FCC 47 CFR PART 15 SUBPART E

Applicant	:	Shenzhen Longing Innovative Aviation Technology Co., Ltd.
Product Type	:	Radio Control Quadcopter
Trade Name	:	LONGING
Model Number	:	LY-250
Test Specification	:	FCC 47 CFR PART 15 SUBPART E ANSI C63.10:2013
Receive Date	:	Jul. 06, 2016
Test Period	:	Jul. 16 ~ Jul. 22, 2016
Issue Date	:	Nov. 09, 2016

Issue by

A Test Lab Techno Corp.
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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Sep. 20, 2016	Initial Issue	Snow Wang
01	Nov. 09, 2016	Revised report information.	Joyce Liao

Verification of Compliance

Issued Date: Nov. 09, 2016

Applicant	:	Shenzhen Longing Innovative Aviation Technology Co., Ltd.
Product Type	:	Radio Control Quadcopter
Trade Name	:	LONGING
Model Number	:	LY-250
FCC ID	:	2AIWS1601250
EUT Rated Voltage	:	DC 7.2V
Test Voltage	:	DC 7.2V
Applicable Standard	:	FCC 47 CFR PART 15 SUBPART E 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：+86-3-2710188 / Fax：+86-3-2710190 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 FCC	Item	Result	Remark
15.407(b)(6) 15.207	AC Power Conducted Emission	N/A	Note
15.407(b) 15.205 / 15.209	Transmitter Radiated Emissions	PASS	---
15.407(a)	Maximum Conducted Output Power and e.i.r.p.	PASS	---
15.407(a)	26dB RF Bandwidth	Reference	---
15.407(e)	6dB RF Bandwidth	PASS	-----
15.407(a)	Peak Power Spectral Density	PASS	---
15.407(g)	Frequency Stability	PASS	---
15.407(a) 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.

Note: Not applicable, this device use DC power source.

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conducted Emission	9kHz ~ 150KHz	2.7 dB
	150kHz ~ 30MHz	2.8 dB
Radiated Emission	9kHz ~ 30MHz	1.457 dB
	30MHz ~ 1000MHz	6.300 dB
	1000MHz ~ 18000MHz	5.474 dB
	18000MHz ~ 26500MHz	5.630 dB
	26500MHz ~ 40000MHz	5.054 dB
Conducted Output Power		+0.27 dB / -0.28 dB
RF Bandwidth		4.96%
Power Spectral Density		+0.71 dB / -0.77 dB
Frequency Stability		+ 2.212 x 10-7% / - 2.170 x 10-7
Duty Cycle		1.06%
Time Occupancy		1.40%

2 EUT Description

Applicant	Shenzhen Longing Innovative Aviation Technology Co., Ltd. A206 Industrialization Base of Virtual University Yuexing 3rd Rd. Nanshan District, Shenzhen 581001, China
Manufacturer	Shenzhen Longing Innovative Aviation Technology Co., Ltd. A206 Industrialization Base of Virtual University Yuexing 3rd Rd. Nanshan District, Shenzhen 581001, China
Product Type	Radio Control Quadcopter
Trade Name	LONGING
Model No.	LY-250
FCC ID	2AIWS1601250
Frequency Range	5740 ~ 5840 MHz
Modulation Type	OFDM
Number of channels	8
Channel bandwidth	20MHz
Antenna Type	Fixed Antenna
Antenna Gain	2.15dBi
Antenna Delivery	1TX / 1RX
Frequency stability specification	± 20 ppm
RF Output Power	0.077 W

Channel list					
CH	MHz	CH	MHz	CH	MHz
01	5740	04	5800	07	5840
02	5760	05	5820	08	5840
03	5780	06	5840		

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: Transmission 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.

Equipment Type	
Outdoor access point	---
Indoor access point	---
Fixed point-to-point access points	---
Client devices	V

Test Mode	ANT-0
Mode 1	V
Mode 2	V

Duty cycle

Test Mode	Frequency (MHz)	on time (ms)	on+off time (ms)	Duty cycle	Duty Factor (dB)	1/T Minimum VBW (kHz)
Mode 2: Transmission Mode	5740.0	18.50	19.950	0.927	0.328	0.054

Duty Cycle Graphs

Mode 2: Transmission Mode	
On time	
On+off time	

3.2. EUT Exercise Software

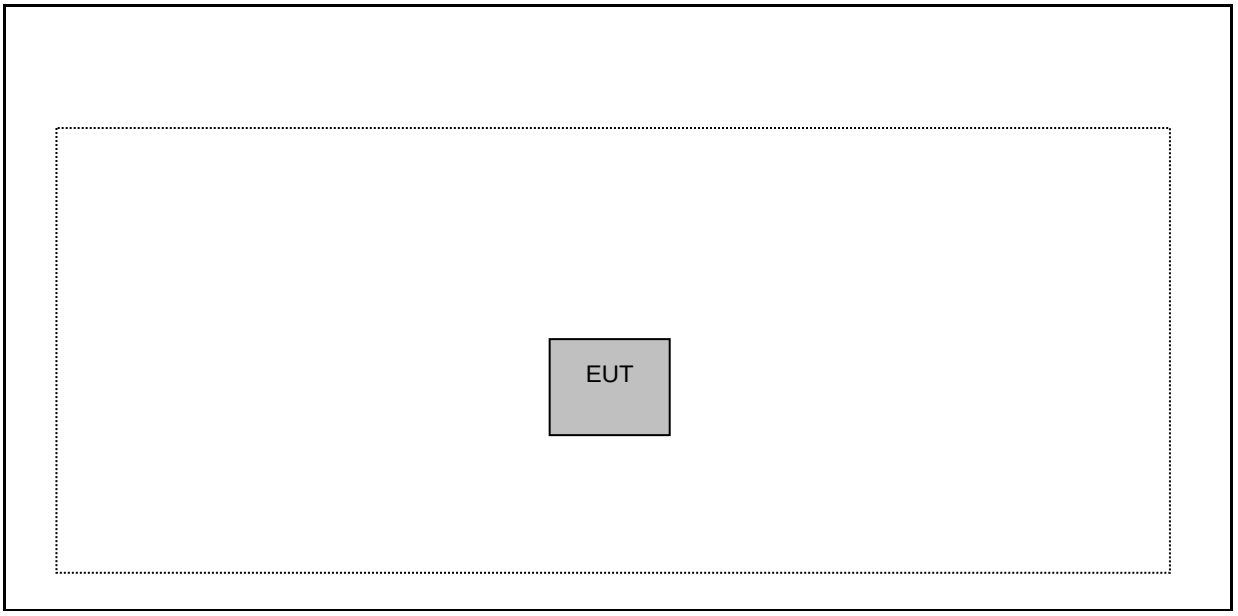
The EUT is operated in the engineering mode to fix the TX frequency for the purposes of measurement. According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E.

