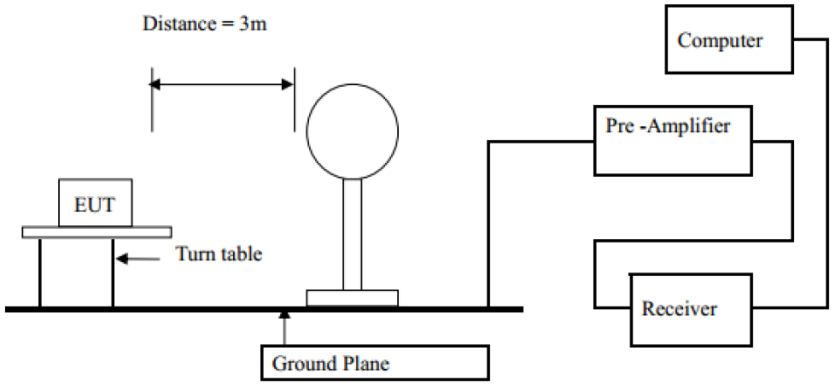
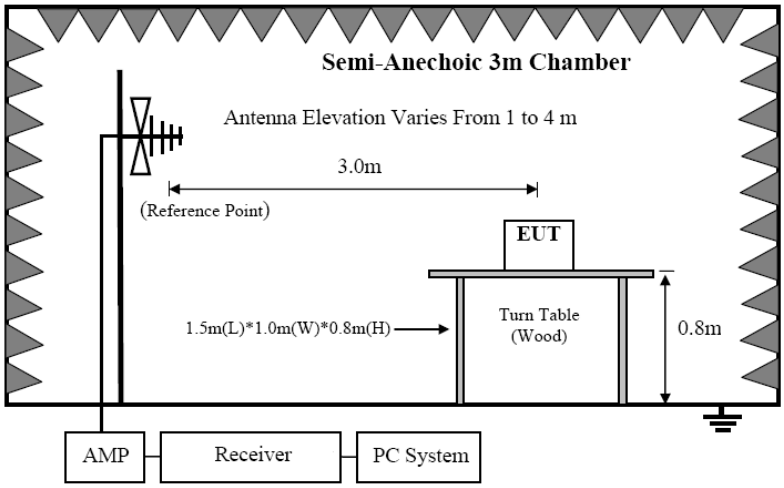
8.2. Block Diagram of Test setup

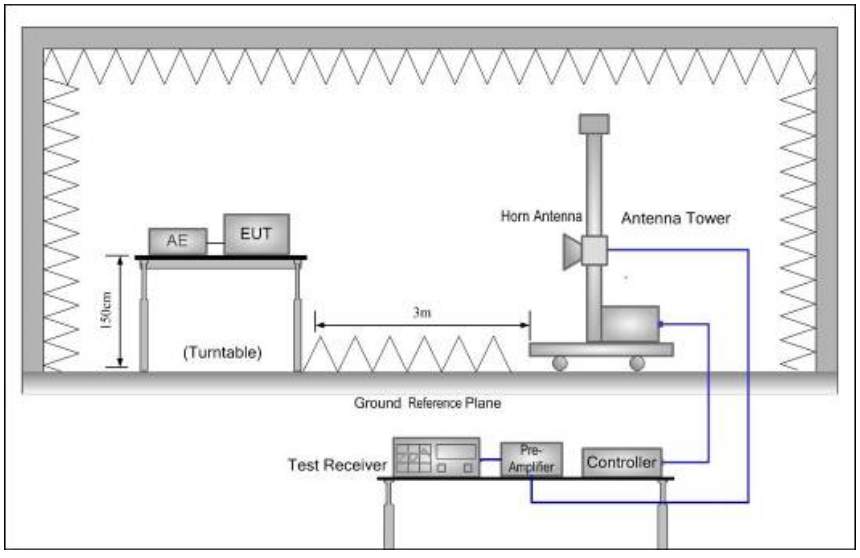
8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 30MHz



8.2.1 In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



8.2.2 In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3. Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

(2) Setup EUT and simulator as shown in section 1.4 and 6.1

(3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

(4) Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated

(5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. 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 Radiated Emission test.

(6) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

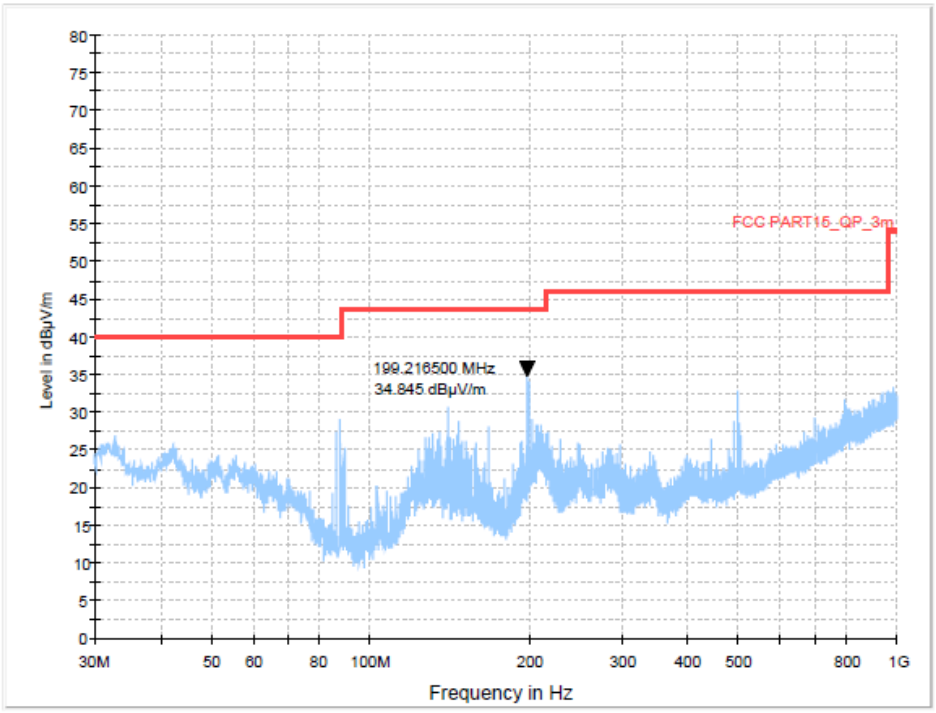
8.4. Test Result

We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency.
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

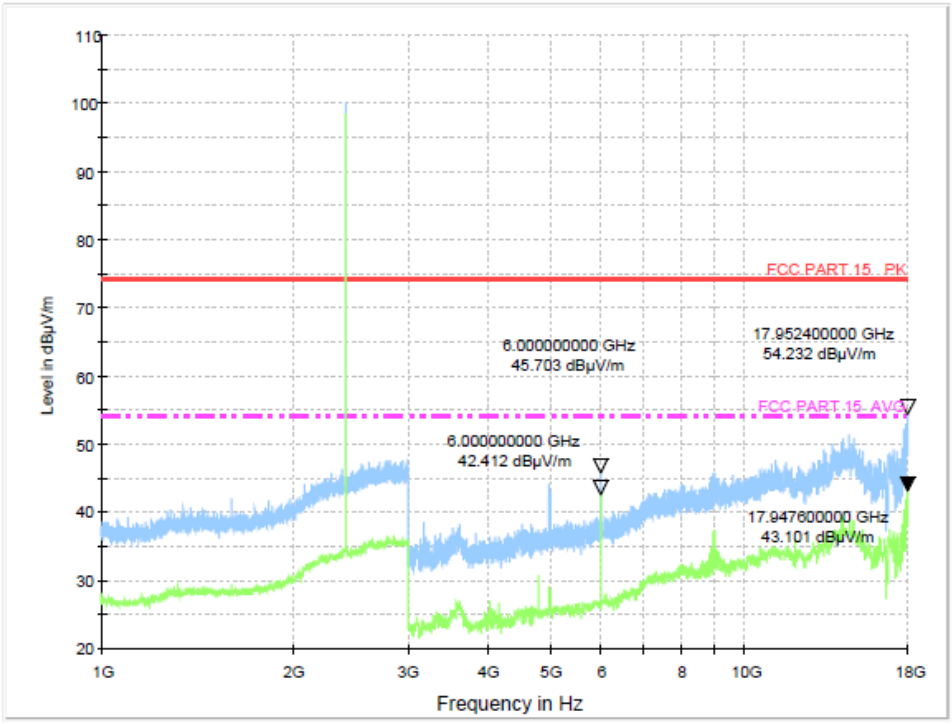
Note: The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

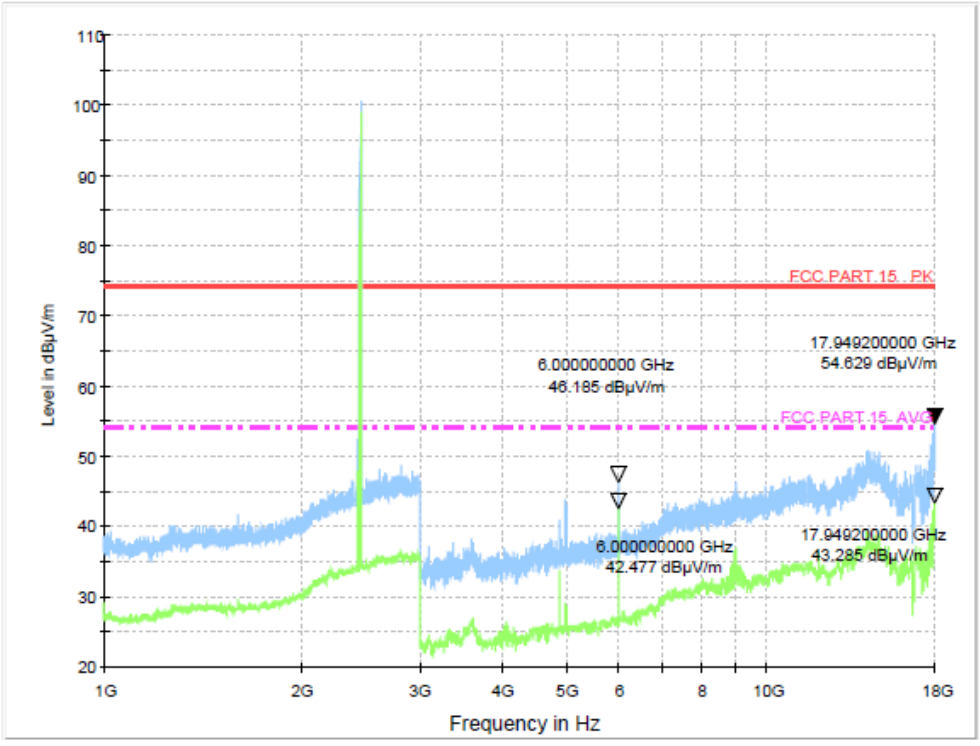
From 30MHz to 1000MHz: Conclusion: PASS



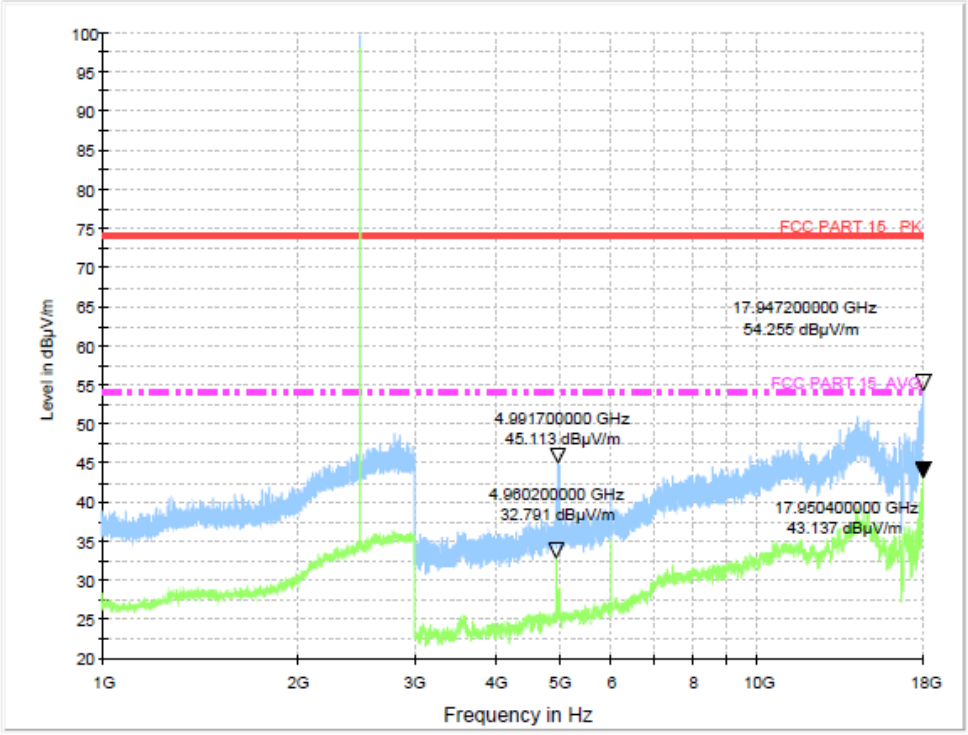
Remark: All modes have been tested, and only worst data of GFSK mode, Channel 2441MHz was listed in this report.

