FCC Part 15.247

TEST REPORT

For

Hontus, Ltd.

11450 NW 122ND Street, Building 100 Miami, Florida, USA 33178

Model:
PT001-20IN-SBLK, PT001-20IN-PCFT,
PT001-20IN-PBLK, PT001-20IN-PSLV
FCC ID: 2AKE6SPACECASE-1000

Report Type:	**Product Type:**
Original Report	Space Case 1

Report Producer:	Kaylee Chiang
Report Number:	RTWA161014001-00B
Report Date:	2016-11-04
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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	2016.11.04	Original

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1 General Information

1.1 Product Description for Equipment Under Test (EUT)

Applicant:	Hontus, Ltd. 11450 NW 122ND Street, Building 100 Miami, Florida, USA 33178
Manufacturer:	Might Electronic Co., Ltd. No 40, 2nd Neighborhood, Yuanshan Vlg., Xinfeng Township, Hsinchu County 30441, Taiwan, R.O.C
Product:	Space Case 1
Model:	PT001-20IN-SBLK, PT001-20IN-PCFT, PT001-20IN-PBLK, PT001-20IN-PSLV
Trade Name:	PLANET TRAVELER
Frequency Range:	2402-2480 MHz
Transmit Power:	BT BLE Mode: -0.63 dBm (0.00086W)
Modulation Technique:	BT BLE Mode: GFSK
Transmit Data Rate:	BT BLE Mode: 1 Mbps
Number of Channels:	BT BLE Mode: 40 Channels
Antenna Specification:	Chip Antenna/Gain: 3.45 dBi
Voltage Range:	5Vdc from USB
Date of Test:	Oct 24, 2016~Nov 03, 2016

**All measurement and test data in this report was gathered from production sample serial number: 161014001 (Assigned by BACL, Taiwan) The EUT supplied by the applicant was received on 2016-10-14*

Model Difference: The major electrical and mechanical constructions of series models are identical to the basic model, except different appearance color. The model, PT001-20IN-SBLK is the testing sample, and the final test data are shown on this test report.

1.2 Objective

This report is prepared on behalf of *Hontus, Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commission's rules.

The tests were performed in order to determine the Bluetooth BLE mode of EUT compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15.247 DSS submission with FCC ID: 2AKE6SPACECASE-1000

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	21	2442
2	2404	--	--
3	2406	--	--
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

Used "Smart RF Studio 7" software.

Test Software Version		Engineering Mode		
Test Frequency		2402MHz	2440MHz	2480MHz
Power Level Setting	GFSK	0	0	0

2.4 Support Equipment List and Details

Description	Manufacturer	Model Number	BSMI	FCC ID	S/N
NB	DELL	E6410	N/A	N/A	10912240367

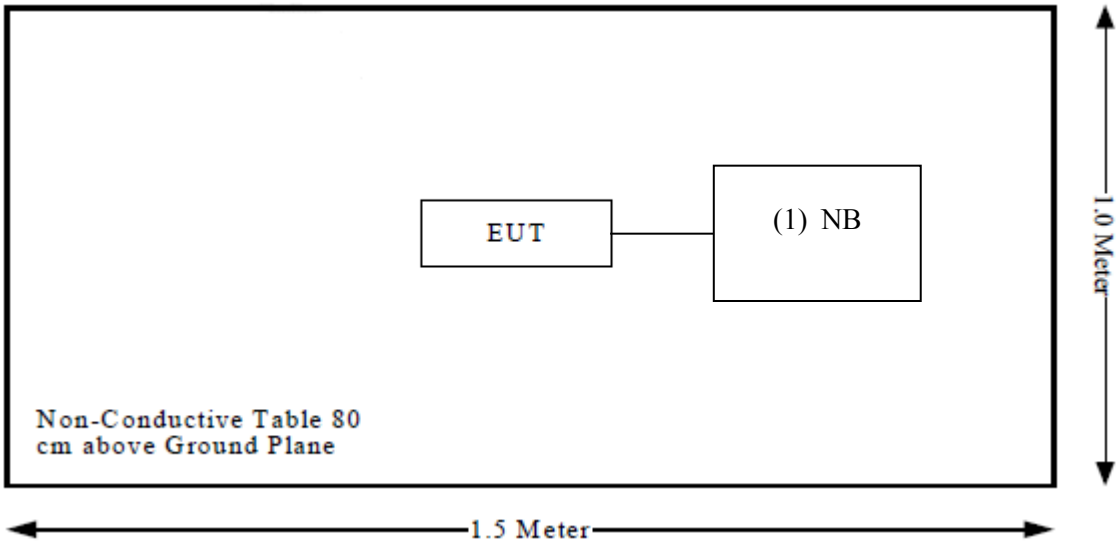
2.5 External Cable List and Details

Cable Description	Length (m)	From	To
Mini USB Cable	1.5	NB	EUT

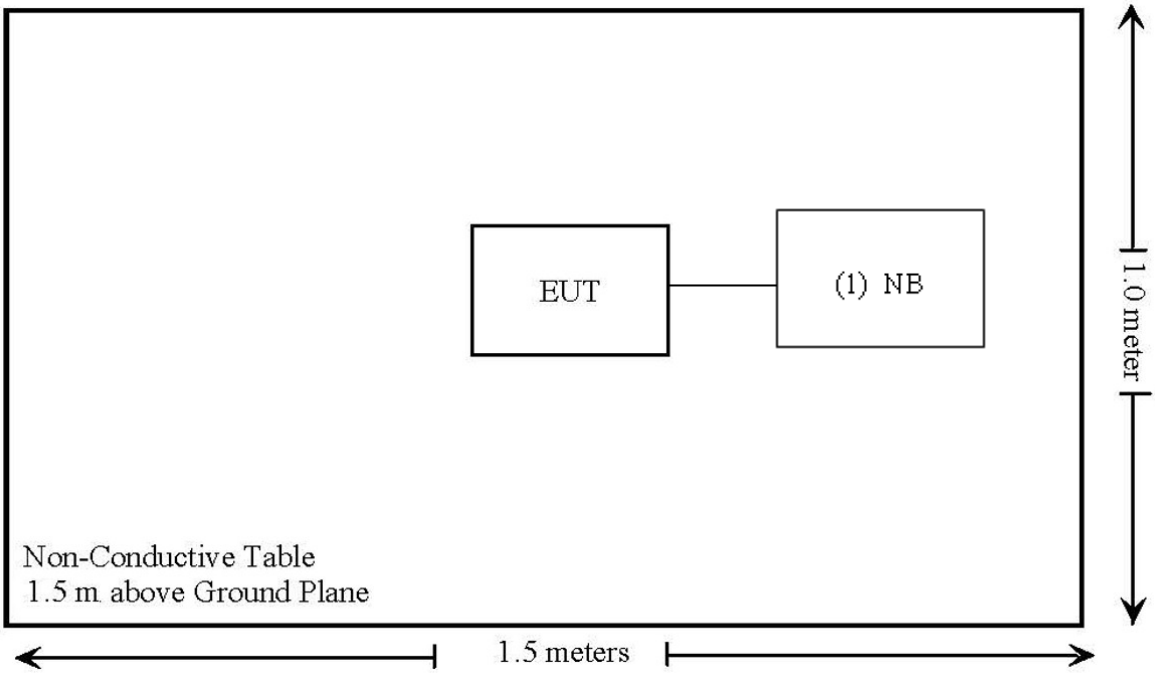
2.6 Block Diagram of Test Setup

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

Below 1GHz:

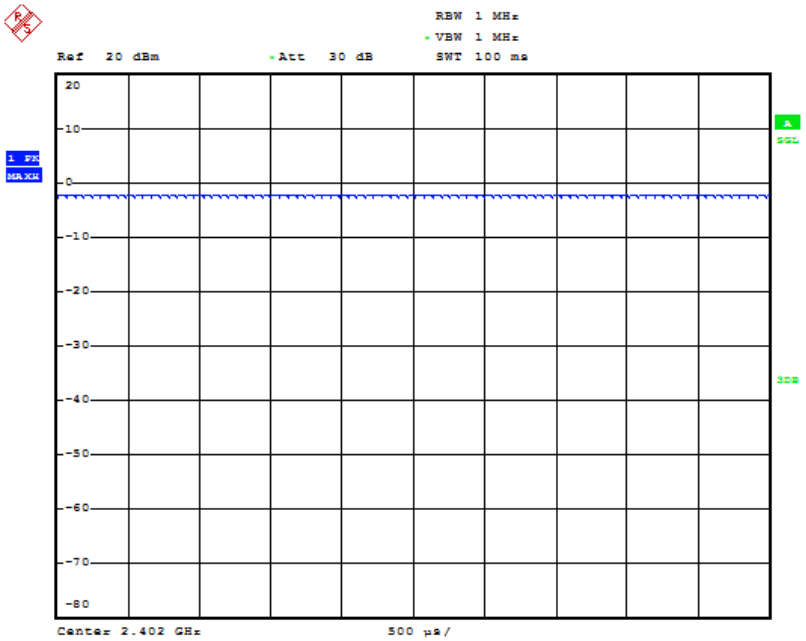


Above 1GHz:



2.7 Duty Cycle

Duty cycle of test signal is < 98%, duty factor shall be considered.
BLE: Duty cycle = 1, Duty factor = 10 * log(1/1) = 0



Date: 25.OCT.2016 16:03:48

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), §1.1310 ,§2.1091	Maximum Permissible Exposure (MPE)	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) & 1.1310 &2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

4.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

4.2 Calculated Data:

3G Module FCC ID: RI7HE910GL.
Worse case:
MPE evaluation for single transmission:

Mode	Frequency Range (MHz)	Antenna Gain		Tune up Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
BT	2402-2480	1.927	1.558	6.5	4.467	20	0.00138	1.0
BLE	2402-2480	3.45	2.213	0	1.000	20	0.00044	1.0
3G	824-849	1.74	1.493	24.00	251.189	20	0.07460	0.56
3G	1850-1910	2.37	1.726	24.00	251.189	20	0.08624	1.0
3G	1710-1755	0.64	1.159	24.00	251.189	20	0.05791	1.0

MPE evaluation for simultaneous transmission:

BT ,BLE and 3G can transmit at the same time, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+……＜1, PD (Power Density)

Worse case MPE evaluation= MPE of BT/1 + MPE of 3G/0.56 =
0.00138/1+0.00044/1+ 0.07460/0.56=0.13503＜1.0

Result: RF exposure evaluation of single and simultaneous transmission meet FCC limt at 20 cm distance.

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
WinWave Electronic Co., Ltd.	8010	Chip Antenna	3.45 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(a) –AC Line Conducted Emissions

6.1 Applicable Standard

According to §15.207

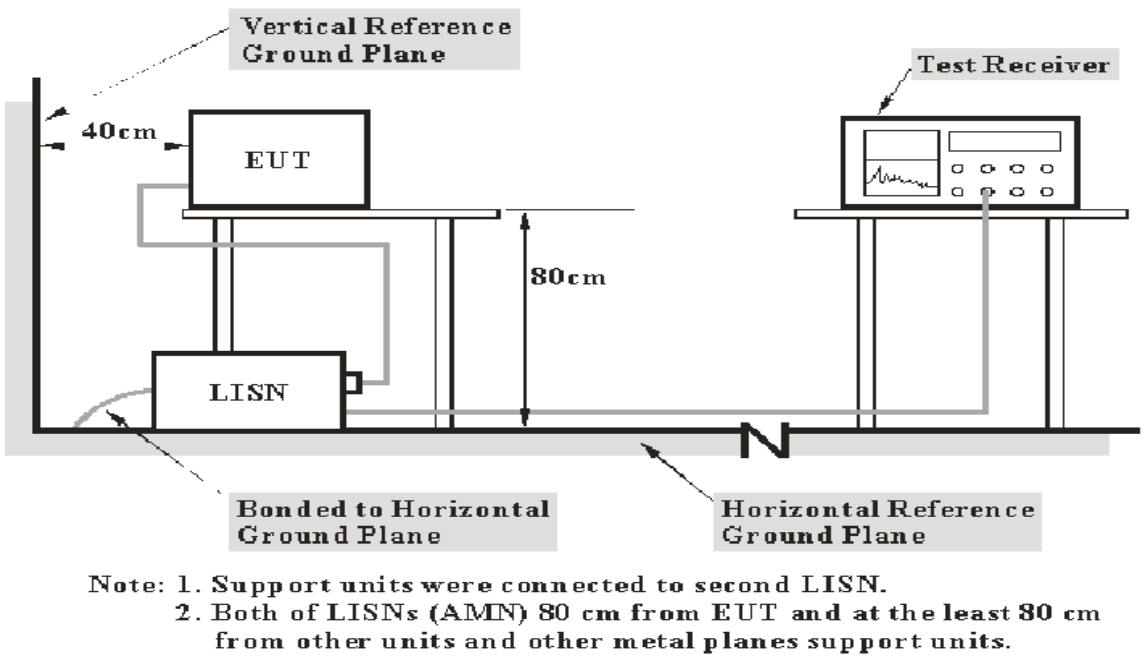
6.2 Measurement Uncertainty

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

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	2.71B

6.3 EUT Setup



The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 limits.
The spacing between the peripherals was 10 cm.

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 basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,

V_C: corrected voltage amplitude

V_R: reading voltage amplitude

A_c: attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The "**Over Limit**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.

The equation for margin calculation is as follows:

Over Limit =Level – Limit Line

6.7 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	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	N.C.R	N.C.R

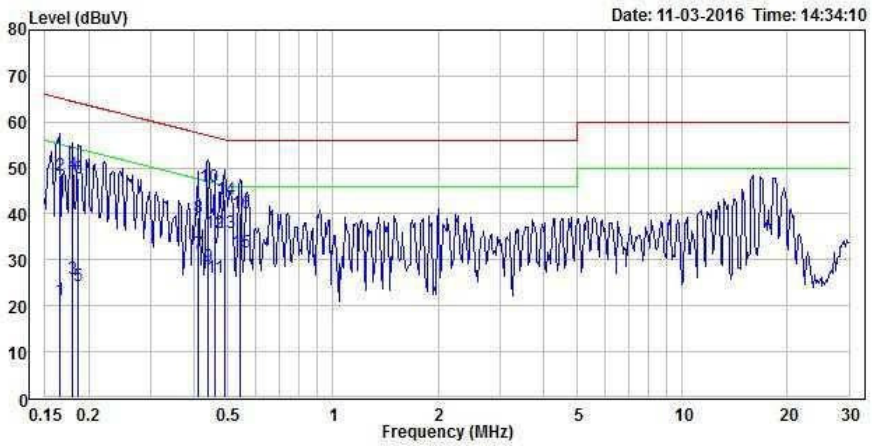
6.8 Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by David Hsu on 2016-11-03.

