

# FCC TEST REPORT

For

**Liuwa Kids Wearable**

**Model Number: LW01A1, LW01A2, LW02A1**

**FCC ID: 2AGRL001**

**Report Number : WT 158006264**

Test Laboratory : Shenzhen Academy of Metrology and Quality Inspection  
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## Test report declaration

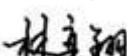
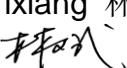
Applicant : iLoda Solutions Limited  
Address : 217A, 2/F, Enterprise Place No. 5 Science Park West Avenue, Shatin, Hong Kong.  
Manufacturer : Shenzhen Zhiliuyun Keji Kaifa Limited  
Address : 2805 Zhongdian Xinxi Building, Futian District, Shenzhen China  
EUT Description : Liuwa Kids Wearable  
Model No : LW01A1, LW01A2, LW02A1  
Trade mark : Liuwa  
Serial Number : /  
FCC ID : 2AGRL001

### Test Standards:

FCC Part 15 15.207, 15.209, 15.247(2014)

The EUT described above is tested by Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory to determine the maximum emissions from the EUT. Shenzhen Academy of Metrology and Quality Inspection EMC Laboratory is assumed full responsibility for the accuracy of the test results. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with FCC Rules Part 15.207, 15.209 and 15.247.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Project Engineer:	 (Chen Sulin 陈司林)	Date: Jan.12, 2016
Checked by:	 (Lin Yixiang 林奕翔)	Date: Jan.12, 2016
Approved by:	 (Lin Bin 林斌)	Date: Jan.12, 2016

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## 1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	FCC Rules	Test Results
6dB DTS bandwidth measurement	15.247 (a) (2)	Pass
Maximum Peak Conducted Power	15.247 (b) (3)	Pass
Maximum Power Spectral Density Level	15.247 (3)	Pass
Conducted Bandedge and Spurious	15.247 (d)	Pass
Radiated Bandedge and Spurious	15.247 (d) 15.209 15.205	Pass
Conducted emission test for AC power port	15.207	Pass
Antenna Requirement	15.203	Pass

Remark: "N/A" means "Not applicable."

## 2. GENERAL INFORMATION

### 2.1. Report information

2.1.1. This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.

2.1.2. The sample/s mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

2.1.3. Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

### 2.2. Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number are 446246 806614 994606(semi anechoic chamber).

The Laboratory is listed in Voluntary Control Council for Interference by Information Technology Equipment (VCCI), and the registration number are R-1974(open area test site) , R-1966(semi anechoic chamber),C-2117(mains ports conducted interference measurement) and T-180(telecommunication ports conducted interference measurement).

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the registration number is 11177A-1 11177A-2.

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the registration number is E2024086Z02.

## **2.3. Measurement Uncertainty**

Conducted Emission  
9kHz~30MHz 3.5dB

Radiated Emission  
30MHz~1000MHz 4.5dB  
1GHz~26.5GHz 4.6dB

### 3. PRODUCT DESCRIPTION

#### 3.1. EUT Description

Description : Liuwa Kids Wearable  
Manufacturer : Shenzhen Zhiliuyun Keji Kaifa Limited  
Model Number : LW01A1, LW01A2, LW02A1  
Operate Frequency : 2402MHz~2480MHz  
Antenna Designation : PIFA Antenna 0dBi

Remark: Two different colors.

LW01A1 is the hardware in green color and LW01A2 is the hardware in yellow color.

LW02A1 is a package that contains two pieces of hardware, one green and one yellow.  
the testing was performed with LW01A2, The test result covers all models.

Bluetooth Low Energy :

Table 2 Working Frequency List

Regulatory Range	RF Channels
2.400-2.4835 GHz	$f=2402+k*2$ MHz, $k=0, \dots, 39$

#### 3.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **2AGRL001**, filing to comply with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

#### 3.3. Block Diagram of EUT Configuration

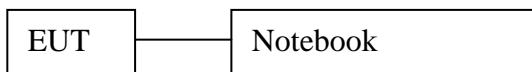


Figure 1 EUT setup

### **3.4. Operating Condition of EUT**

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power.

Worst-case data rates as provided by the client were:

Bluetooth low energy

Test mode is configured to be with duty cycle >98%

### **3.5. Directional Antenna Gain**

The EUT does NOT support a MIMO function.

Directional gain need NOT to be considered.

### **3.6. Support Equipment List**

**Table 3 Support Equipment List**

Name	Model No	S/N	Manufacturer
Notebook	R51	--	IBM
Adaptor for Notebook	02K6654	--	IBM

### **3.7. Test Conditions**

Date of test : Nov.30, 2015- Jan.08, 2016

Date of EUT Receive : Nov.30, 2015

Temperature: 20-23 °C

Relative Humidity: 32-48%

### **3.8. Special Accessories**

Not available for this EUT intended for grant.

### **3.9. Equipment Modifications**

Not available for this EUT intended for grant.

## 4. TEST EQUIPMENT USED

Table 4 Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB8501/09	EMI Test Receiver	Rohde & Schwarz	ESU40	Mar.24, 2015	1 Year
SB8501/04	Bilog Antenna	Schwarzbeck	VULB9163	Mar.23, 2015	1 Year
SB3435	Horn Antenna	Rohde & Schwarz	HF906	Jan.19, 2015	1 Year
SB3937	Horn Antenna	Amplifier Research	AT4002A	Jan.19, 2015	1 Year
SB3450/01	3m Semi-anechoic chamber	Albatross Projects	9X6X6	Oct.09, 2014	2 Years
SB3345	Loop Antenna	Schwarzbeck	FMZB1516	Jan.20, 2015	2 Years
SB3437	Power meter	Rohde & Schwarz	NRVD	Apr.06,2015	1 Year
SB3437/01	Power sensor	Rohde & Schwarz	URV5-Z2	Jul.02,2015	1 Year
SB9721/02	Signal Analyzer	Agilent	N9020A	Dec.28, 2015	1 Year
----	Radiated Emissions Cable set	HUBER+SUHN ER	---	Jan.19, 2015	1 Year
---	Radiated Emissions Cable set	HUBER+SUHN ER	---	Jan.19, 2015	1 Year
SB8501/17	Preamplifier	Rohde & Schwarz	SCU-18	Mar.23, 2015	1 Year
SB8501/16	Preamplifier	Rohde & Schwarz	SCU-26	Mar.23, 2015	1 Year
SB9059	Preamplifier	Rohde & Schwarz	SCU-40	Nov.11, 2015	1 Year

## 5. 6DB BANDWIDTH MEASUREMENT

### 5.1. LIMITS OF 6dB BANDWIDTH MEASUREMENT

CFR 47 (FCC) part 15.247 (a) (2) and 558074 D01 DTS Meas Guidance vv03r02

### 5.2. TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer.

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW)  $\geq 3$  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.

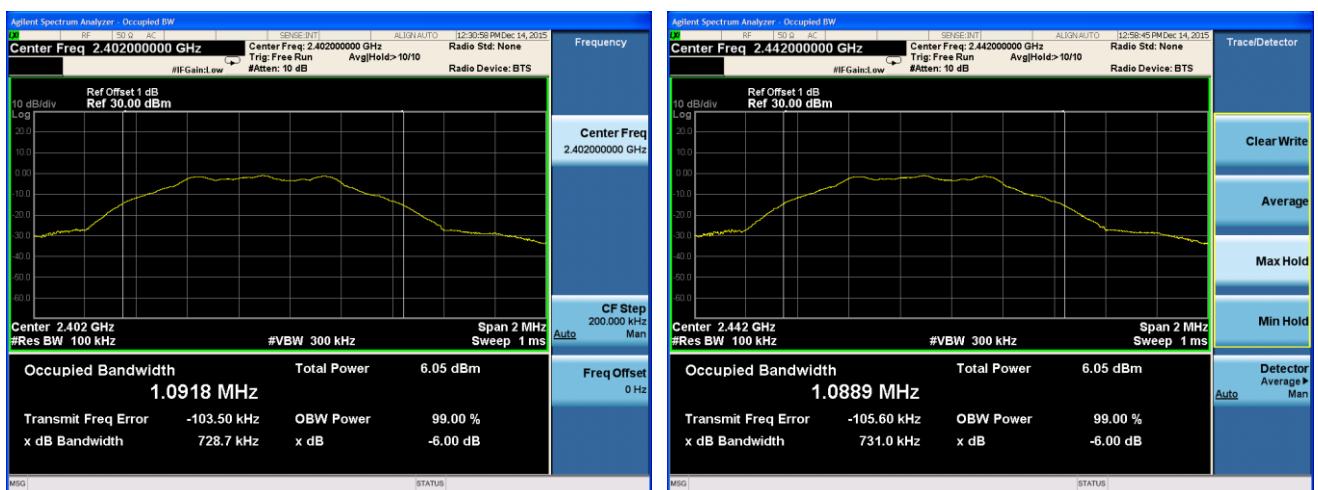
### 5.3. TEST SETUP



## 5.4. Test Data

Table 5 6dB Bandwidth Test Data BLE

CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	results
2402	0.7287	Pass
2442	0.7310	Pass
2480	0.7200	Pass



## 6. MAXIMUM PEAK CONDUCTED OUTPUT POWER MEASUREMENT

### 6.1. LIMITS OF Maximum Peak Conducted Output Power Measurement

CFR 47 (FCC) part 15.247 (b) (3) and 558074 D01 DTS Meas Guidance vv03r02

### 6.2. TEST PROCEDURE

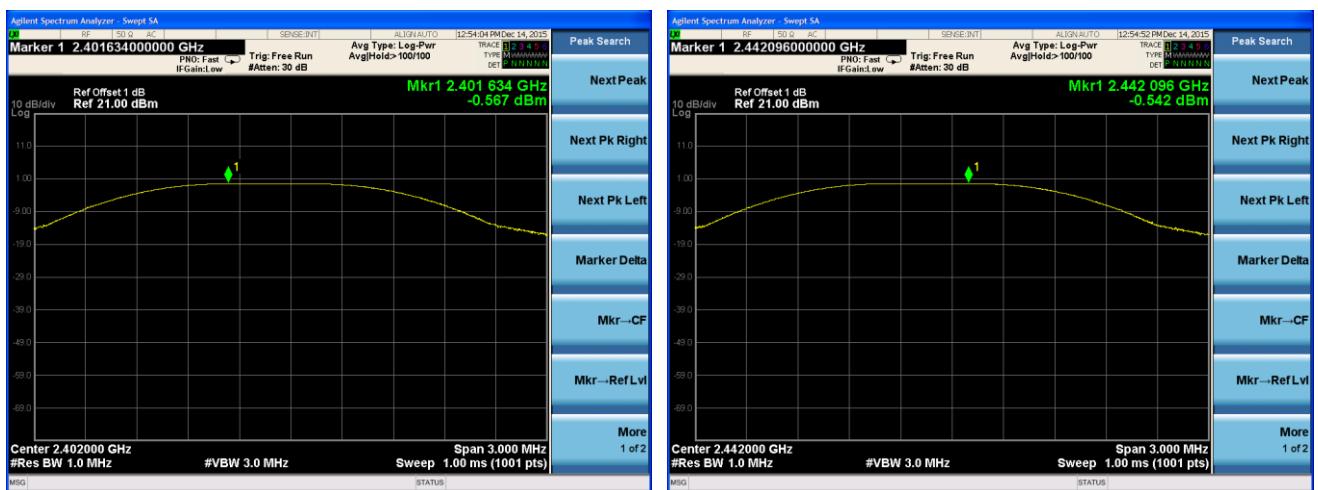
The transmitter output was connected to the spectrum analyzer.

