FCC PART 15.247

TEST REPORT

For

Beijing Jia An Electronic Technology Co,. Ltd

Northfield Telecommunications,Inc. d/b/a Advanced Wireless Communications

FCC ID: VVJ-ZB2530UPA-A

Report Type:	**Product Name:**
Original Report	Zigbee Module

Test Engineer:	Kevin Hu
Report Number:	RBJ170427050
Report Date:	2017-05-23
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: 028-65523123, Fax: 028-65525125 www.baclcorp.com

Note: This test report was 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. (Chengdu). Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This report was valid only with a valid digital signature.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Beijing Jia An Electronic Technology Co,. Ltd*** 's product, model number: ***ZB2530UPA-A (FCC ID: VVJ-ZB2530UPA-A)*** (the "EUT") in this report was a ***Zigbee Module***, which was measured approximately: 3 cm (L) × 1.4 cm (W) × 0.3 cm (H), rated input voltage: DC3.3V.

**All measurement and test data in this report was gathered from final production sample, serial number: 170427050 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-04-27, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***Beijing Jia An Electronic Technology Co,. Ltd*** 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 Rules Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No Related Submittal.

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu's measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein: ±3.17 dB.
-For of all of the Direct Antenna Conducted Emissions Tests reported herein: ±0.56 dB.

-For of all of the direct Radiated Emissions Tests reported herein are:
30 MHz to 200 MHz: ±4.7 dB;
200 MHz to 1 GHz: ±6.0 dB;
1 GHz to 6 GHz: ±5.13dB; and,
6 GHz to 40 GHz: ±5.47dB.

And the uncertainty will not be taken into consideration for all test data recorded in the report.

Test Facility

The test site used by BACL to collect test data is located in the 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 on April 24, 2015. 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. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

The device is a Zigbee module, 16 channels are provided to testing and CH11, CH18, and CH26were selected to test.

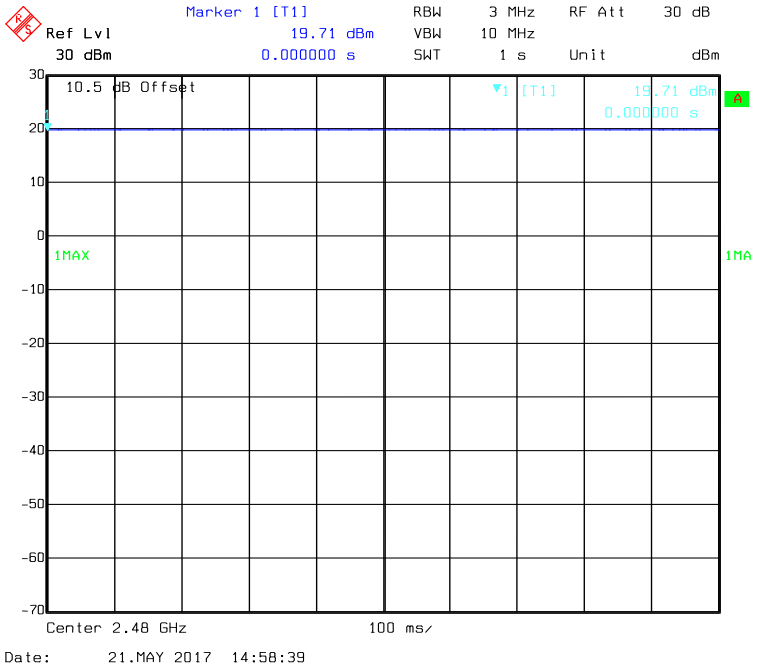
Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	2405	19	2445
12	2410	20	2450
13	2415	21	2455
14	2420	22	2460
15	2425	23	2465
16	2430	24	2470
17	2435	25	2475
18	2440	26	2480

EUT Exercise Software

The software “Tera Term” was used for testing, which was provided by manufacturer. The maximum power with maximum duty cycle was configured by system default setting.

The maximum duty cycle as following table:

Test mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
Zigbee	1000	1000	100%



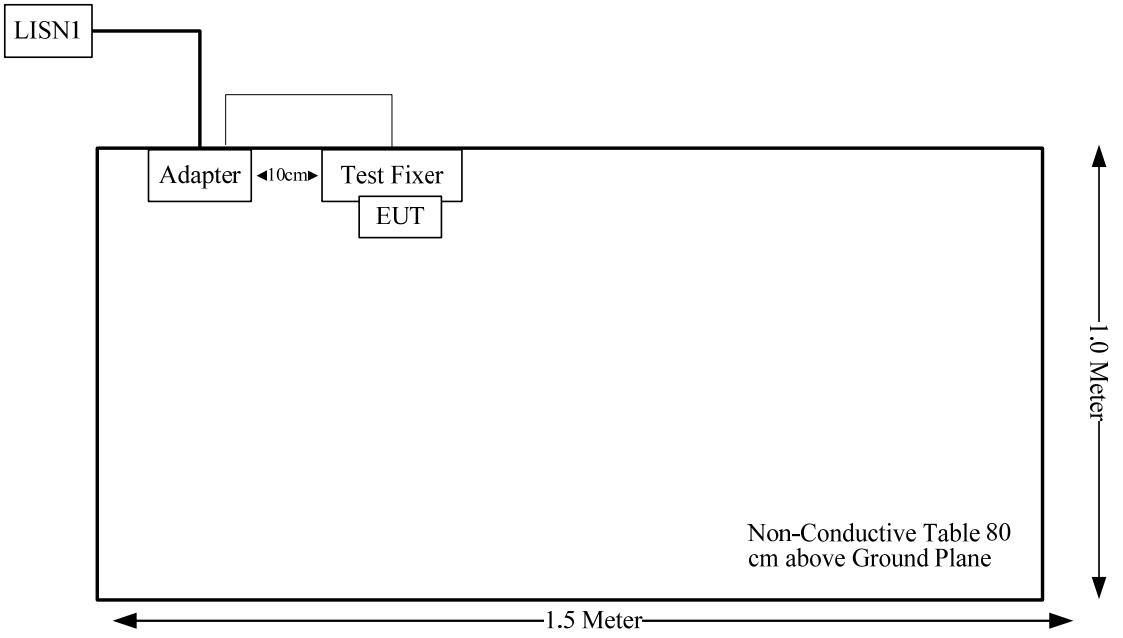
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
HUAWEI	AC Adapter	HKA01105026	0D16043312
Jia An	Test Fixer	/	/

