

RADIO TEST REPORT

S

S

Report No: STS1808038W04

Issued for

Dreamlink E-Commerce Co.,Limited

D711, Tianhui Building Donghua1st Road Longhua District, Shenzhen, China

Product Name:	Bluetooth Headset	
Brand Name:	Linkwitz, Levin, Dylan	
Model Name:	HB-01	
Series Model:	HB-02	
FCC ID:	2AQUAHB-01	
Test Standard:	FCC Part 15.247	

Any reproduction of this document must be done in full. No single part of this document may be reproduced we permission from STS, All Test Data Presented in this report is only applicable to presented Test sample VAL

Shenzhen STS Test Services Co., Ltd. 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com





Report No.: STS1808038W04

TEST RESULT CERTIFICATION

Applicant'sname	Dreamlink E-Commerce Co.,Limited
Address	D711,Tianhui Building Donghua1st Road Longhua District, Shenzhen,China
Manufacture's Name	Dreamlink E-Commerce Co.,Limited
Address	D711,Tianhui Building Donghua1st Road Longhua District, Shenzhen,China
Product description	
Product Name:	Bluetooth Headset
Brand Name:	Linkwitz, Levin, Dylan
Model Name:	HB-01
Series Model	HB-02
Test Standards	FCC Part15.247
Test procedure	: ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of STS, this document may be altered or revised by STS, personal only, and shall be noted in the revision of the document...

Date of Test.....

Date (s) of performance of tests .: 16 Oct.2018 ~17 Oct.2018

Date of Issue 17 Oct.2018

Test Result Pass

Testing Engineer

(Chris chen)

Technical Manager

(Sean she)



Authorized Signatory :

(Vita Li)

Shenzhen STS Test Services Co., Ltd.

Page 3 of 69

Report No.: STS1808038W04



Table of Contents	Page
1. SUMMARY OF TEST RESULTS	6
1.1 TEST FACTORY	7
1.2 MEASUREMENT UNCERTAINTY	7
2. GENERAL INFORMATION	8
2.1 GENERAL DESCRIPTION OF EUT	8
2.2 DESCRIPTION OF TEST MODES	10
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING	10
2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.5 DESCRIPTION OF SUPPORT UNITS	12
2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS	13
3. EMC EMISSION TEST	15
3.1 CONDUCTED EMISSION MEASUREMENT	15
3.2 RADIATED EMISSION MEASUREMENT	18
4. CONDUCTED SPURIOUS & BAND EDGE EMISSION	30
4.1 REQUIREMENT	30
4.2 TEST PROCEDURE	30
4.3 TEST SETUP	30
4.4 EUT OPERATION CONDITIONS	30
4.5 TEST RESULTS	31
5. NUMBER OF HOPPING CHANNEL	43
5.1 APPLIED PROCEDURES / LIMIT	43
5.2 TEST PROCEDURE	43
5.3 TEST SETUP	43
5.4 EUT OPERATION CONDITIONS	43
5.5 TEST RESULTS	44
6. AVERAGE TIME OF OCCUPANCY	45
6.1 APPLIED PROCEDURES / LIMIT	45
6.2 TEST PROCEDURE	45
6.3 TEST SETUP	45
6.4 EUT OPERATION CONDITIONS	45
6.5 TEST RESULTS	46
7. HOPPING CHANNEL SEPARATION MEASUREMEN	52
7.1 APPLIED PROCEDURES / LIMIT	52

Page 4 of 69

Report No.: STS1808038W04



Table of Contents	Page
7.2 TEST PROCEDURE	52
7.3 TEST SETUP	52
7.4 EUT OPERATION CONDITIONS	52
7.5 TEST RESULTS	53
8. BANDWIDTH TEST	59
8.1 APPLIED PROCEDURES / LIMIT	59
8.2 TEST PROCEDURE	59
8.3 TEST SETUP	59
8.4 EUT OPERATION CONDITIONS	59
8.5 TEST RESULTS	60
9. OUTPUT POWER TEST	66
9.1 APPLIED PROCEDURES / LIMIT	66
9.2 TEST PROCEDURE	66
9.3 TEST SETUP	66
9.4 EUT OPERATION CONDITIONS	66
9.5 TEST RESULTS	67
10. ANTENNA REQUIREMENT	68
10.1 STANDARD REQUIREMENT	68
10.2 EUT ANTENNA	68



=#



Page 5 of 69

Report No.: STS1808038W04

Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	17 Oct.2018	STS1808038W04	ALL	Initial Issue



Shenzhen STS Test Services Co., Ltd.



1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: DA 00-705

FCC Part 15.247,Subpart C					
Standard Section	Test Item	Judgment	Remark		
15.207	Conducted Emission	N/A			
15.247(a)(1)	Hopping Channel Separation	PASS			
15.247(a)(1)&(b)(1)	Output Power	PASS			
15.247(c)	Radiated Spurious Emission	PASS			
15.247(d)	Conducted Spurious & Band Edge Emission	PASS			
15.247(a)(iii)	Number of Hopping Frequency	PASS			
15.247(a)(iii)	Dwell Time	PASS			
15.247(a)(1)	Bandwidth	PASS			
15.205	Restricted Band Edge Emission	PASS			
Part 15.247(d)/part 15.209(a)	Band Edge Emission	PASS			
15.203	Antenna Requirement	PASS			

NOTE:

- (1)" N/A" denotes test is not applicable in this Test Report
- (2) All tests are according to ANSI C63.10-2013

Shenzhen STS Test Services Co., Ltd.



Page 7 of 69

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd. Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China CNAS Registration No.: L7649; FCC Registration No.: 625569 IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $\ k=2$, providing a level of confidence of approximately 95 % $^\circ$

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.71dB
4	Spurious emissions, conducted	±0.63dB
5	All emissions,radiated (9KHz-30MHz)	±3.02dB
6	All emissions,radiated (30MHz-200MHz)	±3.80dB
7	All emissions,radiated (200MHz-1000MHz)	±3.97dB
8	All emissions,radiated(>1G)	±3.03dB



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Bluetooth Headset
Trade Name	Linkwitz, Levin, Dylan
Model Name	HB-01
Series Model	HB-02
Model Difference	Only different in model name and brand name.
Channel List	Please refer to the Note 2.
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps)
Bluetooth Version	4.1 BR+EDR
Battery	Battery(rating): Rated Voltage: 3.7V Charge Limit: 4.25V Capacity: 500mAh
Hardware version number	V2.2
Software version number	V1.0
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

Page 9 of 69



2.

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)		
00	2402	27	2429	54	2456		
01	2403	28	2430	55	2457		
02	2404	29	2431	56	2458		
03	2405	30	2432	57	2459		
04	2406	31	2433	58	2460		
05	2407	32	2434	59	2461		
06	2408	33	2435	60	2462		
07	2409	34	2436	61	2463		
08	2410	35	2437	62	2464		
09	2411	36	2438	63	2465		
10	2412	37	2439	64	2466		
11	2413	38	2440	65	2467		
12	2414	39	2441	66	2468		
13	2415	40	2442	67	2469		
14	2416	41	2443	68	2470		
15	2417	42	2444	69	2471		
16	2418	43	2445	70	2472		
17	2419	44	2446	71	2473		
18	2420	45	2447	72	2474		
19	2421	46	2448	73	2475		
20	2422	47	2449	74	2476		
21	2423	48	2450	75	2477		
22	2424	49	2451	76	2478		
23	2425	50	2452	77	2479		
24	2426	51	2453	78	2480		
25	2427	52	2454				
26	2428	53	2455				

3. Table for Filed Antenna

Ar	nt	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1		Linkwitz, Levin, Dylan	HB-01	PCB Antenna	N/A	-0.68	BT Antenna

F



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Mode 5 TX CH39 2 Mbps/π/4-DQPSK	Worst Mode	Description	Data Rate/Modulation
Mode 3 TX CH78 1Mbps/GFSK Mode 4 TX CH00 2 Mbps/π/4-DQPSK Mode 5 TX CH39 2 Mbps/π/4-DQPSK Mode 6 TX CH78 2 Mbps/π/4-DQPSK Mode 7 TX CH00 3 Mbps/8DPSK	Mode 1	TX CH00	1Mbps/GFSK
Mode 4 TX CH00 2 Mbps/π/4-DQPSK Mode 5 TX CH39 2 Mbps/π/4-DQPSK Mode 6 TX CH78 2 Mbps/π/4-DQPSK Mode 7 TX CH00 3 Mbps/8DPSK	Mode 2	TX CH39	1Mbps/GFSK
Mode 5 TX CH39 2 Mbps/π/4-DQPSK Mode 6 TX CH78 2 Mbps/π/4-DQPSK Mode7 TX CH00 3 Mbps/8DPSK	Mode 3	TX CH78	1Mbps/GFSK
Mode 6TX CH782 Mbps/π/4-DQPSKMode7TX CH003 Mbps/8DPSK	Mode 4	TX CH00	2 Mbps/π/4-DQPSK
Mode7 TX CH00 3 Mbps/8DPSK	Mode 5	TX CH39	2 Mbps/π/4-DQPSK
	Mode 6	TX CH78	2 Mbps/π/4-DQPSK
Mode 8 TX CH39 3 Mbps/8DPSK	Mode7	TX CH00	3 Mbps/8DPSK
	Mode 8	TX CH39	3 Mbps/8DPSK
Mode 9 TX CH78 3 Mbps/8DPSK	Mode 9	TX CH78	3 Mbps/8DPSK

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz

and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/ 60Hz is shown in the report

2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

Test software Version	Test program: Bluetooth				
Frequency	2402 MHz	2441 MHz	2480 MHz		
(Power control software) Parameters(1/2/3Mbps)	Power class: 1 M rate:4:27 2 M rate:11:183 3 M rate:15:339	Power class: 1 M rate:4:27 2 M rate:11:183 3 M rate:15:339	Power class: 1 M rate:4:27 2 M rate:11:183 3 M rate:15:339		

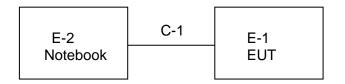


Page 11 of 69

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

Radiated Spurious EmissionTest





Shenzhen STS Test Services Co., Ltd.



