

TEST REPORT

Reference No...... : WTS17S0373995-1E
FCC ID : 2AH7VSPLUG1
Applicant..... : Wally Labs LLC
Address..... : 1415 NE 45th St, Seattle Washington 98105, United States
Manufacturer : SkyRC Technology Co., Ltd.
Address..... : 4/F, Building No. 6, Meitai Industry Park, Guanguang South Road,
Guihua, Guanlan, 518110, Baoan District, Shenzhen, CHINA
Product..... : Smart Plug
Model(s) : SPLUG1
Brand Name..... : 
Standards..... : FCC CFR47 Part 15 Section C 15.247:2017
Date of Receipt sample : 2017-08-04
Date of Test : 2017-08-05 to 2017-11-09
Date of Issue..... : 2017-11-15
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.

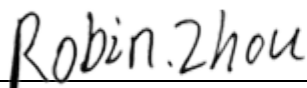
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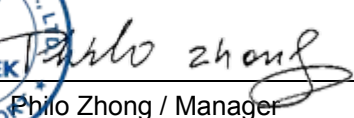
Compiled by:

Approved by:



Robin Zhou / Test Engineer




Philo Zhong / Manager

1 Laboratories Introduction

Waltek Services Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen (CNAS Registration No. L3110, A2LA Certificate Number: 4243.01) and have branches in Foshan (CNAS Registration No. L6478), Dongguan (CNAS Registration No. L9950), Zhongshan, Suzhou (CNAS Registration No. L7754), Ningbo and Hong Kong, Our test capability covered four large fields: safety test. Electronic Magnetic Compatibility(EMC), reliability and energy performance, Chemical test. 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), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc. 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.

Waltek Services (Shenzhen) Co., Ltd.

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	CNAS (Registration No.: L3110) 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		International Services	WPC
Thailand	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

Waltek Services (Shenzhen) Co.,Ltd.

<http://www.waltek.com.cn>

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS17S0373995-1E	2017-08-04	2017-08-05 to 2017-11-09	2017-11-12	original	-	Replaced
WTS17S0373995-1E	2017-08-04	2017-08-05 to 2017-11-09	2017-11-15	revision1	Updated	Valid

4 General Information

4.1 General Description of E.U.T.

Product	: Smart Plug
Model(s)	: SPLUG1
Model Description	: N/A
Operation Frequency	: 2405-2480MHz, 16 Channels in total
Type of Modulation	: IEEE 802.15.4 ZigBee (O-QPSK, 250Kbps max.)
Antenna installation	: PCB Printed Antenna
Antenna Gain	: 0dBi
Software Version	: 1.0.0.
Hardware Version	: V0_11

4.2 Details of E.U.T.

Ratings: 100-120V~15A, 60Hz

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2405	2	2410	3	2415	4	2420
5	2425	6	2430	7	2435	8	2440
9	2445	10	2450	11	2455	12	2460
13	2465	14	2470	15	2475	16	2480

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests; the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting	2405MHz	2440MHz	2480MHz
The Worst Case Power Setting Parameter			
Test Software	SecureCRT		
Type of Modulation	Test Channel		
	Low channel	Middle channel	High channel
O-QPSK	0x12	0x12	0x12
Using the notebook and the serial board to control the fixed transmitting frequency and other test mode. After finishing the test setting, the notebook and the serial board will be removed during measurements.			

Note: The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting and the transmit duty cycle is not less than 98%.
Only the worst case data were reported.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions (Waltek Services (Shenzhen) Co., Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	100947	2017-09-12	2018-09-11
2.	LISN	R&S	ENV216	100115	2017-09-12	2018-09-11
3.	Cable	Top	TYPE16(3.5M)	-	2017-09-12	2018-09-11
3m Semi-anechoic Chamber for Radiation Emissions (Waltek Services (Shenzhen) Co., Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	100091	2017-04-29	2018-04-28
2	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2017-04-09	2018-04-08
3	Amplifier	Agilent	8447D	2944A10178	2017-04-13	2018-04-12
4	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-04-13	2018-04-12
5	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2017-04-13	2018-04-12
3m Semi-anechoic Chamber for Radiation Emissions (Waltek Services (Shenzhen) Co., Ltd.)						
1	Test Receiver	R&S	ESCI	101296	2017-04-13	2018-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2017-04-13	2018-04-12
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2017-04-09	2018-04-08
4	Amplifier	ANRITSU	MH648A	M43381	2017-04-13	2018-04-12
5	Cable	HUBER+SUHNER	CBL2	525178	2017-04-13	2018-04-12
6	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11
RF Conducted Testing (Waltek Services (Shenzhen) Co., Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer	R&S	FSL6	100959	2017-09-12	2018-09-11
2	Coaxial Cable	Top	10Hz-30GHz	-	2017-09-12	2018-09-11
3	Antenna Connector*	Realacc	45RSm	-	2017-09-12	2018-09-11
***: 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.						

10m Semi-anechoic Chamber for Radiation Emissions (Shenzhen Balun Technology Co.,Ltd.)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer	R&S	FSV-40	101544	2017-02-17	2018-02-16
2	Antenna-Horn (18-40 GHz)	A-INFO	LB-180400KF	J211060273	2017-01-07	2018-01-06
3	Amplifier	COM-MV	ZLNA-18-40G-021	1608001	2017-02-17	2018-02-16
4	Cable	Top	18-40GHz	-	2017-02-17	2018-02-16

5.2 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 (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Conducted Emissions test	± 3.64 dB (150kHz-30MHz)
Conducted Spurious emissions	± 2.2 dB

Note 1: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

5.3 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☒ Yes ☐ No

If Yes, list the related test items and lab information:

Test Lab: Shenzhen Balun Technology Co., Ltd.

FCC Designation No.: CN1196, Test Firm Registration No.: 935607.

Lab address: Block B, FL1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China

Test items: Radiated Spurious Emissions,
Conducted Spurious Emissions.

