TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2AG87NM-915-2G

Product: Prism Wi-Fi® Radio Transceiver

Model No.: NM-915-2G

Additional Model: NM-915-1G, NO-915-2G, NO-915-1G, GM-915-1, GM-915-2, GO-915-2, GO-915-1

Trade Mark: N/A

Report No.: TCT180309E020

Issued Date: Apr. 08, 2018

Issued for:

Doodle Labs (SG) Pte Ltd

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

Issued By:

Shenzhen Tongce Testing Lab.

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

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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. Test Certification

Product:	Prism Wi-Fi® Radio Transceiver
Model No.:	NM-915-2G
Additional Model No.:	NM-915-1G, NO-915-2G, NO-915-1G, GM-915-1, GM-915-2, GO-915-2, GO-915-1
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:	Mar.10. 2018 – Apr. 04, 2018
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247 KDB 558074 D01 DTS Meas Guidance v04

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:	Jerry Xie	***Date:***	***Apr. 04, 2018***
	Jerry Xie		
Reviewed By:	Beryl Zhao	***Date:***	***Apr. 08, 2018***
	Beryl Zhao		
Approved By:	Tomsin	***Date:***	***Apr. 08, 2018***
	Tomsin		

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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) §2.1046	PASS
6dB Emission Bandwidth	§15.247 (a)(2) §2.1049	PASS
Power Spectral Density	§15.247 (e)	PASS
Band Edge	1§5.247(d) §2.1051, §2.1057	PASS
Spurious Emission	§15.205/§15.209 §2.1053, §2.1057	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:	Prism Wi-Fi® Radio Transceiver
Product Type:	WLAN(2TX, 2RX)
Radio Type:	2x2 MIMO
Model No.:	NM-915-2G
Additional Model No.:	NM-915-1G, NO-915-2G, NO-915-1G, GM-915-1, GM-915-2, GO-915-2, GO-915-1
Trade Mark:	**N/A**
Hardware Version:	V3
Software Version:	V1.0
Operation Frequency:	905MHz~920MHz
Channel Separation:	5MHz
Number of Channel:	905 MHz, 910 MHz, 915 MHz, 920 MHz,
Modulation Technology:	DSSS, OFDM
Antenna Type:	R-SMA antenna
Antenna Gain:	All are 2dBi
Power Supply:	DC 5V from adapter (voltage range: 5V up to 42V)
Remark:	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Operation Frequency each of channel For DSSS, OFDM.

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	905MHz	2	910MHz	3	915MHz	4	920MHz
Remark: All the channels have been tested.							

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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 above channel
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. For the full battery state and The output power to the maximum state.	

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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
900MHz Dipole Antenna	001-0002	/	/	LSR
Adapter	EP-TA20CBC	R37HAEY0DT1RT3	/	SAMSUNG

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 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

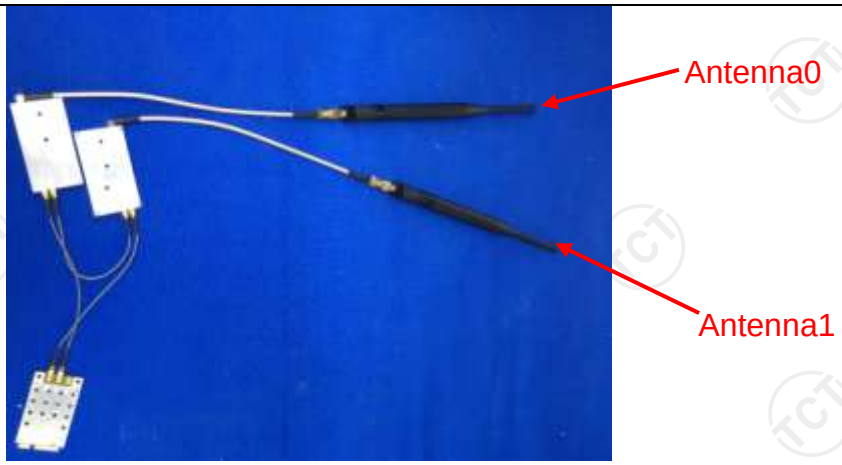
The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

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%

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 902-928 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 EUT has two R-SMA antennas which permanently attached, and the best case gain of the two antennas are 2dBi.	



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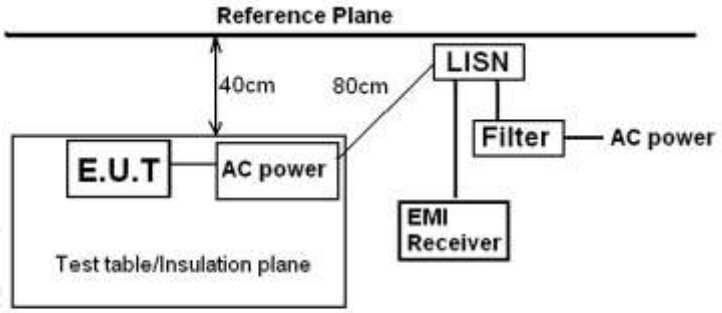
6.2. Conducted Emission

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>Charging + transmitting with modulation</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T is 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

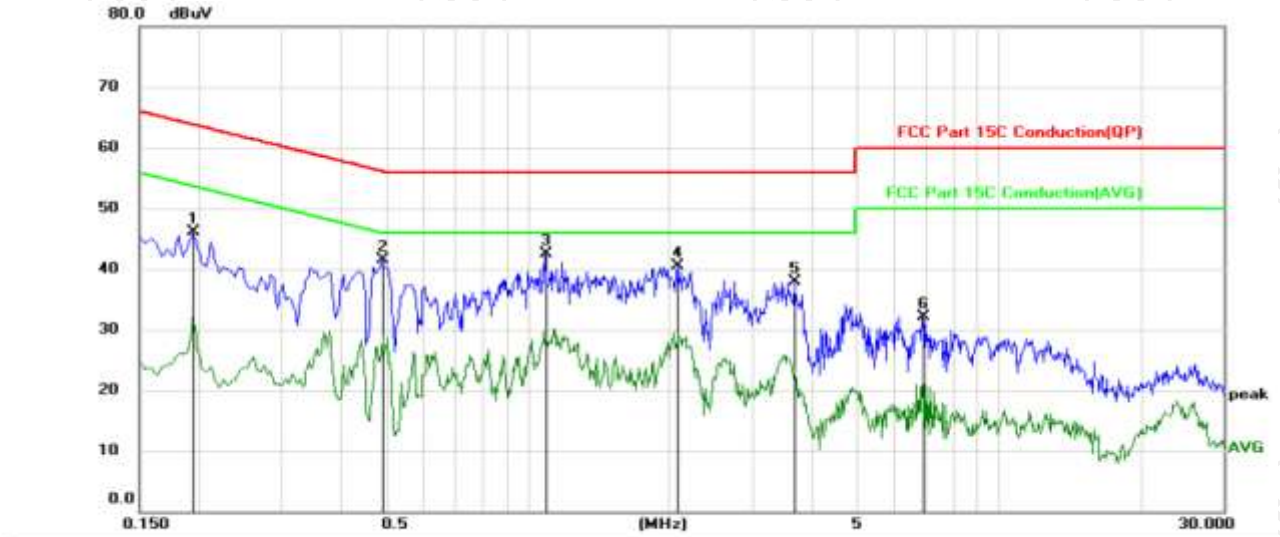
Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

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

6.2.3. Test data

Please refer to following diagram for individual

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



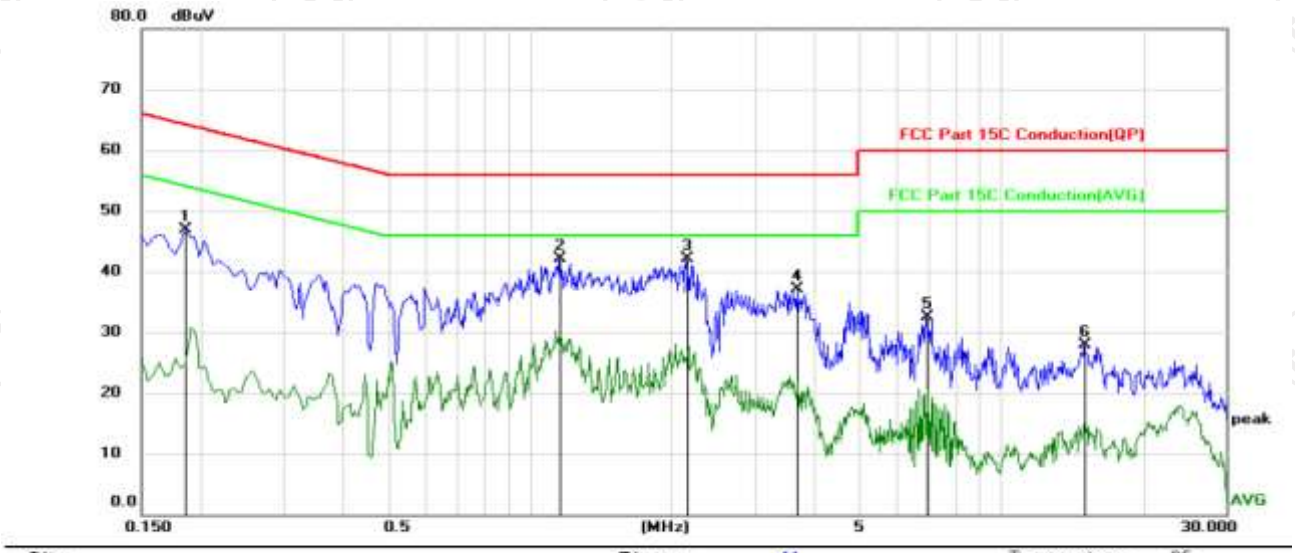
Site
Limit: FCC Part 15C Conduction(QP)
Phase: L1
Power:
Temperature: 25
Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1949	34.56	11.47	46.03	63.83	-17.80	peak	
2		0.4920	30.29	11.31	41.60	56.13	-14.53	peak	
3	*	1.0905	31.18	11.26	42.44	56.00	-13.56	peak	
4		2.0805	28.91	11.67	40.58	56.00	-15.42	peak	
5		3.6915	26.86	11.09	37.95	56.00	-18.05	peak	
6		6.9135	21.19	10.93	32.12	60.00	-27.88	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
** 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: | Humidity: 55 %

