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District, Shenzhen, Guangdong, China 518057

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FCC REPORT

Application No:SZEM1506003812CRApplicant:The House of Marley.LLCManufacturer:The House of Marley.LLC

Factory: Shenzhen 3Nod Digital Technology Co., Ltd.

Product Name: CHANT SPORT

Model No.(EUT): EM-JA009

Trade Mark:

FCC ID: PVB-CHANTSPORT

Standards: 47 CFR Part 15, Subpart C (2014)

Date of Receipt: 2015-07-01

Date of Test: 2015-07-07 to 2015-07-15

Date of Issue: 2015-07-20

Test Result: PASS *

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

Authorized Signature:



Jack Zhang EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.



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2 Version

Revision Record						
Version Chapter Date Modifier Remark						
00		2015-07-20		Original		

Authorized for issue by:		
Tested By	Eric Fu	2015-07-15
	(Eric Fu) /Project Engineer	Date
Prepared By	Jarole Chen	2015-07-20
	(Jade Chen) /Clerk	Date
Checked By	Emen-Li	2015-07-20
	(Emen Li) /Reviewer	Date



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3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 (2009)	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 (2009)	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10 (2009)	PASS
20dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Carrier Frequencies Separation	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Hopping Channel Number	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Dwell Time	47 CFR Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009)	PASS
Pseudorandom Frequency Hopping Sequence	47 CFR Part 15, Subpart C Section 15.247(b)(4)&TCB Exclusion List (7 July 2002)	ANSI C63.10 (2009)	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2009)	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2009)	PASS
Radiated Spurious emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2009)	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 (2009)	PASS



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5 General Information

5.1 Client Information

Applicant:	The House of Marley. LLC				
Address of Applicant:	3000 Pontiac Trail Commerce Township, Oaklang, Michigan, United States				
Manufacturer:	The House of Marley. LLC				
Address of Manufacturer:	3000 Pontiac Trail Commerce Township, Oaklang, Michigan, United States				
Factory:	Shenzhen 3Nod Digital Technology Co.,Ltd.				
Address of Factory:	Building D, No.8 Langhui Road, Tangxiayong Community, Songgang Street, Baoan District, Shenzhen City, Guangdong Province, P.R. China				

5.2 General Description of EUT

denotal becomplien of better				
CHANT SPORT				
EM-JA009				
M A R L E Y				
2402MHz~2480MHz				
V3.0				
Frequency Hopping Spread Spectrum(FHSS)				
GFSK, π/4DQPSK, 8DPSK				
79				
Adaptive Frequency Hopping systems				
Portable production				
Class II(manufacturer declare)				
Blue test 3				
Integral				
2.78dBi				
Battery: Lithium-ion battery: DC 3.7V 1800mAh(charge by USB)				
USB cable:100cm unshielded				



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Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

Note

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency	
The Lowest channel	2402MHz	
The Middle channel	2441MHz	
The Highest channel	2480MHz	



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5.3 Test Environment

Operating Environment	Operating Environment:				
Temperature:	25.0 °C				
Humidity:	53 % RH				
Atmospheric Pressure:	1005mbar				

5.4 Description of Support Units

The EUT has been tested independent unit.

5.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch E&E Lab,

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.





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5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

VCCI

The 10m Semi-anechoic chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• FCC – Registration No.: 556682

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

Industry Canada (IC)

Two 3m Semi-anechoic chambers of SGS-CSTC Standards Technical Services Co., Ltd. have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-2.

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.



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5.10 Equipment List

	Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)		
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	2016-05-13		
2	LISN	Rohde & Schwarz	ENV216	SEL0152	2015-10-24		
3	LISN	ETS-LINDGREN	3816/2	SEL0021	2016-05-13		
4	8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN- T8-02	SEL0162	2015-08-30		
5	4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN- T4-02	SEL0163	2015-08-30		
6	2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN- T2-02	SEL0164	2015-08-30		
7	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	2016-05-13		
8	Coaxial Cable	SGS	N/A	SEL0025	2016-05-13		
9	DC Power Supply	Zhao Xin	RXN-305D	SEL0117	2015-10-24		
10	Humidity/ Temperature Indicator	Shanhai Qixiang	ZJ1-2B	SEL0103	2015-10-24		
11	Barometer	Chang Chun	DYM3	SEL0088	2016-05-13		



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	RE in Chamber						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)		
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	2016-05-13		
2	EMI Test Receiver	Agilent Technologies	N9038A	SEL0312	2015-09-16		
3	EMI Test software	AUDIX	E3	SEL0050	N/A		
4	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0015	2015-10-24		
5	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0006	2015-10-24		
6	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2015-10-24		
7	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	2016-05-13		
8	Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEL0168	2015-10-24		
9	Coaxial cable	SGS	N/A	SEL0027	2016-05-13		
10	Coaxial cable	SGS	N/A	SEL0189	2016-05-13		
11	Coaxial cable	SGS	N/A	SEL0121	2016-05-13		
12	Coaxial cable	SGS	N/A	SEL0178	2016-05-13		
13	Band filter	Amindeon	82346	SEL0094	2016-05-13		
14	Barometer	Chang Chun	DYM3	SEL0088	2016-05-13		
15	DC Power Supply	Zhao Xin	RXN-305D	SEL0117	2015-10-24		
16	Humidity/ Temperature Indicator	Shanhai Qixiang	ZJ1-2B	SEL0103	2015-10-24		
17	Signal Generator (10M-27GHz)	Rohde & Schwarz	SMR27	SEL0067	2016-05-13		
18	Signal Generator	Rohde & Schwarz	SMY01	SEL0155	2015-10-24		
19	Loop Antenna	Beijing Daze	ZN30401	SEL0203	2016-05-13		



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	RF connected test				
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Due date (yyyy-mm-dd)
1	DC Power Supply	Zhao Xin	RXN-305D	SEL0117	2015-10-24
2	Humidity/ Temperature Indicator	HYGRO	ZJ1-2B	SEL0033	2015-10-24
3	Spectrum Analyzer	Rohde & Schwarz	FSP	SEL0154	2015-10-24
4	Coaxial cable	SGS	N/A	SEL0178	2016-05-13
5	Coaxial cable	SGS	N/A	SEL0179	2016-05-13
6	Barometer	ChangChun	DYM3	SEL0088	2016-05-13
7	Signal Generator	Rohde & Schwarz	SML03	SEL0068	2016-04-25
8	Band filter	amideon	82346	SEL0094	2016-05-13
9	POWER METER	R&S	NRVS	SEL0144	2015-10-24
10	Attenuator	Beijin feihang taida	TST-2-6dB	SEL0205	2016-04-25
11	Power Divider(splitter)	Agilent Technologies	11636B	SEL0130	2015-10-24

Note: The calibration interval is one year, all the instruments are valid.



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6 Test results and Measurement Data

6.1 Antenna Requirement

Standard requirement: 47 CFR Part 15C Section 15.203 /247(c)

15.203 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, 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:



The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 2.78dBi.



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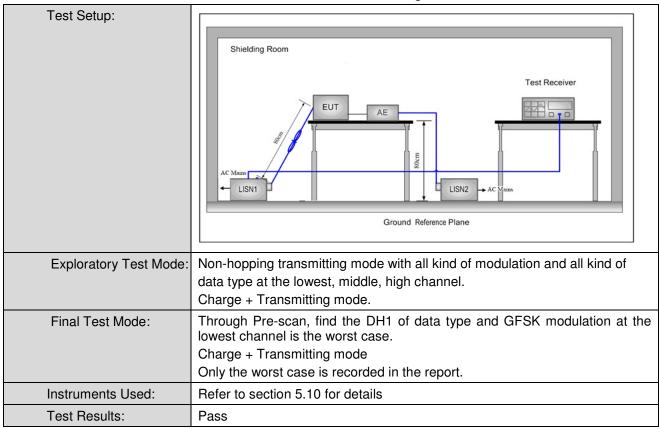
6.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207			
Test Method:	ANSI C63.10: 2009			
Test Frequency Range:	150kHz to 30MHz			
Limit:	For the Author	Limit (d	IBuV)	
	Frequency range (MHz)	Quasi-peak	Average	
	0.15-0.5	66 to 56*	56 to 46*	
	0.5-5	56	46	
	5-30	60	50	
	* Decreases with the logarithn	n of the frequency.		
Test Procedure:	 5-30 60 50 Decreases with the logarithm of the frequency. The mains terminal disturbance voltage test was conducted in a shield room. The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + Slinear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EU was placed on the horizontal ground reference plane, The test was performed with a vertical ground reference plane. The rea of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement. 			



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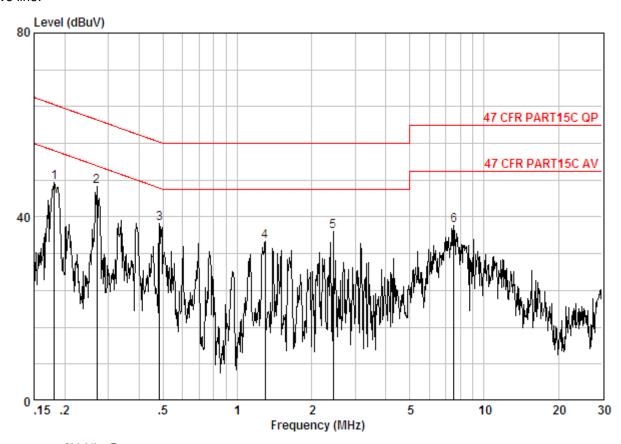
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Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



Site : Shielding Room

Condition : 47 CFR PART15C AV CE LINE

Job No. : 3812CR Test Mode: : TX+charge

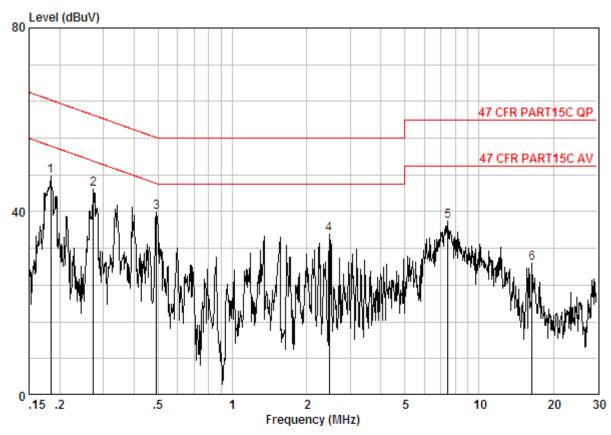
	Freq		LISN Factor					Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.18152	0.02	9.83	37.71	47.56	54.42	-6.86	Peak
2	0.27009	0.01	9.84	36.81	46.66	51.12	-4.46	Peak
3	0.48375	0.01	9.86	28.72	38.59	46.27	-7.68	Peak
4	1.296	0.02	9.91	24.64	34.57	46.00	-11.43	Peak
5	2.448	0.02	9.99	26.88	36.89	46.00	-9.11	Peak
6	7.526	0.01	10.15	28.08	38.24	50.00	-11.76	Peak



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Neutral line:



Site : Shielding Room

Condition : 47 CFR PART15C AV CE NEUTRAL

Job No. : 3812CR Test Mode: : TX+charge

	Freq		LISN Factor					Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.18346	0.02	9.83	37.81	47.66	54.33	-6.67	Peak
2	0.27297	0.01	9.86	35.08	44.95	51.03	-6.08	Peak
3	0.49150	0.01	9.88	30.10	39.99	46.14	-6.16	Peak
4	2.474	0.02	10.12	24.89	35.03	46.00	-10.97	Peak
5	7.486	0.01	10.13	27.71	37.85	50.00	-12.15	Peak
6	16.398	0.02	10.27	18.43	28.72	50.00	-21.28	Peak

Notes:

- 1. The following Quasi-Peak and Average measurements were performed on the EUT:
- 2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.



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6.3 Conducted Peak Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(1)		
Test Method:	ANSI C63.10:2009		
Test Setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane Remark: Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.		
Limit:	30dBm		
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type		
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of $\pi/4DQPSK$ modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.		
Instruments Used:	Refer to section 5.10 for details		
Test Results:	Pass		





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Measurement Data

	GFSK mode				
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result		
Lowest	1.85	30.00	Pass		
Middle	3.50	30.00	Pass		
Highest	4.90	30.00	Pass		
	π/4DQPSK mode				
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result		
Lowest	2.73	30.00	Pass		
Middle	4.31	30.00	Pass		
Highest	5.32	30.00	Pass		
	8DPSK mo	de			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result		
Lowest	2.99	30.00	Pass		
Middle	4.59	30.00	Pass		
Highest	5.46	30.00	Pass		

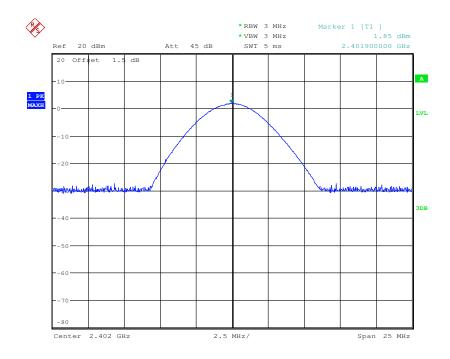


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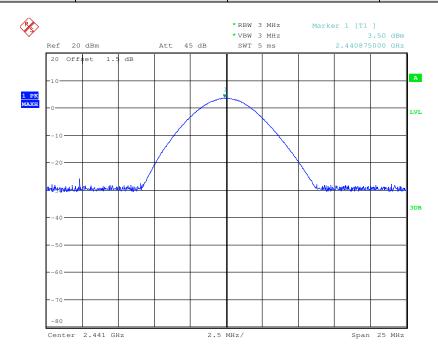
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Test plot as follows:

Test mode: GFSK Test channel: Lowest





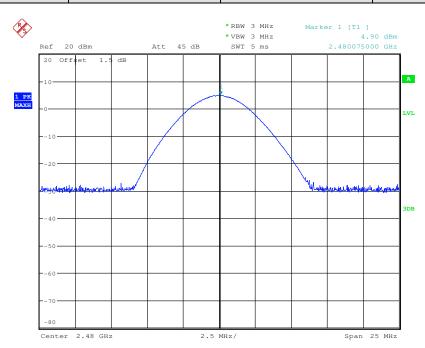


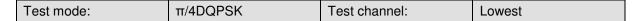


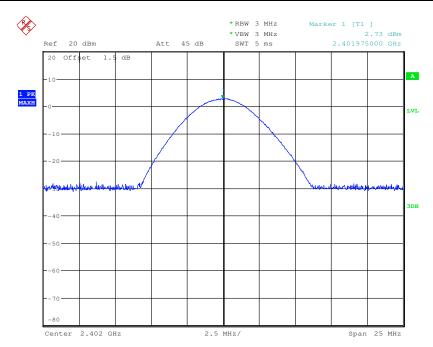
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Test mode: GFSK Test channel: Highest





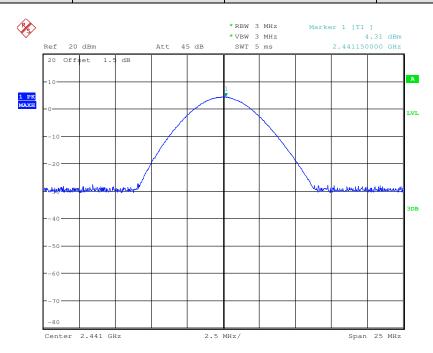




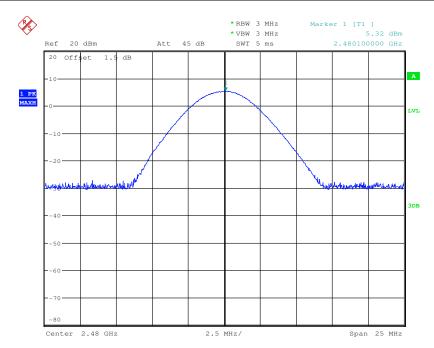
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Test mode: π/4DQPSK Test channel: Middle





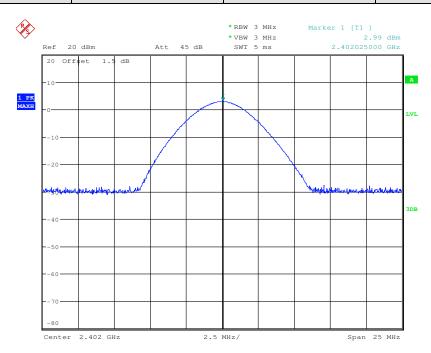




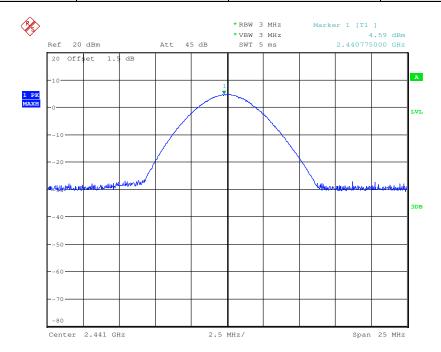
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Test mode: 8DPSK Test channel: Lowest





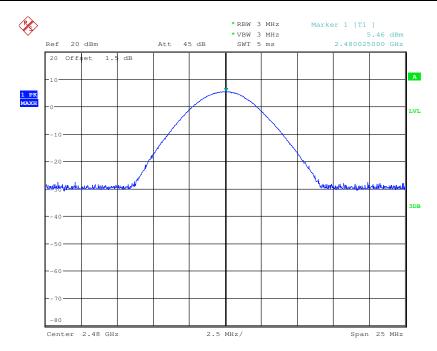




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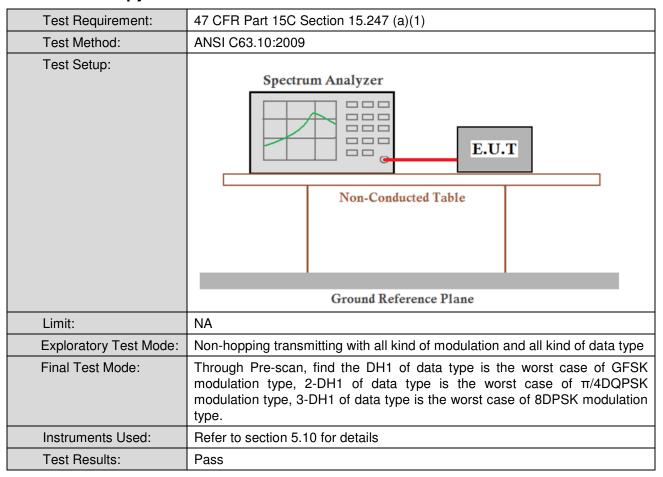