6 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209(a) 15.247	Pass
Conducted Emissions	15.207(a)	Pass
Bandwidth Measurement	15.247(a)(2)	Pass
Maximum Peak Output Power	15.247(b)(3),(4)	Pass
Power Spectral Density	15.247(e)	Pass
Band Edge	15.247(d)	Pass
Antenna Requirement	15.203	Pass
RF Exposure	1.1307(b)(1)	Pass
Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Conducted Emissions

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:

Frequency (MHz)	Limit (dB μ V)	
	Qsi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	50	60
5 to 30	60	50

7.1 E.U.T. Operation

Operating Environment :

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 101.2kPa

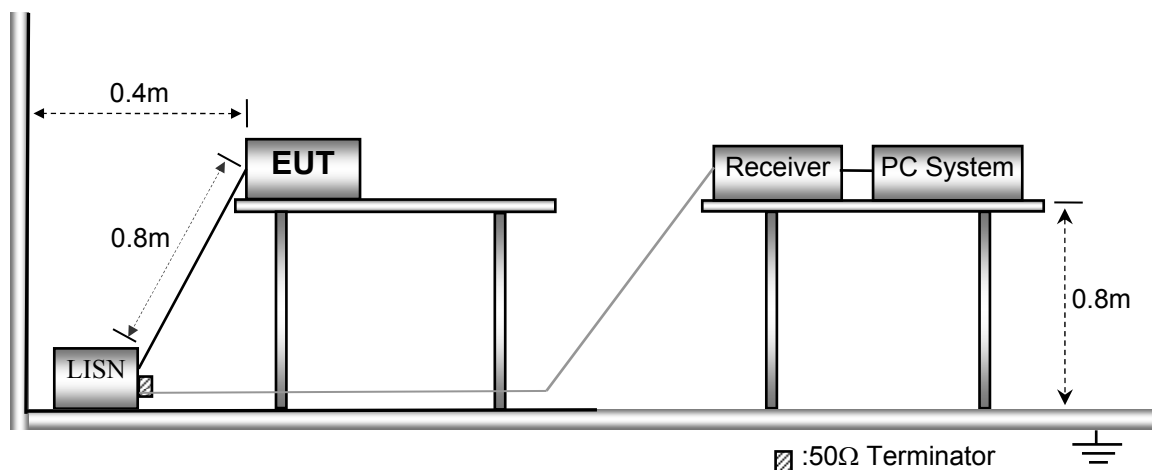
Test Voltage: AC 120V, 60Hz

EUT Operation :

The test was performed in Transmitting mode, the worst test data (O-QPSK modulation High Channel) were shown in the report.

7.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



7.3 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.

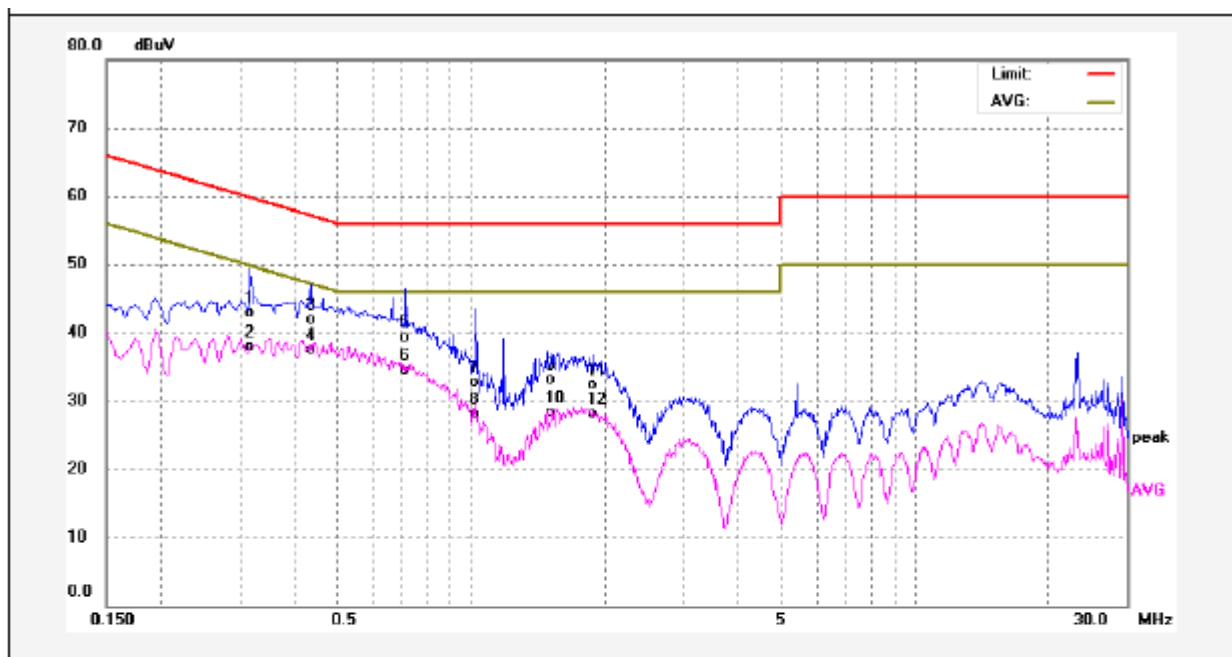
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7.4 Conducted Emission Test Result

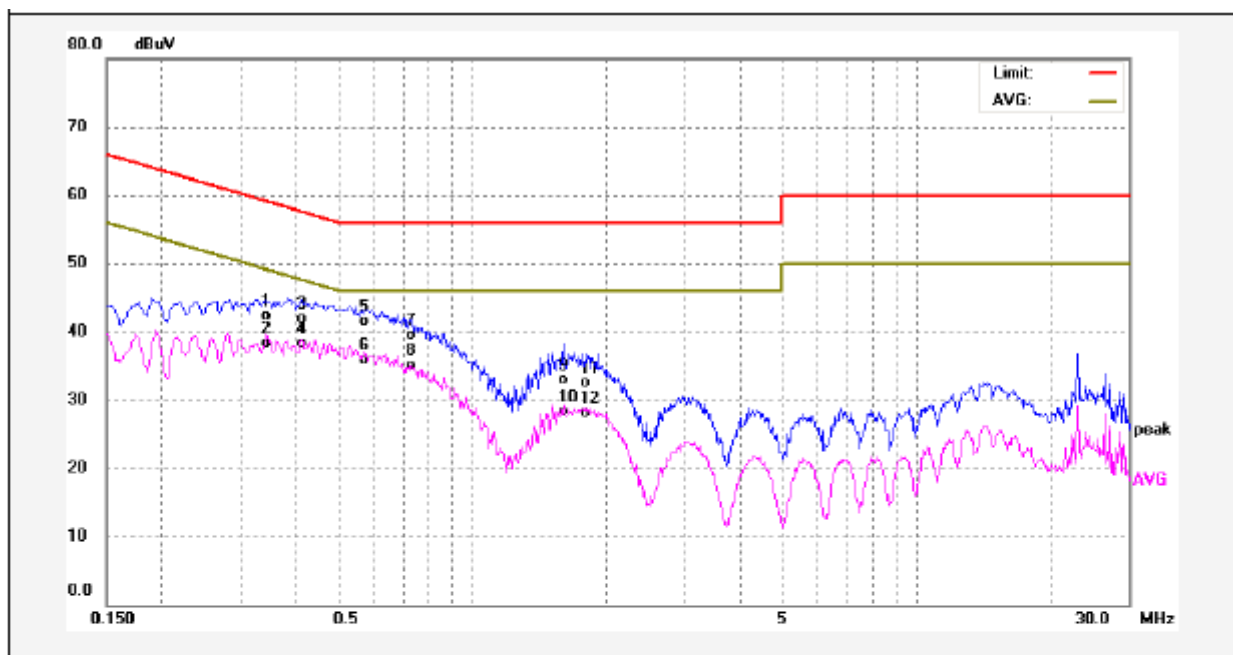
Remark: only the worst data (O-QPSK modulation High Channel mode) were reported

