FCC Part 15.247

TEST REPORT

For

SilverPlus, Inc.

3F., No.46, Zhouzi St., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Model: MPS01
FCC ID: X4L-MPS01

Report Type:	**Product Type:**
Original Report	Bluetooth Smart Watch

Test Engineer:	David Hsu
Report Number:	RTWA160722002-00A
Report Date:	2016-10-13
Reviewed By:	Jerry Chang

Bay Area Compliance Laboratories Corp.(Taiwan)
70, Lane 169, Sec. 2, Datong Road,
Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.
Tel: +886 (2) 2647 6898
Fax: +886 (2) 2647 6895
www.bacl.com.tw

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Taiwan)

REVISION HISTORY

Revision	Issue Date	Description
1.0	2016.10.13	Original

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1 General Information

1.1 Product Description for Equipment Under Test (EUT)

Applicant:	SilverPlus, Inc. 3F., No.46, Zhouzi St., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)
Manufacturer:	Primax Electronics Ltd. 4F, 669, Ruey Kuang Road, Neihu 11492 Taipei, Taiwan, R.O.C.
Product:	Bluetooth Smart Watch
Model:	MPS01
Trade Name:	Martian
Frequency Range:	2402-2480 MHz
Transmit Power:	BT BLE Mode: -0.30 dBm
Modulation Technique:	BT BLE Mode: GFSK
Transmit Data Rate:	BT BLE Mode: 1 Mbps
Number of Channels:	BT BLE Mode: 40 Channels
Antenna Specification:	Monopole Antenna/Gain: -11 dBi
Voltage Range:	DC 3.7 V from Battery
Date of Test:	Jul 22, 2016~Oct 13 , 2016

**All measurement and test data in this report was gathered from production sample serial number: 160722002 (Assigned by BACL, Taiwan) The EUT supplied by the applicant was received on 2016-07-22.*

1.2 Objective

This report is prepared on beha*lf of SilverPlus, Inc. in acc*ordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, AC Line Conducted Emissions, Conducted and Radiated Spurious Emissions.

1.3 Related Submittal(s)/Grant(s)

N/A

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on the 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

Test site at Bay Area Compliance Laboratories Corp. (Taiwan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 431084. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

For BT BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	--	--
2	2404	36	2472
3	2406	37	2474
4	2408	38	2476
--	--	39	2478
20	2440	40	2480

2.2 Equipment Modifications

No modification was made to the EUT

2.3 EUT Exercise Software

N/A

2.4 Support Equipment List and Details

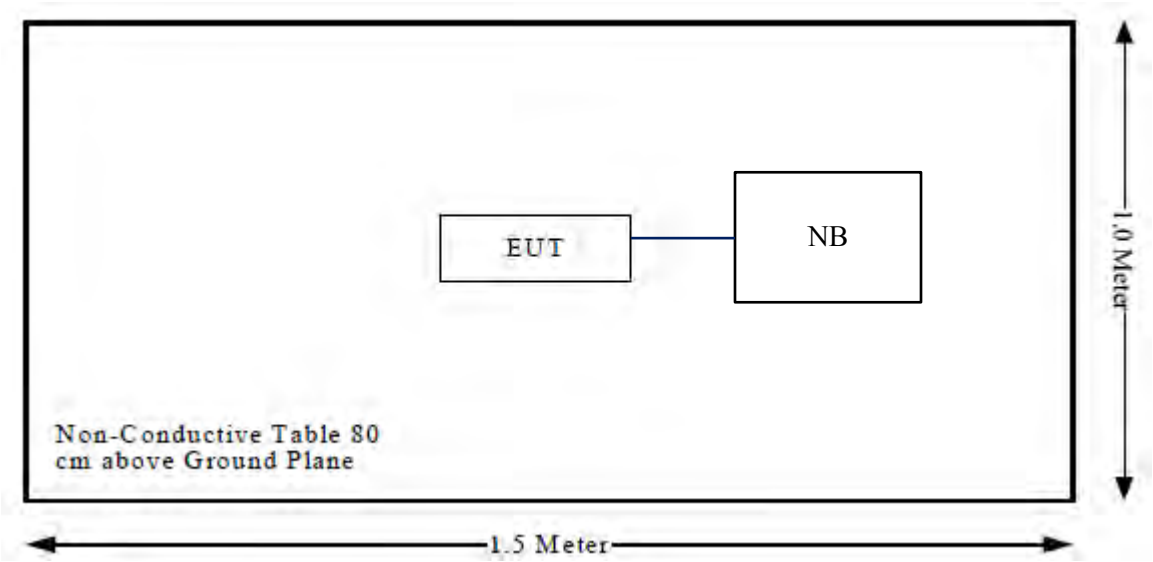
No.	Description	Manufacturer	Model N0.	Data Cable				Power Cable	
				Name	Length	Shielded	With Core	Length	Shielded
1	NB	DELL	E6410	USB	1 m	No	N/A	1.2 m	No

2.5 External Cable List and Details

Cable Description	Length (m)	From	To
USB Cable	1.0	EUT	NB

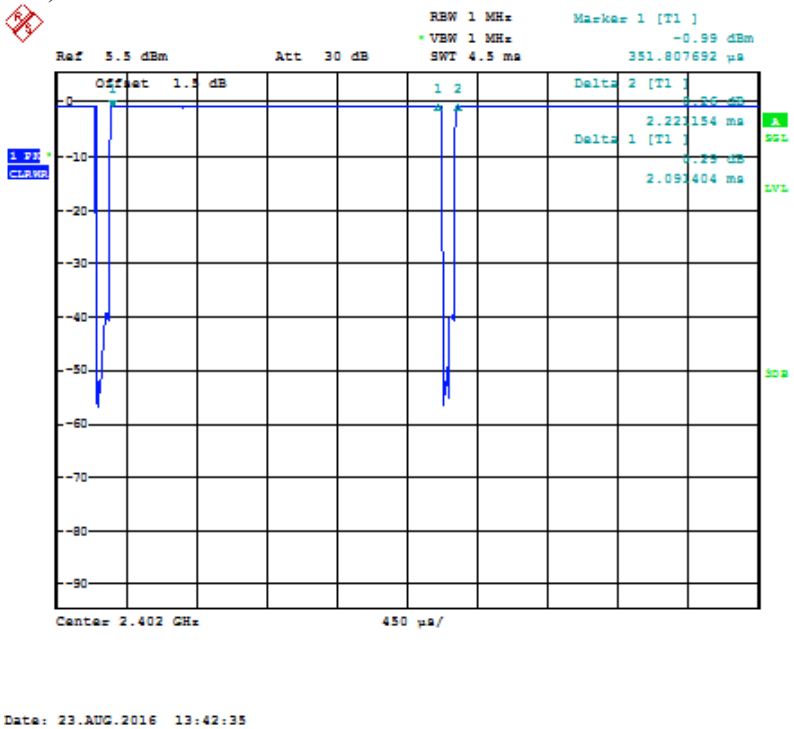
2.6 Block Diagram of Test Setup

See test photographs attached in Exhibit A for the actual connections between EUT and support equipment.



2.7 Duty cycle

BLE Duty cycle:94%
Tx(on)/(Tx on+Tx off): 2.09ms/2.22ms=0.94



3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

4 FCC §15.247(i) , §2.1093 - RF Exposure

4.1 Applicable Standard

According to FCC §15.247(i)

Systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances
≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·
[√ f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

4.2 RF Exposure Evaluation Result

FCC
Worse case:

Frequency (MHz)	Tunp –up Power		Evaluation Distance (mm)	SAR Exclusion Result	Extremity SAR Exclusion Limit (10g SAR)
	(dBm)	(mW)			
2402-2480	-0.30	0.933	5	0.297	7.5

Result: SAR test is exempted.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6 dBi.