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

### 6.3. TEST DATA

Table 6 Maximum Peak Conducted Output Power Test Data BLE

Center Freq.[MHz]	Meas. Level (Cond.) [dBm]	Limit [dBm]	Result
2402	-0.567	< 30	Pass
2442	-0.542	< 30	Pass
2480	-0.488	< 30	Pass



## 7. MAXIMUM POWER SPECTRAL DENSITY LEVEL MEASUREMENT

### 7.1. LIMITS OF Maximum Power Spectral Density Level Measurement

CFR 47 (FCC) part 15.247 (e) and 558074 D01 DTS Meas Guidance vv03r02

### 7.2. TEST PROCEDURE

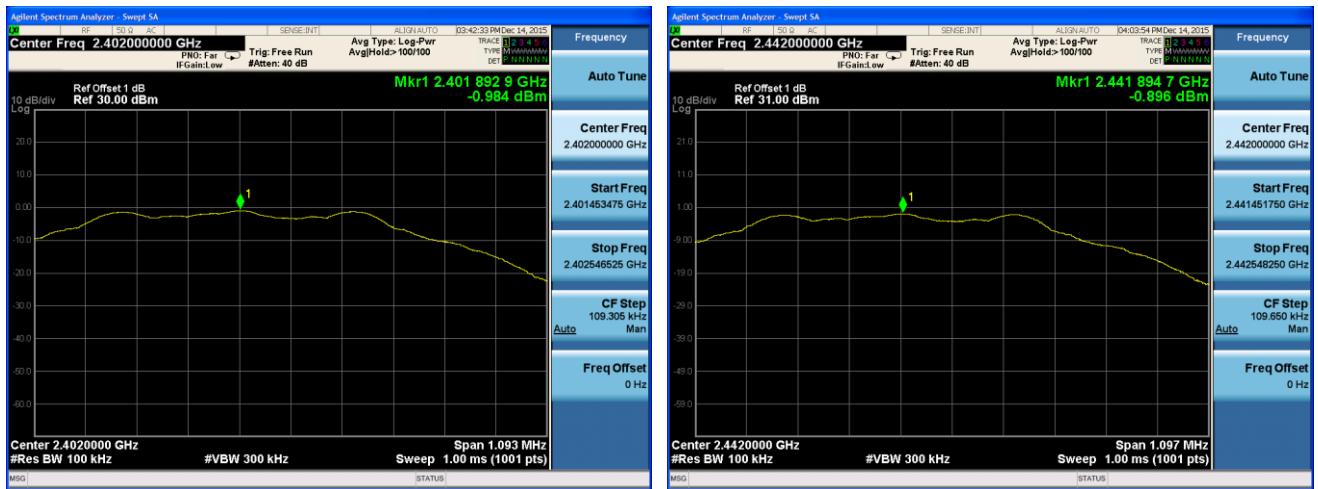
The transmitter output was connected to the spectrum analyzer.

- 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  $\geq 3 \text{ RBW}$ .
- 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.

### 7.3. TEST DATA

Table 7 Maximum Power Spectral Density Level Test Data BLE

Center Freq.[MHz]	PSD [dBm]	Limit [dBm]	Result
2402	-0.948	8	Pass
2442	-0.896	8	Pass
2480	-0.878	8	Pass



## 8. CONDUCTED BANDEDGE AND SPURIOUS MEASURMENT

### 8.1. LIMITS OF Conducted Bandedge and Spurious Measurement

CFR 47 (FCC) part 15.247 (d) and 558074 D01 DTS Meas Guidance vv03r02

### 8.2. TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer.

Establish a reference level by using the following procedure:

a) Set instrument center frequency to DTS channel center frequency.

b) Set the span to  $\geq 1.5$  times the DTS bandwidth.

c) Set the RBW = 100 kHz.

d) Set the VBW  $\geq 3 \times$  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 PSD level.

Emission level measurement

a) Set the center frequency and span to encompass frequency range to be measured.

b) Set the RBW = 100 kHz.

c) Set the VBW  $\geq 3 \times$  RBW.

d) Detector = peak.

e) Ensure that the number of measurement points  $\geq$  span/RBW

f) Sweep time = auto couple.

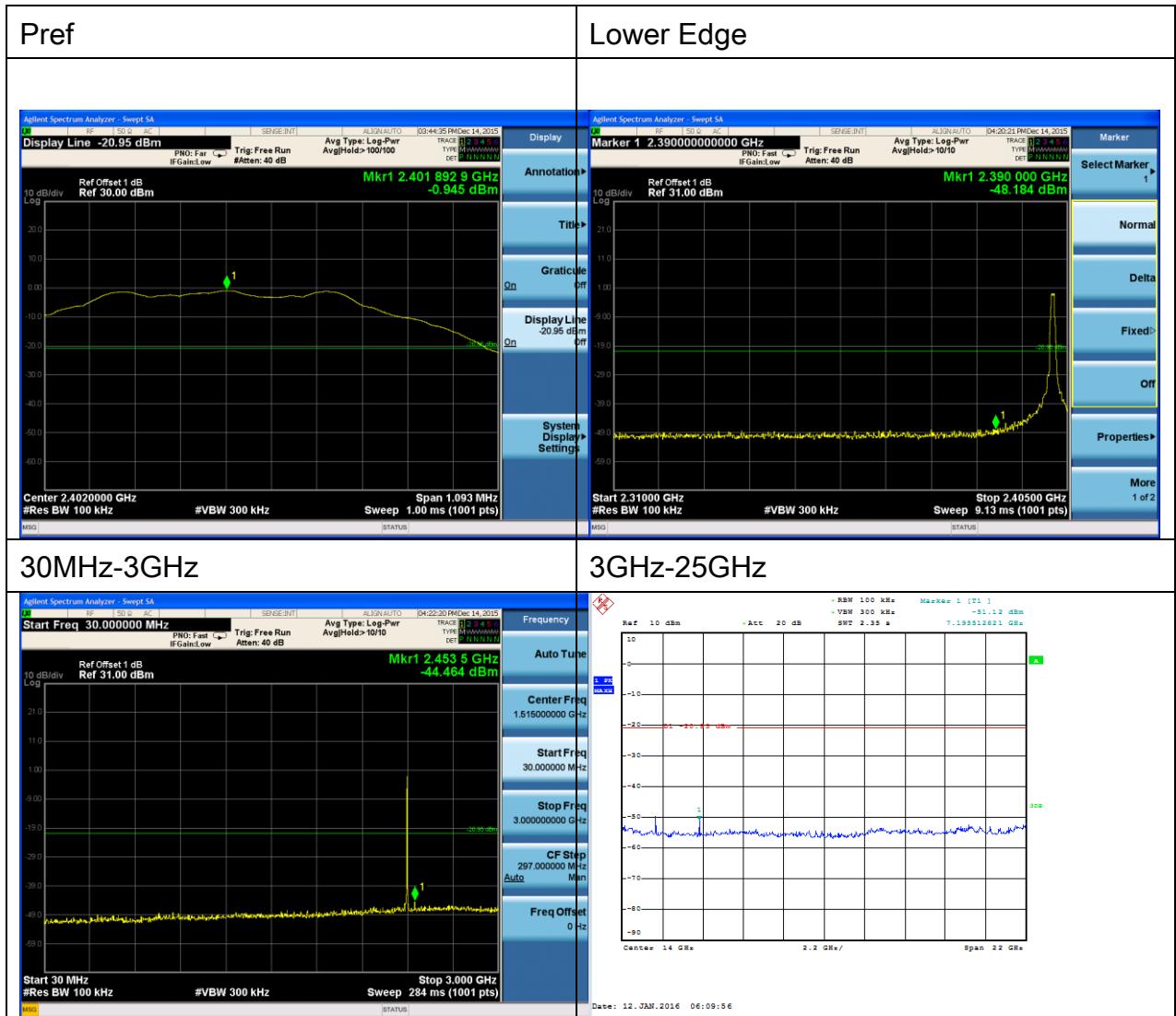
g) Trace mode = max hold.

h) Allow trace to fully stabilize.

