

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

FCC ID: 2AIWW-PD-V19

Report Type: Original Report		Product Type: Microwave Sensor	
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Report Number:	RKS170717002-00A		
Report Date:	2017-12-20		
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Ningbo Pdlux Electronic Technology CO.,LTD.
Tested Model	PD-V19
Product Type	Microwave Sensor
Dimension	26.0mm(L)×20.5 mm(W)×5.4 mm(H)
Power Supply	DC 4.75-5.25 V

All measurement and test data in this report was gathered from production sample serial number: 20170717002. (Assigned by BACL, Kunshan). The EUT was received on 2017-07-17.

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
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°C
Humidity		6%

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 974614 D01. 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 (MHz)
1	5805.67

EUT Exercise Software

No software was used during the test.

Support Equipment List and Details

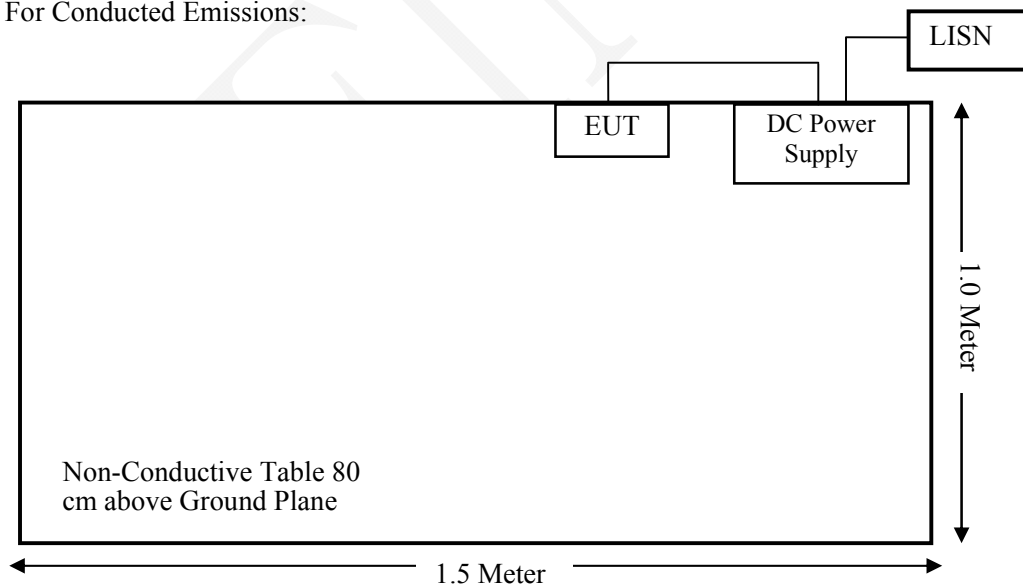
Manufacturer	Description	Model	Serial Number
EAST	Regulated DC Power Supply	MCH-303D-II	14070562

External I/O Cable

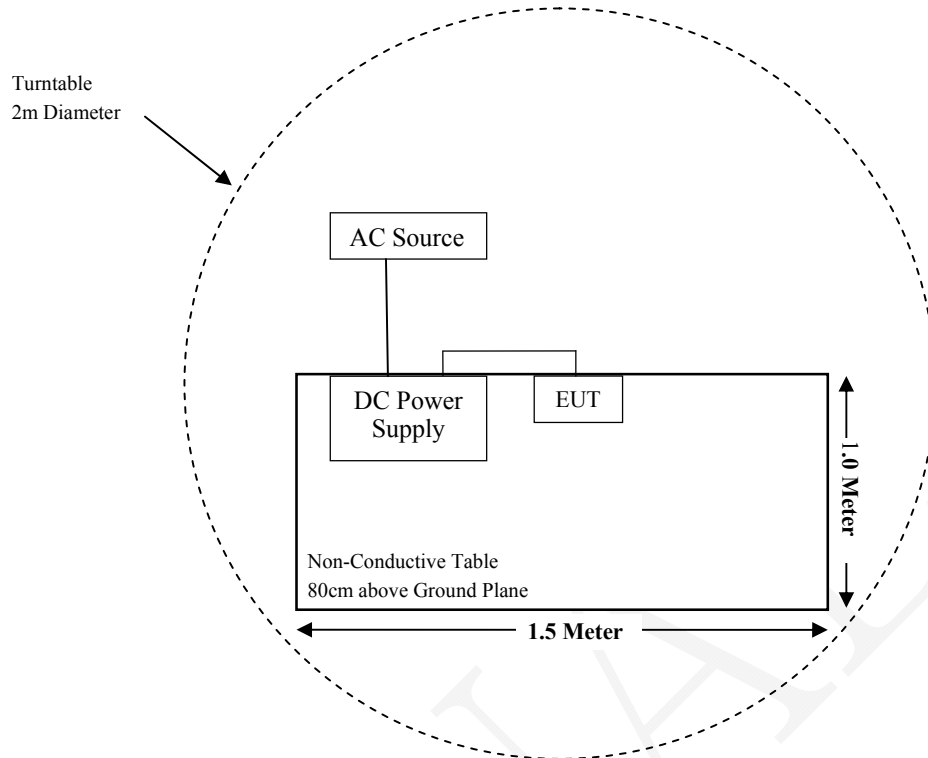
Cable Description	Shielding Type	Length (m)	From Port	To
RF Cable	Un-Shielding	0.8	EUT	DC Power Supply

