

TEST REPORT

Reference No...... : WTS17S0786225X1E
FCC ID..... : 2AAWWS2
Applicant..... : XIA MEN JOYATECH CO., LTD.
Address..... : 304# 28TH BUILDING, GUANRI ROAD, XIAMEN SOFTWARE PARK, XIAMEN, China
Manufacturer..... : XIA MEN JOYATECH CO., LTD.
Address..... : 304# 28TH BUILDING, GUANRI ROAD, XIAMEN SOFTWARE PARK, XIAMEN, China
Product Name..... : Wearable Bluetooth Speaker
Model No...... : S2, 1543
Standards..... : FCC CFR47 Part 15.247:2016
Date of Receipt sample.... : 2017-07-31
Date of Test..... : 2017-10-20 to 2017-10-28
Date of Issue..... : 2017-10-31
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:

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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

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS17S0786225X1E	2017-07-31	2017-10-20 to 2017-10-28	2017-10-31	original	-	valid
This report is based on WTS17S0786225E, added the Radiated Spurious Emissions (18GHz to 25GHz) and Conducted Spurious Emissions (18GHz to 25GHz) test.						

4 General Information

4.1 General Description of E.U.T

Product Name	: Wearable Bluetooth Speaker
Model No.	: S2, 1543
Model Description	: Only the model name is different. The model S2 is the tested sample.
Hardware Version	: S2_MAIN_V03
Software Version	: FR3016-1130-1600

4.2 Details of E.U.T

Operation Frequency	: 2402~2480MHz
Max. RF output power	: -1.05dBm
Type of Modulation	:GFSK, Pi/4 DQPSK,8DPSK
Antenna installation	: PCB Printed Antenna
Antenna Gain	: 0dBi
Technical Data	: DC 3.7V, 400mAh by Li-ion polymer battery; Charging: DC 5V, 0.35A by USB

4.3 Channel List

Bluetooth Classic mode

Channel No.	Frequency (MHz)						
0	2402	1	2403	2	2404	3	2405
4	2406	5	2407	6	2408	7	2409
8	2410	9	2411	10	2412	11	2413
12	2414	13	2415	14	2416	15	2417
16	2418	17	2419	18	2420	19	2421
20	2422	21	2423	22	2424	23	2425
24	2426	25	2427	26	2428	27	2429
28	2430	29	2431	30	2432	31	2433
32	2434	33	2435	34	2436	35	2437
36	2438	37	2439	38	2440	39	2441
40	2442	41	2443	42	2444	43	2445
44	2446	45	2447	46	2448	47	2449
48	2450	49	2451	50	2452	51	2453
52	2454	53	2455	54	2456	55	2457
56	2458	57	2459	58	2460	59	2461
60	2462	61	2463	62	2464	63	2465
64	2466	65	2467	66	2468	67	2469
68	2470	69	2471	70	2472	71	2473
72	2474	73	2475	74	2476	75	2477
76	2478	77	2479	78	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	2402MHz	2441MHz	2480MHz

5 Equipment Used during Test

5.1 Equipments List

RF Conducted Spurious Emissions Testing (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
10m Semi-anechoic Chamber for Radiation Emissions (Above18GHz) (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
Radiated Spurious Emissions	± 7.5 dB
Conducted Spurious emissions	± 2.2 dB

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 (18GHz to 25GHz),
Conducted Spurious Emissions (18GHz to 25GHz).

6 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions*	15.205(a) 15.209 15.247(d)	Pass
Conducted Spurious emissions*	15.247(d)	Pass

Note: Pass=Compliance; Fail=Not Compliance; NT=Not Tested; N/A=Not Applicable.
*: The test is subcontracted to Shenzhen Balun Technology Co.,Ltd.

