

TEST REPORT

Reference No. : WTS18S03106561W
FCC ID..... : 2AIOC-SO07P
Applicant : HANK ELECTRONICS CO., LTD.
Address : Floor 2nd-7th,A8,Hongye Industry City, Lezhujiao, Zhoushi Road,Baoan District, Shenzhen, China
Manufacturer : HANK ELECTRONICS CO., LTD.
Address : Floor 2nd-7th,A8,Hongye Industry City, Lezhujiao, Zhoushi Road,Baoan District, Shenzhen, China
Product : Smart Plug
Model(s)..... : HKZW-SO07P, HKZW-SO07
Standards : FCC CFR47 Part 15 Section 15.249:2017
Date of Receipt sample.... : 2018-03-28
Date of Test : 2018-03-29 to 2018-05-07
Date of Issue : 2018-05-09
Test Result : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

Waltek Services (Shenzhen) Co., Ltd.

Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China
Tel :+86-755-83551033
Fax:+86-755-83552400

Compiled by:

Jack Wen

Jack Wen / Test Engineer

Approved by:



Philo Zhong

Philo Zhong / Manager

2 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation) of USA, Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), IC(Industry Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.



Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

2.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	A2LA (Certificate No.: 4243.01)	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand	International Services	NTC	-
Singapore		IDA	-
Note: 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. 2. IC Canada Registration No.: 7760A			

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of ...	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

3 Contents

	Page
COVER PAGE	1
2 LABORATORIES INTRODUCTION	2
3 CONTENTS	4
4 REVISION HISTORY	5
5 GENERAL INFORMATION	6
5.1 GENERAL DESCRIPTION OF E.U.T.	6
5.2 DETAILS OF E.U.T.....	6
5.3 MODEL DIFFERENCE	6
5.1 CHANNEL LIST	7
5.2 STANDARDS APPLICABLE FOR TESTING	7
5.3 TEST MODE	7
6 EQUIPMENT USED DURING TEST	8
6.1 EQUIPMENTS LIST	8
6.2 MEASUREMENT UNCERTAINTY	10
6.3 TEST EQUIPMENT CALIBRATION	10
7 TEST SUMMARY	11
8 CONDUCTED EMISSION	12
8.1 E.U.T. OPERATION	12
8.2 EUT SETUP	12
8.3 MEASUREMENT DESCRIPTION	13
8.4 CONDUCTED EMISSION TEST RESULT	13
9 RADIATION EMISSION TEST	17
9.1 EUT OPERATION.....	17
9.2 TEST SETUP	18
9.3 SPECTRUM ANALYZER SETUP	19
9.4 TEST PROCEDURE.....	20
9.5 FREQUENCY RANGE OF RADIATED MEASUREMENTS	20
9.6 TEST RESULT	21
10 PERIODIC OPERATION	24
11 BAND EDGE	26
11.1 TEST PROCEDURE.....	26
11.2 TEST RESULT	26
12 20 DB BANDWIDTH MEASUREMENT	27
12.1 TEST PROCEDURE.....	27
12.2 TEST RESULT	27
13 ANTENNA REQUIREMENT	28
14 PHOTOGRAPHS- TEST SETUP AND EUT PHOTOS	29

4 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS18S03106561W	2018-03-28	2018-03-29 to 2018-05-07	2018-05-09	Original	-	Replaced
WTS18S03106561W	2018-03-28	2018-03-29 to 2018-05-07	2018-06-06	Revision1	Add the date of Testing for Conducted Emissions and Radiated Emission	Valid

5 General Information

5.1 General Description of E.U.T.

Product:	Smart Plug
Model(s):	HKZW-SO07P, HKZW-SO07
Model Differences Description:	The models HKZW-SO07P, HKZW-SO07 are same in PCB layout, RF module and appearance. The detail of difference refer to section 5.3 Model Difference.
Type of Modulation:	FSK
Frequency Range:	908.42MHz
Antenna installation:	PCB Printed Antenna
Antenna Gain:	0dBi

5.2 Details of E.U.T.

Ratings: Input: 120V, 60Hz

5.3 Model Difference

	R1, R2, R3, R4, R5, R6, R7, R17, R18, R19, R20, R21, R22, R23, R24, R25, R42, R43, R44, R45	C1, C2, , C16, C17, C18, C19	Q2	U3, U4	Others
HKZW-SO07P	√	√	√	√	√
HKZW-SO07	X	X	X	X	√

Remark: "√" represent that the components was contained in the models. Otherwise check "X"

5.1 Channel List

Channel No.	Frequency (MHz)
1	908.42

5.2 Standards Applicable for Testing

The tests were performed according to following standards:

FCC CFR47 Part 15 Section 15.249:2016 Telecommunication-RADIO FREQUENCY DEVICES-Intentional Radiators-Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

5.3 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests.

Test mode	Test channel
Transmitting	908.42MHz

6 Equipment Used during Test

6.1 Equipments List

Conducted Emissions Test Site						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	2017-09-12	2018-09-11
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2017-09-12	2018-09-11
3.	Limitter	York	MTS-IMP-136	261115-001-0024	2017-09-12	2018-09-11
4.	Cable	LARGE	RF300	-	2017-09-12	2018-09-11
3m Semi-anechoic Chamber for Radiation Emissions Test site						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	100091	2018-04-29	2019-04-28
2	Amplifier	Agilent	8447D	2944A10178	2018-01-12	2019-01-11
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	0703	2017-10-17	2018-10-16
4	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2018-04-07	2019-04-06
5	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2018-04-07	2019-04-06
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2018-04-07	2019-04-06
8	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2018-04-07	2019-04-06
3m Semi-anechoic Chamber for Radiation Emissions Test site						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2018-04-06	2019-04-05
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2018-04-07	2019-04-06
3	Amplifier	ANRITSU	MH648A	M43381	2018-04-07	2019-04-06
4	Cable	HUBER+SUHNER	CBL2	525178	2018-04-07	2019-04-06
RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2017-09-12	2018-09-11

3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2017-09-12	2018-09-11
4.	Coaxial Cable (10Hz-30GHz)	/	/	/	2017-09-12	2018-09-11
5.	Antenna Connector*	/	/	/	2017-09-12	2018-09-11
Remark: "**": The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

6.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)

6.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave, Tianhe District, Guangzhou, Guangdong, China.