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
Adapter Cable	No	No	1.0	USB Port of Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §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 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) & §1.1310 & §2.1091- 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
$S = PG/4\pi R^2$ = 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);

Calculated Data:

Frequency (MHz)	**Antenna Gain**		**Maximum Power including tolerance**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2405-2480	3.5	2.24	21	125.89	20.00	0.06	1.0

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥20 cm.

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 has one IPEX antenna connector, an antenna with 3.5dBi antenna gain was used for the purpose of approve, fulfill the requirement of this section. Please refer to the EUT photos.

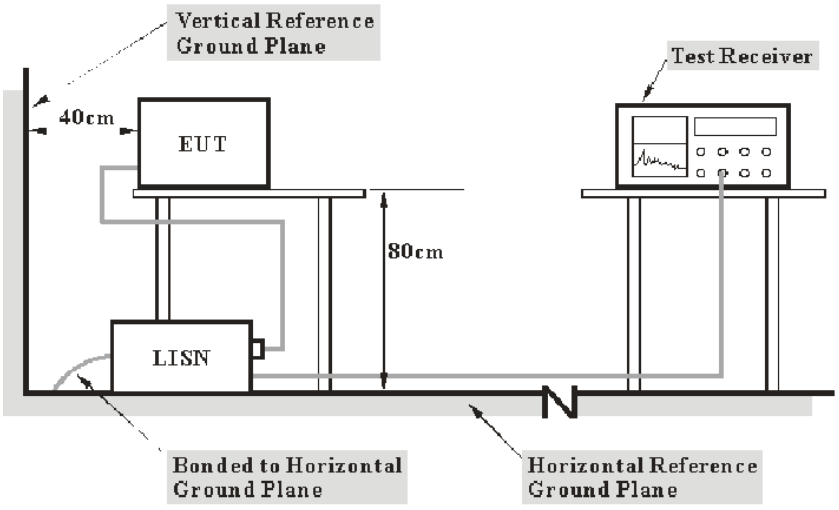
Result: Compliance.

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 spacing between the peripherals was 10 cm.

The adapter 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 adapter 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 maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2016-12-02	2017-12-01
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2016-10-31	2017-10-30
Unknown	Conducted Cable	Unknown	NO.5	2016-11-10	2017-11-09
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Data

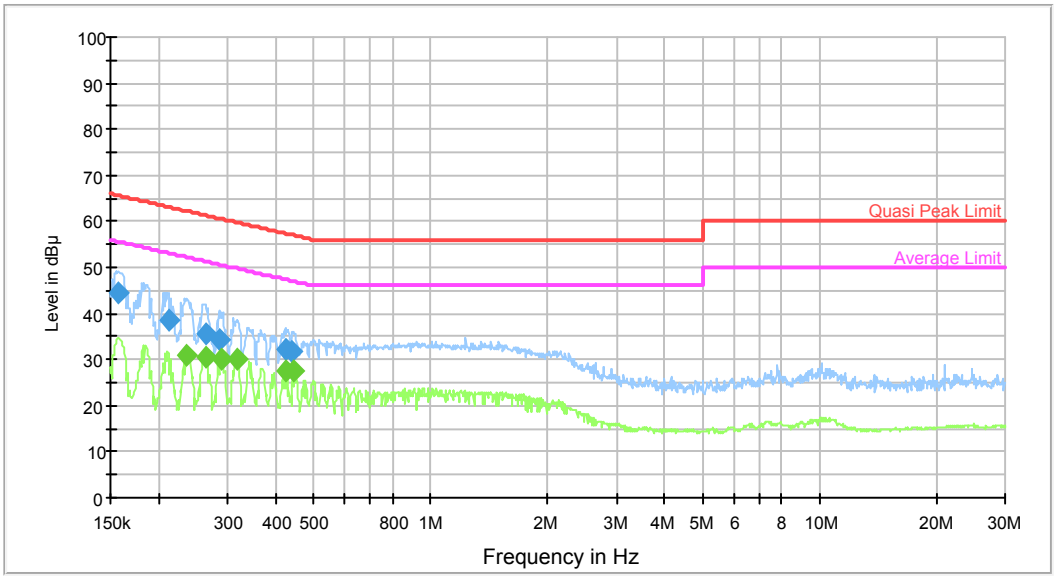
Environmental Conditions

Temperature:	24.9 °C
Relative Humidity:	54.2 %
ATM Pressure:	100.6 kPa

The testing was performed by Kevin Hu on 2017-05-19.

