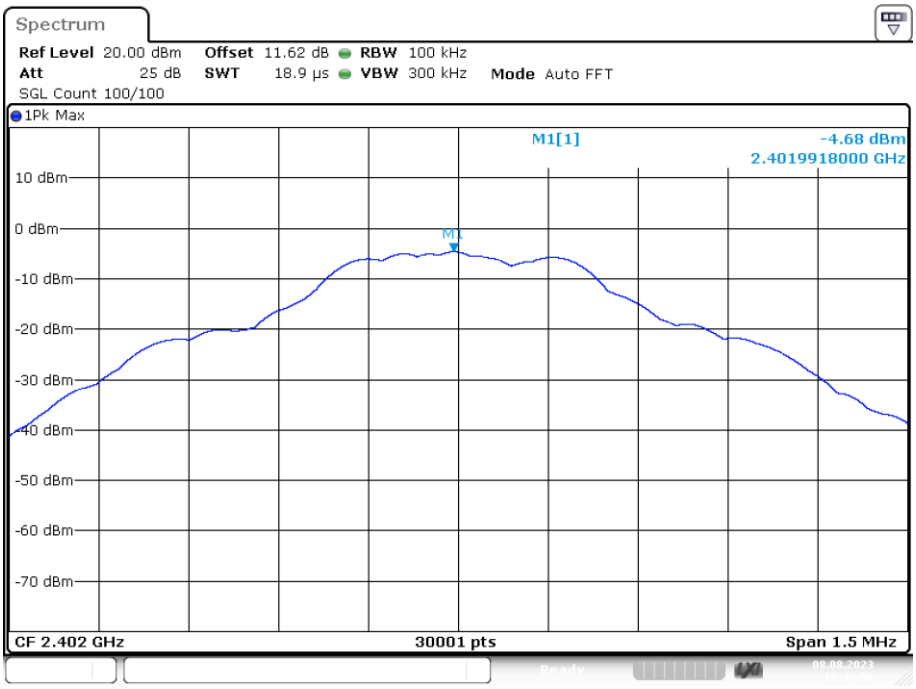
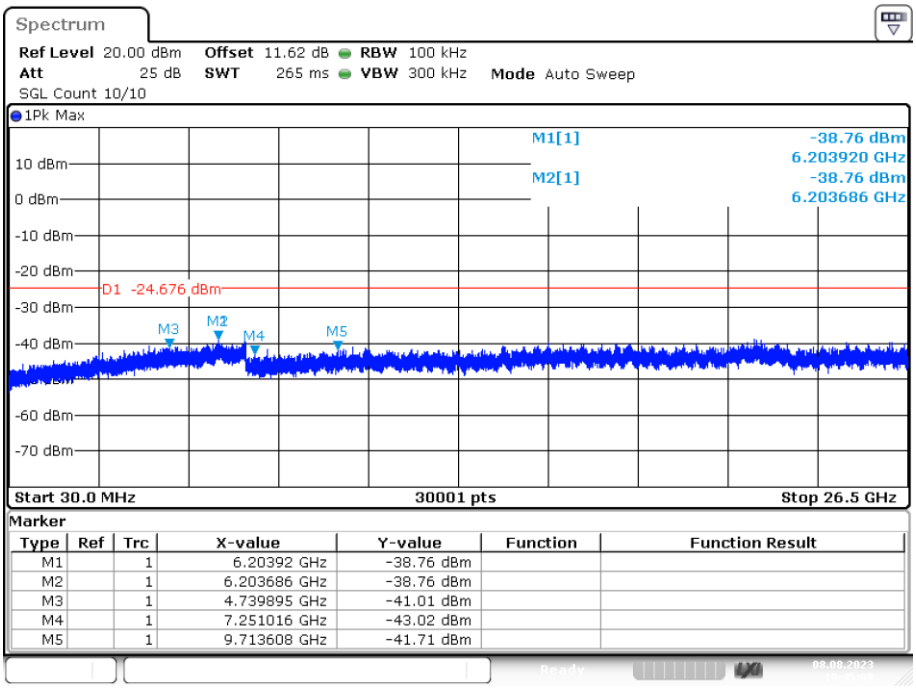
Conducted RF Spurious Emission

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Ref



Date: 8.AUG.2023 10:44:55

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission

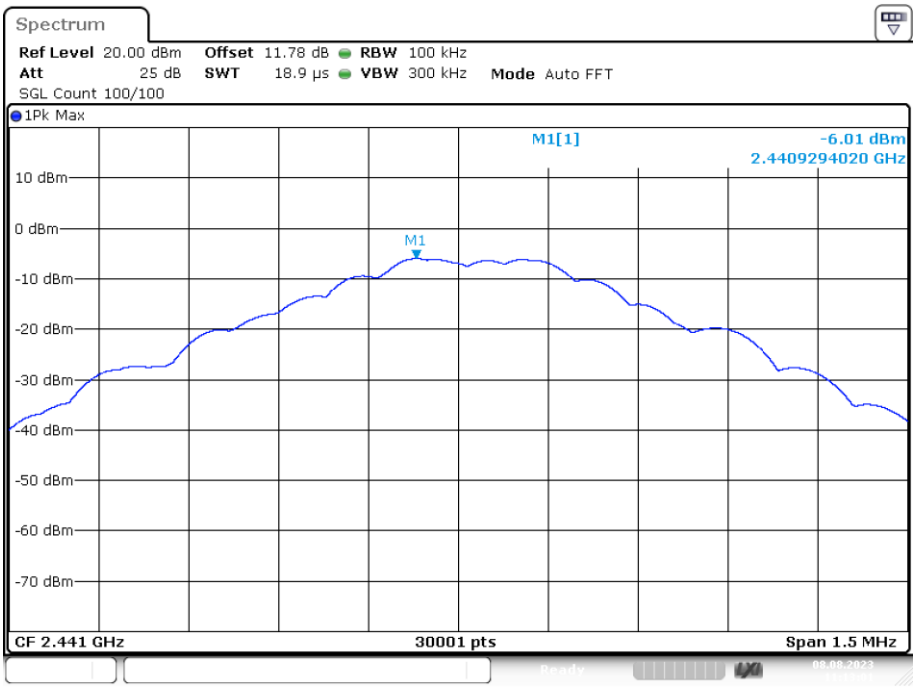


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	6.20392 GHz	-38.76 dBm		
M2		1	6.203686 GHz	-38.76 dBm		
M3		1	4.739895 GHz	-41.01 dBm		
M4		1	7.251016 GHz	-43.02 dBm		
M5		1	9.713608 GHz	-41.71 dBm		

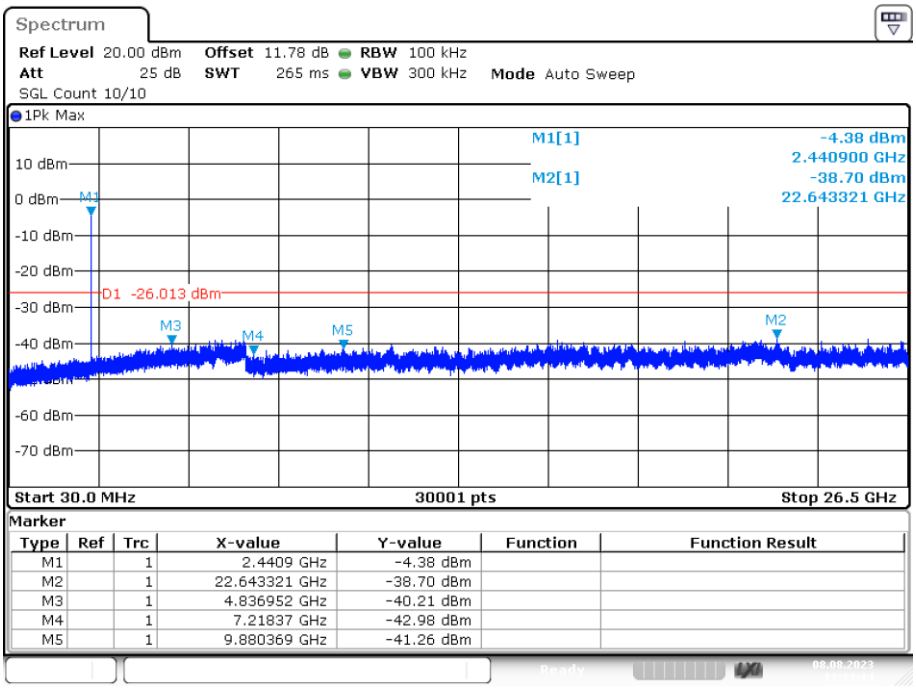
Date: 8.AUG.2023 10:45:09

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Ref



Date: 8.AUG.2023 11:13:01

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission

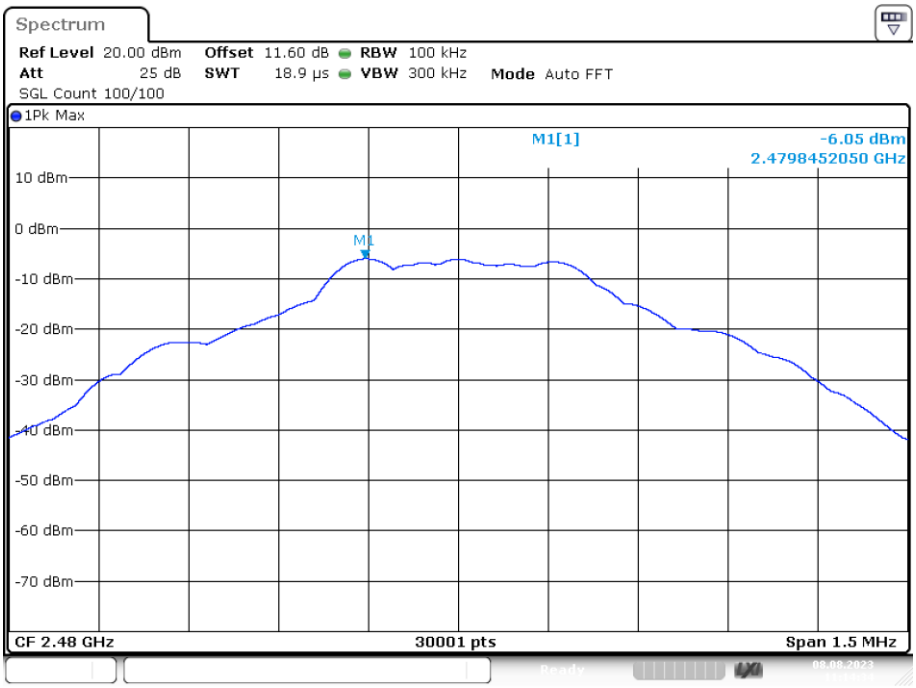


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4409 GHz	-4.38 dBm		
M2		1	22.643321 GHz	-38.70 dBm		
M3		1	4.836952 GHz	-40.21 dBm		
M4		1	7.21837 GHz	-42.98 dBm		
M5		1	9.880369 GHz	-41.26 dBm		

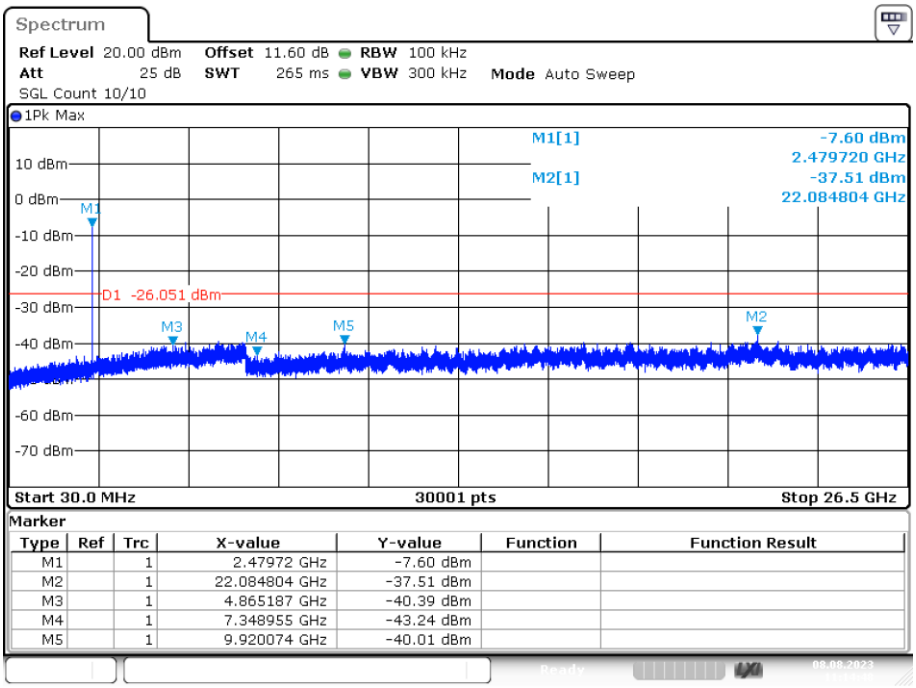
Date: 8.AUG.2023 11:13:14

Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Ref



Date: 8.AUG.2023 11:14:33

Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission

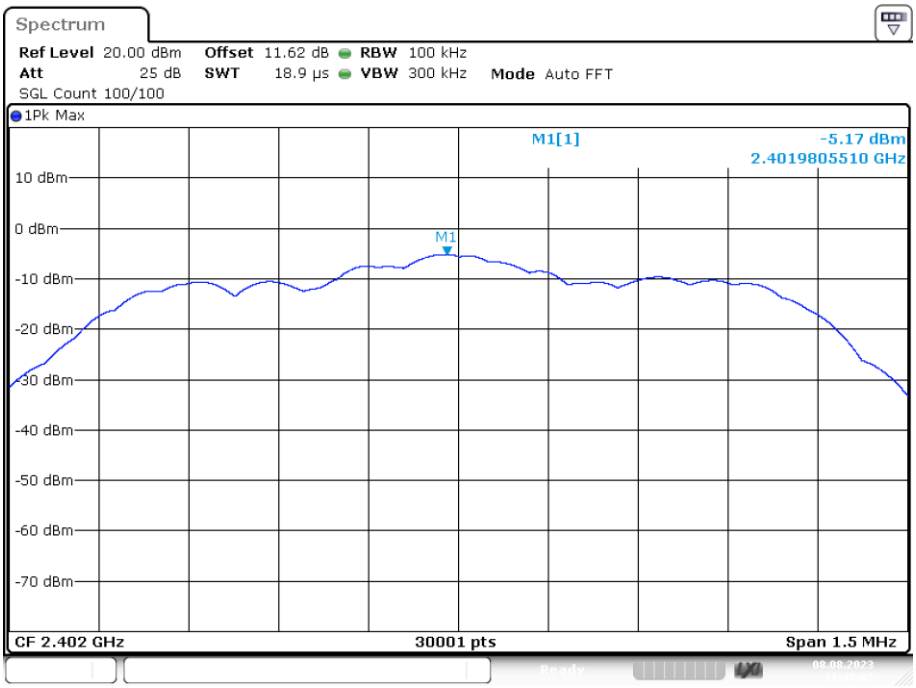


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47972 GHz	-7.60 dBm		
M2		1	22.084804 GHz	-37.51 dBm		
M3		1	4.865187 GHz	-40.39 dBm		
M4		1	7.348955 GHz	-43.24 dBm		
M5		1	9.920074 GHz	-40.01 dBm		

