

# TEST REPORT

**FCC ID: 2AG87NM-DB-3N**

**Product: Wi-Fi® Radio Transceiver**

**Model No.: NM-DB-3NU**

**Additional Model No.: DLM180NU, NO-DB-3NU, NE-DB-3NU, NM-DB-2NU,  
NO-DB-2NU, NE-DB-2NU**

**Trade Mark: N/A**

**Report No.: TCT170310E003**

**Issued Date: Apr. 14, 2017**

Issued for:

**Doodle Labs (SG) Pte Ltd**

**150 Kampong Ampat, KA Centre, Suite #05-03, Singapore 368324**

Issued By:

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This document may be altered or revised by Shenzhen Tongce Testing Lab. personnel only, and shall be noted in the revision section of the document. The test results in the report only apply to the tested sample.

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**Appendix A: Photographs of Test Setup**

**Appendix B: Photographs of EUT**

## 1. Test Certification

<b>Product:</b>	Wi-Fi® Radio Transceiver
<b>Model No.:</b>	NM-DB-3NU
<b>Additional Model No.:</b>	DLM180NU, NO-DB-3NU, NE-DB-3NU, NM-DB-2NU, NO-DB-2NU, NE-DB-2NU
<b>Applicant:</b>	Doodle Labs (SG) Pte Ltd
<b>Address:</b>	150 Kampong Ampat, KA Centre, Suite #05-03, Singapore 368324
<b>Manufacturer:</b>	Doodle Labs (SG) Pte Ltd
<b>Address:</b>	150 Kampong Ampat, KA Centre, Suite #05-03, Singapore 368324
<b>Date of Test:</b>	Mar. 13 – Apr. 13, 2017
<b>Applicable Standards:</b>	FCC CFR Title 47 Part 15 Subpart C Section 15.247 KDB 558074 D01 DTS Meas Guidance v03r05 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:



Beryl Zhao

Date:

Apr. 13, 2017

Reviewed By:



Joe Zhou

Date:

Apr. 14, 2017

Approved By:



Tomsin

Date:

Apr. 14, 2017

## 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
Output Power	§15.247 (b)(3) §2.1046	PASS(Note2)
6dB Emission Bandwidth	§15.247 (a)(2) §2.1049	PASS(Note2)
99% Bandwidth	§2.1049	PASS(Note2)
Power Spectral Density	§15.247 (e)	PASS(Note2)
Band Edge	§15.247(d)	PASS
Spurious Emission	§15.205/§15.209 §2.1053	PASS

**Note1:**

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.

**Note2:** The data of Output Power, 6dB Emission Bandwidth, 99% Bandwidth, Power Spectral Density is refer to the original FCC ID: 2AG87NM-DB-3N..

### 3. EUT Description

<b>Product Name:</b>	Wi-Fi® Radio Transceiver
<b>Product Type:</b>	WLAN(3TX, 3RX)
<b>Radio Type:</b>	3x3 MIMO
<b>Model :</b>	NM-DB-3NU
<b>Additional Model:</b>	DLM180NU, NO-DB-3NU, NE-DB-3NU, NM-DB-2NU, NO-DB-2NU, NE-DB-2NU
<b>Trade Mark:</b>	N/A
<b>Operation Frequency:</b>	2412MHz~2462MHz (802.11b/802.11g/802.11n(HT20)) 2422MHz~2452MHz (802.11n(HT40))
<b>Channel Separation:</b>	5MHz
<b>Number of Channel:</b>	11 for 802.11b/802.11g/802.11n(HT20) 7 for 802.11n(HT40)
<b>Modulation Technology: (IEEE 802.11b)</b>	Direct Sequence Spread Spectrum (DSSS)
<b>Modulation Technology: (IEEE 802.11g/802.11n)</b>	Orthogonal Frequency Division Multiplexing(OFDM)
<b>Data speed (IEEE 802.11b):</b>	1Mbps, 2Mbps, 5.5Mbps, 11Mbps
<b>Data speed (IEEE 802.11g):</b>	6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps
<b>Data speed (IEEE 802.11n):</b>	Up to 150Mbps
<b>Antenna Type:</b>	R-SMA antenna
<b>Antenna Gain:</b>	All are 3dBi
<b>Power Supply:</b>	DC 3.3V
<b>Model difference :</b>	All models above are identical in interior structure, electrical circuits and components, and just model names are different for the marketing requirement.

Items	Description
<b>Beamforming Function</b>	With beamforming

**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

**Antenna and Band width**

Antenna	Three (TX)	
Band width mode	20MHz	40MHz
IEEE 802.11b	V	X
IEEE 802.11g	V	X
IEEE 802.11n	V	V

Note: "V" means support, "x" means not support.

**IEEE 802.11n Spec.**

Protocol	Number of Transmit Chains (NTX)	Data Rate/MCS
802.11n(HT20)	3	MCS0-23
802.11n(HT40)	3	MCS0-23

## 4. Genera Information

### 4.1. Test environment and mode

#### Operating Environment:

Temperature:	25.0 °C
Humidity:	56 % RH
Atmospheric Pressure:	1010 mbar

#### Test Mode:

Engineering mode:	Keep the EUT in continuous transmitting by select channel and modulations (The value of duty cycle is 98.46%)
-------------------	---

The sample above 1GHz was placed 1.5m (0.8m below 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:

**Pre-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
-----------------	---

According to ANSI C63.4 standards, the test results are both the “worst case” and “worst setup” 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n(H20). Duty cycle setting during the transmission is 98.5% with maximum power setting for all modulations.



## 4.2. Description of Support Units

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

Equipment	Model No.	Serial No.	FCC ID	Trade Name
Intel NUC	D54250WYKH	G6YK4390029 U	DOC	Intel

**Note:**

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.

## 5. Facilities and Accreditations

### 5.1. Facilities

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

- FCC - Registration No.: 572331

Shenzhen Tongce Testing Lab

The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

- CNAS - Registration No.: CNAS L6165

Shenzhen TCT Testing Technology Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6165.

