FCC PART 15.247

TEST REPORT

For

Lumenari Technologies, Inc.

200-3071 No. 5 Road, Richmond, British Columbia, V6X 2T4,Canada

FCC ID: 2AM62SC07E26

Report Type:	**Product Name:**
Orginal Report	ELA Smart Chroma Bulb

Report Number:	RSC170804003C
Report Date:	2017-08-07
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65525123, Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Lumenari Technologies, Inc.**'s product, model number: **LUM-EAS-SC07E26 (FCC ID: 2AM62SC07E26)** or the "EUT" as referred to in this report was the **ELA Smart Chroma Bulb**.

Mechanical Description of EUT

The EUT was measured approximately: 60 mm (L) x 112 mm (H).

Rated input voltage: 100-240V~50/60Hz

**All measurement and test data in this report were gathered from final production sample, serial number: 170616003/01 (assigned by BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-06-13, and EUT complied with test requirement.*

Objective

This report is prepared on behalf of ***Lumenari Technologies, Inc.*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

None.

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.71 dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.57 dB
		V	4.81 dB
	200MHz-1GHz	H	5.69 dB
		V	6.07 dB
	1GHz-6GHz		5.49 dB
	6GHz-18GHz		5.57 dB
	18GHz-25GHz		5.48 dB
Conducted RF Power			±0.61dB
Power Spectrum Density			±0.61dB
Occupied Bandwidth			±5%
Humidity			±5%
Temperature			±1℃

Test Methodology

All measurements contained in this report were conducted with:

1. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

2. KDB558074 D01 DTS Meas Guidance v04.

Test Facility

The test site used by BACL to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL 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, The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014. The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332.

BACL's test facility has been fully described in reports on file and registered with the Innovation, Science and Economic Development Canada under Registration Numbers: 3062C-1.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in testing mode, which was provided by manufacturer.

For Zigbee mode, 15 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	-	-

EUT was tested with channel 11, 18 and 25.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

The software “Lettin” was used for testing, which was provided by manufacturer.

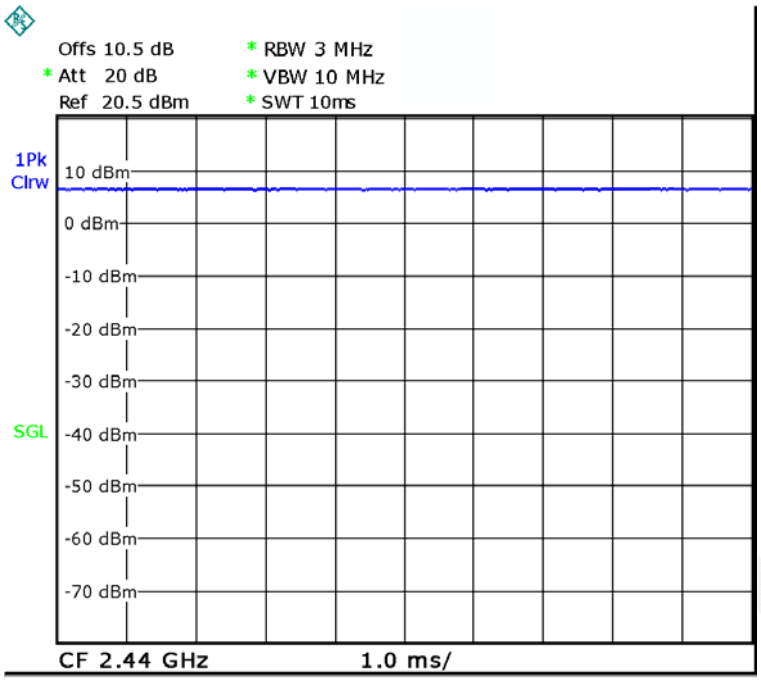
For Zigbee mode, the maximum power setting provided by the manufacturer is below:

Test Software Version	Lettin		
Test Frequency	2405 MHz	2440 MHz	2475 MHz
Data Rate	N/A	N/A	N/A
Power Level	N/A	N/A	N/A

The software configured maximum duty cycle as below:

Test Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
Zigbee	10	10	100

Duty Cycle



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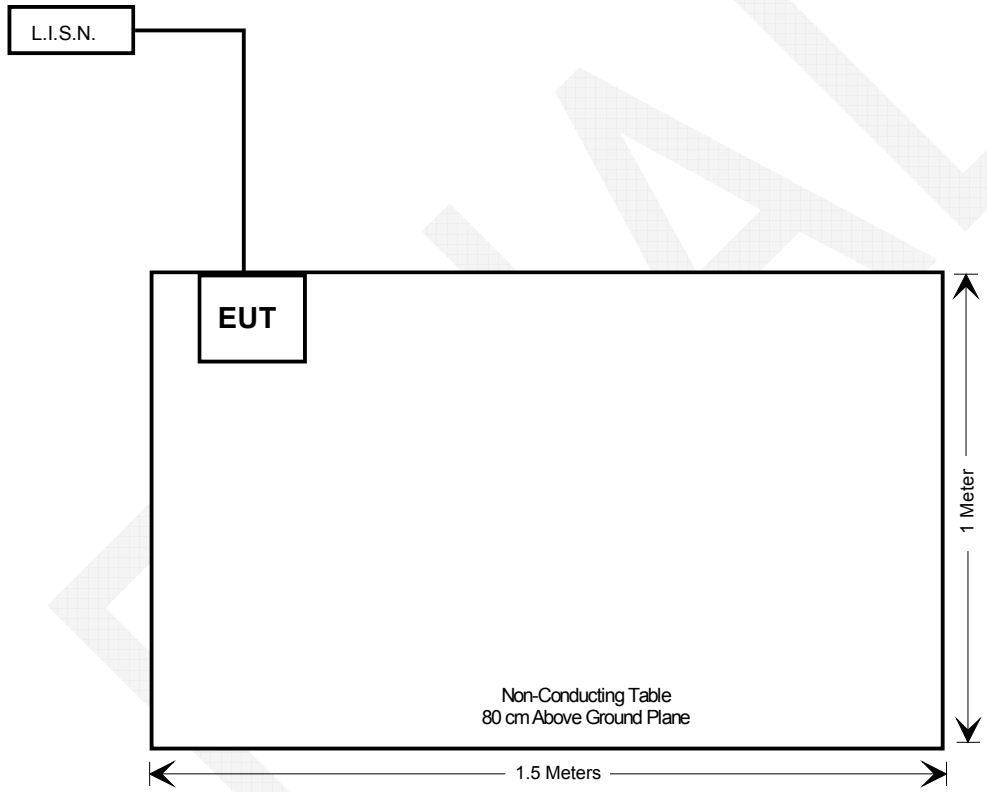
External I/O Cable

