

RADIO TEST REPORT

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Report No.: STS2003054W03

Issued for

ShenZhen Aoni Electronic Industry Co., Ltd.

HongHui Industrial Park,2nd LiuXian Road, Xin'An streets, District 68, Bao'an District, ShenZhen, China

Product Name:	True wireless earbuds	
Brand Name:	Aoni, ANC	
Model Name:	B217	
Series Model:	B228, B207, B208, B216, B219, B221, B222, B225, B227, B229, B230, B231, B233	
FCC ID:	Z63-T0B217B228	
Test Standard:	FCC Part 15.247	

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TEST RESULT CERTIFICATION

Applicant's Name	ShenZhen Aoni Electronic Industry Co., Ltd.
Address	HongHui Industrial Park,2nd LiuXian Road, Xin'An streets, District 68, Bao'an District, ShenZhen, China
Manufacture's Name:	ShenZhen Aoni Electronic Industry Co., Ltd.
Address	HongHui Industrial Park,2nd LiuXian Road, Xin'An streets, District 68, Bao'an District, ShenZhen, China
Product Description	
Product Name	True wireless earbuds
Brand Name	Aoni, ANC
Model Name:	B217
	5000 5007 5000 5040 5040 5004 5000 5007 5007
Series Model	B228, B207, B208, B216, B219, B221, B222, B225, B227, B229, B230, B231, B233
Series Model Test Standards	B230, B231, B233

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 of receipt of test item:Date of receipt of test item:Date (s) of performance of tests :18 Mar. 2020 ~ 30 Mar. 2020Date of Issue:30 Mar. 2020

Test Result Pass

Testing Engineer

(Chris Chen)

Technical Manager

(Sean she)



Authorized Signatory :

(Vita Li)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	30 Mar. 2020	STS2003054W03	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		
15.209	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	Restricted bands of operation	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	±0.68dB
2	Unwanted Emissions, conducted	±2.988dB
3	All emissions, radiated 30-1GHz	±6.7dB
4	All emissions, radiated 1G-6GHz	±5.5dB
5	All emissions, radiated>6G	±5.8dB
6	Conducted Emission (9KHz-150KHz)	±4.43dB
7	Conducted Emission (150KHz-30MHz)	±5dB



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	True wireless earbuds		
Trade Name	Aoni, ANC		
Model Name	B217		
Series Model	B228, B207, B208, B216, B227, B229, B230, B231,	B219, B221, B222, B225, B233	
Model Difference	Only the appearance and	color are difference.	
Channel List	Please refer to the Note 2		
Bluetooth	Frequency:2402 – 2480 M Modulation: GFSK(1Mbps 8DPSK(3Mbps)		
Bluetooth Version	5.0		
BR+EDR	BR+EDR		
Please see Note 3.	Please refer to the Note 3		
Power Rating	Input: USB DC 5V		
Battery	Rated Voltage: 3.8V Charge Limit: 4.35V Capacity: 40mAh		
Charging Box	Model: B217 Input: USB DC 5V Output: DC 5V 60mA*2 Battery Rated Voltage: 3.7V Charge Limit: 4.2V Capacity: 400mAh	Model: B228 Input: USB DC 5V Output: DC 5V 60mA*2 Battery Rated Voltage: 3.7V Charge Limit: 4.2V Capacity: 400mAh	
Hardware version number	N/A		
Software version number	N/A		
Connecting I/O Port(s)	Please refer to the Note 1.		

Note:

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

A	nt.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
	1	Aoni, ANC	B217	PIFA	N/A	1 dBi	BT Antenna



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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 CH00 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 available 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 Emission	Mode 10 : Keeping BT TX

2.3 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

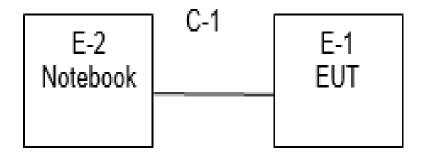
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final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

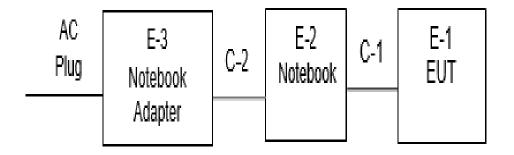


2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



Conducted Emission Test





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 Model/Type No.		Serial No.	Note			
N/A	N/A	N/A	N/A N/A		N/A			

Support units

Item	Equipment	Mfr/Brand	Mfr/Brand Model/Type No.		Note
E-2	Notebook	ThinkPad N/A		N/A	N/A
E-3	Notebook Adapter	ThinkPad	N/A	N/A	N/A
C-1	USB Cable	N/A	100cm	N/A	N/A
C-2	DC Cable	N/A	110cm	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 ^[] Length ^[] column.



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	2019.07.29	2020.07.28		
Signal Analyzer	Agilent	N9020A	MY51110105	2020.03.05	2021.03.04		
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	2019.10.09	2020.10.08		
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK201808090 1	2019.10.12	2020.10.11		
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11		
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	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.07.29	2020.07.28
LISN	R&S	ENV216	101242	2019.10.09	2020.10.08
LISN	EMCO	3810/2NM	23625	2019.10.09	2020.10.08
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
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	15I00041SNO03	2019.10.09	2020.10.08	
Signal Analyzer	Agilent	N9020A	MY49100060	2019.10.09	2020.10.08	
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11	
Test SW	FARAD	LZ-RF /LzRf-3A3				

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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.

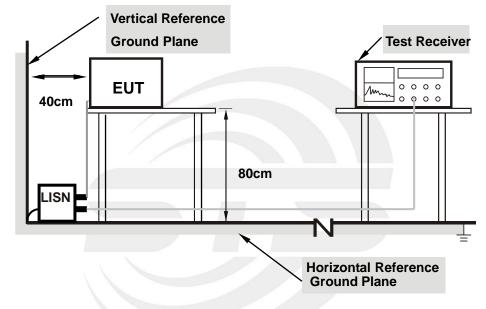
The following table is the setting of the receiver

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

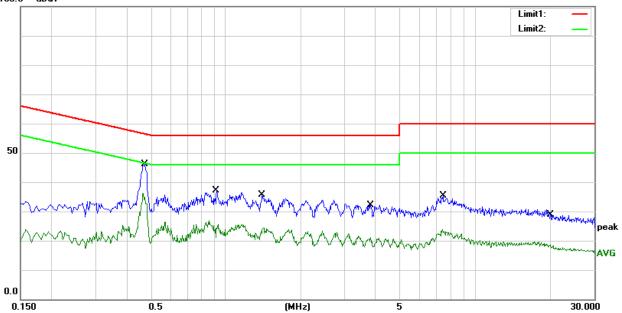
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.4740	26.06	19.99	46.05	56.44	-10.39	QP
2	0.4740	16.25	19.99	36.24	46.44	-10.20	AVG
3	0.9220	17.47	19.76	37.23	56.00	-18.77	QP
4	0.9220	7.16	19.76	26.92	46.00	-19.08	AVG
5	1.3980	15.78	19.74	35.52	56.00	-20.48	QP
6	1.3980	4.62	19.74	24.36	46.00	-21.64	AVG
7	3.8100	12.46	19.77	32.23	56.00	-23.77	QP
8	3.8100	1.47	19.77	21.24	46.00	-24.76	AVG
9	7.4420	15.54	19.85	35.39	60.00	-24.61	QP
10	7.4420	4.10	19.85	23.95	50.00	-26.05	AVG
11	19.9820	8.71	20.29	29.00	60.00	-31.00	QP
12	19.9820	-0.75	20.29	19.54	50.00	-30.46	AVG

Remark:

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

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







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Temperature:	24.2(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	Phase:	Ν
Test Mode:	Mode 10		

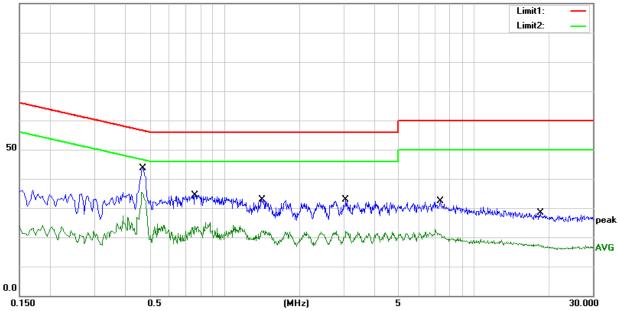
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.4700	23.57	19.99	43.56	56.51	-12.95	QP
2	0.4700	15.36	19.99	35.35	46.51	-11.16	AVG
3	0.7620	14.67	19.79	34.46	56.00	-21.54	QP
4	0.7620	5.27	19.79	25.06	46.00	-20.94	AVG
5	1.4220	13.13	19.74	32.87	56.00	-23.13	QP
6	1.4220	2.74	19.74	22.48	46.00	-23.52	AVG
7	3.0700	13.08	19.75	32.83	56.00	-23.17	QP
8	3.0700	2.41	19.75	22.16	46.00	-23.84	AVG
9	7.3460	12.46	19.84	32.30	60.00	-27.70	QP
10	7.3460	2.96	19.84	22.80	50.00	-27.20	AVG
11	18.4780	8.26	20.23	28.49	60.00	-31.51	QP
12	18.4780	-2.08	20.23	18.15	50.00	-31.85	AVG

Remark:

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

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





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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).

