

FCC PART 15.249

TEST REPORT

For

OKIN Refined Electric Technology Co., Ltd.

Plant 4, No. 410, Xinyonglian Road, Wangjiangjing Development Zone, Jiaxing, Zhejiang, China

FCC ID: PCU-JLDP03045

Report Type: Original Report		Product Type: Control Box	
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Report Number:	RKS170607005-00A		
Report Date:	2017-06-14		
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	OKIN Refined Electric Technology Co., Ltd.
Tested Model	JLDP.03.045.000
Series Model	JLDP.03.021, JLDP.03.053
Product Type	Control Box
Dimension	175 mm(L)×141 mm(W)×40 mm(H)
Power Supply	DC29V from adapter

Adapter information:

Model: JLDP.10.022C

Input: AC100-240 V 50/60Hz 1.5A

Output: DC29V, 1.8A

Note: The difference between tested model and series model was explained in the declaration letter.

All measurement and test data in this report was gathered from production sample serial number: 20170607005. (Assigned by BACL, Kunshan). The EUT was received on 2017-06-07.

Objective

This type approval report is prepared on behalf of OKIN Refined Electric Technology Co., Ltd. in accordance with Part 2-Subpart J, and Part 15-Subparts A, B 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 15.249 rules.

Related Submittal(s)/Grant(s)

FCC Part15.249 DXX submission with FCC ID: PCU-JLDK42.

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.

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2014. 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

The system was configured in testing mode which was provided by manufacturer, 64 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2407.00	33	2432.50
2	2407.80	34	2433.39
3	2408.60	35	2434.19
4	2409.40	36	2434.99
5	2410.20	37	2435.79
6	2411.00	38	2436.59
7	2411.80	39	2437.39
8	2412.60	40	2438.19
9	2413.40	41	2438.99
10	2414.20	42	2439.79
11	2415.00	43	2440.59
12	2415.80	44	2441.39
13	2416.60	45	2442.19
14	2417.40	46	2442.99
15	2418.20	47	2443.79
16	2419.00	48	2444.59
17	2419.80	49	2445.39
18	2420.60	50	2446.19
19	2421.40	51	2446.99
20	2422.20	52	2447.79
21	2423.00	53	2448.59
22	2423.80	54	2449.39
23	2424.60	55	2450.19
24	2425.40	56	2450.99
25	2426.20	57	2451.79
26	2427.00	58	2452.59
27	2427.79	59	2453.39
28	2428.59	60	2454.19
29	2429.39	61	2454.99
30	2430.19	62	2455.79
31	2430.99	63	2456.59
32	2431.79	64	2457.39

EUT was tested with Channel 1, 33 and 64.

EUT Exercise Software

No software was used during the test.

Support Equipment List and Details

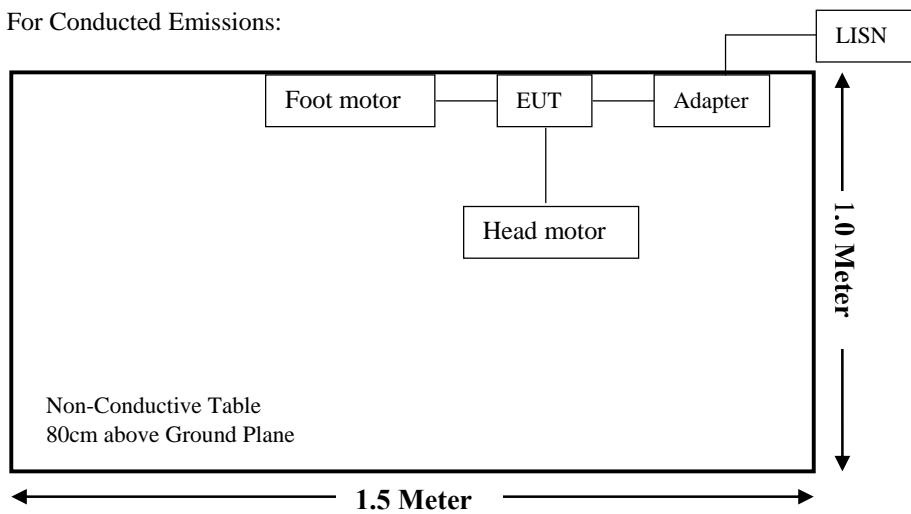
Manufacturer	Description	Model	Serial Number
OKIN	Head motor	B11359	/
OKIN	Foot motor	B11360	/

