

RADIO TEST REPORT

S

Report No.: STS2105157W07

Issued for

Chengdu XGIMI Technology Co., Ltd.

Building A4, No. 1129 Century City Road, New and High-tech zones, Chengdu City, China

Product Name:	Projector			
Brand Name:	XGIMI			
Model Name:	XM03A			
Series Model: XM04A,XM05A,XM06A,XM07A,XM0 XM09A,XM10A,XM11A,XM12A,XM1 XM14A,XM15A,XM16A,XM17A,XM1 XM19A,XM20A,XM21A,XM22A,XM2 XM24A,XM25A,XM26A,XM27A,XM2 XM29A,XM30A,XM31A,XM32A				
FCC ID:	2AFENXM03A			
Test Standard:	FCC Part 15.247			

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TEST RESULT CERTIFICATION

Applicant's Name:	Chengdu XGIMI Technology Co., Ltd.
Address	Building A4, No. 1129 Century City Road, New and High-tech zones, Chengdu City, China
Manufacturer's Name:	Chengdu XGIMI Technology Co., Ltd.
Address	Building A4, No. 1129 Century City Road, New and High-tech zones, Chengdu City, China
Product Description	
Product Name:	Projector
Brand Name:	XGIMI
Model Name:	XM03A
Series Model	XM04A,XM05A,XM06A,XM07A,XM08A,XM09A,XM10A,XM11A, XM12A,XM13A,XM14A,XM15A,XM16A,XM17A,XM18A,XM19A, XM20A,XM21A,XM22A,XM23A,XM24A,XM25A,XM26A,XM27A, XM28A,XM29A,XM30A,XM31A,XM32A
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 of receipt of test item.....: 28 May 2021

Date (s) of performance of tests .: 28 May 2021 ~ 23 June 2021

Date of Issue 23 June 2021

Test Result Pass

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	23 June 2021	STS2105157W07	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)(1)(iii)	Number of Hopping Frequency	PASS			
15.247(a)(1)(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 9K-30MHz	±2.84dB
4	All emissions, radiated 30M-1GHz	±4.39dB
5	All emissions, radiated 1G-6GHz	±5.10dB
6	All emissions, radiated>6G	±5.48dB
7	Conducted Emission (9KHz-150KHz)	±2.79dB
8	Conducted Emission (150KHz-30MHz)	±2.80dB



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	FF	
Trade Name	XGIMI	
Model Name	ХМОЗА	
XM04A,XM05A,XM06A,XM07A,XM08A,XM09A XM10A,XM11A,XM12A,XM13A,XM14A,XM15A Series Model XM16A,XM17A,XM18A,XM19A,XM20A,XM21A XM22A,XM23A,XM24A,XM25A,XM26A,XM27A XM28A,XM29A,XM30A,XM31A,XM32A		
Model Difference	Only the appearance color and model name are different, others are exactly the same.	
Channel List	Please refer to the Note 2.	
Bluetooth	Frequency:2402 – 2480 MHz Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps)	
Bluetooth Version	5.0	
Bluetooth Configuration	BR+EDR	
Antenna Type	Please refer to the Note 3.	
Rating	Input: 100-240V~ 50/60Hz 3.5A	
Hardware version number	V03	
Software version number	V1.0.0	
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.

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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

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	XGIMI	ZTX-AX01- BT-V3.0	PIFA	IPEX	3.49dBi	BT Antenna

Note: The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report.

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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.

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
Mode7	TX CH00	3 Mbps/8DPSK
Mode 8	TX CH39	3 Mbps/8DPSK
Mode 9	TX CH78	3 Mbps/8DPSK
Mode 10	Hopping	GFSK
Mode 11	Hopping π/4-DQPSK	
Mode 12	Hopping 8DPSK	

Note:

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

(2) We 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.

(3) The battery is fully-charged during the radiated and RF conducted test.

For AC Conducted Emission

	Test Case
AC Conducted Emission	Mode 13 : Keeping BT TX

2.3 FREQUENCY HOPPING SYSTEM REQUIREMENTS

(1)Standard and Limit

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.



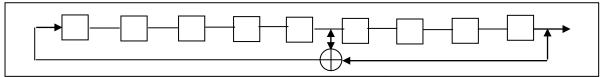
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The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

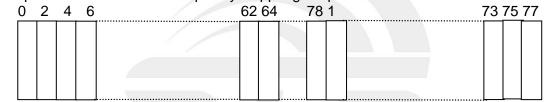
(2)The Pseudorandom sequence may be generated in a nin-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones: i.e. the shift register is initialized with nine ones.

Numver of shift register stages:9

Length of pseudo-random sequence:2⁹-1=511bits Longest sequence of zeros: 8(non-inverted signal)



Liner Feedback Shift Register for Generator of the PRBS sequence An example of Pseudorandom Frequency Hoppong Sequence as follow:



Each frequency used equally on the average by each transmitter. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies ini synchronization with the transmitted signals.

(3) Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

This device was tested with a bluetooth system receiver to check that the device maintained hopping synchronization, and the device complied with these requirements FCC Part 15.247 rule.



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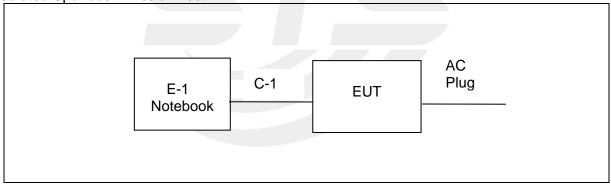
2.4 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

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.

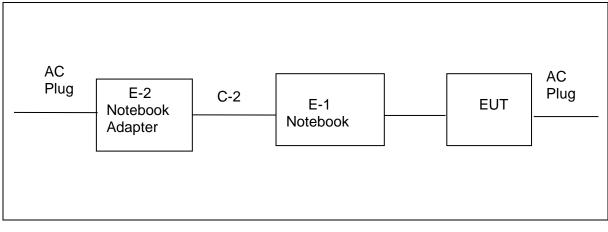
Test software Version	Test program: Bluetooth				
(Power control software) Parameters(1/2/3Mbps)	Power class: DH1 rate:4:27 2DH1 rate:20:54 3DH1 rate:24:83	Power class: DH3 rate:11:183 2DH3 rate:26:367 3DH3 rate:27:552	Power class: DH5 rate:15:339 2DH5 rate:30:679 3DH5 rate:31:1021		

RF Function	Туре	Mode Or Modulation type	ANT Gain(dBi)	Power Class	Software For Testing
		GFSK	3.49	7	
BT	BR+EDR	π/4-DQPSK	3.49	7	WCN_Combo_Tool
		8DPSK	3.49	7	

2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED Radiated Spurious Emission Test



Conducted Emission Test



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2.6 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.

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
E-2	Notebook Adapter	LENOVO	ADLX45DLC3A	N/A	N/A
E-1	Notebook	LENOVO	ThinkPad E470	N/A	N/A
C-1	USB Cable	N/A	N/A	150cm	N/A

Note:

- (1) For detachable type I/O cable should be specified the length in cm in $\[$ ^{Γ} Length $\]$ column.
- (2) "YES" is means "with core"; "NO" is means "without core".



2.7 EQUIPMENTS LIST

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11	
Signal Analyzer	R&S	FSV 40-N	101823	2020.10.10	2021.10.09	
Active loop Antenna	ZHINAN	ZN30900C	16035	2019.07.11	2021.07.10	
Bilog Antenna	TESEQ	CBL6111D	34678	2020.10.12	2022.10.11	
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2019.10.15	2021.10.14	
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2020.10.12	2022.10.11	
Pre-Amplifier (0.1M-3GHz)	EM	EM330	060665	2020.10.12	2021.10.11	
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2020.10.12	2021.10.11	
Pre-Amplifier (18G-40GHz)	SKET	LNPA-1840-50	SK2018101801	2020.10.10	2021.10.09	
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12	
Turn table	EM	SC100_1	60531	N/A	N/A	
Antenna mast	EM	SC100	N/A	N/A	N/A	
Test SW	FARAD	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	2020.10.12	2021.10.11
LISN	R&S	ENV216	101242	2020.10.12	2021.10.11
LISN	EMCO	3810/2NM	23625	2020.10.12	2021.10.11
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			



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RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
			MY55520005	2020.10.10	2021.10.09
Power Sensor	Kovojaht	U2021XA -	MY55520006	2020.10.10	2021.10.09
Power Sensor	Keysight	U2021XA	MY56120038	2020.10.10	2021.10.09
			MY56280002	2020.10.10	2021.10.09
Signal Analyzer	Agilent	N9020A	MY51110105	2021.03.04	2022.03.03
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			



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3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

	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.

