

FCC PART 15.245

TEST REPORT

For

General Luminaire (Shanghai) Co., Ltd

02F Building 05 1128 Jindu Road Minhang District, Shanghai, China

FCC ID: 2AMOB-MCWFHP12-01

Report Type: Original Report		Product Type: Microwave Module	
Test Engineer:	Ada Yu	Ada Yu	
Report Number:	RKSA170824001-00A		
Report Date:	2017-09-26		
Reviewed By:	Oscar Ye RF Leader	Oscar Ye	
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	General Luminaire (Shanghai) Co., Ltd
Tested Model	SN-MCW-HILO-XXX-FHP-12DC-XXX-A
Product Type	Microwave Module
Dimension	79mm(L)×67 mm(W)×40 mm(H)
Power Supply	DC 12V

All measurement and test data in this report was gathered from production sample serial number: 20170824001. (Assigned by BACL, Kunshan). The EUT was received on 2017-08-24.

Objective

This type approval report is prepared on behalf of General Luminaire (Shanghai) 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, 15.209 and 15.245 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		3.19dB
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
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.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Justification

Channel list:

Channel	Frequency (MHz)
1	10519.9
2	10527.9

EUT Exercise Software

No software was used during the test.

Support Equipment List and Details

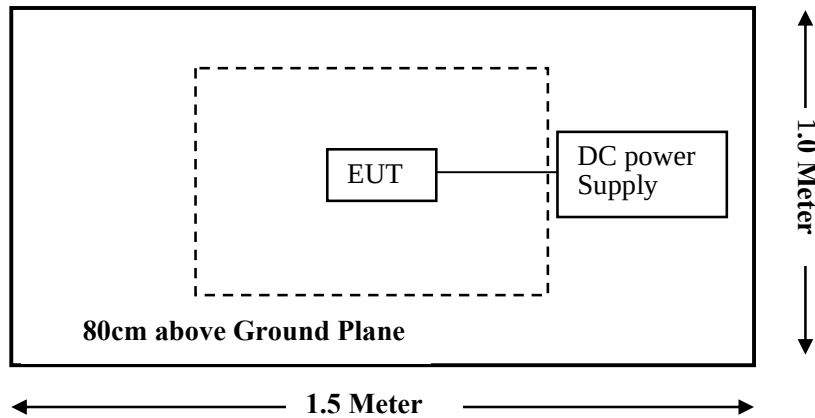
Manufacturer	Description	Model	Serial Number
EAST	Regulated DC Power Supply	MCH-303D-II	14070562

External I/O Cable

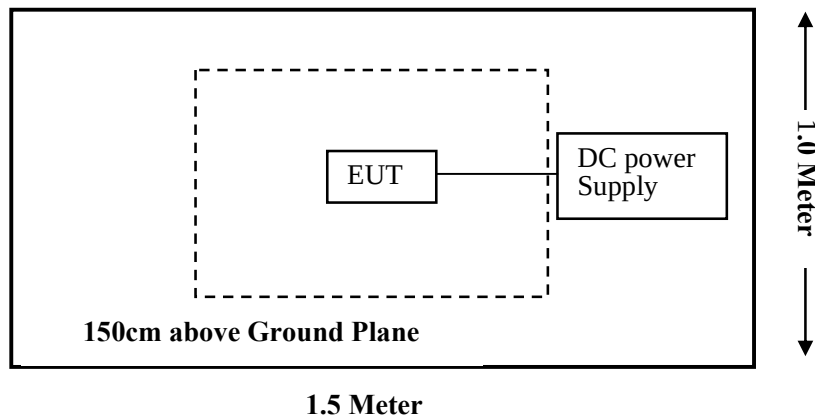
Cable Description	Shielding Type	Length (m)	From Port	To
/	/	/	/	/

Block Diagram of Test Setup

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, §15.245	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	2016-11-25	2017-11-24
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	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
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	2016-12-12	2017-12-11
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2017-05-21	2018-05-20
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	2016-11-25	2017-11-24
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-09
Rohde & Schwarz	LISN	ENV216	3560655016	2016-11-25	2017-11-24
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 an internal smart antenna arrangement and antenna gain is 13.77 dBi, which was permanently attached, fulfill the requirement of this section, please refer to the EUT photos.

