



FCC PART 15.247 TEST REPORT

For

Sudio AB

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FCC ID: 2AF9PTRE

Report Type: Original Report	Product Name: Sudio Wireless
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TABLE OF CONTENTS

GENERAL INFORMATION	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	5
TEST FACILITY.....	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EQUIPMENT MODIFICATIONS	6
EUT EXERCISE SOFTWARE.....	6
SUPPORT EQUIPMENT LIST AND DETAILS	7
EXTERNAL CABLE	7
BLOCK DIAGRAM OF TEST SETUP	8
SUMMARY OF TEST RESULTS	9
FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE.....	10
APPLICABLE STANDARD.....	10
FCC §15.203 - ANTENNA REQUIREMENT	11
APPLICABLE STANDARD.....	11
ANTENNA CONNECTOR CONSTRUCTION	11
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS.....	12
APPLICABLE STANDARD.....	12
EUT SETUP.....	12
EMI TEST RECEIVER SETUP	12
TEST PROCEDURE	13
CORRECTED AMPLITUDE & MARGIN CALCULATION	13
TEST EQUIPMENT LIST AND DETAILS	13
TEST DATA	14
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS.....	17
APPLICABLE STANDARD.....	17
EUT SETUP.....	17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	18
TEST PROCEDURE	18
CORRECTED AMPLITUDE & MARGIN CALCULATION	18
TEST EQUIPMENT LIST AND DETAILS	19
TEST DATA	19
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH	22
APPLICABLE STANDARD.....	22
TEST PROCEDURE	22
TEST EQUIPMENT LIST AND DETAILS	22
TEST DATA	22
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER	25
APPLICABLE STANDARD.....	25
TEST PROCEDURE	25
TEST EQUIPMENT LIST AND DETAILS	25

TEST DATA	26
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE	28
APPLICABLE STANDARD.....	28
TEST PROCEDURE	28
TEST EQUIPMENT LIST AND DETAILS	28
TEST DATA	29
FCC §15.247(e) - POWER SPECTRAL DENSITY	31
APPLICABLE STANDARD.....	31
TEST PROCEDURE	31
TEST EQUIPMENT LIST AND DETAILS	31
TEST DATA	31

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Sudio AB** 's product, model number: **Sudio TRE (FCC ID: 2AF9PTRE)** (the "EUT") in this report was a **Sudio Wireless**, which was measured approximately: 63 cm (L) × 2.2 cm (W) × 1.8 cm (H), rated input voltage: DC3.7V from battery.

Note: The series product, model Sudio TRE, Sudio BLA are electrically identical, the difference between them was explained in the declaration letter, we selected Sudio TRE for fully testing.

**All measurement and test data in this report was gathered from final production sample, serial number: 170509010 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-05-09, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of **Sudio AB** 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)

FCC Part 15C DSS submissions with FCC ID: 2AF9PTRE.

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: ± 5.13 dB; and,

6 GHz to 40 GHz: ± 5.47 dB.

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 testing mode, which was provided by manufacturer.

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.