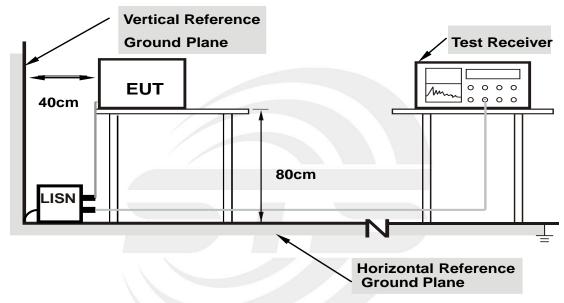
The following table is the setting of the receiver

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 is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 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 is at least 80 cm from the 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 cm from other units and other metal planes support units.

3.1.4 EUT OPERATING CONDITIONS

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



3.1.5 TEST RESULT

Temperature:	26.0(C)	Relative Humidity:	59%RH
Test Voltage:	AC 120V/60Hz	Phase:	L
Test Mode:	Mode 13		

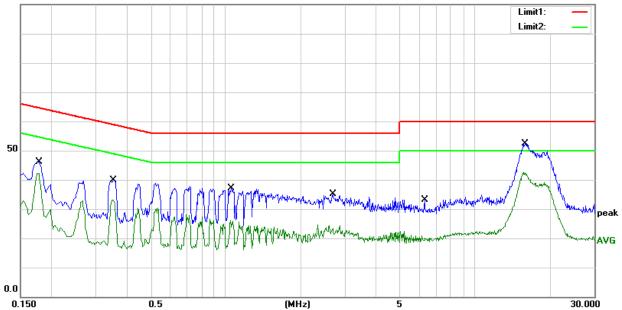
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1796	24.97	20.31	45.28	64.50	-19.22	QP
2	0.1796	17.41	20.31	37.72	54.50	-16.78	AVG
3	0.3540	19.35	20.64	39.99	58.87	-18.88	QP
4	0.3540	12.57	20.64	33.21	48.87	-15.66	AVG
5	1.0500	16.86	20.30	37.16	56.00	-18.84	QP
6	1.0500	4.63	20.30	24.93	46.00	-21.07	AVG
7	2.6820	14.87	20.33	35.20	56.00	-20.80	QP
8	2.6820	1.77	20.33	22.10	46.00	-23.90	AVG
9	6.2580	12.56	20.53	33.09	60.00	-26.91	QP
10	6.2580	-0.75	20.53	19.78	50.00	-30.22	AVG
11	15.8060	30.49	21.92	52.41	60.00	-7.59	QP
12	15.8060	20.67	21.92	42.59	50.00	-7.41	AVG

Remark:

1. All readings are Quasi-Peak and Average values

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

3. Factor=LISN factor+Cable loss+Limiter (10dB)



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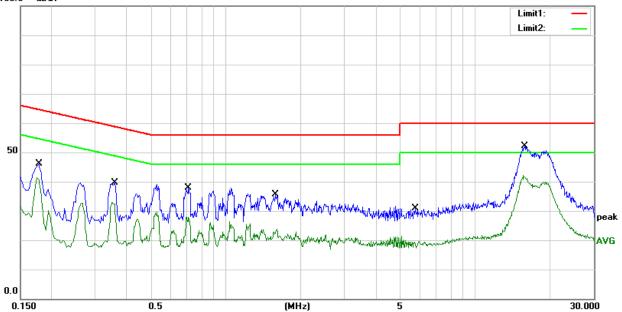
Temperature:	26.0(C)	Relative Humidity:	59%RH
Test Voltage:	AC 120V/60Hz	Phase:	Ν
Test Mode:	Mode 13		

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1780	25.69	20.31	46.00	64.58	-18.58	QP
2	0.1780	19.42	20.31	39.73	54.58	-14.85	AVG
3	0.3580	19.03	20.63	39.66	58.77	-19.11	QP
4	0.3580	9.73	20.63	30.36	48.77	-18.41	AVG
5	0.7100	17.46	20.35	37.81	56.00	-18.19	QP
6	0.7100	6.28	20.35	26.63	46.00	-19.37	AVG
7	1.5900	15.29	20.30	35.59	56.00	-20.41	QP
8	1.5900	2.94	20.30	23.24	46.00	-22.76	AVG
9	5.7740	10.32	20.51	30.83	60.00	-29.17	QP
10	5.7740	-1.65	20.51	18.86	50.00	-31.14	AVG
11	15.8100	30.09	21.92	52.01	60.00	-7.99	QP
12	15.8100	20.32	21.92	42.24	50.00	-7.76	AVG

Remark:

1. All readings are Quasi-Peak and Average values

- 2. Margin = Result (Result = Reading + Factor)-Limit
- 3. Factor=LISN factor+Cable loss+Limiter (10dB)
- 100.0 dBuV



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3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

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

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

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

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

	(dBuV/m) (at 3M)			
FREQUENCY (MHz)	PEAK	AVERAGE		
Above 1000	74	54		
		0.		

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 / 200 KHz	
band)	120 KHz / 300 KHz	

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

For Restricted band

Spectrum Parameter	Setting		
Detector	Peak/AV		
Stort/Stop Eroguopov	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 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 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree 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 polarization 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 QuasiPeak detector mode will be re-measured.
- e. If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was 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.

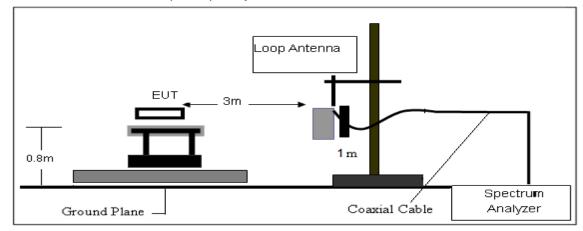
3.2.3 DEVIATION FROM TEST STANDARD

No deviation.

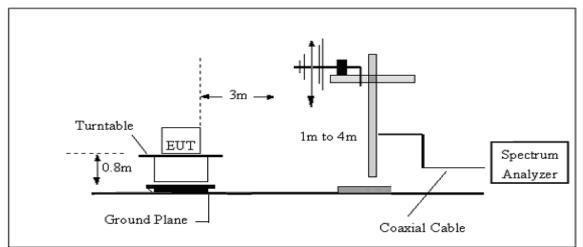


3.2.4 TESTSETUP

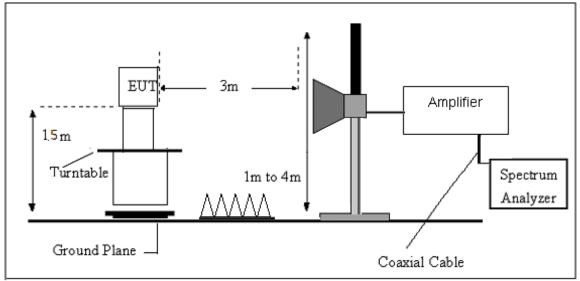
(A) Radiated Emission Test-Up Frequency Below 30MHz

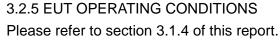


(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



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







3.2.6 FIELD STRENGTH CALCULATION

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

FS = RA + AF + CL - AG Where FS = Field Strength CL = Cable Attenuation Factor (Cable Loss) RA = Reading Amplitude AG = Amplifier Gain AF = Antenna Factor

For example

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

Factor=AF+CL-AG



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3.2.7 TEST RESULTS

(9KHz-30MHz)

Temperature:	23.1(C)	Relative Humidity:	60%RH
Test Voltage:	AC 120V/60Hz	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.



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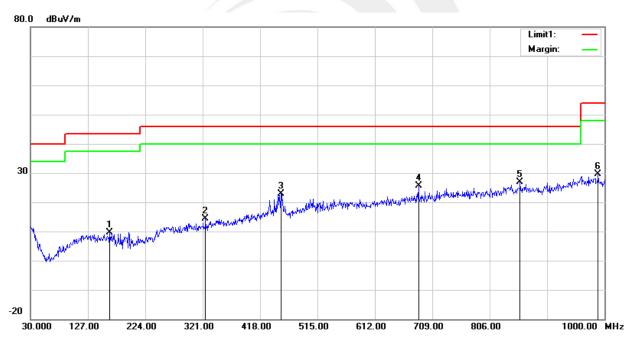
(30MHz-1000MHz)

Temperature:	23.1(C)	Relative Humidity:	60%RH		
Test Voltage:	AC 120V/60Hz	Phase:	Horizontal		
Test Mode:	Mode 1/2/3/4/5/6/7/8/9 (Mode 7 worst mode)				

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	163.8600	28.87	-19.22	9.65	43.50	-33.85	QP
2	325.8500	28.31	-13.83	14.48	46.00	-31.52	QP
3	452.9200	32.53	-9.61	22.92	46.00	-23.08	QP
4	685.7200	30.06	-4.32	25.74	46.00	-20.26	QP
5	857.4100	27.28	-0.50	26.78	46.00	-19.22	QP
6	989.3300	27.44	2.09	29.53	54.00	-24.47	QP

Remark:

- 1. Margin = Result (Result = Reading + Factor)-Limit
- 2. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain





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Temperature:	23.1(C)	Relative Humidity:	60%RH	
Test Voltage:	AC 120V/60Hz	Phase:	Vertical	
Test Mode:	Mode 1/2/3/4/5/6/7/8/9 (Mode 7 worst mode)			

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	141.5500	30.09	-18.11	11.98	43.50	-31.52	QP
2	261.8300	31.30	-14.77	16.53	46.00	-29.47	QP
3	457.7700	33.32	-9.51	23.81	46.00	-22.19	QP
4	729.3700	27.90	-2.52	25.38	46.00	-20.62	QP
5	834.1300	33.77	-0.59	33.18	46.00	-12.82	QP
6	973.8100	27.41	2.25	29.66	54.00	-24.34	QP

Remark:

- 1. Margin = Result (Result = Reading + Factor)–Limit
- 2. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain



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(1GHz~25GHz) Spurious emission Requirements

Frequency	Meter Reading	Amplifier	Loss	Antenna Factor	Corrected Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBµV)	(dB)	(dB)	(dB/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Туре	
				Low Ch	annel (8DPSK/	2402 MHz)				
3264.65	61.82	44.70	6.70	28.20	-9.80	52.02	74.00	-21.98	PK	Vertical
3264.65	50.47	44.70	6.70	28.20	-9.80	40.67	54.00	-13.33	AV	Vertical
3264.77	61.04	44.70	6.70	28.20	-9.80	51.24	74.00	-22.76	PK	Horizontal
3264.77	50.29	44.70	6.70	28.20	-9.80	40.49	54.00	-13.51	AV	Horizontal
4804.42	58.38	44.20	9.04	31.60	-3.56	54.82	74.00	-19.18	PK	Vertical
4804.42	49.29	44.20	9.04	31.60	-3.56	45.73	54.00	-8.27	AV	Vertical
4804.33	59.15	44.20	9.04	31.60	-3.56	55.59	74.00	-18.41	PK	Horizontal
4804.33	50.44	44.20	9.04	31.60	-3.56	46.88	54.00	-7.12	AV	Horizontal
5359.83	48.65	44.20	9.86	32.00	-2.34	46.31	74.00	-27.69	PK	Vertical
5359.83	39.27	44.20	9.86	32.00	-2.34	36.93	54.00	-17.07	AV	Vertical
5359.64	48.09	44.20	9.86	32.00	-2.34	45.75	74.00	-28.25	PK	Horizontal
5359.64	39.44	44.20	9.86	32.00	-2.34	37.10	54.00	-16.90	AV	Horizontal
7205.74	53.61	43.50	11.40	35.50	3.40	57.01	74.00	-16.99	PK	Vertical
7205.74	44.50	43.50	11.40	35.50	3.40	47.90	54.00	-6.10	AV	Vertical
7205.68	53.92	43.50	11.40	35.50	3.40	57.32	74.00	-16.68	PK	Horizontal
7205.68	44.58	43.50	11.40	35.50	3.40	47.98	54.00	-6.02	AV	Horizontal
	•			Middle C	hannel (8DPSł	(/2441 MHz)				
3264.69	62.26	44.70	6.70	28.20	-9.80	52.46	74.00	-21.54	PK	Vertical
3264.69	50.68	44.70	6.70	28.20	-9.80	40.88	54.00	-13.12	AV	Vertical
3264.84	60.85	44.70	6.70	28.20	-9.80	51.05	74.00	-22.95	PK	Horizontal
3264.84	50.19	44.70	6.70	28.20	-9.80	40.39	54.00	-13.61	AV	Horizontal
4882.44	59.43	44.20	9.04	31.60	-3.56	55.87	74.00	-18.13	PK	Vertical
4882.44	50.53	44.20	9.04	31.60	-3.56	46.97	54.00	-7.03	AV	Vertical
4882.48	59.53	44.20	9.04	31.60	-3.56	55.97	74.00	-18.03	PK	Horizontal
4882.48	49.15	44.20	9.04	31.60	-3.56	45.59	54.00	-8.41	AV	Horizontal
5359.65	49.29	44.20	9.86	32.00	-2.34	46.95	74.00	-27.05	PK	Vertical
5359.65	39.13	44.20	9.86	32.00	-2.34	36.79	54.00	-17.21	AV	Vertical
5359.86	47.17	44.20	9.86	32.00	-2.34	44.83	74.00	-29.17	PK	Horizontal
5359.86	38.20	44.20	9.86	32.00	-2.34	35.86	54.00	-18.14	AV	Horizontal
7323.84	53.85	43.50	11.40	35.50	3.40	57.25	74.00	-16.75	PK	Vertical
7323.84	44.01	43.50	11.40	35.50	3.40	47.41	54.00	-6.59	AV	Vertical
7323.82	54.59	43.50	11.40	35.50	3.40	57.99	74.00	-16.01	PK	Horizontal
7323.82	44.76	43.50	11.40	35.50	3.40	48.16	54.00	-5.84	AV	Horizontal



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				High Chan	nel (8DPSK	/2480 MHz)				
3264.77	62.01	44.70	6.70	28.20	-9.80	52.21	74.00	-21.79	PK	Vertical
3264.77	50.51	44.70	6.70	28.20	-9.80	40.71	54.00	-13.29	AV	Vertical
3264.84	61.77	44.70	6.70	28.20	-9.80	51.97	74.00	-22.03	PK	Horizontal
3264.84	50.67	44.70	6.70	28.20	-9.80	40.87	54.00	-13.13	AV	Horizontal
4960.44	59.03	44.20	9.04	31.60	-3.56	55.47	74.00	-18.53	PK	Vertical
4960.44	49.54	44.20	9.04	31.60	-3.56	45.98	54.00	-8.02	AV	Vertical
4960.34	58.85	44.20	9.04	31.60	-3.56	55.29	74.00	-18.71	PK	Horizontal
4960.34	49.68	44.20	9.04	31.60	-3.56	46.12	54.00	-7.88	AV	Horizontal
5359.68	49.25	44.20	9.86	32.00	-2.34	46.91	74.00	-27.09	PK	Vertical
5359.68	39.83	44.20	9.86	32.00	-2.34	37.49	54.00	-16.51	AV	Vertical
5359.78	47.81	44.20	9.86	32.00	-2.34	45.47	74.00	-28.53	PK	Horizontal
5359.78	38.14	44.20	9.86	32.00	-2.34	35.80	54.00	-18.20	AV	Horizontal
7439.95	53.57	43.50	11.40	35.50	3.40	56.97	74.00	-17.03	PK	Vertical
7439.95	44.92	43.50	11.40	35.50	3.40	48.32	54.00	-5.68	AV	Vertical
7439.90	54.77	43.50	11.40	35.50	3.40	58.17	74.00	-15.83	PK	Horizontal
7439.90	44.21	43.50	11.40	35.50	3.40	47.61	54.00	-6.39	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.



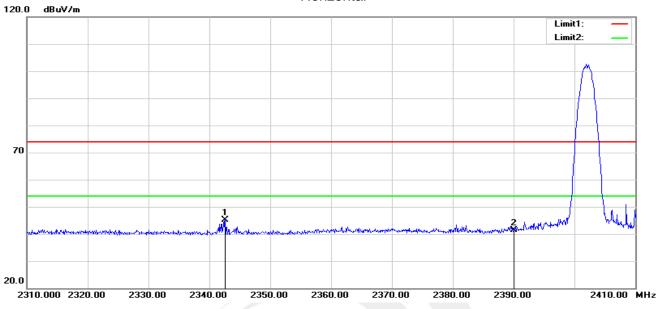
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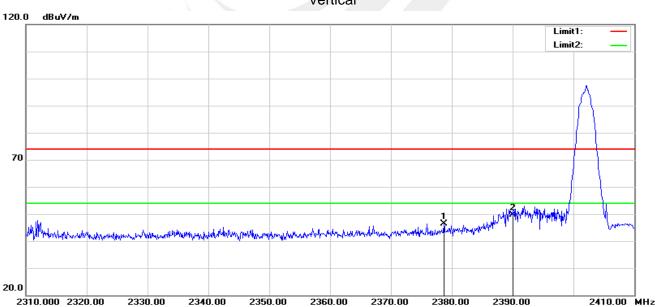


Restricted band Requirements

8DPSK-Low Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2342.600	41.46	3.70	45.16	74.00	-28.84	peak
2	2390.000	37.08	4.34	41.42	74.00	-32.58	peak



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2378.700	42.30	4.17	46.47	74.00	-27.53	peak
2	2390.000	45.21	4.34	49.55	74.00	-24.45	peak

