

RADIO TEST REPORT

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Report No: STS1712367W01

Issued for

BRANDCHARGER LTD

7/F, UNIT H, MAI LUEN INDUSTRIAL BUILDING, 23 KUNG YIP STREET, KWAI HING, Hong Kong

Product Name:	Bluetooth Speaker			
Brand Name:	BRANDCHARGER LTD			
Model Name:	NANO LITE			
Series Model:	N/A			
FCC ID:	2AG5A-NANOLITE			
Test Standard:	FCC Part 15.247			

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TEST RESULT CERTIFICATION

Applicant'sname	BRANDCHARGER LTD
Address	7/F, UNIT H, MAI LUEN INDUSTRIAL BUILDING, 23 KUNG YIP STREET, KWAI HING, Hong Kong
Manufacture's Name	Shenzhen Akkord Technology Co., Ltd
Address	No.117,The 2nd Village Zhangbei,Ailian,Longgang District,Shenzhen Guangdong, China
Product description	
Product Name:	Bluetooth Speaker
Brand Name	BRANDCHARGER LTD
Model Name:	NANO LITE
Series Model	N/A
Test Standards	FCC Part15.247
Test procedure	: ANSI C63.10-2013

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

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Date of Test.....

Date (s) of performance of tests : 29 Dec. 2017 ~ 03 Jan. 2018

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Date of Issue 04 Jan. 2018

Test Result Pass

Testing Engineer

Technical Manager

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7.1 APPLIED PROCEDURES / LIMIT

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	04 Jan. 2018	STS1712367W01	ALL	Initial Issue



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1. SUMMARY OF TEST RESULTS

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

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

NOTE:

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

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1.1 TEST FACTORY

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

1.2 MEASUREMENT UNCERTAINTY

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

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

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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Bluetooth Speaker
Trade Name	BRANDCHARGER LTD
Model Name	NANO LITE
Series Model	N/A
Model Difference	N/A
Channel List	Please refer to the Note 2.
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps),
Battery	Rated Voltage: 3.7V Capacity: 450mAh
Hardware version number	V3.0
Software version number	V1.0
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

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

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2.

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

3. Table for Filed Antenna

An	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	BRANDCHARGER LTD	NANO LITE	PCB Antenna	N/A	-0.58	BT Antenna



2.2 DESCRIPTION OF TEST MODES

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

Worst Mode	Description	Data Rate/Modulation
Mode 1	TX CH00 1Mbps/GFSK	
Mode 2	TX CH39	1Mbps/GFSK
Mode 3	TX CH78	1Mbps/GFSK
Mode 4	TX CH00	2 Mbps/π/4-DQPSK
Mode 5	TX CH39	2 Mbps/π/4-DQPSK
Mode 6	TX CH78	2 Mbps/π/4-DQPSK

Note:

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

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

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

For AC Conducted Emission

	Test Case
AC Conducted	Mode 7 : Keeping BT TX
Emission	

2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

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

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

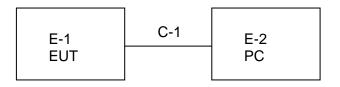


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2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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 EmissionTest



Conducted Emission Test

E-1	C-2	E-3	AC
EUT		Adapter	Plug

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2.5 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
E-2	PC	HP	N/A	N/A	N/A
E-3	Adapter	apple	N/A	N/A	N/A

Item	Shielded Type	Shielded Type Ferrite Core		Note
C-1	USB Cable shielded line	NO	100cm	N/A
C-2	USB Cable shielded line	NO	100cm	N/A

Note:

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



2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Manufacturer	Turne Ma	a		
	Type No.	Serial No.	Last calibration	Calibrated until
R&S	ESW	101535	2017.06.01	2018.05.31
TESEQ	CBL6111D	34678	2017.03.24	2018.03.23
Schwarzbeck	BBHA 9120D	9120D-1343	2017.03.06	2018.03.05
BBHA 9170	SCHWARZBECK	BBHA9170367	2017.05.02	2018.05.01
HH660	Mieo	N/A	2017.10.15	2018.10.14
HH660	Mieo	N/A	2017.10.15	2018.10.14
EM	EM330	60538	2017.03.12	2018.03.11
Agilent	8449B	60538	2017.10.15	2018.10.14
MINI-CIRCUITS	AP-040G	1382501	2017.05.15	2018.05.14
ETS	6512	00165355	2017.03.06	2018.03.05
EM	R01	N/A	2017.03.12	2018.03.11
EM	R06	N/A	2017.03.12	2018.03.11
SCHWARZBECK	R04	N/A	2017.03.12	2018.03.11
SCHWARZBECK	R02	N/A	2017.03/12	2018.03.11
Changling	966	N/A	2017.10.15	2018.10.14
EM	SC100_1	60531	N/A	N/A
EM	SC100	N/A	N/A	N/A
MF	MFA-440H	N/A	N/A	N/A
	TESEQ Schwarzbeck BBHA 9170 HH660 HH660 EM Agilent MINI-CIRCUITS ETS EM EM SCHWARZBECK SCHWARZBECK Changling EM EM	TESEQCBL6111DSchwarzbeckBBHA 9120DBBHA 9170SCHWARZBECKHH660MieoHH660MieoHH660MieoEMEM330Agilent8449BMINI-CIRCUITSAP-040GETS6512EMR01EMR06SCHWARZBECKR04SCHWARZBECKR04SCHWARZBECKR02Changling966EMSC100_1EMSC100	TESEQ CBL6111D 34678 Schwarzbeck BBHA 9120D 9120D-1343 BBHA 9170 SCHWARZBECK BBHA9170367 HH660 Mieo N/A HH660 Mieo N/A EM EM330 60538 Agilent 8449B 60538 MINI-CIRCUITS AP-040G 1382501 ETS 6512 00165355 EM R01 N/A EM R06 N/A SCHWARZBECK R04 N/A SCHWARZBECK R02 N/A EM SC100_1 60531 EM SC100 N/A	TESEQ CBL6111D 34678 2017.03.24 Schwarzbeck BBHA 9120D 9120D-1343 2017.03.06 BBHA 9170 SCHWARZBECK BBHA9170367 2017.05.02 HH660 Mieo N/A 2017.10.15 HH660 Mieo N/A 2017.03.12 HH660 Mieo N/A 2017.03.12 Agilent 8449B 60538 2017.03.12 Agilent 8449B 60538 2017.03.06 ETS 6512 00165355 2017.03.02 EM R01 N/A 2017.03.12 EM R01 N/A 2017.03.12 EM R01 N/A 2017.03.12 EM R06 N/A 2017.03.12 SCHWARZBECK R04 N/A 2017.03.12 SCHWARZBECK R02 N/A 2017.03.12 SCHWARZBECK R02 N/A 2017.03.12 SCHWARZBECK R02 N/A 2017.03.12 Changling 966

