Report No: CCIS12100020602

FCC REPORT (Bluetooth)

Applicant:	Azumi S.A
Address of Applicant:	Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panama City, Rep. Panama

Equipment Under Test (EUT)

Product Name:	Mobile Phone
Model No.:	Q10G
FCC ID:	QRP-AZUMIQ10G
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247:2011
Date of sample receipt:	22 Oct., 2012
Date of Test:	22 Oct., to 25 Oct., 2012
Date of report issued:	25 Oct., 2012
Test Result :	PASS *

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

Authorized Signature:

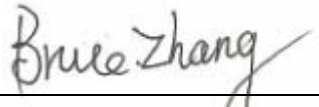
Bruce Zhang
Laboratory Manager

Version

Version No.	Date	Description
00	25 Oct., 2012	*Original*

Prepared By:  ***Date:*** 25 Oct., 2012

Project Engineer

Check By:  ***Date:*** 25 Oct., 2012

Reviewer

2 Contents

Page

3 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List (7 July 2002)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

Pass: The EUT complies with the essential requirements in the standard.

4 General Information

4.1 Client Information

Applicant:	Azumi S.A
Address of Applicant:	Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panama City, Rep. Panama
Manufacturer:	ZECHIN Technology Co., Ltd
Address of Manufacturer:	Unit804,8th Floor Desay Tech Building Gaoxin Road South,Nanshan District Shenzhen,China
Factory:	Longconn Electronics(Shenzhen) Co.;Ltd
Address of Factory:	(Xinchuangji Industrial park) NO. 42,Xingye 1 Road,Phoenix 1st Industrial Zone,Fuyong Town,Baoan District, Shenzhen,518103 ,China

4.2 General Description of E.U.T.

Product Name:	Mobile Phone
Model No.:	Q10G
Operation Frequency:	2402MHz~2480MHz
Transfer rate:	1/2/3 Mbits/s
Number of channel:	79
Modulation type:	GFSK, π/4-DQPSK, 8DPSK
Modulation technology:	FHSS
Antenna Type:	Integral Antenna
Antenna gain:	-4 dBi
AC adapter:	Input:100-240V AC,50/60Hz 0.15A Output:5V DC MAX400mA
Power supply:	Rechargeable Li-ion Battery DC3.7V/850mAh

Operation Frequency each of channel for GFSK, π/4-DQPSK, 8DPSK							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	20	2422MHz	40	2442MHz	60	2462MHz
1	2403MHz	21	2423MHz	41	2443MHz	61	2463MHz
2	2404MHz	22	2424MHz	42	2444MHz	62	2464MHz
3	2405MHz	23	2425MHz	43	2445MHz	63	2465MHz
4	2406MHz	24	2426MHz	44	2446MHz	64	2466MHz
5	2407MHz	25	2427MHz	45	2447MHz	65	2467MHz
6	2408MHz	26	2428MHz	46	2448MHz	66	2468MHz
7	2409MHz	27	2429MHz	47	2449MHz	67	2469MHz
8	2410MHz	28	2430MHz	48	2450MHz	68	2470MHz
9	2411MHz	29	2431MHz	49	2451MHz	69	2471MHz
10	2412MHz	30	2432MHz	50	2452MHz	70	2472MHz
11	2413MHz	31	2433MHz	51	2453MHz	71	2473MHz
12	2414MHz	32	2434MHz	52	2454MHz	72	2474MHz
13	2415MHz	33	2435MHz	53	2455MHz	73	2475MHz
14	2416MHz	34	2436MHz	54	2456MHz	74	2476MHz
15	2417MHz	35	2437MHz	55	2457MHz	75	2477MHz
16	2418MHz	36	2438MHz	56	2458MHz	76	2478MHz
17	2419MHz	37	2439MHz	57	2459MHz	77	2479MHz
18	2420MHz	38	2440MHz	58	2460MHz	78	2480MHz
19	2421MHz	39	2441MHz	59	2461MHz		
Remark: Channel 0, 39 &78 selected for GFSK, π/4-DQPSK and 8DPSK.							

4.3 Test mode

Transmitting mode:	Keep the EUT in transmitting mode with worse case data rate.
Remark	8DPSK were the worst case mode.

4.4 Test Facility

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

- **FCC —Registration No.:** 817957

China Certification & Inspection 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 out files. Registration 817957, February 27, 2012

- **Industry Canada (IC)**

The 3m Semi-anechoic chamber of China Certification & Inspection Services Co., Ltd. Has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

4.5 Test Location

All tests were performed at:

China Certification & Inspection Services Co., Ltd.
Address: 1st Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China
Tel: 0755-23118282
Fax: 0755-23116366

4.6 Other Information Requested by the Customer

None.

4.7 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	3m Semi- Anechoic Chamber	SAEMC	9(L)*6(W)* 6(H)	CCIS0001	June 09 2012	June 09 2013
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	CCIS0002	N/A	N/A
3	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	CCIS0005	June 04 2012	June 04 2013
4	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	CCIS0006	May 30 2012	May 30 2013
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Coaxial Cable	CCIS	N/A	CCIS0016	Apr. 01 2012	Apr. 01 2013
7	Coaxial Cable	CCIS	N/A	CCIS0017	Apr. 01 2012	Apr. 01 2013
8	Coaxial cable	CCIS	N/A	CCIS0018	Apr. 01 2012	Apr. 01 2013
9	Coaxial Cable	CCIS	N/A	CCIS0019	Apr. 01 2012	Apr. 01 2013
10	Coaxial Cable	CCIS	N/A	CCIS0087	Apr. 01 2012	Apr. 01 2013
11	Amplifier(10KHz-1.3GHz)	HP	8447D	CCIS0003	Apr. 01 2012	Apr. 01 2013
12	Amplifier(1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	CCIS0011	June 09 2012	June 09 2013
13	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	Apr. 01 2012	Mar. 31 2013
14	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 30 2012	Mar. 29 2013
15	Printer	Hp	HP LaserJet P1007	N/A	N/A	N/A
16	Positioning Controller	UC	UC3000	CCIS0015	N/A	N/A

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	Shielding Room	ZhongShuo Electron	11.0(L)x4.0(W)x3.0(H)	CCIS0061	Oct. 10 2012	Oct. 10 2013
2	EMI Test Receiver	Rohde & Schwarz	ESPI	CCIS0022	Mar. 16 2012	Mar. 16 2013
4	LISN	CHASE	MN2050D	CCIS0074	Apr. 14 2012	Apr. 14 2013
5	Coaxial Cable	CCIS	N/A	CCIS0086	Mar. 01 2012	Mar. 01 2013
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

5 Test results and Measurement Data

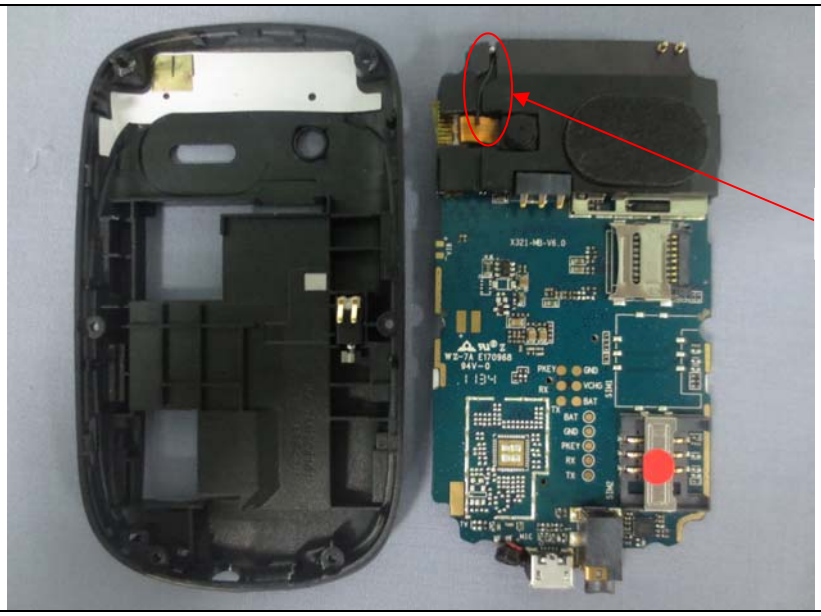
5.1 Antenna requirement:

Standard requirement:	FCC Part15 C Section 15.203 /247(c)

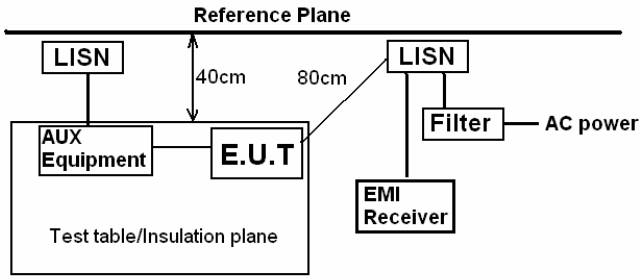
15.203 requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer 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(c) (1)(i) requirement:
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna:	

The antenna is an integral antenna which permanently attached, and the best case gain of the antenna is -4 dBi.

