FCC Part 15.247

RSS-247 Issue 1 , MAY 2015

TEST REPORT

For

ACE CAD Enterprice Co., Ltd.

2F, No.94, Bao Chung Rd., Hsin Tien Dist., New Taipei City, Taiwan

Model: PP581
FCC ID: H2UPP01
IC ID: 21693-PP01

Report Type:	**Product Type:**
Original Report	PenPaper 5x8

Test Engineer:	David Hsu
Report Number:	RTW160601002-00A
Report Date:	2016-8-31
Reviewed By:	Jerry Chang

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REVISION HISTORY

Revision	Issue Date	Description
1.0	2016.08.31	Original

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1 General Information

1.1 Product Description for Equipment Under Test (EUT)

Applicant:	ACE CAD Enterprice Co., Ltd. 2F, No.94, Bao Chung Rd., Hsin Tien Dist., New Taipei City, Taiwan
Manufacturer:	ACE CAD Enterprice Co., Ltd. 2F, No.94, Bao Chung Rd., Hsin Tien Dist., New Taipei City, Taiwan
Product:	PenPaper 5x8
Model:	PP581
Trade Name:	ACECAD
Frequency Range:	2402-2480 MHz
Transmit Power:	BT BLE Mode: -1.40 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:	Chip Antenna/Gain: 0.5 dBi
Voltage Range:	DC 5 V from NB or 3.3Vdc from Battery
Date of Test:	June 01, 2016~August 31, 2016

**All measurement and test data in this report was gathered from production sample serial number: 16060101 (Assigned by BACL, Taiwan) The EUT supplied by the applicant was received on 2016-06-01*

Designation Number: TW1101

1.2 Objective

This report is prepared on behal*f of ACE CAD Enterprice Co., Ltd. in acc*ordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commission's rules and RSS-247 Issue 1, May 2015.

The objective is to determine compliance with FCC Part 15.247 and RSS-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

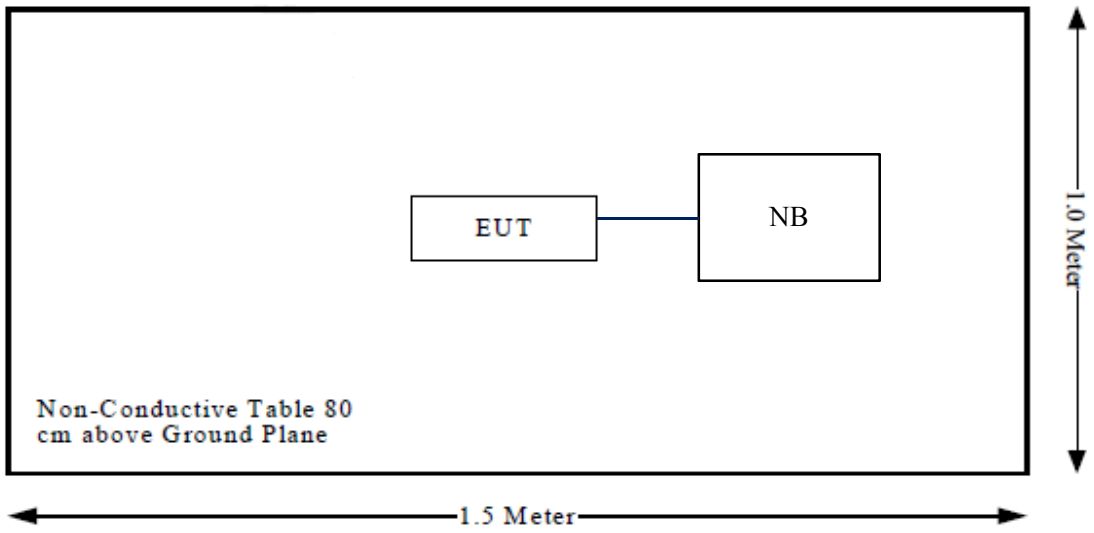
No.	Description	Manufacturer	Model N0.	Data Cable				Power Cable	
				Name	Length	Shielded	With Core	Length	Shielded
1	NB	DELL	E6410	USB	1 m	No	N/A	1.2 m	No

2.5 External Cable List and Details

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

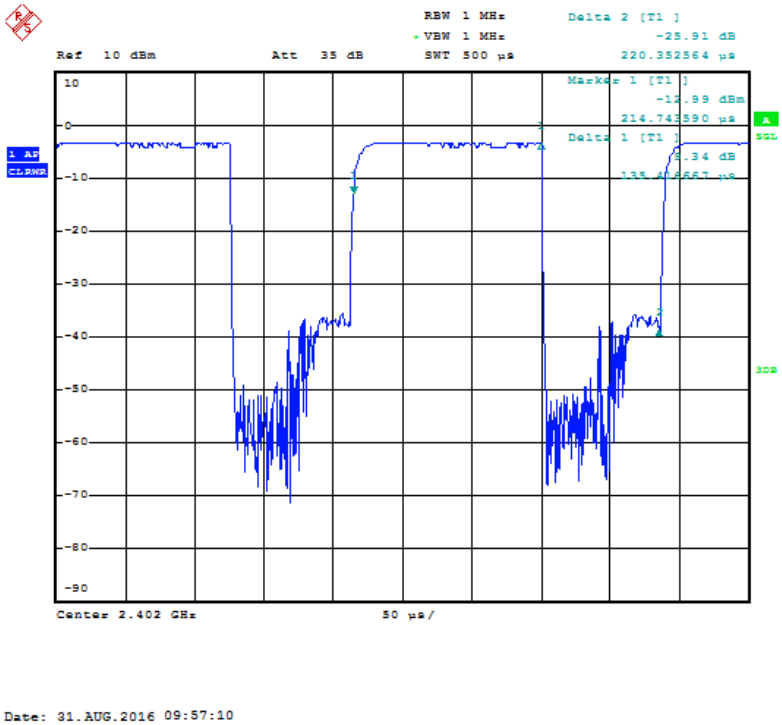
2.6 Block Diagram of Test Setup

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



2.7 Duty cycle

BLE Duty cycle:61%
Tx(on)/(Tx on+Tx off)135us/220us=0.61



3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), §2.1091 RSS-102	RF Exposure	Compliance
§15.203 RSS-Gen 8.3	Antenna Requirement	Compliance
§15.207(a) RSS-Gen 8.8	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d) RSS-Gen 8.9, 8.10, RSS-247 5.5	Spurious Emissions	Compliance
§15.247(a)(2) RSS-247 5.2(1)	6 dB Emission Bandwidth	Compliance
RSS-Gen §6.6	99% Emission Bandwidth	Compliance
§15.247(b)(3) RSS-247 5.4(4)	Maximum Peak Output Power	Compliance
§15.247(d) RSS-247 5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e) RSS-247 5.2(2)	Power Spectral Density	Compliance

4 FCC §15.247(i) , §2.1091 & RSS-102 - 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.

According to RSS-102 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:
below 20 MHzFootnote6 and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).
In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Formulary:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{[21]}$	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{[21]}$	170	180	-	Instantaneous*
0.1-10	-	$1.6/f$	-	6**
1.29-10	$193/f^{0.5}$	-	-	6**
10-20	61.4	0.163	10	6
20-48	$129.8/f^{0.25}$	$0.3444/f^{0.25}$	$44.72/f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	$15.60\ f^{0.25}$	$0.04138\ f^{0.25}$	$0.6455 f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	$616000/f^{1.2}$
150000-300000	$0.354\ f^{0.5}$	$9.40 \times 10^{-4}\ f^{0.5}$	$3.33 \times 10^{-4}\ f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Predication of MPE limit at a given distance

$$S = PG/4 \pi R^2$$

S = power density (in appropriate units, e.g. W/m2 for IC)
P = power input to the antenna (in appropriate units, e.g.W for IC).
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., m for IC)

4.2 RF Exposure Evaluation Result

FCC
Worse case:

Frequency (MHz)	Tune-up Power		Evaluation Distance (mm)	SAR Exclusion Result	Extremity SAR Exclusion Limit (10g SAR)
	(dBm)	(mW)			
2440	-0.5	0.89	5	0.28	7.5

Result: MPE test is exempted.