Conduction Test equipment

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



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RF Connected Test

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



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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

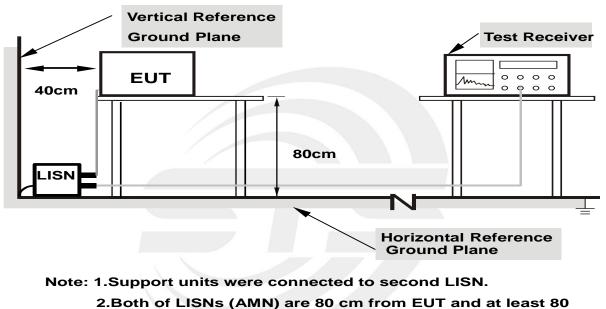
Receiver Parameters	Setting		
Attenuation	10 dB		
Start Frequency	0.15 MHz		
Stop Frequency	30 MHz		
IF Bandwidth	9 kHz		

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3.1.2 TEST PROCEDURE

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



3.1.3 TEST SETUP

3.1.4 EUT OPERATING CONDITIONS

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

from other units and other metal planes



3.1.5 TEST RESULT

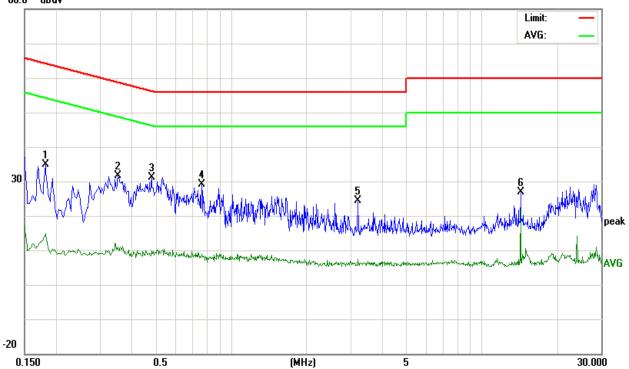
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	L
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 7

No.	Freq.	1	ding_L (dBuV)		Correct Factor	Me	asuren (dBuV)			mit luV)		rgin IB)	P/F
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG	
1	0.1819	24.74		4.64	10.20	34.94		14.84	64.39	54.39	-29.45	-39.55	Р
2	0.3540	21.42		0.46	10.31	31.73		10.77	58.87	48.87	-27.14	-38.10	Р
3	0.4820	20.85		-0.58	10.39	31.24		9.81	56.30	46.30	-25.06	-36.49	Р
4	0.7660	18.90		-1.32	10.30	29.20		8.98	56.00	46.00	-26.80	-37.02	Р
5	3.2100	13.76		-3.23	10.53	24.29		7.30	56.00	46.00	-31.71	-38.70	Р
6	14.3180	16.84		11.76	10.12	26.96		21.88	60.00	50.00	-33.04	-28.12	Р

Remark:

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

2. Margin = Result (Result = Reading + Factor)-Limit 80.0 dBuV





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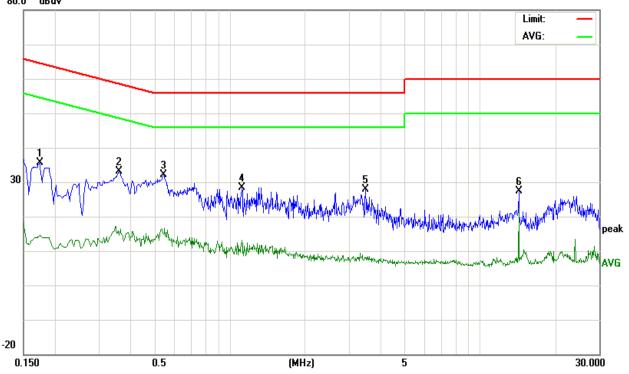
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Ν
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 7

No.	Freq. (dBuV)			Correct Factor		asuren (dBuV)			nit ⊌uV)	Mai (c	rgin IB)	P/F	
	(MHz)	Peak	QP	AVG	dB	Peak	QP	AVG	QP	AVG	QP	AVG	
1	0.1740	25.49		4.37	10.19	35.68		14.56	64.76	54.76	-29.08	-40.20	Ρ
2	0.3620	22.72		4.21	10.31	33.03		14.52	58.68	48.68	-25.65	-34.16	Р
3	0.5460	21.70		4.49	10.36	32.06		14.85	56.00	46.00	-23.94	-31.15	Р
4	1.1220	18.01		2.67	10.37	28.38		13.04	56.00	46.00	-27.62	-32.96	Р
5	3.4980	17.31		-2.50	10.51	27.82		8.01	56.00	46.00	-28.18	-37.99	Р
6	14.3180	17.24		12.22	10.12	27.36		22.34	60.00	50.00	-32.64	-27.66	Р

Remark:

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







3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

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

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

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

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

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

Notes:

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

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

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

For Radiated Emission

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

For Band edge

Spectrum Parameter	Setting		
Detector	Peak		
Stort/Stop Frequency	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 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

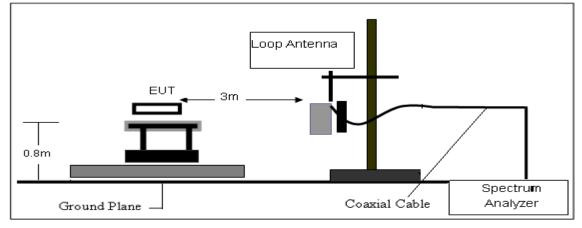
No deviation



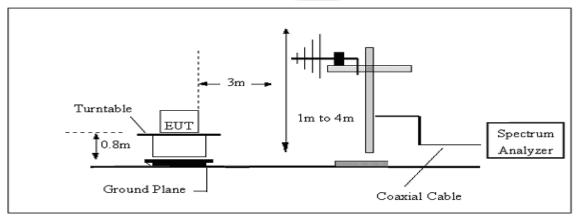


3.2.4 TESTSETUP

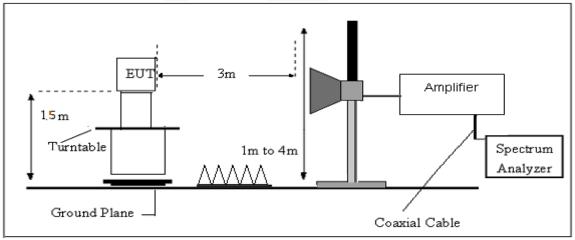
(A) Radiated Emission Test-Up Frequency Below 30MHz