### 5.2. Location

Shenzhen Tongce Testing Lab

Address: 1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

Tel: 86-755-36638142

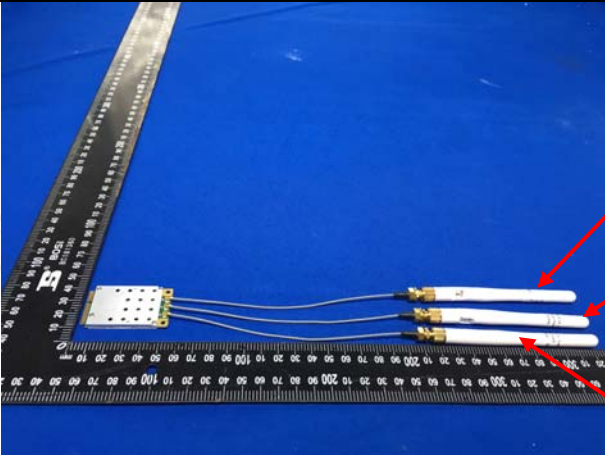
### 5.3. Measurement Uncertainty

The reported uncertainty of measurement  $y \pm U$ , 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	$\pm 2.56\text{dB}$
2	RF power, conducted	$\pm 0.12\text{dB}$
3	Spurious emissions, conducted	$\pm 0.11\text{dB}$
4	All emissions, radiated(<1G)	$\pm 3.92\text{dB}$
5	All emissions, radiated(>1G)	$\pm 4.28\text{dB}$
6	Temperature	$\pm 0.1^{\circ}\text{C}$
7	Humidity	$\pm 1.0\%$

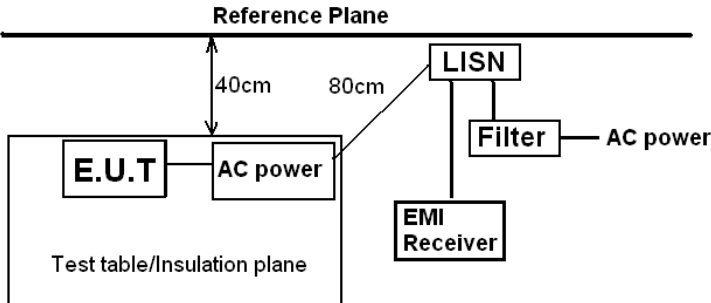
## 6. Test Results and Measurement Data

### 6.1. Antenna requirement

<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
<p>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.</p> <p>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.</p>	
<b>E.U.T Antenna:</b>	
<p>The EUT has three R-SMA antennas which is only the antenna type used, and the best case gain of the three antennas are 3dBi.</p>	
	

## 6.2. Conducted Emission

### 6.2.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.207														
Test Method:	ANSI C63.10:2013														
Frequency Range:	150 kHz to 30 MHz														
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto														
Limits:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></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>	Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)														
	Quasi-peak	Average													
0.15-0.5	66 to 56*	56 to 46*													
0.5-5	56	46													
5-30	60	50													
Test Setup:	<div><p>Reference Plane</p><p>40cm 80cm</p><p>E.U.T AC power LISN Filter AC power EMI Receiver</p><p>Test table/Insulation plane</p><p>Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>														
Test Mode:	TX Mode														
Test Procedure:	<div><div>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.</div><div>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).</div><div>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.</div></div>														
Test Result:	PASS														

## 6.2.2. Test Instruments

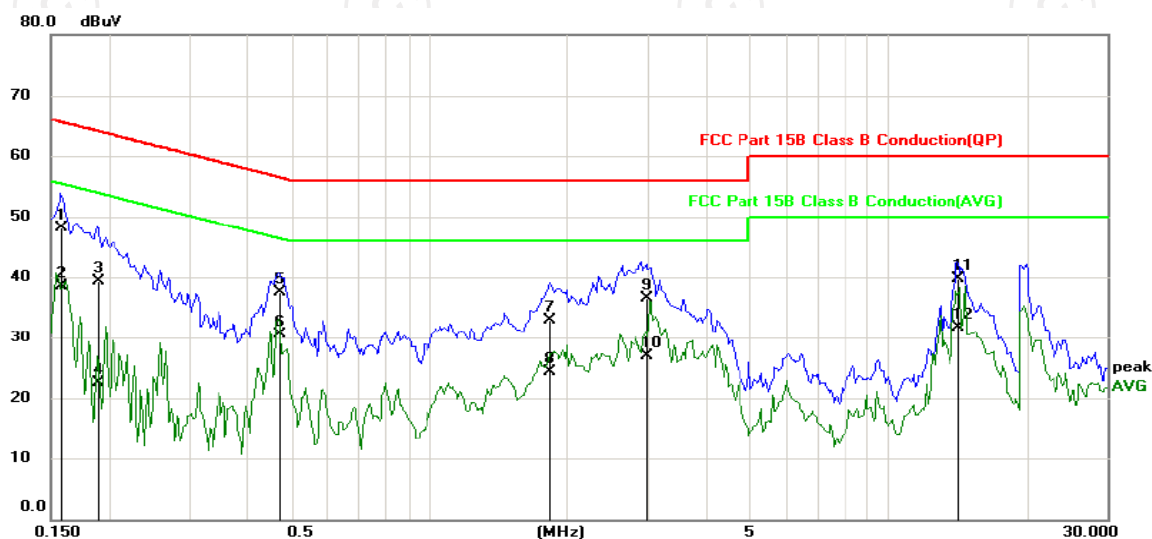
Conducted Emission Shielding Room Test Site (843)				
Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESCS30	100139	Aug. 11, 2017
LISN	Schwarzbeck	NSLK 8126	8126453	Aug. 16, 2017
Coax cable	TCT	CE-05	N/A	Aug. 11, 2017
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

**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: 26  
Limit: FCC Part 15B Class B Conduction (QP) Power: AC 120V/60Hz Humidity: 60 %

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1578	36.69	11.49	48.18	65.58	-17.40	QP	
2		0.1578	26.92	11.49	38.41	55.58	-17.17	AVG	
3		0.1891	27.90	11.48	39.38	64.08	-24.70	QP	
4		0.1891	11.10	11.48	22.58	54.08	-31.50	AVG	
5		0.4703	26.20	11.32	37.52	56.51	-18.99	QP	
6	*	0.4703	19.20	11.32	30.52	46.51	-15.99	AVG	
7		1.8375	21.19	11.62	32.81	56.00	-23.19	QP	
8		1.8375	12.78	11.62	24.40	46.00	-21.60	AVG	
9		2.9859	25.07	11.35	36.42	56.00	-19.58	QP	
10		2.9859	15.59	11.35	26.94	46.00	-19.06	AVG	
11		14.1875	28.15	11.63	39.78	60.00	-20.22	QP	
12		14.1875	20.06	11.63	31.69	50.00	-18.31	AVG	

