FCC PART 15.249

TEST REPORT

For

Ningbo Pdlux Electronic Technology CO.,LTD.

17F, Commerce building of Ningbo, No 588, south Tiantong road,yinzhou district Ningbo China 315000

FCC ID: 2AIWW-PD-V11-H

Report Type:	**Product Type:**
Original Report	Microwave Sensor
Test Engineer:	Matt Yao
Report Number:	RKSA190610001-00A
Report Date:	2019-06-26
Reviewed By:	Oscar Ye RF Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant:	Ningbo Pdlux Electronic Technology CO.,LTD.
Tested Model:	PD-V11-H
Product Type:	Microwave Sensor
Dimension:	25mm(L)*25mm(W)*7mm(H)
Power Supply:	DC 3.0-5.25V

**All measurement and test data in this report was gathered from production sample serial number: 20190610001. (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-06-10.)*

Objective

This type approval report is prepared on behalf of *Ningbo Pdlux Electronic Technology CO.,LTD.* in accordance with Part 2-Subpart J, and Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

Related Submittal(s)/Grant(s)

No Related Submittal(s)/Grant(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	5.65dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

Channel list:

Channel	Frequency (GHz)
1	24.1

EUT Exercise Software

No software was used during the test.

Support Equipment List and Details

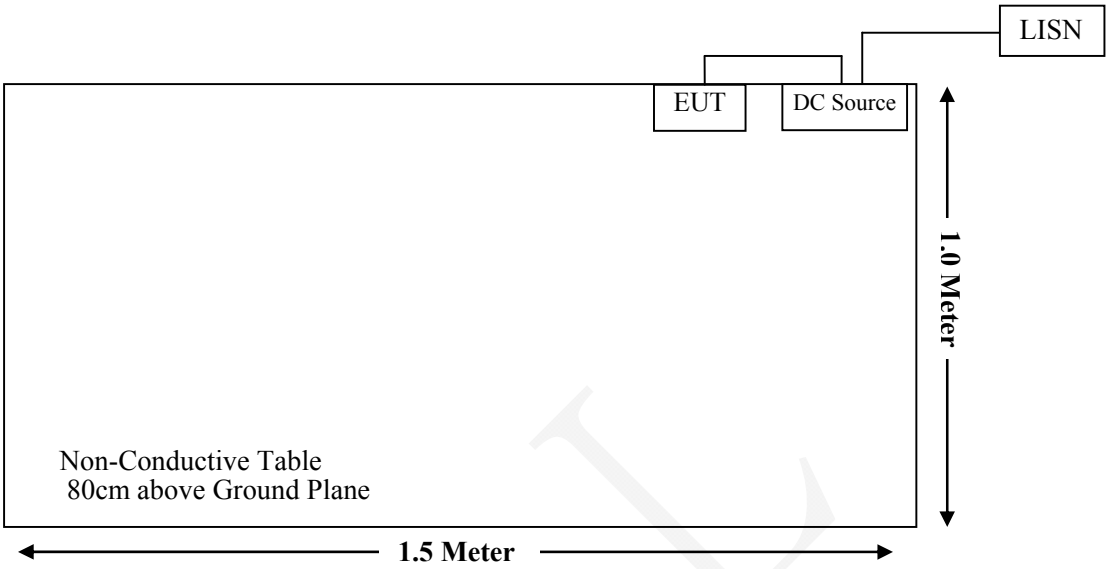
Manufacturer	Description	Model	Serial Number
BEST	DC Power Supply	PS-1502D+	DC001
ZHAOXIN	DC Power Supply	RXN-605D	DC002