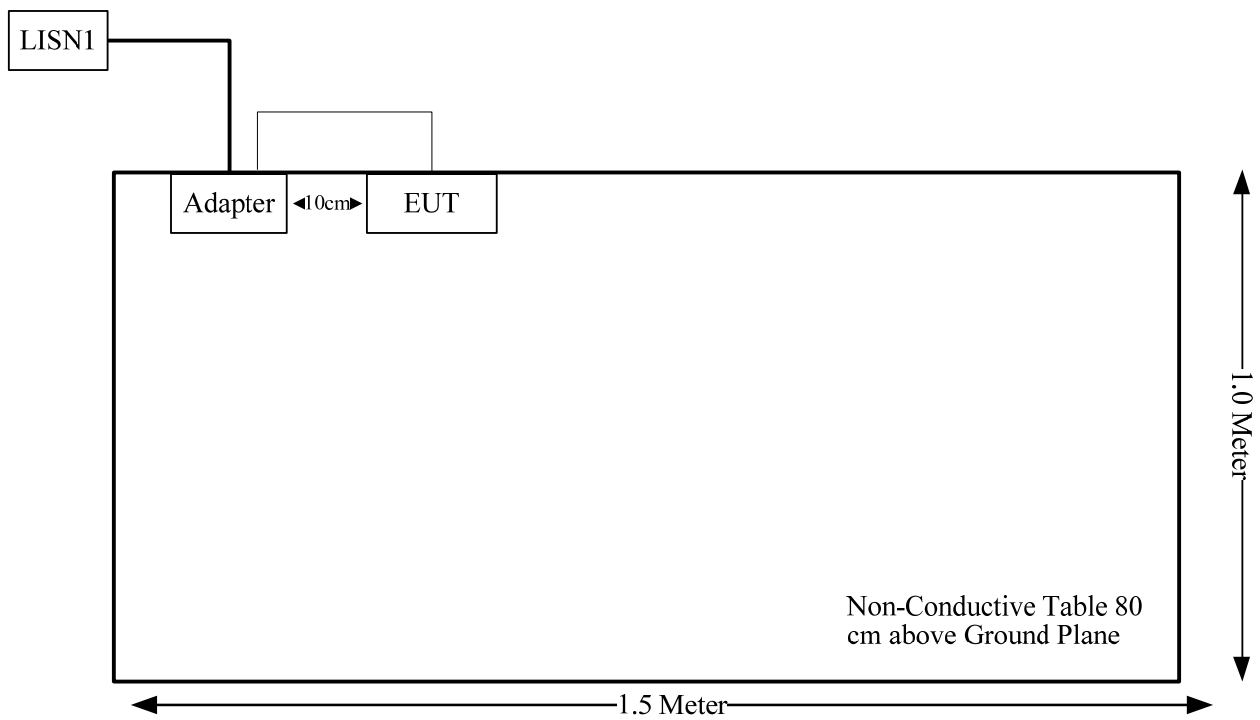
EUT Exercise Software

The worst condition (maximum power) was configured by system default setting, the Test Software CSR BlueSuite 2.4.8 used for change channels and modes

The maximum duty cycle as following table:

Test mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)
BLE	0.46	1.26	36.5

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	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 & §2.1093- RF EXPOSURE

Applicable Standard

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

According to KDB447498 D01 General RF Exposure Guidance v06:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Measurement Result

The max conducted power including tune-up tolerance is 9.2 dBm (8.32 mW).

$[(\text{max. power of channel, mW})/(\text{min. test separation distance, mm})][\sqrt{f(\text{GHz})}]$
 $= 8.32/5 \cdot (\sqrt{2.480}) = 2.6 < 3.0$

So the stand-alone SAR evaluation is not necessary.

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 BT, and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

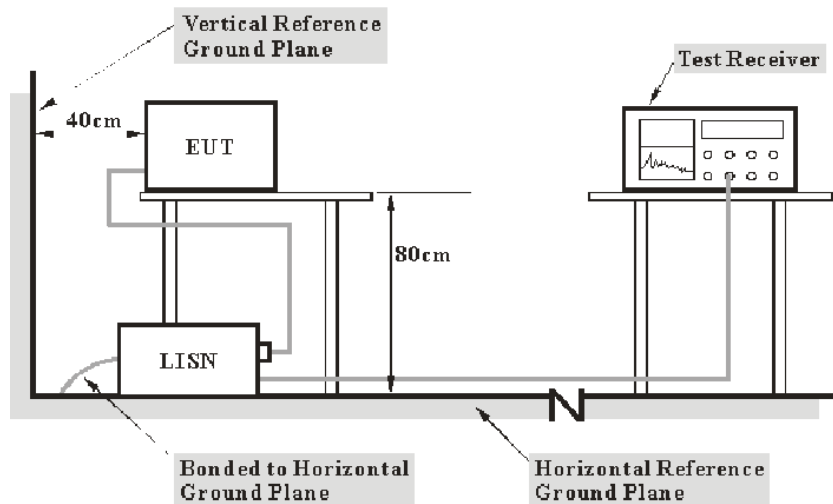
Result: Compliance.

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 the LISN with 120 V/60 Hz AC power

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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

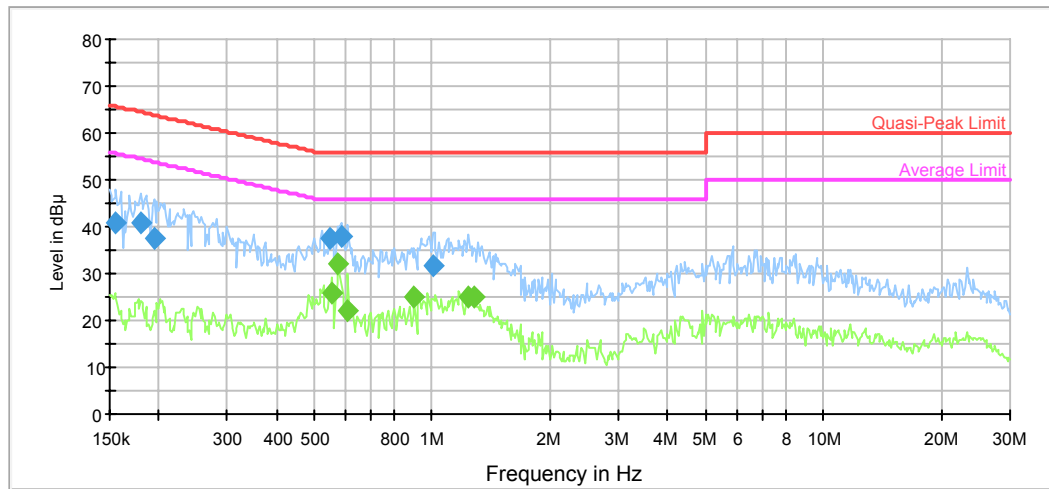
Environmental Conditions

Temperature:	26.9 °C
Relative Humidity:	50.1 %
ATM Pressure:	100.1 kPa

The testing was performed by Jacky Gu on 2017-05-12.