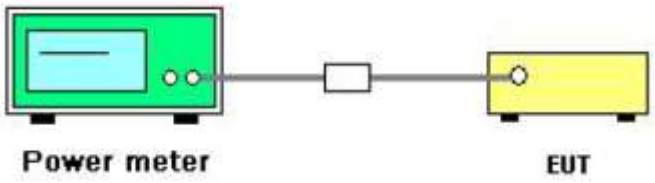
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1860	35.41	11.48	46.89	64.21	-17.32	peak	
2	*	1.1535	30.79	11.28	42.07	56.00	-13.93	peak	
3		2.1480	30.39	11.65	42.04	56.00	-13.96	peak	
4		3.6870	26.09	11.09	37.18	56.00	-18.82	peak	
5		6.9180	21.57	10.93	32.50	60.00	-27.50	peak	
6		15.0090	16.12	11.71	27.83	60.00	-32.17	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
** is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.*

6.3. Maximum Conducted (Peak) Output Power

6.3.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	KDB 558074
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 v04. 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. Measure the Peak output power 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	Anritsu	ML2495A	1005002	Sep. 27, 2018
Pulse Power Senor	Anritsu	MA2411B	0917070	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

6.3.3. Test Data

For DSSS / Antenna 0+Antenna 1					
Test channel	Maximum Conducted (Peak) Output Power (dBm)			Limit (dBm)	Result
	Ant0	Ant1	Total		
905MHz	25.15	25.81	28.50	30	PASS
910MHz	25.34	25.62	28.49	30	PASS
915MHz	25.20	25.44	28.33	30	PASS
920MHz	26.05	25.83	28.95	30	PASS

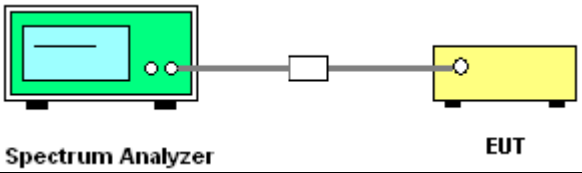
For OFDM / Antenna 0+Antenna 1					
Test channel	Maximum Conducted (Peak) Output Power (dBm)			Limit (dBm)	Result
	Ant0	Ant1	Total		
905MHz	23.50	23.55	26.54	30	PASS
910MHz	23.63	23.48	26.57	30	PASS
915MHz	23.62	23.70	26.67	30	PASS
920MHz	23.68	23.60	26.65	30	PASS

***Note*: G_{ANT} =2dBi, Array Gain=10log(N_{ANT}/N_{SS})=3.01dBi**

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

6.4. Emission Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	KDB 558074
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 v04. 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	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

6.4.3. Test data

Antenna 0:

Test channel	6dB Emission Bandwidth (MHz)	
	For DSSS	For OFDM
905MHz	2.569	4.439
910MHz	2.565	4.453
915MHz	2.571	4.436
920MHz	2.571	4.434
Limit:	>500k	
Test Result:	PASS	

Antenna 1:

Test channel	6dB Emission Bandwidth (MHz)	
	For DSSS	For OFDM
905MHz	2.577	4.465
910MHz	2.574	4.458
915MHz	2.578	4.463
920MHz	2.581	4.464
Limit:	>500k	
Test Result:	PASS	

Test plots as follows:

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Antenna 0:
For DSSS

905MHz Modulation

910MHz Modulation

915MHz Modulation

920MHz Modulation

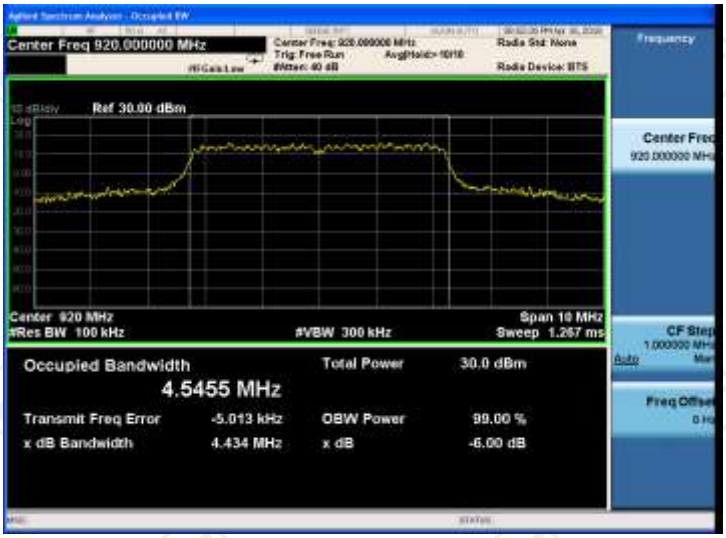
For OFDM

905MHz Modulation

910MHz Modulation

915MHz Modulation

920MHz Modulation



Antenna 1:
For DSSS

905MHz Modulation

910MHz Modulation

915MHz Modulation

920MHz Modulation

For OFDM

905MHz Modulation

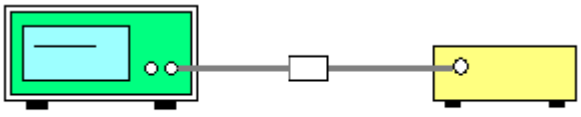
910MHz Modulation

915MHz Modulation

920MHz Modulation

6.5. Power Spectral Density

6.5.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.247 (e)
Test Method:	KDB 558074
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 v04 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	MY49100060	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

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

6.5.3. Test data

For DSSS/ Antenna 0, Antenna 1					
Test channel	AVG Power Spectral Density (dBm/3kHz)			Limit (dBm)	Result
	Ant0	Ant1	Total		
905MHz	2.836	3.799	6.35	8dBm/3kHz	PASS
910MHz	3.587	3.760	6.68	8dBm/3kHz	PASS
915MHz	2.388	3.355	5.91	8dBm/3kHz	PASS
920MHz	3.822	3.466	6.66	8dBm/3kHz	PASS

For OFDM/ Antenna 0, Antenna 1					
Test channel	AVG Power Spectral Density (dBm/3kHz)			Limit (dBm)	Result
	Ant0	Ant1	Total		
905MHz	1.343	2.510	4.98	8dBm/3kHz	PASS
910MHz	2.376	2.296	5.35	8dBm/3kHz	PASS
915MHz	1.516	2.059	4.81	8dBm/3kHz	PASS
920MHz	1.870	2.562	5.24	8dBm/3kHz	PASS

***Note*: G_{ANT} =3dBi, Array Gain=10log(N_{ANT}/N_{SS})=3.01dBi**

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

Test plots as follows:

Antenna 0:
For DSSS

905MHz Modulation

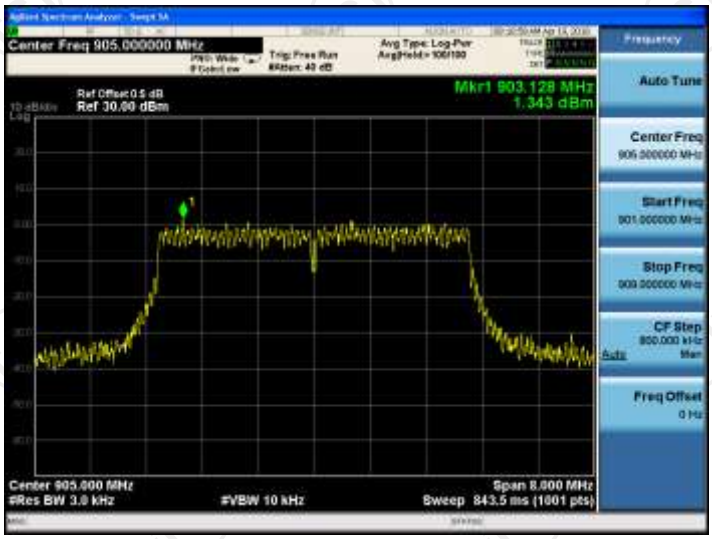
910MHz Modulation

915MHz Modulation

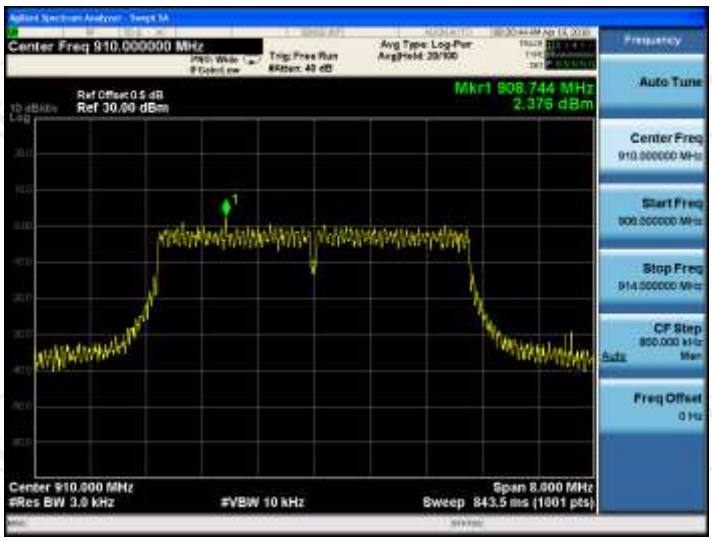
920MHz Modulation

For OFDM

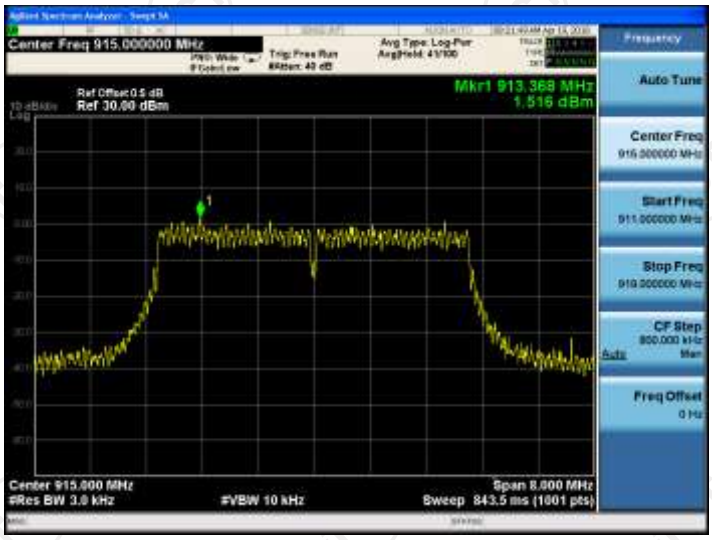
905MHz Modulation



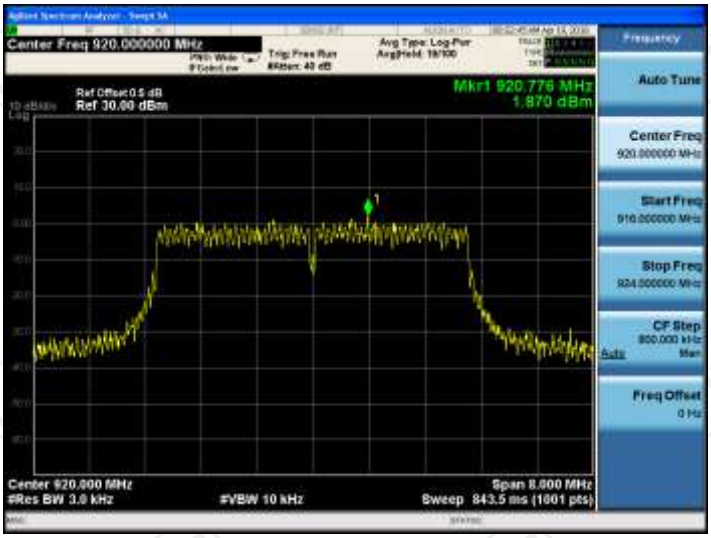
910MHz Modulation



915MHz Modulation



920MHz Modulation



Antenna 1:
For DSSS

905MHz Modulation

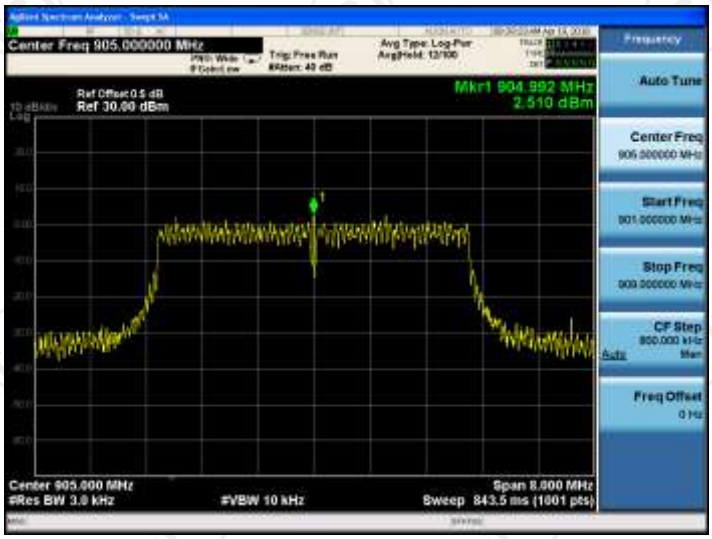
910MHz Modulation

915MHz Modulation

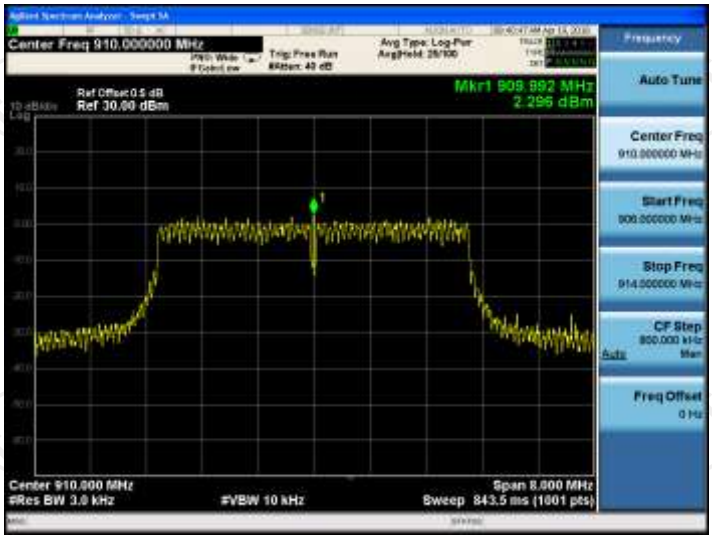
920MHz Modulation

For OFDM

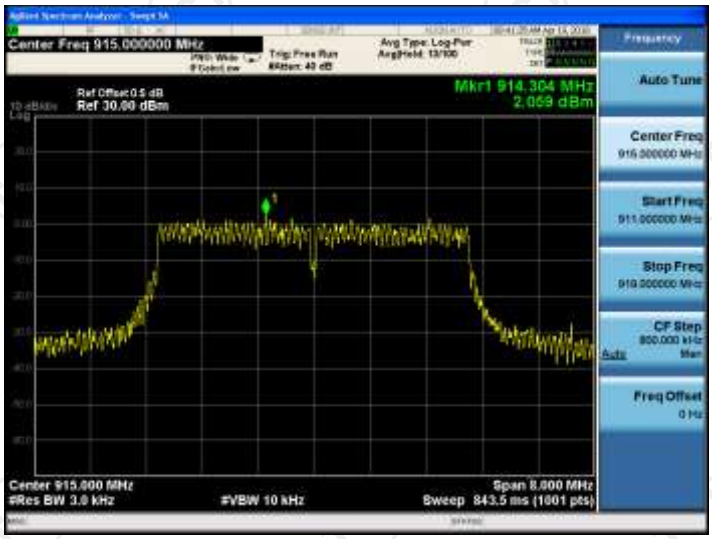
905MHz Modulation



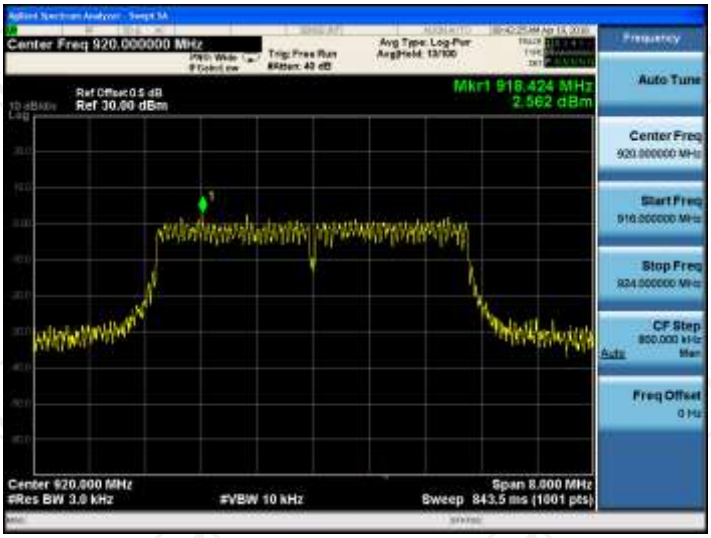
910MHz Modulation



915MHz Modulation



920MHz Modulation



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 DTS Meas. Guidance v04. 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	MY49100060	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
RF Cable (9KHz-26.5GHz)	TCT	RE-06	N/A	Sep. 27, 2018
Antenna Connector	TCT	RFC-01	N/A	Sep. 27, 2018

