

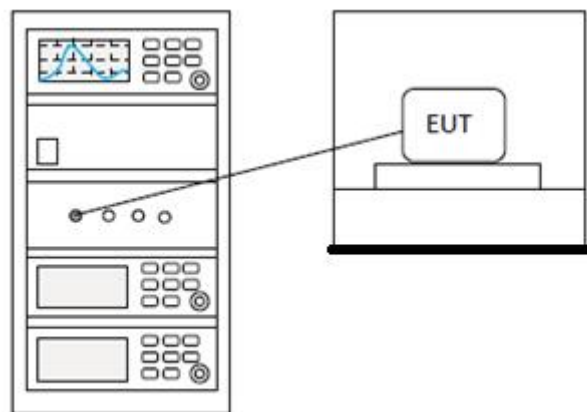
6.5 Power spectrum density

Test Standard	47 CFR Part 15, Subpart C 15.247(e)
Test Method	ANSI C63.10 (2013) Section 11.10.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.5.1 Limit

$\leq 8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

6.5.2 Test setup



6.5.3 Test data

Pass: Please refer to appendix A for details

6.6 Conducted Band Edges Measurement

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10 (2013) Section 11.13
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.6.1 Limit

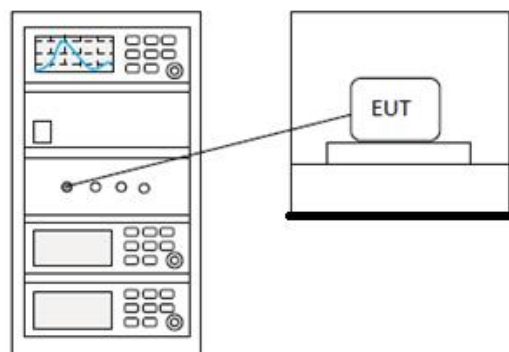
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

Attenuation below the general limits specified in §15.209(a) is not required.

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)).

6.6.2 Test setup



6.6.3 Test data

Pass: Please refer to appendix A for details

6.7 Conducted spurious emissions

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10 (2013) Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

6.7.1 Limit

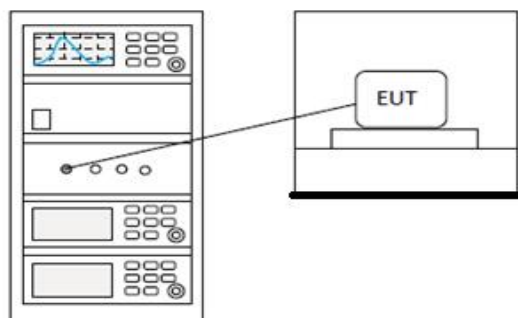
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

Attenuation below the general limits specified in §15.209(a) is not required.

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)).

6.7.2 Test setup



6.7.3 Test data

Pass: Please refer to appendix A for details

6.8 Radiated spurious emissions

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10 (2013) Section 11.11
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