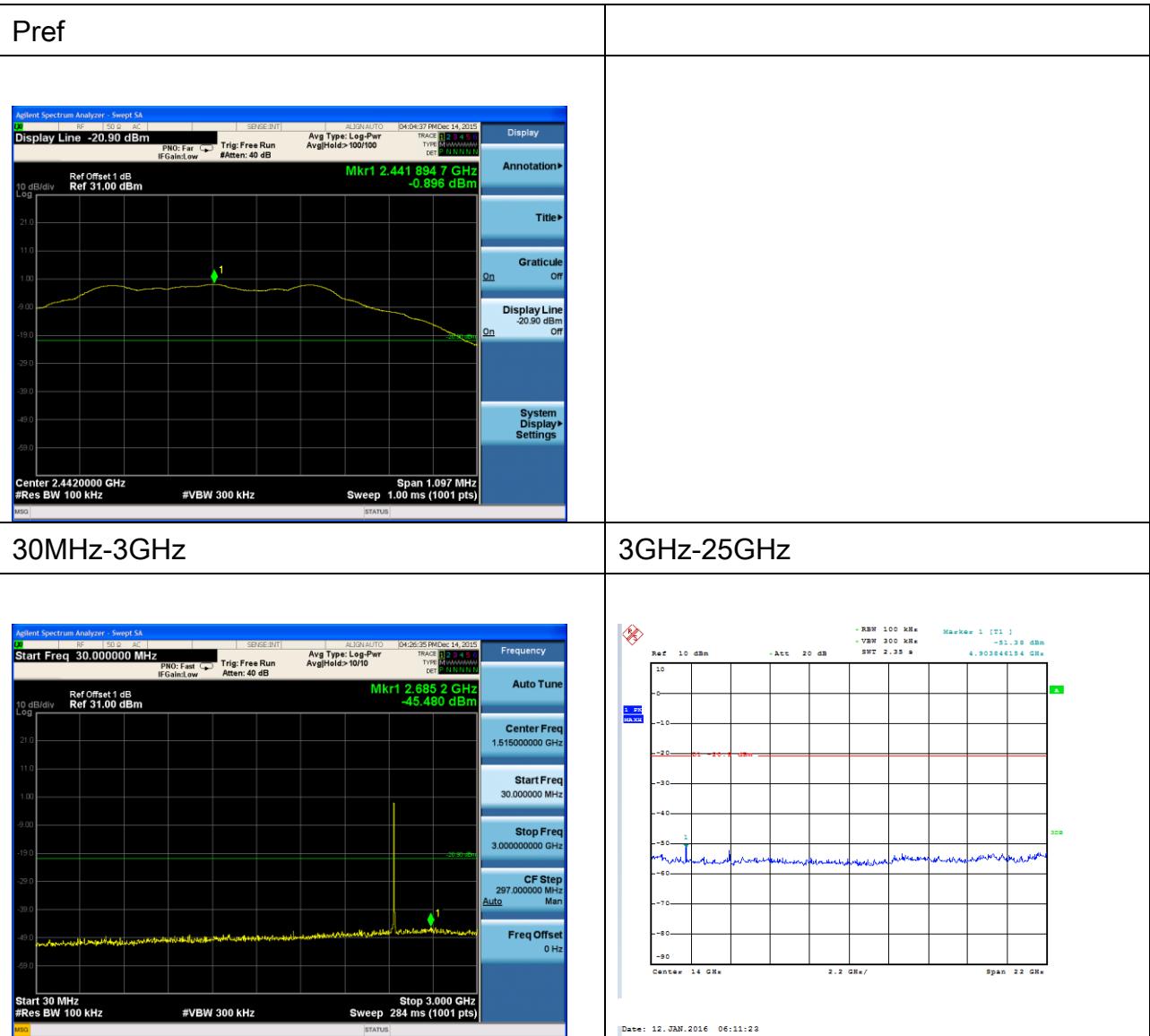
i) Use the peak marker function to determine the maximum amplitude level.

## TEST DATA

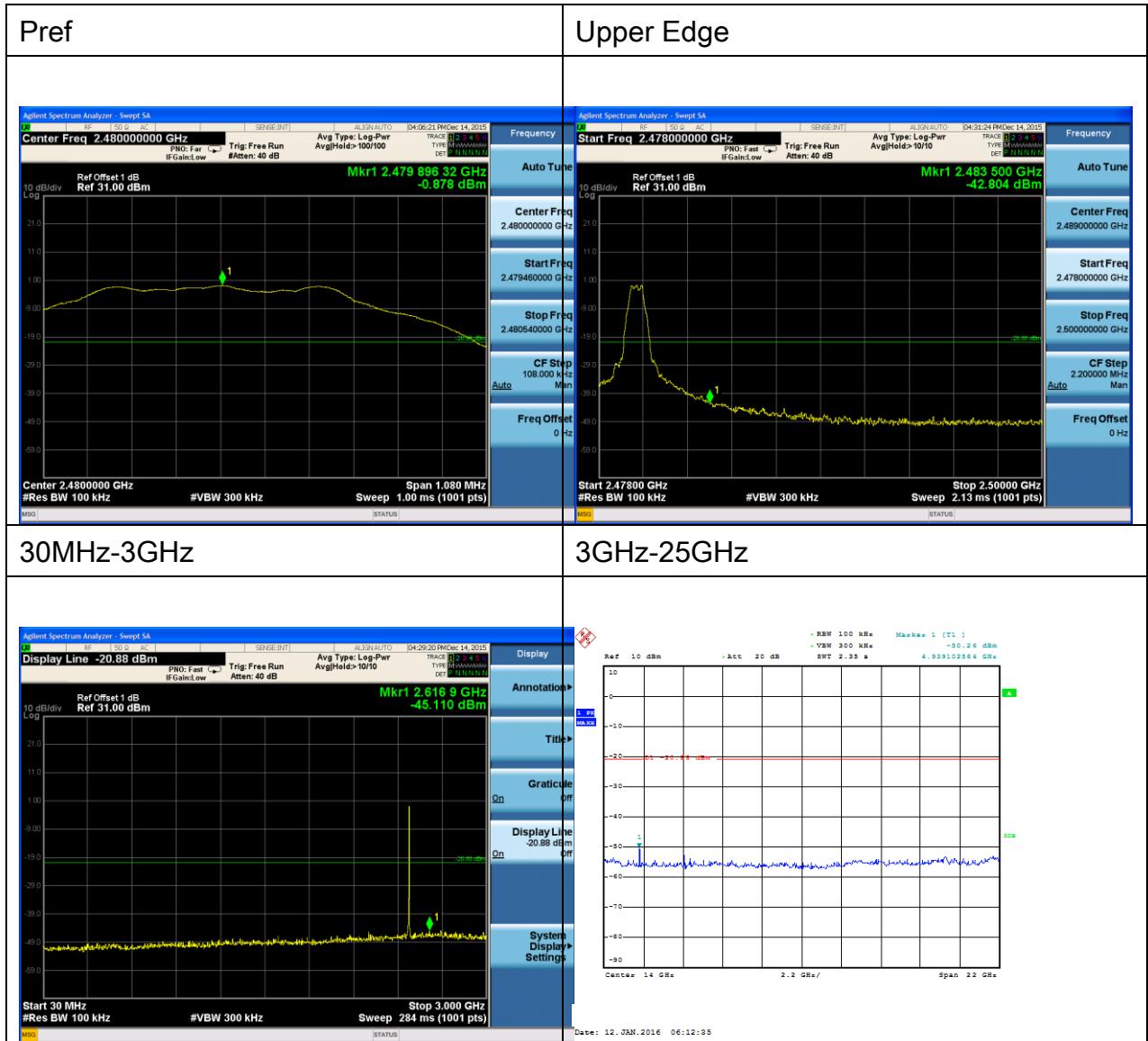
### BLE CH0



## BLE CH20



## BLE CH39



## 9. RADIATED BANDEDGE AND SPURIOUS MEASUREMENT

### 9.1. LIMITS OF Radiated Bandedge and Spurious Measurement

CFR 47 (FCC) part 15.247 (d) and 558074 D01 DTS Meas Guidance vv03r02

### 9.2. TEST PROCEDURE

1. The testing follows the guidelines in ANSI C63.10-2009.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f > 1$  GHz for peak measurement.  
Set RBW = 1 MHz, VBW= 10Hz for  $f > 1$  GHz for AV measurement.

### 9.3. TEST DATA

9kHz-30MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

### Radiated Emission Test Data 9k Hz-30MHz

Frequency MHz	Cable Loss(dB)	Antenna Factor(dB)	Readings(dB $\mu$ V/m)	Level(dB $\mu$ V/m)	Polarity(H/V)	Turntable Angle(degree)	Antenna Height(m)	Limits(dB $\mu$ V/m)	Margin(dB)
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### 30MHz-1GHz

Worst case is shown below for 30MHz-1GHz only.

The emissions don't show in following result tables are more than 20dB below the limits.

### Radiated Emission Test Data 30MHz-1GHz

Frequency MHz	Cable Loss(dB)	Antenna Factor(dB)	Readings(dB $\mu$ V/m)	Level(dB $\mu$ V/m)	Polarity(H/V)	Turntable Angle(degree)	Antenna Height(m)	Limits(dB $\mu$ V/m)	Margin(dB)
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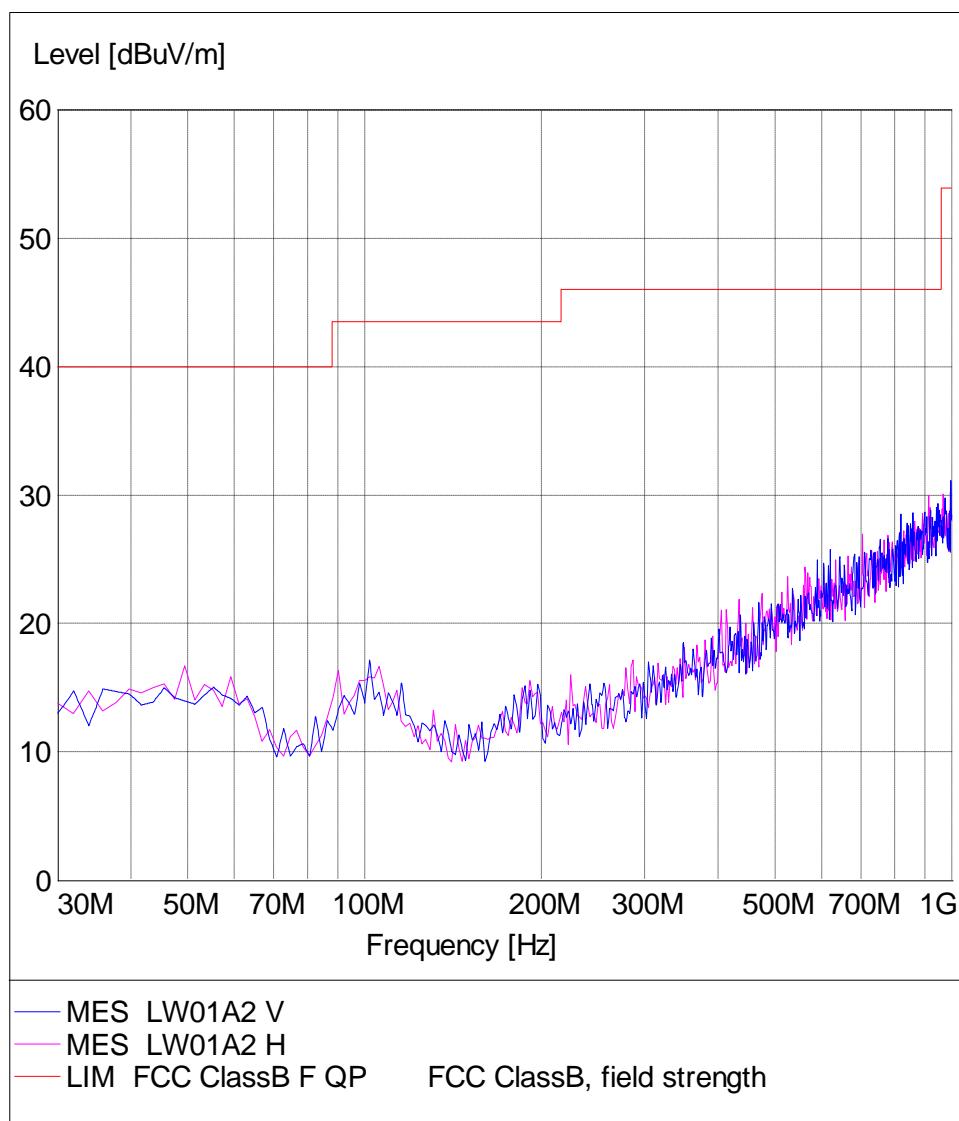
# Radiated Emission

