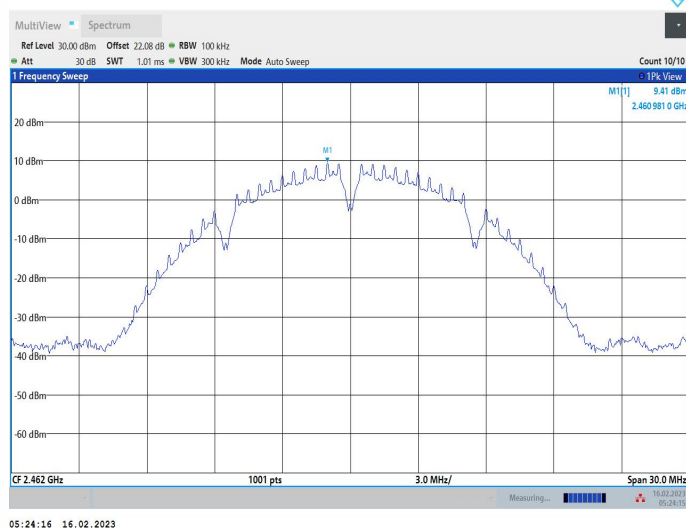
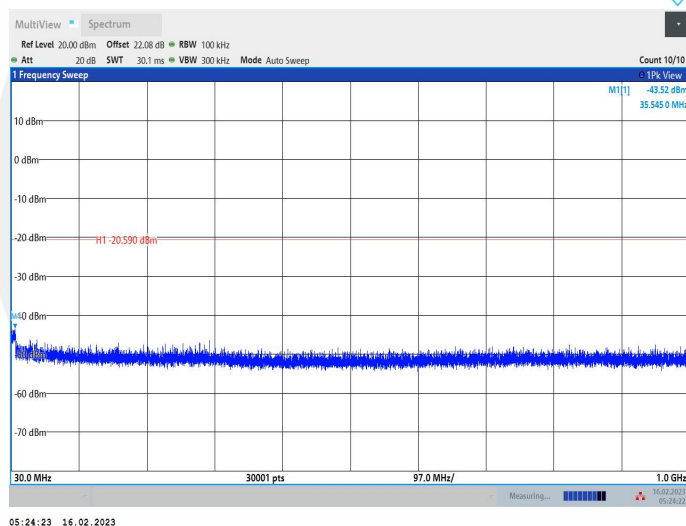