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3180	32.95	10.01	42.96	59.76	-16.80	QP	
2	0.3180	27.98	10.01	37.99	49.76	-11.77	AVG	
3	0.4340	31.90	10.05	41.95	57.18	-15.23	QP	
4	0.4340	27.52	10.05	37.57	47.18	-9.61	AVG	
5	0.7100	29.28	10.11	39.39	56.00	-16.61	QP	
6	0.7100	24.46	10.11	34.57	46.00	-11.43	AVG	
7	1.0220	22.57	10.13	32.70	56.00	-23.30	QP	
8	1.0220	17.96	10.13	28.09	46.00	-17.91	AVG	
9	1.5260	23.01	10.15	33.16	56.00	-22.84	QP	
10	1.5260	18.15	10.15	28.30	46.00	-17.70	AVG	
11	1.8780	22.15	10.19	32.34	56.00	-23.66	QP	
12	1.8780	17.95	10.19	28.14	46.00	-17.86	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3420	32.23	10.05	42.28	59.15	-16.87	QP	
2	0.3420	28.27	10.05	38.32	49.15	-10.83	AVG	
3	0.4140	31.83	10.04	41.87	57.57	-15.70	QP	
4	0.4140	28.36	10.04	38.40	47.57	-9.17	AVG	
5	0.5820	31.50	10.06	41.56	56.00	-14.44	QP	
6	0.5820	25.94	10.06	36.00	46.00	-10.00	AVG	
7	0.7300	29.32	10.11	39.43	56.00	-16.57	QP	
8	0.7300	25.07	10.11	35.18	46.00	-10.82	AVG	
9	1.6100	22.73	10.16	32.89	56.00	-23.11	QP	
10	1.6100	18.13	10.16	28.29	46.00	-17.71	AVG	
11	1.7980	22.42	10.18	32.60	56.00	-23.40	QP	
12	1.7980	17.95	10.18	28.13	46.00	-17.87	AVG	

8 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247& 15.205

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

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

8.1 EUT Operation

Operating Environment :

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 101.2kPa

Test Voltage: AC 120V, 60Hz

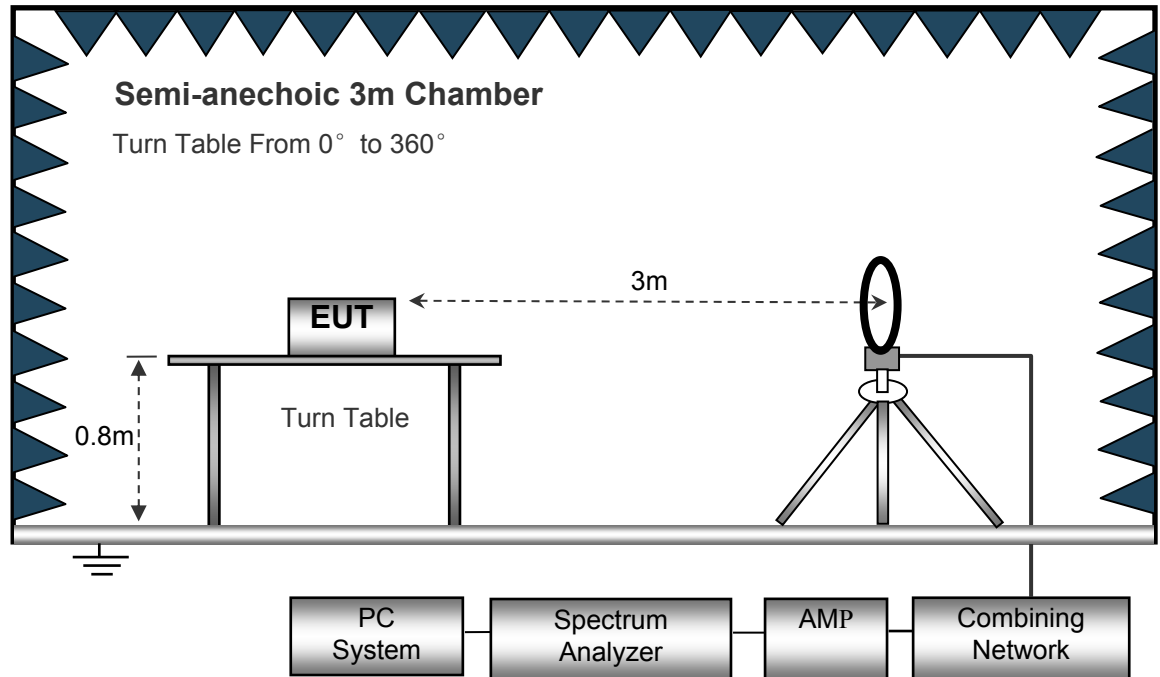
EUT Operation :

The test was performed in Transmitting mode, the test data (O-QPSK modulation) were shown in the report.