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

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

Note:

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

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

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





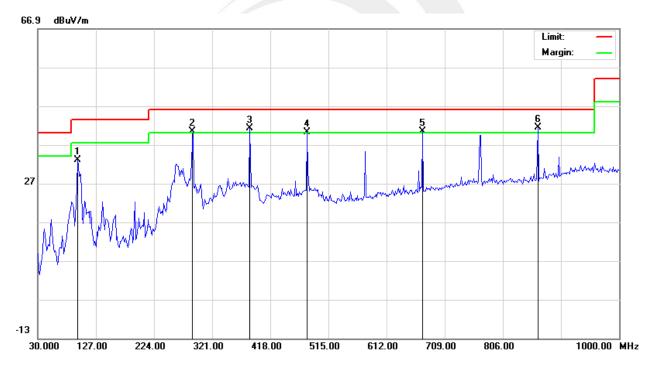
(30MHz-1000MHz)

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

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		96.2831	26.26	6.77	33.03	43.50	-10.47	peak
2	İ	288.6666	26.86	13.48	40.34	46.00	-5.66	peak
3	İ	384.0500	22.30	18.96	41.26	46.00	-4.74	peak
4	İ	479.4332	19.28	20.91	40.19	46.00	-5.81	peak
5	İ	671.8166	15.89	24.45	40.34	46.00	-5.66	peak
6	*	864.2000	13.69	27.68	41.37	46.00	-4.63	peak

Remark:

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



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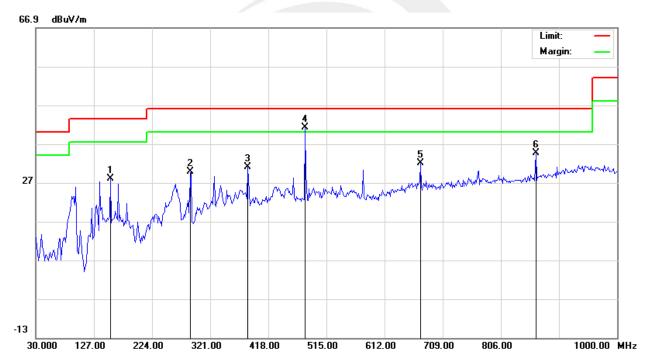
Report No.: STS1712367W01

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

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		154.4833	12.72	15.29	28.01	43.50	-15.49	peak
2		288.6666	14.73	15.07	29.80	46.00	-16.20	peak
3		384.0500	12.04	18.96	31.00	46.00	-15.00	peak
4	*	479.4332	20.32	20.91	41.23	46.00	-4.77	peak
5		671.8166	7.50	24.43	31.93	46.00	-14.07	peak
6		864.2000	6.99	27.68	34.67	46.00	-11.33	peak

Remark:

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





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Report No.: STS1712367W01

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

GFSK Low Channel

				Antenna	Corrected	Emission				
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(d B)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
	Low Channel (2402 MHz)									
3264.86	49.20	44.70	6.70	28.20	-9.80	39.40	74.00	-34.60	PK	Vertical
3264.86	39.82	44.70	6.70	28.20	-9.80	30.02	54.00	-23.98	AV	Vertical
3264.85	48.20	44.70	6.70	28.20	-9.80	38.40	74.00	-35.60	PK	Horizontal
3264.85	37.94	44.70	6.70	28.20	-9.80	28.14	54.00	-25.86	AV	Horizontal
4804.40	59.20	44.20	9.04	31.60	-3.56	55.64	74.00	-18.36	PK	Vertical
4804.40	39.60	44.20	9.04	31.60	-3.56	36.04	54.00	-17.96	AV	Vertical
4804.43	59.27	44.20	9.04	31.60	-3.56	55.71	74.00	-18.29	PK	Horizontal
4804.43	39.41	44.20	9.04	31.60	-3.56	35.85	54.00	-18.15	AV	Horizontal
5359.75	46.23	44.20	9.86	32.00	-2.34	43.89	74.00	-30.11	PK	Vertical
5359.75	37.62	44.20	9.86	32.00	-2.34	35.28	54.00	-18.72	AV	Vertical
5359.58	45.68	44.20	9.86	32.00	-2.34	43.34	74.00	-30.66	PK	Horizontal
5359.58	37.36	44.20	9.86	32.00	-2.34	35.02	54.00	-18.98	AV	Horizontal
7205.89	50.55	43.50	11.40	35.50	3.40	53.95	74.00	-20.05	PK	Vertical
7205.89	33.93	43.50	11.40	35.50	3.40	37.33	54.00	-16.67	AV	Vertical
7205.73	51.58	43.50	11.40	35.50	3.40	54.98	74.00	-19.02	PK	Horizontal
7205.73	33.22	43.50	11.40	35.50	3.40	36.62	54.00	-17.38	AV	Horizontal

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Report No.: STS1712367W01

GFSK Mid Channel

				Antenna	Corrected	Emission				
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Comment
				Mid	Channel (2441 I	MHz)				
3264.61	49.14	44.70	6.70	28.20	-9.80	39.34	74.00	-34.66	PK	Vertical
3264.61	39.42	44.70	6.70	28.20	-9.80	29.62	54.00	-24.38	AV	Vertical
3264.84	48.06	44.70	6.70	28.20	-9.80	38.26	74.00	-35.74	PK	Horizontal
3264.84	39.24	44.70	6.70	28.20	-9.80	29.44	54.00	-24.56	AV	Horizontal
4882.31	59.20	44.20	9.04	31.60	-3.56	55.64	74.00	-18.36	PK	Vertical
4882.31	39.54	44.20	9.04	31.60	-3.56	35.98	54.00	-18.02	AV	Vertical
4882.55	59.40	44.20	9.04	31.60	-3.56	55.84	74.00	-18.16	PK	Horizontal
4882.55	39.11	44.20	9.04	31.60	-3.56	35.55	54.00	-18.45	AV	Horizontal
5359.77	44.95	44.20	9.86	32.00	-2.34	42.61	74.00	-31.39	PK	Vertical
5359.77	37.34	44.20	9.86	32.00	-2.34	35.00	54.00	-19.00	AV	Vertical
5359.68	46.42	44.20	9.86	32.00	-2.34	44.08	74.00	-29.92	PK	Horizontal
5359.68	38.16	44.20	9.86	32.00	-2.34	35.82	54.00	-18.18	AV	Horizontal
7313.93	50.61	43.50	11.40	35.50	3.40	54.01	74.00	-19.99	PK	Vertical
7313.93	32.82	43.50	11.40	35.50	3.40	36.22	54.00	-17.78	AV	Vertical
7313.85	50.49	43.50	11.40	35.50	3.40	53.89	74.00	-20.11	PK	Horizontal
7313.85	33.75	43.50	11.40	35.50	3.40	37.15	54.00	-16.85	AV	Horizontal
	L						1			1

