# FCC TEST REPORT

For

**Z-Wave Scene & Simple Controller**

**Model Number: ZW5306, ZW5304, ZW5305, ZW5307, ZW5308, ZW5309**

**FCC ID: U2ZZW5306**

**Report Number : WT168007638**


| | | |
|---|---|---|
| Test Laboratory | : | Shenzhen Academy of Metrology and Quality Inspection<br>National Digital Electronic Product Testing Center |
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# Test report declaration

| | | |
|---|---|---|
| Applicant | : | SHEENWAY ASIA LTD. |
| Address | : | Room1313, 13/F., AustinTower, 22-26AustinAvenu, TsimSha Tsui, Kowloon. Hong Kong. China |
| Manufacturer | : | SHEENWAY ASIA LTD. |
| Address | : | Room1313, 13/F., AustinTower, 22-26AustinAvenu, TsimSha Tsui, Kowloon. Hong Kong. China |
| EUT Description | : | Z-Wave Scene & Simple Controller |
| Model No | : | ZW5306, ZW5304, ZW5305, ZW5307, ZW5308, ZW5309 |
| FCC ID | : | U2ZZW5306 |

Test Standards:

**FCC Part 15 (October 1, 2015 Edition)**

**ANSI C63.10-2013**

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 C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with FCC Rules Part 15.249.

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 Qichun) | Date: | Jan.18,2017 |
| Checked by: | (Lin Yixiang) | Date: | Jan.18,2017 |
| Approved by: | (Lin Bin) | Date: | Jan.18,2017 |

# TABLE OF CONTENTS

TEST REPORT DECLARATION ..... 2
1. TEST RESULTS SUMMARY ..... 5
2. GENERAL INFORMATION ..... 6
2.1. Report information ..... 6
2.2. Laboratory Accreditation and Relationship to Customer ..... 6
2.3. Measurement Uncertainty ..... 7
3. PRODUCT DESCRIPTION ..... 8
3.1. EUT Description ..... 8
3.2. Block Diagram of EUT Configuration ..... 9
3.3. Operating Condition of EUT ..... 9
3.4. Special Accessories ..... 9
3.5. Equipment Modifications ..... 9
3.6. Support Equipment List ..... 9
3.7. Test Conditions ..... 9
4. TEST EQUIPMENT USED ..... 10
5. CONDUCTED DISTURBANCE TEST ..... 11
5.1. Test Standard and Limit ..... 11
5.2. Test Procedure ..... 11
5.3. Test Arrangement ..... 11
6. RADIATED DISTURBANCE TEST ..... 12
6.1. Test Standard and Limit ..... 12
6.2. Test Procedure ..... 12
6.3. Test Arrangement ..... 12
6.4. Test Data ..... 13
7. OCCUPIED BANDWIDTH ..... 23
7.1. Test Standard and Limit ..... 23
7.2. Test Procedure ..... 23
7.3. Test Arrangement ..... 23
7.4. Test Data ..... 23

8. BAND EDGE ..... 25
8.1. Test Standard and Limit ..... 25
8.2. Band Edge FCC 15.249(d) Limit ..... 25
8.3. Test Procedure ..... 25
8.4. Test Arrangement ..... 25
8.5. Test Data ..... 25
9. ANTENNA REQUIREMENT ..... 27

# 1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

| Test Items | FCC Rules | Test Results |
|---|---|---|
| Conducted Disturbance | 15.207 | Pass |
| Radiated disturbance | 15.249 | Pass |
| Occupied Bandwidth | 15.215 | Pass |
| Band Edges | 15.249 | 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 No.4 TongFa Road, Xili Town, Nanshan District, Shenzhen, 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 806614 (3m anechoic chamber), 446246 (10m anechoic chamber) and 994606 (10m anechoic chamber).

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

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the registration number is UA 50303686.

## 2.3. Measurement Uncertainty

Conducted Emission

9kHz~30MHz 3.5dB

Radiated Emission

30MHz~1000MHz 4.5dB

1GHz~18GHz 4.6dB

# 3. PRODUCT DESCRIPTION

## 3.1. EUT Description

| | | |
|---|---|---|
| Description | : | Z-Wave Scene & Simple Controller |
| Manufacturer | : | SHEENWAY ASIA LTD. |
| Model Number | : | ZW5306, ZW5304, ZW5305, ZW5307, ZW5308, ZW5309 |
| Rated Input | : | DC 3V |
| Power supply | : | DC 3V (CR2032 battery*2) |
| Operate Frequency | : | 908.4MHz, 916MHz |
| Modulation | | 908.4MHz: FSK, 916MHz: GFSK |
| Antenna Designation | : | Integrated |

Remark: Models ZW5306, ZW5304, ZW5305, ZW5307, ZW5308 and ZW5309 basically have the same circuitry theory. The mechanical components, structure, electrical, PCB layout and RF chip are same as each other. The differences are only the plastic enclosure and the number of button in each model. As the number of button is different, the number of related Resistor, Diode and Transistor are also different. The differences are shown as below.

| Model Number | Resistor 33k | Resistor 51k | Resistor 100k | Diode | Transistor |
|---|---|---|---|---|---|
| ZW5304 | R30,R34 | R5-8, R25 | R9, R15 | D1 | Q1, Q2 |
| ZW5305 | R30, R33, R34, R37 | R5-8, R25-27 | R9, R14, R16, R20 | D1, D2 | Q1-Q4 |
| ZW5306 | R30-R37 | R5-R8, R25-R27 | R9-R20 | D1, D2 | Q1-Q4 |
| ZW5307 | R30,R34 | R5-8, R25 | R9, R15 | D1 | Q1, Q2 |
| ZW5308 | R30, R33, R34, R37 | R5-8, R25-27 | R9, R14, R16, R20 | D1, D2 | Q1-Q4 |
| ZW5309 | R30-R37 | R5-R8, R25-R27 | R9-R20 | D1, D2 | Q1-Q4 |

Pre-scan is performed on all models, and ZW5306 is worst-case. Therefore the final tests were performed on ZW5306 only.

## 3.2. Block Diagram of EUT Configuration

EUT

Test Setup

## 3.3. Operating Condition of EUT

Mode 1: Transmitting at 908.4MHz

Mode 2: Transmitting at 916MHz

Mode 3: ON, Receiving

## 3.4. Special Accessories

Not available for this EUT intended for grant.

## 3.5. Equipment Modifications

Not available for this EUT intended for grant.

## 3.6. Support Equipment List

Table 2 Support Equipment List

| Name | Model No | S/N | Manufacturer |
|---|---|---|---|
| -- | -- | -- | -- |

## 3.7. Test Conditions

Date of test：Jan.05, 2017 - Jan.06, 2017

Date of EUT Receive：Dec.30, 2016

Temperature: (19-24) ℃

Relative Humidity: (49-55)%

# 4. TEST EQUIPMENT USED

Table 3 Test Equipment

| No. | Equipment | Manufacturer | Model No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|
| SB8501/09 | EMI Test Receiver | Rohde & Schwarz | ESU40 | Mar.23, 2016 | 1 Year |
| SB3955 | Broadband antenna | SCHWARZBECK | VULB9163 | Jan.07, 2016 | 1 Year |
| SB8501/01 | Horn Antenna | Rohde & Schwarz | HF907 | Mar.21, 2016 | 1 Year |
| SB8501/17 | Preamplifier | Rohde & Schwarz | SCU-18 | Mar.21, 2016 | 1 Year |

# 5. CONDUCTED DISTURBANCE TEST

## 5.1. Test Standard and Limit

### 5.1.1. Test Standard

FCC Part 15 15.207

### 5.1.2. Test Limit

Table 4 Conducted Disturbance Test Limit

| Frequency | Maximum RF Line Voltage (dBμV) | |
|---|---|---|
| | Quasi-peak Level | Average Level |
| 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| 500kHz~5MHz | 56 | 46 |
| 5MHz~30MHz | 60 | 50 |

*Decreasing linearly with logarithm of the frequency

*The lower limit shall apply at the transition frequency.

