TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2AG87RM-2450-2H

Product: Smart Radio

Model No.: RM-2450-2H

Additional Model No.: RO-2450-2H

Trade Mark: N/A

Report No.: TCT190222E014

Issued Date: Mar. 21, 2019

Issued for:

Doodle Labs (SG) Pte Ltd

150 Kampong Ampat, KA Center, Suite 05-03, Singapore, 368324 Singapore

Issued By:

Shenzhen Tongce Testing Lab.

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1. Test Certification

Product:	Smart Radio
Model No.:	RM-2450-2H
Additional Model No.:	RO-2450-2H
Trade Mark:	**N/A**
Applicant:	Doodle Labs (SG) Pte Ltd
Address:	150 Kampong Ampat, KA Center, Suite 05-03, Singapore, 368324 Singapore
Manufacturer:	Doodle Labs (SG) Pte Ltd
Address:	150 Kampong Ampat, KA Center, Suite 05-03, Singapore, 368324 Singapore
Date of Test:	Feb. 25, 2019 – Mar. 20, 2019
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r01 KDB 662911 D01 Multiple Transmitter Output v02r01

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:	***Rleo***	***Date:***	***Mar. 20, 2019***
Reviewed By:	***Beryl Zhao***	***Date:***	***Mar. 21, 2019***
Approved By:	***Tomsin***	***Date:***	***Mar. 21, 2019***

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2. Test Result Summary

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

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.

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3. EUT Description

Product:	Smart Radio
Model No.:	RM-2450-2H
Additional Model No.:	RO-2450-2H
Trade Mark:	**N/A**
Hardware Version:	2
Software Version:	V1.0
Operation Frequency:	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20)) 2422MHz~2452MHz (802.11n(HT40))
Channel Separation:	5MHz
Number of Channel:	11 for 802.11b/802.11g/802.11n(HT20) 7 for 802.11n(HT40)
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 150Mbps
Antenna Type:	External Antenna
Antenna Gain:	2dBi
Power Supply:	DC 5V
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

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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		

Operation Frequency each of channel For 802.11n (HT40)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
--	--	4	2427MHz	7	2442MHz	--	--
--	--	5	2432MHz	8	2447MHz	--	--
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

802.11n (HT40)

Channel	Frequency
The lowest channel	2422MHz
The middle channel	2437MHz
The Highest channel	2452MHz

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4. General 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 below 1GHz, 1.5m above 1GHz) 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.	

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
802.11n(H40)	13.5Mbps
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), 13.5Mbps for 802.11(H40). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.
3. The EUT has two antennas, 802.11b/802.11g is SISO and transimitte signal from

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two antenna is completely uncorrelated; 802.11n(H20)/802.11n(H40) is MIMO, transimitte signal from two antenna is correlated.

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.: 645098

  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

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

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%

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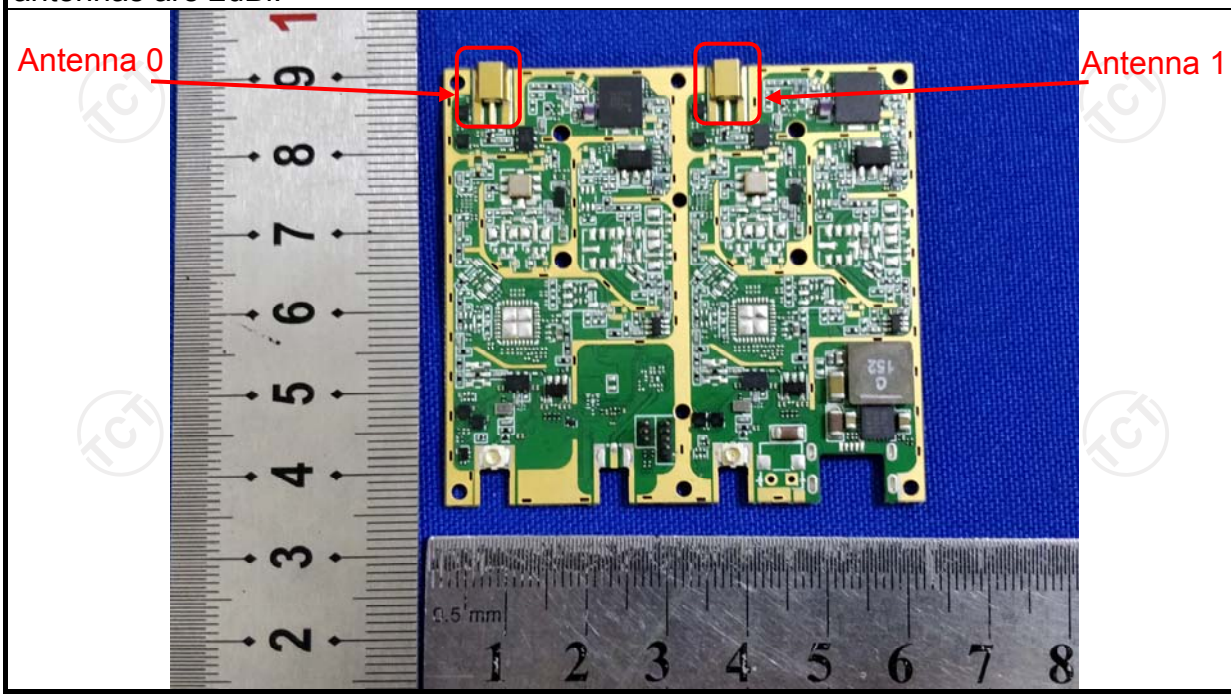
6. Test Results and Measurement Data

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.	
E.U.T Antenna:	
The WIFI antennas are external antennas, and the best case gains of the both antennas are 2dBi.	



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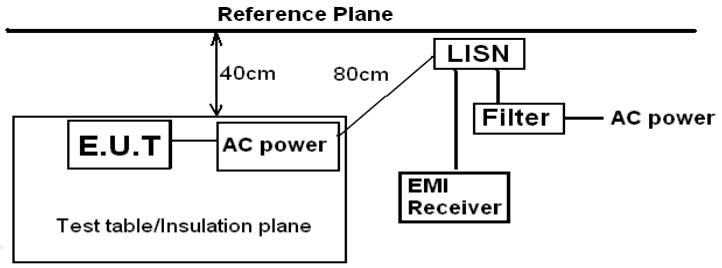
6.2. Conducted Emission

6.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<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>
</table>
</td></tr>
<tr><td>Test Setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Mode:</td><td>transmitting with modulation</td></tr>
<tr><td>Test Procedure:</td><td>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.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

