

RADIO TEST REPORT

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Report No: STS1908110W01

Issued for

Shenzhen iFree Electronic Technology Co., Ltd

7F A9 Building Tian Rui industrial park No.35 Fu Yuan 1st Road, FuYong Road Bao'an District, Shenzhen, China

Product Name:	Bluetooth Earphone
Brand Name:	N/A
Model Name:	BTW-116
Series Model:	BTW-115, GL020, BTW-119, TAGG ZeroG
FCC ID:	2ADQABTW-116
Test Standard:	FCC Part 15.247

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TEST RESULT CERTIFICATION

Applicant's Name:	Shenzhen iFree Electronic Technology Co., Ltd
Address	7F A9 Building Tian Rui industrial park No.35 Fu Yuan 1st Road, FuYong Road Bao'an District, Shenzhen, China
Manufacture's Name:	Shenzhen iFree Electronic Technology Co., Ltd
Address	7F A9 Building Tian Rui industrial park No.35 Fu Yuan 1st Road, FuYong Road Bao'an District, Shenzhen, China
Product Description	
Product Name	Bluetooth Earphone
Brand Name	N/A
Model Name:	BTW-116
Series Model	BTW-115, GL020, BTW-119, TAGG ZeroG
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 : 27 Aug. 2019 ~ 31 Aug. 2019

Date of Issue: 04 Sept. 2019

Test Result Pass

Testing Engineer

(Chris Chen)

Technical Manager

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Authorized Signatory :

(Sunday Hu)

(Vita Li)

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Page 3 of 72 Report No.: STS1908110W01



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 THE EUT	8
2.2 DESCRIPTION OF THE 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 NECESSARY ACCESSORIES AND SUPPORT UNITS	12
2.6 EQUIPMENTS LIST	13
3. EMC EMISSION TEST	14
3.1 CONDUCTED EMISSION MEASUREMENT	14
3.2 RADIATED EMISSION MEASUREMENT	18
4. CONDUCTED SPURIOUS & BAND EDGE EMISSION	30
4.1 LIMIT	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	46
5.1 LIMIT	46
5.2 TEST PROCEDURE	46
5.3 TEST SETUP	46
5.4 EUT OPERATION CONDITIONS	46
5.5 TEST RESULTS	47
6. AVERAGE TIME OF OCCUPANCY	48
6.1 LIMIT	48
6.2 TEST PROCEDURE	48
6.3 TEST SETUP	48
6.4 EUT OPERATION CONDITIONS	48
6.5 TEST RESULTS	49
7. HOPPING CHANNEL SEPARATION MEASUREMEN	55
7.1 LIMIT	55

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Page 4 of 72 Report No.: STS1908110W01



Table of Contents	Page
7.2 TEST PROCEDURE	55
7.3 TEST SETUP	55
7.4 EUT OPERATION CONDITIONS	55
7.5 TEST RESULTS	56
8. BANDWIDTH TEST	62
8.1 LIMIT	62
8.2 TEST PROCEDURE	62
8.3 TEST SETUP	62
8.4 EUT OPERATION CONDITIONS	62
8.5 TEST RESULTS	63
9. OUTPUT POWER TEST	69
9.1 LIMIT	69
9.2 TEST PROCEDURE	69
9.3 TEST SETUP	69
9.4 EUT OPERATION CONDITIONS	69
9.5 TEST RESULTS	70
10. ANTENNA REQUIREMENT	71
10.1 STANDARD REQUIREMENT	71
10.2 EUT ANTENNA	71

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Page 5 of 72 Report No.: STS1908110W01

Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	04 Sept. 2019	STS1908110W01	ALL	Initial Issue



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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: KDB 558074 D01 15.247 Meas Guidance v05r02

	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©	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



1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District,Bao'an District, Shenzhen, Guang Dong, China FCC test Firm Registration Number: 625569 IC test Firm Registration Number: 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 %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.71dB
2	Unwanted Emissions, conducted	±0.63dB
3	All emissions, radiated 30-200MHz	±3.43dB
4	All emissions, radiated 200MHz-1GHz	±3.57dB
5	All emissions, radiated>1G	±4.13dB
6	Conducted Emission (9KHz-150KHz)	±3.18dB
7	Conducted Emission (150KHz-30MHz)	±2.70dB



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Bluetooth Earphone
Trade Name	N/A
Model Name	BTW-116
Series Model	BTW-115, GL020, BTW-119, TAGG ZeroG
Model Difference	The shell structure is different.
Channel List	Please refer to the Note 2.
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps)
Bluetooth Version	5.0
Bluetooth Configuration	BR+EDR
Charge BOX	Input: DC 5V 1A Output: DC 5V 1A
Battery	Rated Voltage: 3.7V Charge Limit: 5V Capacity: 45mAh
Hardware version number	V1.0
Software version number	2.0
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.

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2.

		Chanr	nel 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	N/A	BTW-116	ceramics	N/A	0.8 dBi	BT Antenna



2.2 DESCRIPTION OF THE 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.

1Mbps/GFSK 1Mbps/GFSK 1Mbps/GFSK 2 Mbps/π/4-DQPSK
1Mbps/GFSK
•
2 Mbps/π/4-DQPSK
2 Mbps/π/4-DQPSK
2 Mbps/π/4-DQPSK
3 Mbps/8DPSK
3 Mbps/8DPSK
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

For AC Conducted Emission

	Test Case
AC Conducted	Mode 10 : 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				
(Power control software) Parameters(1/2/3Mbps)	Power class: DH1 rate:4:27 2DH1 rate:20:54 3DH1 rate:24:83	Power class: DH3 rate:11:183 2DH3 rate:26:367 3DH3 rate:27:552	Power class: DH5 rate:15:339 2DH5 rate:30:679 3DH5 rate:31:1021		

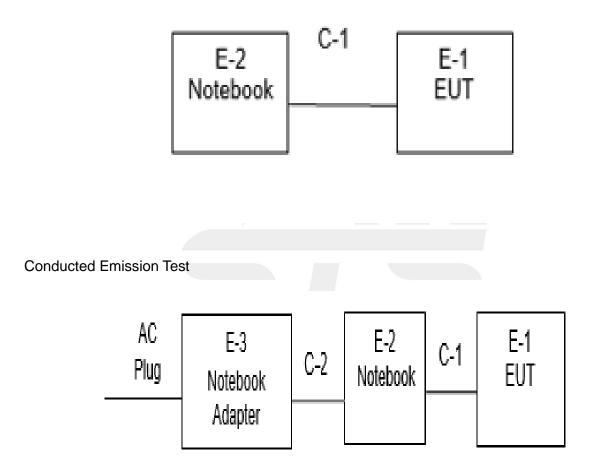


Page 11 of 72 Report No.: STS1908110W01

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 Emission Test



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2.5 DESCRIPTION OF NECESSARY ACCESSORIES AND 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.

Necessary accessories

Item	Equipment	Mfr/Brand	Mfr/Brand Model/Type No.		Note
E-3	Adapter	N/A	N/A	N/A	N/A
C-2	DC Cable	N/A	110cm	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	Notebook	DELL	VOSTRO.3800	N/A	N/A
C-1	USB Cable	N/A	100cm	N/A	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

Radiation 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
Signal Analyzer	Agilent	N9020A	MY51110105	2019.03.02	2020.03.01
Active loop Antenna	ZHINAN	ZN30900C	16035	2018.03.11	2021.03.10
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.1
Horn Antenna	SCHWARZBECK	BBHA 9120D(1201)	9120D-1343	2018.10.19	2021.10.18
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2018.03.11	2021.03.10
Pre-Amplifier(0.1M-3G Hz)	EM	EM330	060665	2018.10.13	2019.10.12
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK201808090 1	2018.10.13	2019.10.12
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	FARAD	E	Z-EMC(Ver.STS	LAB-03A1 RE)	

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	2018.10.11	2019.10.10
LISN	EMCO	3810/2NM	23625	2018.10.11	2019.10.10
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 CE)			

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	
Signal Analyzer	Agilent	N9020A	MY49100060	2018.10.13	2019.10.12	
Temperature & Humidity	HH660	Mieo	N/A	2018.10.11	2019.10.10	
Test SW	FARAD	LZ-RF /LzRf-3A3				



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.

	Conducted Emissionlimit (dBuV)		
FREQUENCY (MHz)	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.