## 5.2. Test Procedure

The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.). AN EMI test receiver is used to test the emissions from both sides of AC line. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

The bandwidth of EMI test receiver is set at 9 kHz.

## 5.3. Test Arrangement

The EUT is power supply by batteries, Therefore this test is not applicable.

# 6. RADIATED DISTURBANCE TEST

## 6.1. Test Standard and Limit

### 6.1.1. Test Standard

FCC Part 15 15.249

### 6.1.2. Test Limit

Table 5 Radiated Disturbance Test Limit

| FREQUENCY MHz | FIELD STRENGTHS LIMITS (μV/m) | FIELD STRENGTHS LIMITS dB (μV/m) |
|---|---|---|
| Fundamental | 50000 | 94.0 |
| Harmonics | 500 | 54.0 |
| 30 ~ 88 | 100 | 40.0 |
| 88 ~ 216 | 150 | 43.5 |
| 216 ~ 960 | 200 | 46.0 |
| 960 ~ | 500 | 54.0 |

* The lower limit shall apply at the transition frequency.
* The test distance is 3m.

## 6.2. Test Procedure

Radiated emission test below 1 GHz, test at SAC, the EUT is placed on a turntable, which is 0.8 meter above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can move up and down to find out the maximum emission level. Radiated emission test above 1 GHz, test at FAR, the EUT is placed on a non-conductive table, which is 1.5 meter above ground. Broadband antenna is used as a receiving antenna at frequency range 30MHz to 1000MHz, Horn antenna is used as a receiving antenna at frequency range above 1GHz. Both horizontal and vertical polarization of the antenna is set on test, in order to find out the max emission, the relative positions of this EUT was rotated through three orthogonal axes.

The RBW of the EMI test receiver is:

30~1000MHz 120KHz
1-18GHz 1MHz

## 6.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture. The EUT shall be measured in the XYZ three positions, and the test data which was shown in the follow was the worst case.

## 6.4. Test Data

Table 6 Radiated Disturbance Test Data

Model No.: ZW5306

Test mode: 1

| Frequency (MHz) | Polarization | Correction Factor (dB) | Antenna Factor (dB/m) | Reading Value (dB μ V) | Emission Level dB ( μ V/m) | Limits dB ( μ V/m) | EUT axes | Note |
|---|---|---|---|---|---|---|---|---|
| 56.538 | Horizontal | 0.9 | 13.0 | -1.3 | 12.6 | 40.0 | X | QP |
| 102.249 | Horizontal | 1.1 | 13.2 | -1.2 | 13.1 | 43.5 | X | QP |
| 199.785 | Horizontal | 1.6 | 10.6 | -0.3 | 11.9 | 43.5 | X | QP |
| 908.400 | Horizontal | 3.9 | 21.1 | 60.6 | 85.6 | 94 | X | Fundamental QP |
| 3633.570 | Horizontal | -38.9 | 32.0 | 54.9 | 48.0 | 74 | X | Harmonics PK |
| 3633.570 | Horizontal | -38.9 | 32.0 | 49.3 | 42.4 | 54 | X | Harmonics AV |
| 4541.987 | Horizontal | -39.4 | 33.7 | 53.6 | 47.9 | 74 | X | Harmonics PK |
| 4541.987 | Horizontal | -39.4 | 33.7 | 46.6 | 40.9 | 54 | X | Harmonics AV |
| 8175.555 | Horizontal | -37.7 | 36.1 | 55.5 | 53.9 | 74 | X | Harmonics PK |
| 8175.555 | Horizontal | -37.7 | 36.1 | 46.9 | 45.3 | 54 | X | Harmonics AV |
| 32.270 | Vertical | 0.7 | 12.3 | -2.5 | 10.5 | 40.0 | X | QP |
| 50.113 | Vertical | 0.8 | 13.3 | -2.3 | 11.8 | 40.0 | X | QP |
| 104.127 | Vertical | 1.3 | 13.2 | -1.3 | 13.2 | 40.0 | X | QP |
| 908.400 | Vertical | 3.9 | 21.1 | 49.2 | 74.2 | 94 | X | Fundamental QP |
| 3633.539 | Vertical | -38.9 | 32.0 | 53.3 | 46.4 | 74 | X | Harmonics PK |
| 3633.539 | Vertical | -38.9 | 32.0 | 45.1 | 38.2 | 54 | X | Harmonics AV |
| 7267.029 | Vertical | -38.2 | 35.6 | 53.9 | 51.3 | 74 | X | Harmonics PK |
| 7267.029 | Vertical | -38.2 | 35.6 | 43.6 | 41.0 | 54 | X | Harmonics AV |
| 8175.621 | Vertical | -37.7 | 36.1 | 55.9 | 54.3 | 74 | X | Harmonics PK |
| 8175.621 | Vertical | -37.7 | 36.1 | 47.5 | 45.9 | 54 | X | Harmonics AV |

Table 7 Radiated Disturbance Test Data

Model No.: ZW5306

Test mode: 2

| Frequency (MHz) | Polarization | Correction Factor (dB) | Antenna Factor (dB/m) | Reading Value (dB μ V) | Emission Level dB ( μ V/m) | Limits dB ( μ V/m) | EUT axes | Note |
|---|---|---|---|---|---|---|---|---|
| 43.276 | Horizontal | 0.7 | 13.6 | -2.7 | 11.6 | 40.0 | X | QP |
| 62.578 | Horizontal | 0.9 | 12.7 | -2.9 | 10.7 | 40.0 | X | QP |
| 105.963 | Horizontal | 1.2 | 13.2 | -1.6 | 12.8 | 43.5 | X | QP |
| 916.000 | Horizontal | 3.9 | 21.1 | 57.8 | 82.8 | 94 | X | Fundamental QP |
| 3663.985 | Horizontal | -39.1 | 32.0 | 54.5 | 47.4 | 74 | X | Harmonics PK |
| 3663.985 | Horizontal | -39.1 | 32.0 | 47.5 | 40.4 | 54 | X | Harmonics AV |
| 4579.992 | Horizontal | -39.2 | 33.7 | 53.1 | 47.6 | 74 | X | Harmonics PK |
| 4579.992 | Horizontal | -39.2 | 33.7 | 45.8 | 40.3 | 54 | X | Harmonics AV |
| 8243.954 | Horizontal | -37.6 | 36.5 | 54.5 | 53.4 | 74 | X | Harmonics PK |
| 8243.954 | Horizontal | -37.6 | 36.5 | 45.7 | 44.6 | 54 | X | Harmonics AV |
| 37.716 | Vertical | 0.7 | 12.3 | -0.7 | 12.3 | 40.0 | X | QP |
| 51.394 | Vertical | 0.8 | 13.3 | -2.2 | 11.9 | 40.0 | X | QP |
| 103.869 | Vertical | 1.3 | 13.2 | -2.2 | 12.3 | 43.5 | X | QP |
| 916.000 | Vertical | 3.9 | 21.1 | 46.7 | 71.7 | 94 | X | Fundamental QP |
| 2328.474 | Vertical | -40.1 | 28.3 | 56.8 | 45.0 | 74 | X | Harmonics PK |
| 2328.474 | Vertical | -40.1 | 28.3 | 49.9 | 38.1 | 54 | X | Harmonics AV |
| 3663.977 | Vertical | -39.1 | 32.0 | 53.3 | 46.2 | 74 | X | Harmonics PK |
| 3663.977 | Vertical | -39.1 | 32.0 | 43.7 | 36.6 | 54 | X | Harmonics AV |
| 8243.955 | Vertical | -37.6 | 36.5 | 55.4 | 54.3 | 74 | X | Harmonics PK |
| 8243.955 | Vertical | -37.6 | 36.5 | 47.8 | 46.7 | 54 | X | Harmonics AV |

