

All modulation modes were tested, and the worst data is shown in the table below:

Reference level measurement

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm]
11B	Ant1	2412	2411.49	7.72
		2437	2437.48	6.03
		2462	2461.48	3.84

Band edge measurements

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	7.71	-35.31	≤-22.3	PASS
		High	2462	3.79	-36.53	≤-26.21	PASS

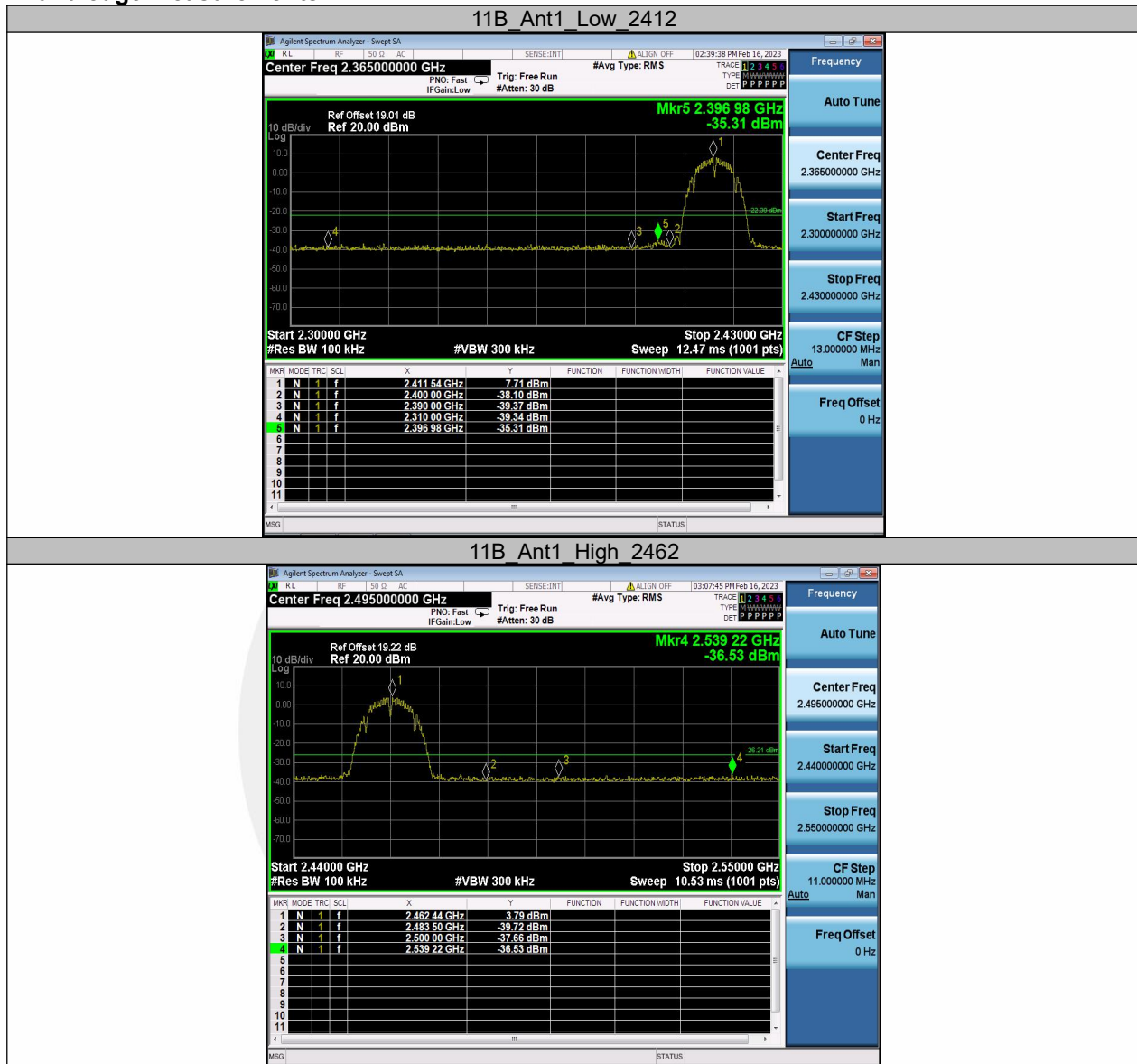
Emission level measurement

TestMode	Antenna	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	7.69	7.69	---	PASS
			30~1000	7.69	-46.33	≤-22.31	PASS
			1000~26500	7.69	-30.6	≤-22.31	PASS
		2437	Reference	5.99	5.99	---	PASS
			30~1000	5.99	-45.98	≤-24.01	PASS
			1000~26500	5.99	-29.8	≤-24.01	PASS
		2462	Reference	3.84	3.84	---	PASS
			30~1000	3.84	-45.91	≤-26.16	PASS
			1000~26500	3.84	-30.02	≤-26.16	PASS