LIMITS OF RESTRICTED FREQUENCY BANDS

FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (MHz)	FREQUENCY (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

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For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP/AV
Start Frequency	9 KHz/150KHz(Peak/QP/AV)
Stop Frequency	150KHz/30MHz(Peak/QP/AV)
	200Hz (From 9kHz to 0.15MHz)/
RB / VB (emission in restricted	9KHz (From 0.15MHz to 30MHz);
band)	200Hz (From 9kHz to 0.15MHz)/
	9KHz (From 0.15MHz to 30MHz)

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/QP
Start Frequency	30 MHz(Peak/QP)
Stop Frequency	1000 MHz (Peak/QP)
RB / VB (emission in restricted	120 KHz / 300 KHz
band)	120 KHZ / 300 KHZ

Spectrum Parameter	Setting	
Attenuation	Auto	
Detector	Peak	
Start Frequency	1000 MHz(Peak)	
Stop Frequency	10th carrier hamonic(Peak)	
RB / VB (emission in restricted	1 MHz / 3 MHz(Peak)	
band)	1 MHz/1/T MHz(AVG)	

For Restricted band

Spectrum Parameter	Setting	
Detector	Peak	
Start/Stop Fraguapay	Lower Band Edge: 2310 to 2410 MHz	
Start/Stop Frequency	Upper Band Edge: 2476 to 2500 MHz	
	1 MHz / 3 MHz(Peak)	
RB / VB	1 MHz/1/T MHz(AVG)	

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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 for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

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

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

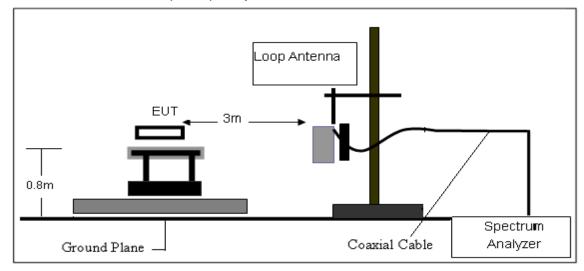
3.2.3 DEVIATION FROM TEST STANDARD

No deviation.

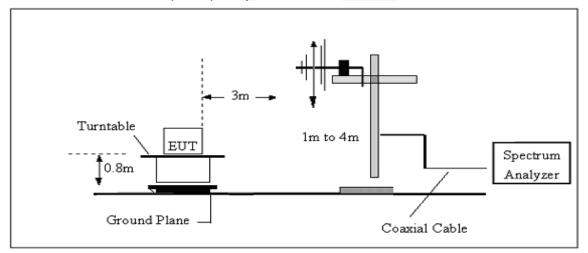


3.2.4 TESTSETUP

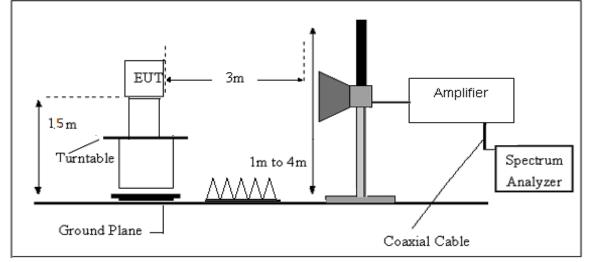
(A) Radiated Emission Test-Up Frequency Below 30MHz



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



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



3.2.5 EUT OPERATING CONDITIONS

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

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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:	22.9(C)	Relative Humidity:	53%RH
Test Voltage:	DC 3.8V	Test Mode:	TX Mode

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

Note:

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

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

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





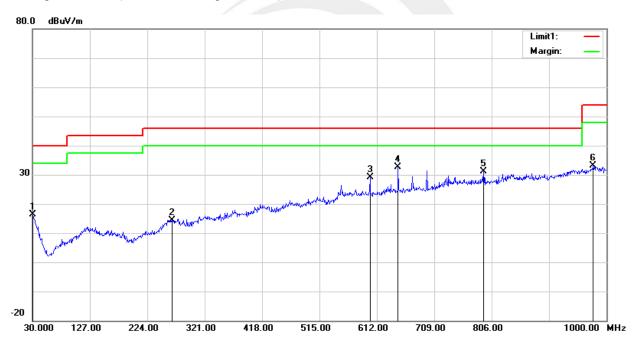
(30MHz-1000MHz)

Temperature:	22.9(C)	Relative Humidity:	53%RH	
Test Voltage:	DC 3.8V	Phase:	Horizontal	
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode 9 worst mode)			

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	30.0000	29.30	-12.85	16.45	40.00	-23.55	QP
2	265.7100	29.29	-14.83	14.46	46.00	-31.54	QP
3	600.3600	34.86	-5.84	29.02	46.00	-16.98	QP
4	647.8900	37.57	-4.88	32.69	46.00	-13.31	QP
5	792.4200	33.11	-1.99	31.12	46.00	-14.88	QP
6	977.6900	30.55	2.52	33.07	54.00	-20.93	QP

Remark:

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



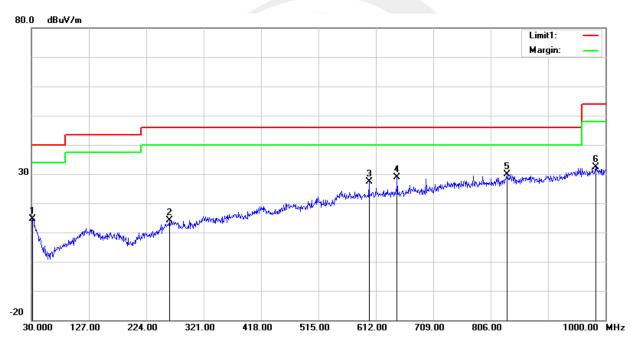


Temperature:	22.9(C)	Relative Humidity:	53%RH				
Test Voltage:	DC 3.8V	Phase:	Vertical				
Test Mode:	Mode 1/2/3/4/5/6/7/8/9(Mode 9 worst mode)						

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	31.9400	28.55	-13.86	14.69	40.00	-25.31	QP
2	262.8000	29.00	-14.76	14.24	46.00	-31.76	QP
3	600.3600	33.29	-5.84	27.45	46.00	-18.55	QP
4	647.8900	33.83	-4.88	28.95	46.00	-17.05	QP
5	833.1600	30.57	-0.62	29.95	46.00	-16.05	QP
6	983.5100	30.01	2.46	32.47	54.00	-21.53	QP

Remark:

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



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(1GHz~25GHz) 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 Chan	nel (8-DPSK/2	2402 MHz)				
3264.71	61.17	44.70	6.70	28.20	-9.80	51.37	74.00	-22.63	PK	Vertical
3264.71	51.07	44.70	6.70	28.20	-9.80	41.27	54.00	-12.73	AV	Vertical
3264.70	61.71	44.70	6.70	28.20	-9.80	51.91	74.00	-22.09	PK	Horizontal
3264.70	50.86	44.70	6.70	28.20	-9.80	41.06	54.00	-12.94	AV	Horizontal
4804.54	59.32	44.20	9.04	31.60	-3.56	55.76	74.00	-18.24	PK	Vertical
4804.54	50.57	44.20	9.04	31.60	-3.56	47.01	54.00	-6.99	AV	Vertical
4804.35	58.84	44.20	9.04	31.60	-3.56	55.28	74.00	-18.72	PK	Horizontal
4804.35	49.12	44.20	9.04	31.60	-3.56	45.56	54.00	-8.44	AV	Horizontal
5359.78	49.36	44.20	9.86	32.00	-2.34	47.02	74.00	-26.98	PK	Vertical
5359.78	39.22	44.20	9.86	32.00	-2.34	36.88	54.00	-17.12	AV	Vertical
5359.60	47.99	44.20	9.86	32.00	-2.34	45.65	74.00	-28.35	PK	Horizontal
5359.60	38.11	44.20	9.86	32.00	-2.34	35.77	54.00	-18.23	AV	Horizontal
7205.70	53.91	43.50	11.40	35.50	3.40	57.31	74.00	-16.69	PK	Vertical
7205.70	44.46	43.50	11.40	35.50	3.40	47.86	54.00	-6.14	AV	Vertical
7205.81	54.62	43.50	11.40	35.50	3.40	58.02	74.00	-15.98	PK	Horizontal
7205.81	44.67	43.50	11.40	35.50	3.40	48.07	54.00	-5.93	AV	Horizontal
				Middle Cha	nnel (8-DPSK	/2441 MHz)		•		
3264.76	62.05	44.70	6.70	28.20	-9.80	52.25	74.00	-21.75	PK	Vertical
3264.76	49.97	44.70	6.70	28.20	-9.80	40.17	54.00	-13.83	AV	Vertical
3264.78	62.21	44.70	6.70	28.20	-9.80	52.41	74.00	-21.59	PK	Horizontal
3264.78	50.76	44.70	6.70	28.20	-9.80	40.96	54.00	-13.04	AV	Horizontal
4882.31	58.69	44.20	9.04	31.60	-3.56	55.13	74.00	-18.87	PK	Vertical
4882.31	50.12	44.20	9.04	31.60	-3.56	46.56	54.00	-7.44	AV	Vertical
4882.60	58.23	44.20	9.04	31.60	-3.56	54.67	74.00	-19.33	PK	Horizontal
4882.60	49.74	44.20	9.04	31.60	-3.56	46.18	54.00	-7.82	AV	Horizontal
5359.78	48.64	44.20	9.86	32.00	-2.34	46.30	74.00	-27.70	PK	Vertical
5359.78	39.10	44.20	9.86	32.00	-2.34	36.76	54.00	-17.24	AV	Vertical
5359.63	48.22	44.20	9.86	32.00	-2.34	45.88	74.00	-28.12	PK	Horizontal
5359.63	38.57	44.20	9.86	32.00	-2.34	36.23	54.00	-17.77	AV	Horizontal
7323.77	54.25	43.50	11.40	35.50	3.40	57.65	74.00	-16.35	PK	Vertical
7323.77	44.70	43.50	11.40	35.50	3.40	48.10	54.00	-5.90	AV	Vertical
7323.74	53.81	43.50	11.40	35.50	3.40	57.21	74.00	-16.79	PK	Horizontal
7323.74	44.38	43.50	11.40	35.50	3.40	47.78	54.00	-6.22	AV	Horizontal



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				High Chanı	nel (8-DPSK	/2480 MHz)				
3264.69	61.65	44.70	6.70	28.20	-9.80	51.85	74.00	-22.15	PK	Vertical
3264.69	49.87	44.70	6.70	28.20	-9.80	40.07	54.00	-13.93	AV	Vertical
3264.85	61.20	44.70	6.70	28.20	-9.80	51.40	74.00	-22.60	PK	Horizontal
3264.85	50.82	44.70	6.70	28.20	-9.80	41.02	54.00	-12.98	AV	Horizontal
4960.34	58.94	44.20	9.04	31.60	-3.56	55.38	74.00	-18.62	PK	Vertical
4960.34	49.55	44.20	9.04	31.60	-3.56	45.99	54.00	-8.01	AV	Vertical
4960.45	59.18	44.20	9.04	31.60	-3.56	55.62	74.00	-18.38	PK	Horizontal
4960.45	50.52	44.20	9.04	31.60	-3.56	46.96	54.00	-7.04	AV	Horizontal
5359.63	48.05	44.20	9.86	32.00	-2.34	45.71	74.00	-28.29	PK	Vertical
5359.63	38.95	44.20	9.86	32.00	-2.34	36.61	54.00	-17.39	AV	Vertical
5359.65	47.54	44.20	9.86	32.00	-2.34	45.20	74.00	-28.80	PK	Horizontal
5359.65	39.34	44.20	9.86	32.00	-2.34	37.00	54.00	-17.00	AV	Horizontal
7439.86	54.35	43.50	11.40	35.50	3.40	57.75	74.00	-16.25	PK	Vertical
7439.86	44.74	43.50	11.40	35.50	3.40	48.14	54.00	-5.86	AV	Vertical
7439.78	54.97	43.50	11.40	35.50	3.40	58.37	74.00	-15.63	PK	Horizontal
7439.78	44.42	43.50	11.40	35.50	3.40	47.82	54.00	-6.18	AV	Horizontal

Note:

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

Emission Level = Reading + Factor

3) 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.



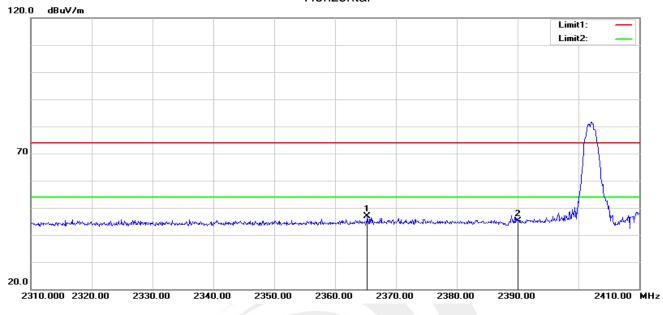
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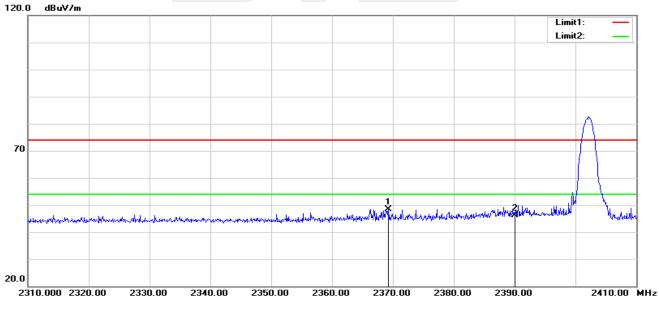
Restricted band Requirements

8DPSK-Low Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2365.300	43.02	3.97	46.99	74.00	-27.01	peak
2	2390.000	40.68	4.34	45.02	74.00	-28.98	peak

Vertical



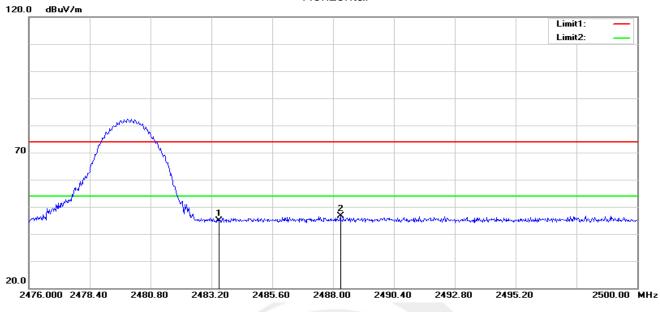
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2369.300	44.47	4.03	48.50	74.00	-25.50	peak
2	2390.000	41.74	4.34	46.08	74.00	-27.92	peak



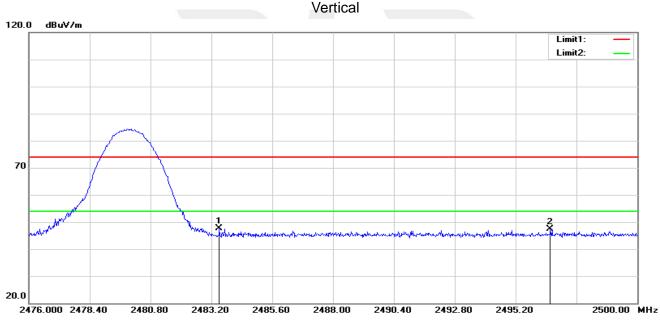
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8DPSK-High Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	40.38	4.60	44.98	74.00	-29.02	peak
2	2488.288	42.01	4.62	46.63	74.00	-27.37	peak



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	42.99	4.60	47.59	74.00	-26.41	peak
2	2496.568	42.85	4.64	47.49	74.00	-26.51	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

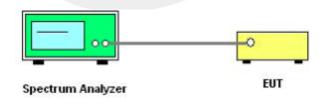
Spectrum Parameter	Setting		
Detector	Peak		
Start/Stop Frequency	30 MHz to 10th carrier harmonic		
RB / VB (emission in restricted band)	100 KHz/300 KHz		
Trace-Mode:	Max hold		

For Band edge

Spectrum Parameter	Setting			
Detector	Peak			
Stort/Stop Eroquopou	Lower Band Edge: 2300– 2407 MHz			
Start/Stop Frequency	Upper Band Edge: 2475 – 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