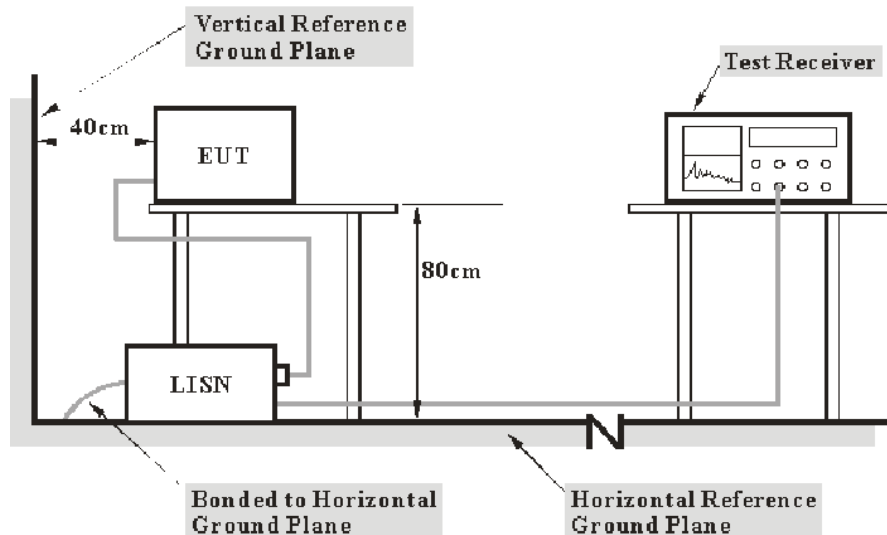
Result: Compliant.

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 adapter 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:

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

Test Results Summary

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

Test Data

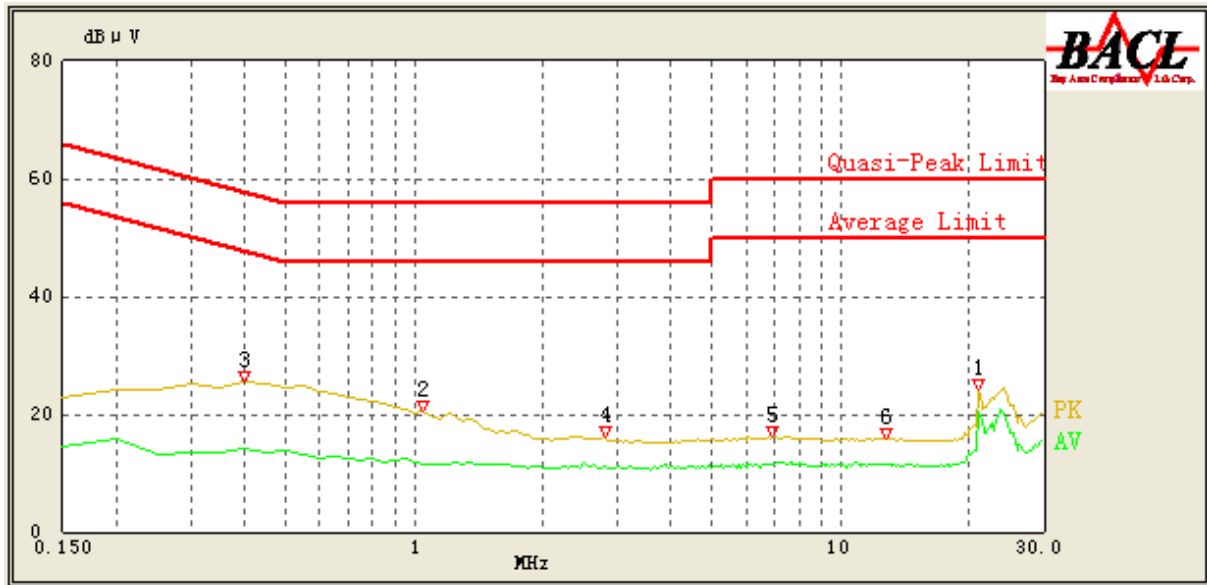
Environmental Conditions

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

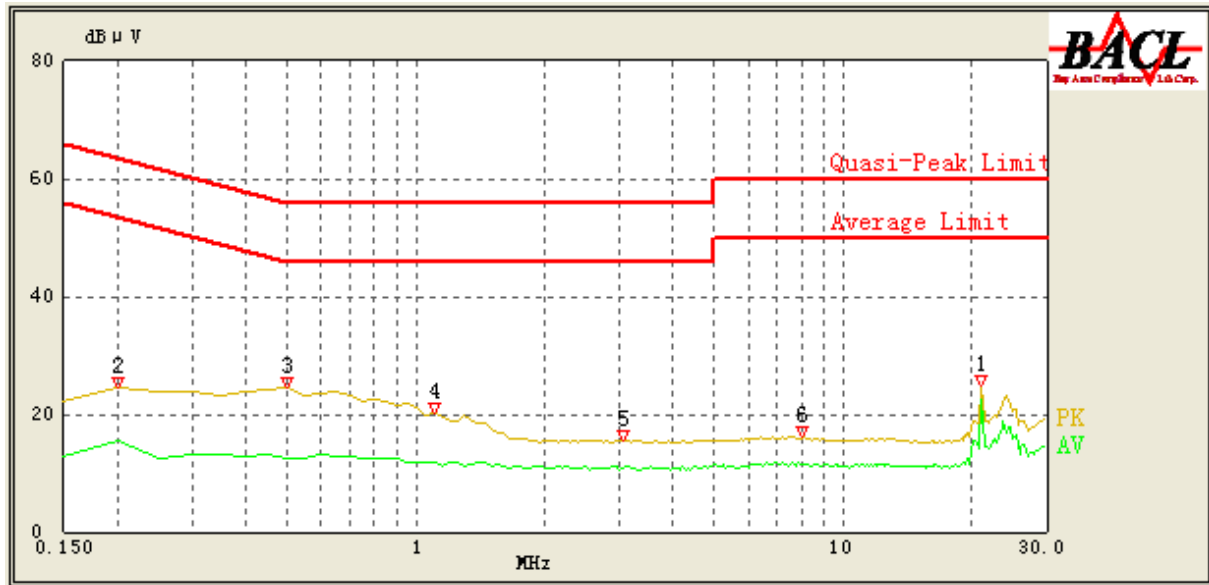
The testing was performed by Ada Yu on 2017-09-10.

EUT operation mode: Transmitting in channel 1 (worst case)

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBμV)	Margin (dB)	Comment
21.050	24.13	QP	9.000	L1	16.44	60.00	35.87	Compliance
21.050	20.46	AV	9.000	L1	16.44	50.00	29.54	Compliance
1.050	20.65	QP	9.000	L1	15.88	56.00	35.35	Compliance
1.050	11.63	AV	9.000	L1	15.88	46.00	34.37	Compliance
0.400	25.38	QP	9.000	L1	16.06	58.86	33.48	Compliance
0.400	14.27	AV	9.000	L1	16.06	48.86	34.59	Compliance
2.800	16.01	QP	9.000	L1	15.85	56.00	39.99	Compliance
2.800	11.07	AV	9.000	L1	15.85	46.00	34.93	Compliance
6.900	16.09	QP	9.000	L1	15.97	60.00	43.91	Compliance
6.950	11.44	AV	9.000	L1	15.98	50.00	38.56	Compliance
12.750	15.95	QP	9.000	L1	16.14	60.00	44.05	Compliance
12.750	11.37	AV	9.000	L1	16.14	50.00	38.63	Compliance