Test Mode: Transmitting

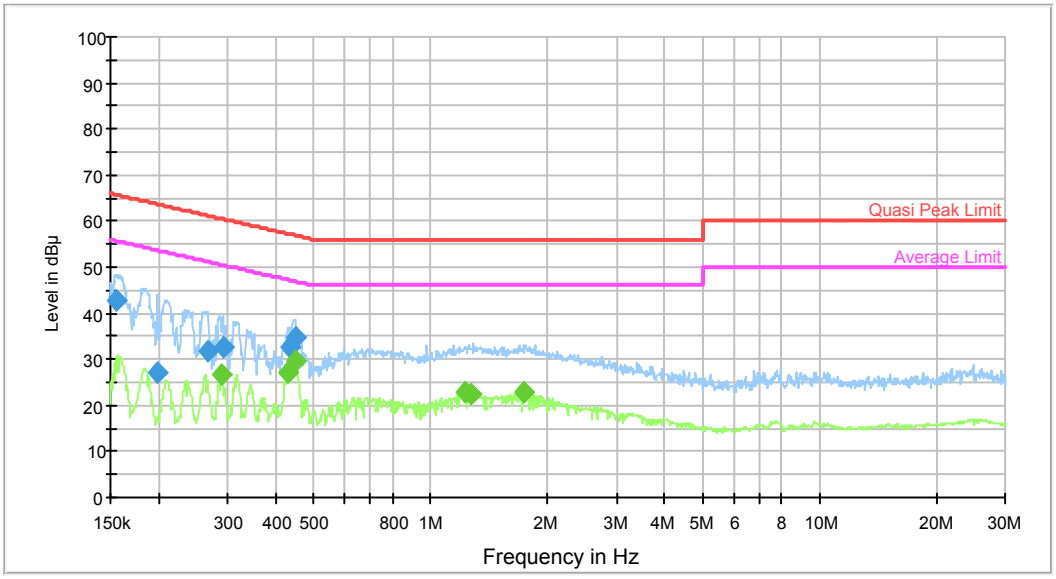
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.157361	44.3	9.000	L1	19.7	21.3	65.6	Compliance
0.211442	38.4	9.000	L1	19.6	24.8	63.1	Compliance
0.264411	35.5	9.000	L1	19.6	25.8	61.3	Compliance
0.285246	34.4	9.000	L1	19.6	26.3	60.7	Compliance
0.421816	32.1	9.000	L1	19.6	25.3	57.4	Compliance
0.440752	31.6	9.000	L1	19.6	25.4	57.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.235506	31.0	9.000	L1	19.6	21.2	52.3	Compliance
0.263357	30.5	9.000	L1	19.6	20.9	51.3	Compliance
0.289837	30.2	9.000	L1	19.6	20.3	50.5	Compliance
0.316443	30.3	9.000	L1	19.6	19.5	49.8	Compliance
0.421816	27.7	9.000	L1	19.6	19.7	47.4	Compliance
0.446062	27.6	9.000	L1	19.6	19.4	46.9	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.155487	42.6	9.000	N	19.7	23.1	65.7	Compliance
0.197569	27.0	9.000	N	19.7	36.7	63.7	Compliance
0.267596	31.8	9.000	N	19.7	29.4	61.2	Compliance
0.292161	32.6	9.000	N	19.7	27.9	60.5	Compliance
0.432041	32.6	9.000	N	19.7	24.6	57.2	Compliance
0.447846	34.7	9.000	N	19.7	22.3	56.9	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.289837	26.5	9.000	N	19.7	24.0	50.5	Compliance
0.428606	27.2	9.000	N	19.7	20.1	47.3	Compliance
0.447846	29.8	9.000	N	19.7	17.1	46.9	Compliance
1.219806	23.0	9.000	N	19.7	23.0	46.0	Compliance
1.274564	22.6	9.000	N	19.7	23.4	46.0	Compliance
1.733235	22.9	9.000	N	19.7	23.1	46.0	Compliance

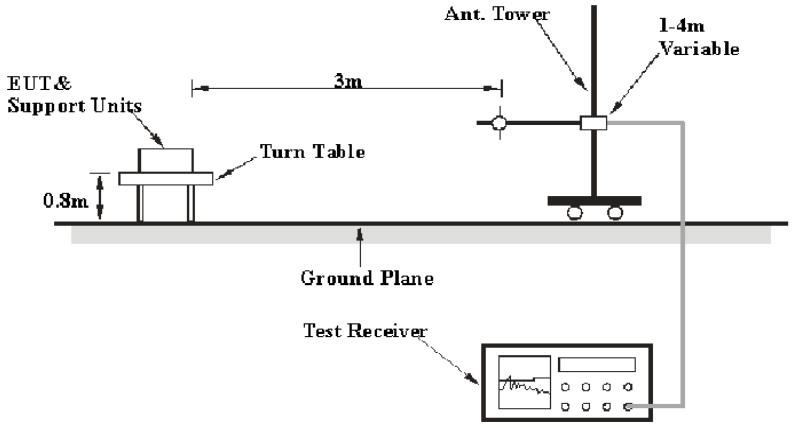
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

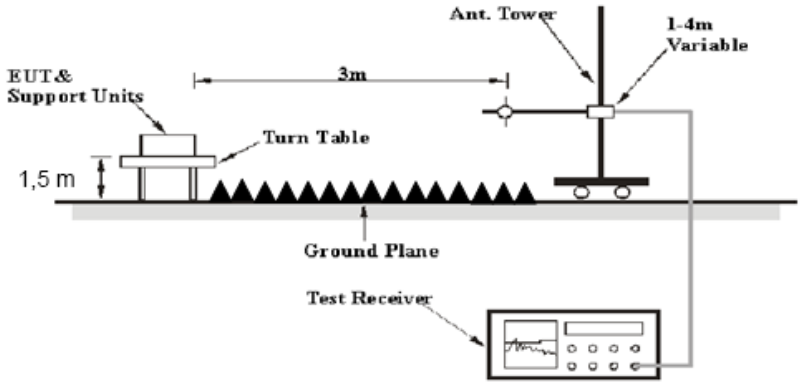
FCC §15.247 (d); §15.209; §15.205;

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 spacing between the peripherals was 10 cm.