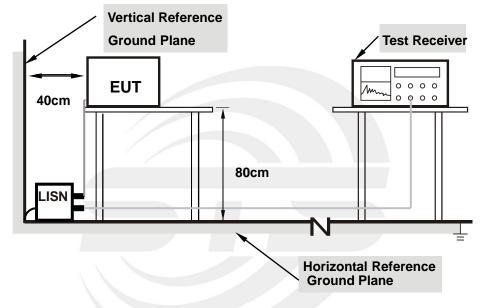
The following table is the setting of the receiver

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



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

Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 10		

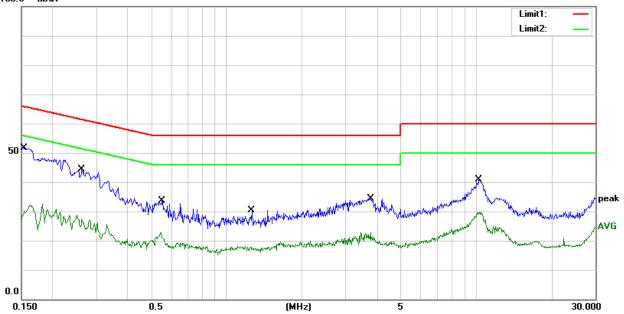
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1540	31.93	19.73	51.66	65.78	-14.12	QP
2	0.1540	12.84	19.73	32.57	55.78	-23.21	AVG
3	0.2620	24.18	20.09	44.27	61.37	-17.10	QP
4	0.2620	8.80	20.09	28.89	51.37	-22.48	AVG
5	0.5500	13.83	19.91	33.74	56.00	-22.26	QP
6	0.5500	0.74	19.91	20.65	46.00	-25.35	AVG
7	1.2660	10.61	19.77	30.38	56.00	-25.62	QP
8	1.2660	-1.54	19.77	18.23	46.00	-27.77	AVG
9	3.7700	14.56	19.87	34.43	56.00	-21.57	QP
10	3.7700	3.05	19.87	22.92	46.00	-23.08	AVG
11	10.2460	20.94	19.84	40.78	60.00	-19.22	QP
12	10.2460	10.02	19.84	29.86	50.00	-20.14	AVG

Remark:

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

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







Page 17 of 72 Report No.: STS1908110W01

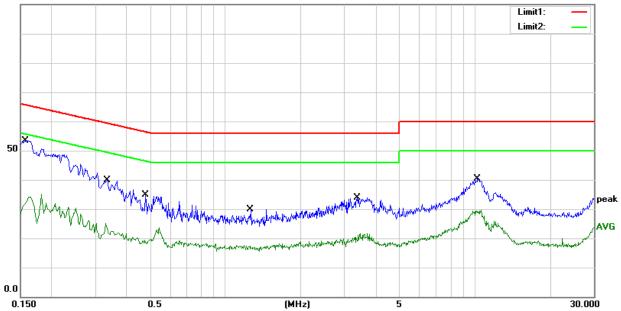
Temperature:	26(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Ν
Test Mode:	Mode 10		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1580	33.66	19.74	53.40	65.57	-12.17	QP
2	0.1580	15.33	19.74	35.07	55.57	-20.50	AVG
3	0.3340	19.73	20.17	39.90	59.35	-19.45	QP
4	0.3340	4.93	20.17	25.10	49.35	-24.25	AVG
5	0.4780	14.98	19.96	34.94	56.37	-21.43	QP
6	0.4780	3.64	19.96	23.60	46.37	-22.77	AVG
7	1.2660	10.11	19.77	29.88	56.00	-26.12	QP
8	1.2660	-1.59	19.77	18.18	46.00	-27.82	AVG
9	3.3780	13.92	19.86	33.78	56.00	-22.22	QP
10	3.3780	1.84	19.86	21.70	46.00	-24.30	AVG
11	10.2460	20.44	19.84	40.28	60.00	-19.72	QP
12	10.2460	9.76	19.84	29.60	50.00	-20.40	AVG

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 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)

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/AV
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/AV
	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 19 of 72 Report No.: STS1908110W01

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

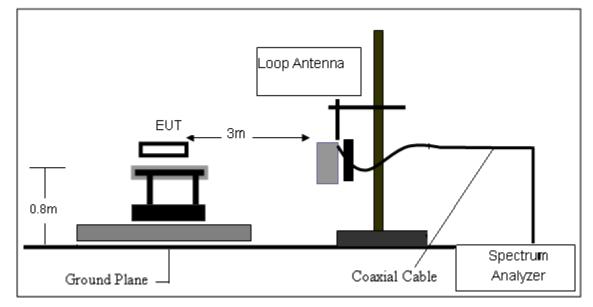
No deviation

Page 20 of 72 Report No.: STS1908110W01

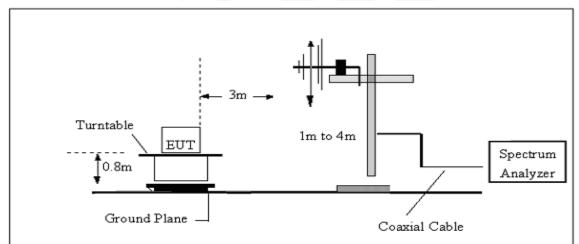


3.2.4 TESTSETUP

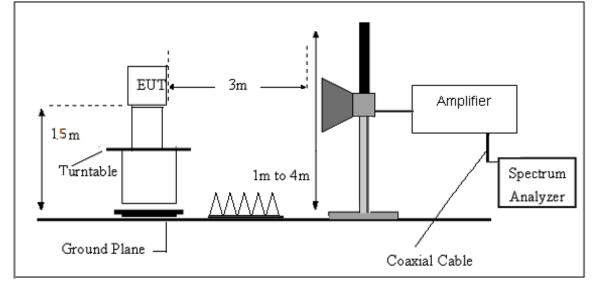
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



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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.



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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



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3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	25.0(C)	Relative Humidity:	64%RH
Test Voltage:	DC 3.7V from battery	Test Mode:	TX Mode

Freq.	Reading	Limit	Margin	State	Toot Docult
(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.





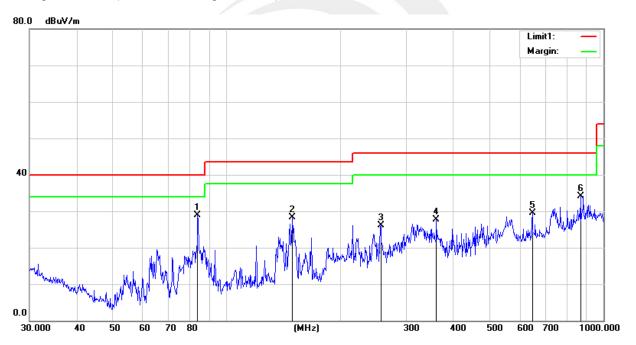
(30MHz-1000MHz)

Temperature:	25.0(C)	Relative Humidity:	64%RH	
Test Voltage:	DC 3.7V from battery	Phase:	Horizontal	
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode 7 worst mode)			

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	83.8156	51.34	-22.45	28.89	40.00	-11.11	QP
2	149.4857	46.72	-18.50	28.22	43.50	-15.28	QP
3	256.5211	41.30	-15.18	26.12	46.00	-19.88	QP
4	360.4476	40.62	-12.85	27.77	46.00	-18.23	QP
5	647.3856	34.35	-4.89	29.46	46.00	-16.54	QP
6	869.1302	34.70	-0.52	34.18	46.00	-11.82	QP

Remark:

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



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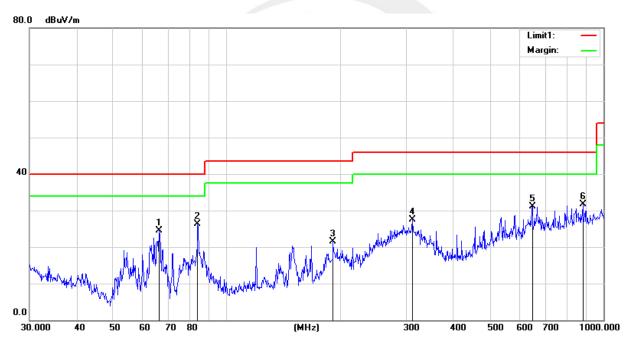


Temperature:	25.0(C)	Relative Humidity:	64%RH
Test Voltage:	DC 3.7V from battery	Phase:	Vertical
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode	7 worst mode)	

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	66.2661	50.03	-25.55	24.48	40.00	-15.52	QP
2	83.8156	48.77	-22.45	26.32	40.00	-13.68	QP
3	191.7450	42.56	-21.03	21.53	43.50	-21.97	QP
4	311.0867	41.96	-14.41	27.55	46.00	-18.45	QP
5	647.3855	36.04	-4.89	31.15	46.00	-14.85	QP
6	881.4067	32.30	-0.66	31.64	46.00	-14.36	QP

Remark:

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





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

Frequency	Meter Reading	Amplifier	Loss	Antenna Factor	Orrected Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
				Low C	hannel (2402	MHz)				
3264.67	61.41	44.70	6.70	28.20	-9.80	51.61	74.00	-22.39	PK	Vertical
3264.67	50.15	44.70	6.70	28.20	-9.80	40.35	54.00	-13.65	AV	Vertical
3264.65	61.09	44.70	6.70	28.20	-9.80	51.29	74.00	-22.71	PK	Horizontal
3264.65	50.61	44.70	6.70	28.20	-9.80	40.81	54.00	-13.19	AV	Horizontal
4804.41	58.27	44.20	9.04	31.60	-3.56	54.71	74.00	-19.29	PK	Vertical
4804.41	49.92	44.20	9.04	31.60	-3.56	46.36	54.00	-7.64	AV	Vertical
4804.58	58.96	44.20	9.04	31.60	-3.56	55.40	74.00	-18.60	PK	Horizontal
4804.58	50.50	44.20	9.04	31.60	-3.56	46.94	54.00	-7.06	AV	Horizontal
5359.89	49.04	44.20	9.86	32.00	-2.34	46.70	74.00	-27.30	PK	Vertical
5359.89	39.56	44.20	9.86	32.00	-2.34	37.22	54.00	-16.78	AV	Vertical
5359.67	47.17	44.20	9.86	32.00	-2.34	44.83	74.00	-29.17	PK	Horizontal
5359.67	38.10	44.20	9.86	32.00	-2.34	35.76	54.00	-18.24	AV	Horizontal
7205.85	53.97	43.50	11.40	35.50	3.40	57.37	74.00	-16.63	PK	Vertical
7205.85	43.83	43.50	11.40	35.50	3.40	47.23	54.00	-6.77	AV	Vertical
7205.72	54.55	43.50	11.40	35.50	3.40	57.95	74.00	-16.05	PK	Horizontal
7205.72	43.72	43.50	11.40	35.50	3.40	47.12	54.00	-6.88	AV	Horizontal
	•			Middle	Channel (244	1 MHz)		•		
3264.89	61.95	44.70	6.70	28.20	-9.80	52.15	74.00	-21.85	PK	Vertical
3264.89	51.18	44.70	6.70	28.20	-9.80	41.38	54.00	-12.62	AV	Vertical
3264.56	61.61	44.70	6.70	28.20	-9.80	51.81	74.00	-22.19	PK	Horizontal
3264.56	51.17	44.70	6.70	28.20	-9.80	41.37	54.00	-12.63	AV	Horizontal
4882.43	58.15	44.20	9.04	31.60	-3.56	54.59	74.00	-19.41	PK	Vertical
4882.43	49.85	44.20	9.04	31.60	-3.56	46.29	54.00	-7.71	AV	Vertical
4882.31	59.49	44.20	9.04	31.60	-3.56	55.93	74.00	-18.07	PK	Horizontal
4882.31	49.23	44.20	9.04	31.60	-3.56	45.67	54.00	-8.33	AV	Horizontal
5359.81	48.14	44.20	9.86	32.00	-2.34	45.80	74.00	-28.20	PK	Vertical
5359.81	40.43	44.20	9.86	32.00	-2.34	38.09	54.00	-15.91	AV	Vertical
5359.83	47.57	44.20	9.86	32.00	-2.34	45.23	74.00	-28.77	PK	Horizontal
5359.83	39.40	44.20	9.86	32.00	-2.34	37.06	54.00	-16.94	AV	Horizontal
7323.69	54.23	43.50	11.40	35.50	3.40	57.63	74.00	-16.37	PK	Vertical
7323.69	43.91	43.50	11.40	35.50	3.40	47.31	54.00	-6.69	AV	Vertical
7323.78	54.12	43.50	11.40	35.50	3.40	57.52	74.00	-16.48	PK	Horizontal
7323.78	43.99	43.50	11.40	35.50	3.40	47.39	54.00	-6.61	AV	Horizontal



Page 27 of 72 Report No.: STS1908110W01

				High C	hannel (248	0 MHz)				
3264.75	61.90	44.70	6.70	28.20	-9.80	52.10	74.00	-21.90	PK	Vertical
3264.75	50.20	44.70	6.70	28.20	-9.80	40.40	54.00	-13.60	AV	Vertical
3264.75	62.06	44.70	6.70	28.20	-9.80	52.26	74.00	-21.74	PK	Horizontal
3264.75	51.12	44.70	6.70	28.20	-9.80	41.32	54.00	-12.68	AV	Horizontal
4960.50	59.40	44.20	9.04	31.60	-3.56	55.84	74.00	-18.16	PK	Vertical
4960.50	49.77	44.20	9.04	31.60	-3.56	46.21	54.00	-7.79	AV	Vertical
4960.41	58.40	44.20	9.04	31.60	-3.56	54.84	74.00	-19.16	PK	Horizontal
4960.41	50.11	44.20	9.04	31.60	-3.56	46.55	54.00	-7.45	AV	Horizontal
5359.83	48.73	44.20	9.86	32.00	-2.34	46.39	74.00	-27.61	PK	Vertical
5359.83	39.43	44.20	9.86	32.00	-2.34	37.09	54.00	-16.91	AV	Vertical
5359.73	47.58	44.20	9.86	32.00	-2.34	45.24	74.00	-28.76	PK	Horizontal
5359.73	38.03	44.20	9.86	32.00	-2.34	35.69	54.00	-18.31	AV	Horizontal
7439.86	53.83	43.50	11.40	35.50	3.40	57.23	74.00	-16.77	PK	Vertical
7439.86	44.65	43.50	11.40	35.50	3.40	48.05	54.00	-5.95	AV	Vertical
7439.91	54.29	43.50	11.40	35.50	3.40	57.69	74.00	-16.31	PK	Horizontal
7439.91	44.25	43.50	11.40	35.50	3.40	47.65	54.00	-6.35	AV	Horizontal

Note:

1) Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK, the worst case is 8DPSK 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.

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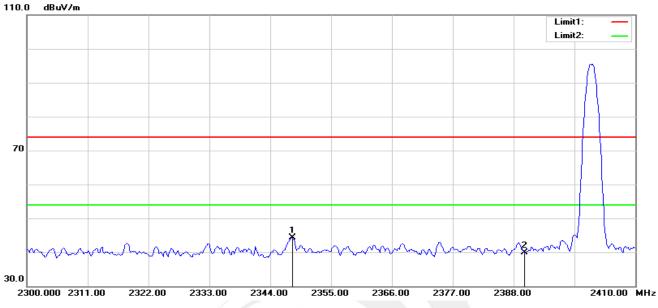
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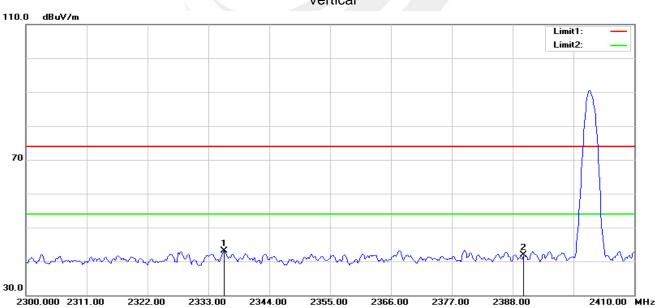


Restricted band Requirements

8DPSK -Low Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2347.960	40.52	3.73	44.25	74.00	-29.75	peak
2	2390.000	35.62	4.34	39.96	74.00	-34.04	peak



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2335.860	39.42	3.66	43.08	74.00	-30.92	peak
2	2390.000	37.47	4.34	41.81	74.00	-32.19	peak

Vertical

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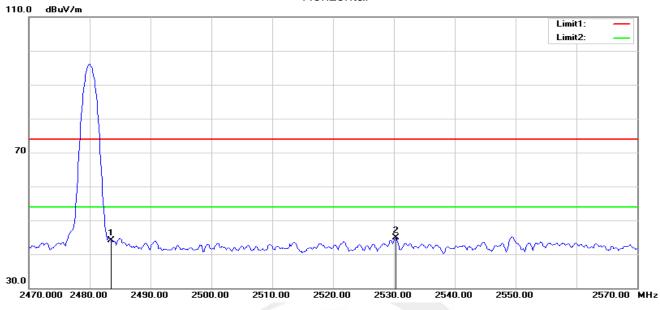
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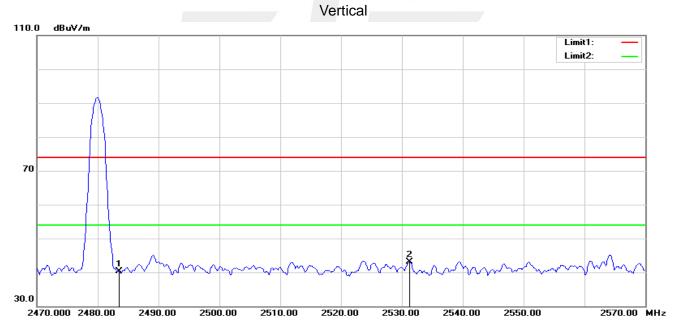
Page 29 of 72

Report No.: STS1908110W01

8DPSK-High Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	39.57	4.60	44.17	74.00	-29.83	peak
2	2530.300	39.96	4.85	44.81	74.00	-29.19	peak



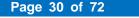
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	35.62	4.60	40.22	74.00	-33.78	peak
2	2531.200	38.22	4.86	43.08	74.00	-30.92	peak

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

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4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 LIMIT

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

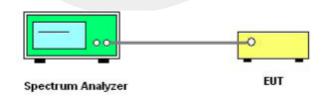
Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

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



The EUT is connected 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

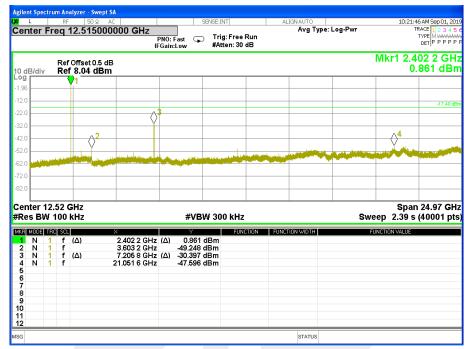
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 TEST RESULTS

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

00 CH



39 CH

		Analyzer - Sv														
nter F			Ω AC 0000000	F	PNO: I Gain:		SENSE:INT D Trig: I #Atter			AL	IGN AUTO Avg T}	/pe: l	Log-Pwr			24 AM Sep 01, 2 TRACE 1 2 3 4 TYPE MWWW DET P P P P
dB/div		ef Offset 0 ef_11.32													Mkr1 2.4 1	140 9 GH .324 dB
32		1														
7					3											-18.11
7																,
7		\Diamond^2		Mark Lower						a bila sel		W .,			and the second second	
7																
7 nter 1	2.52	GHz													Spa	n 24.97 G
es BW	10	0 kHz				#VE	W 300	kHz					S		ep 2.39 s	; (40001 p
	1 1	CL F (Δ) F F (Δ)	3.05	0 9 GHz 1 4 GHz 3 1 GHz		1.324 -52.770 -31.427		FUNC	TION	FUNCT	ION WIDTH			FU	INCTION VALUE	
N	1 1	7	24.34	8 9 GHz		-47.911	dBm									
											STATUS					