External I/O Cable

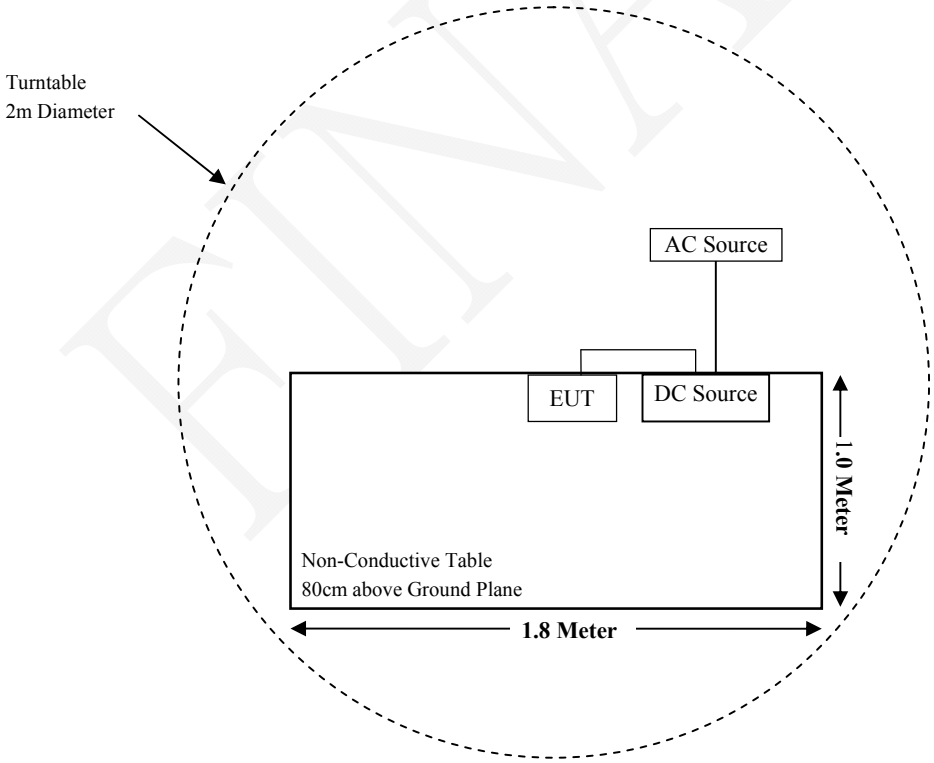
Cable Description	Length (m)	From Port	To
Power Cable	0.8	EUT	DC Source
Power Cable	1.0	DC Source	AC Source

Block Diagram of Test Setup

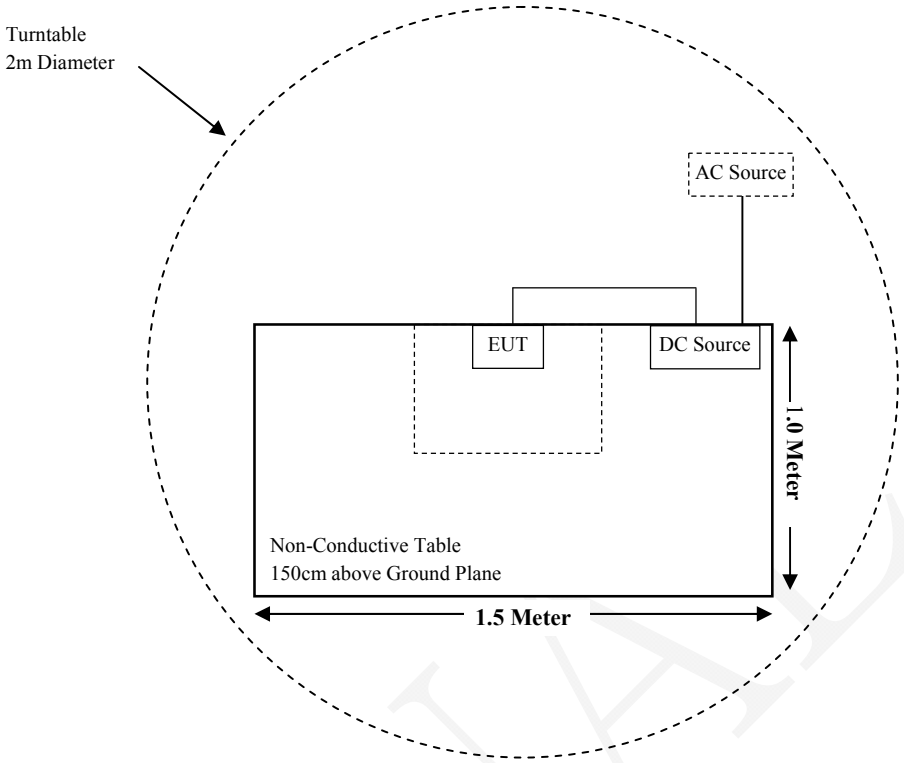
For Conducted Emissions:



For Radiated Emissions(Below 1GHz) :



