FCC PART 15.247

TEST REPORT

For

QUADRANT TECHNOLOGY (SHENZHEN) CO., LTD

3rd floor, 7th building Hongfa JiaTeLi Hi-Tech park of shixin village, shiyan Town,Shenzhen City, Guangdong Province,China

FCC ID: A5JC356712

Report Type:	Product Name:
Original Report	MinionCam

Test Engineer:	*Tom Tang*
Report Number:	DG170405006B
Report Date:	2017-05-07
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: 028-65523123, Fax: 028-65525125 www.baclcorp.com

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TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***QUADRANT TECHNOLOGY (SHENZHEN) CO., LTD*** 's product, model number: ***QCP-A356M (FCC ID: A5JC356712)*** (the "EUT") in this report was a ***MinionCam,*** which was measured approximately: 67.7 mm (L) × 95 mm (W) × 123.3 mm (H), rated input voltage: DC5V from adapter.

Adapter Information:
MODEL: S006AKU0500100
Input: AC100-240V 50/60Hz 200mA
Output: DC5V 1000mA

**All measurement and test data in this report was gathered from final production sample, serial number: 170405006 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-04-07, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***QUADRANT TECHNOLOGY (SHENZHEN) 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.

This application for model number: ***QCP-A356M*** *is* base on Model number: ***QCP-A356,*** FCC ID: ***A5JC35621***, granted on 2016-07-03, the difference between the original device and the current one is as follows:

1. Enabled Bluetooth function by software.

2. AP6212 and 1.12V power system circuit designing were be optimized.

The change made to the device affected the data of wifi radiation spurious emissions below 1GHz and all Bluetooth test data.

Related Submittal(s)/Grant(s)

FCC Part 15C DSS submissions with FCC ID: A5JC356712.

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.

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*

Compliance*:The data for all conducted test and wifi radiated spurious emissions above 1GHz, please refer to the report for Model number: QCP-A356, FCC ID: A5JC35621, report number: ES160524001E, issued on 2016-06-07 by EMTEK(SHENZHEN) CO., LTD.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

For 802.11b/g/n ht20, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

For 802.11b, 802.11g, and 802.11n ht20 modes were tested with channel 1, 6 and 11.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
..	…	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

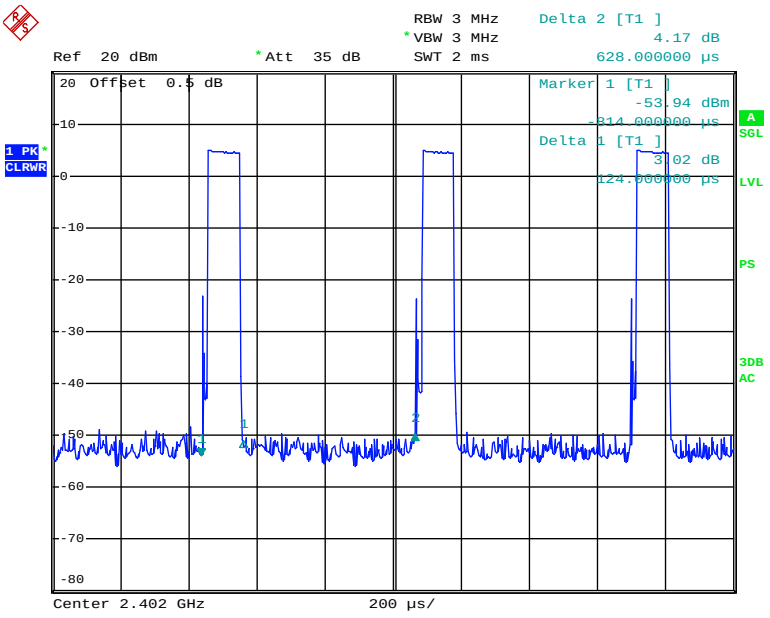
The worst condition (maximum power) was setting by the Test Software as following table:

Test Software Version	PUTTY		
Test Frequency	2402MHz	2440MHz	2480MHz
BLE	0	0	0

The maximum duty cycle as following table:

Test mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
BLE	0.124	0.628	20

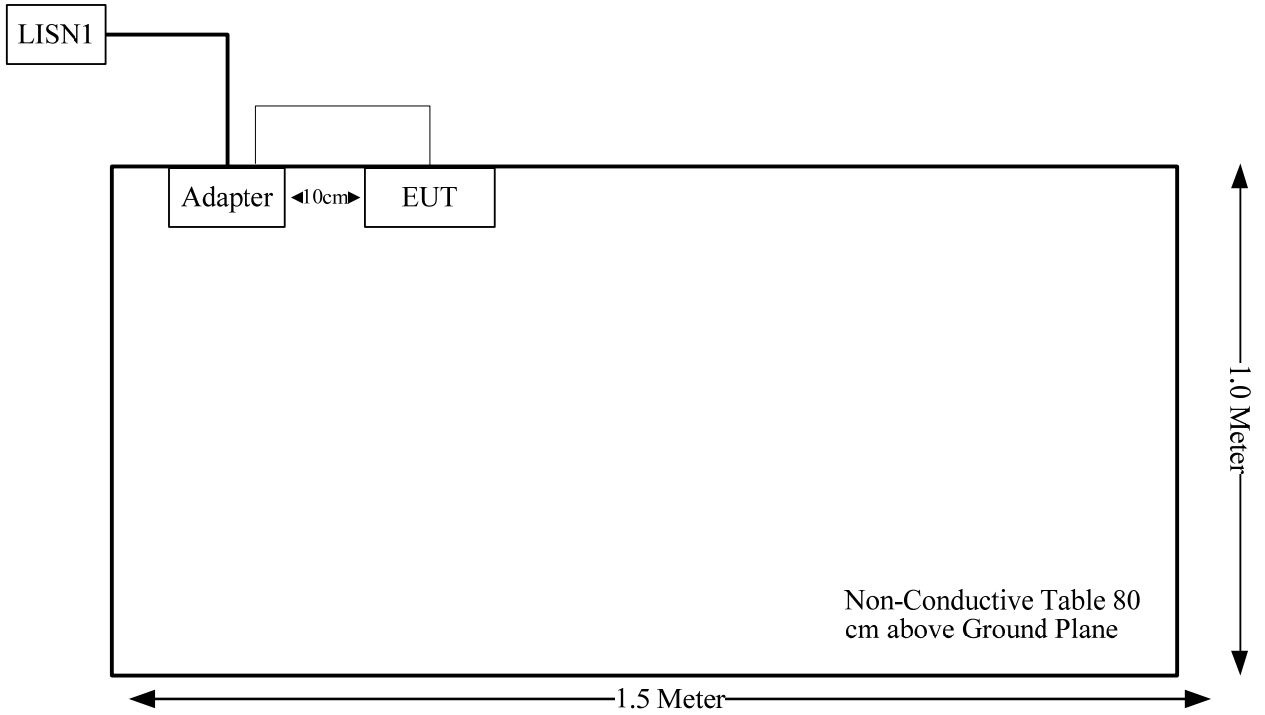
BLE



External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
USB Cable	Yes	No	3.08	USB Port of Adapter	EUT

Block Diagram of Test Setup



FCC §15.247 (i) & §1.1307 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i) and subpart §1.1307, 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 Formula:

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = 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:

Mode	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)			
Bluetooth	2402-2480	1.5	1.41	9	7.94	20.00	0.0022	1.0
Wifi	2012-2462	1.5	1.41	15.5	35.48	20.00	0.0100	1.0

Note: The tune-up power including tolerance is declared by manufacturer.

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 internal antenna arrangement for Wifi/BT, and the antenna gain is 1.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

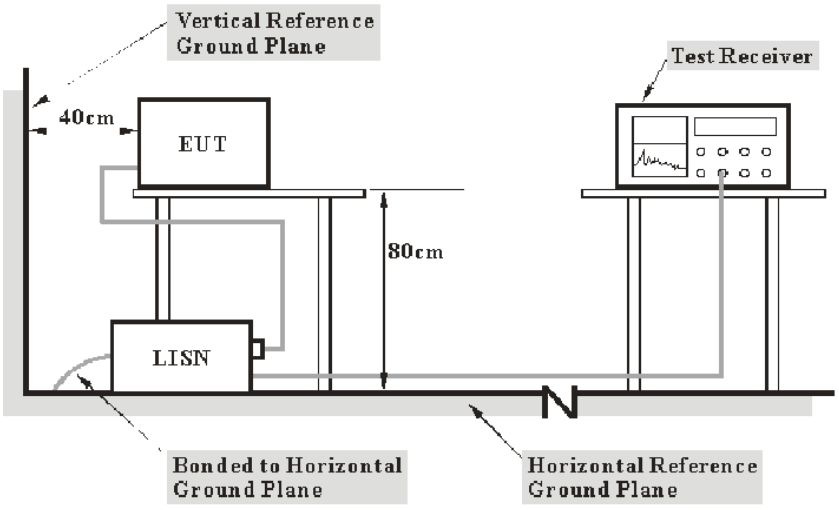
Result: Compliance.

