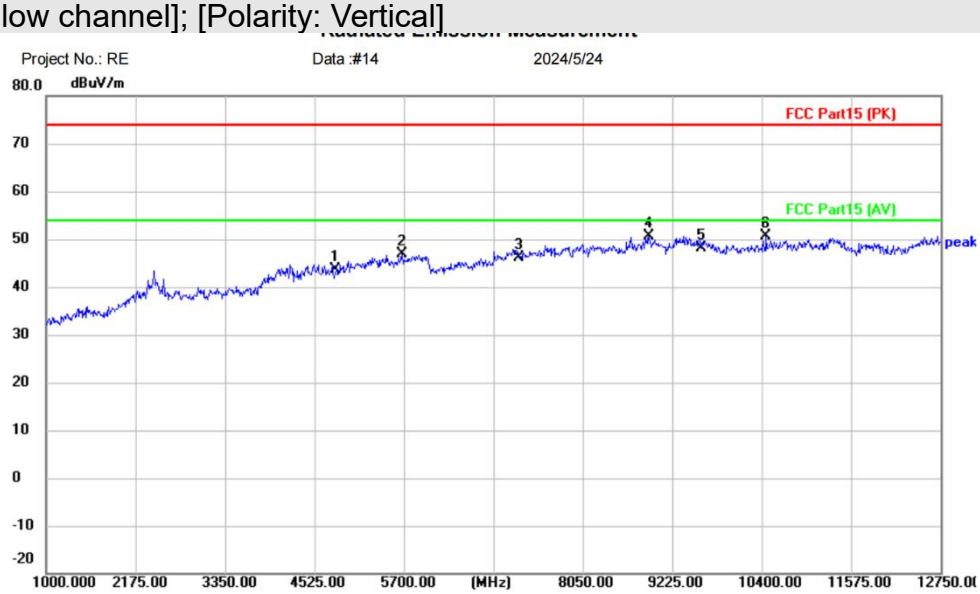
[Test mode: TX low channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2402
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

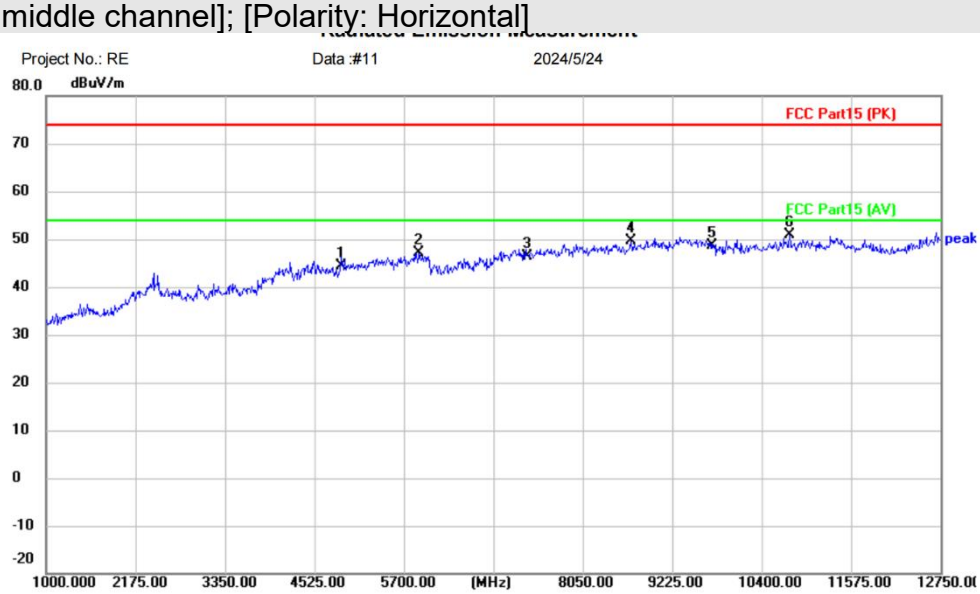
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	37.95	5.64	43.59	74.00	-30.41	peak	
2		5676.500	38.90	7.91	46.81	74.00	-27.19	peak	
3		7206.000	36.93	9.24	46.17	74.00	-27.83	peak	
4		8919.500	38.46	12.14	50.60	74.00	-23.40	peak	
5		9608.000	35.91	12.31	48.22	74.00	-25.78	peak	
6	*	10458.75	37.83	12.82	50.65	74.00	-23.35	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode: TX middle channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2441
Note:

Polarization: ***Horizontal***
Power:

Temperature: (C)
Humidity: %RH

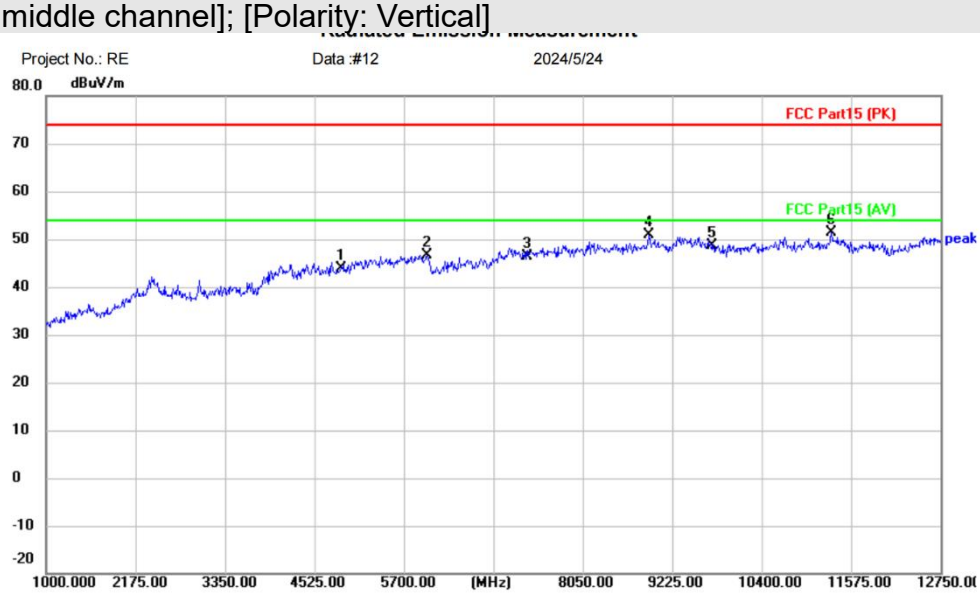
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.000	38.53	5.73	44.26	74.00	-29.74	peak	
2		5899.750	38.39	8.66	47.05	74.00	-26.95	peak	
3		7323.000	36.96	9.43	46.39	74.00	-27.61	peak	
4		8684.500	38.29	11.44	49.73	74.00	-24.27	peak	
5		9764.000	36.52	12.21	48.73	74.00	-25.27	peak	
6	*	10764.25	38.02	12.94	50.96	74.00	-23.04	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode: TX middle channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2441
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

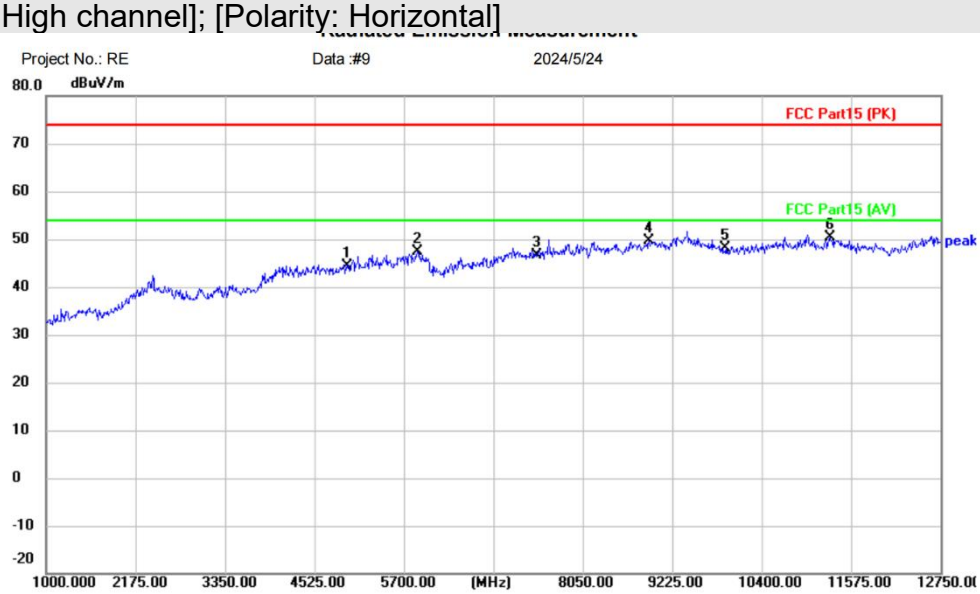
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.000	38.03	5.73	43.76	74.00	-30.24	peak	
2		6005.500	40.98	5.61	46.59	74.00	-27.41	peak	
3		7323.000	36.96	9.43	46.39	74.00	-27.61	peak	
4		8919.500	38.80	12.14	50.94	74.00	-23.06	peak	
5		9764.000	36.50	12.21	48.71	74.00	-25.29	peak	
6	*	11316.50	38.71	12.69	51.40	74.00	-22.60	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode: TX High channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2480
Note:

Polarization: ***Horizontal***
Power:

Temperature: (C)
Humidity: %RH

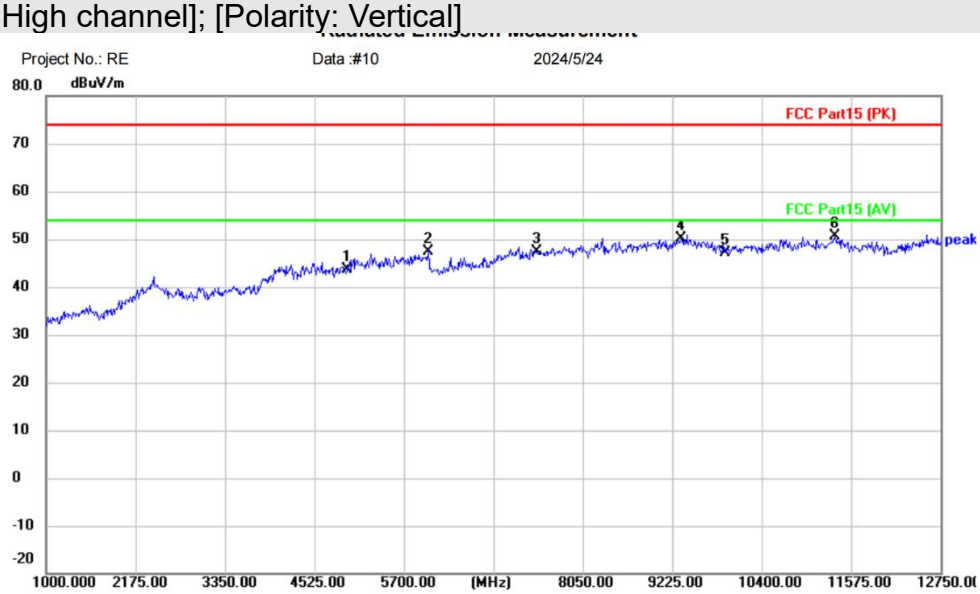
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	37.67	6.60	44.27	74.00	-29.73	peak	
2		5876.250	38.82	8.54	47.36	74.00	-26.64	peak	
3		7440.000	36.96	9.64	46.60	74.00	-27.40	peak	
4		8919.500	37.37	12.14	49.51	74.00	-24.49	peak	
5		9920.000	35.96	12.14	48.10	74.00	-25.90	peak	
6	*	11293.00	37.56	12.70	50.26	74.00	-23.74	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode: TX High channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2480
Note:

Polarization: *Vertical*
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.000	37.15	6.60	43.75	74.00	-30.25	peak	
2		6017.250	41.71	5.63	47.34	74.00	-26.66	peak	
3		7440.000	37.70	9.64	47.34	74.00	-26.66	peak	
4		9342.500	37.55	12.56	50.11	74.00	-23.89	peak	
5		9920.000	35.03	12.14	47.17	74.00	-26.83	peak	
6	*	11363.50	37.87	12.65	50.52	74.00	-23.48	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

6.11 Radiated emissions which fall in the restricted bands

Test Standard	47 CFR Part 15, Subpart C 15.247
Test Method	ANSI C63.10 (2013) Section 6.10.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.11.1 Limit

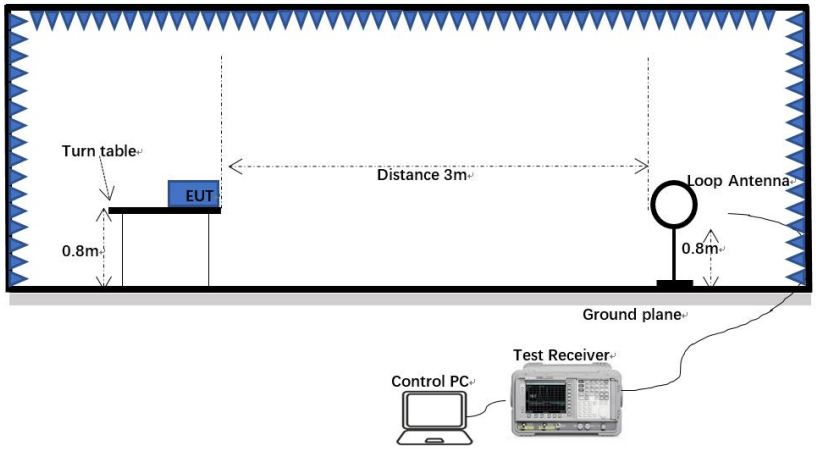
Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

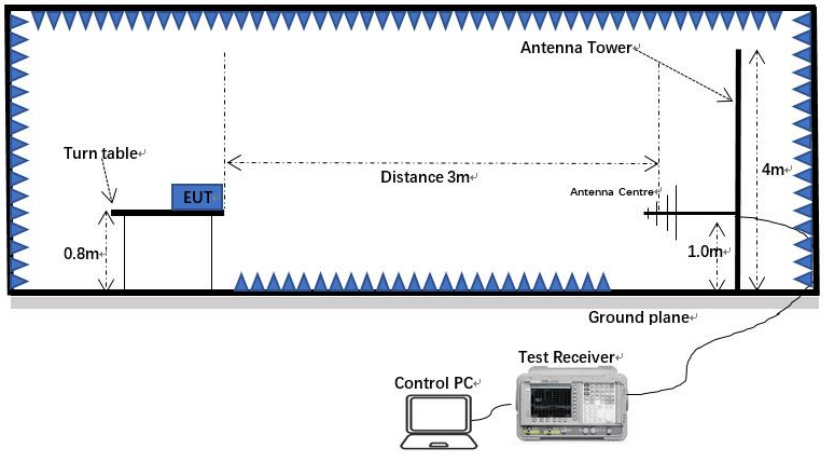
BlueAsia

6.11.2 Test setup

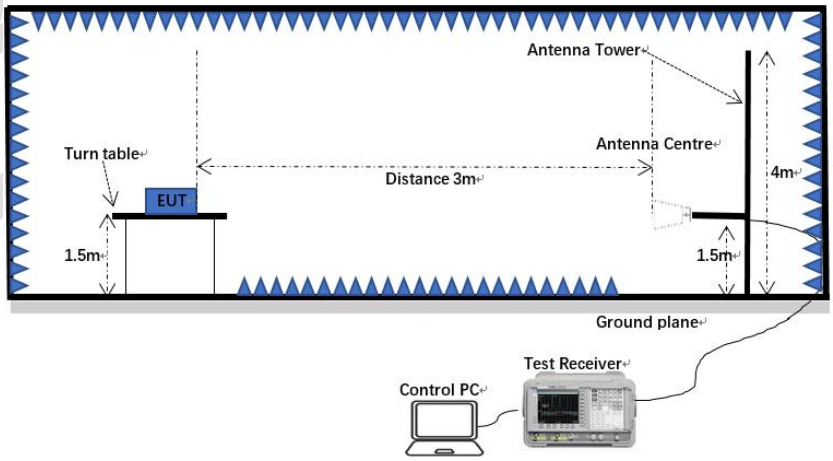
Below 1GHz：



30MHz-1GHz：



Above 1GHz：



6.11.3 Procedure

a) For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b) For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c) The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d) 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.

e) 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.

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

g) 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.

h) Test the EUT in the lowest channel, the middle channel, the highest channel.

i) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

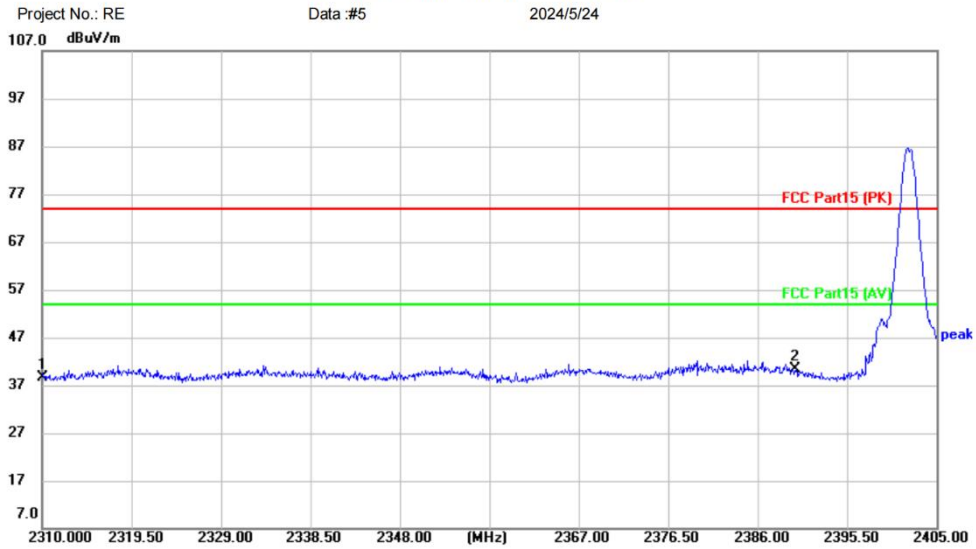
j) Repeat above procedures until all frequencies measured was complete.

Note 1: Level (dBuV) = Reading (dBuV) + Factor (dB/m)
Note 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report. all modes have been tested, and only the worst mode is showed in the report.

6.11.4 Test data

Remark: During the test, pre-scan the GFSK, pi/4DQPSK mode, and found the GFSK mode which it is worse case.

[Test mode: TX low channel]; [Polarity: Horizontal]



Site
Polarization: ***Horizontal***
Temperature: (C)
Limit: FCC Part15 (PK)
Power:
Humidity: %RH
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2402
Note:

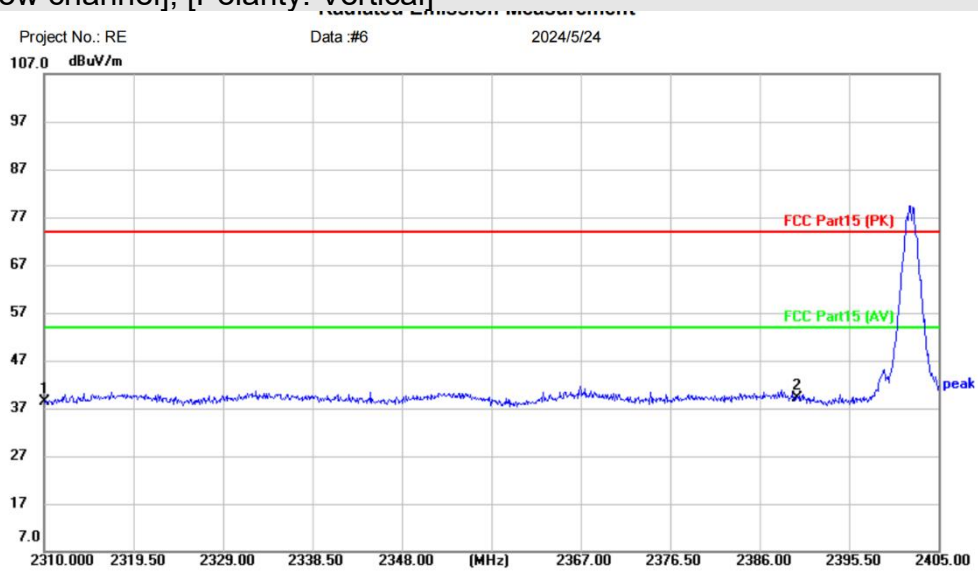
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	41.50	-2.89	38.61	74.00	-35.39	peak	
2	*	2390.000	43.03	-2.70	40.33	74.00	-33.67	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode:TX low channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2402
Note:

Polarization: ***Vertical***
Power:

Temperature: (C)
Humidity: %RH

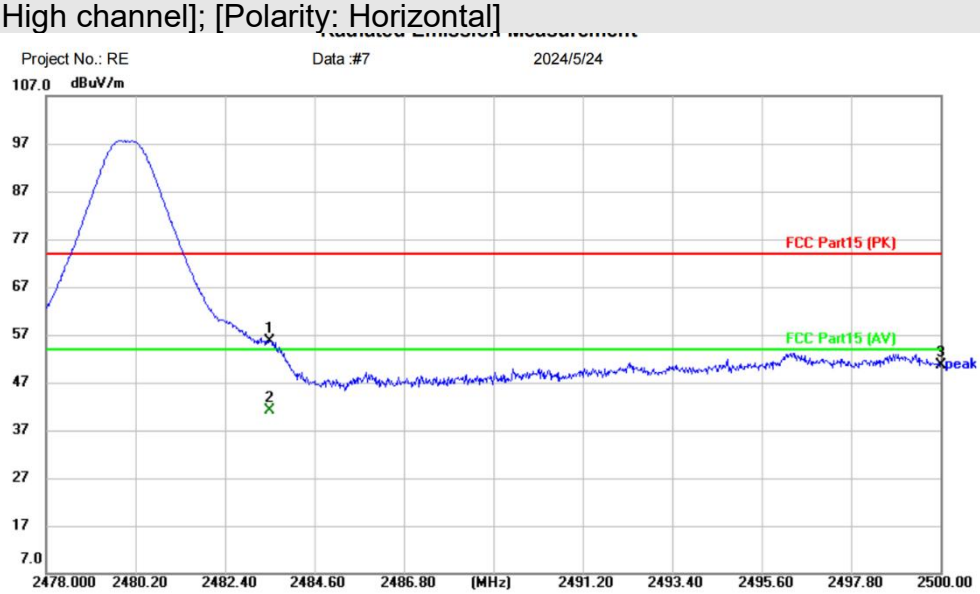
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2310.000	41.22	-2.89	38.33	74.00	-35.67	peak	
2	*	2390.000	41.72	-2.70	39.02	74.00	-34.98	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode: TX High channel]; [Polarity: Horizontal]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2480
Note:

Polarization: ***Horizontal***
Power:

Temperature: (C)
Humidity: %RH

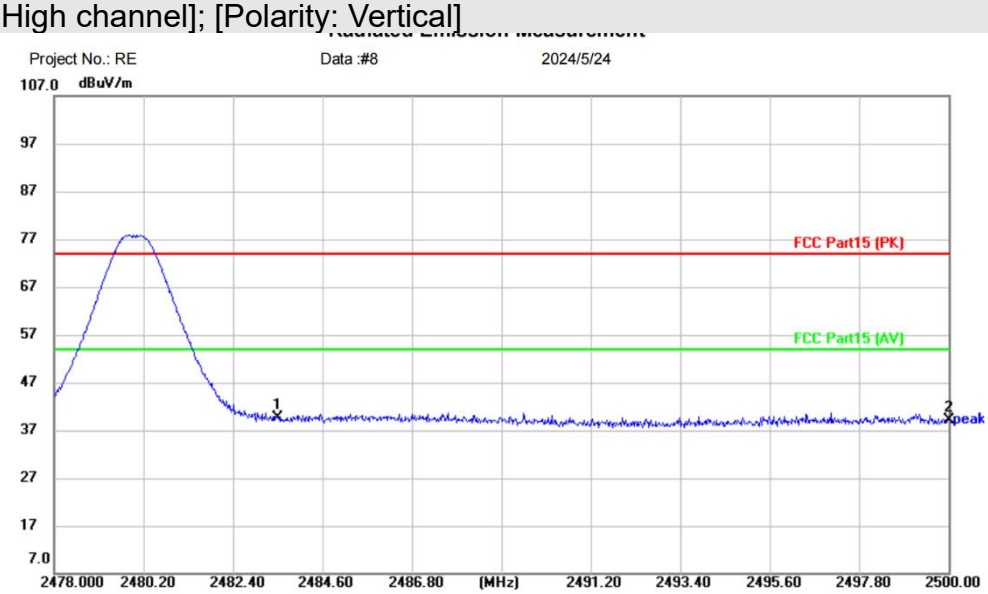
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2483.500	58.43	-2.91	55.52	74.00	-18.48	peak	
2	*	2483.500	43.97	-2.91	41.06	54.00	-12.94	AVG	
3		2500.000	53.69	-3.00	50.69	74.00	-23.31	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

Test Result: Pass

[Test mode:TX High channel]; [Polarity: Vertical]



Site
Limit: FCC Part15 (PK)
EUT: TWS wireless bluetooth earphones
M/N: HE-029B
Mode: BT TX 2480
Note:

Polarization: ***Vertical***
Power:

Temperature: (C)
Humidity: %RH

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2483.500	42.49	-2.91	39.58	74.00	-34.42	peak	
2		2500.000	42.06	-3.00	39.06	74.00	-34.94	peak	

*:Maximum data x:Over limit !:over margin 〈Reference Only

Receiver: ESR_1 Spectrum Analyzer: FSP40

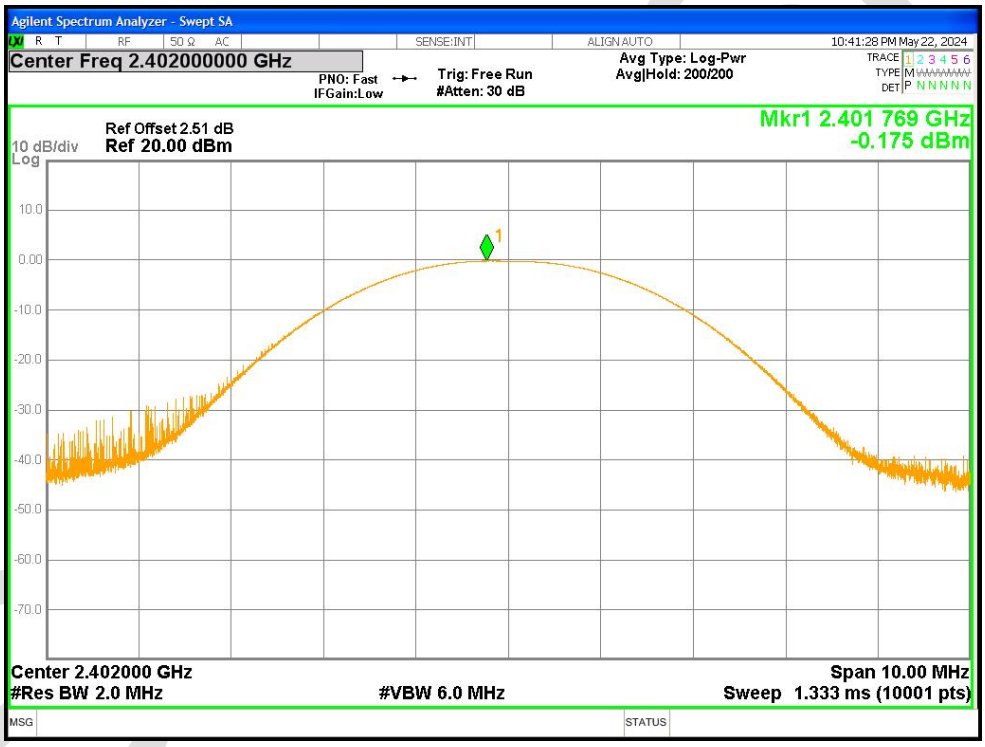
Test Result: Pass

7 Appendix A

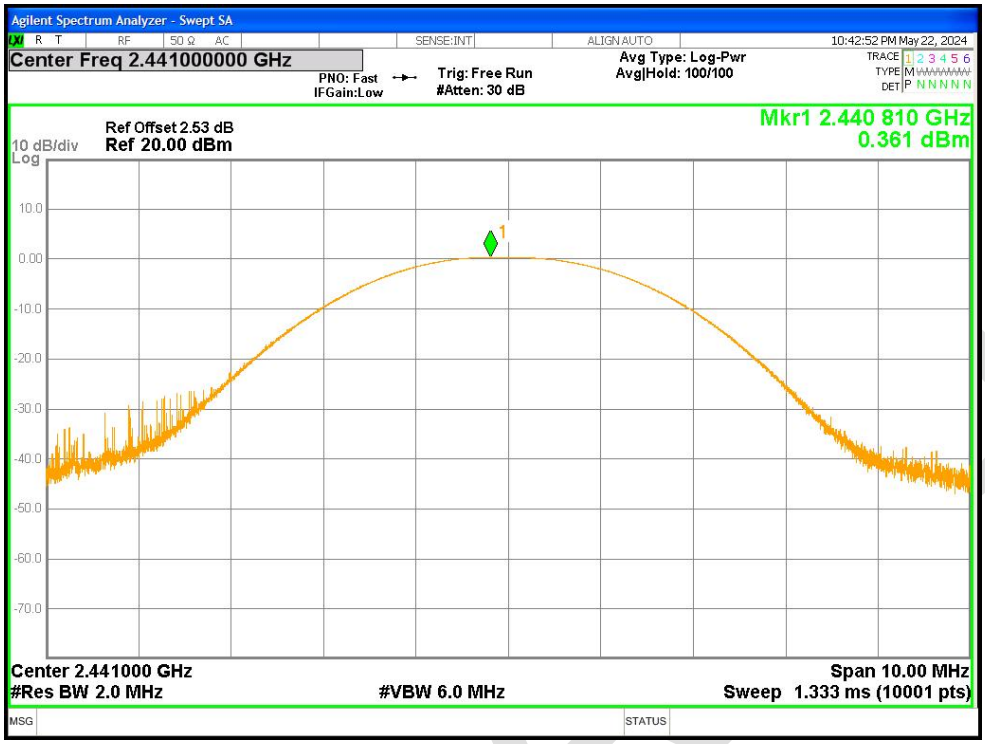
Maximum Conducted Output Power

Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	1-DH1	2402	Ant1	-0.175	21	Pass
NVNT	1-DH1	2441	Ant1	0.361	21	Pass
NVNT	1-DH1	2480	Ant1	1.651	21	Pass
NVNT	2-DH1	2402	Ant1	0.698	21	Pass
NVNT	2-DH1	2441	Ant1	1.223	21	Pass
NVNT	2-DH1	2480	Ant1	2.356	21	Pass