78 CH

L		RF		Ω AC				SENSE:INT		AL	IGN AUTO		10:1	.9:40 AM Sep 01, 2
nter	Fre	ed .	12.515	0000	00 GHz	PNC): Fast () in:Low	Trig: F #Atten	ree Run : 30 dB		Avg Type	: Log-Pwr		TRACE 1 2 3 4 TYPE MWWW DET P P P P
dB/di			Offset 0 [11.22											.480 2 G 1.655 dE
g 22			1											
18														
.8					3									-18.18
8					<u> </u>									
8			\langle	2										
.8			and a state			-	المرجب المراج		and a star	Automation			Second Arth	
8		10.				~	Santa Sector							
.8														
nter es B							#V	BW 300 k	Hz			S	Sp weep 2.39	an 24.97 G s (40001 p
R MODE	TRC			×			Y		FUNCTION	FUNC	TION WIDTH		FUNCTION VALU	E
N	1	f f	(Δ)		2.480 2 G 3.719 9 G			5 dBm 4 dBm						
N	1	f f	(Δ)		4.960 3 G 4.754 7 G			8 dBm 9 dBm						
	Ľ.	•		2-	4.70470	112	-47.02	JUDIII						



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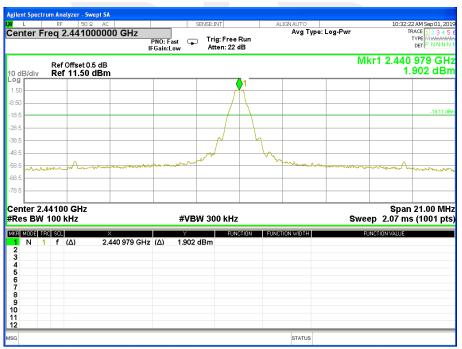


For Band edge

00 CH

lgilent Spectrum Analyzer - Swept SA					
2 RL RF 50 Ω AC Center Freq 2.351500000 GHz	PNO: Fast IFGain:Low	ENSE:INT Trig: Free Run #Atten: 30 dB	ALIGN AUTO Avg Type	-	09:23:33 AM Sep 01, 201 TRACE 1 2 3 4 5 TYPE M WWWW DET P P P P P
Ref Offset 0.5 dB 10 dB/div Ref 12.60 dBm				M	(r1 2.401 867 GH 2.603 dBn
2.60					
-7.40					-17.40 dB
-27.4					
-47.4					\wedge^2
57.4 your constant of the strate of the stra	havententorymet		น _เ ทรมหาศึกษฎในการสุดในการสะเหนือจะ	reflectfally weather the	and a star for the start of the
77.4					
Start 2.30000 GHz #Res BW 100 kHz	#VB\	N 300 kHz		Swee	Stop 2.40300 GH p 9.87 ms (1001 pts
MKG MODE TRC SCL X 1 N 1 f 2.401 867 GH 2 N 1 f 2.390 022 GH 3 N 1 f 2.399 807 GH 4 6 6 7 8 9 9 9 5 5	z -59.425 d	dBm	FUNCTION WIDTH	FU	NCTION VALUE
8 9 10 11 12 50			STATUS		
			STATUS		

39 CH





78 CH

ilent Spect R L	rum Ana RF	lyzer - Swept			SENSE:INT		IGNAUTO		00.55.0	14 AM Sep 01, 20
			000 GHz	PNO: Fast G FGain:Low	Tailan France	Run	Avg Type:	-	Т	RACE 1 2 3 4 5 TYPE M WANNA DET P P P P
) dB/div		Offset 0.5 d 11.82 dE						MI	(r1 2.479 1.	987 GH 819 dB
1.82										
8.2										-18.18
B.2										
B.2		V.	<u>2</u>		3					
3.2 3.2			mar and a start and a start a st	longrammer and	the strategies of the second s	and and an and an and an		hand have the second	and and a second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
8.2										
art 2.4 ≀es BW				#VE	300 kHz			Swee	Stop 2. ep 2.07 m	50000 G s (1001 p
(R MODE 1		(Δ)	× 2.479 987 GHz	γ (Δ) 1.819	FUN	CTION FUNC	ION WIDTH	FL	INCTION VALUE	
3 N	1 f 1 f		2.483 998 GHz 2.487 967 GHz							
4 5 5										
7 3 9										
D 1										
3							STATUS			



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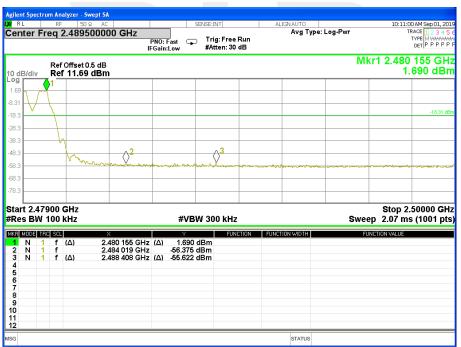


For Hopping Band edge

00 CH

gilent Spectr	r <mark>um Analyzer - S</mark> RF 50			SENSE:INT	Al	IGNAUTO		10:08:39	AM Sep 01, 20:
		500000 GHz	PNO: Fast Gain:Low	Tailas Faces De	un	Avg Type: I	-	TR T	ACE 1 2 3 4 5 YPE M WAAWAA DET P P P P P
0 dB/div	Ref Offset 0 Ref 11.58						М	kr1 2.403 1.	000 GH 578 dBr
og 1.58									
8.42									-18.42 d
8.4									
8.4									
8.4								$\langle \rangle^2$. martin
8.4	an a	Sharen franzis de la filia de la cardera					Brooken maar jilina aki		
8.4									
	0000 GHz 100 kHz		#VB	W 300 kHz			Swe	Stop 2.4 ep 9.87 ms	0300 GH (1001 pt
	RC SCL	×	Y	FUNCT	ION FUNCT	ION WIDTH	F	UNCTION VALUE	
1 N 1 2 N 1 3 N 1 4 5		2.403 000 GHz 2.390 022 GHz 2.399 910 GHz	-58.414	dBm					
4 5 6 7 8 9 0 1									
2						STATUS			

78 CH





Page 36 of 72 Report No.: STS1908110W01

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

ent Spectrum Analyzer - Swe L RF 50 Ω	AC	SENSE:INT	ALIGN AUTO	10:44:04 AM Sep 01, 2
nter Freq 12.5150	PNO	: Fast 😱 Trig: Free Ru n:Low #Atten: 30 dB	Avg Type: Log-Pw n	TRACE 1 2 3 4 TYPE M WAAA DET P P P
Ref Offset 0.5 dB/div Ref 11.65 (Mkr1 2.402 2 G 1.652 dB
1				
5				
4				-17.49
4				
4	Ĭ			
4				
	ير الم مركبين الم	مراجع المراجع والمراجع و	Name and Address of the Owner of	and the second
4				
4				
nter 12.52 GHz				Span 24.97 G
es BW 100 kHz		#VBW 300 kHz		Sweep 2.39 s (40001 p
MODE TRC SCL	×	Y FUNCTIO	N FUNCTION WIDTH	FUNCTION VALUE
N 1 f (Δ) N 1 f	2.402 2 GHz (Δ) 3.603 2 GHz	1.652 dBm -48.332 dBm		
N 1 f (Δ) N 1 f	7.205 8 GHz (Δ) 24.726 6 GHz	-31.406 dBm -47.839 dBm		
	24.7200 0112	41.000 0.011		
			STATUS	
	1			
		39 CH		