7 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	Pass
Radiated Emission	15.249(a) 15.209 15.205(a)	Pass
Periodic Operation	15.35(c)	Pass
Band Edge	15.249 15.205 15.209	Pass
20dB Bandwidth	15:215(c)	Pass
Antenna Requirement	15.203	Pass
Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

8 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.10:2013
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

8.1 E.U.T. Operation

Operating Environment :

Date of testing 2018-03-29 to 2018-04-02

Temperature: 21.5 °C

Humidity: 51.9 % RH

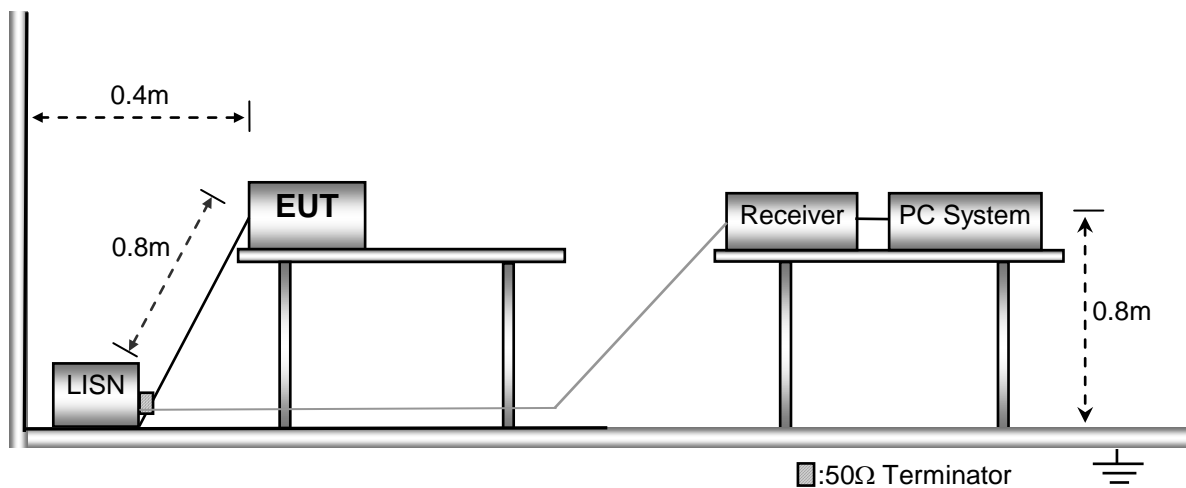
Atmospheric Pressure: 101.2kPa

EUT Operation : Transmitting mode

The test was performed in Transmitting mode, Only the worst case were record in the report.

8.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10.



8.3 Measurement Description

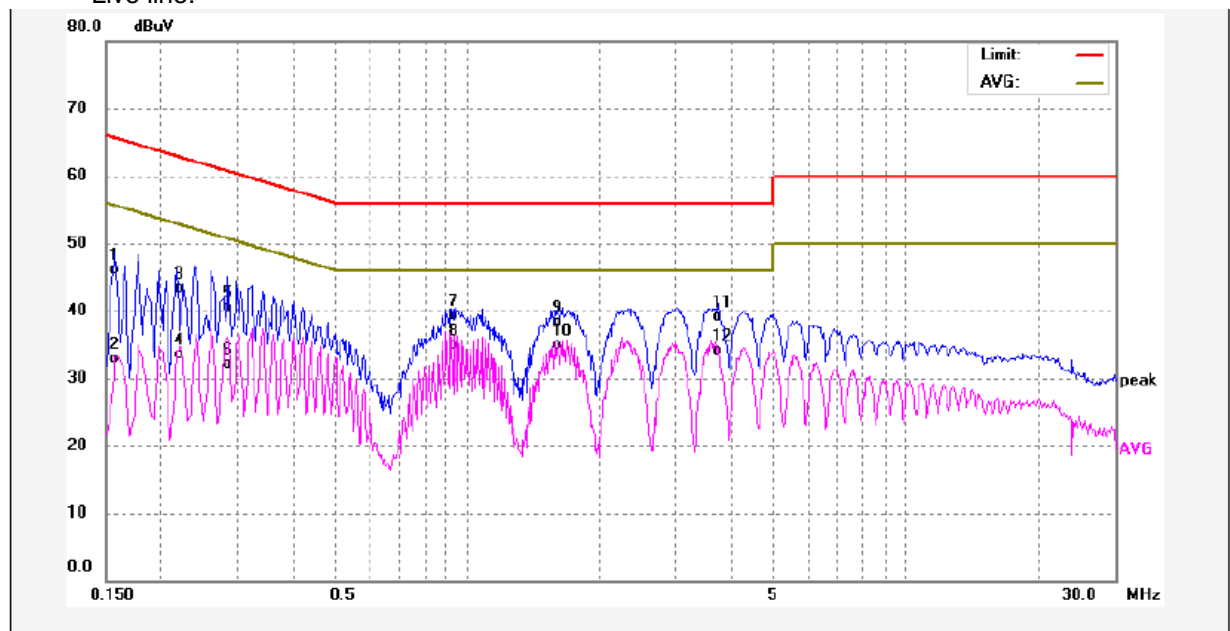
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

