Appendix A

RF Test Data for 2.4GWIFI (Conducted Measurement)

Product Name: Robot vacuum cleaner

Test Model: X20

Environmental Conditions

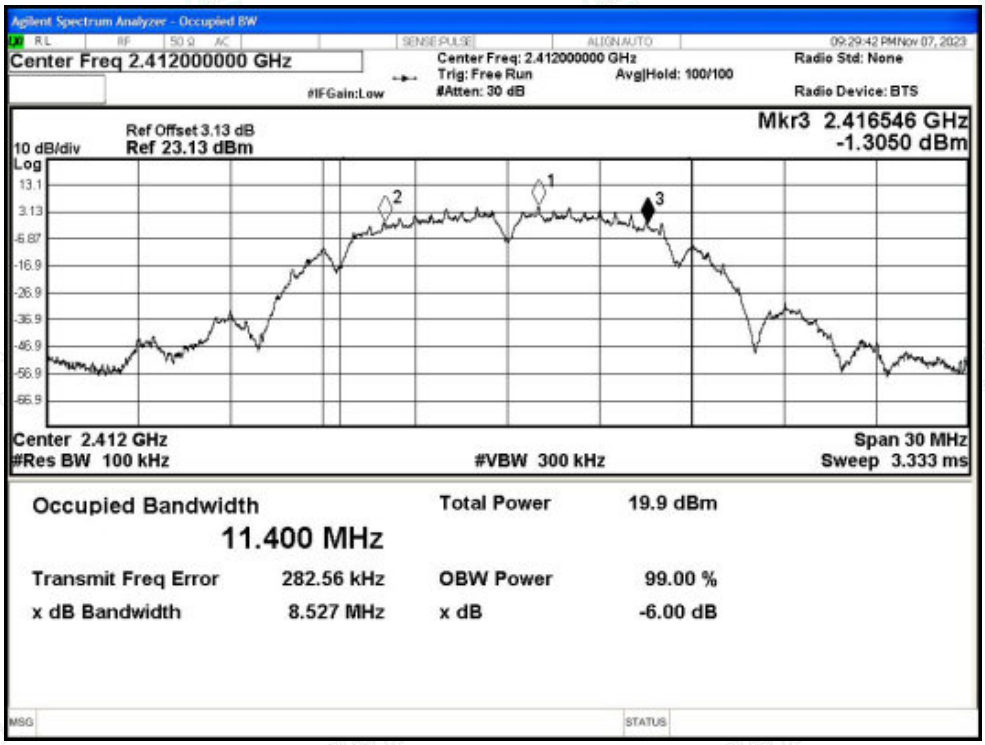
Temperature:	23.8° C
Relative Humidity:	52.1%
ATM Pressure:	100.0 kPa
Test Engineer:	Nick Peng
Supervised by:	Jack Cheng

A.1 -6dB Bandwidth

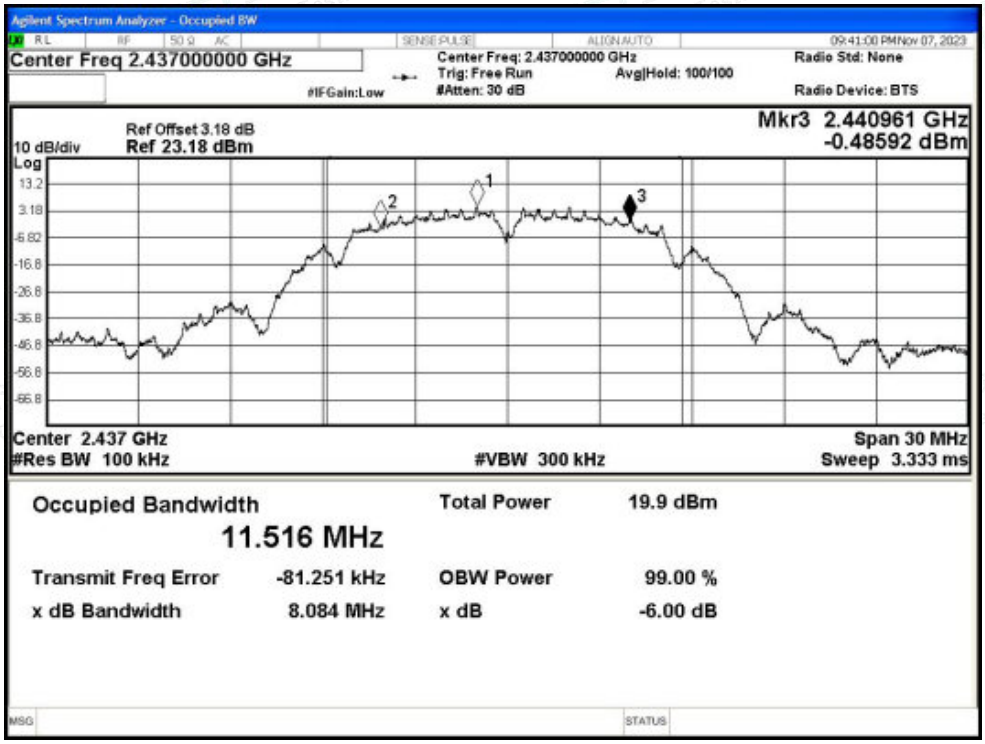
Condition	Mode	Frequency (MHz)	Antenna	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
NVNT	b	2412	Ant1	8.527	>=0.5	Pass
NVNT	b	2437	Ant1	8.084	>=0.5	Pass
NVNT	b	2462	Ant1	9.058	>=0.5	Pass
NVNT	g	2412	Ant1	16.119	>=0.5	Pass
NVNT	g	2437	Ant1	16.308	>=0.5	Pass
NVNT	g	2462	Ant1	16.082	>=0.5	Pass
NVNT	n20	2412	Ant1	16.696	>=0.5	Pass
NVNT	n20	2437	Ant1	16.899	>=0.5	Pass
NVNT	n20	2462	Ant1	17.377	>=0.5	Pass
NVNT	n40	2422	Ant1	35.754	>=0.5	Pass
NVNT	n40	2437	Ant1	35.526	>=0.5	Pass
NVNT	n40	2452	Ant1	34.505	>=0.5	Pass

