

# Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC156188
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# FCC Radio Test Report FCC ID: 2AJ9Z-X11

# **Original Grant**

Report No. : TB-FCC156188

Applicant : EMATIC LIMITED

**Equipment Under Test (EUT)** 

**EUT Name** : ROCK X11

Model No. : ROCK X11

Series Model No. : N/A

Brand Name : EXTREM

**Receipt Date** : 2017-06-23

**Test Date** : 2017-06-24 to 2017-07-09

Issue Date : 2017-07-10

**Standards** : FCC Part 15: 2016, Subpart C(15.247)

**Test Method** : ANSI C63.10: 2013

Conclusions : PASS

In the configuration tested, the EUT complied with the standards specified above,

The EUT technically complies with the FCC requirements

Test/Witness Engineer :

Approved& Authorized :

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0

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# 1. General Information about EUT

#### 1.1 Client Information

**Applicant**: EMATIC LIMITED

Address : Unit 17, 9/F Tower A, New Mandarin Plaza NO, 14 Science Museum

Rd, TST, Hong Kong, China

Manufacturer : EMATIC LIMITED

Address : Unit 17, 9/F Tower A, New Mandarin Plaza NO, 14 Science Museum

Rd, TST, Hong Kong, China

## 1.2 General Description of EUT (Equipment Under Test)

EUT Name	À	ROCK X11		
Models No.	:	ROCK X11		
<b>Model Difference</b>	:	N/A		
		Operation Frequency:	Bluetooth 4.1(EDR): 2402~2480 MHz	
		Number of Channel:	Bluetooth: 79 Channels see Note 2	
Product		Max Peak Output Power:	Bluetooth: 6.710 dBm(GFSK)	
Description		Antenna Gain: 1.15 dBi PIFA Antenna		
		Modulation Type:	GFSK (1 Mbps)	
			π /4-DQPSK (2 Mbps)	
			8-DPSK (3 Mbps)	
Power Supply	:	DC power supplied by AC/	DC Adapter.	
		DC Voltage supplied from Li-ion battery.		
Power Rating	:	AC/DC Adapter(A138A-12	0150U-US2):	
		Input: AC 100~240V 50/60	0Hz, 0.5A.	
		Output: 5V/2.5A&9V/2A&12V/1.5A.		
		DC 3.8V from 10000mA Li	-ion battery.	
Connecting I/O Port(S)	•	Please refer to the User's	Manual	

#### Note:

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

#### (2) Channel List:

		Bluetooth	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



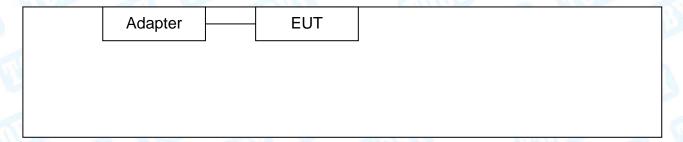
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03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	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	Ulla	A W
26	2428	53	2455	= 11	3.00

<sup>(3)</sup> The Antenna information about the equipment is provided by the applicant.

# 1.3 Block Diagram Showing the Configuration of System Tested

# **Charging+TX Mode**



# 1.4 Description of Support Units

The EUT has been test as an independent unit.



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### 1.5 Description of Test Mode

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 follow was evaluated respectively.

For	Conducted Test
Final Test Mode	Description
Mode 1	Charging + TX Mode

For Radiated Test				
Final Test Mode	Description			
Mode 1	TX GFSK Mode			
Mode 2	TX Mode(GFSK) Channel 00/39/78			
Mode 3	TX Mode( π /4-DQPSK) Channel 00/39/78			
Mode 4	TX Mode(8-DPSK) Channel 00/39/78			
Mode 5	Hopping Mode(GFSK)			
Mode 6	Hopping Mode( π /4-DQPSK)			
Mode 7	Hopping Mode(8-DPSK)			

#### Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate. We have pretested all the test modes above.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

TX Mode: GFSK (1 Mbps)
TX Mode: π /4-DQPSK (2 Mbps)
TX Mode:8-DPSK (3 Mbps)

(2) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane as the normal use. Therefore only the test data of this X-plane was used for radiated emission measurement test.



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## 1.6 Description 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 Bluetooth mode.

Test Software Version	mn!	*#*#3646633#*#*	The state of the s
Frequency	2402 MHz	2441MHz	2480 MHz
GFSK	DEF	DEF	DEF
π /4-DQPSK	DEF	DEF	DEF
8-DPSK	DEF	DEF	DEF

## 1.7 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 %.

Test Item	Parameters	Expanded Uncertainty (U <sub>Lab</sub> )
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.42 dB ±3.42 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.40 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB



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## 1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

#### **CNAS (L5813)**

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

#### FCC List No.: (811562)

The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 811562.

#### IC Registration No.: (11950A-1)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A-1.



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# 2. Test Summary

	F	CC Part 15 Subpart C(15.247)/ RSS	247 Issue 1		
Standard Section					
FCC	IC	Test Item	Judgment	Remark	
15.203	9	Antenna Requirement	PASS	N/A	
15.207	RSS-GEN 7.2.2	Conducted Emission	PASS	N/A	
15.205	RSS-Gen 7.2.3	Restricted Bands	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (2)	Hopping Channel Separation	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (4)	Dwell Time	PASS	N/A	
15.247(b)(1)	RSS 247 5.4 (2)	Peak Output Power	PASS	N/A	
15.247(b)(1)	RSS 247 5.1 (4)	Number of Hopping Frequency	PASS	N/A	
15.247(d)	RSS 247 5.5	Band Edge	PASS	N/A	
15.247(c)& 15.209	RSS 247 5.5	Radiated Spurious Emission	PASS	N/A	
15.247(a)	RSS 247 5.1 (1)	99% Occupied Bandwidth & 20dB Bandwidth	PASS	99%OBW GFSK:861.2499kHz π/4-DQPSK: 1165.60kHz 8-DPSK: 1168.80kHz	

**Note:** N/A is an abbreviation for Not Applicable.



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# 3. Test Equipment

Conducted	d Emission Te	st			
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 22, 2016	Jul. 21, 2017
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 22, 2016	Jul. 21, 2017
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 22, 2016	Jul. 21, 2017
LISN	Rohde & Schwarz	ENV216	101131	Jul. 22, 2016	Jul. 21, 2017
Radiation	Emission Tes	t	-		
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 22, 2016	Jul. 21, 2017
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 22, 2016	Jul. 21, 2017
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.25, 2017	Mar. 24, 2018
Bilog Antenna	ETS-LINDGREN	3142E	00117542	Mar.25, 2017	Mar. 24, 2018
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.24, 2017	Mar. 23, 2018
Horn Antenna	ETS-LINDGREN	3117	00143209	Mar.24, 2017	Mar. 23, 2018
Loop Antenna	Laplace instrument	RF300	0701	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	Sonoma	310N	185903	Mar.24, 2017	Mar. 23, 2018
Pre-amplifier	HP	8449B	3008A00849	Mar.25, 2017	Mar. 24, 2018
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar.24, 2017	Mar. 23, 2018
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Antenna C	onducted Em	ission			
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 22, 2016	Jul. 21, 2017
Spectrum Analyzer	Rohde & Schwarz	ESCI	100010/007	Jul. 22, 2016	Jul. 21, 2017
Power Meter	Anritsu	ML2495A	25406005	Jul. 22, 2016	Jul. 21, 2017
Power Sensor	Anritsu	ML2411B	25406005	Jul. 22, 2016	Jul. 21, 2017



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# 4. Conducted Emission Test

#### 4.1 Test Standard and Limit

4.1.1Test Standard FCC Part 15.207

4.1.2 Test Limit

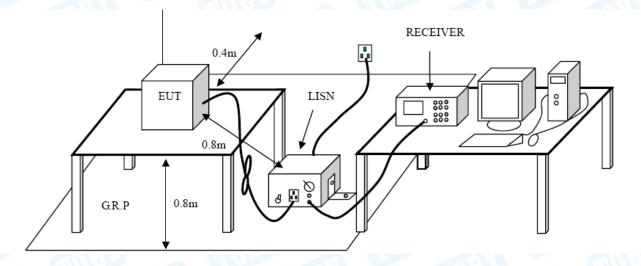
#### **Conducted Emission Test Limit**

Eroguanov	Maximum RF Line Voltage (dBμV)		
Frequency	Quasi-peak Level	Average Level	
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *	
500kHz~5MHz	56	46	
5MHz~30MHz	60	50	

#### Notes:

- (1) \*Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

## 4.2 Test Setup





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#### 4.3 Test Procedure

The EUT was placed 0.8m from the horizontal 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.

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.

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.

LISN at least 80 cm from nearest part of EUT chassis

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

## 4.4 EUT Operating Mode

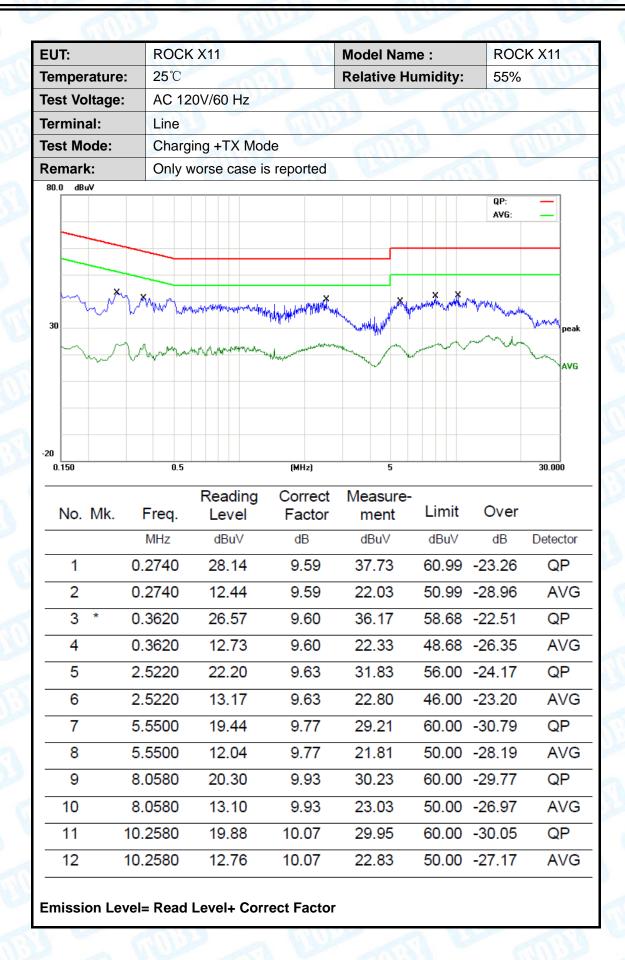
Please refer to the description of test mode.

#### 4.5 Test Data

Test data please refer the following pages.



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EUT:	ROCK X11		Model Name :	ROCK	X11
Temperature:	25℃	- 6A	Relative Humid	ity: 55%	100
Test Voltage:	AC 120V/60 H	z			MAIL
Terminal:	Neutral				
Test Mode:	Charging +TX	Mode		Fig.	
Remark:	Only worse ca	se is reported			W.
80.0 dBuV				00	
				QP: AVG:	_
Ma - X		x ,x,	Jan mathem	Market Market Market	
Juny Jun	Mark water the entire of the	<sup>64</sup> kwhiqhn,lyvalpro-sonipilik.hu	Market Ma	All Mary Mary	The state of the s
30	Jahranger waren waren	Mariana de setemperario montrologo		markeduck	peak
have have		Addres /			The state of the s
					AVG
-20 0.150	0.5	(MHz)	5		30.000
No. Mk. Fr	Readin req. Level	g Correct Factor	Measure- ment Lin	nit Over	
	Hz dBuV	dB	ment Lin		Detector
	940 28.08	9.57	37.65 60.		QP
	940 16.62	9.57		41 -24.22	AVG
3 1.12	220 24.20	9.59		00 -22.21	QP
4 * 1.12	220 15.67	9.59	25.26 46.	00 -20.74	AVG
5 2.29	900 21.80	9.63	31.43 56.	00 -24.57	QP
6 2.29	900 14.58	9.63	24.21 46.	00 -21.79	AVG
7 5.29	580 27.45	9.96	37.41 60.	00 -22.59	QP
8 5.29	580 17.88	9.96	27.84 50.	00 -22.16	AVG
9 7.24	420 28.48	10.29	38.77 60.	00 -21.23	QP
	420 18.24	10.29		00 -21.47	AVG
11 12.7		10.45		00 -21.73	QP
12 12.7		10.45		00 -21.73	AVG
12 12.7	108 10.12	10.45	20.37 30.	00 -21. <del>4</del> 3	
Emission Level=	Read Level+ C	orrect Factor			