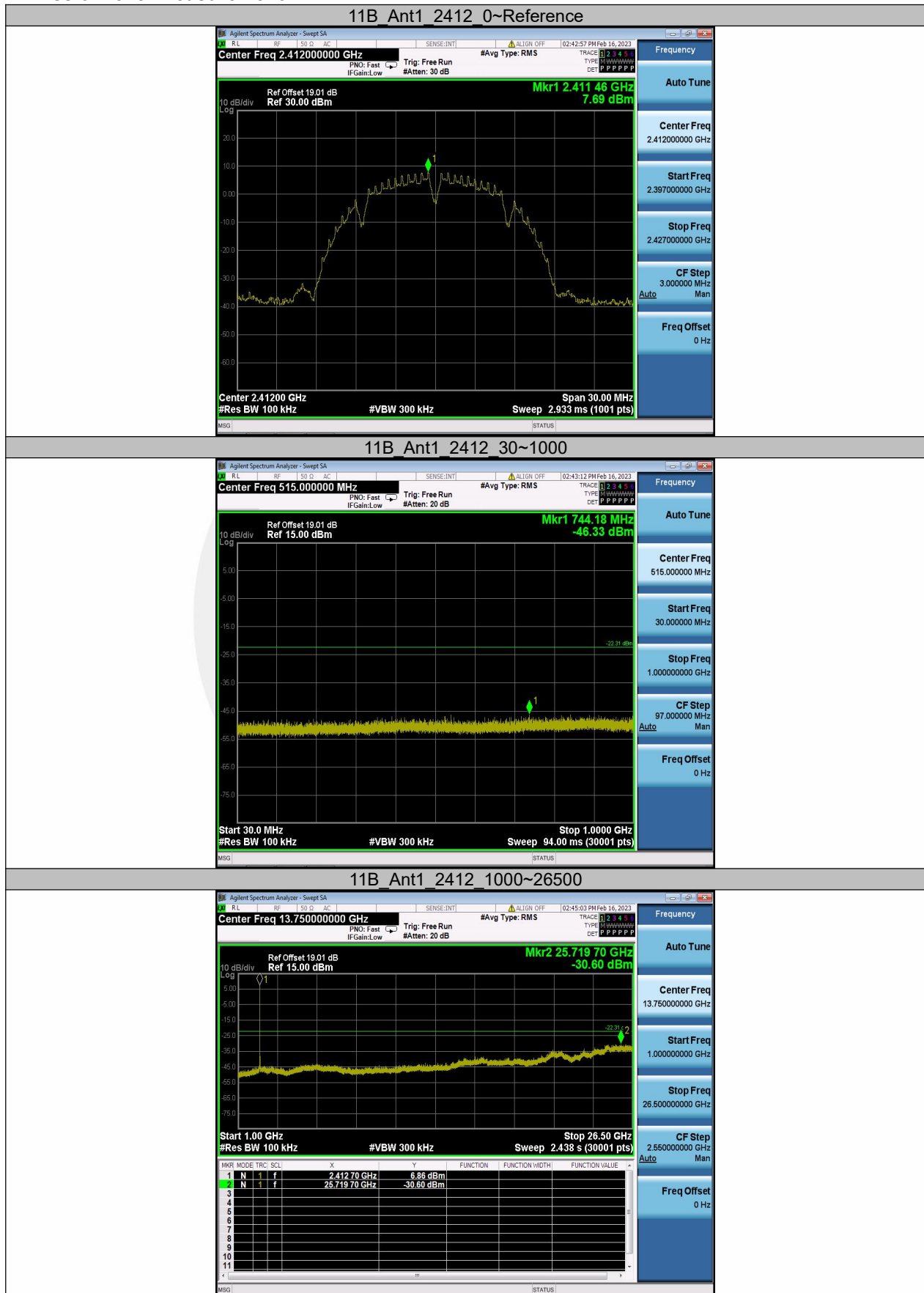
Reference level measurement



Band edge measurements



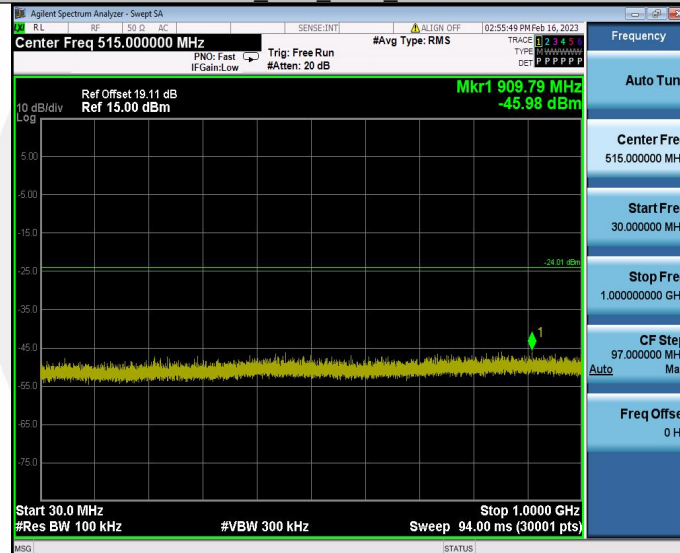
Emission level measurement



11B_Ant1_2437_0~Reference



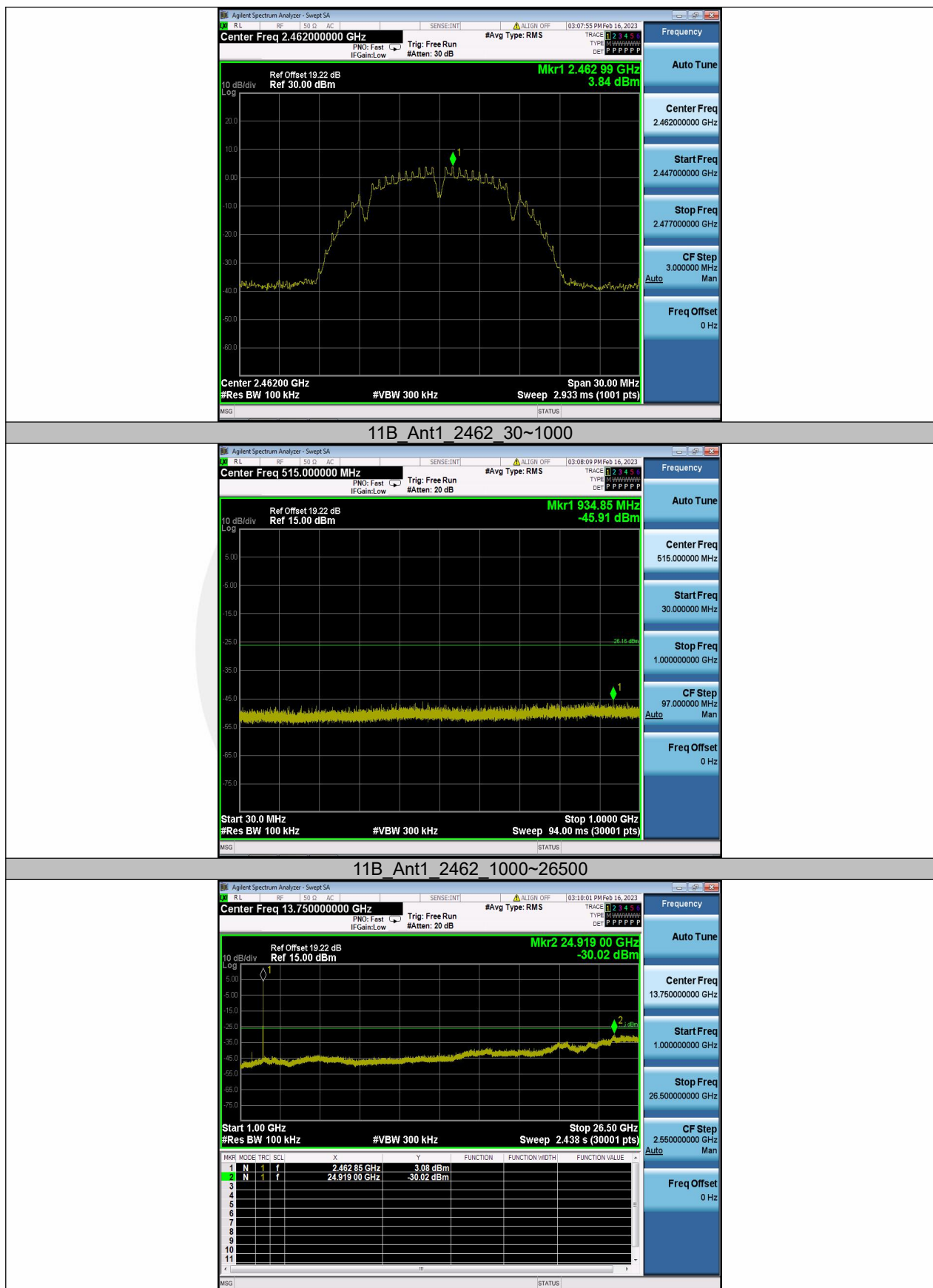
11B_Ant1_2437_30~1000



11B_Ant1_2437_1000~26500



11B_Ant1_2462_0~Reference



7.5 RADIATED EMISSION

7.5.1 Applicable Standard

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

7.5.2 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

7.5.3 Test Configuration

Test according to clause 6.2 radio frequency test setup 2.

7.5.4 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:

For Above 1GHz:

The EUT was placed on a turn table which is 1.5m 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.

VBW ≥ RBW.

Sweep = auto.

Detector function = peak.
Trace = max hold.

For Below 1GHz:

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 = 100 kHz.
VBW $\geq$ RBW.
Sweep = auto.
Detector function = peak.
Trace = max hold.

For Below 30MHz:

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 = 9kHz.
VBW $\geq$ RBW.
Sweep = auto.
Detector function = peak.
Trace = max hold.

For Below 150KHz:

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 = 200Hz.
VBW $\geq$ RBW.
Sweep = auto.
Detector function = peak.
Trace = max hold.

Follow the guidelines in ANSI C63.10 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. 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. 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 limit. Submit this data.
Repeat above procedures until all frequency measured was complete.

7.5.5 Test Results

Temperature:	28.1° C
Relative Humidity:	43%
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)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: Data of measurement within this frequency range shown “ -- ” in the table above means 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 Above 1GHz(1GHz to 25GHz)

All modes 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.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
4822.5	V	53.31	74.00	20.69	peak