2.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	HP	500-320cx	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	USB Cable	NO	100cm	N/A

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in $\[\]$ Length $\[\]$ column.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".



Page 13 of 69

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	102086	2018.10.13	2019.10.12
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2017.10.27	2020.10.26
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	N/A	2018.03.11	2021.03.10
Temperature & Humitidy	HH660	Mieo	N/A	2018.10.13	2019.10.12
Temperature & Humitidy	HH660	Mieo	N/A	2018.10.13	2019.10.12
Pre-mplifier (0.1M-3GHz)	EM	EM330	N/A	2018.03.09	2019.03.08
PreAmplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2018.10.13	2019.10.12
Passive Loop (9K30MHz)	ZHINAN	ZN30900C	16035	2017.03.11	2020.03.10
Low frequency cable	EM	R01	N/A	2018.03.11	2019.03.10
Low frequency cable	EM	R06	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R04	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	R02	N/A	2018.03.11	2019.03.10
Semi-anechoic chamber	Changling	966	N/A	2018.10.24	2020.10.23
trun table	EM	SC100_1	60531	N/A	N/A
Antnna mast	EM	SC100	N/A	N/A	N/A
Max-full Antenna Corp	MF	MFA-440H	N/A	N/A	N/A
			•		•

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2018.10.13	2019.10.12
LISN	R&S	ENV216	101242	2018.10.13	2019.10.12
conduction Cable	EM	C01	N/A	2018.03.11	2019.03.10
Temperature & Humitidy	Mieo	HH660	N/A	2018.10.13	2019.10.12



Page 14 of 69

Report No.: STS1808038W04

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15100041SNO03	2018.10.13	2019.10.12
Power Meter	Agilent	E4419B	QB43312265	2018.03.08	2019.03.07
Spectrum Analyzer	Agilent	N9020A	MY51110105	2018.03.08	2019.03.07
Signal Analyzer	Agilent	N9020A	MY49100060	2018.10.13	2019.10.12



Shenzhen STS Test Services Co., Ltd.

Page 15 of 69



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)		
FREQUENCT (MIDZ)	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	
0.50 -5.0	56.00	46.00	
5.0 -30.0	60.00	50.00	

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

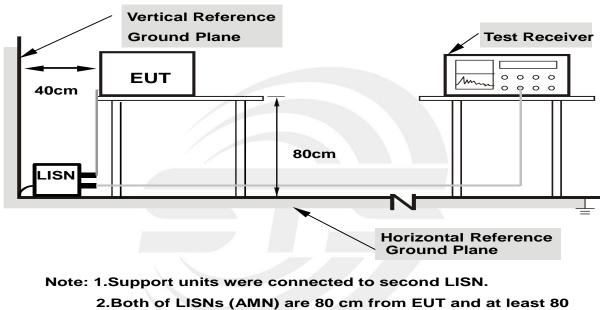
Shenzhen STS Test Services Co., Ltd.

Page 16 of 69



3.1.2 TEST PROCEDURE

- a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item -EUT Test Photos.



3.1.3 TEST SETUP

3.1.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

from other units and other metal planes



3.1.5 TEST RESULT

Temperature:	26 °C	Relative Humidity:	54%
Test Voltage:	AC 120V/60Hz	Phase:	L/N
Test Mode:	N/A		

Note: EUT is only power by battery, So it is not applicable for this test.



Shenzhen STS Test Services Co., Ltd.

Page 18 of 69





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies	Field Strength	Measurement Distance
(MHz)	(micorvolts/meter)	(meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

(dBuV/m) (at 3M)		
PEAK	AVERAGE	
74	54	
	PEAK	

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting	
Attenuation	Auto	
Detector	Peak/AV	
Start Frequency	1000 MHz(Peak/AV)	
Stop Frequency	10th carrier hamonic(Peak/AV)	
RB / VB (emission in restricted	PK=1MHz / 1MHz, AV=1 MHz /10 Hz	
band)		

For Band edge

Spectrum Parameter	Setting	
Detector	Peak/AV	
Start/Stop Frequency	Lower Band Edge: 2300 to 2403 MHz	
	Upper Band Edge: 2479 to 2500 MHz	
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz	

Shenzhen STS Test Services Co., Ltd.

 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

 Tel: + 86-755
 3688
 6288
 Fax:+ 86-755
 3688
 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



Page 19 of 69

Report No.: STS1808038W04

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos. Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

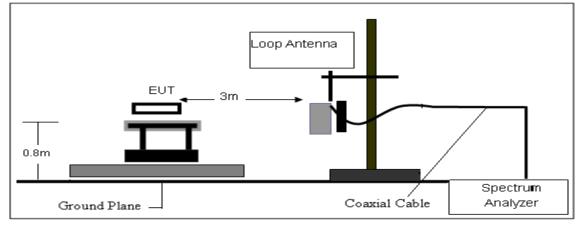
3.2.3 DEVIATION FROM TEST STANDARD

No deviation

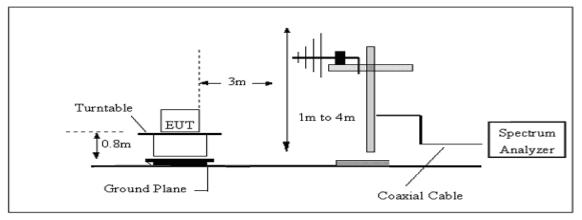
Page 20 of 69



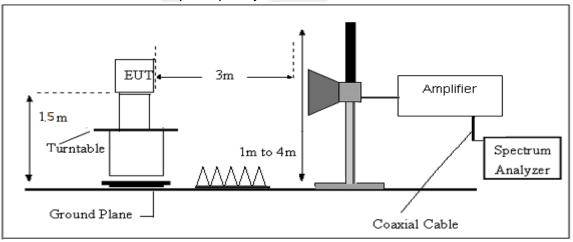
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Shenzhen STS Test Services Co., Ltd.



Page 21 of 69

3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG Where FS = Field Strength CL = Cable Attenuation Factor (Cable Loss) RA = Reading Amplitude AG = Amplifier Gain AF = Antenna Factor

For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

Factor=AF+CL-AG



Shenzhen STS Test Services Co., Ltd.



Report No.: STS1808038W04

3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	27.4 °C	Relative Humidity:	62%
Test Voltage:	DC 3.7V from battery	Test Mode:	TX Mode

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	iesi kesuli
					PASS
					PASS

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.





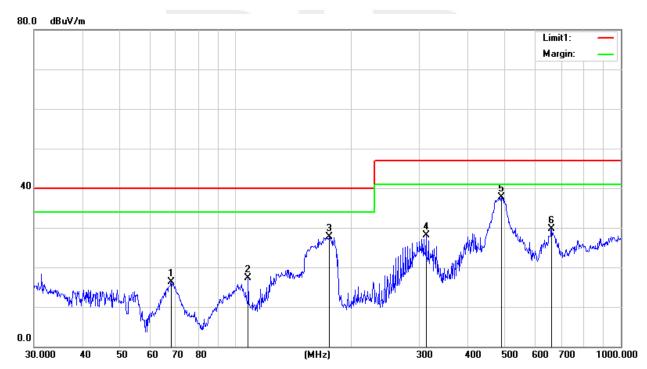
(30MHz-1000MHz)

Temperature:	27.4 ℃	Relative Humidity:	62%
Test Voltage:	DC 3.7V from battery	Phase:	Horizontal
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode	2-1M worst mode)	

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
68.1512	40.41	-24.15	16.26	40.00	-23.74	QP
107.8876	35.88	-18.52	17.36	40.00	-22.64	QP
175.0363	47.02	-19.38	27.64	40.00	-12.36	QP
312.1792	42.59	-14.42	28.17	47.00	-18.83	QP
489.0270	46.78	-9.17	37.61	47.00	-9.39	QP
661.1503	35.86	-6.23	29.63	47.00	-17.37	QP

Remark:

1. Margin = Result (Result = Reading + Factor)-Limit



Page 24 of 69

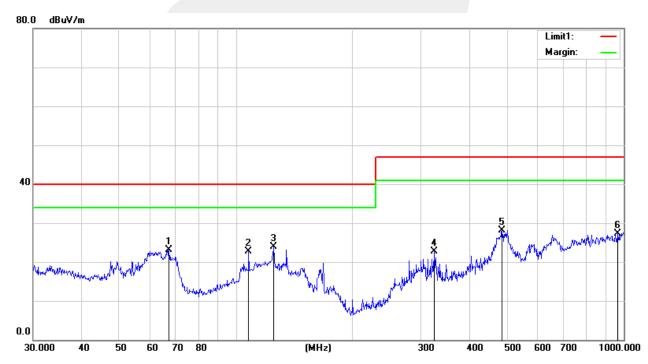


Temperature:	27.4 °C	Relative Humidity:	62%
Test Voltage:	DC 3.7V from battery	Phase:	Vertical
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode	2-1M worst mode)	

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
67.2022	47.33	-24.17	23.16	40.00	-16.84	QP
107.8876	41.29	-18.52	22.77	40.00	-17.23	QP
125.0066	41.43	-17.61	23.82	40.00	-16.18	QP
324.4560	36.81	-14.14	22.67	47.00	-24.33	QP
485.6093	37.38	-9.26	28.12	47.00	-18.88	QP
965.5421	27.36	-0.14	27.22	47.00	-19.78	QP

Remark:

1. Margin = Result (Result = Reading + Factor)–Limit



Shenzhen STS Test Services Co., Ltd.