1.	Setup the EUT shown on 3.3.
2.	Turn on the power of all equipment.
3.	EUT run test program.

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

3.3. Configuration of Test System Details

Radiated Emission



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 Test Results

4.1. Transmitter Radiated Emissions Measurement

■ **Limit**

(1)Undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(a)For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(b)For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(c)For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.

(d)For transmitters operating in the 5.725-5.85 GHz band:

(i)All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2)Limits of Radiated Emission Measurement

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequency Range (MHz)	Field Strength (microvolts/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	10	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

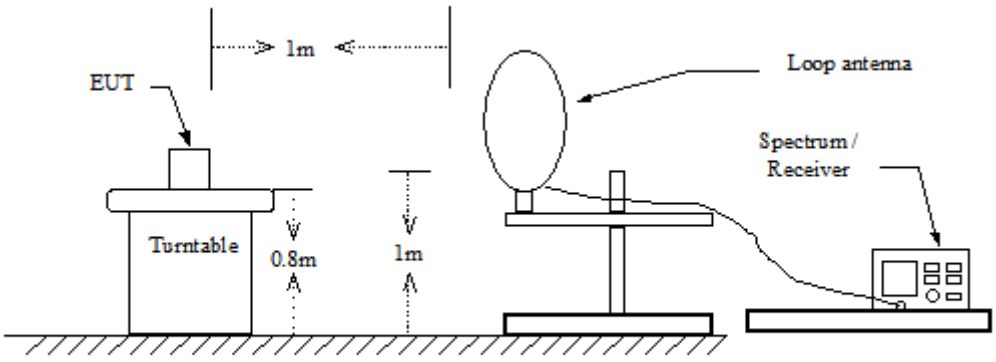
■ **Test Instruments**

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/08/2016	1 year
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/08/2016	1 year
Pre Amplifier	Agilent	8449B	3008A02237	10/07/2015	1 year
Pre Amplifier	Agilent	8447D	2944A11119	01/11/2016	1 year
Broadband Antenna	Schwarzbeck	VULB9168	416	09/25/2015	1 year
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/06/2016	1 year
Horn Antenna (18~40GHz)	ETS	3116	86467	09/01/2015	1 year
Microwave Cable	EMCI	EMC102-KM-KM-14000	151001	10/15/2015	1 year
Microwave Cable	EMCI	EMC-104-SM-SM-14000	140202	10/15/2015	1 year
Microwave Cable	EMCI	EMC104-SM-SM-600	140301	10/15/2015	1 year
Test Site	ATL	TE01	888001	08/27/2015	1 year

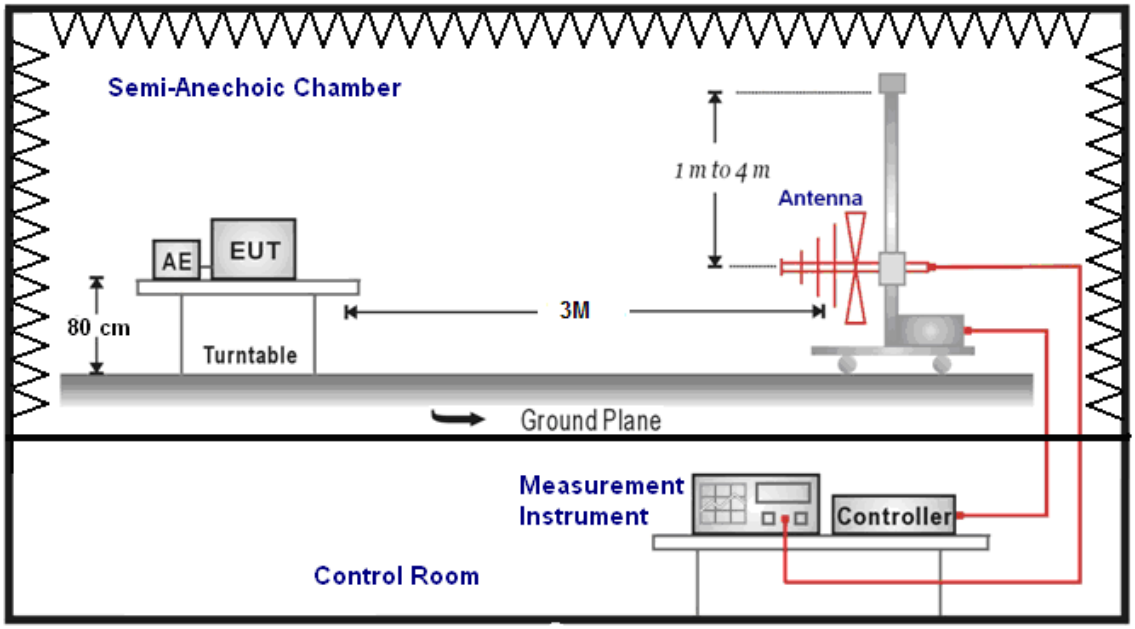
Note: N.C.R. = No Calibration Request.