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:

30MHz-1000MHz:

Detector	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Detector	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum 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 Loss + 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	28.9 °C
Relative Humidity:	52.6 %
ATM Pressure:	100.5kPa

** The testing was performed by Kevin Hu on 2017-05-21.*

Test Mode: Transmitting

30MHz-25GHz:

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector	Polar (H/V)	Factor (dB)					
Low Channel: 2405 MHz									
2405	87.9	PK	H	23.52	3.00	0.00	114.42	N/A	N/A
2405	85.56	AV	H	23.52	3.00	0.00	112.08	N/A	N/A
2405	92	PK	V	23.52	3.00	0.00	118.52	N/A	N/A
2405	89.57	AV	V	23.52	3.00	0.00	116.09	N/A	N/A
2390	40.9	PK	H	23.57	3.00	0.00	67.47	74.00	6.53
2390	23.7	AV	H	23.57	3.00	0.00	50.27	54.00	3.73
4810	56.17	PK	H	30.79	5.12	26.87	65.21	74.00	8.79
4810	40.9	AV	H	30.79	5.12	26.87	49.94	54.00	4.06
7215	51.47	PK	H	34.73	6.17	26.35	66.02	74.00	7.98
7215	35.05	AV	H	34.73	6.17	26.35	49.60	54.00	4.40
1978	40.19	PK	H	24.86	3.03	26.80	41.28	74.00	32.72
1978	29.84	AV	H	24.86	3.03	26.80	30.93	54.00	23.07
684.87	41.1	QP	H	20.65	1.93	28.76	34.92	46.00	11.08
836.79	43.2	QP	H	22.12	2.30	28.36	39.26	46.00	6.74
Middle Channel: 2440 MHz									
2440	86.77	PK	H	23.40	3.00	0.00	113.17	N/A	N/A
2440	84.53	AV	H	23.40	3.00	0.00	110.93	N/A	N/A
2440	90.32	PK	V	23.40	3.00	0.00	116.72	N/A	N/A
2440	88.49	AV	V	23.40	3.00	0.00	114.89	N/A	N/A
4880	40.02	PK	H	31.02	5.09	26.87	49.26	74.00	24.74
4880	22.92	AV	H	31.02	5.09	26.87	32.16	54.00	21.84
7320	47.2	PK	H	34.94	6.22	26.40	61.96	74.00	12.04
7320	35.47	AV	H	34.94	6.22	26.40	50.23	54.00	3.77
3683	50.93	PK	H	27.73	4.45	26.58	56.53	74.00	17.47
3683	34.89	AV	H	27.73	4.45	26.58	40.49	54.00	13.51
1978	40.38	PK	H	24.86	3.03	26.80	41.47	74.00	32.53
1978	29.21	AV	H	24.86	3.03	26.80	30.30	54.00	23.70
684.87	41.37	QP	H	20.65	1.93	28.76	35.19	46.00	10.81
836.79	43.34	QP	H	22.12	2.30	28.36	39.40	46.00	6.60
High Channel: 2480 MHz									
2480	86.31	PK	H	23.27	2.99	0.00	112.57	N/A	N/A
2480	84.19	AV	H	23.27	2.99	0.00	110.45	N/A	N/A
2480	89.87	PK	V	23.27	2.99	0.00	116.13	N/A	N/A
2480	86.54	AV	V	23.27	2.99	0.00	112.80	N/A	N/A
2483.5	39.76	PK	H	23.26	2.99	0.00	66.01	74.00	7.99
2483.5	22.76	AV	H	23.26	2.99	0.00	49.01	54.00	4.99
4960	46.68	PK	H	31.27	5.05	26.88	56.12	74.00	17.88
4960	34.92	AV	H	31.27	5.05	26.88	44.36	54.00	9.64
7440	49.98	PK	H	35.18	6.27	26.45	64.98	74.00	9.02
7440	34.16	AV	H	35.18	6.27	26.45	49.16	54.00	4.84
1978	39.73	PK	H	24.86	3.03	26.80	40.82	74.00	33.18
1978	28.9	AV	H	24.86	3.03	26.80	29.99	54.00	24.01
684.87	42.21	QP	H	20.65	1.93	28.76	36.03	46.00	9.97
836.79	43.76	QP	H	22.12	2.30	28.36	39.82	46.00	6.18

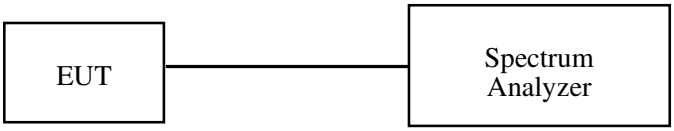
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	NO.3	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	22.6 °C
Relative Humidity:	50.1%
ATM Pressure:	100.4kPa

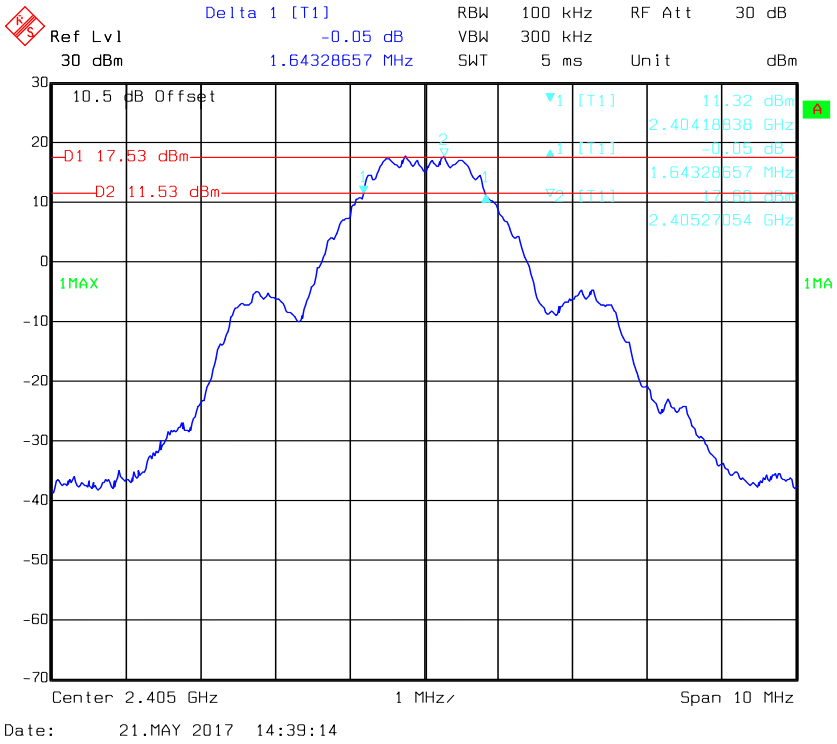
** The testing was performed by Kevin Hu on 2017-05-21.*