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conduction Emissions	Compliant
15.205, §15.209, §15.249	Radiated Emissions& Out of Band Emission	Compliant
§15.215 (c)	20 dB Bandwidth	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2018-11-30	2019-11-29
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Sonoma Instrunent	Pre-amplifier	310N	171205	2018-08-14	2019-08-13
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2018-08-15	2019-08-14
BEST	DC Power Supply	PS-1502D+	DC001	2018-10-10	2019-10-09
ZHAOXIN	DC Power Supply	RXN-605D	DC002	2018-10-10	2019-10-09
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2018-08-27	2019-08-26
Rohde & Schwarz	Signal Analyzer	FSV40	101116	2018-07-23	2019-07-22
Rohde & Schwarz	EMI Test Receiver	ESIB26	100146	2018-11-30	2019-11-29
Agilent	Spectrum Analyzer	8565E	3442A0253	2018-10-25	2019-10-24
ETS-LINDGREN	Horn Antenna	3115	9207-3900	2017-07-15	2020-07-14
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-12-12	2019-12-11
OML	Harmonic Mixer	WR19/M19HWD	U60313-1	2016-10-14	2019-10-14
OML	Horn Antenna	M19RH	11648-01	2016-10-14	2019-10-14
Agilent	Harmonic Mixer	11970V	2521A01767	2016-12-07	2019-12-07
Flann Micowave	Horn Antenna	861V/385	736	2016-12-07	2019-12-07
OML	Harmonic Mixer	WR12/M12HWD	E60120-1	2016-10-19	2019-10-19
OML	Horn Antenna	M12RH	E60120-2	2016-10-19	2019-10-19
OML	Harmonic Mixer	WR08/M08HWD	F60313-1	2016-10-24	2019-10-24
OML	Horn Antenna	M08RH	F60313-2	2016-10-24	2019-10-24
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
EM Electronics Corporation	Amplifier	EM18G40G	060726	2019-03-20	2020-03-19
Narda	Attenuator	10dB	010	2018-08-15	2019-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2018-08-15	2019-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2018-08-15	2019-08-14

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	834115/007	2018-11-30	2019-11-29
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2018-11-30	2019-11-29
Audix	Test Software	e3	V9	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2019-01-10	2020-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2018-08-15	2019-08-14

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

Antenna Connector Construction

The EUT has two PCB antennas,one is TX,the other is RX and antennas gain are 0dBi, which was permanently attached, fulfill the requirement of this section, please refer to the EUT photos.

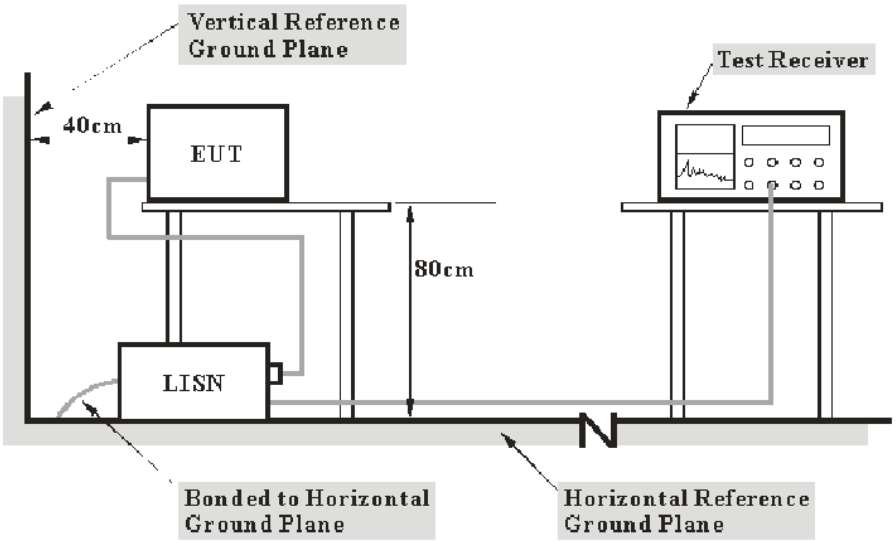
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the DC Source was connected to the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected Factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Corrected Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7dB means the emission is 7 dB above the limit. The equation for Over Limit calculation is as follows:

Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

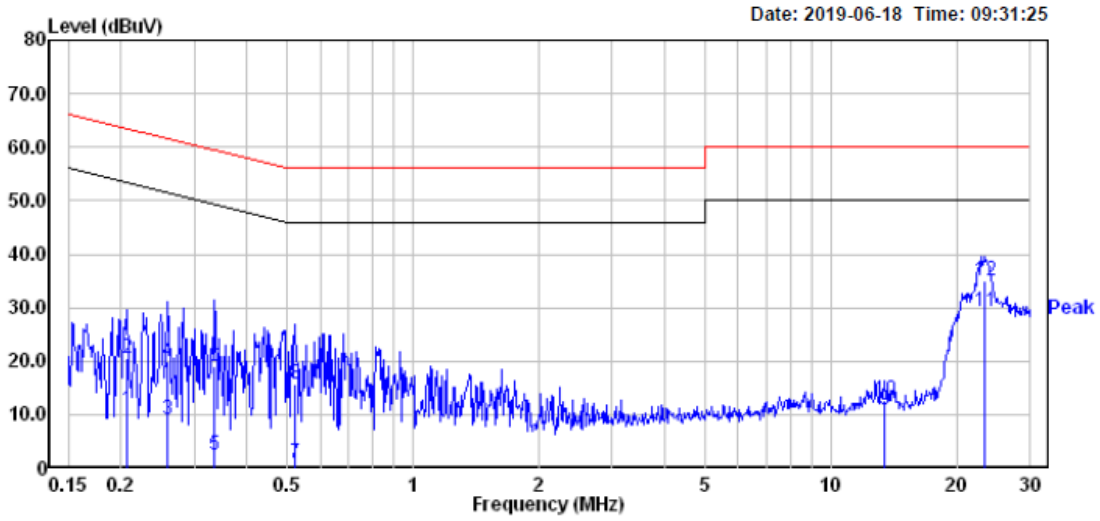
Environmental Conditions

Temperature:	22°C
Relative Humidity:	50 %
ATM Pressure:	101.2kPa

The testing was performed by Matt Yao on 2019-06-18.

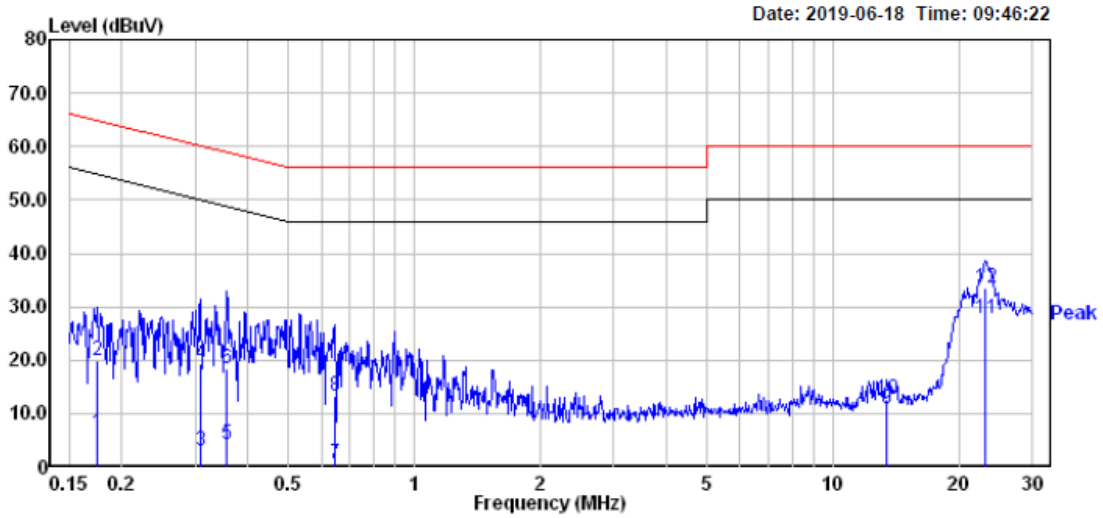
EUT operation mode: Transmitting

AC 120V/60 Hz, Line



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.206	-5.20	16.09	10.89	53.36	-42.47	Average
2	0.206	4.40	16.09	20.49	63.36	-42.87	QP
3	0.258	-6.90	16.09	9.19	51.51	-42.32	Average
4	0.258	3.80	16.09	19.89	61.51	-41.62	QP
5	0.336	-13.60	16.08	2.48	49.31	-46.83	Average
6	0.336	2.80	16.08	18.88	59.31	-40.43	QP
7	0.521	-15.10	16.02	0.92	46.00	-45.08	Average
8	0.521	-0.30	16.02	15.72	56.00	-40.28	QP
9	13.479	-4.80	15.81	11.01	50.00	-38.99	Average
10	13.479	-3.00	15.81	12.81	60.00	-47.19	QP
11	23.387	13.21	15.93	29.14	50.00	-20.86	Average
12	23.387	19.00	15.93	34.93	60.00	-25.07	QP

AC 120V/60 Hz, Neutral



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.174	-9.90	16.10	6.20	54.77	-48.57	Average
2	0.174	3.70	16.10	19.80	64.77	-44.97	QP
3	0.308	-13.20	16.09	2.89	50.02	-47.13	Average
4	0.308	3.20	16.09	19.29	60.02	-40.73	QP
5	0.356	-11.80	16.06	4.26	48.83	-44.57	Average
6	0.356	2.50	16.06	18.56	58.83	-40.27	QP
7	0.644	-15.40	16.00	0.60	46.00	-45.40	Average
8	0.644	-2.70	16.00	13.30	56.00	-42.70	QP
9	13.479	-5.00	15.81	10.81	50.00	-39.19	Average
10	13.479	-3.10	15.81	12.71	60.00	-47.29	QP
11	23.140	11.90	15.95	27.85	50.00	-22.15	Average
12	23.140	17.60	15.95	33.55	60.00	-26.45	QP