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EUT:		ROCK	X11	0.11	Model Nam	e :	ROCK	X11
emper	ature:	25℃			Relative Hu	midity:	55%	
est Vo	Itage:	AC 240	V/60 Hz				1199	
ermina	al:	Line		CHIT:		1 80		
est Mo	ode:	Chargin	ng +TX Mod	е	E m	3	A 6	
Remark	<b>(</b> :	Only wo	orse case is	reported	Charles	TO U	18	
80.0 dB	u∀							
							QP: AVG:	
	. A X	8			X X Jan	The bear was an open of	Registranger and application	4.4A
~~	~~\		YANA YAYAMADA KAMARA KAMAR	hone probable my back	and the property of the second			pea
30	And A	Λ.Λ΄		dia iMile	all advices produced and a second	ومسري بسلطرم والأسطان المحارب في المحاود المعارب الم	morning	and home.
ww	100 100	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	hyth Whiteham	Mr. Marker Marke	and the state of t			AVE
		W V						
-20 0.150		0.5		(MHz)	5			30.000
No.	Mk	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	IVIIX.	MHz	dBuV	dB	dBuV	dBu∀	dB	Detector
1		0.3060	30.19	9.57	39.76		-20.32	QP
2		0.3060	19.44	9.57	29.01		-21.07	AVG
3	(	0.4420	28.87	9.58	38.45	57.02	-18.57	QP
4	(	0.4420	18.51	9.58	28.09	47.02	-18.93	AVC
5	* 4	1.7420	29.52	9.86	39.38	56.00	-16.62	QP
6		1.7420	18.39	9.86	28.25	46.00	-17.75	AVC
7	ŗ.	5.2860	31.10	9.96	41.06		-18.94	QP
8		5.2860	20.13	9.96	30.09		-19.91	AVO
_	6	6.6220	32.04	10.22	42.26		-17.74	QP
9			20.64	10.22	30.86	50.00	-19.14	AVG
10	6	6.6220	20.04					
		1.1980	30.86	10.33	41.19	60.00	-18.81	QP



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EUT:	ROCK X11	A COLOR	Model Name	e :	ROCK	X11	
Temperature:	25℃	- W	Relative Hu	midity:	55%	55%	
Test Voltage:	AC 240V/60	Hz	(III)	13.3		MAIN	
Terminal:	Neutral				4.50		
Test Mode:	Charging +7	X Mode		1 16			
Remark:	Only worse	case is reported		3	a V	W.	
80.0 dBuV					QP:		
					AVG:	_	
· ~Mu .m	X	. x . X.	البلغ الماليان المالي	KANKANA KAN	artiffy year and a	patriff and frage and	
20	A Mayorally	Hary-Crisillad Harman Alaba-4-4-4-1	haman galfar ga High ga Ay raga Bhafir ga ar		J.	peak	
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WWWWWW	/^\	HANDANAMAN WASHINGTON					
,	" V " " ' '						
-20							
0.150	0.5	(MHz)	5			30.000	
	Read	•	Measure-				
No. Mk.	Freq. Lev	el Factor	ment	Limit	Over		
	MHz dBu	V dB	dBuV	dBu∀	dB	Detector	
1 * 0	.4300 27.1	9 9.60	36.79	57.25	-20.46	QP	
2 0	.4300 10.1	0 9.60	19.70	47.25	-27.55	AVG	
3 1	.1539 23.0	9.60	32.61	56.00	-23.39	QP	
4 1	.1539 8.5	9.60	18.13	46.00	-27.87	AVG	
5 1	.8740 23.3	9.61	32.96	56.00	-23.04	QP	
6 1	.8740 11.1		20.73	46.00	-25.27	AVG	
	6.6340 26.8		36.73		-23.27	QP	
	.6340 16.5		26.34		-23.66	AVG	
	.1899 27.0		37.07		-22.93	QP	
	.1899 17.0		27.07	50.00		AVG	
11 11	.7660 26.5	10.20	36.71	60.00	-23.29	QP	
	.7660 17.4	9 10.20	27.69	EO 00	-22.31	AVG	



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# 5. Radiated Emission Test

## 5.1 Test Standard and Limit

5.1.1 Test Standard FCC Part 15.209

5.1.2 Test Limit

#### Radiated Emission Limit (9 kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (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

## Radiated Emission Limit (Above 1000MHz)

Frequency	Class B (dBuV/m)(at 3m)		
(MHz)	Peak	Average	
Above 1000	74	54	

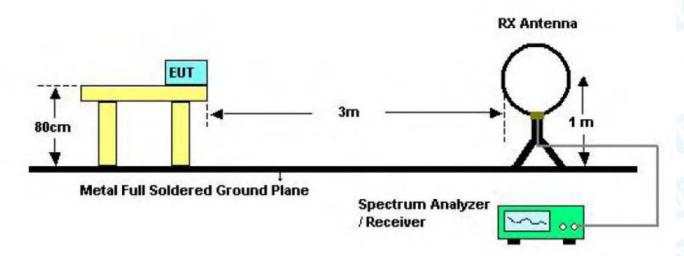
#### Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m)

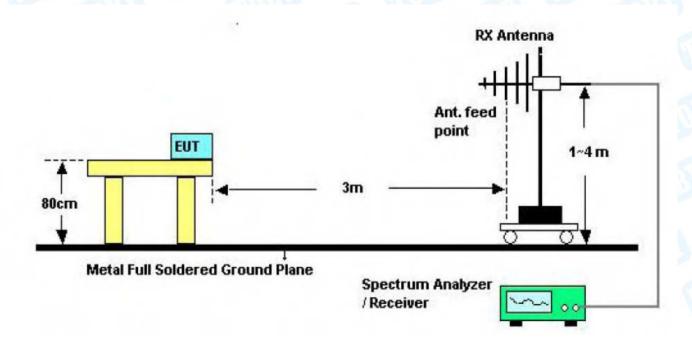


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# 5.2 Test Setup



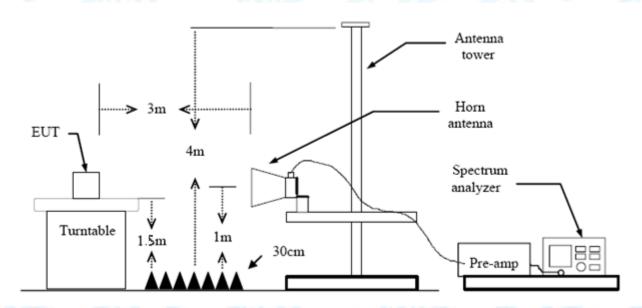
**Below 30MHz Test Setup** 



**Below 1000MHz Test Setup** 



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**Above 1GHz Test Setup** 

#### 5.3 Test Procedure

- (1) The measuring distance of 0.8cm shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.
- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) 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 Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.



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## 5.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power in TX mode.

#### 5.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

Test data please refer the following pages.



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#### 9KHz~30MHz

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB

below the permissible value has no need to be reported.

#### 30MHz~1GHz

ROC	K X11	67	Model Na	ame :	ROCK	X11
25℃	COLUMN TO SERVICE		Relative Humidity:			
AC 1	20V/60Hz			CHID		1
Horiz	contal	A Brown	Time.	1	CALL!	33
TX G	FSK Mode	2402MHz	THILL	1	600	
Only	worse case	is reported		West		1/1/
				(RF)FCC 15C	3M Radiation	
					Margin -6 c	iB [
		3.4				
		2 X . <b>/</b>	5 6 X			
		AND THE RESERVE	John M. M. M.	adma	· · · · · · · · · · · · · · · · · · ·	LP SAPPATON DE LANCE
	, MM,	All Marketines	M. W.	the the street of	And Sharper	
	was also had	qw. r				
1 .						
60 70	80	(MHz)	300	400 500	600 700	1000.00
	Reading	Correct	Measure-			
req.	Level	Factor	ment	Limit	Over	
ИНz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detect
2893	41.85	-14.57	27.28	40.00	-12.72	peal
.0414	50.35	-20.16	30.19	43.50	-13.31	peal
.0414	00.00					
.8439	55.92	-20.13	35.79	43.50	-7.71	pea
		-20.13 -20.18	35.79 36.99	43.50 43.50	-7.71 -6.51	peal peal
.8439	55.92					
	25°C AC 1 Horiz TX G Only	AC 120V/60Hz Horizontal TX GFSK Mode Only worse case  60 70 80  Reading Level MHz dBuV 2893 41.85	AC 120V/60Hz Horizontal TX GFSK Mode 2402MHz Only worse case is reported  Reading Correct Factor Hz dBuV dB/m 2893 41.85 -14.57	AC 120V/60Hz Horizontal TX GFSK Mode 2402MHz Only worse case is reported  Reading Correct Measure- freq. Level Factor ment  MHz dBuV dB/m dBuV/m 2893 41.85 -14.57 27.28	Relative Humidity:  AC 120V/60Hz Horizontal TX GFSK Mode 2402MHz Only worse case is reported  (REJECC 15C)  Reading Correct Measure- Freq. Level Factor ment Limit  MHz dBuV dB/m dBuV/m dBuV/m 2893 41.85 -14.57 27.28 40.00	25°C Relative Humidity: 55%  AC 120V/60Hz Horizontal  TX GFSK Mode 2402MHz Only worse case is reported  (REFECC 15C 3M Radiation Margin 6 6 6 70 80 (MHz) 300 400 500 600 700  Reading Correct Measure-req. Level Factor ment Limit Over MHz dBuV dB/m dBuV/m dBuV/m dB 2893 41.85 -14.57 27.28 40.00 -12.72

<sup>\*:</sup>Maximum data x:Over limit !:over margin



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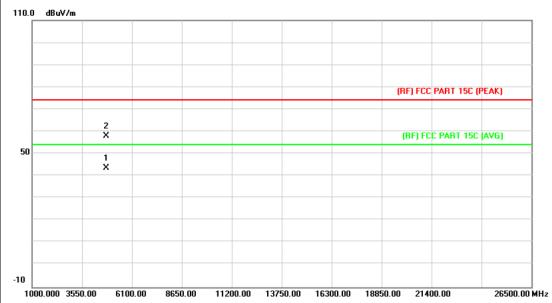
	ROCK X11	WA WA	Model Na	ime :	ROCK	XTT
emperature:	<b>25</b> ℃		Relative H	Relative Humidity:		
est Voltage:	AC 120V/60H	z	A IS		13.0	
nt. Pol.	Vertical			Billi		
est Mode:	TX GFSK Mod	de 2402MHz		31	- WI	M. Property
lemark:	Only worse ca	ase is reported	The same			
80.0 dBuV/m	3 4	5		Jan Landella, al	iC 3M Radiation Margin -6	
		May May 1997	' ' 'water' ' 'bate	ngunt .		
30.000 40 50	60 70 80	(MHz)	300	400 50	0 600 700	1000.00
30.000 40 50	60 70 80  Read Freq. Leve	ing Correct			0 600 700 Over	1000.00
30.000 40 50 No. Mk. F	Read	ing Correct el Factor	300 Measure-	400 50		1000.00
30.000 40 50 No. Mk. F	Read req. Leve	ing Correct el Factor	Measure- ment	400 50 Limit	Over	
No. Mk. F	Read Freq. Leve	ing Correct Factor  dB/m  -14.84	Measure- ment dBuV/m	400 50  Limit  dBuV/m	Over	Detecto
No. Mk. F  1 * 31. 2 45.	Read Freq. Leve MHz dBu\ 7313 49.9	ing Correct Factor  V dB/m  9 -14.84  35 -22.21	Measure- ment dBuV/m 35.15	400 50  Limit  dBuV/m  40.00	Over dB -4.85	Detecto
No. Mk. F  1 * 31. 2 45. 3 70.	Read Leve MHz dBu\ 7313 49.9 5348 54.8	Correct Factor  dB/m  -14.84  -22.21  -23.26	Measure- ment dBuV/m 35.15 32.64	400 50  Limit  dBuV/m  40.00  40.00	Over  dB  -4.85  -7.36	Detecto peak peak peak
No. Mk. F  1 * 31. 2 45. 3 70. 4 93.	Read Level MHz dBu 7313 49.9 5348 54.8 5836 50.3	Correct Factor  V dB/m  19 -14.84  15 -22.21  16 -23.26  16 -21.95	300 Measure- ment dBuV/m 35.15 32.64 27.10	400 50 Limit dBuV/m 40.00 40.00	Over  dB  -4.85  -7.36  -12.90	Detecto peak peak



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## Above 1GHz(Only worse case is reported)

EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		33
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2402MHz		LINE .
Remark:	No report for the emission who prescribed limit.	ich more than 10 dB b	elow the



No	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4803.685	30.19	13.44	43.63	54.00	-10.37	AVG
2		4805.157	44.39	13.45	57.84	74.00	-16.16	peak



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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz	70	TO SERVICE STATE OF THE SERVIC
Ant. Pol.	Vertical	A VI	
Test Mode:	TX GFSK Mode 2402MHz		LITTLE OF
Remark:	No report for the emission prescribed limit.	which more than 10 dB	3 below the

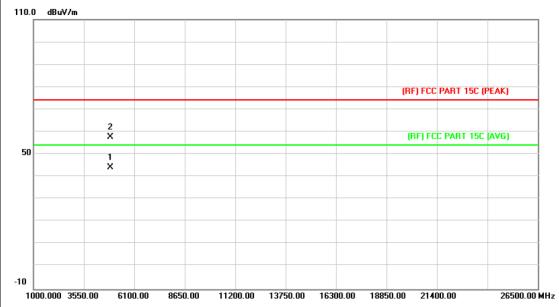


N	0.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4804.502	30.84	13.44	44.28	54.00	-9.72	AVG
2			4805.307	43.91	13.45	57.36	74.00	-16.64	peak