(1GHz~25GHz) Restricted band and Spurious emission Requirements

GFSK Low Channel

				Antenna	Corrected	Emission				
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
	Low Channel (2402 MHz)									
3264.65	60.89	44.70	6.70	28.20	-9.80	51.09	74.00	-22.91	PK	Vertical
3264.65	51.36	44.70	6.70	28.20	-9.80	41.56	54.00	-12.44	AV	Vertical
3264.77	61.03	44.70	6.70	28.20	-9.80	51.23	74.00	-22.77	PK	Horizontal
3264.77	49.91	44.70	6.70	28.20	-9.80	40.11	54.00	-13.89	AV	Horizontal
4804.54	58.69	44.20	9.04	31.60	-3.56	55.13	74.00	-18.87	PK	Vertical
4804.54	49.86	44.20	9.04	31.60	-3.56	46.30	54.00	-7.70	AV	Vertical
4804.43	59.09	44.20	9.04	31.60	-3.56	55.53	74.00	-18.47	PK	Horizontal
4804.43	49.95	44.20	9.04	31.60	-3.56	46.39	54.00	-7.61	AV	Horizontal
5359.65	48.70	44.20	9.86	32.00	-2.34	46.36	74.00	-27.64	PK	Vertical
5359.65	40.25	44.20	9.86	32.00	-2.34	37.91	54.00	-16.09	AV	Vertical
5359.69	47.23	44.20	9.86	32.00	-2.34	44.89	74.00	-29.11	PK	Horizontal
5359.69	38.06	44.20	9.86	32.00	-2.34	35.72	54.00	-18.28	AV	Horizontal
7205.91	53.76	43.50	11.40	35.50	3.40	57.16	74.00	-16.84	PK	Vertical
7205.91	44.01	43.50	11.40	35.50	3.40	47.41	54.00	-6.59	AV	Vertical
7205.90	54.82	43.50	11.40	35.50	3.40	58.22	74.00	-15.78	PK	Horizontal
7205.90	44.68	43.50	11.40	35.50	3.40	48.08	54.00	-5.92	AV	Horizontal



Page 26 of 69

Report No.: STS1808038W04

GFSK Mid Channel

				Antenna	Corrected	Emission					
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector		
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Comment	
	Mid Channel (2441 MHz)										
3264.78	61.42	44.70	6.70	28.20	-9.80	51.62	74.00	-22.38	PK	Vertical	
3264.78	51.10	44.70	6.70	28.20	-9.80	41.30	54.00	-12.70	AV	Vertical	
3264.72	61.43	44.70	6.70	28.20	-9.80	51.63	74.00	-22.37	PK	Horizontal	
3264.72	51.31	44.70	6.70	28.20	-9.80	41.51	54.00	-12.49	AV	Horizontal	
4882.42	59.33	44.20	9.04	31.60	-3.56	55.77	74.00	-18.23	PK	Vertical	
4882.42	49.85	44.20	9.04	31.60	-3.56	46.29	54.00	-7.71	AV	Vertical	
4882.46	58.51	44.20	9.04	31.60	-3.56	54.95	74.00	-19.05	PK	Horizontal	
4882.46	49.61	44.20	9.04	31.60	-3.56	46.05	54.00	-7.95	AV	Horizontal	
5359.59	49.05	44.20	9.86	32.00	-2.34	46.71	74.00	-27.29	PK	Vertical	
5359.59	39.05	44.20	9.86	32.00	-2.34	36.71	54.00	-17.29	AV	Vertical	
5359.80	47.43	44.20	9.86	32.00	-2.34	45.09	74.00	-28.91	PK	Horizontal	
5359.80	38.62	44.20	9.86	32.00	-2.34	36.28	54.00	-17.72	AV	Horizontal	
7313.89	53.73	43.50	11.40	35.50	3.40	57.13	74.00	-16.87	PK	Vertical	
7313.89	43.69	43.50	11.40	35.50	3.40	47.09	54.00	-6.91	AV	Vertical	
7313.90	53.87	43.50	11.40	35.50	3.40	57.27	74.00	-16.73	PK	Horizontal	
7313.90	43.51	43.50	11.40	35.50	3.40	46.91	54.00	-7.09	AV	Horizontal	

Shenzhen STS Test Services Co., Ltd.



GFSK High Channel

				Antenna	Corrected	Emission				
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Comment
	High Channel (2480 MHz)									
3264.69	61.46	44.70	6.70	28.20	-9.80	51.66	74.00	-22.34	PK	Vertical
3264.69	51.82	44.70	6.70	28.20	-9.80	42.02	54.00	-11.98	AV	Vertical
3264.68	60.85	44.70	6.70	28.20	-9.80	51.05	74.00	-22.95	PK	Horizontal
3264.68	50.09	44.70	6.70	28.20	-9.80	40.29	54.00	-13.71	AV	Horizontal
4960.30	58.53	44.20	9.04	31.60	-3.56	54.97	74.00	-19.03	PK	Vertical
4960.30	49.25	44.20	9.04	31.60	-3.56	45.69	54.00	-8.31	AV	Vertical
4960.46	58.21	44.20	9.04	31.60	-3.56	54.65	74.00	-19.35	PK	Horizontal
4960.46	49.23	44.20	9.04	31.60	-3.56	45.67	54.00	-8.33	AV	Horizontal
5359.66	48.88	44.20	9.86	32.00	-2.34	46.54	74.00	-27.46	PK	Vertical
5359.66	40.40	44.20	9.86	32.00	-2.34	38.06	54.00	-15.94	AV	Vertical
5359.67	48.33	44.20	9.86	32.00	-2.34	45.99	74.00	-28.01	PK	Horizontal
5359.67	38.95	44.20	9.86	32.00	-2.34	36.61	54.00	-17.39	AV	Horizontal
7439.96	54.42	43.50	11.40	35.50	3.40	57.82	74.00	-16.18	PK	Vertical
7439.96	44.03	43.50	11.40	35.50	3.40	47.43	54.00	-6.57	AV	Vertical
7439.72	54.30	43.50	11.40	35.50	3.40	57.70	74.00	-16.30	PK	Horizontal
7439.72	44.56	43.50	11.40	35.50	3.40	47.96	54.00	-6.04	AV	Horizontal

Note:

3)

- 1) Scan with GFSK, π/4-DQPSK,8DPSK,the worst case is GFSK Mode
- 2) Factor = Antenna Factor + Cable Loss Pre-amplifier.

Emission Level = Reading + Factor

The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency

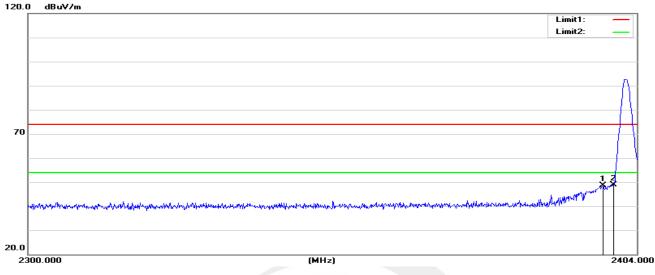
emission is mainly from the environment noise.

Shenzhen STS Test Services Co., Ltd.



Band edge Requirements

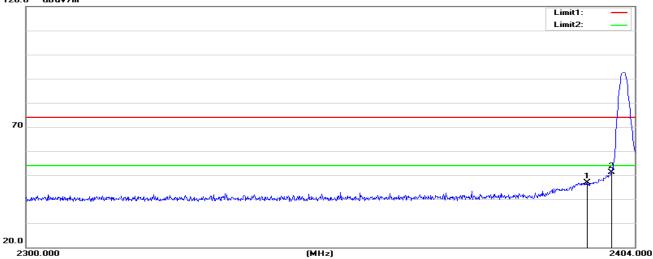
GFSK-Low Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2398.176	50.28	-1.70	48.58	74.00	-25.42	peak
2	2400.000	50.45	-1.69	48.76	74.00	-25.24	peak

Vertical

120.0 dBu∀/m



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2395.784	48.54	-1.73	46.81	74.00	-27.19	peak
2	2400.000	52.83	-1.69	51.14	74.00	-22.86	peak

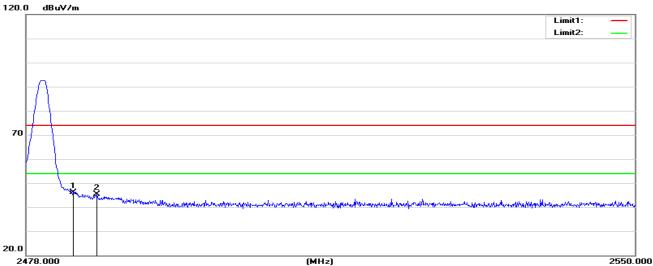
Shenzhen STS Test Services Co., Ltd.



Page 29 of 69

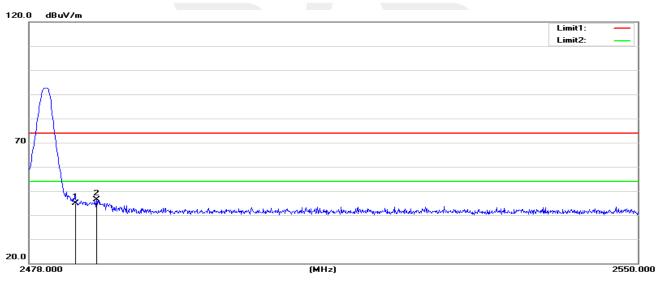
Report No.: STS1808038W04

GFSK-High Horizontal



No.	Frequency	Reading	Correct	Correct Result		Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	47.44	-1.20	46.24	74.00	-27.76	peak
2	2486.352	46.66	-1.19	45.47	74.00	-28.53	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	45.98	-1.20	44.78	74.00	-29.22	peak
2	2485.920	47.60	-1.19	46.41	74.00	-27.59	peak

Note: GFSK, π /4-DQPSK,8DPSK of the nohopping and hopping mode all have been test, the worst case is GFSK of the nohopping mode, this report only show the worst case.

Shenzhen STS Test Services Co., Ltd.