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GFSK High Channel

				Antenna	Corrected	Emission					
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector		
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Comment	
	High Channel (2480 MHz)										
3264.70	48.19	44.70	6.70	28.20	-9.80	38.39	74.00	-35.61	PK	Vertical	
3264.70	37.88	44.70	6.70	28.20	-9.80	28.08	54.00	-25.92	AV	Vertical	
3264.64	49.02	44.70	6.70	28.20	-9.80	39.22	74.00	-34.78	PK	Horizontal	
3264.64	39.08	44.70	6.70	28.20	-9.80	29.28	54.00	-24.72	AV	Horizontal	
4960.40	58.66	44.20	9.04	31.60	-3.56	55.10	74.00	-18.90	PK	Vertical	
4960.40	39.35	44.20	9.04	31.60	-3.56	35.79	54.00	-18.21	AV	Vertical	
4960.32	59.18	44.20	9.04	31.60	-3.56	55.62	74.00	-18.38	PK	Horizontal	
4960.32	38.50	44.20	9.04	31.60	-3.56	34.94	54.00	-19.06	AV	Horizontal	
5359.70	46.26	44.20	9.86	32.00	-2.34	43.92	74.00	-30.08	PK	Vertical	
5359.70	37.29	44.20	9.86	32.00	-2.34	34.95	54.00	-19.05	AV	Vertical	
5359.74	45.67	44.20	9.86	32.00	-2.34	43.33	74.00	-30.67	PK	Horizontal	
5359.74	38.22	44.20	9.86	32.00	-2.34	35.88	54.00	-18.12	AV	Horizontal	
7439.70	51.22	43.50	11.40	35.50	3.40	54.62	74.00	-19.38	PK	Vertical	
7439.70	33.81	43.50	11.40	35.50	3.40	37.21	54.00	-16.79	AV	Vertical	
7439.76	51.51	43.50	11.40	35.50	3.40	54.91	74.00	-19.09	PK	Horizontal	
7439.76	32.97	43.50	11.40	35.50	3.40	36.37	54.00	-17.63	AV	Horizontal	

Note:

3)

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

Emission Level = Reading + Factor

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

emission is mainly from the environment noise.



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Band edge Requirements

Frequency						Emission				
	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Comment
					GFSK					
2390.00	67.79	43.80	4.91	25.90	-12.99	54.80	74.00	-19.20	PK	Vertical
2390.00	53.21	43.80	4.91	25.90	-12.99	40.22	54.00	-13.78	AV	Vertical
2390.00	68.91	43.80	4.91	25.90	-12.99	55.92	74.00	-18.08	PK	Horizontal
2390.00	52.73	43.80	4.91	25.90	-12.99	39.74	54.00	-14.26	AV	Horizontal
2483.50	69.57	43.80	5.12	25.90	-12.78	56.79	74.00	-17.21	PK	Vertical
2483.50	52.78	43.80	5.12	25.90	-12.78	40.00	54.00	-14.00	AV	Vertical
2483.50	70.15	43.80	5.12	25.90	-12.78	57.37	74.00	-16.63	PK	Horizontal
2483.50	53.47	43.80	5.12	25.90	-12.78	40.69	54.00	-13.31	AV	Horizontal
					π/4-DQPSK					
2390.00	68.13	43.80	4.91	25.90	-12.99	55.14	74.00	-18.86	PK	Vertical
2390.00	54.40	43.80	4.91 🗸	25.90	-12.99	41.41	54.00	-12.59	AV	Vertical
2390.00	69.43	43.80	4.91	25.90	-12.99	56.44	74.00	-17.56	PK	Horizontal
2390.00	52.89	43.80	4.91	25.90	-12.99	39.90	54.00	-14.10	AV	Horizontal
2483.50	69.08	43.80	5.12	25.90	-12.78	56.30	74.00	-17.70	PK	Vertical
2483.50	52.76	43.80	5.12	25.90	-12.78	39.98	54.00	-14.02	AV	Vertical
2483.50	70.32	43.80	5.12	25.90	-12.78	57.54	74.00	-16.46	PK	Horizontal
2483.50	53.48	43.80	5.12	25.90	-12.78	40.70	54.00	-13.30	AV	Horizontal

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

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Hopping Band edge

				Antenna	Corrected	Emission				
Frequency	Reading	Amplifier	Loss	Factor	Factor	Level	Limits	Margin	Detector	
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	Comment
					GFSK					
2390.00	68.22	43.80	4.91	25.90	-12.99	55.23	74.00	-18.77	PK	Vertical
2390.00	54.11	43.80	4.91	25.90	-12.99	41.12	54.00	-12.88	AV	Vertical
2390.00	68.81	43.80	4.91	25.90	-12.99	55.82	74.00	-18.18	PK	Horizontal
2390.00	52.89	43.80	4.91	25.90	-12.99	39.90	54.00	-14.10	AV	Horizontal
2483.50	69.90	43.80	5.12	25.90	-12.78	57.12	74.00	-16.88	PK	Vertical
2483.50	52.44	43.80	5.12	25.90	-12.78	39.66	54.00	-14.34	AV	Vertical
2483.50	69.14	43.80	5.12	25.90	-12.78	56.36	74.00	-17.64	PK	Horizontal
2483.50	53.44	43.80	5.12	25.90	-12.78	40.66	54.00	-13.34	AV	Horizontal
					π/4-DQPSK					
2390.00	67.59	43.80	4.91	25.90	-12.99	54.60	74.00	-19.40	PK	Vertical
2390.00	53.11	43.80	4.91 /	25.90	-12.99	40.12	54.00	-13.88	AV	Vertical
2390.00	68.50	43.80	4.91	25.90	-12.99	55.51	74.00	-18.49	PK	Horizontal
2390.00	52.88	43.80	4.91	25.90	-12.99	39.89	54.00	-14.11	AV	Horizontal
2483.50	70.17	43.80	5.12	25.90	-12.78	57.39	74.00	-16.61	PK	Vertical
2483.50	52.34	43.80	5.12	25.90	-12.78	39.56	54.00	-14.44	AV	Vertical
2483.50	69.34	43.80	5.12	25.90	-12.78	56.56	74.00	-17.44	PK	Horizontal
2483.50	53.13	43.80	5.12	25.90	-12.78	40.35	54.00	-13.65	AV	Horizontal
Low me	asurement	frequencies	is range fr	rom 2300 to 240	03 MHz,high me	asurement free	quencies is ra	ange from	2479 to 250	0 MHz.

