FCC Part 15C Test Report

FCC ID: 2BK9QFD-008

Applicant:	Kaiping Futuo Sanitary Ware Co., Ltd
Address:	No. L1-1, No.3 Industrial Park, Shuikou Town, Kaiping City, Guangdong Province, China
Manufacturer:	Kaiping Futuo Sanitary Ware Co., Ltd
Address:	No. L1-1, No.3 Industrial Park, Shuikou Town, Kaiping City, Guangdong Province, China
EUT:	ELECTRIC TOWEL WARMER
Trade Mark:	SAILAINUO
Model Number:	FD-008, FK-015,FK-035,FK-001,FK002,FK-007,FK-008,FK-004
Date of Receipt:	August. 26, 2024
Test Date:	August. 26, 2024 – September. 10, 2024
Date of Report:	September. 10, 2024
Prepared By:	Shenzhen DL Testing Technology Co., Ltd.
Address:	101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China
Applicable Standards:	FCC PART 15 C 15.247 ANSI C63.10:2013
Test Result:	Pass
Report Number:	DL-240708045EB

Prepared (Test Engineer):	Pxing Huang
Reviewer (Supervisor):	Jack Bu
Approved (Manager):	Jade Yang

This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247(c)	Radiated Spurious Emission	PASS	
15.205	Band Edge Emission	PASS	
15.247(b)(1)	Peak Output Power	PASS	
15.247(a)(2)	6dB Bandwidth	PASS	
15.247(d)	Power Spectral Density	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**， providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission Test	±2.56dB
2	RF power,conducted	±0.42dB
3	Spurious emissions,conducted	±2.76dB
4	All emissions,radiated(<1G)	±3.65dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name:	ELECTRIC TOWEL WARMER
Trademark	SAILAINUO
Model No.:	FD-008, FK-015,FK-035,FK-001,FK002,FK-007,FK-008,FK-004
Model Difference	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
BT Version:	4.2
Operation Frequency:	2402~2480MHz
Channel numbers:	40 Channels
Channel separation:	2M
Modulation technology:	GFSK
Operation Frequency:	2412MHz~2462MHz
Channel numbers:	11 Channels for 20MHz bandwidth 7 Channels for 20MHz bandwidth
Channel separation:	5M
Modulation technology:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK);IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK);IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Type:	Internal Antenna
Antenna gain:	0dBi
Power supply:	Input 100V~250V~, 50/60Hz

Note:

1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.The EUT's all information provided by client.

2. Channel Lis

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	06	2437	11	2462
02	2417	07	2442		
03	2422	08	2447		
04	2427	09	2452		
05	2432	10	2457		

2.2 DESCRIPTION OF TEST MODES

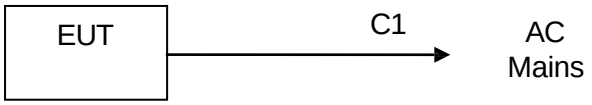
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	IEEE 802.11b
Mode 2	IEEE 802.11g
Mode 3	IEEE 802.11n20
Mode 4	IEEE 802.11n40
Mode 5	Link Mode
For Conducted Emission	
Final Test Mode	Description
Mode 5	Link Mode
For Radiated Emission	
Final Test Mode	Description
Mode 1	IEEE 802.11b

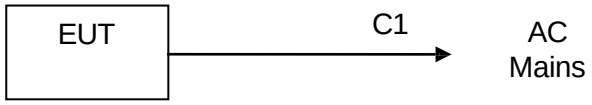
Note: 1. The measurements are performed at the highest, middle, lowest available channels.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model/Type No.	Series No.	Note

Item	Shielded Type	Ferrite Core	Length	Note

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

Test software Version	cmd			
Mode	IEEE 802.11b	IEEE 802.11g	IEEE 802.11n20	IEEE 802.11n40
Power Setting of Softwave	15	15	15	15

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4408B	MY50140780	Dec. 06, 2023	Dec. 07, 2024
2	Test Receiver (9kHz-7GHz)	R&S	ESRP7	101393	Dec. 06, 2023	Dec. 07, 2024
3	Bilog Antenna (30MHz-1GHz)	R&S	VULB9162	00306	Dec. 06, 2023	Dec. 07, 2024
4	Horn Antenna (1GHz-18GHz)	Schwarzbeck	BBHA9120D	02139	Dec. 06, 2023	Dec. 07, 2024
5	Horn Antenna (18GHz-40GHz)	A.H. Systems	SAS-574	588	Dec. 06, 2023	Dec. 07, 2024
6	Amplifier (9KHz-6GHz)	Schwarzbeck	BBV9743B	00153	Dec. 06, 2023	Dec. 07, 2024
7	Amplifier (1GHz-18GHz)	EMEC	EM01G8GA	00270	Dec. 06, 2023	Dec. 07, 2024
8	Amplifier (18GHz-40GHz)	Quanjuda	DLE-161	97	Dec. 06, 2023	Dec. 07, 2024
9	Loop Antenna (9KHz-30MHz)	Schwarzbeck	FMZB1519B	00014	Dec. 06, 2023	Dec. 07, 2024
10	RF cables1 (9kHz-1GHz)	ChengYu	966	004	Dec. 06, 2023	Dec. 07, 2024
11	RF cables2 (1GHz-40GHz)	ChengYu	966	003	Dec. 06, 2023	Dec. 07, 2024
12	Antenna connector	Florida RF Labs	N/A	RF 01#	Dec. 06, 2023	Dec. 07, 2024
13	Power probe	KEYSIGHT	U2021XA	MY55210018	Dec. 06, 2023	Dec. 07, 2024
14	Signal Analyzer 9kHz-26.5GHz	Agilent	N9020A	MY55370280	Dec. 06, 2023	Dec. 07, 2024
15	Test Receiver 20kHz-40GHz	R&S	ESU 40	100376	Dec. 06, 2023	Dec. 07, 2024
16	D.C. Power Supply	LongWei	PS-305D	010964729	Dec. 06, 2023	Dec. 07, 2024
17	Antenna Mast	HaiYue	TPAM-4A	4265214	Dec. 06, 2023	Dec. 07, 2024

Conduction Test equipment

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	843 Shielded Room	ChengYu	843 Room	843	Nov. 24, 2022	Nov. 23, 2025
2	EMI Receiver	R&S	ESR	101421	Dec. 07, 2023	Dec. 06, 2024
3	LISN	R&S	ENV216	102417	Dec. 07, 2023	Dec. 06, 2024
4	843 Cable 1#	ChengYu	CE Cable	001	Dec. 07, 2023	Dec. 06, 2024
5	Pulse Limiter	R&S	VTSD 9561F	12561	Dec. 07, 2023	Dec. 06, 2024

Other

Item	Name	Manufacturer	Model	Software version
1	EMC Conduction Test System	FALA	EZ_EMC	EMC-CON 3A1.1
2	EMC radiation test system	FALA	EZ_EMC	FA-03A2
3	RF test system	MAIWEI	MTS8310	2.0.0.0
4	RF communication test system	MAIWEI	MTS8200	2.0.0.0

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

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

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

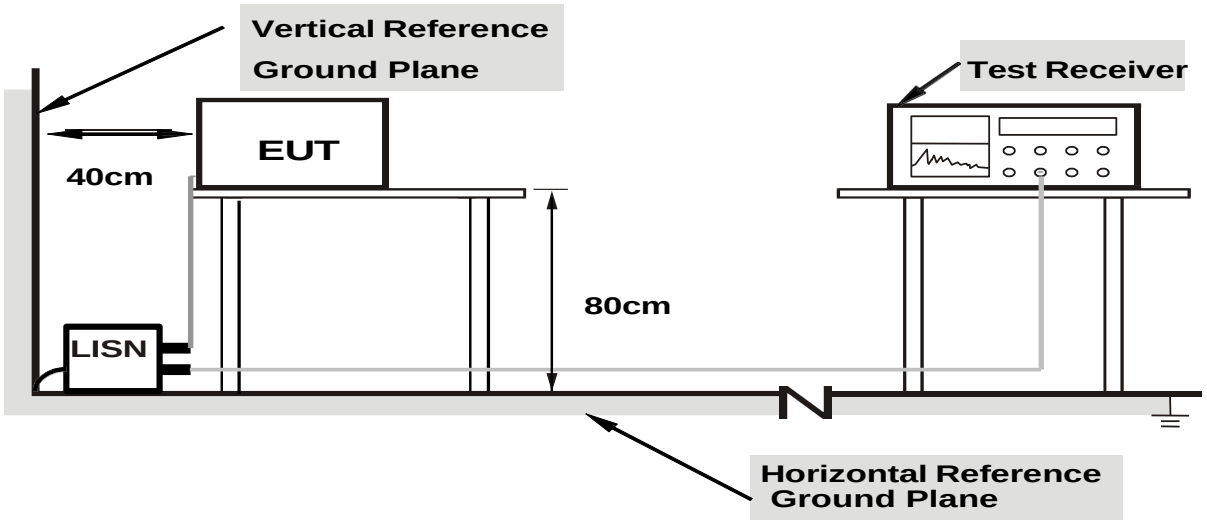
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

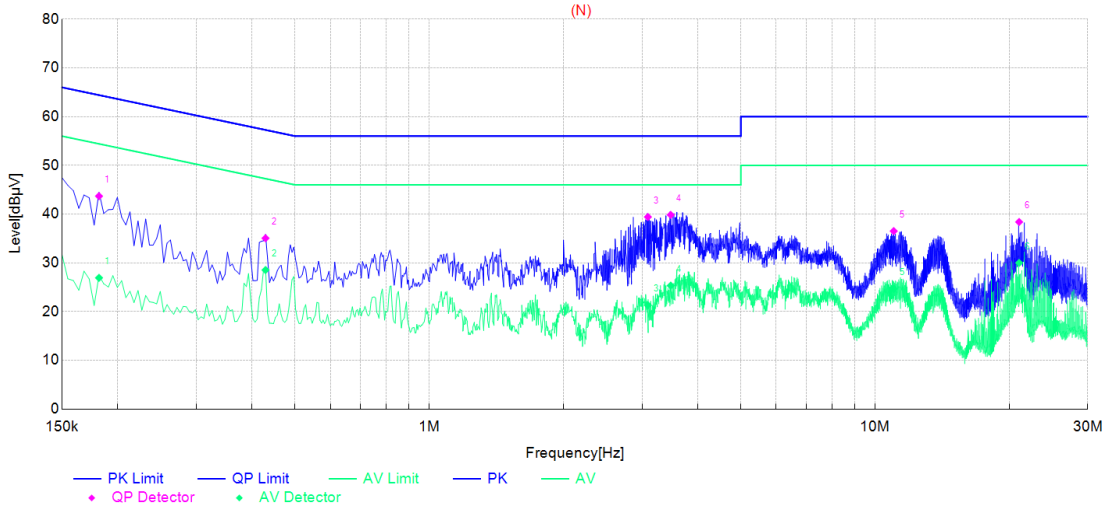
The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

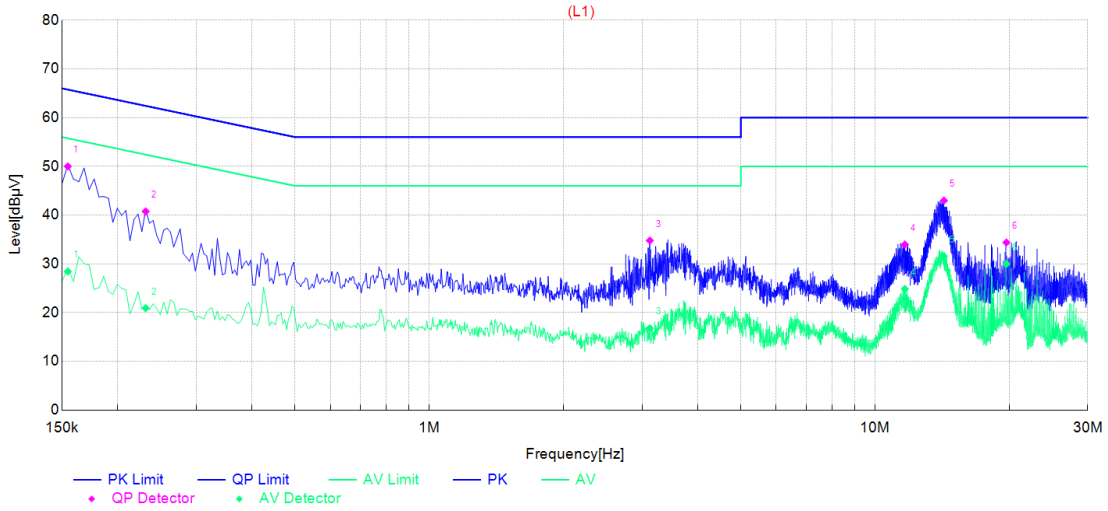
3.1.6 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 5



NO.	Frequency	QP Reading	AVG. Reading	Factor	QP Result	AVG. Result	QP Limit	AVG. Limit	QP Margin	AVG. Margin	Line	Remark
1	0.1815	33.49	16.73	10.20	43.69	26.93	64.42	54.42	20.73	27.49	N	PASS
2	0.429	24.87	18.35	10.19	35.06	28.54	57.27	47.27	22.21	18.73	N	PASS
3	3.093	29.08	10.96	10.34	39.42	21.30	56.00	46.00	16.58	24.70	N	PASS
4	3.48	29.49	14.98	10.35	39.84	25.33	56.00	46.00	16.16	20.67	N	PASS
5	11.013	25.79	13.95	10.73	36.52	24.68	60.00	50.00	23.48	25.32	N	PASS
6	21.0525	26.93	18.54	11.46	38.39	30.00	60.00	50.00	21.61	20.00	N	PASS

Temperature:	25 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode:	Mode 5



NO.	Frequency	QP Reading	AVG. Reading	Factor	QP Result	AVG. Result	QP Limit	AVG. Limit	QP Margin	AVG. Margin	Line	Remark
1	0.1545	39.67	18.10	10.33	50.00	28.43	65.75	55.75	15.75	27.32	L1	PASS
2	0.231	30.64	10.78	10.13	40.77	20.91	62.41	52.41	21.64	31.50	L1	PASS
3	3.1245	24.44	6.46	10.34	34.78	16.80	56.00	46.00	21.22	29.20	L1	PASS
4	11.6655	23.19	14.07	10.78	33.97	24.85	60.00	50.00	26.03	25.15	L1	PASS
5	14.2755	32.07	20.64	10.92	42.99	31.56	60.00	50.00	17.01	18.44	L1	PASS
6	19.7115	22.91	18.51	11.48	34.39	29.99	60.00	50.00	25.61	20.01	L1	PASS

Remark:

1. Result (dBµV) = Reading (dBµV) + Factor (dB).
2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	25GHz
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).
h. Test the EUT in the lowest channel, the middle channel, the Highest channel

Note:

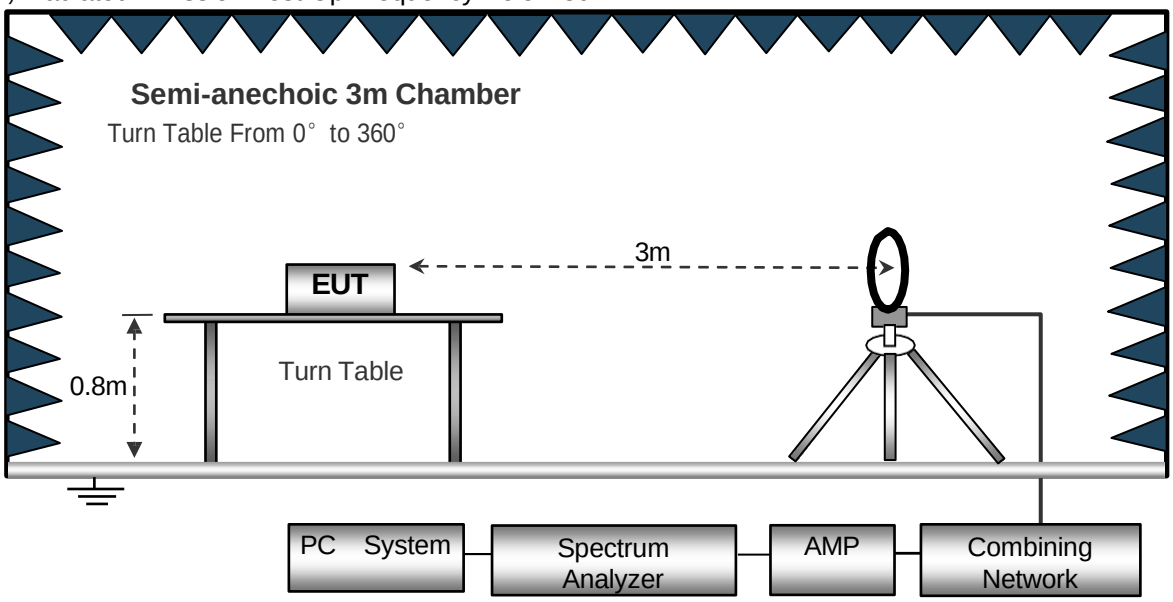
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

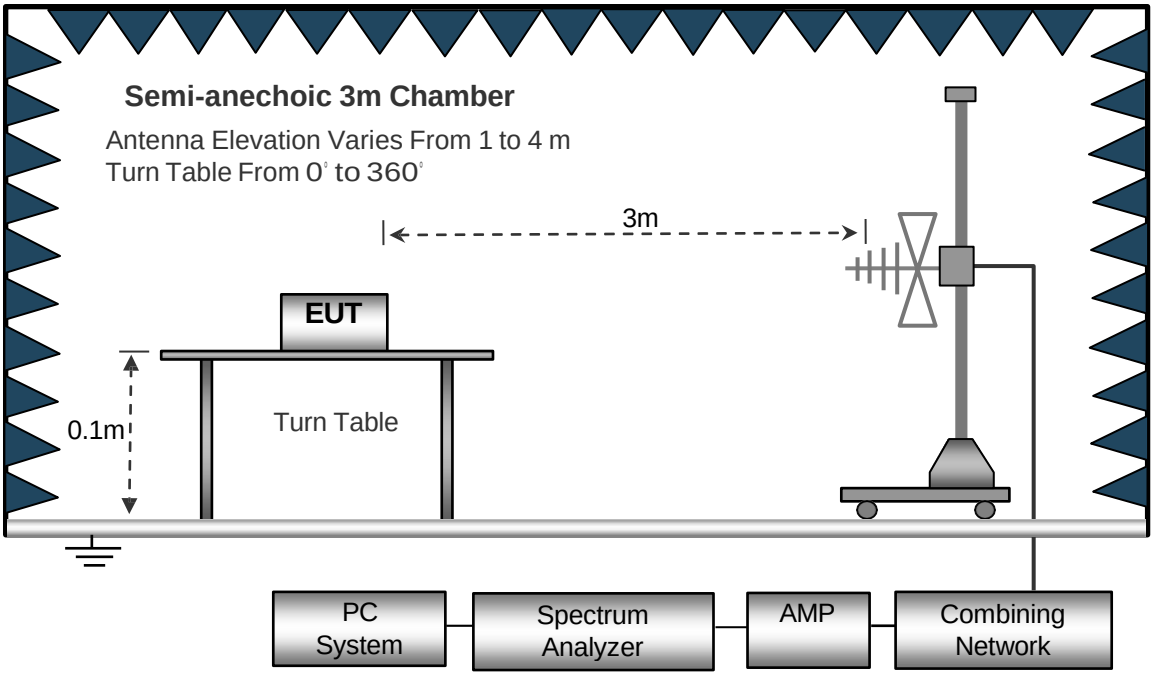
No deviation

3.2.4 TEST SETUP

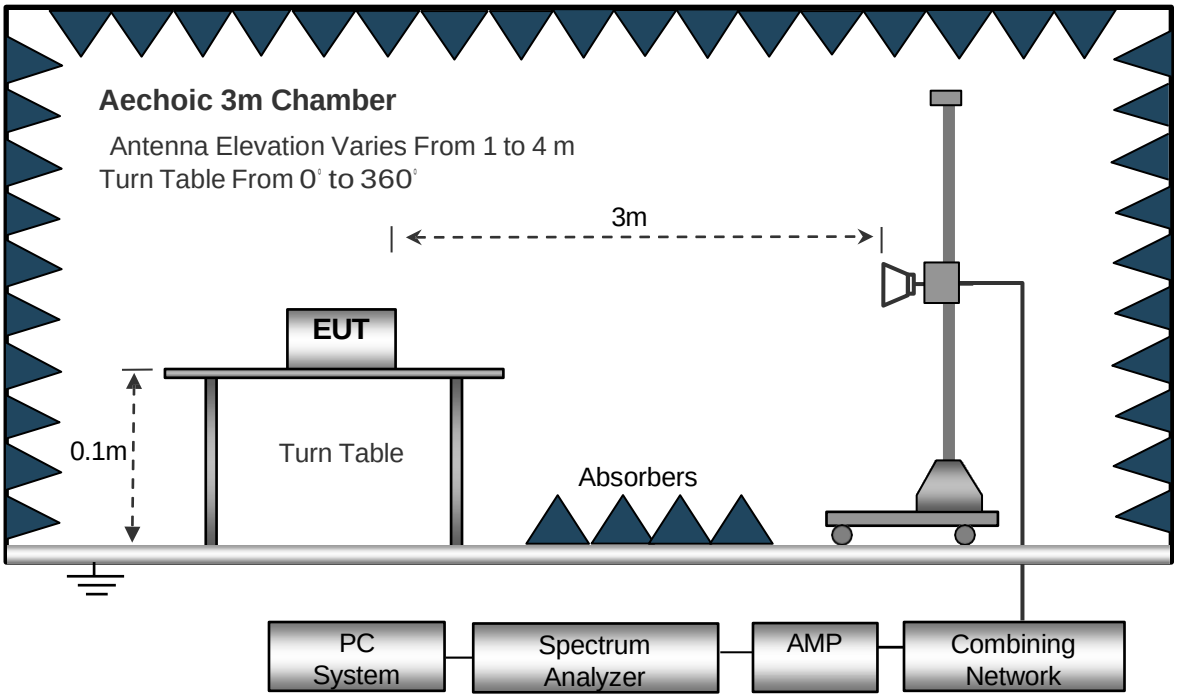
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B） Radiated Emission Test-Up Frequency 30MHz~1GHz



（C） Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

Temperature:	20℃	Relative Humidtity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 12V
Test Mode :	Mode 5	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);

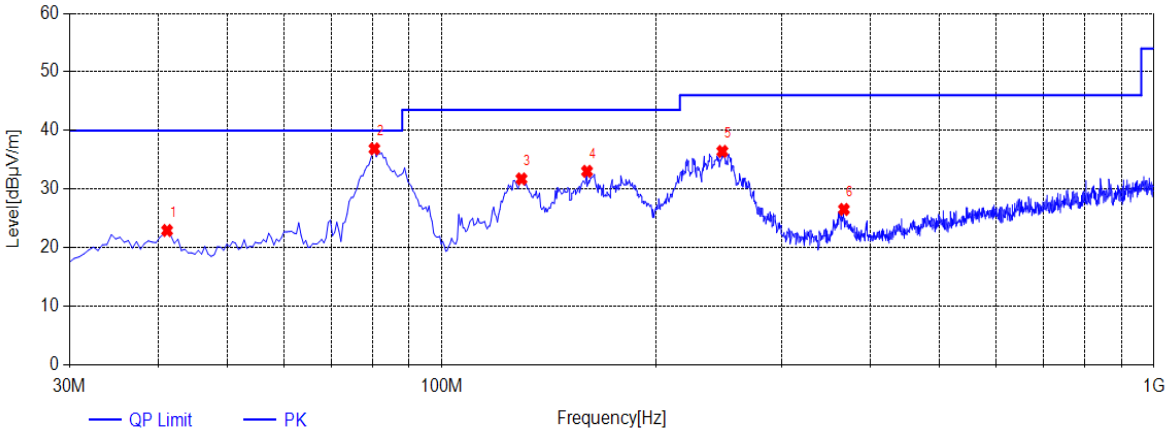
The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS (dBuV/m) = RA (dBuV) + AF (dB/m) + CL (dB) – AG (dB)

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

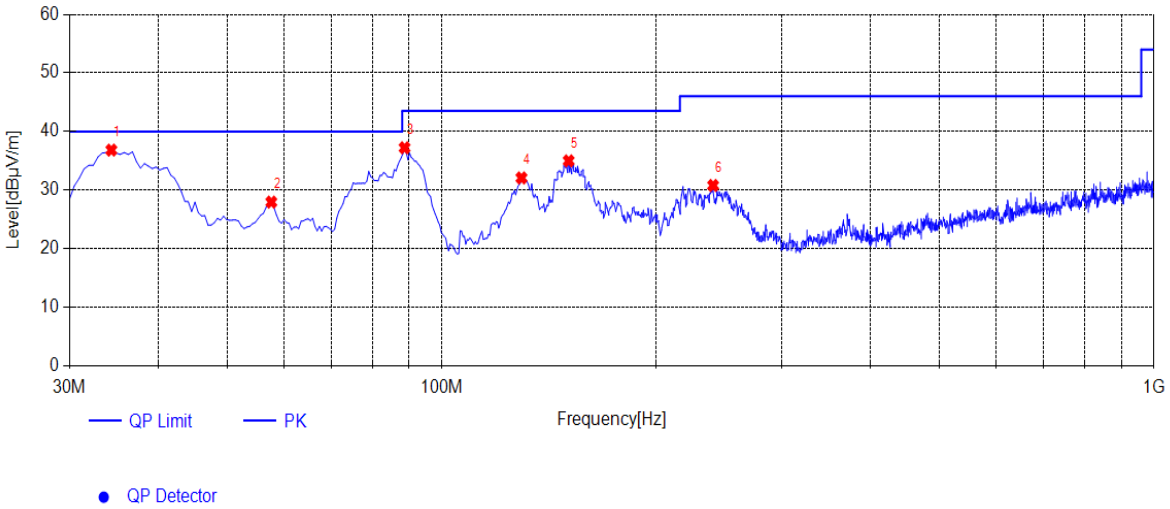
3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Horizontal
Test Voltage :	AC 120V/60Hz		
Test Mode :	Mode 1		



NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity	Remark
1	41.155	34.68	-11.77	22.91	40.00	17.09	QP	Horizonta	PASS
2	80.44	51.22	-14.36	36.86	40.00	3.14	QP	Horizonta	PASS
3	129.425	45.26	-13.54	31.72	43.50	11.78	QP	Horizonta	PASS
4	159.98	46.23	-13.21	33.02	43.50	10.48	QP	Horizonta	PASS
5	247.765	45.22	-8.80	36.42	46.00	9.58	QP	Horizonta	PASS
6	367.075	32.33	-5.82	26.51	46.00	19.49	QP	Horizonta	PASS

Temperature:	26℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization :	Vertical
Test Voltage :	AC 120V/60Hz		
Test Mode :	Mode 1		



NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity	Remark
1	34.365	49.32	-12.50	36.82	40.00	3.18	QP	Vertical	PASS
2	57.645	39.25	-11.32	27.93	40.00	12.07	QP	Vertical	PASS
3	88.685	50.67	-13.46	37.21	43.50	6.29	QP	Vertical	PASS
4	129.425	45.60	-13.54	32.06	43.50	11.44	QP	Vertical	PASS
5	150.765	49.10	-14.12	34.98	43.50	8.52	QP	Vertical	PASS
6	240.49	39.82	-9.05	30.77	46.00	15.23	QP	Vertical	PASS

Remark:

1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) – Pre Amplifier gain (dB).