14626.8	V	64.30	74.00	9.70	peak
17619.3	V	70.14	74.00	3.86	peak
4822.509	V	40.05	54.00	13.95	AVG
14626.87	V	50.67	54.00	3.33	AVG
17619.37	V	50.15	54.00	3.85	AVG
4822.5	H	53.83	74.00	20.17	peak
14641.8	H	64.79	74.00	9.21	peak
17619.3	H	70.18	74.00	3.82	peak
4822.478	H	40.06	54.00	13.94	AVG
14641.87	H	50.42	54.00	3.58	AVG
17619.37	H	49.87	54.00	4.13	AVG

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

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
4873.12	V	52.15	74.00	21.85	peak
14716.8	V	63.93	74.00	10.07	peak
17634.3	V	70.95	74.00	3.05	peak
4873.173	V	39.86	54.00	14.14	AVG
14716.87	V	49.17	54.00	4.83	AVG
17634.37	V	49.61	54.00	4.39	AVG
4873.12	H	52.60	74.00	21.40	peak
14701.8	H	64.80	74.00	9.20	peak
17962.5	H	70.12	74.00	3.88	peak
4873.148	H	39.36	54.00	14.64	AVG
14701.87	H	49.29	54.00	4.71	AVG
17962.5	H	48.05	54.00	5.95	AVG

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

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
4923.75	V	53.42	74.00	20.58	peak
14658.7	V	63.91	74.00	10.09	peak
17621.2	V	69.18	74.00	4.82	peak
4923.741	V	44.11	54.00	9.89	AVG
14658.75	V	50.20	54.00	3.80	AVG
17621.25	V	50.33	54.00	3.67	AVG
4923.75	H	51.61	74.00	22.39	peak
14673.7	H	64.30	74.00	9.70	peak
17596.8	H	69.45	74.00	4.55	peak
4923.763	H	46.99	54.00	7.01	AVG
14673.75	H	49.87	54.00	4.13	AVG
17596.87	H	50.55	54.00	3.45	AVG

- Note:** (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
 (2) Emission Level= Reading Level+Correct Factor.
 (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 modes have been tested, and the worst result recorded was report as below:

Test mode: 802.11n(20MHz) Frequency: Channel 1: 2412MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
2385.51	V	57.58	74.00	16.42	peak
2385.543	V	44.82	54.00	9.18	AVG
2386.44	H	65.44	74.00	8.56	peak
2386.457	H	51.05	54.00	2.95	AVG

Test mode: 802.11n(20MHz) Frequency: Channel 11: 2462MHz

Freq. (MHz)	Ant.Pol.	Emission Level(dBuV/m)	Limit 3m(dBuV/m)	Over(dB)	Detector
2483.83	V	57.47	74.00	16.53	peak
2483.873	V	45.00	54.00	9.00	AVG
2483.55	H	63.63	74.00	10.37	peak
2483.529	H	46.60	54.00	7.40	AVG

