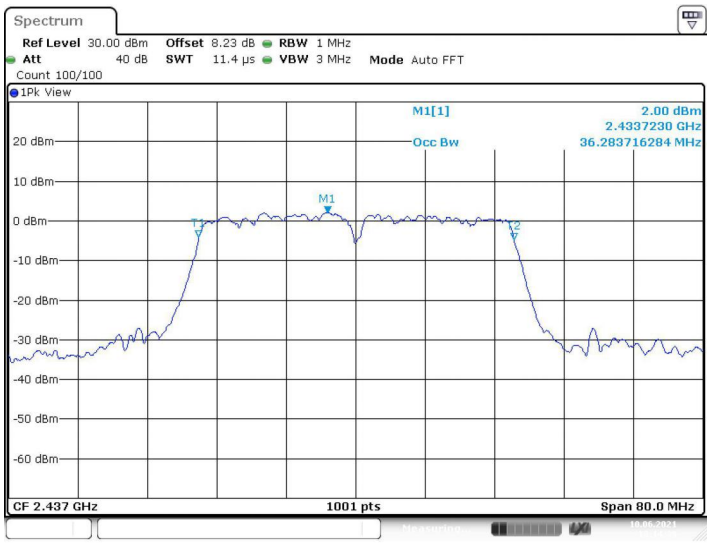
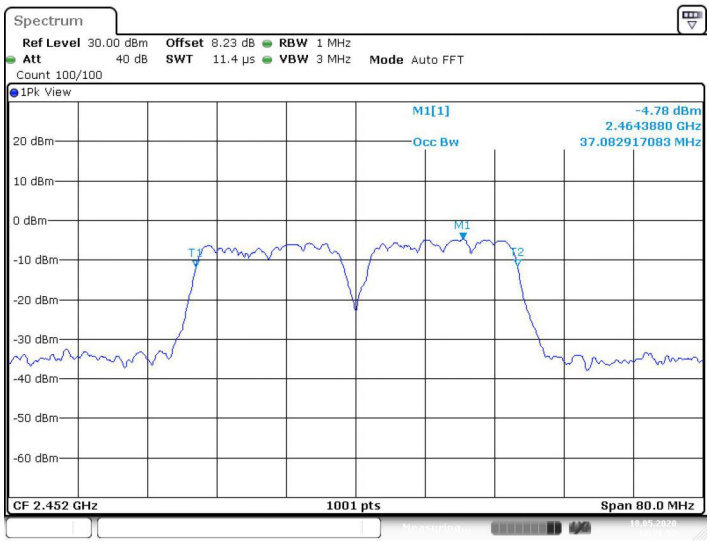
2437 MHz



Date: 10.JUN.2021 10:14:39

2452 MHz



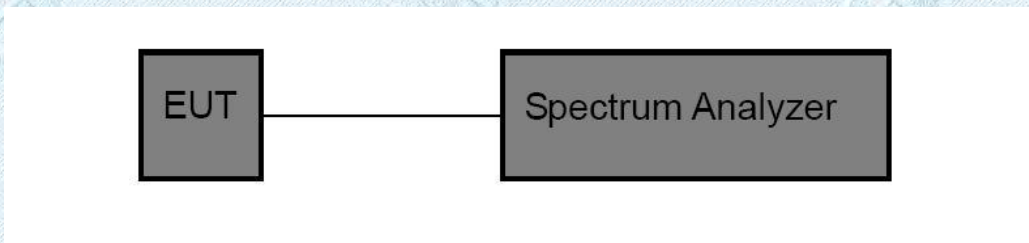
Date: 18.MAY.2020 18:21:56

3.4. Peak Output Power

Limit

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	1 Watt or 30 dBm	2400~2483.5

Test Configuration



Test Procedure

1. The Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. The measurement is according to section 9.1.2 of KDB 558074 D01 15.247 DTS Meas Guidance v05.
3. Spectrum Setting:
   Set analyser center frequency to DTS channel center frequency.
   Set the RBW to: 1MHz
   Set the VBW to: 3MHz
   Detector: peak
   Sweep time: auto
   Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.
4. The power sensor video bandwidth is greater than or equal to the DTS bandwidth of the equipment.

Test Mode

Please refer to the clause 2.3

Test Result

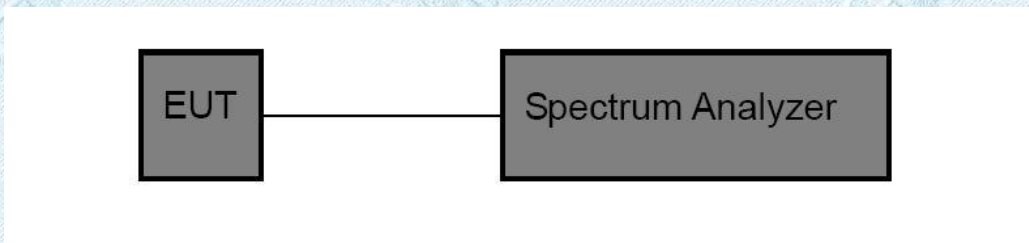
Mode	Channel frequency (MHz)	Test Result (dBm)	Limit (dBm)
802.11b	2412	13.44	30
	2437	12.09	
	2462	13.61	
802.11g	2412	11.46	
	2437	10.08	
	2462	11.35	
802.11n (HT20)	2412	9.71	
	2437	8.28	
	2462	9.70	
802.11n （HT40）	2422	8.25	
	2437	9.00	
	2452	9.53	
Result： PASS			

3.5. Power Spectral Density

Limit

FCC Part 15 Subpart C(15.247)		
Test Item	**Limit**	**Frequency Range(MHz)**
Power Spectral Density	8dBm(in any 3 kHz)	2400~2483.5

Test Configuration



Test Procedure

1. The Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator.
2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to ANSI C63.10 (2013) for compliance to FCC 47CFR 15.247 requirements.
3. Spectrum Setting:
   Set analyser center frequency to DTS channel center frequency.
   Set the span to 1.5 times the DTS bandwidth.
   Set the RBW to: 10 kHz
   Set the VBW to: 30 kHz
   Detector: peak
   Sweep time: auto
   Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

Test Mode

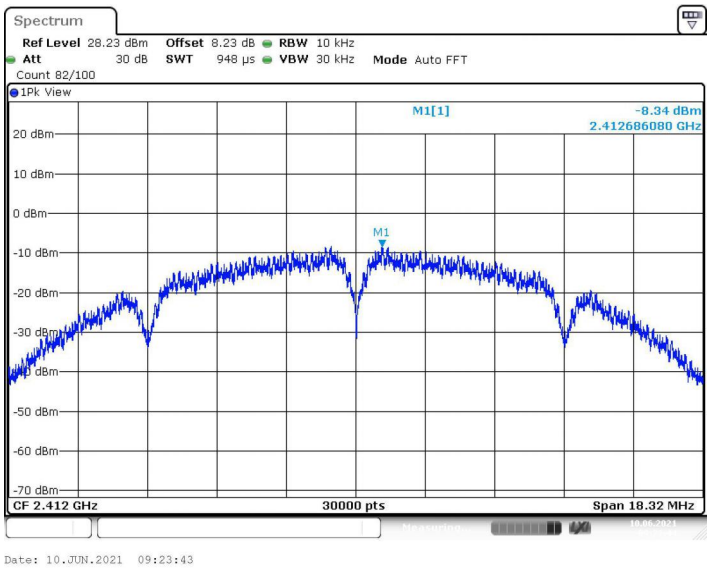
Please refer to the clause 2.3

Test Result

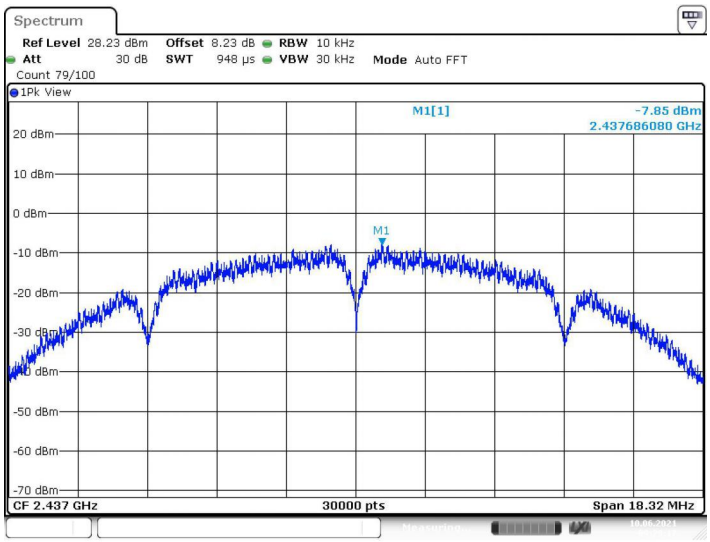
Note:

Power Density(dBm/3kHz)=Power Density(dBm/10kHz)-10*Log(10/3)

Test Mode:	802.11b Mode		
Channel Frequency (MHz)	**Power Density (dBm/10kHz)**	**Power Density (dBm/3kHz)**	**Limit (dBm)**
2412	-8.34	-13.57	8dBm/3kHz
2437	-7.85	-13.08	
2462	-6.55	-11.78	
2412 MHz			



2437 MHz



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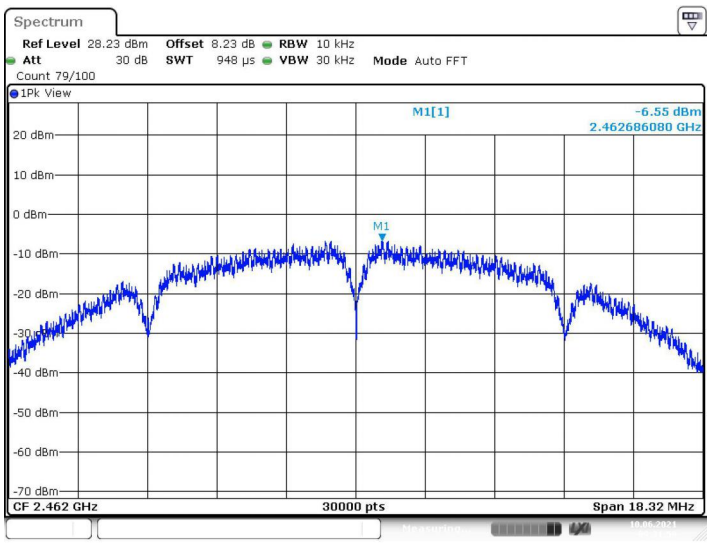
2462 MHz



