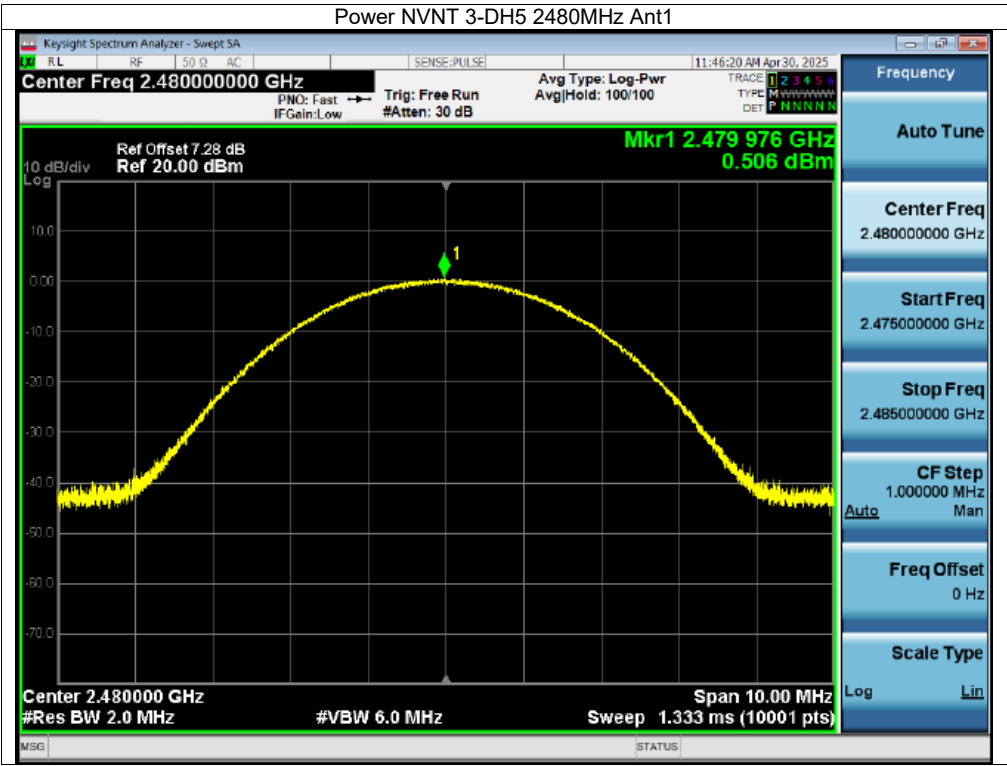
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Antenna Gain (dBi)	E.i.r.p.(dBm)	Limit (dBm)	Verdict
NVNT	1-DH5	2402	Ant1	1.37	-0.69	0.68	36.02	Pass
NVNT	1-DH5	2441	Ant1	0.8	-0.69	0.11	36.02	Pass
NVNT	1-DH5	2480	Ant1	-0.59	-0.69	-1.28	36.02	Pass
NVNT	2-DH5	2402	Ant1	2.18	-0.69	1.49	36.02	Pass
NVNT	2-DH5	2441	Ant1	1.6	-0.69	0.91	36.02	Pass
NVNT	2-DH5	2480	Ant1	0.26	-0.69	-0.43	36.02	Pass
NVNT	3-DH5	2402	Ant1	2.6	-0.69	1.91	36.02	Pass
NVNT	3-DH5	2441	Ant1	1.93	-0.69	1.24	36.02	Pass
NVNT	3-DH5	2480	Ant1	0.51	-0.69	-0.18	36.02	Pass





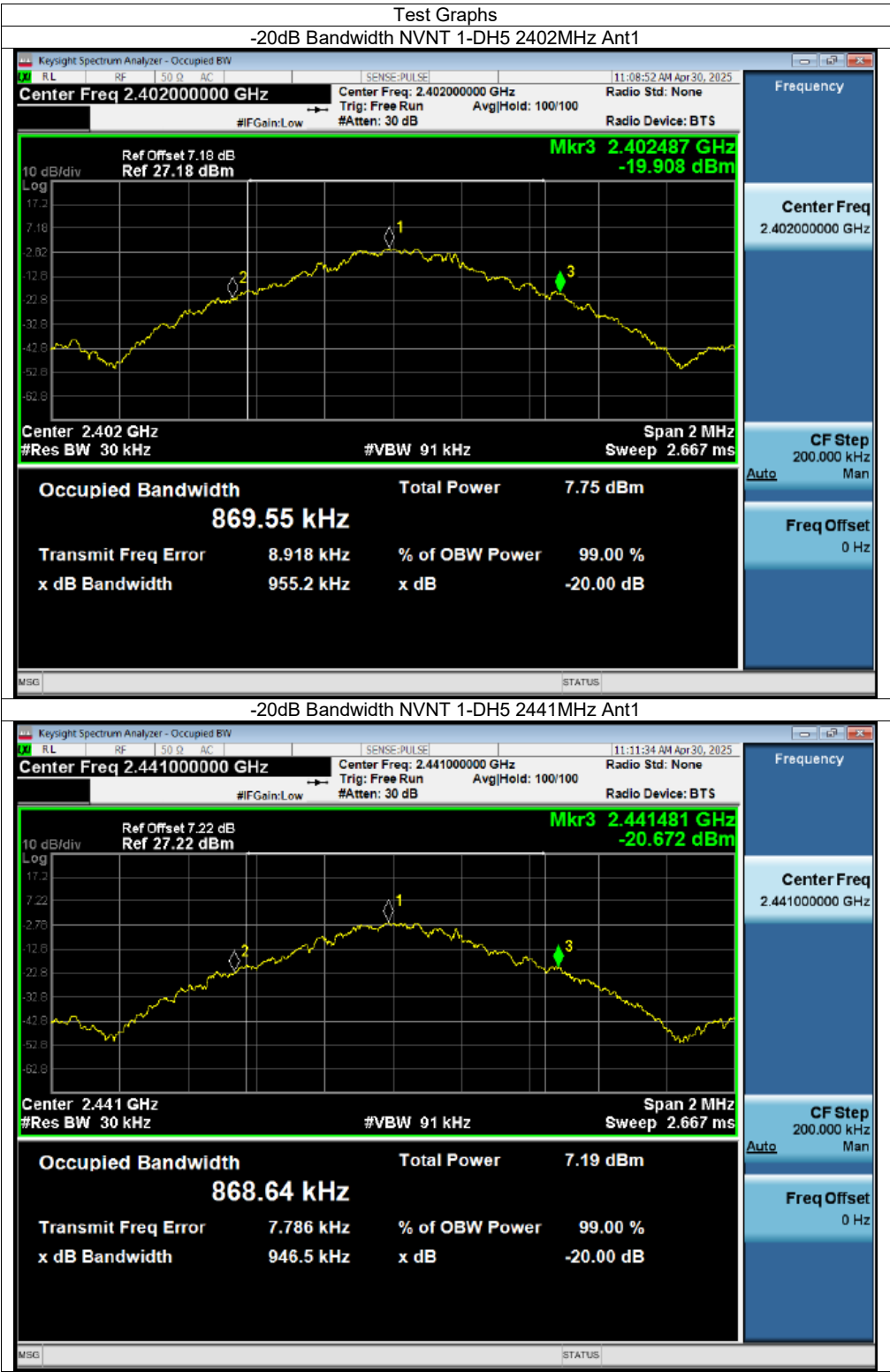


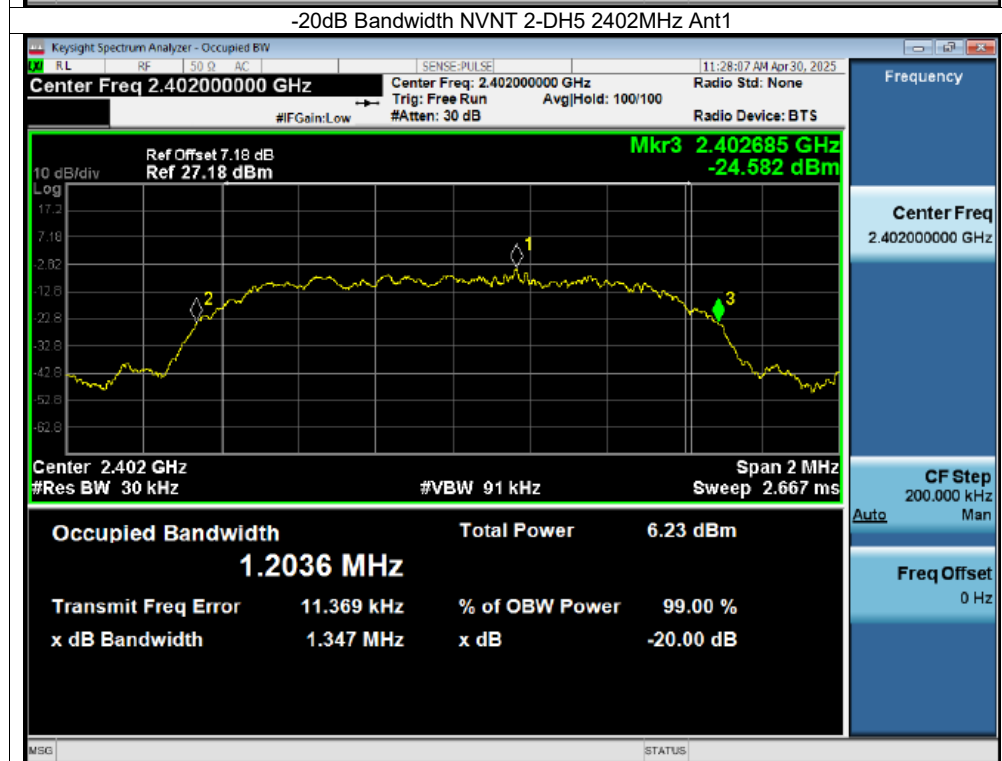


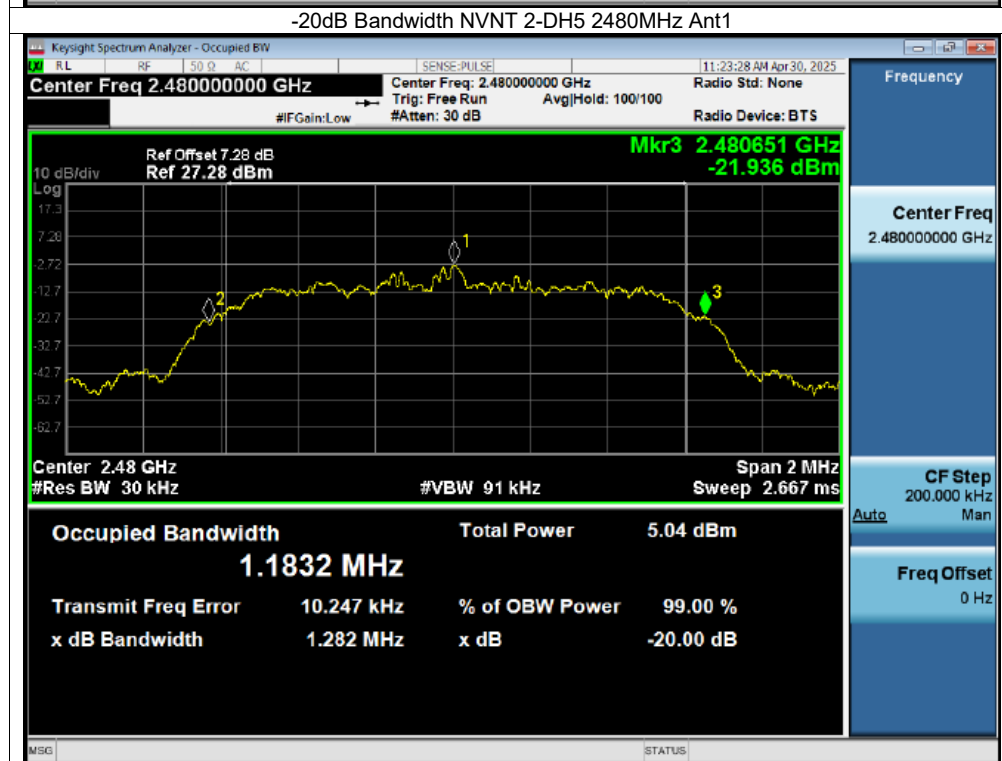


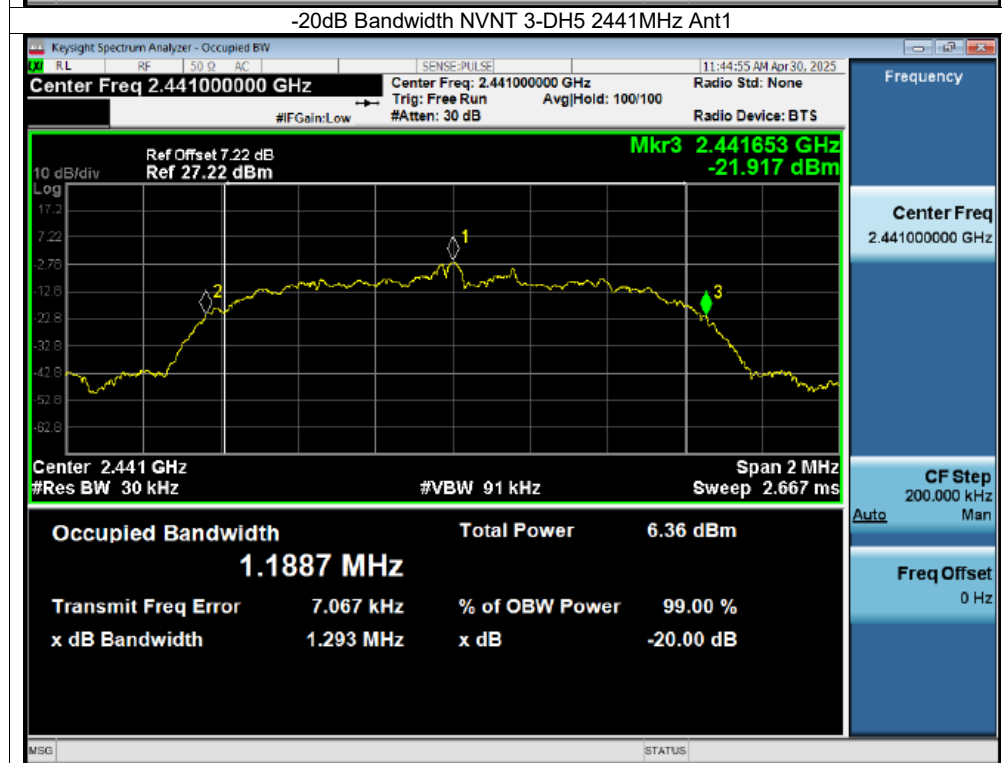
-20dB Bandwidth

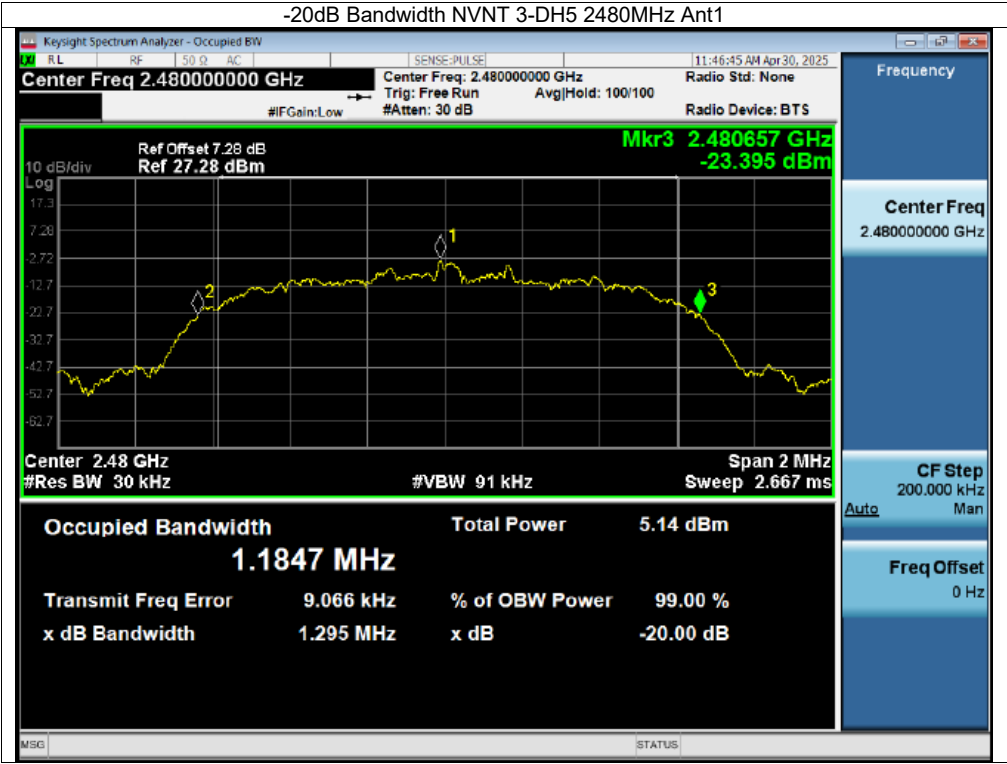
Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH5	2402	Ant1	0.96	N/A	N/A
NVNT	1-DH5	2441	Ant1	0.95	N/A	N/A
NVNT	1-DH5	2480	Ant1	0.95	N/A	N/A
NVNT	2-DH5	2402	Ant1	1.35	N/A	N/A
NVNT	2-DH5	2441	Ant1	1.31	N/A	N/A
NVNT	2-DH5	2480	Ant1	1.28	N/A	N/A
NVNT	3-DH5	2402	Ant1	1.29	N/A	N/A
NVNT	3-DH5	2441	Ant1	1.29	N/A	N/A
NVNT	3-DH5	2480	Ant1	1.3	N/A	N/A