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

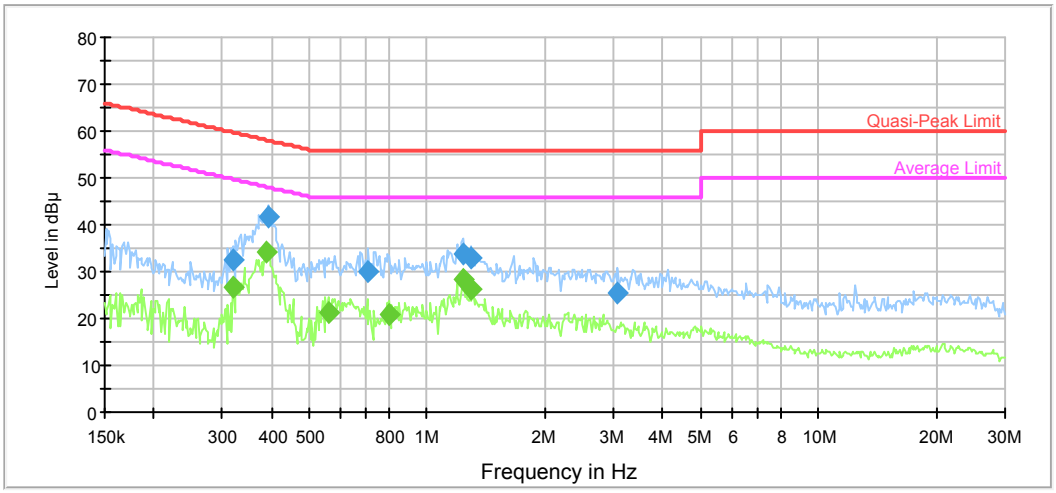
Environmental Conditions

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

The testing was performed by Tom Tang on 2017-05-03.

Test Mode: Transmitting (Wi-Fi transmitting mode was the worst)

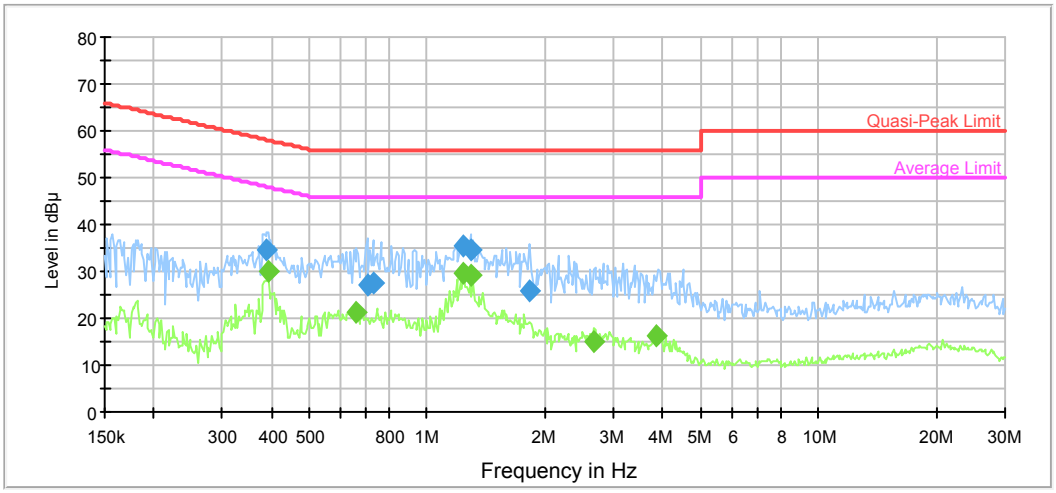
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.319773	32.5	9.000	L1	19.7	27.2	59.7	Compliance
0.393383	41.6	9.000	L1	19.8	16.4	58.0	Compliance
0.709407	29.9	9.000	L1	19.7	26.1	56.0	Compliance
1.239175	33.5	9.000	L1	19.7	22.5	56.0	Compliance
1.289541	32.8	9.000	L1	19.7	23.2	56.0	Compliance
3.073500	25.6	9.000	L1	19.7	30.4	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.319773	26.8	9.000	L1	19.7	22.9	49.7	Compliance
0.387164	34.3	9.000	L1	19.8	13.8	48.1	Compliance
0.558572	21.1	9.000	L1	19.7	24.9	46.0	Compliance
0.799472	20.9	9.000	L1	19.7	25.1	46.0	Compliance
1.239175	28.5	9.000	L1	19.7	17.5	46.0	Compliance
1.289541	26.3	9.000	L1	19.7	19.7	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.390261	34.5	9.000	N	19.6	23.6	58.1	Compliance
0.703777	27.3	9.000	N	19.6	28.7	56.0	Compliance
0.726569	27.4	9.000	N	19.6	28.6	56.0	Compliance
1.239175	35.3	9.000	N	19.6	20.7	56.0	Compliance
1.289541	34.4	9.000	N	19.6	21.6	56.0	Compliance
1.831043	26.0	9.000	N	19.7	30.0	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.393383	30.0	9.000	N	19.6	18.0	48.0	Compliance
0.660314	21.1	9.000	N	19.6	24.9	46.0	Compliance
1.239175	29.6	9.000	N	19.6	16.4	46.0	Compliance
1.289541	29.4	9.000	N	19.6	16.6	46.0	Compliance
2.662831	15.2	9.000	N	19.7	30.8	46.0	Compliance
3.872475	16.1	9.000	N	19.7	29.9	46.0	Compliance