3.2.8 TEST RESULTS (1GHZ~25GHZ)

IEEE 802.11b-the worst

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	4824.00	63.46	51.74	3.08	31.25	46.05	74	-27.95	PK
V	4824.00	57.68	51.74	3.08	31.25	40.27	54	-13.73	AV
V	7236.00	66.93	49.98	7.16	36.63	60.74	74	-13.26	PK
V	7236.00	53.52	49.98	7.16	36.63	47.33	54	-6.67	AV
V	16884.00	43.90	51.53	11.34	41.52	45.23	74	-28.77	PK
H	4824.00	64.29	51.74	3.08	31.25	46.88	74	-27.12	PK
H	4824.00	58.79	51.74	3.08	31.25	41.38	54	-12.62	AV
H	7236.00	63.81	49.98	7.16	36.63	57.62	74	-16.38	PK
H	7236.00	52.39	49.98	7.16	36.63	46.20	54	-7.80	AV
H	16884.00	46.84	51.53	11.34	41.52	48.17	74	-25.83	PK
operation frequency:2437									
V	4874.00	65.11	51.77	3.03	31.34	47.71	74	-26.29	PK
V	4874.00	55.32	51.77	3.03	31.34	37.92	54	-16.08	AV
V	7311.00	65.79	50.02	7.24	36.63	59.64	74	-14.36	PK
V	7311.00	55.76	50.02	7.24	36.63	49.61	54	-4.39	AV
V	17059.00	41.03	51.53	11.34	41.52	42.36	74	-31.64	PK
H	4874.00	65.43	51.77	3.03	31.34	48.03	74	-25.97	PK
H	4874.00	58.35	51.77	3.03	31.34	40.95	54	-13.05	AV
H	7311.00	68.37	50.02	7.24	36.63	62.22	74	-11.78	PK
H	7311.00	55.01	50.02	7.24	36.63	48.86	54	-5.14	AV
H	17059.00	45.13	51.53	11.34	41.52	46.46	74	-27.54	PK
operation frequency:2462									
V	4924.00	67.20	51.69	3.05	31.39	49.95	74	-24.05	PK
V	4924.00	57.72	51.69	3.05	31.39	40.47	54	-13.53	AV
V	7386.00	68.37	50.11	7.25	36.58	62.09	74	-11.91	PK
V	7386.00	56.19	50.11	7.25	36.58	49.91	54	-4.09	AV
V	17234.00	47.24	51.53	11.34	41.52	48.57	74	-25.43	PK
H	4924.00	67.43	51.69	3.05	31.39	50.18	74	-23.82	PK
H	4924.00	58.16	51.69	3.05	31.39	40.91	54	-13.09	AV
H	7386.00	67.01	50.11	7.25	36.58	60.73	74	-13.27	PK
H	7386.00	55.65	50.11	7.25	36.58	49.37	54	-4.63	AV
H	17234.00	43.34	51.53	11.34	41.52	44.67	74	-29.33	PK

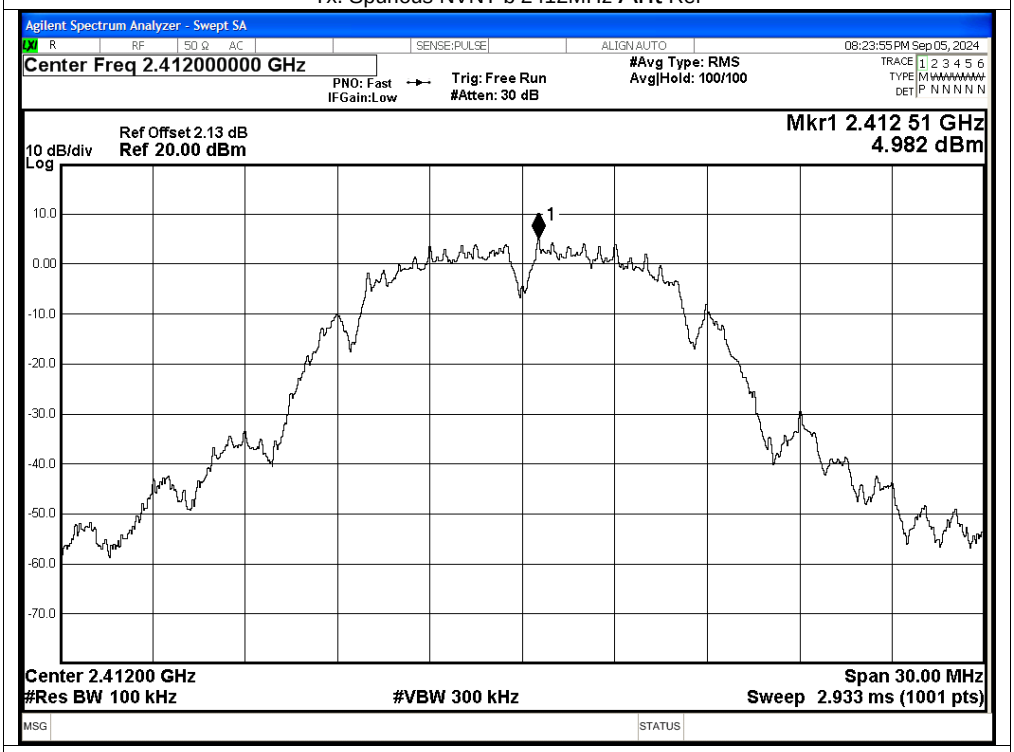
Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4. NOTE: All the modes have been tested and recorded worst mode in the report.

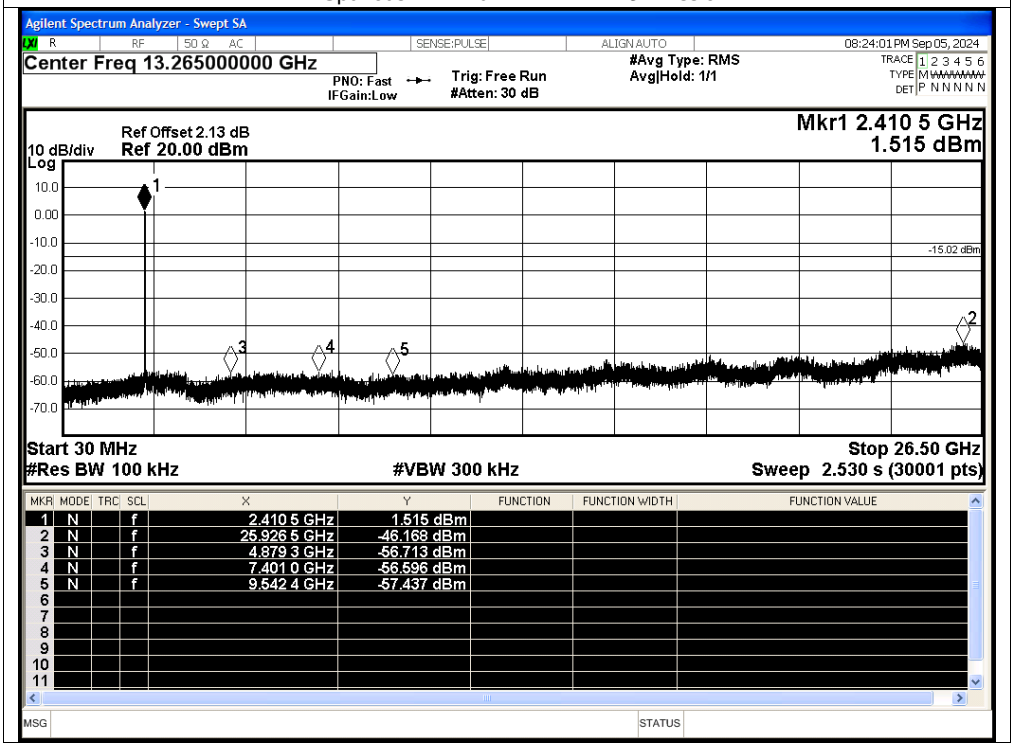
For Conducted

Test Graphs

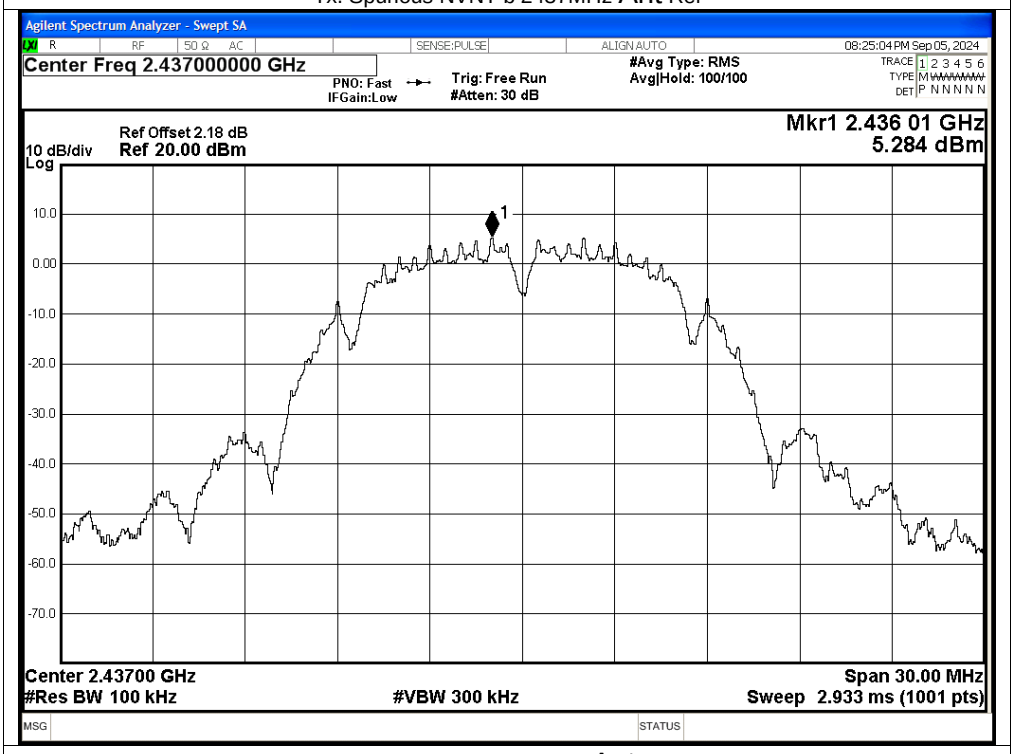
Tx. Spurious NVNT b 2412MHz Ant Ref



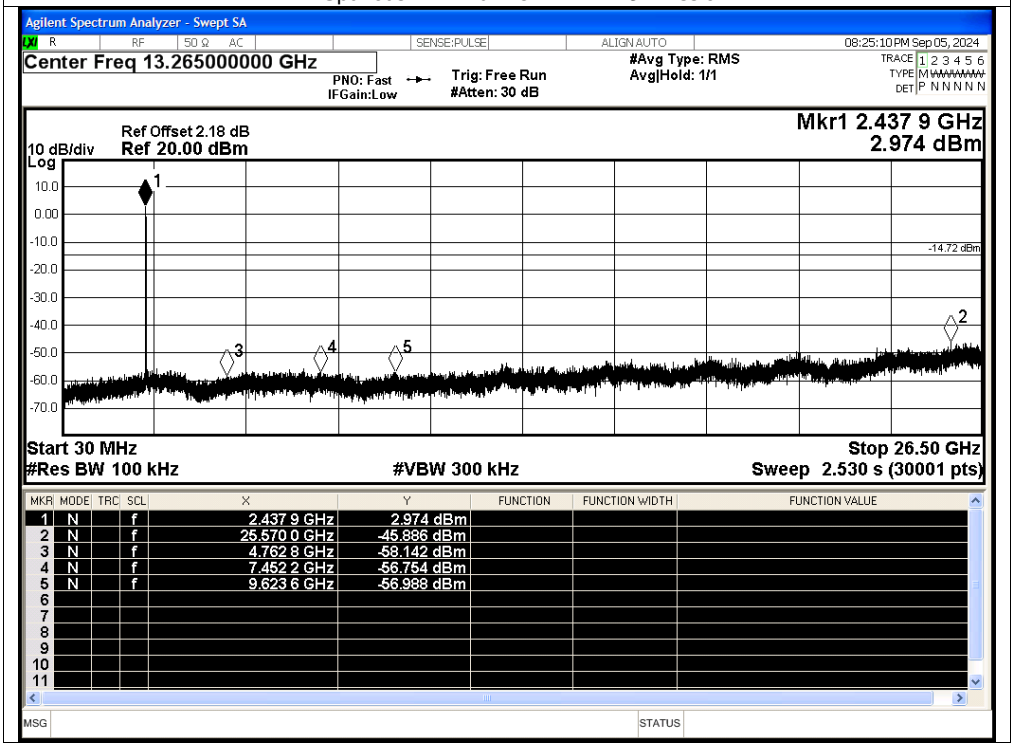
Tx. Spurious NVNT b 2412MHz Ant Emission



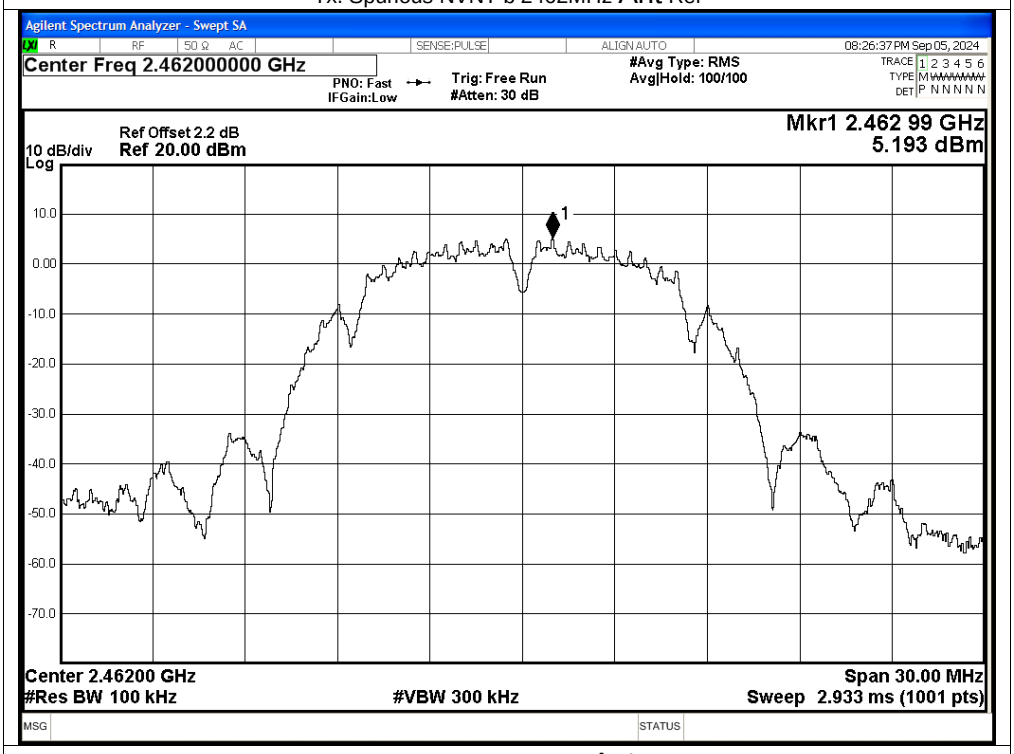
Tx. Spurious NVNT b 2437MHz Ant Ref



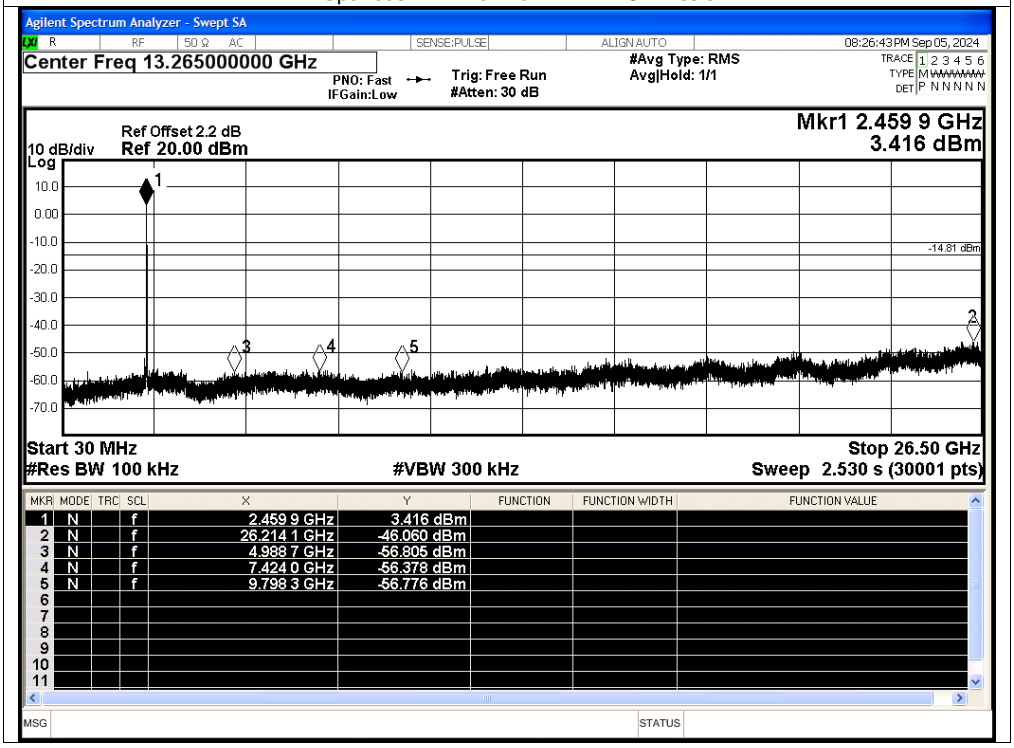
Tx. Spurious NVNT b 2437MHz Ant Emission



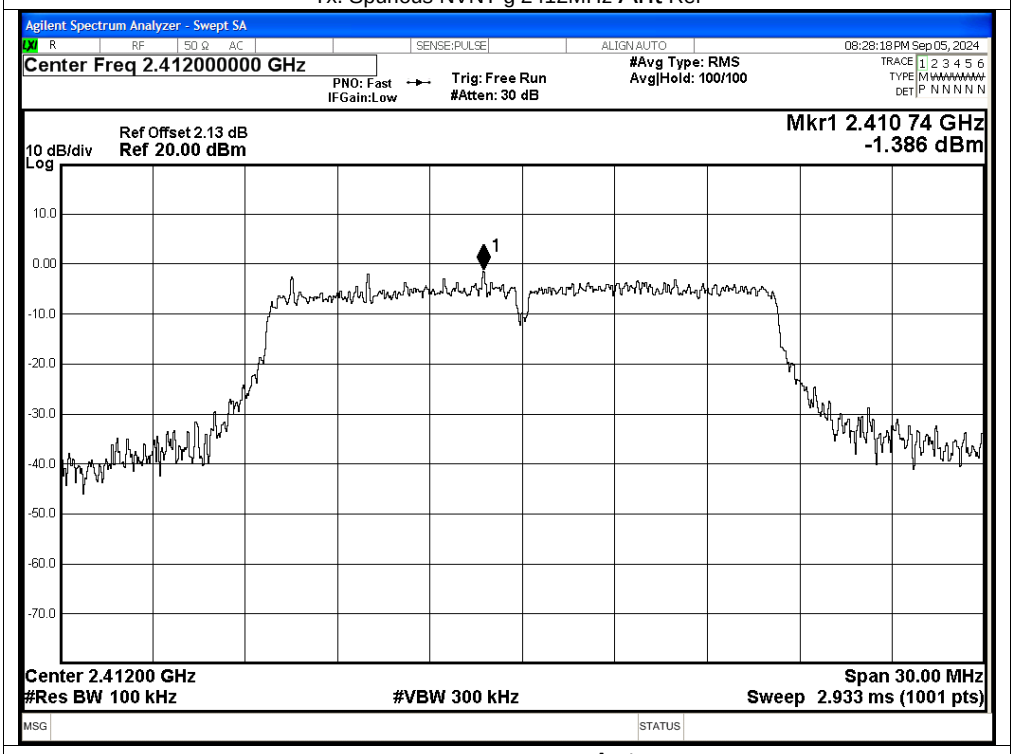
Tx. Spurious NVNT b 2462MHz Ant Ref



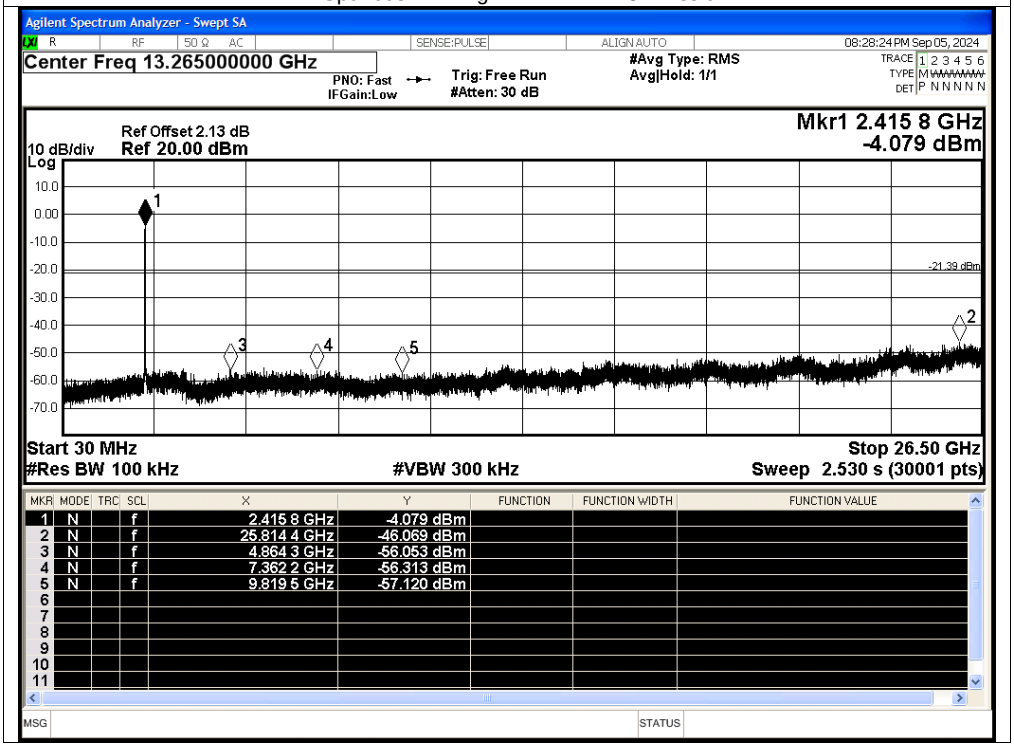
Tx. Spurious NVNT b 2462MHz Ant Emission