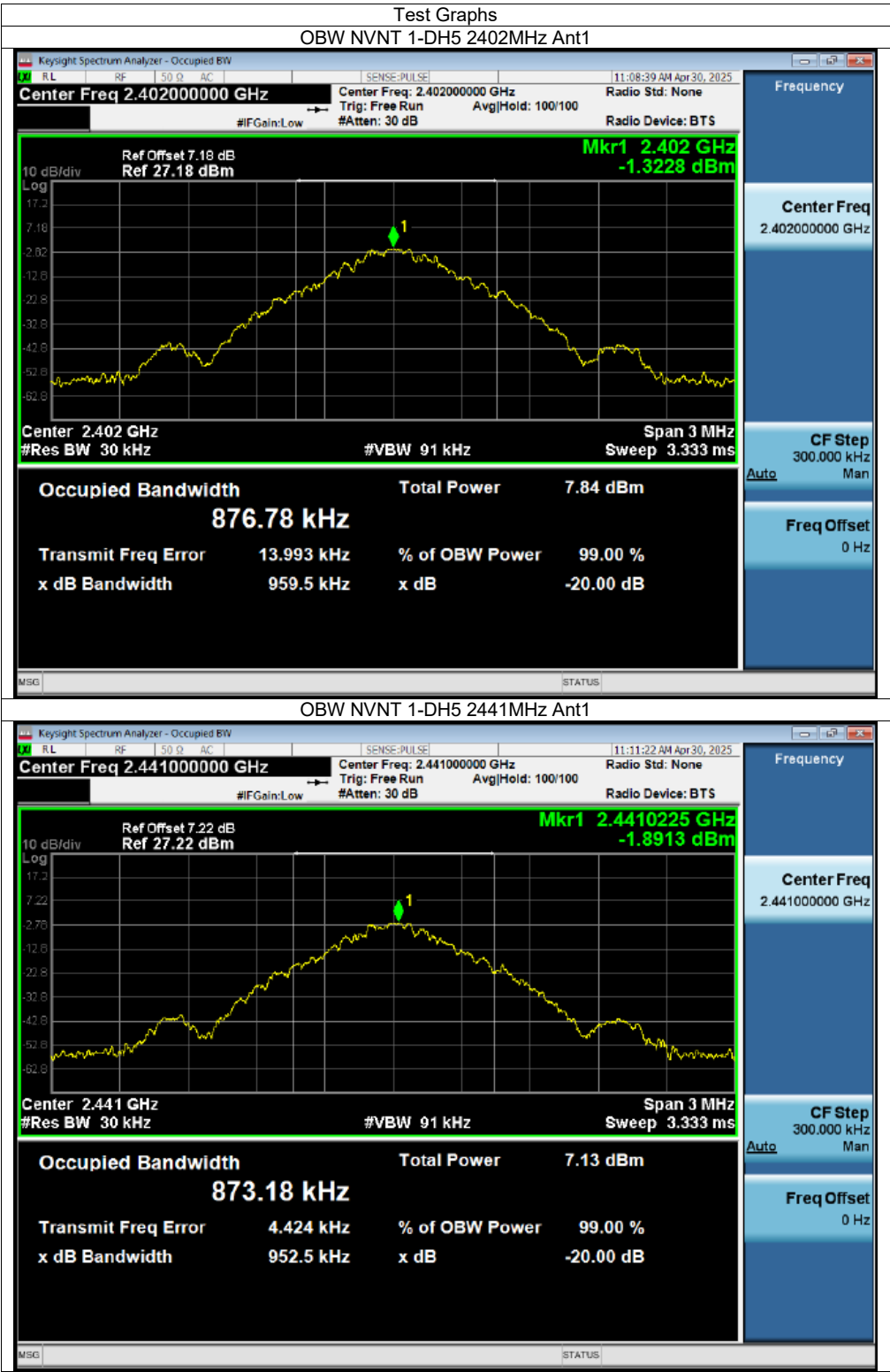






Occupied Channel Bandwidth

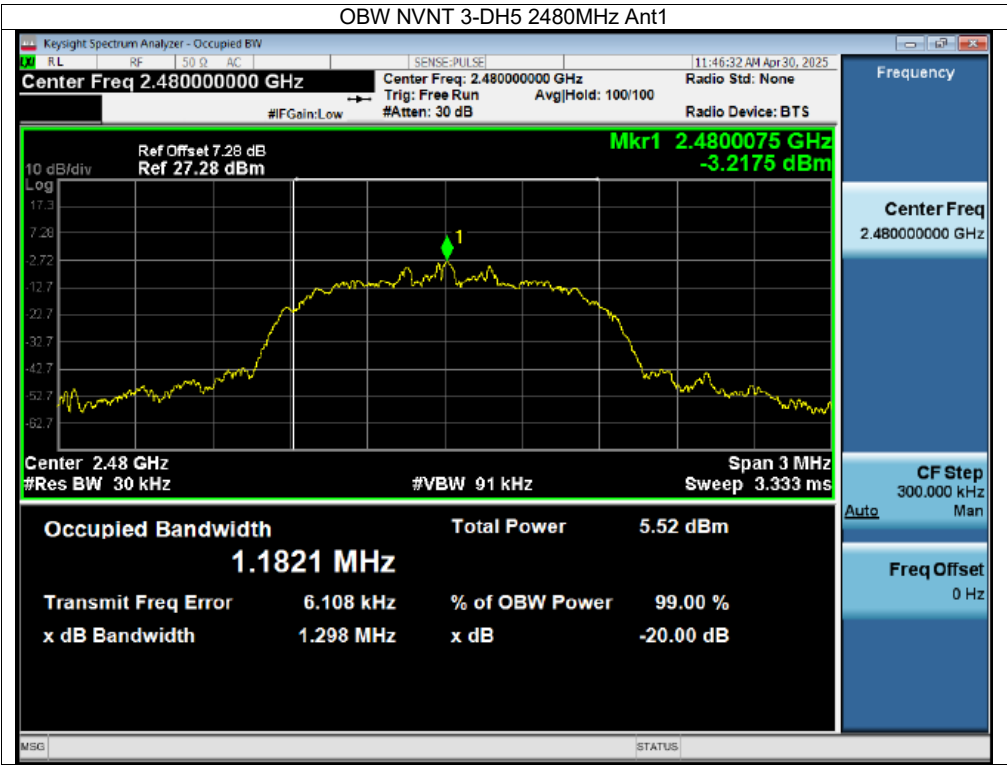
Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH5	2402	Ant1	0.877
NVNT	1-DH5	2441	Ant1	0.873
NVNT	1-DH5	2480	Ant1	0.866
NVNT	2-DH5	2402	Ant1	1.187
NVNT	2-DH5	2441	Ant1	1.199
NVNT	2-DH5	2480	Ant1	1.181
NVNT	3-DH5	2402	Ant1	1.209
NVNT	3-DH5	2441	Ant1	1.195
NVNT	3-DH5	2480	Ant1	1.182





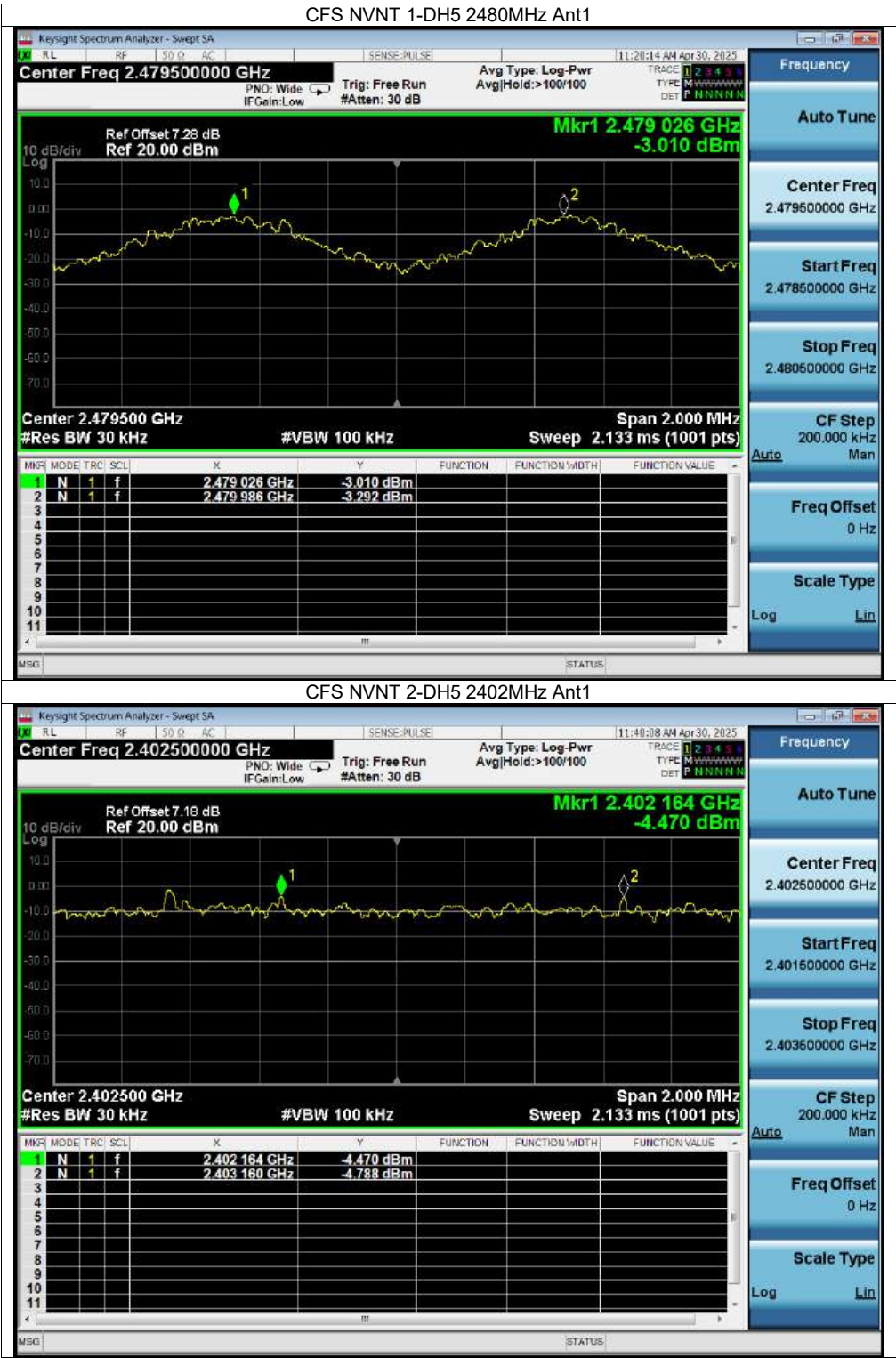






Carrier Frequencies Separation

Condition	Mode	Antenna	Hopping Freq1 (MHz)	Hopping Freq2 (MHz)	HFS (MHz)	Limit (MHz)	Verdict
NVNT	1-DH5	Ant1	2401.974	2402.986	1.012	0.64	Pass
NVNT	1-DH5	Ant1	2441.002	2441.99	0.988	0.633	Pass
NVNT	1-DH5	Ant1	2479.026	2479.986	0.96	0.633	Pass
NVNT	2-DH5	Ant1	2402.164	2403.16	0.996	0.9	Pass
NVNT	2-DH5	Ant1	2440.844	2441.866	1.022	0.873	Pass
NVNT	2-DH5	Ant1	2478.99	2479.992	1.002	0.853	Pass
NVNT	3-DH5	Ant1	2402.006	2402.986	0.98	0.86	Pass
NVNT	3-DH5	Ant1	2441.008	2442.004	0.996	0.86	Pass
NVNT	3-DH5	Ant1	2478.988	2479.986	0.998	0.867	Pass



CFS NVNT 2-DH5 2402MHz Ant1

Keysight Spectrum Analyzer - Swept SA

RLRF500ACSENSE-PULSE

11:40:08 AM Apr 30, 2025

Center Freq 2.402500000 GHz

PNO: Wide Trg: Free Run Avg Type: Log-Pwr

IFGain:Low #Atten: 30 dB Avg/Hold: >100/100

10 dB/div

Log

Ref Offset 7.18 dB

Ref 20.00 dBm

Mkr1 2.402 164 GHz

-4.470 dBm

Center 2.402500 GHz

#Res BW 30 kHz

#VBW 100 kHz

Span 2.000 MHz

Sweep 2.133 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 164 GHz	-4.470 dBm			
2	N	1	f	2.403 160 GHz	-4.788 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

Frequency

Auto Tune

Center Freq 2.402500000 GHz

Start Freq 2.401500000 GHz

Stop Freq 2.403500000 GHz

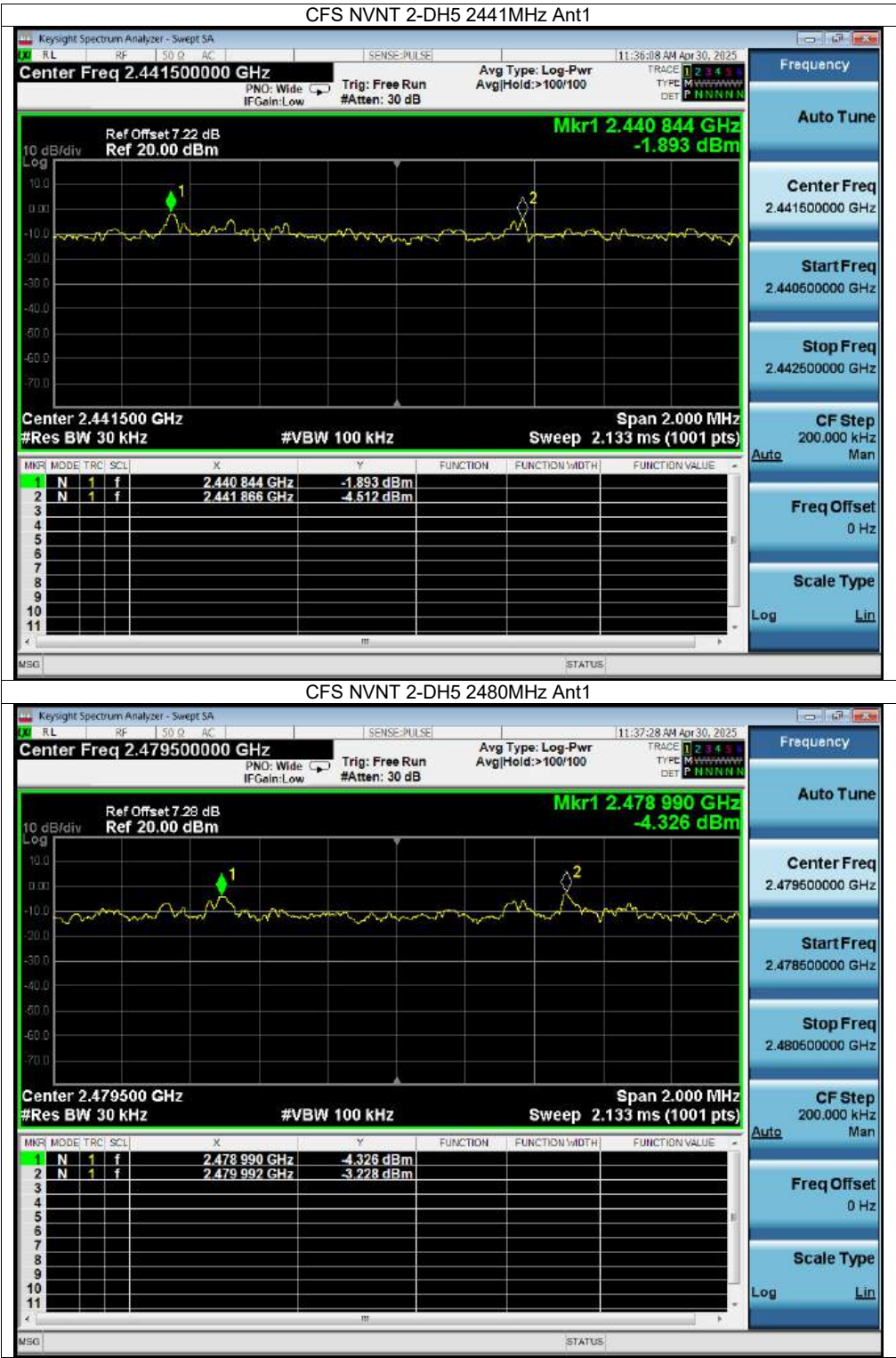
CF Step 200.000 kHz

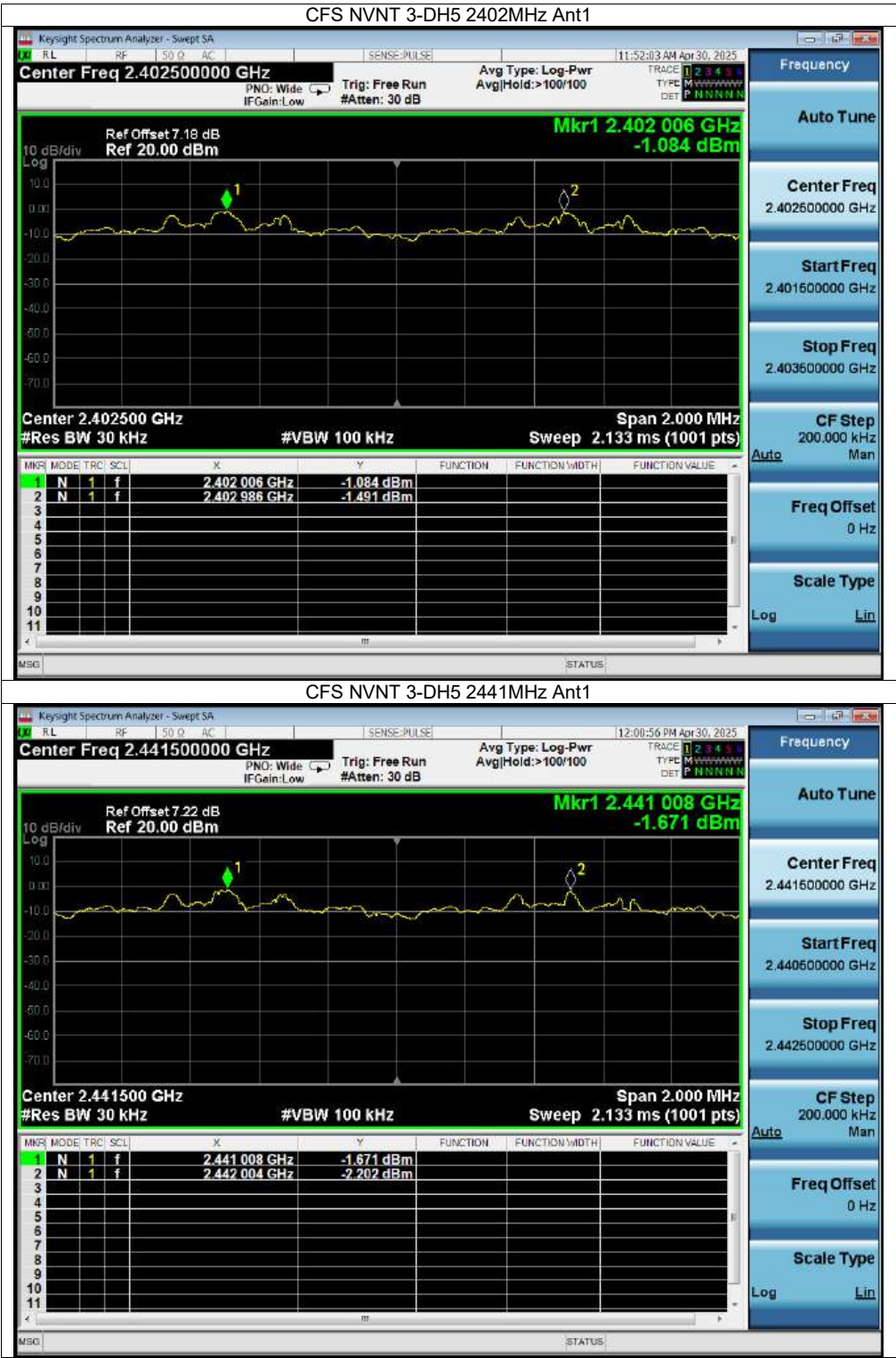
Auto Man

Freq Offset 0 Hz

Scale Type Log Lin

MSGSTATUS





CFS NVNT 3-DH5 2441MHz Ant1

Keysight Spectrum Analyzer - Swept SA

RLRF500ACSENSE-PULSE

12:00:56 PM Apr 30, 2025

Center Freq 2.441500000 GHz

PNO: Wide Trg: Free Run Avg Type: Log-Pwr

IFGain:Low #Atten: 30 dB Avg/Hold: >100/100

10 dB/div

Log

Ref Offset 7.22 dB

Ref 20.00 dBm

Mkr1 2.441 008 GHz

-1.671 dBm

Center 2.441500 GHz

#Res BW 30 kHz

#VBW 100 kHz

Span 2.000 MHz

Sweep 2.133 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.441 008 GHz	-1.671 dBm			
2	N	1	f	2.442 004 GHz	-2.202 dBm			
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG

STATUS

Frequency

Auto Tune

Center Freq 2.441500000 GHz

Start Freq 2.440500000 GHz

Stop Freq 2.442500000 GHz

CF Step 200.000 kHz

Auto Man

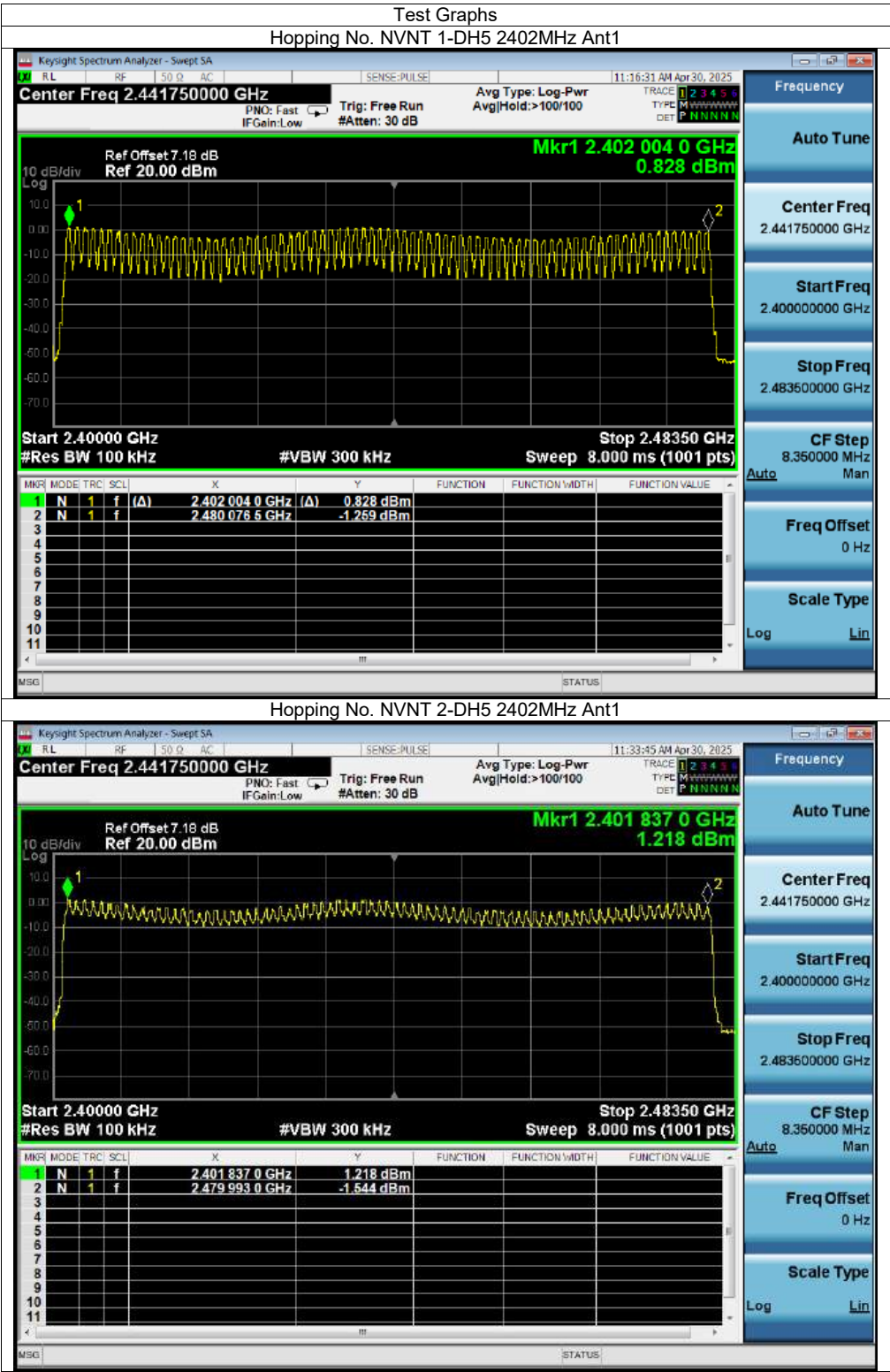
Freq Offset 0 Hz

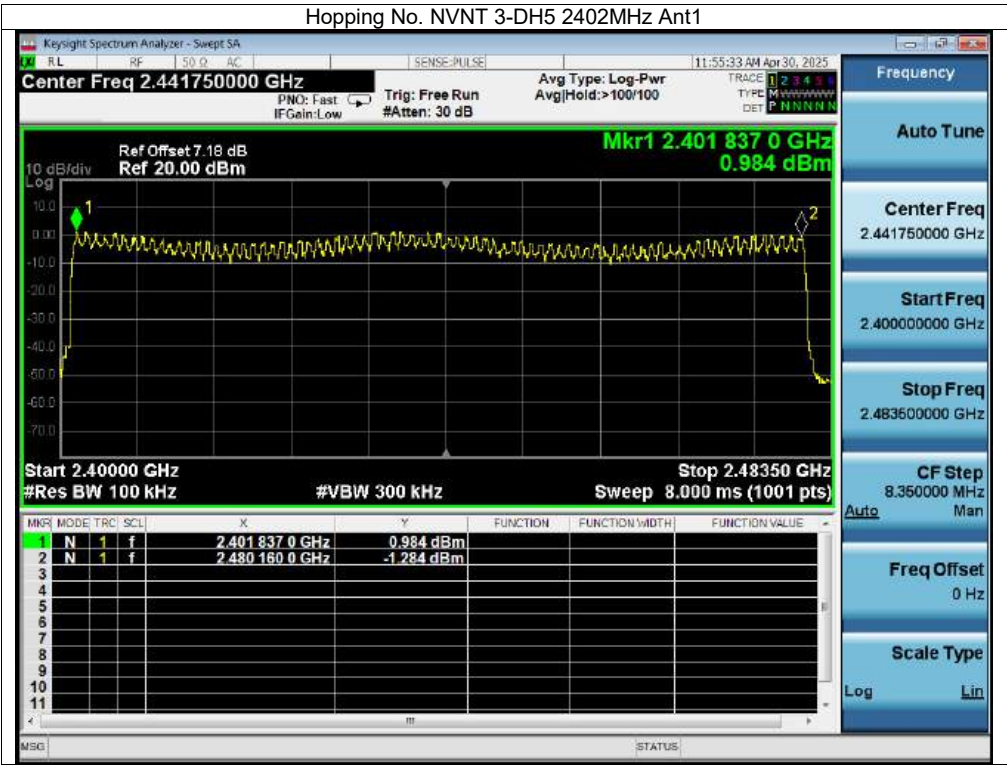
Scale Type Log Lin



Number of Hopping Channel

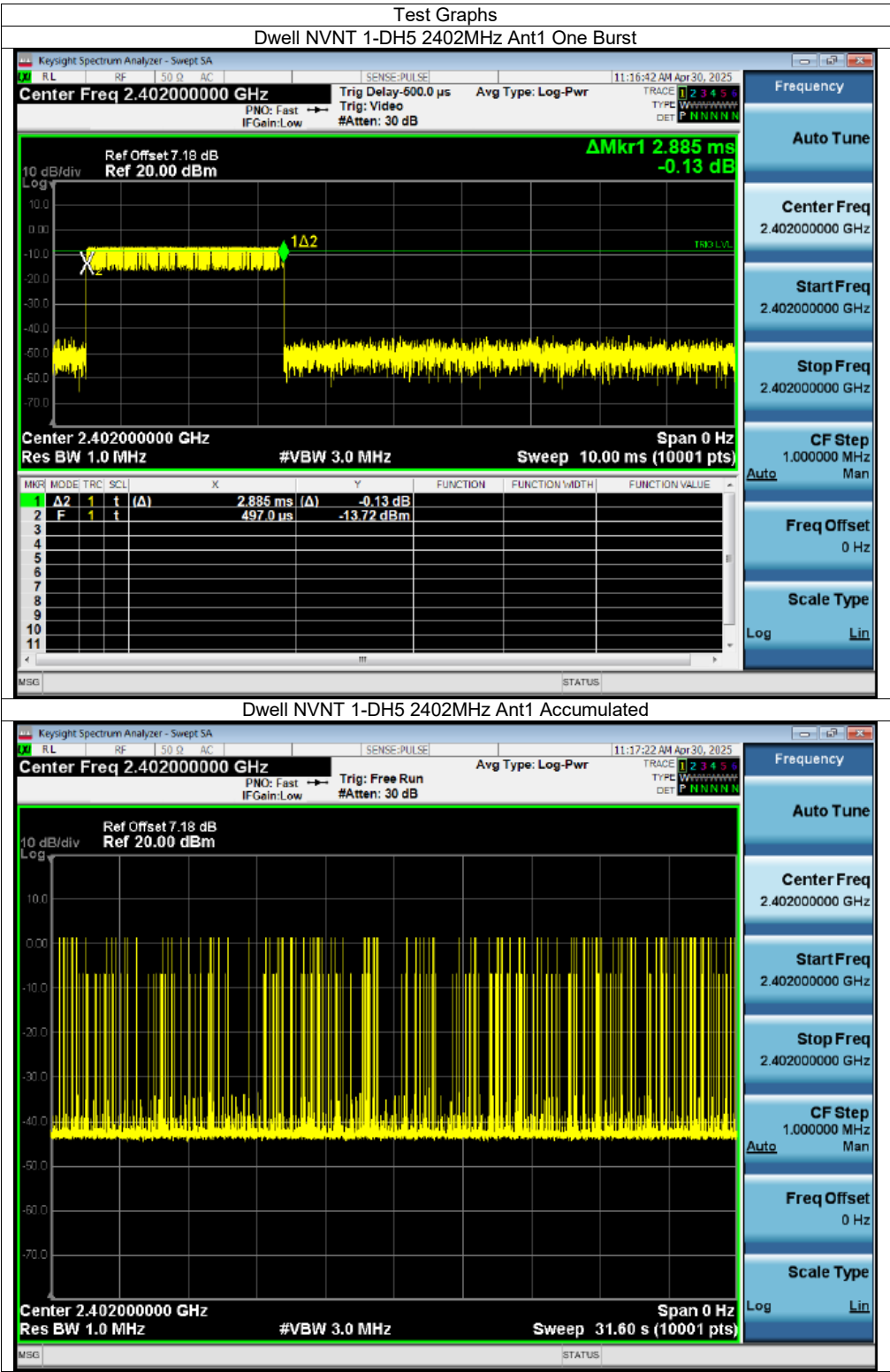
Condition	Mode	Antenna	Hopping Number	Limit	Verdict
NVNT	1-DH5	Ant1	79	15	Pass
NVNT	2-DH5	Ant1	79	15	Pass
NVNT	3-DH5	Ant1	79	15	Pass

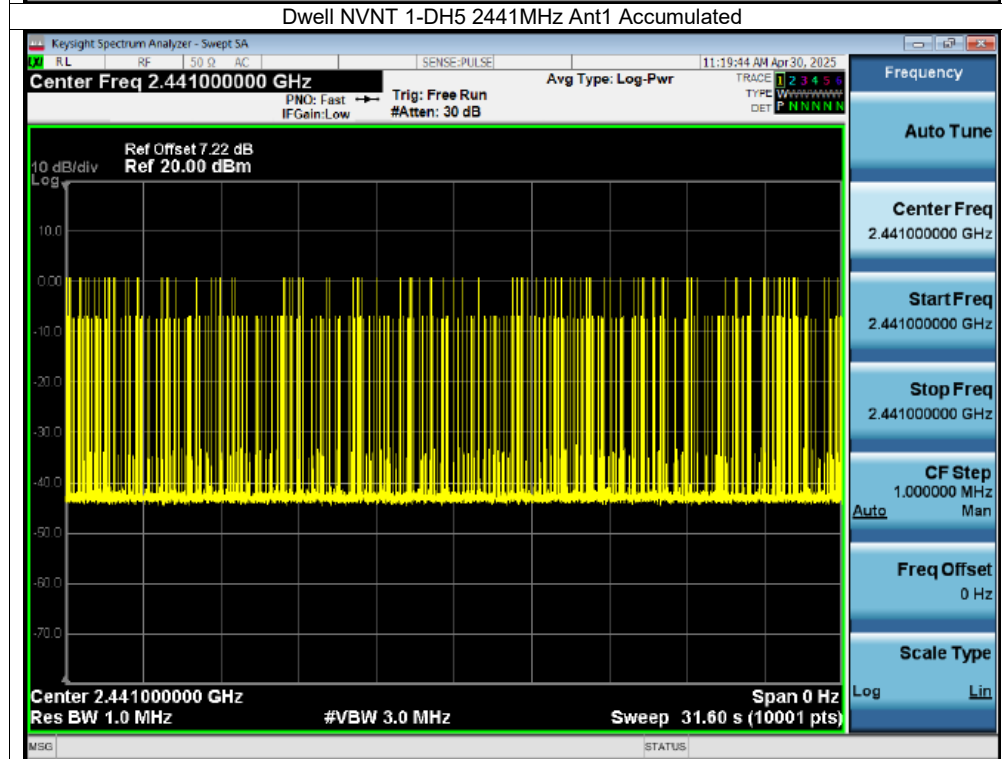
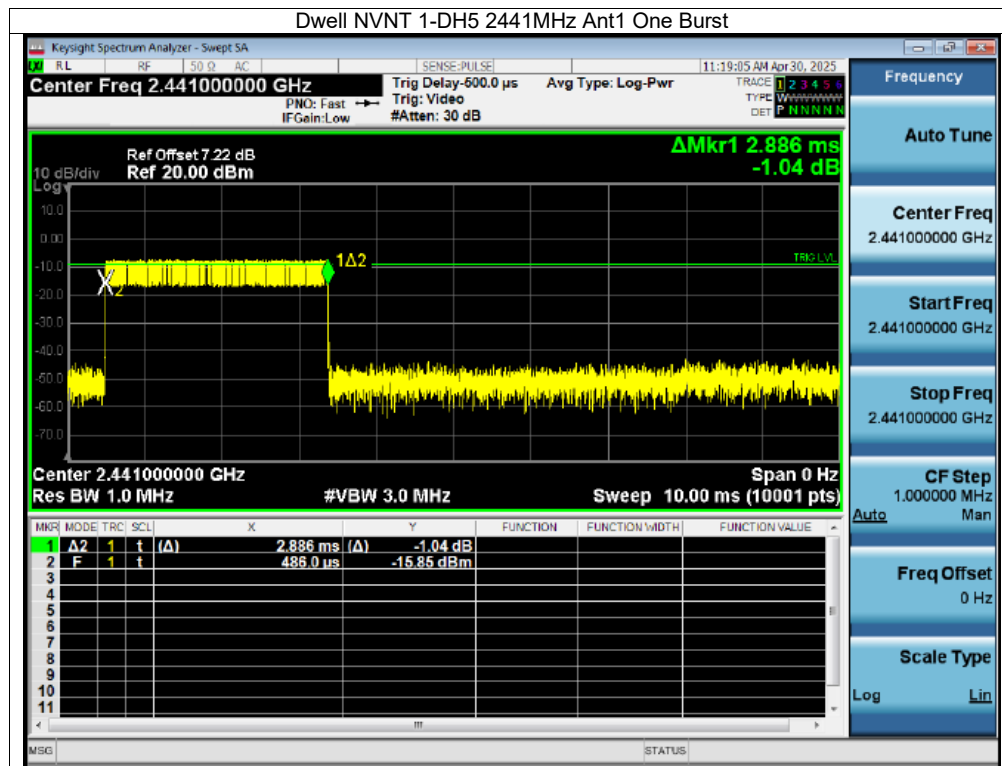