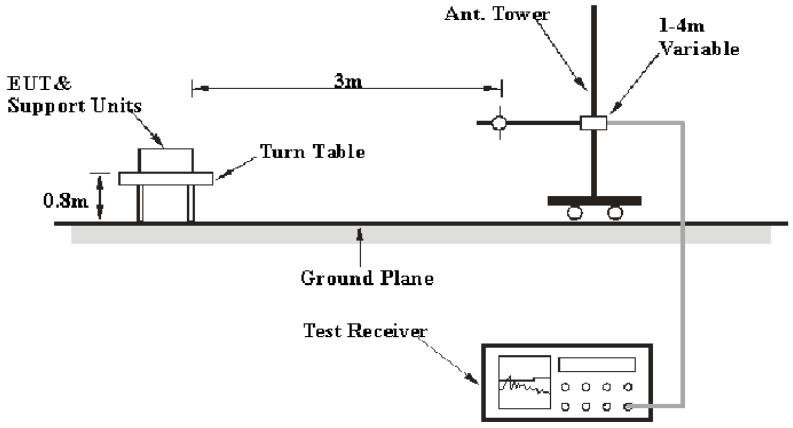
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

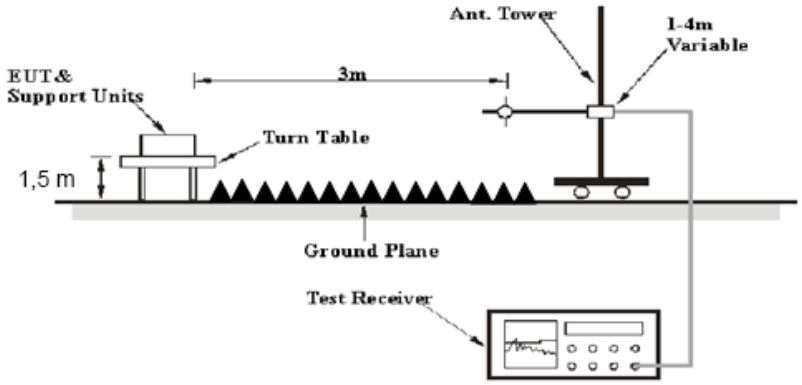
FCC §15.247 (d); §15.209; §15.205;

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:	26.2°C
Relative Humidity:	52.6%
ATM Pressure:	100.4kPa