Test Mode: Transmitting
AC120 V, 60 Hz, Line:

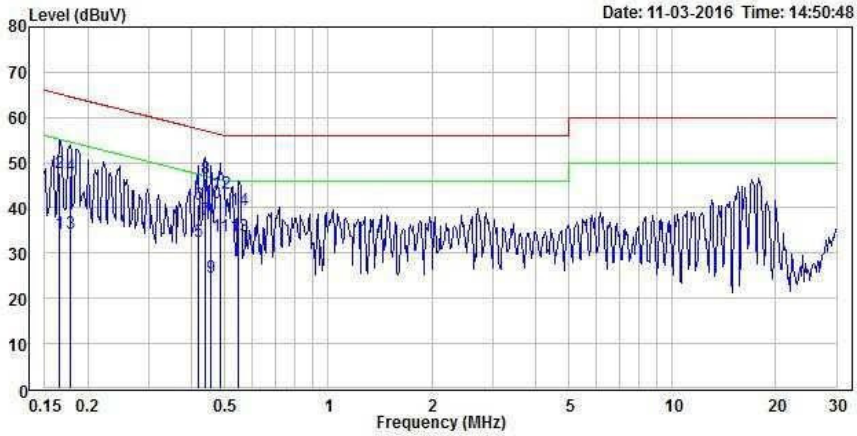


Condition: Line
EUT :
Mode :
Note : 120V/60Hz

	Freq	Level	Limit Line	Over Limit	Factor	Read Level	Remark	Pol/Phase
	MHz	dBuV	dBuV	dB	dB	dBuV		
1	0.165	21.32	55.21	-33.89	19.57	1.75	Average	Line
2	0.165	48.51	65.21	-16.70	19.57	28.94	QP	Line
3	0.180	25.94	54.48	-28.54	19.57	6.37	Average	Line
4	0.180	48.65	64.48	-15.83	19.57	29.08	QP	Line
5	0.186	24.19	54.21	-30.02	19.57	4.62	Average	Line
6	0.186	47.65	64.21	-16.56	19.57	28.08	QP	Line
7	0.413	31.35	47.60	-16.25	19.54	11.81	Average	Line
8	0.413	39.39	57.60	-18.21	19.54	19.85	QP	Line
9	0.440	28.57	47.07	-18.50	19.54	9.03	Average	Line
10	0.440	45.91	57.07	-11.16	19.54	26.37	QP	Line
11	0.458	26.17	46.74	-20.57	19.55	6.62	Average	Line
12	0.458	35.88	56.74	-20.86	19.55	16.33	QP	Line
13	0.492	35.92	46.14	-10.22	19.55	16.37	Average	Line
14	0.492	43.29	56.14	-12.85	19.55	23.74	QP	Line
15	0.541	31.56	46.00	-14.44	19.55	12.01	Average	Line
16	0.541	40.05	56.00	-15.95	19.55	20.50	QP	Line

- 1 -

AC120 V, 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	0.165	34.27	55.21	-20.94	19.55	14.72	Average	Neutral
2	0.165	47.83	65.21	-17.38	19.55	28.28	QP	Neutral
3	0.177	34.46	54.61	-20.15	19.54	14.92	Average	Neutral
4	0.177	47.27	64.61	-17.34	19.54	27.73	QP	Neutral
5	0.419	32.70	47.46	-14.76	19.54	13.16	Average	Neutral
6	0.419	40.90	57.46	-16.56	19.54	21.36	QP	Neutral
7	0.440	37.40	47.07	-9.67	19.54	17.86	Average	Neutral
8	0.440	46.39	57.07	-10.68	19.54	26.85	QP	Neutral
9	0.454	24.49	46.80	-22.31	19.54	4.95	Average	Neutral
10	0.454	41.14	56.80	-15.66	19.54	21.60	QP	Neutral
11	0.484	33.77	46.27	-12.50	19.55	14.22	Average	Neutral
12	0.484	43.17	56.27	-13.10	19.55	23.62	QP	Neutral
13	0.550	33.62	46.00	-12.38	19.55	14.07	Average	Neutral
14	0.550	39.59	56.00	-16.41	19.55	20.04	QP	Neutral

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

7.1 Applicable Standard

FCC§15.247 (d); §15.209; §15.205

7.2 Measurement Uncertainty

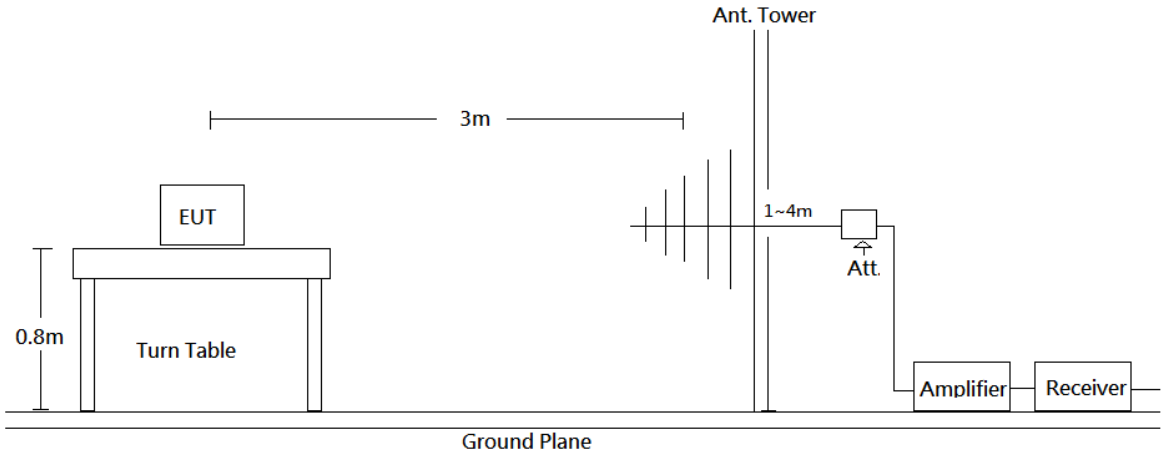
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency 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.

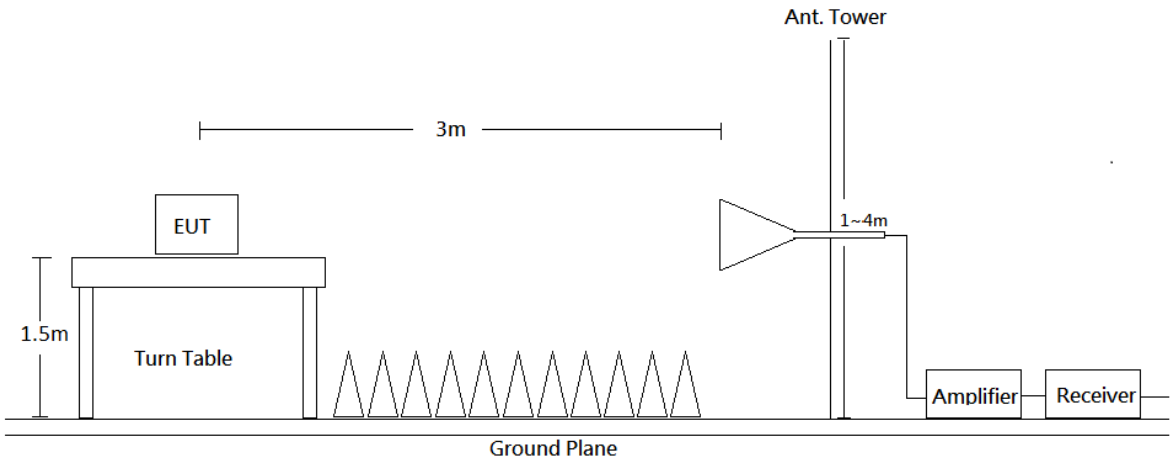
Frequency	Measurement uncertainty
30 MHz~200 MHz	4.21 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.41 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.51 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	4.88 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.30 dB (k=2, 95% level of confidence)
26 GHz~40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

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

$Lm + U(Lm) \leq Llim + Ucispr$

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	2016/11/3	2017/11/2
Mircoflex Cable	UTIFLEX	UFB311A-Q-1440-300300	220490-006	2016/11/3	2017/11/2
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
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192S	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).

