

Appendix E): Power Spectral Density

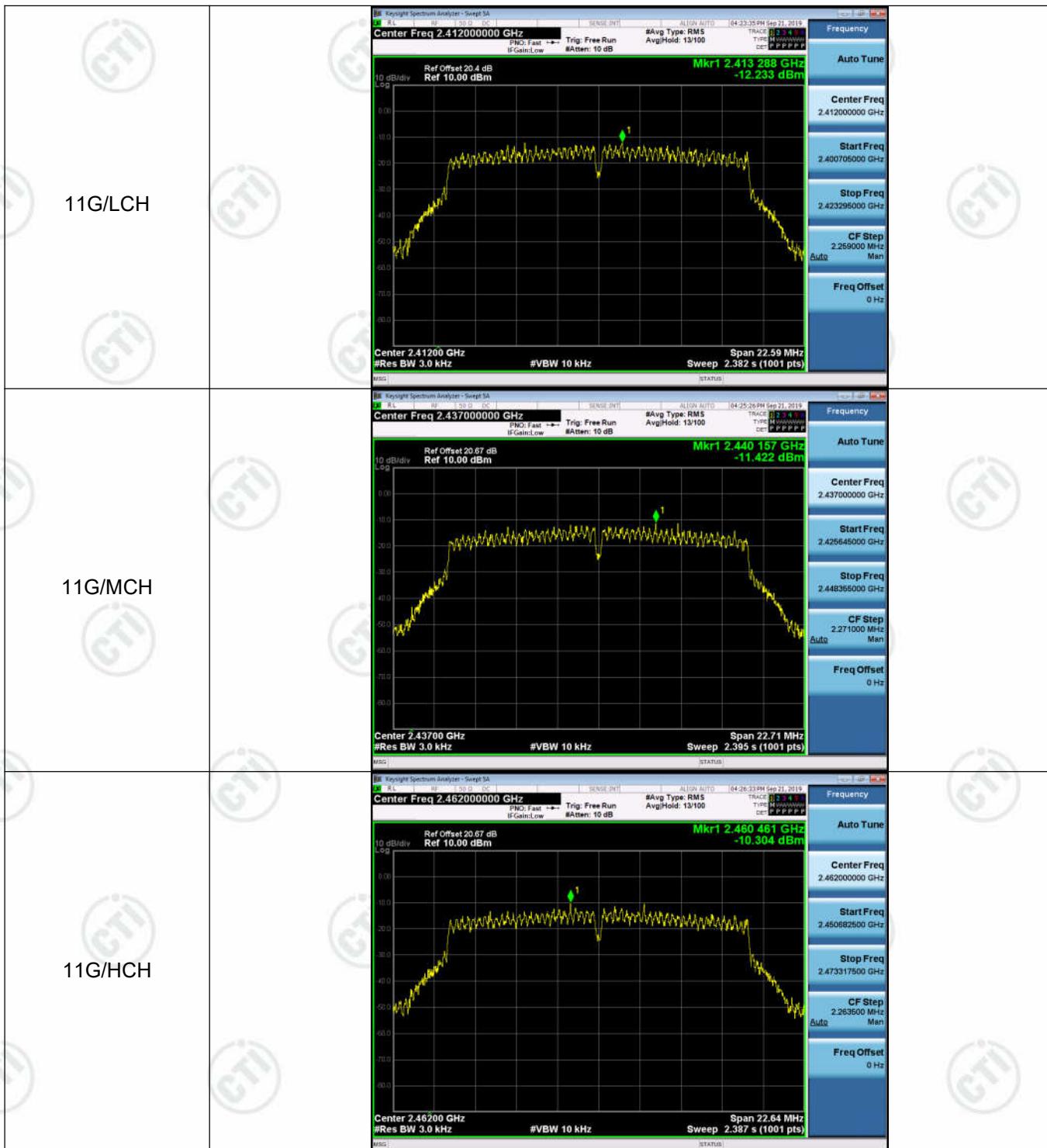
Result Table

Mode	Antenna	Channel	Power Spectral Density [dBm/3kHz]	Verdict
11B	Ant1	LCH	-9.050	PASS
11B	Ant2	LCH	-8.247	PASS
11B	Ant1	MCH	-9.337	PASS
11B	Ant2	MCH	-7.828	PASS
11B	Ant1	HCH	-10.053	PASS
11B	Ant2	HCH	-8.925	PASS
11G	Ant1	LCH	-12.233	PASS
11G	Ant2	LCH	-10.025	PASS
11G	Ant1	MCH	-11.422	PASS
11G	Ant2	MCH	-10.775	PASS
11G	Ant1	HCH	-10.304	PASS
11G	Ant2	HCH	-9.241	PASS
11N20SISO	Ant1	LCH	-10.881	PASS
11N20SISO	Ant2	LCH	-12.754	PASS
11N20SISO	Ant1	MCH	-11.288	PASS
11N20SISO	Ant2	MCH	-12.294	PASS
11N20SISO	Ant1	HCH	-13.085	PASS
11N20SISO	Ant2	HCH	-11.716	PASS
11N20MIMO	Ant1	LCH	-12.198	PASS
11N20MIMO	Ant2	LCH	-11.373	PASS
11N20MIMO	Ant1+2	LCH	-8.76	PASS
11N20MIMO	Ant1	MCH	-13.054	PASS
11N20MIMO	Ant2	MCH	-11.257	PASS
11N20MIMO	Ant1+2	MCH	-9.05	PASS
11N20MIMO	Ant1	HCH	-10.493	PASS
11N20MIMO	Ant2	HCH	-10.981	PASS
11N20MIMO	Ant1+2	HCH	-7.72	PASS
11N40SISO	Ant1	LCH	-15.280	PASS
11N40SISO	Ant2	LCH	-15.026	PASS
11N40SISO	Ant1	MCH	-15.166	PASS
11N40SISO	Ant2	MCH	-15.434	PASS

11N40SISO	Ant1	HCH	-15.888	PASS
11N40SISO	Ant2	HCH	-14.803	PASS
11N40MIMO	Ant1	LCH	-16.039	PASS
11N40MIMO	Ant2	LCH	-13.290	PASS
11N40MIMO	Ant1+2	LCH	-11.44	PASS
11N40MIMO	Ant1	MCH	-15.866	PASS
11N40MIMO	Ant2	MCH	-14.906	PASS
11N40MIMO	Ant1+2	MCH	-12.35	PASS
11N40MIMO	Ant1	HCH	-15.549	PASS
11N40MIMO	Ant2	HCH	-14.553	PASS
11N40MIMO	Ant1+2	HCH	-12.01	PASS

