



Test Report No.:
FCC2020-0027-2

TEST REPORT

Applicant : Schneider Electric (China) Co., Ltd.,
Shenzhen Branch

Product Name : Z-WAVE+ AUX SWITCH

Mode No. : SQR50101WHZ,SQR50101LAZ,SQ
R50101BKZ

Vkan Certification & Testing Co., Ltd.

威凯检测技术有限公司

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Vkan Certification & Testing Co., Ltd. CVC

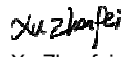
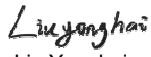
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Applicant		Name : Schneider Electric (China) Co., Ltd., Shenzhen Branch Address : Room 201, Building A, No. 1 Qianwanyi Road, Shengang Cooperation Zone, Qianhai, Shenzhen, China	
Manufacturer		Name : Schneider Electric (China) Co., Ltd., Shenzhen Branch Address : Room 201, Building A, No. 1 Qianwanyi Road, Shengang Cooperation Zone, Qianhai, Shenzhen, China	
Equipment under Test		Product Name : Z-WAVE+ AUX SWITCH Model No. : SQR50101WHZ,SQR50101LAZ,SQR50101BKZ Trade mark : Schneider Electric,Square D Serial no. : — Sampling : —	
Date of Receipt.	2020.12.01	Date of Testing	2020.12.01~2021.02.02
Test Specification		Test Result	
FCC CFR47 Part 15C (2020) Radio Frequency Devices ANSI C63.10 (2013)		PASS	
Evaluation of Test Result		The equipment under test was found to comply with the requirements of the standards applied.  Issue Date: 2021.02.03	
Tested by:  <u>Xu Zhenfei</u> Name Signature		Reviewed by:  <u>Liu Yonghai</u> Name Signature	
		Approved by:  <u>Zeng Bo</u> Name Signature	
Other Aspects: NONE.			
Abbreviations:OK, Pass= passed Fail = failed N/A= not applicable EUT= equipment, sample(s) under tested			
This test report relates only to the EUT, and shall not be reproduced except in full, without written approval of CVC .			

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1. General Product Information

The model of this application: SQR50101WHZ,SQR50101LAZ,SQR50101BKZ.
SQR50101LAZ and SQR50101BKZ have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with SQR50101WHZ. The difference lies only model number and color. All the tests carried out on model SQR50101WHZ.

1.1 General information

Product Name	Z-WAVE+ AUX SWITCH
Model No.	SQR50101WHZ,SQR50101LAZ,SQR50101BKZ
Power Supply	120 Vac,60Hz
Antenna Type	External Antenna
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)
Antenna Gain	Antenna 1:0.5dBi
Wireless Frequency	908.4 MHz, 908.42 MHz, 916.00 MHz
Modulation Type	FSK, GFSK
Data rate	9.6 kbps, 40 kbps, 100 kbps
FCC ID	2AUCU-50101Z
Note: 1. The information of the EUT is declared by the manufacturer.	

2. Test Sites

2.1 Test Facilities

The tests and measurements refer to this report were performed by EMC testing Lab. of Vkan Certification & Testing Co., Ltd.

Add.: No.3, Tiantaiyi Road, Kaitai Avenue, Science City, Guangzhou, 510663, P. R. China

Telephone : +86-20-32293888

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The EMC testing laboratory has been recognized by CNAS, and authorized by Nemko of Norway since 1997, and accredited by DAKKS of Germany since 2007, and assessed and found eligible to participated in the TDAP of VDE testing and certification Institute since 2004, and registered by FCC since 2001.

2.2 Description of Non-standard Method and Deviations

The testing and measurement methods used in this report are applied by all standard methods. Not any non-standard method or deviation from the used standards was used.

2.3 List of Test and Measurement Instruments

Refer to **Appendix**.

3. Test Configuration

3.1 Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

4. Summary of measurement results

Summary of measurements of results	Clause in FCC rules	Verdict	Note
AC Power Line Conducted Emissions	15.207	PASS	
Radiated Emissions	15.249(a)(d)(e),15.205,15.209	PASS	
Occupied Bandwidth	15.215(c)	PASS	
Antenna Requirement	15.203	PASS	

5. Measurement procedure

5.1 AC Power Line Conducted Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

The test is in transmitting mode.

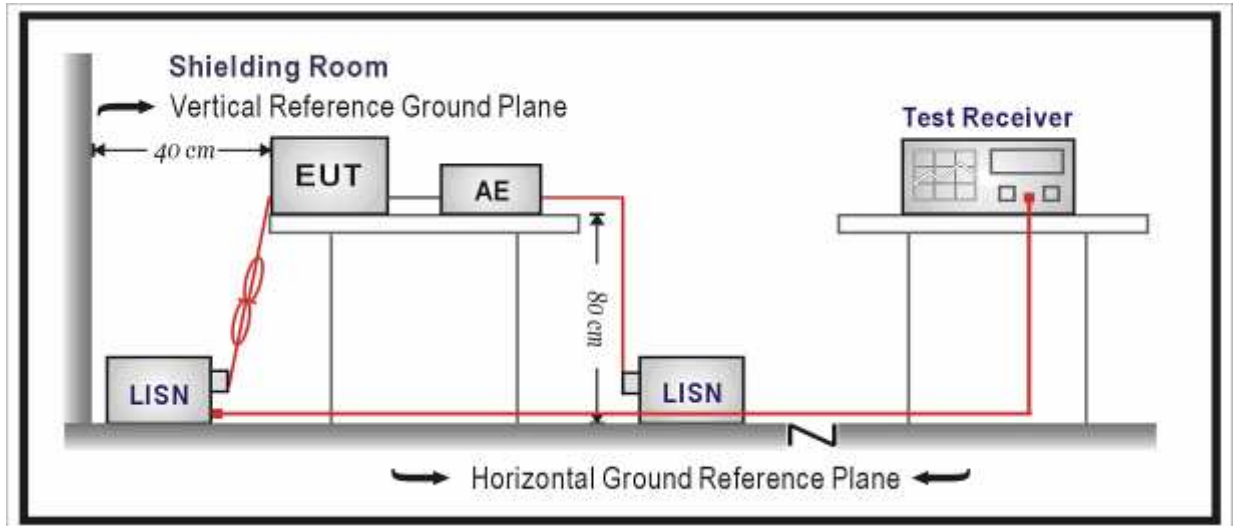
Limits:

Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Test Setup:



Note: AC Power source is used to change the voltage 120V/60Hz.

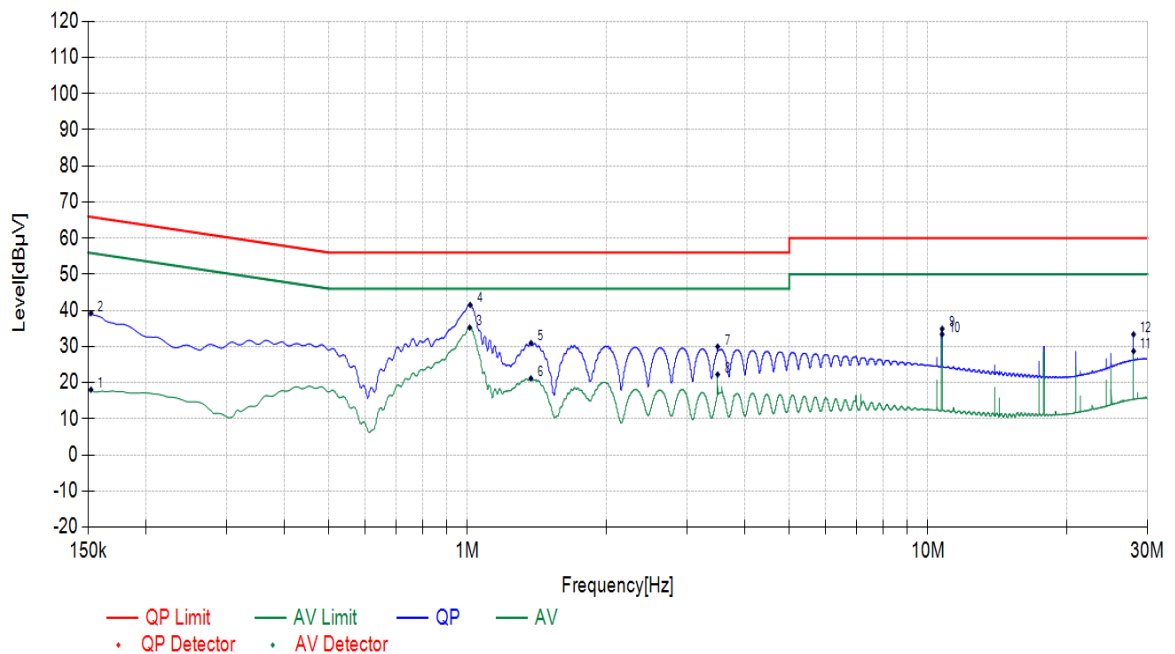
Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$. $U = 3.12$ dB.

Test Results:

Test Carrier frequency (MHz)	908.4
Power port	L

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
12	27.9645	10.59	22.76	33.35	60.00	26.65	QP	PASS
2	0.1523	10.16	29.06	39.22	65.88	26.66	QP	PASS
7	3.4958	10.21	19.76	29.97	56.00	26.03	QP	PASS
5	1.3740	10.18	20.78	30.96	56.00	25.04	QP	PASS
9	10.7385	10.36	24.55	34.91	60.00	25.09	QP	PASS
4	1.0140	10.17	31.34	41.51	56.00	14.49	QP	PASS
10	10.7385	10.36	23.02	33.38	50.00	16.62	AV	PASS
6	1.3740	10.18	10.98	21.16	46.00	24.84	AV	PASS
3	1.0118	10.17	25.07	35.24	46.00	10.76	AV	PASS
11	27.9645	10.59	18.12	28.71	50.00	21.29	AV	PASS
8	3.4958	10.21	12.03	22.24	46.00	23.76	AV	PASS
1	0.1523	10.16	7.89	18.05	55.88	37.83	AV	PASS

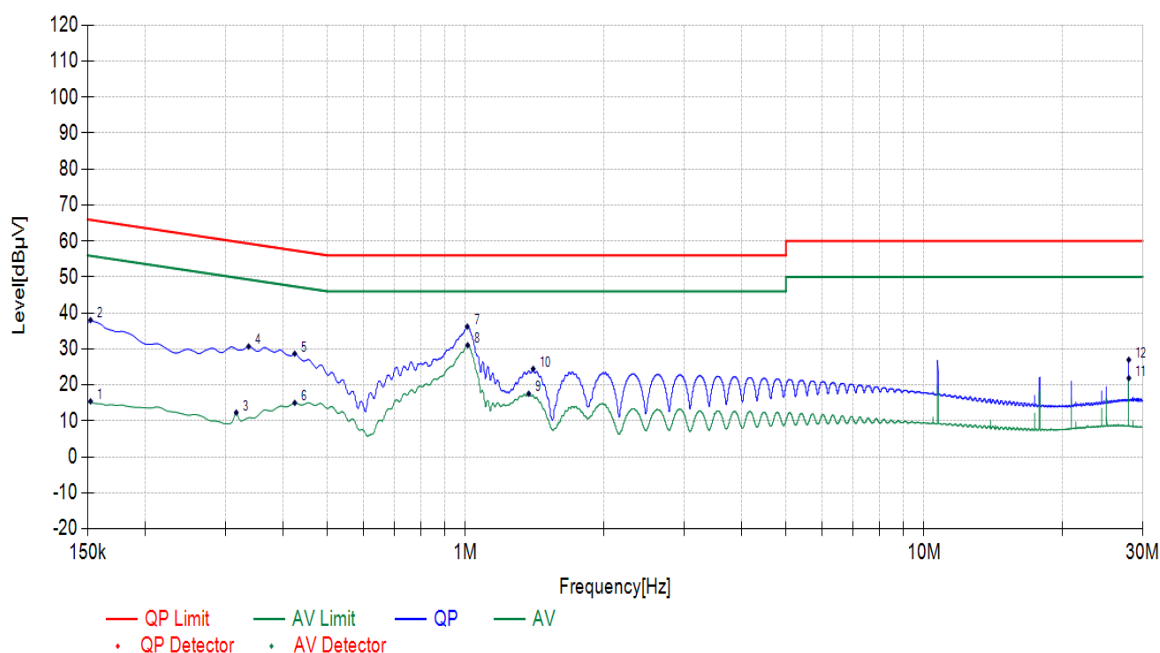


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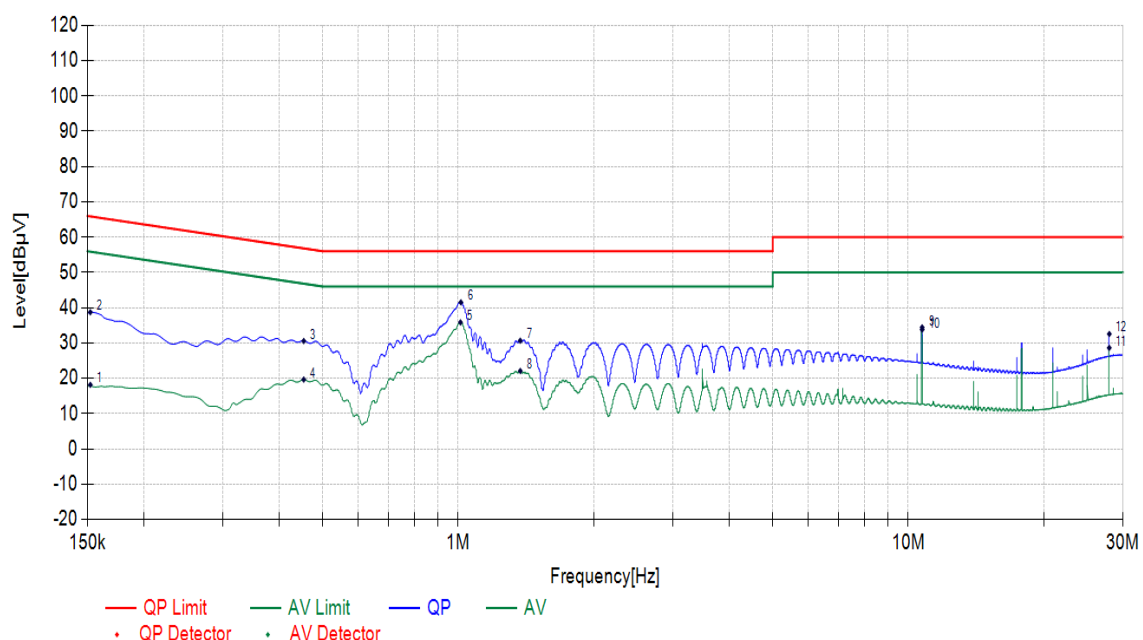
Test Carrier frequency (MHz)	908.4
Power port	N