Cable Description	Length (m)	From	To
AC Power Cable	1.0	L.I.S.N.	EUT

Block Diagram of Test Setup

AC power line conducted emission test:



Test Equipments List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2017-05-20	2018-05-19
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	DE14781	2016-11-10	2017-11-09
N/A	Conducted Cable	NO.5	N/A	N/A	N/A
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emissions Test					
Agilent	Pre-Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2017-05-20	2018-05-19
Sunol Sciences	Broadband Antenna	JB3	A121808	2017-05-18	2020-05-17
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2017-05-18	2018-05-17
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H.Systems,inc	Horn Antenna	SAS-574	505	2016-12-02	2017-12-01
Mini-circuits	Pre-Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
Quinstar	Pre-Amplifier	QLW-18405536-JO	15964004001	2017-05-20	2018-05-19
HP	Pre-Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
INMET	Attenuator	N-6dB	/	2016-11-10	2017-11-09
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2016-12-02	2017-12-01
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2016-11-10	2017-11-09
N/A	RF Cable	NO.3	N/A	2016-11-10	2017-11-09
E-Microwave	DC Block	EMDCB-00036	OE01304225	Each Time	/
N/A	RF Cable	N/A	N/A	Each Time	/

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i), §2.1091 & §1.1307(b)(1)	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	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 conducted output power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (I), §2.1091 & §1.1307(B)(1) - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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/f²)	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

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

Where:
S = 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);

Mode	Frequency	Antenna Gain		Tune-up Conducted Power		Evaluation Distance	Power Density	Limit
	MHz	dBi	numeric	dBm	mW	cm	mW/cm^2	mW/cm^2
Zigbee	2405	0	1.0	4.50	2.82	20	0.0006	1.0

Note: The device meet FCC MPE at 20 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

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. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT have one PFC antenna, which was permanently attached and the antenna gain is 0dBi, fulfill the requirement of this section. Please refer to the EUT photos.

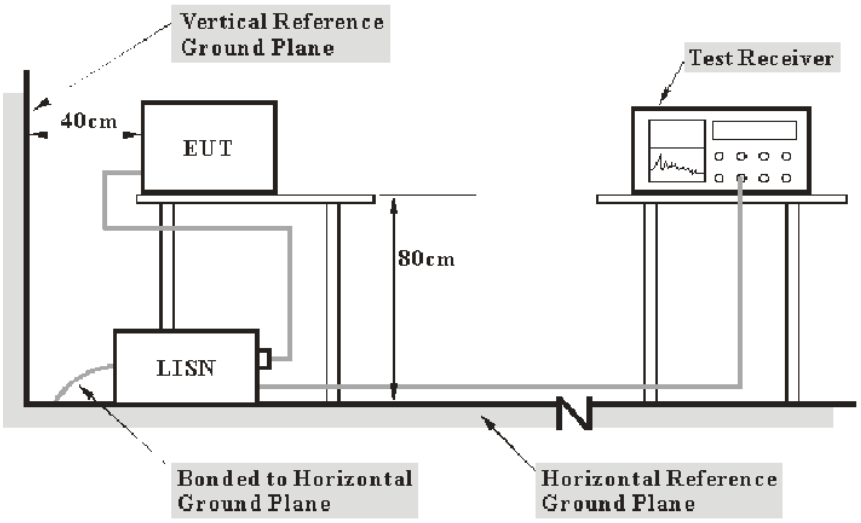
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

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.

The EUT was connected to a 120 V/60 Hz AC power source.

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

Test Procedure

During the conducted emission test, the EUT was connected to the first 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.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

The "**Margin**" 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 limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Data