Vertical

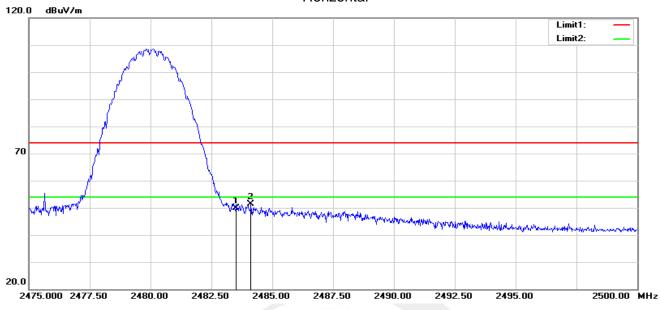
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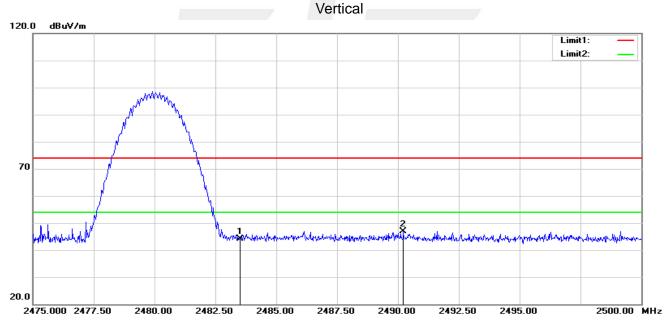
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8DPSK-High Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	45.21	4.60	49.81	74.00	-24.19	peak
2	2484.125	46.81	4.61	51.42	74.00	-22.58	peak



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	39.63	4.60	44.23	74.00	-29.77	peak
2	2490.225	42.22	4.63	46.85	74.00	-27.15	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 Eroquepey	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

For Hopping Band edge

Spectrum Parameter	Setting		
Detector	Peak		
Stort/Stop Eroquopov	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		







The EUT is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Tune the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, the span is set to be greater than RBW.

4.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.



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4.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-00/39/78 CH	Test Voltage:	AC 120V/60Hz

00 CH

		lyzer - Swept								
enter F	RF Freq 1			NO: Fast Gain:Low	ISE:PULSE Trig: Free #Atten: 30	Run	ALIGNAUTO Avg Type	: Log-Pwr	т	0 PM Jun 01, 202 RACE 1 2 3 4 5 TYPE MMMMM DET P P P P P
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7										
9										
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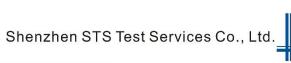
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vilent Spectr	rum Analyzer - Sw	ent SA						
RL	RF 50 Ω		SENSE:PULS	ε	ALIGN AUTO		01:49:22	2 PM Jun 01, 20
enter F	req 12.5150			: Free Run en: 30 dB	Avg Type:	Log-Pwr		RACE 1 2 3 4 TYPE M WAARAA DET P P P P
0 dB/div	Ref Offset 3.0 Ref_17.96						Mkr1 2. 7.	.452 GH 962 dB
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04								
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2.0								
2.0	<u>^2</u>	3					ر بالمعمد الد	and and and
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2.0								
art 30 M Res BW	VIHz 100 kHz		#VBW 300) kHz		Swe	Stop ep 2.386 s	25.00 G ; (1001 p
r Mode T	RC SCL	× 2.452 GHz	7.962 dBm	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE	
2 N 1	f	2.627 GHz	-53.929 dBm					
3 N 1 4 N 1		5.523 GHz 24.451 GHz	-52.547 dBm -44.388 dBm					
5								
7								
3								
3 9 0 1								3



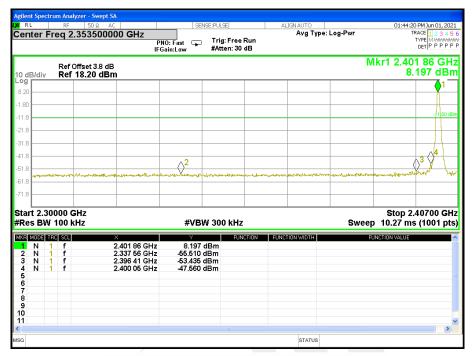
78 CH

L	RF 50 Ω	AC	SENSE:PULSE		ALIGNAUTO		01:51:5	50 PM Jun 01,
nter Frec	12.51500	PN	D: Fast Trig: Fr ain:Low #Atten:		Avg Type:	Log-Pwr		TYPE MWAA
B/div R	tef Offset 3.8 d Ref 16.32 dE						Mkr1 2 6	.477 G .321 dl
	1							
								-12.0
	\wedge^2	3					our manual and a second	ed, may lot for
mangenerations	amalin	ward the second and the	man have an and the	at a south of the	Property and a second second second	Lange and the second		-
rt 30 MH: s BW 10			#VBW 300 ki	Hz		Sw	Stop eep 2.386	o 25.00 C s (1001
MODE TRC S		×		UNCTION	UNCTION WIDTH		FUNCTION VALUE	
N 1 N 1	f f f	2.477 GHz 3.726 GHz 5.573 GHz 24.551 GHz	6.321 dBm -51.917 dBm -52.740 dBm -43.367 dBm					



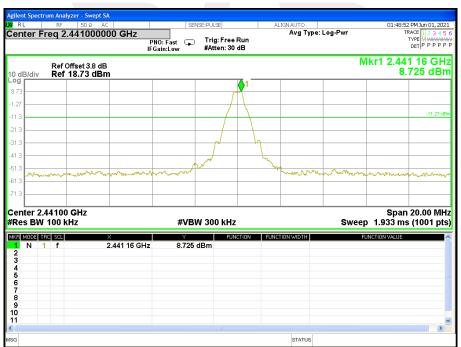


For Band edge(it's also the reference level for conducted spurious emission)



00 CH

39 CH





78 CH

RL	m Analyzer - Swep RF 50 Ω		SEN	SE:PULSE	ALIGN AUTO		01:51:2	0 PM Jun 01, 202
	eq 2.487500	0000 GHz	PNO: Fast 🖵 FGain:Low	Trig: Free Run #Atten: 30 dB		:: Log-Pwr	т	RACE 1 2 3 4 5 TYPE MWAAAAA DET P P P P
) dB/div	Ref Offset 3.8 Ref 17.94 di					М	kr1 2.480 7.	150 GH 937 dBr
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2.1								-12.06 dE
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2.1								
								.50000 GH
			#\/B\/	V 300 KH2		Swoo		
art 2.475 Res BW 1	00 kHz	×	#VBV	V 300 kHz	FUNCTION WIDTH		p 2.400 m	
Res BW 1 R MODE TRO 1 N 1 2 N 1 3 N 1 4 N 1 5	00 kHz	× 2.480 150 GHz 2.483 500 GHz 2.486 575 GHz 2.495 375 GHz	7.937 c -54.507 c	IBm IBm IBm	FUNCTION WIDTH			
Research MODE TRC N 1 1 2 N 1 3 N 1 4 N 1 5 5 7 3 9 9	00 kHz f f	2.480 150 GHz 2.483 500 GHz 2.486 575 GHz	7.937 c -54.507 c -52.913 c	IBm IBm IBm	FUNCTION WIDTH		p 2.400 m	
Res BW 1 R MODE TEC 1 N 1 2 N 1 3 N 1 4 N 1	00 kHz f f	2.480 150 GHz 2.483 500 GHz 2.486 575 GHz	7.937 c -54.507 c -52.913 c	IBm IBm IBm	FUNCTION WIDTH		p 2.400 m	



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For Hopping Band edge

GFSK

l <mark>ent Sp</mark> R L	ectrun	n Anal RF	<mark>yzer - Swep</mark> 50 Ω	t SA AC				-put ord							00.00		1
	r Fre		.351500		P	PNO: Fast Gain:Low	Ģ	:PULSE Trig: Free #Atten: 30		AL	IGN AUTO Avg Ty	pe: Lo	_			TRACE TYPI DE	Jun 01, 20 1 2 3 4 M M M M T P P P P
dB/d			offset 3.8 of 18.11 di											<u>Mkr</u>	1 2.40		76 GH 3 dB
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art 2 Res E						#	VBW	300 kHz	:				Swe	ер	Stop 9.867 r		300 GI 001 pi
R MOD	e trc 1	SCL f		× 2.402 1	76 GHz		Y 113 dE		CTION	FUNCT	ION WIDTH			FUNC	TION VALU	-	
2 N 3 N 1	1	f f		2.390 0 2.400 0			208 dE 926 dE										
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											STATUS						

RL	RF	50 Ω AC		SENS	SE:PULSE	ALIGNAUTO	e: Log-Pwr		M Jun 01, 20 CE 1 2 3 4 1
nter Fi	req 2	.48950000	PN	IO: Fast 😱 ain:Low	Trig: Free Run #Atten: 30 dB	Avgiy	e: Log-rwr	TY	PE MWWWW ET P P P P
dB/div_		Offset 3.8 dB 17.96 dBm					М	kr1 2.479 1 7.9	68 GH 63 dB
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		WV VR	\Diamond^2					$\langle \rangle^3$	
		Wwww	- Margan and the		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	men man	-	man have	
rt 2.47 es BW				#\/D\A	/ 300 kHz		Swoo	Stop 2.5 p 2.067 ms (
				#VDV				•	1001 h
MODE TH	f		× 479 168 GHz	7.963 d	FUNCTION	FUNCTION WIDTH		FUNCTION VALUE	
N 1			483 515 GHz 497 186 GHz	-54.922 d					
		۷.	437 100 0112	-00.000 u	ып				