Test Graphs

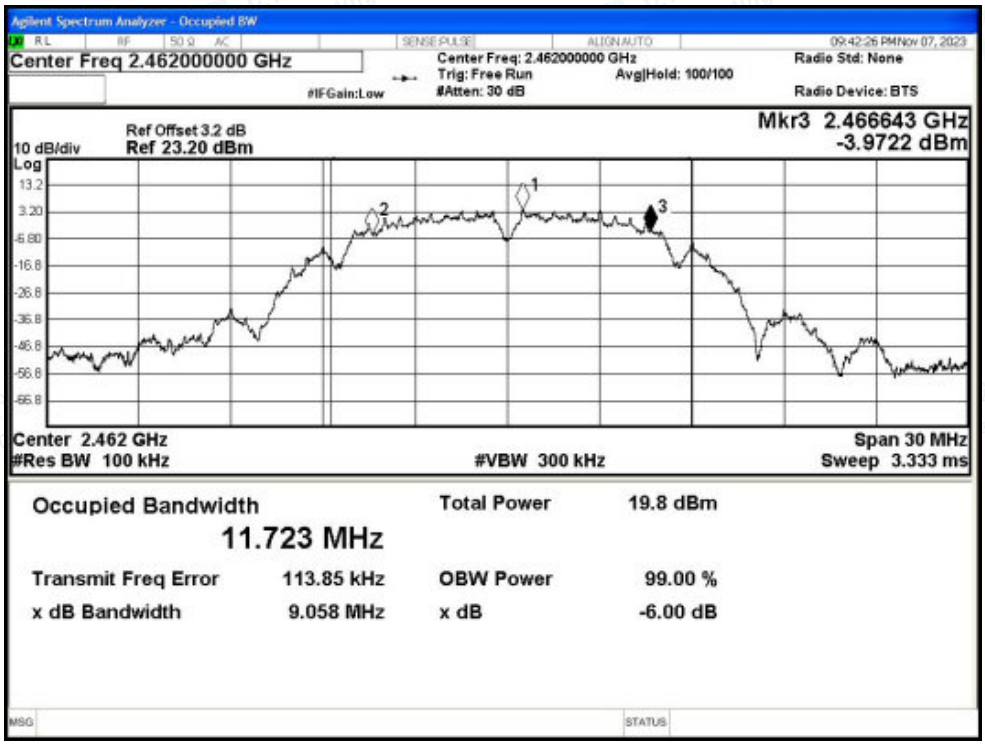
-6dB Bandwidth NVNT b 2412MHz Ant1



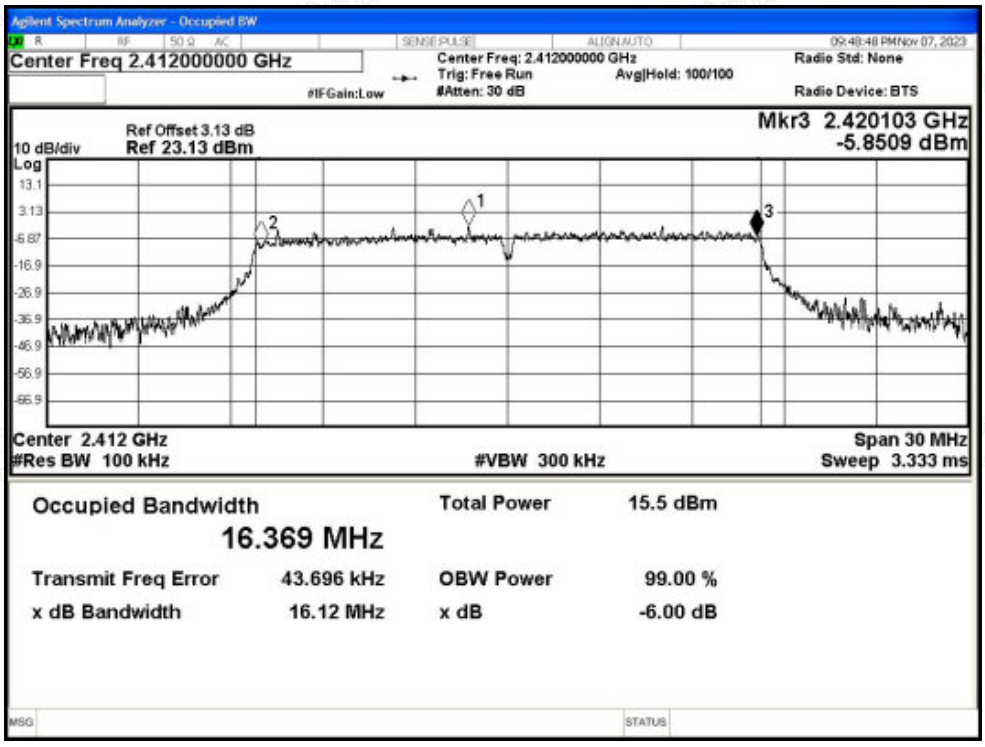
-6dB Bandwidth NVNT b 2437MHz Ant1



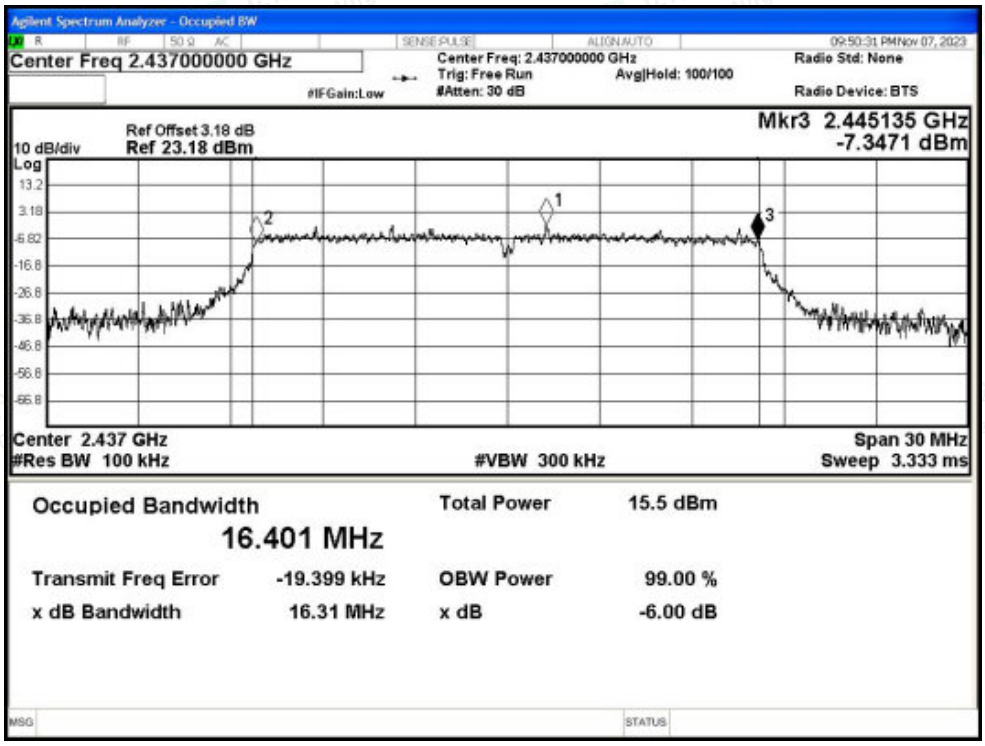
-6dB Bandwidth NVNT b 2462MHz Ant1



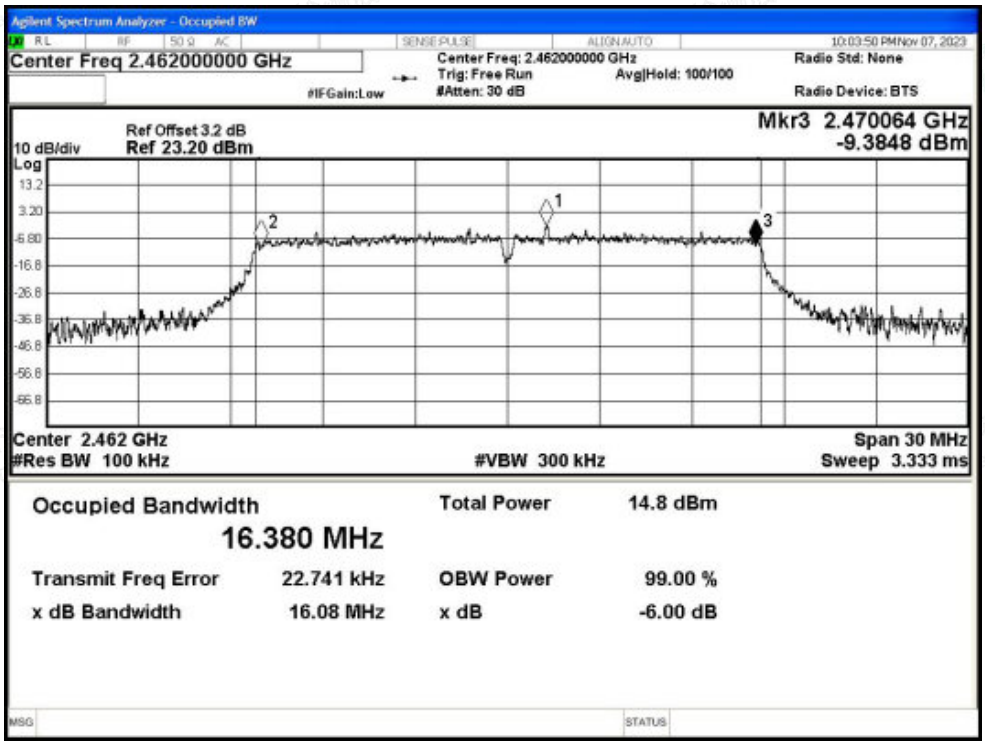
-6dB Bandwidth NVNT g 2412MHz Ant1



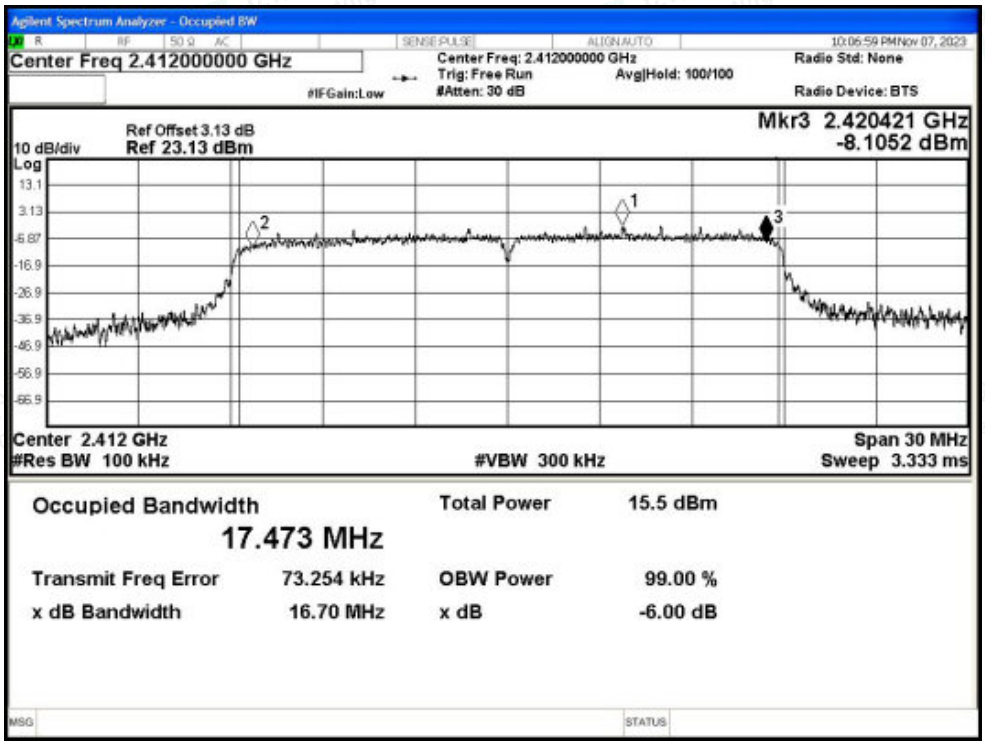
-6dB Bandwidth NVNT g 2437MHz Ant1



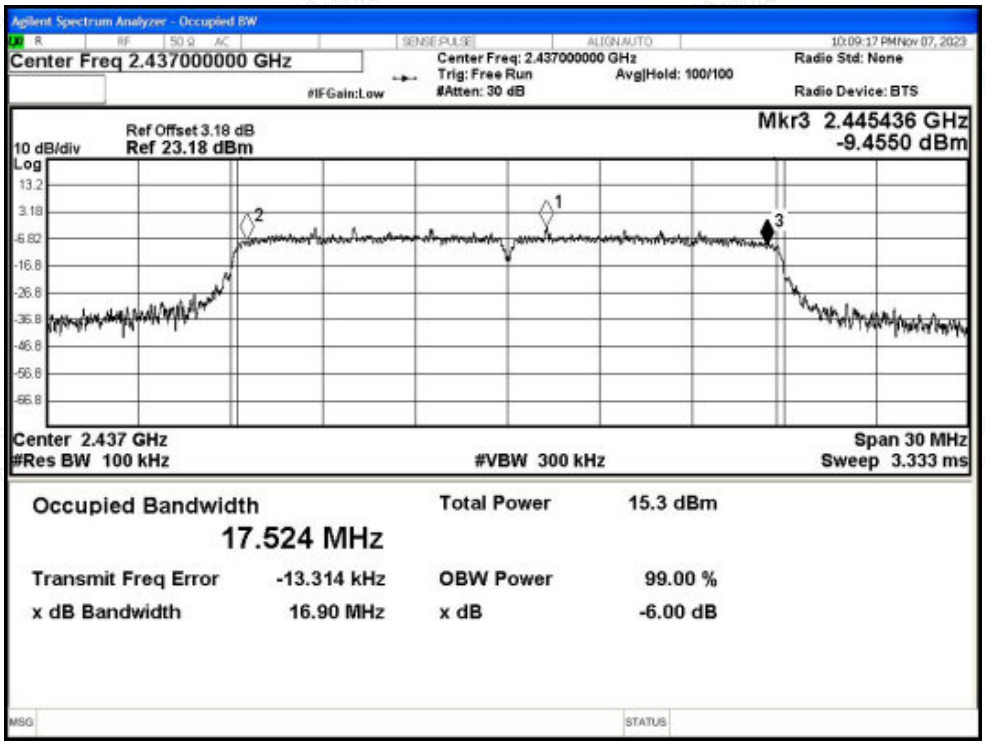
-6dB Bandwidth NVNT g 2462MHz Ant1



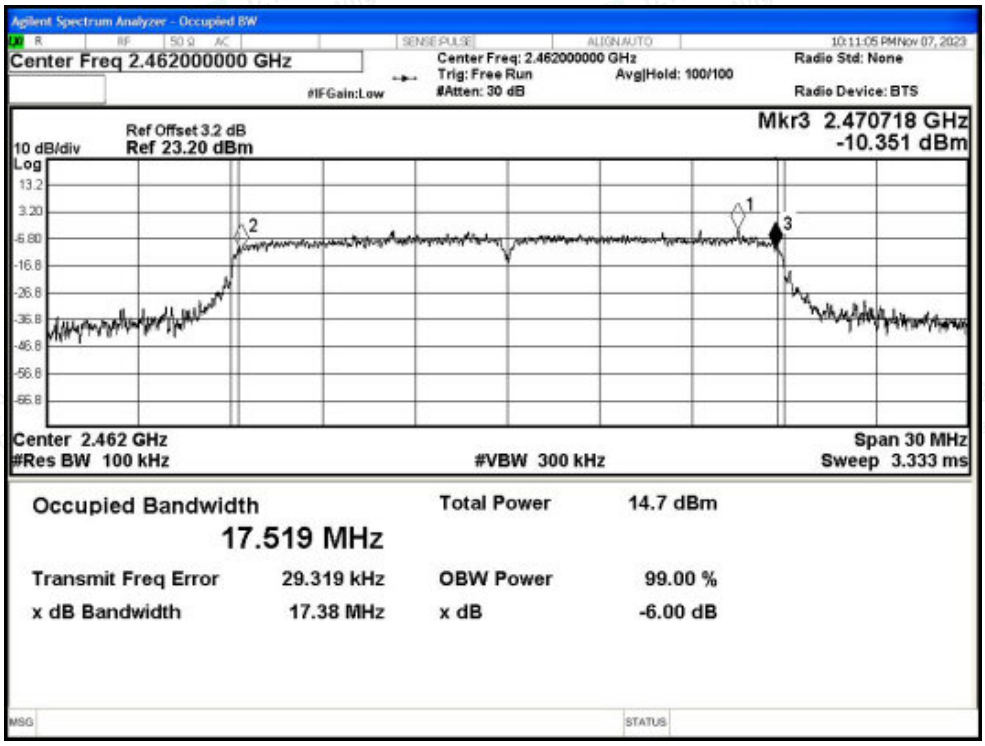
-6dB Bandwidth NVNT n20 2412MHz Ant1



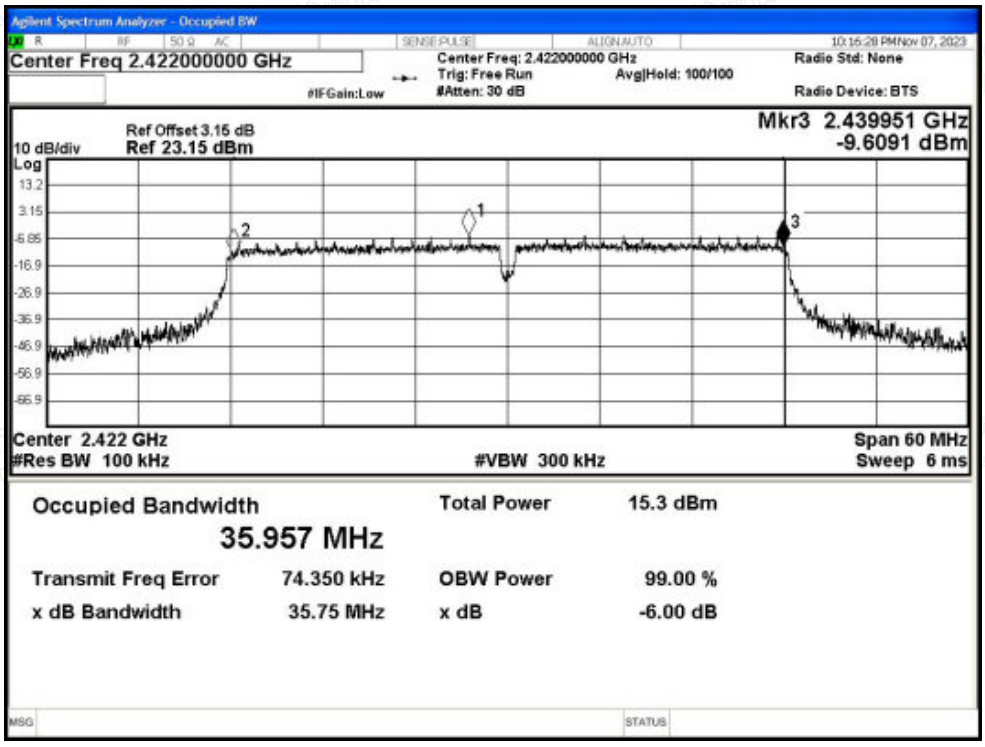
-6dB Bandwidth NVNT n20 2437MHz Ant1



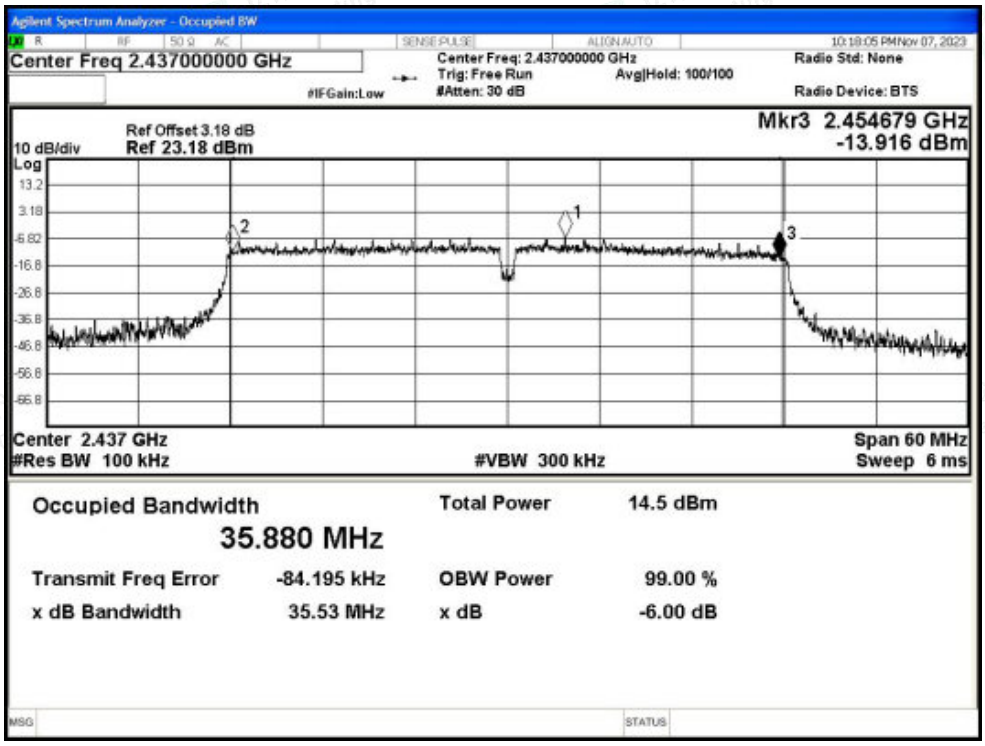
-6dB Bandwidth NVNT n20 2462MHz Ant1



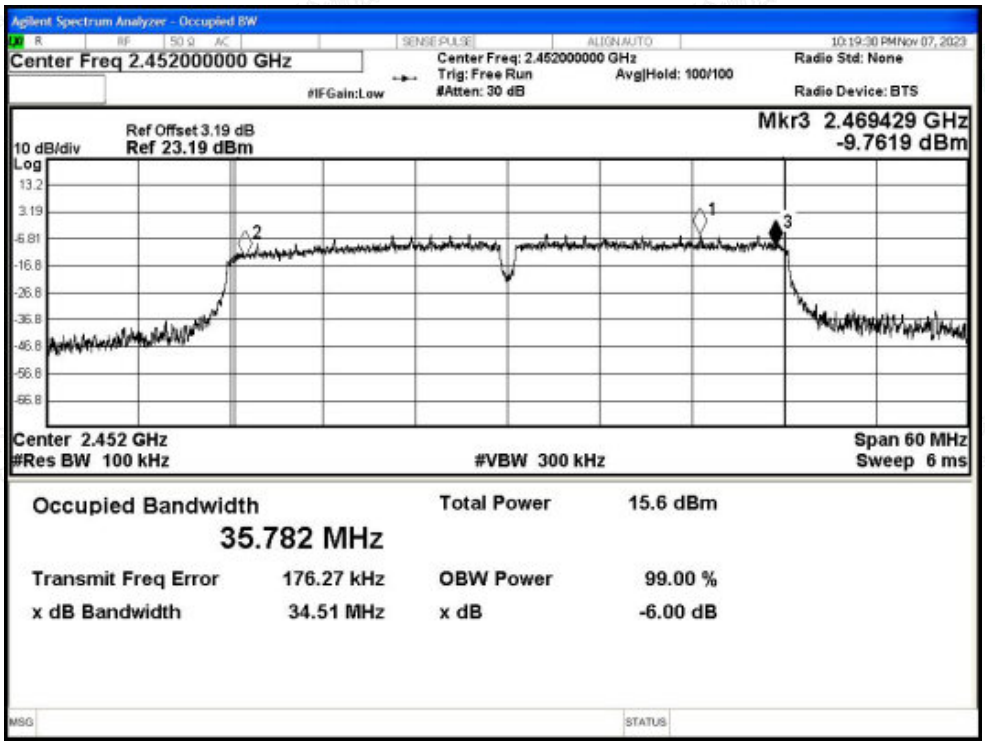
-6dB Bandwidth NVNT n40 2422MHz Ant1



-6dB Bandwidth NVNT n40 2437MHz Ant1



-6dB Bandwidth NVNT n40 2452MHz Ant1



A.2 Maximum Peak Conducted Output Power

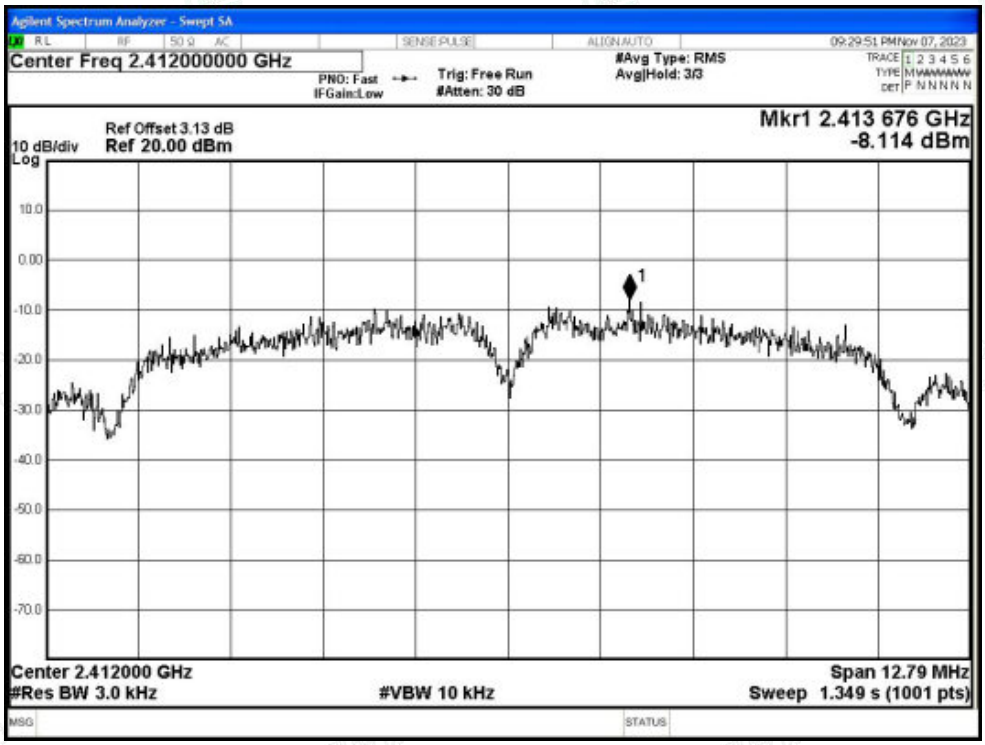
Condition	Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Limit (dBm)	Verdict
NVNT	b	2412	Ant1	14.94	30	Pass
NVNT	b	2437	Ant1	14.86	30	Pass
NVNT	b	2462	Ant1	14.89	30	Pass
NVNT	g	2412	Ant1	14.27	30	Pass
NVNT	g	2437	Ant1	14.28	30	Pass
NVNT	g	2462	Ant1	13.59	30	Pass
NVNT	n20	2412	Ant1	14.01	30	Pass
NVNT	n20	2437	Ant1	13.82	30	Pass
NVNT	n20	2462	Ant1	13.29	30	Pass
NVNT	n40	2422	Ant1	13.57	30	Pass
NVNT	n40	2437	Ant1	12.86	30	Pass
NVNT	n40	2452	Ant1	13.82	30	Pass

A.3 Maximum Power Spectral Density Level

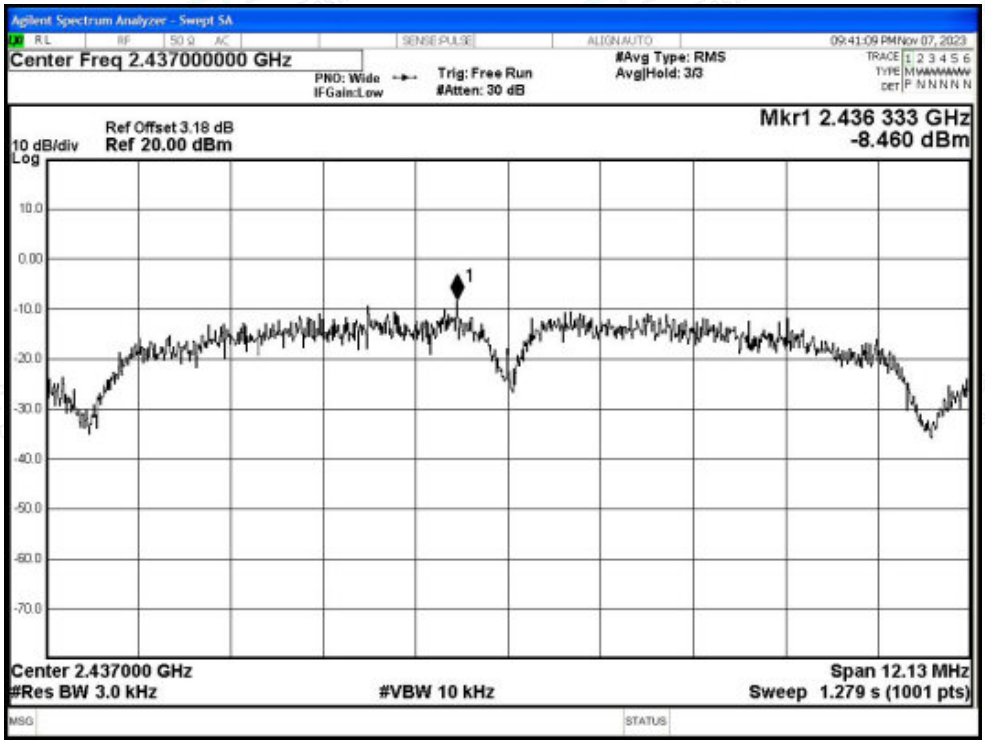
Condition	Mode	Frequency (MHz)	Antenna	Conducted PSD (dBm/3kHz)	Limit (dBm/3kHz)	Verdict
NVNT	b	2412	Ant1	-8.11	8	Pass
NVNT	b	2437	Ant1	-8.46	8	Pass
NVNT	b	2462	Ant1	-9.24	8	Pass
NVNT	g	2412	Ant1	-15.84	8	Pass
NVNT	g	2437	Ant1	-16.53	8	Pass
NVNT	g	2462	Ant1	-17.29	8	Pass
NVNT	n20	2412	Ant1	-16.39	8	Pass
NVNT	n20	2437	Ant1	-16.87	8	Pass
NVNT	n20	2462	Ant1	-17.15	8	Pass
NVNT	n40	2422	Ant1	-20.41	8	Pass
NVNT	n40	2437	Ant1	-20.85	8	Pass
NVNT	n40	2452	Ant1	-19.95	8	Pass