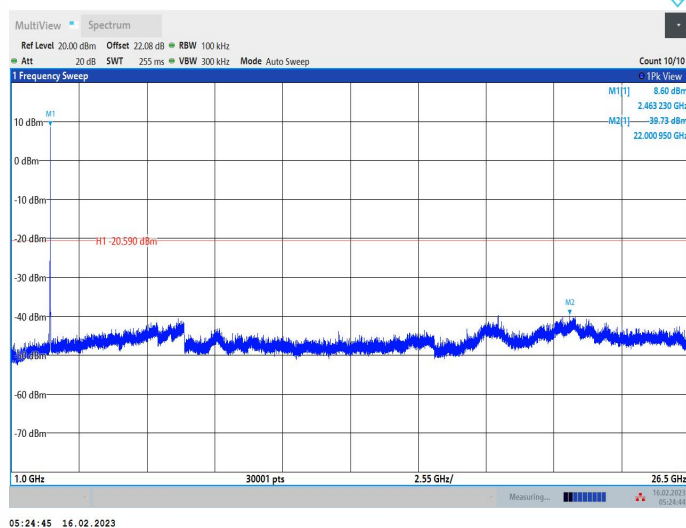
11B_Ant1_2462_0~Reference



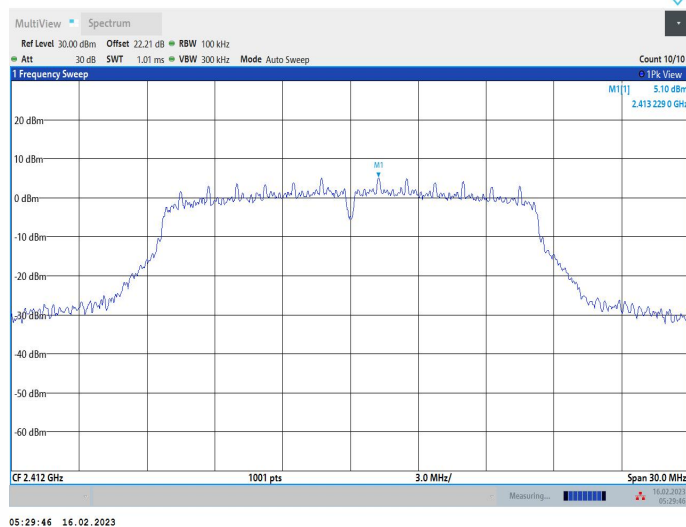
11B_Ant1_2462_30~1000



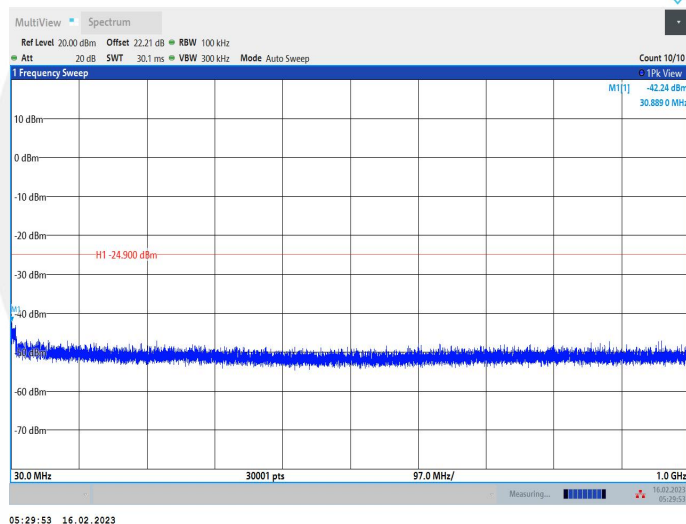
11B_Ant1_2462_1000~26500



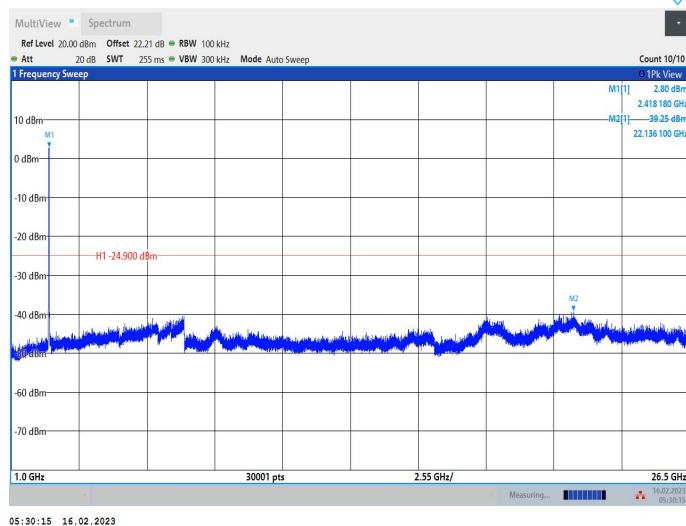
11G_Ant1_2412_0~Reference



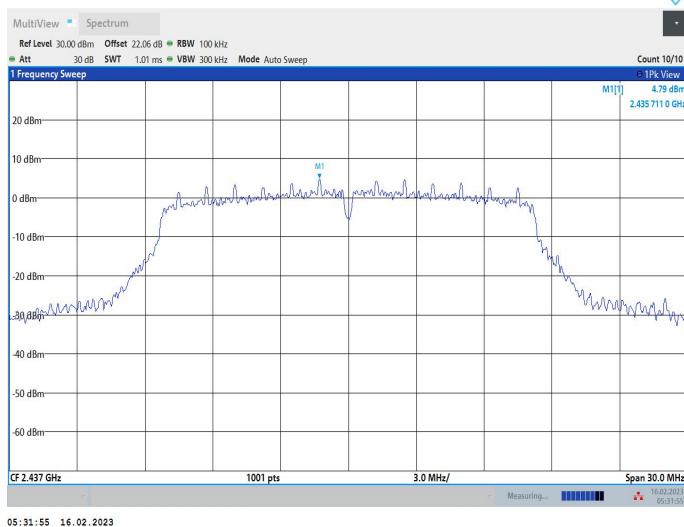
11G_Ant1_2412_30~1000



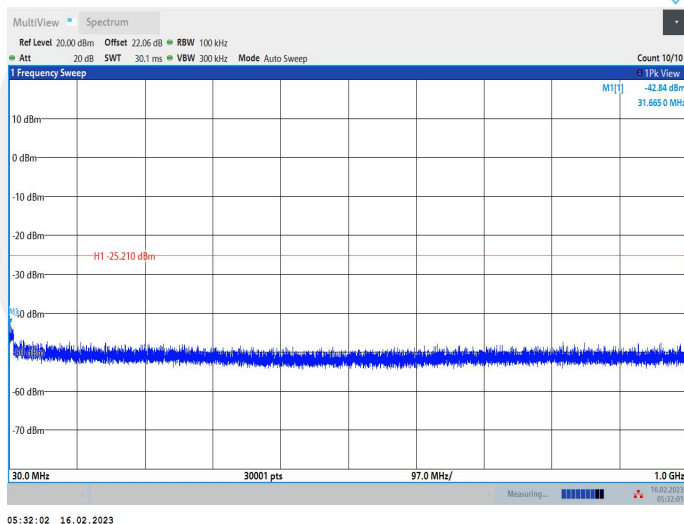
11G_Ant1_2412_1000~26500



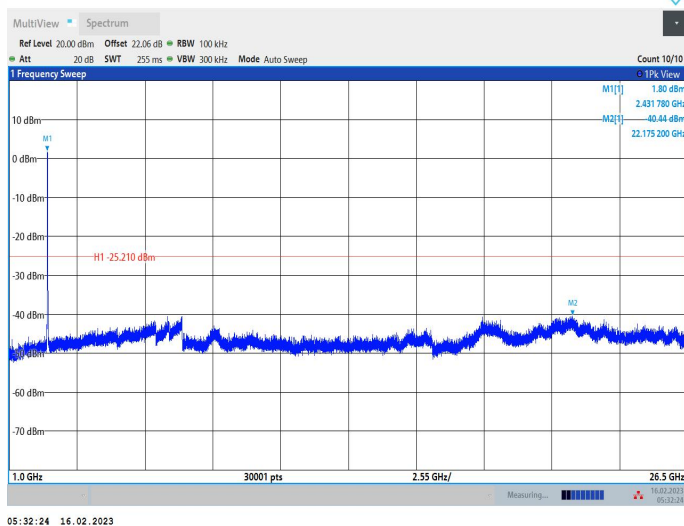
11G_Ant1_2437_0~Reference



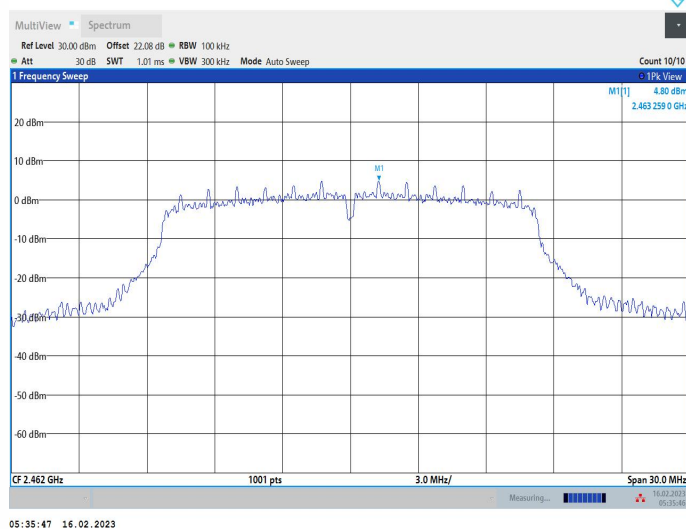
11G_Ant1_2437_30~1000



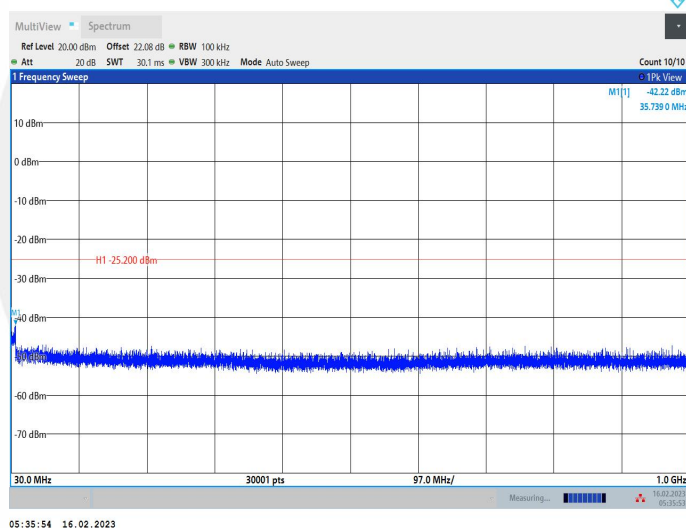
11G_Ant1_2437_1000~26500



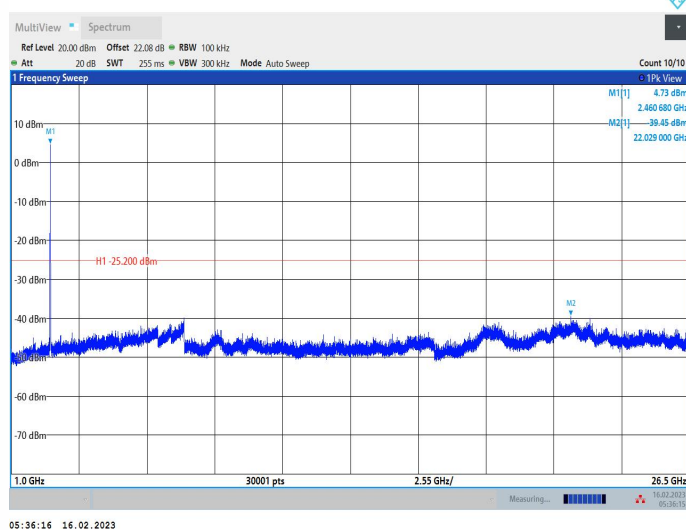
11G_Ant1_2462_0~Reference



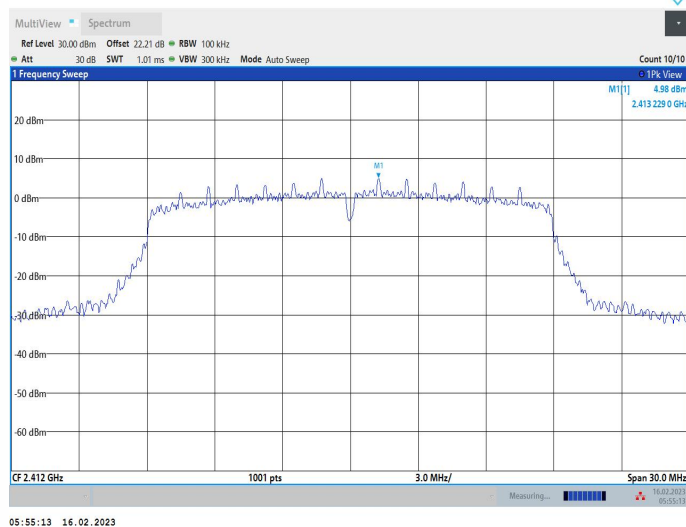
11G_Ant1_2462_30~1000