#### Note:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

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

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

Limit (dBuV) = Limit stated in standard

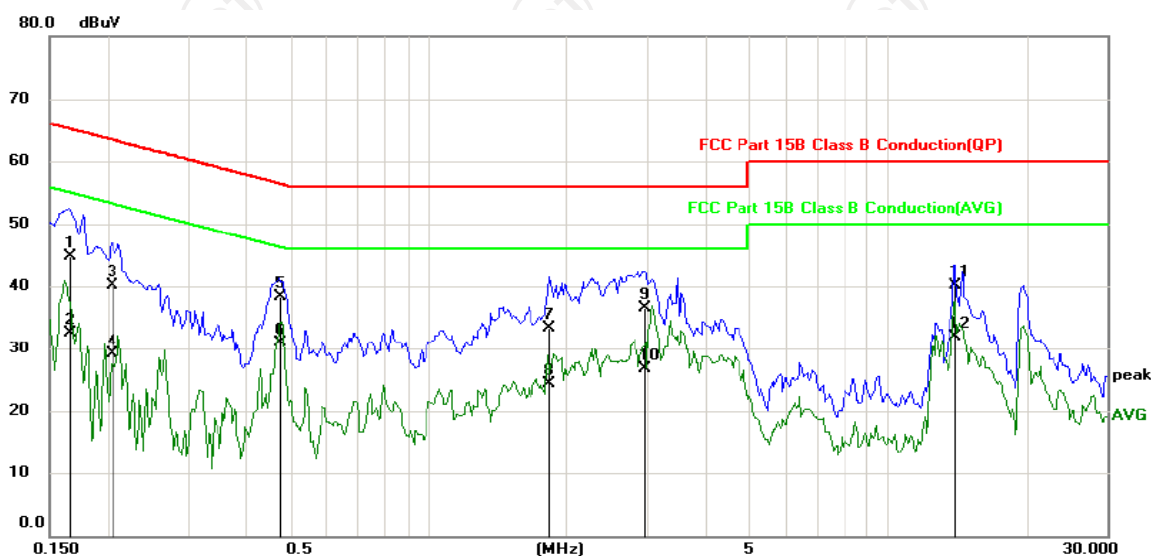
Margin (dB) = Measurement (dBuV) - Limits (dBuV)

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: 26  
Limit: FCC Part 15B Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1655	33.16	11.49	44.65	65.18	-20.53	QP	
2		0.1655	21.00	11.49	32.49	55.18	-22.69	AVG	
3		0.2047	28.69	11.47	40.16	63.42	-23.26	QP	
4		0.2047	17.54	11.47	29.01	53.42	-24.41	AVG	
5		0.4742	27.07	11.32	38.39	56.44	-18.05	QP	
6	*	0.4742	19.62	11.32	30.94	46.44	-15.50	AVG	
7		1.8375	21.75	11.62	33.37	56.00	-22.63	QP	
8		1.8375	12.78	11.62	24.40	46.00	-21.60	AVG	
9		2.9619	25.21	11.36	36.57	56.00	-19.43	QP	
10		2.9619	15.25	11.36	26.61	46.00	-19.39	AVG	
11		13.9883	28.43	11.61	40.04	60.00	-19.96	QP	
12		13.9883	20.34	11.61	31.95	50.00	-18.05	AVG	

### Note:

Freq. = Emission frequency in MHz

Reading level (dBuV) = Receiver reading

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

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

Limit (dBuV) = Limit stated in standard

Margin (dB) = Measurement (dBuV) - Limits (dBuV)

Q.P. =Quasi-Peak

AVG =average

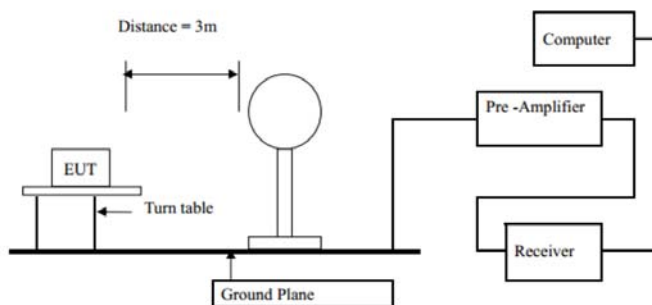
\* is meaning the worst frequency has been tested in the frequency range 150 kHz to 30MHz.

## 6.3. Radiated Spurious Emission Measurement

### 6.3.1. Test Specification

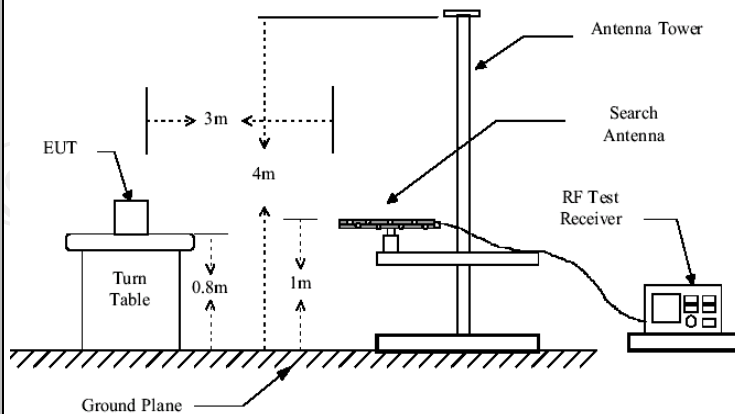
<b>Test Requirement:</b>	FCC Part15 C Section 15.209			
<b>Test Method:</b>	ANSI C63.10:2013			
<b>Frequency Range:</b>	9 kHz to 25 GHz			
<b>Measurement Distance:</b>	3 m			
<b>Antenna Polarization:</b>	Horizontal & Vertical			
<b>Operation mode:</b>	Transmitting mode with modulation			
<b>Receiver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