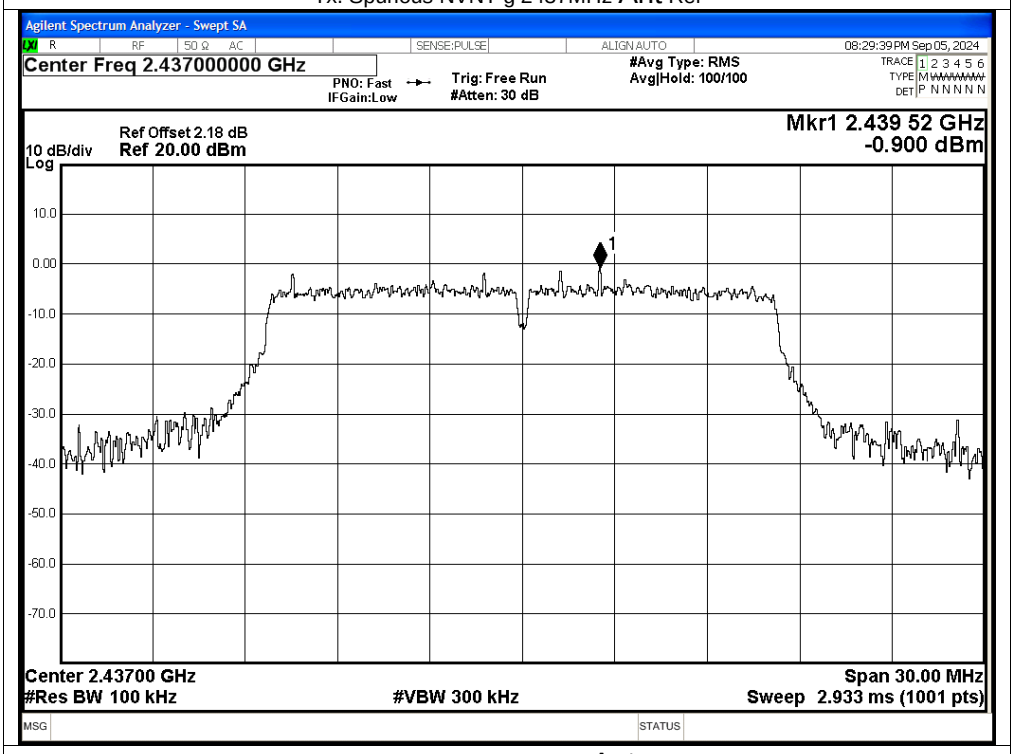
Tx. Spurious NVNT g 2412MHz Ant Ref



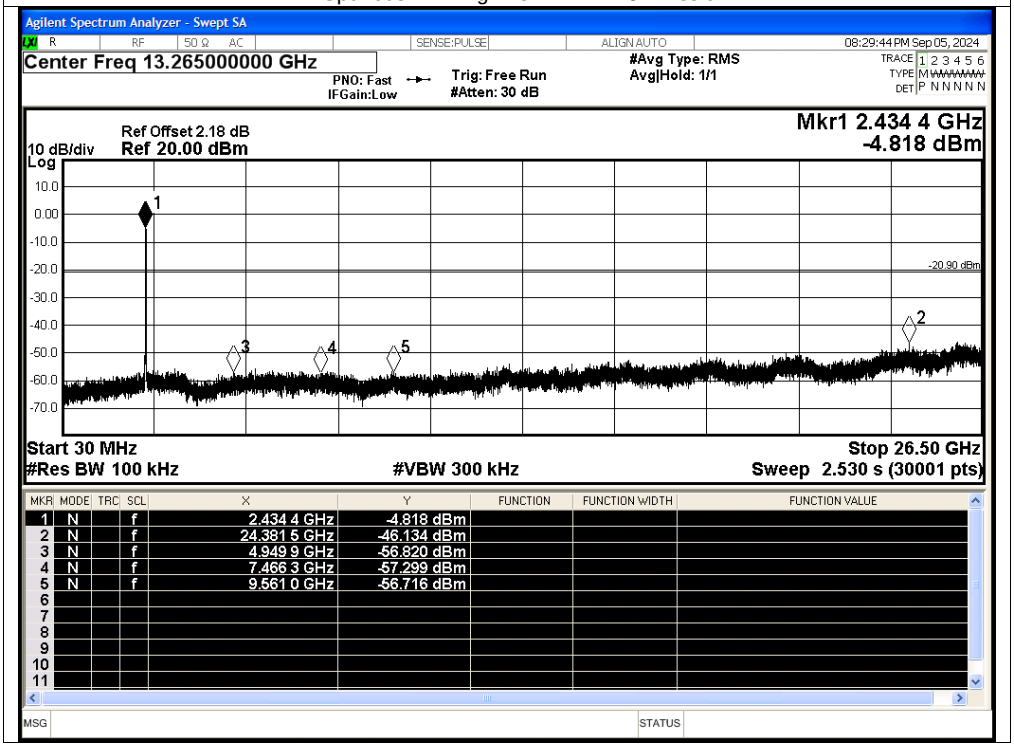
Tx. Spurious NVNT g 2412MHz Ant Emission



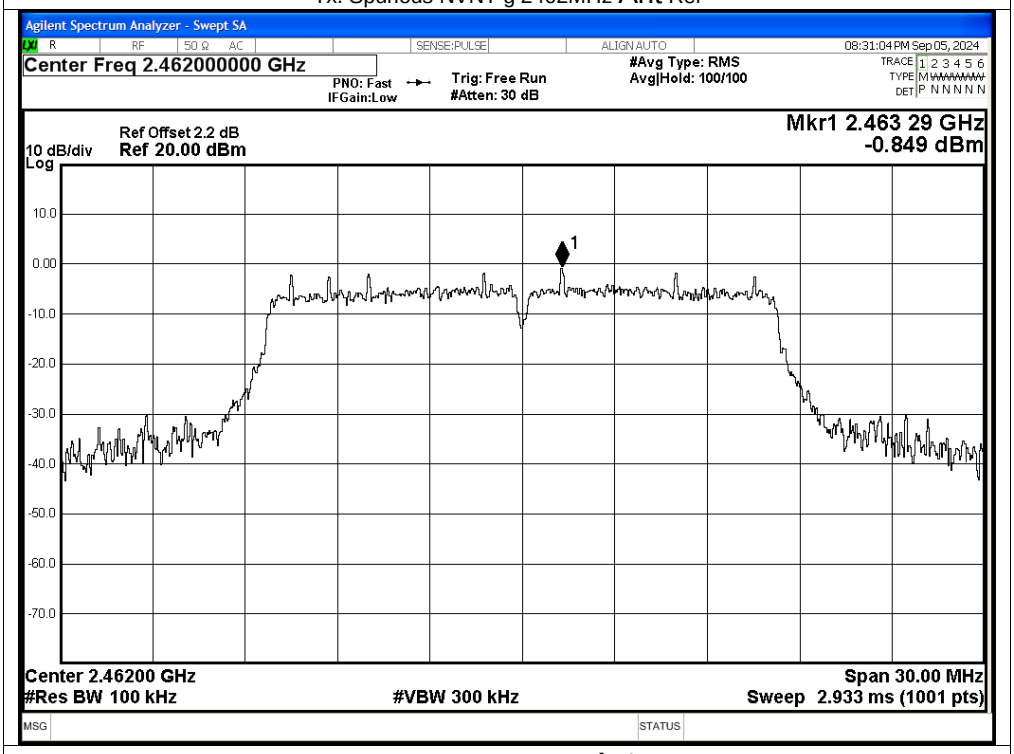
Tx. Spurious NVNT g 2437MHz Ant Ref



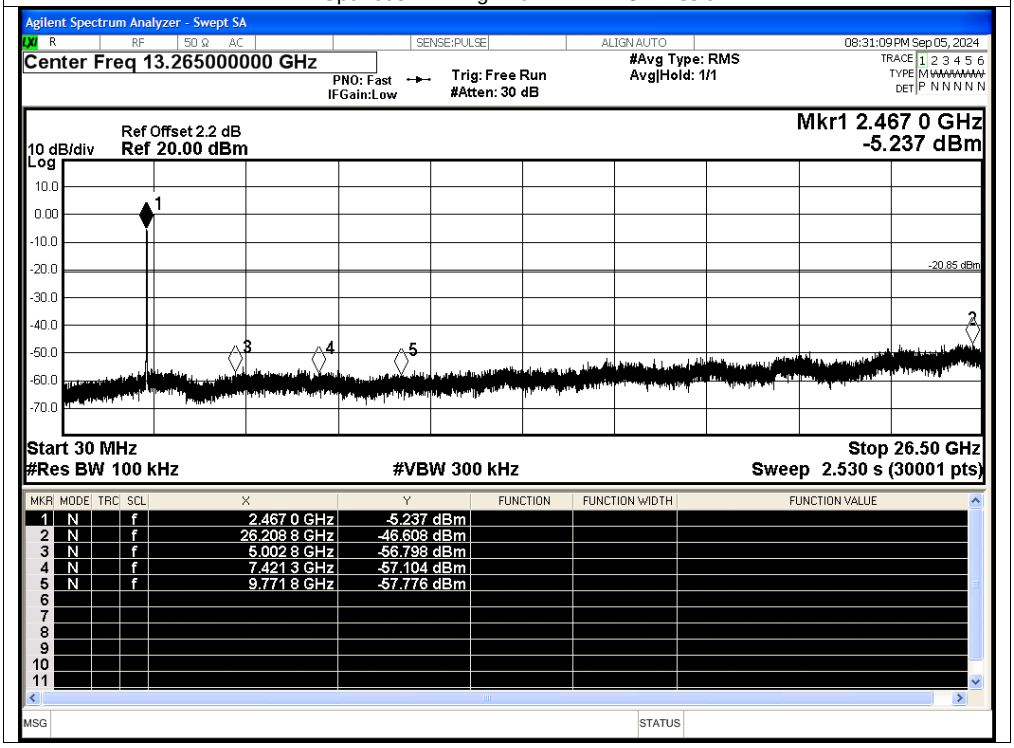
Tx. Spurious NVNT g 2437MHz Ant Emission



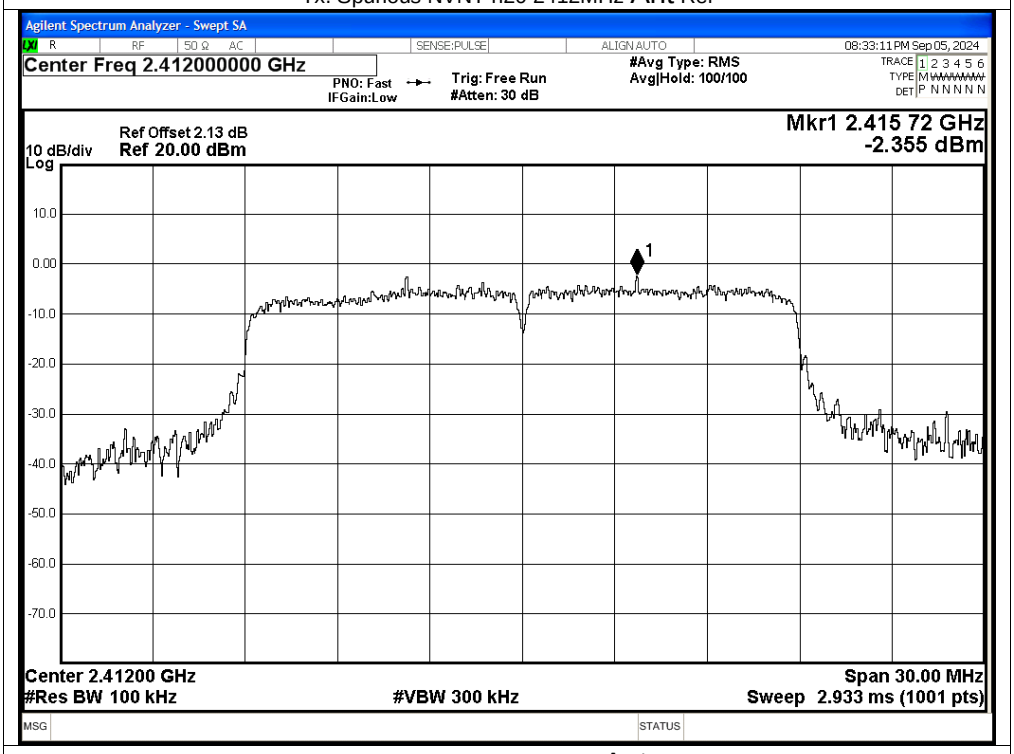
Tx. Spurious NVNT g 2462MHz Ant Ref



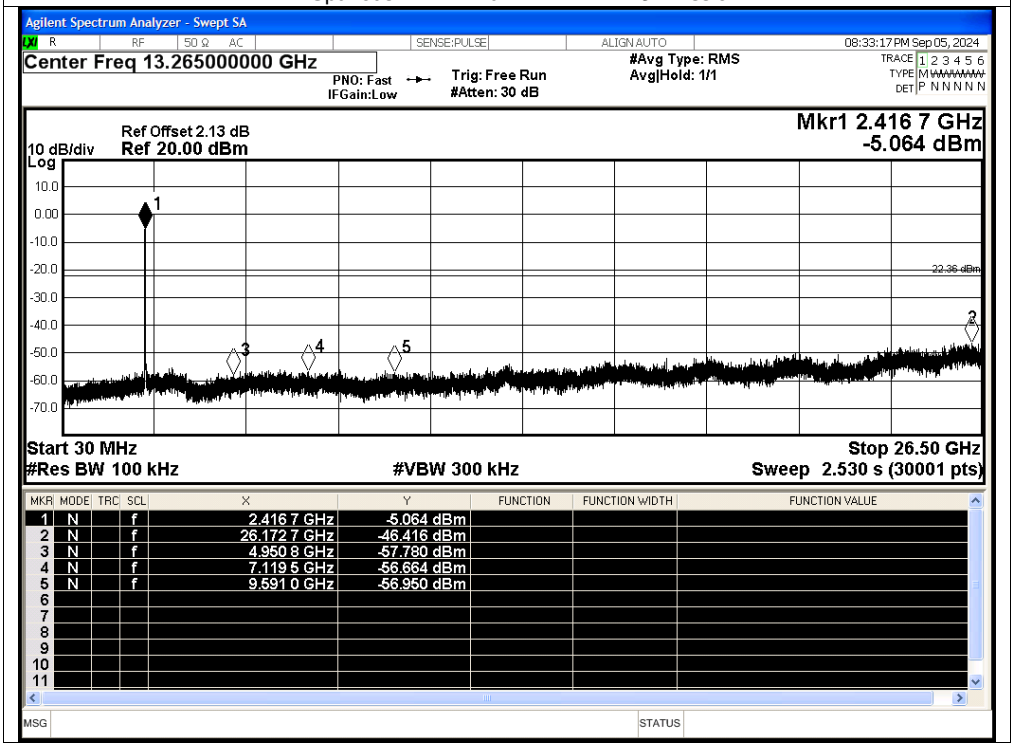
Tx. Spurious NVNT g 2462MHz Ant Emission



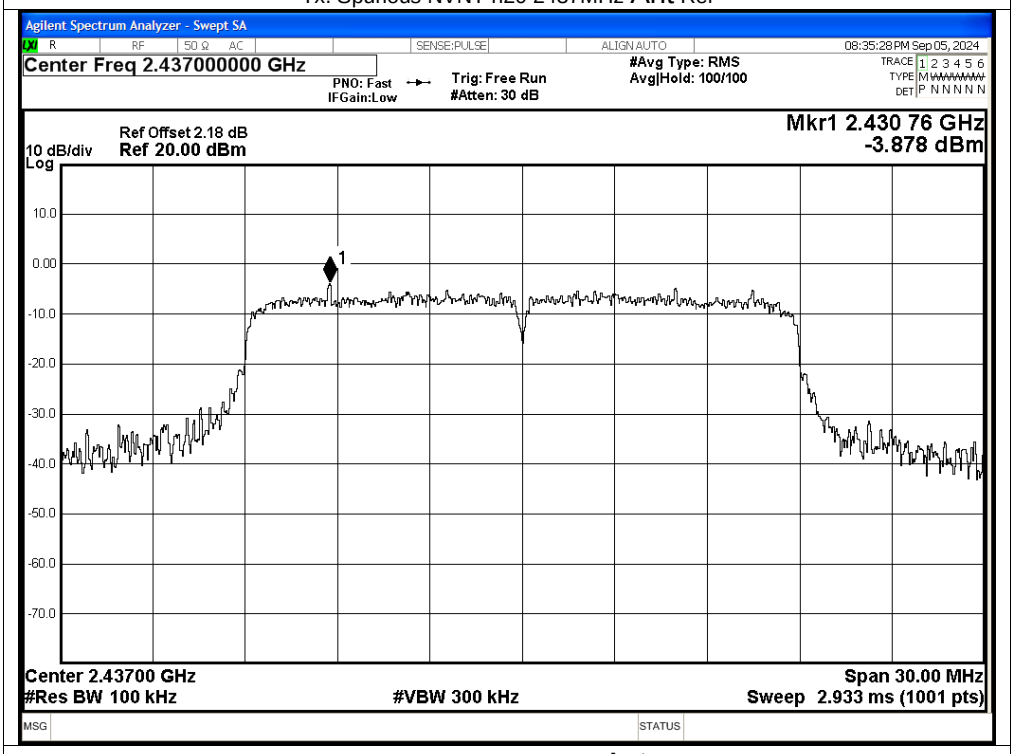
Tx. Spurious NVNT n20 2412MHz Ant Ref



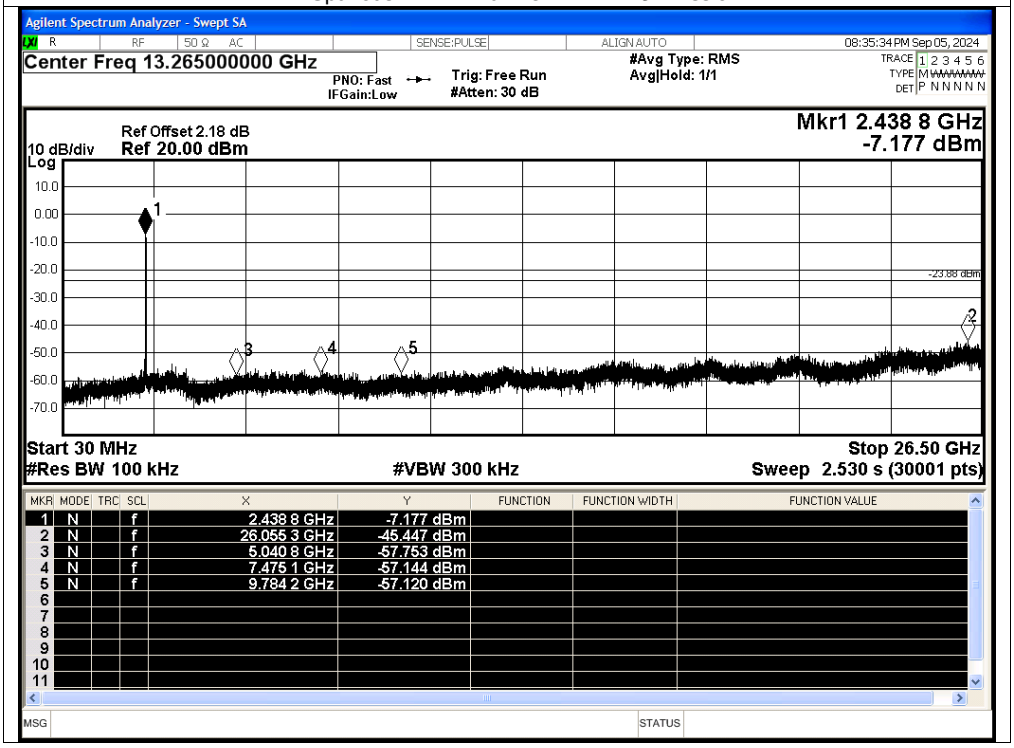
Tx. Spurious NVNT n20 2412MHz Ant Emission



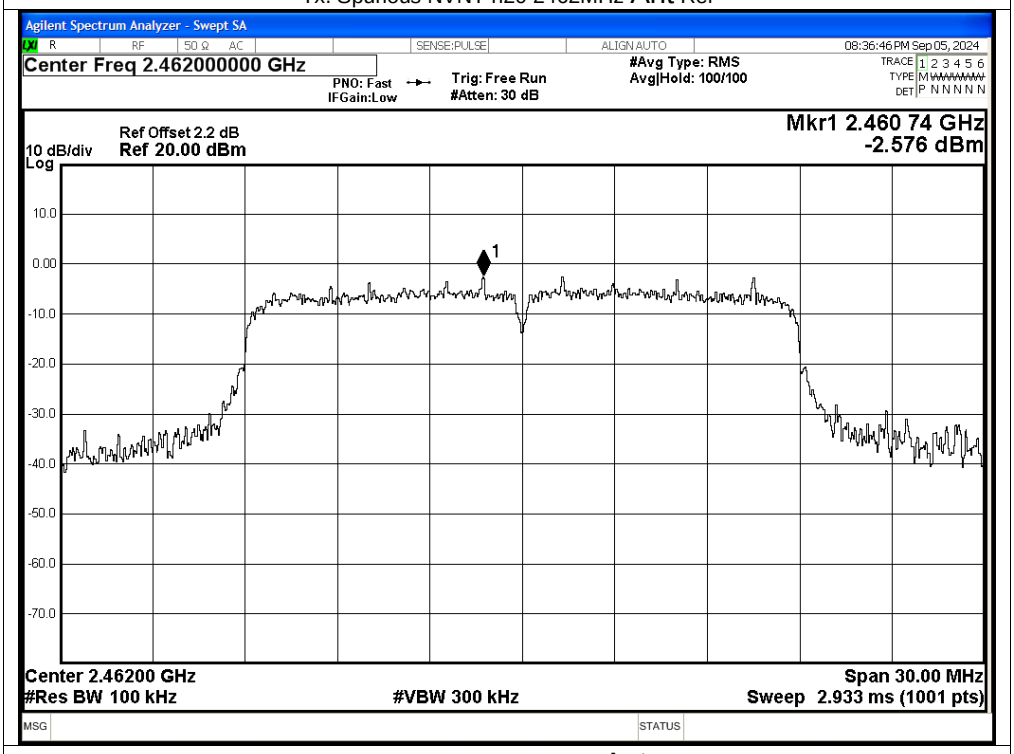
Tx. Spurious NVNT n20 2437MHz Ant Ref



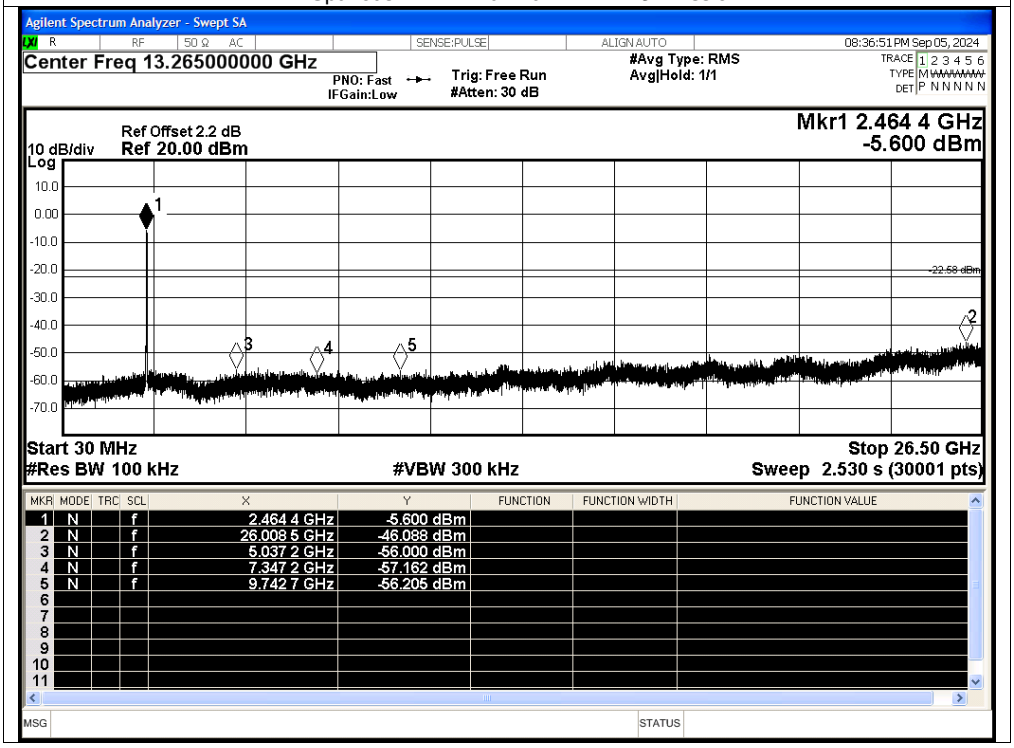
Tx. Spurious NVNT n20 2437MHz Ant Emission