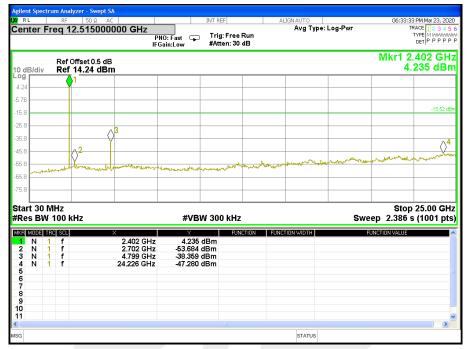
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-00/39/78 CH	Test Voltage:	DC 3.8V

00 CH



39 CH

vilent Spect	trum Analy	vzer - Swept S	54							
RL	RF	50 Ω A			INT REF		ALIGNAUTO		06:38:3) PM Mar 23, 20
enter F	req 12		000 GHz	NO: Fast 😱 Gain:Low	Trig: Free F #Atten: 30 d	Run 1B	Avg Type	: Log-Pwr		TYPE MWWW DET P P P P
) dB/div		ffset 0.5 dE 14.83 dBr								.452 GH 826 dB
.83	- (1								
17										
.2										-14.85
2										
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.2										
art 30	MU7								Ston	25.00 G
	/ 100 k	Hz		#VB	W 300 kHz			Sw	eep 2.386	s (1001 p
R MODE T			×	Y		TION FUI	NCTION WIDTH		FUNCTION VALUE	
2 N	1 f 1 f		2.452 GHz 2.652 GHz	4.826 -56.286	dBm					
	1 f 1 f		4.874 GHz 24.276 GHz	-39.131 -47.780						
i IIII										
;										
)										
1							STATUS			

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78 CH

Spectrum Analyzer - Swe RF 50 Ω	AC	INT REF		ALIGNAUTO		06:44:27 PM Mar
er Freq 12.5150		Tritor Fr		Avg Type:	Log-Pwr	TRACE
		D: Fast 😱 Trig: Fr iin:Low #Atten:				DET
						Mkr1 2.477
Ref Offset 0.5 Idiv Ref 13.11 d						3.109
1						
	A 3					
<u>^2</u>						
M			della della	man and the state many	monther	an marker when the
provident to the state	Marchard and a construction	melundon Marchasel and Marchasel				
30 MHz						Stop 25.00
BW 100 kHz		#VBW 300 k	Hz		Swe	eep 2.386 s (100
DDE TRC SCL	×		FUNCTION F	UNCTION WIDTH		FUNCTION VALUE
N 1 f N 1 f	2.477 GHz 2.677 GHz	3.109 dBm -54.586 dBm				
	4.949 GHz	-38.298 dBm				
N 1 f	24.326 GHz	-47.034 dBm				
N 1 f						
				STATUS		



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For Band edge(it's also the reference level for conducted spurious emission)

Agilent Spect	rum Analyzer -	Swept SA					
LXIRL		50 Ω AC		INT REF	ALIGN AUT		06:33:03 PM Mar 23, 2020
Center F	req 2.353	3500000 GHz	PNO: Fast G	Trig: Free R #Atten: 30 dl	un	Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWWWW DET P P P P F
10 dB/div	Ref Offse Ref 14.4						Mkr1 2.402 19 GHz 4.475 dBm
4.48							1
-5.52							
-15.5							-15,52 dBm
-25.5							A3()
-35.5							11 14 W
-55.5			!				NV I
-65.5	at a top of the second se	ar lannak almarka	have have a hard have a	1. Marine Carlos and Car	en beredformeteller more	neg/kprojeton zynskomblensj	hallon har like the set
-75.5							
Start 2.30 #Res BW	0000 GHz 100 kHz		#VB	SW 300 kHz		Swee	Stop 2.40700 GHz ep 10.27 ms (1001 pts)
MKR MODE T 1 N ⁴ 2 N ⁴	RC SCL 1 f 1 f	× 2.402 19 G 2.328 03 G		FUNCT o dBm	ION FUNCTION WID	TH	FUNCTION VALUE
2 N 3 N 4 N	1 f	2.328 03 G 2.398 76 G 2.400 05 G	Hz -41.308	dBm			
		2.400 00 0	12 -40.002	. ubiii			
5 6 7 8 9							
9 10							
11							~
ISG					STA	TUS	

00 CH

39 CH





78 CH

	RF 50 Ω AC			INT REF	AL	IGNAUTO			PM Mar 23, 20
nter Freq	2.4875000	F	PNO: Fast 😱 Gain:Low	Trig: Free Ru #Atten: 30 dB		Avg Type: L	.og-Pwr	т	ACE 1 2 3 4 YPE MWWWW DET P P P P
dB/div Re	ef Offset 0.5 dB ef 15.37 dBn						Mk	r1 2.479 5.3	850 G⊦ 367 dB
7		1							
3		+							-14.63 c
5									-14.000
	Auron								
5 pra	and the second s	- Your	$\sqrt{2}^{3}$				4		
			V. VV	manna	www.www.	-mangelinger	mount	en man	www.
6									
1								Stop 2.5	50000 GI
rt 2.47500) GHz						Sween		(1001 pt
art 2.47500 es BW 100			#VBV	V 300 kHz			Uncep	2.400 113	· ·
es BW 100	0 kHz	× 479 850 GHz	Y	FUNCTION	DN FUNCT	ION WIDTH		NCTION VALUE	
es BW 100	0 kHz f 2 f 2 f 2 f 2	× 2.479 850 GHz 2.483 500 GHz 2.484 000 GHz 2.494 275 GHz	#VBV 5.367 (-52.162 (-48.959 (-56.546 (functio dBm dBm dBm	DN FUNCT	ION WIDTH			
es BW 100 MODE TROISO N 1 f N 1 f N 1 f	0 kHz f 2 f 2 f 2 f 2	2.479 850 GHz 2.483 500 GHz 2.484 000 GHz	5.367 c -52.162 c -48.959 c	functio dBm dBm dBm	DN FUNC	10N WIDTH			
BW 100 MODE THE SO N 1 f N 1 f N 1 f	0 kHz f 2 f 2 f 2 f 2	2.479 850 GHz 2.483 500 GHz 2.484 000 GHz	5.367 c -52.162 c -48.959 c	functio dBm dBm dBm	DN FUNCI	ION WIDTH			
es BW 100 MODE TROISO N 1 f N 1 f N 1 f	0 kHz f 2 f 2 f 2 f 2	2.479 850 GHz 2.483 500 GHz 2.484 000 GHz	5.367 c -52.162 c -48.959 c	functio dBm dBm dBm	DN FUNCI	ION WIDTH			



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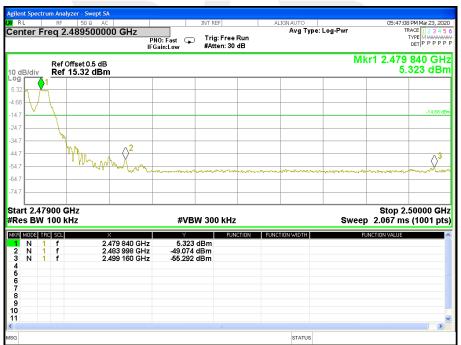


For Hopping Band edge

00 CH

nt Spectro	um Analyzer - S RF 50			INT REF		IGN AUTO		05:44:4	EDM Max 20. /
		Ω AC 500000 GHz	PNO: Fast IFGain:Low		n	Avg Type:	Log-Pwr	Т	5 PM Mar 23, 2 RACE 1 2 3 TYPE MWAA DET P P P
B/div	Ref Offset (Ref 14.20						M	kr1 2.403 4.	000 G 201 dE
									-15.80
<u> </u>									
									11
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	000 GHz								40300 G
	100 kHz		#VE	300 kHz				p 9.867 ms	s (1001 p
MODE TE N 1 N 1 N 1	f f	× 2.403 000 G 2.390 022 G 2.399 807 G	Hz -58.924		DN FUNCT	TION WIDTH	F	UNCTION VALUE	
				:					
						STATUS			

78 CH



Shenzhen STS Test Services Co., Ltd.