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

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4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

4.1 REQUIREMENT

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

4.2 TEST PROCEDURE

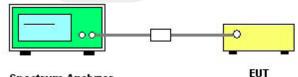
Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

For Band edge

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

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

4.3 TEST SETUP



Spectrum Analyzer

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

4.4 EUT OPERATION CONDITIONS

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



4.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 3.7V
Test Mode:	GFSK(1Mbps)-00/39/78 CH		

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enter	Freq	12.515		PNO: Fast 🖵 FGain:Low	Trig: Free #Atten: 30		Avg Type	: Log-Pwr		TYPE MWWWW DET P P P P
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		trun		lyzer - Swept S											
KAN RL			RF	50 Ω A			SENSE:	PULSE		AL:	IGNAUTO	e: Log-Pwr			1 PM Jan 03, 2018
Cent	er i	Fre	qı	2.515000		PNO: Fast IFGain:Lov		Trig: Free #Atten: 30			Avg typ	e. Log-r wi			TYPE MWWWWW DET P P P P P
10 dB	Vdiv			Offset 0.5 dE 4.75 dBm									N		40 9 GH: .738 dBn
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-5.25 -															
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-35.3 -															
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-85.3															
L															
Start #Res				Hz			#VBW :	300 kHz				s	weep		25.00 GH: (40001 pts)
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	N	1	f		2.440 9 GH		5.738 dB								
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7															
9															
10 11															
<															
MSG											STATUS				

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78 CH

ilent Sp R L	ectrur	<mark>m Anal</mark> RF	l <mark>yzer - Swep</mark> t 50 Ω		SE SE	INSE:PULSE	8	LIGNAUTO		07:07:	50 PM Jan 03, 201
	r Fre			0000 GHz	PNO: Fast 🖵 FGain:Low	Talas Fasta	Run	Avg Type	: Log-Pwr		TRACE 1 2 3 4 5 TYPE MWWW DET P P P P
dB/di			Offset 0.5 c 3.89 dBr								180 2 GH .421 dBi
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art 3 tes B			Hz		#VB	W 300 kHz	<u>.</u>		Swe	Sto ep 2.387 s	p 25.00 GH 6 (40001 pt
R MODI	e trc	f		× 2.480 2 GHz	-7.421		ICTION FUNC	CTION WIDTH		FUNCTION VALUE	
2 N 3 N 4 N	1 1 1	f f f		2.460 2 GHz 2.510 1 GHz 5.864 2 GHz 24.268 4 GHz	-64.091 -62.877	dBm dBm					
5 7 8											
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9) 											>



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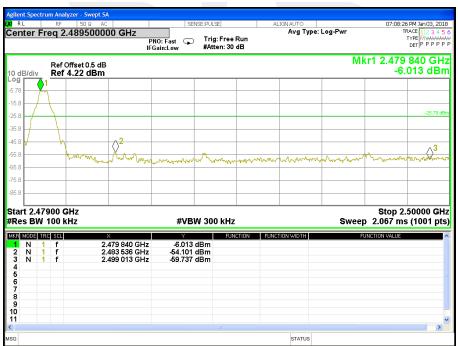


For Band edge

00 CH



78 CH



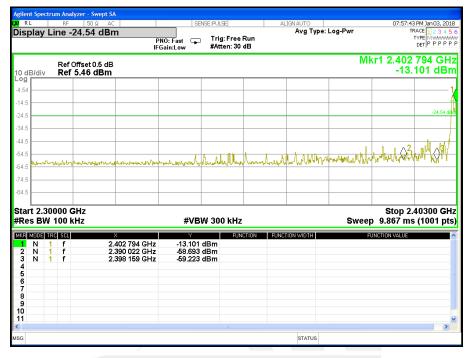
Page 35 of 61



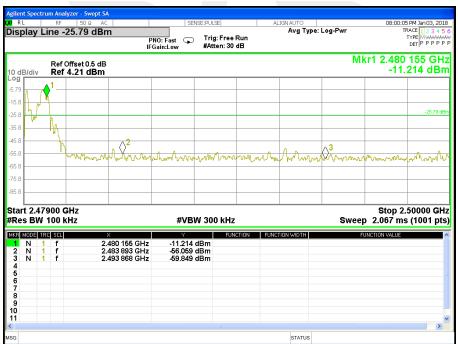
Report No.: STS1712367W01

For Hopping Band edge

00 CH



78 CH





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

	DΩ AC	SENSE:PULSE	AL	GNAUTO	07:13:5	5 PM Jan 03, 20
nter Freq 12.51	5000000 GHz	PNO: Fast Trig: Fr Gain:Low #Atten:	ee Run	Avg Type: Log-Pw	er Ti	RACE 1 2 3 4 TYPE M MAAMA DET P P P P
Ref Offset B/div Ref 4.14					Mkr1 2.4 -5.	02 2 GH 562 dB
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3						-25.860
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and and any solution of the state of the	later free birs in the state of the later of the state of	¹⁴ Second House and all frequences are reported ¹⁴ Norther Earth, although and any literation and all the	National Action of the Association	Antonio anti li bong partabatan alla	- 199 9 0	
rt 30 MHz		#VBW 300 k	Hz		Stop Sweep 2.387 s	25.00 GH (40001 pt
rt 30 MHz es BW 100 kHz MODE TRC SCL	2 402 2 GHz	Y		ION WIDTH		
rt 30 MHz es BW 100 kHz Mode TEC SCL	× 2.402 2 GHz 2.995 8 GHz 4.803 6 GHz 24.338 3 GHz				Sweep 2.387 s	
rt 30 MHz es BW 100 kHz MODE TEC SCU N 1 f N 1 f N 1 f	2.402 2 GHz 2.995 8 GHz 4.803 6 GHz	-5.562 dBm -64.415 dBm -49.442 dBm			Sweep 2.387 s	
rt 30 MHz es BW 100 kHz MODE TRC SCL N 1 f N 1 f N 1 f	2.402 2 GHz 2.995 8 GHz 4.803 6 GHz	-5.562 dBm -64.415 dBm -49.442 dBm			Sweep 2.387 s	
rt 30 MHz es BW 100 kHz MODE TRC SCL N 1 f N 1 f N 1 f	2.402 2 GHz 2.995 8 GHz 4.803 6 GHz	-5.562 dBm -64.415 dBm -49.442 dBm			Sweep 2.387 s	

