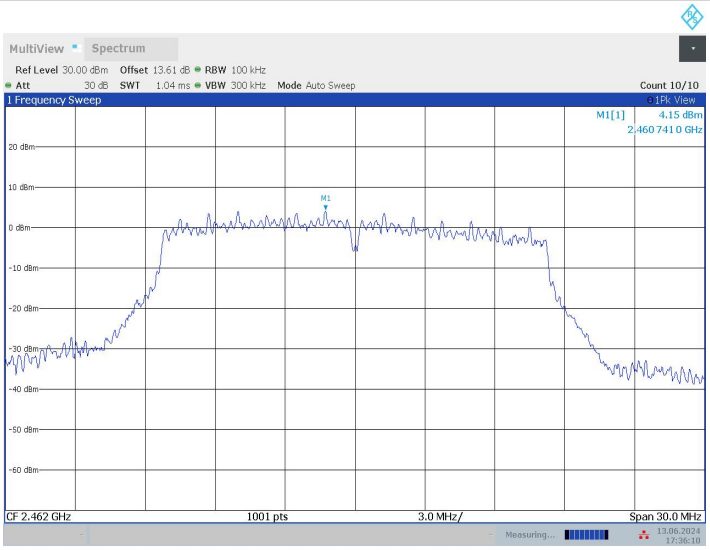
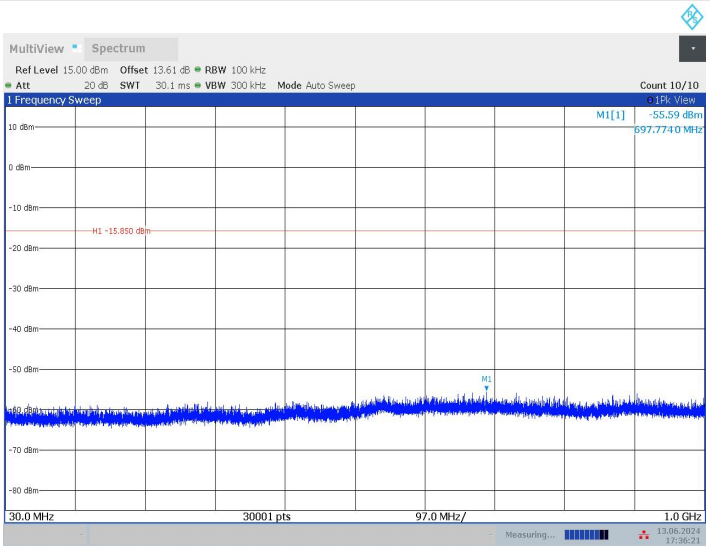
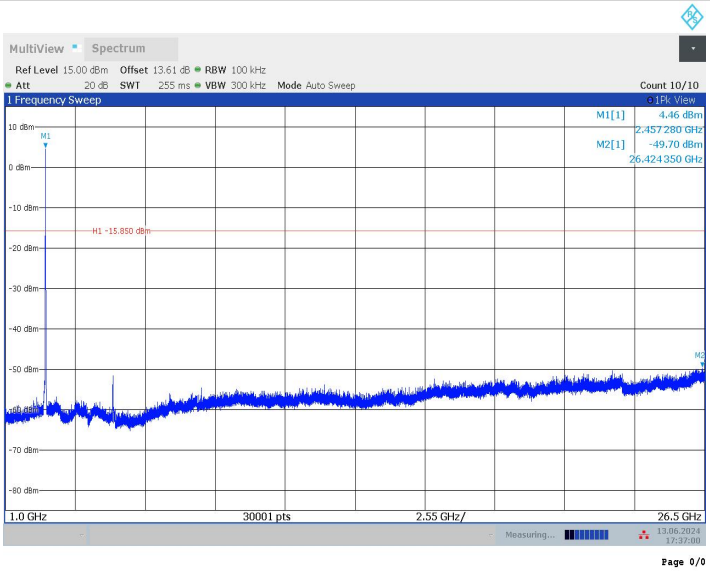


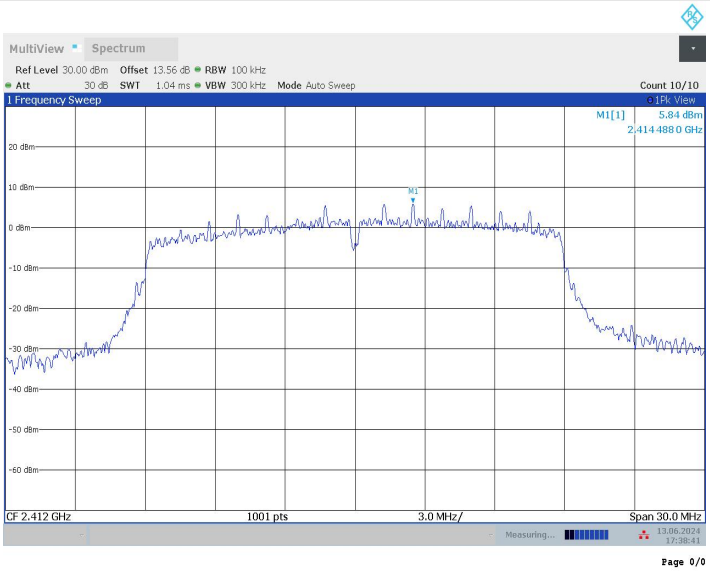
11G_2462_30~1000



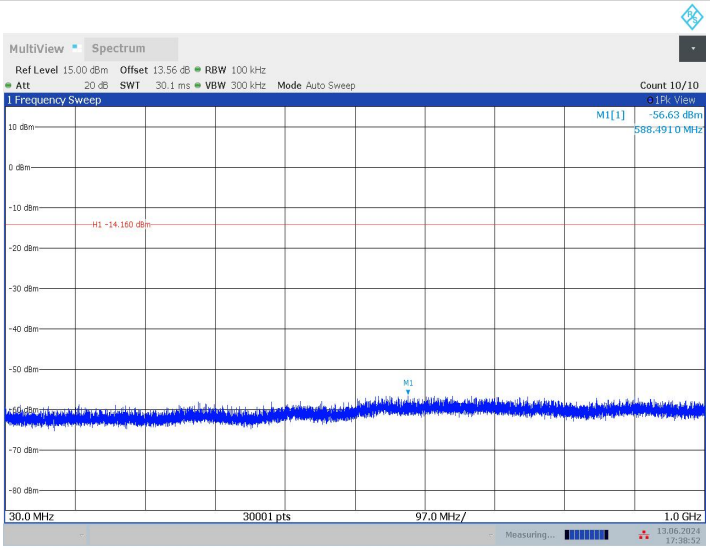
11G_2462_1000~26500



11N20SISO_2412_0~Reference



11N20SISO_2412_30~1000



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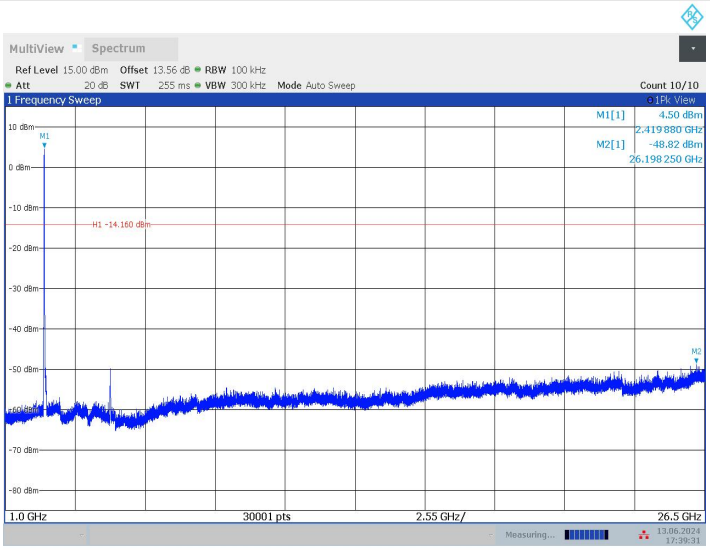