Test Mode: Transmitting

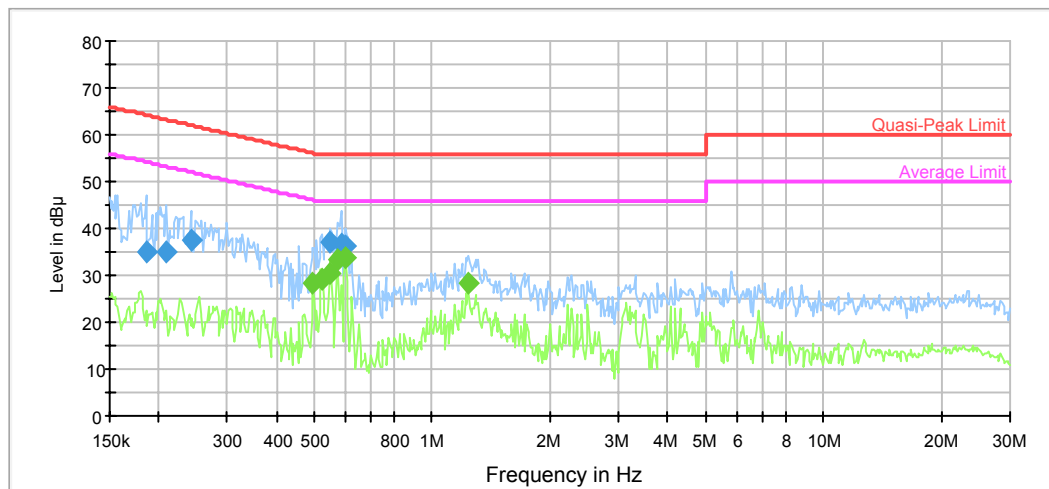
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.156097	41.0	9.000	L1	19.7	24.7	65.7	Compliance
0.180171	40.9	9.000	L1	19.7	23.6	64.5	Compliance
0.195114	37.5	9.000	L1	19.7	26.3	63.8	Compliance
0.549741	37.5	9.000	L1	19.7	18.5	56.0	Compliance
0.585926	37.9	9.000	L1	19.8	18.1	56.0	Compliance
1.007300	31.7	9.000	L1	19.7	24.3	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.554139	26.0	9.000	L1	19.7	20.0	46.0	Compliance
0.576662	32.1	9.000	L1	19.8	13.9	46.0	Compliance
0.609741	22.0	9.000	L1	19.8	24.0	46.0	Compliance
0.900972	25.0	9.000	L1	19.7	21.0	46.0	Compliance
1.239175	24.8	9.000	L1	19.7	21.2	46.0	Compliance
1.279307	25.2	9.000	L1	19.7	20.8	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.186006	35.0	9.000	N	19.6	29.2	64.2	Compliance
0.209621	35.0	9.000	N	19.6	28.2	63.2	Compliance
0.241949	37.4	9.000	N	19.6	24.6	62.0	Compliance
0.549741	37.3	9.000	N	19.6	18.7	56.0	Compliance
0.585926	36.7	9.000	N	19.6	19.3	56.0	Compliance
0.600101	36.2	9.000	N	19.6	19.8	56.0	Compliance

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.495646	28.5	9.000	N	19.6	17.6	46.1	Compliance
0.524077	29.2	9.000	N	19.6	16.8	46.0	Compliance
0.549741	30.5	9.000	N	19.6	15.5	46.0	Compliance
0.572086	33.3	9.000	N	19.6	12.7	46.0	Compliance
0.600101	33.8	9.000	N	19.6	12.2	46.0	Compliance
1.239175	28.5	9.000	N	19.6	17.5	46.0	Compliance

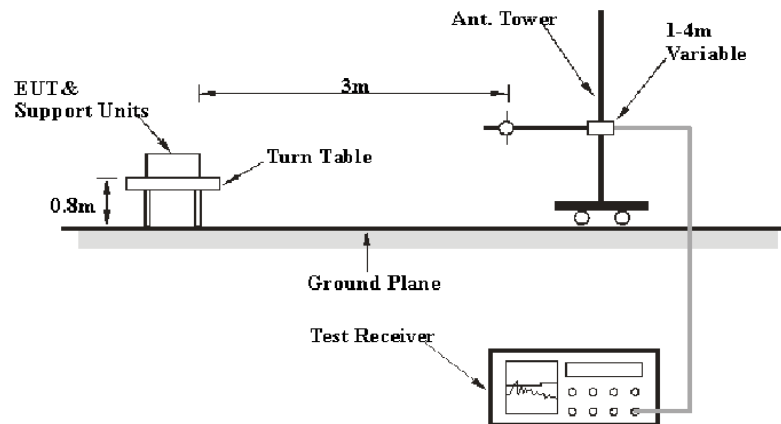
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