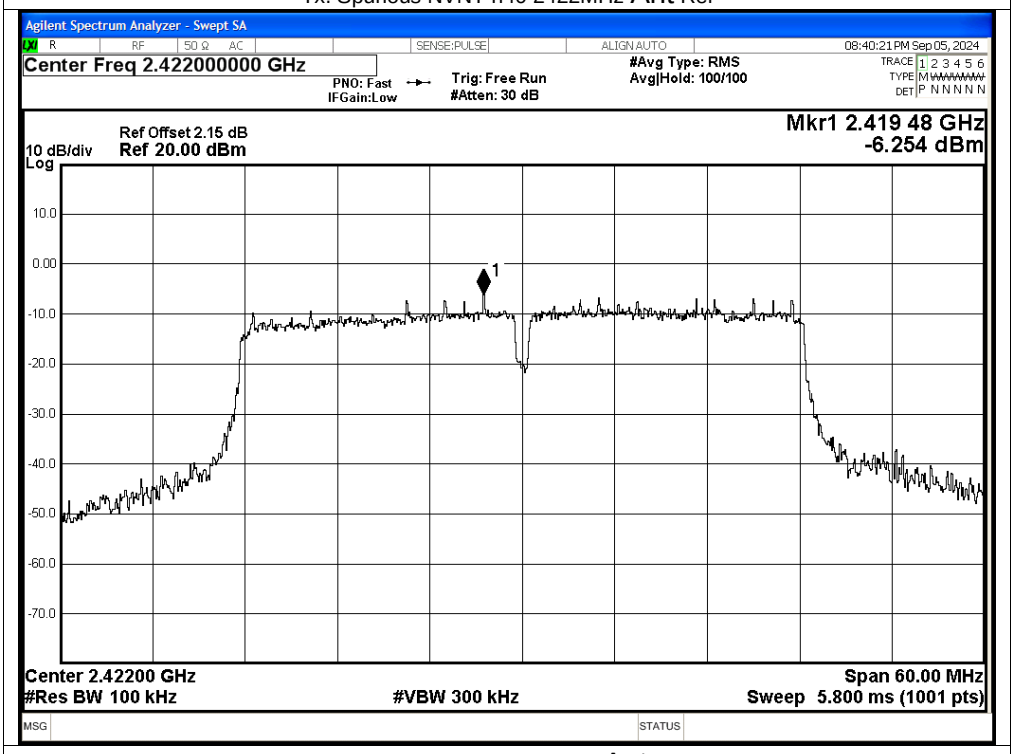
Tx. Spurious NVNT n20 2462MHz Ant Ref



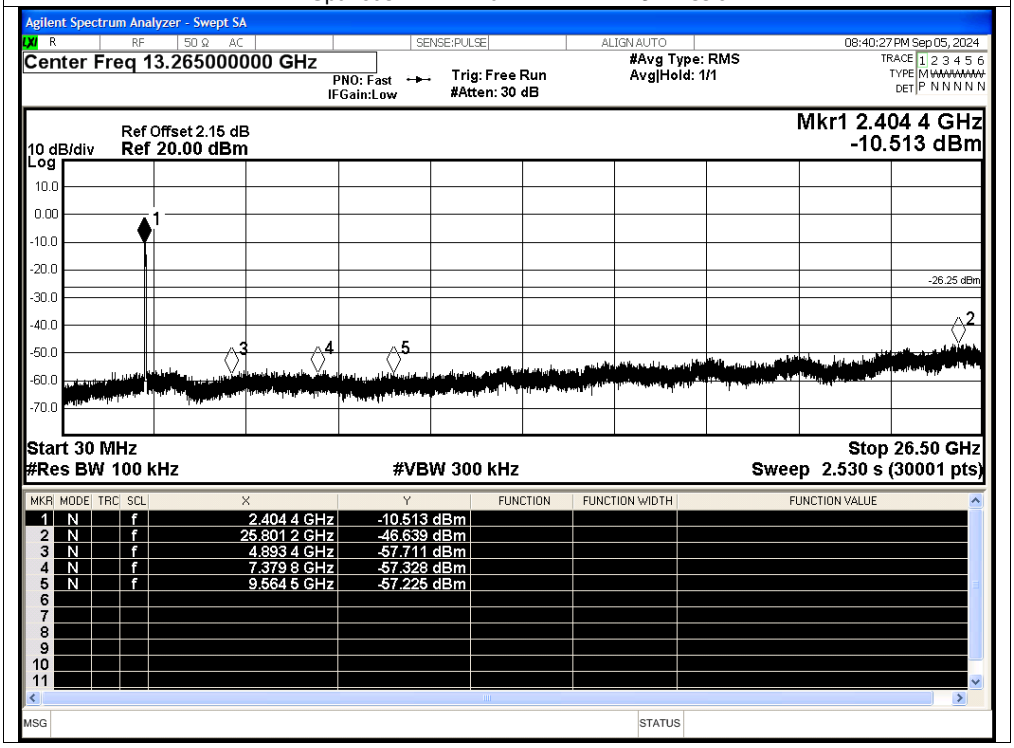
Tx. Spurious NVNT n20 2462MHz Ant Emission



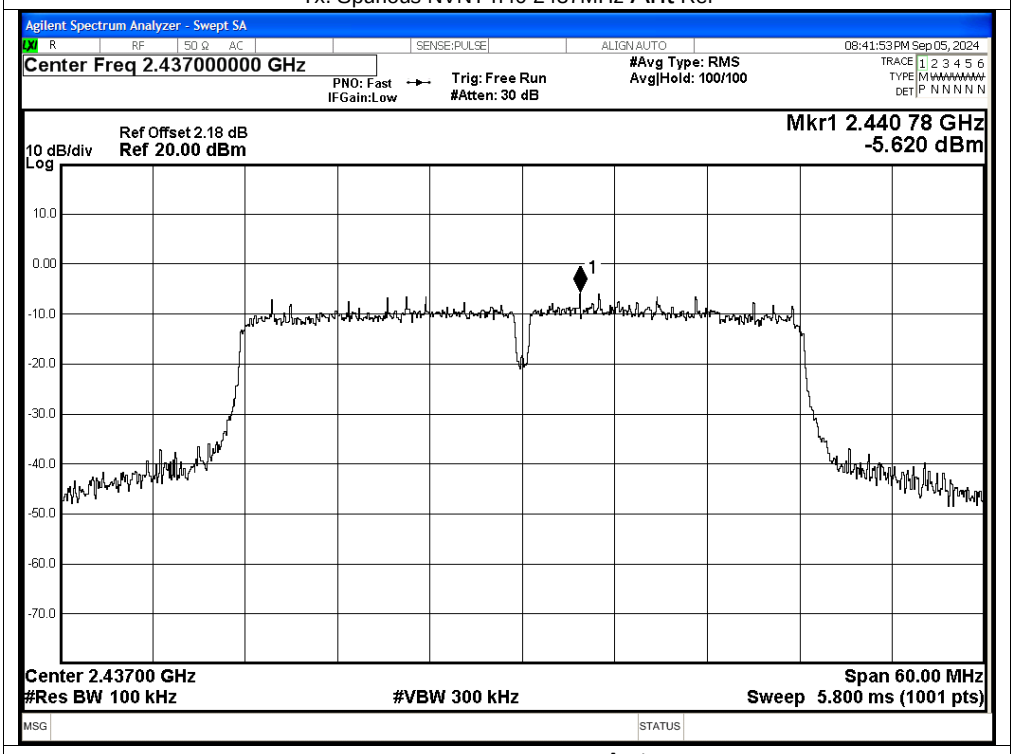
Tx. Spurious NVNT n40 2422MHz Ant Ref



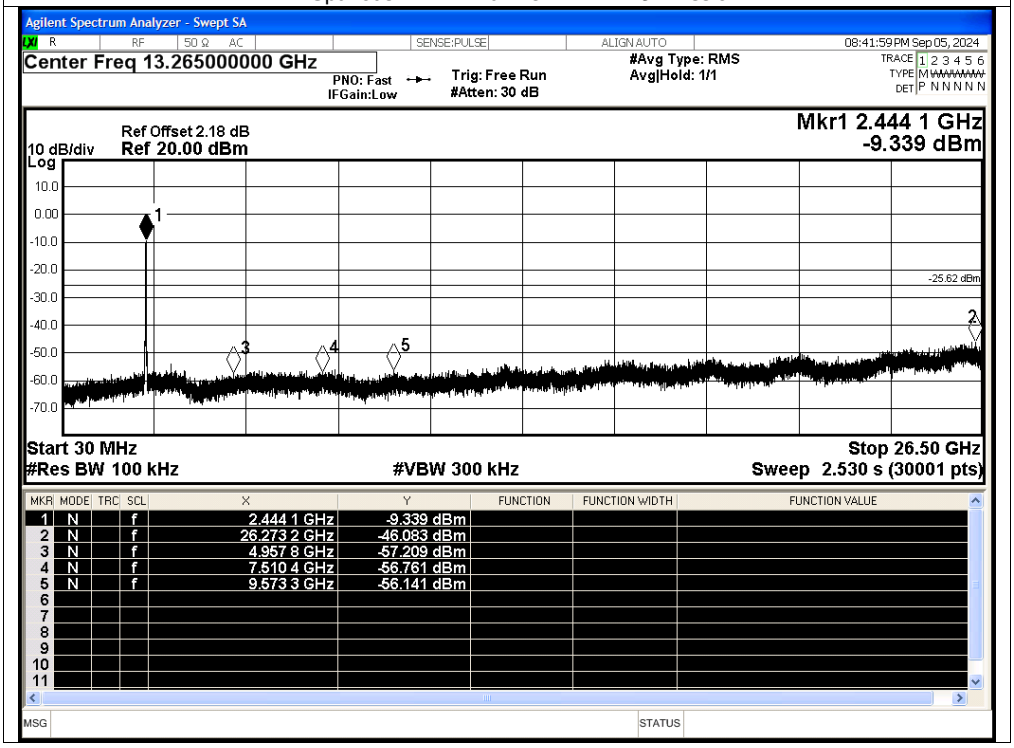
Tx. Spurious NVNT n40 2422MHz Ant Emission



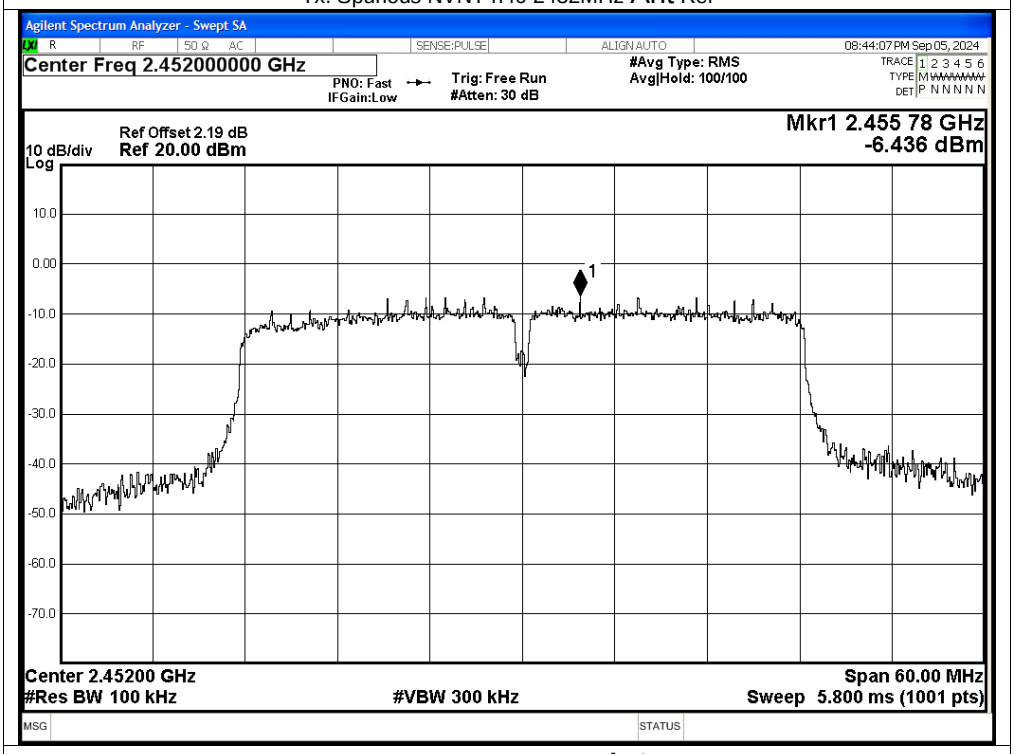
Tx. Spurious NVNT n40 2437MHz Ant Ref



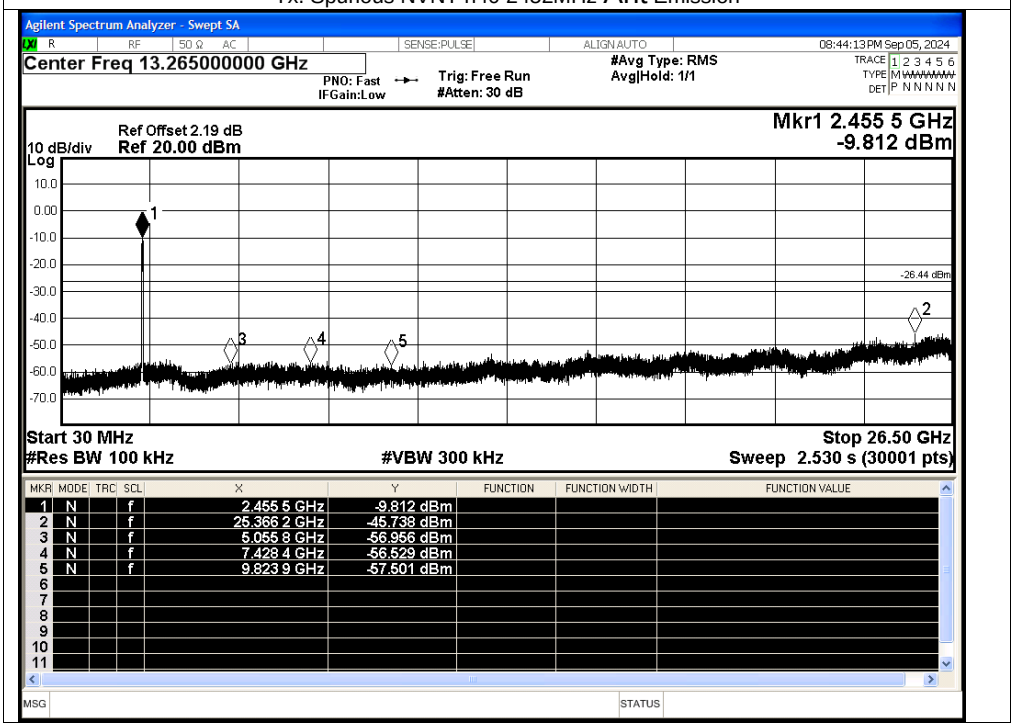
Tx. Spurious NVNT n40 2437MHz Ant Emission



Tx. Spurious NVNT n40 2452MHz Ant Ref



Tx. Spurious NVNT n40 2452MHz Ant Emission



3.3 RADIATED BAND EMISSION MEASUREMENT

3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Limit (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

a. 1. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel,the Highest channel

Note:

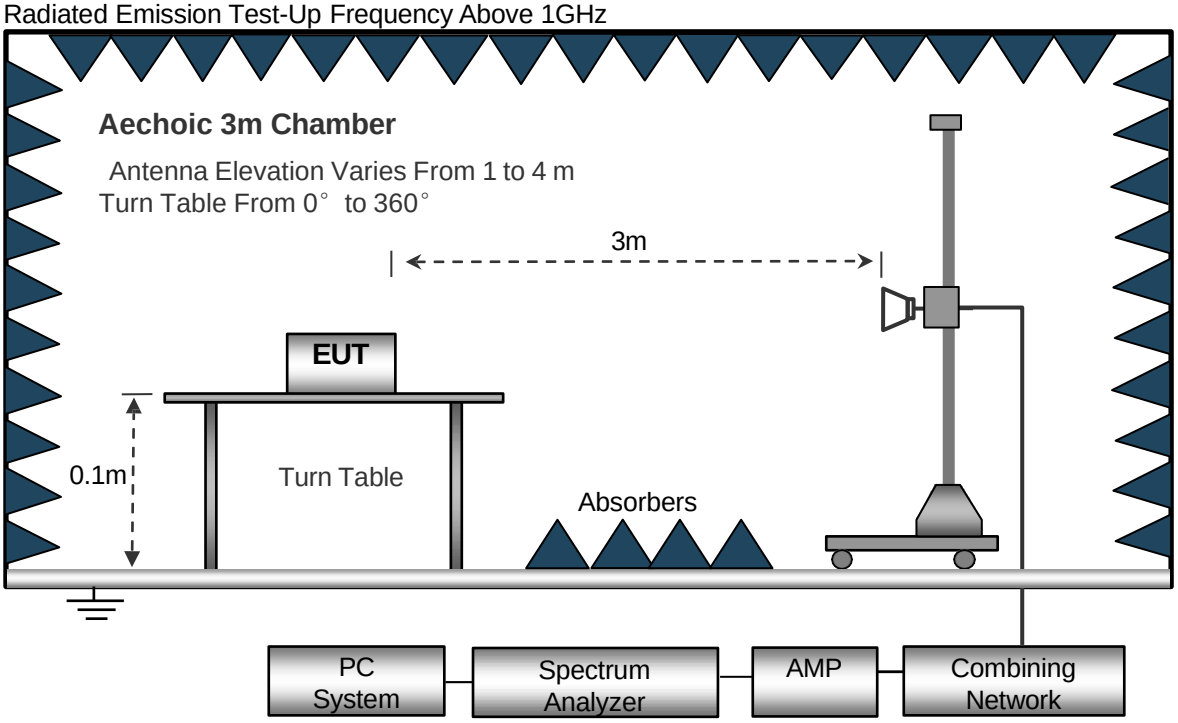
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP

Radiated Emission Test-Up Frequency Above 1GHz



3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.6 TEST RESULT

IEEE 802.11b(the worst)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2412									
V	2390.00	74.33	52.12	2.73	27.38	52.32	74	-21.68	PK
V	2390.00	62.56	52.12	2.73	27.38	40.55	54	-13.45	AV
V	2400.00	74.96	52.16	2.78	27.41	52.99	74	-21.01	PK
V	2400.00	63.34	52.16	2.78	27.41	41.37	54	-12.63	AV
H	2390.00	76.89	52.12	2.73	27.38	54.88	74	-19.12	PK
H	2390.00	66.16	52.12	2.73	27.38	44.15	54	-9.85	AV
H	2400.00	75.32	52.16	2.78	27.41	53.35	74	-20.65	PK
H	2400.00	67.84	52.16	2.78	27.41	45.87	54	-8.13	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2462									
V	2483.50	77.04	52.23	2.86	27.44	55.11	74	-18.89	PK
V	2483.50	65.62	52.23	2.86	27.44	43.69	54	-10.31	AV
V	2500.00	77.47	52.26	2.88	27.49	55.58	74	-18.42	PK
V	2500.00	65.96	52.26	2.88	27.49	44.07	54	-9.93	AV
H	2483.50	75.90	52.23	2.86	27.44	53.97	74	-20.03	PK
H	2483.50	66.92	52.23	2.86	27.44	44.99	54	-9.01	AV
H	2500.00	75.04	52.26	2.88	27.49	53.15	74	-20.85	PK
H	2500.00	67.25	52.26	2.88	27.49	45.36	54	-8.64	AV

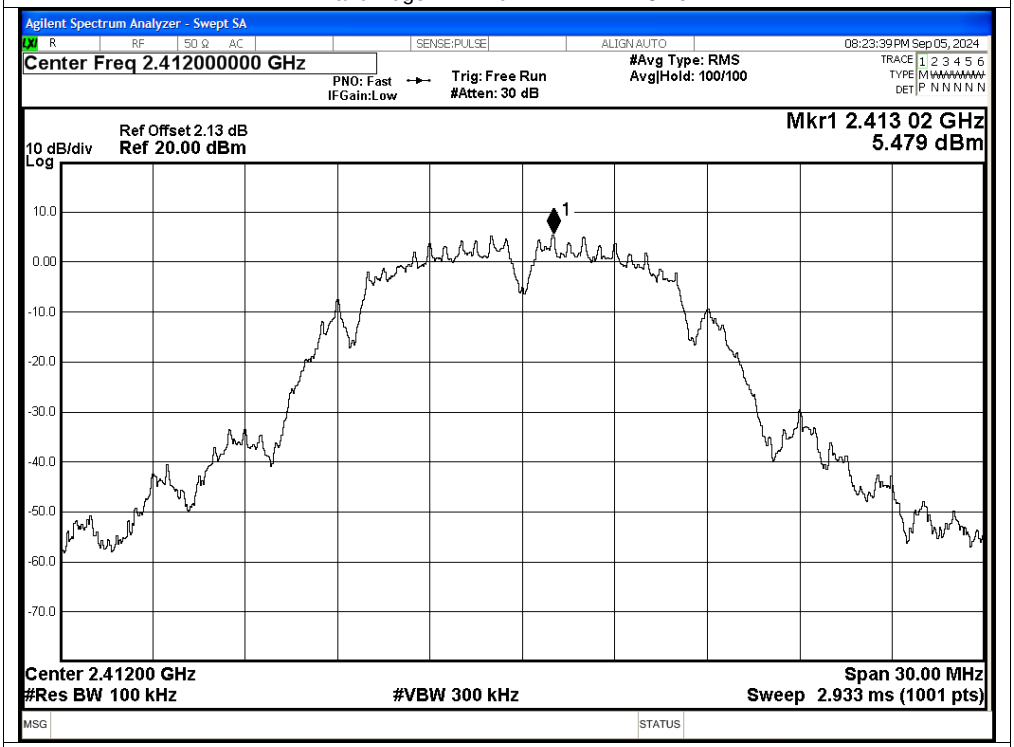
Remark:

1. Emission Level = Meter Reading + Factor, Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

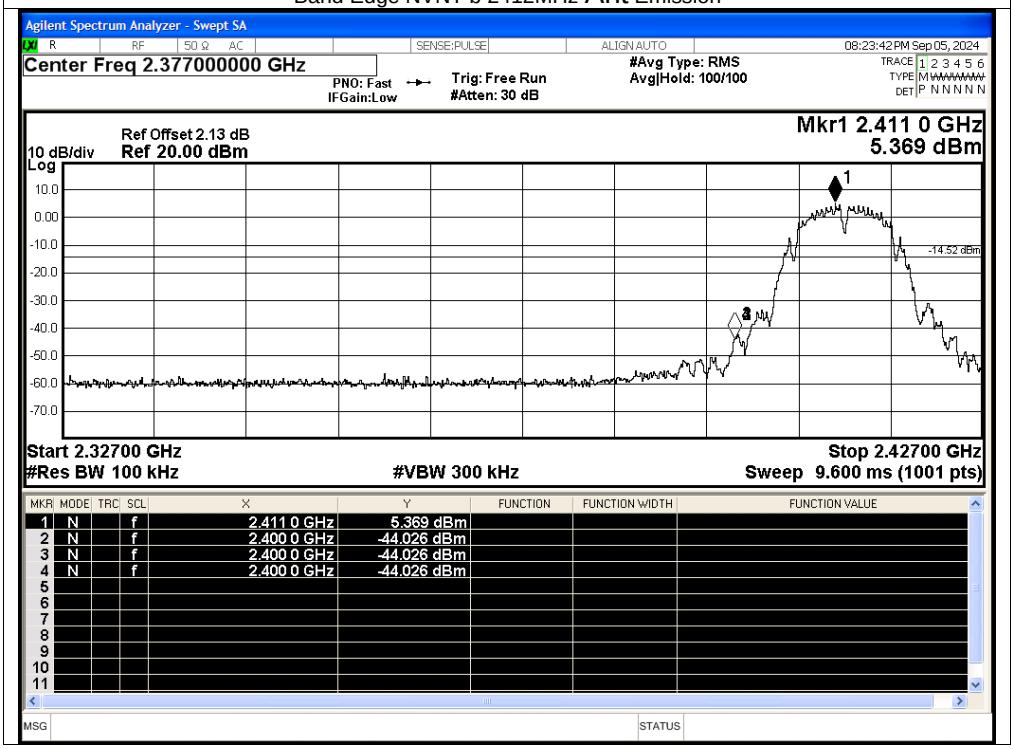
For Conducted

Test Graphs

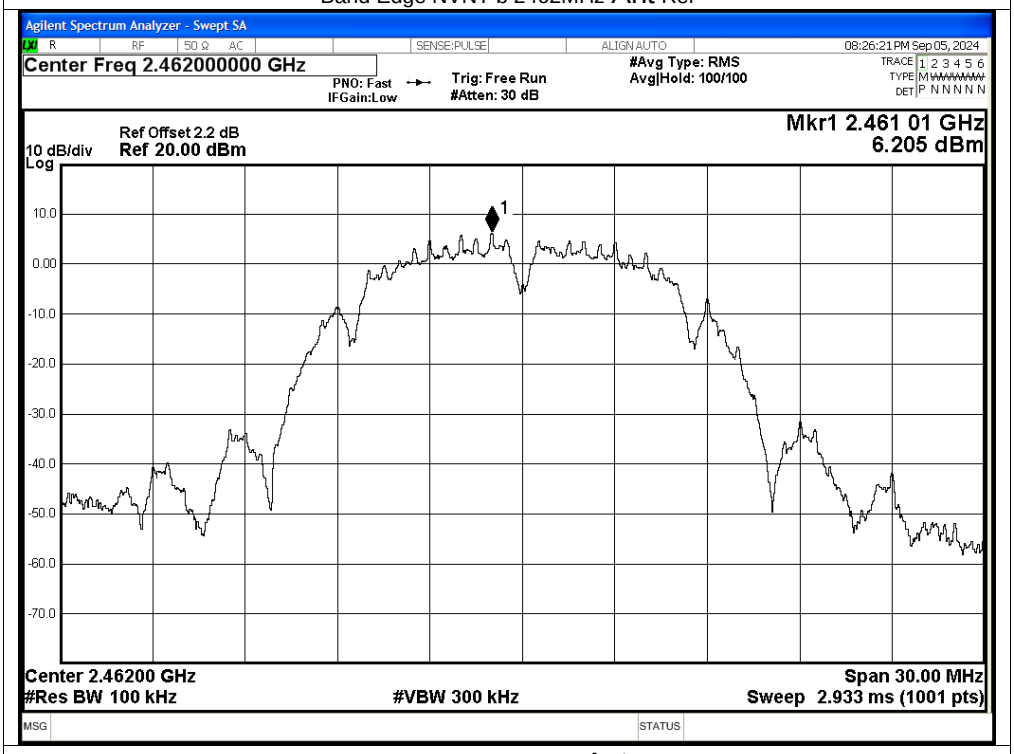
Band Edge NVNT b 2412MHz Ant Ref



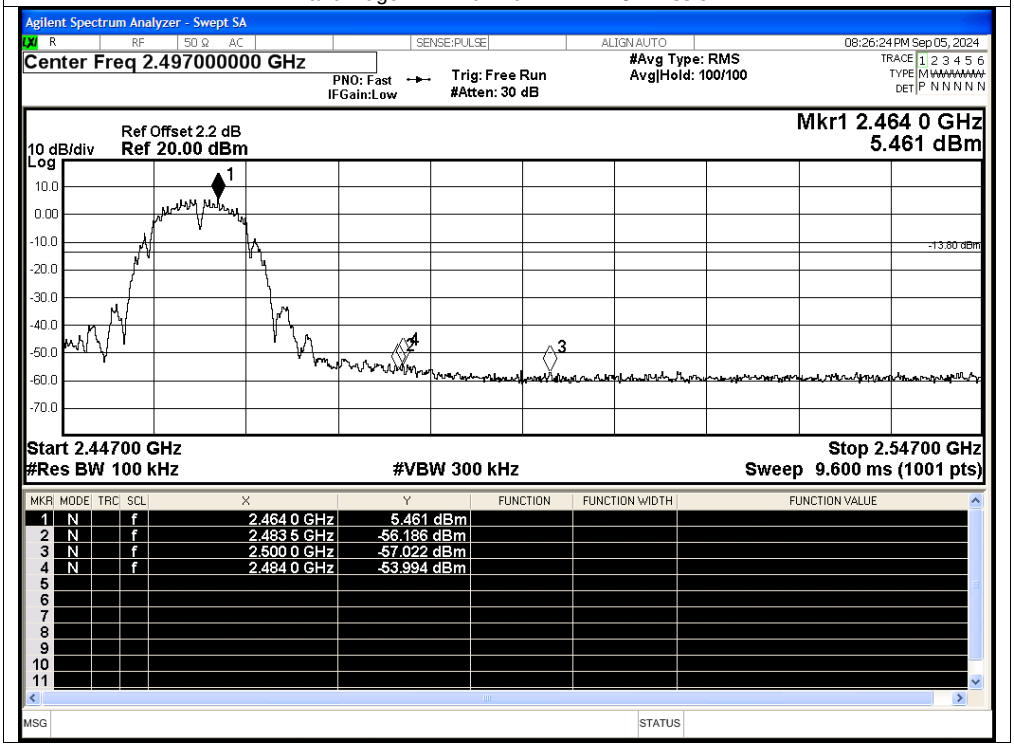
Band Edge NVNT b 2412MHz Ant Emission



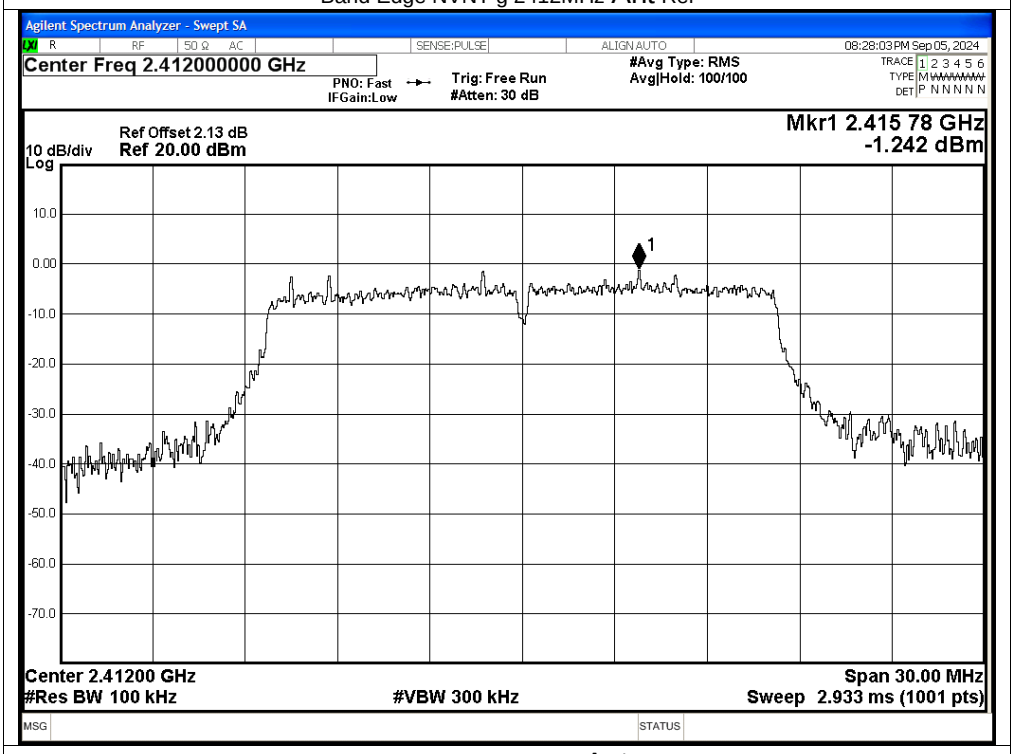
Band Edge NVNT b 2462MHz Ant Ref



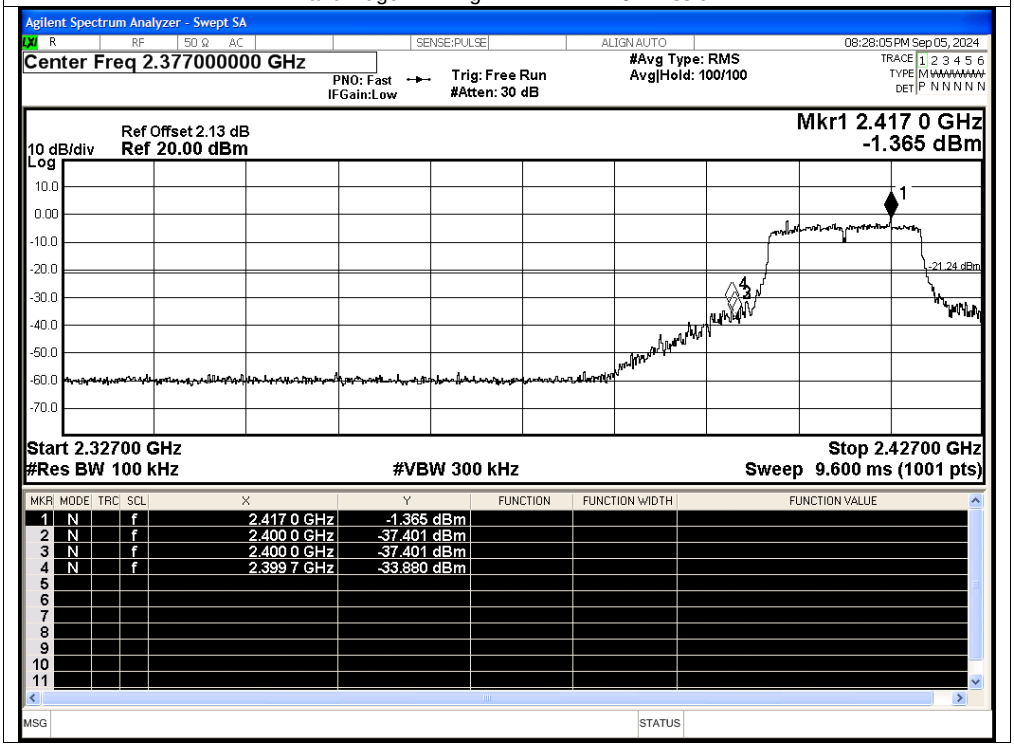
Band Edge NVNT b 2462MHz Ant Emission



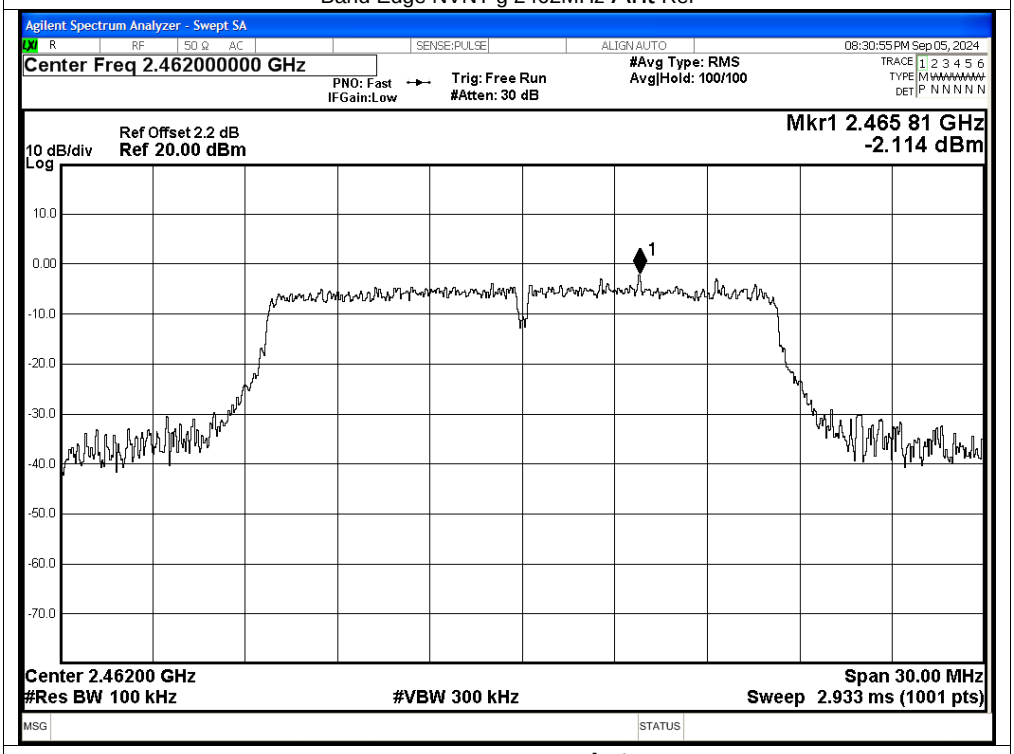
Band Edge NVNT g 2412MHz Ant Ref



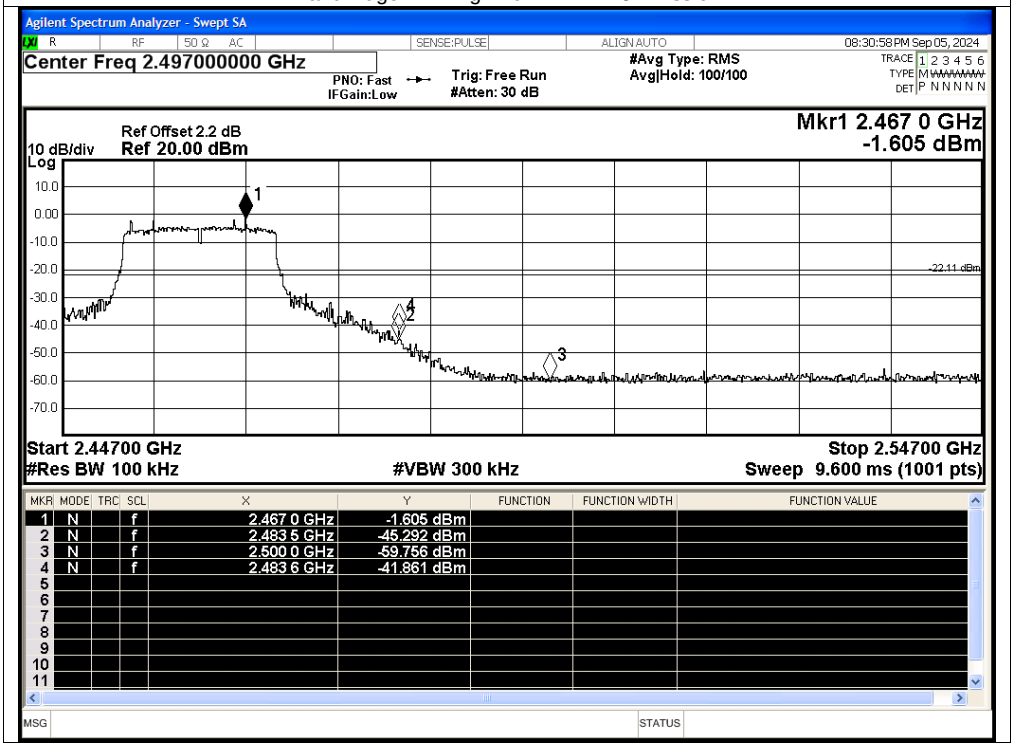
Band Edge NVNT g 2412MHz Ant Emission



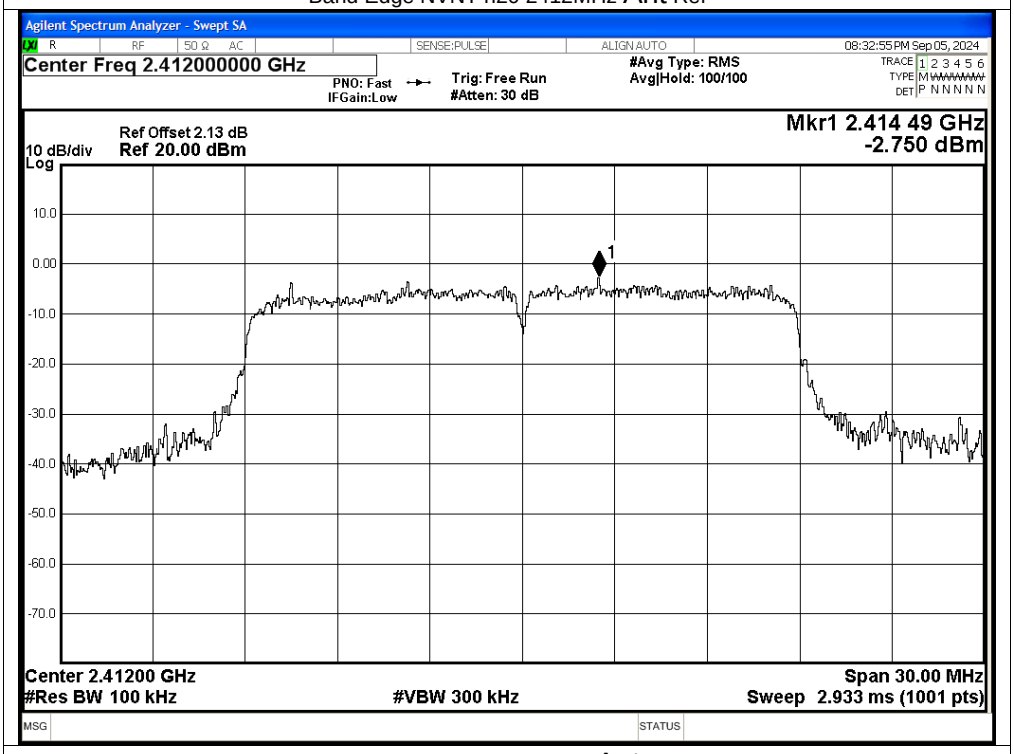
Band Edge NVNT g 2462MHz Ant Ref



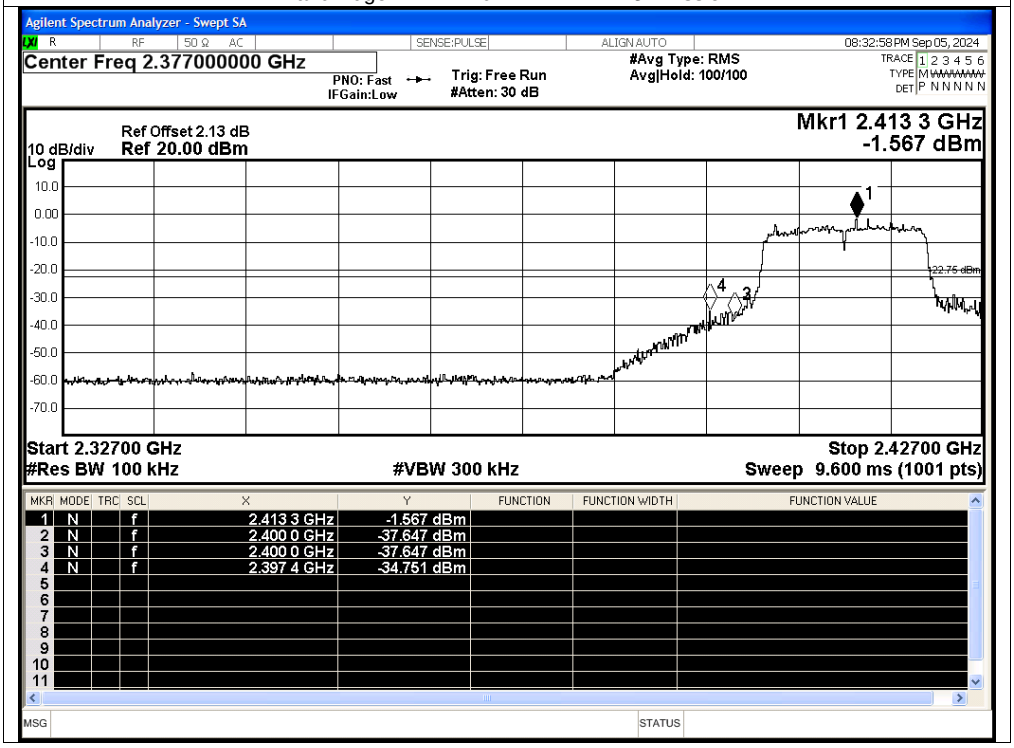
Band Edge NVNT g 2462MHz Ant Emission



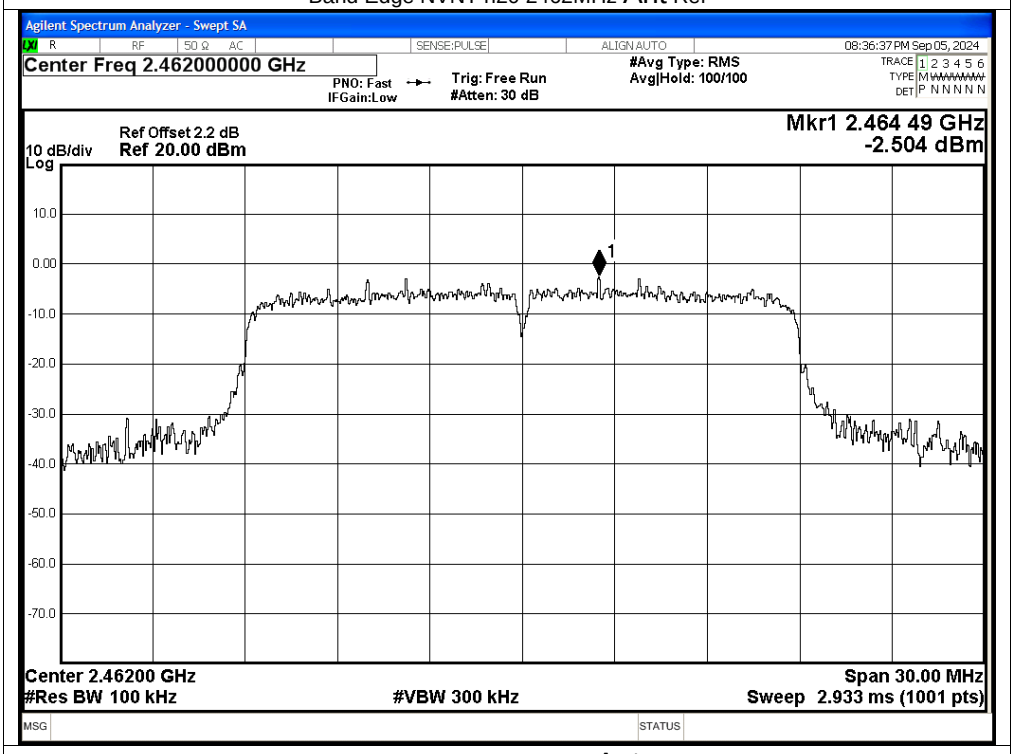
Band Edge NVNT n20 2412MHz Ant Ref



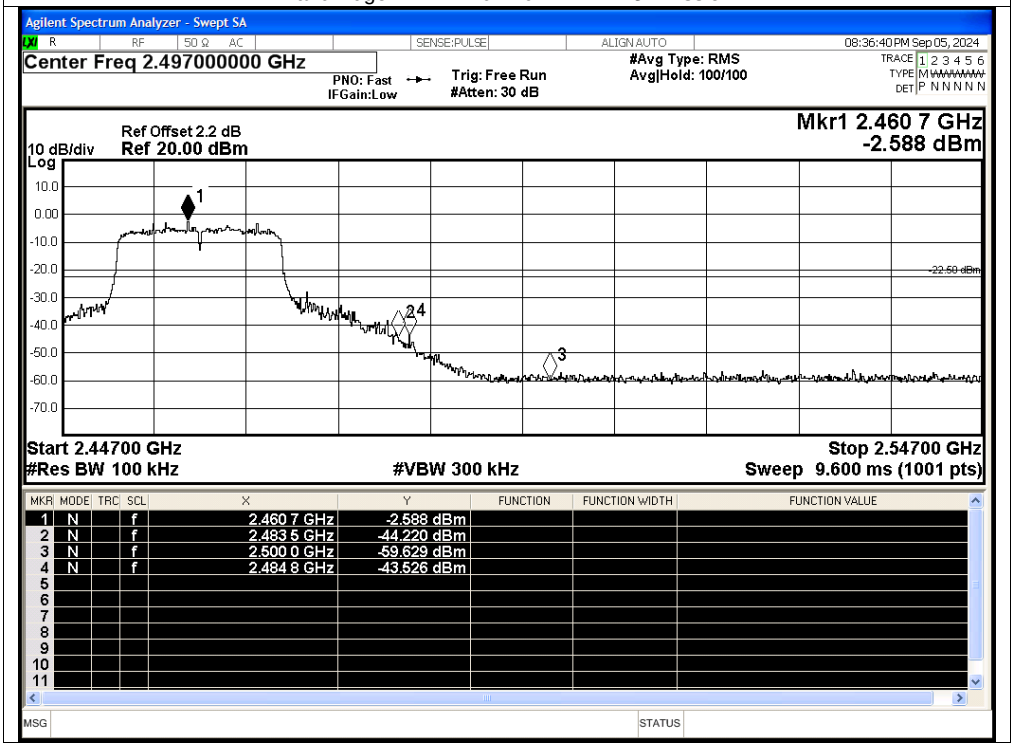
Band Edge NVNT n20 2412MHz Ant Emission



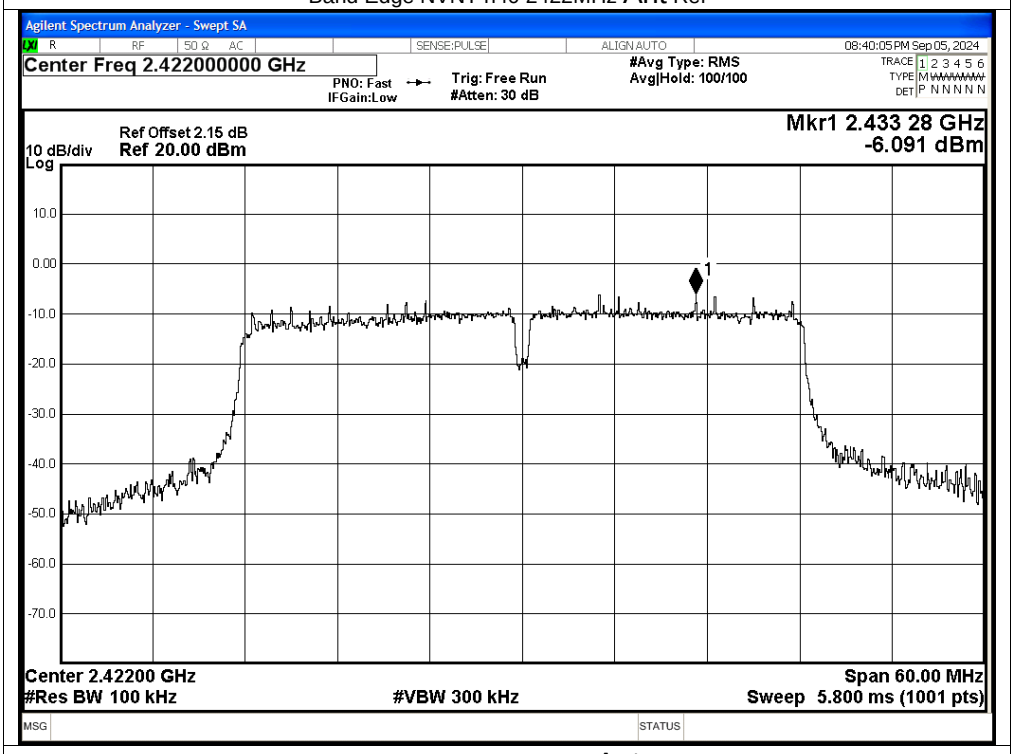
Band Edge NVNT n20 2462MHz Ant Ref



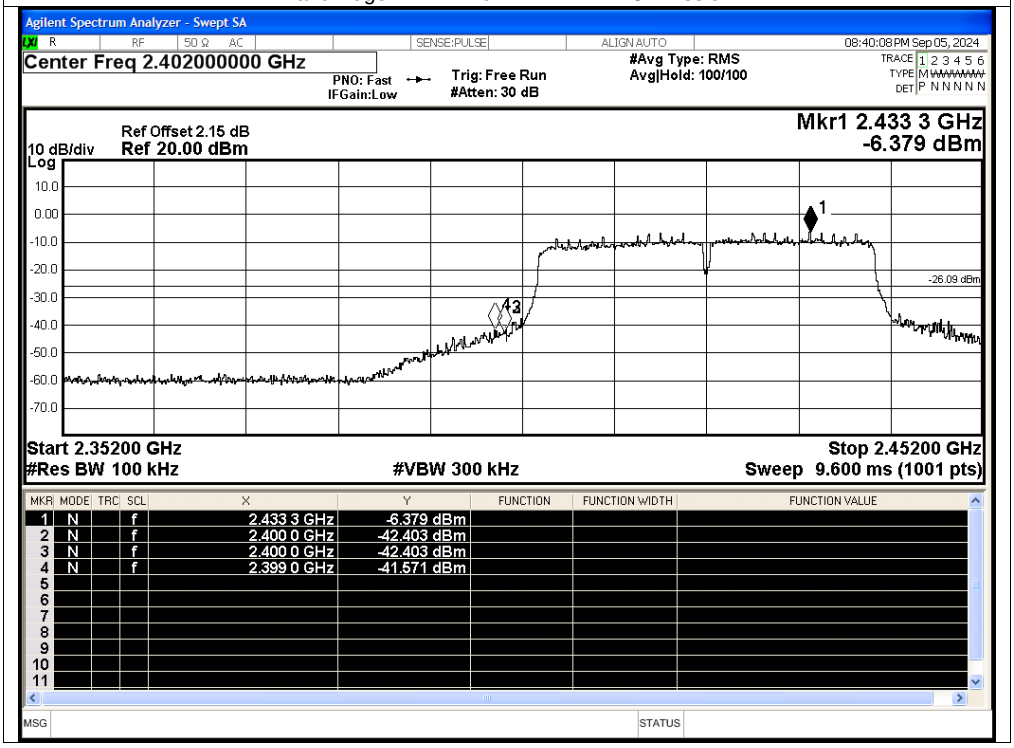
Band Edge NVNT n20 2462MHz Ant Emission



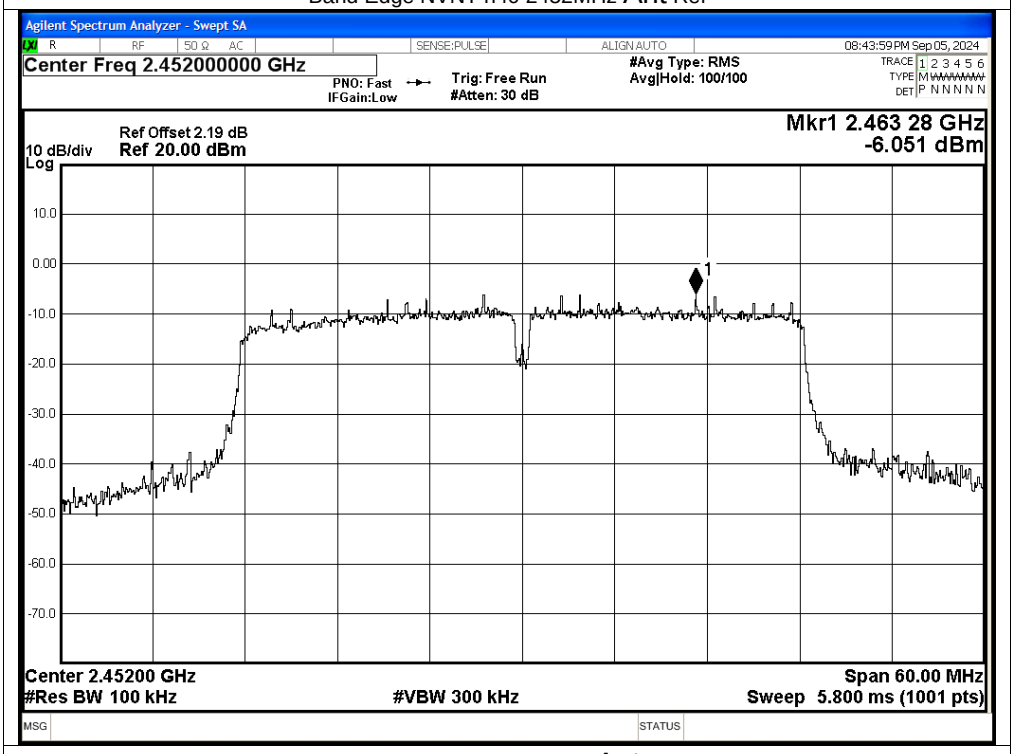
Band Edge NVNT n40 2422MHz Ant Ref



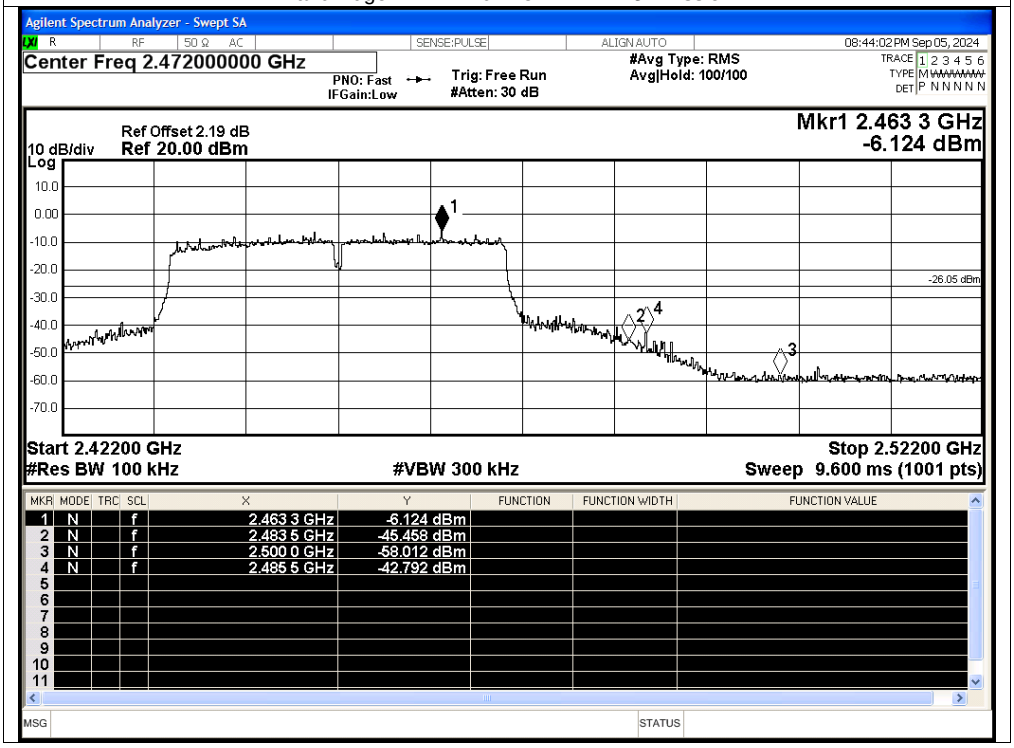
Band Edge NVNT n40 2422MHz Ant Emission



Band Edge NVNT n40 2452MHz Ant Ref



Band Edge NVNT n40 2452MHz Ant Emission



4. PEAK OUTPUT POWER

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

4.1.1 TEST PROCEDURE

a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP

4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage :	AC 120V

Condition	Mode	Frequency (MHz)	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	15.29	0	15.29	30	Pass
NVNT	b	2437	15.39	0	15.39	30	Pass
NVNT	b	2462	15.93	0	15.93	30	Pass
NVNT	g	2412	14.93	0	14.93	30	Pass
NVNT	g	2437	14.8	0	14.8	30	Pass
NVNT	g	2462	14.42	0	14.42	30	Pass
NVNT	n20	2412	14.37	0	14.37	30	Pass
NVNT	n20	2437	13	0	13	30	Pass
NVNT	n20	2462	13.97	0	13.97	30	Pass
NVNT	n40	2422	12.72	0	12.72	30	Pass
NVNT	n40	2437	13.14	0	13.14	30	Pass
NVNT	n40	2452	12.74	0	12.74	30	Pass

5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	= the frequency band of operation
RB	RBW ≥ 3kHz
VB	VBW ≥ 3RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

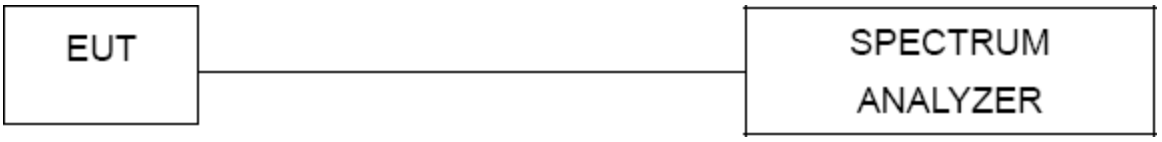
5.1.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION CONDITIONS

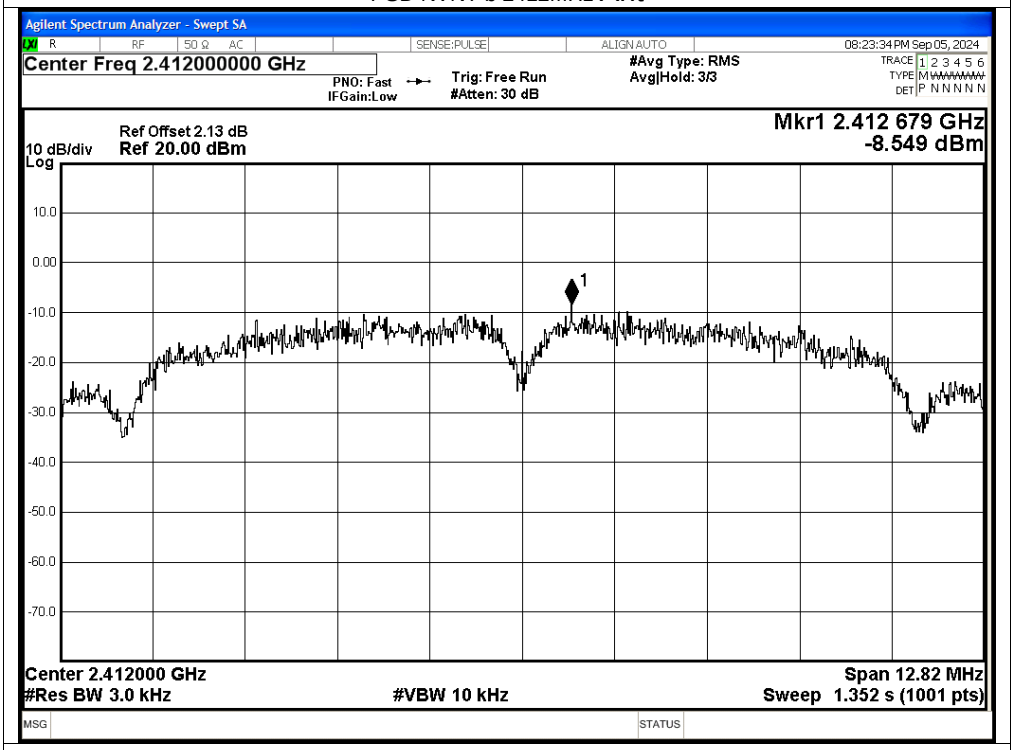
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.5 TEST RESULTS

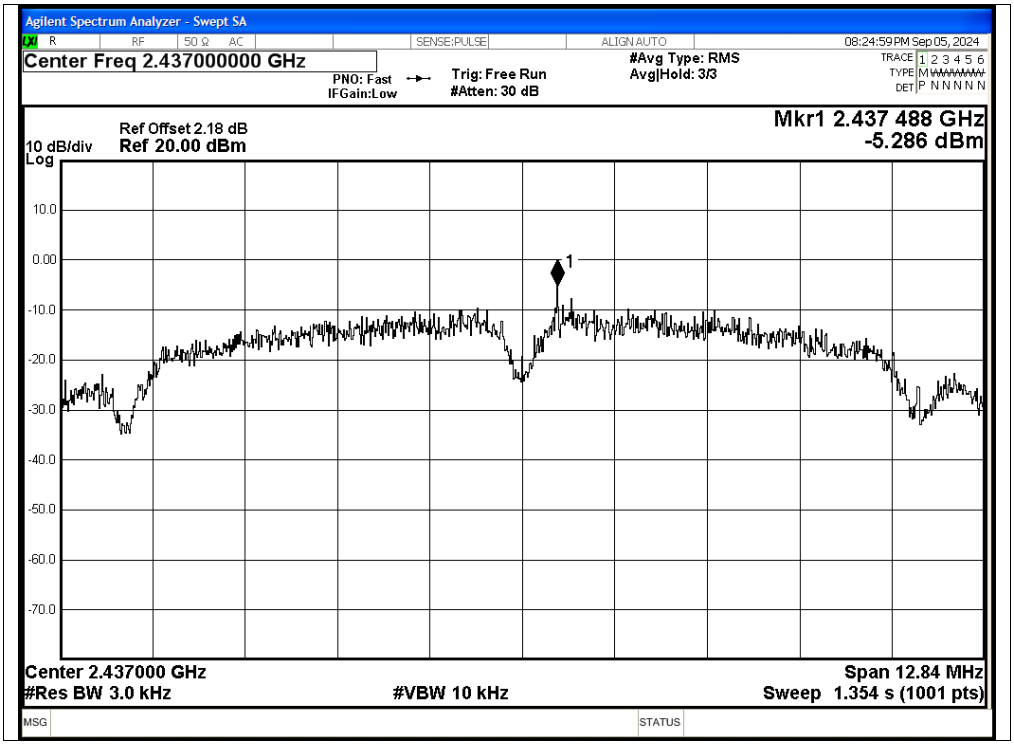
Condition	Mode	Frequency (MHz)	Conducted PSD (dBm/3kHz)	Duty Factor (dB)	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	b	2412	-8.55	0	-8.55	8	Pass
NVNT	b	2437	-5.29	0	-5.29	8	Pass
NVNT	b	2462	-8.31	0	-8.31	8	Pass
NVNT	g	2412	-15.31	0	-15.31	8	Pass
NVNT	g	2437	-16.18	0	-16.18	8	Pass
NVNT	g	2462	-16.16	0	-16.16	8	Pass
NVNT	n20	2412	-16.22	0	-16.22	8	Pass
NVNT	n20	2437	-17.04	0	-17.04	8	Pass
NVNT	n20	2462	-16.42	0	-16.42	8	Pass
NVNT	n40	2422	-21.09	0	-21.09	8	Pass
NVNT	n40	2437	-20.42	0	-20.42	8	Pass
NVNT	n40	2452	-20.53	0	-20.53	8	Pass

