FCC 47 CFR PART 15 SUBPART C

Applicant	:	Revolar Inc
Product Type	:	Personal safety alert
Trade Name	:	REVOLAR
Model Number	:	REVOLAR
Test Specification	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Receive Date	:	Dec. 17, 2015
Test Period	:	Dec. 22 ~ Dec. 25, 2015
Issue Date	:	Feb. 18, 2016

Issue by

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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Jan. 30, 2016	Initial Issue	
01	Feb. 18, 2016	Revised report information.	Snow Wang

Verification of Compliance

Issued Date: Feb. 18, 2016

Applicant	:	Revolar Inc
Product Type	:	Personal safety alert
Trade Name	:	REVOLAR
Model Number	:	REVOLAR
FCC ID	:	2AHAI-MD001
EUT Rated Voltage	:	DC 3.0V
Test Voltage	:	DC 3.0V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART C ANSI C63.10:2013
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330 http://www.atl-lab.com.tw/e-index.htm

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By	: Fly Lu	Reviewed By	: Eric Ou Yang	
(Manager)	(Fly Lu)	(Testing Engineer)	(Eric Ou Yang)	

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1 General Information

1.1 Summary of Test Result

Standard	Item	Result	Remark
15.247			
15.207	AC Power Conducted Emission	Not applicable	This device power by button cell battery
15.247(d)	Transmitter Radiated Emissions	PASS	-----
15.247(b)(3)	Max. Output Power	PASS	-----
15.247(a)(2)	6dB RF Bandwidth	PASS	-----
15.247(e)	Power Spectral Density	PASS	-----
15.247(d)	Out of Band Conducted Spurious Emission	PASS	-----
15.203	Antenna Requirement	PASS	-----

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	9kHz ~ 150KHz	2.7
	150kHz ~ 30MHz	2.8
Radiated Emission	9kHz ~ 30MHz	1.457
	30MHz ~ 1000MHz	6.300
	1000MHz ~ 18000MHz	5.474
	18000MHz ~ 26500MHz	5.630
	26500MHz ~ 40000MHz	5.054

2 EUT Description

Applicant	Revolar Inc 800 N. Grant Street, Suite 120, Denver, Colorado 80203, United States
Manufacturer	Celestica (Thailand) Limited 49/18 Laem Chabang Industrial Estate Moo 5,Tungsukhla,Sriracha Chonburi 20230 Thailand
Product Type	Personal safety alert
Trade Name	REVOLAR
Model No.	REVOLAR
FCC ID	2AHAI-MD001
Frequency Range	Bluetooth LE: 2402 ~ 2480 MHz
Modulation Type	GFSK
Antenna Type	Meandered Inverted-F Antenna
Antenna Gain	5.3 dBi
RF Output Power	0.00059 W / -2.32 dBm

3 Test Methodology

3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Normal Operation Mode
Mode 2: Bluetooth LE Link Mode

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz and power line conducted emissions below 30MHz, which worst case was in normal link mode only.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