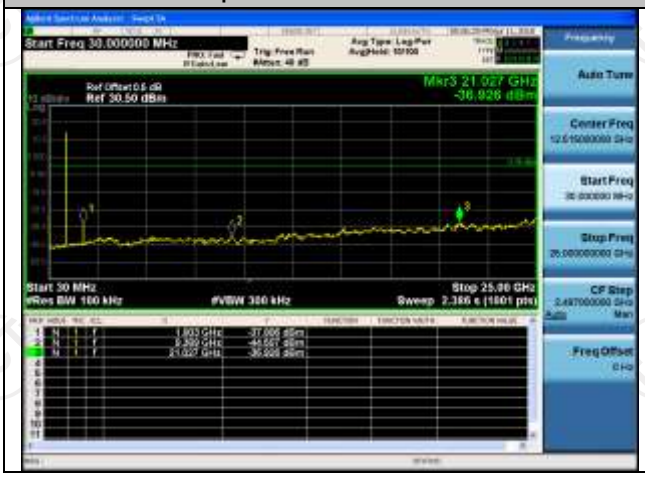
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.6.3. Test Data

Antenna 0:

For DSSS

905MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

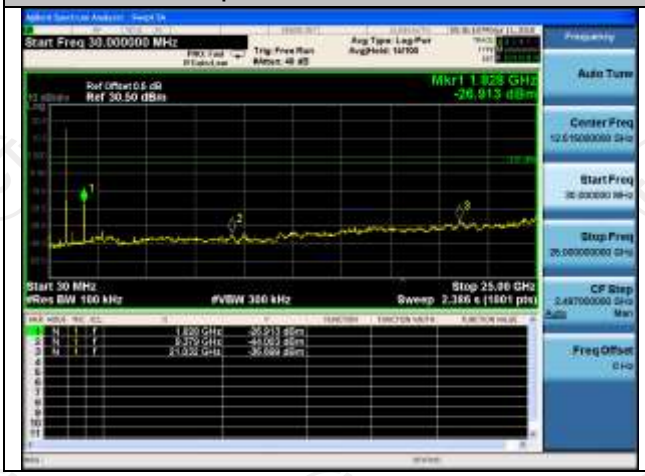
910MHz

100kHz PSD reference Level	Spurious emission
	

915MHz

100kHz PSD reference Level	Spurious emission
	

920MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

For OFDM
905MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

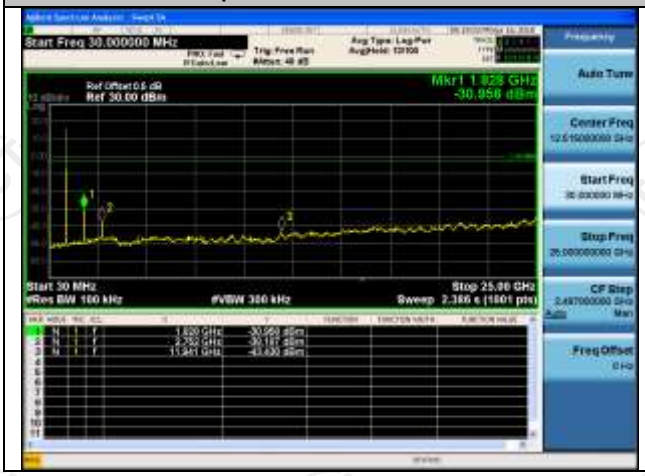
910MHz

100kHz PSD reference Level	Spurious emission
	

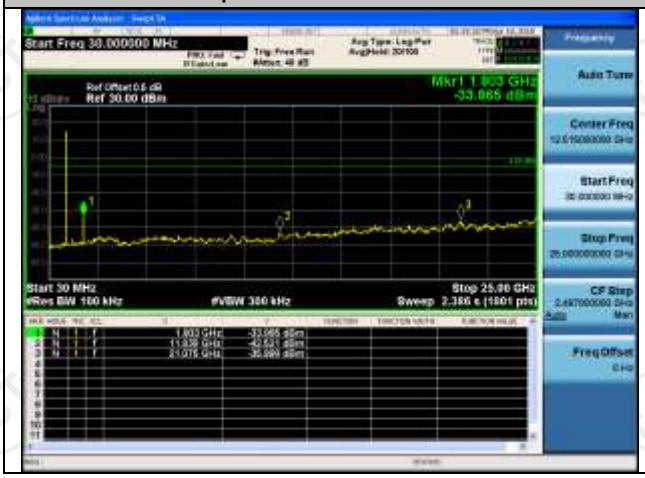
915MHz

100kHz PSD reference Level	Spurious emission
	

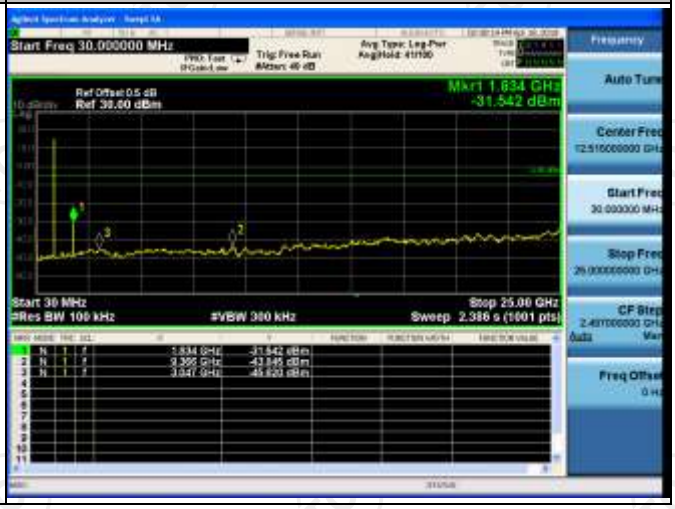
920MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

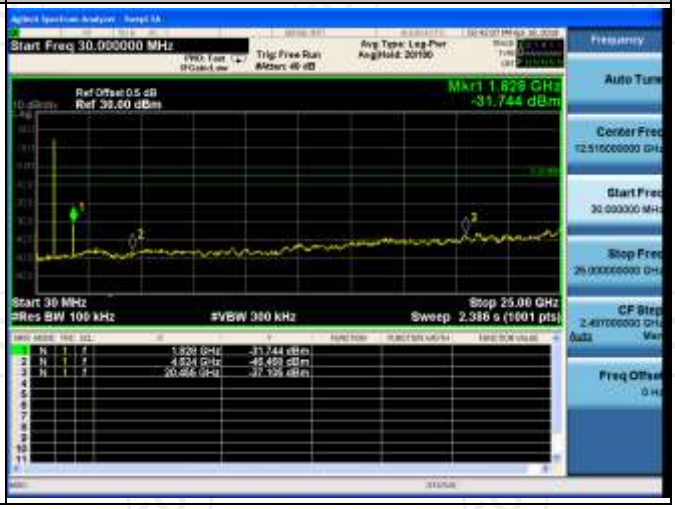
Antenna 1:
For DSSS
905MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

910MHz

100kHz PSD reference Level	Spurious emission
	

915MHz

100kHz PSD reference Level	Spurious emission
	

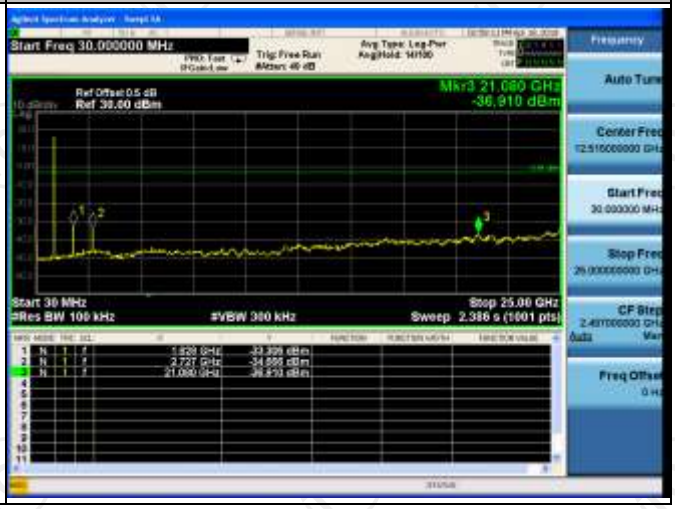
920MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