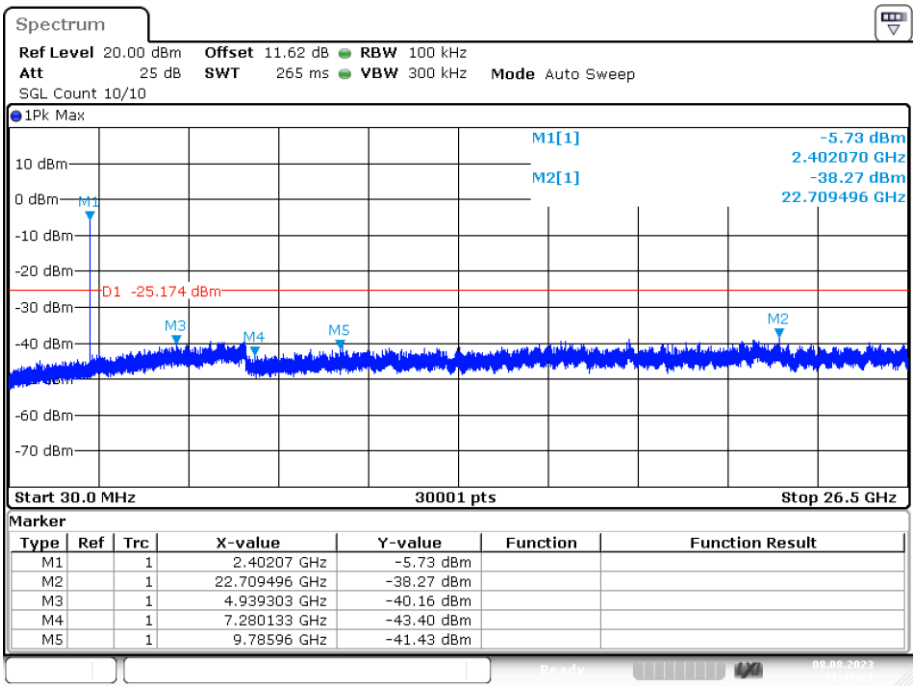
Date: 8.AUG.2023 11:14:47

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Ref



Date: 8.AUG.2023 11:47:06

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission

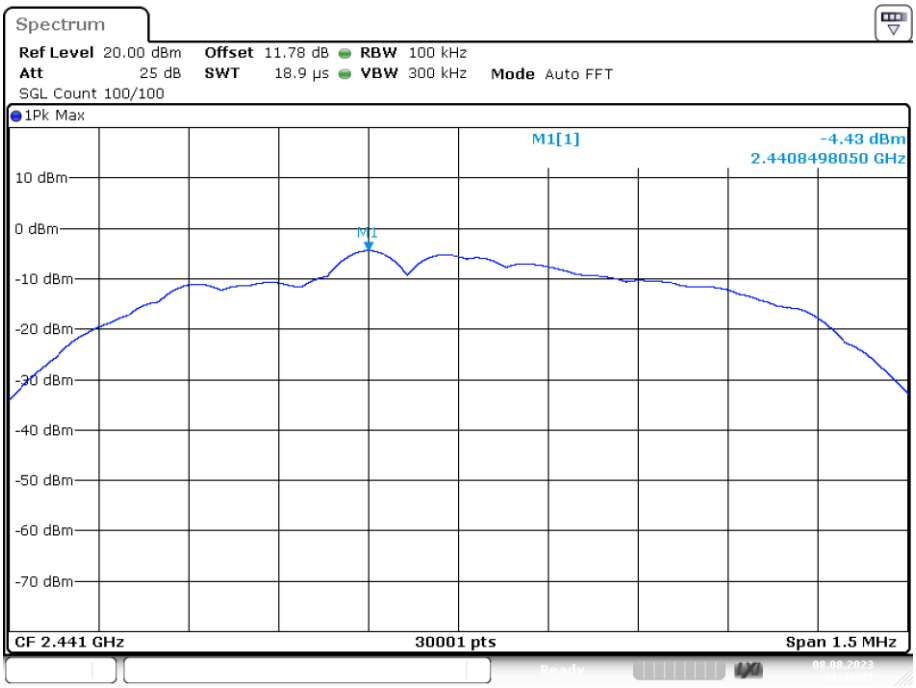


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207 GHz	-5.73 dBm		
M2		1	22.709496 GHz	-38.27 dBm		
M3		1	4.939303 GHz	-40.16 dBm		
M4		1	7.280133 GHz	-43.40 dBm		
M5		1	9.78596 GHz	-41.43 dBm		

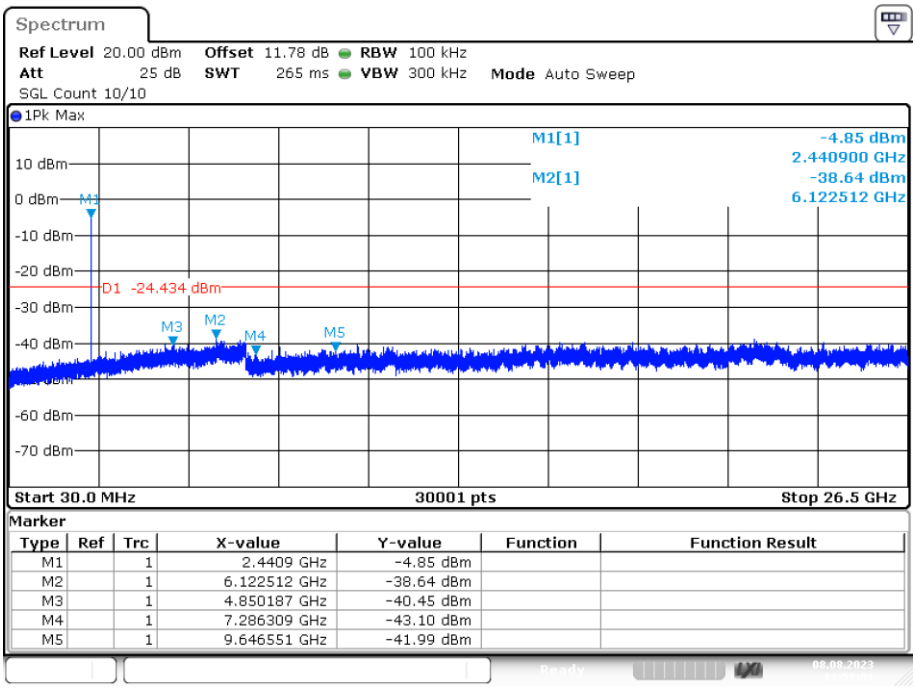
Date: 8.AUG.2023 11:47:20

Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Ref



Date: 8.AUG.2023 11:49:47

Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission

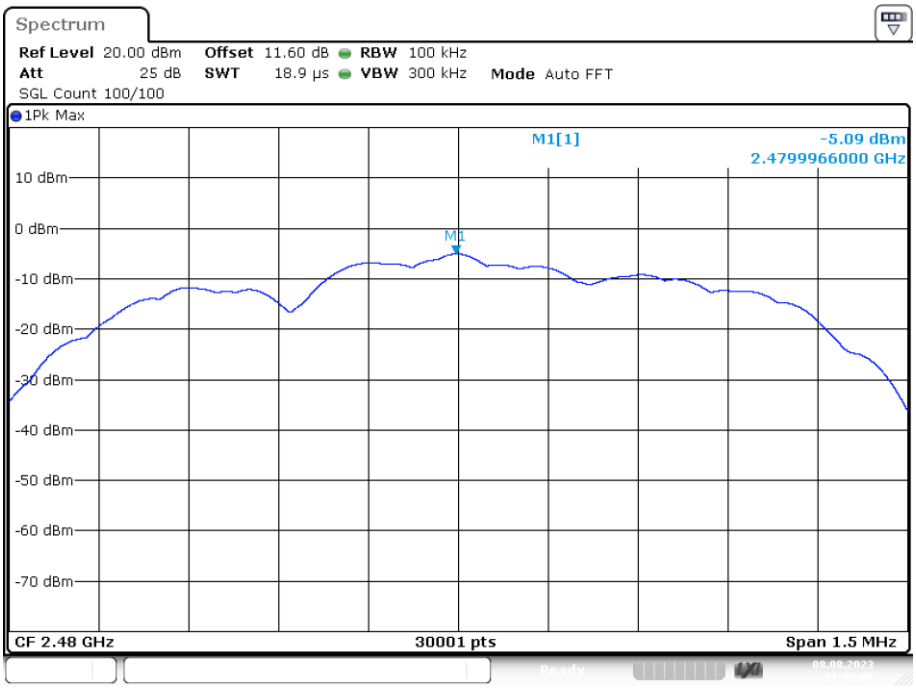


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4409 GHz	-4.85 dBm		
M2		1	6.122512 GHz	-38.64 dBm		
M3		1	4.850187 GHz	-40.45 dBm		
M4		1	7.286309 GHz	-43.10 dBm		
M5		1	9.646551 GHz	-41.99 dBm		

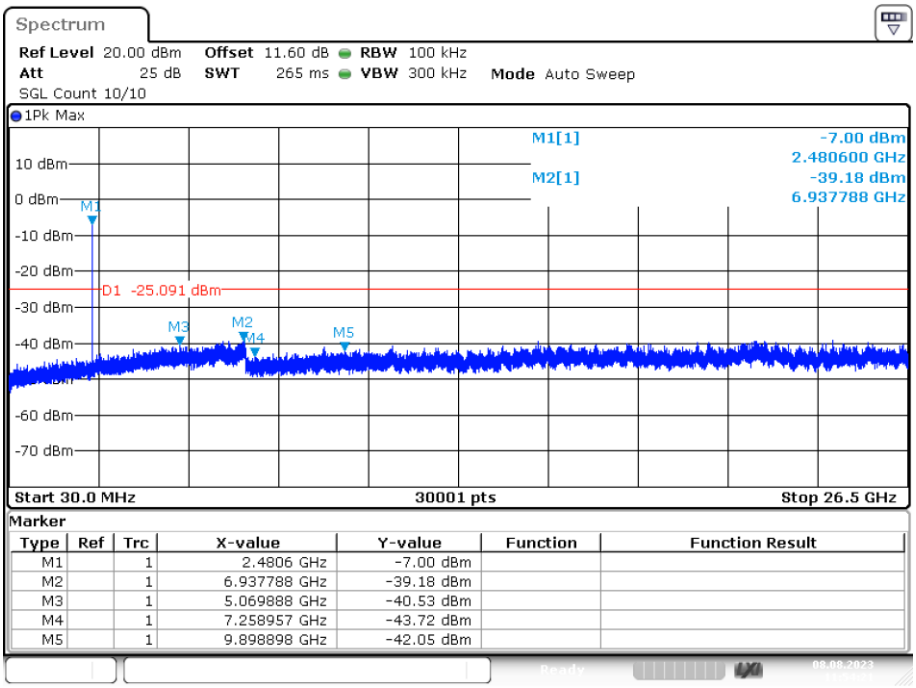
Date: 8.AUG.2023 11:50:01

Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Ref



Date: 8.AUG.2023 11:54:08

Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission

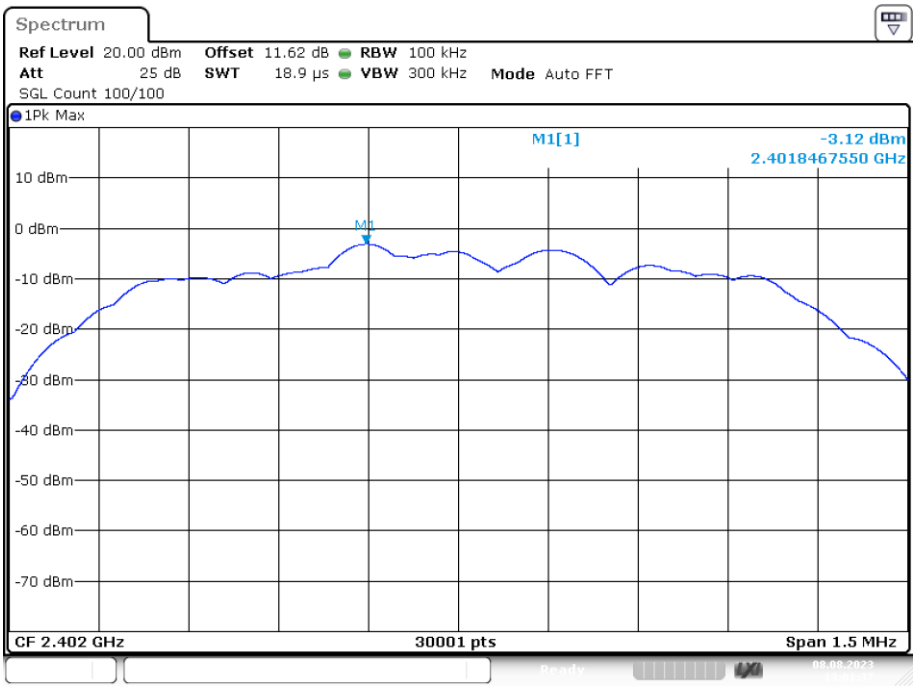


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4806 GHz	-7.00 dBm		
M2		1	6.937788 GHz	-39.18 dBm		
M3		1	5.069888 GHz	-40.53 dBm		
M4		1	7.258957 GHz	-43.72 dBm		
M5		1	9.898898 GHz	-42.05 dBm		