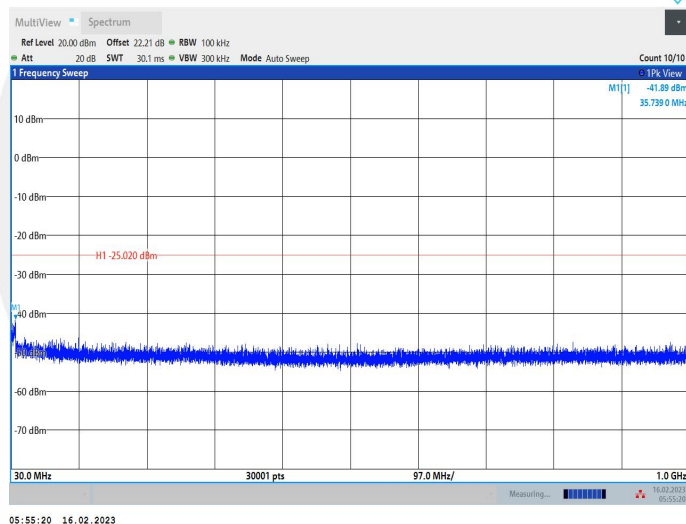
11G_Ant1_2462_1000~26500



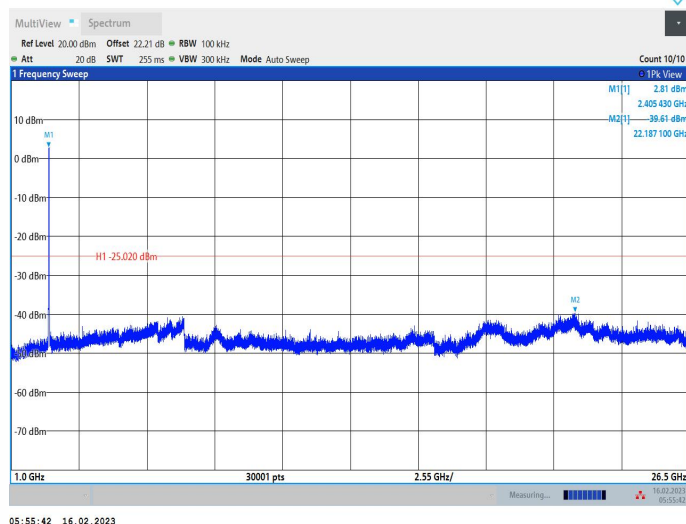
11N20SISO_Ant1_2412_0~Reference



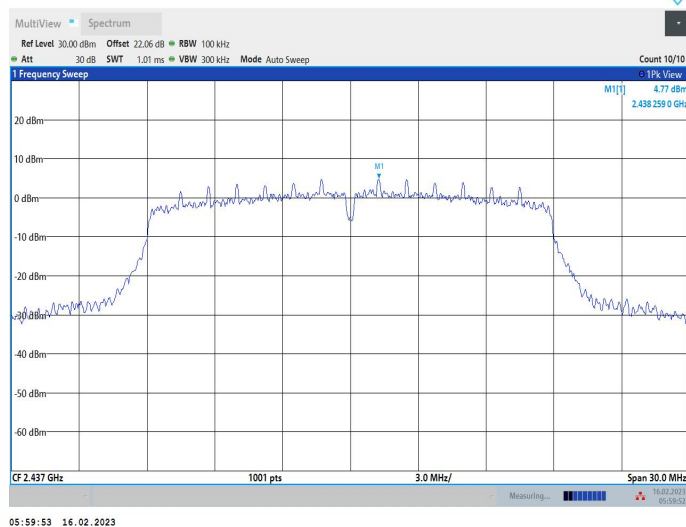
11N20SISO_Ant1_2412_30~1000



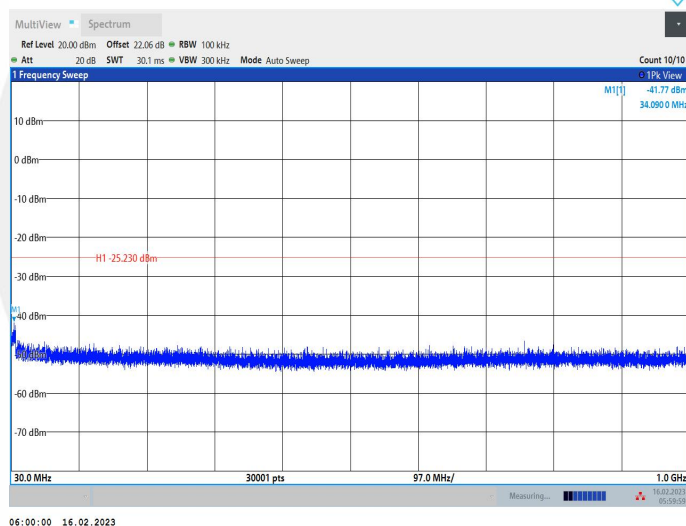
11N20SISO_Ant1_2412_1000~26500



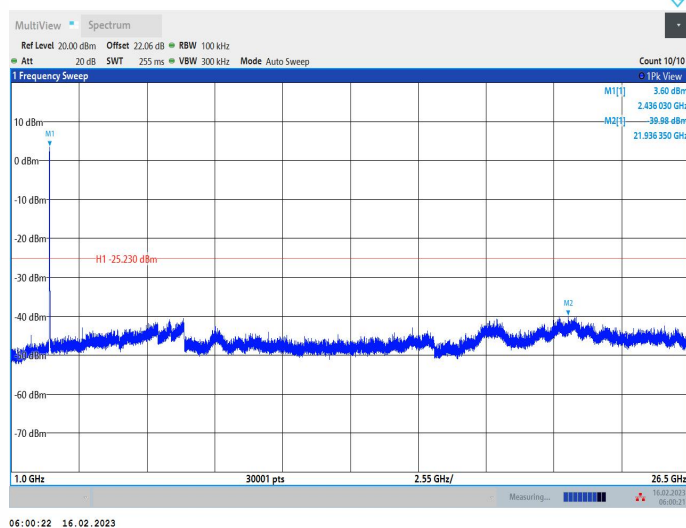
11N20SISO_Ant1_2437_0~Reference



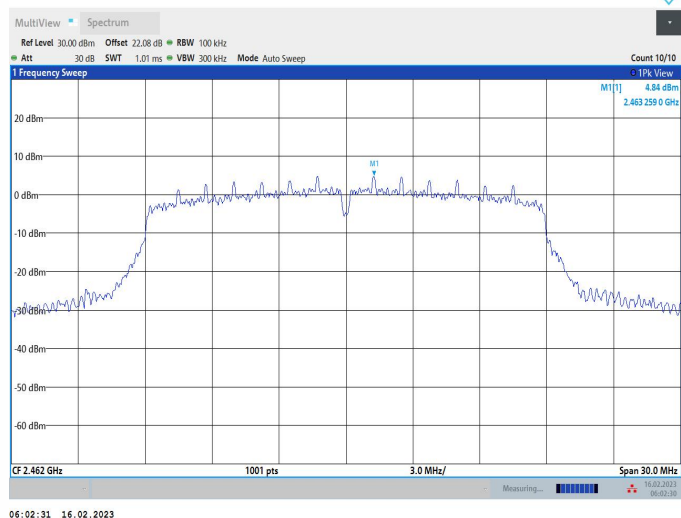
11N20SISO_Ant1_2437_30~1000



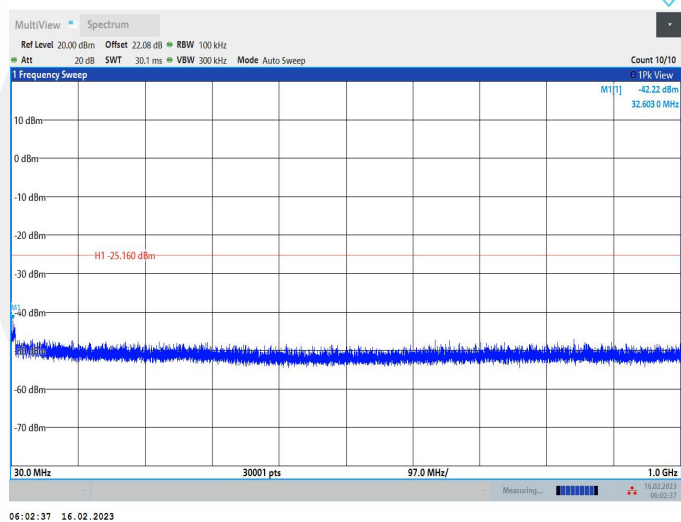
11N20SISO_Ant1_2437_1000~26500



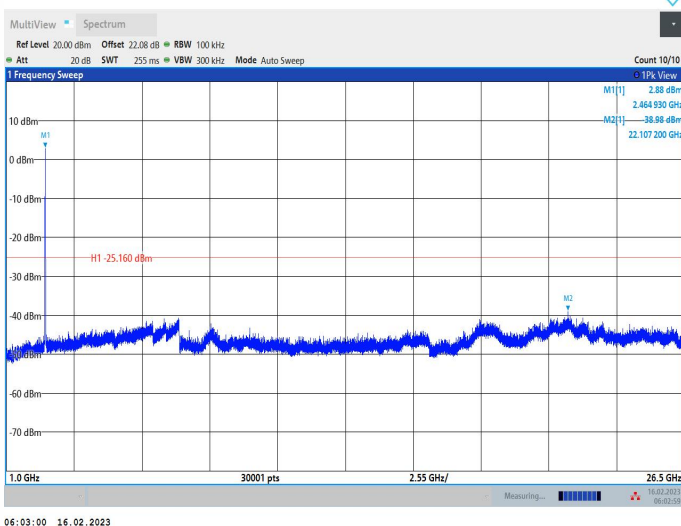
11N20SISO_Ant1_2462_0~Reference



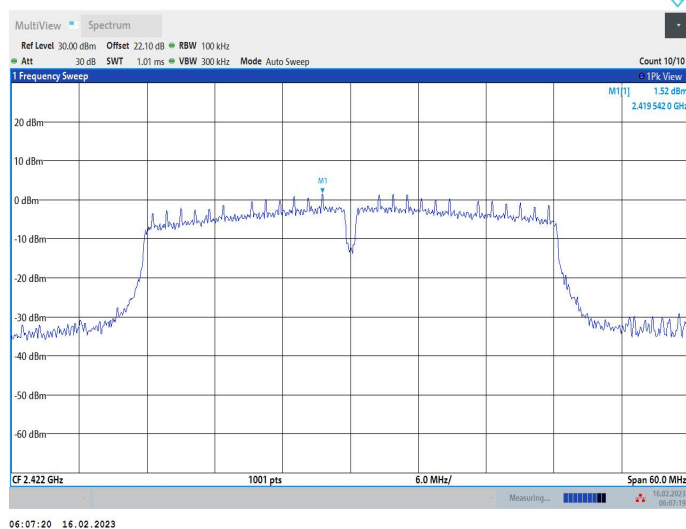
11N20SISO_Ant1_2462_30~1000



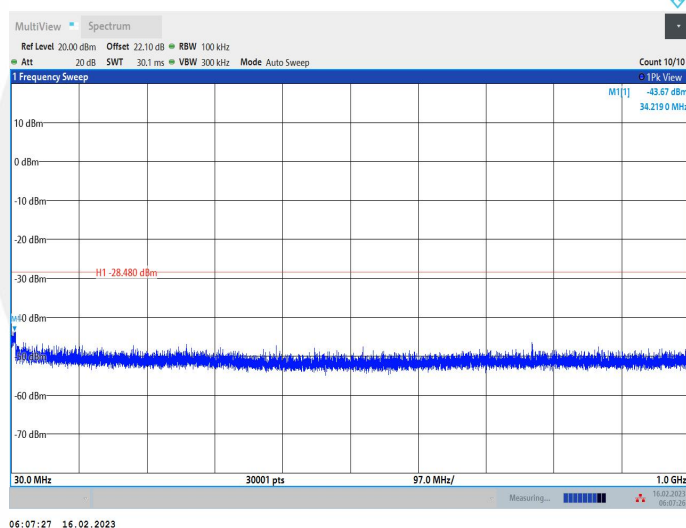
11N20SISO_Ant1_2462_1000~26500



