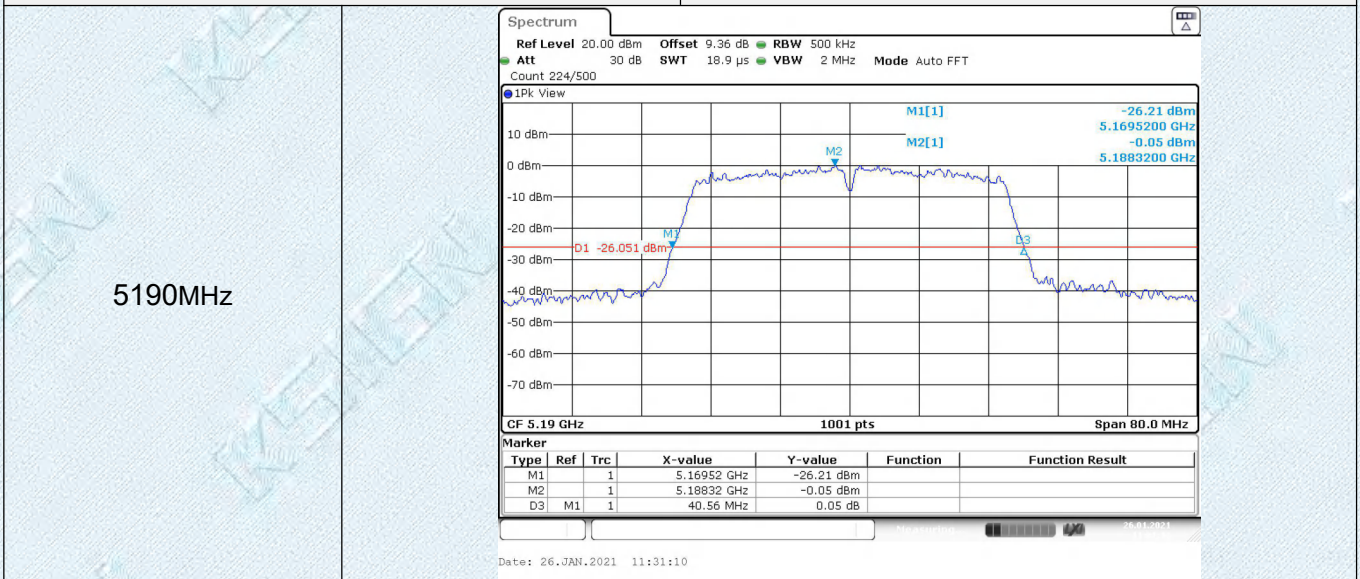
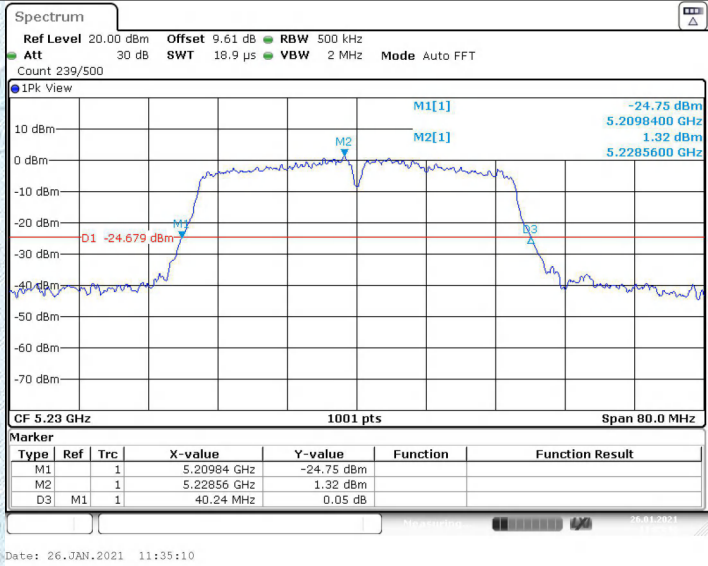


26dB bandwidth

802.11ac (HT40)



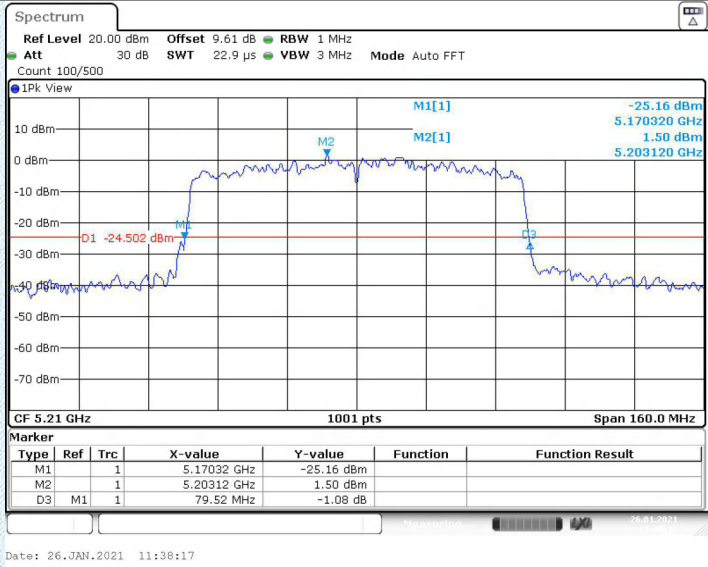
5230MHz



26dB bandwidth

802.11ac (HT80)