Note: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

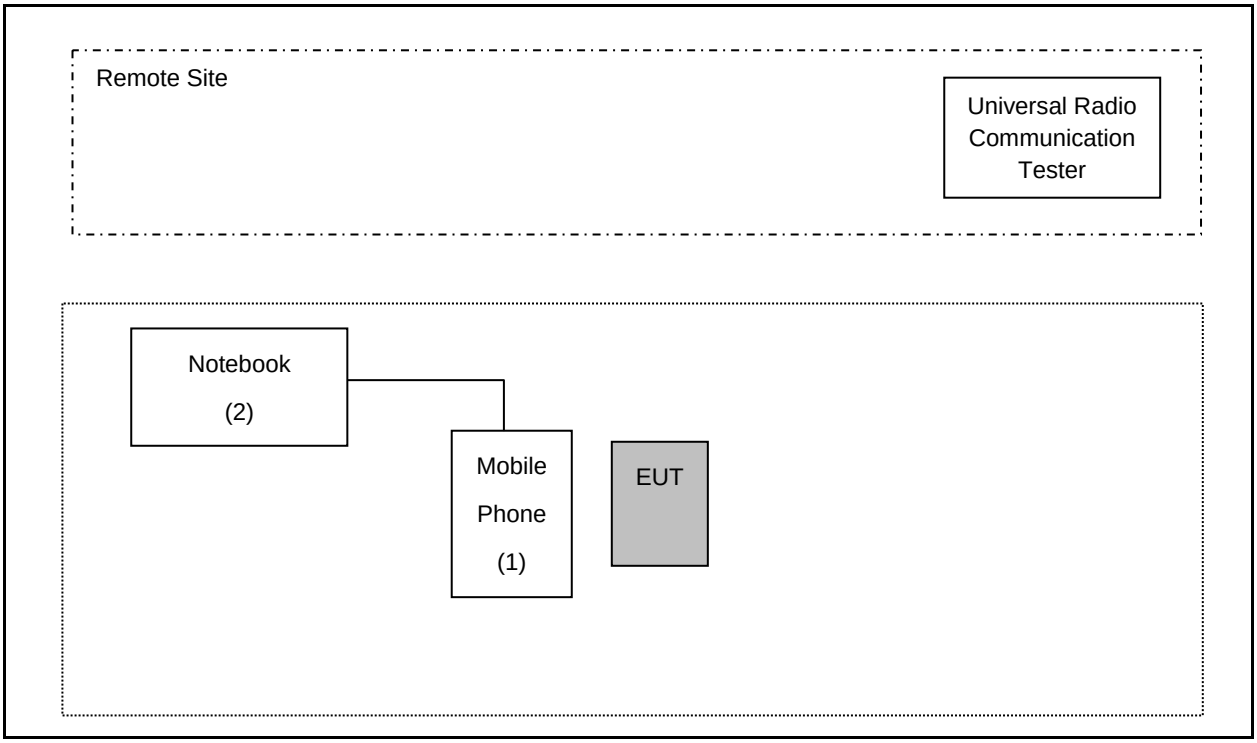
3.2. EUT Exercise Software

1	Setup the EUT shown on 3.3.
2	Turn on the power of all equipment.
3	Turn Bluetooth function link to CBT.
4	EUT run test program.

Measurement Software	
1	EZ-EMC Ver. ATL-03A1-1

3.3. Configuration of Test System Details

Radiated Emissions



Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	Mobile Phone	Foxconn	A1429	F18L945PDTWD	---
(2)	Notebook	DELL	LAPTITU	6699565657	Non-Shielded, 2.0m

3.4. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 Radiated Emission Measurement

4.1. Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m at meter)	Measurement Distance (meters)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

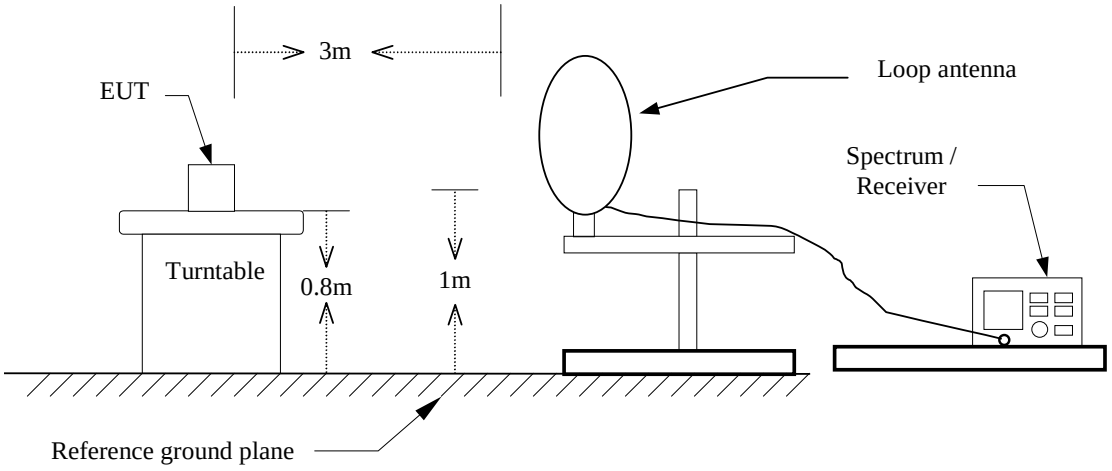
4.2. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/06/2015	(1)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/06/2015	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/24/2015	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/24/2015	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	08/11/2015	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/12/2015	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	07/06/2015	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	02/02/2015	(1)
Microwave Cable	EMCI	EMC-104-SM-SM-14000	140202	02/24/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-600	140301	02/24/2015	(1)
Test Site	ATL	TE01	888001	08/27/2015	(1)