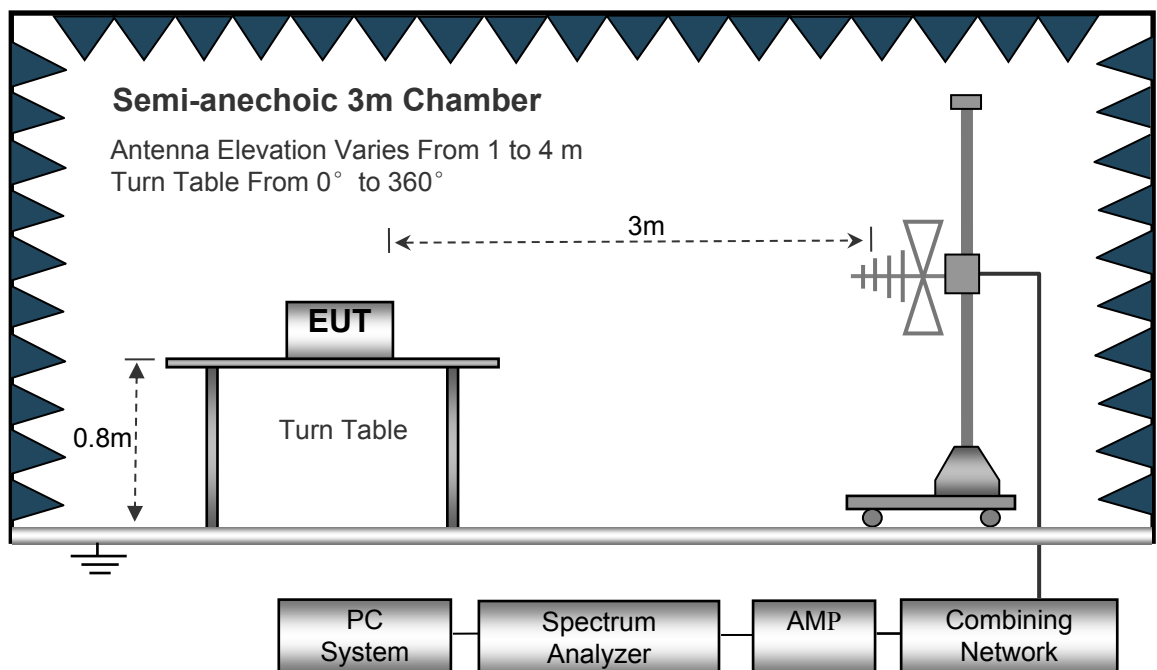
8.2 Test Setup

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

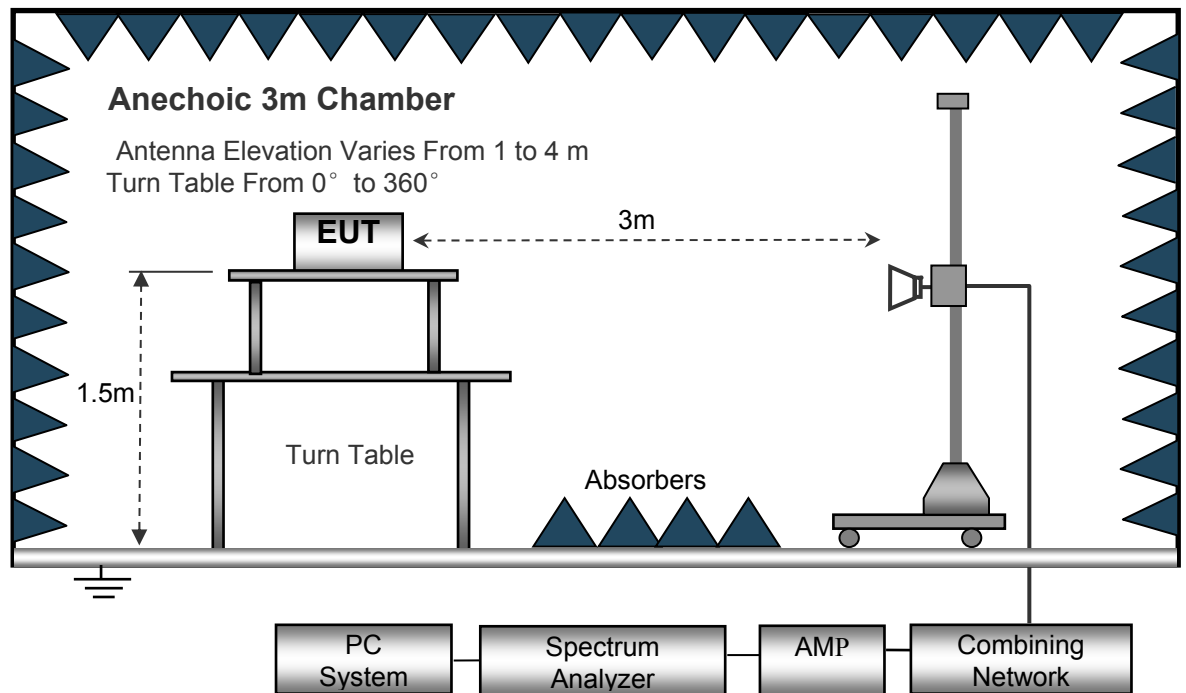
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 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

8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
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.
8. For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

8.6 Summary of Test Results

Test Frequency: 9KHz ~ 30MHz

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

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
O-QPSK Low Channel									
48.33	43.73	QP	24	1.4	H	-16.72	27.01	40.00	-12.99
48.33	44.44	QP	56	1.1	V	-16.72	27.72	40.00	-12.28
4810.00	58.38	PK	334	1.9	H	-5.22	53.16	74.00	-20.84
4810.00	54.78	Ave	334	1.9	H	-5.22	49.56	54.00	-4.44
7215.00	49.41	PK	318	1.5	V	0.73	50.14	74.00	-23.86
7215.00	45.81	Ave	318	1.5	V	0.73	46.54	54.00	-7.46
2322.70	46.26	PK	36	1.1	V	-13.19	33.07	74.00	-40.93
2322.70	37.35	Ave	36	1.1	V	-13.19	24.16	54.00	-29.84
2355.64	44.27	PK	310	2.0	H	-13.14	31.13	74.00	-42.87
2355.64	37.68	Ave	310	2.0	H	-13.14	24.54	54.00	-29.46
2485.78	43.09	PK	215	1.8	V	-13.08	30.01	74.00	-43.99
2485.78	38.03	Ave	215	1.8	V	-13.08	24.95	54.00	-29.05

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
O-QPSK Middle Channel									
48.33	43.79	QP	17	1.6	H	-16.72	27.07	40.00	-12.93
48.33	44.10	QP	63	1.8	V	-16.72	27.38	40.00	-12.62
4880.00	56.05	PK	150	1.5	H	-5.02	51.03	74.00	-22.97
4880.00	52.45	Ave	150	1.5	H	-5.02	47.43	54.00	-6.57
7320.00	49.09	PK	307	1.2	H	1.01	50.10	74.00	-23.90
7320.00	45.49	Ave	307	1.2	H	1.01	46.50	54.00	-7.50
2328.16	46.33	PK	186	1.8	V	-13.19	33.14	74.00	-40.86
2328.16	39.28	Ave	186	1.8	V	-13.19	26.09	54.00	-27.91
2376.08	44.99	PK	283	1.6	H	-13.14	31.85	74.00	-42.15
2376.08	37.29	Ave	283	1.6	H	-13.14	24.15	54.00	-29.85
2492.98	43.45	PK	92	1.0	V	-13.08	30.37	74.00	-43.63
2492.98	37.68	Ave	92	1.0	V	-13.08	24.60	54.00	-29.40

