深圳市计量质量检测研究院
Shenzhen Academy of Metrology & Quality Inspection

FCC TEST REPORT

For

TOGGLE In-Wall Switch Chassis 2.0 120/277Vac

Model Number: ZW4009DV

FCC ID: U2ZZW4009DV

Report Number : WT188007011

Test Laboratory	:	Shenzhen Academy of Metrology and Quality Inspection
Site Location	:	No.4 TongFa Road, Xili Town, Nanshan District, Shenzhen, China
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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	:	TOGGLE In-Wall Switch Chassis 2.0 120/277Vac
Model No	:	ZW4009DV
FCC ID	:	U2ZZW4009DV

Test Standards:

FCC Part 15 (October 1, 2018 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 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.25,2019
Checked by:	(Lin Yixiang)	Date:	Jan.25,2019
Approved by:	(Lin Bin)	Date:	Jan.25,2019

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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 is 582918.

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

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	:	TOGGLE In-Wall Switch Chassis 2.0 120/277Vac
Manufacturer	:	SHEENWAY ASIA LTD.
Model Number	:	ZW4009DV
Rated Input	:	AC 120V/277V, 60Hz
Power supply	:	AC 120V, 60Hz
Operate Frequency	:	908.4MHz, 916MHz
Modulation		908.4MHz: FSK, 916MHz: GFSK
Antenna Designation	:	Integrated

3.2. Block Diagram of EUT Configuration

Test Setup

3.3. Operating Condition of EUT

Mode 1: Transmitting at 908.4MHz

Mode 2: Transmitting at 916MHz

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：Dec.21, 2018 - Jan.12, 2019

Date of EUT Receive：Dec.20, 2018

Temperature: (19-24) ℃

Relative Humidity: (45-53)%

4. TEST EQUIPMENT USED

Table 3 Test Equipment

No.	Equipment	Manufacturer	Model No.	Last Cal.	Cal. Interval
SB3319	Test Receiver	Rohde & Schwarz	ESCS30	Nov.26, 2018	1 Year
SB4357	AMN	Rohde & Schwarz	ENV216	Sep.04, 2018	1 Year
SB8501/09	EMI Test Receiver	Rohde & Schwarz	ESU40	Mar.20, 2018	1 Year
SB3955	Broadband antenna	SCHWARZBECK	VULB9163	Jun.12, 2018	1 Year
SB8501/01	Horn Antenna	Rohde & Schwarz	HF907	Mar.08, 2018	1 Year
SB8501/17	Preamplifier	Rohde & Schwarz	SCU-18	Mar.05, 2018	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 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.

5.4. Test Data

The emissions don't show in below are too low against the limits. Refer to the test curves.

Test mode 1: Transmitting at 908.4MHz (worst-case)

Table 5 Conducted Disturbance Test Data

Model No.: ZW4009DV

Test mode: 1

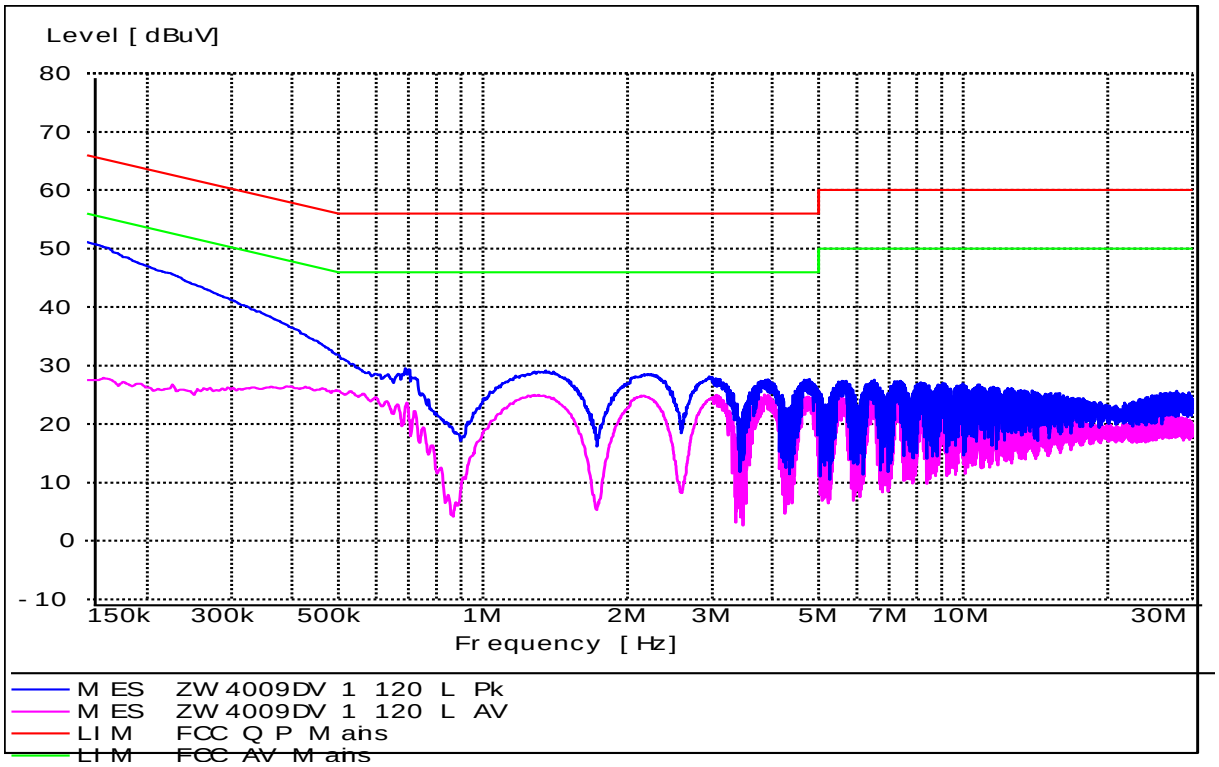
Line							
Frequency MHz	QP		AV		QP	AV	Factor (dB)
	Level (dBuV)	Limit (dBuV)	Level (dBuV)	Limit (dBuV)	Reading (dBuV)	Reading (dBuV)	
0.150	45.7	66	26.3	56	36.0	16.6	9.7
0.234	39.9	62.3	25.3	52.3	30.2	15.6	9.7
0.690	25.7	56	23.3	46	15.9	13.5	9.8
1.338	26.5	56	24.7	46	16.7	14.9	9.8
2.122	26.2	56	24.5	46	16.3	14.6	9.9
3.876	25.5	56	23.8	46	15.6	13.9	9.9
Neutral							
Frequency MHz	QP		AV		QP	AV	Factor (dB)
	Level (dBuV)	Limit (dBuV)	Level (dBuV)	Limit (dBuV)	Reading (dBuV)	Reading (dBuV)	
0.150	44.6	66	25.5	56	34.9	15.8	9.7
0.226	39.8	62.6	25.5	52.6	30.1	15.8	9.7
0.686	30.6	56	22.3	46	20.8	12.5	9.8
1.330	31.7	56	24.1	46	21.9	14.3	9.8
2.178	30.8	56	23.2	46	20.9	13.3	9.9
3.960	27.8	56	20.0	46	17.9	10.1	9.9