4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

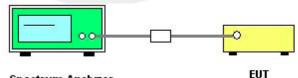
Spectrum Parameter	Setting			
Detector	Peak			
Start/Stop Frequency	30 MHz to 10th carrier harmonic			
RB / VB (emission in restricted band)	100 KHz/300 KHz			
Trace-Mode:	Max hold			

For Band edge

Spectrum Parameter	Setting			
Detector	Peak			
Stort/Stop Eroguopou	Lower Band Edge: 2300– 2403 MHz			
Start/Stop Frequency	Upper Band Edge: 2479 – 2500 MHz			
RB / VB (emission in restricted band)	100 KHz/300 KHz			
Trace-Mode:	Max hold			

Remark : Hopping on and Hopping off mode all have been tested, only worst case hopping off is reported.

4.3 TEST SETUP



Spectrum Analyzer

The EUT is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. Make the measurement with the spectrum analyzer's resolution bandwidth(RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

4.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-00/39/78 CH	Test Voltage:	DC 3.7V

00 CH

	RF 50 Ω	AC	SE	NSE:INT	AL	IGN AUTO		07:09:	38 PM Oct 16, 2
nter Fre	eq 12.51500	1	PNO: Fast 😱 Gain:Low	Trig: Free Run #Atten: 30 dB	1	Avg Type:	Log-Pwr	1	RACE 1 2 3 4 TYPE MWAWA DET P P P P
	Ref Offset 0.5 Ref 7.91 dB							Mkr1 2.4 -2	02 2 GH .095 dB
9	•								
1									-22.10
1									
1	2		\ <mark>3</mark>						
1	Q ⁻			فالمعادية ويتأويه والمراقي	e di danta a	and the second second			
1									
int 30 Mi	Hz		#\/B\4	/ 300 kHz			Swe	Stop eep 2.39 s	25.00 G (40001 p
	00 kHz		#VDV						
es BW 1	SCL	X 2.402.2.CHz	Y	FUNCTIO	N FUNCI	TION WIDTH		UNCTION VALUE	
es BW 1		X 2.402 2 GHz 3.305 4 GHz 7.532 9 GHz 24.400 1 GHz	-2.095 dl -56.036 dl -55.585 dl -47.858 dl	FUNCTIO Bm Bm Bm	N FUNC	TION WIDTH		-	
es BW 1 N 1 N 1 N 1 N 1 N 1	SCL f f f	2.402 2 GHz 3.305 4 GHz 7.532 9 GHz	-2.095 dl -56.036 dl -55.585 dl	FUNCTIO Bm Bm Bm	N FUNC	(ION WIDTH		-	
es BW 1 NODE TRE N 1 N 1 N 1	SCL f f f	2.402 2 GHz 3.305 4 GHz 7.532 9 GHz	-2.095 dl -56.036 dl -55.585 dl	FUNCTIO Bm Bm Bm	N FUNC	TION WIDTH		-	
es BW 1 N 1 N 1 N 1 N 1	SCL f f f	2.402 2 GHz 3.305 4 GHz 7.532 9 GHz	-2.095 dl -56.036 dl -55.585 dl	FUNCTIO Bm Bm Bm	FUNC	TION WIDTH		-	

39 CH

ilent Spect	rum Ana	lyzer - Swept S/	٨								
RL	RF	50 Ω AC			SENSE:INT		ALI	GN AUTO		07:1	4:35 PM Oct 16, 2
enter F	req 1	2.515000	F	'NO: Fast Gain:Low	Trig: Fre #Atten: \$	e Run 80 dB		Аvg Тур	e: Log-Pwr		TRACE 1 2 3 4 TYPE M WWW DET P P P P
	Ref	Offset 0.5 dB									440 9 GI
) dB/div	Ref	9.22 dBm			1					-	0.781 dB
.78		<u>)</u> 1									
0.8											
0.8											-20.78
1.8											
		<u>2</u>	3								
		and all a second a		والمقدرين ومرجعاتها			. Internation				
1.8 				and the second second second							
0.8											
art 30 I tes BW		kHz		#VB	W 300 kH	lz			Sw	Sto reep 2.39	op 25.00 G s (40001 p
R MODE T			×	Y		INCTION	FUNCT	ION WIDTH		FUNCTION VALUE	
N ?	1 f 1 f		2.440 9 GHz 2.501 4 GHz	-0.781 -55.667							
I N '	1 f 1 f		6.157 6 GHz	-55.968	dBm						
N I	IT		24.641 1 GHz	-47.674	авт						
N '											
)											
								STATUS			



78 CH

gilent Spect	rum Ana RF	<mark>lyzer - Swept S</mark> 50 Ω A			SENSE:INT	۵ ا	LIGNAUTO		07:12:	15 PM Oct 16, 20
		2.515000	000 GHz P	NO: Fast 🕞	Tui uu Eusaa	Run	Avg Type:	Log-Pwr		TYPE MWMMM DET P P P F
I0 dB/div		offset 0.5 dE 8.21 dBm							Mkr1 2.4 -1	80 2 GH 790 dBr
.og 1.79		1								
11.8										-21.79 dž
31.8										
41.8		^ <u>2</u>	<u>_</u>							
51.8		2		والمتعادية والمتعادية	ألافا العبر ويعرب الملاف	land a line of the			and the	
51.8 71.8			,		And an and a second					
81.8										
tart 30 I Res BW		(Hz		#VB	W 300 kHz			Swe	Stop eep 2.39 s) 25.00 GH (40001 pt
KR MODE T			×	Y		CTION FUNC	TION WIDTH	F	UNCTION VALUE	
2 N '	l f		2.480 2 GHz 2.643 7 GHz	-1.790 -55.855	dBm					
4 N ⁴	l f		5.954 1 GHz 24.716 6 GHz	-55.758 -47.792						
6 7										
8 9										
0 1 2										
G							STATUS			
			1			_				



=

Shenzhen STS Test Services Co., Ltd.

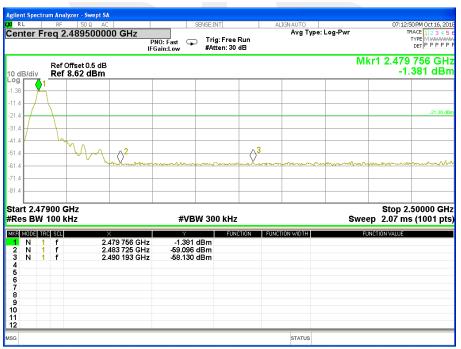


For Band edge

00 CH

		/zer - Swept SA								
enter F	_R ⊧ req 2.	50 Ω AC 35150000	F	'NO: Fast Gain:Low	SENSE:INT Trig: Free #Atten: 30	Run dB	ALIGN AUTO Avg Type:	-	T	3PM Oct 16, 2D RACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
0 dB/div		ffset 0.5 dB 8 .23 dBm						IV	1kr1 2.401 -1.	970 GH 770 dBr
-0g -1.77										(
11.8 21.8										-21.77 d
31.8										0
41.8 51.8								۵	^ 2	Ň
51.8 Alanda 71.8	when had a	aumeselwaren	am-Marchard Mayo	elihan har	hand the law of the second	hadden son day	walleshommen	warment termine		agenerad .
81.8										
tart 2.30 Res BW				#VB	W 300 kHz			Sw	Stop 2. eep 9.87 ms	40300 GH s (1001 pt
KR MODE TR		×		Y		CTION F	UNCTION WIDTH		FUNCTION VALUE	
1 N 1 2 N 1 3 N 1 4 5 6	f	2.3	101 970 GHz 190 022 GHz 199 910 GHz	-1.770 -59.600 -43.849	dBm					
7 8 9 0 1										
2							STATUS			

78 CH



╡



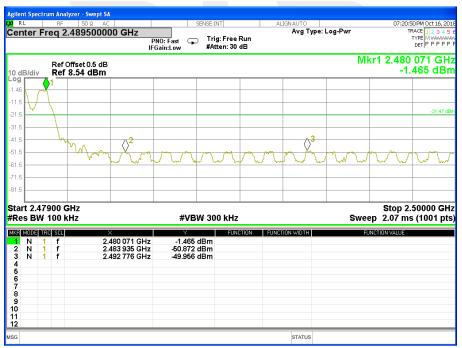


For Hopping Band edge

00 CH

	RF 50	Ω AC		SENSE	INT	ALIGNAUTO		07:18:2	8PM Oct 16
		500000 GH	Z PNO: Fas IFGain:Lo		rig: Free Run Atten: 30 dB		e: Log-Pwr	TR	ACE 1 2 3 YPE MWW DET P P F
B/div	Ref Offset (Ref 8.87 (N	lkr1 2.402 -1.1	897 (133 d
									-21.
<u> </u>								- 2	
							40.444		MARA
south-	man manakanethan	- Martin Martin		mound	mounder	mann	www.www.www	เหมากการภาษาเ	որողուն
-									
-									
t 2.30								Stop 2.4 eep 9.87 ms	
s BW	1000 GHZ			#VBW 3	00 kHz		SWe	eep a.or ms	(
MODE TI	100 kHz RC SCL	×		Y	FUNCTION	FUNCTION WIDTH		EUNCTION VALUE	(1001
Mode Ti N 1 N 1	100 kHz RC SCL	× 2.402 897 2.390 022 2.399 910	GHz -		FUNCTION	FUNCTION WIDTH		•	(1001
Mode Ti N 1 N 1	100 kHz RC SCL 1 f 1 f	2.402 897 2.390 022	GHz -	-1.133 dBm 53.958 dBm	FUNCTION	FUNCTION WIDTH		•	(
MODE TI N 1 N 1	100 kHz RC SCL 1 f 1 f	2.402 897 2.390 022	GHz -	-1.133 dBm 53.958 dBm	FUNCTION	FUNCTION WIDTH		•	(1001