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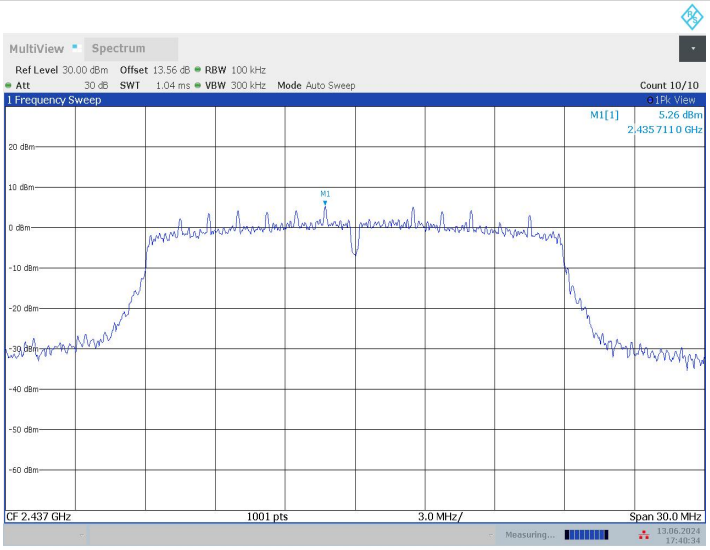

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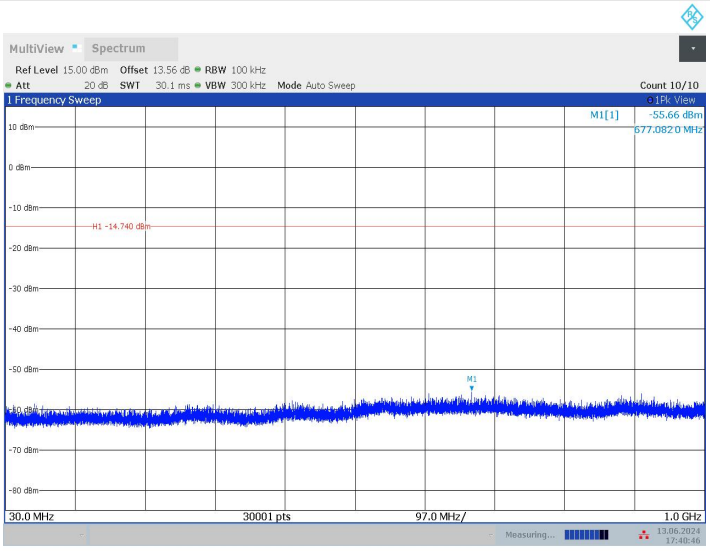

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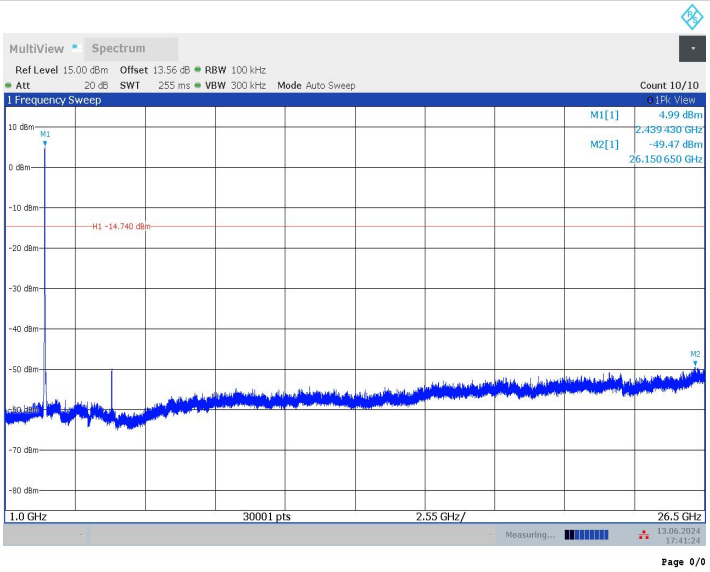
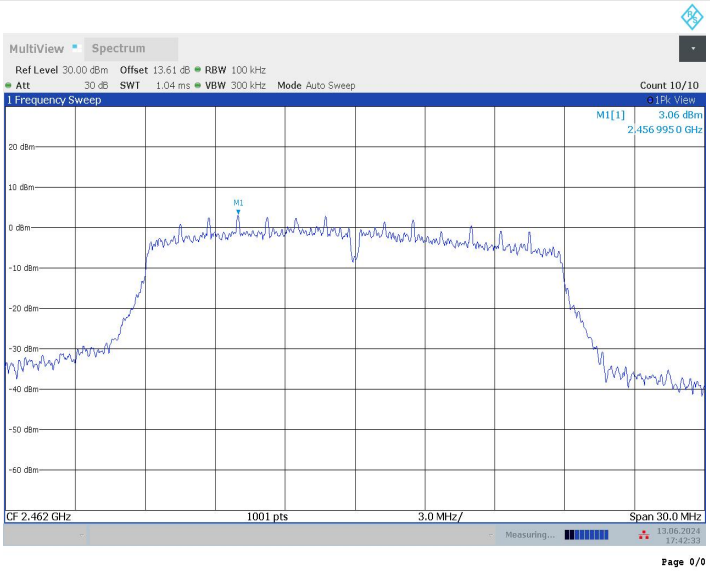


11N20SISO_2462_0~Reference



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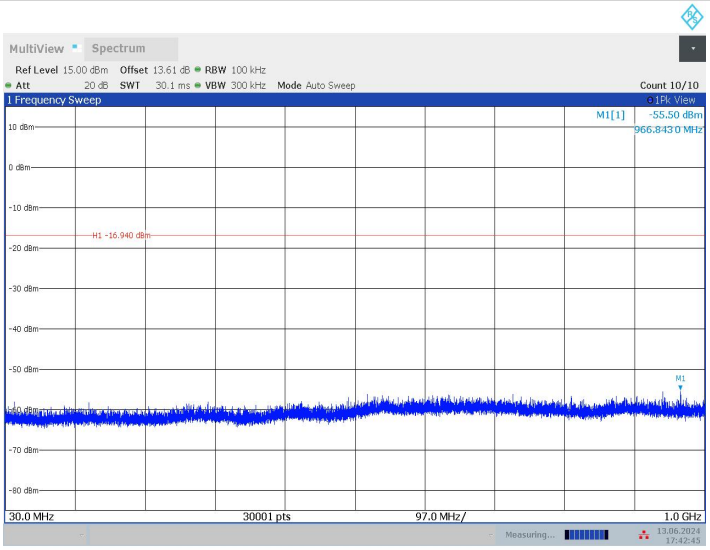
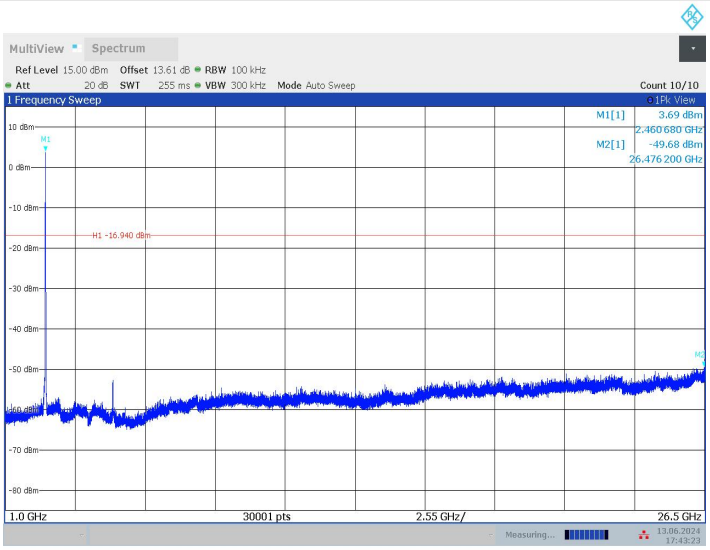