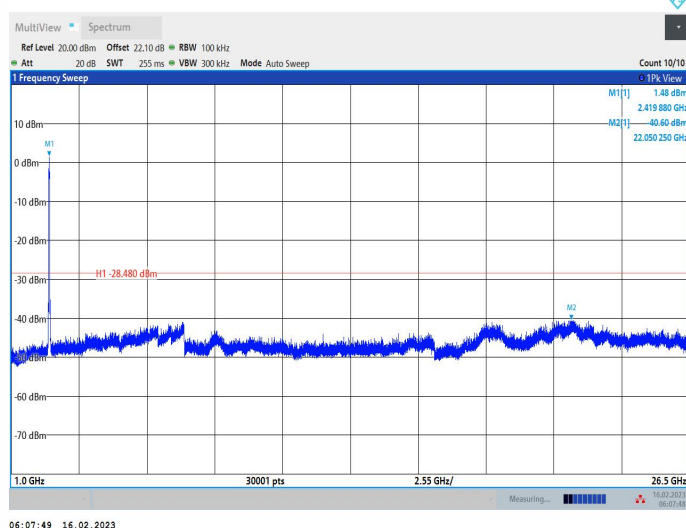
11N40SISO_Ant1_2422_0~Reference



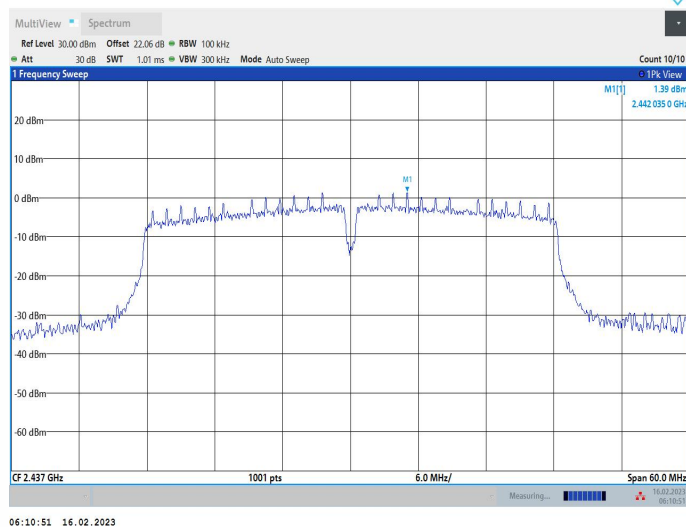
11N40SISO_Ant1_2422_30~1000



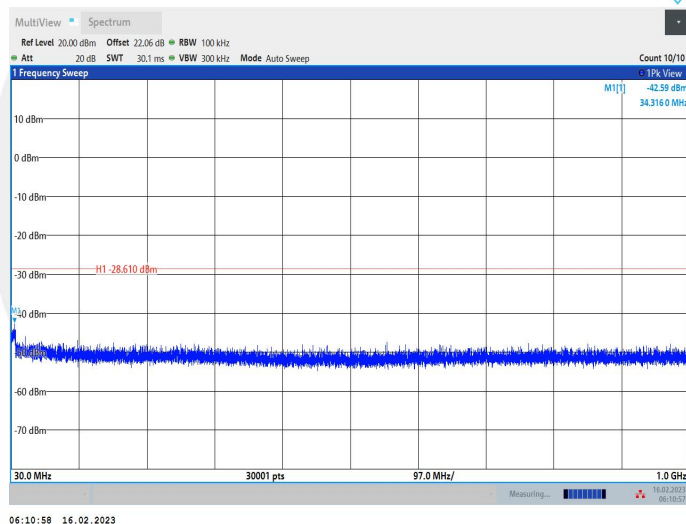
11N40SISO_Ant1_2422_1000~26500



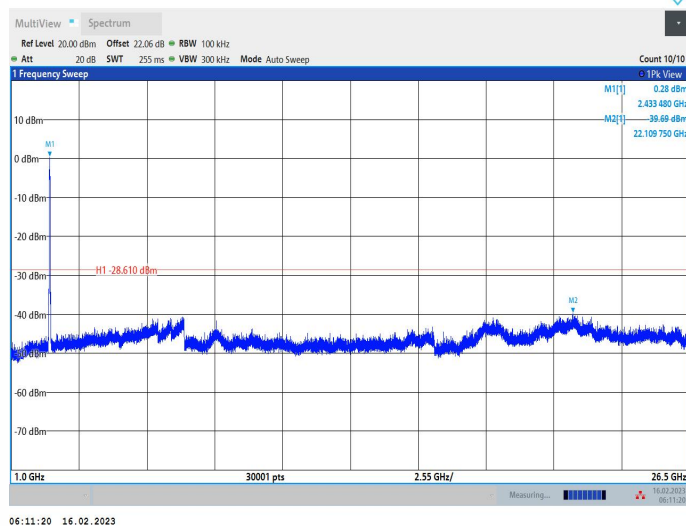
11N40SISO_Ant1_2437_0~Reference



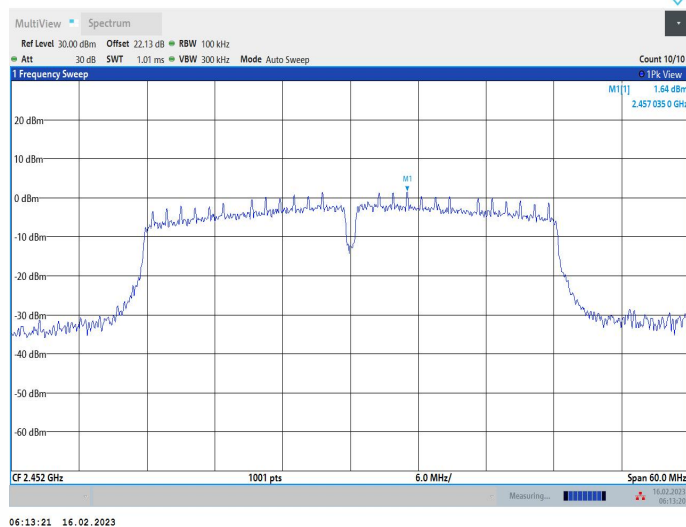
11N40SISO_Ant1_2437_30~1000



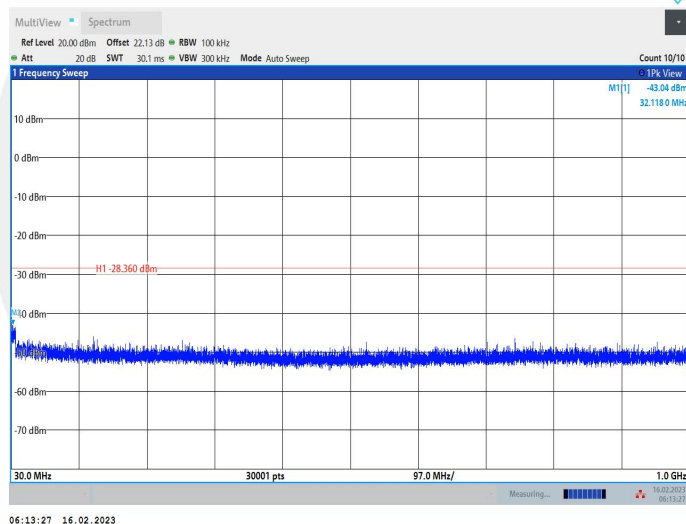
11N40SISO_Ant1_2437_1000~26500



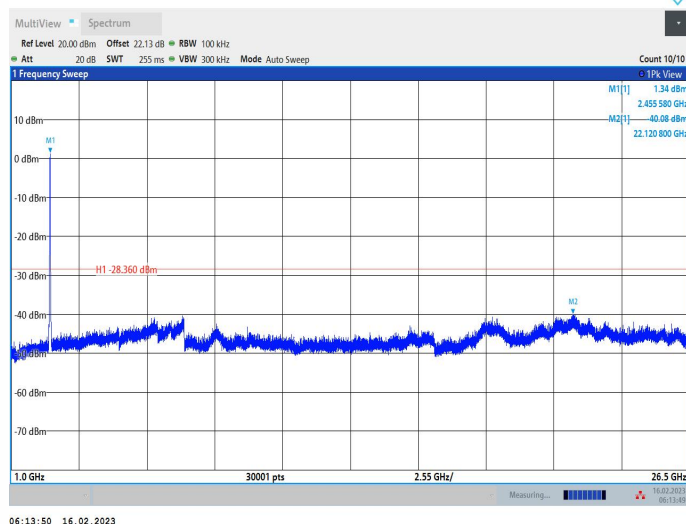
11N40SISO_Ant1_2452_0~Reference



11N40SISO_Ant1_2452_30~1000



11N40SISO_Ant1_2452_1000~26500



8.5 RADIATED SPURIOUS EMISSION

8.5.1 Applicable Standard

According to FCC Part 15.247(d) and 15.209 and KDB 558074 D01 15.247 Meas Guidance v05r02