For radiated emissions below 30MHz

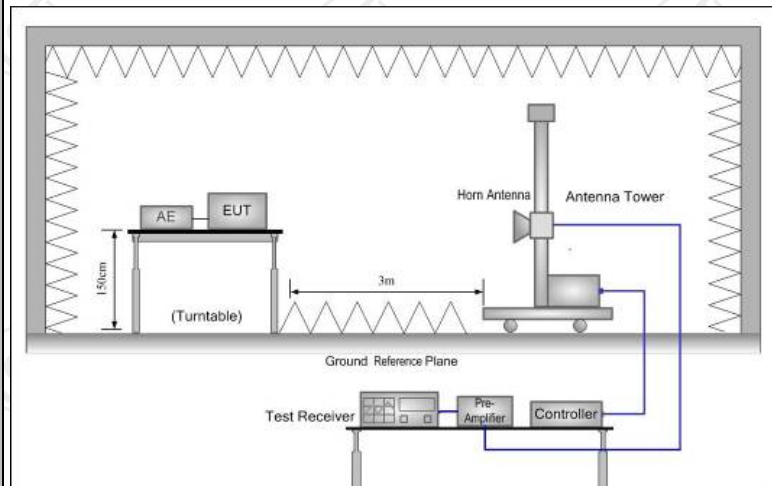




## 30MHz to 1GHz



## Above 1GHz



## Test Procedure:

1. The testing follows ANSI C63.10:2013.
2. 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,

	<p>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.</p> <p>3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level</p> <p>4. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.</p> <p>5. Use the following spectrum analyzer settings:</p> <p>(1) Span shall wide enough to fully capture the emission being measured;</p> <p>(2) Set RBW=100 kHz for <math>f &lt; 1 \text{ GHz}</math>; <math>\text{VBW} \geq \text{RBW}</math>; Sweep = auto; Detector function = peak; Trace = max hold;</p> <p>(3) Set RBW = 1 MHz, VBW= 3MHz for <math>f \geq 1 \text{ GHz}</math> for peak measurement.</p> <p>For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. <math>\text{VBW} \geq 1/T</math>, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.</p>
Test results:	PASS

### 6.3.2. Test Instruments

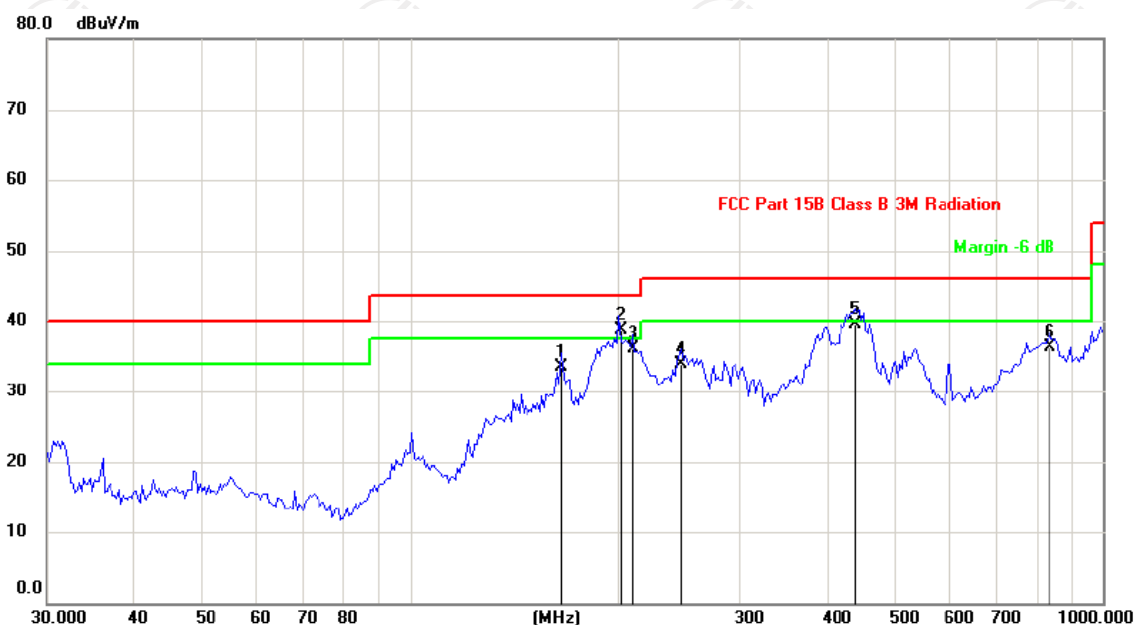
Radiated Emission Test Site (966)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESPI Test Receiver	ROHDE&SCHW ARZ	ESVD	100008	Aug. 11, 2017
Spectrum Analyzer	ROHDE&SCHW ARZ	FSEM	848597/001	Aug. 11, 2017
Spectrum Analyzer	Agilent	N9020A	MY49100060	Aug. 12, 2017
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Aug. 11, 2017
Pre-amplifier	HP	8447D	2727A05017	Aug. 11, 2017
Loop antenna	ZHINAN	ZN30900A	12024	Aug. 13, 2017
Broadband Antenna	Schwarzbeck	VULB9163	340	Aug. 13, 2017
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Aug. 13, 2017
Horn Antenna	Schwarzbeck	BBHA 9170	373	Aug. 13, 2017
Coax cable	TCT	RE-low-01	N/A	Aug. 11, 2017
Coax cable	TCT	RE-high-02	N/A	Aug. 11, 2017
Coax cable	TCT	RE-low-03	N/A	Aug. 11, 2017
Coax cable	TCT	RE-High-04	N/A	Aug. 11, 2017
Antenna Mast	CCS	CC-A-4M	N/A	Aug. 12, 2017
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A
Semi anechoic chamber	SAEMC	Chamber-#1	DQM0274	Aug. 12, 2017