6.2.2. Test Instruments

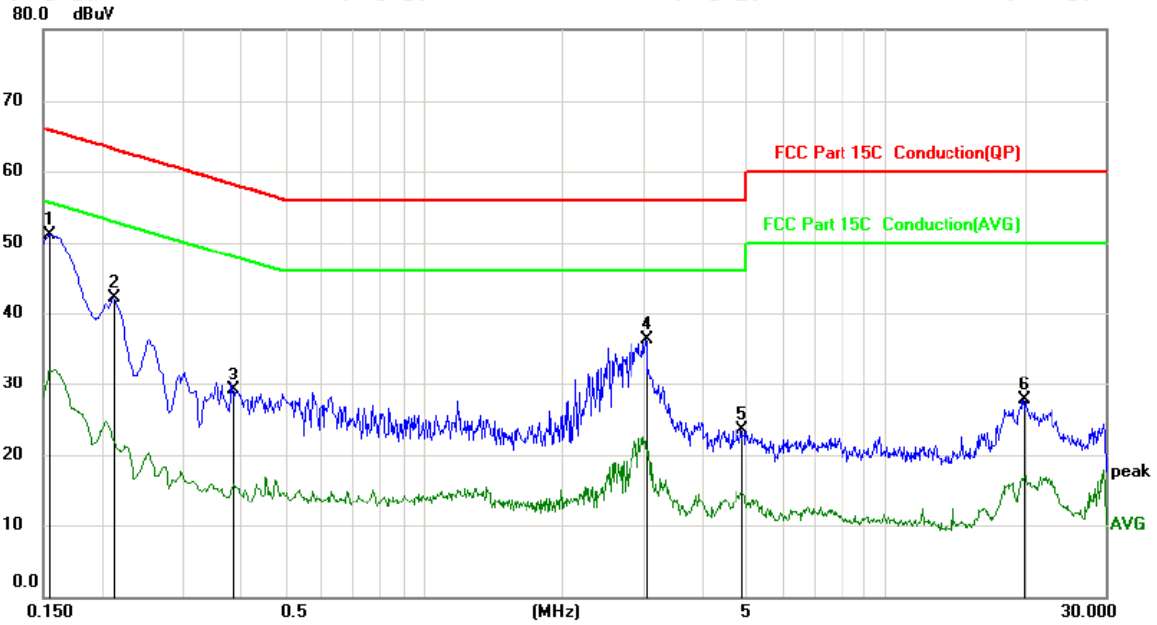
Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	R&S	ESPI	101402	Jul. 17, 2019
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 20, 2019
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 16, 2019
EMI Test Software	Shurple Technology	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	Phase:	*L1*	Temperature: 25
Limit: FCC Part 15C Conduction(QP)	Power:	AC 120V/60Hz	Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1545	41.00	10.12	51.12	65.75	-14.63	peak	
2		0.2130	32.07	10.13	42.20	63.09	-20.89	peak	
3		0.3852	18.95	10.13	29.08	58.17	-29.09	peak	
4		3.0390	26.24	10.13	36.37	56.00	-19.63	peak	
5		4.8885	13.28	10.13	23.41	56.00	-32.59	peak	
6		19.9140	17.49	10.20	27.69	60.00	-32.31	peak	

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)

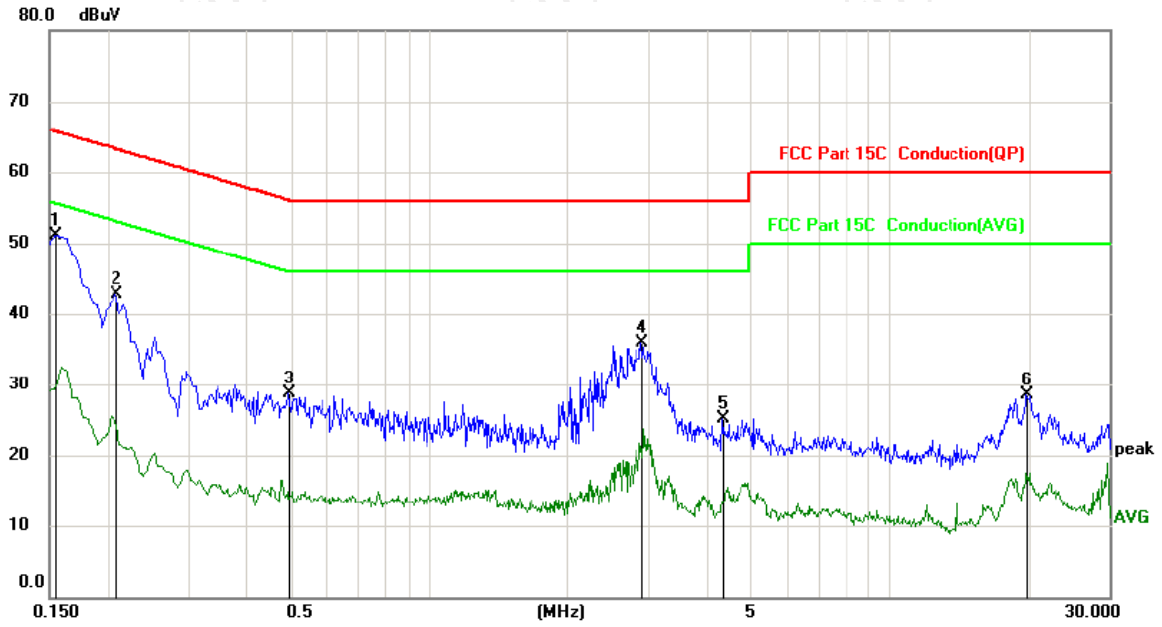
Q.P. =Quasi-Peak

AVG =average

**Any value more than 10dB below limit have not been specifically reported.*

** 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	Phase:	*N*	Temperature: 25
Limit: FCC Part 15C Conduction(QP)	Power:	AC 120V/60Hz	Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1545	41.04	10.12	51.16	65.75	-14.59	peak	
2		0.2085	32.59	10.13	42.72	63.26	-20.54	peak	
3		0.4965	18.65	10.13	28.78	56.06	-27.28	peak	
4		2.8995	25.77	10.12	35.89	56.00	-20.11	peak	
5		4.3170	15.01	10.13	25.14	56.00	-30.86	peak	
6		19.8285	18.26	10.20	28.46	60.00	-31.54	peak	

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
**Any value more than 10dB below limit have not been specifically reported.*
** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

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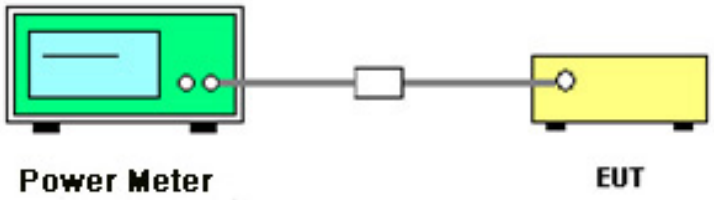
6.3. Maximum Conducted (Peak) Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB558074, KDB662911
Limit:	30dBm
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows the Measurement Procedure of FCC KDB No. 558074 D01 15.247 Meas Guidance v05r01. 2. The RF output of EUT was connected to the Power Meter 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. Read the value and record the results in the test report.
Test Result:	PASS

6.3.2. Test Instruments

Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anristsu	ML2495A	1005002	Sep. 20, 2019
Pulse Power Senor	Anristsu	MA2411B	0917070	Sep. 20, 2019
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 20, 2019
Antenna Connector	TCT	RFC-01	N/A	Sep. 20, 2019

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

6.3.3. Test Data

Configuration IEEE 802.11b/ Antenna 0+Antenna 1				
Test channel	Maximum Conducted (Peak) Output Power (dBm)		Limit (dBm)	Result
	Antenna 0	Antenna 1		
Lowest	29.18	29.29	30	PASS
Middle	29.79	29.37	30	PASS
Highest	29.07	28.73	30	PASS

Configuration IEEE 802.11g/ Antenna 0+Antenna 1				
Test channel	Maximum Conducted (Peak) Output Power (dBm)		Limit (dBm)	Result
	Antenna 0	Antenna 1		
Lowest	29.54	28.55	30	PASS
Middle	29.15	28.92	30	PASS
Highest	29.05	28.83	30	PASS