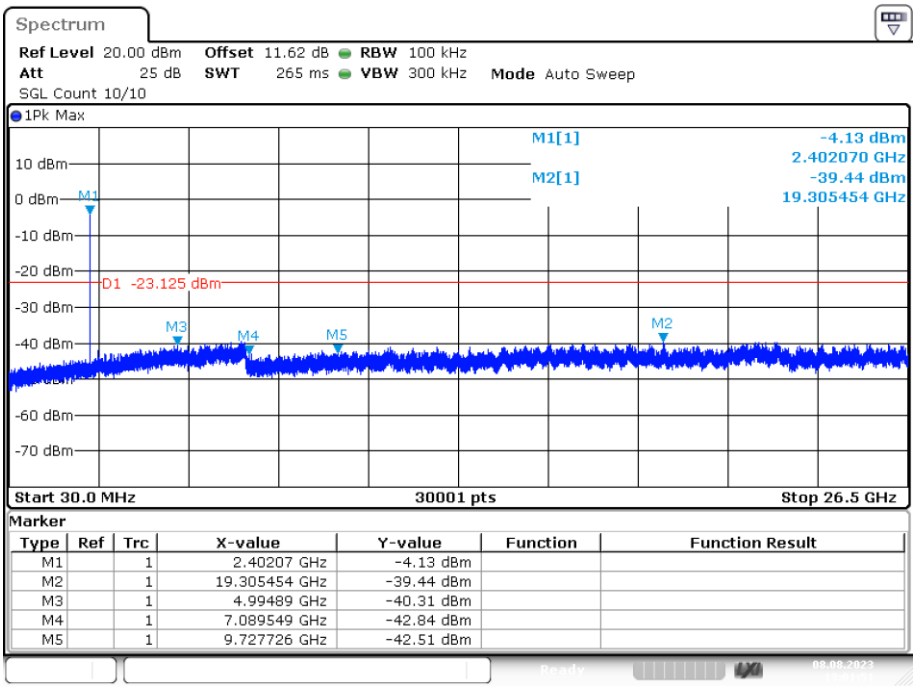
Date: 8.AUG.2023 11:54:21

Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Ref



Date: 8.AUG.2023 13:01:38

Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission

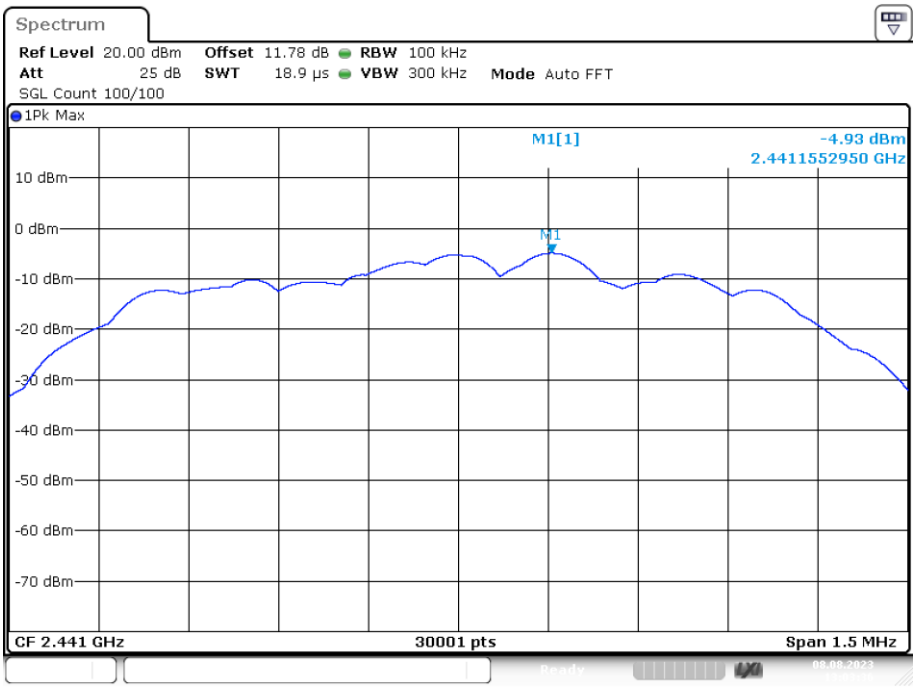


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207 GHz	-4.13 dBm		
M2		1	19.305454 GHz	-39.44 dBm		
M3		1	4.99489 GHz	-40.31 dBm		
M4		1	7.089549 GHz	-42.84 dBm		
M5		1	9.727726 GHz	-42.51 dBm		

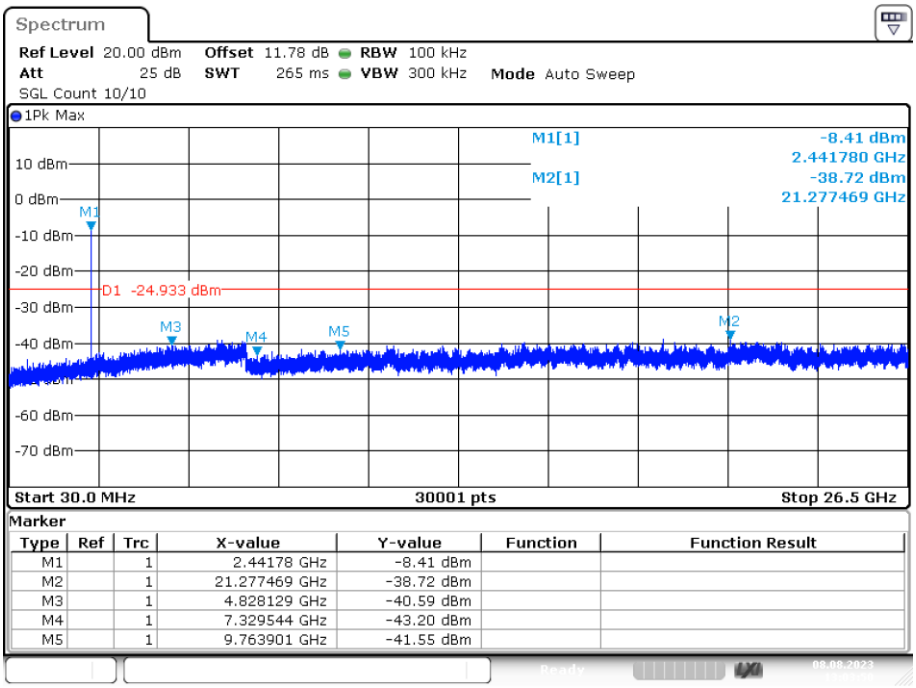
Date: 8.AUG.2023 13:01:51

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Ref



Date: 8.AUG.2023 13:03:36

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission

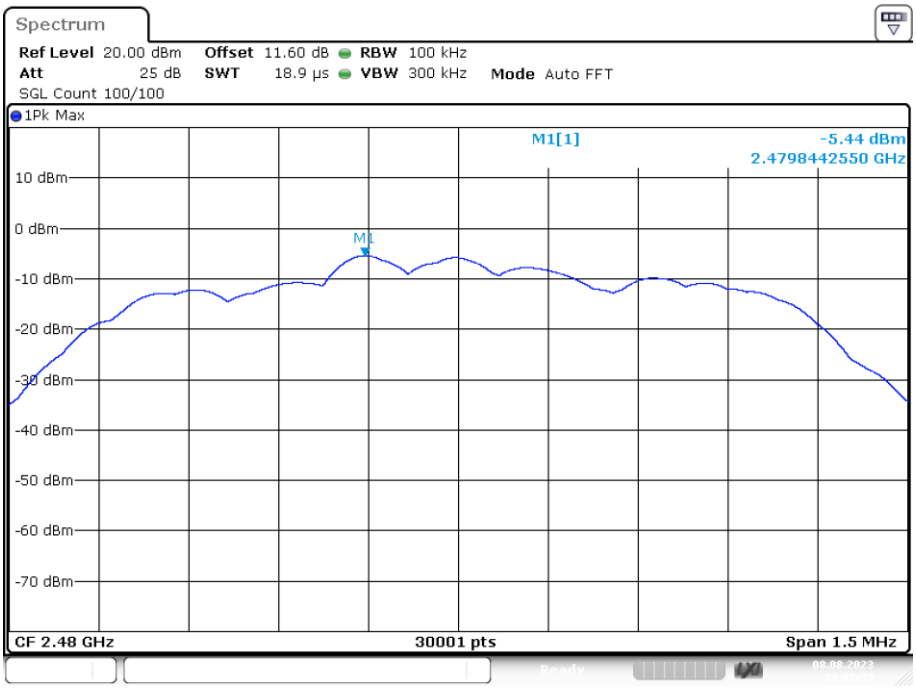


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44178 GHz	-8.41 dBm		
M2		1	21.277469 GHz	-38.72 dBm		
M3		1	4.828129 GHz	-40.59 dBm		
M4		1	7.329544 GHz	-43.20 dBm		
M5		1	9.763901 GHz	-41.55 dBm		

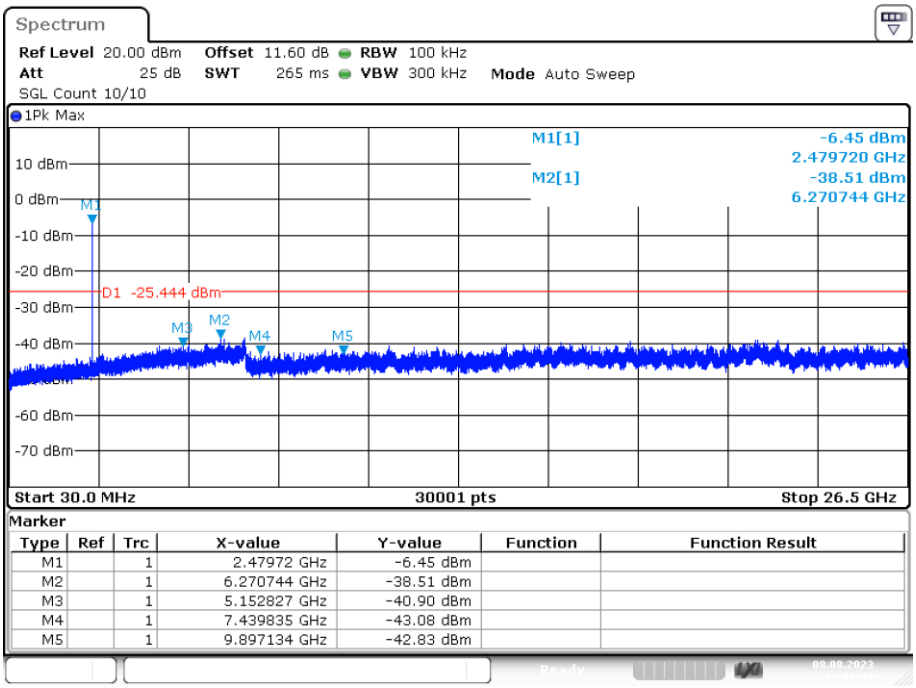
Date: 8.AUG.2023 13:03:50

Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Ref



Date: 8.AUG.2023 13:05:35

Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



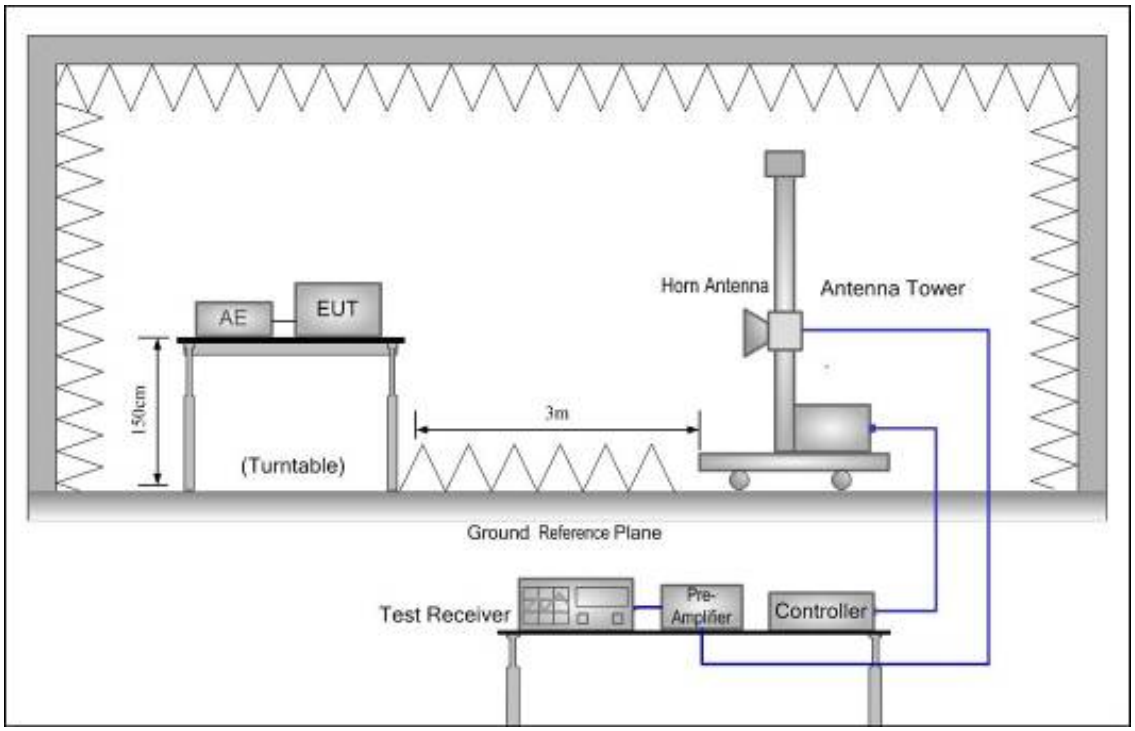
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47972 GHz	-6.45 dBm		
M2		1	6.270744 GHz	-38.51 dBm		
M3		1	5.152827 GHz	-40.90 dBm		
M4		1	7.439835 GHz	-43.08 dBm		
M5		1	9.897134 GHz	-42.83 dBm		

Date: 8.AUG.2023 13:05:49

9. BAND EDGE COMPLIANCE

9.1. Block Diagram of Test Setup



9.2. Limit

All the lower and upper band-edges emissions appearing within restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

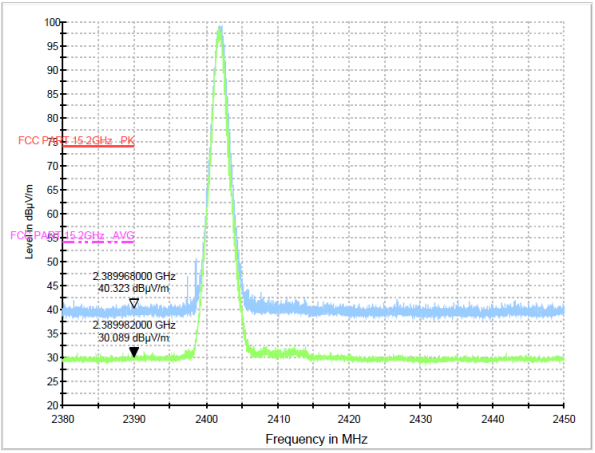
9.3. Test Procedure

All restriction band and non- restriction band have been tested ， only worse case is reported.