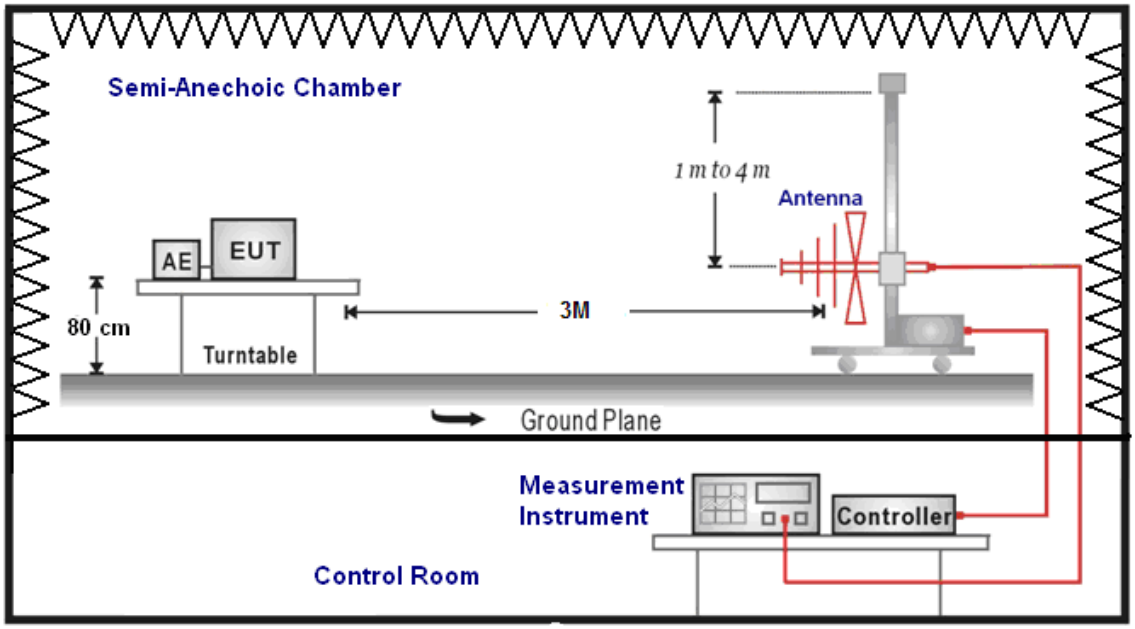
Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

4.3. Setup

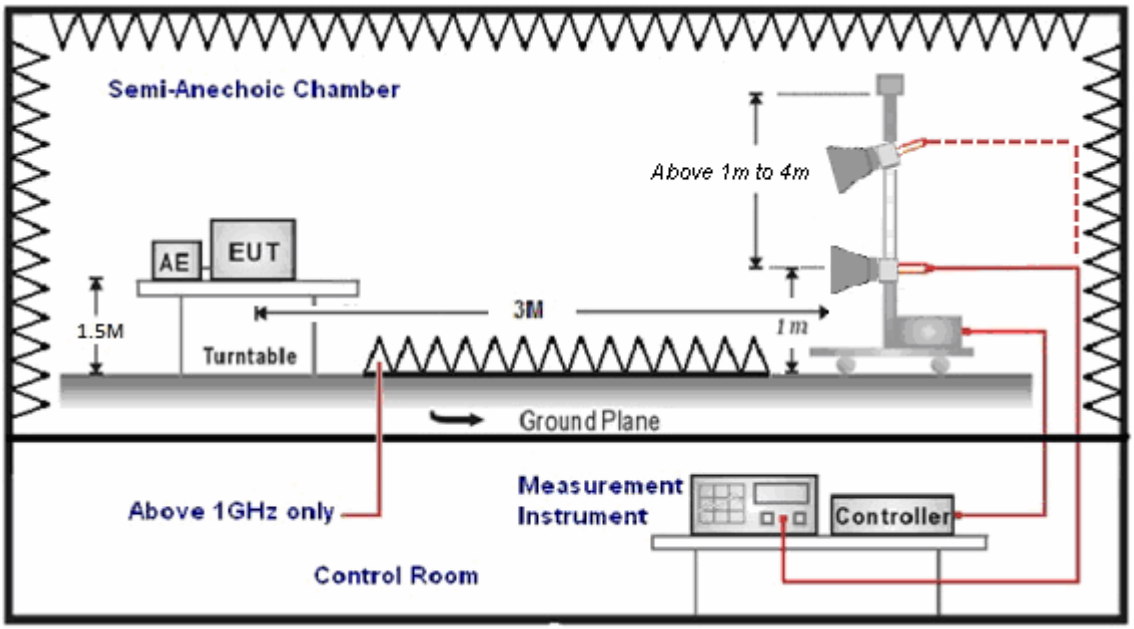
9kHz ~ 30MHz



Below 1GHz



Above 1GHz


Semi-Anechoic Chamber
Above 1m to 4m
AE
EUT
1.5M
3M
1m
Turntable
Ground Plane
Above 1GHz only
Measurement
Instrument
Controller
Control Room