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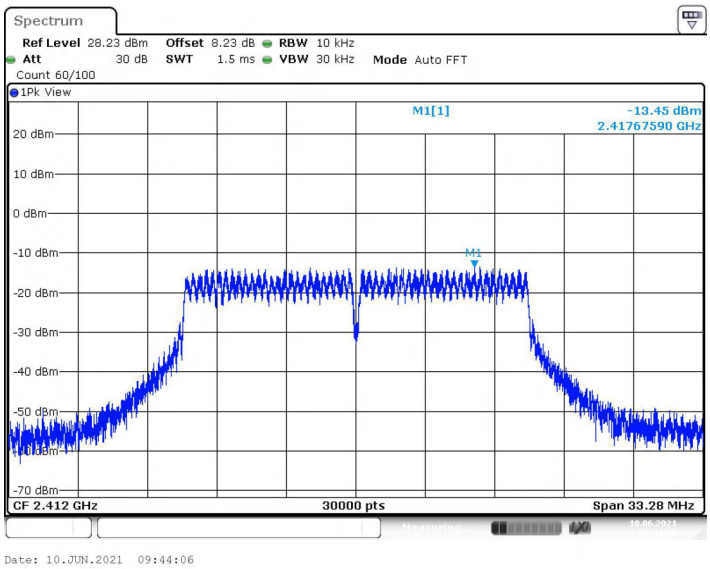
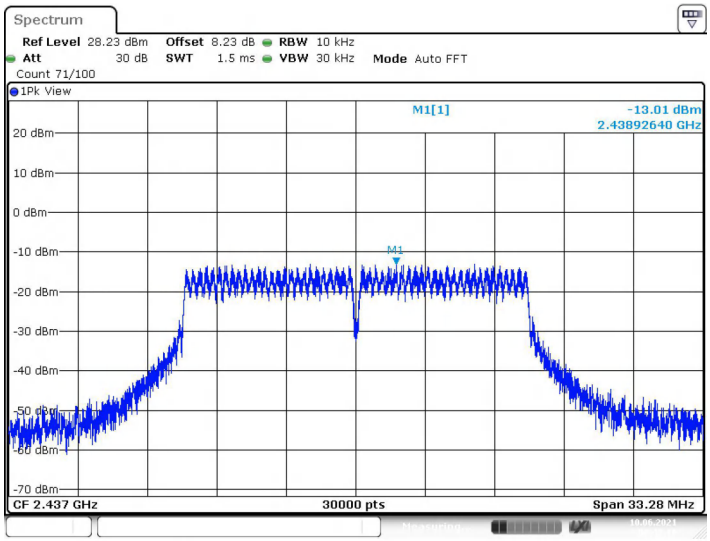
Test Mode:	802.11g Mode		
Channel Frequency (MHz)	**Power Density (dBm/10 kHz)**	**Power Density (dBm/3 kHz)**	**Limit (dBm)**
2412	-13.45	-18.68	8dBm/3kHz
2437	-13.01	-18.24	
2462	-13.31	-18.54	
2412 MHz			



2437 MHz



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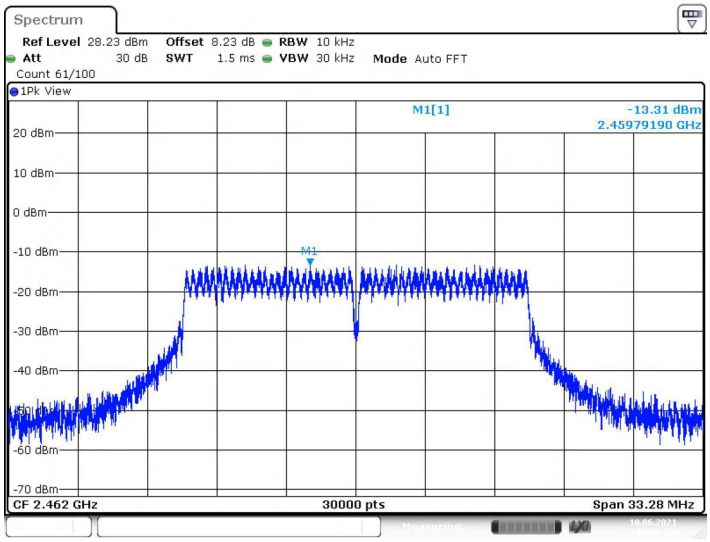
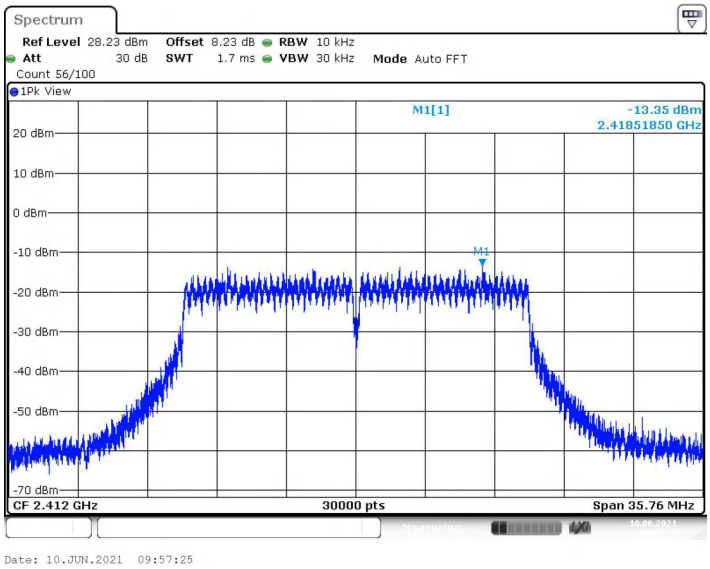
2462 MHz

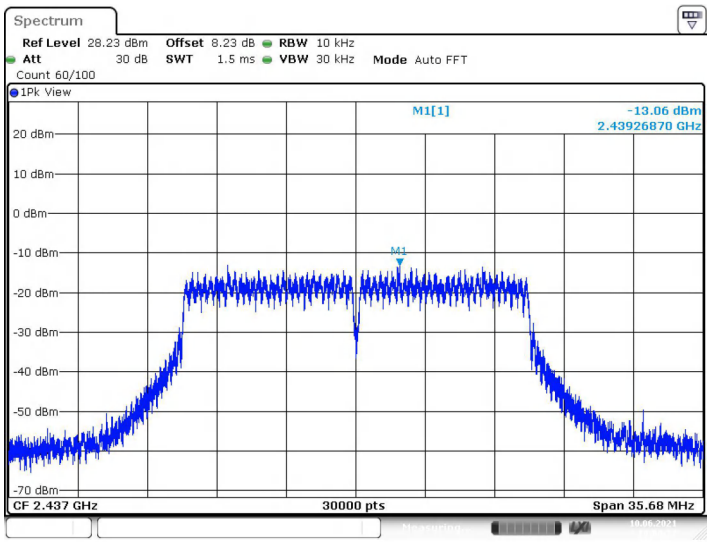


Date: 10.JUN.2021 09:51:27

Test Mode:	802.11n(HT20) Mode		
Channel Frequency (MHz)	**Power Density (dBm/10kHz)**	**Power Density (dBm/3 kHz)**	**Limit (dBm)**
2412	-13.35	-18.58	8dBm/3kHz
2437	-13.06	-18.29	
2462	-14.12	-19.35	
2412 MHz			



2437 MHz



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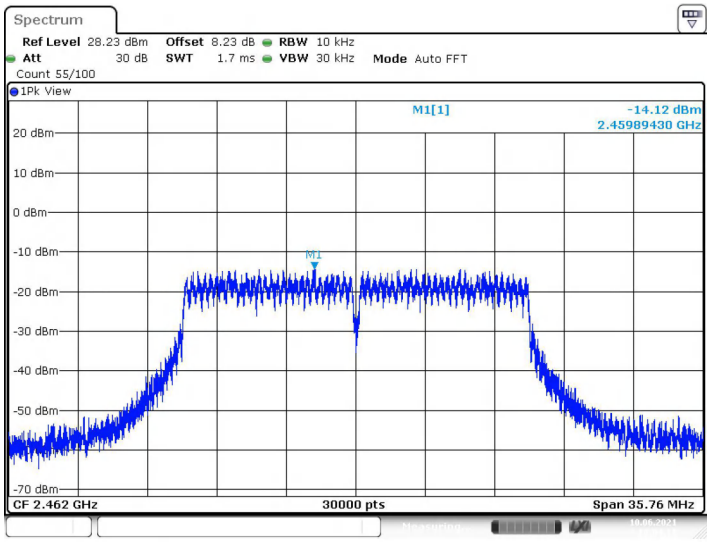
2462 MHz



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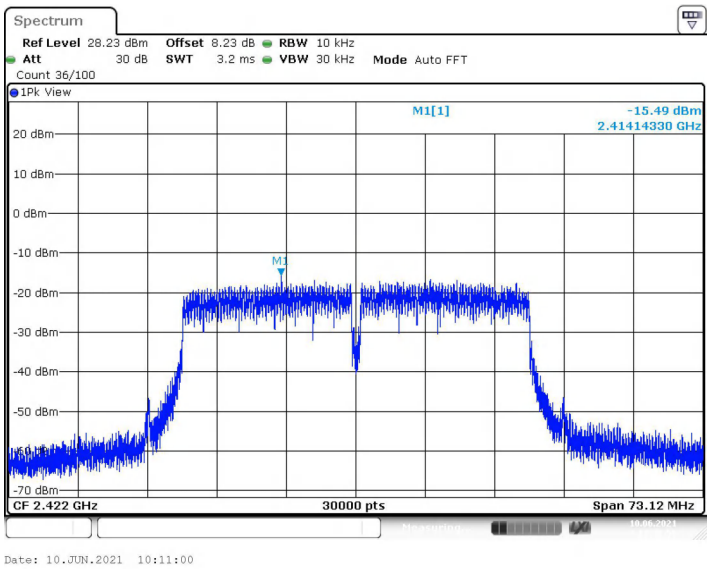
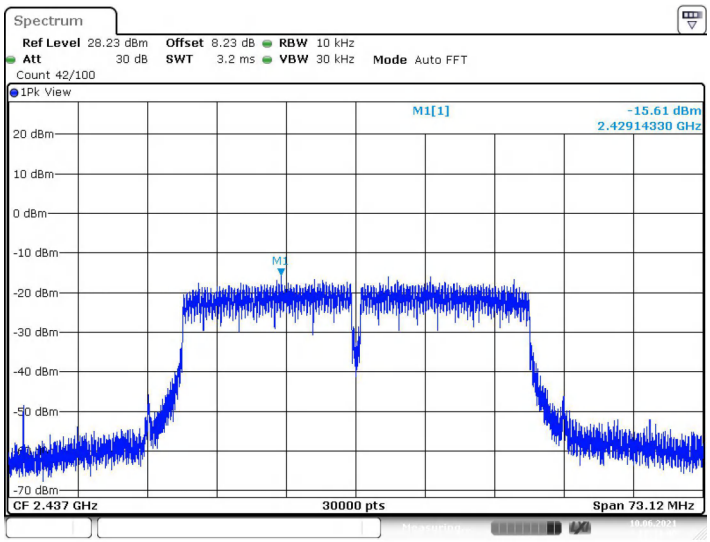
Test Mode:	802.11n(HT40) Mode		
Channel Frequency (MHz)	**Power Density (dBm/10 kHz)**	**Power Density (dBm/3 kHz)**	**Limit (dBm)**
2422	-15.49	-20.72	8dBm/3kHz
2437	-15.61	-20.84	
2452	-16.24	-21.47	
2422 MHz			



2437 MHz



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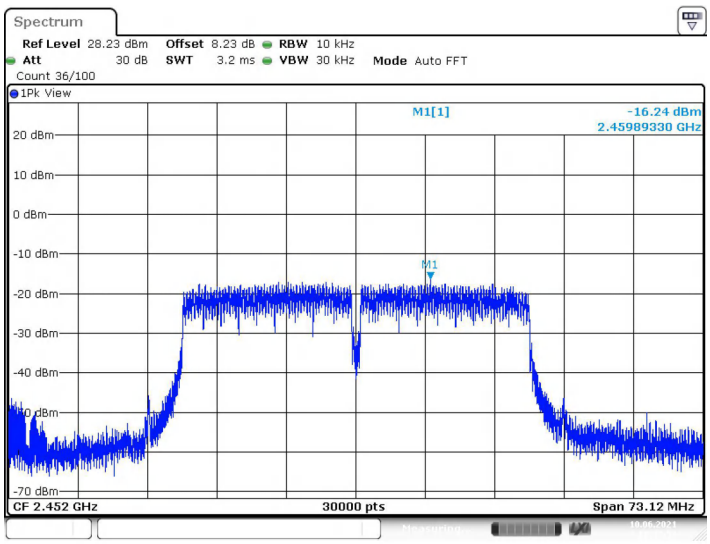
2452 MHz



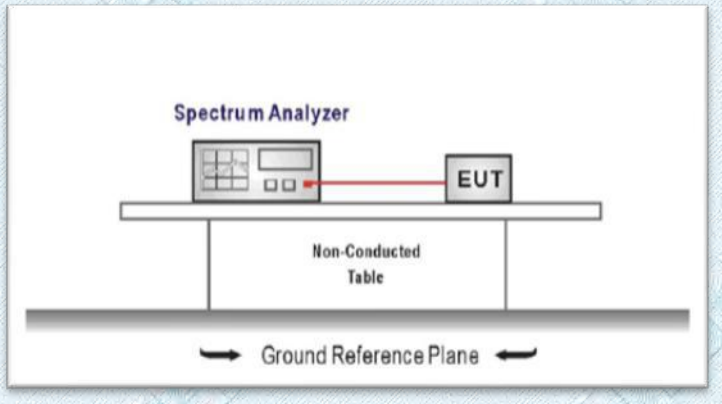
Date: 10.JUN.2021 10:17:53

3.6. Band edge and Spurious Emission (Conducted)

Limit

FCC CFR Title 47 Part 15 Subpart C Section15.247 (d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.