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

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(kHz)	300	10000 * 2400/F(kHz)	20log ^{(2400/F(kHz))} + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log ^{(24000/F(kHz))} + 40
1.705 ~ 30	30	30	100 * 30	20log ⁽³⁰⁾ + 40
30 ~ 88	100	3	100	20log ⁽¹⁰⁰⁾
88 ~ 216	150	3	150	20log ⁽¹⁵⁰⁾
216 ~ 960	200	3	200	20log ⁽²⁰⁰⁾
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾

7.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

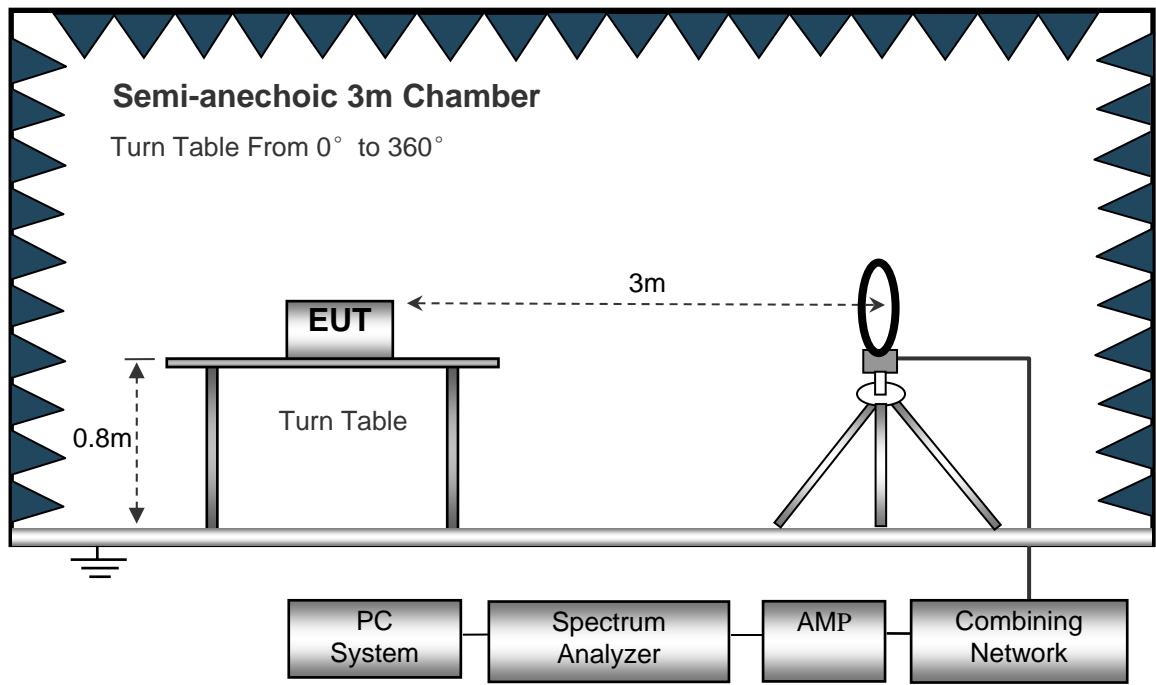
EUT Operation :

The test was performed in Charging + Transmitting mode, the worst test data (8DPSK modulation Middle Channel) were shown in the report.