Test Graphs

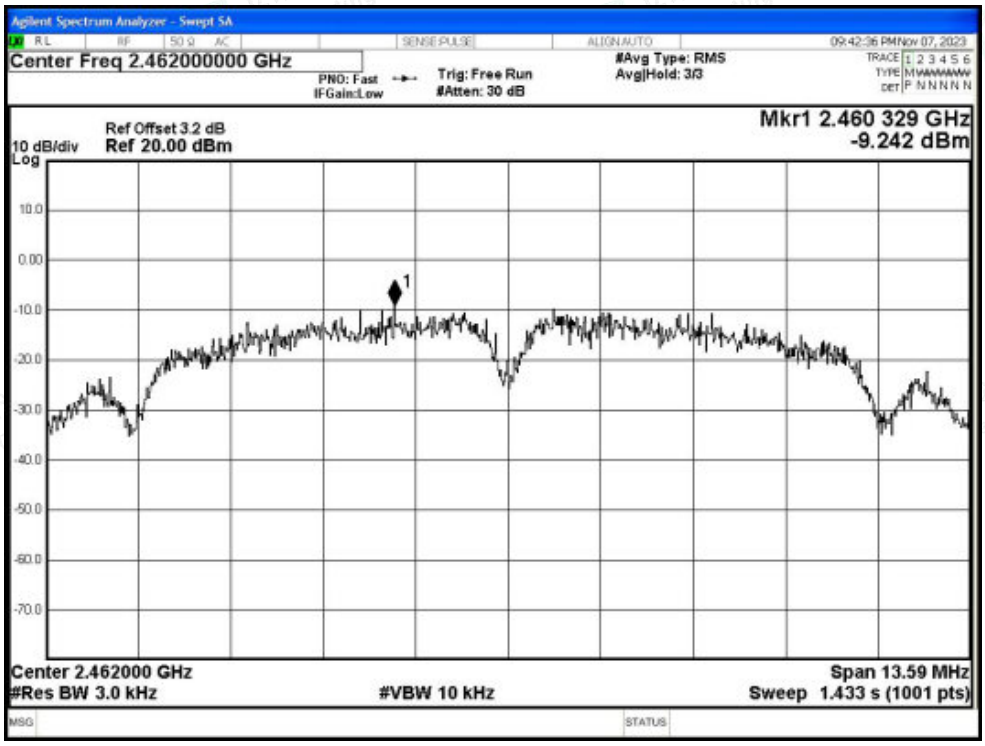
PSD NVNT b 2412MHz Ant1



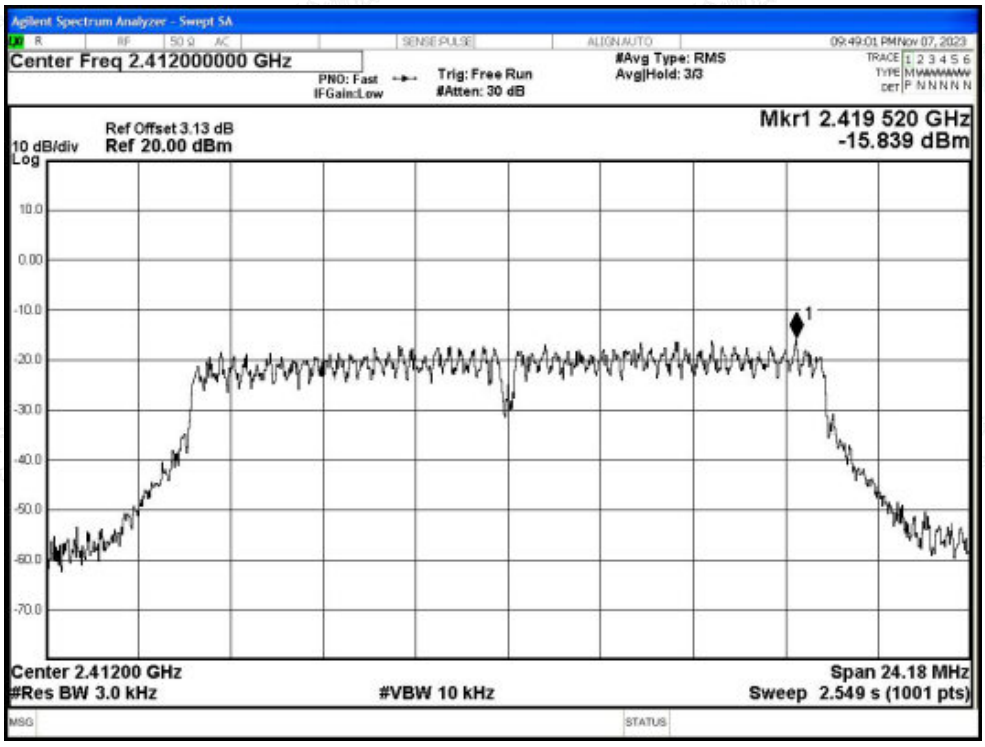
PSD NVNT b 2437MHz Ant1



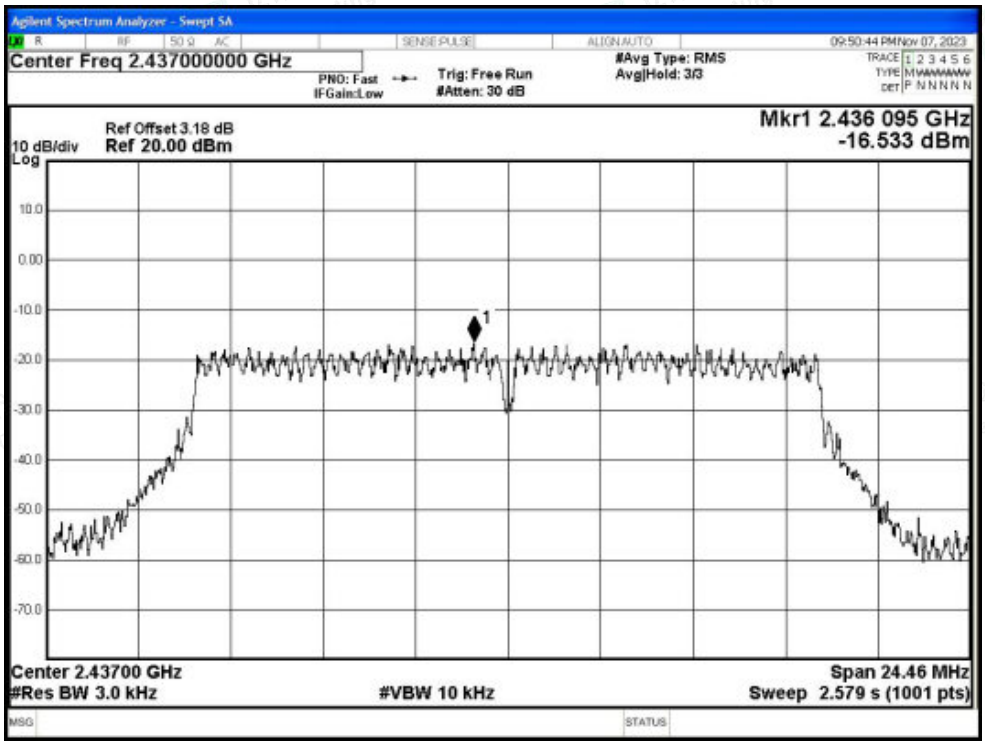
PSD NVNT b 2462MHz Ant1



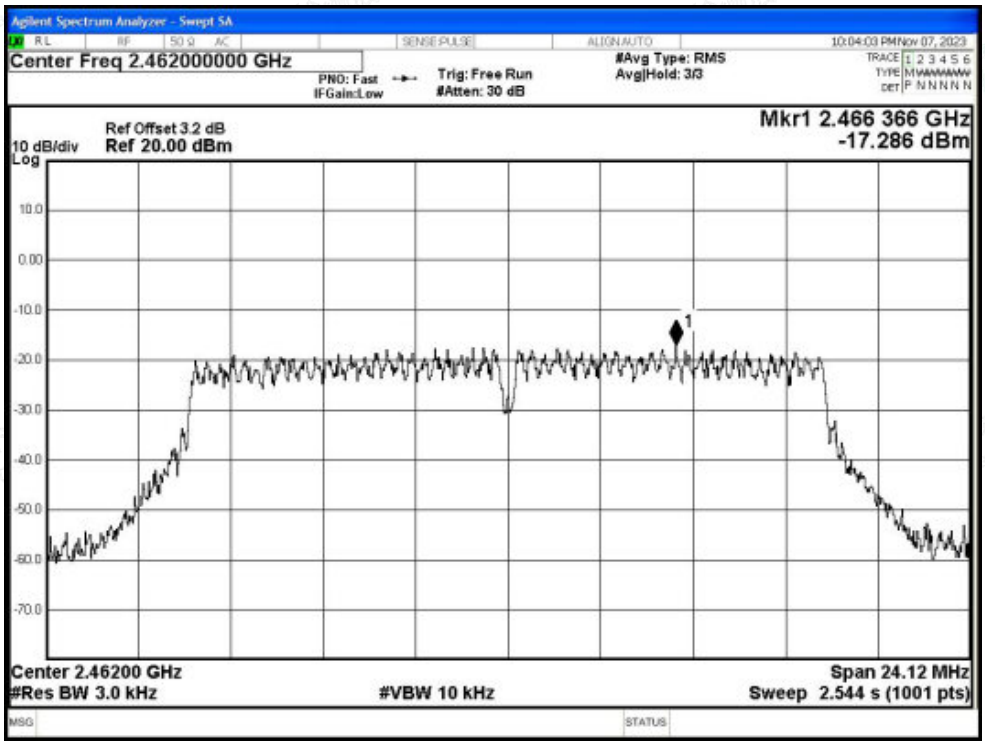
PSD NVNT g 2412MHz Ant1



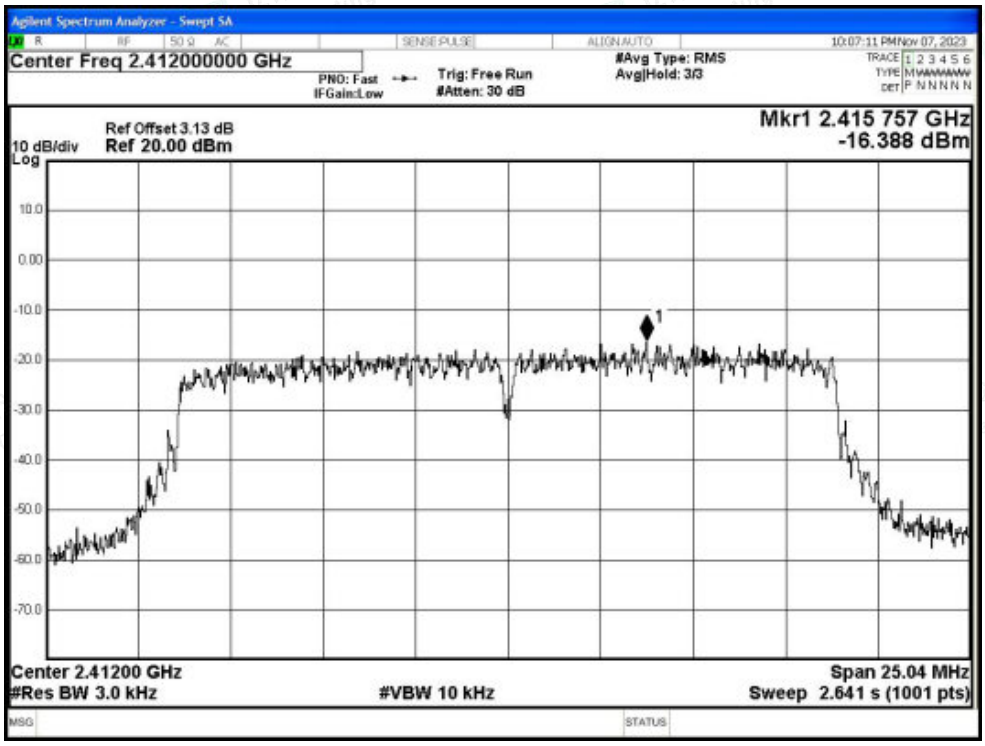
PSD NVNT g 2437MHz Ant1



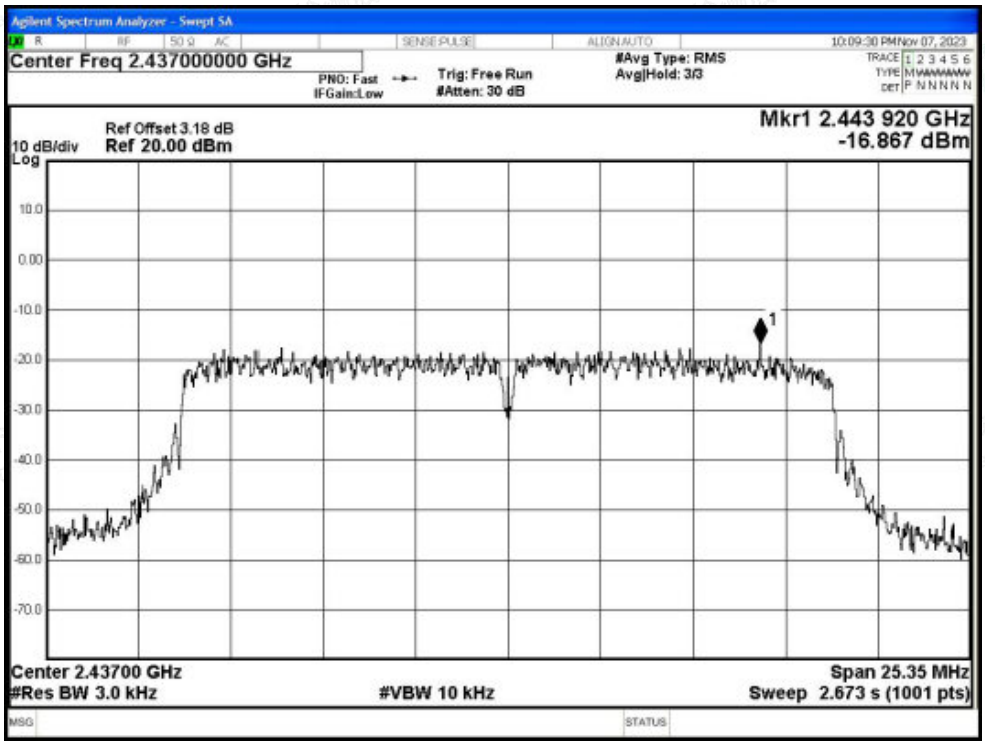
PSD NVNT g 2462MHz Ant1



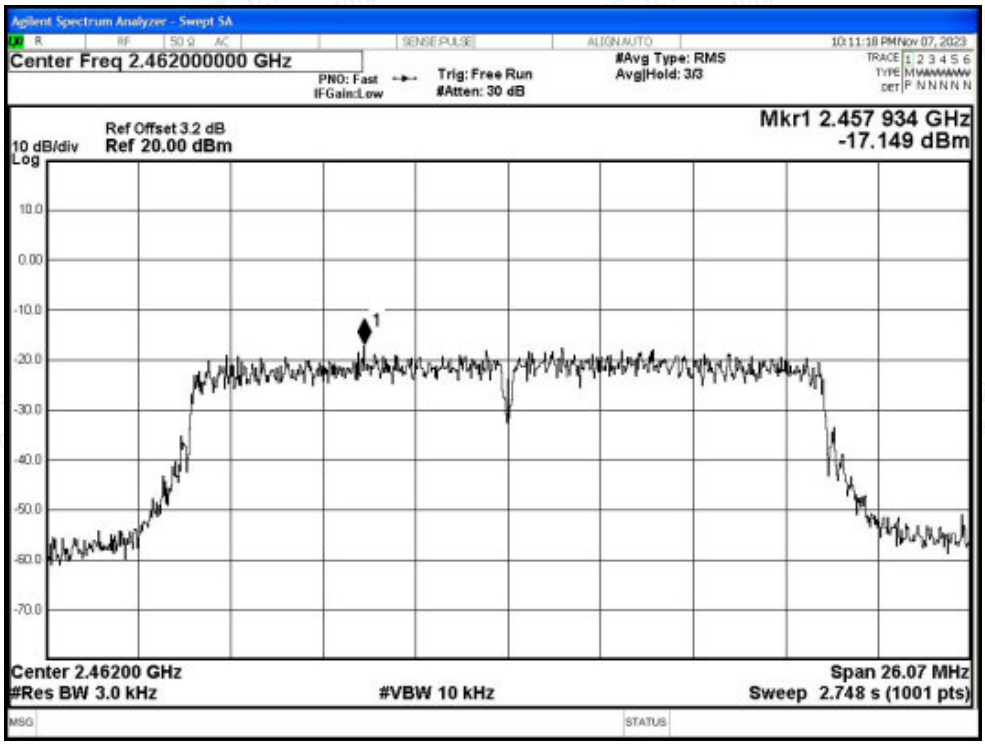
PSD NVNT n20 2412MHz Ant1



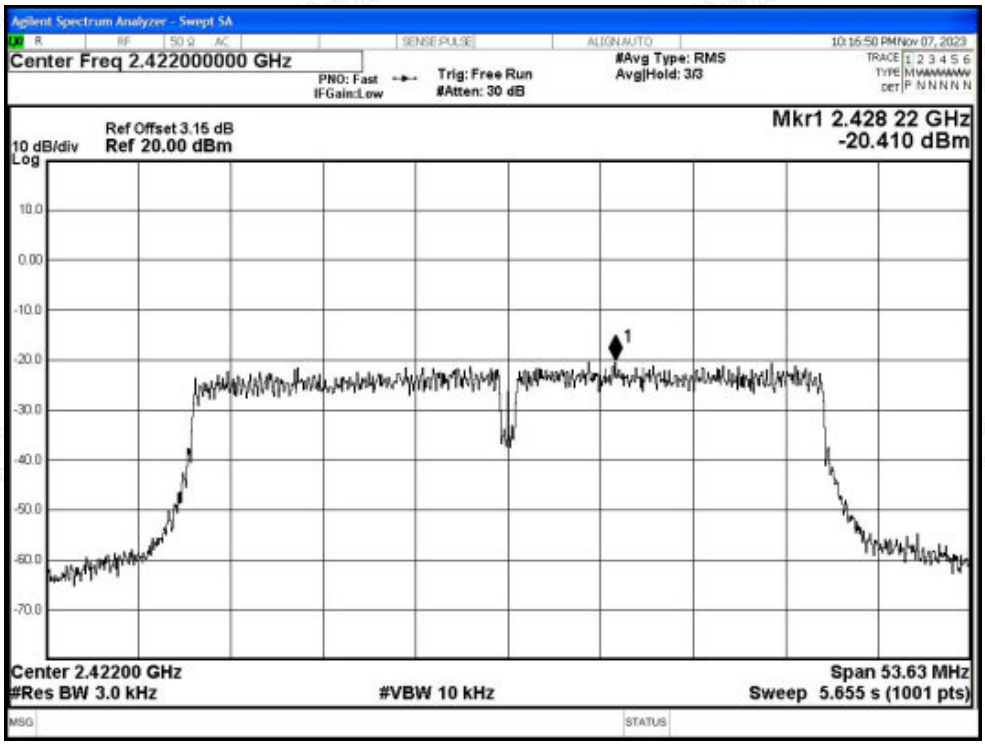
PSD NVNT n20 2437MHz Ant1



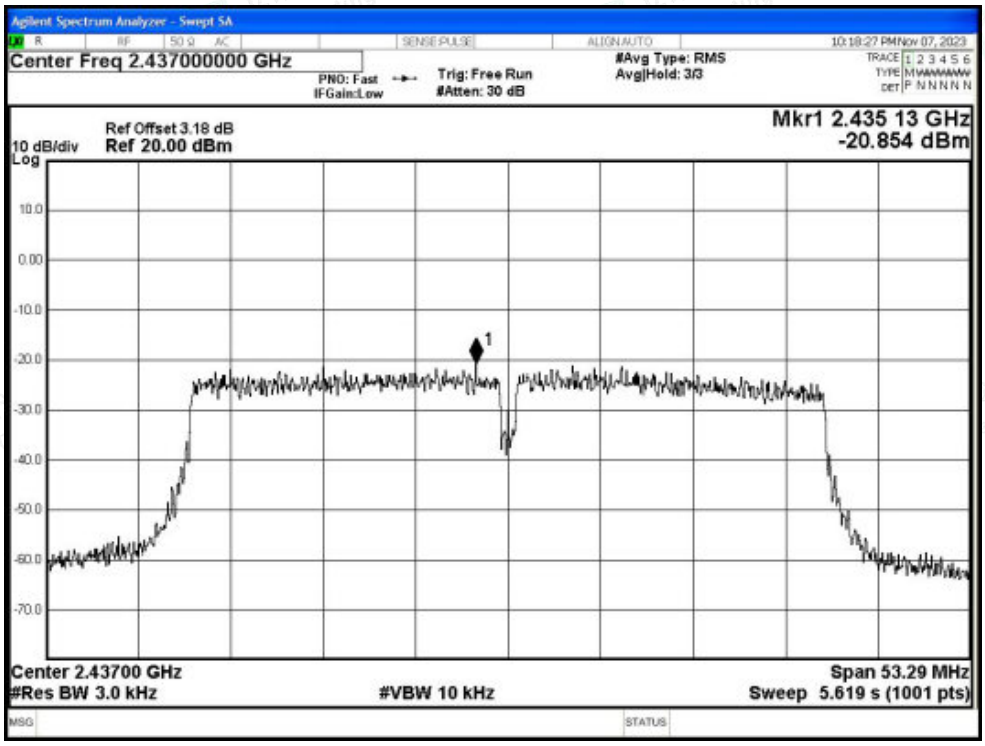
PSD NVNT n20 2462MHz Ant1



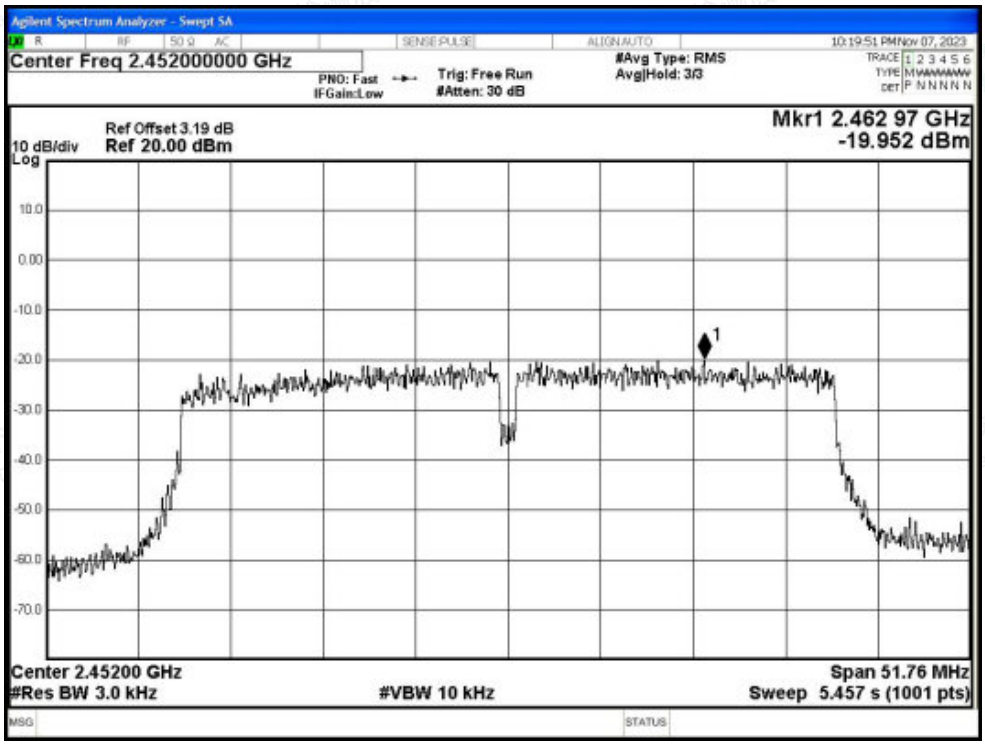
PSD NVNT n40 2422MHz Ant1



PSD NVNT n40 2437MHz Ant1



PSD NVNT n40 2452MHz Ant1

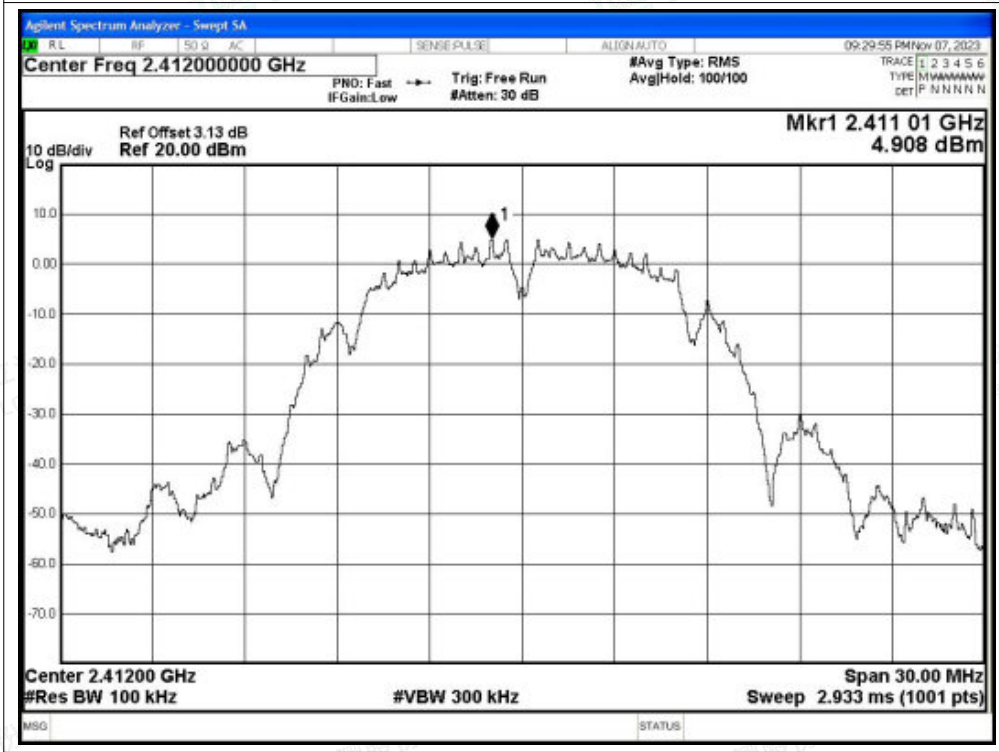


A.4 Band Edge

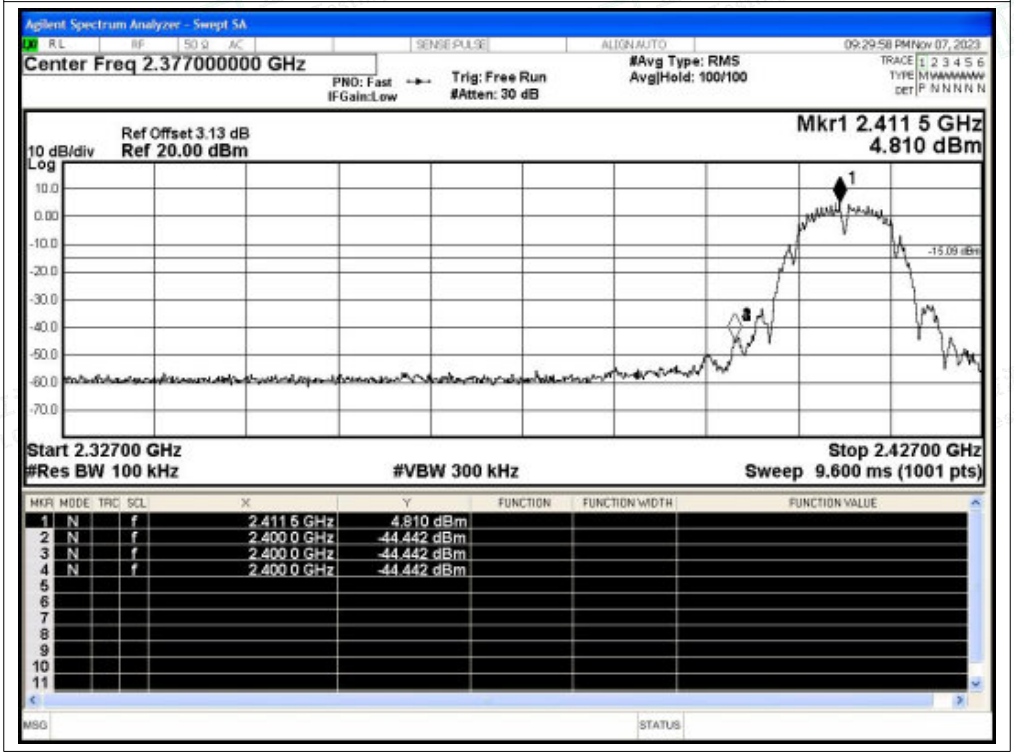
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant1	-49.35	-20	Pass
NVNT	b	2462	Ant1	-58.65	-20	Pass
NVNT	g	2412	Ant1	-32.52	-20	Pass
NVNT	g	2462	Ant1	-41.91	-20	Pass
NVNT	n20	2412	Ant1	-31	-20	Pass
NVNT	n20	2462	Ant1	-42.09	-20	Pass
NVNT	n40	2422	Ant1	-32.76	-20	Pass
NVNT	n40	2452	Ant1	-34.47	-20	Pass