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

FCC§15.205, §15.209&§15.249- RADIATED EMISSIONS& OUT OF BAND EMISSION

Applicable Standard

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

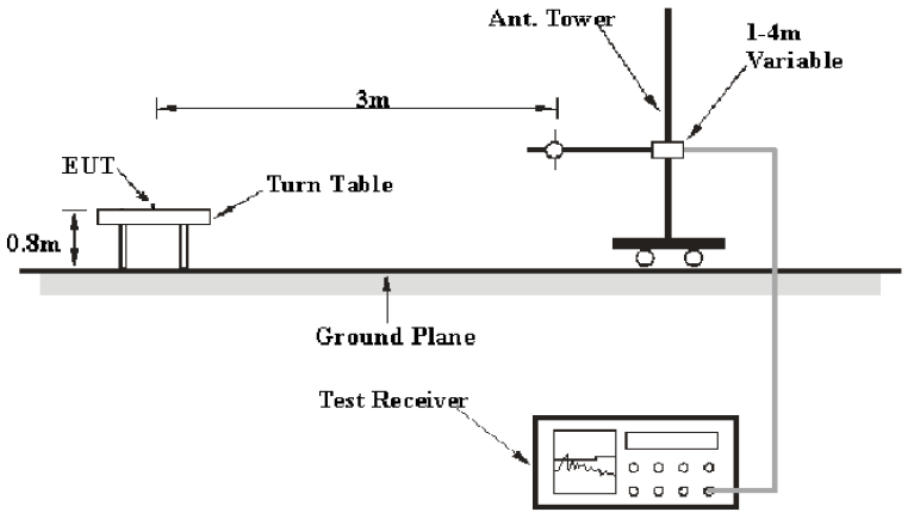
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

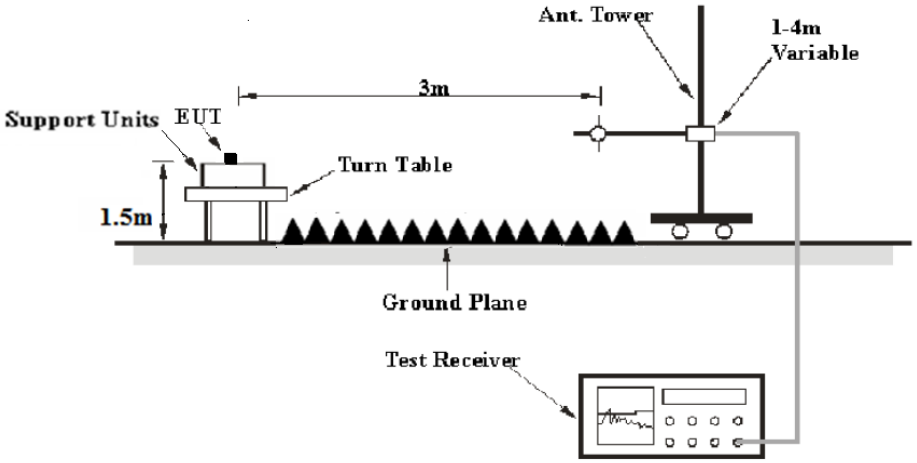
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

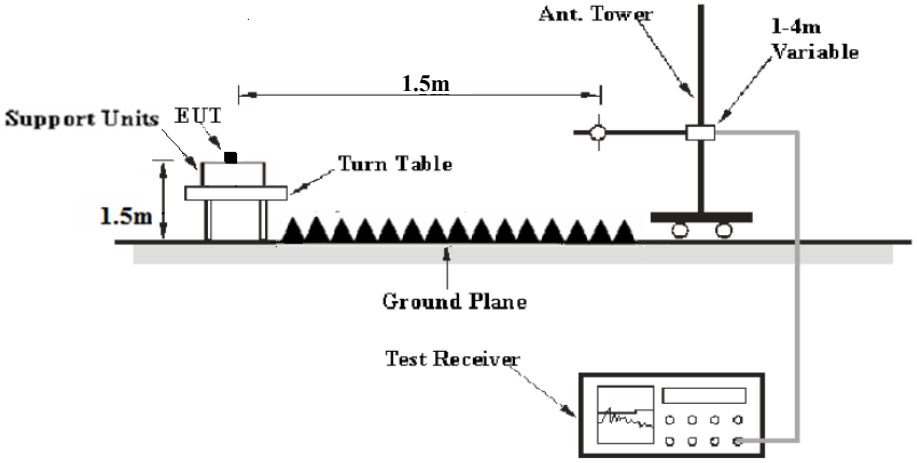
Below 1 GHz:



1 GHz-18GHz:



18 GHz-100GHz:



The radiated emission and out of band emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209/15.205 and FCC 15.249 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

Test Equipment Setup

The system was investigated from 30 MHz to 100 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1GHz	1MHz	3 MHz	/	PK
	1MHz	3 MHz	/	Ave

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude (dBμV /m) = Meter Reading (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amplifier Gain (dB)

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin (dB) = Limit (dBμV/m) – Corrected Amplitude (dBμV /m)

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 &15.205 & 15.249.

