TCT

TEST REPORT

FCC ID: 2ACMYAWFB15

IC: 12036A-AWFB15

Product: Battery Operated Wireless Network Camera

Model No.: AWFB15

Additional Model No.: N/A

Trade Mark: N/A

Report No.: TCT160411E016

Issued Date: Apr. 19, 2016

Issued for:

Atoms Labs LLC

2670 Firewheel Dr. Suite D Flower Mound ,TX 75028 UAS

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

Product:	Battery Operated Wireless Network Camera
Model No.:	AWFB15
Additional Model No.:	N/A
Applicant:	Atoms Labs LLC
Address:	2670 Firewheel Dr. Suite D Flower Mound ,TX 75028 UAS
Manufacturer:	Atoms Labs LLC
Address:	2670 Firewheel Dr. Suite D Flower Mound ,TX 75028 UAS
Date of Test:	Apr. 11, 2016 - Apr. 18, 2016
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 KDB 558074 D01 DTS Meas Guidance v03r04 §RSS GEN, §RSS 247

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:	***Beryl Zhao***	***Date:***	***Apr. 18, 2016***
Reviewed By:	***Joe Zh***	***Date:***	***Apr. 19, 2016***
Approved By:	***Tomsin***	***Date:***	***Apr. 19, 2016***

SHENZHEN TONGCE TESTING LAB TCT

2. Test Result Summary

For FCC:

Requirement	CFR 47 Section	Result
Antenna requirement	§15.203/§15.247 (c)	PASS
AC Power Line Conducted Emission	§15.207	PASS
Conducted Peak Output Power	§15.247 (b)(3)	PASS
6dB Emission Bandwidth	§15.247 (a)(2)	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209	PASS

For IC:

Requirement	RSS Section	Result
Antenna requirement	§RSS Gen sect. 8.3	PASS
AC Power Line Conducted Emission	§RSS Gen sect. 8.8	PASS
Conducted Peak Output Power	§RSS 247 sect. 5.4(4)	PASS
6dB Emission Bandwidth	§RSS 247 sect. 5.2(1) §RSS Gen sect. 6.6	PASS
Power Spectral Density	§RSS 247 sect. 5.2(2)	PASS
Band Edge	§RSS 247 sect. 5.5	PASS
Spurious Emission	§RSS Gen sect. 8.9	PASS

Note:

1. PASS: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

3. N/A: Test case does not apply to the test object.

4. The test result judgment is decided by the limit of test standard.

3. EUT Description

Product Name:	Battery Operated Wireless Network Camera
Model :	AWFB15
Additional Model:	N/A
Trade Mark:	**N/A**
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20))
Channel Separation:	5MHz
Number of Channel:	11 for 802.11b/802.11g/802.11n(HT20)
Modulation Technology: (IEEE 802.11b)	Direct Sequence Spread Spectrum (DSSS)
Modulation Technology: (IEEE 802.11g/802.11n)	Orthogonal Frequency Division Multiplexing(OFDM)
Data speed (IEEE 802.11b):	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
Data speed (IEEE 802.11g):	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps,54Mbps
Data speed (IEEE 802.11n):	Up to 65Mbps
Antenna Type:	Internal antenna
Antenna Gain:	2dBi
Power Supply:	Battery DC12V via 4*3V OR Adapter Information1: Model: GQ05-050100-AU Input: AC 100-240V, 50-60Hz Output: DC 5V, 1A OR Adapter Information2: Model: KSAS0050500100VUD Input: AC 100-240V, 50-60Hz Output: DC 5V, 1A

Operation Frequency each of channel For 802.11b/g/n(HT20)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

802.11b/802.11g/802.11n (HT20)

Channel	Frequency
The lowest channel	2412MHz
The middle channel	2437MHz
The Highest channel	2462MHz

4. Genera Information

4.1. Test environment and mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations(The value of duty cycle is 98.46%)
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. For the full battery state and The output power to the maximum state.	
Test software:	
Executed command fixed test channel under DOS.	

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:	
Per-scan all kind of data rate in lowest channel, and found the follow list which it was worst case.	
Mode	Data rate
802.11b	1Mbps
802.11g	6Mbps
802.11n(H20)	6.5Mbps
Final Test Mode:	
Operation mode:	Keep the EUT in continuous transmitting with modulation
1. For WIFI function, the engineering test program was provided and enabled to make EUT continuous transmit/receive. 2.According to ANSI C63.10 standards, the test results are both the “worst case” and	

"worst setup" 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.

4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

5. Facilities and Accreditations

5.1. Facilities

The test facility is recognized, certified, or accredited by the following organizations:

- FCC - Registration No.: 572331
  Shenzhen Tongce Testing Lab
  The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.
- IC - Registration No.: 10668A-1
  The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing
- CNAS - Registration No.: CNAS L6165
  Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

5.2. Location

Shenzhen Tongce Testing Lab
Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China
Tel: 86-755-36638142

5.3. Measurement Uncertainty

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1G)	±3.92dB
5	All emissions, radiated(>1G)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

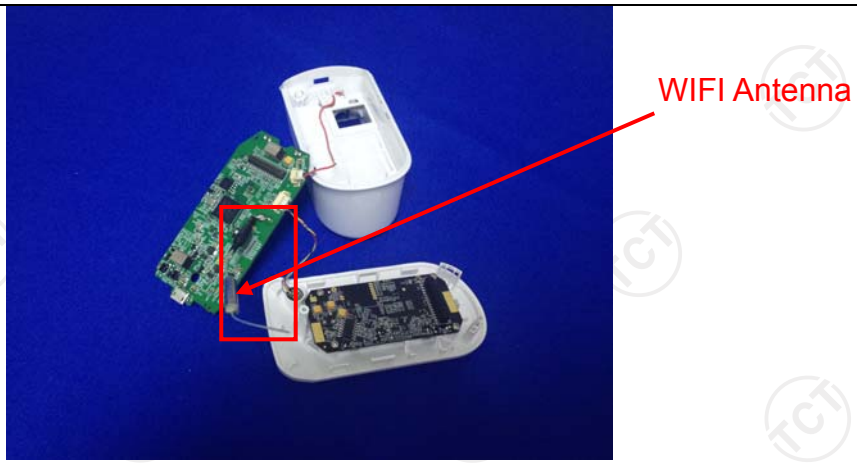
6. Test Results and Measurement Data

6.1. Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)

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(c) (1)(i) requirement:
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.
RSS Gen section 8.3 requirement:
The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.
Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.
Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.
User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:
This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

E.U.T Antenna:	
The WIFI antenna is a internal antenna which permanently attached, and the best case gain of the antenna is 2dBi.	



