Product Name:	Blutronium
Model No.:	B-TRON 5000
Applicant:	U.S. Converters LLC 1321 Upland Dr., Suite 5462 Houston, TX 77043, USA
Date of Receipt:	Nov. 23, 2015
Finished date of Test:	Dec. 25, 2015
Applicable Standards:	47 CFR Part 15, Subpart C 47 CFR Part 15, Subpart B ANSI C63.4: 2003 FCC Public Notice DA 00-705(March 2000)

We, **Spectrum Research & Testing Laboratory Inc.**, hereby certify that one sample of the above was tested in our laboratory with positive results according to the above-mentioned standards. The records in the report are an accurate account of the results. Details of the results are given in the subsequent pages of this report.

Tested By : Leo Yang , Date: 2015/12/25

(Leo Yang)

Approved By : , Date: 12/25/2015

(Johnson Ho, Director)

Revisions History

Report No.	Issue Date	Revisions
FCCA15112310	Dec. 25, 2015	Initial issue
FCCA15112310	Feb. 24, 2016	P.07 Chinese words revise P.08 Remove external photos P.61 Remove internal photos P.62 - P.70 Remove test setup photos
FCCA15112310	Apr. 18, 2016	P.61 Add assessment formula

Table of Contents

1. DOCUMENT POLICY AND TEST STATEMENT

1.1 DOCUMENT POLICY

- The report shall not be reproduced except in full, without the written approval of SRT Lab, Inc.

1.2 TEST STATEMENT

- The test results in the report apply only to the unit tested by SRT Lab.
- There was no deviation from the requirements of test standards during the test.
- DC power source, 3.3Vdc of Li-ion battery
- AC 120V/60Hz for PC was used during the test.

- Frequency hopping systems between 2400 and 2483.5 MHz band use at least 75 nonoverlapping channels, except that as few as 15 nonoverlapping channels may be used for systems that intelligently modify their hopsets in accordance with Section 15.247(g)(h). Hopsets modified in this manner must be redetermined at least once every 30 seconds. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

- hopping channel sample :(From left to right, up to down)
  18 58 16 76 29 61 69 59 74 51 75 41 09 49 68 66 21 43 61 16 37
  14 17 28 10 27 06 62 59 70 65 32 51 73 69 67 22 43 62 17 57 38
  52 36 30 49 27 46 06 67 05 26 41 58 54 31 59 71 69 28 58 39 16
  78 75 74 29 47 69 62 45 62 02 40 17 38 16 57 37 56 11 76 32 50
  27 26 05 46 24 17 15 38

1.3 EUT MODIFICATION

- No modification in SRT Lab.

2. DESCRIPTION OF EUT AND TEST MODE

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Blutronium
MODEL NO.	B-TRON 5000
POWER SUPPLY	DC power source from Li-ion battery : DC 3.3V,200mA AC power source of PC for USB port : AC 120V/60Hz
CABLE	N/A
FREQUENCY BAND	2.400GHz ~ 2.4835GHz
CARRIER FREQUENCY	2.402GHz ~ 2.480GHz
NUMBER OF CHANNEL	79
RATED RF OUTPUT POWER	13.22 dBm@2441 MHz
MODULATION TYPE	π/4 DQPSK, 8DPSK
MODE OF OPERATION	Duplex
ANTENNA TYPE	Chip Antenna
ANTENNA GAIN	2 dBi
OPERATING TEMPERATURE RANGE	-10 ~ 70°C

NOTE： For more detailed information, please refer to the EUT's specification or user's manual provided by manufacturer.

2.2 DESCRIPTION OF EUT INTERNAL DEVICE

Device	Brand	Model #	FCC ID/DoC	Cable
Li-ion battery	N/A	IP583450	N/A	DC 3.3V,200mA

2.3 EUT OPERATING CONDITION

1. Setup the EUT and all peripheral devices .
2. Turn on the power of all equipment and EUT.
3. Set the EUT under continuous transmission condition, standby mode.
4. The EUT was set to the highest available power level.

2.4 DESCRIPTION OF SYSTEM RECEIVER

1.Required setting (e.g. RBW) of Spectrum Analyzer (System Receiver) be decrypted into Test Procedure of each test item in Test Report.

2.For Bluetooth function, the EUT execute the RF utility which from the BT module supplier to provide channel selection, power level and data rate for transmitting and receiving signals continuously, therefore the Spectrum Analyzer(System Receiver) be set to measure these signals directly without synchronization.

3.Each frequency is used equally on the average by each transmitter.

4.The receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and they shift frequencies in synchronization with the transmitted signals.

2.5 Used Channel and Frequency Table

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
CH00	2402MHz	CH20	2422MHz	CH40	2442MHz	CH60	2462MHz
CH01	2403MHz	CH21	2423MHz	CH41	2443MHz	CH61	2463MHz
CH02	2404MHz	CH22	2424MHz	CH42	2444MHz	CH62	2464MHz
CH03	2405MHz	CH23	2425MHz	CH43	2445MHz	CH63	2465MHz
CH04	2406MHz	CH24	2426MHz	CH44	2446MHz	CH64	2466MHz
CH05	2407MHz	CH25	2427MHz	CH45	2447MHz	CH65	2467MHz
CH06	2408MHz	CH26	2428MHz	CH46	2448MHz	CH66	2468MHz
CH07	2409MHz	CH27	2429MHz	CH47	2449MHz	CH67	2469MHz
CH08	2410MHz	CH28	2430MHz	CH48	2450MHz	CH68	2470MHz
CH09	2411MHz	CH29	2431MHz	CH49	2451MHz	CH69	2471MHz
CH10	2412MHz	CH30	2432MHz	CH50	2452MHz	CH70	2472MHz
CH11	2413MHz	CH31	2433MHz	CH51	2453MHz	CH71	2473MHz
CH12	2414MHz	CH32	2434MHz	CH52	2454MHz	CH72	2474MHz
CH13	2415MHz	CH33	2435MHz	CH53	2455MHz	CH73	2475MHz
CH14	2416MHz	CH34	2436MHz	CH54	2456MHz	CH74	2476MHz
CH15	2417MHz	CH35	2437MHz	CH55	2457MHz	CH75	2477MHz
CH16	2418MHz	CH36	2438MHz	CH56	2458MHz	CH76	2478MHz
CH17	2419MHz	CH37	2439MHz	CH57	2459MHz	CH77	2479MHz
CH18	2420MHz	CH38	2440MHz	CH58	2460MHz	CH78	2480MHz
CH19	2421MHz	CH39	2441MHz	CH59	2461MHz		

2.6 DESCRIPTION OF TEST MODE

Mode		Frequency
1	Tx-1	2402 MHz
2	Tx-2	2441 MHz
3	Tx-3	2480 MHz
4	Standby	NA
5	Link	NA

NOTE : The axis X,Y and Z we evaluate in chamber, the X axis is worst case.

2.7 DESCRIPTION OF SUPPORT UNIT

The EUT was configured by the requirement of ANSI C63.4:2003. All interface ports were connected to the appropriate support units via specific cables. The support units and cables are listed below.

NO	DEVICE	BRAND	MODEL #	FCC ID/DOC	CABLE
1	Keyboard	ACER	SK-9611	DoC	1.8m unshielded data cable.
2	Mouse	Wintek	WSS30	DoC	1.5m unshielded data cable.
3	LCD Monitor	Dell	U2412Mb	DoC	1.8m unshielded power cable 1.5m shielded data cable.
4	Printer	HP	C8995A	DoC	1.5m unshielded power cord 1.5m shielded data cable.
5	PC	ASUS	CM1735	DoC	1.8m unshielded power cable
6	USB 2.0 HDD	TERASYS	F12-U	DoC	1.5m shielded data cable.
7	MiniUSB/USB Cable	N/A	N/A	N/A	0.5 m shielded data cable.
8	RS232/USB Cable	N/A	N/A	N/A	1.2 m shielded data cable.

NOTE : For the actual test configuration, please refer to the photos of testing.

3. DESCRIPTION OF APPLIED STANDARDS

The EUT is a wireless product. According to the specifications provided by the applicant, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C

47 CFR Part 15, Subpart B

ANSI C63.4: 2003

Public Notice DA 00-705 (March 2000)

All tests have been performed and recorded as the above standards.

3.1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications：

STANDARD SECTION	TEST TYPE AND LIMIT RESULTS	RESULTS
15.247(a)	Channel separation test Limit：minimum of 25 kHz or the 20 dB bandwidth	PASS
15.247(a)	20dB Bandwidth	PASS
15.247(a)(b)	Quantity of hopping channel test Limit：75 non-overlapping hopping channels	PASS
15.247(a)	Time of occupancy (Dwell Time) Limit：greater than 0.4 seconds	PASS
15.247(b)	Peak power test Limit：1 watt	PASS
15.247(d)	Band Edge Measurement Limit：20dB less than the peak value of fundamental frequency	PASS
15.33(a) 15.249	Transmitter Radiated Emissions Limit：Table 15.209	PASS
15.203	Antenna requirement Limit：max. 6dBi	PASS

4. TECHNICAL CHARACTERISTICS TEST

4.1 CHANNEL SEPARATION TEST

4.1.1 LIMIT

FCC Part15, Subpart C Section 15.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Frequency Range (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

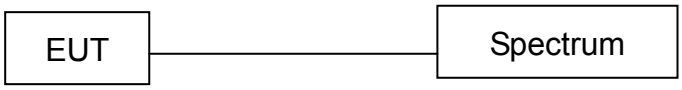
4.1.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test：

Equipment/ Facilities	Specifications	Manufacturer	Model#/ Serial#	Due Date of Cal. & Cal. Center
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAY. 23, 2016 ETC

NOTE：The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.1.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.1.4 TEST PROCEDURE

1.The EUT is programmed to transmit signals continuously for all testing.

2. Use the following spectrum analyzer settings according to DA 00-705 guidance:
   Span =2 to 3 times the 20 dB bandwidth; RBW ≥ 1% of 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.

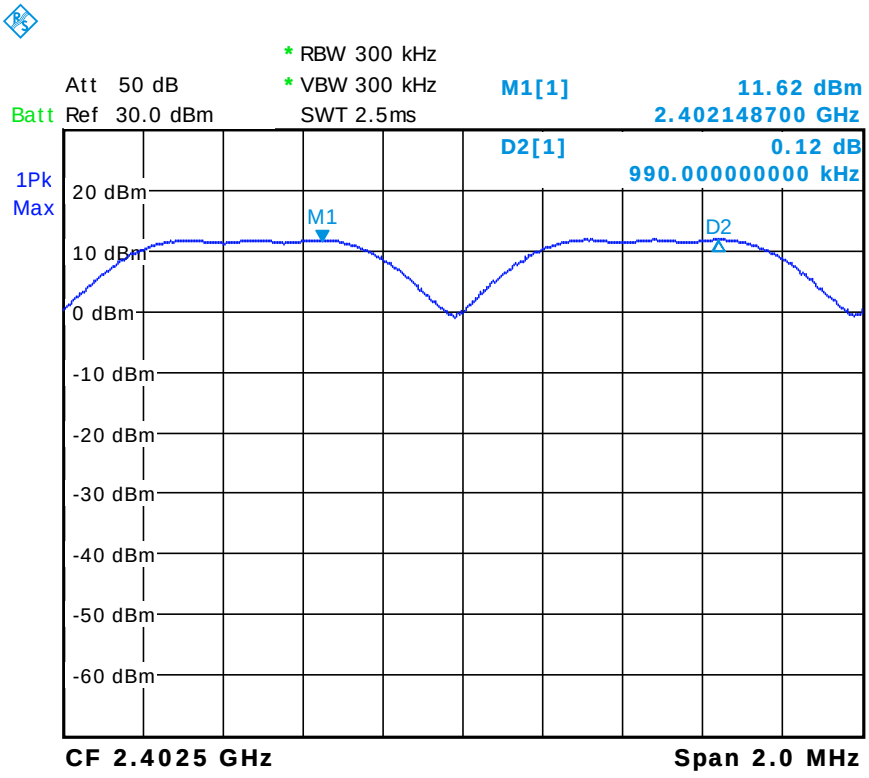
3.Printed out the test result from the spectrum by hard copy function.

4.1.5 TEST RESULT

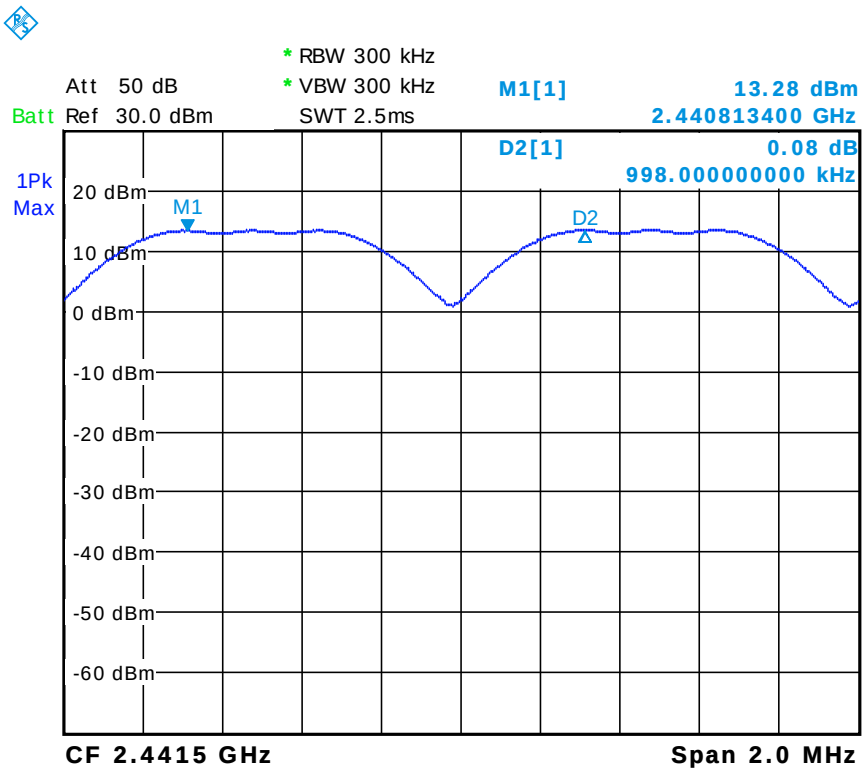
Temperature：	16°C	Humidity：	66%RH
Spectrum Detector：	PK	Tested by：	Leo Yang
Test Result：	PASS	Tested Date：	Dec. 24, 2015

Channel Number	Channel Frequency (MHz)	Separation Read Value (kHz)	Minimum Limit(20dB Bandwidth) (kHz)
00	2402	990	25
39	2441	998	25
78	2480	994	25