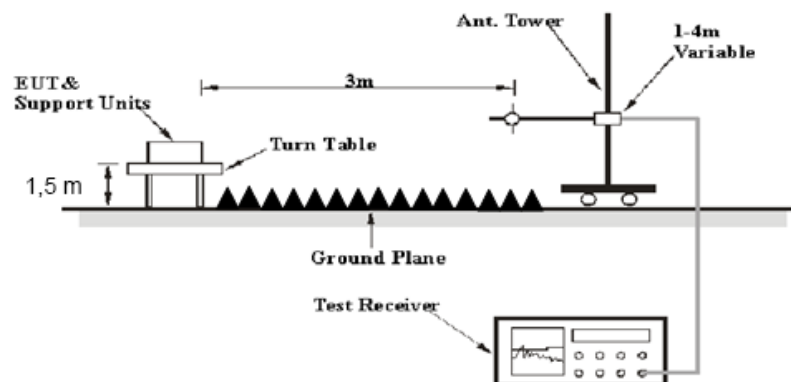
FCC §15.247 (d); §15.209; §15.205;

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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

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Test Data

Environmental Conditions

Temperature:	27.0 °C
Relative Humidity:	50 %
ATM Pressure:	100.1kPa

* The testing was performed by Jacky Gu on 2017-05-16.

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: 2402 MHz									
2402	70.81	PK	H	23.53	3.00	0.00	97.34	N/A	N/A
2402	66	AV	H	23.53	3.00	0.00	92.53	N/A	N/A
2402	69.01	PK	V	23.53	3.00	0.00	95.54	N/A	N/A
2402	63.86	AV	V	23.53	3.00	0.00	90.39	N/A	N/A
2390	30.88	PK	H	23.57	3.00	0.00	57.45	74.00	16.55
2390	15.59	AV	H	23.57	3.00	0.00	42.16	54.00	11.84
4804	48.52	PK	H	30.77	5.12	26.87	57.54	74.00	16.46
4804	42.97	AV	H	30.77	5.12	26.87	51.99	54.00	2.01
7206	38.68	PK	H	34.71	6.16	26.35	53.20	74.00	20.80
7206	33.76	AV	H	34.71	6.16	26.35	48.28	54.00	5.72
1618	31.41	PK	H	24.29	2.76	26.45	32.01	74.00	41.99
1618	20.75	AV	H	24.29	2.76	26.45	21.35	54.00	32.65
141.55	45.8	QP	H	13.05	0.67	28.11	31.41	43.50	12.09
369.5	47.3	QP	H	15.70	1.42	27.97	36.45	46.00	9.55
Middle Channel: 2440 MHz									
2440	72.17	PK	H	23.40	3.00	0.00	98.57	N/A	N/A
2440	66.8	AV	H	23.40	3.00	0.00	93.20	N/A	N/A
2440	69.48	PK	V	23.40	3.00	0.00	95.88	N/A	N/A
2440	64.99	AV	V	23.40	3.00	0.00	91.39	N/A	N/A
4880	47.68	PK	H	31.02	5.09	26.87	56.92	74.00	17.08
4880	42.4	AV	H	31.02	5.09	26.87	51.64	54.00	2.36
7320	38.63	PK	H	34.94	6.22	26.40	53.39	74.00	20.61
7320	34.11	AV	H	34.94	6.22	26.40	48.87	54.00	5.13
1645	31.13	PK	H	24.33	2.78	26.47	31.77	74.00	42.23
1645	20.88	AV	H	24.33	2.78	26.47	21.52	54.00	32.48
2263	34.25	PK	H	24.01	3.02	26.86	34.42	74.00	39.58
2263	23.38	AV	H	24.01	3.02	26.86	23.55	54.00	30.45
141.55	45.7	QP	H	13.05	0.67	28.11	31.31	43.50	12.19
369.5	47.0	QP	H	15.70	1.42	27.97	36.15	46.00	9.85

High Channel: 2480 MHz									
2480	73.91	PK	H	23.27	2.99	0.00	100.17	N/A	N/A
2480	69.23	AV	H	23.27	2.99	0.00	95.49	N/A	N/A
2480	70.06	PK	V	23.27	2.99	0.00	96.32	N/A	N/A
2480	65.07	AV	V	23.27	2.99	0.00	91.33	N/A	N/A
2483.5	36.36	PK	H	23.26	2.99	0.00	62.61	74.00	11.39
2483.5	19.6	AV	H	23.26	2.99	0.00	45.85	54.00	8.15
4960	49.11	PK	H	31.27	5.05	26.88	58.55	74.00	15.45
4960	42.74	AV	H	31.27	5.05	26.88	52.18	54.00	1.82
7440	40.19	PK	H	35.18	6.27	26.45	55.19	74.00	18.81
7440	35.28	AV	H	35.18	6.27	26.45	50.28	54.00	3.72
1689	30.09	PK	H	24.40	2.81	26.52	30.78	74.00	43.22
1689	20.25	AV	H	24.40	2.81	26.52	20.94	54.00	33.06
141.55	45.5	QP	H	13.05	0.67	28.11	31.11	43.50	12.39
369.5	46.5	QP	H	15.70	1.42	27.97	35.65	46.00	10.35