Page 39 of 75 Report No.: STS2105157W07

Temperature:	25 ℃	Relative Humidity:	50%
	π/4-DQPSK(2Mbps)– 00/39/78 CH	Test Voltage:	AC 120V/60Hz

RL	RF 50 9	2 AC	SENSE:PULSE		ALIGNAUTO		02:05:33 PM Jun 01, 2
nter F	req 12.515		0: Fast		Avg Type: L	og-Pwr	TRACE 1 2 3 4 TYPE M WWW DET P P P P
dB/div	Ref Offset 3 Ref 14.91					I	Mkr1 2.402 GI 4.912 dB
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art 30 M es BW	/IHz 100 kHz		#VBW 300 ki	Hz		Sweep	Stop 25.00 G 2.386 s (1001 p
MODE T	RC SCL	×	Y I I	FUNCTION FU	UNCTION WIDTH	FUNC	TION VALUE
N 1 N 1 N 1	f f f	2.402 GHz 3.326 GHz 5.448 GHz 24.526 GHz	4.912 dBm -40.057 dBm -54.172 dBm -44.426 dBm				
N 1							3

00 CH

39	CH
39	OH

RL	RF	lyzer - Swept	AC	05	NSE:PULSE		LIGNAUTO		00,00,0	19 PM Jun 01, 20
			000 GHz	PNO: Fast		un	Avg Type	Log-Pwr		RACE 1 2 3 4 TYPE MWAMAA DET P P P P
dB/div		Offset 3.8 d 20.00 dB								.452 GH .294 dB
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art 30 I es BW				#\(P)	W 300 kHz			Swa	Stop ep 2.386) 25.00 G
R MODE			×	#VD	EUNOT		TION WIDTH			s (1001 p
N N N	1 f 1 f 1 f 1 f		2.452 GHz 3.326 GHz 5.498 GHz 24.900 GHz	-39.996	dBm dBm dBm	ION FONC			UNCTION VALUE	
			14.000 0112	40.000						
										3

Shenzhen STS Test Services Co., Ltd.



78 CH

		lyzer - Swept S								
enter F	req 1	50 Q A 2.515000	000 GHz	NO: Fast Gain:Low	Trig: Free F #Atten: 30	Run	LIGNAUTO Avg Type:	Log-Pwr		30 PM Jun 01, 20 TRACE 1 2 3 4 TYPE MWWW DET P P P P
dB/div		Offset 3.8 dE 13.75 dBr								2.477 GH .749 dB
75	(1								
25										-11.78 c
6.3 6.3										
6.3										
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5.3										
art 30 I Res BW		(Hz		#VBV	V 300 kHz			Sw	Sto veep 2.386	p 25.00 GI s (1001 pi
R MODE T	_		×	Y		CTION FUNC	TION WIDTH		FUNCTION VALUE	
3 N '	1 f 1 f 1 f 1 f		2.477 GHz 2.677 GHz 5.948 GHz 24.551 GHz	3.749 -53.395 -54.030 -44.488	dBm dBm					
5 7 8										
9										
										>
1										



Shenzhen STS Test Services Co., Ltd.



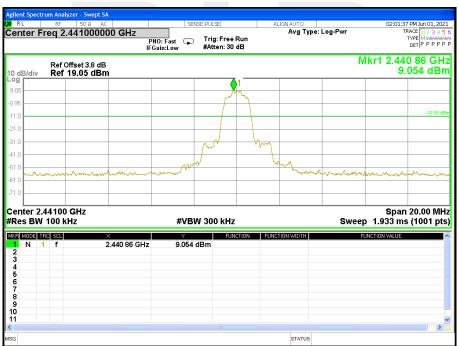


For Band edge(it's also the reference level for conducted spurious emission)

		lyzer - Swept SA							
L <mark>XI</mark> RL	RF	50Ω AC	SE	NSE:PULSE	AL	.IGN AUTO	. <u> </u>		8 PM Jun 01, 2021
Center F	req 2	.353500000 GHz	BNO Fort	Trig: Free F	Run	Avg Type	e: Log-Pwr		RACE 1 2 3 4 5 6
			PNO: Fast G	#Atten: 30 c					DETPPPPP
	D .6	Offset 3.8 dB					IV	lkr1 2.40	2 08 GHz
10 dB/div		18.39 dBm						8.	394 dBm
Log 8.39									1
									A
-1.61									-11,61 dBm
-11.6									
-21.6									
-31.6									.u h
-41.6			<u>^2</u>						
-51.6	- A 1994 1994		2	. taubundu	AmbanhAntonata	a h	when my other here	monoral	we have
-61.6									
-71.6									
Start 2.30	0000 6	-U-7						Stop 2	40700 GHz
#Res BW			#VB	W 300 kHz			Sweep		s (1001 pts)
MKR MODE T	RCI SCLI	×	l Y	FUNC	TION FUNC	TION WIDTH		JNCTION VALUE	~
1 N 1	1 f	2.402 08 0							
	1 f 1 f	2.337 02 0							
4 N '	1 f	2.400 05 0							
5 6 7 8 9									
7									
8									
10									
11 <									~
MSG						STATUS			
mod						STATUS			

00 CH

39 CH



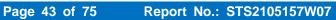


78 CH

	lyzer - Swept SA							
RL RF Inter Freq 2	50 Ω AC 2.48750000	P	NO: East	::PULSE Trig: Free Run #Atten: 30 dB	ALIGN AUTO Avg Type:	Log-Pwr	TR. T	PM Jun 01, 202 ACE 1 2 3 4 5 YPE MWWWW DET P P P P F
	Offset 3.8 dB 18.22 dBm					M	kr1 2.479 8.2	850 GH 219 dBi
22	<u> </u>	1 کر						
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							Stop 2.5	
			#VBW	300 kHz		Swee	p 2.400 ms	(1001 pt
es BW 100 H Mode TRC SCL N 1 f N 1 f N 1 f N 1 f	KHZ 2.4 2.4 2.4	79 850 GHz 83 500 GHz 85 475 GHz 93 600 GHz	#VBW 8.219 dE -55.088 dE -54.728 dE -54.506 dE	FUNCTION 3m 3m 3m	FUNCTION WIDTH			(1001 pi
N 1 f	KHZ 2.4 2.4 2.4	79 850 GHz 83 500 GHz 85 475 GHz	8.219 dE -55.088 dE -54.728 dE	FUNCTION 3m 3m 3m	FUNCTION WIDTH		p 2.400 ms	(1001 pt



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For Hopping Band edge

π/4-DQPSK

	nalyzer - Swept SA								
	RF 50 Ω AC		SET	ISE:PULSE	ALI	GNAUTO Avg Type:			PM Jun 01, 2021 ACE 1 2 3 4 5
enter Freq	2.35150000	PN	IO: Fast 😱 Jain:Low	Trig: Free Run #Atten: 30 dB		Avg Type:	Log-Pwr	Т	YPE MWWWWWW DET P P P P P
	ef Offset 3.8 dB ef 17.45 dBm						M	kr1 2.401 7.4	970 GH: 147 dBn
.45									
55									
2.6									-12.55 dB
.6									/3
.6									Y
.6	the decomposition of the second	un non nahhnanke	manhammandura	whener when a some	Munderun	and all all and a second	han an a	at marting and a strategy of the strategy of t	^م لفاليا ويرادي ماريوليو.
2.6									
art 2.30000 les BW 100			#VBI	N 300 kHz			Swee	Stop 2.4 p 9.867 ms	0300 GH (1001 pts
R MODE TRC SO		01 970 GHz	Y 7.447	FUNCTION	FUNCT	ON WIDTH	F	UNCTION VALUE	
2 N 1 f 3 N 1 f 4	2.3	90 022 GHz 00 013 GHz	-56.155 -48.448	dBm					
5 5 7 3									
) 1									
2						STATUS			>
5G						STATUS			

	50Ω.		SENSE:	PULSE	ALIGNAUTO	e: Log-Pwr	03:02:22 PM Jun 01, 2 TRACE 1 2 3 4
nter Freq	2.489500	PN		Frig: Free Run Atten: 30 dB	Avgiyp	e: Log-Pwr	TYPE MWWW DET P P P
B/div Re	f Offset 3.8 d f 17.87 dB					Mk	r1 2.479 840 GI 7.872 dB
/ 1							
my my							
							-12.13
	n						
<u> </u>	m					∧ 3	
	- Www.	and anonna	mann	mound	marmoleconten	hanne	month
<u> </u>							
-							
rt 2.47900 s BW 100			#VBW :	300 kHz		Sweep	Stop 2.50000 G 2.067 ms (1001 p
MODE TRC SC		Х	Ÿ	FUNCTION	FUNCTION WIDTH	EU	NCTION VALUE
N 1 f		2.479 840 GHz 2.483 515 GHz	7.872 dB -56.274 dB				
N 1 f		2.493 469 GHz	-52.973 dB	m			