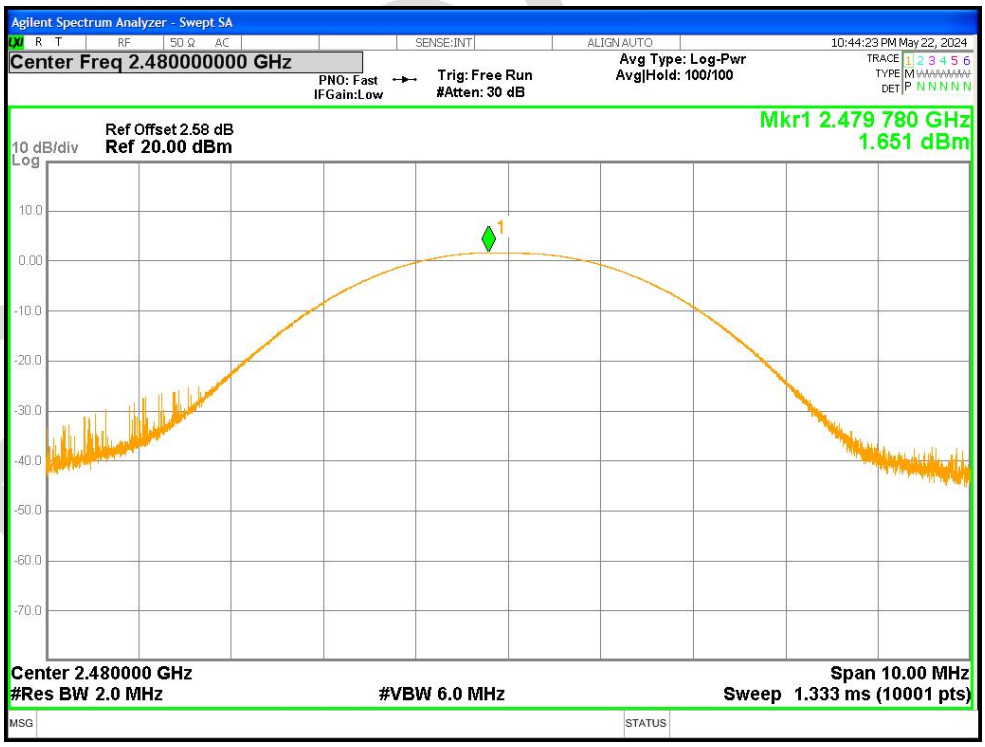
Power NVNT 1-DH1 2402MHz Ant1



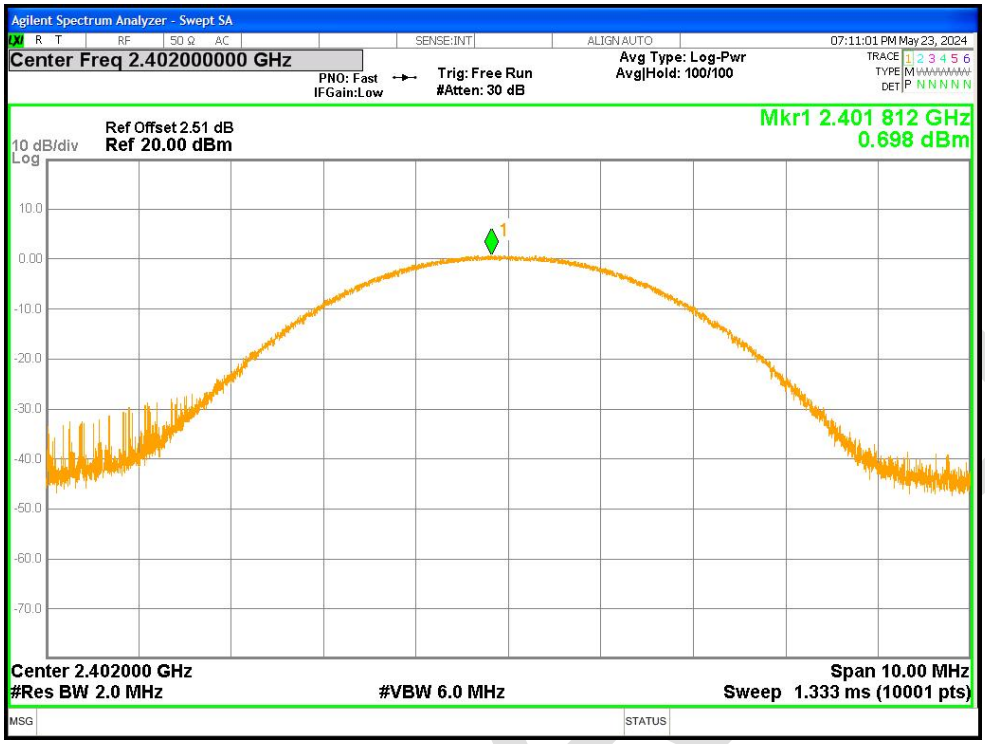
Power NVNT 1-DH1 2441MHz Ant1



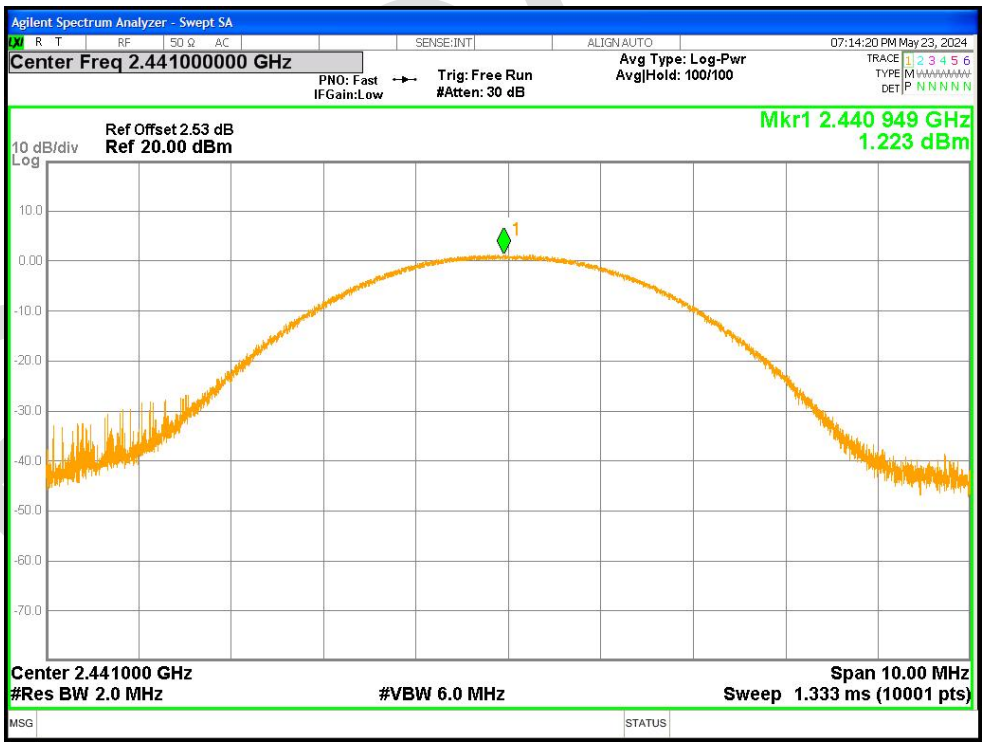
Power NVNT 1-DH1 2480MHz Ant1



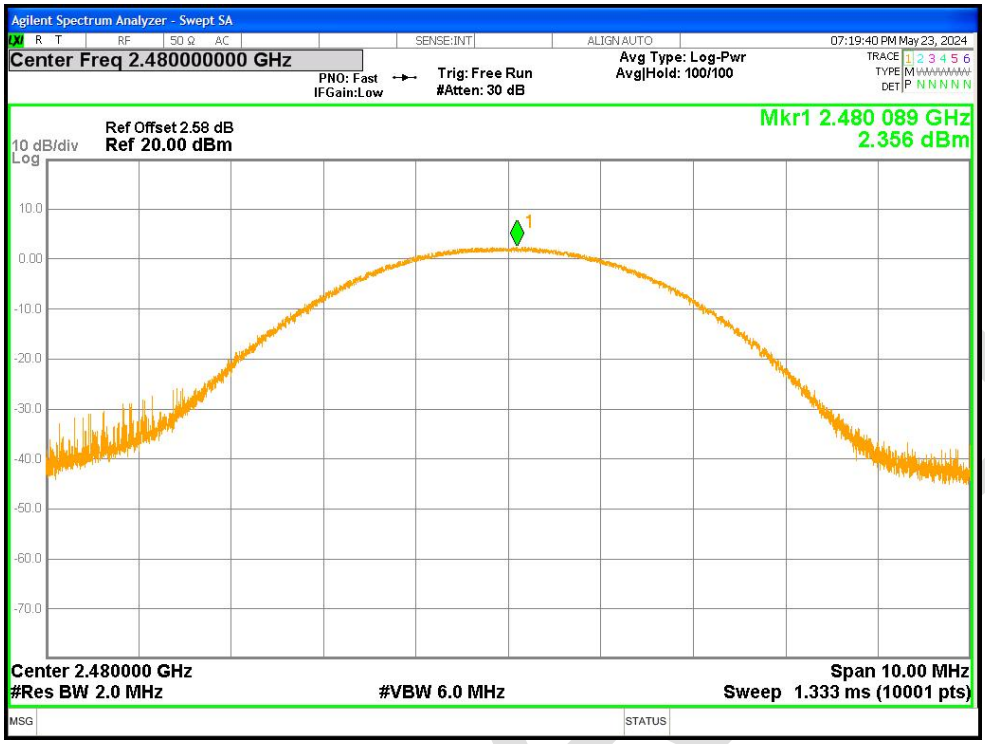
Power NVNT 2-DH1 2402MHz Ant1



Power NVNT 2-DH1 2441MHz Ant1



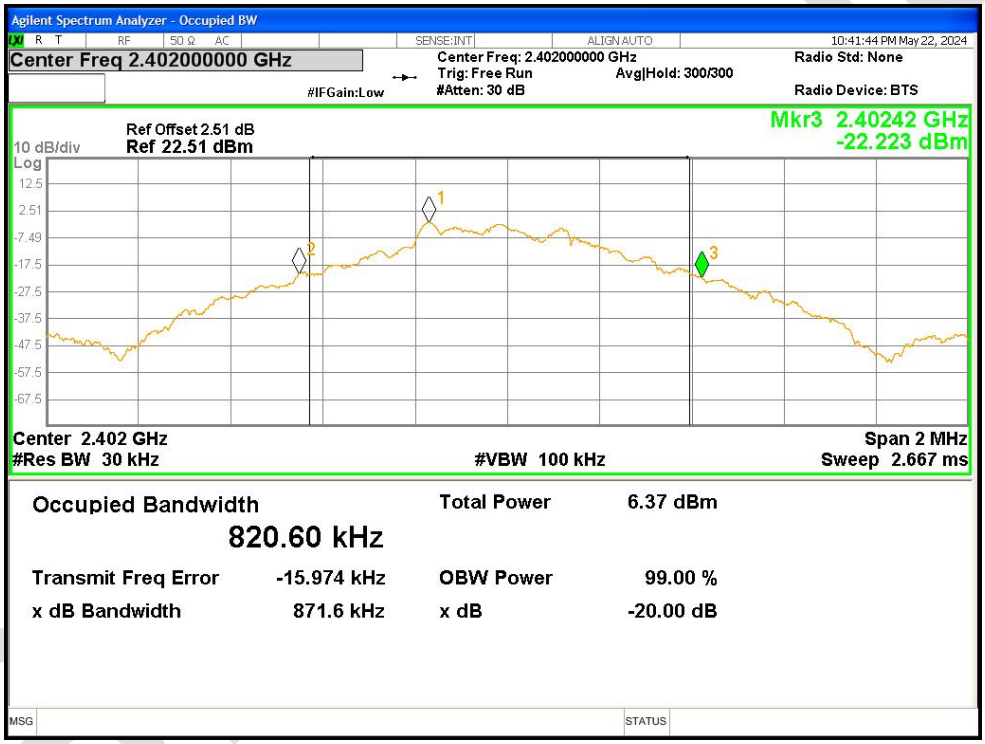
Power NVNT 2-DH1 2480MHz Ant1


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.480000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
07:19:40 PM May 23, 2024
Ref Offset 2.58 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.480 089 GHz
2.356 dBm
Center 2.480000 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 10.00 MHz
Sweep 1.333 ms (10001 pts)

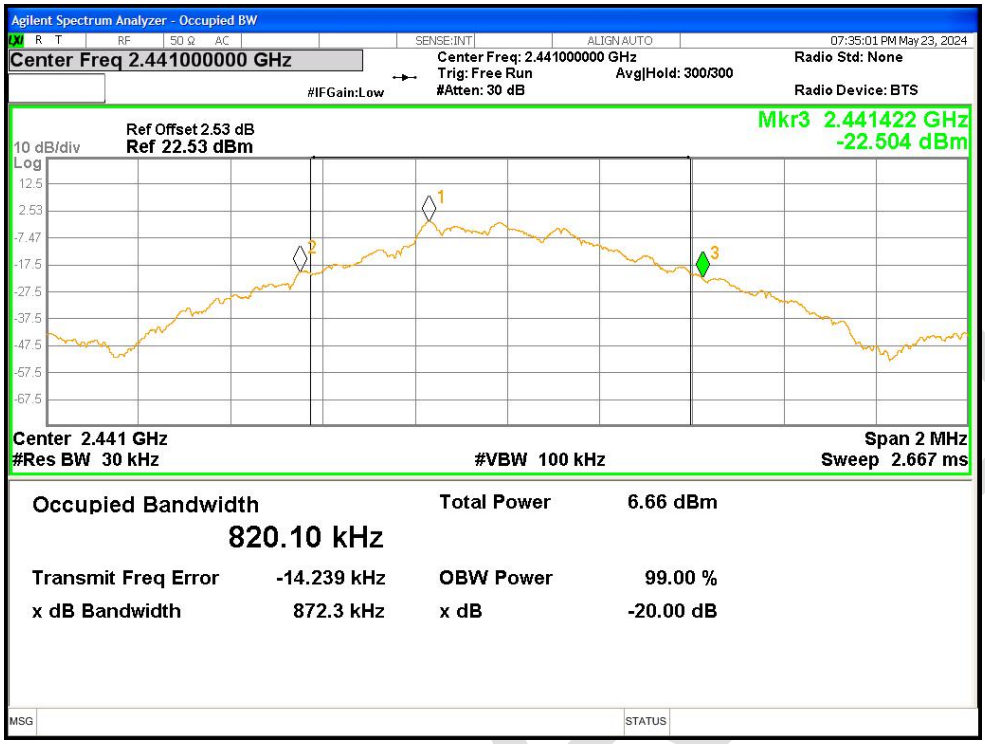
-20dB Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	-20 dB Bandwidth (MHz)	Limit -20 dB Bandwidth (MHz)	Verdict
NVNT	1-DH1	2402	Ant1	0.872	N/A	Pass
NVNT	1-DH1	2441	Ant1	0.872	N/A	Pass
NVNT	1-DH1	2480	Ant1	0.869	N/A	Pass
NVNT	2-DH1	2402	Ant1	1.253	N/A	Pass
NVNT	2-DH1	2441	Ant1	1.25	N/A	Pass
NVNT	2-DH1	2480	Ant1	1.247	N/A	Pass