** The testing was performed by Tom Tang on 2017-05-07*

Test Mode: Transmitting

BLE Mode
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: 2402 MHz									
2402	71.04	PK	H	23.53	3.00	0.00	97.57	N/A	N/A
2402	68.57	AV	H	23.53	3.00	0.00	95.1	N/A	N/A
2402	74.11	PK	V	23.53	3.00	0.00	100.64	N/A	N/A
2402	70.94	AV	V	23.53	3.00	0.00	97.47	N/A	N/A
2390	27.88	PK	V	23.57	3.00	0.00	54.45	74	19.55
2390	15.66	AV	V	23.57	3.00	0.00	42.23	54	11.77
4804	34.25	PK	V	30.77	5.12	26.87	43.27	74	30.73
4804	24.48	AV	V	30.77	5.12	26.87	33.5	54	20.5
7206	32.99	PK	V	34.71	6.16	26.35	47.51	74	26.49
7206	22.35	AV	V	34.71	6.16	26.35	36.87	54	17.13
1425	31.11	PK	V	23.91	2.57	26.40	31.19	74	42.81
1425	20.17	AV	V	23.91	2.57	26.40	20.25	54	33.75
215.27	44.25	QP	H	11.46	0.97	27.70	28.98	43.50	14.52
41.64	41.63	QP	V	13.90	0.32	28.52	27.33	40.00	12.67
Middle Channel: 2440 MHz									
2440	71.91	PK	H	23.40	3.00	0.00	98.31	N/A	N/A
2440	69.39	AV	H	23.40	3.00	0.00	95.79	N/A	N/A
2440	73.77	PK	V	23.40	3.00	0.00	100.17	N/A	N/A
2440	70.70	AV	V	23.40	3.00	0.00	97.1	N/A	N/A
4880	34.52	PK	V	31.02	5.09	26.87	43.76	74	30.24
4880	24.26	AV	V	31.02	5.09	26.87	33.5	54	20.5
7320	33.08	PK	V	34.94	6.22	26.40	47.84	74	26.16
7320	22.92	AV	V	34.94	6.22	26.40	37.68	54	16.32
1468	31.56	PK	V	24.02	2.63	26.36	31.85	74	42.15
1468	20.20	AV	V	24.02	2.63	26.36	20.49	54	33.51
2119	31.90	PK	V	24.50	3.04	26.84	32.6	74	41.4
2119	20.66	AV	V	24.50	3.04	26.84	21.36	54	32.64
215.27	44.52	QP	H	11.46	0.97	27.70	29.25	43.50	14.25
41.64	41.77	QP	H	13.90	0.32	28.52	27.47	40.00	12.53
High Channel: 2480 MHz									
2480	71.65	PK	H	23.27	2.99	0.00	97.91	N/A	N/A
2480	69.39	AV	H	23.27	2.99	0.00	95.65	N/A	N/A
2480	74.24	PK	V	23.27	2.99	0.00	100.5	N/A	N/A
2480	71.77	AV	V	23.27	2.99	0.00	98.03	N/A	N/A
2483.5	28.84	PK	V	23.26	2.99	0.00	55.09	74	18.91
2483.5	16.06	AV	V	23.26	2.99	0.00	42.31	54	11.69
4960	34.75	PK	V	31.27	5.05	26.88	44.19	74	29.81
4960	24.58	AV	V	31.27	5.05	26.88	34.02	54	19.98
7440	34.25	PK	V	35.18	6.27	26.45	49.25	74	24.75
7440	23.81	AV	V	35.18	6.27	26.45	38.81	54	15.19
1503	31.61	PK	V	24.10	2.67	26.33	32.05	74	41.95
1503	20.17	AV	V	24.10	2.67	26.33	20.61	54	33.39
215.27	45.36	QP	H	11.46	0.97	27.70	30.09	43.50	13.41
41.64	42.19	QP	H	13.90	0.32	28.52	27.89	40.00	12.11

WIFI Mode:
30MHz-1GHz(802.11b Mode Low channel was the worst)

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)					
802.11b, Low Channel: 2412 MHz									
95.96	42.32	QP	H	9.59	0.53	28.33	24.11	43.50	19.39
119.24	39.51	QP	H	15.35	0.73	28.15	27.44	43.50	16.06
215.27	44.12	QP	H	11.46	0.97	27.70	28.85	43.50	14.65
369.5	38.19	QP	H	15.70	1.42	27.97	27.34	46.00	18.66
41.64	40.1	QP	V	13.90	0.32	28.52	25.80	40.00	14.20
83.35	43.62	QP	V	8.33	0.54	28.37	24.12	40.00	15.88
95.96	42.22	QP	V	9.59	0.53	28.33	24.01	43.50	19.49
167.74	41.98	QP	V	11.88	0.93	27.99	26.80	43.50	16.70
216.24	41.91	QP	V	11.49	0.98	27.70	26.68	46.00	19.32
420.91	39.33	QP	V	16.80	1.47	28.40	29.20	46.00	16.80

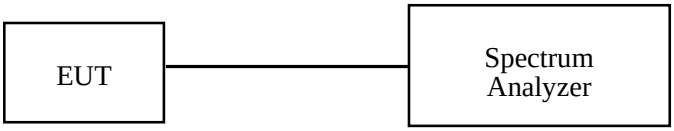
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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	EMI Test Receiver	ESCI	100028	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