5210MHz

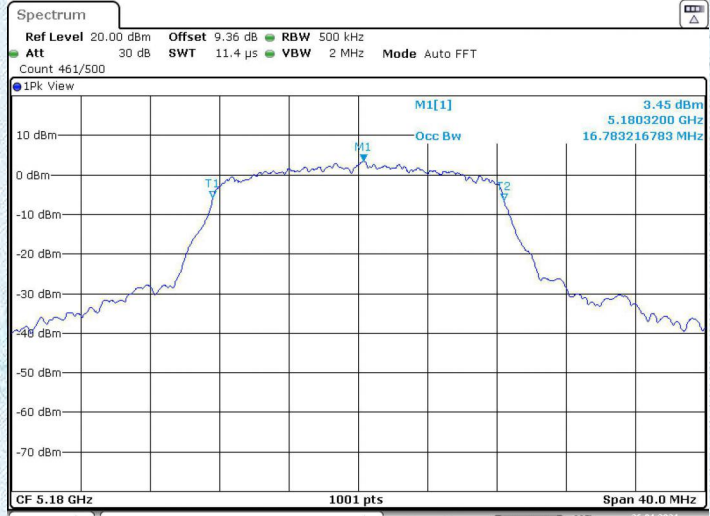


**Band U-NII-1**

99% Occupied bandwidth

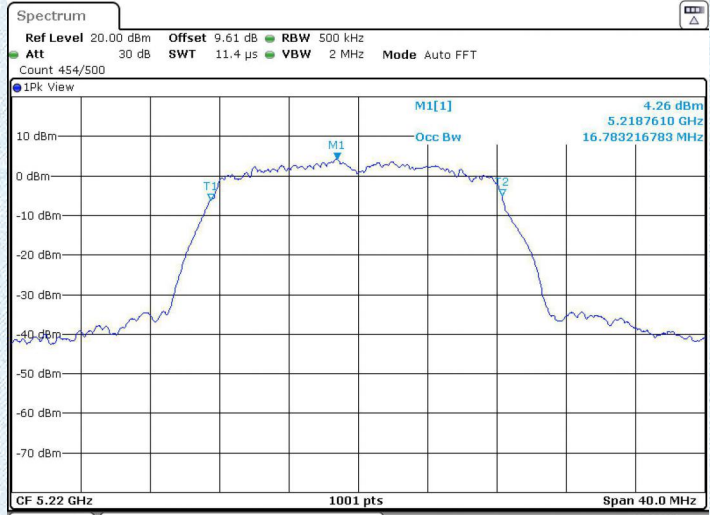
802.11a

5180MHz



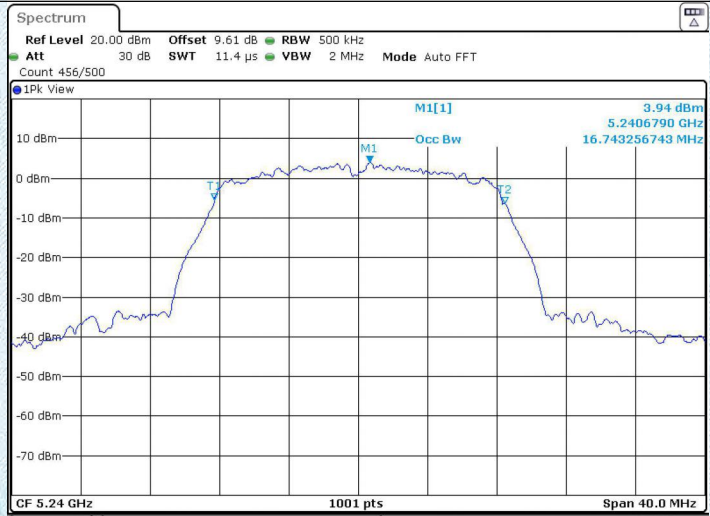
Date: 26.JAN.2021 10:48:06

5220MHz



Date: 26.JAN.2021 10:54:59

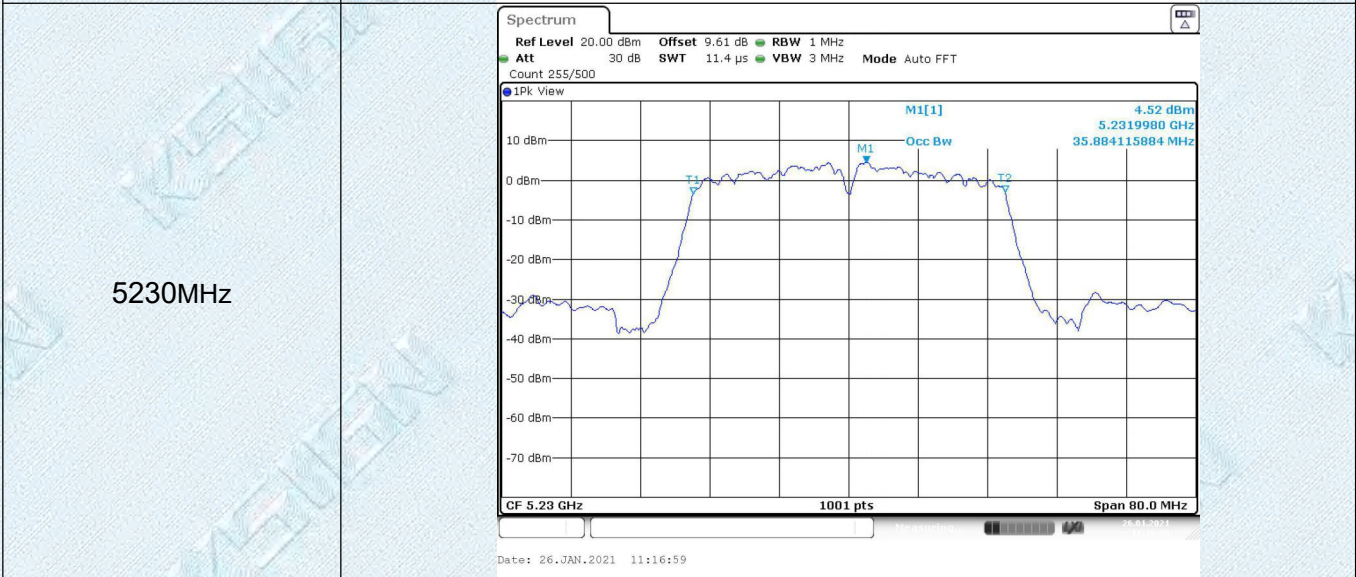
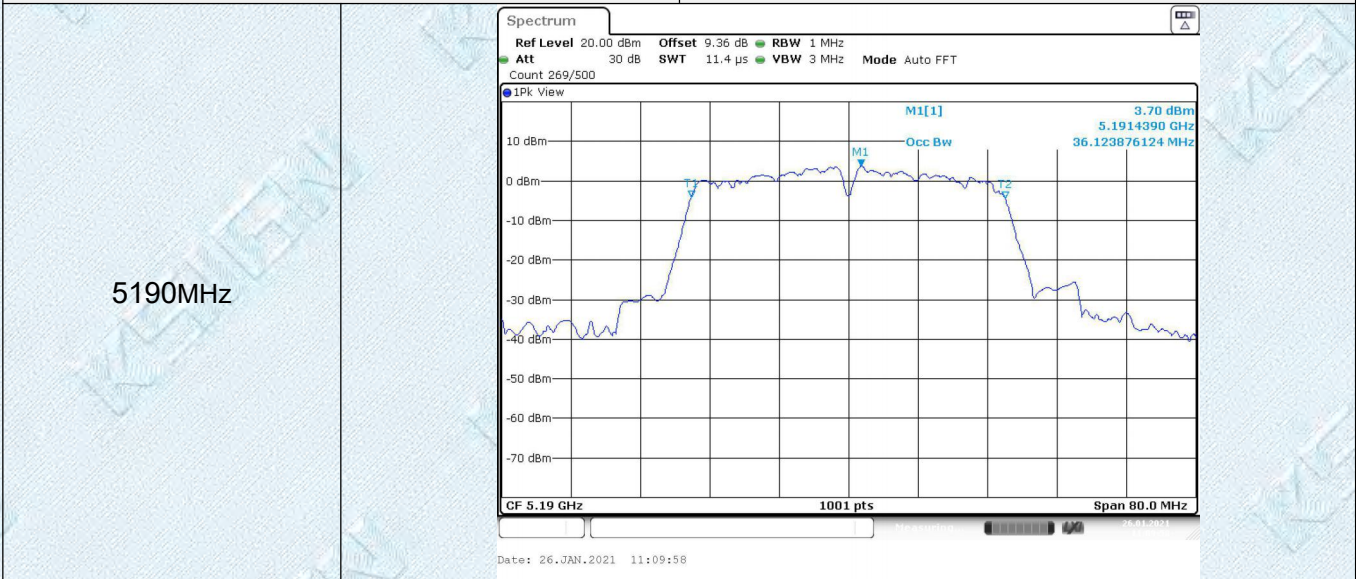
5240MHz



Date: 26.JAN.2021 10:57:16

99% Occupied bandwidth	802.11n (HT20)
5180MHz	<p>CF 5.18 GHz 1001 pts Span 40.0 MHz</p> <p>Date: 26, JAN, 2021 11:01:42</p>
5220MHz	<p>CF 5.18 GHz 1001 pts Span 40.0 MHz</p> <p>Date: 26, JAN, 2021 11:01:42</p>
5240MHz	<p>CF 5.22 GHz 1001 pts Span 40.0 MHz</p> <p>Date: 26, JAN, 2021 11:04:51</p>

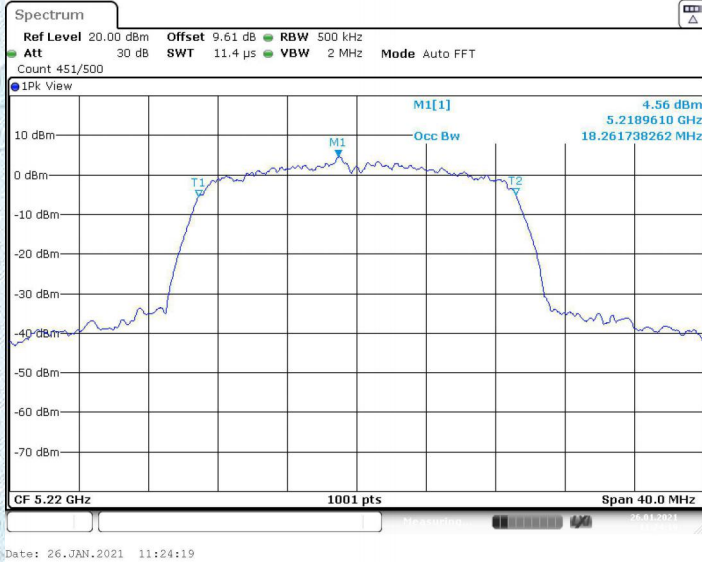
**99% Occupied bandwidth** **802.11n (HT40)**



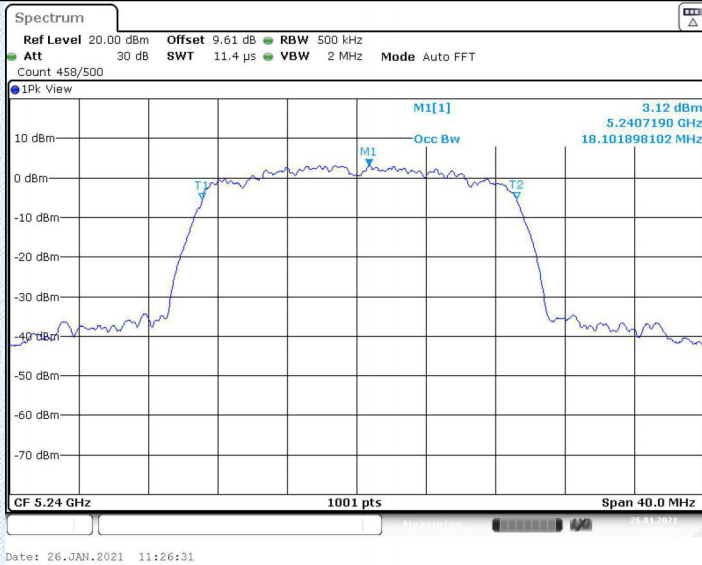
**99% Occupied bandwidth** **802.11ac (HT20)**