Table 8 Radiated Disturbance Test Data

Model No.: ZW5306

Test mode: 3

| Frequency (MHz) | Polarization | Correction Factor (dB) | Antenna Factor (dB/m) | Reading Value (dB μ V) | Emission Level dB ( μ V/m) | Limits dB ( μ V/m) | EUT axes | Note |
|---|---|---|---|---|---|---|---|---|
| 43.607 | Horizontal | 0.7 | 13.6 | -2.3 | 12.0 | 40.0 | X | QP |
| 59.592 | Horizontal | 0.9 | 13.0 | -2.2 | 11.7 | 40.0 | X | QP |
| 101.105 | Horizontal | 1.1 | 13.2 | -0.9 | 13.4 | 43.5 | X | QP |
| 193.997 | Horizontal | 1.7 | 10.6 | -0.2 | 12.1 | 43.5 | X | QP |
| 3770.582 | Horizontal | -39.0 | 32.0 | 50.5 | 43.5 | 74 | X | PK |
| 3770.582 | Horizontal | -39.0 | 32.0 | 36.2 | 29.2 | 54 | X | AV |
| 6052.490 | Horizontal | -37.9 | 34.7 | 49.9 | 46.7 | 74 | X | PK |
| 6052.490 | Horizontal | -37.9 | 34.7 | 36.6 | 33.4 | 54 | X | AV |
| 7300.678 | Horizontal | -38.1 | 35.6 | 52.4 | 49.9 | 74 | X | PK |
| 7300.678 | Horizontal | -38.1 | 35.6 | 38.6 | 36.1 | 54 | X | AV |
| 45.816 | Vertical | 0.8 | 13.6 | -2.4 | 12.0 | 40.0 | X | QP |
| 58.544 | Vertical | 0.8 | 13.0 | -2.2 | 11.6 | 40.0 | X | QP |
| 97.061 | Vertical | 1.0 | 12.8 | -1.1 | 12.7 | 43.5 | X | QP |
| 197.305 | Vertical | 1.7 | 10.6 | 0.0 | 12.3 | 43.5 | X | QP |
| 3400.315 | Vertical | -38.9 | 31.5 | 49.6 | 42.2 | 74 | X | PK |
| 3400.315 | Vertical | -38.9 | 31.5 | 35.7 | 28.3 | 54 | X | AV |
| 7332.400 | Vertical | -38.0 | 35.6 | 52.7 | 50.3 | 74 | X | PK |
| 7332.400 | Vertical | -38.0 | 35.6 | 38.2 | 35.8 | 54 | X | AV |
| 8871.300 | Vertical | -36.5 | 37.0 | 50.6 | 51.1 | 74 | X | PK |
| 8871.300 | Vertical | -36.5 | 37.0 | 36.5 | 37.0 | 54 | X | AV |

Note: 1. Emission level(dBuV/m)=Reading Value(dBuV) + Correction Factor(dB)+Antenna Factor (dB/m)

2. Correction Factor(dB) = Cable Factor (dB)+Amplifier Factor(dB)

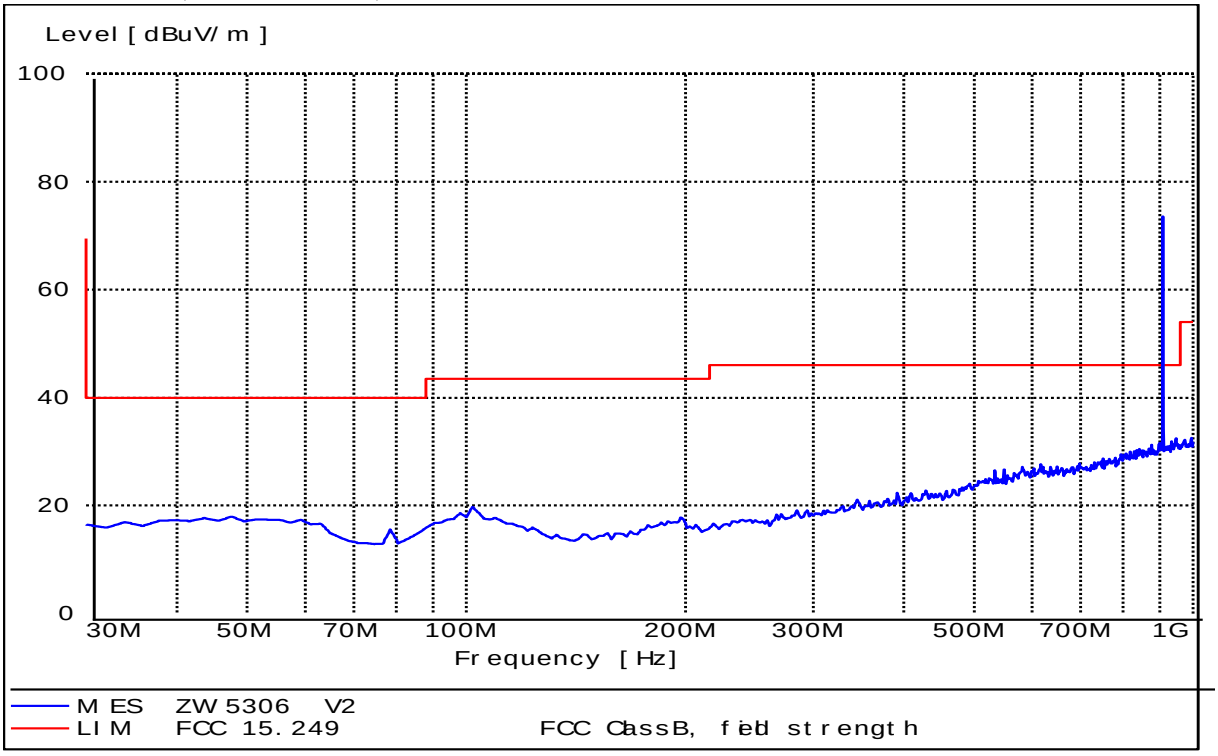
3. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Table 9 Restricted Band Radiated Emission Data

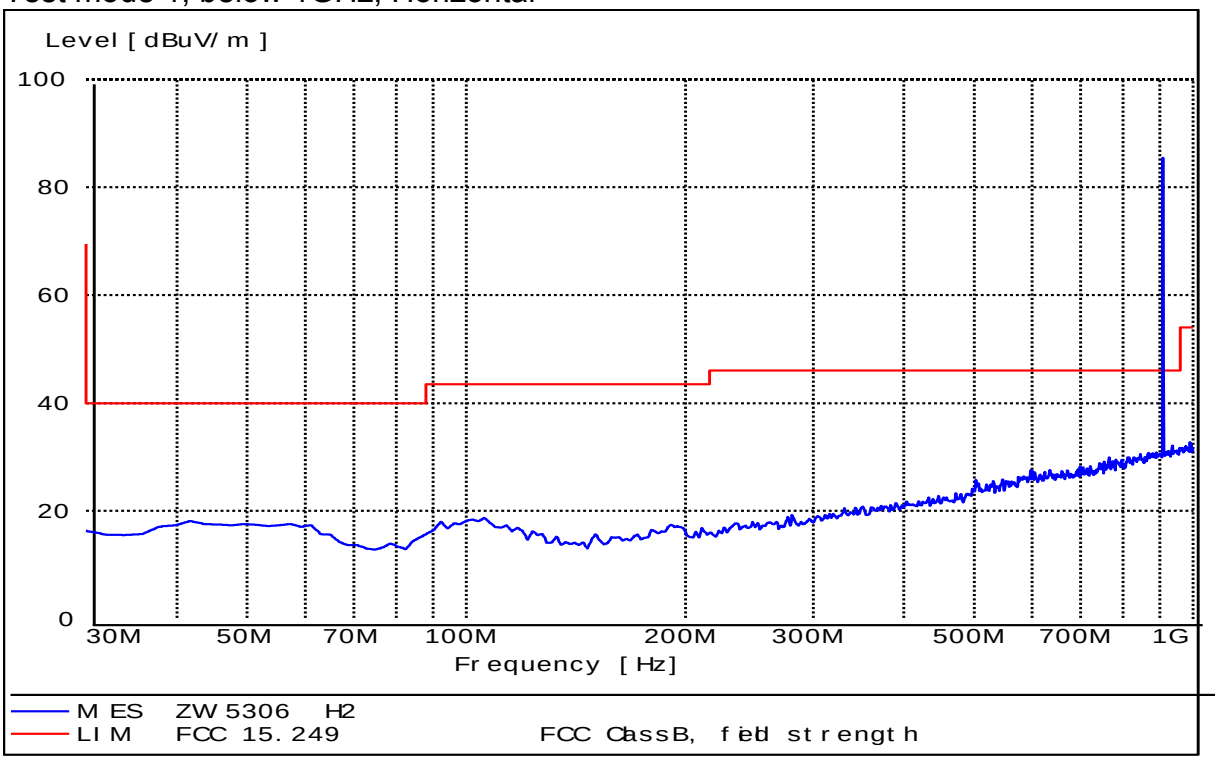
| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2655 - 2900 | |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | |
| 13.36 - 13.41 | | | |

All the emission levels of the above band were less than the limit 20dB.