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6.4 20dB Occupy Bandwidth



Measurement Data

Toot abannal	2	20dB Occupy Bandwidth (kHz	<u>z</u>)
Test channel	GFSK	π/4DQPSK	8DPSK
Lowest	879	1218	1215
Middle	873	1218	1215
Highest	876	1221	1212

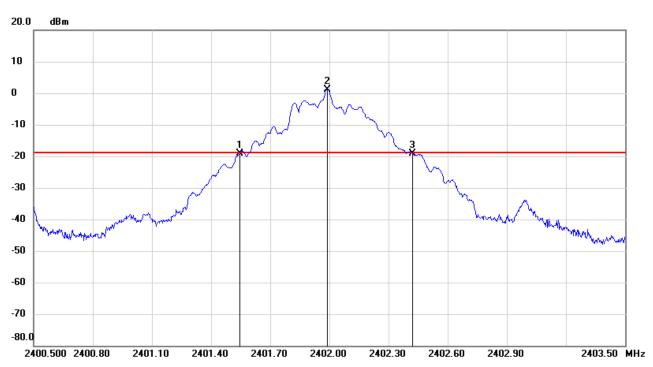


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Test plot as follows:





No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.5440	-19.02	-18.77	-0.25
2	2401.9910	1.23	-18.77	20.00
3	2402.4230	-19.12	-18.77	-0.35

No.		〉Frequency(MHz)	〉Level(dB)
1	mk3-mk1	0.879	-0.1



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.5440	-17.08	-17.07	-0.01
2	2440.9910	2.93	-17.07	20.00
3	2441.4170	-17.10	-17.07	-0.03

No.		〉Frequency(MHz)	› Level(dB)
1	mk3-mk1	0.873	-0.02



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.5410	-15.81	-15.71	-0.10
2	2479.9910	4.29	-15.71	20.00
3	2480.4170	-15.73	-15.71	-0.02

No.		> Frequency(MHz)	› Level(dB)
1	mk3-mk1	0.876	0.08





-70 -80.0

2400.500 2400.80

2401.10

2401.40

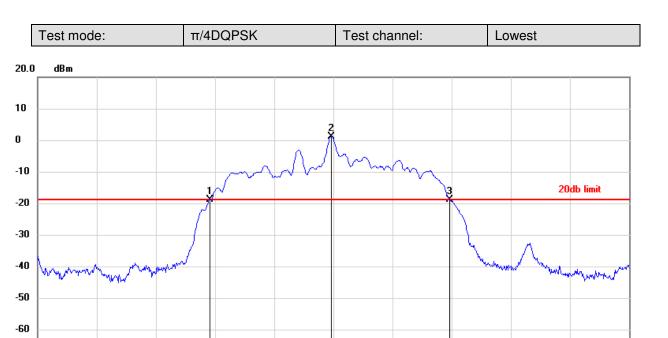
2401.70

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2403.50 MHz

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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.3730	-18.86	-18.76	-0.10
2	2401.9880	1.24	-18.76	20.00
3	2402.5910	-18.84	-18.76	-0.08

2402.00

2402.30

2402.60

2402.90

No.		〉Frequency(MHz)	› Level(dB)
1	mk3-mk1	1.218	0.02



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.3700	-17.38	-17.08	-0.30
2	2440.9910	2.92	-17.08	20.00
3	2441.5880	-17.12	-17.08	-0.04

No.		〉Frequency(MHz)	〉Level(dB)
1	mk3-mk1	1.218	0.26



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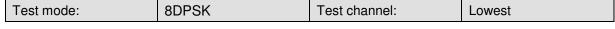
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.3700	-15.79	-15.68	-0.11
2	2479.9910	4.32	-15.68	20.00
3	2480.5910	-15.91	-15.68	-0.23

No.		〉Frequency(MHz)	› Level(dB)
1	mk3-mk1	1.221	-0.12



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.3970	-18.93	-18.76	-0.17
2	2401.9910	1.24	-18.76	20.00
3	2402.6120	-19.26	-18.76	-0.50

No.		› Frequency(MHz)	〉Level(dB)
1	mk3-mk1	1.215	-0.33



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.3970	-17.27	-17.05	-0.22
2	2440.9910	2.95	-17.05	20.00
3	2441.6120	-17.65	-17.05	-0.60

No.		> Frequency(MHz)	› Level(dB)
1	mk3-mk1	1.215	-0.38



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.4000	-15.81	-15.67	-0.14
2	2479.9910	4.33	-15.67	20.00
3	2480.6120	-16.14	-15.67	-0.47

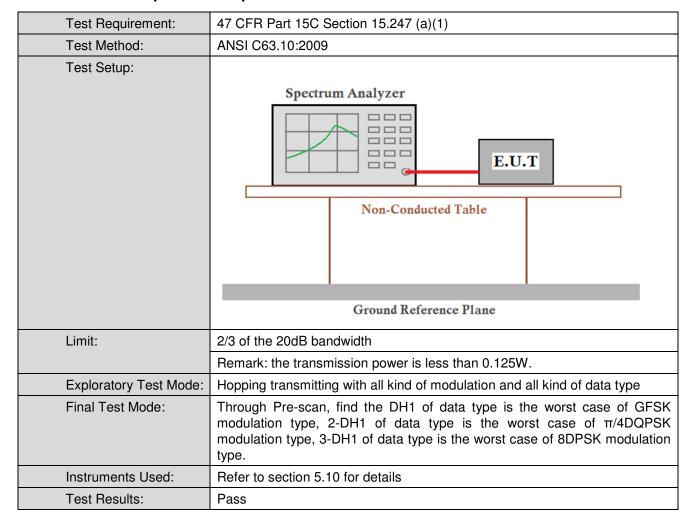
No.		〉Frequency(MHz)	〉Level(dB)
1	mk3-mk1	1.212	-0.33



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6.5 Carrier Frequencies Separation





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Measurement Data

GFSK mode				
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result	
Lowest	4000		Pass	
Middle	1000		Pass	
Highest	Highest 1002		Pass	
π/4DQPSK mode				
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result	
Lowest	1000		Pass	
Middle	Middle 1023		Pass	
Highest	1020	≥814	Pass	
8DPSK mode				
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result	
Lowest	1044		Pass	
Middle	1017		Pass	
Highest	Highest 990		Pass	

Note: According to section 6.4,

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	879	586
π/4DQPSK	1221	814
8DPSK	1215	810

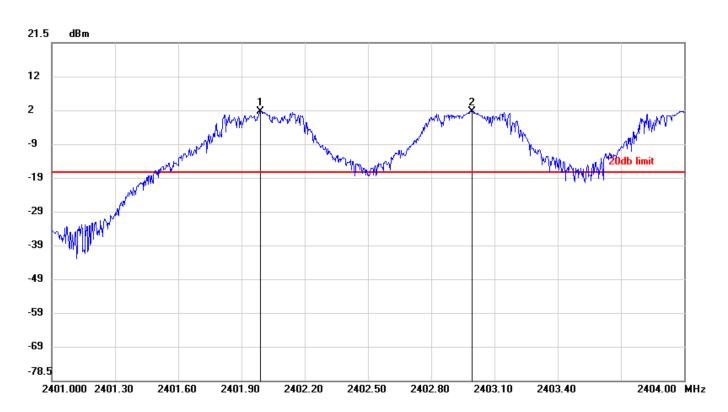


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Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest



No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.9900	1.04	-16.98	18.02
2	2402.9920	1.12	-16.98	18.10

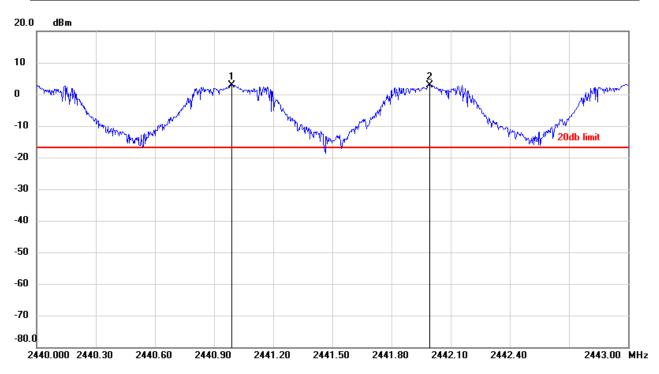
No.		〉Frequency(MHz)	› Level(dB)
1	mk2-mk1	1.002	0.08



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.9900	2.93	-16.98	19.91
2	2441.9920	2.97	-16.98	19.95

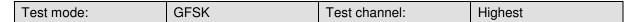
N	lo.		> Frequency(MHz)	› Level(dB)
	1	mk2-mk1	1.002	0.04

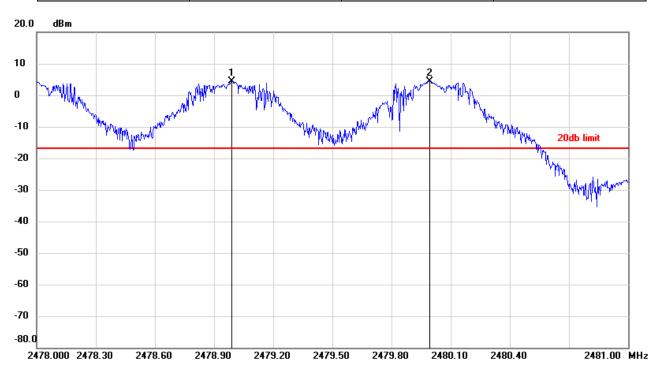




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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2478.9900	4.34	-16.98	21.32
2	2479.9920	4.39	-16.98	21.37

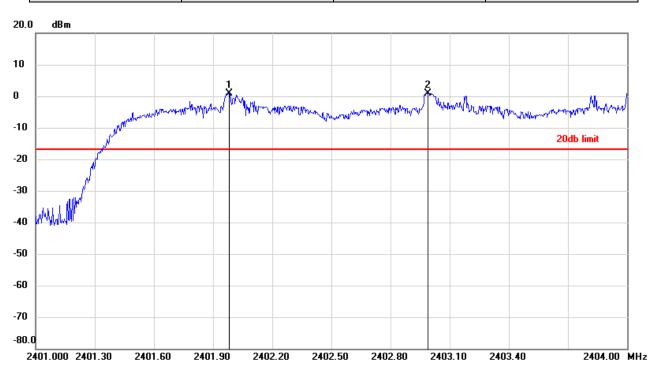
No.		> Frequency(MHz)	› Level(dB)
1	mk2-mk1	1.002	0.05



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.9810	0.87	-16.98	17.85
2	2402.9890	0.99	-16.98	17.97

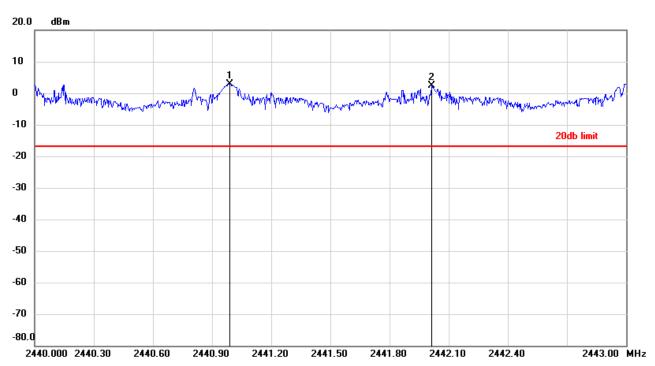
No.		> Frequency(MHz)	› Level(dB)
1	mk2-mk1	1.008	0.12



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.9900	2.81	-16.98	19.79
2	2442.0130	2.43	-16.98	19.41

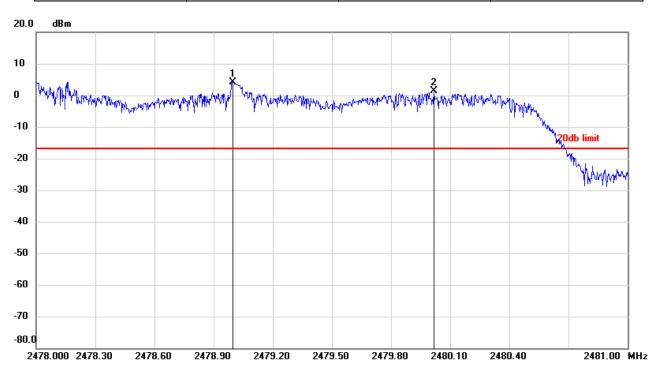
No.		〉Frequency(MHz)	〉Level(dB)
1	mk2-mk1	1.023	-0.38



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2478.9960	4.13	-16.98	21.11
2	2480.0160	1.32	-16.98	18.30

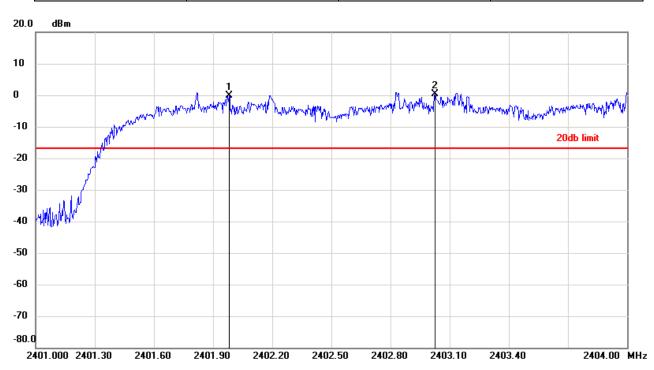
No.		〉Frequency(MHz)	› Level(dB)
1	mk2-mk1	1.02	-2.81



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.9810	-0.01	-16.98	16.97
2	2403.0250	0.26	-16.98	17.24

No.		〉Frequency(MHz)	〉Level(dB)
1	mk2-mk1	1.044	0.27



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.9720	2.38	-16.98	19.36
2	2441.9890	2.80	-16.98	19.78

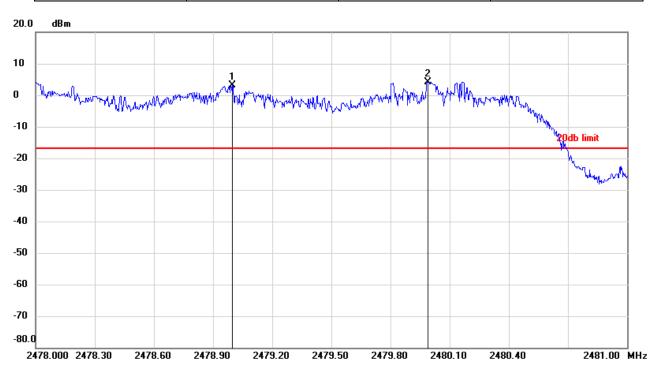
No.		〉Frequency(MHz)	〉Level(dB)
1	mk2-mk1	1.017	0.42



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2478.9990	3.08	-16.98	20.06
2	2479.9890	4.18	-16.98	21.16

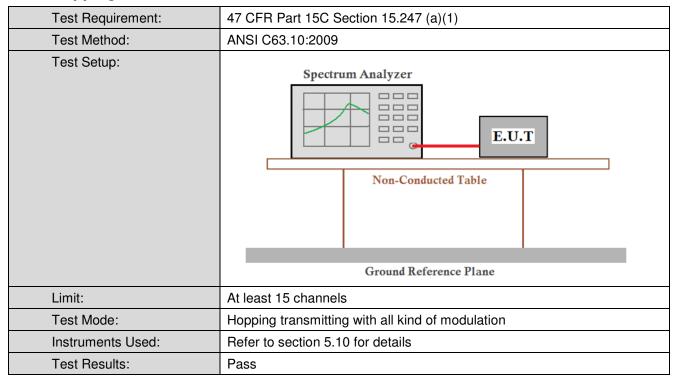
No.		〉Frequency(MHz)	〉Level(dB)
1	mk2-mk1	0.99	1.1



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6.6 Hopping Channel Number



Measurement Data

Mode	Hopping channel numbers	Limit
GFSK	79	≥15
π/4DQPSK	79	≥15
8DPSK	79	≥15

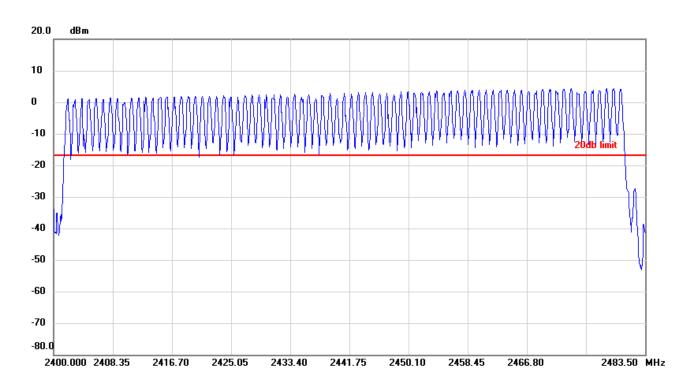


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Test plot as follows:



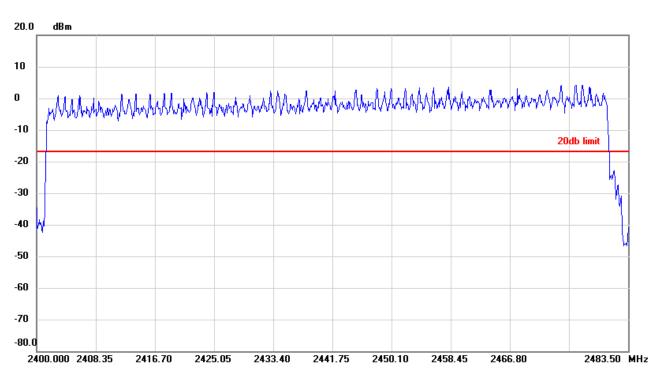




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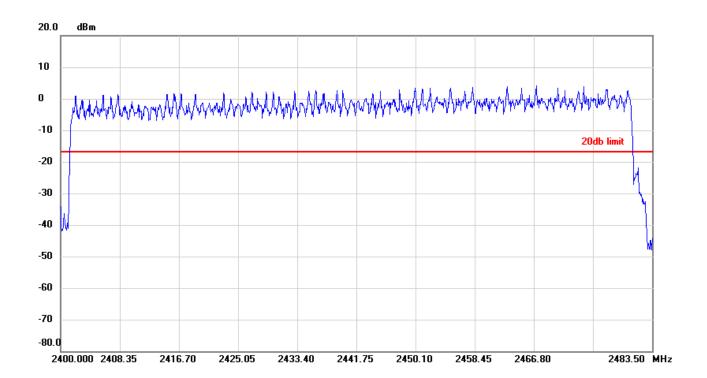