**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

Please refer to following diagram for individual  
Below 1GHz

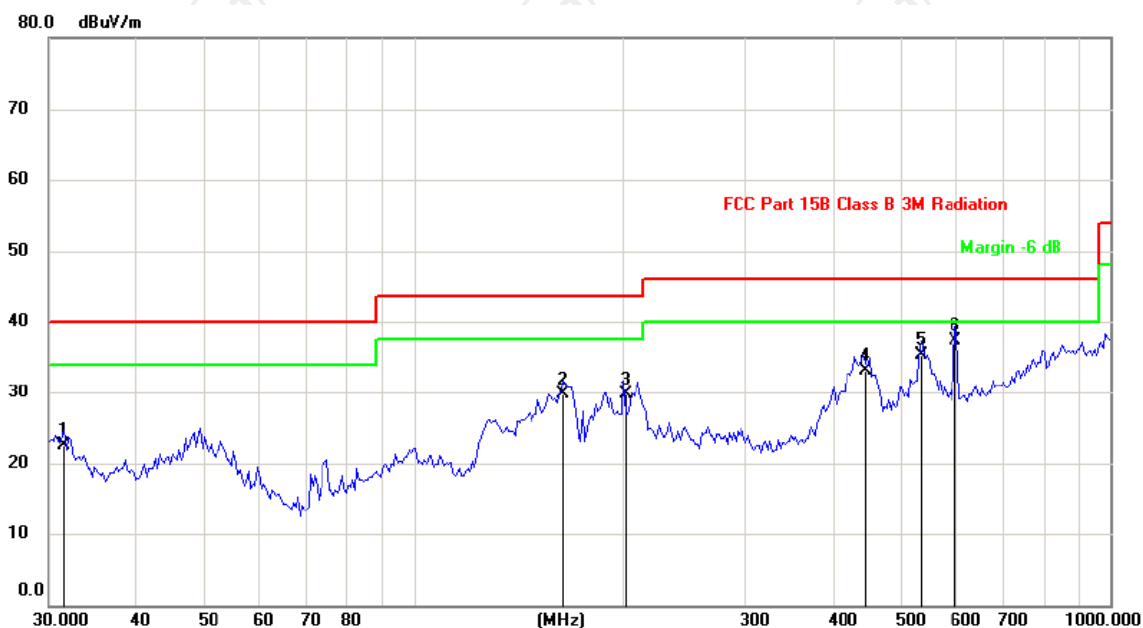
Horizontal:



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

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		165.4714	47.60	-14.07	33.53	43.50	-9.97	QP		
2	*	200.0432	50.40	-11.67	38.73	43.50	-4.77	QP		
3		210.1294	47.40	-11.33	36.07	43.50	-7.43	QP		
4		246.9901	44.00	-10.06	33.94	46.00	-12.06	QP		
5		439.4730	44.50	-4.92	39.58	46.00	-6.42	QP		
6		838.8868	34.30	1.93	36.23	46.00	-9.77	QP		

Vertical:



Site

Polarization: **Vertical**

Temperature: 25

Limit: FCC Part 15B Class B 3M Radiation

Power: AC 120V/60Hz

Humidity: 55 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		31.5125	36.10	-13.53	22.57	40.00	-17.43	QP		
2		164.3129	43.90	-14.16	29.74	43.50	-13.76	QP		
3		200.0432	41.30	-11.67	29.63	43.50	-13.87	QP		
4		442.5722	38.00	-4.82	33.18	46.00	-12.82	QP		
5		535.0376	38.00	-2.60	35.40	46.00	-10.60	QP		
6	*	598.7066	39.20	-1.95	37.25	46.00	-8.75	QP		

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

2. Measurements were conducted in all three channels (high, middle, low) and all modulation (802.11b, 802.11g, 802.11n(HT20), 802.11n(HT40)), and the worst case Mode (Lowest 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	45.24	-4.20	41.04	74.00	54.00
2377.38	H	46.43	-4.10	42.33	74.00	54.00
2390	H	51.49	-3.94	47.55	74.00	54.00
2310	V	42.08	-4.20	37.88	74.00	54.00
2377.38	V	52.80	-4.10	48.70	74.00	54.00
2390	V	51.06	-3.94	47.12	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	52.99	-3.60	49.39	74.00	54.00
2487.09	H	44.54	-3.50	41.04	74.00	54.00
2500	H	41.01	-3.34	37.67	74.00	54.00
2483.5	V	53.50	-3.60	49.90	74.00	54.00
2487.09	V	46.03	-3.50	42.53	74.00	54.00
2500	V	41.61	-3.34	38.27	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	47.07	-4.20	42.87	74.00	54.00
2388.96	H	51.11	-4.12	46.99	74.00	54.00
2390	H	53.58	-3.94	49.64	74.00	54.00
2310	V	40.32	-4.20	36.12	74.00	54.00
2388.96	V	48.20	-4.12	44.08	74.00	54.00
2390	V	51.44	-3.94	47.5	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	53.49	-3.6	49.89	74.00	54.00
2487.59	H	49.54	-3.52	46.02	74.00	54.00
2500	H	46.84	-3.34	43.50	74.00	54.00
2483.5	V	50.70	-3.60	47.10	74.00	54.00
2487.59	V	46.91	-3.52	43.39	74.00	54.00
2500	V	45.62	-3.34	42.28	74.00	54.00

Modulation Type: 802.11n(20MHz)

Low channel: 2412 MHz						
Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	Correction Factor (dB/m)	Peak Final Emission Level	Peak limit (dBμV/m)	AV limit (dBμV/m)
2310	H	45.69	-4.20	41.49	74.00	54.00
2388.01	H	54.31	-4.10	50.21	74.00	54.00
2390	H	53.01	-3.94	49.07	74.00	54.00
2310	V	46.54	-4.20	42.34	74.00	54.00
2388.01	V	54.33	-4.10	50.23	74.00	54.00
2390	V	51.01	-3.94	47.07	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	55.34	-3.60	51.74	74.00	54.00
2392.55	H	52.85	-3.50	49.35	74.00	54.00
2500	H	46.76	-3.34	43.42	74.00	54.00
2483.5	V	52.09	-3.60	48.49	74.00	54.00
2392.55	V	50.03	-3.50	46.53	74.00	54.00
2500	V	49.12	-3.34	45.78	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	50.97	-4.20	46.77	74.00	54.00
2387.85	H	55.16	-4.10	51.06	74.00	54.00
2390	H	52.83	-3.94	48.89	74.00	54.00
2310	V	51.71	-4.20	47.51	74.00	54.00
2389.98	V	51.03	-4.10	46.93	74.00	54.00
2390	V	49.95	-3.94	46.01	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	52.23	-3.60	48.63	74.00	54.00
2493.51	H	53.61	-3.50	50.11	74.00	54.00
2500	H	49.23	-3.34	45.89	74.00	54.00
2493.51	V	53.43	-3.60	49.83	74.00	54.00
2489.36	V	52.48	-3.46	49.02	74.00	54.00
2500	V	50.49	-3.34	47.15	74.00	54.00