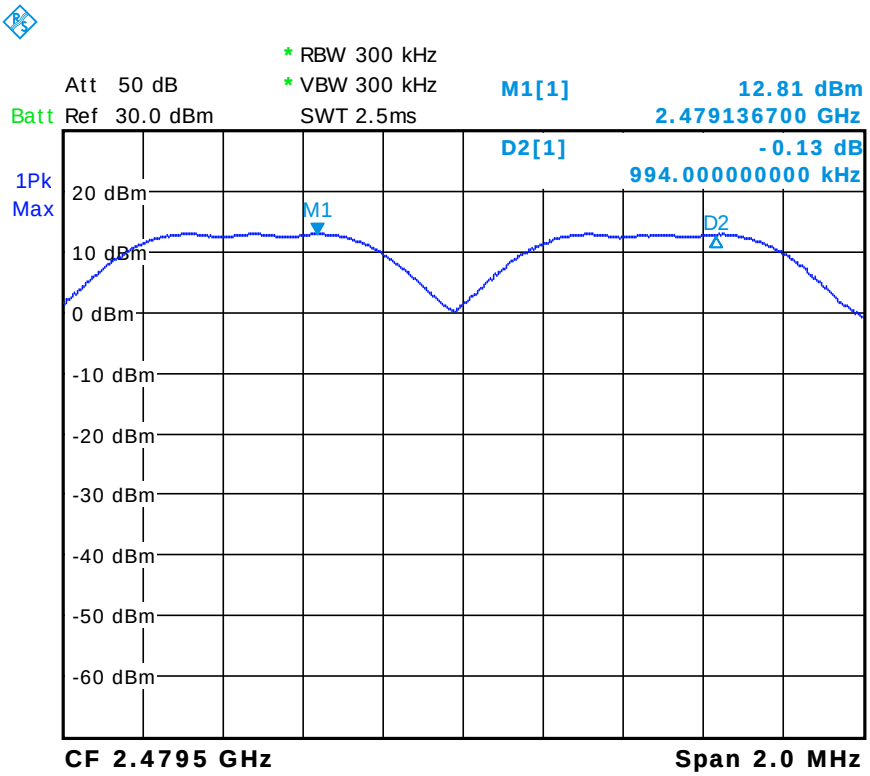
CH00：



CH39：


* RBW 300 kHz
Att 50 dB
* VBW 300 kHz
M1[1]
13.28 dBm
Batt Ref 30.0 dBm
SWT 2.5ms
2.440813400 GHz
D2[1]
0.08 dB
998.000000000 kHz
1Pk
Max
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
D2
CF 2.4415 GHz
Span 2.0 MHz

CH78：


* RBW 300 kHz
Att 50 dB
* VBW 300 kHz
M1[1]
12.81 dBm
Batt Ref 30.0 dBm
SWT 2.5ms
2.479136700 GHz
D2[1]
-0.13 dB
994.000000000 kHz
1Pk
Max
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
D2
CF 2.4795 GHz
Span 2.0 MHz

4.2 20dB Bandwidth

4.2.1 LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

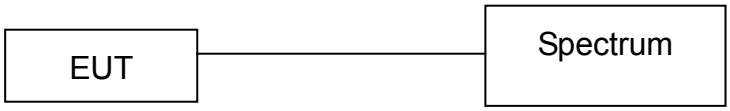
4.2.2 TEST EQUIPMENT

The following test equipment was used during the test：

Equipment/ Facilities	Specifications	Manufacturer	Model#/ Serial#	Due Date of Cal. & Cal. Center
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAY. 23, 2016 ETC

NOTE : The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.2.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.2.4 TEST PROCEDURE

1.The EUT is programmed to transmit signals continuously for all testing.

2. Use the following spectrum analyzer settings according to DA 00-705 guidance:
   Span =2 to 3 times the 20 dB bandwidth; RBW ≥ 1% of 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.

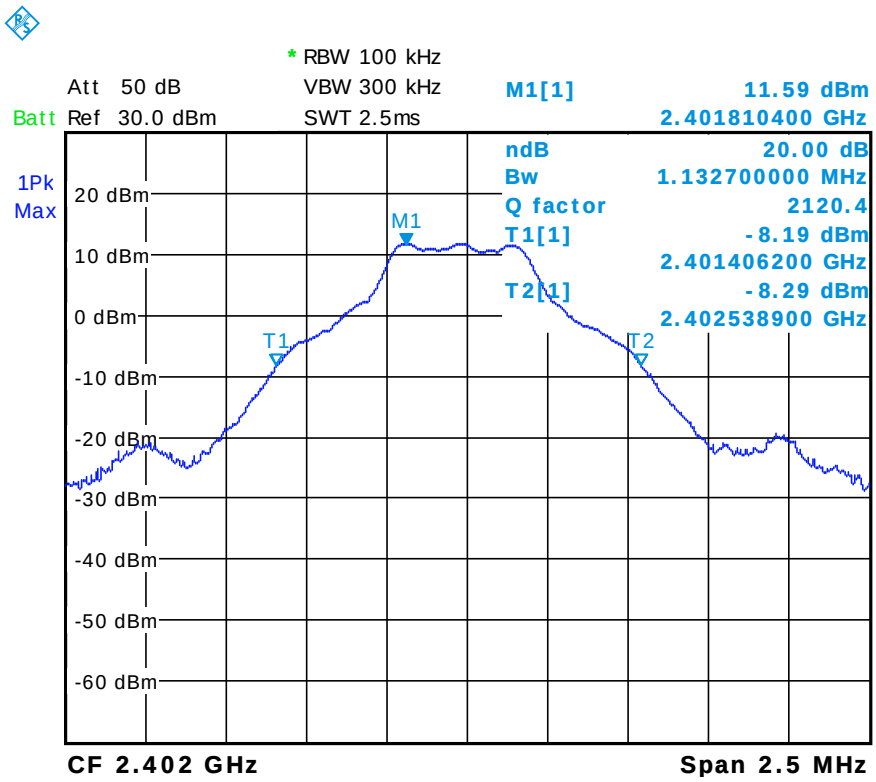
3.Printed out the test result from the spectrum by hard copy function.

4.2.5 TEST RESULT

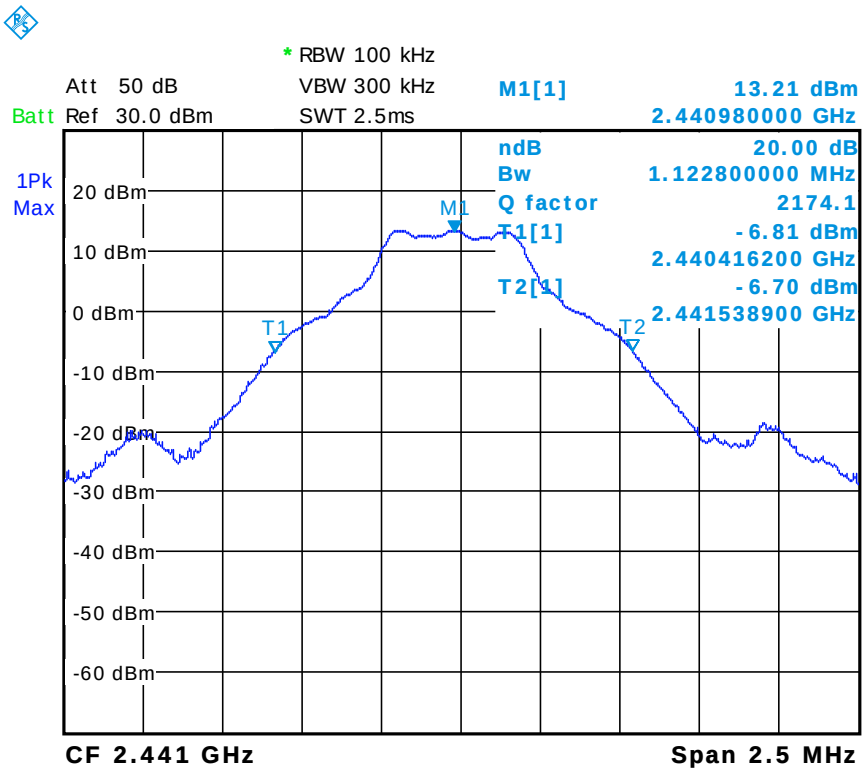
Temperature:	16°C	Humidity:	66%RH
Spectrum Detector:	PK	Tested by:	Leo Yang
Test Result:	PASS	Tested Date:	Dec. 24, 2015

Channel Number	Channel Frequency (MHz)	20dB Down Bandwidth (KHz)
00	2402	1132.7
39	2441	1122.8
78	2480	1137.7

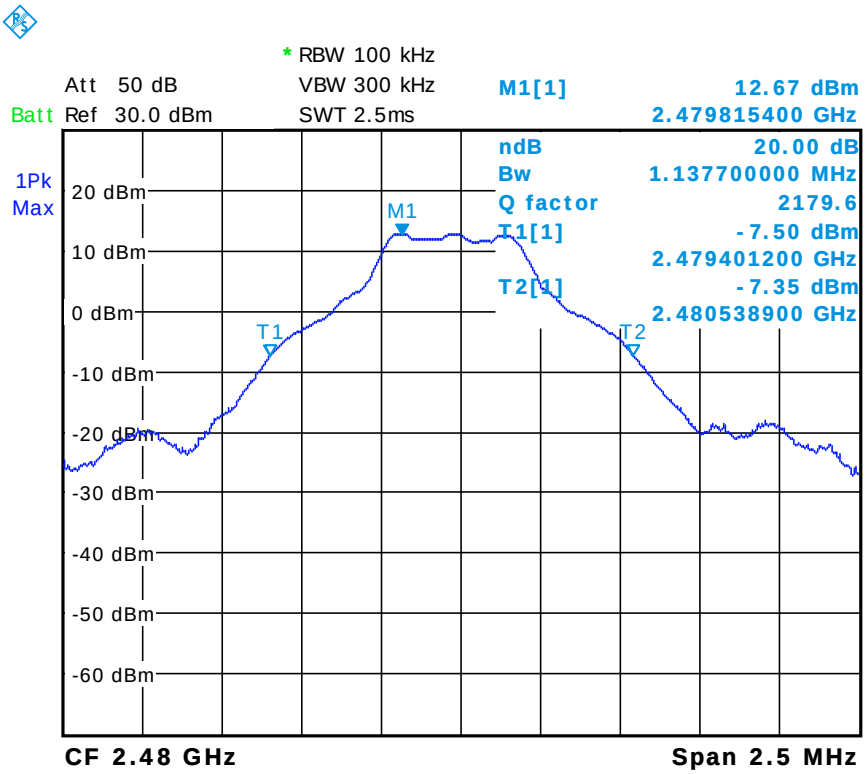
CH00：



CH39：


* RBW 100 kHz
Att 50 dB
VBW 300 kHz
M1[1] 13.21 dBm
Batt Ref 30.0 dBm
SWT 2.5ms
2.440980000 GHz
ndB 20.00 dB
Bw 1.122800000 MHz
1Pk
Max
Q factor 2174.1
T1[1] -6.81 dBm
2.440416200 GHz
T2[1] -6.70 dBm
2.441538900 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
T1
T2
CF 2.441 GHz
Span 2.5 MHz

CH78：


* RBW 100 kHz
Att 50 dB
VBW 300 kHz
M1[1] 12.67 dBm
Batt Ref 30.0 dBm
SWT 2.5ms
2.479815400 GHz
ndB 20.00 dB
Bw 1.137700000 MHz
1Pk
Max
Q factor 2179.6
T1[1] -7.50 dBm
2.479401200 GHz
T2[1] -7.35 dBm
2.480538900 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
T1
T2
CF 2.48 GHz
Span 2.5 MHz

4.3 QUANTITY OF HOPPING CHANNEL TEST

4.3.1 LIMIT

FCC Part15, Subpart C Section 15.247(a)(b).
Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels.

Frequency Range (MHz)	Limit (Quantity of Hopping Channel)			
	20dB Bandwidth <250kHZ	20dB Bandwidth >250kHZ	20dB Bandwidth <1MHz	20dB Bandwidth >1MHz
902-928	50	25	N/A	N/A
2400-2483.5	N/A	N/A	75	15
5725-5850	N/A	N/A	75	N/A

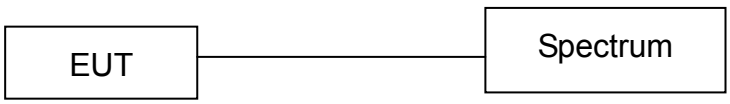
4.3.2 TEST EQUIPMENT

The following test equipment was used during the test：

Equipment/ Facilities	Specifications	Manufacturer	Model#/ Serial#	Due Date of Cal. & Cal. Center
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAY. 23, 2016 ETC

NOTE：The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.3.4 TEST PROCEDURE

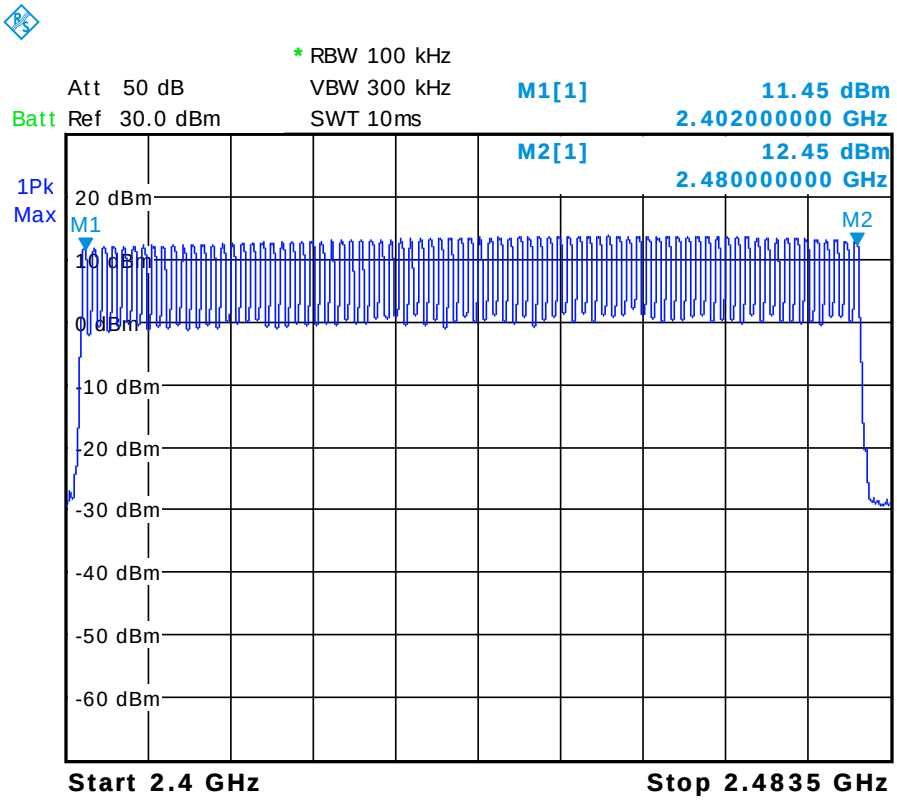
1.The EUT was operating in hopping mode or could be controlled its channel.
2. Use the following spectrum analyzer settings according to DA 00-705 guidance:
Span = the frequency band of operation; RBW ≥ 1% of the SPAN; VBW ≥ RBW;
Sweep = auto; Detector function = peak; Trace = max hold.
3.Printed out the test result from the spectrum by hard copy function.

4.3.5 TEST RESULT

Temperature:	16°C	Humidity:	66%RH
Spectrum Detector:	PK	Tested by:	Leo Yang
Test Result:	PASS	Tested Date:	Dec. 24, 2015

Hopping Channel Frequency Range(MHz)	Quantity of Hopping Channel Read Value	Quantity of Hopping Channel Limit
2400~2483.5	79	75

CH00 ~ CH78：



4.4 TIME OF OCCUPANCY (Dwell Time)

4.4.1 LIMIT

FCC Part15, Subpart C Section 15.247(a).

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Frequency Range (MHz)	Limit (ms)		
	20dB Bandwidth <250kHZ(50Channel)	20dB Bandwidth >250kHZ(25Channel)	20dB Bandwidth <1MHz(75Channel)
902-928	400(20s)	400(10s)	NA
2400-2483.5	NA	NA	400(30s)
5725-5850	NA	NA	400(30s)

NOTE： The “()” is all channel’s average time of occupancy.