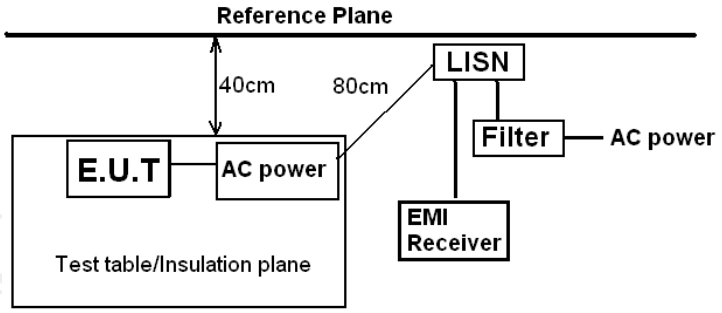
6.2. Conducted Emission

6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207 RSS Gen
Test Method:	ANSI C63.10:2013
Frequency Range:	150 kHz to 30 MHz
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto
Limits:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Test Setup:



Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m

Test Mode:	Charging + transmitting with modulation
Test Procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. 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: 2013 on conducted measurement.
Test Result:	PASS

6.2.2. Test Instruments

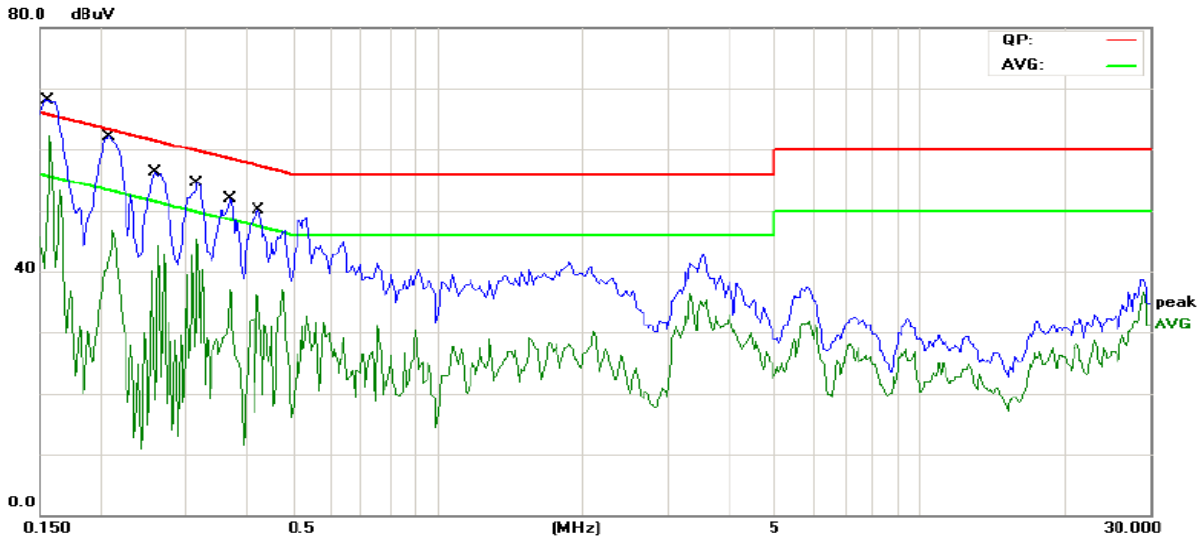
Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI Test Receiver	R&S	ESCS30	100139	Sep. 11, 2016
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 16, 2016
Coax cable	TCT	CE-05	N/A	Sep. 11, 2016
EMI Test Software	Shurple Technology	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).*

6.2.3. Test data

Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: *L1* Temperature: 23 (C)

Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1578	50.29	11.49	61.78	65.57	-3.79	QP	
2		0.1578	38.68	11.49	50.17	55.57	-5.40	AVG	
3		0.2086	42.95	11.46	54.41	63.26	-8.85	QP	
4		0.2086	29.07	11.46	40.53	53.26	-12.73	AVG	
5		0.2594	36.47	11.43	47.90	61.45	-13.55	QP	
6		0.2594	20.46	11.43	31.89	51.45	-19.56	AVG	
7		0.3180	35.50	11.40	46.90	59.76	-12.86	QP	
8		0.3180	23.39	11.40	34.79	49.76	-14.97	AVG	
9		0.3727	33.33	11.36	44.69	58.44	-13.75	QP	
10		0.3727	20.56	11.36	31.92	48.44	-16.52	AVG	
11		0.4273	32.91	11.34	44.25	57.30	-13.05	QP	
12		0.4273	19.46	11.34	30.80	47.30	-16.50	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBµV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBµV) = Reading level (dBµV) + Corr. Factor (dB)

Limit (dBµV) = Limit stated in standard

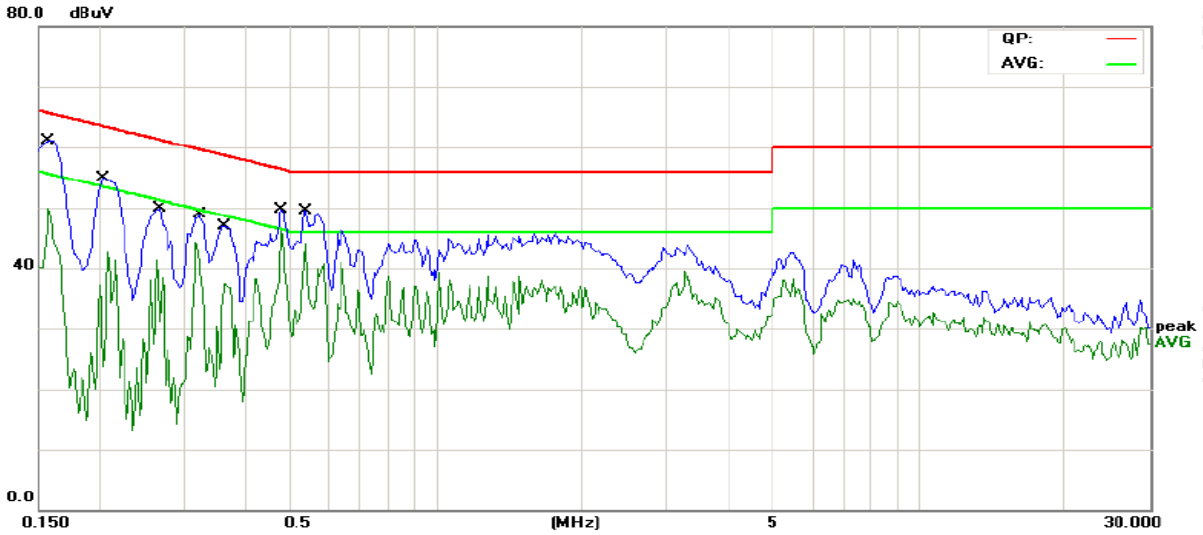
Margin (dB) = Measurement (dBµV) – Limits (dBµV)