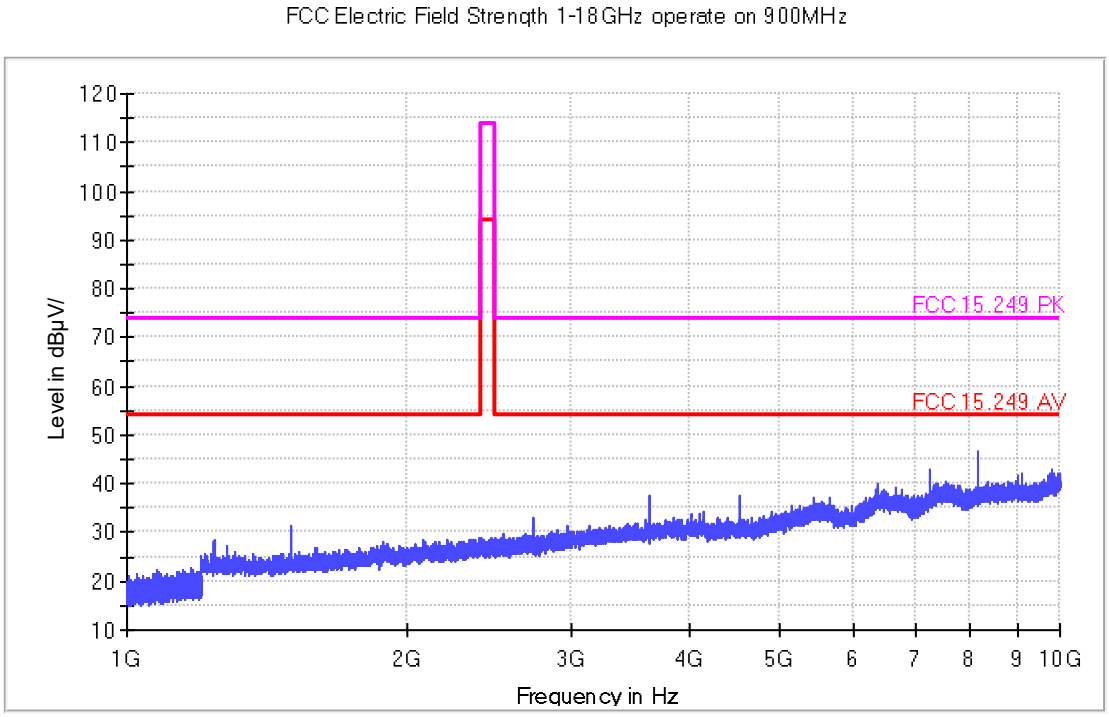
Test mode 1, below 1GHz, Vertical



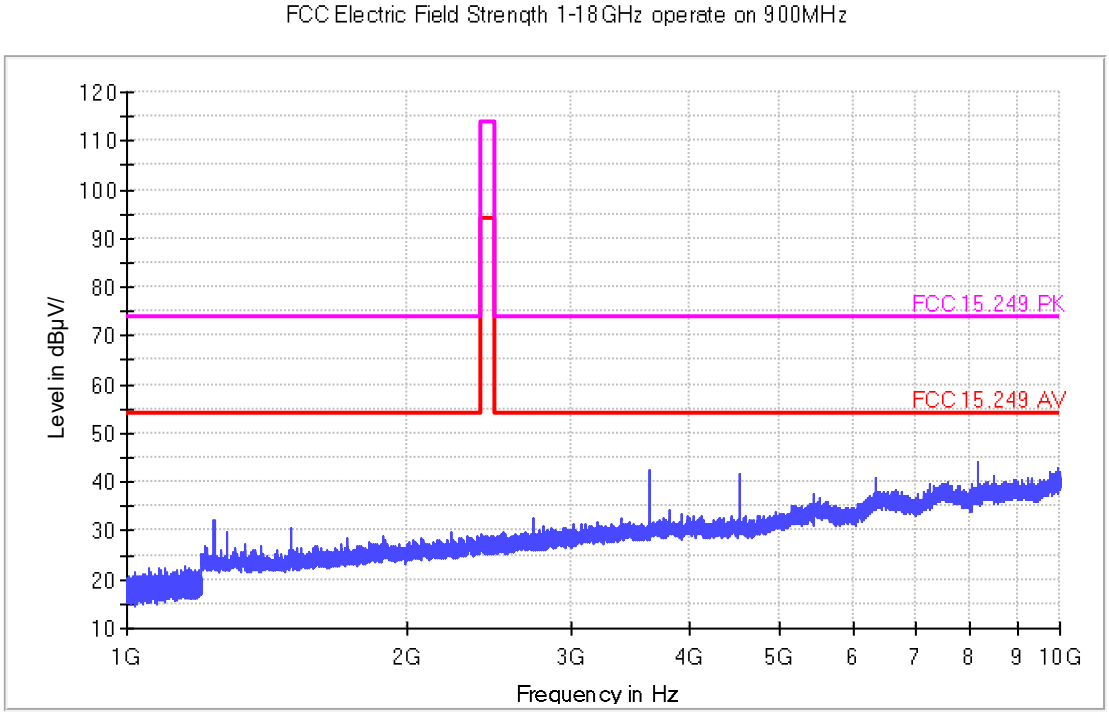

Test mode 1, below 1GHz, Horizontal



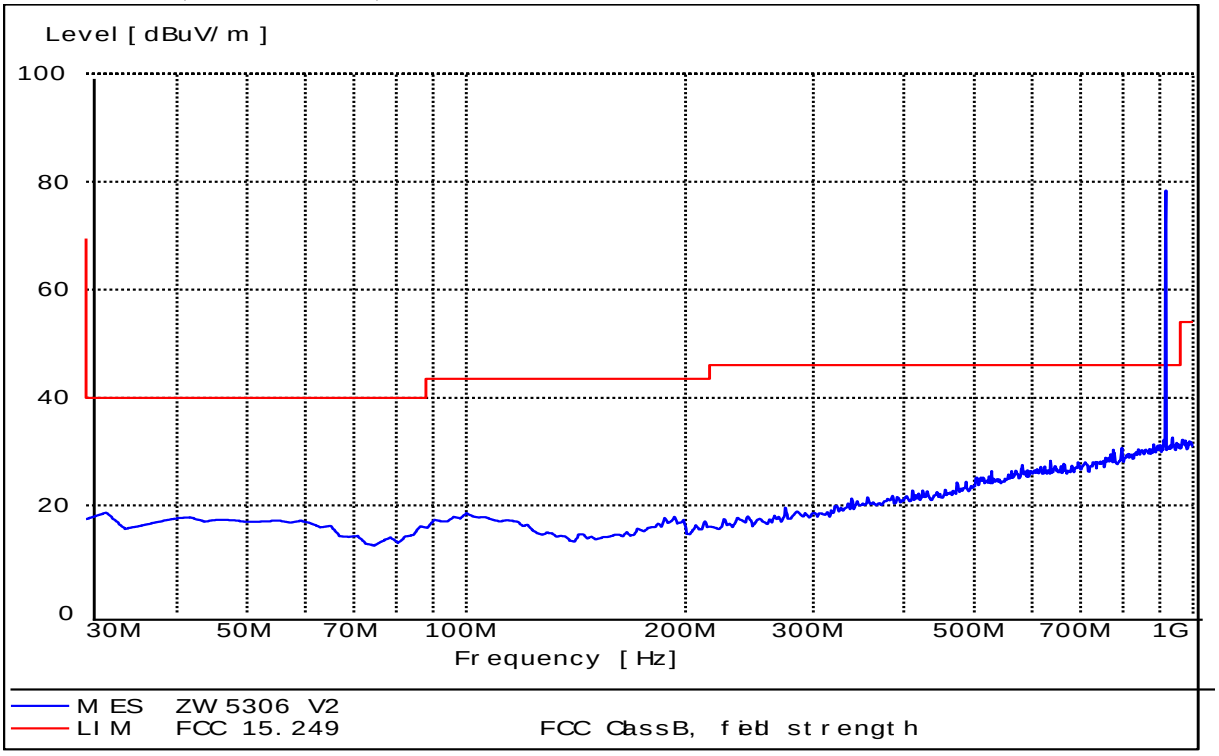
Test mode 1, above 1GHz, Vertical



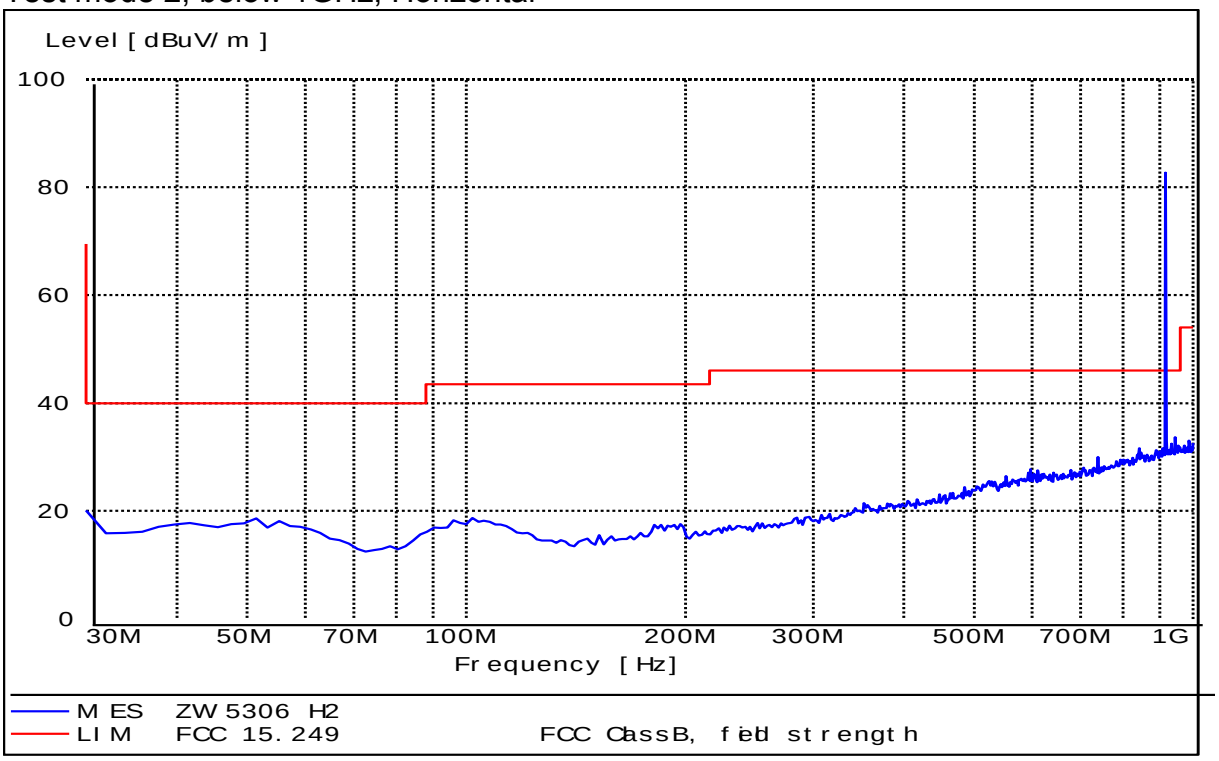

Test mode 1, above 1GHz, Horizontal



