

RADIO TESTREPORT

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Report No: STS1712279W01

Issued for

Sentry Industries Limited

507 Houston Center, 63 Mody Road, Tst, Hong Kong, China

Product Name:	Bluetooth Headset
Brand Name:	SENTRY
Model Name:	BT910
Series Model:	N.A
FCC ID:	2ACP4BT910
Test Standard:	FCC Part 15.247

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Page 2 of 61

Report No.: STS1712279W01

TEST RESULT CERTIFICATION

Applicant'sname	Sentry Industries Limited
Address	507 Houston Center, 63 Mody Road, Tst, Hong Kong, China
Manufacture's Name	Guangdong SAIYO Electronics Industry Co., Ltd.
Address	Xibian Industry Zone, Tongyu Town, Chaoyang District, Shantou City, Guangdong Province, China
Product description	
Product Name:	Bluetooth Headset
Brand Name	SENTRY
Model Name:	BT910
Series Model	N.A
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.

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Date of Test.....

Date (s) of performance of tests : 22 Dec. 2017~25 Dec. 2017

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Date of Issue: 26 Dec. 2017

Test Result Pass

Testing Engineer

Technical Manager

Sean She

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(Hakim.hou)

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Authorized Signatory :

(Vita Li)

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Page 3 of 61

Report No.: STS1712279W01



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	10
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	19
4. CONDUCTED SPURIOUS & BAND EDGE EMISSION	31
4.1 REQUIREMENT	31
4.2 TEST PROCEDURE	31
4.3 TEST SETUP	31
4.4 EUT OPERATION CONDITIONS	31
4.5 TEST RESULTS	32
5. NUMBER OF HOPPING CHANNEL	40
5.1 APPLIED PROCEDURES / LIMIT	40
5.2 TEST PROCEDURE	40
5.3 TEST SETUP	40
5.4 EUT OPERATION CONDITIONS	40
5.5 TEST RESULTS	41
6. AVERAGE TIME OF OCCUPANCY	42
6.1 APPLIED PROCEDURES / LIMIT	42
6.2 TEST PROCEDURE	42
6.3 TEST SETUP	42
6.4 EUT OPERATION CONDITIONS	42
6.5 TEST RESULTS	43
7. HOPPING CHANNEL SEPARATION MEASUREMEN	47
7.1 APPLIED PROCEDURES / LIMIT	47

=#

Page 4 of 61

Report No.: STS1712279W01



Table of Contents	Page
7.2 TEST PROCEDURE	47
7.3 TEST SETUP	47
7.4 EUT OPERATION CONDITIONS	47
7.5 TEST RESULTS	48
8.1 APPLIED PROCEDURES / LIMIT	52
8.2 TEST PROCEDURE	52
8.3 TEST SETUP	52
8.4 EUT OPERATION CONDITIONS	52
8.5 TEST RESULTS	53
9. OUTPUT POWER TEST	57
9.1 APPLIED PROCEDURES / LIMIT	57
9.2 TEST PROCEDURE	57
9.3 TEST SETUP	57
9.4 EUT OPERATION CONDITIONS	57
9.5 TEST RESULTS	58
10. ANTENNA REQUIREMENT	59
10.1 STANDARD REQUIREMENT	59
10.2 EUT ANTENNA	59

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Page 5 of 61

Report No.: STS1712279W01

Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	26 Dec. 2017	STS1712279W01	ALL	Initial Issue



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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	PASS			
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

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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** %.

Page 7 of 61

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

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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Bluetooth Headset
Trade Name	SENTRY
Model Name	BT910
Series Model	N.A
Model Difference	N/A
Channel List	Please refer to the Note 2.
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps)
Adapter	N/A
Battery	Rated Voltage: 3.7V Capacity: 80mAh
Hardware version number	V1.1
Software version number	V1.1
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 61



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

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	SENTRY	BT910	PCB Antenna	N/A	0	BT Antenna

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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.

Worst Mode	Description	Data Rate/Modulation
Mode 1	TX CH00 1Mbps/GFSK	
Mode 2	TX CH39	1Mbps/GFSK
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

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,50/60Hz is shown in the report

For AC Conducted Emission

	Test Case
AC Conducted	Mode 7 : Keeping BT TX
Emission	

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(1/2Mbps)	Power class: 1 M rate:4:27 2 M rate:11:183	Power class: 1 M rate:4:27 2 M rate:11:183	Power class: 1 M rate:4:27 2 M rate:11:183				

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

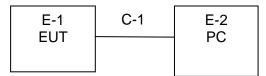
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final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

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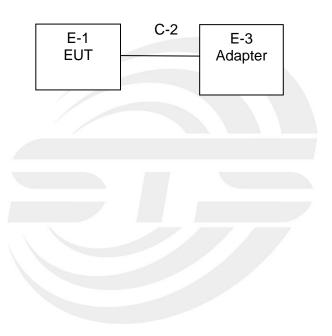


Page 11 of 61

Radiated Spurious EmissionTest



Conducted Emission Test



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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	PC	HP	N/A	N/A	N/A
E-3	Adapter	N/A	N/A	N/A	N/A

Item	Shielded Type Ferrite Core		Length	Note
C-1	USB Cable	NO	100cm	N/A
C-2	USB Cable shielded line (Charging)	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 ^rLength^a column.
- (3) "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".



2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Manufacturer	Turne Ma	a			
	Type No.	Serial No.	Last calibration	Calibrated until	
R&S	ESW	101535	2017.06.01	2018.05.31	
TESEQ	CBL6111D	34678	2017.03.24	2018.03.23	
Schwarzbeck	BBHA 9120D	9120D-1343	2017.03.06	2018.03.05	
BBHA 9170	SCHWARZBECK	BBHA9170367	2017.05.02	2018.05.01	
HH660	Mieo	N/A	2017.10.15	2018.10.14	
HH660	Mieo	N/A	2017.10.15	2018.10.14	
EM	EM330	60538	2017.03.12	2018.03.11	
Agilent	8449B	60538	2017.10.15	2018.10.14	
MINI-CIRCUITS	AP-040G	1382501	2017.05.15	2018.05.14	
ETS	6512	00165355	2017.03.06	2018.03.05	
EM	R01	N/A	2017.03.12	2018.03.11	
EM	R06	N/A	2017.03.12	2018.03.11	
SCHWARZBECK	R04	N/A	2017.03.12	2018.03.11	
SCHWARZBECK	R02	N/A	2017.03/12	2018.03.11	
Changling	966	N/A	2017.10.15	2018.10.14	
EM	SC100_1	60531	N/A	N/A	
EM	SC100	N/A	N/A	N/A	
Max-full Antenna Corp MF		N/A	N/A	N/A	
	TESEQ Schwarzbeck BBHA 9170 HH660 HH660 EM Agilent MINI-CIRCUITS ETS EM EM SCHWARZBECK SCHWARZBECK Changling EM EM	TESEQCBL6111DSchwarzbeckBBHA 9120DBBHA 9170SCHWARZBECKHH660MieoHH660MieoHH660MieoEMEM330Agilent8449BMINI-CIRCUITSAP-040GETS6512EMR01EMR06SCHWARZBECKR04SCHWARZBECKR04SCHWARZBECKR02Changling966EMSC100_1EMSC100	TESEQ CBL6111D 34678 Schwarzbeck BBHA 9120D 9120D-1343 BBHA 9170 SCHWARZBECK BBHA9170367 HH660 Mieo N/A HH660 Mieo N/A EM EM330 60538 Agilent 8449B 60538 MINI-CIRCUITS AP-040G 1382501 ETS 6512 00165355 EM R01 N/A EM R06 N/A SCHWARZBECK R04 N/A SCHWARZBECK R02 N/A EM SC100_1 60531 EM SC100 N/A	TESEQ CBL6111D 34678 2017.03.24 Schwarzbeck BBHA 9120D 9120D-1343 2017.03.06 BBHA 9170 SCHWARZBECK BBHA9170367 2017.05.02 HH660 Mieo N/A 2017.10.15 HH660 Mieo N/A 2017.03.12 HH660 Mieo N/A 2017.03.12 Agilent 8449B 60538 2017.03.12 Agilent 8449B 60538 2017.03.06 ETS 6512 00165355 2017.03.02 EM R01 N/A 2017.03.12 EM R01 N/A 2017.03.12 EM R01 N/A 2017.03.12 EM R06 N/A 2017.03.12 SCHWARZBECK R04 N/A 2017.03.12 SCHWARZBECK R02 N/A 2017.03.12 SCHWARZBECK R02 N/A 2017.03.12 SCHWARZBECK R02 N/A 2017.03.12 Changling 966	