■ **Setup**

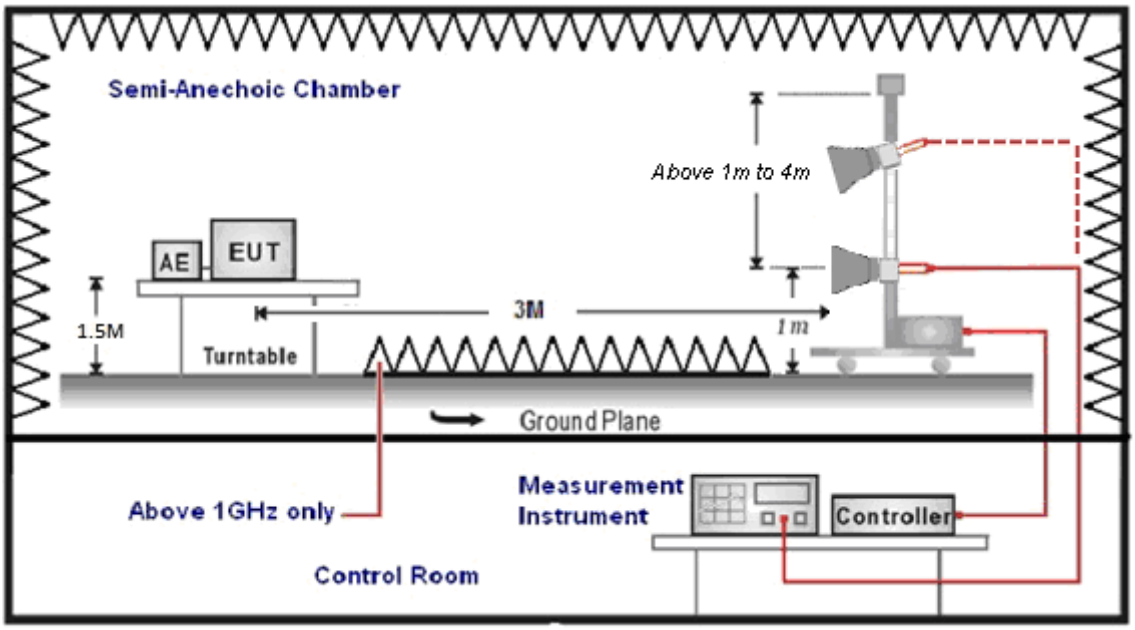
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



■ **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 40 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 restricted measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 10 Hz for average measurements when Duty cycle > 0.98 / 1/T for average measurements when Duty cycle < 0.98.

For out of band measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements.

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 Trilog-Broadband Antenna at 3 Meter and the ETS-Lindgren Double-Ridged Waveguide Horn antnna Schwarzbeck Mess-Elektronik Broadband Horn Antenna was used in frequencies 1 – 40 GHz at a distance of 3 meter. The antenna at an angle toward the source of the emission.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

Measuring Instruments and setting

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000MHz
Stop Frequency	40GHz
RBW/VBW(Emission in restricted band)	1MHz / 3MHz for Peak 1MHz / (1/T) for Average
RBW/VBW(Emission in non-restricted band)	1MHz / 3MHz for Peak

■ **Test Result**

Below 1GHz

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 1	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Description:		Date:	07/16/2016

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
96.0050	46.35	-16.80	29.55	43.50	-13.95	QP	H
165.2450	40.32	-11.09	29.23	43.50	-14.27	QP	H
192.0000	48.78	-14.07	34.71	43.50	-8.79	QP	H
267.2000	52.19	-11.52	40.67	46.00	-5.33	QP	H
287.9850	46.77	-10.71	36.06	46.00	-9.94	QP	H
316.6050	41.74	-9.94	31.80	46.00	-14.20	QP	H
46.2350	37.18	-11.37	25.81	40.00	-14.19	QP	V
164.1700	30.41	-11.05	19.36	43.50	-24.14	QP	V
192.0200	43.40	-14.07	29.33	43.50	-14.17	QP	V
265.7800	42.68	-11.59	31.09	46.00	-14.91	QP	V
317.7950	32.62	-9.90	22.72	46.00	-23.28	QP	V
533.5650	31.88	-4.86	27.02	46.00	-18.98	QP	V

Note: 1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

2. Result = Correction factor + Reading

3. Correction factor = Antenna Factor + Cable loss – Pre-Amplifier gain.

Above 1GHz

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5740MHz	Date:	07/18/2016
Description:			

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
11480.000	45.31	6.59	51.90	74.00	-22.10	peak	H
11480.000	45.06	6.59	51.65	74.00	-22.35	peak	V

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5800MHz	Date:	07/18/2016
Description:			

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
11523.000	44.32	6.58	50.90	74.00	-23.10	peak	H
11600.000	43.41	6.57	49.98	74.00	-24.02	peak	H
12016.000	45.82	6.99	52.81	74.00	-21.19	peak	H
11594.000	44.03	6.57	50.60	74.00	-23.40	peak	V
11600.000	43.57	6.57	50.14	74.00	-23.86	peak	V
12016.000	45.05	6.99	52.04	74.00	-21.96	peak	V
12781.000	45.70	7.89	53.59	74.00	-20.41	peak	V