Test Graph

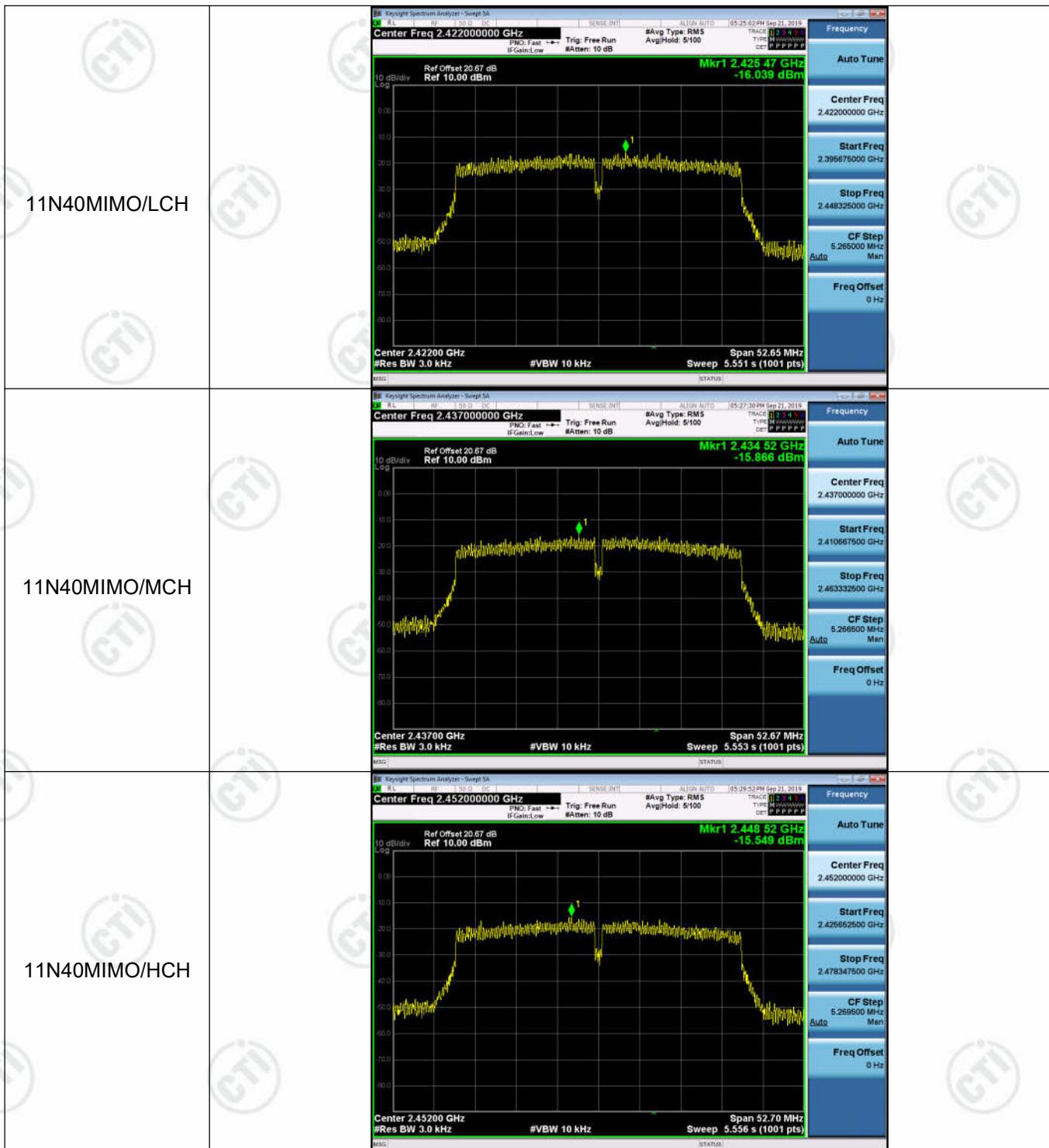
























Appendix F): Antenna Requirement

15.203 requirement:

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, 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:



The antenna type is PIFA with I-PEX connector, that is a unique connector and compliant with the requirement for 15.203. The best case gain of the antenna is 2dBi.

Appendix G): AC Power Line Conducted Emission

Test Procedure:	<p>Test frequency range :150KHz-30MHz</p> <p>1)The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</p> <p>3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,</p> <p>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.</p> <p>5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.</p>														
Limit:	<table border="1"> <thead> <tr> <th rowspan="2">Frequency range (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>Quasi-peak</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>0.15-0.5</td> <td>66 to 56*</td> <td>56 to 46*</td> </tr> <tr> <td>0.5-5</td> <td>56</td> <td>46</td> </tr> <tr> <td>5-30</td> <td>60</td> <td>50</td> </tr> </tbody> </table> <p>* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.</p> <p>NOTE : The lower limit is applicable at the transition frequency</p>	Frequency range (MHz)	Limit (dB μ V)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dB μ V)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													

Measurement Data

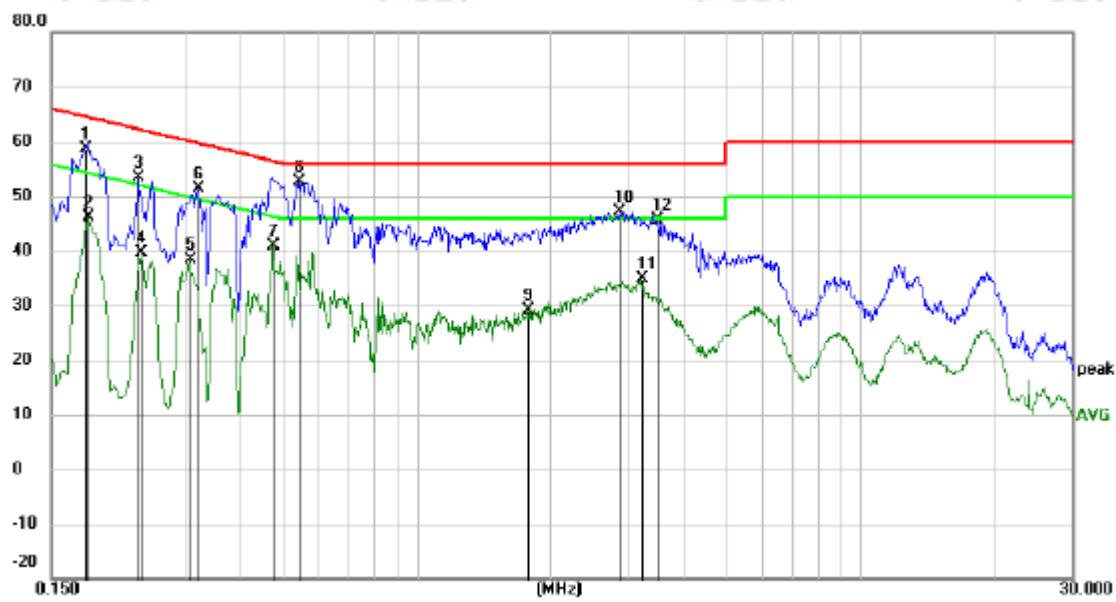
An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Product : WIFI+BT Module
Temperature : 23.2°C

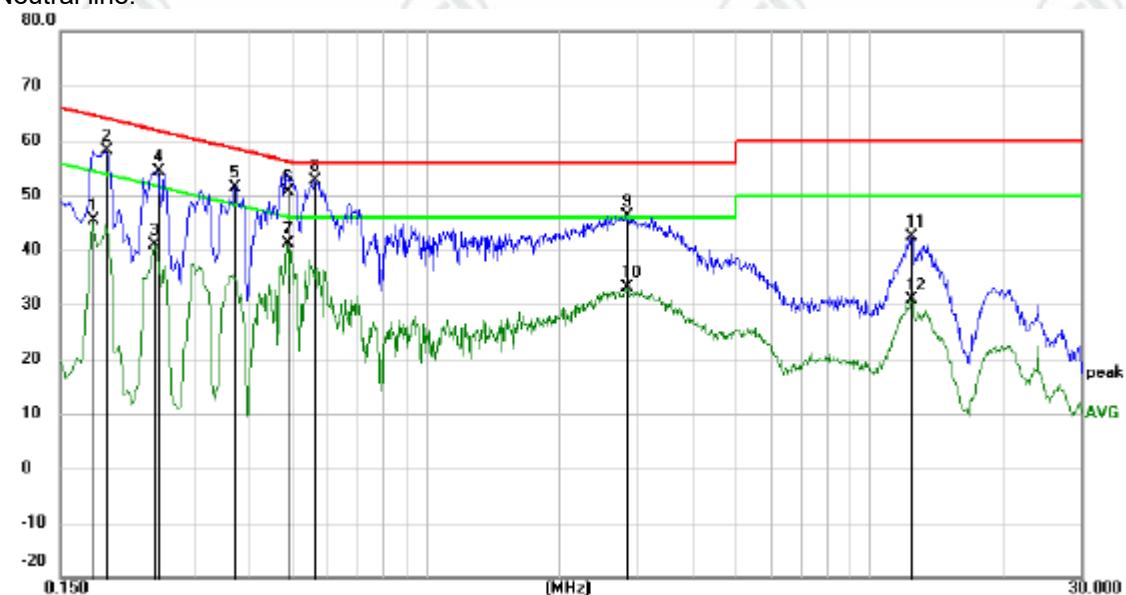
Model/Type reference : WCT5LM2001
Humidity : 51%

Live line:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector		Comment
								Detector	Detector	
1		0.1787	48.70	10.00	58.70	64.55	-5.85	peak		
2		0.1815	36.15	10.00	46.15	54.42	-8.27	Avg		
3		0.2355	43.22	10.05	53.27	62.25	-8.98	peak		
4		0.2400	29.52	10.05	39.57	52.10	-12.53	Avg		
5		0.3075	28.30	10.09	38.39	50.04	-11.65	Avg		
6		0.3209	41.32	10.08	51.40	59.68	-8.28	peak		
7		0.4740	30.76	10.00	40.76	46.44	-5.68	Avg		
8 *		0.5415	42.51	10.05	52.56	56.00	-3.44	peak		
9		1.7790	19.40	9.85	29.25	46.00	-16.75	Avg		
10		2.8590	37.37	9.83	47.20	56.00	-8.80	peak		
11		3.2190	25.01	9.83	34.84	46.00	-11.16	Avg		
12		3.4890	35.76	9.83	45.59	56.00	-10.41	peak		

Neutral line:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1770	35.46	10.00	45.46	54.63	-9.17	Avg	
2		0.1905	48.19	10.01	58.20	64.01	-5.81	peak	
3		0.2445	30.88	10.06	40.94	51.94	-11.00	Avg	
4		0.2490	44.39	10.06	54.45	61.79	-7.34	peak	
5		0.3704	41.45	10.03	51.48	58.49	-7.01	peak	
6		0.4875	40.60	10.00	50.60	56.21	-5.61	QP	
7		0.4875	31.24	10.00	41.24	46.21	-4.97	Avg	
8	*	0.5639	42.63	10.08	52.71	56.00	-3.29	peak	
9		2.8320	36.38	9.83	46.21	56.00	-9.79	peak	
10		2.8320	23.30	9.83	33.13	46.00	-12.87	Avg	
11		12.4485	32.31	9.97	42.28	60.00	-17.72	peak	
12		12.4485	20.87	9.97	30.84	50.00	-19.16	Avg	

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.