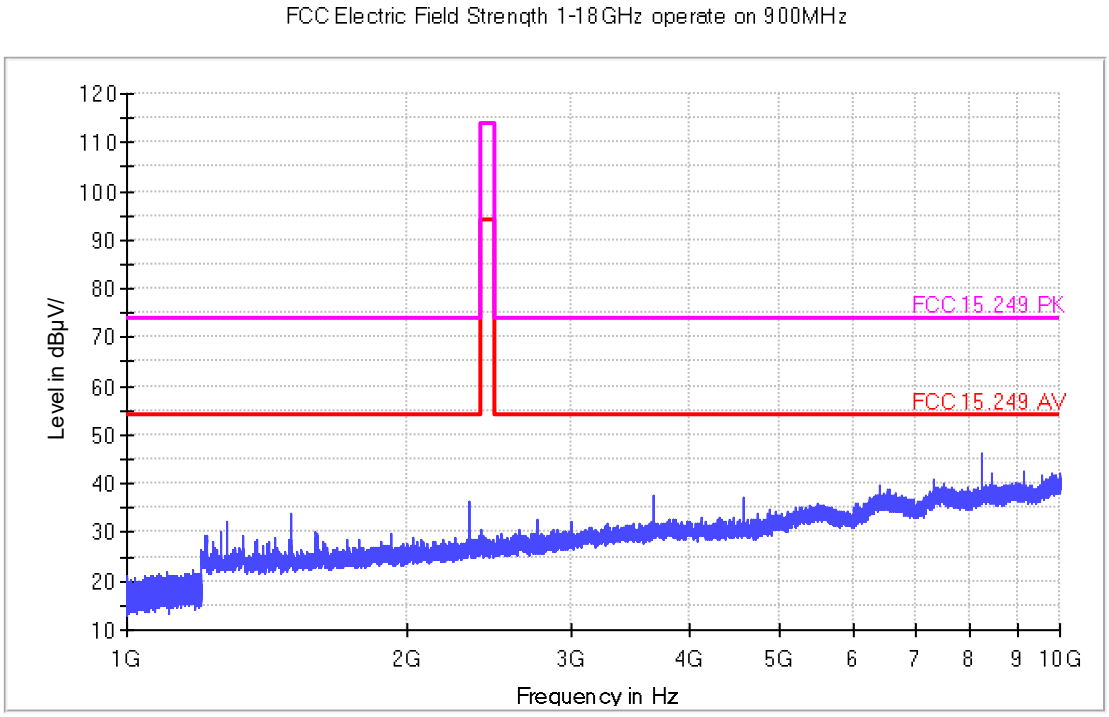
Test mode 2, below 1GHz, Vertical



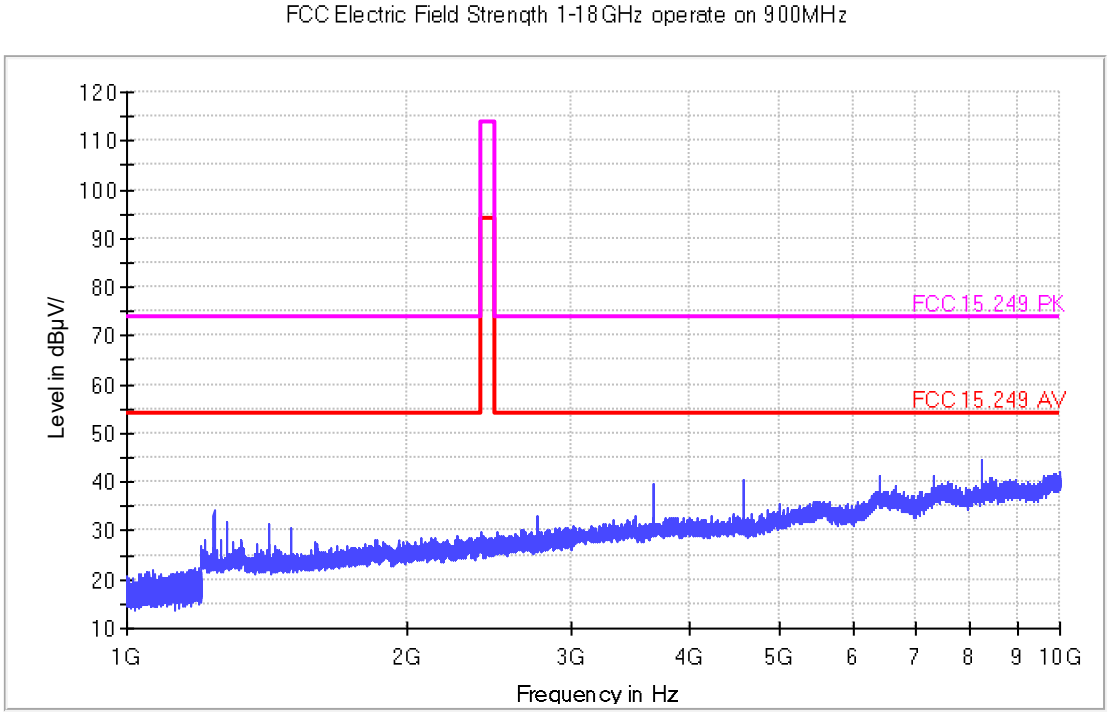

Test mode 2, below 1GHz, Horizontal



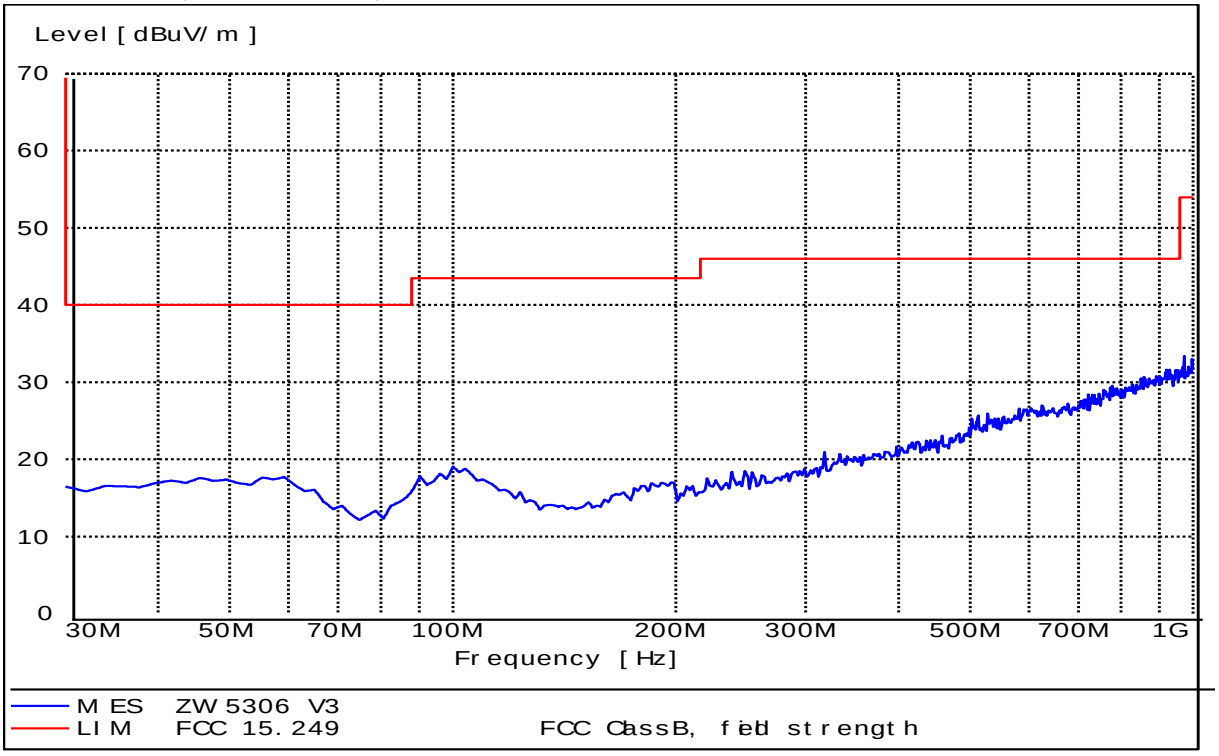
Test mode 2, above 1GHz, Vertical



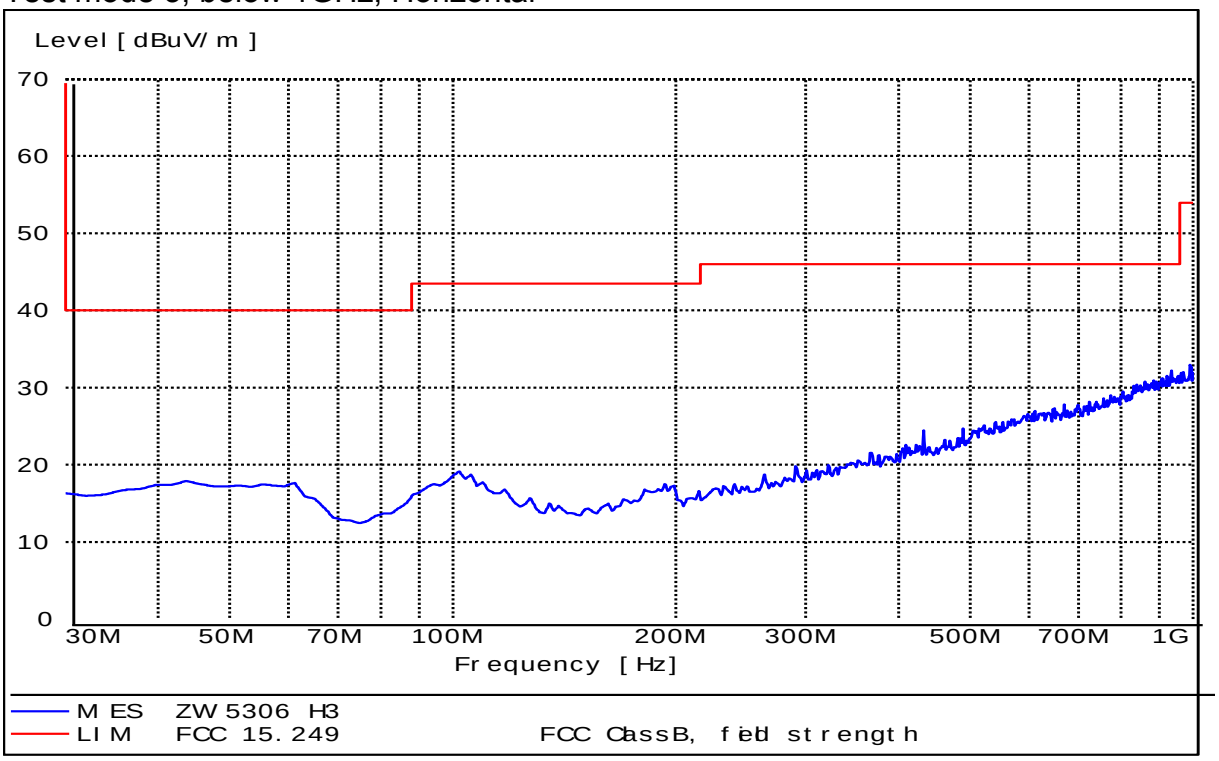

Test mode 2, above 1GHz, Horizontal