5220MHz



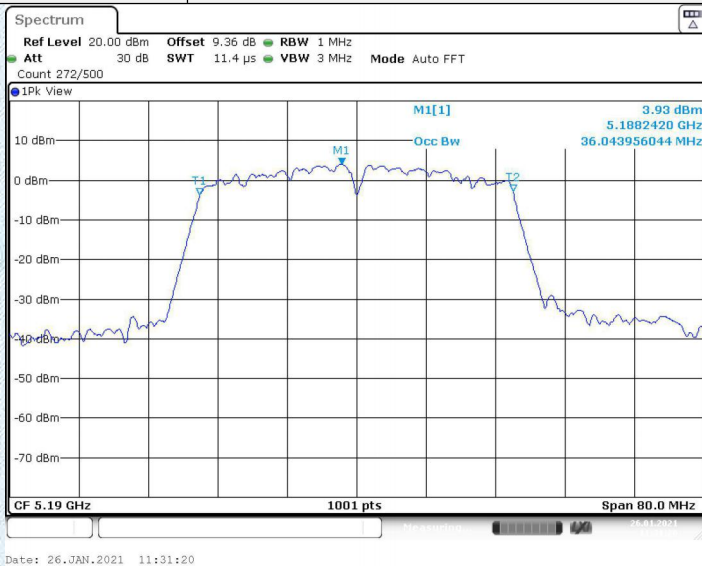
5240MHz

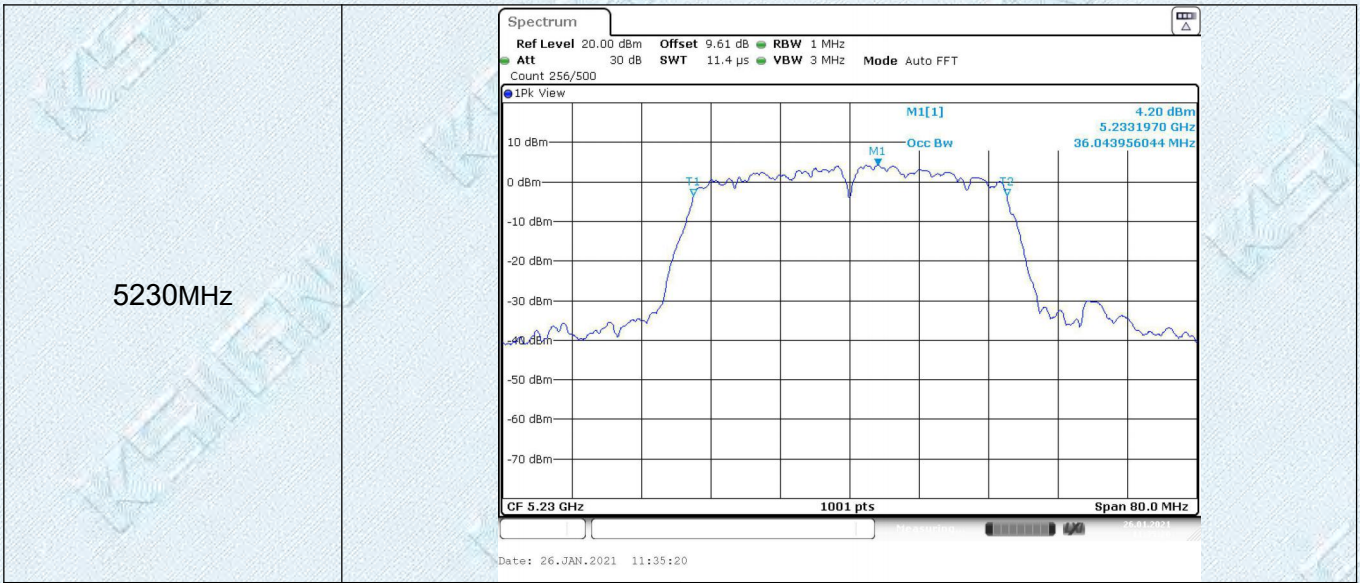


99% Occupied bandwidth

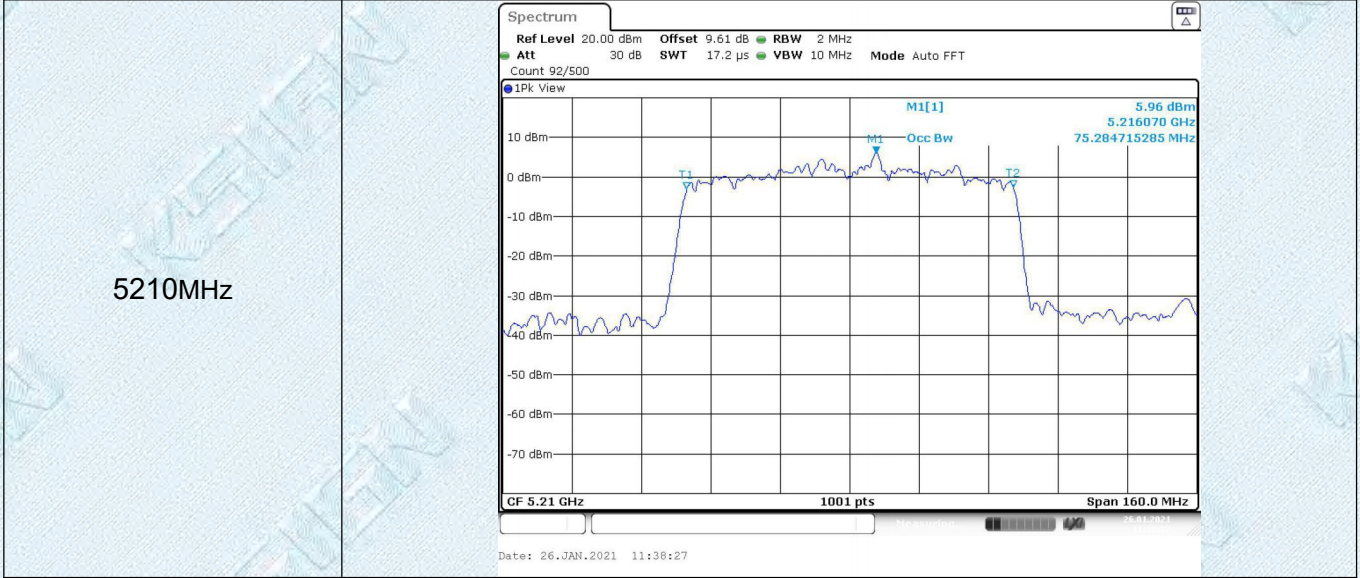
802.11ac (HT40)

5190MHz





**99% Occupied bandwidth** **802.11ac (HT80)**

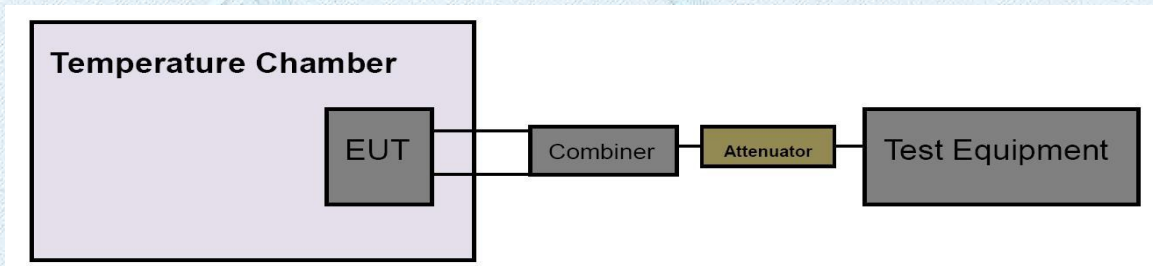


### 3.5. Frequency Stability Measurement

Limit

FCC Part 15 Subpart C(15.407)		
Test Item	Limit	Frequency Range(MHz)
Peak Excursion Measurement	Specified in the user's manual, the transmitter center frequency tolerance shall be $\pm 20$ ppm maximum for the 5 GHz band (IEEE 802.11n specification)	5150~5250
		5250~5350
		5470~5725
		5725~5850

Test Configuration



Test Procedure

The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above.

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Set analyser centre frequency to transmitting frequency.
- (3) Set the span to encompass the entire emissions bandwidth (EBW) of the signal.
- (4) Set the RBW to: 10 kHz, VBW=10 kHz with peak detector and maxhold settings.
- (5) The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.
- (6) Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
- (7) Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
- (8) Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

NOTE: The EUT was set to continuously transmitting in continuously un-modulation transmitting mode.

Test Mode

Please refer to the clause 2.2.



**Test Result**

Pre-scan 802.11a/n(HT20/HT40)/ac(HT20/HT40/HT80) modulation, and found the 802.11a modulation 5180MHz which it is worse case, so only show the test data for worse case.

<b>Band U-NII-1</b>	
<b>801.11a</b>	<b>5180 MHz</b>
<b>Voltage vs. Frequency Stability</b>	
<b>Voltage (V)</b>	<b>Measurement Frequency (Hz)</b>
3.7	-7000
3.33	-7000
4.07	-7000
<b>Max. Deviation (Hz)</b>	0
<b>Max. Deviation (ppm)</b>	0
<b>Limit (ppm)</b>	<b>20</b>
<b>Result</b>	<b>Pass</b>
<b>Temperature vs. Frequency Stability</b>	
<b>Temperature (°C)</b>	<b>Measurement Frequency (Hz)</b>
-30	-7000
-20	-7000
-10	-7000
0	-7000
10	-7000
20	-7000
30	-8000
40	-7000
50	-8000
<b>Max. Deviation (Hz)</b>	1000
<b>Max. Deviation (ppm)</b>	0.193051
<b>Limit (ppm)</b>	<b>20</b>
<b>Result</b>	<b>Pass</b>

### 3.6. Band Edge Emissions(Radiated)

**Limit**

FCC CFR Title 47 Part 15 Subpart C Section 15.407(b):  
Limits of unwanted emission out of the restricted bands

Frequency (MHz)	EIRP Limits (dBm)	Equivalent Field Strength at 3m (dBuV/m)
5150~5250	-27	68.2
5250~5350	-27	68.2
5470~5725	-27	68.2
5725~5850	-27(Note 2)	68.2
	10(Note 2)	105.2
	15.6(Note 2)	110.8
	27(Note 2)	122.2

NOTE:

1, The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

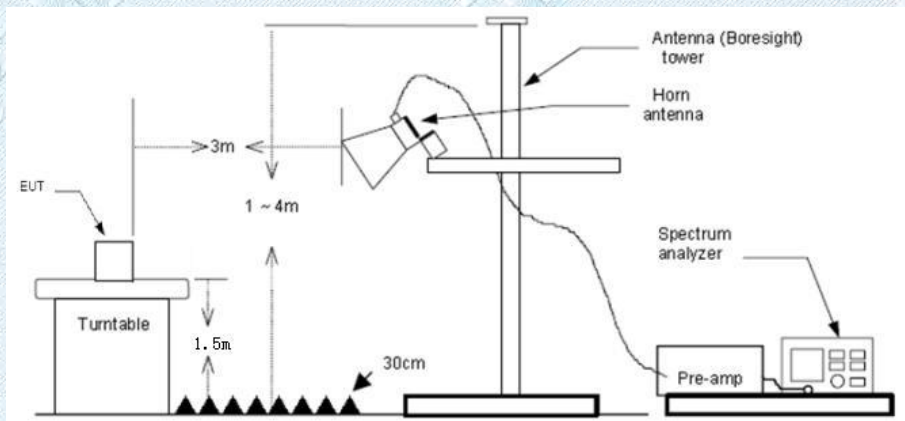
$$E = \frac{1000000\sqrt{30P}}{3} \text{ uV/m, where P is the eirp (Watts)}$$

2, According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.

\* Increase/Decreases with the linearity of the frequency.

For emission above 1GHz and in restricted band, according to FCC KDB 789033 D02 General UNII Test Procedure, all emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.  $E[\text{dB}\mu\text{V}/\text{m}] = \text{EIRP}[\text{dBm}] + 95.2$ , for  $d = 3$  meters.

**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 RMS detector for Average value.

**Test Mode**

Please refer to the clause 2.2.