Test Configuration



Test Procedure

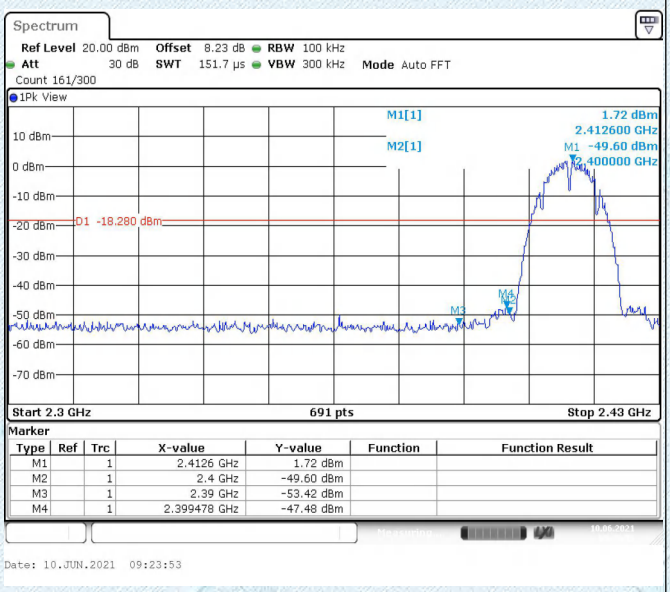
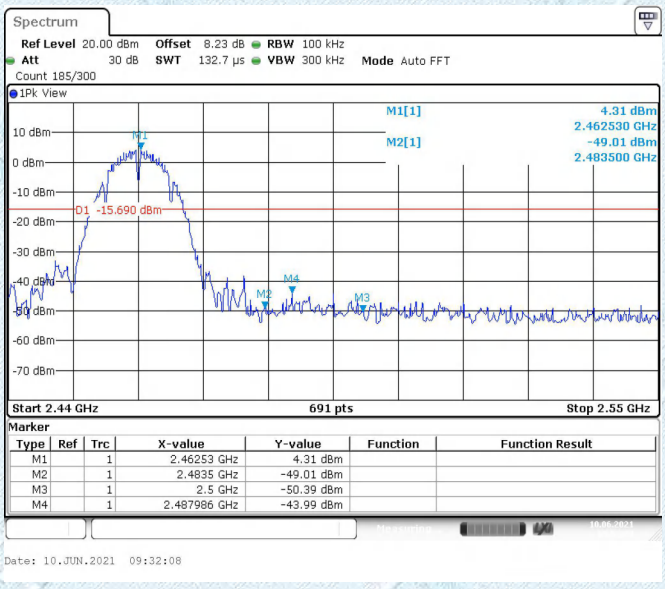
1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator..
2. Establish a reference level by using the following procedure
   Center frequency=DTS channel center frequency
   The span = 1.5 times the DTS bandwidth.
   RBW = 100 kHz, VBW ≥ 3 x RBW
   Detector = peak, Sweep time = auto couple, Trace mode = max hold
   Allow trace to fully stabilize
   Use the peak marker function to determine the maximum PSD level

   Note: the channel found to contain the maximum PSD level can be used to establish the reference level.
3. Emission level measurement
   Set the center frequency and span to encompass frequency range to be measured
   RBW = 100 kHz, VBW ≥ 3 x RBW
   Detector = peak, Sweep time = auto couple, Trace mode = max hold
   Allow trace to fully stabilize
   Use the peak marker function to determine the maximum amplitude level.
4. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
5. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emissions relative to the limit.

Test Mode

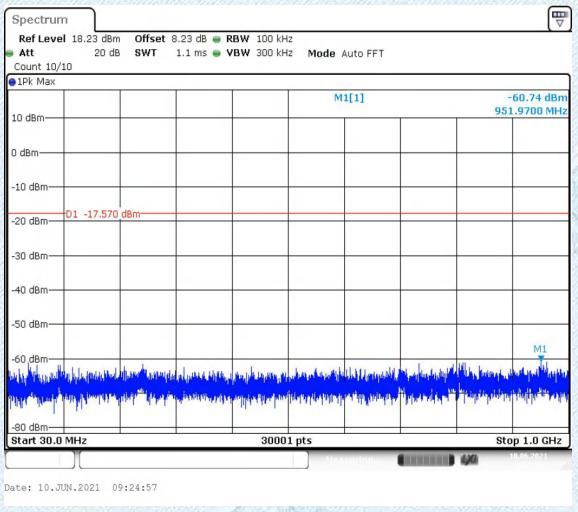
Please refer to the clause 2.3.