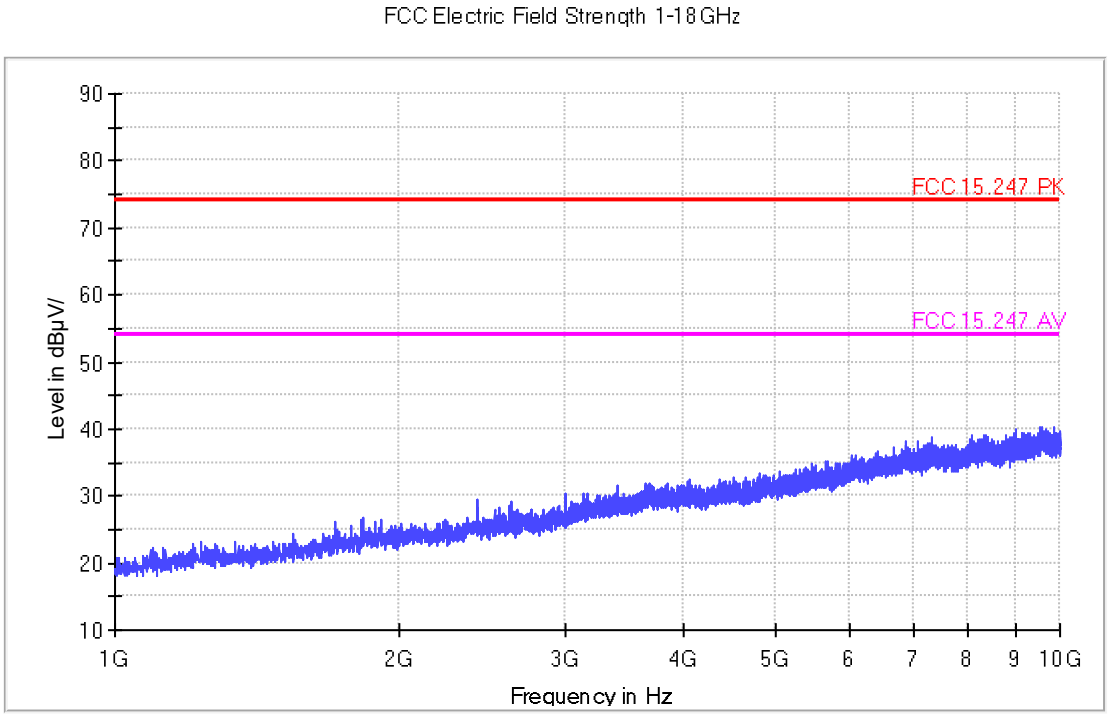
Test mode 3, below 1GHz, Vertical



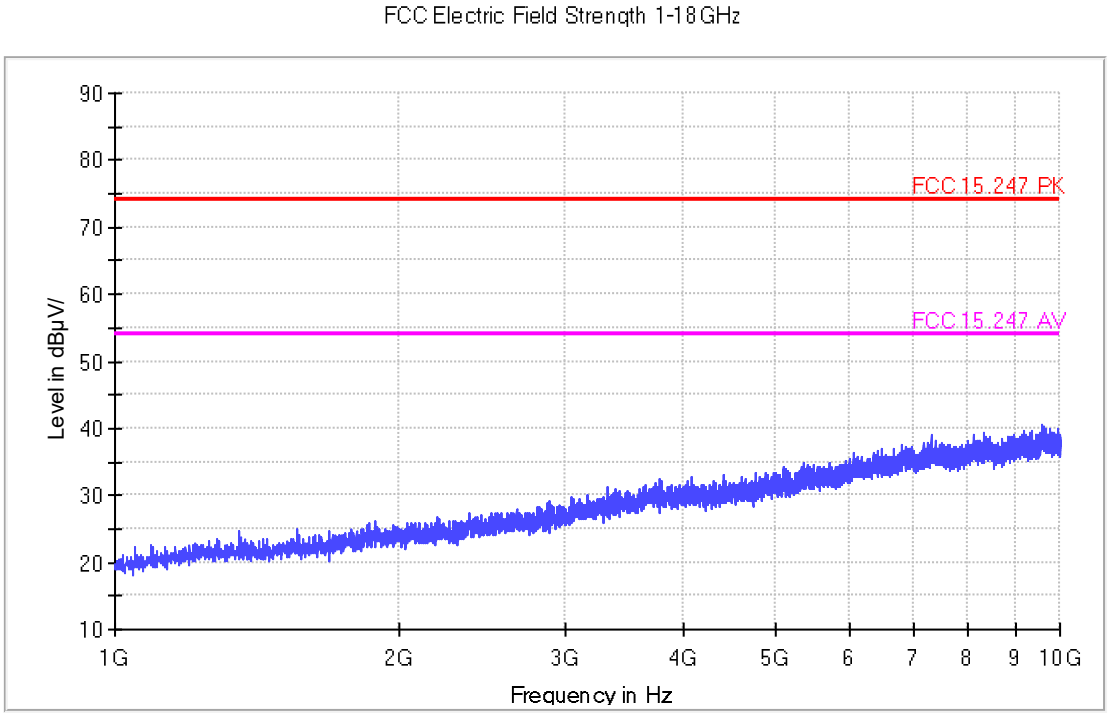

Test mode 3, below 1GHz, Horizontal



Test mode 3, above 1GHz, Vertical




Test mode 3, above 1GHz, Horizontal



# 7. OCCUPIED BANDWIDTH

## 7.1. Test Standard and Limit

### 7.1.1. Test Standard

FCC Part 15 15.215

