

RADIO TEST REPORT

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Report No: STS1903052W03

Issued for

SHEN ZHEN DX-SMART TECHNOLOGY CO., LTD

Room 511, Bldg C, Yuxing Technology Park, Gushu Second Road, Baoan District, Shenzhen, China

Product Name:	BLUETOOTH MODULE
Brand Name:	N/A
Model Name:	DX-BT18
Series Model:	DX-BT18-X
FCC ID:	2AKS8DX-BT18
Test Standard:	FCC Part 15.247

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TEST RESULT CERTIFICATION

Applicant'sname	SHEN ZHEN DX-SMART TECHNOLOGY CO., LTD
Address	Room 511, Bldg C, Yuxing Technology Park, Gushu Second Road, Baoan District, Shenzhen, China
Manufacture's Name:	SHEN ZHEN DX-SMART TECHNOLOGY CO., LTD
Address	Room 511, Bldg C, Yuxing Technology Park, Gushu Second Road, Baoan District, Shenzhen, China
Product description	
Product Name	BLUETOOTH MODULE
Brand Name	N/A
Model Name:	DX-BT18
Series Model	DX-BT18-X
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 : 12 Mar. 2019 ~ 15 Mar. 2019

Date of Issue: 19 Mar. 2019

Test Result Pass

Testing Engineer

(Chris chen)

Technical Manager

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Authorized Signatory :

(Sunday Hu)

(Vita Li)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	22 Feb. 2019	STS1903052W03	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 v05r01

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		
15.205 15.209	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 15.209	Restricted Band Edge Emission	PASS		
15.247(d)	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 FCC Registration No.: 625569; 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

Shenzhen STS Test Services Co., Ltd.



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	BLUETOOTH MODULE
Trade Name	N/A
Model Name	DX-BT18
Series Model	DX-BT18-X
Model Difference	Only different in model name
Channel List	Please refer to the Note 2.
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps)
Bluetooth Version	4.2 BR+EDR
Power Rating	Input: DC 3.3V,17mA
Hardware version number	DX-BT18
Software version number	1.0
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.





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	DX-BT18	PCB	N/A	0 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.

Description	Data Rate/Modulation	
TX CH00	1Mbps/GFSK	
TX CH39	1Mbps/GFSK	
TX CH78	1Mbps/GFSK	
TX CH00	2 Mbps/π/4-DQPSK	
TX CH39	2 Mbps/π/4-DQPSK	
TX CH78	2 Mbps/π/4-DQPSK	
TX CH00	3 Mbps/8DPSK	
TX CH39	3 Mbps/8DPSK	
TX CH78	3 Mbps/8DPSK	
	TX CH00 TX CH39 TX CH78 TX CH00 TX CH39 TX CH39 TX CH78 TX CH78 TX CH78 TX CH78 TX CH78 TX CH78 TX CH39 TX CH39 TX CH39	

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

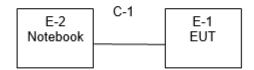


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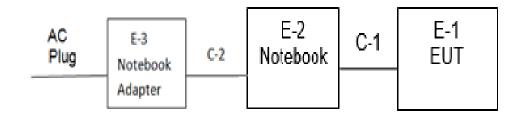
2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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



Conducted 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	Serial No.	Note					
N/A	N/A	N/A	N/A	N/A	N/A				

Support units

Item	Equipment	Mfr/Brand Model/Type No.		Serial No.	Note
E-2	Notebook	HP	500-320cx	N/A	N/A
E-3	Notebook Adatper	HP	HSTNN-CA15	N/A	N/A
C-1	USB Cable	N/A	100cm	N/A	N/A
C-2	DC Cable	N/A	100cm	N/A	N/A

Note:

- (1) The support equipment was authorized by SDOC.
- (2) For detachable type I/O cable should be specified the length in cm in ^rLength ^l 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	2020.11.01
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

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

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



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.

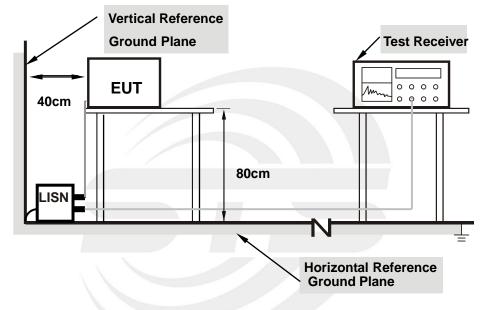
The following table is the setting of the receiver

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

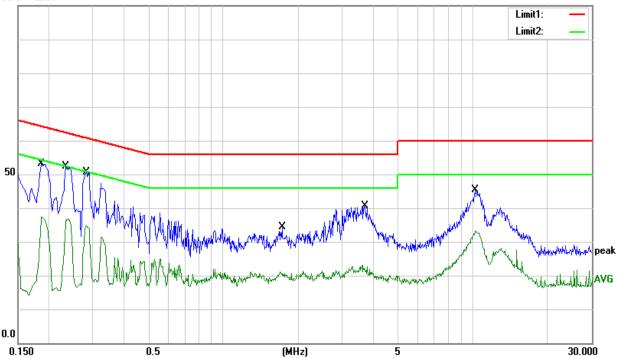
Temperature:	23.0 ℃	Relative Humidity:	64%
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 10		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1860	32.96	20.23	53.19	64.21	-11.02	QP
2	0.1860	16.53	20.23	36.76	54.21	-17.45	AVG
3	0.2340	31.99	20.40	52.39	62.31	-9.92	QP
4	0.2340	16.27	20.40	36.67	52.31	-15.64	AVG
5	0.2820	29.88	20.63	50.51	60.76	-10.25	QP
6	0.2820	14.28	20.63	34.91	50.76	-15.85	AVG
7	1.7220	14.24	20.09	34.33	56.00	-21.67	QP
8	1.7220	-0.16	20.09	19.93	46.00	-26.07	AVG
9	3.6820	20.79	19.96	40.75	56.00	-15.25	QP
10	3.6820	2.04	19.96	22.00	46.00	-24.00	AVG
11	10.2860	25.26	20.12	45.38	60.00	-14.62	QP
12	10.2860	12.74	20.12	32.86	50.00	-17.14	AVG

Remark:

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

100.0 dBuV



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^{1.} All readings are Quasi-Peak and Average values.

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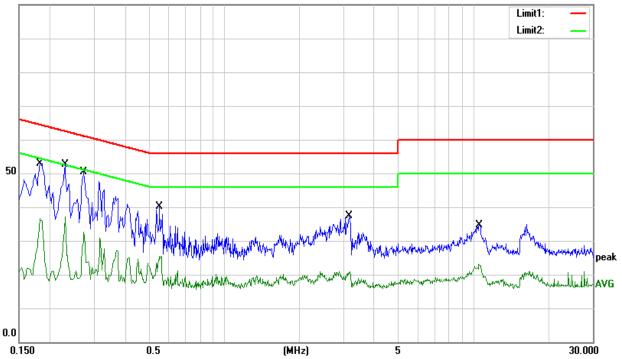
Temperature:	23.0 ℃	Relative Humidity:	64%
Test Voltage:	AC 120V/60Hz	Phase:	Ν
Test Mode:	Mode 10		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1820	32.76	20.23	52.99	64.39	-11.40	QP
2	0.1820	15.85	20.23	36.08	54.39	-18.31	AVG
3	0.2300	32.22	20.38	52.60	62.45	-9.85	QP
4	0.2300	15.64	20.38	36.02	52.45	-16.43	AVG
5	0.2740	29.82	20.59	50.41	61.00	-10.59	QP
6	0.2740	12.01	20.59	32.60	51.00	-18.40	AVG
7	0.5500	19.63	20.42	40.05	56.00	-15.95	QP
8	0.5500	5.04	20.42	25.46	46.00	-20.54	AVG
9	3.1580	17.45	19.97	37.42	56.00	-18.58	QP
10	3.1580	0.09	19.97	20.06	46.00	-25.94	AVG
11	10.5220	14.45	20.12	34.57	60.00	-25.43	QP
12	10.5220	2.51	20.12	22.63	50.00	-27.37	AVG