**Test Results**

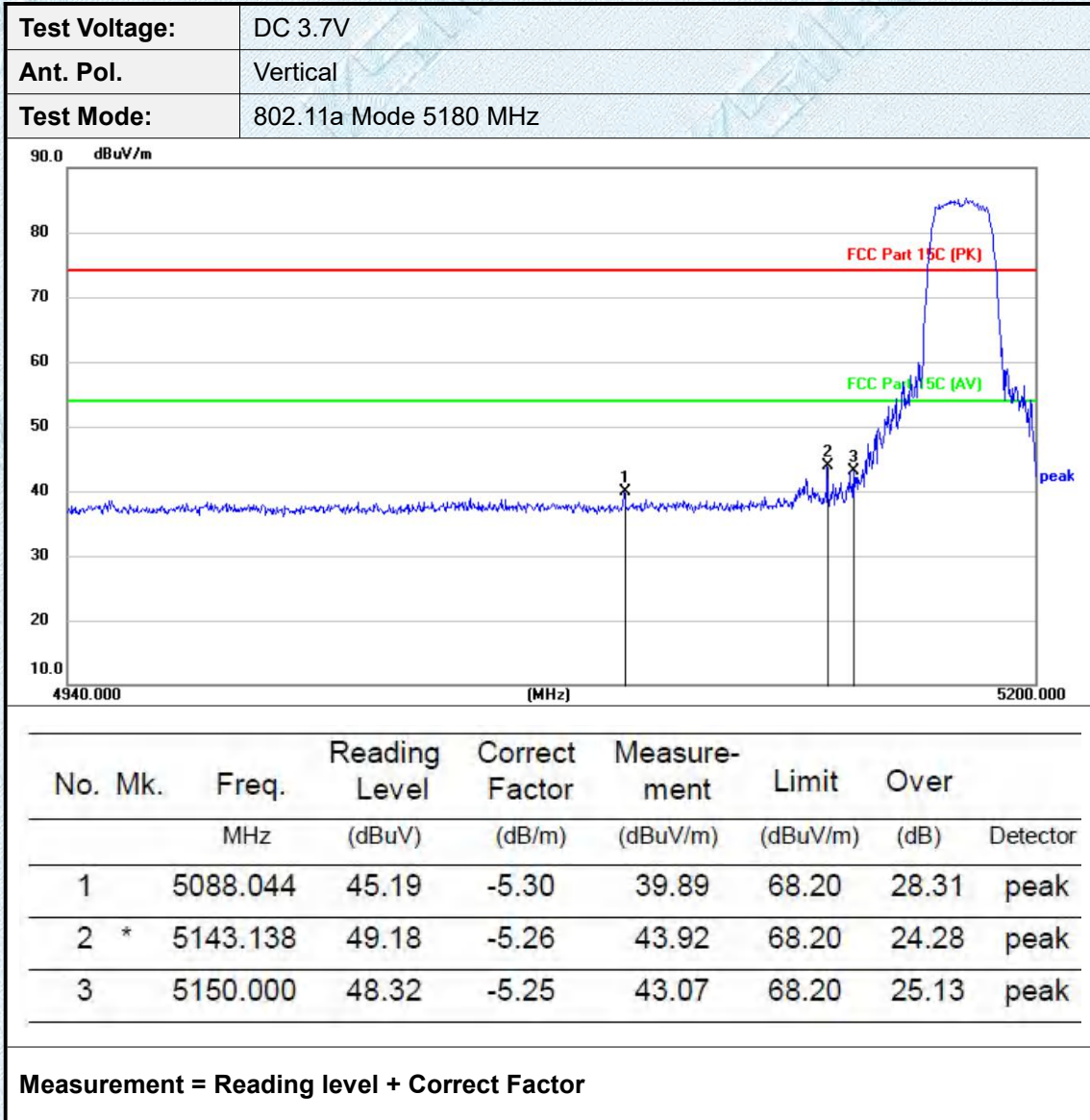
Note:

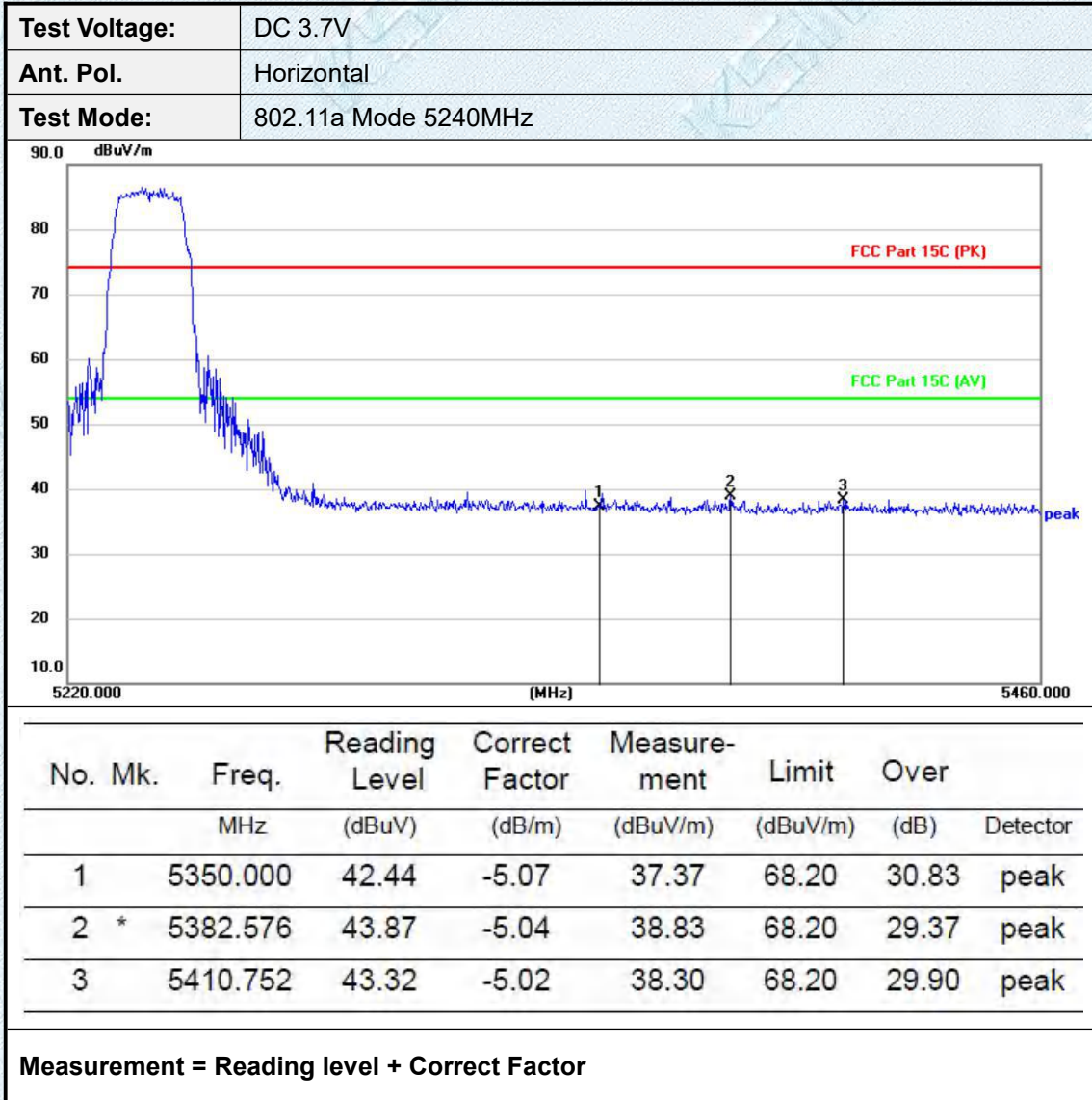
1.Measurement = Reading level + Correct Factor

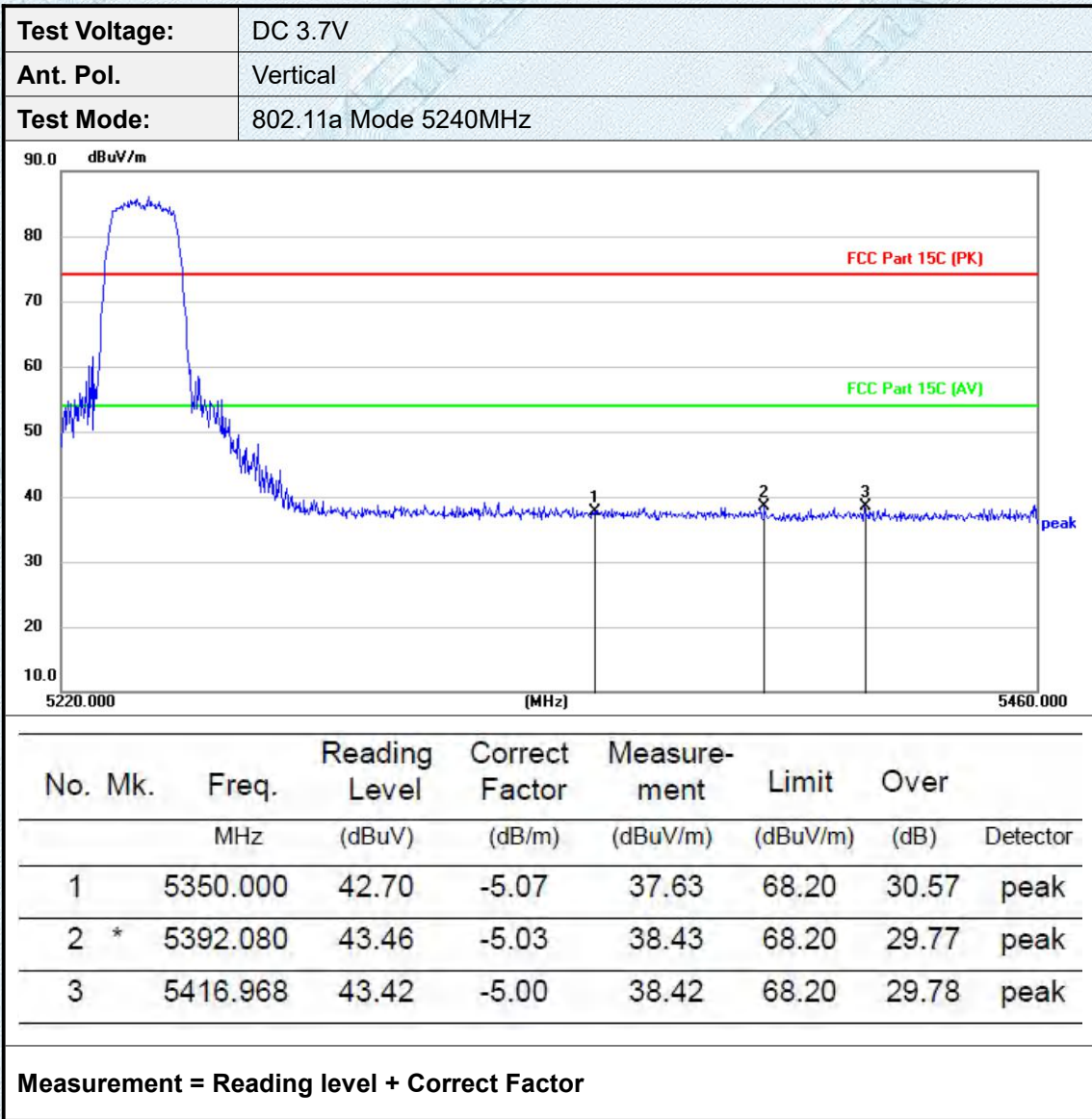
Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

2.Pre-scan 802.11a/n(HT20/HT40)/ac(HT20/HT40/HT80) modulation, and found the 802.11a modulation which it is worse case for above 1GHz, so only show the test data for worse case.