Appendix H): Restricted bands around fundamental frequency (Radiated)

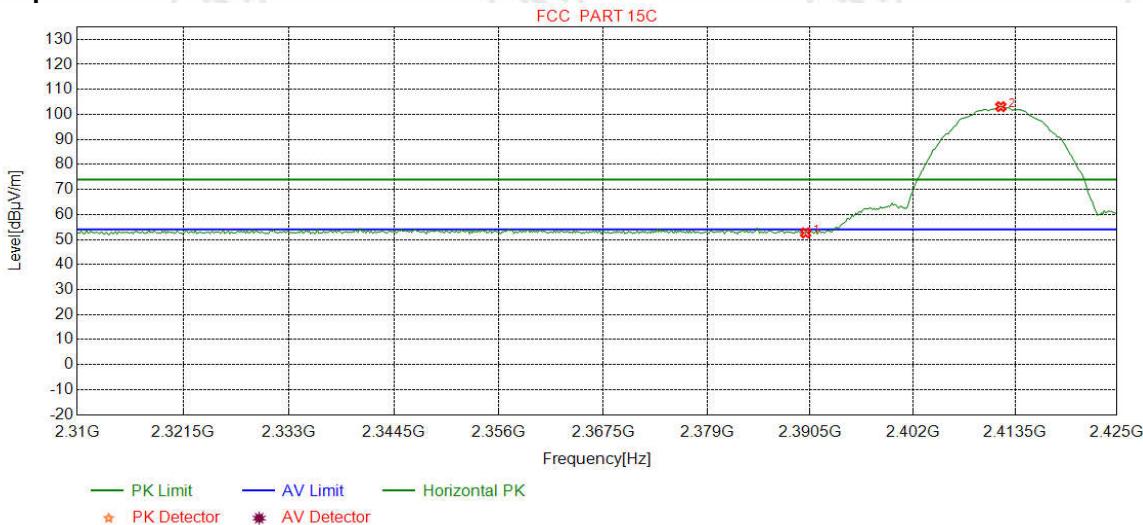
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark	
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak	
	Above 1GHz	Peak	1MHz	3MHz	Peak	
		Peak	1MHz	10Hz	Average	
Test Procedure:	Below 1GHz test procedure as below: Test method Refer as KDB 558074 D01					
	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 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. 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 and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel 					
	Above 1GHz test procedure as below: <ol style="list-style-type: none"> Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter). Test the EUT in the lowest channel , the Highest channel The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete. 					
Limit:	Frequency	Limit (dB μ V/m @3m)	Remark			
	30MHz-88MHz	40.0	Quasi-peak Value			
	88MHz-216MHz	43.5	Quasi-peak Value			
	216MHz-960MHz	46.0	Quasi-peak Value			
	960MHz-1GHz	54.0	Quasi-peak Value			
	Above 1GHz	54.0	Average Value			
		74.0	Peak Value			

Test plot as follows:

Ant 1:

Mode:	802.11 b(11Mbps) Transmitting	Channel:	2412
Remark:	PK		

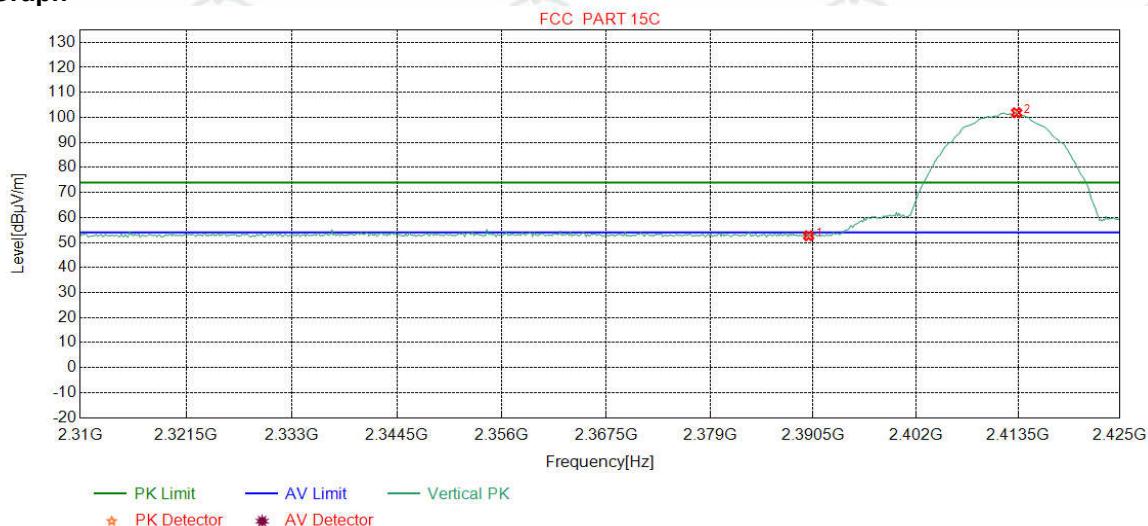
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	49.45	52.63	74.00	21.37	Pass	Horizontal
2	2411.9024	32.28	13.35	-42.43	99.90	103.10	74.00	-29.10	Pass	Horizontal

Mode:	802.11 b(11Mbps) Transmitting	Channel:	2412
Remark:	PK		

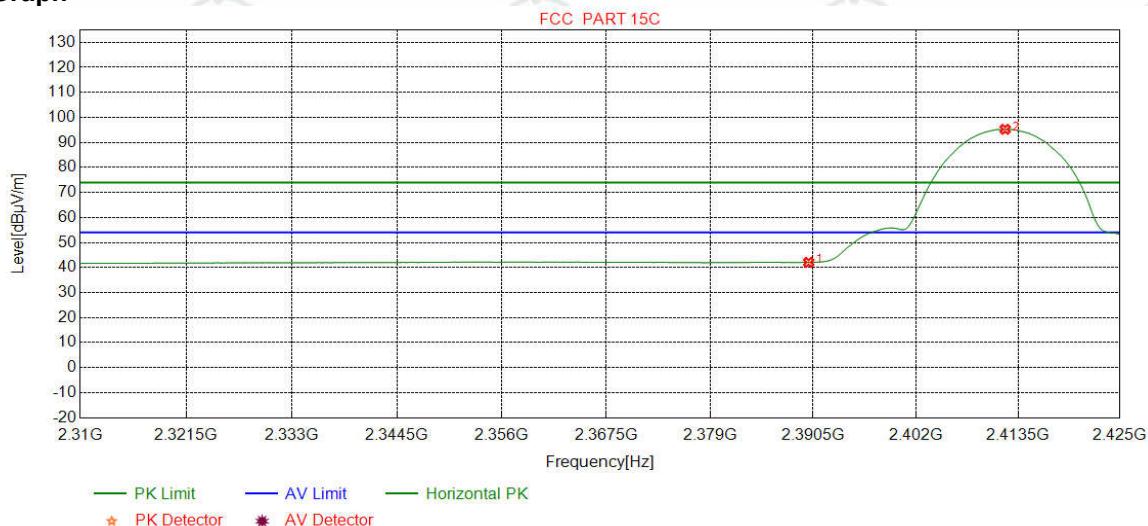
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	49.49	52.67	74.00	21.33	Pass	Vertical
2	2413.3417	32.28	13.36	-42.43	98.66	101.87	74.00	-27.87	Pass	Vertical