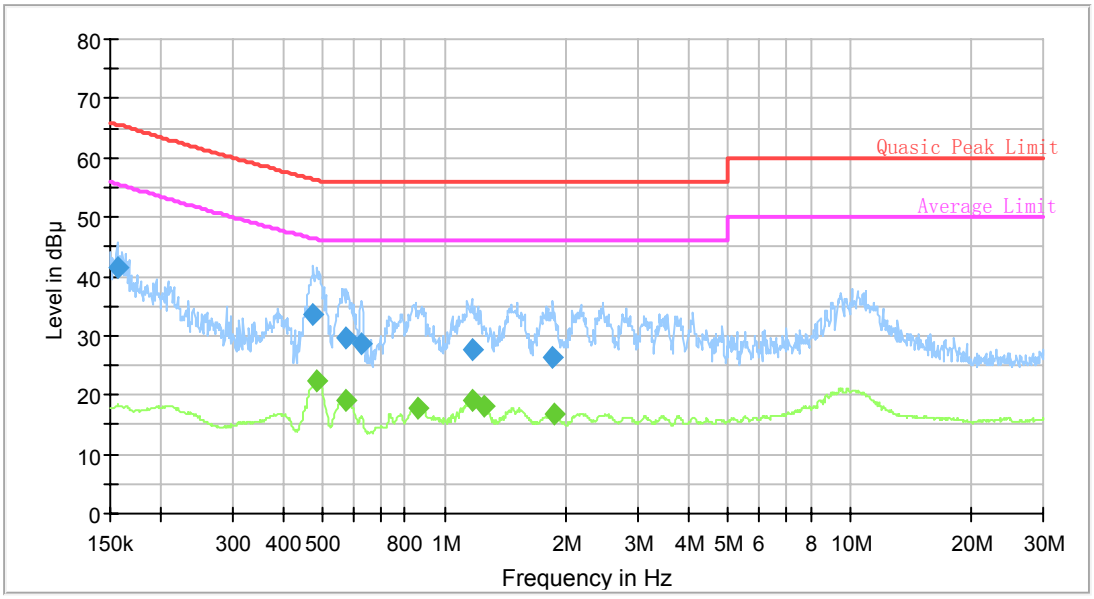
Environmental Conditions

Temperature:	28 °C
Relative Humidity:	50 %
ATM Pressure:	94.8 kPa

The testing was performed by Tom Tang on 2017-06-20.

Test Mode: Transmitting

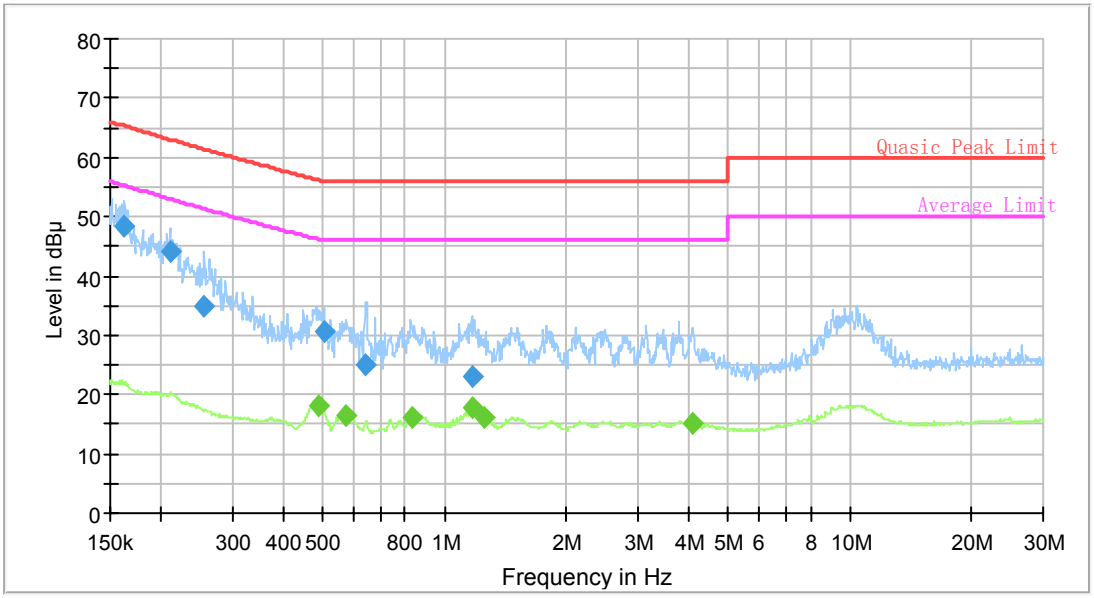
AC120V/60Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.156109	41.6	9.000	L1	19.7	24.0	65.6
0.475483	33.5	9.000	L1	19.8	22.9	56.4
0.573613	29.7	9.000	L1	19.8	26.3	56.0
0.626269	28.5	9.000	L1	19.8	27.5	56.0
1.167401	27.5	9.000	L1	19.8	28.5	56.0
1.854943	26.3	9.000	L1	19.8	29.7	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.485069	22.4	9.000	L1	19.8	23.8	46.2
0.573613	19.1	9.000	L1	19.8	26.9	46.0
0.861902	17.7	9.000	L1	19.8	28.3	46.0
1.167401	19.0	9.000	L1	19.8	27.0	46.0
1.249376	18.3	9.000	L1	19.8	27.7	46.0
1.877292	16.9	9.000	L1	19.8	29.1	46.0

AC120V/60Hz, Neutral



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.162467	48.3	9.000	N	19.6	17.0	65.3
0.210599	44.2	9.000	N	19.5	18.8	63.0
0.256100	34.8	9.000	N	19.5	26.6	61.4
0.504824	30.6	9.000	N	19.6	25.4	56.0
0.641450	25.2	9.000	N	19.5	30.8	56.0
1.167401	23.2	9.000	N	19.6	32.8	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.490913	18.2	9.000	N	19.6	28.0	46.1
0.569052	16.4	9.000	N	19.5	29.6	46.0
0.834811	16.0	9.000	N	19.5	30.0	46.0
1.167401	17.9	9.000	N	19.6	28.1	46.0
1.249376	16.3	9.000	N	19.6	29.7	46.0
4.088893	15.2	9.000	N	19.6	30.8	46.0