8.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

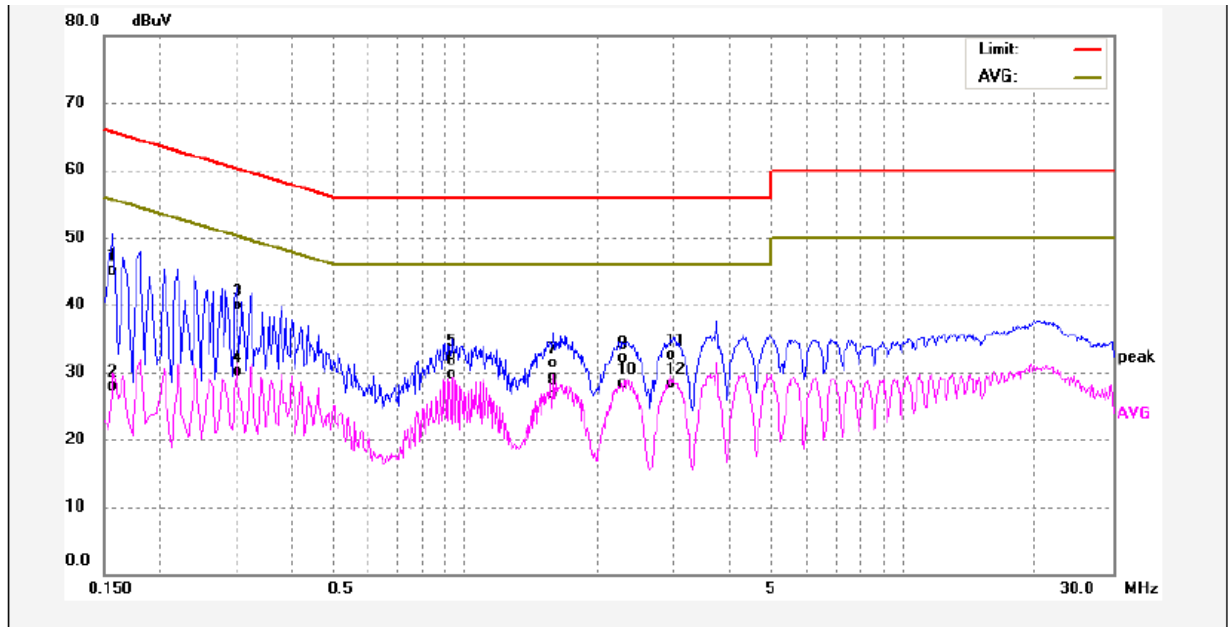
Model- HKZW-SO07

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	36.07	9.98	46.05	65.56	-19.51	QP	
2	0.1580	22.86	9.98	32.84	55.56	-22.72	AVG	
3	0.2180	33.37	9.95	43.32	62.89	-19.57	QP	
4	0.2180	23.59	9.95	33.54	52.89	-19.35	AVG	
5	0.2860	30.42	9.99	40.41	60.64	-20.23	QP	
6	0.2860	22.15	9.99	32.14	50.64	-18.50	AVG	
7	0.9420	29.29	10.06	39.35	56.00	-16.65	QP	
8	0.9420	24.82	10.06	34.88	46.00	-11.12	AVG	
9	1.6019	28.09	10.16	38.25	56.00	-17.75	QP	
10	1.6019	24.66	10.16	34.82	46.00	-11.18	AVG	
11	3.7580	28.76	10.26	39.02	56.00	-16.98	QP	
12	3.7580	23.84	10.26	34.10	46.00	-11.90	AVG	

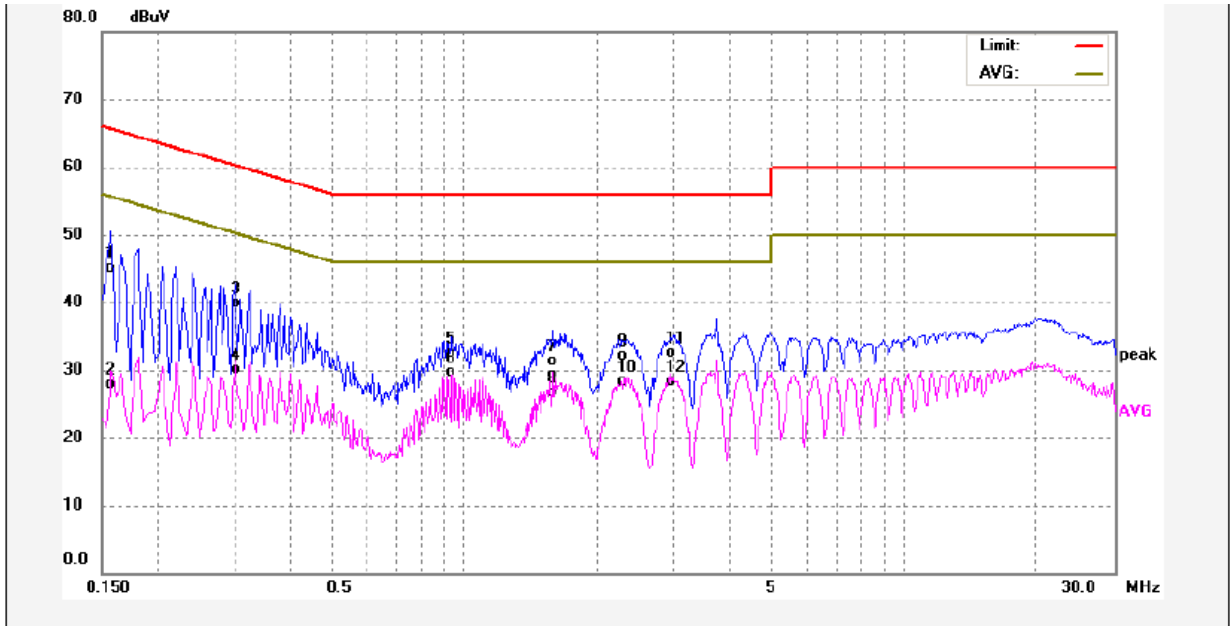
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	35.21	9.98	45.19	65.56	-20.37	QP	
2	0.1580	17.94	9.98	27.92	55.56	-27.64	AVG	
3	0.3020	29.87	9.98	39.85	60.19	-20.34	QP	
4	0.3020	20.06	9.98	30.04	50.19	-20.15	AVG	
5	0.9380	22.42	10.06	32.48	56.00	-23.52	QP	
6	0.9380	19.69	10.06	29.75	46.00	-16.25	AVG	
7	1.5859	21.10	10.16	31.26	56.00	-24.74	QP	
8	1.5859	16.59	10.16	26.75	46.00	-19.25	AVG	
9	2.2780	21.82	10.22	32.04	56.00	-23.96	QP	
10	2.2780	18.07	10.22	28.29	46.00	-17.71	AVG	
11	2.9860	22.20	10.24	32.44	56.00	-23.56	QP	
12	2.9860	18.15	10.24	28.39	46.00	-17.61	AVG	