AC 120V/60 Hz, Neutral

Frequency (MHz)	Reading (dBμV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBμV)	Margin (dB)	Comment
21.050	24.77	QP	9.000	N	16.18	60.00	35.23	Compliance
21.050	22.56	AV	9.000	N	16.18	50.00	27.44	Compliance
0.200	24.49	QP	9.000	N	16.05	64.57	40.08	Compliance
0.200	15.57	AV	9.000	N	16.05	54.57	39.00	Compliance
0.500	24.58	QP	9.000	N	16.11	56.00	31.42	Compliance
0.500	12.49	AV	9.000	N	16.11	46.00	33.51	Compliance
1.100	20.01	QP	9.000	N	15.94	56.00	35.99	Compliance
1.100	11.77	AV	9.000	N	15.94	46.00	34.23	Compliance
3.050	15.50	QP	9.000	N	15.90	56.00	40.50	Compliance
3.050	10.81	AV	9.000	N	15.90	46.00	35.19	Compliance
8.050	16.06	QP	9.000	N	15.94	60.00	43.94	Compliance
8.050	11.56	AV	9.000	N	15.94	50.00	38.44	Compliance

Note:

- 1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
- 2) Corrected Amplitude = Reading + Corr.
- 3) Margin = Limit –Corrected Amplitude

FCC§15.205, §15.209&§15.245- RADIATED EMISSIONS& OUT OF BAND EMISSION**Applicable Standard**

According to FCC§15.245 (b), The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25.0
24075-24175	2500	25.0

(1) Regardless of the limits shown in the above table, harmonic emissions in the restricted bands below 17.7 GHz, as specified in §15.205, shall not exceed the field strength limits shown in §15.209. Harmonic emissions in the restricted bands at and above 17.7 GHz shall not exceed the following field strength limits:

(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

(ii) For all other field disturbance sensors, 7.5 mV/m.

(iii) Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands, other than the second and third harmonics from devices operating in the 24075-24175 MHz band, fully comply with the limits given in §15.209. Continuous operation of field disturbance sensors designed to be used in farm equipment, vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations, or railroad locomotives, railroad cars and other equipment which travels on fixed tracks is permitted. A field disturbance sensor will be considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g., putting a vehicle into reverse gear, activating a turn signal, etc.).

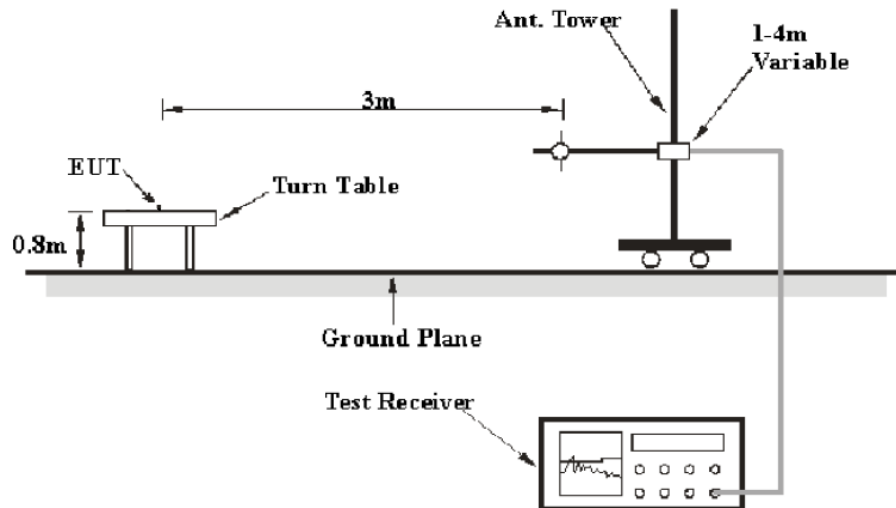
(2), Field strength limits are specified at a distance of 3 meters.

