

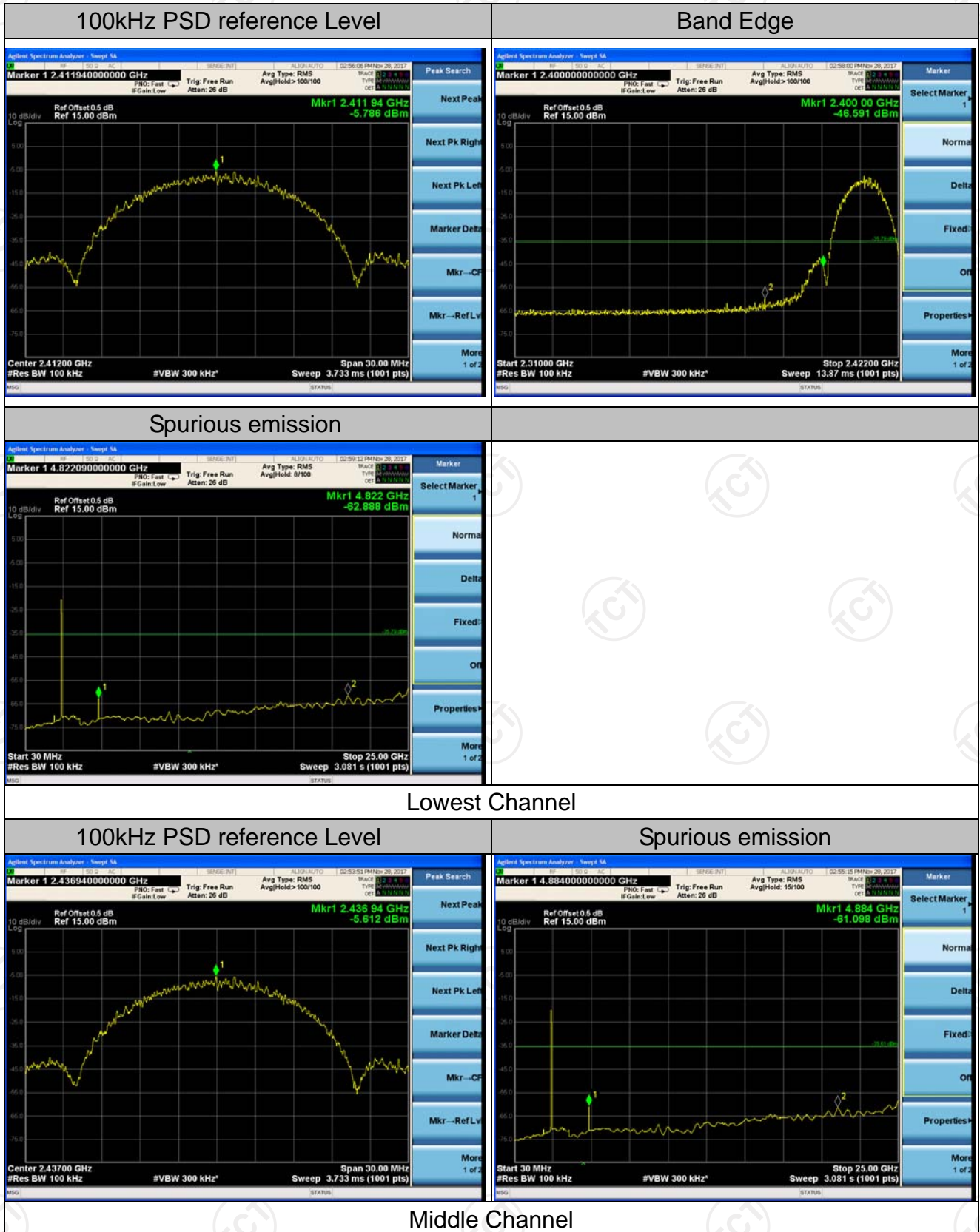
**6.6.2. Test Instruments**

RF Test Room				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

6.6.3. Test Data

802.11b Modulation



## 100kHz PSD reference Level



## Band Edge

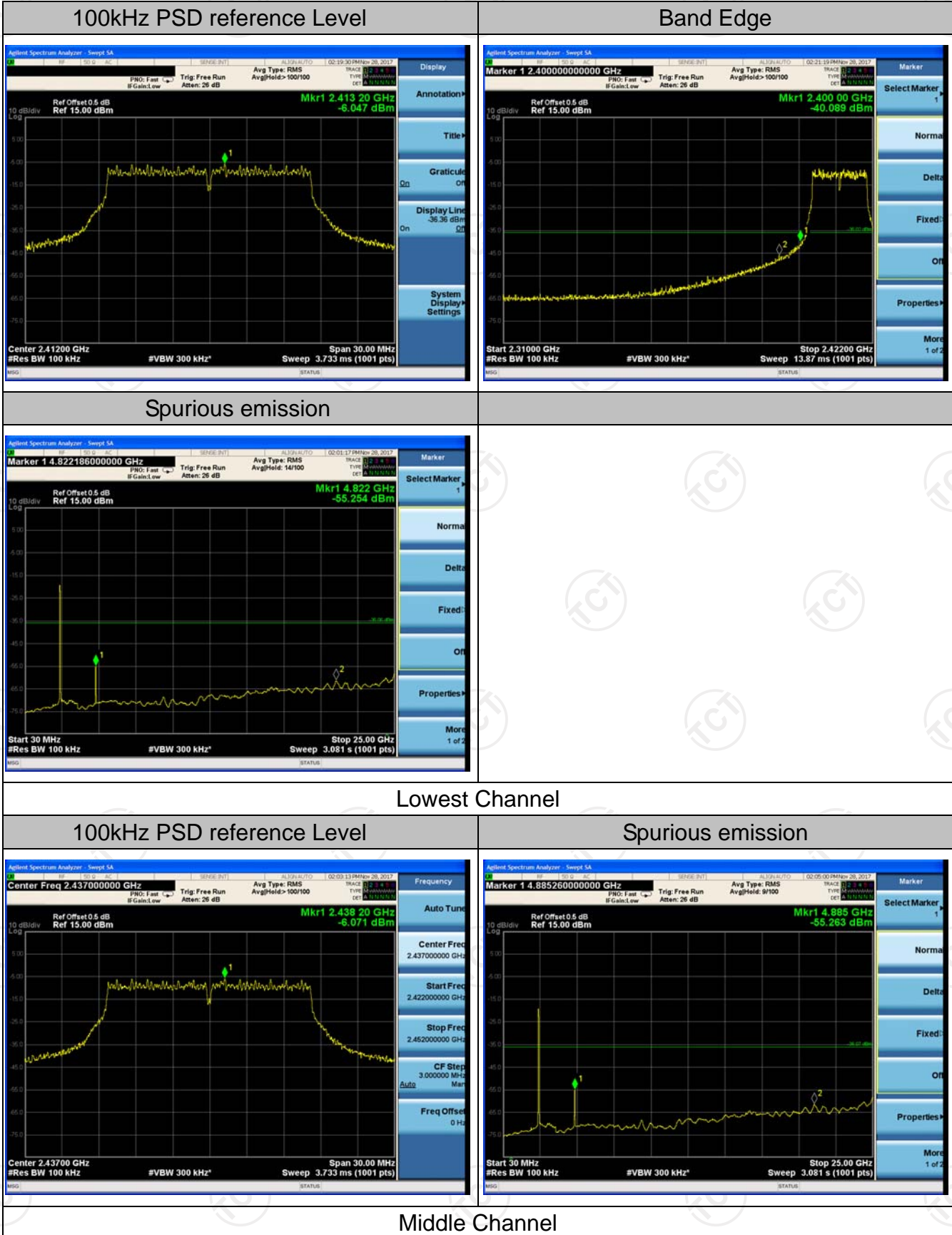


## Spurious emission

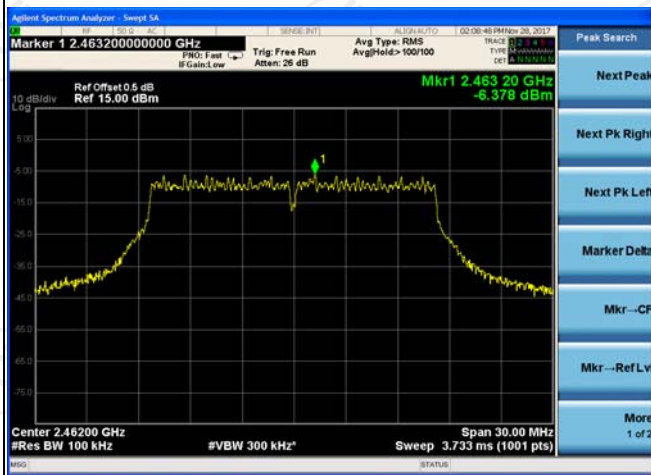


## Highest Channel

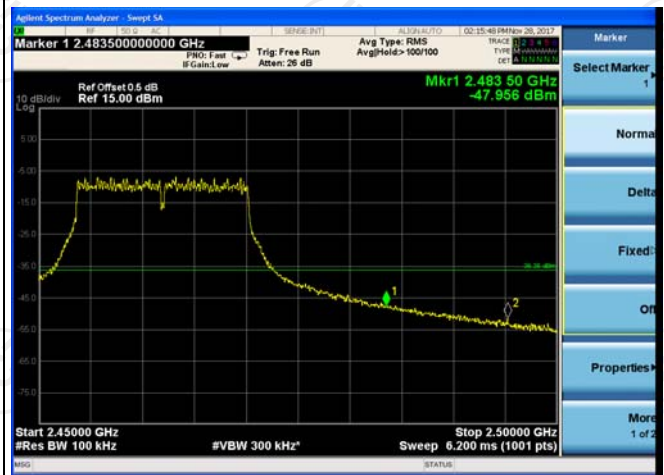
802.11g Modulation



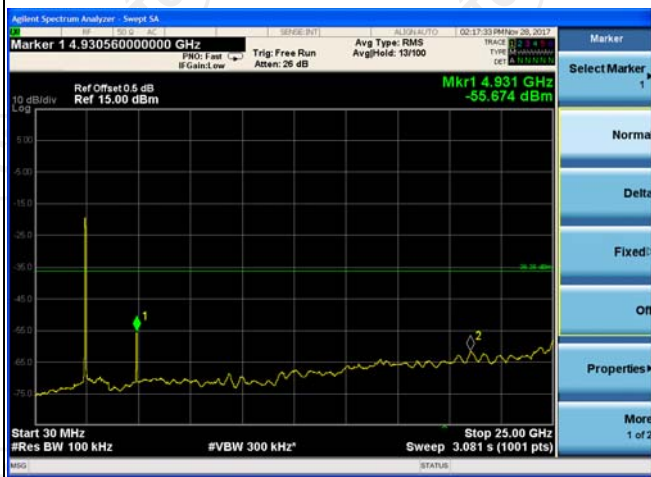
100kHz PSD reference Level



Band Edge

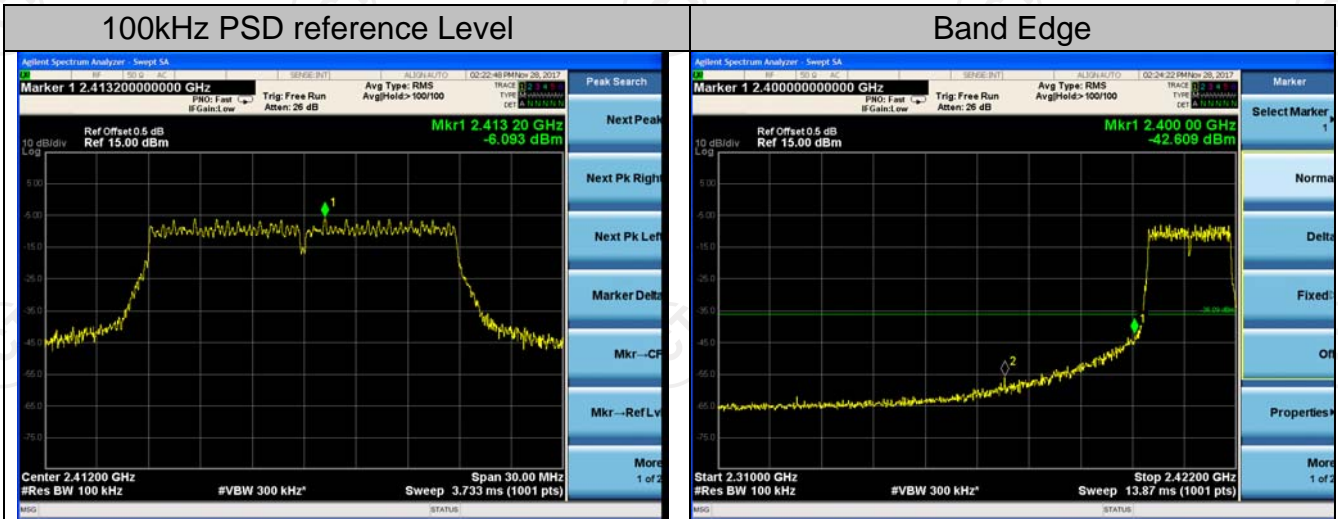


Spurious emission



Highest Channel