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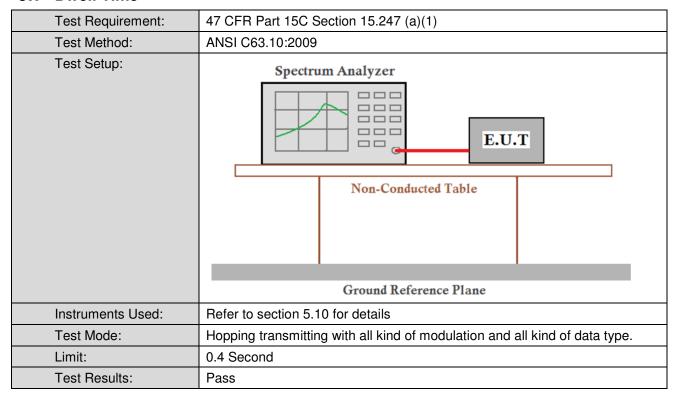




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6.7 Dwell Time



Measurement Data

Mode	Packet	Dwell time (second)	Limit (second)
	DH1	0.135	0.4
GFSK	DH3	0.253	0.4
	DH5	0.295	0.4
	2-DH1	0.139	0.4
π/4DQPSK	2-DH3	0.254	0.4
	2-DH5	0.295	0.4
	3-DH1	0.139	0.4
8DPSK	3-DH3	0.254	0.4
	3-DH5	0.295	0.4



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Remark:

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

The lowest channel (2402MHz), as below:

DH1 time slot=0. 423 (ms)*total number=135.36 (ms)

DH3 time slot=1. 686 (ms)^* total number = 252.9 (ms)

DH5 time slot=2.944 (ms)* total number = 294.4 (ms)

2-DH1 time slot=0. 434 (ms)*total number=138.88 (ms)

2-DH3 time slot=1.695 (ms)* total number = 254.25 (ms)

2-DH5 time slot= 2.948 (ms)^* total number = 294.8 (ms)

3-DH1 time slot=0.434 (ms)*total number=138.88 (ms)

3-DH3 time slot= 1.692 (ms)^* total number = 253.8 (ms)

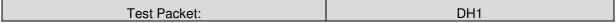
3-DH5 time slot= 2.952 (ms)^* total number = 295.2 (ms)

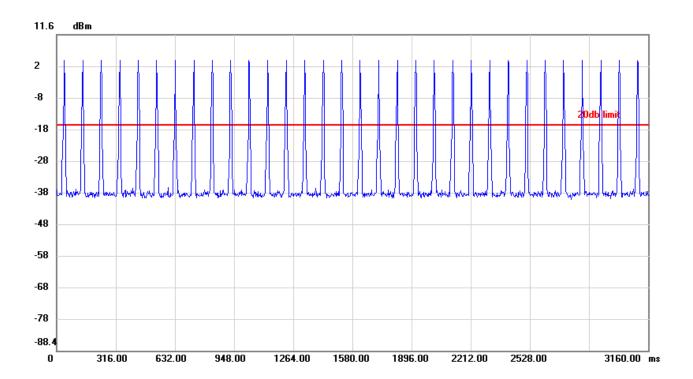


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Test plot as follows:

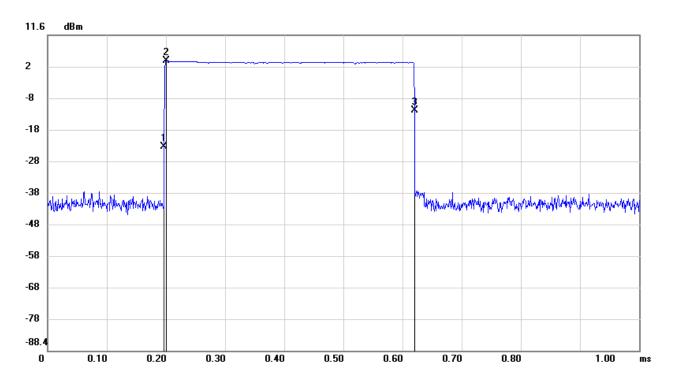






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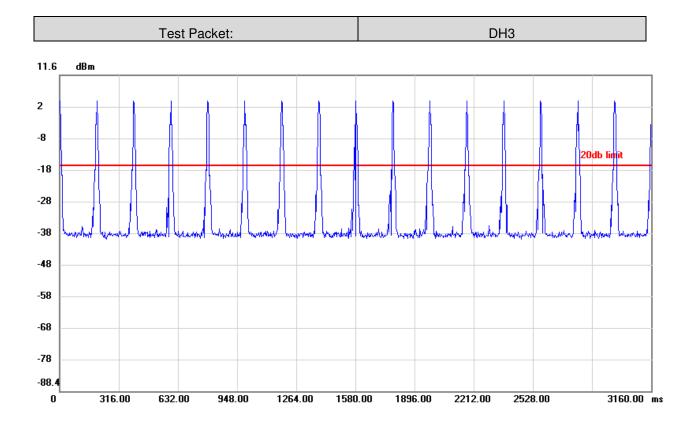
No.	Sweep time(ms)	Result(dBm)
1	0.1970	-23.84
2	0.2000	3.56
3	0.6200	-12.29

No.		〉Time(ms)	> Level(dB)
1	mk3-mk1	0.423	11.55



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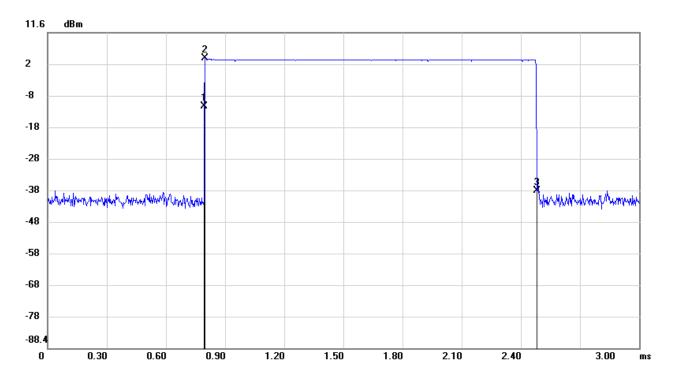
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No.	Sweep time(ms)	Result(dBm)
1	0.7950	-11.83
2	0.7980	3.50
3	2.4810	-38.59

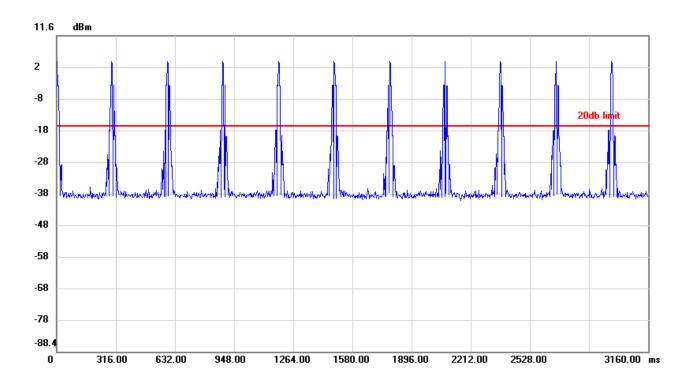
No.		> Time(ms)	› Level(dB)
1	mk3-mk1	1.686	-26.76



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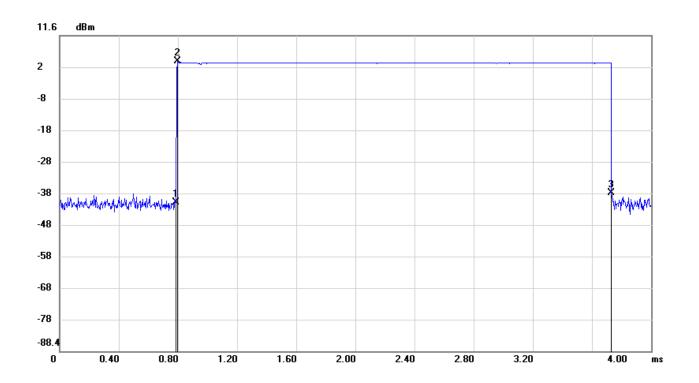






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No.	Sweep time(ms)	Result(dBm)
1	0.7880	-41.30
2	0.7960	3.46
3	3.7320	-38.25

No.		〉Time(ms)	› Level(dB)
1	mk3-mk1	2.944	3.05



0

316.00

632.00

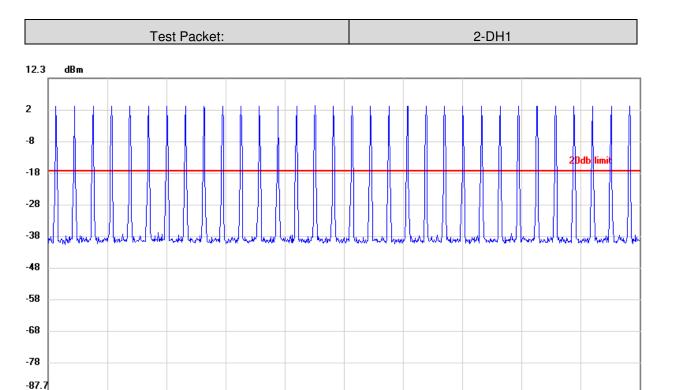
948.00

1264.00

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1580.00

1896.00

2212.00

2528.00

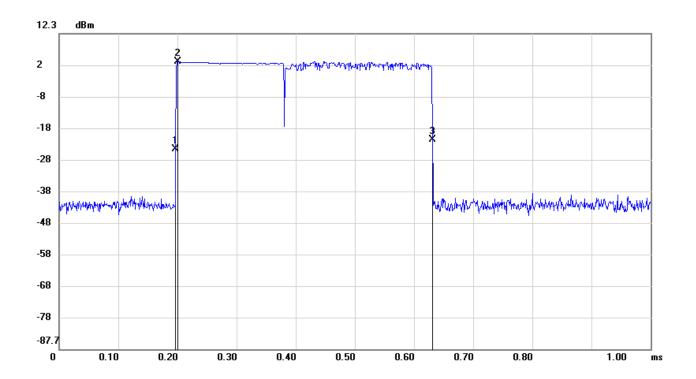
3160.00 ms





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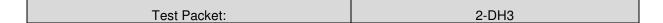
No.	Sweep time(ms)	Result(dBm)
1	0.1970	-24.32
2	0.2000	3.55
3	0.6310	-21.22

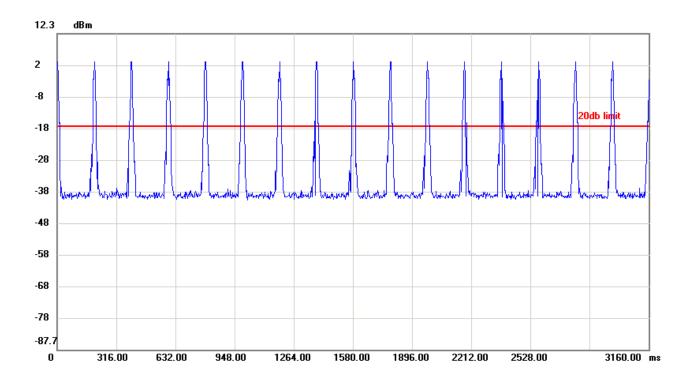
No.		〉Time(ms)	〉Level(dB)
1	mk3-mk1	0.434	3.1



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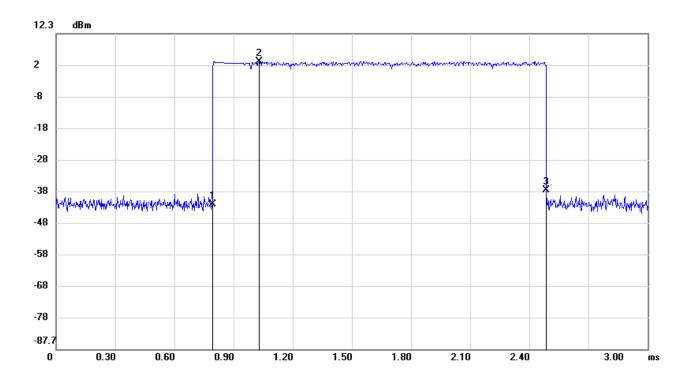






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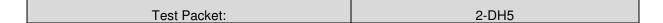
No.	Sweep time(ms)	Result(dBm)
1	0.7920	-41.85
2	1.0290	3.52
3	2.4870	-37.39

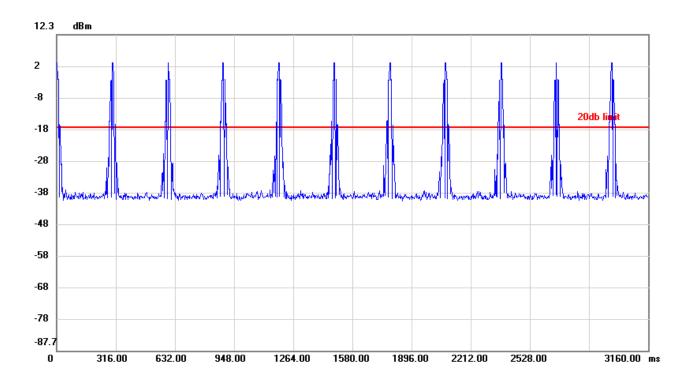
No.		〉Time(ms)	〉Level(dB)
1	mk3-mk1	1.695	4.46



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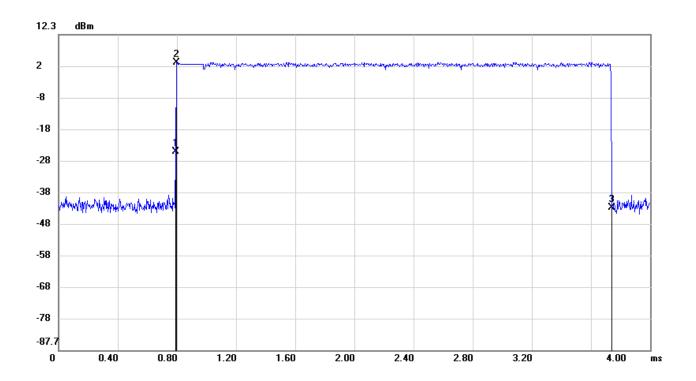






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No.	Sweep time(ms)	Result(dBm)
1	0.7920	-24.91
2	0.7960	3.47
3	3.7400	-42.65

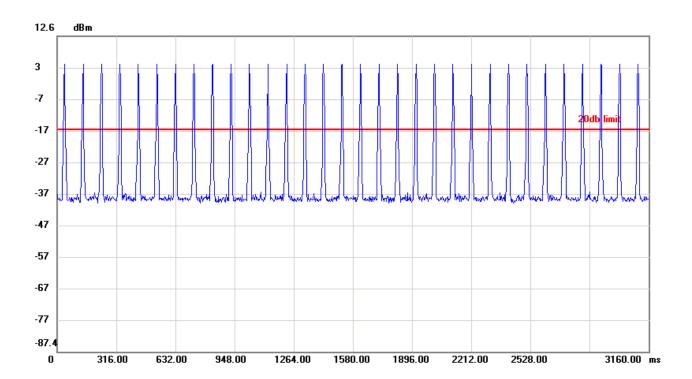
No.		〉Time(ms)	〉Level(dB)
1	mk3-mk1	2.948	-17.74



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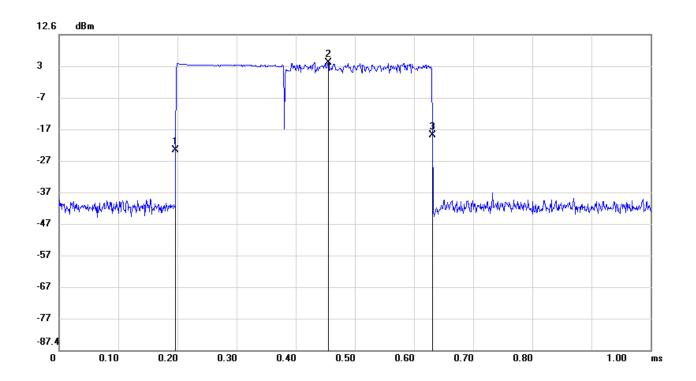
3-DH1
O DITT





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No.	Sweep time(ms)	Result(dBm)
1	0.1970	-23.93
2	0.4550	3.76
3	0.6310	-19.35

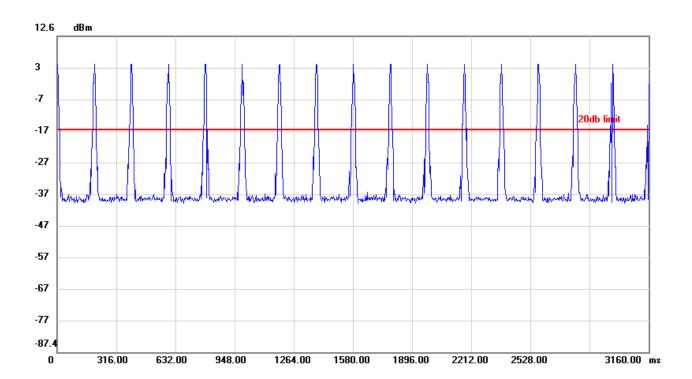
No.		〉Time(ms)	〉Level(dB)
1	mk3-mk1	0.434	4.58