### 3.7. Radiated Spurious Emissions

**Limit**

FCC CFR Title 47 Part 15 Subpart E Section 15.407(b):

**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)

**Limits of unwanted emission out of the restricted bands**

Frequency (MHz)	EIRP Limits (dBm)	Equivalent Field Strength at 3m (dBuV/m)
5150~5250	-27	68.2
5250~5350	-27	68.2
5470~5725	-27	68.2
5725~5850	-27(Note 2)	68.2
	10(Note 2)	105.2
	15.6(Note 2)	110.8
	27(Note 2)	122.2

**NOTE:**

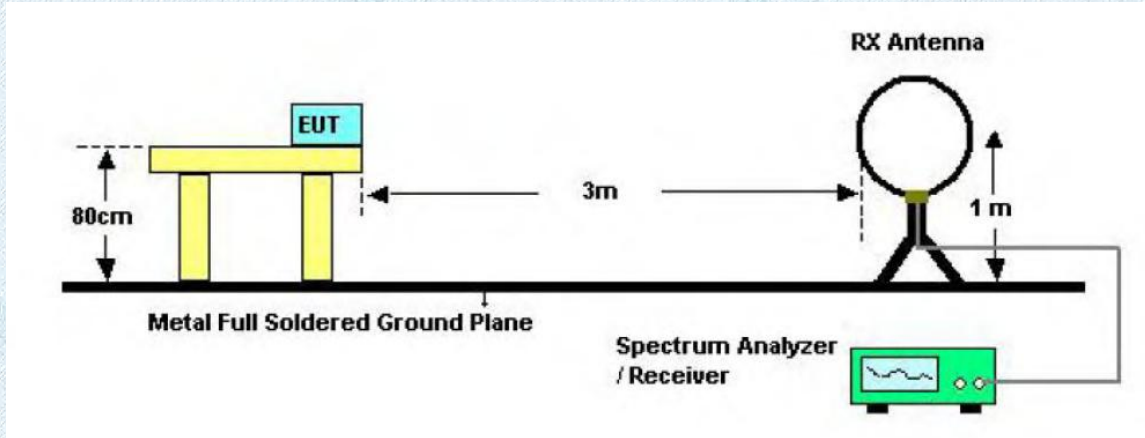
1, The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000 \sqrt{30P}}{3} \text{ uV/m, where P is the eirp (Watts)}$$

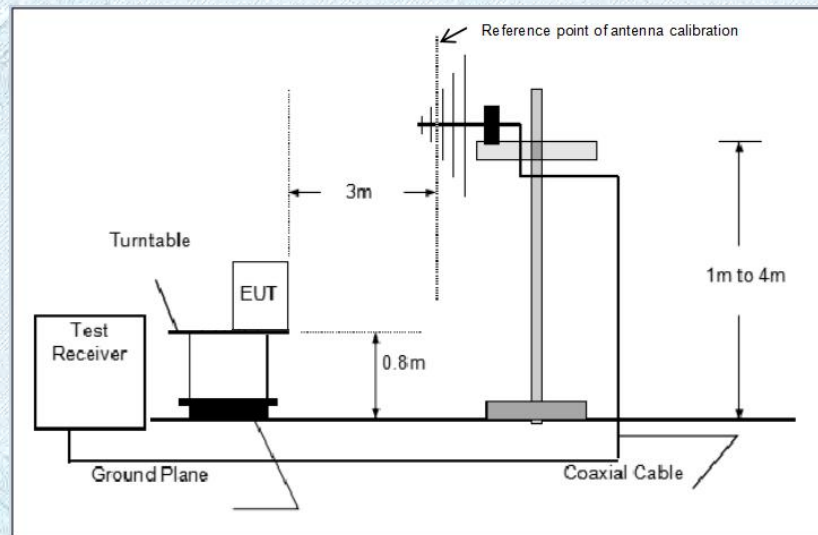
2, According to FCC 16-24, All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27dBm/MHz at the band edge.



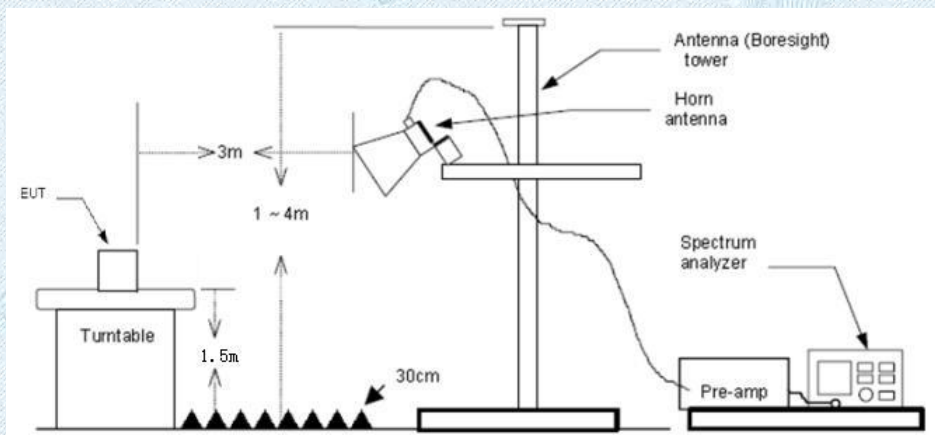
**Test Configuration**



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 1.5 m 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=3MHz Peak detector for Peak value.  
RBW=1MHz, VBW=10Hz RMS detector for Average value.

### Test Mode

Please refer to the clause 2.2.

### Test Result

#### **9 KHz~30 MHz and 18GHz~40GHz**

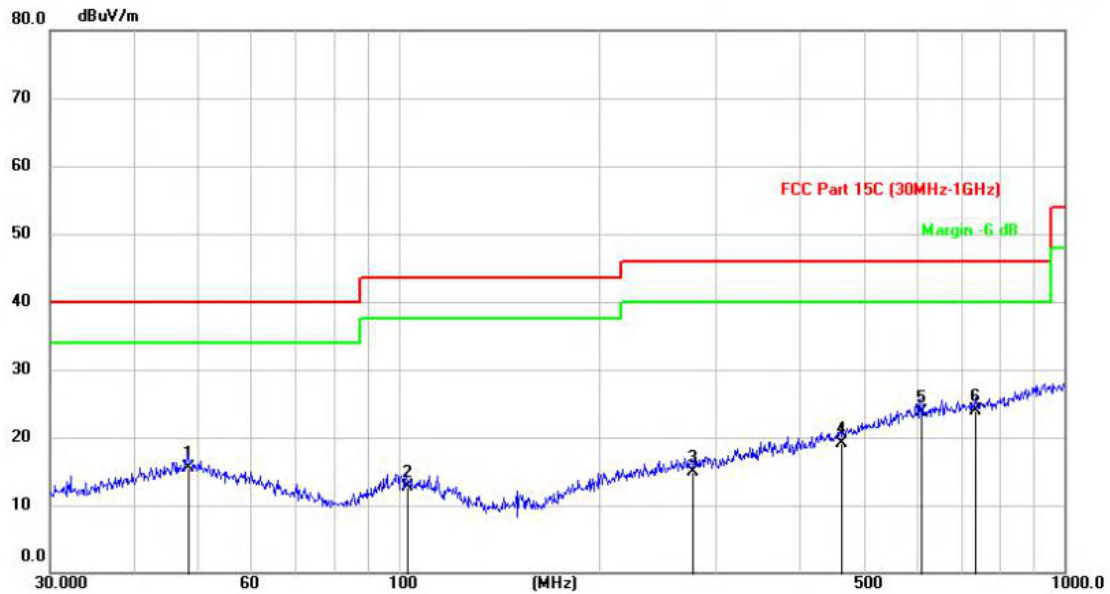
From 9 KHz~30 MHz and 18GHz~40GHz: Conclusion: PASS

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 802.11a/n(HT20/HT40)/ac(HT20/HT40/HT80) modulation, and found the 802.11a modulation 5220MHz which it is worse case for 30MHz-1GHz , so only show the test data for worse case.
- 6) Pre-scan 802.11a/n(HT20/HT40)/ac(HT20/HT40/HT80) modulation, and found the 802.11a modulation which it is worse case for above 1GHz, so only show the test data for worse case.

30MHz-1GHz

<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Horizontal
<b>Test Mode:</b>	TX 802.11a Mode 5220MHz (U-NII-1)
<b>Remark:</b>	Only worse case is reported



No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		48.3147	25.94	-10.41	15.53	40.00	-24.47	QP
2		102.8991	25.49	-12.80	12.69	43.50	-30.81	QP
3		276.2203	25.78	-10.93	14.85	46.00	-31.15	QP
4		461.0502	26.13	-7.10	19.03	46.00	-26.97	QP
5		607.9998	27.89	-4.24	23.65	46.00	-22.35	QP
6	*	735.7802	27.53	-3.60	23.93	46.00	-22.07	QP

Measurement = Reading Level+ Correct Factor

<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Vertical
<b>Test Mode:</b>	TX 802.11a Mode 5220MHz (U-NII-1)
<b>Remark:</b>	Only worse case is reported