From 1G to 18GHz Conclusion: PASS

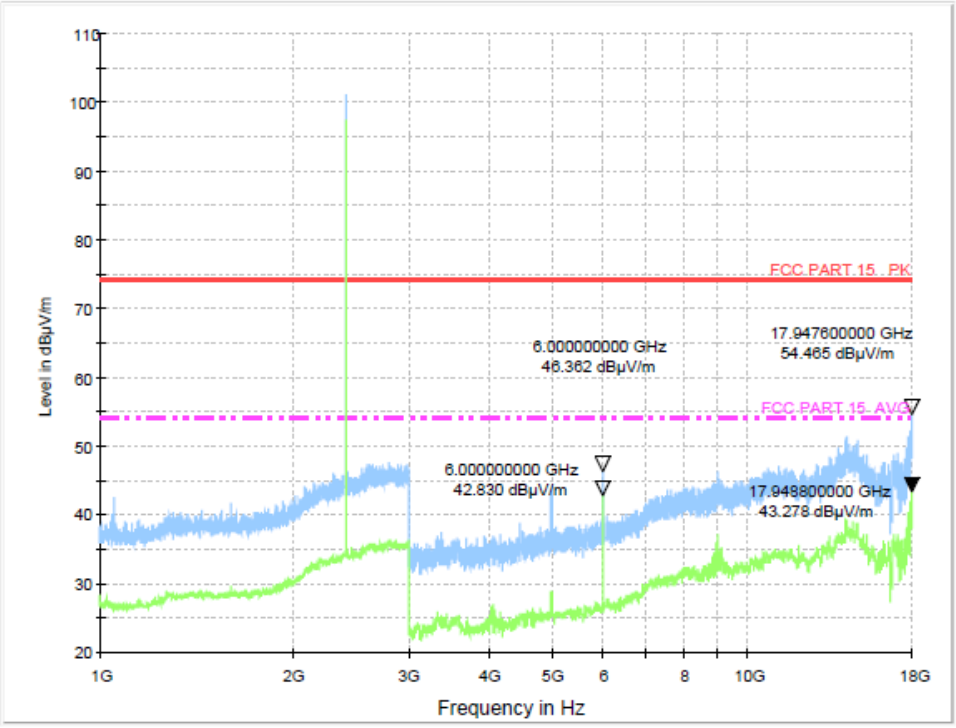
Test Mode: GFSK TX Low


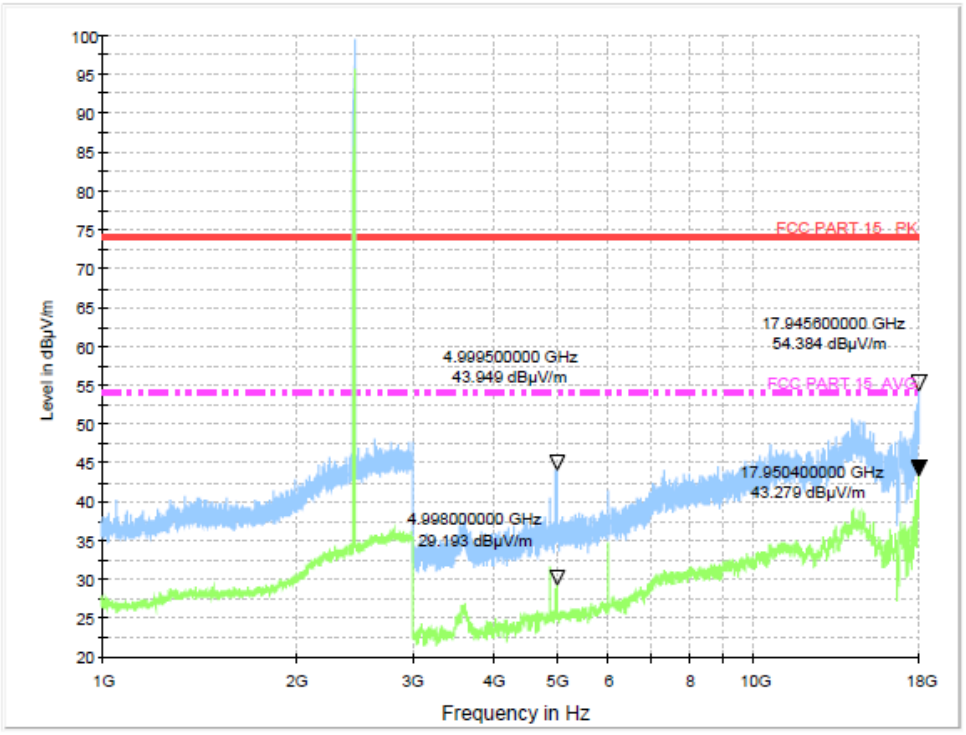
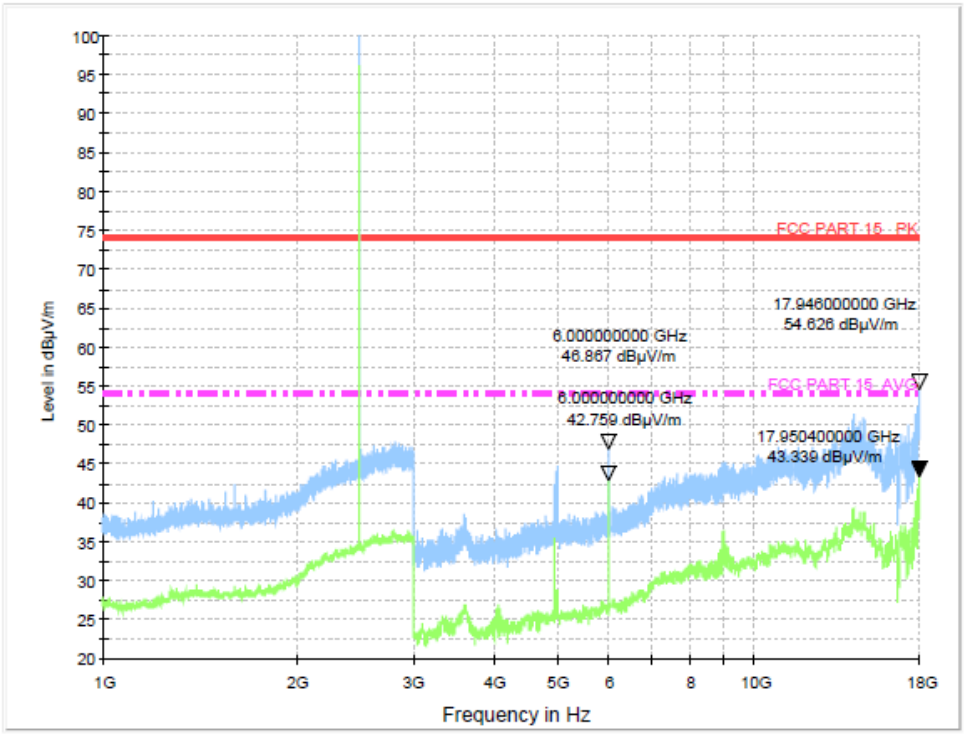
Test Mode: GFSK TX Mid


Test Mode: GFSK TX High

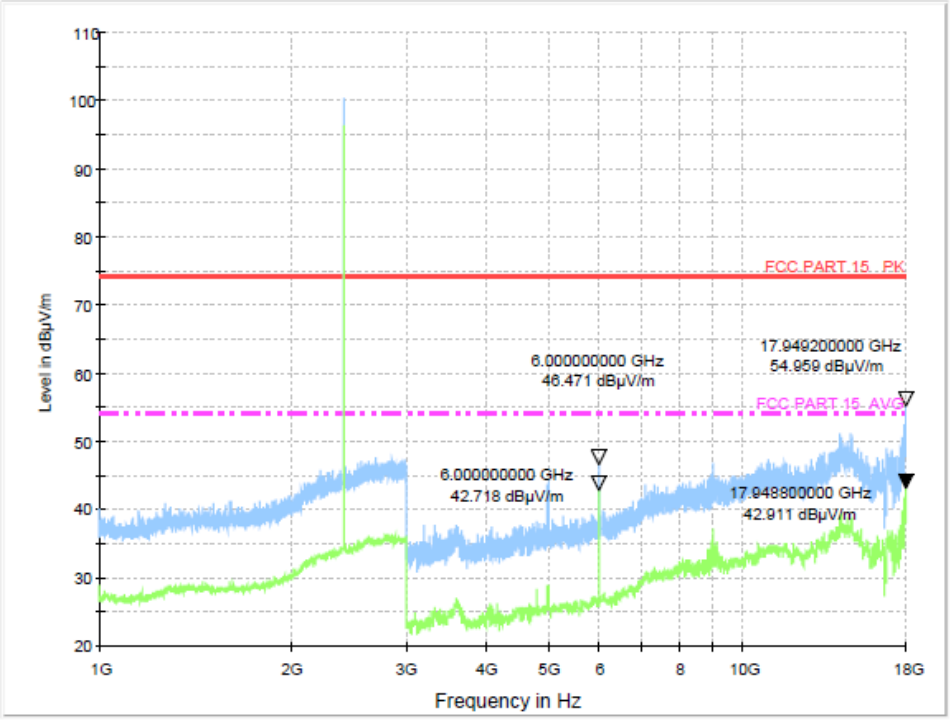


Test Mode: π/4 DQPSK TX Low

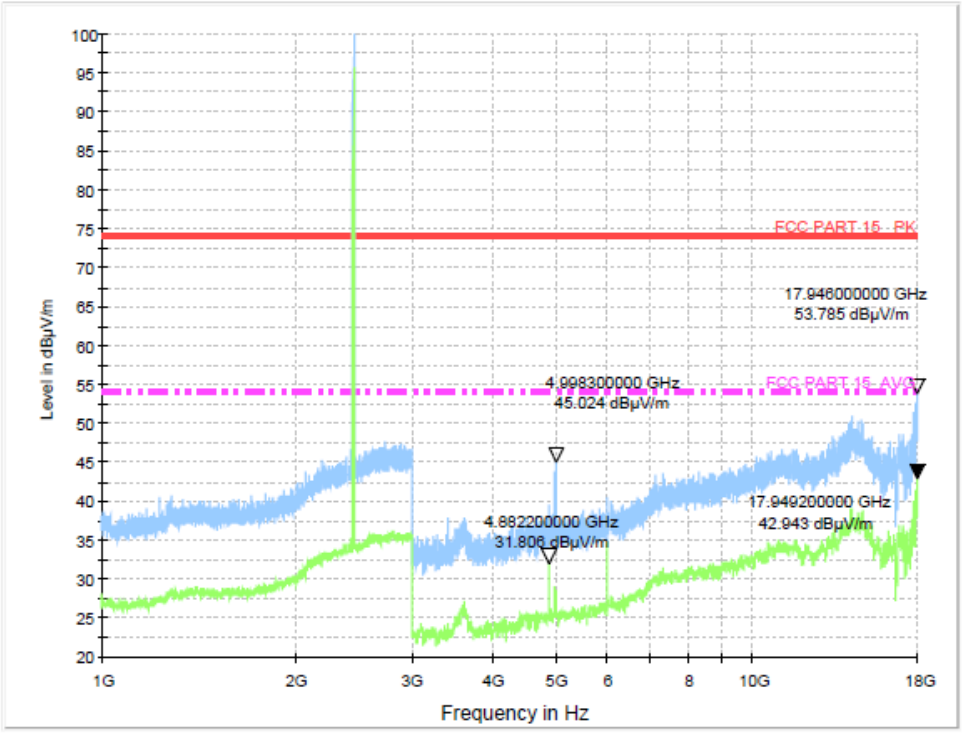


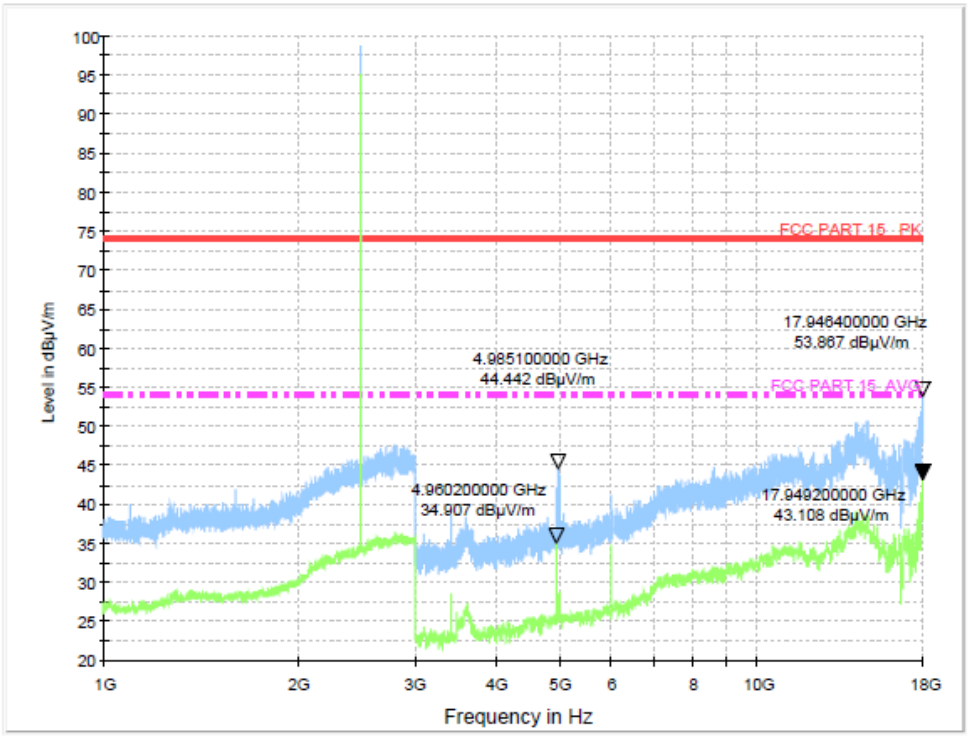
Test Mode: π/4 DQPSK TX Mid

Test Mode: π/4 DQPSK TX High


Test Mode: 8DPSK TX Low

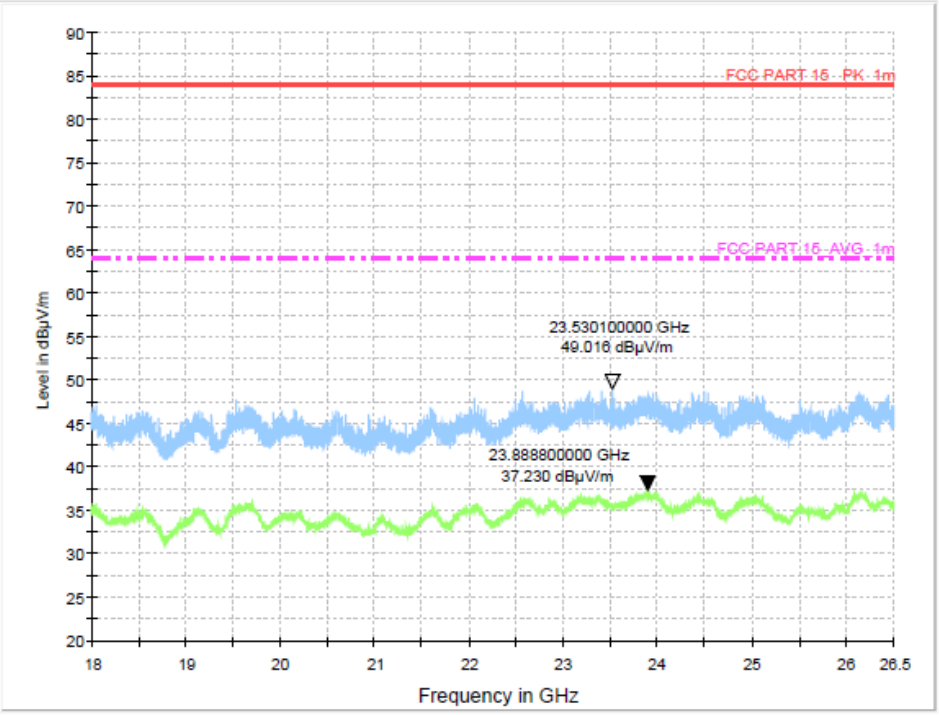


Test Mode: 8DPSK TX Mid



Test Mode: 8DPSK TX High


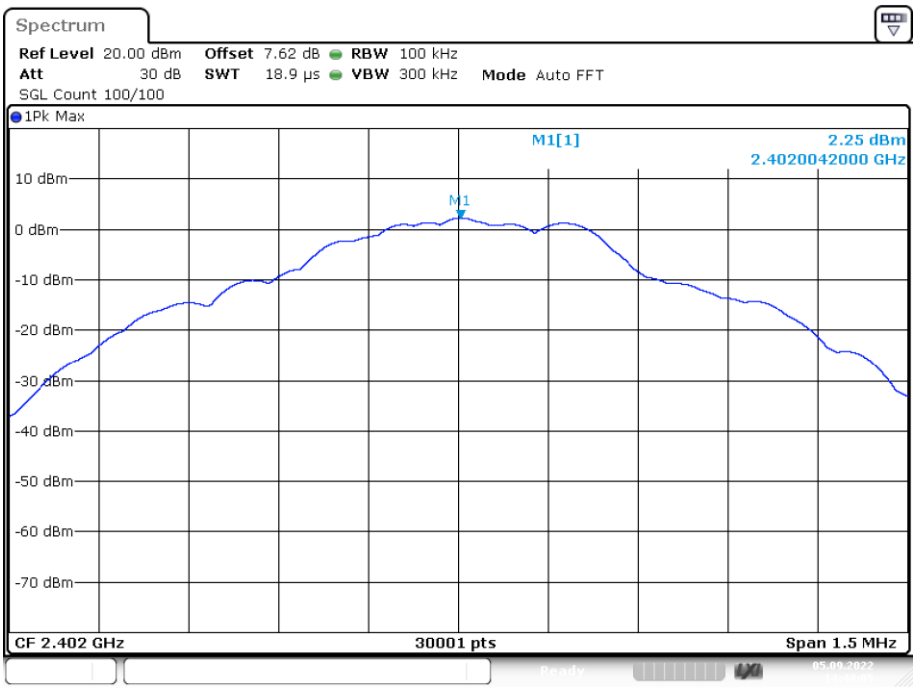
From 18G to 26.5GHz Conclusion: PASS



Remark: All modes have been tested, and only worst data of GFSK mode, Channel 2441MHz was listed in this report.