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

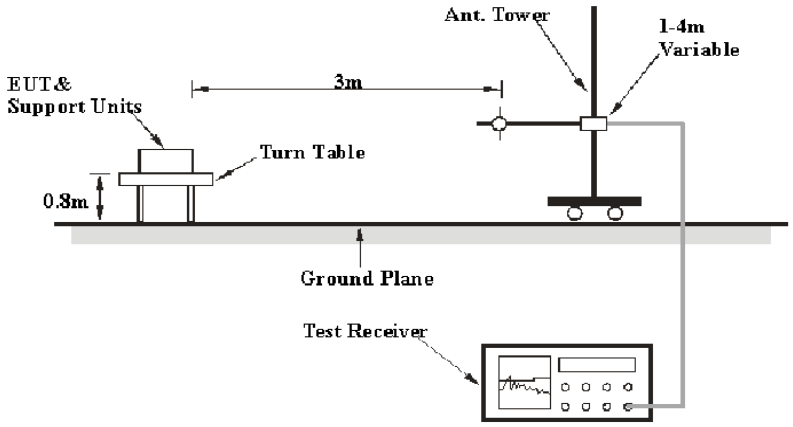
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

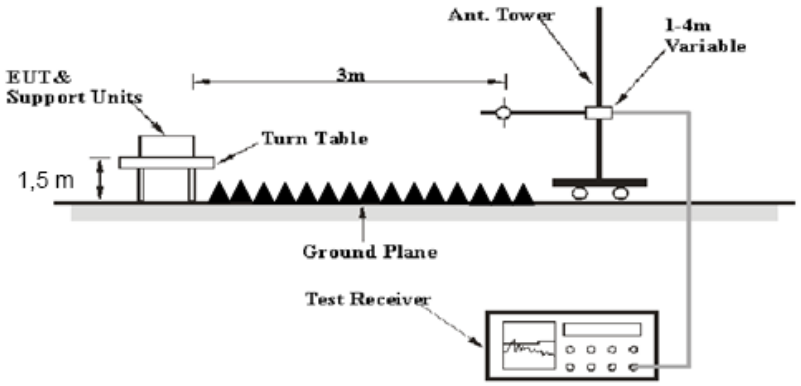
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The 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 15.209, and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The EUT was connected to a 120 V/60 Hz AC power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

Frequency Range	RBW	Video B/W	Duty Cycle	Detector
Above 1 GHz	1MHz	3 MHz	Any	PK
	1MHz	10Hz	>98%	AV
	1MHz	1/T	<98%	AV

Note: T is Transmission Duration

Test Procedure

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

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + 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 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit –Corrected Amplitude

Test Data

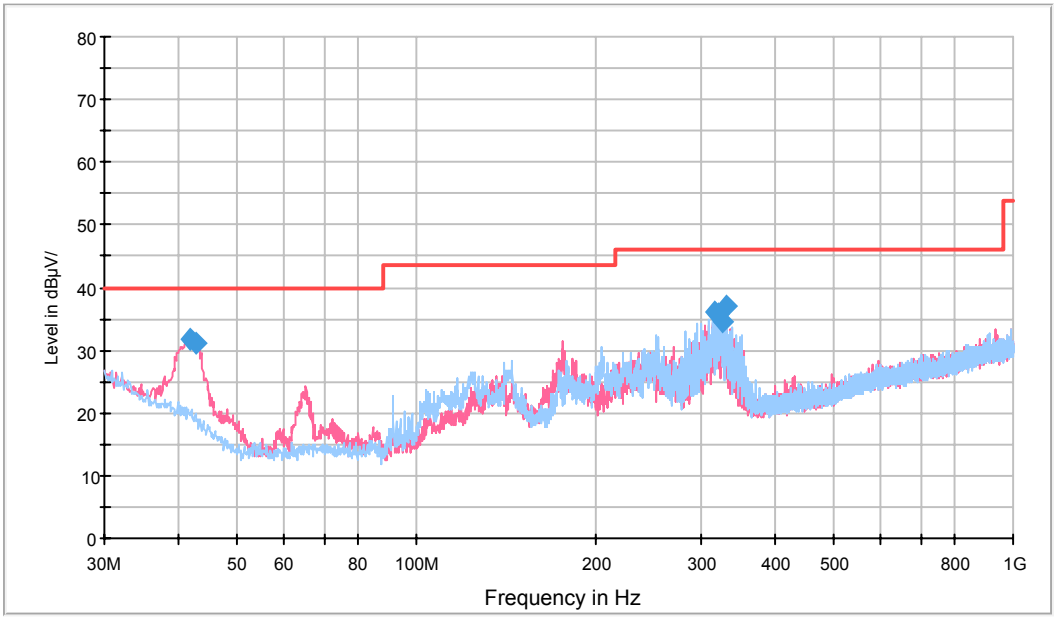
Environmental Conditions

Temperature:	28 °C
Relative Humidity:	54 %
ATM Pressure:	94.8 kPa

** The testing was performed by Tom Tang on 2017-06-20.*

Test Mode: Transmitting

30MHz-1GHz:



Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
41.640000	31.8	150.0	V	261.0	-8.2	8.2	40.0
42.610000	31.0	100.0	V	331.0	-8.8	9.0	40.0
316.998750	36.1	132.0	H	136.0	-5.6	9.9	46.0
321.000000	35.8	100.0	H	234.0	-5.6	10.2	46.0
325.001250	34.5	200.0	H	224.0	-5.5	11.5	46.0
331.427500	37.0	100.0	H	234.0	-5.4	9.0	46.0

1GHz-25GHz:

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
Low Channel: 2405 MHz									
2405	65.22	PK	H	28.72	3.00	0.00	96.94	N/A	N/A
2405	61.70	AV	H	28.72	3.00	0.00	93.42	N/A	N/A
2405	69.14	PK	V	28.72	3.00	0.00	100.86	N/A	N/A
2405	65.84	AV	V	28.72	3.00	0.00	97.56	N/A	N/A
2390	29.42	PK	V	28.67	3.00	0.00	61.09	74.00	12.91
2390	14.59	AV	V	28.67	3.00	0.00	46.26	54.00	7.74
4810	37.95	PK	V	33.87	5.12	26.87	50.07	74.00	23.93
4810	29.02	AV	V	33.87	5.12	26.87	41.14	54.00	12.86
7215	32.10	PK	V	36.40	6.17	26.35	48.32	74.00	25.68
7215	19.04	AV	V	36.40	6.17	26.35	35.26	54.00	18.74
Middle Channel: 2440 MHz									
2440	65.01	PK	H	28.82	3.00	0.00	96.83	N/A	N/A
2440	61.63	AV	H	28.82	3.00	0.00	93.45	N/A	N/A
2440	69.14	PK	V	28.82	3.00	0.00	100.96	N/A	N/A
2440	65.97	AV	V	28.82	3.00	0.00	97.79	N/A	N/A
4880	36.20	PK	V	34.06	5.09	26.87	48.48	74.00	25.52
4880	25.32	AV	V	34.06	5.09	26.87	37.60	54.00	16.40
7320	31.94	PK	V	36.55	6.22	26.40	48.31	74.00	25.69
7320	18.79	AV	V	36.55	6.22	26.40	35.16	54.00	18.84
High Channel: 2475 MHz									
2475	64.99	PK	H	28.93	2.99	0.00	96.91	N/A	N/A
2475	61.70	AV	H	28.93	2.99	0.00	93.62	N/A	N/A
2475	69.41	PK	V	28.93	2.99	0.00	101.33	N/A	N/A
2475	65.65	AV	V	28.93	2.99	0.00	97.57	N/A	N/A
2483.5	29.16	PK	V	28.95	2.99	0.00	61.10	74.00	12.90
2483.5	15.19	AV	V	28.95	2.99	0.00	47.13	54.00	6.87
4950	34.70	PK	V	34.26	5.05	26.88	47.13	74.00	26.87
4950	21.87	AV	V	34.26	5.05	26.88	34.30	54.00	19.70
7425	31.98	PK	V	36.70	6.27	26.45	48.50	74.00	25.50
7425	18.49	AV	V	36.70	6.27	26.45	35.01	54.00	18.99

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude

Spurious emissions more than 20 dB below the limit were not reported.

FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

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.

Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Data

Environmental Conditions

Temperature:	29 °C
Relative Humidity:	50 %
ATM Pressure:	94.8 kPa

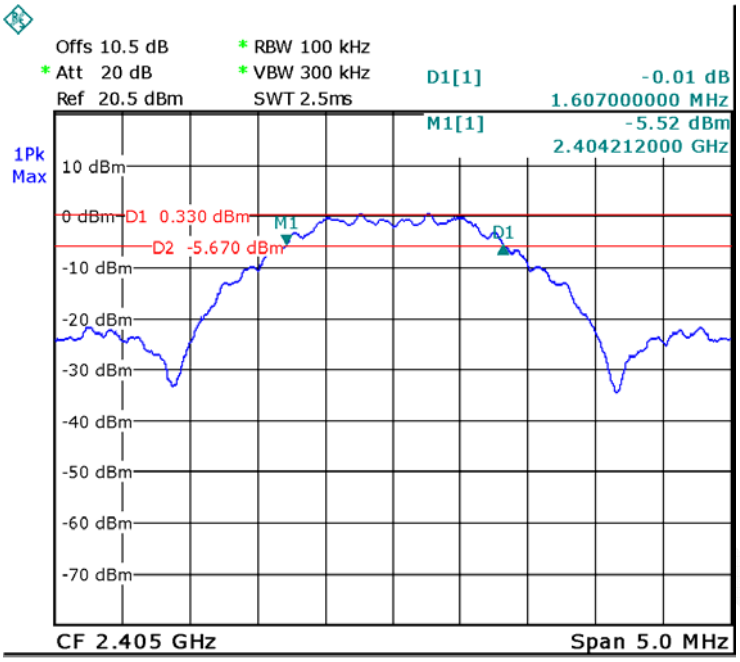
** The testing was performed by Tom Tang on 2017-06-22.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
Zigbee	Low	2405	1.607	≥0.5
	Middle	2440	1.607	≥0.5
	High	2475	1.607	≥0.5

Low Channel



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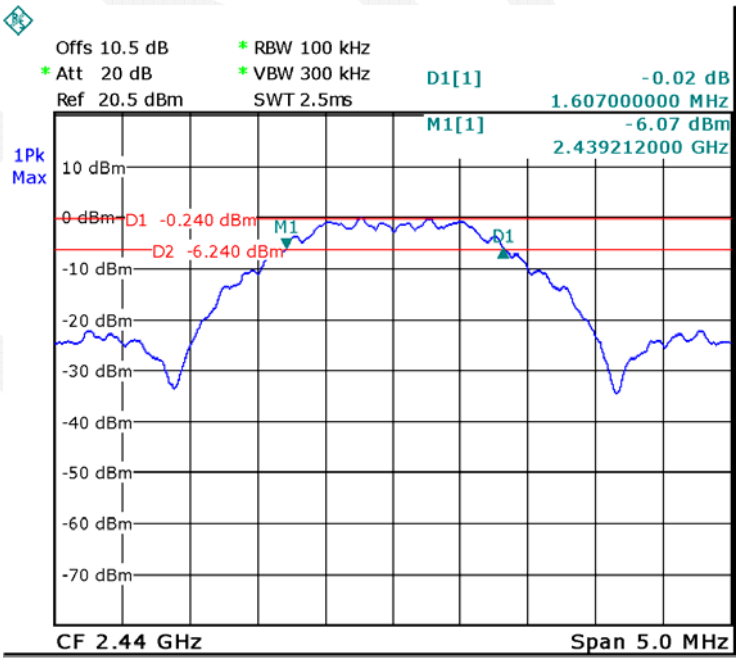
Middle Channel