Mode:	802.11 b(11Mbps) Transmitting	Channel:	2412
Remark:	AV		

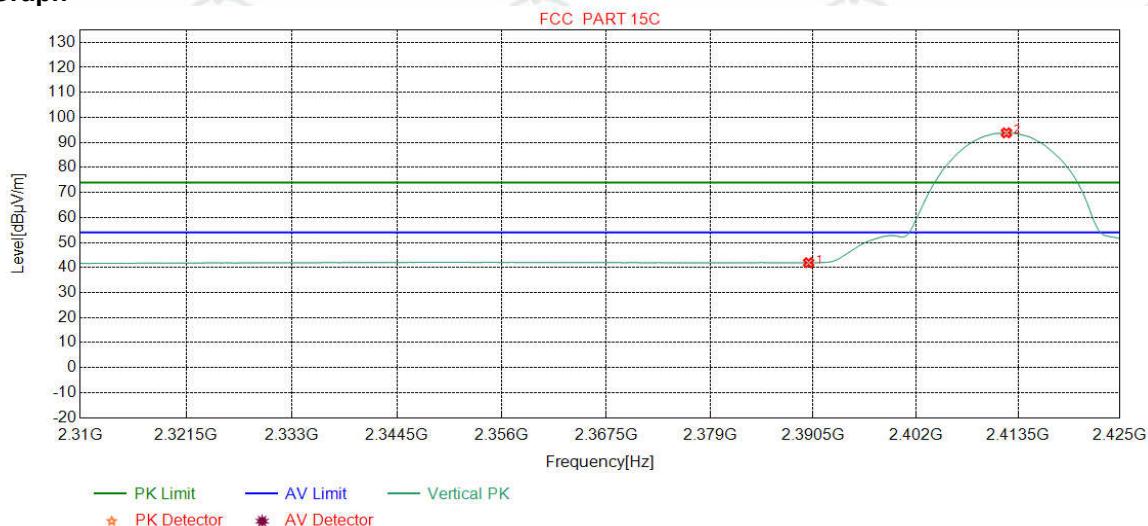
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	38.90	42.08	54.00	11.92	Pass	Horizontal
2	2412.0463	32.28	13.36	-42.44	92.04	95.24	54.00	-41.24	Pass	Horizontal

Mode:	802.11 b(11Mbps) Transmitting	Channel:	2412
Remark:	AV		

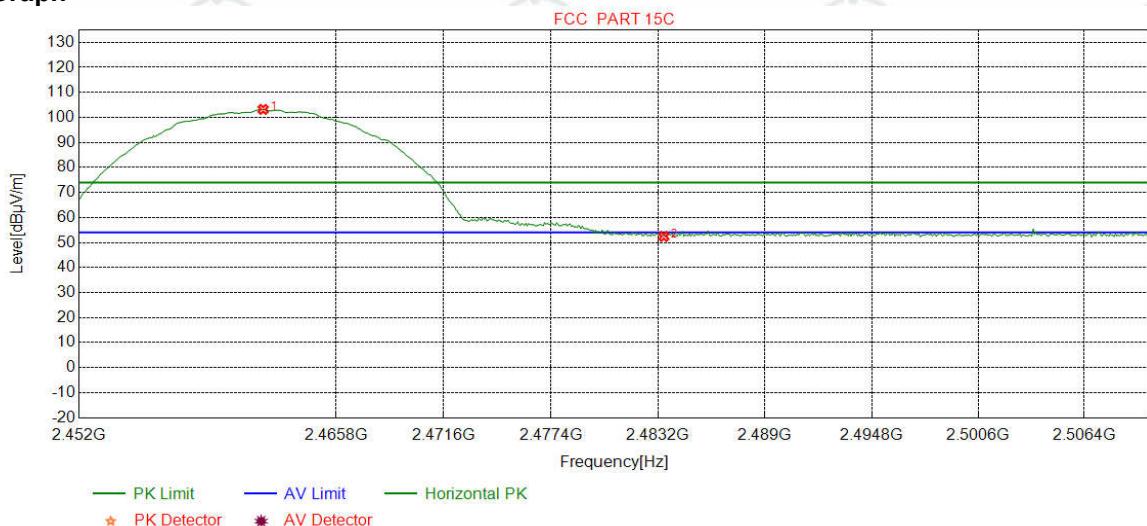
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	38.74	41.92	54.00	12.08	Pass	Vertical
2	2412.1902	32.28	13.36	-42.44	90.63	93.83	54.00	-39.83	Pass	Vertical

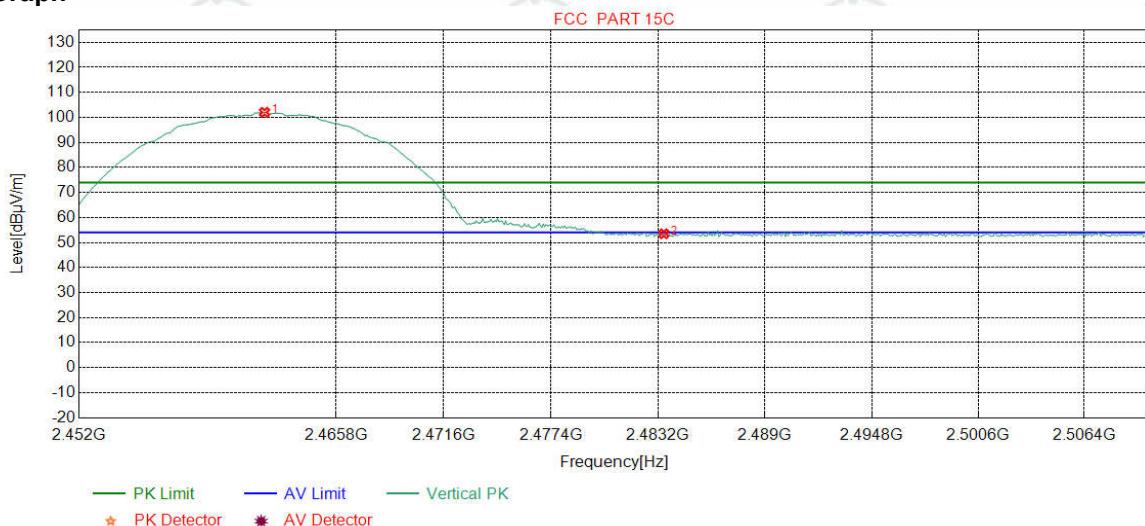
Mode:	802.11 b(11Mbps) Transmitting	Channel:	2462
Remark:	PK		

Test Graph



Mode:	802.11 b(11Mbps) Transmitting	Channel:	2462
Remark:	PK		

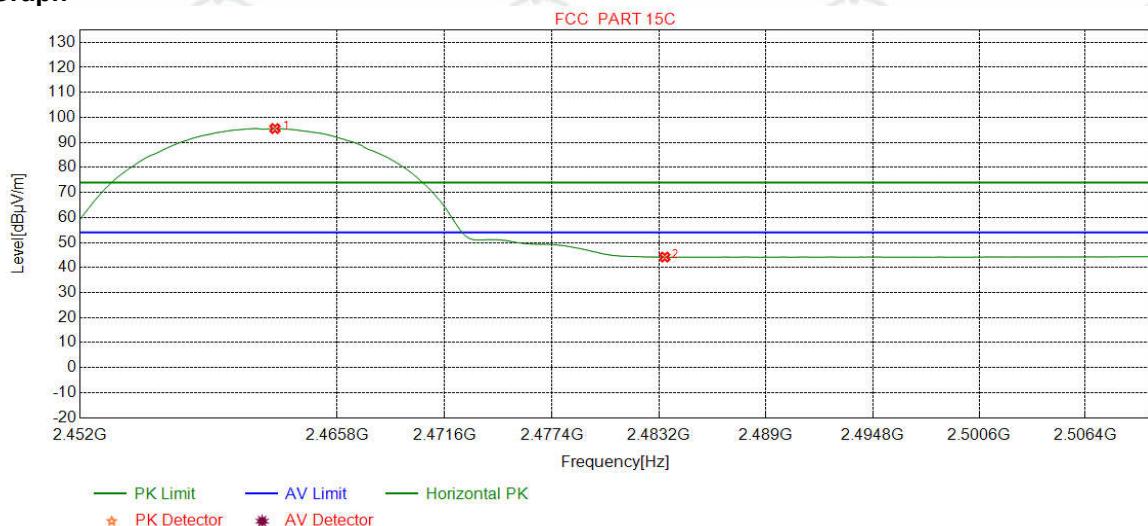
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2461.9449	32.35	13.48	-42.41	98.60	102.02	74.00	-28.02	Pass	Vertical
2	2483.5000	32.38	13.38	-42.40	50.14	53.50	74.00	20.50	Pass	Vertical