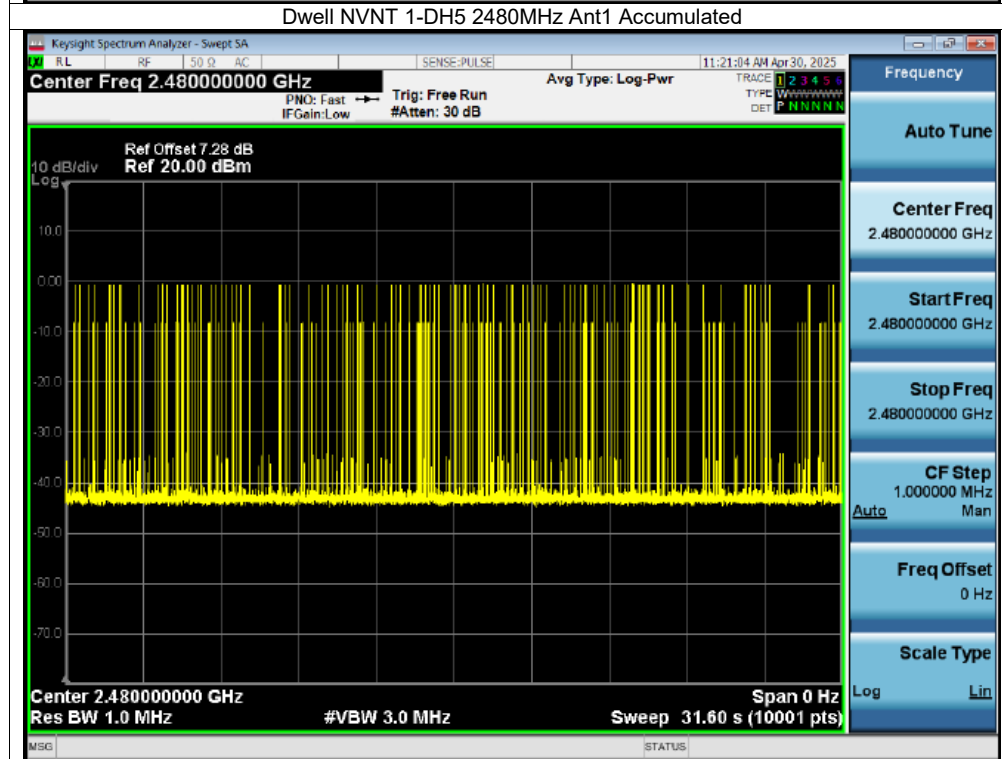
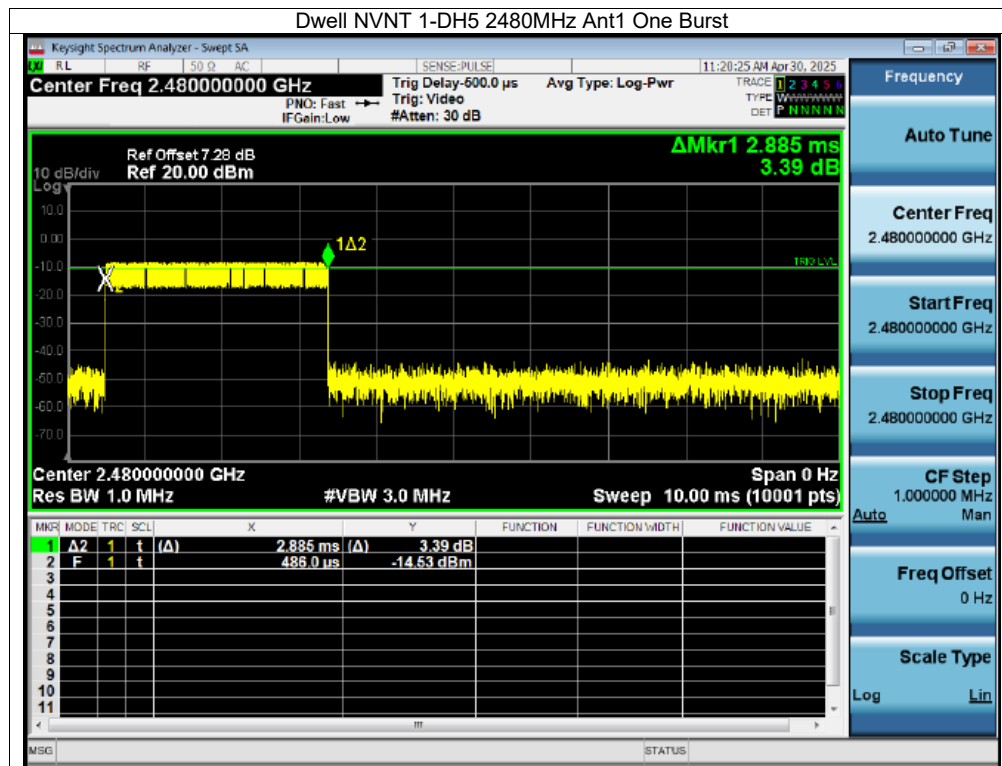


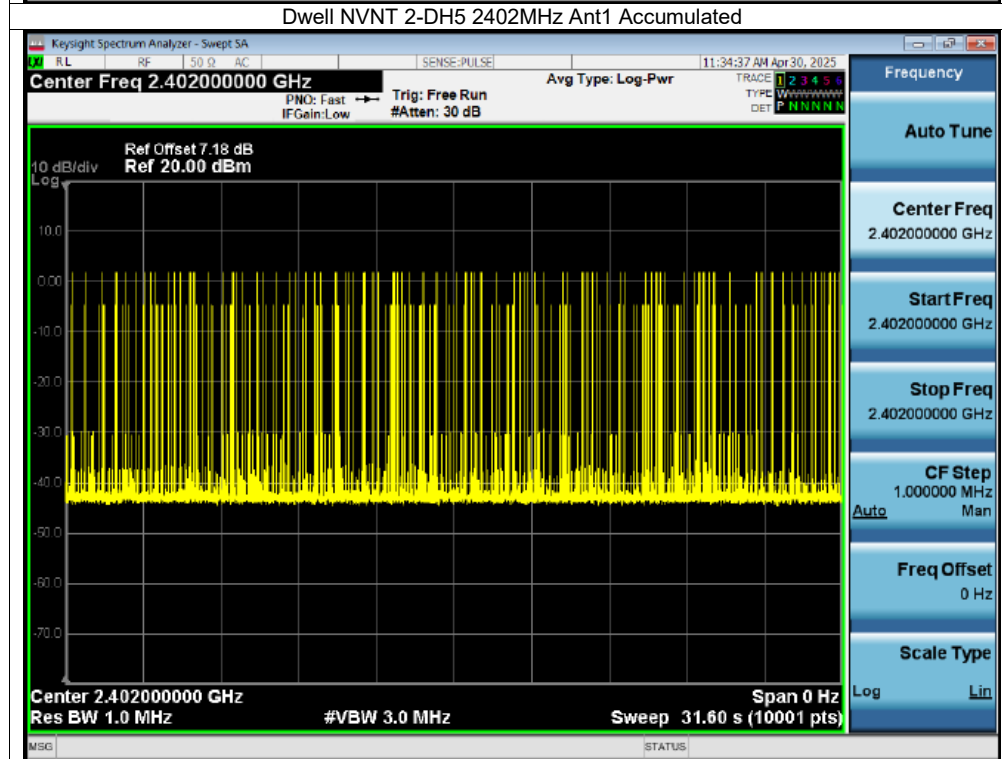
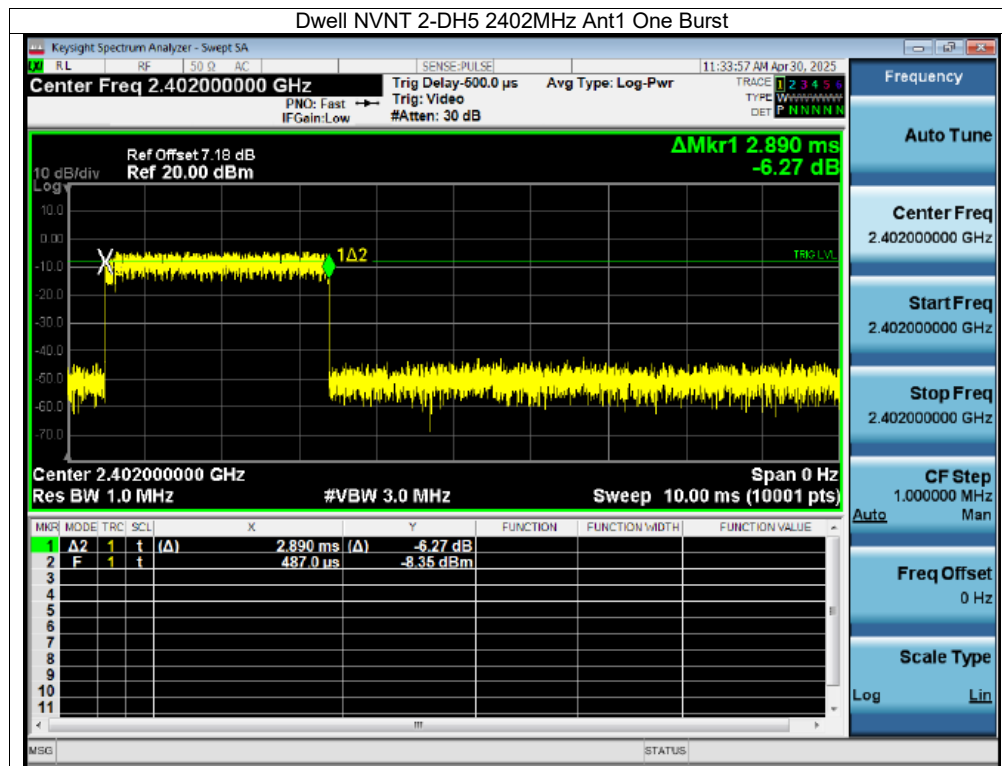
Dwell Time

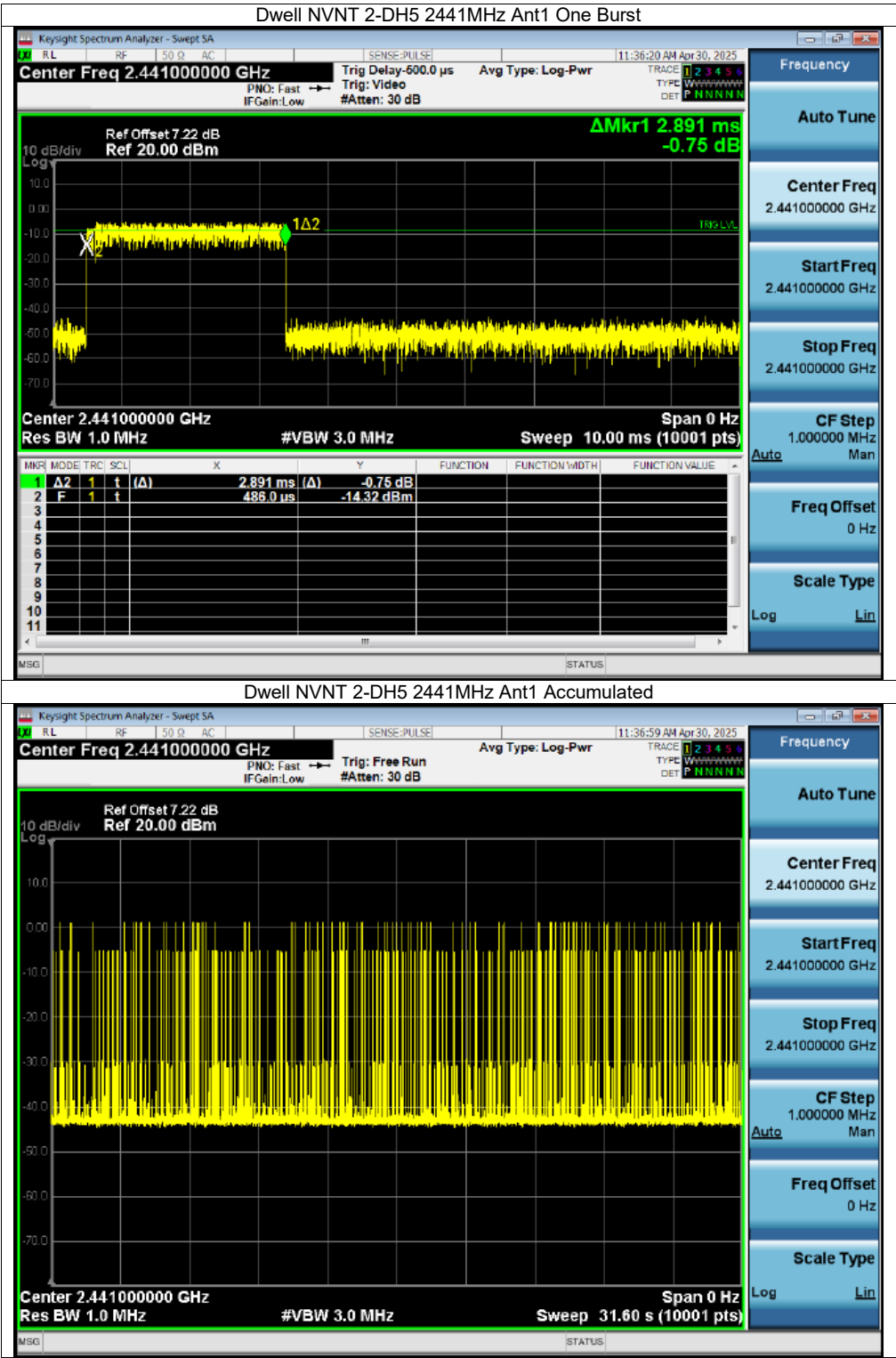
Condition	Mode	Frequency (MHz)	Antenna	Pulse Time (ms)	Total Dwell Time (ms)	Burst Count	Period Time (ms)	Limit (ms)	Verdict
NVNT	1-DH5	2402	Ant1	2.885	340.43	118	31600	400	Pass
NVNT	1-DH5	2441	Ant1	2.886	300.144	104	31600	400	Pass
NVNT	1-DH5	2480	Ant1	2.885	317.35	110	31600	400	Pass
NVNT	2-DH5	2402	Ant1	2.89	317.9	110	31600	400	Pass
NVNT	2-DH5	2441	Ant1	2.891	274.645	95	31600	400	Pass
NVNT	2-DH5	2480	Ant1	2.892	326.796	113	31600	400	Pass
NVNT	3-DH5	2402	Ant1	2.893	318.23	110	31600	400	Pass
NVNT	3-DH5	2441	Ant1	2.893	289.3	100	31600	400	Pass
NVNT	3-DH5	2480	Ant1	2.894	327.022	113	31600	400	Pass











Dwell NVNT 2-DH5 2441MHz Ant1 Accumulated

Keysight Spectrum Analyzer - Sweep SA

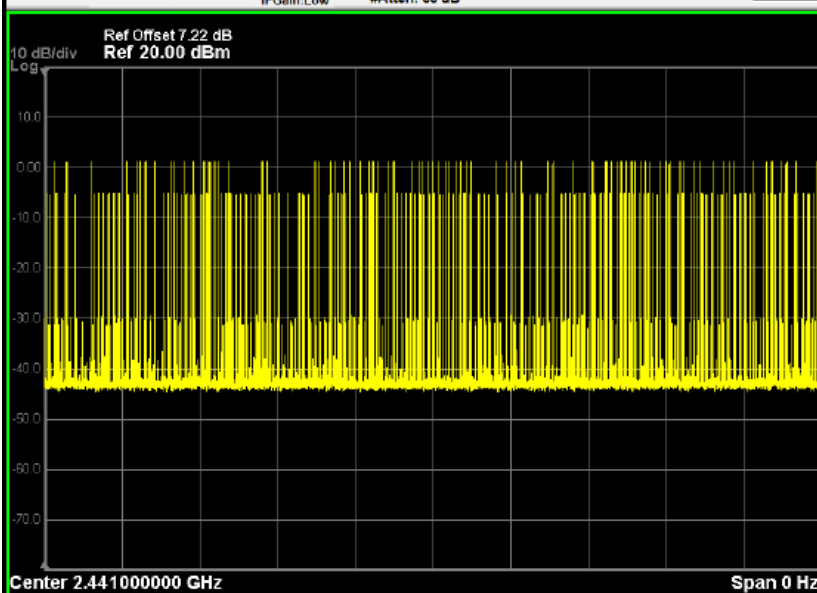
RLRF500ACSENSE-PULSE11:36:59 AM Apr 30, 2025

Center Freq 2.441000000 GHzTrig: Free RunAvg Type: Log-Pwr

PNO: FastIF Gain: Low#Atten: 30 dB

Ref Offset 7.22 dB

Ref 20.00 dBm



Center 2.441000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 31.60 s (10001 pts)

Span 0 Hz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ 2	1	t	(Δ)	2.891 ms	(Δ)	-0.75 dB	
2	F	1	t		488.0 μ s		-14.32 dBm	
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSGSTATUS

Frequency

Auto Tune

Center Freq
2.441000000 GHz

Start Freq
2.441000000 GHz

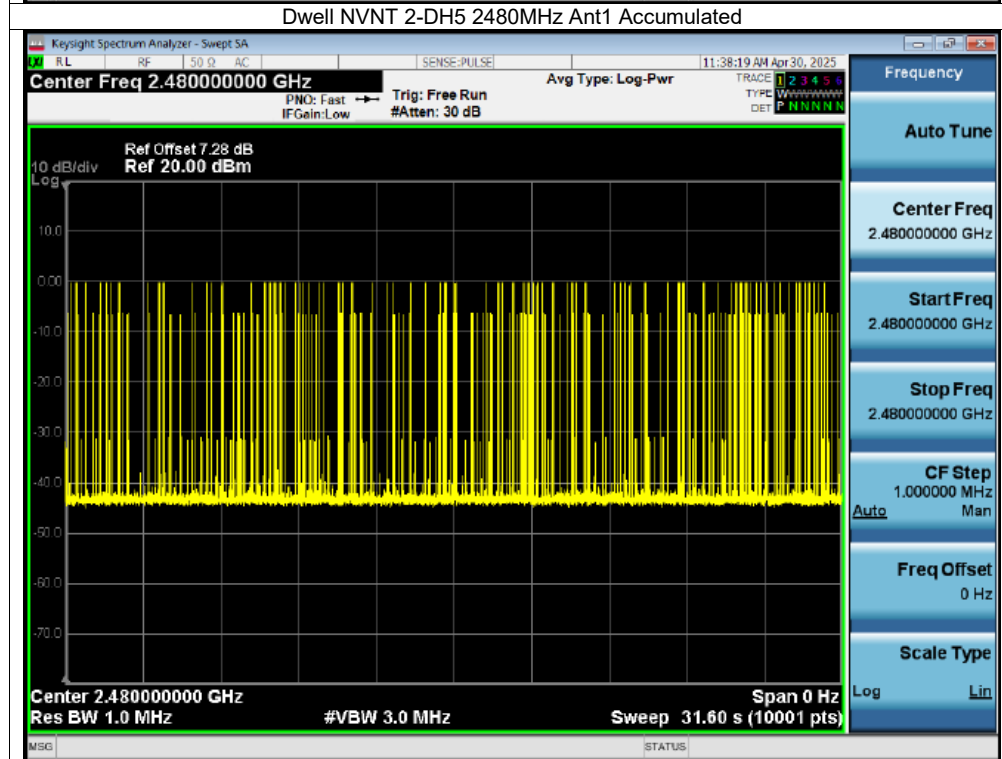
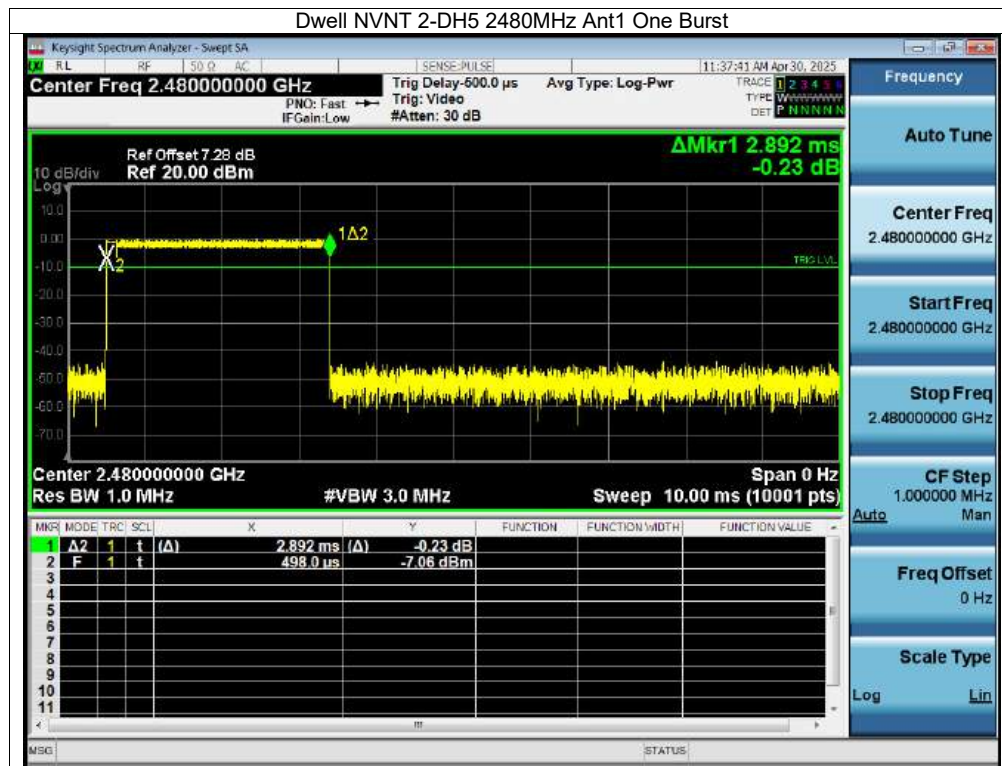
Stop Freq
2.441000000 GHz