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
12	27.9645	10.67	15.70	26.97	60.00	33.03	QP	PASS
10	1.4055	10.18	14.56	24.44	56.00	31.56	QP	PASS
7	1.0095	10.17	26.85	36.22	56.00	19.78	QP	PASS
5	0.4245	10.15	19.53	28.68	57.36	28.68	QP	PASS
2	0.1523	10.15	27.56	38.01	65.88	27.87	QP	PASS
4	0.3368	10.15	21.52	30.67	59.28	28.61	QP	PASS
8	1.0118	10.17	20.84	31.01	46.00	14.99	AV	PASS
6	0.4245	10.15	4.85	15.00	47.36	32.36	AV	PASS
3	0.3165	10.14	2.16	12.30	49.80	37.50	AV	PASS
9	1.3740	10.18	7.36	17.54	46.00	28.46	AV	PASS
11	27.9645	10.67	11.20	21.87	50.00	28.13	AV	PASS
1	0.1523	10.15	5.27	15.42	55.88	40.46	AV	PASS



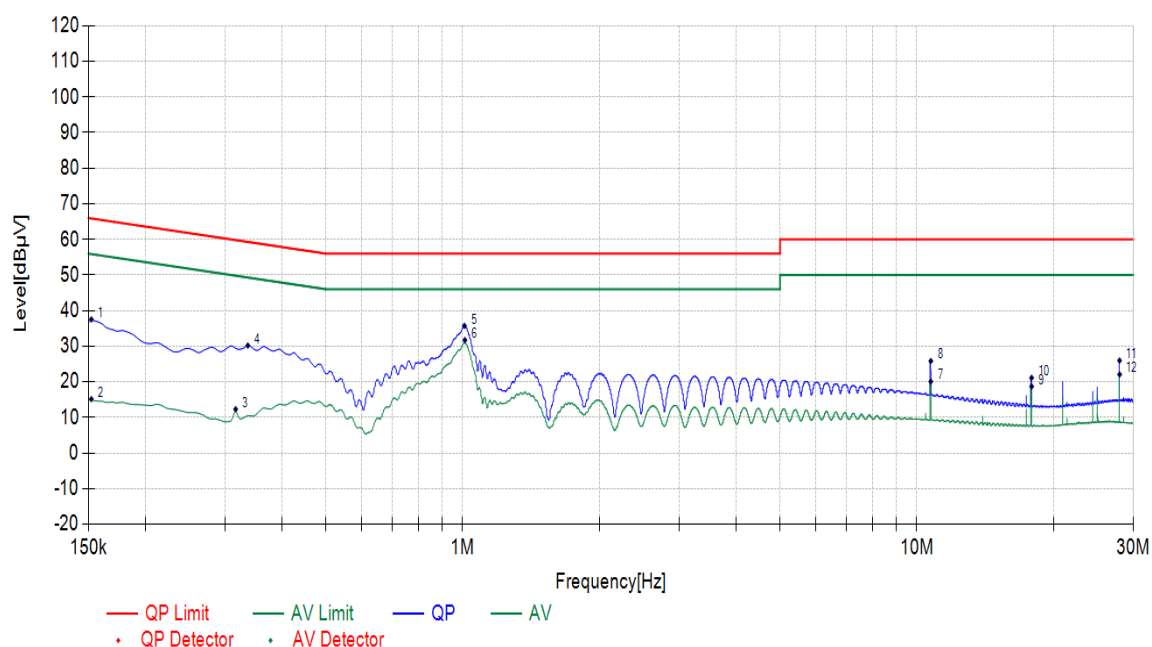
Test Carrier frequency (MHz)	908.42
Power port	L

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
12	27.9645	10.59	21.96	32.55	60.00	27.45	QP	PASS
3	0.4538	10.15	20.41	30.56	56.81	26.25	QP	PASS
6	1.0140	10.17	31.34	41.51	56.00	14.49	QP	PASS
2	0.1523	10.16	28.56	38.72	65.88	27.16	QP	PASS
9	10.7385	10.36	24.05	34.41	60.00	25.59	QP	PASS
7	1.3740	10.18	20.48	30.66	56.00	25.34	QP	PASS
4	0.4538	10.15	9.47	19.62	46.81	27.19	AV	PASS
5	1.0118	10.17	25.67	35.84	46.00	10.16	AV	PASS
11	27.9645	10.59	18.02	28.61	50.00	21.39	AV	PASS
10	10.7385	10.36	23.42	33.78	50.00	16.22	AV	PASS
8	1.3740	10.18	11.88	22.06	46.00	23.94	AV	PASS
1	0.1523	10.16	7.99	18.15	55.88	37.73	AV	PASS



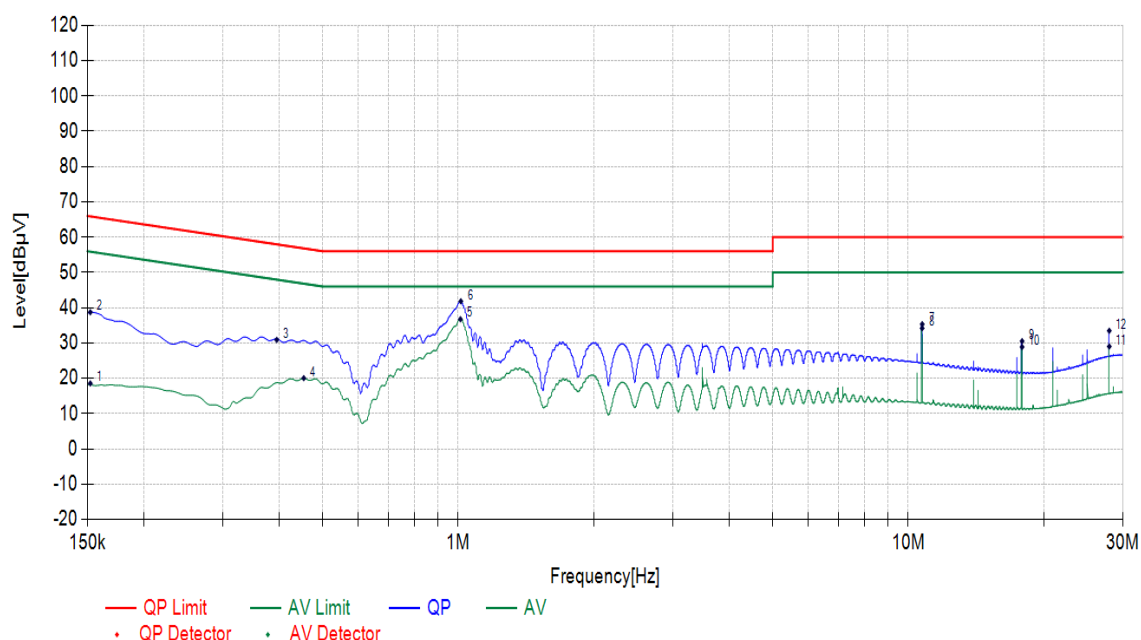
Test Carrier frequency (MHz)	908.42
Power port	N

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
1	0.1523	10.15	27.36	37.51	65.88	28.37	QP	PASS
10	17.9003	10.53	10.58	21.11	60.00	38.89	QP	PASS
11	27.9645	10.67	15.30	25.97	60.00	34.03	QP	PASS
5	1.0095	10.17	25.55	35.72	56.00	20.28	QP	PASS
8	10.7385	10.37	15.46	25.83	60.00	34.17	QP	PASS
4	0.3368	10.15	20.02	30.17	59.28	29.11	QP	PASS
12	27.9645	10.67	11.40	22.07	50.00	27.93	AV	PASS
2	0.1523	10.15	4.97	15.12	55.88	40.76	AV	PASS
3	0.3165	10.14	2.16	12.30	49.80	37.50	AV	PASS
9	17.9003	10.53	8.16	18.69	50.00	31.31	AV	PASS
7	10.7385	10.37	9.71	20.08	50.00	29.92	AV	PASS
6	1.0118	10.17	21.54	31.71	46.00	14.29	AV	PASS



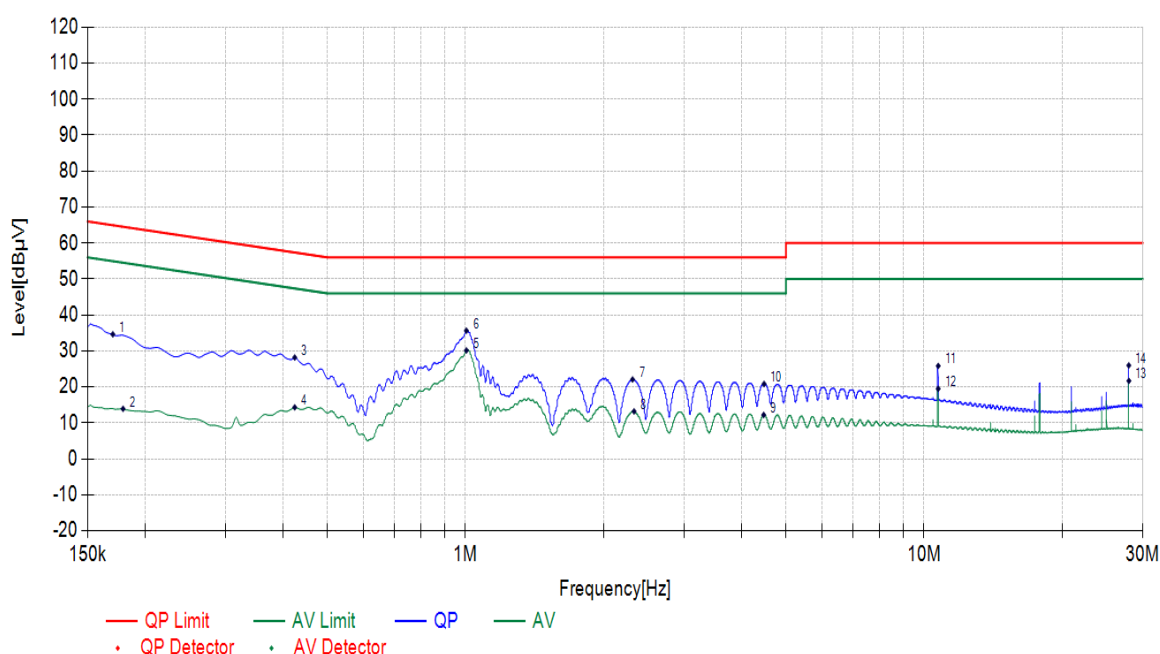
Test Carrier frequency (MHz)	916
Power port	L

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
12	27.9645	10.59	22.86	33.45	60.00	26.55	QP	PASS
3	0.3953	10.15	20.73	30.88	57.95	27.07	QP	PASS
6	1.0140	10.17	31.64	41.81	56.00	14.19	QP	PASS
2	0.1523	10.16	28.56	38.72	65.88	27.16	QP	PASS
9	17.9003	10.50	20.01	30.51	60.00	29.49	QP	PASS
7	10.7385	10.36	24.95	35.31	60.00	24.69	QP	PASS
4	0.4538	10.15	9.87	20.02	46.81	26.79	AV	PASS
5	1.0118	10.17	26.57	36.74	46.00	9.26	AV	PASS
11	27.9645	10.59	18.42	29.01	50.00	20.99	AV	PASS
10	17.9003	10.50	18.38	28.88	50.00	21.12	AV	PASS
8	10.7385	10.36	23.82	34.18	50.00	15.82	AV	PASS
1	0.1523	10.16	8.39	18.55	55.88	37.33	AV	PASS



Test Carrier frequency (MHz)	916
Power port	N

Suspected List								
NO.	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV]	Limit [dBμV]	Margin [dB]	Detector	Pass/Fail
14	27.9645	10.67	15.30	25.97	60.00	34.03	QP	PASS
1	0.1703	10.14	24.47	34.61	64.95	30.34	QP	PASS
7	2.3145	10.20	11.86	22.06	56.00	33.94	QP	PASS
10	4.4790	10.23	10.60	20.83	56.00	35.17	QP	PASS
11	10.7385	10.37	15.46	25.83	60.00	34.17	QP	PASS
3	0.4245	10.15	18.03	28.18	57.36	29.18	QP	PASS
6	1.0050	10.17	25.44	35.61	56.00	20.39	QP	PASS
9	4.4700	10.23	1.97	12.20	46.00	33.80	AV	PASS
5	1.0050	10.17	19.97	30.14	46.00	15.86	AV	PASS
2	0.1793	10.14	3.76	13.90	54.52	40.62	AV	PASS
4	0.4245	10.15	4.15	14.30	47.36	33.06	AV	PASS
8	2.3325	10.20	2.98	13.18	46.00	32.82	AV	PASS



5.2 Radiated Emission

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.

Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, below 30MHz, the center of the loop shall be 1 meters; above 30MHz, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.

Set the spectrum analyzer in the following:

Below 1GHz (detector: Peak and Quasi-Peak)

RBW=100kHz / VBW=300kHz / Sweep=AUTO

Above 1GHz(detector: Peak):

(a)PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO

(b)AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded. Then this mode was measured in the following mode: EUT with cradle and EUT without cradle. The worst emission was found in EUT with cradle mode and the worst case was recorded.

The test is in transmitting mode.

Limits:

Limit in restricted band(Part 15.209)

Frequency (MHz)	Measurement Distance (m)	Field strength(uV/m)	Level (dBuV/m)
0.009–0.490	300	2400/F(kHz)	/
0.490–1.705	30	24000/F(kHz)	/
1.705–30.0	30	30	/
30 - 88	3	100	40
88 - 216	3	150	43.5
216 - 960	3	200	46
Above 960-1000	3	500	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument Antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

Limit in radiated emission measurement (Part 15.209)

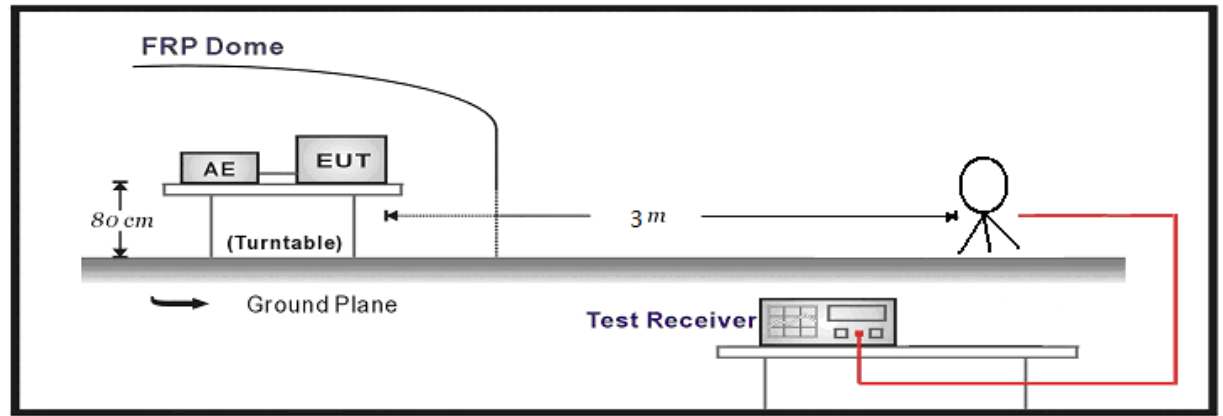
Frequency(MHz)	Field strength(dBuV/m) @3m	
Above 1000	74(peak)	54(average)

Limit in radiated emission measurement (Part 15.249)

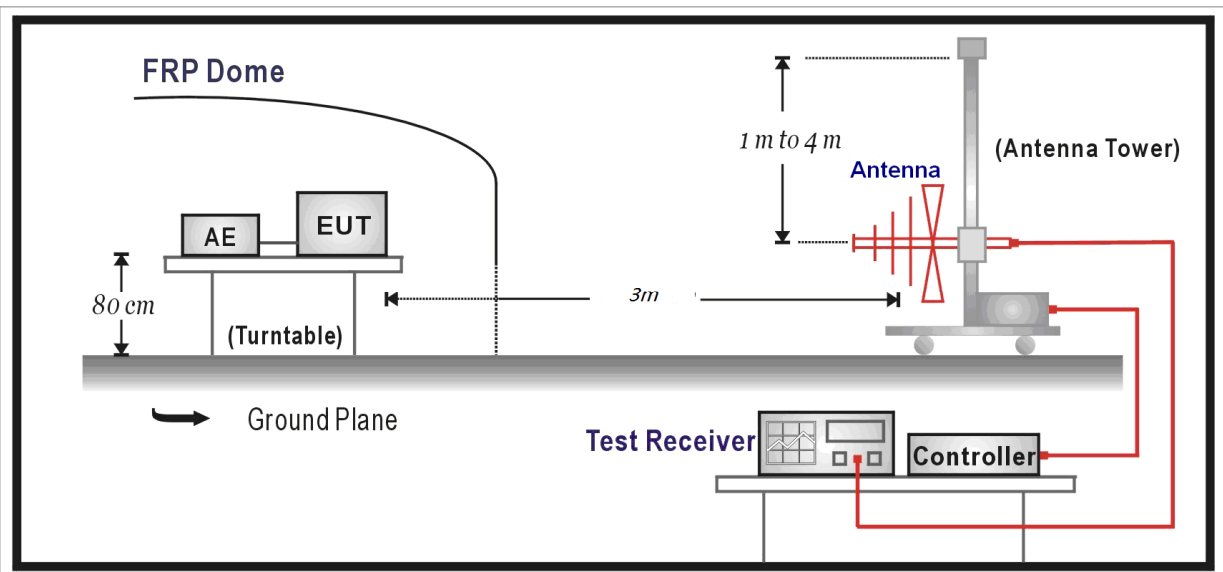
Frequency(MHz)	Field strength(dBuV/m) @3m	
	(millivolts/meter)	(dBuV/m)
902-928 MHz fundamental	50	94
902-928 MHz harmonics	500	/

Test Setup:

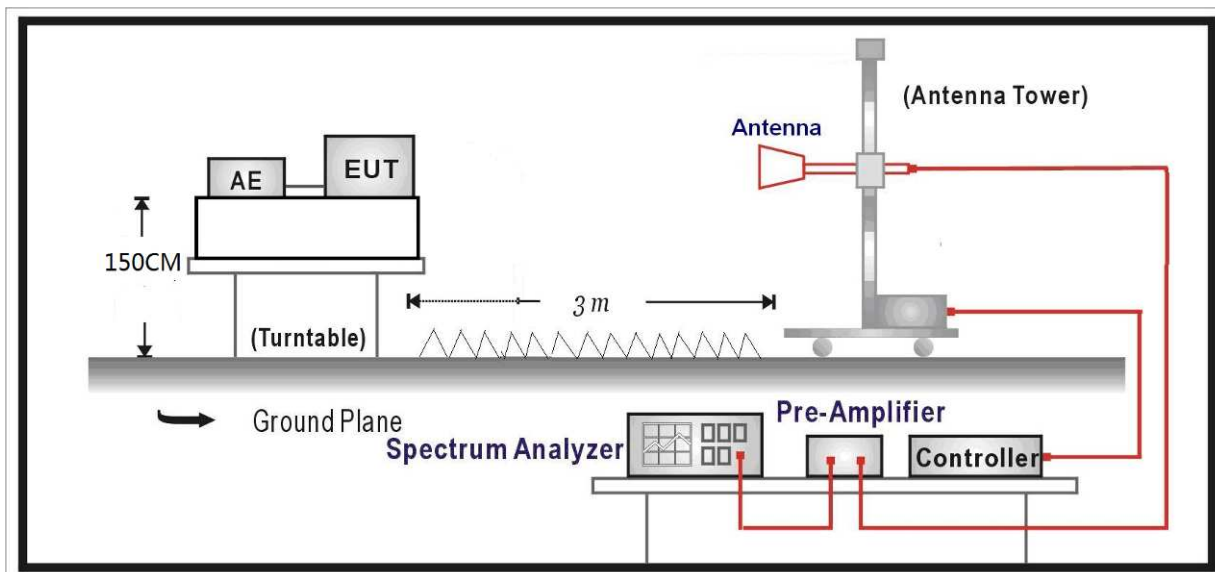
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



Measurement Uncertainty:

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
above 1G	4.10 dB
below 1G	4.84 dB

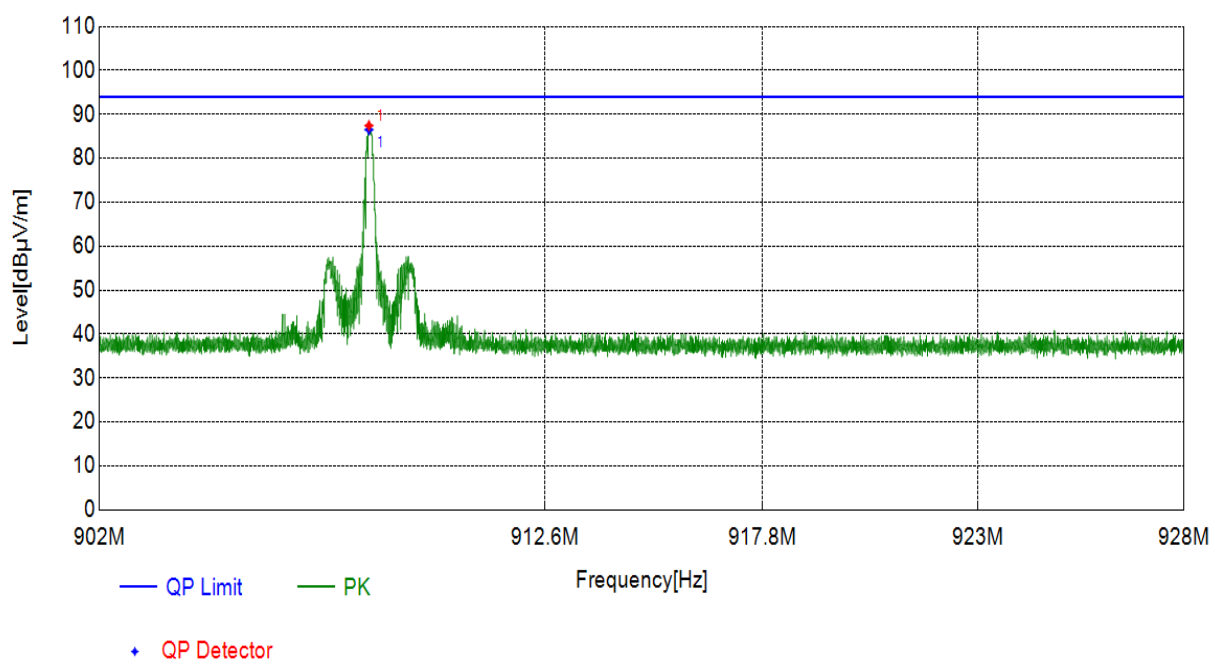
Test Results:

Fundamental Field Strength:

Test Carrier frequency (MHz)	908.4
Polarity	Horizontal

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
908.3960	Horizontal	31.87	55.67	87.44	94.00	6.56	PK	100	50	PASS

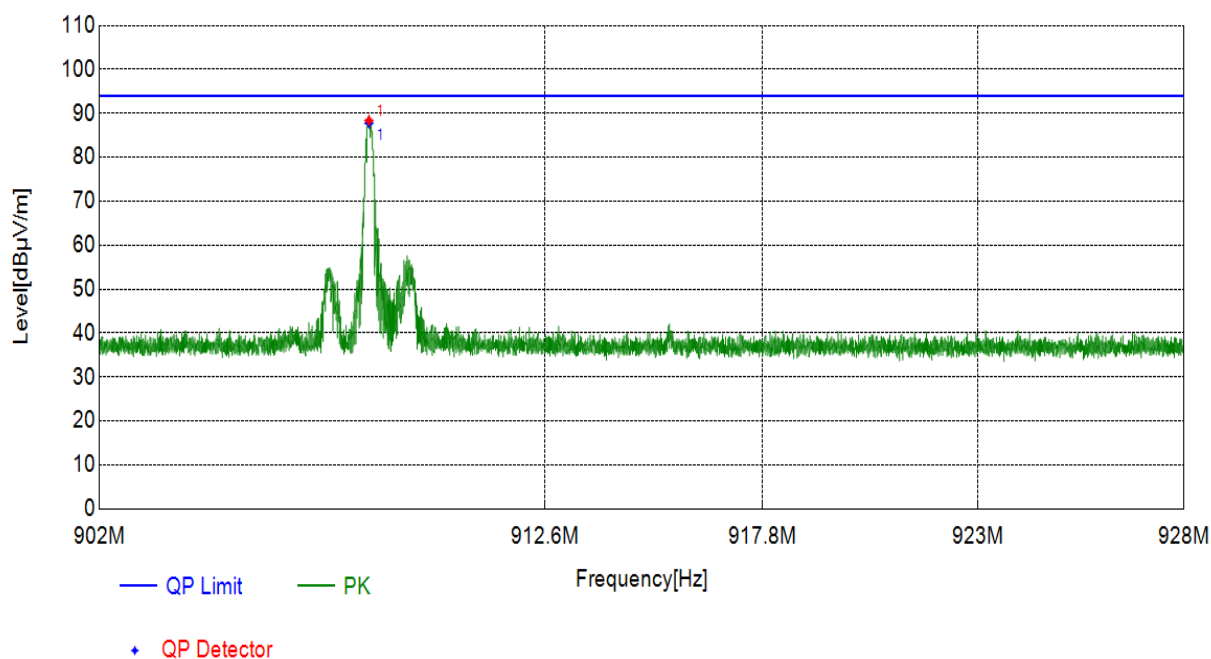
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
908.3960	Horizontal	31.87	86.60	94.00	7.50	100	50	PASS	