Note: 1. Result = Correction factor + Reading

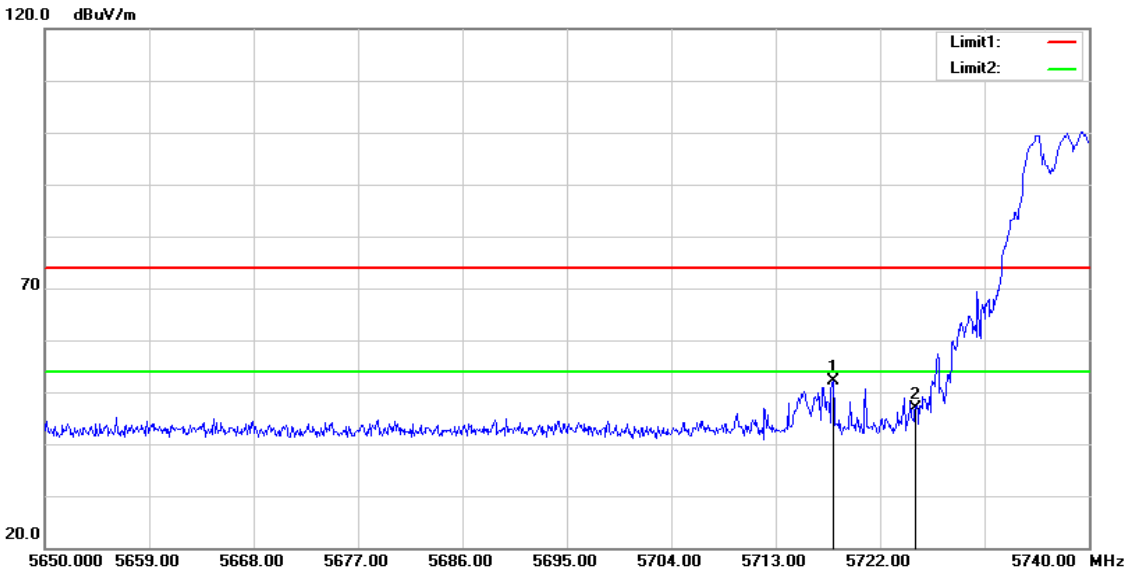
2. Correction factor = Antenna Factor + Cable loss – Pre-Amplifier gain.

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5840MHz	Date:	07/18/2016
Description:			

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
11680.000	42.89	6.71	49.60	74.00	-24.40	peak	H
12628.000	45.83	7.57	53.40	74.00	-20.60	peak	H
11680.000	43.59	6.71	50.30	74.00	-23.70	peak	V
12033.000	45.77	7.02	52.79	74.00	-21.21	peak	V

Band Edge

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5740 MHz	Date:	07/22/2016
Ant.Polar.:	Horizontal		

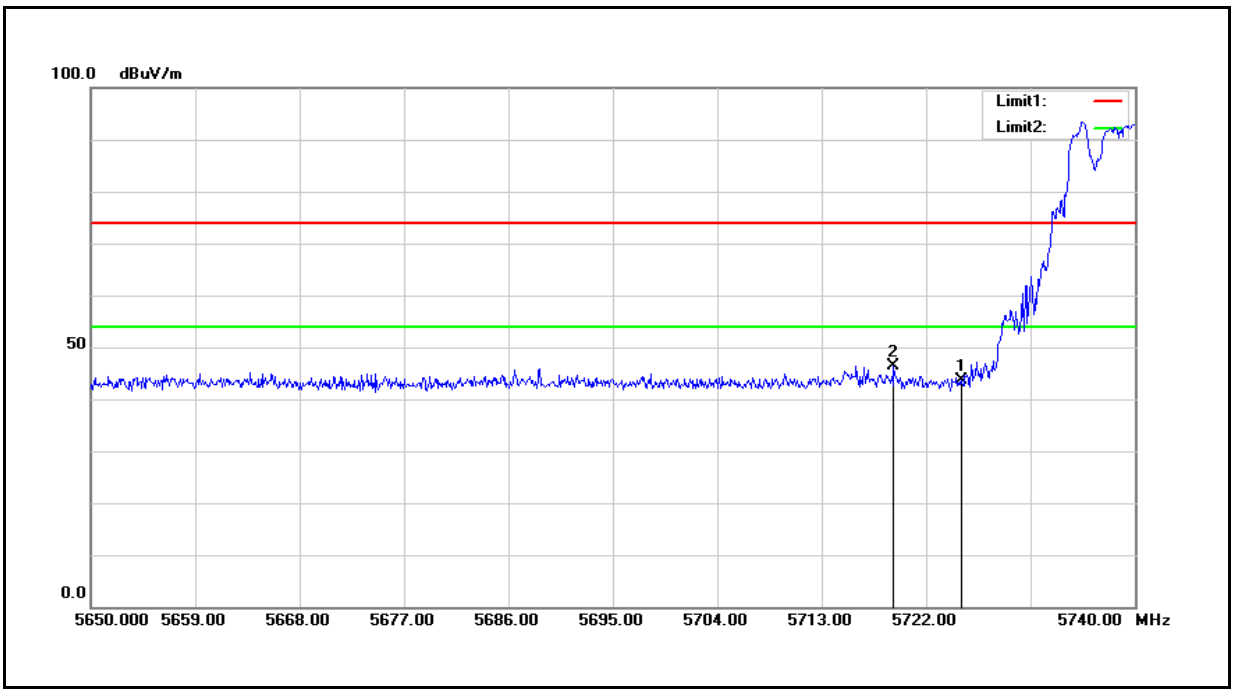


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5717.950	58.91	-6.83	52.08	74.00	-21.92	peak
2	5725.000	53.80	-6.85	46.95	74.00	-27.05	peak