ISEDC:

Worse case:

$1.31 \times 10^{-2} f^{0.6834}$ W=2.7W

EUT Eirp power 0.0008W

Maximum power less than 2.7W

Result: MPE test is exempted.

5 FCC §15.203 & RSS-Gen 8.3 – 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.

According to RSS-Gen 8.3: Transmitter Antenna for Licence-Exempt Radio Apparatus

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.Footnote8 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada *to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.*

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

5.2 Antenna List and Details

Manufacturer	Model	Type	Antenna Gain	Result
Johanson Technology Inc.	2450AT18B100	Chip	0.5 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 & RSS-247 8.8 - AC Line Conducted Emissions

6.1 Applicable Standard

According to FCC §15.207 and RSS-Gen 8.8 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

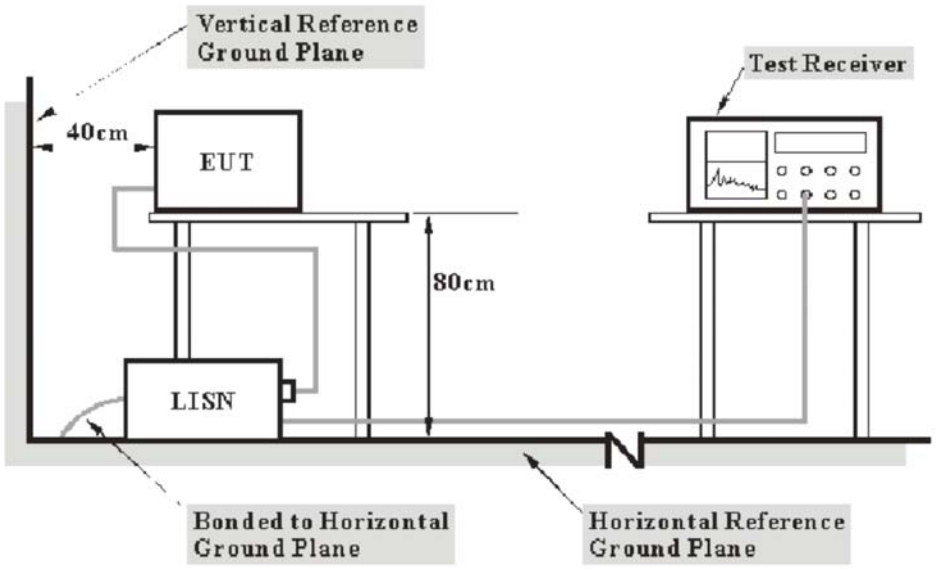
6.2 Measurement Uncertainty

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	R & S	ENV216	101248	2015/8/3	2016/8/2
EMI Test Receiver	R & S	ESCI	100540	2015/7/25	2016/7/24
RF Cable	EMEC	EM-CB5D	001	2015/7/29	2016/7/28
LISN	EMCO	3816/2	00075848	2015/7/8	2016/7/7
Pulse Limiter	R & S	ESH3Z2	TXZEM025	2015/8/28	2016/8/27
software	AUDIX	E3	9.150826k	N.C.R	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

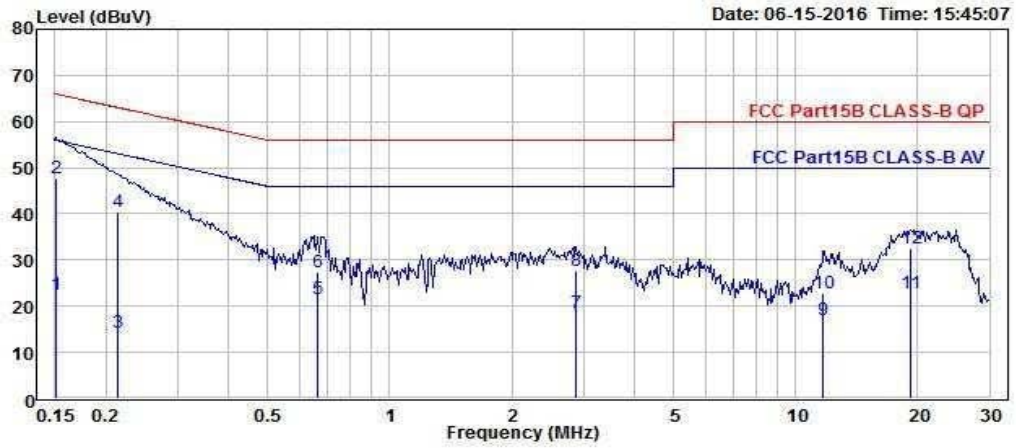
Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by David Hsu on 2016-06-15.

6.9 Test Results

Please refer to the following plots and tables.

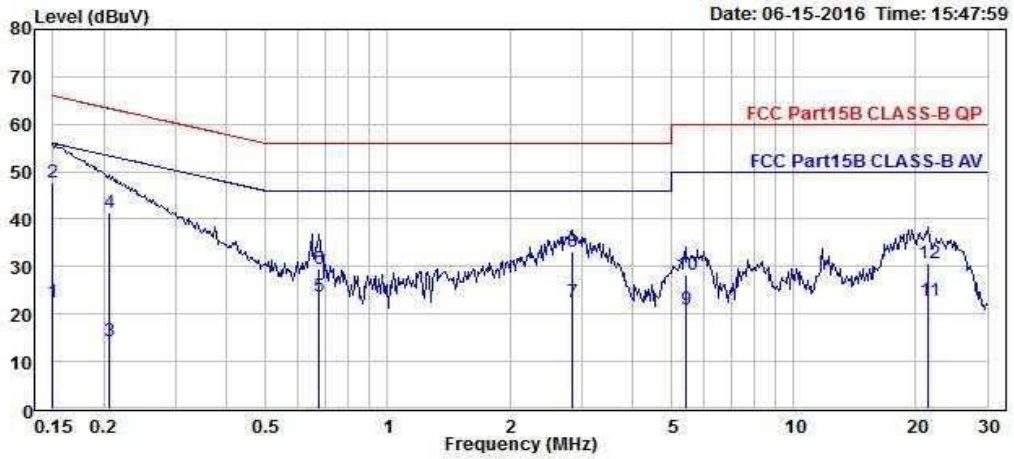
AC 120V/60 Hz, Line



Condition: limit\FCC Part15B CLASS-B QP.csv Line
EUT : PenPaper 5X8
Model : PP581
Note : 120V/60Hz

	Freq	Level	Limit Line	Over Limit	Factor	Read Level	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	
1	0.151	22.49	55.93	-33.44	19.57	2.92	Average
2	0.151	47.78	65.93	-18.15	19.57	28.21	QP
3	0.213	14.36	53.09	-38.73	19.56	-5.20	Average
4	0.213	40.60	63.09	-22.49	19.56	21.04	QP
5	0.666	21.61	46.00	-24.39	19.57	2.04	Average
6	0.666	27.52	56.00	-28.48	19.57	7.95	QP
7	2.883	18.61	46.00	-27.39	19.66	-1.05	Average
8	2.883	27.81	56.00	-28.19	19.66	8.15	QP
9	11.717	17.00	50.00	-33.00	19.81	-2.81	Average
10	11.717	22.80	60.00	-37.20	19.81	2.99	QP
11	19.202	22.72	50.00	-27.28	19.87	2.85	Average
12	19.202	32.44	60.00	-27.56	19.87	12.57	QP