Test Carrier frequency (MHz)	908.4
Polarity	Vertical

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
908.3960	Vertical	31.87	56.72	88.39	94.00	5.61	PK	100	50	PASS

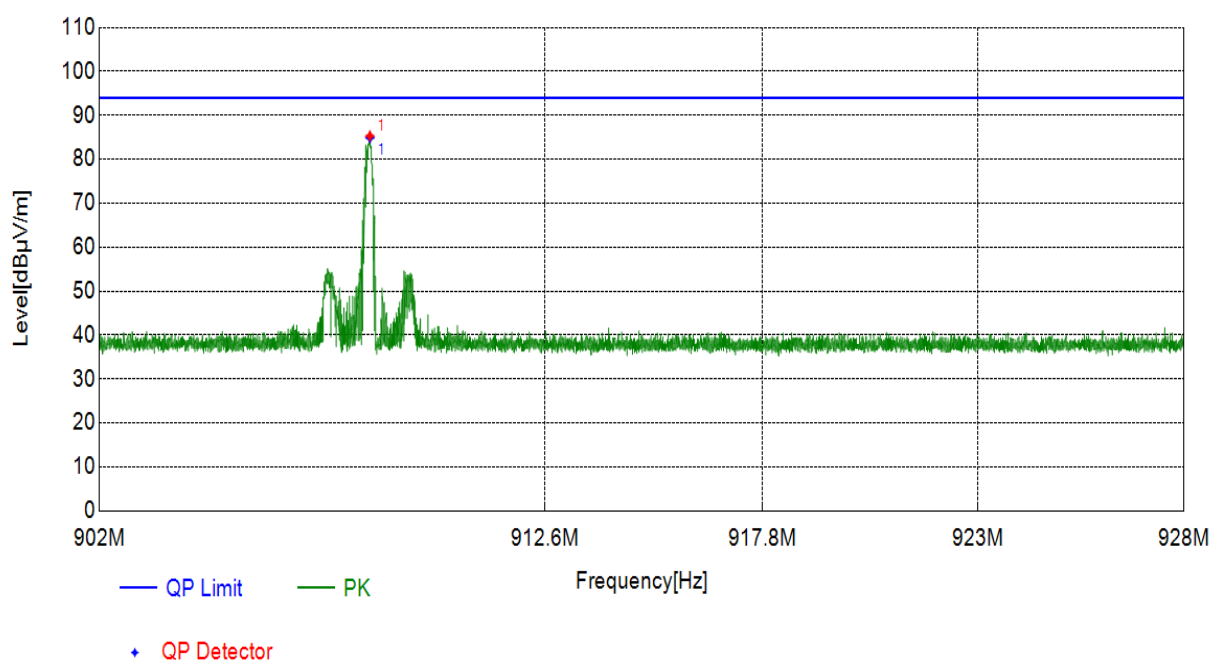
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
908.3960	Vertical	31.87	87.87	94.00	6.23	100	50	PASS	



Test Carrier frequency (MHz)	908.42
Polarity	Horizontal

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
908.4184	Horizontal	31.87	53.55	85.32	94.00	8.68	PK	100	150	PASS

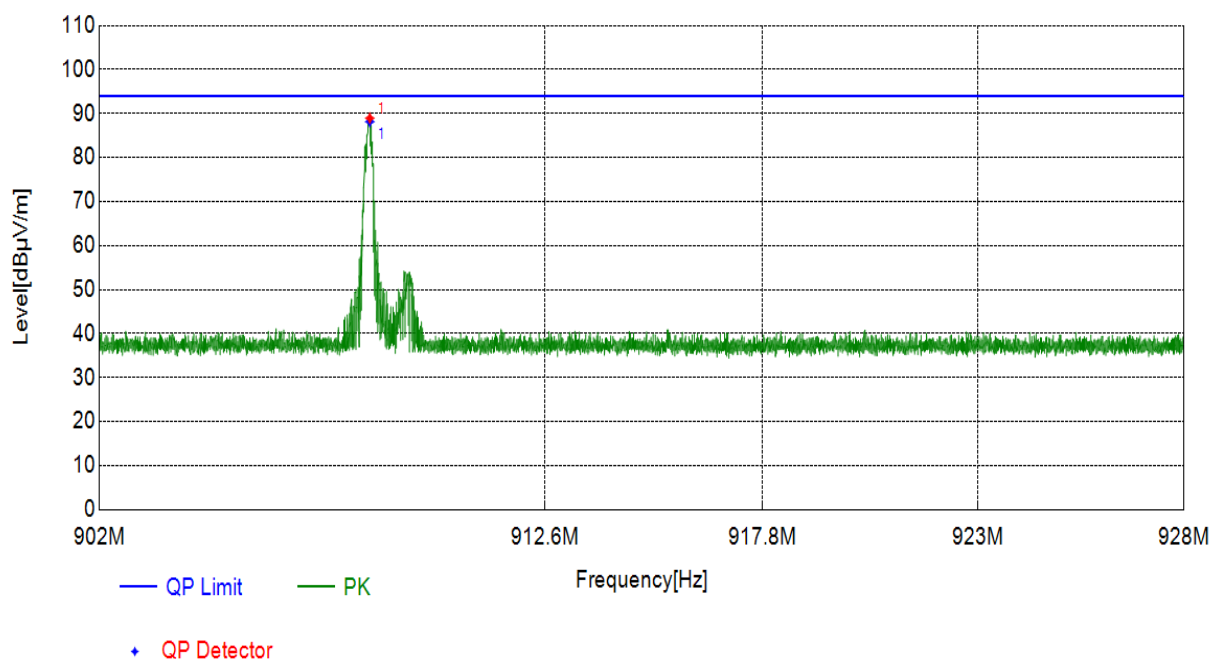
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
908.4184	Horizontal	31.87	84.98	94.00	9.12	100	150	PASS	



Test Carrier frequency (MHz)	908.42
Polarity	Vertical

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
908.4158	Vertical	31.87	57.08	88.96	94.00	5.05	PK	100	20	PASS

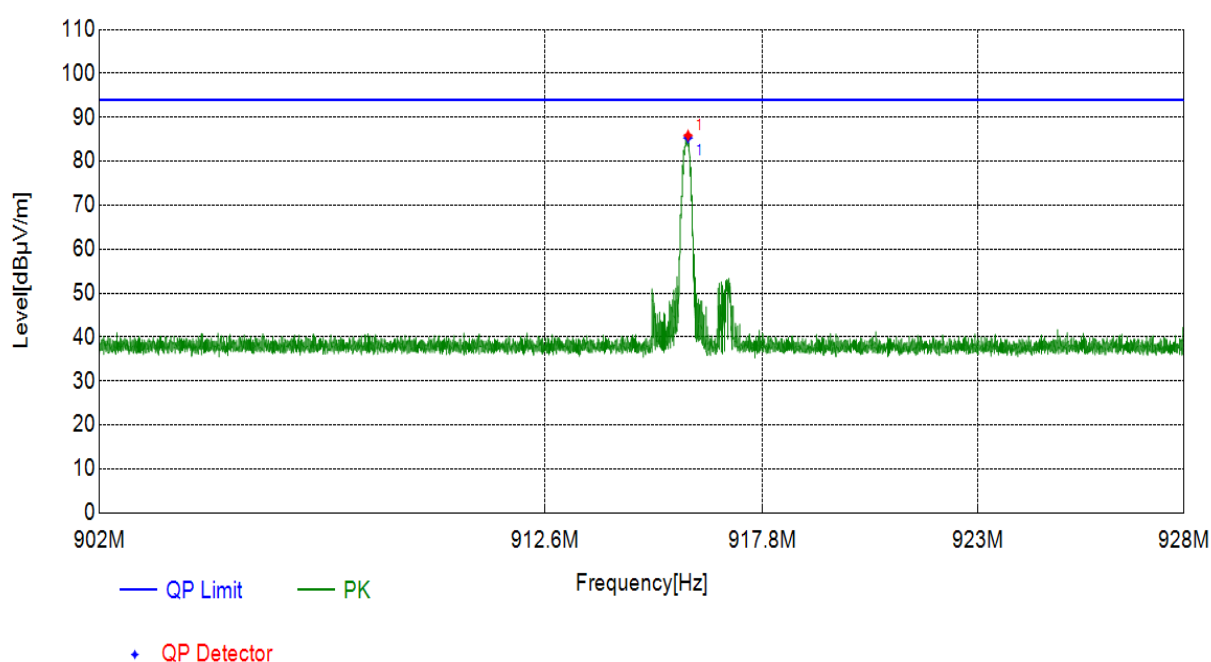
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
908.4158	Vertical	31.87	88.23	94.00	5.87	100	20	PASS	



Test Carrier frequency (MHz)	916
Polarity	Horizontal

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
916.0206	Horizontal	31.85	54.14	85.89	94.00	8.11	PK	100	70	PASS

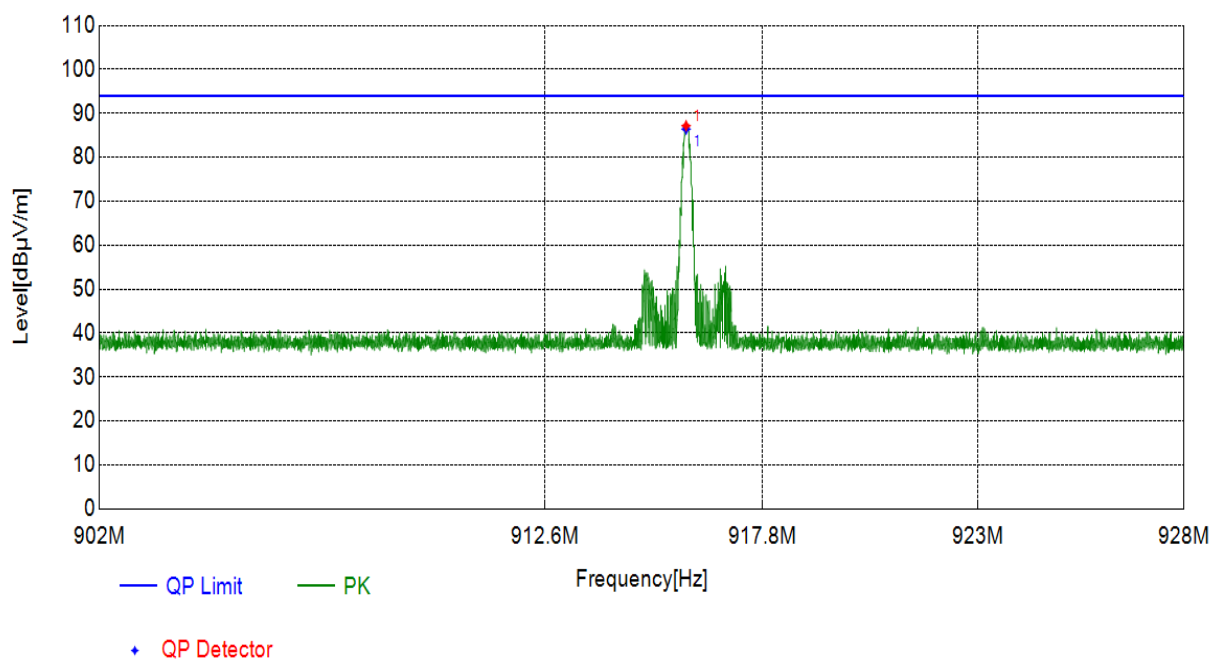
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
916.0206	Horizontal	31.85	85.42	94.00	8.68	100	70	PASS	



Test Carrier frequency (MHz)	916
Polarity	Vertical

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dB μ V/m]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
915.9738	Vertical	31.85	55.42	87.17	94.00	6.83	PK	100	90	PASS

Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dB μ V/m]	QP Limit [dB μ V/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
915.9738	Vertical	31.85	86.49	94.00	7.61	100	90	PASS	