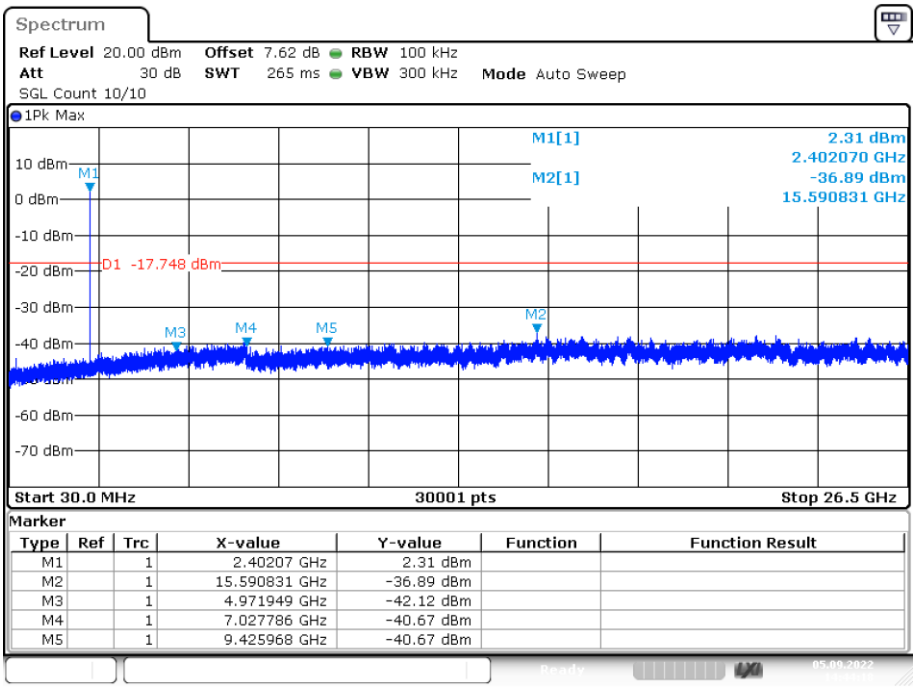
Conducted RF Spurious Emission

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Ref



Date: 5.SEP.2022 14:44:05

Tx. Spurious NVNT 1-DH1 2402MHz Ant1 Emission

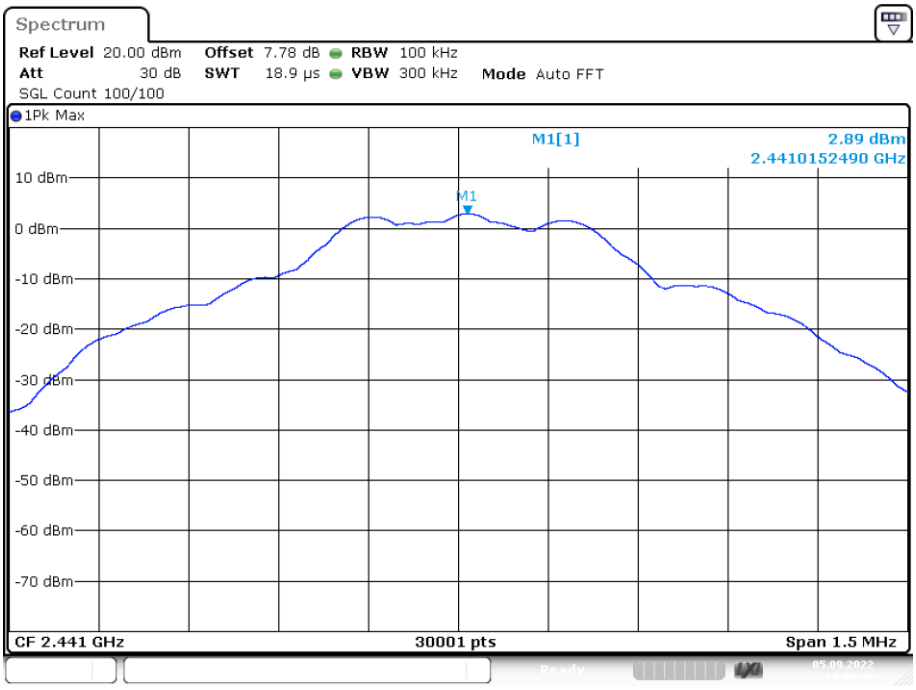


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207 GHz	2.31 dBm		
M2		1	15.590831 GHz	-36.89 dBm		
M3		1	4.971949 GHz	-42.12 dBm		
M4		1	7.027786 GHz	-40.67 dBm		
M5		1	9.425968 GHz	-40.67 dBm		

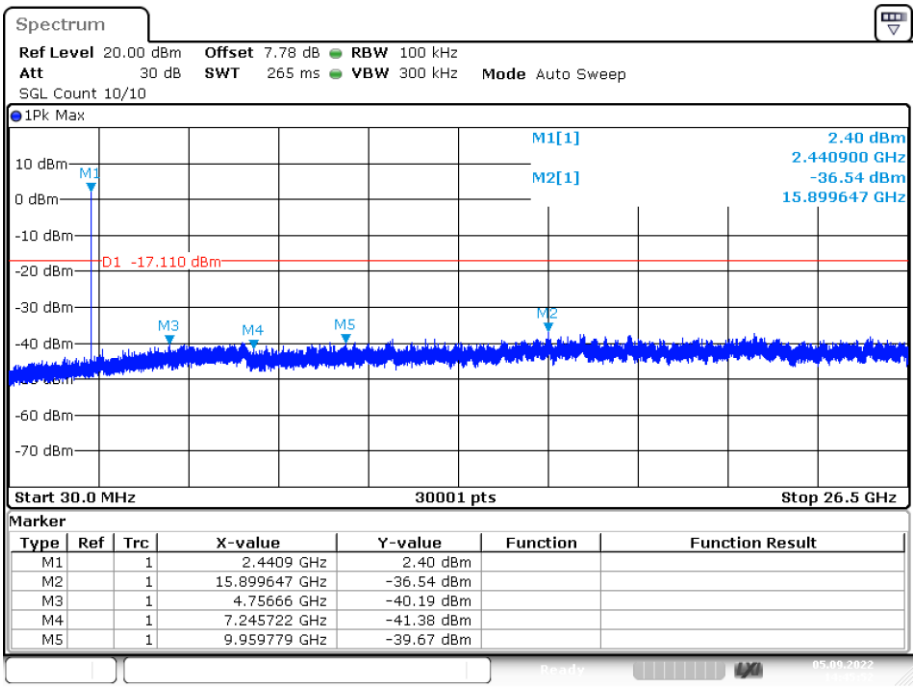
Date: 5.SEP.2022 14:44:18

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Ref



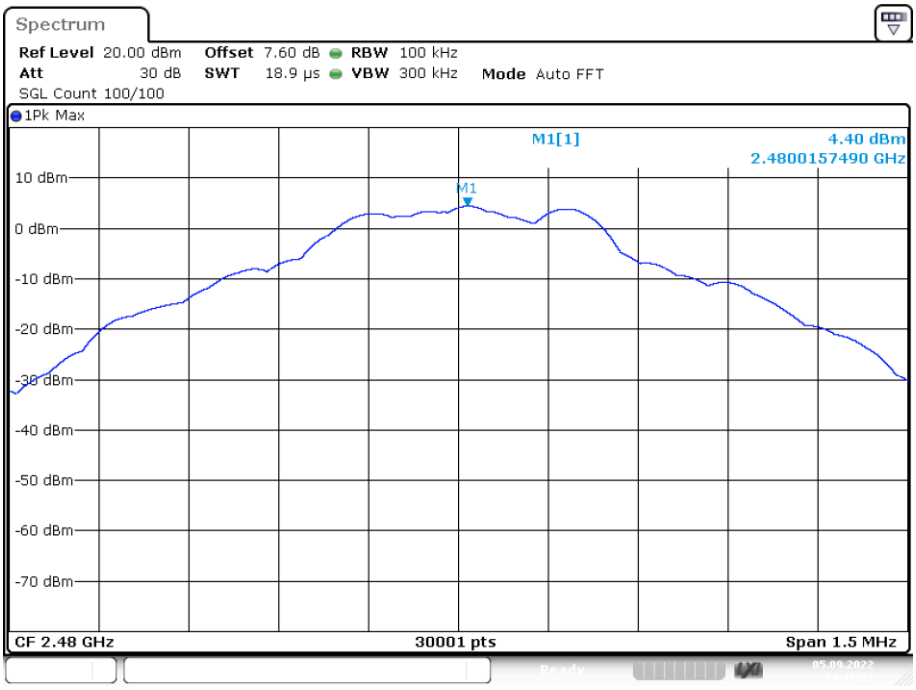
Date: 5.SEP.2022 14:45:38

Tx. Spurious NVNT 1-DH1 2441MHz Ant1 Emission



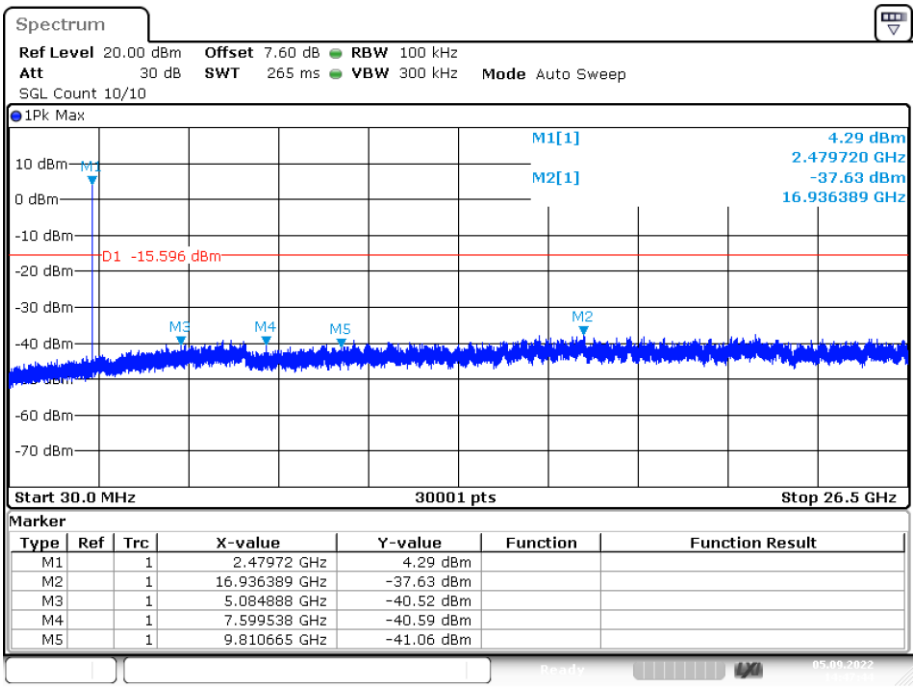
Date: 5.SEP.2022 14:45:52

Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Ref



Date: 5.SEP.2022 14:47:31

Tx. Spurious NVNT 1-DH1 2480MHz Ant1 Emission

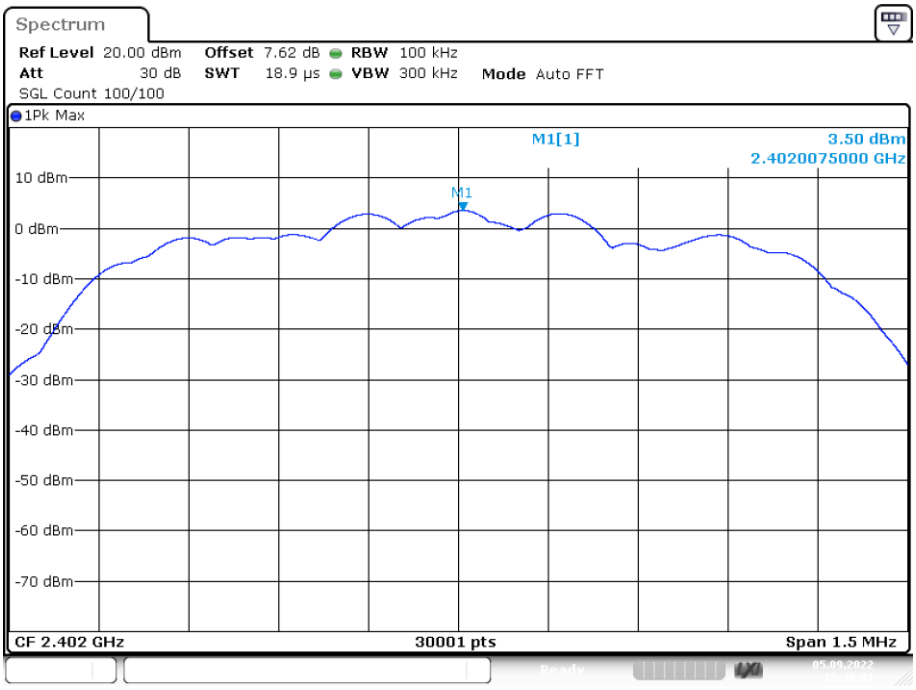


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47972 GHz	4.29 dBm		
M2		1	16.936389 GHz	-37.63 dBm		
M3		1	5.084888 GHz	-40.52 dBm		
M4		1	7.599538 GHz	-40.59 dBm		
M5		1	9.810665 GHz	-41.06 dBm		

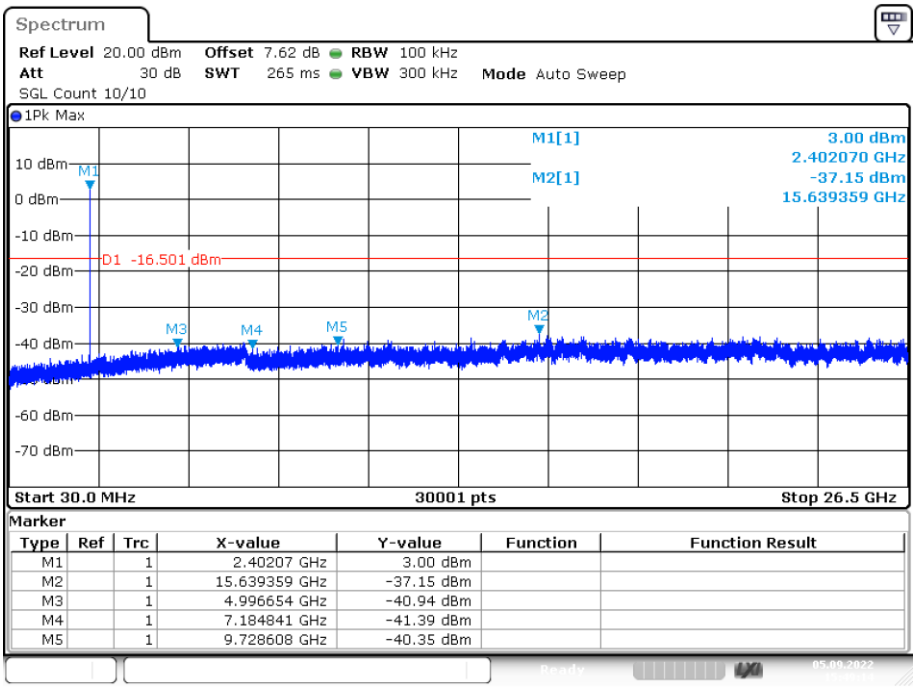
Date: 5.SEP.2022 14:47:44

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Ref



Date: 5.SEP.2022 15:49:01

Tx. Spurious NVNT 2-DH1 2402MHz Ant1 Emission

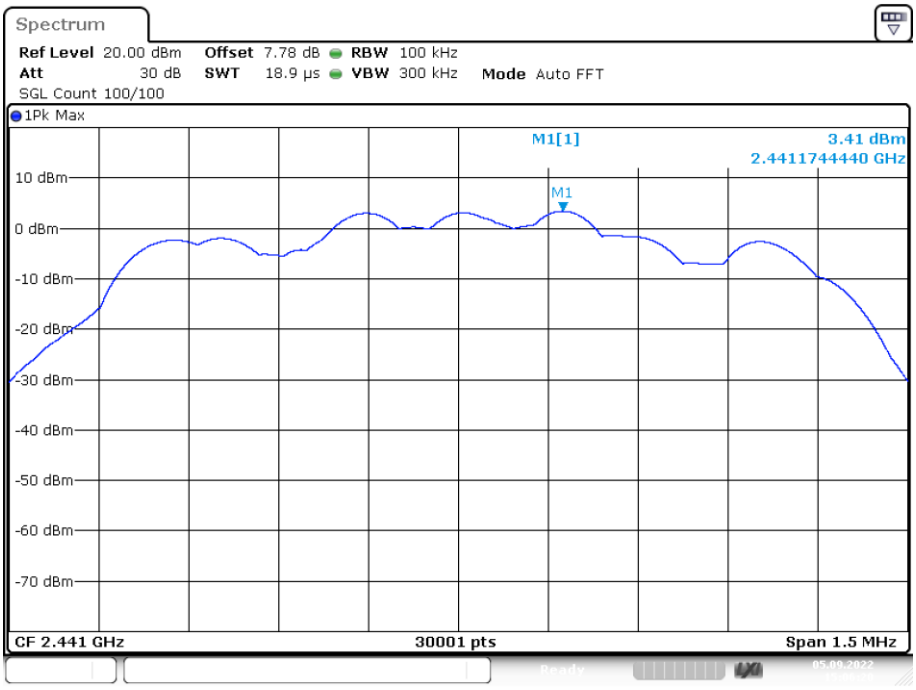


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207 GHz	3.00 dBm		
M2		1	15.639359 GHz	-37.15 dBm		
M3		1	4.996654 GHz	-40.94 dBm		
M4		1	7.184841 GHz	-41.39 dBm		
M5		1	9.728608 GHz	-40.35 dBm		