Main: AC 120V/60 Hz, Neutral



Condition: limit\FCC Part15B CLASS-B QP.csv Neutral
EUT : PenPaper 5X8
Model : PP581
Note : 120V/60Hz

	Freq	Level	Limit Line	Over Limit	Factor	Read Level	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	
1	0.150	22.62	56.00	-33.38	19.58	3.04	Average
2	0.150	47.83	66.00	-18.17	19.58	28.25	QP
3	0.206	14.37	53.35	-38.98	19.57	-5.20	Average
4	0.206	41.25	63.35	-22.10	19.57	21.68	QP
5	0.676	23.64	46.00	-22.36	19.57	4.07	Average
6	0.676	29.38	56.00	-26.62	19.57	9.81	QP
7	2.860	22.53	46.00	-23.47	19.66	2.87	Average
8	2.860	33.02	56.00	-22.98	19.66	13.36	QP
9	5.410	20.98	50.00	-29.02	19.72	1.26	Average
10	5.410	28.32	60.00	-31.68	19.72	8.60	QP
11	21.468	22.93	50.00	-27.07	19.96	2.97	Average
12	21.468	30.74	60.00	-29.26	19.96	10.78	QP

7 FCC §15.209, §15.205 , §15.247(d) & RSS-247 5.5 , RSS-GEN 8.9 & 8.10 – 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 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

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).

As per RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 and Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

7.2 Measurement Uncertainty

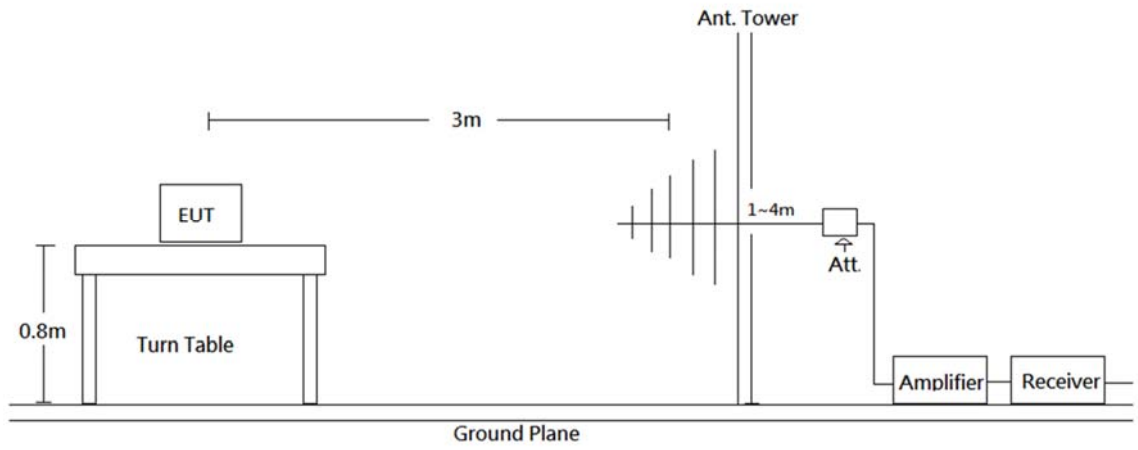
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency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

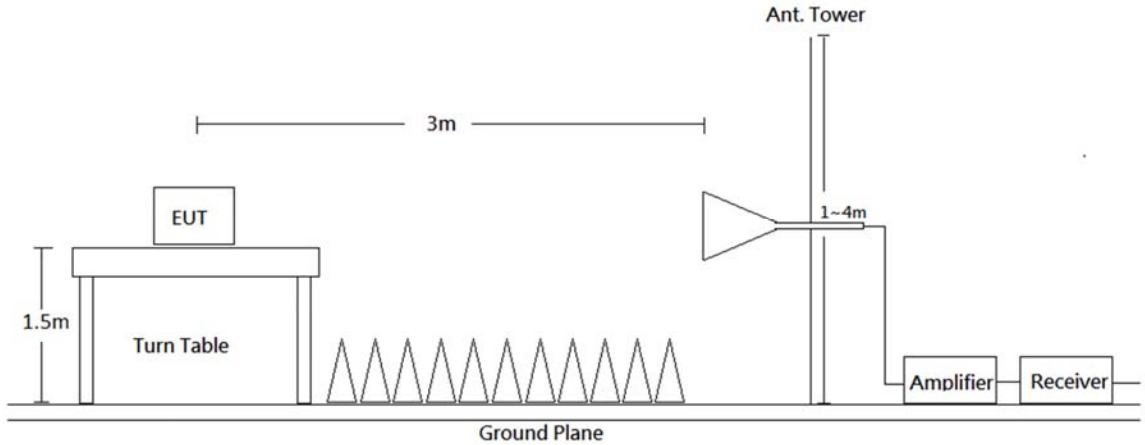
Frequency	Measurement uncertainty
30 MHz~200 MHz	4.21 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.41 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.51 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	4.88 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.30 dB (k=2, 95% level of confidence)
26 GHz~40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

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

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
EMEC Attenuator	EMEC	UNAT-6+	15542	2015/12/8	2016/12/7
Pre Amplifier	Sonoma	310N	130601	2015/7/3	2016/7/2
Horn Antenna	EMCO	3115	9311-4158	2016/5/10	2017/5/9
Horn Antenna	ETS-Lindgren	3116	00062638	2015/9/7	2016/9/6
Preamplifier	EMEC	EM01G18G	060657	2015/12/21	2016/12/20
Preamplifier	EMEC	EM18G40G	060656	2015/12/21	2016/12/20
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	2015/7/3	2016/7/2
Mircoflex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2015/12/2	2016/12/1
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
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	Rohde & Schwarz	EMC32	BACL-03A1	N.C.R	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).

7.9 Test Environmental Conditions

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

The testing was performed by David Hsu on 2016-06-15.