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Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) -00/39/78 CH	Test Voltage:	AC 120V/60Hz

R L			RF	50 Q	AC		SEN	SE:PULSE		ALIG	VAUTO		02:	18:24 PM Jun 01, 20
ent	er	Fre	eq 1	2.5150	100000 GH	IZ PNO: F IFGain:	ast 🖵 Low	Trig: Free I #Atten: 30			Avg Type	: Log-Pwr		TRACE 1 2 3 4 TYPE MWMM DET P P P P
				Offset 3.8									Mkr	2.402 GH 3.582 dB
dB g r	/div	/	Ret	13.58 0	IBM									0.002 UD
58				<u>'</u>										
12														-11.51 c
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4														
4														
) MI W 1		kHz			#VBV	V 300 kHz				S		top 25.00 GI 36 s (1001 pi
	ODE N	TRC 1	SCL f		× 2.402	GHz	Y 3.582 (CTION	FUNCTIO	N WIDTH		FUNCTION VAL	UE
	N	1	f		3.126	GHz	-54.138 c	dBm						
	N N	1	f		5.473 24.301		-53.304 c							
														>

00 CH

39 CH

RL	trum An	alyzer - Swept S		SEN	SE:PULSE	A	LIGNAUTO		02:21:5	5 PM Jun 01, 20
		12.515000	000 GHz	'NO: Fast Gain:Low	Trig: Free R #Atten: 30 d	un	Avg Type:	Log-Pwr		TYPE MWAAA DET P P P P
dB/div		⁷ Offset 3.8 dE f 16.23 dBr								.452 GH .234 dB
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77										
.8 8										-10.96
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art 30 es BV		kHz		#VBV	V 300 kHz			Swe	Stop eep 2.386	o 25.00 G s (1001 p
R MODE	TRC SCI 1 f		× 2.452 GHz	6,234 c	FUNCT	ION FUNC	TION WIDTH	ł	FUNCTION VALUE	
N	1 f		2.627 GHz	-53.253 d	IBm					
B N I N	1 f 1 f		5.923 GHz 24.276 GHz	-52.701 d -45.156 d						
•										
)										
										>



78 CH

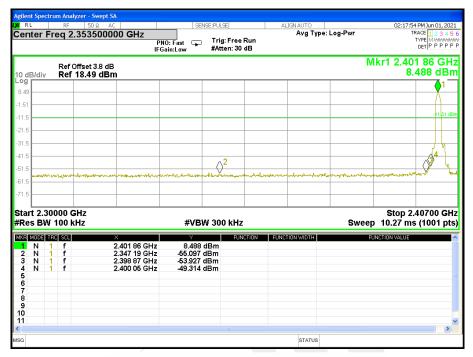
L RF 50 Q	AC	SENSE:PULSE	4	ALIGNAUTO		6:17 PM Jun 01,
ter Freq 12.5150	PNO	D: Fast 😱 Trig: Fre iin:Low #Atten: 3		Avg Type: Log	-Pwr	TRACE 1 2 3 TYPE MWW DET P P P
Ref Offset 3.8 B/div Ref 16.08 (2.477 G 6.083 dl
						-11.7
<u>2</u>	3					1
and the man and the strates	show of the state of the state	and a second and a second	Mary Asher Ha	un and a start a start and a start	South Martin Martin Strate	where the second se
water and the						
t 30 MHz						op 25.00 G
s BW 100 kHz		#VBW 300 kH			Sweep 2.38	
MODE TRC SCL N 1 f N 1 f N 1 f N 1 f N 1 f	* 2.477 GHz 3.151 GHz 5.623 GHz 24.426 GHz	6.083 dBm -53.670 dBm -53.086 dBm -43.915 dBm	UNCTION FUN	CTION WIDTH	FUNCTION VALU	JE



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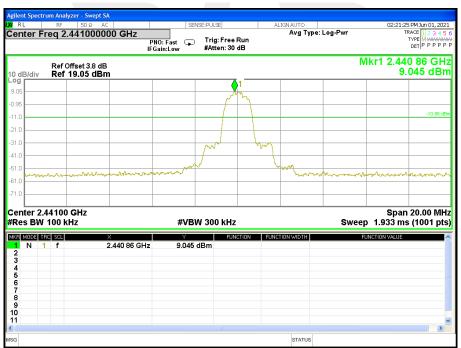


For Band edge(it's also the reference level for conducted spurious emission)



00 CH

39 CH





78 CH

		yzer - Swept SA								
enter F	_R , req 2.	50 Ω AC 48750000	00 GHz	SE PNO: Fast Gain:Low	NSE:PULSE Trig: Free #Atten: 30	Run	Avg Type:	-	Т	7 PM Jun 01, 202 RACE 1 2 3 4 5 TYPE MWWWW DET P P P P
dB/div)ffset 3.8 dB 18.23 dBm						MI	kr1 2.479 8.	850 GH 229 dBr
.23			1 _							
.8										-11.77 d
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1.8		M	by							
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.8										
art 2.47				#VB	W 300 kHz			Swee	Stop 2. p 2.400 ms	50000 GF s (1001 pt
art 2.47 tes BW N 1 N 1 N 1 N 1	100 k FC SCL f f	Hz 2. 2. 2.	8 479 850 GHz 483 500 GHz 486 400 GHz 492 200 GHz	#VB 8.229 -55.557 -53.760 -54.592	dBm dBm dBm		CTION WIDTH		Stop 2. p 2.400 ms	50000 Gł s (1001 pt
2 N 1 3 N 1	100 k rc scu f f f	Hz 2. 2. 2.	479 850 GHz 483 500 GHz 486 400 GHz	8.229 -55.557 -53.760	dBm dBm dBm		CTION WIDTH		p 2.400 m	50000 GH \$ (1001 pts



Shenzhen STS Test Services Co., Ltd.





For Hopping Band edge

8DPSK

gilent Specti R L	rum Analyze							
	RF req 2.3	50 Ω AC 51500000 GHz	PNO: Fast	VSE:PULSE Trig: Free Run #Atten: 30 dB		be: Log-Pwr	TR	PM Jun 01, 202 ACE 1 2 3 4 5 YPE MWWWW DET P P P P P
dB/div		et 3.8 dB .47 dBm				M	(r1 2.401 6.4	867 GH 471 dBr
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53								-13.53 d
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.5							²	
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.5								
	0000 GH: 100 kHz		#VB\	N 300 kHz		Sweep	Stop 2.4 9.867 ms	10300 GH (1001 pt
R MODE T		× 2.401 867 GI	z 6.471	dBm	N FUNCTION WIDTH	ii.	JNCTION VALUE	
N 1	f f	2.390 022 GF 2.400 013 GF						
					STATUS			

nter Fr	RF 50:	Ω AC 600000 GHz	SENSE:PUL	.56	ALIGNAUTO Avg Type: L	og-Pwr	05:44:43 PM Jun 01, 20 TRACE 1 2 3 4
	04 2.4000	P		g: Free Run ten: 30 dB		-	DET P P P
B/div	Ref Offset 3 Ref 17.31					Mkr1 2	2.479 042 GH 7.305 dB
1 mm							
Mr.	~~						
·							-12.70 c
	- War						
<u> </u>					A3		
	1000	monterman	mon	hundre	mannam	and and a second and	- manager in the start of the start of the
	900 GHz						top 2.50000 G
es BW	100 kHz		#VBW 30	0 kHz		Sweep 2.0	67 ms (1001 p
MODE TRI		× 2.479 042 GHz	Y 7.305 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	IVALUE
N 1	f f	2.483 515 GHz	-54.926 dBm				
N 1	f	2.491 558 GHz	-53.790 dBm				
				Ш	STATUS		

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

Please refer to section 3.1.4 of this report.



5.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	AC 120V/60Hz

Number of Hopping Channel

79

Hopping channel

RL		RF		AC			SE	NSE:PU	.SE			AL	IGN AUTI				(4 PM Jun 0	
nter	Fre	q 2.4	417500	000 GH:	F	PNO: Fast Gain:Low	, F) Tri #At	g: Free ten: 30	Run dB			Avg	Туре:	Log-P	wr			RACE 1 2 TYPE MW DET P P	3 4 W// P F
dB/di			set 3.8 di 9.00 dB													Mkr	2 2.4		93 0 (3.11 c	GI IB
	⟩¹ YYYY	WW	mm	mm	ΛΥΥ	WW	WY	WW	YYYY	W	YWY	W	YYYY	WW	ww	WW	nw	WW	WW	2
.0 0.																				
.0 / - .0 .0																				
		00 GH 00 kH					#VB	W 30	0 kHz							Swee	St p 1.13	op 2. 13 ms	.48350 5 (1001	G P
R MODE N N N N	1 1 1	f f		× 402 004 0 479 993 0				dBm dBm	FUN	ICTION	F	UNCT	'ION WID	TH		F	UNCTION	/ALUE		
1																				>

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6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

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

6.2 TEST PROCEDURE

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

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.