5.2 Antenna List and Details

Manufacturer	Model	Type	Antenna Gain	Result
WHA YU Industrial Co., Ltd.	C1895-510002-A	Monopole Antenna	-11 dBi	Compliance

The EUT has one integral antenna arrangement, which was permanently attached; fulfill the requirement of this section. Please refer to the internal photos.

6 FCC §15.207 & - AC Line Conducted Emissions

6.1 Applicable Standard

According to FCC §15.207 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.
Note 2: A linear average detector is required

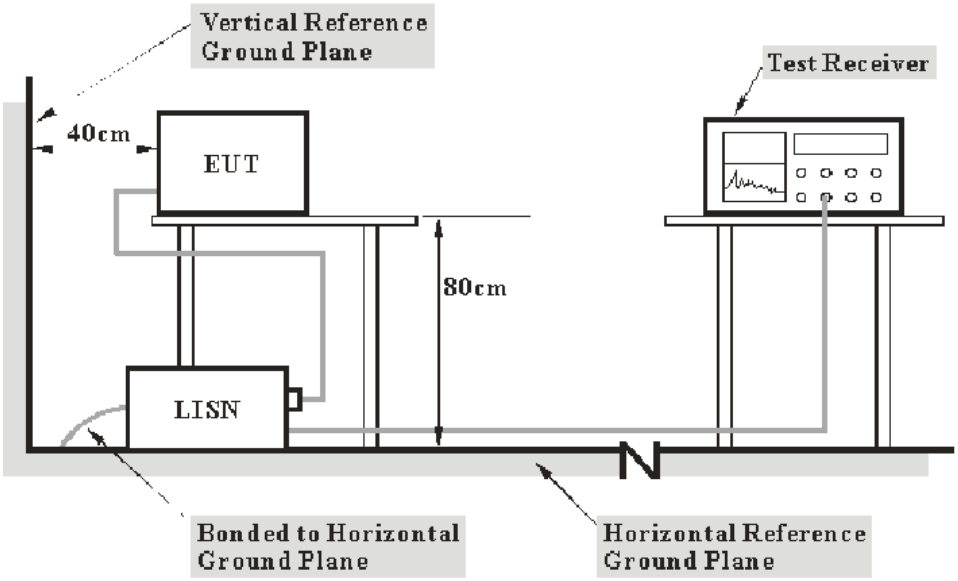
6.2 Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN/ISN and receiver, LISN/ISN voltage division factor, LISN/ISN VDF frequency interpolation and receiver related input quantities, etc.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Taiwan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report

Port	Expanded Measurement uncertainty
AC Mains	2.71 dB (k=2, 95% level of confidence)
CAT 3	3.81 dB (k=2, 95% level of confidence)
CAT 5	4.24 dB (k=2, 95% level of confidence)
CAT 6	4.71 dB (k=2, 95% level of confidence)

6.3 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

6.4 EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	IF B/W
150 kHz - 30 MHz	9 kHz

6.5 Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

6.6 Corrected Factor & Margin Calculation

The factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

The "Over Limit" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an over limit of -7 dB means the emission is 7 dB below the limit. The equation for Over Limit calculation is as follows:

Over Limit = Level – Limit Line

6.7 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
LISN	Rohde & Schwarz	ENV216	101248	2016/7/27	2017/7/26
LISN	EMCO	3816/2	75848	2016/8/4	2017/8/3
EMI Test Receiver	Rohde & Schwarz	ESCI	100540	2016/7/22	2017/7/21
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM025	2016/8/19	2017/8/18
RF Cable	EMEC	EM-CB5D	001	2016/7/27	2017/7/26
Software	AUDIX	E3	V9.150826k	NCR	N.C.R

***Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Taiwan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

6.8 Test Environmental Conditions

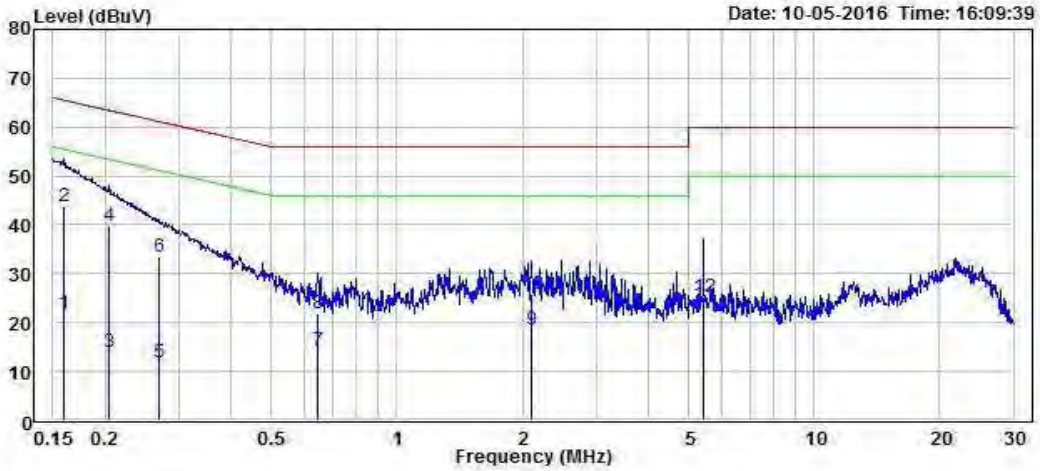
Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by David Hsu on 2016-10-05.

6.9 Test Results

Please refer to the following plots and tables.

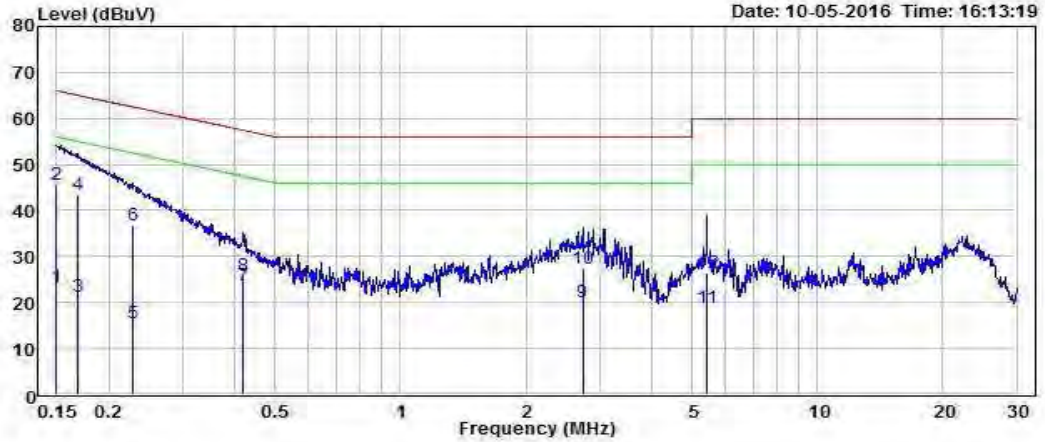
AC 120V/60 Hz, Line



Condition: Line
EUT :
Mode :
Note : 120V/60Hz

	Freq	Level	Limit Line	Over Limit	Factor	Read Level	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB	dB	dBuV		
1	0.160	21.99	55.47	-33.48	19.56	2.43	Average	Line
2	0.160	43.82	65.47	-21.65	19.56	24.26	QP	Line
3	0.205	14.01	53.41	-39.40	19.58	-5.57	Average	Line
4	0.205	39.79	63.41	-23.62	19.58	20.21	QP	Line
5	0.269	11.73	51.16	-39.43	19.56	-7.83	Average	Line
6	0.269	33.54	61.16	-27.62	19.56	13.98	QP	Line
7	0.647	14.38	46.00	-31.62	19.56	-5.18	Average	Line
8	0.647	22.04	56.00	-33.96	19.56	2.48	QP	Line
9	2.100	18.57	46.00	-27.43	19.66	-1.09	Average	Line
10	2.100	25.73	56.00	-30.27	19.66	6.07	QP	Line
11	5.432	23.71	50.00	-26.29	19.68	4.03	Average	Line
12	5.432	25.32	60.00	-34.68	19.68	5.64	QP	Line