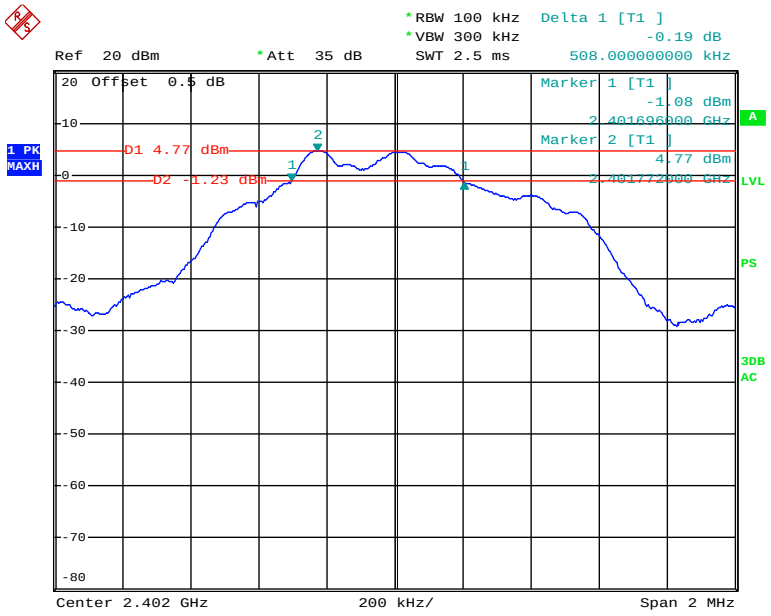
** The testing was performed by Tom Tang on 2017-04-22.*

Test Mode: Transmitting

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

Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
BLE	Low	2402	0.51	≥0.5
	Middle	2440	0.51	≥0.5
	High	2480	0.51	≥0.5

BLE Low Channel



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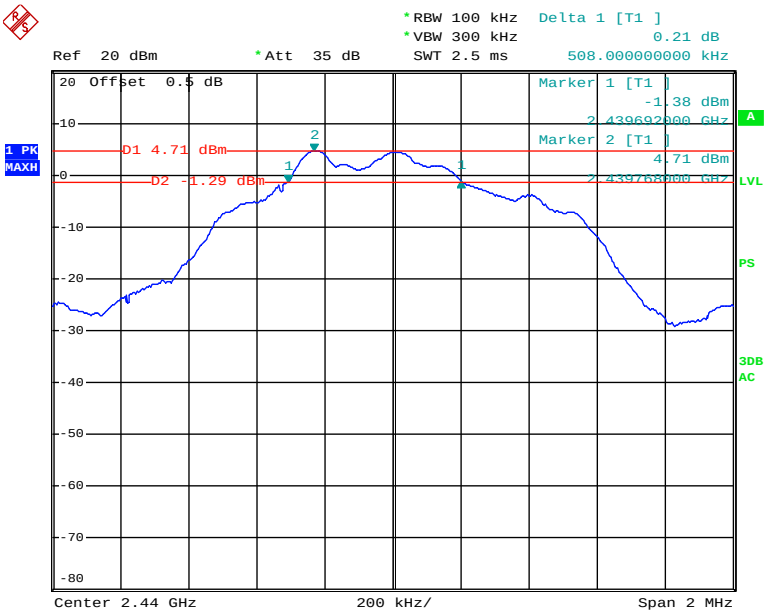
BLE Middle Channel



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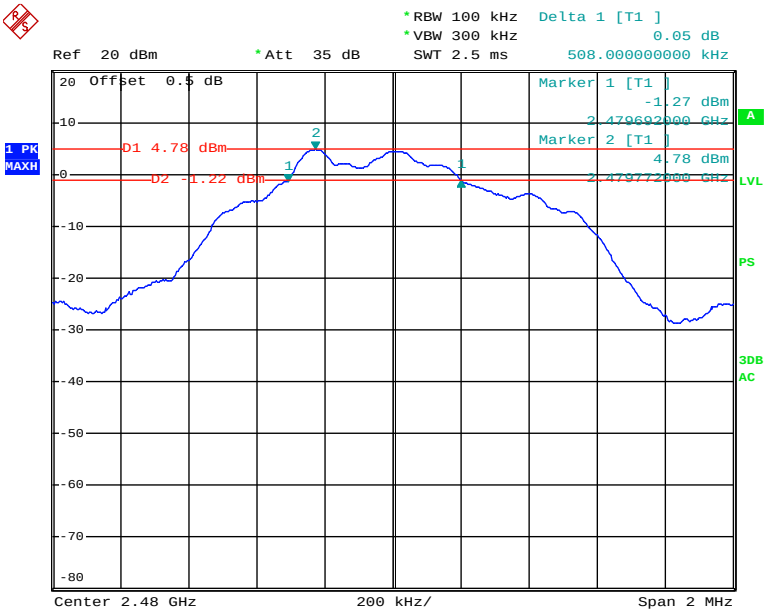
BLE High Channel



