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-CB1322

Report Type:	**Product Type:**
Original Report	Control Box

Test Engineer:	Chris Wang
Report Number:	RSHA170816005-00A
Report Date:	2017-09-05
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

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	OKIN Refined Electric Technology Co., Ltd.
Tested Model	CB.13.22.02
Series Model	CB.13.22.01, CB.13.22.03, CB.13.22.04
Model Difference	Model names
Product Type	Control Box
Dimension	159mm(L)×85mm(W)×41mm(H)
Power Supply	DC 29V from adapter

All measurement and test data in this report was gathered from production sample serial number: 20170816005. (Assigned by BACL, Kunshan). The EUT was received on 2017-08-16.

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 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)

FCC Part15.249 DXX submission with FCC ID: PCU-RF3019.

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	4.88dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
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 for GFSK modulation:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2403	40	2442
2	2404	41	2443
…	…	…	…
38	2440	77	2479
39	2441	78	2480

EUT was tested with channel 1, 40 and 78.

EUT Exercise Software

No software was used during the test.

Support Equipment List and Details

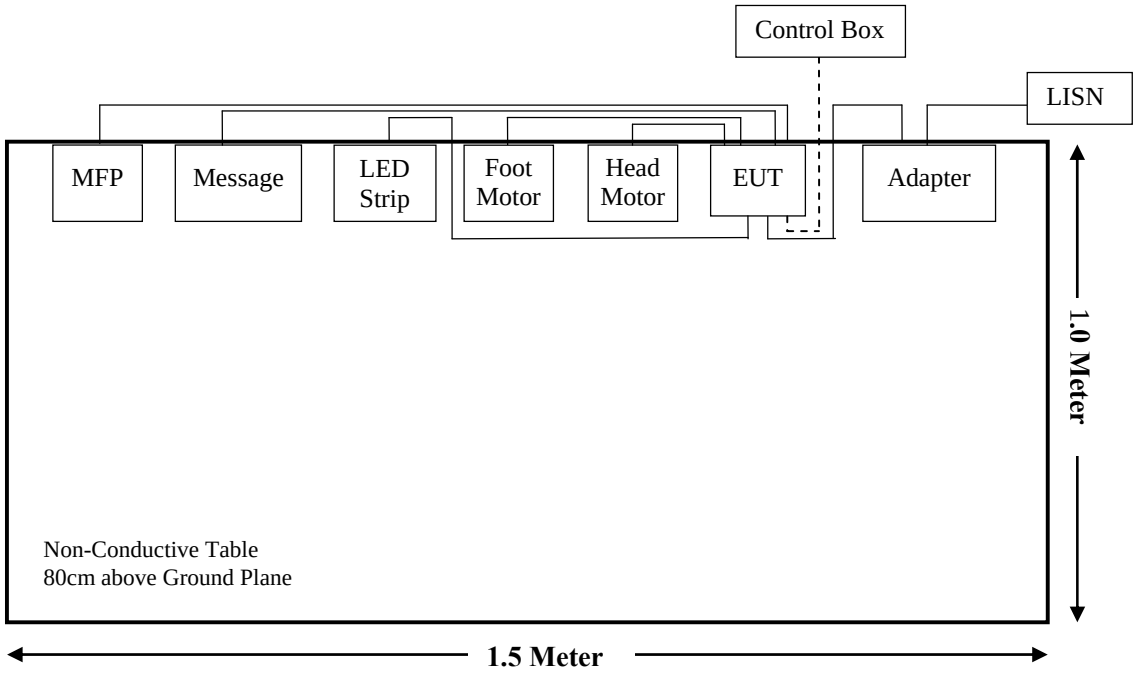
Manufacturer	Description	Model	Serial Number
OKIN	Head Motor	B15313	Q17071700001
OKIN	Foot Motor	B15312	Q17071400002
OKIN	Message	JLDK.04.05.01	JLDK-4
OKIN	MFP	74389	Qww286616540
OKIN	Adapter Input: AC100-240V 50/60Hz 1.5A Output: DC 29V, 1.8A	09-290018	RBD7174000646
OKIN	LED Strip	R5.113.00.011	/
OKIN	Control Box	CB.13.22.02	/