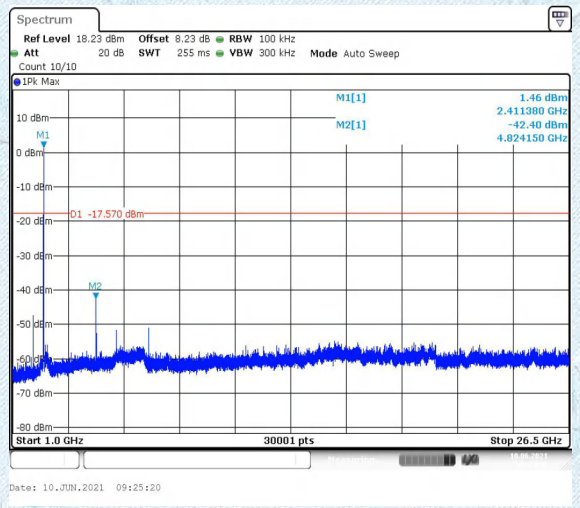
Test Results

802.11b	
CH01-Bandedge	CH11-Bandedge
	

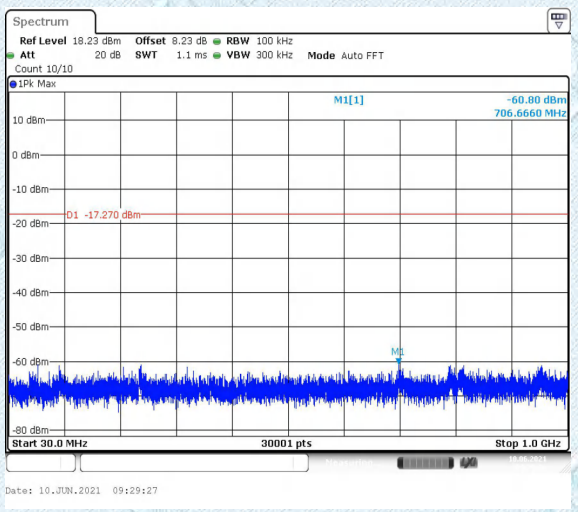
802.11b

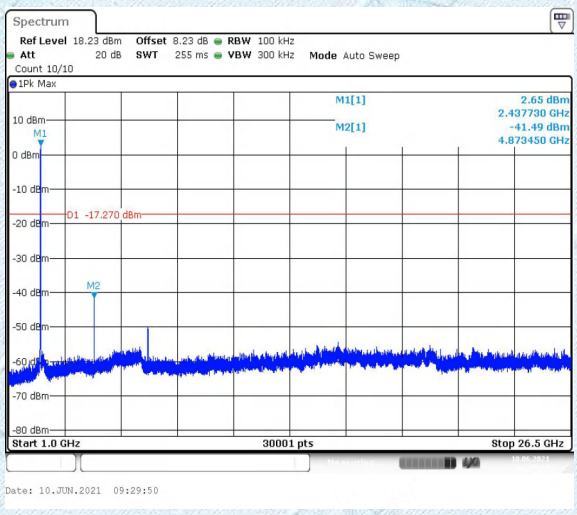
CH01-SE



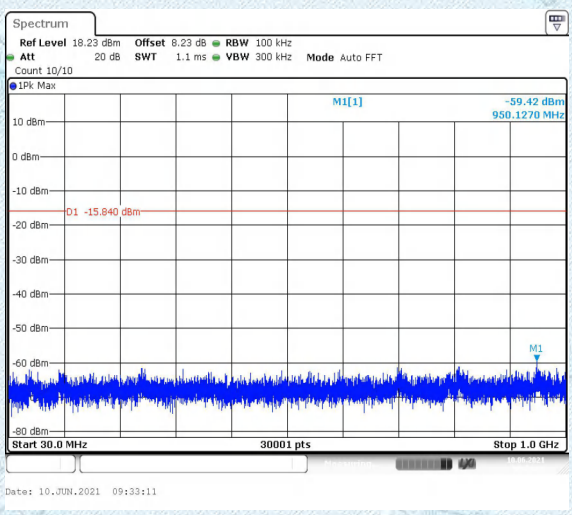


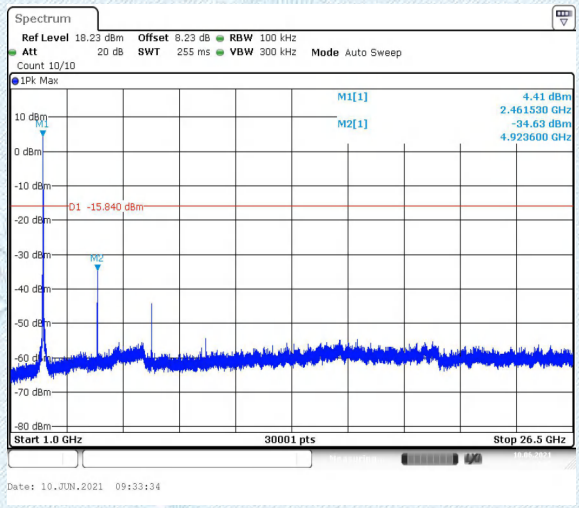
CH06-SE



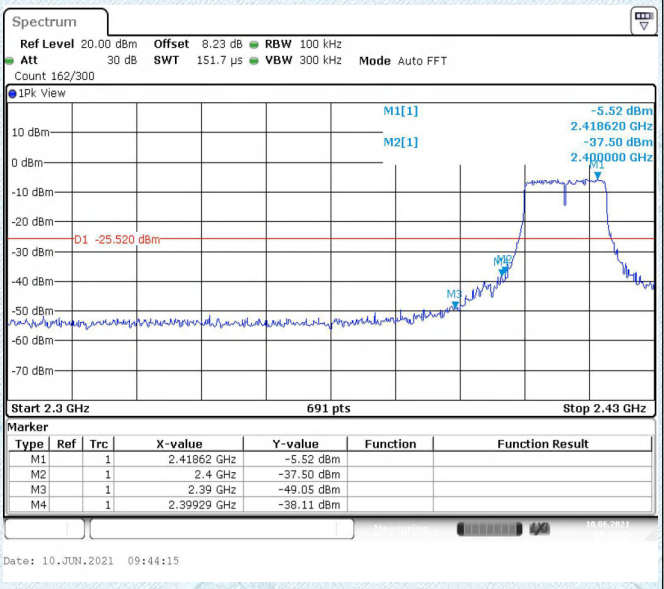


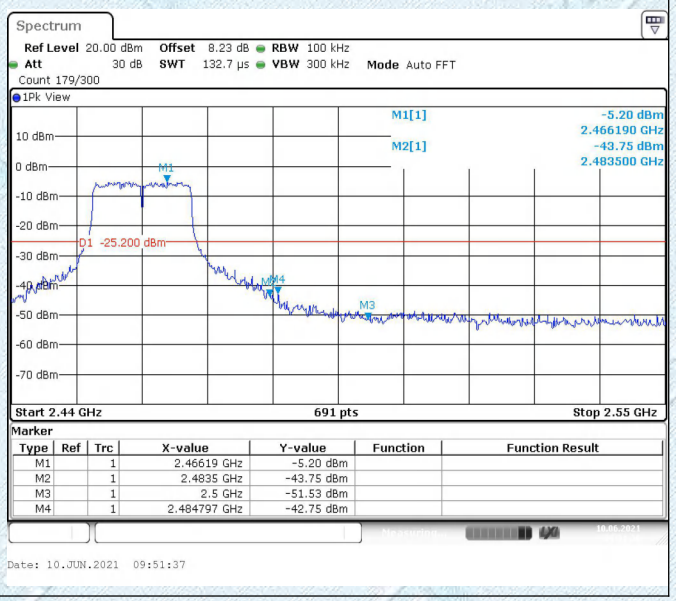
CH11-SE





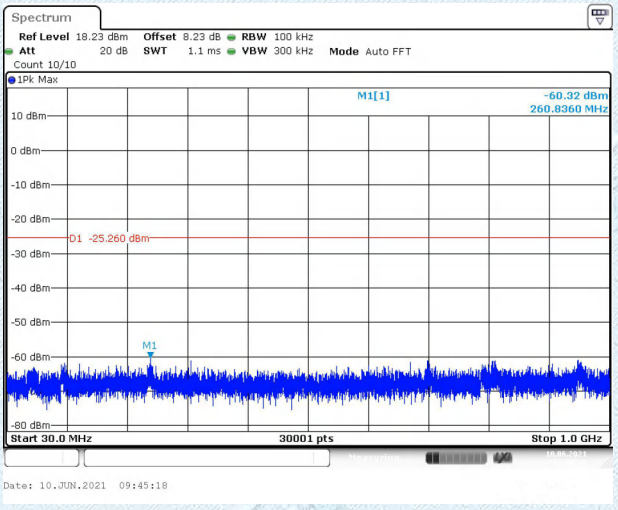
802.11g	
CH01-Bandedge	CH11-Bandedge

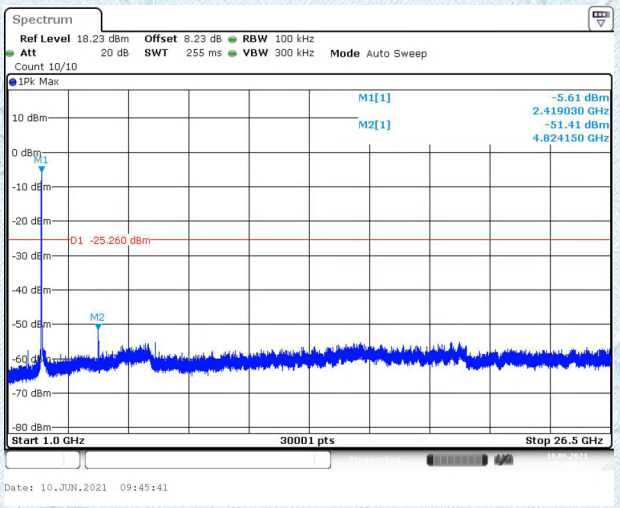




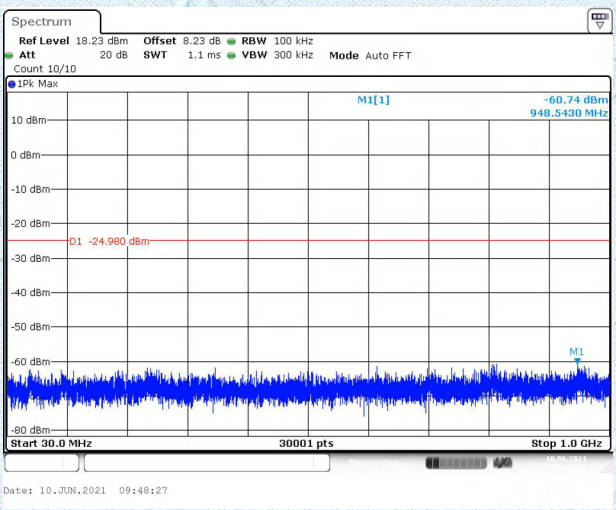
802.11g

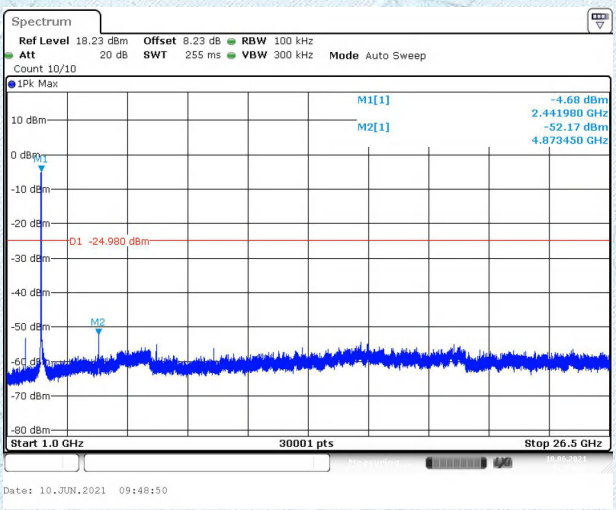
CH01-SE



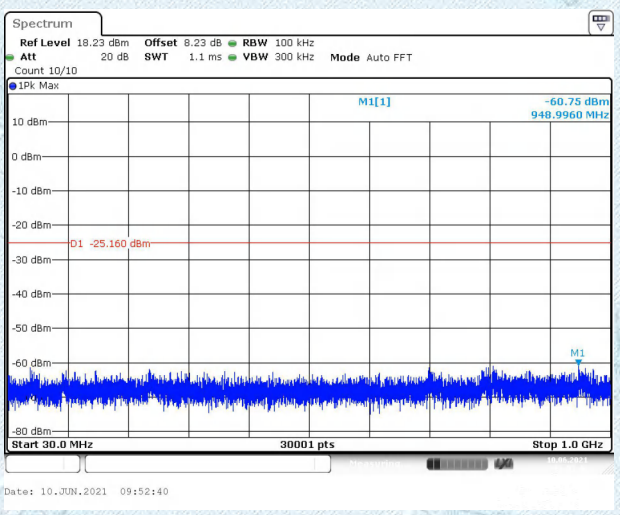


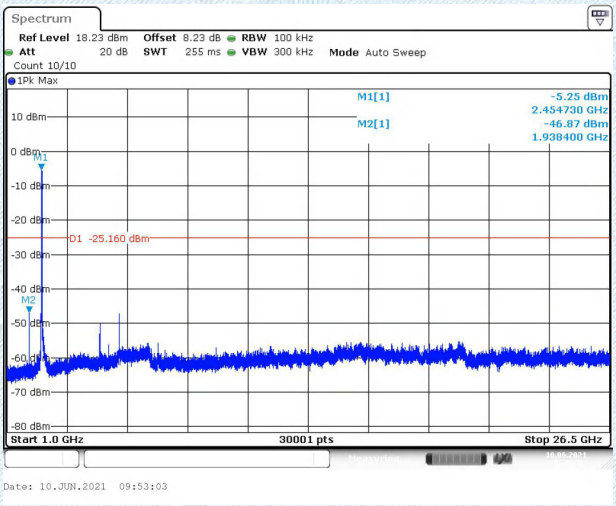
CH06-SE





CH11-SE

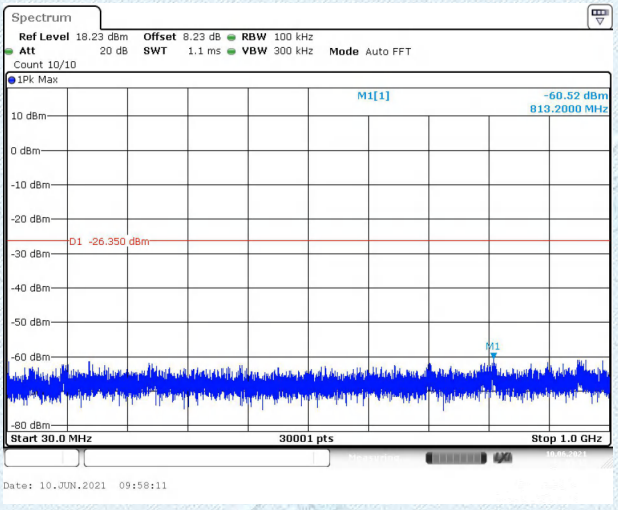


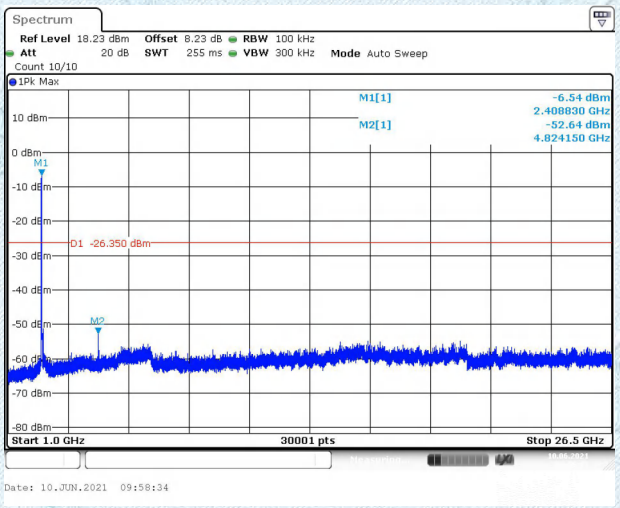


802.11n(HT20)	
CH01-Bandedge	CH11-Bandedge

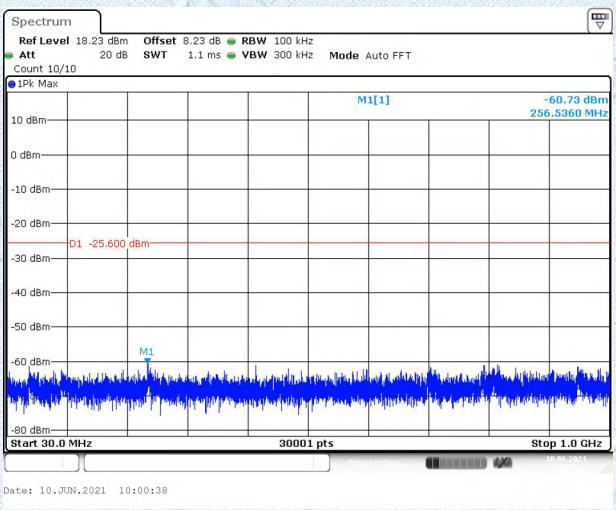
802.11n(HT20)