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2017.10.15	2018.10.14
LISN	R&S	ENV216	101242	2017.10.15	2018.10.14
conduction Cable	EM	C01	N/A	2017.03.12	2018.03.11
Temperature & Humitidy	Mieo	HH660	N/A	2017.10.15	2018.10.14



Page 14 of 61

Report No.: STS1712279W01

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15100041SNO03	2017.10.15	2018.10.14
Power Meter	R&S	NRP	100510	2017.10.15	2018.10.14
Spectrum Analyzer	Agilent	E4407B	MY50140340	2017.03.11	2018.03.10
Signal Analyzer	Agilent	N9020A	MY49100060	2017.03.11	2018.03.10



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Page 15 of 61



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)					
	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

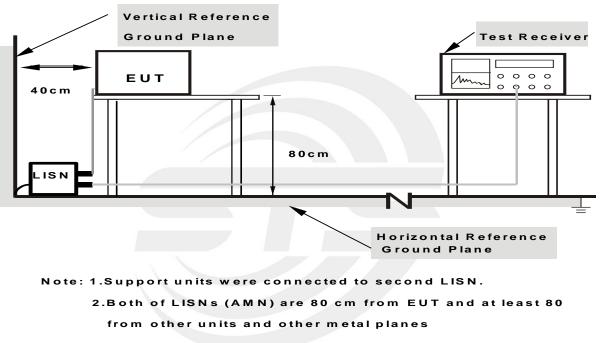
Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

Page 16 of 61



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.



3.1.5 TEST RESULT

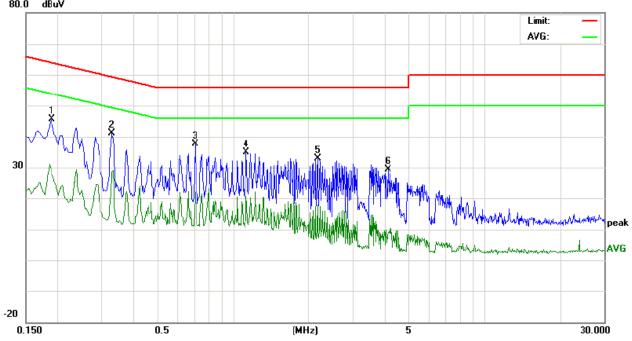
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	L
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 7

Freq.	Reading_Level (dBuV)		Correct Factor	Me	Measurement (dBuV)		Limit (dBuV)		Margin (dB)		P/F	
(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG	
0.1900	35.53		18.12	10.20	45.73		28.32	64.03	54.03	-18.30	-25.71	Р
0.3300	30.74		18.25	10.30	41.04		28.55	59.45	49.45	-18.41	-20.90	Р
0.7060	27.25		10.88	10.35	37.60		21.23	56.00	46.00	-18.40	-24.77	Р
1.1340	24.55		10.36	10.37	34.92		20.73	56.00	46.00	-21.08	-25.27	Р
2.1740	22.70		7.70	10.29	32.99		17.99	56.00	46.00	-23.01	-28.01	Р
4.1500	18.95		-1.45	10.36	29.31		8.91	56.00	46.00	-26.69	-37.09	Р

Remark:

1. All readings are Quasi-Peak and Average values.

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





Page 18 of 61

Report No.: STS1712279W01

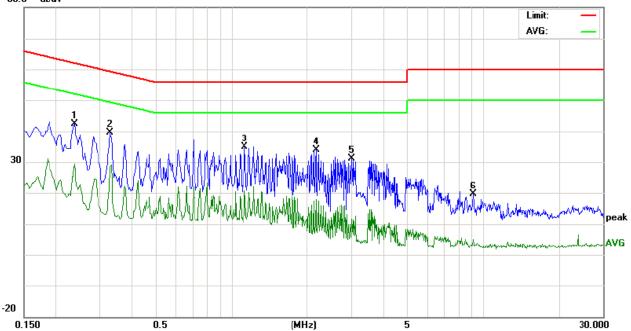
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Ν
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 7

Freq.	Reading_Level (dBuV)		Correct Factor	Measurement (dBuV)		Limit (dBuV)		Margin (dB)		P/F		
(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG	
0.2379	32.17		19.04	10.26	42.43		29.30	62.17	52.17	-19.74	-22.87	Р
0.3300	29.24		18.25	10.30	39.54		28.55	59.45	49.45	-19.91	-20.90	Р
1.1336	24.55		10.36	10.37	34.92		20.73	56.00	46.00	-21.08	-25.27	Р
2.1739	23.70		7.70	10.29	33.99		17.99	56.00	46.00	-22.01	-28.01	Р
3.0178	20.55		1.18	10.55	31.10		11.73	56.00	46.00	-24.90	-34.27	Р
9.1499	9.44		-5.42	10.26	19.70		4.84	60.00	50.00	-40.30	-45.16	Ρ

Remark:

1. All readings are Quasi-Peak and Average values.

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





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 Dista	
(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)

FREQUENCY (MHz)	(dBuV/m) (at 3M)		
	PEAK	AVERAGE	
Above 1000	74	54	

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

For Band edge

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

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Page 20 of 61

Report No.: STS1712279W01

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

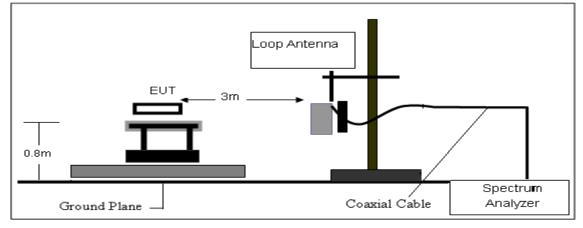
No deviation



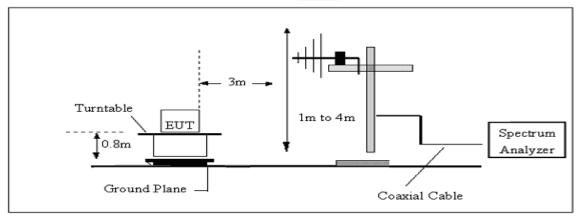


3.2.4 TESTSETUP

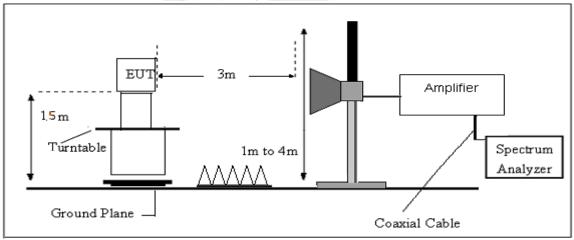
(A) Radiated Emission Test-Up Frequency Below 30MHz



(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 22 of 61

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 - AGWhere 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.