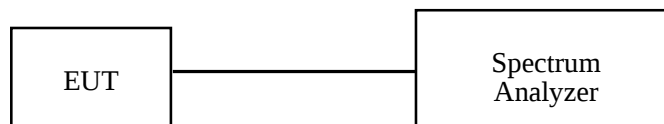
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- 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

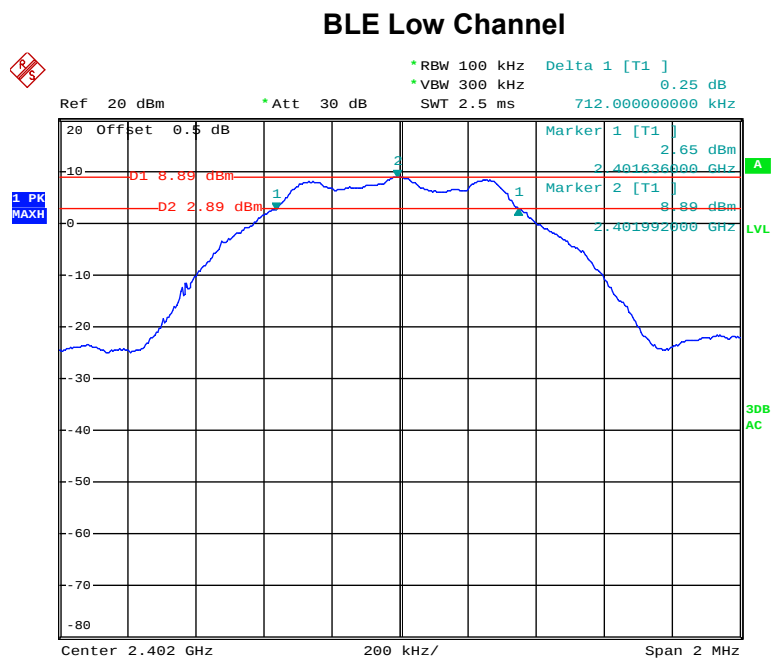
Temperature:	26.9 °C
Relative Humidity:	50.1%
ATM Pressure:	100.1kPa

* The testing was performed by Jacky Gu on 2017-05-12.

Test Mode: Transmitting

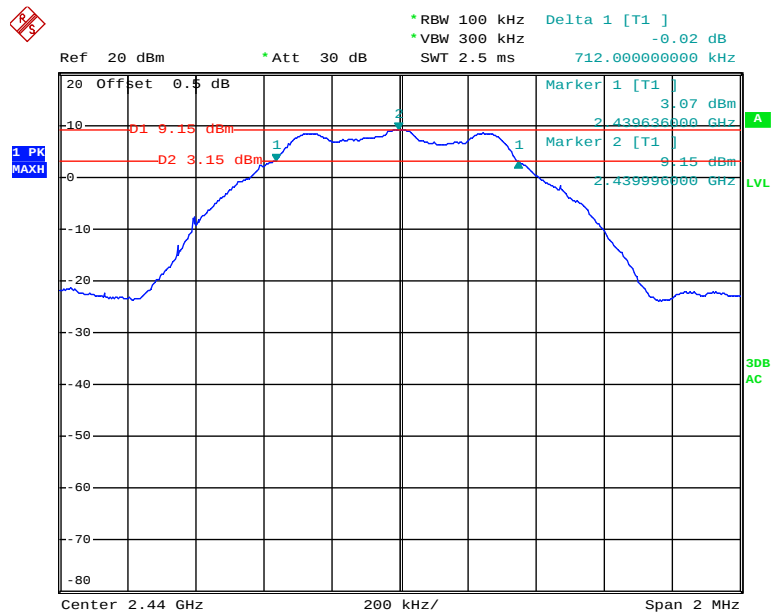
Test Result: Compliant. Please refer to the following table and plots.

Test mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
BLE	Low	2402	0.712	≥ 0.5
	Middle	2440	0.712	≥ 0.5
	High	2480	0.708	≥ 0.5