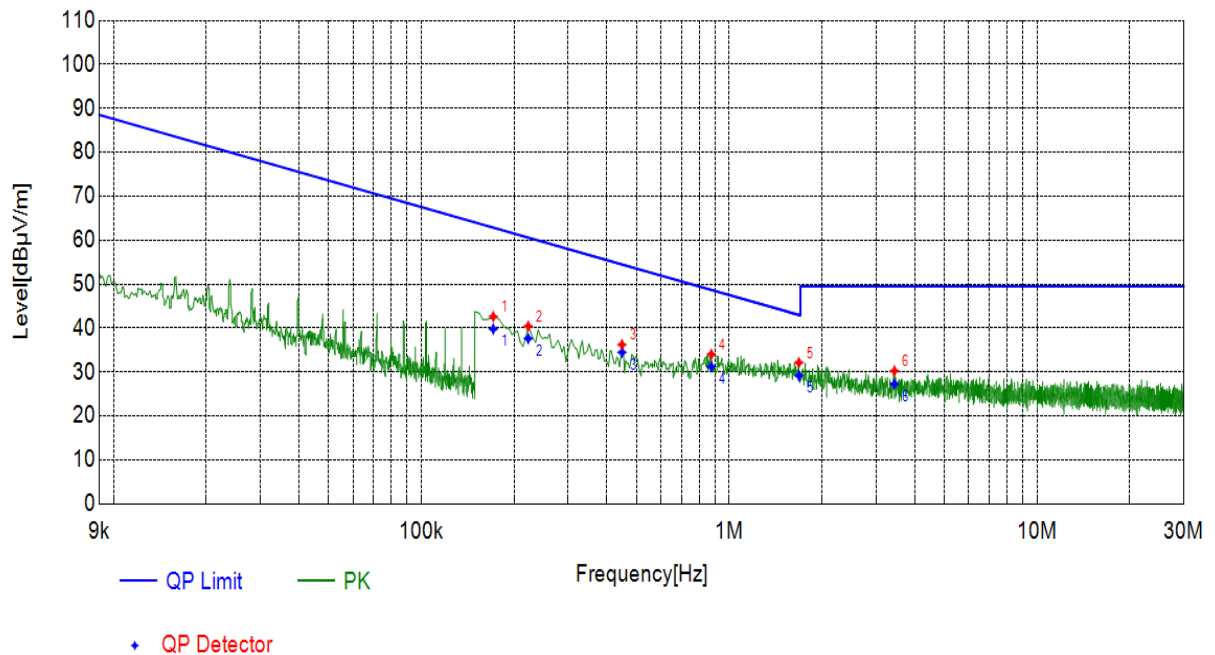


SPURIOUS EMISSIONS 9KHz~30MHz:

Radiated Emission	9KHz-30MHz
Polarity	X axis

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
0.1713	X axis	20.40	22.20	42.60	62.85	20.25	PK	100	150	PASS
0.2225	X axis	20.37	20.06	40.43	60.57	20.14	PK	100	90	PASS
0.4485	X axis	20.41	15.80	36.21	54.47	18.26	PK	100	250	PASS
0.8750	X axis	20.59	13.43	34.02	48.68	14.66	PK	100	320	PASS
1.6854	X axis	20.73	11.39	32.12	43.00	10.88	PK	100	40	PASS
3.4425	X axis	20.99	9.25	30.24	49.50	19.26	PK	100	0	PASS

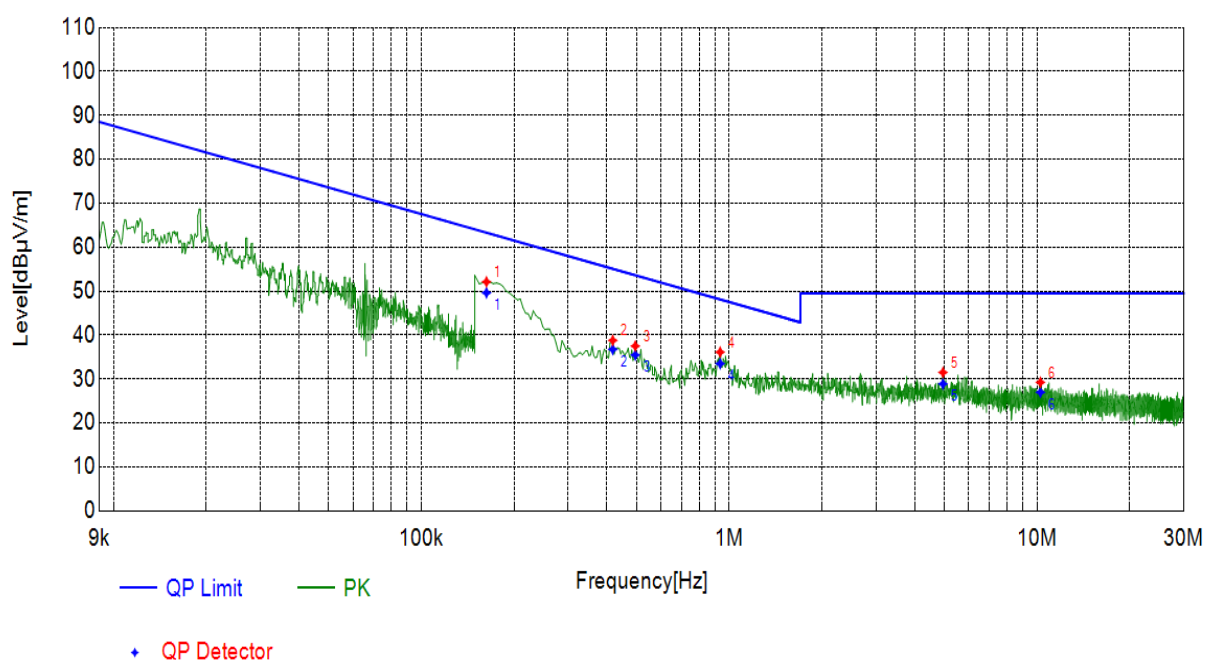
Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
0.1713	X axis	20.40	39.78	62.85	23.07	100	150	PASS
0.2225	X axis	20.37	37.61	60.57	22.96	100	90	PASS
0.4485	X axis	20.41	34.47	54.47	20.00	100	250	PASS
0.8750	X axis	20.59	31.21	48.68	17.47	100	320	PASS
1.6854	X axis	20.73	29.14	43.00	13.86	100	40	PASS
3.4425	X axis	20.99	27.26	49.50	22.24	100	0	PASS



Radiated Emission	9KHz-30MHz
Polarity	Y axis

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
0.1628	Y axis	20.41	31.70	52.11	63.29	11.18	PK	100	270	PASS
0.4187	Y axis	20.32	18.46	38.78	55.07	16.29	PK	100	300	PASS
0.4955	Y axis	20.56	16.94	37.50	53.60	16.10	PK	100	320	PASS
0.9347	Y axis	20.56	15.55	36.11	48.11	12.00	PK	100	90	PASS
4.9480	Y axis	21.13	10.36	31.49	49.50	18.01	PK	100	270	PASS
10.2578	Y axis	20.95	8.29	29.24	49.50	20.26	PK	100	230	PASS

Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
0.1628	Y axis	20.41	49.61	63.29	13.68	100	270	PASS	
0.4187	Y axis	20.32	36.75	55.07	18.32	100	300	PASS	
0.4955	Y axis	20.56	35.47	53.60	18.13	100	320	PASS	
0.9347	Y axis	20.56	33.49	48.11	14.62	100	90	PASS	
4.9480	Y axis	21.13	28.87	49.50	20.63	100	270	PASS	
10.2578	Y axis	20.95	26.98	49.50	22.52	100	230	PASS	



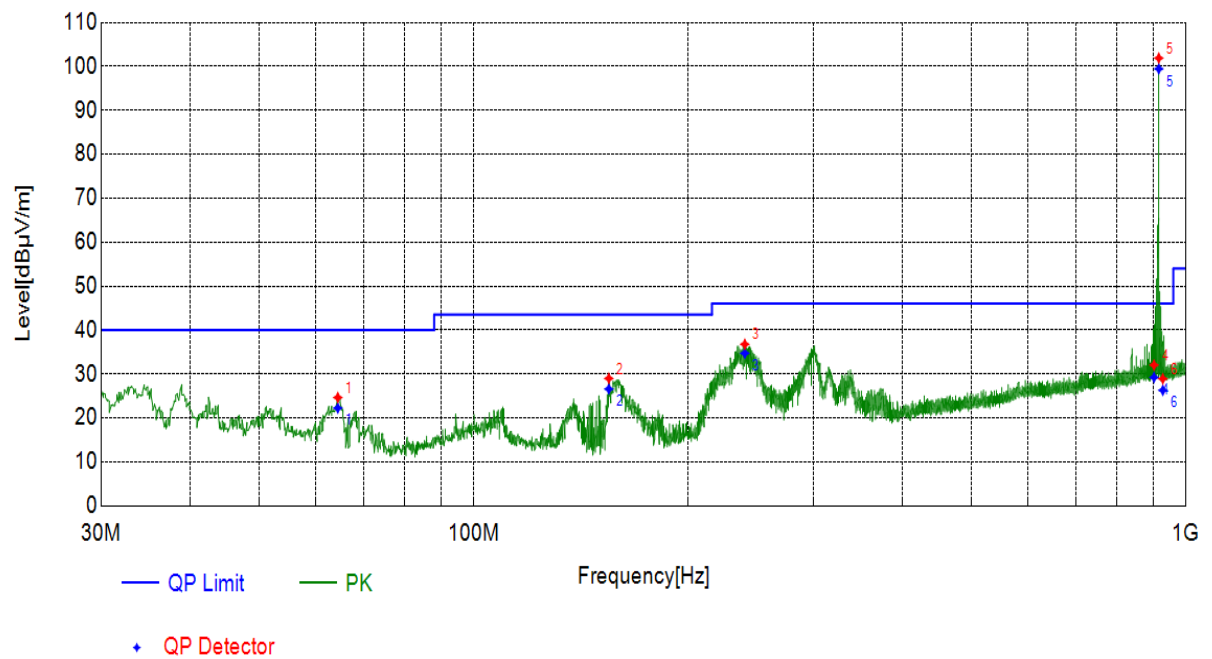
- Note:
1. Quasi-Peak = Reading value + Correction factor
 2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
 3. All the modes had been tested, but only the worst data recorded in the report.

SPURIOUS EMISSIONS 30MHz~1GHz:

Radiated Emission	30MHz-1GHz
Polarity	Horizontal
Channel	Worst-Case HIGH channel

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
64.4384	Horizontal	17.41	7.24	24.65	40.00	15.35	PK	100	225	PASS
154.7545	Horizontal	15.90	13.09	28.99	43.52	14.53	PK	100	249	PASS
240.2200	Horizontal	20.01	16.76	36.77	46.02	9.25	PK	100	359	PASS
902.0202	Horizontal	31.88	0.15	32.03	46.02	13.99	PK	100	220	PASS
916.0866	Horizontal	31.85	70.04	101.89	46.02	-55.87	PK	100	46	Fundamental
928.0188	Horizontal	31.84	-2.93	28.91	46.02	17.11	PK	100	55	PASS

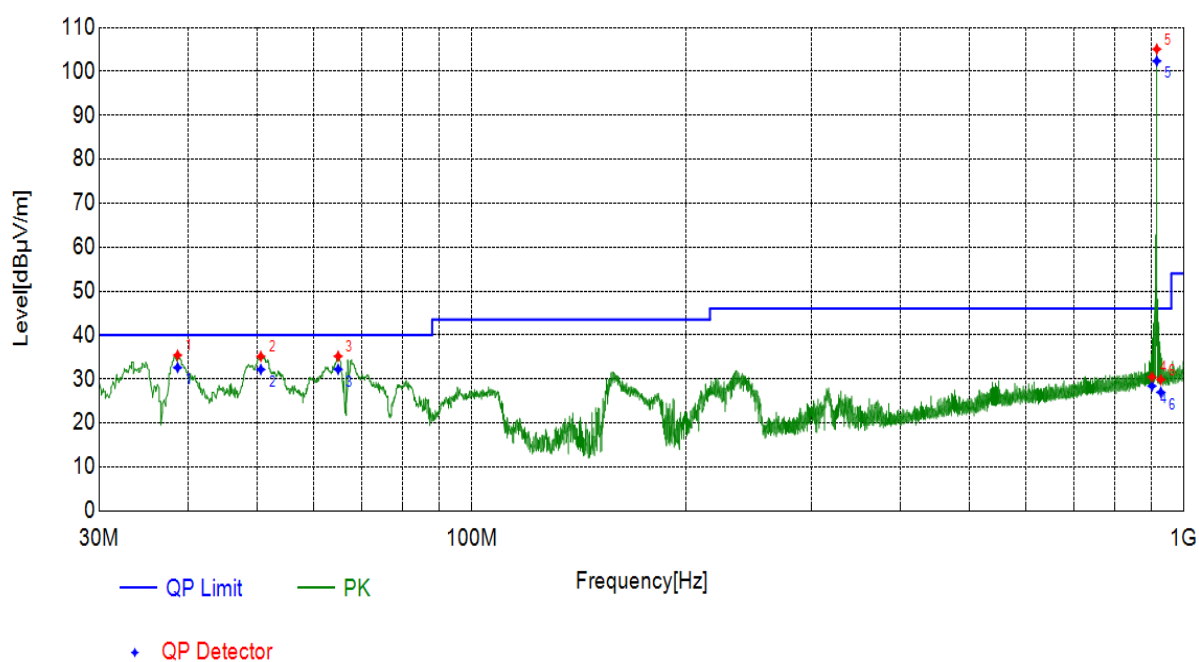
Final Data List									
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail	
64.4384	Horizontal	17.41	22.24	40.00	17.76	171	225	PASS	
154.7545	Horizontal	15.90	26.58	43.52	16.94	103	249	PASS	
240.2200	Horizontal	20.01	34.72	46.02	11.30	148	359	PASS	
902.0202	Horizontal	31.88	29.22	46.02	16.80	100	220	PASS	
916.0866	Horizontal	31.85	99.44	46.02	-53.42	110	46	Fundamental	
928.0188	Horizontal	31.84	26.29	46.02	19.73	130	55	PASS	