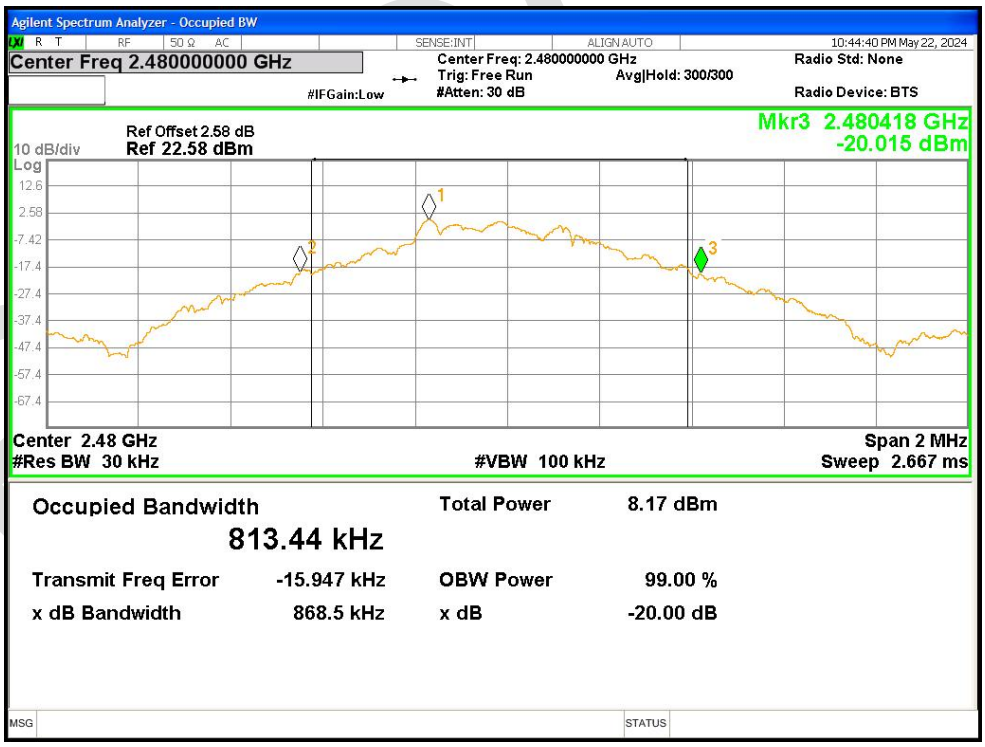
-20dB Bandwidth NVNT 1-DH1 2402MHz Ant1



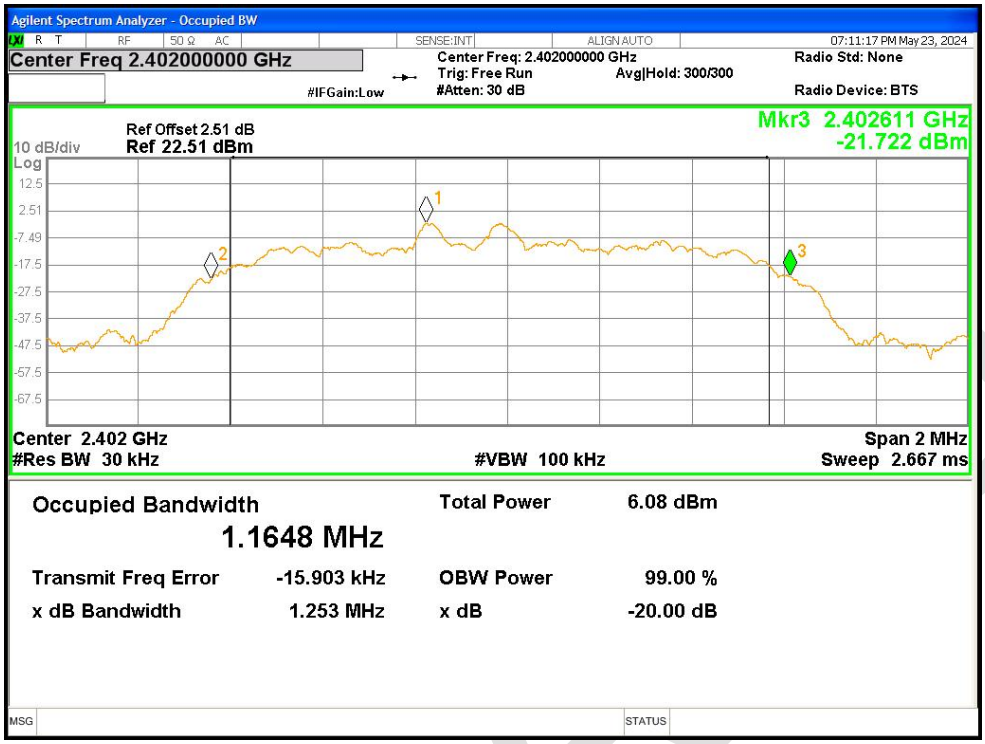
-20dB Bandwidth NVNT 1-DH1 2441MHz Ant1



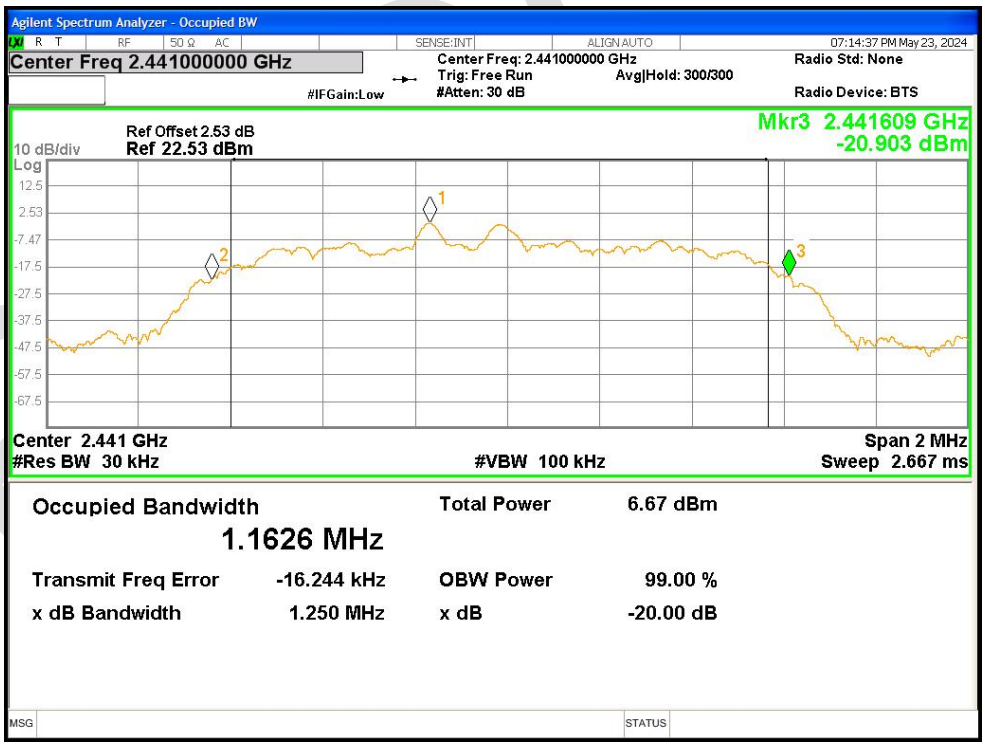
-20dB Bandwidth NVNT 1-DH1 2480MHz Ant1



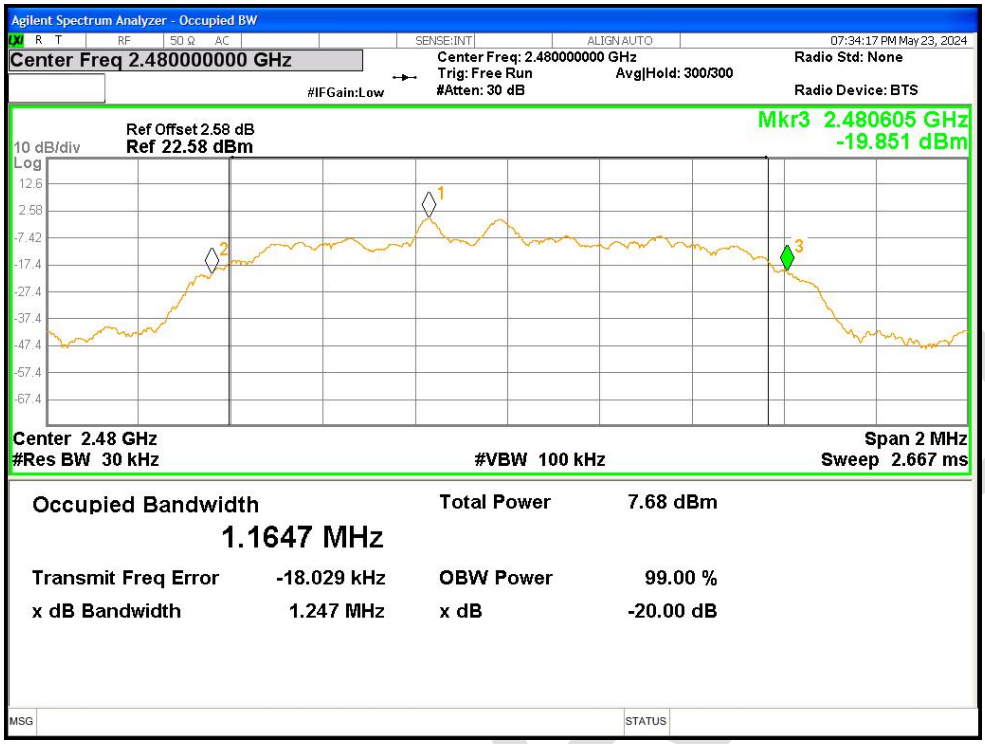
-20dB Bandwidth NVNT 2-DH1 2402MHz Ant1



-20dB Bandwidth NVNT 2-DH1 2441MHz Ant1



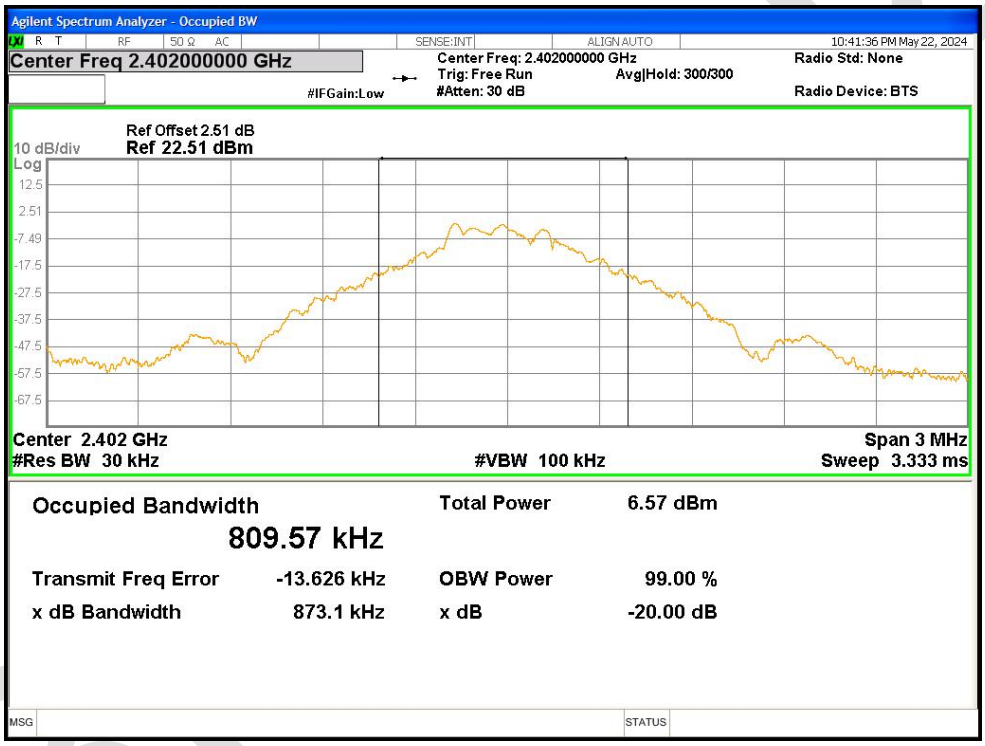
-20dB Bandwidth NVNT 2-DH1 2480MHz Ant1


Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg|Hold: 300/300
#IFGain:Low
Radio Std: None
Radio Device: BTS
07:34:17 PM May 23, 2024
Ref Offset 2.58 dB
10 dB/div
Ref 22.58 dBm
Log
Mkr3 2.480605 GHz
-19.851 dBm
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 2 MHz
Sweep 2.667 ms
Occupied Bandwidth
1.1647 MHz
Total Power 7.68 dBm
Transmit Freq Error -18.029 kHz
OBW Power 99.00 %
x dB Bandwidth 1.247 MHz
x dB -20.00 dB
MSG
STATUS

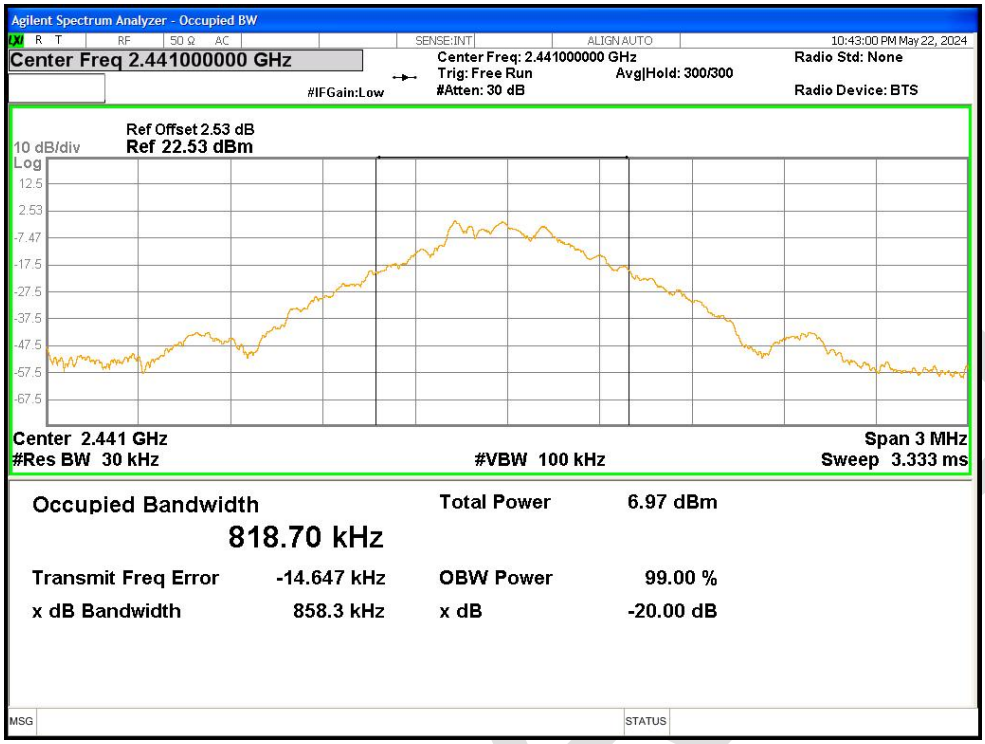
Occupied Channel Bandwidth

Condition	Mode	Frequency (MHz)	Antenna	99% OBW (MHz)
NVNT	1-DH1	2402	Ant1	0.80957
NVNT	1-DH1	2441	Ant1	0.81870
NVNT	1-DH1	2480	Ant1	0.81625
NVNT	2-DH1	2402	Ant1	1.1665
NVNT	2-DH1	2441	Ant1	1.1663
NVNT	2-DH1	2480	Ant1	1.1663