7.9 Test Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The Radiated Spurious emission testing was performed by David Hsu on 2016-11-10.
The Conducted Spurious Emissions testing was performed by David Hsu on 2016-10-25.

7.10 Test Results

Mode: Test Mode

BLE Mode (30MHz ~25GHz)
2402MHz

Horizontal

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.)
191.9900	44.54	-12.37	32.17	43.50	-11.33	100	75	QP
288.0200	48.91	-10.19	38.72	46.00	-7.28	100	29	QP
416.0600	36.53	-7.56	28.97	46.00	-17.03	100	338	QP
480.0800	33.06	-6.26	26.80	46.00	-19.20	100	263	QP
799.2100	32.32	-1.06	31.26	46.00	-14.74	100	2	QP
879.7200	31.84	0.64	32.48	46.00	-13.52	100	13	QP
2388.375	59.26	-5.27	53.99	74.00	-20.01	100	295	PK
2388.375	45.90	-5.27	40.63	54.00	-13.37	100	295	Ave
2402.340	91.36	-5.25	86.11	N/A	N/A	100	211	PK
2402.340	80.23	-5.25	74.98	N/A	N/A	100	211	Ave
4808.000	50.96	0.65	51.61	74.00	-22.39	100	115	PK
4808.000	44.74	0.65	45.39	54.00	-8.61	100	115	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

Vertical

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.)
127.9700	36.49	-10.76	25.73	43.50	-17.77	100	53	QP
288.0200	37.53	-10.19	27.34	46.00	-18.66	100	16	QP
320.0300	35.82	-9.61	26.21	46.00	-19.79	100	184	QP
352.0400	32.31	-8.94	23.37	46.00	-22.63	100	186	QP
599.3900	29.71	-4.32	25.39	46.00	-20.61	100	117	QP
797.2700	31.33	-1.11	30.22	46.00	-15.78	100	215	QP
2381.535	58.99	-5.29	53.70	74.00	-20.30	100	307	PK
2381.535	46.48	-5.29	41.19	54.00	-12.81	100	307	Ave
2402.340	94.34	-5.25	89.09	N/A	N/A	100	204	PK
2402.340	83.06	-5.25	77.81	N/A	N/A	100	204	Ave
4808.000	48.21	0.65	48.86	74.00	-25.14	100	346	PK
4808.000	41.73	0.65	42.38	54.00	-11.62	100	346	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

2440MHz

Horizontal

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.)
34.8500	27.53	-7.15	20.38	40.00	-19.62	100	222	QP
143.4900	35.14	-11.18	23.96	43.50	-19.54	100	305	QP
175.5000	43.61	-12.92	30.69	43.50	-12.81	100	105	QP
191.9900	44.85	-12.37	32.48	43.50	-11.02	100	75	QP
288.0200	49.22	-10.19	39.03	46.00	-6.97	100	29	QP
480.0800	34.40	-6.26	28.14	46.00	-17.86	100	263	QP
2440.300	91.86	-5.16	86.70	N/A	N/A	100	233	PK
2440.300	79.70	-5.16	74.54	N/A	N/A	100	233	Ave
4876.000	48.96	0.91	49.87	74.00	-24.13	100	108	PK
4876.000	43.25	0.91	44.16	54.00	-9.84	100	108	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

Vertical

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.)
72.6800	38.41	-16.91	21.50	40.00	-18.50	100	135	QP
127.9700	37.37	-10.76	26.61	43.50	-16.89	100	53	QP
288.0200	37.55	-10.19	27.36	46.00	-18.64	100	16	QP
352.0400	32.55	-8.94	23.61	46.00	-22.39	100	186	QP
599.3900	30.12	-4.32	25.80	46.00	-20.20	100	117	QP
797.2700	32.18	-1.11	31.07	46.00	-14.93	100	215	QP
2440.300	92.31	-5.16	87.15	N/A	N/A	100	193	PK
2440.300	80.82	-5.16	75.66	N/A	N/A	100	193	Ave
4876.000	44.00	0.91	44.91	74.00	-29.09	100	347	PK
4876.000	38.12	0.91	39.03	54.00	-14.97	100	347	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

2480 MHz

Horizontal

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.)
127.9700	46.08	-10.76	35.32	43.50	-8.18	100	95	QP
191.9900	48.78	-12.37	36.41	43.50	-7.09	100	75	QP
288.0200	49.69	-10.19	39.50	46.00	-6.50	100	29	QP
320.0300	43.59	-9.61	33.98	46.00	-12.02	100	258	QP
480.0800	39.73	-6.26	33.47	46.00	-12.53	100	263	QP
998.0600	32.67	3.64	36.31	54.00	-17.69	100	286	QP
2479.840	86.21	-5.06	81.15	N/A	N/A	100	236	PK
2479.840	84.63	-5.06	79.57	N/A	N/A	100	236	Ave
2483.500	57.44	-5.05	52.39	74.00	-21.61	100	327	PK
2483.500	46.48	-5.05	41.43	54.00	-12.57	100	327	Ave
4961.000	44.59	1.23	45.82	74.00	-28.18	100	104	PK
4961.000	38.62	1.23	39.85	54.00	-14.15	100	104	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

Vertical

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.)
68.8000	41.63	-17.04	24.59	40.00	-15.41	100	176	QP
127.9700	37.33	-10.76	26.57	43.50	-16.93	100	53	QP
288.0200	37.72	-10.19	27.53	46.00	-18.47	100	16	QP
599.3900	35.63	-4.32	31.31	46.00	-14.69	100	117	QP
722.5800	34.64	-2.69	31.95	46.00	-14.05	100	360	QP
797.2700	31.95	-1.11	30.84	46.00	-15.16	100	215	QP
2479.840	90.31	-5.06	85.25	N/A	N/A	100	196	PK
2479.840	88.46	-5.06	83.40	N/A	N/A	100	196	Ave
2483.500	57.42	-5.05	52.37	74.00	-21.63	100	45	PK
2483.500	47.34	-5.05	42.29	54.00	-11.71	100	45	Ave
4961.000	42.07	1.23	43.30	74.00	-30.70	100	16	PK
4961.000	36.29	1.23	37.52	54.00	-16.48	100	16	Ave

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

Test Mode: simultaneous transmissions (WCDMA+BT+BLE)