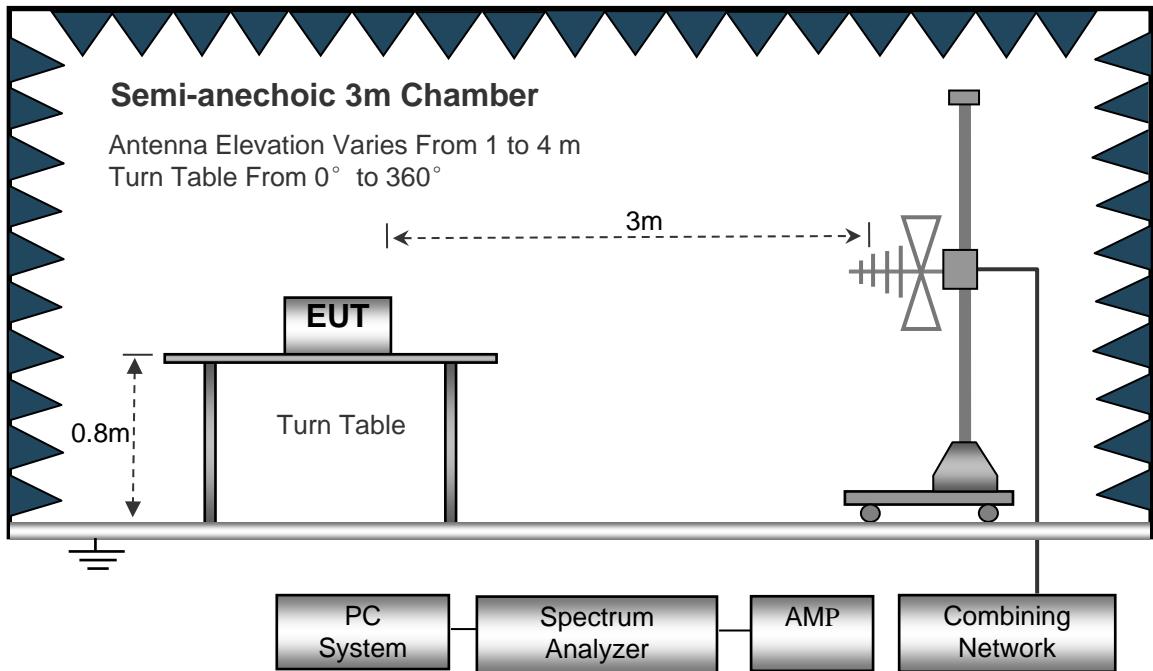
7.2 Test Setup

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

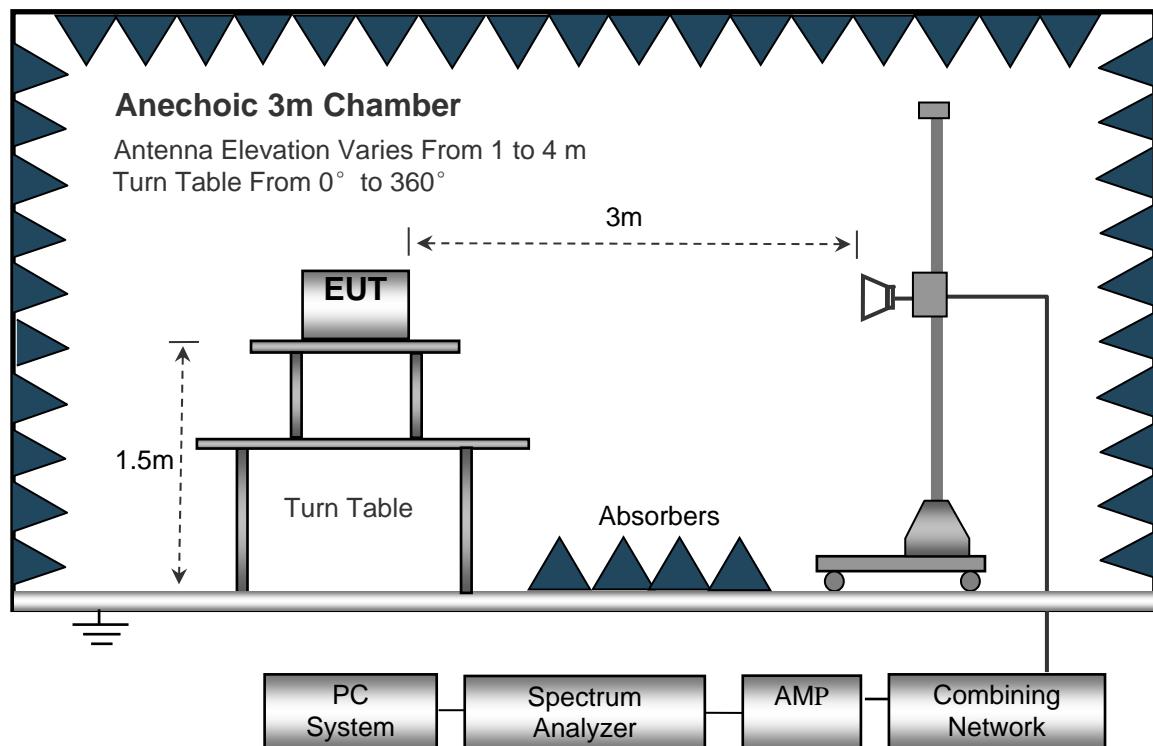
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



7.3 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

7.4 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 Z position. So the data shown was the Z position only.