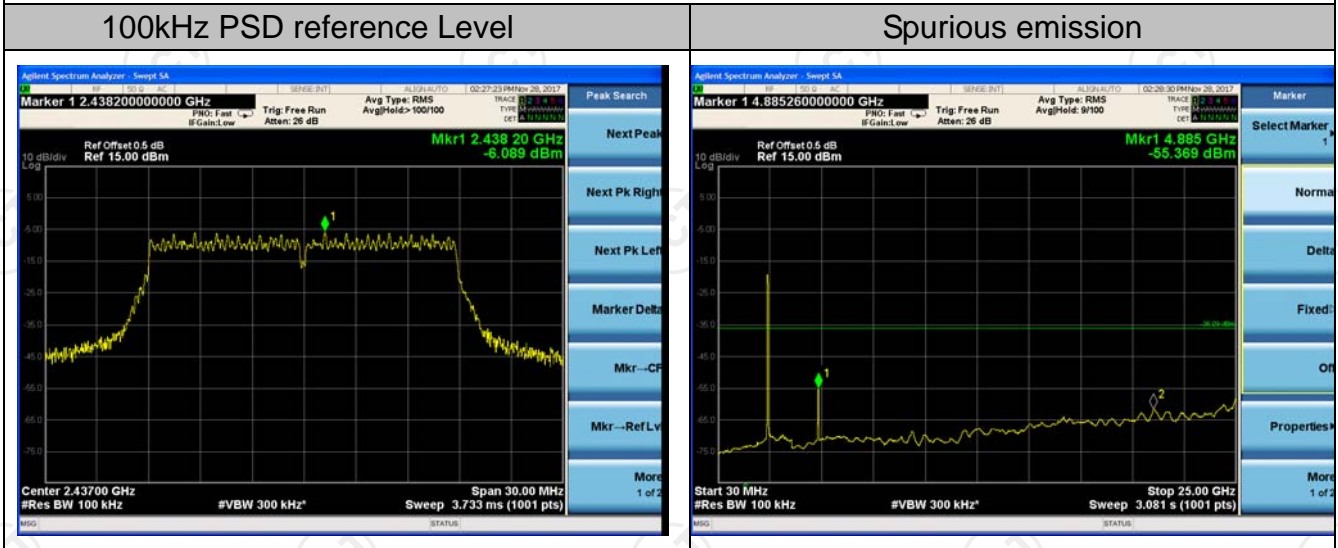
802.11n (HT20) Modulation



Spurious emission

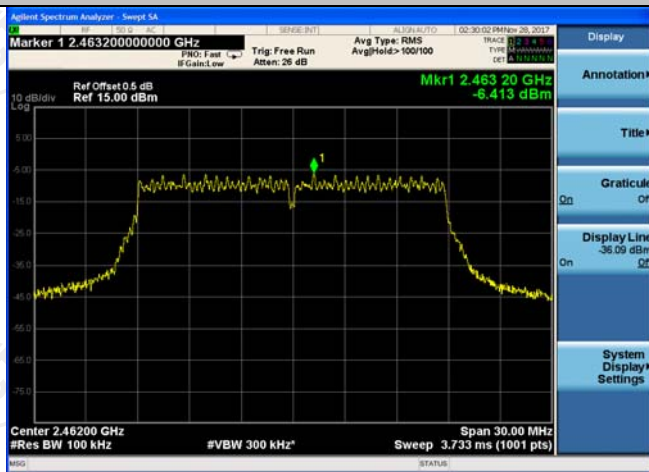


Lowest Channel

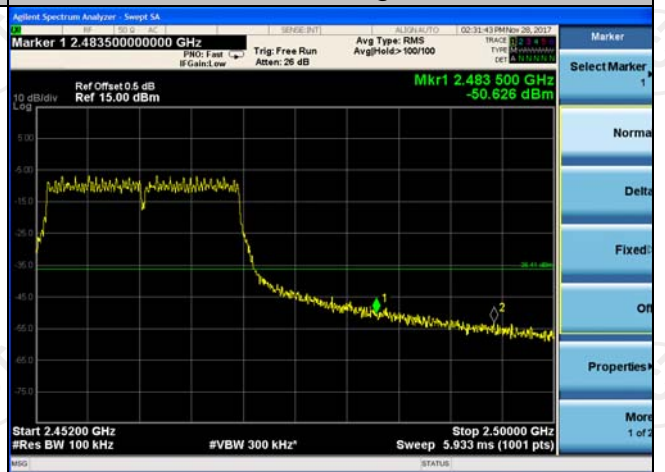


Middle Channel

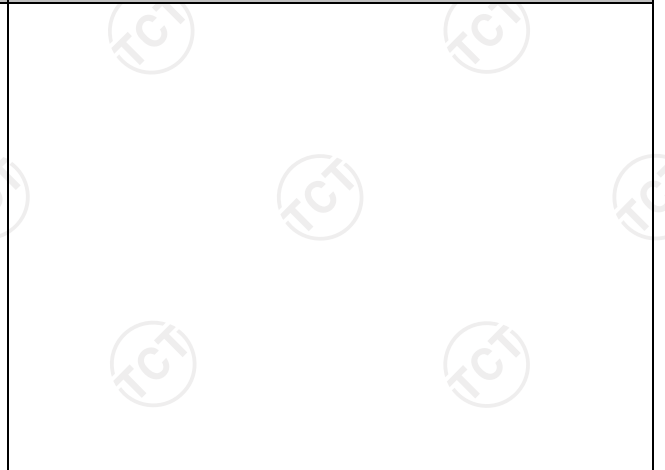
100kHz PSD reference Level



Band Edge



Spurious emission



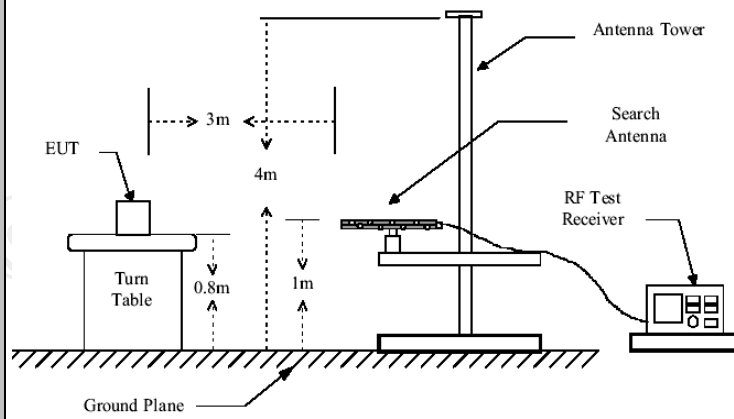
Highest Channel

## 6.7. Radiated Spurious Emission Measurement

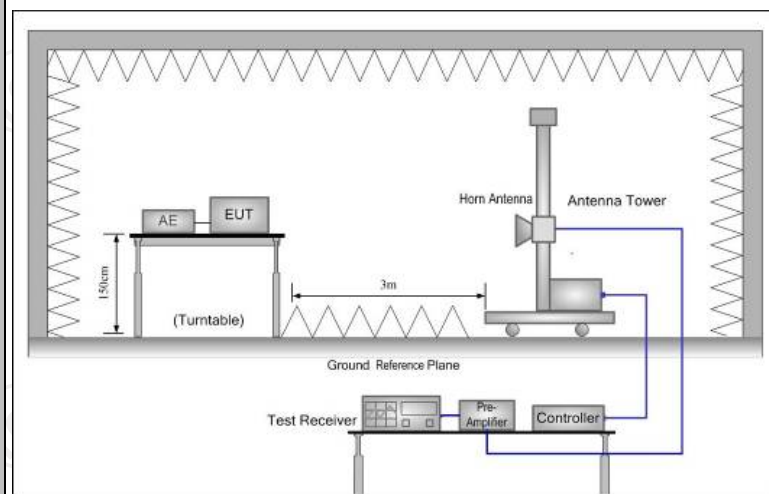
### 6.7.1. Test Specification

<b>Test Requirement:</b>	FCC Part15 C Section 15.209					