Test Data

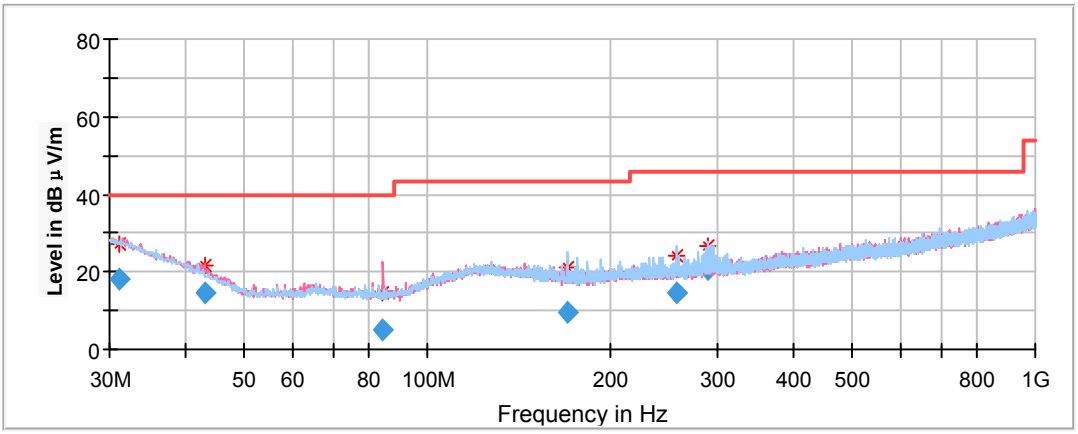
Environmental Conditions

Temperature:	24.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2kPa

The testing was performed by Matt Yao on 2019-06-19.

Test Mode: Transmitting (Scan with X-Axis, Y-Axis and Z-Axis position, the worst case Z-Axis was recorded)

30MHz-1G

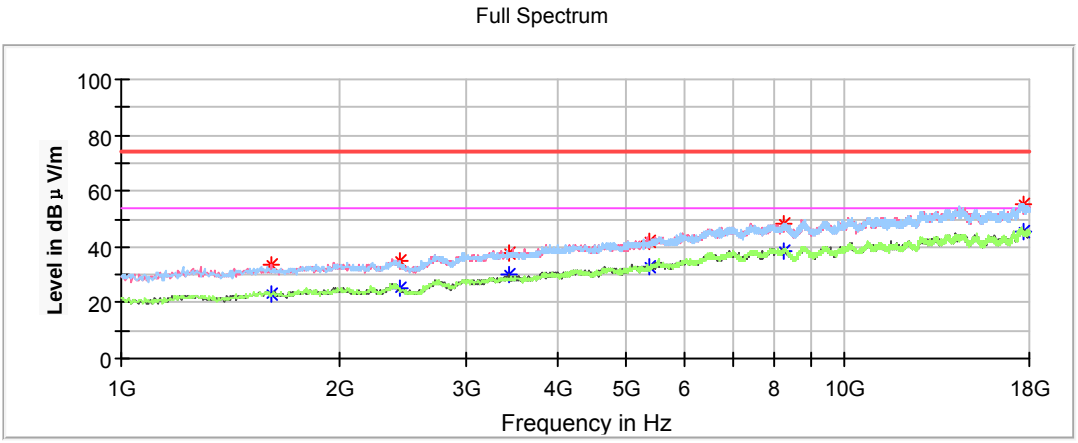


Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corr. (dB)	Limit (dBµV/m)	Margin (dB)
	QuasiPeak (dB µ V/m)	Height (cm)	Polar (H/V)				
31.040500	18.27	199.0	V	127.0	-4.6	40.00	21.73
43.088050	14.66	101.0	V	303.0	-12.8	40.00	25.34
84.459300	4.93	101.0	V	168.0	-17.6	40.00	35.07
170.543750	9.81	199.0	H	272.0	-13.2	43.50	33.69
256.556800	14.54	101.0	H	155.0	-11.9	46.00	31.46
289.277800	20.52	101.0	H	202.0	-10.8	46.00	25.48

1GHz-18GHz

Note:
1. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
   Corrected Amplitude = Corrected Factor + Reading
   Margin = Limit - Corrected. Amplitude
2. The other spurious emission which is 20dB to the limit was not recorded.