## EUT Information

EUT Model Name: LW01A2  
Operation mode: Charging and Transmitting  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal\ Vertical  
Operator Name:  
Comment:



1GHz-18GHz

BLE CH0

## Radiated Emission

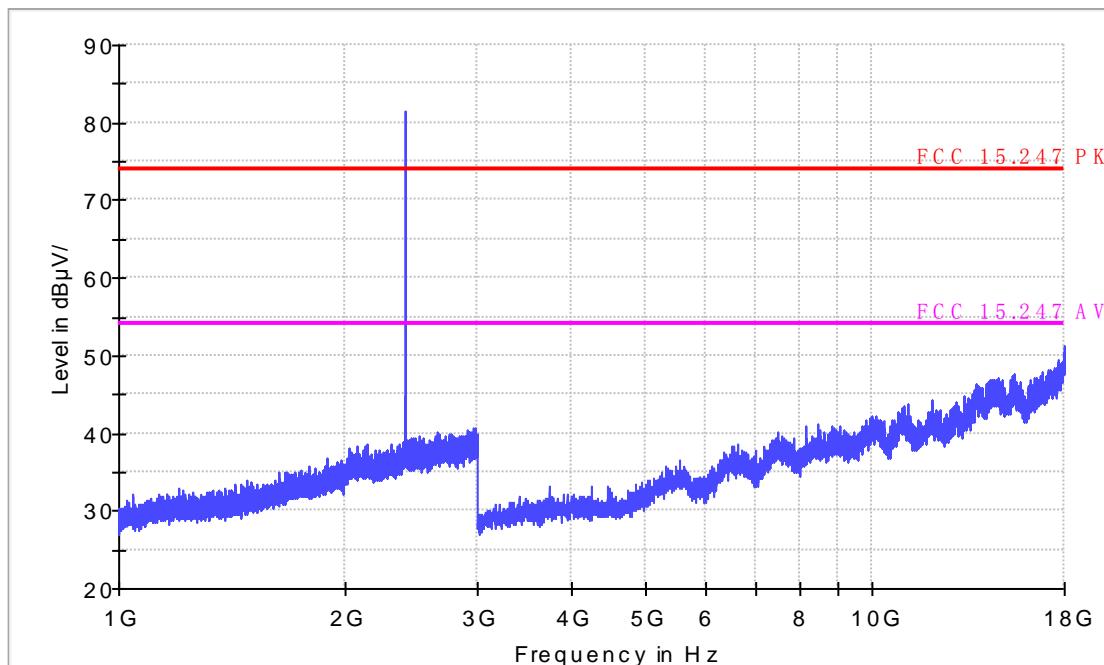
### EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

### Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

Electric Field Strength FCC 15.247 1-18GHz



# Radiated Emission

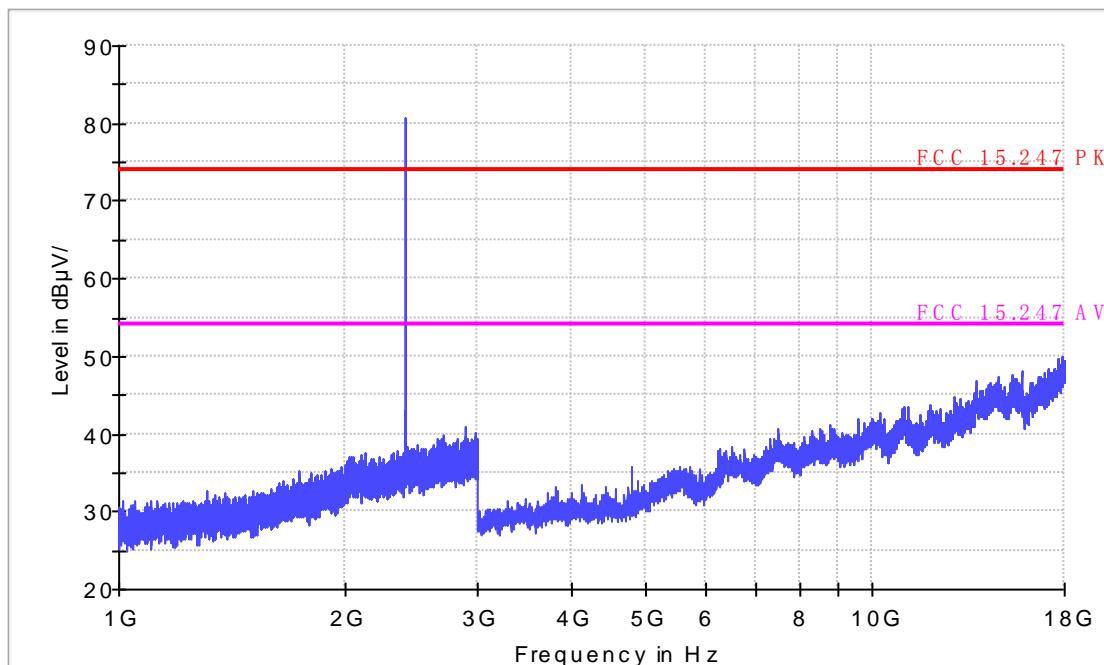
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

Electric Field Strength FCC 15.247 1-18GHz



18GHz-26.5GHz

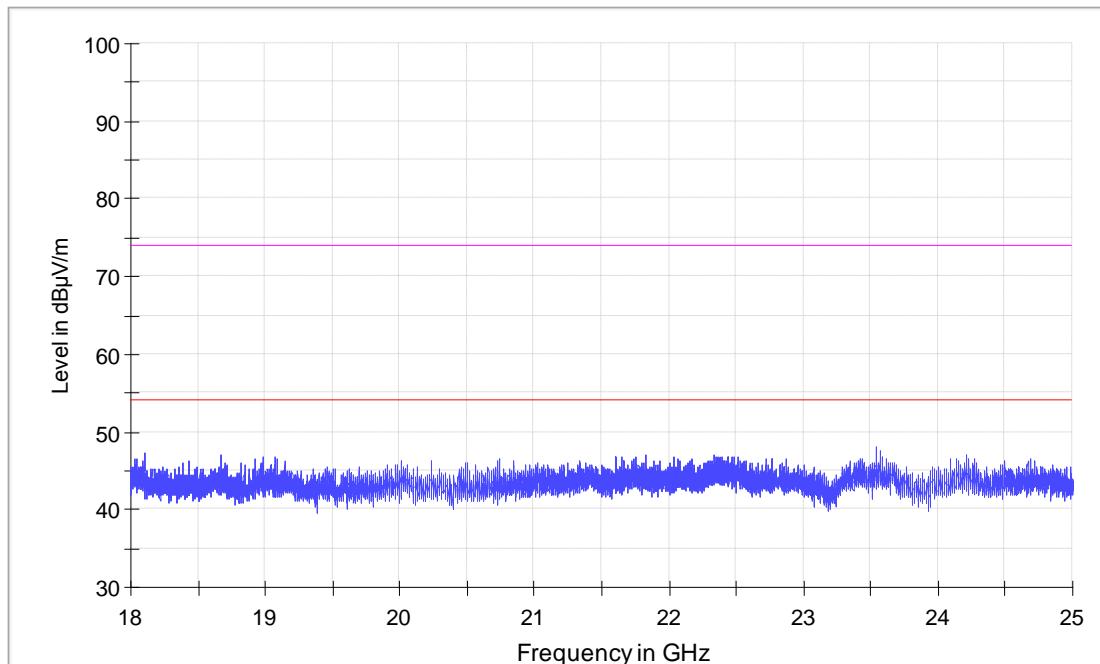
## Radiated Emission

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

### Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

FCC Electric Field Strength 18-26.5GHz



# Radiated Emission

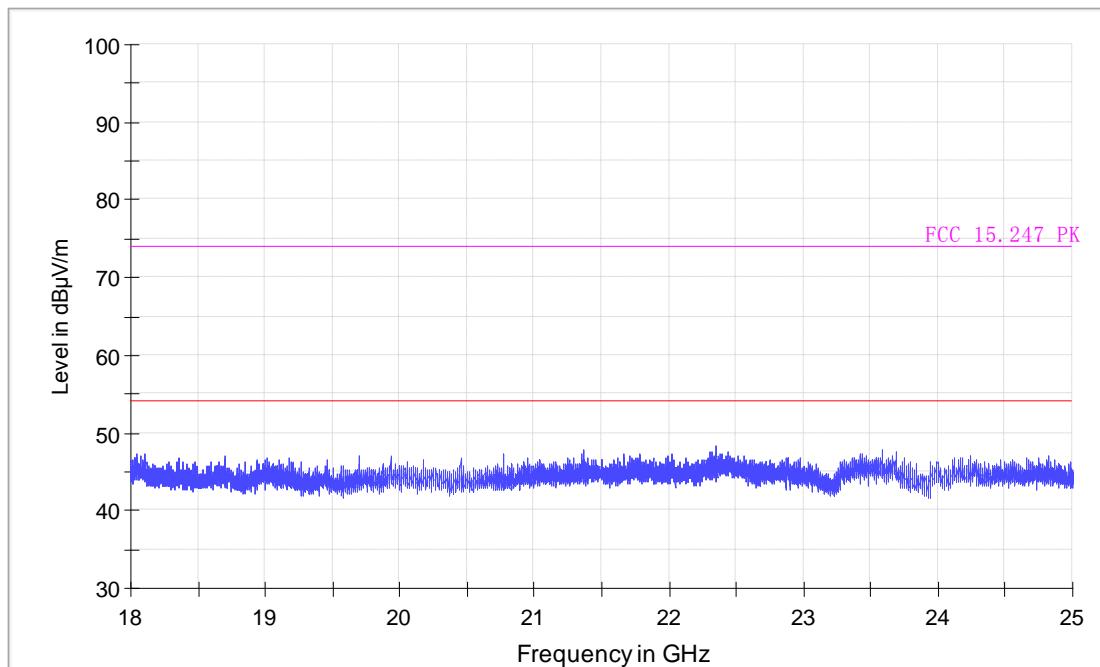
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 18-26.5GHz