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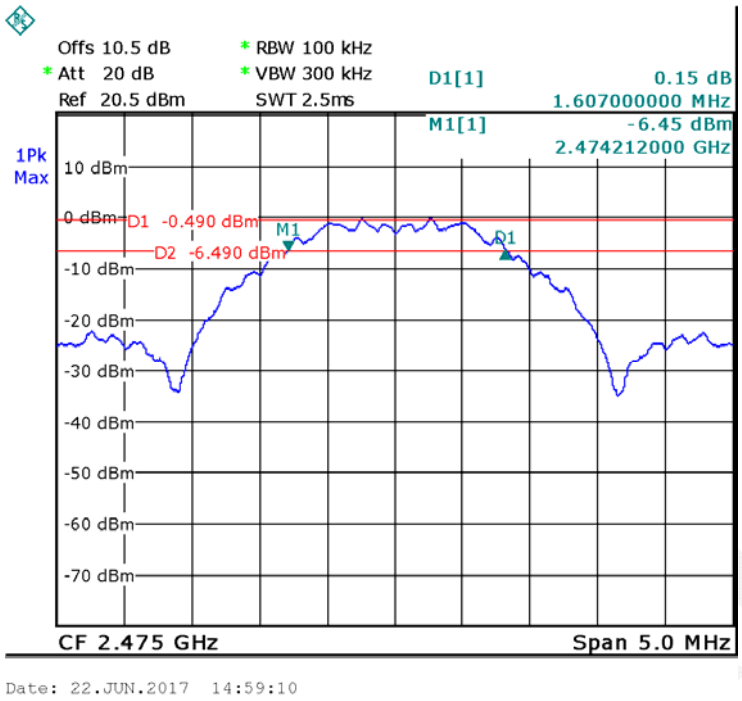
High Channel



FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for 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.

Test Procedure

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW $\geqslant$ DTS bandwidth.
b) Set VBW $\geqslant 3\times$RBW
c) Set span $\geqslant 3\times$RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level

Test Data

Environmental Conditions

Temperature:	29 °C
Relative Humidity:	50 %
ATM Pressure:	94.8 kPa

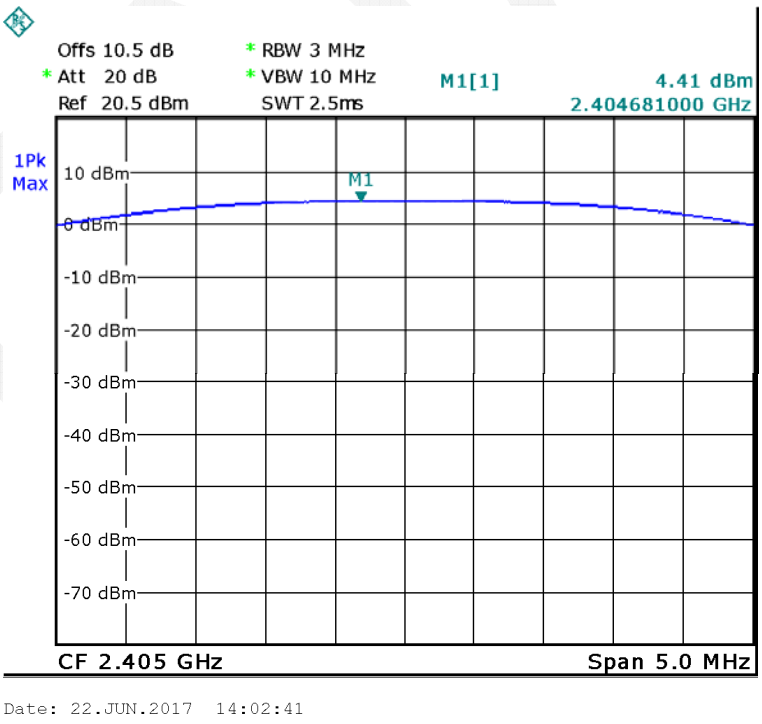
** The testing was performed by Tom Tang on 2017-06-22.*

Test Mode: Transmitting

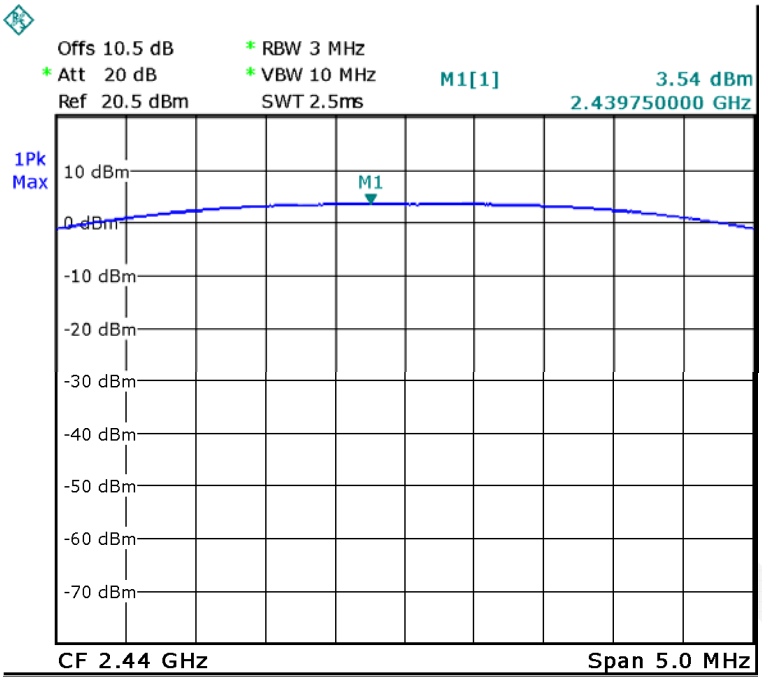
Test Result: Compliant. Please refer to the following table and plots.