AC 120V/60 Hz, Neutral



Condition: Neutral
EUT :
Mode :
Note : 120V/60Hz

	Freq	Level	Limit Line	Over Limit	Factor	Read Level	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB	dB	dBuV		
1	0.150	23.45	56.00	-32.55	19.56	3.89	Average	Neutral
2	0.150	45.67	66.00	-20.33	19.56	26.11	QP	Neutral
3	0.168	21.29	55.04	-33.75	19.54	1.75	Average	Neutral
4	0.168	43.53	65.04	-21.51	19.54	23.99	QP	Neutral
5	0.227	15.65	52.55	-36.90	19.52	-3.87	Average	Neutral
6	0.227	36.83	62.55	-25.72	19.52	17.31	QP	Neutral
7	0.420	23.76	47.44	-23.68	19.54	4.22	Average	Neutral
8	0.420	25.98	57.44	-31.46	19.54	6.44	QP	Neutral
9	2.733	20.14	46.00	-25.86	19.66	0.48	Average	Neutral
10	2.733	27.46	56.00	-28.54	19.66	7.80	QP	Neutral
11	5.432	18.96	50.00	-31.04	19.73	-0.77	Average	Neutral
12	5.432	26.55	60.00	-33.45	19.73	6.82	QP	Neutral

7 FCC §15.209, §15.205 , §15.247(d) – Spurious Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

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

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.2 Measurement Uncertainty

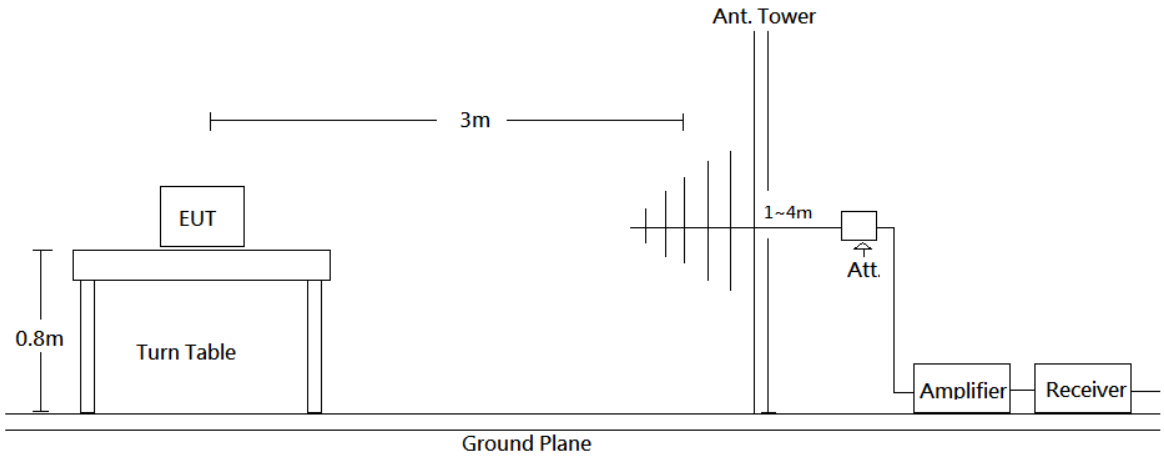
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

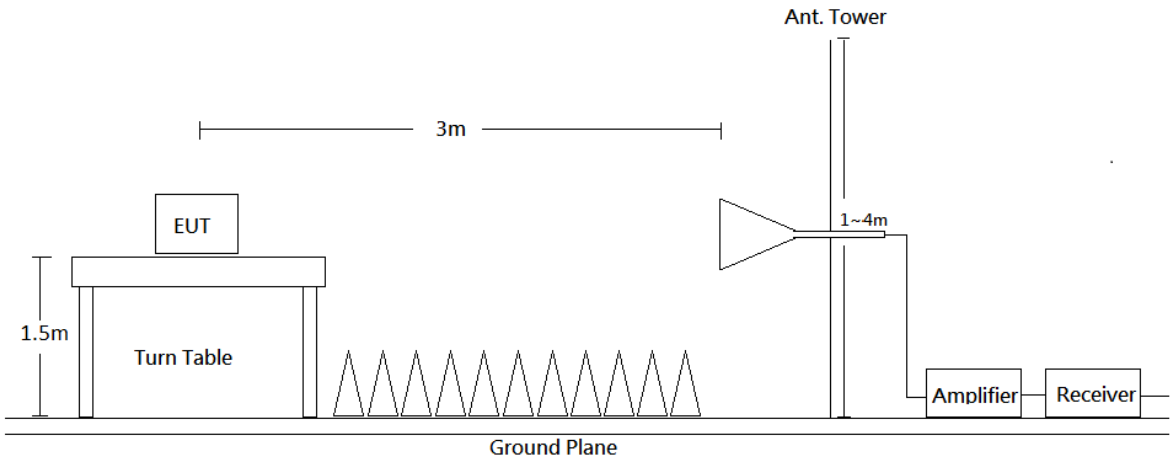
Frequency	Measurement uncertainty
30 MHz~200 MHz	4.21 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.41 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.51 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	4.88 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.30 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.30 dB (k=2, 95% level of confidence)

7.3 EUT Setup

Blow 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

7.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Set RBW = 1 MHz, VBW= 3MHz for f > 1 GHz for peak measurement. For average measurement: VBW = 10 Hz, when duty cycle is no less than 98 percent. VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Frequency Range	RBW	VBW	IF BW	Detector
30-1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave

7.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

7.6 Corrected Factor & Margin Calculation

The Correct Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain + Attenuator

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:
Margin = Result –Limit

7.7 Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.209 Limit. Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

Lm + U(Lm) ≤ Llim + Ucispr

In BACL, U(Lm) is less than Ucispr, if Lm is less than Llim, it implies that the EUT complies with the limit.

7.8 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Broadband Antenna	Sunol Sciences	JB6	A050115	2015/12/8	2016/12/7
Amplifier	Sonoma	310N	130602	2016/7/15	2017/7/14
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2015/11/4	2016/11/3
Mircoflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2015/11/4	2016/11/3
Mircoflex Cable	UTIFLEX	UFB197C-1-2362-70U-70U	225757-001	2016/7/15	2017/7/14
Mircoflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2015/12/2	2016/12/1
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	060772	N.C.R	N.C.R
Software	Farad	EZ_EMC	BACL-03A1	N.C.R	N.C.R
Horn Antenna	EMCO	3115	9311-4158	2016/5/10	2017/5/9
Horn Antenna	ETS-Lindgren	3116	00062638	2016/9/5	2017/9/4
Preamplifier	EMEC	EM01G18G	060657	2015/12/21	2016/12/20
Preamplifier	EMEC	EM18G40G	060656	2015/12/21	2016/12/20
Spectrum Analyzer	Rohde & Schwarz	FSEK30	825084/006	2015/12/24	2016/12/23
Mircoflex Cable	ROSNAL	K1K50-UP0264-K1K50-80CM	160309-2	2016/3/24	2017/3/23
Mircoflex Cable	ROSNAL	K1K50-UP0264-K1K50-450CM	160309-1	2016/3/24	2017/3/23

***Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Taiwan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

7.9 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by David Hsu on 2016-08-23.