Radiated Emission	30MHz-1GHz
Polarity	Vertical
Channel	Worst-Case HIGH channel

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
38.6339	Vertical	21.18	14.23	35.41	40.00	4.59	PK	100	107	PASS
50.5661	Vertical	20.44	14.70	35.14	40.00	4.86	PK	100	290	PASS
64.9235	Vertical	17.31	17.86	35.17	40.00	4.83	PK	100	201	PASS
902.0202	Vertical	31.88	-1.42	30.46	46.02	15.56	PK	100	163	PASS
916.0866	Vertical	31.85	73.22	105.07	46.02	-59.05	PK	100	177	Fundamental
928.0188	Vertical	31.84	-1.99	29.85	46.02	16.17	PK	100	154	PASS

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
38.6339	Vertical	21.18	32.60	40.00	7.40	174	107	PASS
50.5661	Vertical	20.44	32.17	40.00	7.83	131	290	PASS
64.9235	Vertical	17.31	32.20	40.00	7.80	108	201	PASS
902.0202	Vertical	31.88	28.39	46.02	17.63	100	163	PASS
916.0866	Vertical	31.85	102.36	46.02	-56.34	150	177	Fundamental
928.0188	Vertical	31.84	26.98	46.02	19.04	170	154	PASS

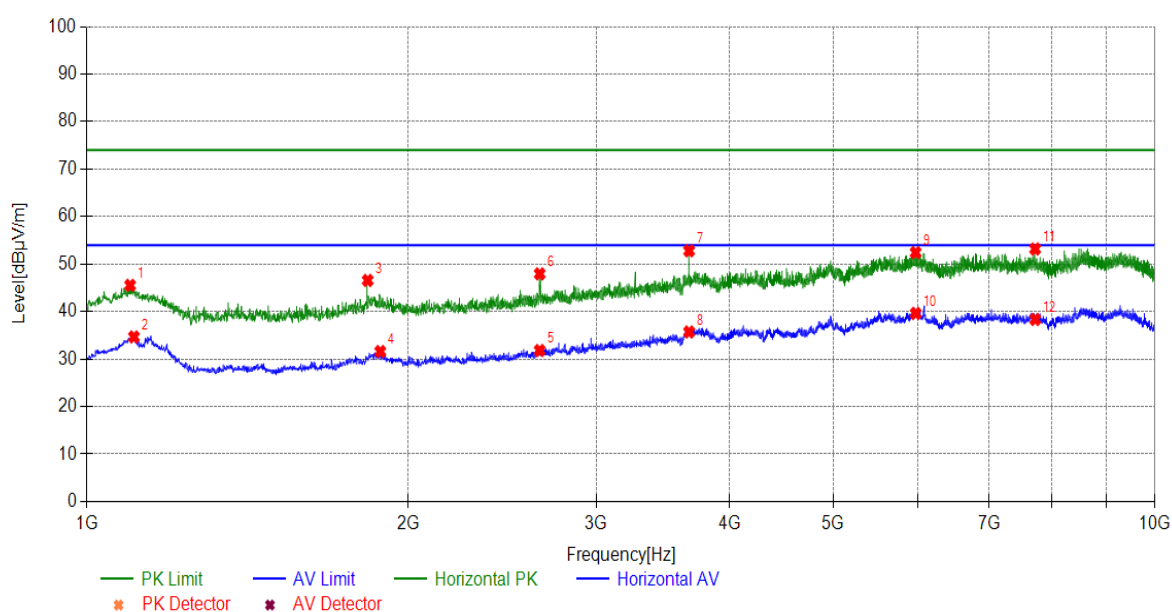


- Note:
1. Quasi-Peak = Reading value + Correction factor
 2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
 3. All the modes had been tested, but only the worst data recorded in the report.
 4. About the Fundamental emission test result please refer to section 5.2-Fundamental Field Strength.

SPURIOUS EMISSIONS 1GHz~10GHz:

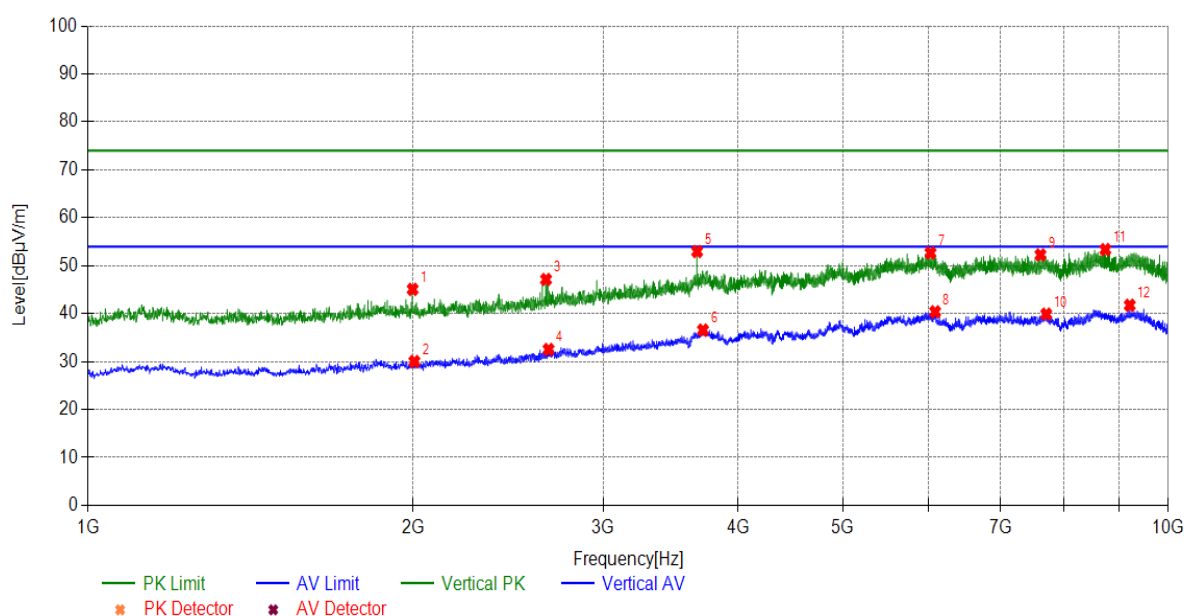
Radiated Emission	1GHz~10GHz
Polarity	Horizontal
Channel	Worst-Case HIGH channel

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect or	Height [cm]	Angle deg	Pass/Fail
1098.10	Horizon	-12.64	58.17	45.53	74.00	28.47	PK	100	200	PASS
2655.26	Horizon	-8.12	56.06	47.94	74.00	26.06	PK	100	352	PASS
7725.47	Horizon	1.56	51.62	53.18	74.00	20.82	PK	100	104	PASS
3664.26	Horizon	-4.44	57.24	52.80	74.00	21.20	PK	100	252	PASS
5971.19	Horizon	-1.11	53.53	52.42	74.00	21.58	PK	100	205	PASS
1832.58	Horizon	-10.92	57.48	46.56	74.00	27.44	PK	100	166	PASS
1882.98	Horizon	-10.76	42.34	31.58	54.00	22.42	AV	100	18	PASS
1107.11	Horizon	-12.61	47.27	34.66	54.00	19.34	AV	100	65	PASS
2655.26	Horizon	-8.12	39.92	31.80	54.00	22.20	AV	100	18	PASS
5972.09	Horizon	-1.11	40.72	39.61	54.00	14.39	AV	100	23	PASS
3664.26	Horizon	-4.44	40.14	35.70	54.00	18.30	AV	100	18	PASS
7726.37	Horizon	1.56	36.78	38.34	54.00	15.66	AV	100	357	PASS



Radiated Emission	1GHz~10GHz
Polarity	Vertical
Channel	Worst-Case HIGH channel

Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dB μ V/m]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
1998.19	Vertical	-10.35	55.42	45.07	74.00	28.93	PK	100	346	PASS
7617.46	Vertical	1.54	50.70	52.24	74.00	21.76	PK	100	317	PASS
8747.07	Vertical	2.74	50.61	53.35	74.00	20.65	PK	100	260	PASS
3664.26	Vertical	-4.44	57.40	52.96	74.00	21.04	PK	100	307	PASS
2655.26	Vertical	-8.12	55.25	47.13	74.00	26.87	PK	100	217	PASS
6026.10	Vertical	-1.05	53.71	52.66	74.00	21.34	PK	100	346	PASS
2669.66	Vertical	-8.05	40.58	32.53	54.00	21.47	AV	100	341	PASS
2005.40	Vertical	-10.32	40.32	30.00	54.00	24.00	AV	100	346	PASS
9214.22	Vertical	3.53	38.21	41.74	54.00	12.26	AV	100	346	PASS
6085.50	Vertical	-1.05	41.43	40.38	54.00	13.62	AV	100	346	PASS
7712.87	Vertical	1.56	38.34	39.90	54.00	14.10	AV	100	346	PASS
3710.17	Vertical	-4.36	40.93	36.57	54.00	17.43	AV	100	346	PASS



- Note:
1. Quasi-Peak = Reading value + Correction factor
 2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
 3. All the modes had been tested, but only the worst data recorded in the report.
 4. About the Fundamental emission test result please refer to section 5.2-Fundamental Field Strength.

5.3 Occupied Bandwidth

Ambient condition:

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement:

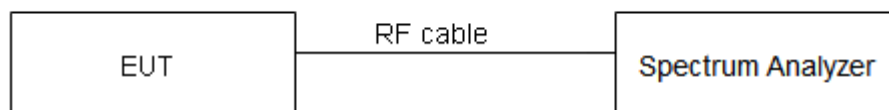
Tests are performed in accordance with ANSI C63.10-2013.

The 20 dB and 99% bandwidth of the fundamental frequency remain inside the band of operation of 902-928 MHz. The EUT was connected to the spectrum analyzer and z-wave test set via a power splitter with a known loss. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 10 kHz and VBW is set to 30 kHz on spectrum analyzer.

Limits:

No specific occupied bandwidth requirements in part 15.215(c).

Test Setup:



Measurement Uncertainty:

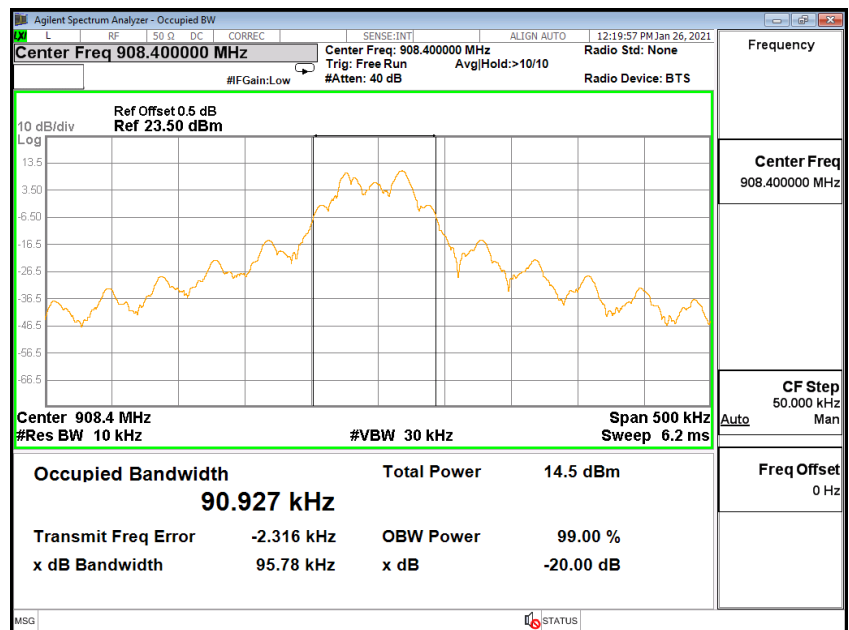
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