Block Diagram of Test Setup

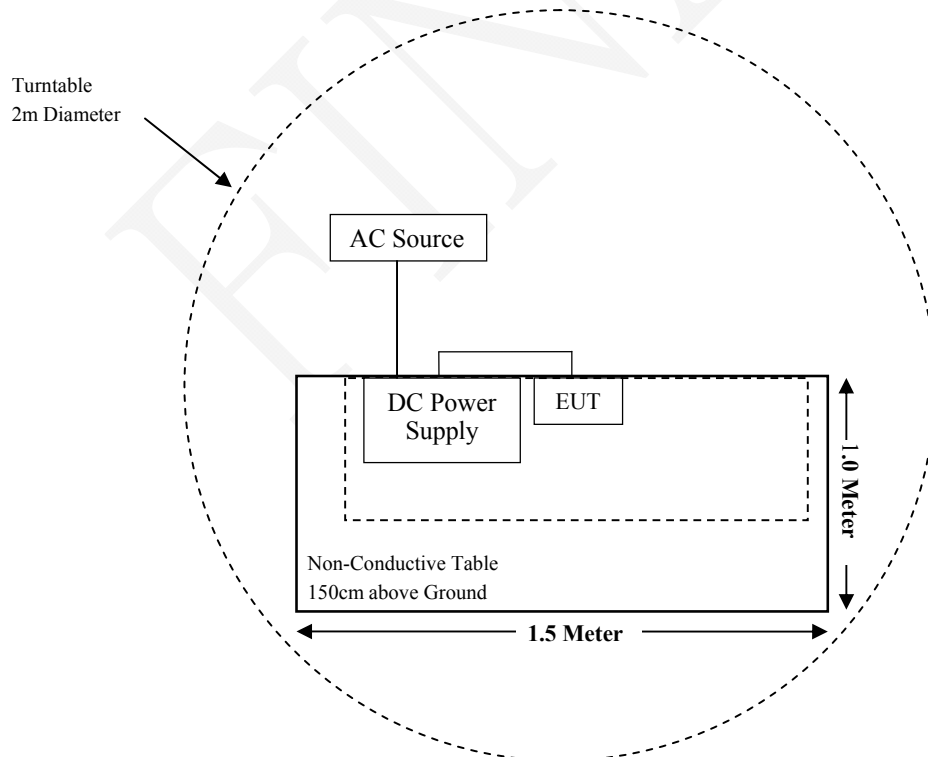
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

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

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	2017-11-12	2018-11-11
Sunol Sciences	Broadband Antenna	JB3	A040914-2	2016-01-09	2019-01-08
Sonoma Instrument	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	/	/
Radiated Emission Test (Chamber 2#)					
Rohde & Schwarz	EMI Test Receiver	ESU40	100207	2017-08-27	2018-08-26
HP	Spectrum Analyzer	8565EC	3946A00131	2017-06-16	2018-06-15
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
Wisewave	Horn Antenna	ARH-1923-02	11648-02	2016-12-22	2017-12-21
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-22	2017-12-21
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2017-05-21	2018-05-20
MICRO-TRONICS	Band Reject Filter	BRC50705	G085	2017-08-05	2018-08-04
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	/	/
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2017-11-12	2018-11-11
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2017-11-12	2018-11-11
Rohde & Schwarz	LISN	ENV216	3560655016	2017-11-12	2018-11-11
BACL	BACL-EMC	V1.0	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2017-01-10	2018-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2017-08-15	2018-08-14
EAST	Regulated DC Power Supply	MCH-303D-II	14070562	/	/

* **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.