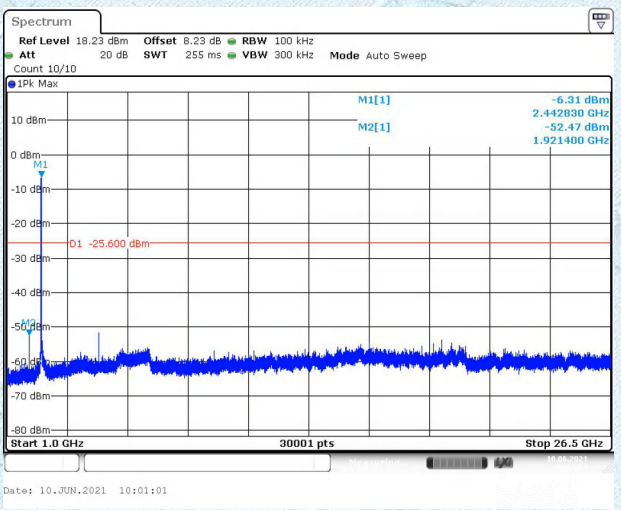
CH01-SE



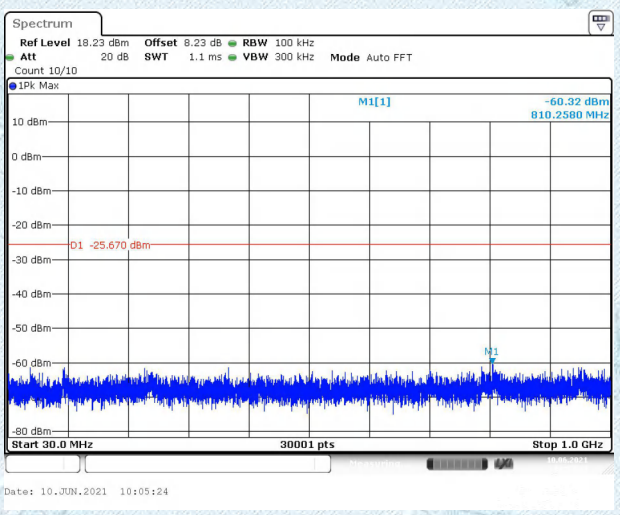


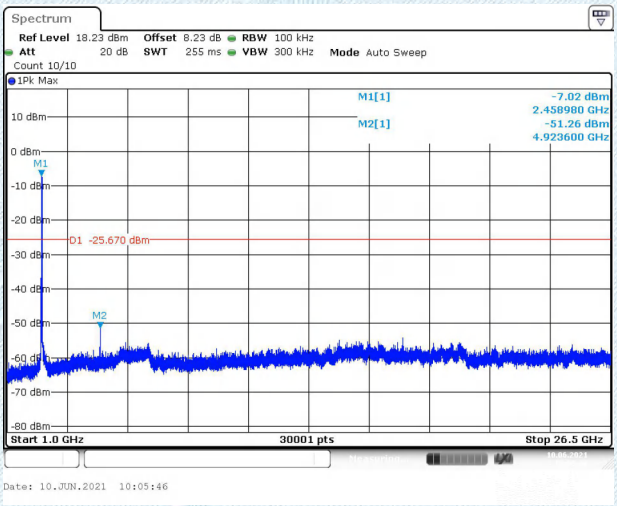
CH06-SE





CH11-SE

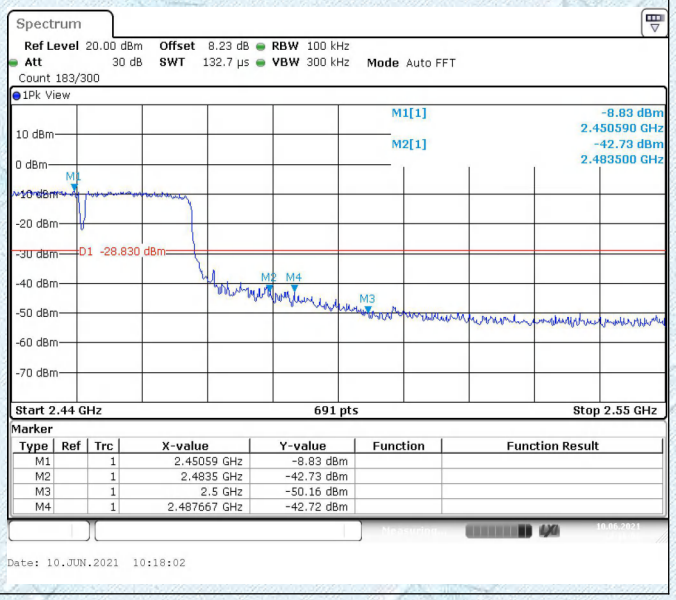




802.11n(HT40)

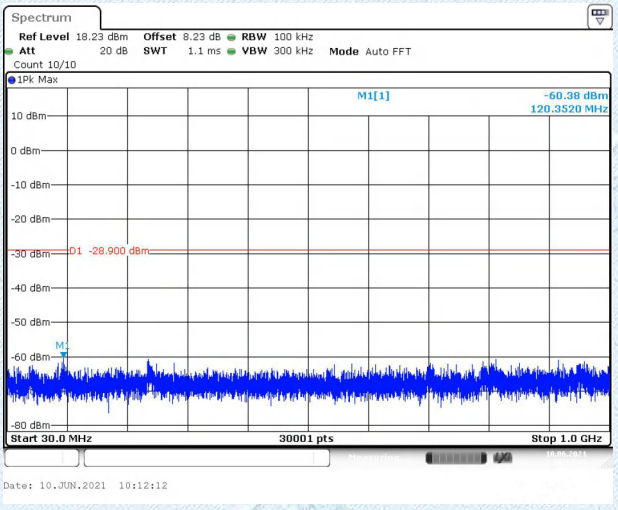
CH03-Bandedge

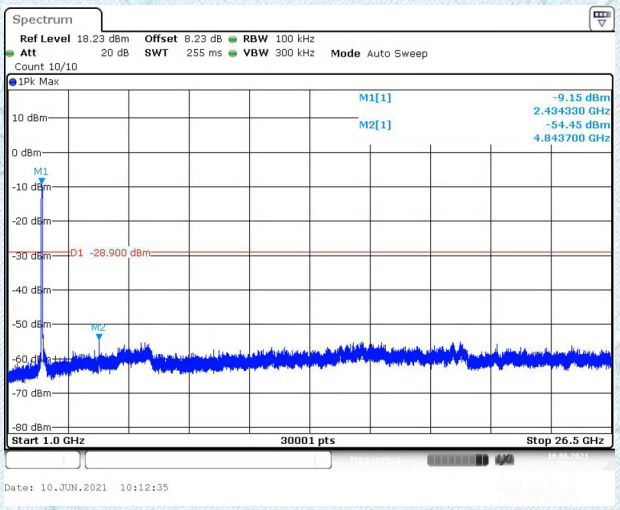
CH09-Bandedge



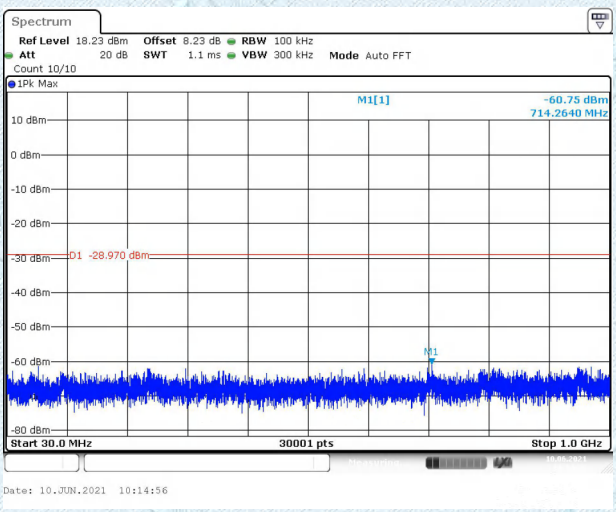
802.11n(HT40)

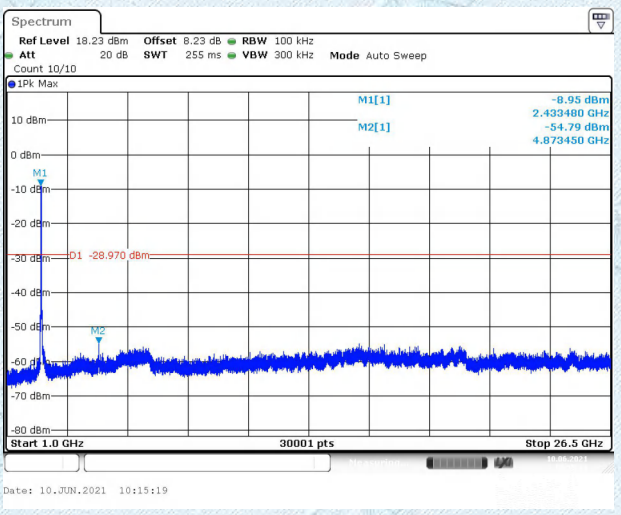
CH03-SE



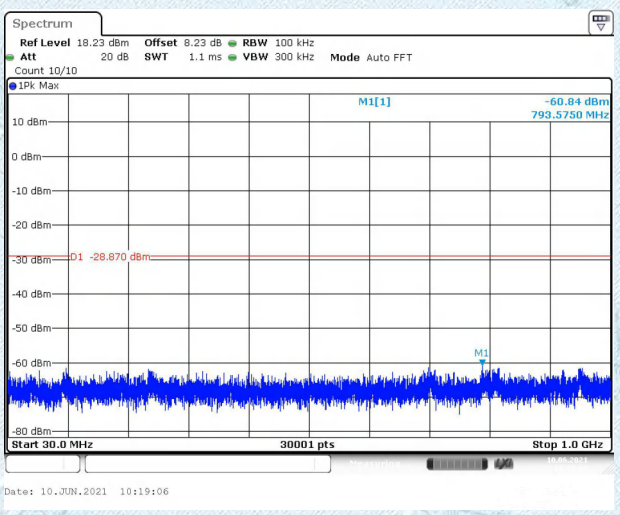


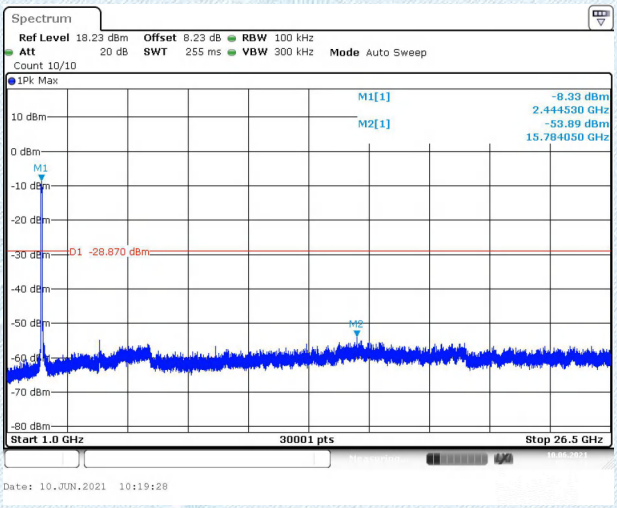
CH06-SE





CH09-SE



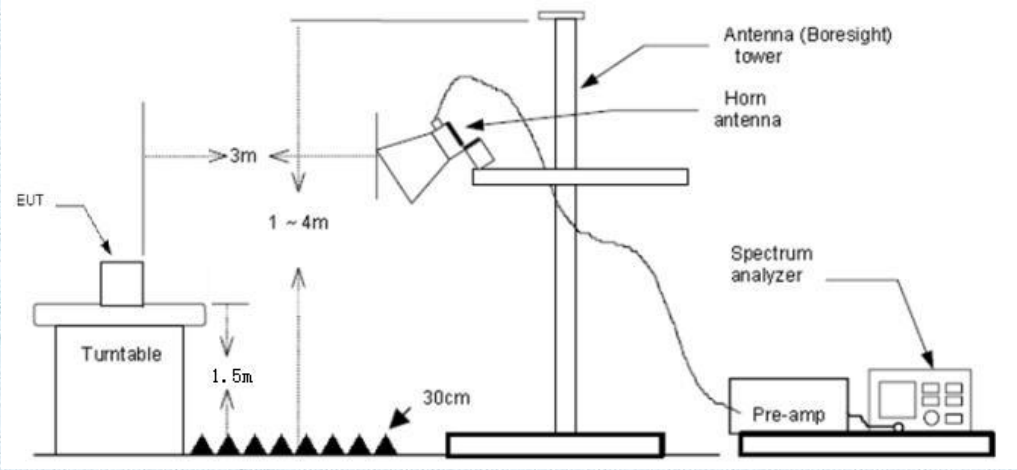


3.7. Band Edge Emissions(Radiated)

Limit

Restricted Frequency Band (MHz)	(dBuV/m)(at 3m)	
	Peak	Average
2310 ~2390	74	54
2483.5 ~2500	74	54
Note: All restriction bands have been tested, only the worst case is reported.		

Test Configuration



Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
   RBW=1MHz, VBW=3MHz PEAK detector for Peak value.
   RBW=1MHz, VBW=10Hz with Average detector for Average Value.