7.10 Test Results

Mode: Test Mode

Below 1 GHz, 2402 MHz

Horizontal

NO.	Frequency (MHz)	Reading (dBμV)	Cord. Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	239.52	46.72	-12.37	34.35	46.00	-11.65	100	296	QP
2	262.80	46.98	-11.25	35.73	46.00	-10.27	100	71	QP
3	311.30	49.97	-9.79	40.18	46.00	-5.82	100	63	QP
4	336.52	51.13	-9.27	41.86	46.00	-4.14	100	57	QP
5	359.80	49.24	-8.78	40.46	46.00	-5.54	100	61	QP
6	383.08	46.40	-8.31	38.09	46.00	-7.91	100	46	QP

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Vertical

NO.	Frequency (MHz)	Reading (dBμV)	Cord. Factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	30.00	39.13	-3.62	35.51	40.00	-4.49	100	64	QP
2	138.64	37.56	-11.00	26.56	43.50	-16.94	100	345	QP
3	262.80	38.98	-11.25	27.73	46.00	-18.27	100	61	QP
4	311.30	40.47	-9.79	30.68	46.00	-15.32	100	36	QP
5	336.52	38.29	-9.27	29.02	46.00	-16.98	100	348	QP
6	497.54	36.78	-5.98	30.80	46.00	-15.20	100	67	QP

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

2440MHz

Horizontal

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	239.52	47.03	-12.37	34.66	46.00	-11.34	100	296	QP
2	262.80	46.68	-11.25	35.43	46.00	-10.57	100	70	QP
3	311.30	49.96	-9.79	40.17	46.00	-5.83	100	55	QP
4	336.52	51.04	-9.27	41.77	46.00	-4.23	100	64	QP
5	359.80	48.76	-8.78	39.98	46.00	-6.02	100	48	QP
6	383.08	46.70	-8.31	38.39	46.00	-7.61	100	56	QP

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Vertical

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	30.00	39.50	-3.62	35.88	40.00	-4.12	100	75	QP
2	311.30	39.50	-9.79	29.71	46.00	-16.29	100	32	QP
3	336.52	39.01	-9.27	29.74	46.00	-16.26	100	355	QP
4	383.08	37.49	-8.31	29.18	46.00	-16.82	100	16	QP
5	623.64	34.27	-4.03	30.24	46.00	-15.76	100	61	QP
6	831.22	31.50	-0.43	31.07	46.00	-14.93	100	221	QP

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

2480 MHz

Horizontal

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	239.52	47.38	-12.37	35.01	46.00	-10.99	100	298	QP
2	262.80	47.00	-11.25	35.75	46.00	-10.25	100	63	QP
3	311.30	50.45	-9.79	40.66	46.00	-5.34	100	308	QP
4	336.52	49.74	-9.27	40.47	46.00	-5.53	100	53	QP
5	359.80	49.35	-8.78	40.57	46.00	-5.43	100	60	QP
6	480.08	40.45	-6.26	34.19	46.00	-11.81	100	301	QP

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Vertical

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	30.00	39.46	-3.62	35.84	40.00	-4.16	100	106	QP
2	136.70	37.12	-10.93	26.19	43.50	-17.31	100	299	QP
3	311.30	40.17	-9.79	30.38	46.00	-15.62	100	30	QP
4	336.52	39.88	-9.27	30.61	46.00	-15.39	100	352	QP
5	580.96	35.69	-4.70	30.99	46.00	-15.01	100	97	QP
6	617.82	35.18	-4.10	31.08	46.00	-14.92	100	72	QP

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Above 1 GHz, 2402 MHz

Horizontal

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2388.75	53.90	-5.27	48.63	74.00	-25.37	100	155	peak
2	2388.75	44.88	-5.27	39.61	54.00	-14.39	100	155	AVG
3	2402.00	95.64	-5.25	90.39	N/A	N/A	100	155	peak
4	2402.00	75.80	-5.25	70.55	N/A	N/A	100	155	AVG
5	4800.00	46.31	0.62	46.93	74.00	-27.07	150	156	PK
6	4800.00	43.11	0.62	43.73	54.00	-10.27	150	156	Ave
7	7270.00	38.72	6.65	45.37	74.00	-28.63	150	77	PK
8	7270.00	32.62	6.65	39.27	54.00	-14.73	150	77	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Vertical

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2389.13	50.28	-5.27	45.01	74.00	-28.99	100	1	peak
2	2389.13	44.82	-5.27	39.55	54.00	-14.45	100	1	AVG
3	2402.00	88.92	-5.25	83.67	N/A	N/A	100	360	peak
4	2402.00	70.26	-5.25	65.01	N/A	N/A	100	360	AVG
5	4989.00	42.51	1.33	43.84	74.00	-30.16	150	78	PK
6	4989.00	34.67	1.33	36.00	54.00	-18.00	150	78	Ave
7	7250.00	38.77	6.57	45.34	74.00	-28.66	150	143	PK
8	7250.00	35.94	6.57	42.51	54.00	-11.49	150	143	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

2440 MHz

Horizontal

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2439.90	93.98	-5.16	88.82	N/A	N/A	100	153	peak
2	2439.90	73.95	-5.16	68.79	N/A	N/A	100	153	AVG
3	4880.00	45.33	0.93	46.26	74.00	-27.74	150	184	PK
4	4880.00	44.62	0.93	45.55	54.00	-8.45	150	184	Ave
5	7294.00	38.42	6.74	45.16	74.00	-28.84	150	153	PK
6	7294.00	32.74	6.74	39.48	54.00	-14.52	150	153	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Vertical

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2440.20	88.05	-5.16	82.89	N/A	N/A	100	134	peak
2	2440.20	68.98	-5.16	63.82	N/A	N/A	100	134	AVG
3	4880.00	40.71	0.93	41.64	74.00	-32.36	150	180	PK
4	4880.00	39.18	0.93	40.11	54.00	-13.89	150	180	Ave
5	7259.00	38.97	6.61	45.58	74.00	-28.42	150	61	PK
5	7259.00	33.30	6.61	39.91	54.00	-14.09	150	61	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

2480 MHz

Horizontal

NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2479.84	92.49	-5.06	87.43	N/A	N/A	100	69	peak
2	2479.84	87.53	-5.06	82.47	N/A	N/A	100	69	AVG
3	2483.50	55.74	-5.05	50.69	74.00	-23.31	100	69	peak
4	2483.50	49.41	-5.05	44.36	54.00	-9.64	100	69	AVG
5	4960.00	43.03	1.23	44.26	74.00	-29.74	150	177	PK
6	4960.00	42.50	1.23	43.73	54.00	-10.27	150	177	Ave
7	7244.00	38.62	6.55	45.17	74.00	-28.83	150	81	PK
8	7244.00	31.88	6.55	38.43	54.00	-15.57	150	81	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