REMARKS: 1. Emission level(dBuV)=Read Value(dBuV) + Correction Factor(dB)

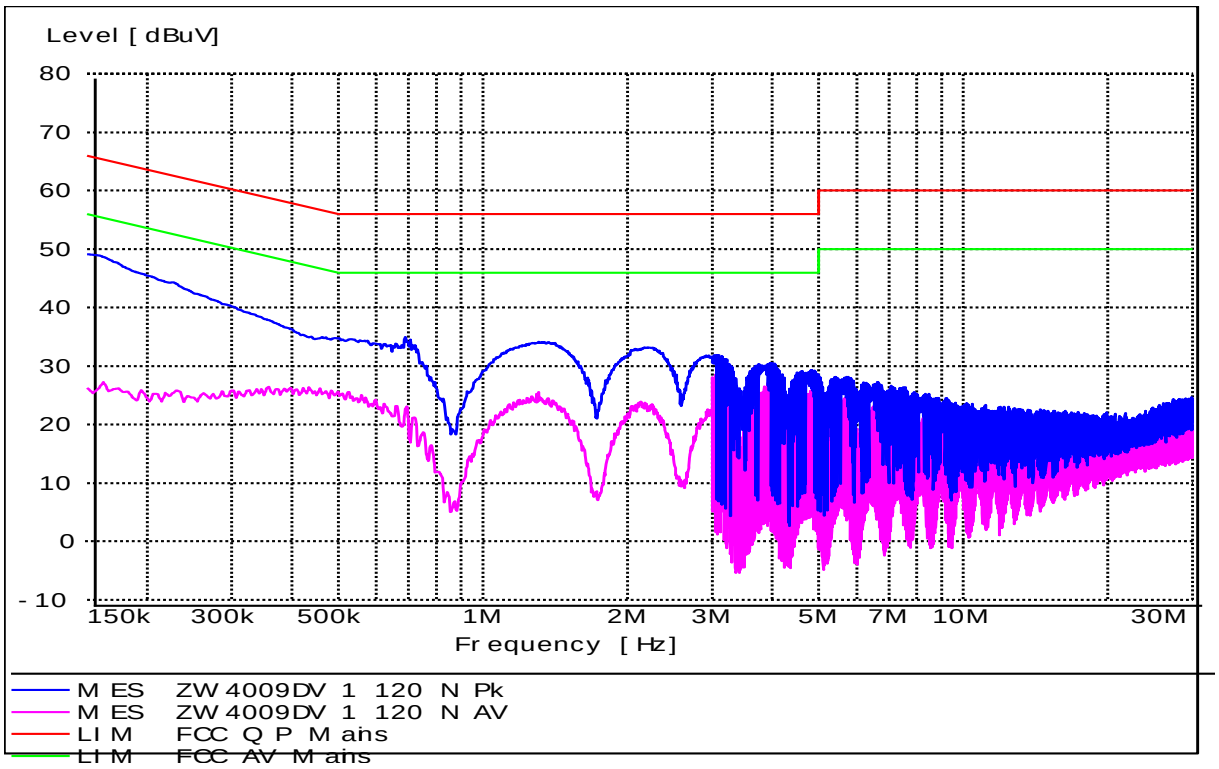
2. Correction Factor(dB) =LISN Factor (dB) + Cable Factor (dB)+Limiter Factor(dB)

3. The other emission levels were very low against the limit.

Line



Neutral



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 6 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 7 Radiated Disturbance Test Data

Model No.: ZW4009DV

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
38.013	Horizontal	0.7	12.3	1.1	14.1	40.0	X	QP
45.551	Horizontal	0.8	13.6	0.6	15.0	40.0	X	QP
94.148	Horizontal	1.1	11.9	2.3	15.3	43.5	X	QP
908.401	Horizontal	3.9	21.1	63.1	88.1	94	X	Fundamental QP
1816.816	Horizontal	-40.4	26.9	51.0	37.5	74	X	Harmonics PK
1816.816	Horizontal	-40.4	26.9	37.6	24.1	54	X	Harmonics AV
2725.196	Horizontal	-39.8	29.6	56.3	46.1	74	X	Harmonics PK
2725.196	Horizontal	-39.8	29.6	50.9	40.7	54	X	Harmonics AV
4541.970	Horizontal	-39.4	33.7	49.9	44.2	74	X	Harmonics PK
4541.970	Horizontal	-39.4	33.7	37.8	32.1	54	X	Harmonics AV
8175.795	Horizontal	-37.7	36.1	51.9	50.3	74	X	Harmonics PK
8175.795	Horizontal	-37.7	36.1	38.2	36.6	54	X	Harmonics AV
31.035	Vertical	0.6	12.3	12.4	25.3	40.0	X	QP
34.018	Vertical	0.7	12.3	10.5	23.5	40.0	X	QP
43.609	Vertical	0.7	13.6	7.9	22.2	40.0	X	QP
908.401	Vertical	3.9	21.1	60.2	85.2	94	X	Fundamental QP
1816.649	Vertical	-40.4	26.9	52.1	38.6	74	X	Harmonics PK
1816.649	Vertical	-40.4	26.9	38.2	24.7	54	X	Harmonics AV
2725.186	Vertical	-39.8	29.6	55.1	44.9	74	X	Harmonics PK
2725.186	Vertical	-39.8	29.6	49.4	39.2	54	X	Harmonics AV
8175.591	Vertical	-37.7	36.1	53.1	51.5	74	X	Harmonics PK
8175.591	Vertical	-37.7	36.1	45.8	44.2	54	X	Harmonics AV