Test Graphs

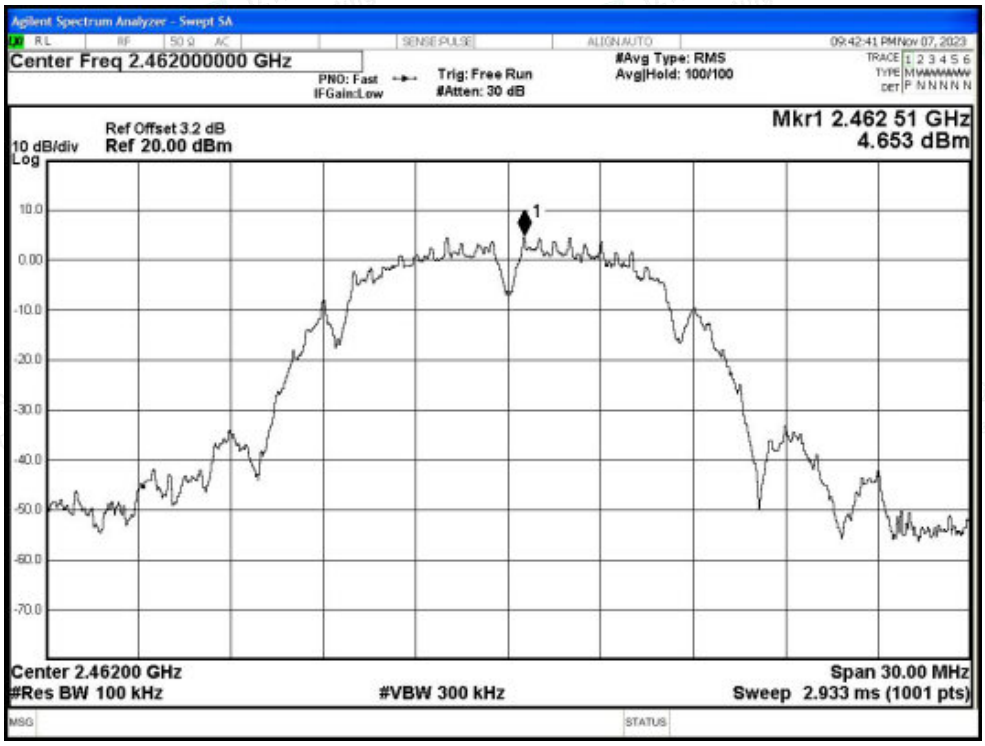
Band Edge NVNT b 2412MHz Ant1 Ref



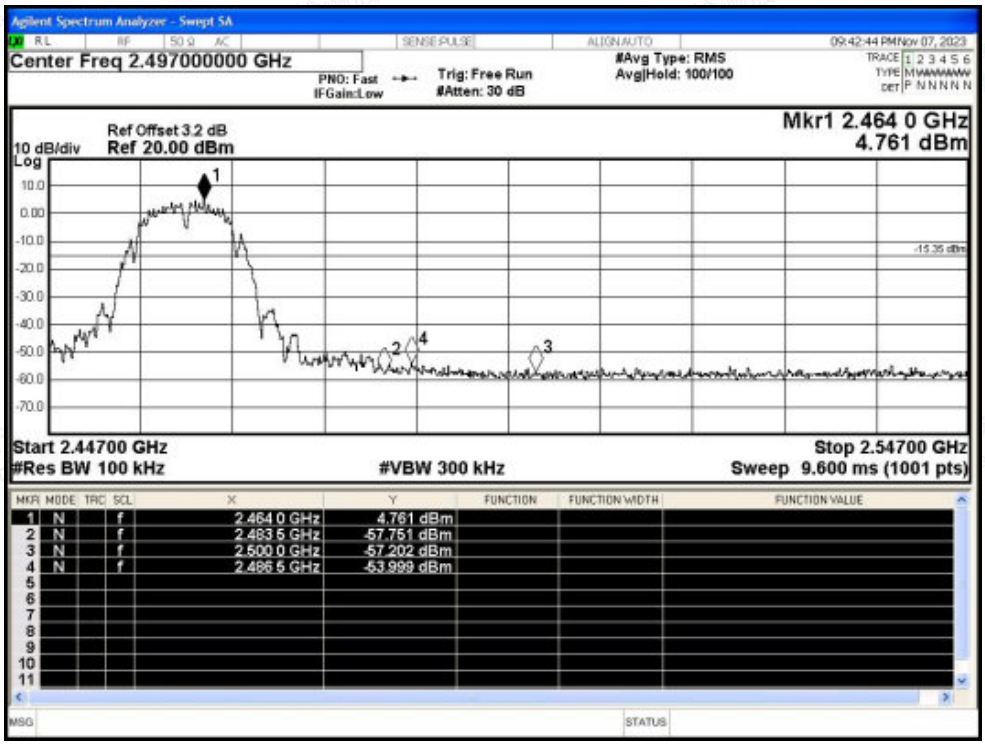
Band Edge NVNT b 2412MHz Ant1 Emission



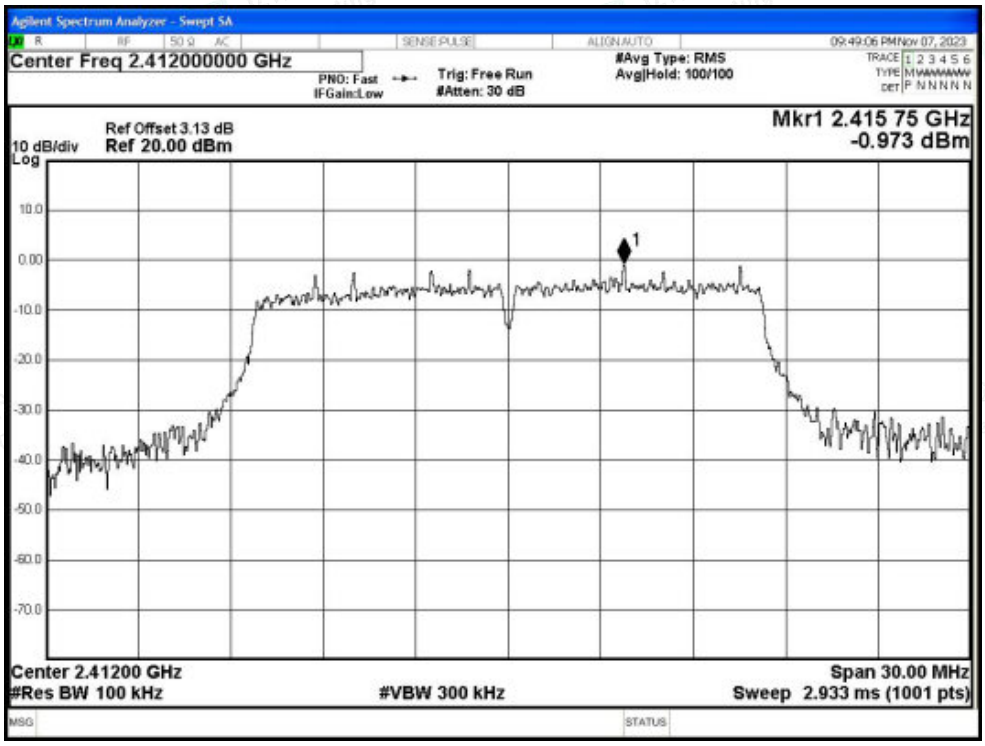
Band Edge NVNT b 2462MHz Ant1 Ref



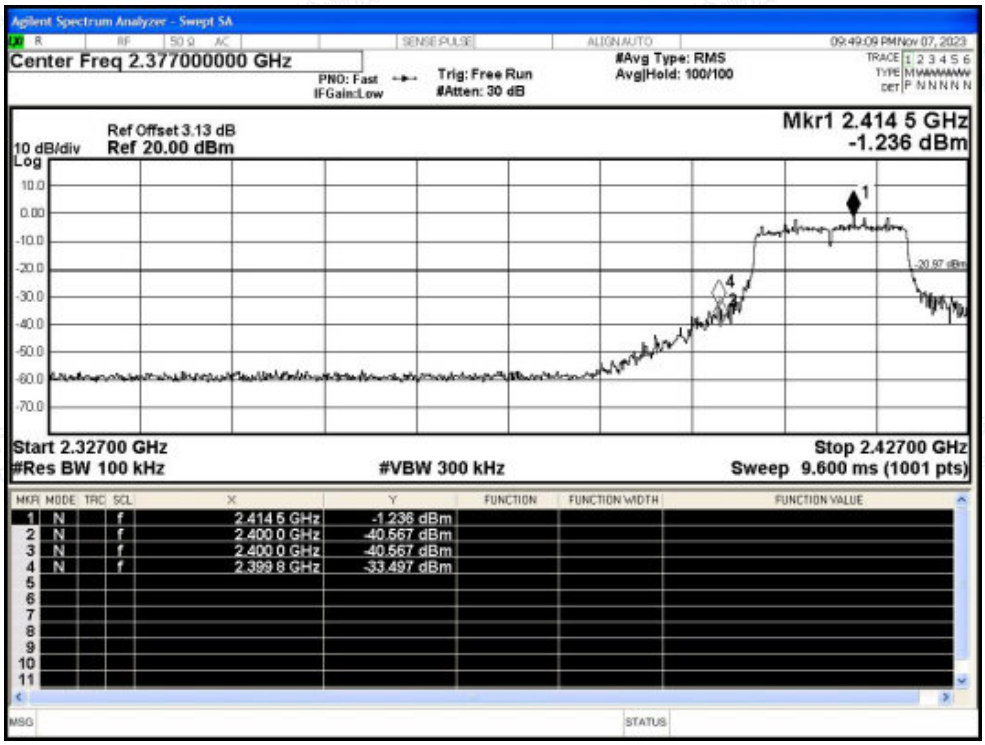
Band Edge NVNT b 2462MHz Ant1 Emission



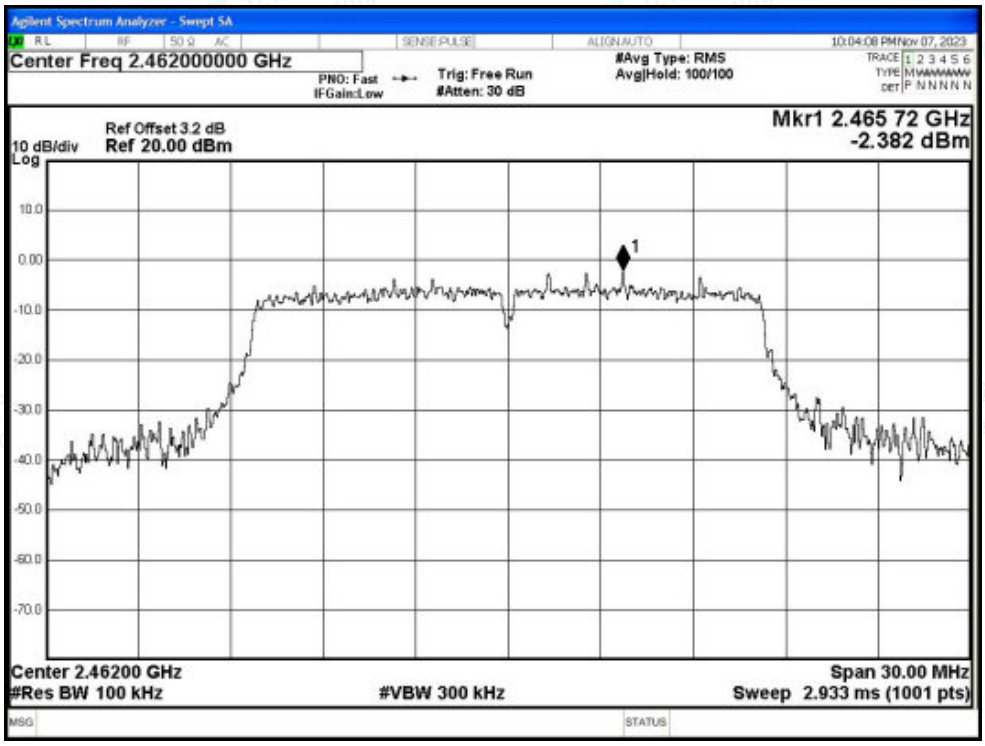
Band Edge NVNT g 2412MHz Ant1 Ref



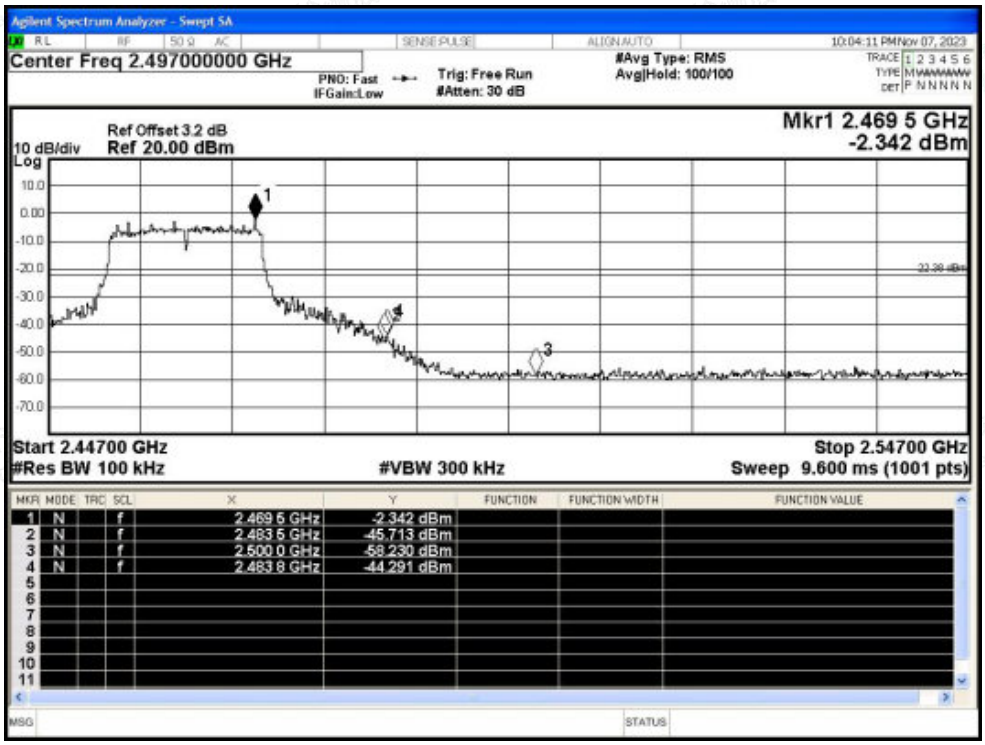
Band Edge NVNT g 2412MHz Ant1 Emission



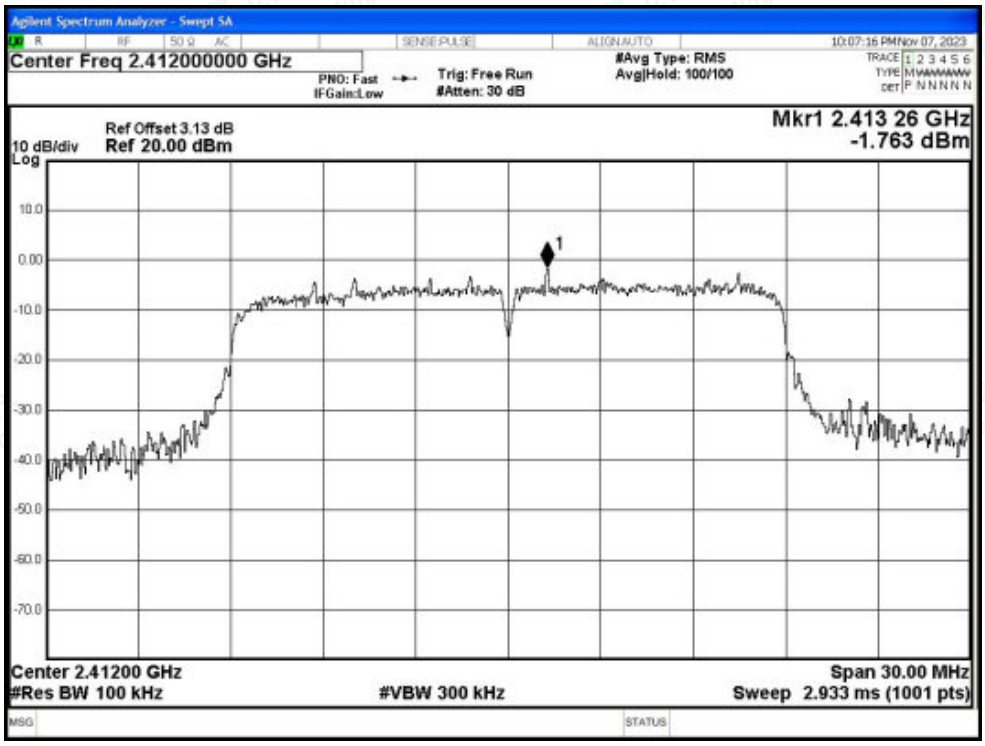
Band Edge NVNT g 2462MHz Ant1 Ref



Band Edge NVNT g 2462MHz Ant1 Emission

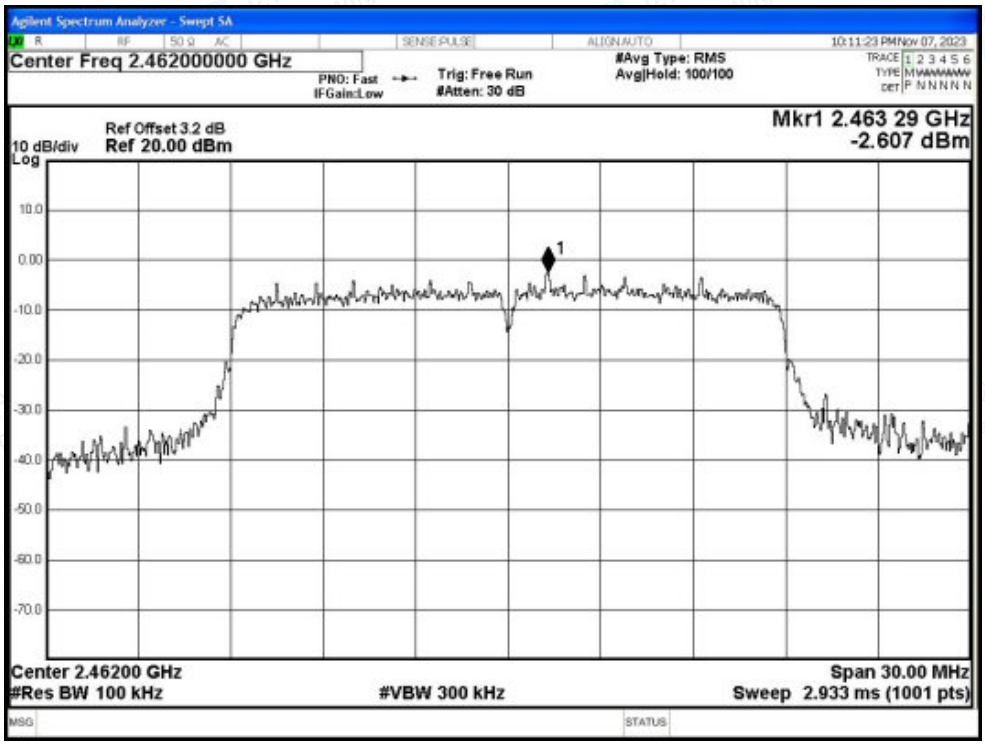


Band Edge NVNT n20 2412MHz Ant1 Ref

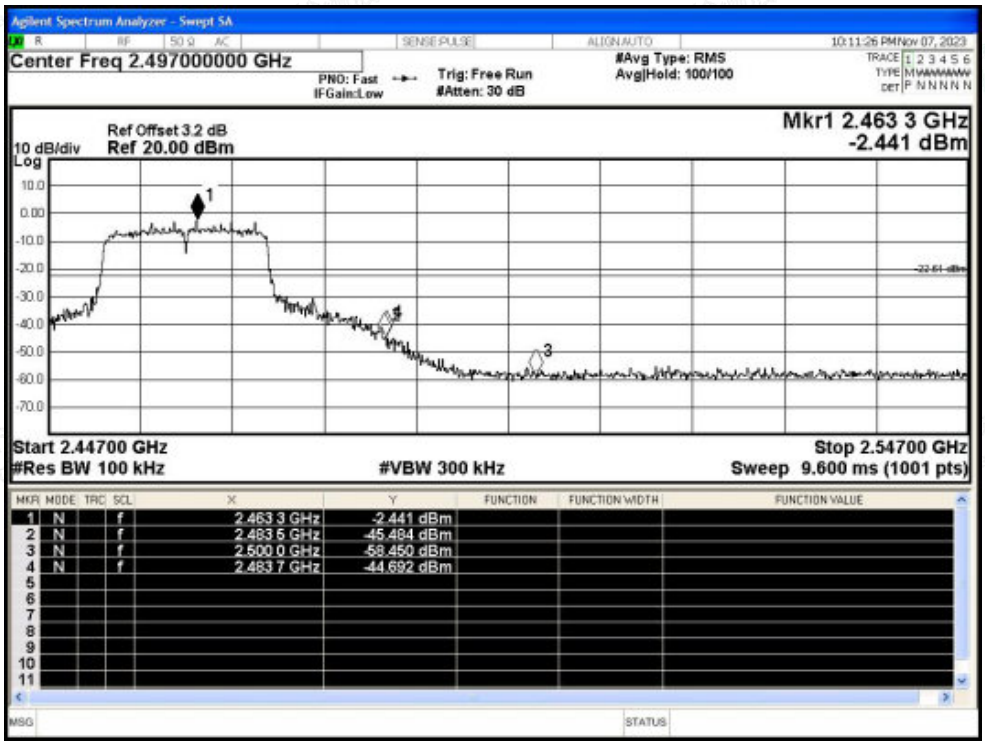


Band Edge NVNT n20 2412MHz Ant1 Emission

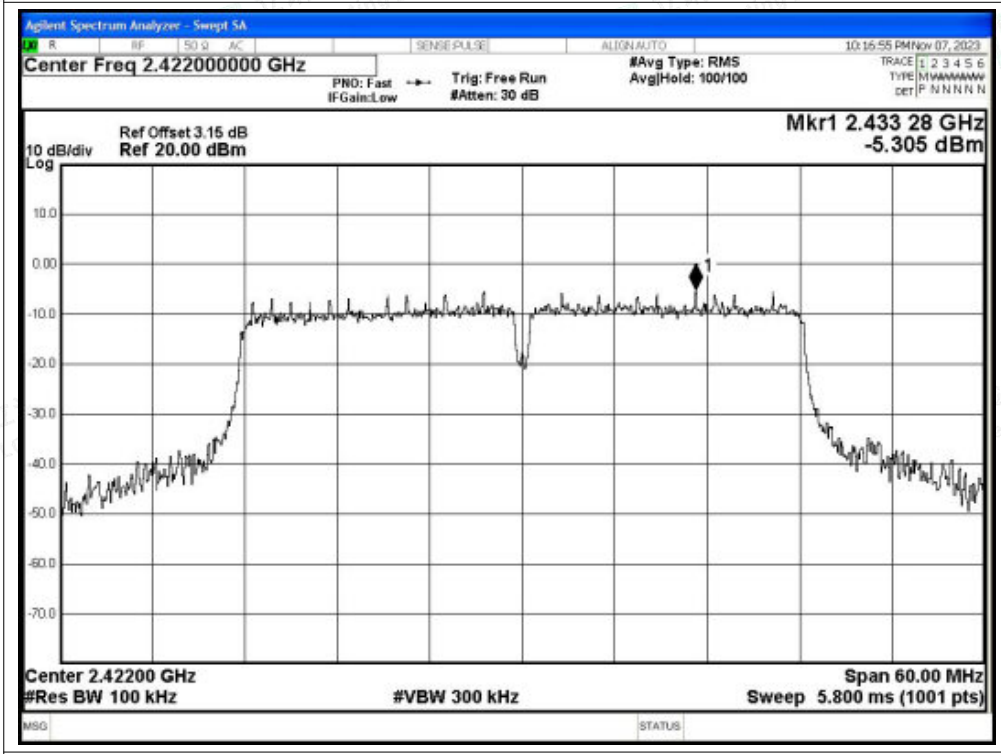
Band Edge NVNT n20 2462MHz Ant1 Ref



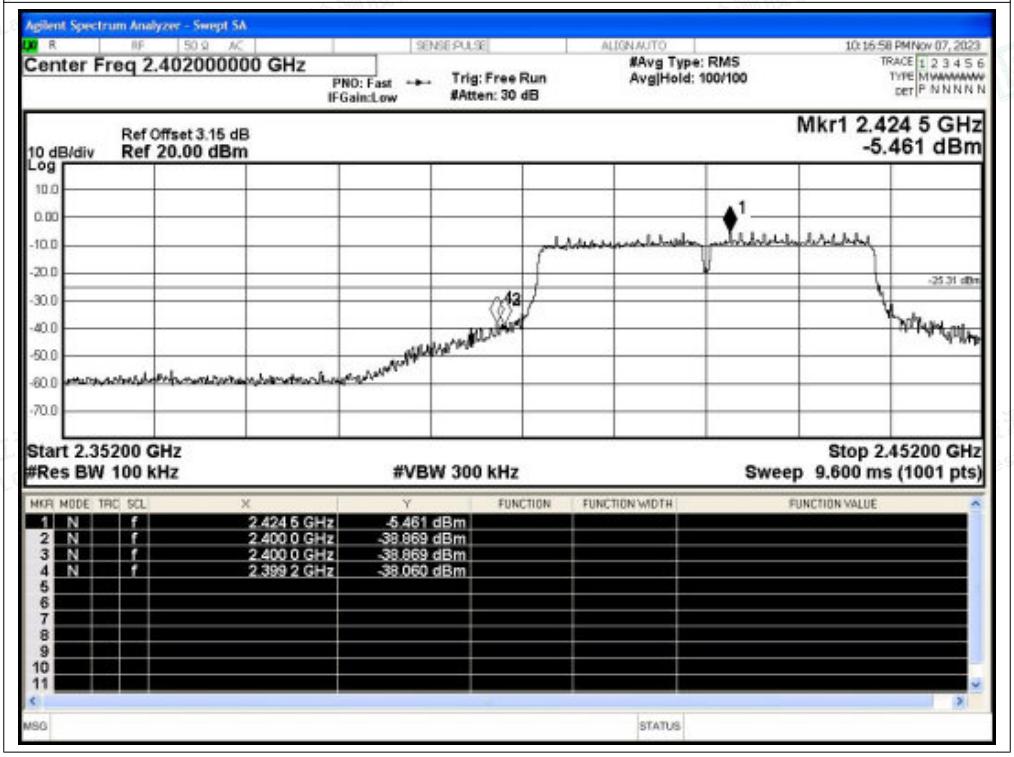
Band Edge NVNT n20 2462MHz Ant1 Emission



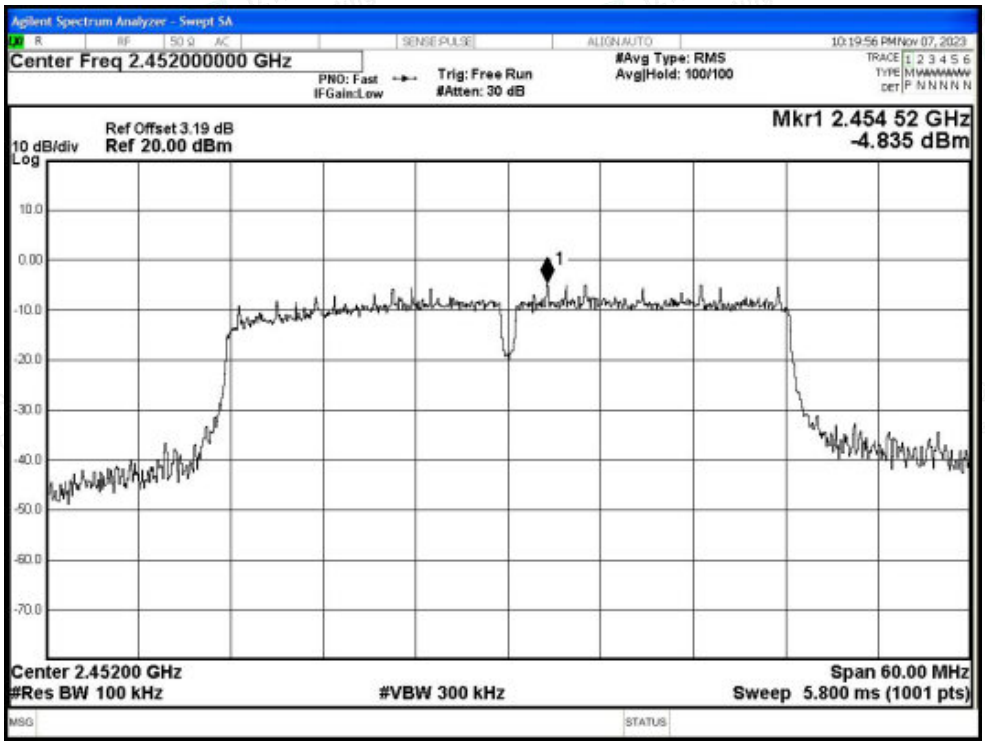
Band Edge NVNT n40 2422MHz Ant1 Ref



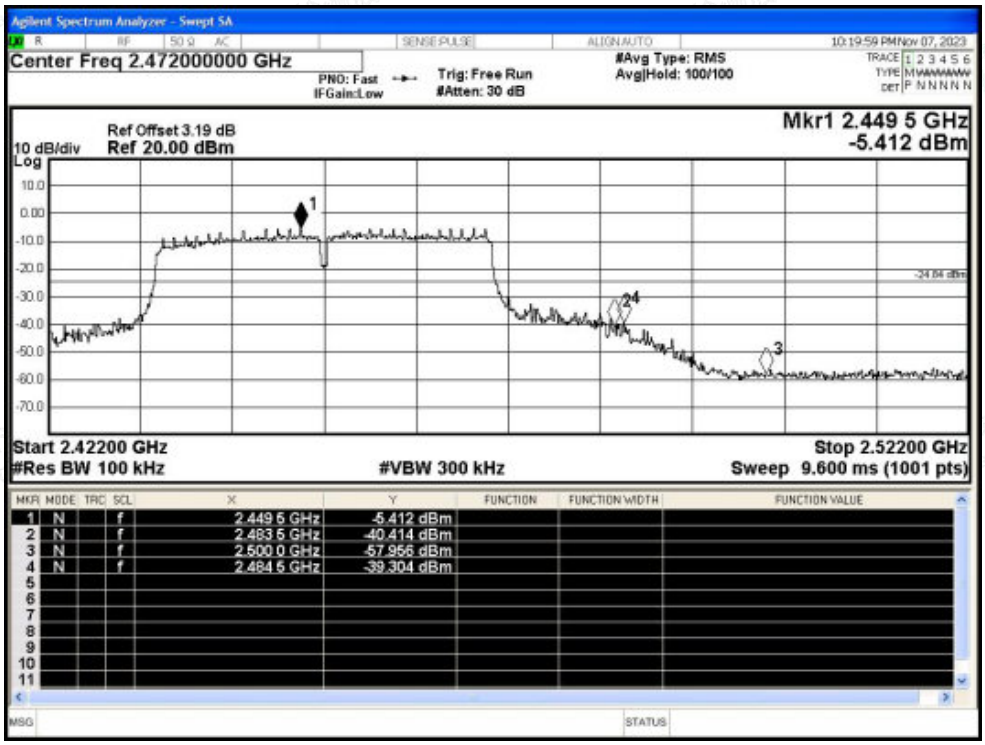
Band Edge NVNT n40 2422MHz Ant1 Emission



Band Edge NVNT n40 2452MHz Ant1 Ref



Band Edge NVNT n40 2452MHz Ant1 Emission

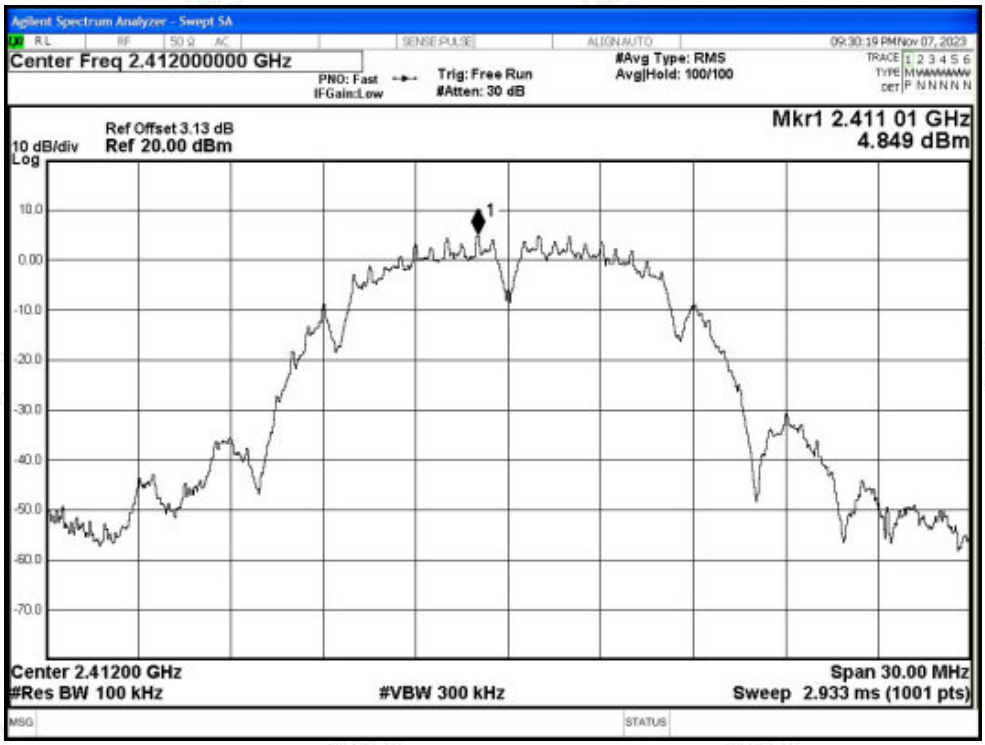


A.5 Conducted RF Spurious Emission

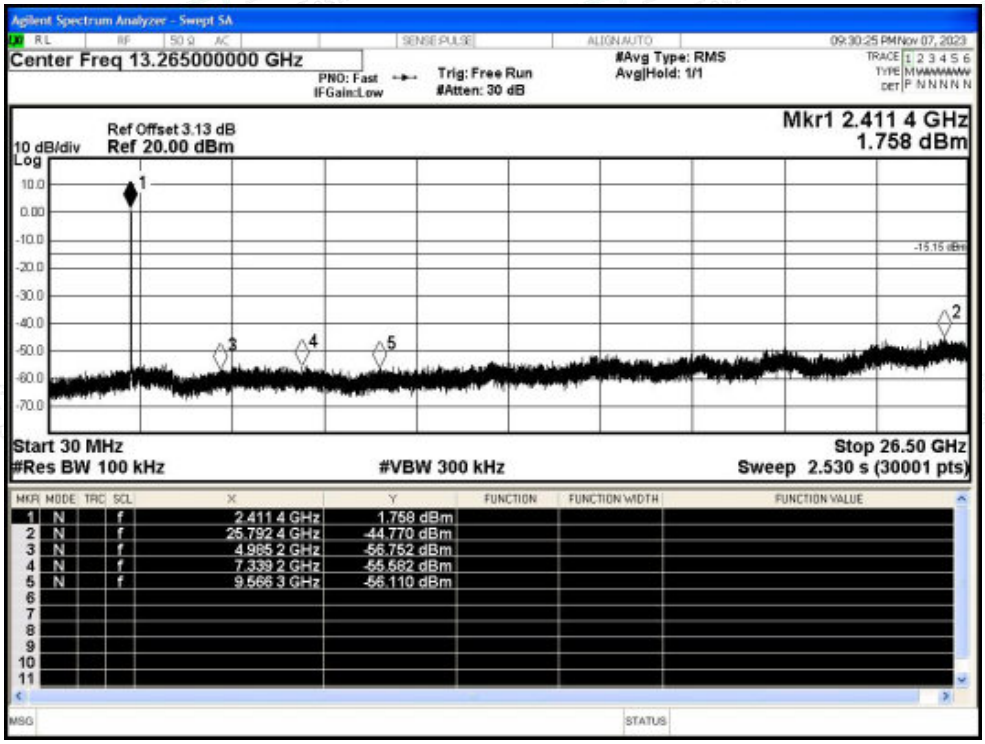
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	b	2412	Ant1	-49.62	-20	Pass
NVNT	b	2437	Ant1	-50.46	-20	Pass
NVNT	b	2462	Ant1	-49.6	-20	Pass
NVNT	g	2412	Ant1	-43.8	-20	Pass
NVNT	g	2437	Ant1	-43.79	-20	Pass
NVNT	g	2462	Ant1	-42.68	-20	Pass
NVNT	n20	2412	Ant1	-43.77	-20	Pass
NVNT	n20	2437	Ant1	-42.92	-20	Pass
NVNT	n20	2462	Ant1	-41.46	-20	Pass
NVNT	n40	2422	Ant1	-39.7	-20	Pass
NVNT	n40	2437	Ant1	-38.2	-20	Pass
NVNT	n40	2452	Ant1	-41.28	-20	Pass

Test Graphs

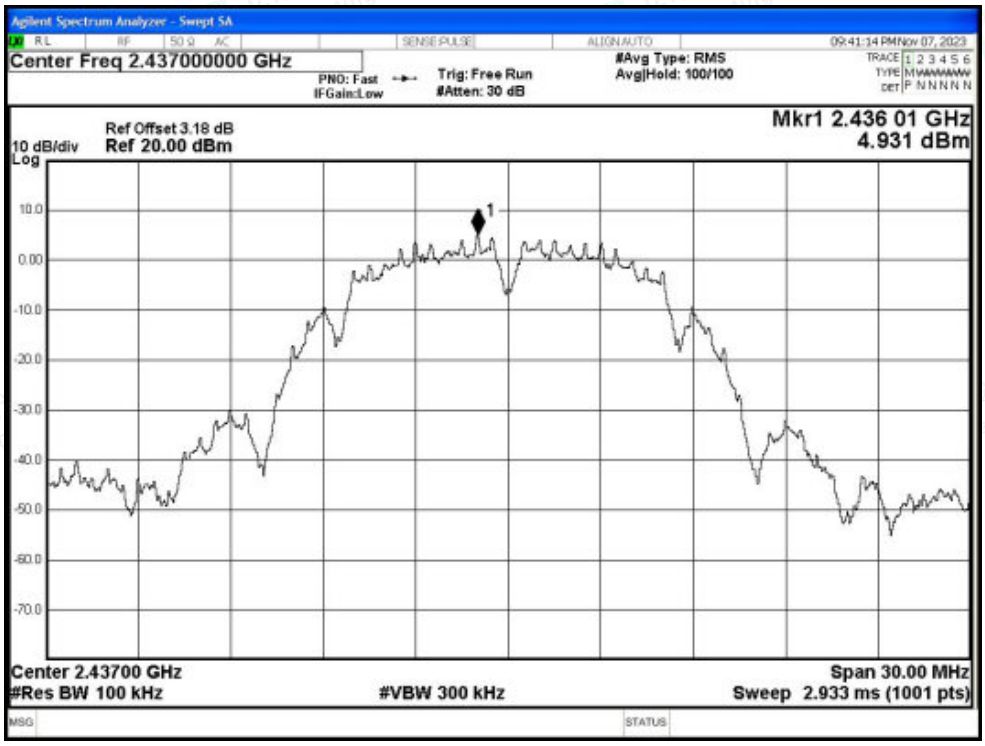
Tx. Spurious NVNT b 2412MHz Ant1 Ref



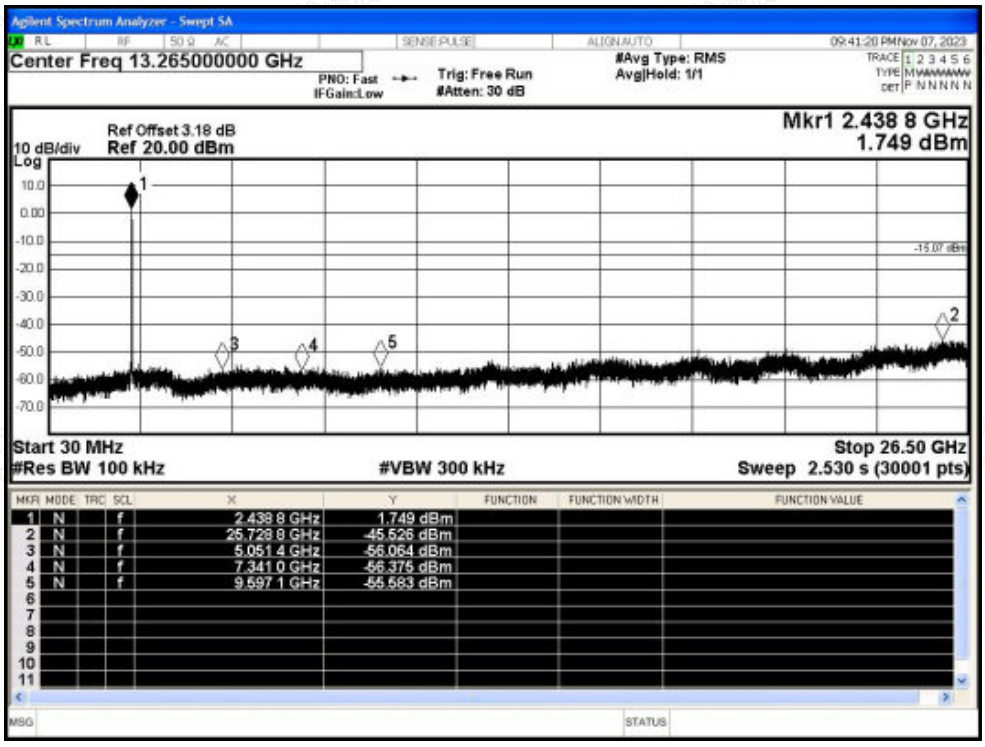
Tx. Spurious NVNT b 2412MHz Ant1 Emission



Tx. Spurious NVNT b 2437MHz Ant1 Ref



Tx. Spurious NVNT b 2437MHz Ant1 Emission



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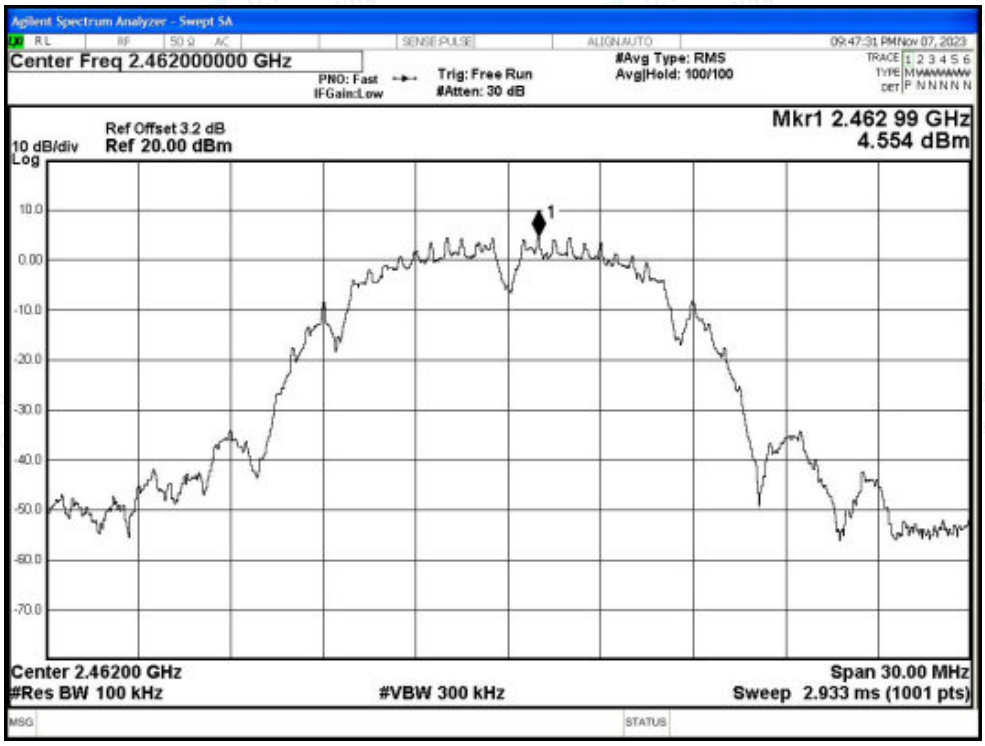

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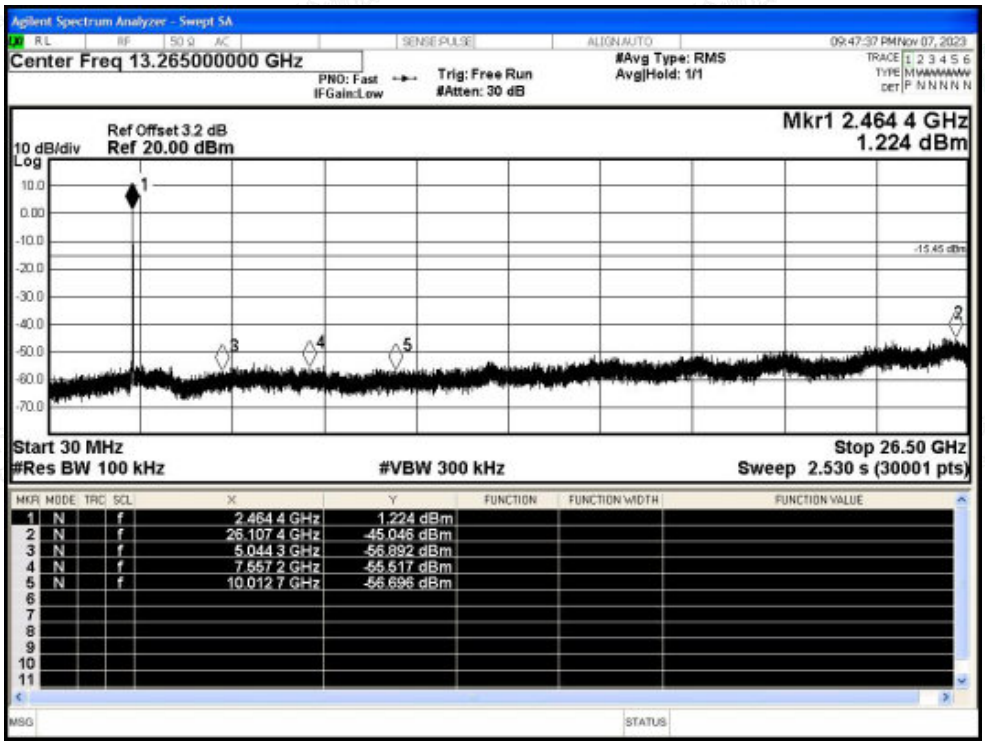

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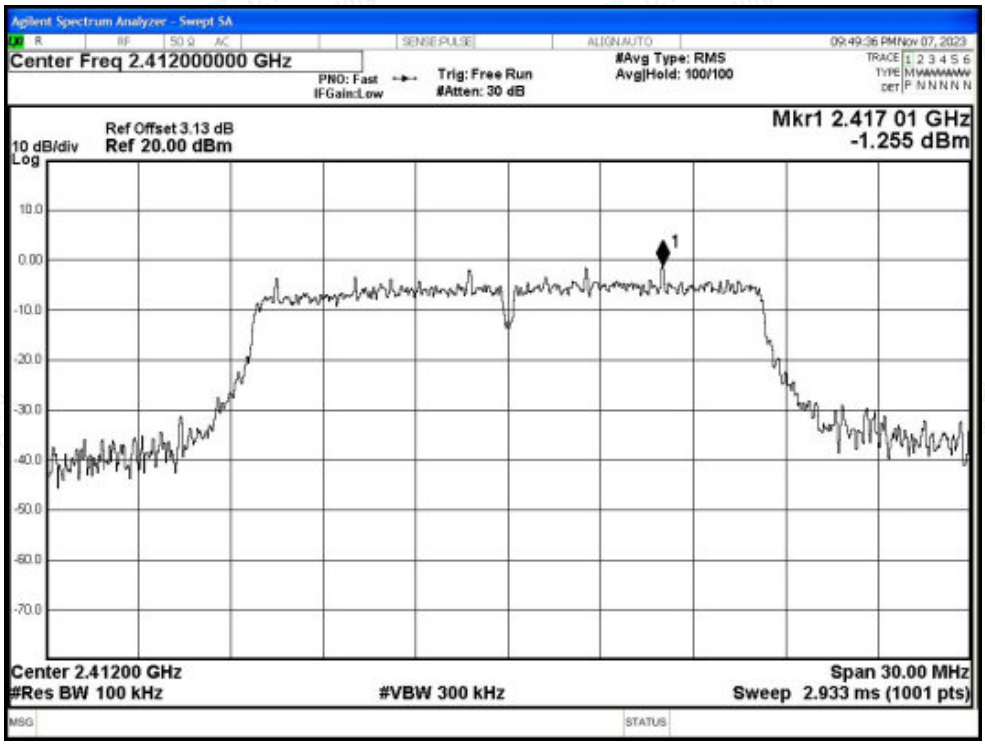