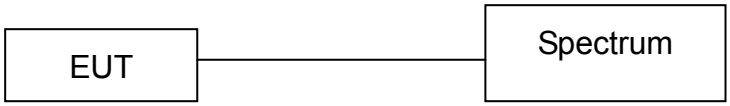
4.4.2 TEST EQUIPMENT

The following test equipment was used during the test：

Equipment/ Facilities	Specifications	Manufacturer	Model#/ Serial#	Due Date of Cal. & Cal. Center
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAY. 23, 2016 ETC

NOTE：The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.4.4 TEST PROCEDURE

1.The EUT is programmed to transmit signals continuously for all testing.

2. Use the following spectrum analyzer settings according to DA 00-705 guidance:
   Span = zero SPAN, centered on a hopping channel; RBW = 1MHz; VBW ≥ RBW;
   Sweep = as necessary to capture the entire dwell time per hopping channel;
   Detector function = peak; Trace = max hold.

3.Printed out the test result from the spectrum by hard copy function.

4.4.5 TEST RESULT

Temperature:	16°C	Humidity:	66%RH
Spectrum Detector:	PK	Tested by:	Leo Yang
Test Result:	PASS	Tested Date:	Dec. 24, 2015

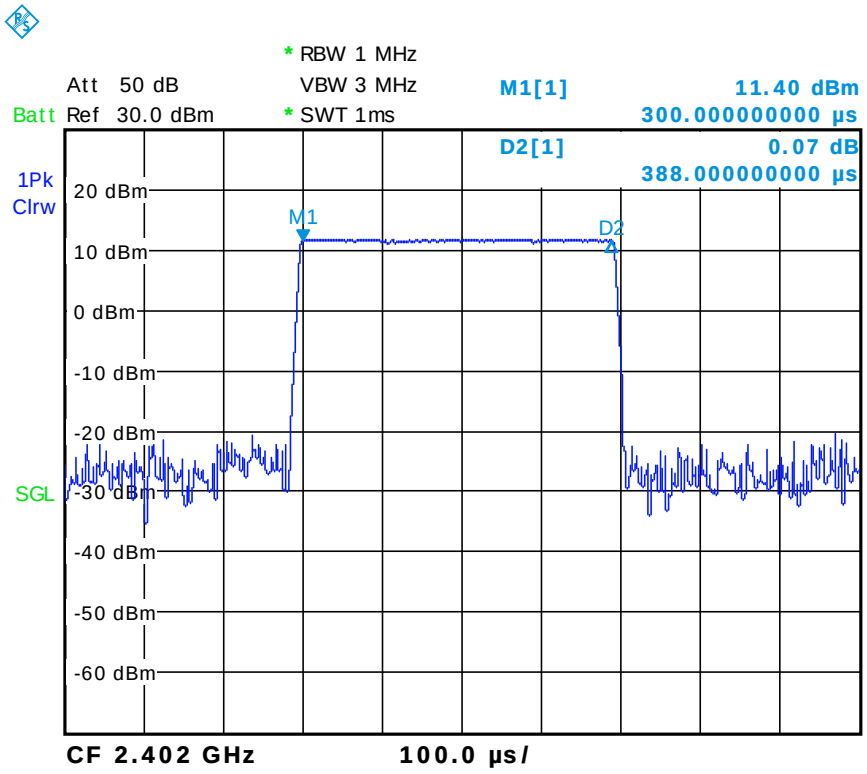
Channel Number	Channel Frequency (MHz)	Pulse Time (ms)	Period Time (s)	Time of Occupancy (Dwell Time) (ms)	Average Time of Occupancy Limit (ms)
CH00_DH1	2402.00	0.388	31.6	124.16	400
CH00_DH3	2402.00	1.648	31.6	263.68	400
CH00_DH5	2402.00	2.898	31.6	309.12	400
CH39_DH1	2441.00	0.394	31.6	126.08	400
CH39_DH3	2441.00	1.648	31.6	263.68	400
CH39_DH5	2441.00	2.898	31.6	309.12	400
CH78_DH1	2480.00	0.394	31.6	126.08	400
CH78_DH3	2480.00	1.654	31.6	264.64	400
CH78_DH5	2480.00	2.904	31.6	309.76	400

CH00_DH1 = 0.388(ms) x (1600 / 2 / 79) x 31.6 = 124.16(ms)
CH00_DH3 = 1.648(ms) x (1600 / 4 / 79) x 31.6 = 263.68(ms)
CH00_DH5 = 2.898(ms) x (1600 / 6 / 79) x 31.6 = 309.12(ms)

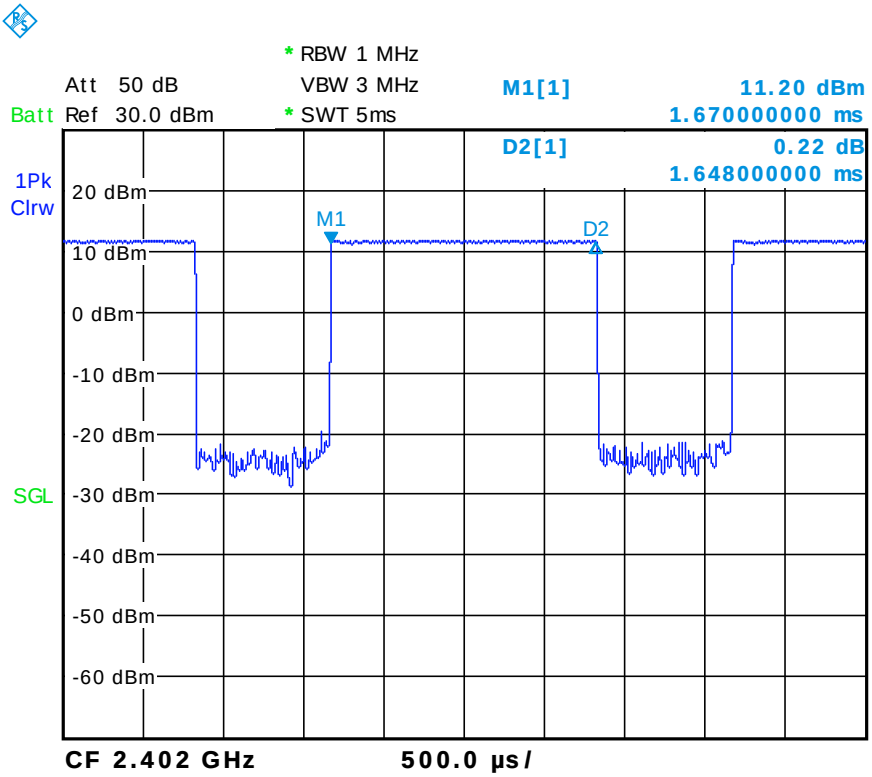
CH39_DH1 = 0.394(ms) x (1600 / 2 / 79) x 31.6 = 126.08(ms)
CH39_DH3 = 1.648(ms) x (1600 / 4 / 79) x 31.6 = 263.68(ms)
CH39_DH5 = 2.898(ms) x (1600 / 6 / 79) x 31.6 = 309.12(ms)

CH78_DH1 = 0.394(ms) x (1600 / 2 / 79) x 31.6 = 126.08(ms)
CH78_DH3 = 1.654(ms) x (1600 / 4 / 79) x 31.6 = 264.64(ms)
CH78_DH5 = 2.904(ms) x (1600 / 6 / 79) x 31.6 = 309.76(ms)