3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Test Mode:	TX Mode
Test Voltage:	DC 3.7V from battery		

Freq.	Reading	Limit	Margin	State	Toot Dooult
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	Test Result
					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.



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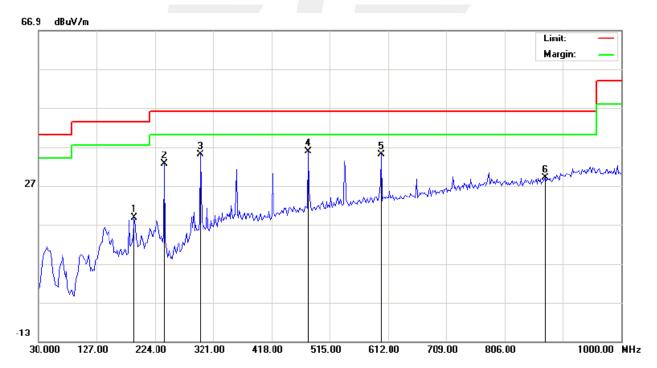
(30MHz-1000MHz)

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Horizontal
Test Voltage:	DC 3.7V from battery		Mode 1/2/3/4/5/6 (Mode 3-1M worst mode)

Freq.	Reading	Factor	Measurement	Limit	Over	Detector
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
190.0500	7.36	11.54	18.90	43.50	-24.60	peak
240.1667	24.78	7.90	32.68	46.00	-13.32	peak
299.9833	19.62	15.41	35.03	46.00	-10.97	peak
479.4333	14.89	20.91	35.80	46.00	-10.20	peak
600.6833	11.25	23.73	34.98	46.00	-11.02	peak
873.9000	1.05	27.93	28.98	46.00	-17.02	peak

Remark:

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





Page 25 of 61

Report No.: STS1712279W01

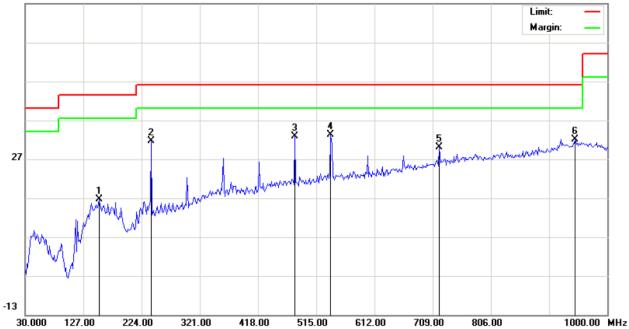
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Vertical
Test Voltage:	DC 3.7V from battery	Test Mode:	Mode 1/2/3/4/5/6 (Mode 3-1M worst mode)

Freq.	Reading	Factor	Measurement	Limit	Over	Detector
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
152.8667	1.24	15.28	16.52	43.50	-26.98	peak
240.1667	18.69	12.94	31.63	46.00	-14.37	peak
479.4333	11.97	20.91	32.88	46.00	-13.12	peak
539.2500	11.10	22.19	33.29	46.00	-12.71	peak
720.3167	4.26	25.78	30.04	46.00	-15.96	peak
946.6500	2.14	29.91	32.05	46.00	-13.95	peak

Remark:

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







Page 26 of 61

Report No.: STS1712279W01

(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 I	//Hz)				
3264.75	49.07	44.70	6.70	28.20	-9.80	39.27	74.00	-34.73	PK	Vertical
3264.75	38.09	44.70	6.70	28.20	-9.80	28.29	54.00	-25.71	AV	Vertical
3264.79	47.94	44.70	6.70	28.20	-9.80	38.14	74.00	-35.86	PK	Horizontal
3264.79	39.31	44.70	6.70	28.20	-9.80	29.51	54.00	-24.49	AV	Horizontal
4804.55	58.49	44.20	9.04	31.60	-3.56	54.93	74.00	-19.07	PK	Vertical
4804.55	39.34	44.20	9.04	31.60	-3.56	35.78	54.00	-18.22	AV	Vertical
4804.50	58.22	44.20	9.04	31.60	-3.56	54.66	74.00	-19.34	PK	Horizontal
4804.50	38.56	44.20	9.04	31.60	-3.56	35.00	54.00	-19.00	AV	Horizontal
5359.85	45.90	44.20	9.86	32.00	-2.34	43.56	74.00	-30.44	PK	Vertical
5359.85	37.20	44.20	9.86	32.00	-2.34	34.86	54.00	-19.14	AV	Vertical
5359.67	46.18	44.20	9.86	32.00	-2.34	43.84	74.00	-30.16	PK	Horizontal
5359.67	38.22	44.20	9.86	32.00	-2.34	35.88	54.00	-18.12	AV	Horizontal
7205.96	50.79	43.50	11.40	35.50	3.40	54.19	74.00	-19.81	PK	Vertical
7205.96	33.91	43.50	11.40	35.50	3.40	37.31	54.00	-16.69	AV	Vertical
7205.74	50.84	43.50	11.40	35.50	3.40	54.24	74.00	-19.76	PK	Horizontal
7205.74	32.79	43.50	11.40	35.50	3.40	36.19	54.00	-17.81	AV	Horizontal

Shenzhen STS Test Services Co., Ltd.



Page 27 of 61

Report No.: STS1712279W01

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 N	//Hz)				
3264.87	48.41	44.70	6.70	28.20	-9.80	38.61	74.00	-35.39	PK	Vertical
3264.87	38.89	44.70	6.70	28.20	-9.80	29.09	54.00	-24.91	AV	Vertical
3264.82	48.76	44.70	6.70	28.20	-9.80	38.96	74.00	-35.04	PK	Horizontal
3264.82	38.91	44.70	6.70	28.20	-9.80	29.11	54.00	-24.89	AV	Horizontal
4882.39	58.95	44.20	9.04	31.60	-3.56	55.39	74.00	-18.61	PK	Vertical
4882.39	38.12	44.20	9.04	31.60	-3.56	34.56	54.00	-19.44	AV	Vertical
4882.46	58.74	44.20	9.04	31.60	-3.56	55.18	74.00	-18.82	PK	Horizontal
4882.46	38.35	44.20	9.04	31.60	-3.56	34.79	54.00	-19.21	AV	Horizontal
5359.73	45.58	44.20	9.86	32.00	-2.34	43.24	74.00	-30.76	PK	Vertical
5359.73	37.46	44.20	9.86	32.00	-2.34	35.12	54.00	-18.88	AV	Vertical
5359.74	45.62	44.20	9.86	32.00	-2.34	43.28	74.00	-30.72	PK	Horizontal
5359.74	37.08	44.20	9.86	32.00	-2.34	34.74	54.00	-19.26	AV	Horizontal
7313.71	51.35	43.50	11.40	35.50	3.40	54.75	74.00	-19.25	PK	Vertical
7313.71	32.79	43.50	11.40	35.50	3.40	36.19	54.00	-17.81	AV	Vertical
7313.88	51.75	43.50	11.40	35.50	3.40	55.15	74.00	-18.85	PK	Horizontal
7313.88	33.58	43.50	11.40	35.50	3.40	36.98	54.00	-17.02	AV	Horizontal