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Page 36 of 73 Report No.: STS2003054W03

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 00/39/78 CH	Test Voltage:	DC 3.8V

RL	rum Analyzer - Sv RF 50 !		SENSE:PULSE	ALIGN AU	то	09:45:56 AM Mar 24, 20
ter F	req 12.515		D: Fast Trig: Free in:Low #Atten: 3	e Run	g Type: Log-Pwr	TRACE 1 2 3 4 TYPE MWWW DET P P P
B/div	Ref Offset 0 Ref 13.84					Mkr1 2.402 GF 3.839 dB
	0 1					
						-15.54 (
		3				/
	<mark>⊘</mark> 2					1
	munderman	mentermander	a margale have a strange and	and show of the second states and a second states and the second s	and the sylles and an and all many a	
<u> </u>						
1 30 I	MHZ					Stop 25.00 G
	100 kHz		#VBW 300 kH	z	Sw	eep 2.386 s (1001 p
MODE T	RC SCL	x		NCTION FUNCTION WI	DTH	FUNCTION VALUE
N ·	1 f 1 f 1 f 1 f	2.402 GHz 2.702 GHz 4.799 GHz 24.451 GHz	3.839 dBm -55.318 dBm -45.230 dBm -48.295 dBm			
						>

00 CH

20	CU
39	CH

RL	RF	50 Q A	GA C	SE	NSE:PULSE		ALIGNAUTO		10:18:	42 AM Mar 24, 2
nter F	req 1	12.515000	P	NO: Fast 🖵 Gain:Low			Avg Type	: Log-Pwr		TYPE MWWW DET P P P P
dB/div		Offset 0.5 dE 7.33 dBm								2.452 GI .668 dB
7	(1								
1										
/										14.83
7										
/		(∕ <mark>3</mark>							
·			Υ							
		\Diamond^2						and the second	and marken and	en mar
	howw	Kenner	an marked and a	monoundhor	mapping and a start	mann	all have the marked	No Alexandra and alexandra		
<u> </u>										
rt 30 F es BW		kHz		#VB	W 300 kHz				eep 2.386	o 25.00 G s (1001 p
	RC SCL		×	Y		CTION FUN	ICTION WIDTH		FUNCTION VALUE	
N Ó	f		2.452 GHz 2.677 GHz	-2.668 -56.617						
N N			4.874 GHz	-39.144 -47.795						
IN .	T		24.501 GHz	-41.195	авт					



78 CH

RF 50 Q		SENSE:PULSE	1	LIGNAUTO		09:56:46 AM M	ar 24
ter Freg 12.5150				Avg Type: L	.og-Pwr	TRACE 1	23
		D: Fast 😱 Trig: Fr ain:Low #Atten:				TYPE DET	1999 P P
						Mkr1 2.477	10
Ref Offset 0.5 Idiv Ref 14.51 c						4.513	
							-
Y.							
							-14.5
	<u>3</u>						
	Y						
$and a b^2$					and which when we	monor	ne m
man parte a falled a farmer and	where and the second second	and water and	and the second and the second s				
t 30 MHz						Stop 25.0	00
s BW 100 kHz		#VBW 300 ki	Ηz		Swe	ep 2.386 s (10	
IODE TRC SCL	×		UNCTION FUN	CTION WIDTH	FL	INCTION VALUE	
N 1 f N 1 f	2.477 GHz 2.577 GHz	4.513 dBm -56.561 dBm					
N 1 f	4.949 GHz	-40.923 dBm					
N 1 f	24.226 GHz	-48.329 dBm					



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For Band edge(it's also the reference level for conducted spurious emission)

	rum Analyzer - S	Swept SA							
LXI RL	RF 50		SE	NSE:PULSE	AL	IGN AUTO			AM Mar 24, 2020
Center F	req 2.353	500000 GHz	PNO: Fast 😱 IFGain:Low	Trig: Free Ru #Atten: 30 dB		Avg Type: I			ACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P
10 dB/div	Ref Offset Ref 14.46						N		1 97 GHz 458 dBm
4.46									1
-5.54									
-15.5									-15 54 dBm
-25.5									. 3
-35.5									
-40.0	() ²								NW.
-65.5	art-manyaline	hannen hann an		and the mental hash the second	لله المحمول الم	warmylahairegra	defendence de	manipanthana	
-75.5									
	0000 GHz / 100 kHz		#VB	W 300 kHz			Sweep		40700 GHz (1001 pts)
	rrc scl 1 f 1 f 1 f	× 2.401 97 G 2.310 59 G 2.398 87 G	Hz -58.193	dBm	ON FUNCT	ION WIDTH	FL	JNCTION VALUE	^
	1 f	2.398 87 G 2.400 05 G							
7 8 9									
10									
11 <									<u>×</u>
WSG						STATUS			