11N20SISO_2462_1000~26500



Conclusion: Pass

A.7. Radiated Unwanted Emission

Limits

Measurement Limit

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

In addition, 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)).

Limit in restricted band

Frequency (MHz)	Field strength(μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Note: When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor.

Test setup

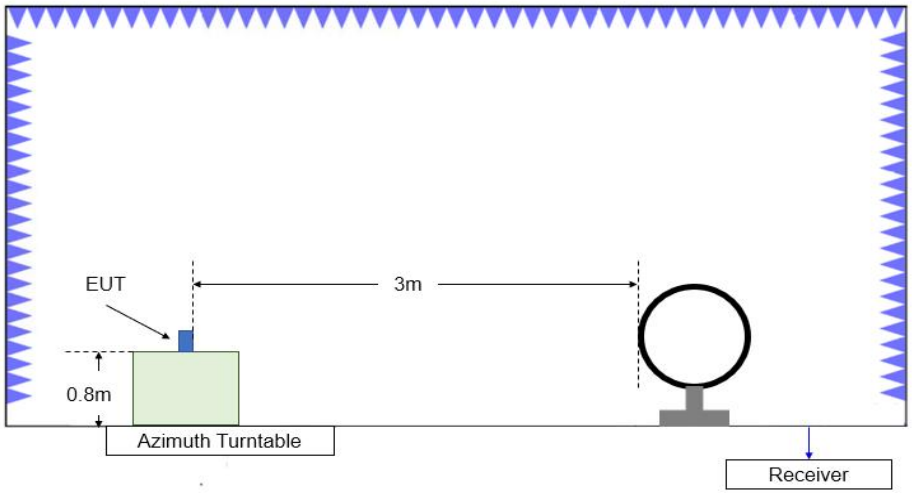


Figure A.7.1. Test Site Diagram (9kHz-30MHz)

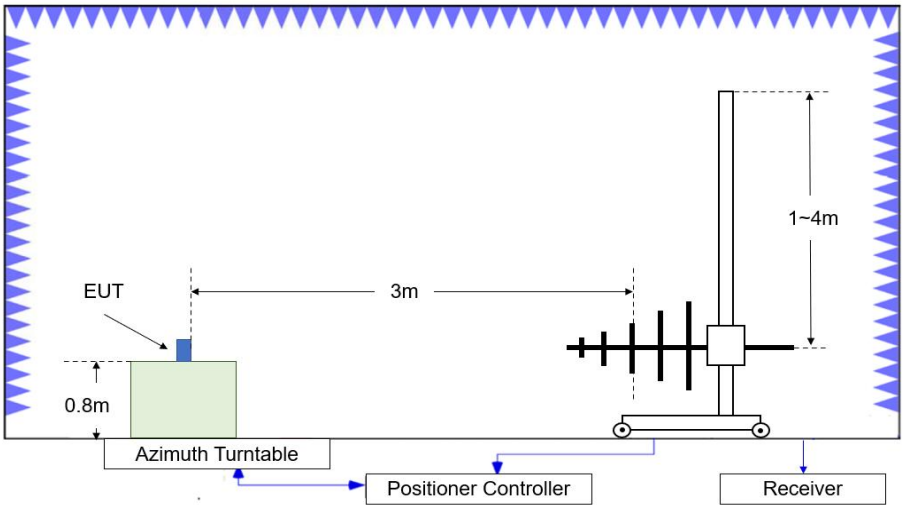


Figure A.7.2. Test Site Diagram (30MHz-1GHz)

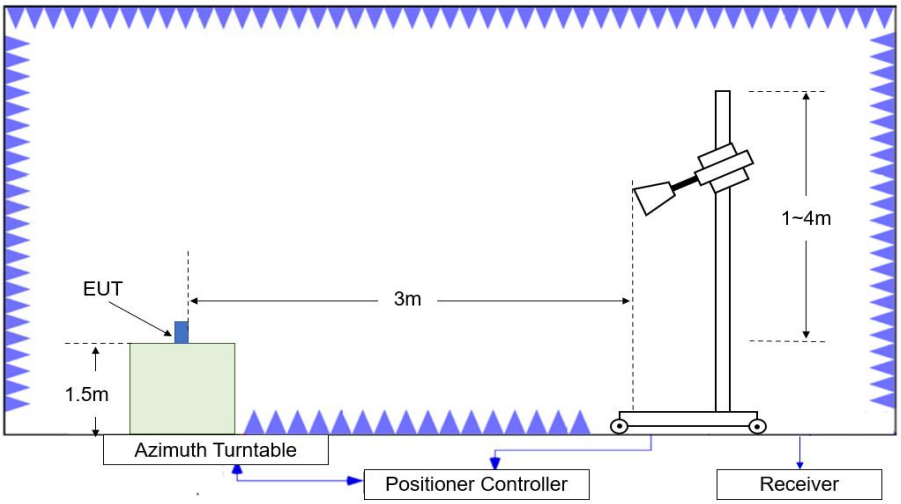


Figure A.7.3. Test Site Diagram (1GHz-40GHz)

Test Procedures

Radiated unwanted emissions from the EUT were measured according to ANSI C63.10.

Test setting

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100kHz/300kHz	5
1000-3000	1MHz/3MHz	15
3000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Sample Calculation

A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss.

P_{Mea} is the field strength recorded from the instrument.

The measurement results are obtained as described below:

Result=P_{Mea}+$A_{Rpl=}$ P_{Mea}+Cable Loss+Antenna Factor

Test note

1. The EUT is operating at its maximum duty cycle and its maximum power control level.
2. Investigation has been done on all modes and modulations/data rates. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.
3. Spurious emissions for all channels were investigated and almost the same below 1GHz. According to FCC 47 CFR §15.31, emission levels are not report much lower than the limit by over 20dB
4. Measurement frequencies were performed from 9 kHz to the 10^{th} harmonic of highest fundamental frequency or 40GHz, whichever is lower.