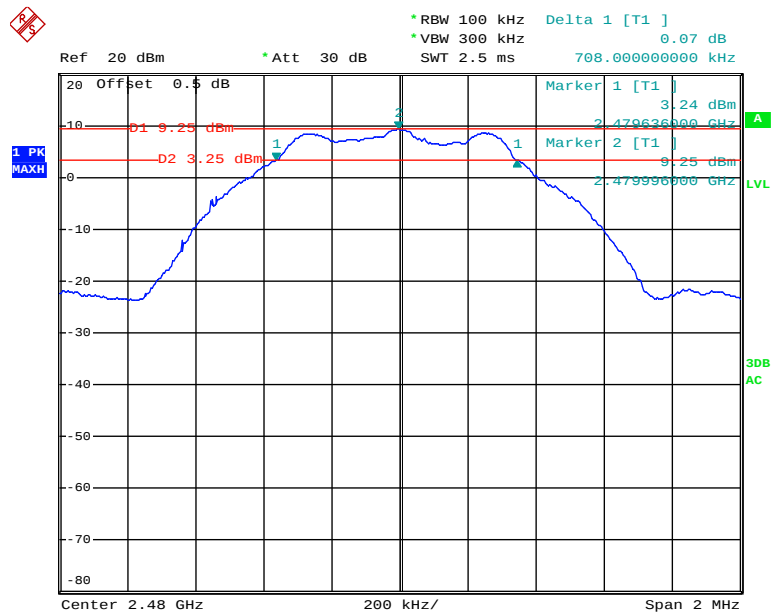
Date: 12.MAY.2017 20:41:13

BLE Middle Channel



Date: 12.MAY.2017 20:44:28

BLE High Channel



Date: 12.MAY.2017 20:45:30

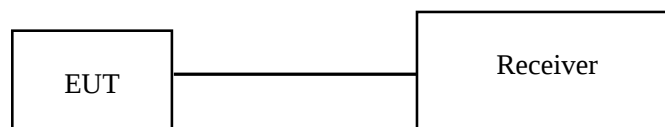
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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	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:	26.9 °C
Relative Humidity:	50.1%
ATM Pressure:	100.1kPa

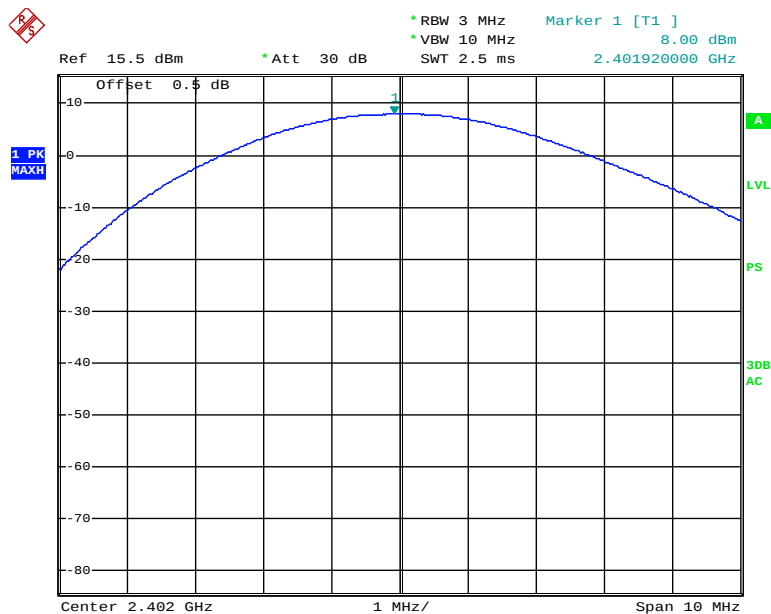
* The testing was performed by Jacky Gu on 2017-05-12.

Test Mode: Transmitting

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

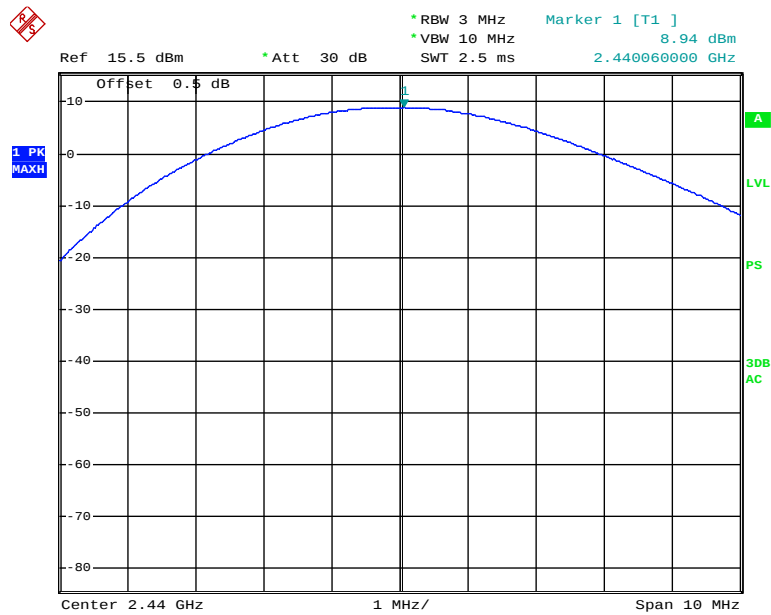
Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
BLE	Low	2402	8.00	30
	Middle	2440	8.94	30
	High	2480	9.06	30