8.5.2 Conformance Limit

According to FCC Part 15.247(d): radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	24000/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

8.5.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

8.5.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz(1GHz to 25GHz), 100 kHz for $f < 1$ GHz(30MHz to 1GHz), 200Hz for $f < 150$ KHz(9KHz to 150KHz), 9KHz for $f < 30$ MHz(150KHz to 30KHz)

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

8.5.5 Test Results

Temperature:	25° C
Relative Humidity:	60%
ATM Pressure:	1011 mbar

■ Spurious Emission below 30MHz(9KHz to 30MHz)

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance}/\text{test distance})$ (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

- Spurious Emission Above 1GHz(1GHz to 25GHz)
- All antenna modes 2.4G 802.11b/g/n have been tested, and the worst result recorded was report as below:

Test mode: 802.11 b Frequency: Channel 1: 2412MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4822.5	V	55.71	41.86	74	54	18.29	12.14
14673.7	V	63.33	49.97	74	54	10.67	4.03
17636.2	V	68.02	49.85	74	54	5.98	4.15
4824.37	H	55.91	42.58	74	54	18.09	11.42
14626.8	H	64.06	50.21	74	54	9.94	3.79
17602.5	H	69.22	50.62	74	54	4.78	3.38

Test mode: 802.11 b Frequency: Channel 6: 2437MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4873.12	V	54.49	34.82	74	54	19.51	19.18
14726.2	V	63.72	48.92	74	54	10.28	5.08
17988.7	V	69.37	47.94	74	54	4.63	6.06
4873.12	H	54.34	41.48	74	54	19.66	12.52
14660.6	H	63.83	50.14	74	54	10.17	3.86
17617.5	H	69.12	50.26	74	54	4.88	3.74

Test mode: 802.11 b Frequency: Channel 11: 2462MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4923.75	V	52.14	40.17	74	54	21.86	13.83
14578.1	V	63.45	49.13	74	54	10.55	4.87
17964.3	V	69.49	47.95	74	54	4.51	6.05
4923.75	H	51.88	41.72	74	54	22.12	12.28
14666.2	H	64.02	49.90	74	54	9.98	4.10
17611.8	H	69.44	50.08	74	54	4.56	3.92

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

All antenna modes 2.4G 802.11b/g/n have been tested, and the worst result recorded was report as below:

Test mode: 802.11 b Frequency: Channel 1: 2412MHz

Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
2386.32	V	46.99	74	41.67	54
2385.54	H	49.32	74	40.88	54

Test mode: 802.11 b Frequency: Channel 11: 2462MHz

Frequency (MHz)	Polarity	PK(dBuV/m) (VBW=3MHz)	Limit 3m (dBuV/m)	AV(dBuV/m) (VBW=10Hz)	Limit 3m (dBuV/m)
2486.73	V	48.76	74	41.97	54
2487.07	H	51.95	74	41.75	54

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).

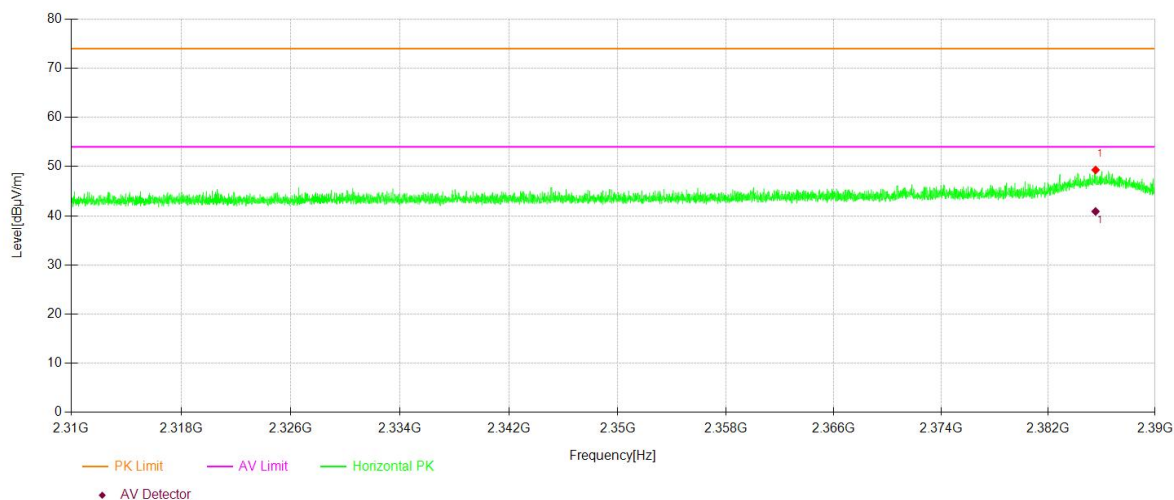
(2) Emission Level= Reading Level+Correct Factor +Cable Loss.

(3) Correct Factor= Ant_F + Cab_L - Preamp

(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

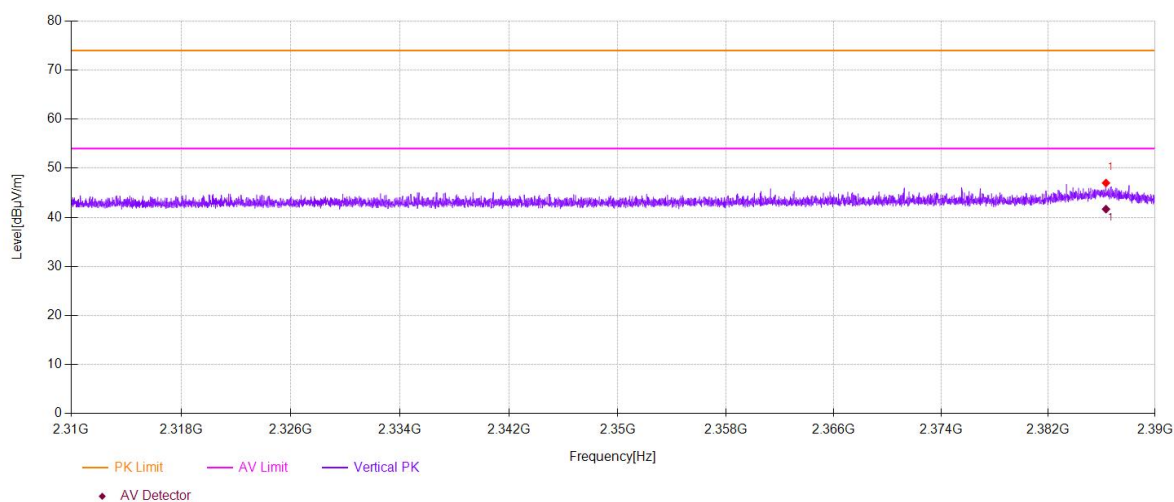
Spurious Emission in Restricted Band 2310-2390MHz

Test Model ☒ 802.11b ☐ 802.11g ☐ 802.11n(HT20) ☐ 802.11n(HT40)
☒ Channel 1: 2412MHz ☐ Channel 3: 2422MHz Polarity: H
 VBW=3MHz



Spurious Emission in Restricted Band 2310-2390MHz

Test Model ☒ 802.11b ☐ 802.11g ☐ 802.11n(HT20) ☐ 802.11n(HT40)
☒ Channel 1: 2412MHz ☐ Channel 3: 2422MHz Polarity: V
 VBW=3MHz