Remark:

All readings are Quasi-Peak and Average values.
 Margin = Result (Result =Reading + Factor)–Limit

100.0 dBuV



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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
Start Frequency	1000 MHz(Peak)
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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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/9kHz for PK & AV /QP
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

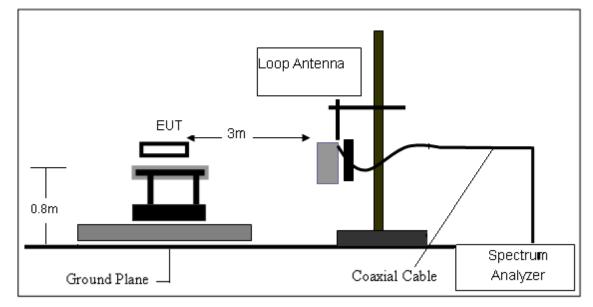
No deviation

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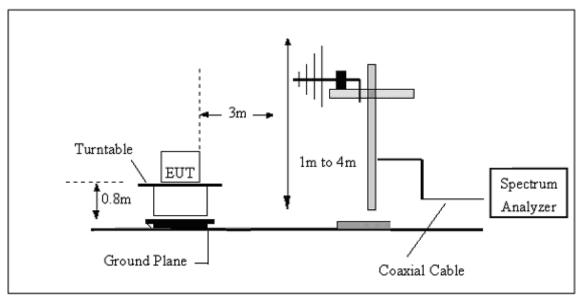


3.2.4 TESTSETUP

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



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

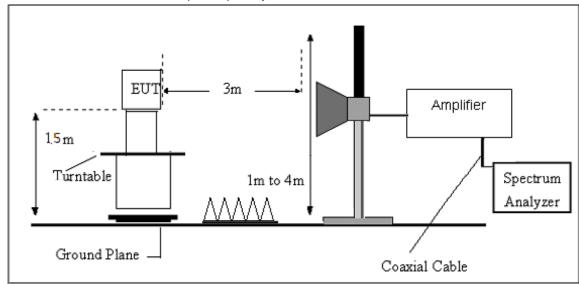




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(C) Radiated Emission Test-Up Frequency Above 1GHz



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.

3.2.6 FIELD STRENGTH CALCULATION

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

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

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

Factor=AF+CL-AG



3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	21.9℃	Relative Humidity:	62%
Test Voltage:	DC 3.3V	Test Mode:	TX Mode

Freq.	Reading	Limit	Margin	State	Test Result
(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.





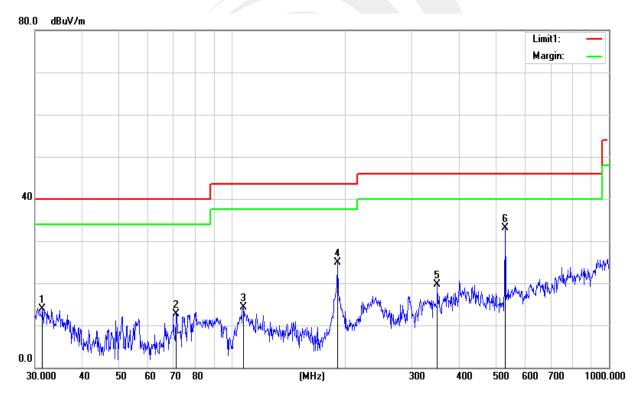
(30MHz-1000MHz)

Temperature:	21.9 ℃	Relative Humidity:	62%	
Test Voltage:	DC 3.3V	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	31.3992	25.91	-11.91	14.00	40.00	-26.00	QP
2	71.0803	36.59	-23.94	12.65	40.00	-27.35	QP
3	107.1337	32.88	-18.58	14.30	43.50	-29.20	QP
4	190.4050	45.08	-20.25	24.83	43.50	-18.67	QP
5	350.4768	33.19	-13.57	19.62	46.00	-26.38	QP
6	530.1014	41.06	-7.92	33.14	46.00	-12.86	QP

Remark:

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



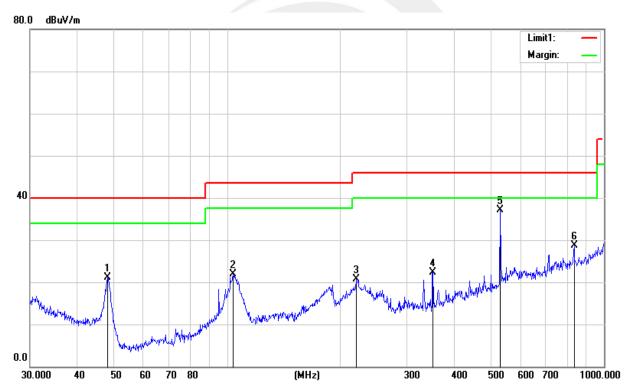


Temperature:	21.9℃	Relative Humidity:	62%
Test Voltage:	DC 3.3V	Phase:	Vertical
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode	7 worst mode)	

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	48.1626	41.62	-20.53	21.09	40.00	-18.91	QP
2	103.8055	40.68	-18.87	21.81	43.50	-21.69	QP
3	219.8450	39.90	-19.13	20.77	46.00	-25.23	QP
4	351.7080	35.83	-13.51	22.32	46.00	-23.68	QP
5	530.1014	45.07	-7.92	37.15	46.00	-8.85	QP
6	833.3171	31.79	-3.01	28.78	46.00	-17.22	QP

Remark:

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



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

8DPSK											
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 Ch	annel (2402 N	/IHz)					
3264.62	61.81	44.70	6.70	28.20	-9.80	52.01	74.00	-21.99	PK	Vertical	
3264.62	51.51	44.70	6.70	28.20	-9.80	41.71	54.00	-12.29	AV	Vertical	
3264.86	61.57	44.70	6.70	28.20	-9.80	51.77	74.00	-22.23	PK	Horizontal	
3264.86	50.22	44.70	6.70	28.20	-9.80	40.42	54.00	-13.58	AV	Horizontal	
4804.38	59.45	44.20	9.04	31.60	-3.56	55.89	74.00	-18.11	PK	Vertical	
4804.38	50.30	44.20	9.04	31.60	-3.56	46.74	54.00	-7.26	AV	Vertical	
4804.40	59.04	44.20	9.04	31.60	-3.56	55.48	74.00	-18.52	PK	Horizontal	
4804.40	50.49	44.20	9.04	31.60	-3.56	46.93	54.00	-7.07	AV	Horizontal	
5359.64	49.39	44.20	9.86	32.00	-2.34	47.05	74.00	-26.95	PK	Vertical	
5359.64	40.39	44.20	9.86	32.00	-2.34	38.05	54.00	-15.95	AV	Vertical	
5359.85	47.36	44.20	9.86	32.00	-2.34	45.02	74.00	-28.98	PK	Horizontal	
5359.85	39.02	44.20	9.86	32.00	-2.34	36.68	54.00	-17.32	AV	Horizontal	
7205.93	54.93	43.50	11.40	35.50	3.40	58.33	74.00	-15.67	PK	Vertical	
7205.93	44.13	43.50	11.40	35.50	3.40	47.53	54.00	-6.47	AV	Vertical	
7205.94	53.84	43.50	11.40	35.50	3.40	57.24	74.00	-16.76	PK	Horizontal	
7205.94	43.87	43.50	11.40	35.50	3.40	47.27	54.00	-6.73	AV	Horizontal	
				Middle C	hannel (2441	MHz)					
3264.72	61.49	44.70	6.70	28.20	-9.80	51.69	74.00	-22.31	PK	Vertical	
3264.72	50.85	44.70	6.70	28.20	-9.80	41.05	54.00	-12.95	AV	Vertical	
3264.80	61.81	44.70	6.70	28.20	-9.80	52.01	74.00	-21.99	PK	Horizontal	
3264.80	51.02	44.70	6.70	28.20	-9.80	41.22	54.00	-12.78	AV	Horizontal	
4882.49	59.44	44.20	9.04	31.60	-3.56	55.88	74.00	-18.12	PK	Vertical	
4882.49	49.71	44.20	9.04	31.60	-3.56	46.15	54.00	-7.85	AV	Vertical	
4882.60	58.22	44.20	9.04	31.60	-3.56	54.66	74.00	-19.34	PK	Horizontal	
4882.60	50.12	44.20	9.04	31.60	-3.56	46.56	54.00	-7.44	AV	Horizontal	
5359.80	49.02	44.20	9.86	32.00	-2.34	46.68	74.00	-27.32	PK	Vertical	
5359.80	39.45	44.20	9.86	32.00	-2.34	37.11	54.00	-16.89	AV	Vertical	
5359.84	47.24	44.20	9.86	32.00	-2.34	44.90	74.00	-29.10	PK	Horizontal	
5359.84	38.93	44.20	9.86	32.00	-2.34	36.59	54.00	-17.41	AV	Horizontal	
7323.70	54.75	43.50	11.40	35.50	3.40	58.15	74.00	-15.85	PK	Vertical	
7323.70	44.05	43.50	11.40	35.50	3.40	47.45	54.00	-6.55	AV	Vertical	
7323.93	54.22	43.50	11.40	35.50	3.40	57.62	74.00	-16.38	PK	Horizontal	
7323.93	43.50	43.50	11.40	35.50	3.40	46.90	54.00	-7.10	AV	Horizontal	

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



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		High Channel (2480 MHz)											
3264.87	61.75	44.70	6.70	28.20	-9.80	51.95	74.00	-22.05	PK	Vertical			
3264.87	50.54	44.70	6.70	28.20	-9.80	40.74	54.00	-13.26	AV	Vertical			
3264.63	61.50	44.70	6.70	28.20	-9.80	51.70	74.00	-22.30	PK	Horizontal			
3264.63	51.01	44.70	6.70	28.20	-9.80	41.21	54.00	-12.79	AV	Horizontal			
4960.47	59.28	44.20	9.04	31.60	-3.56	55.72	74.00	-18.28	PK	Vertical			
4960.47	49.41	44.20	9.04	31.60	-3.56	45.85	54.00	-8.15	AV	Vertical			
4960.51	59.25	44.20	9.04	31.60	-3.56	55.69	74.00	-18.31	PK	Horizontal			
4960.51	49.60	44.20	9.04	31.60	-3.56	46.04	54.00	-7.96	AV	Horizontal			
5359.82	49.37	44.20	9.86	32.00	-2.34	47.03	74.00	-26.97	PK	Vertical			
5359.82	39.21	44.20	9.86	32.00	-2.34	36.87	54.00	-17.13	AV	Vertical			
5359.65	47.45	44.20	9.86	32.00	-2.34	45.11	74.00	-28.89	PK	Horizontal			
5359.65	38.13	44.20	9.86	32.00	-2.34	35.79	54.00	-18.21	AV	Horizontal			
7439.96	53.56	43.50	11.40	35.50	3.40	56.96	74.00	-17.04	PK	Vertical			
7439.96	43.48	43.50	11.40	35.50	3.40	46.88	54.00	-7.12	AV	Vertical			
7439.85	54.75	43.50	11.40	35.50	3.40	58.15	74.00	-15.85	PK	Horizontal			
7439.85	43.96	43.50	11.40	35.50	3.40	47.36	54.00	-6.64	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

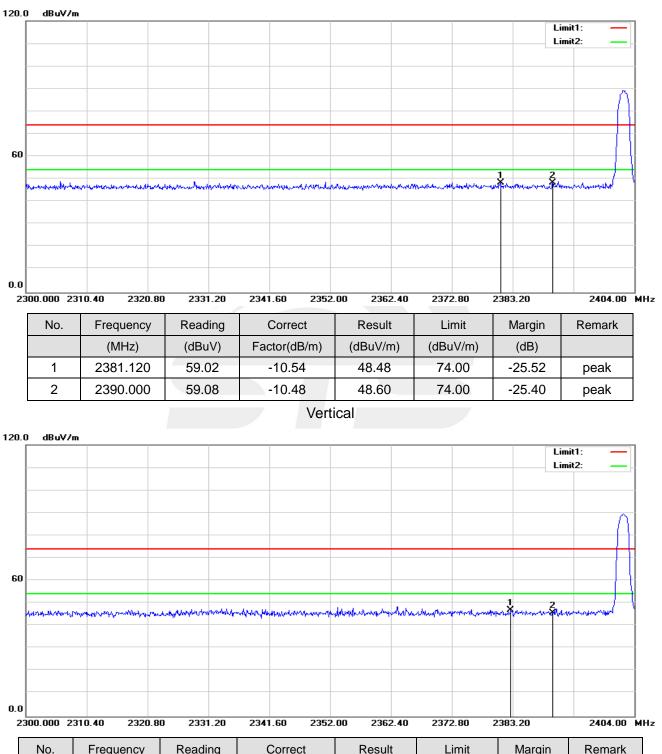
emission is mainly from the environment noise.

Shenzhen STS Test Services Co., Ltd.



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	2382.888	57.39	-10.53	46.86	74.00	-27.14	peak
2	2390.000	56.33	-10.48	45.85	74.00	-28.15	peak

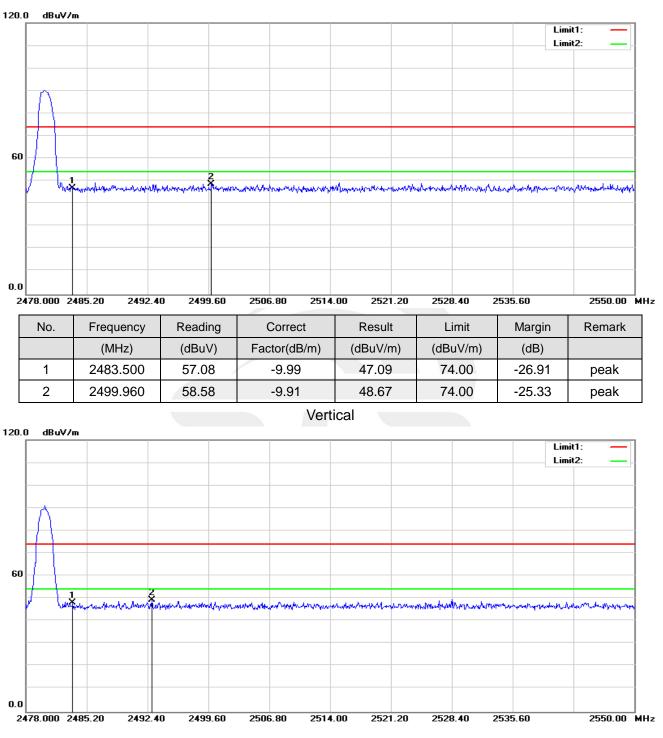
1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China Tel: + 86-755 3688 6288 Fax:+ 86-755 3688 6277 Http://www.stsapp.com E-mail: sts@stsapp.com