Configuration IEEE 802.11n(H20)/ Antenna 0+Antenna 1					
Test channel	Maximum Conducted (Peak) Output Power (dBm)			Limit (dBm)	Result
	Antenna 0	Antenna 1	Total		
Lowest	25.99	26.69	29.36	30	PASS
Middle	26.52	26.58	29.56	30	PASS
Highest	26.74	26.54	29.65	30	PASS

Configuration IEEE 802.11n(H40)/ Antenna 0+Antenna 1					
Test channel	Maximum Conducted (Peak) Output Power (dBm)			Limit (dBm)	Result
	Antenna 0	Antenna 1	Total		
Lowest	27.10	26.50	29.82	30	PASS
Middle	26.70	26.58	29.65	30	PASS
Highest	26.46	26.55	29.52	30	PASS

***Note*:**

G_{ANT} = 2dBi, Array Gain= 10log(N_{ANT}/NSS)= 3.01dBi

Directional Gain=G_{ANT} + Array Gain= 5.01dBi < 6dBi, So limit=30dBm

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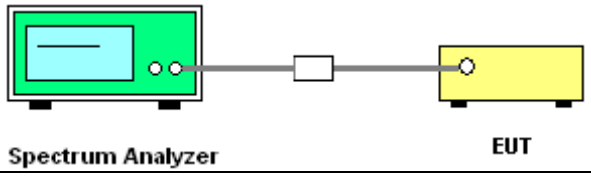
6.4. Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB558074
Limit:	>500kHz
Test Setup:	
Test Mode:	Transmitting mode with modulation
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r01. 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

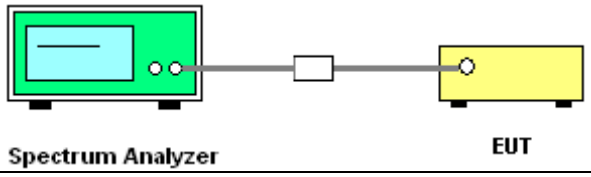
6.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 20, 2019
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 20, 2019
Antenna Connector	TCT	RFC-01	N/A	Sep. 20, 2019

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

6.5. Power Spectral Density

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB558074, KDB662911
Limit:	The peak 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 15.247 Meas Guidance v05r01. 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

6.5.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 20, 2019
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 20, 2019
Antenna Connector	TCT	RFC-01	N/A	Sep. 20, 2019

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

Test data

Configuration IEEE 802.11b/ Antenna 0, Antenna 1				
Test channel	AVG Power Spectral Density (dBm/3kHz)		Limit (dBm/3kHz)	Result
	Antenna 0	Antenna 1		
Lowest	-0.81	-1.46	8	PASS
Middle	-0.85	-0.62	8	PASS
Highest	-1.50	-1.85	8	PASS

Configuration IEEE 802.11g/ Antenna 0, Antenna 1				
Test channel	AVG Power Spectral Density (dBm/3kHz)		Limit (dBm/3kHz)	Result
	Antenna 0	Antenna 1		
Lowest	-3.08	-3.36	8	PASS
Middle	-2.47	-3.40	8	PASS
Highest	-2.43	-3.02	8	PASS

Configuration IEEE 802.11n (HT20)/ Antenna 0, Antenna 1					
Test channel	AVG Power Spectral Density (dBm/3kHz)			Limit (dBm/3kHz)	Result
	Antenna 0	Antenna 1	Total		
Lowest	-6.24	-7.09	-3.63	8	PASS
Middle	-4.41	-6.86	-2.45	8	PASS
Highest	-4.77	-5.62	-2.16	8	PASS

Configuration IEEE 802.11n (HT40)/ Antenna 0, Antenna 1					
Test channel	AVG Power Spectral Density (dBm/3kHz)			Limit (dBm/3kHz)	Result
	Antenna 0	Antenna 1	Total		
Lowest	-9.38	-9.58	-6.47	8	PASS
Middle	-9.08	-9.08	-6.07	8	PASS
Highest	-9.70	-9.08	-6.37	8	PASS

Note:

G_{ANT} = 2dBi, Array Gain= 10log(NANT/NSS)= 3.01dBi

Directional Gain=G_{ANT} + Array Gain= 5.01dBi <6dBi, So limit=8dBm/3kHz

Refer to Appendix A: Test Result of Conducted Test

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6.6. Conducted Band Edge and Spurious Emission Measurement

6.6.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	KDB558074
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 15.247 Meas Guidance v05r01. 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

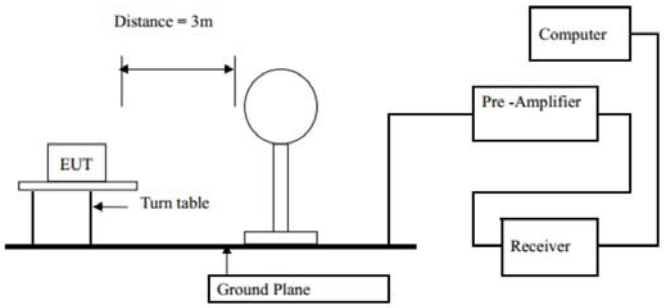
6.6.2. Test Instruments

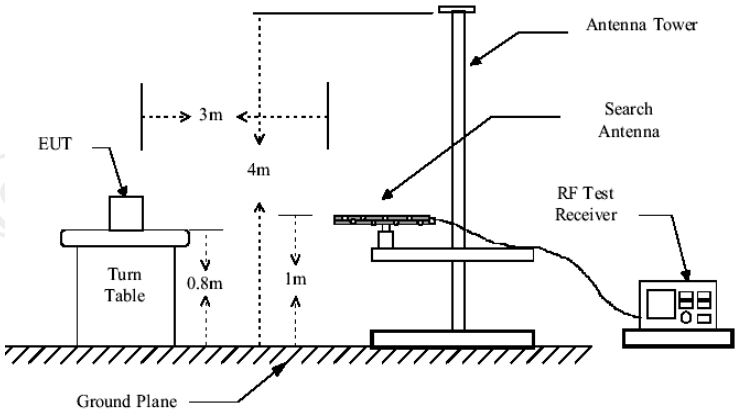
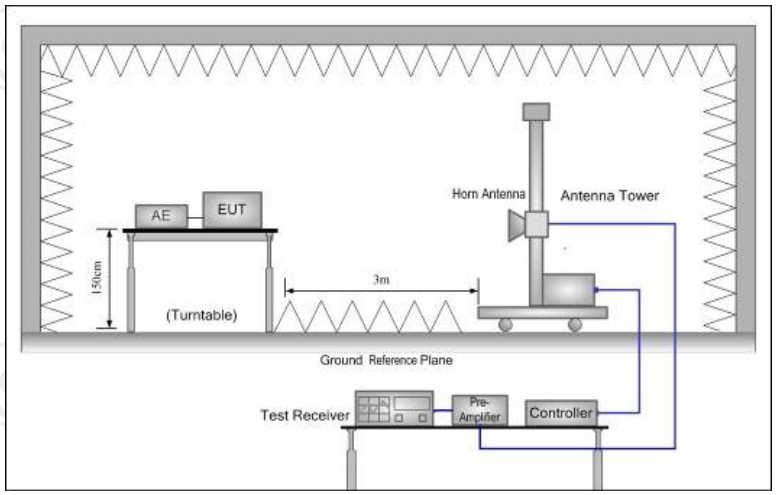
RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100619	Sep. 20, 2019
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ40	200061	Sep. 20, 2019
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 20, 2019
Antenna Connector	TCT	RFC-01	N/A	Sep. 20, 2019