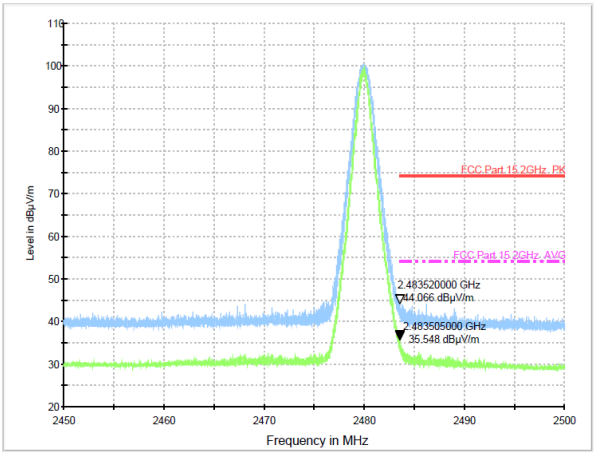
9.4. Test Result

PASS. (See below detailed test data)

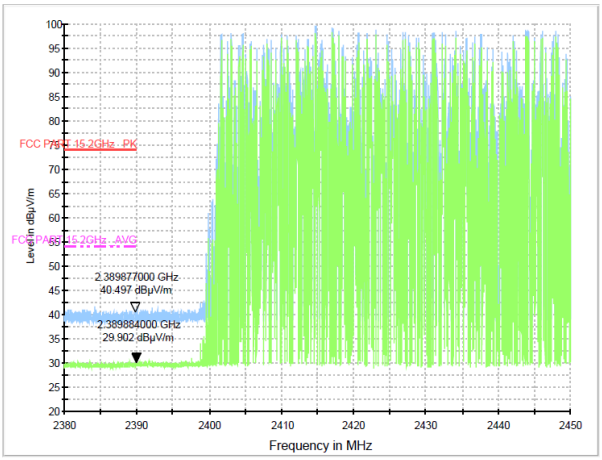
Test Mode: GFSK-Low Hopping-off



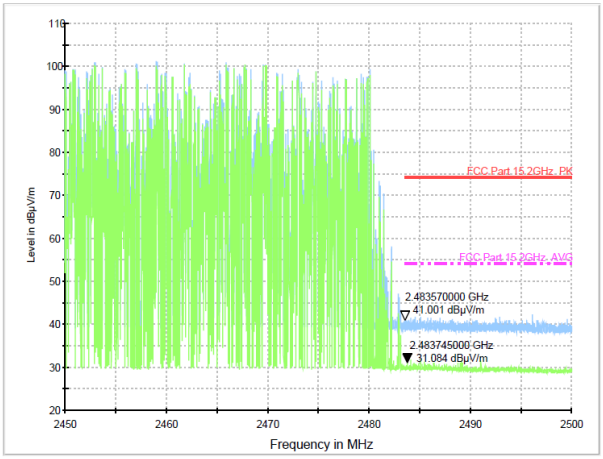
Test Mode: GFSK-High Hopping-off



Test Mode: GFSK-Low Hopping-on



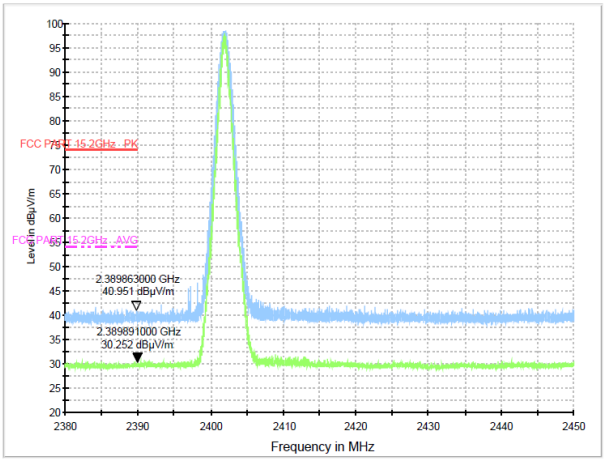
Test Mode: GFSK-High Hopping-on



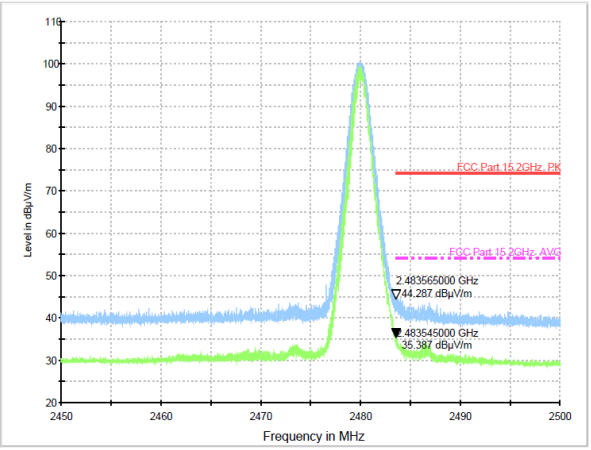
Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

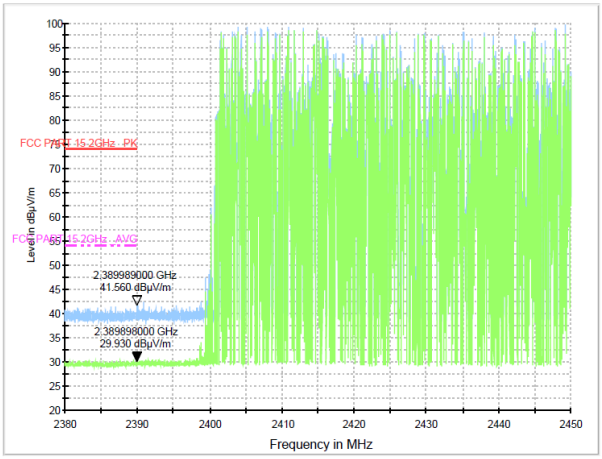
Test Mode: π/4 DQPSK-Low Hopping-off



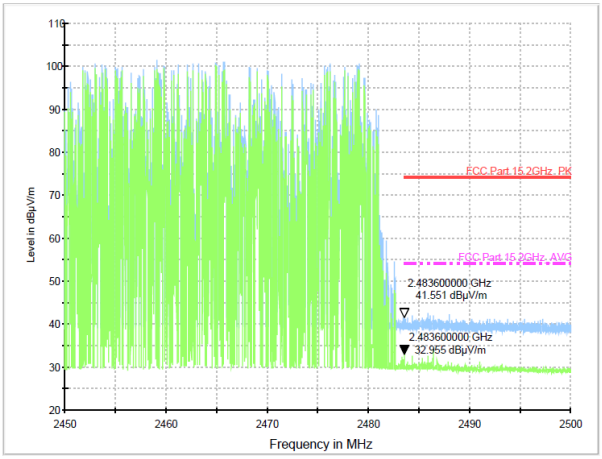
Test Mode: π/4 DQPSK-High Hopping-off



Test Mode: π/4 DQPSK-Low Hopping-on



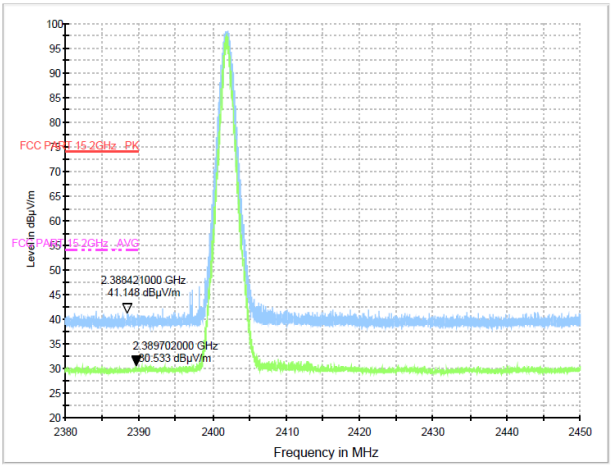
Test Mode: π/4 DQPSK-High Hopping-on



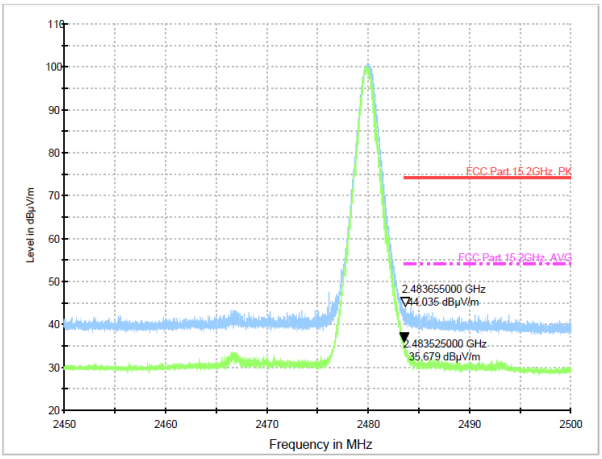
Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

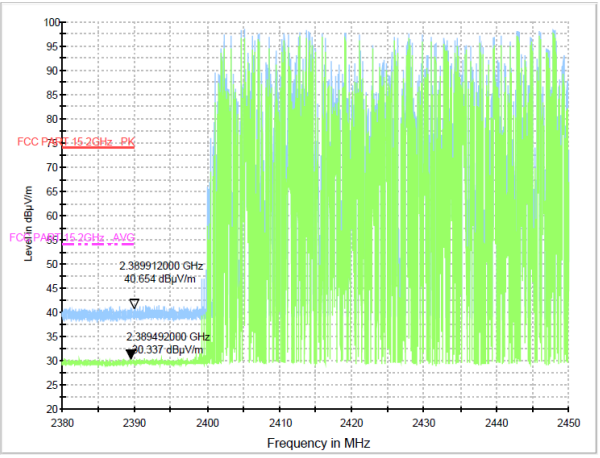
Test Mode: 8DPSK-Low Hopping-off



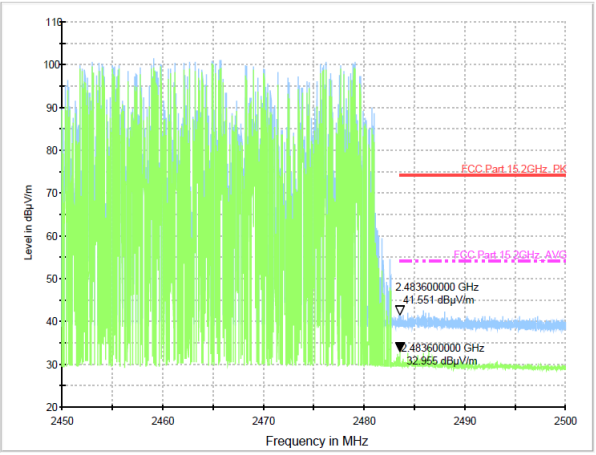
Test Mode: 8DPSK-High Hopping-off



Test Mode: 8DPSK-Low Hopping-on



Test Mode: 8DPSK-High Hopping-on

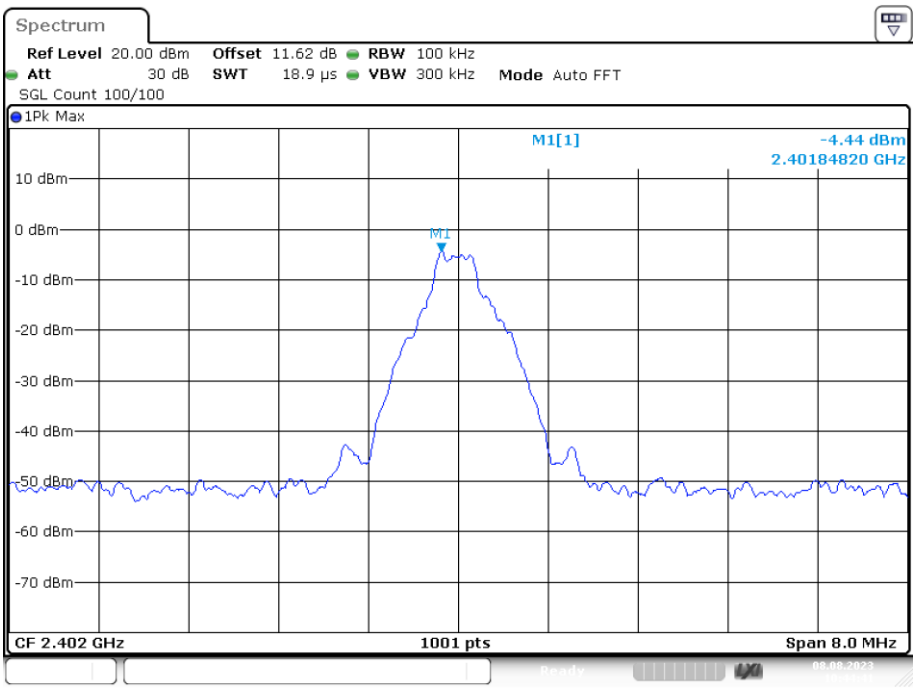


Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

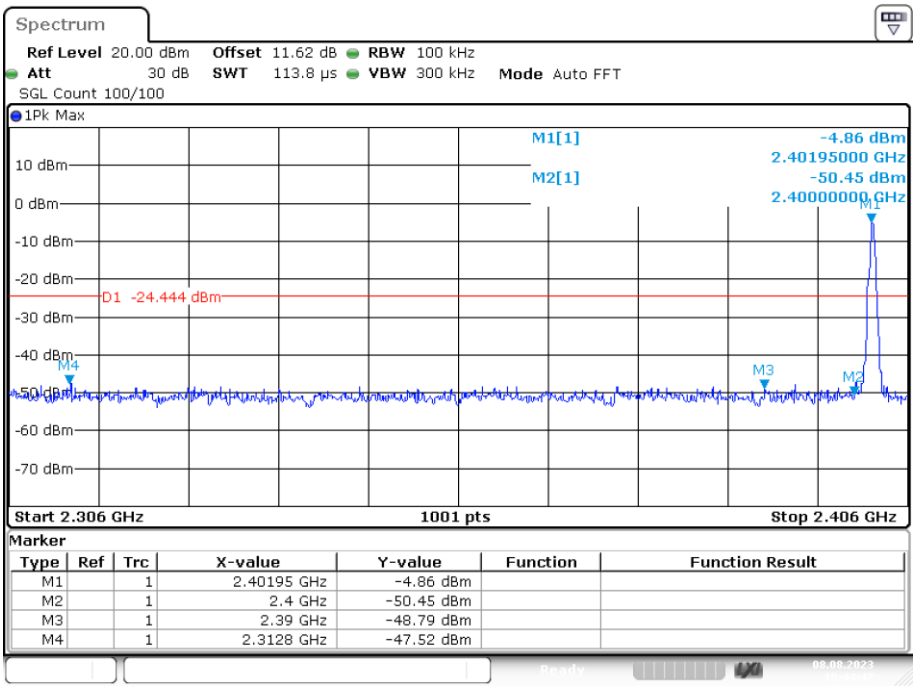
Conducted Method

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



Date: 8.AUG.2023 10:44:41

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

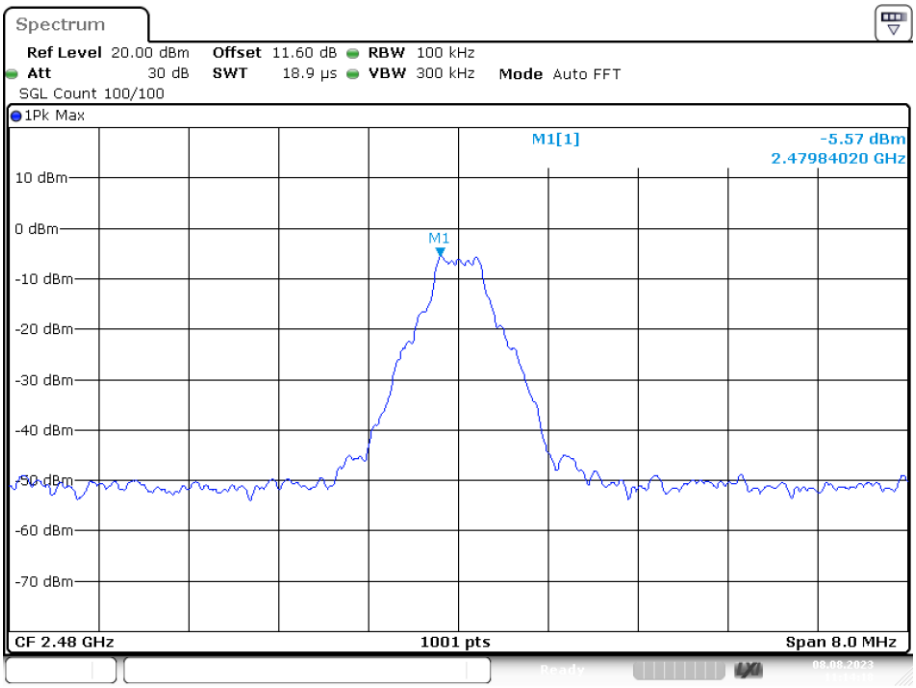


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40195 GHz	-4.86 dBm		
M2		1	2.4 GHz	-50.45 dBm		
M3		1	2.39 GHz	-48.79 dBm		
M4		1	2.3128 GHz	-47.52 dBm		