00 CH

39	CH
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L	RF 50 Ω	2 AC	SE	ENSE:INT	ALIG	NAUTO		10:53:	05 AM Sep 01, 2
		000000 GHz	PNO: Fast 🖵 -Gain:Low	Trig: Free Run #Atten: 30 dB	maxa	Avg Type:	Log-Pwr		TRACE 1 2 3 4 TYPE MWWWW DET P P P P
) dB/div	Ref Offset 0. Ref 8.43 d							Mkr1 2.4	40 9 GH .574 dB
.57	 1								
1.6									-18.09
.6		A3							-10.09
.6		()							
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.6									
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enter 12	52 CHz								n 24.97 G
	100 kHz		#VBW	V 300 kHz			Sw	eep 2.39 s	; (40001 p
es BW	100 kHz	X	Y	FUNCTION	FUNCTIO	N WIDTH		eep 2.39 s	(40001 p
ResBW RMODENE N 1 2 N 1	100 kHz f (Δ) f	2.440 9 GHz 3.661 3 GHz	γ (Δ) -1.574 d -46.351 d	FUNCTION	FUNCTIO	N WIDTH			: (40001 p
Res BW R MODE TE N 1 2 N 1 3 N 1	100 kHz f (Δ) f (Δ) f (Δ)	2.440 9 GHz	γ (Δ) -1.574 d -46.351 d	FUNCTION Bm Bm Bm	FUNCTIO	N WIDTH			: (40001 p
tes BW E MODE TE N 1 N 1 N 1 N 1 N 1	100 kHz f (Δ) f (Δ) f (Δ)	2.440 9 GHz 3.661 3 GHz 4.882 3 GHz	 (Δ) -1.574 d -46.351 d (Δ) -34.886 d 	FUNCTION Bm Bm Bm	FUNCTIO	N WIDTH			; (40001 p
Res BW I N 1 2 N 1 3 N 1 4 N 1 5 5 5	100 kHz f (Δ) f (Δ) f (Δ)	2.440 9 GHz 3.661 3 GHz 4.882 3 GHz	 (Δ) -1.574 d -46.351 d (Δ) -34.886 d 	FUNCTION Bm Bm Bm	FUNCTIO	N WIDTH			(40001 p
Res BW B MODE ME I N 1 2 N 1 3 N 1 4 N 1 5 7 3 3 9 9	100 kHz f (Δ) f (Δ) f (Δ)	2.440 9 GHz 3.661 3 GHz 4.882 3 GHz	 (Δ) -1.574 d -46.351 d (Δ) -34.886 d 	FUNCTION Bm Bm Bm	FUNCTIO	N WIDTH			(40001 p
R MODE TF N 1 1 2 N 1 3 N 1 4 N 1 5 5 5 7 3 3 3 0 1	100 kHz f (Δ) f (Δ) f (Δ)	2.440 9 GHz 3.661 3 GHz 4.882 3 GHz	 (Δ) -1.574 d -46.351 d (Δ) -34.886 d 	FUNCTION Bm Bm Bm	FUNCTIO	N WIDTH			- (40001 p
Res BW R MODE NE N 1 2 N 1 3 N 1	100 kHz f (Δ) f (Δ) f (Δ)	2.440 9 GHz 3.661 3 GHz 4.882 3 GHz	 (Δ) -1.574 d -46.351 d (Δ) -34.886 d 	FUNCTION Bm Bm Bm	FUNCTIO	NWIDTH			(40001 p

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78 CH

			AC		SE	ENSE:INT	AL	IGN AUTO			1 AM Sep 01, 2
nter	Freq	12.5150	000000 GHz	PNO: F IFGain:I] ast	Trig: Free #Atten: 30		Avg Type:	Log-Pwr		TYPE MWWW DET P P P
dB/div		f Offset 0.5 ef 9.45 dE								Mkr1 2.4 -0.	80 2 G 548 dE
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6											-18.24
6			() ³								
		^2	2							4	
6		- V				1.1.1.4	والمراجع والمراجع		و ما دان المار و ما در الم		surged as a line of the
6											he have been
6											
											04.07.0
nter 7	12.52	GHZ							0	span eep 2.39 s	24.97 G
	V 100				#VBV	V 300 kHz			SWI	ceh 2.38.2	(
es BV	TRC SC) kHz	×		Y	FUNG	TION FUNCT	ION WIDTH		UNCTION VALUE	(10001)
es BV Mode N N	TRC SC 1 f 1 f	kHz Δ	× 2.480 2 GH 3.719 9 GH	z	-0.548 d -48.251 d	FUND Bm Bm	TION FUNCT	ION WIDTH		•	
es BV	TRC SC 1 f	kHz (Δ)		z z (Δ)	Y -0.548 d	FUNC Bm Bm Bm	TION FUNCT	ION WIDTH		•	(10001)
es BV NODE N N N	1780 SO 1 f 1 f 1 f	kHz (Δ)	3.719 9 GH: 4.960 3 GH:	z z (Δ)	-0.548 d -48.251 d -33.464 d	FUNC Bm Bm Bm	TION FUNCT	ION WIDTH		•	(10001)
es BV N N N N	1780 SO 1 f 1 f 1 f	kHz (Δ)	3.719 9 GH: 4.960 3 GH:	z z (Δ)	-0.548 d -48.251 d -33.464 d	FUNC Bm Bm Bm	TION FUNCT	ION WIDTH		•	(10001)
es BV N N N N	1780 SO 1 f 1 f 1 f	kHz (Δ)	3.719 9 GH: 4.960 3 GH:	z z (Δ)	-0.548 d -48.251 d -33.464 d	FUNC Bm Bm Bm	TION FUNCT	ION WIDTH		•	(10001)
es BV	1780 SO 1 f 1 f 1 f	kHz (Δ)	3.719 9 GH: 4.960 3 GH:	z z (Δ)	-0.548 d -48.251 d -33.464 d	FUNC Bm Bm Bm	TION FUNCT	ION WIDTH		•	(10001)
es BV N N N N	1780 SO 1 f 1 f 1 f	kHz (Δ)	3.719 9 GH: 4.960 3 GH:	z z (Δ)	-0.548 d -48.251 d -33.464 d	FUNC Bm Bm Bm	TION FUNCT	ION WIDTH		•	



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Shenzhen STS Test Services Co., Ltd.

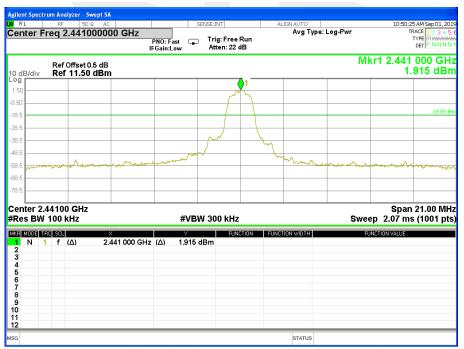


For Band edge

00 CH

		yzer - Swep										
RL enter F	_R ⊧ Freq 2		ac)000 GH	PNC): Fast 🔾 in:Low	SENSE:INT	Free Run n: 30 dB	ALIG	Avg Type:		Т	24 AM Sep 01, 20 RACE 1 2 3 4 5 TYPE M WARK DET P P P P
0 dB/div		offset 0.5 d 12.51 dE								N	1kr1 2.401 2	970 GH 513 dB
2.51												
.49 7.5												-17.49 d
7.5												6
7.5											^2	<u> </u>
7.5 7.5	warner	an a	nton	ration of particular	angen na air air air air air air air air air ai	ile connected	-gent-definitions	morena	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	manahanahans	approximately and	photological Physics
7.5												
art 2.30 Res BW					#V	3W 300 I	kHz			Swe	Stop 2 eep 9.87 m	.40300 GI s (1001 pi
R MODE TI	RC SCL		×		Y		FUNCTION	FUNCTIO	IN WIDTH		FUNCTION VALUE	
N 1 2 N 1 3 N 1	1 f	Δ) Δ)	2.401 970 2.390 022 2.399 704	GHz	-57.93							
1 5 7 3												
3))												
1												
2												

39 CH





78 CH

gilent Spectrum An									
RL RF				SENSE:INT	AL	IGNAUTO Avg Type:			5 AM Sep 01, 20 RACE 1 2 3 4 5
enter Freq 2	2.489500000		PNO: Fast 🕞 FGain:Low	⊃ Trig: Free F #Atten: 30 o		Avg Type:	Log-Pwr		TYPE MWWWW DET P P P P F
0 dB/div Ref	Offset 0.5 dB 11.77 dBm						MI	(r1 2.479 1.	987 GH 765 dBi
og 1.77									
3.23									
8.2									-18.24 d
8.2	5								
18.2		<mark>2</mark>		∆ 3					
8.2	war war	mahan	Martinen	how	way and flow and	- de antes	᠂ᢕᠬᠴᠣᡐᠧᡒᡟᢦ	and	and a state of the
8.2									
tart 2.47900 Res BW 100			#VE	W 300 kHz			Swee	Stop 2. p 2.07 m	50000 GI s (1001 pi
Krimode Tro Scl 1 n 1 f		79 987 GHz	(A) 4 705	FUNC	TION FUNCT	TION WIDTH	FU	NCTION VALUE	
2 N 1 f	2.48	34 355 GHz	-54.439	dBm					
3 N 1 f 4 5	(Δ) 2.48	37 484 GHz	(Δ) -54.091	авт					
5 7									
/ B									
8 9 0									
1 2									
G						STATUS			



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Shenzhen STS Test Services Co., Ltd.