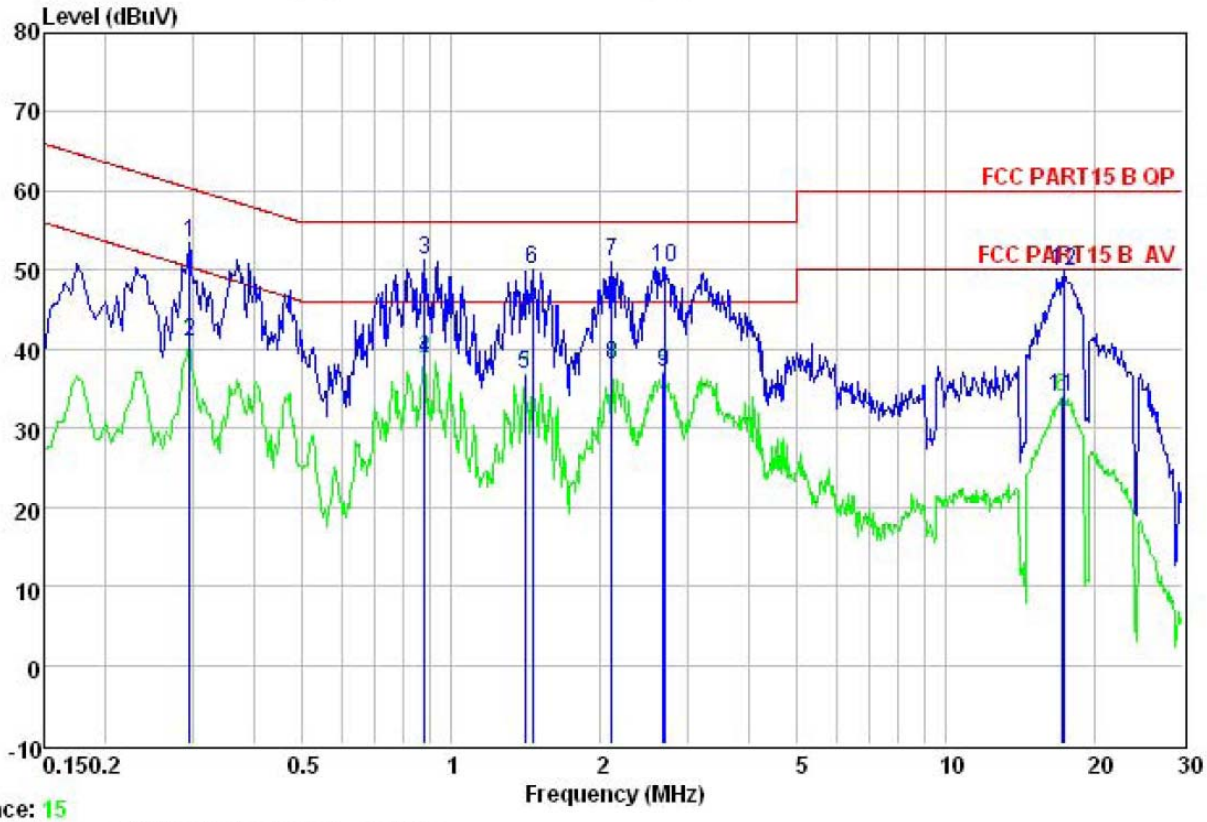


5.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.4:2003
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9kHz, VBW=30kHz, Sweep time=auto
Limit:	Frequency range (MHz) / Limit (dBuV): 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 logarithm of the frequency.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.
Test Instruments:	Refer to section 5.7 for details
Test mode:	Bluetooth mode
Test results:	Pass

Measurement Data

Line:

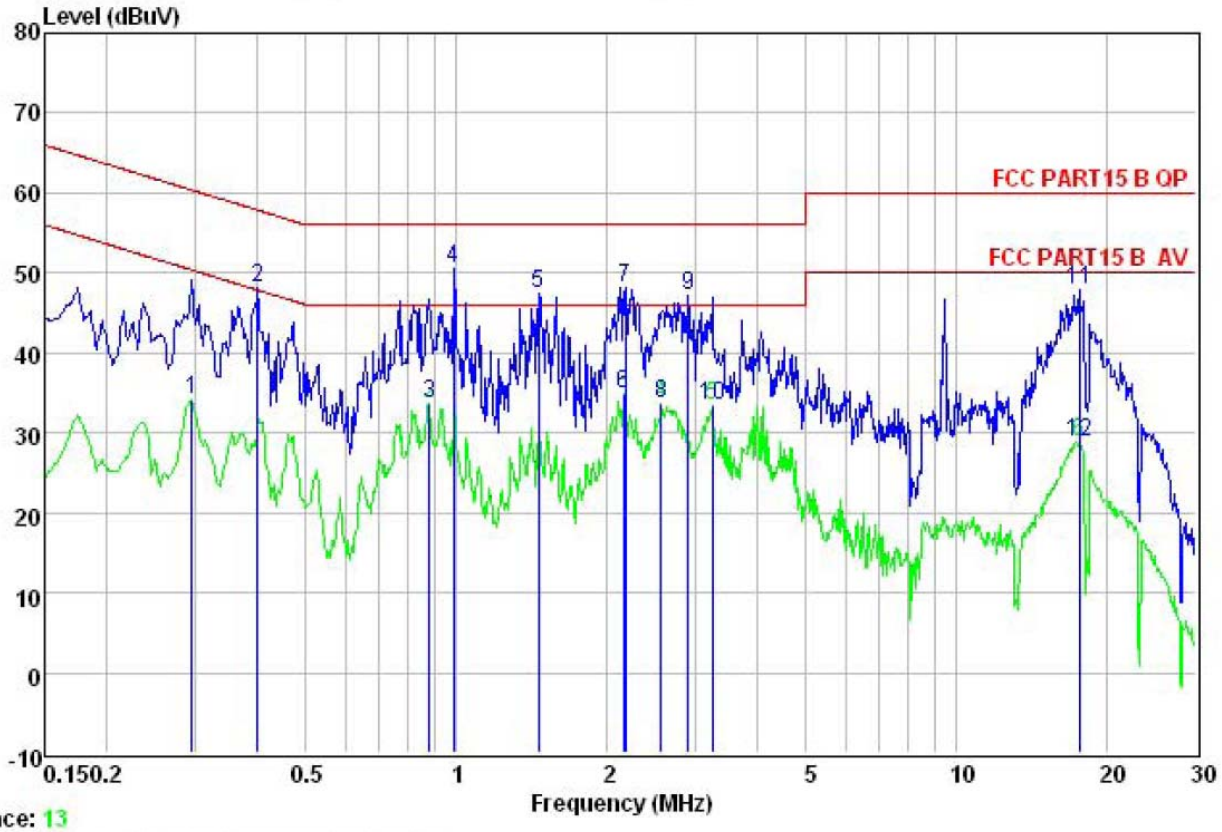


Trace: 15

Site : CCIS Conducted Test Site
Condition : FCC PART15 B QP LISN LINE
Job NO. : 206RF
Test Mode : BT mode
Test engieer: Joe
Power Rating: AC 120V/60Hz

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.296	42.56	10.26	0.74	53.56	60.37	-6.81	QP
2	0.296	29.94	10.26	0.74	40.94	50.37	-9.43	Average
3	0.880	40.33	10.20	0.84	51.37	56.00	-4.63	QP
4	0.880	27.79	10.20	0.84	38.83	46.00	-7.17	Average
5	1.403	26.10	10.24	0.48	36.82	46.00	-9.18	Average
6	1.456	39.42	10.25	0.37	50.04	56.00	-5.96	QP
7	2.110	39.70	10.28	0.96	50.94	56.00	-5.06	QP
8	2.110	26.90	10.28	0.96	38.14	46.00	-7.86	Average
9	2.678	25.71	10.28	0.94	36.93	46.00	-9.07	Average
10	2.707	39.20	10.28	0.93	50.41	56.00	-5.59	QP
11	17.109	22.75	10.28	0.91	33.94	50.00	-16.06	Average
12	17.291	38.61	10.28	0.91	49.80	60.00	-10.20	QP

Neutral:



Trace: 13

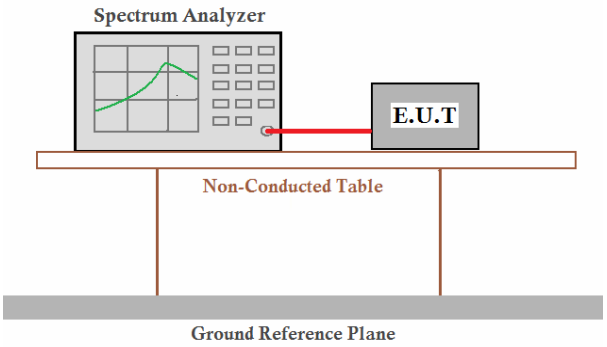
Site : CCIS Conducted Test Site
Condition : FCC PART15 B QP LISN NEUTRAL
Job NO. : 206RF
Test Mode : BT mode
Test engieer: Joe
Power Rating: AC 120V/60Hz

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.296	23.27	10.24	0.74	34.25	50.37	-16.12	Average
2	0.400	37.06	10.26	0.72	48.04	57.86	-9.82	QP
3	0.880	22.62	10.19	0.84	33.65	46.00	-12.35	Average
4	0.984	39.55	10.20	0.87	50.62	56.00	-5.38	QP
5	1.456	36.86	10.24	0.37	47.47	56.00	-8.53	QP
6	2.155	23.56	10.27	0.96	34.79	46.00	-11.21	Average
7	2.178	36.88	10.27	0.96	48.11	56.00	-7.89	QP
8	2.567	22.40	10.27	0.94	33.61	46.00	-12.39	Average
9	2.900	35.88	10.28	0.92	47.08	56.00	-8.92	QP
10	3.241	22.26	10.28	0.90	33.44	46.00	-12.56	Average
11	17.568	36.77	10.29	0.92	47.98	60.00	-12.02	QP
12	17.568	17.70	10.29	0.92	28.91	50.00	-21.09	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss

5.3 Conducted Output Power

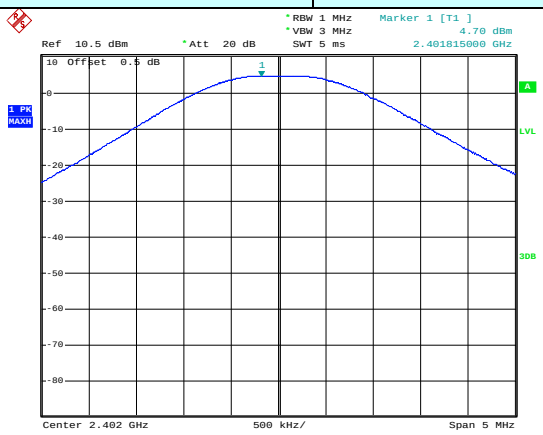
Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.4:2003 and DA00-705
Receiver setup:	RBW=1MHz, VBW=3MHz, Detector=Peak (If 20dB BW ≤1 MHz) RBW=3MHz, VBW=10MHz, Detector=Peak (If 20dB BW > 1 MHz)
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.70	30.00	Pass
Middle	4.22	30.00	Pass
Highest	3.33	30.00	Pass
π /4-DQPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.03	30.00	Pass
Middle	3.63	30.00	Pass
Highest	2.63	30.00	Pass
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	4.91	30.00	Pass
Middle	4.49	30.00	Pass
Highest	3.51	30.00	Pass

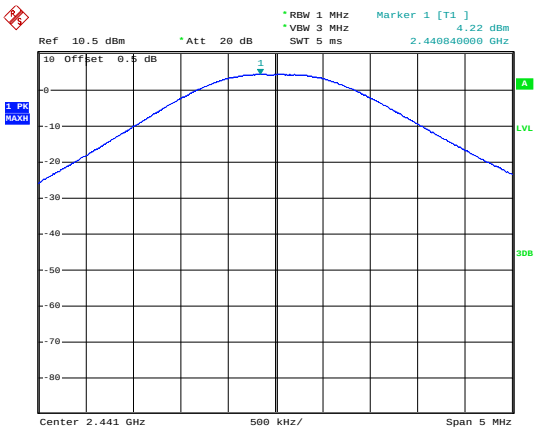
Test plot as follows:

Modulation mode:	GFSK



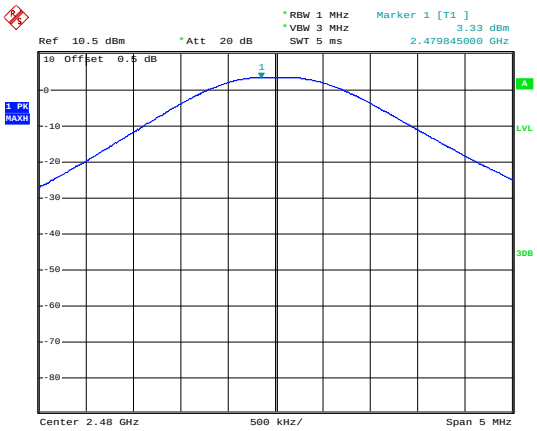
Date: 24.OCT.2012 08:31:20

Lowest channel



Date: 24.OCT.2012 08:49:26

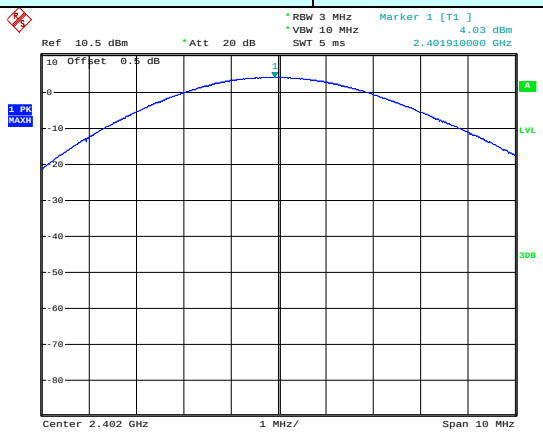
Middle channel



Date: 24.OCT.2012 08:49:53

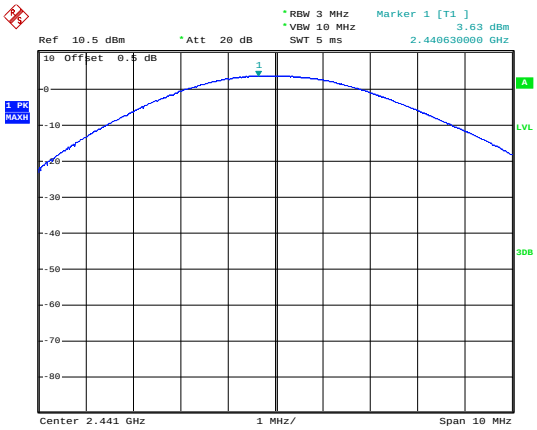
Highest channel

Modulation mode:	π/4-DQPSK



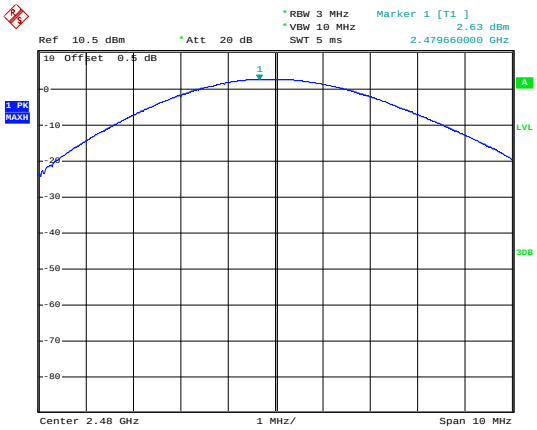
Date: 24.OCT.2012 08:53:28

Lowest channel



Date: 24.OCT.2012 08:52:32

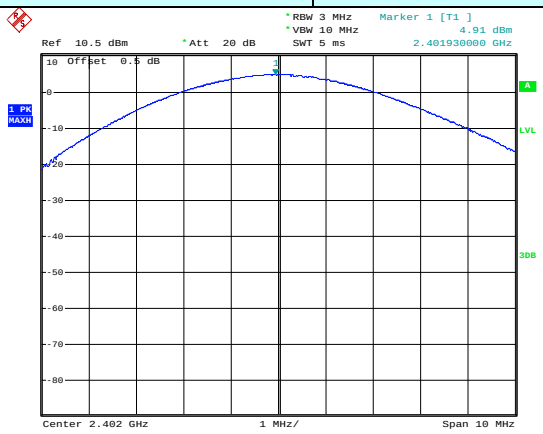
Middle channel



Date: 24.OCT.2012 08:54:08

Highest channel

Modulation mode:	8DPSK



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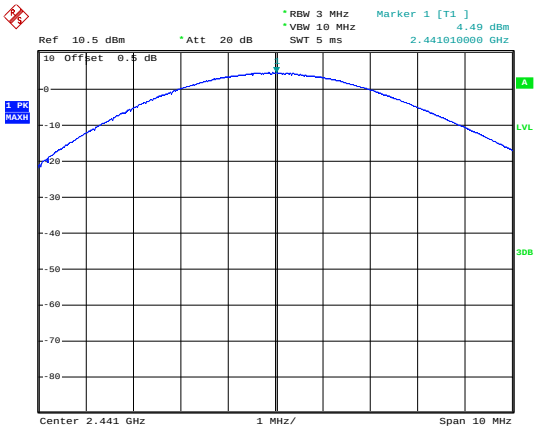
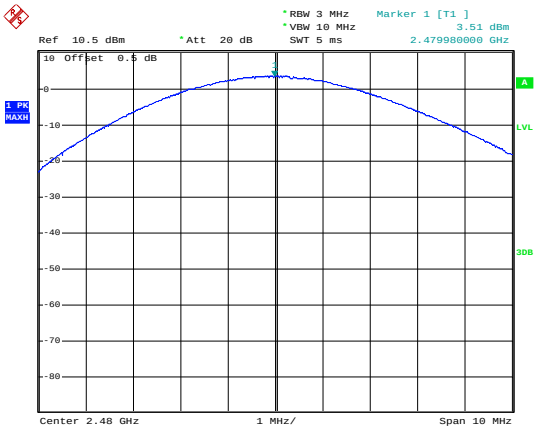
Lowest channel



Date: 24.OCT.2012 10:58:54

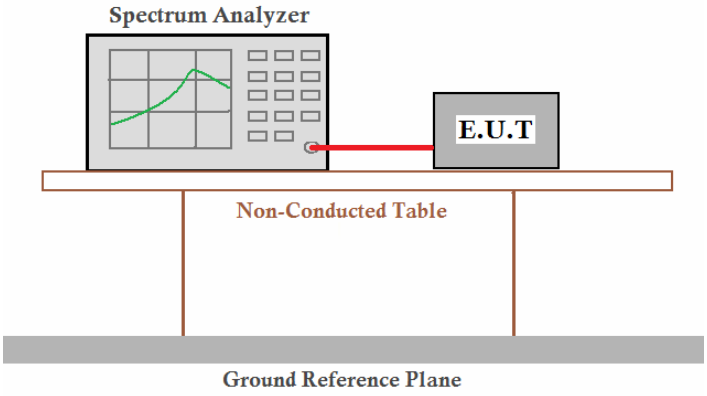
Middle channel



Date: 24.OCT.2012 10:59:32

Highest channel

5.4 20dB Occupy Bandwidth

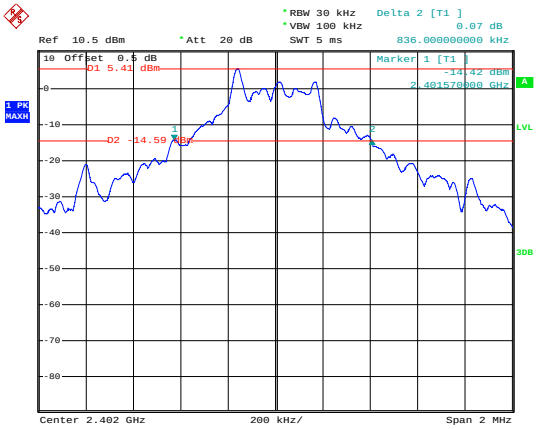
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and DA00-705
Receiver setup:	RBW=30kHz, VBW=100kHz,detector=Peak
Limit:	NA
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Measurement Data

Test channel	20dB Occupy Bandwidth (kHz)		
	GFSK	π /4-DQPSK	8DPSK
Lowest	836	1116	1162
Middle	816	1112	1164
Highest	824	1116	1164

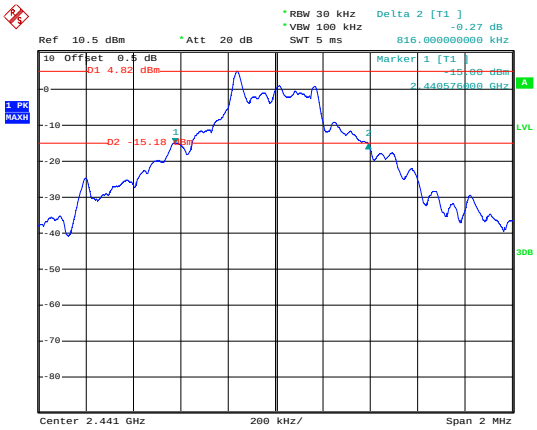
Test plot as follows:

Modulation mode:	GFSK



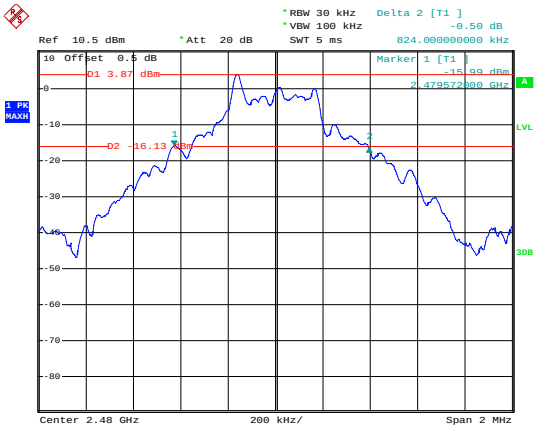
Date: 25.OCT.2012 04:15:39

Lowest channel



Date: 25.OCT.2012 04:20:15

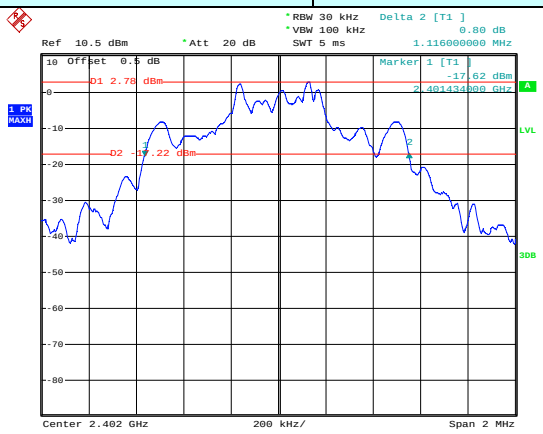
Middle channel



Date: 25.OCT.2012 04:24:01

Highest channel

Modulation mode:	π/4-DQPSK



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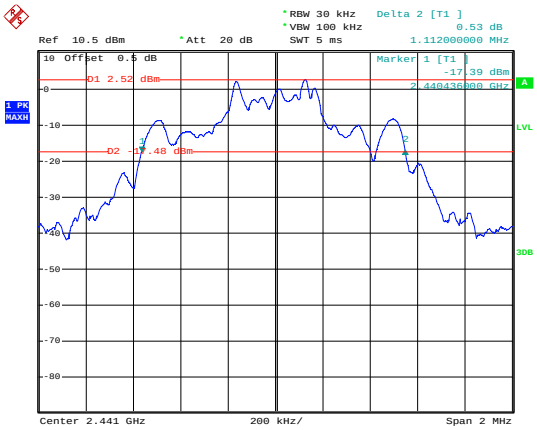
Lowest channel



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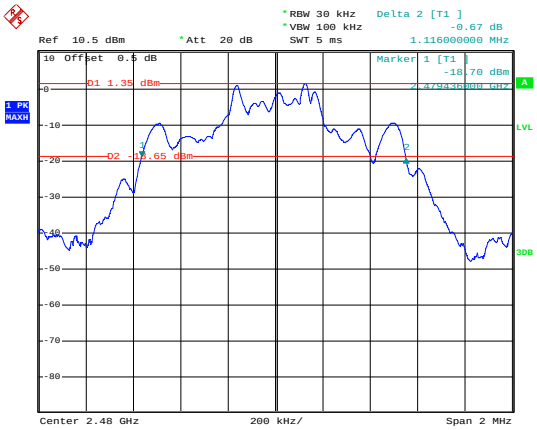
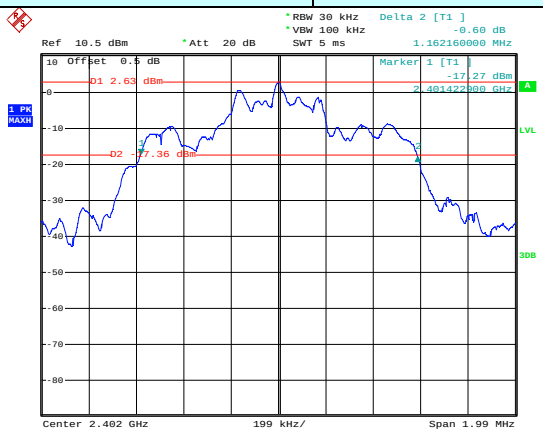
Middle channel



Date: 25.OCT.2012 04:45:45

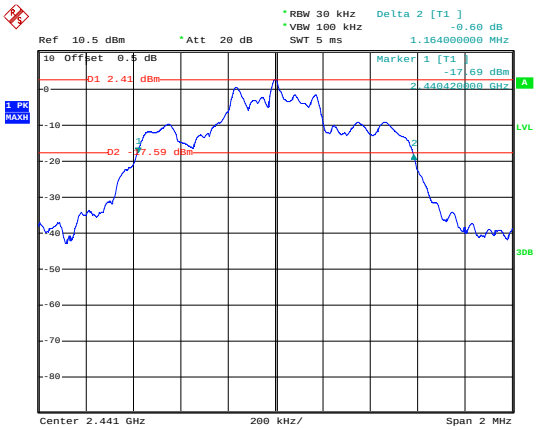
Highest channel

Modulation mode:	8DPSK



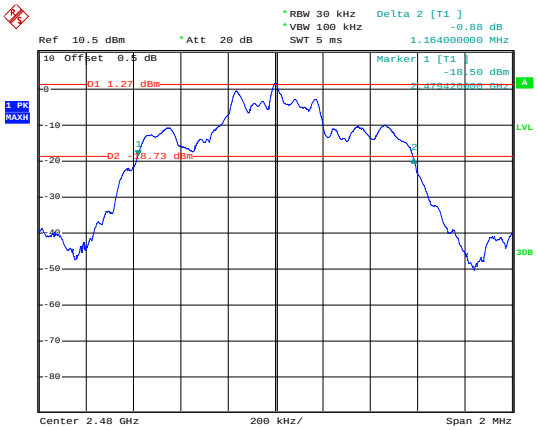
Date: 25.OCT.2012 05:04:01

Lowest channel



Date: 25.OCT.2012 05:08:26

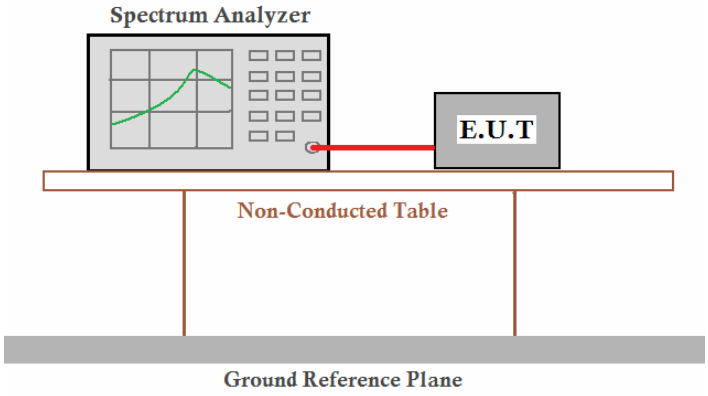
Middle channel



Date: 25.OCT.2012 05:12:16

Highest channel

5.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and DA00-705
Receiver setup:	RBW=100kHz, VBW=300kHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data

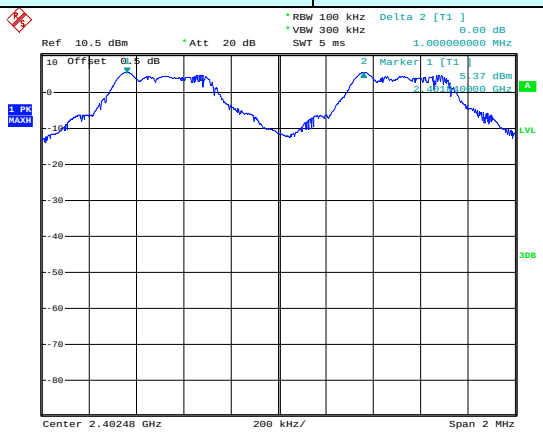
GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	*557.333*	Pass
Middle	1000	*557.333*	Pass
Highest	1000	*557.333*	Pass
π/4-DQPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	*744.000*	Pass
Middle	1006	*744.000*	Pass
Highest	1008	*744.000*	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1002	*776.000*	Pass
Middle	1002	*776.000*	Pass
Highest	1004	*776.000*	Pass

Note: According to section 5.4

Mode	*20dB bandwidth (kHz) (worse case)*	*Limit (kHz) (Carrier Frequencies Separation)*
GFSK	*836*	*557.333*
π/4-DQPSK	*1116*	*744.000*
8DPSK	*1164*	*776.000*

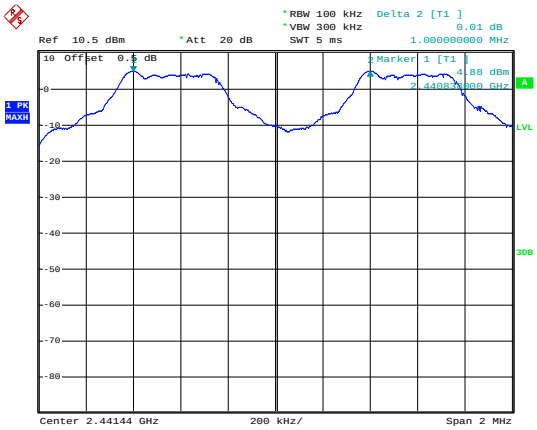
Test plot as follows:

Modulation mode:	GFSK



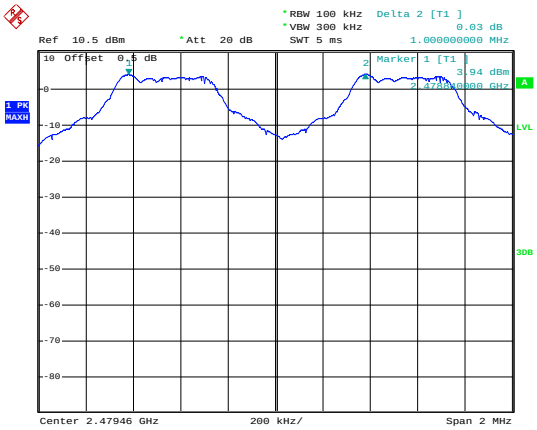
Date: 25.OCT.2012 04:19:04

Lowest channel



Date: 25.OCT.2012 04:22:52

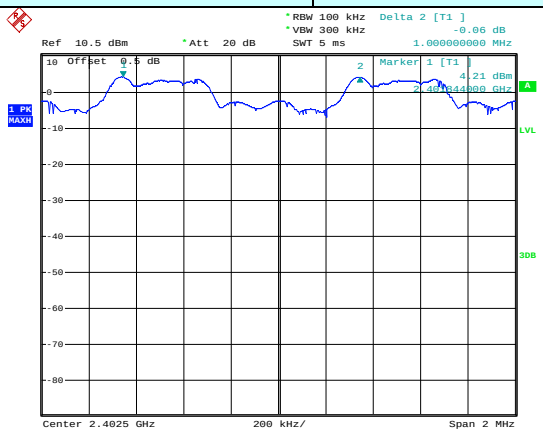
Middle channel



Date: 25.OCT.2012 04:27:02

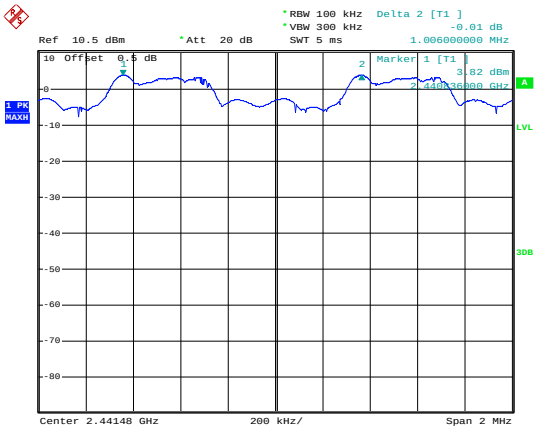
Highest channel

Modulation mode:	π /4-DQPSK



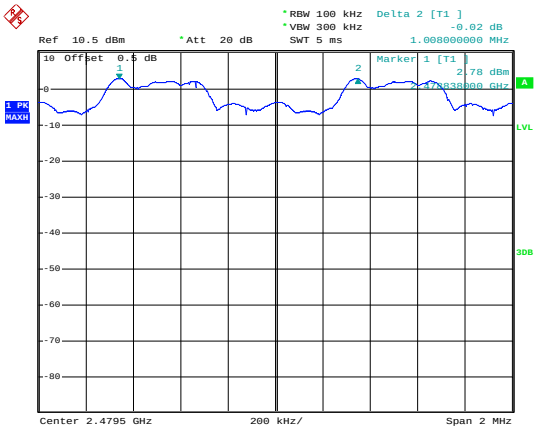
Date: 25.OCT.2012 04:40:37

Lowest channel



Date: 25.OCT.2012 04:44:26

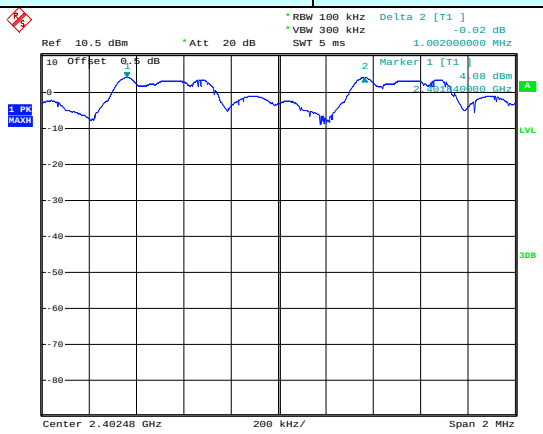
Middle channel



Date: 25.OCT.2012 04:50:01

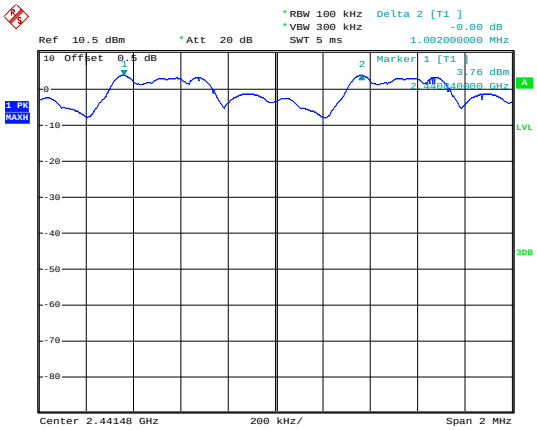
Highest channel

Modulation mode:	8DPSK



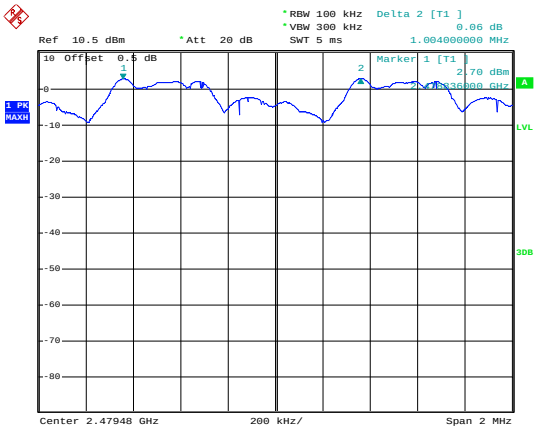
Date: 25.OCT.2012 05:07:16

Lowest channel



Date: 25.OCT.2012 05:11:05

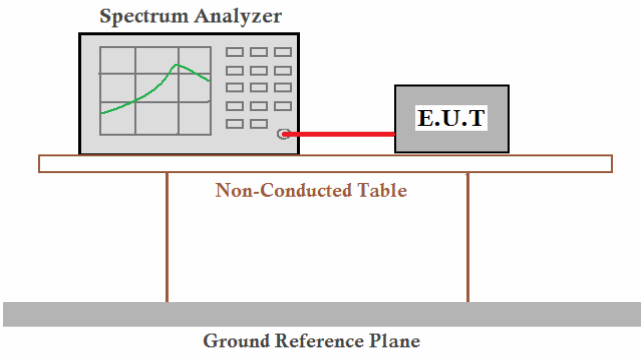
Middle channel



Date: 25.OCT.2012 05:15:46

Highest channel

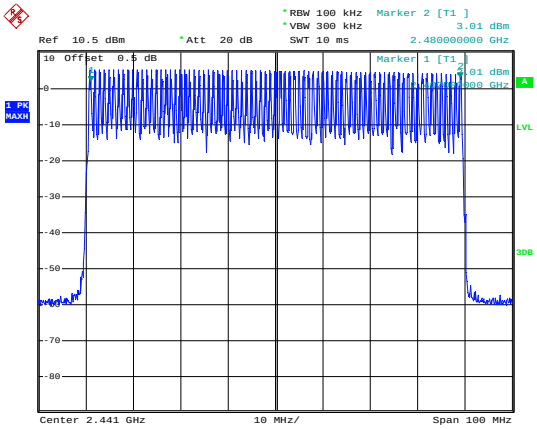
5.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and DA00-705
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data:

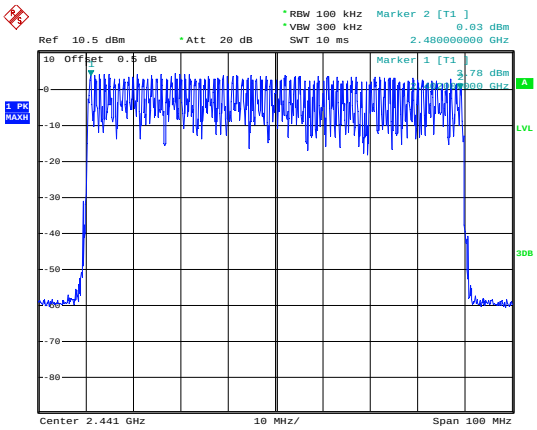
Mode	Hopping channel numbers	Limit	Result
GFSK, π/4-DQPSK, 8DPSK,	79	15	Pass

GFSK



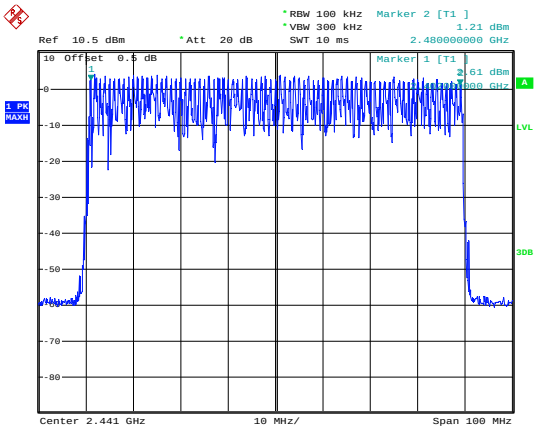
Date: 25.OCT.2012 04:30:31

π/4-DQPSK



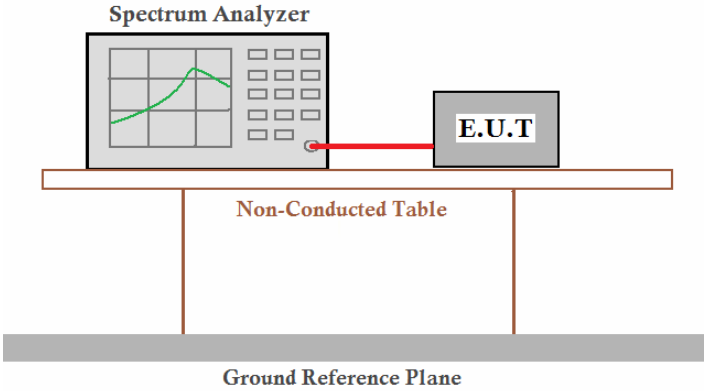
Date: 25.OCT.2012 04:59:52

8DPSK



Date: 25.OCT.2012 05:19:30

5.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Hopping mode
Test results:	Pass

Measurement Data (Worse case)

Mode	Packet	Dwell time (second)	Limit (second)	Result
GFSK	DH1	0.1536	0.4	Pass
	DH3	0.1088		
	DH5	0.3166		
π /4-DQPSK	2-DH1	0.1356	0.4	Pass
	2-DH3	0.1088		
	2-DH5	0.3166		
8DPSK	3-DH1	0.1344	0.4	Pass
	3-DH3	0.2720		
	3-DH5	0.3155		

For GFSK, π/4-DQPSK and 8DPSK:

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

The lowest channel (2402MHz), middle channel (2441MHz), highest channel (2480MHz) as below

DH1 time slot=0.408(ms)*(1600/ (2*79))*31.6=153.6ms

DH3 time slot=1.680(ms)*(1600/ (4*79))*31.6=108.8 ms

DH5 time slot=2.940(ms)*(1600/ (6*79))*31.6=316.6ms

2DH1 time slot=0.424(ms)*(1600/ (2*79))*31.6=135.6ms

2DH3 time slot=1.680(ms)*(1600/ (4*79))*31.6=108.8ms

2DH5 time slot=2.970(ms)*(1600/ (6*79))*31.6=316.6ms

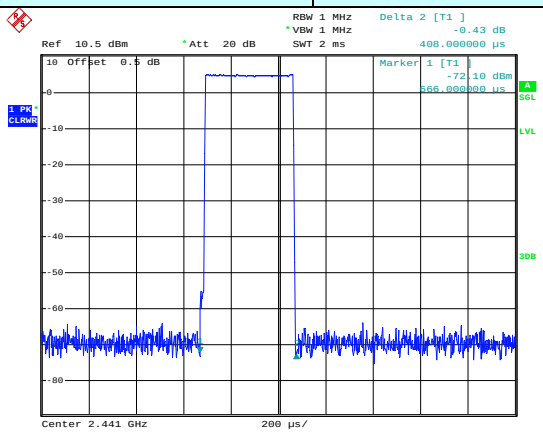
3DH1 time slot=0.420(ms)*(1600/ (2*79))*31.6=134.4ms