Vertical

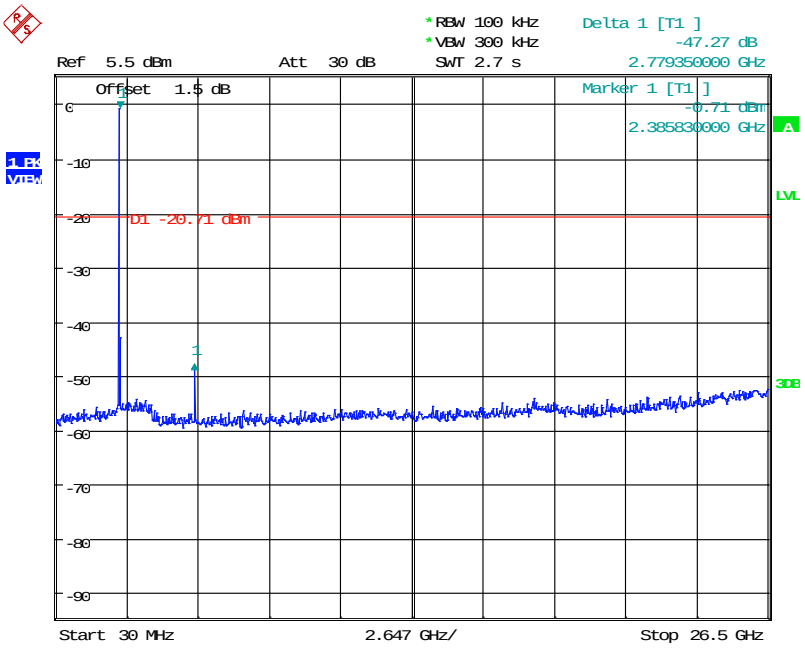
NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2480.230	87.72	-5.06	82.66	N/A	N/A	100	118	peak
2	2480.230	83.06	-5.06	78.00	N/A	N/A	100	118	AVG
3	2483.500	56.50	-5.05	51.45	74.00	-22.55	100	344	peak
4	2483.500	49.19	-5.05	44.14	54.00	-9.86	100	344	AVG
5	4846.00	40.28	0.79	41.07	74.00	-32.93	150	357	PK
6	4846.00	36.31	0.79	37.10	54.00	-16.90	150	357	Ave
7	7236.00	38.61	6.53	45.14	74.00	-28.86	150	301	PK
8	7236.00	30.44	6.53	36.97	54.00	-17.03	150	301	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator

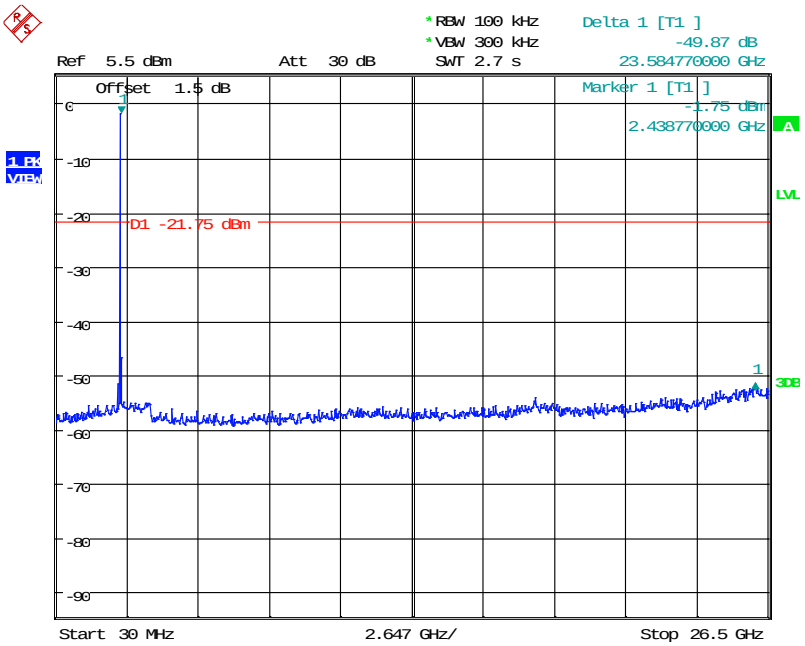
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	47.27	≥ 20	Compliance
Middle	2440	49.87	≥ 20	Compliance
High	2480	42.82	≥ 20	Compliance

Low Channel



Middle Channel



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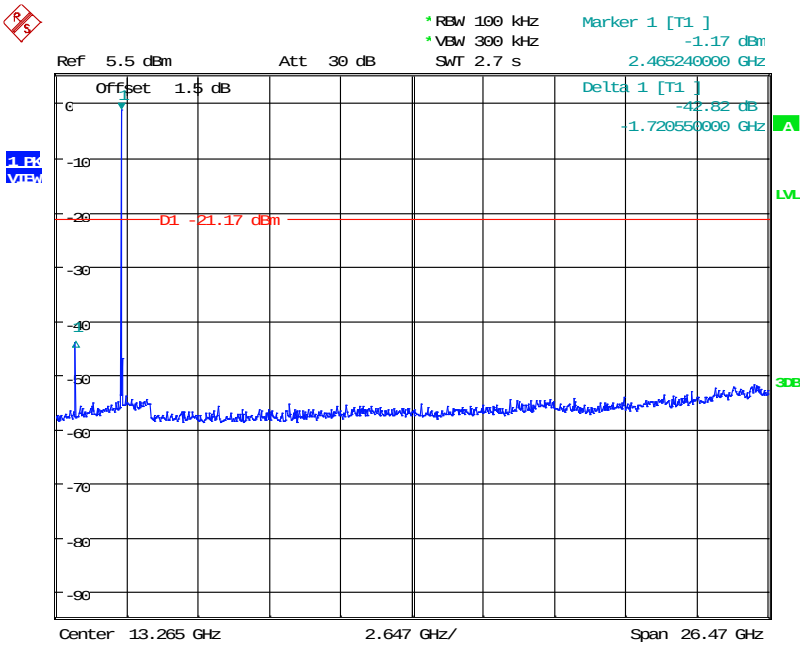
High Channel



Date: 23.AUG.2016 11:14:34

8 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a) (2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

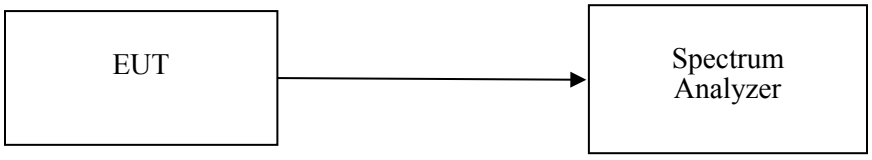
8.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.