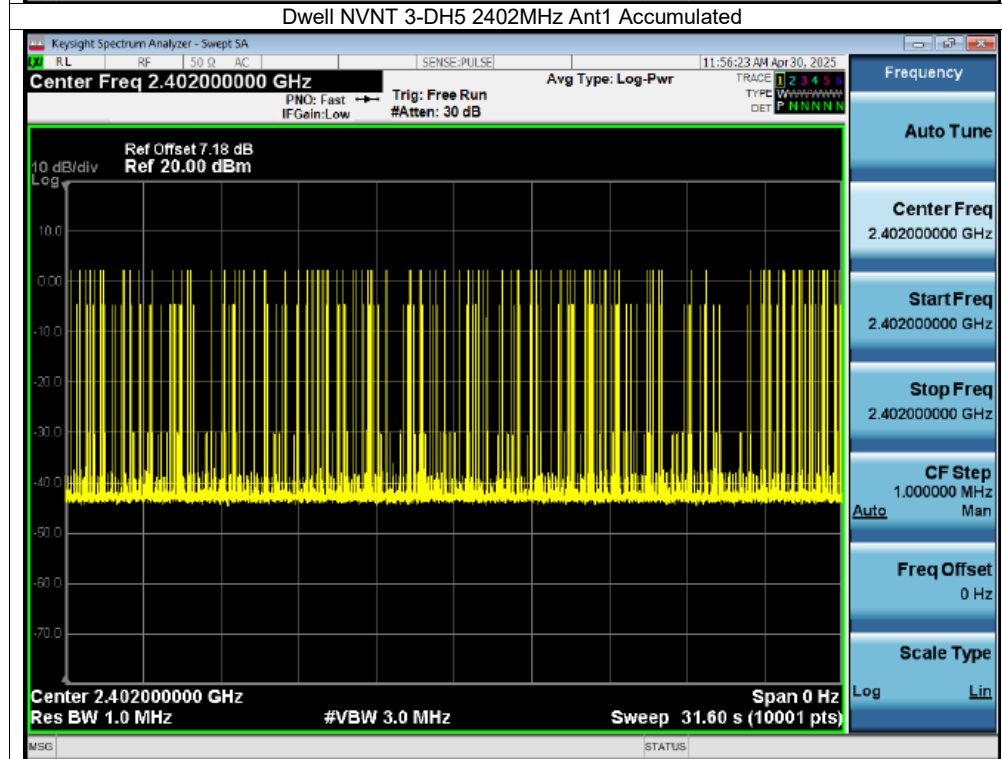
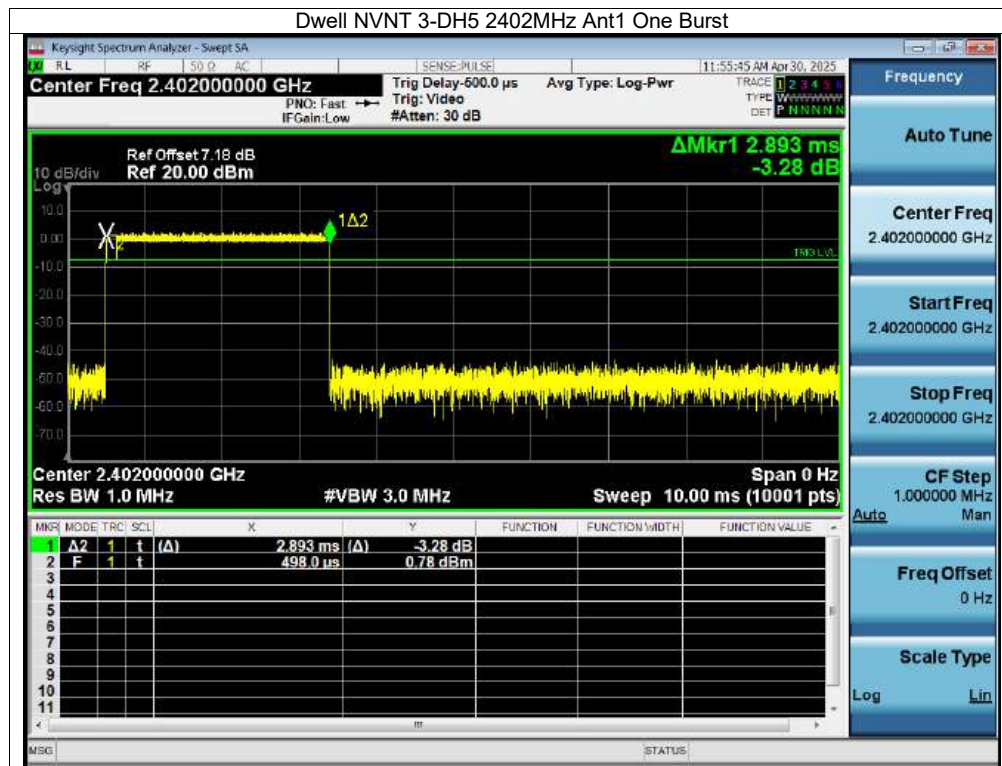
CF Step
1.000000 MHz

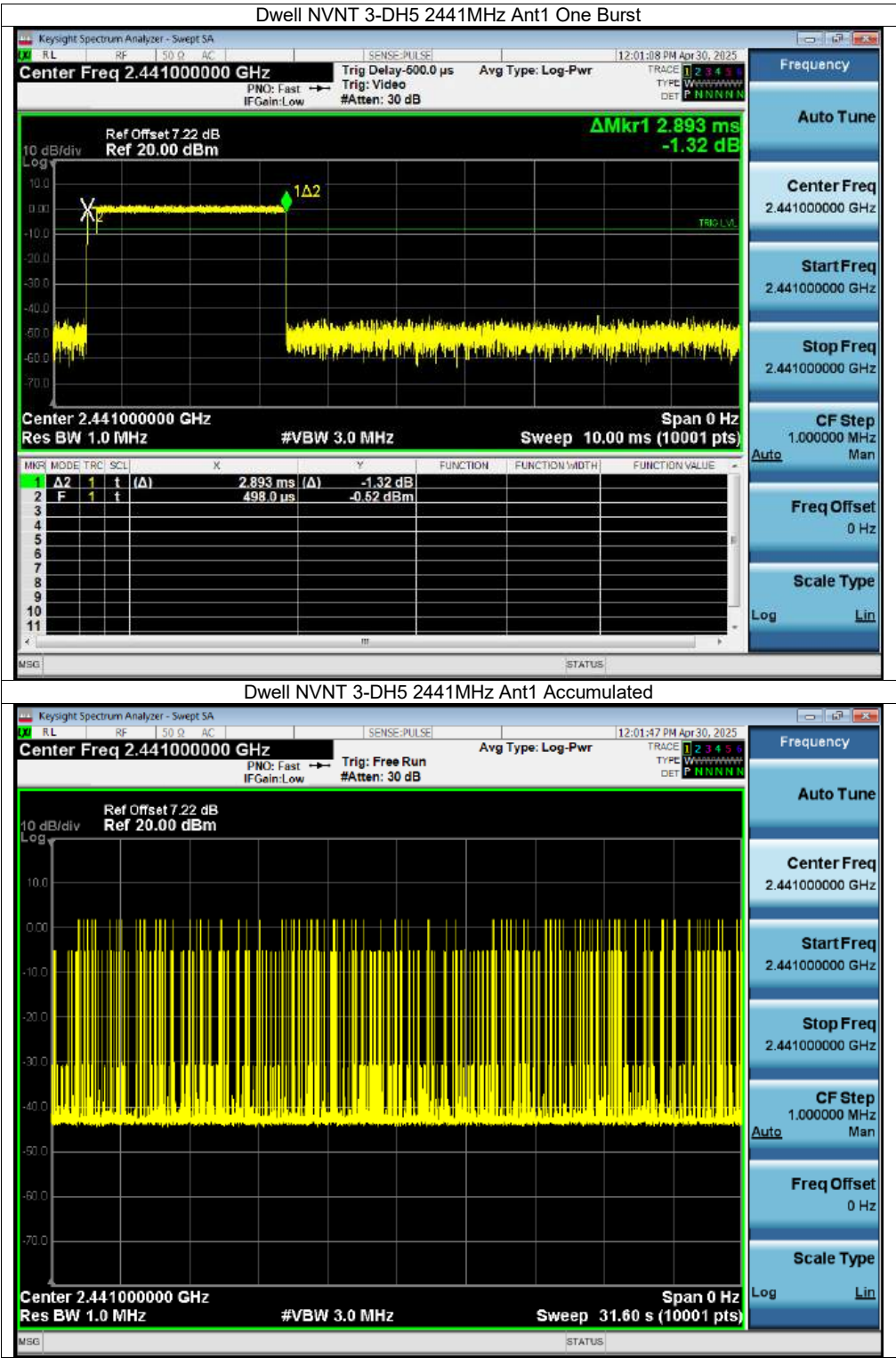
AutoMan

Freq Offset
0 Hz

Scale Type
LogLin







Dwell NVNT 3-DH5 2441MHz Ant1 Accumulated

Keysight Spectrum Analyzer - Sweep SA

RLRF50 OACSENSE-PULSE

12:01:47 PM Apr 30, 2025

Center Freq 2.441000000 GHz

Trig: Free Run

Avg Type: Log-Pwr

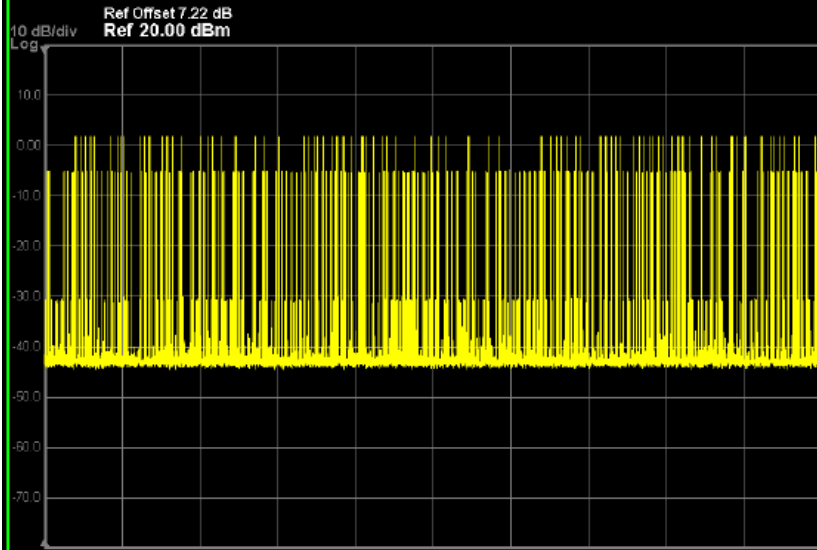
PNQ: Fast

Trig: Free Run

#Atten: 30 dB

Ref Offset 7.22 dB

Ref 20.00 dBm



Center 2.441000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 31.60 s (10001 pts)

Span 0 Hz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ 2	1	t	(Δ)	2.893 ms	(Δ)	-1.32 dB	
2	F	1	t		498.0 μ s		-0.52 dBm	
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG

STATUS

Frequency

Auto Tune

Center Freq
2.441000000 GHz

Start Freq
2.441000000 GHz

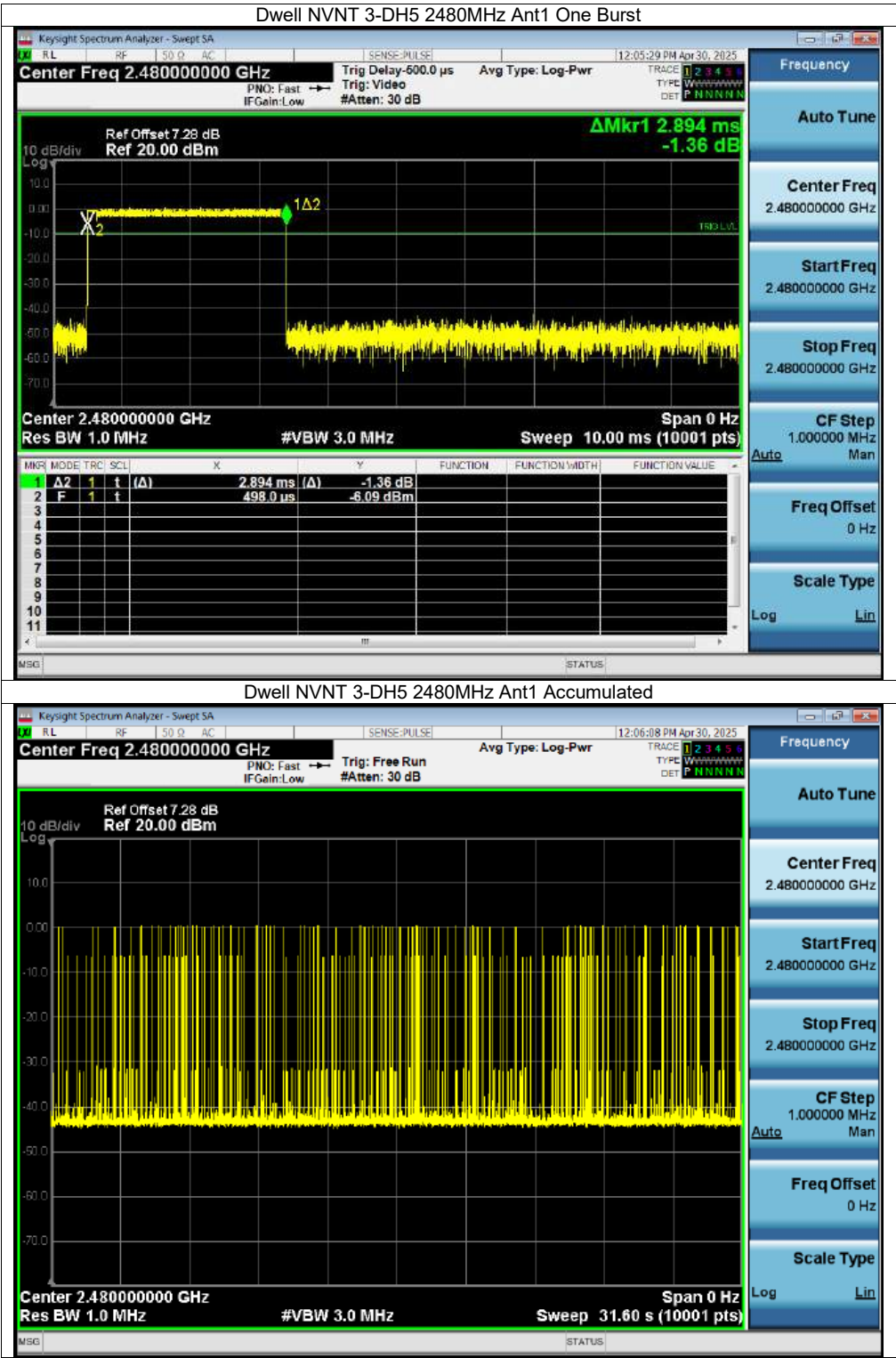
Stop Freq
2.441000000 GHz

CF Step
1.000000 MHz

Auto Man

Freq Offset
0 Hz

Scale Type
Log Lin



Dwell NVNT 3-DH5 2480MHz Ant1 Accumulated

Keysight Spectrum Analyzer - Sweep SA

RLRF50 OACSENSE-PULSE

12:06:08 PM Apr 30, 2025

Center Freq 2.480000000 GHz

Trig: Free Run

Avg Type: Log-Pwr

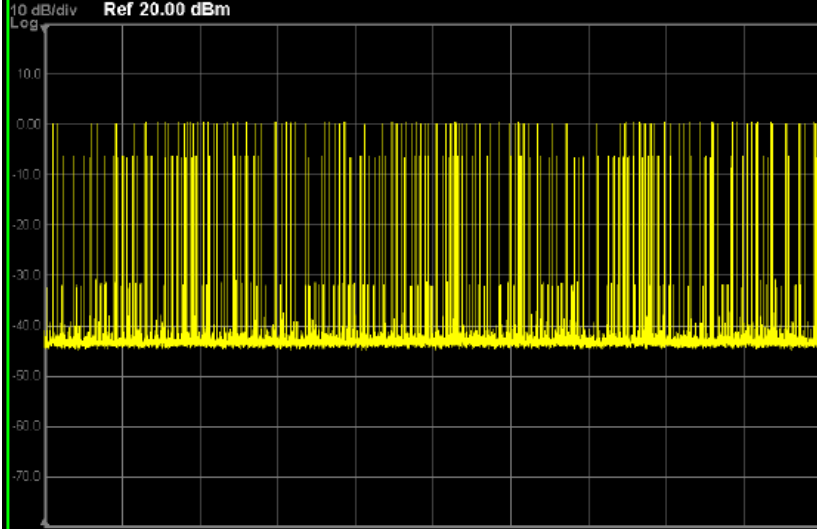
PN0: Fast

Trig: Free Run

#Atten: 30 dB

Ref Offset 7.28 dB

Ref 20.00 dBm



Center 2.480000000 GHz

Res BW 1.0 MHz

#VBW 3.0 MHz

Sweep 31.60 s (10001 pts)

Span 0 Hz

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	Δ 2	1	t	(Δ)	2.894 ms	(Δ)		-1.36 dB
2	F	1	t		498.0 μ s			-6.09 dBm
3								
4								
5								
6								
7								
8								
9								
10								
11								