4.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height(below 1GHz use 0.8m turntable / above 1GHz use 1.5m turntable), top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 9 kHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements when Duty cycle >98% / 1/T for average measurements when Duty cycle <98%. A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

(1) Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)
FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.
P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:
(a) For fundamental frequency : Transmitter Output < +30dBm
(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4.5. Test Result

Below 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	REVOLAR	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	1	Date:	12/25/2015
		Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
217.5000	36.46	-12.68	23.78	46.00	-22.22	QP	H
277.5000	32.81	-9.93	22.88	46.00	-23.12	QP	H
391.5000	29.33	-7.42	21.91	46.00	-24.09	QP	H
501.0000	26.17	-5.30	20.87	46.00	-25.13	QP	H
697.0000	25.21	-1.32	23.89	46.00	-22.11	QP	H
813.0000	25.71	0.82	26.53	46.00	-19.47	QP	H
217.5000	33.46	-12.68	20.78	46.00	-25.22	QP	V
282.5000	29.52	-9.70	19.82	46.00	-26.18	QP	V
399.5000	29.02	-7.26	21.76	46.00	-24.24	QP	V
520.0000	26.15	-4.87	21.28	46.00	-24.72	QP	V
671.0000	26.62	-1.89	24.73	46.00	-21.27	QP	V
819.5000	26.12	0.95	27.07	46.00	-18.93	QP	V

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3.No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).

Above 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	REVOLAR	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	2	Date:	12/24/2015
Frequency:	2402MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3030.000	35.47	1.46	36.93	74.00	-37.07	peak	H
4633.000	30.65	6.79	37.44	74.00	-36.56	peak	H
6733.000	31.20	12.11	43.31	74.00	-30.69	peak	H
3065.000	33.77	1.62	35.39	74.00	-38.61	peak	V
4563.000	31.42	6.55	37.97	74.00	-36.03	peak	V
6670.000	31.57	11.96	43.53	74.00	-30.47	peak	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	REVOLAR	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	2	Date:	12/24/2015
Frequency:	2440MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2981.000	34.60	1.26	35.86	74.00	-38.14	peak	H
4633.000	30.44	6.79	37.23	74.00	-36.77	peak	H
6719.000	31.17	12.07	43.24	74.00	-30.76	peak	H
3009.000	33.34	1.35	34.69	74.00	-39.31	peak	V
4591.000	29.68	6.64	36.32	74.00	-37.68	peak	V
6677.000	30.86	11.97	42.83	74.00	-31.17	peak	V

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	REVOLAR	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	2	Date:	12/24/2015
Frequency:	2480MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
3023.000	33.38	1.42	34.80	74.00	-39.20	peak	H
4549.000	30.65	6.49	37.14	74.00	-36.86	peak	H
6495.000	29.80	11.54	41.34	74.00	-32.66	peak	H
3009.000	36.64	1.35	37.99	74.00	-36.01	peak	V
4542.000	30.11	6.47	36.58	74.00	-37.42	peak	V
6726.000	30.47	12.09	42.56	74.00	-31.44	peak	V

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Band Edge

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	REVOLAR	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	2	Date:	12/24/2015
Frequency:	2402 MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2379.410	39.86	-0.36	39.50	74.00	-34.50	peak	H
2390.000	37.45	-0.33	37.12	74.00	-36.88	peak	H
2374.790	39.13	-0.39	38.74	74.00	-35.26	peak	V
2390.000	37.00	-0.33	36.67	74.00	-37.33	peak	V

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 3.0V
Model Number:	REVOLAR	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Mode:	2	Date:	12/24/2015
Frequency:	2480 MHz	Test By:	Eric Ou Yang

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2483.500	37.80	0.03	37.83	74.00	-36.17	peak	H
2494.460	40.46	0.07	40.53	74.00	-33.47	peak	H
2483.500	37.18	0.03	37.21	74.00	-36.79	peak	V
2494.700	39.64	0.07	39.71	74.00	-34.29	peak	V