Horizontal

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.)
58.1300	56.35	-17.51	38.84	40.00	-1.16	400	203	QP
65.8900	50.12	-17.34	32.78	40.00	-7.22	300	190	QP
110.5100	43.24	-12.00	31.24	43.50	-12.26	400	5	QP
207.5100	51.36	-13.16	38.20	43.50	-5.30	100	207	QP
224.9700	54.06	-13.16	40.90	46.00	-5.10	100	184	QP
299.6600	47.76	-10.85	36.91	46.00	-9.09	100	95	QP
1673.000	66.89	-7.56	59.33	74.00	-14.67	100	70	PK
1673.000	30.26	-7.56	22.70	54.00	-31.30	100	70	Ave
3346.000	42.13	-1.75	40.38	74.00	-33.62	300	48	PK
3346.000	27.52	-1.75	25.77	54.00	-28.23	300	48	Ave
4808.000	41.65	0.65	42.30	74.00	-31.70	200	103	PK
4808.000	37.57	0.65	38.22	54.00	-15.78	200	103	Ave

Note:Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

Vertical

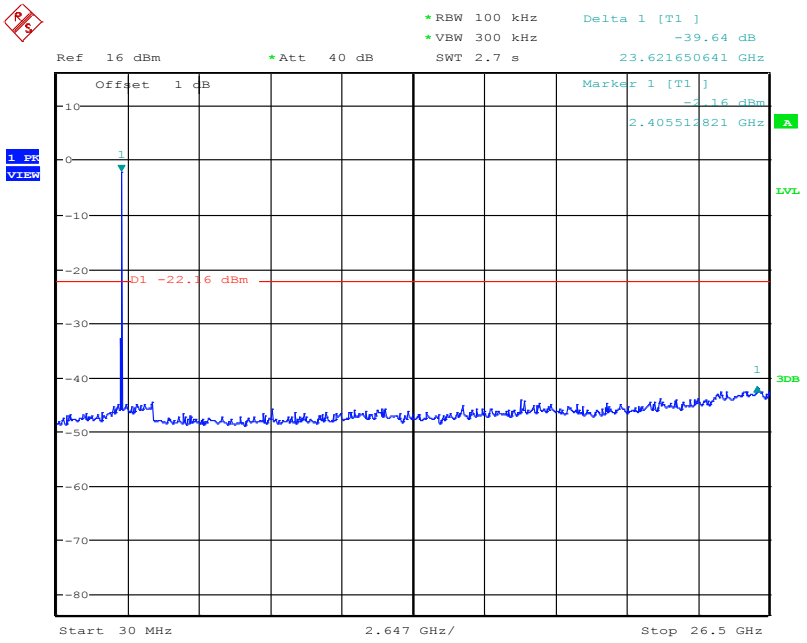
Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
127.9700	36.71	-10.76	25.95	43.50	-17.55	100	53	QP
288.0200	38.19	-10.19	28.00	46.00	-18.00	100	16	QP
320.0300	35.30	-9.61	25.69	46.00	-20.31	100	184	QP
352.0400	32.70	-8.94	23.76	46.00	-22.24	100	186	QP
597.4500	32.03	-4.36	27.67	46.00	-18.33	100	140	QP
798.2400	31.54	-1.09	30.45	46.00	-15.55	100	230	QP
1673.000	60.81	-7.56	53.25	74.00	-20.75	400	103	peak
1673.000	28.41	-7.56	20.85	54.00	-33.15	400	103	AVG
4808.000	41.31	0.65	41.96	74.00	-32.04	121	0	peak
4808.000	36.48	0.65	37.13	54.00	-16.87	121	0	AVG

Note: Result = Reading + Factor
Margin = Result – Limit
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain
The other emission levels were very low against the limit.

Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	RESULT
Low	2402	39.64	≥ 20	PASS
Mid	2440	39.02	≥ 20	PASS
High	2480	38.49	≥ 20	PASS

Low Channel



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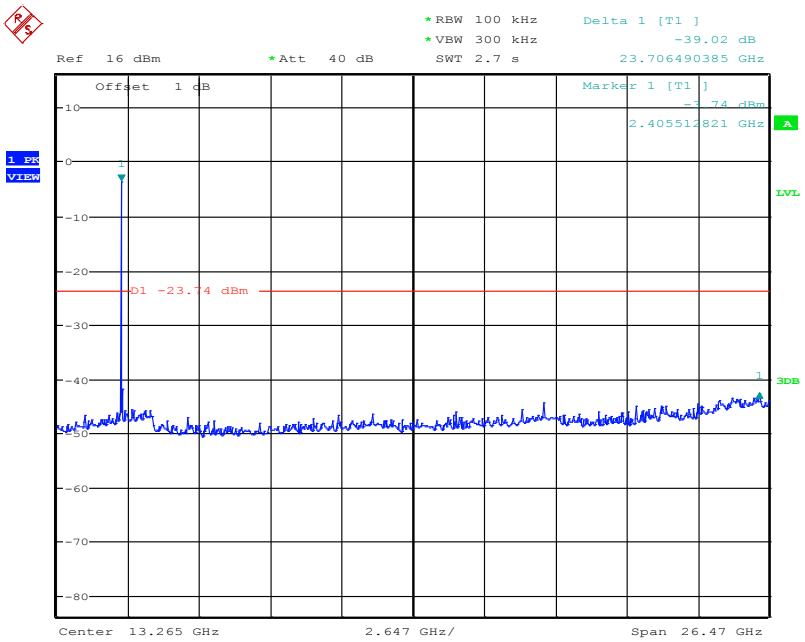
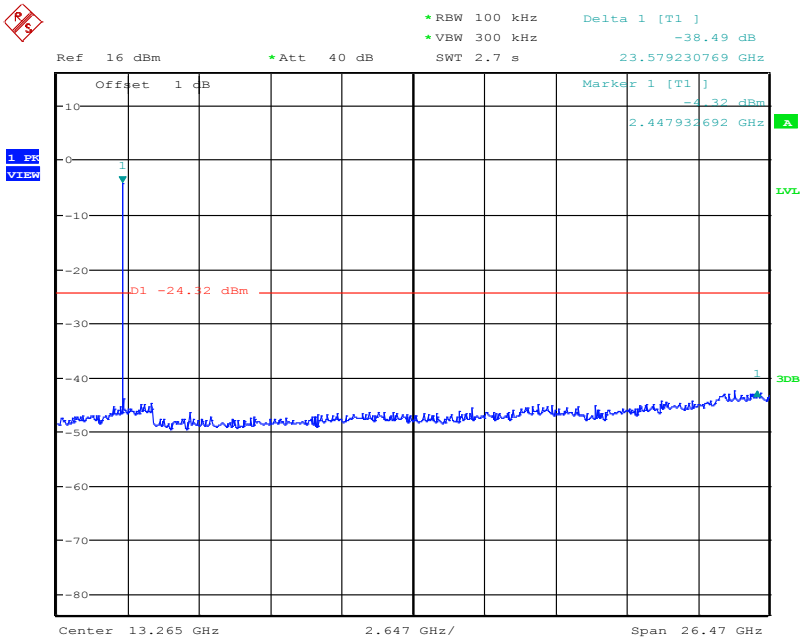
Middle Channel



Date: 25.OCT.2016 09:56:47

High Channel



Date: 25.OCT.2016 10:00:58

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.