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

6.7. Radiated Spurious Emission Measurement

6.7.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>300</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>30</td></tr>
<tr><td>1.705-30</td><td>30</td><td>30</td></tr>
<tr><td>30-88</td><td>100</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table>
<table>
<tr><td>Frequency</td><td>Field Strength (microvolts/meter)</td><td>Measurement Distance (meters)</td><td>Detector</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>500</td><td>3</td><td>Average</td></tr>
<tr><td>5000</td><td>3</td><td>Peak</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>For radiated emissions below 30MHz
 
</td></tr>
</table>

	30MHz to 1GHz  Above 1GHz 
Test Procedure:	1. The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r01. 2. For the radiated emission test below 1GHz: The EUT was placed on a turntable with 1.5 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

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6.7.2. Test Instruments

Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	ROHDE&SCHWARZ	ESIB7	100197	Jul. 17, 2019
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ40	200061	Sep. 20, 2019
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 16, 2019
Pre-amplifier	HP	8447D	2727A05017	Sep. 16, 2019
Loop antenna	ZHINAN	ZN30900A	12024	Oct. 20, 2019
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 02, 2019
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Oct. 20, 2019
Antenna Mast	Keleto	RE-AM	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 16, 2019
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 16, 2019
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 16, 2019
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 16, 2019
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

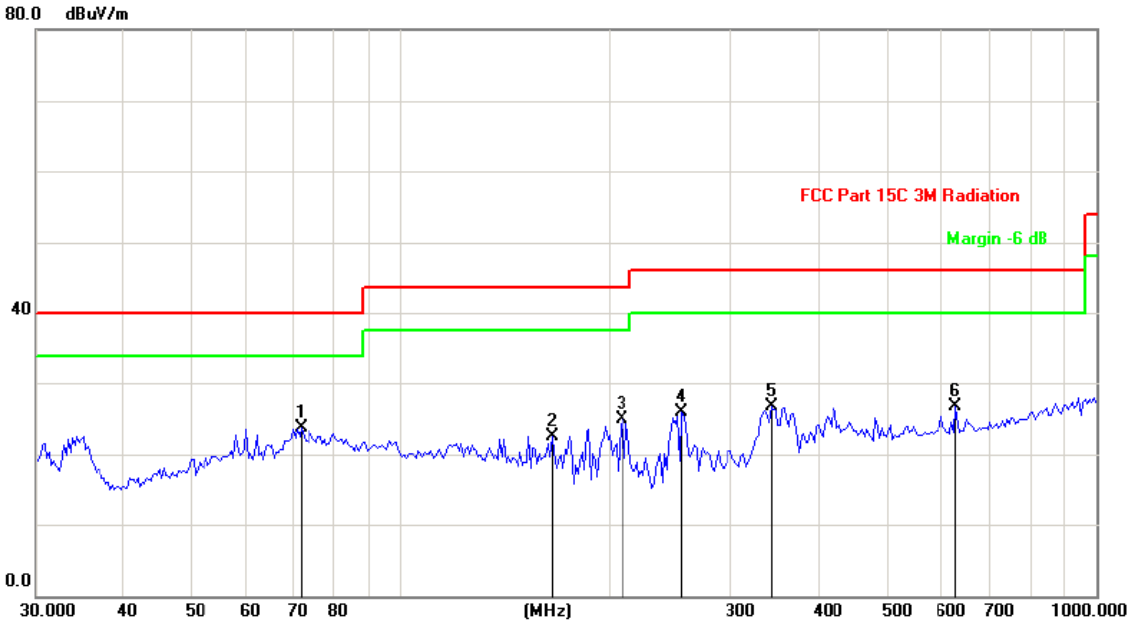
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

Test Data

Please refer to following diagram for individual

Below 1GHz

Horizontal:



Site

Limit: FCC Part 15C 3M Radiation

Polarization: *Horizontal*

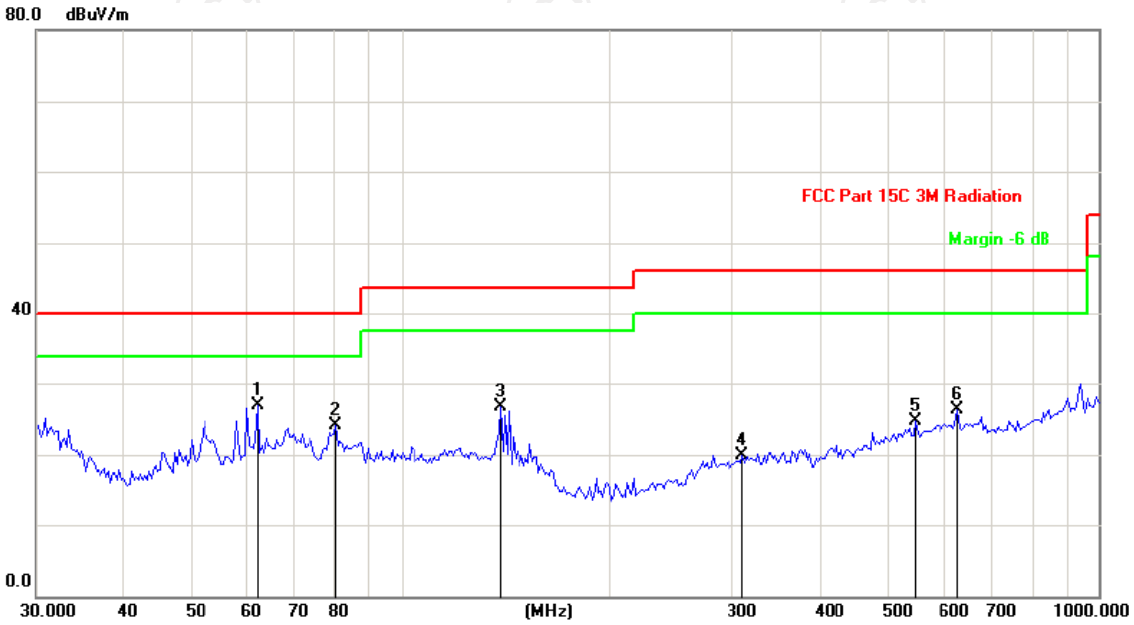
Power: AC 120V/60Hz

Temperature: 25

Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	*	72.2111	39.58	-15.87	23.71	40.00	-16.29	peak			
2		165.4714	38.11	-15.56	22.55	43.50	-20.95	peak			
3		208.6579	38.62	-13.76	24.86	43.50	-18.64	peak			
4		254.0312	38.34	-12.43	25.91	46.00	-20.09	peak			
5		341.2441	36.64	-9.90	26.74	46.00	-19.26	peak			
6		628.8935	32.43	-5.67	26.76	46.00	-19.24	peak			

Vertical:



Site

Limit: FCC Part 15C 3M Radiation

Polarization: *Vertical*

Power: AC 120V/60Hz

Temperature: 25

Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector	cm	degree	Comment
1	*	62.3038	40.01	-13.13	26.88	40.00	-13.12	peak			
2		80.8041	40.39	-16.20	24.19	40.00	-15.81	peak			
3		138.8120	42.75	-16.01	26.74	43.50	-16.76	peak			
4		309.2710	30.59	-10.70	19.89	46.00	-26.11	peak			
5		546.4366	31.82	-7.03	24.79	46.00	-21.21	peak			
6		628.8935	31.91	-5.67	26.24	46.00	-19.76	peak			