External I/O Cable

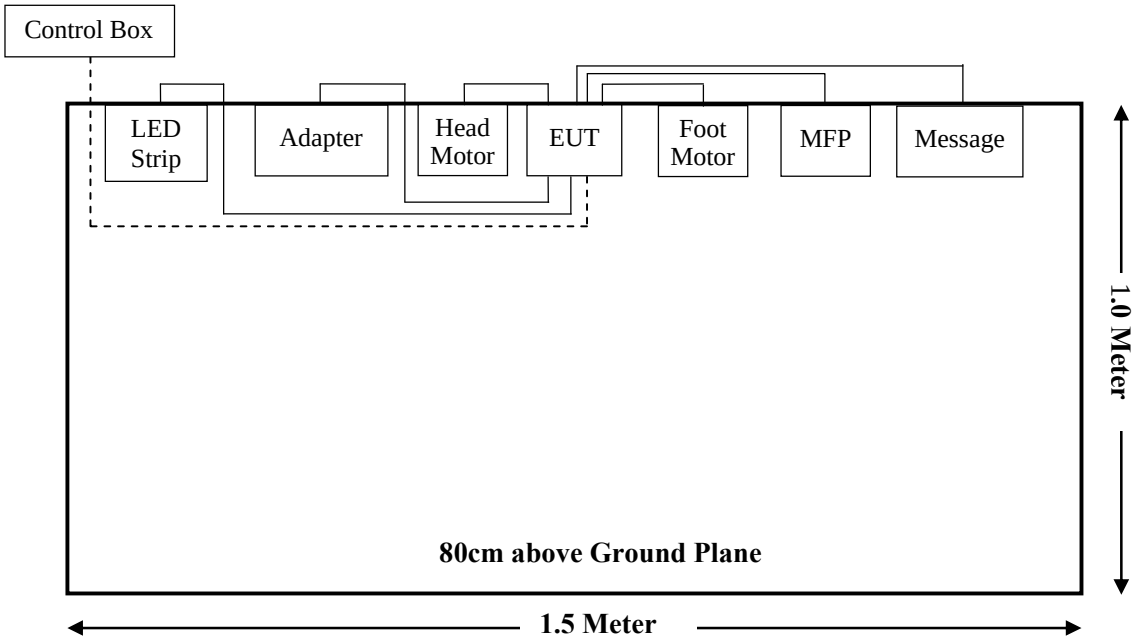
Cable Description	Length(m)	From Port	To
LED Strip Tieline	0.8	EUT	LED Strip
Lan Cable	0.8	EUT	Control Box

Block Diagram of Test Setup

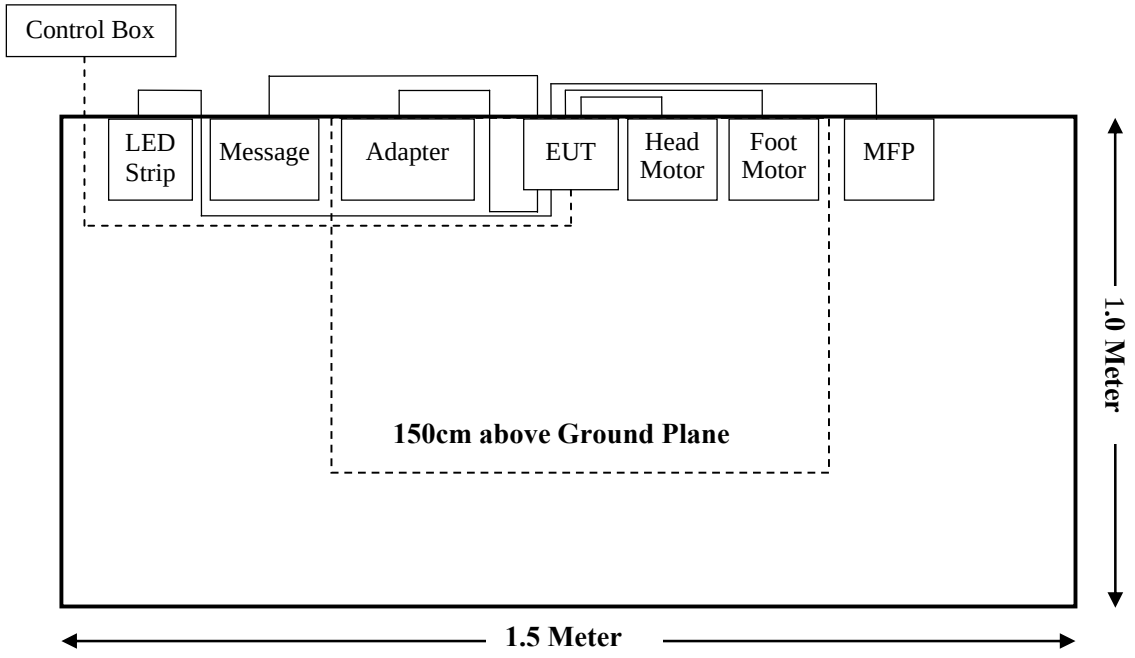
For Conducted Emissions:



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	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A040914-2	2016-01-09	2019-01-08
Sonoma Instrunent	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
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
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	2016-12-12	2017-12-11
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
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-20
OKIN	RF Cable	N/A	N/A	2017-08-22	2018-08-21
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

*** 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 0dBi, which was permanently attached ,fulfill the requirement of this section, please refer to the EUT photos.

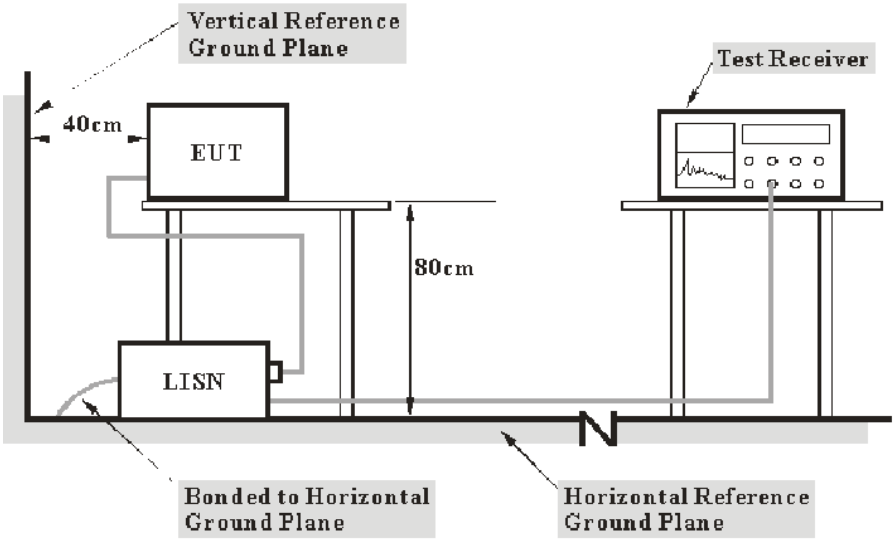
Result: Compliant.

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 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:

Correction Factor = LISN VDF + 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:

Margin = Limit – Corrected Amplitude

Test Results Summary

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

Test Data

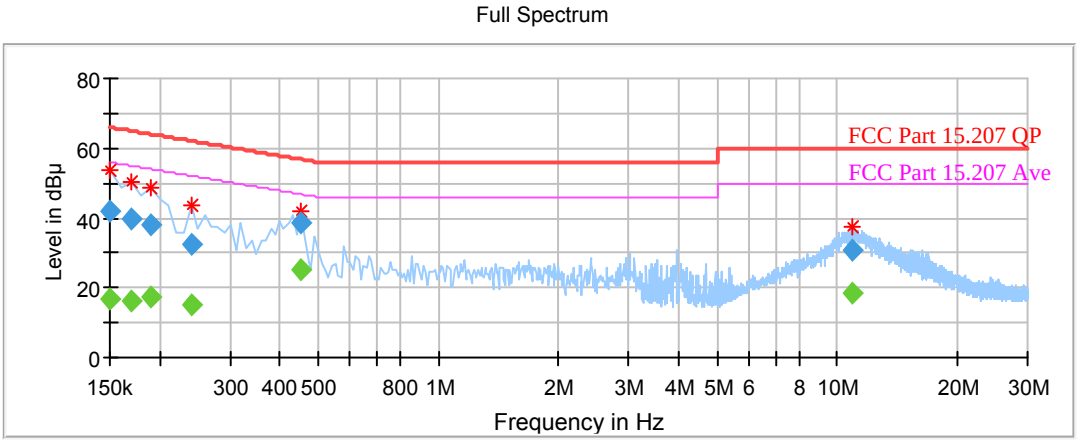
Environmental Conditions

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

The testing was performed by Chris Wang on 2017-08-28.

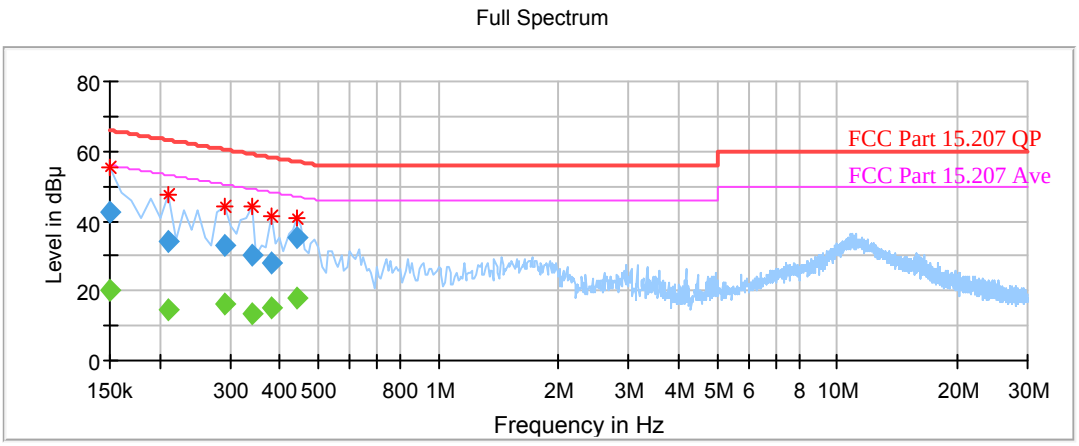
EUT operation mode: Transmitting in high channel(worst case)

AC 120V/60 Hz, Line



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB µ V)	Margin (dB)	Comment
0.150000	---	16.71	9.000	L1	16.1	56.00	39.29	Compliance
0.150000	41.98	---	9.000	L1	16.1	66.00	24.02	Compliance
0.170000	---	16.23	9.000	L1	16.1	54.96	38.73	Compliance
0.170000	39.77	---	9.000	L1	16.1	64.96	25.19	Compliance
0.190000	---	17.45	9.000	L1	16.1	54.04	36.59	Compliance
0.190000	38.19	---	9.000	L1	16.1	64.04	25.85	Compliance
0.240000	---	14.89	9.000	L1	16.0	52.10	37.21	Compliance
0.240000	32.18	---	9.000	L1	16.0	62.10	29.92	Compliance
0.450000	---	24.92	9.000	L1	16.1	46.88	21.96	Compliance
0.450000	38.81	---	9.000	L1	16.1	56.88	18.07	Compliance
10.840000	---	18.70	9.000	L1	16.1	50.00	31.30	Compliance
10.840000	30.77	---	9.000	L1	16.1	60.00	29.23	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB µ V)	Margin (dB)	Comment
0.150000	---	20.27	9.000	N	16.1	56.00	35.73	Compliance
0.150000	42.30	---	9.000	N	16.1	66.00	23.70	Compliance
0.210000	---	14.62	9.000	N	16.1	53.21	38.59	Compliance
0.210000	33.85	---	9.000	N	16.1	63.21	29.36	Compliance
0.290000	---	16.18	9.000	N	16.1	50.52	34.34	Compliance
0.290000	33.10	---	9.000	N	16.1	60.52	27.42	Compliance
0.340000	---	13.27	9.000	N	16.1	49.20	35.93	Compliance
0.340000	30.32	---	9.000	N	16.1	59.20	28.88	Compliance
0.380000	---	15.33	9.000	N	16.1	48.28	32.95	Compliance
0.380000	27.88	---	9.000	N	16.1	58.28	30.40	Compliance
0.440000	---	18.09	9.000	N	16.1	47.06	28.97	Compliance
0.440000	35.45	---	9.000	N	16.1	57.06	21.61	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:

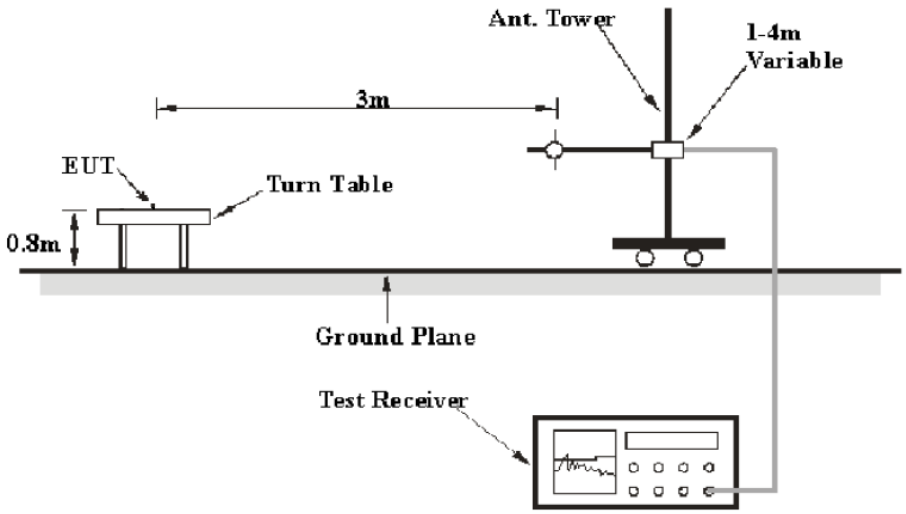
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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

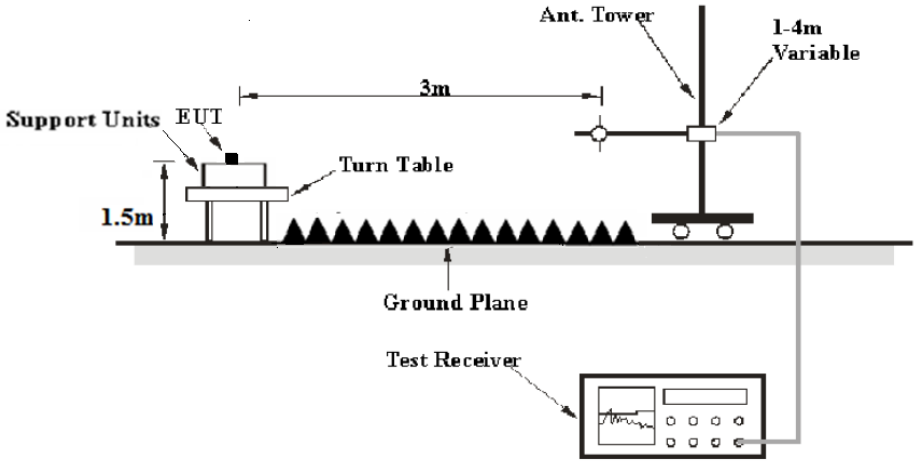
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit –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 2017-09-04.