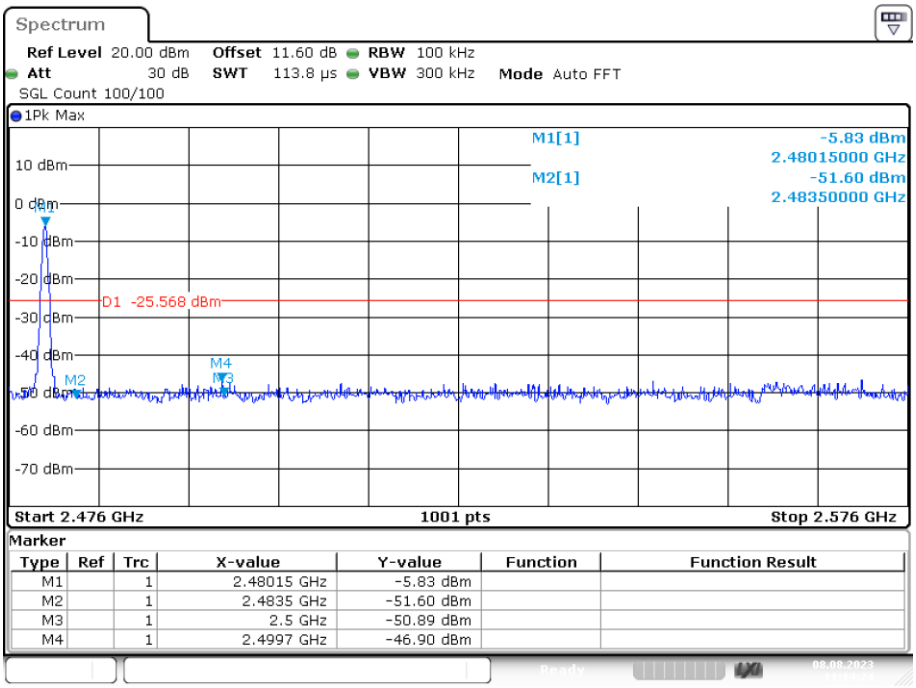
Date: 8.AUG.2023 10:44:46

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



Date: 8.AUG.2023 11:14:17

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

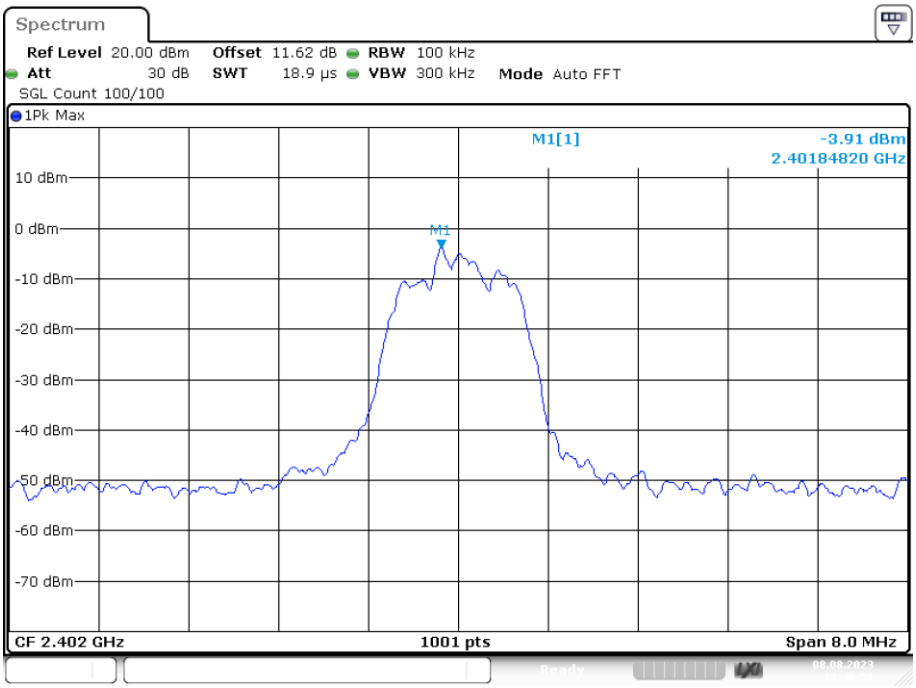


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48015 GHz	-5.83 dBm		
M2		1	2.4835 GHz	-51.60 dBm		
M3		1	2.5 GHz	-50.89 dBm		
M4		1	2.4997 GHz	-46.90 dBm		

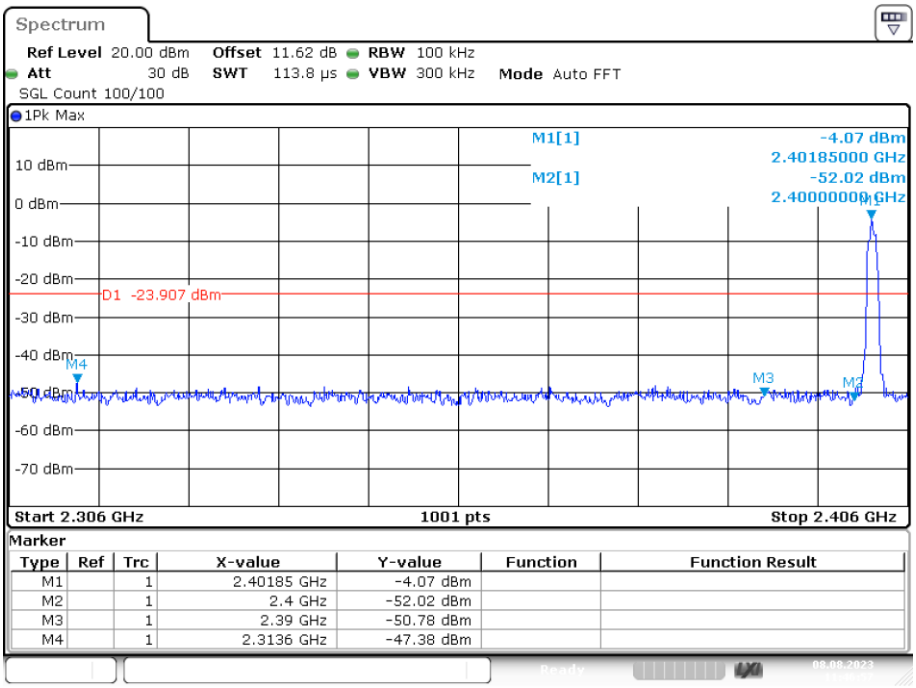
Date: 8.AUG.2023 11:14:23

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



Date: 8.AUG.2023 11:46:50

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

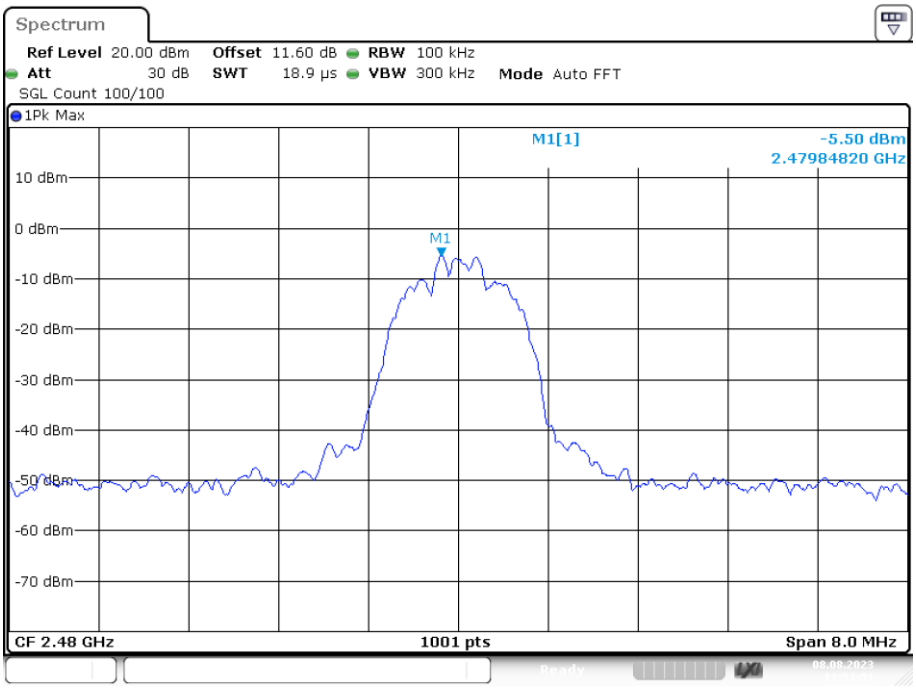


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40185 GHz	-4.07 dBm		
M2		1	2.4 GHz	-52.02 dBm		
M3		1	2.39 GHz	-50.78 dBm		
M4		1	2.3136 GHz	-47.38 dBm		

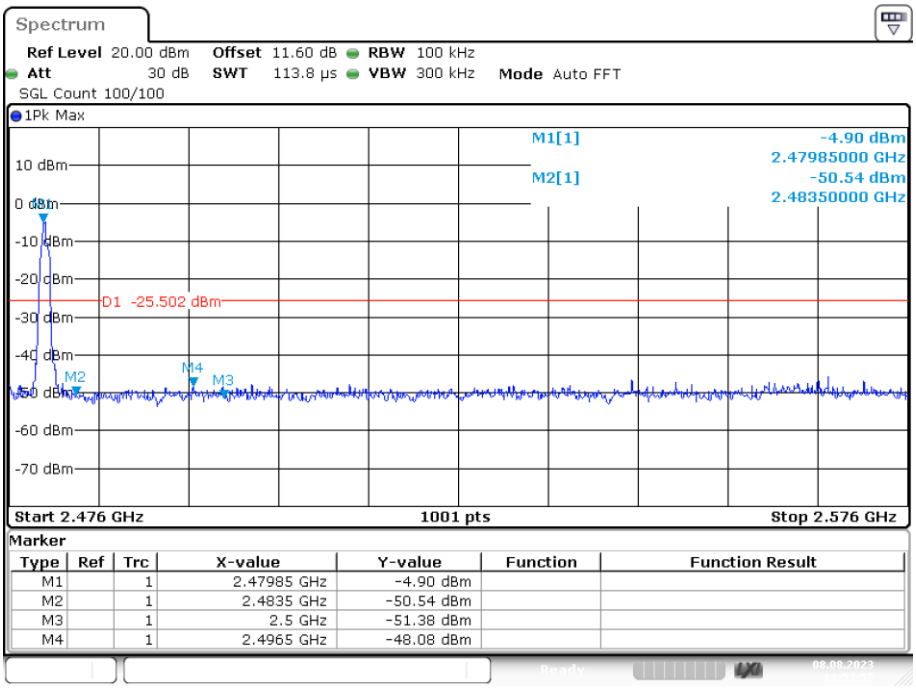
Date: 8.AUG.2023 11:46:56

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



Date: 8.AUG.2023 11:53:51

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

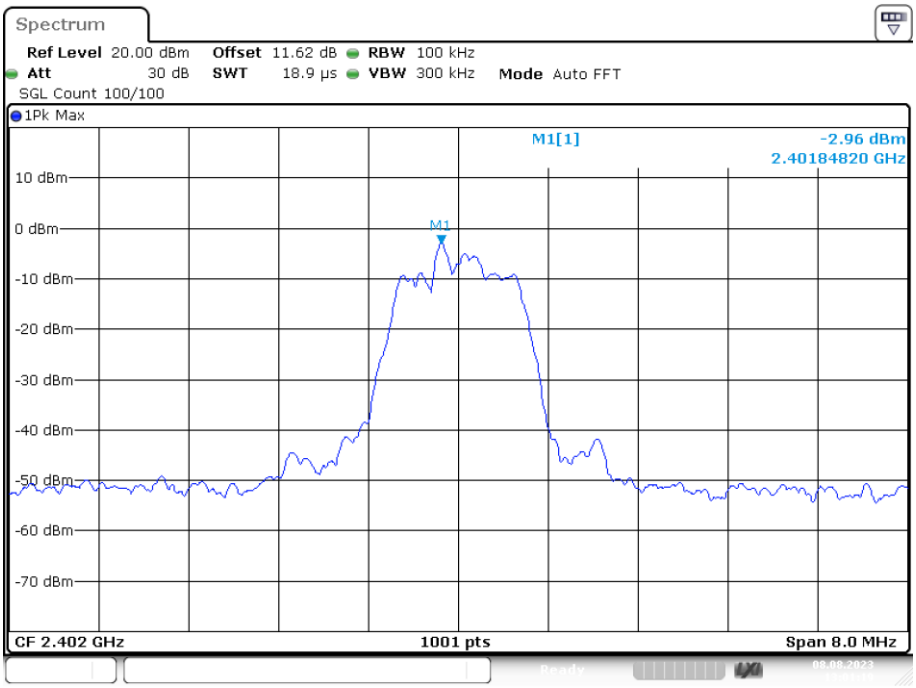


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47985 GHz	-4.90 dBm		
M2		1	2.4835 GHz	-50.54 dBm		
M3		1	2.5 GHz	-51.38 dBm		
M4		1	2.4965 GHz	-48.08 dBm		