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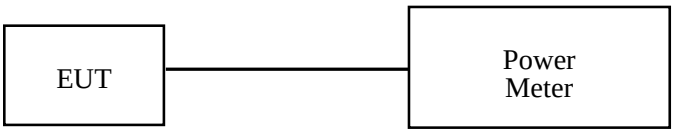
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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
Agilent	Wideband Power Sensor	N1921A	MY54170074	2016-01-03	2017-01-02
Agilent	P-Series Power Meter	N1912A	MY5000798	2016-01-03	2017-01-02
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 Tom Tang on 2017-04-22.*

Test Mode: Transmitting

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

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
BLE	Low	2402	4.96	30
	Middle	2440	4.9	30
	High	2480	5.02	30

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	EMI Test Receiver	ESCI	100028	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

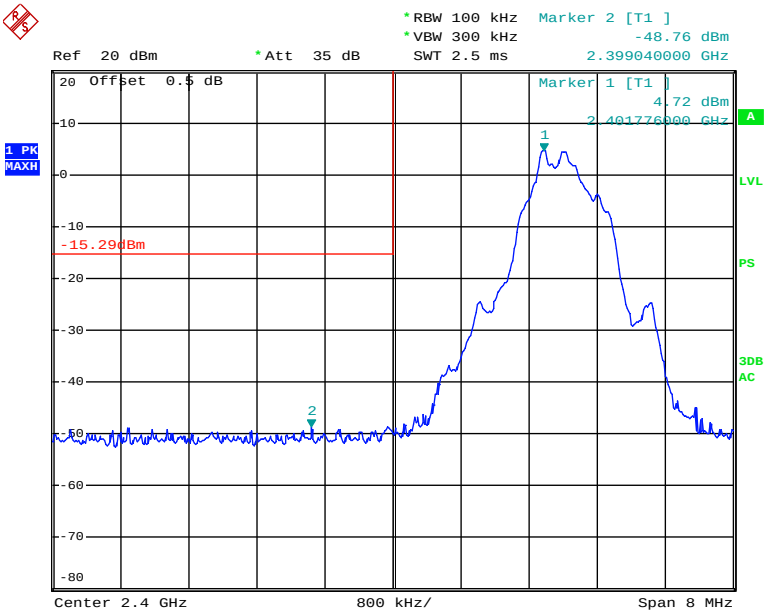
Temperature:	22.6 °C
Relative Humidity:	50.1%
ATM Pressure:	100.4kPa

** The testing was performed by Tom Tang on 2017-04-22.*

Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

BLE Band Edge， Left Side



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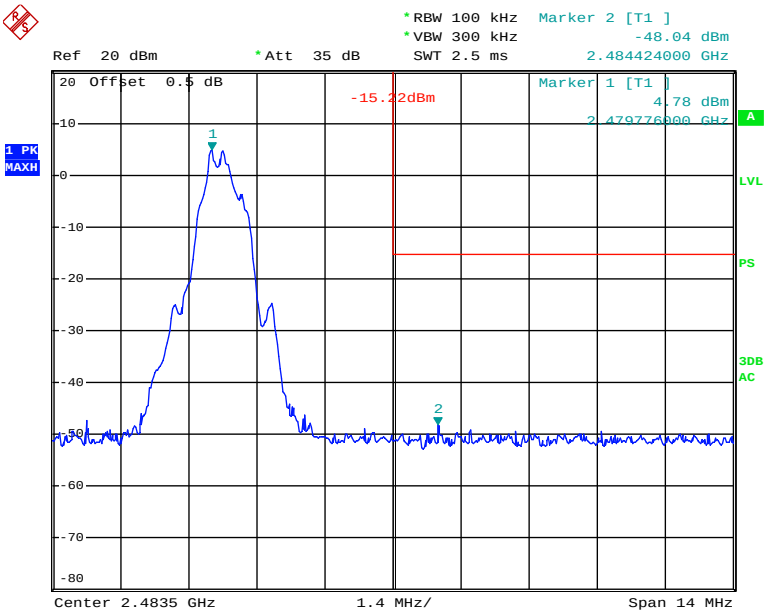
BLE Band Edge, Right Side



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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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	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