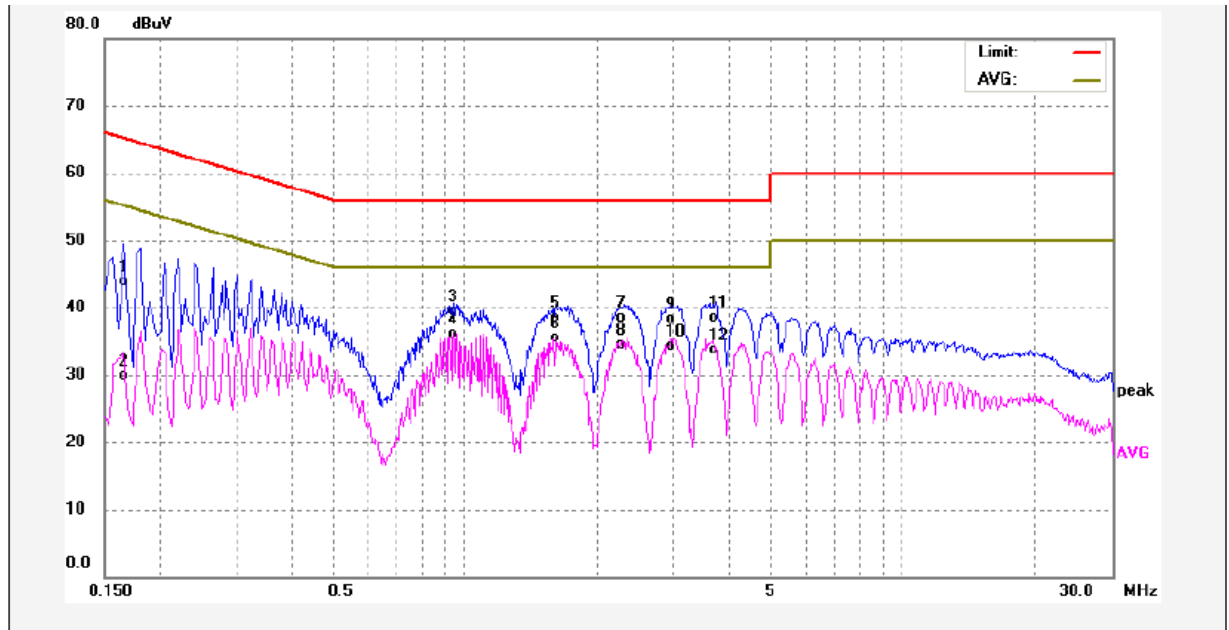
Model- HKZW-SO07P

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	35.21	9.98	45.19	65.56	-20.37	QP	
2	0.1580	17.94	9.98	27.92	55.56	-27.64	AVG	
3	0.3020	29.87	9.98	39.85	60.19	-20.34	QP	
4	0.3020	20.06	9.98	30.04	50.19	-20.15	AVG	
5	0.9380	22.42	10.06	32.48	56.00	-23.52	QP	
6	0.9380	19.69	10.06	29.75	46.00	-16.25	AVG	
7	1.5859	21.10	10.16	31.26	56.00	-24.74	QP	
8	1.5859	16.59	10.16	26.75	46.00	-19.25	AVG	
9	2.2780	21.82	10.22	32.04	56.00	-23.96	QP	
10	2.2780	18.07	10.22	28.29	46.00	-17.71	AVG	
11	2.9860	22.20	10.24	32.44	56.00	-23.56	QP	
12	2.9860	18.15	10.24	28.39	46.00	-17.61	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1660	34.07	9.90	43.97	65.15	-21.18	QP	
2	0.1660	20.04	9.90	29.94	55.15	-25.21	AVG	
3	0.9420	29.38	10.06	39.44	56.00	-16.56	QP	
4	0.9420	26.12	10.06	36.18	46.00	-9.82	AVG	
5	1.6060	28.33	10.16	38.49	56.00	-17.51	QP	
6	1.6060	25.26	10.16	35.42	46.00	-10.58	AVG	
7	2.3060	28.24	10.22	38.46	56.00	-17.54	QP	
8	2.3060	24.37	10.22	34.59	46.00	-11.41	AVG	
9	2.9300	28.06	10.24	38.30	56.00	-17.70	QP	
10	2.9300	24.13	10.24	34.37	46.00	-11.63	AVG	
11	3.7540	28.19	10.26	38.45	56.00	-17.55	QP	
12	3.7540	23.42	10.26	33.68	46.00	-12.32	AVG	

9 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.249&15.209&15.205
Test Method:	ANSI 63.10: 2013;ANSI C63.4:2014
Measurement Distance:	3m
Date of testing:	2018-04-30 to 2018-05-03
Test Result:	PASS

15.249(a)Limit:

Fundamental frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928 MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25 GHz	250	108	2500	68