00 CH

39 CH





78 CH

Analyzer - Swept S		SENS	E:PULSE	AL	IGNAUTO		09:56:15	5 AM Mar 24, 202
	00 GHz	PNO: Fast	Trig: Free F	Run		Log-Pwr	TF	RACE 1 2 3 4 5 TYPE MWWWWW DET P P P P P
						MI		850 GH 464 dBr
) س								
								-14.54 df
~								
~~~~		$2^3$				∧4		
		W Valler In	᠕ᡥᠯᢇᠵᡘᢧ᠆ᠬ᠕ᡀ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	montental	mmmmmmm	enan and	
		#VBN	/ 300 kHz			Sweep		50000 GH (1001 pt
	X 479 850 GHz	5 464 d		TION FUNCT	TION WIDTH	FL	JNCTION VALUE	
f 2 f 2	.483 500 GHz .484 000 GHz	-51.406 d -48.116 d	Bm Bm					
	RF 50.2 A 2.4875000 tef Offset 0.5 dE tef 15.46 dBr 0 GHz 0 GHz 10 kHz 50 2 f 2 f 2 f 2	RF 900 AC 2.487500000 GHz I tef Offset 0.5 dB tef 15.46 dBm 0 GHz 0 GHz 1 0 GHz 1 1 1 1 1 1 1 1 1 1 1 1 1	RF     50.0     AC     SEN:       2.487500000 GHz     PN0: Fast IFGain:Low     PN0: Fast FGain:Low     PN0: Fast IFGain:Low       tef Offset 0.5 dB     1     1     1     1       0     GHz     1     1     1     1       0     GHz     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1	RF     50 0 AC     SEMSE PULSE       2.487500000 GHz     PN0: Fast     Trig: Free F       IFGain:Low     #Atten: 30 d       tef Offset 0.5 dB     1     1       0     GHz     4       0     GHz     #VBW 300 kHz       0     GHz     #VBW 300 kHz       0     GHz     4.46 dBm       0     GHz     4.48 100 GHz       4.48 100 GHz     5.464 dBm	RF     50.0     AC     SENSE-PULSE     AL       2.487500000 GHz     PN0: Fast IFGain:Low     Trig: Free Run #Atten: 30 dB     Trig: Free Run #Atten: 30 dB       tef Offset 0.5 dB tef 15.46 dBm     1     1     1     1       0     0     4     3     1     1     1       0     0     0     4     3     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1     1	RF SD 0 AC SENSE:PULSE ALIGNAUTO   1 2.487500000 GHz Avg Type: Avg Type:   PN0: Fast IF Gain:Low Trig: Free Run #Atten: 30 dB Avg Type:   tef Offset 0.5 dB Image: Sense:	RF SD.0 AC SENSERVUSE ALIGNAUTO   1 2.487500000 GHz Avg Type: Log-Pwr   PN0: Fast Trig: Free Run #Atten: 30 dB   Lef Offset 0.5 dB Milet 15.46 dBm   Lef Offset 0.5 dB Milet 15.46 dBm   0 GHz   0 GHz   0 GHz   6 2.479 850 GHz   6 2.479 850 GHz   7 2.483 500 GHz   6 2.484 dBm	RF     SD.D     AC     SENSE.PULSE     ALIGNAUTO     09:56:15       12.487500000 GHz     PN0: Fast IFGain:Low     Trig: Free Run #Atten: 30 dB     Avg Type: Log-Pwr     Trig: Free Run #Atten: 30 dB       tef Offset0.5 dB     Mkr1 2.479     5.     5.       1     1     5.     5.       0     0     4.000     4.000       0     0     4.000     4.000       0     0     4.000     4.000       0     0     4.000     4.000       0     0     4.000     4.000       0     0     4.000     4.000     4.000       1     1     1     4.000     4.000       1     1     1     1     4.000       1     1     1     1     4.000       1     1     1     1     4.000       1     1     1     1     4.000     4.000       1     1     1     1     1     4.000     1       1



Shenzhen STS Test Services Co., Ltd.

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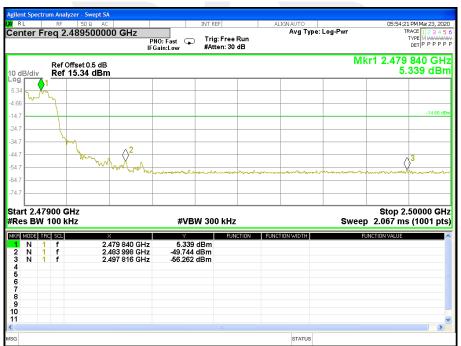


### For Hopping Band edge

00 CH



78 CH





Page 41 of 73 Report No.: STS2003054W03

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) -00/39/78 CH	Test Voltage:	DC 3.8V

# 00 CH

RL RF 50 1	Ω AC	SENSE:PULSE		ALIGNAUTO		0:01:21 AM Mar 24, 20
nter Freq 12.515	PN		Free Run n: 30 dB	Avg Type: Log	I-Pwr	TRACE 1 2 3 4 TYPE MWMMM DET P P P P
Ref Offset 0 dB/div Ref 13.04					Mki	1 2.402 GF 3.042 dB
96						-15.42 d
0						
.0						
° 2				man	www.www.am	mannaman
.0 .0	en martin and the strategy the	my was weather and a start a	Terry and the second			
.0						
art 30 MHz es BW 100 kHz		#VBW 300	kHz			Stop 25.00 Gi 386 s (1001 pi
R MODE TRO SCL N 1 f	× 2.402 GHz	Y 3.042 dBm	FUNCTION FL	JNCTION WIDTH	FUNCTION V.	ALUE
N 1 f N 1 f N 1 f N 1 f	2.402 GH2 2.702 GHz 4.799 GHz 24.151 GHz	-56.631 dBm -39.402 dBm -47.946 dBm				

# 39 CH

ilent Spe R L	ectrun		lyzer - Swept								
	Fre	RF 2 <b>q 1</b>	50 Q 2.51500	0000 GHz	IO: Fast 😱	E:PULSE Trig: Free Ri #Atten: 30 dl	un	ALIGNAUTO Avg Type	e: Log-Pwr		TACE 1234 TYPE MWWW DET PPPP
dB/di			Offset 0.5 d 14.72 dB								.452 GI .719 dB
72			1								
28											
.3											-14.92
.3				/ 3							
.3				Y							
3			^ <mark>2</mark>						. 175.	- and production	monent
.3	and the second	أيهري	- channes	And management	manne	malant	www.hunge	Derrichter Martin	A Martin Carlo and		
.3											
.3											
art 30 tes B			(Hz		#VBM	/ 300 kHz			Sw	Stop eep 2.386	o 25.00 G s (1001 p
R MODE	TRC			× 2.452 GHz	Y 4,719 c	FUNCT	ION FUT	NCTION WIDTH		FUNCTION VALUE	
N N	1	f f		2.627 GHz	-55.938 d	Bm					
N	1	f		4.874 GHz 24.625 GHz	-38.870 d -48.260 d						
				24.020 0112	40.200 0	211					
								STATUS			



# 78 CH

t Spectrum Analyzer - Swept SA RF 50 Ω AC	SENSE:PULSE	ALIGNAUTO	10:12:56 AM Mar 24
ter Freq 12.515000000 GHz	PNO: Fast Trig: Free Rur FGain:Low #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 3 TYPE M WM DET P P
Ref Offset 0.5 dB B/div Ref 15.13 dBm			Mkr1 2.477 0 5.130 d
2	Mulayharden werde her worker worker	with the stand and a	mon man
Amaline market			
t 30 MHz s BW 100 kHz	#VBW 300 kHz	Sv	Stop 25.00 /eep 2.386 s (1001
MODE TRC SCL X N 1 f 2.477 GHz N 1 f 2.652 GHz N 1 f 7.446 GHz N 1 f 24.826 GHz	-56.606 dBm -53.894 dBm	N FUNCTION WIDTH	FUNCTION VALUE



Shenzhen STS Test Services Co., Ltd.

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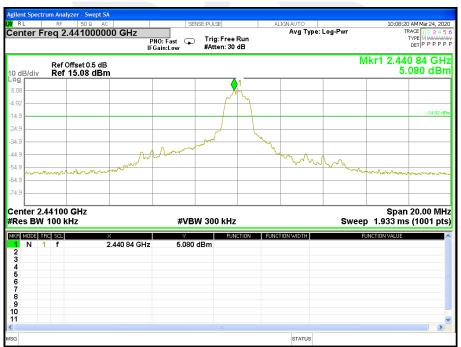


### For Band edge(it's also the reference level for conducted spurious emission)

		ilyzer - Swept SA							
LXI RL	RF	50 Ω AC		ENSE:PULSE	A	IGN AUTO			) AM Mar 24, 2020
Center F	req 2	2.353500000 GHz	PNO: Fast 🕞 IFGain:Low	Trig: Free I #Atten: 30		Avg Type:	-		RACE 1 2 3 4 5 6 TYPE M M A 5 6 DET P P P P P P
10 dB/div		Offset 0.5 dB 14.58 dBm					N		1 97 GHz 578 dBm
4.58									1
-5.42									
-15.4									-15,42 dBm
-25.4									03.
-35.4									M 4
-40.4		2</td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
-65.4	and the state of the	here and the second second	ambeleannon	and the second	anan manyan	Masheene warme	and have made and and and	- American	
-75.4									
Start 2.30 #Res BW			#VE	W 300 kHz			Sweep		40700 GHz ; (1001 pts)
<b>1</b> N 1	RC SCL 1 f 1 f	× 2.401 97		dBm	CTION FUNC	TION WIDTH	EL	JNCTION VALUE	<u> </u>
3 N 1	f f	2.322 58 2.398 76 2.400 05	GHz -41.000	dBm					
5 6		2.400 05	GHZ -44.001	ubm					=
7									
9 10									
11									~
MSG						STATUS			

#### 00 CH

39 CH





# 78 CH

		/zer - Swept S/								