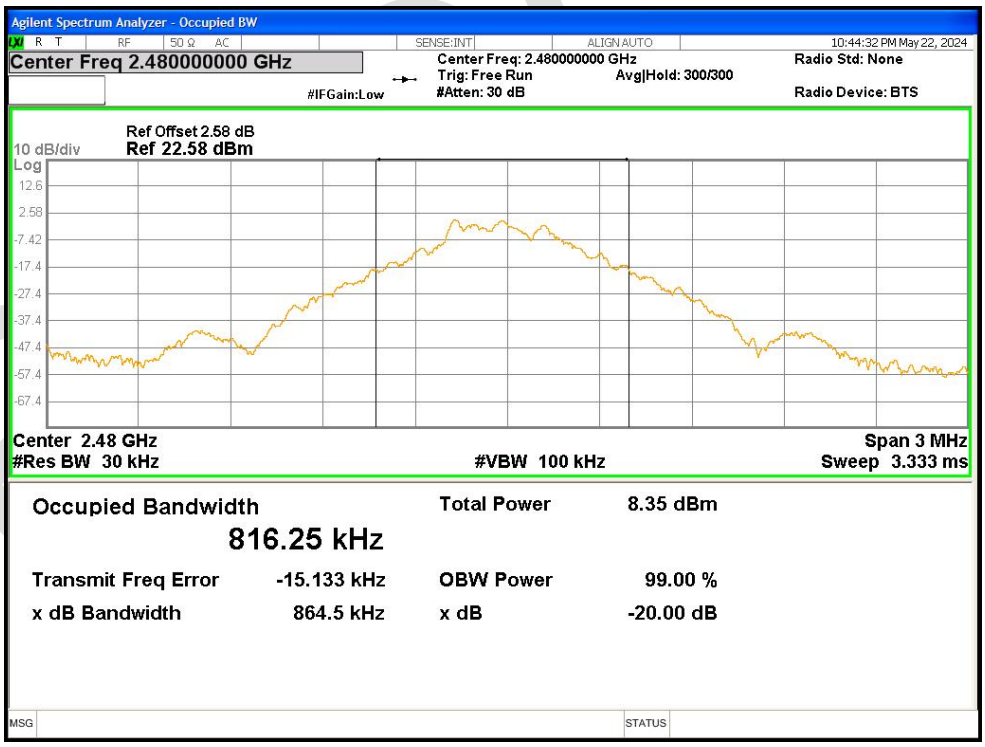
OBW NVNT 1-DH1 2402MHz Ant1



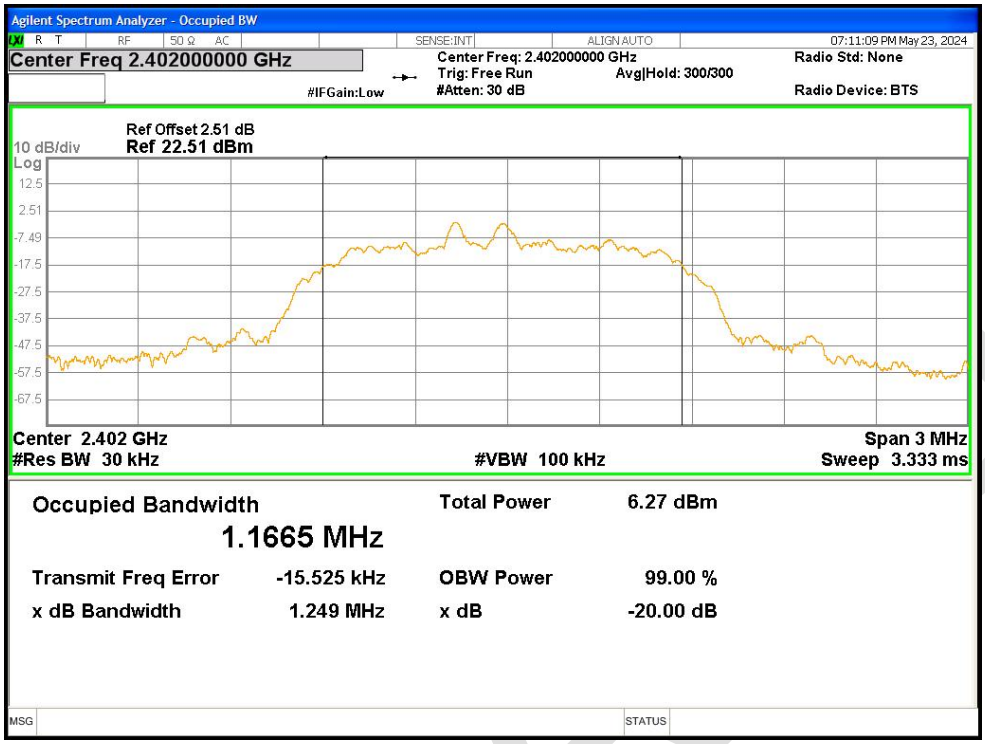
OBW NVNT 1-DH1 2441MHz Ant1



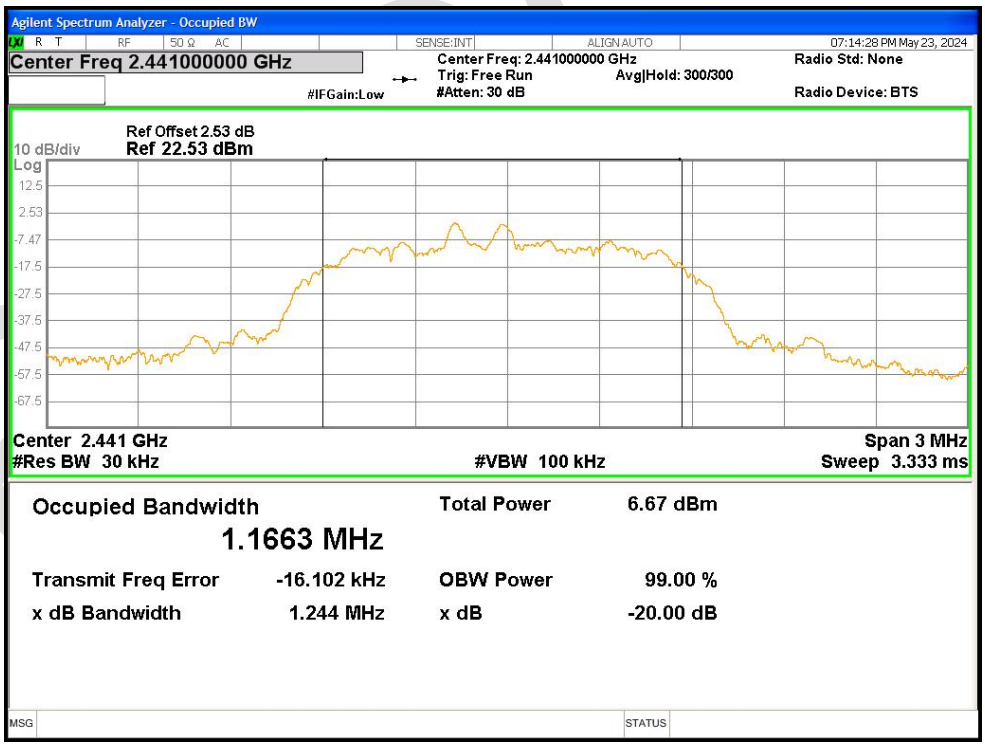
OBW NVNT 1-DH1 2480MHz Ant1



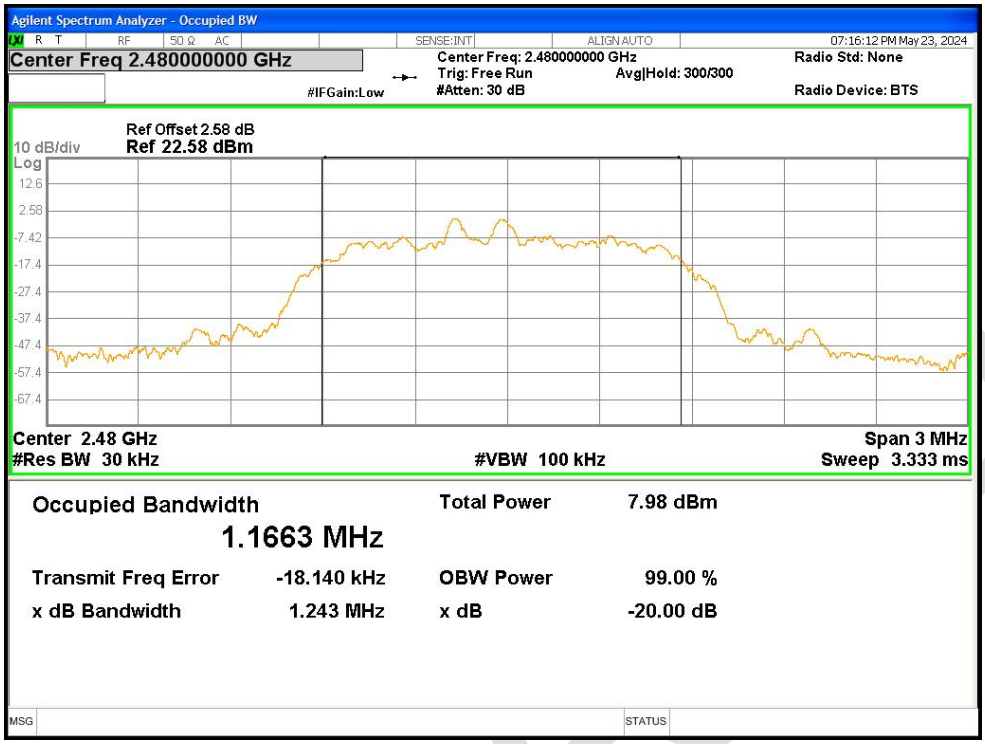
OBW NVNT 2-DH1 2402MHz Ant1



OBW NVNT 2-DH1 2441MHz Ant1



OBW NVNT 2-DH1 2480MHz Ant1

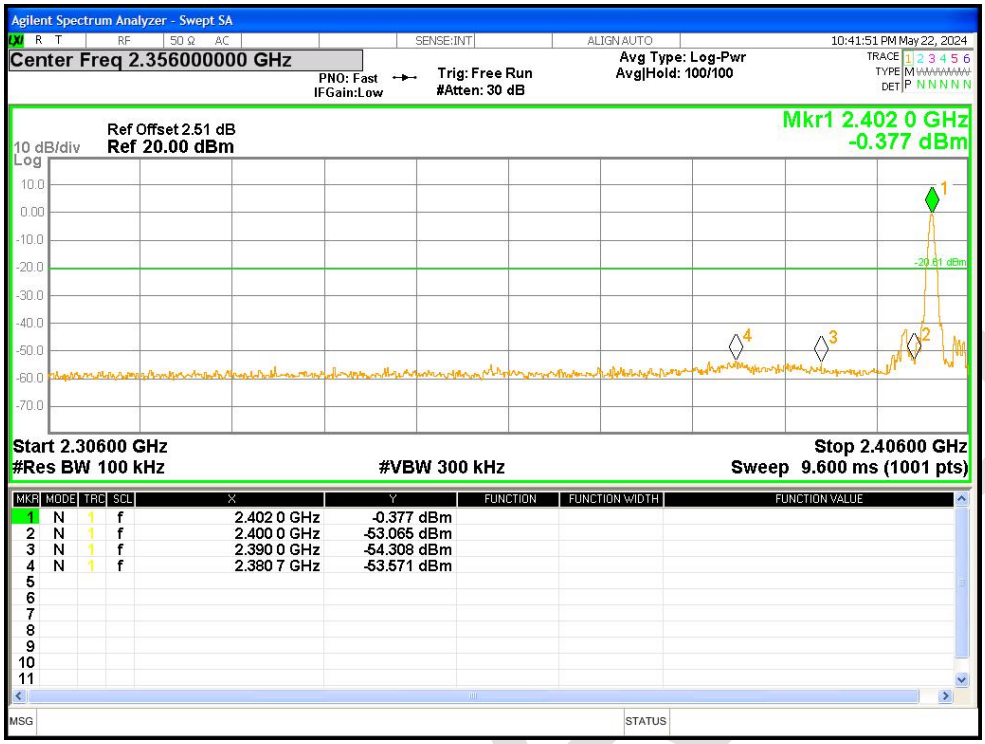

Agilent Spectrum Analyzer - Occupied BW
Center Freq 2.480000000 GHz
Center Freq: 2.480000000 GHz
Trig: Free Run
#Atten: 30 dB
Avg|Hold: 300/300
Radio Std: None
Radio Device: BTS
07:16:12 PM May 23, 2024
#IFGain:Low
Ref Offset 2.58 dB
10 dB/div