78 CH



П



Page 35 of 69

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	π/4-DQPSK(2Mbps)– 00/39/78 CH	Test Voltage:	DC 3.7V

RL	RF	50 Q AC		SEN	ISE:INT	ALIGN	IAUTO		07:40:3	2 PM Oct 16, 2	
enter	er Freq 12.515000000 GHz				Trig: Free Run #Atten: 30 dB				TRACE 1 2 3 4 5 TYPE M WWWW DET P P P F		
dB/div		offset 0.5 dB 4.03 dBm							Mkr1 2.40 -5.9	02 2 GI 970 dB	
97		1								*	
										-25.97	
		$\langle \rangle^2$	3				ana ana ana ang ang ang ang ang ang ang	المعالفين معرف) 	
art 30 s BW	MHz 3.0 MH	Iz		#VBW	300 kHz			Swe	Stop ep 2.39 s (25.00 G 40001 p	
-	TRC SCU	>	2.402 2 GHz	Y -5.970 dB	FUNCTION	FUNCTION	WIDTH	FL	JNCTION VALUE		
N N N	1 f 1 f 1 f		2.402 2 GH2 3.044 5 GHz 6.228 2 GHz 24.481 2 GHz	-55.999 dB -56.073 dB -47.353 dB	lm Im						

00 CH

39 CH

-	rum An RF		AC	SENSE:II	T	ALIGN AUTO		07:42:3	7 PM Oct 1
ter F	req ′	12.5150			g:FreeRun ten:30dB	Avg Tyj	e: Log-Pwr	Т	ACE 1 2 YPE MWA DET P P I
3/div		Offset 0.5 5.04 dE						Mkr1 2.44 -4.9	10 9 (959 d
<u> </u>	(1							
									-24
<u> </u>		\Diamond^2	3						اللغر ومحاداته
<u> </u>									
t 30 F BW 3	MHz 3.0 M	Hz		#VBW 30	0 kHz		Sw	Stop /eep 2.39 s (25.00 40001
	RC SOL		×	Y	FUNCTION	FUNCTION WIDTH		FUNCTION VALUE	
N Ý	1 f 1 f 1 f		2.440 9 GHz 2.631 2 GHz 5.657 0 GHz 21.609 7 GHz	-4.959 dBm -55.947 dBm -56.329 dBm -47.803 dBm					
N 1									
N									
N									



78 CH

RL		RF	<mark>/zer - Swept</mark> 50 ב /	AC		SENSE:INT		ALIG	NAUTO			:14 PM Oct 16, 2
enter	Fre	eq 12	2.515000		PNO: Fast Gain:Low	⊖ Trig: Fre #Atten: 3	e Run 0 dB		Avg Type:	Log-Pwr		TYPE M WAAAA DET P P P P
) dB/di			ffset 0.5 di 2.51 dBm								Mkr1 2.4 -7	179 6 GI .491 dB
.49		- {	1									*
7.5												
7.5												-27.49
.5			~ 2		. 2							
.5			$\sum_{i=1}^{n}$		Σ				and the second			
.5												
.5												
7.5							-					
art 30 es BW			z		#VB	W 300 kH	z			Sw	Stop eep 2.39 s	o 25.00 G (40001 p
R MODE				Х	Y		NCTION	FUNCTIO	N WIDTH	l	UNCTION VALUE	
N 2 N	1	f		2.479 6 GHz 3.023 9 GHz	-7.491 -55.729							
	1	f		7.548 5 GHz	-55.927	dBm						
3 N				24.992 5 GHz	-47.376	авт						
3 N 4 N	1											
8 N 1 N 5	1	1										
3 N 4 N 5 7	1											
3 N 4 N 5 7 8 9	1											
3 N 4 N 5 7 8 9 0	1											
3 N 4 N 5 7 8	1											



Shenzhen STS Test Services Co., Ltd.

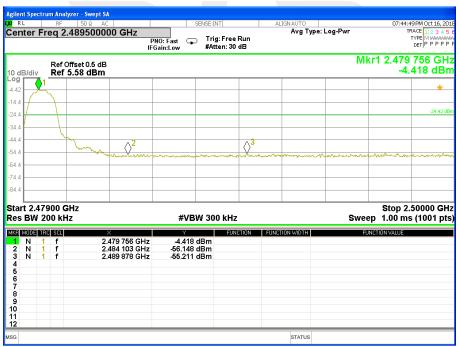


For Band edge

00 CH

	rum Analyzer -									
Center F	req 2.351	οΩ AC 500000		PNO: Fast G	SENSE:INT Trig: Free #Atten: 30		ALIGN AUTO Avg Type:	-	TF	7 PM Oct 16, 20 RACE 1 2 3 4 5 TYPE M WWWM DET P P P P P
10 dB/div	Ref Offset Ref 5.54							N	lkr1 2.402 -4.	073 GH 458 dBr
4.46										*
24.5										-24.46 dE
34.5										
44.5 54.5 	بمرسالاللاب المسيم	Margar Anna Part	-	hand	n-len-manulo	- Martin Mart		un more and		- annound
4.5										
74.5 B4.5										
tart 2.30 es BW 1	0000 GHz 1.0 MHz			#VE	300 kHz			Swe	Stop 2. eep 1.00 ms	40300 GH s (1001 pt
ikr mode ti <mark>1</mark> n 1	1 f		2 073 GHz		dBm	CTION FU	NCTION WIDTH		FUNCTION VALUE	
	1 f 1 f		0 022 GHz 9 910 GHz							
5 6										
7 8 9										
ő										
1										

78 CH



╡



For Hopping Band edge

00 CH

	um Analyzer - Sv							
enter Fr			PNO: Fast Gain:Low	ENSE:INT Trig: Free Run #Atten: 30 dB	ALIGNAUTO Avg Typ	e: Log-Pwr	TF	3PM Oct 16, 20 RACE 1 2 3 4 9 TYPE M WARWA DET P P P P P
dB/div	Ref Offset 0 Ref 6.92 (М	kr1 2.403 -3.	000 GH 085 dBi
08								*
3.1								-23.09
.1								
.1								Ĭ
1	home concele	- Andrewski - Marchae	****	hand hard hard hard hard hard hard hard har	and the second s		an marine and	and when the second
.1								
3.1								
art 2.30 es BW 1	000 GHz .0 MHz		#VB	W 300 kHz		Swe	Stop 2. ep 1.00 ms	40300 GI ; (1001 pi
R MODE TR		×	Y	FUNCTION	FUNCTION WIDTH	E	UNCTION VALUE	
N 1 N 1 N 1		2.403 000 GHz 2.390 022 GHz 2.399 910 GHz	-3.085 -50.360 -39.686	dBm				
2								
1					STATUS			

78 CH

RL	RF	50 Ω AC		SENSE:INT	ALIGN AUT		07:38:55 PM Oct 16,
nter F	req 2.48	39500000 GH		Trig: Free Ru #Atten: 30 dB	n [–]	Type: Log-Pwr	TRACE 1234 TYPE M WAAW DET P P P F
IB/div		et 0.5 dB 3 dBm				Μ	lkr1 2.479 756 G -4.568 dE
							*
							-24.51
	h	2			3		
	24	mannah	- Martin and and a start and a start a	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man	man	
<u> </u>							
	900 GHz 200 kHz	!	#1	/BW 300 kHz		Swe	Stop 2.50000 G ep 1.00 ms (1001 j
MODE TR	f	× 2.479 756		68 dBm	IN FUNCTION WID	Н	FUNCTION VALUE
N 1 N 1		2.483 956 2.490 928		97 dBm 27 dBm			



Page 39 of 69

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) -00/39/78 CH	Test Voltage:	DC 3.7V

00 CH

RL		RF 50 Q	2 AC	SE	ENSE:INT	AL	IGNAUTO		07:57:29	PM Oct 16, 20
enter	r Fre		000000 GHz	PNO: Fast 🖵 Gain:Low	Trig: Free Ru #Atten: 30 dB		Avg Type:	Log-Pwr	TR/ T	ACE 1 2 3 4 5 YPE M WARAN DET P P P P F
) dB/di		Ref Offset 0. Ref_5.44 d							Mkr1 2.40 -4.5	02 2 GF 560 dB
.56		1								*
4.6										-24.56 d
4.6									∧4	
4.6		\Diamond^2	3		the second second second second second	and a second second				
1.6										
4.6										
art 3	0 MI	47								25.00 GH
	N 3.0) MHz		#VBW	V 300 kHz			SW	eep 2.39 s (4000 i h
E MOD N N N N N N N N	_) MHz	X 2.402 2 GHz 3.266 7 GHz 5.406 7 GHz 21.663 4 GHz	#VBW -4.560 d -55.848 d -55.880 d -47.940 d	FUNCTIO IBm IBm IBm		ION WIDTH		eep 2.39 s (4000 T P
ESBU 1000 1 N 2 N 3 N	E TRC 1 1) MHz SCL f f	2.402 2 GHz 3.266 7 GHz 5.406 7 GHz	-4.560 d -55.848 d -55.880 d	FUNCTIO IBm IBm IBm	N FUNCT	ION WIDTH		• •	+0001 p

39 CH

		nalyzer - Sw								
nter F	R Freq		AC 00000 GHz		SENSE:INT		ALIGNAUTO Avg Type	Log-Pwr		37 PM Oct 16, RACE 1 2 3
			F	NO: Fast Gain:Low	Trig: Free #Atten: 30					DET P P P
dB/div		f Offset 0.0 ef 6.17 di							Mkr1 2.4	40 9 G 835 di
		1	5m							*
3										
⊧—										-23.8
3 										
		2	0	3				a. In militar	الم الحديثة الم	
3 3 utanin		d Marine and								
3										
8										
ITT 30	MHz								Stop	25.00 0
s BW	3.0 N	AHz		#VB	W 300 kHz	:		Sw	reep 2.39 s	(40001
MODE 1	TRC SC	L	× 2.440 9 GHz	-3.835		CTION FUN	CTION WIDTH		FUNCTION VALUE	
N	1 f 1 f		2.669 3 GHz 7.398 6 GHz	-55.960	dBm					
	1 f		24.689 7 GHz	-47.309						
							STATUS			