Table 8 Radiated Disturbance Test Data

Model No.: ZW4009DV

Test mode: 2

Frequency (MHz)	Polarization	Correction Factor (dB)	Antenna Factor (dB/m)	Reading Value (dBμV)	Emission Level dB (μV/m)	Limits dB (μV/m)	EUT axes	Note
38.024	Horizontal	0.7	12.3	1.8	14.8	40.0	X	QP
57.335	Horizontal	0.8	13.0	1.3	15.1	40.0	X	QP
99.983	Horizontal	1.1	12.8	2.1	16.0	43.5	X	QP
915.975	Horizontal	3.9	21.1	61.8	86.8	94	X	Fundamental QP
1832.237	Horizontal	-40.5	26.9	51.9	38.3	74	X	Harmonics PK
1832.237	Horizontal	-40.5	26.9	38.3	24.7	54	X	Harmonics AV
2747.991	Horizontal	-39.8	29.6	65.9	55.7	74	X	Harmonics PK
2747.991	Horizontal	-39.8	29.6	51.2	41.0	54	X	Harmonics AV
4579.986	Horizontal	-39.2	33.7	50.0	44.5	74	X	Harmonics PK
4579.986	Horizontal	-39.2	33.7	37.1	31.6	54	X	Harmonics AV
8244.609	Horizontal	-37.6	36.5	52.0	50.9	74	X	Harmonics PK
8244.609	Horizontal	-37.6	36.5	38.7	37.6	54	X	Harmonics AV
31.723	Vertical	0.6	12.3	11.6	24.5	40.0	X	QP
43.705	Vertical	0.7	13.6	7.8	22.1	40.0	X	QP
49.439	Vertical	0.7	13.6	7.1	21.4	40.0	X	QP
915.975	Vertical	3.9	21.1	58.9	83.9	94	X	Fundamental QP
1831.770	Vertical	-40.5	26.9	52.7	39.1	74	X	Harmonics PK
1831.770	Vertical	-40.5	26.9	38.8	25.2	54	X	Harmonics AV
2747.987	Vertical	-39.8	29.6	55.3	45.1	74	X	Harmonics PK
2747.987	Vertical	-39.8	29.6	49.8	39.6	54	X	Harmonics AV
8243.808	Vertical	-37.6	36.5	51.8	50.7	74	X	Harmonics PK
8243.808	Vertical	-37.6	36.5	43.0	41.9	54	X	Harmonics 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)

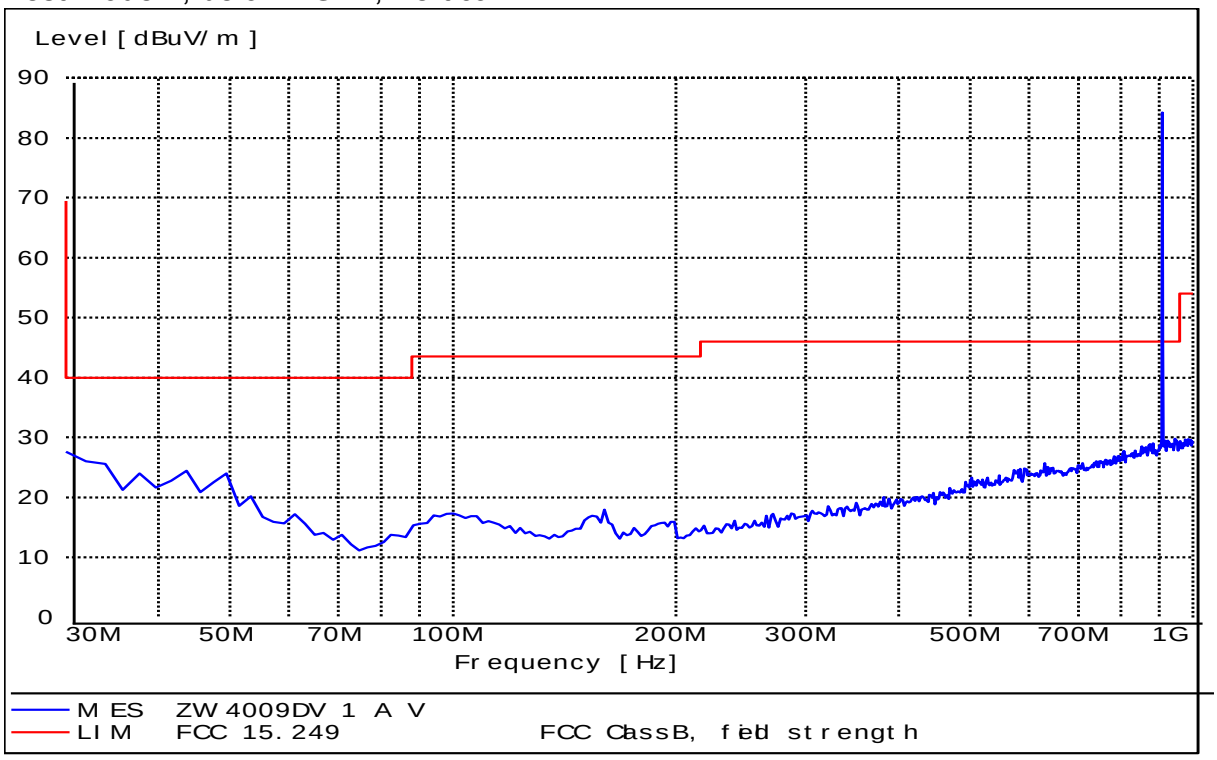
3. No other spurious and harmonic emissions were reported greater than listed emissions above table.