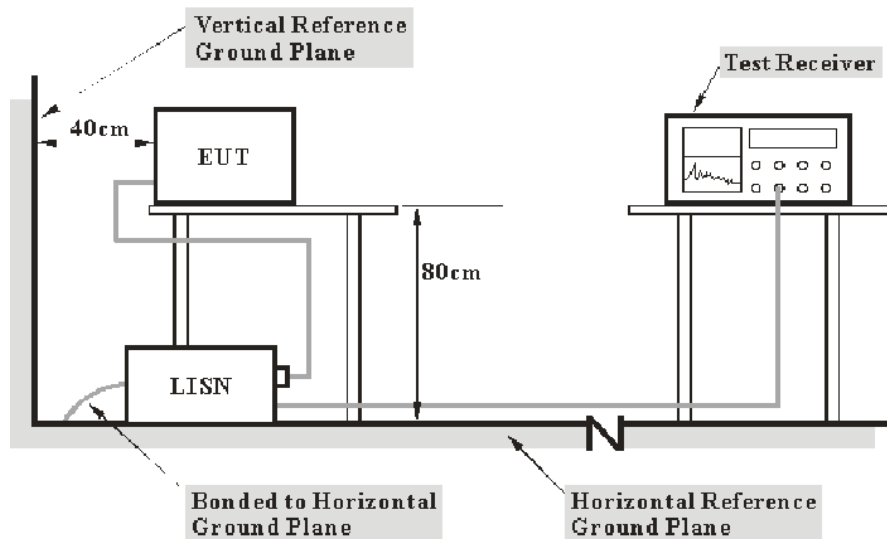
Antenna Connector Construction

The EUT has a patch antenna and antenna gain is 1.0 dBi, 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 power supply was connected to the outlet of 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:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss}$$