78 CH

RL	ectrur	n Analy RF	zer - Swept S			SENSE:INT		LIGNAUTO		08:01	:45 PM Oct 16, 2
enter	Fre	əq 12	.515000		PNO: Fast Gain:Low	Trig: Fre #Atten: 3	e Run 0 dB	Avg Type:	Log-Pwr		TRACE 1 2 3 4 TYPE MWAM DET P P P P
) dB/di			ffset 0.5 dE 2.47 dBm							Mkr1 2.4 -7	479 6 GI 1.531 dB
.53			1								*
7.5											
.5											-27.53
.5			•		3						
.5			\mathcal{I}	1.)°	1	minute and the second		ومعجل مستريك	Sand States	
1.5 1.5	land field							1			
.5											
7.5											
art 30	0 MI	47								Stor	p 25.00 G
es BV			z		#VB	W 300 KH	z		Sw	eep 2.39 s	6 (40001 p
-	_			X	Y		NCTION FUNC	TION WIDTH		FUNCTION VALUE	
_		f		2.479 6 GHz	-7.531						
1 N	1	f		3.261 1 GHz	-55.478						
1 N 2 N 3 N	1	f		7.466 7 GHz	-54.674	dBm					
N 2 N 3 N 4 N	1					dBm					
N 2 N 3 N 4 N 5	1	f		7.466 7 GHz	-54.674	dBm					
N 2 N 3 N 4 N 5	1	f		7.466 7 GHz	-54.674	dBm					
1 N 2 N 3 N 4 N 5 7 8	1	f		7.466 7 GHz	-54.674	dBm					
2 N 3 N 4 N 5 7 8 9 0	1	f		7.466 7 GHz	-54.674	dBm					
1 N 2 N 3 N 4 N 5 5 7 3 9 0 1	1	f		7.466 7 GHz	-54.674	dBm					
1 N 2 N 3 N 4 N 5 7 7 8 9	1	f		7.466 7 GHz	-54.674	dBm		STATUS			



Shenzhen STS Test Services Co., Ltd.

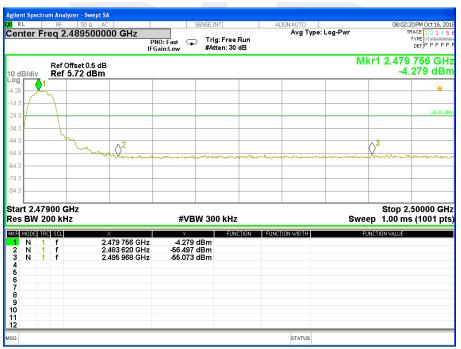


For Band edge

00 CH

		zer - Swept SA								
enter F	_R ⊧ req 2.3	50 Ω AC 35150000	00 GHz	PNO: Fast G	SENSE:INT Trig: Free I #Atten: 30	Run	IGN AUTO Avg Type:		TF	3PM Oct 16, 2 RACE 1 2 3 4 TYPE M WAW DET P P P P
) dB/div		ffset 0.5 dB 5.71 dBm						М	kr1 2.402 -4.	073 GI 276 dB
29										*
I.3										-24.29
1.3										
1.3 mitum		Man an an							a	man
.3										
1.3										
1.3										
art 2.30 es BW 1				#VE	3W 300 kHz			Swe	Stop 2. ep 1.00 ms	40300 G ; (1001 p
R MODE T			×	Y	FUNC	TION FUNCT	TION WIDTH	F	UNCTION VALUE	
N 1 2 N 1 3 N 1 4		2.3	402 073 GHz 390 022 GHz 399 910 GHz	-52.070	dBm					
5 7 3										
)										
2										

78 CH



╡



For Hopping Band edge

00 CH

	um Analyzer - Sv								
RL		Ω AC	9	ENSE:INT	AL	IGN AUTO AVG Type:	l e a Dum		0 PM Oct 16, 20
Senter Fr	eq 2.3515		PNO: Fast 😱 Gain:Low	Trig: Free Ru #Atten: 30 dE		Avg Type.	Log-P wi		DET P P P P P
0 dB/div	Ref Offset 0 Ref 7.08 c						M	kr1 2.403 -2.	000 GH 917 dBr
. og 2.92									*
12.9									1
2.9									-22.92
12.9									A:
12.9								^2	Ý
72.9				In the later of the later		and so and a	and more strategy the	Lowerman	monor
52.9									
2.9									
72.9 B2.9									
52.9									
tart 2.30 les BW 1			#VB\	N 300 kHz			Swe	Stop 2. ep 1.00 ms	40300 GH 6 (1001 pt
IKR MODE TR	C SCL	×	Y	FUNCTI	DN FUNC	TION WIDTH	FL	JNCTION VALUE	
1 N 1 2 N 1 3 N 1 4	f f f	2.403 000 GHz 2.390 022 GHz 2.399 910 GHz	-2.917 (-50.794 (-38.824 (dBm					
5 6									
7									
8 9									
10 1									
2									

78 CH



=



5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

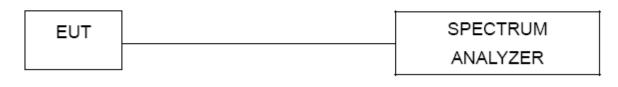
	FCC Part 15.247,Subpart C								
Section	Test Item	Limit	FrequencyRange (MHz)	Result					
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS					

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	1MHz
VB	1MHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 100KHz, VBW=100KHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Test Mode:	Hopping Mode-GFSK Mode	Test Voltage:	DC 3.7V

Number of Hopping Channel

79

Hopping channel

RL RF	50 Ω AC	SENSE:INT	ALIGNAUTO	07:16:05 PM Oct 16, 2
enter Freq 2.44	PN	D: Fast 😱 Trig: Fre Jin:Low #Atten: 3		g-Pwr TRACE 1 2 3 4 TYPE MWAAAA DET A A A A
0 dB/div Ref 9.5	set 0.5 dB 50 dBm			Mkr2 2.479 826 0 GF -1.42 dB
.og				2
10.5				
0.5				
0.5				
0.5				
0.5				
0.5				
0.5				
0.5				
tart 2.40000 GHz		#VBW 1.0 MH	lz	
tart 2.40000 GHz Res BW 1.0 MHz XF MODE TRC SCL 1 N 1 f 2 N 1 f			Z	
tart 2.40000 GHz Res BW 1.0 MHz R MODE TRC SCI 1 N 1 f 2 N 1 f 3 4	2 2.402 087 5 GHz	Y 1.81 dBm		Sweep 1.00 ms (1001 p
tart 2.40000 GHz Res BW 1.0 MHz Res	2 × 2.402 087 5 GHz	Y 1.81 dBm		Sweep 1.00 ms (1001 p
tart 2.40000 GHz Res BW 1.0 MHz BE MODE TRO SCI 1 N 1 f 2 N 1 f 3 4 5 6 6 7	2 × 2.402 087 5 GHz	Y 1.81 dBm		Sweep 1.00 ms (1001 p
tart 2.40000 GHz Res BW 1.0 MHz 88 M009 140 SCI 1 N 1 f 2 N 1 f 3 4 5 6 6 7 8 9	2 × 2.402 087 5 GHz	Y 1.81 dBm		Sweep 1.00 ms (1001 p
tart 2.40000 GHz Res BW 1.0 MHz 1 N 1 f 2 N 1 f 3	2 × 2.402 087 5 GHz	Y 1.81 dBm		Stop 2.48350 G Sweep 1.00 ms (1001 p FUNCTION VALUE

Shenzhen STS Test Services Co., Ltd.



6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

	F	CC Part 15.247,Subpart	С	
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

6.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW =1MHz/VBW =3MHz.
- c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
- d. Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to e. zero span.
- f. Measure the maximum time duration of one single pulse.
- g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
- \tilde{h} . Measure the maximum time duration of one single pulse.
- i. DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). Sothe dwell time is the time duration of the pulse times 3.37 x 31.6 = 106.6 within 31.6 seconds.
- j. DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So he dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds.
- k. DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



Report No.: STS1808038W04

6.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	DC 3.7V

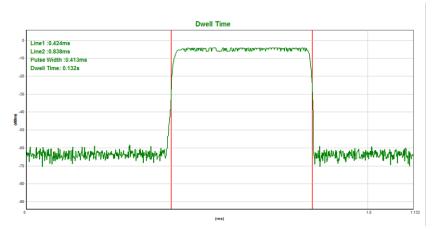
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
DH1	2441 MHz	0.413	0.132	0.4
DH3	2441 MHz	1.630	0.261	0.4
DH5	2441 MHz	2.920	0.311	0.4



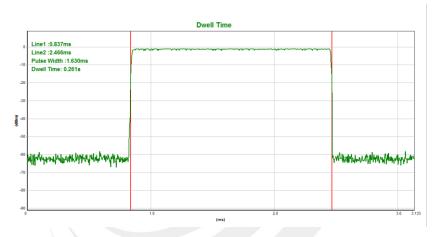
Shenzhen STS Test Services Co., Ltd.



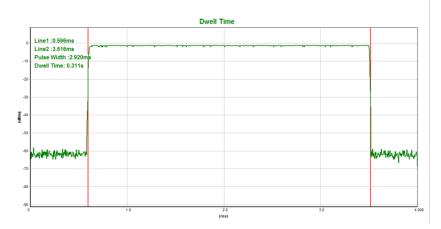
CH39-DH1



CH39-DH3



CH39-DH5



F

Shenzhen STS Test Services Co., Ltd.