External I/O Cable

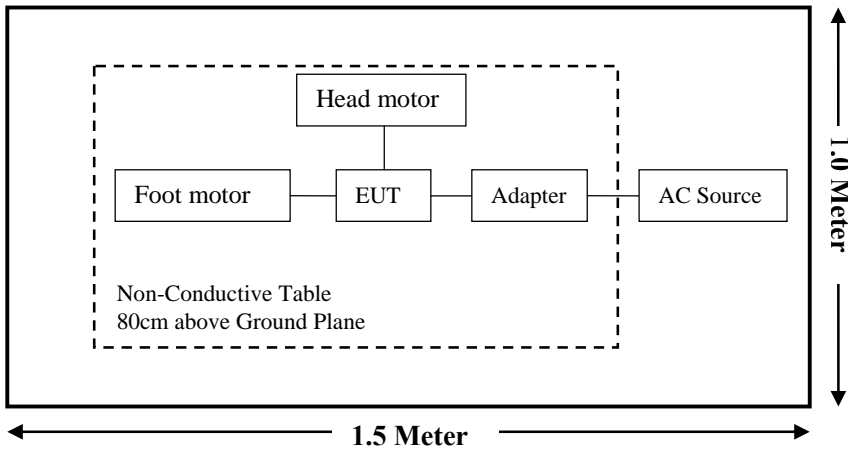
Cable Description	Shielding Type	Length (m)	From Port	To
/	/	/	/	/

Block Diagram of Test Setup

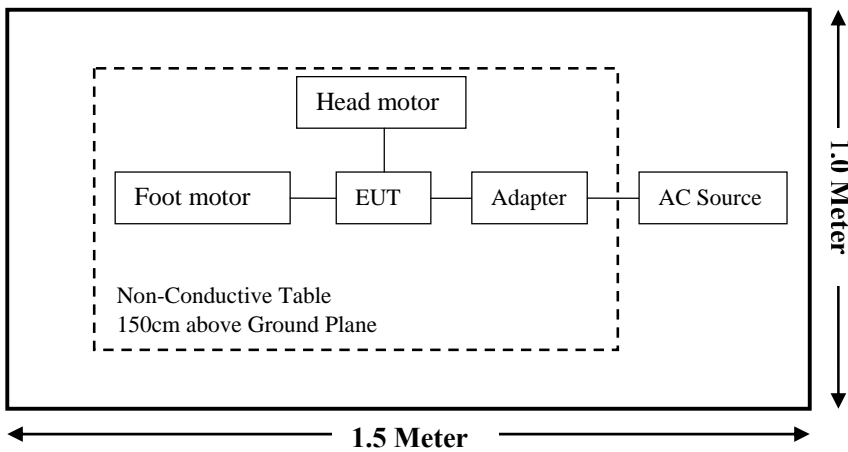
For Conducted Emissions:



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					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
Sonoma Instrument	Pre-amplifier	330	171377	2016-12-12	2017-12-11
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
Haojintech	Coaxial Cable	Cable-1	001	2016-12-12	2017-12-11
Haojintech	Coaxial Cable	Cable-2	002	2016-12-12	2017-12-11
Haojintech	Coaxial Cable	Cable-3	003	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-4	004	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2016-12-12	2017-12-11
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-20
OKIN	RF Cable	N/A	N/A	2017-05-25	2018-05-24
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
Rohde & Schwarz	CE Test software	EMC32	100357	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2016-09-08	2017-09-07

* **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 PCB antenna arrangement and antenna gain is 3.3dBi, which was permanently attached ,fulfill the requirement of this section, please refer to the EUT photos.