Ref 22.58 dBm
Log
12.6
2.58
-7.42
-17.4
-27.4
-37.4
-47.4
-57.4
-67.4
Center 2.48 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 3.333 ms
Occupied Bandwidth
1.1663 MHz
Total Power 7.98 dBm
Transmit Freq Error -18.140 kHz
OBW Power 99.00 %
x dB Bandwidth 1.243 MHz
x dB -20.00 dB
MSG
STATUS

Band Edge

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	No-Hopping	-52.96	-20	Pass
NVNT	1-DH1	2480	Ant1	No-Hopping	-47.77	-20	Pass
NVNT	2-DH1	2402	Ant1	No-Hopping	-53.12	-20	Pass
NVNT	2-DH1	2480	Ant1	No-Hopping	-48.51	-20	Pass

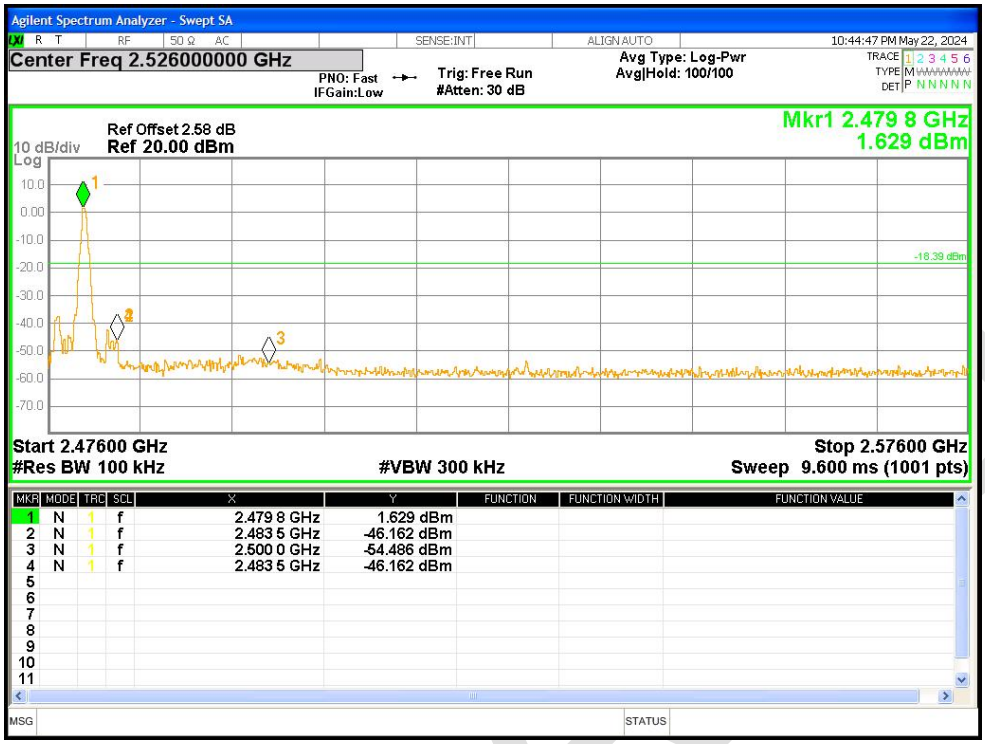
Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Ref