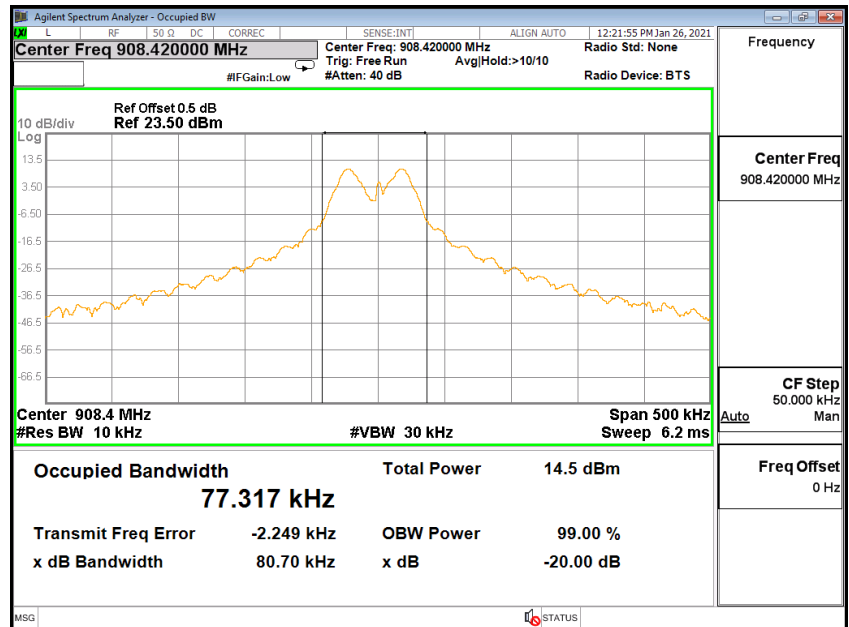
Mode	Frequency (MHz)	Rate (kbps)	20dB Bandwidth(kHz)	99% Bandwidth(kHz)
z-wave	908.4	40	95.78	90.927
	908.42	9.6	80.70	77.317
	916	100	125.7	114.79

Test Graphs:

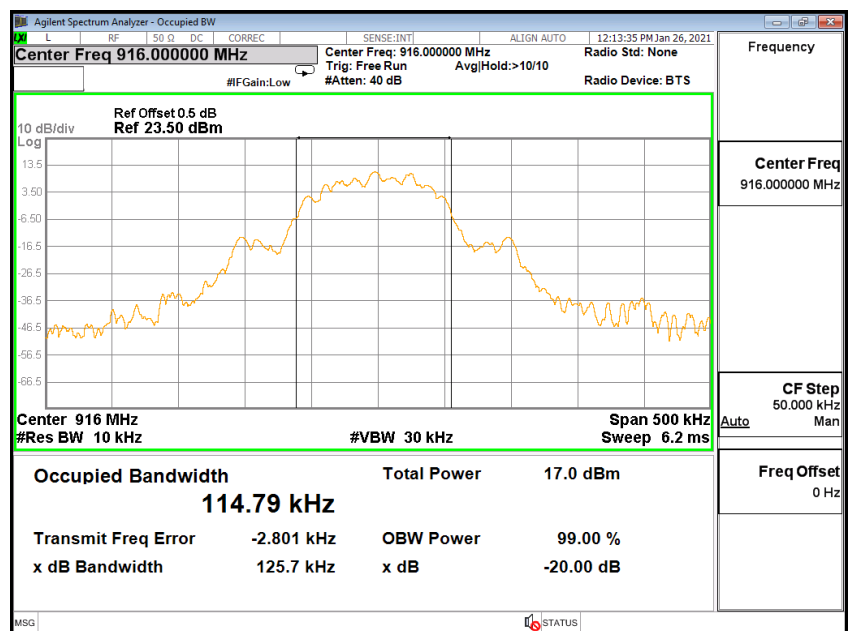
Carrier frequency
(MHz): 908.4
(40kbps)



Carrier frequency
(MHz): 908.42
(9.6kbps)



Carrier frequency
(MHz): 916(100kbps)



5.4 Antenna Measurement

Limits:

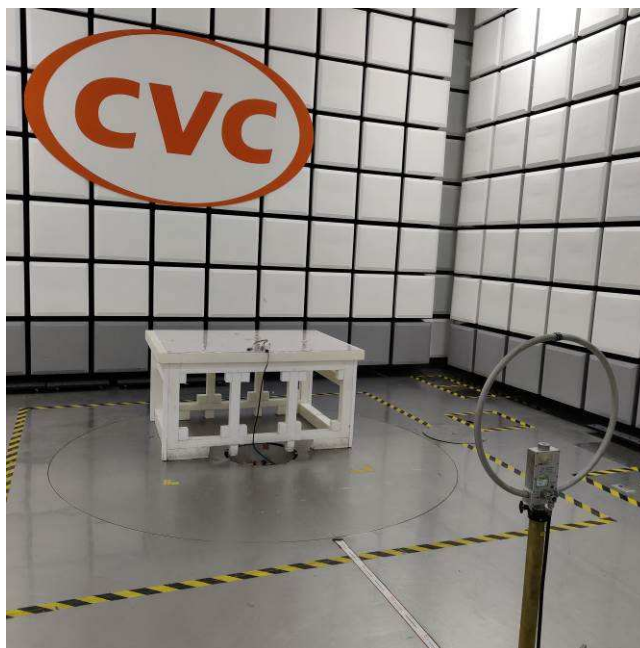
For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

Antenna Description:

See section 1 – antenna information

6. Test Setup Photograph

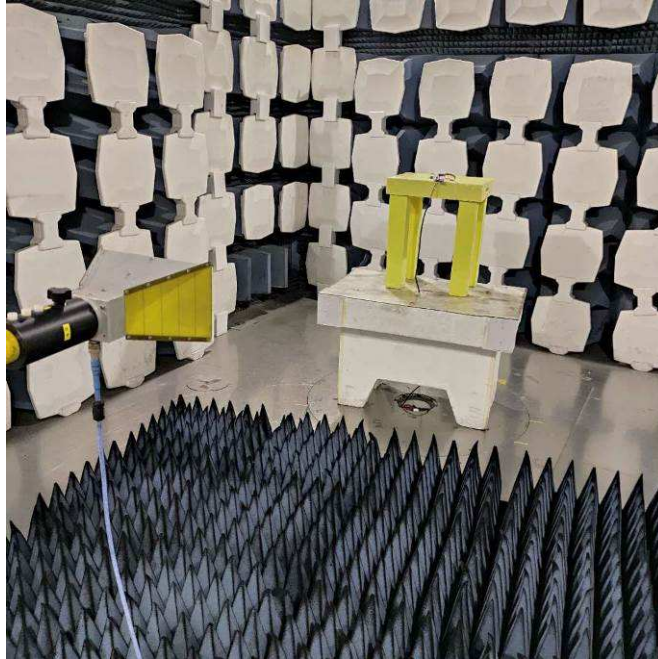
(1) Radiated spurious emission Test Setup-1(9KHz~30MHz)



(2) Radiated spurious emission Test Setup-2(Below 1GHz)



(3) Radiated spurious emission Test Setup-3(Above 1GHz)