Mode:	802.11 b(11Mbps) Transmitting	Channel:	2462
Remark:	AV		

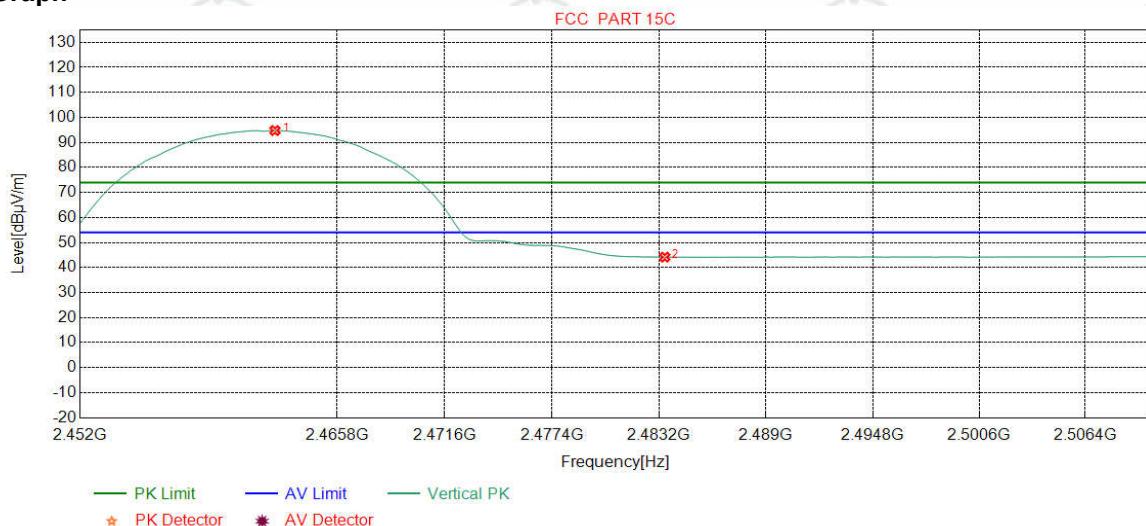
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2462.4531	32.35	13.47	-42.41	92.12	95.53	54.00	-41.53	Pass	Horizontal
2	2483.5000	32.38	13.38	-42.40	40.83	44.19	54.00	9.81	Pass	Horizontal

Mode:	802.11 b(11Mbps) Transmitting	Channel:	2462
Remark:	AV		

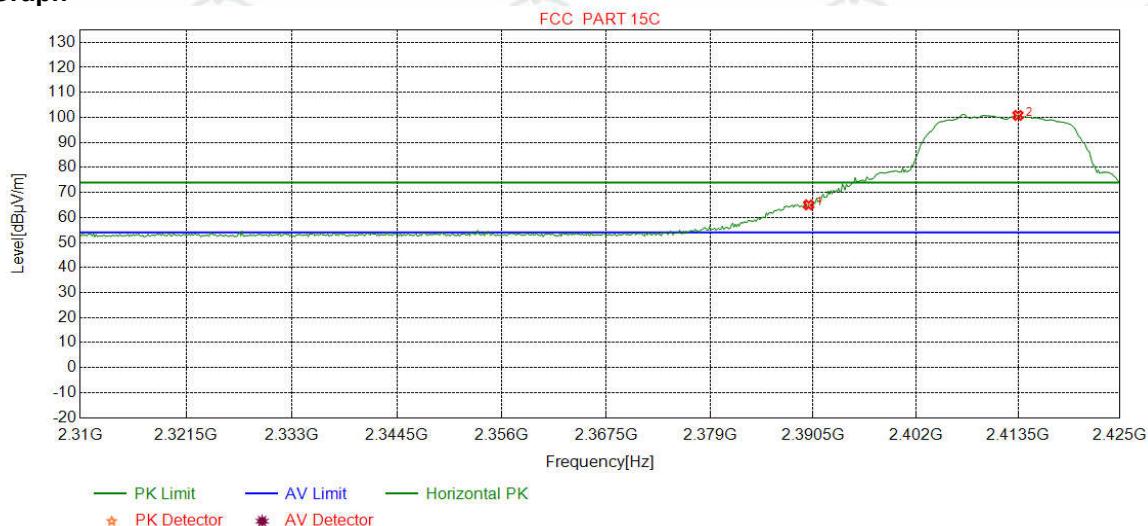
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2462.4531	32.35	13.47	-42.41	91.34	94.75	54.00	-40.75	Pass	Vertical
2	2483.5000	32.38	13.38	-42.40	40.80	44.16	54.00	9.84	Pass	Vertical

Mode:	802.11 g(6Mbps) Transmitting	Channel:	2412
Remark:	PK		

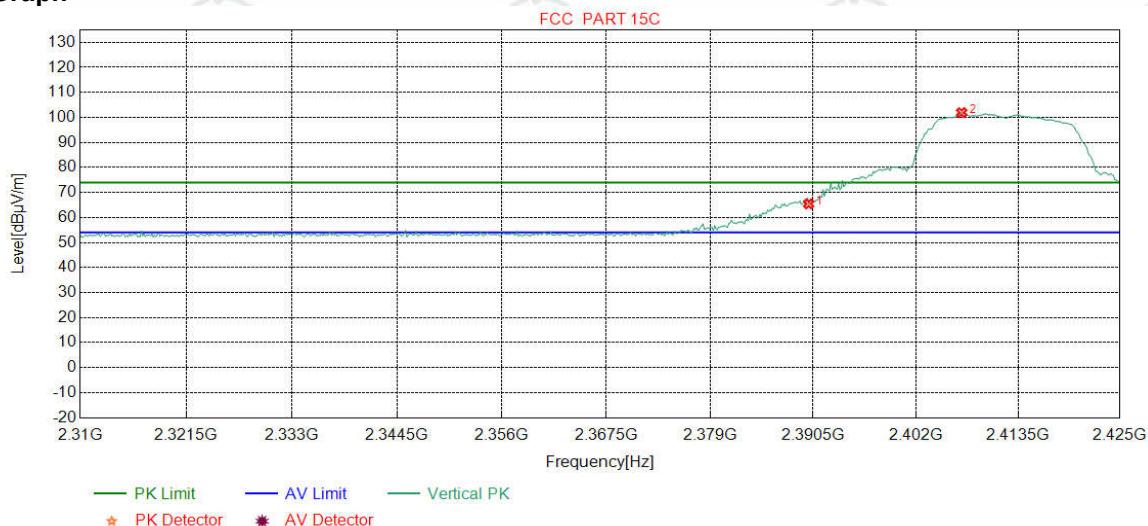
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	61.86	65.04	74.00	8.96	Pass	Horizontal
2	2413.4856	32.28	13.36	-42.43	97.59	100.80	74.00	-26.80	Pass	Horizontal

Mode:	802.11 g(6Mbps) Transmitting	Channel:	2412
Remark:	PK		

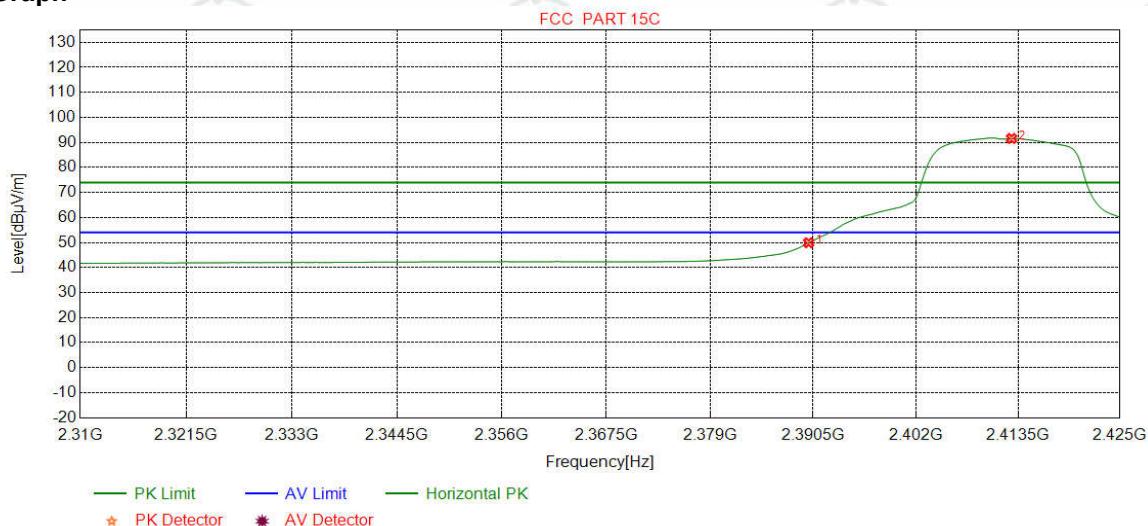
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	62.26	65.44	74.00	8.56	Pass	Vertical
2	2407.1527	32.27	13.33	-42.43	98.74	101.91	74.00	-27.91	Pass	Vertical