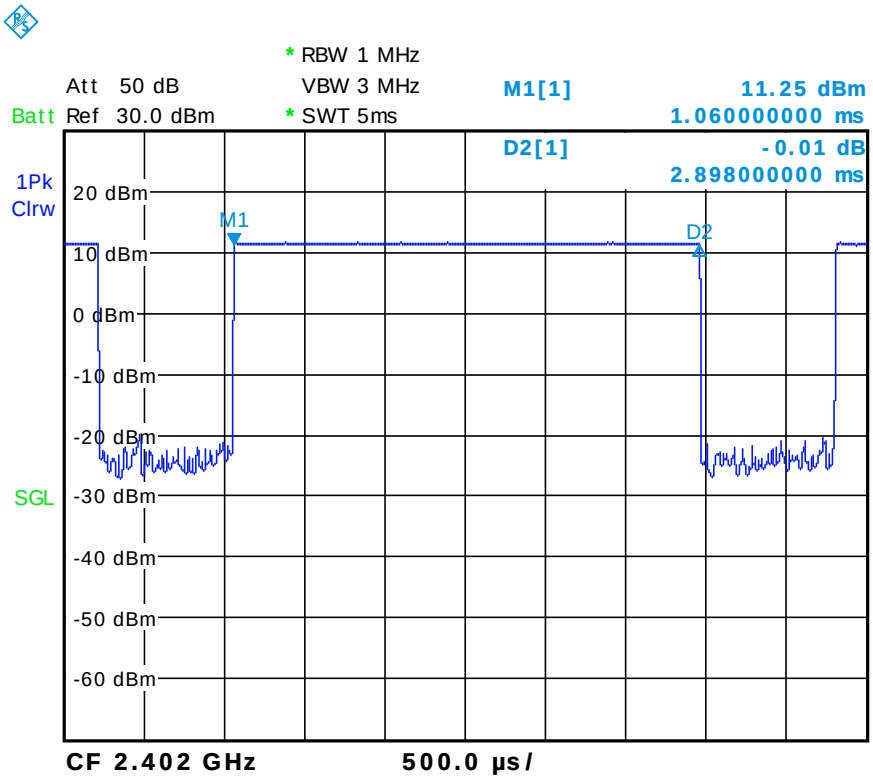
CH00_DH1：



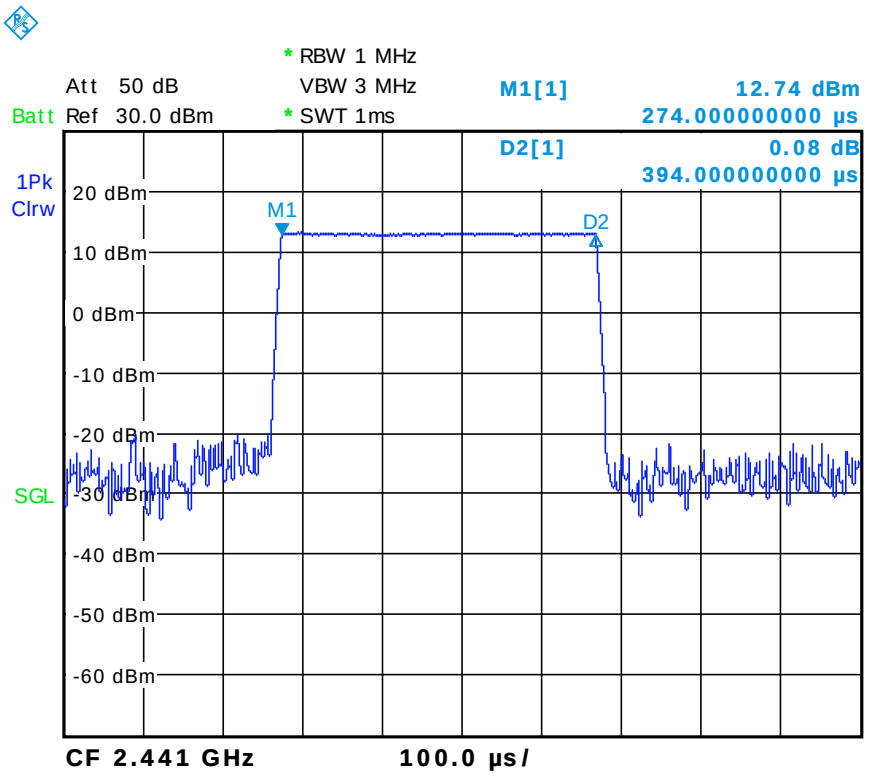
CH00_DH3：



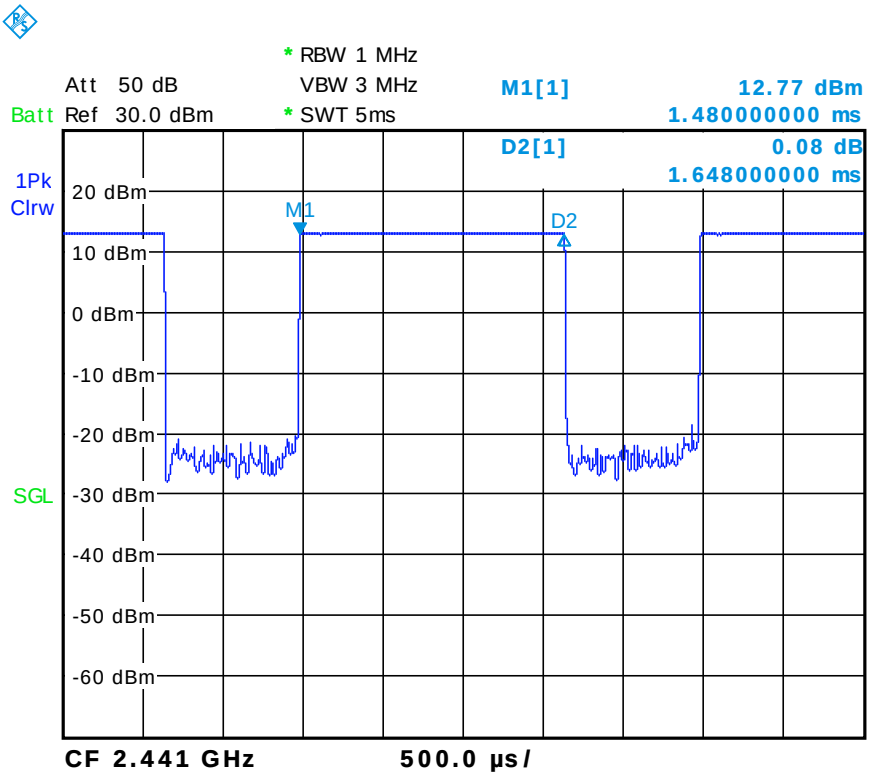
CH00_DH5：



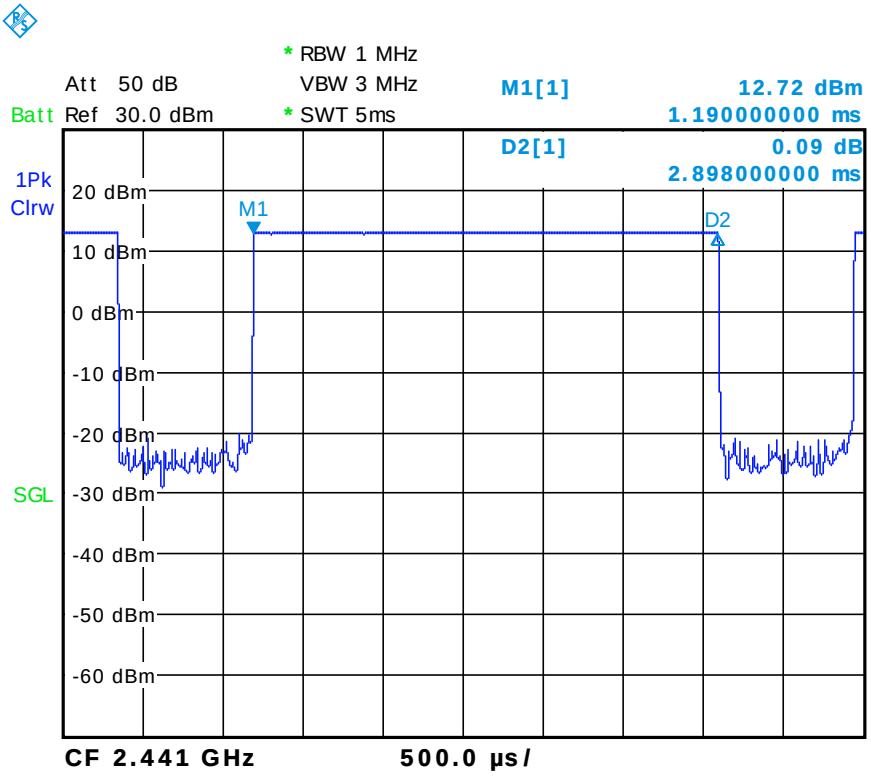
CH39_DH1：



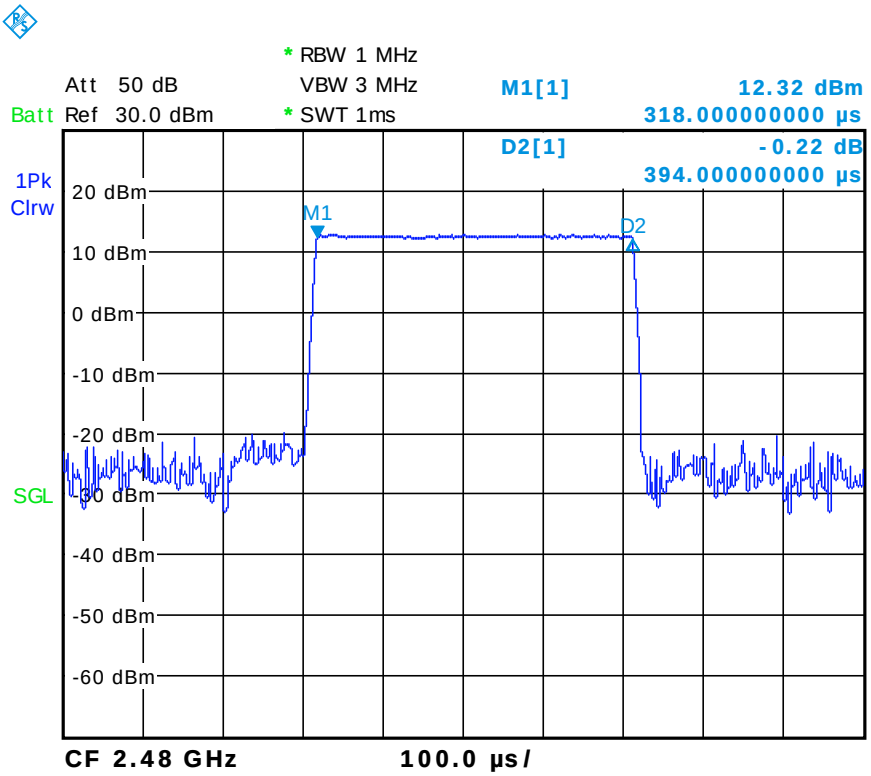
CH39_DH3：



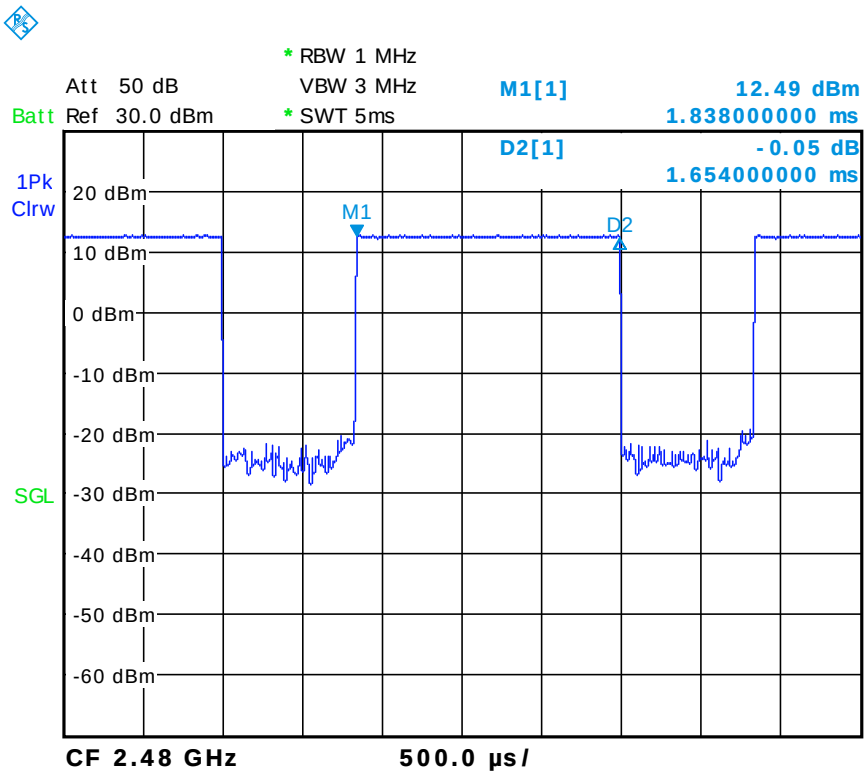
CH39_DH5：



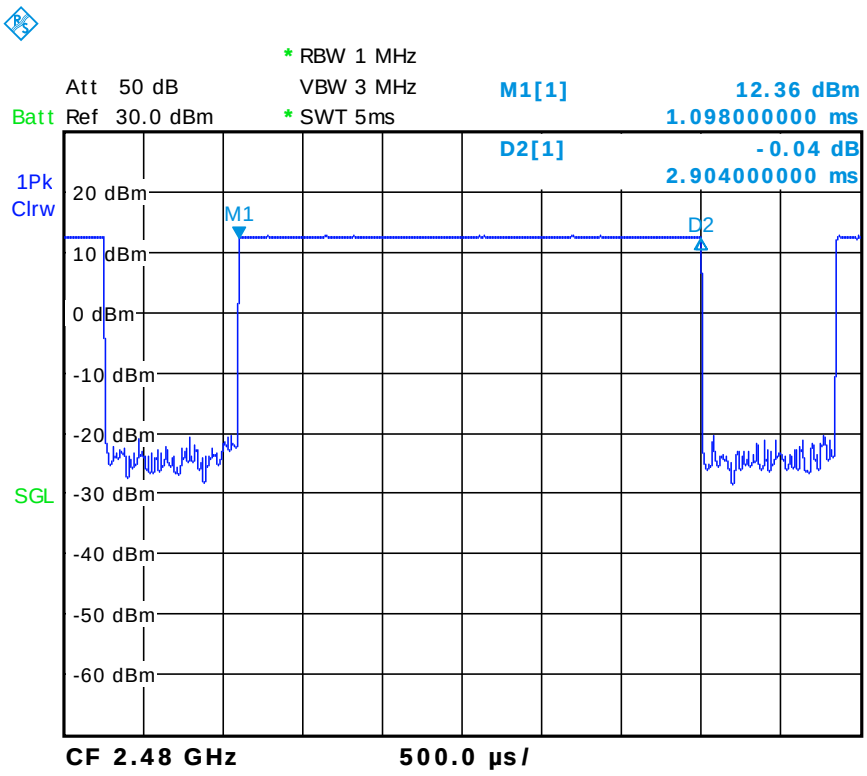
CH78_DH1：



CH78_DH3：



CH78_DH5：


* RBW 1 MHz
Att 50 dB
VBW 3 MHz
M1[1]
12.36 dBm
Batt Ref 30.0 dBm
* SWT 5ms
1.098000000 ms
D2[1]
-0.04 dB
2.904000000 ms
1Pk
Clrw
20 dBm
M1
D2
10 dBm
0 dBm
-10 dBm
-20 dBm
SGL
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.48 GHz
500.0 µs/

4.5 PEAK POWER TEST

4.5.1 LIMIT

FCC Part15, Subpart C Section 15.247.

Frequency Range (MHz)	Limit(W)				
	Quantity of Hopping Channel	50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

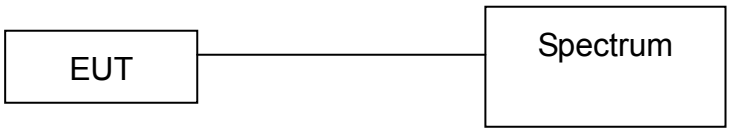
4.5.2 TEST EQUIPMENT

The following test equipment was used during the test：

Equipment/ Facilities	Specifications	Manufacturer	Model#/ Serial#	Due Date of Cal. & Cal. Center
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAY. 23, 2016 ETC

NOTE：The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.5.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.5.4 TEST PROCEDURE

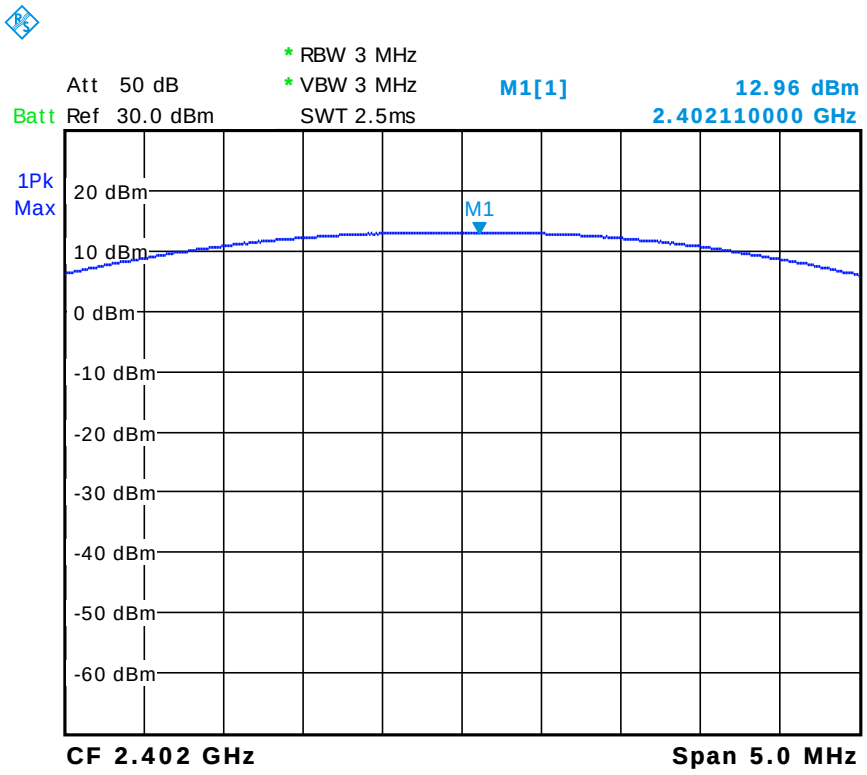
1. The EUT is programmed to transmit signals continuously for all testing.
2. Use the following spectrum analyzer settings according to DA 00-705 guidance:
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel;
   RBW > the 20 dB bandwidth of the emission being measured;
   VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
3. Printed out the test result from the spectrum by hard copy function.
4. Recorded the read value of the power meter.

4.5.5 TEST RESULT

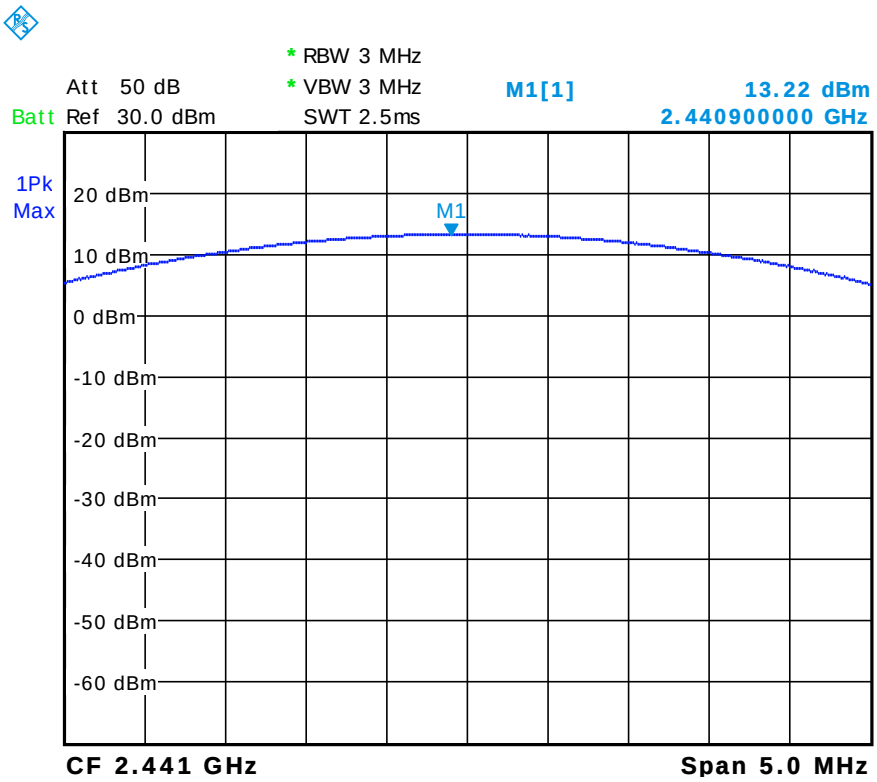
Temperature:	16°C	Humidity:	66%RH
Spectrum Detector:	PK	Tested by:	Leo Yang
Test Result:	PASS	Tested Date:	Dec. 24, 2015

Channel Number	Channel Frequency (MHz)	Peak Output Power (dBm)	Peak Power Limit (dBm)
00	2402.00	12.96	30
39	2441.00	13.22	30
78	2480.00	12.73	30

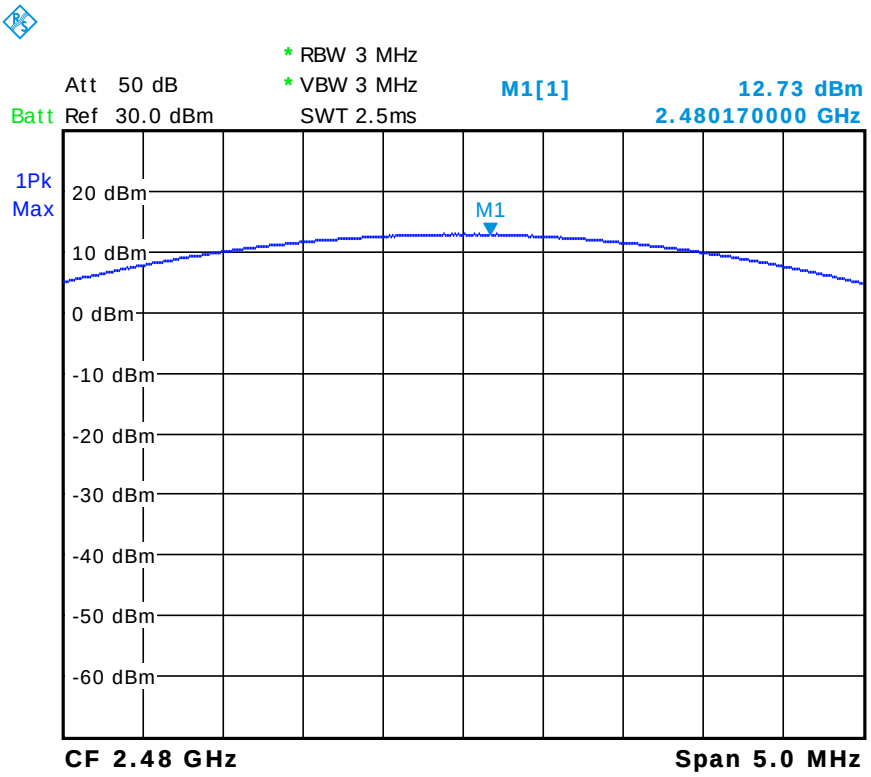
CH00：



CH39：


* RBW 3 MHz
Att 50 dB
* VBW 3 MHz
M1[1]
13.22 dBm
Batt Ref 30.0 dBm
SWT 2.5ms
2.440900000 GHz
1Pk
Max
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 2.441 GHz
Span 5.0 MHz