nter Fi	req 2.	50 Ω AC 48750000	00 GHz	PNO: Fast Gain:Low	ISE:PULSE Trig: Free #Atten: 30	Run	IGNAUTO Avg Type: I	Log-Pwr		5 AM Mar 24, 20 RACE 1 2 3 4 5 TYPE MWWWW DET P P P P
dB/div		offset 0.5 dB 15.43 dBm						Mk		850 GH 429 dBr
43			1							
.6			1							-14.57 df
.6										
.6 .6	٨	-val	- V.	3						
.6	v		~~~	WWW.X.M	Section 4					
.6						and part as the	and a character of the second s	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	*1.~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ALCOURT CONTRACTOR
.6										
art 2.47 es BW				#VB\	W 300 kHz			Sweep	Stop 2 2.400 m	.50000 GH s (1001 pt
R MODE TH	C SCL		× 479 850 GHz	Y 5.429		ICTION FUNC	TION WIDTH	FL	INCTION VALUE	
N 1 N 1 N 1	f	2.	483 500 GHz 484 000 GHz 494 550 GHz	-51.890 -48.653 -58.036	dBm					



Shenzhen STS Test Services Co., Ltd.

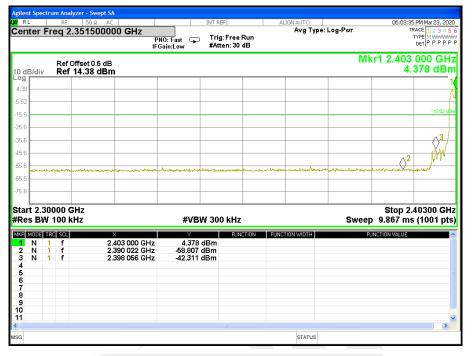
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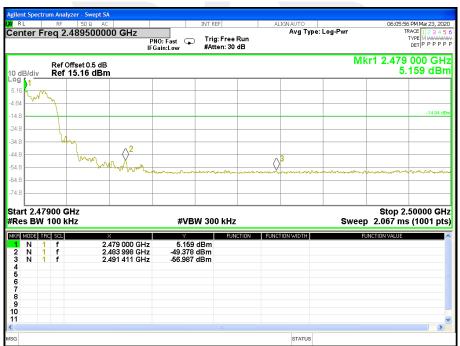


### For Hopping Band edge

00 CH



78 CH



Shenzhen STS Test Services Co., Ltd.



# 5. NUMBER OF HOPPING CHANNEL

### 5.1 LIMIT

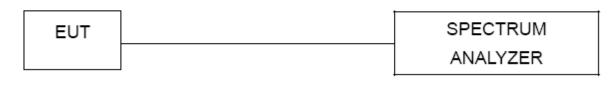
FCC Part 15.247,Subpart C								
Section	Test Item	Limit	FrequencyRange (MHz)	Result				
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS				

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:	<b>25</b> ℃	Relative Humidity:	60%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	DC 3.8V

# Number of Hopping Channel

#### 79

# Hopping channel

	50 Ω AC	INT REF	ALIGNAUT		05:42:24 PM Mar 23, 20
enter Freq 2.44 [,]	PNC	: Fast 🖵 Trig: Fre in:Low #Atten: 3	e Run	Type: Log-Pwr	TRACE 1 2 3 4 TYPE M WWWW DET P P P P
Ref Offse dB/div Ref 15.0				Mkr	2 2.479 993 0 GH 5.49 dB
	mmmmm		0000000000	VYVYYYYYYYYYY	
4.3					
4.3					
4.3					
4.3 tart 2.40000 GHz Res BW 300 kHz		#VBW 300 kH	lz	Swee	Stop 2.48350 Gl p 1.133 ms (1001 pt
R MODE TRC SCU 1 N 1 f 2 N 1 f 3	× 2.402 254 5 GHz 2.479 993 0 GHz	4.54 dBm 5.49 dBm	UNCTION FUNCTION WID		UNCTION VALUE
4					
5					
5 7 7 9 9					

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## 6. AVERAGE TIME OF OCCUPANCY

#### 6.1 LIMIT

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

#### 6.2 TEST PROCEDURE

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

#### 6.3 TEST SETUP



### 6.4 EUT OPERATION CONDITIONS

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



# 6.5 TEST RESULTS

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	DC 3.8V

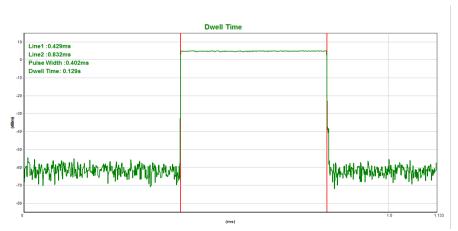
Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	middle	0.402	0.129	0.4
DH3	middle	1.662	0.266	0.4
DH5	middle	2.915	0.311	0.4



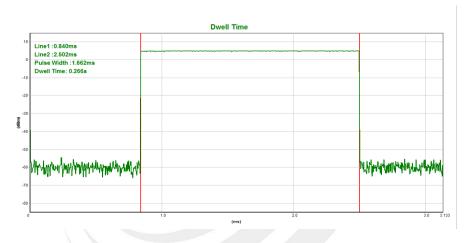
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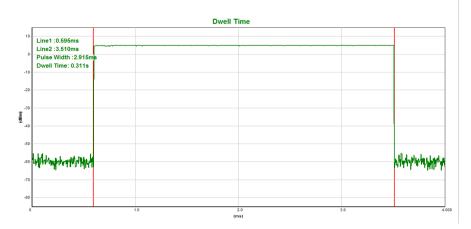
### CH39-DH1



### CH39-DH3







Shenzhen STS Test Services Co., Ltd.



Page 51 of 73 Report No.: STS2003054W03

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	DC 3.8V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	middle	0.411	0.132	0.4
2DH3	middle	1.666	0.267	0.4
2DH5	middle	2.918	0.311	0.4

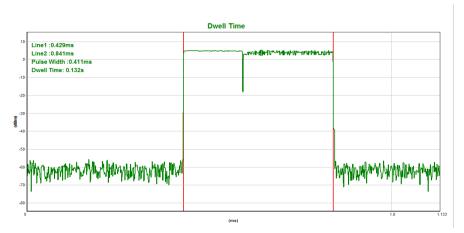


Shenzhen STS Test Services Co., Ltd.

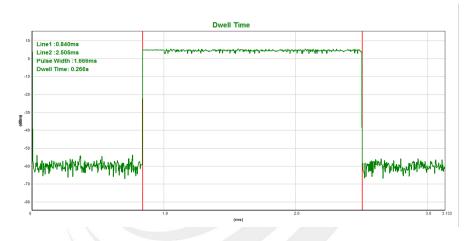
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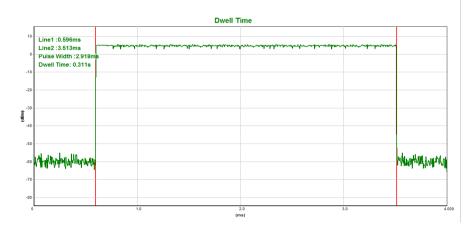
#### CH39-2DH1



### CH39-2DH3



#### CH39-2DH5





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Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	DC 3.8V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	middle	0.411	0.132	0.4
3DH3	middle	1.665	0.266	0.4
3DH5	middle	2.926	0.312	0.4

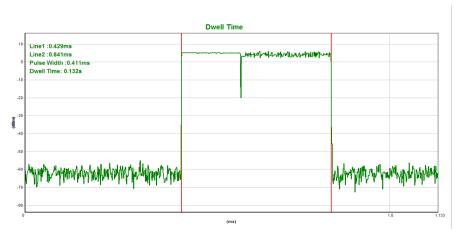


Shenzhen STS Test Services Co., Ltd.

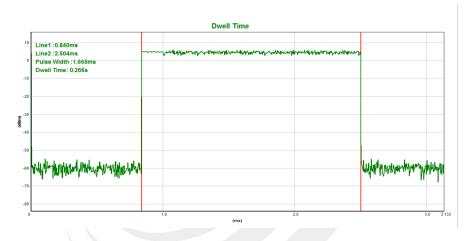
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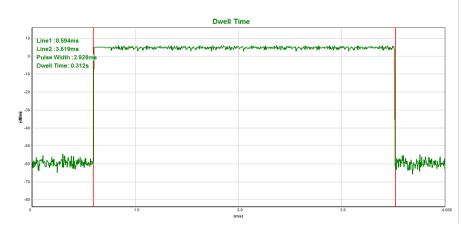
### CH39-3DH1



### CH39-3DH3



### CH39-3DH5



Shenzhen STS Test Services Co., Ltd.

## 7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

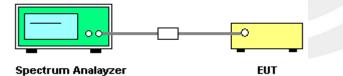
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that 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 Separa			
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:	<b>25</b> ℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	DC 3.8V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.990	2402.992	1.002	0.848	Complies
2441 MHz	2440.987	2441.989	1.002	0.832	Complies
2480 MHz	2478.990	2479.986	0.996	0.833	Complies

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

### CH00 -1Mbps

RL	Im Analyzer - Sv RF 50 S		IN	r REF	ALIGN AUTO		06:35:41 PM Mar 23, 202
		00000 GHz		rig: Free Run Atten: 30 dB	Avg Type: L	og-Pwr	TRACE 1 2 3 4 5 TYPE MWMM DET P P P P P
) dB/div	Ref Offset 0 Ref 14.40					Mkr2	2.402 992 GH 4.512 dBr
2 .40			<u></u> \1		2		
60		$\sim$	m		$\sim$	$\sim$	
5.6			~	$\sim$	$\sim$	$\sim$	
	~	~~		$\sim$		n n n n n n n n n n n n n n n n n n n	~~
							~
.6							hand
.6							
.6							
.6							
i.6							
enter 2.4 Res BW 3	02500 GHz 30 kHz	<u> </u>	#VBW 1	00 kHz		Sweep 3.2	Span 3.000 MH 200 ms (1001 pt
R MODE TRI		×	Y	FUNCTION	FUNCTION WIDTH	FUNCTIO	N VALUE
IN 1 IN 1	f	2.401 990 GHz 2.402 992 GHz	4.47 dBr 4.51 dBr				
3							
5							
5							
3							
5							
5 1							>

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#### CH39 -1Mbps

RF 50 Ω AC		INT REF	ALIGNAUTO	06:41:00 PM Mar 2
Freq 2.441500000	PNO: Wide IFGain:Low	, Trig: Free Run , #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 TYPE MM DET P P
Ref Offset 0.5 dB iv Ref 14.90 dBm				Mkr2 2.441 989 4.939 d
			2	
	m	~	m	
	~		$\sim$	
		- mar	· · · · · · · · · · · · · · · · · · ·	
× ·				
r 2.441500 GHz				Span 3.000
BW 30 kHz		#VBW 100 kHz	Sw	eep 3.200 ms (100
DE TRC SCL X		Y FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
	0 987 GHz 1 989 GHz	4.90 dBm 4.94 dBm		
1 f 2.44				
1 f 2.44		4.54 0011		
1 f 2.44		4.34 dbm		
1 f 2.44		4.54 0.511		
1 f 2.44				
1 f 2.44				
1 f 2.44				
1 f 2.44				

#### CH78 -1Mbps



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Temperature:	<b>25</b> ℃	Relative Humidity:	50%
Test Mode:	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)	Test Voltage:	DC 3.8V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.987	2402.989	1.002	0.809	Complies
2441 MHz	2440.990	2441.992	1.002	0.811	Complies
2480 MHz	2478.993	2479.989	0.996	0.810	Complies

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

RL	RF	50 Ω AC		SENSE	PULSE	ALIGN A	UTO		09:49:0	1 AM Mar 24, 202
enter F	req 2.4	02500000	GHz PNO: IFGair	Wide 😱	Trig: Free Rui #Atten: 30 dB	A	vg Type: Log	J-Pwr		RACE 12345 TYPE MWAAAAA DET PPPPP