7.5 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:

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

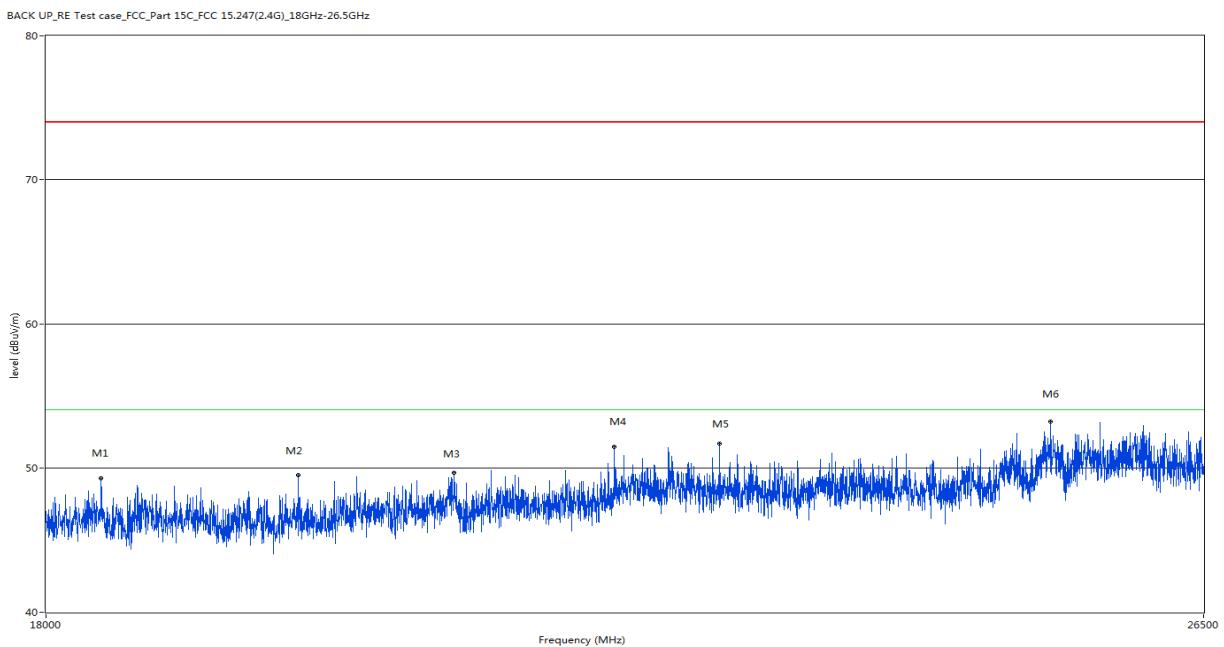
The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