CH78：


* RBW 3 MHz
Att 50 dB
* VBW 3 MHz
M1[1]
12.73 dBm
Batt Ref 30.0 dBm
SWT 2.5ms
2.480170000 GHz
1Pk
Max
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 2.48 GHz
Span 5.0 MHz

4.6 BAND EDGE TEST

4.6.1 LIMIT

FCC Part15, Subpart C Section 15.247. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

OPERATING FREQUENCY RANGE (MHz)	SPURIOUS EMISSION FREQUENCY (MHz)	LIMIT	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902 - 928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400 - 2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725 - 5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

4.6.2 TEST EQUIPMENT

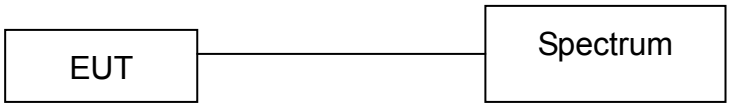
The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	20 MHz TO 1000 MHz	ROHDE & SCHWARZ	ESVS30 / 841977/003	NOV.18, 2016 ETC
BI-LOG ANTENNA	30 MHz TO 2 GHz	SCHAFFNER	CBL6141A / 4181	JUN.15, 2016 ETC
OPEN AREA TEST SITE	3 – 10 M MEASUREMENT	SRT	A02 / SRT002	MAR.16, 2016 SRT
COAXIAL CABLE	30 M	TIMES	LMR-400 / #30M (L1TCAB014)	MAY. 17, 2016 ETC
FILTER	2 LINE, 30 A	FIL.COIL	FC-943 / 869	NCR
SPECTRUM ANALYZER	9 kHz TO 40GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC.10,2016 ETC
HORN ANTENNA	1 GHz TO 18 GHz	EMCO	3115/ 9602-4681	JAN.17, 2016 ETC
PRE-AMPLIFIER	1 GHz TO 26.5 GHz	AGILENT	8449B/ 3008A01995	JAN.23, 2016 ETC
ANECHOIC CHAMBER	3 M MEASUREMENT	SRT	A01 / SRT001	NOV.21, 2016 SRT
RF CABLE	UP TO 18 GHz 1.5 m	JYEBAO	A30A30-L 142 / EQF-0035(001)	NOV. 24, 2016 ETC
RF CABLE	UP TO 18 GHz 3.5 m	JYEBAO	A30A30-L 142 / EQF-0036(002)	JUN. 21, 2016 ETC

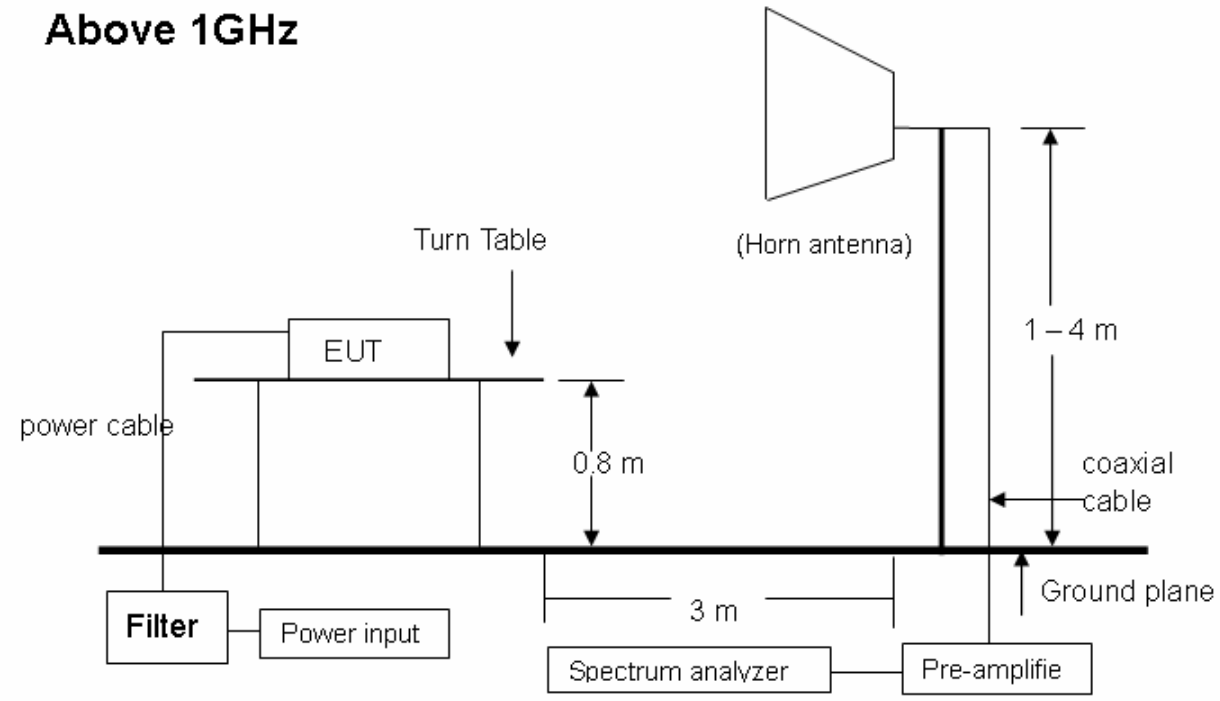
NOTE : The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.3 TEST SETUP

FOR RF Conducted test (dBc)



The EUT was connected to a spectrum through a 50Ω RF cable.



NOTE： The EUT system was put on a wooden table with 0.8m heights above a ground plane.

For the actual test configuration, please refer to the photos of testing.

4.6.4 TEST PROCEDURE

1. Conducted Test:
   The EUT was operating in continuous transmission mode or could be controlled its channel.
   Use the following spectrum analyzer settings according to DA 00-705 guidance:
   Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation; RBW ≥ 1% of the SPAN; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
   Printed out the test result from the spectrum by hard copy function.
2. Radiated emission test:
   The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 3 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

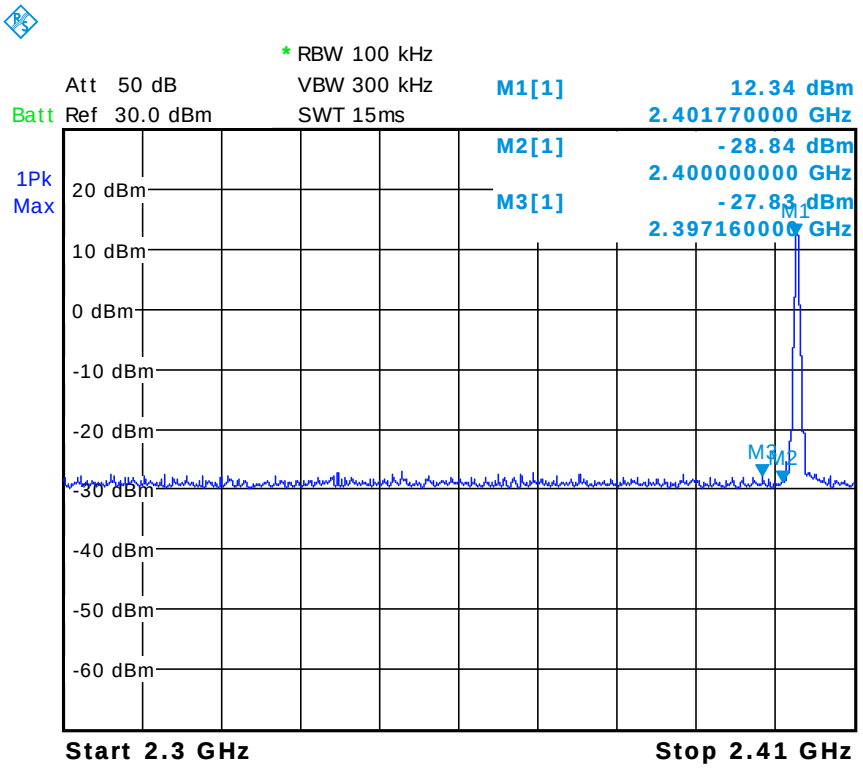
4.6.5 TEST RESULT

Temperature:	16°C	Humidity:	66%RH
Spectrum Detector:	PK. and AV.	Tested Mode:	TX1,TX3
Tested By:	Leo Yang	Tested Date:	Dec. 24, 2015

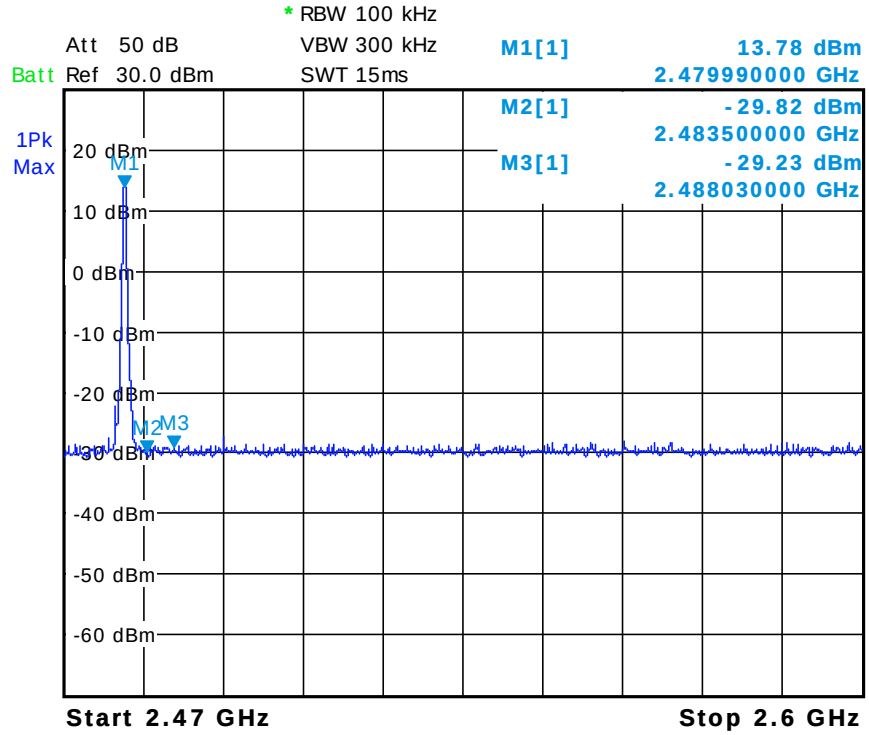
1. Conducted test

Frequency (MHz)	PEAK POWER OUTPUT (dBm)	Emission read Value(dBm)	Result of Band edge (dBc)	Band edge LIMIT (dBc)
<2400	12.34	-27.83	40.17	>20dBc
>2483.5	13.78	-29.23	43.01	>20dBc

Below 2400MHz：



Above 2483.5 MHz：



2. Radiated emission test：

Below 2400MHz (mode 1 of 2402MHz emission)

Frequency (MHz)	Correct Factor (dB)	Ant. Fac. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Over Limit (dBuV/m)	
				PK	AV	PK	AV	PK	AV	PK	AV
2400.00	-31.02	28.08	H	63.01	52.17	60.07	49.23	74.00	54.00	-13.93	-4.77
2400.00	-31.02	28.08	V	59.50	49.33	56.56	46.39	74.00	54.00	-17.44	-7.61
2396.80	-31.02	28.08	H	45.10	35.23	42.15	32.28	74.00	54.00	-31.85	-21.72
2394.60	-31.02	28.07	V	45.37	35.63	42.42	32.68	74.00	54.00	-31.58	-21.32

About 2483.5MHz (mode 3 of 2480MHz emission)

Frequency (MHz)	Correct Factor (dB)	Ant. Fac. (dB)	Ant. Pol. (H/V)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Over Limit (dBuV/m)	
				PK	AV	PK	AV	PK	AV	PK	AV
2483.50	-30.92	28.18	H	49.77	39.58	47.03	36.84	74.00	54.00	-26.97	-17.16
2483.50	-30.92	28.18	V	48.29	38.52	45.55	35.78	74.00	54.00	-28.45	-18.22
2487.70	-30.92	28.18	H	45.81	35.69	43.08	32.96	74.00	54.00	-30.92	-21.04
2488.70	-30.91	28.19	V	45.90	35.78	43.17	33.05	74.00	54.00	-30.83	-20.95

4.7 CONDUCTED EMISSION TEST

4.7.1 LIMIT

Frequency (MHz)	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

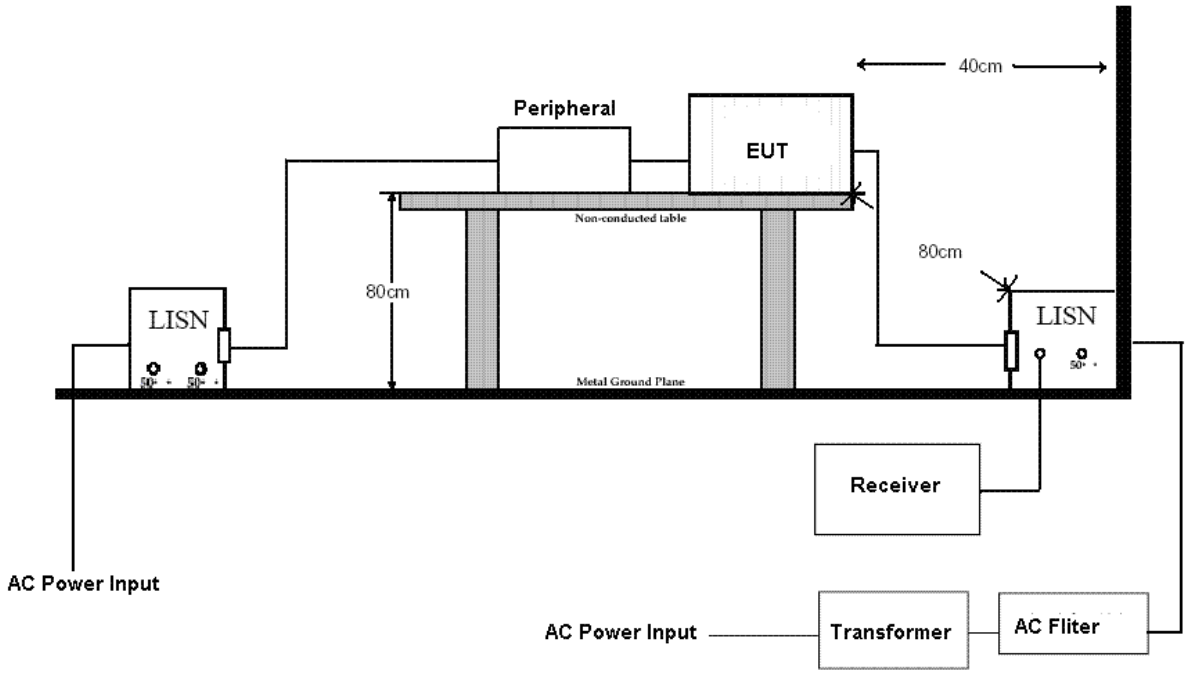
4.7.2 TEST EQUIPMENT

The following test equipment was used for the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz ~ 2.75 GHz	ROHDE & SCHWARZ	ESCS30 / 100376	JAN. 11, 2016 ETC
EMI TEST RECEIVER	9 kHz ~ 30 MHz	ROHDE & SCHWARZ	ESHS30 / 826003/008	JAN. 16, 2016 ETC
LISN	50 μH, 50 ohm	FCC	FCC-LISN-50-25-2 / 01017	MAY. 27, 2016 ETC
LISN	50 μH, 50 ohm	SOLAR	9252-50-R-24-BNC/ 951315	NOV. 05, 2016 ETC
LISN	50 μH, 50 ohm	EMCO	3825/2/ 9204-1952	MAY 26, 2016 ETC
50Ω BNC TYPE TERMINATOR	50 ohm	N/A	11593A/ L1TEQU005	NOV. 22, 2016 ETC
50Ω BNC TYPE TERMINATOR	50 ohm	N/A	B00-CD-357/ L1TEQU009	MAY. 28, 2016 ETC
COAXIAL CABLE	5 m	HUBER+SUHNER	RG214/U / #5M(L1TCAB013)	MAY. 10, 2016 ETC
FILTER	2 LINE, 30 A	FIL.COIL	FC-943 / 771	NCR
GROUND PLANE	2 m (H) x 3 m (W)	SRT	N/A	NCR
GROUND PLANE	2.5 m (H) x 3 m (W)	SRT	N/A	NCR
PULSE LIMITER	9 kHz ~ 30 MHz Insertion Loss= 10dB±0.3dB	ROHDE & SCHWARZ	ESH3Z2/ L1TTES010	DEC. 23, 2016 ETC

NOTE:
The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.7.3 TEST SETUP



NOTE :
1. The EUT was put on a wooden table with 0.8m heights above ground plane, and 0.4m away from reference ground plane (> 2mx2m).
2. For the actual test configuration, please refer to the photos of testing.