(3) 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.

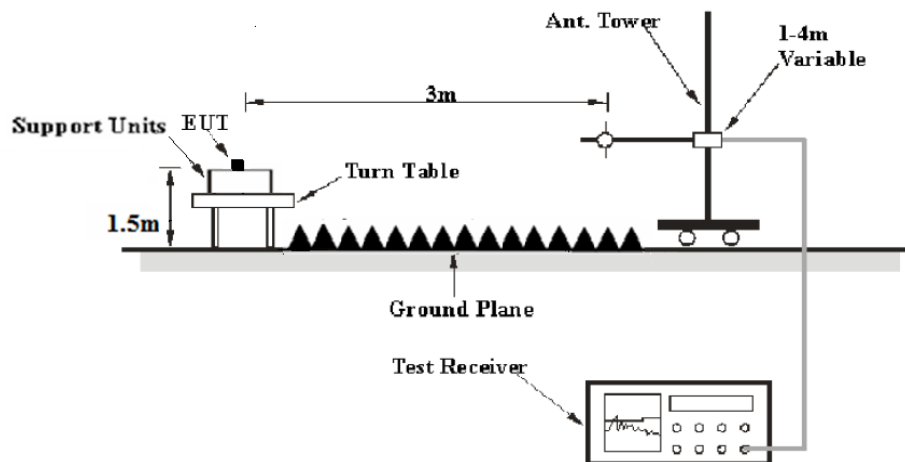
(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

EUT Setup

Below 1 GHz:



Above 1 GHz:



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 15.245 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 52.5 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer 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

Frequency Range	RBW	Video B/W	Detector
1GHz – 52.5GHz	1MHz	3 MHz	PK
	1MHz	10 Hz	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 and average 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 & 15.245.

Test Data

Environmental Conditions

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

The testing was performed by Ada Yu on 2017-09-19.

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

30 MHz-52.5 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.245/205/209	
	Reading (dBμV)	Detector (PK/QP/ Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Channel 1 (10519.90MHz)									
225.17	42.15	QP	69	133	H	-11.87	30.28	46	15.72
5562.36	43.72	PK	231	134	V	4.22	47.94	74	26.06
5562.36	32.76	Ave	182	122	V	4.22	36.98	54	17.02
10500.00	45.19	PK	202	120	H	16.98	62.17	74	11.83
10500.00	32.24	Ave	176	105	H	16.98	49.22	54	4.78
10519.90	94.03	PK	329	132	H	16.99	111.02	148	36.98
10519.90	93.12	Ave	120	111	H	16.99	110.11	128	17.89
10519.90	92.67	PK	125	126	V	16.99	109.66	148	38.34
10519.90	91.79	Ave	282	124	V	16.99	108.78	128	19.22
10550.00	43.25	PK	188	109	V	17.00	60.25	74	13.75
10550.00	31.56	Ave	242	149	V	17.00	48.56	54	5.44
21039.80	69.35	PK	163	103	H	24.83	94.18	108	13.82
21039.80	58.29	Ave	271	125	H	24.83	83.12	88	4.88
17521.73	38.13	PK	343	141	H	23.67	61.80	74	12.20
17521.73	25.46	Ave	248	139	H	23.67	49.13	54	4.87
Channel 2 (10527.90MHz)									
225.17	42.13	QP	196	132	H	-11.87	30.26	46	15.74
2491.47	43.96	PK	281	142	V	-4.70	39.26	74	34.74
2491.47	33.17	Ave	127	116	V	-4.70	28.47	54	25.53
6301.73	42.51	PK	320	119	V	7.30	49.81	74	24.19
6301.73	31.44	Ave	268	134	V	7.30	38.74	54	15.26
10500.00	42.16	PK	321	148	V	16.98	59.14	74	14.86
10500.00	30.59	Ave	176	100	V	16.98	47.57	54	6.43
10527.90	93.08	PK	119	128	H	16.99	110.07	148	37.93
10527.90	92.41	Ave	188	121	H	16.99	109.40	128	18.60
10527.90	92.02	PK	318	144	V	16.99	109.01	148	38.99
10527.90	91.39	Ave	127	108	V	16.99	108.38	128	19.62
10550.00	43.98	PK	170	150	V	17.00	60.98	74	13.02
10550.00	32.05	Ave	170	139	V	17.00	49.05	54	4.95
21055.80	69.25	PK	103	143	V	24.83	94.08	108	13.92
21055.80	58.11	Ave	332	109	V	24.83	82.94	88	5.06