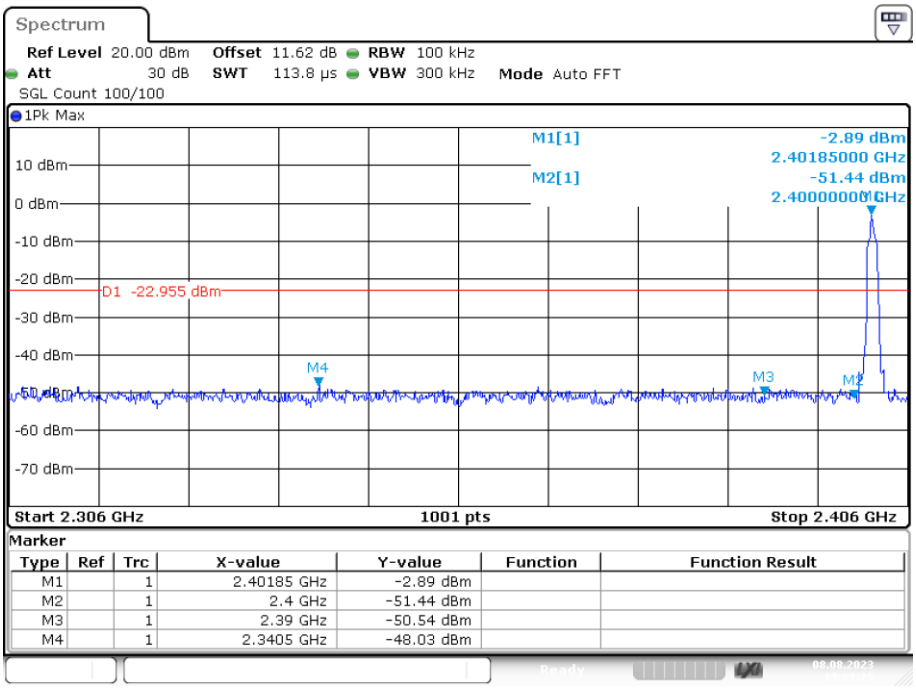
Date: 8.AUG.2023 11:53:57

Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Ref



Date: 8.AUG.2023 13:01:19

Band Edge NVNT 3-DH1 2402MHz Ant1 No-Hopping Emission

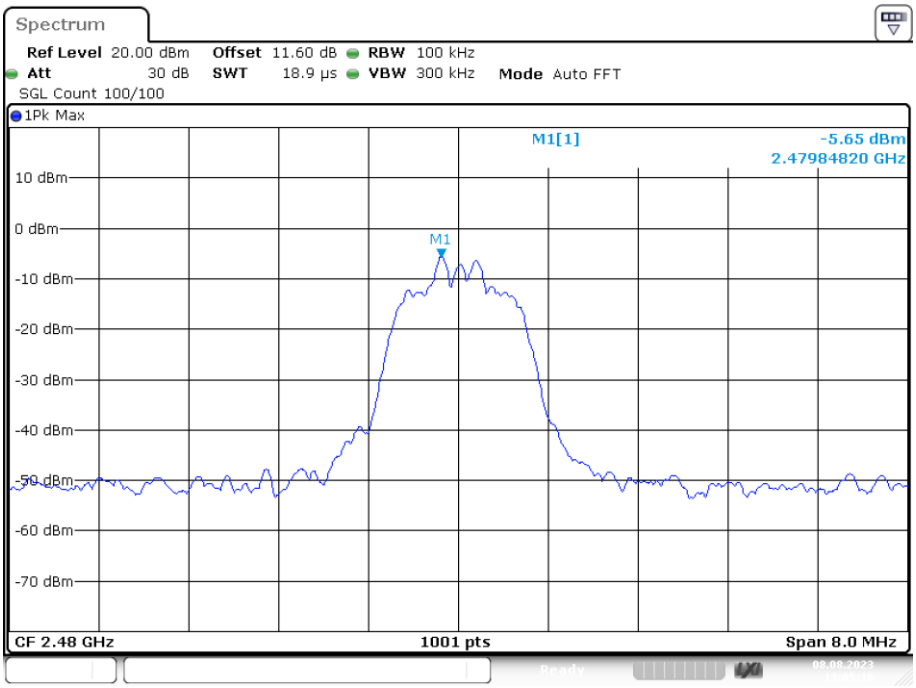


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40185 GHz	-2.89 dBm		
M2		1	2.4 GHz	-51.44 dBm		
M3		1	2.39 GHz	-50.54 dBm		
M4		1	2.3405 GHz	-48.03 dBm		

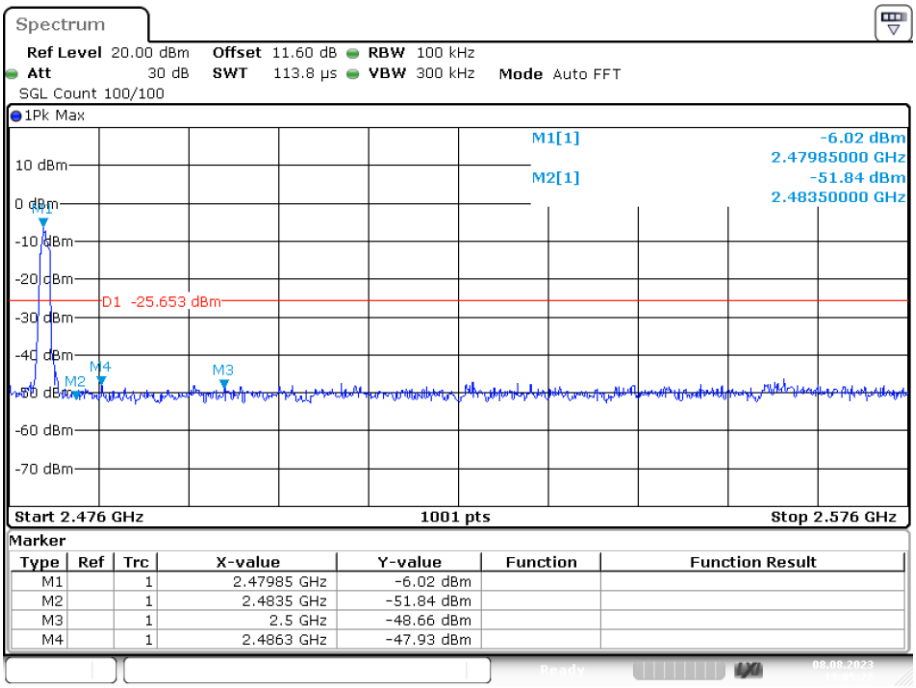
Date: 8.AUG.2023 13:01:25

Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Ref



Date: 8.AUG.2023 13:05:16

Band Edge NVNT 3-DH1 2480MHz Ant1 No-Hopping Emission

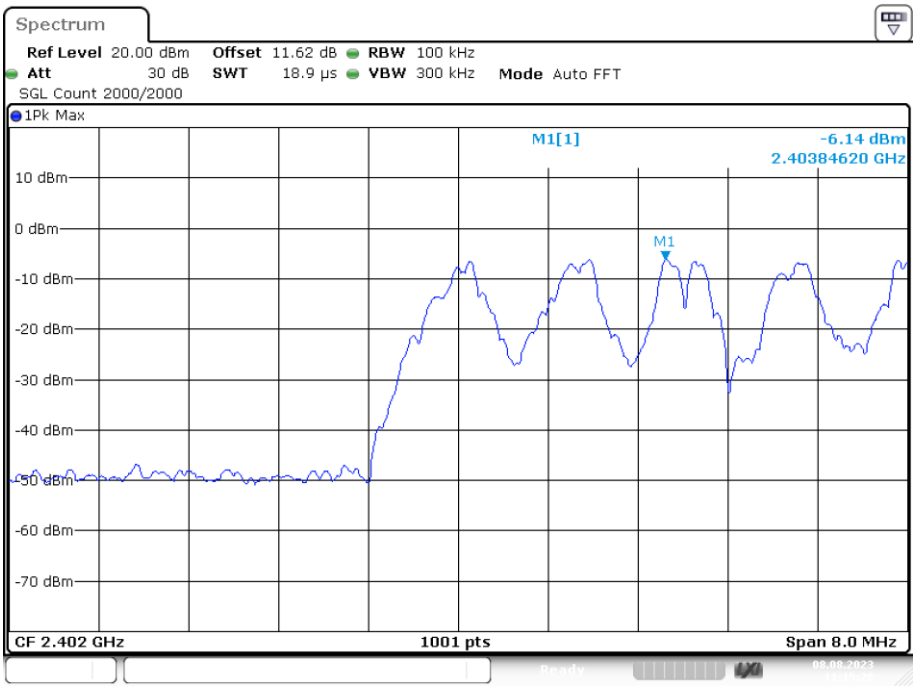


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47985 GHz	-6.02 dBm		
M2		1	2.4835 GHz	-51.84 dBm		
M3		1	2.5 GHz	-48.66 dBm		
M4		1	2.4863 GHz	-47.93 dBm		

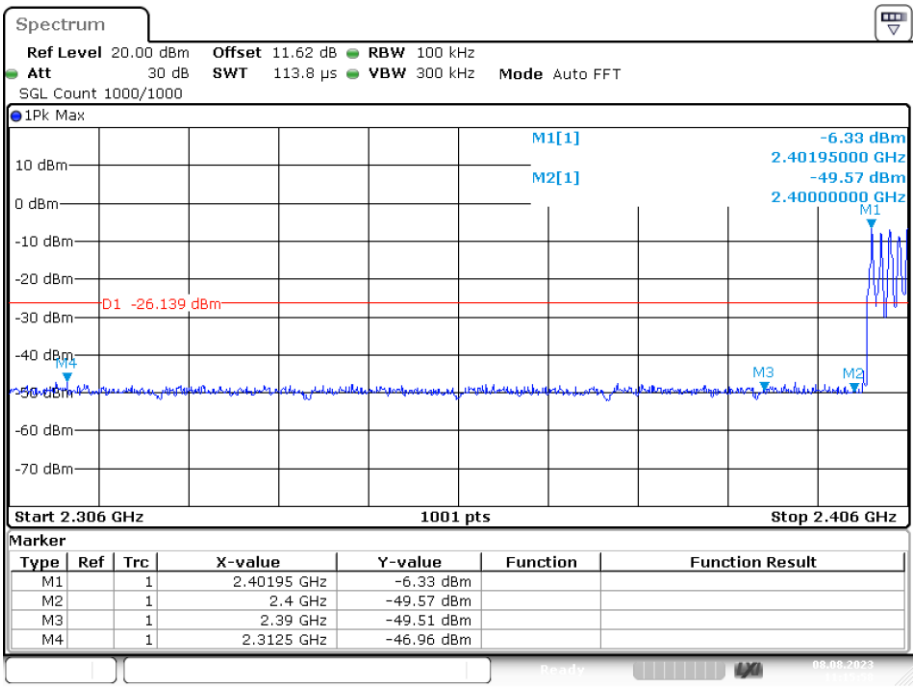
Date: 8.AUG.2023 13:05:21

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



Date: 8.AUG.2023 11:15:27

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

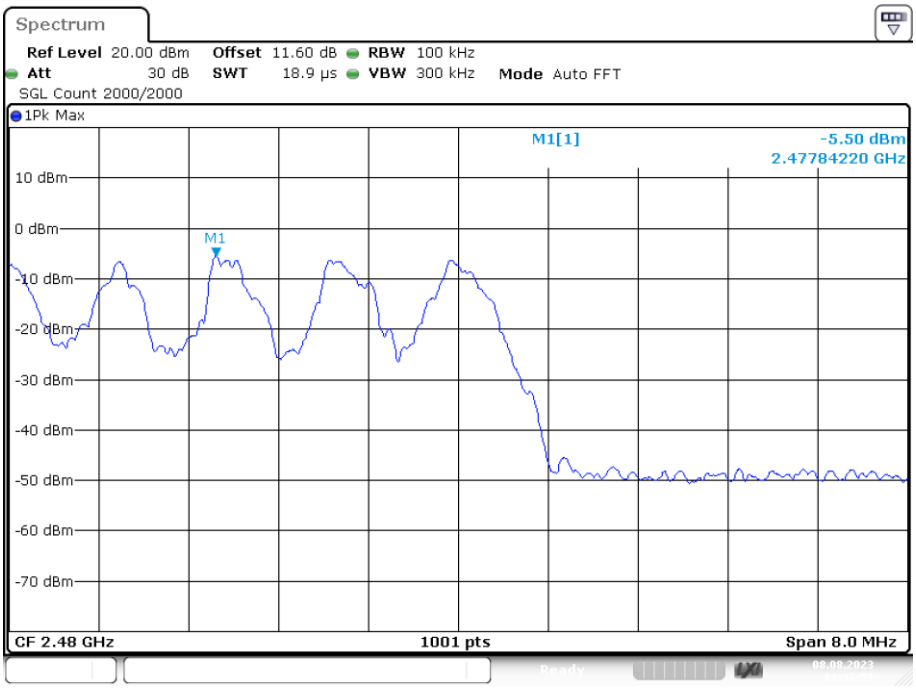


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40195 GHz	-6.33 dBm		
M2		1	2.4 GHz	-49.57 dBm		
M3		1	2.39 GHz	-49.51 dBm		
M4		1	2.3125 GHz	-46.96 dBm		

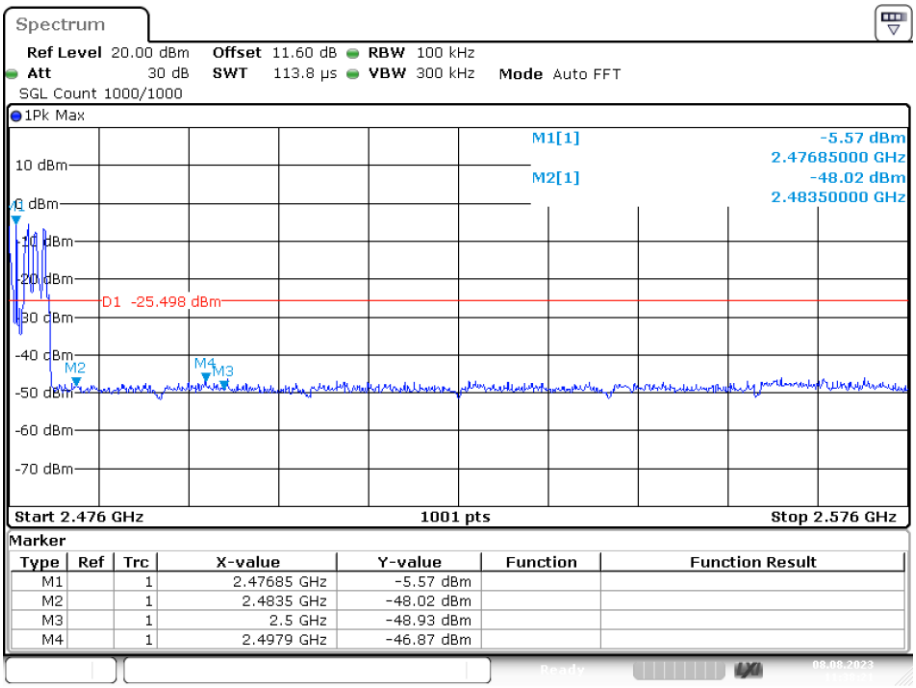
Date: 8.AUG.2023 11:15:58

Band Edge(Hopping) NVNT 1-DH1 2480MHz Ant1 Hopping Ref



Date: 8.AUG.2023 11:37:51

Band Edge(Hopping) NVNT 1-DH1 2480MHz Ant1 Hopping Emission

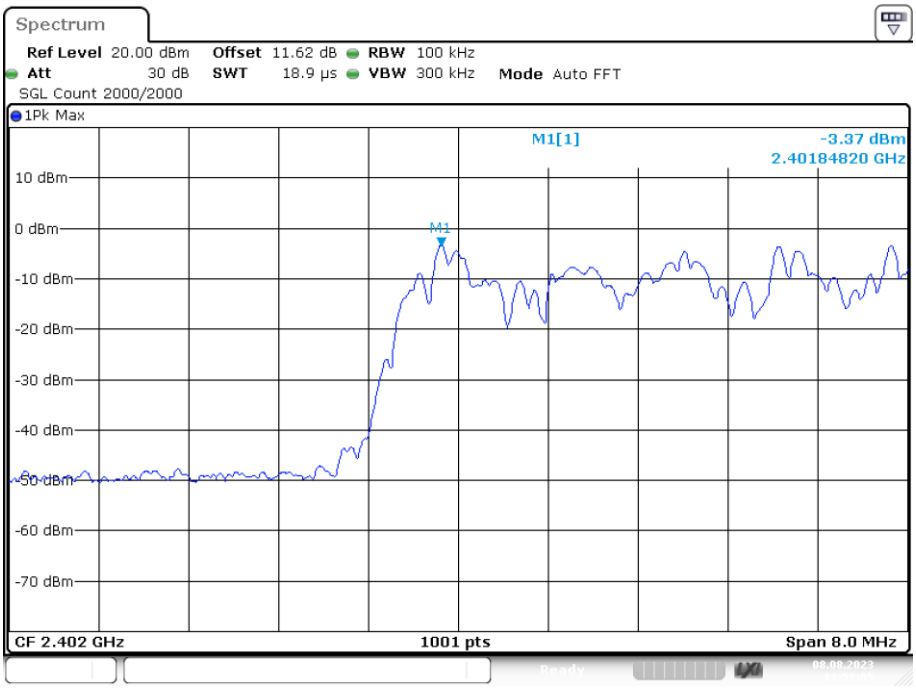


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47685 GHz	-5.57 dBm		
M2		1	2.4835 GHz	-48.02 dBm		
M3		1	2.5 GHz	-48.93 dBm		
M4		1	2.4979 GHz	-46.87 dBm		