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

7.6 Summary of Test Results

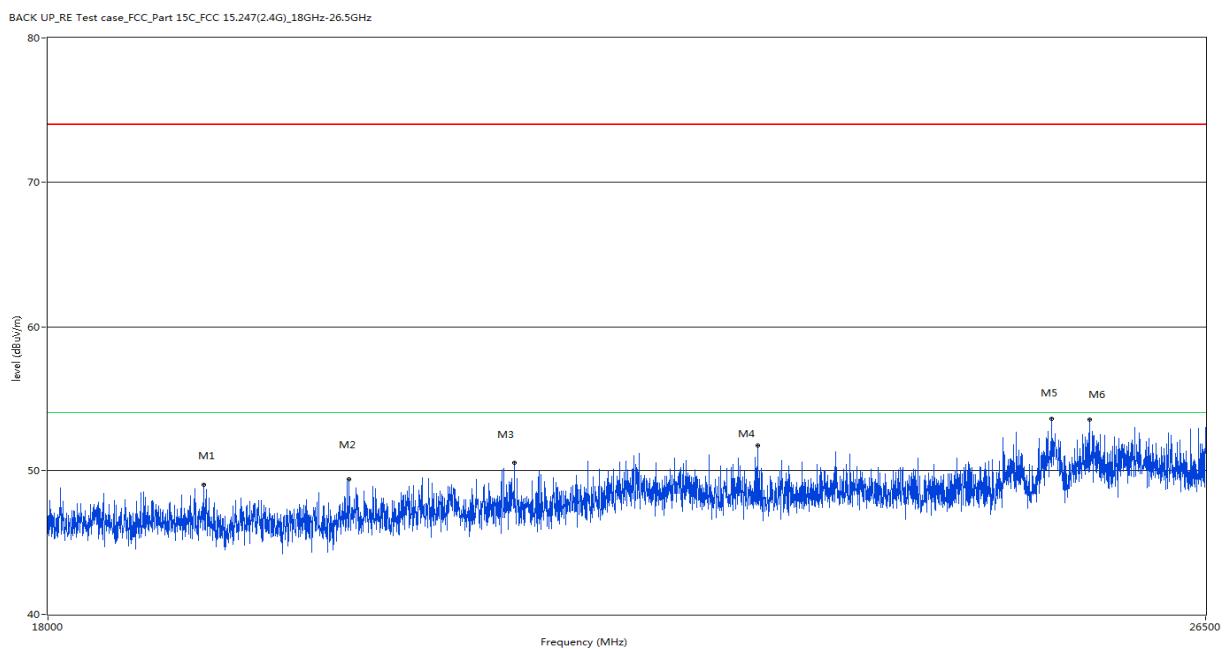
Test Frequency: 18GHz~25GHz

Remark: All the mode are tested and emissions more than 20dB below the limit, so only the worst data (8DPSK modulation Middle Channel) were reported.



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	ANT	Verdict
1	18335.750	49.25	15.90	74.0	24.75	Peak	Horizontal	Pass
2	19585.249	49.47	16.19	74.0	24.53	Peak	Horizontal	Pass
3	20628.625	49.65	16.57	74.0	24.35	Peak	Horizontal	Pass
4	21763.375	51.44	17.78	74.0	22.56	Peak	Horizontal	Pass
5	22545.375	51.67	18.32	74.0	22.33	Peak	Horizontal	Pass
6	25180.375	53.18	19.28	74.0	20.82	Peak	Horizontal	Pass

Note: Where limits are specified by regulations for both average and peak detection, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	ANT	Verdict
1	18962.625	49.01	16.10	74.0	24.99	Peak	Vertical	Pass
2	19904.000	49.39	16.23	74.0	24.61	Peak	Vertical	Pass
3	21034.500	50.52	16.81	74.0	23.48	Peak	Vertical	Pass
4	22815.250	51.72	18.44	74.0	22.28	Peak	Vertical	Pass
5	25174.000	53.55	19.27	74.0	20.45	Peak	Vertical	Pass
6	25490.625	53.52	19.47	74.0	20.48	Peak	Vertical	Pass

Note: Where limits are specified by regulations for both average and peak detection, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

8 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Limit:

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 Section 15.209(a) is not required. 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) (see Section 15.205(c)).

8.1 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

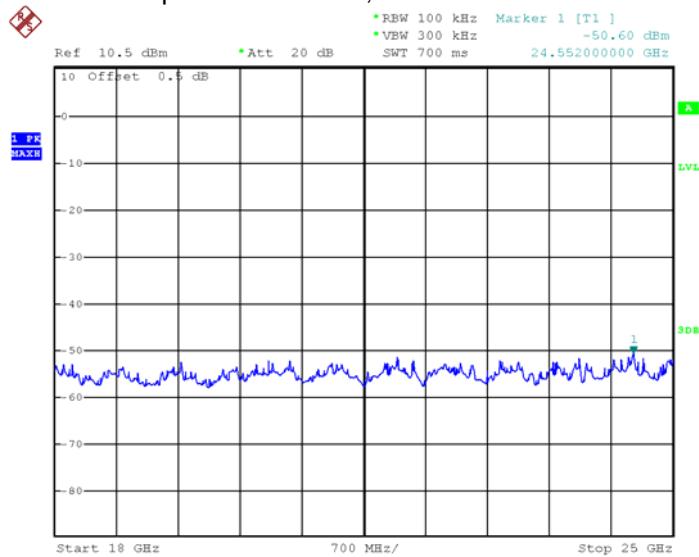
Detector function = peak, Trace = max hold