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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz		773
Ant. Pol.	Horizontal	The same of the	
Test Mode:	TX GFSK Mode 2441MHz		THE PARTY OF THE P
Remark:	No report for the emission prescribed limit.	which more than 10 dB	3 below the

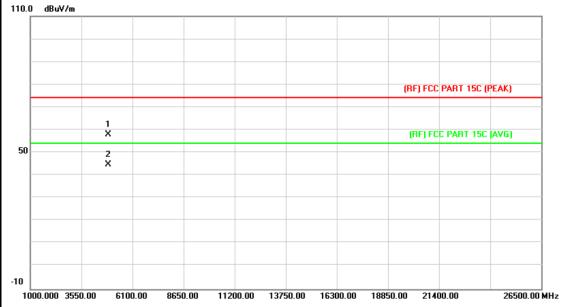


N	No.	Mk.	Freq.	_		Measure- ment	Limit	Over	
			MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4881.661	30.32	13.90	44.22	54.00	-9.78	AVG
2			4882.648	43.64	13.90	57.54	74.00	-16.46	peak



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	st Voltage: AC 120V/60Hz						
Ant. Pol.	Vertical						
Test Mode:	TX GFSK Mode 2441MHz		LINE TO SERVICE				
Remark: No report for the emission which more than 10 dB below the prescribed limit.							
1100 JD-V/-							



No.	Mk	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.433	43.98	13.90	57.88	74.00	-16.12	peak
2	*	4882.602	30.72	13.90	44.62	54.00	-9.38	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Horizontal	Horizontal					
Test Mode:	TX GFSK Mode 2480MHz		LITTLE TO				
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

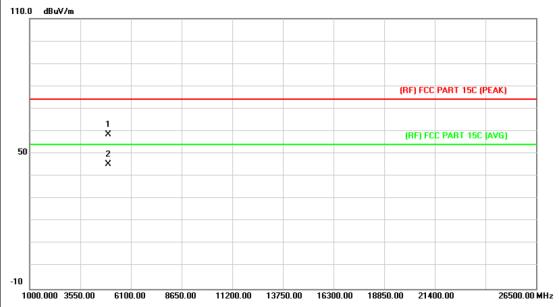


N	lo. N	Лk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4	1959.118	30.74	14.36	45.10	54.00	-8.90	AVG
2		4	1960.472	44.00	14.36	58.36	74.00	-15.64	peak



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EUT:	ROCK X11	Model Name :	ROCK X11			
Temperature:	25℃	Relative Humidity:	55%			
Test Voltage:	AC 120V/60Hz					
Ant. Pol.	Vertical	W CO				
Test Mode:	TX GFSK Mode 2480MHz	CU1372	LINE TO			
Remark:	No report for the emission v prescribed limit.	which more than 10 dB	below the			

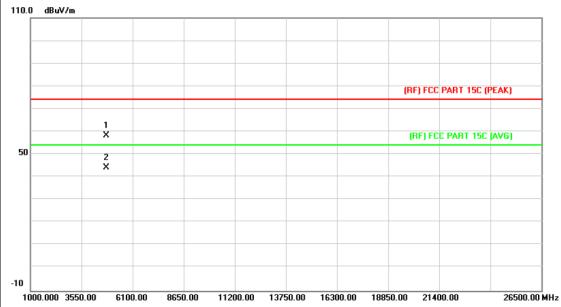


No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4960.878	44.08	14.36	58.44	74.00	-15.56	peak
2	*	4961.365	30.82	14.38	45.20	54.00	-8.80	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz						
Ant. Pol.	Horizontal						
Test Mode:	TX π /4-DQPSK Mode 2402	MHz	A LIVE				
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						

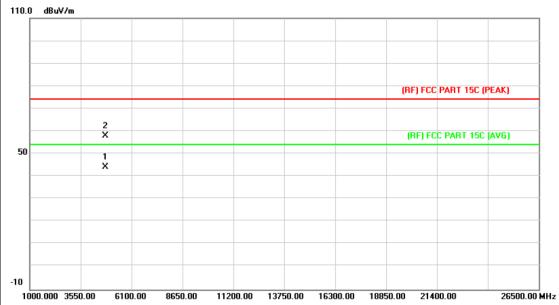


No	o. Mk	. Freq.	_	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4804.125	44.90	13.44	58.34	74.00	-15.66	peak
2	*	4805.345	30.67	13.45	44.12	54.00	-9.88	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz						
Ant. Pol.	Vertical						
Test Mode:	TX π /4-DQPSK Mode 240	02MHz	- Chillian				
Remark:	No report for the emission prescribed limit.	which more than 10 dE	3 below the				

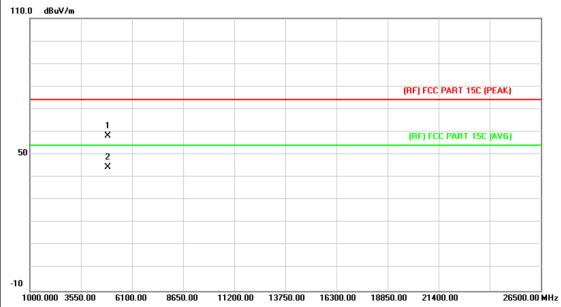


N	o. M	k. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4804.442	30.76	13.44	44.20	54.00	-9.80	AVG
2		4805.362	44.60	13.45	58.05	74.00	-15.95	peak



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz						
Ant. Pol.	Horizontal						
Test Mode:	TX π /4-DQPSK Mode 2441	MHz	LITTLE OF				
Remark: No report for the emission which more than 10 dB below the prescribed limit.							



No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.476	44.26	13.90	58.16	74.00	-15.84	peak
2	*	4883.742	30.58	13.92	44.50	54.00	-9.50	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11					
Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz						
Ant. Pol.	Vertical	W PO						
Test Mode:	TX π /4-DQPSK Mode 244	1MHz	LINE TO SERVICE					
Remark:	No report for the emission prescribed limit.	which more than 10 dB	below the					
1100 ID VI								

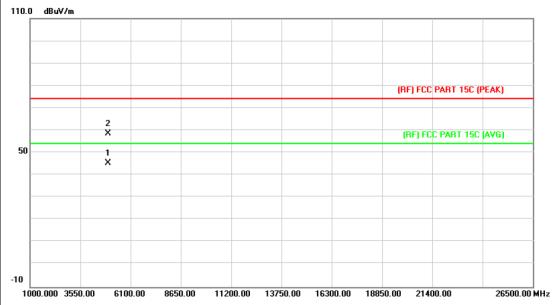


No	o. Mł	c. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4880.782	30.61	13.89	44.50	54.00	-9.50	AVG
2		4882.684	44.33	13.90	58.23	74.00	-15.77	peak



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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz	1	33
Ant. Pol.	Horizontal		
Test Mode:	TX π /4-DQPSK Mode 2480M	Hz	LINE TO SERVICE
Remark:	No report for the emission wh prescribed limit.	ich more than 10 dB b	elow the



1	No.	Mk.	Freq.			Measure- ment	Limit	Over	
			MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4959.788	31.00	14.36	45.36	54.00	-8.64	AVG
2			4961.344	44.09	14.38	58.47	74.00	-15.53	peak



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EUT:	ROCK X11	Model Name :	ROCK X11						
Temperature:	25℃	Relative Humidity:	55%						
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz							
Ant. Pol.	Vertical								
Test Mode:	TX π /4-DQPSK Mode 2480M	Hz	LITTLE TO						
Remark:	No report for the emission which more than 10 dB below the								
	prescribed limit.								



No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.548	44.42	14.36	58.78	74.00	-15.22	peak
2	*	4960.725	31.07	14.36	45.43	54.00	-8.57	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11					
Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz						
Ant. Pol.	Horizontal							
Test Mode:	TX 8-DPSK Mode 2402MHz		LILL TO					
Remark:	Remark: No report for the emission which more than 10 dB below the prescribed limit.							
110.0 40.44	100 m.							



1	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4803.325	30.08	13.44	43.52	54.00	-10.48	AVG
2			4804.554	44.21	13.44	57.65	74.00	-16.35	peak



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz						
Ant. Pol.	Vertical						
Test Mode:	TX 8-DPSK Mode 2402MF	Hz	THE PARTY OF THE P				
Remark:	No report for the emission which more than 10 dB below the prescribed limit.						
	prescribed iiiiit.						

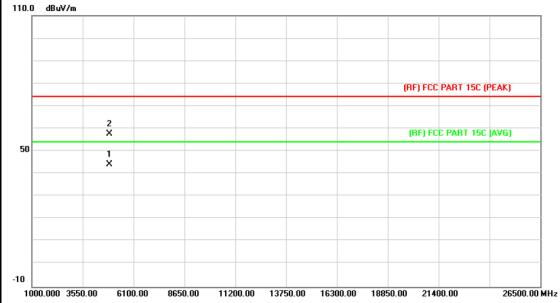


N	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4804.320	29.90	13.44	43.34	54.00	-10.66	AVG
2			4805.426	44.11	13.45	57.56	74.00	-16.44	peak



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EUT:	ROCK X11	Model Name :	ROCK X11					
Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz						
Ant. Pol.	Horizontal	Horizontal						
Test Mode:	TX 8-DPSK Mode 2441MHz		LINE TO					
Remark: No report for the emission which more than 10 dB below the prescribed limit.								



No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4881.421	30.38	13.90	44.28	54.00	-9.72	AVG
2		4882.365	43.86	13.90	57.76	74.00	-16.24	peak



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EUT:	ROCK X11	Model Name :	ROCK X11					
Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz						
Ant. Pol.	Vertical							
Test Mode:	TX 8-DPSK Mode 2441MHz		- CALLER					
Remark:	No report for the emission which more than 10 dB below the prescribed limit.							

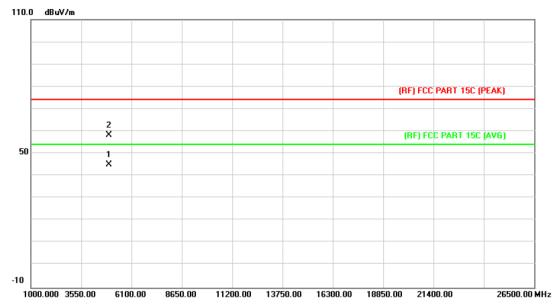


N	o. Mk	. Freq.	Reading Level		Measure- ment	Limit Over		
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4881.657	30.82	13.90	44.72	54.00	-9.28	AVG
2		4883.304	43.65	13.91	57.56	74.00	-16.44	peak



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EUT:	ROCK X11	Model Name :	ROCK X11						
Temperature:	25℃	Relative Humidity:	55%						
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz							
Ant. Pol.	Horizontal								
Test Mode:	TX 8-DPSK Mode 2480MHz		LINE TO SERVICE						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.								

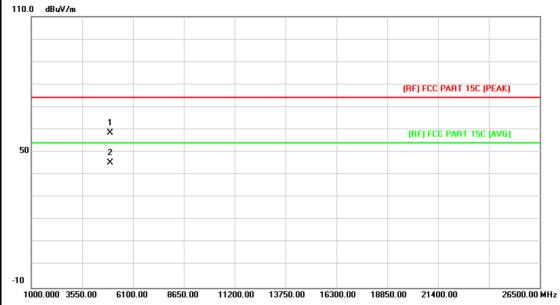


	No.	Mk.	Freq.	Reading Level		Measure- ment	Limit Over		
			MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4959.678	30.74	14.36	45.10	54.00	-8.90	AVG
2			4961.428	43.99	14.38	58.37	74.00	-15.63	peak



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EUT:	ROCK X11	Model Name :	ROCK X11						
Temperature:	25℃	Relative Humidity:	55%						
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz							
Ant. Pol.	Vertical								
Test Mode:	TX 8-DPSK Mode 2480MHz		LINE TO						
Remark:	No report for the emission which more than 10 dB below the prescribed limit.								



No. Mk.		Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4960.442	44.28	14.36	58.64	74.00	-15.36	peak
2	*	4961.326	30.84	14.38	45.22	54.00	-8.78	AVG



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# 6. Restricted Bands Requirement

## 6.1 Test Standard and Limit

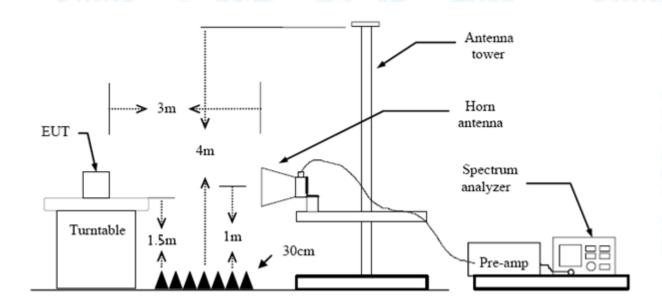
6.1.1 Test Standard FCC Part 15.209 FCC Part 15.205

6.1.2 Test Limit

Restricted Frequency	Class B (dE	B (dBuV/m)(at 3m)		
Band (MHz)	Peak	Average		
310 ~2390	74	54		
2483.5 ~2500	74	54		

Note: All restriction bands have been tested, only the worst case is reported.

# 6.2 Test Setup





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#### 6.3 Test Procedure

(1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 1.5m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.

- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) 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 Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with AVG Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

# 6.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

#### 6.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

All restriction bands have been tested, only the worst case is reported.