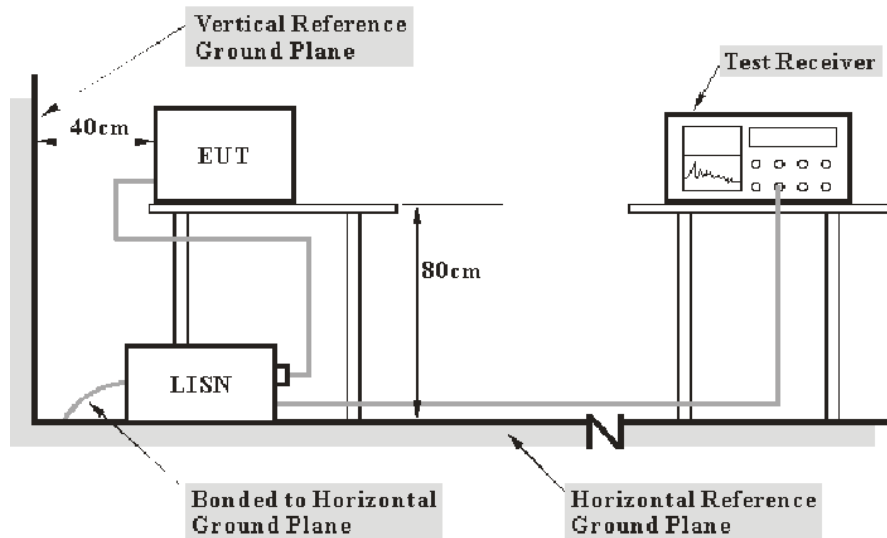
Result: Compliant.

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

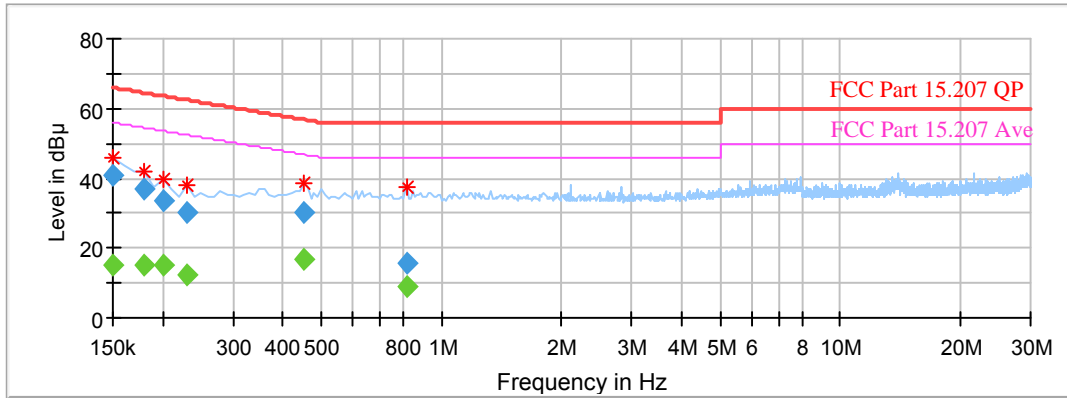
Temperature:	24.6°C
Relative Humidity:	52%
ATM Pressure:	101.2 kPa

The testing was performed by Chris Wang on 2017-06-12.

EUT operation mode: Transmitting in low channel (worst case).

AC 120V/60 Hz, Line

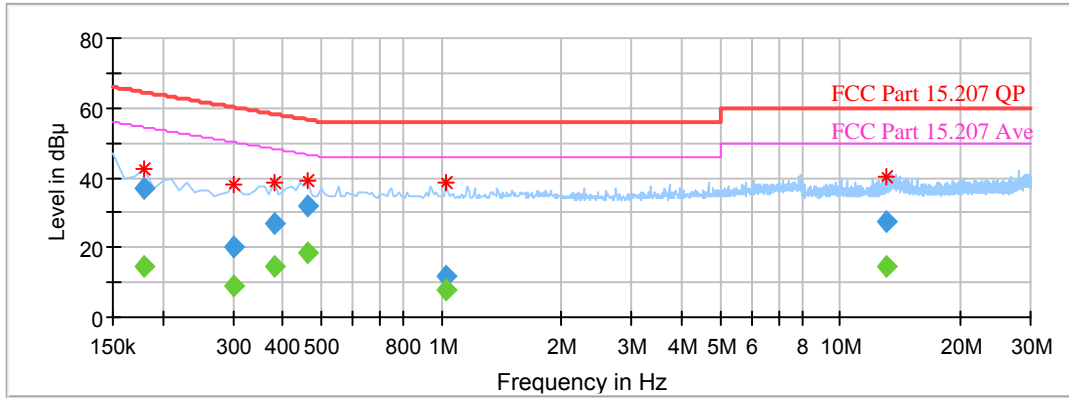
Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	---	14.85	9.000	L1	10.1	41.15	56.00	Compliance
0.150000	40.99	---	9.000	L1	10.1	25.01	66.00	Compliance
0.180000	---	14.93	9.000	L1	10.0	39.56	54.49	Compliance
0.180000	36.74	---	9.000	L1	10.0	27.75	64.49	Compliance
0.200000	---	14.98	9.000	L1	10.0	38.63	53.61	Compliance
0.200000	33.78	---	9.000	L1	10.0	29.83	63.61	Compliance
0.230000	---	12.41	9.000	L1	10.0	40.04	52.45	Compliance
0.230000	30.07	---	9.000	L1	10.0	32.38	62.45	Compliance
0.450000	---	16.80	9.000	L1	10.1	30.08	46.88	Compliance
0.450000	30.01	---	9.000	L1	10.1	26.87	56.88	Compliance
0.820000	---	8.94	9.000	L1	9.9	37.06	46.00	Compliance
0.820000	15.73	---	9.000	L1	9.9	40.27	56.00	Compliance