8.2 Test Result

18GHz – 25GHz

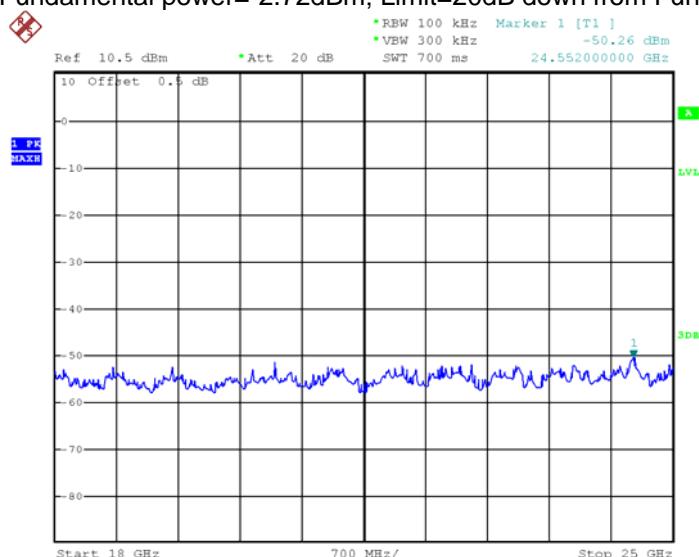
GFSK Low Channel

(Note: Fundamental power=-3.00dBm; Limit=20dB down from Fundamental=-23.00dBm)



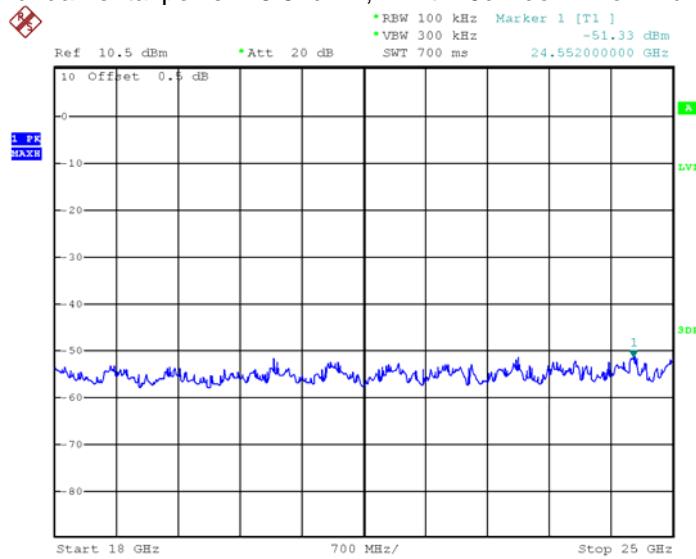
GFSK Middle Channel

(Note: Fundamental power=-2.72dBm; Limit=20dB down from Fundamental=-22.72dBm)