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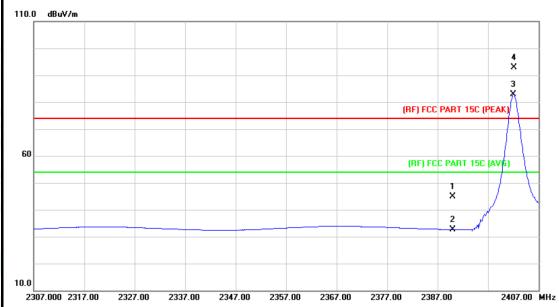
# (1) Radiation Test

EUT	Γ:		ROC	CK X11	M			Me	odel	Name :	lame: ROCK		
Tem	peratu	re:	25℃		M		K	Re	lative	Humidity	<b>/</b> : 55	%	
Test	Voltag	e:	AC 1	120V/60	Hz			13					1
Ant.	Pol.		Hori	zontal	1	100		6	Mi	30		61	الماليال
Test	Mode:		TX	GFSK M	ode :	2402MH	Z	N			18	Val.	6
Rem	ark:		Only	worse	case	is repor	ted		-	BIN			
110.0	dBuV/m												
												4 ×	
Ì													
												3 X	
-										(RF) FCC	PART 150	(PEAK	
60										(BE) FO	C PART 15	ic (AVG	
										(,	1		
											×		
-			-						-		2 X		
10.0													
	09.000 231		329.00	2339.00 Read	ing	9.00 2359 Corre	ct		asure	-	9.00		109.00 MHz
N	o. Mk.	Fre	eq.	Leve		Facto	or		ent	Limit		er	
		MH	IZ	dBu\	V	dB/m		dB	uV/m	dBuV/r	n d	В	Detector
1		2390.	000	44.2	29	0.77		4	5.06	74.00	-28	3.94	peak
2		2390.	000	32.0	)6	0.77		3	2.83	54.00	) -21	1.17	AVG
3	*	2402.	000	85.7	<b>'</b> 0	0.82		86	6.52	Fundamenta	l Frequer	псу	AVG
4	Х	2402.	200	101.3	36	0.82		10	2.18	Fundamenta	I Frequer	псу	peak



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EUT:	ROCK X11	Model Name :	ROCK X11					
Temperature:	25℃	Relative Humidity:	55%					
Test Voltage:	AC 120V/60Hz							
Ant. Pol.	Vertical							
Test Mode:	TX GFSK Mode 2402MHz	MILLER	1 100					
Remark:	Only worse case is reported	(III)						
	·							

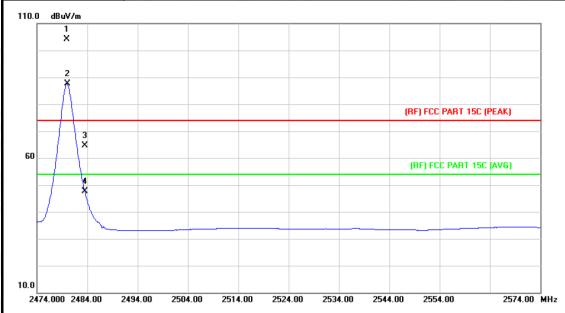


No.	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.06	0.77	44.83	74.00	-29.17	peak
2		2390.000	31.86	0.77	32.63	54.00	-21.37	AVG
3	*	2402.000	81.99	0.82	82.81	Fundamental Frequency		AVG
4	X	2402.200	92.13	0.82	92.95	Fundamental	Frequency	peak



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Horizontal						
Test Mode:	TX GFSK Mode 2480 MHz	TX GFSK Mode 2480 MHz					
Remark:	Only worse case is reported						

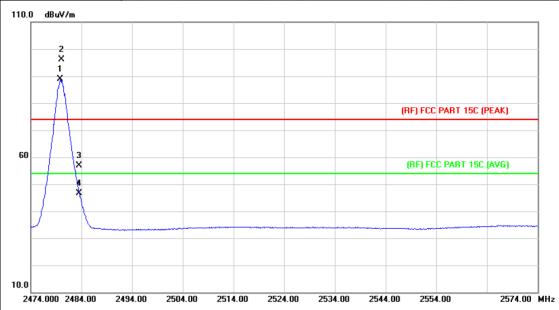


No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2479.900	103.06	1.15	104.21	Fundamental	Frequency	peak
2	*	2480.000	86.43	1.15	87.58	Fundamental	Frequency	AVG
3		2483.500	63.55	1.17	64.72	74.00	-9.28	peak
4		2483.500	46.42	1.17	47.59	54.00	-6.41	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Vertical						
Test Mode:	TX GFSK Mode 2480 MHz		L. C. L.				
Remark:	Only worse case is reported						

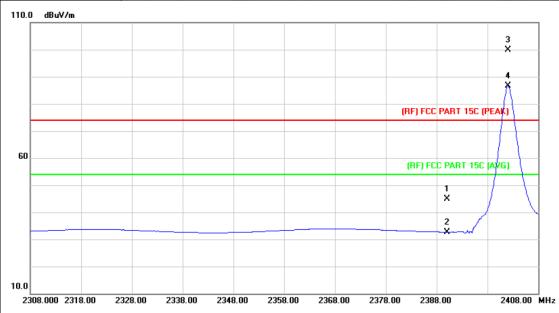


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2479.800	87.61	1.15	88.76	Fundamenta	I Frequency	AVG
2	X	2480.000	94.94	1.15	96.09	Fundamenta	I Frequency	peak
3		2483.500	55.80	1.17	56.97	74.00	-17.03	peak
4		2483.500	45.56	1.17	46.73	54.00	-7.27	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Horizontal						
Test Mode:	TX π /4-DQPSK Mode 24	02MHz	a William				
Remark:	rk: Only worse case is reported						

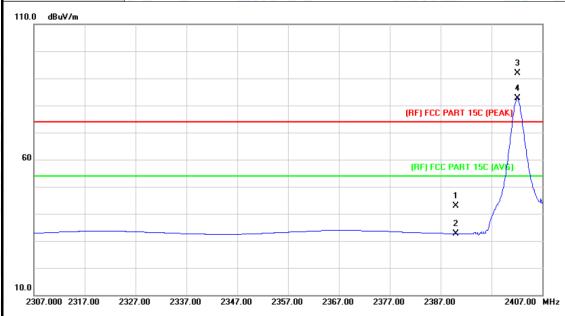


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.06	0.77	44.83	74.00	-29.17	peak
2		2390.000	31.96	0.77	32.73	54.00	-21.27	AVG
3	X	2402.100	99.05	0.82	99.87	Fundamenta	I Frequency	peak
4	*	2402.100	85.71	0.82	86.53	Fundamenta	l Frequency	AVG



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EUT:	ROCK X11	OCK X11 Model Name :					
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz	Time I					
Ant. Pol.	Vertical						
Test Mode:	TX π /4-DQPSK Mode 2402M	Hz	1 Million				
Remark:	Remark: Only worse case is reported						
110.0 dBuV/m							

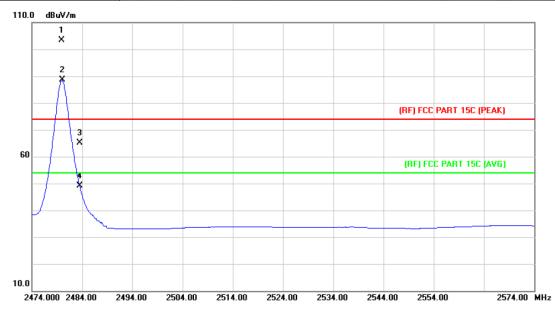


No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	42.13	0.77	42.90	74.00	-31.10	peak
2		2390.000	31.88	0.77	32.65	54.00	-21.35	AVG
3	X	2402.100	90.99	0.82	91.81	Fundamenta	l Frequency	peak
4	*	2402.100	81.71	0.82	82.53	Fundamenta	l Frequency	AVG



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EUT:	ROCK X11	Model Name :					
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz	AC 120V/60Hz					
Ant. Pol.	Horizontal						
Test Mode:	TX π /4-DQPSK Mode 2480M	TX π /4-DQPSK Mode 2480MHz					
Remark:	Only worse case is reported						

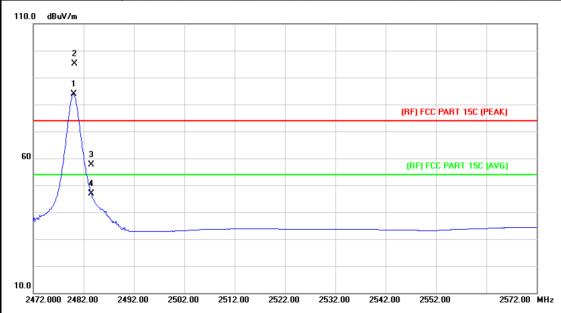


N	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2479.900	102.11	1.15	103.26	Fundamenta	al Frequency	peak
2	*	2480.000	87.38	1.15	88.53	Fundamenta	al Frequency	AVG
3		2483.500	63.89	1.17	65.06	74.00	-8.94	peak
4		2483.500	47.90	1.17	49.07	54.00	-4.93	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11				
Temperature:	25℃	Relative Humidity:	55%				
Test Voltage:	AC 120V/60Hz		133				
Ant. Pol.	Vertical						
Test Mode:	TX π /4-DQPSK Mode 2480	TX π /4-DQPSK Mode 2480MHz					
Remark:	Only worse case is reported						

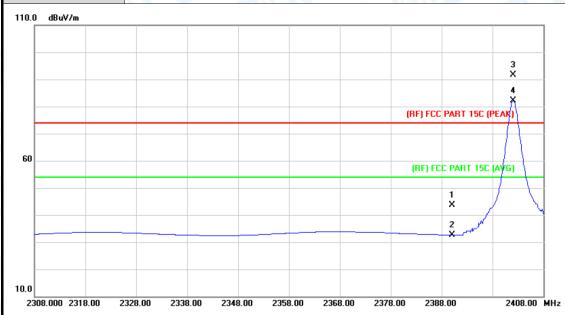


No	o. M	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2480.000	82.66	1.15	83.81	Fundamenta	I Frequency	AVG
2	X	2480.200	93.89	1.15	95.04	Fundamenta	I Frequency	peak
3		2483.500	56.45	1.17	57.62	74.00	-16.38	peak
4		2483.500	45.82	1.17	46.99	54.00	-7.01	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11		
Temperature:	25℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Ant. Pol.	Horizontal	Horizontal			
Test Mode:	TX 8-DPSK Mode 2402MHz				
Remark:	Only worse case is reported				

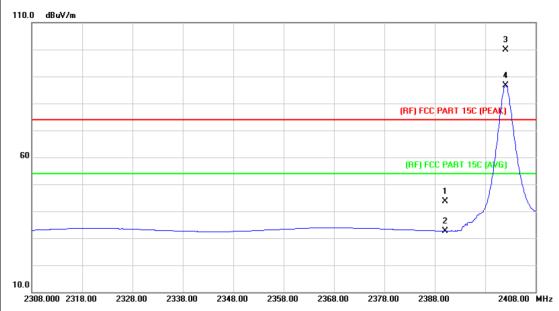


No.	Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	42.81	0.77	43.58	74.00	-30.42	peak
2		2390.000	31.86	0.77	32.63	54.00	-21.37	AVG
3	X	2402.100	90.82	0.82	91.64	Fundamenta	I Frequency	peak
4	*	2402.100	81.39	0.82	82.21	Fundamenta	I Frequency	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11		
Temperature:	25℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Ant. Pol.	Vertical				
Test Mode:	TX 8-DPSK Mode 2402MHz				
Remark: Only worse case is reported					

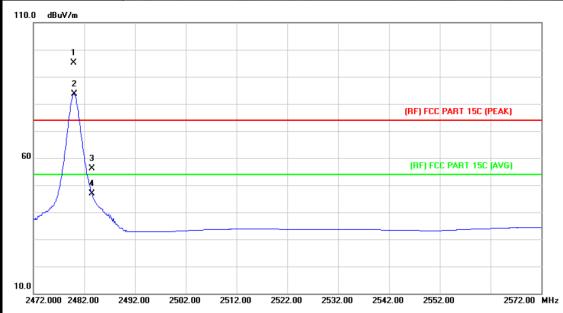


No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	42.90	0.77	43.67	74.00	-30.33	peak
2		2390.000	31.96	0.77	32.73	54.00	-21.27	AVG
3	X	2402.100	98.98	0.82	99.80	Fundamenta	I Frequency	peak
4	*	2402.100	85.93	0.82	86.75	Fundamenta	al Frequency	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11		
Temperature:	25℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Ant. Pol.	Horizontal	Horizontal			
Test Mode:	TX 8-DPSK Mode 2480MHz				
Remark:	Only worse case is reported				

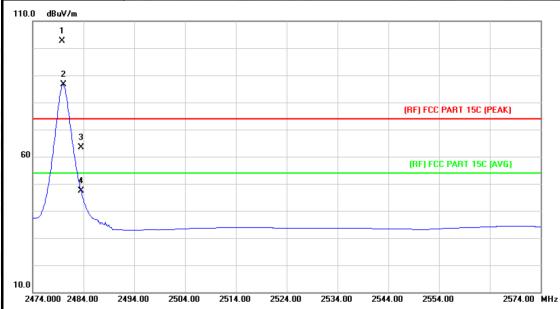


N	lo. M	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2479.900	93.89	1.15	95.04	Fundamenta	al Frequency	peak
2	*	2480.000	82.45	1.15	83.60	Fundamenta	al Frequency	AVG
3		2483.500	54.94	1.17	56.11	74.00	-17.89	peak
4		2483.500	45.70	1.17	46.87	54.00	-7.13	AVG