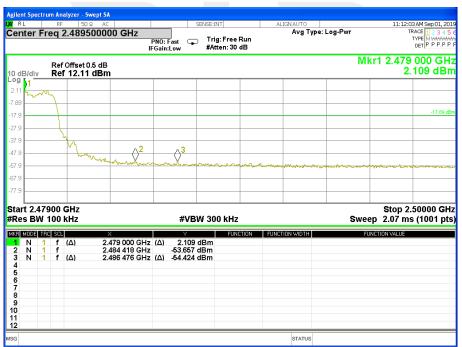


For Hopping Band edge

00 CH

ilent Spect R L	rum Analyzer - S RF 50	wept SA Ω AC		ENSE:INT	A	LIGNAUTO		11:00:41	LAM Sep 01, 2
		500000 GHz	PNO: Fast 😱 FGain:Low	Trig: Free F #Atten: 30 c	Run	Avg Type:	Log-Pwr	TR	ACE 1 2 3 4 TYPE M WAAAA DET P P P P
dB/div	Ref Offset 0 Ref 12.12						Mł	(r1 2.401 2.	970 GI 115 dB
g 12									
88									-17.88
.9									-11.00
.9									
.9								<mark>2</mark>	A not and
.9 9	- Joseph and the	when the second from the second	- Martine -	al Caladian Carlos	and the second second	an a	allaget of a strategy at	Xan	yr an all the
.9									
	0000 GHz 100 kHz		#VB\	V 300 kHz			Swee	Stop 2.4 p 9.87 ms	40300 G (1001 p
R MODE T	RC SCL 1 f (Δ)	× 2.401 970 GHz	× (Δ) 2.115 (TION FUNC	TION WIDTH	ÆU	NCTION VALUE	
2 N *	1 f 1 f (Δ)	2.390 022 GHz 2.399 910 GHz	-57.762 0	lBm					
i									
2									
						STATUS			

78 CH





Page 41 of 72 Report No.: STS1908110W01

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

00 CH

L		RF 5	Swept SA D Ω AC			SE	NSE:INT		ALIGN	AUTO			11:4	44:43 AM Ser	01.20
enter			500000		PNO: Fa FGain:Lo	ist 🗔	Trig: Free #Atten: 30			Avg Type	: Log-Pwi	r		TRACE 1 TYPE M DET P	234
) dB/div		Ref Offset Ref 9.94										N		.402 2 2.182	
.06		V 1													
D.1															-17.41 d
0.1 0.1			3												
0.1		_	°,2 ↓												-(
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0.1 📷			and the second second		-										
0.1	40 5													on 24.0	7.01
enter		2 GHz 10 kHz				#VBW	/ 300 kHz					Swee		an 24.9 s (4000	
enter Res B	W 10	0 kHz				Y	FUN		UNCTION	WIDTH				s (4000	
enter Res Bi	W 10	10 kHz scu f (∆) f	2. 3.	402 2 GHz 603 2 GHz	-	Y 2.182 d 45.634 d	FUN Bm Bm		UNCTION	WIDTH			p 2.39	s (4000	
enter Res B 1 N 2 N 3 N	W 10	10 kHz 501 f (Δ) f (Δ)	2. 3. 4.	603 2 GHz 804 3 GHz	(Δ)	Y 2.182 d 45.634 d 35.176 d	FUN Bm Bm Bm		UNCTION	WIDTH			p 2.39	s (4000	
enter Res B Model N N N N N N N N N N	W 10	10 kHz scu f (∆) f	2. 3. 4.	603 2 GHz	(Δ)	Y 2.182 d 45.634 d	FUN Bm Bm Bm		UNCTION	WIDTH			p 2.39	s (4000	
enter Res B 1 N 2 N 3 N 4 N 5 5 7	W 10	10 kHz 501 f (Δ) f (Δ)	2. 3. 4.	603 2 GHz 804 3 GHz	(Δ)	Y 2.182 d 45.634 d 35.176 d	FUN Bm Bm Bm		UNCTION	IWIDTH			p 2.39	s (4000	
enter Res B 8 M000 1 N 2 N 3 N 4 N 5 6 6 7 7	W 10	10 kHz 501 f (Δ) f (Δ)	2. 3. 4.	603 2 GHz 804 3 GHz	(Δ)	Y 2.182 d 45.634 d 35.176 d	FUN Bm Bm Bm		UNCTION	I WIDTH			p 2.39	s (4000	
enter Res B 1 N 3 N 4 N 5 6 8 9 9 0	W 10	10 kHz 501 f (Δ) f (Δ)	2. 3. 4.	603 2 GHz 804 3 GHz	(Δ)	Y 2.182 d 45.634 d 35.176 d	FUN Bm Bm Bm			IWIDTH			p 2.39	s (4000	
Res B 1 N 2 N 3 N	W 10	10 kHz 501 f (Δ) f (Δ)	2. 3. 4.	603 2 GHz 804 3 GHz	(Δ)	Y 2.182 d 45.634 d 35.176 d	FUN Bm Bm Bm			I WIDTH			p 2.39	s (4000	

39 CH

		ectrur		alyzer - Swe										
IXI			RF				SE	ENSE:INT		ALIC	GNAUTO	: Log-Pwr	11:5	3:11 AM Sep 01, 20:
Cer	nter	Fre	p,	12.5150		PNO: Gain		Trig: Free #Atten: 30			AVg Type	: Log-Pwr		TRACE 1 2 3 4 5 TYPE MWWWW DET P P P P P
	IB/div			Offset 0.5 10.07 d										.440 9 GH 1.415 dBr
Log 0.070			•	1										
-9.93														-18.12 dB
-19.9	1				۸3									-10.12 00
-29.9	1											_		
-39.9	1			\wedge										\bigcirc
-59.9		en e fulle	الأجرائي	and the second					a la constante					
-69.9		(*************************************												
-79.9	-													
	nter es Bi						#VBV	V 300 kH	z			S	Spa weep 2.39	an 24.97 GH s (40001 pts
MKR 1	MODE N	TRC	sa	(Δ)	× 2.440 9 GHz	(0)	Y 1.415 d		NCTION	FUNCTIO	DN WIDTH		FUNCTION VALUE	
2	N	1	f		3.661 3 GHz		-49.153 d	Bm						
3	N N	1	f f	(Δ)	4.882 3 GHz 24.465 6 GHz	(<u>(</u>)	-34.770 d -48.450 d							
5 6														
7														
8 9 10														
8 9														

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78 CH

		RF		2 AC			SENSE	EINT		ALI	GN AUTO					:54 AM Sep 01, 2
nter	· Fre	pe	12.515	000000 G	Р	'NO: Fast Gain:Low		rig: Free Atten: 30			Avg Ty	/pe:L	og-Pwr			TRACE 1 2 3 4 TYPE MWMW DET P P P F
dB/di			Offset 0. f 11.39											Ν		480 2 G I.391 dE
9 39			1													
51																-17.81
.6					0	3										-17.01
6					Y	/										
.6				2							and the state line.		L. June			الالداريس الدر
6	ener di															
.6																
.6																
nter es B						:	#VBW 3	00 kHz						Swee		n 24.97 G s (40001 p
	E TRC			×			Y		CTION	FUNCT	ION WIDTH			FUN	CTION VALUE	
	1	f	(Δ)		2 GHz 3 GHz		l.391 dBn 8.194 dBn									
N		f	(Δ)	7.440 24.722	5 GHz		.044 dBn .157 dBn									
NNN	1				o Griz	-47	.157 000									
NNNN	1	f														
N N N		f														
		f														
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N		f														
N N N		f									STATUS					



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Shenzhen STS Test Services Co., Ltd.

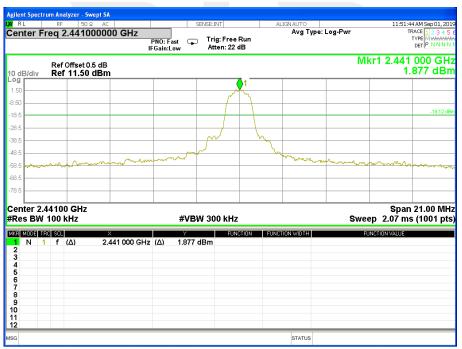


For Band edge

00 CH

RL			rept SA							
	req 3			PNO: Fast FGain:Low	SENSE:INT Trig: Fr #Atten:		ALIGN AUTO Avg Type	: Log-Pwr	TF	2 AM Sep 01, 2 RACE 1 2 3 4 TYPE M WAAAA DET P P P P
) dB/div		Offset 0. f 12.59						N	lkr1 2.401 2.	867 GH 588 dB
.59						_				
41 7.4										-17.41
.4										
.4									\wedge^2	
.4	otueni	mennentra	araana sharanga sharan	aman m	wanderstitess worders	ma and the state of the state o	angleda angleda Angleda angleda	dathan minaidae un	and the state of t	
.4										
art 2.30 les BW				#	¢VBW 300 ki	Ηz		Swe	Stop 2. ep 9.87 ms	40300 G ; (1001 p
R MODE TF			X			UNCTION	FUNCTION WIDTH		FUNCTION VALUE	
N 1 N 1	f	(Δ)	2.401 867 GHz 2.390 022 GHz		588 dBm 765 dBm					
8 N 1 4 5		(Δ)	2.399 498 GHz		186 dBm					
7 3 9										
1										

39 CH





78 CH

	um Analyzer - Sv						
enter F		2 AC 000000 GHz	PNO: Fast	Trig: Free Run	ALIGN AUTO Avg Type	: Log-Pwr	11:35:26 AM Sep 01, 2 TRACE 1 2 3 4 TYPE M WWWW DET P P P P
) dB/div	Ref Offset 0 Ref 12.19	.5 dB	IFGain:Low	#Atten: 30 dB		Mkr1	2.479 840 GH 2.191 dB
19 81	1						
1.8 1.8							-17.81
1.8 <u></u>	- Martin - M	2 martan		3			
.8				er handerkonservind	and a second and a s	A more the operation of the second	and a star and the star of the
art 2.47	'900 GHz 100 kHz		#VB	W 300 kHz		Sweep	Stop 2.50000 G 2.07 ms (1001 p
R MODE TR N 1 2 N 1 3 N 1	f (Δ) f	× 2.479 840 GH 2.483 977 GH 2.488 009 GH	z -53.355	dBm	FUNCTION WIDTH	FUNCTIO	N VALUE
		2.488 009 GH	2 (Δ) -52.909	abm			
2							



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Shenzhen STS Test Services Co., Ltd.