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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)				
3264.72	48.61	44.70	6.70	28.20	-9.80	38.81	74.00	-35.19	PK	Vertical
3264.72	39.59	44.70	6.70	28.20	-9.80	29.79	54.00	-24.21	AV	Vertical
3264.57	49.08	44.70	6.70	28.20	-9.80	39.28	74.00	-34.72	PK	Horizontal
3264.57	38.96	44.70	6.70	28.20	-9.80	29.16	54.00	-24.84	AV	Horizontal
4960.47	59.47	44.20	9.04	31.60	-3.56	55.91	74.00	-18.09	PK	Vertical
4960.47	38.67	44.20	9.04	31.60	-3.56	35.11	54.00	-18.89	AV	Vertical
4960.50	58.13	44.20	9.04	31.60	-3.56	54.57	74.00	-19.43	PK	Horizontal
4960.50	38.58	44.20	9.04	31.60	-3.56	35.02	54.00	-18.98	AV	Horizontal
5359.87	45.62	44.20	9.86	32.00	-2.34	43.28	74.00	-30.72	PK	Vertical
5359.87	37.30	44.20	9.86	32.00	-2.34	34.96	54.00	-19.04	AV	Vertical
5359.78	45.94	44.20	9.86	32.00	-2.34	43.60	74.00	-30.40	PK	Horizontal
5359.78	37.19	44.20	9.86	32.00	-2.34	34.85	54.00	-19.15	AV	Horizontal
7439.93	51.43	43.50	11.40	35.50	3.40	54.83	74.00	-19.17	PK	Vertical
7439.93	32.57	43.50	11.40	35.50	3.40	35.97	54.00	-18.03	AV	Vertical
7439.66	51.42	43.50	11.40	35.50	3.40	54.82	74.00	-19.18	PK	Horizontal
7439.66	33.50	43.50	11.40	35.50	3.40	36.90	54.00	-17.10	AV	Horizontal

Note:

3)

- 1) Scan with GFSK, π /4-DQPSK, ,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.



Page 29 of 61

Band edge Requirements

				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
					GFSK					
2390.00	68.09	43.80	4.91	25.90	-12.99	55.10	74.00	-18.90	PK	Vertical
2390.00	53.54	43.80	4.91	25.90	-12.99	40.55	54.00	-13.45	AV	Vertical
2390.00	68.83	43.80	4.91	25.90	-12.99	55.84	74.00	-18.16	PK	Horizonta
2390.00	53.31	43.80	4.91	25.90	-12.99	40.32	54.00	-13.68	AV	Horizonta
2483.50	70.02	43.80	5.12	25.90	-12.78	57.24	74.00	-16.76	PK	Vertical
2483.50	52.09	43.80	5.12	25.90	-12.78	39.31	54.00	-14.69	AV	Vertical
2483.50	69.59	43.80	5.12	25.90	-12.78	56.81	74.00	-17.19	PK	Horizonta
2483.50	52.70	43.80	5.12	25.90	-12.78	39.92	54.00	-14.08	AV	Horizonta
					π/4-DQPSK			I		
2390.00	67.84	43.80	4.91	25.90	-12.99	54.85	74.00	-19.15	PK	Vertical
2390.00	53.68	43.80	4.91	25.90	-12.99	40.69	54.00	-13.31	AV	Vertical
2390.00	68.39	43.80	4.91	25.90	-12.99	55.40	74.00	-18.60	PK	Horizonta
2390.00	52.66	43.80	4.91	25.90	-12.99	39.67	54.00	-14.33	AV	Horizonta
2483.50	69.55	43.80	5.12	25.90	-12.78	56.77	74.00	-17.23	PK	Vertical
2483.50	52.38	43.80	5.12	25.90	-12.78	39.60	54.00	-14.40	AV	Vertical
2483.50	70.24	43.80	5.12	25.90	-12.78	57.46	74.00	-16.54	PK	Horizonta
2483.50	53.37	43.80	5.12	25.90	-12.78	40.59	54.00	-13.41	AV	Horizonta

Only showthe worst point data of the emissions in the frequency 2300-2403 MHz and 2479-2500 MHz.

Shenzhen STS Test Services Co., Ltd.



Page 30 of 61

Hopping Band edge

				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
					GFSK					
2390.00	68.47	43.80	4.91	25.90	-12.99	55.48	74.00	-18.52	PK	Vertical
2390.00	53.99	43.80	4.91	25.90	-12.99	41.00	54.00	-13.00	AV	Vertical
2390.00	69.25	43.80	4.91	25.90	-12.99	56.26	74.00	-17.74	PK	Horizontal
2390.00	52.66	43.80	4.91	25.90	-12.99	39.67	54.00	-14.33	AV	Horizontal
2483.50	70.24	43.80	5.12	25.90	-12.78	57.46	74.00	-16.54	PK	Vertical
2483.50	53.31	43.80	5.12	25.90	-12.78	40.53	54.00	-13.47	AV	Vertical
2483.50	69.46	43.80	5.12	25.90	-12.78	56.68	74.00	-17.32	PK	Horizontal
2483.50	52.07	43.80	5.12	25.90	-12.78	39.29	54.00	-14.71	AV	Horizontal
					π/4-DQPSK					
2390.00	67.44	43.80	4.91	25.90	-12.99	54.45	74.00	-19.55	PK	Vertical
2390.00	53.04	43.80	4.91 🗸	25.90	-12.99	40.05	54.00	-13.95	AV	Vertical
2390.00	69.14	43.80	4.91	25.90	-12.99	56.15	74.00	-17.85	PK	Horizontal
2390.00	52.67	43.80	4.91	25.90	-12.99	39.68	54.00	-14.32	AV	Horizontal
2483.50	69.00	43.80	5.12	25.90	-12.78	56.22	74.00	-17.78	PK	Vertical
2483.50	52.04	43.80	5.12	25.90	-12.78	39.26	54.00	-14.74	AV	Vertical
2483.50	69.35	43.80	5.12	25.90	-12.78	56.57	74.00	-17.43	PK	Horizontal
2483.50	52.83	43.80	5.12	25.90	-12.78	40.05	54.00	-13.95	AV	Horizontal
Low measurement frequencies is range from 2300 to 2403 MHz, high measurement frequencies is range from 2479 to 2500 MHz.										

Only showthe worst point data of the emissions in the frequency 2300-2403 MHz and 2479-2500 MHz.

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

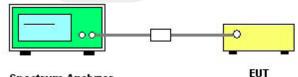
Spectrum Parameter	Setting				
Detector	Peak				
Start/Stop Frequency	30 MHz to 10th carrier harmonic				
RB / VB (emission in restricted band)	100 KHz/300 KHz				
Trace-Mode:	Max hold				

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%
Pressure:	1012 hPa	Test Voltage:	DC 3.7V
Test Mode:	GFSK(1Mbps)-00/39/78 CH		

	RF	lyzer - Swept S/ 50 Ω AC		SEI	NSE:PULSE		ALIGNAUTO		04:17:05	i PM Dec 25, 20
enter F	req 1	2.515000	P	'NO: Fast 🖵 Gain:Low	Trig: Free F #Atten: 30 d		Avg Type:	Log-Pwr		ACE 1 2 3 4 TYPE M WWWW DET P P P P
dB/div		Offset 0.5 dB 4.85 dBm							Mkr1 2.4 -5.	02 2 GH 147 dB
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.2										
.2										-25.15 c
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.2		2 Y	×							$ \bigcirc $
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2		And the second second			Contract of the local distance					
2										
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art 30	NALI								Ston	25.00 GI
es BW		(Hz		#VB	W 300 kHz			Swe	ep 2.387 s	
R MODE 1	TRC SCL		x	Y	FUNC	TION FUN	ICTION WIDTH		FUNCTION VALUE	
Ν	1 f 1 f		2.402 2 GHz 2.741 7 GHz	-5.147 -56.166						
N	1 f		4.803 6 GHz	-46.365	dBm					
N			24.290 9 GHz	-47.874	dBm					
N N	1 f									
N	1 f									
N N	1 f									
N	1 f									
N N	1 f									3