4.7.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:2003 and CISPR22:2003. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm/50μH as specified. All readings were quasi-peak and average values with 10 kHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. Both lines of the power mains of EUT were measured and the cables connected to EUT and support units were moved to find the maximum emission levels for each frequency. First, find the margin or higher points at least 6 points by software, then use manual to find the maximum data. The procedure is referred on the test procedure of SRT LAB.

4.7.5 TEST RESULT

Temperature:	25 °C	Humidity:	66 %RH
Tested By:	Leo Yang	Tested Mode:	TX-1
Receiver Detector:	Q.P. and AV.	Modulation Type:	Π/4 DQPSK, 8DPSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Dec. 23, 2015

Power Line Measured：Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.06	55.71	52.53	55.77	52.59	66.00	56.00	-10.23	-3.41
0.153	0.06	53.76	50.56	53.82	50.62	65.84	55.84	-12.02	-5.22
0.528	-0.09	39.45	29.40	39.36	29.31	56.00	46.00	-16.64	-16.69
3.309	-0.04	30.98	25.60	30.94	25.56	56.00	46.00	-25.06	-20.44
4.794	0.00	29.61	21.42	29.61	21.42	56.00	46.00	-26.39	-24.58
8.258	0.09	36.70	28.09	36.79	28.18	60.00	50.00	-23.21	-21.82

Power Line Measured：Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.05	55.37	52.42	55.42	52.47	66.00	56.00	-10.58	-3.53
0.153	0.05	53.36	50.54	53.41	50.59	65.84	55.84	-12.43	-5.25
0.524	-0.08	36.15	28.90	36.07	28.82	56.00	46.00	-19.93	-17.18
3.210	-0.03	31.32	26.35	31.29	26.32	56.00	46.00	-24.71	-19.68
3.239	-0.03	35.38	27.89	35.35	27.86	56.00	46.00	-20.65	-18.14
19.182	0.35	33.90	25.01	34.25	25.36	60.00	50.00	-25.75	-24.64

NOTE :
1. Measurement uncertainty is 2.91dB
2. Emission level = Reading valus + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
   Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

Temperature:	25 ˚C	Humidity:	66 %RH
Tested By:	Leo Yang	Tested Mode:	TX-2
Receiver Detector:	Q.P. and AV.	Modulation Type:	Π/4 DQPSK, 8DPSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Dec. 23, 2015

Power Line Measured：Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.06	56.23	52.74	56.29	52.80	66.00	56.00	-9.71	-3.20
0.153	0.06	54.19	50.85	54.25	50.91	65.84	55.84	-11.59	-4.93
0.600	-0.10	37.32	25.52	37.22	25.42	56.00	46.00	-18.78	-20.58
7.801	0.08	35.08	31.62	35.16	31.70	60.00	50.00	-24.84	-18.30
8.106	0.09	36.18	31.25	36.27	31.34	60.00	50.00	-23.73	-18.66
17.552	0.34	36.23	25.49	36.57	25.83	60.00	50.00	-23.43	-24.17

Power Line Measured：Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.05	56.82	53.08	56.87	53.13	66.00	56.00	-9.13	-2.87
0.153	0.05	54.67	51.10	54.72	51.15	65.84	55.84	-11.12	-4.69
0.500	-0.08	38.19	22.32	38.11	22.24	56.00	46.00	-17.89	-23.76
3.309	-0.03	33.72	28.95	33.69	28.92	56.00	46.00	-22.31	-17.08
3.388	-0.03	32.63	25.94	32.60	25.91	56.00	46.00	-23.40	-20.09
8.481	0.09	35.23	30.79	35.32	30.88	60.00	50.00	-24.68	-19.12

NOTE :

1. Measurement uncertainty is 2.91dB
2. Emission level = Reading valus + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
   Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

Temperature:	25 ˚C	Humidity:	66 %RH
Tested By:	Leo Yang	Tested Mode:	TX-3
Receiver Detector:	Q.P. and AV.	Modulation Type:	Π/4 DQPSK, 8DPSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Dec. 23, 2015

Power Line Measured：Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.06	57.22	53.58	57.28	53.64	66.00	56.00	-8.72	-2.36
0.153	0.06	55.09	51.52	55.15	51.58	65.84	55.84	-10.69	-4.26
0.500	-0.09	37.02	22.88	36.93	22.79	56.00	46.00	-19.07	-23.21
3.259	-0.04	31.71	25.12	31.67	25.08	56.00	46.00	-24.33	-20.92
8.400	0.09	34.61	31.37	34.70	31.46	60.00	50.00	-25.30	-18.54
8.552	0.10	35.18	32.00	35.28	32.10	60.00	50.00	-24.72	-17.90

Power Line Measured：Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.05	57.52	53.83	57.57	53.88	66.00	56.00	-8.43	-2.12
0.153	0.05	55.29	51.68	55.34	51.73	65.84	55.84	-10.50	-4.11
0.524	-0.08	35.82	28.72	35.74	28.64	56.00	46.00	-20.26	-17.36
3.309	-0.03	35.84	32.75	35.81	32.72	56.00	46.00	-20.19	-13.28
3.388	-0.03	32.35	25.57	32.32	25.54	56.00	46.00	-23.68	-20.46
8.248	0.08	35.84	31.34	35.92	31.42	60.00	50.00	-24.08	-18.58

NOTE :

1. Measurement uncertainty is 2.91dB
2. Emission level = Reading valus + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
   Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

Temperature:	25 ˚C	Humidity:	66 %RH
Tested By:	Leo Yang	Tested Mode:	Standby
Receiver Detector:	Q.P. and AV.	Modulation Type:	Ⅱ/4 DQPSK, 8DPSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Dec. 23, 2015

Power Line Measured：Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.06	58.78	53.68	58.84	53.74	66.00	56.00	-7.16	-2.26
0.153	0.06	56.07	52.18	56.13	52.24	65.84	55.84	-9.71	-3.60
0.504	-0.09	35.52	19.53	35.43	19.44	56.00	46.00	-20.57	-26.56
3.309	-0.04	36.25	31.09	36.21	31.05	56.00	46.00	-19.79	-14.95
3.457	-0.04	31.79	26.47	31.75	26.43	56.00	46.00	-24.25	-19.57
8.400	0.09	35.03	30.81	35.12	30.90	60.00	50.00	-24.88	-19.10

Power Line Measured：Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.05	58.84	53.61	58.89	53.66	66.00	56.00	-7.11	-2.34
0.153	0.05	56.31	52.46	56.36	52.51	65.84	55.84	-9.48	-3.33
0.504	-0.08	35.13	19.86	35.05	19.78	56.00	46.00	-20.95	-26.22
3.259	-0.03	31.73	21.39	31.70	21.36	56.00	46.00	-24.30	-24.64
3.309	-0.03	35.13	29.75	35.10	29.72	56.00	46.00	-20.90	-16.28
8.177	0.08	36.93	27.91	37.01	27.99	60.00	50.00	-22.99	-22.01

NOTE :

1. Measurement uncertainty is 2.91dB
2. Emission level = Reading valus + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
   Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

Temperature:	25 ˚C	Humidity:	66 %RH
Tested By:	Leo Yang	Tested Mode:	Link
Receiver Detector:	Q.P. and AV.	Modulation Type:	Π/4 DQPSK, 8DPSK
Frequency Range:	0.15 – 30 MHz	Tested Date:	Dec. 23, 2015

Power Line Measured：Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.06	58.24	53.83	58.30	53.89	66.00	56.00	-7.70	-2.11
0.153	0.06	56.15	51.93	56.21	51.99	65.84	55.84	-9.63	-3.85
0.504	-0.09	35.52	20.13	35.43	20.04	56.00	46.00	-20.57	-25.96
3.309	-0.04	36.19	32.88	36.15	32.84	56.00	46.00	-19.85	-13.16
8.025	0.08	35.68	32.07	35.76	32.15	60.00	50.00	-24.24	-17.85
8.177	0.09	35.73	30.95	35.82	31.04	60.00	50.00	-24.18	-18.96

Power Line Measured：Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.150	0.05	58.40	54.31	58.45	54.36	66.00	56.00	-7.55	-1.64
0.153	0.05	55.95	52.10	56.00	52.15	65.84	55.84	-9.84	-3.69
0.500	-0.08	36.51	22.32	36.43	22.24	56.00	46.00	-19.57	-23.76
3.309	-0.03	36.17	32.28	36.14	32.25	56.00	46.00	-19.86	-13.75
4.061	-0.01	30.69	27.12	30.68	27.11	56.00	46.00	-25.32	-18.89
8.552	0.09	35.79	30.57	35.88	30.66	60.00	50.00	-24.12	-19.34

NOTE :

1. Measurement uncertainty is 2.91dB
2. Emission level = Reading valus + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
   Difference of Pulse Limiter Factor between EMI Test Receiver corrected 10dB insertion loss.
4. Margin value = Emission level - Limit
5. The emission of other frequencies was very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

4.8 RADIATED EMISSION TEST

4.8.1 LIMIT

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table：

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (dBμV/m)
0.009 - 0.490	300	2400/F(KHz)
0.490 - 1.705	30	24000/F(KHz)
1.705 - 30	30	30
30 - 88	3	40.0
88 - 216	3	43.5
216 - 960	3	46.0
Above 960	3	54.0

Note : 1. 30 dBuV (in 30m) = 70 dBuV (in 3m).

2. Transmitters that require Crystal Controlled Oscillators with values below 30 MHz requires the Test Report to show “Spurious Radiated Emissions” results below 30 MHz per FCC Part 15.33(a).

FCC Part15, Subpart C Section 15.249 limit of radiated emission for frequency below1000MHz (Average).

FREQUENCY (MHz)	FIELD STRENGTH OF FUNDAMENTAL (millivolts/meter)	FIELD STRENGTH OF HARMONICS (millivolts/meter)
902 - 928	50	500
2400 - 2483.5	50	500
5725 - 5875	50	500
24000 - 24250	250	2500

NOTE :

1. In the emission tables above , the tighter limit applies at the band edges.
2. Distance refers to the distance between measuring instrument, antemma, and the closest point of any part of the device or system.
3. 50mV = 94dBuV

FCC Part 15, Section15.35(b) limit of radiated emission for frequency above 1000 MHz

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

4.8.2 TEST EQUIPMENT

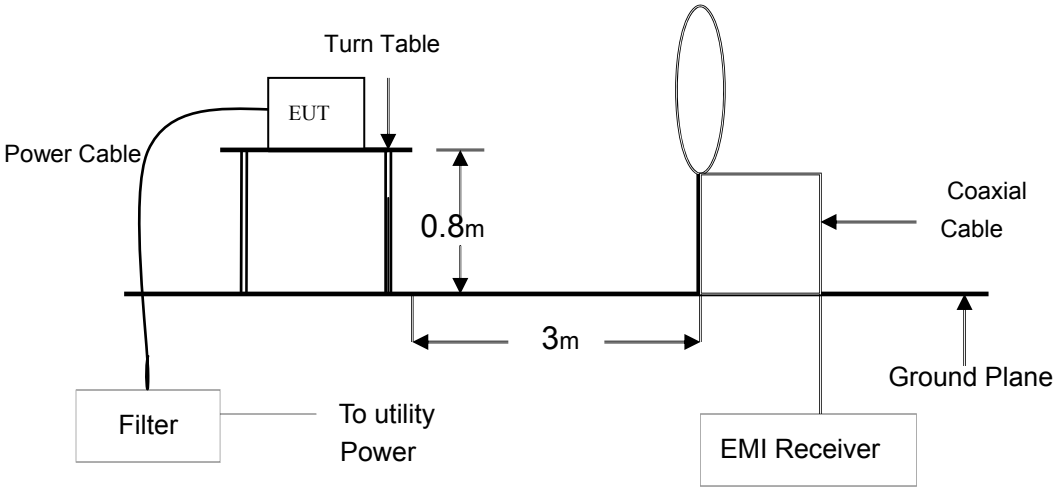
The following test equipment was used during the radiated emission test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz ~ 2.75 GHz	ROHDE & SCHWARZ	ESCS30 / 100376	JAN. 11, 2016 ETC
EMI TEST RECEIVER	20 MHz ~ 1000 MHz	ROHDE & SCHWARZ	ESVS30 / 841977/003	NOV. 18, 2016 ETC
SPECTRUM ANALYZER	9 kHz ~ 40GHz	ROHDE & SCHWARZ	FSP40 / 100093	DEC 10, 2016 ETC
EMI TEST RECEIVER (INCLUDE SPECTRUM ANALYZER)	9 KHz ~ 6 GHz	ROHDE & SCHWARZ	ESL /100176	MAY 23, 2016 ETC
LOOP ANTENNA	9 kHz ~ 30 MHz	ETS.LINDGREN	HFH2-Z2/ 860605/002 (1162 1/2)	MAR. 17, 2016 ETC
BI-LOG ANTENNA	30 MHz ~ 2 GHz	SCHAFFNER	CBL6141A / 4181	JUN. 15, 2016 ETC
HORN ANTENNA	1 GHz ~ 18 GHz	EMCO	3115/ 9602-4681	JAN. 17, 2016 ETC
HORN ANTENNA	18 ~ 40 GHZ	ETS-LINDGREN	3116 /00032255	JAN. 09, 2016 ETC
PRE-AMPLIFIER	1 GHz ~ 26.5 GHz	AGILENT	8449B/ 3008A01995	JAN. 23, 2016 ETC
PRE-AMPLIFIER	0.1 ~ 1300 MHz	HP	8447D / 2944A06746	OCT. 15, 2016 ETC
OPEN AREA TEST SITE	3 – 10 M MEASUREMENT	SRT	A02 / SRT002	MAR. 16, 2016 SRT
ANECHOIC CHAMBER	3 M MEASUREMENT	SRT	A01 / SRT001	NOV. 21, 2016 SRT
RF CABLE	UP TO 18 GHz 1.5 m	JYEBAO	A30A30-L 142 / EQF-0035(001)	NOV. 24, 2016 ETC
RF CABLE	UP TO 18 GHz 3.5 m	JYEBAO	A30A30-L 142 / EQF-0036(002)	JUN. 21, 2016 ETC
K-TYPE CABLE	UP TO 40 GHz 3 m	HUBER+SUHNER	SF102-46/2*11SK 252 /MY2611/2	MAR. 03, 2016 ETC
K-TYPE CABLE	UP TO 40 GHz, 1 m	HUBER+SUHNER	SF 102-40/2*11 /23934/2	OCT. 05, 2016 ETC
COAXIAL CABLE	30 M	TIMES	LMR-400 / #30M(L1TCAB014)	MAY. 17, 2016 ETC
FILTER	2 LINE, 30 A	FIL.COIL	FC-943 / 869	NCR
CDN	0.15 MHz ~ 300 MHz	LUTHI	CDN L-801 M2/M3 / 2790	MAY. 17, 2016 ETC