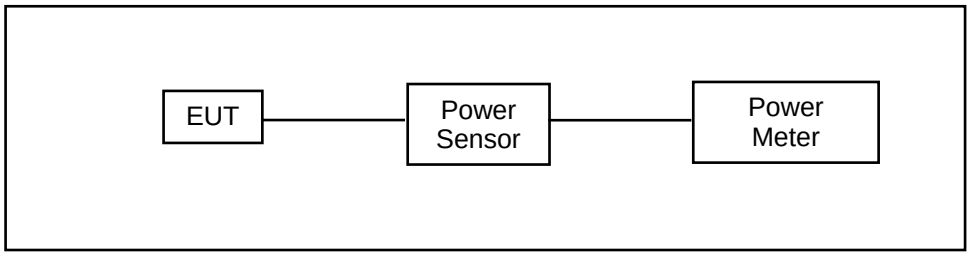
Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2.Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

5 Maximum Conducted Output Power Measurement

5.1. Limit

For DTS employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W.

5.2. Test Setup



5.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Single Channel PK Power Sensor	Agilent	N1911A	MY45101619	12/11/2015	(1)
Wideband Power Meter	Agilent	N1921A	MY45241957	12/11/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

5.4. Test Procedure

The tests below are run with the EUT's transmitter set at high power in TX mode. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. Remove the Subjective device's antenna and connect the RF output port to power sensor. The maximum peak output power shall not exceed 1 watt.

Use a direct connection between the antenna port of transmitter and the power sensor, for prevent the power sensor input attenuation 40-50 dB. Set the RBW Bandwidth of the emission or use a channel power meter mode.

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt (+30 dBm). For antennas with gains greater than 6 dBi, transmitter output level must be decreased by an amount equal to (GAIN - 6)/3 dBm.

The antenna port of the EUT was connected to the input of a power sensor. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

5.5. Test Result

Model Number	REVOLAR					
Test Item	Transmitter Output Power					
Date of Test	12/22/2015					
Test Mode	Frequency (MHz)	Average Output Power		Peak Output Power		
		Measurement Results		Measurement Results		Limit
		dBm	W	dBm	W	W
Mode 2	2402	-3.58	0.00044	**-2.32**	**0.00059**	< 1
	2440	-3.98	0.00040	-2.85	0.00052	< 1
	2480	-4.17	0.00038	-2.98	0.00050	< 1

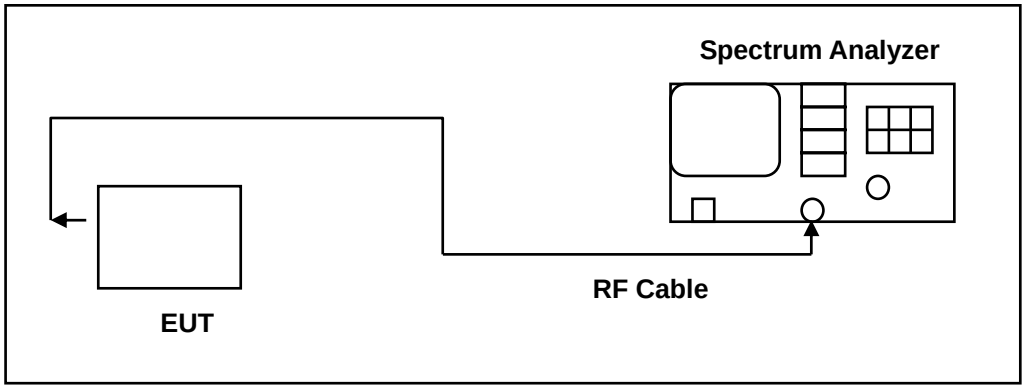
Note: The relevant measured result has the offset with cable loss already.