MSG

STATUS

Frequency

Auto Tune

Center Freq 2.480000000 GHz

Start Freq 2.480000000 GHz

Stop Freq 2.480000000 GHz

CF Step 1.000000 MHz

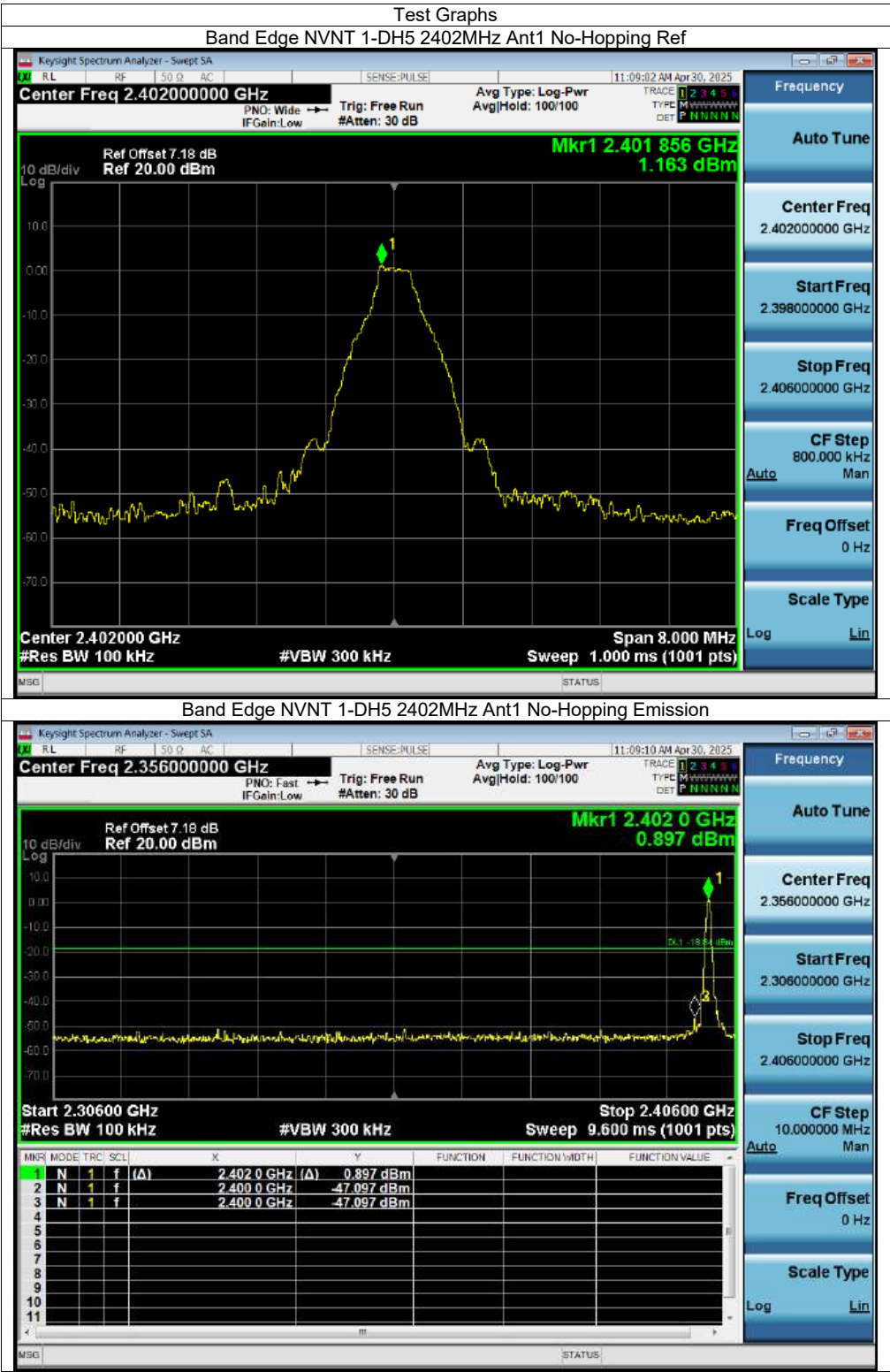
Auto Man

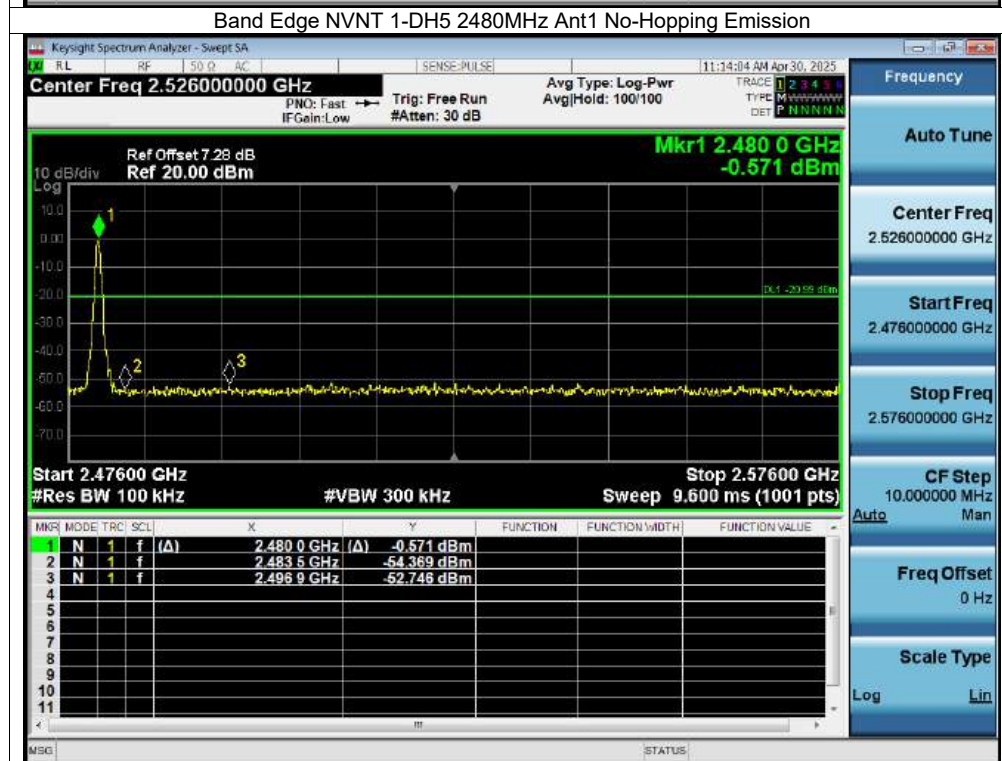
Freq Offset 0 Hz

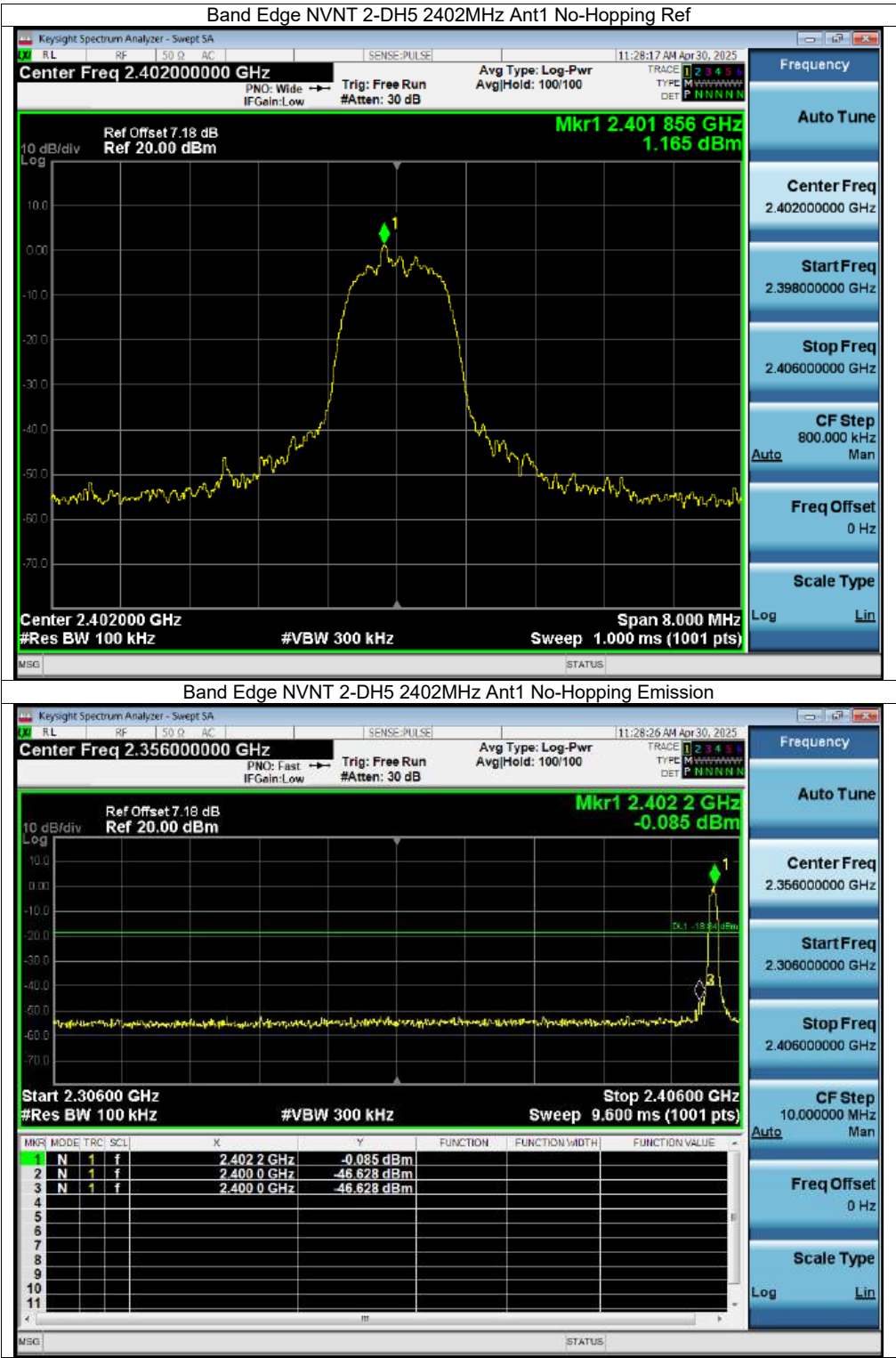
Scale Type Log Lin

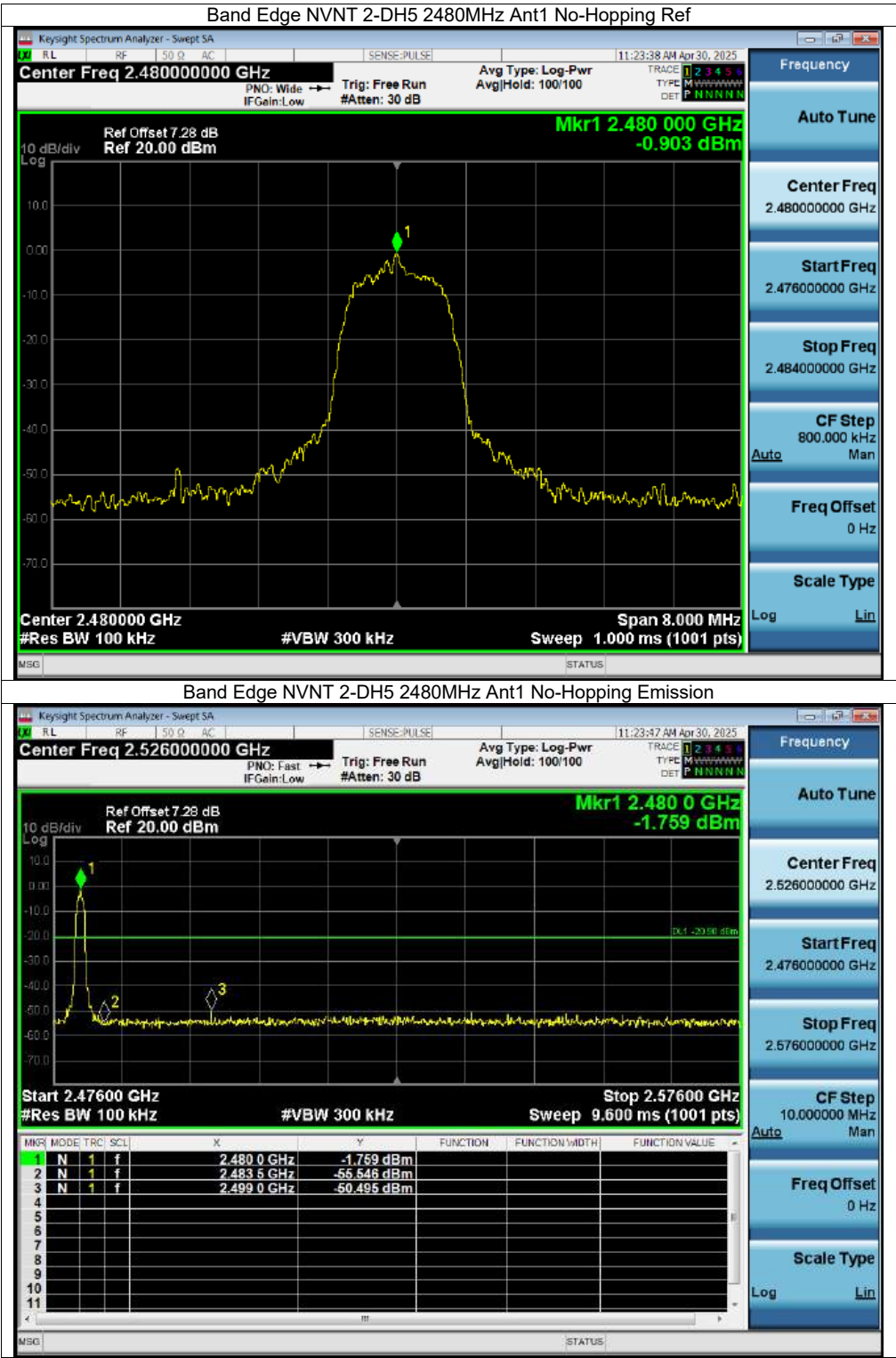
Band Edge

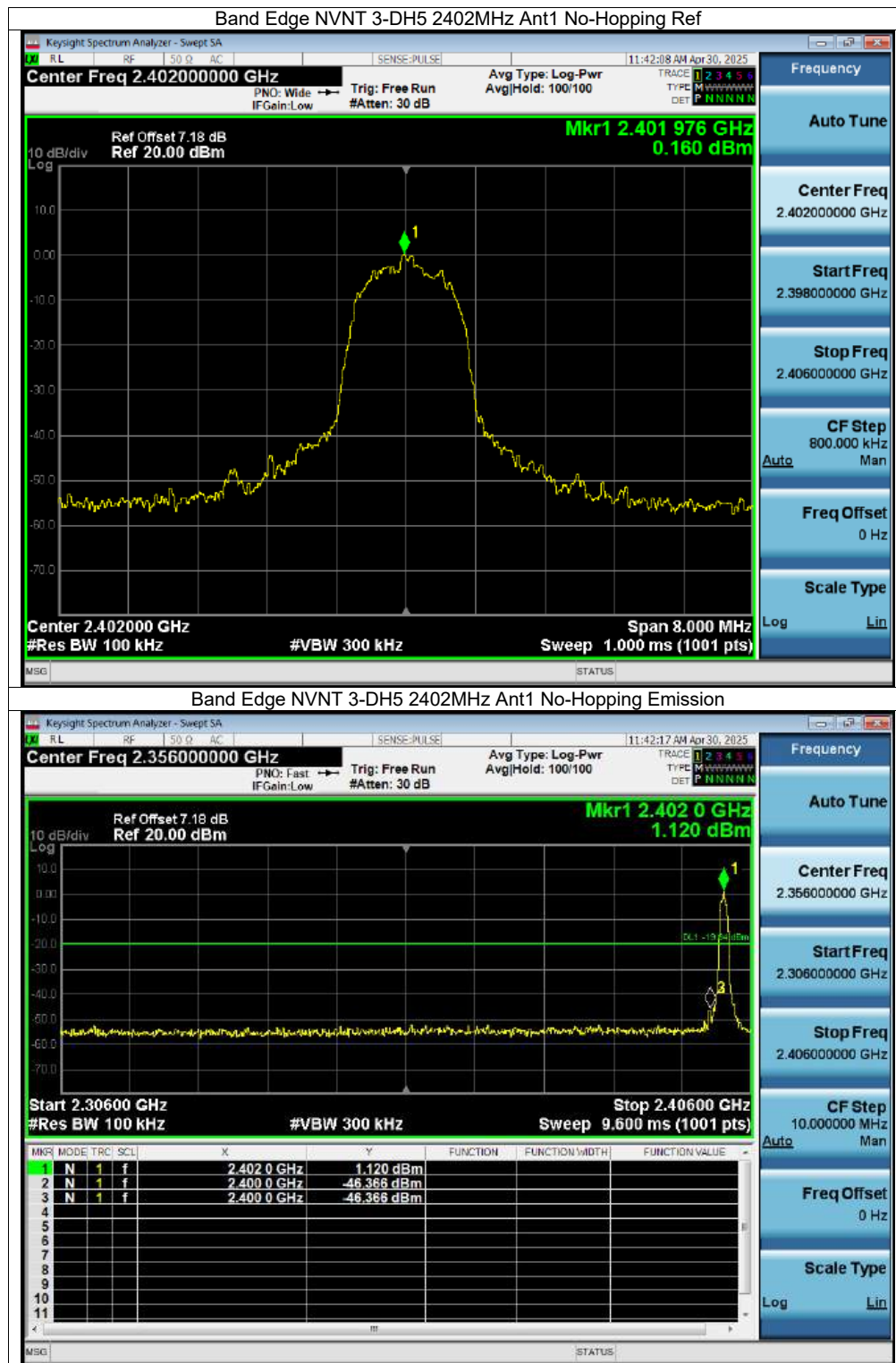
Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	No-Hopping	-48.263	-20	Pass
NVNT	1-DH5	2480	Ant1	No-Hopping	-51.757	-20	Pass
NVNT	2-DH5	2402	Ant1	No-Hopping	-47.795	-20	Pass
NVNT	2-DH5	2480	Ant1	No-Hopping	-49.587	-20	Pass
NVNT	3-DH5	2402	Ant1	No-Hopping	-46.53	-20	Pass
NVNT	3-DH5	2480	Ant1	No-Hopping	-50.76	-20	Pass