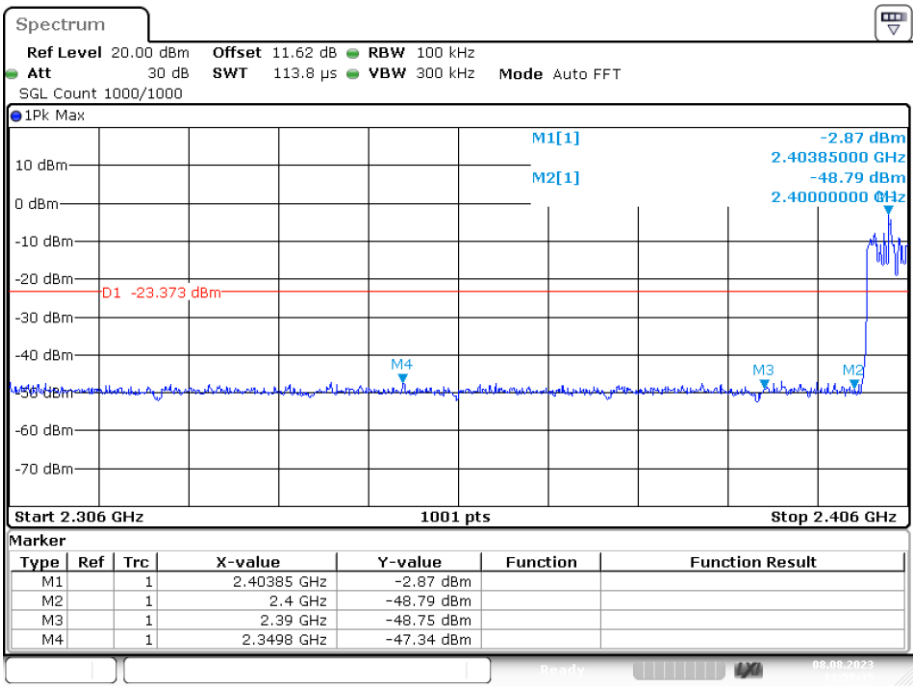
Date: 8.AUG.2023 11:38:20

Band Edge(Hopping) NVNT 2-DH1 2402MHz Ant1 Hopping Ref



Date: 8.AUG.2023 11:59:05

Band Edge(Hopping) NVNT 2-DH1 2402MHz Ant1 Hopping Emission

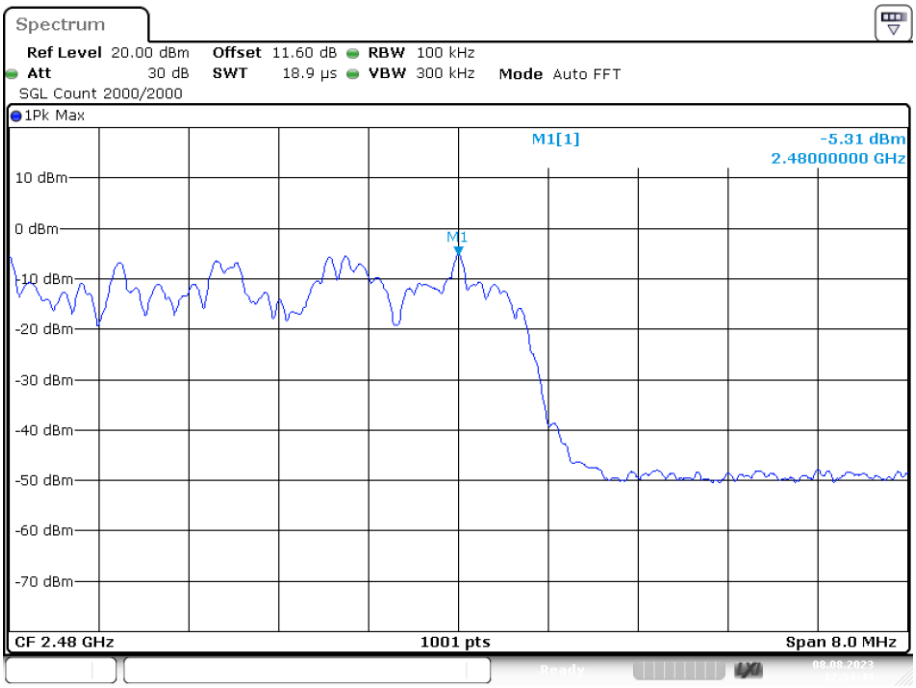


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40385 GHz	-2.87 dBm		
M2		1	2.4 GHz	-48.79 dBm		
M3		1	2.39 GHz	-48.75 dBm		
M4		1	2.3498 GHz	-47.34 dBm		

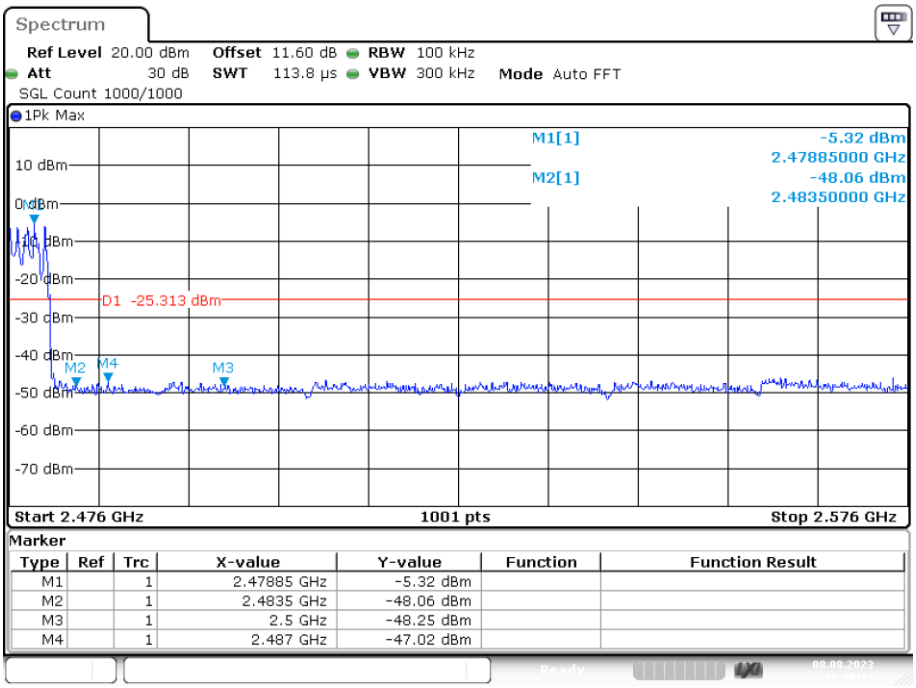
Date: 8.AUG.2023 11:59:35

Band Edge(Hopping) NVNT 2-DH1 2480MHz Ant1 Hopping Ref



Date: 8.AUG.2023 12:34:45

Band Edge(Hopping) NVNT 2-DH1 2480MHz Ant1 Hopping Emission

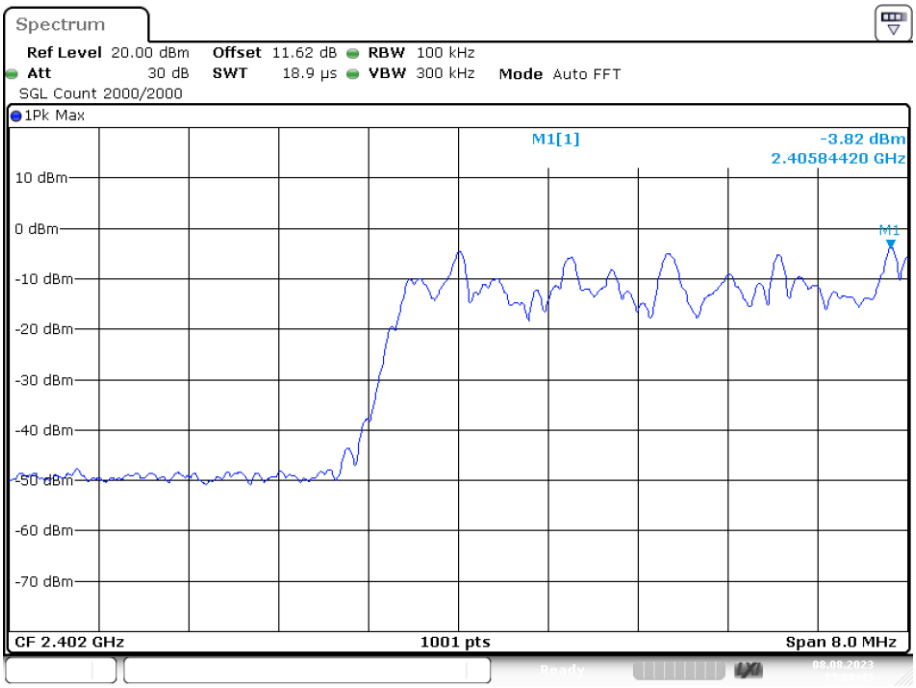


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47885 GHz	-5.32 dBm		
M2		1	2.4835 GHz	-48.06 dBm		
M3		1	2.5 GHz	-48.25 dBm		
M4		1	2.487 GHz	-47.02 dBm		

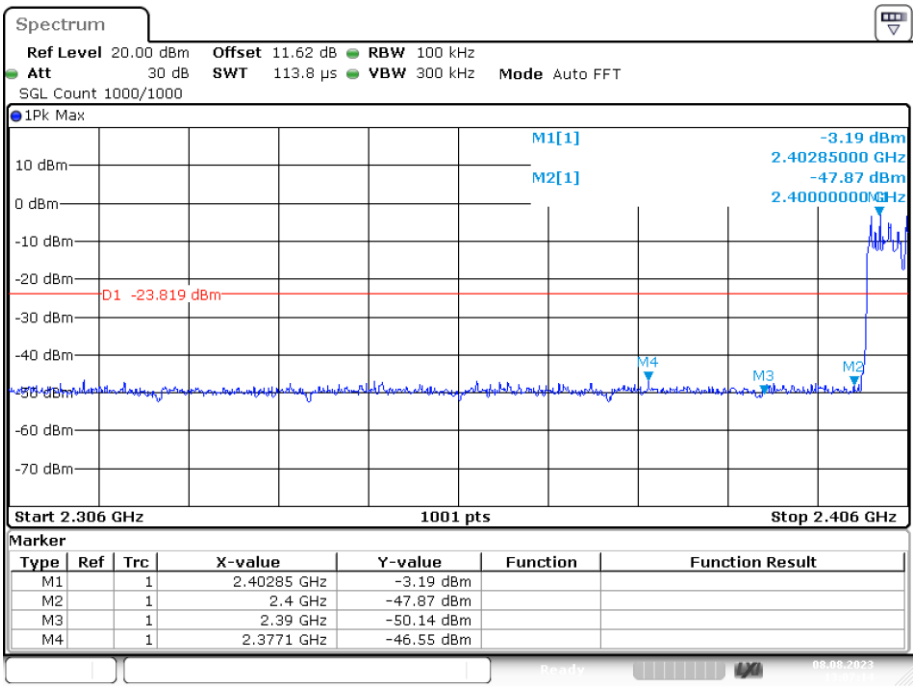
Date: 8.AUG.2023 12:35:13

Band Edge(Hopping) NVNT 3-DH1 2402MHz Ant1 Hopping Ref



Date: 8.AUG.2023 13:06:43

Band Edge(Hopping) NVNT 3-DH1 2402MHz Ant1 Hopping Emission

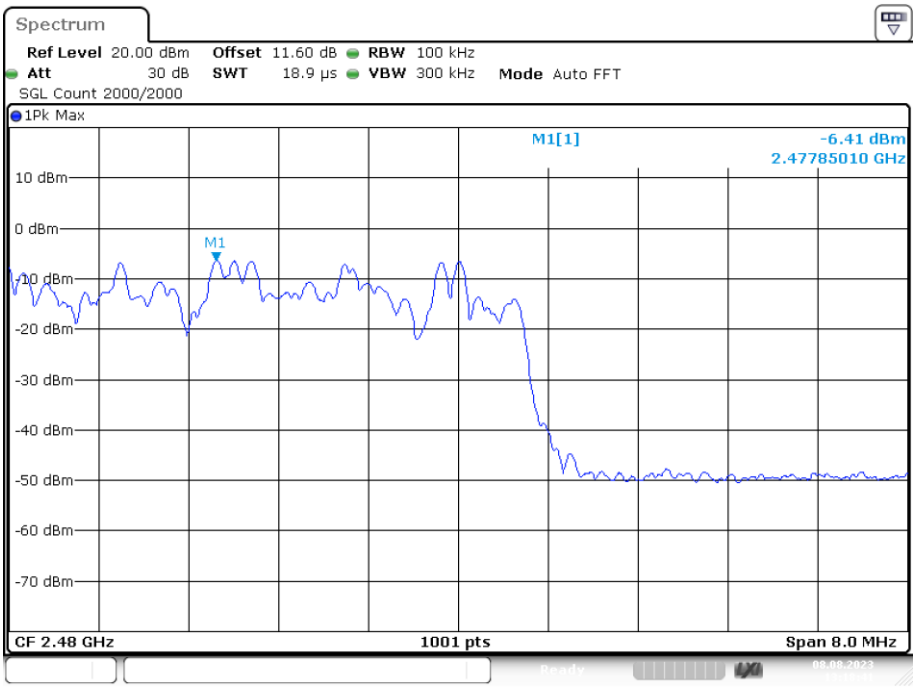


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40285 GHz	-3.19 dBm		
M2		1	2.4 GHz	-47.87 dBm		
M3		1	2.39 GHz	-50.14 dBm		
M4		1	2.3771 GHz	-46.55 dBm		