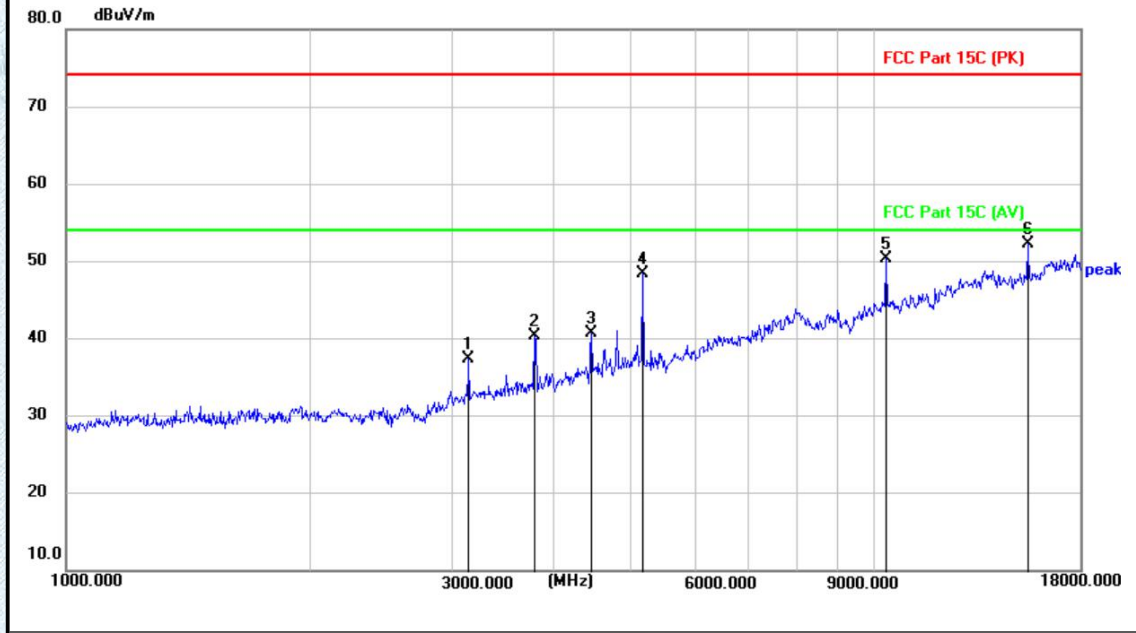


No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		48.5525	25.32	-10.40	14.92	40.00	-25.08	QP
2		66.4989	28.24	-13.73	14.51	40.00	-25.49	QP
3		112.6427	25.58	-13.69	11.89	43.50	-31.61	QP
4		228.8914	25.72	-12.18	13.54	46.00	-32.46	QP
5		587.6671	27.74	-4.54	23.20	46.00	-22.80	QP
6	*	766.8635	27.67	-3.38	24.29	46.00	-21.71	QP

Measurement = Reading Level+ Correct Factor

Adobe 1GHz

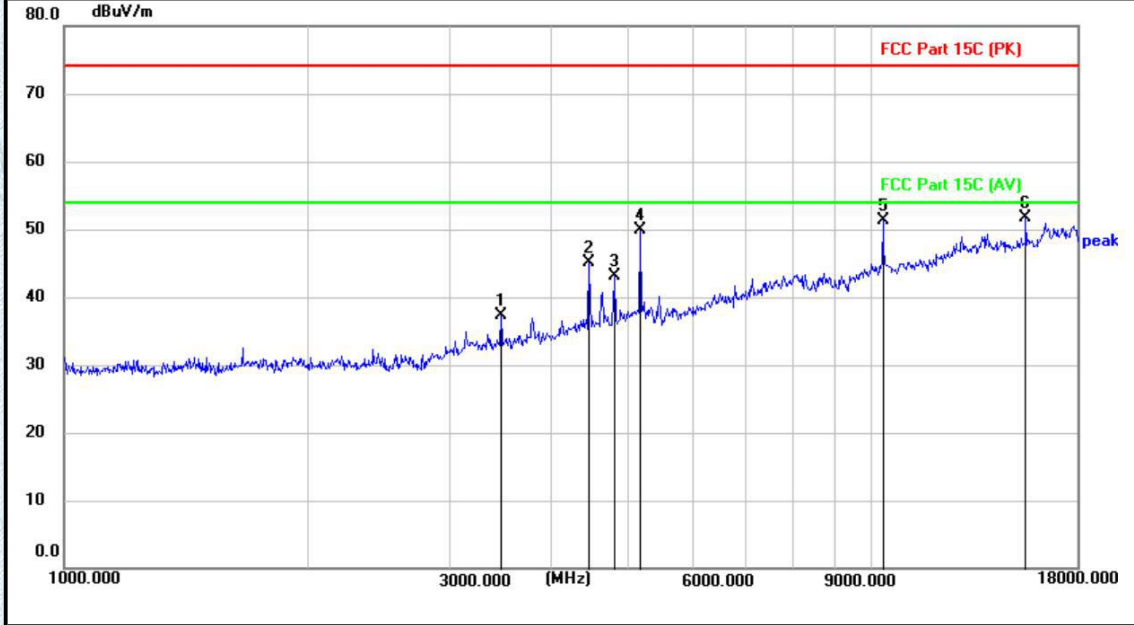
<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Horizontal
<b>Test Mode:</b>	TX 802.11a Mode 5180MHz
<b>Remark:</b>	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		3150.500	47.68	-10.31	37.37	74.00	36.63	peak
2		3808.400	49.21	-8.91	40.30	74.00	33.70	peak
3		4474.800	47.61	-6.84	40.77	74.00	33.23	peak
4		5176.900	53.62	-5.23	48.39	74.00	25.61	peak
5		10356.800	45.71	4.68	50.39	74.00	23.61	peak
6	*	15529.900	40.11	12.08	52.19	74.00	21.81	peak

Measurement = Reading level + Correct Factor

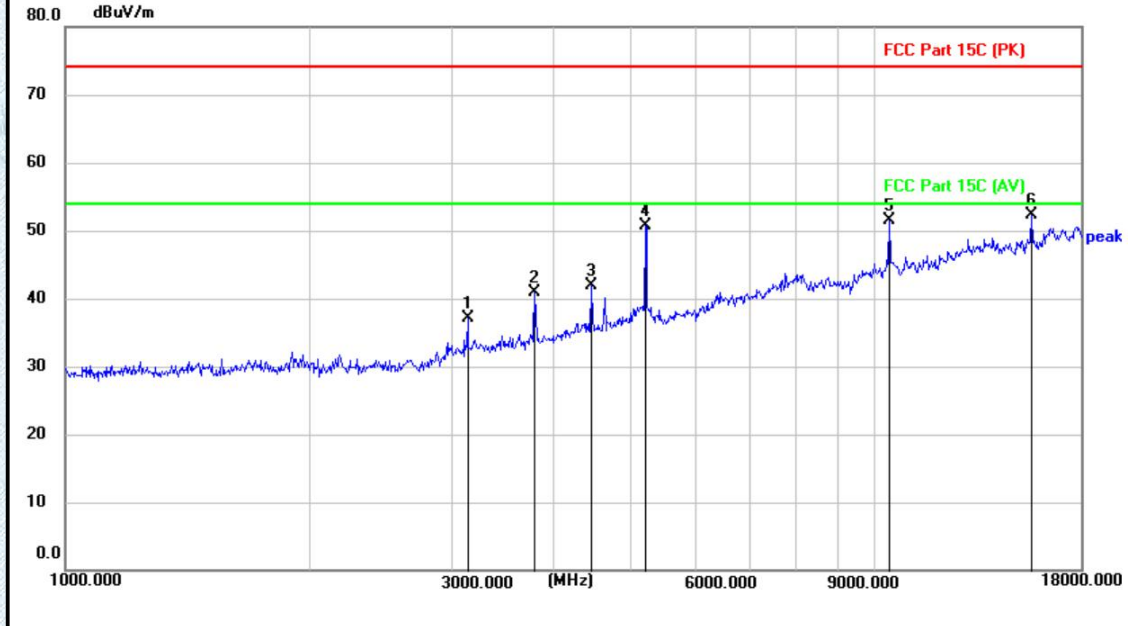
<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Vertical
<b>Test Mode:</b>	TX 802.11a Mode 5180MHz
<b>Remark:</b>	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		3480.300	47.09	-9.71	37.38	74.00	36.62	peak
2		4474.800	51.98	-6.84	45.14	74.00	28.86	peak
3		4809.700	49.08	-5.91	43.17	74.00	30.83	peak
4		5176.900	55.23	-5.23	50.00	74.00	24.00	peak
5		10355.100	46.72	4.68	51.40	74.00	22.60	peak
6	*	15541.800	39.52	12.10	51.62	74.00	22.38	peak

**Measurement = Reading level + Correct Factor**

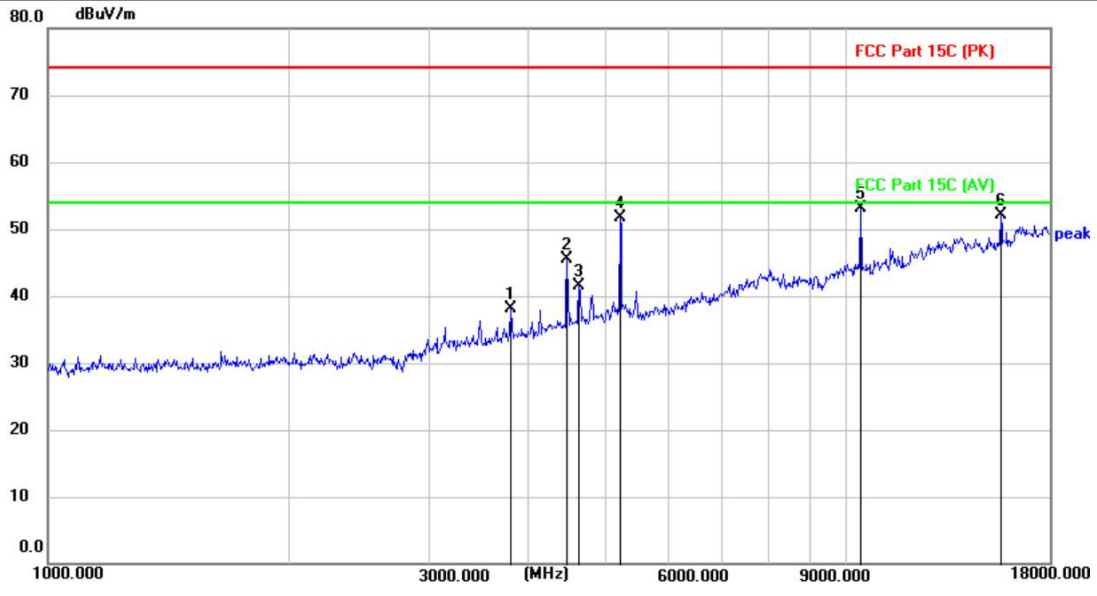
<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Horizontal
<b>Test Mode:</b>	TX 802.11a Mode 5220MHz
<b>Remark:</b>	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		3147.100	47.42	-10.32	37.10	74.00	36.90	peak
2		3810.100	49.75	-8.90	40.85	74.00	33.15	peak
3		4473.100	48.85	-6.85	42.00	74.00	32.00	peak
4		5217.700	55.95	-5.19	50.76	74.00	23.24	peak
5		10436.700	46.67	4.81	51.48	74.00	22.52	peak
6	*	15652.300	40.01	12.22	52.23	74.00	21.77	peak

**Measurement = Reading level + Correct Factor**

<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Vertical
<b>Test Mode:</b>	TX 802.11a Mode 5220MHz
<b>Remark:</b>	No report for the emission which more than 10 dB below the prescribed limit.