Table 9 **Restricted Band Radiated Emission Data**

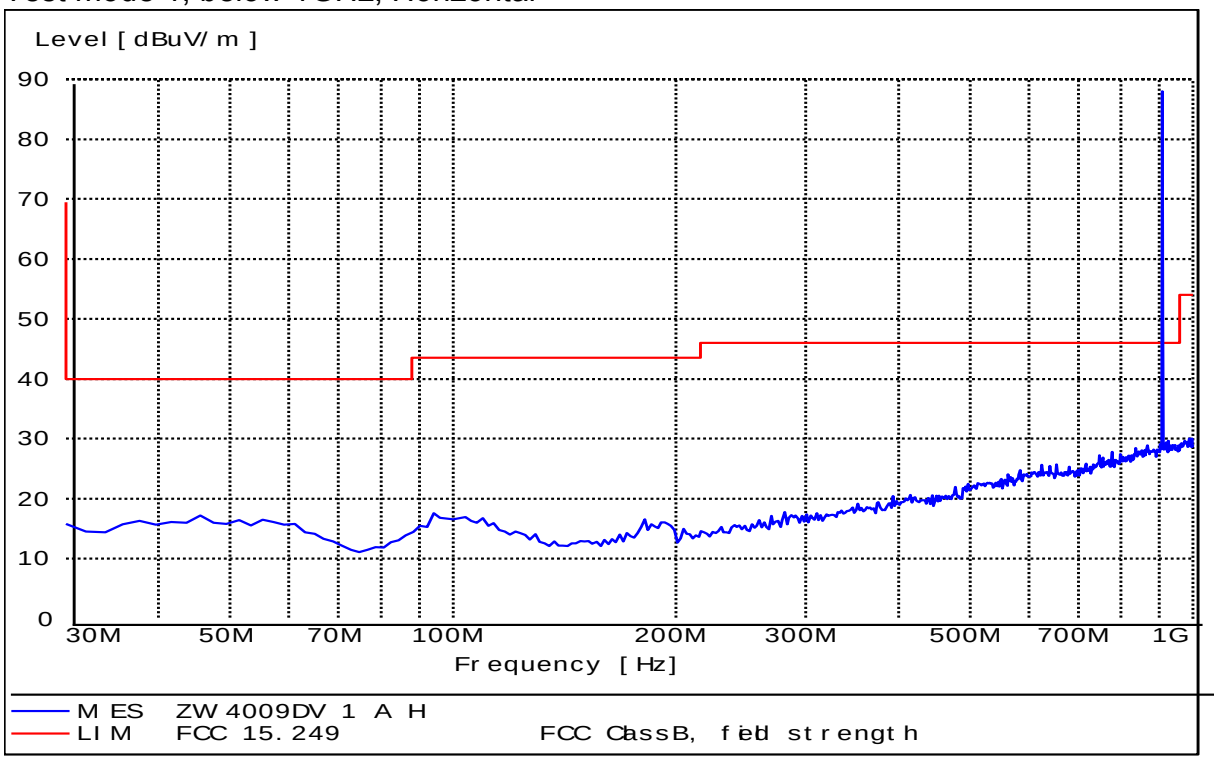
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	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.