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 (2403.00MHz)									
171.26	33.88	QP	125	216	V	-13.70	20.18	43.5	23.32
2403.00	90.92	PK	305	144	V	-4.93	85.99	114	28.01
2403.00	90.02	Ave	305	144	V	-4.93	85.09	94	8.91
2403.00	80.60	PK	99	192	H	-4.93	75.67	114	38.33
2403.00	79.68	Ave	99	192	H	-4.93	74.75	94	19.25
2390.00	42.94	PK	160	225	V	-4.96	37.98	74	36.02
2390.00	30.47	Ave	160	225	V	-4.96	25.51	54	28.49
2400.00	45.59	PK	270	219	V	-4.94	40.65	74	33.35
2400.00	32.33	Ave	270	219	V	-4.94	27.39	54	26.61
1534.47	42.44	PK	14	159	V	-7.91	34.53	74	39.47
1534.47	29.56	Ave	14	159	V	-7.91	21.65	54	32.35
4806.00	45.72	PK	243	121	V	2.48	48.20	74	25.80
4806.00	36.23	Ave	243	121	V	2.48	38.71	54	15.29
7209.00	37.04	PK	79	237	V	9.79	46.83	74	27.17
7209.00	24.51	Ave	79	237	V	9.79	34.30	54	19.70

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 (2442.00MHz)									
171.26	33.85	QP	111	156	V	-13.70	20.15	43.5	23.35
2442.00	90.43	PK	305	191	V	-4.82	85.61	114	28.39
2442.00	89.54	Ave	305	191	V	-4.82	84.72	94	9.28
2442.00	80.02	PK	99	150	H	-4.82	75.20	114	38.80
2442.00	79.13	Ave	99	150	H	-4.82	74.31	94	19.69
1534.47	42.41	PK	160	118	V	-7.91	34.50	74	39.50
1534.47	29.54	Ave	160	118	V	-7.91	21.63	54	32.37
4139.68	39.77	PK	270	124	V	1.08	40.85	74	33.15
4139.68	27.87	Ave	270	124	V	1.08	28.95	54	25.05
4884.00	45.46	PK	14	155	V	2.65	48.11	74	25.89
4884.00	36.00	Ave	14	155	V	2.65	38.65	54	15.35
6662.33	39.35	PK	243	210	H	8.66	48.01	74	25.99
6662.33	27.79	Ave	243	210	H	8.66	36.45	54	17.55
7326.00	36.76	PK	79	218	V	9.97	46.73	74	27.27
7326.00	24.28	Ave	79	218	V	9.97	34.25	54	19.75

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 (2480.00MHz)									
171.26	33.90	QP	158	189	V	-13.70	20.20	43.5	23.30
2480.00	90.98	PK	305	159	V	-4.72	86.26	114	27.74
2480.00	90.09	Ave	305	159	V	-4.72	85.37	94	8.63
2480.00	80.83	PK	99	105	H	-4.72	76.11	114	37.89
2480.00	79.94	Ave	99	105	H	-4.72	75.22	94	18.78
2483.50	43.56	PK	160	130	V	-4.71	38.85	74	35.15
2483.50	31.49	Ave	160	130	V	-4.71	26.78	54	27.22
2583.17	42.64	PK	270	143	V	-4.22	38.42	74	35.58
2583.17	30.33	Ave	270	143	V	-4.22	26.11	54	27.89
4960.00	45.36	PK	14	107	V	2.82	48.18	74	25.82
4960.00	34.88	Ave	14	107	V	2.82	37.70	54	16.30
6662.33	39.34	PK	243	163	H	8.66	48.00	74	26.00
6662.33	27.77	Ave	243	163	H	8.66	36.43	54	17.57
7440.00	36.61	PK	79	169	V	10.14	46.75	74	27.25
7440.00	24.12	Ave	79	169	V	10.14	34.26	54	19.74

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

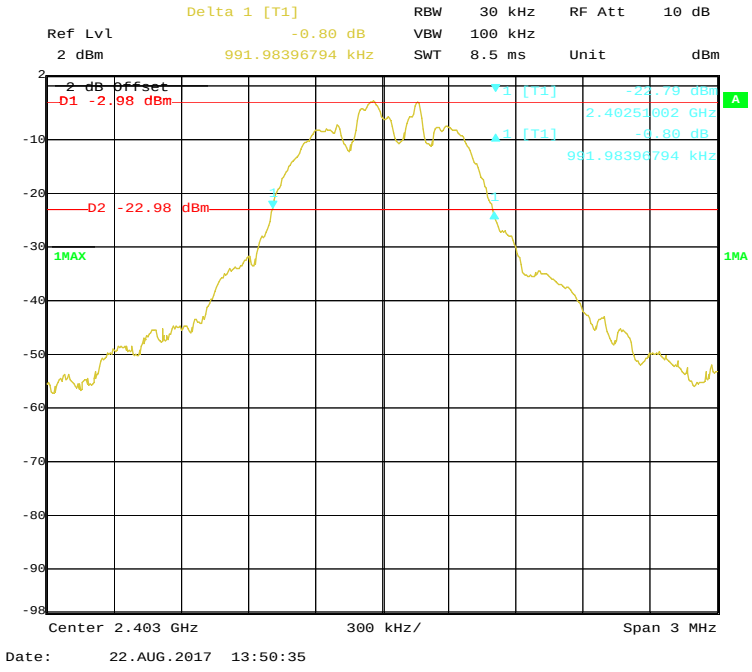
The testing was performed by Chris Wang on 2017-08-22.