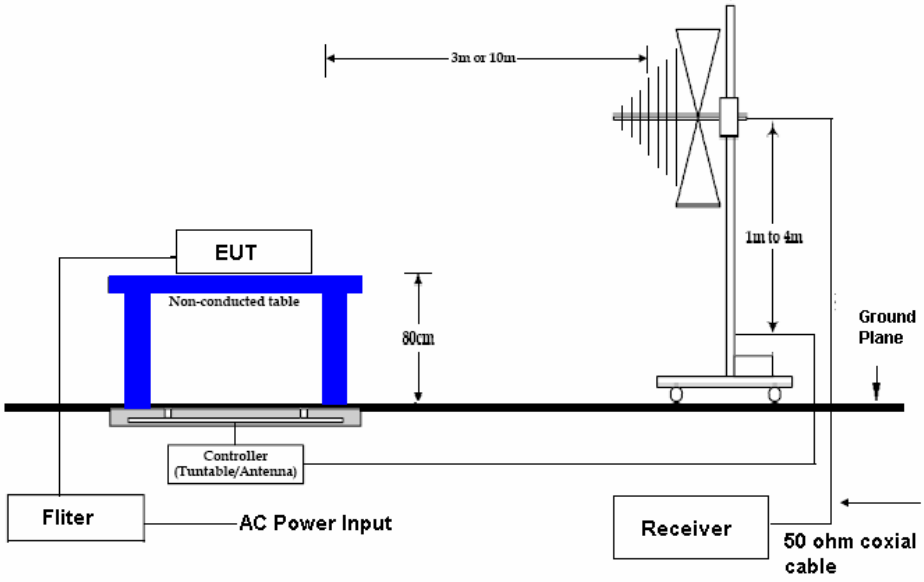
NOTE:
The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.8.3 TEST SET-UP

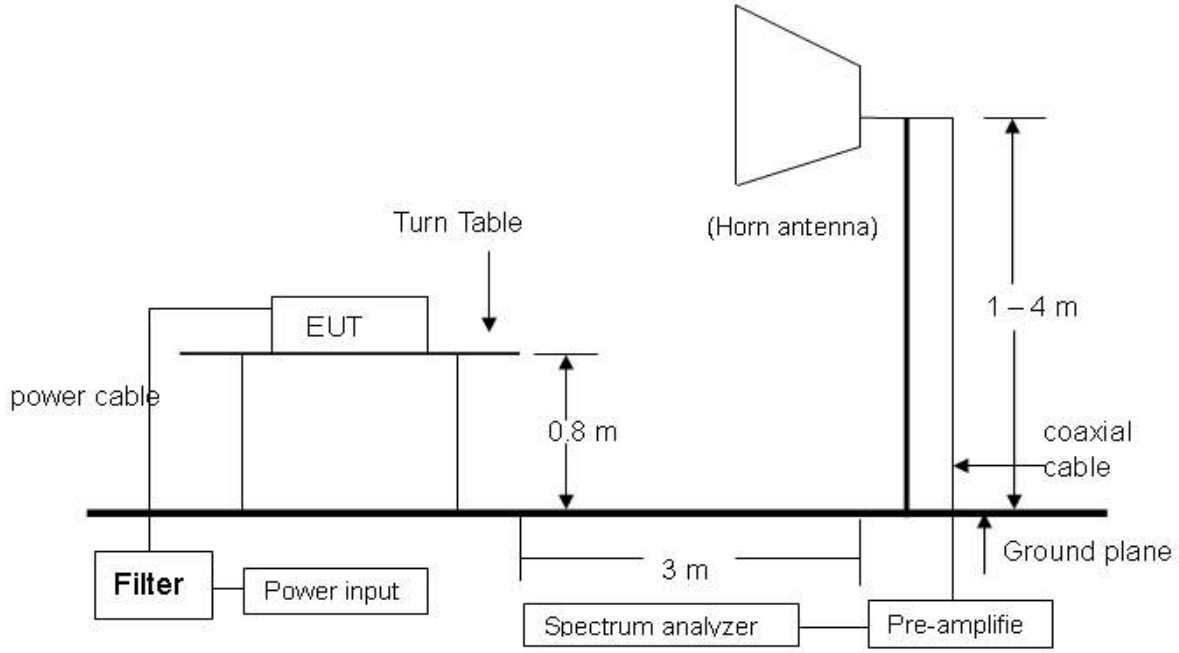
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



NOTE：The EUT system was put on a wooden table with 0.8m heights above a ground plane.

For the actual test configuration, please refer to the photos of testing.

4.8.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:2003 and CISPR 22:2003.

The measurements were made at an open area test site with 3 meter measurement distance under 1 GHz and with 3m distance above 1GHz.

The frequency spectrum measured started from 30 MHz to 1 GHz, all readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver.

Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak or average values with 1 MHz resolution bandwidth of the test receiver.

The EUT system was operated in all typical methods by users.

The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

First, find the margin or higher points at least 6 points by software, then use manual to find the maximum data.

The procedure is referred on the test procedure of SRT LAB.

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	9KHz – 30 MHz	Measured Distance:	3 m
Receiver Detector:	AV.	Tested Mode:	Tx-1
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Frequency (KHz)	Cable Loss (dB)	Ant. Fac. (dB)	Reading (dBμV)	Emission (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)
4.23	0.43	20.01	5.26	25.69	70.00	-44.31
7.05	0.55	20.41	5.30	26.25	70.00	-43.75
17.52	0.87	21.52	3.32	25.71	70.00	-44.29
22.95	1.02	21.83	3.46	26.31	70.00	-43.69
24.78	1.07	21.85	3.05	25.97	70.00	-44.03
26.19	1.11	21.86	3.45	26.43	70.00	-43.57

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	9KHz – 30 MHz	Measured Distance:	3 m
Receiver Detector:	AV.	Tested Mode:	Tx-2
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Frequency (KHz)	Cable Loss (dB)	Ant. Fac. (dB)	Reading (dBμV)	Emission (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)
4.26	0.43	20.02	5.85	26.29	70.00	-43.71
7.77	0.58	20.48	5.70	26.75	70.00	-43.25
10.65	0.68	20.77	5.08	26.53	70.00	-43.47
11.97	0.72	20.92	4.82	26.45	70.00	-43.55
16.62	0.85	21.42	4.03	26.30	70.00	-43.70
24.45	1.06	21.84	3.56	26.47	70.00	-43.53

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	9KHz – 30 MHz	Measured Distance:	3 m
Receiver Detector:	AV.	Tested Mode:	Tx-3
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Frequency (KHz)	Cable Loss (dB)	Ant. Fac. (dB)	Reading (dBμV)	Emission (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)
13.62	0.76	21.10	4.48	26.34	70.00	-43.66
15.90	0.83	21.35	3.92	26.09	70.00	-43.91
19.74	0.93	21.76	3.60	26.30	70.00	-43.70
23.34	1.03	21.83	3.81	26.68	70.00	-43.32
26.10	1.11	21.86	3.04	26.01	70.00	-43.99
28.08	1.17	21.88	4.11	27.16	70.00	-42.84

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	9KHz – 30 MHz	Measured Distance:	3 m
Receiver Detector:	AV.	Tested Mode:	Standby
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Frequency (KHz)	Cable Loss (dB)	Ant. Fac. (dB)	Reading (dBμV)	Emission (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)
3.99	0.41	19.95	5.96	26.32	70.00	-43.68
10.86	0.68	20.79	4.22	25.70	70.00	-44.30
13.41	0.76	21.08	4.78	26.61	70.00	-43.39
17.04	0.86	21.47	3.82	26.14	70.00	-43.86
18.21	0.89	21.60	4.00	26.49	70.00	-43.51
28.65	1.18	21.89	3.18	26.25	70.00	-43.75

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	9KHz – 30 MHz	Measured Distance:	3 m
Receiver Detector:	AV.	Tested Mode:	Link
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Frequency (KHz)	Cable Loss (dB)	Ant. Fac. (dB)	Reading (dBμV)	Emission (dBμV/m)	Limit Line (dBμV/m)	Margin (dB)
2.10	0.31	19.92	6.01	26.24	70.00	-43.76
7.23	0.55	20.42	6.11	27.09	70.00	-42.91
15.48	0.81	21.30	4.24	26.35	70.00	-43.65
17.94	0.88	21.57	4.23	26.68	70.00	-43.32
22.26	1.00	21.82	3.58	26.41	70.00	-43.59
27.03	1.14	21.87	4.42	27.43	70.00	-42.57

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	30 M – 1 GHz	Tested Mode:	Tx-1
Detector Type:	Quasi-peak	IF Bandwidth:	120 kHz
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Antenna Polarization：Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
56.61	1.51	12.08	22.55	36.14	40	-3.86	128	3.59
75.65	1.60	8.50	21.82	31.92	40	-8.08	230	3.31
311.72	3.18	14.16	21.12	38.46	46	-7.54	185	3.11
514.79	4.43	18.39	17.62	40.44	46	-5.56	60	3.02
759.14	5.64	22.14	9.99	37.77	46	-8.23	241	2.89
785.06	5.75	22.24	9.53	37.52	46	-8.48	107	1.63

Antenna Polarization：Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
35.97	1.33	21.90	7.17	30.40	40	-9.60	273	1.04
56.61	1.51	12.08	24.37	37.96	40	-2.04	64	1.18
62.59	1.53	10.24	23.84	35.61	40	-4.39	157	2.15
77.05	1.62	8.38	24.34	34.34	40	-5.66	280	3.17
87.02	1.70	8.76	23.23	33.69	40	-6.31	194	3.26
517.88	4.45	18.48	17.99	40.91	46	-5.09	223	3.34

NOTE :
1. Measurement uncertainty is 4.73dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	30 M – 1 GHz	Tested Mode:	Tx-2
Detector Type:	Quasi-peak	IF Bandwidth:	120 kHz
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Antenna Polarization：Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
56.61	1.51	12.08	22.87	36.46	40	-3.54	133	3.62
64.98	1.54	9.88	20.05	31.47	40	-8.53	334	3.38
93.20	1.75	9.27	21.91	32.93	44	-10.57	159	3.18
311.72	3.18	14.16	18.85	36.19	46	-9.81	102	3.01
514.00	4.43	18.39	17.38	40.20	46	-5.80	257	2.87
770.80	5.69	22.18	7.28	35.15	46	-10.85	42	1.61

Antenna Polarization：Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
35.97	1.33	21.90	7.43	30.66	40	-9.34	144	1.20
56.61	1.51	12.08	23.78	37.37	40	-2.63	247	1.68
62.59	1.53	10.24	23.49	35.26	40	-4.74	195	1.89
75.65	1.60	8.50	25.09	35.19	40	-4.81	302	2.67
87.02	1.70	8.76	23.56	34.02	40	-5.98	228	3.04
399.45	3.80	16.47	17.05	37.32	46	-8.68	62	3.35

NOTE :
1. Measurement uncertainty is 4.73dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	30 M – 1 GHz	Tested Mode:	Tx-3
Detector Type:	Quasi-peak	IF Bandwidth:	120 kHz
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Antenna Polarization：Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
56.61	1.51	12.08	21.71	35.30	40	-4.70	151	3.54
62.59	1.53	10.24	20.59	32.36	40	-7.64	255	3.31
311.72	3.18	14.16	18.82	36.16	46	-9.84	70	3.17
514.79	4.43	18.39	17.39	40.21	46	-5.79	123	3.02
752.26	5.61	22.11	8.96	36.68	46	-9.32	96	2.75
788.15	5.77	22.25	7.48	35.50	46	-10.50	108	1.62

Antenna Polarization：Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
56.61	1.51	12.08	22.60	36.19	40	-3.81	42	1.06
62.59	1.53	10.24	23.12	34.89	40	-5.11	75	1.19
75.65	1.60	8.50	24.37	34.47	40	-5.53	309	2.11
87.02	1.70	8.76	22.54	33.00	40	-7.00	291	2.34
94.69	1.76	9.36	21.06	32.18	44	-11.32	224	3.08
514.79	4.43	18.39	18.95	41.77	46	-4.23	315	3.35

NOTE :
1. Measurement uncertainty is 4.73dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	30 M – 1 GHz	Tested Mode:	Standby
Detector Type:	Quasi-peak	IF Bandwidth:	120 kHz
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Antenna Polarization：Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(º)	EL(m)
63.29	1.53	10.06	19.26	30.85	40	-9.15	337	3.57
69.47	1.56	8.98	18.40	28.94	40	-11.06	254	3.32
190.99	2.38	11.30	17.67	31.35	44	-12.15	152	3.11
497.15	4.34	17.96	12.85	35.15	46	-10.85	247	3.04
514.79	4.43	18.39	14.41	37.23	46	-8.77	170	2.18
788.15	5.77	22.25	7.31	35.33	46	-10.67	103	1.62

Antenna Polarization：Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(º)	EL(m)
35.97	1.33	21.90	7.44	30.67	40	-9.33	51	1.12
63.29	1.53	10.06	22.85	34.44	40	-5.56	49	1.28
81.83	1.65	8.28	21.57	31.50	40	-8.50	144	1.83
516.19	4.44	18.45	15.08	37.97	46	-8.03	239	2.15
751.56	5.60	22.10	3.82	31.53	46	-14.47	185	3.04
788.15	5.77	22.25	3.21	31.23	46	-14.77	199	3.28

NOTE :
1. Measurement uncertainty is 4.73dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

Temperature:	24 ˚C	Humidity:	67 %RH
Frequency Range:	30 M – 1 GHz	Tested Mode:	Link
Detector Type:	Quasi-peak	IF Bandwidth:	120 kHz
Tested By:	Leo Yang	Tested Date:	Dec. 23, 2015