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8DPSK-High Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	58.20	-9.99	48.21	74.00	-25.79	peak
2	2492.904	59.43	-9.95	49.48	74.00	-24.52	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

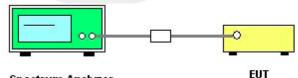
Spectrum Parameter	Setting				
Detector	Peak				
Start/Stop Frequency	30 MHz to 10th carrier harmonic				
RB / VB (emission in restricted band)	100 KHz/300 KHz				
Trace-Mode:	Max hold				

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



Spectrum Analyzer

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

4.4 EUT OPERATION CONDITIONS

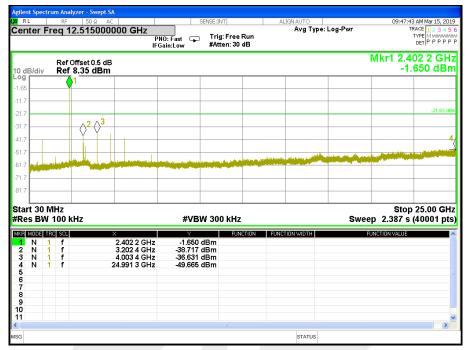
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-00/39/78 CH	Test Voltage:	DC 3.3V

00 CH



39 CH

		alyzer - Swept S	5A .							
RL	RF	50 Ω A			SENSE:INT	A	IGN AUTO			9 AM Mar 15, 20
enter	Freq 1	12.515000	Р	PNO: Fast 🖵 Gain:Low	Trig: Free #Atten: 30		Avg Type:	Log-Pwr	1	RACE 1 2 3 4 5 TYPE MWWWW DET P P P P
0 dB/div		Offset 0.5 dE 9.09 dBm							Mkr1 2.4 -0	40 9 GH 915 dBi
0.91		<u>)</u> 1								
0.9										-20.91 d
0.9		$\wedge^2 \wedge^3$								
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	0 MHz W 100 I	kHz		#VB	W 300 kHz	:	1	Swee	Stop p 2.387 s	25.00 GI (40001 p
R MODE	TRC SCL		× 2.440 9 GHz	Y -0.915		ICTION FUNC	TION WIDTH	F	UNCTION VALUE	
	1 T									
2 N 3 N	1 f 1 f		3.254 9 GHz 4.068 3 GHz	-38.026 -35.831	dBm					
2 N 3 N 4 N	1 f		3.254 9 GHz		dBm					
2 N 3 N 4 N 5 7 8	1 f 1 f		3.254 9 GHz 4.068 3 GHz	-35.831	dBm					
2 N 3 N 4 N 5 7 3 9 0	1 f 1 f		3.254 9 GHz 4.068 3 GHz	-35.831	dBm					
2 N 3 N	1 f 1 f		3.254 9 GHz 4.068 3 GHz	-35.831	dBm					>



78 CH

. opece	rum Ana RE	a <mark>lyzer - Swe</mark> 50 Ω				SENSE:INT		ALIO	GNAUTO				09:42:	24 AM Mar 15
			00000 G	PNC): Fast 😱 in:Low	Trig: Fre #Atten: 3		1 1645	Avg Ty	/pe:L	og-Pwr			TRACE 1 2 3 TYPE MWW DET P P F
3/div		Offset 0.5 8.21 dE										М		480 2 C .792 d
<u> </u>	(1								_				
														-21
		$\langle \rangle^2 \langle$	3											
							la manuala se di	la constante da	فالمعدد والملاسب والم	and the second	e Maria andara	(Juliulani)	a another there	Y
								A	فالعبار بحيريه		antine Transf			
t 30 I s BW	MHz 100	kHz			#VB	W 300 kH	z				S	weep		p 25.00 s (40001
N	RC <mark>SCL</mark> 1 f 1 f		× 2.480 3.306		-1.792 -36.664	dBm	INCTION	FUNCTI	ON WIDTH			FUNC	TION VALUE	
	1 f 1 f		4.133 23.749	2 GHz	-36.981 -36.981 -48.700	dBm								
									STATUS					



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 E-mail: sts@stsapp.com





For Band edge

00 CH

Ref Offset 0.5 dB Mkr1 2.402 176 GF -0.673 dB 10 dB/div Ref 0.973 dB 207	gilent Spectrum Analyzer - Swept SA			
Ref Offset 0.5 dB Mikr1 2.402 176 GF 10 dB/div Ref 9.33 dBm -0.673 dB 10 dB/div Ref 9.30 dB -0.673 dB 10 dB/div Ref 9.30 dB -0.673 dB 10 dB/div Ref 9.30 dB -0.673 dB 10 dB/div -0.673 dB -0.673 dB 10 dB/div 1 f 2.399 807 GHz -0.673 dB 2 N 1 f 2.399 807 GHz -0.673		SENSE:INT	ALIGNAUTO	09:48:21 AM Mar 15, 2019
•••••••••••••••••••••••••••••	center Freq 2.351500000	PNO: Fast 😱 Trig: Fre	e Run	DET PPPP
0.67 10.7 20.7	0 dB/div Ref 9.33 dBm			Mkr1 2.402 176 GHz -0.673 dBm
207	-			
20.7	10.7			
407 407 <td>20.7</td> <td></td> <td></td> <td>-20.67 dBm</td>	20.7			-20.67 dBm
60.7 60.7 <td< td=""><td></td><td></td><td></td><td>A3</td></td<>				A3
Key Key <td></td> <td></td> <td></td> <td></td>				
B0.7 Start 2.30000 GHz Stop 2.40300 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.40300 GHz MXS MODE TRC SCL X #VBW 300 kHz Stop 2.40300 GHz 1 N 1 f 2.402 176 GHz -0.673 dBm 2 N 1 f 2.399 002 GHz -59.650 dBm 3 N 1 f 2.399 807 GHz -45.803 dBm		Marana participation and a second and a second seco	and a second	and a new particular and the second second
Start 2.30000 GHz Stop 2.40300 GHz #Res BW 100 kHz #VBW 300 kHz Stop 2.40300 GHz MXR MODE TRC SCL X Y FUNCTION VIDTH FUNCTION VIDTH 1 N 1 f 2.402 176 GHz -0.673 dBm	70.7			
#Res BW 100 kHz #VBW 300 kHz Sweep 9.867 ms (1001 pt) MXS MODE FUNCTION FUNCTION WIDTH FUNCTION VALUE IN 1 f 2.490 022 GHz -0.673 dBm FUNCTION VALUE 3 N 1 f 2.399 807 GHz -45.803 dBm FUNCTION VALUE	80.7			
MXR MODE FILE FUNCTION FUNCTION WIDTH FUNCTION VALUE 1 N 1 f 2.402 176 GHz 0.673 dBm 2 N 1 f 2.399 022 GHz -59.650 dBm 3 N 1 f 2.399 807 GHz -45.803 dBm				Stop 2.40300 GHz
I f 2.402 176 GHz -0.673 dBm 2 N 1 f 2.390 022 GHz -59.650 dBm 3 N 1 f 2.399 807 GHz -45.803 dBm	Res BW 100 kHz	#VBW 300 kH	2	
4	1 N 1 f 2.402 2 N 1 f 2.390	176 GHz -0.673 dBm 022 GHz -59.650 dBm	NCTION FUNCTION WIDTH	FUNCTION VALUE
5 6 7		807 GHz -45.803 dBm		
7	5			
8	8			
8 9 10	9 10			
11	11			~
ISG STATUS			STATUS	