AC 120V/60 Hz, Neutral

Full Spectrum



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.180000	---	14.55	9.000	N	10.1	39.94	54.49	Compliance
0.180000	36.70	---	9.000	N	10.1	27.79	64.49	Compliance
0.300000	---	8.96	9.000	N	10.1	41.28	50.24	Compliance
0.300000	19.87	---	9.000	N	10.1	40.37	60.24	Compliance
0.380000	---	14.81	9.000	N	10.1	33.47	48.28	Compliance
0.380000	26.91	---	9.000	N	10.1	31.37	58.28	Compliance
0.460000	---	18.28	9.000	N	10.1	28.41	46.69	Compliance
0.460000	31.72	---	9.000	N	10.1	24.97	56.69	Compliance
1.030000	---	7.83	9.000	N	9.9	38.17	46.00	Compliance
1.030000	11.60	---	9.000	N	9.9	44.40	56.00	Compliance
13.020000	---	14.73	9.000	N	10.0	35.27	50.00	Compliance
13.020000	27.48	---	9.000	N	10.0	32.52	60.00	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&§15.249- 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:

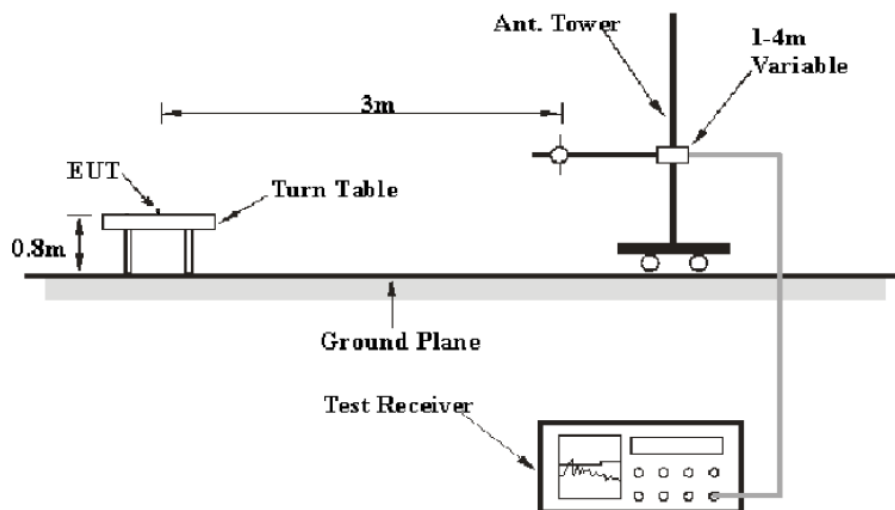
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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