# Radiated Emission

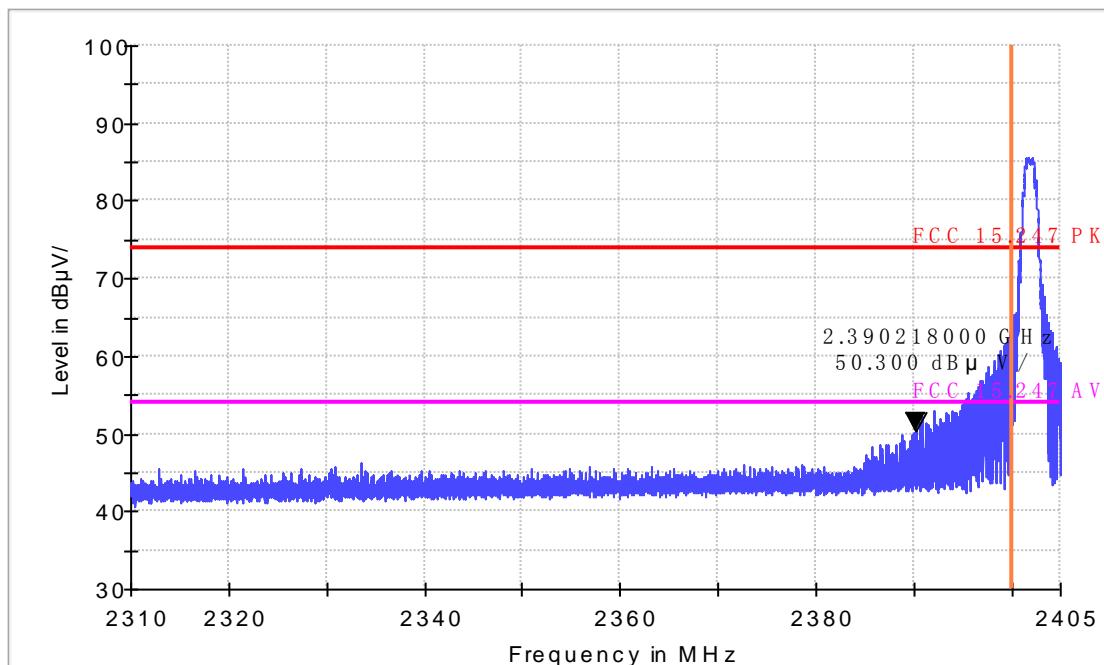
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-PK



# Radiated Emission

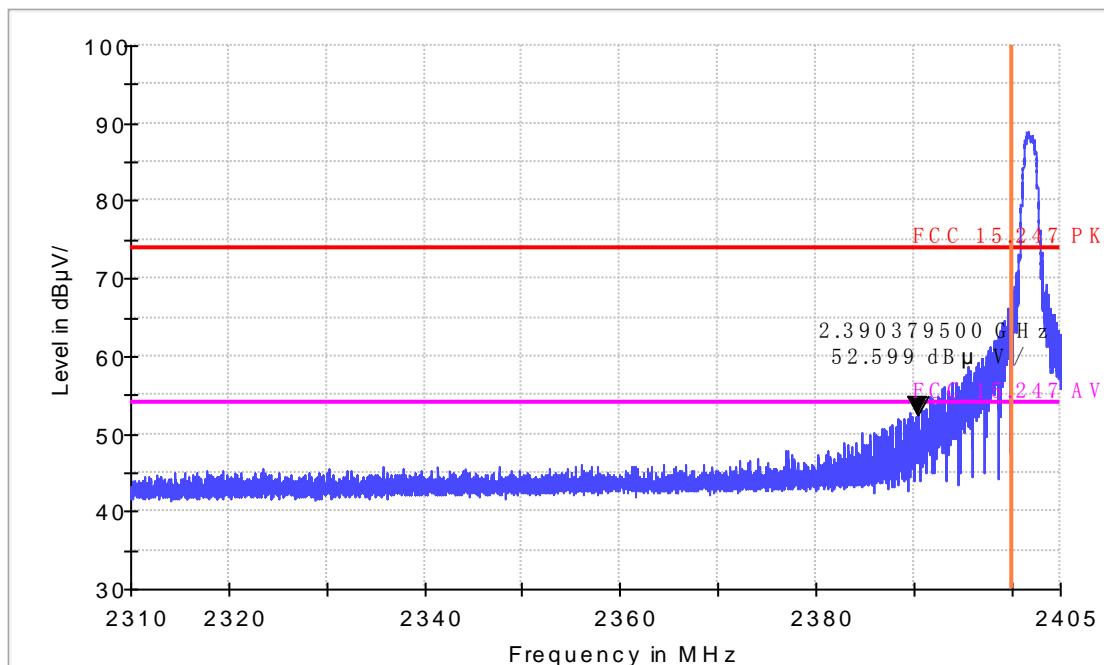
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-PK



# Radiated Emission

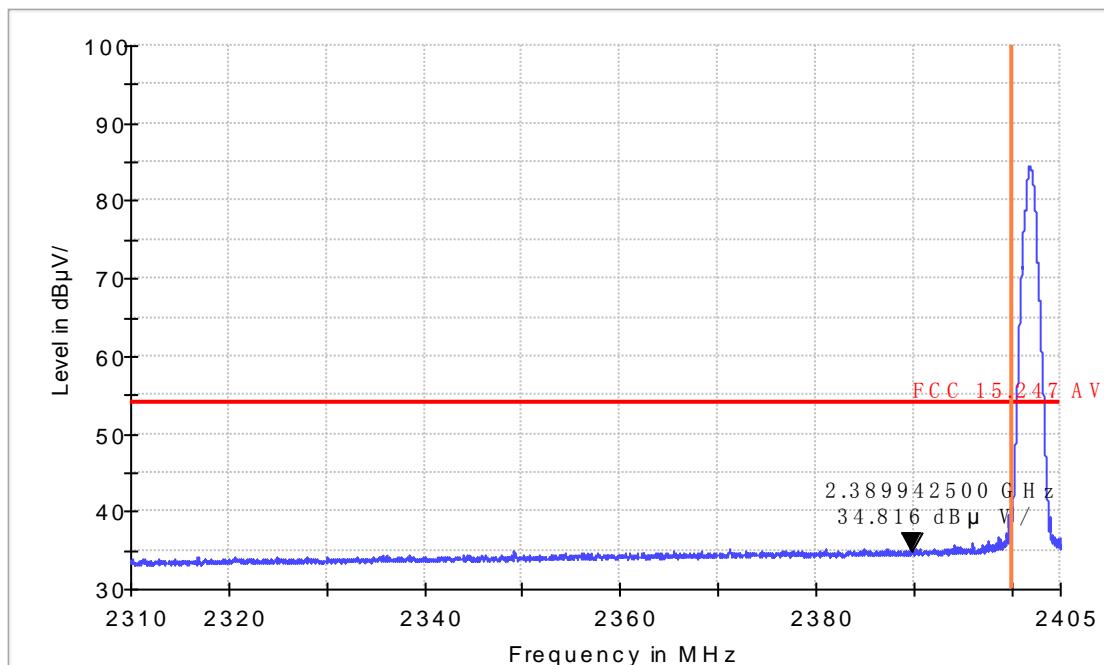
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-AV



# Radiated Emission

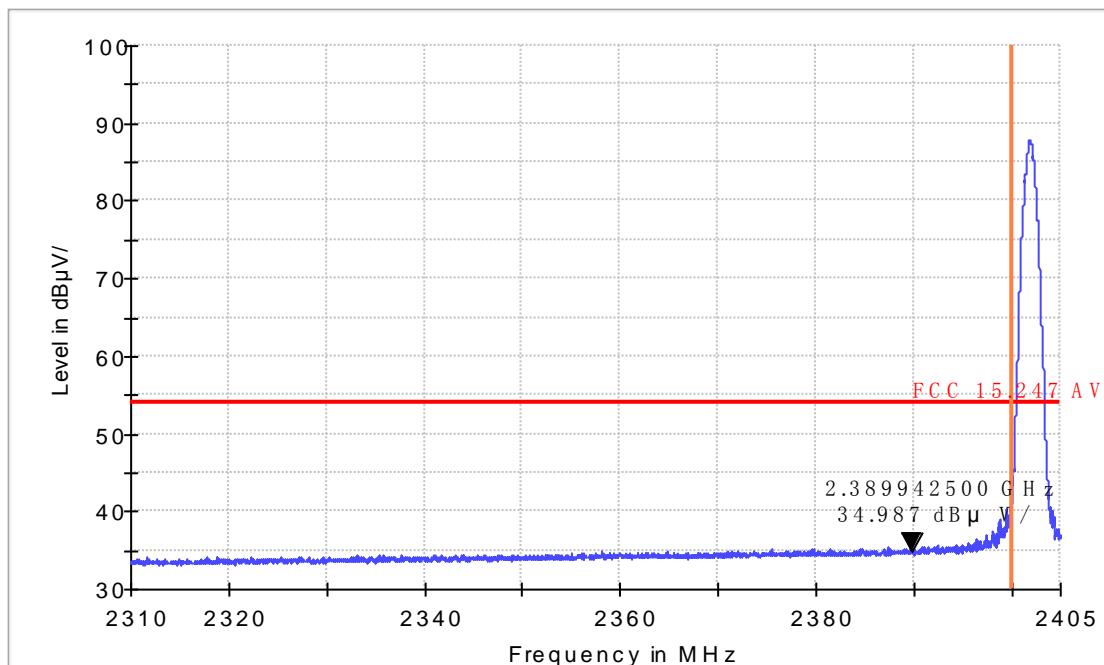
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH0  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-AV