Note: 1. Result = Correction factor + Reading

2. Correction factor = Antenna Factor + Cable loss – Pre-Amplifier gain.

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5740 MHz	Date:	07/22/2016
Ant.Polar.:	Vertical		

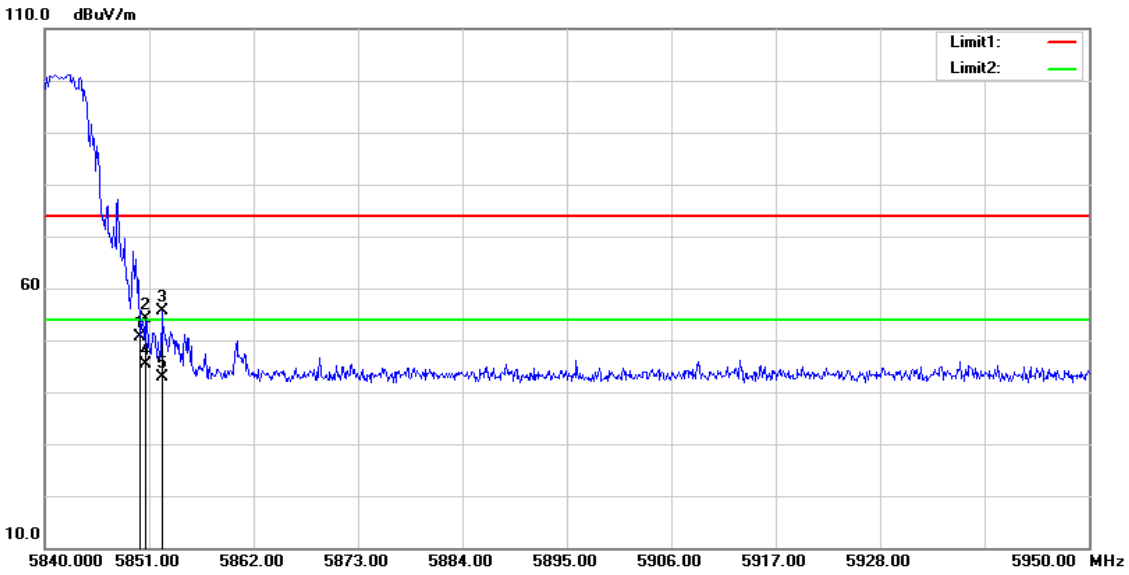


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5725.000	50.46	-6.85	43.61	74.00	-30.39	peak
2	5719.210	53.17	-6.83	46.34	74.00	-27.66	peak

Note: 1. Result = Correction factor + Reading

2. Correction factor = Antenna Factor + Cable loss – Pre-Amplifier gain.

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5840 MHz	Date:	07/22/2016
Ant.Polar.:	Horizontal		

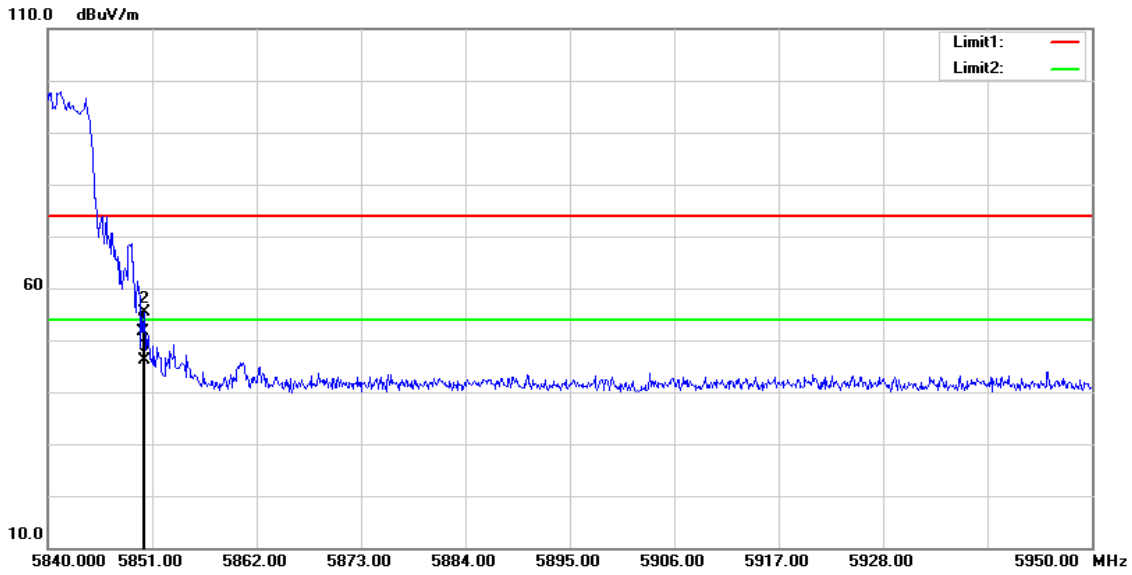


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5850.000	57.30	-6.63	50.67	74.00	-23.33	peak
2	5850.670	60.74	-6.63	54.11	74.00	-19.89	peak
3	5852.320	62.18	-6.62	55.56	74.00	-18.44	peak
4	5850.670	51.94	-6.63	45.31	54.00	-8.69	AVG
5	5852.320	49.43	-6.62	42.81	54.00	-11.19	AVG