4. Repeat above procedures until all frequencies measured were complete.



8.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	R & S	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192 S	2015/12/18	2016/12/17

***Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Taiwan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

8.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

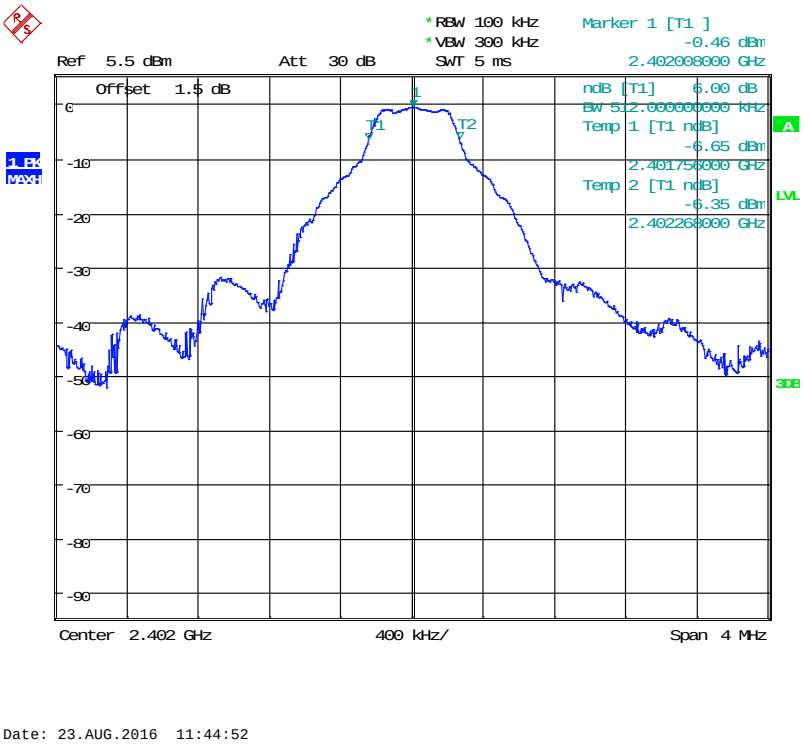
The testing was performed by David Hsu on 2016-08-23.

8.5 Test Results

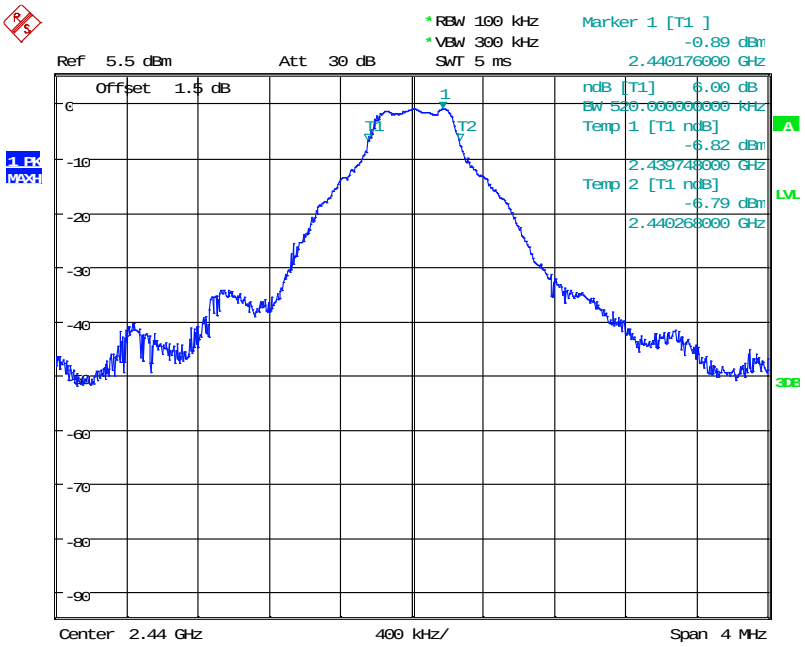
Channel	Frequency (MHz)	6 dB OBW (MHz)	Limit (MHz)	Result
Low	2402	0.51	> 0.5	Compliance
Middle	2440	0.52	> 0.5	Compliance
High	2480	0.51	> 0.5	Compliance

Please refer to the following plots

Low Channel

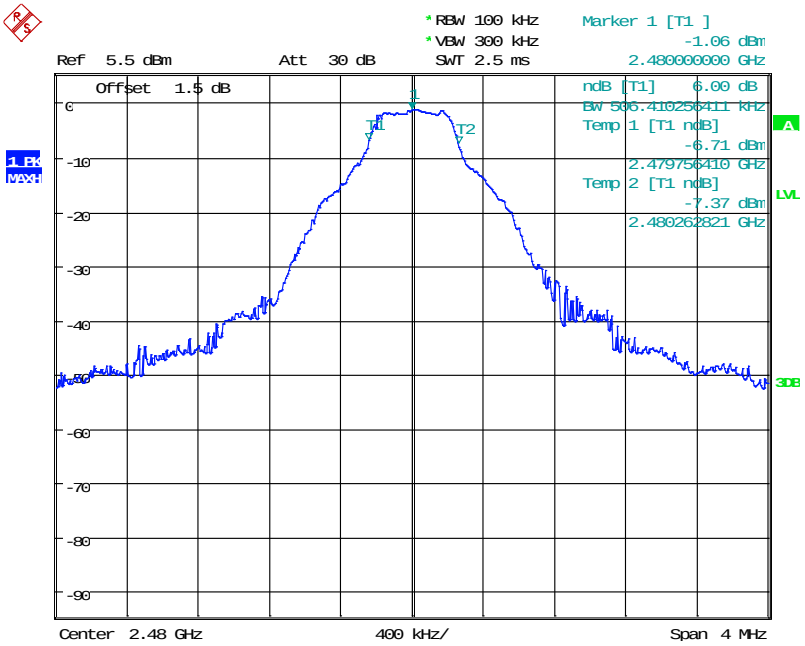


Middle Channel



Date: 23.AUG.2016 12:06:12

High Channel



Date: 23.AUG.2016 10:47:03

9 FCC §15.247(b)(3)– Maximum Output Power

9.1 Applicable Standard

According to FCC §15.247(b) (3).

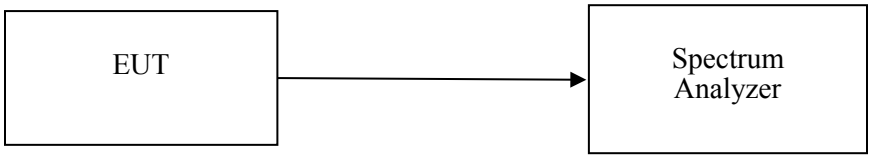
Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

9.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI Test Receiver.

3. Add a correction factor to the display.



9.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Cable	WOKEN	SFL402	00100A1F6A192S	2015/12/18	2016/12/17
Spectrum Analyzer	R & S	FSU26	200268	2016/5/7	2017/5/6

***Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Taiwan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

9.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by David Hsu on 2016-08-23.