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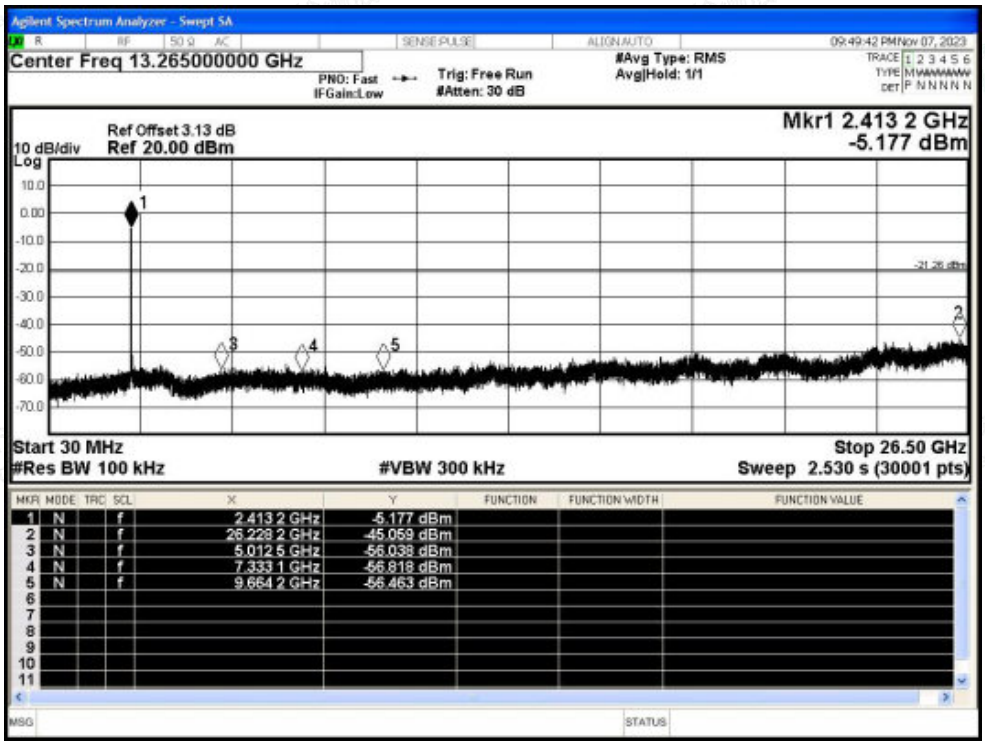

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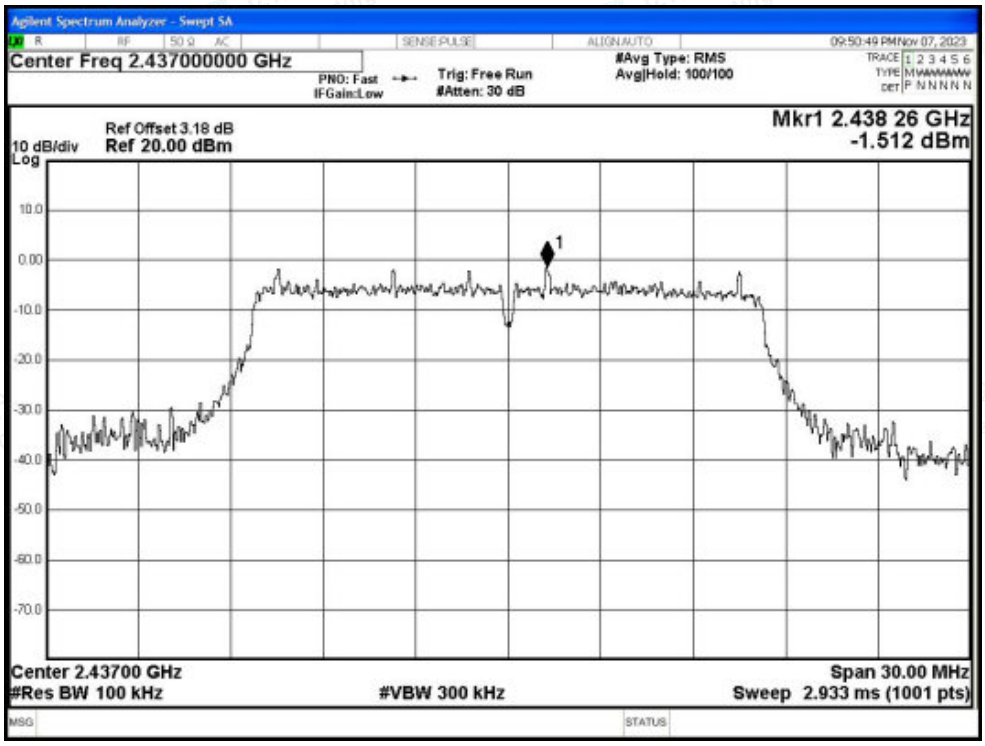

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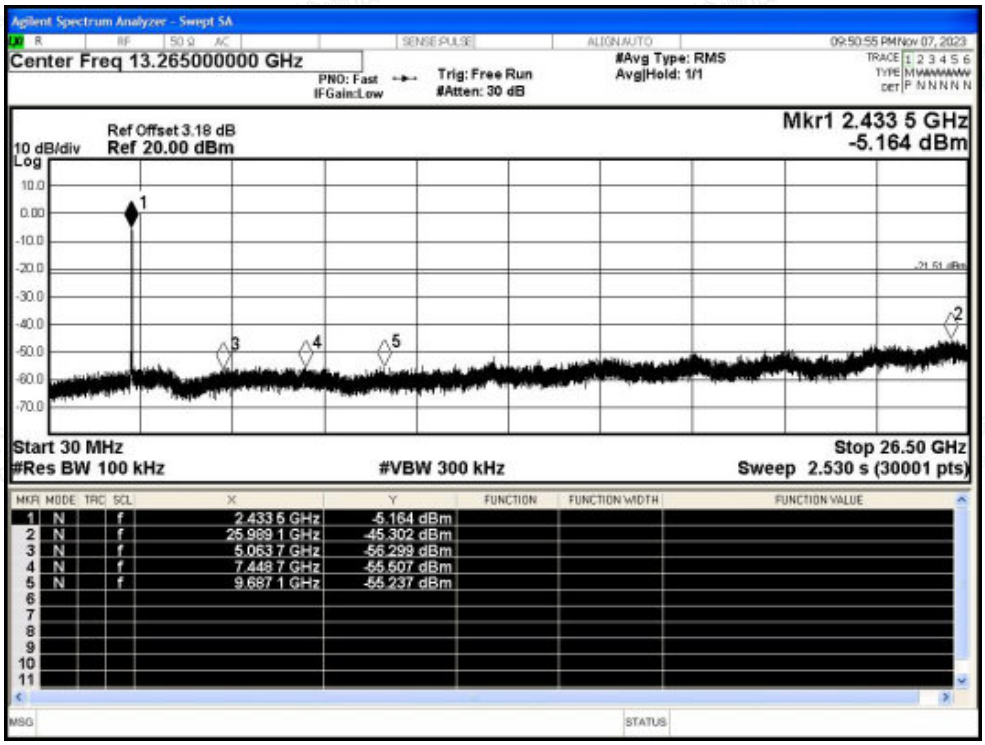

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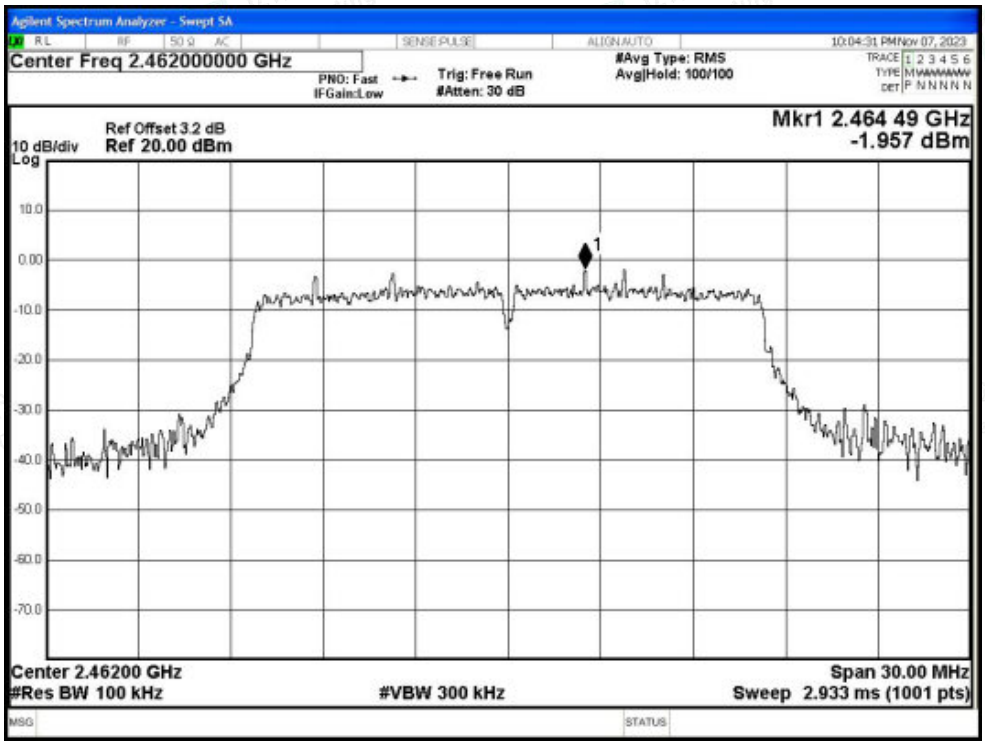

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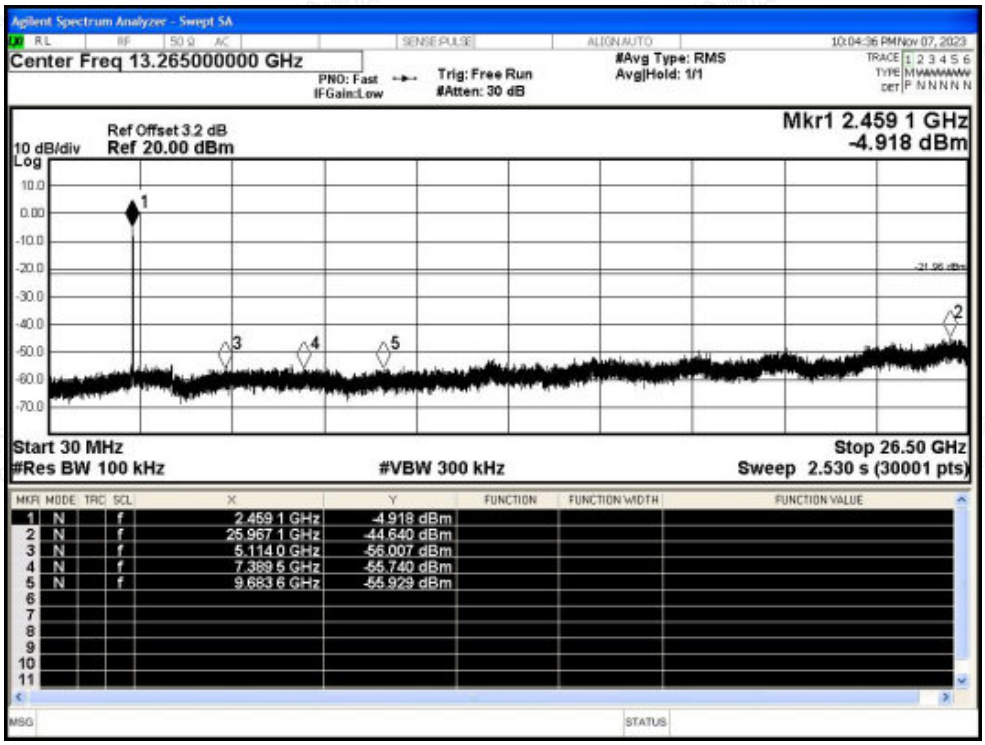

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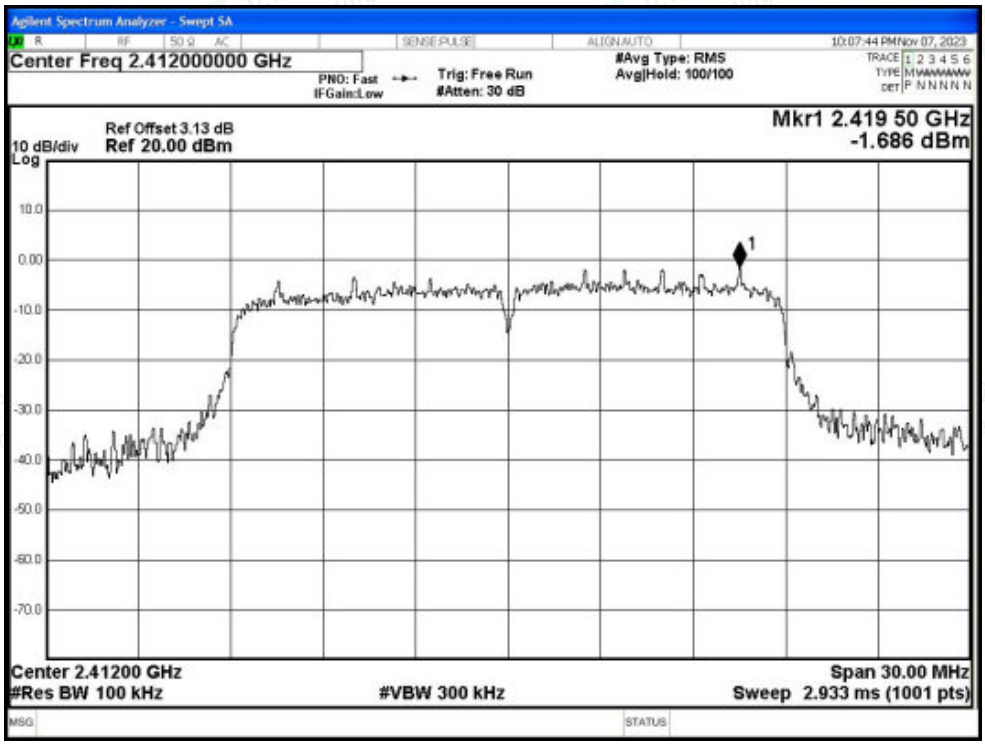

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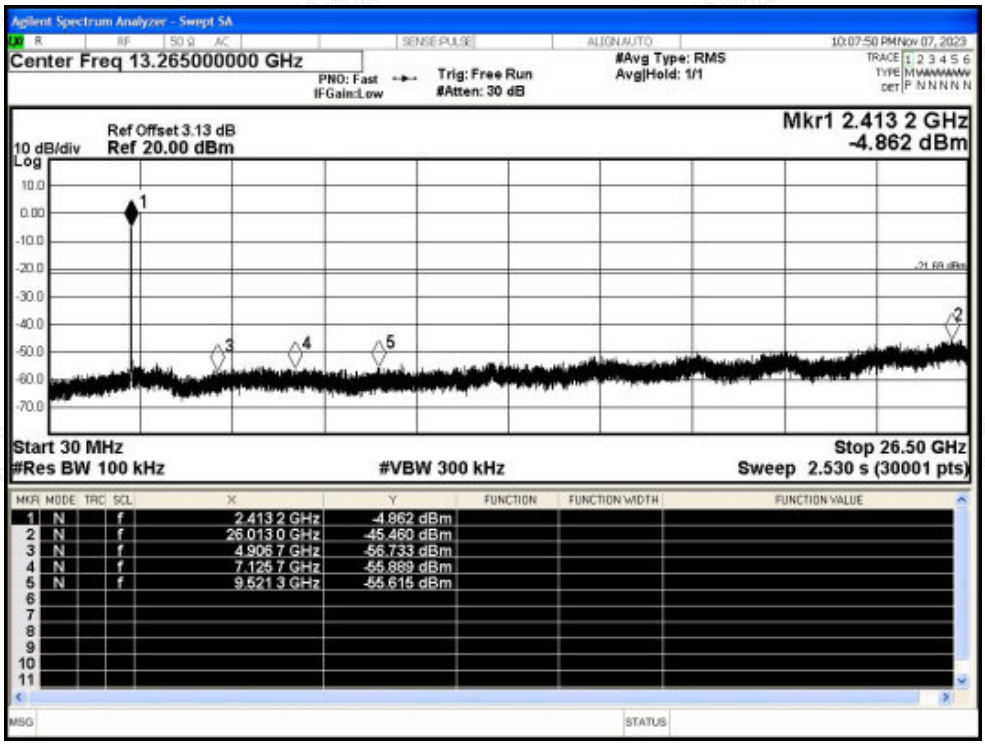

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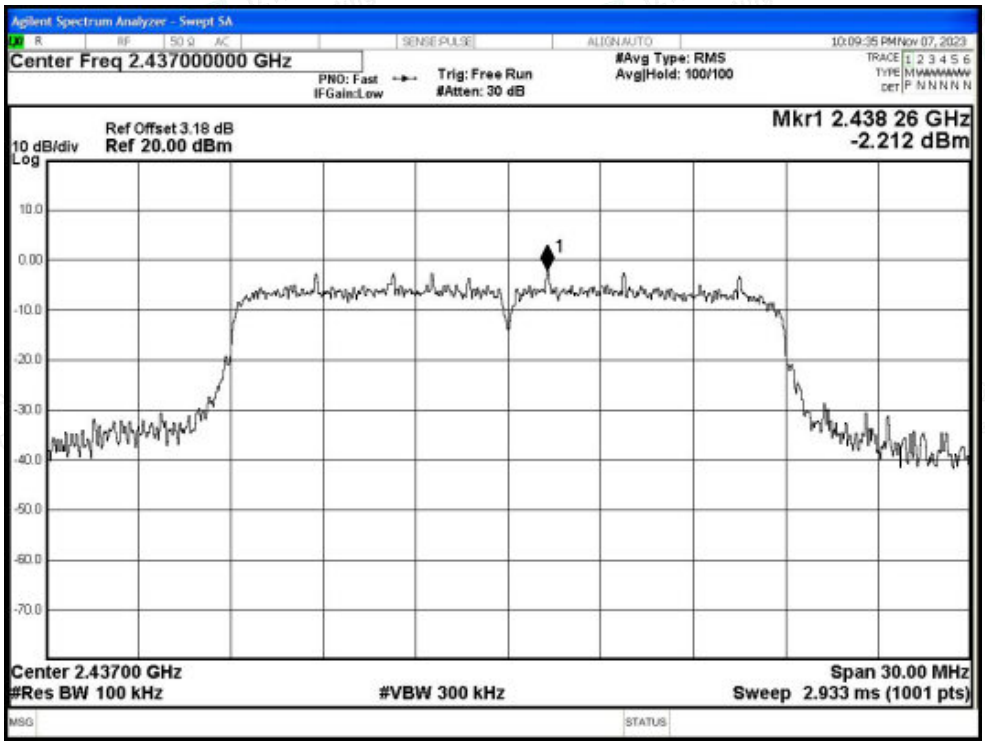

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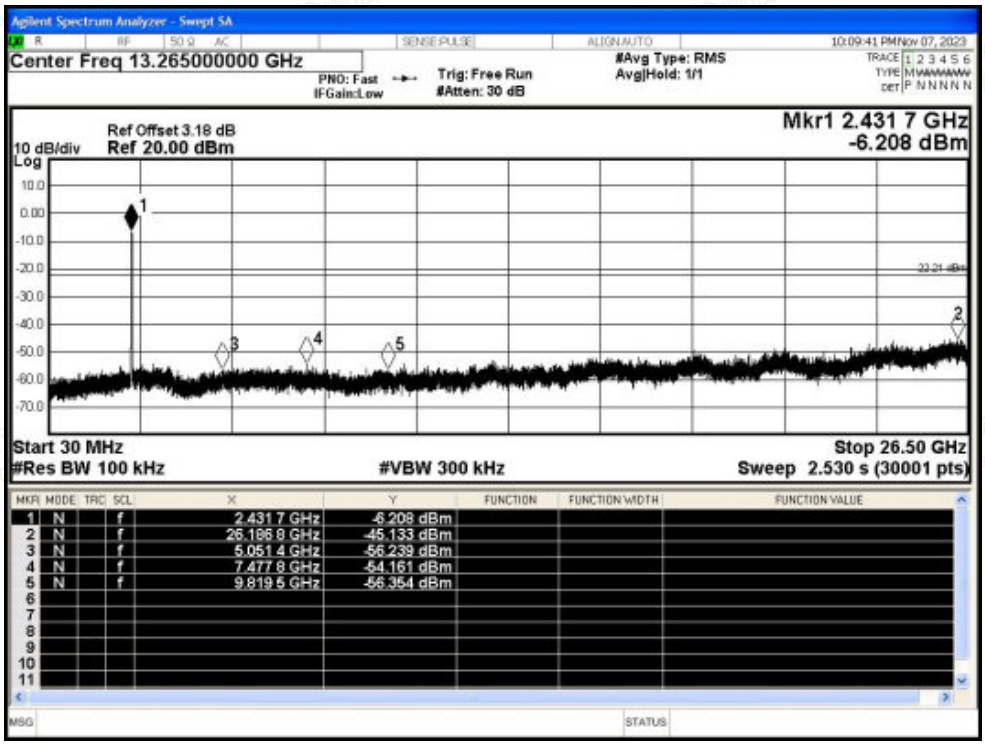

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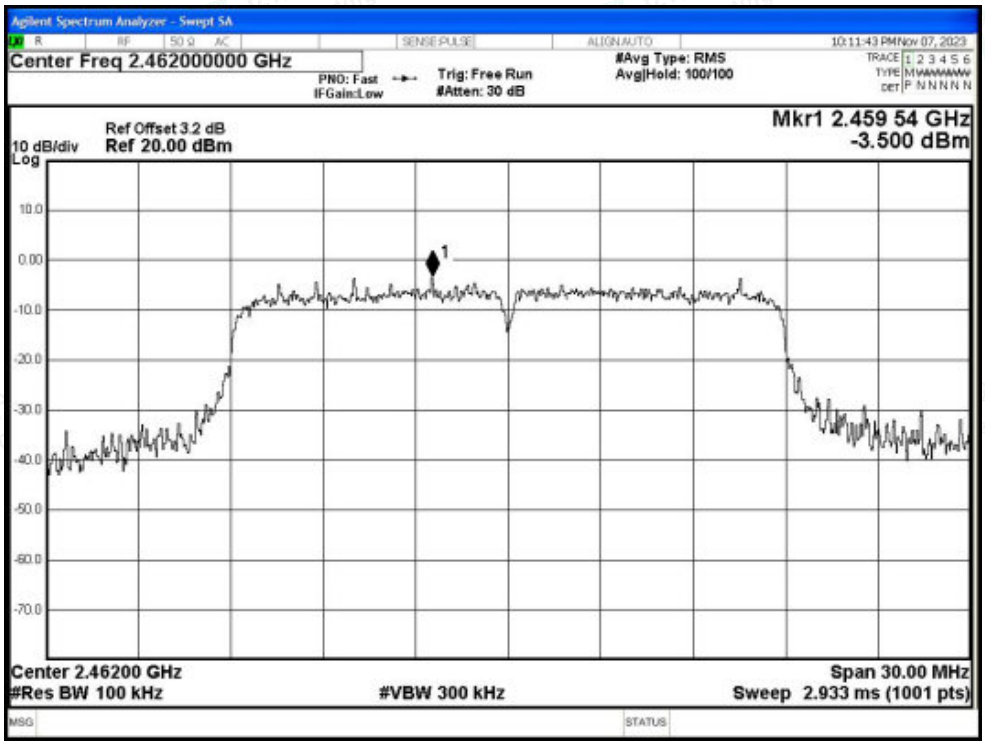
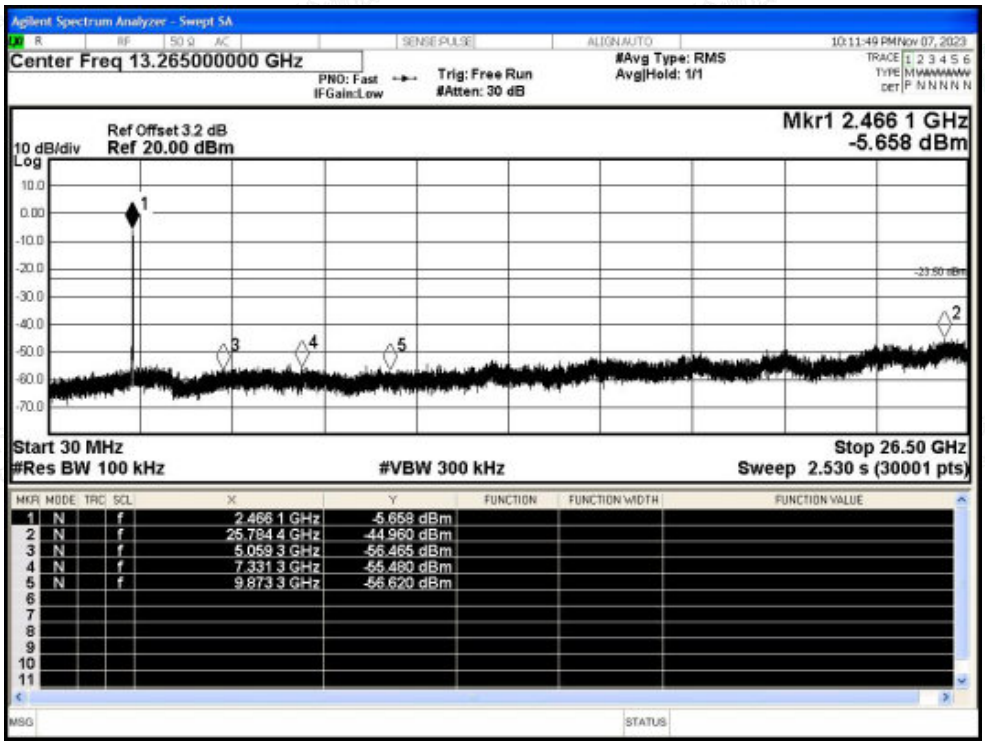
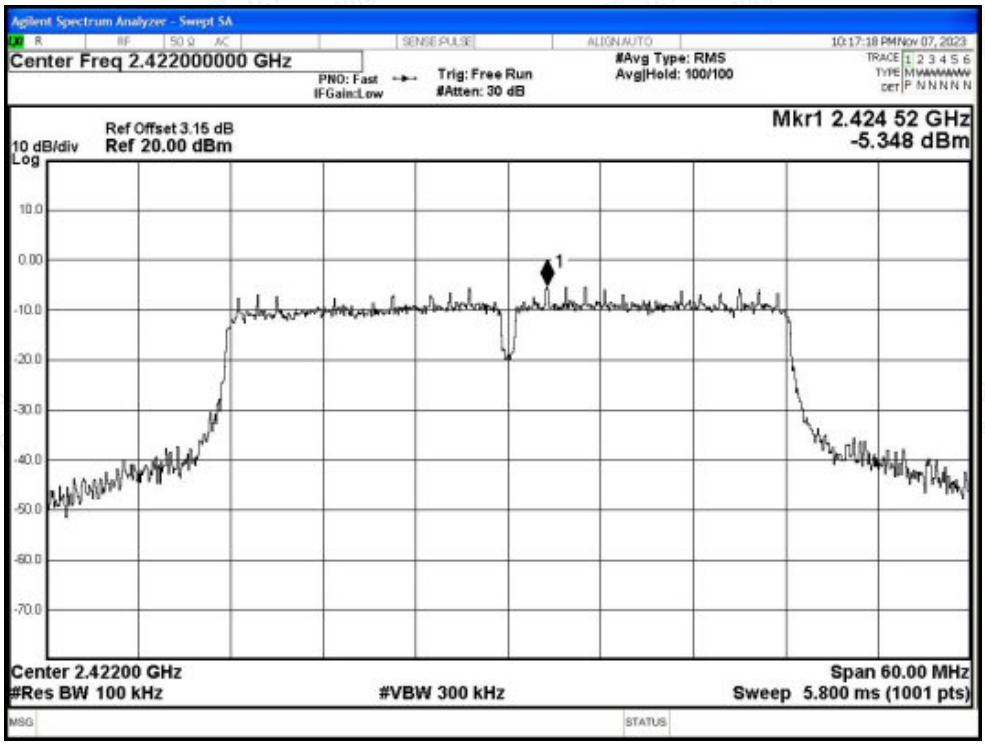