Test Mode: Transmitting

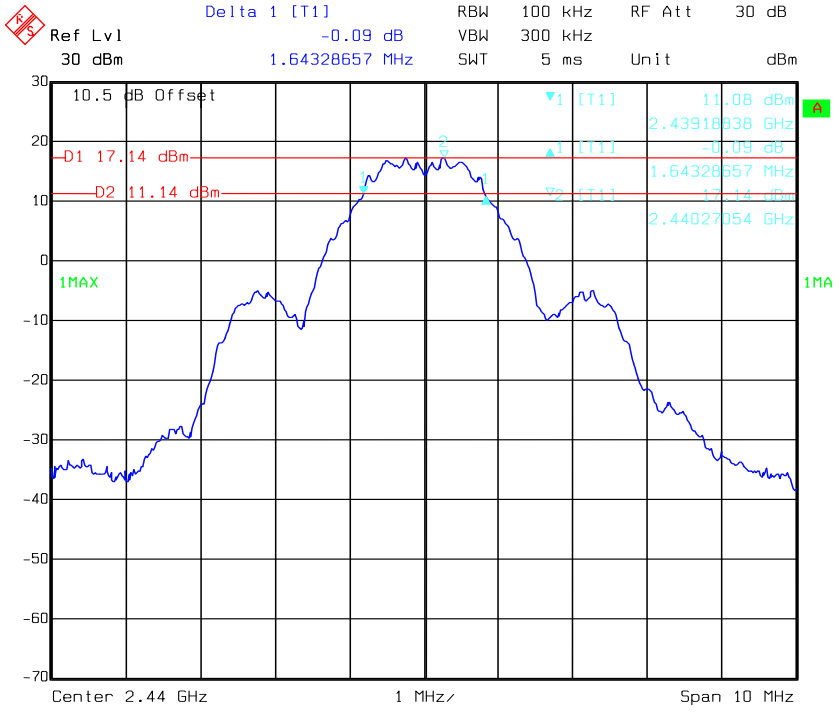
Test Result: Compliant. Please refer to the following table and plots.

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
Low	2405	1.64	≥0.5
Middle	2440	1.64	≥0.5
High	2480	1.64	≥0.5

Low Channel



Middle Channel



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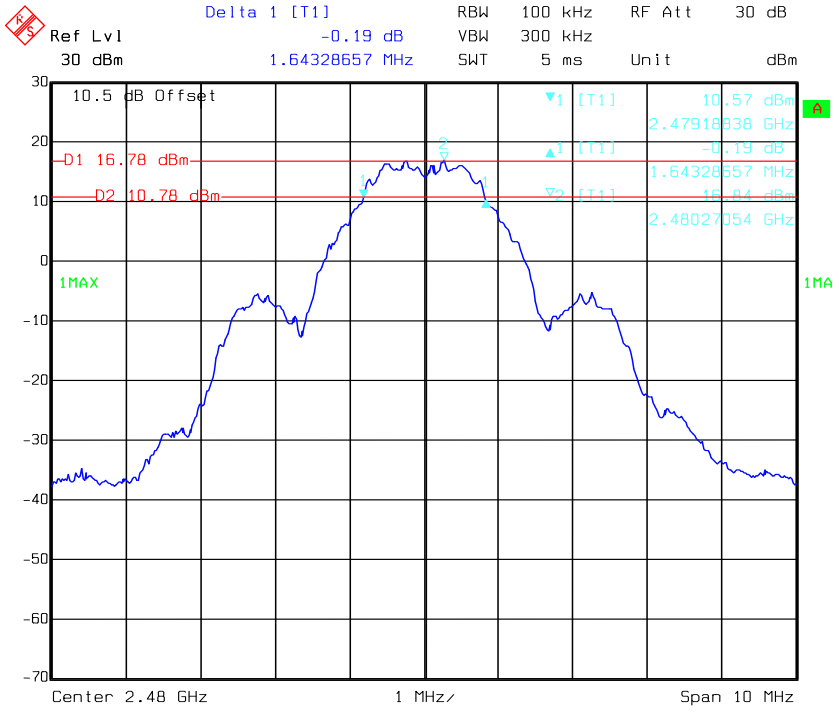
High Channel



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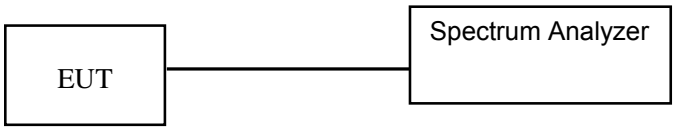
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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

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 test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	NO.3	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	22.6 °C
Relative Humidity:	50.1%
ATM Pressure:	100.4kPa