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

$$\text{Margin} = \text{Limit} - \text{Reading}$$

Test Results Summary

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

Test Data

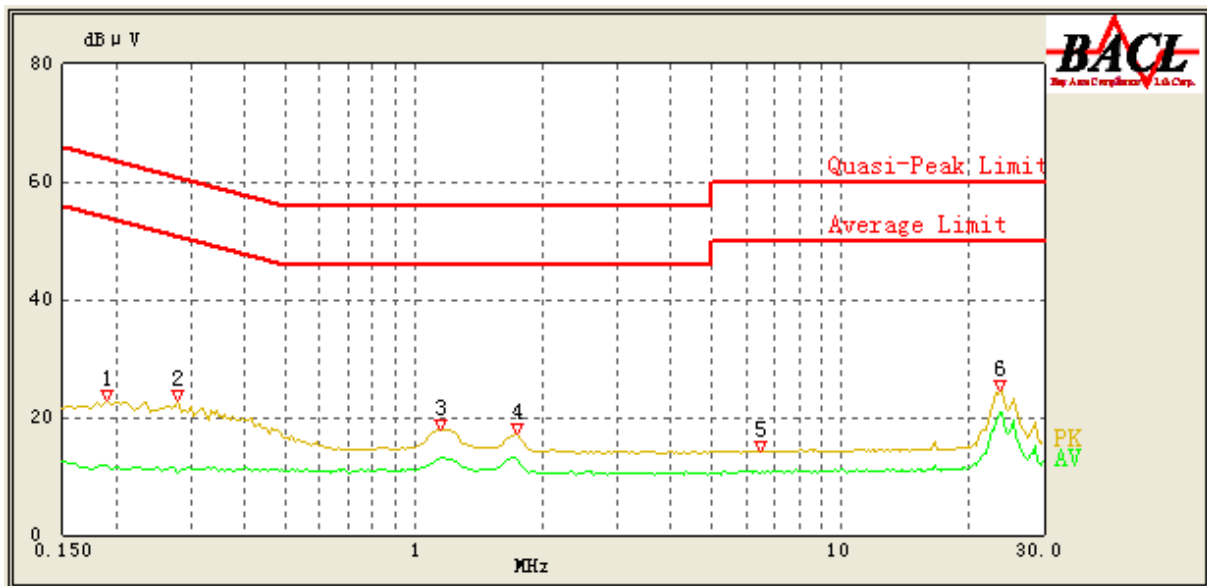
Environmental Conditions

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

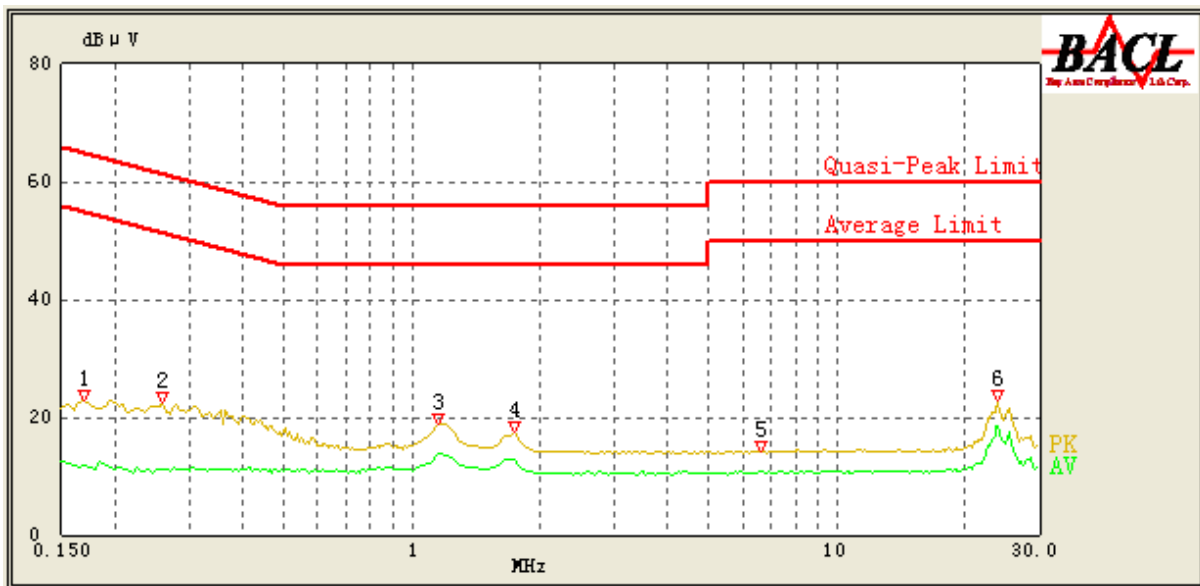
The testing was performed by Ada Yu on 2017-12-04.

EUT operation mode: Transmitting

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBμV)	Margin (dB)	Comment
0.190	22.77	QP	9.000	L1	16.02	64.86	42.09	Compliance
0.190	11.85	AV	9.000	L1	16.02	54.86	43.01	Compliance
0.280	22.68	QP	9.000	L1	16.03	62.29	39.61	Compliance
0.280	10.60	AV	9.000	L1	16.03	52.29	41.69	Compliance
1.150	17.99	QP	9.000	L1	15.88	56.00	38.01	Compliance
1.150	13.16	AV	9.000	L1	15.88	46.00	32.84	Compliance
1.750	17.05	QP	9.000	L1	15.86	56.00	38.95	Compliance
1.750	12.89	AV	9.000	L1	15.86	46.00	33.11	Compliance
6.500	14.31	QP	9.000	L1	15.95	60.00	45.69	Compliance
6.500	10.55	AV	9.000	L1	15.95	50.00	39.45	Compliance
23.750	24.54	QP	9.000	L1	16.45	60.00	35.46	Compliance
23.750	20.99	AV	9.000	L1	16.45	50.00	29.01	Compliance