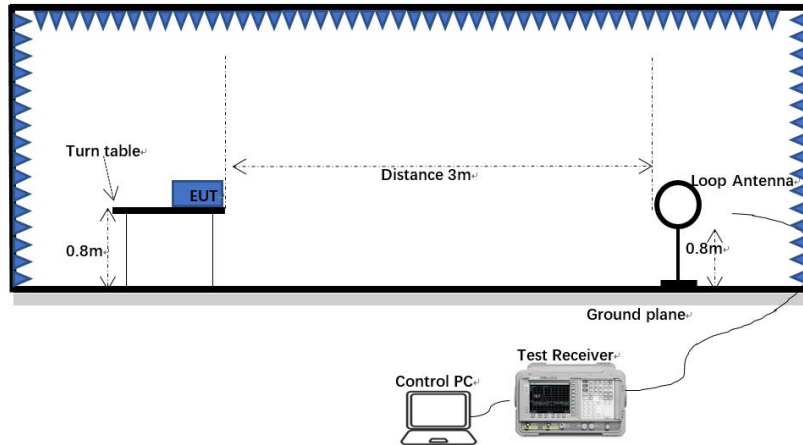
6.8.1 Limit

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

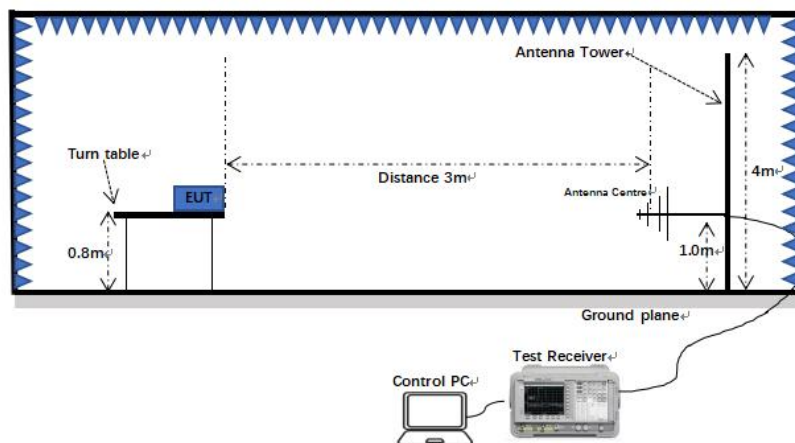
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

6.8.2 Test setup

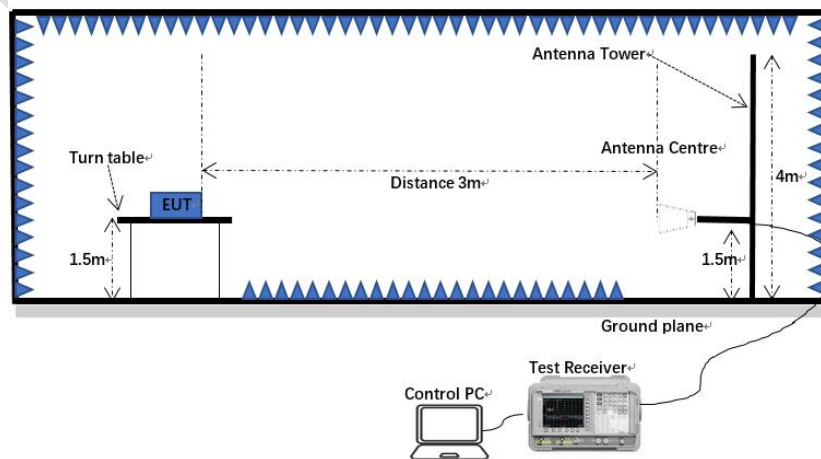
Below 1GHz:



30MHz-1GHz:



Above 1GHz:



6.8.3 Procedure

- a) For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c) The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h) Test the EUT in the lowest channel, the middle channel, the highest channel.
- i) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j) Repeat above procedures until all frequencies measured was complete.

Note 1: Scan from 9 kHz to 25GHz, the disturbance above 12.75GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported. Fundamental frequency is blocked by filter, and only spurious emission is shown.

Note 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Note 3: The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Level (dBuV)} = \text{Reading (dBuV)} + \text{Factor (dB/m)}$$

6.8.4 Test data

Remark: During the test, pre-scan the 802.11b/g/n mode, and found the 802.11b mode which it is worse case, only the worse case lowest channel of 1Mbps for 802.11b was recorded in the report.

Below 1GHz

[Test mode: TX]; [Polarity: Horizontal]



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	46.3402	-0.16	19.52	19.36	40.00	-20.64	QP
2	70.8315	1.48	16.66	18.14	40.00	-21.86	QP
3	140.3420	0.20	19.99	20.19	43.50	-23.31	QP
4	302.4811	2.42	20.13	22.55	46.00	-23.45	QP
5	440.1962	1.60	23.62	25.22	46.00	-20.78	QP
6 *	948.7609	3.00	31.46	34.46	46.00	-11.54	QP

Test Result: Pass

[Test mode: TX]; [Polarity: Vertical]



Test Result: Pass

Remark: During the test, pre-scan the 802.11b/g/n mode, and found the 802.11b mode which it is worse case, only the worse case for 802.11b was recorded in the report.