BLE CH20

# Radiated Emission

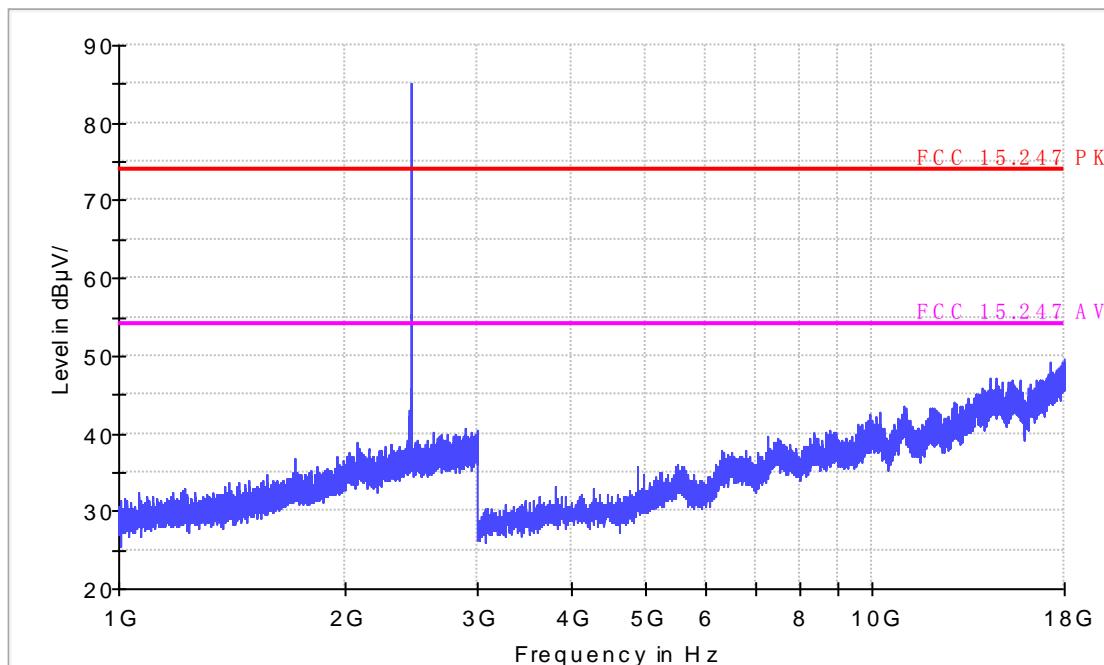
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH20  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

Electric Field Strength FCC 15.247 1-18GHz



# Radiated Emission

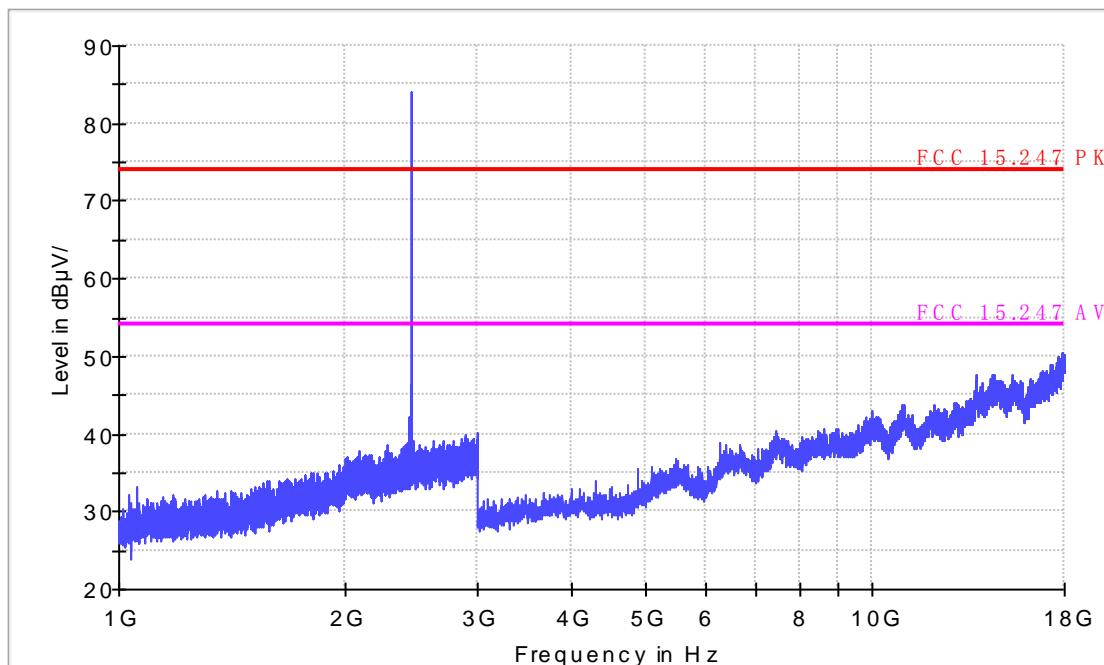
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH20  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

Electric Field Strength FCC 15.247 1-18GHz



# Radiated Emission

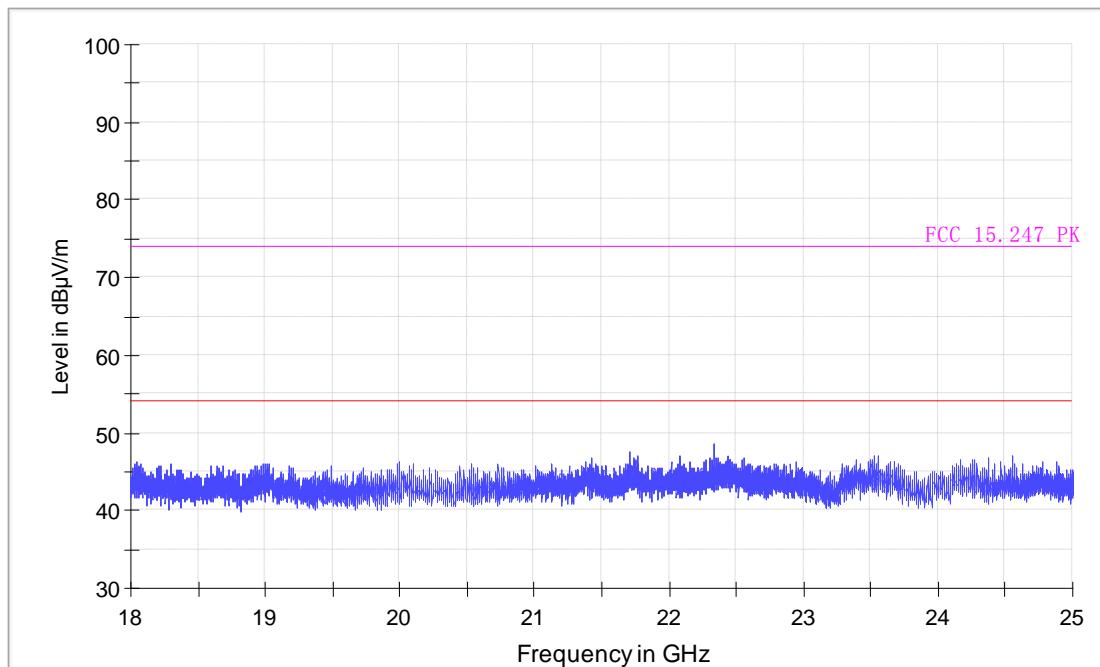
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH20  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal

FCC Electric Field Strength 18-26.5GHz



# Radiated Emission

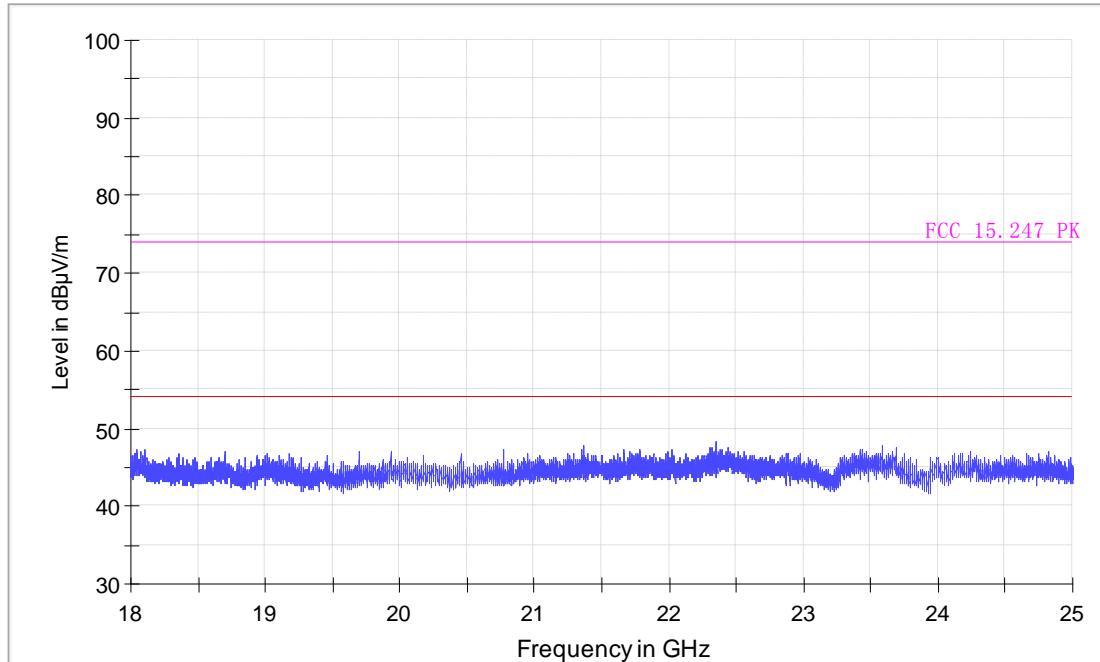
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH20  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 18-26.5GHz