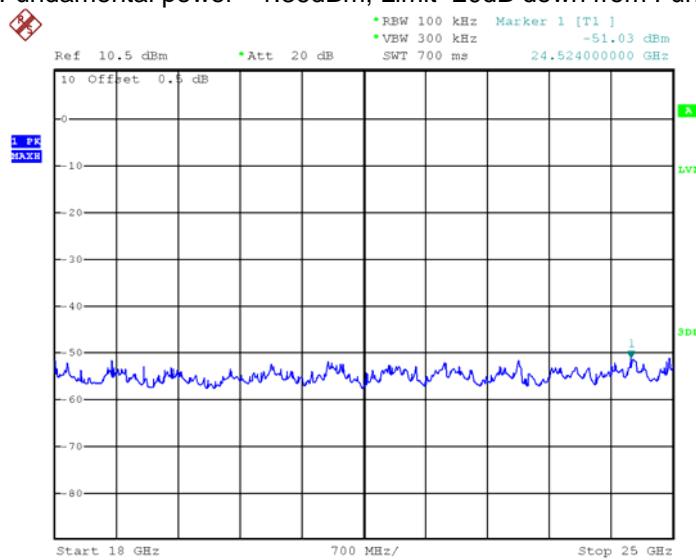


GFSK High Channel

(Note: Fundamental power=-3.51dBm; Limit=20dB down from Fundamental=-23.51dBm)

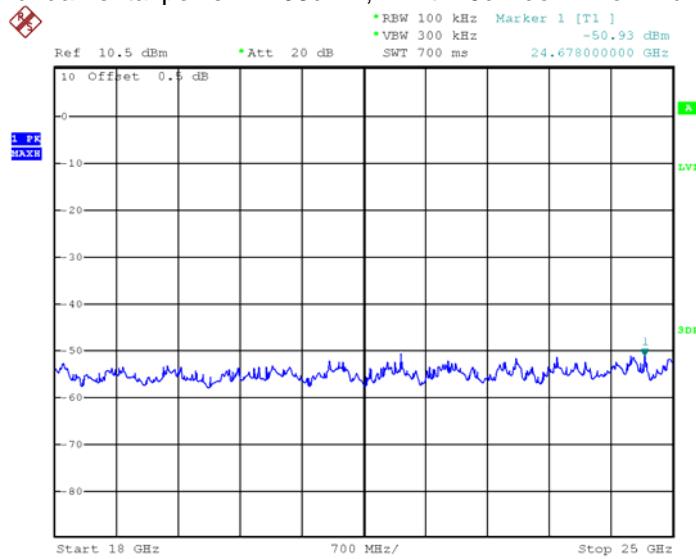
 $\pi/4$ DQPSK Low Channel

(Note: Fundamental power=-1.36dBm; Limit=20dB down from Fundamental=-21.36dBm)

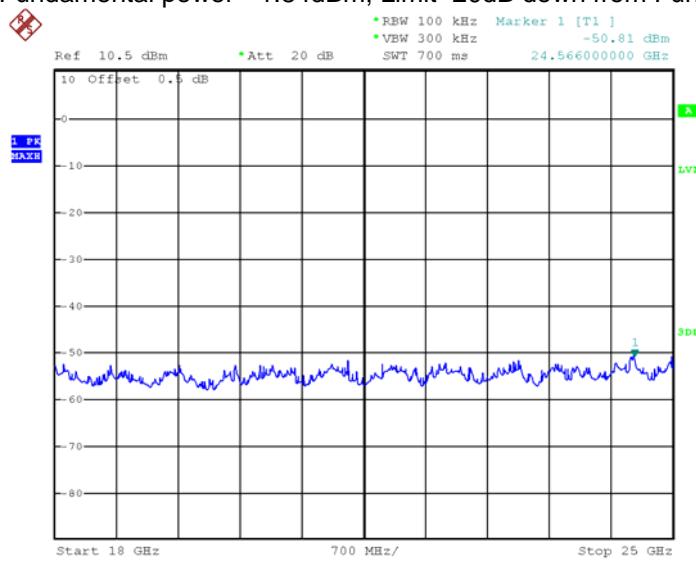


$\pi/4$ DQPSK Middle Channel

(Note: Fundamental power=-1.08dBm; Limit=20dB down from Fundamental=-21.08dBm)