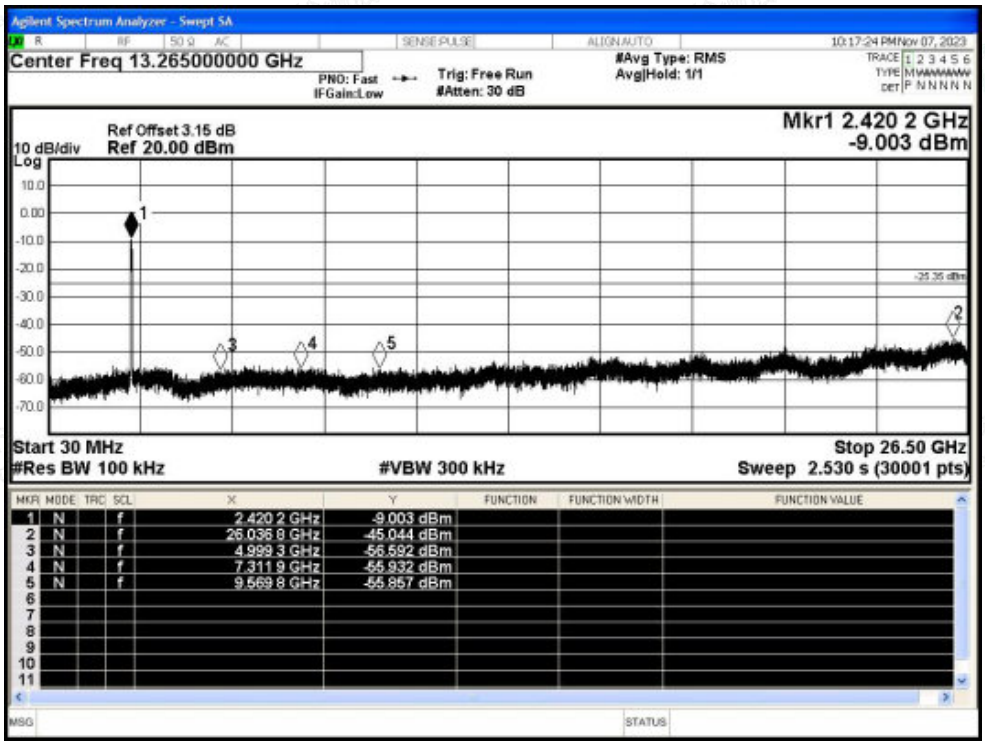
Tx. Spurious NVNT n20 2462MHz Ant1 Emission



Tx. Spurious NVNT n40 2422MHz Ant1 Ref



Tx. Spurious NVNT n40 2422MHz Ant1 Emission



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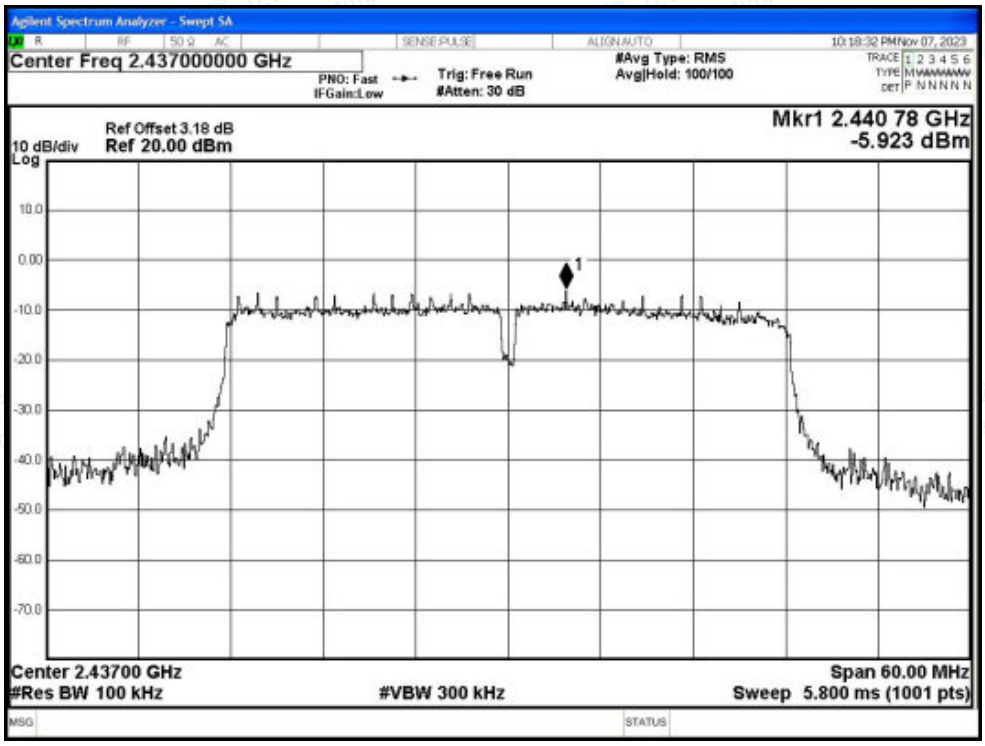
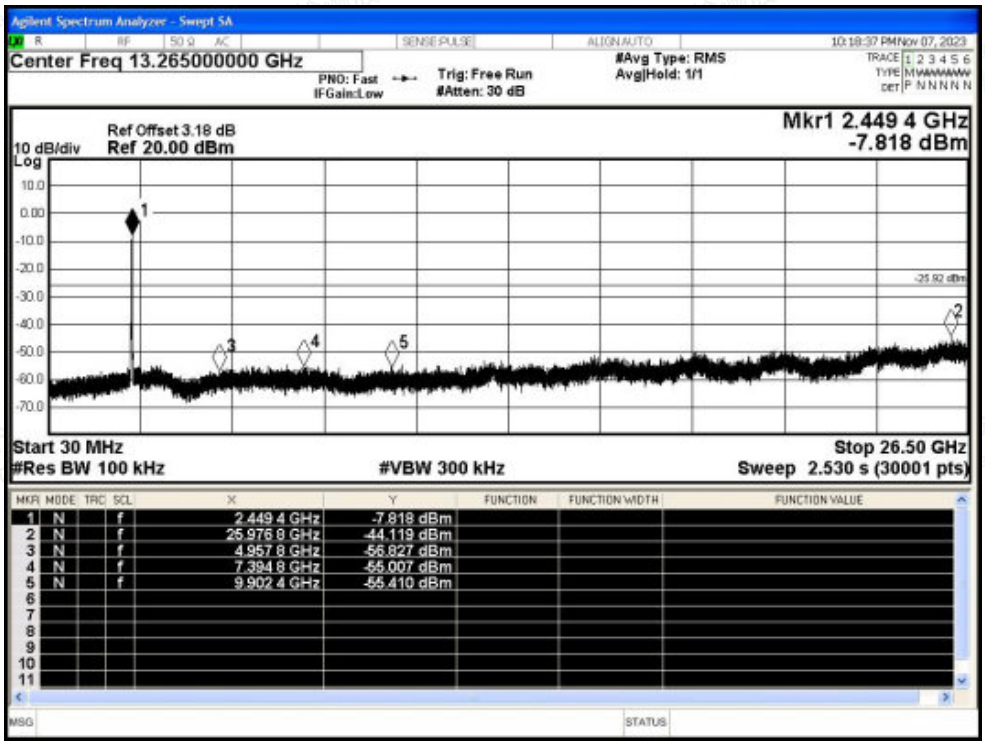
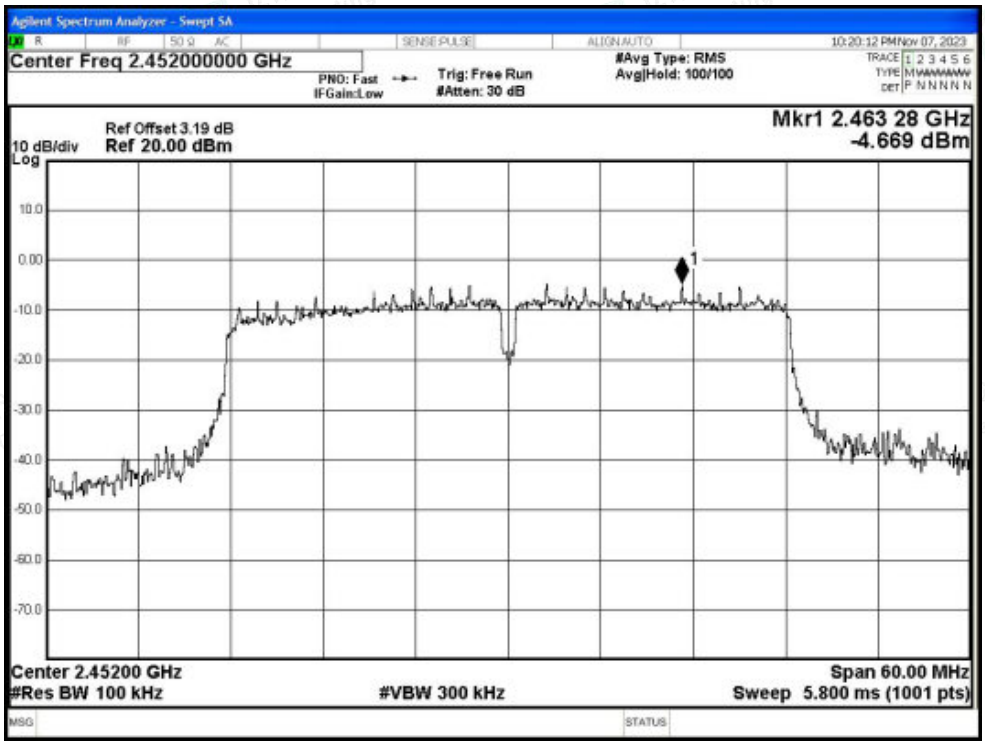


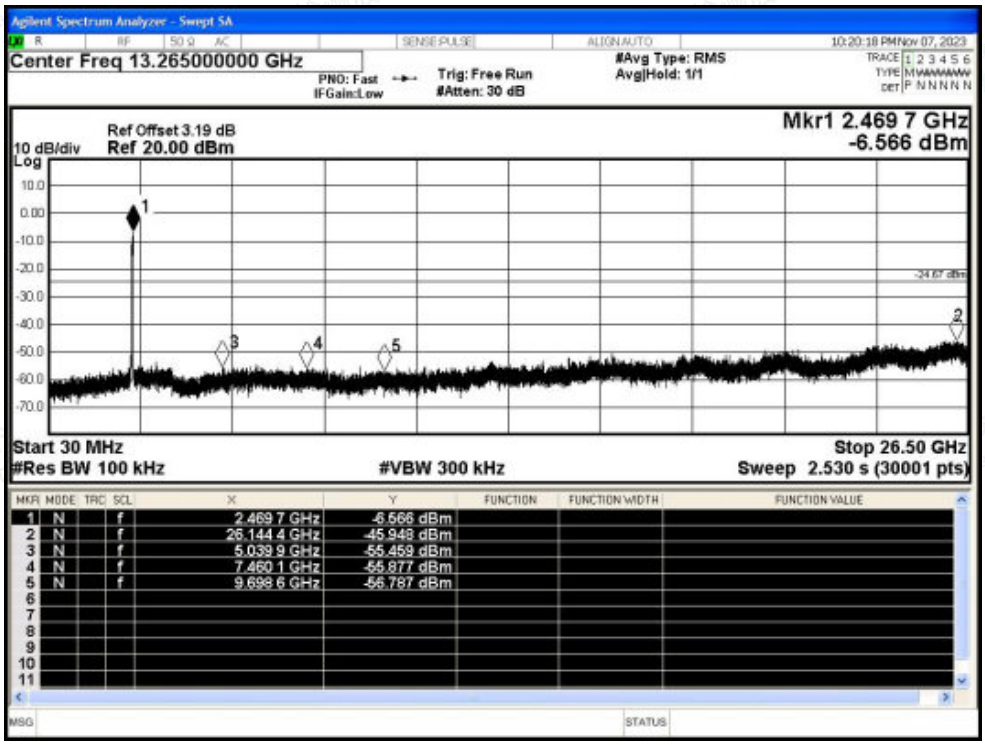
Tx. Spurious NVNT n40 2437MHz Ant1 Emission



Tx. Spurious NVNT n40 2452MHz Ant1 Ref



Tx. Spurious NVNT n40 2452MHz Ant1 Emission

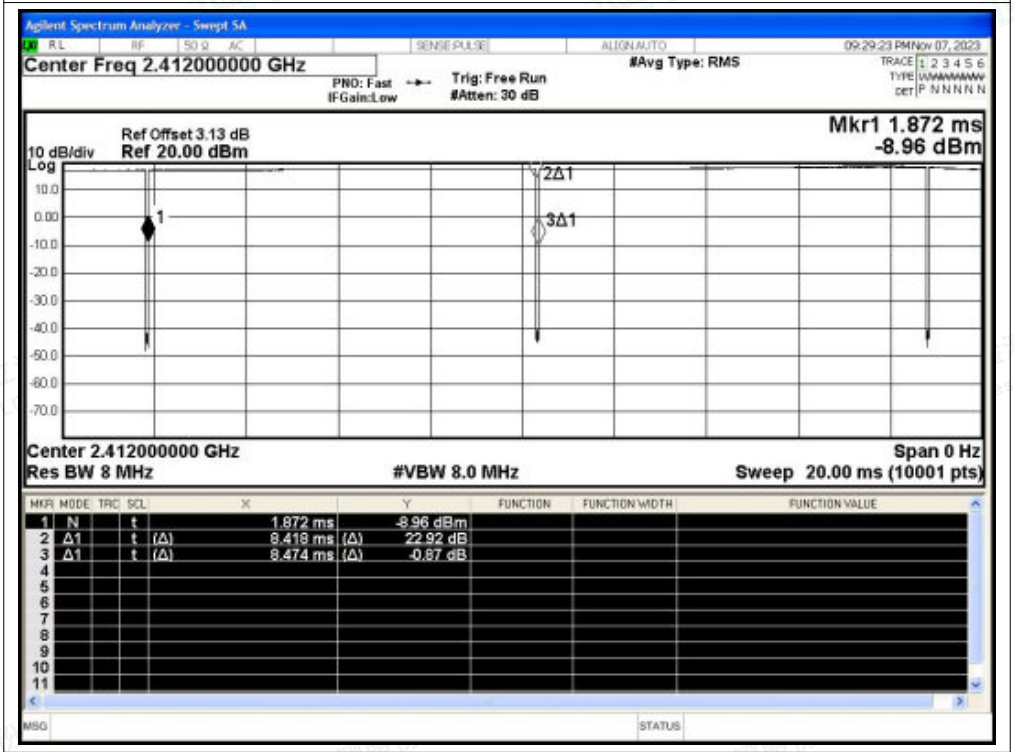


A.6 Duty Cycle

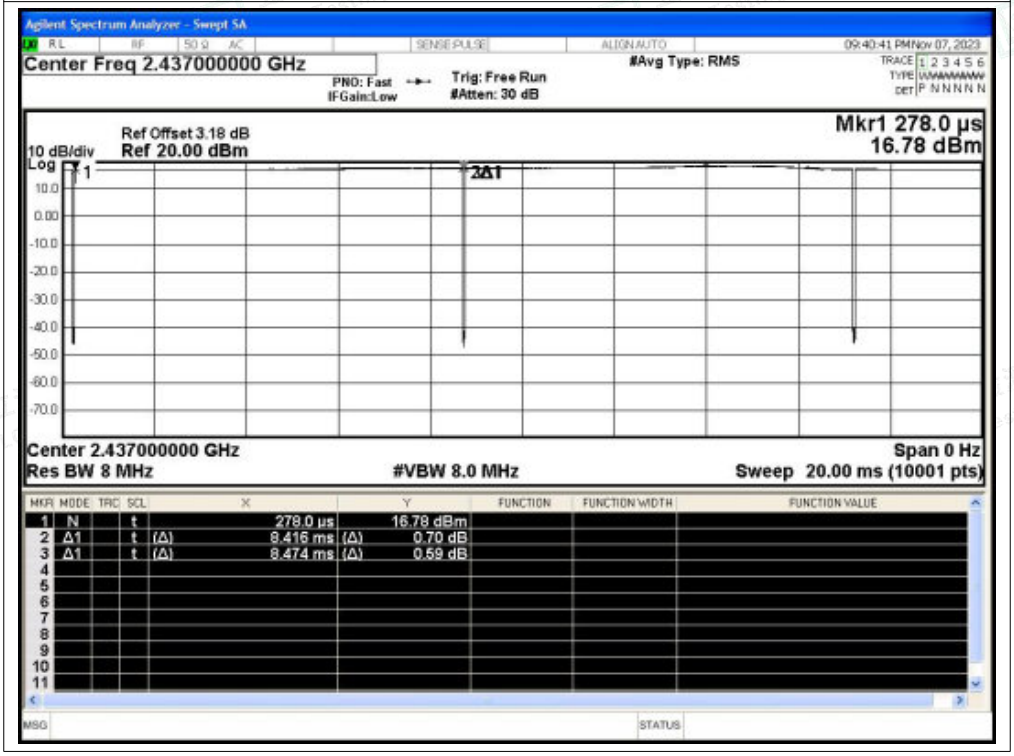
Condition	Mode	Frequency (MHz)	Antenna	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	b	2412	Ant1	99.34	0	0.01
NVNT	b	2437	Ant1	99.32	0	0.01
NVNT	b	2462	Ant1	99.32	0	0.01
NVNT	g	2412	Ant1	95.62	0.19	0.72
NVNT	g	2437	Ant1	95.62	0.19	0.72
NVNT	g	2462	Ant1	95.75	0.19	0.72
NVNT	n20	2412	Ant1	95.01	0.22	0.85
NVNT	n20	2437	Ant1	95.02	0.22	0.85
NVNT	n20	2462	Ant1	95.02	0.22	0.85
NVNT	n40	2422	Ant1	90.46	0.44	1.7
NVNT	n40	2437	Ant1	90.46	0.44	1.7
NVNT	n40	2452	Ant1	90.45	0.44	1.7