6.5 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	AC 120V/60Hz

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	middle	0.374	0.120	0.4
DH3	middle	1.634	0.261	0.4
DH5	middle	2.876	0.307	0.4



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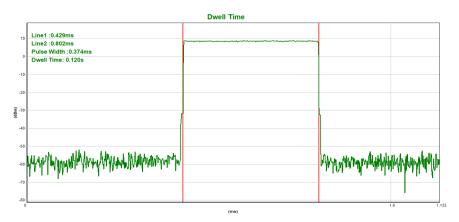
Ш



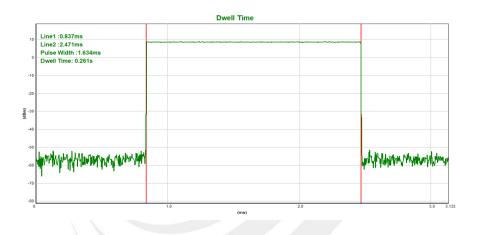
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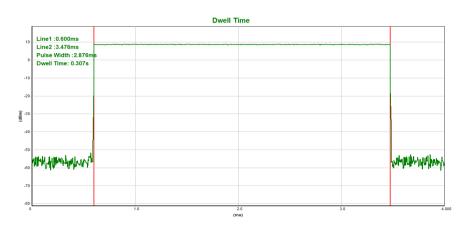
CH39-DH1



CH39-DH3







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Temperature:	25 ℃	Relative Humidity:	50%
Test Mode:	π/4-DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	AC 120V/60Hz

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	middle	0.382	0.122	0.4
2DH3	middle	1.633	0.261	0.4
2DH5	middle	2.880	0.307	0.4

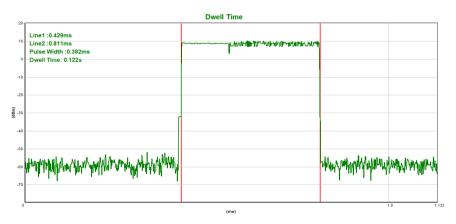


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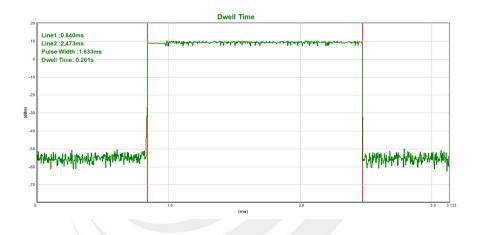


Report No.: STS2105157W07

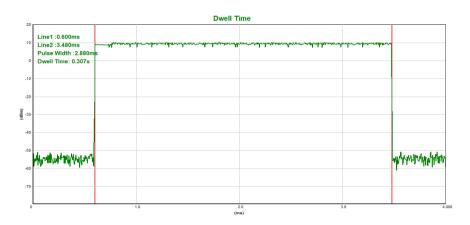
CH39-2DH1



CH39-2DH3







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Temperature:	25 ℃	Relative Humidity:	50%
	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	AC 120V/60Hz

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	middle	0.383	0.123	0.4
3DH3	middle	1.632	0.261	0.4
3DH5	middle	2.884	0.308	0.4

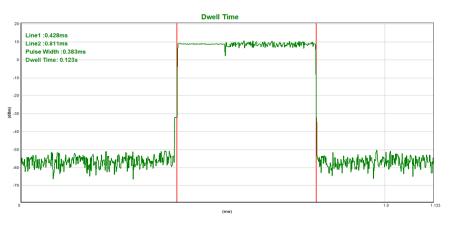


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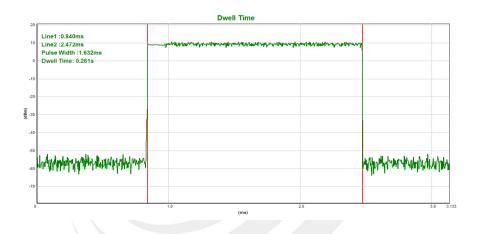


Report No.: STS2105157W07

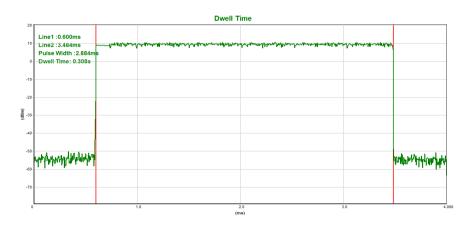
CH39-3DH1



CH39-3DH3







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7. HOPPING CHANNEL SEPARATION MEASUREMEN

7.1 LIMIT

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

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

7.2 TEST PROCEDURE

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

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.



7.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
LOCT MINDAD.	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	AC 120V/60Hz

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.895	2402.989	1.094	0.821	Complies
2441 MHz	2440.831	2441.836	1.005	0.892	Complies
2480 MHz	2478.831	2479.839	1.008	0.891	Complies

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

CH00 -1Mbps





CH39 -1Mbps

RF	50 Ω AC	SENSE:PULSE	ALIGN AUTO	02:32:45 PM Jun 01, 20
ter Freq 2.44	11500000 GHz PN IFG	D: Wide Trig: Free ain:Low #Atten: 3	Avg Type: L e Run	og-Pwr TRACE 1234 TYPE MWWW DET P P P
B/div Ref 15	et 3.8 dB .55 dBm			Mkr2 2.441 836 GF 6.851 dB
	$\sum_{i=1}^{1}$		2	
Why -	v.	m h	- Manual	m
v m	www.www	WWW		~ mm mm
nter 2.441500	GHz			Span 3.000 MI
s BW 30 kHz		#VBW 100 kH		Sweep 3.200 ms (1001 pt
MODE TRC SCL N 1 f	× 2.440 831 GHz	6.22 dBm	INCTION FUNCTION WIDTH	FUNCTION VALUE
N 1 f	2.441 836 GHz	6.85 dBm		

CH78 -1Mbps



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Temperature:	25℃	Relative Humidity:	50%
	CH00 / CH39 / CH78 (π/4-DQPSK(2Mbps) Mode)	Test Voltage:	AC 120V/60Hz

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.828	2402.842	1.014	0.841	Complies
2441 MHz	2440.831	2441.839	1.008	0.840	Complies
2480 MHz	2478.834	2479.839	1.005	0.840	Complies

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

RL	RF 50 Ω A0		SENSE:PULSE		ALIGN AUTO		02:46:4	6 PM Jun 01, 202:
enter Fre	eq 2.4025000			Free Run n: 30 dB	Avg Type:	Log-Pwr	т	RACE 1 2 3 4 5 TYPE MWWWWW DET P P P P P
dB/div	Ref Offset 3.8 dB Ref 15.34 dBn					М	kr2 2.402 5.	842 GH 671 dBr
.34		$\langle 1 \rangle$			2			Δ
66	^	m m	mapon	m	my mm	man	hour	mym
.7								
.7								
.7 Www	v l							
.7								
.7								
.7								
enter 2.40 Res BW 3	02500 GHz		#VBW 100	kU7		Swee	Span p 3.200 ms	3.000 MH
R MODE TRO		×	#VBVV 100		FUNCTION WIDTH			s (1001 pc
IN 1 N 1	f 2	.401 828 GHz .402 842 GHz	5.37 dBm 5.67 dBm	Tonenon			one non viebe	
	1 2	.402 042 0112	0.07 dBill					
5								
5 7 3								
))								
1								

CH00 -2Mbps

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CH39 -2Mbps

RF	50 Ω AC		SENSE:PULSE	ALI	GNAUTO			7 PM Jun 01,
er Freq 2.4	41500000 GH		Trig: Free F #Atten: 30 c		Avg Type:	Log-Pwr		RACE 1 2 3 TYPE MWAA DET P P P
	set 3.8 dB 4.96 dBm					M	kr2 2.441 6.	839 G 989 d
		$\sqrt{1}$			2 2			0
m	monor	m	mm	man	mm	how	non	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
			, v					
er 2.441500	<u>CU</u> -						Onen	2 000 1
BW 30 kHz		#	/BW 100 kHz			Swee	span p 3.200 ms	3.000 I ; (1001
DDE TRC SCL N 1 f	× 2.440 83	1.047	FUNC	TION FUNCT	ON WIDTH	F	UNCTION VALUE	
N 1 f	2.440 83		.99 dBm					

CH78 -2Mbps



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Temperature:	25℃	Relative Humidity:	50%
Test Mode:	CH00 / CH39 / CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	AC 120V/60Hz

Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2401.822	2402.836	1.014	0.847	Complies
2441 MHz	2440.834	2441.830	0.996	0.846	Complies
2480 MHz	2478.828	2479.839	1.011	0.845	Complies