00 CH

39	CH

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		ectrui		lyzer - Swept SA								
l XI R			RF	50 Ω AC		SEI	NSE:PULSE		ALIGNAUTO		08:11	:25 PM Jan 03, 2018
Dis	play	/ Lii	ne -	25.63 dBm		0:Fast 🖵 ain:Low	Trig: Free #Atten: 30		Avg T	ype: Log-Pwr		TRACE 1 2 3 4 5 6 TYPE MWWWWWW DET P P P P P P
10 d Log	RefOrfset0.5 dB Mkr1 2.440 9 GHz 10 dB/div Ref 4.37 dBm -11.993 dBm											
-5.63				1								
-15.6			1	(
												-25.63 dBm
-25.8	1											
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-75.6		leidee		- terms of		and the second second						
-85.6												
00.0												
	Start 30 MHz Stop 25.00 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 2.387 s (40001 pts)											
MKR	MODE	TRC	SCL	×		Y	FUN	ICTION F	UNCTION WIDTH		FUNCTION VALUE	<u>^</u>
1		1	f		440 9 GHz	-11.993						
2	N	1	f f		173 7 GHz 882 3 GHz	-61.986 -45.470						
4	Ν	1	f	23.	838 3 GHz	-47.365	dBm					
5 6												
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MSG									STATU	s		
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78 CH

		rzer - Swept S/												
Center F	RF Treq 12	50 Ω AC 2.515000		PNO: Fa IFGain:L	ast 🖵	NSE:PULSE Trig: Fre #Atten: 3		ALI	GNAUTO Avg Typ	e: Log	-Pwr		TRACE TYPE DET	Jan 03, 2018 1 2 3 4 5 (M WWWWW P P P P P F
I0 dB/div		ffset 0.5 dB 3. <mark>19 dBm</mark>										Mkr1 :		2 GHz 6 dBm
-6.81		1												
26.8														-26.81 dBr
36.8														4
46.8		•	3	_					. المعاد الارد			in a channaith		
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86.8		and a state of the second				kolon grá jypiski 11 m								
						W 300 kH								.00 GH; 001 pts
36.8 Start 30 I Res BW	100 kl RC SCU 1 f 1 f	Hz	× 2.480 2 GH 2.503 9 GH		#VB -7.576 -65.342	W 300 kH dBm dBm			ION WIDTH		Swe	S	7 s (40	
6.8 tart 30 f Res BW 1 N 2 N 3 N 4 N 5	100 ki RC SCL 1 f	Hz	× 2.480 2 GH	łz łz	#VB	W 300 kH dBm dBm dBm	z				Swe	S ep 2.38	7 s (40	
16.8 tart 30 Res BW 1 N 2 N 3 N	100 kl 1 f 1 f 1 f	Hz	× 2.480 2 GH 2.503 9 GH 4.960 3 GH	łz łz	#VB -7.576 -65.342 -61.749	W 300 kH dBm dBm dBm	z				Swe	S ep 2.38	7 s (40	
Image: Second state	100 kl 1 f 1 f 1 f	Hz	× 2.480 2 GH 2.503 9 GH 4.960 3 GH	łz łz	#VB -7.576 -65.342 -61.749	W 300 kH dBm dBm dBm	z				Swe	S ep 2.38	7 s (40	
Image: Second state sta	100 kl 1 f 1 f 1 f	Hz	× 2.480 2 GH 2.503 9 GH 4.960 3 GH	łz łz	#VB -7.576 -65.342 -61.749	W 300 kH dBm dBm dBm	z				Swe	S ep 2.38	7 s (40	



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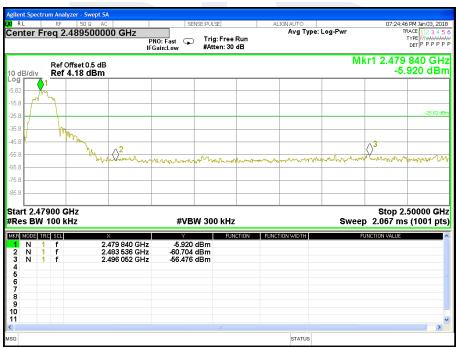
Page 38 of 61

For Band edge

00 CH

RL RE	lyzer - Swept SA 50 Ω AC		NSE:PULSE	ALIGNAUTO		07:14:34 PM Jan 03. 2
	.351500000 GH		Trig: Free Run #Atten: 30 dB	ALIGNACIO Avg Type:	Log-Pwr	TRACE 1 2 3 TYPE MWW DET P P P
B/div Ref	Offset 0.5 dB 5.49 dBm				Mk	r1 2.401 867 G -4.462 dE
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5						-2431
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	mmmmmm	Change and a state	werne and a second second second	M Transformer () () ()		a contraction of
rt 2.30000 G		#VBI	W 300 kHz		Sweep	Stop 2.40300 G 9.867 ms (1001 p
rt 2.30000 G es BW 100 k MODE TRO SCU N 1 f	KHZ 2.401 867	'GHz -4.462	FUNCTION	FUNCTION WIDTH	•	
rt 2.30000 G es BW 100 k N 1 f N 1 f N 1 f	(Hz ×	GHz -4.462 GHz -60.530	FUNCTION dBm dBm	FUNCTION WIDTH	•	9.867 ms (1001 p
rt 2.30000 G es BW 100 k MODE TRC SCL N 1 f N 1 f	KHZ 2.401 867 2.390 022	GHz -4.462 GHz -60.530	FUNCTION dBm dBm	FUNCTION WIDTH	•	9.867 ms (1001 p
rt 2.30000 G es BW 100 k MODE TRC SCL N 1 f N 1 f	KHZ 2.401 867 2.390 022	GHz -4.462 GHz -60.530	FUNCTION dBm dBm		•	9.867 ms (1001 p
rt 2.30000 G es BW 100 k MODE TRC SCL N 1 f N 1 f	KHZ 2.401 867 2.390 022	GHz -4.462 GHz -60.530	FUNCTION dBm dBm	FUNCTION WIDTH	•	9.867 ms (1001 p

78 CH



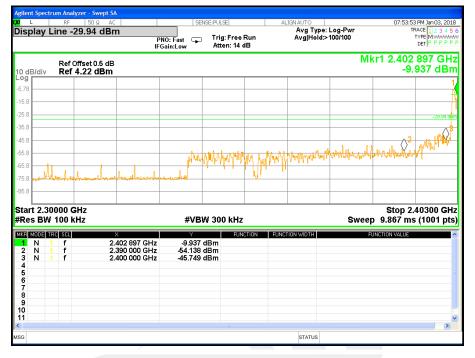
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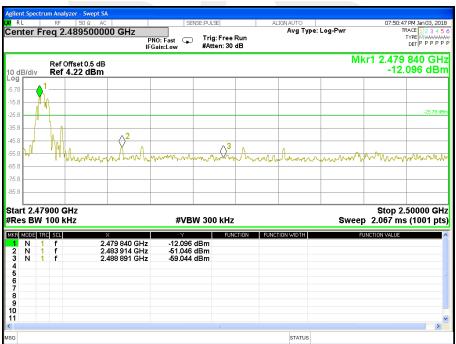