Test Result

Peak

802.11b

Ch1

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2383.500	60.69	6.01	31.70	22.98	74.00	13.31	H
2386.510	60.49	5.99	31.72	22.78	74.00	13.51	H
4824.400	50.88	-33.56	34.10	50.34	74.00	23.12	V
7236.000	42.29	-31.64	35.70	38.23	74.00	31.71	H
9648.000	44.91	-29.73	36.80	37.85	74.00	29.09	V
12060.000	47.54	-28.80	38.86	37.48	74.00	26.46	H

Ch6

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2422.000	61.94	6.03	31.84	24.06	74.00	12.06	H
2453.200	61.41	6.10	31.93	23.38	74.00	12.59	V
4874.000	53.27	-33.48	34.10	52.65	74.00	20.73	V
7311.000	42.40	-31.67	35.72	38.35	74.00	31.60	H
9648.000	44.12	-29.73	36.80	37.06	74.00	29.88	V
12060.000	46.73	-28.80	38.86	36.67	74.00	27.27	H

Ch11

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2484.125	61.31	6.14	32.24	22.93	74.00	12.69	H
2486.025	61.70	6.14	32.26	23.31	74.00	12.30	V
4924.000	56.90	-33.16	34.10	55.97	74.00	17.10	V
7386.000	42.72	-31.40	35.80	38.31	74.00	31.28	V
9848.000	43.38	-30.29	37.00	36.68	74.00	30.62	V
12310.000	46.81	-29.24	38.90	37.15	74.00	27.19	V

802.11g

Ch1

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.240	65.82	5.98	31.74	28.10	74.00	8.18	V
2389.940	65.77	5.98	31.74	28.05	74.00	8.23	H
4823.000	53.77	-33.55	34.10	53.22	74.00	20.23	V
7236.000	43.47	-31.64	35.70	39.41	74.00	30.53	H
9648.000	45.71	-29.73	36.80	38.64	74.00	28.29	V
12060.000	46.53	-28.80	38.86	36.47	74.00	27.47	V

Ch6

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2409.600	64.01	6.00	31.82	26.19	74.00	9.99	H
2460.000	62.67	6.11	32.00	24.55	74.00	11.33	V
4875.000	52.37	-33.47	34.10	51.74	74.00	21.63	V
7311.000	42.67	-31.67	35.72	38.62	74.00	31.33	V
9748.000	44.04	-30.00	36.90	37.14	74.00	29.96	V
12185.000	46.13	-29.14	38.99	36.29	74.00	27.87	H

Ch11

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.525	66.41	6.14	32.24	28.03	74.00	7.59	H
2483.875	65.69	6.14	32.24	27.31	74.00	8.31	H
4918.000	52.56	-33.08	34.10	51.54	74.00	21.44	H
7386.000	43.50	-31.40	35.80	39.09	74.00	30.50	H
9848.000	43.35	-30.29	37.00	36.65	74.00	30.65	V
12310.000	47.31	-29.24	38.90	37.64	74.00	26.69	V

802.11n-HT20

Ch1

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.450	66.22	5.98	31.74	28.51	74.00	7.78	V
2389.940	66.91	5.98	31.74	29.19	74.00	7.09	H
4823.000	54.10	-33.55	34.10	53.56	74.00	19.90	V
7236.000	42.89	-31.64	35.70	38.82	74.00	31.11	H
9648.000	45.09	-29.73	36.80	38.02	74.00	28.91	H
12060.000	46.52	-28.80	38.86	36.45	74.00	27.48	V

Ch6

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2409.600	60.32	6.00	31.82	22.49	74.00	13.68	V
2464.800	60.52	6.11	32.05	22.36	74.00	13.48	V
4874.000	52.07	-33.48	34.10	51.45	74.00	21.93	H
7311.000	41.97	-31.67	35.72	37.92	74.00	32.03	V
9748.000	44.86	-30.00	36.90	37.97	74.00	29.14	V
12185.000	46.62	-29.14	38.99	36.77	74.00	27.38	V

Ch11

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.525	69.57	6.14	32.24	31.19	74.00	4.43	V
2483.675	69.15	6.14	32.24	30.77	74.00	4.85	V
4919.000	54.87	-33.10	34.10	53.86	74.00	19.13	V
7386.000	43.82	-31.40	35.80	39.42	74.00	30.18	H
9848.000	43.89	-30.29	37.00	37.19	74.00	30.11	H
12310.000	47.77	-29.24	38.90	38.10	74.00	26.23	H

Average

802.11b

Ch1

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.400	46.55	5.98	31.74	8.83	54.00	7.45	V
2389.800	46.62	5.98	31.74	8.90	54.00	7.38	V
4824.000	49.89	-33.56	34.10	49.35	54.00	4.11	H
7236.000	31.07	-31.64	35.70	27.00	54.00	22.93	H
9648.000	34.09	-29.73	36.80	27.03	54.00	19.91	V
12060.000	35.36	-28.80	38.86	25.30	54.00	18.64	V

Ch6

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2415.200	48.60	6.02	31.83	10.75	54.00	5.40	V
2457.400	49.77	6.11	31.97	11.69	54.00	4.23	V
4874.000	50.83	-33.48	34.10	50.20	54.00	3.17	V
7311.000	31.22	-31.67	35.72	27.17	54.00	22.78	H
9648.000	33.28	-29.73	36.80	26.22	54.00	20.72	H
12060.000	34.71	-28.80	38.86	24.65	54.00	19.29	V

Ch11

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.600	49.18	6.14	32.24	10.80	54.00	4.82	V
2486.000	49.20	6.14	32.26	10.81	54.00	4.80	V
4922.000	46.42	-33.14	34.10	45.45	54.00	7.58	V
7386.000	31.29	-31.40	35.80	26.89	54.00	22.71	V
9848.000	32.41	-30.29	37.00	25.70	54.00	21.59	V
12310.000	35.22	-29.24	38.90	25.56	54.00	18.78	V

802.11g

Ch1

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.800	47.69	5.98	31.74	9.97	54.00	6.31	V
2390.000	47.80	5.98	31.74	10.08	54.00	6.20	V
4823.000	37.89	-33.55	34.10	37.35	54.00	16.11	H
7236.000	30.94	-31.64	35.70	26.87	54.00	23.06	H
9648.000	33.84	-29.73	36.80	26.78	54.00	20.16	V
12060.000	35.34	-28.80	38.86	25.28	54.00	18.66	V

Ch6

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2412.200	48.77	6.01	31.82	10.93	54.00	5.23	V
2462.000	49.85	6.11	32.02	11.72	54.00	4.15	V
4876.000	39.03	-33.47	34.10	38.39	54.00	14.97	V
7311.000	31.23	-31.67	35.72	27.18	54.00	22.77	V
9748.000	33.12	-30.00	36.90	26.22	54.00	20.88	H
12185.000	34.73	-29.14	38.99	24.88	54.00	19.27	H

Ch11

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.600	50.35	6.14	32.24	11.98	54.00	3.65	V
2483.800	50.29	6.14	32.24	11.91	54.00	3.71	V
4920.500	35.90	-33.12	34.10	34.91	54.00	18.10	H
7386.000	31.22	-31.40	35.80	26.82	54.00	22.78	V
9848.000	32.31	-30.29	37.00	25.61	54.00	21.69	V
12310.000	35.15	-29.24	38.90	25.49	54.00	18.85	H

802.11n-HT20

Ch1

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2389.800	48.14	5.98	31.74	10.43	54.00	5.86	V
2390.000	48.33	5.98	31.74	10.61	54.00	5.67	V
4822.500	37.69	-33.55	34.10	37.14	54.00	16.31	V
7236.000	30.96	-31.64	35.70	26.90	54.00	23.04	V
9648.000	33.87	-29.73	36.80	26.81	54.00	20.13	H
12060.000	35.20	-28.80	38.86	25.14	54.00	18.80	H