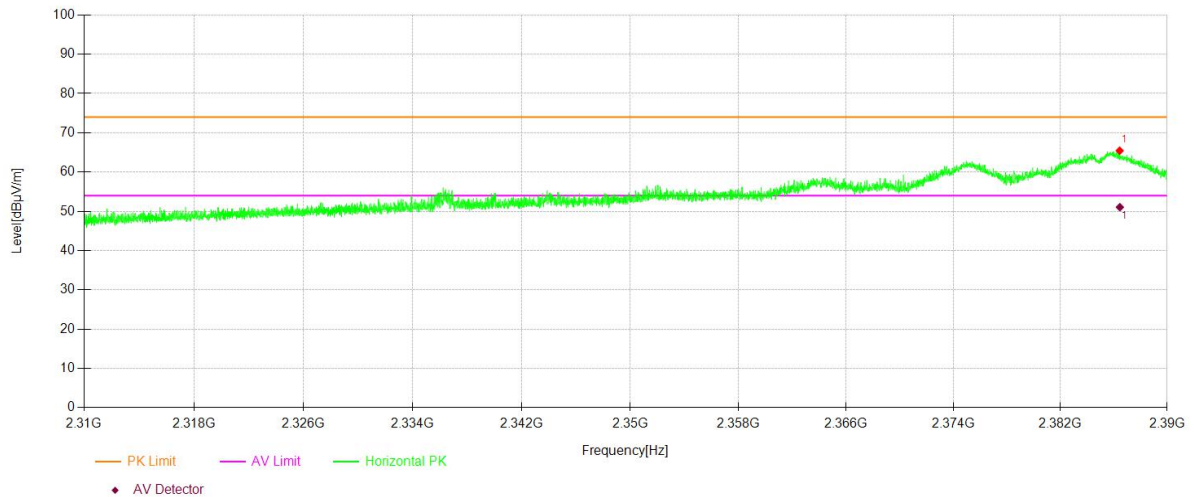
Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
(2) Emission Level= Reading Level+Correct Factor.
(3) Correct Factor= Ant_F + Cab_L - Preamp
(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be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