Mode:	802.11 g(6Mbps) Transmitting	Channel:	2412
Remark:	AV		

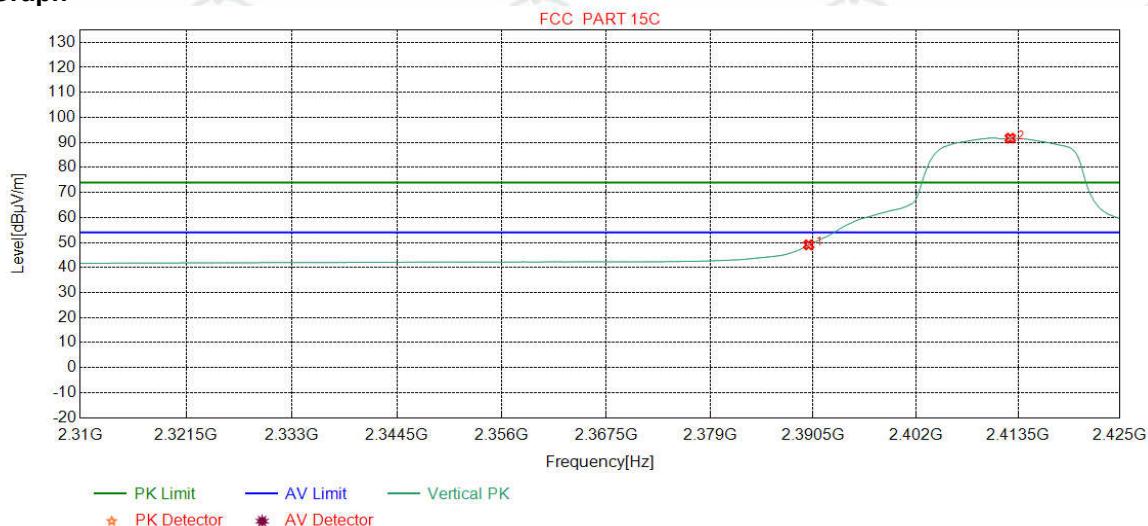
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	46.74	49.92	54.00	4.08	Pass	Horizontal
2	2412.7660	32.28	13.36	-42.43	88.37	91.58	54.00	-37.58	Pass	Horizontal

Mode:	802.11 g(6Mbps) Transmitting	Channel:	2412
Remark:	AV		

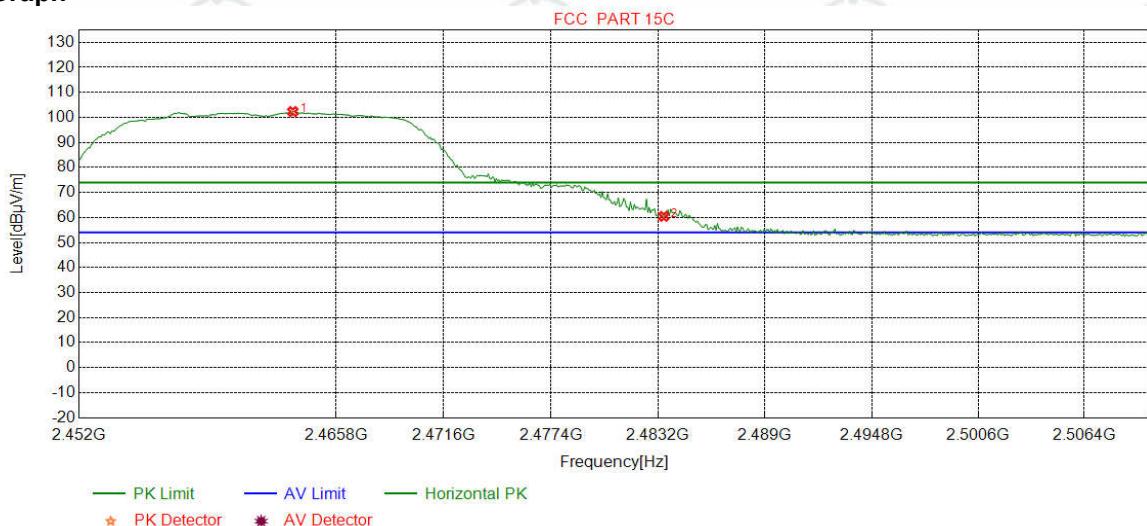
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	45.87	49.05	54.00	4.95	Pass	Vertical
2	2412.6220	32.28	13.36	-42.43	88.47	91.68	54.00	-37.68	Pass	Vertical

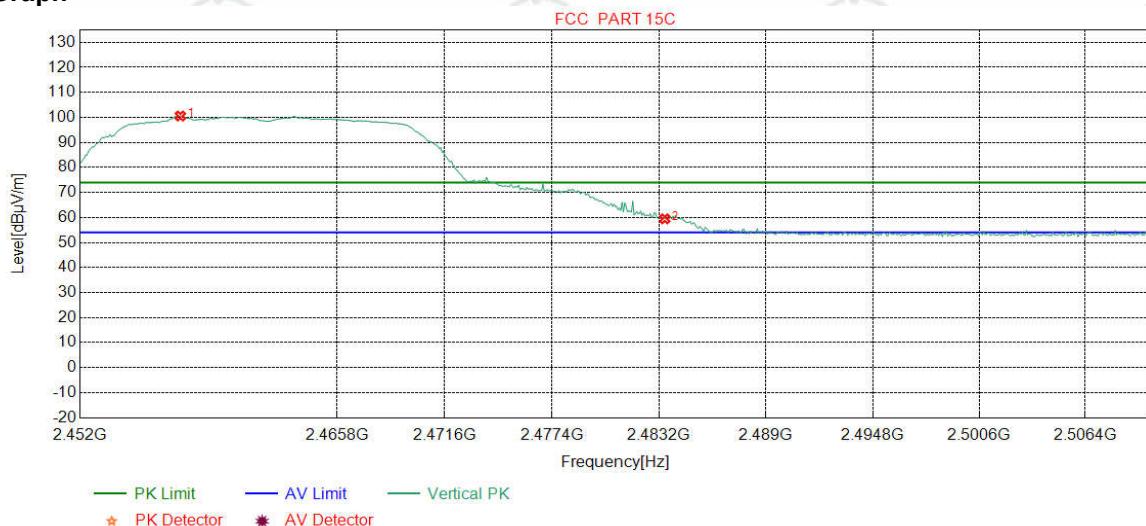
Mode:	802.11 g(6Mbps) Transmitting	Channel:	2462
Remark:	PK		

Test Graph



Mode:	802.11 g(6Mbps) Transmitting	Channel:	2462
Remark:	PK		

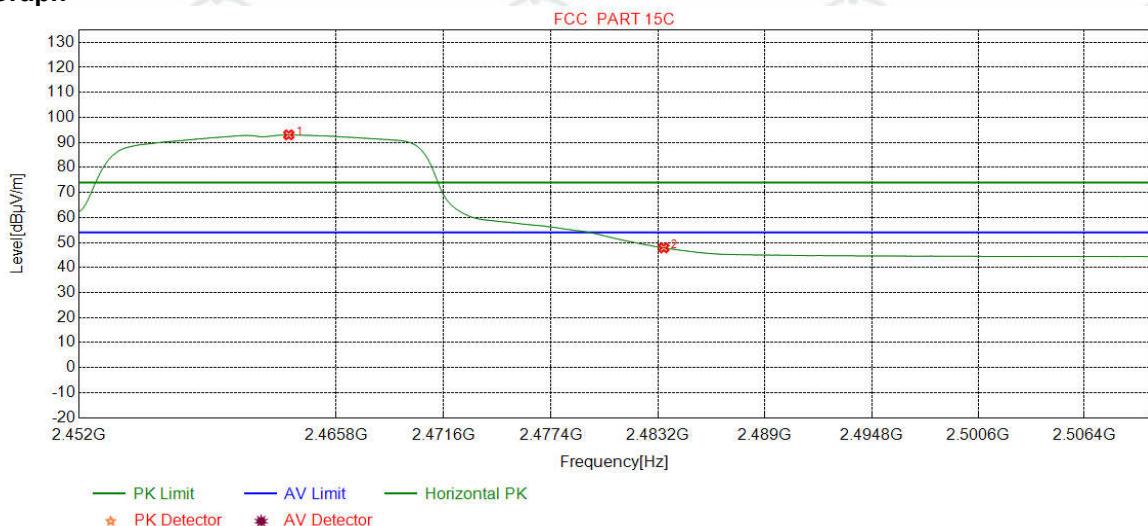
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2457.3717	32.34	13.50	-42.41	97.12	100.55	74.00	-26.55	Pass	Vertical
2	2483.5000	32.38	13.38	-42.40	56.11	59.47	74.00	14.53	Pass	Vertical