15.209 Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40=(29.54+40)$
30 ~ 88	100	3	100	$20\log^{(100)} =(40)$
88 ~ 216	150	3	150	$20\log^{(150)} =(43.5)$
216 ~ 960	200	3	200	$20\log^{(200)} =(46)$
Above 960	500	3	500	$20\log^{(500)} =(54)$

Note: RF Voltage(dBuV)=20 log₁₀ RF Voltage(uV)

9.1 EUT Operation

Operating Environment :

Temperature:	23.5 °C
Humidity:	51.1 % RH
Atmospheric Pressure:	101.2kPa

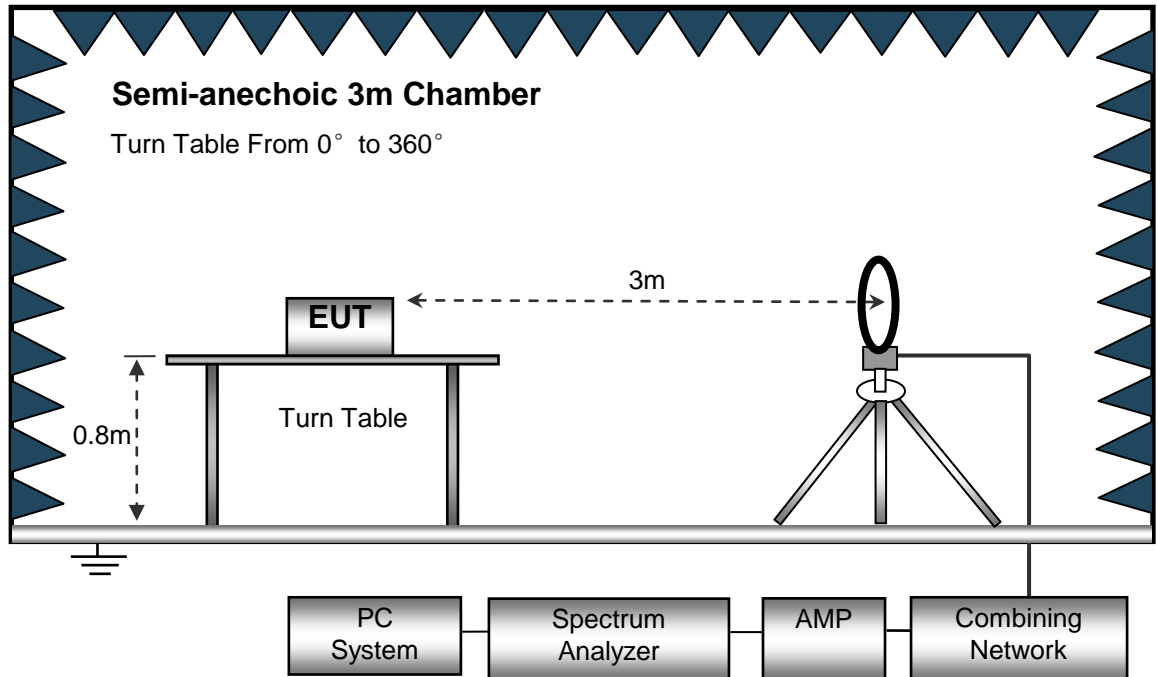
EUT Operation :

The test was performed in Transmitting mode (DC 3.6V by battery), the test data were shown in the report.

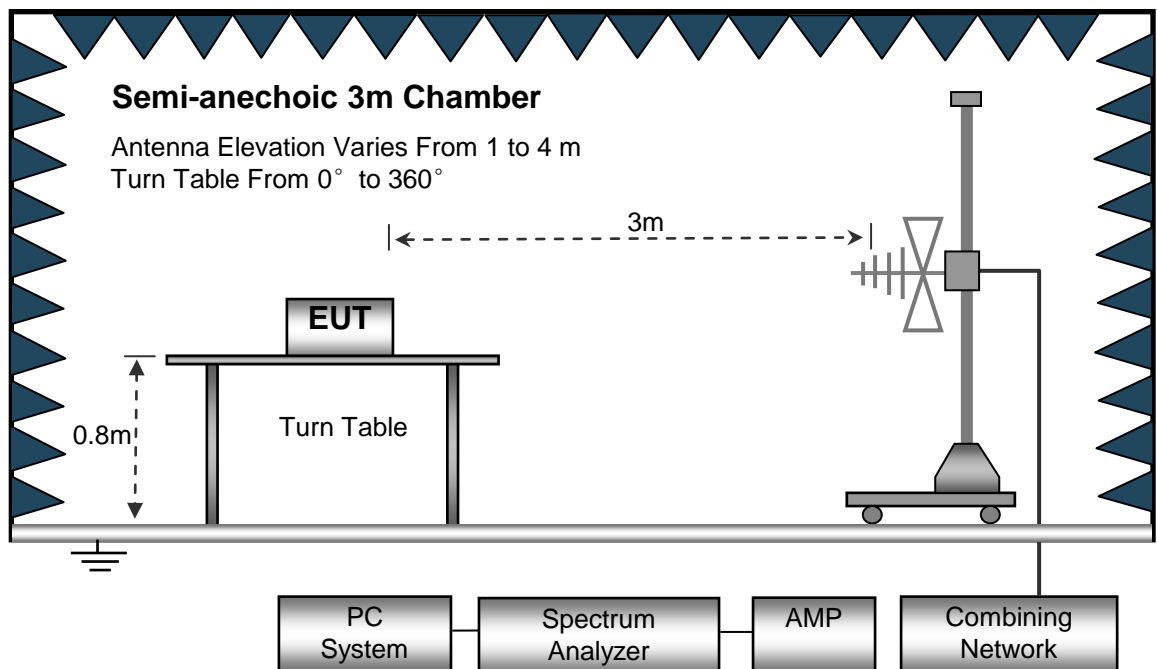
9.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10: 2013.