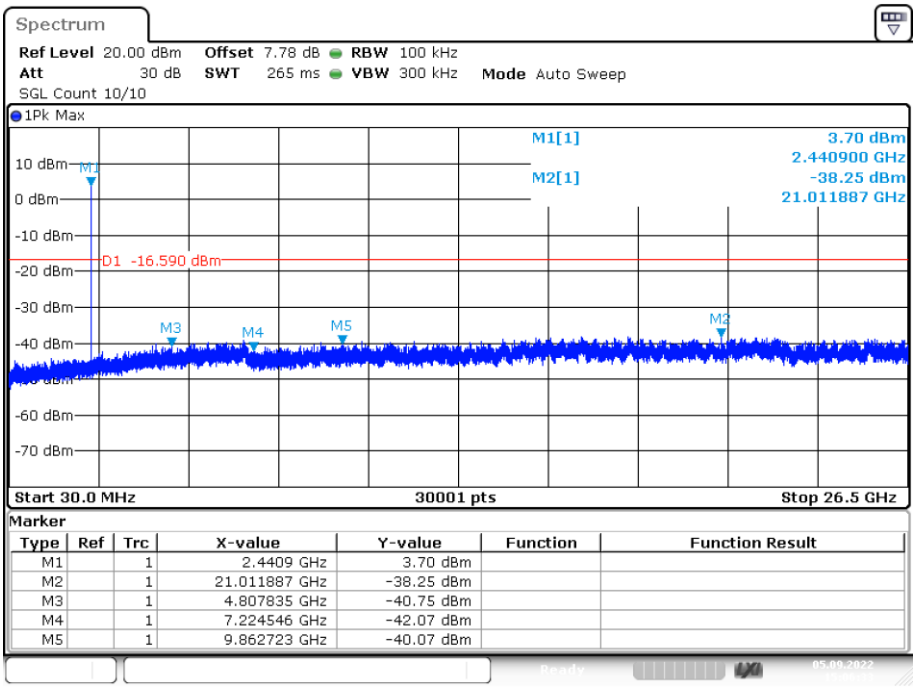
Date: 5.SEP.2022 15:49:15

Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Ref



Date: 5.SEP.2022 15:06:20

Tx. Spurious NVNT 2-DH1 2441MHz Ant1 Emission

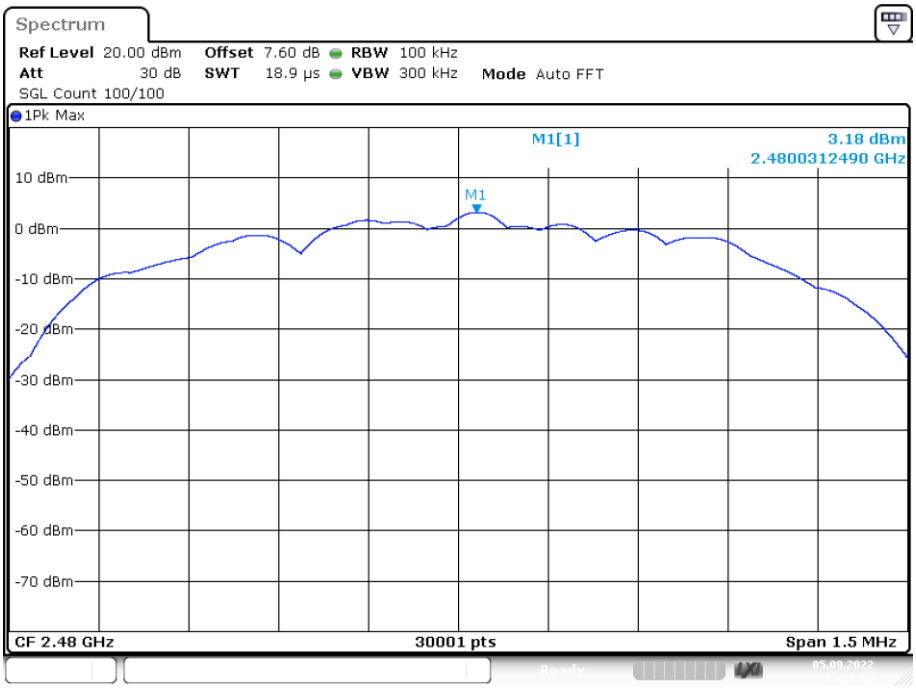


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4409 GHz	3.70 dBm		
M2		1	21.011887 GHz	-38.25 dBm		
M3		1	4.807835 GHz	-40.75 dBm		
M4		1	7.224546 GHz	-42.07 dBm		
M5		1	9.862723 GHz	-40.07 dBm		

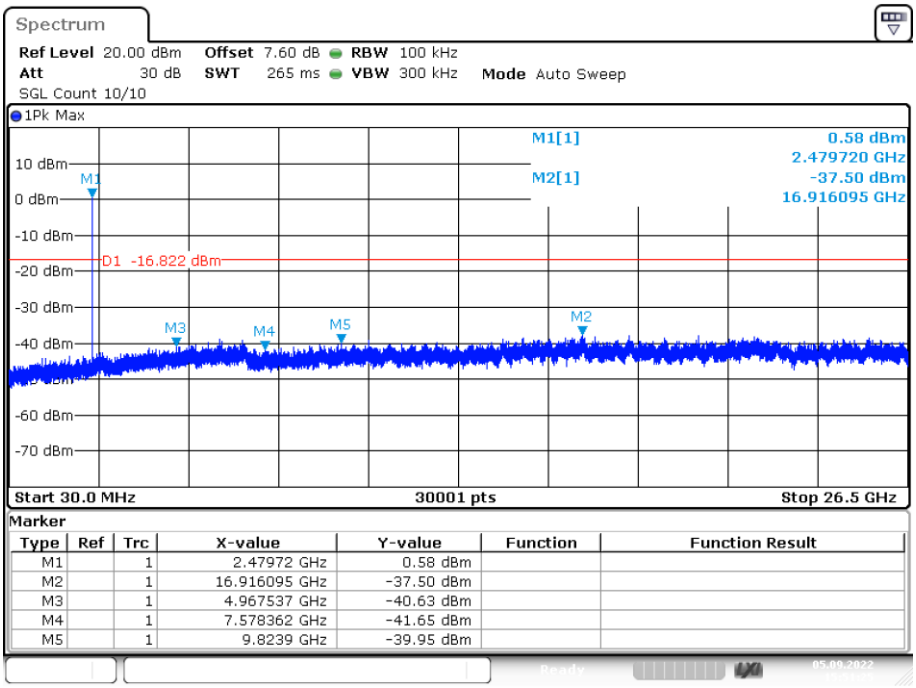
Date: 5.SEP.2022 15:06:33

Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Ref



Date: 5.SEP.2022 15:51:12

Tx. Spurious NVNT 2-DH1 2480MHz Ant1 Emission

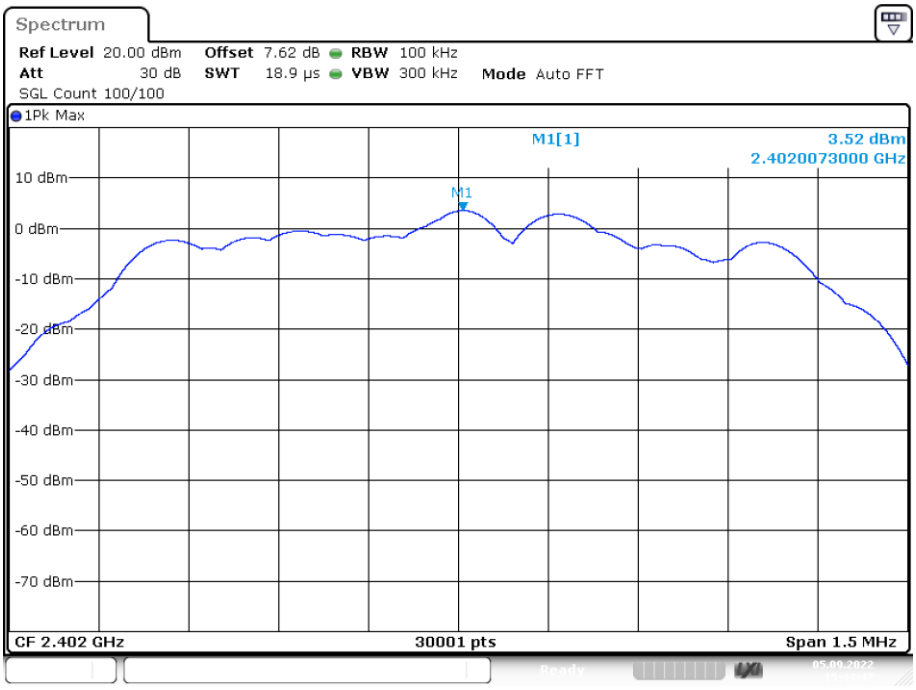


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47972 GHz	0.58 dBm		
M2		1	16.916095 GHz	-37.50 dBm		
M3		1	4.967537 GHz	-40.63 dBm		
M4		1	7.578362 GHz	-41.65 dBm		
M5		1	9.8239 GHz	-39.95 dBm		

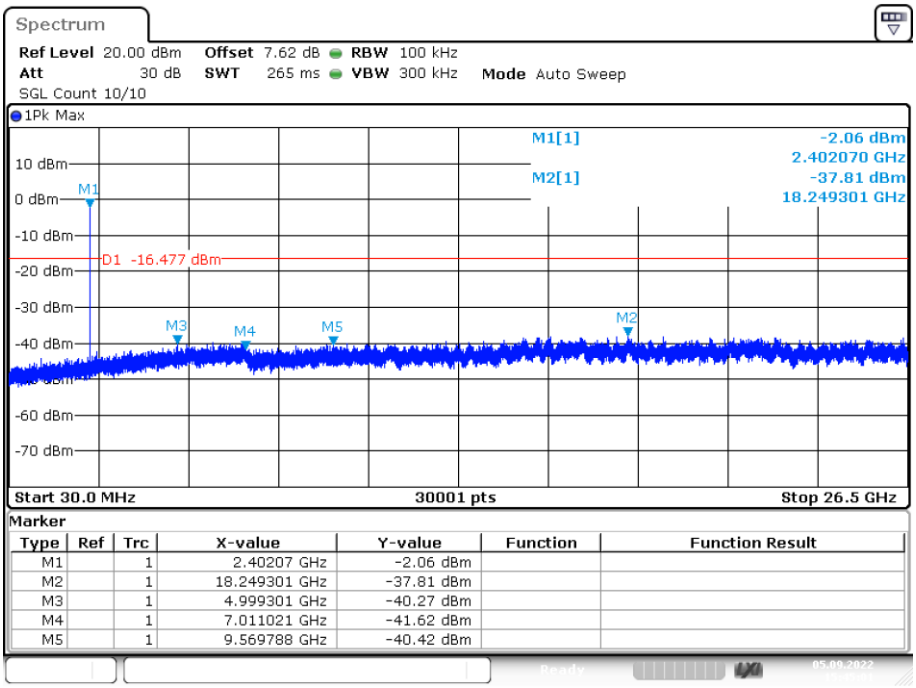
Date: 5.SEP.2022 15:51:25

Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Ref



Date: 5.SEP.2022 15:44:47

Tx. Spurious NVNT 3-DH1 2402MHz Ant1 Emission

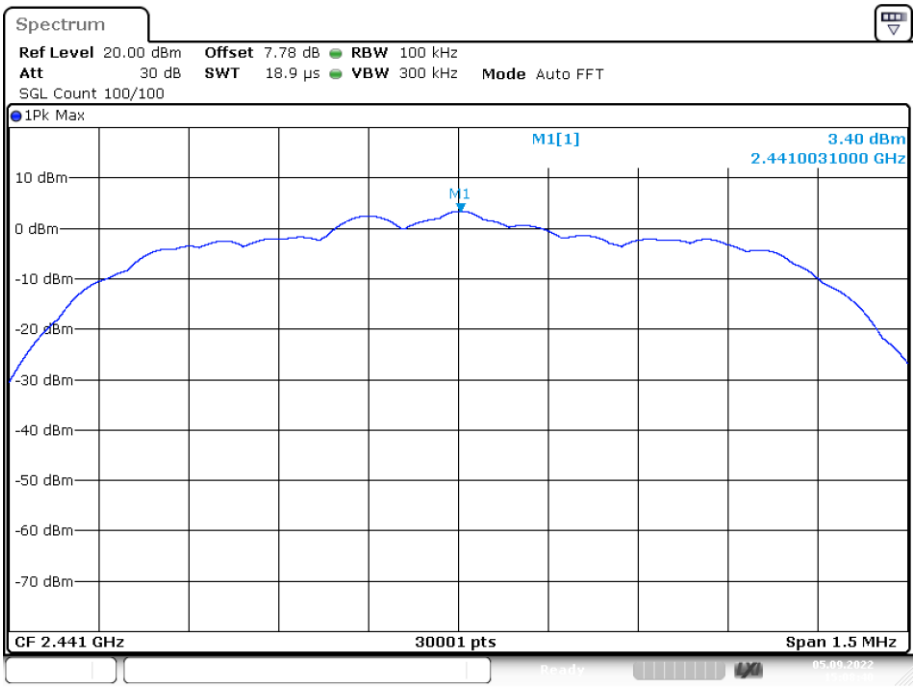


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207 GHz	-2.06 dBm		
M2		1	18.249301 GHz	-37.81 dBm		
M3		1	4.999301 GHz	-40.27 dBm		
M4		1	7.011021 GHz	-41.62 dBm		
M5		1	9.569788 GHz	-40.42 dBm		