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	125.61	27.56	-10.8	16.76	43.5	-26.74	100	308.0	QP
2	199.75	27.9	-10.8	17.1	43.5	-26.40	121	308.0	QP
3	386.82	27.46	-8.2	19.26	46	-26.74	109	95.0	QP
4	546.87	28.4	-5.4	23	46	-23.00	112	287.0	QP
5	766.50	28.46	-1.8	26.66	46	-19.34	101	21.0	QP
6	948.03	26.88	2.4	29.28	46	-16.72	105	78.0	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	70.87	29.66	-16.9	12.76	40	-27.24	100	204	QP
2	169.95	30.03	-12.4	17.63	43.5	-25.87	121	225	QP
3	296.75	28.57	-10.1	18.47	46	-27.53	124	258	QP
4	472.73	28.57	-6.4	22.17	46	-23.83	108	121	QP
5	612.69	28.83	-4.2	24.63	46	-21.37	111	0	QP
6	959.81	27.42	2.7	30.12	46	-15.88	118	246	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	115.91	28.98	-11.5	17.48	43.5	-26.02	101	167	QP
2	199.05	27.57	-10.9	16.67	43.5	-26.83	120	158	QP
3	366.72	28.27	-8.6	19.67	46	-26.33	118	146	QP
4	558.65	29.21	-5.2	24.01	46	-21.99	106	39	QP
5	767.89	28.94	-1.8	27.14	46	-18.86	102	18	QP
6	896.07	31.06	1.0	32.06	46	-13.94	105	5	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	70.87	30.24	-16.9	13.34	40	-26.66	102	175	QP
2	192.82	28.59	-12.2	16.39	43.5	-27.11	111	12	QP
3	454.02	28.79	-6.7	22.09	46	-23.91	105	135	QP
4	537.86	28.47	-5.5	22.97	46	-23.03	109	318	QP
5	755.42	28.78	-2.1	26.68	46	-19.32	113	216	QP
6	950.11	26.55	2.5	29.05	46	-16.95	118	338	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	Limit	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
				(dBµV/m)					
1	30.69	27.17	-4.1	23.07	40	-16.93	108	112	QP
2	113.83	28.67	-11.8	16.87	43.5	-26.63	120	91	QP
3	199.05	27.18	-10.9	16.28	43.5	-27.22	114	190	QP
4	467.88	28.24	-6.5	21.74	46	-24.26	106	313	QP
5	634.86	28.76	-3.9	24.86	46	-21.14	117	116	QP
6	853.80	27.44	0.0	27.44	46	-18.56	101	308	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	Limit	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
				(dBµV/m)					
1	32.07	27.35	-5.1	22.25	40	-17.75	105	302	QP
2	71.57	29.87	-16.9	12.97	40	-27.03	118	327	QP
3	201.82	27.96	-11.2	16.76	43.5	-26.74	104	21	QP
4	273.88	28.7	-10.5	18.2	46	-27.8	106	3	QP
5	728.40	29.47	-2.6	26.87	46	-19.13	113	306	QP
6	956.35	26.6	2.6	29.2	46	-16.80	121	294	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	2402.31	97.51	-5.2	92.31	NA	NA	102	65	PK
2	2402.31	94.73	-5.2	89.53	NA	NA	121	65	Ave
3	4803.65	44.73	0.6	45.33	74	-28.67	100	299	PK
4	4803.65	35.83	0.6	36.43	54	-17.57	103	299	Ave
5	17960.39	34.93	23	57.93	74	-16.07	118	169	PK
6	17960.39	27.36	23	50.36	54	-3.64	109	169	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	2402.30	92.29	-5.2	87.09	NA	NA	100	176	PK
2	2402.30	86.49	-5.2	81.29	NA	NA	106	176	Ave
3	7950.36	39.48	8.1	47.58	74	-26.42	101	45	PK
4	7950.36	29.57	8.1	37.67	54	-16.33	109	45	Ave
5	17880.03	34.53	22.5	57.03	74	-16.97	113	71	PK
6	17880.03	27.36	22.5	49.86	54	-4.14	117	71	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	2439.97	97.43	-5.1	92.33	NA	NA	100	84	PK
2	2439.97	95.35	-5.1	90.25	NA	NA	103	84	Ave
3	4883.62	43.68	0.9	44.58	74	-29.42	120	64	PK
4	4883.62	30.05	0.9	30.95	54	-23.05	108	64	Ave
5	17920.13	34.61	22.8	57.41	74	-16.59	116	250	PK
6	17920.13	27.31	22.8	50.11	54	-3.89	104	250	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	2440.38	93.67	-5.1	88.57	NA	NA	102	157	PK
2	2440.38	77.1	-5.1	72	NA	NA	110	157	Ave
3	7790.05	39.37	7.9	47.27	74	-26.73	106	287	PK
4	7790.05	29.05	7.9	36.95	54	-17.05	104	287	Ave
5	17959.74	34.79	23	57.79	74	-16.21	113	243	PK
6	17959.74	26.71	23	49.71	54	-4.29	107	243	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	2479.89	97.43	-5.1	92.43	NA	NA	102	27	PK
2	2479.89	93.97	-5.1	88.87	NA	NA	105	27	Ave
3	7929.69	39.48	8.1	47.58	74	-26.42	110	83	PK
4	7929.69	29.54	8.1	37.64	54	-16.36	106	83	Ave
5	17979.70	34.28	23.1	57.38	74	-16.62	113	9	PK
6	17979.70	26.74	23.1	49.84	54	-4.16	118	9	Ave

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

Vertical

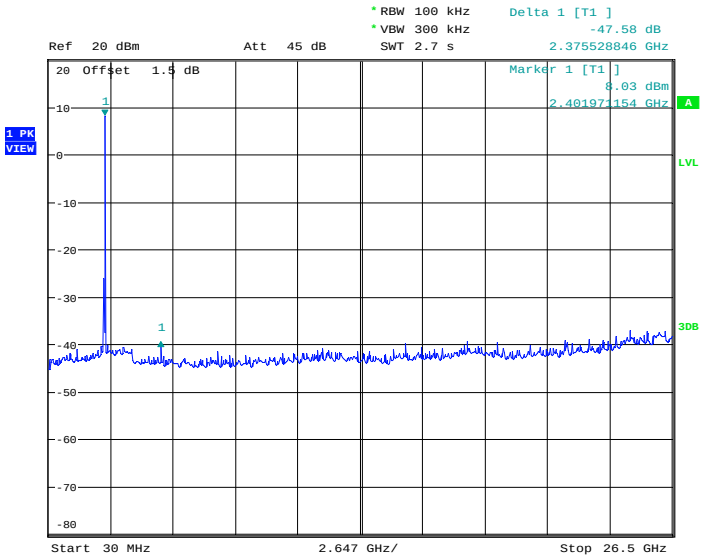
NO.	Frequency (MHz)	Reading (dBµV)	Cord. Factor (dB/m)	Result (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Ant. Height (cm)	Table Degree	Remark (PK/QP/Ave.)
1	2479.45	90.98	-5.1	85.88	NA	NA	100	141	PK
2	2479.45	83.05	-5.1	77.95	NA	NA	103	141	Ave
3	7909.72	39.42	8.1	47.52	74	-26.48	106	343	PK
4	7909.72	29.51	8.1	37.61	54	-16.39	120	343	Ave
5	17980.20	33.9	23.1	57	74	-17.00	116	34	PK
6	17980.20	26.74	23.1	49.84	54	-4.16	104	34	Ave

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

Conducted Spurious Emissions:

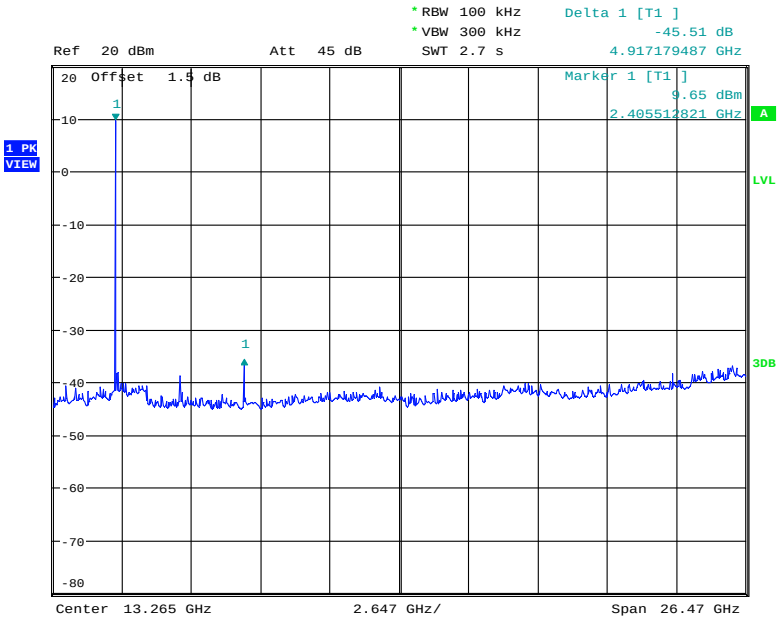
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
Low	2402	47.56	≥ 20	Compliance
Middle	2440	45.51	≥ 20	Compliance
High	2480	42.47	≥ 20	Compliance