Above 1GHz:

[TestMode: TX 802.11b low channel]; [Polarity: Horizontal]



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		4824.000	35.92	6.29	42.21	74.00	-31.79	peak
2		6017.250	38.69	5.96	44.65	74.00	-29.35	peak
3		7236.000	34.12	10.45	44.57	74.00	-29.43	peak
4		8449.500	34.59	11.50	46.09	74.00	-27.91	peak
5		9648.000	33.12	13.50	46.62	74.00	-27.38	peak
6	*	11551.50	33.62	14.82	48.44	74.00	-25.56	peak

Test Result: Pass

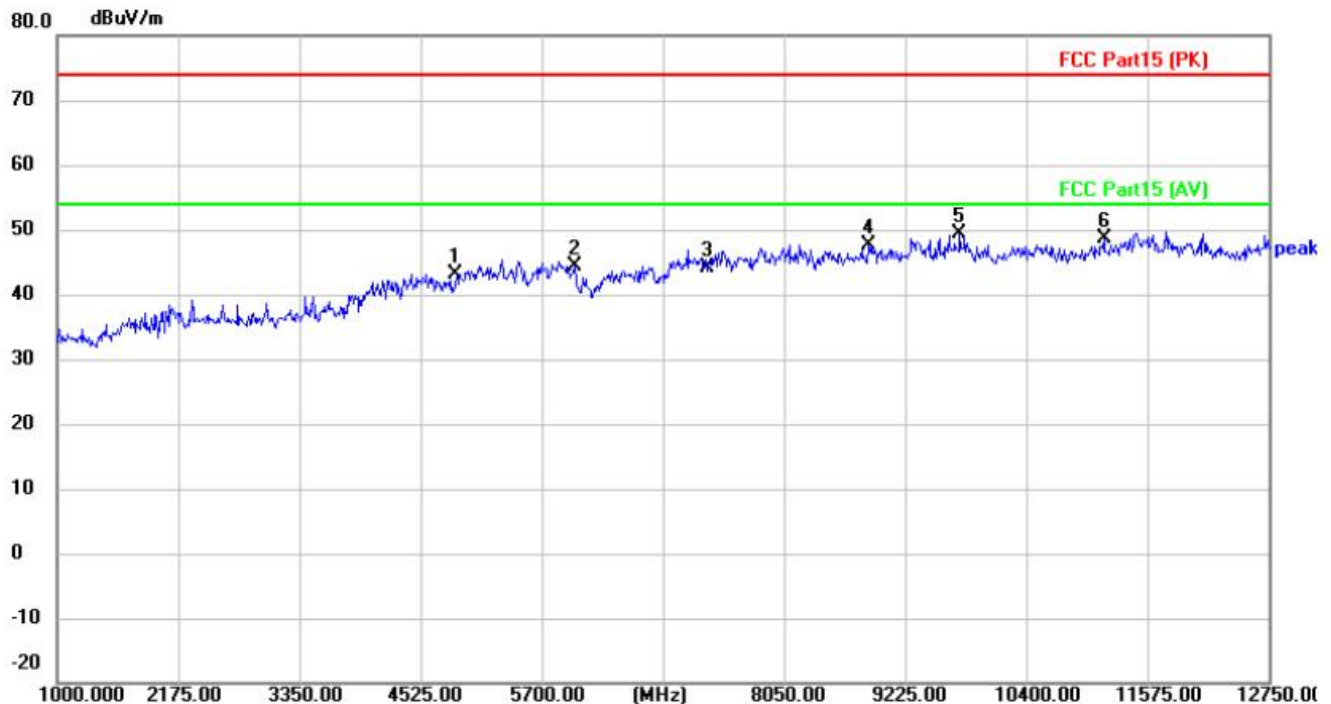
[Test mode: TX 802.11b low channel]; [Polarity: Vertical]



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		4824.000	34.89	6.29	41.18	74.00	-32.82	peak
2		5911.500	35.22	9.08	44.30	74.00	-29.70	peak
3		7236.000	34.46	10.45	44.91	74.00	-29.09	peak
4		8238.000	35.33	11.26	46.59	74.00	-27.41	peak
5		9648.000	32.77	13.50	46.27	74.00	-27.73	peak
6	*	11516.25	34.27	14.86	49.13	74.00	-24.87	peak

Test Result: Pass

[TestMode: TX 802.11b mid channel]; [Polarity: Horizontal]



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		4874.000	36.67	6.39	43.06	74.00	-30.94	peak
2		6017.250	38.46	5.96	44.42	74.00	-29.58	peak
3		7311.000	34.21	9.98	44.19	74.00	-29.81	peak
4		8872.500	35.46	12.20	47.66	74.00	-26.34	peak
5	*	9748.000	35.56	13.81	49.37	74.00	-24.63	peak
6		11152.00	35.44	13.27	48.71	74.00	-25.29	peak

Test Result: Pass

[TestMode: TX 802.11b mid channel]; [Polarity: Vertical]