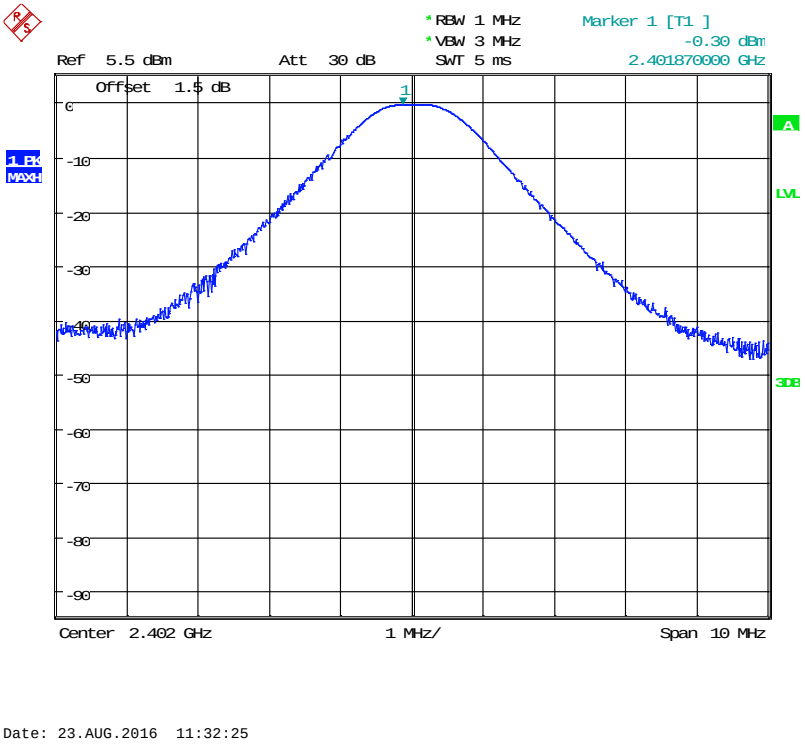
9.5 Test Results

Conducted Output power

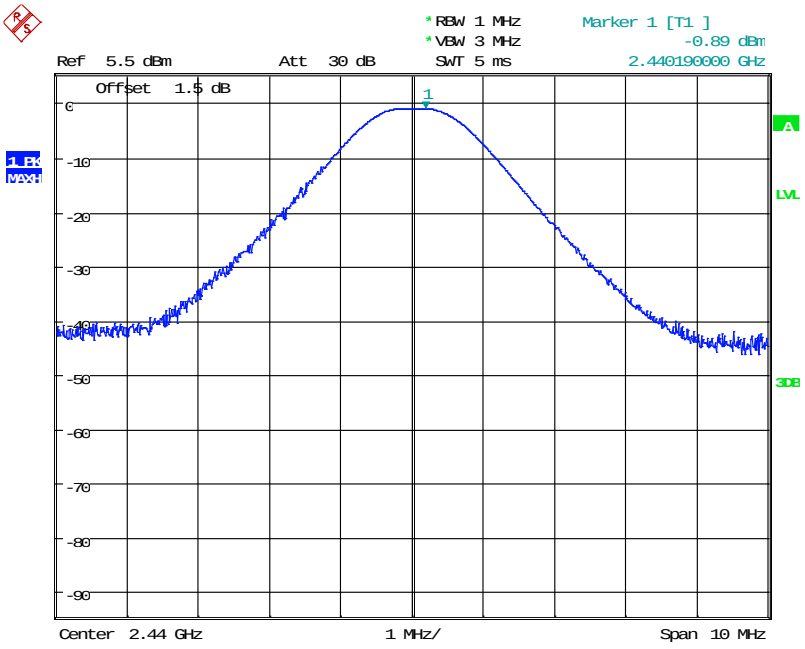
Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
Low	2402	-0.30	30	Compliance
Middle	2440	-0.89	30	Compliance
High	2480	-0.96	30	Compliance

Please refer to the following plots

Low Channel

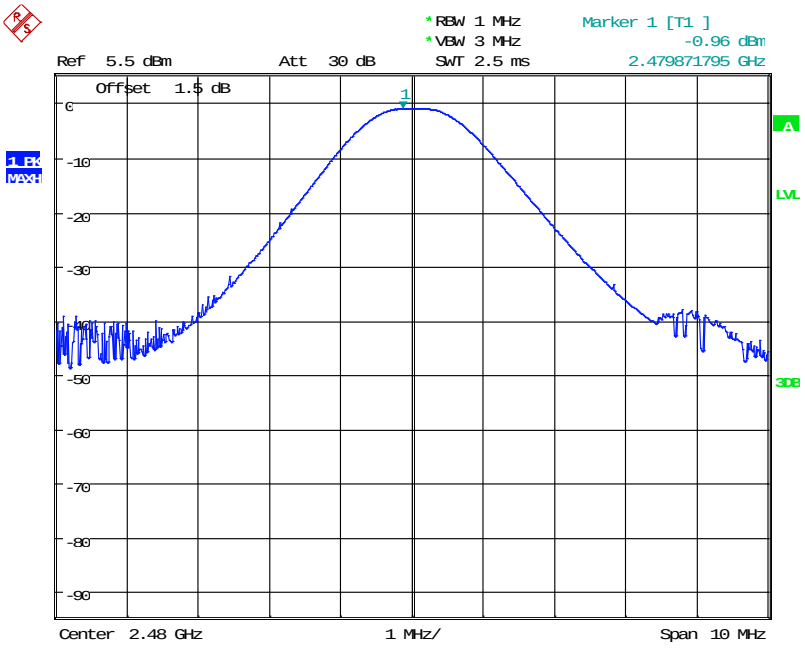


Middle Channel



Date: 23.AUG.2016 13:13:26

High Channel



Date: 23.AUG.2016 10:40:48

10 FCC §15.247(d)– 100 kHz Bandwidth of Frequency Band Edge

10.1 Applicable Standard

According to FCC §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

10.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

10.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	R & S	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192 S	2015/12/18	2016/12/17

***Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Taiwan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

10.4 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

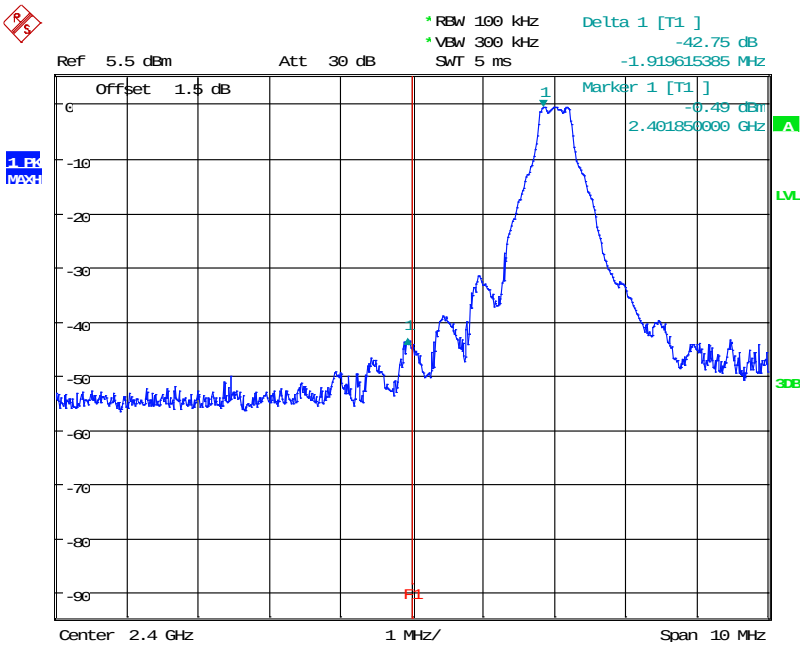
The testing was performed by David Hsu on 2016-08-23

10.5 Test Results

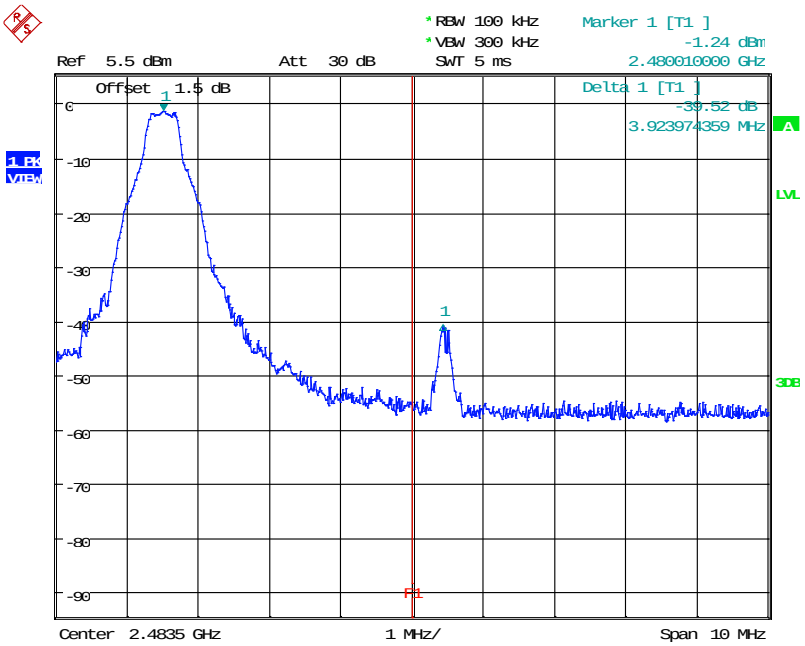
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Delta Peak to Band Emission (dBc)	RESULT
Low	2402	42.75	≥ 20	PASS
High	2480	39.52	≥ 20	PASS