Low Channel



Date: 16.MAR.2016 12:57:13

Middle Channel



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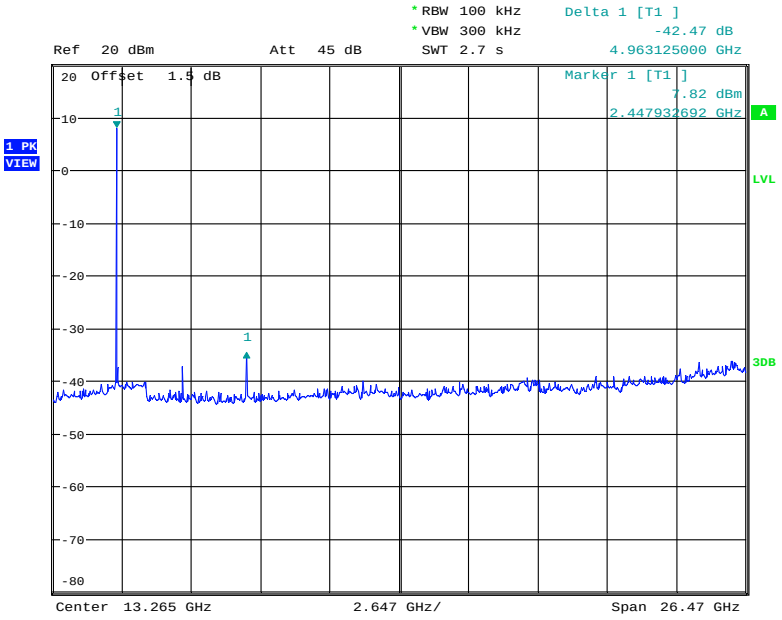
High Channel



Date: 16.MAR.2016 13:16:15

8 FCC §15.247(a)(2) & RSS-247 5.2 – 6 dB Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a) (2) and RSS-247 5.2.

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.

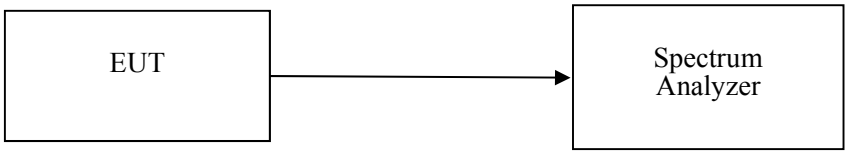
8.2 Test Procedure

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
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2016/3/9	2017/3/8

***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

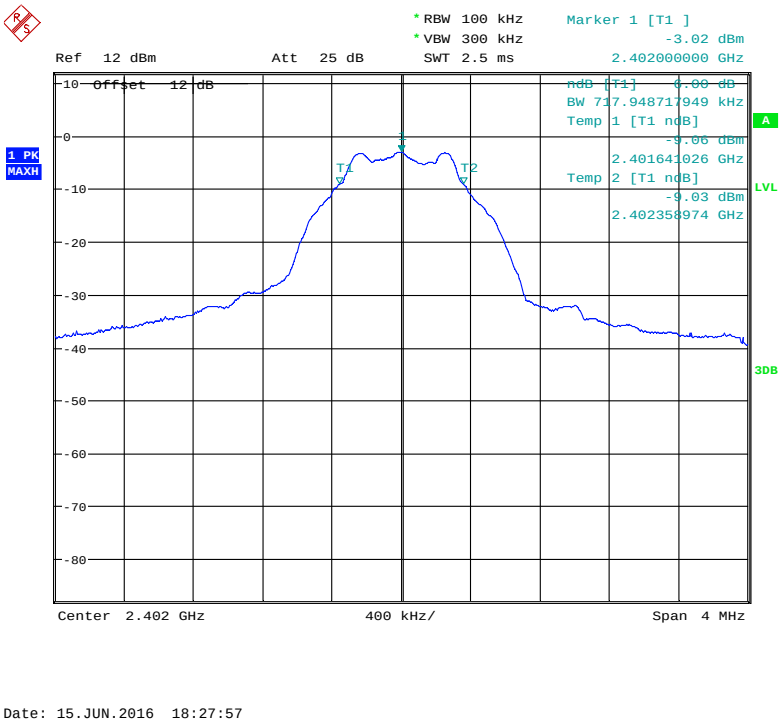
The testing was performed by David Hsu on 2016-06-15.

8.5 Test Results

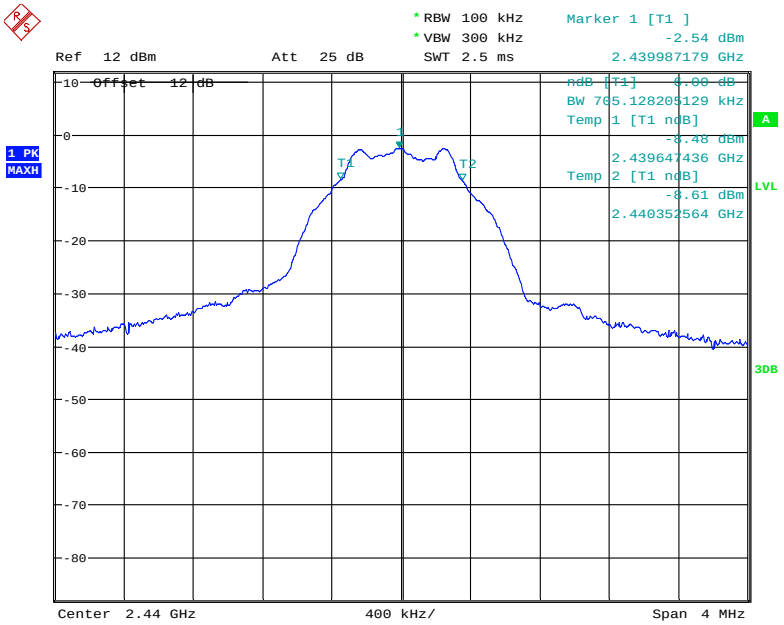
Channel	Frequency (MHz)	6 dB OBW (MHz)	Limit (MHz)	Result
Low	2402	0.72	> 0.5	Compliance
Middle	2440	0.71	> 0.5	Compliance
High	2480	0.69	> 0.5	Compliance