78 CH





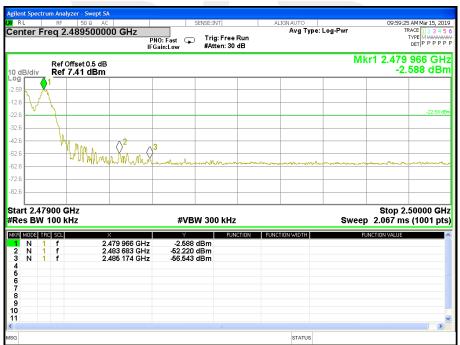


For Hopping Band edge

00 CH

ilent Spect	rum Analy RF	<mark>/zer - Swep</mark> t 50 Ω			SENSE:INT		ALIGN AUTO		00/57/0	3 AM Mar 15, 201
			000 GHz	PNO: Fast Gain:Low			Avg Type:	_	Т	RACE 1 2 3 4 5 TYPE MWMMMM DET P P P P P
) dB/div		ffset 0.5 d 8.34 dBi						M	lkr1 2.401 -1.	970 GH 663 dBr
.66										(
.7										-21.66 d
.7										
.7										
.7	ob-conflig	unhaymalanm	at a state of the	und have		-	been the by the been the based by	-	2 2	Marchan
.7										
.7										
	0000 G / 100 k			#VB	W 300 kHz			Swee	Stop 2 p 9.867 m	.40300 GH s (1001 pt
R MODE T	RC SCL		× 2.401 970 GHz	-1.663		ICTION	FUNCTION WIDTH		FUNCTION VALUE	
	1 f 1 f		2.390 022 GHz 2.399 807 GHz	-60.973 -49.537						
• •										
3										
							STATUS			>

78 CH



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Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 00/39/78 CH	Test Voltage:	DC 3.3V

RL RF	yzer - Swept S 50 Ω AC			SENSE:INT		ALIGN.			10.9	51:04 AM Mar 15, 20
nter Freq 1							Avg Type:	Log-Pwr	10	TRACE 1 2 3 4
		PI	10: Fast 🖵 Gain:Low	Trig: Fre #Atten: 3	e Run 0 dB					DET P P P P
			Jan.2000						Mkr1.2	.402 2 GI
	offset 0.5 dB 7.63 dBm									-2.374 dB
	1									
7										
4										
4	2									-22.37 (
4	$-\langle \rangle^2 \langle \rangle^3$									
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N 1 f		4.003 4 GHz	-36.646	dBm						
N 1 f		24.949 4 GHz	-49.214	dBm						
							STATUS			
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00 CH

39	CH
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es BV N N N N	W 100 TRO SCI 1 f 1 f	kHz	2.440 9 GHz 3.254 9 GHz	-3.225 dE -39.730 dE	FUNCTION 3m 3m 3m	FUNCTION WIDTH		ep 2.387 s	25.00 G (40001 p
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Shenzhen STS Test Services Co., Ltd.



78 CH

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art 30 MHz les BW 100 kH	Hz	#VBW 30) kHz		Sweep	Stop 25. 2.387 s (400	
8 MODE TRC SCL N 1 f N 1 f N 1 f N 1 f	× 2.480 2 GHz 3.306 7 GHz 4.959 7 GHz 24.942 6 GHz	-37.112 dBm -38.924 dBm	Function FL	INCTION WIDTH	FUNC	TION VALUE	
				STATUS			



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 E-mail: sts@stsapp.com



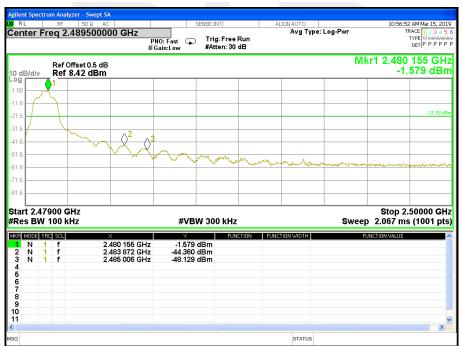


For Band edge

00 CH

enter Freq 2.351500000 GHz PN0: Fast IFGain:Low Trig: Free Run #Atten: 30 dB Mkr1 2.402 176 C -0.639 d 07		um Analyzer -							
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7 7	.7								
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78 CH





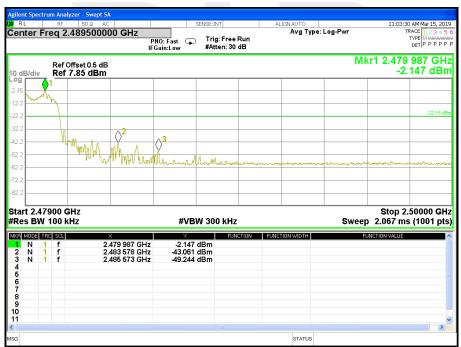


For Hopping Band edge

00 CH

	m Analyzer - Sv								
N G	RF 50 9 eq 2.3515	00000 GHz	PNO: Fast 🖵 FGain:Low	SENSE:INT Trig: Free Ru #Atten: 30 dB	n	IGN AUTO Avg Type:	-	Т	9 AM Mar 15, 20: RACE 1 2 3 4 5 TYPE M WAMAAA DET P P P P F
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1 1									
									>
						STATUS			

78 CH



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Page 38 of 68 Report No.: STS1903052W03

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) -00/39/78 CH	Test Voltage:	DC 3.3V

RL			50 Q AC				SEN	SE:INT		ALI	GNAUTO			11:1	1:51 AM Mar 15, 2
enter	Fre	q 12.5	15000	000 GH	P	NO: Fast Gain:Low		Trig: Free #Atten: 30			Avg Typ	e: Log-Pv			TRACE 1 2 3 4 TYPE MWWW DET P P P F
dB/div			et 0.5 dB 1 dBm												.402 2 G 3.891 dE
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art 30		Iz D0 kHz					#VBW	300 kHz					Swee	Sto p 2.387	op 25.00 G s (40001 p
art 30 les Bl	W 10	00 kHz		×			Y	FU	-	FUNCTI	ON WIDTH			Ste p 2.387	s (40001 p
art 30 Res Bl N N N N N N N N N N N N	W 10	00 kHz		× 2.402 2 3.202 4 4.804 3 24.573 6	GHz GHz	-3 -34 -39		m m m	-	FUNCTI	on width			p 2.387	s (40001 p
art 30 Res Bl Model N 2 N 3 N 4 N 5	W 10 1 1 1	DOKHZ SCL f f f		2.402 2 3.202 4 4.804 3	GHz GHz	-3 -34 -39	Y 3.891 dB 1.969 dB 9.117 dB	m m m	-	FUNCTI	ON WIDTH			p 2.387	s (40001 p
art 30 Res B1 I N 2 N 3 N 4 N 5 5 7 8 9 9	W 10 1 1 1	DOKHZ SCL f f f		2.402 2 3.202 4 4.804 3	GHz GHz	-3 -34 -39	Y 3.891 dB 1.969 dB 9.117 dB	m m m	-	FUNCTI	ON WIDTH			p 2.387	s (40001 p
TRIMODE 1 N 2 N 3 N	W 10 1 1 1	DOKHZ SCL f f f		2.402 2 3.202 4 4.804 3	GHz GHz	-3 -34 -39	Y 3.891 dB 1.969 dB 9.117 dB	m m m	-	FUNCTI	ON WIDTH			p 2.387	s (40001 p