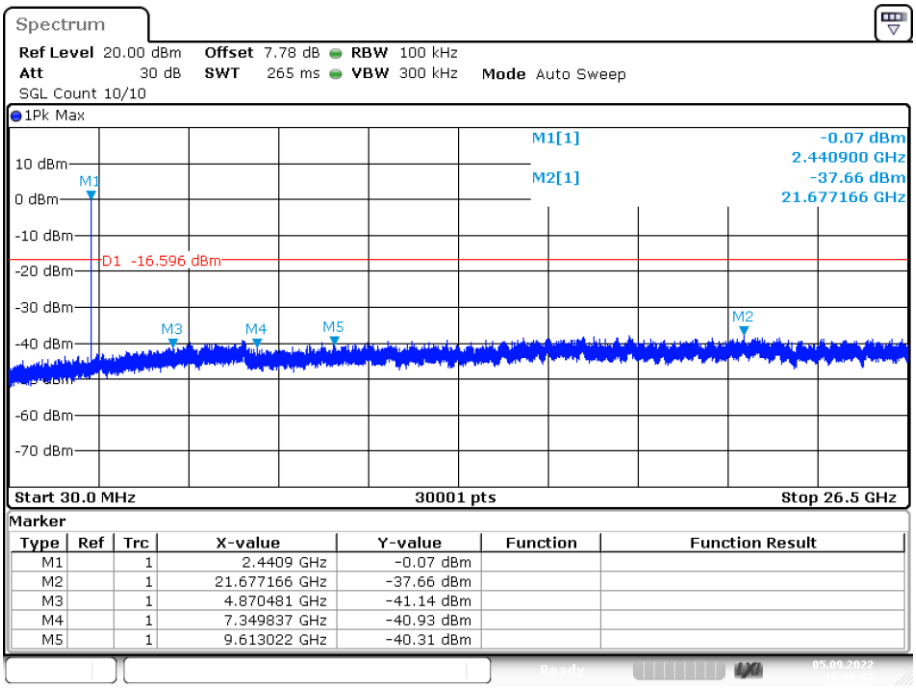
Date: 5.SEP.2022 15:45:01

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Ref



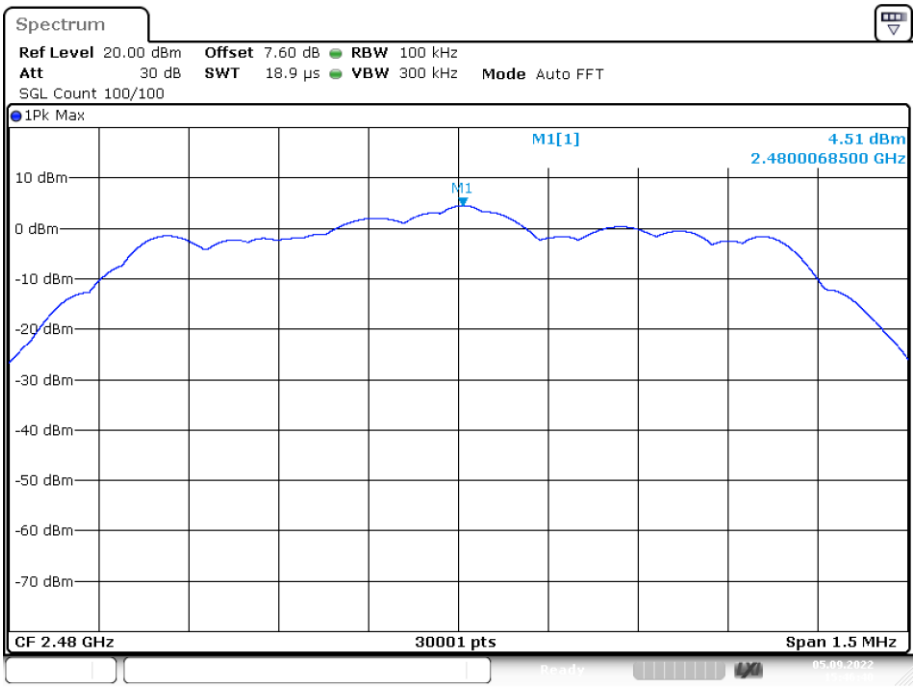
Date: 5.SEP.2022 15:08:40

Tx. Spurious NVNT 3-DH1 2441MHz Ant1 Emission



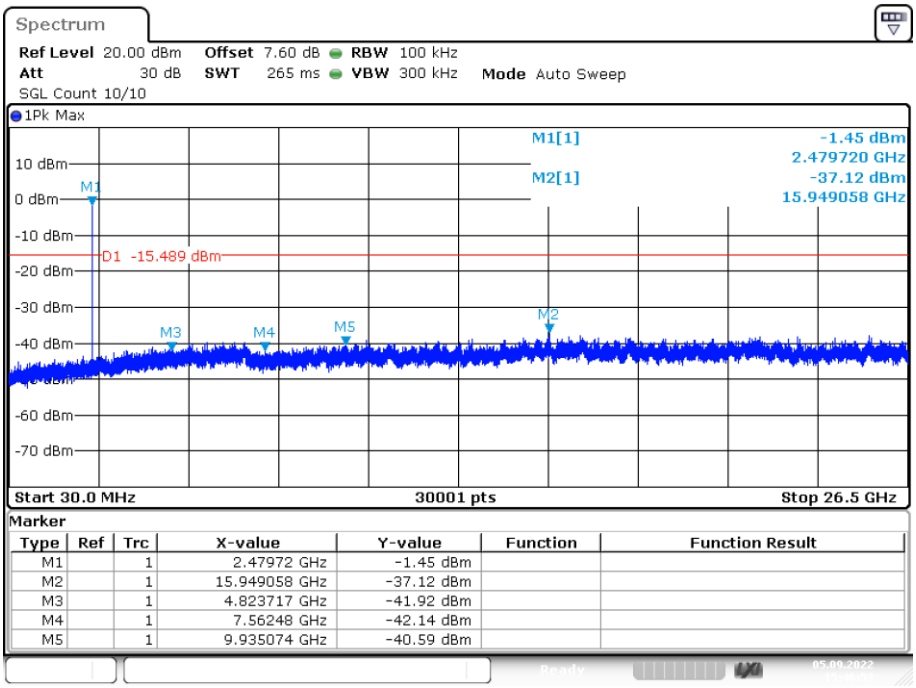
Date: 5.SEP.2022 15:08:53

Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Ref



Date: 5.SEP.2022 15:46:40

Tx. Spurious NVNT 3-DH1 2480MHz Ant1 Emission



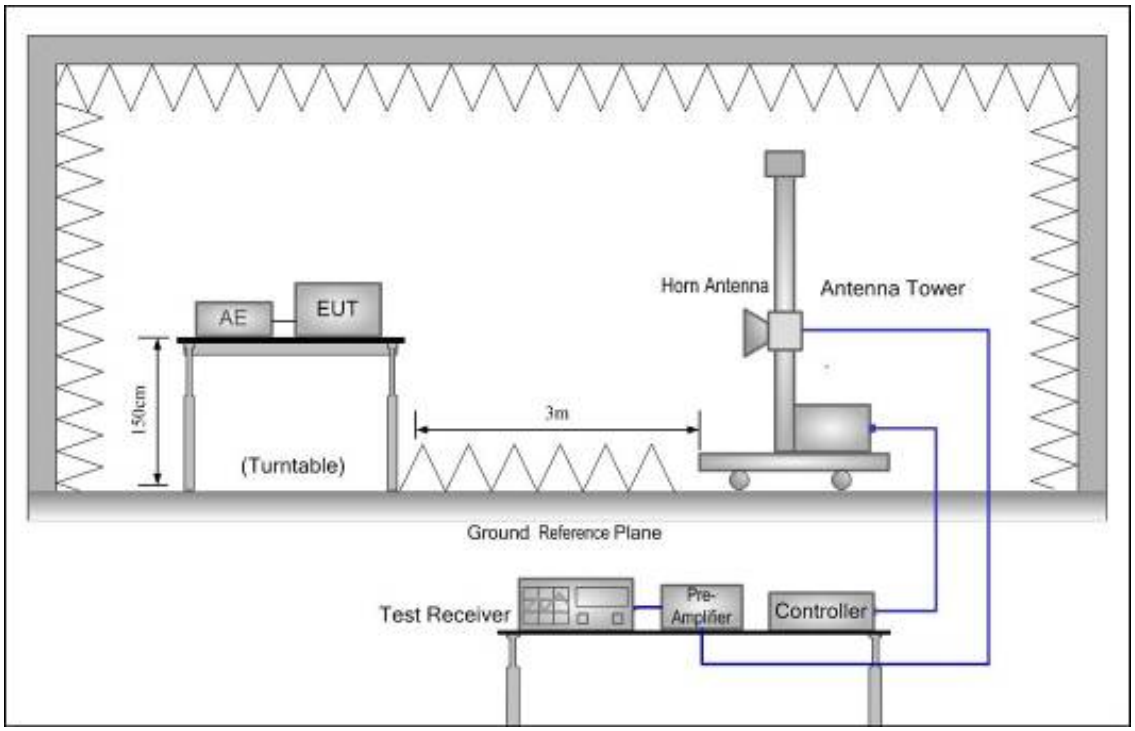
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47972 GHz	-1.45 dBm		
M2		1	15.949058 GHz	-37.12 dBm		
M3		1	4.823717 GHz	-41.92 dBm		
M4		1	7.56248 GHz	-42.14 dBm		
M5		1	9.935074 GHz	-40.59 dBm		

Date: 5.SEP.2022 15:46:53

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.

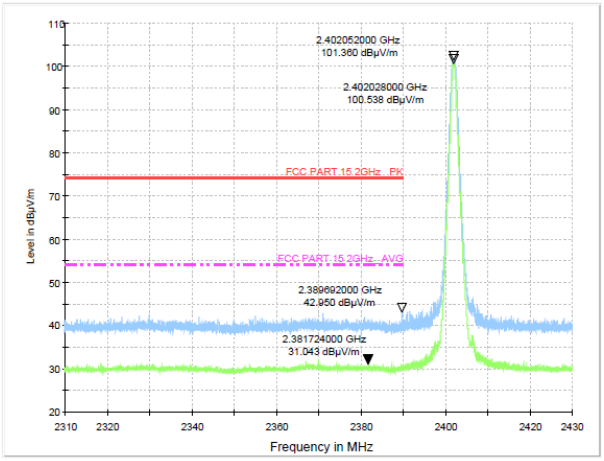
9.3. Test Procedure

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

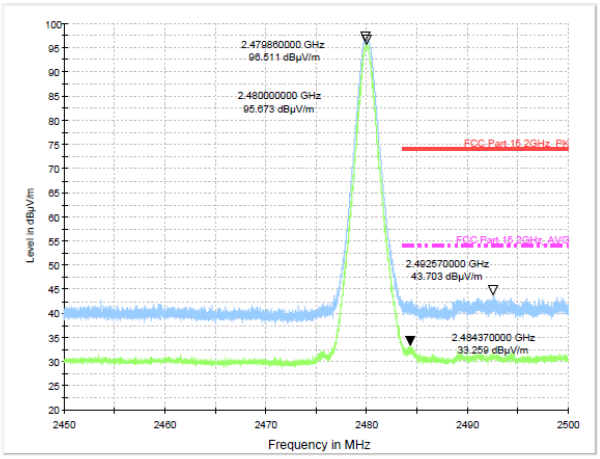
9.4. Test Result

PASS. (See below detailed test data)

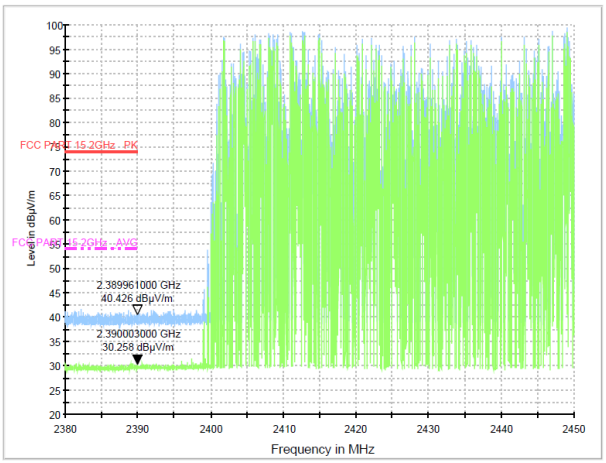
Test Mode: GFSK-Low Hopping-off



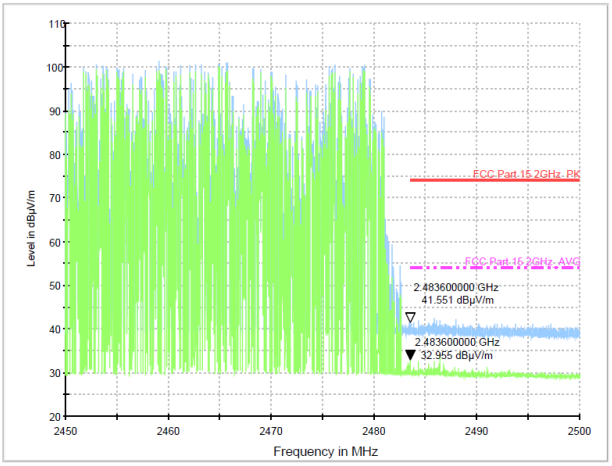
Test Mode: GFSK-High Hopping-off



Test Mode: GFSK-Low Hopping-on



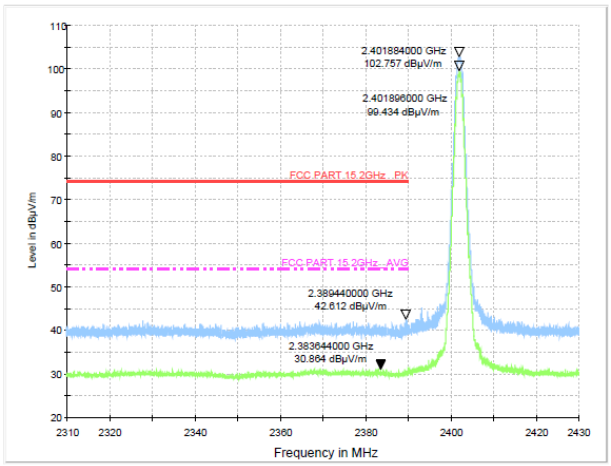
Test Mode: GFSK-High Hopping-on



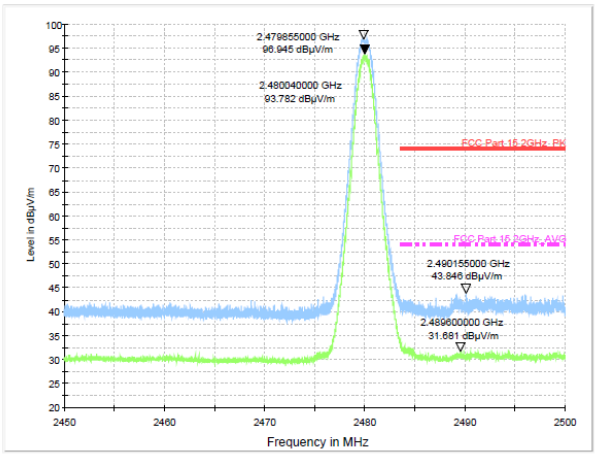
Note: 1. *:Maximum data; x:Over limit; !:over margin.

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

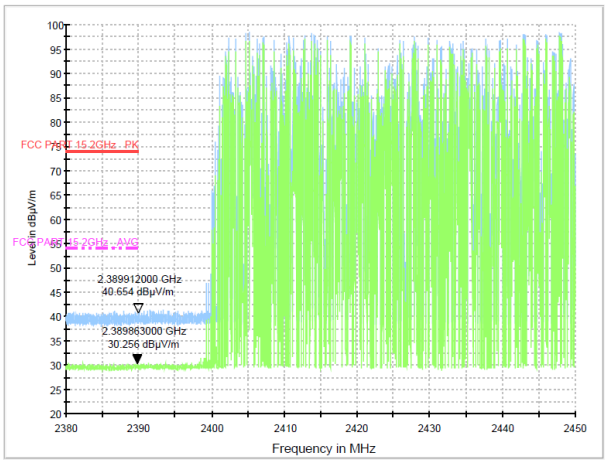
Test Mode: π/4 DQPSK-Low Hopping-off



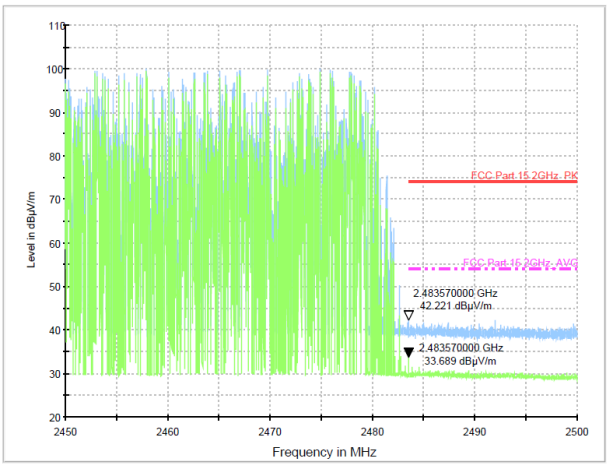
Test Mode: π/4 DQPSK-High Hopping-off



Test Mode: π/4 DQPSK-Low Hopping-on



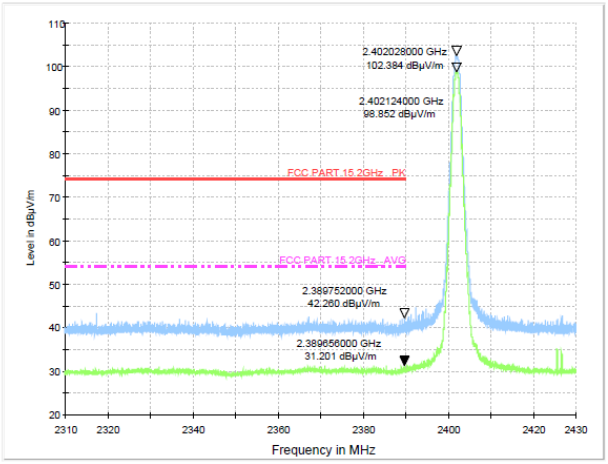
Test Mode: π/4 DQPSK-High Hopping-on



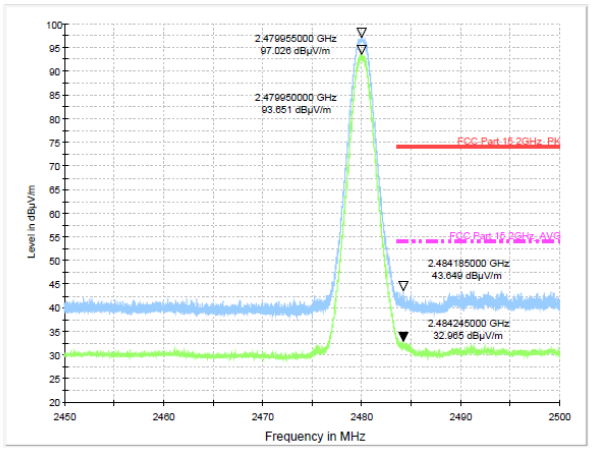
Note: 1. *:Maximum data; x:Over limit; !:over margin.