BLE CH39

# Radiated Emission

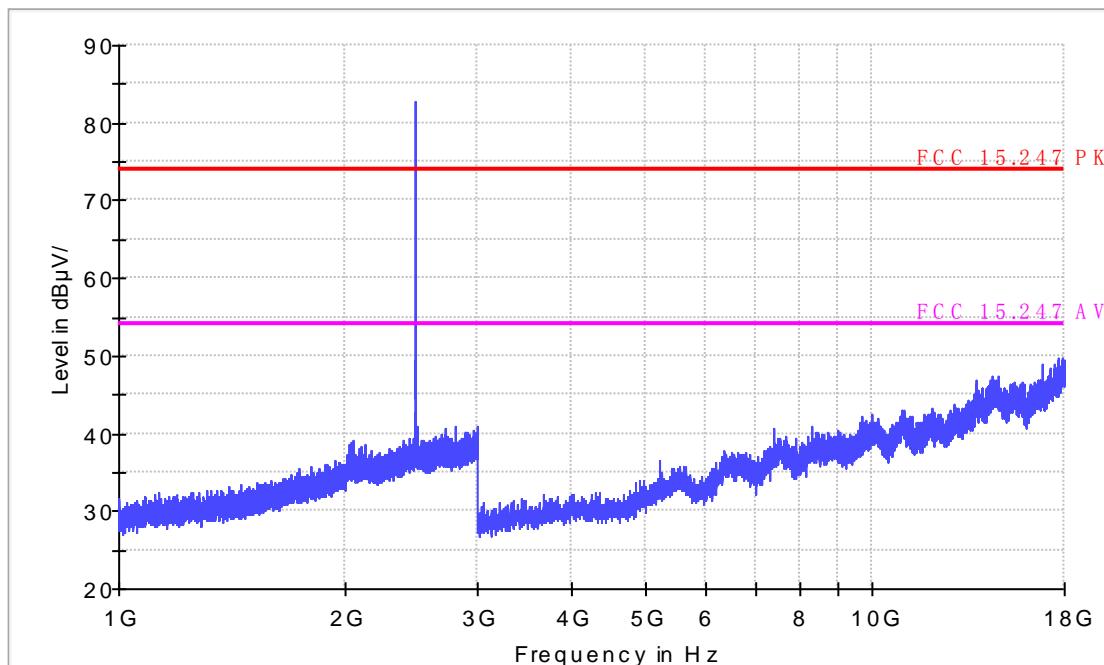
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

Electric Field Strength FCC 15.247 1-18GHz



# Radiated Emission

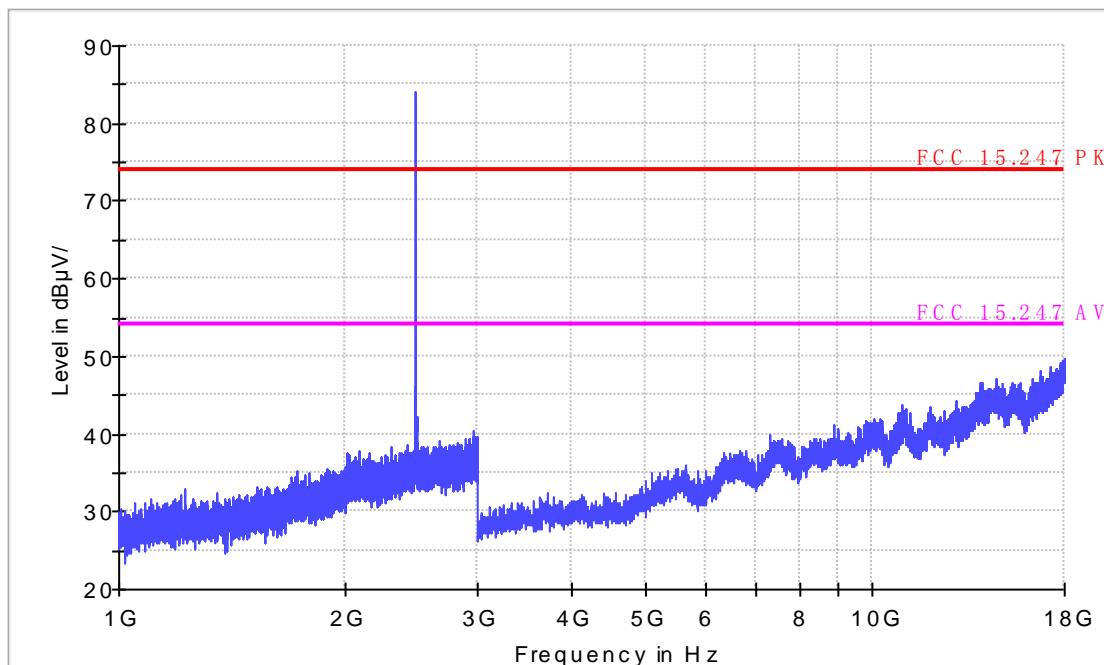
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

Electric Field Strength FCC 15.247 1-18GHz



# Radiated Emission

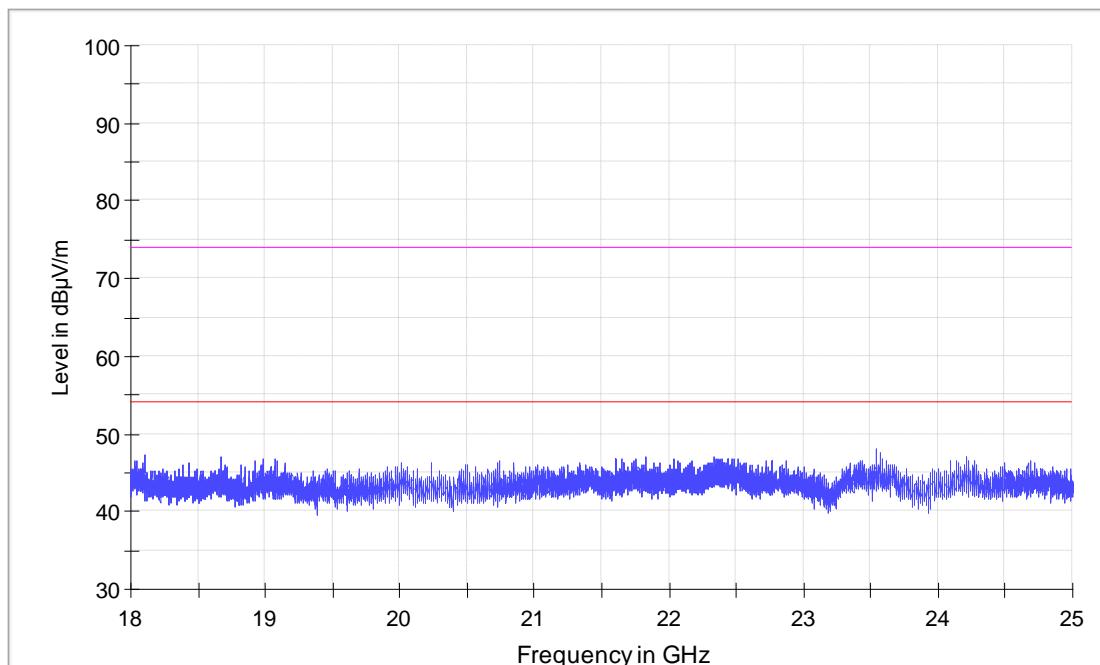
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:

FCC Electric Field Strength 18-26.5GHz



# Radiated Emission

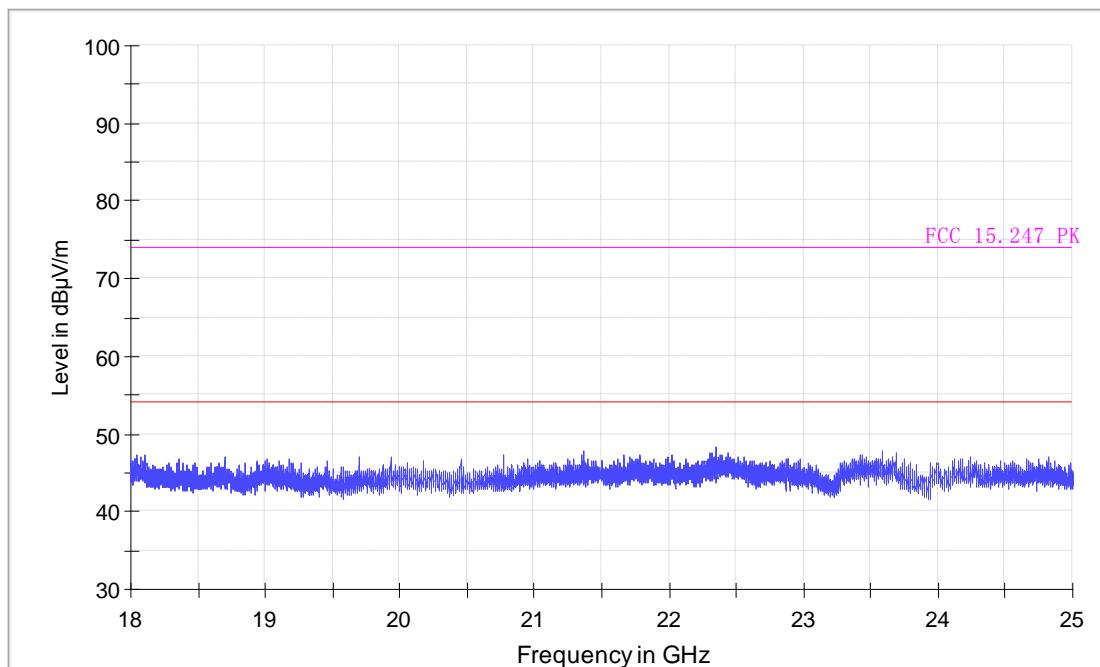
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 18-26.5GHz