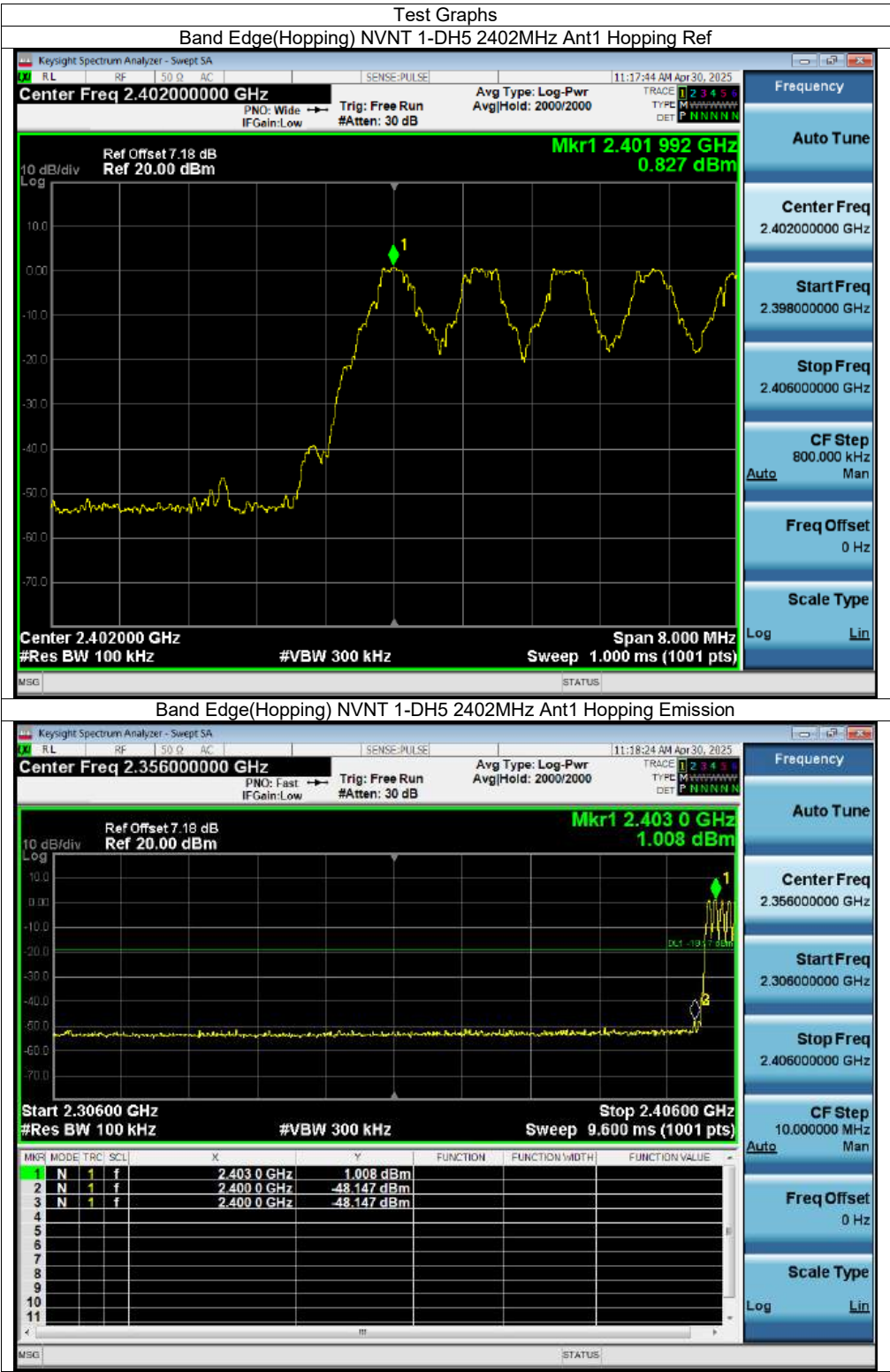






Band Edge(Hopping)

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	Hopping	-48.977	-20	Pass
NVNT	1-DH5	2480	Ant1	Hopping	-50.69	-20	Pass
NVNT	2-DH5	2402	Ant1	Hopping	-50.569	-20	Pass
NVNT	2-DH5	2480	Ant1	Hopping	-49.781	-20	Pass
NVNT	3-DH5	2402	Ant1	Hopping	-48.617	-20	Pass
NVNT	3-DH5	2480	Ant1	Hopping	-50.143	-20	Pass







Band Edge(Hopping) NVNT 2-DH5 2402MHz Ant1 Hopping Emission

Keysight Spectrum Analyzer - Swept SA

RLRF500ACSENSE-PULSE

11:35:38 AM Apr 30, 2025

Center Freq 2.35600000 GHz

PNO: Fast → Trig: Free Run Avg Type: Log-Pwr

IF Gain: Low #Atten: 30 dB Avg/Hold: 2000/2000

TRACE 1 2 3 4 5 6

TYPE M W W W W W W W

DET P N N N N N N

Ref Offset 7.18 dB

Ref 20.00 dBm

Mkr1 2.405 0 GHz

-1.290 dBm



Start 2.30600 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.40600 GHz Sweep 9.600 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.405 0 GHz	-1.290 dBm			
2	N	1	f	2.400 0 GHz	-60.712 dBm			
3	N	1	f	2.370 6 GHz	-60.258 dBm			
4								
5								
6								
7								
8								
9								
10								
11								

MSG

STATUS

Frequency

Auto Tune

Center Freq 2.356000000 GHz

Start Freq 2.306000000 GHz

Stop Freq 2.406000000 GHz

CF Step 10.000000 MHz

Auto Man

Freq Offset 0 Hz

Scale Type Log Lin



Band Edge(Hopping) NVNT 2-DH5 2480MHz Ant1 Hopping Emission

Keysight Spectrum Analyzer - Swept SA

RLRF500ACSENSE-PULSE

11:41:09 AM Apr 30, 2025

Center Freq 2.526000000 GHz

PNO: Fast → Trig: Free Run Avg Type: Log-Pwr

IFGain:Low #Atten: 30 dB Avg|Hold: 2000/2000

TRACE 1 2 3 4 5 6

TYPE M W W W W W W W

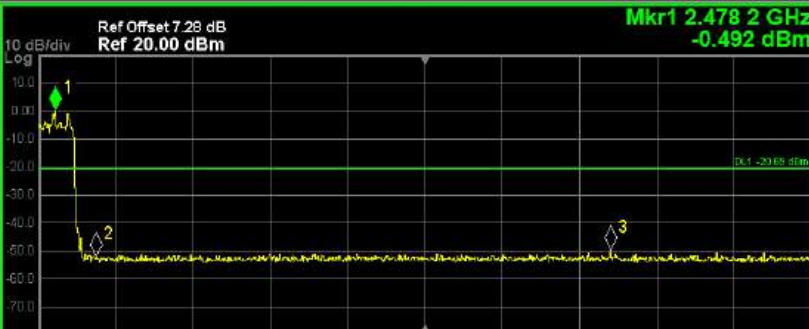
DET P N N N N N N

Ref Offset 7.28 dB

Ref 20.00 dBm

Mkr1 2.478 2 GHz

-0.492 dBm



Start 2.47600 GHz

#Res BW 100 kHz

#VBW 300 kHz

Stop 2.57600 GHz

Sweep 9.600 ms (1001 pts)

MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.478 2 GHz	-0.492 dBm			
2	N	1	f	2.483 5 GHz	-52.799 dBm			
3	N	1	f	2.550 0 GHz	-50.472 dBm			
4								
5								
6								
7								
8								
9								
10								
11								