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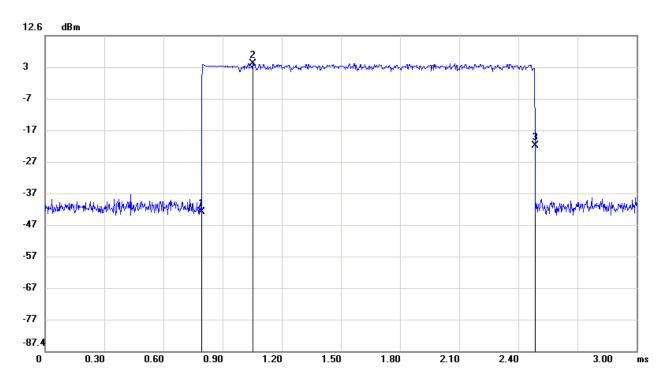
Test Packet:	3-DH3





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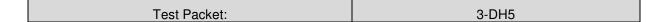
No.	Sweep time(ms)	Result(dBm)
1	0.7920	-43.25
2	1.0530	3.72
3	2.4840	-22.31

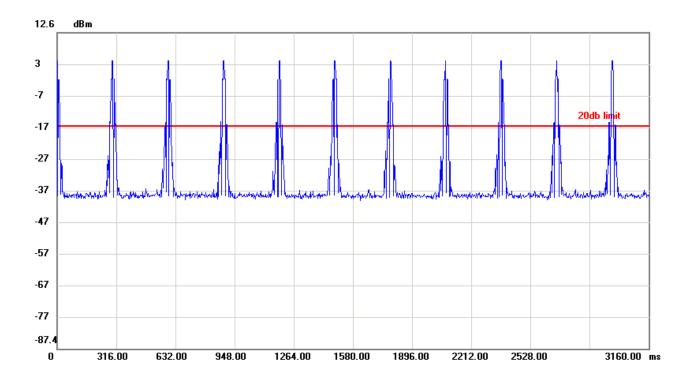
No.		〉Time(ms)	› Level(dB)
1	mk3-mk1	1.692	20.94



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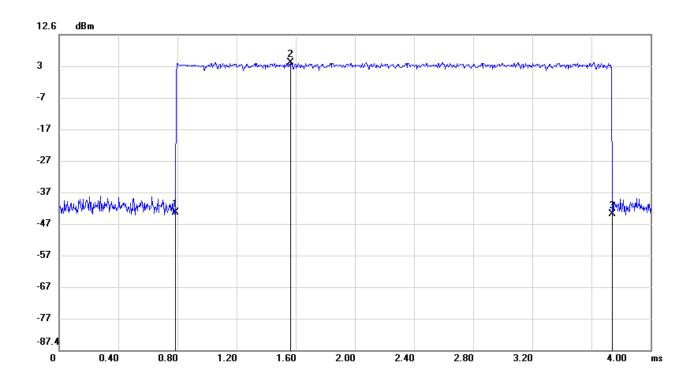






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No.	Sweep time(ms)	Result(dBm)
1	0.7880	-43.70
2	1.5640	3.70
3	3.7400	-44.35

No.		〉Time(ms)	› Level(dB)
1	mk3-mk1	2.952	-0.65



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6.8 Band-edge for RF Conducted Emissions

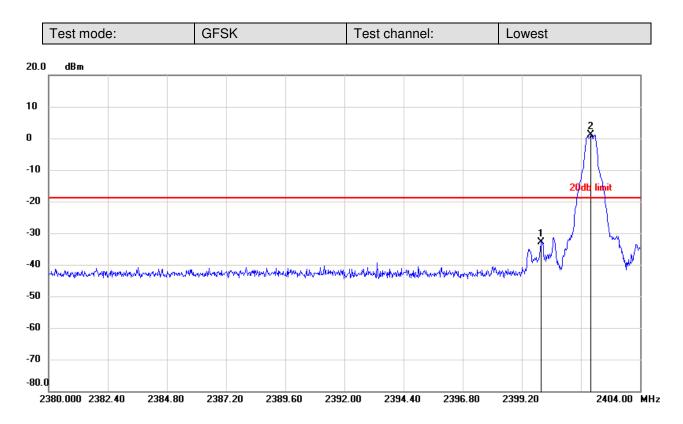
Test Requirement:	47 CFR Part 15C Section 15.247 (d)		
Test Method:	ANSI C63.10:2009		
Test Setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane Remark:		
Limit:	Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.		
Exploratory Test Mode:			
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of $\pi/4DQPSK$ modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.		
Instruments Used:	Refer to section 5.10 for details		
Test Results:	Pass		



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Test plot as follows:

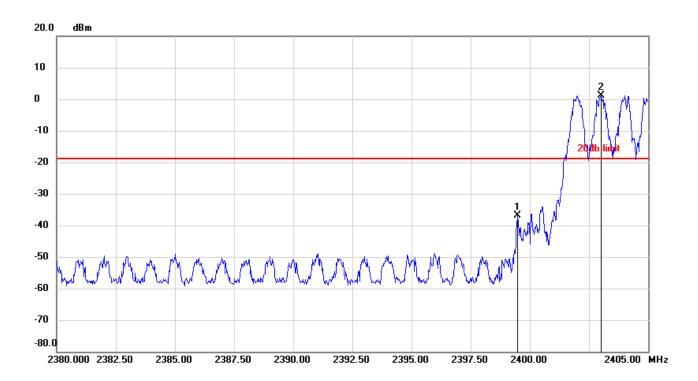


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.9920	-32.81	-18.77	-14.04
2	2402.0080	1.23	-18.77	20.00



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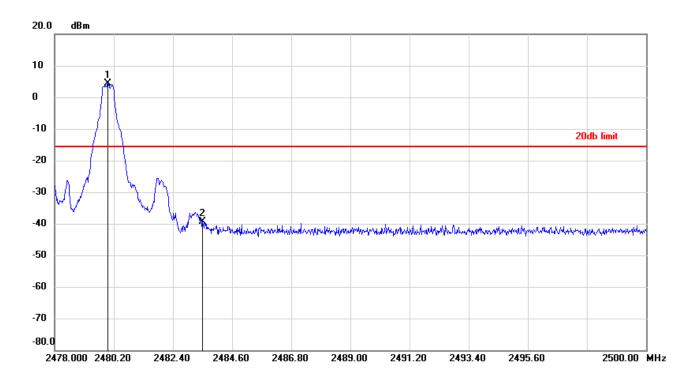
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.4750	-36.91	-18.89	-18.02
2	2403.0000	1.11	-18.89	20.00



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Test mode:	GFSK	Test channel:	Highest
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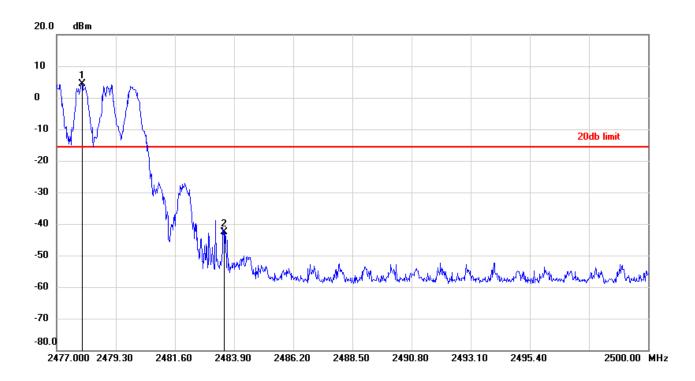


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.9800	4.32	-15.68	20.00
2	2483.5000	-39.39	-15.68	-23.71



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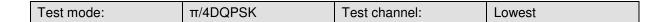


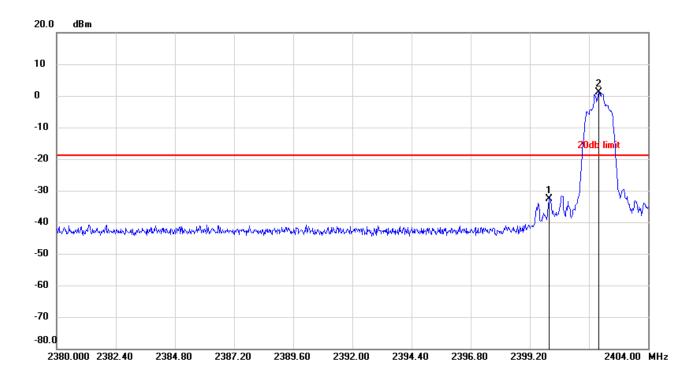
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2477.9890	4.34	-15.66	20.00
2	2483.5090	-42.74	-15.66	-27.08



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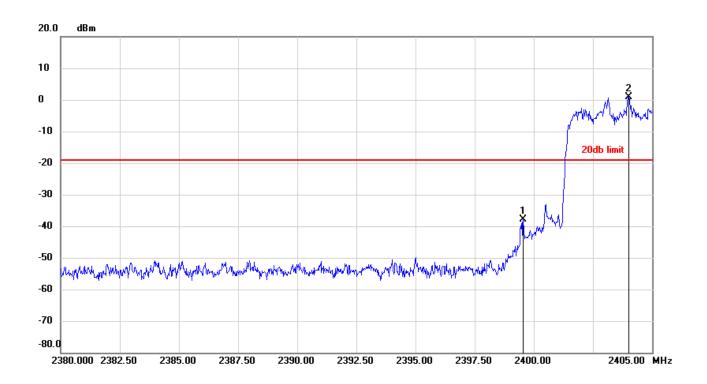


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.9920	-32.70	-18.75	-13.95
2	2402.0080	1.25	-18.75	20.00



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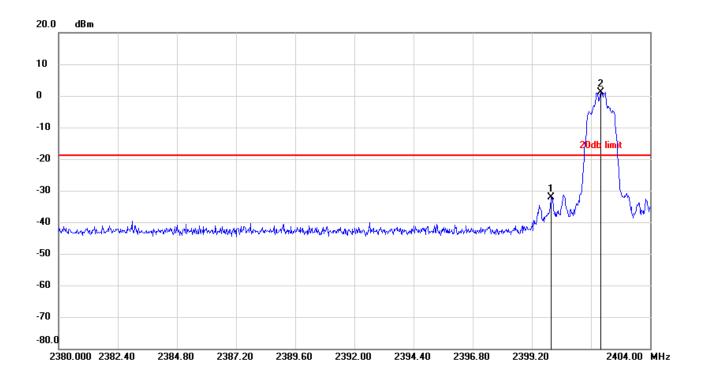
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.5500	-37.88	-19.00	-18.88
2	2404.0000	1.00	-19.00	20.00



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Test mode:	π/4DQPSK	Test channel:	Highest

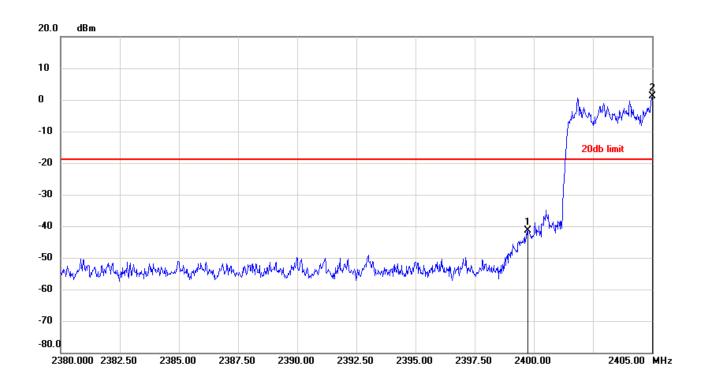


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.9920	-32.19	-18.77	-13.42
2	2402.0080	1.23	-18.77	20.00



Report No.: SZEM150600381202

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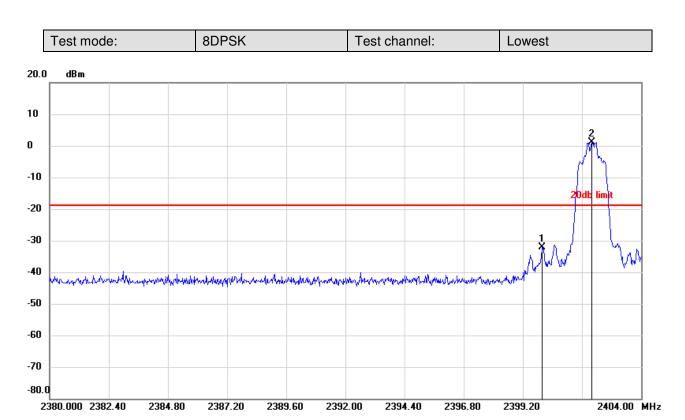
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.7500	-41.25	-18.93	-22.32
2	2405.0000	1.07	-18.93	20.00





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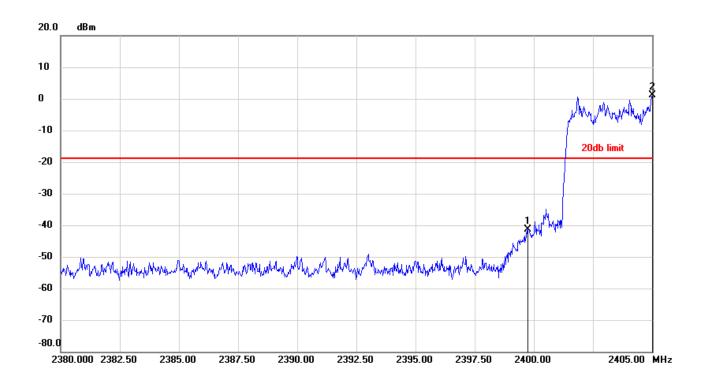


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.9920	-32.19	-18.77	-13.42
2	2402.0080	1.23	-18.77	20.00



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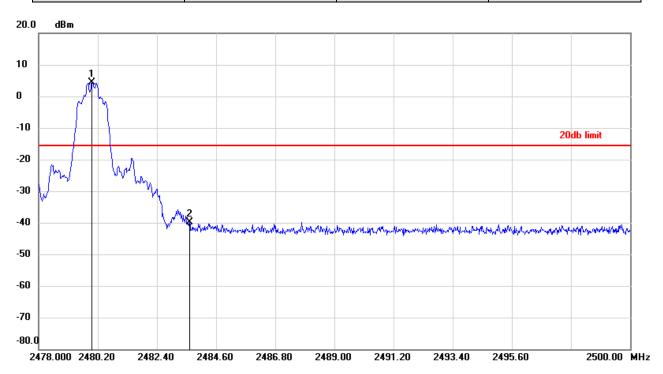
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2399.7500	-41.25	-18.93	-22.32
2	2405.0000	1.07	-18.93	20.00



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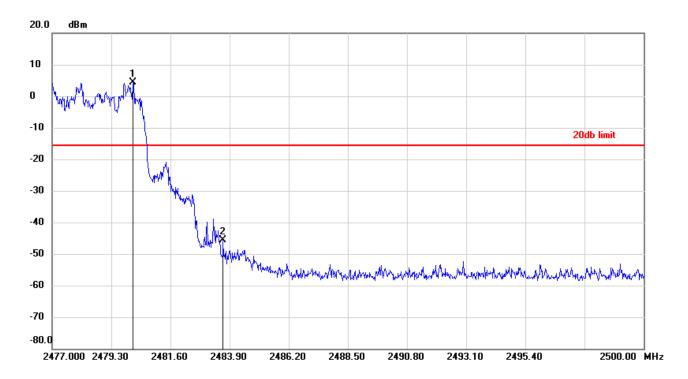


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.9800	4.33	-15.67	20.00
2	2483.6100	-39.76	-15.67	-24.09



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2480.1510	4.29	-15.71	20.00
2	2483.6470	-45.57	-15.71	-29.86



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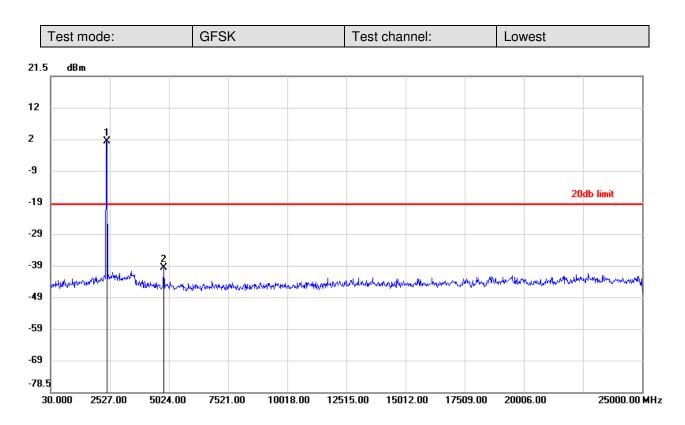
6.9 Spurious RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10:2009
Test Setup:	Spectrum Analyzer E.U.T Non-Conducted Table Ground Reference Plane
	Remark: Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Exploratory Test Mode:	Non-hopping transmitting with all kind of modulation and all kind of data type
Final Test Mode:	Through Pre-scan, find the DH1 of data type is the worst case of GFSK modulation type, 2-DH1 of data type is the worst case of $\pi/4DQPSK$ modulation type, 3-DH1 of data type is the worst case of 8DPSK modulation type.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass



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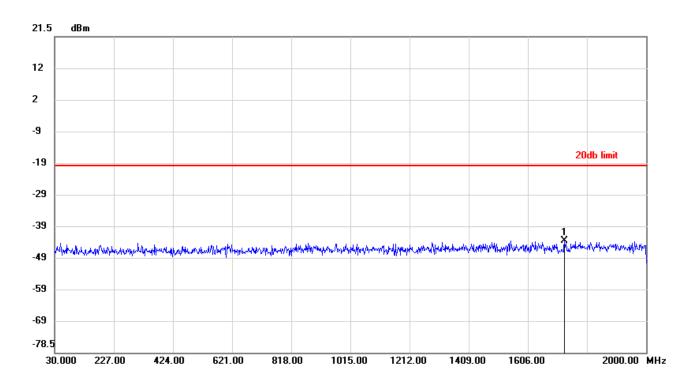


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.3177	0.99	-19.01	20.00
2	4804.2640	-39.18	-19.01	-20.17



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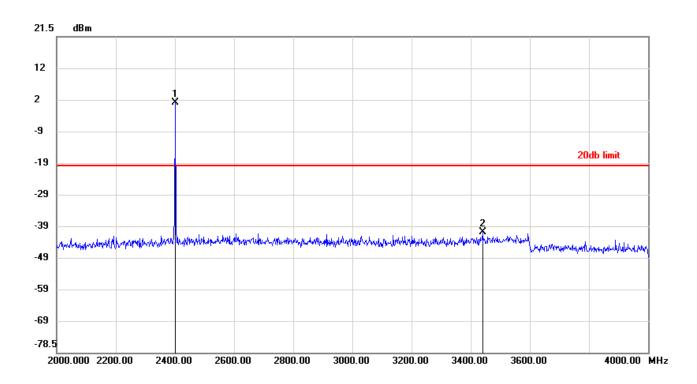