Channel 1 (24.1GHz)



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corr. (dB)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
1612.000000	33.49	---	250.0	V	11.0	-9.6	74.00	40.51
1612.000000	---	23.18	250.0	V	11.0	-9.6	54.00	30.82
2421.200000	35.17	---	200.0	H	0.0	-7.1	74.00	38.83
2421.200000	---	24.83	200.0	H	0.0	-7.1	54.00	29.17
3431.000000	---	29.84	200.0	V	0.0	-3.7	54.00	24.16
3431.000000	38.08	---	200.0	V	0.0	-3.7	74.00	35.92
5386.000000	---	32.66	100.0	H	119.0	1.0	54.00	21.34
5386.000000	42.07	---	100.0	H	119.0	1.0	74.00	31.93
8252.200000	---	38.66	100.0	H	9.0	6.7	54.00	15.34
8252.200000	48.06	---	100.0	H	9.0	6.7	74.00	25.94
17629.400000	---	45.17	100.0	V	328.0	14.1	54.00	8.83
17629.400000	54.96	---	100.0	V	328.0	14.1	74.00	19.04

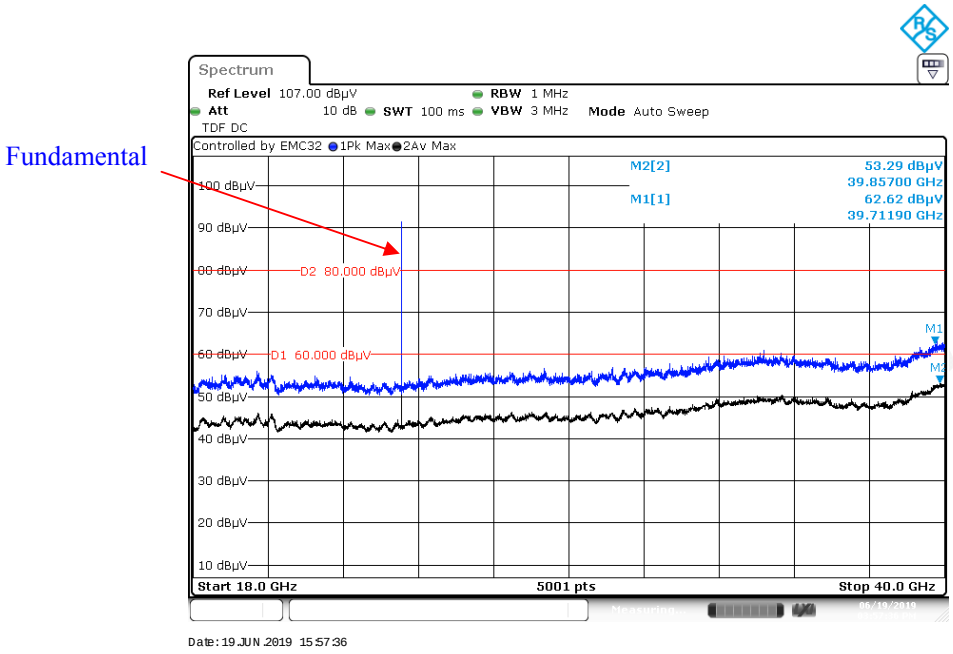
18GHz-100GHz:

Note:

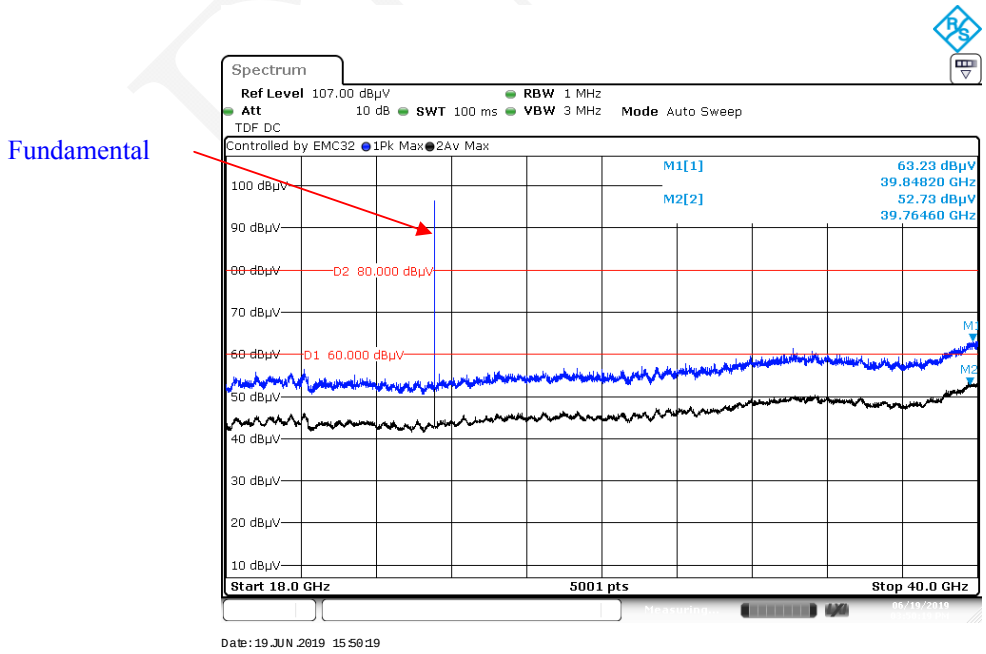
1.The test distance is 1.5m, the limit for Peak is 74dBuV/m@3m= 80dBuV/m @1.5m, the limit for Average is 54dBuV/m@3m= 60dBuV/m @1.5m