Test Mode: Transmitting

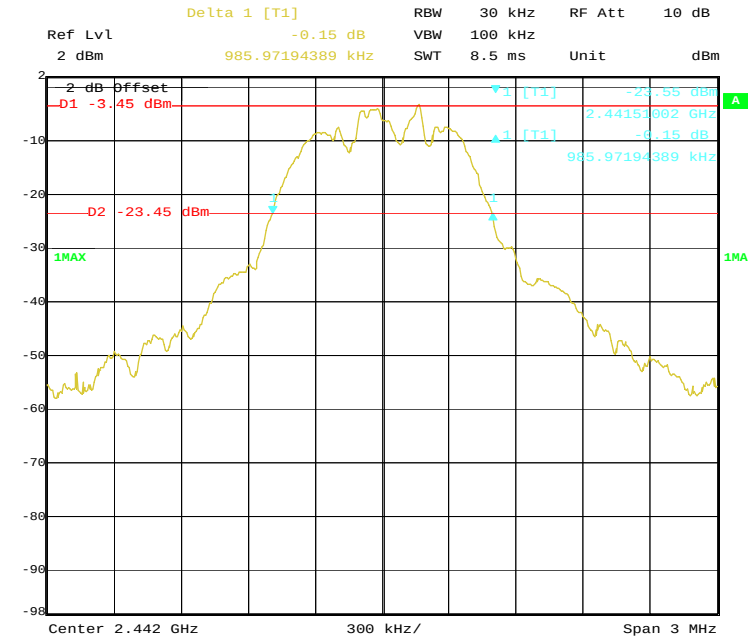
Test Result: Compliant.

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2403.00	0.992
Middle	2442.00	0.986
High	2480.00	0.998

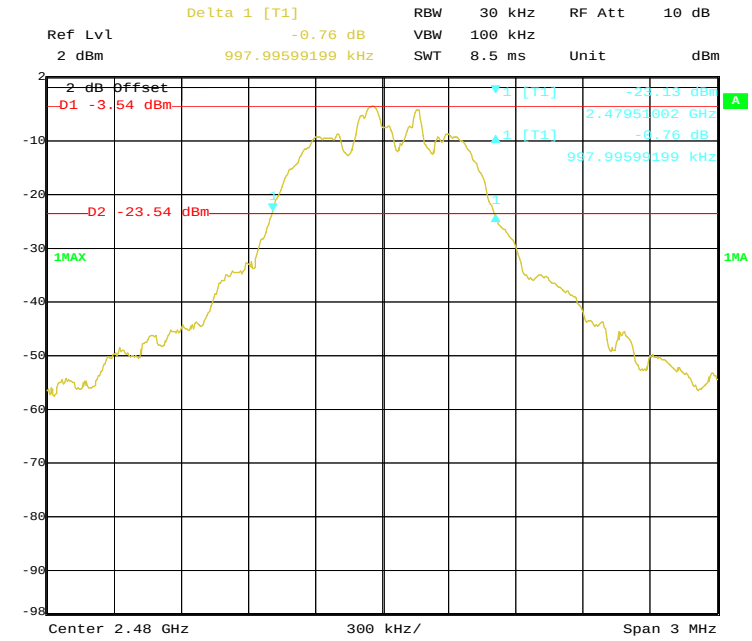
Low Channel



Middle Channel



High Channel



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