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), 802.11n(HT40)), and the worst case Mode (Middle channel and 802.11b)

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	45.74	-4.20	41.54	74.00	54.00
2377.38	H	54.31	-4.10	50.21	74.00	54.00
2390	H	53.93	-3.94	49.99	74.00	54.00
2310	V	48.15	-4.20	43.95	74.00	54.00
2377.38	V	54.47	-4.10	50.37	74.00	54.00
2390	V	55.82	-3.94	51.88	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	52.26	-3.60	48.66	74.00	54.00
2487.09	H	51.09	-3.50	47.59	74.00	54.00
2500	H	47.68	-3.34	44.34	74.00	54.00
2483.5	V	53.27	-3.60	49.67	74.00	54.00
2487.09	V	50.51	-3.50	47.01	74.00	54.00
2500	V	48.68	-3.34	45.34	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	50.43	-4.20	46.23	74.00	54.00
2388.96	H	55.17	-4.12	51.05	74.00	54.00
2390	H	52.94	-3.94	49.00	74.00	54.00
2310	V	51.08	-4.20	46.88	74.00	54.00
2388.96	V	50.71	-4.12	46.59	74.00	54.00
2390	V	49.25	-3.94	45.31	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	52.69	-3.60	49.09	74.00	54.00
2487.59	H	54.31	-3.52	50.79	74.00	54.00
2500	H	49.83	-3.34	46.49	74.00	54.00
2483. 5	V	54.08	-3.60	50.48	74.00	54.00
2487.59	V	52.26	-3.52	48.74	74.00	54.00
2500	V	50.37	-3.34	47.03	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	48.25	-4.20	44.05	74.00	54.00
2388.01	H	52.73	-4.10	48.63	74.00	54.00
2390	H	53.49	-3.94	49.55	74.00	54.00
2310	V	48.62	-4.20	44.42	74.00	54.00
2388.01	V	53.84	-4.10	49.74	74.00	54.00
2390	V	52.06	-3.94	48.12	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	53.74	-3.60	50.14	74.00	54.00
2392.55	H	53.19	-3.50	49.69	74.00	54.00
2500	H	48.37	-3.34	45.03	74.00	54.00
2483. 5	V	54.90	-3.60	51.30	74.00	54.00
2392.55	V	53.58	-3.50	50.08	74.00	54.00
2500	V	48.21	-3.34	44.87	74.00	54.00

Modulation Type: 802.11n(40MHz)

Low channel: 2422 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	49.59	-4.20	45.39	74.00	54.00
2387.85	H	54.14	-4.10	50.04	74.00	54.00
2390	H	53.76	-3.94	49.82	74.00	54.00
2310	V	51.43	-4.20	47.23	74.00	54.00
2389.98	V	53.27	-4.10	49.17	74.00	54.00
2390	V	54.05	-3.94	50.11	74.00	54.00

Modulation Type: 802.11n(40MHz)

High channel: 2452 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	50.28	-3.60	46.68	74.00	54.00
2493.51	H	52.75	-3.50	49.25	74.00	54.00
2500	H	51.14	-3.34	47.80	74.00	54.00
2493.51	V	52.65	-3.60	49.05	74.00	54.00
2489.36	V	54.18	-3.46	50.72	74.00	54.00
2500	V	51.27	-3.34	47.93	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	47.62	---	0.75	48.37	---	74	54	-5.63
7236	H	36.19	---	9.87	46.06	---	74	54	-7.94
---	H	---	---	---	---	---	---	---	---
4824	V	44.53	---	0.75	45.28	---	74	54	-8.72
7236	V	35.28	---	9.87	45.15	---	74	54	-8.85
---	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	46.85	---	0.97	47.82	---	74	54	-6.18
7311	H	34.01	---	9.83	43.84	---	74	54	-10.16
---	H	---	---	---	---	---	---	---	---
4874	V	48.37	---	0.97	49.34	---	74	54	-4.66
7311	V	39.94	---	9.83	49.77	---	74	54	-4.23
---	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	45.76	---	1.18	46.94	---	74	54	-7.06
7386	H	37.40	---	10.07	47.47	---	74	54	-6.53
---	H	---	---	---	---	---	---	---	---
4924	V	47.07	---	1.18	48.25	---	74	54	-5.75
7386	V	39.51	---	10.07	49.58	---	74	54	-4.42
---	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.*

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	45.08	---	0.75	45.83	---	74	54	-8.17
7236	H	34.52	---	9.87	44.39	---	74	54	-9.61
---	H	---	---	---	---	---	---	---	---
4824	V	46.73	---	0.75	47.48	---	74	54	-6.52
7236	V	35.19	---	9.87	45.06	---	74	54	-8.94
---	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	44.21	---	0.97	45.18	---	74	54	-8.82
7311	H	35.95	---	9.83	45.78	---	74	54	-8.22
---	H	---	---	---	---	---	---	---	---
4874	V	47.36	---	0.97	48.33	---	74	54	-5.67
7311	V	38.80	---	9.83	48.63	---	74	54	-5.37
---	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	43.64	---	1.18	44.82	---	74	54	-9.18
7386	H	34.47	---	10.07	44.54	---	74	54	-9.46
---	H	---	---	---	---	---	---	---	---
4924	V	42.12	---	1.18	43.30	---	74	54	-10.70
7386	V	33.59	---	10.07	43.66	---	74	54	-10.34
---	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: 802.11n (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	44.48	---	0.75	45.23	---	74	54	-8.77
7236	H	35.75	---	9.87	45.62	---	74	54	-8.38
---	H	---	---	---	---	---	---	---	---
4824	V	44.02	---	0.75	44.77	---	74	54	-9.23
7236	V	34.84	---	9.87	44.71	---	74	54	-9.29
---	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	46.63	---	0.97	47.60	---	74	54	-6.40
7311	H	35.17	---	9.83	45.00	---	74	54	-9.00
---	H	---	---	---	---	---	---	---	---
4874	V	44.35	---	0.97	45.32	---	74	54	-8.68
7311	V	34.50	---	9.83	44.33	---	74	54	-9.67
---	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	43.96	---	1.18	45.14	---	74	54	-8.86
7386	H	33.21	---	10.07	43.28	---	74	54	-10.72
---	H	---	---	---	---	---	---	---	---
4924	V	42.72	---	1.18	43.90	---	74	54	-10.10
7386	V	33.05	---	10.07	43.12	---	74	54	-10.88
---	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: 802.11n (HT40)

Low channel: 2422 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)			
4844	H	42.31	---	0.75	43.06	---	74	54	-10.94
7266	H	33.63	---	9.87	43.50	---	74	54	-10.50
---	H	---	---	---	---	---	---	---	---
4824	V	42.52	---	0.75	43.27	---	74	54	-10.73
7236	V	32.79	---	9.87	42.66	---	74	54	-11.34
---	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	43.95	---	0.97	44.92	---	74	54	-9.08
7311	H	33.18	---	9.83	43.01	---	74	54	-10.99
---	H	---	---	---	---	---	---	---	---
4874	V	42.27	---	0.97	43.24	---	74	54	-10.76
7311	V	32.80	---	9.83	42.63	---	74	54	-11.37
---	V	---	---	---	---	----	---	---	---