**Note:**

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



## Above 1GHz

Modulation Type: 802.11b

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	46.09	---	0.66	46.75	---	74	54	-7.25
7236	H	39.67	---	9.5	49.17	---	74	54	-4.83
---	H	---	---	---	---	---	---	---	---
4824	V	46.42	---	0.66	47.08	---	74	54	-6.92
7236	V	37.82	---	9.5	47.32	---	74	54	-6.68
---	V	---	---	---	---	---	---	---	---

Middle channel: 2437MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4874	H	45.15	---	0.99	46.14	---	74	54	-7.86
7311	H	40.51	---	9.85	50.36	---	74	54	-3.64
---	H	---	---	---	---	---	---	---	---
4874	V	47.61	---	0.99	48.60	---	74	54	-5.40
7311	V	38.25	---	9.85	48.10	---	74	54	-5.90
---	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	46.11	---	1.33	47.44	---	74	54	-6.56
7386	H	39.37	---	10.22	49.59	---	74	54	-4.41
---	H	---	---	---	---	---	---	---	---
4924	V	45.70	---	1.33	47.03	---	74	54	-6.97
7386	V	35.40	---	10.22	45.62	---	74	54	-8.38
---	V	---	---	---	---	---	---	---	---

### Note:

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



Modulation Type: 802.11g

Low channel: 2412 MHz

Frequency (MHz)	Ant. Pol. H/V	Peak reading (dBμV)	AV reading (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	48.10	---	0.75	48.85	---	74	54	-5.15
7236	H	40.45	---	9.87	50.32	---	74	54	-3.68
---	H	---	---	---	---	---	---	---	---
4824	V	47.33	---	0.75	48.08	---	74	54	-5.92
7236	V	40.62	---	9.87	50.49	---	74	54	-3.51
---	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	47.70	---	0.97	48.67	---	74	54	-5.33
7311	H	40.41	---	9.83	50.24	---	74	54	-3.76
---	H	---	---	---	---	---	---	---	---
4874	V	46.95	---	0.97	47.92	---	74	54	-6.08
7311	V	40.47	---	9.83	50.30	---	74	54	-3.70
---	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	47.10	---	1.18	48.28	---	74	54	-5.72
7386	H	40.10	---	10.07	50.17	---	74	54	-3.83
---	H	---	---	---	---	---	---	---	---
4924	V	46.71	---	1.18	47.89	---	74	54	-6.11
7386	V	40.01	---	10.07	50.08	---	74	54	-3.92
---	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 (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4824	H	47.61	---	1.33	48.94	---	74	54	-5.06
7236	H	38.06	---	10.22	48.28	---	74	54	-5.72
---	H	---	---	---	---	---	---	---	---
4824	V	45.57	---	1.33	46.90	---	74	54	-7.10
7236	V	36.43	---	10.22	46.65	---	74	54	-7.35
---	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	45.34	---	0.99	46.33	---	74	54	-7.67
7311	H	39.86	---	9.85	49.71	---	74	54	-4.29
---	H	---	---	---	---	---	---	---	---
4874	V	45.51	---	0.99	46.50	---	74	54	-7.50
7311	V	38.03	---	9.85	47.88	---	74	54	-6.12
---	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	44.05	---	1.33	45.38	---	74	54	-8.62
7386	H	37.11	---	10.22	47.33	---	74	54	-6.67
---	H	---	---	---	---	---	---	---	---
4924	V	43.50	---	1.33	44.83	---	74	54	-9.17
7386	V	37.29	---	10.22	47.51	---	74	54	-6.49
---	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 (dBμV)	Correction Factor (dB/m)	Emission Level		Peak limit (dBμV/m)	AV limit (dBμV/m)	Margin (dB)
					Peak (dBμV/m)	AV (dBμV/m)			
4844	H	45.82	---	0.66	46.48	---	74	54	-7.52
7266	H	39.13	---	9.5	48.63	---	74	54	-5.37
---	H	---	---	---	---	---	---	---	---
4824	V	44.69	---	0.66	45.35	---	74	54	-8.65
7236	V	36.84	---	9.5	46.34	---	74	54	-7.66
---	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	44.64	---	0.99	45.63	---	74	54	-8.37
7311	H	37.49	---	9.85	47.34	---	74	54	-6.66
---	H	---	---	---	---	---	---	---	---
4874	V	45.47	---	0.99	46.46	---	74	54	-7.54
7311	V	37.66	---	9.85	47.51	---	74	54	-6.49
---	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	45.04	---	1.33	46.37	---	74	54	-7.63
7356	H	37.17	---	10.22	47.39	---	74	54	-6.61
---	H	---	---	---	---	---	---	---	---
4904	V	43.33	---	1.33	44.66	---	74	54	-9.34
7356	V	37.40	---	10.22	47.62	---	74	54	-6.38
---	V	---	---	---	---	---	---	---	---