Mode:	802.11 g(6Mbps) Transmitting	Channel:	2462
Remark:	AV		

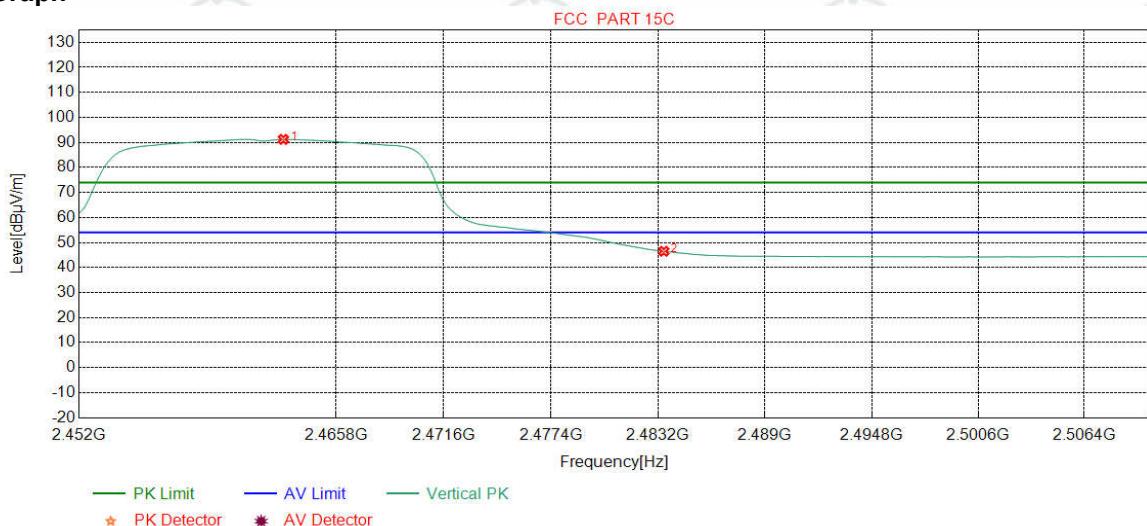
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2463.2516	32.35	13.47	-42.41	89.62	93.03	54.00	-39.03	Pass	Horizontal
2	2483.5000	32.38	13.38	-42.40	44.50	47.86	54.00	6.14	Pass	Horizontal

Mode:	802.11 g(6Mbps) Transmitting	Channel:	2412
Remark:	AV		

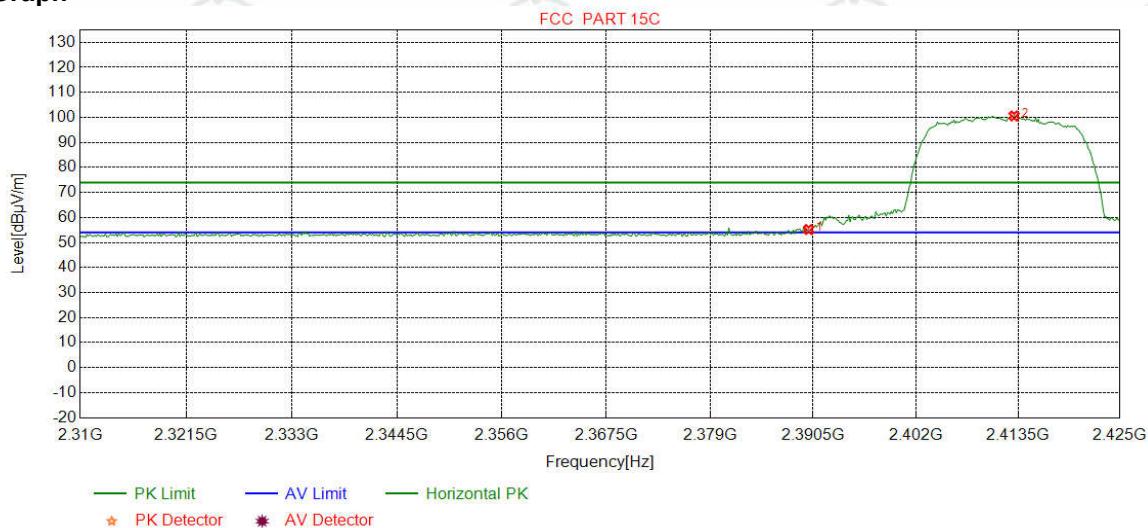
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2462.9612	32.35	13.47	-42.41	87.81	91.22	54.00	-37.22	Pass	Vertical
2	2483.5000	32.38	13.38	-42.40	43.13	46.49	54.00	7.51	Pass	Vertical

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2412
Remark:	PK		

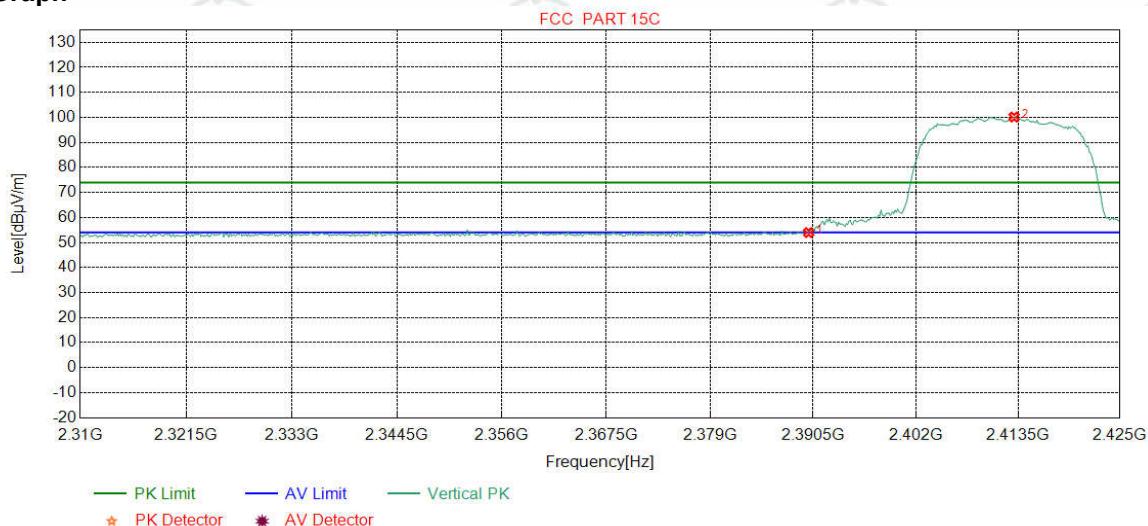
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	52.02	55.20	74.00	18.80	Pass	Horizontal
2	2413.0538	32.28	13.36	-42.43	97.36	100.57	74.00	-26.57	Pass	Horizontal

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2412
Remark:	PK		

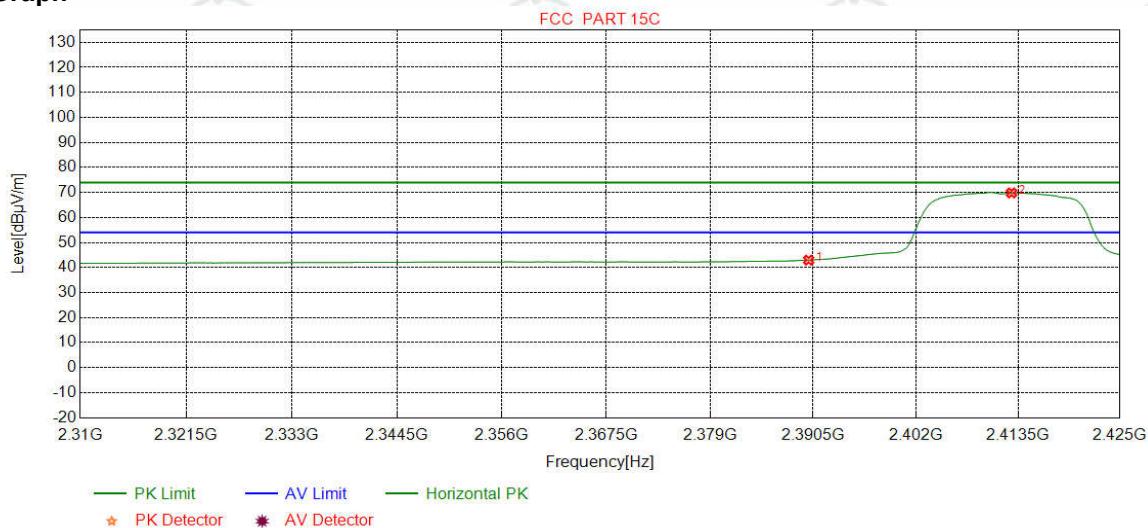
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	50.79	53.97	74.00	20.03	Pass	Vertical
2	2413.0538	32.28	13.36	-42.43	96.93	100.14	74.00	-26.14	Pass	Vertical