Note: 1. Result = Correction factor + Reading

2. Correction factor = Antenna Factor + Cable loss – Pre-Amplifier gain.

Standard:	FCC Part 15E	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 7.2V
Test Mode:	Mode 2	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Frequency:	5840 MHz	Date:	07/22/2016
Ant.Polar.:	Vertical		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5850.000	58.24	-6.63	51.61	74.00	-22.39	peak
2	5850.120	61.98	-6.63	55.35	74.00	-18.65	peak
3	5850.120	52.72	-6.63	46.09	54.00	-7.91	AVG

Note: 1. Result = Correction factor + Reading

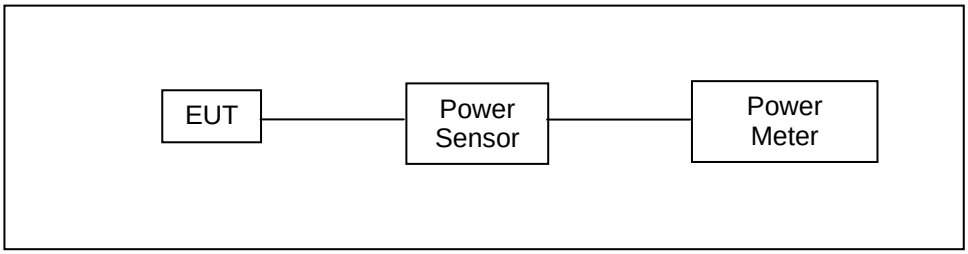
2. Correction factor = Antenna Factor + Cable loss – Pre-Amplifier gain.

4.2. Maximum Conducted Output Power and Transmit power control Measurement

■ **Limit**

Frequency Range (MHz)	FCC Maximum Conducted Output Power Limit
5.725 ~ 5.850 GHz	The lesser of 1W (30dBm)

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Power Sensor	Anritsu	MA2411B	1126022	08/24/2015	1 year
Power Meter	Anritsu	ML2495A	1135009	08/24/2015	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01r02, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices
Section (E) Maximum Conducted Output Power
3. Measurement using a Power Meter (PM)
b) Method PM-G (Measurement using a gated RF average power meter)

■ **Test Result**

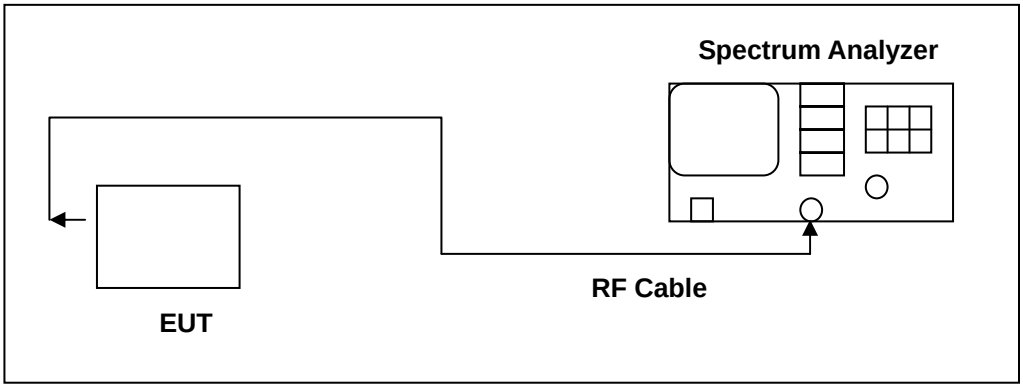
Model Number	LY-250		
Test Item	Maximum Conducted Output Power		
Test Mode	Mode 2: Transmission Mode		
Date of Test	07/16/2016		
Frequency (MHz)	Max. Outup Power		FCC Limit
	(dBm)	(W)	(dBm)
5740	18.43	0.070	30
5800	18.51	0.071	
5840	**18.89**	**0.077**	