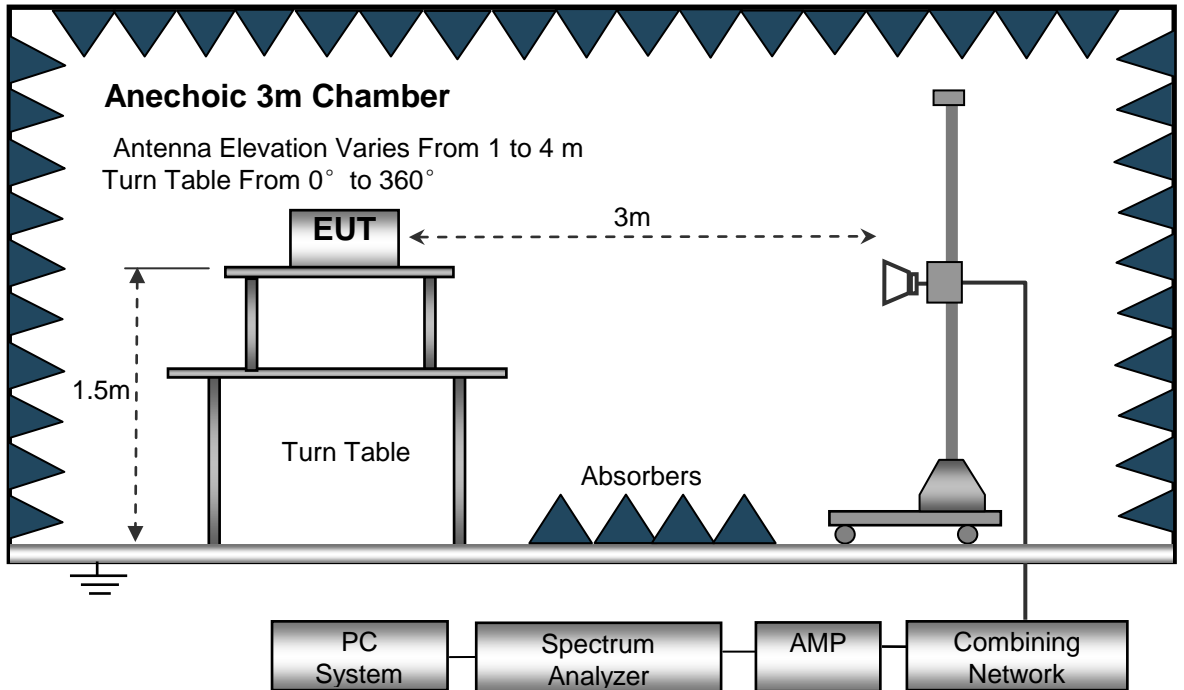
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30MHz to 1GHz.



The test setup for emission measurement above 1 GHz.



9.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed Auto
 IF Bandwidth 10kHz
 Video Bandwidth 10kHz
 Resolution Bandwidth 10kHz

30MHz ~ 1GHz

Sweep Speed Auto
 Detector PK
 Resolution Bandwidth 100kHz
 Video Bandwidth 300kHz

Above 1GHz

Sweep Speed Auto
 Detector PK
 Resolution Bandwidth 1MHz
 Video Bandwidth 3MHz
 Detector Ave.
 Resolution Bandwidth 1MHz
 Video Bandwidth 10Hz

Video Bandwidth 10Hz

9.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane; For above 1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X, Y, Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), after pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

9.5 Frequency range of radiated measurements.

According to FCC 47 CFR Section 15.33:

(a) For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

- (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
- (2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
- (3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
- (4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

Result: So the Frequency range of radiated form: 9KHz to 10GHz.

9.6 Test Result

Model: HKZW-SO07

Test Frequency: 9 KHz~30 MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 10GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.249/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP)	Degree	(m)	(H/V)	(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)
55.76	30.42	QP	266	1.5	V	-16.92	13.50	40.00	-26.50
908.42	80.77	PK*	161	2.0	H	1.98	82.75	114.00	-31.25
908.42	81.08	PK*	38	1.6	V	1.98	83.06	114.00	-30.94
1816.84	58.64	PK	315	1.2	H	-13.80	44.84	74.00	-29.16
1816.84	58.76	PK	47	1.9	V	-13.80	44.96	74.00	-29.04
2725.26	56.21	PK	277	1.9	H	-11.14	45.07	74.00	-28.93
2725.26	56.07	PK	112	1.0	V	-11.14	44.93	74.00	-29.07
3633.68	54.28	PK	140	1.7	H	-9.35	44.93	74.00	-29.07
3633.68	54.16	PK	250	1.4	V	-9.35	44.81	74.00	-29.19

Model: HKZW-SO07P**Test Frequency: 9 KHz~30 MHz**

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 10GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.249/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP)	Degree	(m)	(H/V)	(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)
55.42	30.02	QP	266	1.5	V	-16.92	13.10	40.00	-26.90
908.42	81.55	PK*	161	2.0	H	1.98	83.53	114.00	-30.47
908.42	80.78	PK*	38	1.6	V	1.98	82.76	114.00	-31.24
1816.84	58.34	PK	315	1.2	H	-13.80	44.54	74.00	-29.46
1816.84	59.21	PK	47	1.9	V	-13.80	45.41	74.00	-28.59
2725.26	55.23	PK	277	1.9	H	-11.14	44.09	74.00	-29.91
2725.26	55.87	PK	112	1.0	V	-11.14	44.73	74.00	-29.27
3633.68	54.38	PK	140	1.7	H	-9.35	45.03	74.00	-28.97
3633.68	54.72	PK	250	1.4	V	-9.35	45.37	74.00	-28.63

(* Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements. So based on the data in Section9, the PRF is 5.46Hz which less than 20Hz, measuring equipment employing a peak function.)