## 7.2. Test Procedure

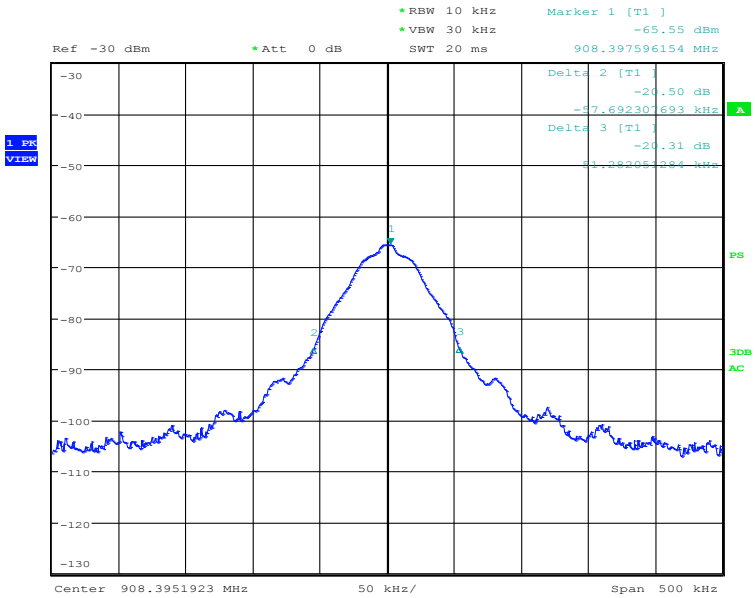
1. Set EUT as normal operation
2. Set EMI test receiver Center Frequency = fundamental frequency, RBW=10kHz, VBW= 30kHz, Span=Wide enough to capture the complete power envelope.
3. Set EMI test receiver Max hold. Mark peak, -20dB.