Test Graphs

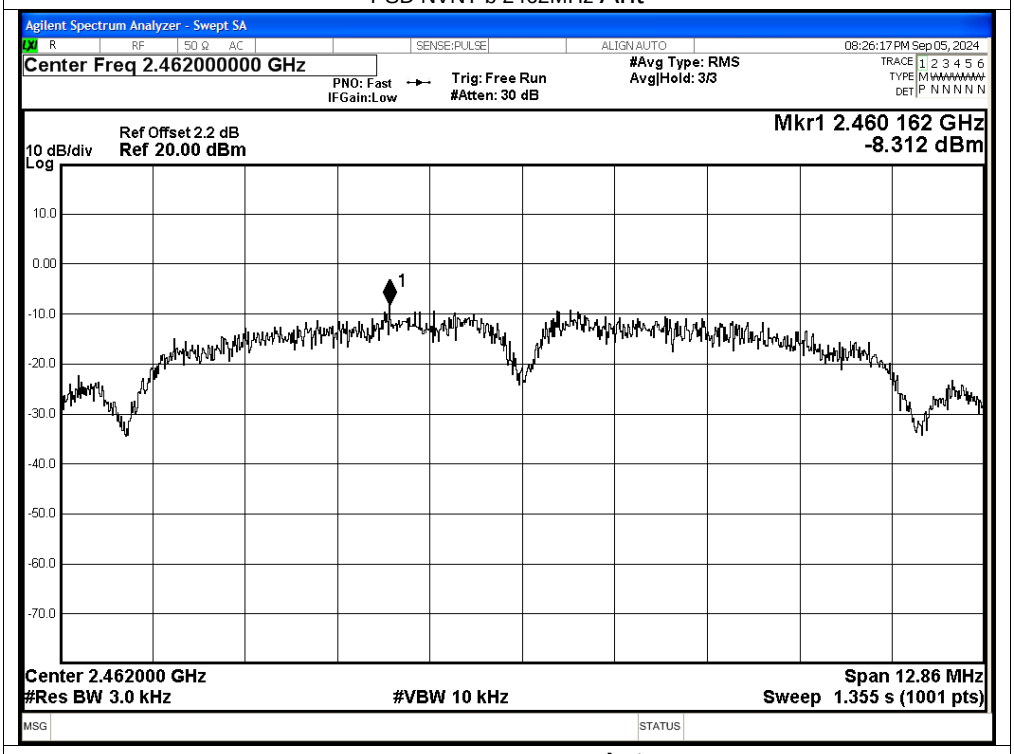
PSD NVNT b 2412MHz Ant



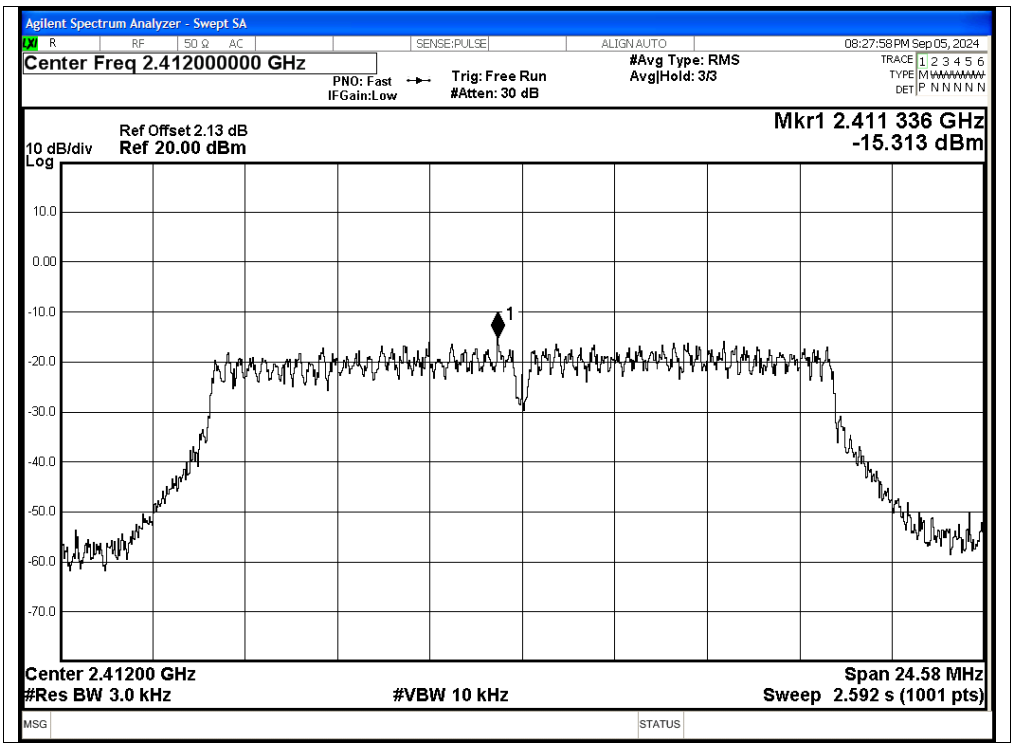
PSD NVNT b 2437MHz Ant



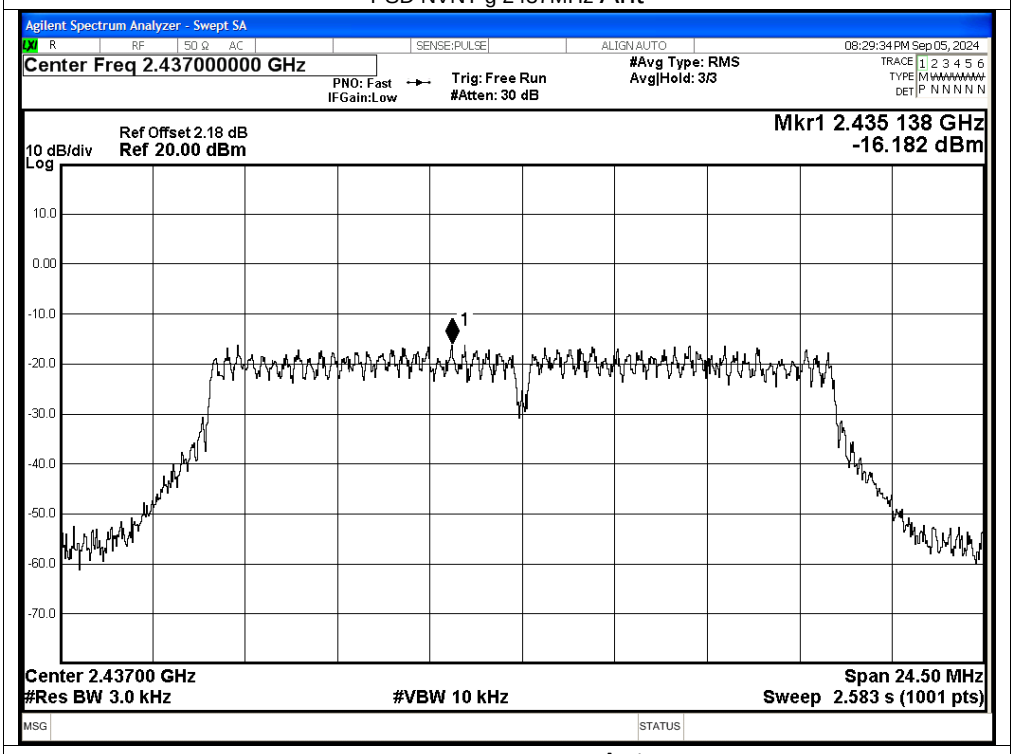
PSD NVNT b 2462MHz Ant



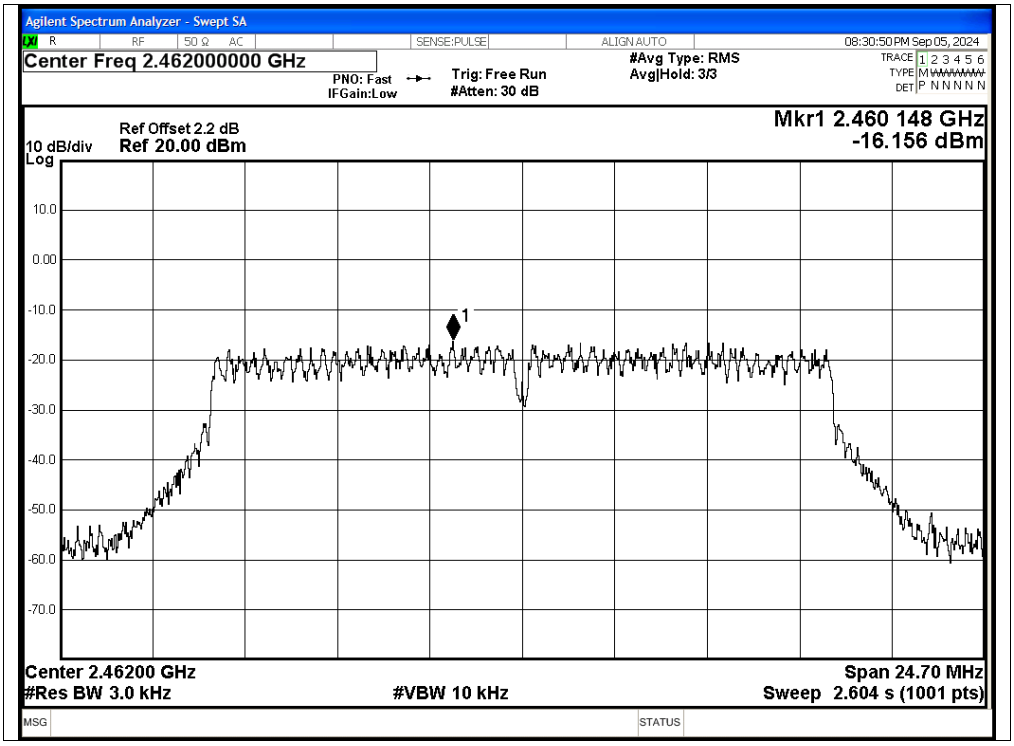
PSD NVNT g 2412MHz Ant



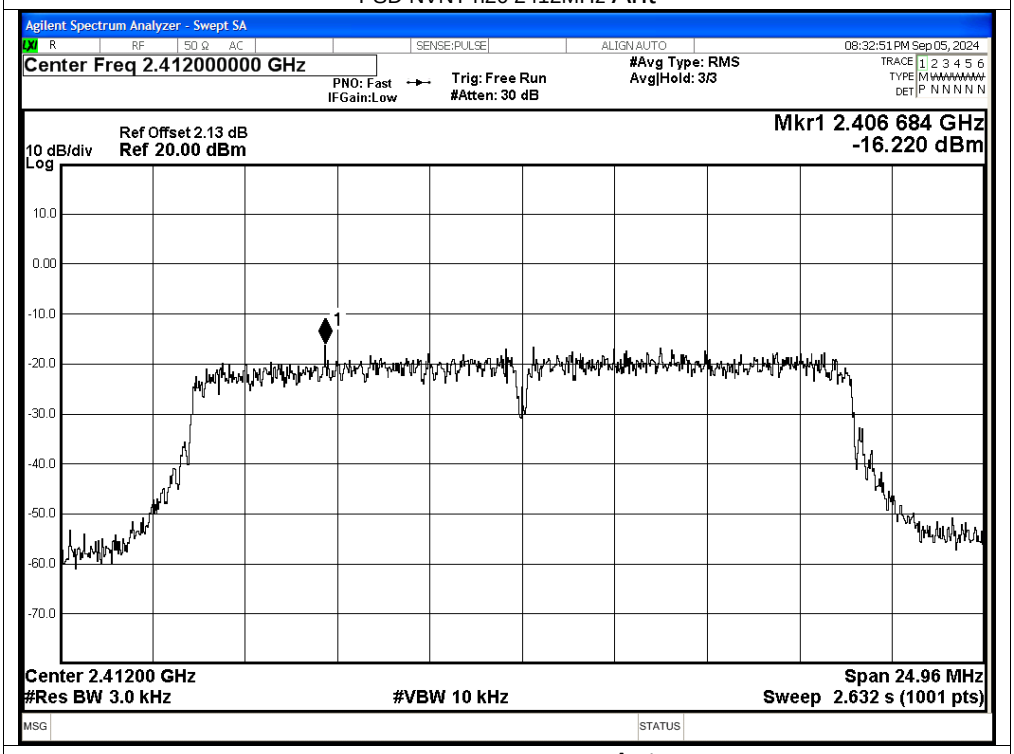
PSD NVNT g 2437MHz Ant



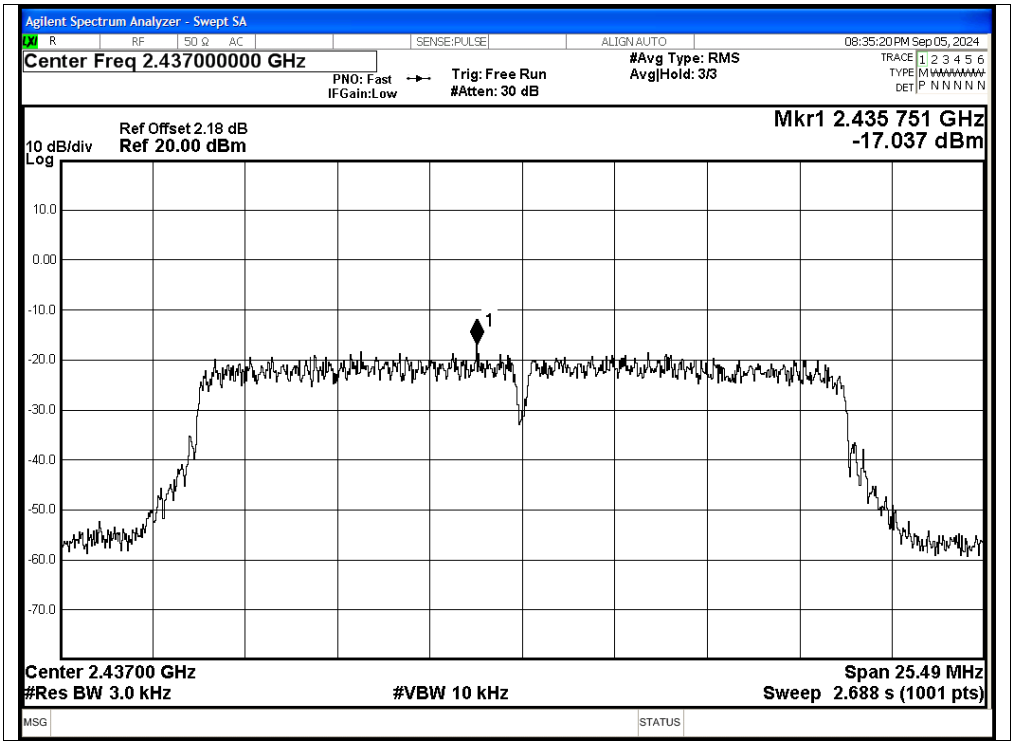
PSD NVNT g 2462MHz Ant



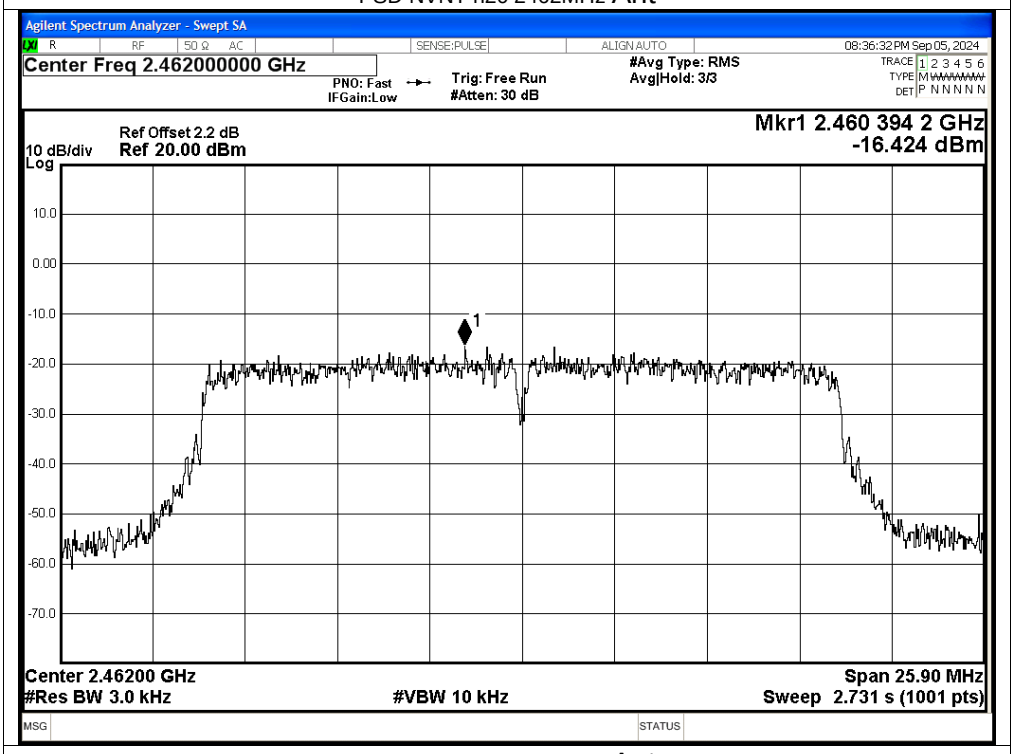
PSD NVNT n20 2412MHz Ant



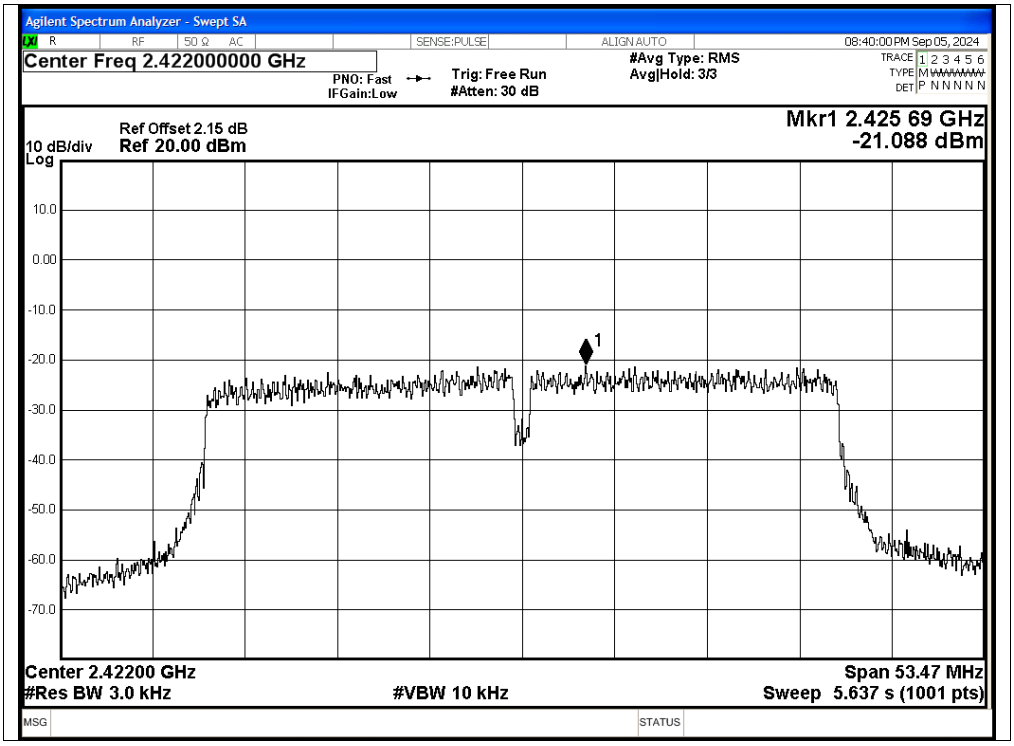
PSD NVNT n20 2437MHz Ant



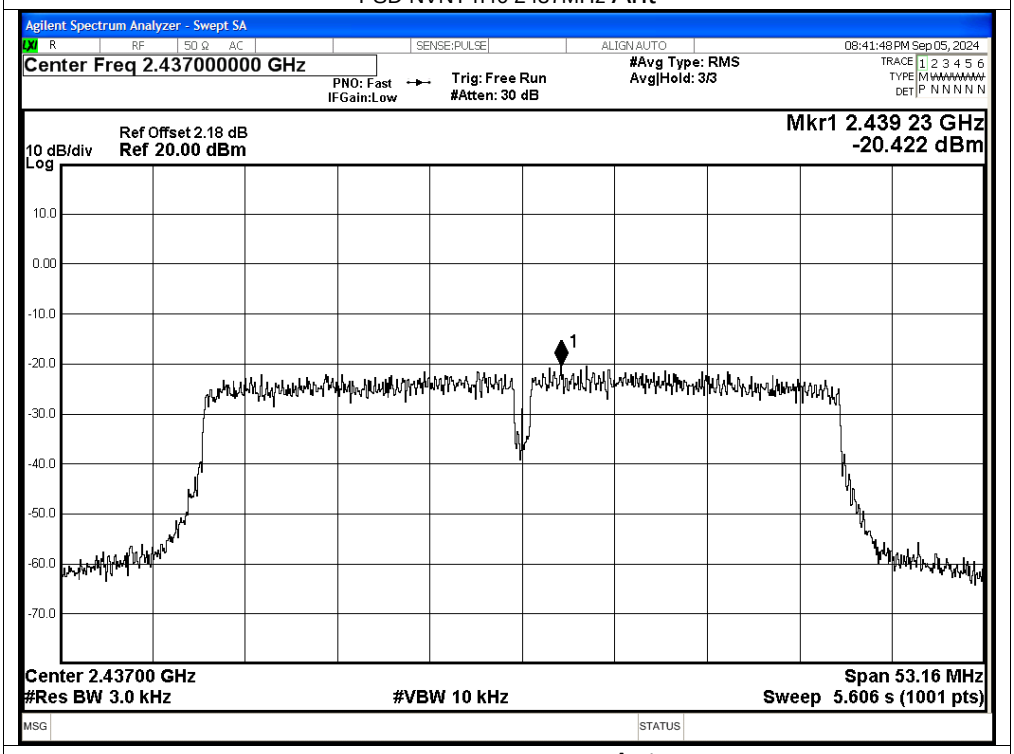
PSD NVNT n20 2462MHz Ant



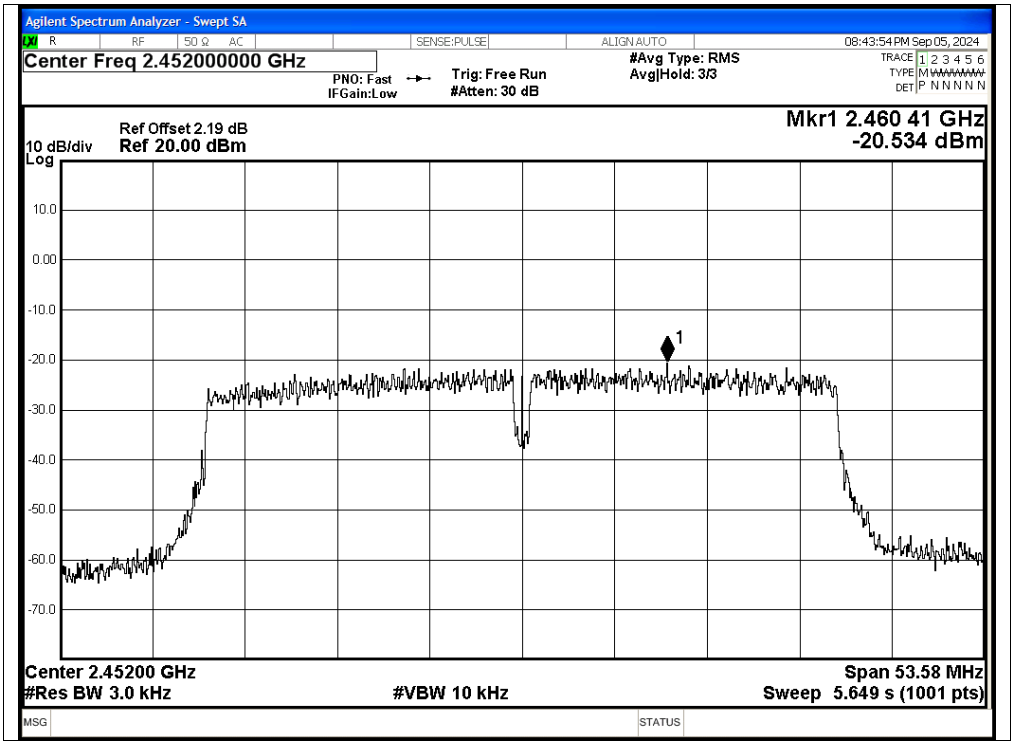
PSD NVNT n40 2422MHz Ant



PSD NVNT n40 2437MHz Ant



PSD NVNT n40 2452MHz Ant


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.452000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
#Avg Type: RMS
Avg|Hold: 3/3
08:43:54 PM Sep 05, 2024
Ref Offset 2.19 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.460 41 GHz
-20.534 dBm
Center 2.45200 GHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 53.58 MHz
Sweep 5.649 s (1001 pts)

6. 6DB BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range(MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

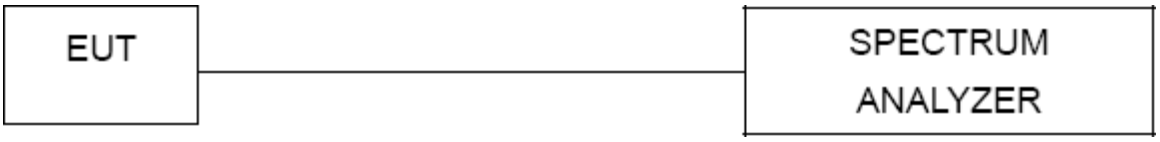
6.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥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 frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

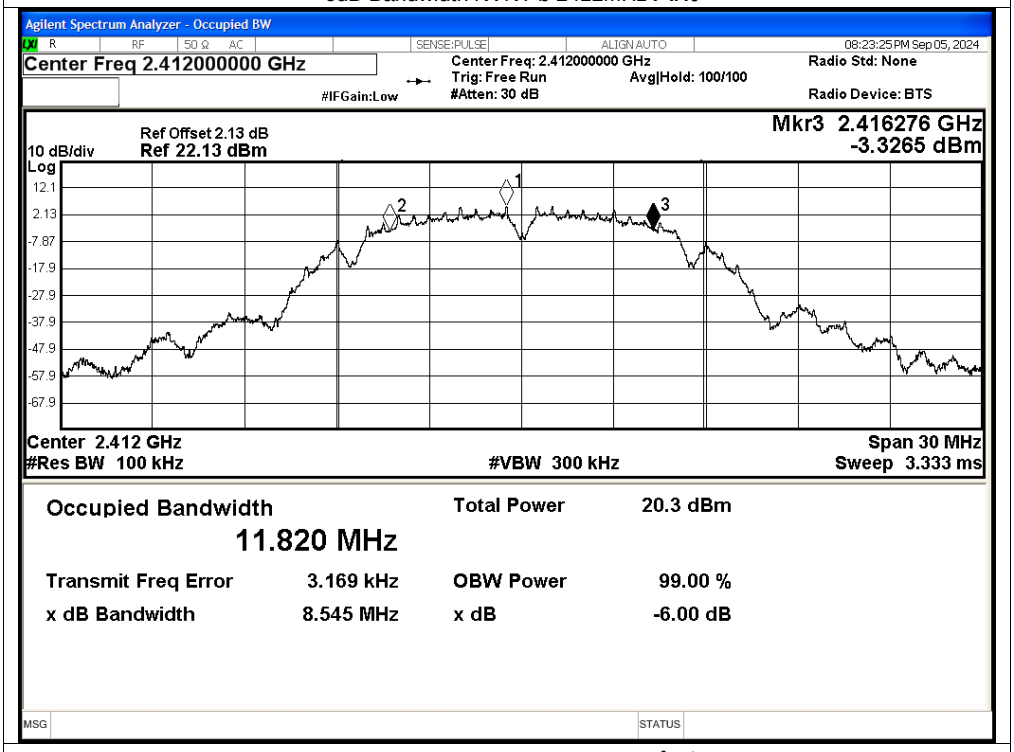
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 TEST RESULTS

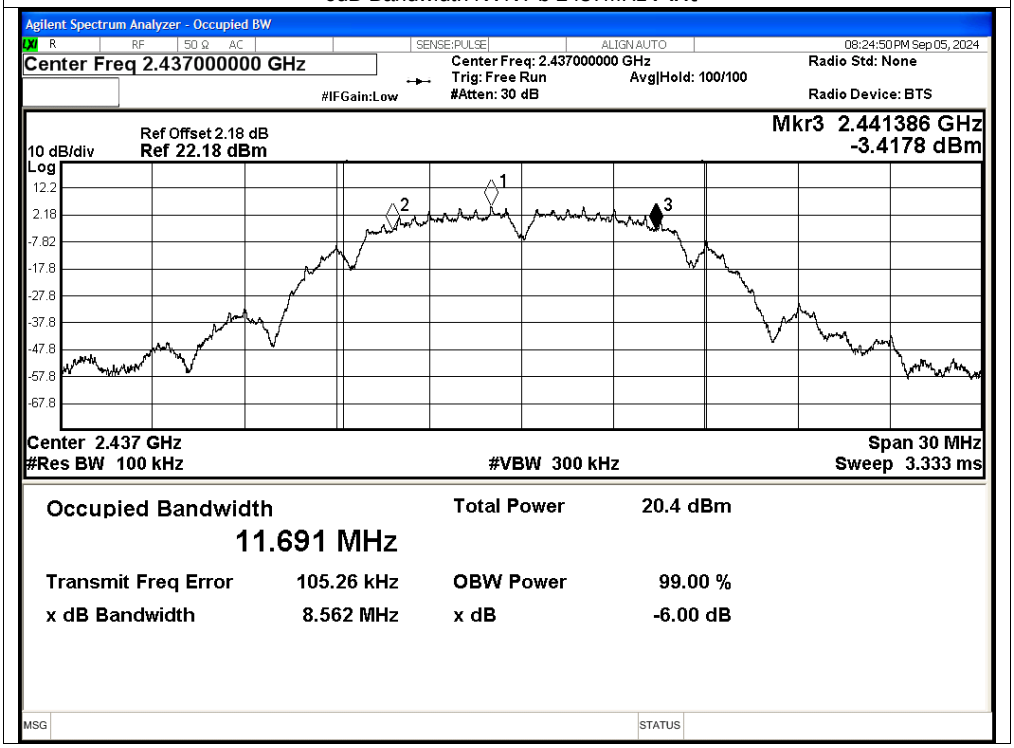
Condition	Mode	Frequency (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	8.545	>=0.5	Pass
NVNT	b	2437	8.562	>=0.5	Pass
NVNT	b	2462	8.57	>=0.5	Pass
NVNT	g	2412	16.386	>=0.5	Pass
NVNT	g	2437	16.333	>=0.5	Pass
NVNT	g	2462	16.464	>=0.5	Pass
NVNT	n20	2412	16.639	>=0.5	Pass
NVNT	n20	2437	16.993	>=0.5	Pass
NVNT	n20	2462	17.267	>=0.5	Pass
NVNT	n40	2422	35.644	>=0.5	Pass
NVNT	n40	2437	35.442	>=0.5	Pass
NVNT	n40	2452	35.718	>=0.5	Pass