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1730.0443	-43.06	-19.32	-23.74



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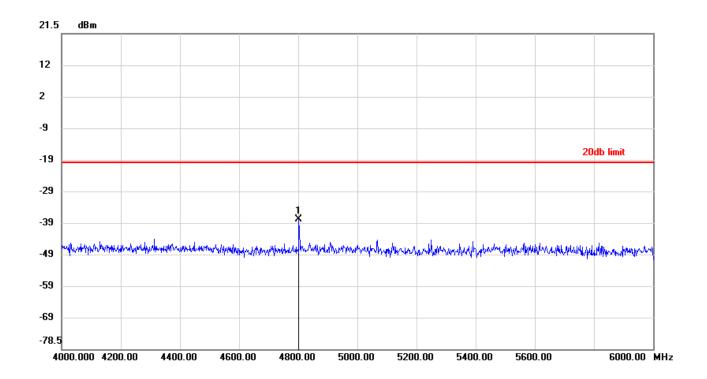


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.9333	0.68	-19.32	20.00
2	3441.0667	-40.35	-19.32	-21.03



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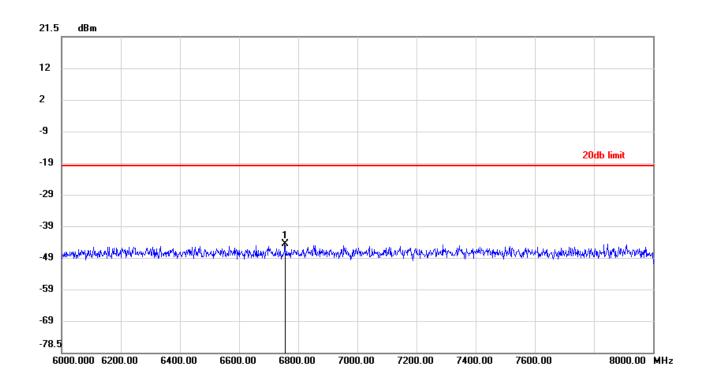


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4803.9333	-37.49	-19.32	-18.17



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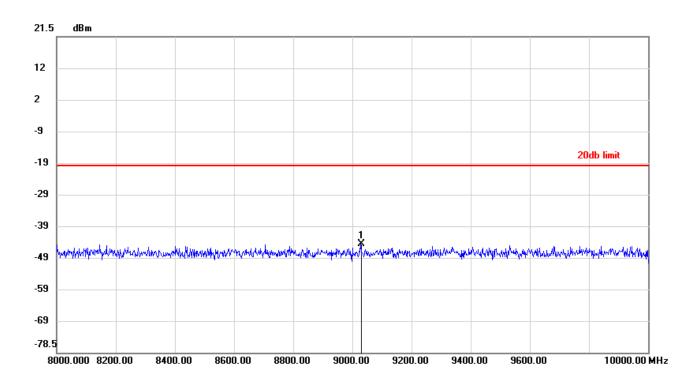
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	6755.6667	-44.12	-19.32	-24.80





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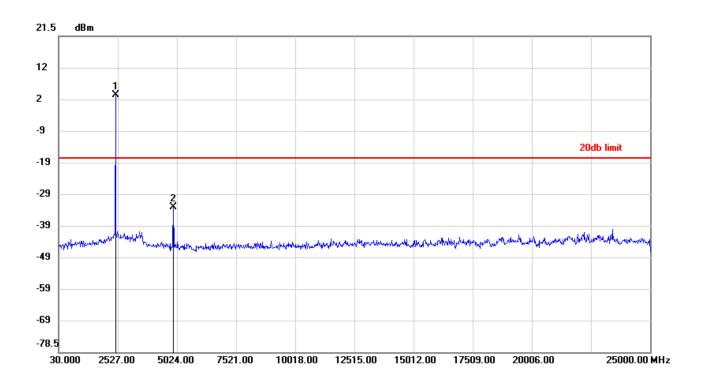
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	9028.8667	-44.21	-19.32	-24.89



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Test mode: GFSK Test channel: Middle

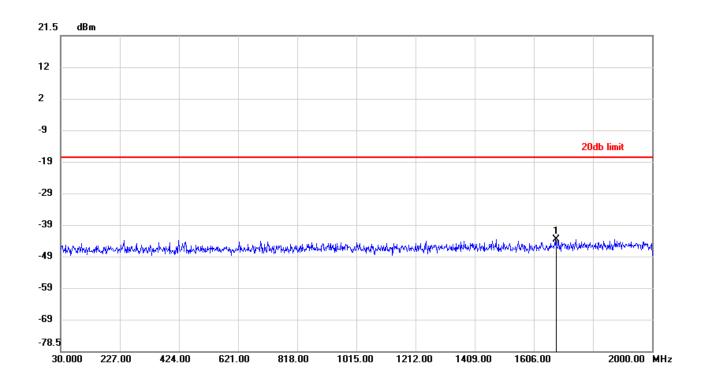


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.4373	2.81	-17.19	20.00
2	4881.6710	-32.67	-17.19	-15.48



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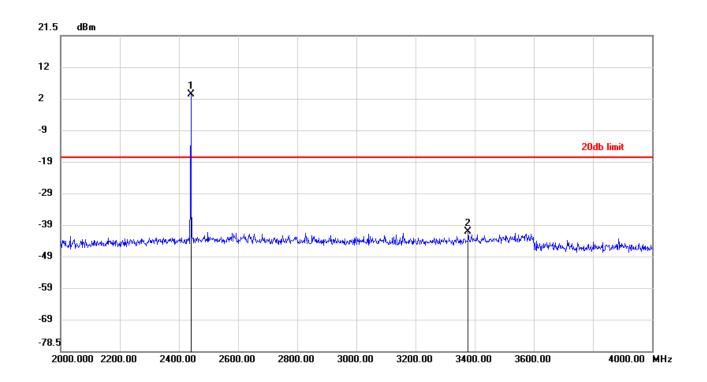


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1679.7437	-43.16	-17.02	-26.14



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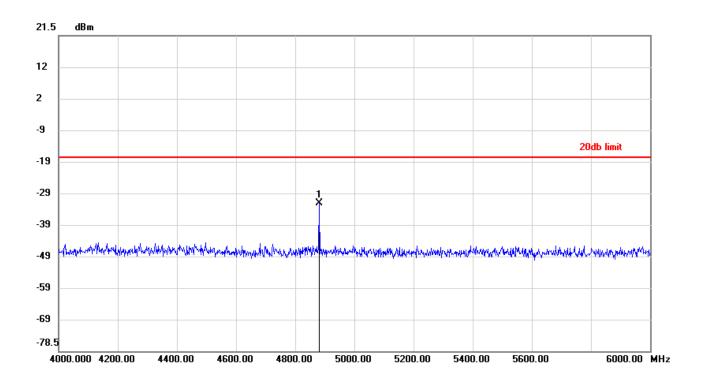


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.9333	2.98	-17.02	20.00
2	3379.1333	-40.71	-17.02	-23.69



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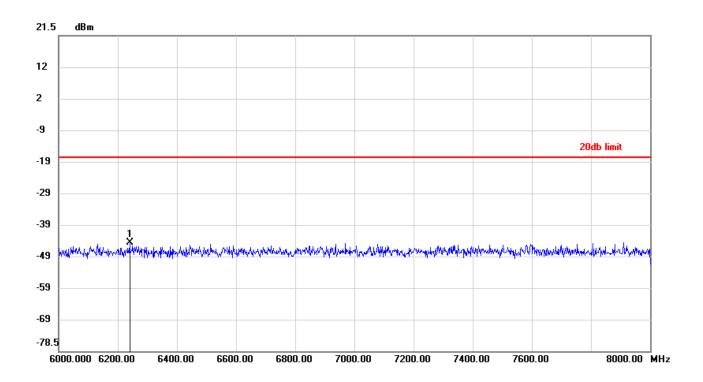


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4881.9333	-31.71	-17.02	-14.69



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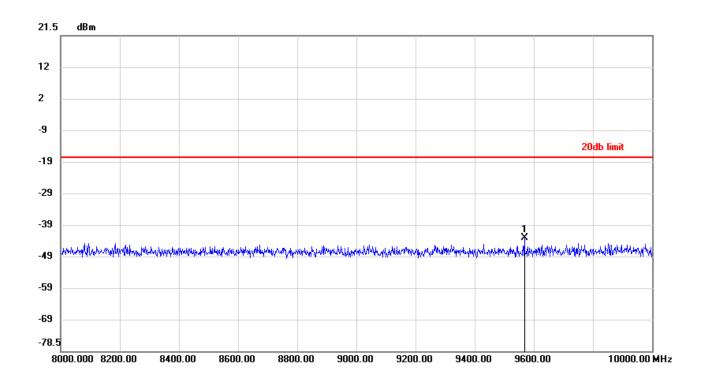


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	6241.8667	-44.08	-17.02	-27.06



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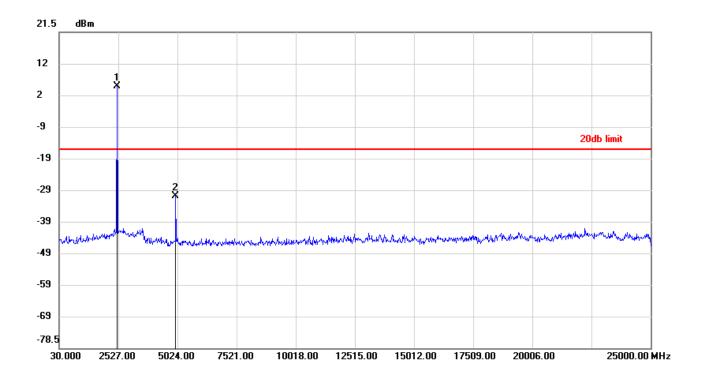
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	9569.4000	-42.56	-17.02	-25.54



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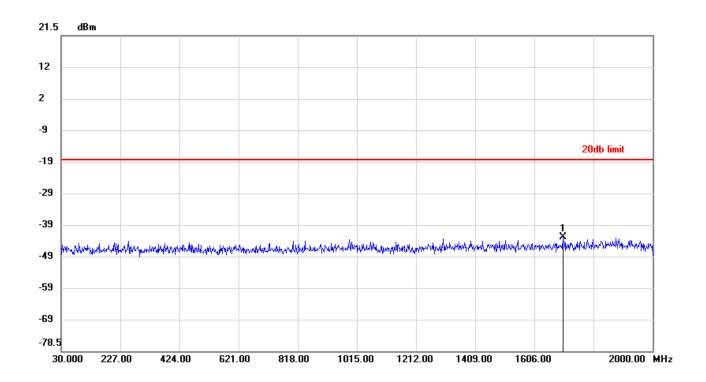


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.5570	4.37	-15.63	20.00
2	4959.0780	-30.25	-15.63	-14.62



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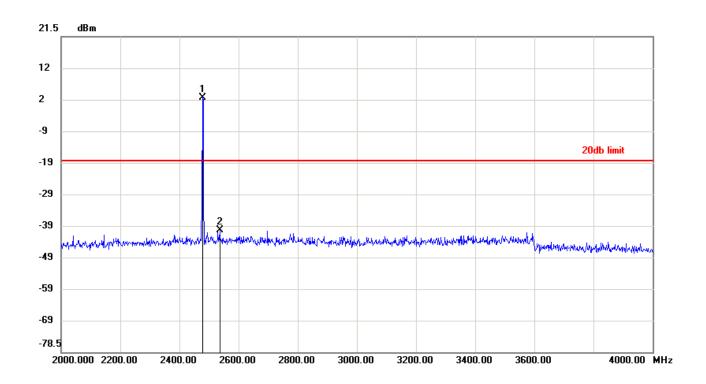


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1701.0853	-42.45	-17.89	-24.56



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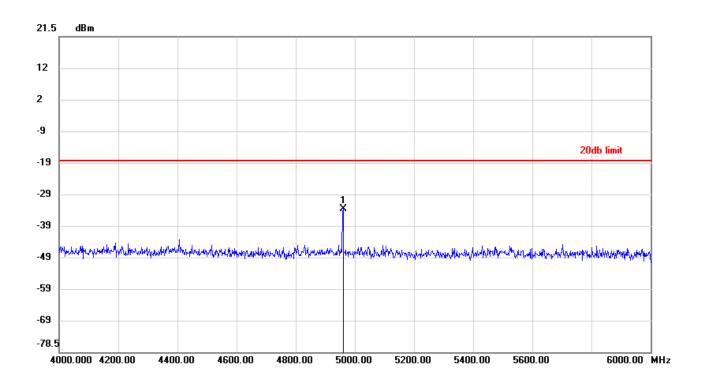
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.9333	2.11	-17.89	20.00
2	2537.6667	-39.99	-17.89	-22.10





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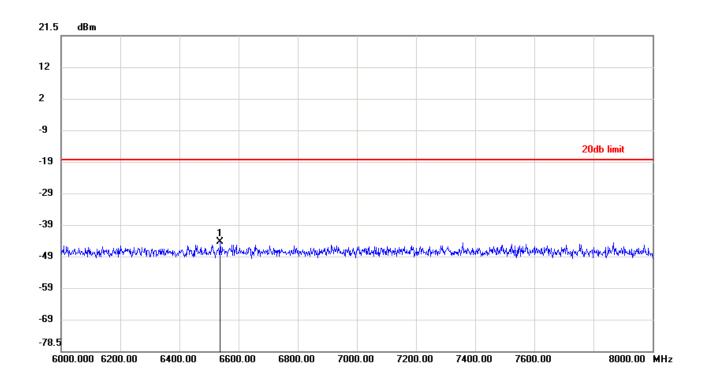


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4960.0000	-33.18	-17.89	-15.29



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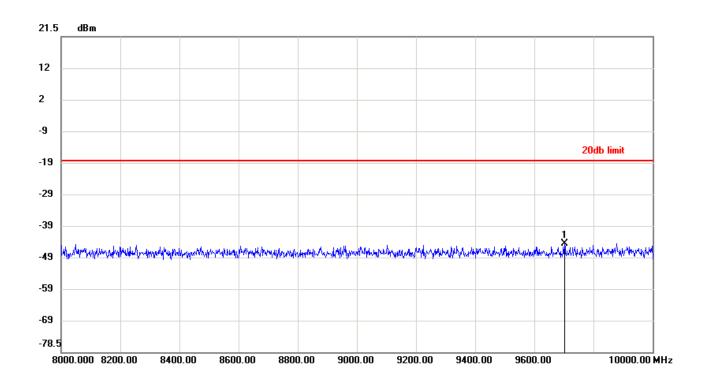


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	6539.1333	-43.86	-17.89	-25.97



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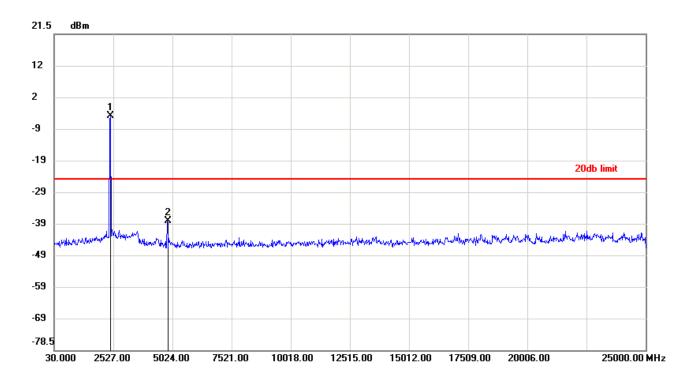
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	9702.4000	-44.05	-17.89	-26.16



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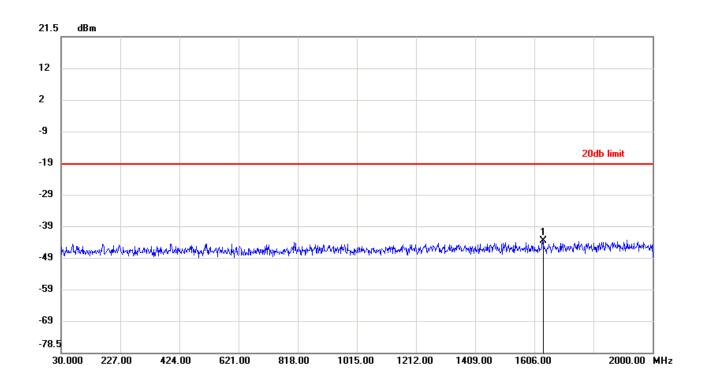


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2402.1500	-4.27	-24.27	20.00
2	4803.4317	-37.51	-24.27	-13.24



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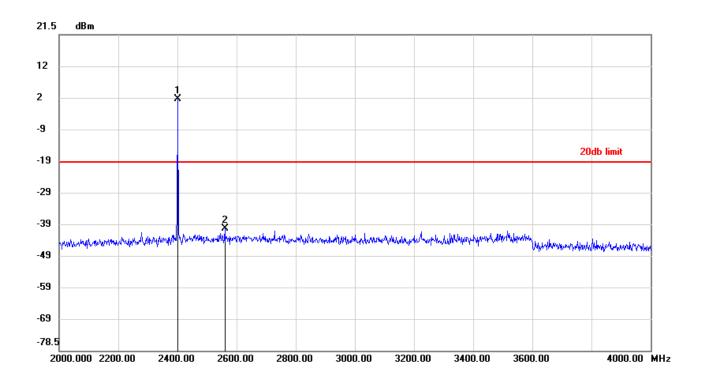


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1635.0247	-43.22	-18.81	-24.41