Page 48 of 69

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	DC 3.7V

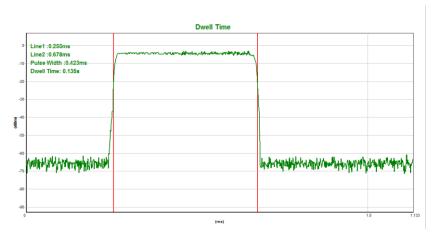
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
2DH1	2441 MHz	0.423	0.135	0.4
2DH3	2441 MHz	1.676	0.268	0.4
2DH5	2441 MHz	2.924	0.312	0.4



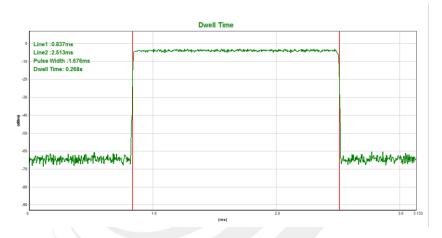
Shenzhen STS Test Services Co., Ltd.



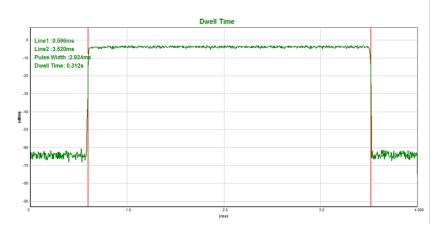
CH39-2DH1



CH39-2DH3



CH39-2DH5



Shenzhen STS Test Services Co., Ltd.



Page 50 of 69 Report No

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	DC 3.7V

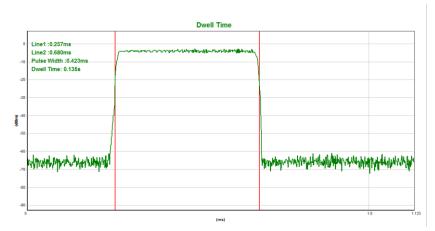
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
3DH1	2441 MHz	0.423	0.135	0.4
3DH3	2441 MHz	1.674	0.268	0.4
3DH5	2441 MHz	2.928	0.312	0.4



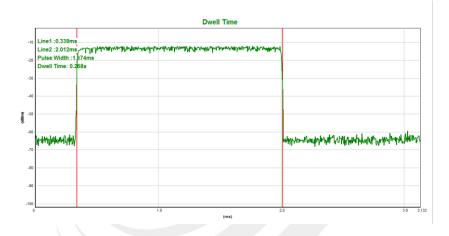
Shenzhen STS Test Services Co., Ltd.



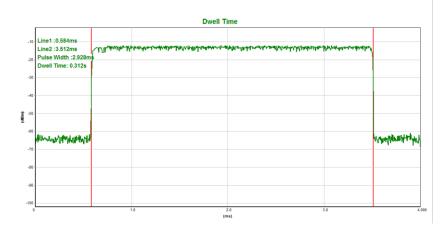
CH39-3DH1



CH39-3DH3



CH39-3DH5



Shenzhen STS Test Services Co., Ltd.





7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 20 dB Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.2 TEST PROCEDURE

- a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- c. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.3 TEST SETUP



Spectrum Analayzer

EUT

7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



7.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	DC 3.7V

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	0.999	0.908	Complies
2441 MHz	0.999	0.883	Complies
2480 MHz	1.005	0.885	Complies

For GFSK: Ch. Separation Limits: > 20dB bandwidth

RL RF	50 Ω AC		SENSE:INT	ALIGN AUTO		08:31:49 PM Oct 16, 2
rker 1 2.4019	927000000 GH		Trig: Free Run #Atten: 30 dB	Avg Type:	Log-Pwr	TRACE 1 2 3 4 TYPE M WANN DET P P P P
B/div Ref 7.	fset 0.5 dB .26 dBm				Mkr	2 2.402 926 GI -1.854 dB
4		()1		2		
,	(m		m		
,	~~~~		h		M.	
					~	~
						m
7						
nter 2.402500		#\	/BW 100 kHz		Sweep	Span 3.000 M 3.20 ms (1001 p
nter 2.402500 es BW 30 kHz		#\		FUNCTION WIDTH		Span 3.000 M 3.20 ms (1001 p monvalue
nter 2.402500 es BW 30 kHz X00e TRC SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p
nter 2.402500 es BW 30 kHz XODE TRC SCL	×	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p
nter 2.402500 es BW 30 kHz X00e TRC SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p
nter 2.402500 es BW 30 kHz MODE TRE SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p
nter 2.402500 es BW 30 kHz MODE TRE SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p
nter 2.402500 es BW 30 kHz X00e TRC SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p
nter 2.402500 es BW 30 kHz MODE TRE SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		Span 3.000 M 3.20 ms (1001 p Monvaue
nter 2.402500 es BW 30 kHz X00e TRC SCL	× 2.401 927	Y 7 GHz -2.	FUNCTION	FUNCTION WIDTH		3.20 ms (1001 p

CH00 -1Mbps

Shenzhen STS Test Services Co., Ltd.



CH39 -1Mbps

	2.4	40924000		PNO: Wide IFGain:Low		ree Run :30 dB		Type: Log-Pwr		TYPE M DET P
		f Offset 0.5 d		IFGail.Low					Mkr2 2.44	1 923
liv		f 8.36 dBr								1.655
				<u>\</u> 1				2		
			1	\sim			m	m		
		~	~~~~		h	\sim	~	5		
		~				~			~~~	
	\bigcap	1								
~	~									Y
		00 GHz							Spa	an 3.00
зw	30 k	Hz		7	#VBW 100 k	Hz		SI	weep 3.20	ns (10
	RC SCL		X			FUNCTION	FUNCTION WIDTH	1	FUNCTION VALUE	
1			2.440 924 G 2.441 923 G		1.64 dBm 1.66 dBm					

CH78 -1Mbps



╡

Shenzhen STS Test Services Co., Ltd.



Page 55 of 69

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
LOCT IVIONO.	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)	Test Voltage:	DC 3.7V

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	1.002	0.812	Complies
2441 MHz	0.996	0.813	Complies
2480 MHz	0.999	0.813	Complies

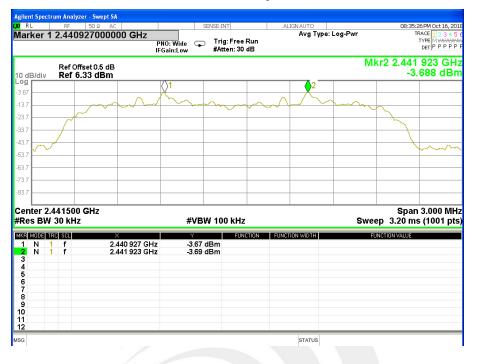
For π /4-DQPSK(2Mbps): Ch. Separation Limits: > two-thirds 20dB bandwidth