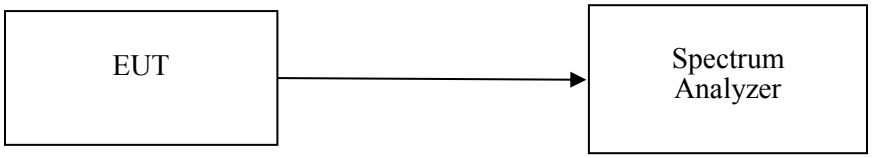
8.2 Test Procedure

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	Rohde & Schwarz	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192S	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:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

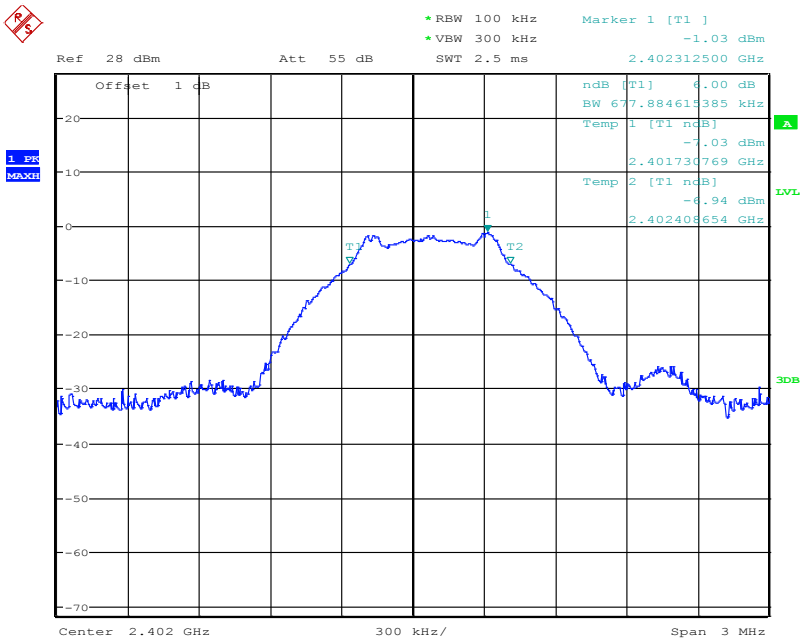
The testing was performed by David Hsu on 2016-10-24.

8.5 Test Results

Channel	Frequency (MHz)	6 dB OBW (MHz)	Limit (MHz)	Result
Low	2402	0.68	> 0.5	Compliance
Middle	2440	0.69	> 0.5	Compliance
High	2480	0.69	> 0.5	Compliance

Please refer to the following plots

Low Channel



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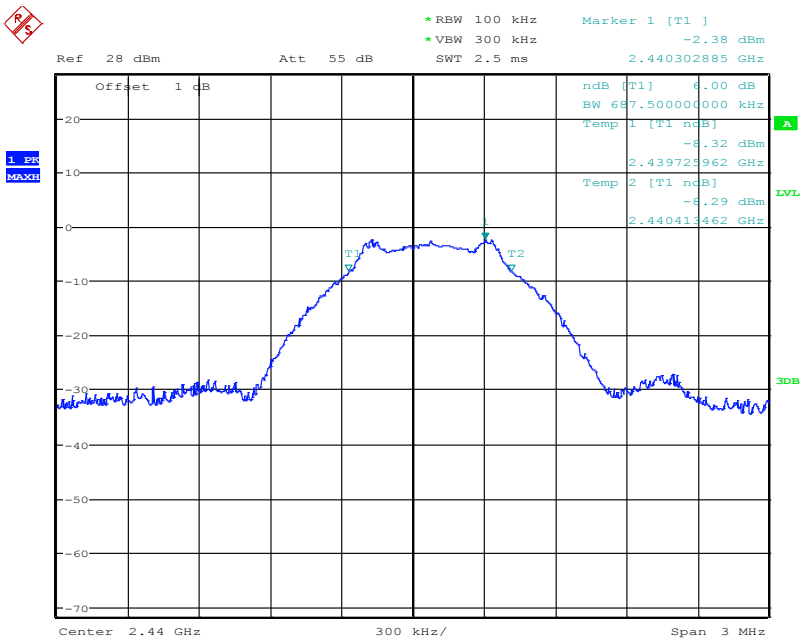
Middle Channel



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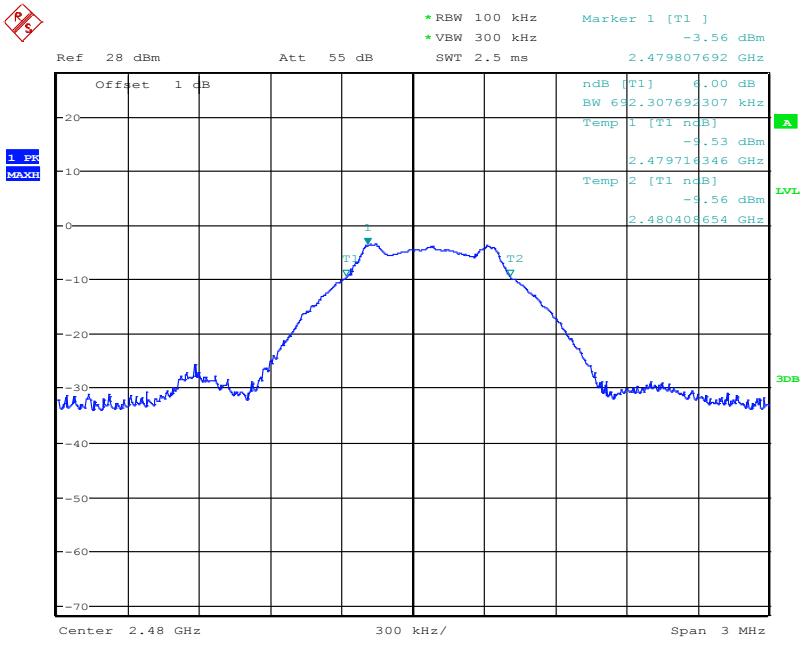
High Channel



Date: 24.OCT.2016 17:45:49

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

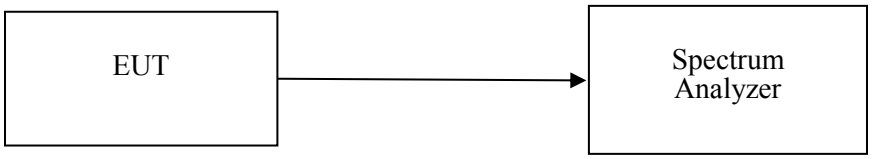
9.1 Applicable Standard

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
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192S	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).