AC 120V/60 Hz, Neutral

Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBμV)	Margin (dB)	Comment
0.170	22.83	QP	9.000	N	16.06	65.43	42.60	Compliance
0.170	11.67	AV	9.000	N	16.06	55.43	43.76	Compliance
0.260	22.39	QP	9.000	N	16.06	62.86	40.47	Compliance
0.260	11.21	AV	9.000	N	16.06	52.86	41.65	Compliance
1.150	18.91	QP	9.000	N	15.94	56.00	37.09	Compliance
1.150	13.69	AV	9.000	N	15.94	46.00	32.31	Compliance
1.750	17.43	QP	9.000	N	15.92	56.00	38.57	Compliance
1.750	12.82	AV	9.000	N	15.92	46.00	33.18	Compliance
6.650	14.29	QP	9.000	N	15.91	60.00	45.71	Compliance
6.700	10.68	AV	9.000	N	15.91	50.00	39.32	Compliance
23.800	22.75	QP	9.000	N	16.22	60.00	37.25	Compliance
23.750	18.42	AV	9.000	N	16.22	50.00	31.58	Compliance

Note:

1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss

2) Margin = Limit – Reading

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:

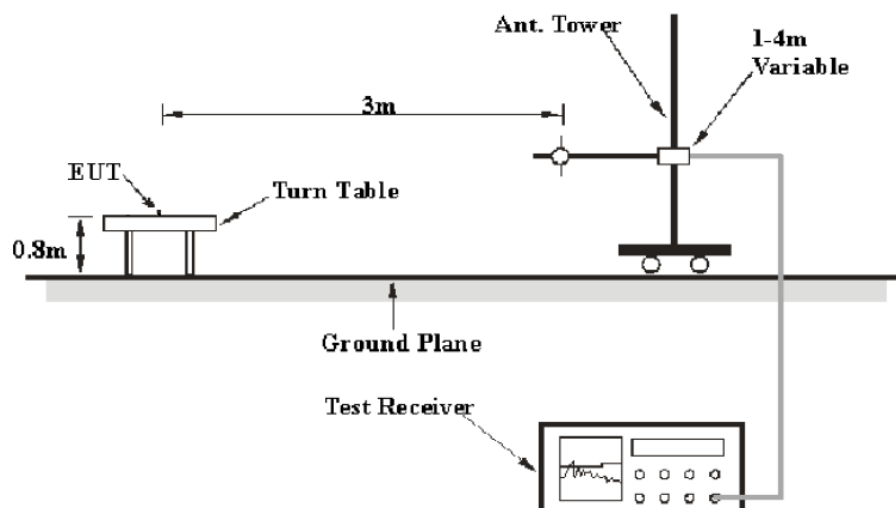
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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

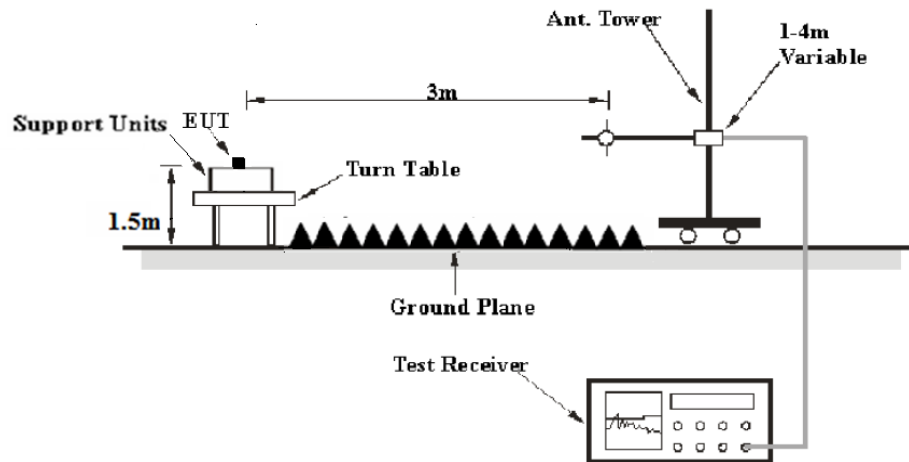
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