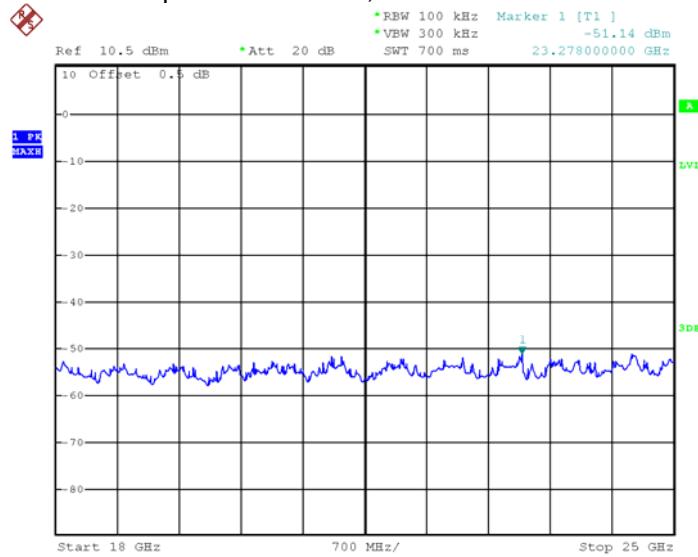
 $\pi/4$ DQPSK High Channel

(Note: Fundamental power=-1.84dBm; Limit=20dB down from Fundamental=-21.84dBm)



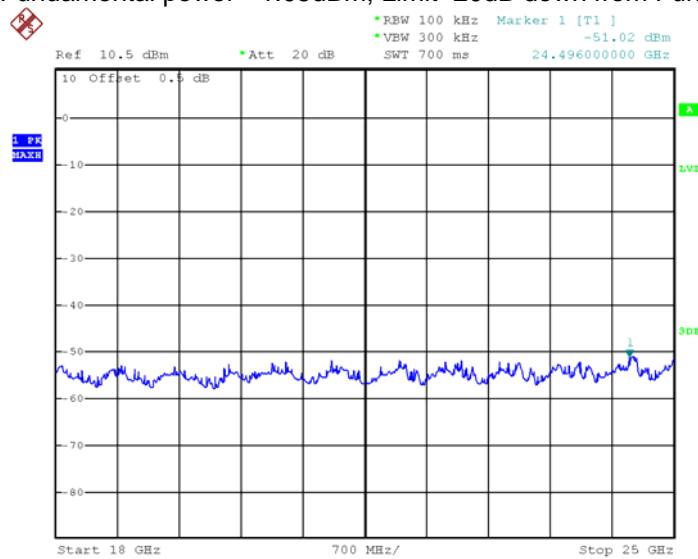
8DPSK Low Channel

(Note: Fundamental power=-1.29dBm; Limit=20dB down from Fundamental=-21.29dBm)



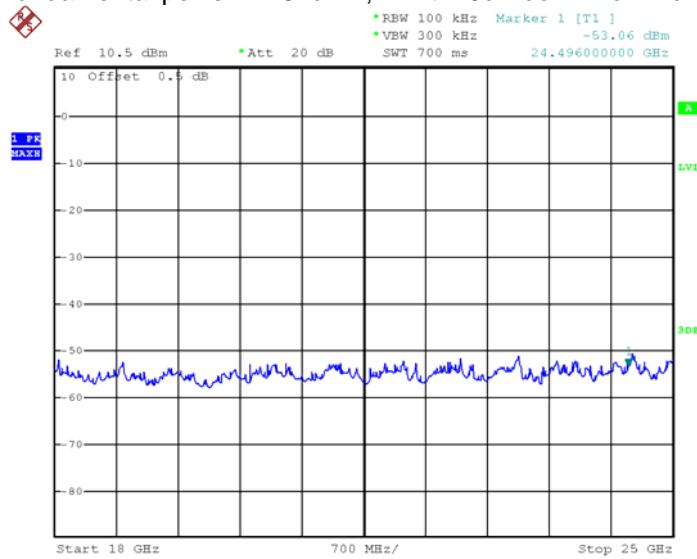
8DPSK Middle Channel

(Note: Fundamental power=-1.05dBm; Limit=20dB down from Fundamental=-21.05dBm)



8DPSK High Channel

(Note: Fundamental power=-1.81dBm; Limit=20dB down from Fundamental=-21.81dBm)



9 Photographs-Model S2 Test Setup

9.1 Photograph - Spurious Emissions Radiated Test Setup



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