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EUT:	ROCK X11	Model Name :	ROCK X11		
Temperature:	25℃	Relative Humidity:	55%		
Test Voltage:	AC 120V/60Hz				
Ant. Pol.	Vertical				
Test Mode:	TX 8-DPSK Mode 2480MHz				
Remark:	Only worse case is reported				
440.0 10.111	•				

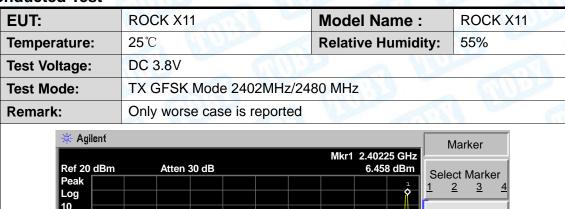


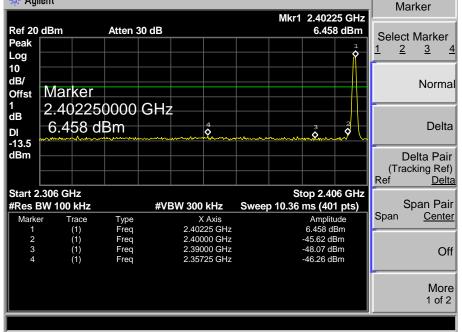
No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBu∀	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.800	101.37	1.15	102.52	Fundamental	Frequency	peak
2	*	2480.000	85.42	1.15	86.57	Fundamental	Frequency	AVG
3		2483.500	62.11	1.17	63.28	74.00	-10.72	peak
4		2483.500	46.16	1.17	47.33	54.00	-6.67	AVG

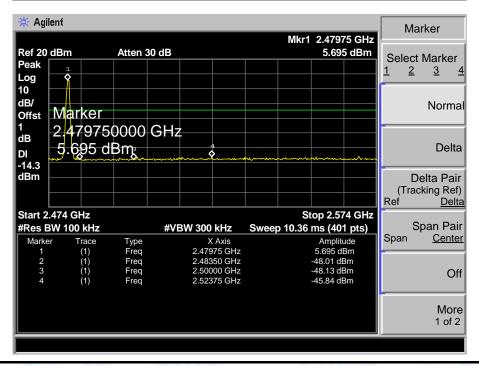


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### (2) Conducted Test

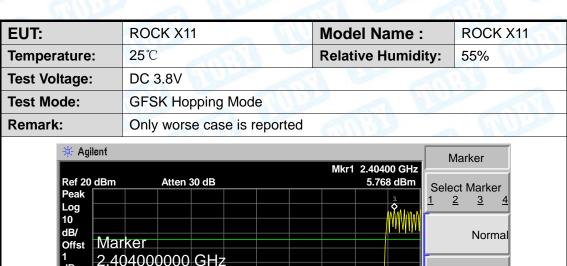


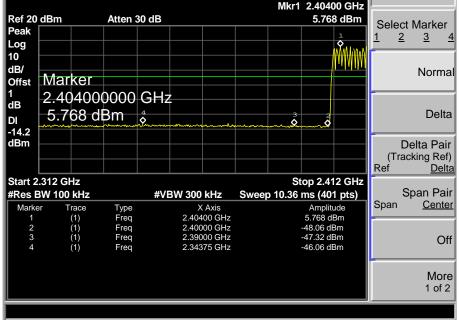


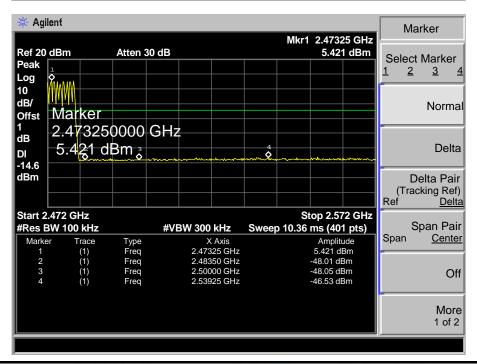




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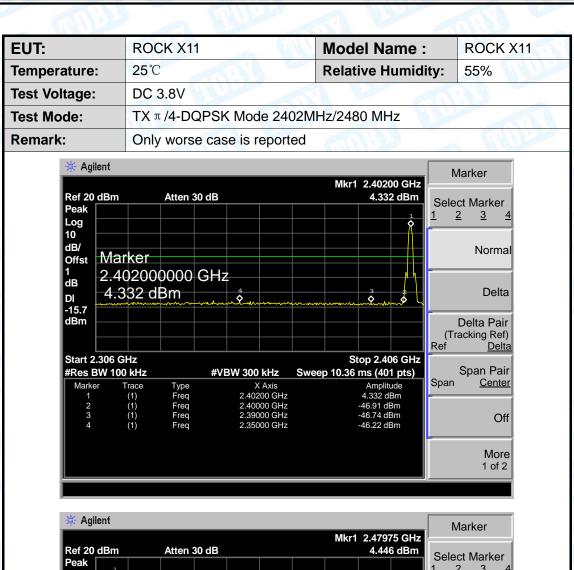






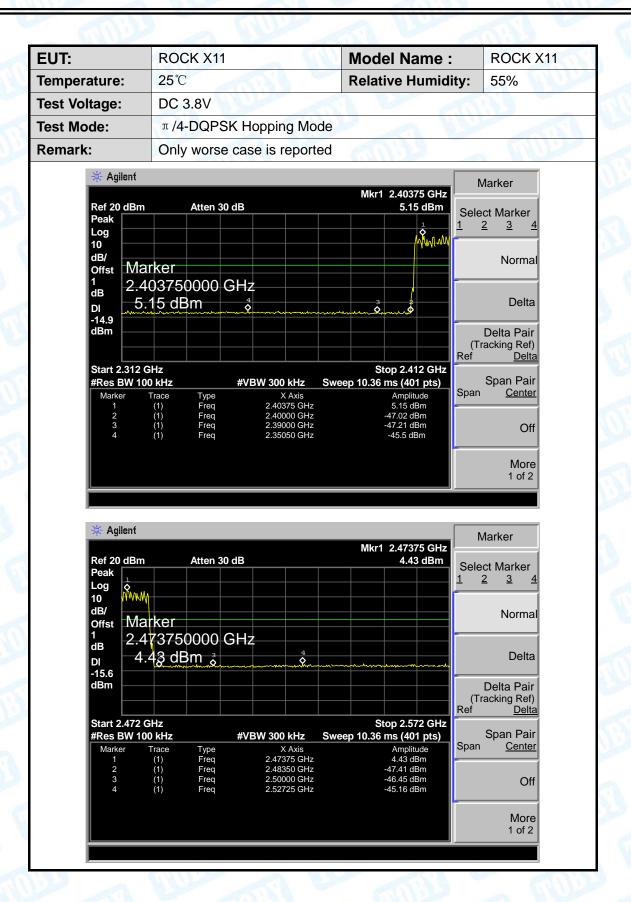


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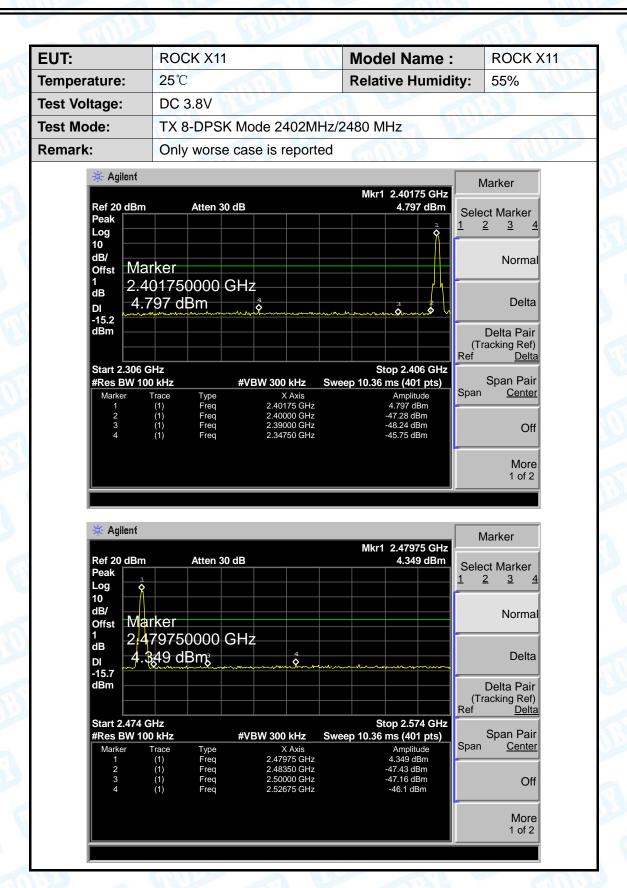


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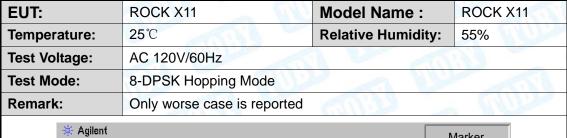


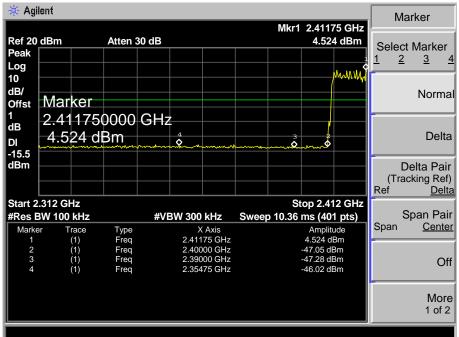
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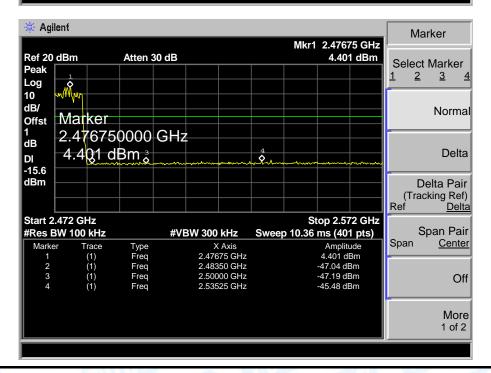




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# 7. Number of Hopping Channel

### 7.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.247 (a)(1)

6.1.2 Test Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

## 7.2 Test Setup



#### 7.3 Test Procedure

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

## 7.4 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

## 7.5 Test Data



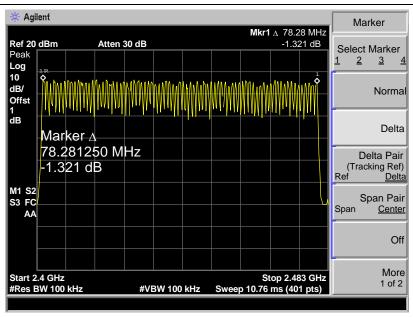
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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	DC 3.8V	nm P	30

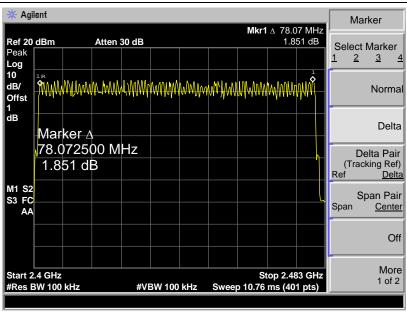
Test Mode: Hopping Mode

Frequency Range	Test Mode	Quantity of Hopping Channel	Limit
	GFSK	79	
2402MHz~2480MHz	π /4-DQPSK	79	>15
	8-DPSK	79	

#### **GFSK Mode**

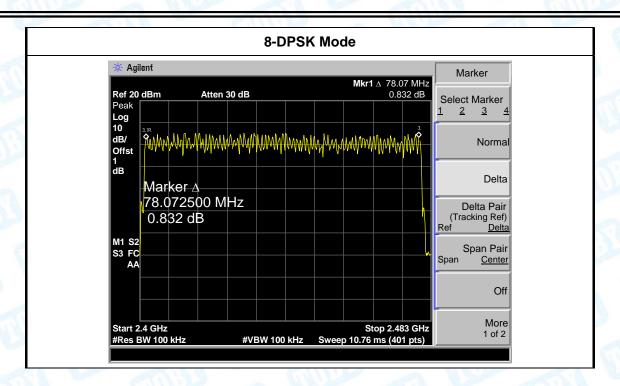


### $\pi$ /4-DQPSK Mode





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# 8. Average Time of Occupancy

#### 8.1 Test Standard and Limit

8.1.1 Test Standard FCC Part 15.247 (a)(1)

8.1.2 Test Limit

Section	Test Item	Limit
15.247(a)(1)/ RSS-210	Average Time of	0.4.000
Annex 8(A8.1d)	Occupancy	0.4 sec

## 8.2 Test Setup



#### 8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=1MHz.
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the center frequency on any frequency would be measure and set the frequency span to zero.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.