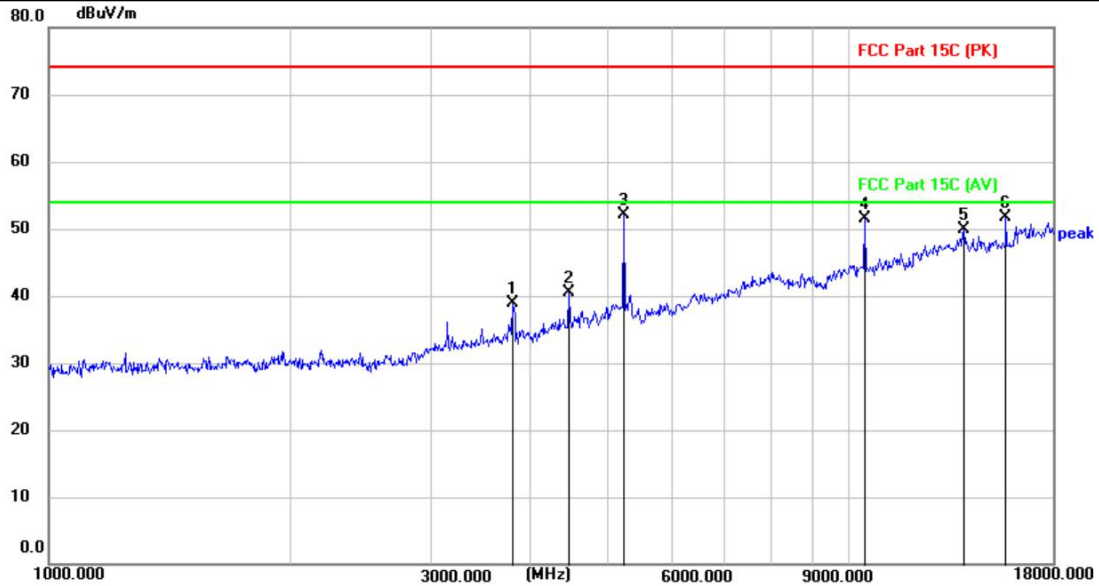


No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		3810.100	46.96	-8.90	38.06	74.00	35.94	peak
2		4474.800	52.43	-6.84	45.59	74.00	28.41	peak
3		4638.000	47.87	-6.37	41.50	74.00	32.50	peak
4		5221.100	56.85	-5.19	51.66	74.00	22.34	peak
5	*	10438.400	48.22	4.81	53.03	74.00	20.97	peak
6		15667.600	39.85	12.24	52.09	74.00	21.91	peak

Measurement = Reading level + Correct Factor



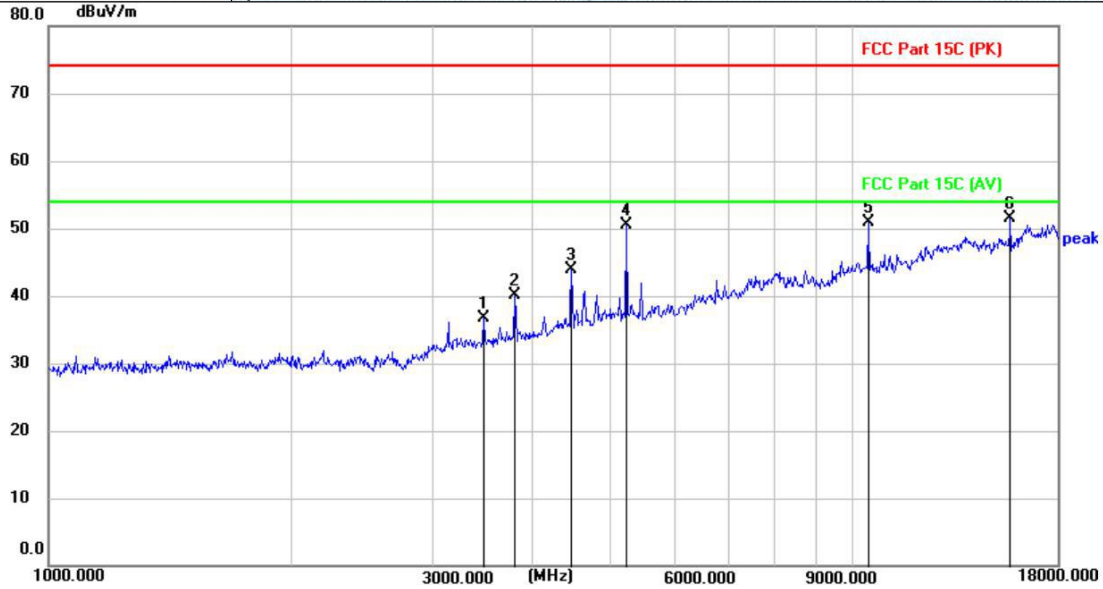
<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Horizontal
<b>Test Mode:</b>	TX 802.11a Mode 5240MHz
<b>Remark:</b>	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		3811.800	47.71	-8.90	38.81	74.00	35.19	peak
2		4471.400	47.27	-6.85	40.42	74.00	33.58	peak
3	*	5239.800	57.33	-5.17	52.16	74.00	21.84	peak
4		10479.200	46.54	4.89	51.43	74.00	22.57	peak
5		13954.000	38.72	11.17	49.89	74.00	24.11	peak
6		15716.900	39.38	12.30	51.68	74.00	22.32	peak

Measurement = Reading level + Correct Factor

<b>Test Voltage:</b>	DC 3.7V
<b>Ant. Pol.</b>	Vertical
<b>Test Mode:</b>	TX 802.11a Mode 5240MHz
<b>Remark:</b>	No report for the emission which more than 10 dB below the prescribed limit.



No.	Mk.	Freq. MHz	Reading Level (dBuV)	Correct Factor (dB/m)	Measure- ment (dBuV/m)	Limit (dBuV/m)	Over (dB)	Detector
1		3478.600	46.36	-9.72	36.64	74.00	37.36	peak
2		3811.800	48.93	-8.90	40.03	74.00	33.97	peak
3		4476.500	50.67	-6.84	43.83	74.00	30.17	peak
4		5238.100	55.58	-5.17	50.41	74.00	23.59	peak
5		10474.100	46.07	4.87	50.94	74.00	23.06	peak
6	*	15718.600	39.23	12.30	51.53	74.00	22.47	peak

Measurement = Reading level + Correct Factor

### 3.8. Conducted Emission

Limit

FCC CFR Title 47 Part 15 Subpart C Section 15.207:

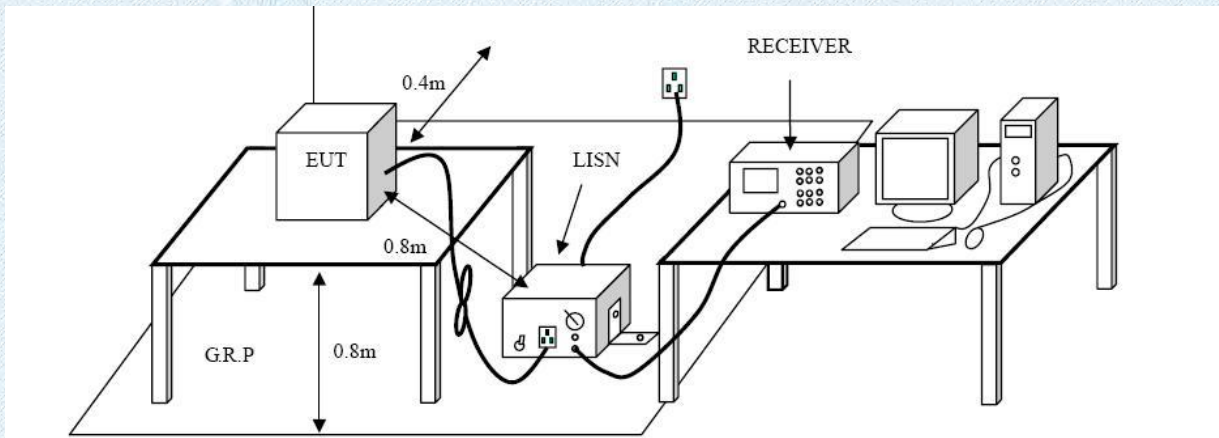
Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dB $\mu$ V)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

Test Configuration



Test Procedure

1. The EUT was setup according to ANSI C63.10:2013 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

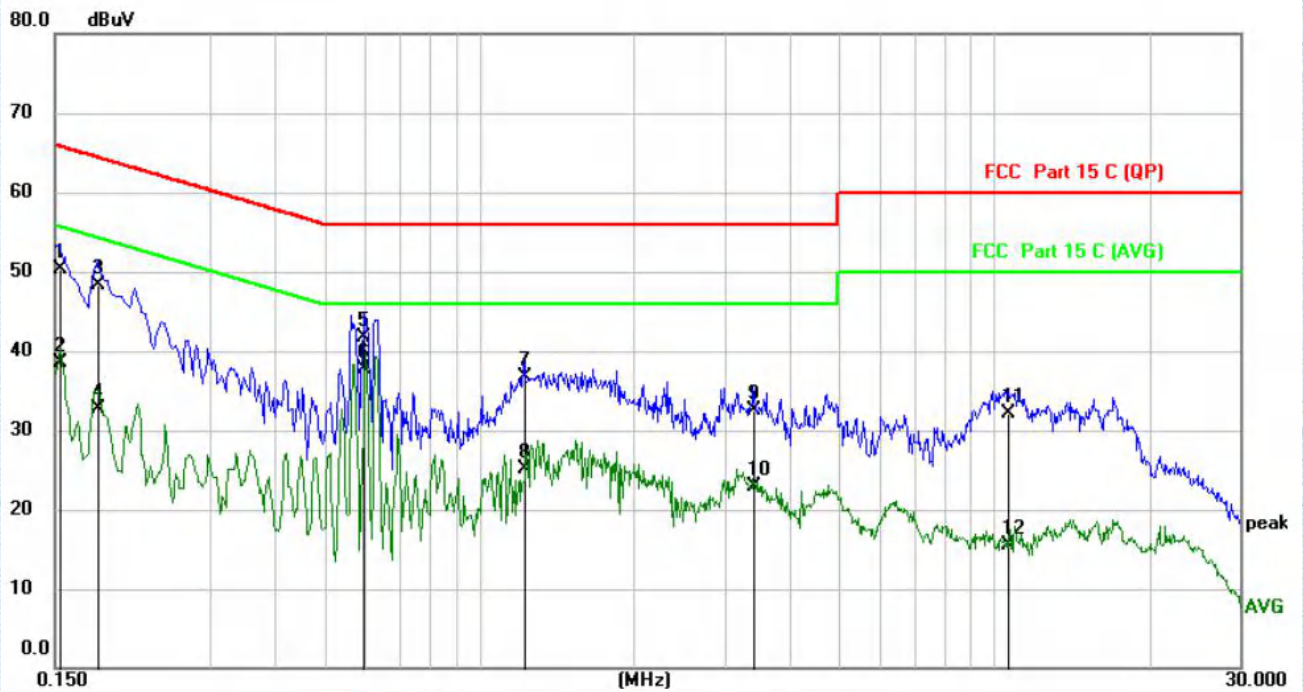
Test Mode

Please refer to the clause 2.2.