Test Mode

Please refer to the clause 2.3.

Test Results

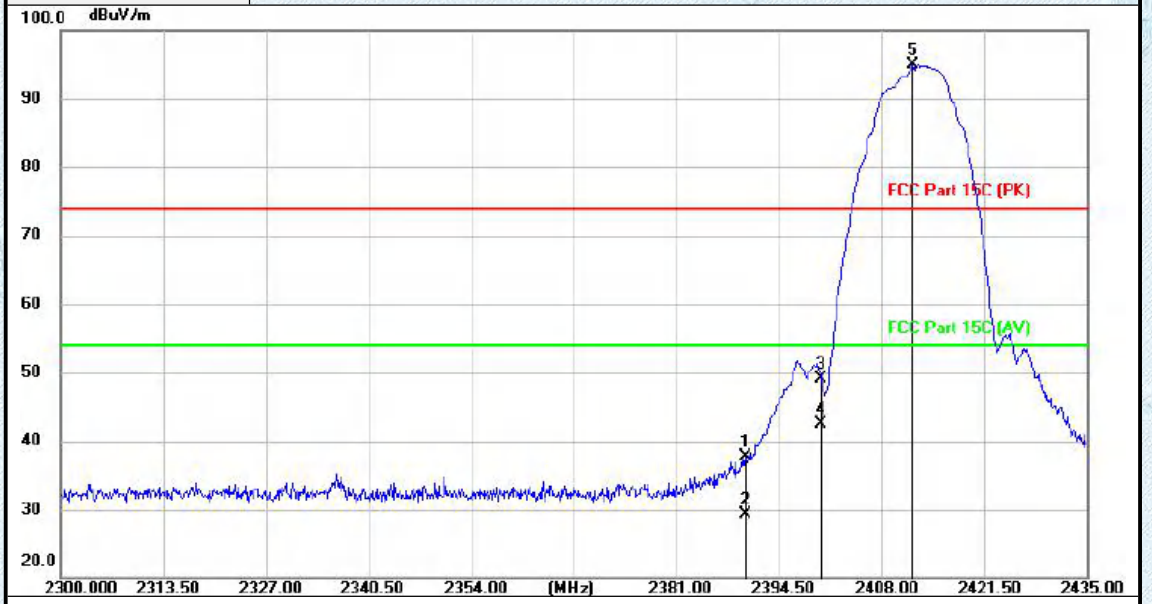
Note:

1.Measurement = Reading level + Correct Factor

Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

2.Pre-scan 802.11b, 802.11g, 802.11n(HT20) and 802.11n(HT40) mode, and found the 802.11b mode which it is worse case, so only show the test data for worse case.

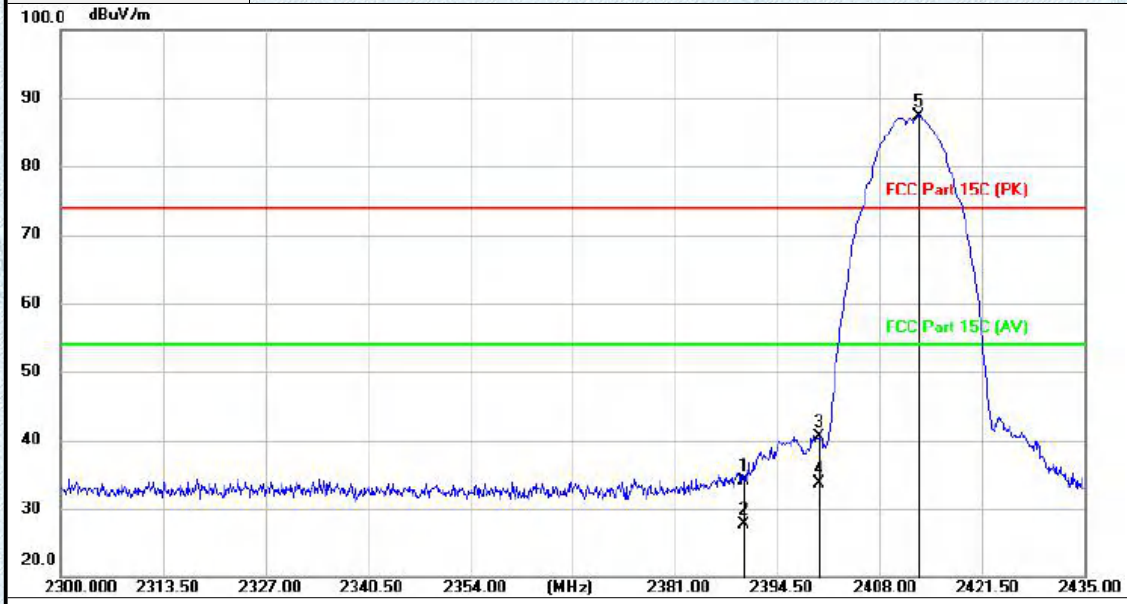
Test Voltage:	DC 7.6V
Ant. Pol.	Horizontal
Test Mode:	802.11b Mode 2412MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	48.61	-10.92	37.69	74.00	-36.31	peak
2		2390.000	40.18	-10.92	29.26	54.00	-24.74	AVG
3		2400.000	59.98	-10.92	49.06	74.00	-24.94	peak
4		2400.000	53.46	-10.92	42.54	54.00	-11.46	AVG
5	*	2412.023	105.78	-10.92	94.86	74.00	20.86	peak

Measurement = Reading level + Correct Factor

Test Voltage:	DC 7.6V
Ant. Pol.	Vertical
Test Mode:	802.11b Mode 2412 MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	45.04	-10.92	34.12	74.00	-39.88	peak
2		2390.000	38.56	-10.92	27.64	54.00	-26.36	AVG
3		2400.000	51.40	-10.92	40.48	74.00	-33.52	peak
4		2400.000	44.55	-10.92	33.63	54.00	-20.37	AVG
5	*	2413.130	98.26	-10.91	87.35	74.00	13.35	peak

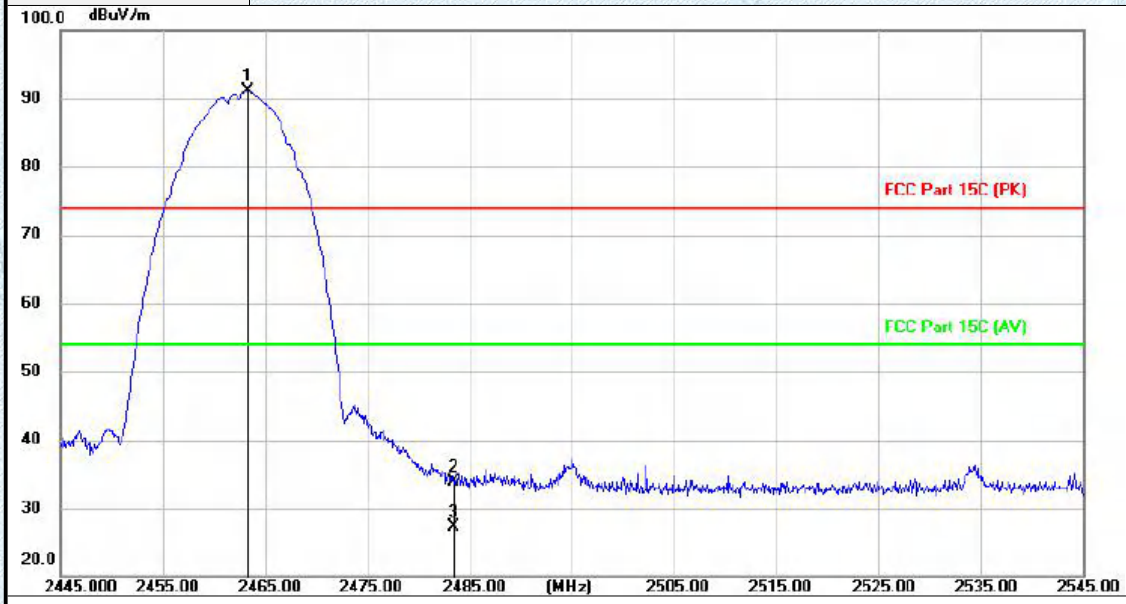
Measurement = Reading level + Correct Factor

Test Voltage:	DC 7.6V
Ant. Pol.	Horizontal
Test Mode:	802.11b Mode 2462MHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	2462.020	105.91	-10.89	95.02	74.00	21.02	peak
2		2483.500	48.94	-10.88	38.06	74.00	-35.94	peak
3		2483.500	42.12	-10.88	31.24	54.00	-22.76	AVG

Measurement = Reading level + Correct Factor

Test Voltage:	DC 7.6V
Ant. Pol.	Vertical
Test Mode:	802.11b Mode 2462MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	2463.280	101.97	-10.89	91.08	74.00	17.08	peak
2		2483.500	44.78	-10.88	33.90	74.00	-40.10	peak
3		2483.500	38.22	-10.88	27.34	54.00	-26.66	AVG

Measurement = Reading level + Correct Factor

3.8. Spurious Emission (Radiated)

Limit

Radiated Emission Limits (9 kHz~1000 MHz)

Frequency (MHz)	Field Strength (microvolt/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

Radiated Emission Limit (Above 1000MHz)

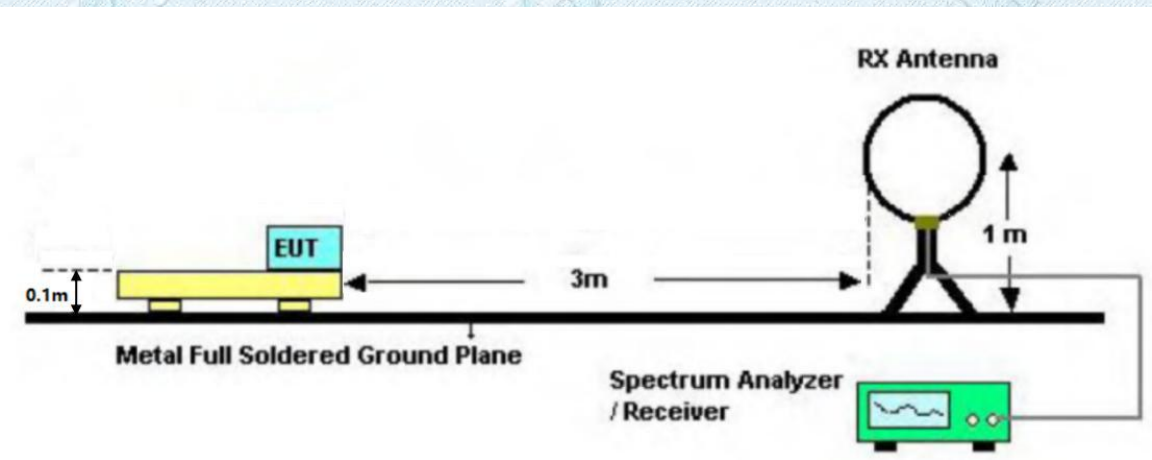
Frequency (MHz)	Distance Meters(at 3m)	
	Peak	Average
Above 1000	74	54

Note:

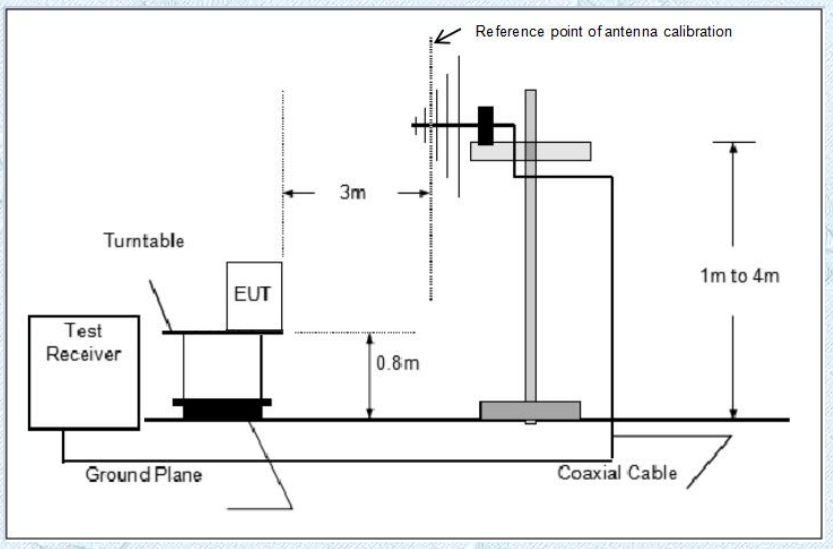
(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