Q.P. =Quasi-Peak

AVG =average

** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



Site Chamber #2 Phase: N Temperature: 23 (C)
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1578	46.82	11.49	58.31	65.57	-7.26	QP	
2		0.1578	36.33	11.49	47.82	55.57	-7.75	AVG	
3		0.2047	38.84	11.46	50.30	63.41	-13.11	QP	
4		0.2047	24.28	11.46	35.74	53.41	-17.67	AVG	
5		0.2672	35.41	11.43	46.84	61.20	-14.36	QP	
6		0.3219	33.72	11.40	45.12	59.66	-14.54	QP	
7		0.3648	28.94	11.38	40.32	58.62	-18.30	QP	
8		0.3648	20.67	11.38	32.05	48.62	-16.57	AVG	
9		0.4781	36.90	11.31	48.21	56.37	-8.16	QP	
10	*	0.4781	32.65	11.31	43.96	46.37	-2.41	AVG	
11		0.5367	35.11	11.29	46.40	56.00	-9.60	QP	
12		0.5367	29.25	11.29	40.54	46.00	-5.46	AVG	

Note:

Freq. = Emission frequency in MHz

Reading level (dBµV) = Receiver reading

Corr. Factor (dB) = Antenna factor + Cable loss

Measurement (dBµV) = Reading level (dBµV) + Corr. Factor (dB)

Limit (dBµV) = Limit stated in standard

Margin (dB) = Measurement (dBµV) – Limits (dBµV)

Q.P. =Quasi-Peak

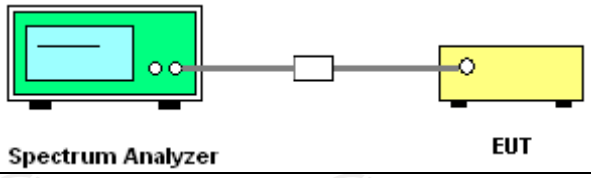
AVG =average

** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

The Conducted Emission of the EUT with adapter 1 and adapter 2 is all tested, but only the worst result is recorded in the report.

6.2.4. Maximum Conducted (Average) Output Power

6.2.5. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3) RSS 247 sect. 5.4(4)
Test Method:	KDB 558074 D01 DTS Meas Guidance v03r04
Limit:	30dBm
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r04. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Measure the conducted output power and record the results in the test report.
Test Result:	PASS

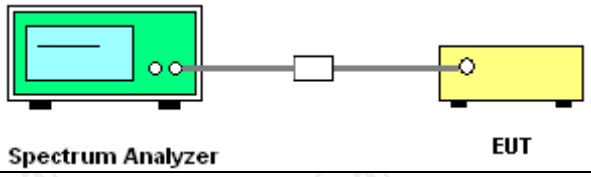
6.2.6. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
RF cable	TCT	RE-06	N/A	Sep. 12, 2016
Antenna Connector	TCT	RFC-01	N/A	Sep. 12, 2016

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

6.3. Emission Bandwidth

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2) RSS 247 sect. 5.2(1), RSS Gen sect. 6.6
Test Method:	KDB 558074 D01 DTS Meas Guidance v03r04
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r04. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz. 4. Measure and record the results in the test report.
Test Result:	PASS

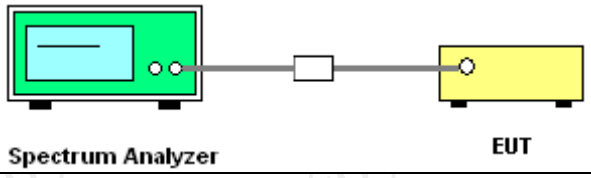
6.3.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
RF cable	TCT	RE-06	N/A	Sep. 12, 2016
Antenna Connector	TCT	RFC-01	N/A	Sep. 12, 2016

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

6.4. Power Spectral Density

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e) RSS 247 sect. 5.2(2)
Test Method:	KDB 558074 D01 DTS Meas Guidance v03r04
Limit:	The average power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows Measurement Procedure 10.3 Method AVGPSD of FCC KDB Publication No.558074 D01 DTS Meas. Guidance v03r04 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW): 3 kHz ≤ RBW ≤ 100 kHz. Video bandwidth VBW ≥ 3 x RBW. Set the span to at least 1.5 times the OBW. 5. Detector = RMS, Sweep time = auto couple. 6. Employ trace averaging (RMS) mode over a minimum of 100 traces. Use the peak marker function to determine the maximum power level. 6. Measure and record the results in the test report.
Test Result:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
RF cable	TCT	RE-06	N/A	Sep. 12, 2016
Antenna Connector	TCT	RFC-01	N/A	Sep. 12, 2016

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

6.5. Conducted Band Edge and Spurious Emission Measurement

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d) RSS 247 sect. 5.5
Test Method:	ANSI C63.10:2013
Limit:	In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r04. 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement. 3. Set to the maximum power setting and enable the EUT transmit continuously. 4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d). 5. Measure and record the results in the test report. 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
Test Result:	PASS

6.5.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
RF cable	TCT	RE-06	N/A	Sep. 12, 2016
Antenna Connector	TCT	RFC-01	N/A	Sep. 12, 2016

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

6.6. Radiated Spurious Emission Measurement

6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.209 RSS Gen sect. 8.9
Test Method:	ANSI C63.10: 2013
Frequency Range:	9 kHz to 25 GHz
Measurement Distance:	3 m
Antenna Polarization:	Horizontal & Vertical
Operation mode:	Transmitting mode with modulation

Receiver Setup:

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

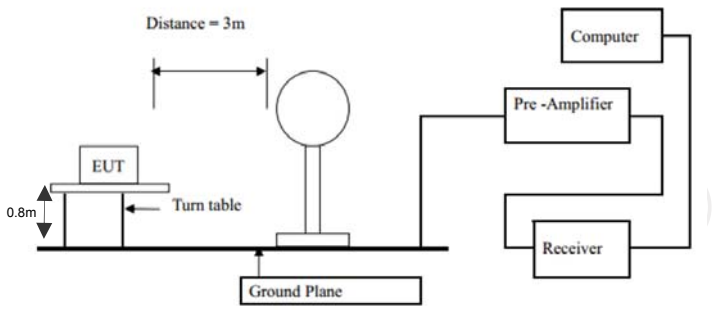
Limit:

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

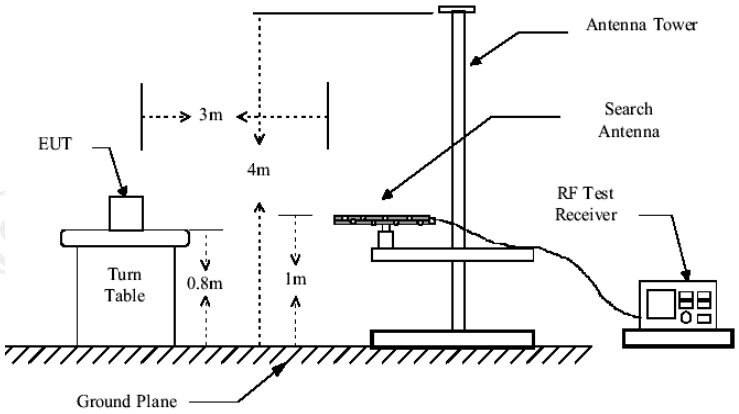
Frequency	Field Strength (microvolts/meter)	Measurement Distance (meters)	Detector
Above 1GHz	500	3	Average
	5000	3	Peak

Test setup:

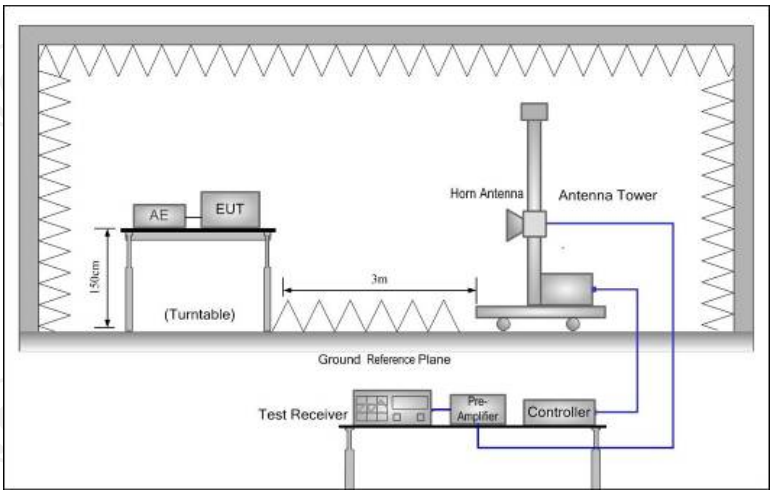
For radiated emissions below 30MHz



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

	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. 3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level 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. 5. Use the following spectrum analyzer settings: (1) Span shall wide enough to fully capture the emission being measured; (2) Set RBW=100 kHz for f < 1 GHz; VBW ⩾RBW; Sweep = auto; Detector function = peak; Trace = max hold; (3) Set RBW = 1 MHz, VBW= 3MHz for f 1 GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW ⩾ 1/T, 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.
Test results:	PASS

6.6.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
ESPI Test Receiver	ROHDE&SCHWARZ	ESVD	100008	Sep. 11, 2016
Spectrum Analyzer	ROHDE&SCHWARZ	FSEM	848597/001	Sep. 11, 2016
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 12, 2016
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 11, 2016
Pre-amplifier	HP	8447D	2727A05017	Sep. 11, 2016
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 13, 2016
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 13, 2016
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 13, 2016
Horn Antenna	Schwarzbeck	BBHA 9170	373	Sep. 13, 2016
Coax cable	TCT	RE-low-01	N/A	Sep. 11, 2016
Coax cable	TCT	RE-high-02	N/A	Sep. 11, 2016
Coax cable	TCT	RE-low-03	N/A	Sep. 11, 2016
Coax cable	TCT	RE-High-04	N/A	Sep. 11, 2016
Antenna Mast	CCS	CC-A-4M	N/A	Sep. 12, 2016
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

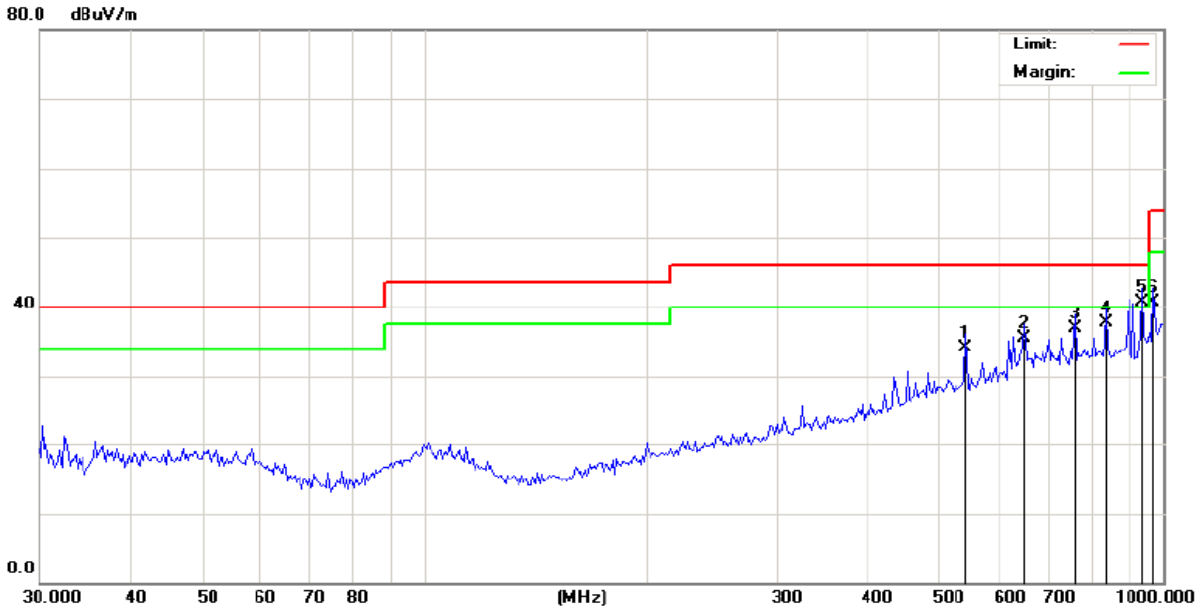
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.6.3. Test Data