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV/m	dBuV/m	dB	
1		4874.000	35.21	6.39	41.60	74.00	-32.40	peak
2		6264.000	35.87	7.13	43.00	74.00	-31.00	peak
3		7311.000	35.07	9.98	45.05	74.00	-28.95	peak
4		8661.000	35.10	11.79	46.89	74.00	-27.11	peak
5	*	9748.000	35.07	13.81	48.88	74.00	-25.12	peak
6		10740.75	34.10	12.90	47.00	74.00	-27.00	peak

Test Result: Pass

[Test mode: TX 802.11b High channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		4924.000	35.26	6.89	42.15	74.00	-31.85	peak
2		5829.250	36.94	8.93	45.87	74.00	-28.13	peak
3		7386.000	34.36	10.39	44.75	74.00	-29.25	peak
4		8919.500	36.03	12.38	48.41	74.00	-25.59	peak
5		9848.000	33.96	13.44	47.40	74.00	-26.60	peak
6	*	11199.00	35.43	13.27	48.70	74.00	-25.30	peak

Test Result: Pass

[Test mode: TX 802.11b High channel]; [Polarity: Vertical]



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		4924.000	35.06	6.89	41.95	74.00	-32.05	peak
2		6264.000	35.29	7.13	42.42	74.00	-31.58	peak
3		7386.000	34.51	10.39	44.90	74.00	-29.10	peak
4		8449.500	35.07	11.50	46.57	74.00	-27.43	peak
5		9848.000	32.13	13.44	45.57	74.00	-28.43	peak
6	*	11328.25	34.41	13.47	47.88	74.00	-26.12	peak

Test Result: Pass

6.9 Radiated emissions which fall in the restricted bands

Test Standard	47 CFR Part 15, Subpart C 15.247(d)
Test Method	ANSI C63.10 (2013) Section 6.12
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX

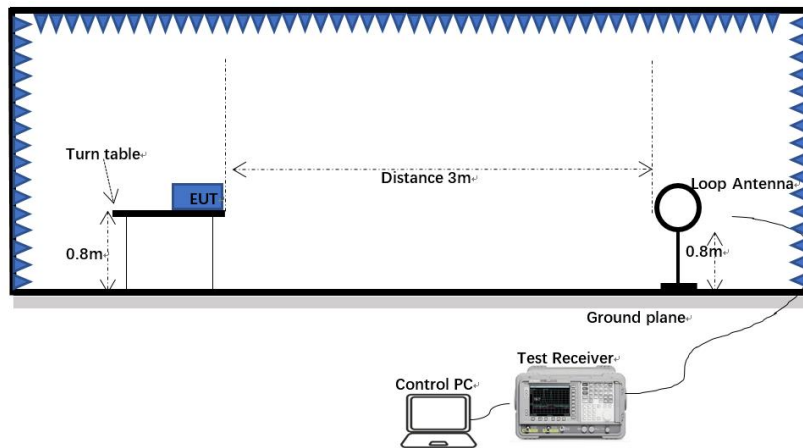
6.9.1 Limit

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

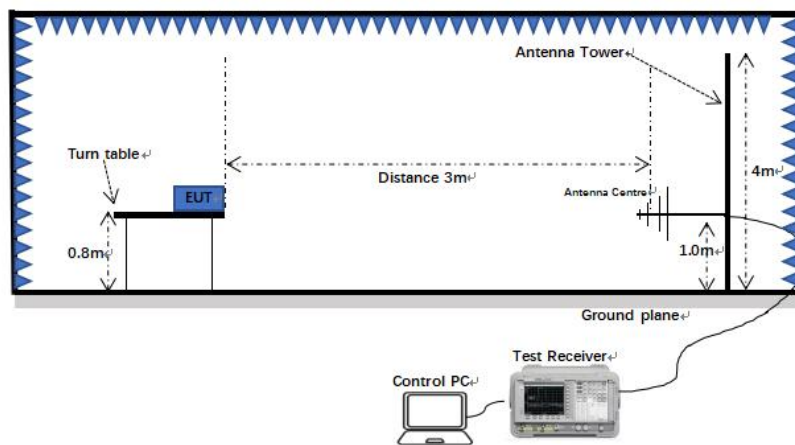
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