9.4 Test Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

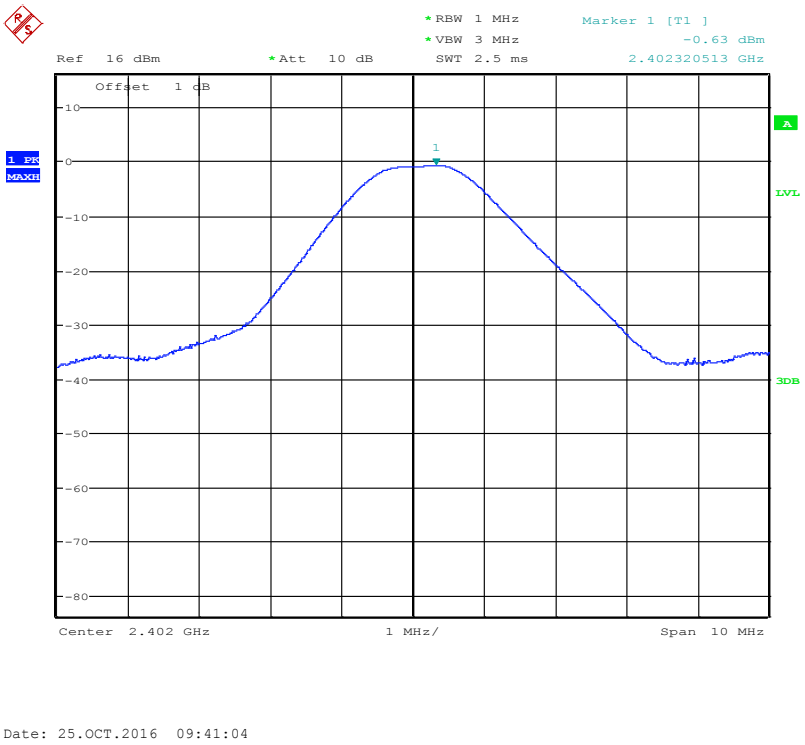
The testing was performed by David Hsu on 2016-10-25.

9.5 Test Results

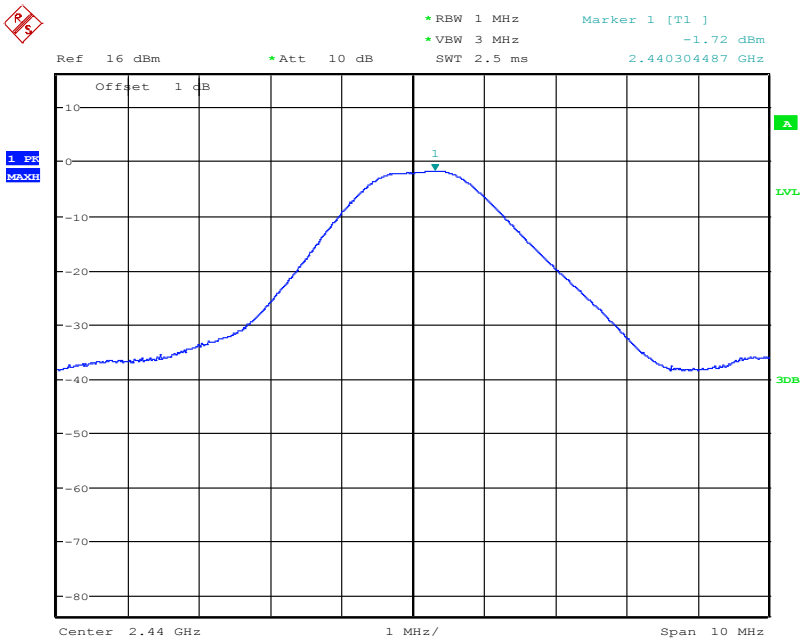
Channel	Frequency (MHz)	Conducted Output Power (dBm)	Conducted Output Power (W)	Limit (W)	Result
Low	2402	-0.63	0.00086	1	Compliance
Middle	2440	-1.72	0.00067	1	Compliance
High	2480	-2.82	0.00052	1	Compliance

Please refer to the following plots

Low Channel



Middle Channel



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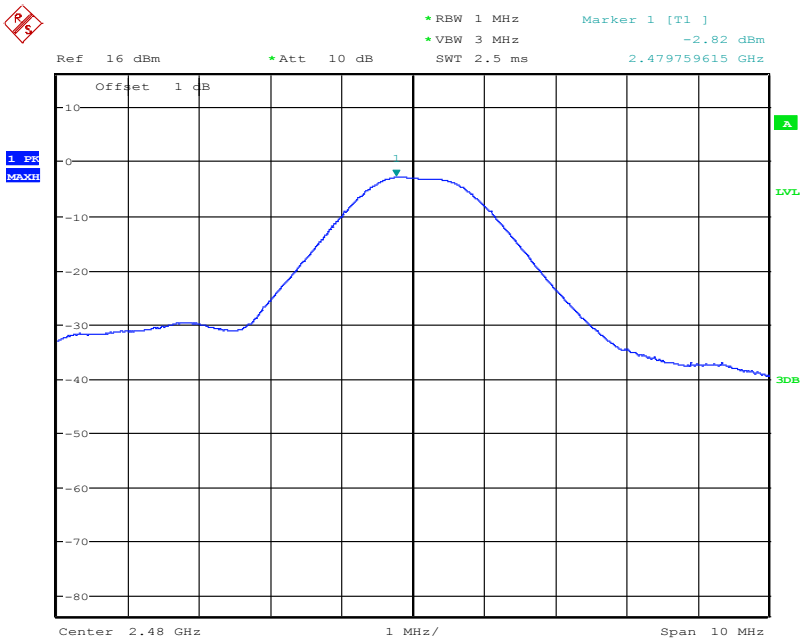
High Channel



Date: 25.OCT.2016 09:44:06

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	Rohde & Schwarz	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192S	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:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

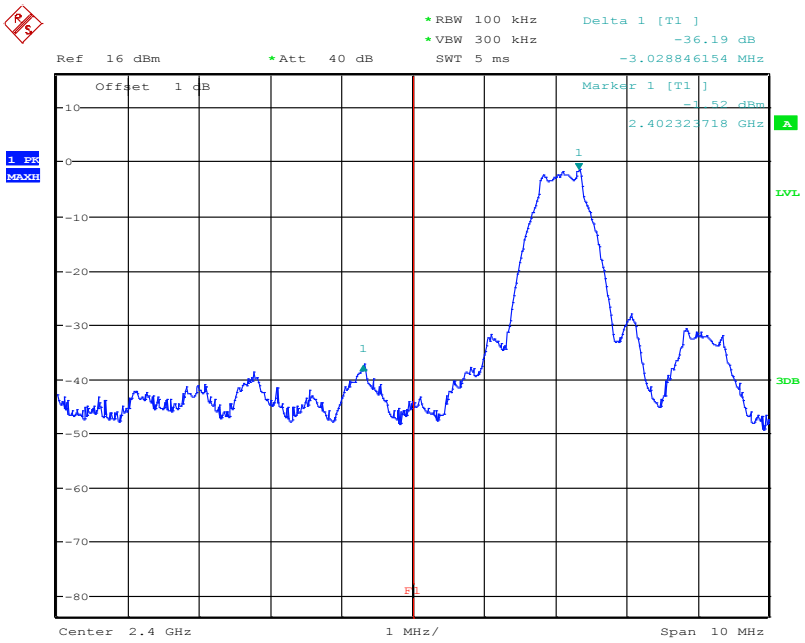
The testing was performed by David Hsu on 2016-10-25.