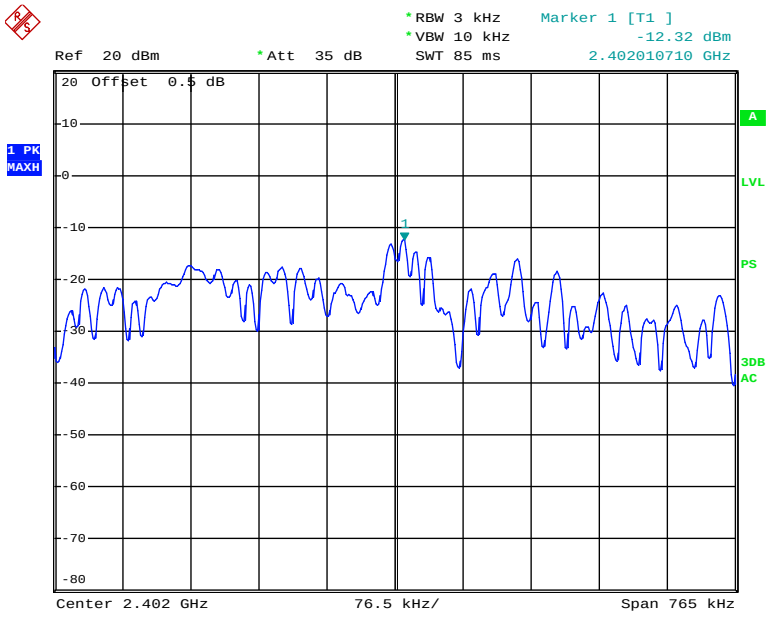
** The testing was performed by Tom Tang on 2017-04-22.*

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)
BLE	Low	2402	-12.32	≤8
	Middle	2440	-12.51	≤8
	High	2480	-12.41	≤8

Power Spectral Density, BLE Low Channel



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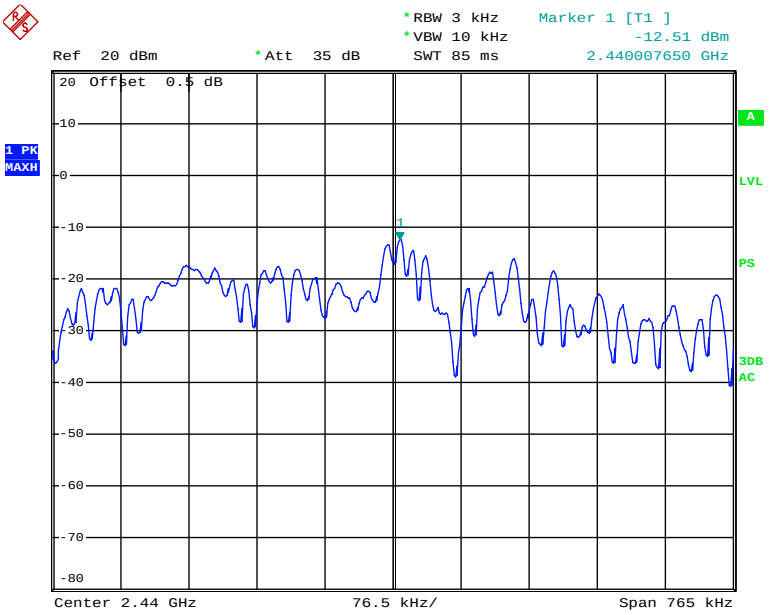
Power Spectral Density, BLE Middle Channel



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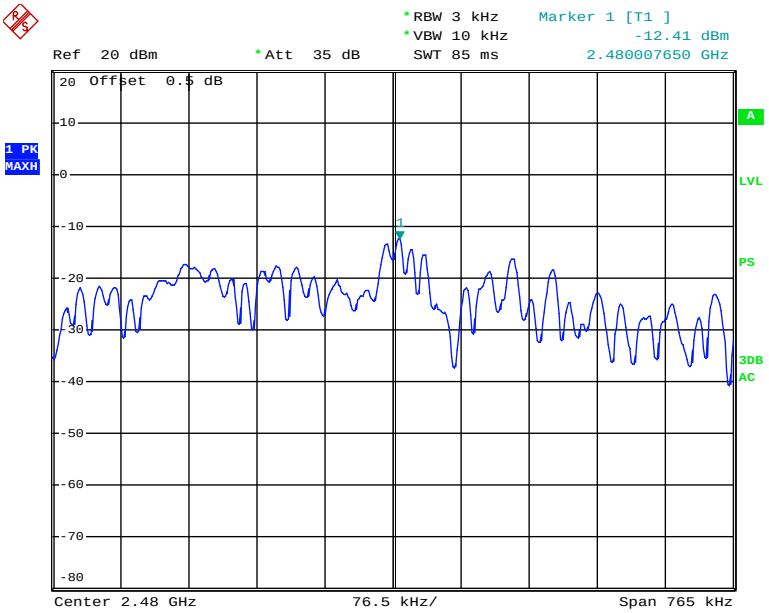
Power Spectral Density, BLE High Channel



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