6 6dB RF Bandwidth Measurement

6.1. Limit

6dB RF Bandwidth: Systems using digital modulation techniques may operate in the 2400–2483.5 MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

6.2. Test Setup



6.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

dRemark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

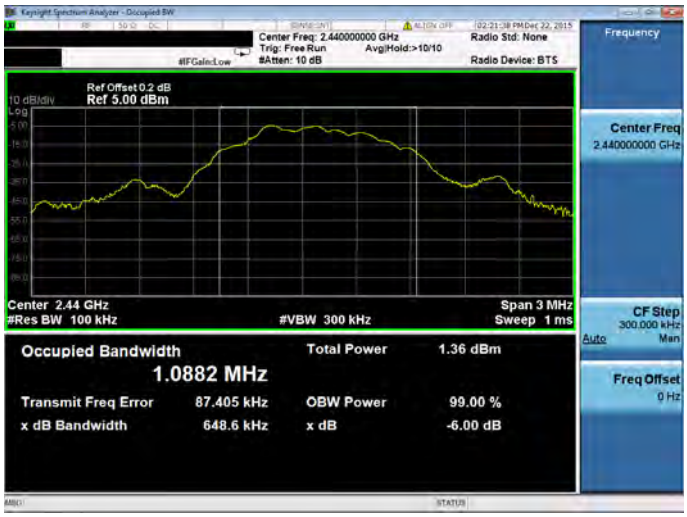
6.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.
6dB RF Bandwidth: The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES RBW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A peak output reading was taken, a DISPLAY line was drawn 6 dB lower than peak level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.
The test was performed at 3 channels (Channel low, middle, high)

6.5. Test Result

Model Number	REVOLAR		
Test Item	6dB RF Bandwidth		
Test Mode	Mode 2: Bluetooth LE Link Mode		
Date of Test	12/22/2015	Test Site	TE05
Frequency (MHz)	6dB Bandwidth (kHz)	6dB RF Bandwidth Limit (kHz)	
2402	658.100	> 500	
2440	648.600	> 500	
2480	623.200	> 500	

6.6. Test Graphs

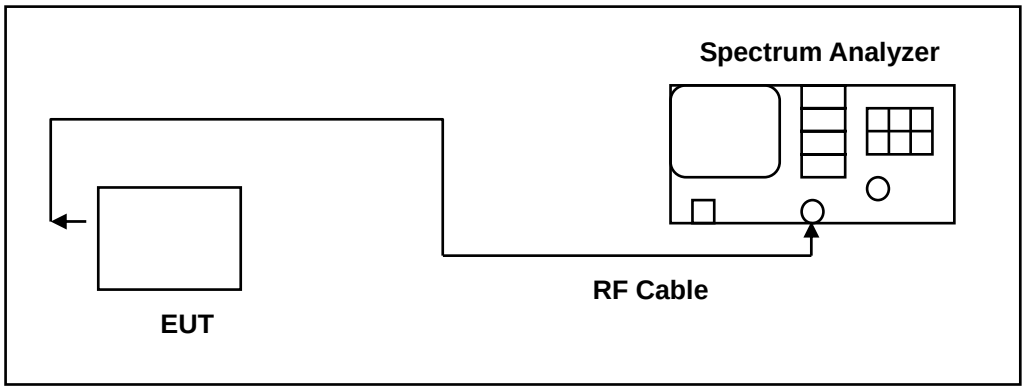
Mode 2: Bluetooth LE Link Mode	
2402	
2440	
2480	

7 Maximum Power Density Measurement

7.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.2. Test Setup



7.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.
Note: N.C.R. = No Calibration Request.

7.4. Test Procedure

The EUT tested to DTS test procedure of KDB558074D01 for compliance to FCC 47CFR 15.247 requirements.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 × RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.5. Test Result

Model Number	REVOLAR		
Test Item	Maximum Power Density		
Test Mode	Mode 2: Bluetooth LE Link Mode		
Date of Test	12/22/2015	Test Site	TE05
Frequency (MHz)	Reading (dBm/3KHz)		Limit (dBm)
2402	-9.858		< 8
2440	-10.317		< 8
2480	-10.329		< 8

7.6. Test Graphs

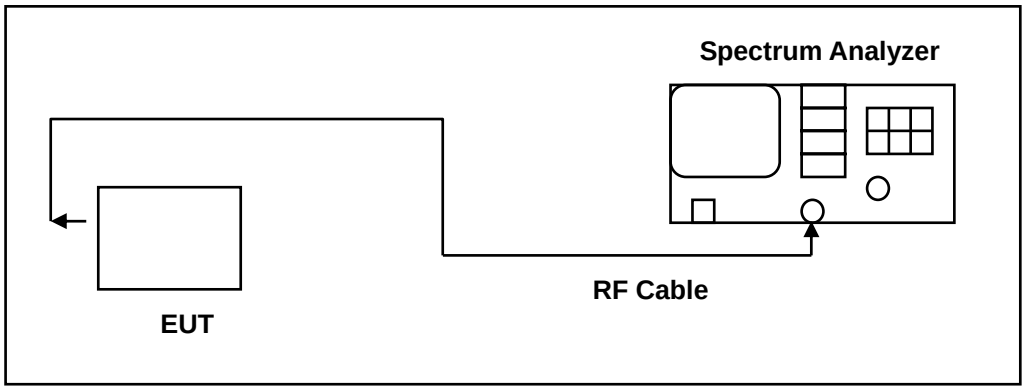
Mode 2: Bluetooth LE Link Mode	
2402	
2440	
2480	