10.5 Test Results

Please refer to the following plots

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	RESULT
Low	2402	36.19	≥ 20	PASS
High	2480	36.28	≥ 20	PASS

Band Edge, CH low



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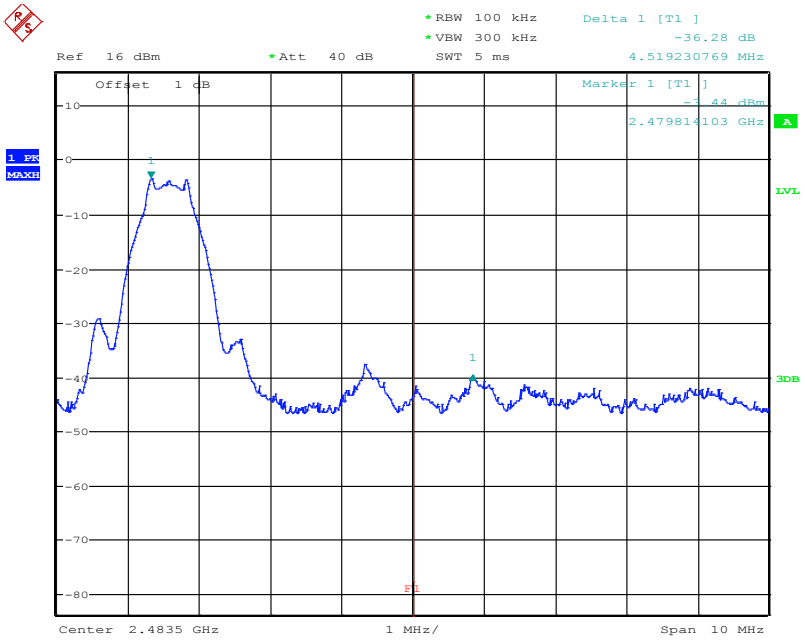
Band Edge, CH High



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11 FCC §15.247(e) – Power Spectral Density

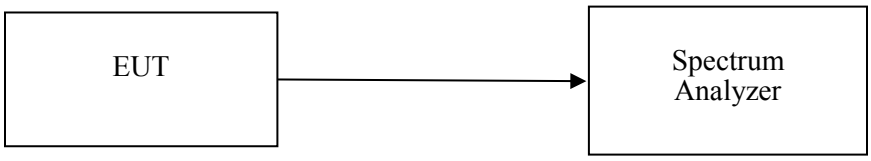
11.1 Applicable Standard

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	Rohde & Schwarz	FSU26	200268	2016/5/7	2017/5/6
Cable	WOKEN	SFL402	00100A1F6A192S	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:	25 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

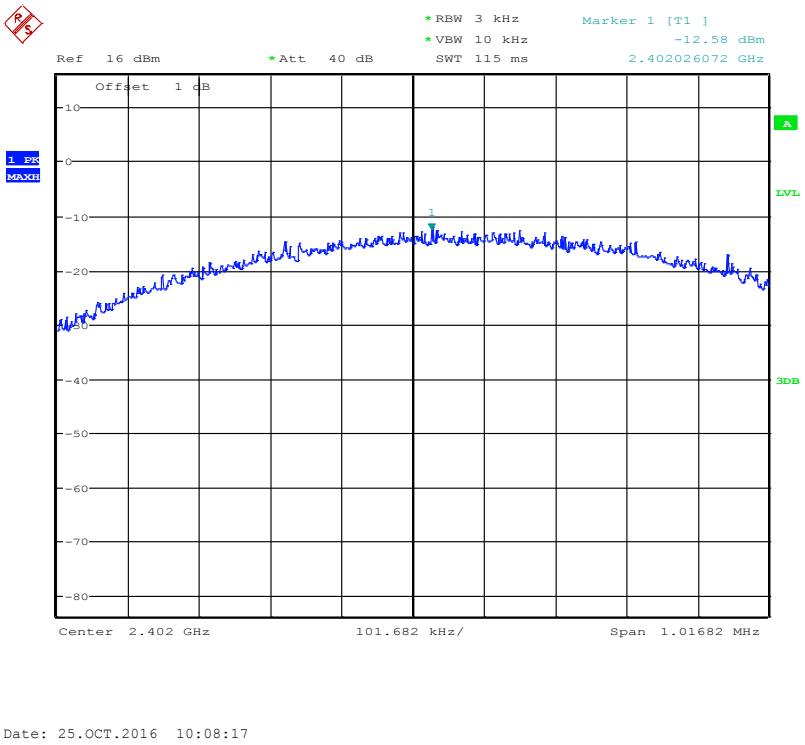
The testing was performed by David Hsu on 2016-10-25.

11.4 Test Results

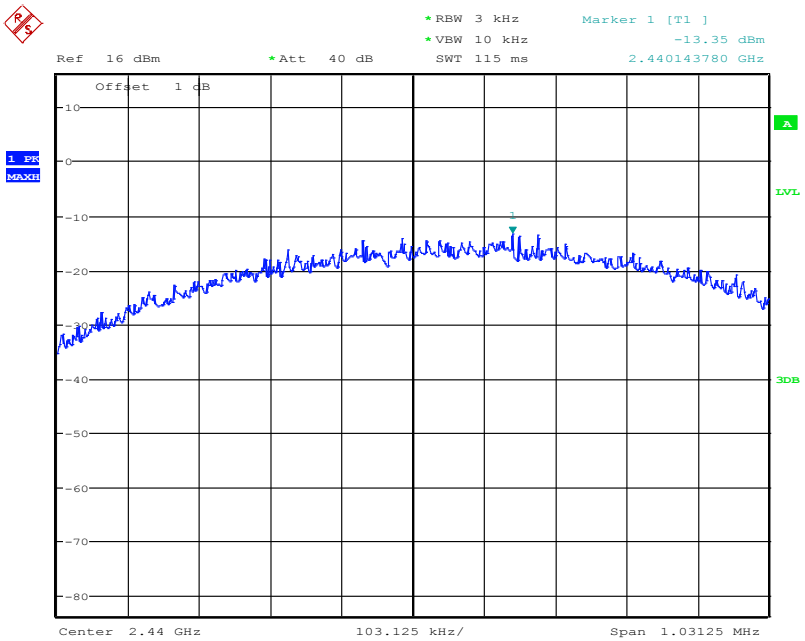
Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
Low	2402	-12.58	8	Compliance
Middle	2440	-13.35	8	Compliance
High	2480	-14.89	8	Compliance

Please refer to the following plots

Low Channel



Middle Channel



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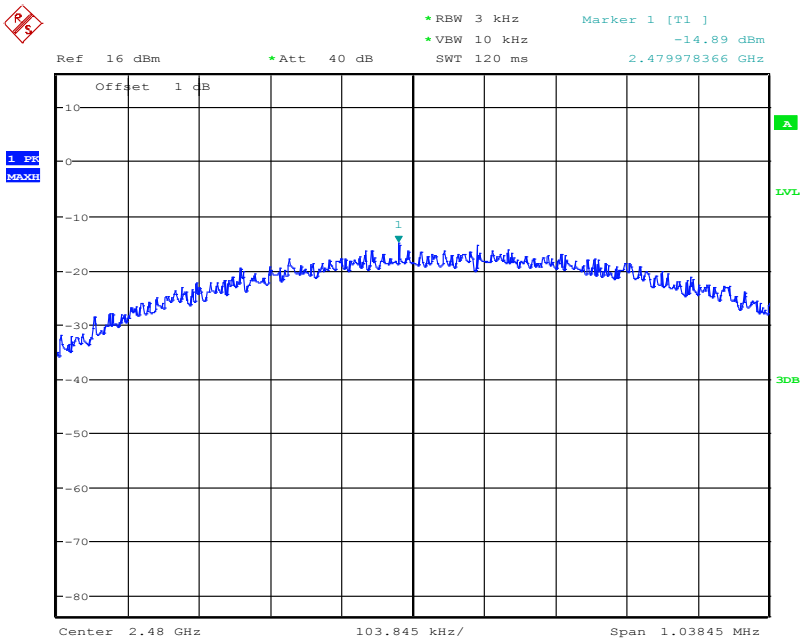
High Channel



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