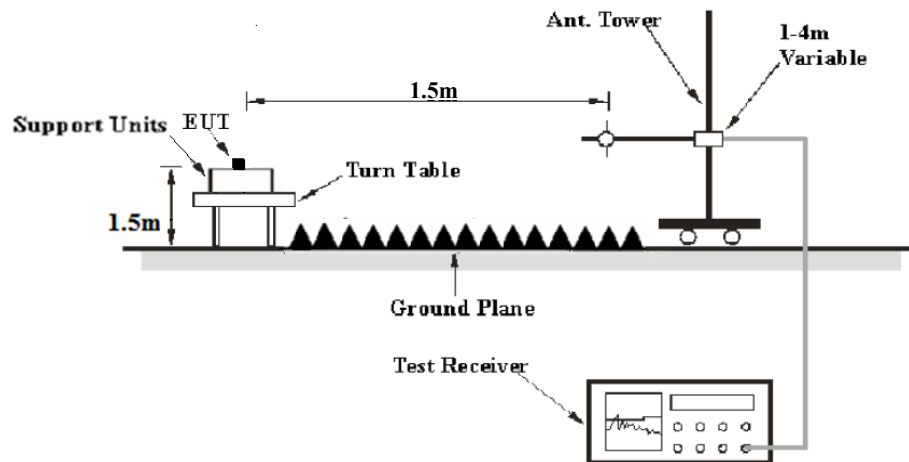
Below 1 GHz:



1 GHz-18GHz:



18 GHz-40GHz:



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 40 GHz.

During the radiated emission test, the EMI test receiver Setup were 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.

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak detection mode 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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**

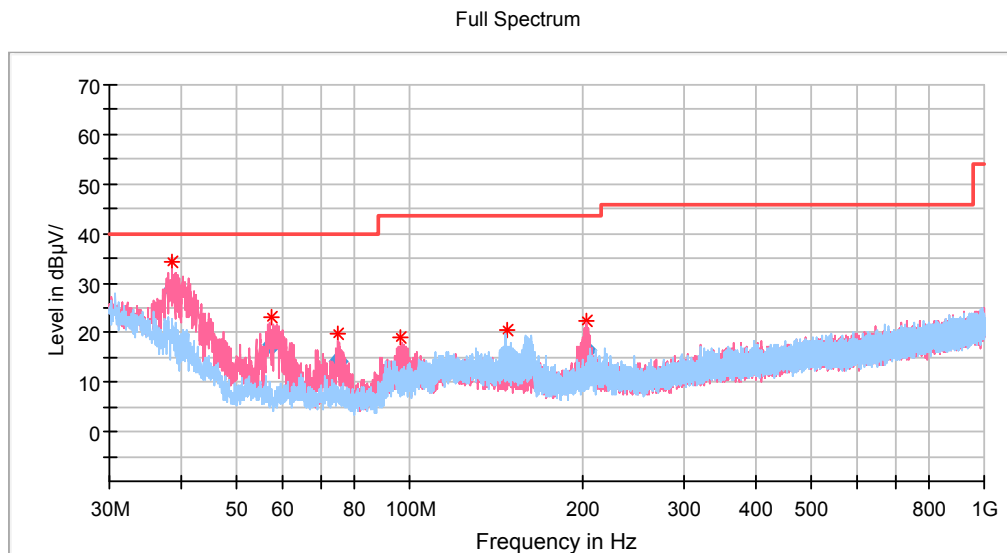
Temperature:	24.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2kPa

The testing was performed by Ada Yu on 2017-12-04 to 2017-12-19.

Test Mode: Transmitting

Spurious Emission Test:**30MHz-1G:**

Pre-scan in the X,Y and Z axes of orientation, the worst case in the **X-axis of orientation** was recorded



Frequency (MHz)	Corrected Amplitude	Rx Antenna		Turntable Degree	Corr. (dB)	Limit (dBµV)	Margin (dB)
	QuasiPeak (dB µ V/m)	Height (cm)	Polar (H/V)				
38.620333	28.64	200.0	V	0.0	-15.3	40.00	11.36
57.503467	17.45	200.0	V	276.0	-23.0	40.00	22.55
75.162734	14.01	200.0	V	136.0	-23.1	40.00	25.99
96.624433	12.65	100.0	V	65.0	-21.9	43.50	30.85
147.433900	13.46	100.0	H	7.0	-18.9	43.50	30.04
202.539833	16.53	200.0	V	183.0	-19.3	43.50	26.97

1GHz - 18GHz:

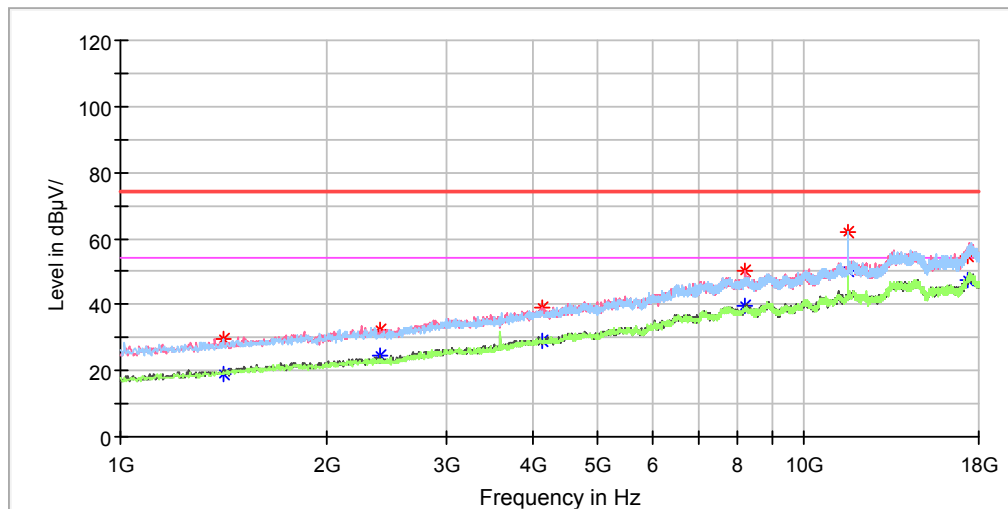
Pre-scan in the X,Y and Z axes of orientation, the worst case in the **X-axis of orientation** was recorded

Note:

1. This test was performed with the 5.725-5.875GHz band reject filter.
2. Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude

Channel: 5805.67MHz

Full Spectrum

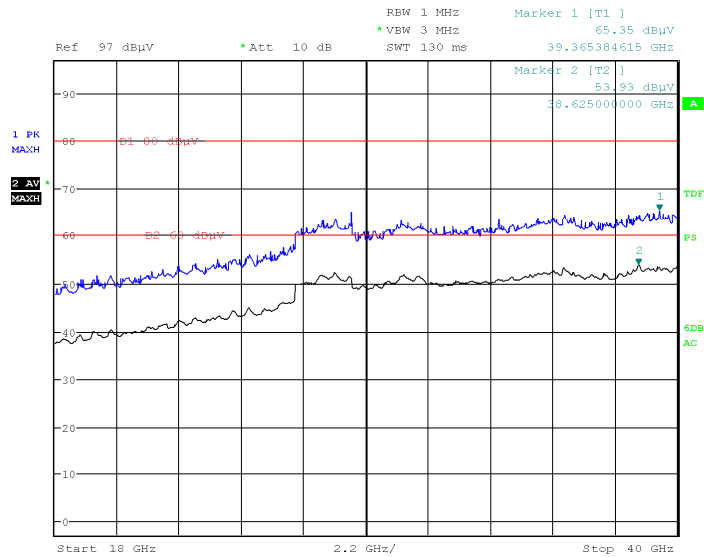


Frequency (MHz)	Corrected Amplitude		Rx Antenna		Turntable Degree	Corr. (dB)	Limit (dBμV)	Margin (dB)
	MaxPeak (dBμV /m)	Average (dBμV /m)	Height (cm)	Polar (H/V)				
1411.400000	---	18.80	200.0	H	0.0	-10.8	54.00	35.20
1411.400000	29.85	---	150.0	H	23.0	-10.8	74.00	44.15
2400.800000	---	24.34	150.0	V	316.0	-7.4	54.00	29.66
2400.800000	32.22	---	150.0	V	316.0	-7.4	74.00	41.78
4141.600000	---	28.80	150.0	V	316.0	-2.0	54.00	25.20
4141.600000	38.79	---	150.0	V	316.0	-2.0	74.00	35.21
8211.400000	---	39.42	150.0	V	0.0	7.9	54.00	14.58
8211.400000	50.01	---	200.0	V	51.0	7.9	74.00	23.99
11594.400000	62.11	---	150.0	V	241.0	12.4	74.00	11.89
11594.400000	---	50.08	150.0	V	241.0	12.4	54.00	3.92
17374.400000	54.62	---	200.0	V	240.0	19.3	74.00	19.38
17374.400000	---	47.70	150.0	V	359.0	19.3	54.00	6.30