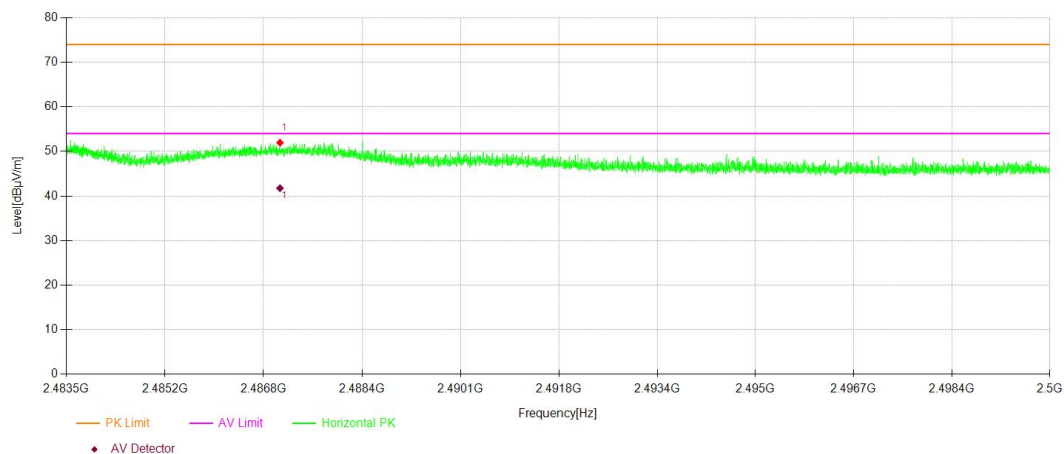


Spurious Emission in Restricted Band 2483.5-2500MHz

Test Model ☒ 802.11b ☐ 802.11g ☐ 802.11n(HT20) ☐ 802.11n(HT40)

☒ Channel 11: 2462MHz ☐ Channel 9: 2452MHz Polarity: H

 VBW=3MHz

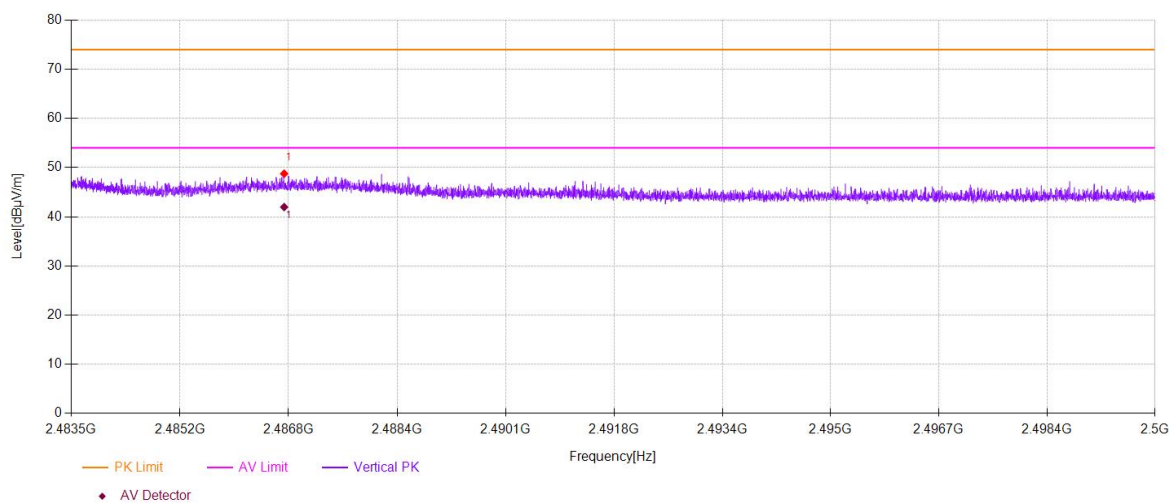


Spurious Emission in Restricted Band 2483.5-2500MHz

Test Model ☒ 802.11b ☐ 802.11g ☐ 802.11n(HT20) ☐ 802.11n(HT40)

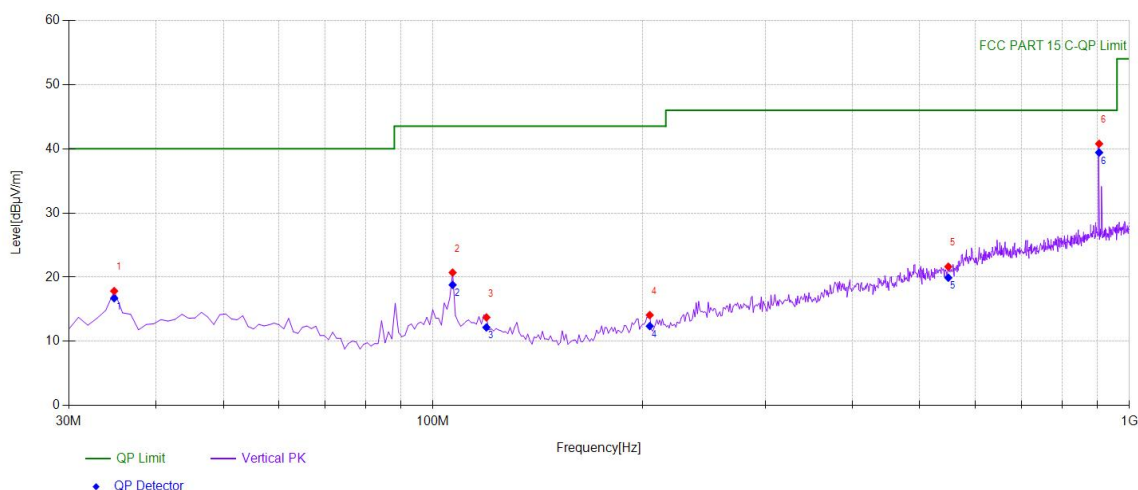
☒ Channel 11: 2462MHz ☐ Channel 9: 2452MHz Polarity: V

 VBW=3MHz



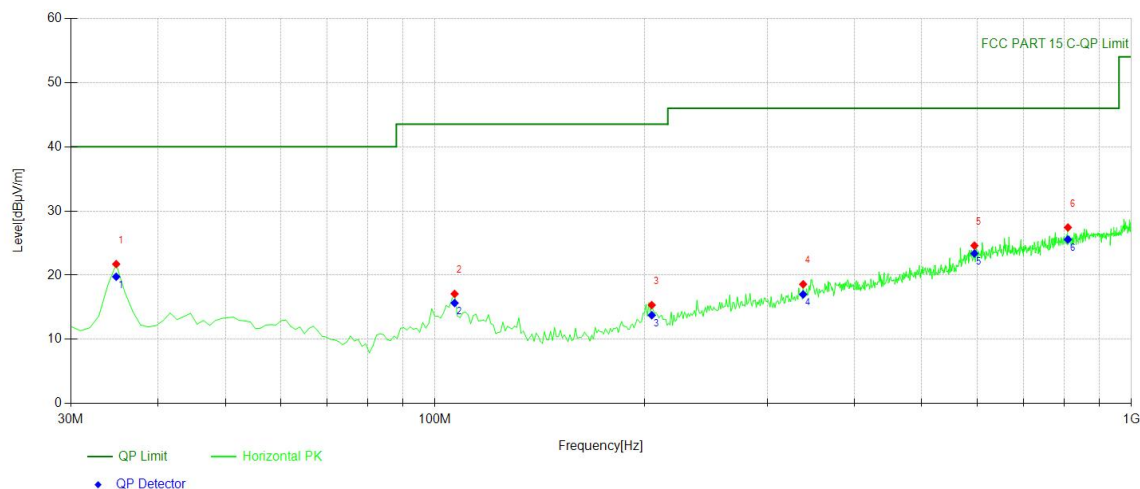
- Spurious Emission below 1GHz (30MHz to 1GHz)
- All antenna modes 2.4G 802.11b/g/n have been tested, and the worst result 802.11b recorded was report as below:

2412



Suspected Data List

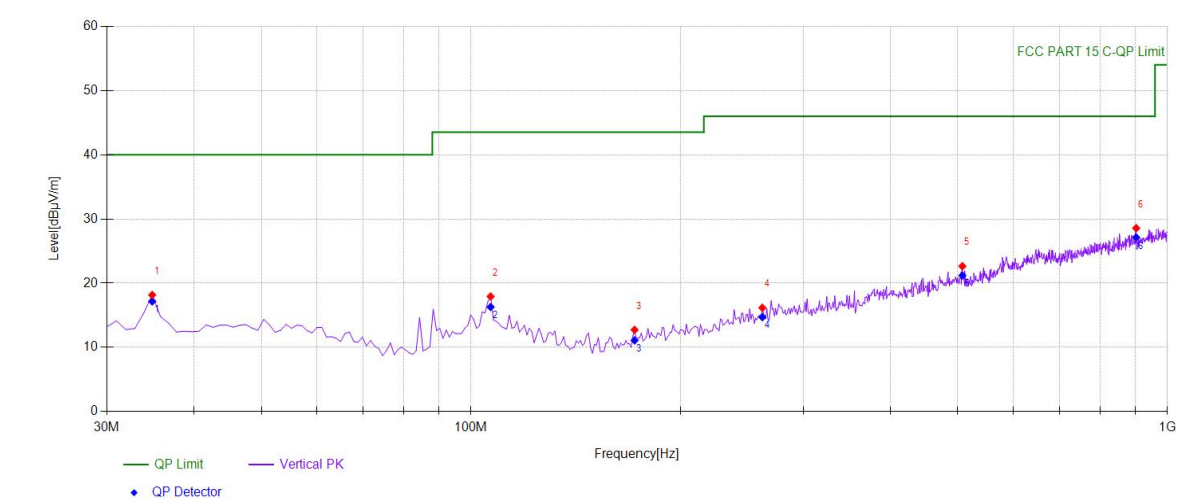
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	34.8549	36.07	-18.23	17.84	PK	40.00	22.16	Vertical
2	106.706	37.87	-17.15	20.72	PK	43.50	22.78	Vertical
3	119.329	31.62	-17.88	13.74	PK	43.50	29.76	Vertical
4	204.774	31.23	-17.13	14.10	PK	43.50	29.40	Vertical
5	549.469	30.85	-9.21	21.64	PK	46.00	24.36	Vertical
6	904.844	43.59	-2.82	40.77	PK	46.00	5.23	Vertical