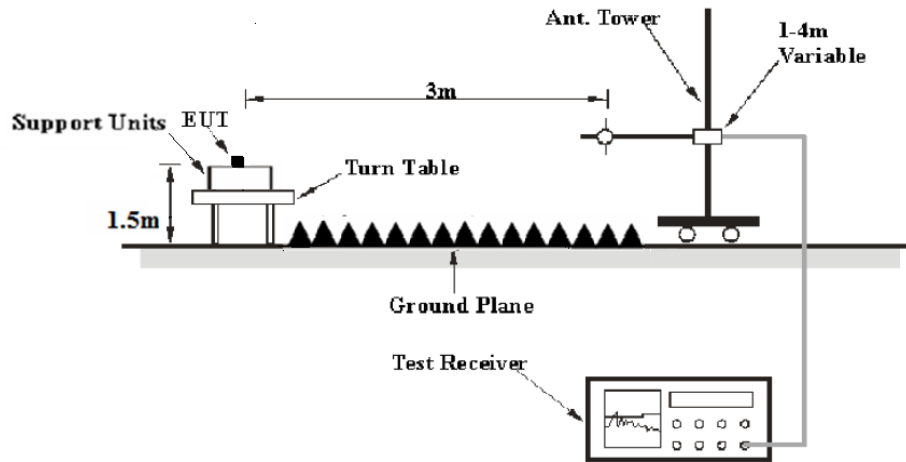
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

EUT Setup

Below 1 GHz:



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 15.249 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 25 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 – 25GHz	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 & 15.249.

Test Data

Environmental Conditions

Temperature:	24.6°C
Relative Humidity:	52%
ATM Pressure:	101.2 kPa

The testing was performed by Chris Wang on 2017-06-12.

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

30MHz-25GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.249/205/209	
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Low Channel (2407.00MHz)									
70.74	37.58	QP	119	100	V	-5.21	32.37	40	7.63
2407.00	94.54	PK	182	213	V	-6.18	88.36	114	25.64
2407.00	76.68	Ave	182	213	V	-6.18	70.50	94	23.50
2407.00	92.16	PK	326	214	H	-6.18	85.98	114	28.02
2407.00	74.38	Ave	326	214	H	-6.18	68.20	94	25.80
2390.00	61.52	PK	183	129	V	-6.22	55.30	74	18.70
2390.00	42.89	Ave	183	129	V	-6.22	36.67	54	17.33
2400.00	68.33	PK	341	199	V	-6.19	62.14	74	11.86
2400.00	43.15	Ave	341	199	V	-6.19	36.96	54	17.04
1042.08	45.58	PK	164	207	V	-12.20	33.38	74	40.62
1042.08	30.61	Ave	164	207	V	-12.20	18.41	54	35.59
4814.00	45.81	PK	307	240	V	1.64	47.45	74	26.55
4814.00	28.52	Ave	307	240	V	1.64	30.16	54	23.84
7221.00	41.82	PK	308	108	V	7.57	49.39	74	24.61
7221.00	25.19	Ave	308	108	V	7.57	32.76	54	21.24

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.249/205/209	
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
Middle Channel (2432.50MHz)									
70.74	37.56	QP	127	100	V	-5.21	32.35	40	7.65
2432.50	93.93	PK	108	211	V	-6.17	87.76	114	26.24
2432.50	75.55	Ave	108	211	V	-6.17	69.38	94	24.62
2432.50	89.09	PK	246	104	H	-6.17	82.92	114	31.08
2432.50	71.83	Ave	246	104	H	-6.17	65.66	94	28.34
1042.08	45.55	PK	144	177	V	-12.20	33.35	74	40.65
1042.08	30.57	Ave	144	177	V	-12.20	18.37	54	35.63
3104.21	43.06	PK	354	236	H	-2.97	40.09	74	33.91
3104.21	28.30	Ave	354	236	H	-2.97	25.33	54	28.67
4865.00	45.85	PK	130	137	V	1.75	47.60	74	26.40
4865.00	28.51	Ave	130	137	V	1.75	30.26	54	23.74
6478.96	42.76	PK	285	232	H	5.83	48.59	74	25.41
6478.96	27.83	Ave	285	232	H	5.83	33.66	54	20.34
7297.50	41.84	PK	35	146	V	7.64	49.48	74	24.52
7297.50	25.21	Ave	35	146	V	7.64	32.85	54	21.15