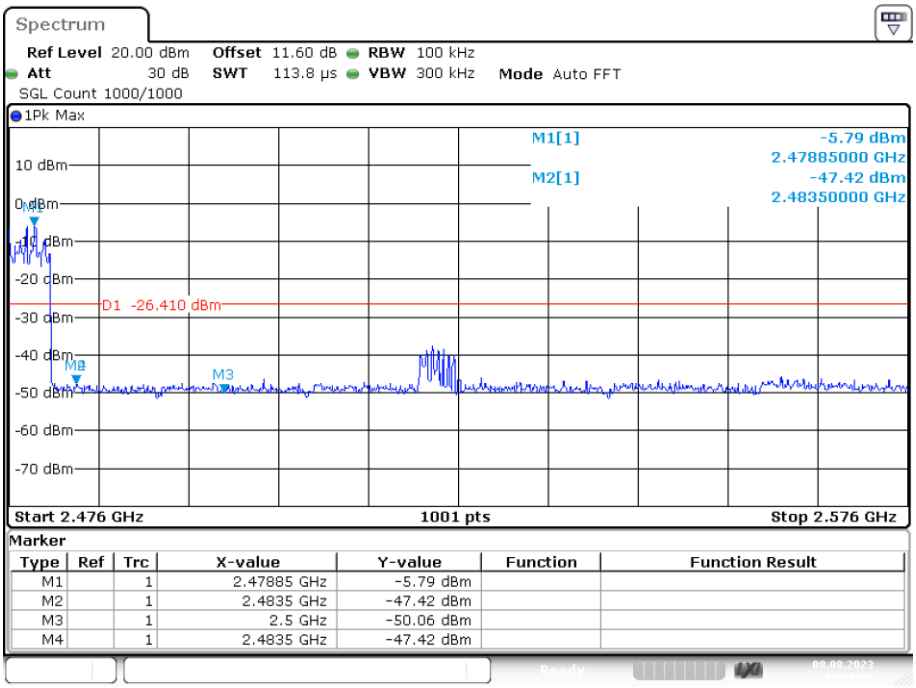
Date: 8.AUG.2023 13:07:14

Band Edge(Hopping) NVNT 3-DH1 2480MHz Ant1 Hopping Ref



Date: 8.AUG.2023 13:18:41

Band Edge(Hopping) NVNT 3-DH1 2480MHz Ant1 Hopping Emission



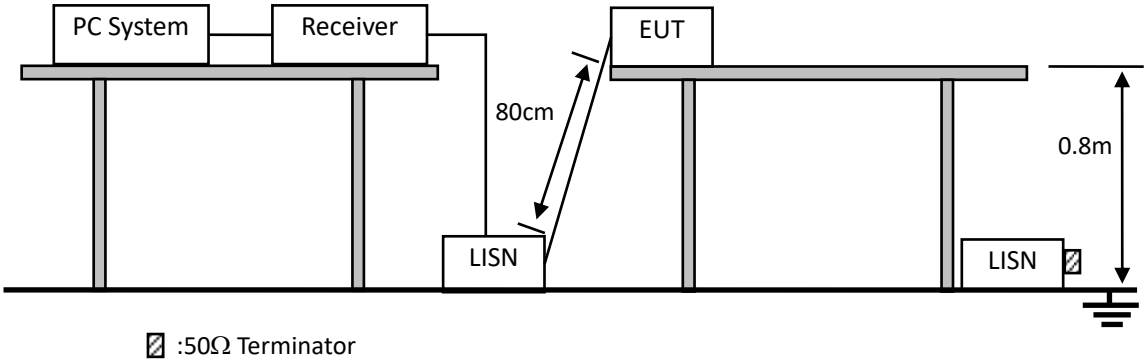
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47885 GHz	-5.79 dBm		
M2		1	2.4835 GHz	-47.42 dBm		
M3		1	2.5 GHz	-50.06 dBm		
M4		1	2.4835 GHz	-47.42 dBm		

Date: 8.AUG.2023 13:19:10

10. POWER LINE CONDUCTED EMISSIONS

10.1.Block Diagram of Test Setup



10.2.Limit

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. * Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

10.3.Test Procedure

(1) The EUT was placed on a non-metallic table, 80cm above the ground plane.
(2) Setup the EUT and simulator as shown in 10.1
(3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N2), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 :2013on conducted Emission test.
(4) The bandwidth of test receiver is set at 10KHz.
(5) The frequency range from 150 KHz to 30MHz is checked.

10.4.Test Result

PASS. (See below detailed test data)

Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

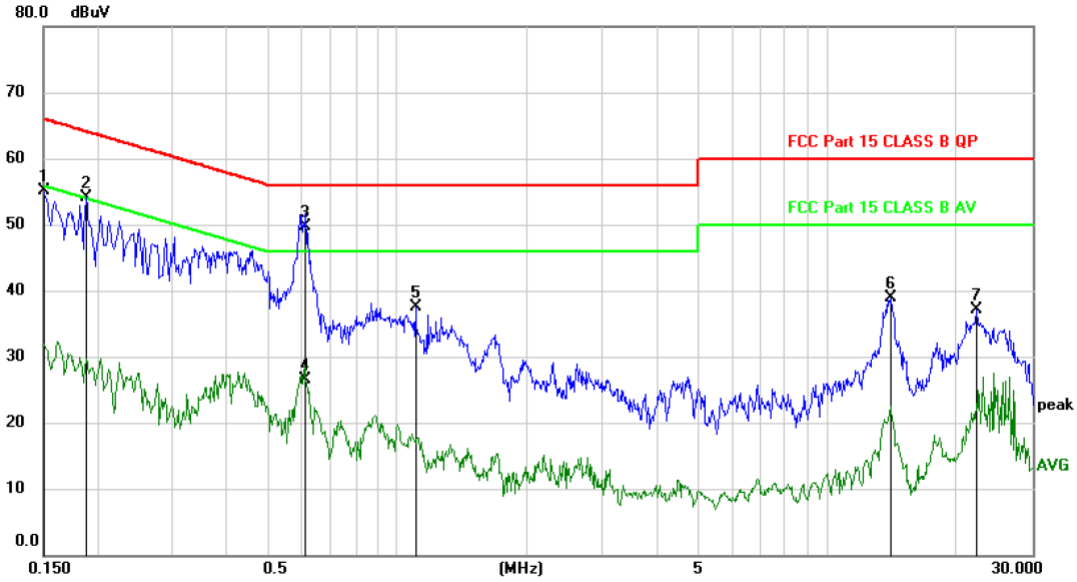
Line:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1740	44.77	9.93	54.70	64.77	-10.07	peak	
2		0.2250	42.10	9.94	52.04	62.63	-10.59	peak	
3	*	0.6000	40.44	9.92	50.36	56.00	-5.64	QP	
4		0.6000	17.97	9.92	27.89	46.00	-18.11	AVG	
5		0.8490	29.75	9.95	39.70	56.00	-16.30	peak	
6		14.0820	31.28	10.31	41.59	60.00	-18.41	peak	
7		22.0290	26.84	10.46	37.30	60.00	-22.70	peak	

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

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Neutral:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	45.11	9.94	55.05	66.00	-10.95	peak	
2		0.1890	44.19	9.92	54.11	64.08	-9.97	peak	
3	*	0.6120	39.83	9.92	49.75	56.00	-6.25	QP	
4		0.6120	16.60	9.92	26.52	46.00	-19.48	AVG	
5		1.1040	27.59	9.90	37.49	56.00	-18.51	peak	
6		14.0850	28.52	10.31	38.83	60.00	-21.17	peak	
7		22.2150	26.58	10.46	37.04	60.00	-22.96	peak	

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

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Note: All modes and channels have been tested and only the GFSK 2402MHz mode with the worst data is listed.

11. ANTENNA REQUIREMENTS

11.1.Limit

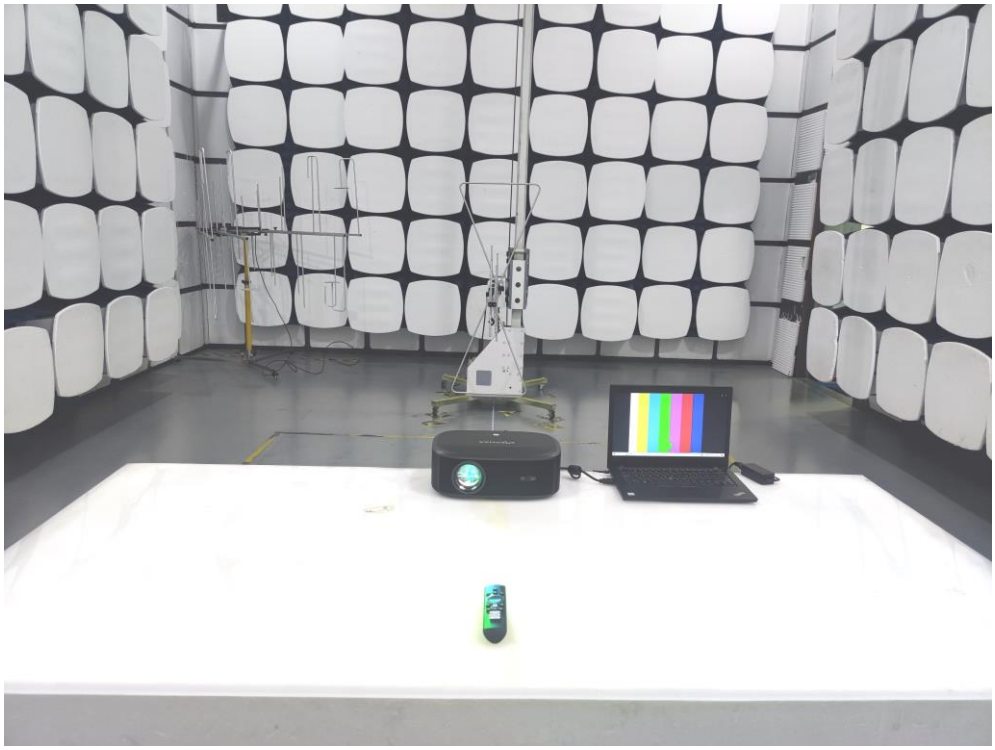
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

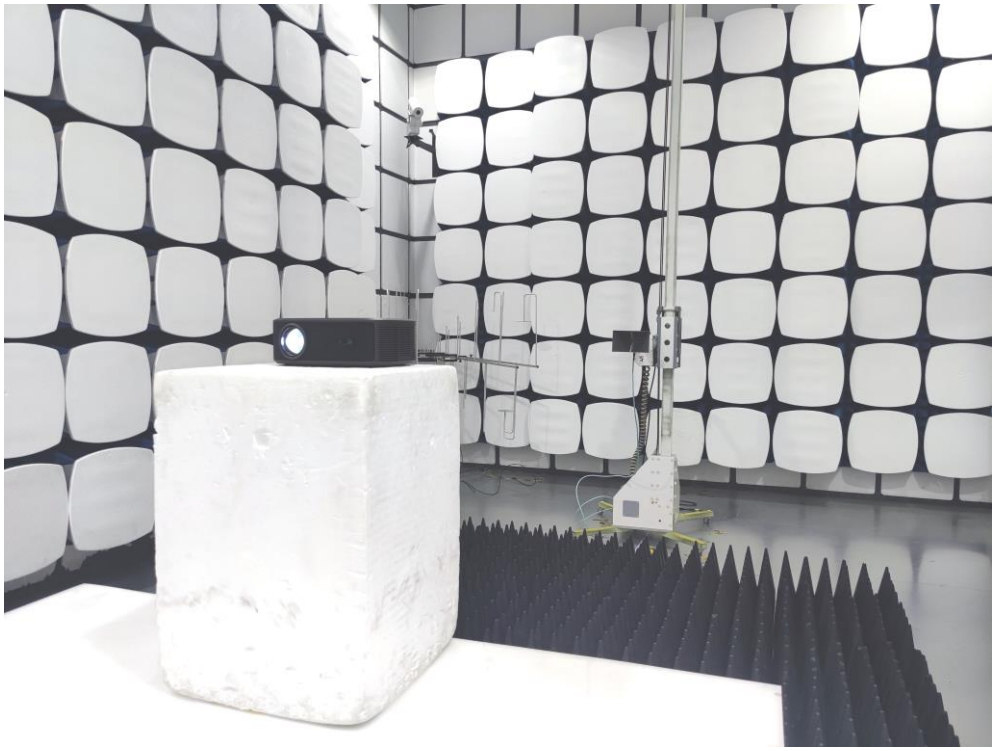
11.2.Result

The EUT antenna is Internal Antenna. It complies with the standard requirement.

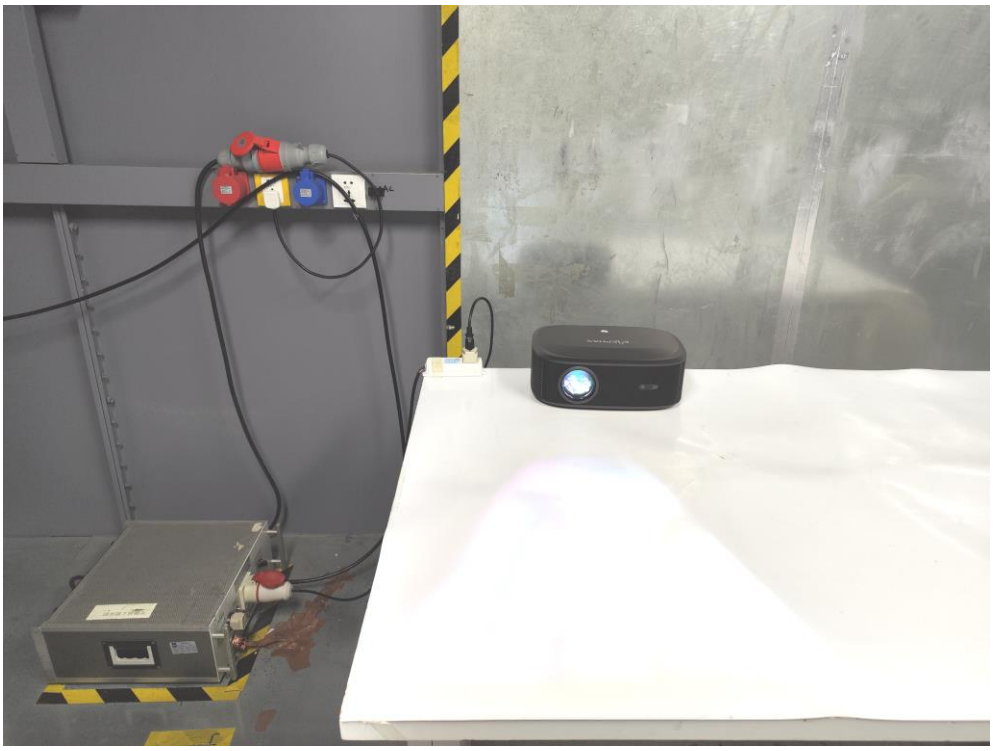
12. TEST SETUP PHOTO

12.1.Photo of Radiated Emission test





12.2.Photo of Conducted Emission test



-------END OF REPORT-------