For Hopping Band edge

00 CH



78 CH





5. NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES / LIMIT

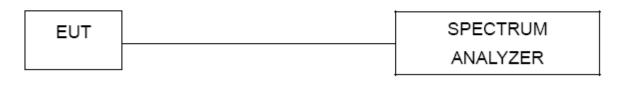
FCC Part 15.247,Subpart C					
Section	Test Item	Limit	FrequencyRange (MHz)	Result	
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS	

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	100KHz
VB	100KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

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

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

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



5.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Pressure:	1015 hPa	Test Voltage:	DC 3.7V
Test Mode:	Hopping Mode		

Number of Hopping Channel

79

Hopping channel

gilent Spectrum Analyzer -				
RL RF S isplay Line -24.5	ο Ω AC O dBm PNO: IFGair	Fast Fisher Handler For Handler For Handler Fast Fisher Handler Handler For Ha	ALIGNAUTO Avg Type: Log-Pwr	07:55:21 PM Jan 03, 201 TRACE 1 2 3 4 5 TYPE M WWWW DET P P P P
Ref Offse dB/div Ref 5.55			Μ	kr2 2.480 243 5 GH -5.81 dBr
^{2g} 1				2
4.5				
4.5				
1.5				
1.5				
.5				
1.5				
art 2.40000 GHz Res BW 1.0 MHz		#VBW 1.0 MHz	Sw	Stop 2.48350 GH eep 1.000 ms (1001 pt
R MODE TRC SCL	× 2.402 254 5 GHz	Y FUNCTION -4.46 dBm	FUNCTION WIDTH	FUNCTION VALUE
2 N 1 f	2.480 243 5 GHz	-5.81 dBm		
3				
5				
3				
9				

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6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

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

6.2 TEST PROCEDURE

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

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

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



6.5 TEST RESULTS

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

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
DH1	2441 MHz	0.370	0.118	0.4
DH3	2441 MHz	1.640	0.262	0.4
DH5	2441 MHz	2.880	0.307	0.4

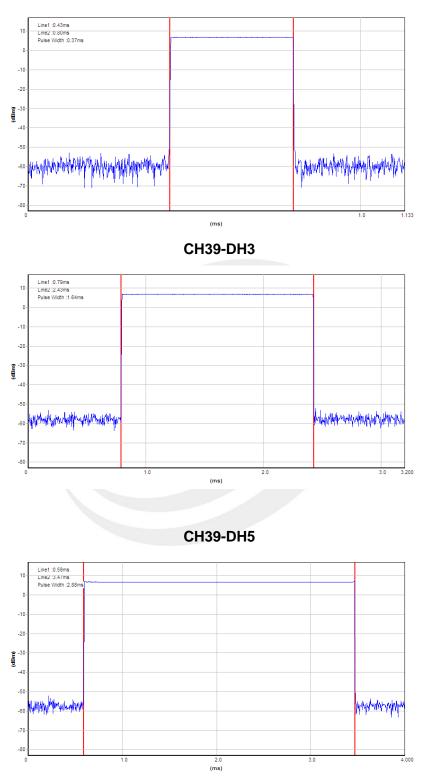


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CH39-DH1



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Report No.: STS1712367W01

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

Data Packet	Frequency	Pulse Duration(ms)	Dwell Time(s)	Limits(s)
2DH1	2441 MHz	0.380	0.122	0.4
2DH3	2441 MHz	1.640	0.262	0.4
2DH5	2441 MHz	2.880	0.307	0.4

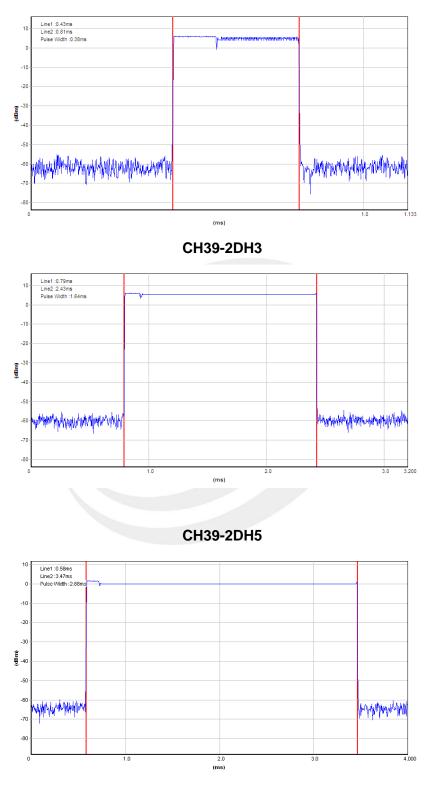


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CH39-2DH1



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7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 APPLIED PROCEDURES / LIMIT

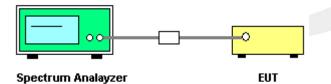
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that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

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

7.2 TEST PROCEDURE

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

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



7.5 TEST RESULTS

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

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	0.999	0.586	Complies
2441 MHz	1.002	0.587	Complies
2480 MHz	1.002	0.586	Complies

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

CH00 -1Mbps

R L RF	50 Ω AC	SENSE:PULSE	ALIGNAUTO	07:00:41 PM Jan 03, 20
	PN IF(IO: Wide 🖵 Trig: Free F Gain:Low #Atten: 30 d		TRACE 1 2 3 4 TYPE MWWWW DET P P P P
dB/div Ref 3	ffset 0.5 dB 3.78 dBm			Mkr2 2.402 830 GH -6.188 dB
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	5			
2				
nter 2.402500) GHz			Span 3.000 M
es BW 30 kHz	2	#VBW 100 kHz	S	weep 3.200 ms (1001 p
	×	Y FUNC	TION FUNCTION WIDTH	FUNCTION VALUE
	2.401 831 GHz	-6.24 dBm -6.19 dBm		
N 1 f	2 402 830 GHz			
N 1 f	2.402 830 GHz			
N 1 f	2.402 830 GHz			
N 1 f	2.402 830 GHz			
	2.402 830 GHz			
N 1 f	2.402 830 GHz			
N 1 f	2.402 830 GHz			,

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CH39 -1Mbps



CH78 -1Mbps





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Report No.: STS1712367W01

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

Frequency	Ch. Separation (MHz)	Limit	Result
2402 MHz	1.155	0.835	Complies
2441 MHz	0.999	0.837	Complies
2480 MHz	0.999	0.835	Complies