Low Channel



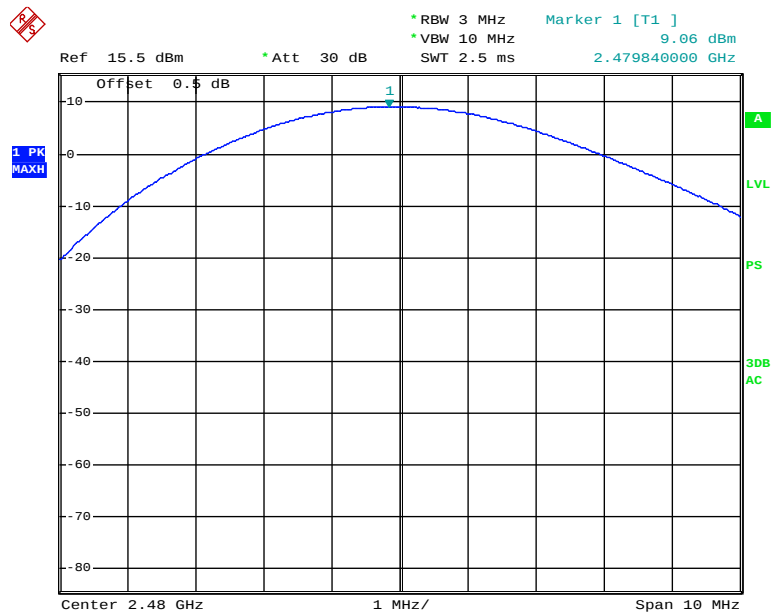
Date: 12.MAY.2017 20:39:46

Middle Channel



Date: 12.MAY.2017 20:42:16

High Channel



Date: 12.MAY.2017 20:43:29

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

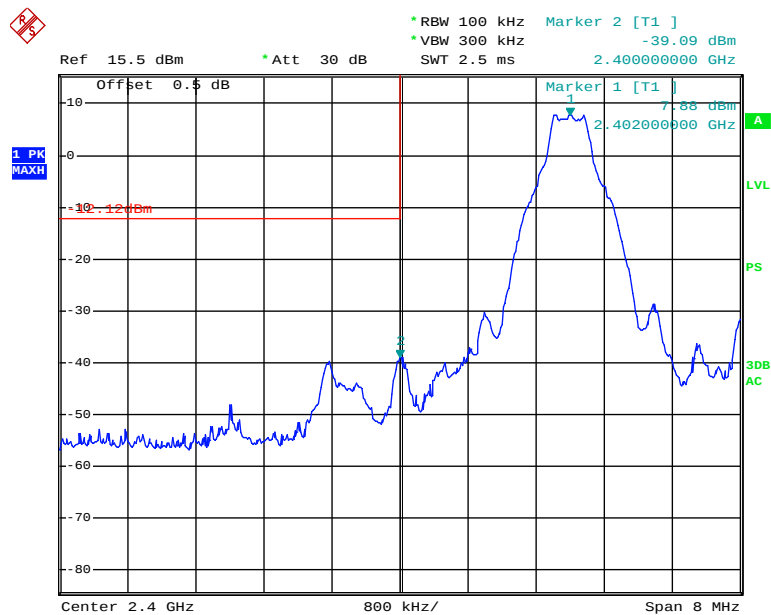
Temperature:	26.9 °C
Relative Humidity:	50.1%
ATM Pressure:	100.1kPa

* The testing was performed by Jacky Gu on 2017-05-12.

Test mode: Transmitting

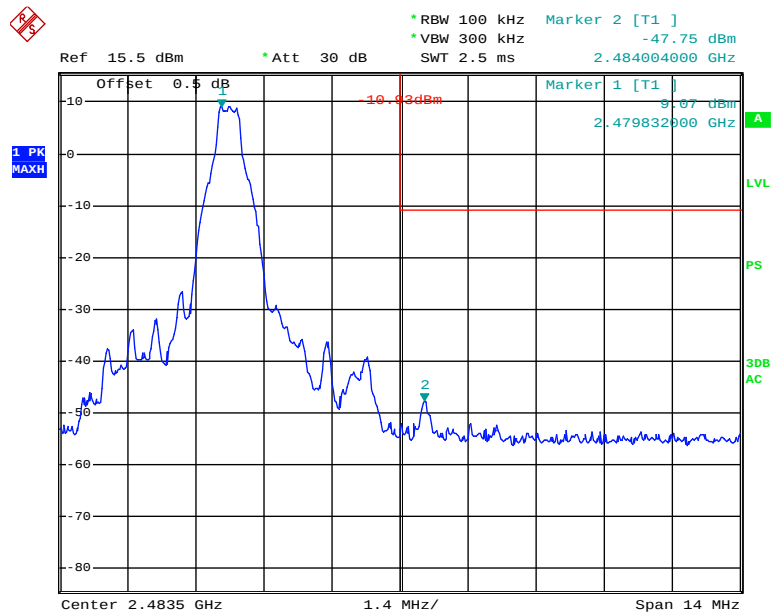
Test Result: Compliant. Please refer to following plots.