Test Results

Pre-scan 802.11a/n(HT20/HT40)/ac(HT20/HT40/HT80) modulation, and found the 802.11a modulation 5220MHz which it is worse case, so only show the test data for worse case.

Test Voltage:	AC 120V/60 Hz
Terminal:	Line

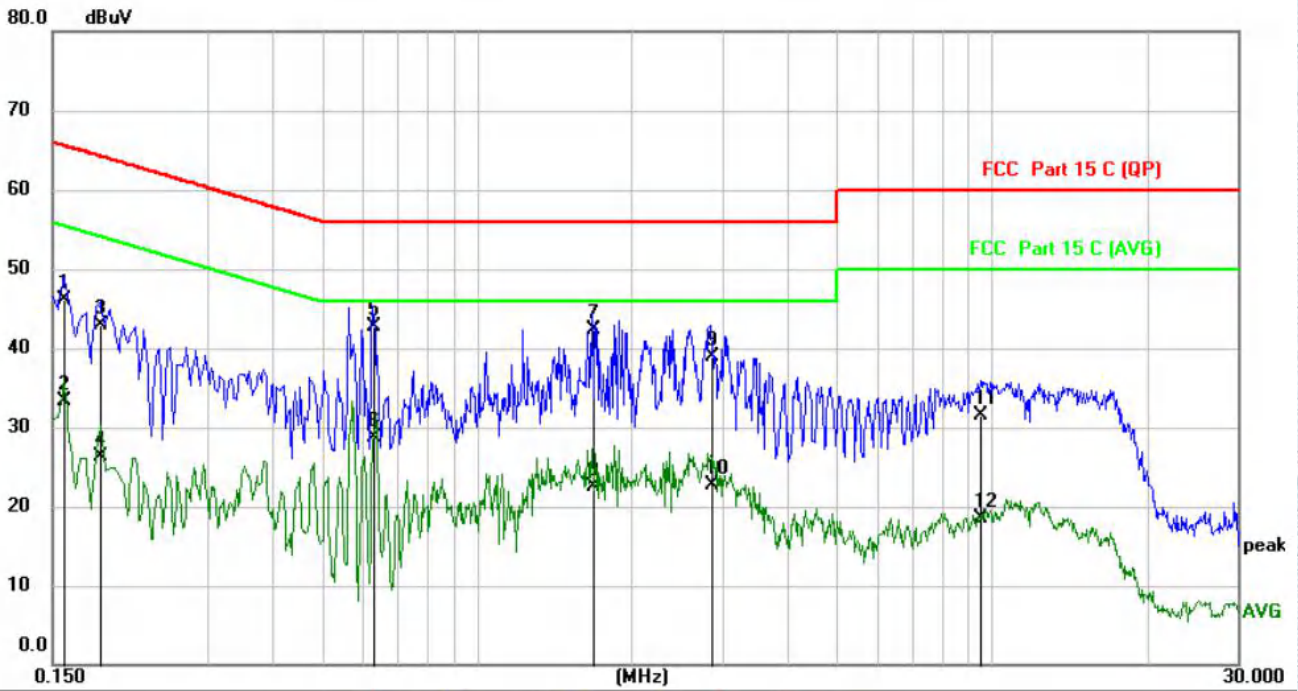


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1539	39.44	10.82	50.26	65.79	-15.53	QP
2		0.1539	27.72	10.82	38.54	55.79	-17.25	AVG
3		0.1819	37.48	10.86	48.34	64.40	-16.06	QP
4		0.1819	21.91	10.86	32.77	54.40	-21.63	AVG
5		0.5977	30.71	10.90	41.61	56.00	-14.39	QP
6	*	0.5977	26.81	10.90	37.71	46.00	-8.29	AVG
7		1.2257	25.75	10.88	36.63	56.00	-19.37	QP
8		1.2257	14.13	10.88	25.01	46.00	-20.99	AVG
9		3.4100	21.58	10.93	32.51	56.00	-23.49	QP
10		3.4100	12.03	10.93	22.96	46.00	-23.04	AVG
11		10.6615	21.21	10.96	32.17	60.00	-27.83	QP
12		10.6615	4.54	10.96	15.50	50.00	-34.50	AVG

Remarks:

- 1.Measurement = Reading Level+ Correct Factor
- 2.Over = Measurement -Limit

Test Voltage:	AC 120V/60 Hz
Terminal:	Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1580	35.25	10.84	46.09	65.57	-19.48	QP
2		0.1580	22.42	10.84	33.26	55.57	-22.31	AVG
3		0.1859	31.98	10.87	42.85	64.22	-21.37	QP
4		0.1859	15.42	10.87	26.29	54.22	-27.93	AVG
5	*	0.6300	31.91	10.87	42.78	56.00	-13.22	QP
6		0.6300	17.75	10.87	28.62	46.00	-17.38	AVG
7		1.6776	31.52	10.88	42.40	56.00	-13.60	QP
8		1.6776	11.60	10.88	22.48	46.00	-23.52	AVG
9		2.8500	27.92	10.92	38.84	56.00	-17.16	QP
10		2.8500	11.81	10.92	22.73	46.00	-23.27	AVG
11		9.5014	20.66	10.91	31.57	60.00	-28.43	QP
12		9.5014	7.66	10.91	18.57	50.00	-31.43	AVG

Remarks:

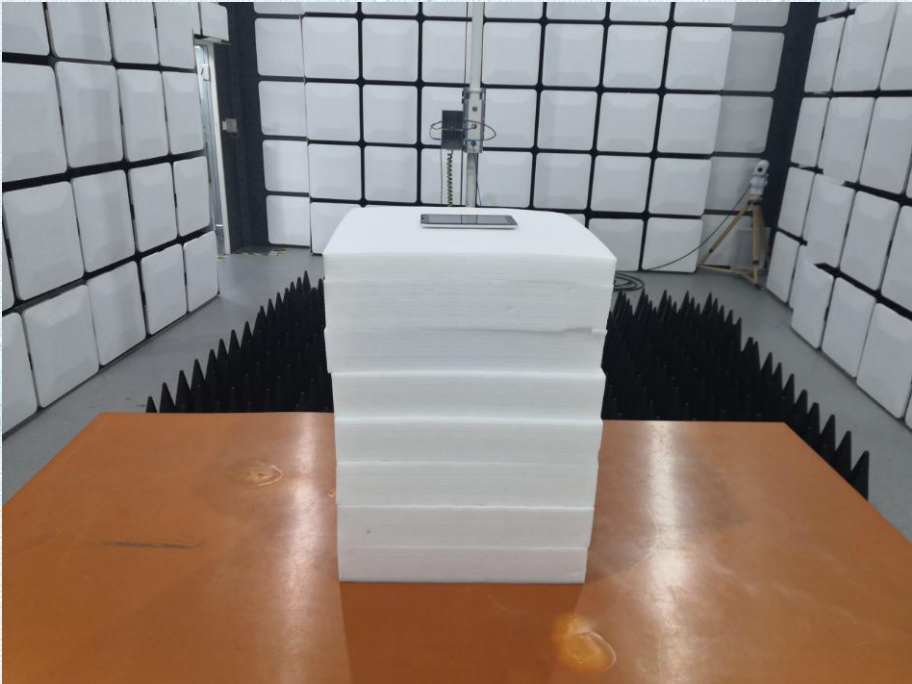
- 1.Measurement = Reading Level+ Correct Factor
- 2.Over = Measurement -Limit

## 4. EUT TEST PHOTOS

Radiated Emissions (30MHz~1000MHz)



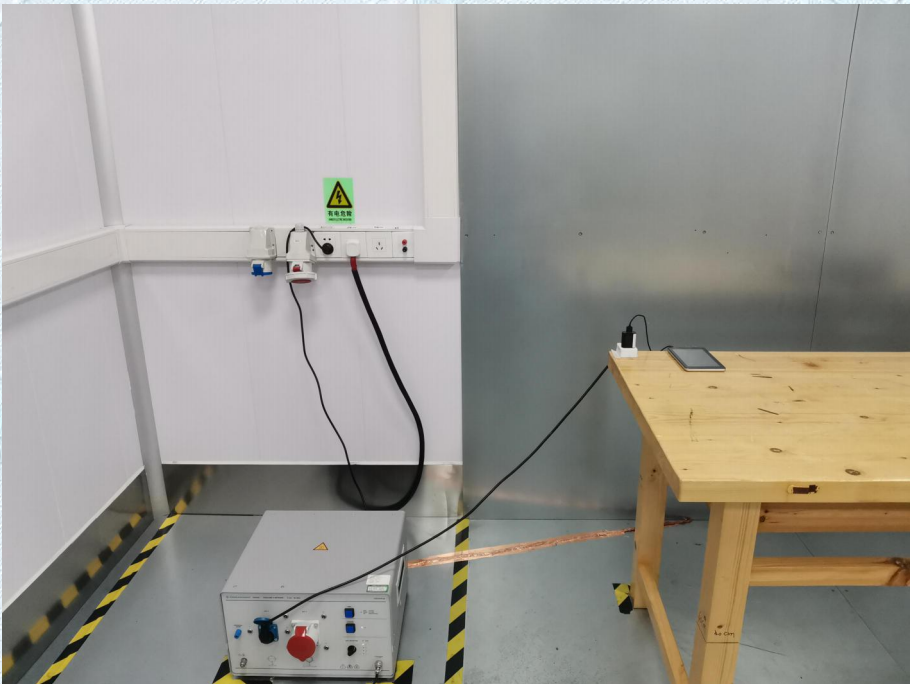
Radiated Emissions (Above 1GHz)



RF Conducted



Conducted Emission



## 5. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Reference to the document No.: KS2101S0424E01

\*\*\*\*\*THE END\*\*\*\*\*