Ch6

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2411.800	49.29	6.01	31.82	11.45	54.00	4.71	V
2464.400	49.82	6.11	32.05	11.67	54.00	4.18	V
4877.500	38.29	-33.46	34.10	37.64	54.00	15.71	H
7311.000	31.23	-31.67	35.72	27.18	54.00	22.77	H
9748.000	33.22	-30.00	36.90	26.32	54.00	20.78	H
12185.000	34.82	-29.14	38.99	24.97	54.00	19.18	H

Ch11

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2484.000	49.79	6.14	32.24	11.41	54.00	4.21	V
2484.800	49.59	6.14	32.25	11.20	54.00	4.41	V
4921.500	35.88	-33.13	34.10	34.92	54.00	18.12	H
7386.000	31.18	-31.40	35.80	26.77	54.00	22.82	V
9848.000	32.30	-30.29	37.00	25.60	54.00	21.70	V
12310.000	35.13	-29.24	38.90	25.47	54.00	18.87	V

Conclusion: Pass

Note: the spurious emission above 18G is noise only and did not show on the report.

Band edge compliance

802.11b mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11b	1	2.31GHz~2.43GHz---L	Fig.1	**P**
	11	2.45GHz~2.50GHz---H	Fig.2	**P**

802.11g mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11g	1	2.31GHz~2.43GHz---L	Fig.3	**P**
	10	2.45GHz~2.50GHz---H	Fig.4	**P**
	11	2.45GHz~2.50GHz---H	Fig.5	**P**

802.11n-HT20 mode

Mode	Channel	Frequency Range	Test Results	Conclusion
802.11n (HT20)	1	2.31GHz~2.43GHz---L	Fig.6	**P**
	10	2.45GHz~2.50GHz---H	Fig.7	**P**
	11	2.45GHz~2.50GHz---H	Fig.8	**P**

Test graphs as below:

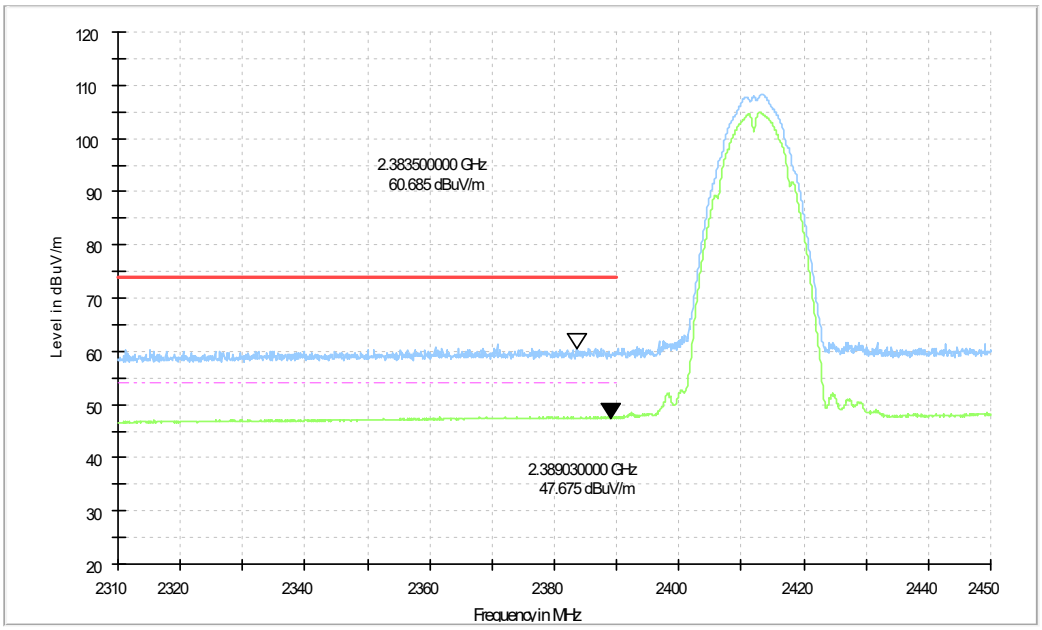


Fig.1 Transmitter Spurious Emission - Radiated (Power): 802.11b, ch1, 2.31 GHz – 2.43GHz

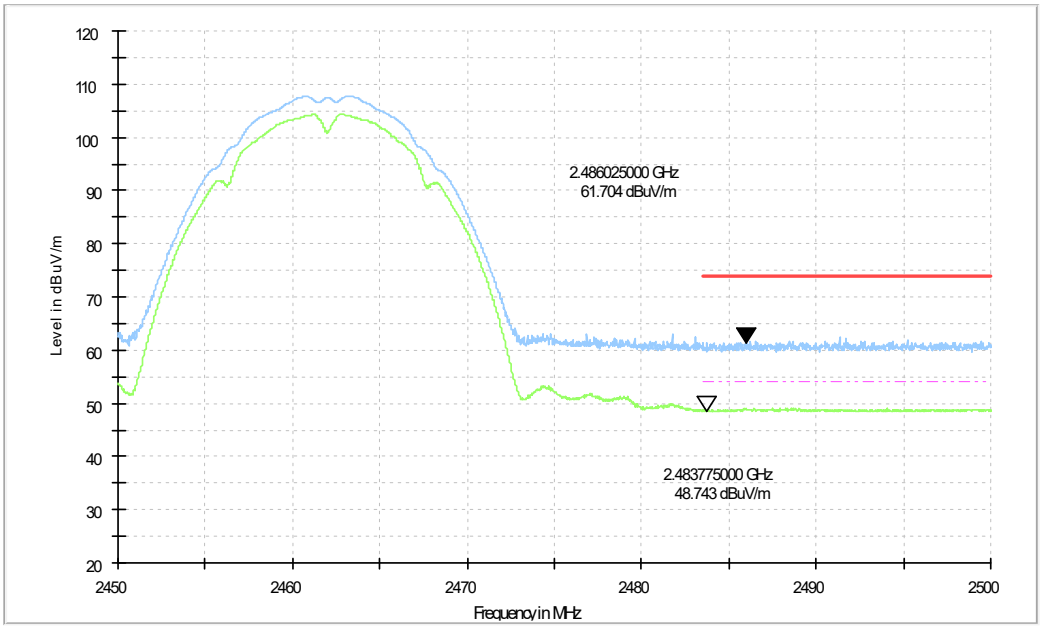


Fig.2 Transmitter Spurious Emission - Radiated (Power): 802.11b, ch11, 2.45 GHz - 2.50GHz