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

RL RF	yzer - Swept SA 50 Ω AC	SENSE:PULS	=	ALIGN AUTO		07:19:04 PM Jan 03, 2
	.402500000 GHz	NO: Wide Trig	Free Run en: 30 dB	Avg Type: I	Log-Pwr	TRACE 1 2 3 4 TYPE MWWW DET P P P
dB/div Ref	Dffset 0.5 dB 3.67 dBm				Mkı	2 2.402 986 GI -6.254 dB
33						
.3	~~~~	Y V Ym	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		· m	\sim
.3						
.3						
3						
3						
.3						
enter 2.40250 les BW 30 kH		#VBW 100	kHz		Sweep	Span 3.000 M 3.200 ms (1001 p
R MODE TRC SCL N 1 f N 1 f	× 2.401 831 GHz 2.402 986 GHz		FUNCTION F	UNCTION WIDTH	FUN	CTION VALUE
	2.402 000 0112	0.10 0.011				
• 3 9						
9]						
						3

CH00 -2Mbps

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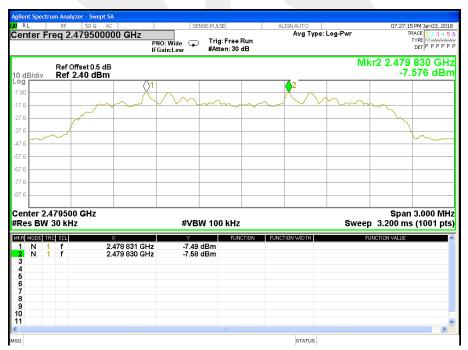




CH39 -2Mbps



CH78 -2Mbps



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8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES / LIMIT

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

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

8.2 TEST PROCEDURE

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

8.3 TEST SETUP

EUT	SPECTRUM
	ANALYZER

8.4 EUT OPERATION CONDITIONS

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



8.5 TEST RESULTS

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

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.879	PASS
2441 MHz	0.880	PASS
2480 MHz	0.878	PASS

CH00 -1Mbps



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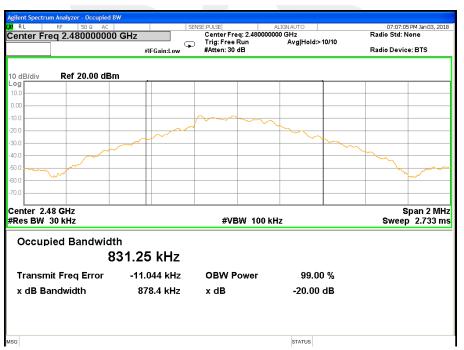
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CH39 -1Mbps



CH78 -1Mbps



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

Frequency	20dB Bandwidth(MHz)	Result
2402 MHz	1.253	PASS
2441 MHz	1.256	PASS
2480 MHz	1.252	PASS

CH00 -2Mbps

	rum Analyzer - Occupied B	W				
RL	RF 50 Ω AC			ALIGNAUTO	07:13:09 PM Jan 03, 2018 Radio Std: None	
Center Freq 2.402000000 GHz			Center Freq: 2.40200000 GHz Trig: Free Run Avg Hold:>10/10			
		#IFGain:Low	#Atten: 30 dB		Radio Device: BTS	
10 dB/div	Ref 20.00 dBn	1				
10.0						
0.00						
-10.0						
-20.0		\sim	$\sim \sim \sim$	how		
-30.0					Mr.	
-40.0						
-50.0						
-60.0						
-70.0						
Center 2. #Res BW			#VBW 100 ki	u.,	Span 2 MHz Sweep 2.733 ms	
#Res DW	JU KHZ		#VDVV 100 KI	nz	Sweep 2.755 ms	
Occur	pied Bandwidt	h				
-	1	1641 MHz				
Transr	nit Freq Error	-15.064 kHz	OBW Power	99.00 %		
x dB B	andwidth	1.253 MHz	x dB	-20.00 dB		
ISG				STATUS		

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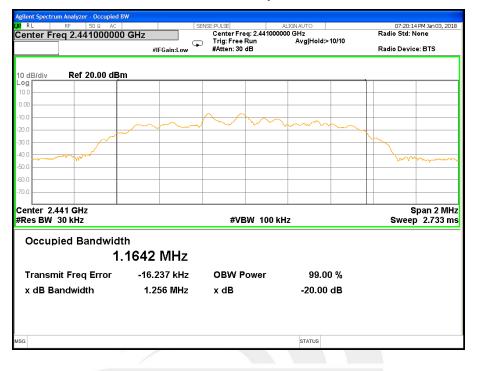
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CH39 -2Mbps



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9. OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

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

9.2 TEST PROCEDURE

a. The EUT was directly connected to the Power Meter

9.3 TEST SETUP

EUT	Power meter	

9.4 EUT OPERATION CONDITIONS

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



9.5 TEST RESULTS

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

GFSK(1Mbps)					
Test Channel	Frequency	Conducted Output Power		LIMIT	
	(MHz) Peak (dBm) AVG (dBm)		dBm		
CH00	2402	-4.32	-8.33	20.97	
CH39	2441	-4.91	-8.90	20.97	
CH78	2480	-4.93	-8.94	20.97	

Note: the channel separation >2/3 bandwidth

π/4QPSK(2Mbps)					
Test Channel	Frequency	Conducted	Output Power	LIMIT	
Test Channer	(MHz) Peak (dBm) AVG (dBm)		dBm		
CH00	2402	-4.38	-8.38	20.97	
CH39	2441	-5.31	-9.32	20.97	
CH78	2480	-6.12	-10.09	20.97	

Note: the channel separation >2/3 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 PCB Antenna. It comply with the standard requirement.



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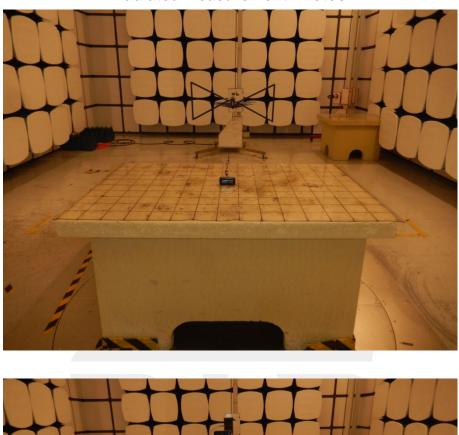
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APPENDIX-PHOTOS OF TEST SETUP



Radiated Measurement Photos



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Conducted Measurement Photos



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

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