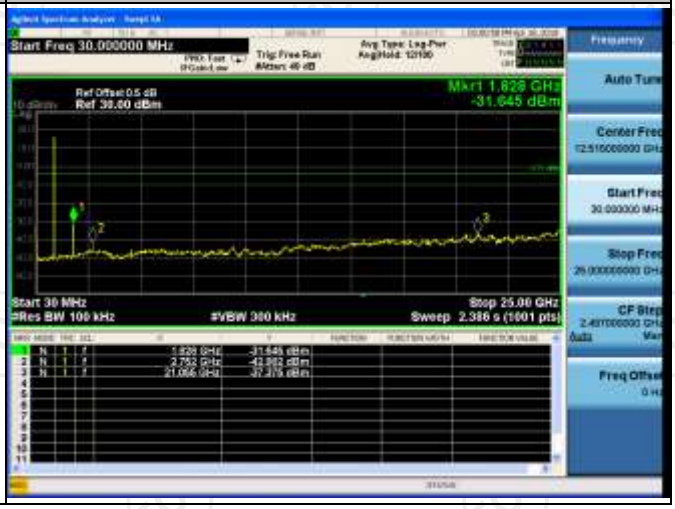
For OFDM
905MHz

100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

910MHz

100kHz PSD reference Level	Spurious emission
	

915MHz

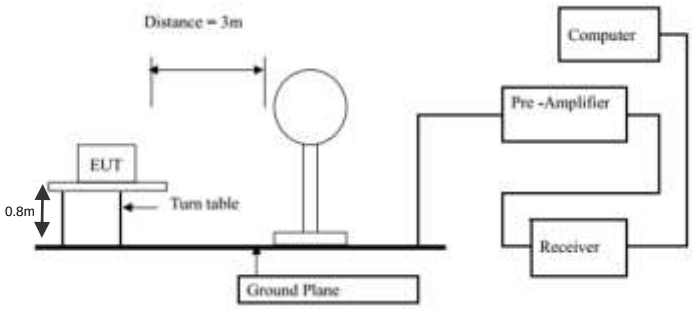
100kHz PSD reference Level	Spurious emission
	

920MHz

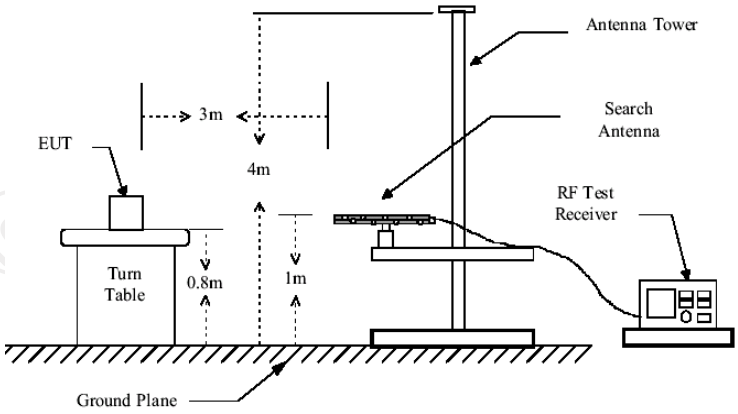
100kHz PSD reference Level	Band Edge
	
Spurious emission	
	

6.7. Radiated Spurious Emission Measurement

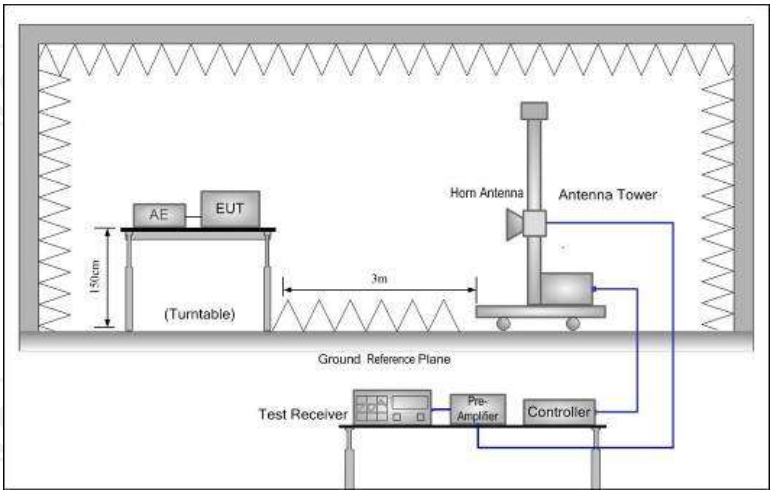
6.7.1. Test Specification

<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
 

30MHz to 1GHz</td></tr>
</table>



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

Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

6.7.2. Test Instruments

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

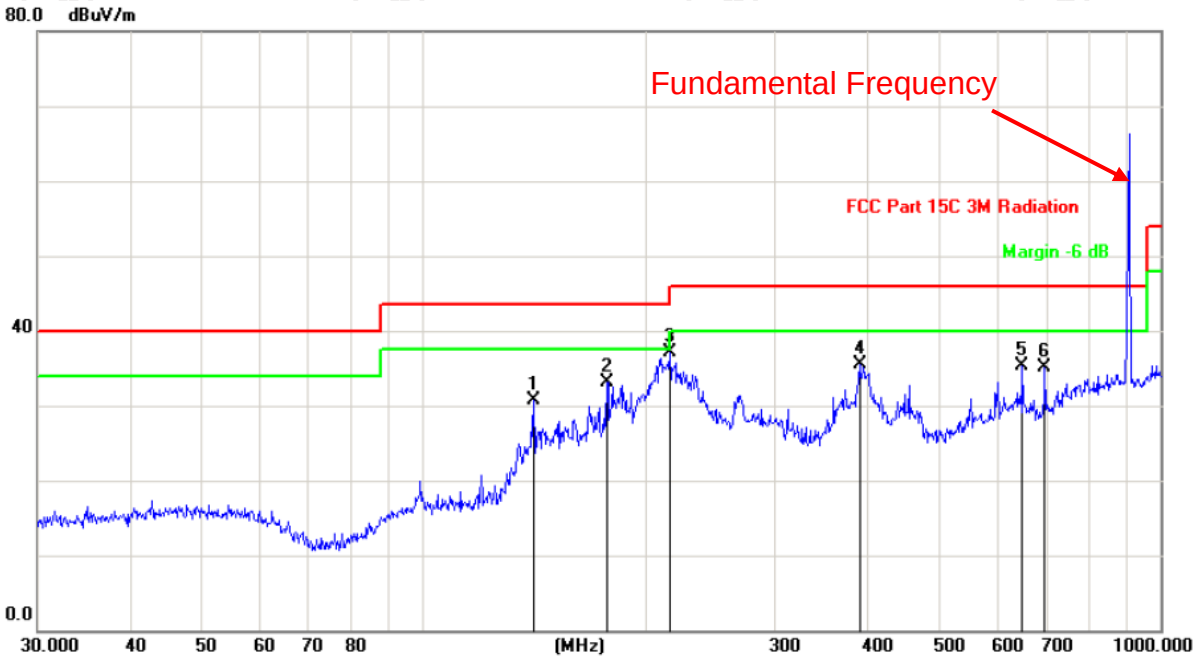
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.7.3. Test Data

Please refer to following diagram for individual

Below 1GHz

Horizontal:

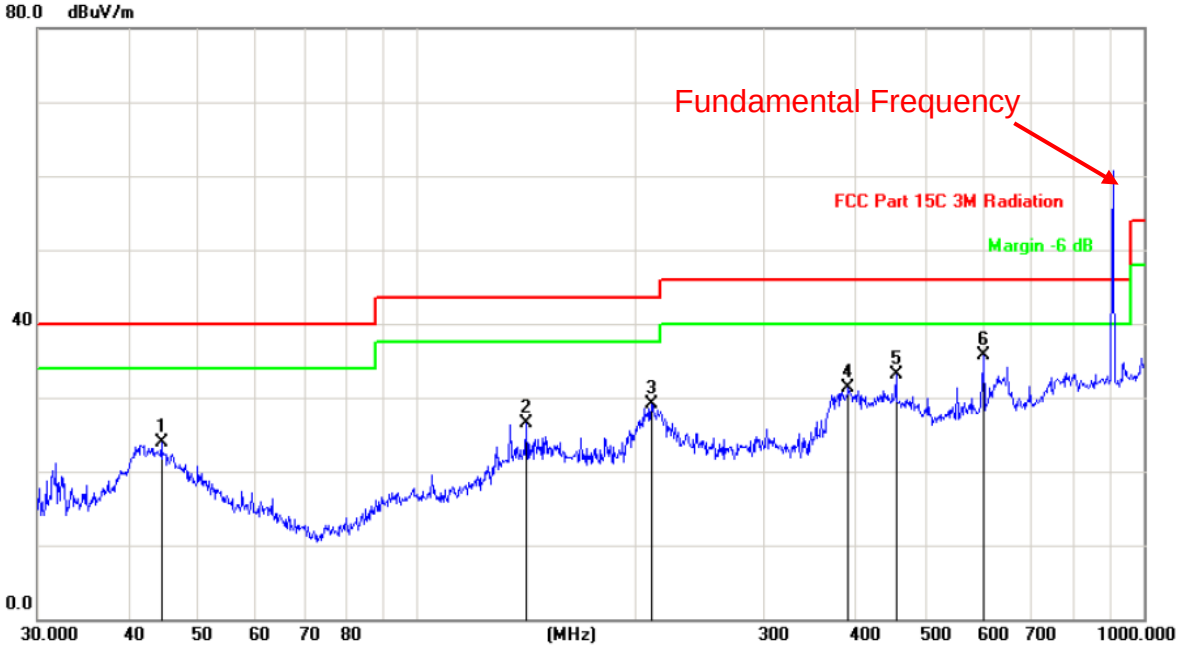


Site | Polarization: *Horizontal* | Temperature: 25

Limit: FCC Part 15C 3M Radiation | Power: AC 120V/60Hz | Humidity: 55 %

No.	Mk.	Freq.	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		141.3298	46.72	-15.98	30.74	43.50	-12.76	peak			
2		177.5089	47.23	-14.11	33.12	43.50	-10.38	peak			
3	*	216.0240	49.21	-12.12	37.09	46.00	-8.91	peak			
4		390.7225	41.64	-6.05	35.59	46.00	-10.41	peak			
5		649.6597	35.79	-0.40	35.39	46.00	-10.61	peak			
6		696.8567	35.15	-0.04	35.11	46.00	-10.89	peak			

Vertical:



Site | Polarization: *Vertical* | Temperature: 25

Limit: FCC Part 15C 3M Radiation | Power: AC 120V/60Hz | 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		44.4307	36.73	-12.75	23.98	40.00	-16.02	peak			
2		141.3298	42.50	-15.98	26.52	43.50	-16.98	peak			
3		210.0482	41.37	-12.35	29.02	43.50	-14.48	peak			
4		392.0951	37.29	-6.02	31.27	46.00	-14.73	peak			
5		455.9057	37.39	-4.29	33.10	46.00	-12.90	peak			
6	*	601.4265	36.52	-0.75	35.77	46.00	-10.23	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 four channels (905MHz, 910MHz, 915MHz, 920MHz and two modulations (DSSS, OFDM), and the worst case Mode (905MHz and DSSS) was submitted only

Test Result of Radiated Spurious at Band edges

905MHz									
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)			
902	H	59.18	---	-4.2	54.98	---	74.00	---	-19.02
902	H	---	52.51	-4.2	---	48.31	---	54.00	-5.69
---	---	---	---	---	---	---	---	---	---
902	V	58.67	---	-4.2	54.47	---	74.00	---	-19.53
902	V	---	49.73	-4.2	---	45.53	---	54.00	-8.47
---	---	---	---	---	---	---	---	---	---
920MHz									
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)			
928	H	60.81	---	-4.2	56.61	---	74.00	---	-17.39
928	H	---	51.69	-4.2	---	47.49	---	54.00	-6.51
---	---	---	---	---	---	---	---	---	---

928	V	59.32	---	-4.2	55.12	---	74.00	---	-18.88
928	V	---	50.88	-4.2	---	46.68	---	54.00	-7.32
---	---	---	---	---	---	---	---	---	---

Note:

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

Above 1GHz

905MHz									
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)			
1810	H	52.41	---	-3.94	48.47	---	74.00	54.00	-5.53
2706	H	47.62	---	0.52	48.14	---	74.00	54.00	-5.86
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
1810	V	48.67	---	-3.94	44.73	---	74.00	54.00	-9.27
2706	V	45.22	---	0.52	45.74	---	74.00	54.00	-8.26
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---

910MHz									
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)			
1820	H	53.21	---	-3.94	49.25	---	74.00	54.00	-4.75
2730	H	48.87	---	0.52	49.39	---	74.00	54.00	-4.41
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
1820	V	51.12	---	-3.94	47.16	---	74.00	54.00	-6.84
2730	V	50.37	---	0.52	50.89	---	74.00	54.00	-3.11
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	----	---	---	---

915MHz									
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)			
1830	H	52.37	---	-3.98	48.39	---	74.00	54.00	-5.61
2745	H	49.52	---	0.57	50.09	---	74.00	54.00	-3.91
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
1830	V	51.69		-3.98	47.71		74.00	54.00	-6.29
2745	V	49.07		0.57	49.64		74.00	54.00	-4.36
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	----	---	---	---

920MHz									
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)			
1840	H	50.61	---	-3.98	46.63	---	74.00	54.00	-7.37
2760	H	49.53	---	0.57	50.1	---	74.00	54.00	-3.9
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
1840	V	51.86	---	-3.98	47.88	---	74.00	54.00	-6.12
2760	V	48.21	---	0.57	48.78	---	74.00	54.00	-5.22
---	---	---	---	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---	---
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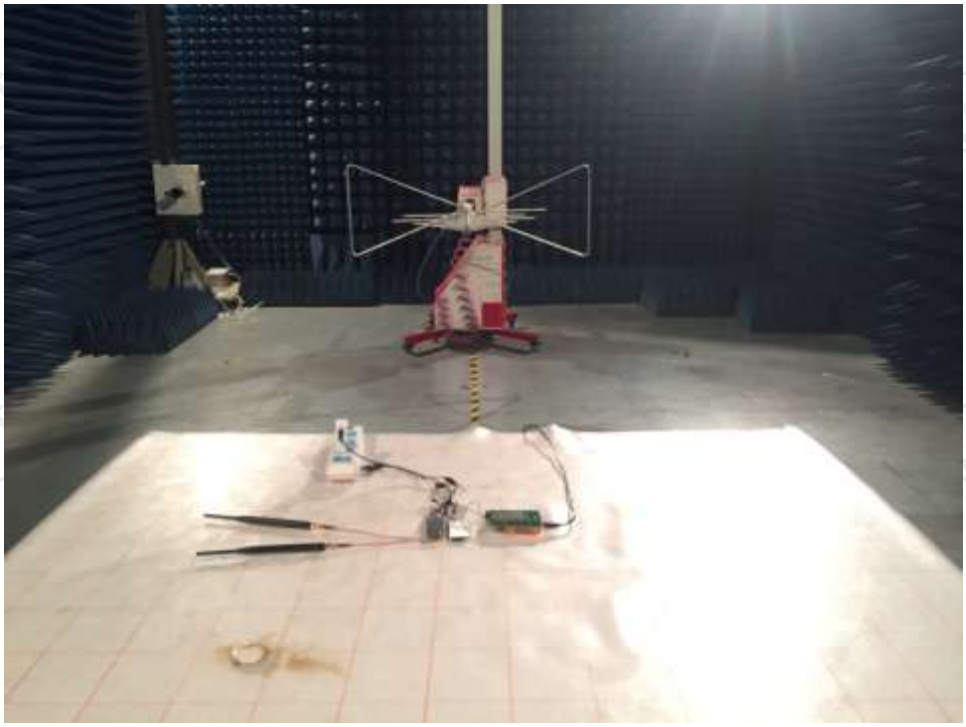
Note:

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: Photographs of Test Setup

Product: Prism Wi-Fi® Radio Transceiver
Model: NM-915-2G
Radiated Emission



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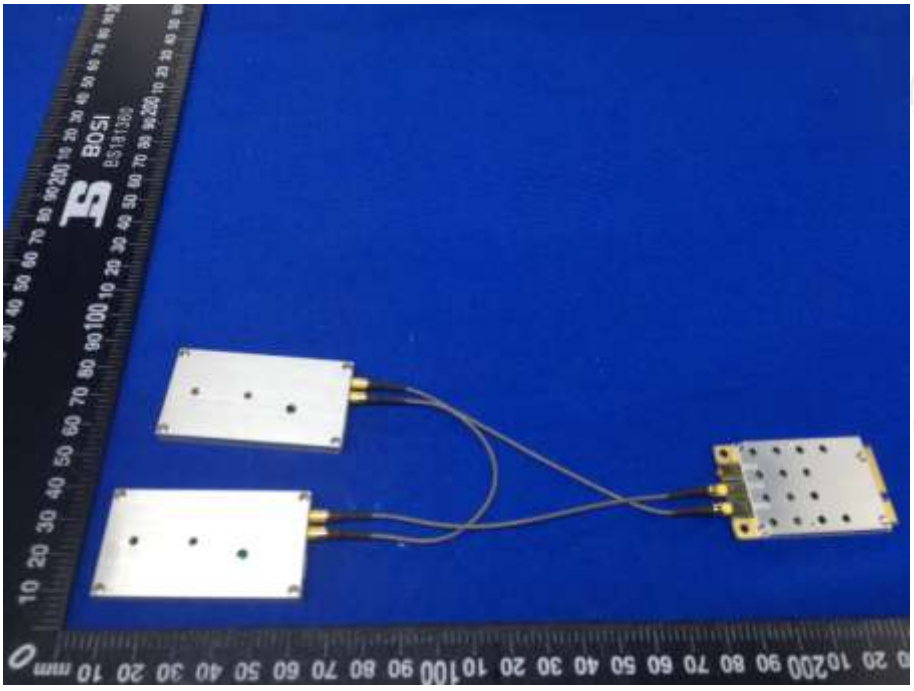
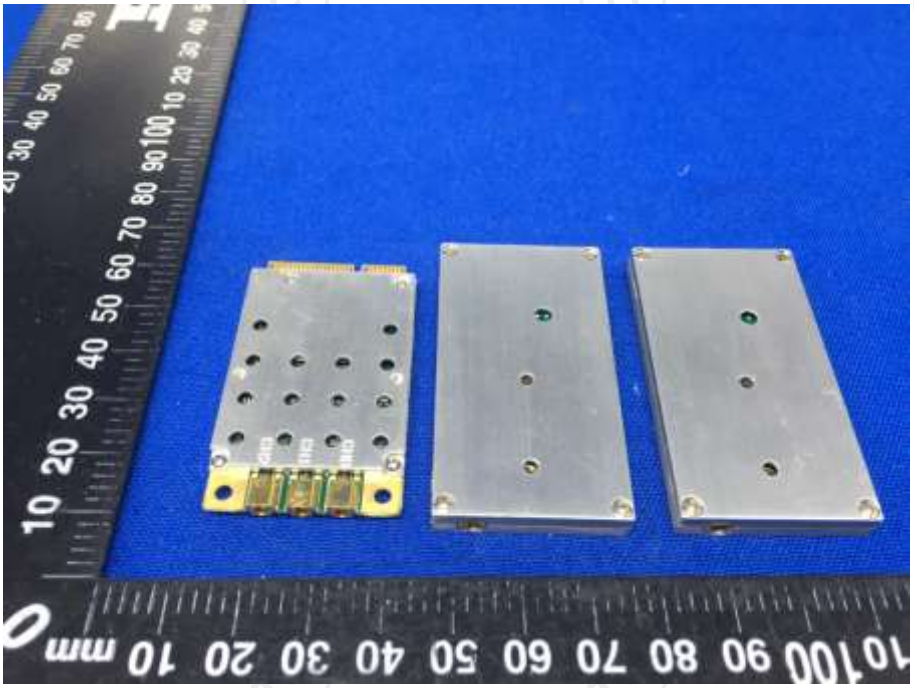
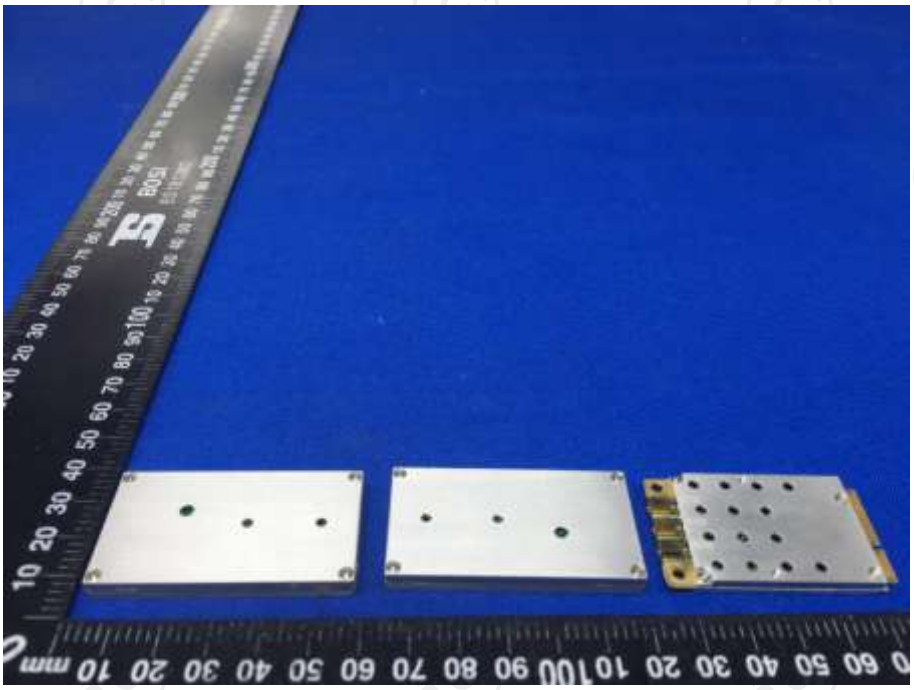
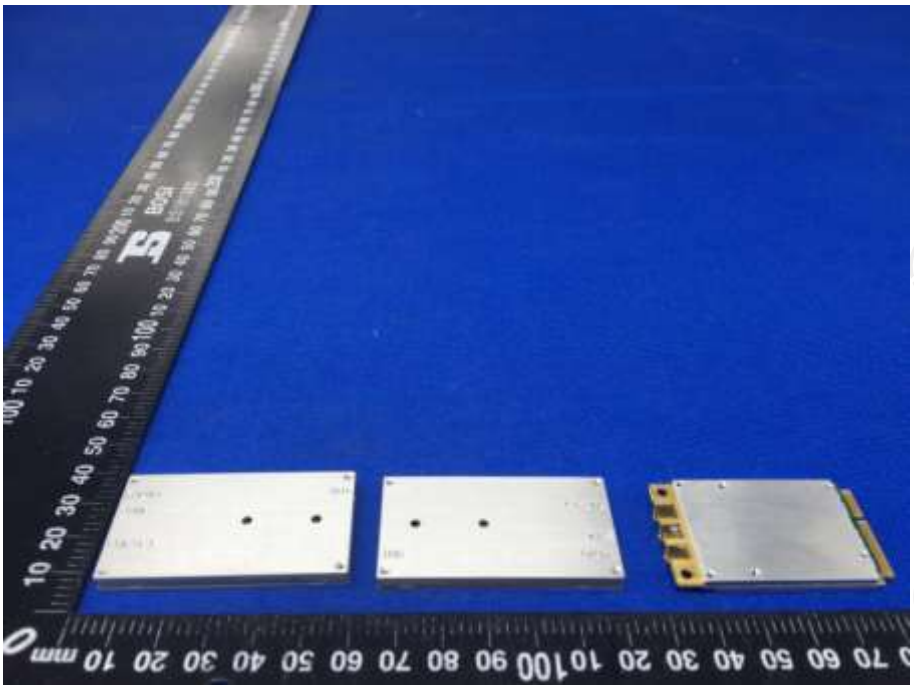
Conducted Emission

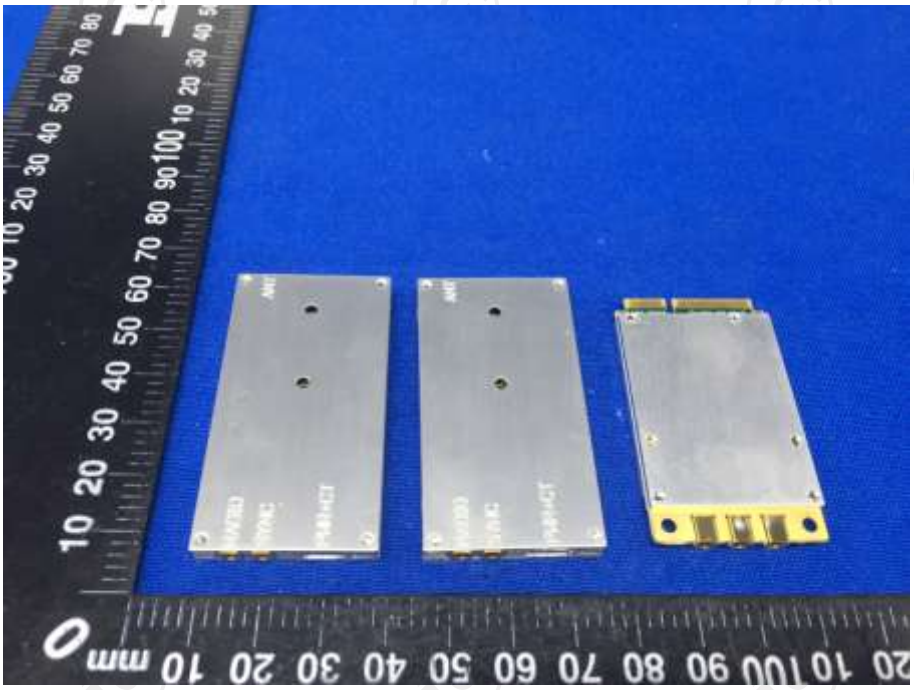
Appendix B: Photographs of EUT
Product: Prism Wi-Fi® Radio Transceiver
Model: NM-915-2G
External Photos