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

CH00 -3Mbps

	RF	50Ω AC		SENS	E:PULSE	ALIGN AUTO		06:08:55	i PM Jun 01, 202:
arkei	r 2 2.40	028360000	PN	0: Wide 🖵 iain:Low	Trig: Free Run #Atten: 30 dB	Аvg Туре	: Log-Pwr		TYPE MWWWW DET P P P P P
) dB/di		f Offset 3.8 dB f 15.45 dBn					Mk	r2 2.402	836 GH: .66 dBn
^{og}						2			
5.45			a man ha	mm	~	a man monad	mon .co	0	nha
.55		m		Y~	Mar a	MANNA MA	- 2 A 2	myn	WV
4.6					<u>۷</u> ۷				
4.6		Mrd							
4.6		1							
4.6 1	Mr 1	1							
4.6	• W								
4.6									
4.6									
	· 2.4025 3W 30 k	i00 GHz Hz		#VBW	/ 100 kHz		Sweep	Span 9 3.200 ms	3.000 MH (1001 pts
KRI MODI	E TRC SCL		×	Ÿ	FUNCTION	FUNCTION WIDTH	E	INCTION VALUE	· ·
1 N	1 f	2	.401 822 GHz	3.45 d					
2 N 3	1 f	2	.402 836 GHz	4.66 d	Bm				
5									
4 5 6 7									
5 6 7 8									
5 6 7 8 9 0									
5 6									>

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CH39 -3Mbps

	SENS	E:PULSE	ALIGNAUTO	05:52:42 PM Jun 01,
r 2 2.441830000000 G	GHz PNO: Wide IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 3 TYPE M WAA DET P P P
Ref Offset 3.8 dB div Ref 18.52 dBm				Mkr2 2.441 830 G 5.109 d
	01		2	
mann	when	mann	Ann	mmmm
		u yra	<u>, , , , , , , , , , , , , , , , , , , </u>	
				Span 3.000 l
	#VBW	/ 100 kHz	Sw	eep 3.200 ms (1001
	¥ 834 GHz 5.338 d	FUNCTION FL	SW	eep 3.200 ms (1001
BW 30 kHz	Y	FUNCTION FL		•
BW 30 kHz	¥ 834 GHz 5.338 d	FUNCTION FL		•
BW 30 kHz	¥ 834 GHz 5.338 d	FUNCTION FL		•
BW 30 kHz	¥ 834 GHz 5.338 d	FUNCTION FL		• •
BW 30 kHz	¥ 834 GHz 5.338 d	FUNCTION FL		• •

CH78 -3Mbps



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8. BANDWIDTH TEST

8.1 LIMIT

FCC Part15 15.247,Subpart C						
Section	Test Item	Limit	FrequencyRange (MHz)	Result		
15.247 (a)(1)	Bandwidth	N/A	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



8.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.



8.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	50%
	GFSK(1Mbps) CH00 / CH39 / C78	Test Voltage:	AC 120V/60Hz

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.821	PASS
2441 MHz	0.892	PASS
2480 MHz	0.891	PASS

CH00 -1Mbps

Agilent Spectrum Analyzer - Occupied	BW			
KI RF 50 Ω AC Center Freq 2.40200000		ENSE:PULSE Center Freq: 2.402000	ALIGNAUTO	01:43:42 PM Jun 01, 2021 Radio Std: None
Center Freq 2.4020000		Trig: Free Run	Avg Hold:>10/10	
	#IFGain:Low	#Atten: 30 dB		Radio Device: BTS
10 dB/div Ref 20.00 dB	im (
10.0		<u></u>		
0.00				
-10.0			Man	
-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
O a sum is all D an about	141-	Total Power	13.9 dBm	
Occupied Bandwid		TULAI FUWEI	13.9 UDIII	
8	317.72 kHz			
Transmit Freq Error	-7.443 kHz	OBW Power	99.00 %	
x dB Bandwidth	820.5 kHz	x dB	-20.00 dB	
MSG			STATUS	
			I I	

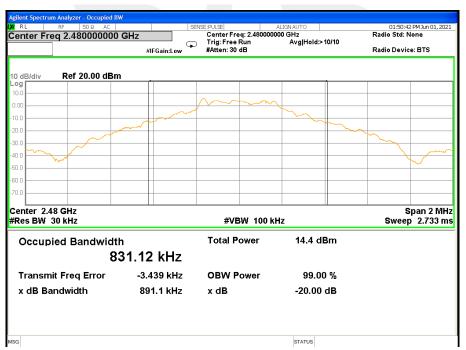
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CH39 -1Mbps



CH78 -1Mbps





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Temperature:	25°C	Relative Humidity:	50%
	π/4-DQPSK(2Mbps) CH00 / CH39 / C78	Test Voltage:	AC 120V/60Hz

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.262	PASS
2441 MHz	1.260	PASS
2480 MHz	1.260	PASS

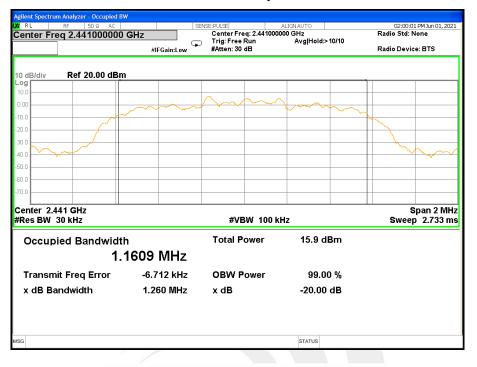
CH00 -2Mbps



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CH39 -2Mbps



CH78 -2Mbps



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Temperature:	25°C	Relative Humidity:	50%
	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	AC 120V/60Hz

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.270	PASS
2441 MHz	1.269	PASS
2480 MHz	1.267	PASS

CH00 -3Mbps

ilent Spectrum Analyzer - Occupied R L RF 50 Ω AC		ENSE:PULSE	ALIGNAUTO	02:13:02 PM Jun 01, 2021
enter Freq 2.40200000		Center Freq: 2.402000	000 GHz	Radio Std: None
	#IFGain:Low	⊖ Trig: Free Run #Atten: 30 dB	Avg Hold:>10/10	Radio Device: BTS
dB/div Ref 20.00 dB	m			
9 g				
.00		n m n m		
.0	~~~~~~		m	
.0				
				han m
0				
.0				
enter 2.402 GHz			· · ·	Span 2 MH
les BW 30 kHz		#VBW 100 k	Hz	Sweep 2.733 m
Occupied Bandwid	th	Total Power	15.0 dBm	
1.	.1582 MHz			
Transmit Freq Error	5.415 kHz	OBW Power	99.00 %	
x dB Bandwidth	1.270 MHz	x dB	-20.00 dB	
			STATUS	

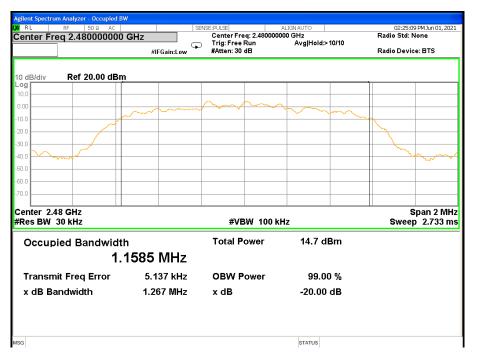
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CH39 -3Mbps



CH78 -3Mbps



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9. OUTPUT POWER TEST

9.1 LIMIT

FCC Part 15.247,Subpart C					
Section	tion Test Item Limit Frequency Range (MHz				
		1 W or 0.125W			
15.247 (a)(1)&(b)(1)	Output 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

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

- a) Use the following spectrum analyzer settings:
- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW \geq RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.
- b) Allow trace to stabilize.
- c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

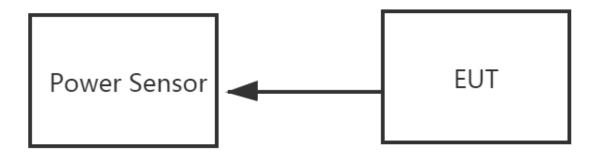
e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

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 DSS bandwidth and shall use a fast-responding diode detector.

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

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9.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Voltage:	AC 120V/60Hz		

Mode Channel Number				Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)		
	0	2402	8.62	5.72	30.00	
GFSK(1M)	39	2441	8.95	5.85	30.00	
	78	2480	8.23	5.04	30.00	

Note: the channel separation >20dB bandwidth

Mode Channel Number		Frequency (MHz)	Peak Power	Average Power	Limit
	Number		(dBm)	(dBm)	(dBm)
	0	2402	10.84	5.67	20.97
π/4-DQPSK(2M)	39	2441	10.83	5.77	20.97
, ,	78	2480	10.06	4.97	20.97

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

Mode Channel Number	Channel Frequer	Frequency		Peak Power	Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)		
	0	2402	11.27	5.67	20.97	
8-DPSK(3M)	39	2441	11.23	5.78	20.97	
	78	2480	10.47	4.97	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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