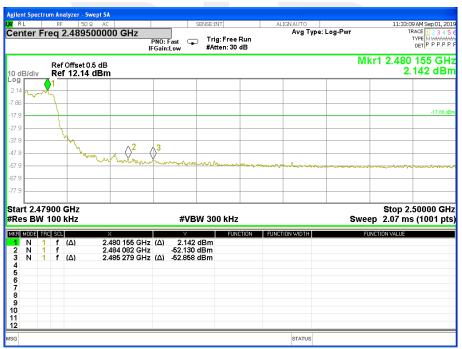


For Hopping Band edge

00 CH

gilent Spectrum Analyzer - Swept SA RL RF 50 Ω AC	SENSE:INT	ALIGNAUTO	11:30:48 AM Sep 01, 20
enter Freq 2.351500000 GHz	PNO: Fast Trig: Free R IFGain:Low #Atten: 30 d	Avg Type: Log-F tun	TRACE 12345 TYPE MUMANN DET P P P F
Ref Offset 0.5 dB 0 dB/div Ref 12.35 dBm			Mkr1 2.403 000 GH 2.346 dBi
0g 2.35			
7.7			-17.65 d
7.7			
7.7			
7.7	ware at marked and a marked for the marked and the	ฟะตูปเรื่อว่า-นอาตุ(DR)ใจและเป็นจะว่างในจะสาว ^{มการเร} าด	anon 22 month of A
7.7			
7.7			
tart 2.30000 GHz Res BW 100 kHz	#VBW 300 kHz		Stop 2.40300 Gi Sweep 9.87 ms (1001 pt
KR MODE THC Sci. X 1 N 1 f (Δ) 2.403 000 (Δ) 000 (Δ) 2 N 1 f (Δ) 2.390 022 (Δ) 00 (Δ) 3 N 1 f (Δ) 2.399 704 (Δ) 00 (Δ) 5 - <t< th=""><th>Hz -58.544 dBm</th><th>ION FUNCTION WIDTH</th><th>FUNCTION VALUE</th></t<>	Hz -58.544 dBm	ION FUNCTION WIDTH	FUNCTION VALUE
1 2 6		STATUS	

78 CH



Shenzhen STS Test Services Co., Ltd.



5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

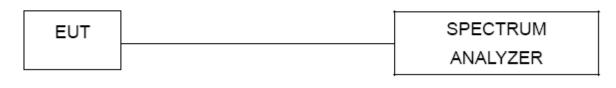
	FCC Part 15.247,Subpart C									
Section	Test Item	Limit	FrequencyRange (MHz)	Result						
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS						

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	300KHz
VB	300KHz
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= 300KHz, VBW=300KHz, 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 from battery

Number of Hopping Channel

79

Hopping channel

RL		RF	50	DΩ AC			SEN	ISE:INT		AL	IGN AUTO		10:06	:17 AM Sep 01,
nte	r F	req	2.441	75000		PNO: Fast FGain:Low		Trig: Free #Atten: 30			Avg Type:	Log-Pwr		TRACE 1 2 3 4 TYPE M WARAN DET P P P F
dB/c	liv		Offset f 12.0 4	0.5 dB 4 dBm								Mkı	2 2.480	160 0 G 1.89 dE
9 34	()1 IVV	w	YYYY	ww	www	MAAAA	m	mm	ww	w	mmm	www	www	WWW
96														
.0														
.0 .0														
.0														
.0														
		000 300	GHz kHz			i	#VBW	300 kH:	z			Swe	Stop ep 1.13 r	2.48350 G ns (1001 p
		ic sa		>		(4)	Y		ICTION	FUNC	ION WIDTH	:	UNCTION VALUE	
N			(Δ)		2 171 0 GHz 0 160 0 GHz		2.08 dE 1.89 dE							
· 														

Shenzhen STS Test Services Co., Ltd.



6. AVERAGE TIME OF OCCUPANCY

6.1 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:	25℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	DC 3.7V from battery

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	middle	0.385	0.123	0.4
DH3	middle	1.647	0.264	0.4
DH5	middle	2.898	0.309	0.4



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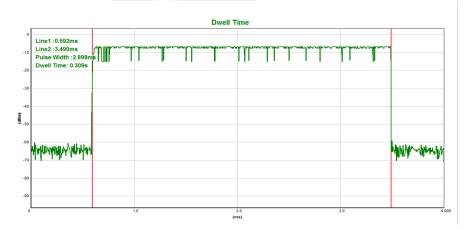
CH39-DH1



CH39-DH3



CH39-DH5



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Page 51 of 72 Report No.: STS1908110W01

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

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	middle	0.396	0.127	0.4
2DH3	middle	1.654	0.265	0.4
2DH5	middle	2.896	0.309	0.4

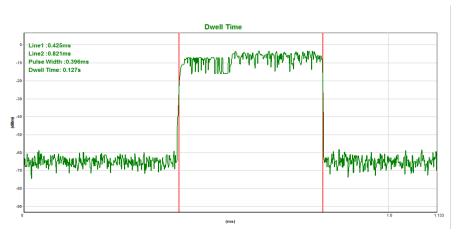


П

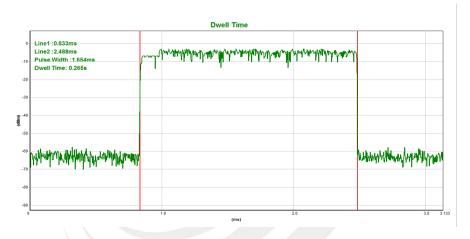
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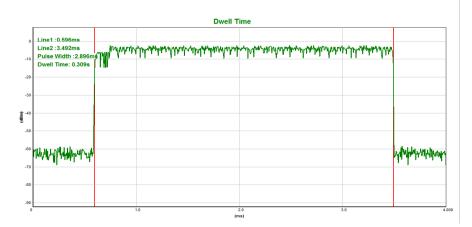
CH39-2DH1



CH39-2DH3



CH39-2DH5





Page 53 of 72 Report No.: STS1908110W01

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

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	middle	0.397	0.127	0.4
3DH3	middle	1.648	0.264	0.4
3DH5	middle	2.907	0.310	0.4



П

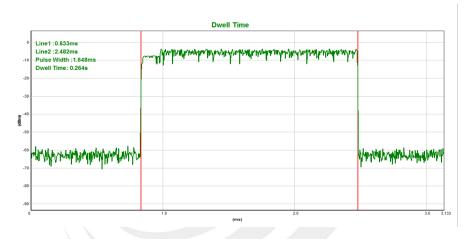
Shenzhen STS Test Services Co., Ltd.



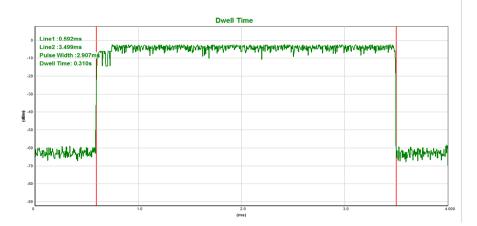
CH39-3DH1



CH39-3DH3



CH39-3DH5





7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

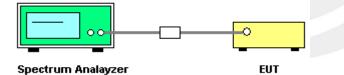
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that 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



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 from battery

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.822	2402.818	0.996	0.923	Complies
2441 MHz	2440.822	2441.821	0.999	0.920	Complies
2480 MHz	2478.819	2479.821	1.002	0.922	Complies

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

CH00 -1Mbps



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CH39 -1Mbps



CH78 -1Mbps





Page 58 of 72 Report No.: STS1908110W01

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

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.993	2402.983	0.990	0.879	Complies
2441 MHz	2440.993	2441.983	0.990	0.879	Complies
2480 MHz	2478.993	2479.983	0.990	0.879	Complies

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

		Ω AC		SENSE:IN	IT	ALIGN AUTO			AM Sep 01, 2
enter F	Freq 2.402	500000 GHz	PNO: Wi IFGain:L		: Free Run en: 30 dB	Avg Typ	e: Log-Pwr	TRA T'	ICE 1 2 3 4 PE MWWW DET P P P P
dB/div	Ref Offset Ref 10.0						Mk	r2 2.402 9 3.0	983 GH)02 dB
70			()1			2	2		
		~~~~	$\sim 1 \sim$	$\sim$	n	$\sim$	V		
93	~		-					5	
9.9									
9.9	_ /								$\sim$
.9									~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
9.9									
9.9									
.9									
9.9									
	.402500 GH ∮ 30 kHz	lz		#VBW 10	) kHz		Swee	Span 3 p 3.20 ms	3.000 M (1001 p
R MODE		×		Y	FUNCTION	FUNCTION WIDTH	FUN	ICTION VALUE	
1 N 2 N	1 f (Δ) 1 f	2.401 993 (		0.07 dBm 3.00 dBm					
3		2		0.00 42					
5									
4 5 7									
5 5 7 8									
5									

#### CH00 -2Mbps



#### CH39 -2Mbps

	RF	50 Ω .	AC		SENSE:INT		ALIGN AUTO		10:46:43 AM Sej
er Fro	eq 2	.441500	000 GHz	PNO: Wide IFGain:Low	Trig: Fr #Atten:	ee Run 30 dB	Avg Type	: Log-Pwr	TRACE 1 TYPE M DET P
		Offset 0.5 d 9.34 dBn						М	kr2 2.441 983 1.696
418	Rei	3.34 UDI		()1			2		
					~ ~ ~	-	$h \wedge$		
		~~~	$\gamma \sim $		- man	$\gamma\gamma\gamma\gamma$	~~~	y when	$\sim$
		~							- <u></u>
	_/								
\sim	\checkmark								\sim
r 2.4	4150	00 GHz							Span 3.00
BW 3	10 kł	Ηz		#	VBW 100 k	Hz		Swe	ep 3.20 ms (100
DE TRO			X			UNCTION	FUNCTION WIDTH	FU	UNCTION VALUE
1	f f	(<u>仏</u>)	2.440 993 GH 2.441 983 GH	lz (∆) -t iz ∕	.65 dBm .70 dBm				