Test Mode	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limits (dBm)
Zigbee	2405	4.41	⩽30
	2440	3.54	⩽30
	2475	3.36	⩽30

Low Channel



Middle Channel



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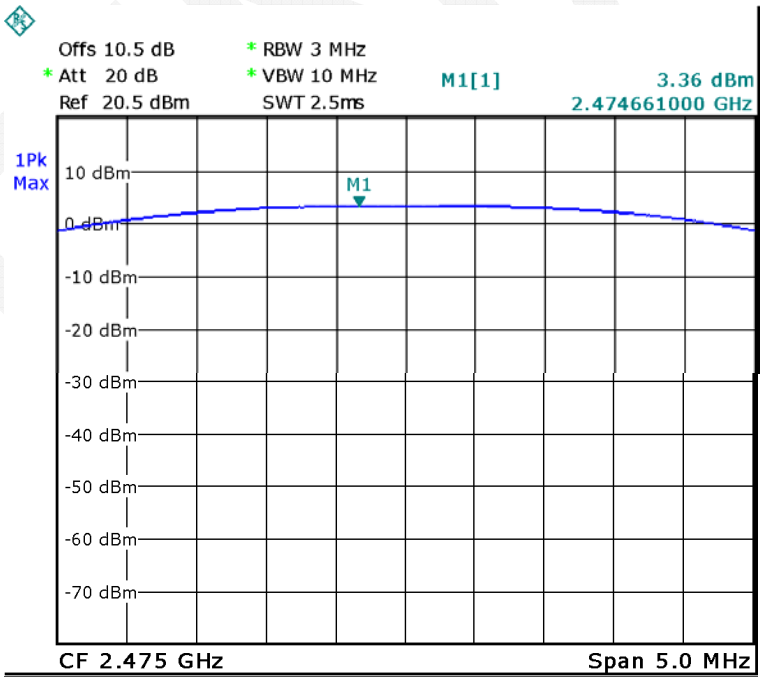
High Channel



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FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

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)).

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.

Test Data

Environmental Conditions

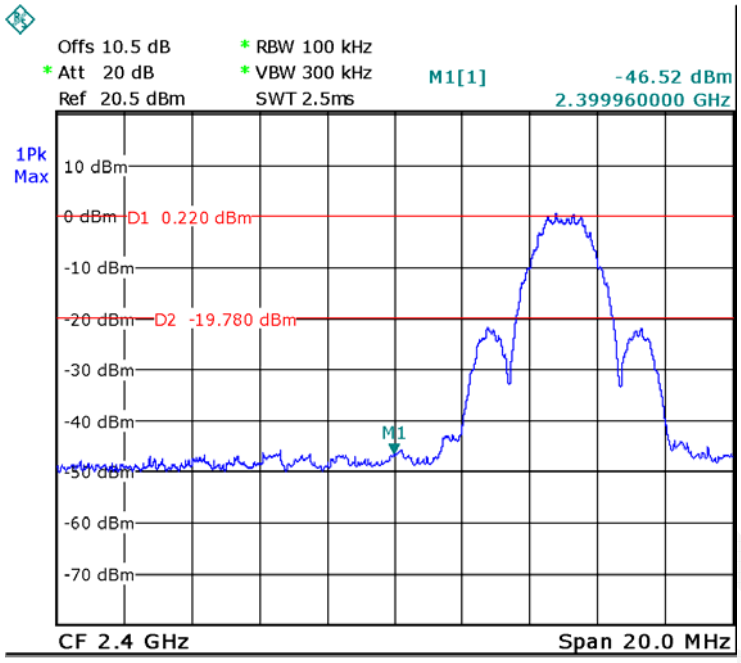
Temperature:	29 °C
Relative Humidity:	50 %
ATM Pressure:	94.8 kPa

** The testing was performed by Tom Tang on 2017-06-22.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following plots.

Band Edge, Left Side



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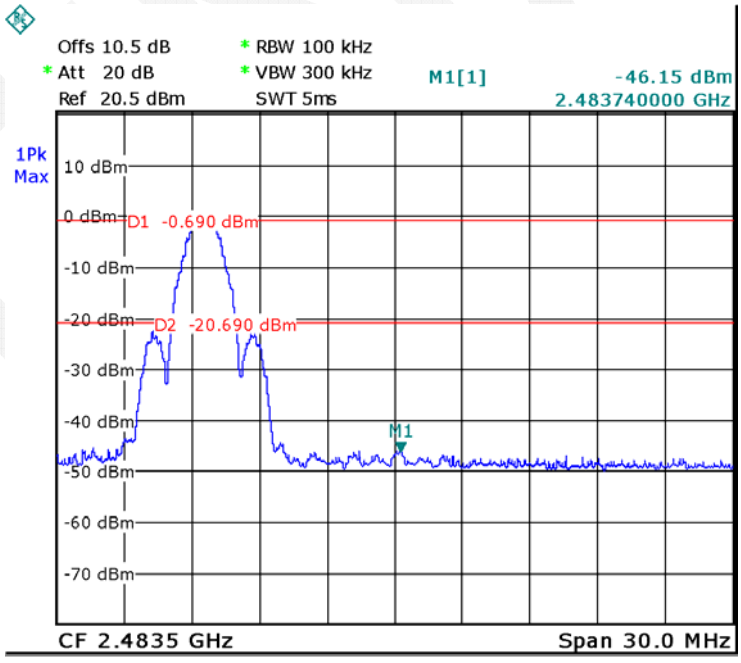
Band Edge, Right Side



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FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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.