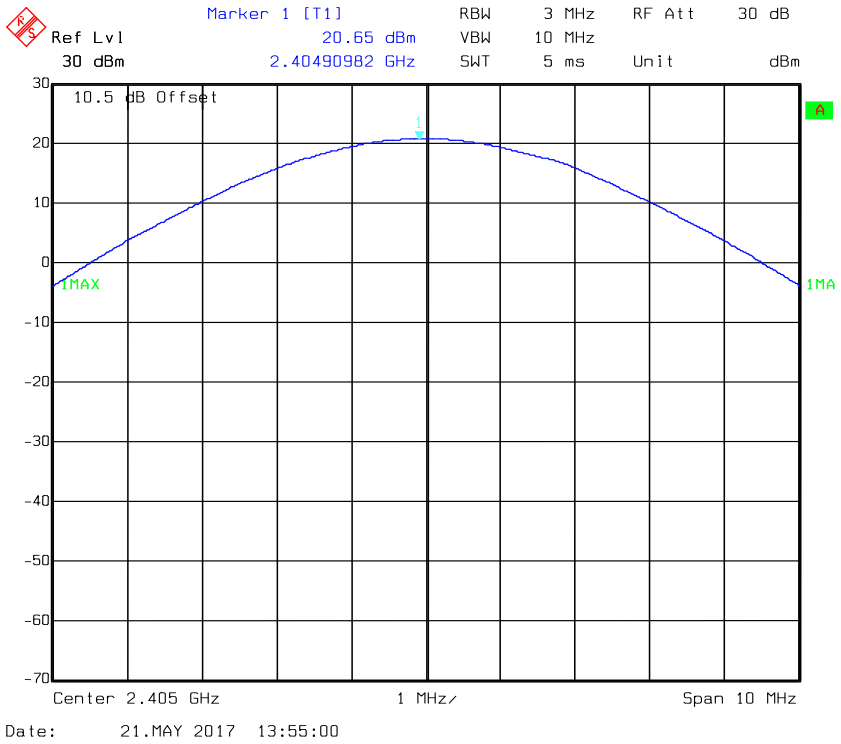
** The testing was performed by Kevin Hu on 2017-05-21.*

Test Mode: Transmitting

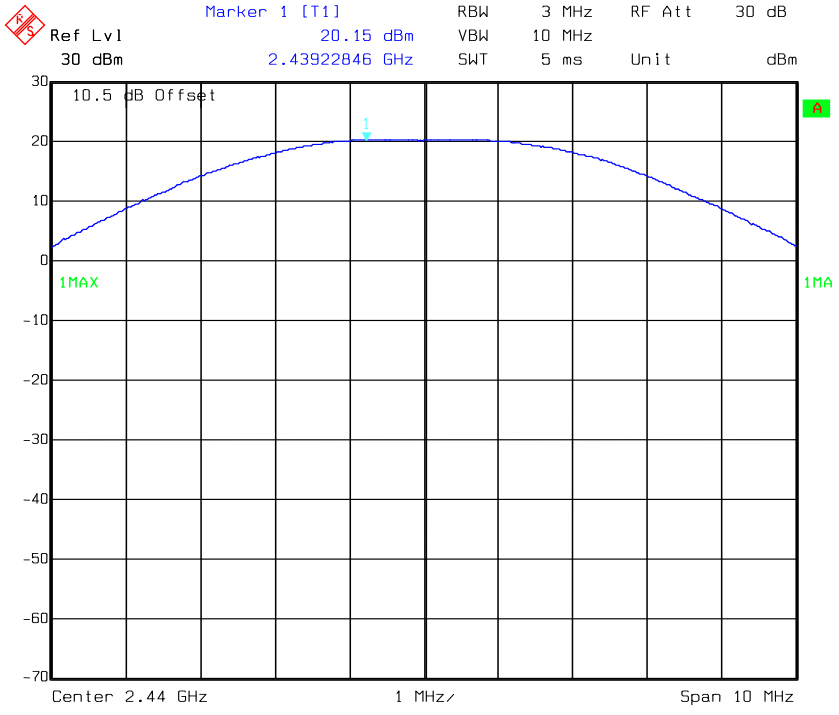
Test Result: Compliant. Please refer to the following table.

Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
Low	2405	20.65	30
Middle	2440	20.15	30
High	2480	19.8	30

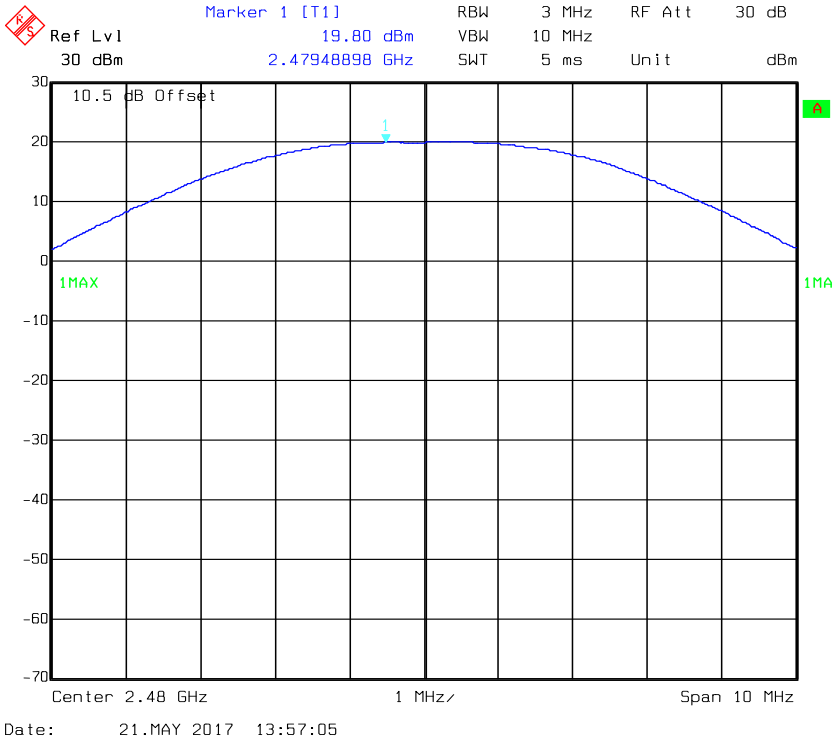
Low Channel



Middle Channel



High Channel



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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	NO.3	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