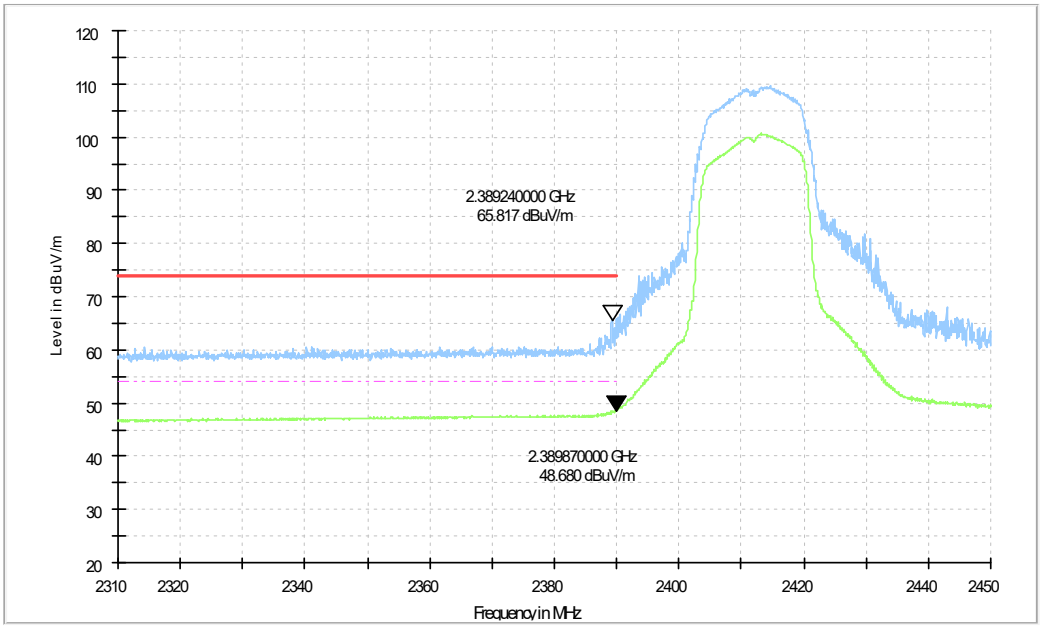


Fig.3 Transmitter Spurious Emission - Radiated (Power): 802.11g, ch1, 2.31 GHz - 2.43GHz

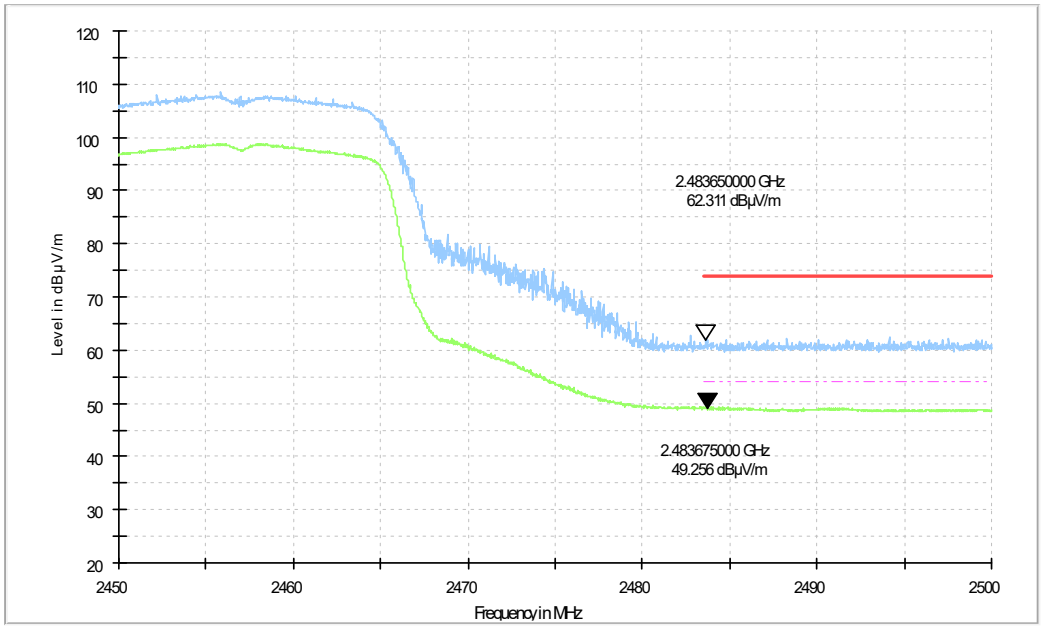


Fig.4 Transmitter Spurious Emission - Radiated (Power): 802.11g, ch10, 2.45 GHz - 2.50GHz

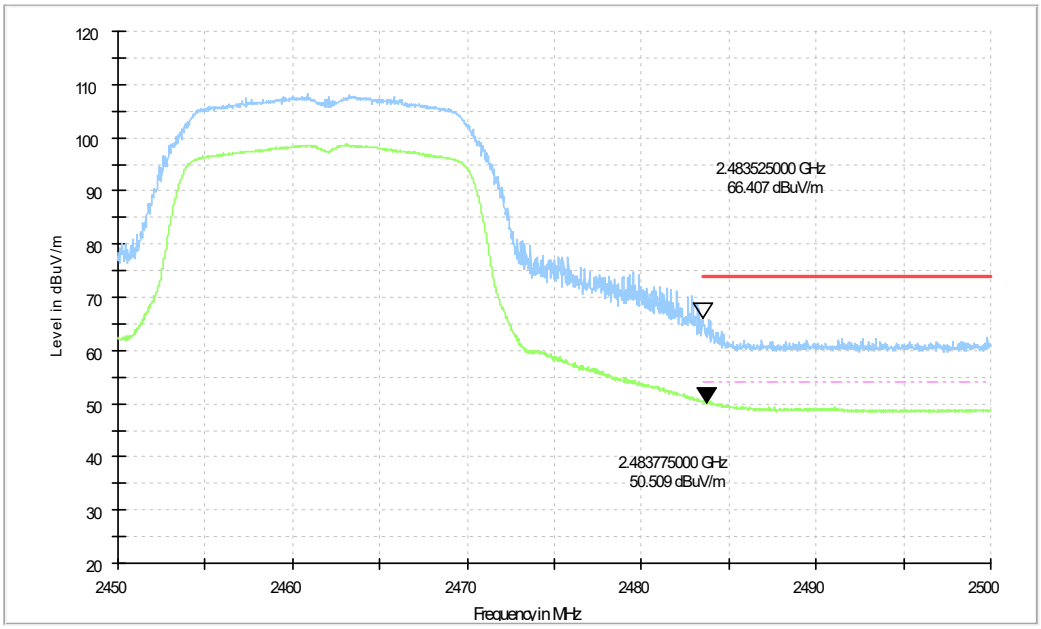


Fig.5 Transmitter Spurious Emission - Radiated (Power): 802.11g, ch11, 2.45 GHz - 2.50GHz

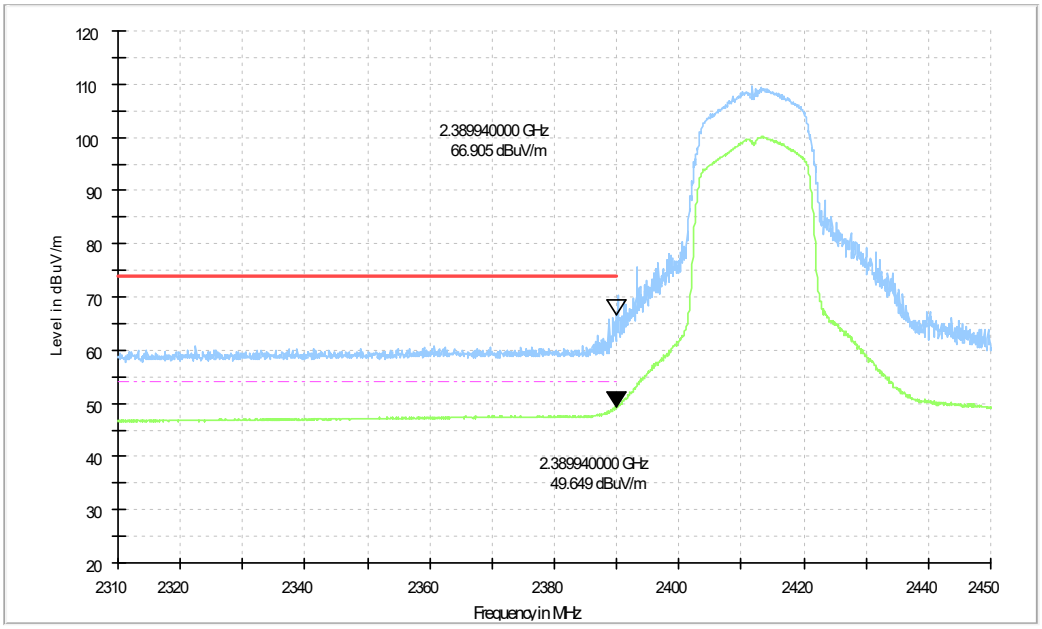


Fig.6 Transmitter Spurious Emission - Radiated (Power): 802.11n-HT20, ch1, 2.31 GHz - 2.43GHz