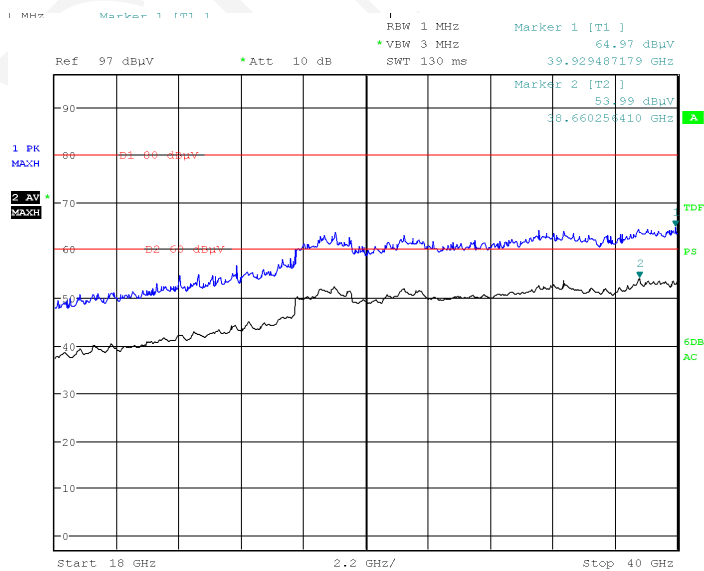
18GHz-40GHz:

Pre-scan in the X,Y and Z axes of orientation, the worst case in the **X-axis of orientation** was recorded

Note: The test distance is 1.5m, The limit $74\text{dBuV/m}@3\text{m} = 80\text{dBuV/m}@1.5\text{m}$

Horizontal

Date: 19.DEC.2017 11:03:03

Vertical

Date: 19.DEC.2017 11:08:50

Fundamental Test:

Pre-scan in the X,Y and Z axes of orientation, the worst case in the X-axis of orientation was recorded

Note:

- Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
 Corrected Amplitude = Corrected Factor + Reading
 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)				
5805.67	94.24	---	150.0	H	218.0	2.1	114.00	19.76
5805.67	---	82.40	250.0	H	188.0	2.1	94.00	11.60
5805.67	94.05	---	128.0	V	256.0	2.1	114.00	19.95
5805.67	---	82.32	136.0	V	57.0	2.1	94.00	11.68

Band Edge Test:

Pre-scan in the X,Y and Z axes of orientation, the worst case in the X-axis of orientation was recorded

Note:

- Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
 Corrected Amplitude = Corrected Factor + Reading
 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)				
5725.00	---	40.19	142	V	205	1.98	54	13.94
5725.00	51.26	---	142	V	205	1.98	74	22.87
5875.00	---	41.58	242	V	166	2.24	54	12.46
5875.00	52.34	---	242	V	166	2.24	74	21.75

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**

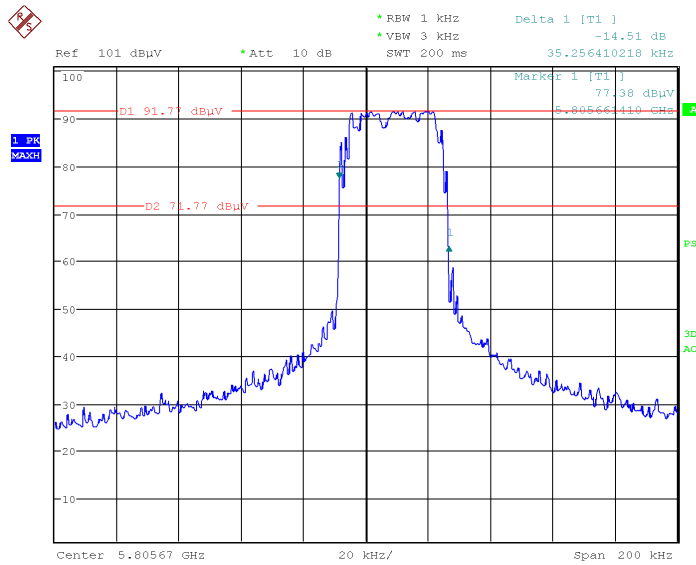
Temperature:	24.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2kPa

The testing was performed by Ada Yu on 2017-12-04.

Test Result: Compliant.

Test Mode: Transmitting

Frequency (MHz)	20 dB Bandwidth (kHz)
5805.67	35.26



Date: 4.DEC.2017 15:27:02

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