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

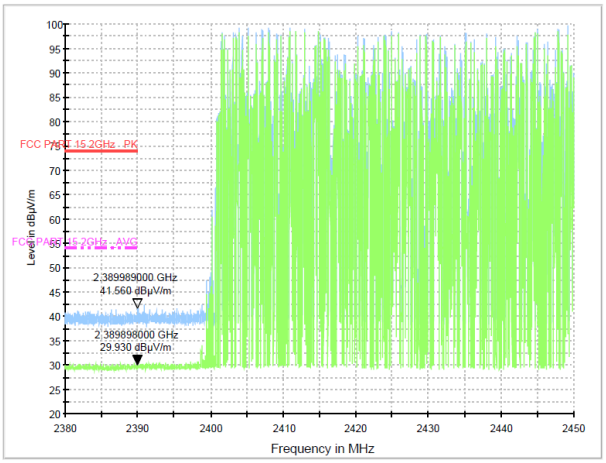
Test Mode: 8DPSK-Low Hopping-off



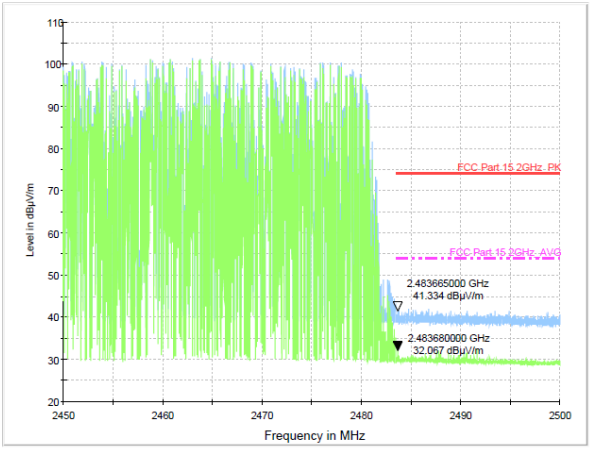
Test Mode: 8DPSK-High Hopping-off



Test Mode: 8DPSK-Low Hopping-on



Test Mode: 8DPSK-High Hopping-on



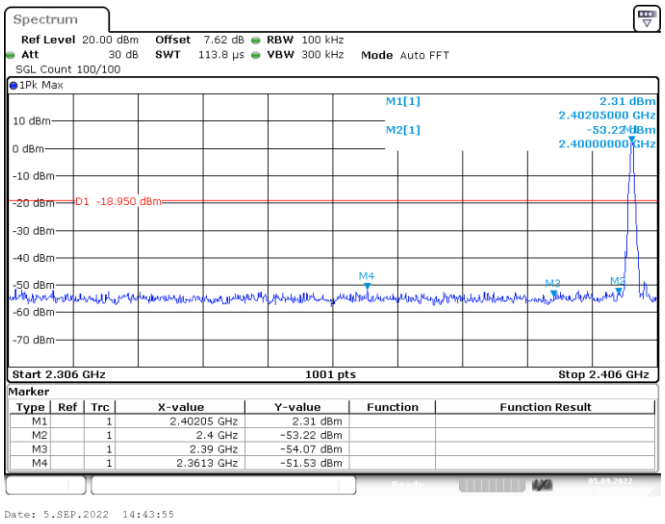
Note: 1. *:Maximum data; x:Over limit; !:over margin.

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

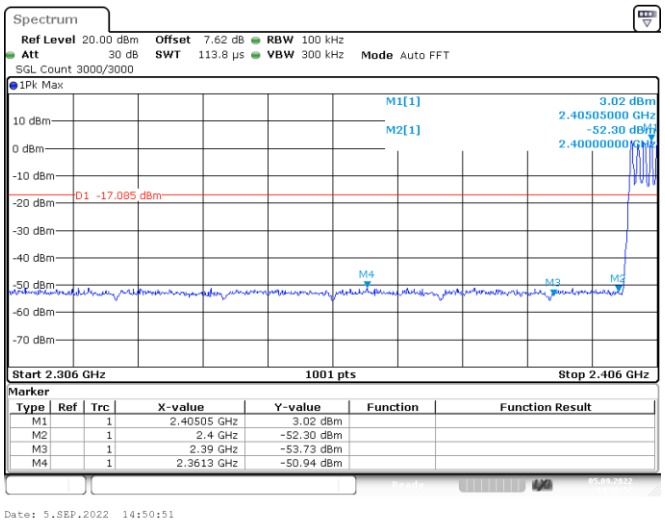
Conducted Method

GFSK Mode:

Test channel:	Lowest channel

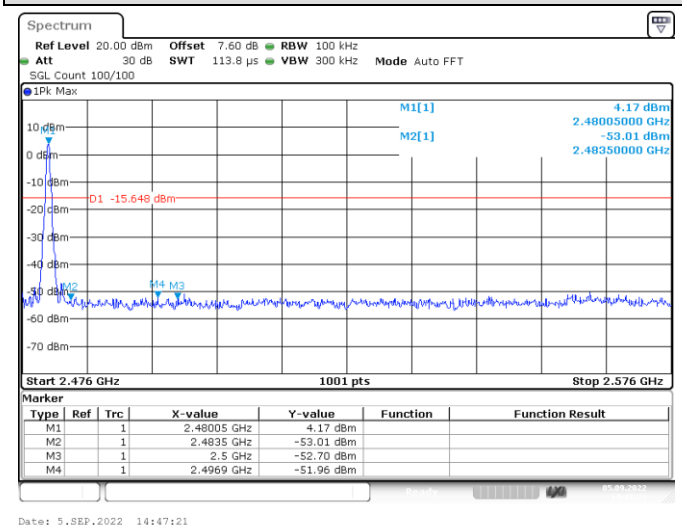


No-hopping mode

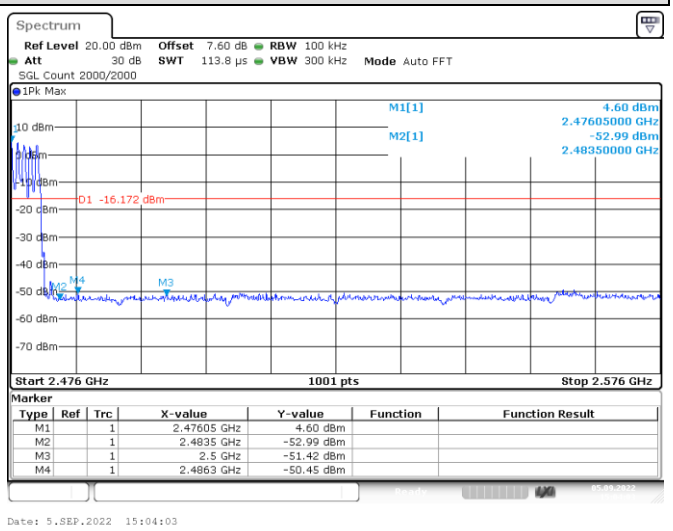


Hopping mode

Test channel:	Highest channel



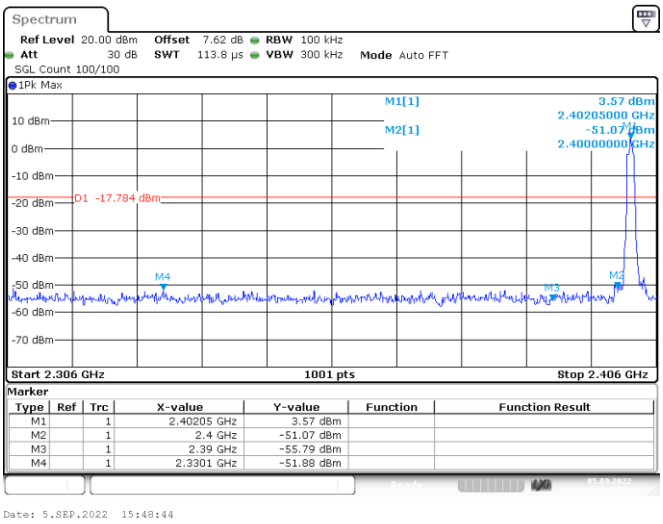
No-hopping mode



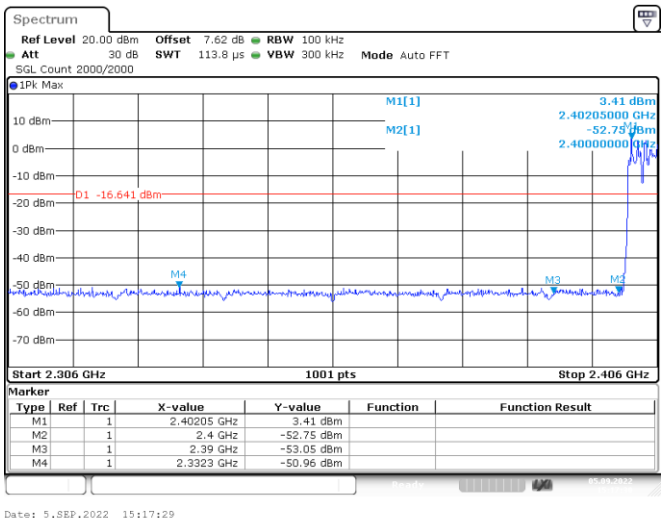
Hopping mode

π/4DQPSK Mode:

Test channel:	Lowest channel

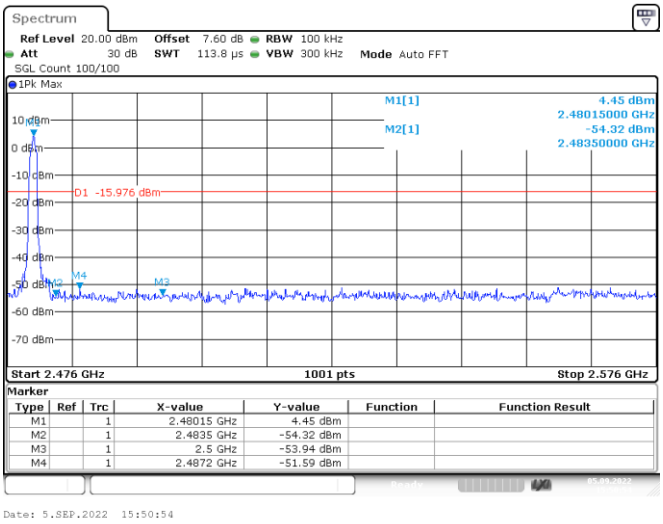


No-hopping mode

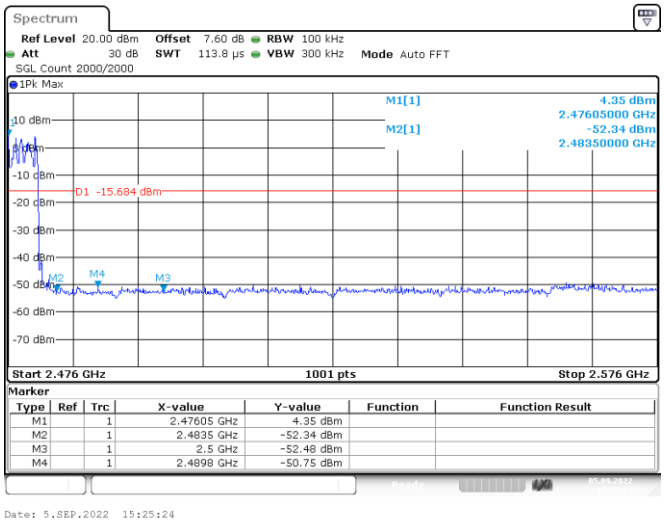


Hopping mode

Test channel:	Highest channel



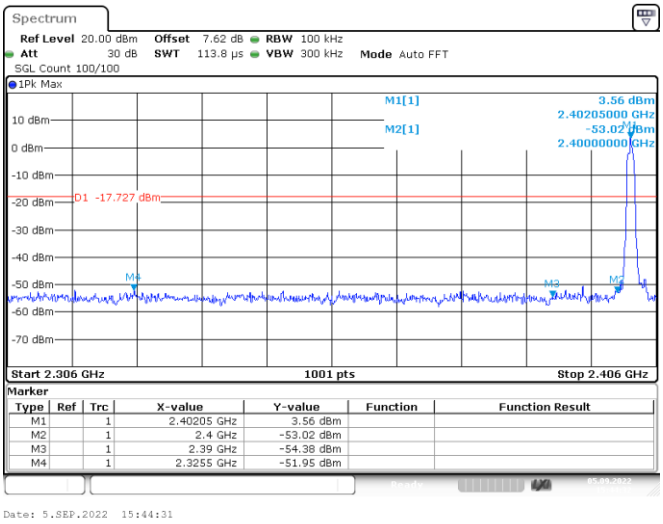
No-hopping mode



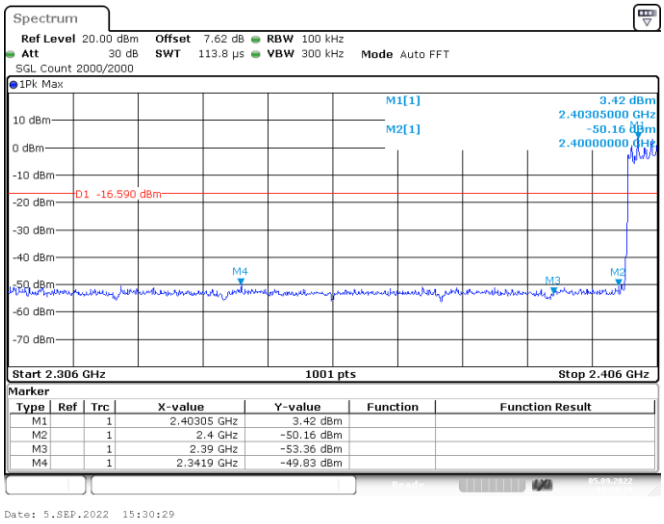
Hopping mode

8DPSK Mode:

Test channel:	Lowest channel

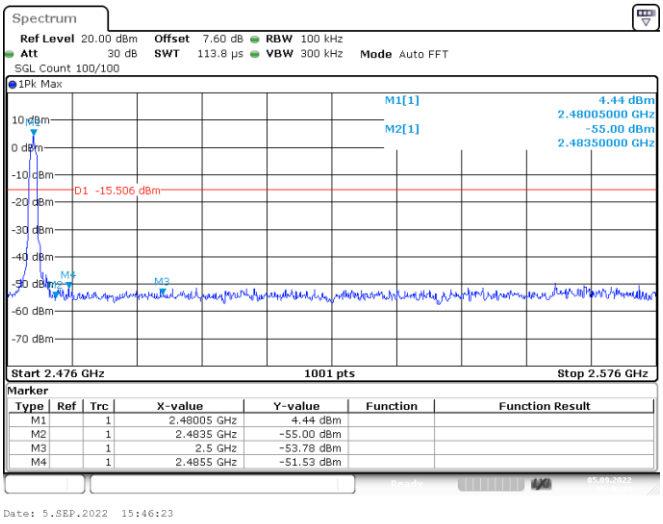


No-hopping mode

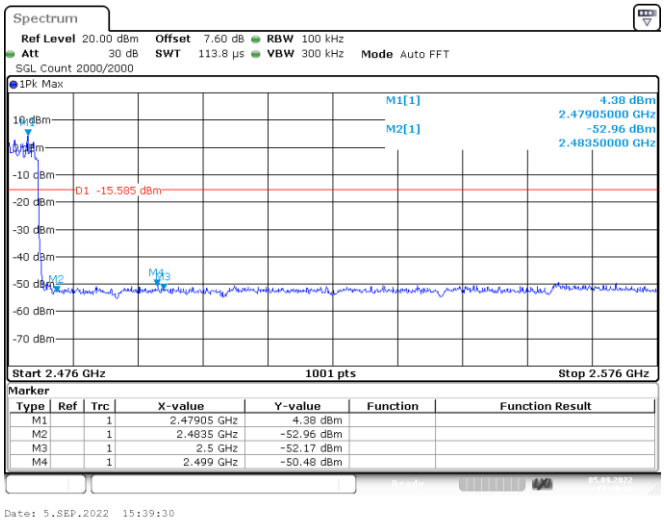


Hopping mode

Test channel:	Highest channel



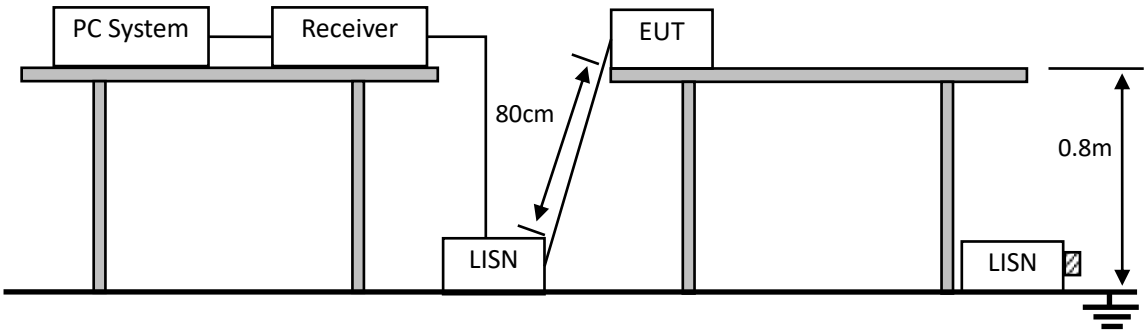
No-hopping mode



Hopping mode

10. POWER LINE CONDUCTED EMISSIONS

10.1.Block Diagram of Test Setup



:50Ω Terminator

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.