4.3. 26dB RF Bandwidth Measurement

■ **Limit**

N/A

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

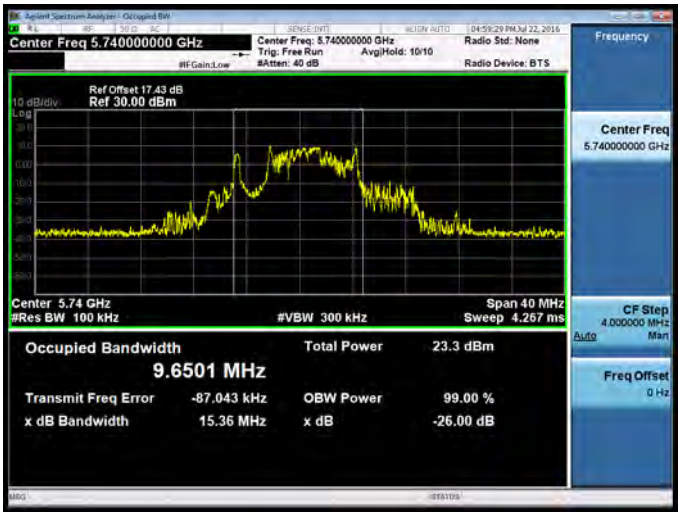
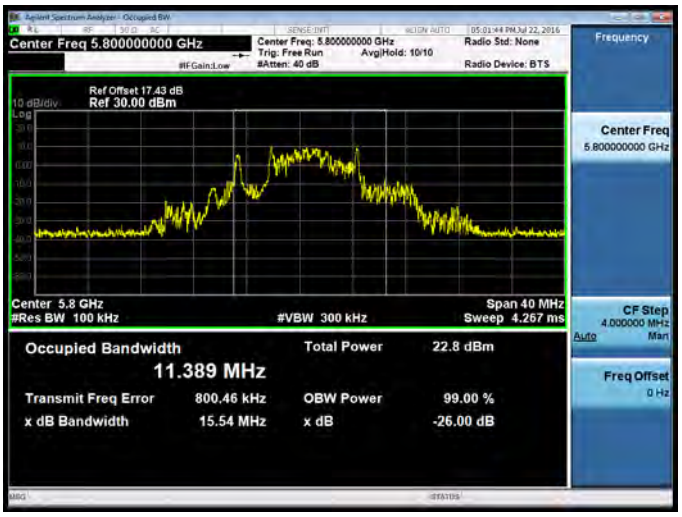
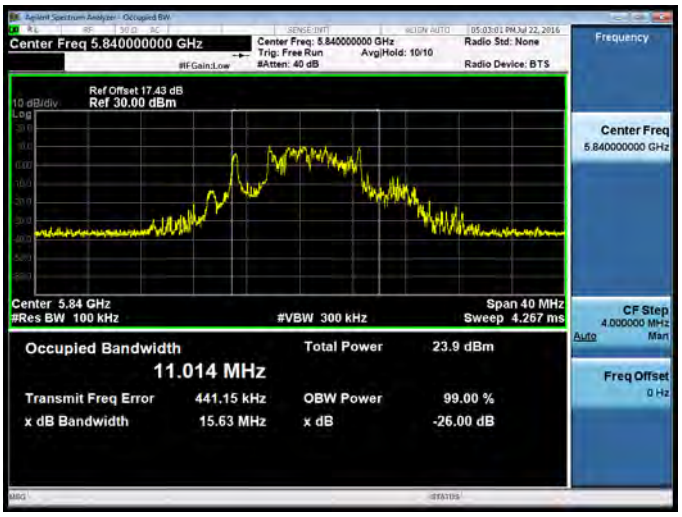
The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01r02, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	>26dB Bandwidth
RBW	Approximately 1% of the emission bandwidth
VBW	VBW > RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

■ **Test Result**

Test Mode	Mode 2: Transmission Mode
Date of Test	07/22/2016
	26dB Bandwidth (kHz)
5740	15360
5800	15540
5840	15630

■ **Test Graphs**

Mode 2: Transmission Mode	
5740 MHz	
5800 MHz	
5840 MHz	

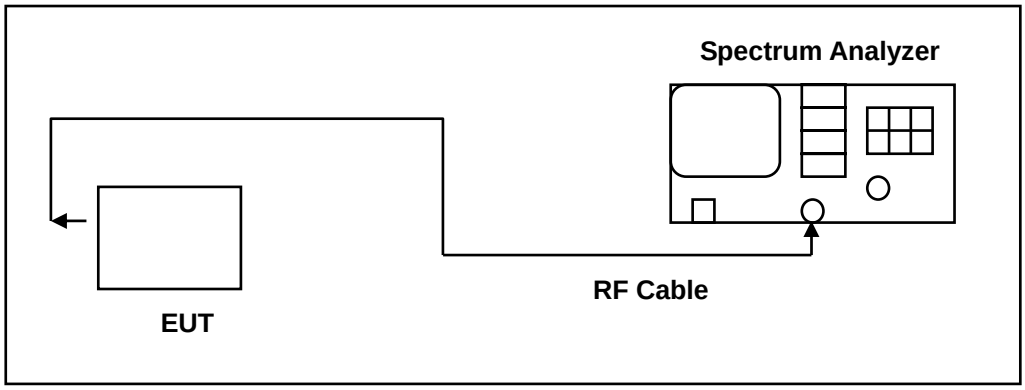
4.4. 6dB RF Bandwidth Measurement

■ **Limit**

6dB RF Bandwidth

Systems using digital modulation techniques may operate in the 5725~5850MHz bands. The minimum 6 dB band-width shall be at least 500 kHz.

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

6dB RF Bandwidth

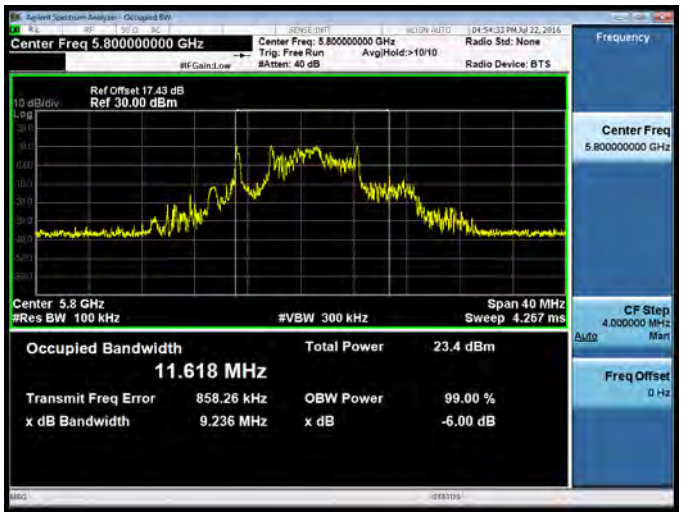
The EUT tested to UNII test procedure of KDB789033 D02 for compliance to FCC 47CFR 15.407 requirements. The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was 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.