High channel: 2452 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)			
4904	H	43.04	---	1.18	44.22	---	74	54	-9.78
7356	H	33.46	---	10.07	43.53	---	74	54	-10.47
---	H	---	---	---	---	---	---	---	---
4904	V	42.27	---	1.18	43.45	---	74	54	-10.55
7356	V	34.62	---	10.07	44.69	---	74	54	-9.31
---	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.*

Appendix A: Test Result of Conducted Test

Antenna 0

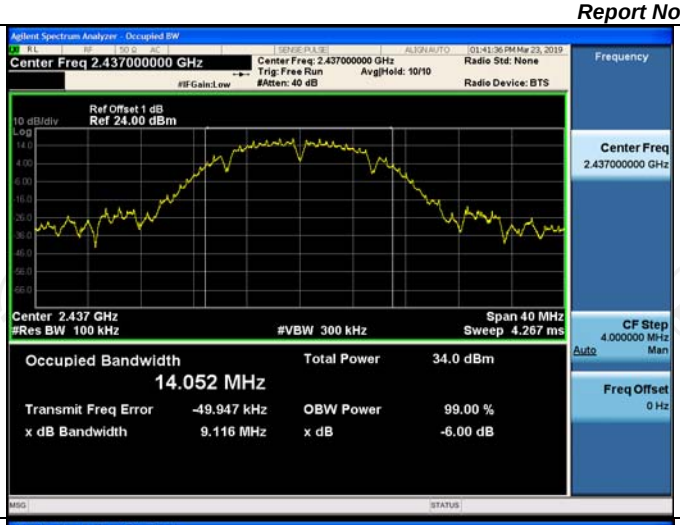
6dB Occupied Bandwidth

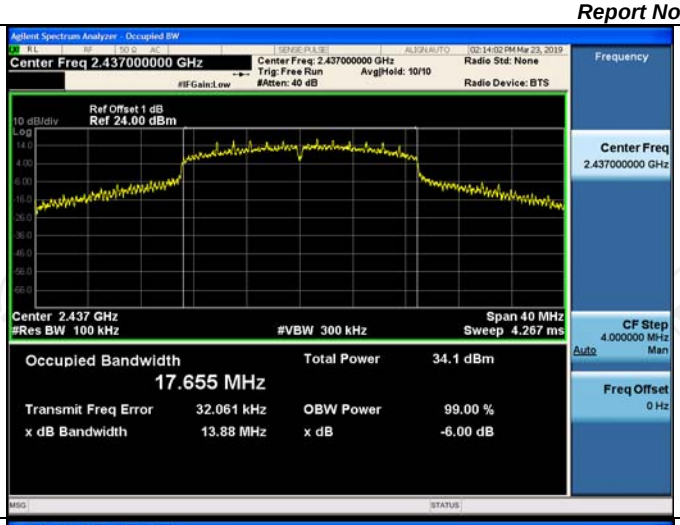
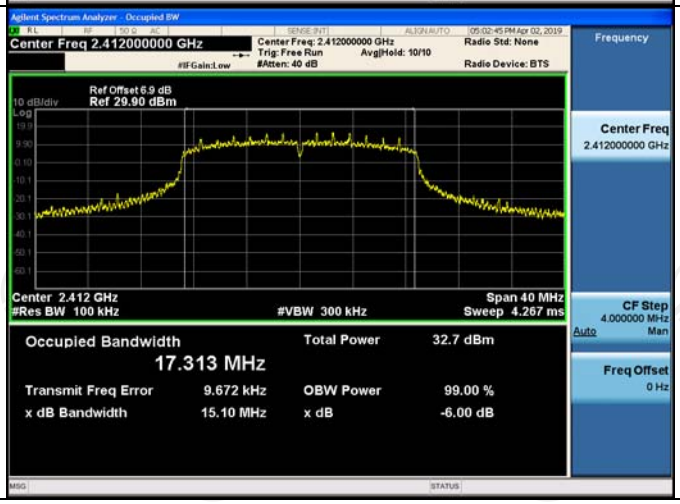
Result Table

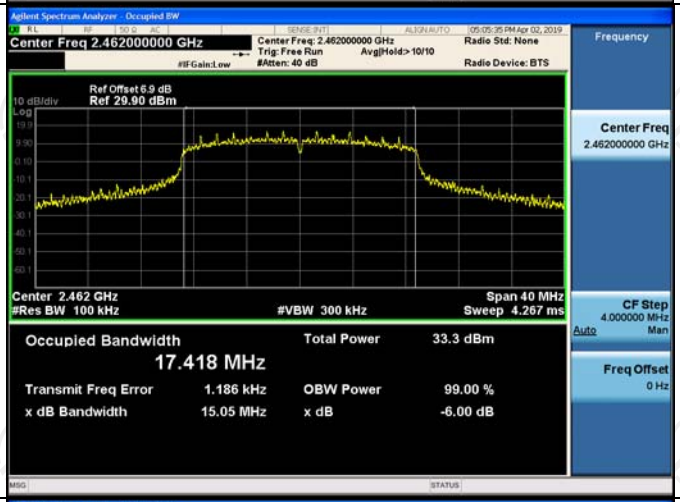
Mode	Channel	6dB Bandwidth [MHz]	99% OBW [MHz]	Verdict
11B	LCH	9.574	13.865	PASS
11B	MCH	9.116	14.052	PASS
11B	HCH	9.538	14.100	PASS
11G	LCH	14.20	17.569	PASS
11G	MCH	13.88	17.655	PASS
11G	HCH	15.08	17.699	PASS
11N20	LCH	15.10	17.313	PASS
11N20	MCH	15.04	17.353	PASS
11N20	HCH	15.05	17.418	PASS
11N40	LCH	32.49	35.909	PASS
11N40	MCH	35.03	35.749	PASS
11N40	HCH	35.05	35.686	PASS