*(Pre-scan with low, middle and high channels of operation in the X,Y and Z axes of orientation, the worst case **Z-axis of orientation** was recorded)*

Horizontal



Vertical



Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corr. (dB)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
48200	---	62.27	155	H	310	32.1	74	11.73
48200	70.35	---	155	H	310	32.1	94	23.65
48200	---	64.65	202	V	150	32.1	74	9.35
48200	72.03	---	202	V	150	32.1	94	21.97
72300	---	42.46	165	H	36	37.52	74	31.54
72300	52.75	---	165	H	36	37.52	94	41.25
72300	---	49.58	200	V	55	37.52	74	24.42
72300	55.87	---	200	V	55	37.52	94	38.13

Note:
Extrapolation factor of 20dB/decade from 3m to 1.5m
Distance extrapolation factor =20 log (specific distance [3m]/test distance [1.5m]) dB
Limit line = Specific limits(dBµV) + distance extrapolation factor (6dB)

Radiation spurious Band edge:

1. This test is performed with a 10dB Attenuator.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
3. Corrected Amplitude = Corrected Factor + Reading
4. Margin = Limit - Corrected. Amplitude

Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corr. (dB)	Limit (dBµV/m)	Margin (dB)
	MaxPeak (dBµV /m)	Average (dBµV /m)	Height (cm)	Polar (H/V)				
24100	---	79.79	150	H	244	20.88	114	34.21
24100	90.63	---	150	H	244	20.88	134	43.37
24100	---	85.05	167	V	44	20.88	114	28.95
24100	96.45	---	167	V	44	20.88	134	37.55
24000	---	47.61	150	V	155	20.46	60	12.39
24000	52.49	---	150	V	155	20.46	80	27.51
24250	---	48.93	200	V	333	20.46	60	11.07
24250	55.72	---	200	V	333	20.46	80	24.28

Note:
Extrapolation factor of 20dB/decade from 3m to 1.5m
Distance extrapolation factor =20 log (specific distance [3m]/test distance [1.5m]) dB
Limit line = Specific limits(dBµV) + distance extrapolation factor (6dB)

FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the test table without connection to measurement instrument. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

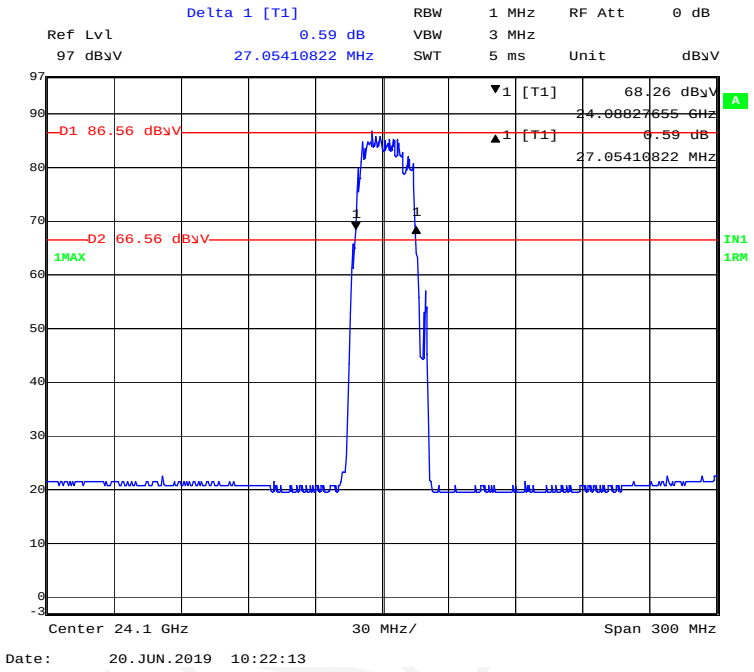
Temperature:	24.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2kPa

The testing was performed by Matt Yao on 2019-06-20.

Test Result: Compliant.

Test Mode: Transmitting in sweeping mode.

Frequency (GHz)	20 dB Bandwidth (MHz)
24.1	27.054



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