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
O-QPSK High Channel									
48.33	43.15	QP	148	1.0	H	-16.72	26.43	40.00	-13.57
48.33	44.75	QP	328	1.1	V	-16.72	28.03	40.00	-11.97
4960.00	55.70	PK	106	2.0	V	-4.80	50.90	74.00	-23.10
4960.00	52.10	Ave	106	2.0	V	-4.80	47.30	54.00	-6.70
7440.00	49.02	PK	32	1.4	V	1.33	50.35	74.00	-23.65
7440.00	45.42	Ave	32	1.4	V	1.33	46.75	54.00	-7.25
2342.74	46.04	PK	226	2.0	V	-13.19	32.85	74.00	-41.15
2342.74	39.98	Ave	226	2.0	V	-13.19	26.79	54.00	-27.21
2377.00	42.01	PK	105	1.4	H	-13.14	28.87	74.00	-45.13
2377.00	36.35	Ave	105	1.4	H	-13.14	23.21	54.00	-30.79
2494.42	42.12	PK	4	1.7	V	-13.08	29.04	74.00	-44.96
2494.42	37.37	Ave	4	1.7	V	-13.08	24.29	54.00	-29.71

Test Frequency: 18GHz~25GHz

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

9 Band Edge Measurement

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) and 15.205(c).
Test Method:	558074 D01 DTS Meas Guidance v04, April 5, 2017
Test Limit:	Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

9.1 Test Produce

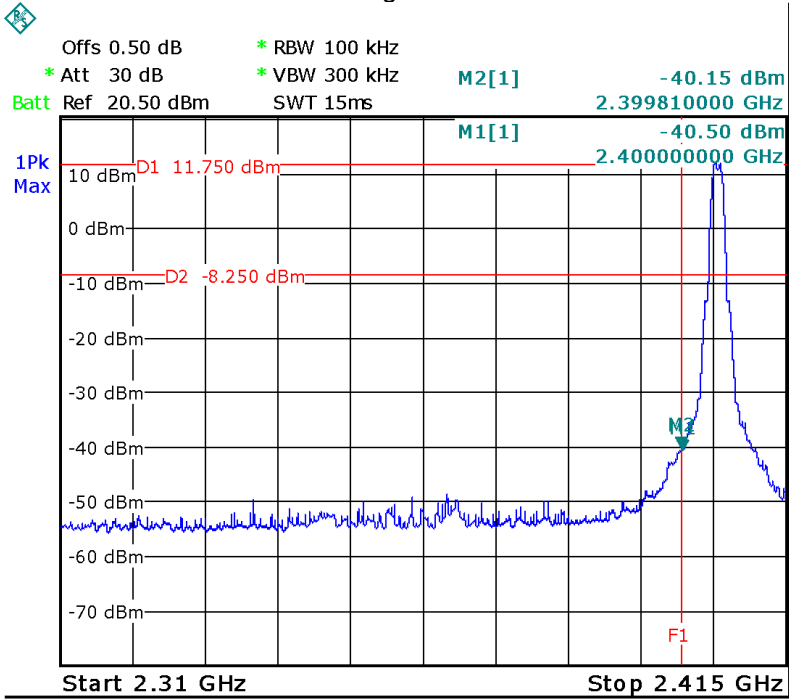
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto

Detector function = peak, Trace = max hold
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