<b>Test Method:</b>	ANSI C63.10: 2013					
<b>Frequency Range:</b>	9 kHz to 25 GHz					
<b>Measurement Distance:</b>	3 m					
<b>Antenna Polarization:</b>	Horizontal & Vertical					
<b>Operation mode:</b>	Transmitting mode with modulation					
<b>Receiver Setup:</b>	Frequency	Detector	RBW	VBW	Remark	
	9kHz- 150kHz	Quasi-peak	200Hz	1kHz	Quasi-peak Value	
	150kHz- 30MHz	Quasi-peak	9kHz	30kHz	Quasi-peak Value	
	30MHz-1GHz	Quasi-peak	100KHz	300KHz	Quasi-peak Value	
	Above 1GHz	Peak	1MHz	3MHz	Peak Value	
		Peak	1MHz	10Hz	Average Value	
<b>Limit:</b>	Frequency	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	30	30			
	30-88	100	3			
	88-216	150	3			
	216-960	200	3			
	Above 960	500	3			
	Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector		
	Above 1GHz	500	3	Average		
	5000	3	Peak			
<b>Test setup:</b>	For radiated emissions below 30MHz					
	<p>The diagram shows a test setup for radiated emissions below 30MHz. An Equipment Under Test (EUT) is placed on a turn table at a height of 0.8m. A ground plane is positioned below the turn table. An antenna is positioned at a distance of 3m from the EUT. The antenna is connected to a receiver chain consisting of a Pre-Amplifier, a Receiver, and a Computer. The receiver chain is connected to the antenna.</p>					
	30MHz to 1GHz					





Above 1GHz



**Test Procedure:**

1. For the radiated emission test below 1GHz:  
The EUT was placed on a turntable with 0.8 meter above ground. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. 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.
- For the radiated emission test above 1GHz:  
Place the measurement antenna on a turntable with 1.5 meter above ground, which is away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for