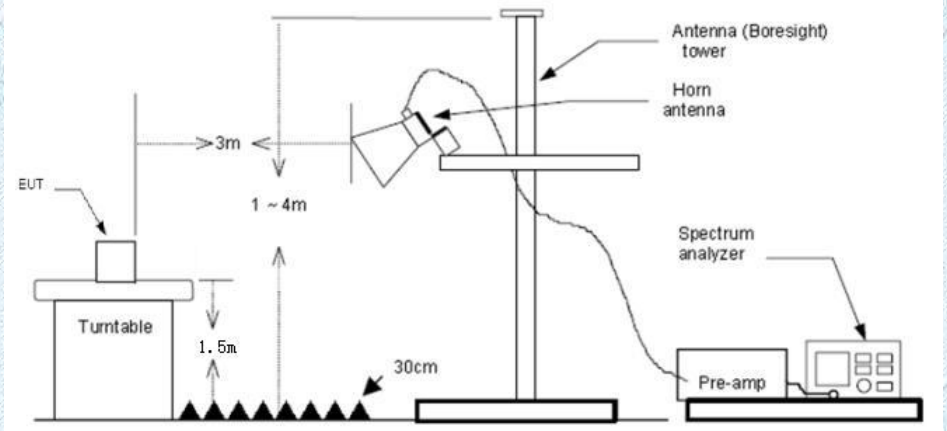
Test Configuration



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings

   (1) Span shall wide enough to fully capture the emission being measured;

   (2) Below 1 GHz:

   RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

   If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

   (3) From 1 GHz to 10th harmonic:

   RBW=1MHz, VBW=1MHz Peak detector for Peak value.

   RBW=1MHz, VBW=10Hz RMS detector for Average value.

Test Mode

Please refer to the clause 2.3.

Test Result

9 KHz~30 MHz and 18GHz~25GHz

From 9 KHz~30 MHz and 18GHz~25GHz: Conclusion: PASS

Note:

1) Measurement = Reading level + Correct Factor
   Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor
2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.
3) The emission levels of other frequencies are very lower than the limit and not show in test report.
4) The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
5) Pre-scan 802.11b/g/n(HT20/HT40) modulation, and found the 802.11b modulation 2412MHz which it is worse case for 30MHz-1GHz , so only show the test data for worse case.
6) Pre-scan 802.11b/g/n(HT20/HT40) modulation, and found the 802.11b modulation which it is worse case for above 1GHz, so only show the test data for worse case.

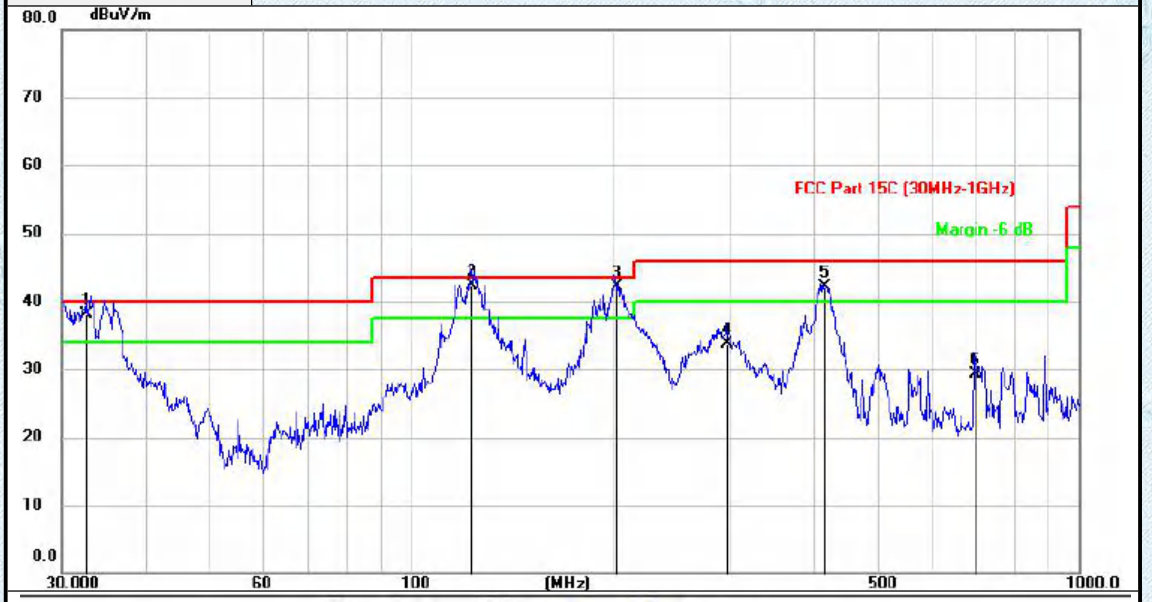
30MHz-1GHz

Test Voltage:	DC 7.6V
Ant. Pol.	Horizontal
Test Mode:	TX 2412MHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	!	122.8771	59.44	-17.80	41.64	43.50	-1.86	QP
2		147.4553	52.29	-19.84	32.45	43.50	-11.05	QP
3	!	202.9527	58.54	-16.62	41.92	43.50	-1.58	QP
4		255.1754	54.24	-15.83	38.41	46.00	-7.59	QP
5	*	291.1381	60.16	-15.34	44.82	46.00	-1.18	QP
6	!	414.7223	54.56	-10.20	44.36	46.00	-1.64	QP

Measurement = Reading Level+ Correct Factor

Test Voltage:	DC 7.6V
Ant. Pol.	Vertical
Test Mode:	TX 2412MHz

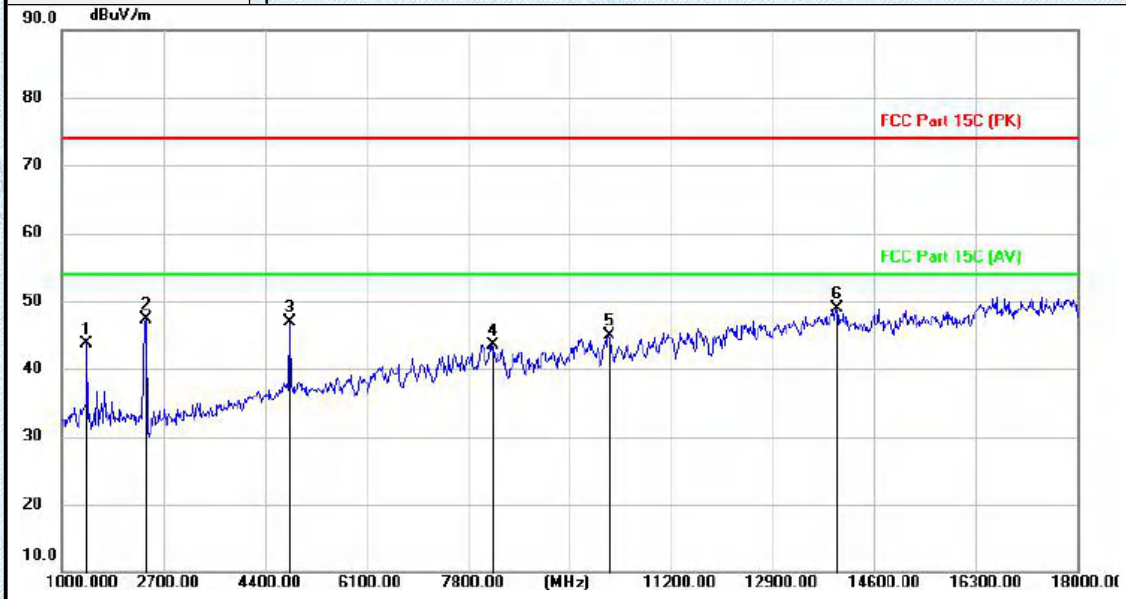


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	!	32.7027	54.81	-16.66	38.15	40.00	-1.85	QP
2	*	122.8771	60.16	-17.80	42.36	43.50	-1.14	QP
3	!	202.8104	58.77	-16.62	42.15	43.50	-1.35	QP
4		297.0157	48.90	-15.25	33.65	46.00	-12.35	QP
5	!	416.0332	52.35	-10.20	42.15	46.00	-3.85	QP
6		698.8143	36.82	-7.46	29.36	46.00	-16.64	QP

Measurement = Reading Level+ Correct Factor

Adobe 1GHz

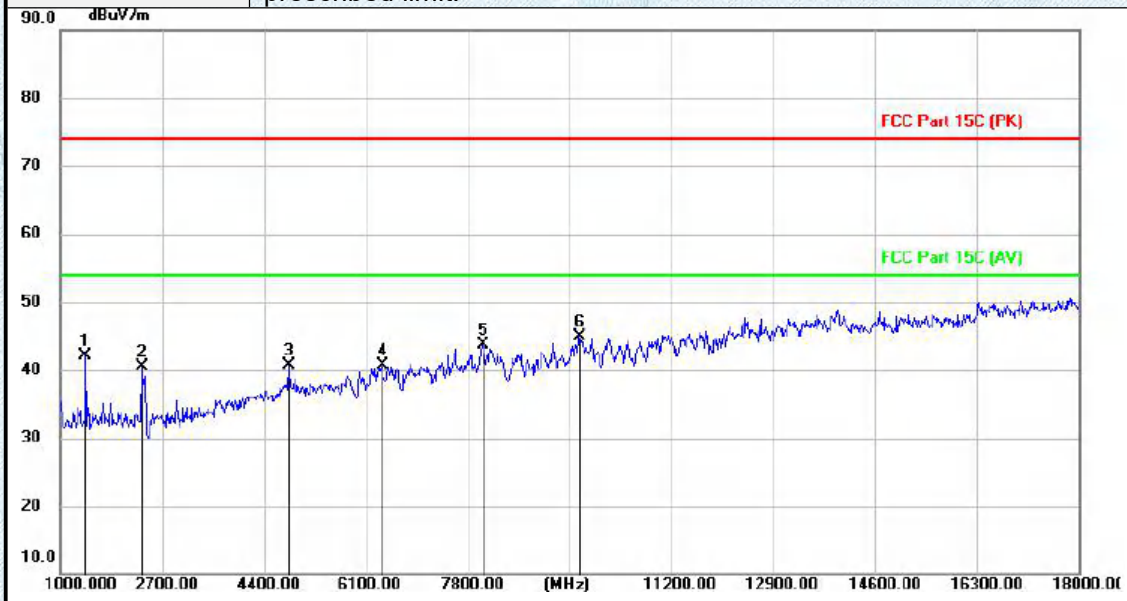
Test Voltage:	DC 7.6V
Ant. Pol.	Horizontal
Test Mode:	TX 802.11b Mode 2412MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		1425.000	55.65	-11.87	43.78	74.00	-30.22	peak
2		2411.000	58.21	-10.91	47.30	74.00	-26.70	peak
3		4823.300	52.68	-5.87	46.81	74.00	-27.19	peak
4		8194.400	41.50	2.03	43.53	74.00	-30.47	peak
5		10154.500	40.55	4.33	44.88	74.00	-29.12	peak
6	*	13960.800	37.65	11.18	48.83	74.00	-25.17	peak