Test Graphs

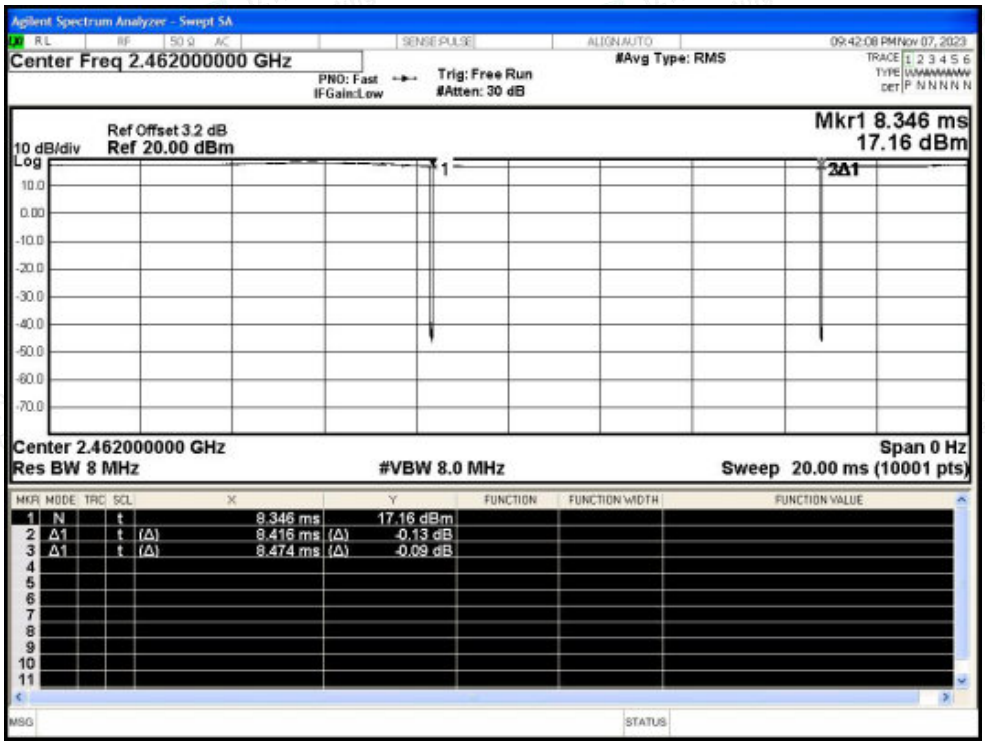
Duty Cycle NVNT b 2412MHz Ant1



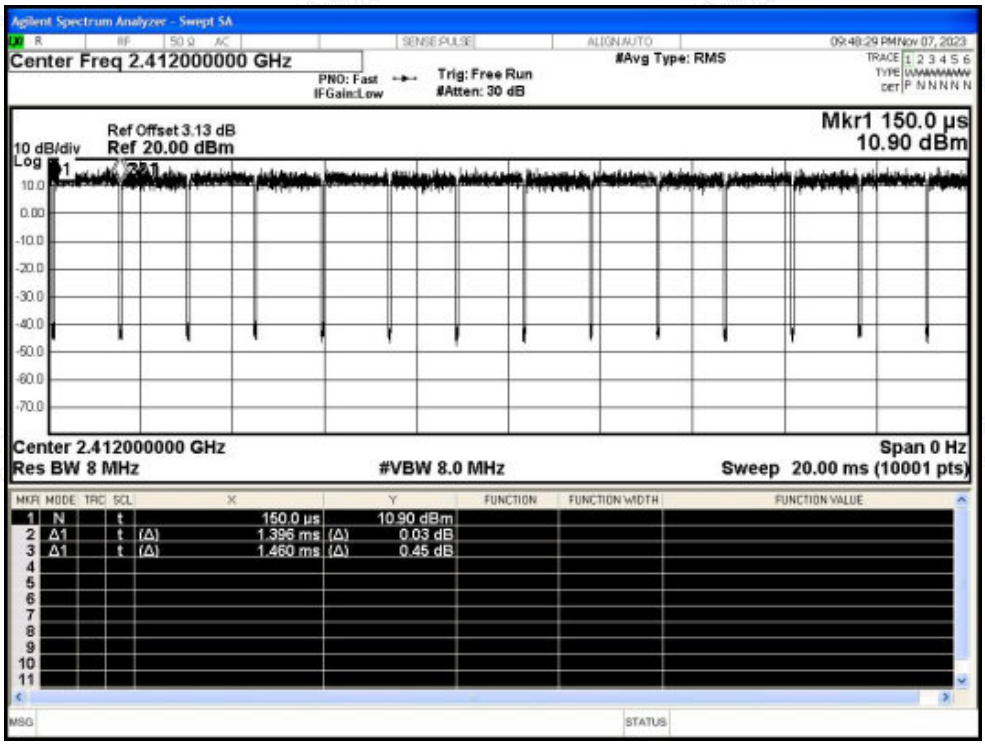
Duty Cycle NVNT b 2437MHz Ant1



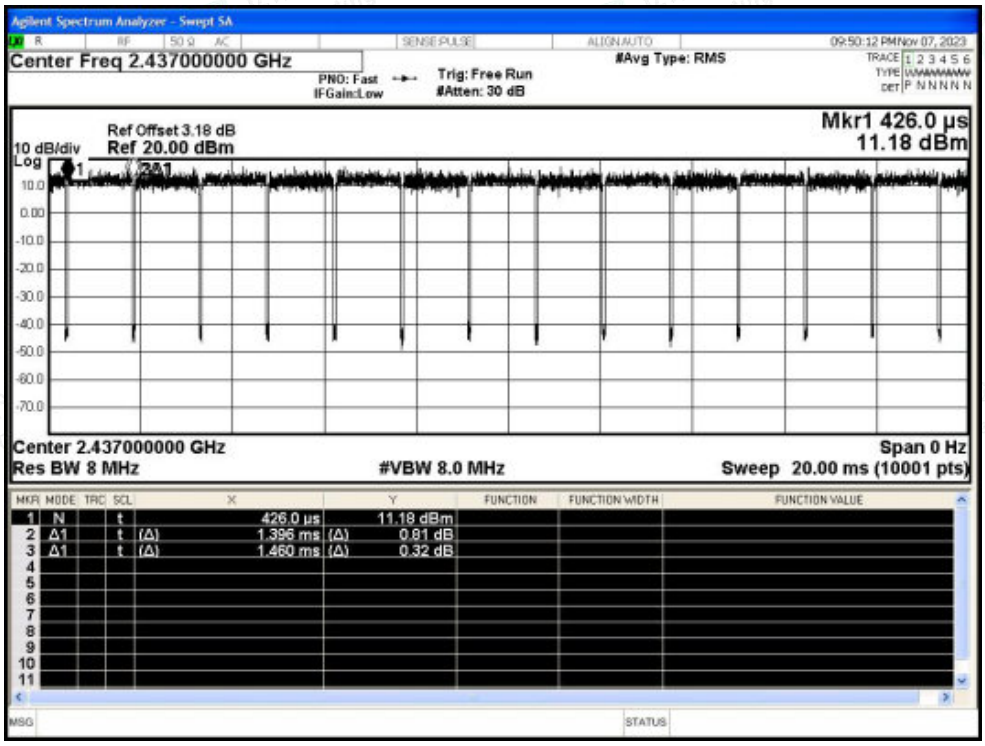
Duty Cycle NVNT b 2462MHz Ant1



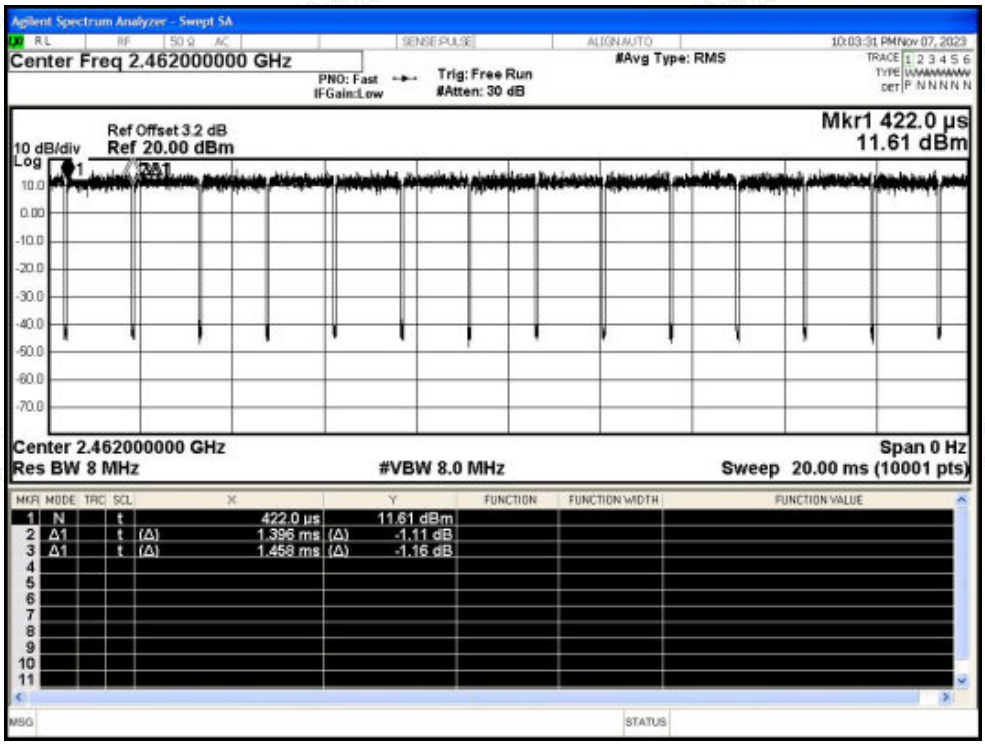
Duty Cycle NVNT g 2412MHz Ant1



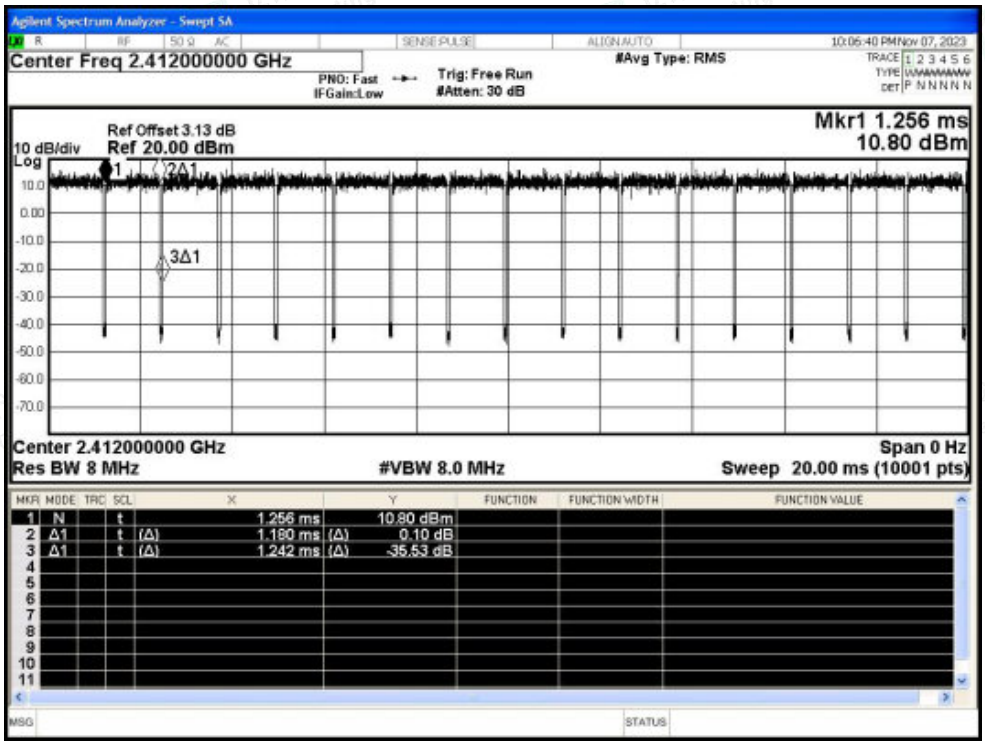
Duty Cycle NVNT g 2437MHz Ant1



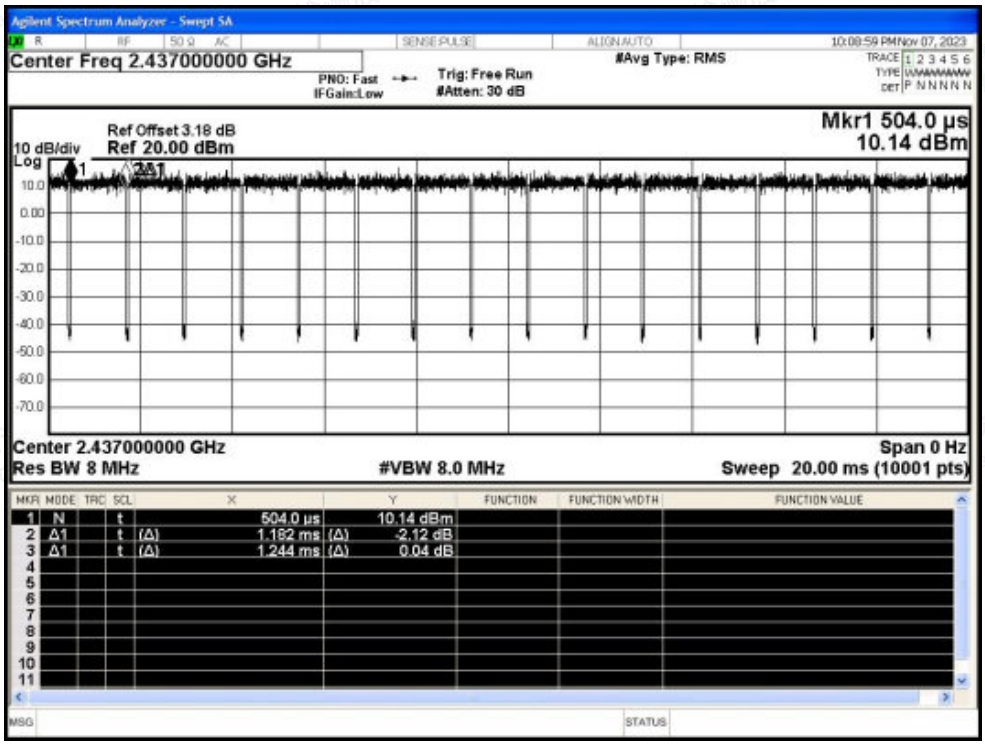
Duty Cycle NVNT g 2462MHz Ant1



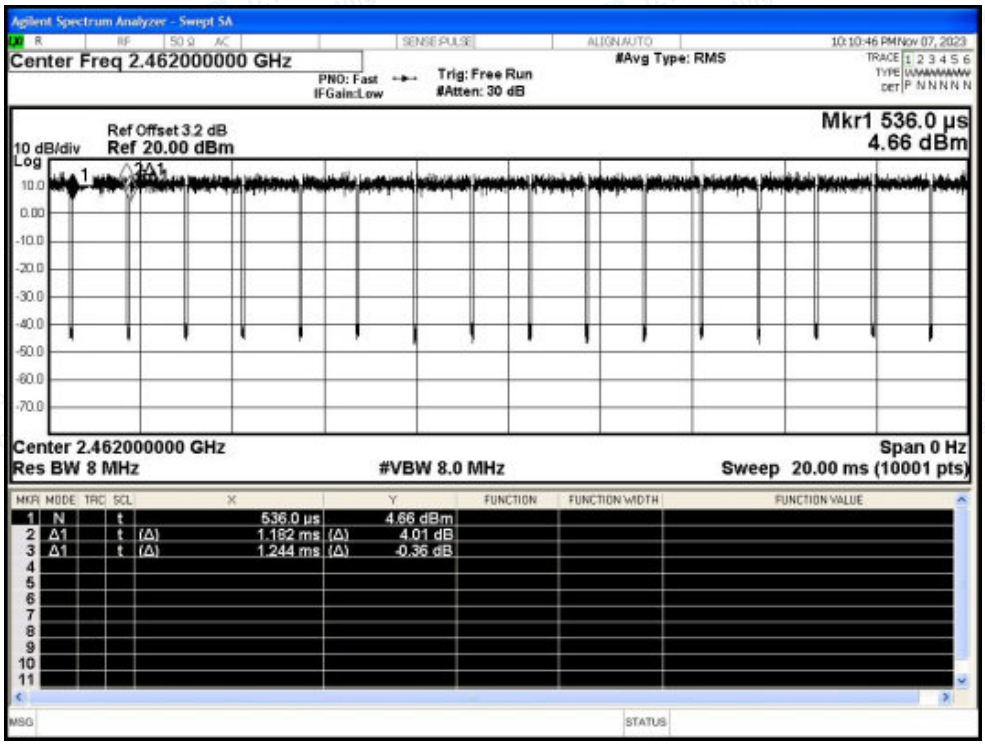
Duty Cycle NVNT n20 2412MHz Ant1



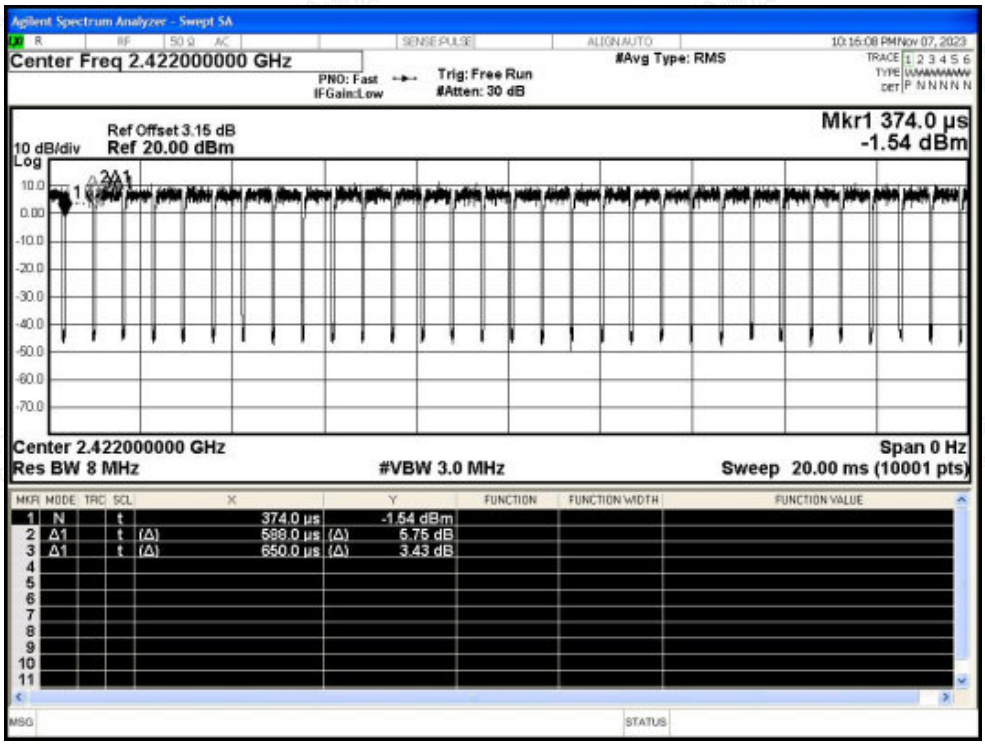
Duty Cycle NVNT n20 2437MHz Ant1



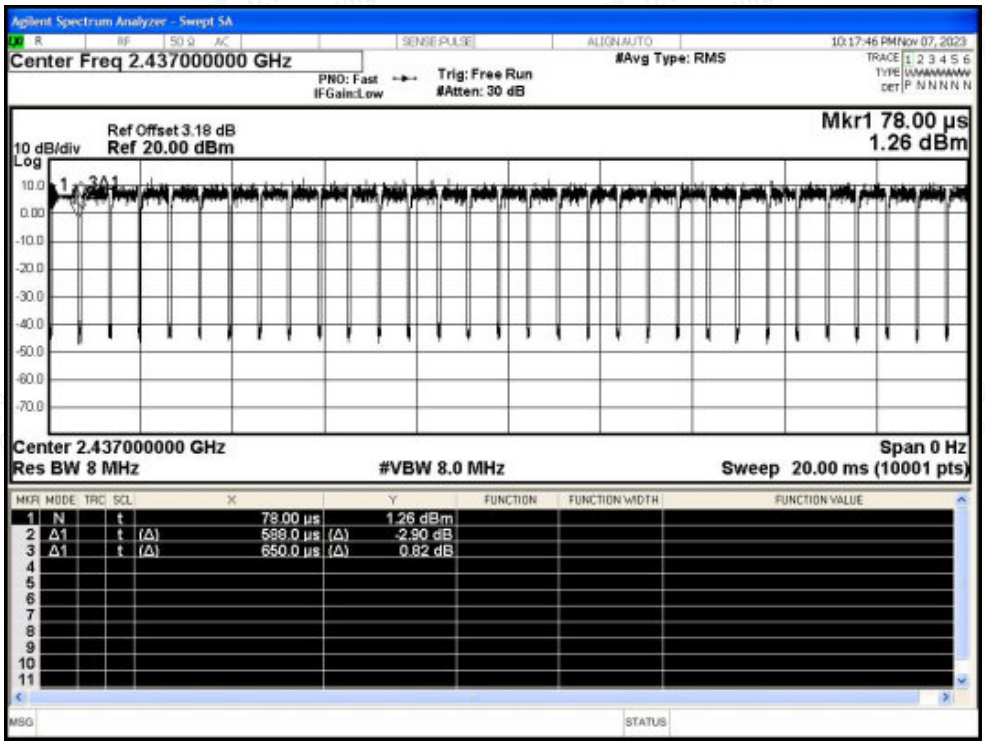
Duty Cycle NVNT n20 2462MHz Ant1



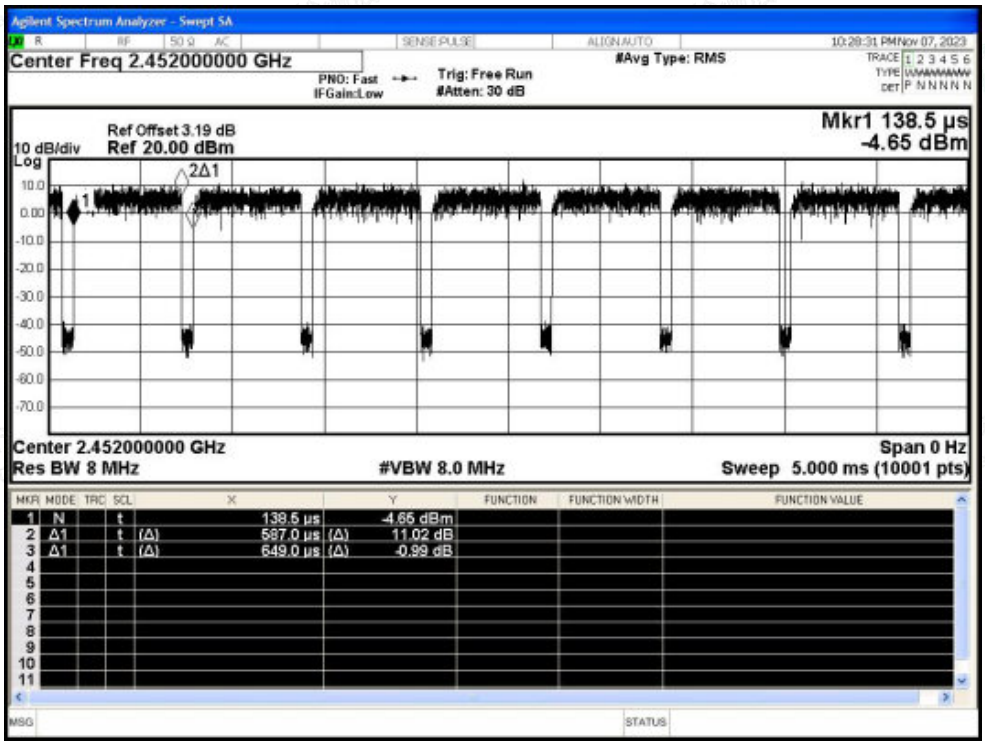
Duty Cycle NVNT n40 2422MHz Ant1



Duty Cycle NVNT n40 2437MHz Ant1



Duty Cycle NVNT n40 2452MHz Ant1



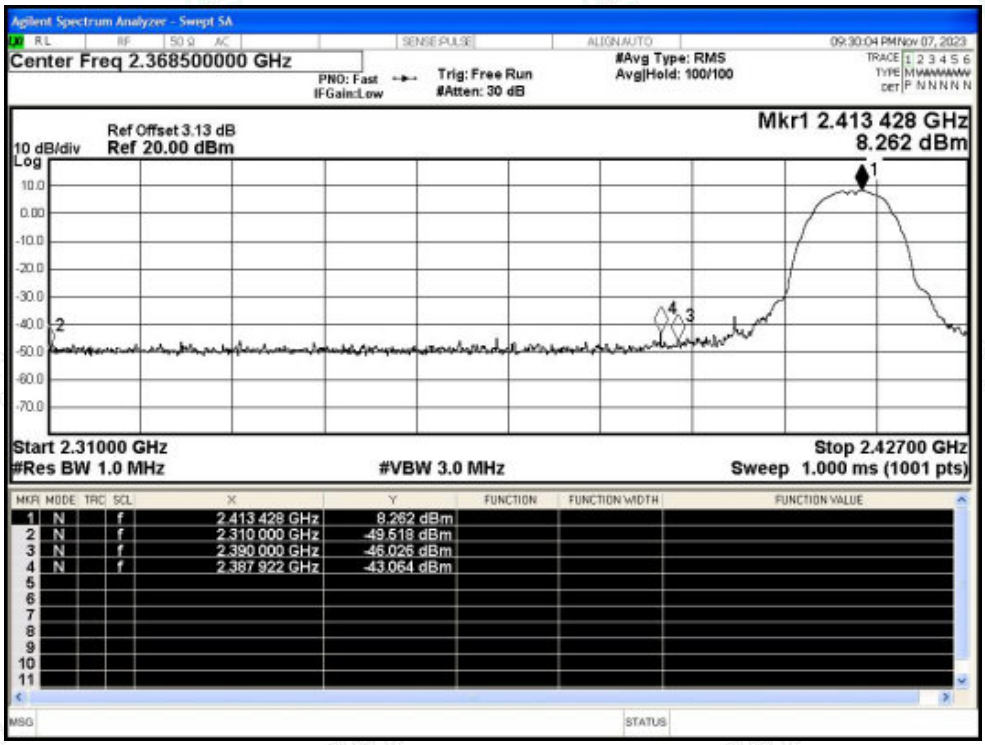
A.7 Restrict Band

Condition	Mode	Frequency (MHz)	Antenna	Spur Freq (MHz)	Power (dBm)	Gain (dBi)	E (dBuV/m)	Detector	Limit (dBuV/m)	Verdict
NVNT	b	2412	Ant1	2310	-49.52	2.97	48.71	Peak	74	Pass
NVNT	b	2412	Ant1	2310	-56.95	2.97	41.28	Average	54	Pass
NVNT	b	2412	Ant1	2387.922	-43.06	2.97	55.17	Peak	74	Pass
NVNT	b	2412	Ant1	2387.22	-54.31	2.97	43.92	Average	54	Pass
NVNT	b	2412	Ant1	2390	-46.03	2.97	52.20	Peak	74	Pass
NVNT	b	2412	Ant1	2390	-54.91	2.97	43.32	Average	54	Pass
NVNT	b	2462	Ant1	2483.5	-46.25	2.97	51.98	Peak	74	Pass
NVNT	b	2462	Ant1	2483.5	-53.83	2.97	44.40	Average	54	Pass
NVNT	b	2462	Ant1	2484.312	-39.41	2.97	58.82	Peak	74	Pass
NVNT	b	2462	Ant1	2483.782	-53.75	2.97	44.48	Average	54	Pass
NVNT	b	2462	Ant1	2500	-47.52	2.97	50.71	Peak	74	Pass
NVNT	b	2462	Ant1	2500	-56.23	2.97	42.00	Average	54	Pass
NVNT	g	2412	Ant1	2310	-50.03	2.97	48.20	Peak	74	Pass
NVNT	g	2412	Ant1	2310	-56.61	2.97	41.62	Average	54	Pass
NVNT	g	2412	Ant1	2389.443	-40.44	2.97	57.79	Peak	74	Pass
NVNT	g	2412	Ant1	2389.794	-52.22	2.97	46.01	Average	54	Pass
NVNT	g	2412	Ant1	2390	-41.83	2.97	56.40	Peak	74	Pass
NVNT	g	2412	Ant1	2390	-52.01	2.97	46.22	Average	54	Pass
NVNT	g	2462	Ant1	2483.5	-36.04	2.97	62.19	Peak	74	Pass
NVNT	g	2462	Ant1	2483.5	-46.23	2.97	52.00	Average	54	Pass
NVNT	g	2462	Ant1	2484.259	-29.63	2.97	68.60	Peak	74	Pass
NVNT	g	2462	Ant1	2483.729	-46.21	2.97	52.02	Average	54	Pass
NVNT	g	2462	Ant1	2500	-49.63	2.97	48.60	Peak	74	Pass
NVNT	g	2462	Ant1	2500	-55.78	2.97	42.45	Average	54	Pass
NVNT	n20	2412	Ant1	2310	-49.21	2.97	49.02	Peak	74	Pass
NVNT	n20	2412	Ant1	2310	-56.57	2.97	41.66	Average	54	Pass
NVNT	n20	2412	Ant1	2389.209	-40.34	2.97	57.89	Peak	74	Pass
NVNT	n20	2412	Ant1	2389.911	-51.12	2.97	47.11	Average	54	Pass
NVNT	n20	2412	Ant1	2390	-42.52	2.97	55.71	Peak	74	Pass
NVNT	n20	2412	Ant1	2390	-50.96	2.97	47.27	Average	54	Pass
NVNT	n20	2462	Ant1	2483.5	-40.59	2.97	57.64	Peak	74	Pass
NVNT	n20	2462	Ant1	2483.5	-50.47	2.97	47.76	Average	54	Pass
NVNT	n20	2462	Ant1	2483.888	-36.84	2.97	61.39	Peak	74	Pass
NVNT	n20	2462	Ant1	2483.57	-49.87	2.97	48.36	Average	54	Pass
NVNT	n20	2462	Ant1	2500	-49.55	2.97	48.68	Peak	74	Pass
NVNT	n20	2462	Ant1	2500	-55.76	2.97	42.47	Average	54	Pass
NVNT	n40	2422	Ant1	2310	-51.41	2.97	46.82	Peak	74	Pass

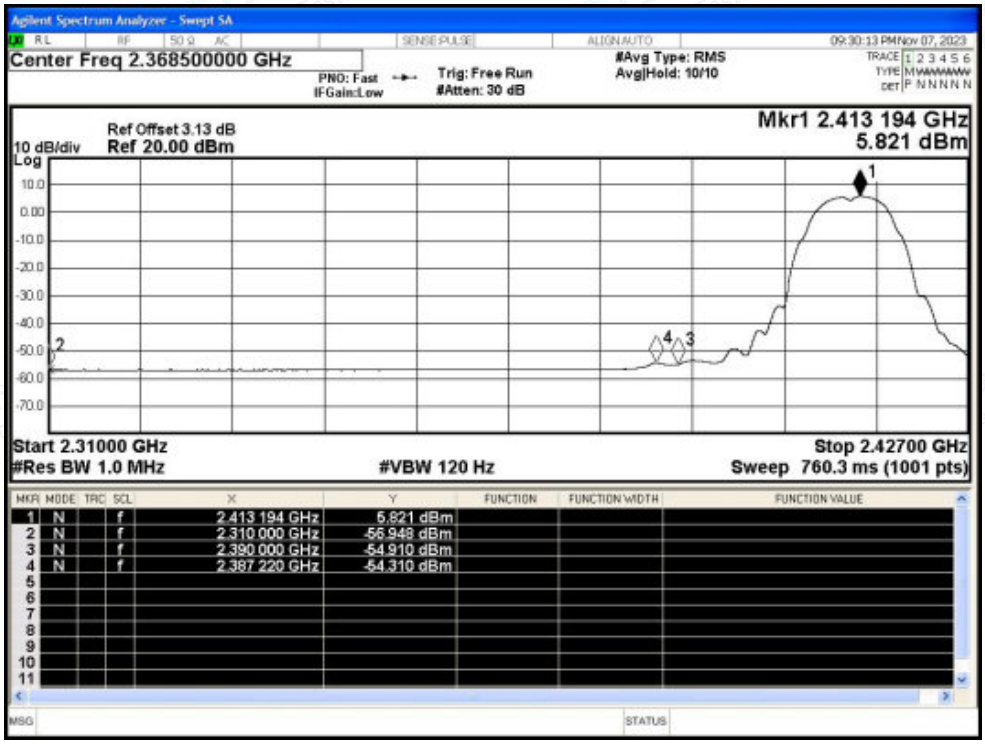
NVNT	n40	2422	Ant1	2310	-56.29	2.97	41.94	Average	54	Pass
NVNT	n40	2422	Ant1	2389.946	-33.3	2.97	64.93	Peak	74	Pass
NVNT	n40	2422	Ant1	2389.946	-47.86	2.97	50.37	Average	54	Pass
NVNT	n40	2422	Ant1	2390	-33.3	2.97	64.93	Peak	74	Pass
NVNT	n40	2422	Ant1	2390	-47.86	2.97	50.37	Average	54	Pass
NVNT	n40	2452	Ant1	2483.5	-36.23	2.97	62.00	Peak	74	Pass
NVNT	n40	2452	Ant1	2483.5	-44.48	2.97	53.75	Average	54	Pass
NVNT	n40	2452	Ant1	2483.62	-26.65	2.97	71.58	Peak	74	Pass
NVNT	n40	2452	Ant1	2483.62	-45.29	2.97	52.94	Average	54	Pass
NVNT	n40	2452	Ant1	2500	-57.41	2.97	40.82	Peak	74	Pass
NVNT	n40	2452	Ant1	2500	-65.72	2.97	32.51	Average	54	Pass

Test Graphs

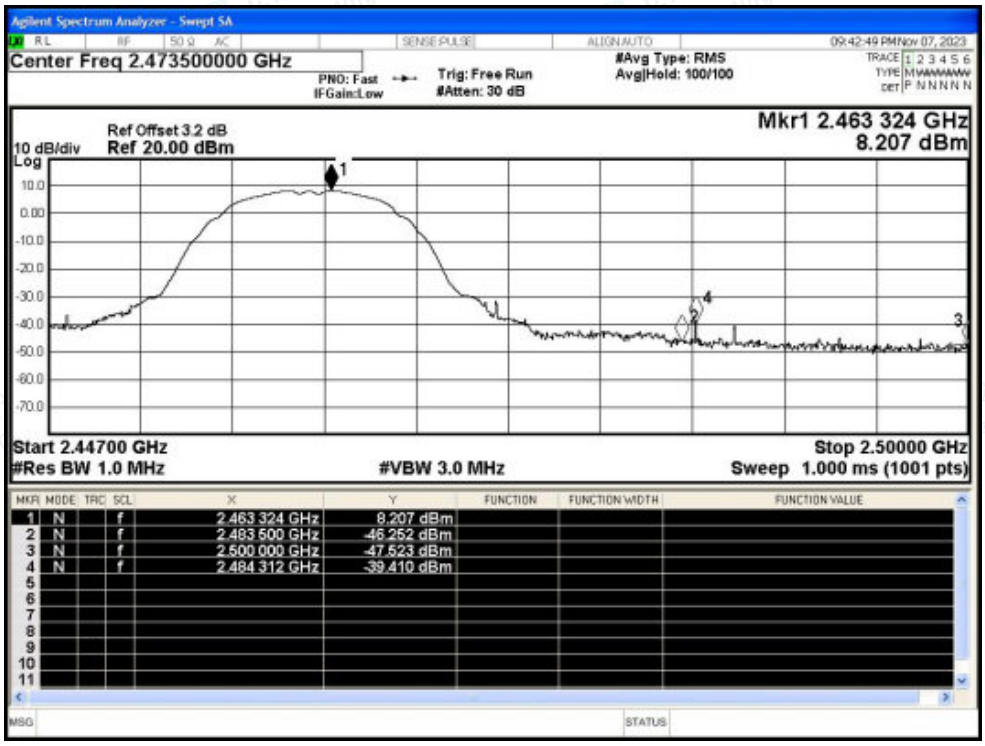
Restrict Band NVNT b 2412MHz Ant1 Peak



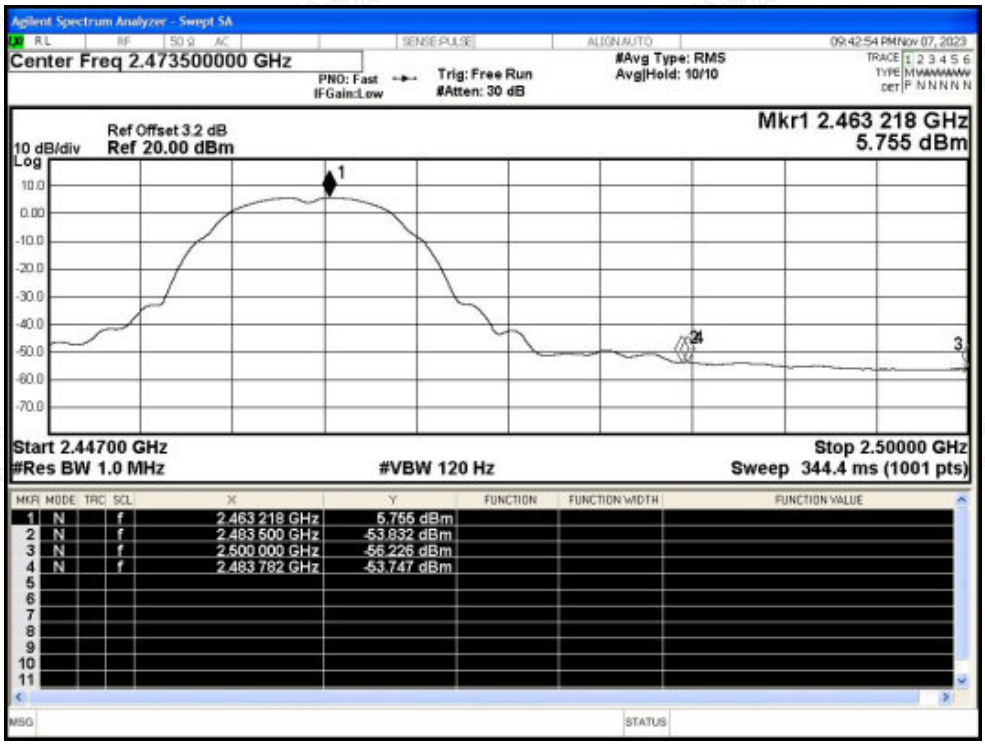
Restrict Band NVNT b 2412MHz Ant1 Average