Please refer to following diagram for individual

Below 1GHz

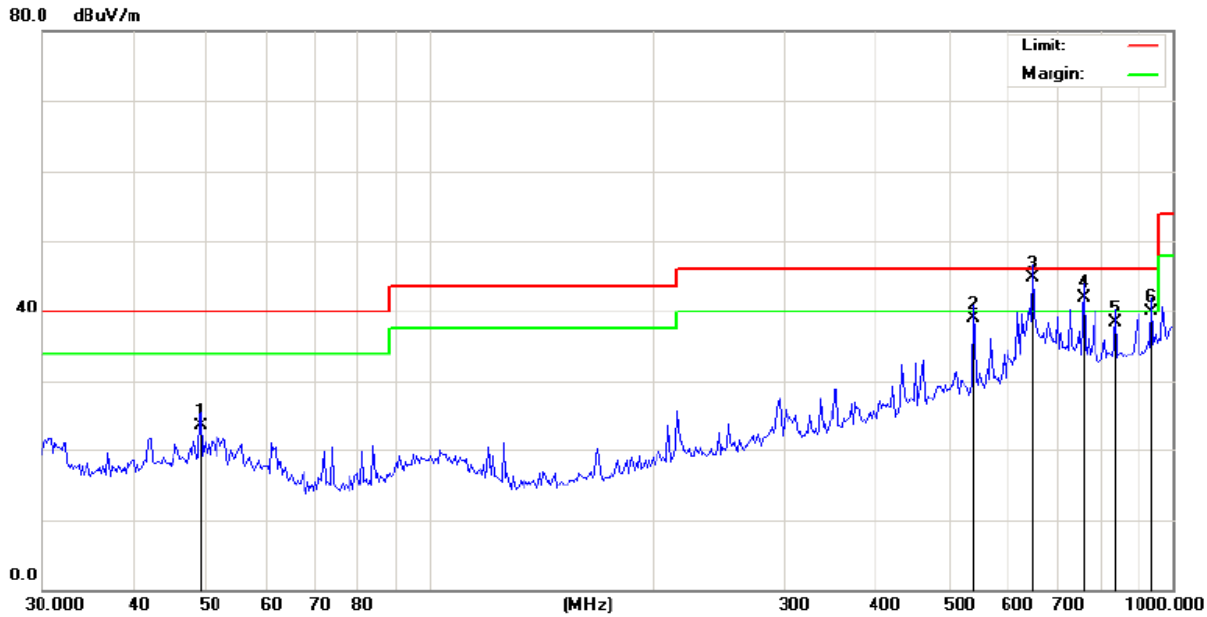
Horizontal:



Site			Polarization:	*Horizontal*	Temperature:	25
Limit: FCC Part 15B Class B RE_3 m			Power:		Humidity:	54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		541.9813	36.56	-2.54	34.02	46.00	-11.98	QP		0	
2		648.7550	36.46	-0.92	35.54	46.00	-10.46	QP		0	
3		759.3026	36.04	0.92	36.96	46.00	-9.04	QP		0	
4		840.1254	35.81	1.94	37.75	46.00	-8.25	QP		0	
5	*	940.0574	36.59	4.03	40.62	46.00	-5.38	QP		0	
6		972.2935	35.61	5.12	40.73	54.00	-13.27	QP		0	

Vertical:



Site	Polarization: ***Vertical***	Temperature:	25
Limit: FCC Part 15B Class B RE_3 m	Power:	Humidity:	54 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		49.1910	35.65	-12.08	23.57	40.00	-16.43	QP		0	
2		541.9813	41.40	-2.54	38.86	46.00	-7.14	QP		0	
3	*	648.7550	45.65	-0.92	44.73	46.00	-1.27	QP		0	
4	!	759.3026	41.00	0.92	41.92	46.00	-4.08	QP		0	
5		840.1254	36.36	1.94	38.30	46.00	-7.70	QP		0	
6		940.0574	35.94	4.03	39.97	46.00	-6.03	QP		0	

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 (Highest channel and 802.11b) 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 (dBμV)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dBμV/m)	AV limit (dBμV/m)
2310	H	45.48	-4.20	41.28	74.00	54.00
2377.38	H	47.65	-4.10	43.55	74.00	54.00
2390	H	52.57	-3.94	48.63	74.00	54.00
2310	V	43.61	-4.20	39.41	74.00	54.00
2377.38	V	53.73	-4.10	49.63	74.00	54.00
2390	V	55.14	-3.94	51.2	74.00	54.00

Modulation Type: 802.11b

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	42.84	-3.60	39.24	74.00	54.00
2487.09	H	47.26	-3.50	43.76	74.00	54.00
2500	H	44.4	-3.34	41.06	74.00	54.00
2483.5	V	54.24	-3.60	50.64	74.00	54.00
2487.09	V	46.86	-3.50	43.36	74.00	54.00
2500	V	42.14	-3.34	38.8	74.00	54.00

Modulation Type: 802.11g

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	45.36	-4.20	41.16	74.00	54.00
2388.96	H	47.72	-4.10	43.62	74.00	54.00
2390	H	52.69	-3.94	48.75	74.00	54.00
2310	V	43.69	-4.20	39.49	74.00	54.00
2388.96	V	53.82	-4.10	49.72	74.00	54.00
2390	V	55.19	-3.94	51.25	74.00	54.00