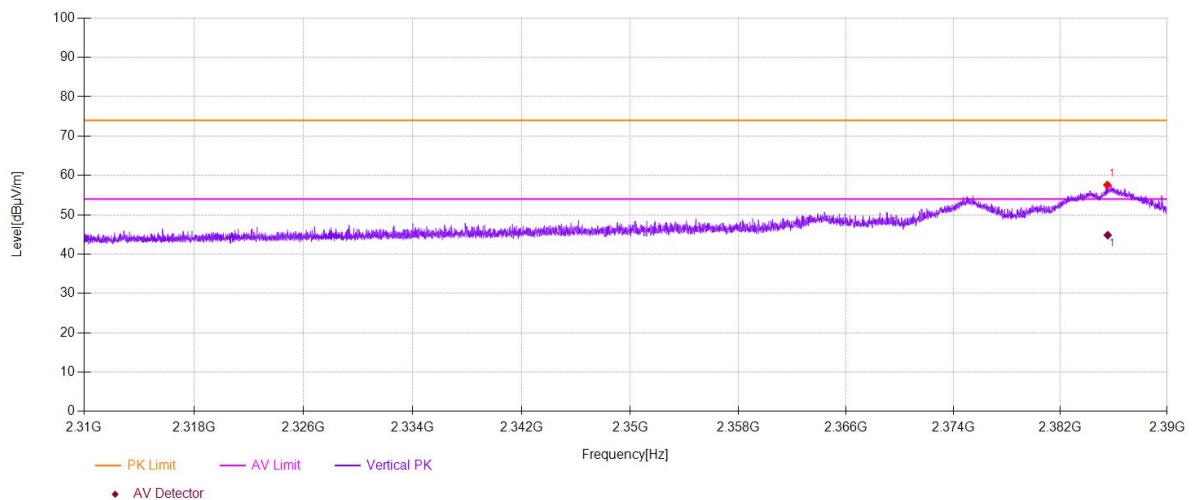


Spurious Emission in Restricted Band 2310-2390MHz

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

☒ Channel 1:2412MHz ☐ Channel 3: 2422MHz Polarity: V

VBW=3MHz

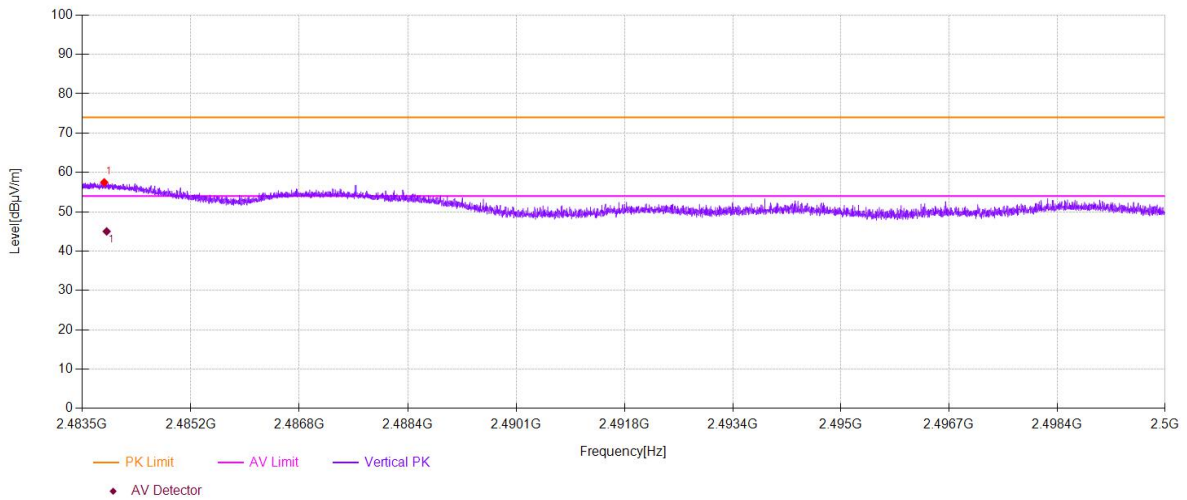


Spurious Emission in Restricted Band 2483.5-2500MHz

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

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

VBW=3MHz

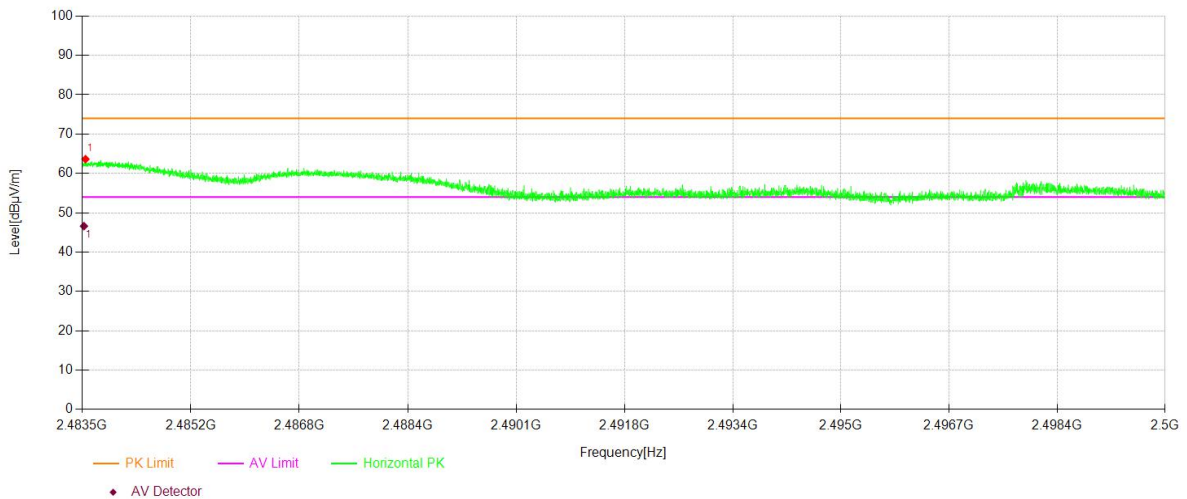


Spurious Emission in Restricted Band 2483.5-2500MHz

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

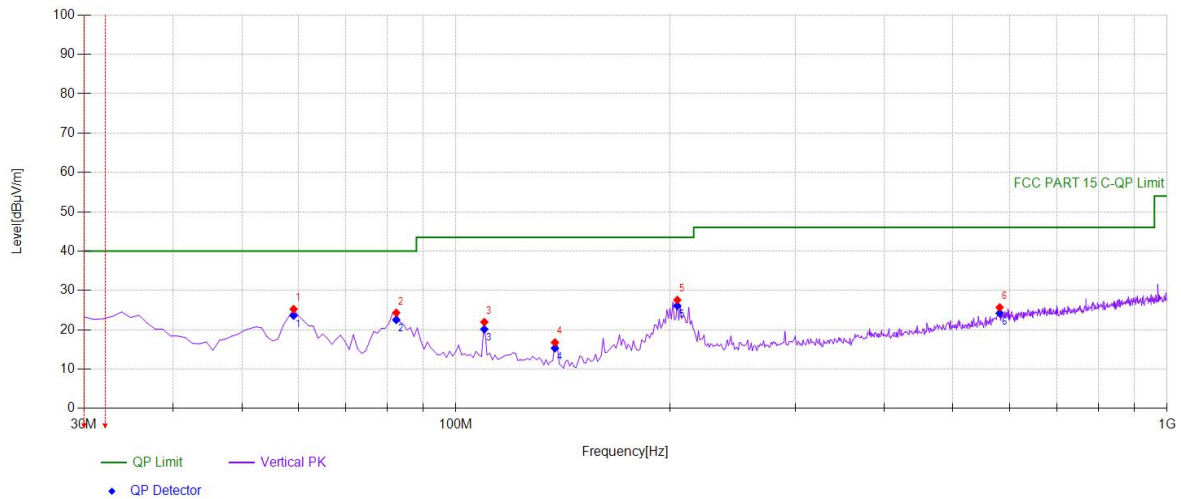
☒ Channel 11: 2462MHz ☐ Channel 9: 2452MHz Polarity: V

VBW=3MHz



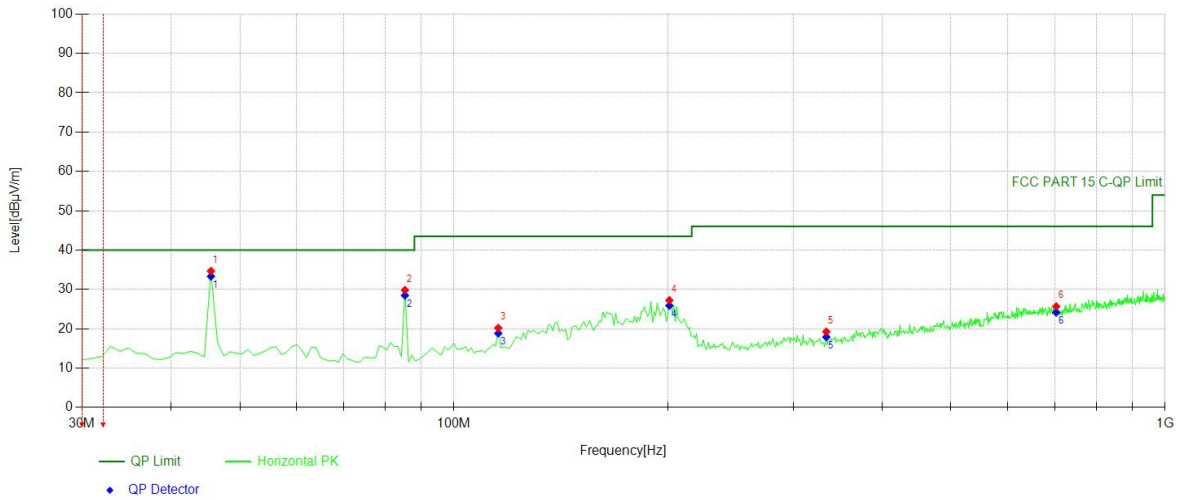
- Spurious Emission below 1GHz (30MHz to 1GHz)
All modes have been tested, and the worst result recorded was report as below:

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



Suspected Data List

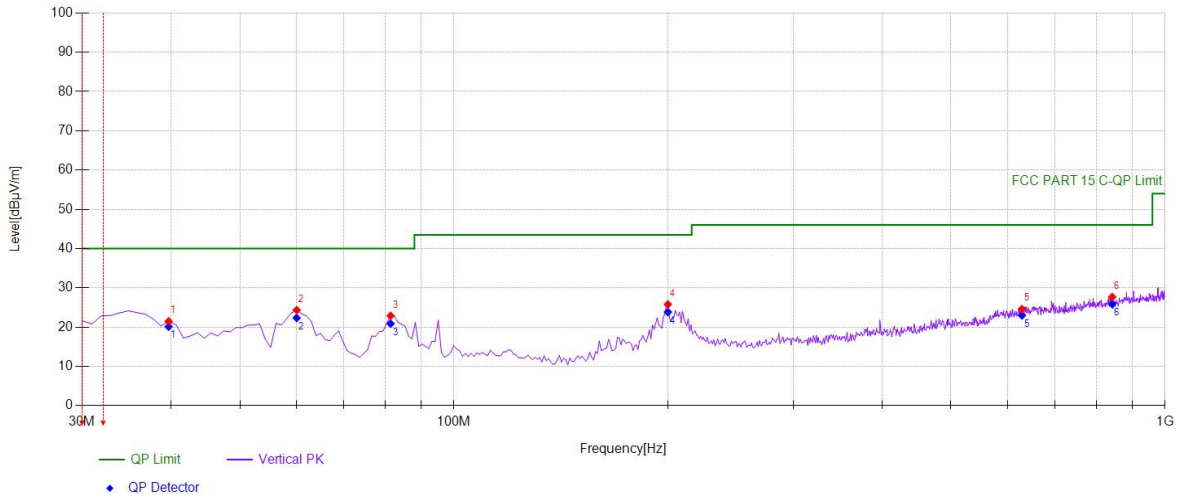
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height[cm]
1	59.1291	43.69	-18.43	25.26	PK	40.00	14.74	Vertical	74	100
2	82.4324	45.26	-20.92	24.34	PK	40.00	15.66	Vertical	269	100
3	109.619	39.26	-17.30	21.96	PK	43.50	21.54	Vertical	0	100
4	137.777	36.55	-19.78	16.77	PK	43.50	26.73	Vertical	154	100
5	204.774	44.69	-17.13	27.56	PK	43.50	15.94	Vertical	322	100
6	581.511	32.83	-7.14	25.69	PK	46.00	20.31	Vertical	157	100



Suspected Data List

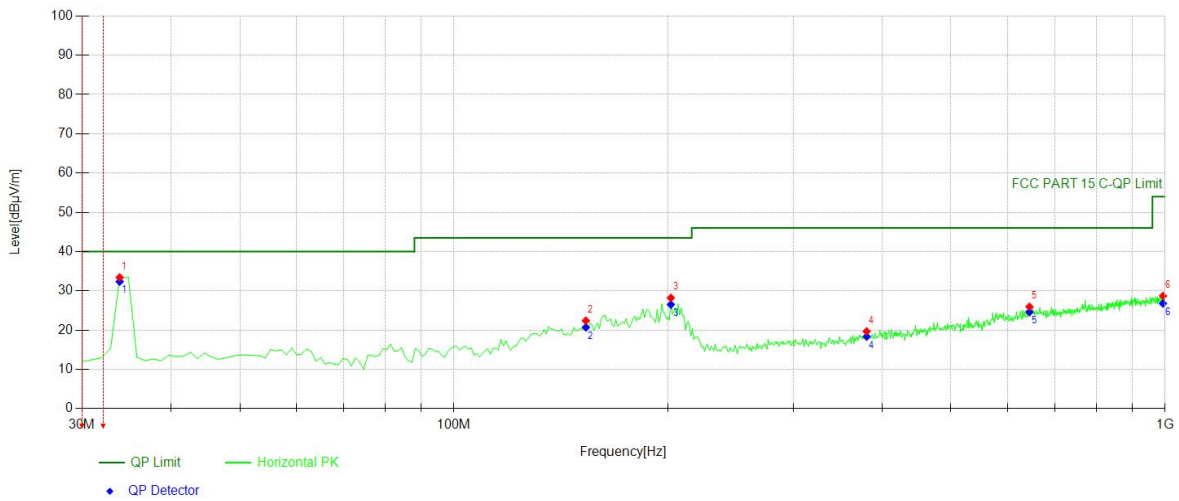
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height [cm]
1	45.5355	52.20	-17.53	34.67	PK	40.00	5.33	Horizon	277	100
2	85.3453	50.08	-20.24	29.84	PK	40.00	10.16	Horizon	280	100
3	115.445	37.84	-17.65	20.19	PK	43.50	23.31	Horizon	346	100
4	200.890	44.37	-17.13	27.24	PK	43.50	16.26	Horizon	173	100
5	333.913	32.91	-13.64	19.27	PK	46.00	26.73	Horizon	69	100
6	702.882	31.59	-5.91	25.68	PK	46.00	20.32	Horizon	97	100