3DH3 time slot=1.700(ms)*(1600/ (4*79))*31.6=272.0ms

3DH5 time slot=2.960(ms)*(1600/ (6*79))*31.6=315.5ms

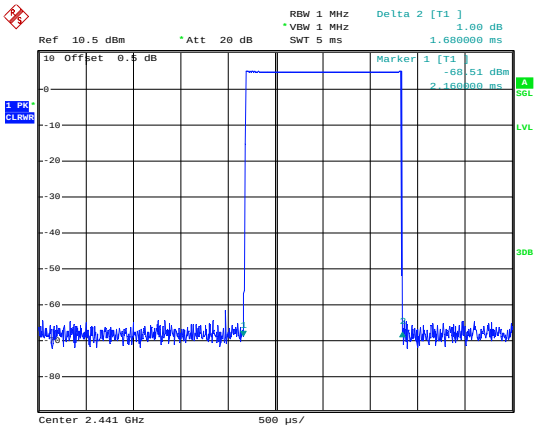
Test plot as follows:

Modulation mode:	GFSK



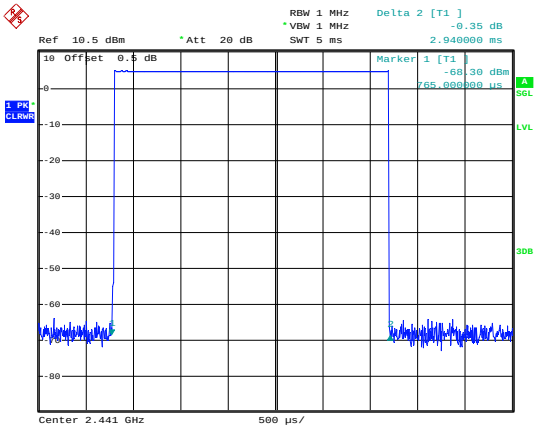
Date: 25.OCT.2012 04:31:58

DH1, 2-DH1, 3-DH1



Date: 25.OCT.2012 04:32:50

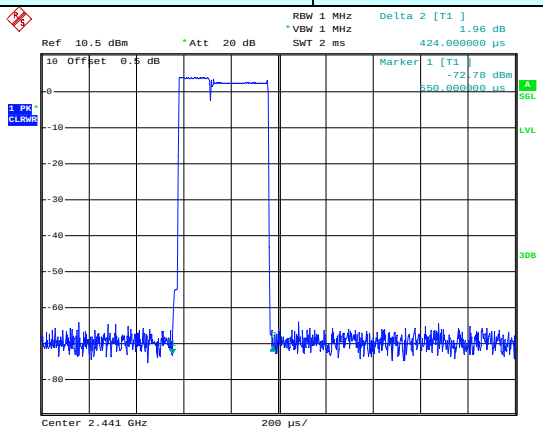
DH3, 2-DH3, 3-DH3



Date: 25.OCT.2012 04:33:26

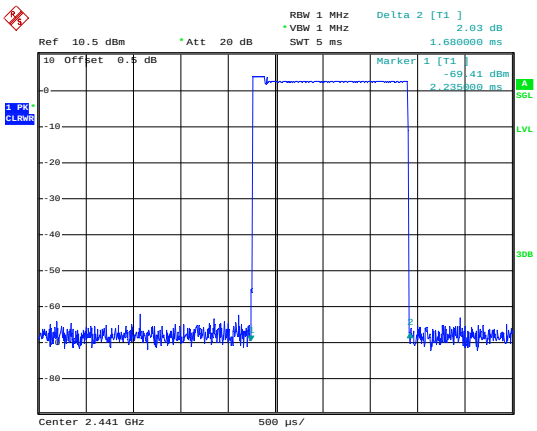
DH5, 2-DH5, 3-DH5

Modulation mode:	π/4-DQPSK



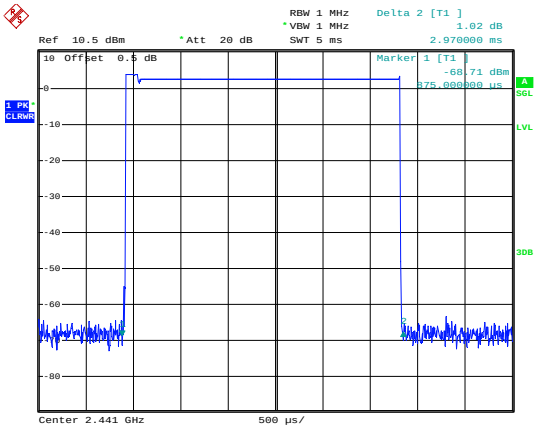
Date: 25.OCT.2012 05:01:13

DH1, 2-DH1, 3-DH1



Date: 25.OCT.2012 05:02:08

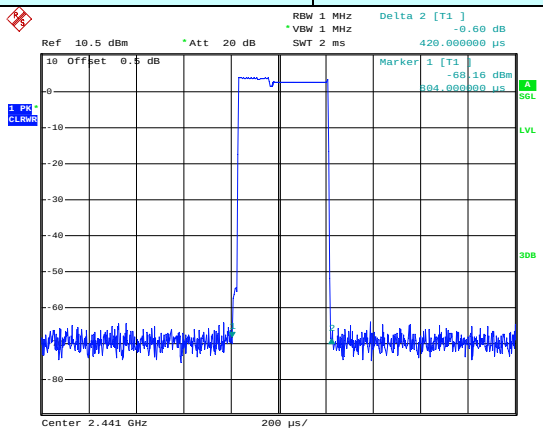
DH3, 2-DH3, 3-DH3



Date: 25.OCT.2012 05:02:50

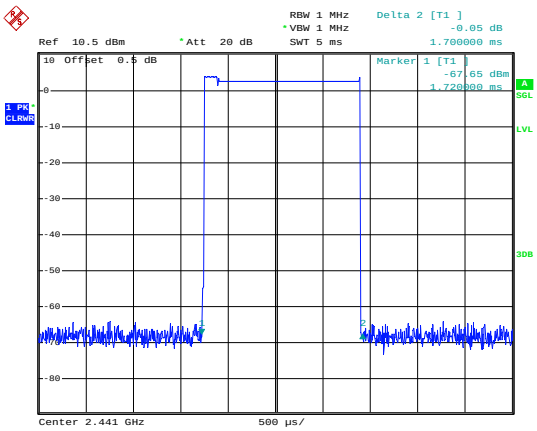
DH5, 2-DH5, 3-DH5

Modulation mode:	8DPSK



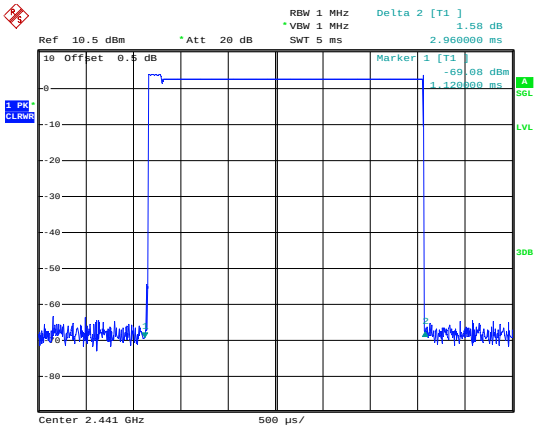
Date: 25.OCT.2012 05:20:30

DH1, 2-DH1, 3-DH1



Date: 25.OCT.2012 05:21:06

DH3, 2-DH3, 3-DH3



Date: 25.OCT.2012 05:21:33

DH5, 2-DH5, 3-DH5

5.8 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:

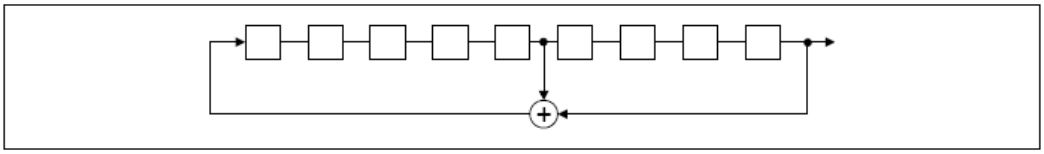
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

EUT Pseudorandom Frequency Hopping Sequence

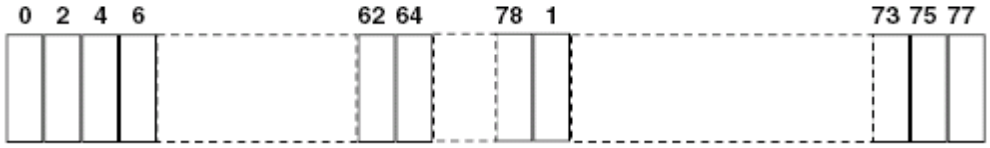
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized 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:

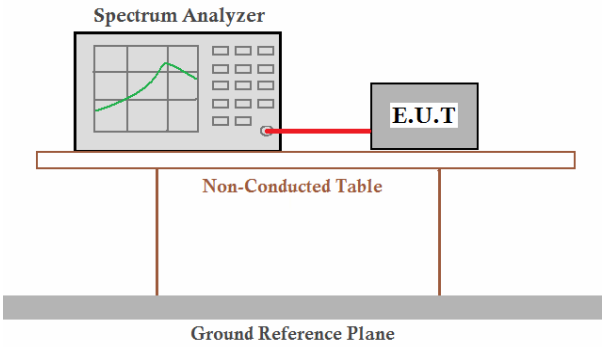


Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

5.9 Band Edge

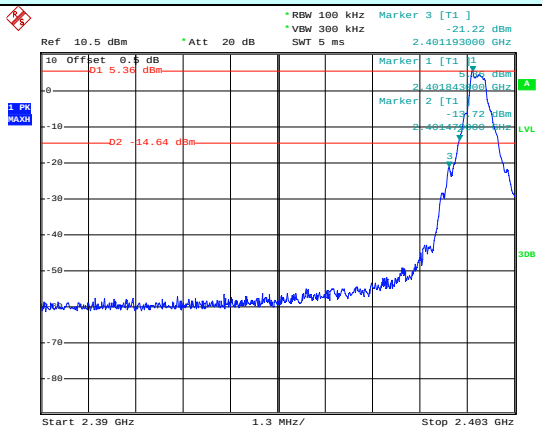
5.9.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and DA00-705
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
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 30 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.
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode and hopping mode
Test results:	Pass

Test plot as follows:

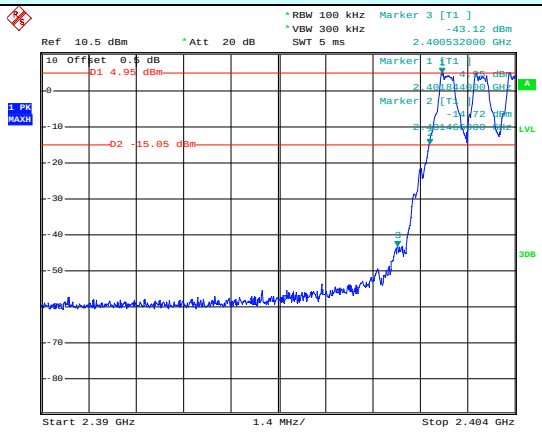
GFSK

Test channel:	Lowest channel



Date: 25.OCT.2012 04:16:34

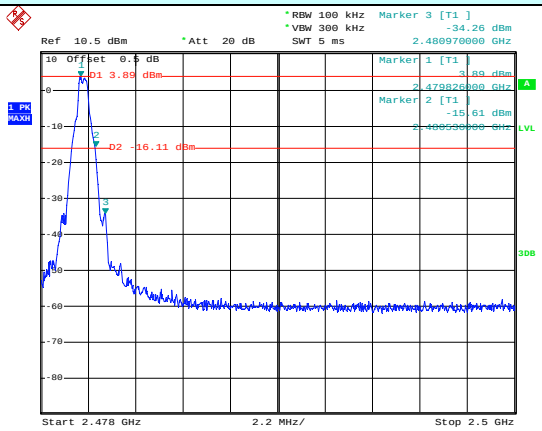
No-hopping mode



Date: 25.OCT.2012 05:27:59

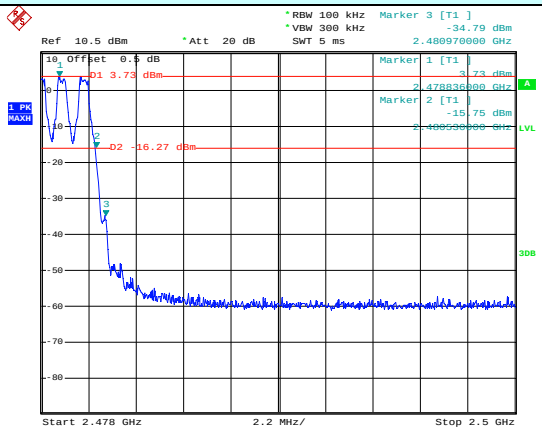
Hopping mode

Test channel:	Highest channel



Date: 25.OCT.2012 04:24:44

No-hopping mode

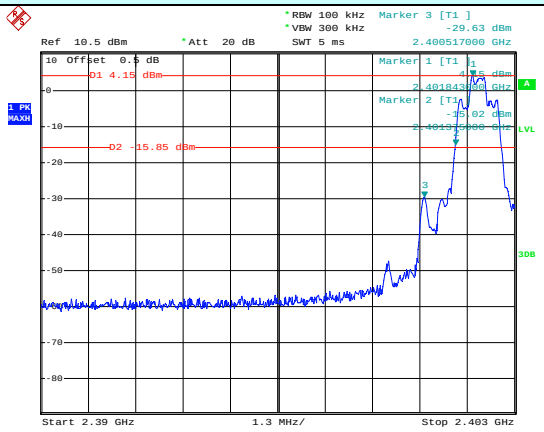


Date: 25.OCT.2012 05:26:31

Hopping mode

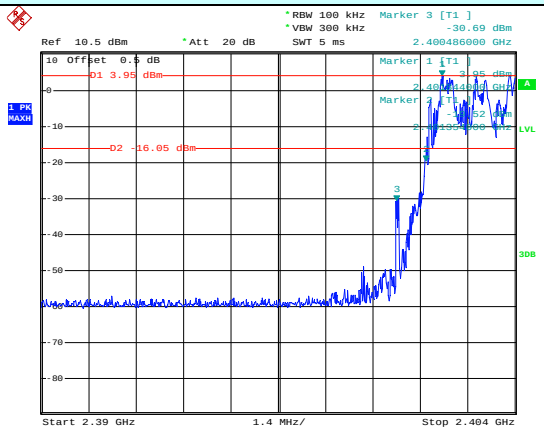
π /4-DQPSK

Test channel:	Lowest channel



Date: 25.OCT.2012 04:37:30

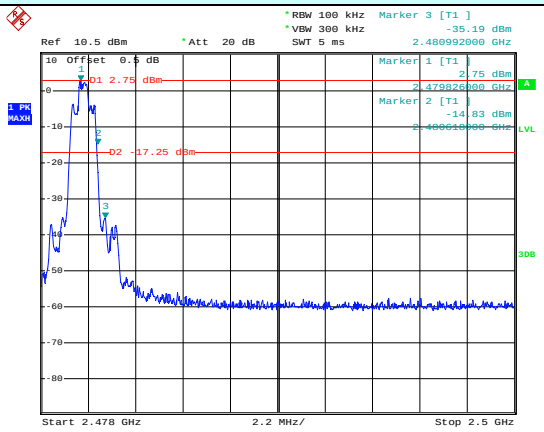
No-hopping mode



Date: 25.OCT.2012 04:53:21

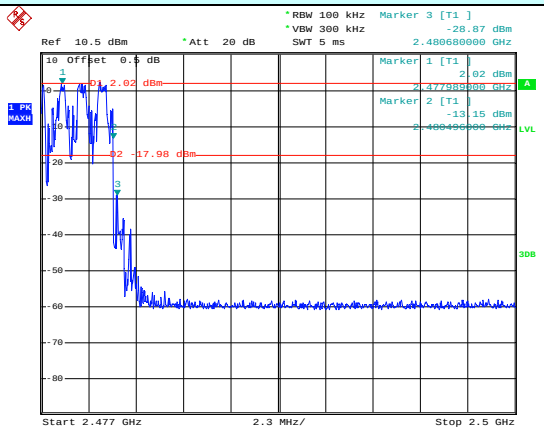
Hopping mode

Test channel:	Highest channel



Date: 25.OCT.2012 04:47:17

No-hopping mode

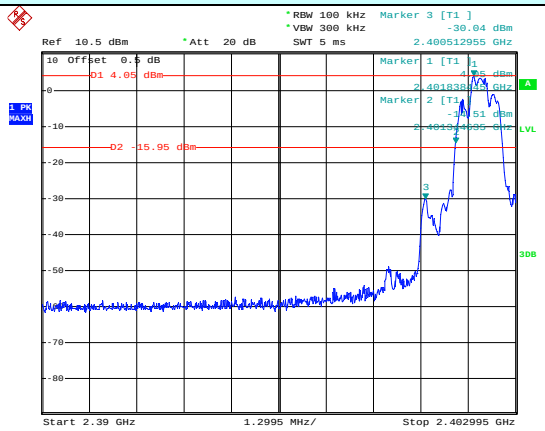


Date: 25.OCT.2012 04:56:30

Hopping mode

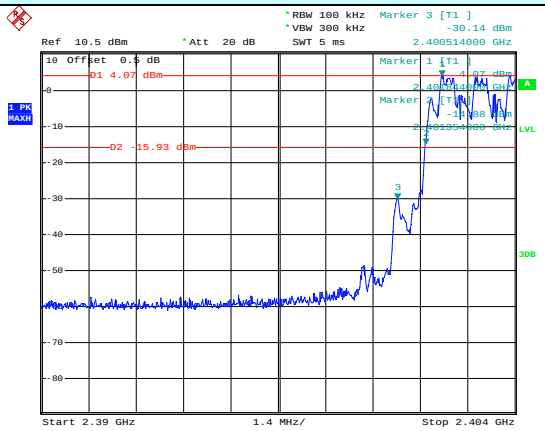
8DPSK

Test channel:	Lowest channel



Date: 25.OCT.2012 05:04:41

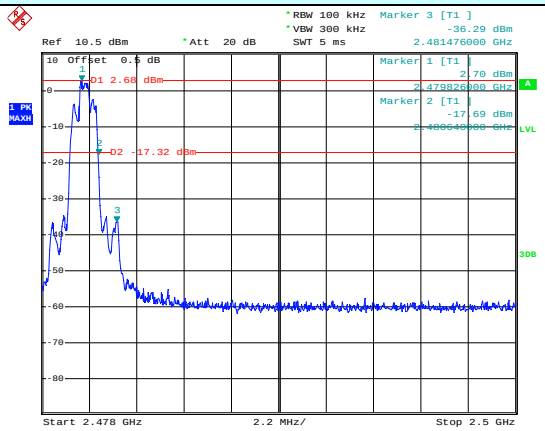
No-hopping mode



Date: 25.OCT.2012 05:23:09

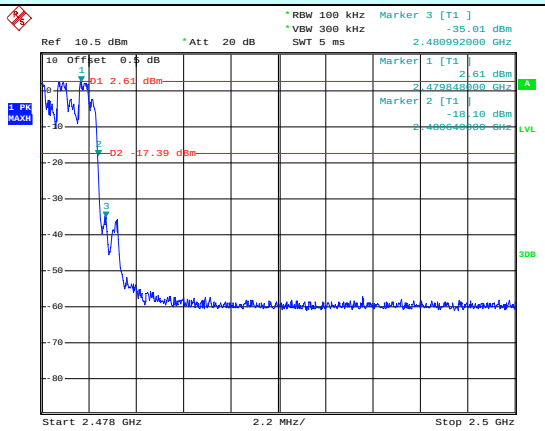
Hopping mode

Test channel:	Highest channel



Date: 25.OCT.2012 05:13:10

No-hopping mode



Date: 25.OCT.2012 05:24:41

Hopping mode

5.9.2 Radiated Emission Method

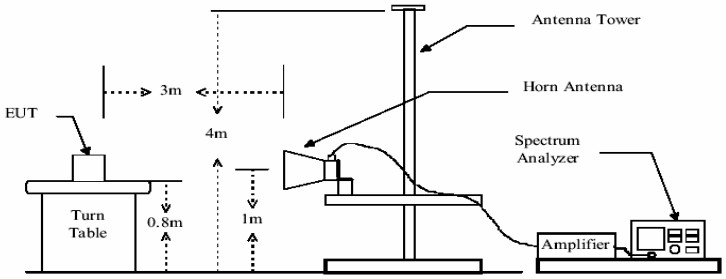
Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.4: 2003
Test Frequency Range:	2.3GHz to 2.5GHz
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
Above 1GHz	54.00	Average Value
	74.00	Peak Value