■ **Test Result**

Test Mode	Mode 2: Transmission Mode	
Date of Test	07/22/2016	
Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)
5740	9212	> 500
5800	9236	> 500
5840	9858	> 500

■ **Test Graphs**

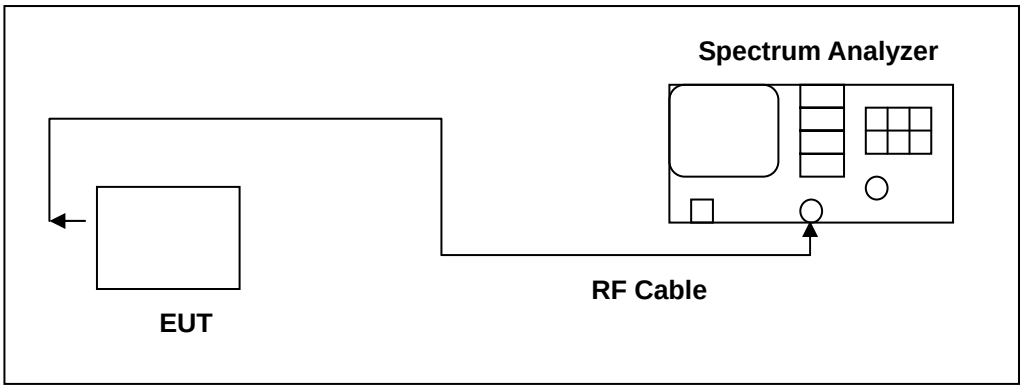
Mode 2: Transmission Mode	
5740 MHz	
5800 MHz	
5840 MHz	

4.5. Peak Power Spectral Density Measurement

■ **Limit**

Frequency Range (MHz)	FCC Limit
5.725 ~ 5.850 GHz	30 dBm/500KHz

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4445A	MY45300744	12/15/2015	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

The test is performed in accordance with KDB789033: D02 General UNII Test Procedures New Rules v01r02, Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	1 MHz (5725 ~ 5850MHz use 500 kHz)
VBW	3 MHz (5725 ~ 5850MHz use 1500 kHz)
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times
Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add 10log(500kHz/100kHz) to the measured result.	

■ **Test Result**

Test Mode	Mode 2: Transmission Mode			
Date of Test	07/22/2016			
Frequency (MHz)	Measurement (dBm/500KHz)	Duty Factor (dB)	Calculated (dBm/500KHz)	Limit (dBm/500KHz)
5740	10.440	0.328	10.768	30
5800	9.869	0.328	10.197	
5840	9.878	0.328	10.206	

Note: Method SA-2, Power density = measured result + duty factor.

■ **Test Graphs**

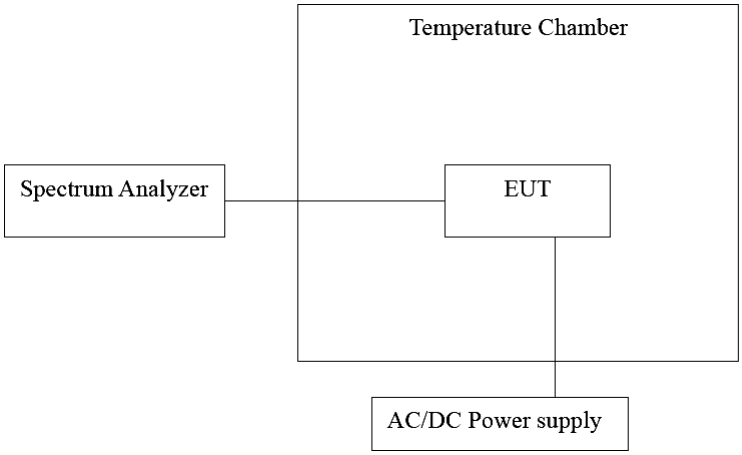
Mode 2: Transmission Mode	
5740 MHz	
5800 MHz	
5840 MHz	

4.6. Frequency Stability Measurement

■ **Limit**

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

■ **Test Setup**



■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY45107753	07/27/2015	1 year
Temperature & Humidity Chamber	TAICHY	MHU-225LA	980729	04/18/2016	1 year
Test Site	ATL	TE05	TE05	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Test Procedure**

1. The EUT was placed inside the environmental test chamber and powered by nominal AC/DC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

■ **Test Result**

Temperature Variations

Test Mode	Mode 2: Transmission Mode					
V_{Nom}	7.2 Vdc					
Date of Test	07/16/2016					
Frequency	Temp. (^{o}C)	Voltage	Measured Freq. (MHz)	Delta Freq. (Hz)	Tolerance (ppm)	Result (Pass/Fail)
5800 MHz	-30	V_{Nom}	5799.9347	-65300	-11.259	Pass
	-20		5799.9691	-30900	-5.328	Pass
	-10		5800.0359	35900	6.190	Pass
	0		5800.0296	29600	5.103	Pass
	10		5799.9756	-24400	-4.207	Pass
	20		5799.9819	-18100	-3.121	Pass
	30		5799.9437	-56300	-9.707	Pass
	40		5800.0456	45600	7.862	Pass
	50		5799.9372	-62800	-10.828	Pass
	60		5799.9547	-45300	-7.810	Pass

Voltage Variations

Test Mode	Mode 2: Transmission Mode					
Date of Test	07/16/2016					
Frequency	Temp. (^{o}C)	Voltage	Measured Freq. (MHz)	Delta Freq. (Hz)	Tolerance (ppm)	Result (Pass/Fail)
5800 MHz	20	V_{Low}	5799.9619	-38100	-6.569	Pass
		V_{Nom}	5799.9431	-56900	-9.810	Pass
		V_{High}	5800.0416	41600	7.172	Pass

Note: The manufacturer's frequency stability specification is better then 20ppm.

4.7. Antenna Requirement

- **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 15.407 (a), 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.

- **Antenna Connector Construction**

See section 2 – antenna information.