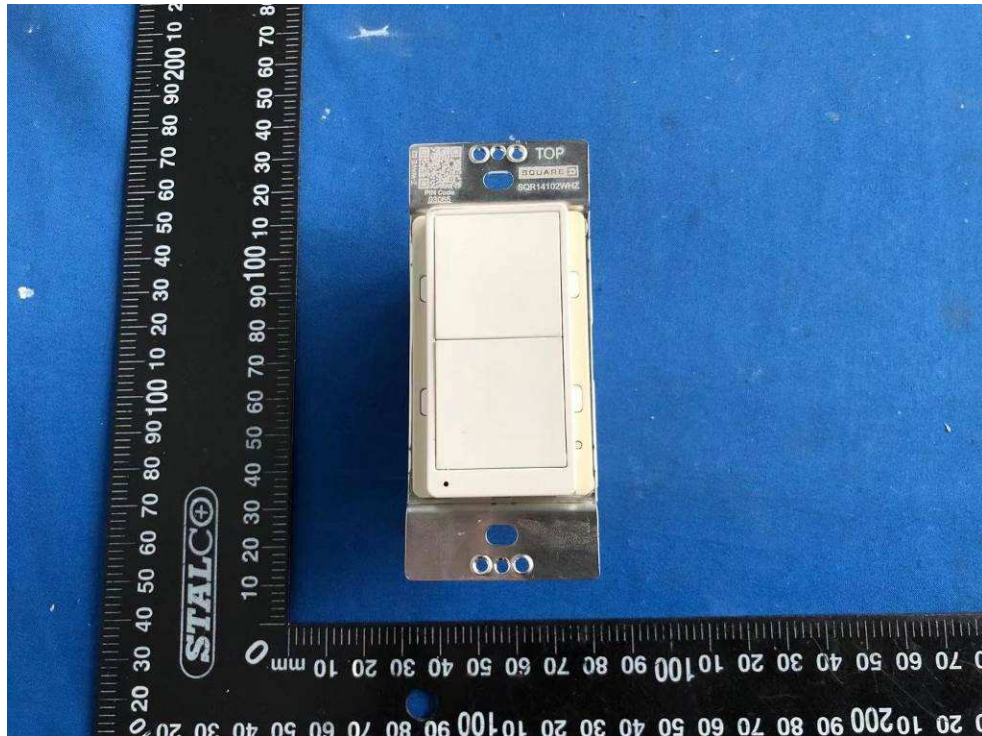


(4) Conducted Emission Test Setup

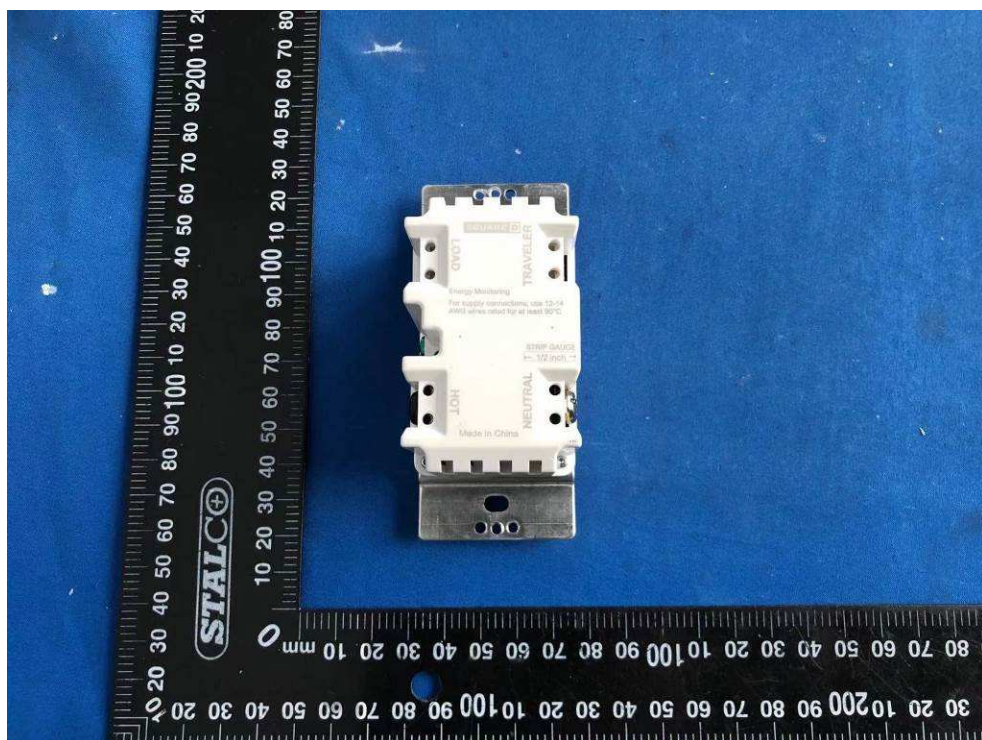


7. EUT Photograph

(1) EUT Photo



(2) EUT Photo



(3) EUT Photo



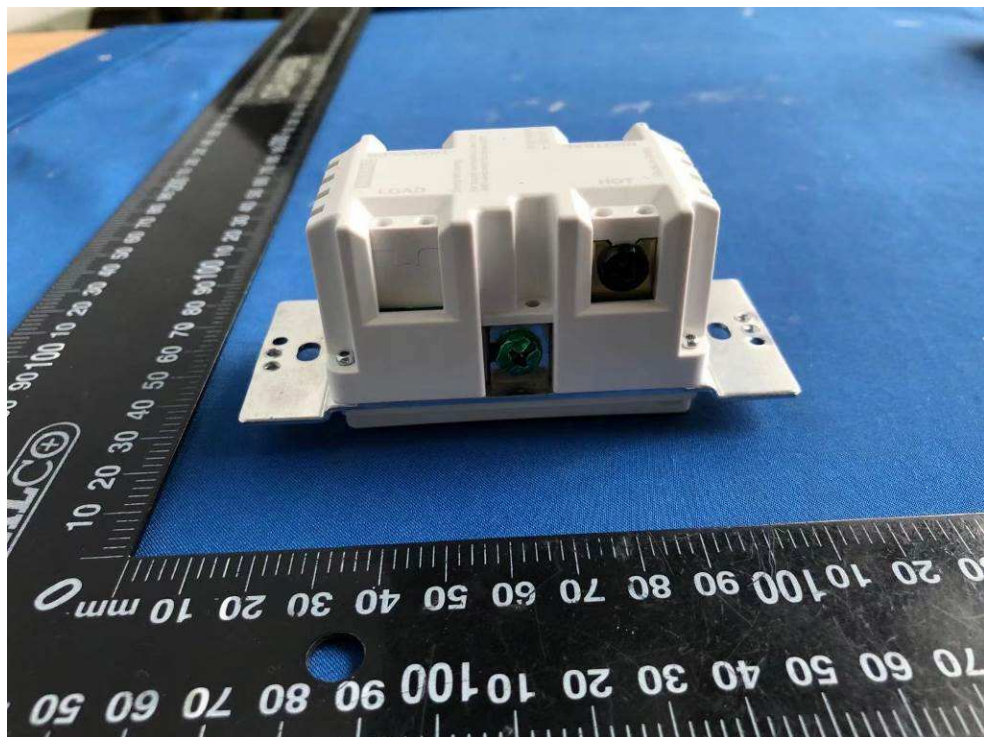
(4) EUT Photo



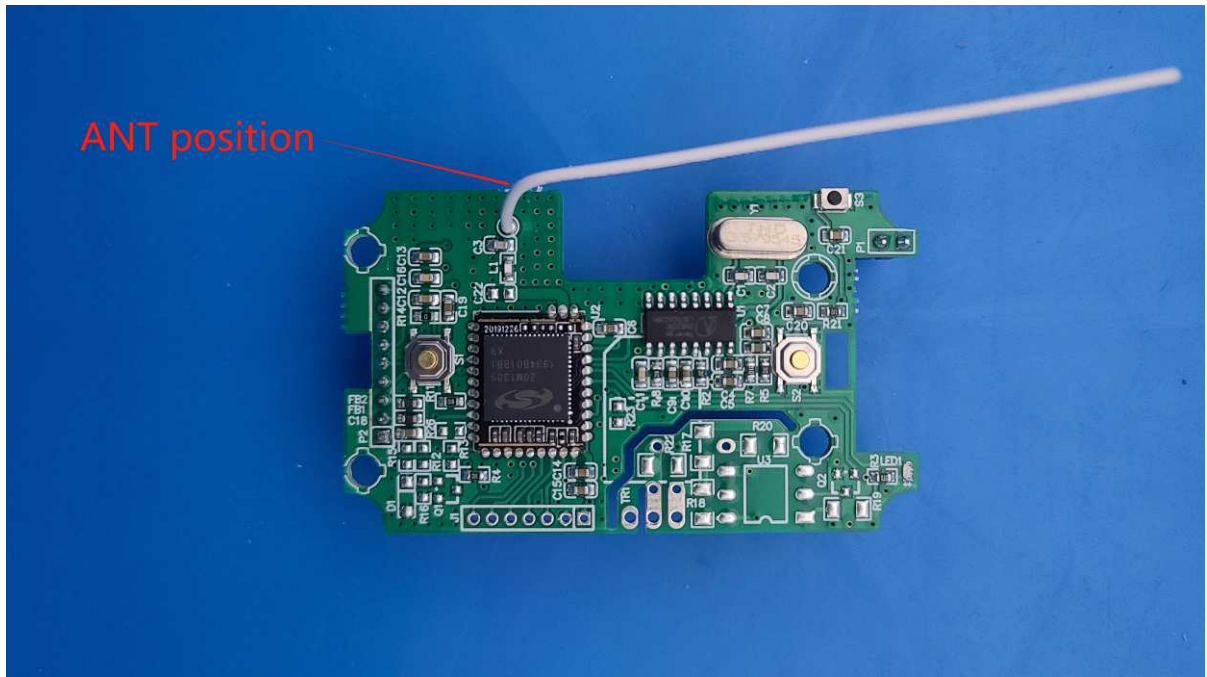
(5) EUT Photo



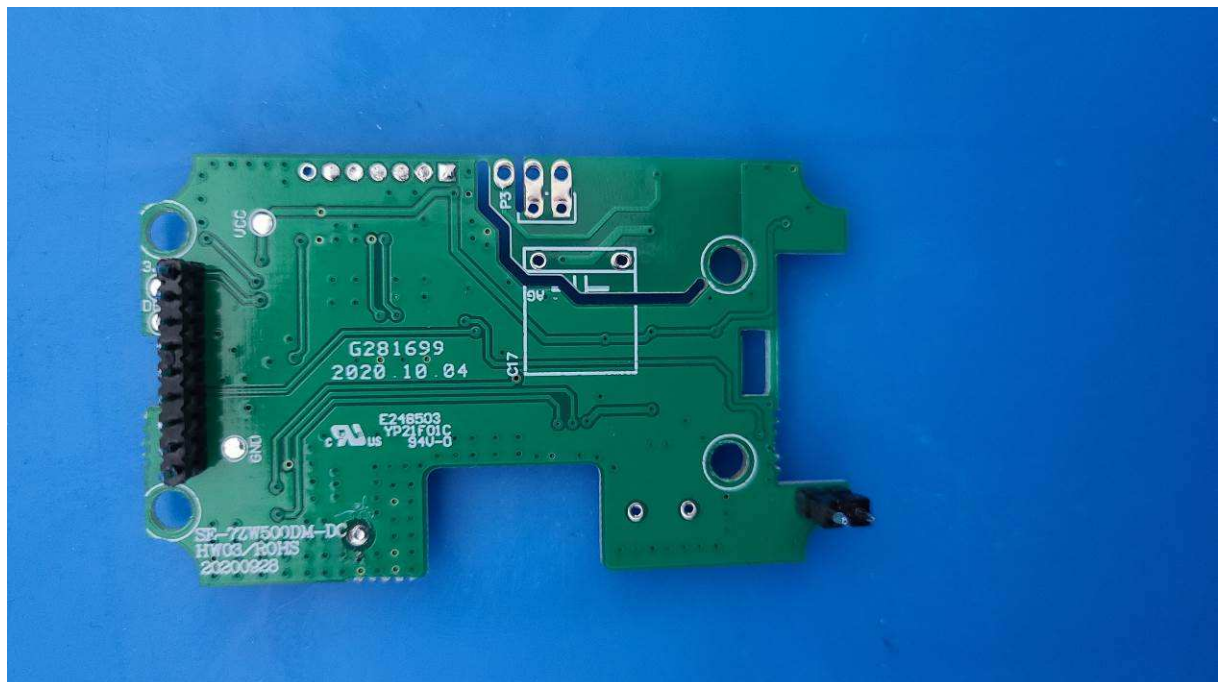
(6) EUT Photo



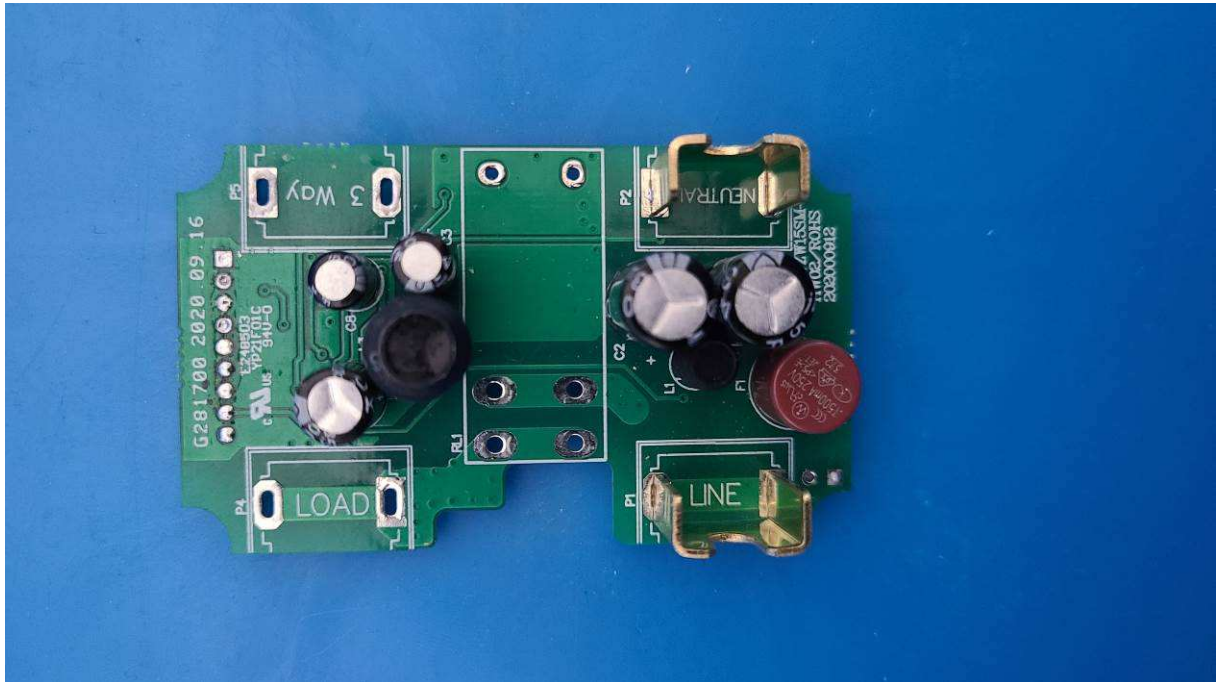
(7) EUT Photo



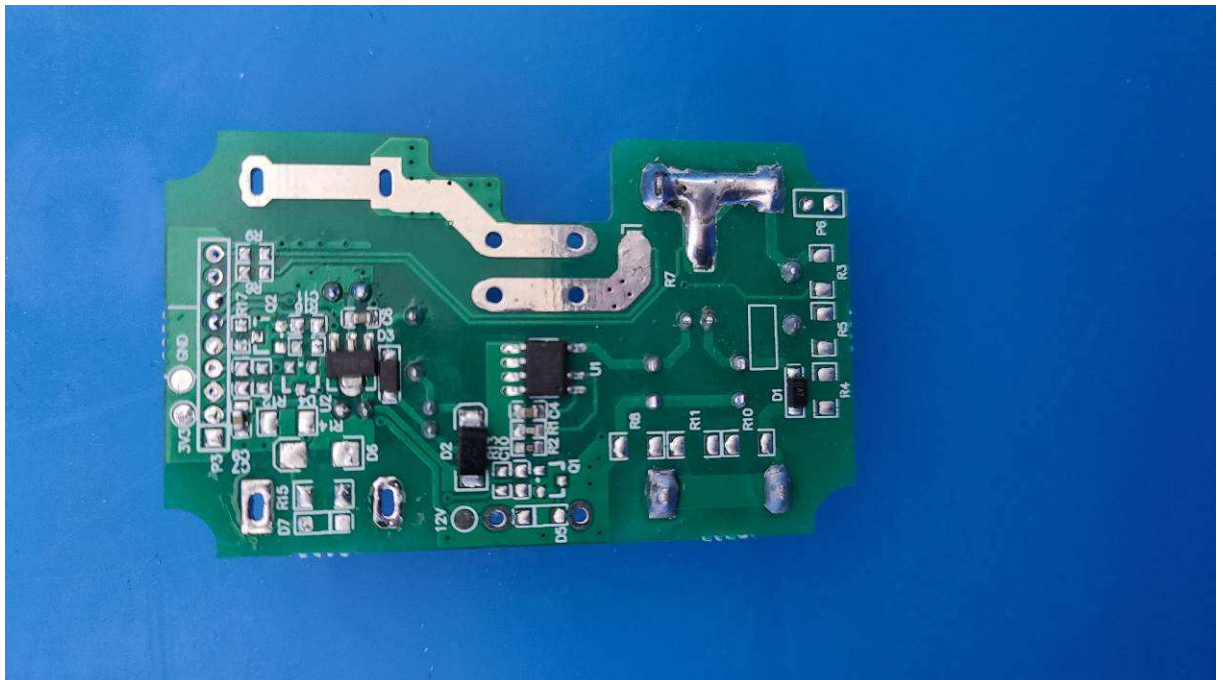
(8) EUT Photo



(9) EUT Photo



(10) EUT Photo



8. Appendix

Equipment list	Type/Mode	Equipment No.	Manufacturer	Cal. Due
EMI Test Receiver	ESI26	EM-0087	R&S	2021-03-15
EMI Test Receiver	ESR3	VG DY-0705	R&S	2021-03-15
LISN	NSLK 8127	VG DY-0150	SCHWARZBECK	2021-09-04
LISN	NSLK 8128	VG DY-0149	SCHWARZBECK	2021-09-04
Impedance Stabilization Network	NTFM8131	EM-000498	SCHWARZBECK	2021-06-09
Voltage Probe	TK9420	VG DY-0128	SCHWARZBECK	2021-03-11
Power Divider	4901.17.B	DB-0016	HUBER+SUHNER	2021-11-08
Shielding Room(#1)	GP1A	WKNF-0001	LEINING	2024-08-08
Shielding Room(#2)	GP1A	WKNF-0006	LEINING	2024-08-08
EMI Test Receiver	N9038A-508	EM-000397	Agilent	2021-03-15
EMI Test Receiver	ESR7	VG DY-0956	R&S	2021-03-11
Broadband Antenna(3m)	VULB 9163	EM-000342	SCHWARZBECK	2021-07-11
Broadband Antenna(5m)	VULB 9163	EM-000382	SCHWARZBECK	2021-05-10
Loop Antenna	HLA 6121	EM-000546	TESEQ	2021-06-28
Waveguide Horn Antenna	BBHA9120B	EM-000383	SCHWARZBECK	2021-03-15
Waveguide Horn Antenna	HF906	WKNA-0024-8	R&S	2021-03-15
Semi-Anechoic Chamber(3m)	FACT-4	WKNA-0024	ETS	2024-12-12
Semi-Anechoic Chamber(5m)	SAC-5	EM-000557	COMTEST	2024-11-02
Spectrum analyzer	N9030A	EM-000395	Agilent	2021-06-08

The End