Please refer to the following plots

Low Channel

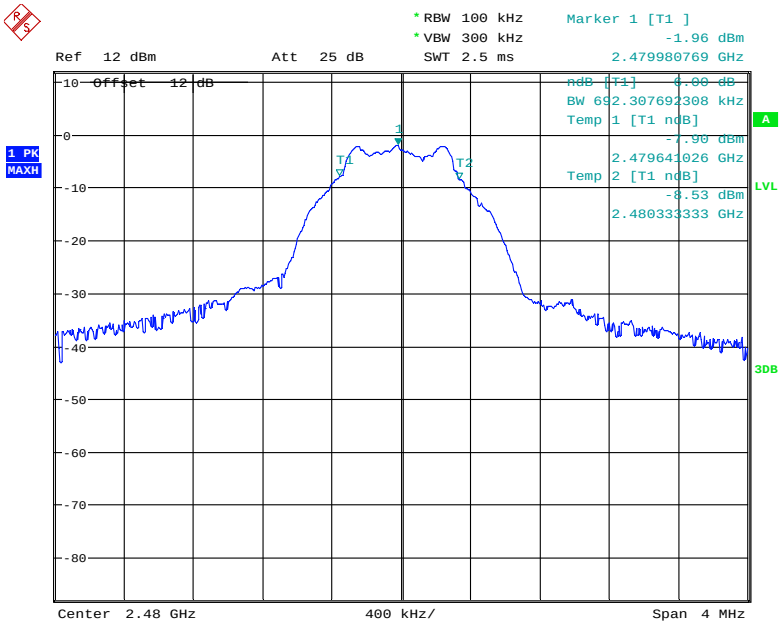


Middle Channel



Date: 15.JUN.2016 18:30:30

High Channel



Date: 15.JUN.2016 18:31:31

9 RSS-GEN 6.6 –99% Emission Bandwidth

9.1 Applicable Standard

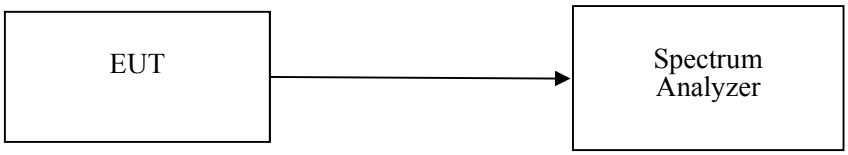
According to RSS-GEN 6.6

9.2 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 occupied bandwidth function.

3. Measure the bandwidth were 99% occupied bandwidth. Record the emission bandwidth.



9.3 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
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2016/3/9	2017/3/8

***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

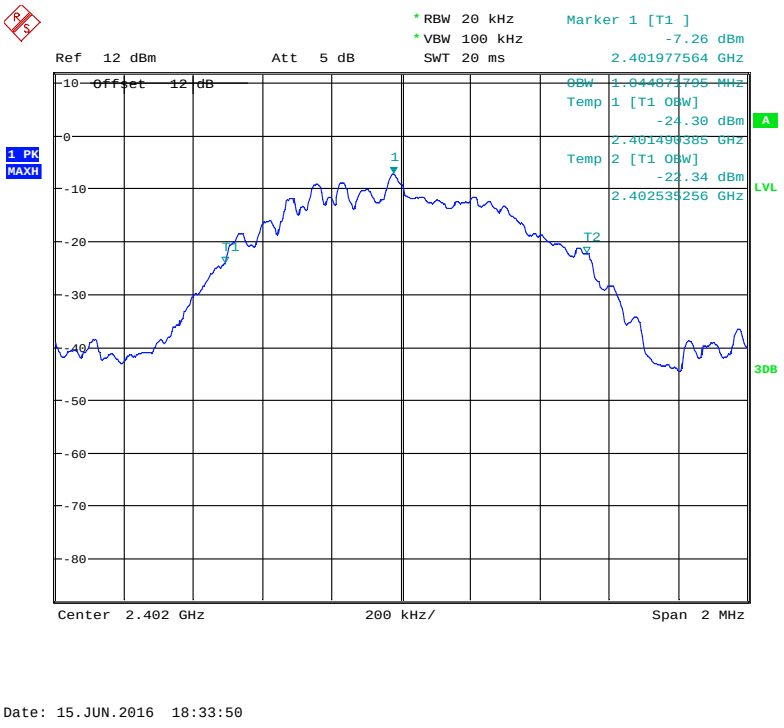
The testing was performed by David Hsu on 2016-06-15.

9.5 Test Results

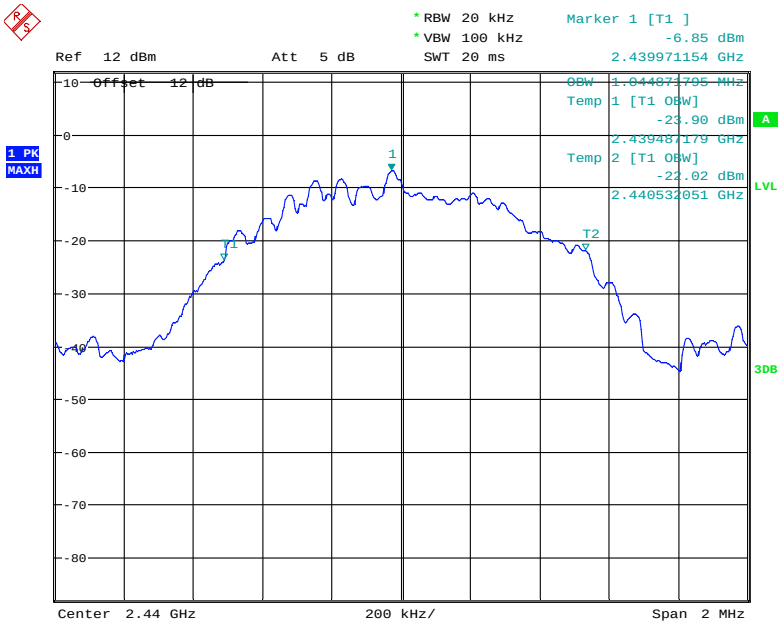
Channel	Frequency (MHz)	99% OBW (MHz)
Low	2402	1.044
Middle	2440	1.044
High	2480	1.041

Please refer to the following plots

Low Channel

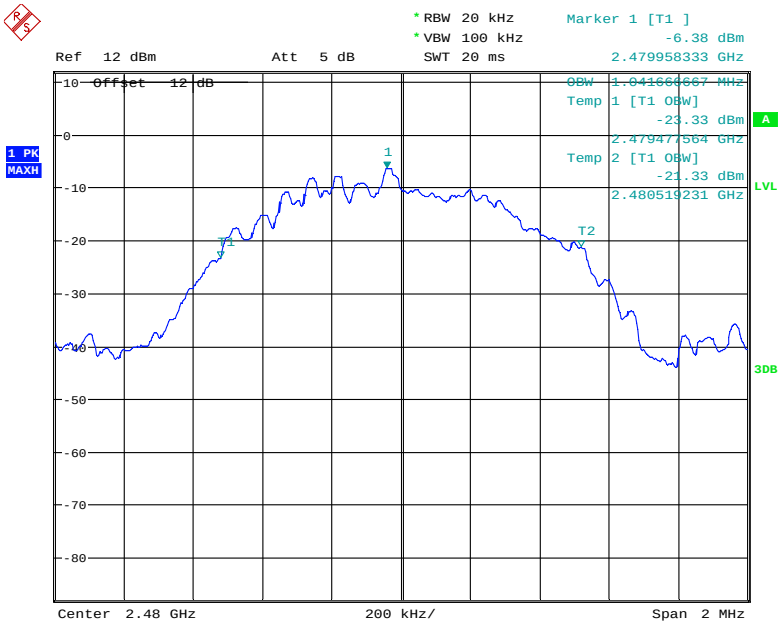


Middle Channel



Date: 15.JUN.2016 18:34:24

High Channel



Date: 15.JUN.2016 18:33:02

10 FCC §15.247(b)(3) & RSS-247 5.4(4)– Maximum Output Power

10.1 Applicable Standard

According to FCC §15.247(b) (3) and RSS-247 5.4(4).

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.

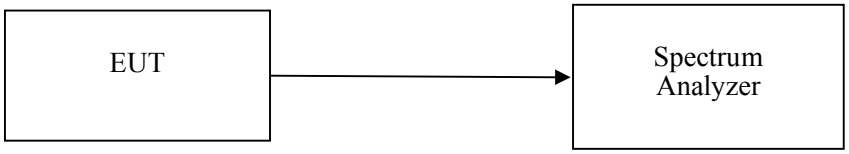
For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

10.2 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.