# Radiated Emission

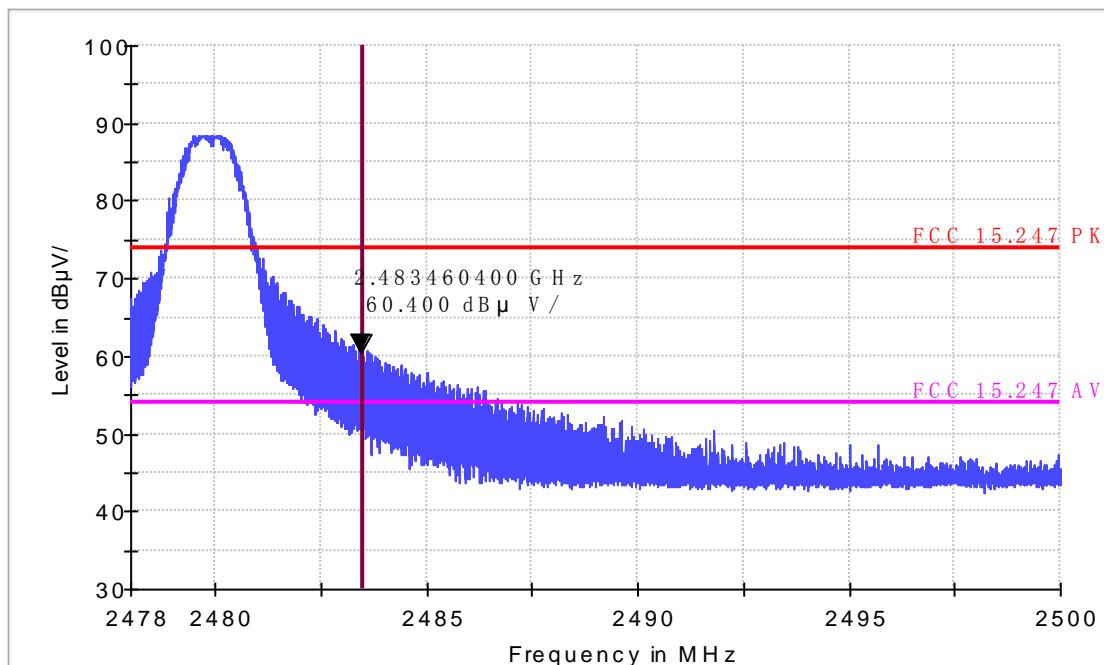
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-PK



# Radiated Emission

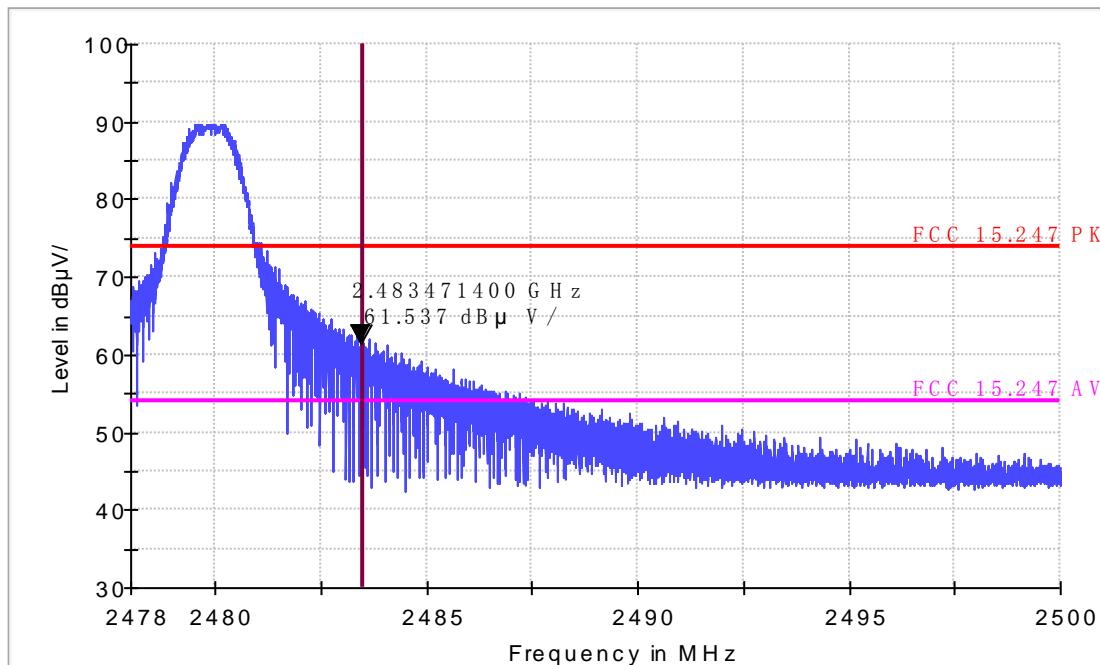
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-PK



# Radiated Emission

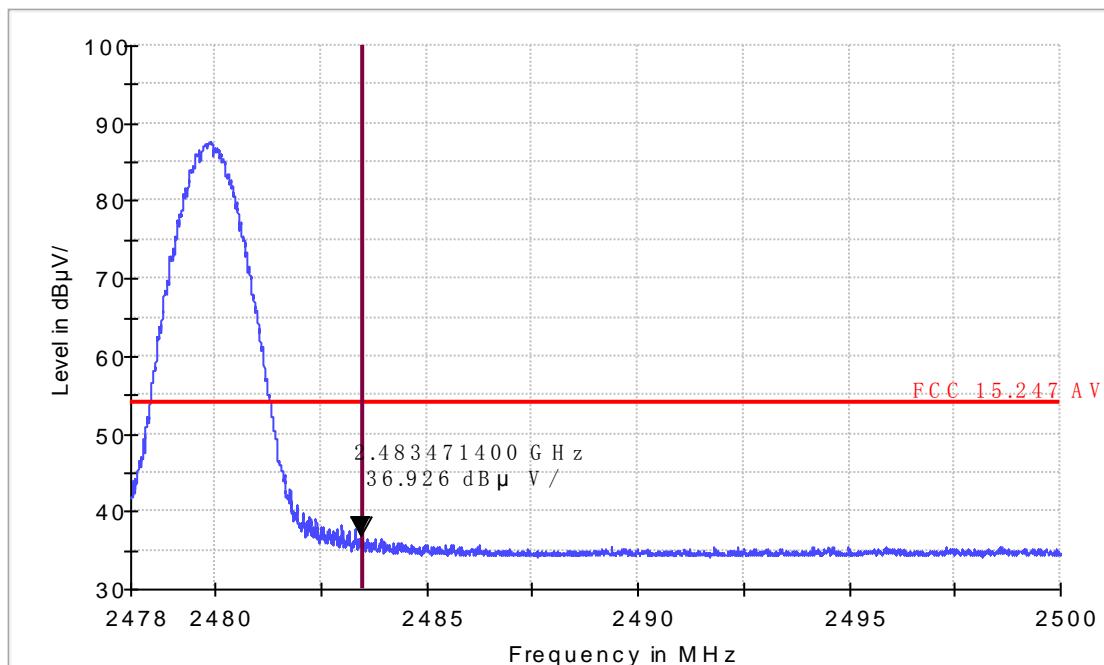
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Horizontal  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-AV



# Radiated Emission

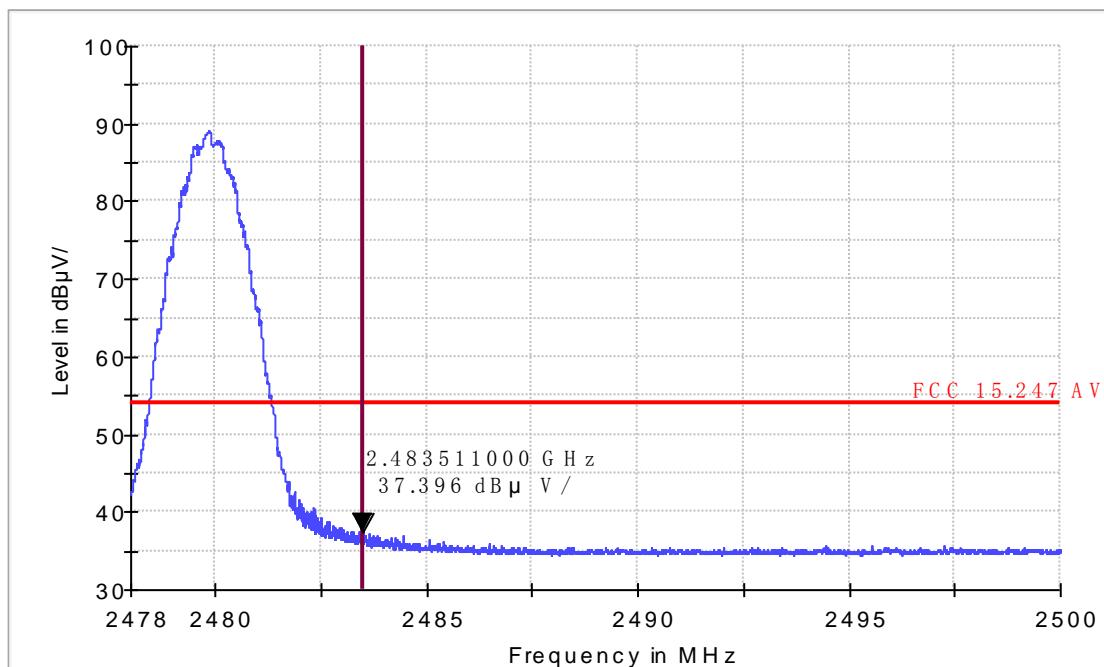
## EUT Information

EUT Model Name: LW01A2  
Operation mode: BLE CH39  
Test Voltage:  
Comment:

## Common Information

Test Site: SMQ EMC Lab.  
Environment  
Antenna Polarization: Vertical  
Operator Name:  
Comment:

FCC Electric Field Strength 2.4GHz Bandedge-AV



## **10. ANTENNA REQUIREMENTS**

### **10.1. Applicable requirements**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

### **10.2. Antenna Connector**

Antenna Connector is on the PCB within enclosure and not accessible to user.

### **10.3. Antenna Gain**

The antenna gain of EUT is less than 6 dBi.