Please refer to the following plots

Band Edge, Left Side



Band Edge, Right Side



Date: 23.AUG.2016 11:23:40

11 FCC §15.247(e) – Power Spectral Density

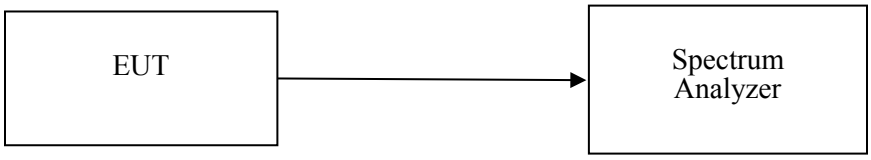
11.1 Applicable Standard

According to FCC §15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

11.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	R & S	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192 S	2015/12/18	2016/12/17

***Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Taiwan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

11.3 Test Environmental Conditions

Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

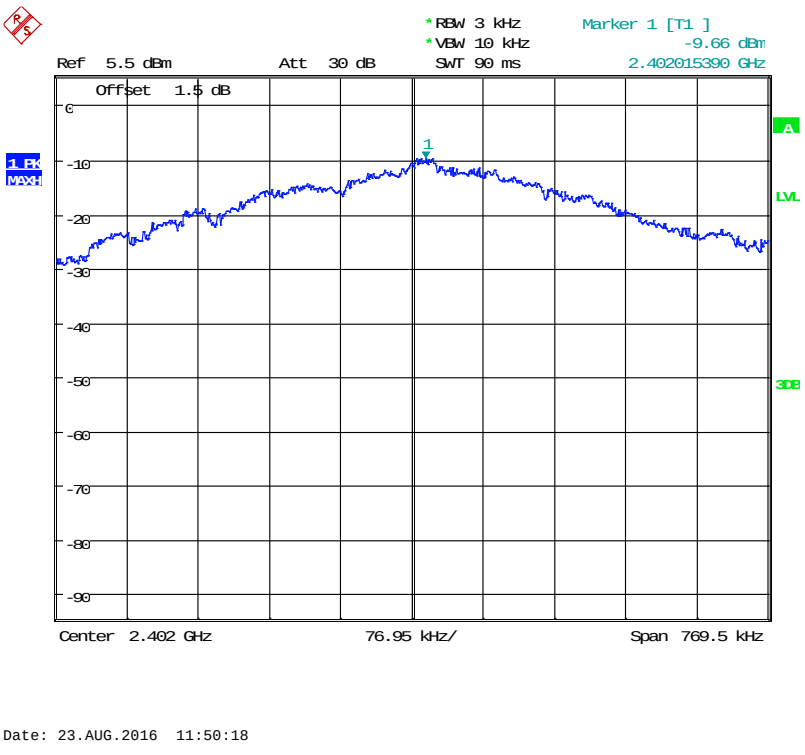
The testing was performed by David Hsu on 2016-08-23.

11.4 Test Results

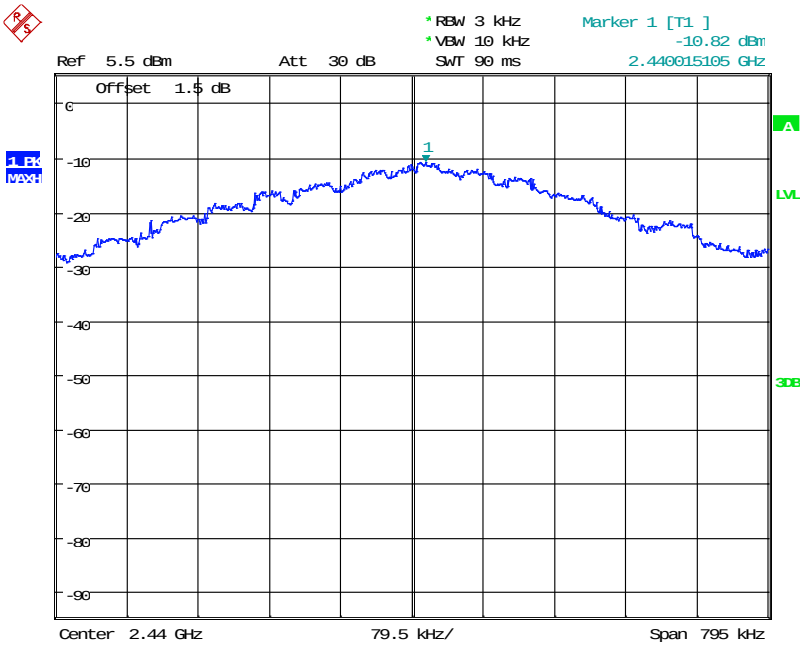
Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
Low	2402	-9.66	8	Compliance
Middle	2440	-10.82	8	Compliance
High	2480	-11.78	8	Compliance

Please refer to the following plots

Low Channel

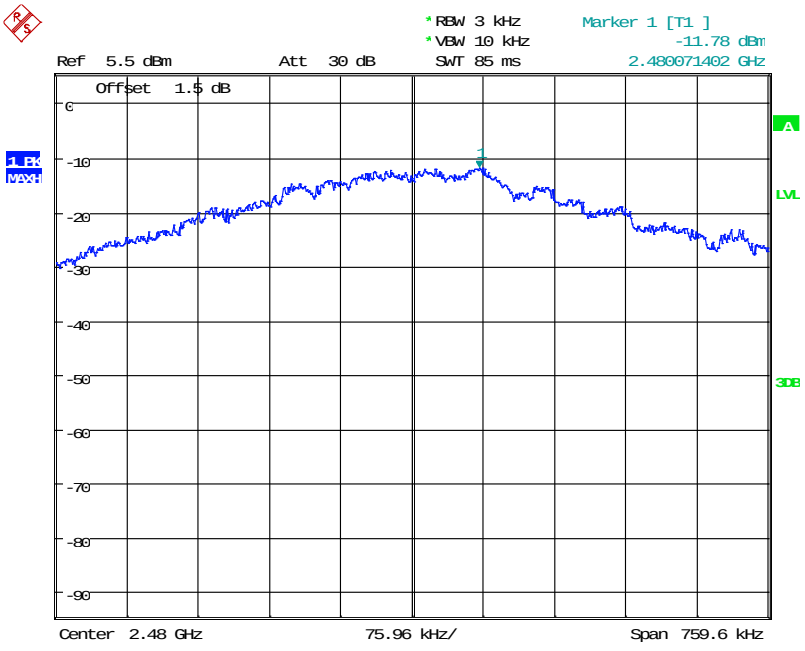


Middle Channel



Date: 23.AUG.2016 13:06:40

High Channel



Date: 23.AUG.2016 11:06:21

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