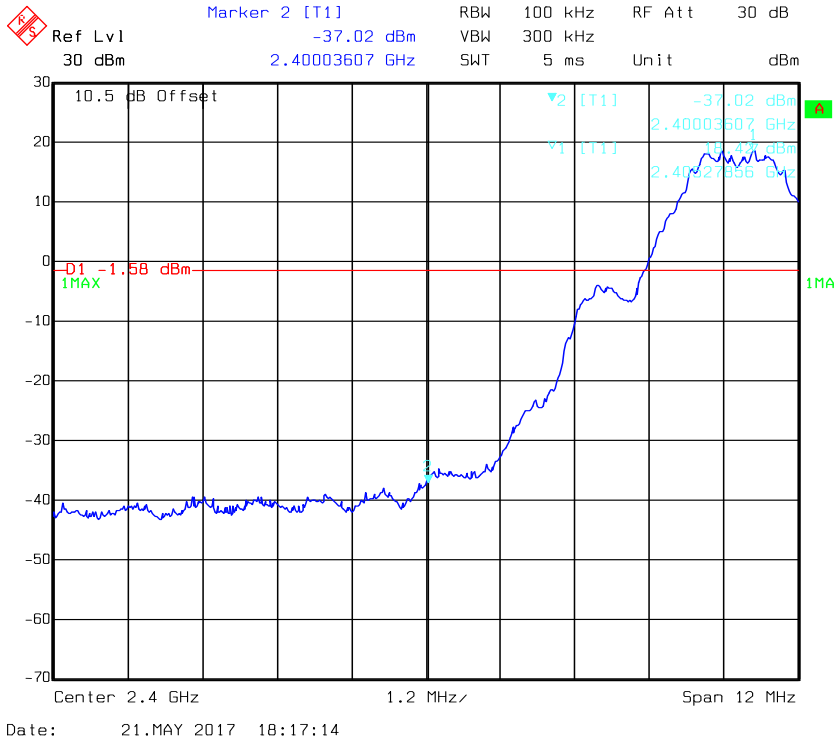
Temperature:	22.6 °C
Relative Humidity:	50.1%
ATM Pressure:	100.4kPa

** The testing was performed by Kevin Hu on 2017-05-21.*

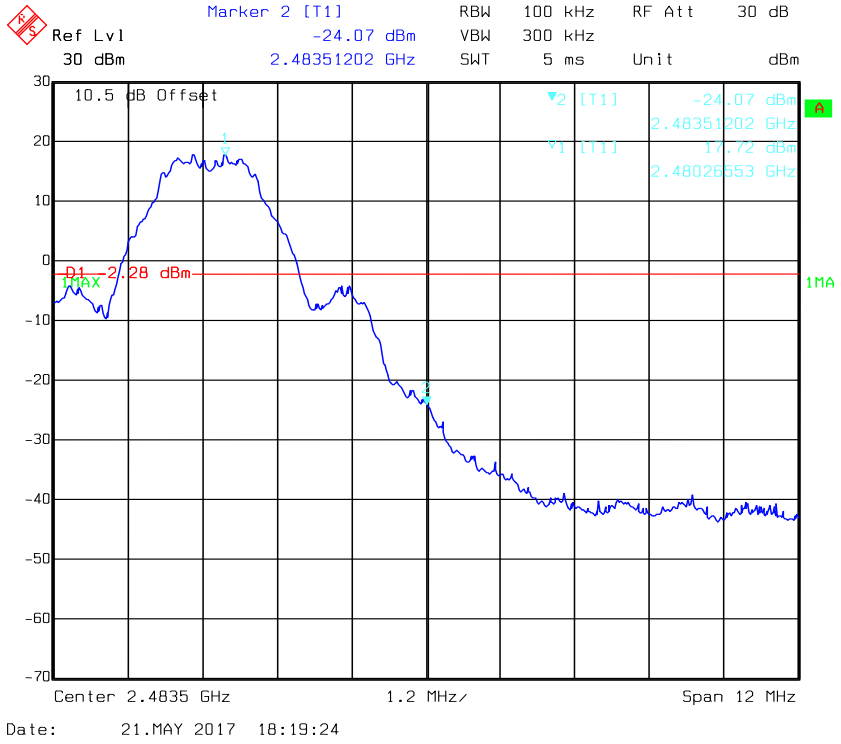
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

Band Edge， Left Side



Band Edge, Right Side



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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
Unknown	RF Cable	Unknown	NO.3	Each Time	/