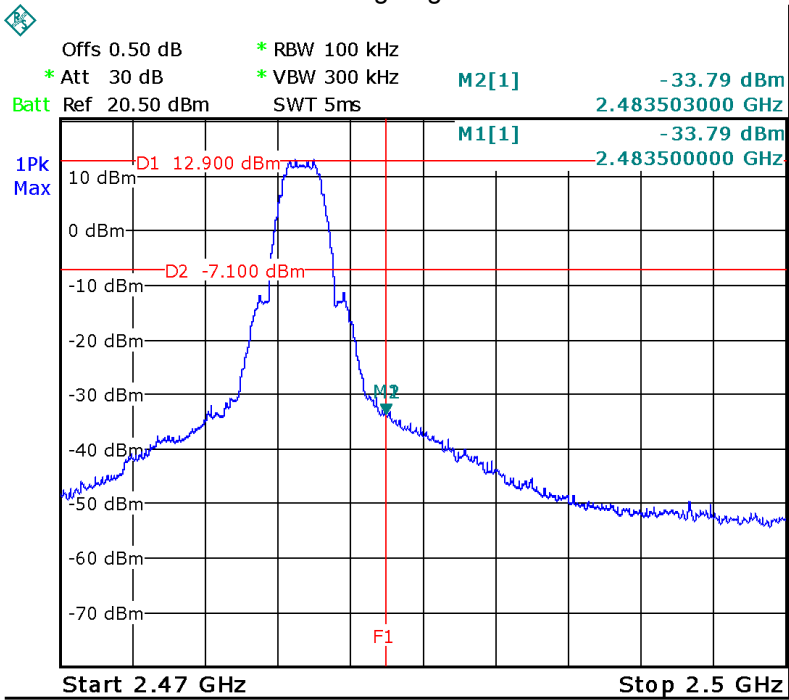
9.2 Test Result

O-QPSK mode

Band edge-left side



Band edge-right side



10 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance v04, April 5, 2017

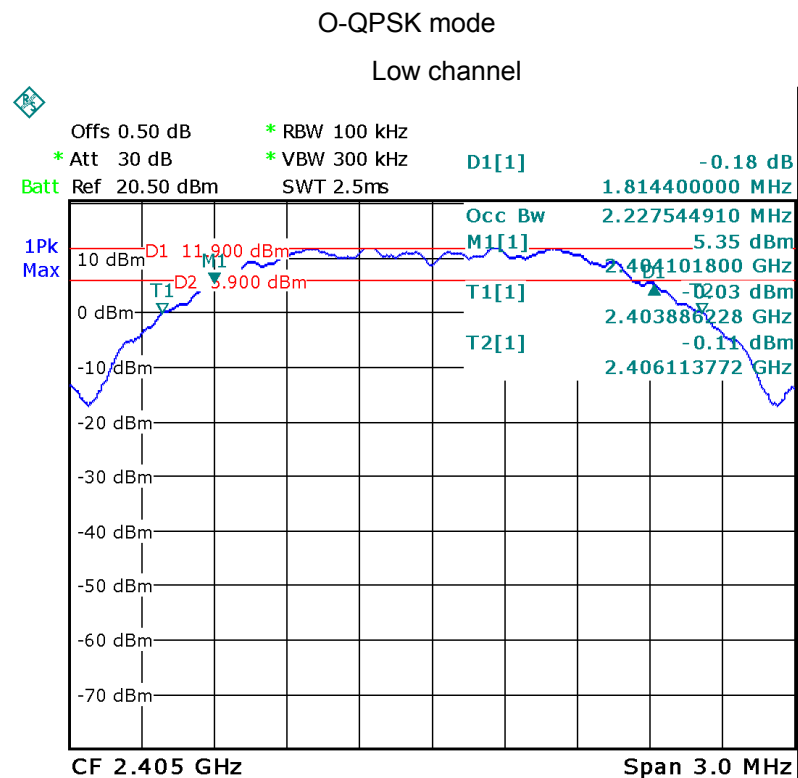
10.1 Test Procedure

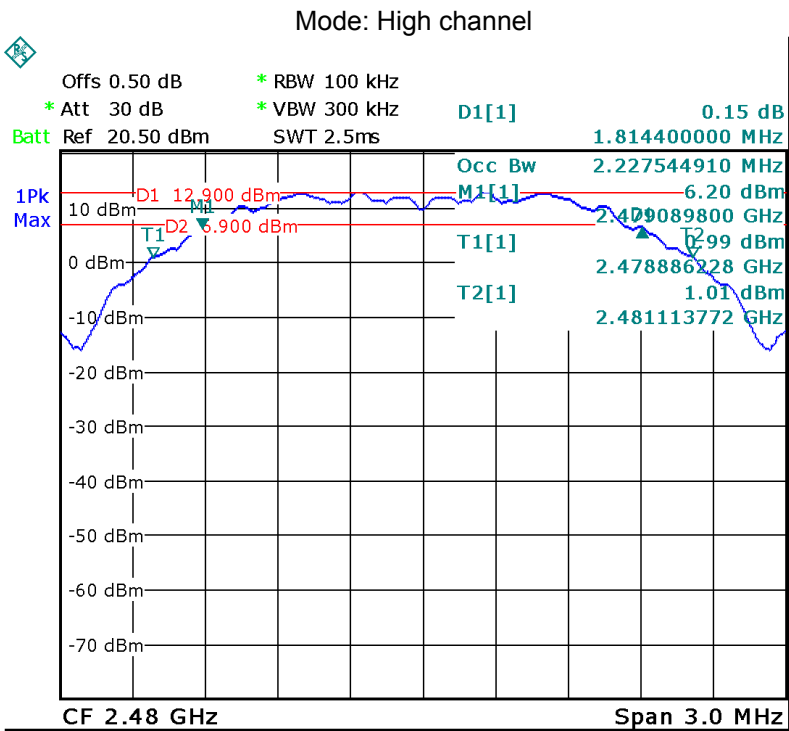
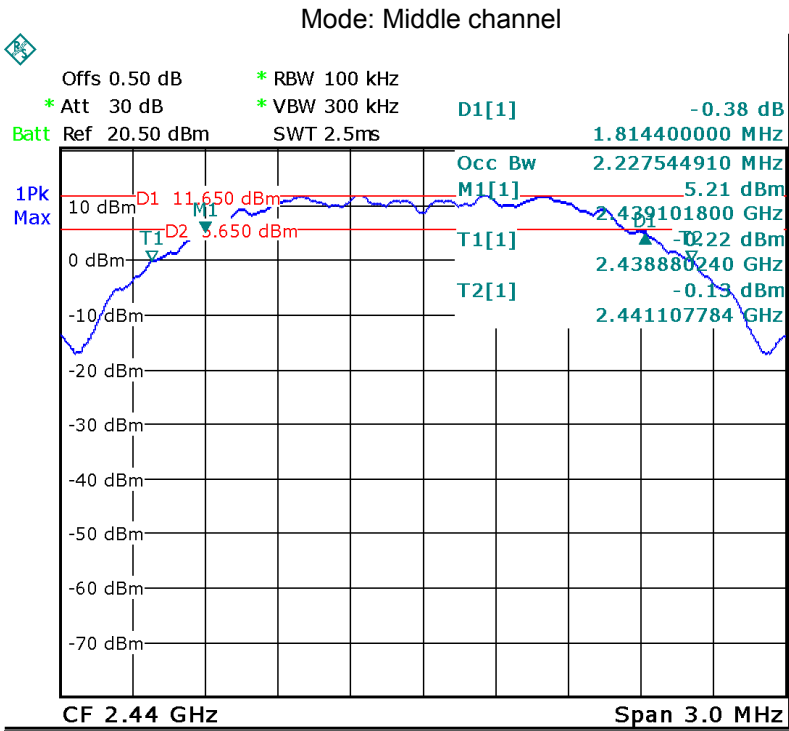
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

10.2 Test Result

Operation mode	6dB Bandwidth (MHz)	99% Bandwidth(MHz)
Low channel	1.814	2.228
Middle channel	1.814	2.228
High channel	1.814	2.228

Test result plot as follows:





11 Maximum Peak Output Power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance v04, April 5, 2017

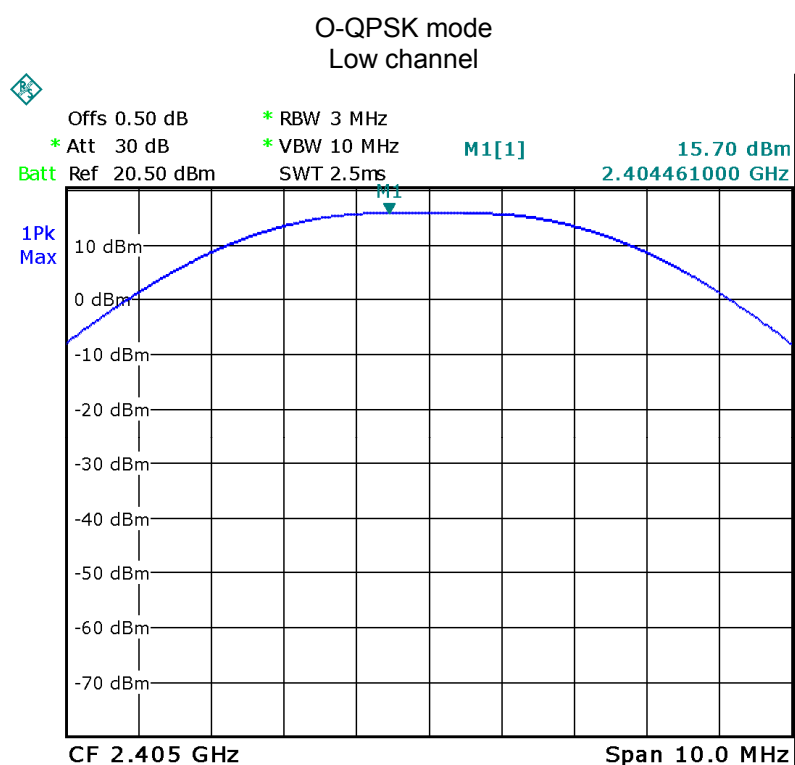
11.1 Test Procedure

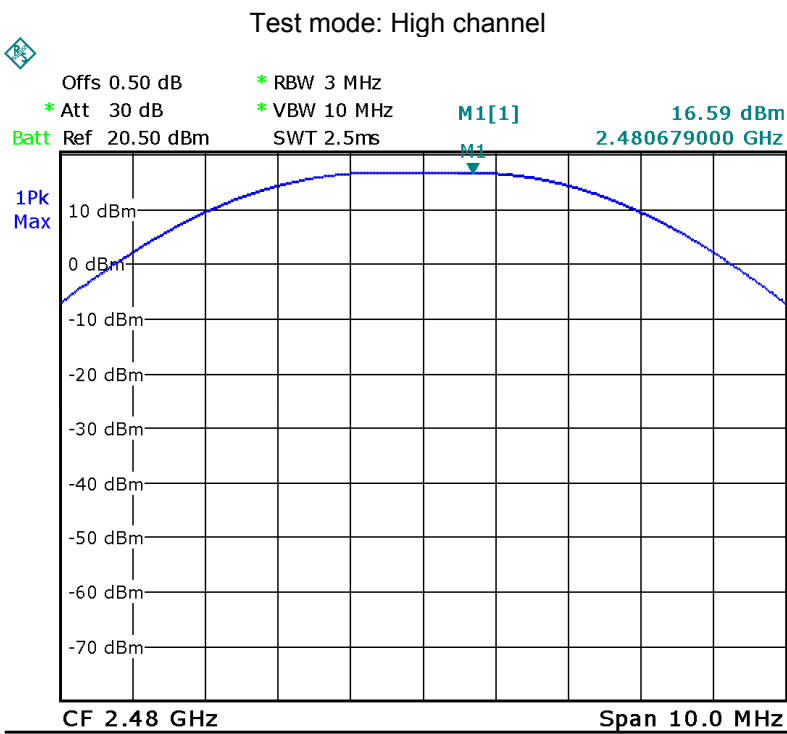
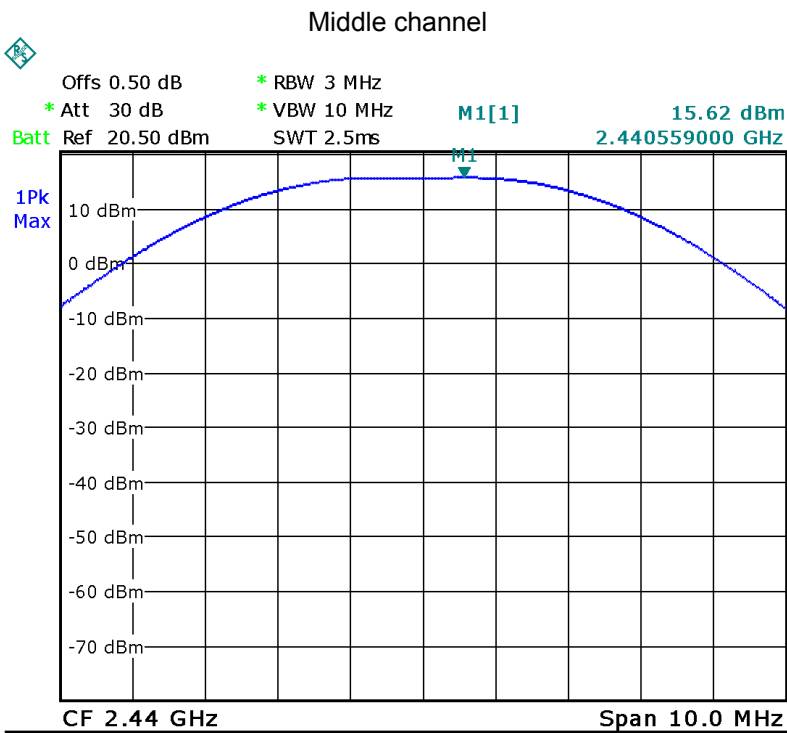
558074 D01 DTS Meas Guidance v04, April 5, 2017

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 = 3MHz. VBW = 10MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

11.2 Test Result

Maximum Peak Output Power (dBm)		
Lower channel	Middle channel	High channel
15.70	15.62	16.59
Limit: 1W/30dBm		





12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: 558074 D01 DTS Meas Guidance v04, April 5, 2017