	<p>receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.</p> <p>3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p> <p>4. For measurement below 1GHz, 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.</p> <p>5. Use the following spectrum analyzer settings:</p> <p>(1) Span shall wide enough to fully capture the emission being measured;</p> <p>(2) Set RBW=100 kHz for <math>f &lt; 1</math> GHz; <math>VBW \geq RBW</math>; Sweep = auto; Detector function = peak; Trace = max hold;</p> <p>(3) Set RBW = 1 MHz, <math>VBW = 3</math> MHz for <math>f \geq 1</math> GHz for peak measurement.</p> <p>For average measurement: <math>VBW = 10</math> Hz, when duty cycle is no less than 98 percent. <math>VBW \geq 1/T</math>, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.</p>
<b>Test results:</b>	PASS

**6.7.2. Test Instruments**

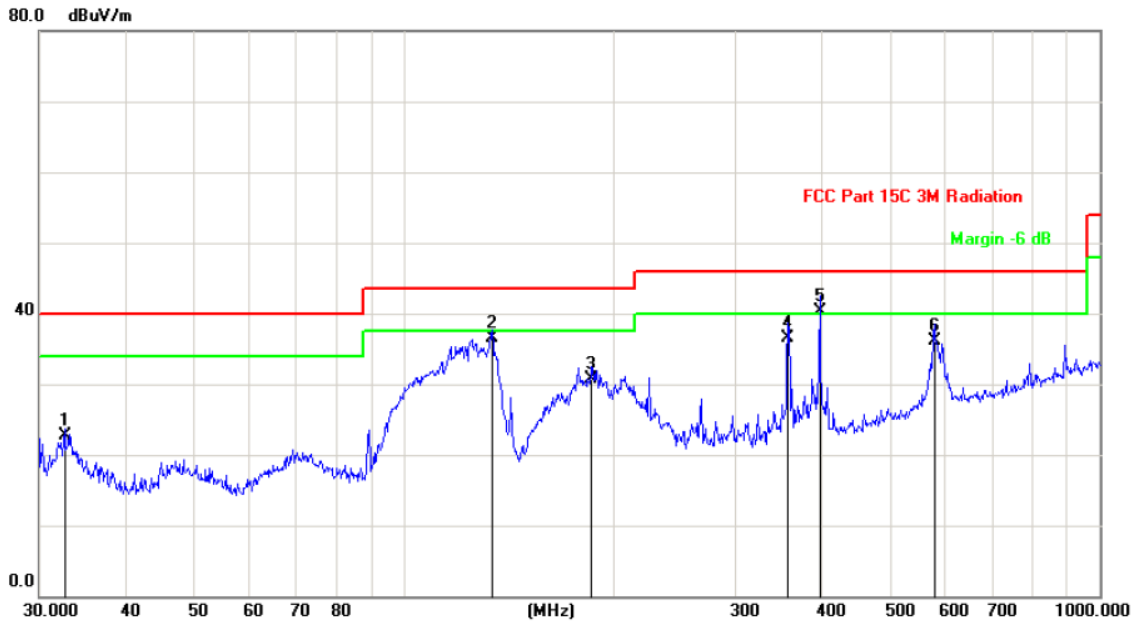
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHW ARZ	FSQ	200061	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

**Note:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

**6.7.3. Test Data**

Please refer to following diagram for individual  
Below 1GHz

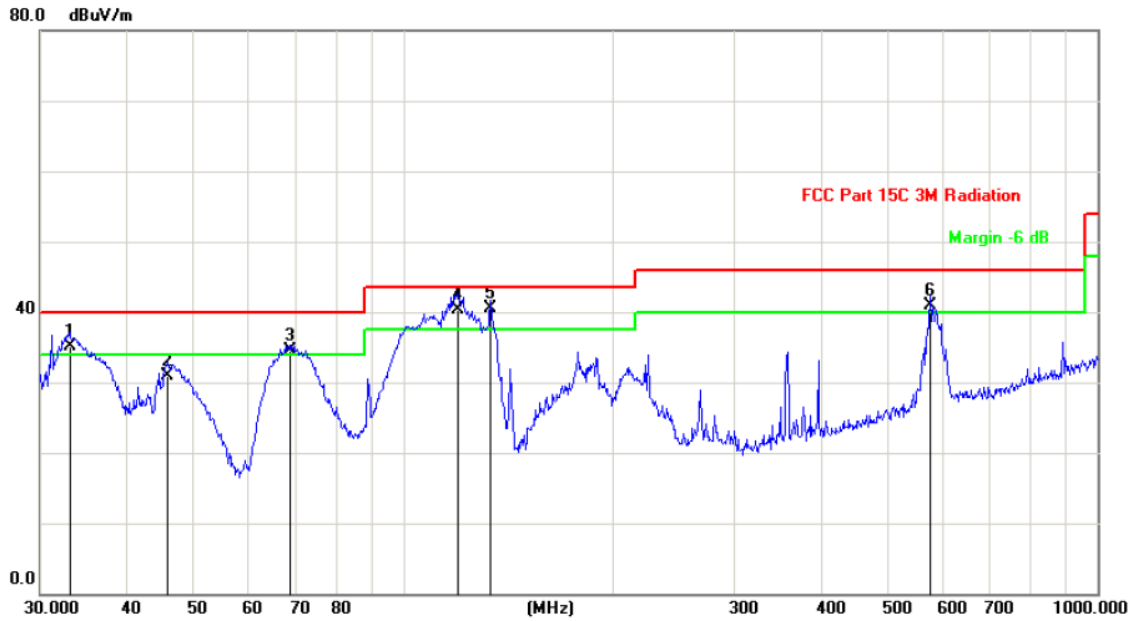
Horizontal:



Site: Polarization: **Horizontal** Temperature: 25  
Limit: FCC Part 15C 3M Radiation Power: AC 120V/60Hz Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		32.6340	36.20	-13.53	22.67	40.00	-17.33	QP		
2		134.0882	52.30	-15.76	36.54	43.50	-6.96	QP		
3		186.4409	44.30	-13.57	30.73	43.50	-12.77	QP		
4		356.6758	43.60	-7.05	36.55	46.00	-9.45	QP		
5	*	396.2415	46.30	-5.90	40.40	46.00	-5.60	QP		
6		578.6699	37.30	-1.27	36.03	46.00	-9.97	QP		

Vertical:



Site: Polarization: **Vertical** Temperature: 25  
 Limit: FCC Part 15C 3M Radiation Power: AC 120V/60Hz Humidity: 55 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Antenna Height cm	Table Degree	Comment
1	!	33.0950	48.60	-13.49	35.11	40.00	-4.89	QP		
2		45.8553	43.60	-12.71	30.89	40.00	-9.11	QP		
3	!	68.8721	51.30	-16.81	34.49	40.00	-5.51	QP		
4	!	119.8556	54.56	-14.16	40.40	43.50	-3.10	QP		
5	*	133.6188	56.30	-15.74	40.56	43.50	-2.94	QP		
6	!	574.6258	42.30	-1.36	40.94	46.00	-5.06	QP		

**Note:** 1. The low frequency, which started from 9KHz~30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported

2. Measurements were conducted in all three channels (high, middle, low) and all modulation(802.11b, 802.11g, 802.11n(HT20) ), and the worst case Mode (Middle channel and 802.11g) was submitted only.

**Test Result of Radiated Spurious at Band edges**

Modulation Type: 802.11b

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)
2310	H	43.51	-4.20	39.31	74.00	54.00
2377.38	H	46.23	-4.10	42.13	74.00	54.00
2390	H	50.5	-3.94	46.56	74.00	54.00
2310	V	42.65	-4.20	38.45	74.00	54.00
2377.38	V	54.74	-4.10	50.64	74.00	54.00
2390	V	49.80	-3.94	45.86	74.00	54.00

Modulation Type: 802.11b

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)
2483.5	H	52.32	-3.60	48.72	74.00	54.00
2487.09	H	45.67	-3.50	42.17	74.00	54.00
2500	H	45.62	-3.34	42.28	74.00	54.00
2483.5	V	55.26	-3.60	51.66	74.00	54.00
2487.09	V	45.70	-3.50	42.20	74.00	54.00
2500	V	39.81	-3.34	36.47	74.00	54.00

Modulation Type: 802.11g

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)
2310	H	40.39	-4.20	36.19	74.00	54.00
2388.96	H	51.23	-4.12	47.11	74.00	54.00
2390	H	52.1	-3.94	48.16	74.00	54.00
2310	V	44.98	-4.20	40.78	74.00	54.00
2388.96	V	48.71	-4.12	44.59	74.00	54.00
2390	V	54.95	-3.94	51.01	74.00	54.00

Modulation Type: 802.11g

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)
2483.5	H	53.43	-3.60	49.83	74.00	54.00
2487.59	H	49.36	-3.52	45.84	74.00	54.00
2500	H	46.68	-3.34	43.34	74.00	54.00
2483.5	V	50.61	-3.60	47.01	74.00	54.00
2487.59	V	46.82	-3.52	43.3	74.00	54.00
2500	V	45.5	-3.34	42.16	74.00	54.00

Modulation Type: 802.11n(20MHz)

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dBμV/m)	AV limit (dBμV/m)
2310	H	50.18	-4.20	45.98	74.00	54.00
2388.01	H	55.94	-4.10	51.84	74.00	54.00
2390	H	52.79	-3.94	48.85	74.00	54.00
2310	V	48.34	-4.20	44.14	74.00	54.00
2388.01	V	50.76	-4.10	46.66	74.00	54.00
2390	V	50.84	-3.94	46.9	74.00	54.00

Modulation Type: 802.11n(20MHz)