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



Suspected Data List

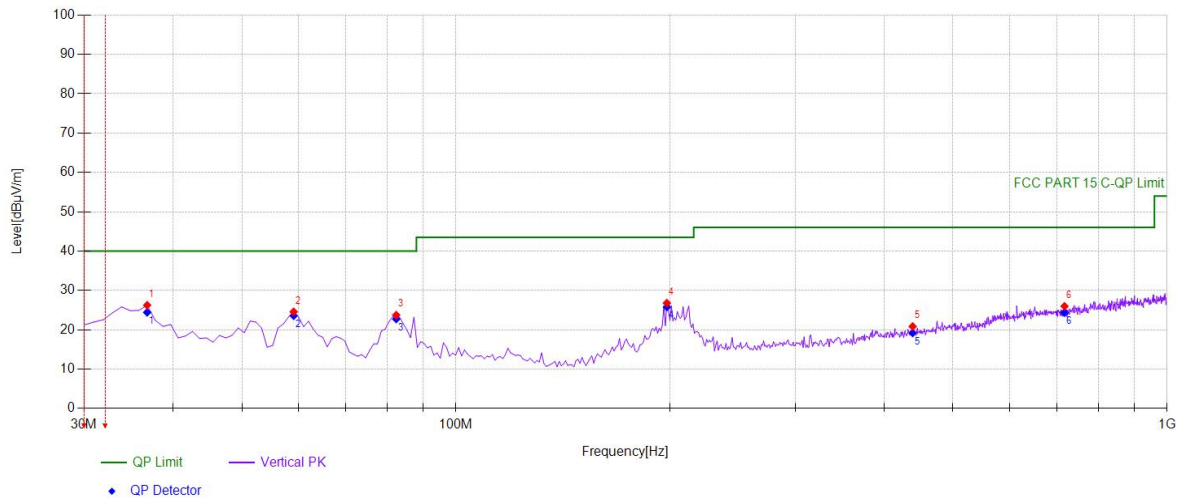
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height [cm]
1	39.7097	39.39	-17.93	21.46	PK	40.00	18.54	Vertical	336	100
2	60.1001	42.89	-18.56	24.33	PK	40.00	15.67	Vertical	68	100
3	81.4615	44.03	-21.15	22.88	PK	40.00	17.12	Vertical	277	100
4	199.919	42.94	-17.13	25.81	PK	43.50	17.69	Vertical	312	100
5	629.089	31.37	-6.77	24.60	PK	46.00	21.40	Vertical	12	100
6	842.702	31.52	-3.84	27.68	PK	46.00	18.32	Vertical	207	100



Suspected Data List

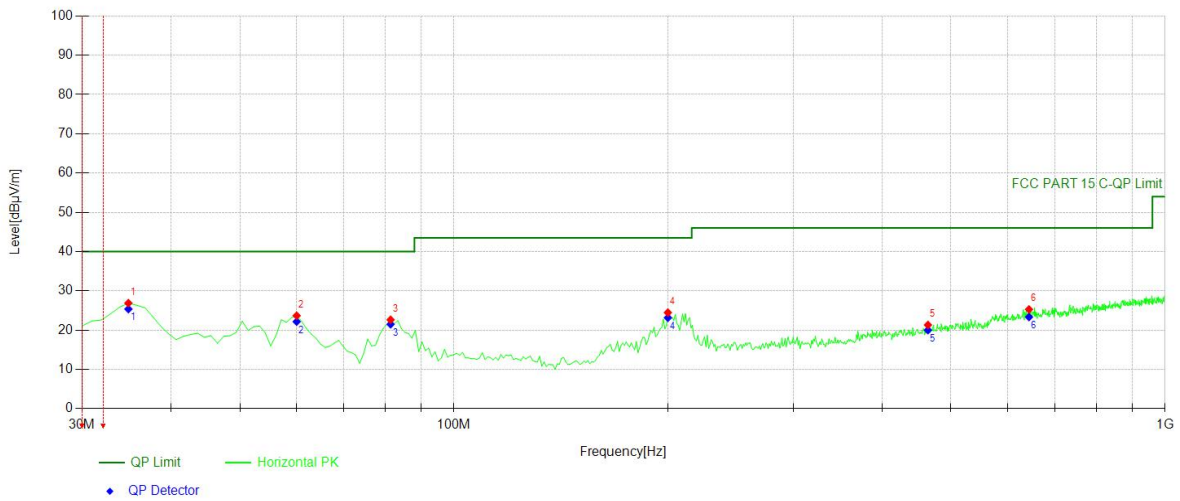
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height [cm]
1	33.8839	51.71	-18.29	33.42	PK	40.00	6.58	Horizon	359	100
2	153.313	42.12	-19.71	22.41	PK	43.50	21.09	Horizon	294	100
3	201.861	45.35	-17.13	28.22	PK	43.50	15.28	Horizon	28	100
4	380.520	31.52	-11.83	19.69	PK	46.00	26.31	Horizon	246	100
5	644.624	32.19	-6.24	25.95	PK	46.00	20.05	Horizon	294	100
6	993.203	30.41	-1.71	28.70	PK	54.00	25.30	Horizon	353	100

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



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height [cm]
1	36.7968	44.37	-18.11	26.26	PK	40.00	13.74	Vertical	169	100
2	59.1291	43.00	-18.43	24.57	PK	40.00	15.43	Vertical	86	100
3	82.4324	44.66	-20.92	23.74	PK	40.00	16.26	Vertical	319	100
4	197.978	44.04	-17.25	26.79	PK	43.50	16.71	Vertical	252	100
5	438.778	32.05	-11.21	20.84	PK	46.00	25.16	Vertical	72	100
6	717.447	31.82	-5.83	25.99	PK	46.00	20.01	Vertical	332	100



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity	Angle[°]	Height [cm]
1	34.8549	45.11	-18.23	26.88	PK	40.00	13.12	Horizon	355	100
2	60.1001	42.24	-18.56	23.68	PK	40.00	16.32	Horizon	83	100
3	81.4615	43.79	-21.15	22.64	PK	40.00	17.36	Horizon	348	100
4	199.919	41.60	-17.13	24.47	PK	43.50	19.03	Horizon	93	100
5	464.024	32.11	-10.79	21.32	PK	46.00	24.68	Horizon	24	100
6	643.653	31.53	-6.24	25.29	PK	46.00	20.71	Horizon	34	100

7.6 CONDUCTED EMISSION TEST

7.6.1 Applicable Standard

According to IC RSS-Gen 8.8

7.6.2 Conformance Limit

FCC Part 15, Subpart B, Class B

Conducted Emission Limit		
Frequency(MHz)	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.