8 Out of Band Conducted Emissions Measurement

8.1. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

8.2. Test Setup



8.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	(1)
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/27/2015	(1)
Microwave Cable	EMCI	EMC104-SM-SM-1500	140303	02/24/2015	(1)
Test Site	ATL	TE05	TE05	N.C.R.	-----

Remark: (1) Calibration period 1 year.
Note: N.C.R. = No Calibration Request.

8.4. Test Procedure

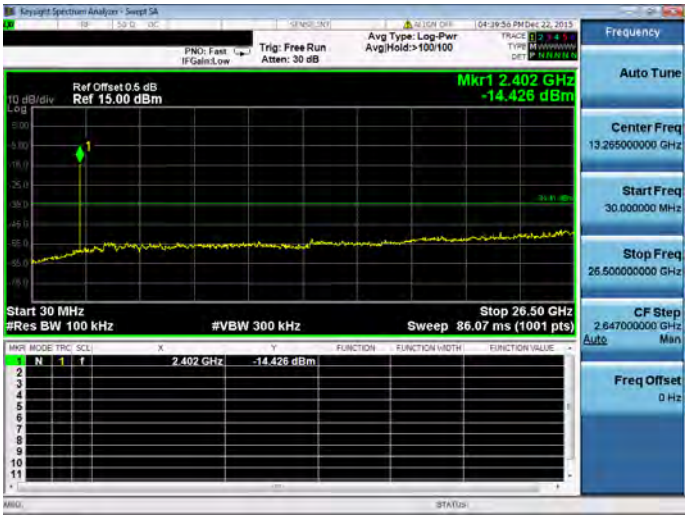
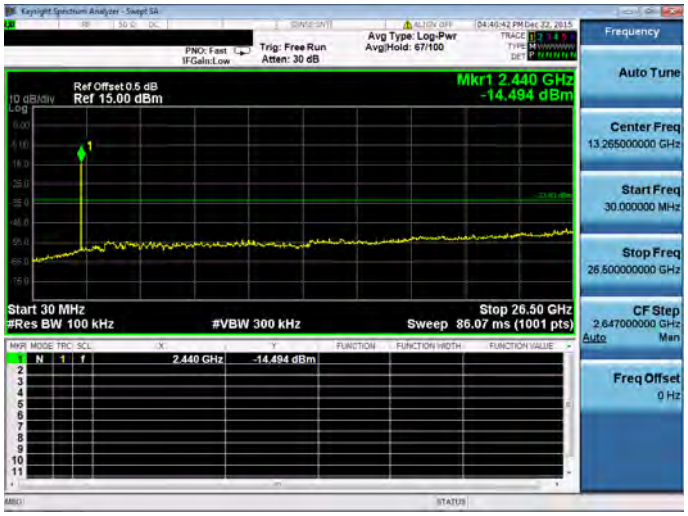
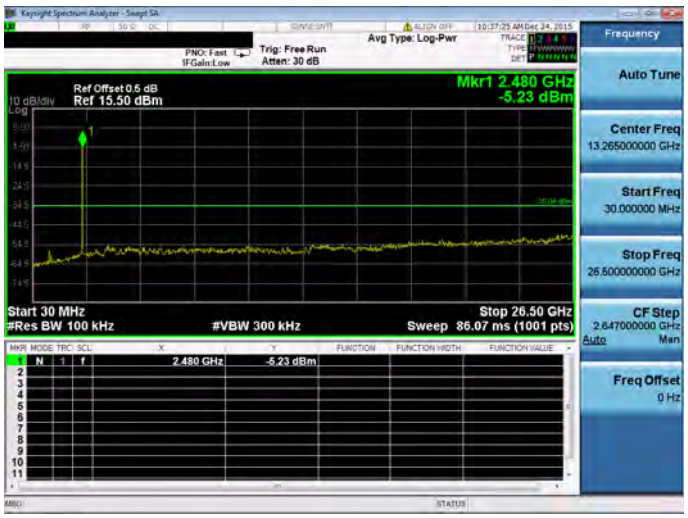
In any 100 kHz bandwidth outside the EUT pass band, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the pass band.
The test was performed at 3 channels.