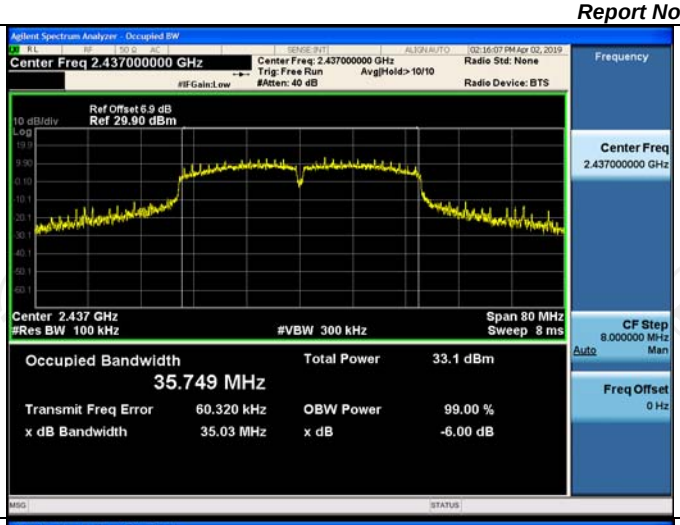
Test Graph

Graphs		
11B/LCH		

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

11G/MCH			
11G/HCH			
11N20/LCH			

11N20/MCH			
11N20/HCH			
11N40/LCH			

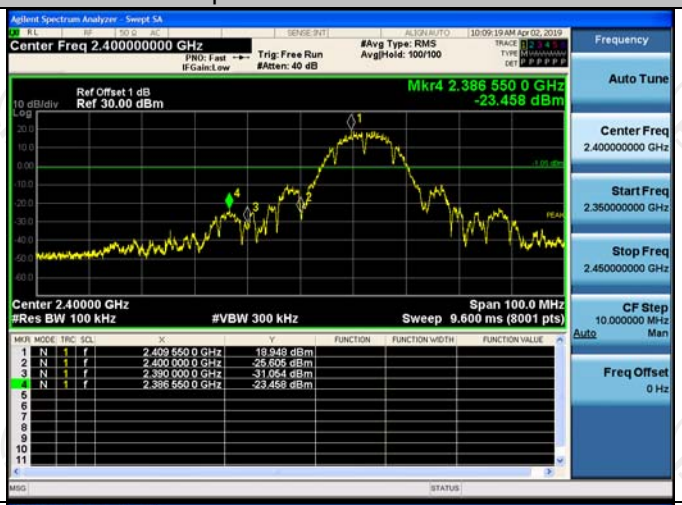
11N40/MCH			
11N40/HCH			

Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power [dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
11B	LCH	18.948	-23.458	-1.05	PASS
11B	HCH	19.607	-22.957	-0.39	PASS
11G	LCH	18.541	-16.470	-1.46	PASS
11G	HCH	19.001	-14.027	-1.00	PASS
11N20	LCH	17.416	-18.173	-2.58	PASS
11N20	HCH	18.916	-15.543	-1.08	PASS
11N40	LCH	13.775	-12.380	-6.23	PASS
11N40	HCH	13.325	-13.623	-6.68	PASS

Test Graph

Graphs			
11B/LCH			
11B/HCH			

11G/LCH			
11G/HCH			
11N20/LCH			

11N20/HCH			
11N40/LCH			
11N40/HCH			

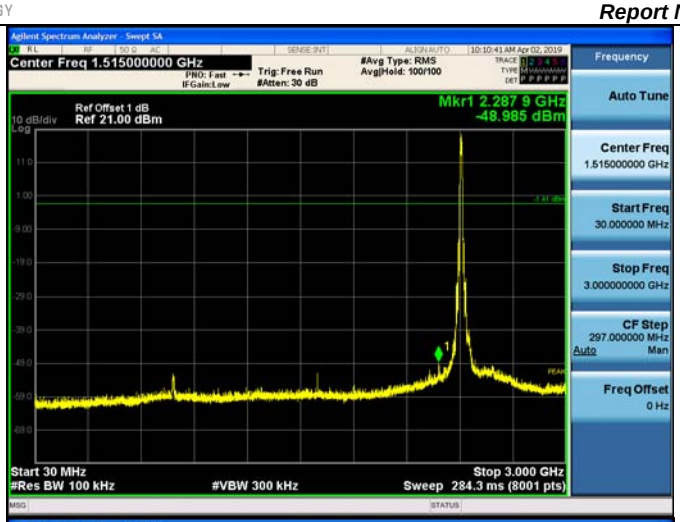
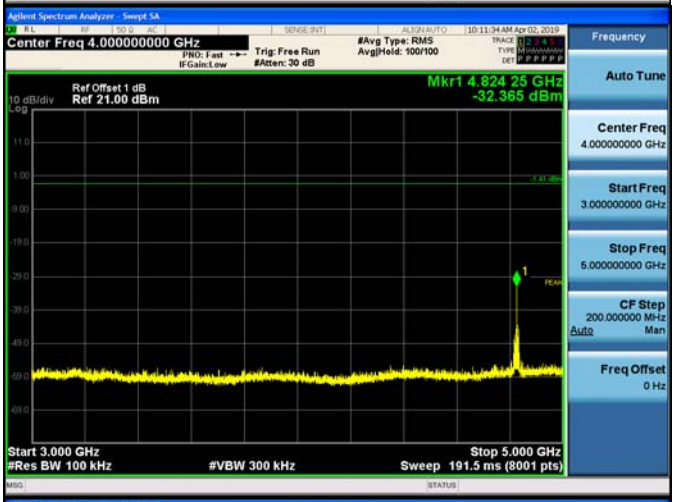
RF Conducted Spurious Emissions

Result Table

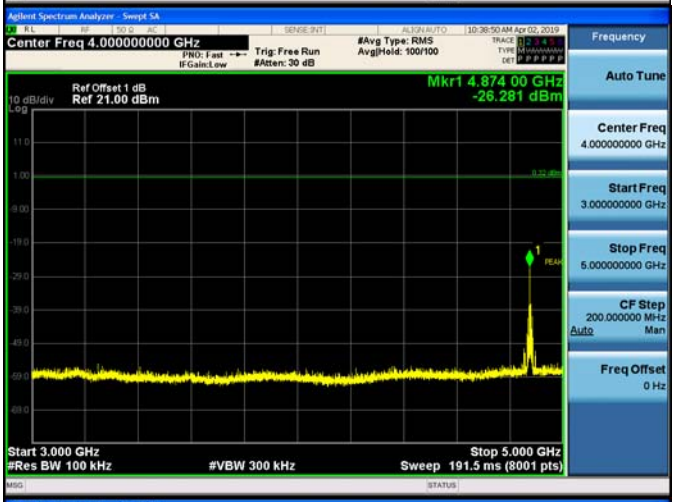
Mode	Channel	Pref [dBm]	Puw [dBm]	Verdict
11B	LCH	18.590	<Limit	PASS
11B	MCH	20.318	<Limit	PASS
11B	HCH	19.674	<Limit	PASS
11G	LCH	19.426	<Limit	PASS
11G	MCH	19.325	<Limit	PASS
11G	HCH	18.531	<Limit	PASS
11N20	LCH	18.814	<Limit	PASS
11N20	MCH	18.635	<Limit	PASS
11N20	HCH	17.995	<Limit	PASS
11N40	LCH	13.805	<Limit	PASS
11N40	MCH	12.848	<Limit	PASS
11N40	HCH	13.068	<Limit	PASS