AV = Peak +20Log10(duty cycle) =PK+(-16.59) [refer to section 9 for more detail]

Model: HKZW-SO07

Frequency	PK	RX Antenna Polar	Duty cycle Factor	AV	FCC Part 15.249/209/205	
					Limit	Margin
(MHz)	(dB μ V/m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
908.42	82.75	H	-16.59	66.16	94.00	-27.84
908.42	83.06	V	-16.59	66.47	94.00	-27.53
1816.84	44.84	H	-16.59	28.25	54.00	-25.75
1816.84	44.96	V	-16.59	28.37	54.00	-25.63
2725.26	45.07	H	-16.59	28.48	54.00	-25.52
2725.26	44.93	V	-16.59	28.34	54.00	-25.66
3633.68	44.93	H	-16.59	28.34	54.00	-25.66
3633.68	44.81	V	-16.59	28.22	54.00	-25.78

Model: HKZW-SO07P

Frequency	PK	RX Antenna Polar	Duty cycle Factor	AV	FCC Part 15.249/209/205	
					Limit	Margin
(MHz)	(dB μ V/m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
908.42	83.53	H	-16.59	66.94	94.00	-27.06
908.42	82.76	V	-16.59	66.17	94.00	-27.83
1816.84	44.54	H	-16.59	27.95	54.00	-26.05
1816.84	45.41	V	-16.59	28.82	54.00	-25.18
2725.26	44.09	H	-16.59	27.50	54.00	-26.50
2725.26	44.73	V	-16.59	28.14	54.00	-25.86
3633.68	45.03	H	-16.59	28.44	54.00	-25.56
3633.68	45.37	V	-16.59	28.78	54.00	-25.22

10 Periodic Operation

The duty cycle was determined by the following equation:

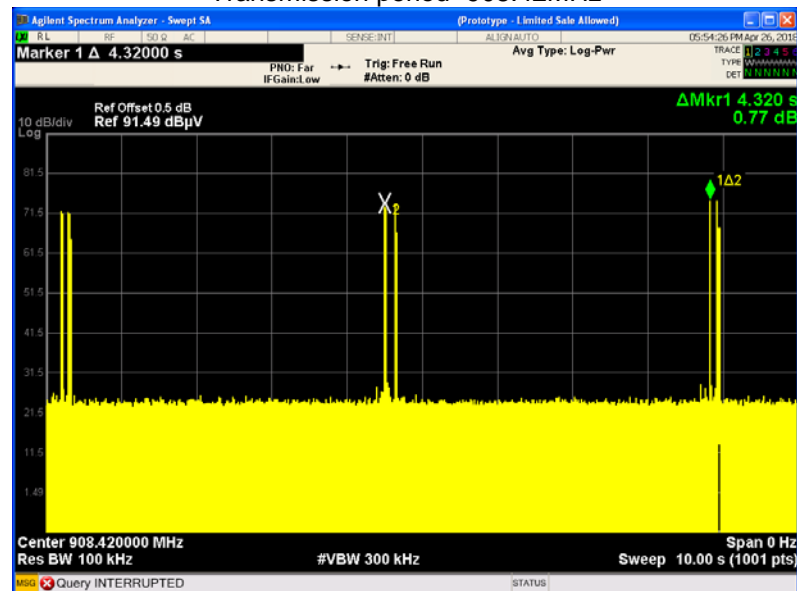
To calculate the actual field intensity, the duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion

Duty Cycle(%)=Total On interval in a complete pulse train/ Length of a complete pulse train * %

Duty Cycle Correction Factor(dB)=20 * Log₁₀(Duty Cycle(%))

Test frequency(MHz)	908.42
Total transmission time(ms)	14.80
Length of a complete transmission period(ms)	100*
Duty Cycle(%)	14.80
Duty Cycle Correction Factor(dB)	-16.59

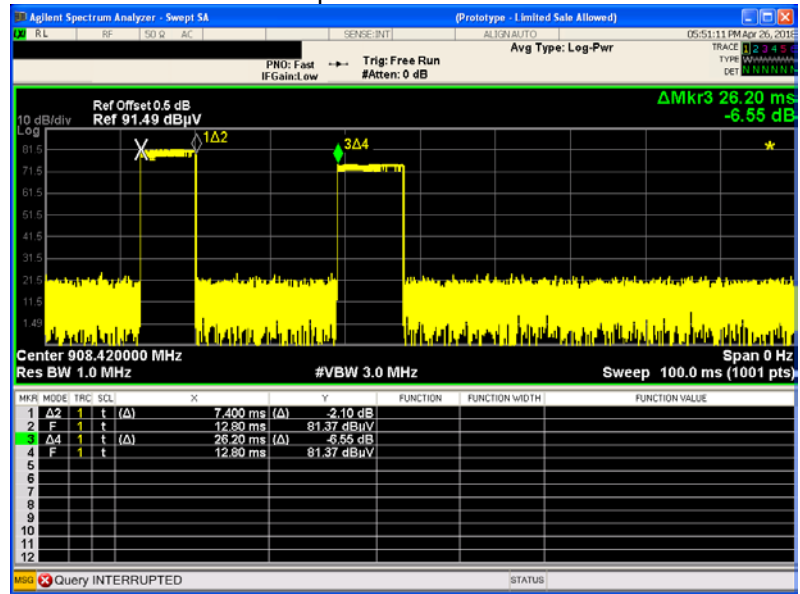
Transmission period -908.42MHz



(* Note: the transmitter operates for longer than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. So the Length of a complete transmission period=100ms)

Refer to the duty cycle plot (as below)