CH78 -2Mbps



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Page 60 of 72 Report No.: STS1908110W01

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

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.990	2402.983	0.993	0.844	Complies
2441 MHz	2440.993	2441.983	0.990	0.845	Complies
2480 MHz	2478.993	2479.983	0.990	0.846	Complies

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

CH00 -3Mbps

RL	RF	50 Ω AC		SENSE:INT	ALIGN AUTO		11:42:04 AM Sep 01, 2
enter	Freq 2.40	2500000 GHz	PNO: Wide 🕞	Trin Free Door	Avg Type:	: Log-Pwr	TRACE 1234 TYPE MMMM DET P P P P
0 dB/di		et 0.5 dB .07 dBm				Mkr2	2.402 983 GI 2.379 dB
og 070			1		2		
			$\sim\sim\sim\sim$		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	\sim	
.93		1					m
9.9							~
9.9	~ (
9.9 👡							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
9.9							
9.9							
9.9							
9.9							
	2.402500 (W 30 kHz	GHz	#VB	W 100 kHz		Sweep	Span 3.000 M 3.20 ms (1001 p
zel woor	TRC SCL 1 f (Δ)	× 2.401 990 GH;	Υ (Δ) 0.07	FUNCTION	FUNCTION WIDTH	FUNCT	ON VALUE
		2.402 983 GH					
1 N 2 N	1 f	2.402 300 011					
1 N 2 N 3		2.402 300 011					
1 N 2 N 3 4 5		2.402 300 611					
1 N 2 N 3 4 5 6		2.402 300 011					
1 N 2 N 3 4 5 6 7		2.402 300 011					
1 N 2 N 3 4 5 6 7 8 9		2.402 505 611					
1 N 2 N 3 4 5 6 7		2.402.300 011					

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CH39 -3Mbps

		RF	50 Ω	AC			SENSE:INT		ALIGN.			11:4	7:37 AM Sep 0
er	Fre	èq 2	2.44150	0000 GH	PNO	:Wide G	⊃ Trig: Fi #Atten:	ee Run 30 dB		Avg Type:	: Log-Pwr		TRACE 1 2 3 TYPE MWW DET P P F
/div			Offset 0.5 9.37 dE								P	Mkr2 2.44	l1 983 (1.719 d
7411		nei	5.01 GE			⊘1				2			
					$\sim n$	$\prec \sim$	-			\sim	~ ~		
					~ +		\sim	\sim	~~	~		m_	
			-									\	
		- 1	1										<u>\</u>
_	\sim	\checkmark											\wedge
~													
		415 10 k	00 GHz Hz			#VE	3W 100 k	Hz			Sw	Sp veep 3.20	an 3.000 ms (1001
		SCL		х		Y		FUNCTION	FUNCTION	WIDTH		FUNCTION VALU	
N N	1	f	(Δ)	2.440 99	3 GHz (Δ		dBm dBm						
	1	1		2.441 30	0 01 12	1.72							

CH78 -3Mbps



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8. BANDWIDTH TEST

8.1 LIMIT

	FCC Part15 15.247,Subpart C							
Ī	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:	25 ℃	Relative Humidity:	50%
	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.7V from battery

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.923	PASS
2441 MHz	0.92	PASS
2480 MHz	0.922	PASS

CH00 -1Mbps



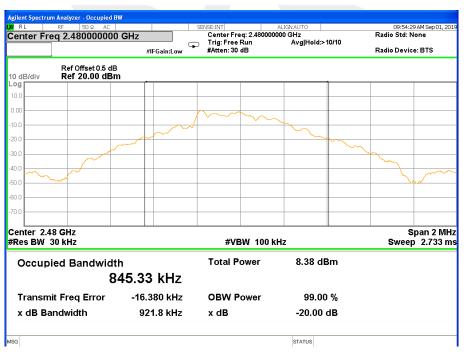
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CH39 -1Mbps



CH78 -1Mbps



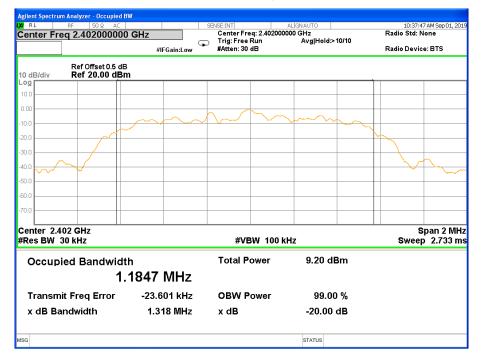


Page 65 of 72 Report No.: STS1908110W01

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

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.318	PASS
2441 MHz	1.319	PASS
2480 MHz	1.319	PASS

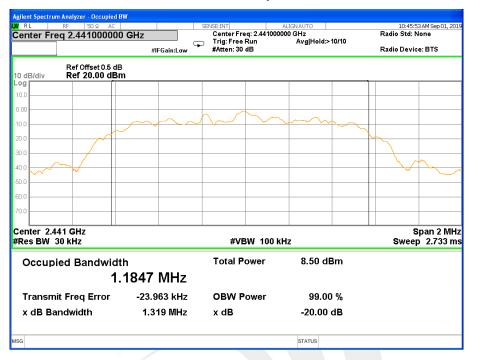
CH00 -2Mbps



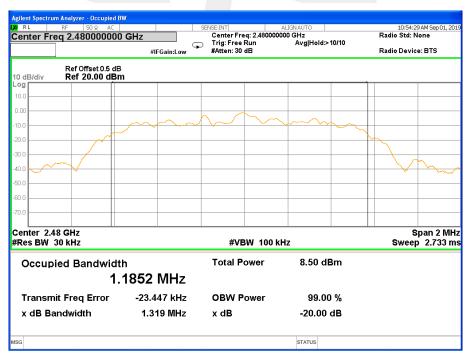
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CH39 -2Mbps



CH78 -2Mbps





Page 67 of 72 Report No.: STS1908110W01

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

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.266	PASS
2441 MHz	1.268	PASS
2480 MHz	1.269	PASS

CH00 -3Mbps

	GHz	SENSE:INT Center Freq: 2.402000 Trig: Free Run	ALIGN AUTO DOO GHz Avg Hold:>10/10	11:39:46 AM Sep 01, Radio Std: None
	با #IFGain:Low	#Atten: 30 dB	Avginola.> lone	Radio Device: BTS
Ref Offset 0.5 dB dB/div Ref 20.00 dBn				
0				
0		-		
	~~~~~~		Ymm_	
				- Von
D				
D				
)				
nter 2.402 GHz es BW 30 kHz		#VBW 100 k	Hz	Span 2 M Sweep 2.733
Occupied Bandwidt	h	Total Power	9.48 dBm	
1.	1672 MHz			
Transmit Freq Error	-8.578 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.266 MHz	x dB	-20.00 dB	

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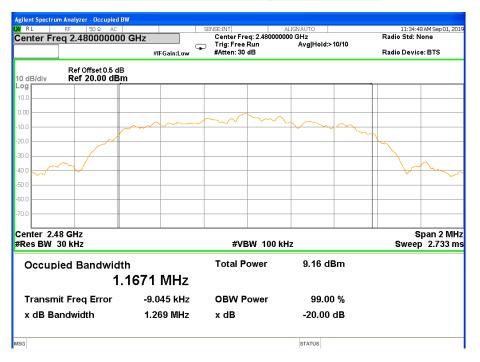
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## CH39 -3Mbps



#### CH78 -3Mbps



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# 9. OUTPUT POWER TEST

## 9.1 LIMIT

FCC Part 15.247,Subpart C					
Section	Test Item	Limit	FrequencyRange (MHz)	Result	
15.247	Output	1 W or 0.125W			
15.247 Output (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	PASS		

## 9.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Sensor&PC

## 9.3 TEST SETUP

EUT Power s	ensor PC
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## 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%
Test Voltage:	DC 3.7V from battery		

Mode	Channel	Frequency	Peak Power	Average Power	Limit
	Number (MHz)	(dBm)	(dBm)	(dBm)	
	0	2402	2.68	1.43	30.00
GFSK(1M)	39	2441	2.49	1.20	30.00
	78	2480	1.85	0.26	30.00

## Note: the channel separation >20dB bandwidth

Mode Channel Number		Peak Power	Average Power	Limit	
	Number	(MHz)	(dBm)	(dBm)	(dBm)
	0	2402	5.17	1.35	20.97
π/4-DQPSK( 2M)	39	2441	4.90	1.05	20.97
,	78	2480	4.93	1.26	20.97

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

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
8-DPSK(3M)	0	2402	5.97	1.52	20.97
	39	2441	5.51	1.10	20.97
	78	2480	5.72	1.12	20.97

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



## 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 ceramics Antenna. It comply with the standard requirement.



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## **APPENDIX-PHOTOS OF TEST SETUP**

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

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



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