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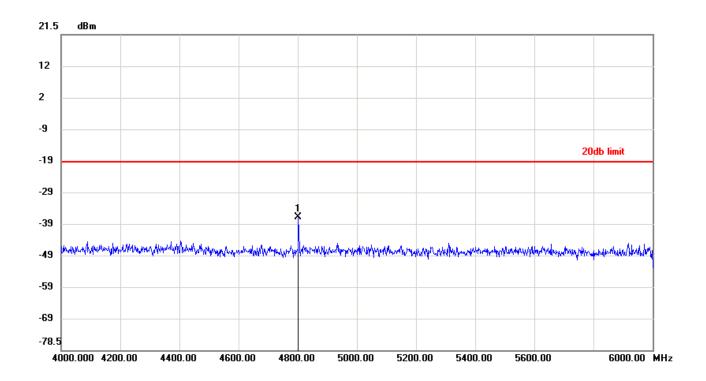


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.9333	1.19	-18.81	20.00
2	2560.9333	-39.90	-18.81	-21.09



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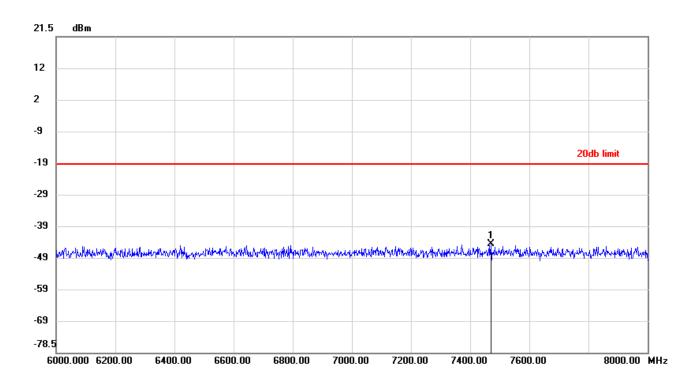


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4803.9333	-36.40	-18.81	-17.59



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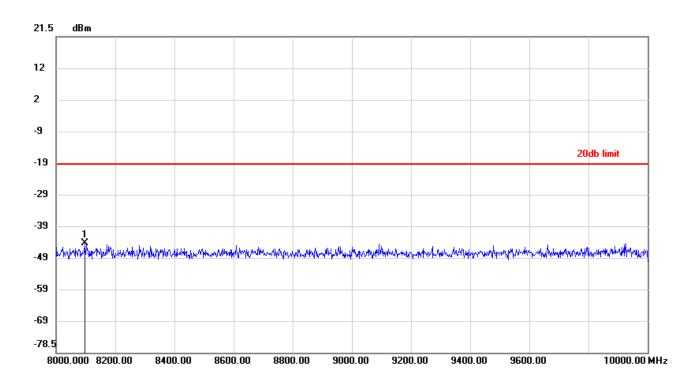


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	7470.5333	-44.05	-18.81	-25.24



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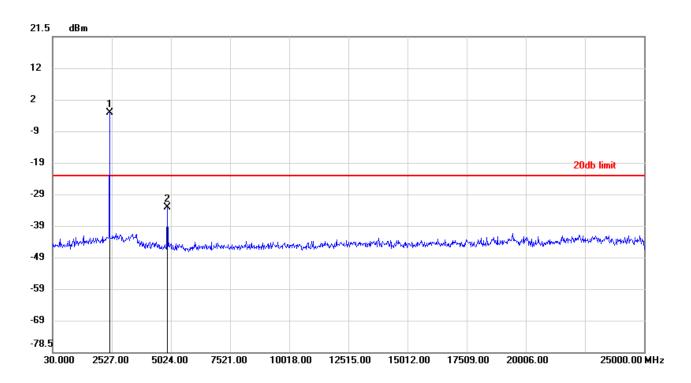
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	8097.0000	-43.90	-18.81	-25.09



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Test mode:	π/4DQPSK	Test channel:	Middle



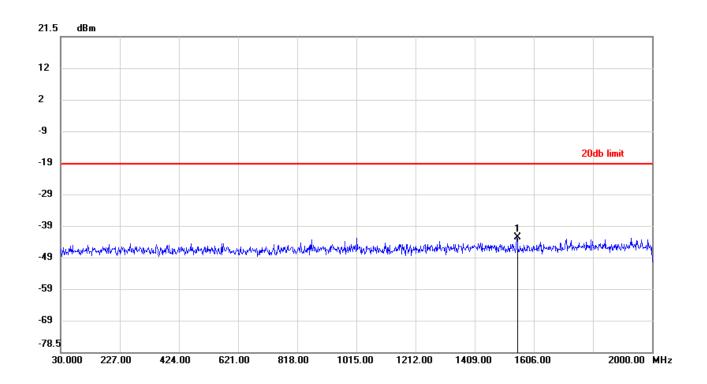
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2441.2697	-2.72	-22.72	20.00
2	4881.6710	-32.73	-22.72	-10.01





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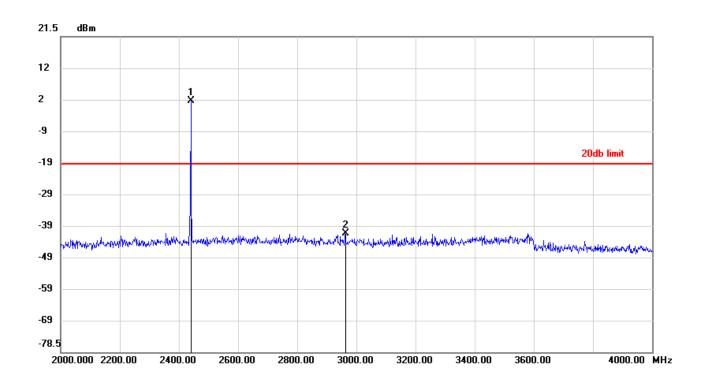


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1549.5267	-42.02	-18.94	-23.08



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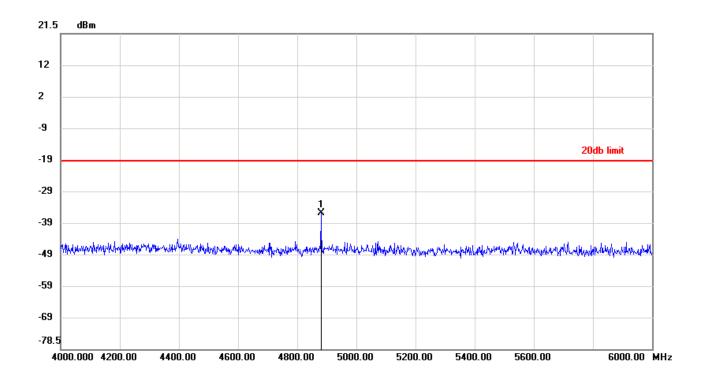


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.9333	1.06	-18.94	20.00
2	2963.4667	-40.77	-18.94	-21.83



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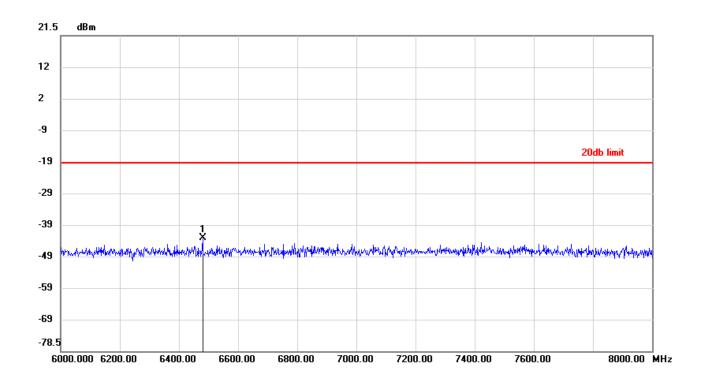


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4881.6667	-35.30	-18.94	-16.36



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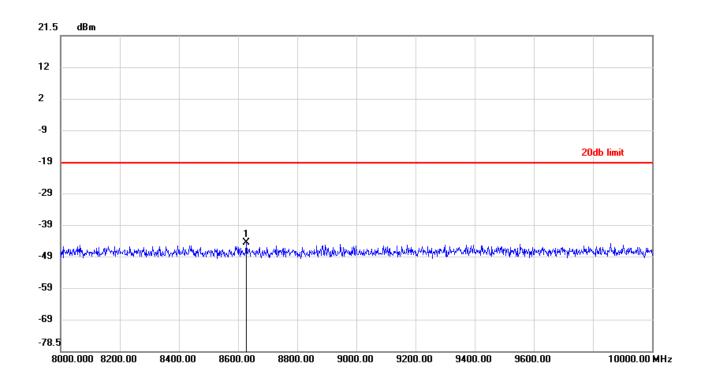


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	6481.4000	-42.65	-18.94	-23.71



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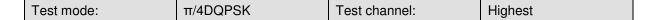


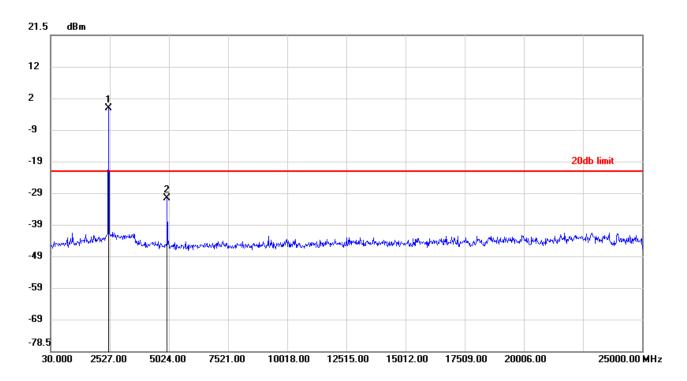
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	8628.4000	-44.21	-18.94	-25.27



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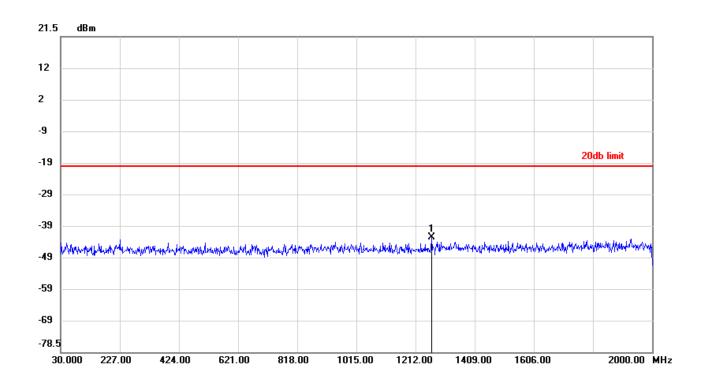


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.5570	-1.74	-21.74	20.00
2	4959.9103	-30.15	-21.74	-8.41



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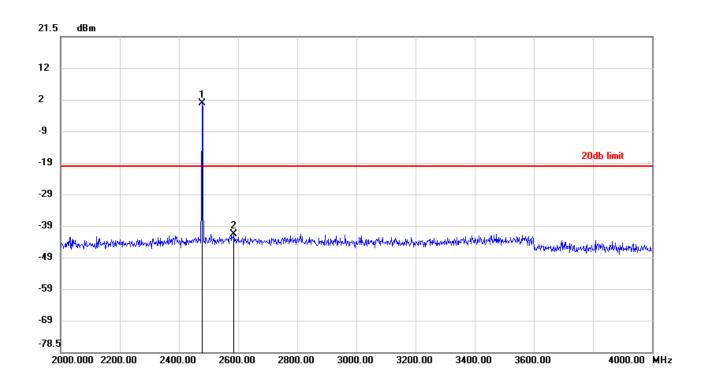


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1266.3063	-42.20	-19.57	-22.63



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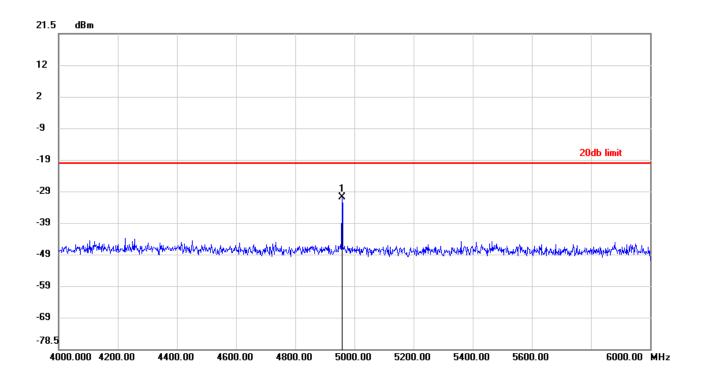


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.7333	0.43	-19.57	20.00
2	2587.8000	-41.06	-19.57	-21.49



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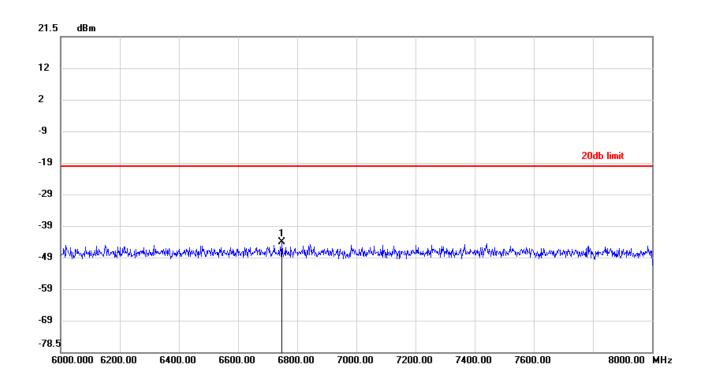


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4959.9333	-30.31	-19.57	-10.74



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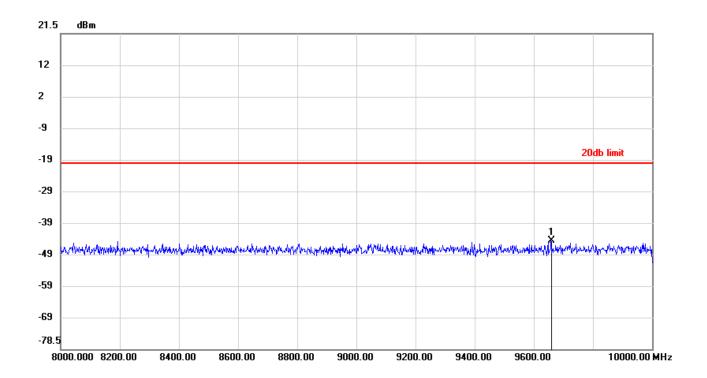
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	6749.2000	-43.74	-19.57	-24.17





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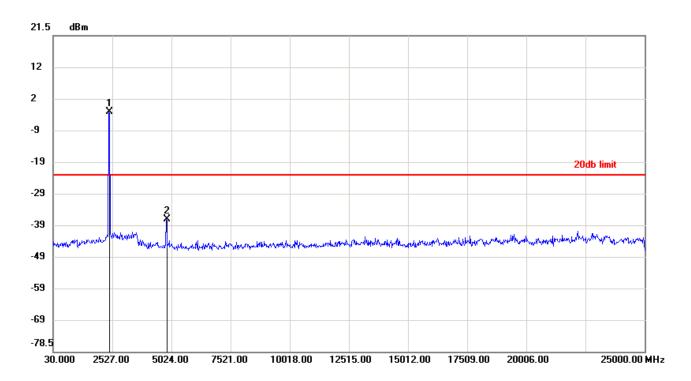
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	9659.8667	-44.23	-19.57	-24.66



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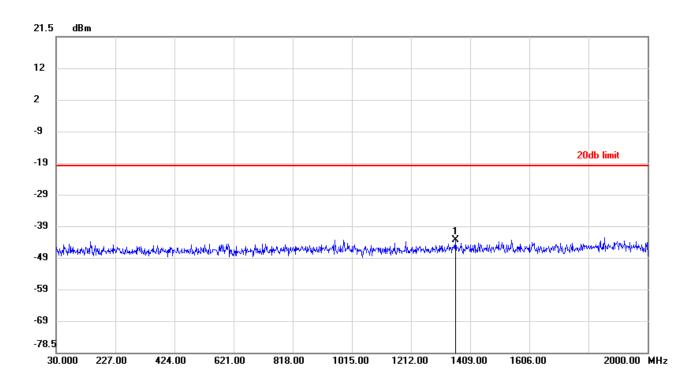


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.3177	-2.66	-22.66	20.00
2	4803.4317	-36.66	-22.66	-14.00



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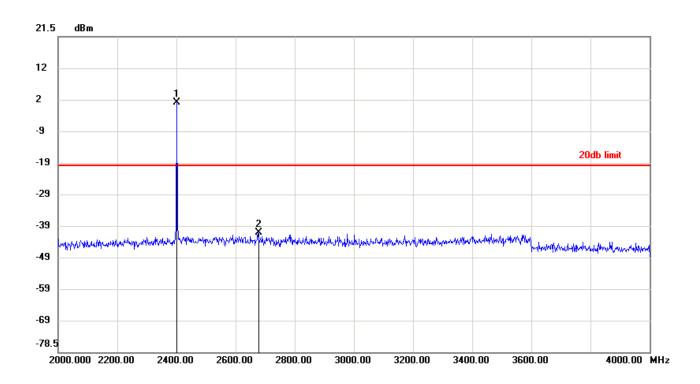


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1361.0633	-42.75	-19.47	-23.28



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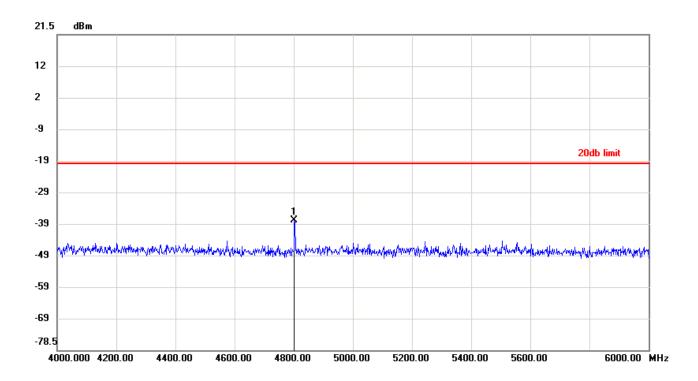


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2401.7333	0.53	-19.47	20.00
2	2676.2667	-40.74	-19.47	-21.27