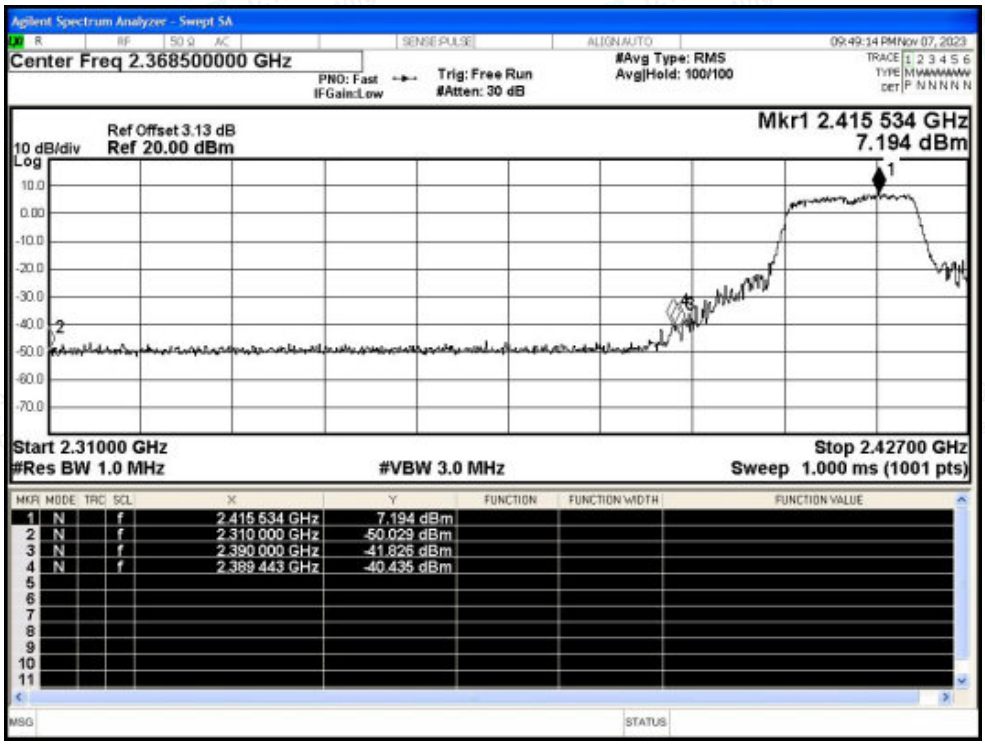
Restrict Band NVNT b 2462MHz Ant1 Peak



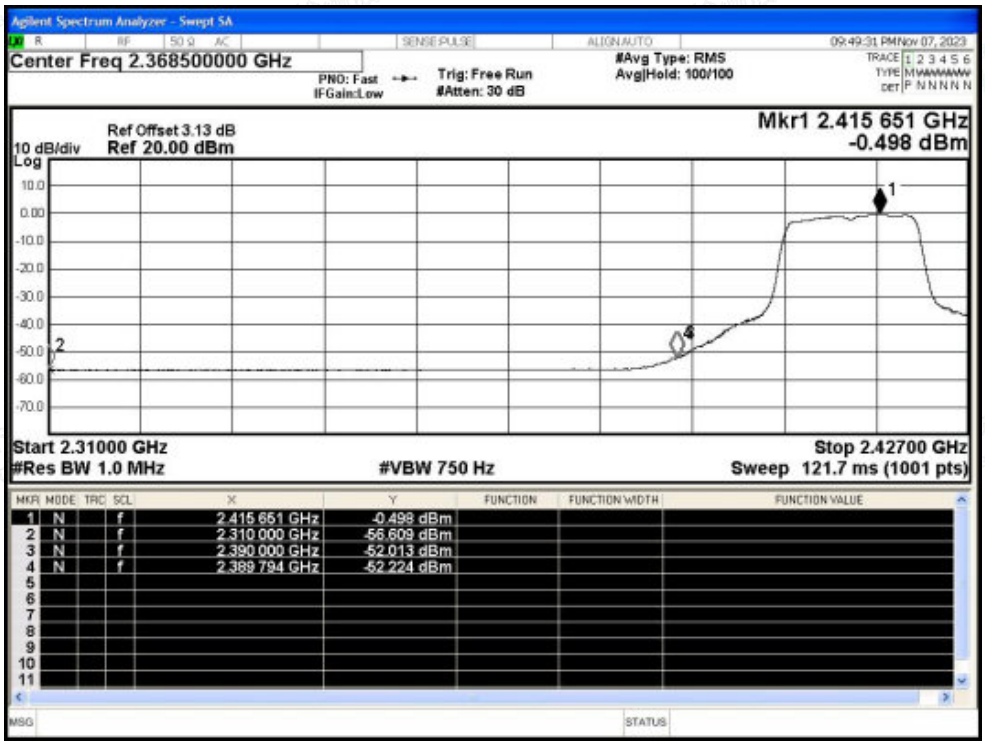
Restrict Band NVNT b 2462MHz Ant1 Average



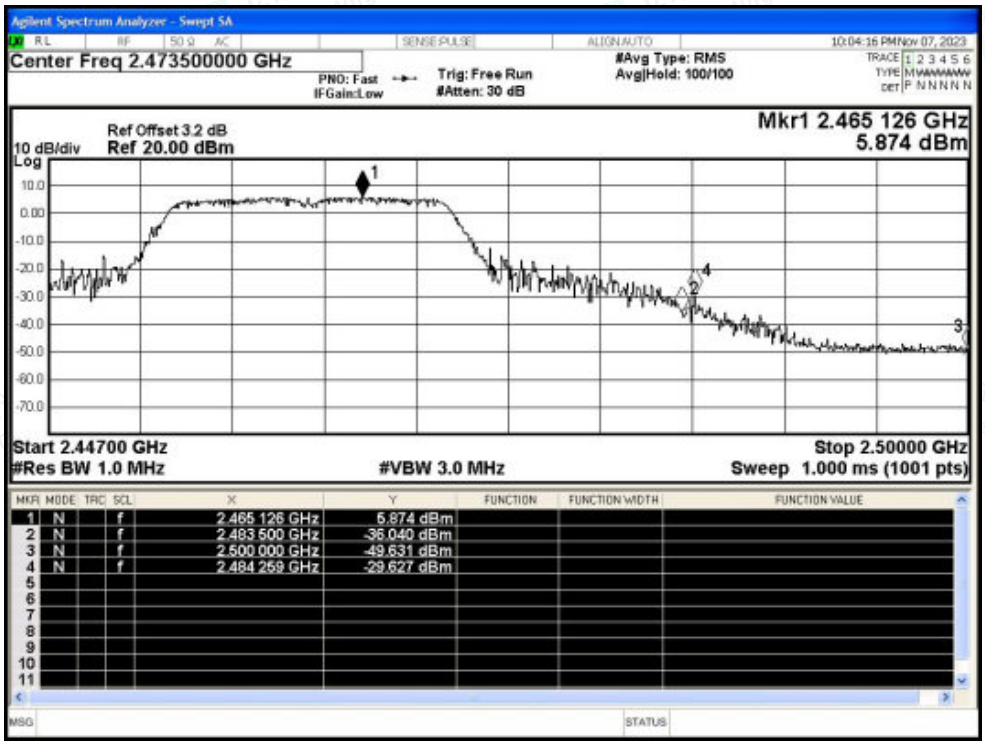
Restrict Band NVNT g 2412MHz Ant1 Peak



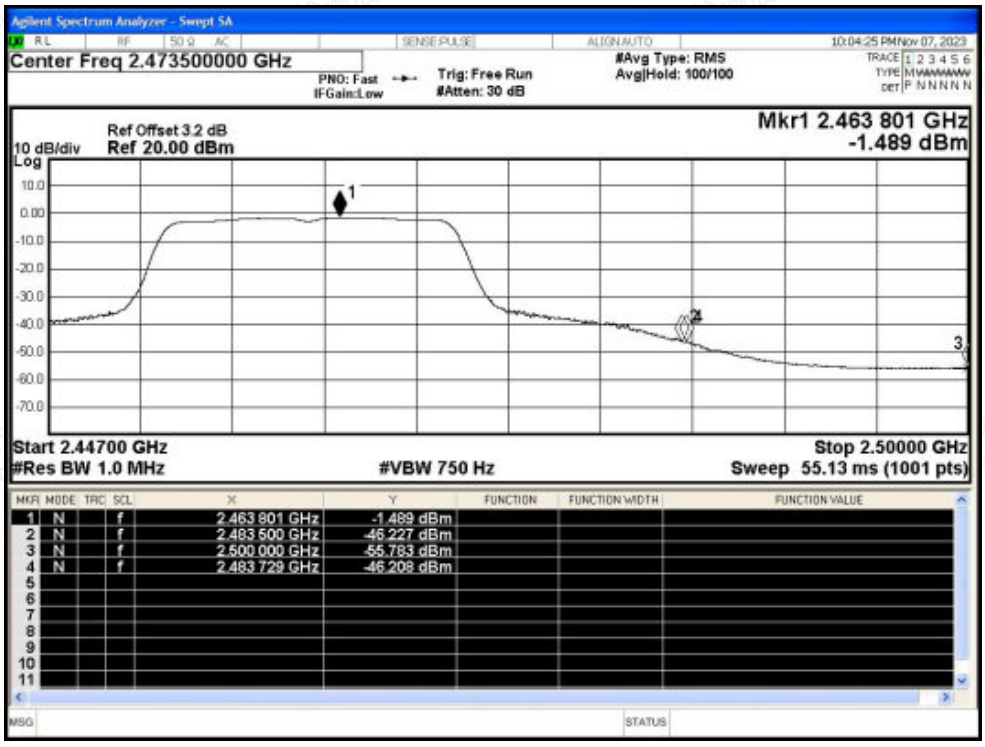
Restrict Band NVNT g 2412MHz Ant1 Average



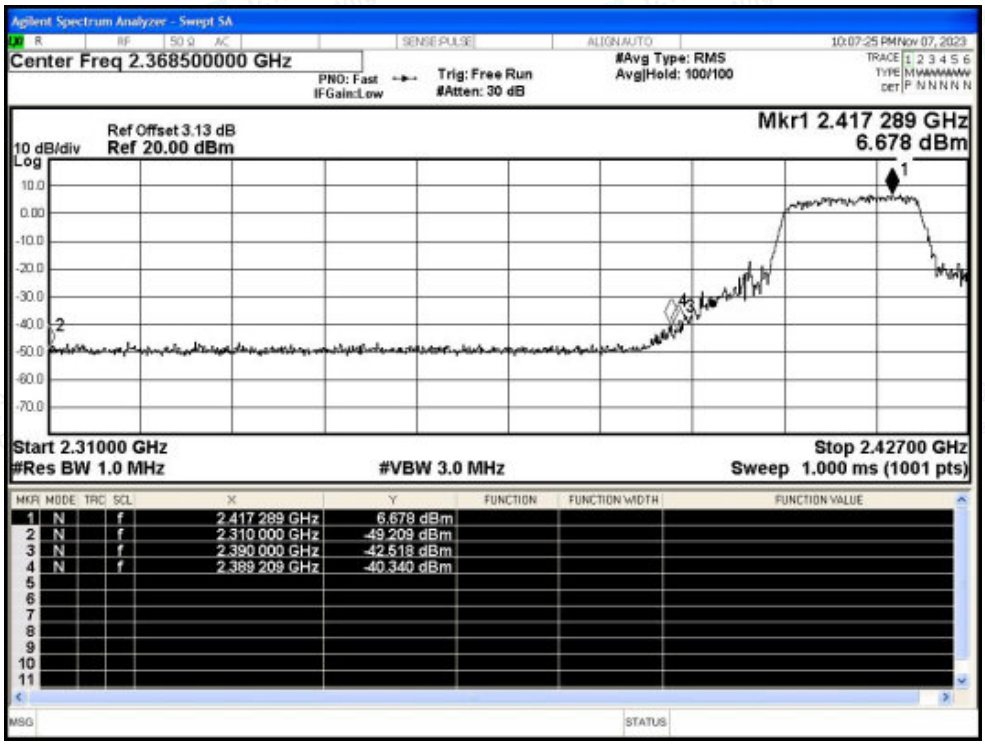
Restrict Band NVNT g 2462MHz Ant1 Peak



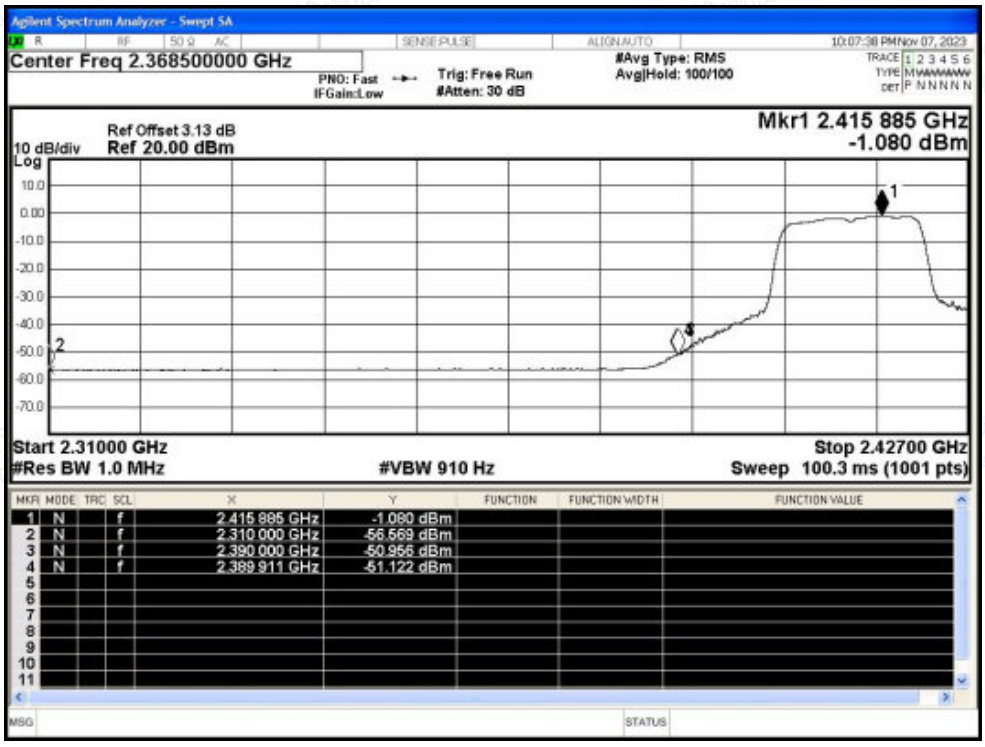
Restrict Band NVNT g 2462MHz Ant1 Average



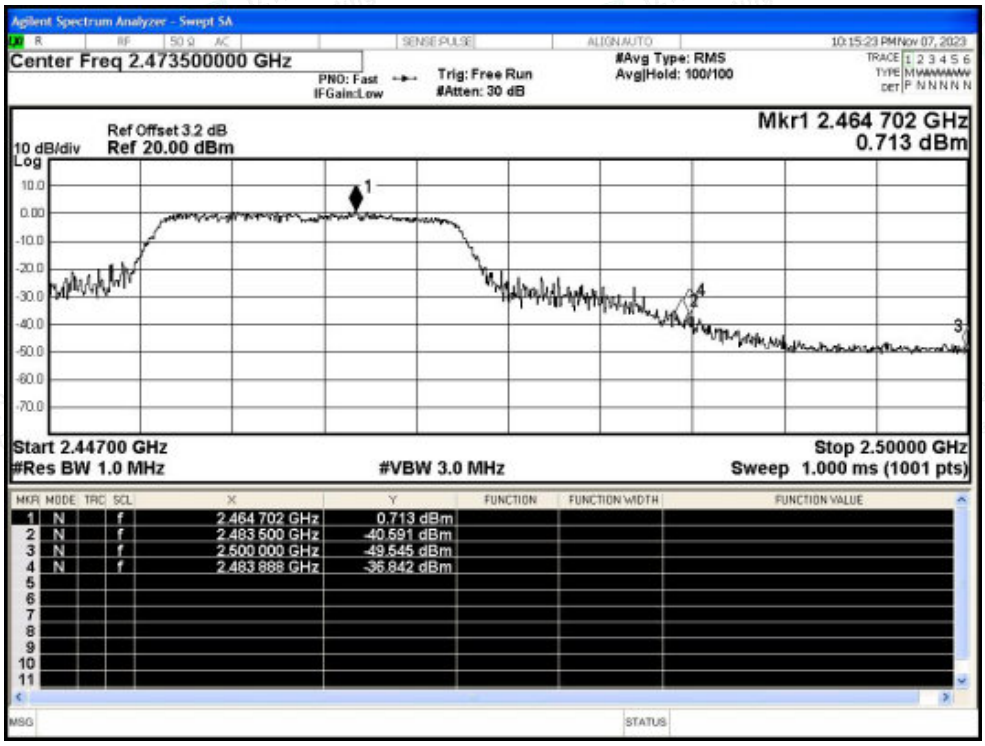
Restrict Band NVNT n20 2412MHz Ant1 Peak



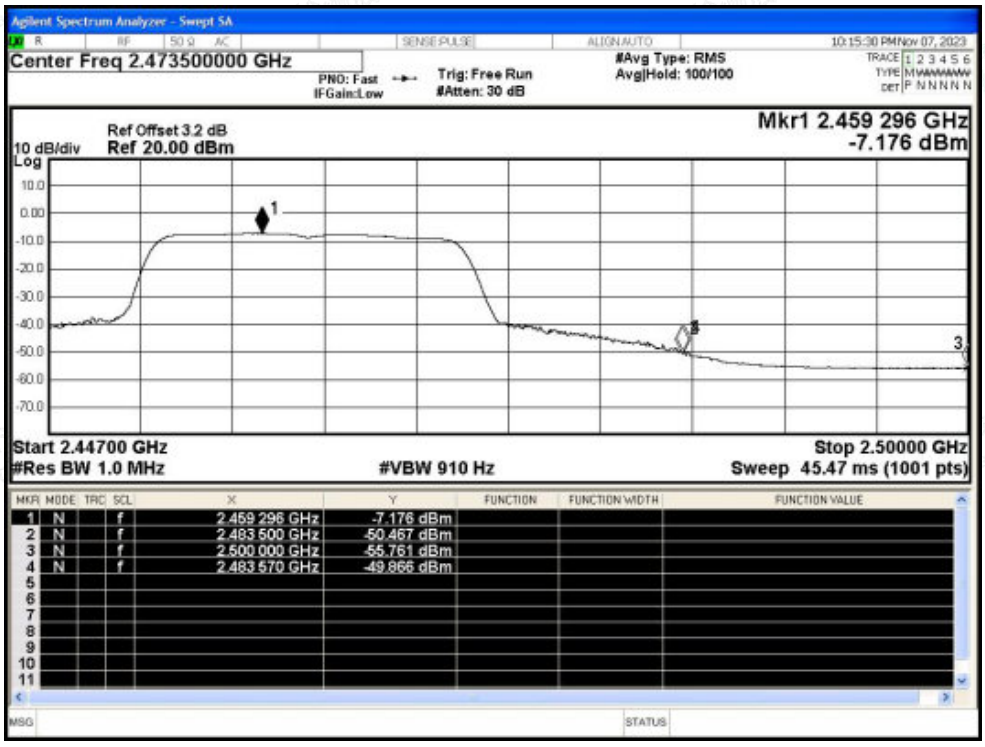
Restrict Band NVNT n20 2412MHz Ant1 Average



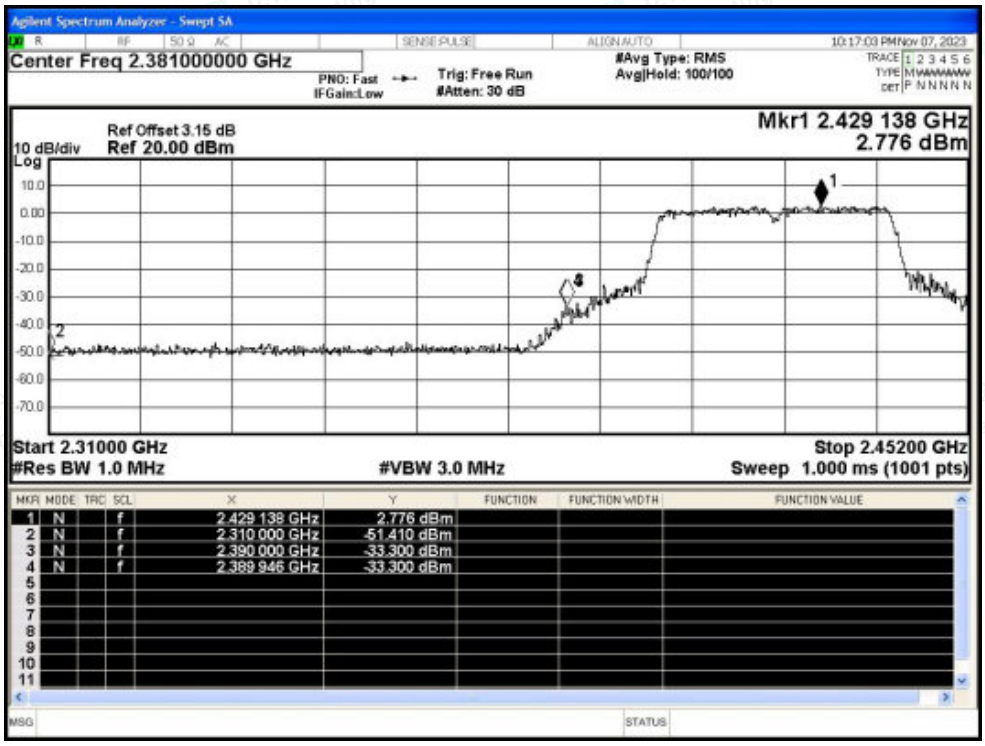
Restrict Band NVNT n20 2462MHz Ant1 Peak



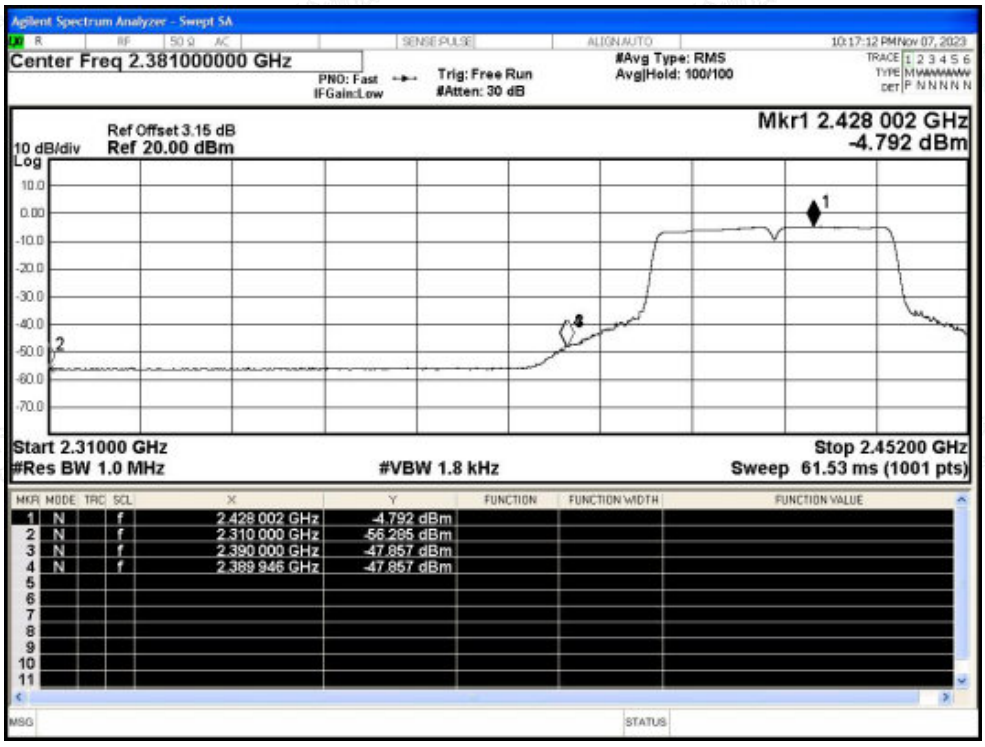
Restrict Band NVNT n20 2462MHz Ant1 Average



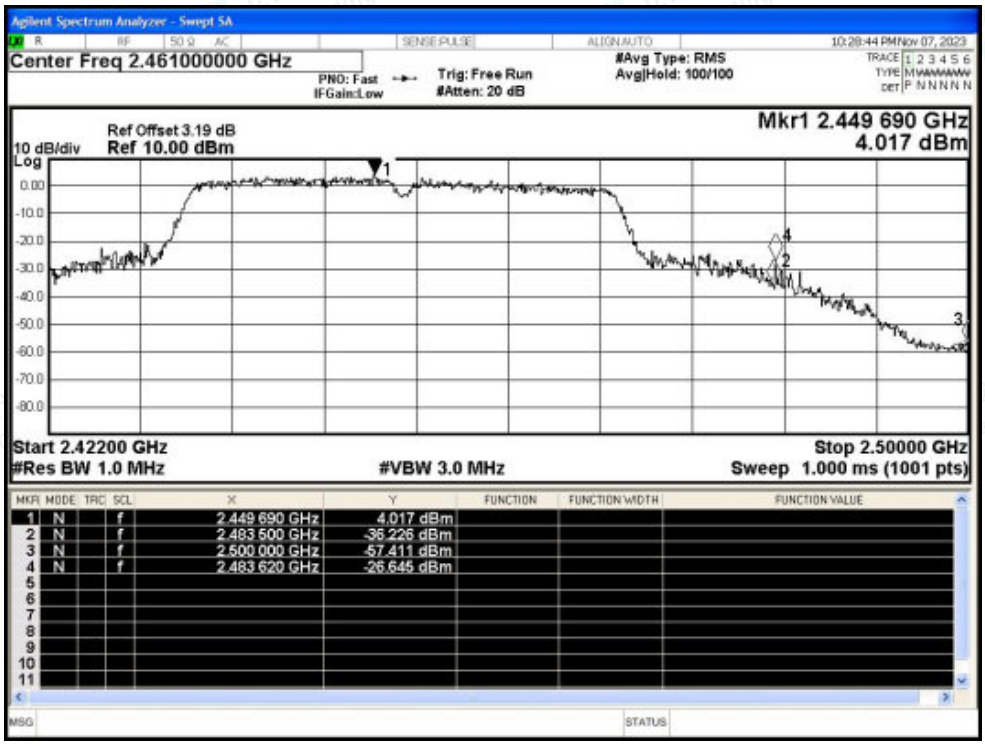
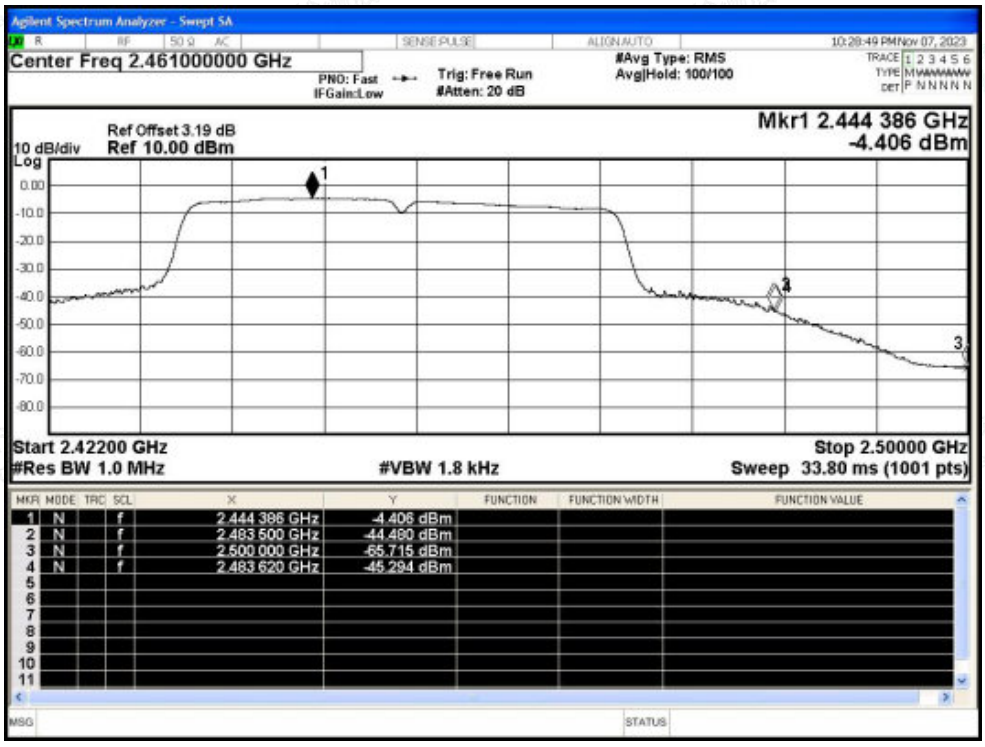
Restrict Band NVNT n40 2422MHz Ant1 Peak



Restrict Band NVNT n40 2422MHz Ant1 Average



Restrict Band NVNT n40 2452MHz Ant1 Peak



Restrict Band NVNT n40 2452MHz Ant1 Average