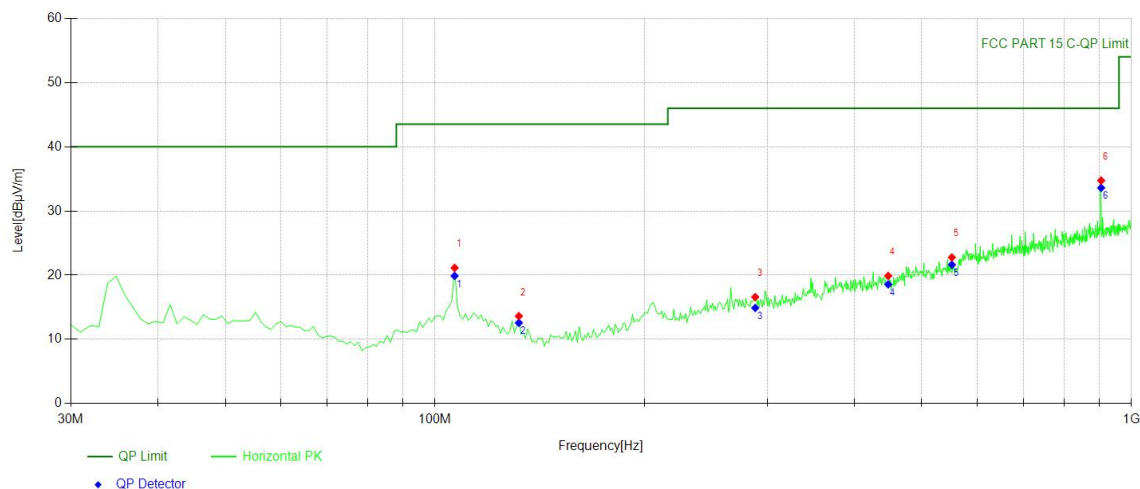
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	34.8549	39.96	-18.23	21.73	PK	40.00	18.27	Horizontal
2	106.706	34.24	-17.15	17.09	PK	43.50	26.41	Horizontal
3	204.774	32.48	-17.13	15.35	PK	43.50	28.15	Horizontal
4	337.797	32.11	-13.52	18.59	PK	46.00	27.41	Horizontal
5	595.105	31.75	-7.14	24.61	PK	46.00	21.39	Horizontal
6	810.660	31.77	-4.34	27.43	PK	46.00	18.57	Horizontal

2437



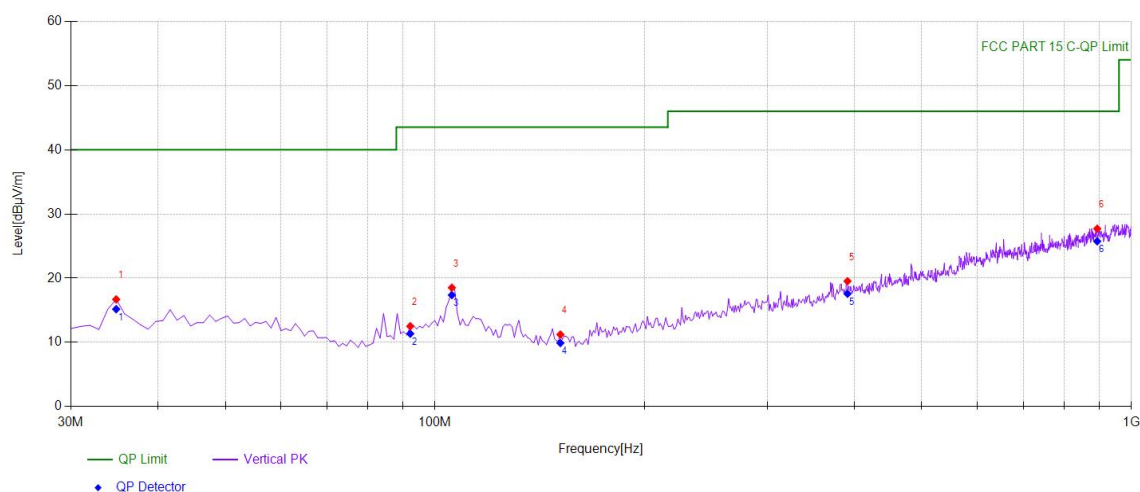
Suspected Data List								
NO.	Freq. [MHz]	Reading [dBµV]	Factor [dB/m]	Level [dBµV/m]	Detector	Limit [dBµV/m]	Margin [dB]	Polarity
1	34.8549	36.40	-18.23	18.17	PK	40.00	21.83	Vertical
2	106.706	35.08	-17.15	17.93	PK	43.50	25.57	Vertical
3	171.761	31.60	-18.86	12.74	PK	43.50	30.76	Vertical
4	262.062	31.26	-15.09	16.17	PK	46.00	29.83	Vertical
5	507.717	32.43	-9.78	22.65	PK	46.00	23.35	Vertical
6	901.931	31.39	-2.82	28.57	PK	46.00	17.43	Vertical



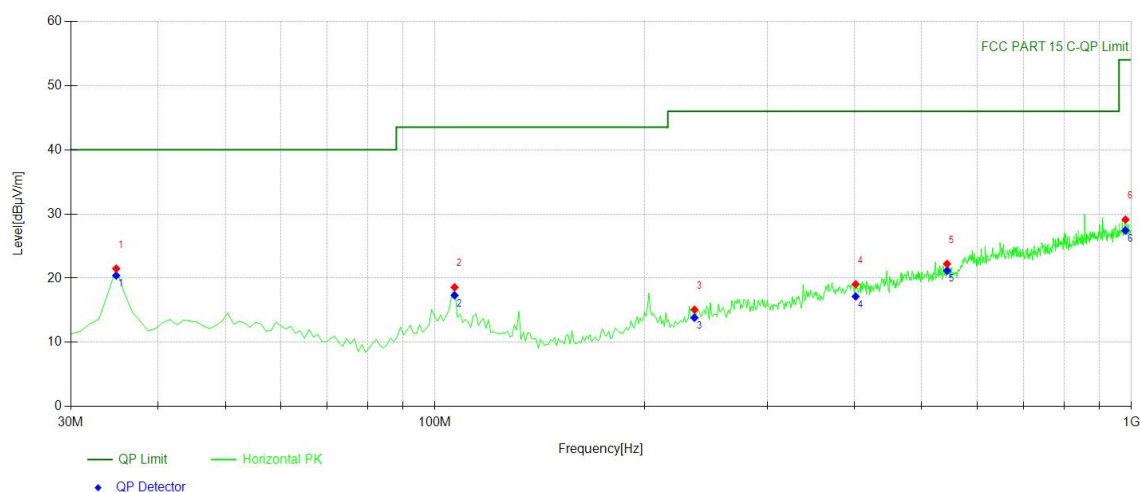
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	106.706	38.29	-17.15	21.14	PK	43.50	22.36	Horizontal
2	131.952	32.82	-19.19	13.63	PK	43.50	29.87	Horizontal
3	288.278	30.75	-14.16	16.59	PK	46.00	29.41	Horizontal
4	447.517	31.04	-11.14	19.90	PK	46.00	26.10	Horizontal
5	552.382	31.93	-9.16	22.77	PK	46.00	23.23	Horizontal
6	904.844	37.56	-2.82	34.74	PK	46.00	11.26	Horizontal

2462



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	34.8549	34.93	-18.23	16.70	PK	40.00	23.30	Vertical
2	92.1421	31.18	-18.66	12.52	PK	43.50	30.98	Vertical
3	105.735	35.63	-17.10	18.53	PK	43.50	24.97	Vertical
4	151.371	30.97	-19.74	11.23	PK	43.50	32.27	Vertical
5	391.201	31.37	-11.83	19.54	PK	46.00	26.46	Vertical
6	893.193	30.57	-2.86	27.71	PK	46.00	18.29	Vertical



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	34.8549	39.72	-18.23	21.49	PK	40.00	18.51	Horizontal
2	106.706	35.73	-17.15	18.58	PK	43.50	24.92	Horizontal
3	235.845	30.68	-15.58	15.10	PK	46.00	30.90	Horizontal
4	401.881	30.84	-11.79	19.05	PK	46.00	26.95	Horizontal
5	543.643	31.44	-9.22	22.22	PK	46.00	23.78	Horizontal
6	980.580	30.90	-1.78	29.12	PK	54.00	24.88	Horizontal

8.6 CONDUCTED EMISSIONS TEST

8.6.1 Applicable Standard

According to FCC Part 15.207(a)

8.6.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.6.3 Test Configuration

Test according to clause 7.3conducted emission test setup

8.6.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.