Modulation Type: 802.11g

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	43.94	-3.60	40.34	74.00	54.00
2487.59	H	47.33	-3.50	43.83	74.00	54.00
2500	H	44.52	-3.34	41.18	74.00	54.00
2483. 5	V	54.24	-3.60	50.64	74.00	54.00
2487.59	V	46.93	-3.50	43.43	74.00	54.00
2500	V	42.28	-3.34	38.94	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	45.01	-4.20	40.81	74.00	54.00
2388.01	H	48.02	-4.10	43.92	74.00	54.00
2390	H	52.72	-3.94	48.78	74.00	54.00
2310	V	43.88	-4.20	39.68	74.00	54.00
2388.01	V	53.43	-4.10	49.33	74.00	54.00
2390	V	55.62	-3.94	51.68	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	45.04	-4.20	40.84	74.00	54.00
2392.55	H	47.91	-4.10	43.81	74.00	54.00
2500	H	52.83	-3.94	48.89	74.00	54.00
2483. 5	V	43.76	-4.20	39.56	74.00	54.00
2392.55	V	53.46	-4.10	49.36	74.00	54.00
2500	V	55.52	-3.94	51.58	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 (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	50.29	---	0.75	51.04	---	74	54	-2.96
7236	H	41.67	---	9.87	51.54	---	74	54	-2.46
---	H	---	---	---	---	---	---	---	---
4824	V	49.63	---	0.75	50.38	---	74	54	-3.62
7236	V	41.93	---	9.87	51.8	---	74	54	-2.20
---	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	49.24	---	0.97	50.21	---	74	54	-3.79
7311	H	41.33	---	9.83	51.16	---	74	54	-2.84
---	H								
4874	V	48.97	---	0.97	49.94	---	74	54	-4.06
7311	V	41.33	---	9.83	51.16	---	74	54	-2.84
---	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	49.39	---	1.18	50.57	---	74	54	-3.43
7386	H	40.17	---	10.07	50.24	---	74	54	-3.76
---	H								
4924	V	49.87	---	1.18	51.05	---	74	54	-2.95
7386	V	41.25	---	10.07	51.32	---	74	54	-2.68
---	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 (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	49.85	---	0.75	50.6	---	74	54	-3.4
7236	H	41.81	---	9.87	51.68	---	74	54	-2.32
---	H	---	---	---	---	---	---	---	---
4824	V	49.51	---	0.75	50.26	---	74	54	-3.74
7236	V	41.45	---	9.87	51.32	---	74	54	-2.68
---	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	48.97	---	0.97	49.94	---	74	54	-4.06
7311	H	41.69	---	9.83	51.52	---	74	54	-2.48
---	H								
4874	V	49.13	---	0.97	50.1	---	74	54	-3.9
7311	V	41.64	---	9.83	51.47	---	74	54	-2.53
---	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	49.22	---	1.18	50.4	---	74	54	-3.6
7386	H	40.52	---	10.07	50.59	---	74	54	-3.41
---	H								
4924	V	49.64	---	1.18	50.82	---	74	54	-3.18
7386	V	41.78	---	10.07	51.85	---	74	54	-2.15
---	V	---	---	---	---	---	---	---	---

Note:

3. *Emission Level=Peak Reading + Correction Factor; Correction Factor= Antenna Factor + Cable loss – Pre-amplifier*
4. *Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)*
5. *The emission levels of other frequencies are very lower than the limit and not show in test report.*
6. *Measurements were conducted from 1 GHz to the 10th harmonic of highest fundamental frequency. The highest test frequency is 25GHz.*
7. *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 (dBμV)	AV reading (dBuV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	49.77	---	0.75	50.52	---	74	54	-3.48
7236	H	41.64	---	9.87	51.51	---	74	54	-2.49
---	H	---	---	---	---	---	---	---	---
4824	V	49.39	---	0.75	50.14	---	74	54	-3.86
7236	V	41.41	---	9.87	51.28	---	74	54	-2.72
---	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	48.62	---	0.97	49.59	---	74	54	-4.41
7311	H	41.41	---	9.83	51.24	---	74	54	-2.76
---	H								
4874	V	49.16	---	0.97	50.13	---	74	54	-3.87
7311	V	41.79	---	9.83	51.62	---	74	54	-2.38
---	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	48.89	---	1.18	50.07	---	74	54	-3.93
7386	H	40.83	---	10.07	50.9	---	74	54	-3.1
---	H								
4924	V	49.38	---	1.18	50.56	---	74	54	-3.44
7386	V	41.51	---	10.07	51.58	---	74	54	-2.42
---	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.*

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

Appendix A: Test Result of Conducted Test

Conducted Average Output Power

Result Table

Mode	Channel	Meas.Level [dBm]	Av.Power [dBm]	Verdict
11B	LCH	14.43	14.43	PASS
11B	MCH	11.9	11.9	PASS
11B	HCH	13.33	13.33	PASS
11G	LCH	11.52	11.52	PASS
11G	MCH	9.25	9.25	PASS
11G	HCH	10.46	10.46	PASS
11N20SISO	LCH	11.5	11.5	PASS
11N20SISO	MCH	9.27	9.27	PASS
11N20SISO	HCH	10.41	10.41	PASS

Test Graph

Graphs			
11B/LCH			
11B/MCH			

11B/HCH			
11G/LCH			
11G/MCH			

11G/HCH			
11N20SISO/LCH			
11N20SISO/MCH			

11N20SISO/HCH			

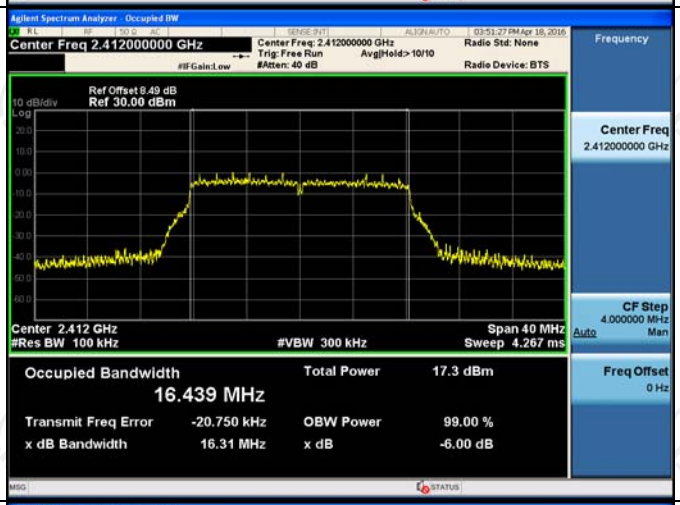
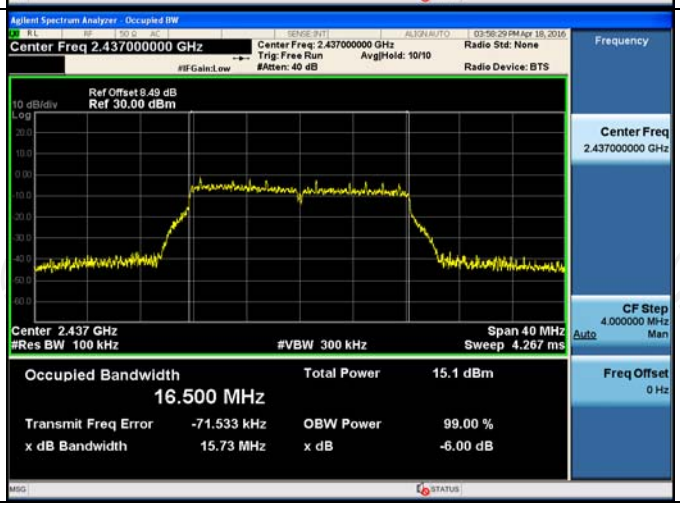
6dB Occupied Bandwidth