39 CH

lent Sp	ectru	n Anal	yzer - Swept	t SA							
RL		RF		AC		SENSE:INT	Al	IGNAUTO		11:09:2	1 AM Mar 15, 20
nter	r Fre	eq 1	2.51500		PNO: Fast 🖵 Gain:Low	Trig: Free I #Atten: 30	Run 1B	Avg Type:	Log-Pwr	т	RACE 1 2 3 4 TYPE MWAAA DET P P P P
dB/d			Offset 0.5 o 7.86 dBr							Mkr1 2.4 -1.	40 9 GI 253 dB
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	80 MI 3W 1		Hz		#VB	W 300 kHz			Swee	Stop 2.387 s	25.00 G (40001 j
	E TRC			×	Y		TION FUNC	TION WIDTH	F	UNCTION VALUE	
N N	1	f		2.440 9 GHz 3.254 9 GHz	-1.253 -34.470						
N	1	f		4.068 3 GHz	-36.154						
N	1	T		24.219 7 GHz	-48.982	aBm					

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78 CH

	Swept SA	OF NOT VINT		11.01	
nter Freg 12.51		SENSE:INT	ALIGNAUTO Avg Type:		:25 AM Mar 15, 20 TRACE 1 2 3 4 1
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Ref Offset B/div Ref 4.00					480 2 GF 6.003 dB
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rt 30 MHz					op 25.00 GI
es BW 100 kHz		#VBW 300 kHz		Sweep 2.387	· · ·
MODE TRC SCL	× 2.480 2 GHz	-6.003 dBm	NCTION FUNCTION WIDTH	FUNCTION VALU	
	3.306 7 GHz	-36.131 dBm -36.684 dBm			
N 1 f N 1 f					
	4.133 2 GHz 24.955 1 GHz	-49.429 dBm			
N 1 f N 1 f					
N 1 f N 1 f					
N 1 f N 1 f					
N 1 f N 1 f					
N 1 f N 1 f					



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 Http://www.stsapp.com
 E-mail: sts@stsapp.com



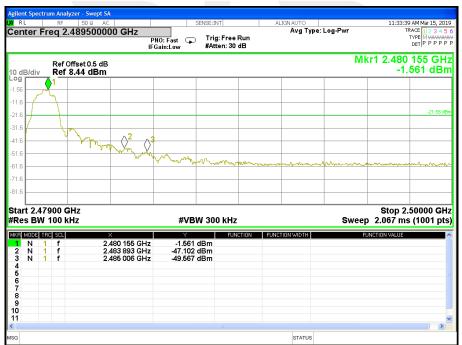


For Band edge

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	Analyzer - Swept		c	ENSE:INT	AI	.IGN AUTO		11:12:2	9 AM Mar 15, 20
	2.351500	000 GHz P	NO: Fast 🖵 Gain:Low	Trig: Free R #Atten: 30 dl	un	Avg Type:	_		TYPE MUMMUM DET P P P P
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art 2.30000 es BW 100			#VB\	V 300 kHz			Swee	Stop 2 p 9.867 m	.40300 GH s (1001 pt
R MODE TRC S	CL	×	Y	FUNCT	ION FUNC	TION WIDTH		UNCTION VALUE	<u> </u>
N 1 f N 1 f N 1 f	7	2.402 176 GHz 2.390 022 GHz 2.399 910 GHz	-0.691 -59.526 -33.965	dBm					
									>

78 CH



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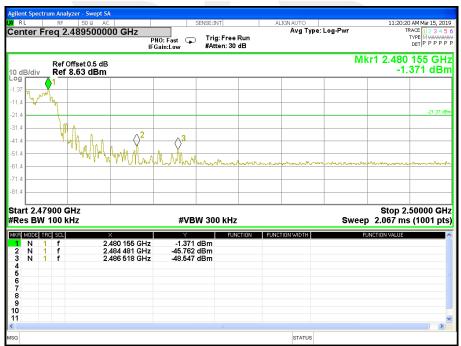


For Hopping Band edge

00 CH

gilent Spectr	um Analyzer -	Swept SA iO Ω AC			SENSE:INT		ALIGNAUTO		44.475	i9 AM Mar 15, 201
	req 2.351		PI	NO: Fast 🖵 Gain:Low		Run	ALIGNAUTO Avg Type	-		TYPE MWAAAAAA DET P P P P P
0 dB/div	Ref Offset Ref 8.58							M		970 GH: .423 dBn
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21.4										-21.42 dBr
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	000 GHz 100 kHz			#VB	W 300 kHz			Swee	Stop 2 p 9.867 m	.40300 GH s (1001 pts
KR MODE TE		× 2.401	970 GHz	ү -1.423		ICTION FUN	ICTION WIDTH		UNCTION VALUE	
2 N 1 3 N 1 4			022 GHz 086 GHz	-59.599 -35.391						
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3							STATUS			

78 CH



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5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

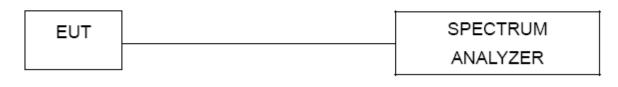
	FCC Part 15.247,Subpart C										
Section	Test Item	Limit	FrequencyRange (MHz)	Result							
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS							

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	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%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	DC 3.3V

Number of Hopping Channel

79

Hopping channel

RL		RF		AC		SENSE:P	ULSE		ALIGN AU					39 PM Mar 15	
Cent	er F	req 2	2.441750)000 GHz F	PNO: Fast Gain:Low		rig: Free Atten: 30		Av	g Type:	Log-Pwr			TRACE 1 2 TYPE MWA DET P P I	ANANA
0 dE	3/div		Offset 0.5 19.77 dB								М	kr2 2		243 5 0 2.06 d	
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- 1	1														1
10.2	1														1
i0.2															l
0.2															-R
0.2															
30.2															
Res	s BW	0000 / 300	kHz		#	VBW 3	00 kHz				Swe	-	1.133 m	.48350 s (1001	GH pts
1	N	TRC SCL 1 f 1 f		× 2.402 004 0 GHz 2.480 243 5 GHz		1 2.14 dBr 2.06 dBr	n	CTION F	UNCTION WI	DTH		FUNC	TION VALUE		
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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 3.3V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	middle	0.400	0.128	0.4
DH3	middle	1.661	0.266	0.4
DH5	middle	2.905	0.310	0.4



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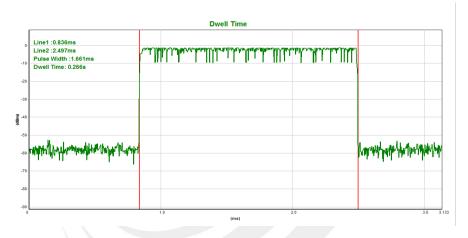
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 Fax:+ 86-755 3688 6277
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 E-mail: sts@stsapp.com



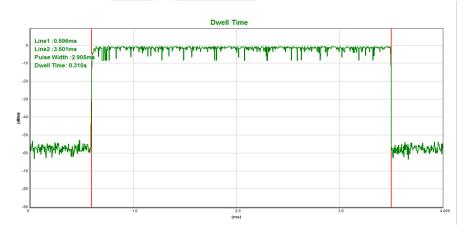
CH39-DH1

		Dwell Time		
-10	Line1 :0.427ms Line2 :0.827ms Pulse Width :0.400ms Dwell Time: 0.128s	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
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-50	www.www.www.www.www.www.		/4~44/ha4rm/d?+rvy).	Malayyyyhaary
70 80				