MSG

STATUS

Frequency

Auto Tune

Center Freq

2.526000000 GHz

Start Freq

2.476000000 GHz

Stop Freq

2.576000000 GHz

CF Step

10.000000 MHz

Auto Man

Freq Offset

0 Hz

Scale Type

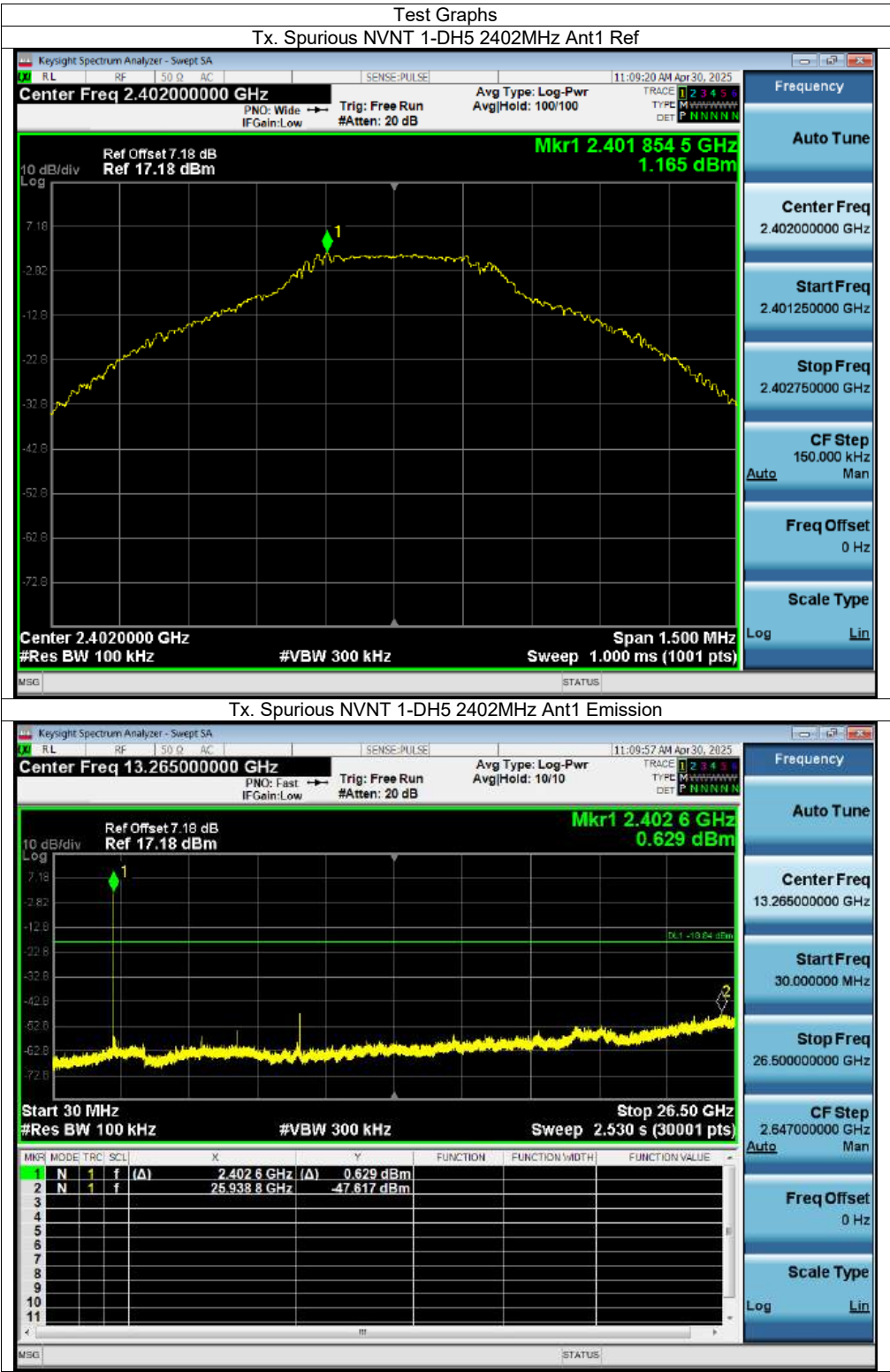
Log Lin



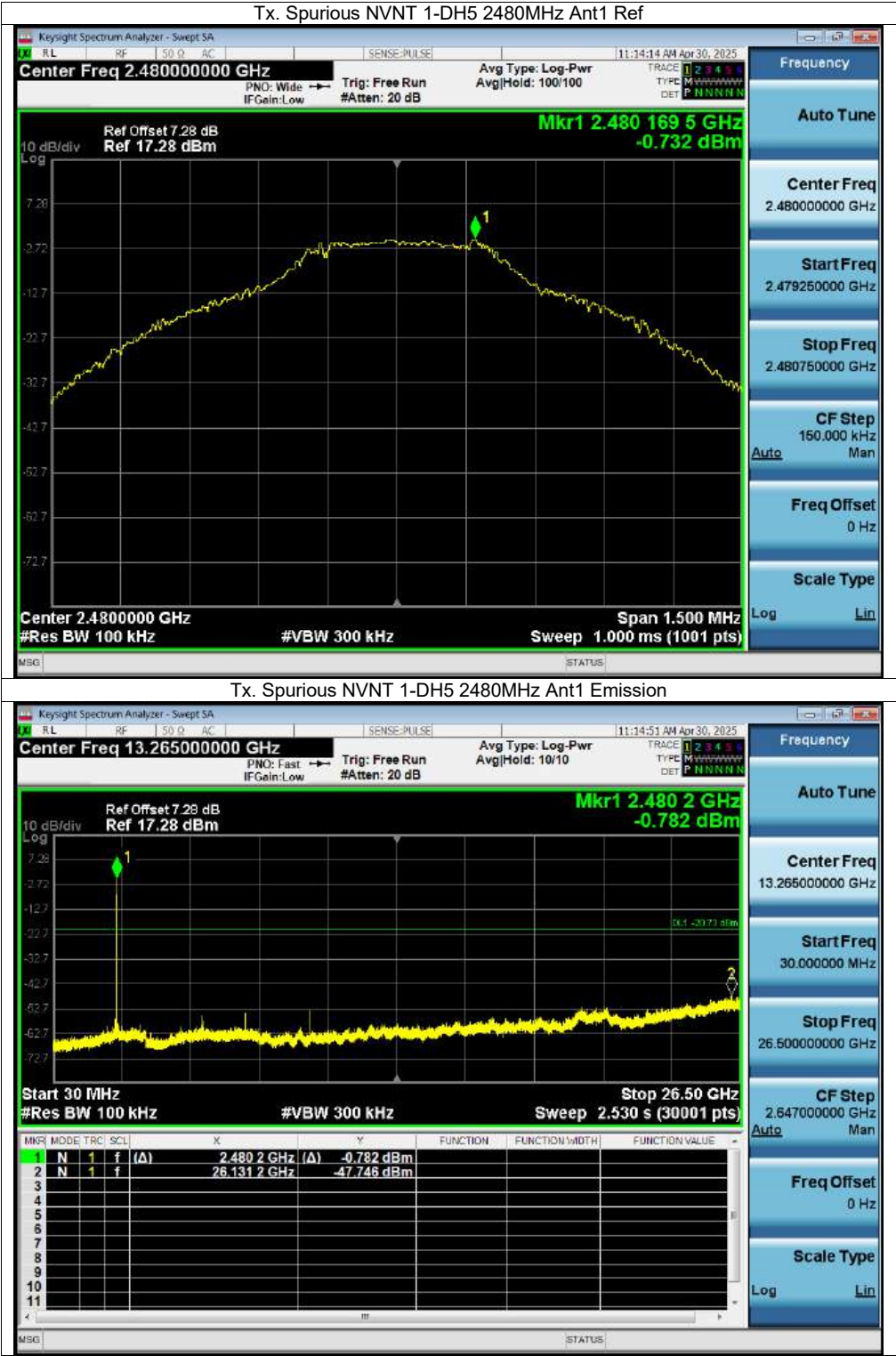


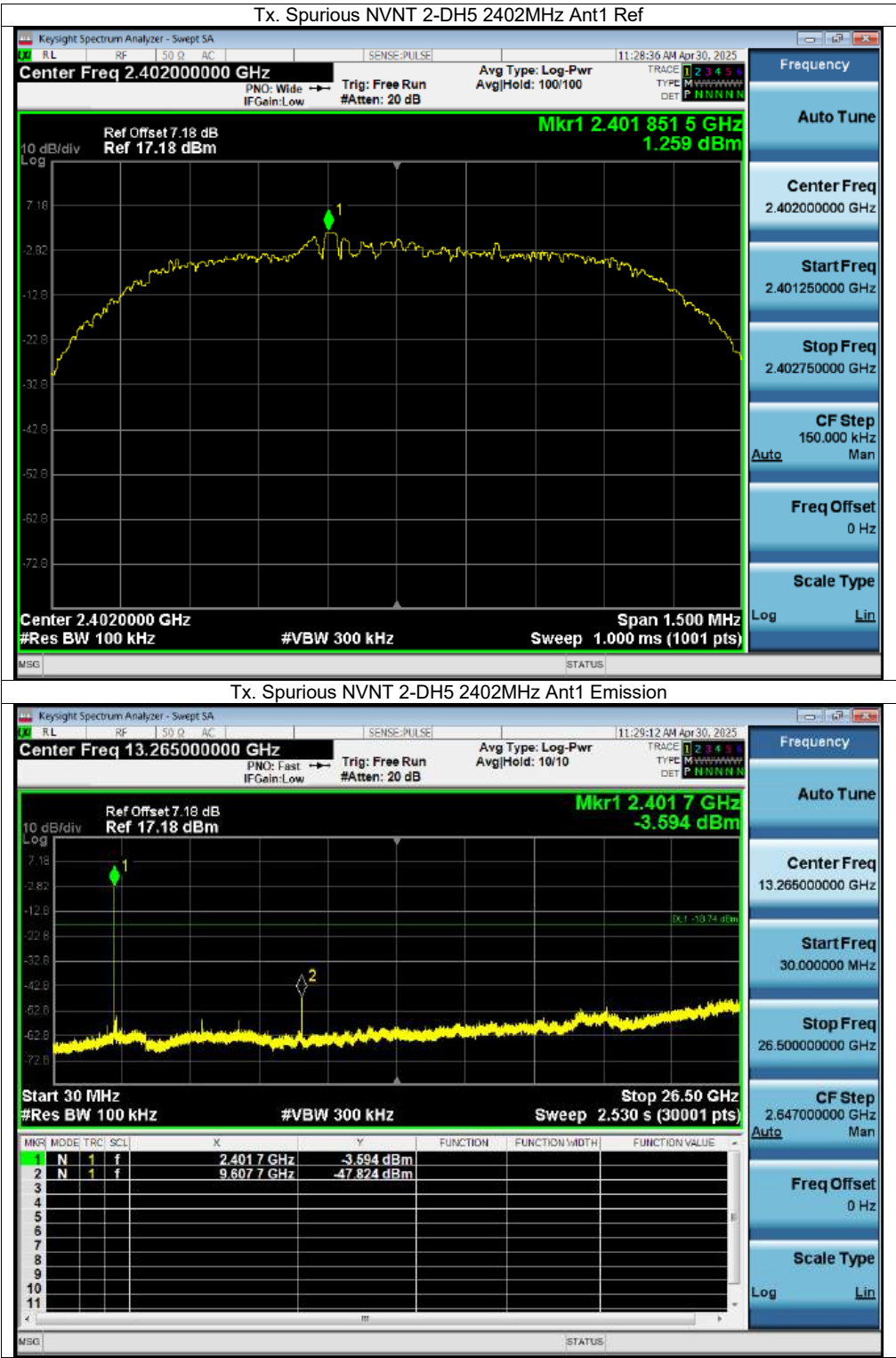
Conducted RF Spurious Emission

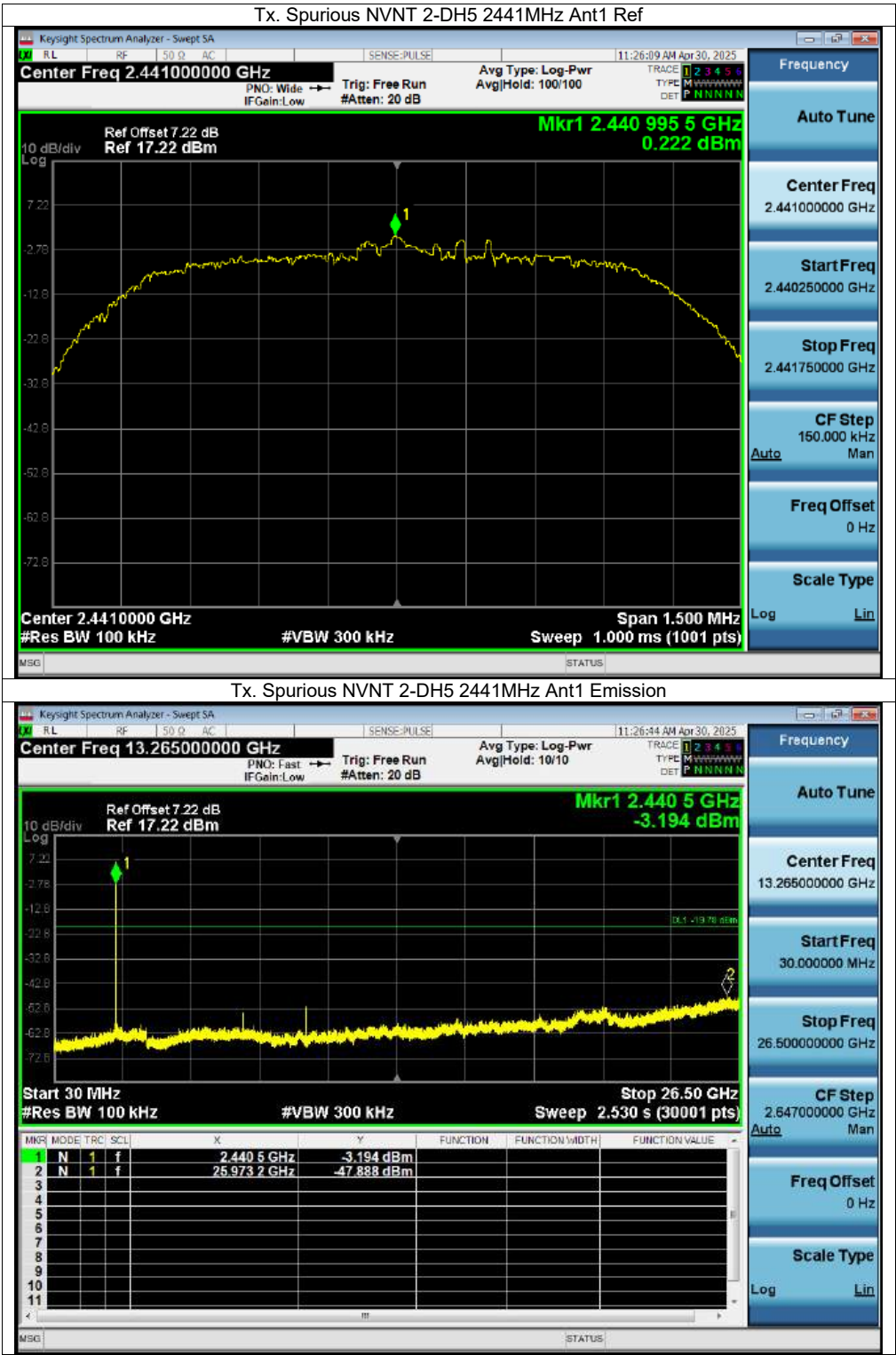
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH5	2402	Ant1	-48.79	-20	Pass
NVNT	1-DH5	2441	Ant1	-48.8	-20	Pass
NVNT	1-DH5	2480	Ant1	-47.02	-20	Pass
NVNT	2-DH5	2402	Ant1	-49.08	-20	Pass
NVNT	2-DH5	2441	Ant1	-48.11	-20	Pass
NVNT	2-DH5	2480	Ant1	-47.04	-20	Pass
NVNT	3-DH5	2402	Ant1	-48.9	-20	Pass
NVNT	3-DH5	2441	Ant1	-47.93	-20	Pass
NVNT	3-DH5	2480	Ant1	-47.11	-20	Pass

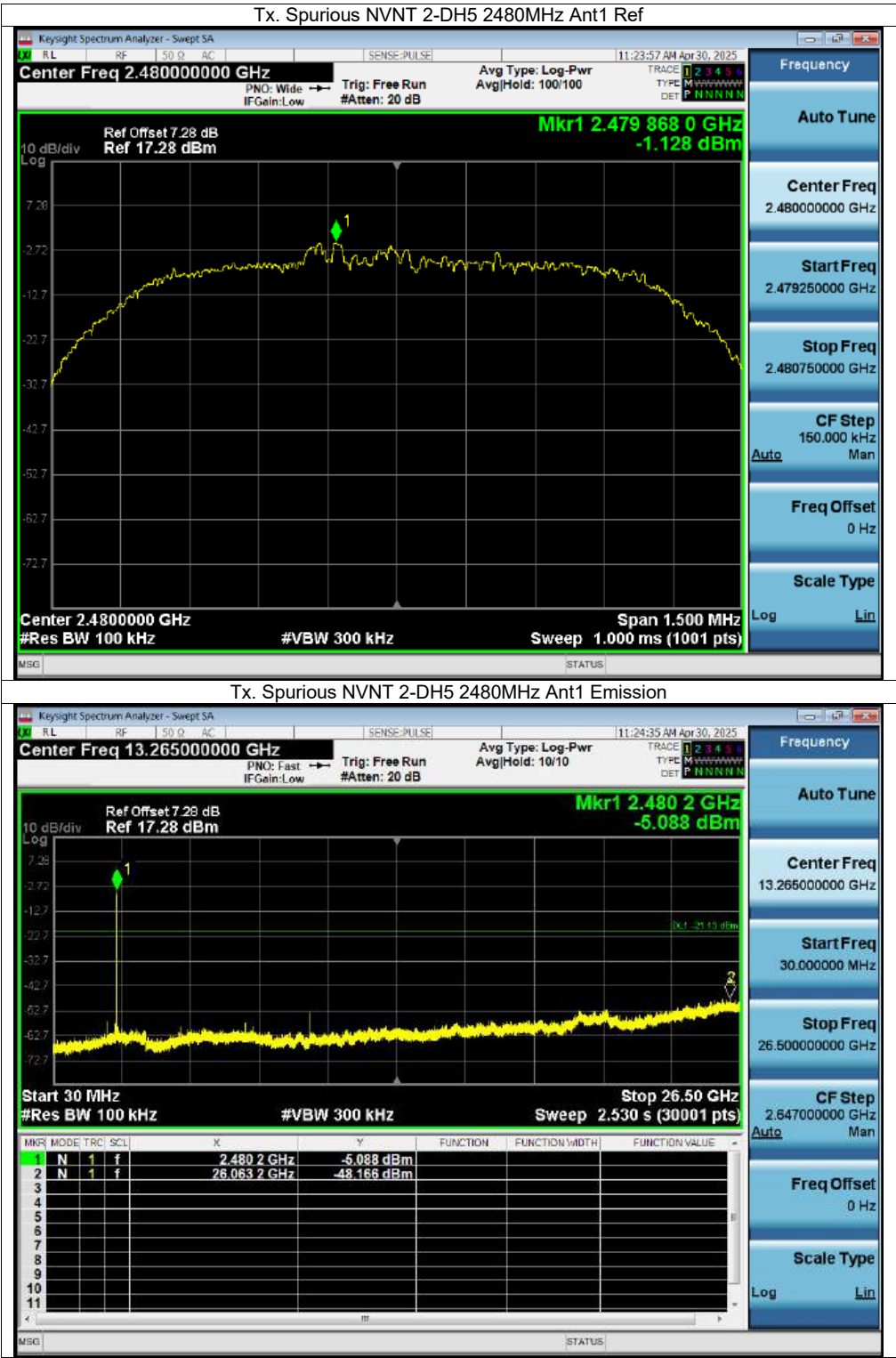


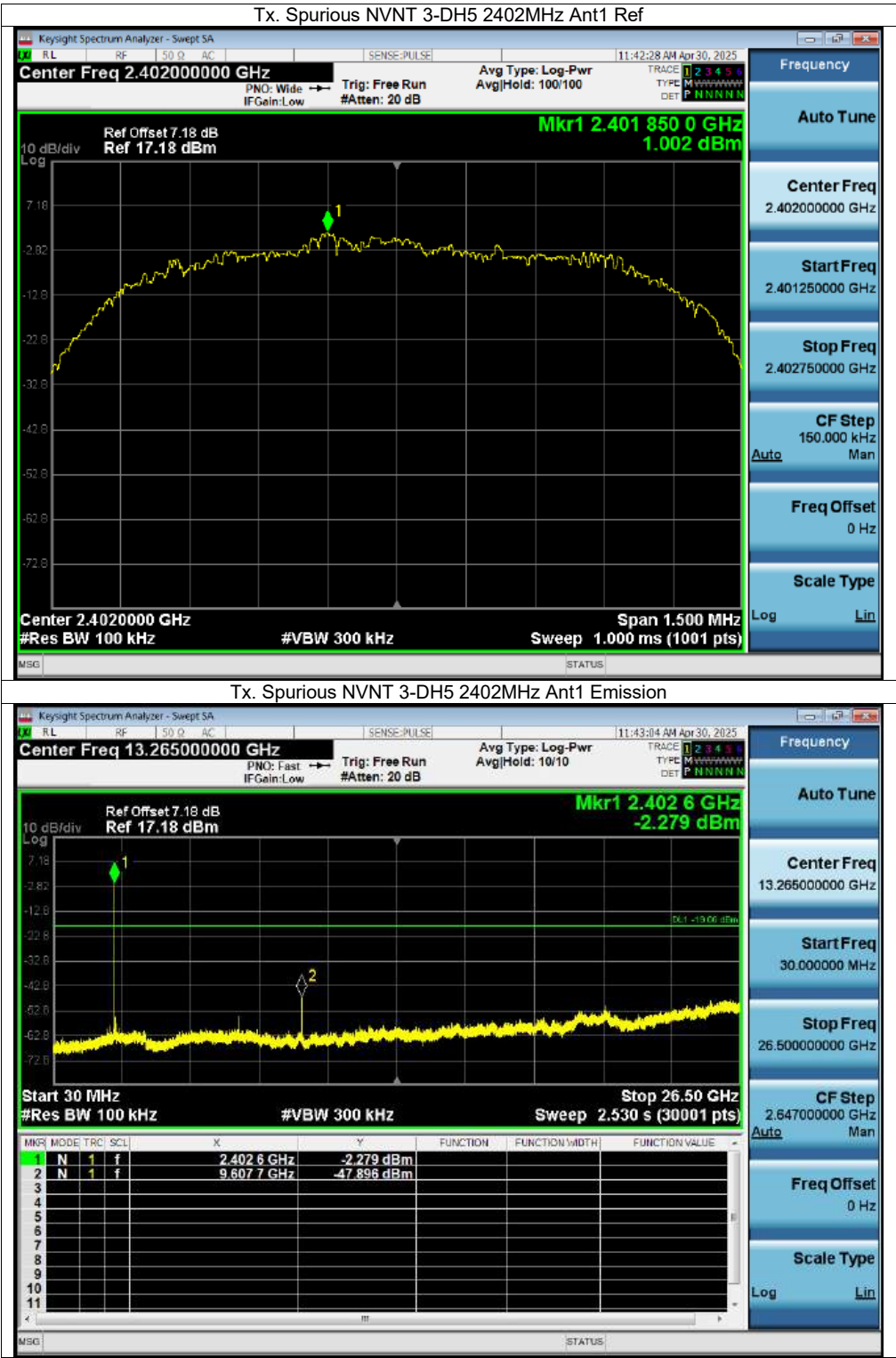


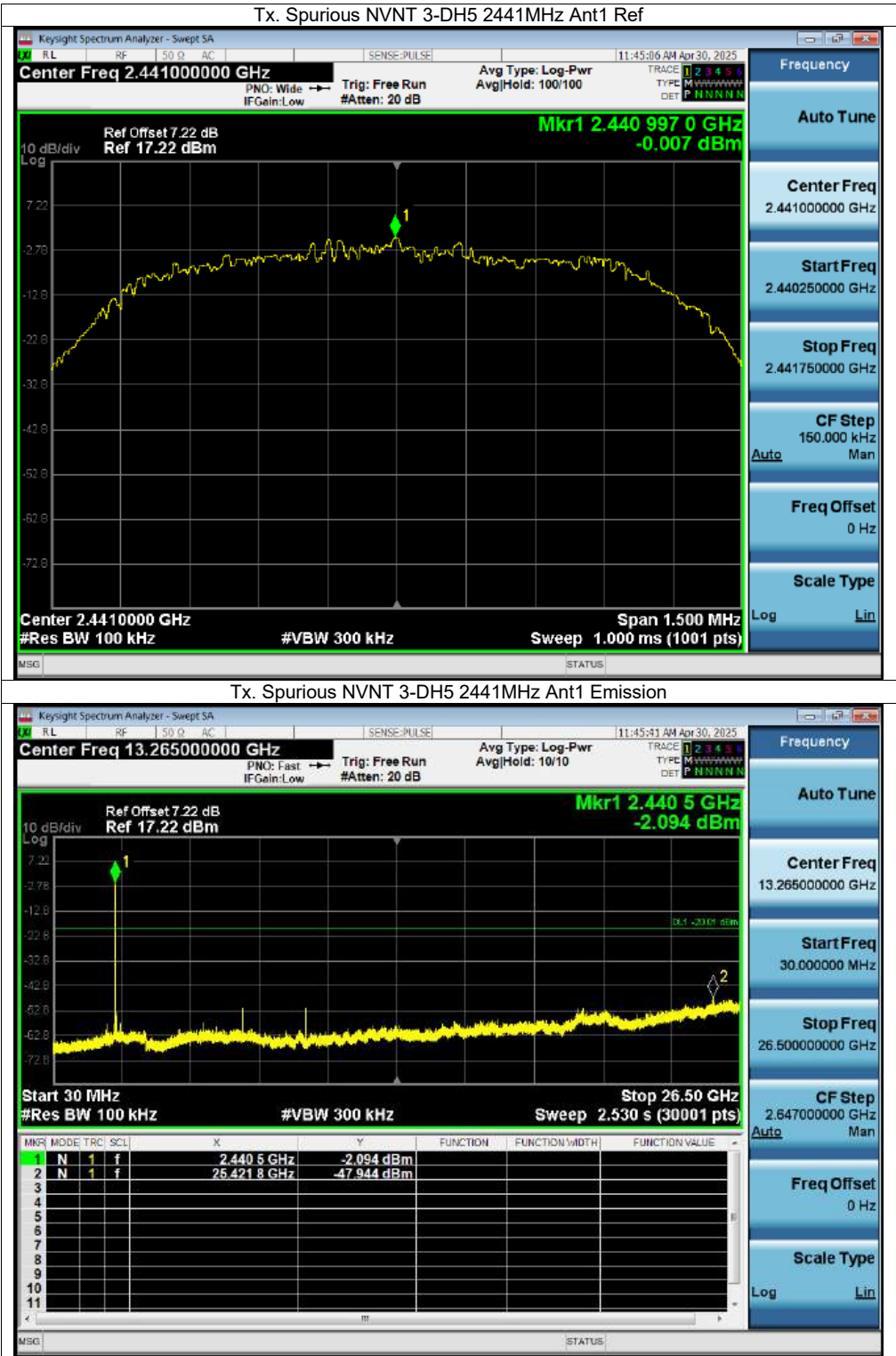


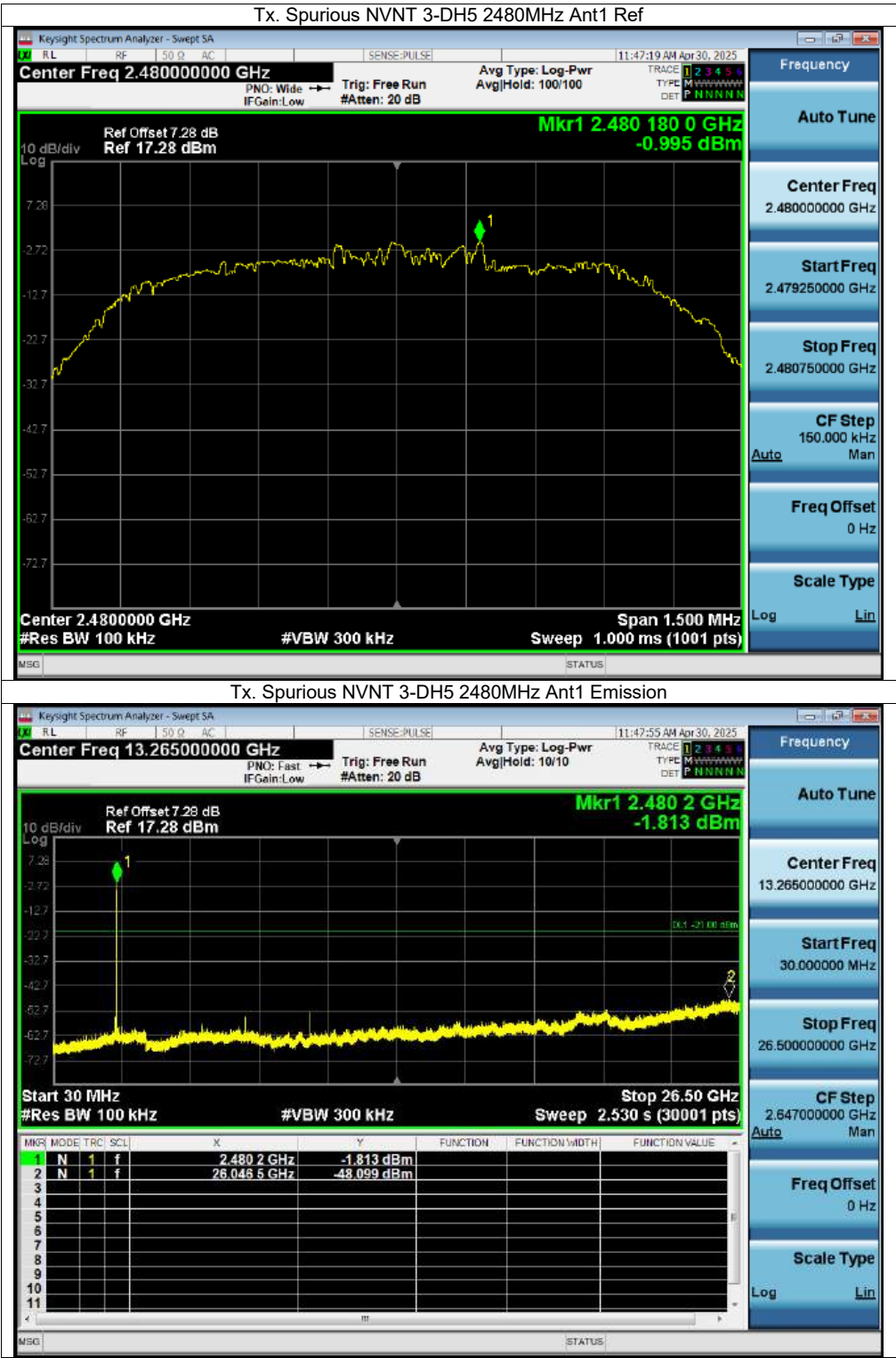












END OF REPORT