8.5. Test Graphs

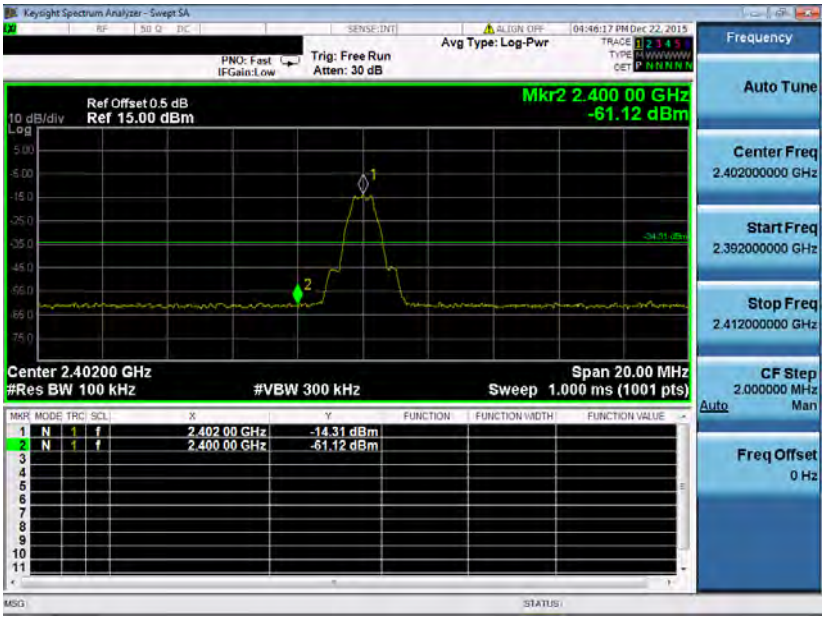
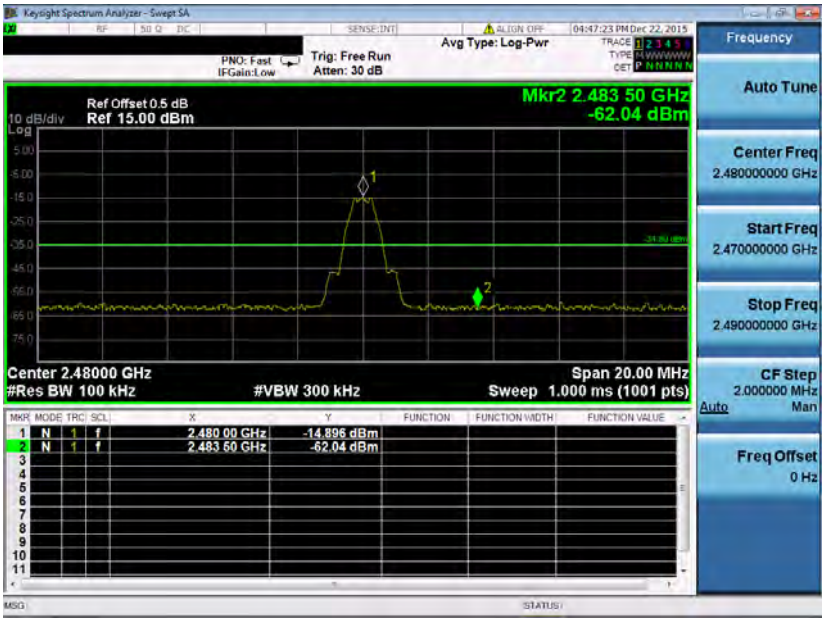
Reference level

Mode 2: Bluetooth LE Link Mode	
2402	
2440	
2480	

Out of Band Conducted Emissions

Mode 2: Bluetooth LE Link Mode	
2402	
2440	
2480	

Conducted Band Edge

Mode 2: Bluetooth LE Link Mode	
2402	
2480	

9 Antenna Measurement

9.1. Limit

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 with the device.
And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2. Antenna Connector Construction

The antenna used in this product is Meandered Inverted-F Antenna. And the maximum Gain of this antenna is 5.3 dBi