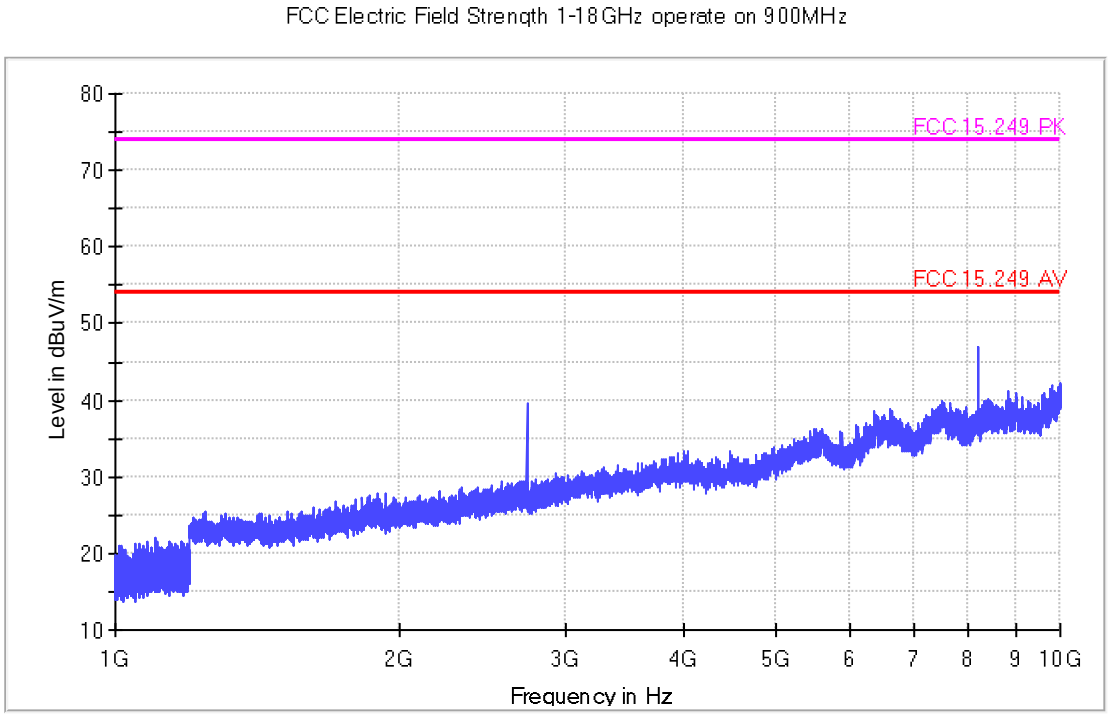
Test mode 1, below 1GHz, Vertical



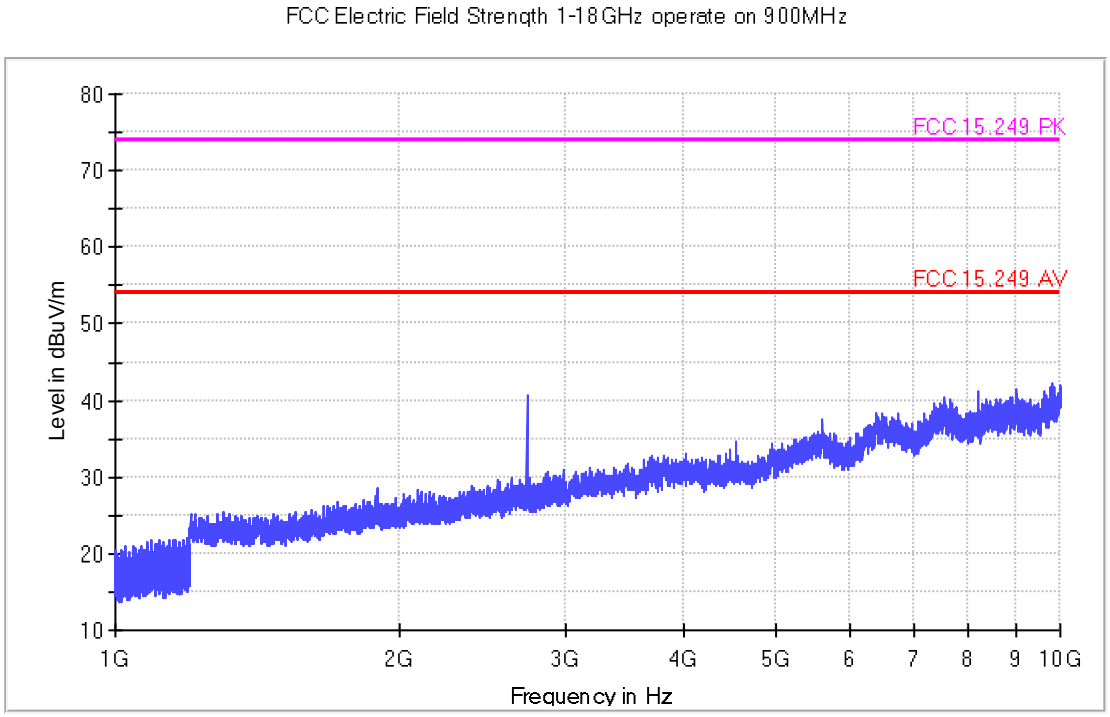
Test mode 1, below 1GHz, Horizontal



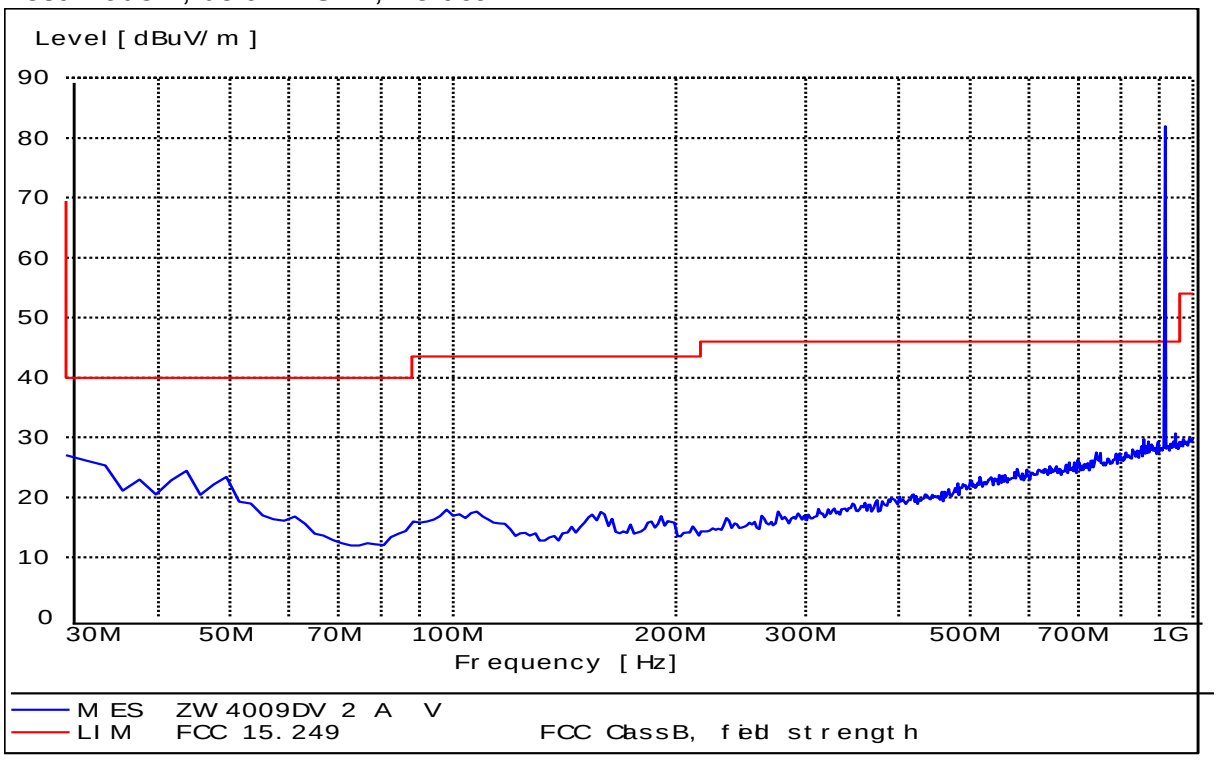
Test mode 1, above 1GHz, Vertical



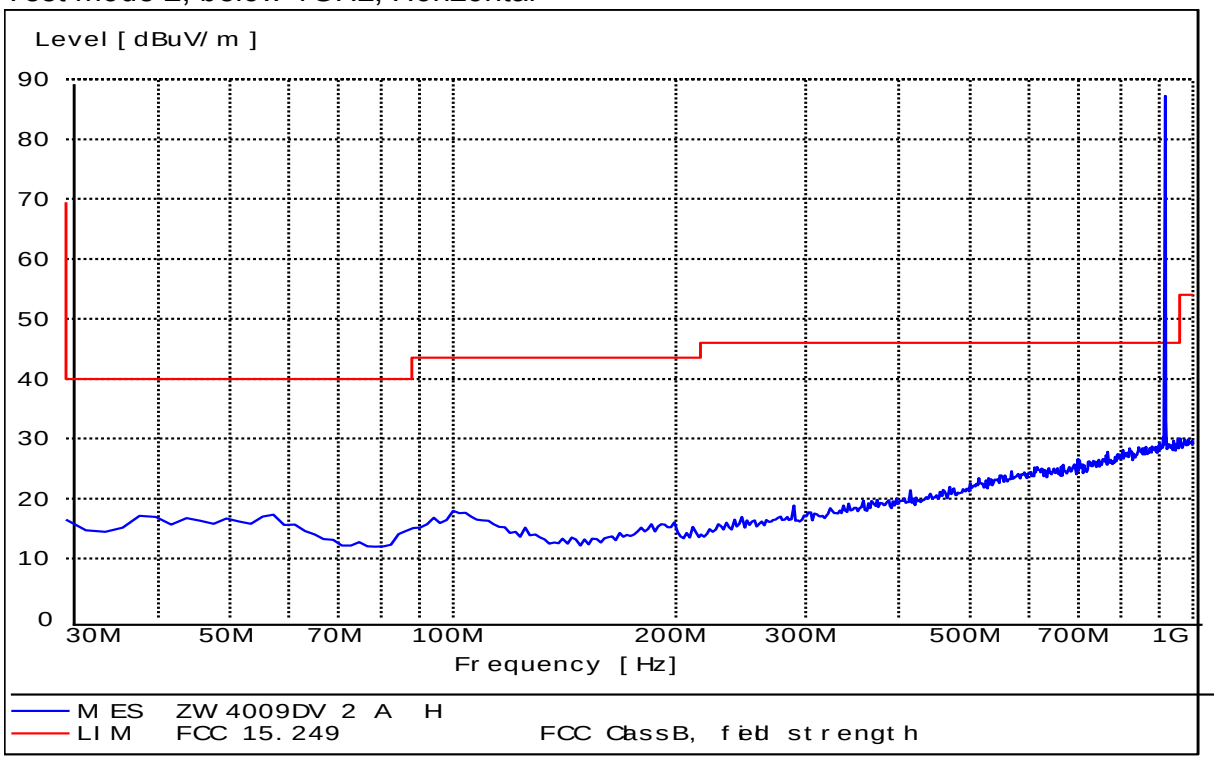
Test mode 1, above 1GHz, Horizontal