6.9.2 Test setup

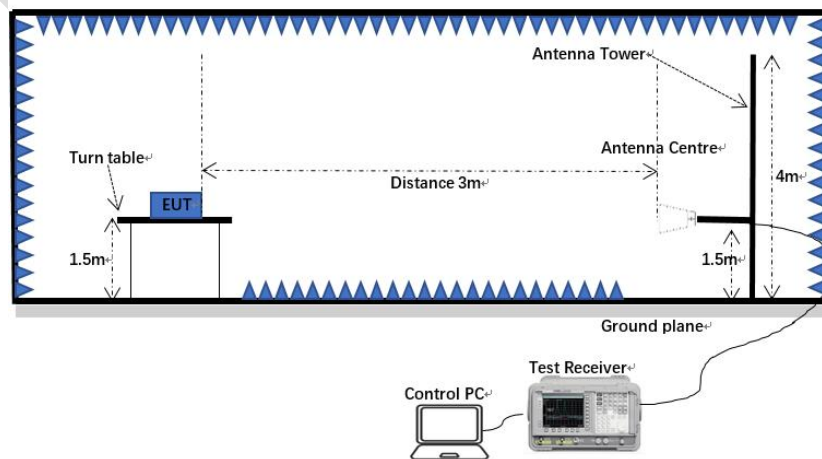
Below 1GHz:



30MHz-1GHz:



Above 1GHz:



6.9.3 Procedure

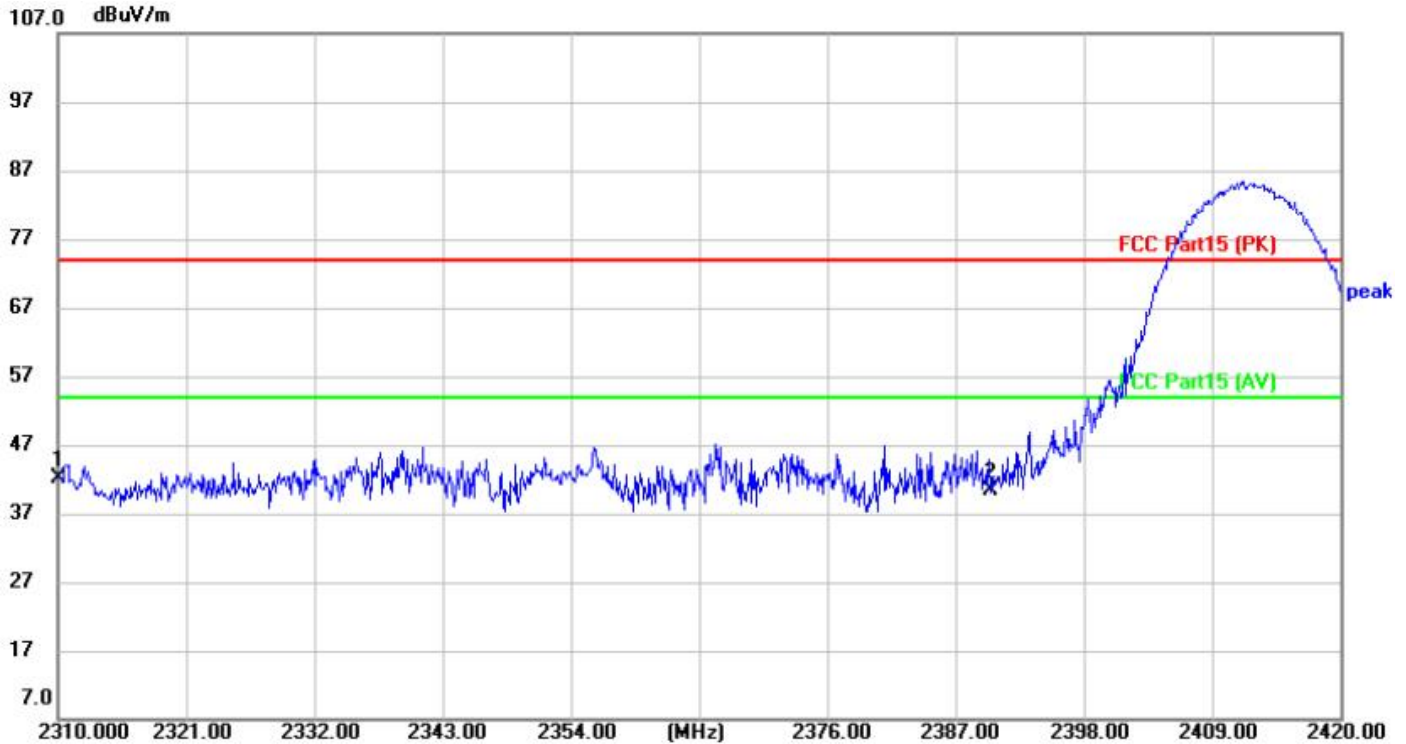
- a) For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c) The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d) The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h) Test the EUT in the lowest channel, the middle channel, the highest channel.
- i) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j) Repeat above procedures until all frequencies measured was complete.