Test Procedure

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3×RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	29 °C
Relative Humidity:	50 %
ATM Pressure:	94.8 kPa

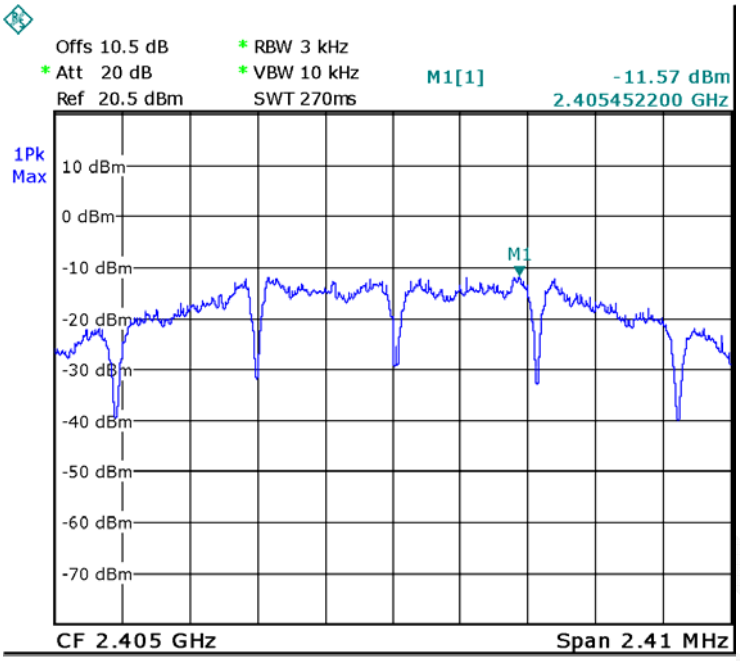
** The testing was performed by Tom Tang on 2017-06-22.*

Test Mode: Transmitting

Test Result: Compliant. Please refer to the following table and plots.

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Zigbee	Low	2405	-11.57	≤8
	Middle	2440	-11.83	≤8
	High	2475	-12.80	≤8

Power Spectral Density, Low Channel



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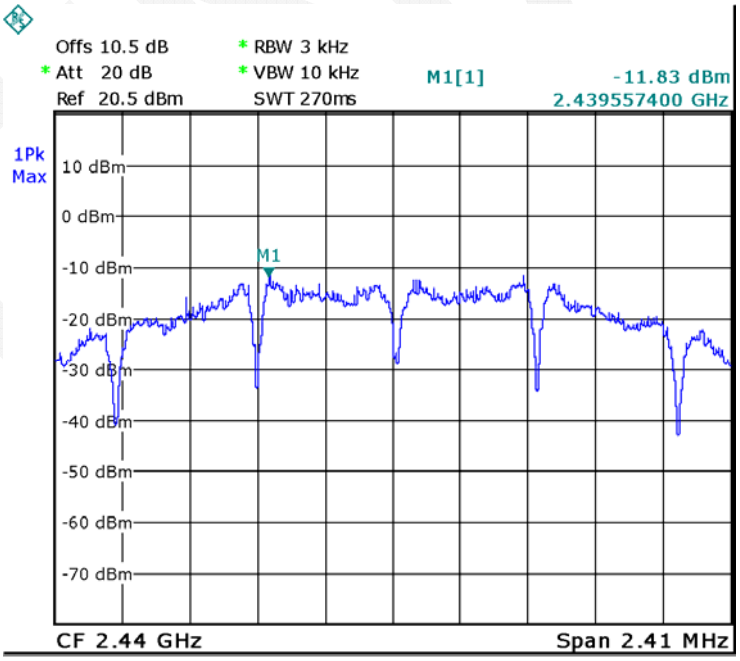
Power Spectral Density, Middle Channel



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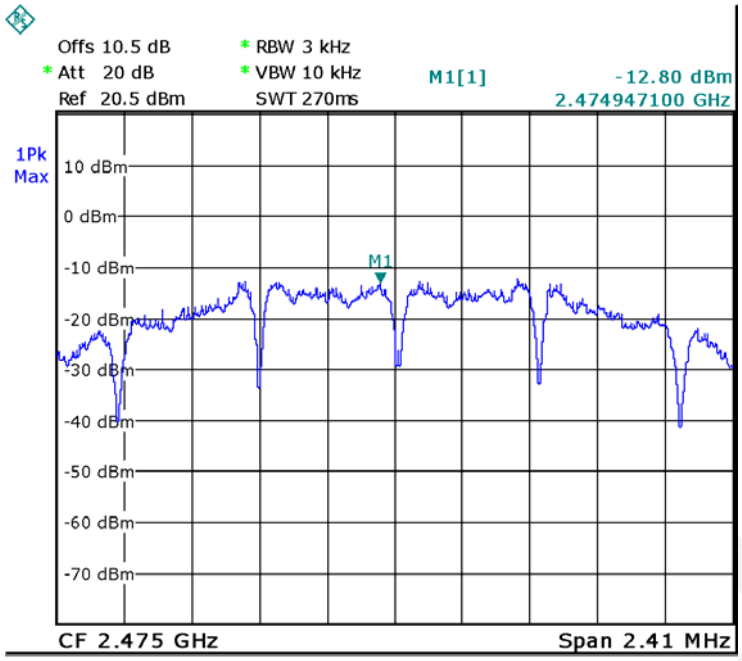
Power Spectral Density, High Channel



******* END OF REPORT *******