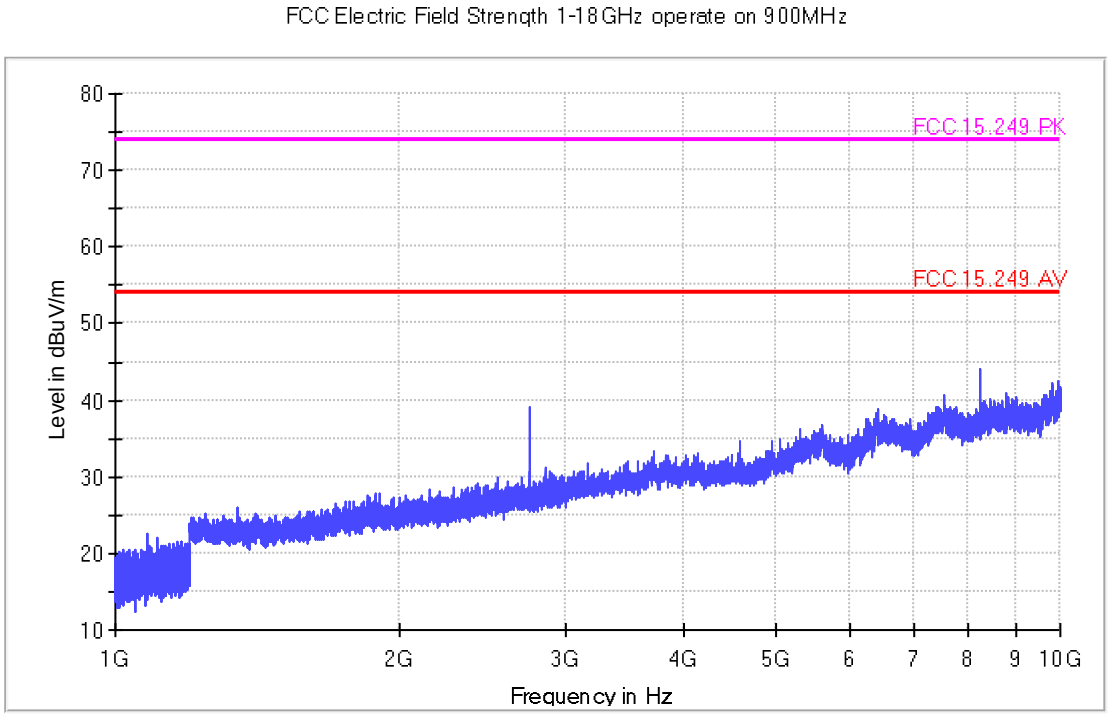
Test mode 2, below 1GHz, Vertical



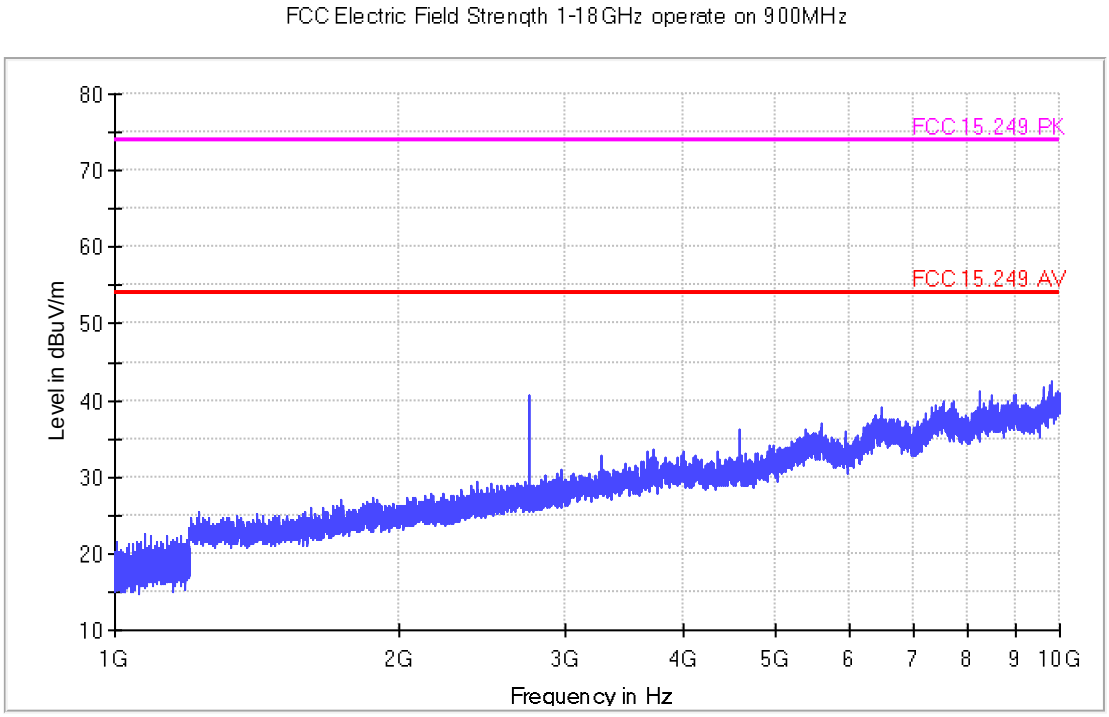
Test mode 2, below 1GHz, Horizontal



Test mode 2, above 1GHz, Vertical



Test mode 2, above 1GHz, Horizontal



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=1% to 5% of the OBW, VBW=3 times of RBW, Span=Wide enough to capture the complete power envelope.