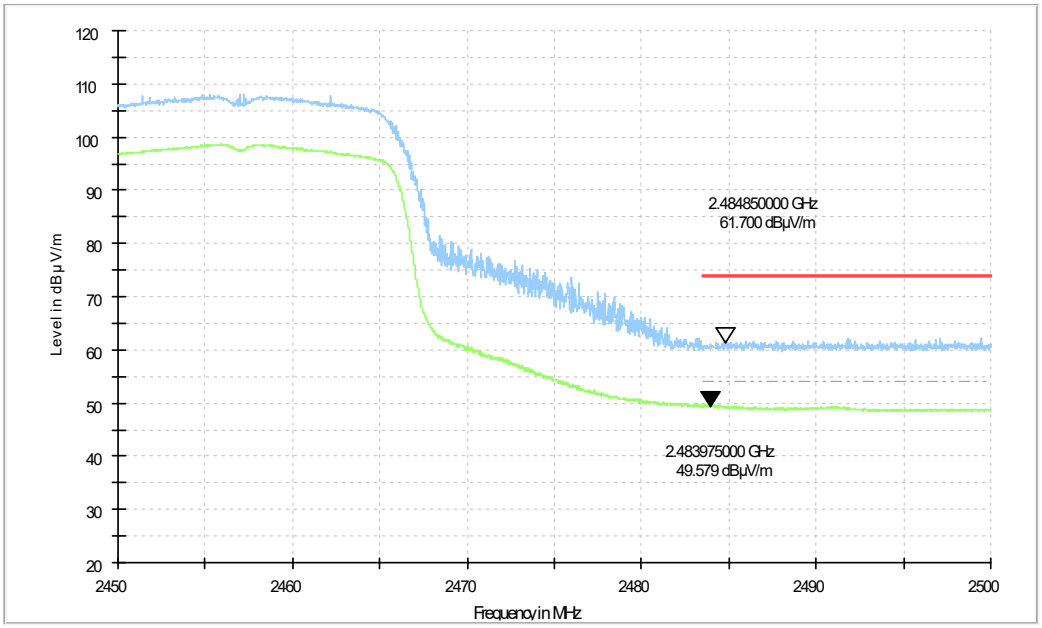


Fig.7 Transmitter Spurious Emission - Radiated (Power): 802.11n-HT20, ch10, 2.45 GHz - 2.50GHz

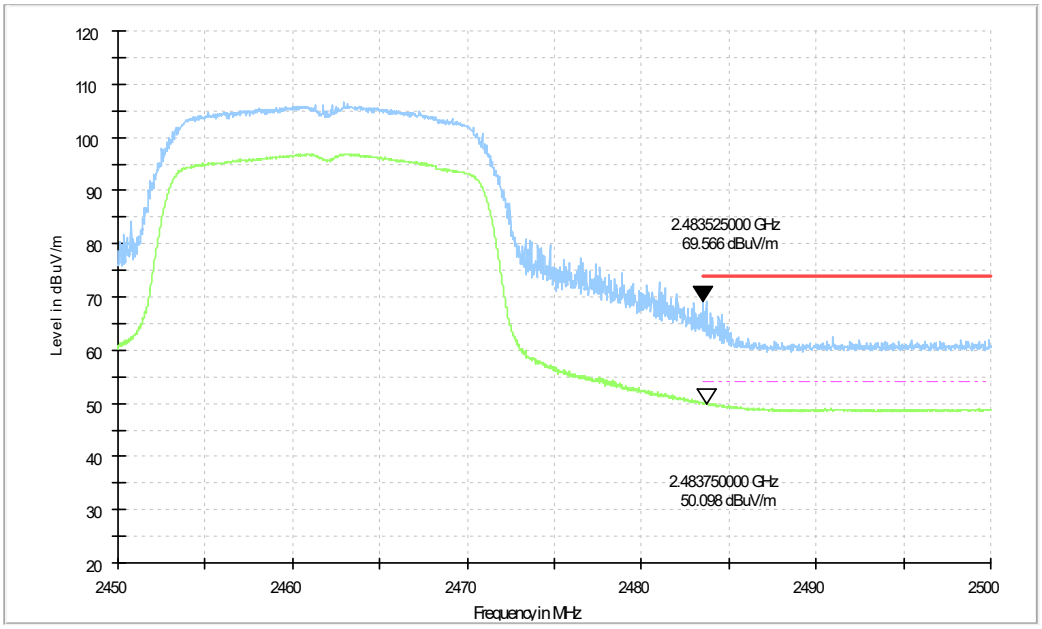


Fig.8 Transmitter Spurious Emission - Radiated (Power): 802.11n-HT20, ch11, 2.45 GHz - 2.50GHz

A.8. AC Power-line Conducted Emission

Summary

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section

Method of Measurement:

See Clause 6.2 of ANSI C63.10 specifically.

See Clause 4 and Clause 5 of ANSI C63.10 generally.

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver: Quasi-Peak / Average Detector.

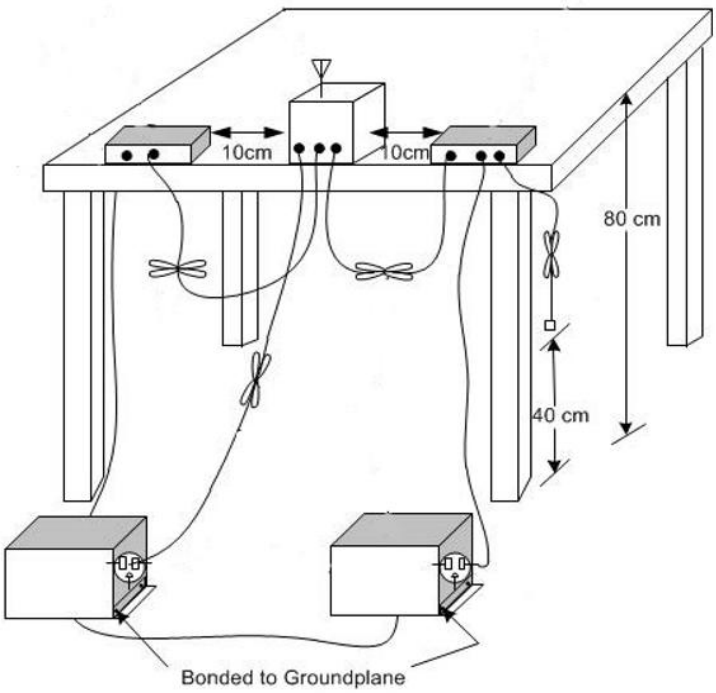
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth
0.15-30	9kHz