				NO: Wide 🔾 🖵 Gain:Low	Trig: Free #Atten: 30	dB				DET P P P
dB/div		Offset 0.5 dB 5.16 dBm						M	kr2 2.402 -3.	926 G 391 dl
				∆ 1			2			
		~~~~	hand	$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$	$\sim$	mm	~	
- 18		$\sim$							- Jag	
⊧—	-+									
	$\sqrt{-}$									~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Ē										
3 <b> </b>										
⊢										
	2 4025	00 GHz								3.000 N
				#VB	W 100 kHz			Swe	ep 3.20 ms	5 (1001
es Bl	N 30 ki									
es B1	A/30 ki		× 401 924 GHz	Y		CTION FUNC	TION WIDTH	EL.	JNCTION VALUE	
es Bl	A/30 ki	2.	× 401 924 GHz 402 926 GHz	¥ -4.85 -3.39	dBm	CTION FUNC	TION WIDTH	a a a a a a a a a a a a a a a a a a a	UNCTION VALUE	
es Bi	N 30 ki TRC SCL 1 f	2.	401 924 GHz	Y -4.85	dBm	CTION FUNC	TION WIDTH	F	JNCTION VALUE	
es Bi Mode N	N 30 ki TRC SCL 1 f	2.	401 924 GHz	Y -4.85	dBm	CTION FUNC	TION WIDTH	F	UNCTION VALUE	
es Bi Mode N	N 30 ki TRC SCL 1 f	2.	401 924 GHz	Y -4.85	dBm	CTION FUNC	TION WIDTH	F	UNCTION VALUE	
es Bi Mode N	N 30 ki TRC SCL 1 f	2.	401 924 GHz	Y -4.85	dBm	CTION FUNC	TION WIDTH	F	UNCTION VALUE	

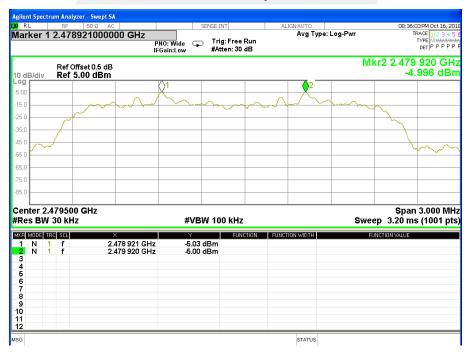
### CH00 -2Mbps



#### CH39 -2Mbps



#### CH78 -2Mbps



Shenzhen STS Test Services Co., Ltd.



Page 57 of 69

Report No.: STS1808038W04

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	DC 3.7V

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	1.002	0.804	Complies
2441 MHz	0.999	0.805	Complies
2480 MHz	1.008	0.805	Complies

For 8DPSK(3Mbps):Ch. Separation Limits: > two-thirds 20dB bandwidth

gilent Spectrum Ana				
RL RF	50 Ω AC	SENSE:INT	ALIGN AUTO Avg Type: Log-F	08:37:03 PM Oct 16, 2 Pwr TRACE 1 2 3 4
	P	NO: Wide 😱 Trig: Free l Gain:Low #Atten: 30	Run	TYPE M WWW. DET P P P
dB/div Ref	Offset 0.5 dB 5.14 dBm			Mkr2 2.402 926 GI -3.375 dB
.86		()1	2	
4.9		m		$\sim$
4.9	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		Ŭ V	m ly
4.9				
4.9				
4.9				
4.9				
4.9				
enter 2.40250				Span 3.000 M
Res BW 30 kl	Hz	#VBW 100 kHz		Sweep 3.20 ms (1001 p
KR MODE TRC SCL	Х		TION FUNCTION WIDTH	FUNCTION VALUE
1 N 1 f 2 N 1 f	2.401 924 GHz 2.402 926 GHz	-4.83 dBm -3.37 dBm		
3				
4 5 6				
6 7				
8				
9 0				
1				
G				
			STATUS	

### CH00 -3Mbps

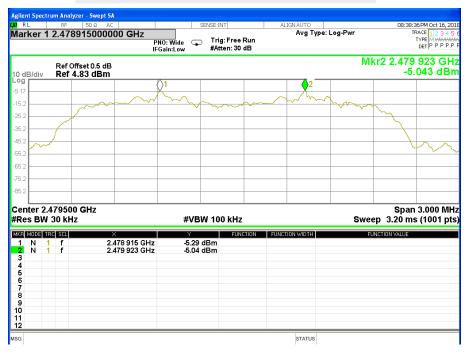
Shenzhen STS Test Services Co., Ltd.



# CH39 -3Mbps

		SENSE:INT	ALIGN AUTO Avg Type: Log-F	08:37:40 PM TRACE
r 1 2.440924000	PNO: Wide IFGain:Low	) Trig: Free Run #Atten: 30 dB	Avg Type. Log-	TYPE
Ref Offset 0.5 di				Mkr2 2.441 92 -3.611
	<u> </u>		<b>A</b> 2	
		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
~				
2.441500 GHz W 30 kHz	#VB	W 100 kHz		Span 3.0 Sweep 3.20 ms (10
TRC SCL	X Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
	2.440 924 GHz -3.58	dBm		
1 f :	2.441 923 GHz -3.62	dBm		

CH78 -3Mbps



╡



8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 15.247,Subpart C						
Section	Test Item	Limit	FrequencyRange (MHz)	Result		
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS		

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.3 TEST SETUP

EUT	SPECTRUM
	ANALYZER

8.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



Report No.: STS1808038W04

8.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.908	PASS
2441 MHz	0.883	PASS
2480 MHz	0.885	PASS

CH00 -1Mbps



Shenzhen STS Test Services Co., Ltd.



CH39 -1Mbps



CH78 -1Mbps



Shenzhen STS Test Services Co., Ltd.



Page 62 of 69

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth(MHz)	Result
2402 MHz	1.218	PASS
2441 MHz	1.220	PASS
2480 MHz	1.220	PASS

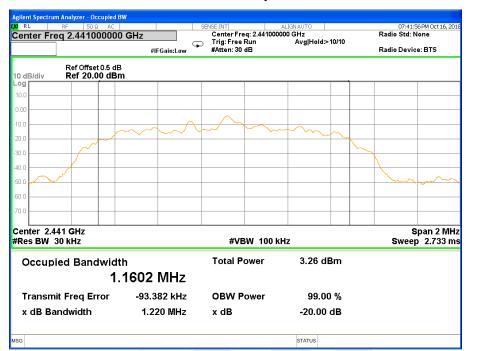
CH00 -2Mbps



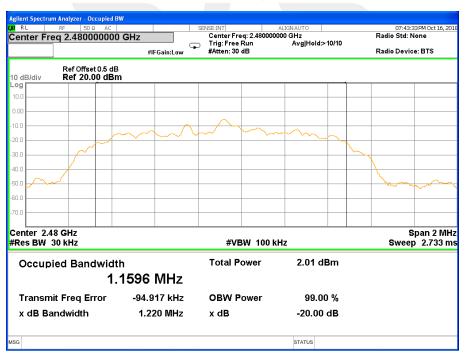
Shenzhen STS Test Services Co., Ltd.



CH39 -2Mbps



CH78 -2Mbps



Shenzhen STS Test Services Co., Ltd.



Page 64 of 69

Report No.: STS1808038W04

Temperature:	25 ℃	Relative Humidity:	50%
	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	DC 3.7V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.206	PASS
2441 MHz	1.207	PASS
2480 MHz	1.208	PASS

CH00 -3Mbps

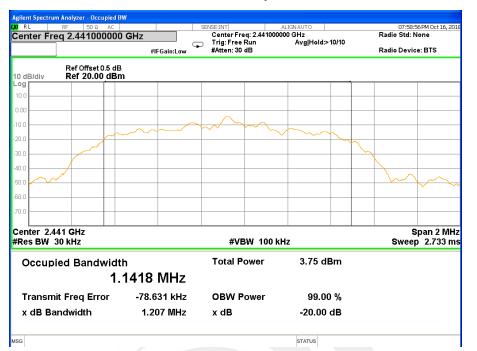
RL RF 50Ω AC		SENSE:INT	ALIGNAUTO	07:56:47 PM Oct 16, 20
enter Freq 2.40200000	GHz	Center Freq: 2.402000		Radio Std: None
	#IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Hold:>10/10	Radio Device: BTS
Ref Offset 0.5 dB dB/div Ref 20.00 dBn				
a let				
.0				
0				
		where the second	~	
	~~~~			
				<u></u>
				$\lambda \sim \sim$
0				
0				
nter 2.402 GHz				Span 2 Mi
es BW 30 kHz		#VBW 100 k	Hz	Sweep 2.733 r
Occupied Bandwidt	h	Total Power	2.41 dBm	
1.	1447 MHz			
Transmit Freq Error	-66.574 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.206 MHz	x dB	-20.00 dB	
	1.200 MHZ	X GD	-20.00 UB	

Shenzhen STS Test Services Co., Ltd.

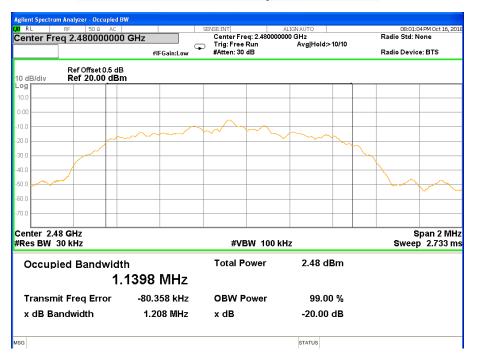
=#



#### CH39 -3Mbps



CH78 -3Mbps



Shenzhen STS Test Services Co., Ltd.



# 9. OUTPUT POWER TEST

# 9.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247	Outout	1 W or 0.125W		
(a)(1)&(b)(1)	Output Power	if channel separation > 2/3 bandwidthprovided thesystems operatewith an output power no greater than125 mW(20.97dBm)	2400-2483.5	PASS

#### 9.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Meter

#### 9.3 TEST SETUP

EUT	Power meter	

### 9.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.



Report No.: STS1808038W04

### 9.5 TEST RESULTS

Temperature:	<b>25</b> ℃	Relative Humidity:	60%
Test Voltage:	DC 3.7V		

GFSK(1Mbps)					
Test Channel	Frequency	Conducted	Output Power	LIMIT	
	(MHz)	Peak (dBm) AVG (dBm)		dBm	
CH00	2402	0.22	-4.21	30	
CH39	2441	0.92	-3.84	30	
CH78	2480	-1.08	-5.67	30	

Note: the channel separation >20dB bandwidth

π/4QPSK(2Mbps)					
Test Channel	Frequency	Conducted	Output Power	LIMIT	
Test Channer	(MHz) Peak (dBm) AVG (dBm)		dBm		
CH00	2402	-2.28	-6.49	20.97	
CH39	2441	-1.28	-5.91	20.97	
CH78	2480	-3.78	-8.34	20.97	

Note: the channel separation >2/3 20dB bandwidth

8DPSK(3Mbps)					
Test Channel	Frequency	Conducted	Output Power	LIMIT	
Test Channer	(MHz)	Peak (dBm)	AVG (dBm)	dBm	
CH00	2402	-2.08	-6.83	20.97	
CH39	2441	-1.18	-5.62	20.97	
CH78	2480	-3.38	-7.79	20.97	

Note: the channel separation >2/3 20dB bandwidth

Shenzhen STS Test Services Co., Ltd.



Page 68 of 69

# 10. ANTENNA REQUIREMENT

### **10.1 STANDARD REQUIREMENT**

15.203 requirement: For intentional device, according to 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.

# 10.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.

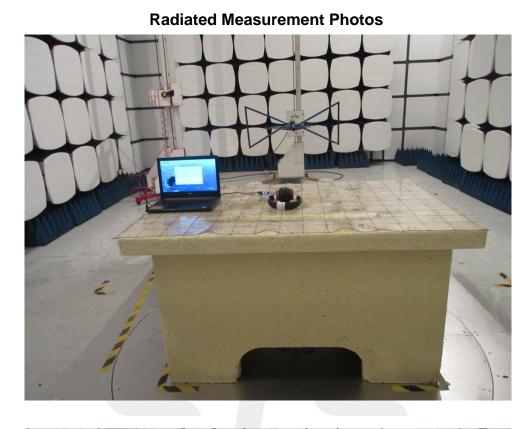


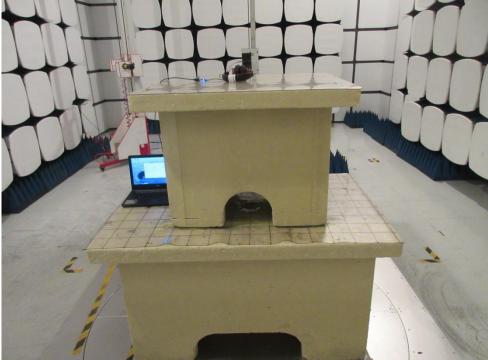
Shenzhen STS Test Services Co., Ltd.



Page 69 of 69

# **APPENDIX-PHOTOS OF TEST SETUP**





* * * * * END OF THE REPORT * * * * *

Shenzhen STS Test Services Co., Ltd.