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBµV/m)	FCC Part 15.249/205/209	
	Reading (dBµV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
High Channel (2457.39MHz)									
70.74	37.55	QP	125	100	V	-5.21	32.34	40	7.66
2457.39	93.78	PK	44	166	V	-6.07	87.71	114	26.29
2457.39	75.21	Ave	44	166	V	-6.07	69.14	94	24.86
2457.39	90.28	PK	326	159	H	-6.07	84.21	114	29.79
2457.39	72.89	Ave	326	159	H	-6.07	66.82	94	27.18
2483.50	42.09	PK	227	245	V	-6.01	36.08	74	37.92
2483.50	26.90	Ave	227	245	V	-6.01	20.89	54	33.11
1042.08	45.53	PK	9	248	V	-12.20	33.33	74	40.67
1042.08	30.56	Ave	9	248	V	-12.20	18.36	54	35.64
4914.78	45.83	PK	272	242	V	1.87	47.70	74	26.30
4914.78	28.52	Ave	272	242	V	1.87	30.39	54	23.61
6478.96	42.78	PK	133	143	H	5.83	48.61	74	25.39
6478.96	27.84	Ave	133	143	H	5.83	33.67	54	20.33
7372.17	41.79	PK	216	122	V	7.72	49.51	74	24.49
7372.17	25.16	Ave	216	122	V	7.72	32.88	54	21.12

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

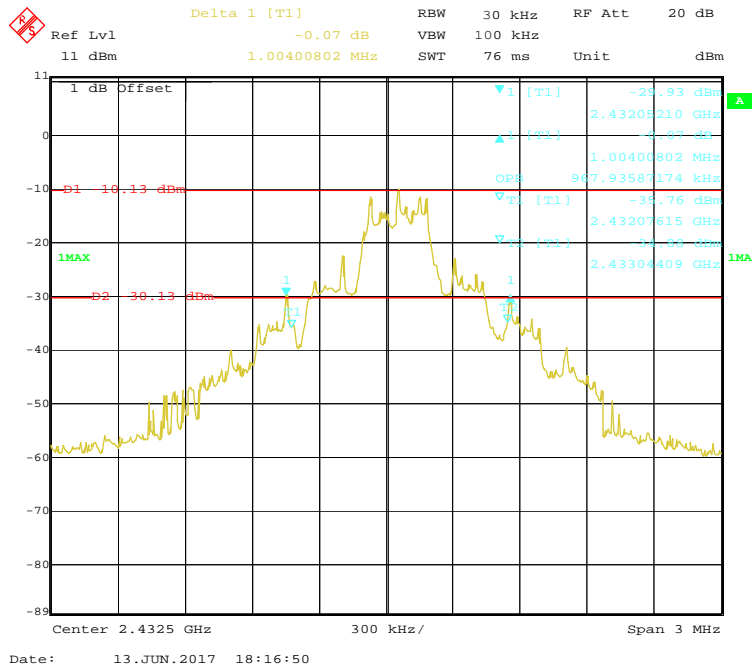
Temperature:	24.2°C
Relative Humidity:	51 %
ATM Pressure:	101.2kPa

The testing was performed by Chris Wang on 2017-06-13.

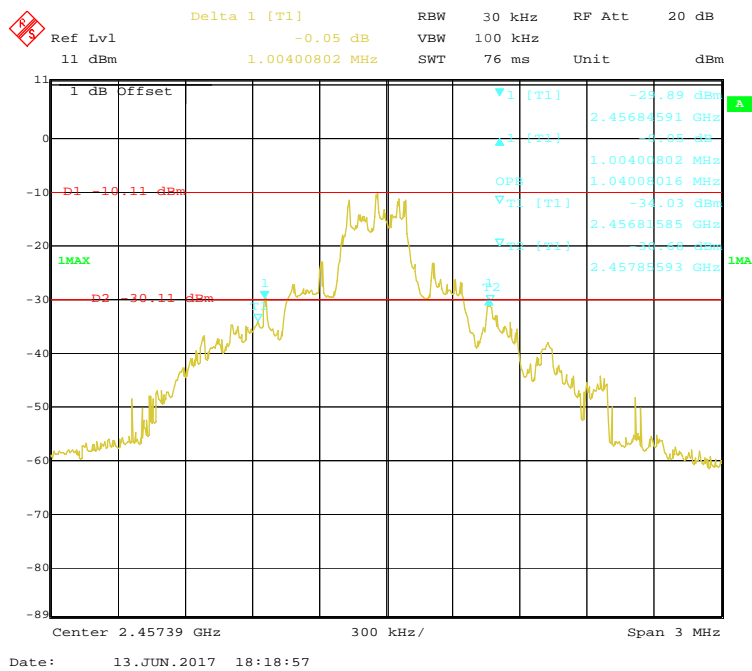
Test Result: Compliant.

Please refer to following tables and plots

Middle Channel



High Channel



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