Band Edge NVNT 1-DH1 2402MHz Ant1 No-Hopping Emission

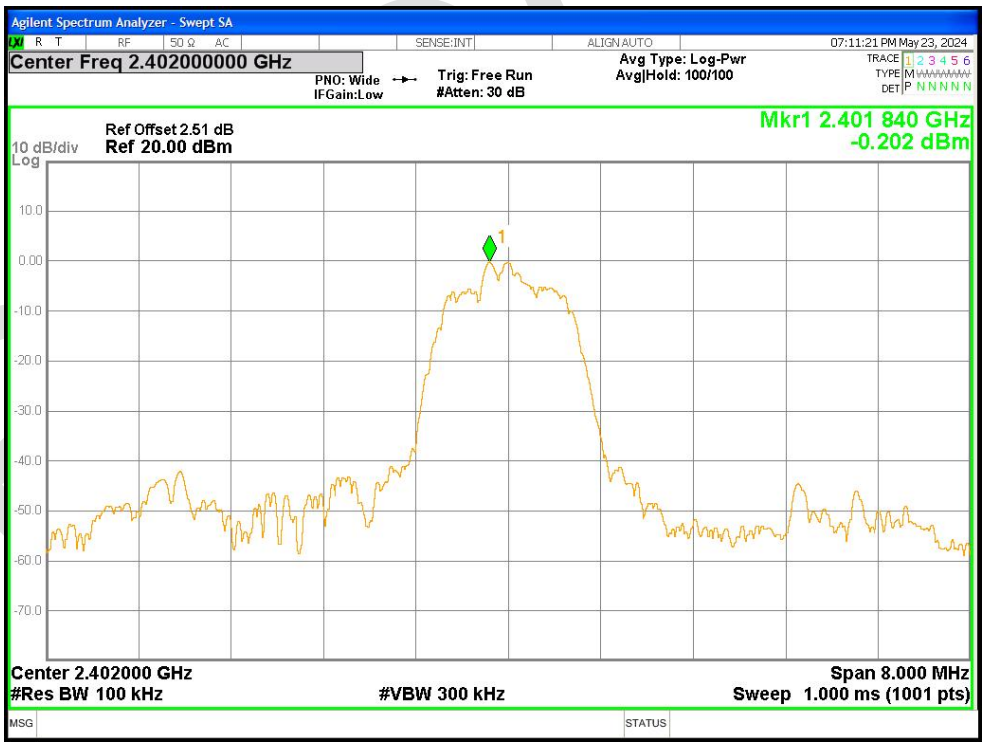


Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Ref

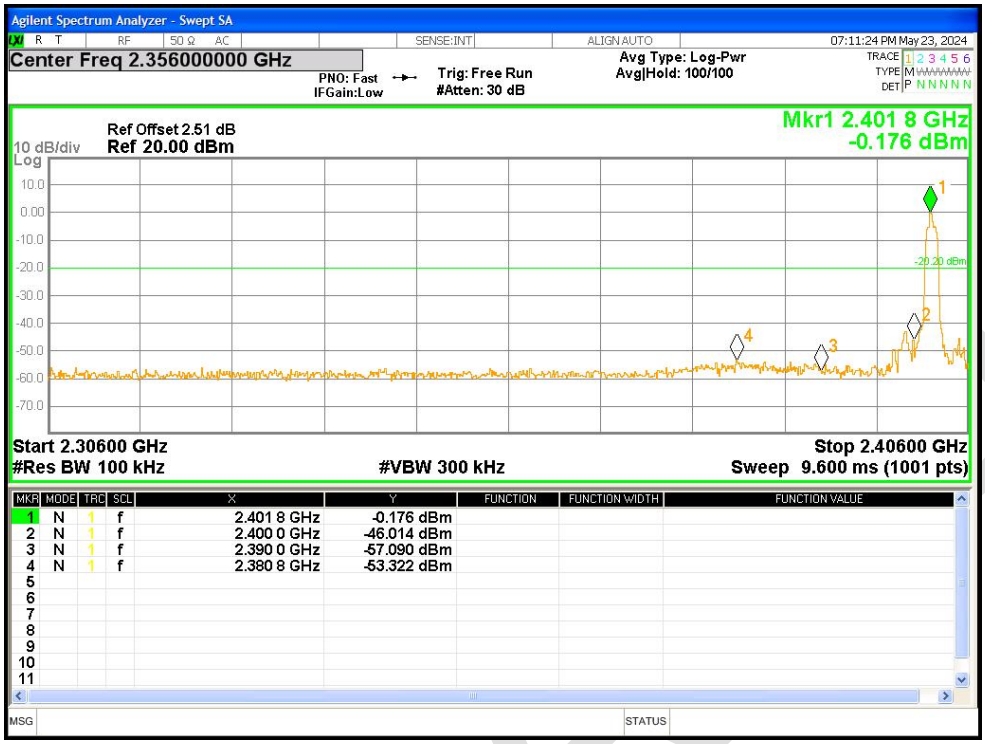
Band Edge NVNT 1-DH1 2480MHz Ant1 No-Hopping Emission



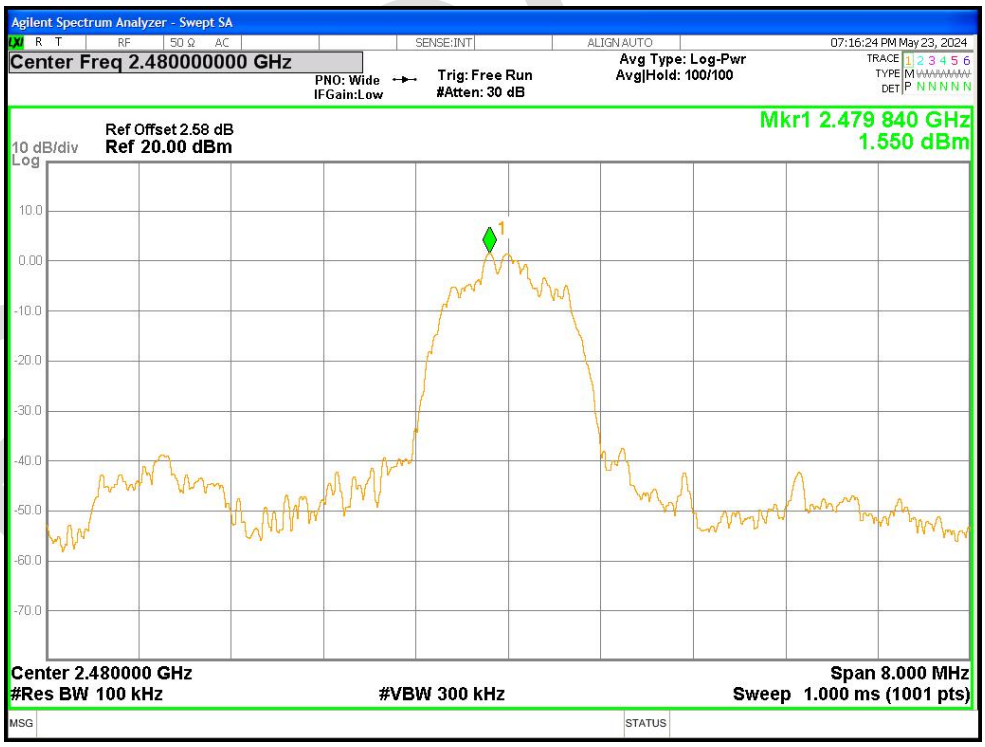
Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Ref



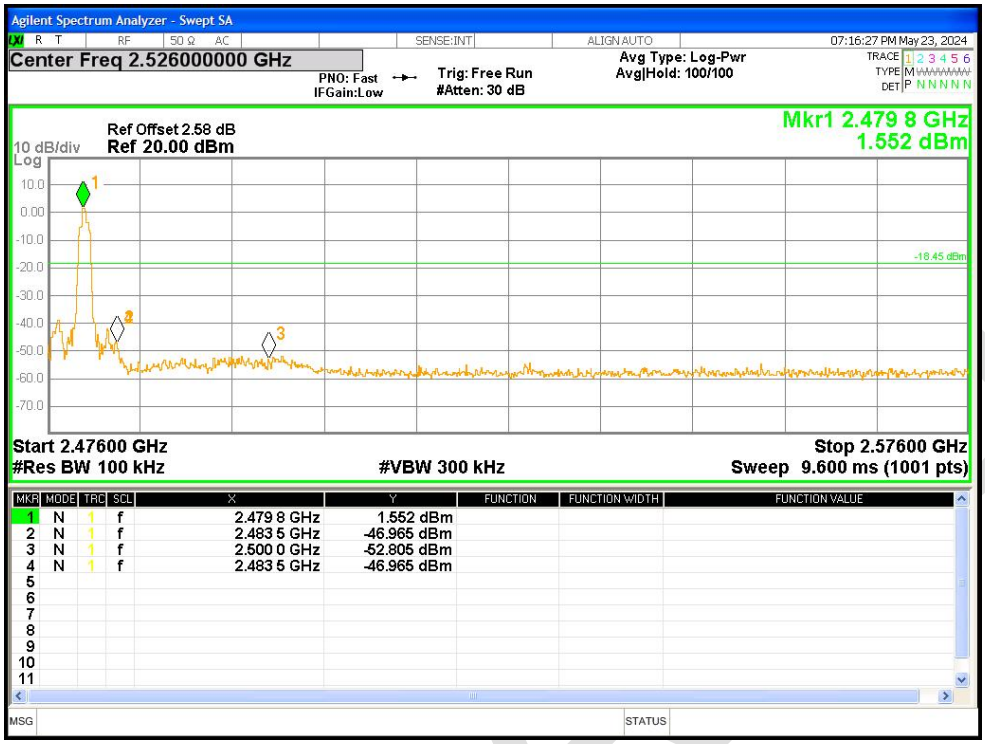
Band Edge NVNT 2-DH1 2402MHz Ant1 No-Hopping Emission



Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Ref



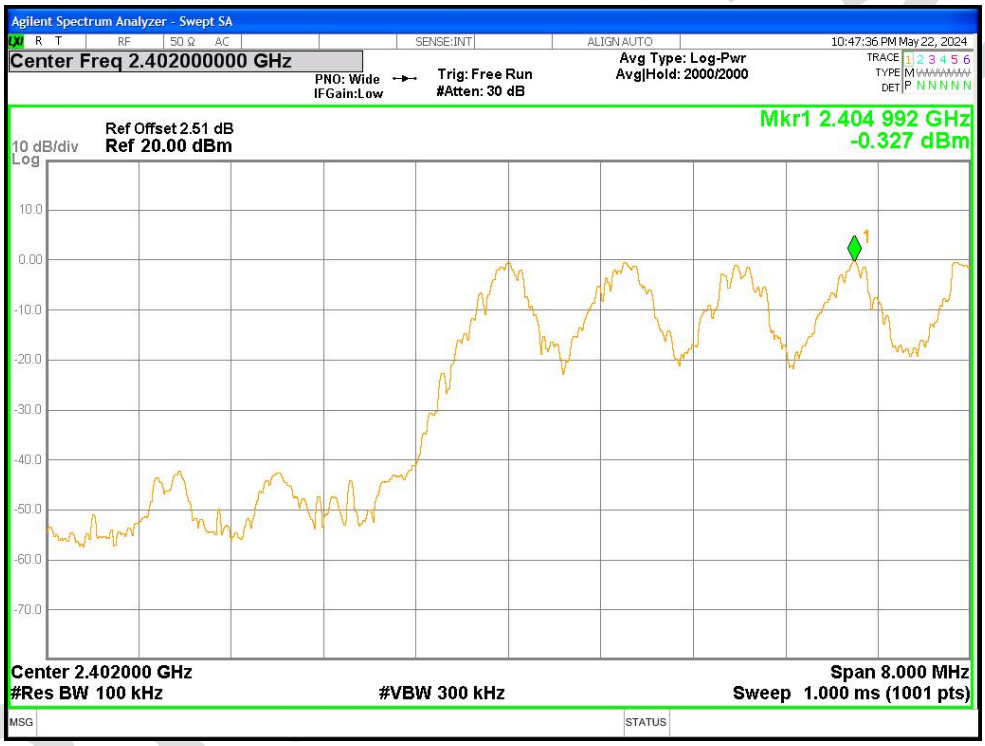
Band Edge NVNT 2-DH1 2480MHz Ant1 No-Hopping Emission


Agilent Spectrum Analyzer - Swept SA
Center Freq 2.526000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold: 100/100
07:16:27 PM May 23, 2024
Ref Offset 2.58 dB
10 dB/div
Ref 20.00 dBm
Log
Mkr1 2.479 8 GHz
1.552 dBm
-18.45 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 2.479 8 GHz 1.552 dBm
2 N 1 f 2.483 5 GHz -46.965 dBm
3 N 1 f 2.500 0 GHz -52.805 dBm
4 N 1 f 2.483 5 GHz -46.965 dBm

Band Edge(Hopping)

Condition	Mode	Frequency (MHz)	Antenna	Hopping Mode	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	Hopping	-51.59	-20	Pass
NVNT	1-DH1	2480	Ant1	Hopping	-47.77	-20	Pass
NVNT	2-DH1	2402	Ant1	Hopping	-51.95	-20	Pass
NVNT	2-DH1	2480	Ant1	Hopping	-50.78	-20	Pass

Band Edge(Hopping) NVNT 1-DH1 2402MHz Ant1 Hopping Ref



Band Edge(Hopping) NVNT 1-DH1 2402MHz Ant1 Hopping Emission