00 CH

		/zer - Swept S/									
(X) RL	RF	50Ω AC		9	ENSE:PULSE		A	LIGNAUTO	e: Log-Pwr		57 PM Dec 25, 2017 TRACE 1 2 3 4 5 6
Center	Freq 12	2.515000		PNO: Fast G		Free Run n: 30 dB		Avgiyp	e. Log-rwr		TYPE MWWWWWW DET P P P P P P
10 dB/div		ffset 0.5 dB 7.73 dBm									l40 9 GHz .266 dBm
Log -2.27		1									
-12.3											
-22.3											-22.27 dBm
-32.3											
-42.3		<u> </u>	3								A
	\Diamond	2								1.4.4	X
-52.3	a sublem state	a hadron a hadro	and the standards		وتلد السنجي بألنا	and the second	ulus ai				
-62.3		and the second s									
-72.3											
-82.3											
Start 30 #Res B\		Hz		#VI	BW 300	kHz			Swe		o 25.00 GHz (40001 pts)
MKR MODE			×	Y		FUNCTION	I FUNC	TION WIDTH		FUNCTION VALUE	^
1 N 2 N	1 f		2.440 9 GH 2.505 2 GH		6 dBm 2 dBm						
3 N 4 N	1 f		4.882 3 GH 24.685 4 GH	z -45.27	8 dBm 2 dBm						
	1 1		24.080 4 GH	z -41.42	2 abm						
5 6 7											
8 9											
10											
11											~
MSG								STATUS			

39 CH



78 CH

ilent Spectr	rum Analy RF	zer - Swept S								
		50 Q AC 2.515000	000 GHz	NO: Fast Gain:Low	NSE:PULSE Trig: Free #Atten: 30	Run	ALIGN AUTO Avg Type:	Log-Pwr		54 PMDec 25, 20 TRACE 1 2 3 4 1 TYPE MWWW DET P P P P 1
dB/div		ffset 0.5 dB 7. <mark>37 dBm</mark>								180 2 GH .632 dBi
63		1								
2.6										-22.63 d
2.6			A 3							
2.6		2	Ŷ					Contract of the last		
2.6						ing and a finite state				
2.6										
art 30 M Res BW		Hz		#VB	W 300 kHz			Swe	Sto ep 2.387 s	p 25.00 GH (40001 pt
R MODE T N 1 2 N 1 3 N 1 4 N 1	f f f		× 2.480 2 GHz 2.543 9 GHz 4.959 7 GHz 24.337 7 GHz	-2.632 -51.350 -45.836 -48.132	dBm dBm dBm	CTION FUN	CTION WIDTH		FUNCTION VALUE	
5 7 3 9										
										>
							STATUS			



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Shenzhen STS Test Services Co., Ltd.



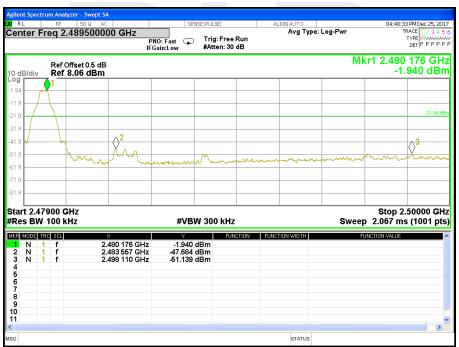
Page 34 of 61

For Band edge

00 CH

Agilent Spect							
Comton F		50 Ω AC	SEI	NSE:PULSE	ALIGNAUTO Avg Type:	Log-Pwr	04:17:43 PM Dec 25, 2017 TRACE 1 2 3 4 5 6
Center F	red 2.35	P	PNO: Fast 😱 Gain:Low	Trig: Free Run #Atten: 30 dB	nyg type.	Log-rwi	TYPE MWWWWW DET P P P P P
10 dB/div	Ref Offse Ref 7.06					Mł	r1 2.402 176 GHz -2.937 dBm
Log -2.94							
-12.9							
-22.9							-23.09 dBn
-32.9							
-42.9							
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-72.9							
-82.9							
Start 2.30 #Res BW			#VB	W 300 kHz		Sweep	Stop 2.40300 GHz 9.867 ms (1001 pts)
MKR MODE TI	RC SCL	×	Y	FUNCTION	FUNCTION WIDTH	FL	INCTION VALUE
1 N 1 2 N 1 3 N 1		2.402 176 GHz 2.390 022 GHz 2.398 159 GHz	-2.937 -59.014 -35.973	dBm			
4 5 6 7							
7							
8							
10 11							~
<							>
4SG					STATUS		

78 CH



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Page 35 of 61



Report No.: STS1712279W01

For Hopping Band edge

00 CH

Agile	nt Spe	ctrur	n Ana	ilyzer - Swept SA									
L XI R	L		RF	50 Ω AC 2.351500000 GH		SE	ENSE:PULSE		ALI	GNAUTO			PMDec 25, 2017
Cer	nter	Fre	q 2	2.351500000 GH	lz	1		_		Avg Type:	Log-Pwr		RACE 1 2 3 4 5 6
			•		PNO: F		Trig: Fre						DET P P P P P
					IFGain:	Low	#Atten: 3	io ab					berp 11111
											M	kr1 2.403	000 GHz
10 d				Offset 0.5 dB 6.86 dBm									144 dBm
Log	Brain	/	RCI	0.60 0011							1		
-3.14													
-13.1													
-23.1	-												-23.14 dβm Λ 3
-33.1													() ³
												2	
-43.1													MMM H++
-53.1						- ADA	nannnnn	<u> (</u>	100000	hannhaan	mandelworker	₩₩₩₩₩₩₩₩	
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-73.1													
-83.1								_					
Sta	rt 2.:	300	00 (GHz								Stop 2.	40300 GHz
#Re	s Bl	W 1	00	kHz		#VB	W 300 kH	Iz			Swee	p 9.867 ms	(1001 pts)
In The State	MODE	Lzee						UNCTION		ION WIDTH		UNCTION VALUE	
MRB	N	1	f	2.403 00		-3.144		UNCTION	FUNCT	ION WIDTH	-	UNCTION VALUE	^
	N	1	f	2.390 02		-51.132							
2 3	Ň	1	f	2.399 18		-36.038							
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4 5 6 7 8 9													
8													
9													
10 11													
2 3 4 5 6 7 8 9 10 11													>
										STATUS			
MSG										514105			

78 CH

ilent Spectr	um Analyzer	- Swept SA							
RL		50 Ω AC		ENSE:PULSE		ALIGNAUTO			2 PM Dec 25, 20
enter F	req 2.48	9500000 GH	Z PNO: Fast IFGain:Low	⊃ Trig: Free #Atten: 30		Avg Type:	Log-Pwr		RACE 1 2 3 4 5 TYPE MWWW DET P P P P
dB/div	Ref Offse Ref 7.9						М	kr1 2.480 -2.	029 GH 018 dBi
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1.									-22.02 0
0		. 2							۸3
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	900 GHz 100 kHz		#VI	300 kHz			Swee	Stop 2. p 2.067 ms	50000 G s (1001 p
R MODE TH		×	Y Y		ICTION FU	INCTION WIDTH	F	UNCTION VALUE	
N 1 N 1	f	2.480 029 2.483 914		8 dBm 3 dBm					
N 1		2.498 929							
									>
						STATUS			