Test plot -908.42MHz



11 Band Edge

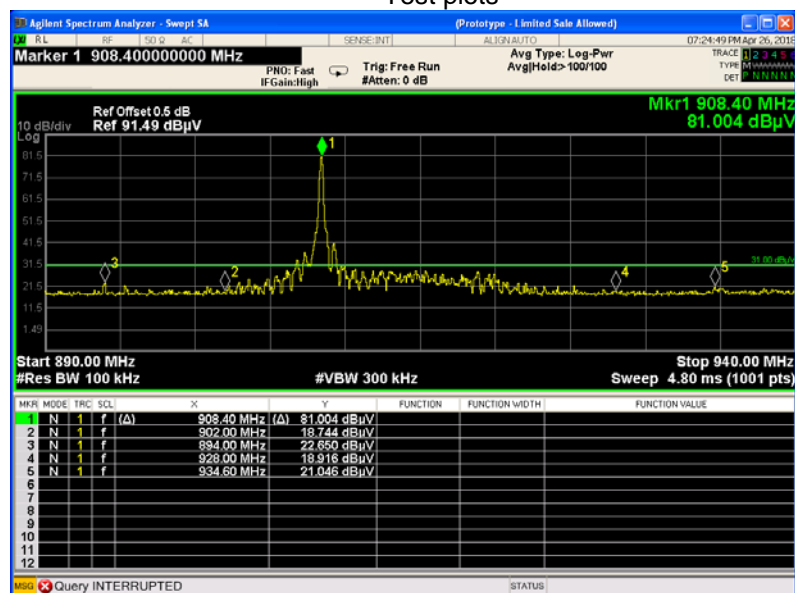
Test Requirement:	15.249(d):Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
Test Method:	ANSI C63.10:2013
Test Mode:	Transmitting

11.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

11.2 Test Result

Test plots



12 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.215(c)
 Test Method: ANSI C63.10:2013
 Test Mode: Transmitting

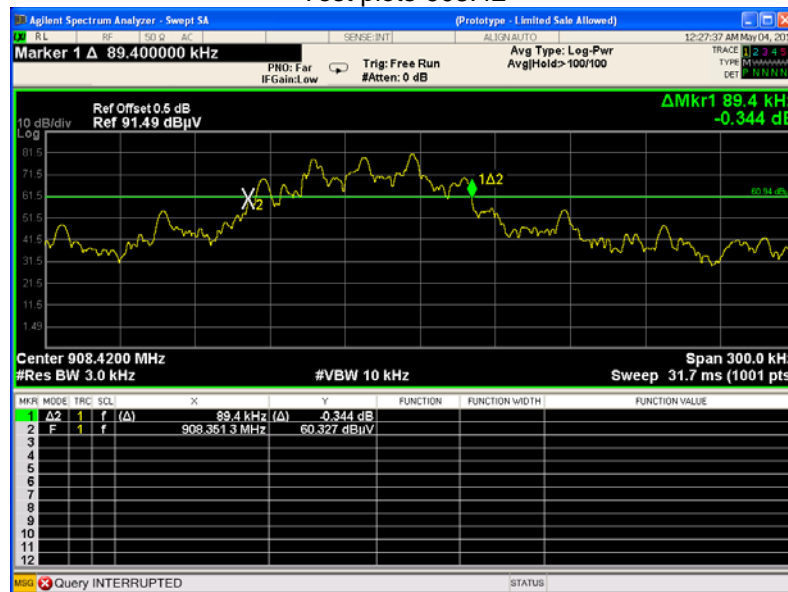
12.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyser: RBW = 3 kHz, VBW = 10 kHz

12.2 Test Result

Frequency (MHz)	20dB Bandwidth Emission (kHz)
908.42	89.40

Test plots-908.42



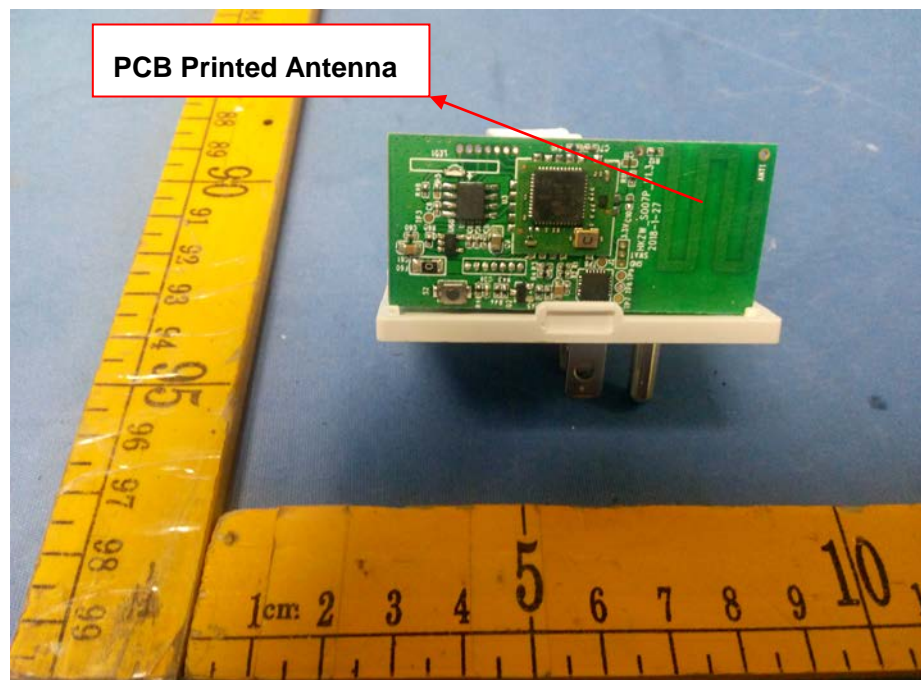
13 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR 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.

Result:

The EUT has one PCB Printed Antenna for Z-wave, the gain is 0dBi. meets the requirements of FCC 15.203.



14 Photographs- Test Setup and EUT Photos

Refer to the file Ext Photos, Int Photos and Tsup Photos.

=====**End of Report**=====