**Note:**

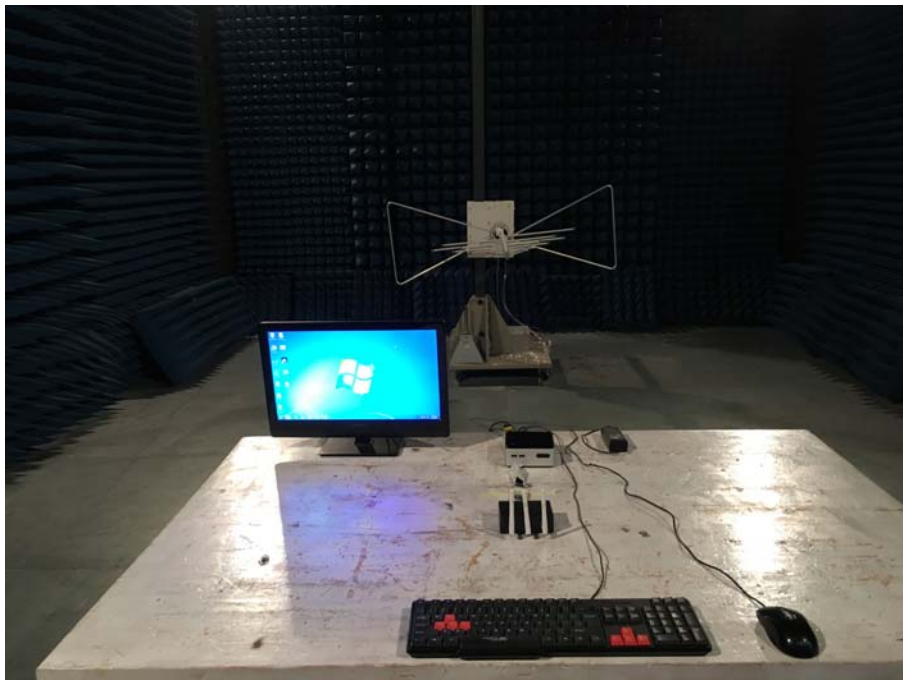
1. Emission Level=Peak Reading + Correction Factor; Correction Factor=Antenna Factor + Cable loss – Pre-amplifier
2. Margin (dB) = Emission Level (Peak) (dBμV/m)-Average limit (dBμV/m)
3. The emission levels of other frequencies are very lower than the limit and not show in test report.
4. Measurements 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: Photographs of Test Setup