Temperature:	25 ℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 3.7V
Test Mode:	π/4-DQPSK(2Mbps) –00/39/78	СН	

	RF 50 Ω	AC	SENSE:PUL	-E	ALIGN AUTO		05:03:17 PME	ec 25, 2017
enter	Freq 12.5150	DOOOOO GHz	D: Fast 😱 Trig nin:Low #Att	: Free Run en: 30 dB	Avg Type:	Log-Pwr	TRACE TYPE	12345 MWWWW PPPPP
	Ref Offset 0.8					N	/kr1 2.402	
) dB/div	Ref 1.43 dl	Bm					-6.03	4 dBm
.57	V 1							
8.6								
8.6								-28.57 dBr
8.6								
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tart 30) MHz	· · ·	#VBW 30	N 1-11-		•	Stop 25	
	M 400 1.11-			JKHZ		Sweep	2.387 s (40	uu1 pts
Res B	W 100 kHz		#VBW 30				19719111111	
Res B 1 N 2 N 3 N 4 N	W 100 kHz TRC SCL 1 f 1 f 1 f 1 f	X 2.402 2 GHz 2.580 1 GHz 9.599 8 GHz 24.486 2 GHz	-6.034 dBm -56.988 dBm -51.007 dBm -47.709 dBm		UNCTION WIDTH	FU	NCTION VALUE	
Res B 1 N 2 N 3 N 4 N 5 6 7 8 9	TRC SCL 1 f 1 f 1 f	2.402 2 GHz 2.580 1 GHz 9.599 8 GHz	-6.034 dBm -56.988 dBm -51.007 dBm		UNCTION WIDTH	Fut	NCTION VALUE	
Res B 1 N 2 N 3 N 4 N 5 6 7 8	TRC SCL 1 f 1 f 1 f	2.402 2 GHz 2.580 1 GHz 9.599 8 GHz	-6.034 dBm -56.988 dBm -51.007 dBm		UNCTION WIDTH	FU	NCTION VALUE	

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30	CH
39	CΠ

		ectru		alyzer - Sw								
(x/ ℝ Cer		Fre	RF 7	50 g 12.515	AC 000000 GHz		ENSE:PULSE Trig: Free #Atten: 30		ALIGN AUTO Avg Typ	e: Log-Pwr		IS PMDec 25, 2017 TRACE 1 2 3 4 5 6 TYPE M WWWWWW DET P P P P P P
10 d Log	B/div			Offset 0. 2.28 d								l40 9 GHz .511 dBm
-7.72				(1								
-17.7 -27.7												-27.72 dBm
-37.7 -47.7	\vdash			\ <mark>2</mark>	3							4
-47.7					Y.				Contraction of the			
-67.7 -77.7												
-87.7	-											
	rt 30 es Bi			kHz		#VI	3W 300 kHz	:		Swe		o 25.00 GHz (40001 pts)
1 2 3	NODE N N	1 1 1	f f		× 2.440 9 G 2.505 2 G 4.881 7 G	Hz -51.15 Hz -51.33	1 dBm 3 dBm 2 dBm	ICTION	FUNCTION WIDTH		FUNCTION VALUE	^
4567	N	1	f		24.885 1 G	Hz -48.01	o aBM					
8 9 10 11												~
MSG									STATUS			>

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78 CH

	rum Analyzer -									
enter F		Ω Ω AC 15000000 G		Fast 😱	SE:PULSE Trig: Free #Atten: 30	Run dB	ALIGN AUTO Avg Type	a: Log-Pwr		55 PMDec 25, 201 TRACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
0 dB/div	Ref Offse Ref 7.39									179 6 GH .606 dBr
.61	<u>1</u>									
2.6										-22.61 df
2.6	2	3								
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2.6										
tart 30 M Res BW	VIHz 100 kHz			#VBV	V 300 kHz			Swe	Sto eep 2.387 s	p 25.00 GH (40001 pt
1 N 1 2 N 1 3 N 1 4 N 1	f f f	× 2.479 2.502 4.960 23.805	7 GHz 3 GHz	-2.606 c -47.758 c -45.568 c -48.406 c	iBm iBm iBm	CTION FL	JNCTION WIDTH		FUNCTION VALUE	
5 5 7										
9										
3 9 0 1										>



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Shenzhen STS Test Services Co., Ltd.

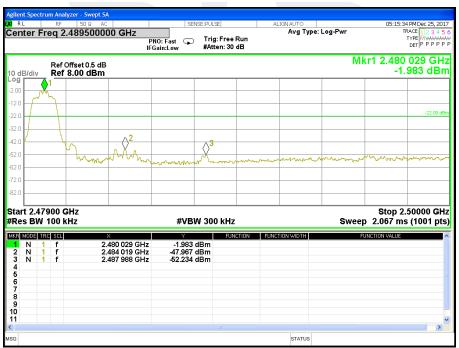


For Band edge

00 CH

	um Analyzer - S							
XIRL			SEN	ISE:PULSE	ALIGNAUTO Avg Type:	Log Dur		M Dec 25, 2017 CE 1 2 3 4 5 6
Center F	req 2.351:	500000 GHz P IF	NO: Fast 🖵 Gain:Low	Trig: Free Run #Atten: 30 dB	Avg type.	Log-r wi	T)	PE M WWWWWW PET P P P P P P
10 dB/div	Ref Offset					М	kr1 2.402 (-3.1)73 GHz 52 dBm
Log -3.15								
-13.2								
-23.2								-23.15 dBm ∧ 3
-33.2								
-43.2							^2	ht (\ /-
-53.2	Marchannes	and the state of the	manhore		mandermakerstrage	Levenner	annound 2	\mathcal{W}
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-73.2								
-83.2								
Start 2.30 #Res BW			#VBV	V 300 kHz		Swee	Stop 2.4 p 9.867 ms	0300 GHz (1001 pts)
MKR MODE TI	RC SCL	×	Y	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE	~
1 N 1 2 N 1 3 N 1		2.402 073 GHz 2.390 022 GHz 2.398 159 GHz	-3.152 (-57.822 (-35.947 (dBm				
4 5 6 7								
7								
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					514105	_	_	

78 CH



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Page 39 of 61



Report No.: STS1712279W01

For Hopping Band edge

00 CH

		ctru		alyzer - Swept SA										
l,Xi F			RF	50 Ω AC			SENSE	PULSE		ALI	GNAUTO			B PM Dec 25, 2017
Cer	nter	Fre	ea 2	2.35150000	0 GHz						Avg Type:	Log-Pwr		RACE 1 2 3 4 5 6
						PNO: Fast		Trig: Free						DET P P P P P
						IFGain:Low	v .	#Atten: 30	dB					DETPETITION
												M	kr1 2.403	000 GHz
				Offset 0.5 dB										164 dBm
Log	B/div	/	Ret	6.84 dBm	1									
-3.18														1
														J. J.
-13.2														
-23.2														-23.16 dBm
-33.2														\wedge^3
-33.4														sXh1
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-53.2							14100	LUADA-	LAA A	MAAA	- AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	And a laboration of the second	ԱԱՌՈԱՆԾԵՐ	Nuo total
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-63.2														
-73.2	-													I
-83.2														
-03.2														
Sta	rt 2.	300	00.	GH7									Stop 2	40300 GHz
	s B						#\/B\M	300 kHz				Swaa		(1001 pts)
777.5	30		001	N112			# V D V V	300 KHZ				Gwee	p 9.807 ma	s (1001 pts)
MKB	MODE	TRC			×		Y		ICTION	FUNCTI	ON WIDTH	F	UNCTION VALUE	^
1	Ν	1	f		403 000 GH		3.164 dE							
2 3	N	1	f		390 022 GH: 399 189 GH:		1.773 dE 5.952 dE							
4	IN			2.	399 109 GH.	2 -06	5.902 UE	SIL						
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MSG											STATUS			