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2412
Remark:	AV		

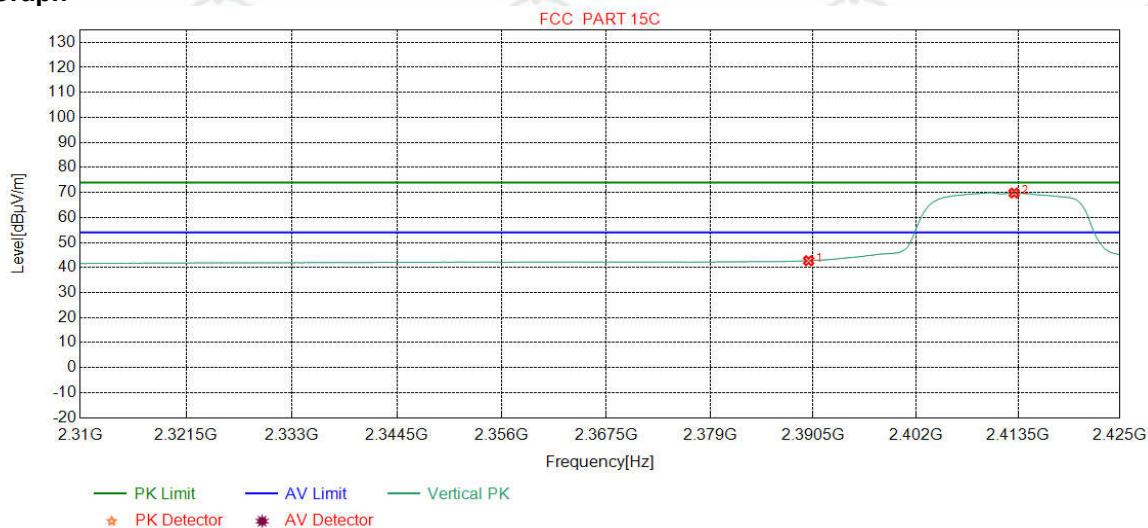
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	39.79	42.97	54.00	11.03	Pass	Horizontal
2	2412.7660	32.28	13.36	-42.43	66.60	69.81	54.00	-15.81	Pass	Horizontal

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2412
Remark:	AV		

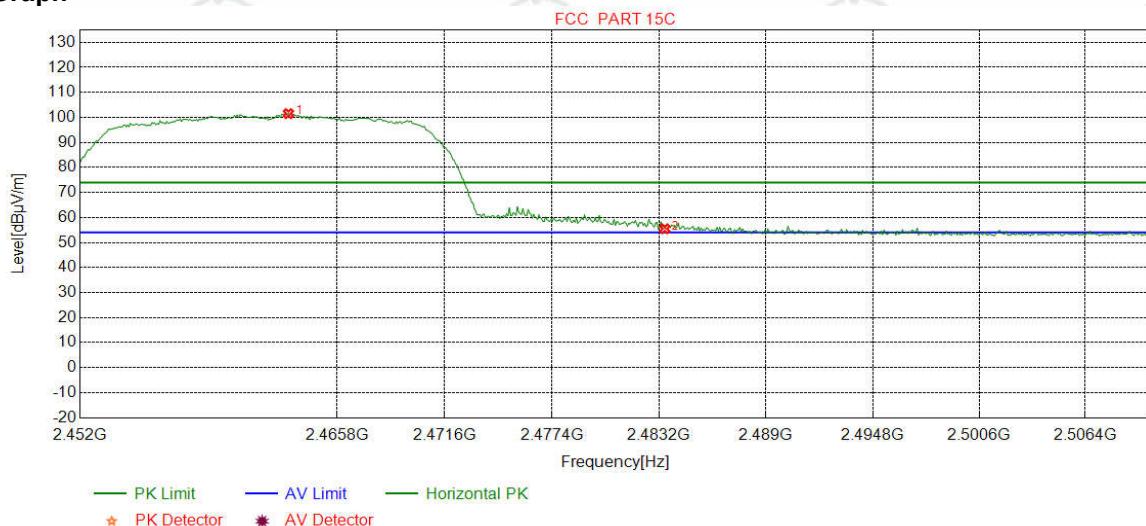
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2390.0000	32.25	13.37	-42.44	39.53	42.71	54.00	11.29	Pass	Vertical
2	2413.0538	32.28	13.36	-42.43	66.55	69.76	54.00	-15.76	Pass	Vertical

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2462
Remark:	PK		

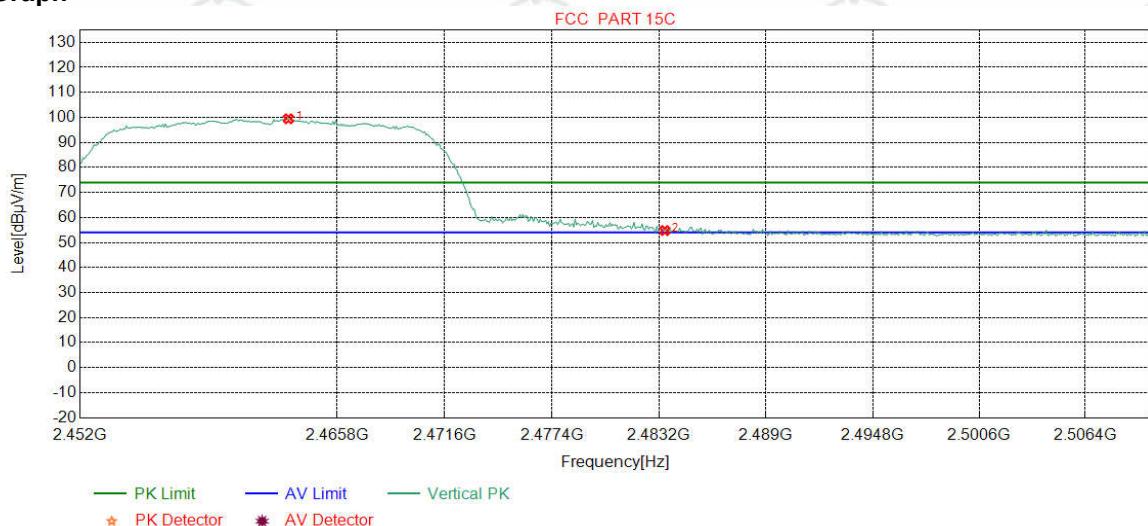
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2463.1790	32.35	13.47	-42.41	98.09	101.50	74.00	-27.50	Pass	Horizontal
2	2483.5000	32.38	13.38	-42.40	52.13	55.49	74.00	18.51	Pass	Horizontal

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2462
Remark:	PK		

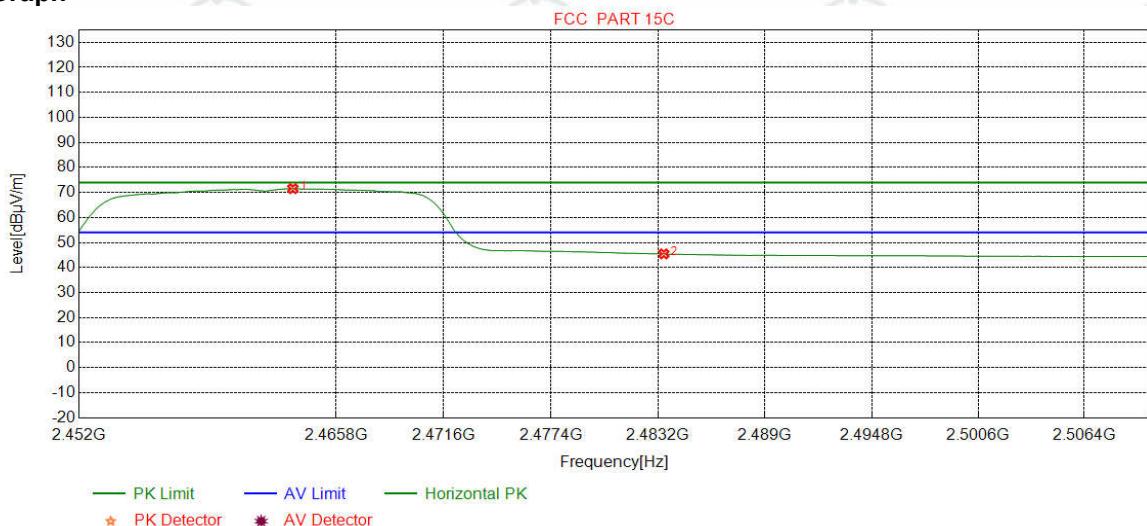
Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2463.1790	32.35	13.47	-42.41	96.03	99.44	74.00	-25.44	Pass	Vertical
2	2483.5000	32.38	13.38	-42.40	51.43	54.79	74.00	19.21	Pass	Vertical

Mode:	802.11 n(HT20) (6.5Mbps) Transmitting	Channel:	2462
Remark:	AV		

Test Graph



NO	Freq. [MHz]	Ant Factor [dB]	Cable loss [dB]	Pream gain [dB]	Reading [dB μ V]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Result	Polarity
1	2463.4693	32.35	13.47	-42.41	68.11	71.52	54.00	-17.52	Pass	Horizontal
2	2483.5000	32.38	13.38	-42.40	42.09	45.45	54.00	8.55	Pass	Horizontal