Measurement = Reading level + Correct Factor

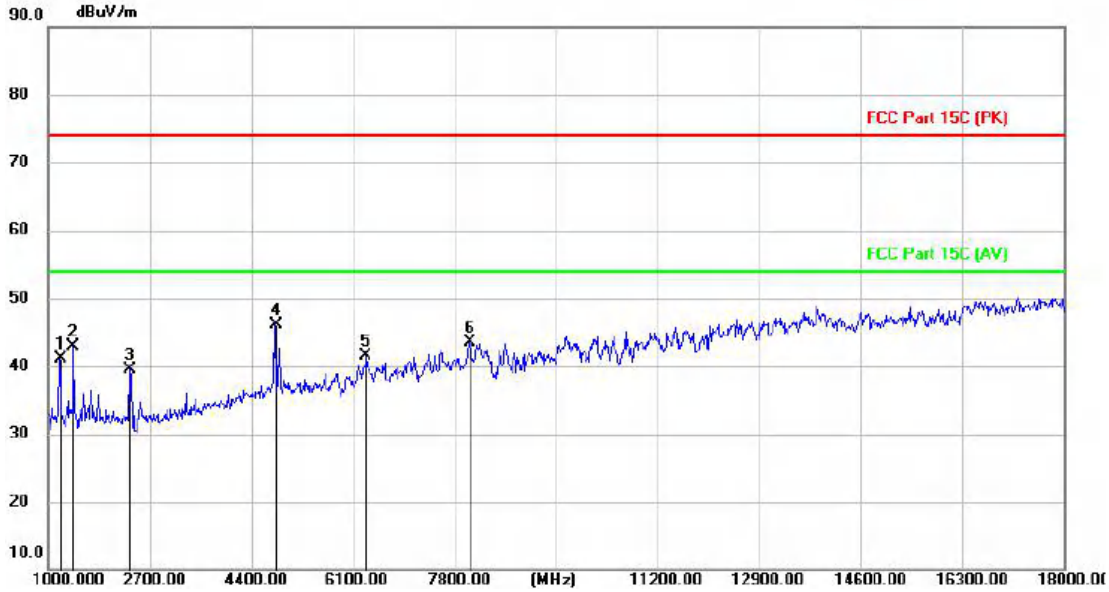
Test Voltage:	DC 7.6V
Ant. Pol.	Vertical
Test Mode:	TX 802.11b Mode 2412MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		1425.000	54.07	-11.87	42.20	74.00	-31.80	peak
2		2375.300	51.51	-10.93	40.58	74.00	-33.42	peak
3		4823.300	46.49	-5.87	40.62	74.00	-33.38	peak
4		6360.100	43.36	-2.59	40.77	74.00	-33.23	peak
5		8044.800	41.56	2.06	43.62	74.00	-30.38	peak
6	*	9659.800	41.68	3.32	45.00	74.00	-29.00	peak

Measurement = Reading level + Correct Factor

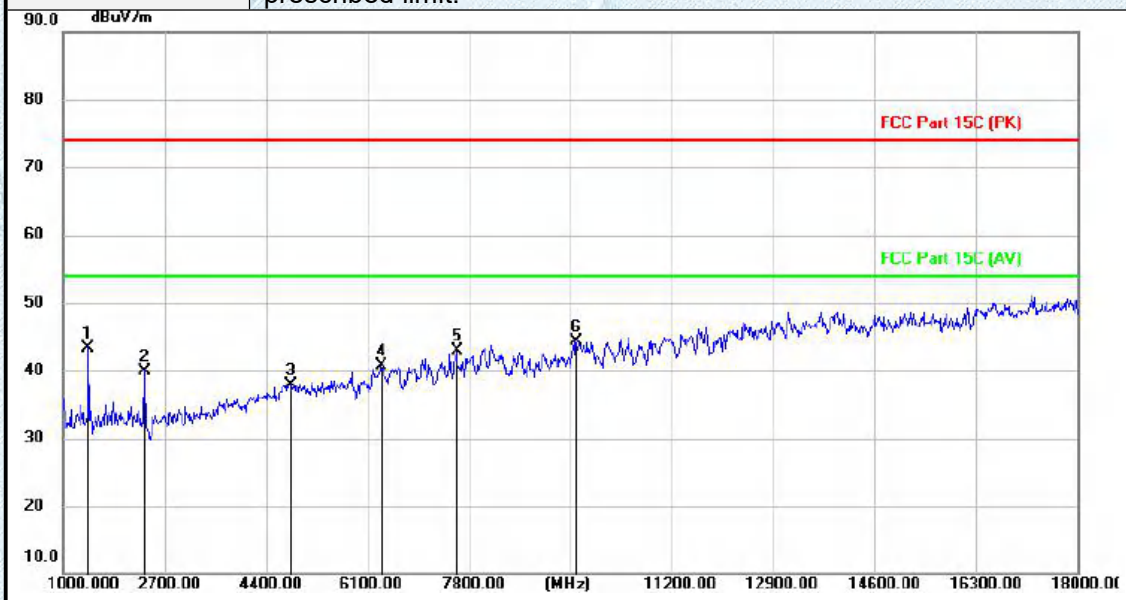
Test Voltage:	DC 7.6V
Ant. Pol.	Horizontal
Test Mode:	TX 802.11b Mode 2437MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		1195.500	53.06	-12.05	41.01	74.00	-32.99	peak
2		1425.000	54.72	-11.87	42.85	74.00	-31.15	peak
3		2375.300	50.41	-10.93	39.48	74.00	-34.52	peak
4	*	4804.600	52.09	-5.92	46.17	74.00	-27.83	peak
5		6321.000	44.15	-2.72	41.43	74.00	-32.57	peak
6		8053.300	41.54	2.05	43.59	74.00	-30.41	peak

Measurement = Reading level + Correct Factor

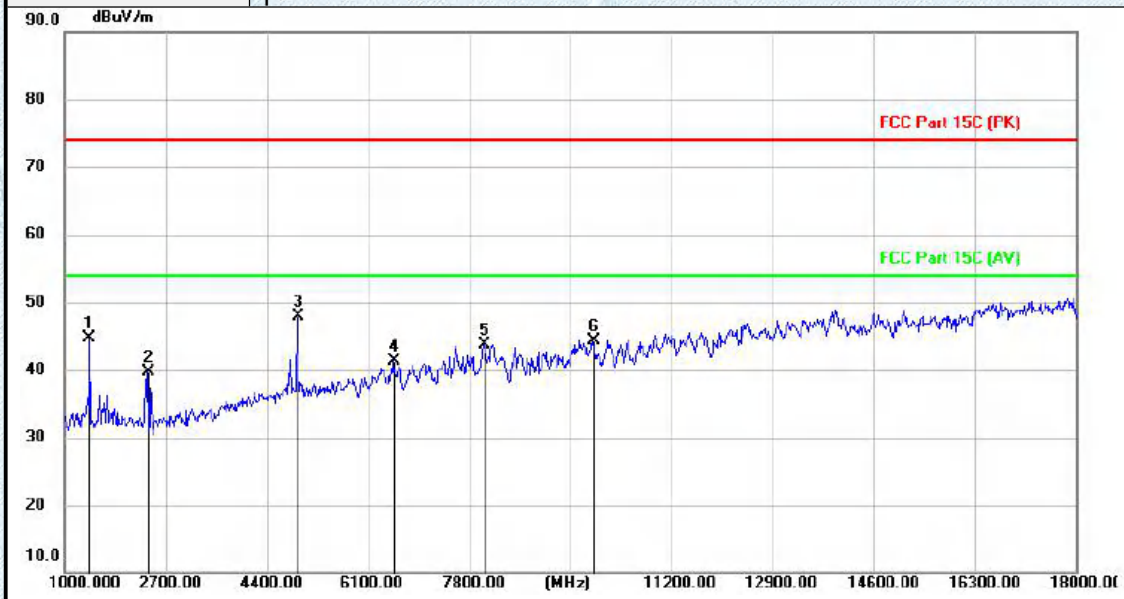
Test Voltage:	DC 7.6V
Ant. Pol.	Vertical
Test Mode:	TX 802.11b Mode 2437MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		1425.000	55.18	-11.87	43.31	74.00	-30.69	peak
2		2375.300	50.76	-10.93	39.83	74.00	-34.17	peak
3		4804.600	43.80	-5.92	37.88	74.00	-36.12	peak
4		6331.200	43.30	-2.68	40.62	74.00	-33.38	peak
5		7609.600	41.75	1.10	42.85	74.00	-31.15	peak
6	*	9593.500	41.15	3.18	44.33	74.00	-29.67	peak

Measurement = Reading level + Correct Factor

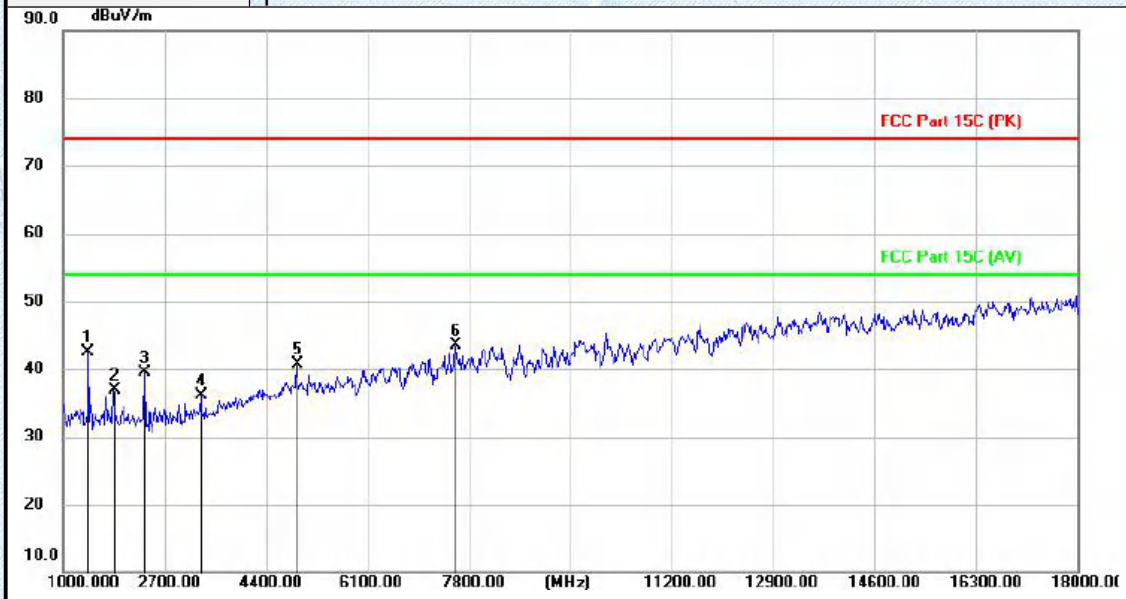
Test Voltage:	DC 7.6V
Ant. Pol.	Horizontal
Test Mode:	TX 802.11b Mode 2462MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		1425.000	56.57	-11.87	44.70	74.00	-29.30	peak
2		2402.500	50.58	-10.91	39.67	74.00	-34.33	peak
3	*	4923.600	53.46	-5.60	47.86	74.00	-26.14	peak
4		6526.700	43.41	-2.04	41.37	74.00	-32.63	peak
5		8053.300	41.61	2.05	43.66	74.00	-30.34	peak
6		9879.100	40.59	3.81	44.40	74.00	-29.60	peak

Measurement = Reading level + Correct Factor

Test Voltage:	DC 7.6V
Ant. Pol.	Vertical
Test Mode:	TX 802.11b Mode 2462MHz
Remark:	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		1425.000	54.37	-11.87	42.50	74.00	-31.50	peak
2		1856.800	48.17	-11.18	36.99	74.00	-37.01	peak
3		2375.300	50.49	-10.93	39.56	74.00	-34.44	peak
4		3325.600	46.13	-10.00	36.13	74.00	-37.87	peak
5		4923.600	46.37	-5.60	40.77	74.00	-33.23	peak
6	*	7573.900	42.49	1.00	43.49	74.00	-30.51	peak

Measurement = Reading level + Correct Factor

4.EUT TEST PHOTOS

Reference to the document No.: Test Photos.

5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Reference to the document No.: External Photos and Internal Photos.

******THE END******