## 8.4 EUT Operating Condition

The average time of occupancy on any channel within the Period can be calculated with formulas:

 $\{Total \ of \ Dwell\} = \{Pulse \ Time\} * (1600 / X) / \{Number \ of \ Hopping \ Frequency\} * \{Period\} = 0.4s * \{Number \ of \ Hopping \ Frequency\}$ 

Note: X=2 or 4 or 6 (1DH1=2, 1DH3=4, 1DH5=6. 2DH1=2, 2DH3=4, 2DH5=6. 3DH1=2,3DH3=4, 3DH5=6)

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

The EUT was set to the Hopping Mode by the Customer.



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### 8.5 Test Data

EUT:	EUT: ROCK X11			1133	Model Name : ROCK X11		
Temperature: 25°		s°C		Relative Humidity:	55%		
Test Voltage: DC		DC	OC 3.8V				
Test Mode:		Hop	oping Mode (C	SFSK)	CHILD ST	A W	
Test	Channel		Pulse	Total of Dwel	Period Time	Limit	Result
Mode	(MH	z)	Time (ms)	(ms)	(s)	(ms)	Result
1DH1	244	1	0.420	134.40	31.60	400	PASS
1DH3	244	1	1.715	272.00	31.60	400	PASS
1DH5	244	1	2.9575	315.47	31.60	400	PASS

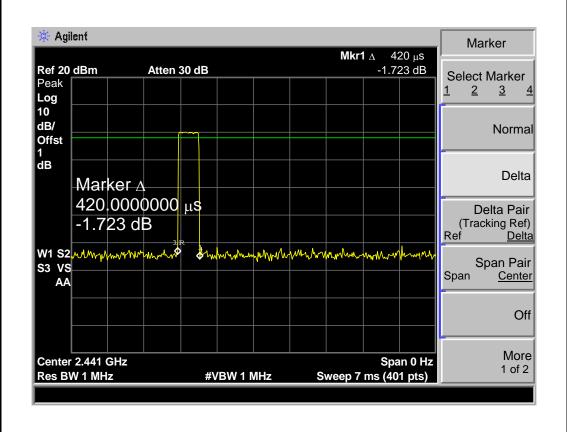
1DH1 Total of Dwell= Pulse Time\*(1600/2)\*31.6/79

1DH3 Total of Dwell= Pulse Time\*(1600/4)\*31.6/79

1DH5 Total of Dwell= Pulse Time\*(1600/6)\*31.6/79

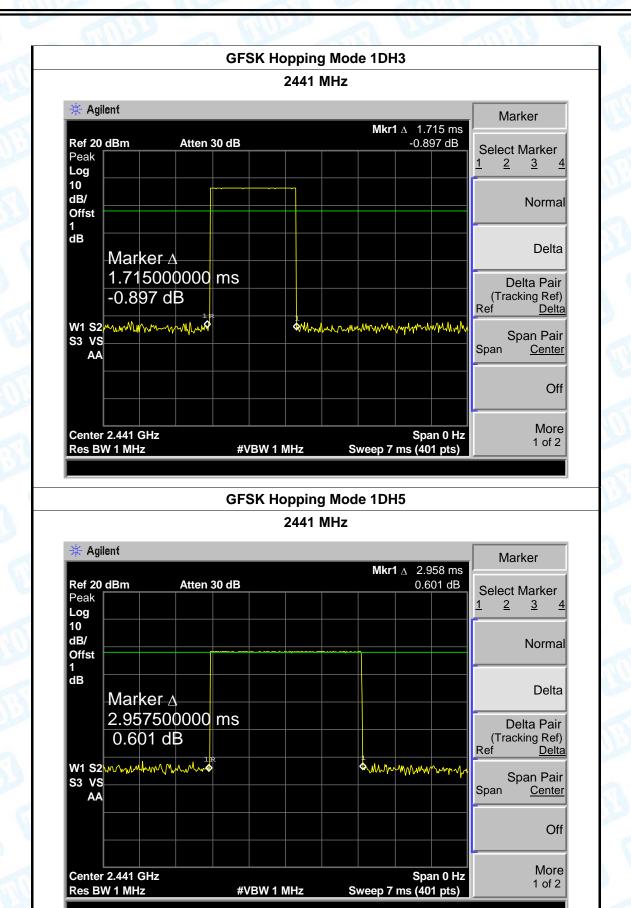
#### **GFSK Hopping Mode 1DH1**

#### 2441 MHz





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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	DC 3.8V		19

**Test Mode:** Hopping Mode ( π /4-DQPSK)

Test	Channel	Pulse	Total of Dwell	Period Time	Limit	Result
Mode	(MHz)	Time (ms)	(ms)	(s)	(ms)	Nesuit
2DH1	2441	0.420	134.40	31.60	400	PASS
2DH3	2441	1.6975	271.60	31.60	400	PASS
2DH5	2441	2.9575	315.47	31.60	400	PASS

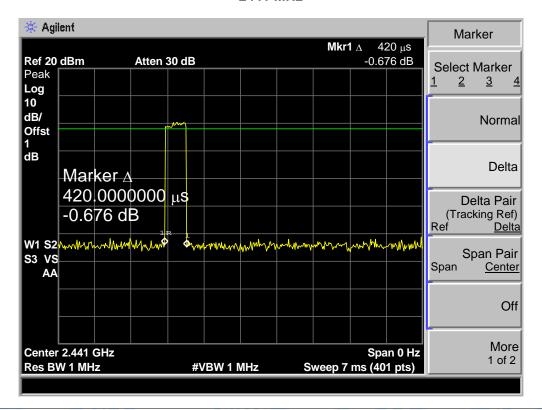
2DH1 Total of Dwell= Pulse Time\*(1600/2)\*31.6/79

2DH3 Total of Dwell= Pulse Time\*(1600/4)\*31.6/79

2DH5 Total of Dwell= Pulse Time\*(1600/6)\*31.6/79

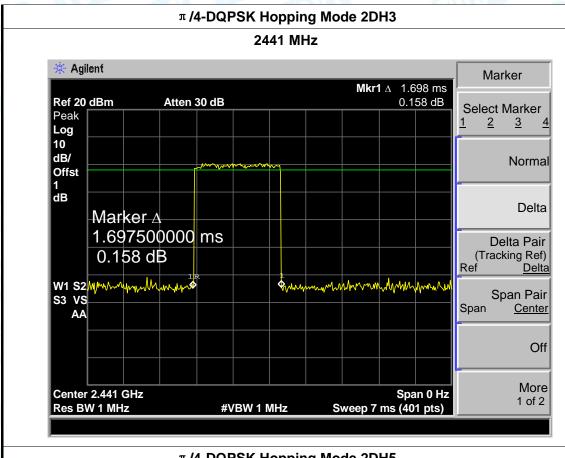
#### π /4-DQPSK Hopping Mode 2DH1

#### 2441 MHz



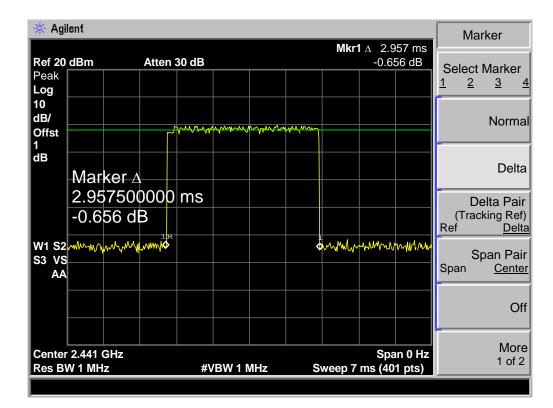


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л /4-DQPSK Hopping Mode 2DH5







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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	DC 3.8V		19.11

lest voltage: DC 3.8V

Test Mode: Hopping Mode (8-DPSK)

Test	Channel	Pulse	Total of Dwell	Period Time	Limit	Result
Mode	(MHz)	Time (ms)	(ms)	(s)	(ms)	Result
3DH1	2441	0.420	134.40	31.60	400	PASS
3DH3	2441	1.7325	277.20	31.60	400	PASS
3DH5	2441	2.9400	313.60	31.60	400	PASS

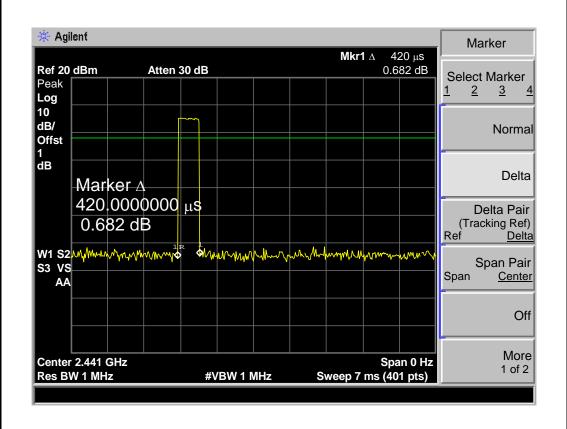
2DH1 Total of Dwell= Pulse Time\*(1600/2)\*31.6/79

2DH3 Total of Dwell= Pulse Time\*(1600/4)\*31.6/79

2DH5 Total of Dwell= Pulse Time\*(1600/6)\*31.6/79

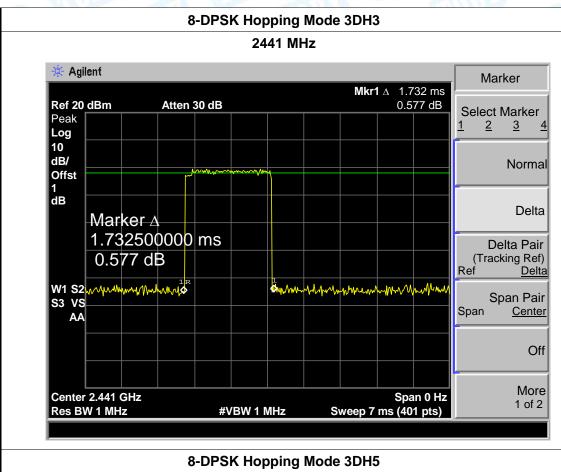
#### 8-DPSK Hopping Mode 3DH1

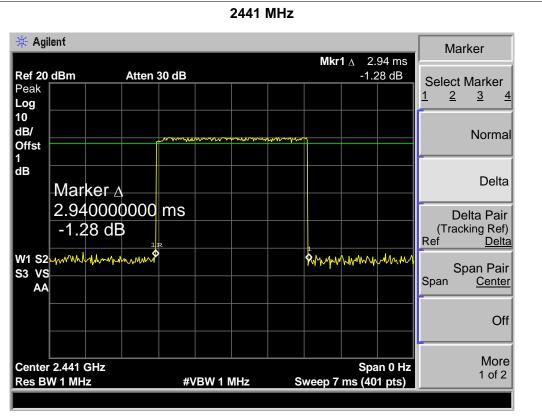
#### 2441 MHz





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# 9. Channel Separation and Bandwidth Test

#### 9.1 Test Standard and Limit

9.1.1 Test Standard FCC Part 15.247

9.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	<=1 MHz (20dB bandwidth)	2400~2483.5
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5

## 9.2 Test Setup



## 9.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Channel Separation: RBW=30 kHz, VBW=100 kHz.

Bandwidth: RBW=30 kHz, VBW=100 kHz.

- (3) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
  - (4) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:30 kHz, and Video Bandwidth:100 kHz. Sweep Time set auto.

# 9.4 EUT Operating Condition

The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Bandwidth Test.