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor

Margin = Limit - Corr. Amplitude

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

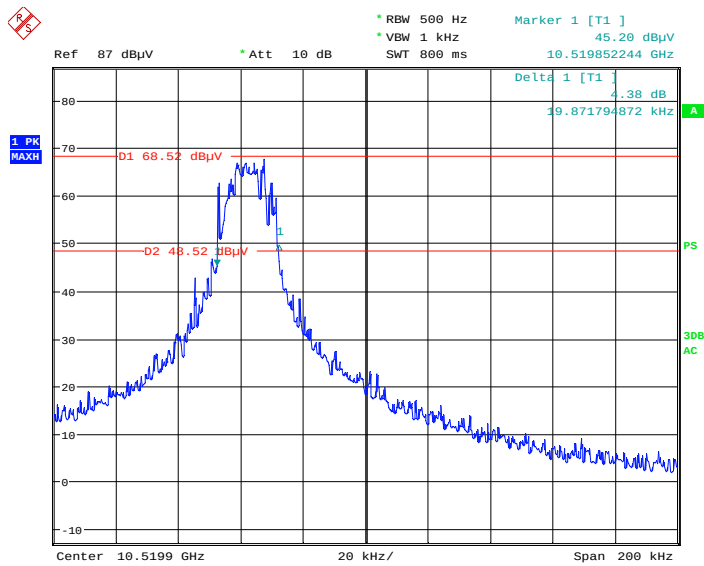
The testing was performed by Ada Yu on 2017-09-20.

Test Result: Compliant.

Test Mode: Transmitting

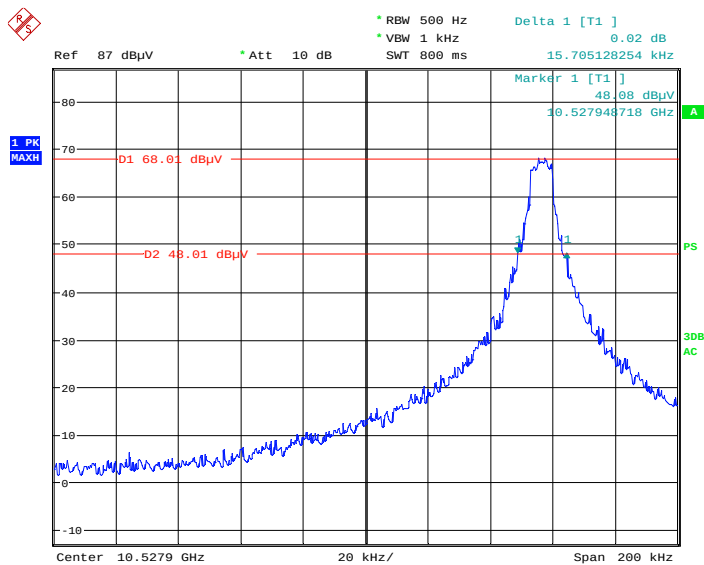
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
1	10519.90	19.87
2	10527.90	15.71

Channel 1



Date: 20.SEP.2017 02:14:20

Channel 2



Date: 20.SEP.2017 01:19:05

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