CH39-DH3



CH39-DH5



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Page 47 of 68 Report No.: STS1903052W03

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	DC 3.3V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	middle	0.411	0.132	0.4
2DH3	middle	1.664	0.266	0.4
2DH5	middle	2.912	0.311	0.4



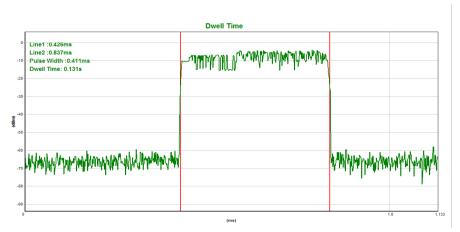
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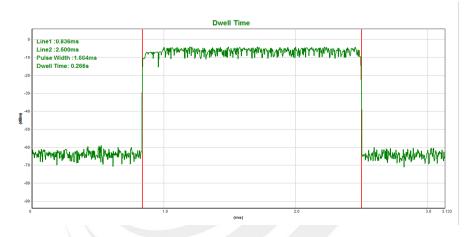
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 Fax:+ 86-755 3688 6277
 Http://www.stsapp.com
 E-mail: sts@stsapp.com



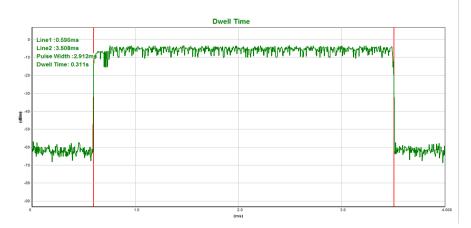
CH39-2DH1



CH39-2DH3



CH39-2DH5



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Temperature:	25 ℃	Relative Humidity:	50%
	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	DC 3.3V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	middle	0.411	0.132	0.4
3DH3	middle	1.662	0.266	0.4
3DH5	middle	2.912	0.311	0.4



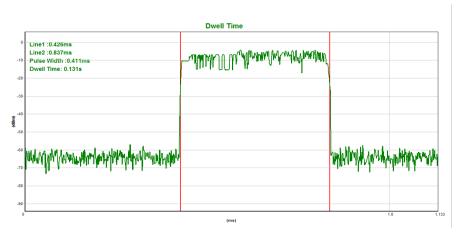
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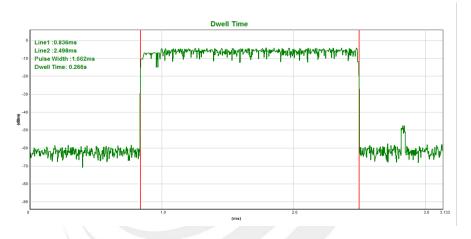
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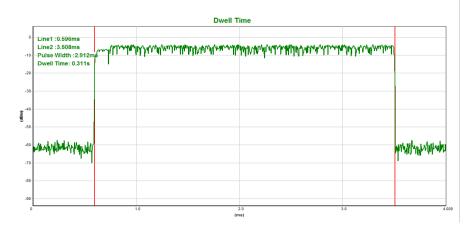
CH39-3DH1



CH39-3DH3



CH39-3DH5



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7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

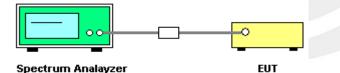
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that 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%
Test Mode:	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	DC 3.3V

Frequency	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	0.999	0.953	Complies
2441 MHz	1.002	0.945	Complies
2480 MHz	0.999	0.953	Complies

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

:49:08 AM Mar 15, 2019 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P F R I Center Freq 2.402500000 GHz Avg Type: Log-Pwr PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB Mkr2 2.402 971 GHz Ref Offset 0.5 dB Ref 7.01 dBm -2.981 dBm 10 dB/div \sim 43. 63 Center 2.402500 GHz #Res BW 30 kHz Span 3.000 MHz Sweep 3.200 ms (1001 pts) #VBW 100 kHz MXRS MODOE TRC SCLI 1 N 1 f 2 N 1 f 3 4 f 5 6 f 7 8 9 10 10 11 FUNCTION WIDTH -2.98 dBm -2.98 dBm 2.401 969 GHz 2.402 971 GHz STATUS

CH00 -1Mbps

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CH39 -1Mbps



CH78 -1Mbps





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Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)	Test Voltage:	DC 3.3V

Frequency	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	1.002	0.859	Complies
2441 MHz	1.002	0.858	Complies
2480 MHz	1.002	0.858	Complies

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

	rum Analyzer - Swe							
RL		AC CLL-	SENSE:I	TI	ALIGNAUTO Avg Type:	Log Pur		AM Mar 15, 20: ACE 1 2 3 4 5
enter Fi	req 2.40250	PN		j: Free Run ien: 30 dB	Avg Type.	Log-Pwr	1	TYPE MWAMAN DET P P P P
dB/div	Ref Offset 0.5 Ref 6.08 dE					Mk	r2 2.402 -3.1	974 GH 794 dBi
.92			⊘ 1		2			
3.9		\sim	s mar	\sim	\sim	m		
3.9	~~						- ~~	
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3.9								
3.9								
enter 2.4	402500 GHz						Span	3.000 MH
Res BW	30 kHz		#VBW 10) kHz		Sweep	3.200 ms	(1001 pt
R MODE TR		×	Y	FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE	
1 N 1 2 N 1		2.401 972 GHz 2.402 974 GHz	-3.92 dBm -3.79 dBm					
3 4								
5								
7								
8 9								
0								
• 1 1								
3					STATUS			

CH00 -2Mbps



CH39 -2Mbps

		SENSE:INT	ALIGN AUTO		10:54:38 AM Mar 1
er Freq 2.441500000	D GHz PNO: Wide IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Type 1	-	TRACE 12 TYPE MW DET P P
Ref Offset 0.5 dB div Ref 6.03 dBm				Mkr2 2	.441 974 (-3.994 c
	_1		2		
000		n n		man -	
	~~				<u>_</u>
					γ
					m
		· · ·			Span 3.000
)0 ms (100/
	#	VBW 100 kHz		Sweep 3.20	, o iii o (100
BW 30 kHz De TRC SCL X		Y FUNCTIO	N FUNCTION WIDTH	Sweep 3.20	
BW 30 kHz De TRC SCL × V 1 f 2.44	40 972 GHz -3	functio	N FUNCTION WIDTH		
l 1 f 2.44	40 972 GHz -3	Y FUNCTIO	N FUNCTION WIDTH		
BW 30 kHz De TRC SCL × I 1 f 2.44	40 972 GHz -3	functio	N FUNCTION WIDTH		
BW 30 kHz De TRC SCL × I 1 f 2.44	40 972 GHz -3	functio	N FUNCTION WIDTH		
BW 30 kHz DE TRC SOL X I 1 f 2.44	40 972 GHz -3	functio	N FUNCTION WIDTH		
BW 30 kHz De TRC SCL × I 1 f 2.44	40 972 GHz -3	functio	N FUNCTION WIDTH		
BW 30 kHz De TRC SCL × I 1 f 2.44	40 972 GHz -3	functio	N FUNCTION WIDTH		

CH78 -2Mbps



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Temperature:	25 ℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	DC 3.3V

Frequency	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	0.999	0.867	Complies
2441 MHz	1.002	0.869	Complies
2480 MHz	1.002	0.868	Complies