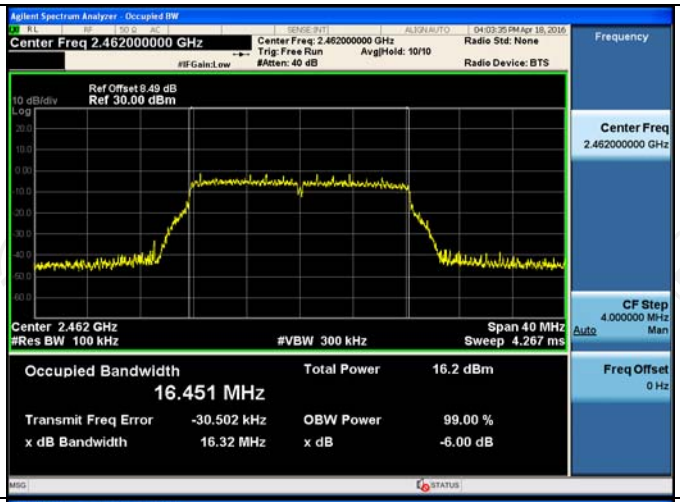
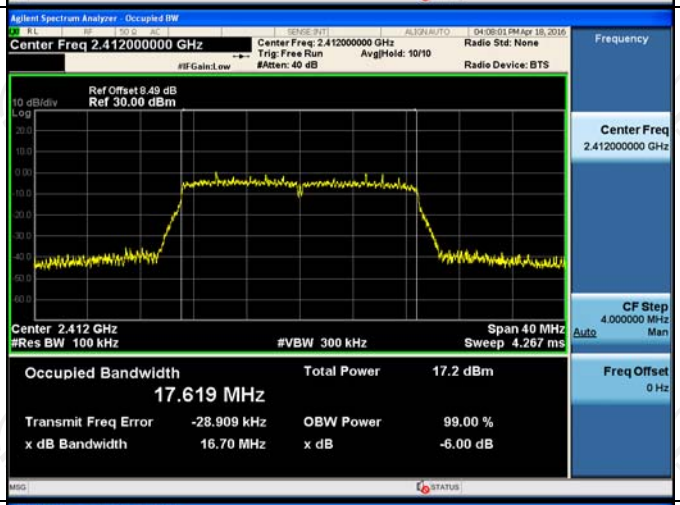
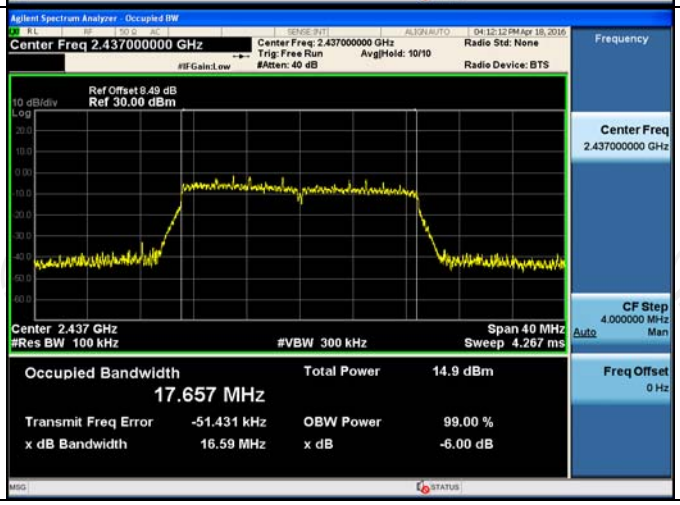
Result Table

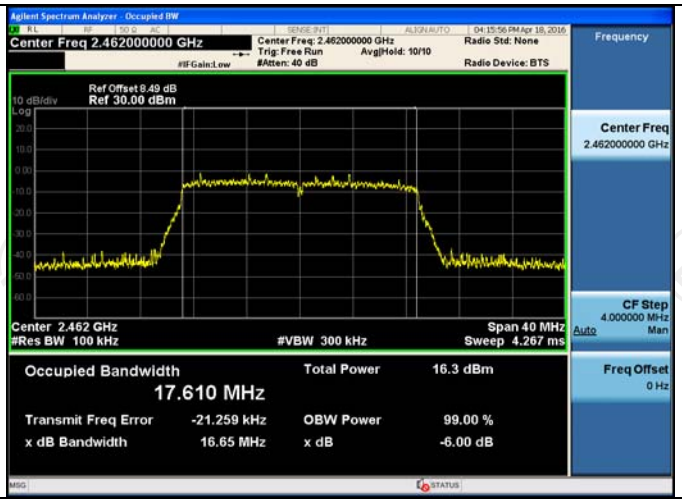
Mode	Channel	6dB Bandwidth [MHz]	99% OBW [MHz]	Verdict
11B	LCH	12.04	13.866	PASS
11B	MCH	12.53	14.011	PASS
11B	HCH	12.07	13.859	PASS
11G	LCH	16.31	16.439	PASS
11G	MCH	15.73	16.500	PASS
11G	HCH	16.32	16.451	PASS
11N20SISO	LCH	16.70	17.619	PASS
11N20SISO	MCH	16.59	17.657	PASS
11N20SISO	HCH	16.65	17.610	PASS