Product: Wi-Fi® Radio Transceiver

Model: NM-DB-3NU

Radiated Emission

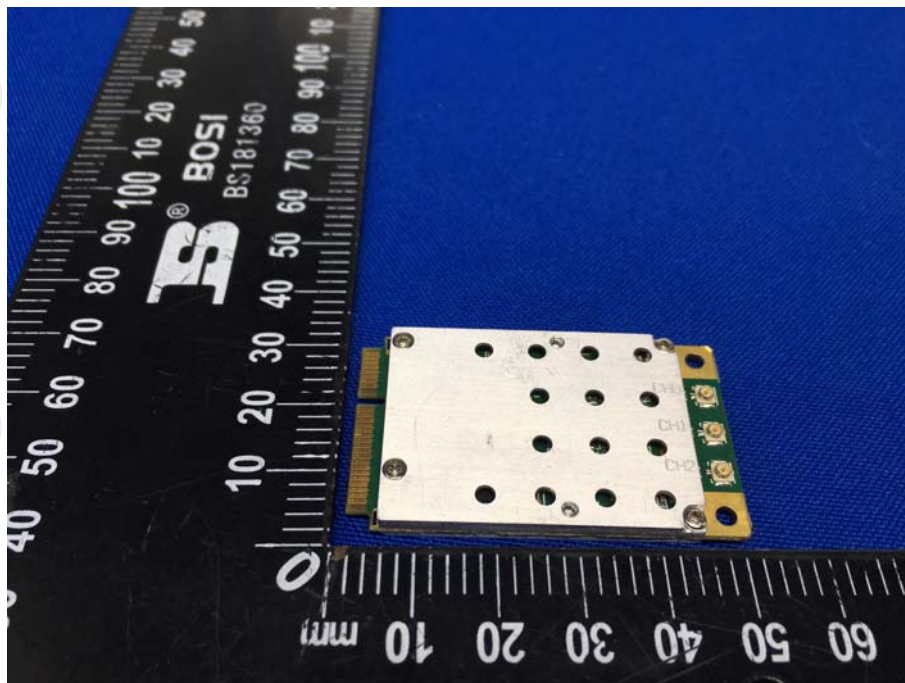


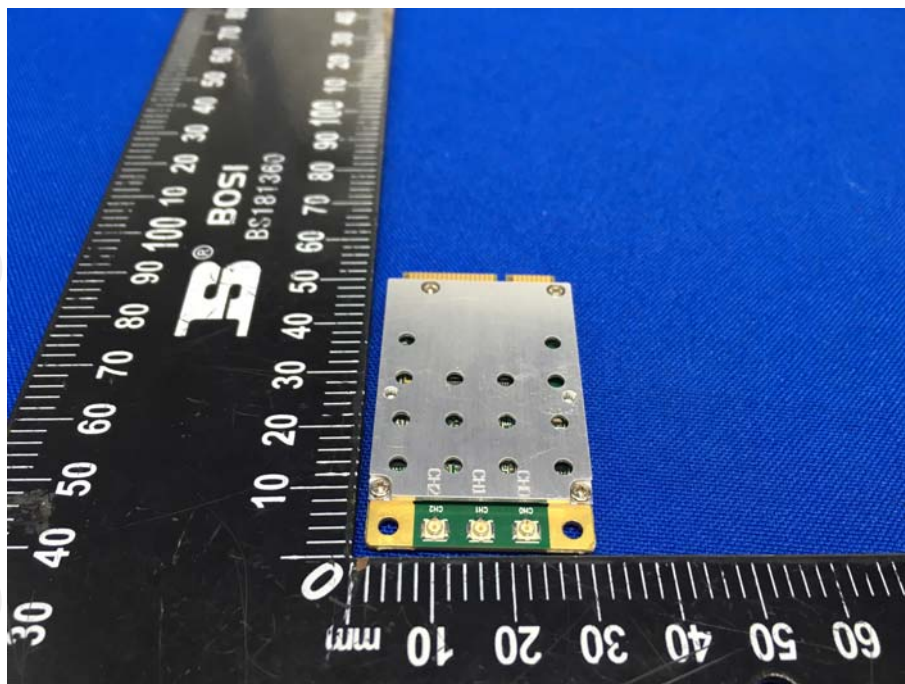
## Conducted Emission



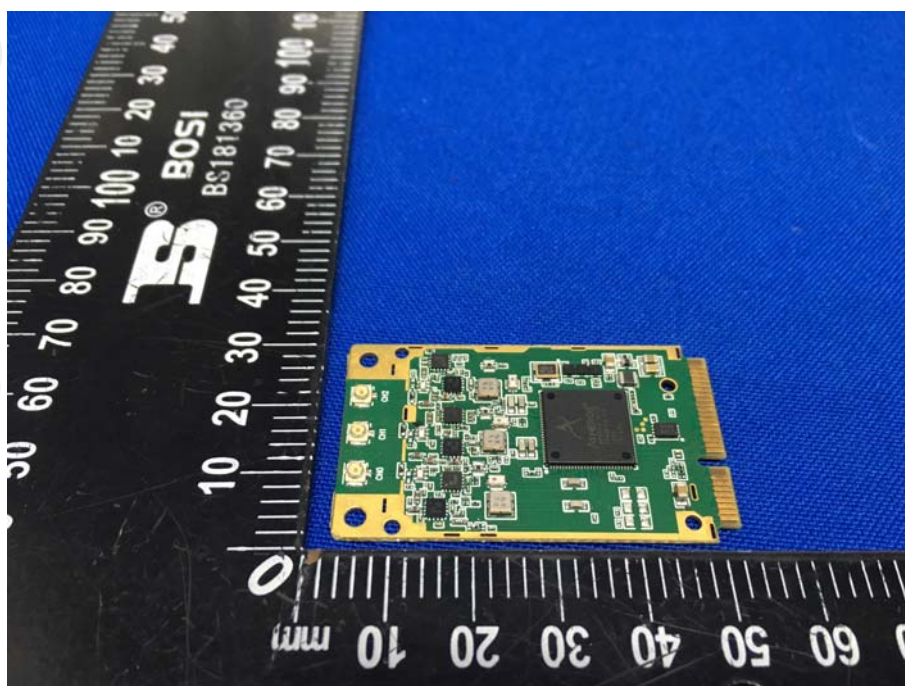
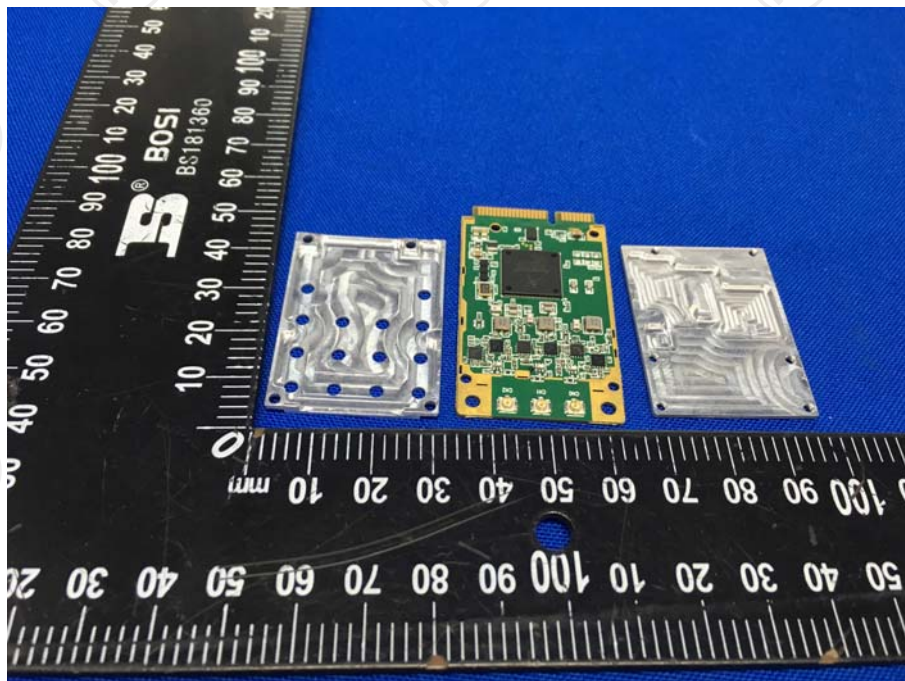


**Appendix B: Photographs of EUT**  
**Product: Wi-Fi® Radio Transceiver**  
**Model: NM-DB-3NU**  
**External Photos**

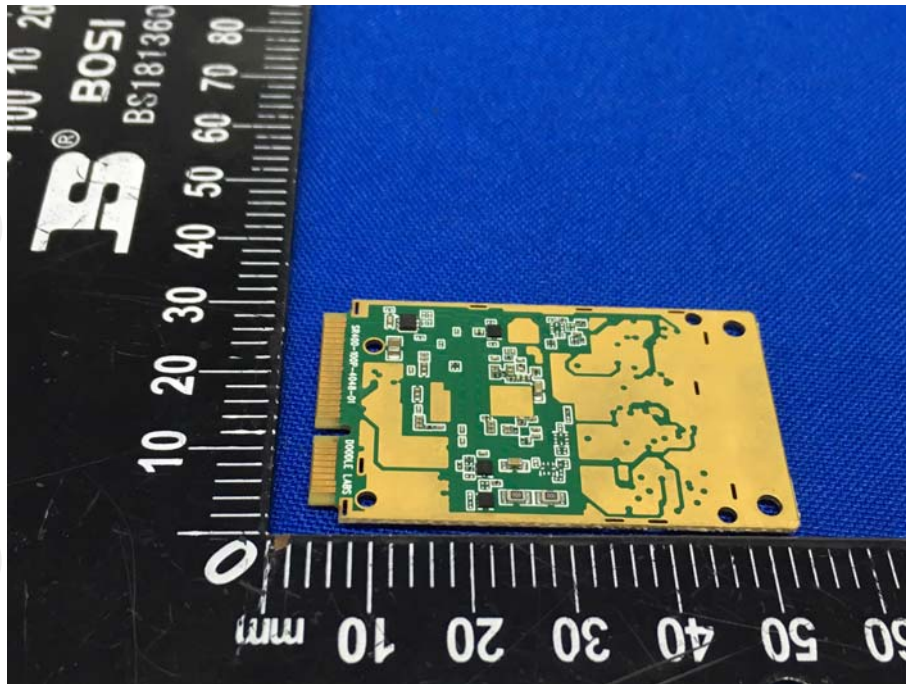




**Product: Wi-Fi® Radio Transceiver**  
**Model: NM-DB-3NU**  
**Internal Photos**







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