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Test Data

Environmental Conditions

Temperature:	22.6 °C
Relative Humidity:	50.1%
ATM Pressure:	100.4kPa

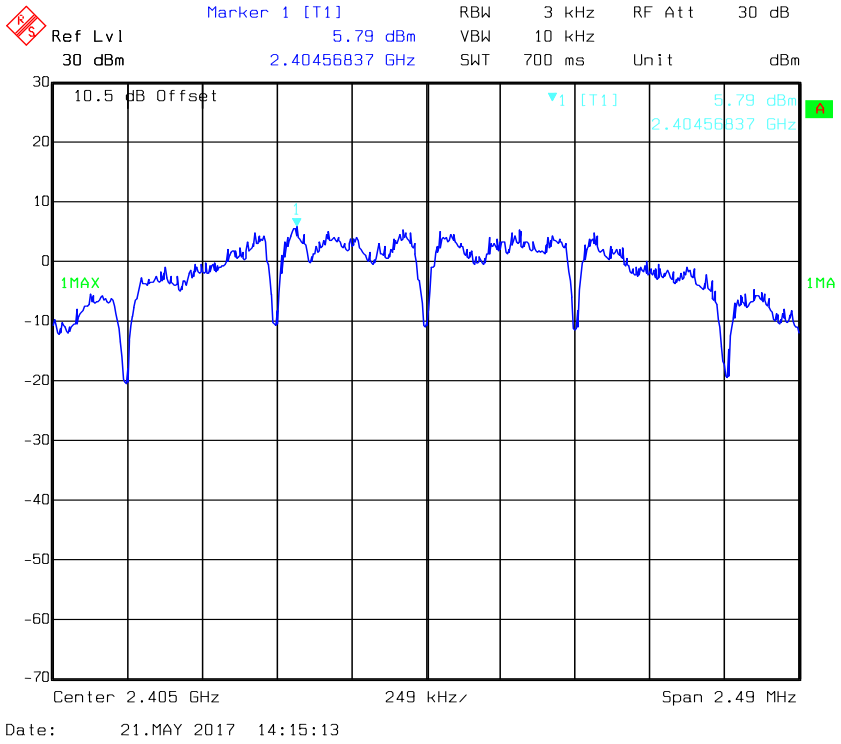
** The testing was performed by Kevin Hu on 2017-05-21.*

Test Mode: Transmitting

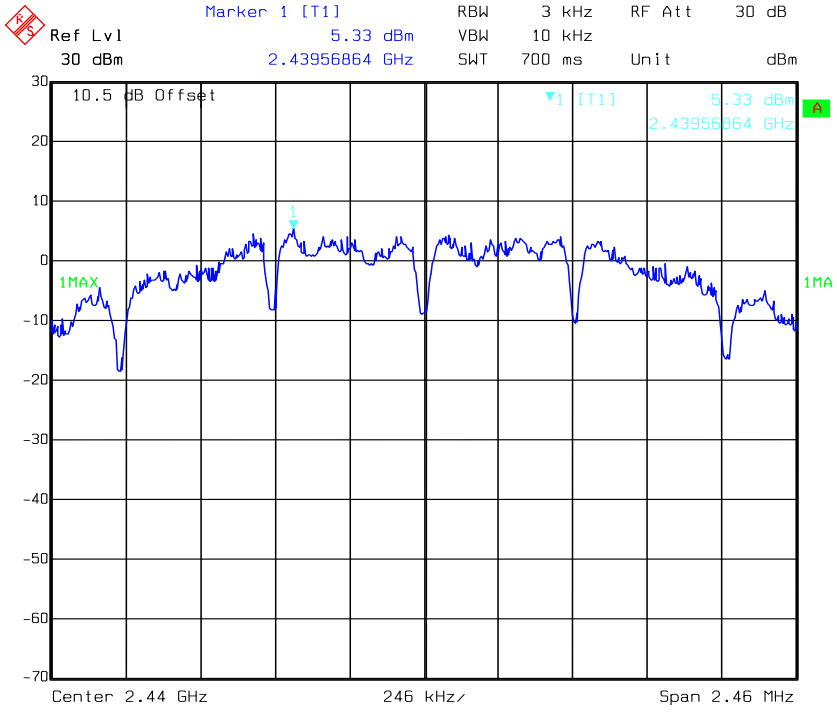
Test Result: Compliant. Please refer to the following table and plots

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
Low	2405	5.79	≤8
Middle	2440	5.33	≤8
High	2480	4.96	≤8

Power Spectral Density, Low Channel



Power Spectral Density, Middle Channel



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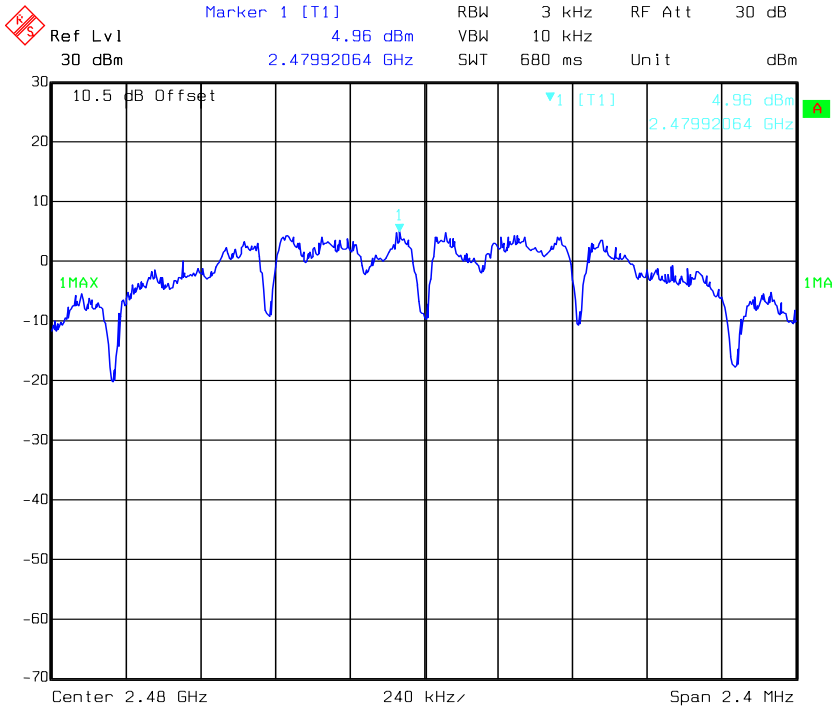
Power Spectral Density, High Channel



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