Note 1: Level (dBuV) = Reading (dBuV) + Factor (dB/m)

Note 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

6.9.4 Test data

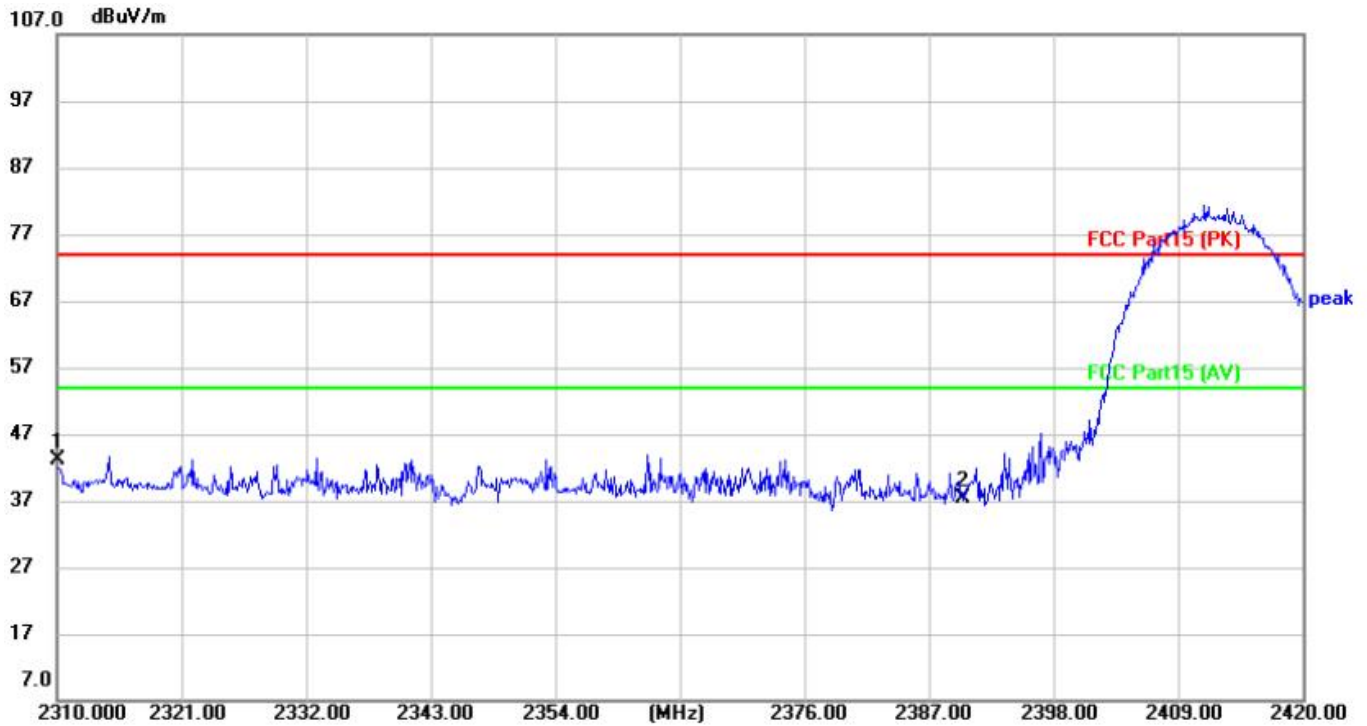
[Test mode: TX 802.11b low channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	2310.000	45.11	-2.87	42.24	74.00	-31.76	peak
2		2390.000	42.89	-2.44	40.45	74.00	-33.55	peak

Test Result: Pass

[Test mode:TX 802.11b low channel]; [Polarity: Vertical]



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1	*	2310.000	45.88	-2.87	43.01	74.00	-30.99	peak
2		2390.000	39.93	-2.44	37.49	74.00	-36.51	peak

Test Result: Pass

[Test mode: TX 802.11b High channel]; [Polarity: Horizontal]



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2483.500	44.79	-2.91	41.88	74.00	-32.12	peak
2	*	2500.000	45.95	-3.00	42.95	74.00	-31.05	peak

Test Result: Pass