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Test setup



Measurement Result and limit:

WLAN (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11b	Idle	
0.15 to 0.5	66 to 56	Fig.A.8.1	Fig.A.8.2	P
0.5 to 5	56			
5 to 30	60			
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

WLAN (Average Limit)

Frequency range (MHz)	Average Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		802.11b	Idle	
0.15 to 0.5	56 to 46	Fig.A.8.1	Fig.A.8.2	P
0.5 to 5	46			
5 to 30	50			
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Conclusion: Pass

Test graphs as below:

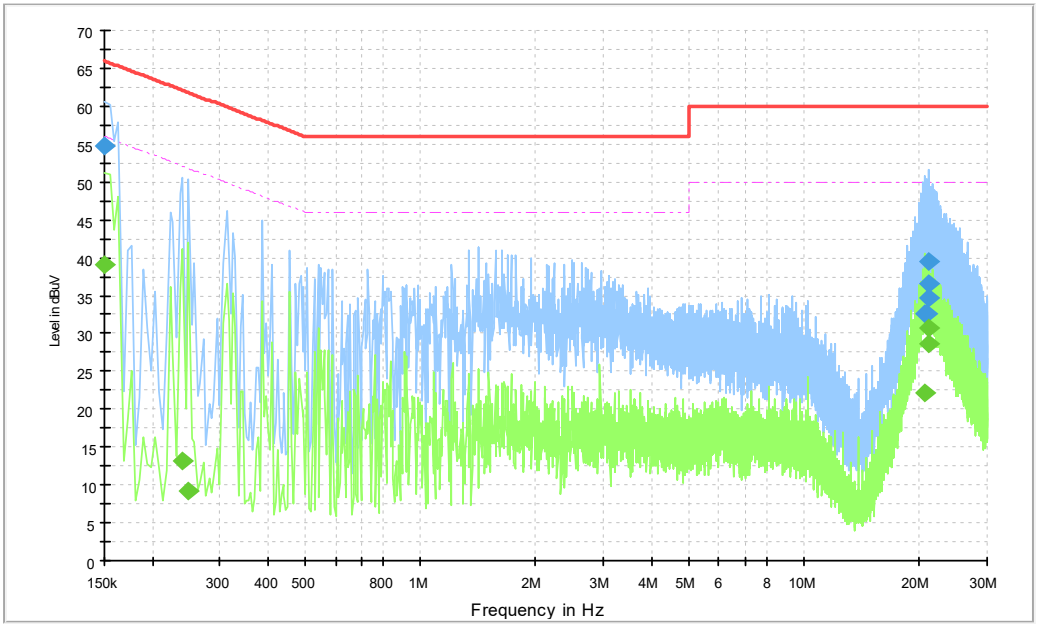


Fig.A.8.1 AC Powerline Conducted Emission-802.11b

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	54.8	2000.0	9.000	N	20.3	11.2	66.0
20.737500	32.6	2000.0	9.000	N	20.3	27.4	60.0
20.769000	32.6	2000.0	9.000	N	20.3	27.4	60.0
21.133500	34.7	2000.0	9.000	N	20.3	25.3	60.0
21.196500	39.5	2000.0	9.000	L1	20.1	20.5	60.0
21.228000	36.5	2000.0	9.000	N	20.3	23.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	39.0	2000.0	9.000	N	20.3	17.0	56.0
0.240000	13.1	2000.0	9.000	L1	20.0	39.0	52.1
0.249000	9.2	2000.0	9.000	N	20.1	42.6	51.8
20.737500	22.1	2000.0	9.000	N	20.3	27.9	50.0
21.196500	28.7	2000.0	9.000	N	20.3	21.3	50.0
21.228000	30.8	2000.0	9.000	L1	20.1	19.2	50.0

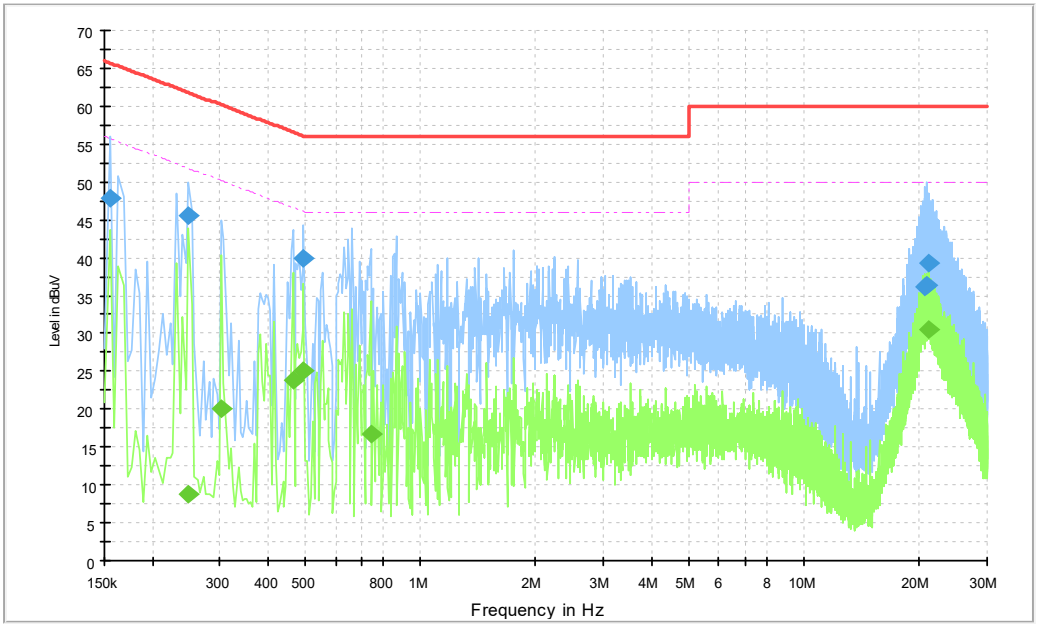


Fig.A.8.2 AC Powerline Conducted Emission-Idle

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	54.8	2000.0	9.000	N	20.3	11.2	66.0
20.737500	32.6	2000.0	9.000	N	20.3	27.4	60.0
20.769000	32.6	2000.0	9.000	N	20.3	27.4	60.0
21.133500	34.7	2000.0	9.000	N	20.3	25.3	60.0
21.196500	39.5	2000.0	9.000	L1	20.1	20.5	60.0
21.228000	36.5	2000.0	9.000	N	20.3	23.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	39.0	2000.0	9.000	N	20.3	17.0	56.0
0.240000	13.1	2000.0	9.000	L1	20.0	39.0	52.1
0.249000	9.2	2000.0	9.000	N	20.1	42.6	51.8
20.737500	22.1	2000.0	9.000	N	20.3	27.9	50.0
21.196500	28.7	2000.0	9.000	N	20.3	21.3	50.0
21.228000	30.8	2000.0	9.000	L1	20.1	19.2	50.0

ANNEX B: EUT parameters

Disclaimer: The antenna gain and worse case provided by the client may affect the validity of the measurement results in this report, and the client shall bear the impact and consequences arising therefrom.

ANNEX C: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 26th day of June 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

*****END OF REPORT*****