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

	rum Analy	zer - Swept SA								
RL	RF	50 Ω AC		9	ENSE:INT	AL	IGN AUTO			8 AM Mar 15, 2
enter F	req 2.	40250000	Р	NO: Wide 🖵 Gain:Low	Trig: Free Ru #Atten: 30 dE		Avg Type:	Log-Pwr	Т	RACE 1 2 3 4 TYPE MWWWA DET P P P P
) dB/div		ffset 0.5 dB 6 .11 dBm						MI	(r2 2.402 -3.	971 GI 840 dB
89				1			2			
3.9		~~~	$\sim\sim$	$\sim \sim$	\sim	\sim	\sim	\sim	~~~	
3.9		\bigwedge							- ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
8.9 ~~~									<u> </u>	
8.9										
8.9										
3.9										
3.9										
3.9										
enter 2. Res BW				#VB\	N 100 kHz			Sweep	Span 3.200 ms	3.000 M s (1001 p
R MODE T		>		Y	FUNCT	ON FUNC	TION WIDTH	FL	JNCTION VALUE	
	l f		401 972 GHz 402 971 GHz	-3.89 -3.84						
3 4										
5										
7										
9										
0										
0										>

CH00 -3Mbps



CH39 -3Mbps

	DΩ AC	SENSE:INT	A	ALIGN AUTO	1	1:09:56 AM Mar :
r Freq 2.441	PN		Free Run n: 30 dB	Avg Type: Log	-Pwr	TRACE 1 2 TYPE MV DET P P
Ref Offset div Ref 5.98					Mkr2 2.	441 974 -4.044 (
		1		2		
	m	~~~~~		$\sim \sim \sim \sim \sim$	~~~~	
~	~	¥	· ~ ·		- m	<u> </u>
-						$\overline{\mathbf{A}}$
						- mon
r 2.441500 GH	Iz					pan 3.000
BW 30 kHz		#VBW 100	kHz		Sweep 3.20	0 ms (100
DE TRC SCL	×	Y	FUNCTION FUNC	CTION WIDTH	FUNCTION V	ALUE
1 f 1 f	2.440 972 GHz 2.441 974 GHz	-4.02 dBm -4.04 dBm				

CH78 -3Mbps



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8. BANDWIDTH TEST

8.1 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:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.3V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.953	PASS
2441 MHz	0.945	PASS
2480 MHz	0.953	PASS

CH00 -1Mbps

Agilent Spectrum Analyzer - Occupied BW G RL RF 50 Ω AC	/	SENSE:INT	ALIGNAUTO	09:46:58 AM Mar 15, 2019
enter Freq 2.402000000	GHz	Center Freq: 2.402000	000 GHz	Radio Std: None
	#IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Hold>10/10	Radio Device: BTS
	#IFGall.LOW	with ov ab		
0 dB/div Ref 20.00 dBm				
-og				
10.0				
0.00				
10.0		m		
20.0	\sim			
30.0				
40.0				
50.0				
50.0				
70.0				
Center 2.402 GHz				Span 2 MHz
#Res BW 30 kHz		#VBW 100 k	Hz	Sweep 2.733 ms
Occupied Bandwidth	1	Total Power	5.68 dBm	
-	94.55 kHz			
03	94.00 KHZ			
Transmit Freq Error	454 Hz	OBW Power	99.00 %	
x dB Bandwidth	952.5 kHz	x dB	-20.00 dB	
	902.0 KHZ		-20.00 aB	
sg			STATUS	

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CH39 -1Mbps



CH78 -1Mbps



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Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.3V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.289	PASS
2441 MHz	1.287	PASS
2480 MHz	1.287	PASS

CH00 -2Mbps

	m Analyzer - Occupied BW					
Center Fre	RF 50 Ω AC eq 2.402000000		Center Freq: 2.402000		10:50:19 AM Mar 15, 2019 Radio Std: None	
	Trig: Free Run Avg Hold>10/10 #IFGain:Low #Atten: 30 dB					
10 dB/div	Ref 20.00 dBm					
Log						
0.00						
-10.0			m			
-20.0		$\sim \sim$		man		
-30.0						
-40.0						
-50.0						
-60.0						
-70.0						
Center 2.4 #Res BW			#VBW 100 k	H7	Span 2 MHz Sweep 2.733 ms	
	ied Bandwidth	, 1	Total Power	5.55 dBm		
		1582 MHz				
Transm	it Freq Error	-4.872 kHz	OBW Power	99.00 %		
x dB Ba	andwidth	1.289 MHz	x dB	-20.00 dB		
MSG				STATUS		

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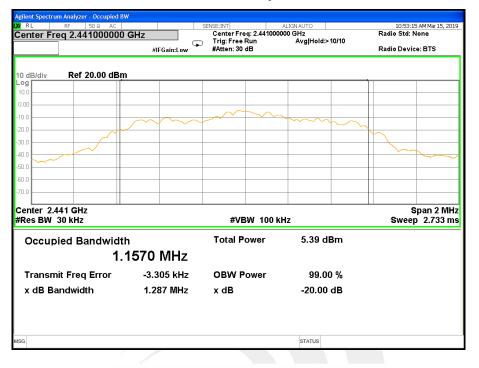
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CH39 -2Mbps



CH78 -2Mbps





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Temperature:	25 ℃	Relative Humidity:	50%
	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	DC 3.3V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.300	PASS
2441 MHz	1.303	PASS
2480 MHz	1.302	PASS

CH00 -3Mbps

RL RF 50 Ω AC enter Freq 2.40200000		SENSE:INT Center Freg: 2.4020000	ALIGN AUTO	11:11:05 AM Mar 15, 2019 Radio Std: None
	#IFGain:Low	⊃ Trig: Free Run #Atten: 30 dB	Avg Hold>10/10	Radio Device: BTS
dB/div Ref 20.00 dB	m			
b g				
00				
.0				
0				
0				
0				
0				
.0				
.0				
enter 2.402 GHz Res BW 30 kHz		#VBW 100 ki		Span 2 MH Sweep 2.733 m
Occupied Bandwid	th	Total Power	5.70 d B m	
1	.1966 MHz			
Transmit Freq Error	-17.276 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.300 MHz	x dB	-20.00 dB	
			STATUS	

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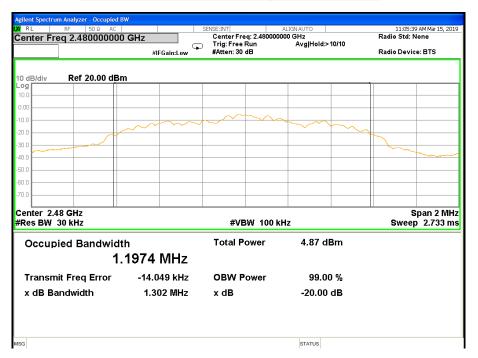
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CH39 -3Mbps



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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 (a)(1)&(b)(1)	Output Power	1 W or 0.125W if channel separation > 2/3 bandwidthprovided	2400-2483.5	PASS	
		thesystems operatewith an output power no greater than125 mW(20.97dBm)			

9.2 TEST PROCEDURE

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

9.3 TEST SETUP

EUT Power s	ensor PC
-------------	----------

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:	25℃	Relative Humidity:	60%
Test Voltage:	DC 3.3V		

Mode Channel Number		Frequency	Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	
	0	2402	0.08	-1.73	30.00
GFSK	39	2441	-0.29	-2.15	30.00
	78	2480	-1.30	-3.20	30.00

Note: the channel separation >20dB bandwidth

Mode Channel Number		Frequency	Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	
	0	2402	0.45	-2.86	20.97
π/4-DQPSK	39	2441	0.11	-3.21	20.97
	78	2480	-0.89	-4.28	20.97

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

Mode Channel Number		Frequency	Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	
	0	2402	0.83	-2.85	20.97
8-DPSK	39	2441	0.52	-3.21	20.97
	78	2480	-0.51	-4.28	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 PCB 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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