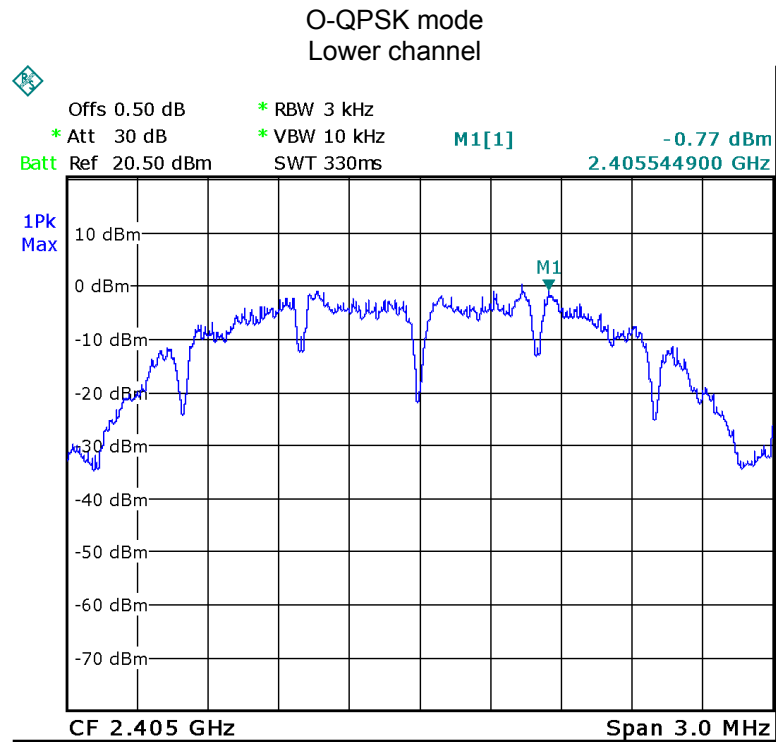
12.1 Test Procedure

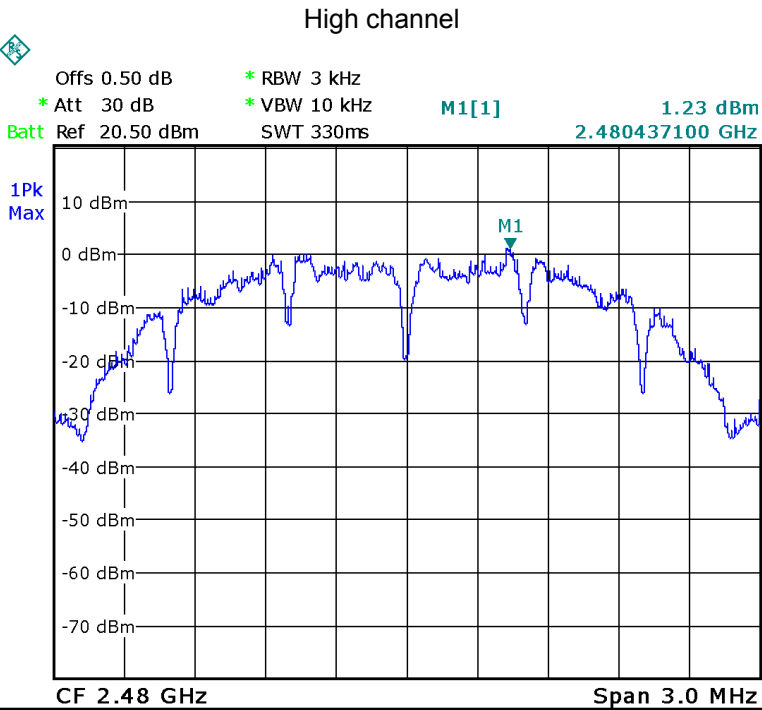
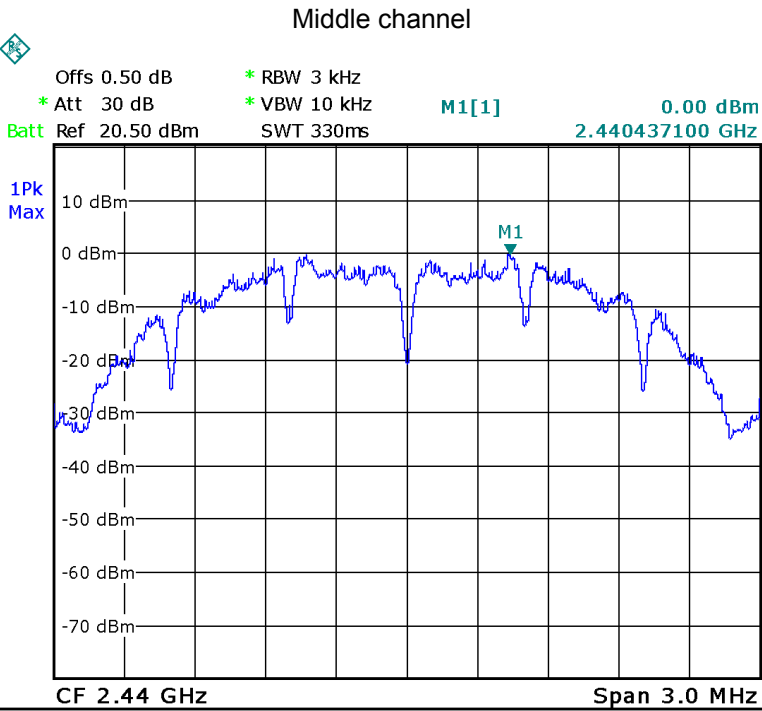
558074 D01 DTS Meas Guidance v04, April 5, 2017

- 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 = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
- 3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section
Submit this plot.

12.2 Test Result

Power Spectral density (dBm per 3kHz)		
Lower channel	Middle channel	High channel
-0.77	0.00	1.23
Limit: 8dBm per 3kHz		





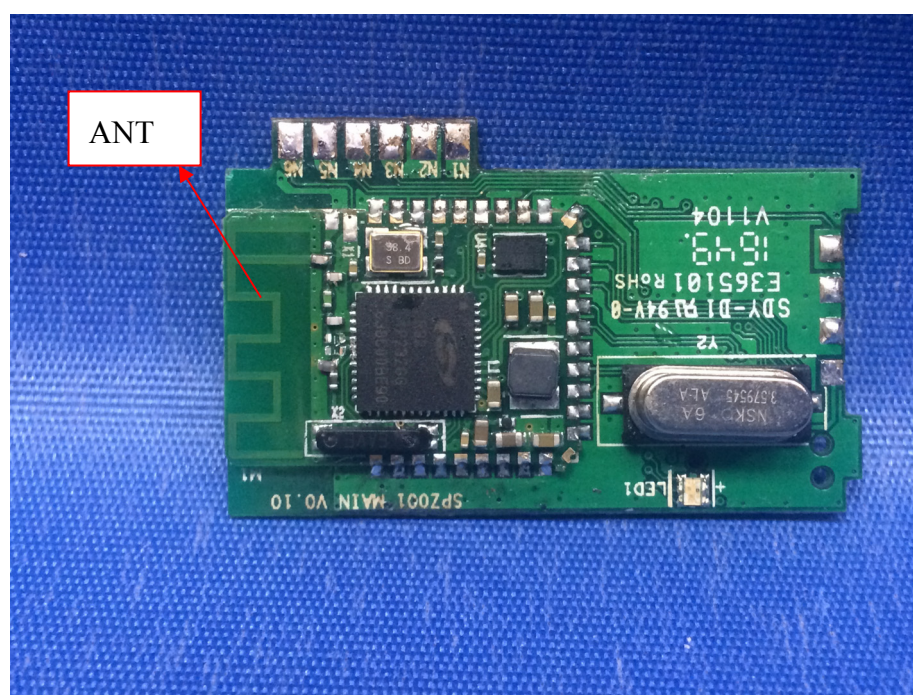
13 Antenna Requirement

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, the gain is 0dBi. meets the requirements of FCC 15.203.



14 FCC ID: 2AH7VSPLUG1 RF Exposure

Note: Please refer to RF Exposure test report: WTS17S0373995E -2E.

15 Photographs-Model SPLUG1 Test Setup Photos

Note: Please refer to Photos: WTS17S0373995E -3E.

16 Photographs - Constructional Details

16.1 Model SPLUG1-External Photos

Note: Please refer to Photos: WTS17S0373995E -3E.

16.2 Model SPLUG1-Internal Photos

Note: Please refer to Photos: WTS17S0373995E -3E.

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