7.6.3 Test Configuration

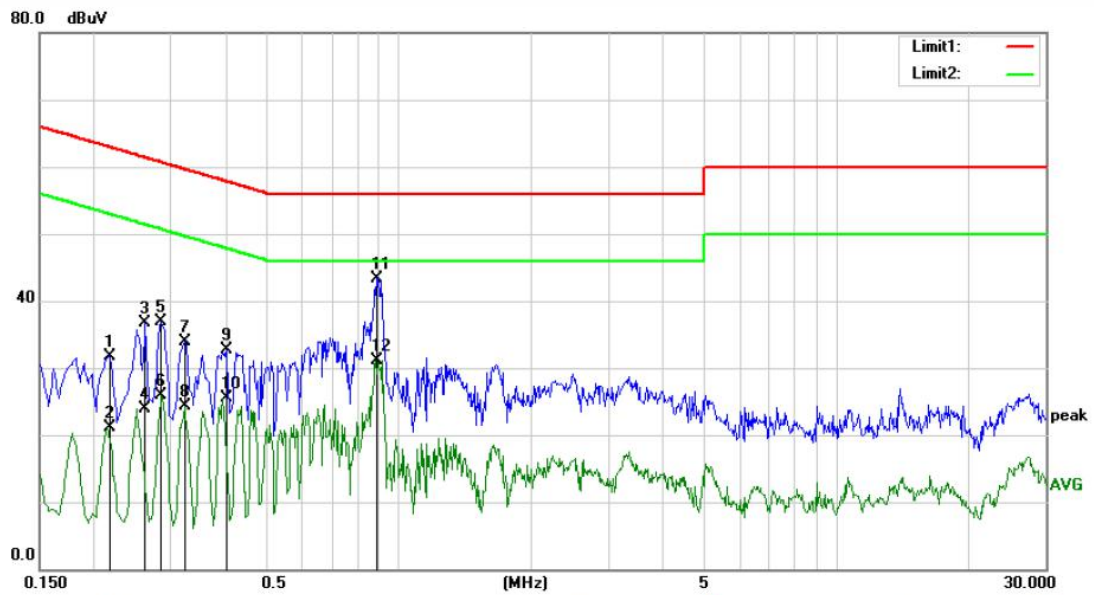
Test according to clause 6.3 conducted emission test setup 3.

7.6.4 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.

7.6.5 Test Results

Pass

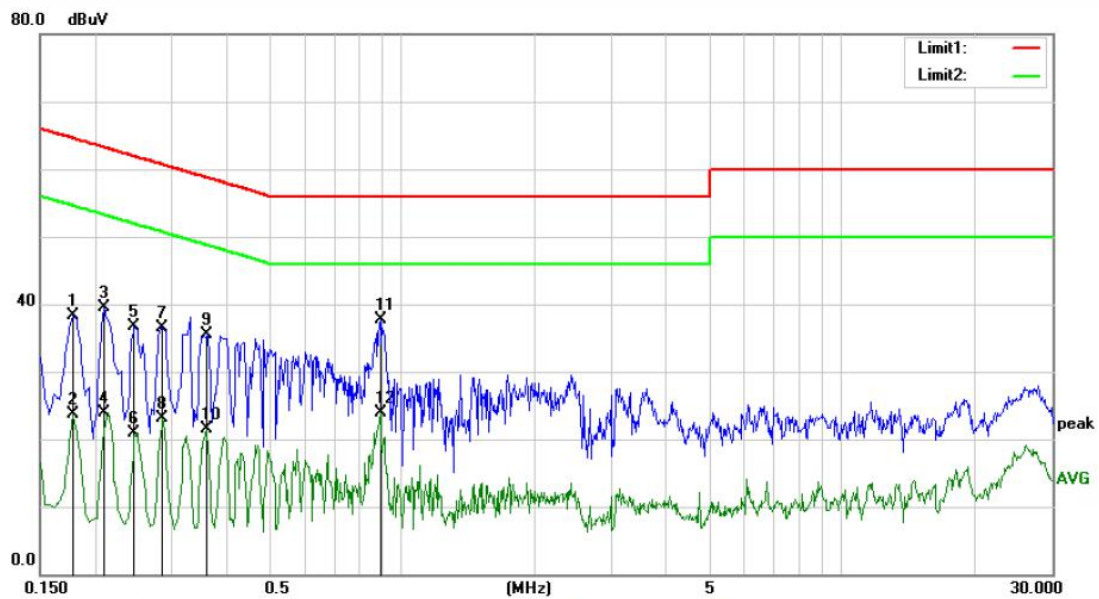


Site Conduction #2

Phase: **N**

Temperature: 25.1

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2180	21.70	10.10	31.80	62.89	-31.09	QP	
2		0.2180	10.97	10.10	21.07	52.89	-31.82	AVG	
3		0.2620	26.63	10.10	36.73	61.37	-24.64	QP	
4		0.2620	13.86	10.10	23.96	51.37	-27.41	AVG	
5		0.2860	26.76	10.09	36.85	60.64	-23.79	QP	
6		0.2860	15.75	10.09	25.84	50.64	-24.80	AVG	
7		0.3220	23.84	10.09	33.93	59.66	-25.73	QP	
8		0.3220	14.22	10.09	24.31	49.66	-25.35	AVG	
9		0.4020	22.57	10.10	32.67	57.81	-25.14	QP	
10		0.4020	15.44	10.10	25.54	47.81	-22.27	AVG	
11	*	0.8860	33.24	10.16	43.40	56.00	-12.60	QP	
12		0.8860	20.95	10.16	31.11	46.00	-14.89	AVG	



Site Conduction #2					Phase: L1		Temperature: 25.1	
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector Comment
1		0.1780	28.25	10.10	38.35	64.58	-26.23	QP
2		0.1780	13.65	10.10	23.75	54.58	-30.83	AVG
3		0.2100	29.46	10.10	39.56	63.21	-23.65	QP
4		0.2100	13.79	10.10	23.89	53.21	-29.32	AVG
5		0.2460	26.55	10.10	36.65	61.89	-25.24	QP
6		0.2460	10.73	10.10	20.83	51.89	-31.06	AVG
7		0.2860	26.49	10.09	36.58	60.64	-24.06	QP
8		0.2860	12.96	10.09	23.05	50.64	-27.59	AVG
9		0.3580	25.41	10.10	35.51	58.77	-23.26	QP
10		0.3580	11.31	10.10	21.41	48.77	-27.36	AVG
11	*	0.8940	27.63	10.16	37.79	56.00	-18.21	QP
12		0.8940	13.78	10.16	23.94	46.00	-22.06	AVG

7.7 ANTENNA APPLICATION

7.7.1 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..

7.7.2 Result

PASS

The EUT PCB antenna, antenna gain is 3.26dBi.

- ☐ 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 ---