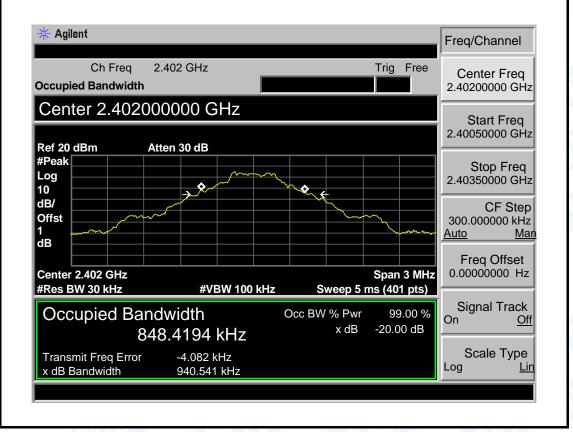
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### 9.5 Test Data

EUT: ROCK X11		Model Name :	ROCK X11			
Temperature: 25°C		Relative Humidity:	55%			
Test Voltage: DC 3.8V						
Test Mode: TX Mode (GFSK)			CHILLES .	7 1100		
Channel frequency (MHz)		99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)		
2402		848.4194	940.541			
2441		848.9176	937.779			
2480		861.2499	937.840			
GFSK TX Mode						

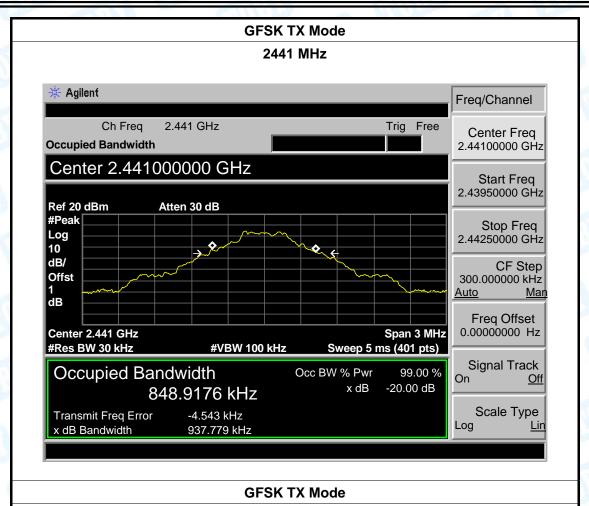
#### JESK IX Mode

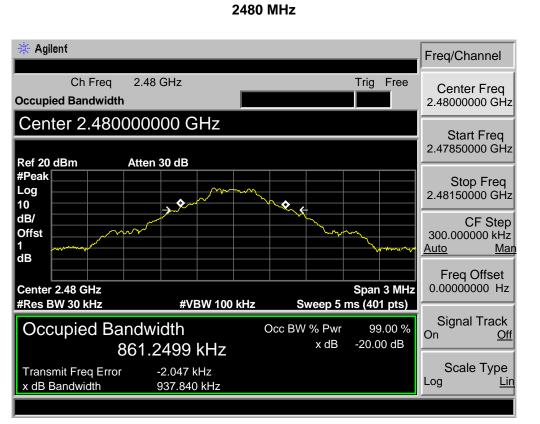
#### 2402 MHz





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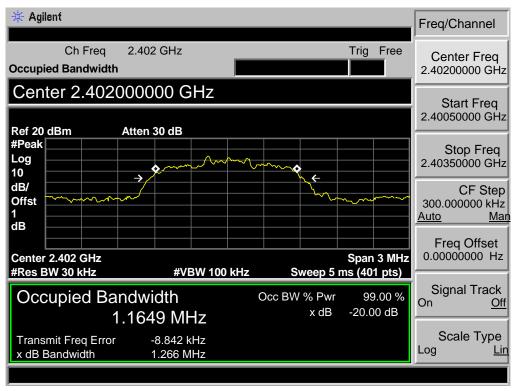






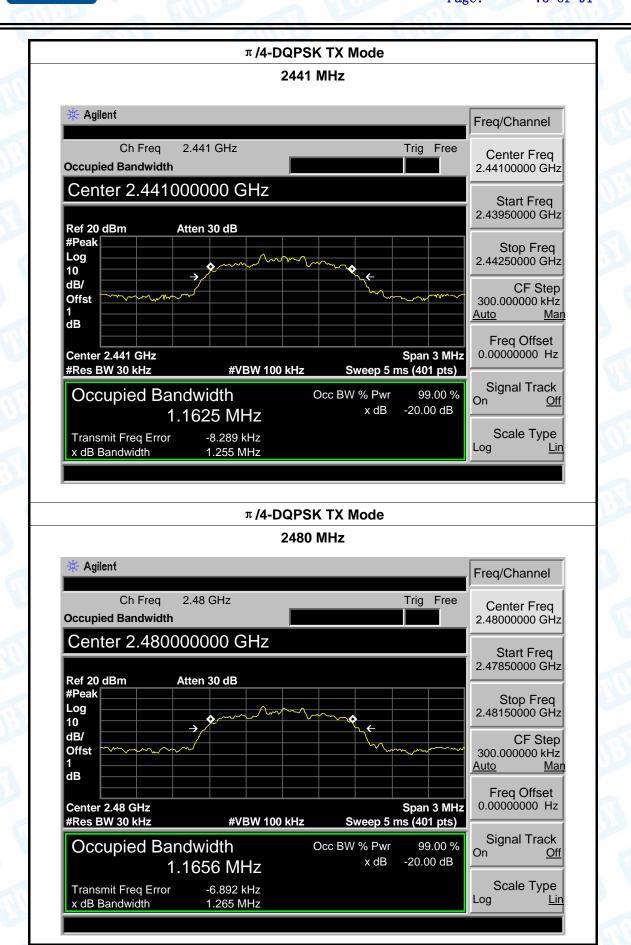
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0.11			CINE C				
EUT:	ROCK X11		Model Name :	ROCK X11			
Temperature:	25°	C	Relative Humidity:	55%			
Test Voltage:	DC	3.8V		1333			
Test Mode:	TX	Mode (π/4-DQPSK)	W CO				
Channel frequent	ncy	99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)			
2402		1164.90	1266.00	844.00			
2441		1162.50	1255.00	836.67			
2480		1165.60	1265.00	843.33			
π /4-DQPSK TX Mode							
	2402 MHz						





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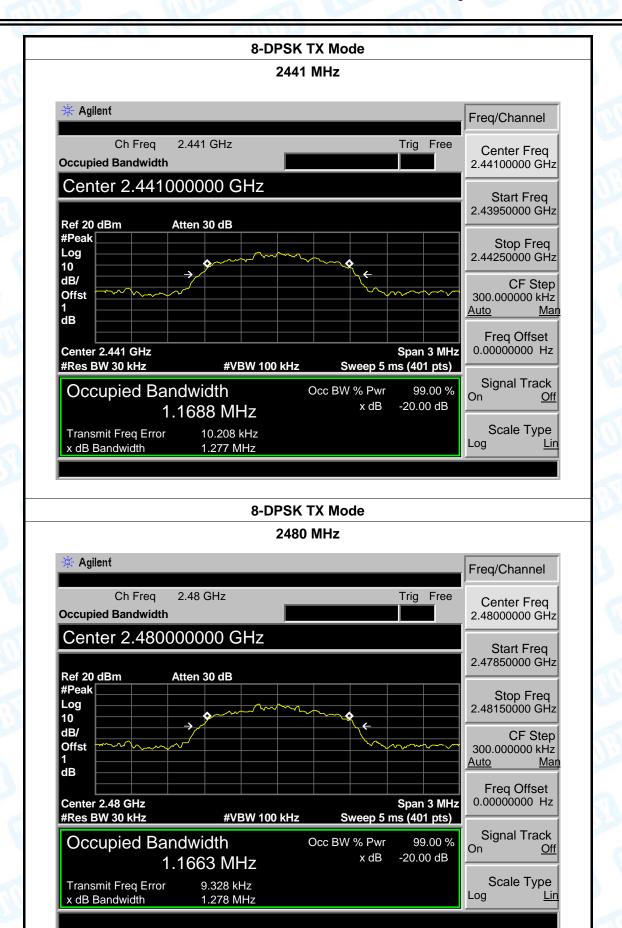


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UT:	ROCK X	ROCK X11		
emperature:	25℃	D. C.	Relative Humidity:	55%
est Voltage:	DC 3.8V	611	NA CONTRACTOR NA	
est Mode:	TX Mode	e (8-DPSK)		THE PERSON NAMED IN
hannel freque (MHz)	ncy	99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)
2402		1167.60	1269.00	846.00
2441		1168.80	1277.00	851.33
2480		1166.30	1278.00	852.00
		8-DPSK 1	ΓX Mode	
				Freq/Channel
Ch F		02 GHz	Trig Free	Center Freq 2.40200000 GHz
Center 2.  Ref 20 dBm #Peak Log 10	dwidth 402000		Trig Free	Center Freq 2.40200000 GHz Start Freq 2.40050000 GHz Stop Freq 2.40350000 GHz
Center 2.  Ref 20 dBm #Peak Log	Atter	000 GHz	Span 3 MHz Sweep 5 ms (401 pts)	Center Freq 2.40200000 GHz  Start Freq 2.40050000 GHz  Stop Freq 2.40350000 GHz  CF Step 300.0000000 kHz Auto Man  Freq Offset 0.000000000 Hz
Center 2.  Ref 20 dBm #Peak Log 10 dB/ Offst 1 dB  Center 2.402 G	Atter  Atter  BHz Hz  1.16	000 GHz 130 dB #VBW 100 kHz	Span 3 MHz	Center Freq 2.40200000 GHz  Start Freq 2.40050000 GHz  Stop Freq 2.40350000 GHz  CF Step 300.000000 kHz Auto Man  Freq Offset



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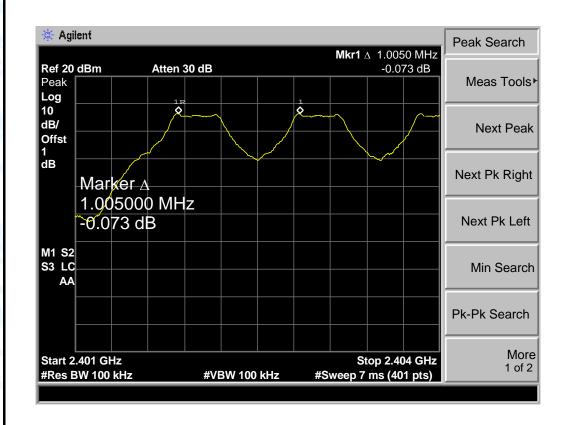
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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	DC 3.8V		
	11 M . I . (OFOIO)		- 1 / 1 / 1 / 2 mg

Test Mode: Hopping Mode (GFSK)

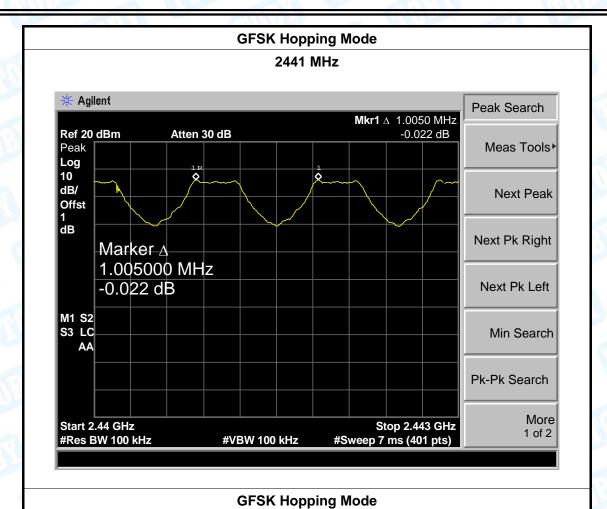
Channel frequency	Separation Read Value	Separation Limit
(MHz)	(kHz)	(kHz)
2402	1005.00	940.541
2441	1005.00	937.779
2480	1005.00	937.840

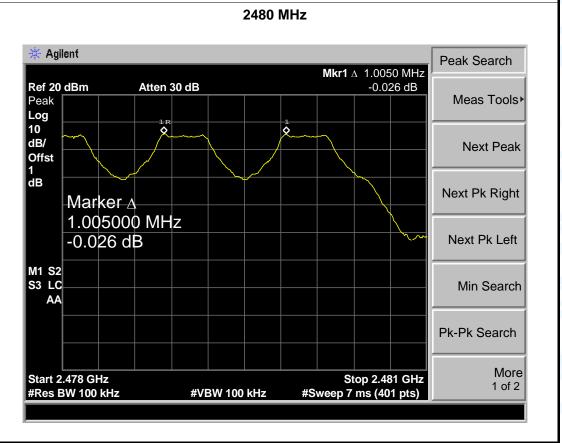
### **GFSK Hopping Mode**





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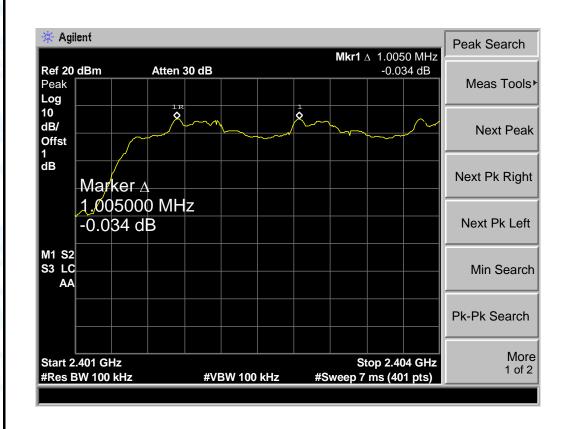
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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	DC 3.8V		

**Test Mode:** Hopping Mode ( π /4-DQPSK)

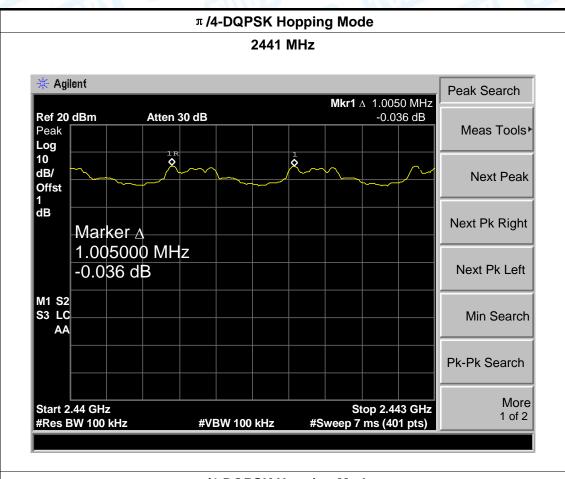
Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit (kHz)
2402	1005.00	844.00
2441	1005.00	836.67
2480	1005.00	843.33