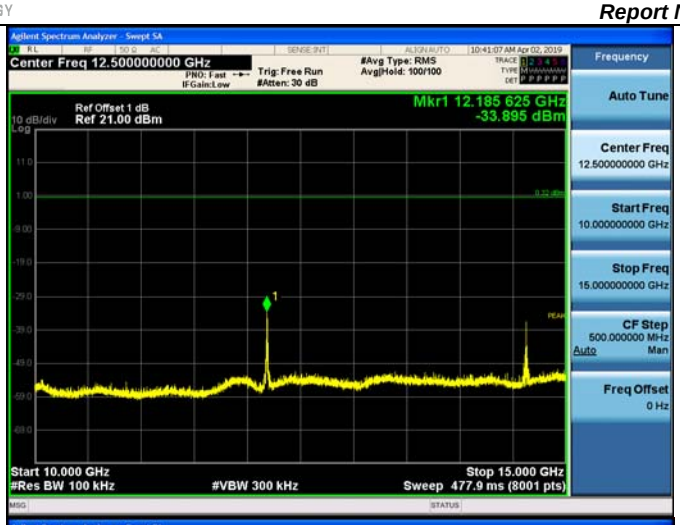
Test Graph

11B_LCH_Graphs			
Pref/11B/LCH			

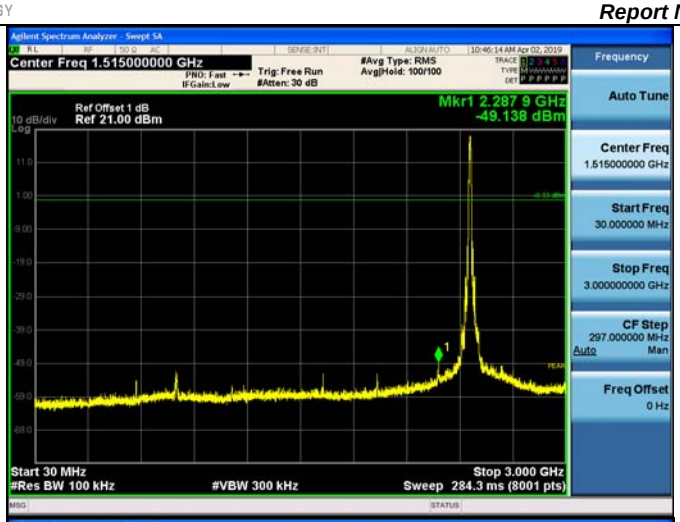
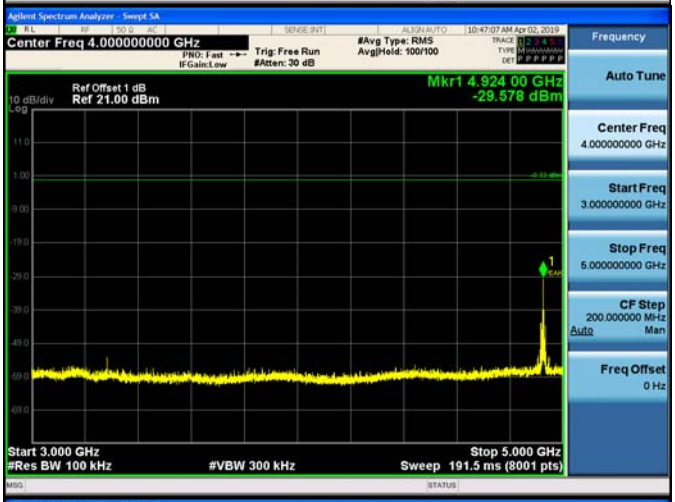
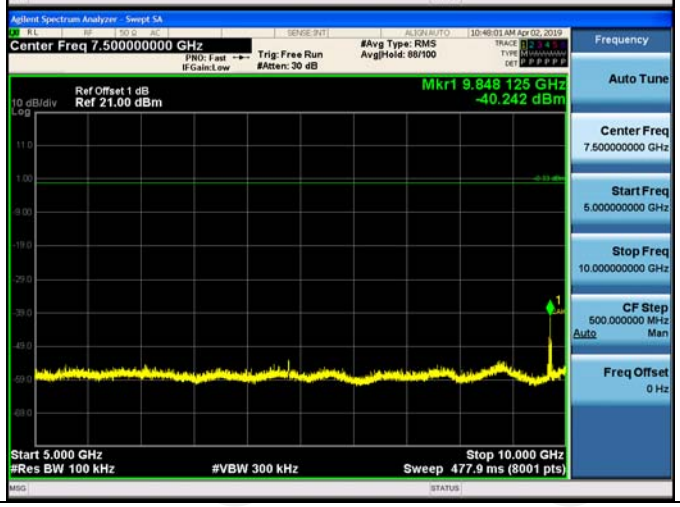
Puw/11B/LCH		  	

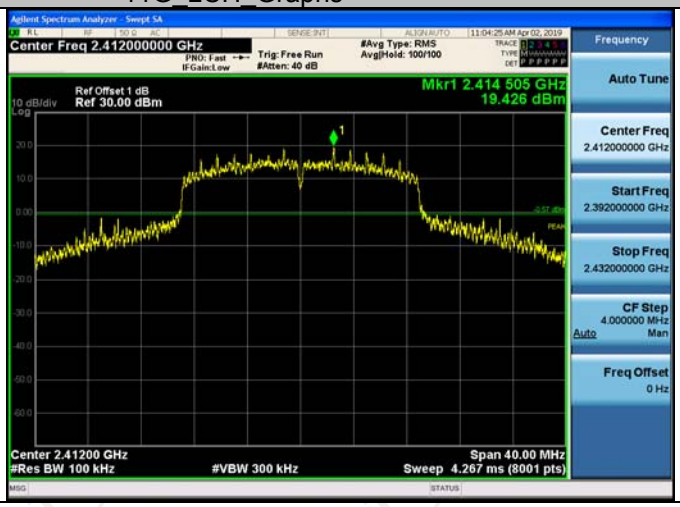
11B_MCH_Graphs	
Pref/11B/MCH	

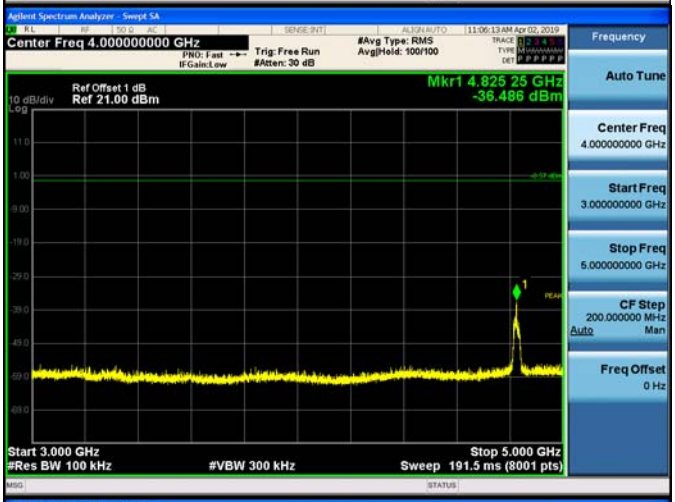
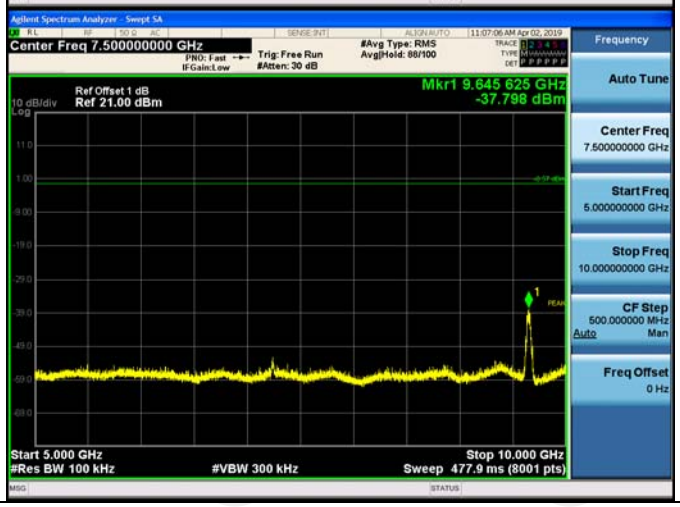
Puw/11B/MCH		  	



11B_HCH_Graphs	
Pref/11B/HCH	

Puw/11B/HCH		  	

11G_LCH_Graphs	
Pref/11G/LCH	

Puw/11G/LCH		  	

11G_MCH_Graphs		
Pref/11G/MCH