Antenna Polarization：Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(º)	EL(m)
65.68	1.54	9.70	19.87	31.11	40	-8.89	225	3.61
70.17	1.56	8.80	20.19	30.55	40	-9.45	71	3.42
142.94	2.09	12.32	14.60	29.01	44	-14.49	152	3.27
190.99	2.38	11.30	16.77	30.45	44	-13.05	318	3.05
514.79	4.43	18.39	11.68	34.50	46	-11.50	240	2.88
788.15	5.77	22.25	5.73	33.75	46	-12.25	105	1.61

Antenna Polarization：Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(º)	EL(m)
65.68	1.54	9.70	23.43	34.67	40	-5.33	61	1.06
83.23	1.67	8.44	18.53	28.64	40	-11.36	144	1.19
379.71	3.66	15.91	15.23	34.80	46	-11.20	342	1.25
514.79	4.43	18.39	13.36	36.18	46	-9.82	159	2.03
769.11	5.68	22.18	3.96	31.82	46	-14.18	77	2.55
785.06	5.75	22.24	3.11	31.10	46	-14.90	292	3.39

NOTE :
1. Measurement uncertainty is 4.73dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Tx-1
Detector Type:	PK. and AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
1599.06	-32.70	26.36	55.04	45.23	48.69	38.88	74	54	-25.31	-15.12	135	2.37
3119.93	-31.24	30.42	47.36	37.29	46.54	36.47	74	54	-27.46	-17.53	211	1.93
3654.56	-30.59	31.26	47.15	36.71	47.83	37.39	74	54	-26.17	-16.61	108	1.66
3904.84	-30.39	32.01	45.81	35.24	47.44	36.87	74	54	-26.56	-17.13	45	1.39
4379.37	-29.94	32.15	46.61	36.32	48.82	38.53	74	54	-25.18	-15.47	200	1.25
4999.11	-29.19	33.40	44.60	34.28	48.81	38.49	74	54	-25.19	-15.51	319	1.18

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
1599.29	-32.70	26.36	52.17	42.25	45.82	35.90	74	54	-28.18	-18.10	52	1.13
2009.15	-32.05	27.81	48.73	38.47	44.49	34.23	74	54	-29.51	-19.77	216	1.75
3129.63	-31.22	30.43	47.33	37.25	46.54	36.46	74	54	-27.46	-17.54	207	1.93
3624.10	-30.61	31.17	47.39	36.22	47.95	36.78	74	54	-26.05	-17.22	341	2.04
4484.76	-29.84	32.11	46.56	36.24	48.83	38.51	74	54	-25.17	-15.49	194	2.27
4999.11	-29.19	33.40	44.52	34.57	48.73	38.78	74	54	-25.27	-15.22	255	2.40

NOTE:

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Tx-1 (Fundamental and Harmonics)
Detector:	PK. And AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2402.00 (F)	-31.75	28.36	101.55	92.37	98.17	88.99	114	94	-15.83	-5.01	56	1.51
4804.00	-29.44	32.89	43.08	33.87	46.53	37.32	74	54	-27.47	-16.68	270	1.57
7206.00	-28.47	35.64	28.66	48.23	35.83	55.39	74	54	-38.17	1.39	128	1.63
9608.00	-27.82	37.79	28.20	52.51	38.17	62.48	74	54	-35.83	8.48	74	1.72
12010.00	-26.57	39.19	25.02	51.39	37.65	64.02	74	54	-36.35	10.02	291	1.59
14412.00	-24.37	41.91	20.02	52.88	37.56	70.42	74	54	-36.44	16.42	335	1.61

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2402.00 (F)	-31.75	28.36	97.51	87.23	94.13	83.85	114	94	-19.87	-10.15	246	1.60
4804.00	-29.44	32.89	42.56	32.75	46.01	36.20	74	54	-27.99	-17.80	94	1.55
7206.00	-28.47	35.64	29.21	49.96	36.38	57.12	74	54	-37.62	3.12	108	1.56
9608.00	-27.82	37.79	27.30	50.82	37.27	60.79	74	54	-36.73	6.79	155	1.38
12010.00	-26.57	39.19	25.42	51.32	38.05	63.95	74	54	-35.95	9.95	203	1.45
14412.00	-24.37	41.91	21.17	53.86	38.71	71.40	74	54	-35.29	17.40	86	1.49

NOTE:

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Tx-2
Detector Type:	PK. and AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
1624.51	-32.66	26.45	56.32	46.27	50.10	40.05	74	54	-23.90	-13.95	229	2.22
3159.05	-31.18	30.46	47.28	37.83	46.56	37.11	74	54	-27.44	-16.89	106	1.86
3574.06	-30.65	31.02	46.02	36.24	46.39	36.61	74	54	-27.61	-17.39	79	1.73
4004.90	-30.31	32.30	45.16	35.17	47.15	37.16	74	54	-26.85	-16.84	158	1.62
4654.61	-29.63	32.50	45.77	35.63	48.64	38.50	74	54	-25.36	-15.50	61	1.25
4999.11	-29.19	33.40	42.89	32.55	47.10	36.76	74	54	-26.90	-17.24	55	1.14

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
1624.51	-32.66	26.45	52.40	42.78	46.18	36.56	74	54	-27.82	-17.44	253	1.08
3049.96	-31.33	30.35	47.93	37.17	46.95	36.19	74	54	-27.05	-17.81	178	1.53
3599.27	-30.63	31.10	47.24	36.59	47.71	37.06	74	54	-26.29	-16.94	269	1.70
3969.73	-30.33	32.21	45.59	35.23	47.46	37.10	74	54	-26.54	-16.90	45	1.84
4614.27	-29.68	32.40	45.52	35.74	48.24	38.46	74	54	-25.76	-15.54	202	1.99
4999.11	-29.19	33.40	43.17	33.29	47.38	37.50	74	54	-26.62	-16.50	345	2.27

NOTE:

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Tx-2 (Fundamental and Harmonics)
Detector:	PK. And AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2441.00 (F)	-31.72	28.42	102.86	92.15	99.56	88.85	114	94	-14.44	-5.15	221	1.54
4882.00	-29.34	33.09	47.09	36.81	50.84	40.56	74	54	-23.16	-13.44	39	1.50
7323.00	-28.40	35.94	39.57	29.38	47.11	36.92	74	54	-26.89	-17.08	159	1.63
9764.00	-27.78	37.91	38.22	28.15	48.35	38.28	74	54	-25.65	-15.72	67	1.48
12205.00	-26.15	39.08	35.74	25.19	48.67	38.12	74	54	-25.33	-15.88	120	1.45
14646.00	-24.40	41.45	30.87	20.09	47.92	37.14	74	54	-26.08	-16.86	278	1.61

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2441.00 (F)	-31.72	28.42	96.29	86.11	92.99	82.81	114	94	-21.01	-11.19	253	1.60
4882.00	-29.34	33.09	42.02	32.47	45.77	36.22	74	54	-28.23	-17.78	198	1.57
7323.00	-28.40	35.94	38.89	28.27	46.43	35.81	74	54	-27.57	-18.19	92	1.52
9764.00	-27.78	37.91	39.62	28.55	49.75	38.68	74	54	-24.25	-15.32	313	1.67
12205.00	-26.15	39.08	35.17	25.30	48.10	38.23	74	54	-25.90	-15.77	295	1.39
14646.00	-24.40	41.45	29.57	19.63	46.62	36.68	74	54	-27.38	-17.32	133	1.48

NOTE:

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Tx-3
Detector Type:	PK. and AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
1654.96	-32.61	26.55	57.39	47.25	51.33	41.19	74	54	-22.67	-12.81	145	2.39
2934.52	-31.44	30.06	46.14	36.28	44.77	34.91	74	54	-29.23	-19.09	76	2.20
3459.41	-30.77	30.76	45.21	35.51	45.20	35.50	74	54	-28.80	-18.50	218	1.86
4004.65	-30.31	32.30	44.81	34.29	46.80	36.28	74	54	-27.20	-17.72	102	1.69
4449.45	-29.87	32.12	46.07	36.55	48.32	38.80	74	54	-25.68	-15.20	35	1.41
4999.11	-29.19	33.40	43.01	33.27	47.22	37.48	74	54	-26.78	-16.52	200	1.25

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
1654.67	-32.61	26.55	51.10	41.22	45.04	35.16	74	54	-28.96	-18.84	166	1.08
2004.74	-32.06	27.81	51.23	42.37	46.98	38.12	74	54	-27.02	-15.88	273	1.14
3179.41	-31.15	30.48	47.10	37.59	46.43	36.92	74	54	-27.57	-17.08	320	1.53
3919.43	-30.37	32.06	46.05	36.44	47.73	38.12	74	54	-26.27	-15.88	115	1.72
4614.52	-29.68	32.40	45.32	35.09	48.04	37.81	74	54	-25.96	-16.19	208	1.89
4999.11	-29.19	33.40	42.89	32.40	47.10	36.61	74	54	-26.90	-17.39	49	2.22

NOTE :

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Tx-3 (Fundamental and Harmonics)
Detector:	PK. And AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2480.00 (F)	-31.69	28.47	102.21	92.81	99.00	89.60	114	94	-15.00	-4.40	157	1.59
4960.00	-29.24	33.30	44.40	34.68	48.46	38.74	74	54	-25.54	-15.26	298	1.43
7440.00	-28.33	36.24	40.27	29.31	48.18	37.22	74	54	-25.82	-16.78	42	1.47
9920.00	-27.75	38.04	38.90	28.20	49.19	38.49	74	54	-24.81	-15.51	98	1.52
12400.00	-25.73	38.96	34.28	24.10	47.51	37.33	74	54	-26.49	-16.67	194	1.56
14880.00	-24.44	40.56	31.74	21.06	47.86	37.18	74	54	-26.14	-16.82	235	1.49

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2480.00 (F)	-31.69	28.47	96.61	86.87	93.40	83.66	114	94	-20.60	-10.34	330	1.39
4960.00	-29.24	33.30	41.66	31.49	45.72	35.55	74	54	-28.28	-18.45	256	1.35
7440.00	-28.33	36.24	39.27	29.12	47.18	37.03	74	54	-26.82	-16.97	40	1.56
9920.00	-27.75	38.04	38.09	28.10	48.38	38.39	74	54	-25.62	-15.61	110	1.52
12400.00	-25.73	38.96	34.81	24.30	48.04	37.53	74	54	-25.96	-16.47	260	1.72
14880.00	-24.44	40.56	30.65	20.87	46.77	36.99	74	54	-27.23	-17.01	78	1.63

NOTE:

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Standby
Detector Type:	PK. and AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2934.54	-31.44	30.06	45.16	35.23	43.79	33.86	74	54	-30.21	-20.14	233	2.33
3104.38	-31.26	30.40	46.53	36.47	45.68	35.62	74	54	-28.32	-18.38	186	2.21
3639.31	-30.60	31.22	46.25	35.82	46.87	36.44	74	54	-27.13	-17.56	215	1.83
3939.47	-30.36	32.12	45.02	34.37	46.78	36.13	74	54	-27.22	-17.87	71	1.57
4004.39	-30.31	32.30	45.96	35.25	47.95	37.24	74	54	-26.05	-16.76	169	1.41
4999.11	-29.19	33.40	44.76	34.61	48.97	38.82	74	54	-25.03	-15.18	76	1.13

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
3109.32	-31.25	30.41	47.56	37.28	46.72	36.44	74	54	-27.28	-17.56	148	1.08
3534.81	-30.68	30.90	45.91	35.43	46.13	35.65	74	54	-27.87	-18.35	53	1.19
3974.20	-30.33	32.22	45.24	35.69	47.13	37.58	74	54	-26.87	-16.42	329	1.35
4579.84	-29.72	32.31	45.47	34.27	48.05	36.85	74	54	-25.95	-17.15	112	1.67
4839.21	-29.39	32.98	45.62	35.59	49.21	39.18	74	54	-24.79	-14.82	207	1.89
4999.11	-29.19	33.40	42.81	32.62	47.02	36.83	74	54	-26.98	-17.17	280	2.32

NOTE :

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	20 ˚C	Humidity:	68 %RH
Frequency Range:	1 GHz – 25 GHz	Tested Mode:	Link
Detector Type:	PK. and AV.	IF Bandwidth:	1 MHz
VBW:	3 MHz	Tested Date:	Dec. 24, 2015
Tested By:	Leo Yang		

Antenna Polarization：Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
3089.46	-31.28	30.39	47.25	37.81	46.36	36.92	74	54	-27.64	-17.08	335	2.39
3284.59	-31.01	30.58	46.56	36.33	46.14	35.91	74	54	-27.86	-18.09	143	2.21
4069.83	-30.24	32.27	45.45	33.89	47.48	35.92	74	54	-26.52	-18.08	218	1.80
4564.73	-29.74	32.27	45.90	34.62	48.43	37.15	74	54	-25.57	-16.85	102	1.72
4924.11	-29.29	33.20	46.42	35.70	50.34	39.62	74	54	-23.66	-14.38	78	1.43
4999.11	-29.19	33.40	44.31	34.68	48.52	38.89	74	54	-25.48	-15.11	65	1.15

Antenna Polarization：Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m)		Limit (dBμV/m)		Margin (dB)		AZ (°)	EL (m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
3649.41	-30.59	31.25	45.82	35.71	46.48	36.37	74	54	-27.52	-17.63	144	1.09
3889.97	-30.40	31.97	46.19	36.43	47.76	38.00	74	54	-26.24	-16.00	277	1.22
4109.18	-30.20	32.26	44.98	34.28	47.03	36.33	74	54	-26.97	-17.67	62	1.43
4429.71	-29.89	32.13	45.34	35.39	47.58	37.63	74	54	-26.42	-16.37	134	1.69
4719.18	-29.54	32.67	45.50	34.23	48.63	37.36	74	54	-25.37	-16.64	202	1.99
4999.11	-29.19	33.40	43.76	33.71	47.97	37.92	74	54	-26.03	-16.08	298	2.35

NOTE :

1. Measurement uncertainty is 3.81dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

5. Antenna application

5.1 Antenna requirement

The EUT's antenna is met the requirement of FCC part15C section15.203 and 15.204.

5.2 Result

The EUT's antenna used a Chip. Gain of antenna types is 2 dBi that meet the requirement.

5.3 Description of RF Exposure

SAR compliance has been evaluated in the product(s), and con be used in host product(s) with substantially similar physical dimensions, construction, and electrical and RF characteristics. End-users must be provided with specific information required to satisfy RF exposure compliance for all final host devices. Compliance of this device in all final host configurations is the responsibility of the Grantee.

- The separation distance -20 cm must be clearly stated in the operating and/or installation manual that is supplied to the User.
- This application is being made on behalf of the "Grantee".

$S = (30*P*G) / (377d^2)$

Where:
S: Power Density (mW/cm^2);
P: Transmitter power (mW);
G: Numeric Ant Gain;
d: Distance (20 cm);

Transmitter power = 0.021W
Ant gain = 2 dBi ;so Ant numeric gain= $10^{(2 / 10)}$ = 1.59

$S = (30*21*1.59) / (377*20^2) = 0.0066$ mW/cm^2
The power density should be < 1.0 mW/cm^2 to meet the exemption.

6. TERMS OF ABBREVIATION

AV.	Average detection
AZ(°)	Turn table azimuth
Correct.	Correction
EL(m)	Antenna height (meter)
EUT	Equipment Under Test
Horiz.	Horizontal direction
LISN	Line Impedance Stabilization Network
NSA	Normalized Site Attenuation
Q.P.	Quasi-peak detection
SRT Lab	Spectrum Research & Testing Laboratory, Inc.
Vert.	Vertical direction