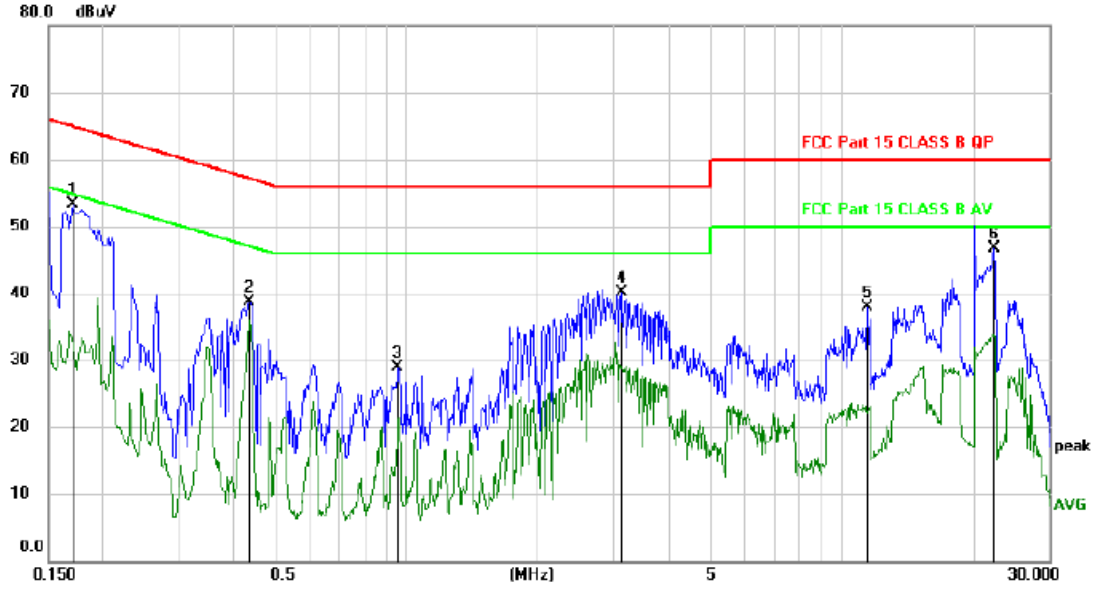
(5) The frequency range from 150 KHz to 30MHz is checked.

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:

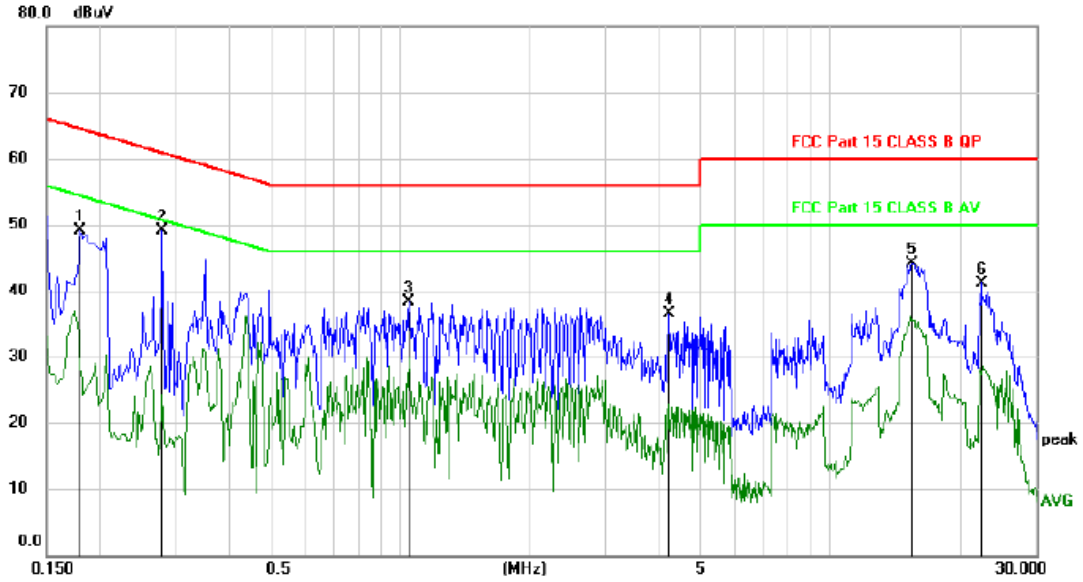


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1710	43.41	9.93	53.34	64.91	-11.57	peak	
2		0.4350	28.76	9.95	38.71	57.16	-18.45	peak	
3		0.9570	18.97	9.94	28.91	56.00	-27.09	peak	
4		3.1170	30.05	9.96	40.01	56.00	-15.99	peak	
5		11.4389	27.71	10.24	37.95	60.00	-22.05	peak	
6		22.3890	36.25	10.45	46.70	60.00	-13.30	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		0.1800	39.22	9.93	49.15	64.49	-15.34	peak	
2	*	0.2790	39.21	9.94	49.15	60.85	-11.70	peak	
3		1.0440	28.32	9.92	38.24	56.00	-17.76	peak	
4		4.2030	26.43	9.98	36.41	56.00	-19.59	peak	
5		15.4500	33.74	10.34	44.08	60.00	-15.92	peak	
6		22.4100	30.75	10.45	41.20	60.00	-18.80	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

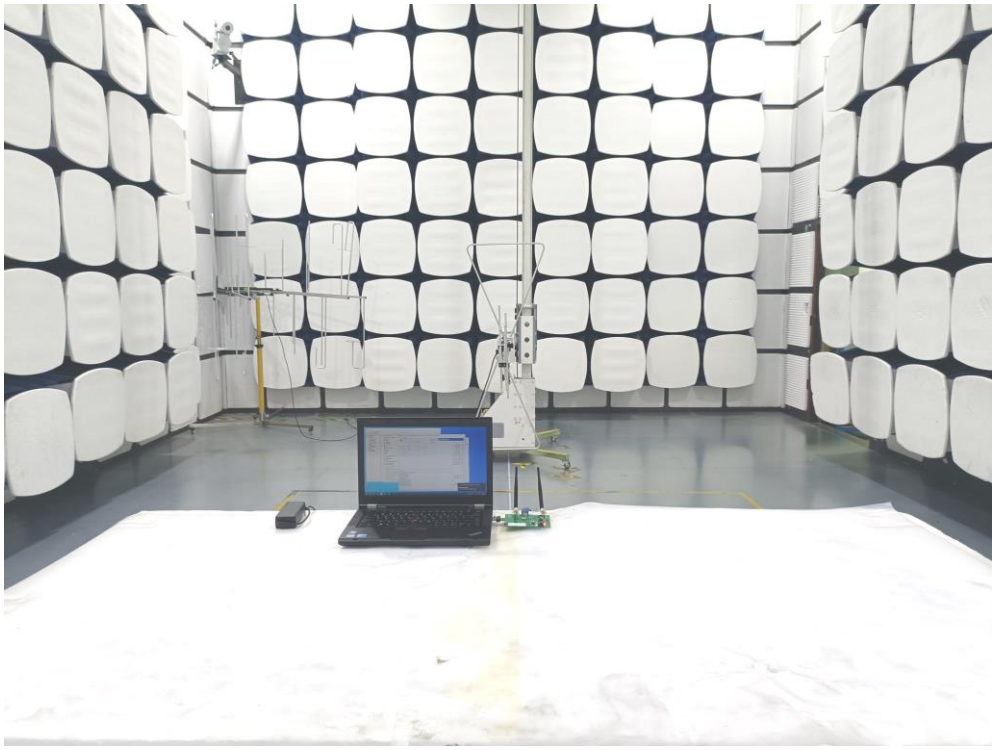
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional 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.

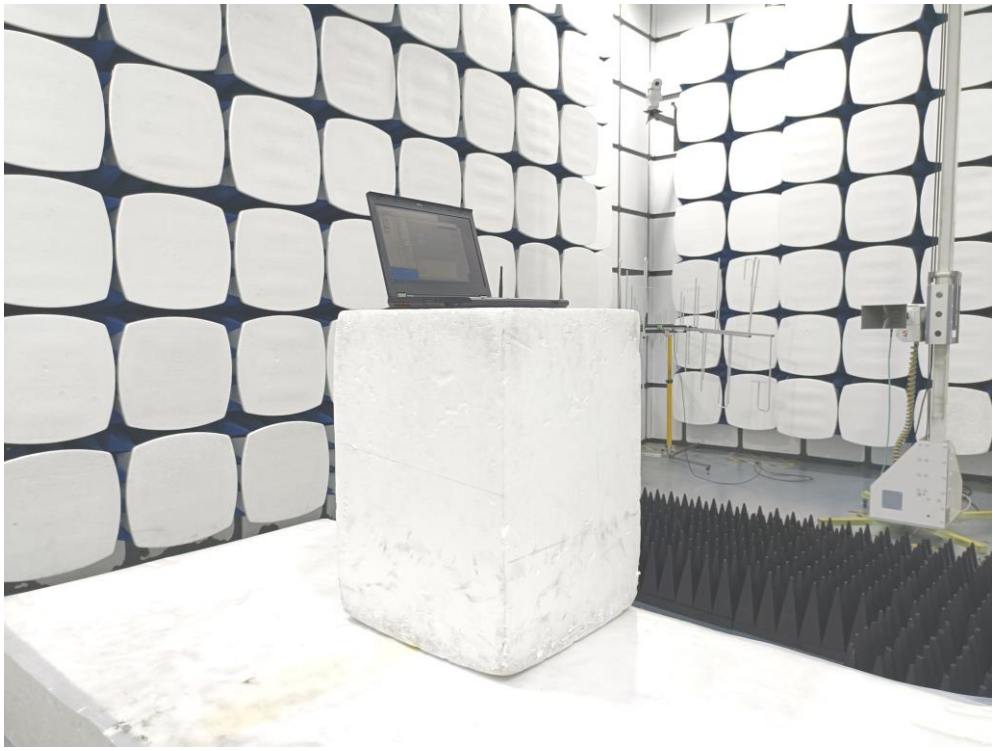
11.2.Result

The use of an antenna that is uniquely coupled to the intended radiator shall be considered sufficient to comply with the provisions of this section.