BLE Band Edge , Left Side



Date: 12.MAY.2017 20:40:07

BLE Band Edge, Right Side



Date: 12.MAY.2017 20:44:03

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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- 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:	26.9 °C
Relative Humidity:	50.1%
ATM Pressure:	100.1kPa

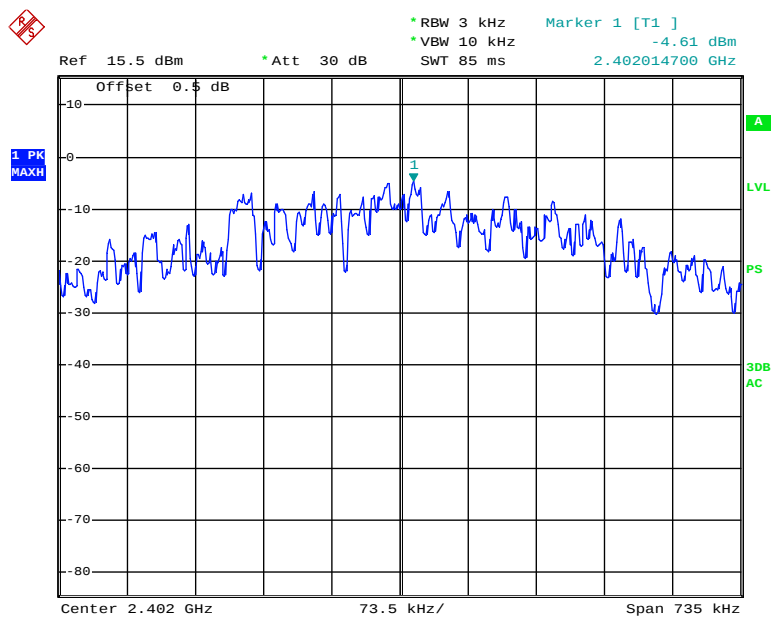
* The testing was performed by Jacky Gu on 2017-05-12.

Test Mode: Transmitting

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

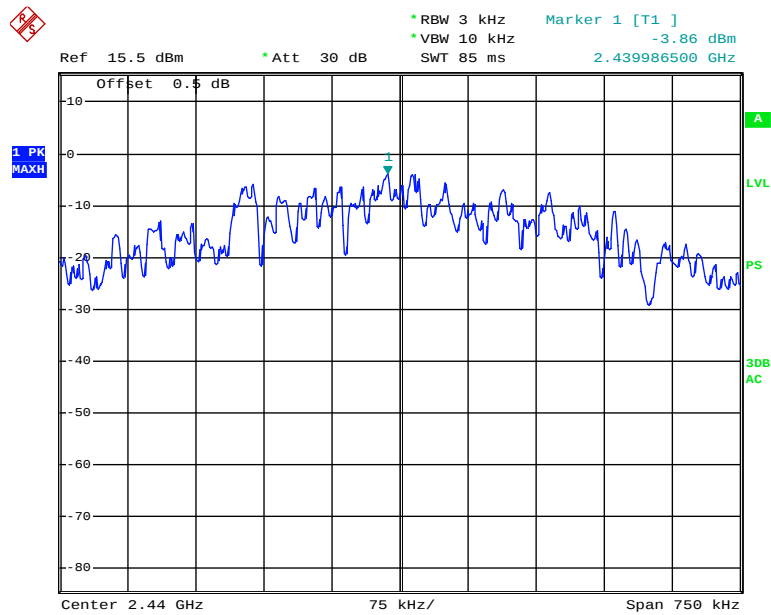
Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
BLE	Low	2402	-4.61	≤8
	Middle	2440	-3.86	≤8
	High	2480	-3.52	≤8

Power Spectral Density, BLE Low Channel



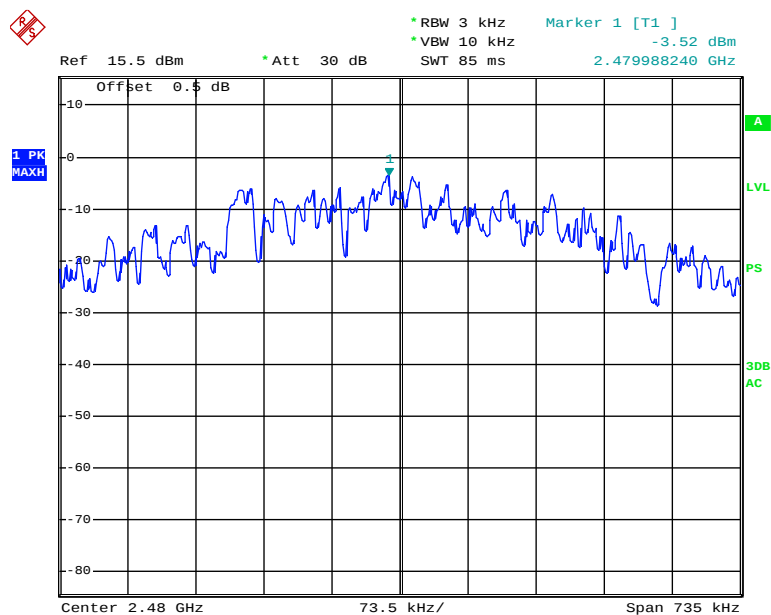
Date: 12.MAY.2017 20:39:52

Power Spectral Density, BLE Middle Channel



Date: 12.MAY.2017 20:42:24

Power Spectral Density, BLE High Channel



Date: 12.MAY.2017 20:43:36

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