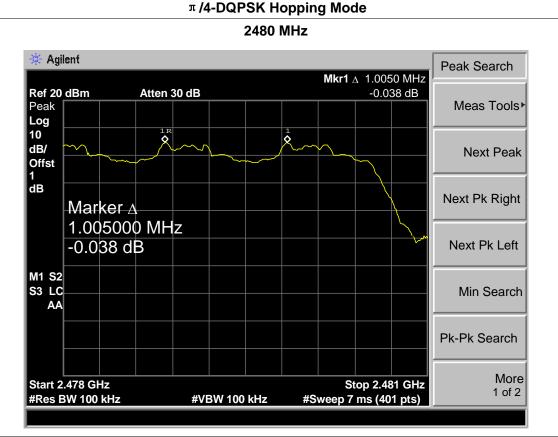
### π/4-DQPSK Hopping Mode





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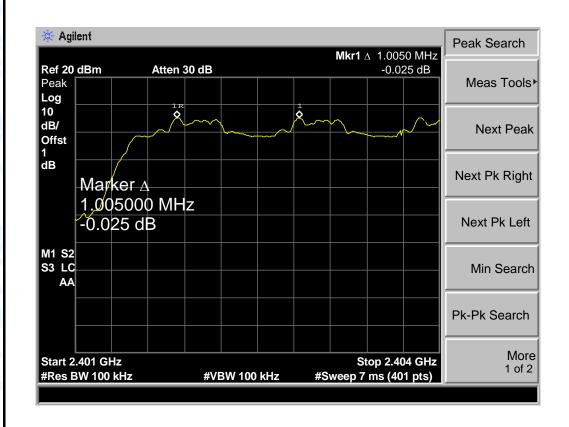
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EUT:	ROCK X11	Model Name :	ROCK X11
Temperature:	25℃	Relative Humidity:	55%
Test Voltage:	DC 3.8V		
	11 ' 14 1 (0 DD01()		Sec. 4.1.4.1.4.20

Test Mode: Hopping Mode (8-DPSK)

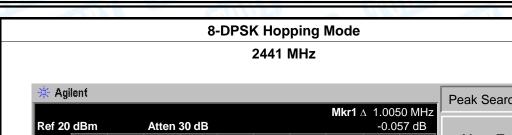
Channel frequency	Separation Read Value	Separation Limit	
(MHz)	(kHz)	(kHz)	
2402	1005.00	846.00	
2441	1005.00	851.33	
2480	1005.00	852.00	

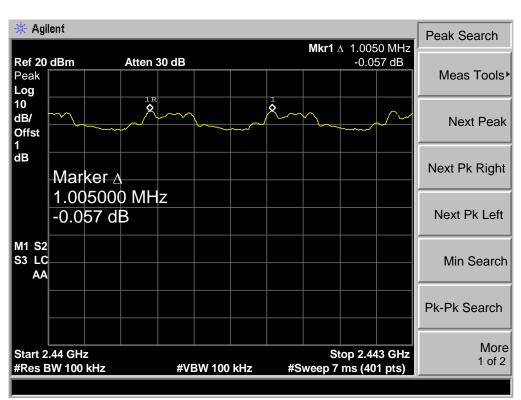
### 8-DPSK Hopping Mode





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#### 8-DPSK Hopping Mode 2480 MHz 🔆 Agilent Peak Search Mkr1 A 1.0050 MHz Atten 30 dB -0.045 dB Ref 20 dBm Meas Tools▶ Peak Log 10 dB/ Next Peak Offst dB Next Pk Right Marker A 1.005000 MHz -0.045 dB Next Pk Left M1 S2 S3 LC Min Search AΑ Pk-Pk Search More Stop 2.481 GHz Start 2.478 GHz 1 of 2 #Res BW 100 kHz **#VBW 100 kHz** #Sweep 7 ms (401 pts)



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# 10. Peak Output Power Test

# 10.1 Test Standard and Limit

10.1.1 Test Standard FCC Part 15.247 (b) (1)

10.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm) Other <125 mW(21dBm)	2400~2483.5

# 10.2 Test Setup



# 10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Peak Detector: RBW=1 MHz, VBW=3 MHz for bandwidth less than 1MHz. RBW=3 MHz, VBW=3 MHz for bandwidth more than 1MHz.

# 10.4 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.



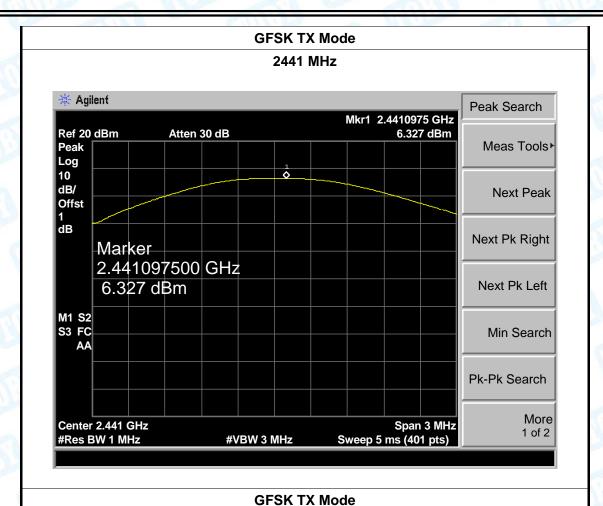
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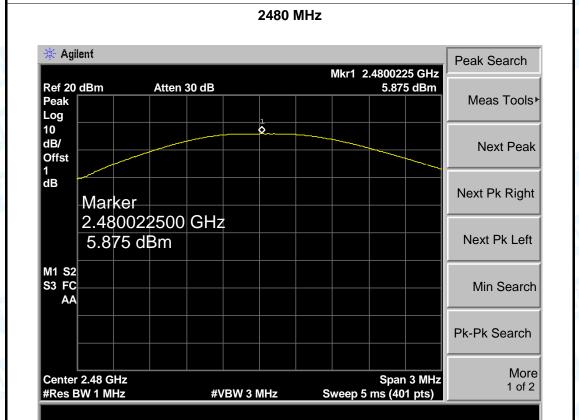
# 10.5 Test Data

IT:		ROCK X11 25℃		Model Name :	ROCK X11
nperat	ure:			Relative Humidity:	55%
st Volta	ge:	DC 3.8V		COLD STATE	a William
st Mode	<b>)</b> :	TX Mode	e (GFSK)		13
hannel frequency (MHz) Test Result (dBm)		t (dBm) L	imit (dBm)		
	2402		6.710	)	
	2441		6.327	7	30
	2480		5.875	5	
			GFSK TX	Mode	
			2402 M	lHz	
Ref 20 Peak		Atten 3		6.71 dBm	Meas Tools
Log 10 dB/ Offst 1 dB			1		Next Peak
10 dB/ Offst 1	Mark 2.402				
10 dB/ Offst 1	2.402	er 2060000 I dBm			Next Peak
10 dB/ Offst 1	2.402 6.71	2060000			Next Peak  Next Pk Right
10 dB/ Offst 1 dB M1 S2 S3 FC	2.402 6.71	2060000			Next Peak  Next Pk Right  Next Pk Left



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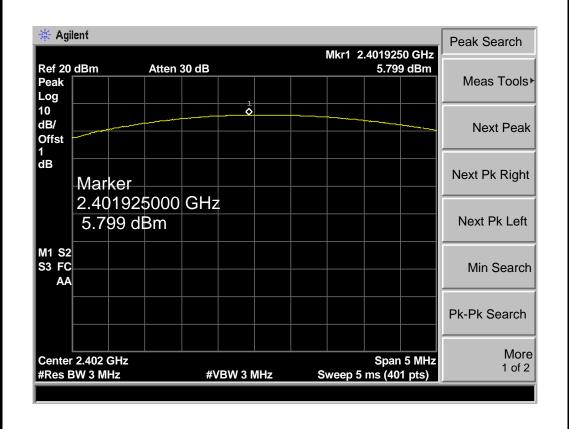




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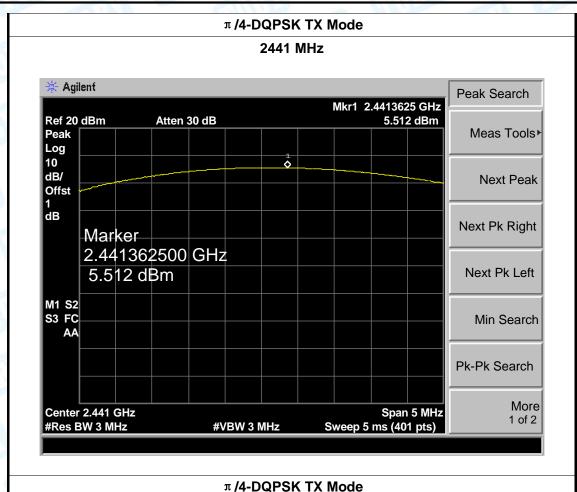
EUT:	ROCK X1	1 [1]	Model Name :	ROCK X11
Temperature:	25℃		Relative Humidity:	55%
Test Voltage:	DC 3.8V	N. C.		773
Test Mode:	TX Mode	( π /4-DQPSK)		
Channel frequen	cy (MHz)	Test Result	(dBm)	imit (dBm)
2402		5.799		
2441		5.512		21
2480		5.026		
		π /4-DQPSK T	TX Mode	

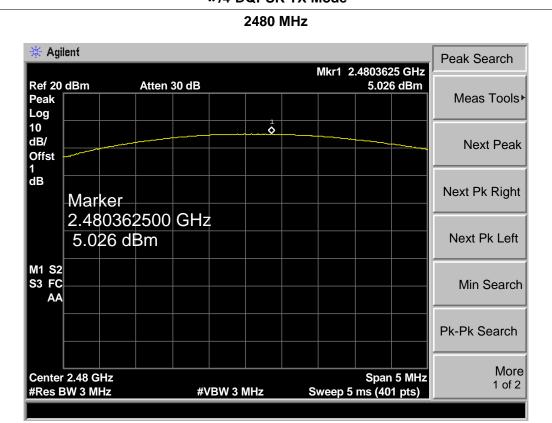
#### \_\_\_\_\_





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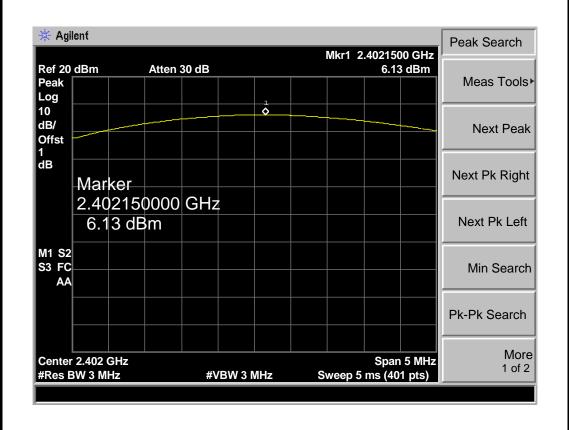






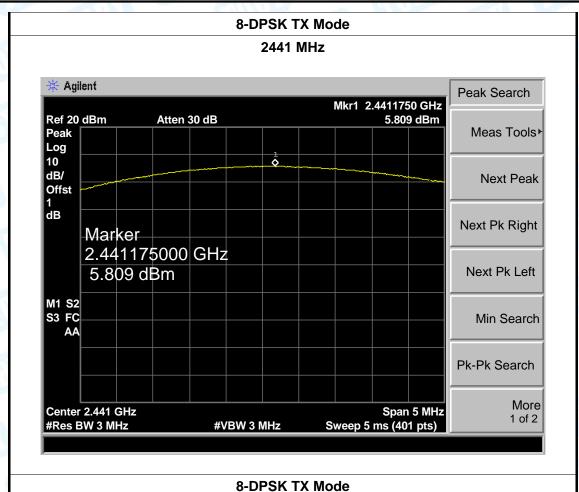
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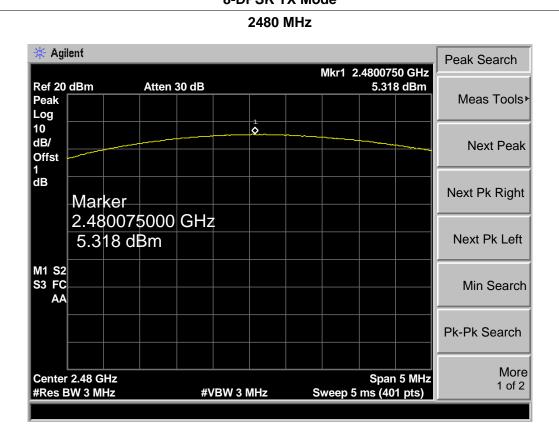
EUT:	ROCK X1	1	Model Name :	ROCK X11	
Temperature:	25℃		Relative Humidity:	55%	
Test Voltage:	DC 3.8V	N. S. C.		130	
Test Mode:	TX Mode	le (8-DPSK)			
Channel frequency (MHz)		Test Result	(dBm) L	imit (dBm)	
2402		6.130	)		
2441		5.809			
2480		5.318			
		8-DPSK TX	Mode		





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# 11. Antenna Requirement

# 11.1 Standard Requirement

11.1.1 Standard FCC Part 15.203

### 11.1.2 Requirement

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

### 11.2 Antenna Connected Construction

The directional gains of the antenna used for transmitting is 1.15dBi, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

### 11.3 Result

The EUT antenna is a PIFA Antenna. It complies with the standard requirement.

Antenna Type		
Die Co	Permanent attached antenna	With the
a Turk	⊠Unique connector antenna	
No.	Professional installation antenna	100

----END OF REPORT----