78 CH

ilent Spectr	rum Anal RE	yzer - Swept S/		07			ALIGNAUTO		04/55-0	5 PM D 05 - 00
		50 Ω AC 48950000	00 GHz	PNO: Fast	NSE:PULSE Trig: Free #Atten: 30	Run	ALIGNAUTO Avg Type:	Log-Pwr		5 PM Dec 25, 20 RACE 1 2 3 4 5 TYPE MWWWW DET P P P P
dB/div)ffset 0.5 dB 8.03 dBm						M	kr1 2.479 -1.	021 GH 969 dBi
az <mark>/</mark> '	W.									
.0										-21.97 c
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- -										
0										
									0 4 0	
art 2.47 es BW				#VB	W 300 kHz			Swee	stop 2. p 2.067 m	.50000 GI s (1001 pt
MODE TO N 1 N 1 N 1	f	2. 2.	x 479 021 GHz 483 914 GHz 487 904 GHz	-1.969 -46.291 -45.775	dBm dBm	ICTION FUN	ICTION WIDTH		FUNCTION VALUE	
										>



5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

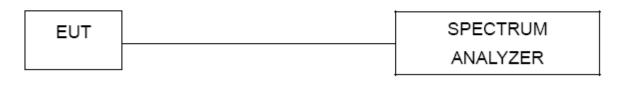
FCC Part 15.247,Subpart C								
Section	Test Item	Limit	FrequencyRange (MHz)	Result				
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS				

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	100KHz
VB	100KHz
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%
Pressure:	1015 hPa	Test Voltage:	DC 3.7V
Test Mode:	Hopping Mode		

Number of Hopping Channel

79

Hopping channel

nter F	req 2	50 Q AC 2.4417500	00 GHz	IO: Fast 😱	ISE:PULSE Trig: Free Ri #Atten: 30 dl	un	Avg Type:	Log-Pwr	TE	PMDec 25, 20 RACE 1 2 3 4 TYPE M WWWW DET A A A A
dB/div		Offset 0.5 dB 8.01 dBm						Mkr	2 2.480 2 -2	43 5 GH 2.00 dBi
	 ~~~~~			*****			******			~~~~ ²
∘ {										
° {										
0										
	0000 ( / 1.0 N			#VBI	W 1.0 MHz			Swee	Stop 2. p 1.000 ms	48350 GH (1001 pt
	TRC SCL		X	Y	FUNCT	ION FUNCTIO	IN WIDTH	ŀ	UNCTION VALUE	
N N	1 f 1 f	2.4	02 254 5 GHz 80 243 5 GHz	-3.14 -2.00	dBm dBm					
										>
							STATUS			

Shenzhen STS Test Services Co., Ltd.



# 6. AVERAGE TIME OF OCCUPANCY

### 6.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.247,Subpart C								
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.



6.5 TEST RESULTS

Temperature:	<b>25℃</b>	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 3.7V
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5		

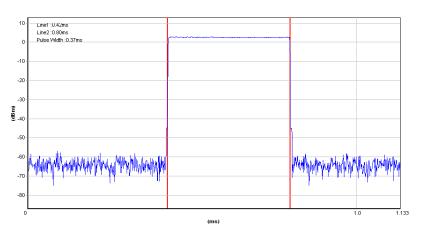
Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
DH1	2441 MHz	0.370	0.118	0.4
DH3	2441 MHz	1.630	0.261	0.4
DH5	2441 MHz	2.880	0.307	0.4



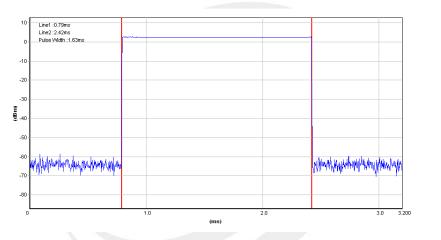
Shenzhen STS Test Services Co., Ltd.



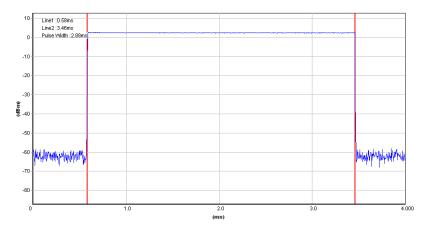
#### CH39-DH1



#### CH39-DH3



CH39-DH5



F

Shenzhen STS Test Services Co., Ltd.



Page 45 of 61

Report No.: STS1712279W01

Temperature:	<b>25</b> ℃	Relative Humidity:	50%					
Pressure:	1012 hPa	Test Voltage:	DC 3.7V					
Test Mode:	π/4-DQPSK(2Mbps) –2DH1/2DH3/2DH5							

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
2DH1	2441 MHz	0.380	0.122	0.4
2DH3	2441 MHz	2.880	0.461	0.4
2DH5	2441 MHz	2.930	0.313	0.4

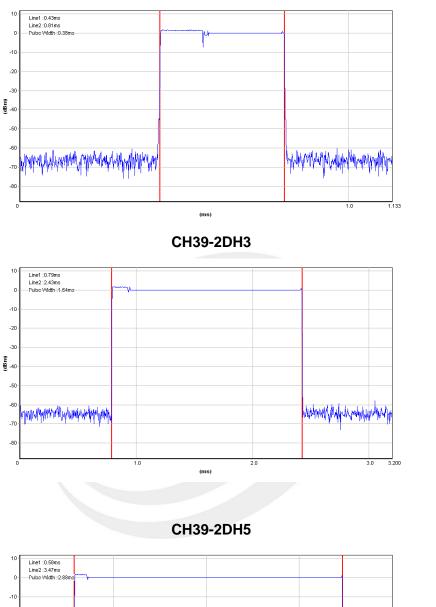


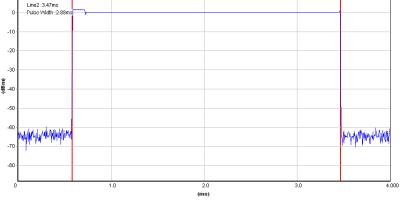
Shenzhen STS Test Services Co., Ltd.





### CH39-2DH1





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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:	<b>25</b> ℃	Relative Humidity:	50%	
Pressure:	1012 hPa	Test Voltage:	DC 3.7V	
Test Mode:	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)			

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	0.999	0.561	Complies
2441 MHz	0.996	0.558	Complies
2480 MHz	0.999	0.559	Complies

For GFSK: Ch. Separation Limits: > two-thirds 20dB bandwidth

# CH00 -1Mbps

RF	50 Ω AC	SENSE:PULSE	ALIGNAUTO	04:15:50 PM Dec 25
ter Freq 2.40		0: Wide 😱 Trig: Free Run ain:Low #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 3 TYPE M WM DET P P P
	set 0.5 dB ô4 dBm		N	/kr2 2.403 010 0 -3.141 d
		<b>∆</b> 1	2	
		~~~		
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h and a start of the start of t				
ter 2.402500 ( s BW 30 kHz	GHz	#VBW 100 kHz	Swe	Span 3.000 l ep   3.200 ms (1001
MODE TRC SCL	× 2.402 011 GHz	Y FUNCTION -8.36 dBm	FUNCTION WIDTH	FUNCTION VALUE
N 1 f	2.403 010 GHz	-3.14 dBm		

Shenzhen STS Test Services Co., Ltd.