## 7.3. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

## 7.4. Test Data

Transmitting at 908.4MHz: 20dB bandwidth =109.0 kHz

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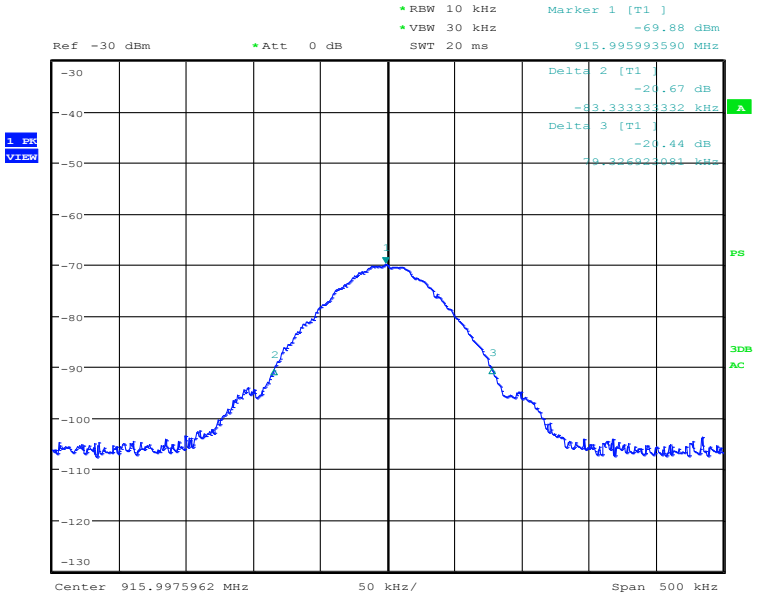
Date: 6.JAN.2017 13:58:04

Transmitting at 916MHz: 20dB bandwidth =162.7 kHz

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Date: 6.JAN.2017 13:59:56

# 8. BAND EDGE

## 8.1. Test Standard and Limit

### 8.1.1. Test Standard

FCC Part 15 15.249

## 8.2. Band Edge FCC 15.249(d) Limit

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation

## 8.3. 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 instruments. 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. Measure the highest amplitude appearing on spectral display and set it as reference level. Plot the graph with marking the highest point and edge frequency.
4. Repeat above procedures until all measured frequencies were complete.

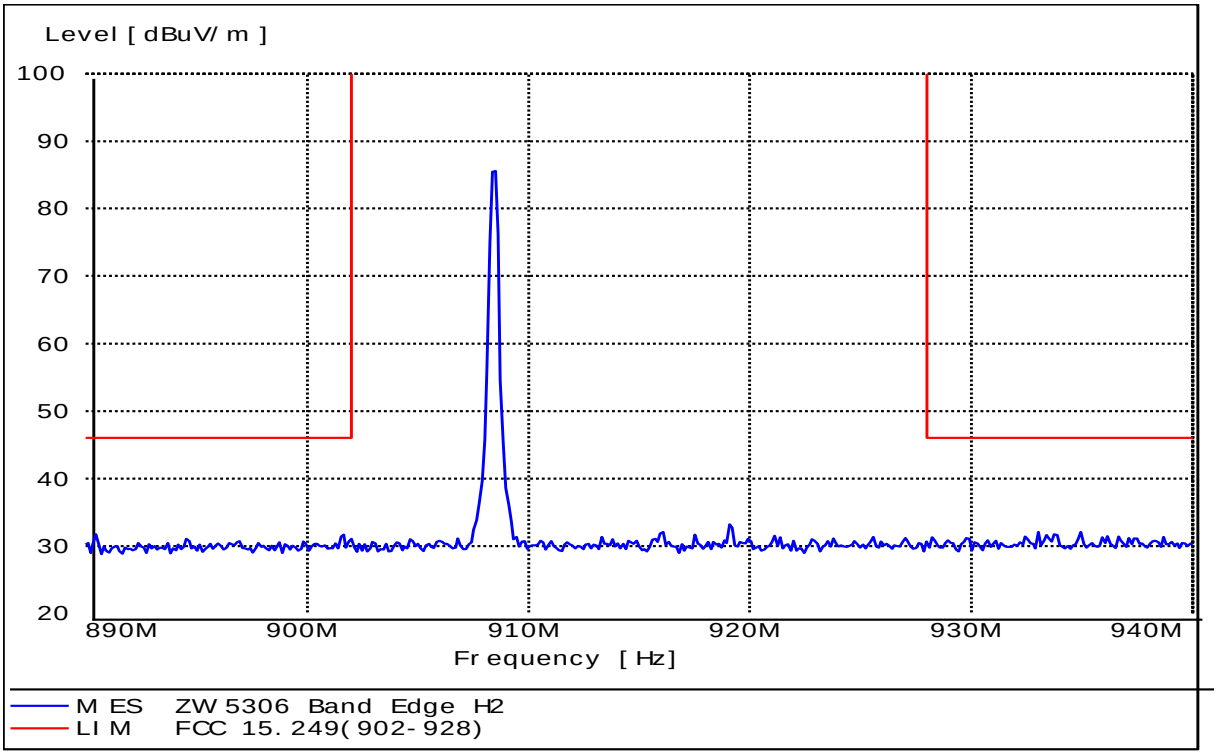
## 8.4. Test Arrangement

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application. The detailed information refers to test picture.

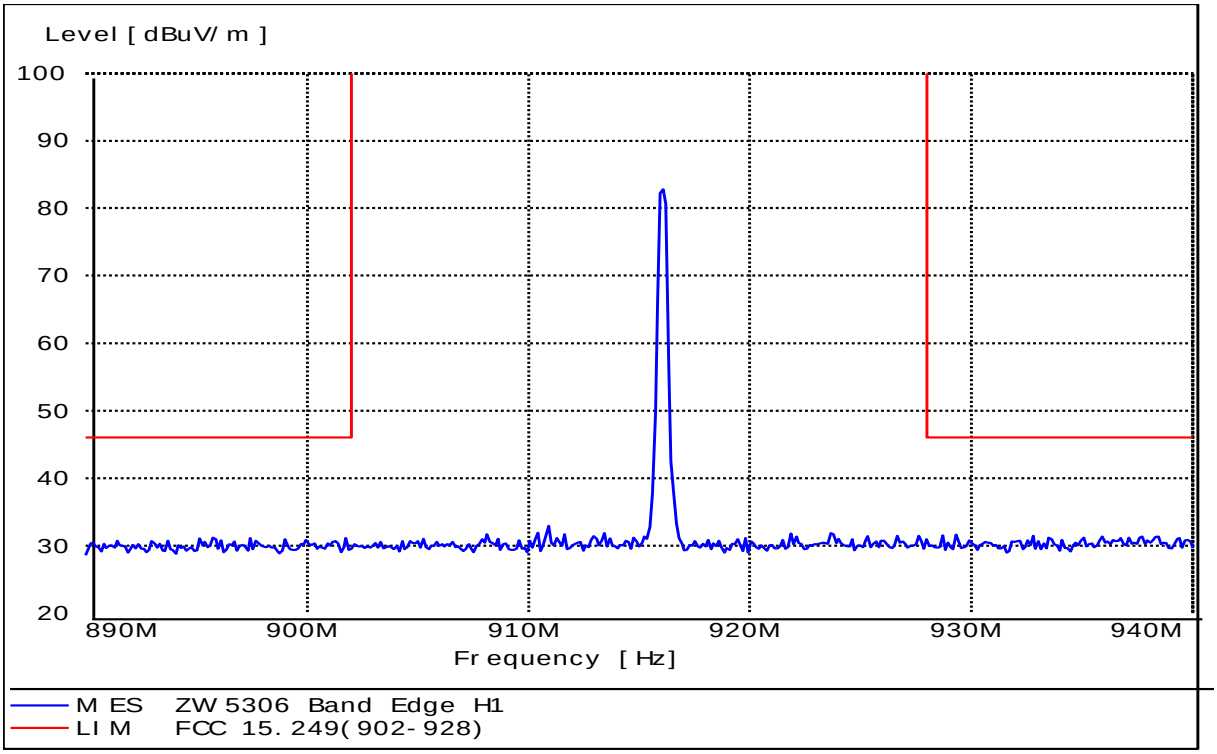
## 8.5. Test Data

All the emission outside 902 to 928 is lower than 46 dB ($\mu$ V/m). The detailed information refers to test picture.

Transmitting at 908.4MHz




Transmitting at 916MHz



# 9. ANTENNA REQUIREMENT

According to Section 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 EUT has a built in antenna which is integrated inside the enclosure, this is permanently attached antenna and meets the requirements of this section.