10.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Cable	WOKEN	SFL402	00100A1F6A192 S	2015/12/18	2016/12/17
Spectrum Analyzer	R & S	FSU26	200268	2016/5/7	2017/5/6
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2016/3/9	2017/3/8

***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 2016-08-31.

10.5 Test Results

Conducted Output power

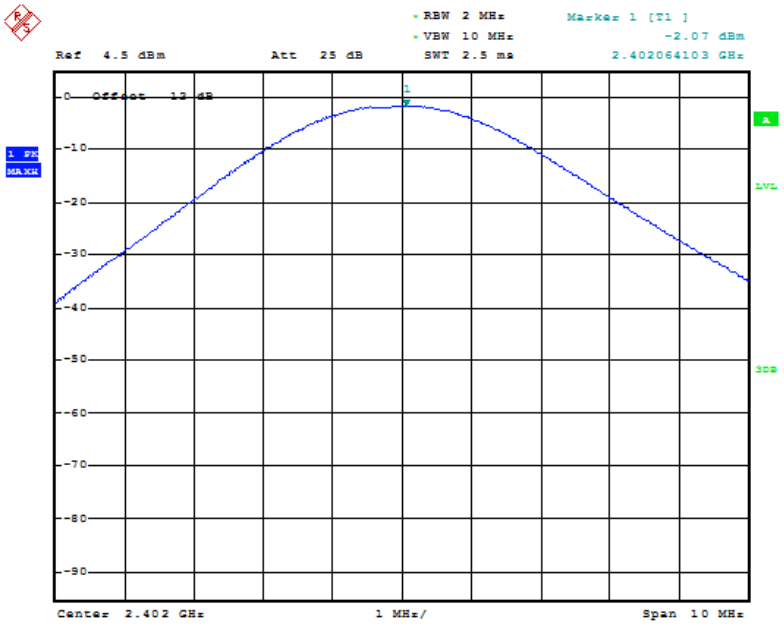
Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
Low	2402	-2.07	30	Compliance
Middle	2440	-1.40	30	Compliance
High	2480	-1.55	30	Compliance

EIRP POWER

Channel	Frequency (MHz)	EIRP Power (dBm)	Limit (dBm)	Result
Low	2402	-1.57	36	Compliance
Middle	2440	-0.90	36	Compliance
High	2480	-1.05	36	Compliance

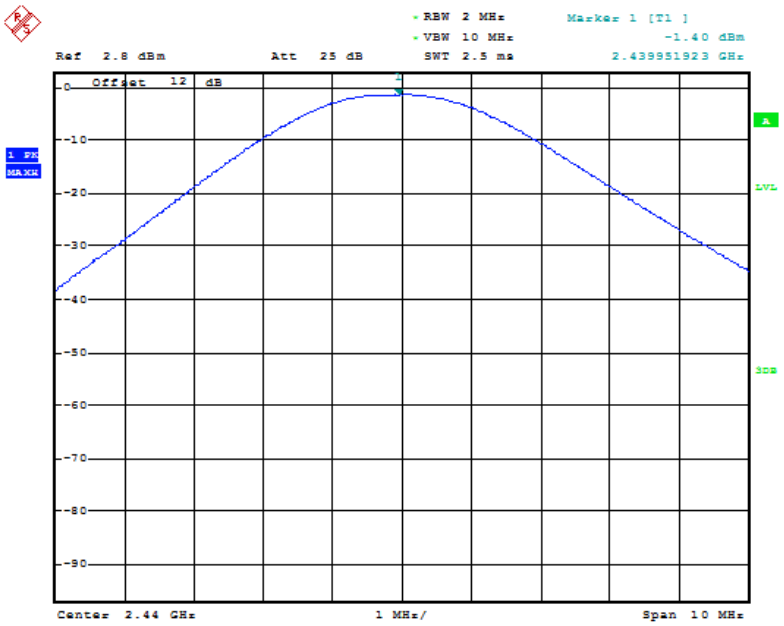
Please refer to the following plots

Low Channel



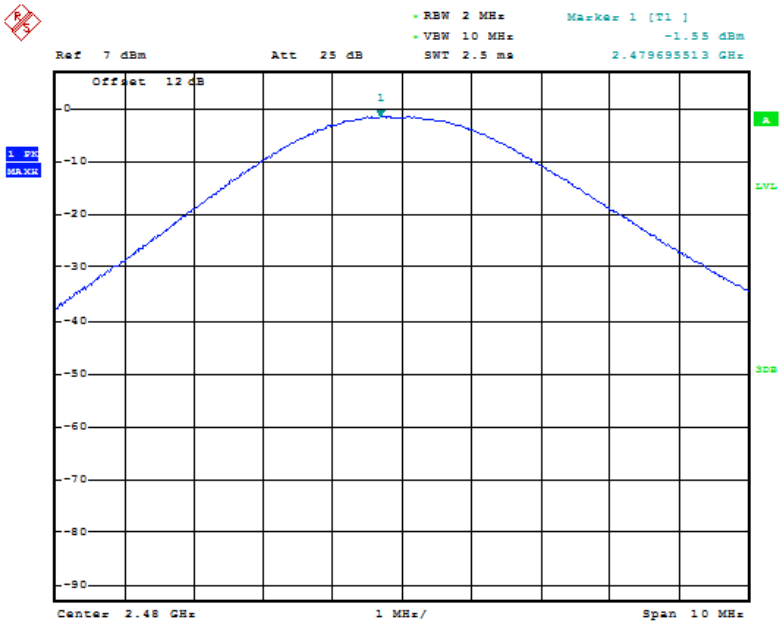
Date: 31.AUG.2016 09:39:30

Middle Channel



Date: 31.AUG.2016 09:53:46

High Channel



Date: 31.AUG.2016 09:47:30

11 FCC §15.247(d) & RSS-247 §5.5 – 100 kHz Bandwidth of Frequency Band Edge

11.1 Applicable Standard

According to FCC §15.247(d) and RSS-247 5.5.

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)).

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 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.

11.3 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
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2016/3/9	2017/3/8

***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).

11.4 Test Environmental Conditions

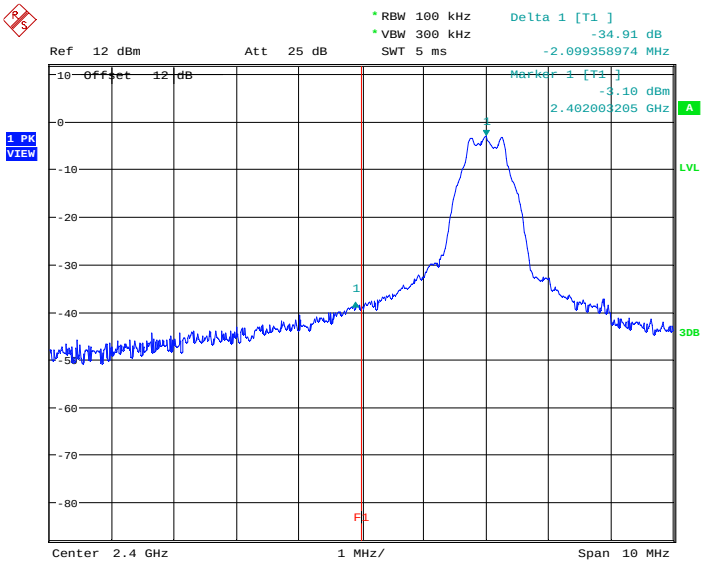
Temperature:	26° C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by David Hsu on 2016-06-15..