#### CH39 -1Mbps



# CH78 -1Mbps



Shenzhen STS Test Services Co., Ltd.



Page 50 of 61

Report No.: STS1712279W01

Temperature:	<b>25</b> ℃	Relative Humidity:	50%	
Pressure:	1012 hPa	Test Voltage:	DC 3.7V	
Test Mode:	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)			

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	0.999	0.807	Complies
2441 MHz	0.999	0.805	Complies
2480 MHz	0.999	0.807	Complies

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

RL		50 Ω AC 2500000 GHz	SENSE:PULSE	1	ALIGNAUTO Avg Type: Log-Pw		1 PM Dec 25, 20: RACE 1 2 3 4 5
	req 2.402	PNC		Free Run n: 30 dB	111g 19pc. 20g 1 /		DET P P P P
	Ref Offse					Mkr2 2.403	010 GH 167 dBi
dB/div	Ref 6.80	) dBm	A.			-0.	107 UB
.20					<u></u> 2		
3.2			$\bigwedge$	~	AAM		
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1.2							\
1.2	~~						$\lambda \sim$
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.2							
1.2							
.2							
enter 2.4 Res BW	402500 G 30 kHz	Hz	#VBW 100	kHz	2	Span Sweep 3.200 ms	3.000 Mi (1001 pi
R MODE TR		×	Y	FUNCTION FL	INCTION WIDTH	FUNCTION VALUE	
N 1		2.402 011 GHz 2.403 010 GHz	-3.20 dBm -3.17 dBm				
		2.403 0 10 GHZ	-5.17 dBm				
1							
i 1							
'							
3							
ý –							

# CH00 -2Mbps

Shenzhen STS Test Services Co., Ltd.





#### CH39 -2Mbps



#### CH78 -2Mbps





# 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.



# 8.5 TEST RESULTS

Temperature:	<b>25</b> ℃	Relative Humidity:	50%	
Pressure:	1012 hPa	Test Voltage:	DC 3.7V	
Test Mode:	GFSK(1Mbps)CH00 / CH39 / C78			

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.841	PASS
2441 MHz	0.837	PASS
2480 MHz	0.839	PASS

# CH00 -1Mbps



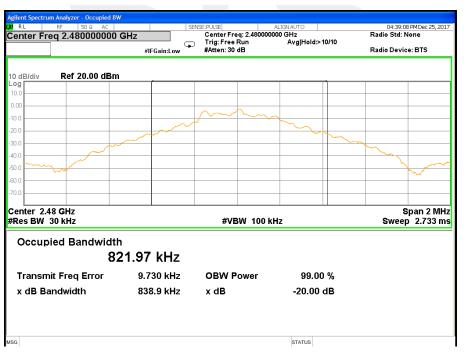
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#### CH39 -1Mbps



#### CH78 -1Mbps



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Page 55 of 61

Report No.: STS1712279W01

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 3.7V
Test Mode:	π/4-DQPSK(2Mbps)CH00 / CH39 / C78		

Frequency	20dB Bandwidth(MHz)	Result
2402 MHz	1.211	PASS
2441 MHz	1.208	PASS
2480 MHz	1.210	PASS

# CH00 -2Mbps

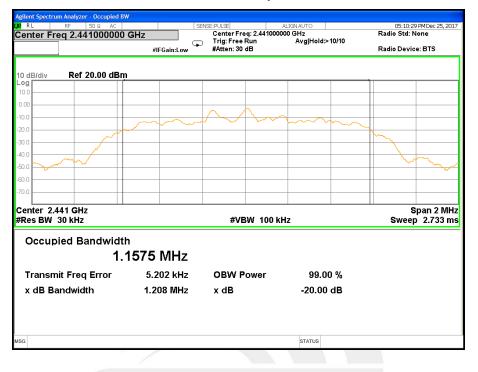
	um Analyzer - Occupied BW				
XIRL	RF 50 Ω AC		ENSE: PULSE Center Freg: 2.4020000	ALIGNAUTO	05:02:32 PMDec 25, 2017 Radio Std: None
Center Fr	eq 2.402000000		Trig: Free Run	Avg Hold:>10/10	
		#IFGain:Low	#Atten: 30 dB		Radio Device: BTS
10 dB/div Log	Ref 20.00 dBm				
10.0					
0.00					
-10.0			$\wedge \wedge \sim$		
-20.0		$\sim$			~~
-30.0					
-40.0					
-50.0	~~~~				- m ma
-60.0					
-70.0					
Center 2.4	402 CH7				Span 2 MHz
#Res BW			#VBW 100 k	Hz	Sweep 2.733 ms
Occur	ied Bandwidth				
0000		1576 MHz			
Transm	nit Freq Error	5.197 kHz	OBW Power	99.00 %	
x dB Ba	andwidth	1.211 MHz	x dB	-20.00 dB	
MSG				STATUS	

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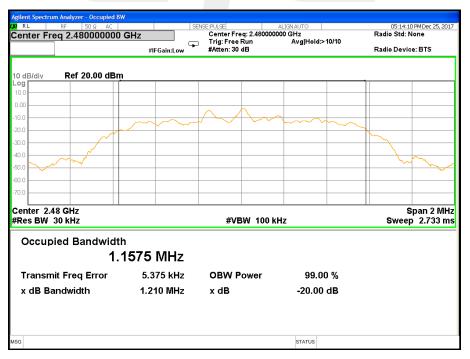
=#



#### CH39 -2Mbps



### CH78 -2Mbps





# 9. OUTPUT POWER TEST

# 9.1 APPLIED PROCEDURES / LIMIT

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

#### 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.



# 9.5 TEST RESULTS

Temperature:	<b>25</b> ℃	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 3.7V

GFSK(1Mbps)					
Test Channel	Frequency	Conducted Output Power Peak (dBm) AVG (dBm)		LIMIT	
	(MHz)			dBm	
CH00	2402	-1.42	-5.43	20.97	
CH39	2441	-0.92	-4.93	20.97	
CH78	2480	-0.83	-4.84	20.97	

Note: the channel separation >2/3 bandwidth

π/4QPSK(2Mbps)					
Test Channel Frequency Conducted Output Power				LIMIT	
Test Channer	(MHz)	Peak (dBm) AVG (dBm)		dBm	
CH00	2402	-1.95	-5.96	20.97	
CH39	2441	-1.46	-5.47	20.97	
CH78	2480	-1.32	-5.32	20.97	

Note: the channel separation >2/3 bandwidth

Shenzhen STS Test Services Co., Ltd.



Page 59 of 61

Report No.: STS1712279W01

# 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.



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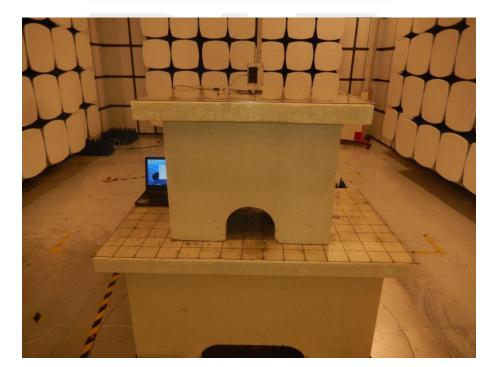


Page 60 of 61

# **APPENDIX-PHOTOS OF TEST SETUP**



**Radiated Measurement Photos** 



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Page 61 of 61

# **Conducted Measurement Photos**



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

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