Test Graphs

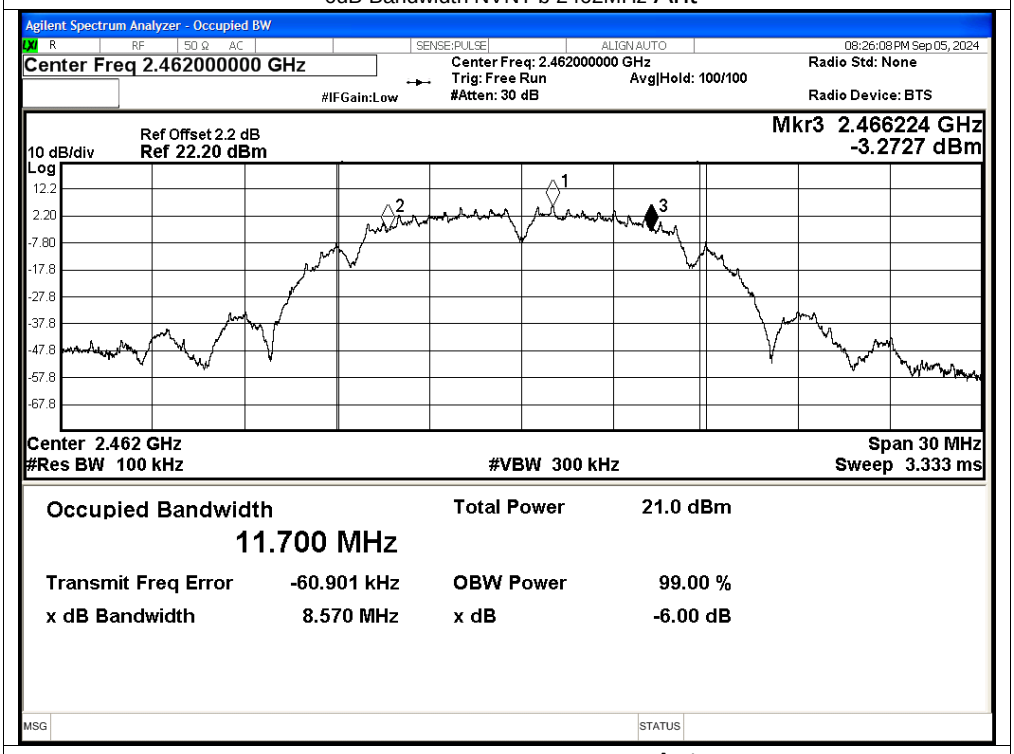
-6dB Bandwidth NVNT b 2412MHz Ant



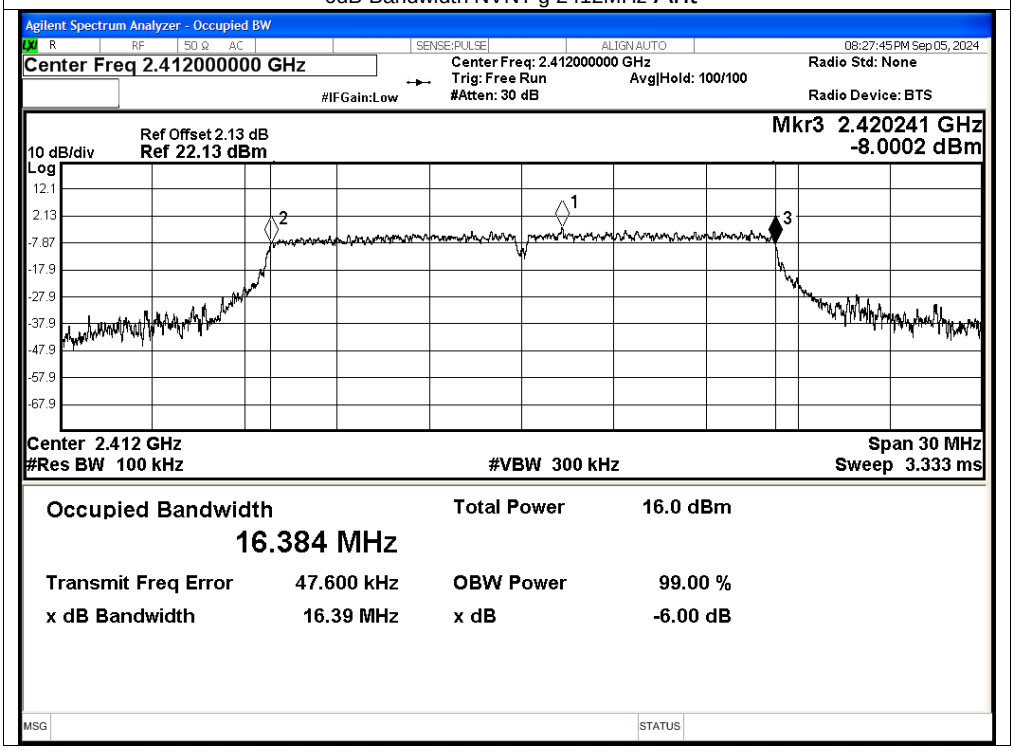
-6dB Bandwidth NVNT b 2437MHz Ant



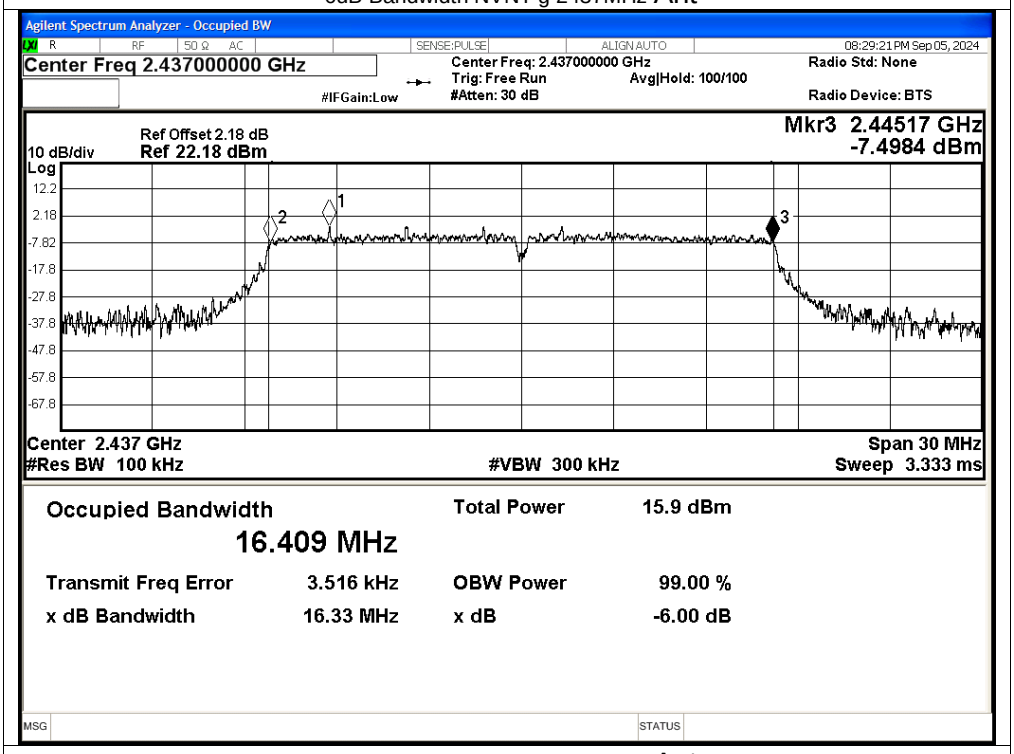
-6dB Bandwidth NVNT b 2462MHz Ant



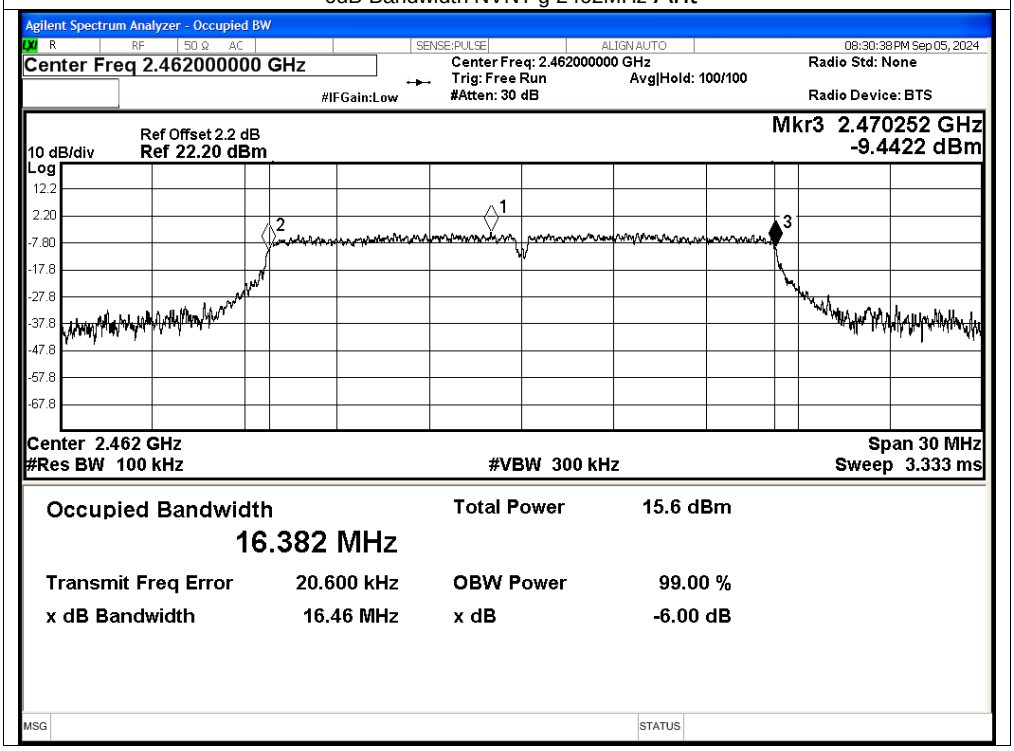
-6dB Bandwidth NVNT g 2412MHz Ant



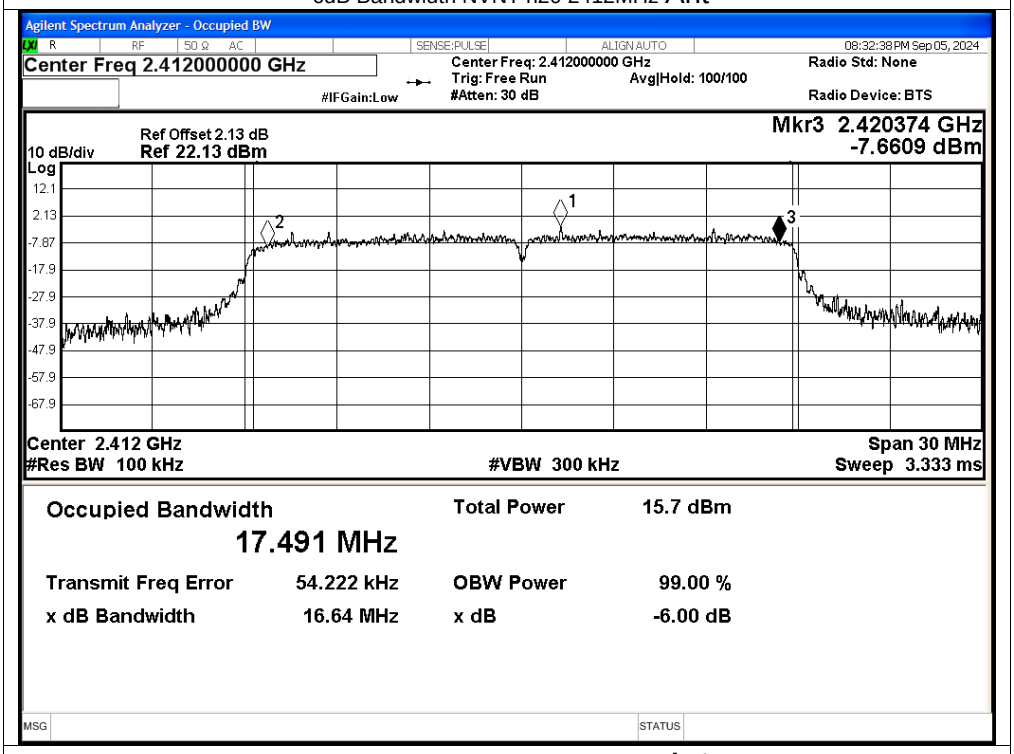
-6dB Bandwidth NVNT g 2437MHz Ant



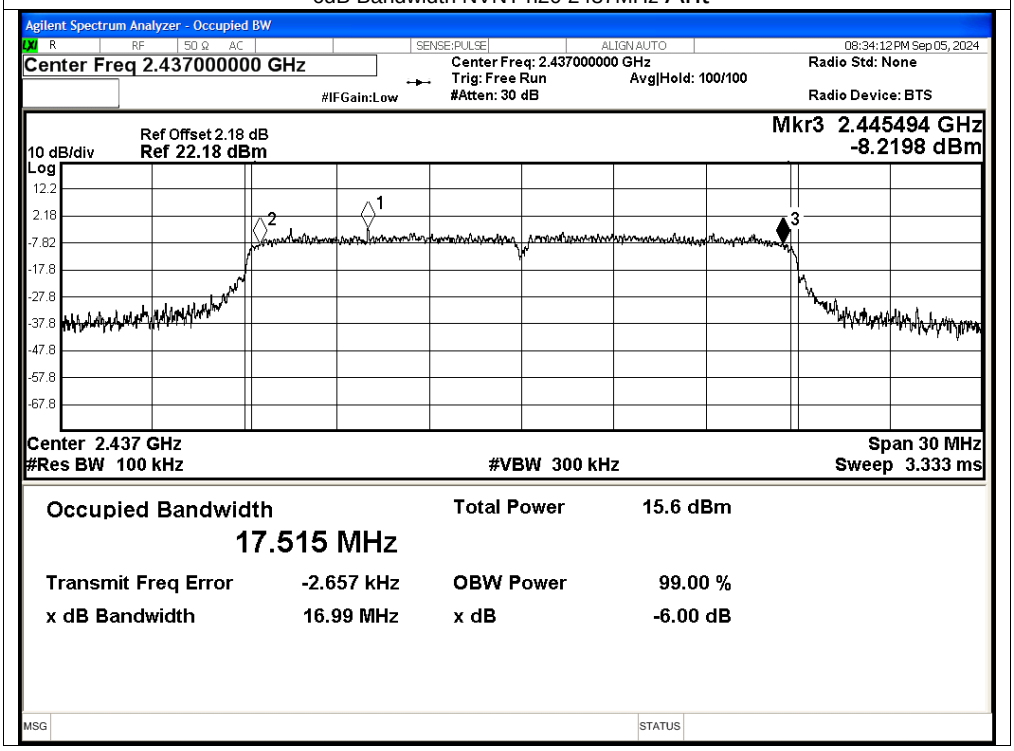
-6dB Bandwidth NVNT g 2462MHz Ant



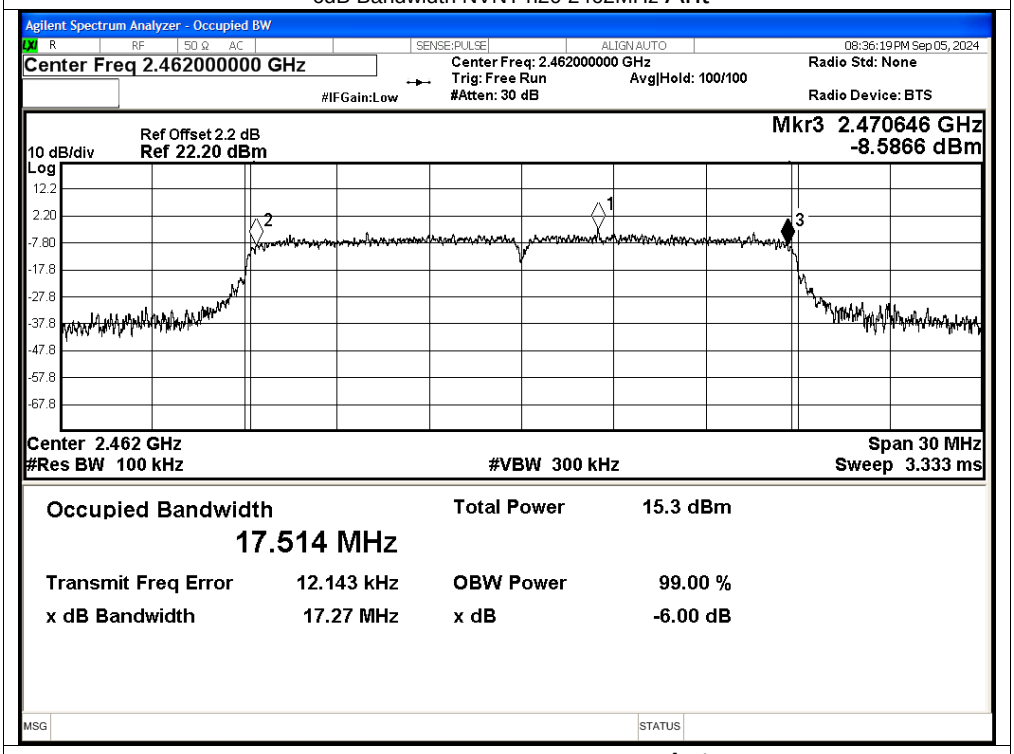
-6dB Bandwidth NVNT n20 2412MHz Ant



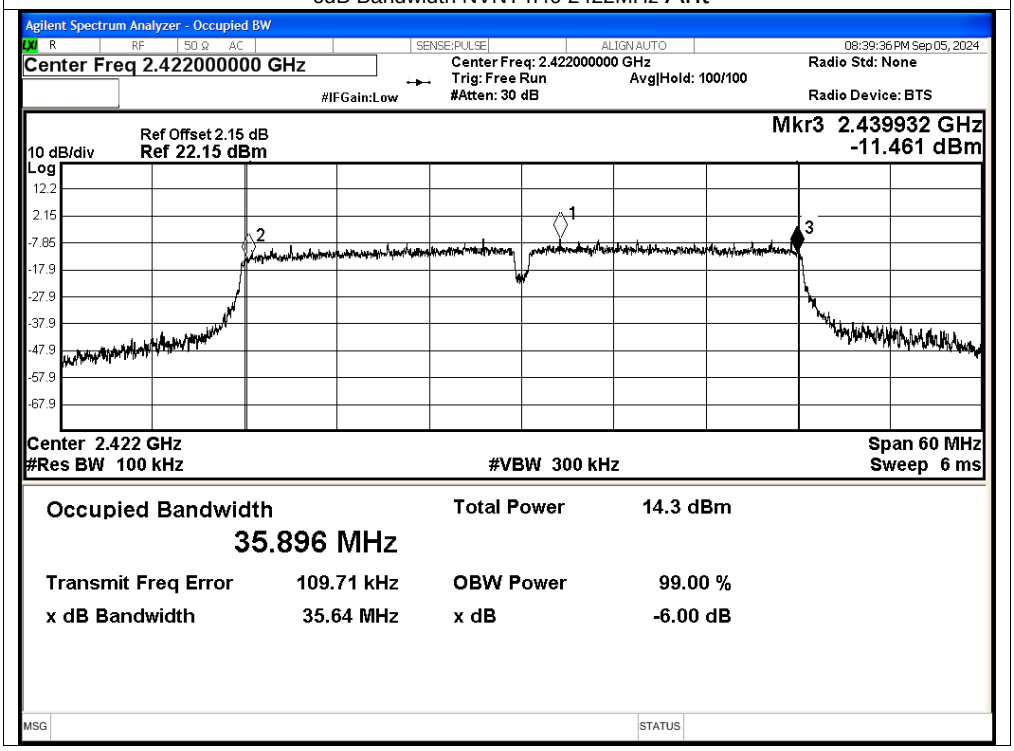
-6dB Bandwidth NVNT n20 2437MHz Ant



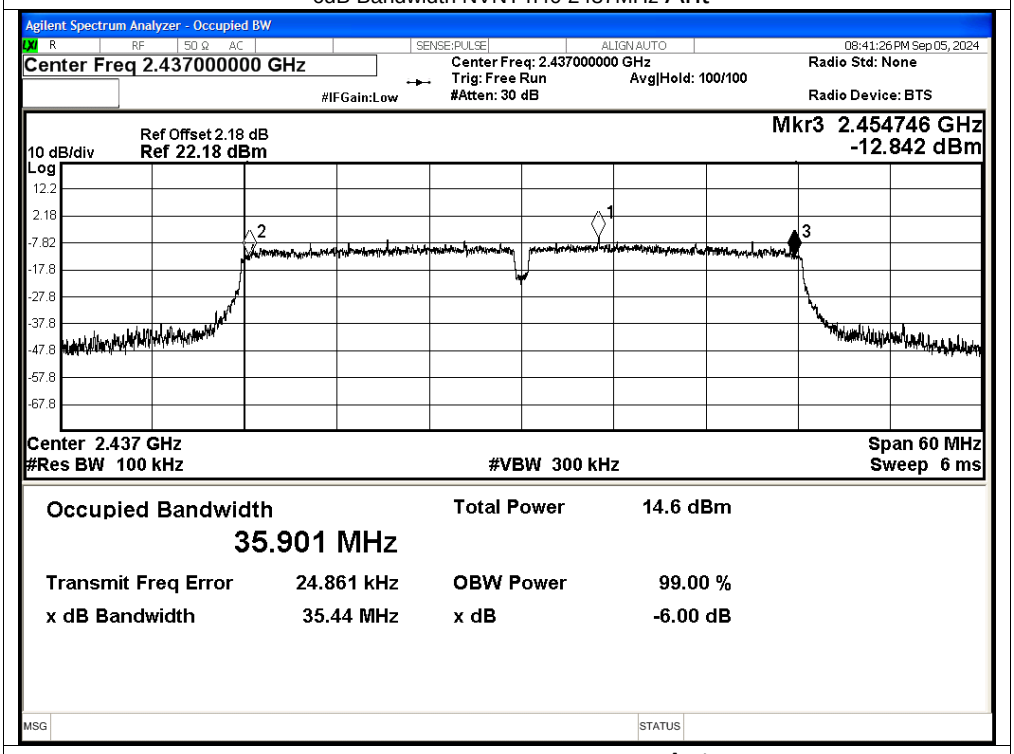
-6dB Bandwidth NVNT n20 2462MHz Ant



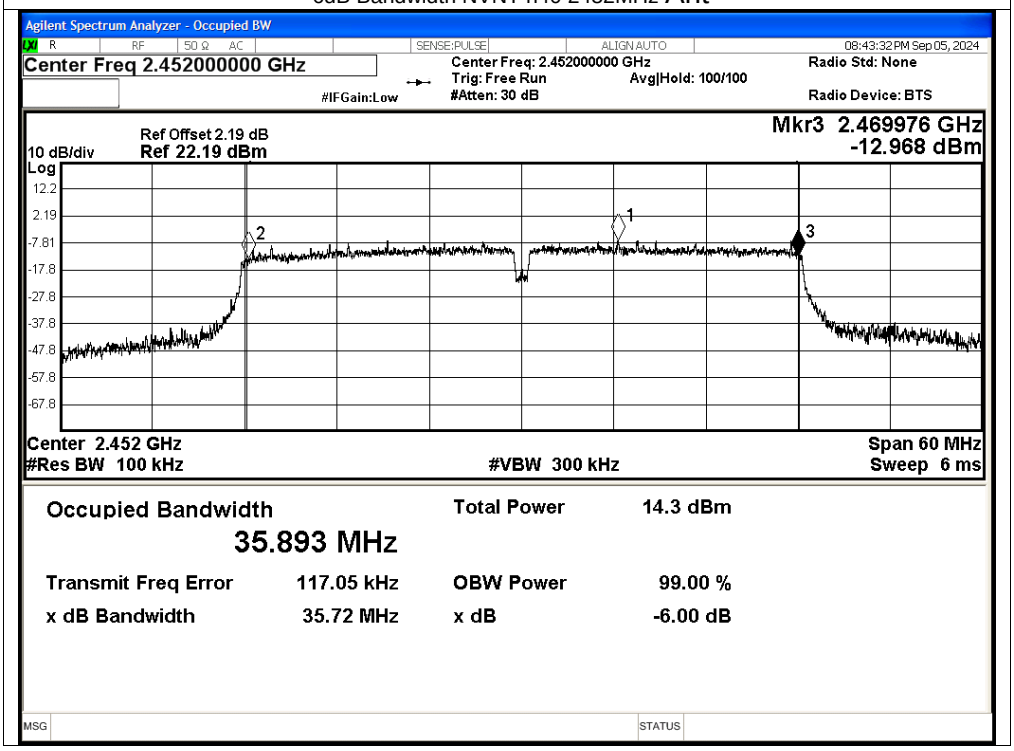
-6dB Bandwidth NVNT n40 2422MHz Ant



-6dB Bandwidth NVNT n40 2437MHz Ant



-6dB Bandwidth NVNT n40 2452MHz Ant



6.1.6. ANTENNA REQUIREMENT

6.2 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

6.3 EUT ANTENNA

The EUT antenna is internal antenna,. It comply with the standard requirement.

7. TEST SEUUP PHOTO

Please refer to the Test setup Photos

8. EUT PHOTO

Please refer to the External Photos and Internal Photos

※※※※※ END OF REPORT ※※※※※