Test Graph

Graphs			
11B/LCH			
11B/MCH			

11B/HCH			
11G/LCH			
11G/MCH			

11G/HCH			
11N20SISO/LCH			
11N20SISO/MCH			

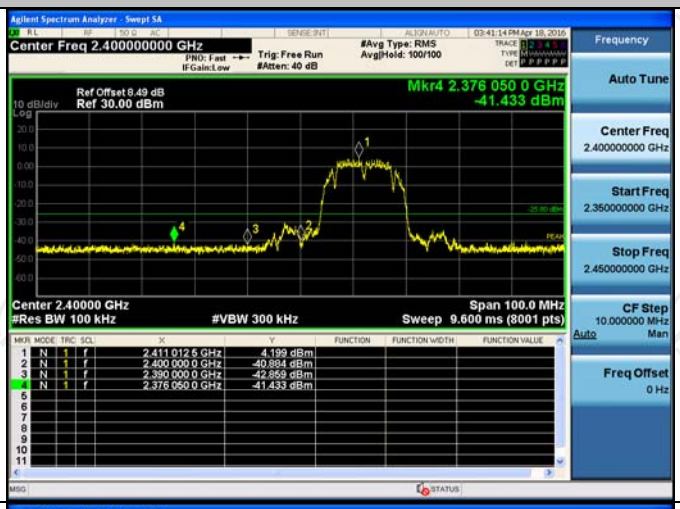
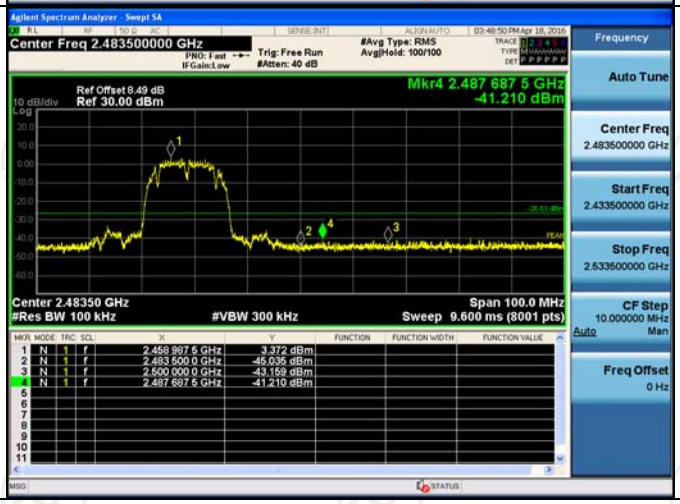
11N20SISO/HCH			

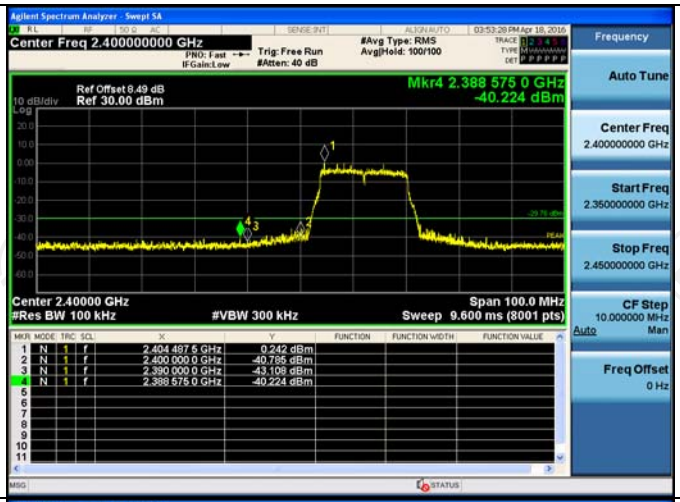
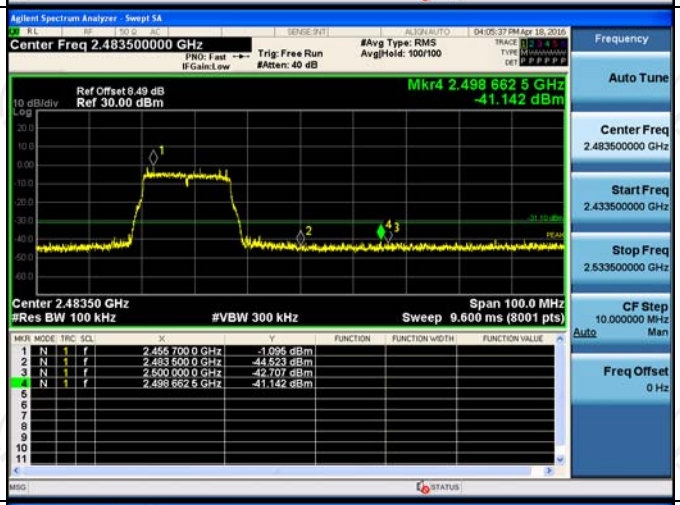
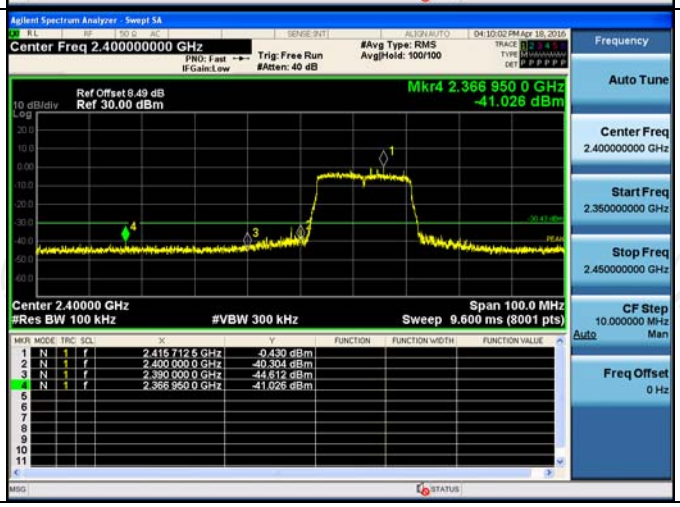
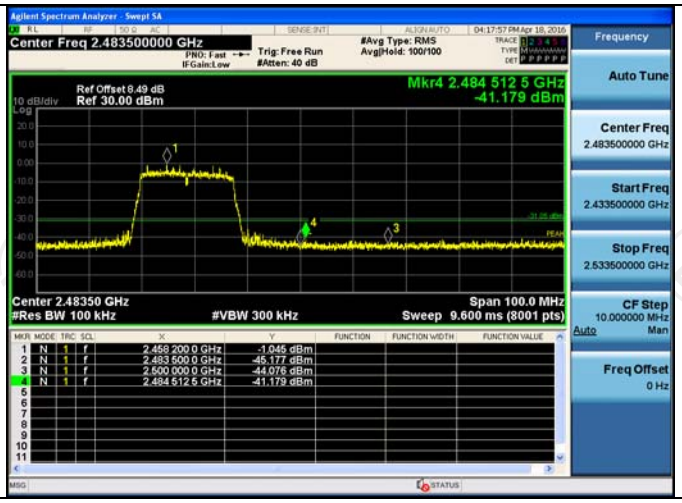
Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	4.199	-41.433	-25.8	PASS
11B	HCH	3.372	-41.210	-26.63	PASS
11G	LCH	0.242	-40.224	-29.76	PASS
11G	HCH	-1.095	-41.142	-31.1	PASS
11N20SISO	LCH	-0.430	-41.026	-30.43	PASS
11N20SISO	HCH	-1.045	-41.179	-31.05	PASS

Test Graph

Graphs			
11B/LCH			
11B/HCH			

11G/LCH			
11G/HCH			
11N20SISO/LCH			

11N20SISO/HCH