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dBμV/m)	AV limit (dBμV/m)
2483.5	H	57.00	-3.60	53.40	74.00	54.00
2392.55	H	50.84	-3.50	47.34	74.00	54.00
2500	H	46.57	-3.34	43.23	74.00	54.00
2483.5	V	51.91	-3.60	48.31	74.00	54.00
2392.55	V	49.86	-3.50	46.36	74.00	54.00
2500	V	48.99	-3.34	45.65	74.00	54.00

**Note:**

1. Peak Final Emission Level=Peak Reading + Correction Factor;
2. Correction Factor= Antenna Factor + Cable loss – Pre-amplifier

**Above 1GHz**

Modulation Type: 802.11b

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	50.01	---	0.75	50.76	---	74	54	-3.24
7236	H	42.27	---	9.87	52.14	---	74	54	-1.86
---	H	---	---	---	---	---	---	---	---
4824	V	49.29	---	0.75	50.04	---	74	54	-3.96
7236	V	42.81	---	9.87	52.68	---	74	54	-1.32
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874	H	48.77	---	0.97	49.74	---	74	54	-4.26
7311	H	41.61	---	9.83	51.44	---	74	54	-2.56
---	H	---	---	---	---	---	---	---	---
4874	V	49.06	---	0.97	50.03	---	74	54	-3.97
7311	V	41.53	---	9.83	51.36	---	74	54	-2.64
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4924	H	49.09	---	1.18	50.27	---	74	54	-3.73
7386	H	40.22	---	10.07	50.29	---	74	54	-3.71
---	H	---	---	---	---	---	---	---	---
4924	V	49.01	---	1.18	50.19	---	74	54	-3.81
7386	V	41.08	---	10.07	51.15	---	74	54	-2.85
---	V	---	---	---	---	---	---	---	---

**Note:**

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.
5. Data of measurement shown “---“in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.



Modulation Type: 802.11g

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	50.46	---	0.75	51.21	---	74	54	-2.79
7236	H	42.51	---	9.87	52.38	---	74	54	-1.62
---	H	---	---	---	---	---	---	---	---
4824	V	49.08	---	0.75	49.83	---	74	54	-4.17
7236	V	42.57	---	9.87	52.44	---	74	54	-1.56
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874	H	48.88	---	0.97	49.85	---	74	54	-4.15
7311	H	40.44	---	9.83	50.27	---	74	54	-3.73
---	H	---	---	---	---	---	---	---	---
4874	V	48.72	---	0.97	49.69	---	74	54	-4.31
7311	V	40.14	---	9.83	49.97	---	74	54	-4.03
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4924	H	48.76	---	1.18	49.94	---	74	54	-4.06
7386	H	38.57	---	10.07	48.64	---	74	54	-5.36
---	H	---	---	---	---	---	---	---	---
4924	V	48.74	---	1.18	49.92	---	74	54	-4.08
7386	V	38.78	---	10.07	48.85	---	74	54	-5.15
---	V	---	---	---	---	---	---	---	---

**Note:**

- Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
- Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.
- Data of measurement shown "—" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

Modulation Type: 802.11n (HT20)

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
4824	H	50.39	---	0.75	51.14	---	74	54	-2.86
7236	H	40.69	---	9.87	50.56	---	74	54	-3.44
---	H	---	---	---	---	---	---	---	---
4824	V	50.56	---	0.75	51.31	---	74	54	-2.69
7236	V	41.07	---	9.87	50.94	---	74	54	-3.06
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
4874	H	50.56	---	0.75	51.31	---	74	54	-2.69
7311	H	41.07	---	9.87	50.94	---	74	54	-3.06
---	H	---	---	---	---	---	---	---	---
4874	V	48.67	---	0.97	49.64	---	74	54	-4.36
7311	V	41.55	---	9.83	51.38	---	74	54	-2.62
---	V	---	---	---	---	---	---	---	---

High channel: 2462 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dB $\mu$ V)	AV reading (dB $\mu$ V)	Correction Factor (dB/m)	Emission Level		Peak limit (dB $\mu$ V/m)	AV limit (dB $\mu$ V/m)	Margin (dB)
					Peak (dB $\mu$ V/m)	AV (dB $\mu$ V/m)			
4924	H	49.16	---	0.97	50.13	---	74	54	-3.87
7386	H	41.69	---	9.83	51.52	---	74	54	-2.48
---	H	---	---	---	---	---	---	---	---
4924	V	49.26	---	0.97	50.23	---	74	54	-3.77
7386	V	41.53	---	9.83	51.36	---	74	54	-2.64
---	V	---	---	---	---	---	---	---	---

**Note:**

1. Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dB $\mu$ V/m)-Average limit (dB $\mu$ V/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.
5. Data of measurement shown "—" in the above table mean that the reading of emissions is attenuated more than 20 dB below the limits or the field strength is too small to be measured.

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