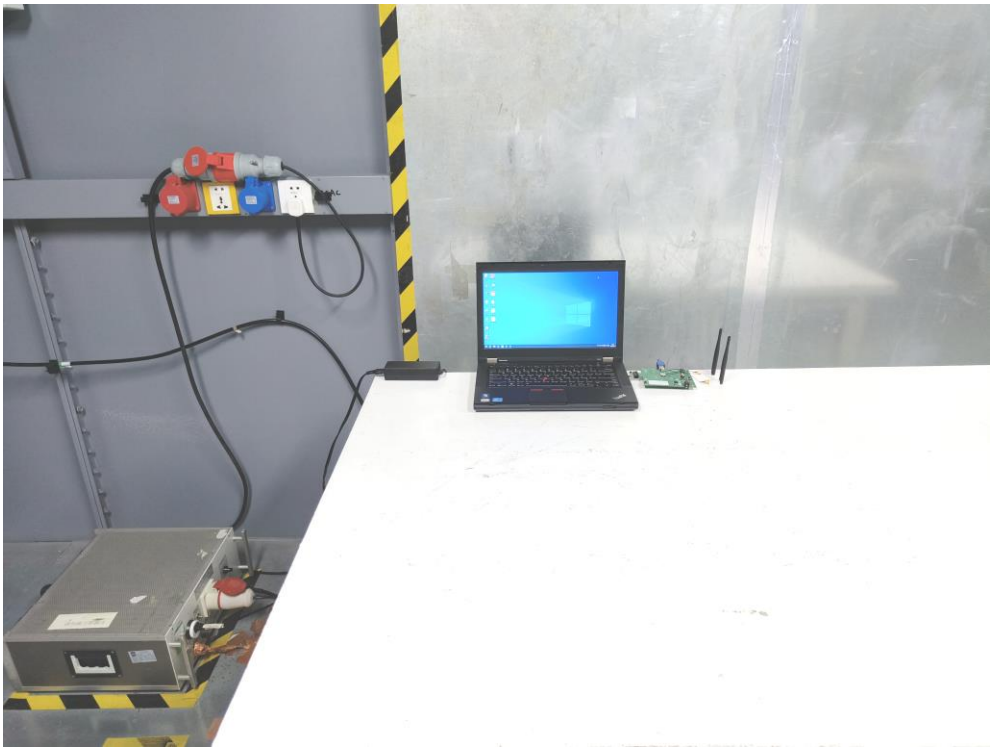
12. TEST SETUP PHOTO

12.1.Photo of Radiated Emission test

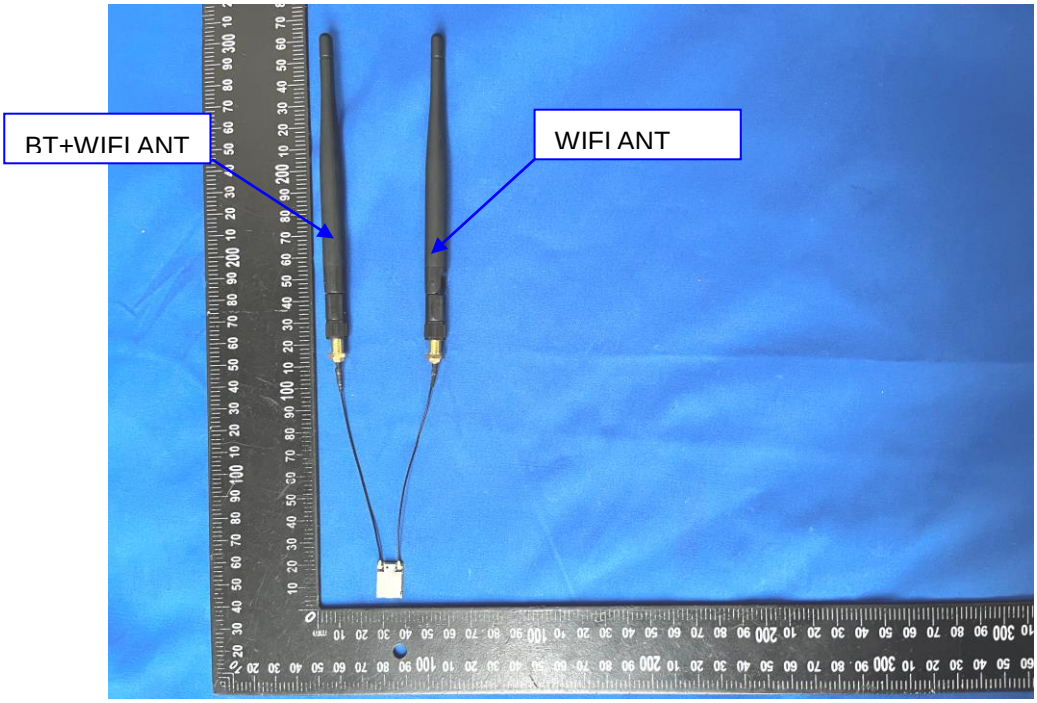


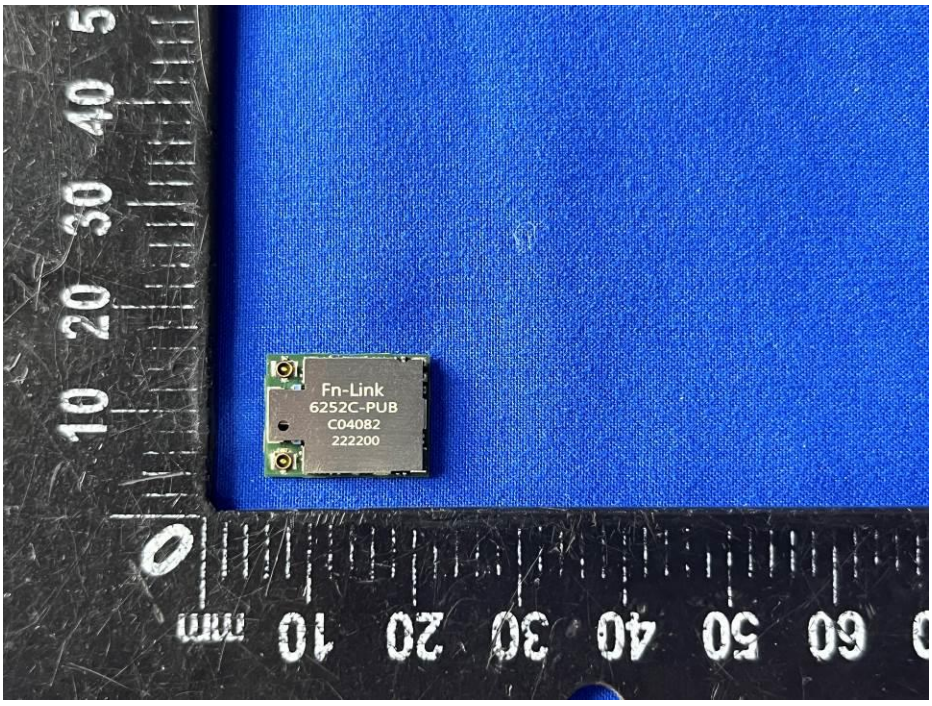


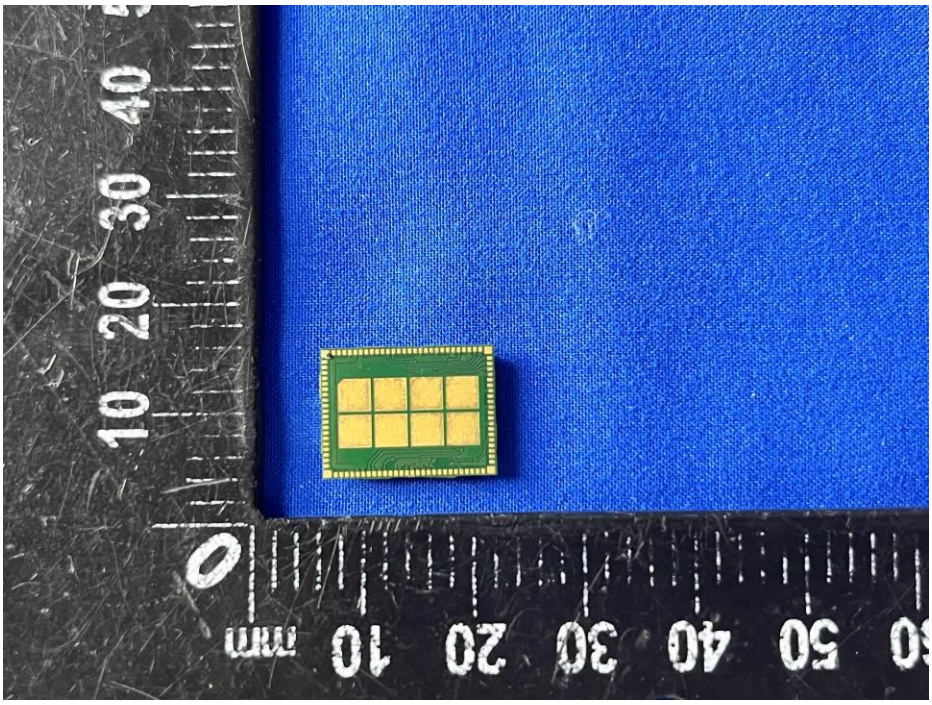
12.2.Photo of Conducted Emission test

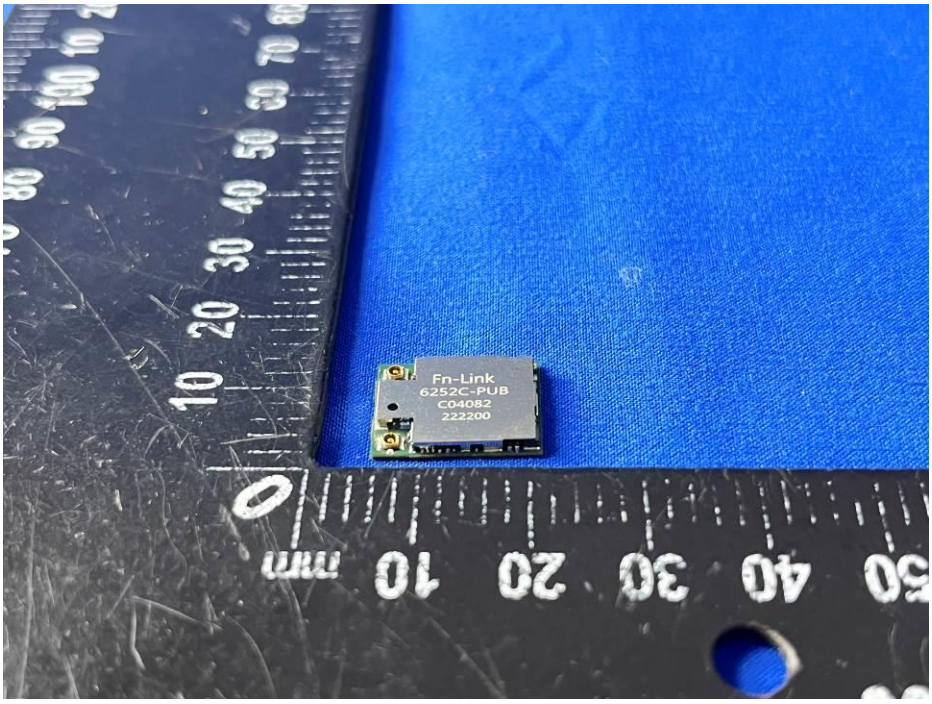


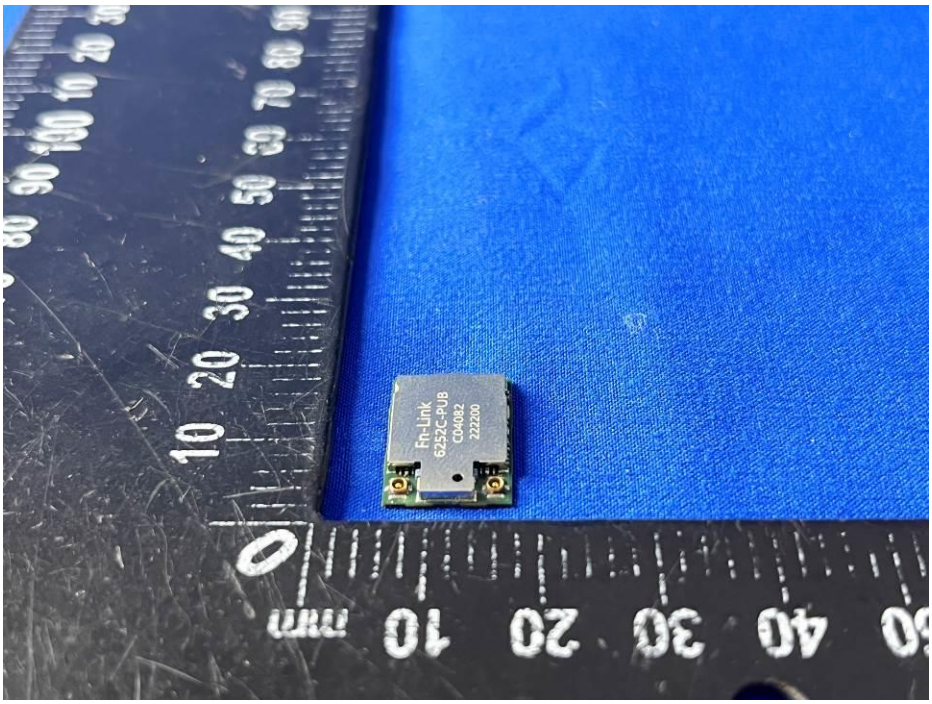
13. EUT Photo








Fn-Link
6252C-PUB
C04082
222200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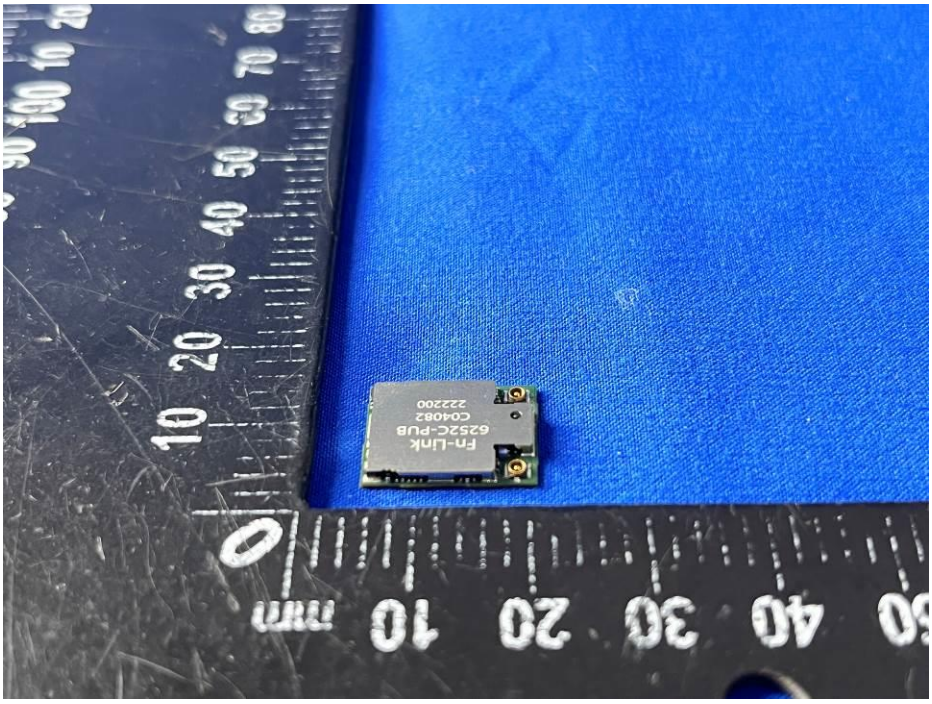
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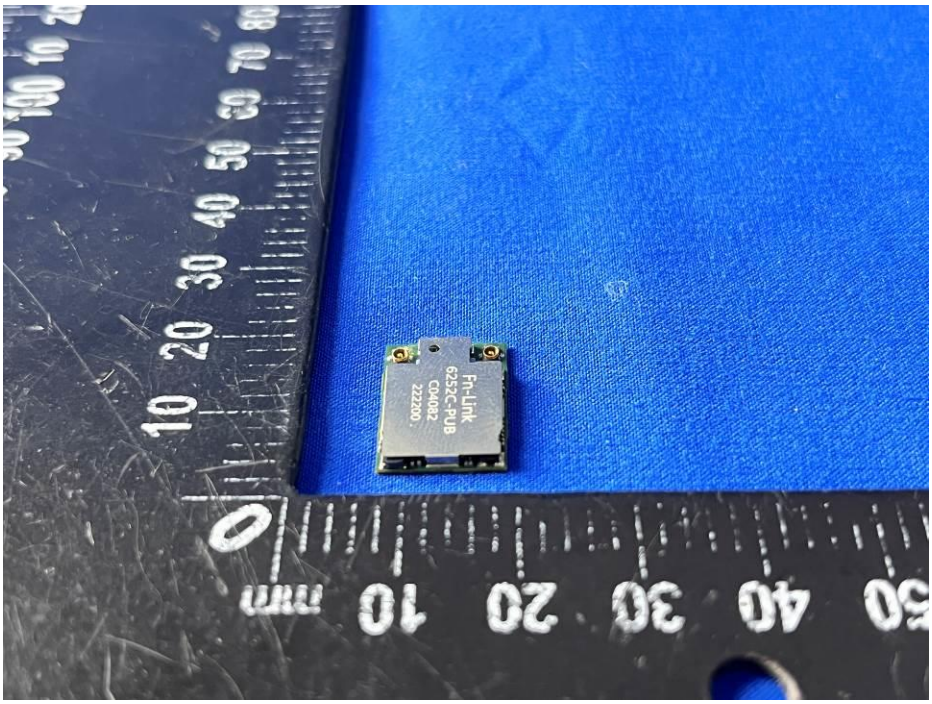
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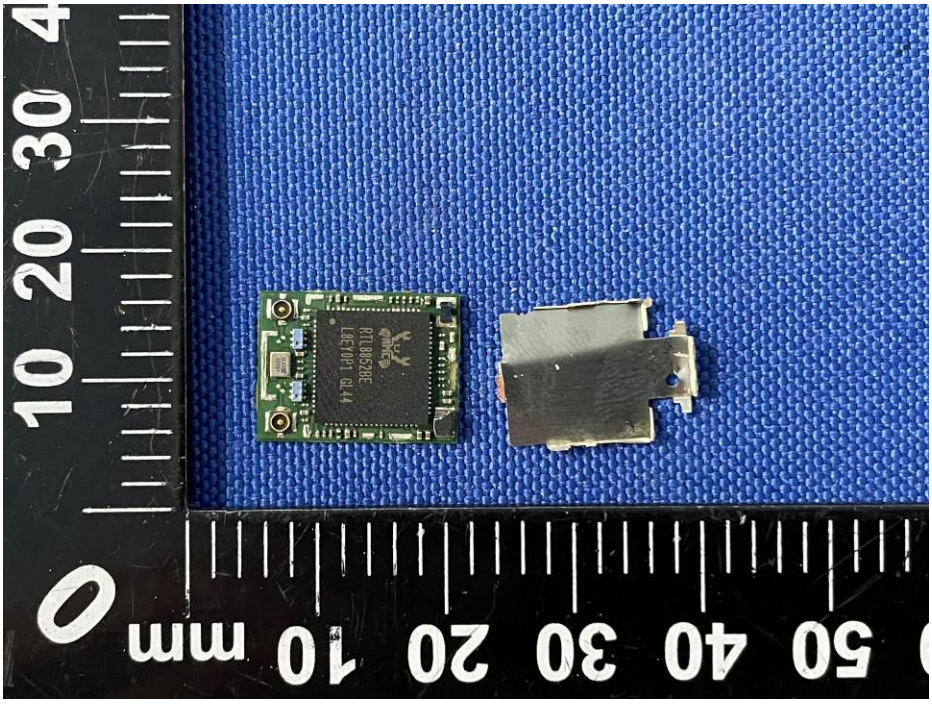
RTL8852BE
L8C10P1 GL44