3. Set EMI test receiver Max hold. Mark peak, -20dB.

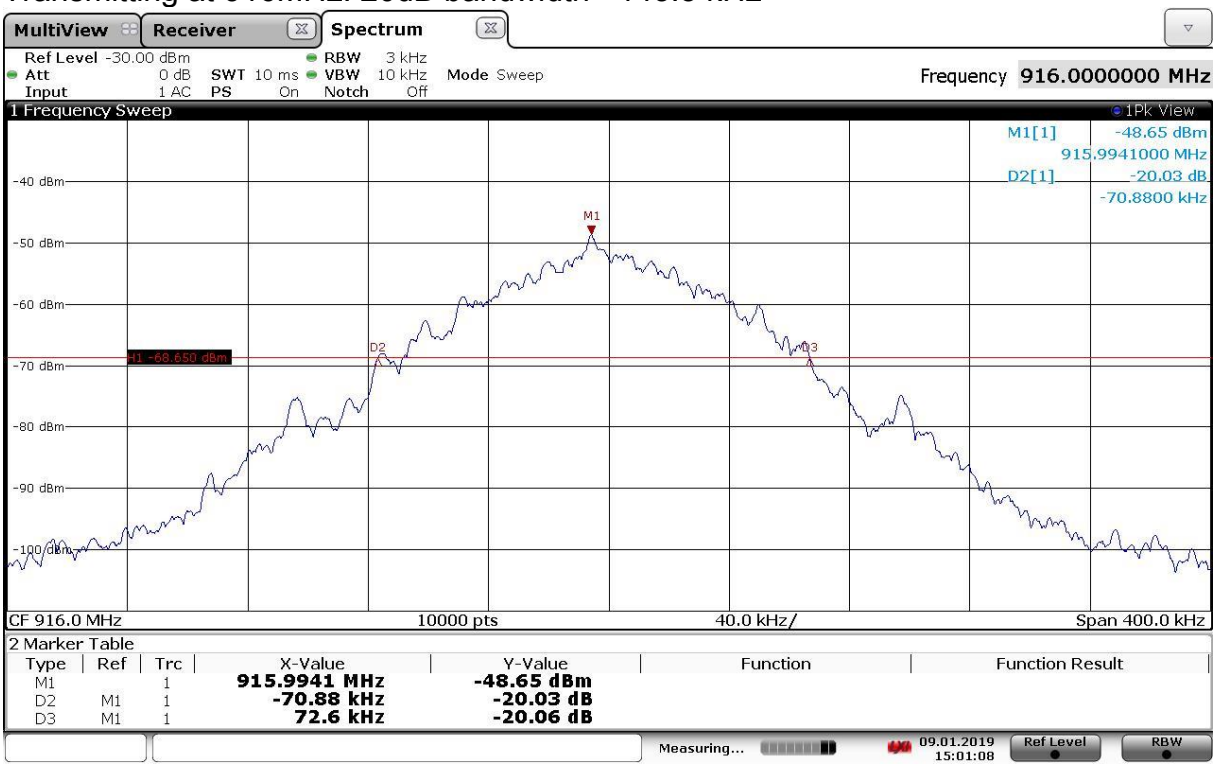
7.3. Test Arrangement

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 =89.1 kHz

Transmitting at 916MHz: 20dB bandwidth =143.5 kHz



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.