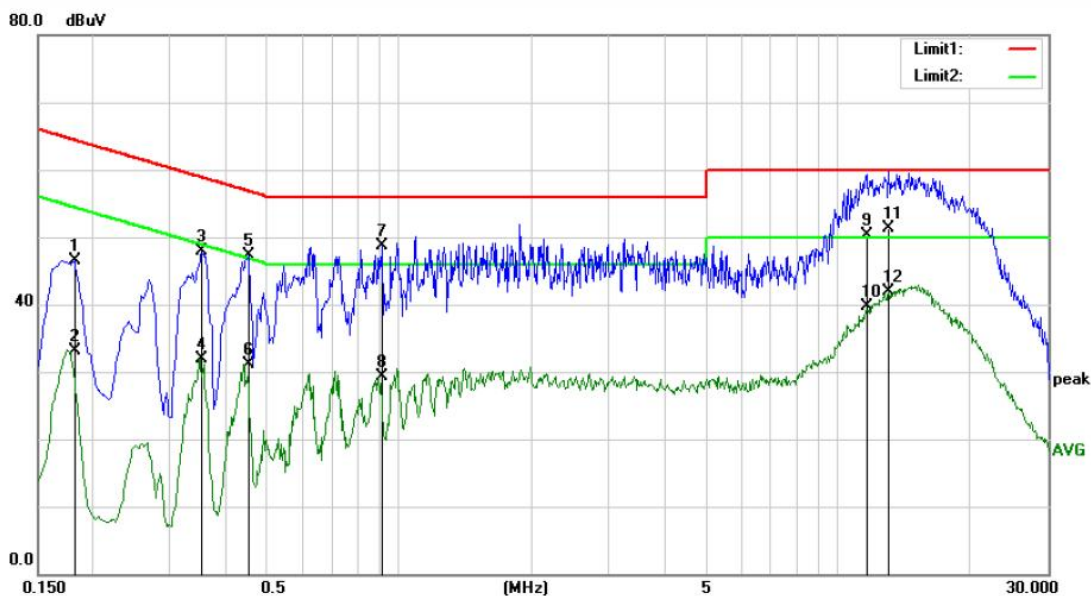
Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Repeat above procedures until all frequency measured were complete.

8.6.5 Test Results

Pass

The AC120V voltage has been tested, and the worst result recorded was report as below:



Site Conduction #2

Phase: N

Temperature: 25.1

Limit: (CE)FCC PART 15 class B_QP

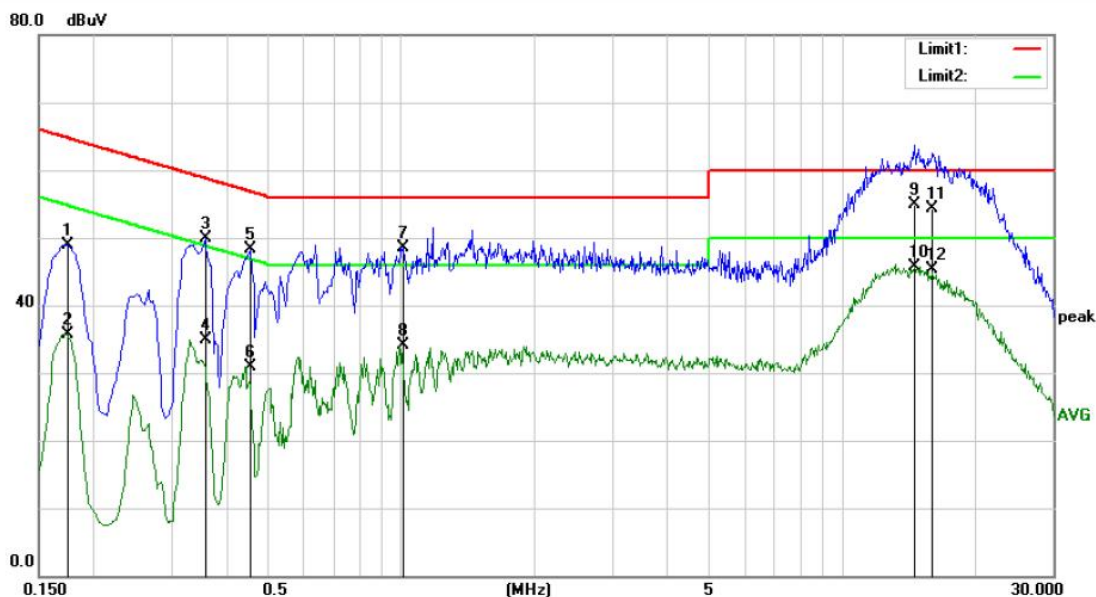
Power: AC 120V/60Hz

Humidity: 45 %

Mode: WIFI mode

Note:

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over		
		MHz	Level	Factor	ment			Detector	Comment
			dBuV	dB	dBuV	dBuV	dB		
1		0.1820	36.39	10.10	46.49	64.39	-17.90	QP	
2		0.1820	23.10	10.10	33.20	54.39	-21.19	AVG	
3		0.3540	37.73	10.10	47.83	58.87	-11.04	QP	
4		0.3540	21.89	10.10	31.99	48.87	-16.88	AVG	
5		0.4540	37.21	10.10	47.31	56.80	-9.49	QP	
6		0.4540	21.03	10.10	31.13	46.80	-15.67	AVG	
7	*	0.9100	38.45	10.16	48.61	56.00	-7.39	QP	
8		0.9100	19.09	10.16	29.25	46.00	-16.75	AVG	
9		11.6100	39.93	10.47	50.40	60.00	-9.60	QP	
10		11.6100	29.15	10.47	39.62	50.00	-10.38	AVG	
11		13.0180	40.81	10.49	51.30	60.00	-8.70	QP	
12		13.0180	31.51	10.49	42.00	50.00	-8.00	AVG	



Site Conduction #2

Phase: **L1**

Temperature: 25.1

Limit: (CE)FCC PART 15 class B_QP

Power: AC 120V/60Hz

Humidity: 45 %

Mode: WIFI mode

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1740	38.78	10.09	48.87	64.77	-15.90	QP	
2		0.1740	25.61	10.09	35.70	54.77	-19.07	AVG	
3		0.3580	39.75	10.10	49.85	58.77	-8.92	QP	
4		0.3580	24.80	10.10	34.90	48.77	-13.87	AVG	
5		0.4540	38.21	10.10	48.31	56.80	-8.49	QP	
6		0.4540	20.81	10.10	30.91	46.80	-15.89	AVG	
7		1.0100	38.27	10.18	48.45	56.00	-7.55	QP	
8		1.0100	23.93	10.18	34.11	46.00	-11.89	AVG	
9		14.5340	44.38	10.52	54.90	60.00	-5.10	QP	
10	*	14.5340	35.12	10.52	45.64	50.00	-4.36	AVG	
11		15.9980	43.80	10.50	54.30	60.00	-5.70	QP	
12		15.9980	34.86	10.50	45.36	50.00	-4.64	AVG	

8.7 ANTENNA APPLICATION

8.7.1 Antenna Requirement

Standard	Requirement
FCC CRF Part15.203	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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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.

8.7.2 Result

PASS.

The EUT is Internal Antenna, the gain is 0.92 dBi.

Note:

- ☒ Antenna uses a permanently attached antenna which is not replaceable.
- ☐ Not using a standard antenna jack or electrical connector for antenna replacement
- ☐ The antenna has to be professionally installed (please provide method of installation)

Which in accordance to section 15.203, please refer to the internal photos.

Detail of factor for radiated emission

Frequency(MHz)	Ant_F(dB)	Cab_L(dB)	Preamp(dB)	Correct Factor(dB)
0.009	20.6	0.03	\	20.63
0.15	20.7	0.1	\	20.8
1	20.9	0.15	\	21.05
10	20.1	0.28	\	20.38
30	18.8	0.45	\	19.25
30	11.7	0.62	27.9	-15.58
100	12.5	1.02	27.8	-14.28
300	12.9	1.91	27.5	-12.69
600	19.2	2.92	27	-4.88
800	21.1	3.54	26.6	-1.96
1000	22.3	4.17	26.2	0.27
1000	25.6	1.76	41.4	-14.04
3000	28.9	3.27	43.2	-11.03
5000	31.1	4.2	44.6	-9.3
8000	36.2	5.95	44.7	-2.55
10000	38.4	6.3	43.9	0.8
12000	38.5	7.14	42.3	3.34
15000	40.2	8.15	41.4	6.95
18000	45.4	9.02	41.3	13.12
18000	37.9	1.81	47.9	-8.19
21000	37.9	1.95	48.7	-8.85
25000	39.3	2.01	42.8	-1.49
28000	39.6	2.16	46.0	-4.24
31000	41.2	2.24	44.5	-1.06
34000	41.5	2.29	46.6	-2.81
37000	43.8	2.30	46.4	-0.3
40000	43.2	2.50	42.2	3.5

*** End of Report ***