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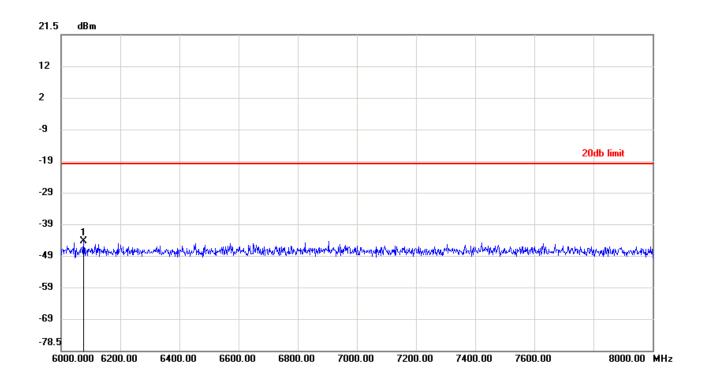


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4803.9333	-37.42	-19.47	-17.95



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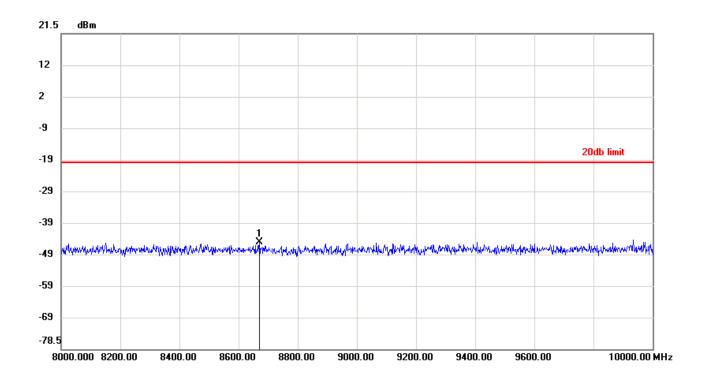


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	6077.2000	-43.78	-19.47	-24.31



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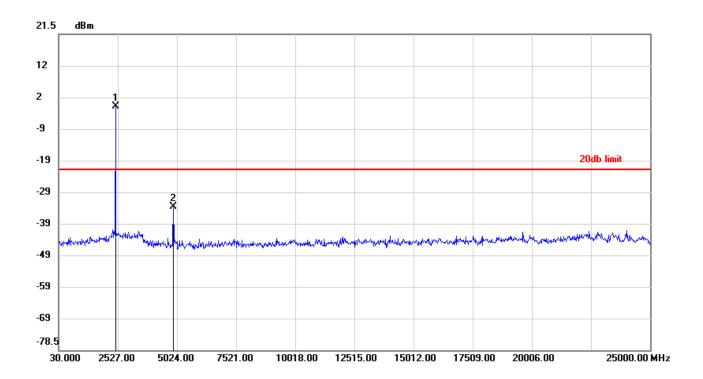
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	8671.9333	-44.51	-19.47	-25.04



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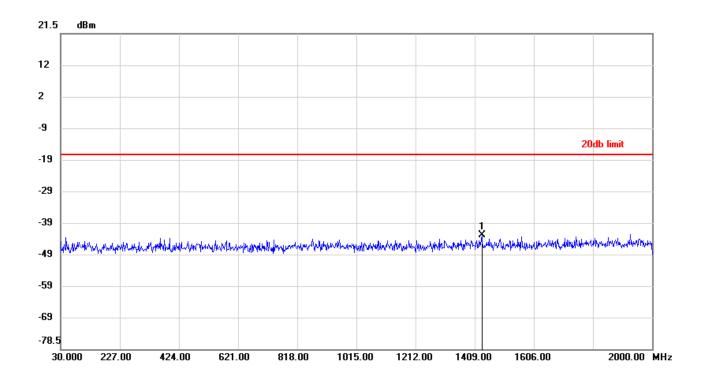


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.4373	-1.31	-21.31	20.00
2	4881.6710	-33.04	-21.31	-11.73



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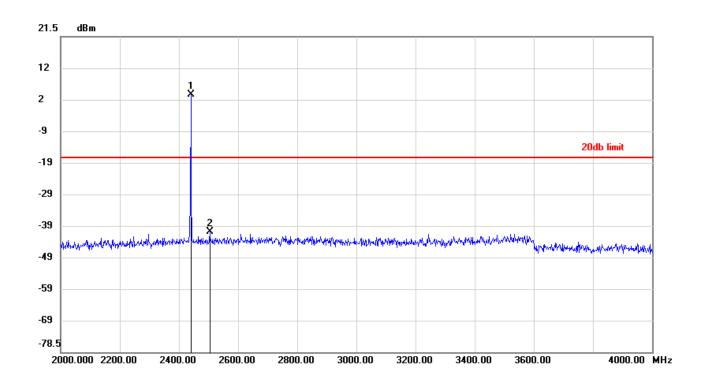


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1433.6250	-42.47	-16.98	-25.49



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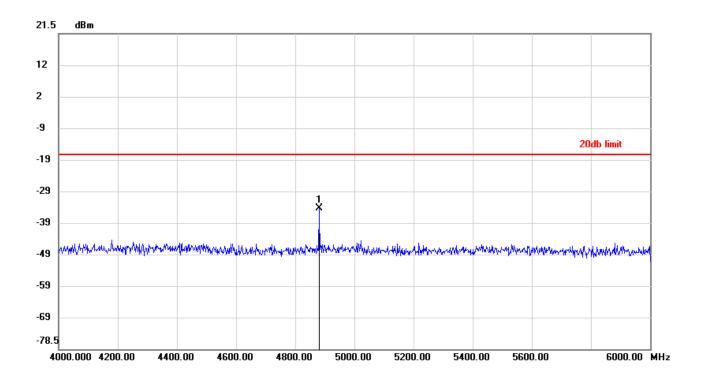
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2440.9333	3.02	-16.98	20.00
2	2504.6667	-40.46	-16.98	-23.48





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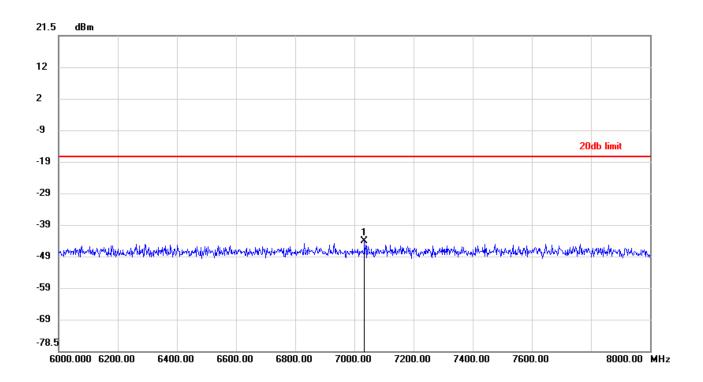


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	4881.9333	-33.86	-16.98	-16.88



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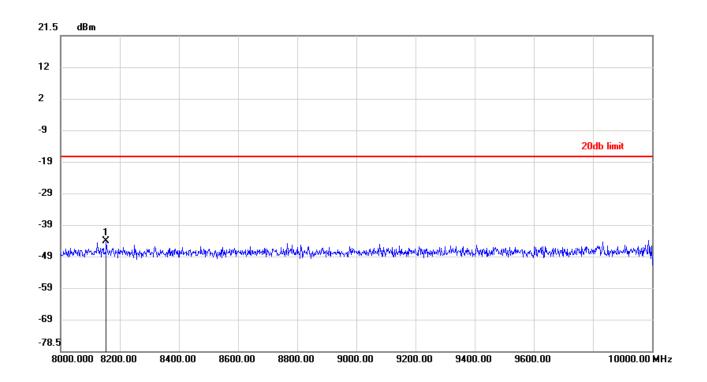


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	7035.6000	-43.66	-16.98	-26.68



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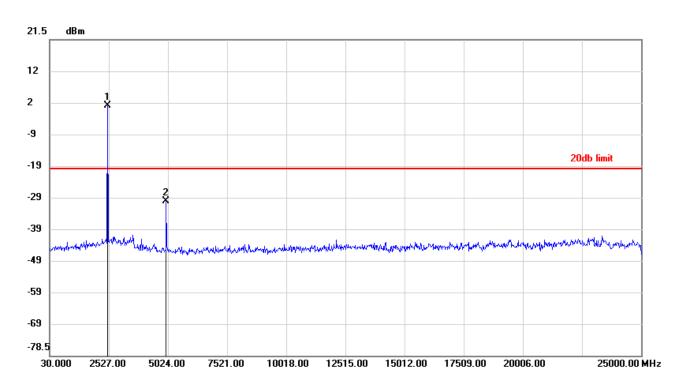
No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	8154.8000	-43.73	-16.98	-26.75



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Test mode: 8DPSK Test channel: Highest

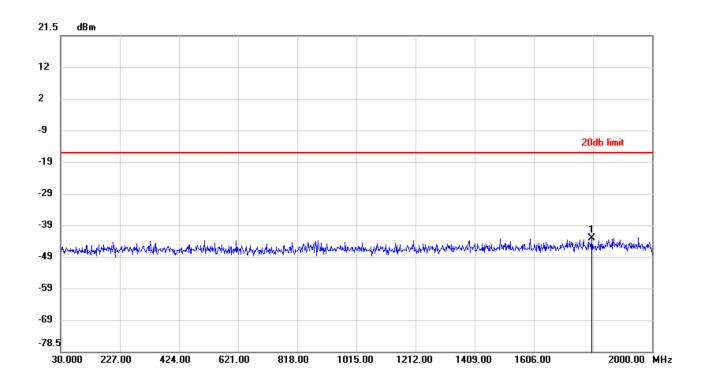


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	2479.5570	0.53	-19.47	20.00
2	4959.0780	-29.71	-19.47	-10.24



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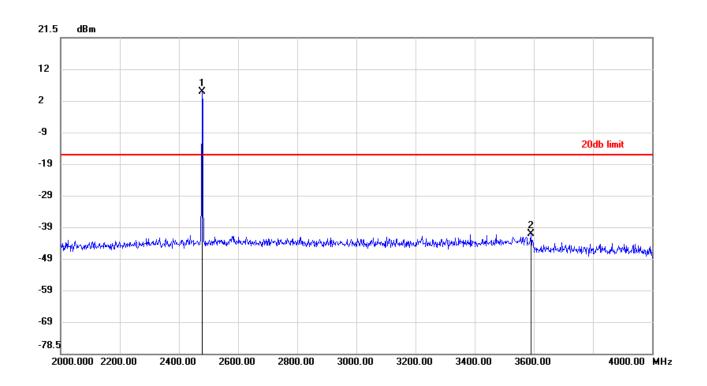


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)
1	1799.9793	-42.54	-15.65	-26.89



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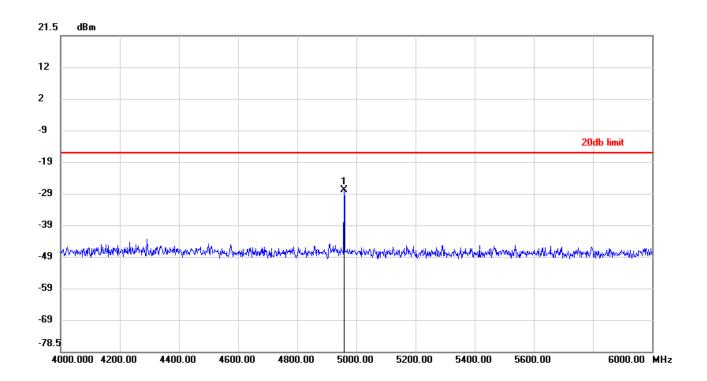


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)	
1	2479.9333	4.35	-15.65	20.00	
2	3590.7333	-40.72	-15.65	-25.07	



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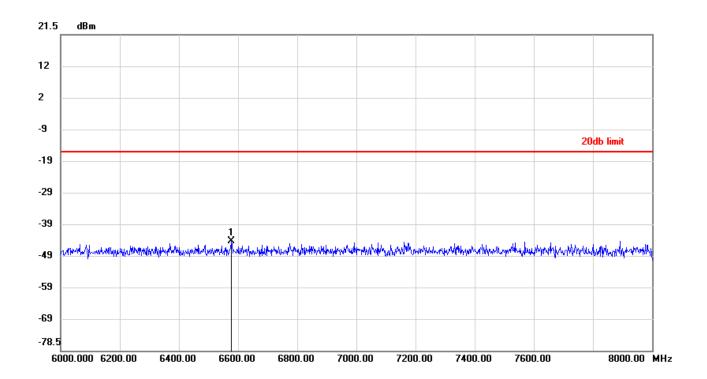


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)	
1	4959.9333	-27.30	-15.65	-11.65	



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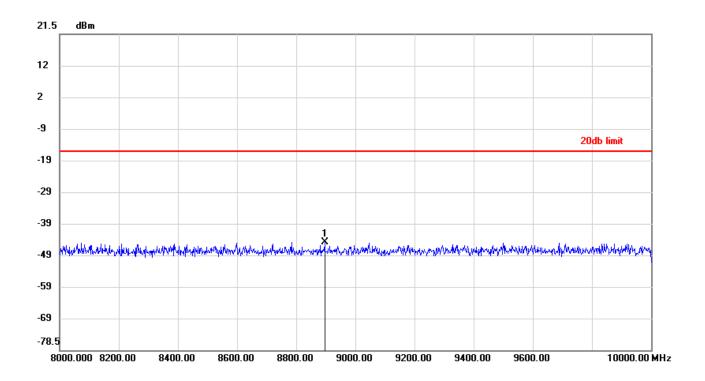


No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)	
1	6577.8667	-43.91	-15.65	-28.26	



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No.	Frequency(MHz)	Result(dBm)	Limit(dBm)	Margin(dBm)	
1	8897.0000	-44.39	-15.65	-28.74	

Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.



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6.10 Other requirements Frequency Hopping Spread Spectrum System

Test Requirement: 47 CFR Part 15C Section 15.247 (a)(1), (h) requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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.

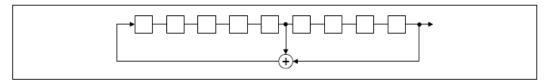
The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of 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.

Compliance for section 15.247(a)(1)

According to Bluetooth Core Specification, the pseudorandom sequence may be generated in a nine-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.

- Number of shift register stages: 9
- Length of pseudo-random sequence: $2^9 1 = 511$ bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

20 62 46 77 7 64 8 73 16 75 1

GS

Each frequency used equally on the average by each transmitter.

According to Bluetooth Core Specification, Bluetooth receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any Bluetooth transmitters and shift frequencies in synchronization with the transmitted signals.



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Compliance for section 15.247(g)

According to Bluetooth Core Specification, the Bluetooth system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the Bluetooth system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h)

According to Bluetooth Core specification, the Bluetooth system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels.

According to the Bluetooth Core specification, the Bluetooth system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.



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6.11 Radiated Spurious Emission

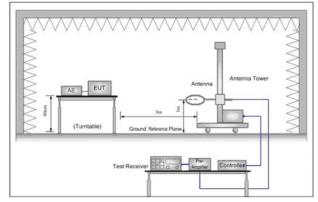
Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205								
Test Method:	ANSI C63.10: 2009								
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)								
Receiver Setup:	Frequency		Detector	RBW	VBW	Remark			
	0.009MHz-0.090MH	Z	Peak	10kHz	z 30kHz	Peak			
	0.009MHz-0.090MH	Z	Average	10kHz	z 30kHz	Average			
	0.090MHz-0.110MH	Z	Quasi-peak	10kHz	z 30kHz	Quasi-peak			
	0.110MHz-0.490MH	z	Peak	10kHz	z 30kHz	Peak			
	0.110MHz-0.490MH	Z	Average	10kHz	z 30kHz	Average			
	0.490MHz -30MHz		Quasi-peak	10kHz	30kHz	Quasi-peak			
	30MHz-1GHz		Quasi-peak	100 kH	Iz 300kHz	Quasi-peak			
	Above 1GHz		Peak	1MHz	3MHz	Peak			
	Above 1GH2		Peak	1MHz	10Hz	Average			
Limit:	Frequency		eld strength crovolt/meter)	Limit (dBuV/m)	Remark	Measureme distance (m	11		
	0.009MHz-0.490MHz	2	400/F(kHz)	-	-	300			
	0.490MHz-1.705MHz	24	1000/F(kHz)	-	-	30			
	1.705MHz-30MHz		30	-	-	30			
	30MHz-88MHz		100	40.0	Quasi-peak	3			
	88MHz-216MHz		150	43.5	Quasi-peak	3			
	216MHz-960MHz		200	46.0	Quasi-peak	3			
	960MHz-1GHz		500	54.0	Quasi-peak	3			
	Above 1GHz		500	54.0	Average	3			
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission lim applicable to the equipment under test. This peak limit applies to the top								



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Test Setup:



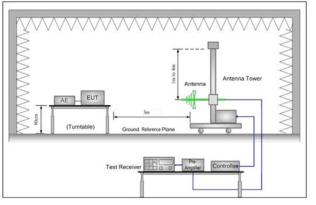


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

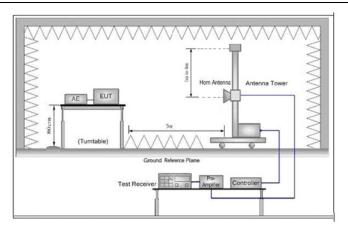


Figure 3. Above 1 GHz

Test Procedure:

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB



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	margin would be re-tested one by one using peak guest restant
	margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
	g. Test the EUT in the lowest channel (2402MHz),the middle channel (2441MHz),the Highest channel (2480MHz)
	h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
	i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of
	data type
	Transmitting mode, Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the DH1 of data type and GFSK modulation is the worst case.
	Pretest the EUT at Transmitting mode and Charge + Transmitting mode, found the Charge + Transmitting mode which it is worse case
	For below 1GHz part, through pre-scan, the worst case is the lowest channel.
	Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

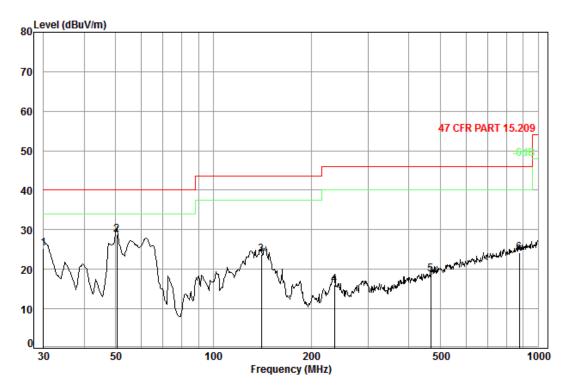


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6.11.1 Radiated Emission below 1GHz