dB/div		set 0.5 dB 4.41 dBm						Mk		989 GH 521 dBr
.41				<b>∑</b> 1			<b>2</b>			
59				S		$\sim \wedge$	$\sim$	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
		$\sim$				<u> </u>			<u> </u>	
i.6	$- \Gamma$	·							<u> </u>	
.6	$ \rightarrow $									han
.6	-									
.6										
.6										
.6										
nter 2	402500	CH2							Enar	3.000 MH
	30 kHz	GHZ		#VBW	100 kHz			Sweep	3.200 m	s (1001 pt
R MODE T	RC SCL	X		Y	FUNCTIO	N FUNCTION	WIDTH	EL	INCTION VALUE	
	1 f 1 f		987 GHz 989 GHz	4.42 dE 4.52 dE						
3		2.402	000 0112	4.02 42	200					
5										
; ,										
3										
2										
)										
)										>

### CH00 -2Mbps

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#### CH39 -2Mbps



#### CH78 -2Mbps





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Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	DC 3.8V

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.990	2402.992	1.002	0.793	Complies
2441 MHz	2440.990	2441.992	1.002	0.805	Complies
2480 MHz	2478.993	2479.992	0.999	0.805	Complies

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

CH00 -3Mbps

R L RF	50 Ω AC	SENSE:PULSE	ALIGN AUTO	10:02:43 AM Mar 24, 202
enter Freq 2	.402500000 GHz	NO: Wide 🖵 Trig: Fr Gain:Low #Atten:	Avg Type: Log ree Run 30 dB	
dB/div Ref	Offset 0.5 dB 13.01 dBm			Mkr2 2.402 992 GH 4.645 dBr
01		$\sum_{i=1}^{1}$	<u></u> 2	
99		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
		× ~		
.0				
.0				
.0				
0				
.0				
enter 2.40250 Res BW 30 kH		#VBW 100 k	Hz	Span 3.000 M⊦ Sweep 3.200 ms (1001 pt
R MODE TRC SCL	×	Y	FUNCTION FUNCTION WIDTH	FUNCTION VALUE
N 1 f N 1 f	2.401 990 GHz 2.402 992 GHz	4.59 dBm 4.65 dBm		
	2.402 992 GH2	4.05 GBII		
l				
4 5 5				
4 5 7 8				
4 5 7 8 9				
4 5 5 7 8 9 0				

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#### CH39 -3Mbps



#### 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 Sep	
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace Max Hold	
Sweep Time	Auto

#### 8.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

### 8.3 TEST SETUP

EUT	SPECTRUM
	ANALYZER

### **8.4 EUT OPERATION CONDITIONS**

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



### **8.5 TEST RESULTS**

Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.8V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.848	PASS
2441 MHz	0.832	PASS
2480 MHz	0.833	PASS

### CH00 -1Mbps

Agilent Spectrum Analyzer - Occupied BW	/			
X RL RF 50 Ω AC Center Freq 2.402000000	GHz	INT REF Center Freg: 2.402000	ALIGNAUTO	06:32:18 PM Mar 23, 2020 Radio Std: None
	#IFGain:Low	Tuin: Ene e Dium	Avg Hold≫10/10	Radio Device: BTS
10 dB/div Ref 20.00 dBm				
10.0				
0.00		$\sim$		
-10.0				
-20.0	~			
-30.0				
-40.0				
-50.0				
-60.0				
-70.0				
Center 2.402 GHz #Res BW 30 kHz		#VBW 100 k	Hz	Span 2 MHz Sweep   2.733 ms
Occupied Bandwidth	1	Total Power	11.3 dBm	
	1.00 kHz			
Transmit Freq Error	-2.566 kHz	OBW Power	99.00 %	
x dB Bandwidth	847.7 kHz	x dB	-20.00 dB	
MSG			STATUS	

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#### CH39 -1Mbps



#### CH78 -1Mbps



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Temperature:	<b>25</b> ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps) CH00 / CH39 / C78	Test Voltage:	DC 3.8V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.213	PASS
2441 MHz	1.217	PASS
2480 MHz	1.215	PASS

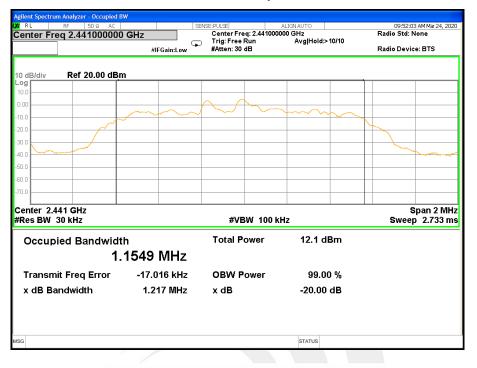
### CH00 -2Mbps



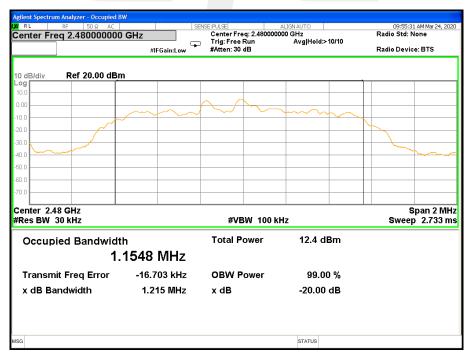
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#### CH39 -2Mbps



### CH78 -2Mbps



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Temperature:	<b>25</b> ℃	Relative Humidity:	50%
LOST MICODO.	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	DC 3.8V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.19	PASS
2441 MHz	1.208	PASS
2480 MHz	1.207	PASS

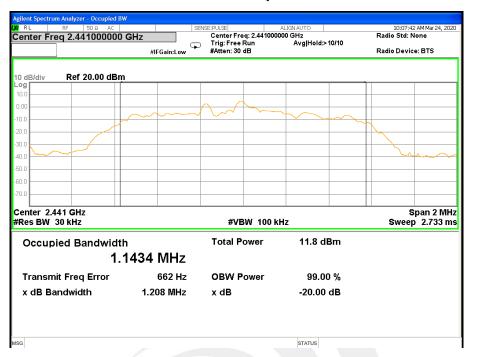
## CH00 -3Mbps

gilent Spectrum Analyzer - Occupied B\ G RL RF 50 Ω AC	S		ALIGNAUTO	10:00:06 AM Mar 24, 2020
Center Freq 2.40200000	GHz #IFGain:Low	Center Freq: 2.402000 Trig: Free Run #Atten: 30 dB	000 GHZ Avg Hold:>10/10	Radio Std: None Radio Device: BTS
0 dB/div Ref 20.00 dBm	I	1		_
10.0				
.00		$\sim$		
0.0				$\sim$
0.0				
0.0				
0.0				
0.0				
enter 2.402 GHz Res BW 30 kHz		#VBW 100 k	H7	Span 2 MH Sweep 2.733 m
Occupied Bandwidt	ำ	Total Power	11.3 dBm	00000 2.000
1.1	1429 MHz			
Transmit Freq Error	7.808 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.190 MHz	x dB	-20.00 dB	
s			STATUS	

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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			
(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

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

RBW ≥ DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

a) Set the RBW  $\geq$  DTS bandwidth.

b) Set VBW ≥ [3 × RBW].

c) Set span ≥ [3 × RBW].

d) Sweep time = auto couple.

e) Detector = peak.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.

Integrated band power method:

The following procedure can be used when the maximum available RBW of the instrument is less than the

DTS bandwidth:

a) Set the RBW = 1 MHz.

b) Set the VBW  $\geq$  [3  $\times$  RBW].

c) Set the span  $\geq$  [1.5  $\times$  DTS bandwidth].

d) Detector = peak.

e) Sweep time = auto couple.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select the peak detector). If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.



9.3 TEST SETUP

EUT	Power sensor	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.



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### 9.5 TEST RESULTS

Temperature:	<b>25℃</b>	Relative Humidity:	60%
Test Voltage:	DC 3.8V		

	Channel		Peak Power	Average Power	Limit
Mode	Number		(dBm)	(dBm)	
	0	2402	5.11	3.65	30.00
GFSK(1M)	39	2441	5.30	3.85	30.00
	78	2480	5.42	3.93	30.00

Note: the channel separation >20dB bandwidth

Mode Channel Number		Frequency	Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	
	0	2402	6.29	2.38	20.97
π/4-DQPSK( 2M)	39	2441	6.49	2.59	20.97
2101)	78	2480	6.59	2.65	20.97

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

Mode Channel	Frequency	Peak Power	Average Power	Limit	
Mode	Number	(MHz)	(dBm)	(dBm)	(dBm)
	0	2402	6.62	2.39	20.97
8-DPSK(3M)	39	2441	6.78	2.59	20.97
	78	2480	6.85	2.56	20.97

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

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## 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 PIFA 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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