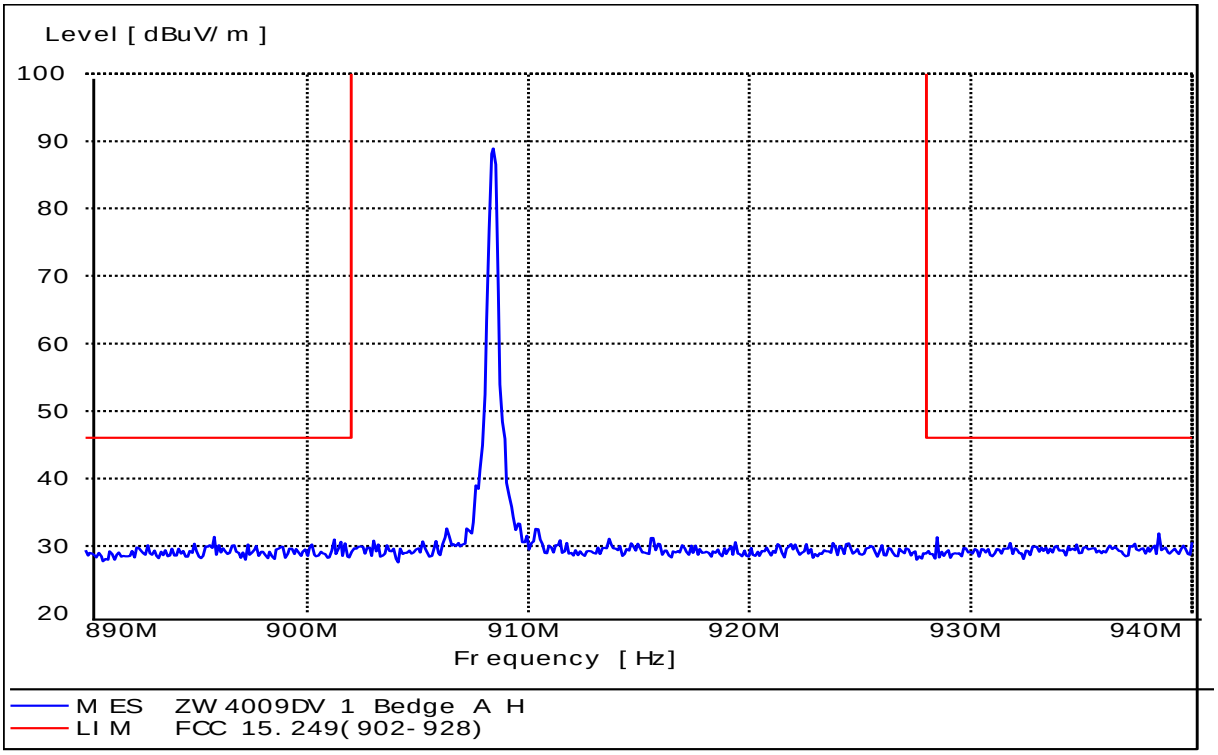
8.4. Test Arrangement

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.

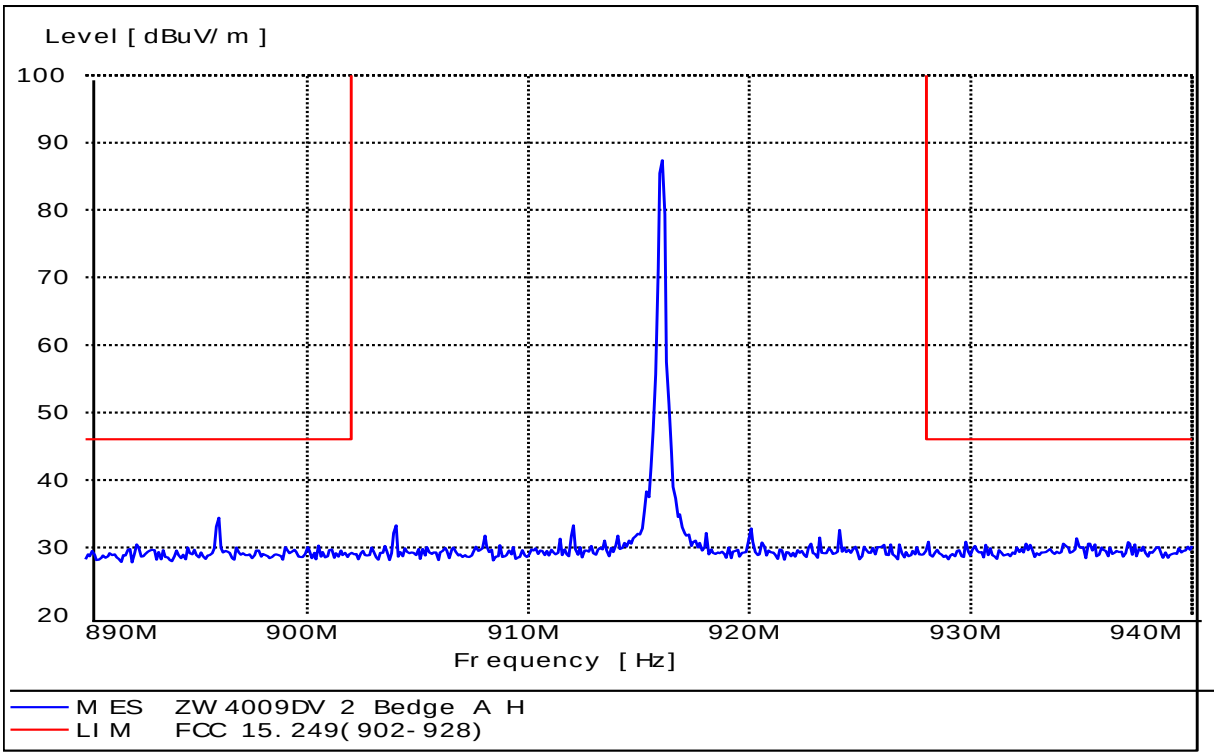
8.5. Test Data

All the emission outside 902 to 928 is lower than 46 dB (μ 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.