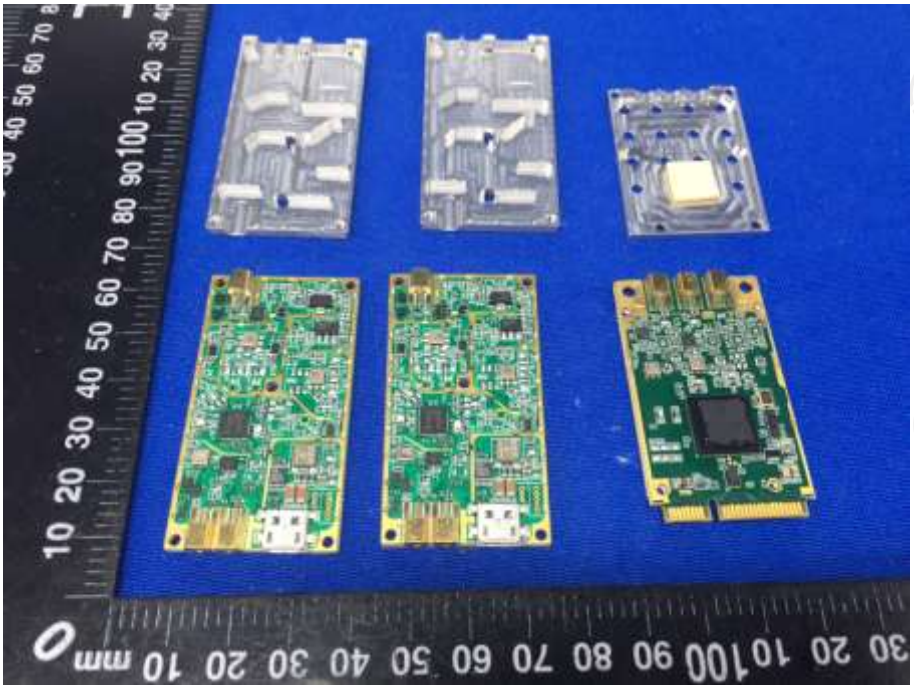








Product: Prism Wi-Fi® Radio Transceiver
Model: NM-915-2G
Internal Photos



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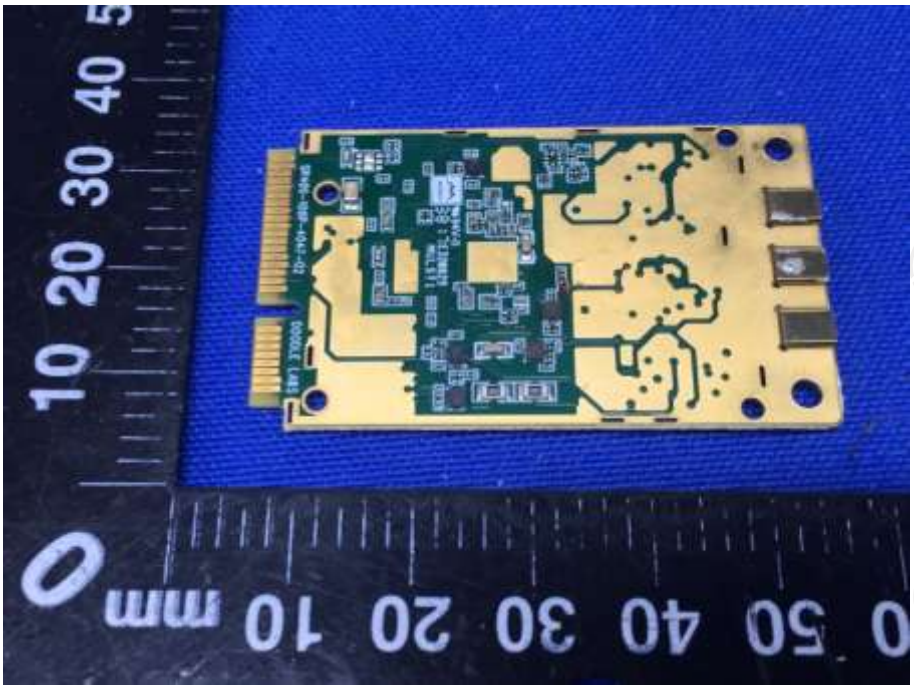
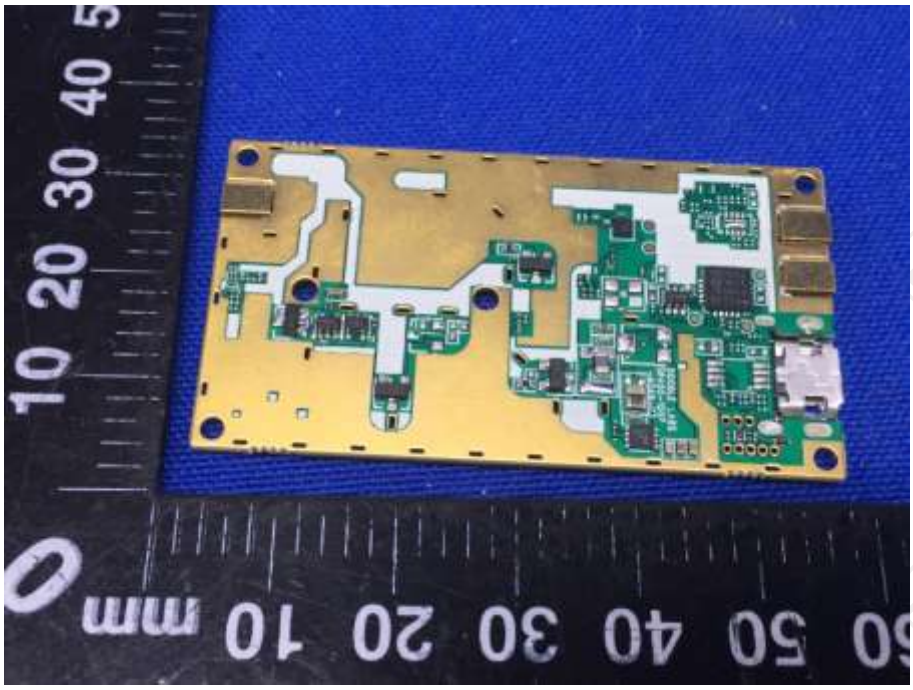
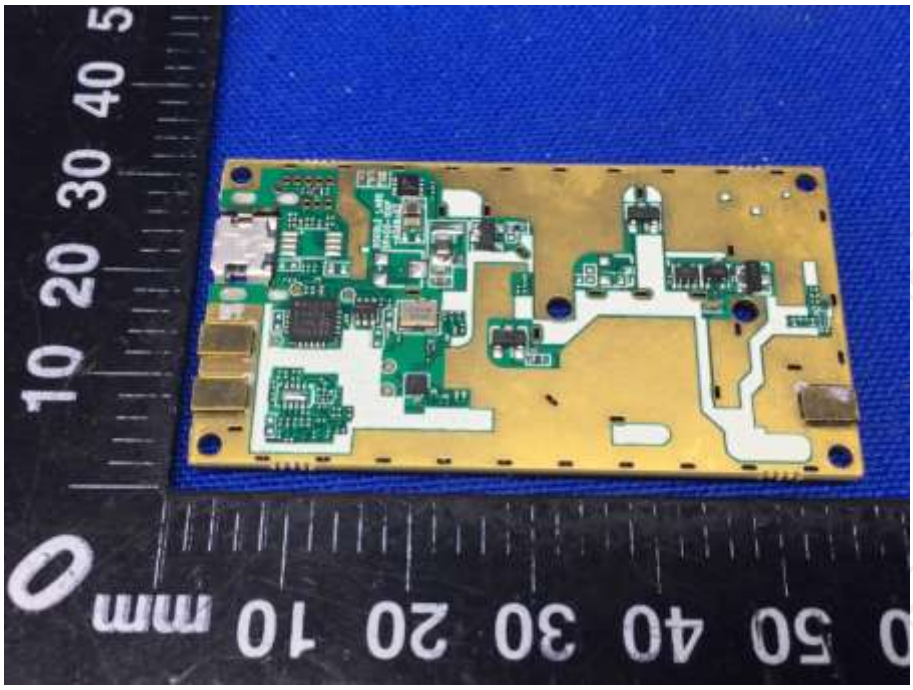

mm 0 10 20 30 40 50


mm 0 10 20 30 40 50 60


mm
0
10
20
30
40
50


mm
0
10
20
30
40
50



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

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