30MHz~1GHz (QP)		
Test mode:	Charge + Transmitting	Vertical



Condition: 47 CFR PART 15.209 3m 3142C Vertical

Job No. : 3812CR

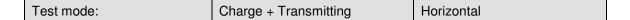
Test mode: b

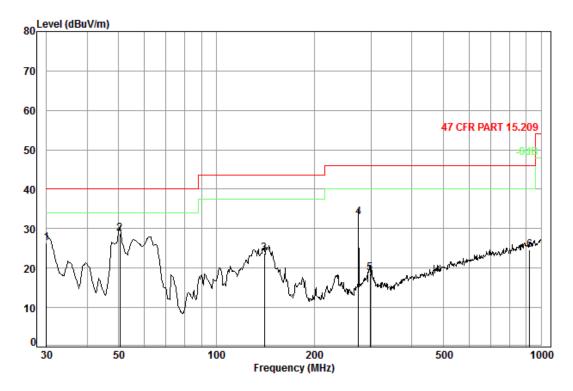
	Cable	Ant	Preamp	Read		Limit	0ver
Frea	Loss	Factor	Factor	Level	Level	Line	Limit
MHz	dB	dR/m	dB		dBuV/m	dRuV/m	dB
11112	ub	ub/III	ub	ubuv	ubuv/iii	ubuv/III	ub
		40.70					
30.00	0.60	18.70	27.36	33.27	25.21	40.00	-14.79
50.41	0.80	8.64	27.29	46.63	28.78	40.00	-11.22
140.34	1.30	8.13	26.95	41.29	23.77	43.50	-19.73
235.82	1.60	11.85	26.58	29.36	16.23	46.00	-29.77
467.24	2.48	17.52	27.54	26.29	18.75	46.00	-27.25
875.25	3.51	23.00	26.89	24.62	24.24	46.00	-21.76



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Condition: 47 CFR PART 15.209 3m 3142C Horizontal

Job No. : 3812CR

Test mode: b

	Freq			Preamp Factor				Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.00	0.60	18.70	27.36	34.48	26.42	40.00	-13.58
2	50.41	0.80	8.64	27.29	46.63	28.78	40.00	-11.22
3	140.34	1.30	8.13	26.95	41.29	23.77	43.50	-19.73
4	274.19	1.79	12.78	26.47	44.83	32.93	46.00	-13.07
5	297.22	1.89	13.78	26.41	29.38	18.64	46.00	-27.36
6	922.52	3.62	23.29	26.68	24.43	24.66	46.00	-21.34



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6.11.2 Transmitter Emission above 1GHz

Test mode:	1	GFSK(DH1)	Test	channel:	Lowest	Rema	rk:	Peak
Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
3792.453	6.80	33.14	38.87	45.39	46.46	74.00	-27.54	Vertical
4804.000	6.42	34.70	39.24	50.14	52.02	74.00	-21.98	Vertical
5982.226	8.05	36.27	39.19	46.42	51.55	74.00	-22.45	Vertical
7206.000	8.92	35.63	39.07	45.77	51.25	74.00	-22.75	Vertical
9608.000	9.99	37.33	37.93	42.12	51.51	74.00	-22.49	Vertical
11455.380	10.38	38.19	38.45	43.60	53.72	74.00	-20.28	Vertical
3543.121	6.94	32.94	38.76	46.36	47.48	74.00	-26.52	Horizontal
4804.000	6.42	34.70	39.24	51.82	53.70	74.00	-20.30	Horizontal
6034.386	8.07	36.26	39.18	46.33	51.48	74.00	-22.52	Horizontal
7206.000	8.92	35.63	39.07	45.71	51.19	74.00	-22.81	Horizontal
9608.000	9.99	37.33	37.93	43.26	52.65	74.00	-21.35	Horizontal
11096.470	10.30	38.11	38.27	43.25	53.39	74.00	-20.61	Horizontal

Test mode:		GFSK(DH1)	Test	channel:	Middle	Rema	rk:	Peak
Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Limit (dBµV/m)	Over limit (dB)	Polarization
3754.236	6.82	33.12	38.85	45.55	46.64	74.00	-27.36	Vertical
4882.000	6.59	34.78	39.26	46.75	48.86	74.00	-25.14	Vertical
6025.661	8.07	36.27	39.18	46.21	51.37	74.00	-22.63	Vertical
7323.000	9.08	35.50	39.06	45.94	51.46	74.00	-22.54	Vertical
9764.000	9.90	37.81	37.84	42.85	52.72	74.00	-21.28	Vertical
11112.540	10.31	38.11	38.28	43.43	53.57	74.00	-20.43	Vertical
3668.321	6.87	33.05	38.81	46.22	47.33	74.00	-26.67	Horizontal
4882.000	6.59	34.78	39.26	50.93	53.04	74.00	-20.96	Horizontal
6051.874	8.07	36.24	39.18	46.22	51.35	74.00	-22.65	Horizontal
7323.000	9.08	35.50	39.06	45.70	51.22	74.00	-22.78	Horizontal
9764.000	9.90	37.81	37.84	42.33	52.20	74.00	-21.80	Horizontal
11323.540	10.35	38.14	38.38	43.47	53.58	74.00	-20.42	Horizontal



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Test mode:		GFSK(DH1)	Test	channel:	Highest	Rema	rk:	Peak
Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
3721.784	6.84	33.09	38.84	45.42	46.51	74.00	-27.49	Vertical
4960.000	6.76	34.86	39.29	51.66	53.99	74.00	-20.01	Vertical
5939.103	7.99	36.18	39.19	47.26	52.24	74.00	-21.76	Vertical
7440.000	9.23	35.43	39.05	45.80	51.41	74.00	-22.59	Vertical
9920.000	9.81	38.27	37.75	40.58	50.91	74.00	-23.09	Vertical
11689.790	10.47	38.39	38.56	43.28	53.58	74.00	-20.42	Vertical
3610.398	6.90	33.01	38.79	45.62	46.74	74.00	-27.26	Horizontal
4960.000	6.76	34.86	39.29	51.47	53.80	74.00	-20.20	Horizontal
5999.562	8.08	36.30	39.18	46.50	51.70	74.00	-22.30	Horizontal
7440.000	9.23	35.43	39.05	44.58	50.19	74.00	-23.81	Horizontal
9920.000	9.81	38.27	37.75	42.59	52.92	74.00	-21.08	Horizontal
11064.410	10.29	38.11	38.25	43.17	53.32	74.00	-20.68	Horizontal

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
 - Final Test Level =Receiver Reading + Antenna Factor + Cable Factor Preamplifier Factor
- 2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

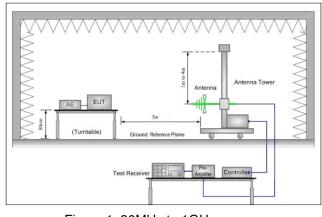


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6.12Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15	47 CFR Part 15C Section 15.209 and 15.205						
Test Method:	ANSI C63.10: 2009							
Test Site:	Measurement Distance: 3m	Measurement Distance: 3m (Semi-Anechoic Chamber)						
Limit:	Frequency	Limit (dBuV/m @3m)	Remark					
	30MHz-88MHz	40.0	Quasi-peak Value					
	88MHz-216MHz	43.5	Quasi-peak Value					
	216MHz-960MHz	46.0	Quasi-peak Value					
	960MHz-1GHz	54.0	Quasi-peak Value					
	Above 1GHz	54.0	Average Value					
	Above IGHZ	74.0	Peak Value					
Test Setup:								



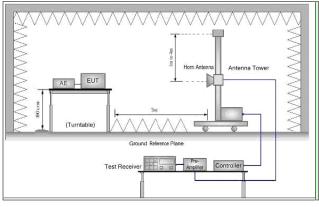


Figure 1. 30MHz to 1GHz

Figure 2. Above 1 GHz



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Test Procedure:	 a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel g. Test the EUT in the lowest channel , the Highest channel h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was
E	complete.
Exploratory Test Mode:	Non-hopping transmitting mode with all kind of modulation and all kind of data type Transmitting mode, Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the DH5 of data type and GFSK modulation is the worst case. Pretest the EUT at Transmitting mode and Charge + Transmitting mode, found the Charge + Transmitting mode which it is worse case Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass
	l .



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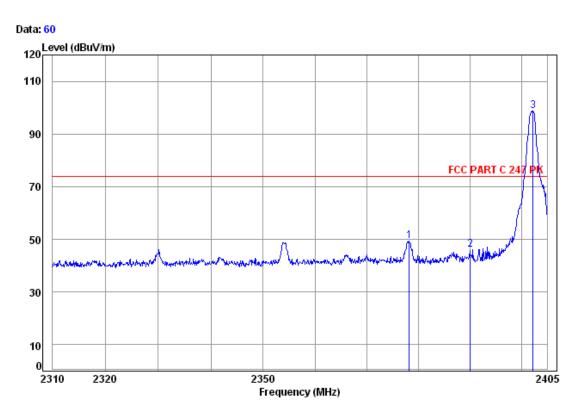


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Test plot as follows:

Worse case mode: GFSK (DH5) Test channel: Lowest Remark: Peak Vertical



Site : chamber

Condition: FCC PART C 247 PK 3m Vertical

Job No: : 3812CR

Mode: : 2402 Band edge

	Freq			Preamp Factor				
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2378.11	4.88	32.27	38.46	50.67	49.36	74.00	-24.64
2	2390.00	4.90	32.35	38.46	47.40	46.19	74.00	-27.81
3 рр	2402.29	4.92	32.41	38.46	99.82	98.69	74.00	24.69

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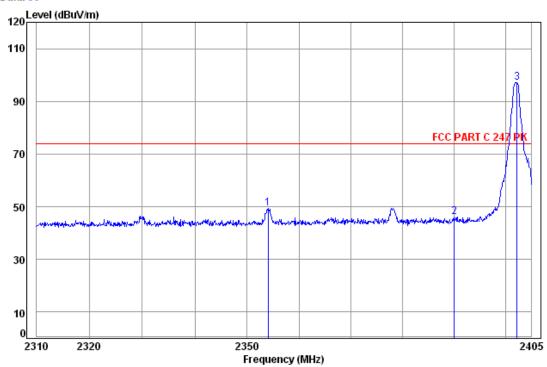


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Worse case mode: GFSK (DH5) Test channel: Remark: Peak Lowest Horizontal





: chamber

Condition: FCC PART C 247 PK 3m Horizontal

Job No: : 3812CR

Mode: : 2402 Band edge

	Freq			Preamp Factor				
_	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 2 3 pp	2353.98 2390.00 2402.29	4.90	32.35		47.27	46.06	74.00	-27.94

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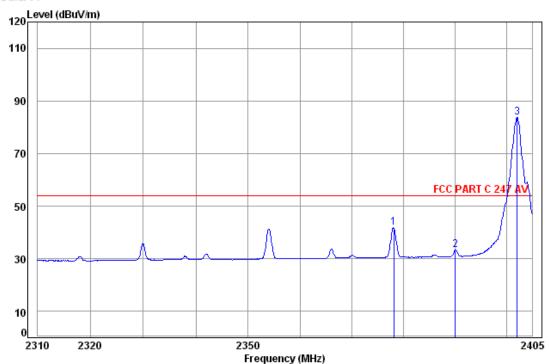


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Worse case mode: GFSK (DH5) Test channel: Lowest Remark: Average Vertical





Site : chamber

Condition: FCC PART C 247 AV 3m Vertical

Job No: : 3812CR

Mode: : 2402 Band edge

		Cable	Ant	Preamp	Read		Limit	0∨er
	Freq	Loss	Factor	Factor	Le∨el	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2378.01	4.88	32.27	38.46	43.06	41.75	54.00	-12.25
2	2390.00	4.90	32.35	38.46	34.47	33.26	54.00	-20.74
3 рр	2402.09	4.92	32.41	38.46	84.88	83.75	54.00	29.75

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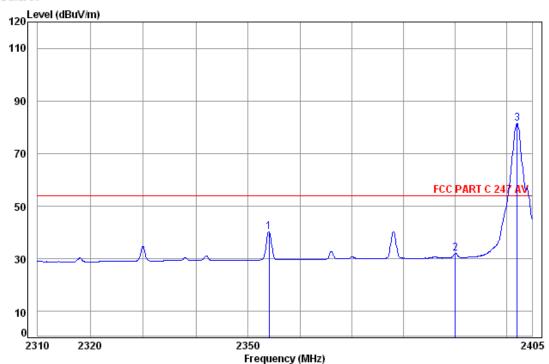


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Worse case mode: GFSK (DH5) Test channel: Lowest Remark: Average Horizontal





Site : chamber

Condition: FCC PART C 247 AV 3m Horizontal

Job No: : 3812CR

Mode: : 2402 Band edge

		Cable	Ant	Preamp	Read		Limit	0∨er
	Freq	Loss	Factor	Factor	Le∨el	Level	Line	Limit
_								
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2353.98	4.85	32.11	38.46	41.81	40.31	54.00	-13.69
2	2390.00	4.90	32.35	38.46	33.20	31.99	54.00	-22.01
3 рр	2402.09	4.92	32.41	38.46	82.62	81.49	54.00	27.49

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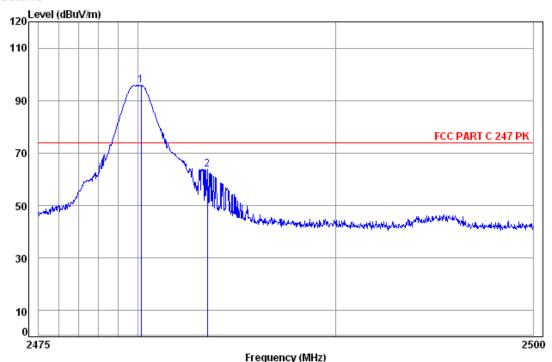


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Worse case mode: GFSK (DH5) Test channel: Highest Remark: Peak Vertical





Site : chamber

Condition: FCC PART C 247 PK 3m Vertical

Job No: : 3812CR

1 2

Mode: : 2480 Band edge

	Freq			Preamp Factor				
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
рр	2480.15	5.02	32.44	38.47	96.83	95.82	74.00	21.82
	2483.50	5.03	32.44	38.47	64.62	63.62	74.00	- 10.38

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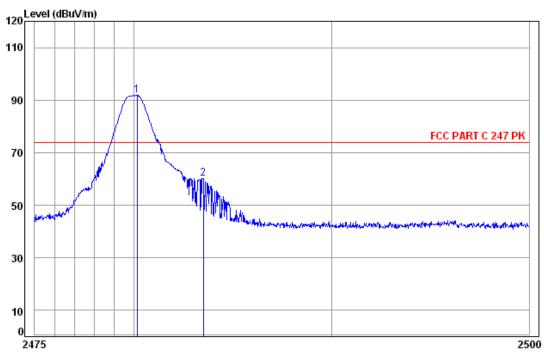


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Worse case mode: GFSK (DH5) Test channel: Highest Remark: Peak Horizontal





Frequency (MHz)

Site : chamber

Condition: FCC PART C 247 PK 3m Horizontal

Job No: : 3812CR

1 2

Mode: : 2480 Band edge

	Freq			Preamp Factor				
-	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
pp	2480.15 2483.50							

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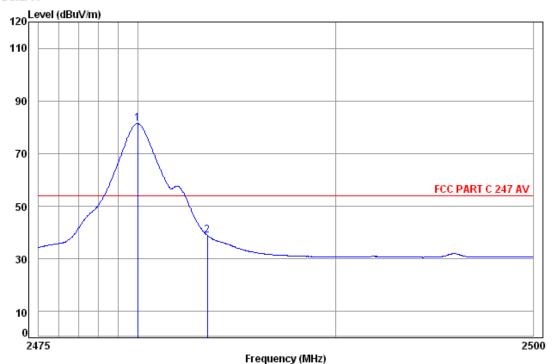


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Worse case mode: GFSK (DH5) Test channel: Highest Remark: Average Vertical





: chamber

Condition: FCC PART C 247 AV 3m Vertical

Job No: : 3812CR

2

: 2480 Band edge Mode:

		Cable	Ant	Preamp	Read		Limit	0∨er
	Frea	Loss	Factor	Factor	Level	Level	Line	Limit
_	MII-		-ID /		-ID. 37	JD. 377	JD. 377	
	MHz	аь	ab/m	dB	abuv	abuv/m	abuv/m	ab
1 pp	2479.98	5.02	32.44	38.47	82.41	81.40	54.00	27.40
	2483 50							

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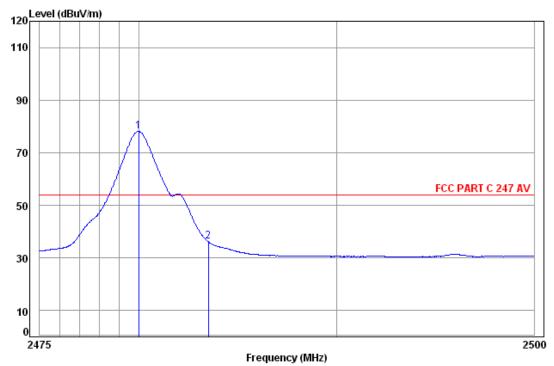


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Worse case mode: GFSK (DH5) Test channel: Highest Remark: Average Horizontal





Site : chamber

Condition: FCC PART C 247 AV 3m Horizontal

Job No: : 3812CR

Mode: : 2480 Band edge

				Preamp Factor			Freq	
dB	dBuV/m	dBuV/m	dBuV	dB	dB/m	dB	MHz	-
							2479.98 2483.50	pp

Note:

1 2

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

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7 Photographs - EUT Test Setup

Test model No.: EM-JA009

7.1 Conducted Emission



7.2 Radiated Emission



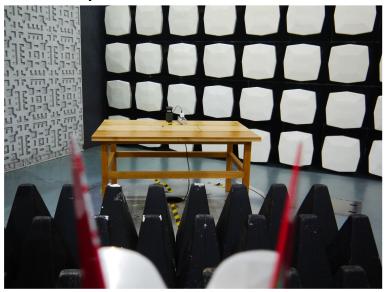
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7.3 Radiated Spurious Emission



8 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1506003812CR.



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