11.5 Test Results

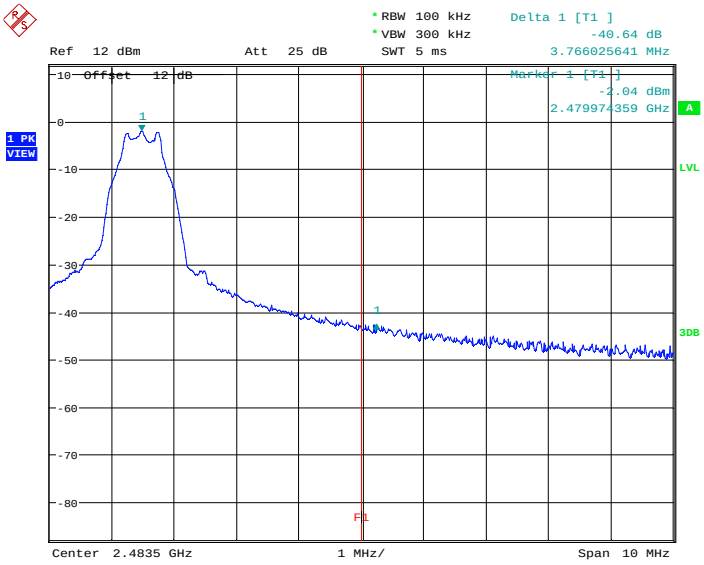
Please refer to the following plots

Band Edge, Left Side



Date: 15.JUN.2016 19:33:46

Band Edge, Right Side



Date: 15.JUN.2016 19:30:29

12 FCC §15.247(e) & RSS-247 5.2(2) – Power Spectral Density

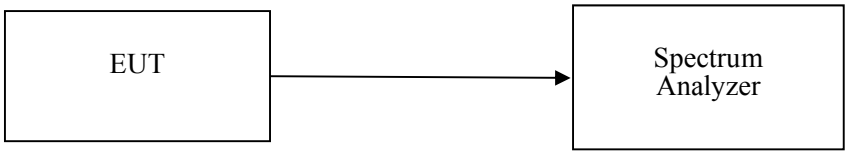
12.1 Applicable Standard

According to FCC §15.247(e) and RSS-247 5.2.

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.

12.2 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	00100A1F6A192S	2015/12/18	2016/12/17
Attenuator	MINI-CIRCUITS	BW-S10W5+	N/A	2016/3/9	2017/3/8

***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).

12.3 Test Environmental Conditions

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

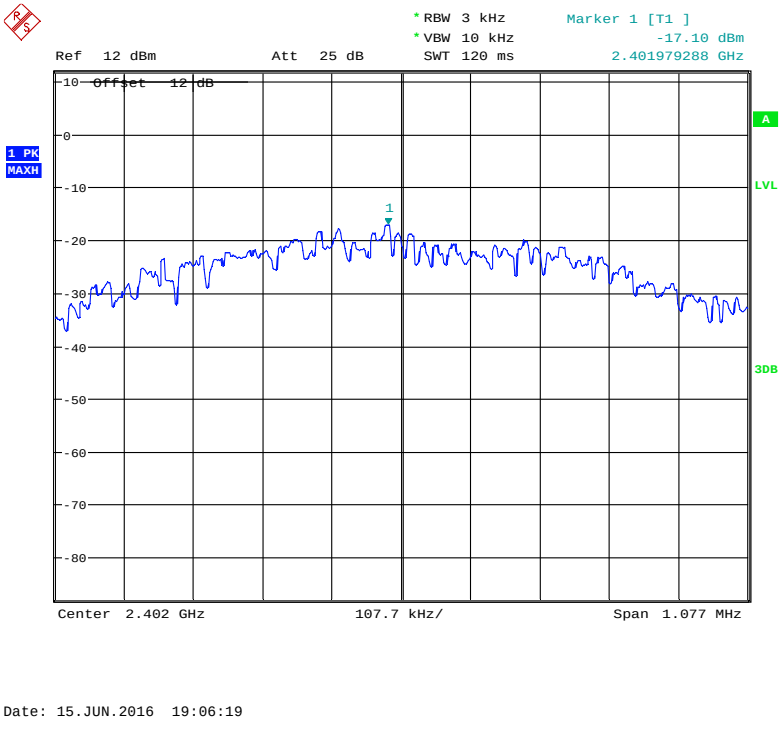
The testing was performed by David Hsu on 2016-06-15..

12.4 Test Results

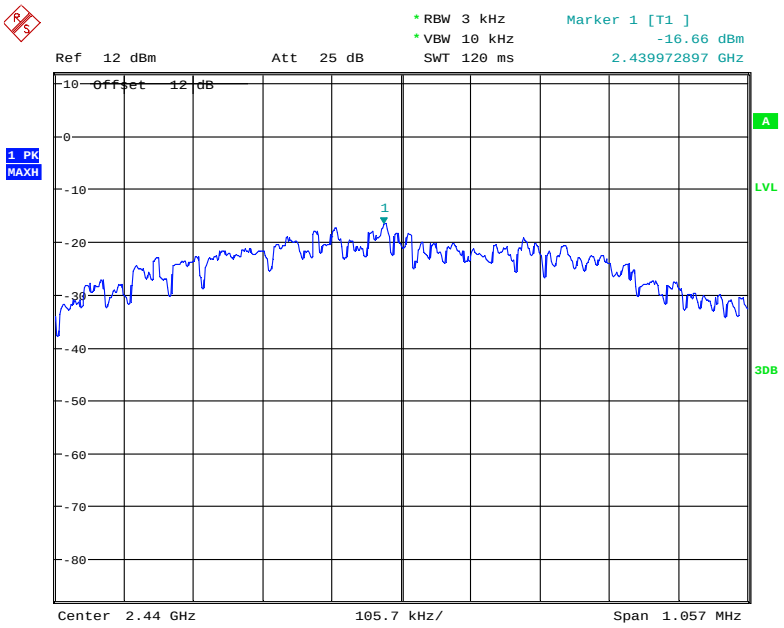
Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
Low	2402	-17.10	8	Compliance
Middle	2440	-16.66	8	Compliance
High	2480	-16.05	8	Compliance

Please refer to the following plots

Low Channel

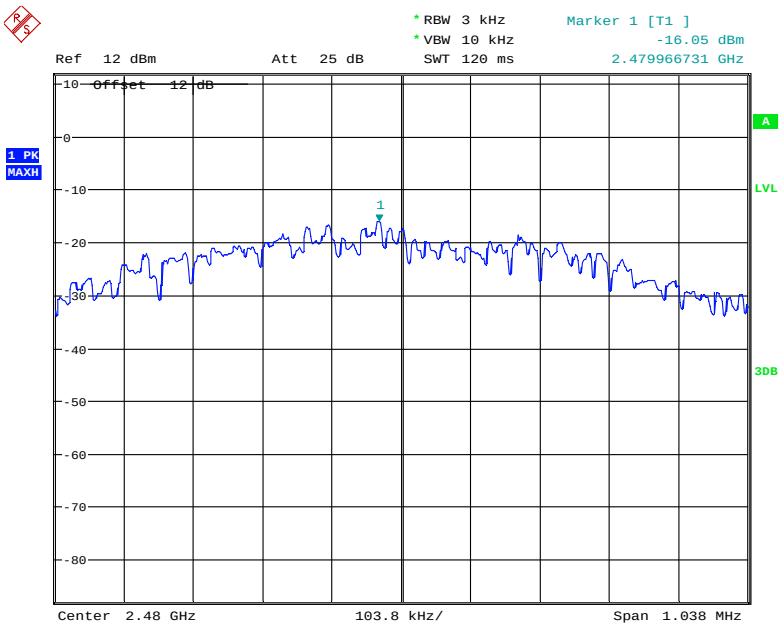


Middle Channel



Date: 15.JUN.2016 19:12:45

High Channel



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