Test setup:



Test Procedure:

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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 margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Passed

Remark:

1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8DPSK, and found the 8DPSK modulation is the worst case.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.*

Test channel:	Lowest	Level:	Peak

Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	63.25	27.58	3.81	34.83	59.81	74.00	-14.19	Horizontal
2390.00	64.26	27.58	3.81	34.83	60.82	74.00	-13.18	Vertical

Test channel:	Lowest	Level:	Average

Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	48.35	27.58	3.81	34.83	44.91	54.00	-9.09	Horizontal
2390.00	46.25	27.58	3.81	34.83	42.81	54.00	-11.19	Vertical

Test channel:	Highest	Level:	Peak

Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	65.34	27.52	3.89	34.86	61.89	74.00	-12.11	Horizontal
2483.50	67.15	27.52	3.89	34.86	63.70	74.00	-10.30	Vertical

Test channel:	Highest	Level:	Average

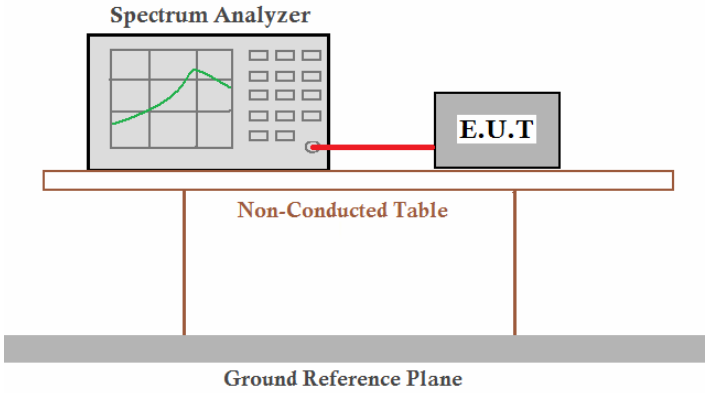
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	45.32	27.52	3.89	34.86	41.87	54.00	-12.13	Horizontal
2483.50	46.28	27.52	3.89	34.86	42.83	54.00	-11.17	Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

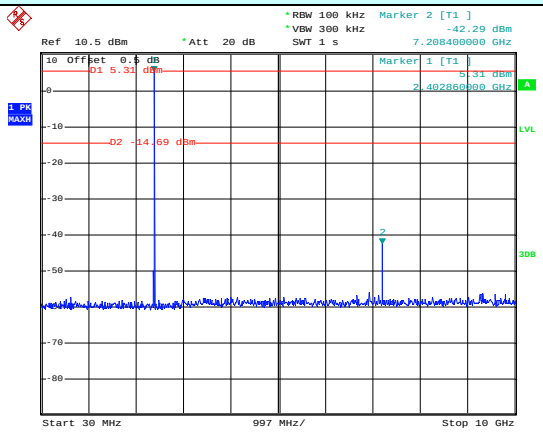
5.10 Spurious Emission

5.10.1 Conducted Emission Method

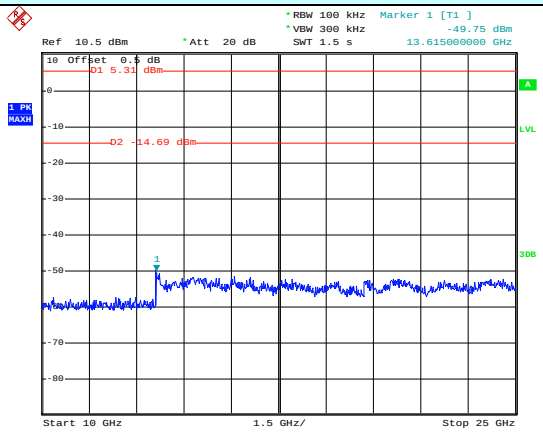
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and DA00-705
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 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.
Test setup:	
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

GFSK

Lowest channel

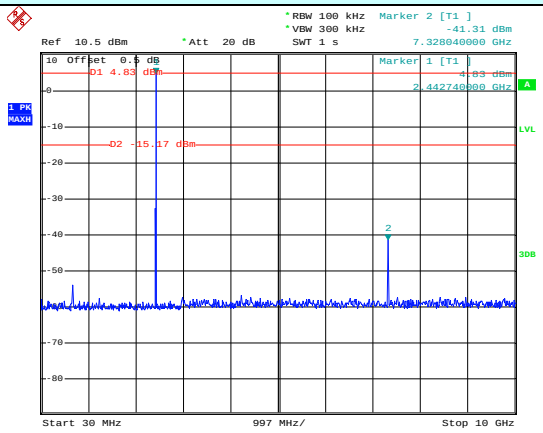


30MHz~10GHz

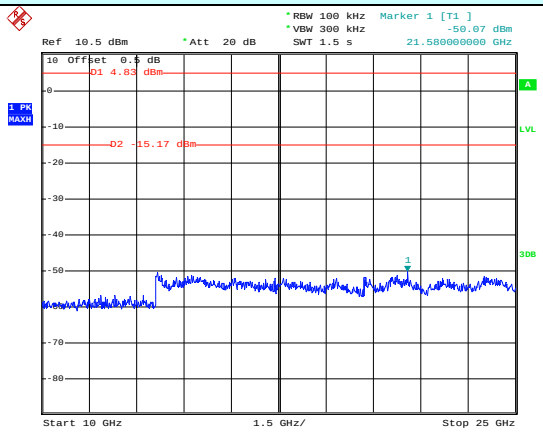


10GHz~25GHz

Middle channel

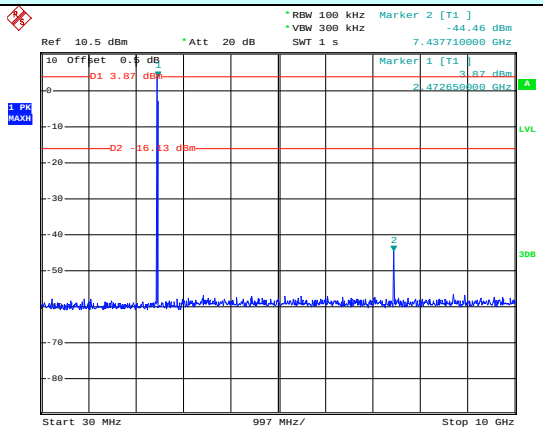


30MHz~10GHz

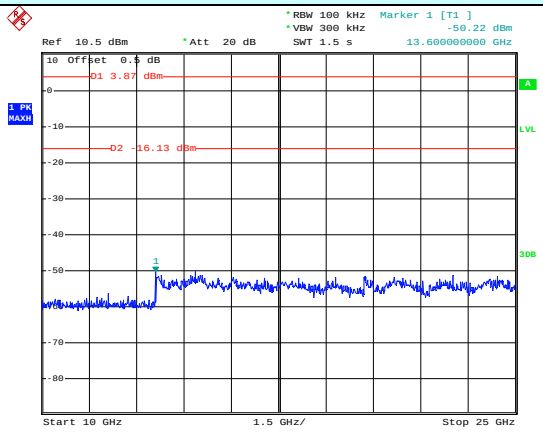


10GHz~25GHz

Highest channel



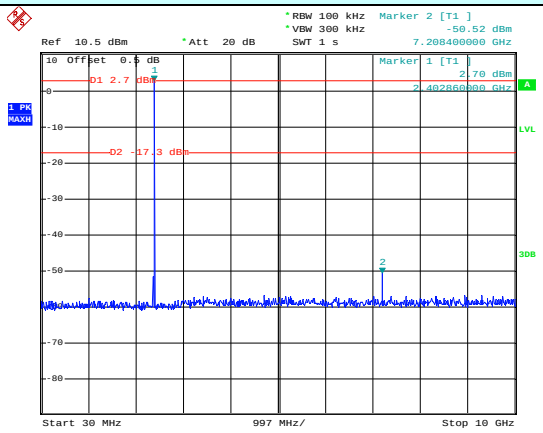
30MHz~10GHz



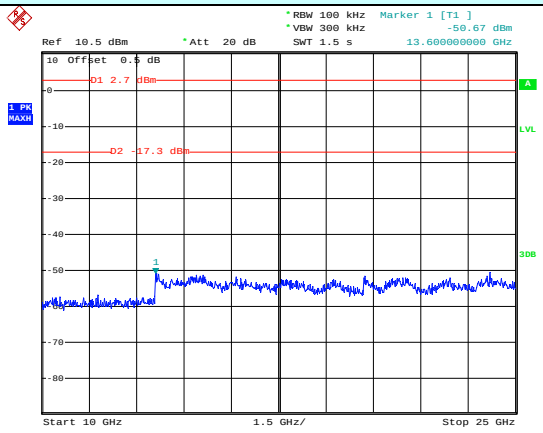
10GHz~25GHz

π /4-DQPSK

Lowest channel

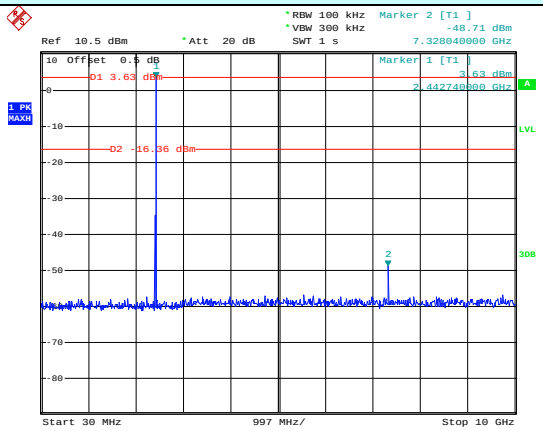


30MHz~10GHz

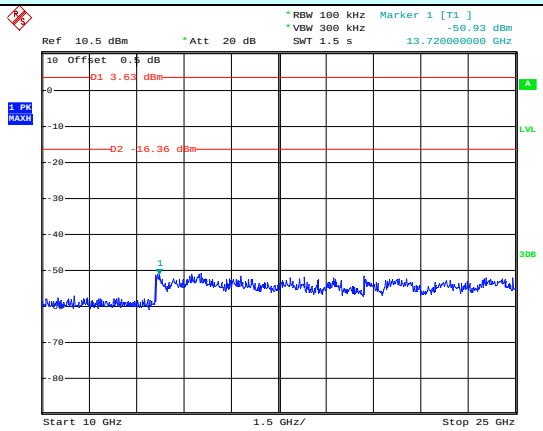


10GHz~25GHz

Middle channel

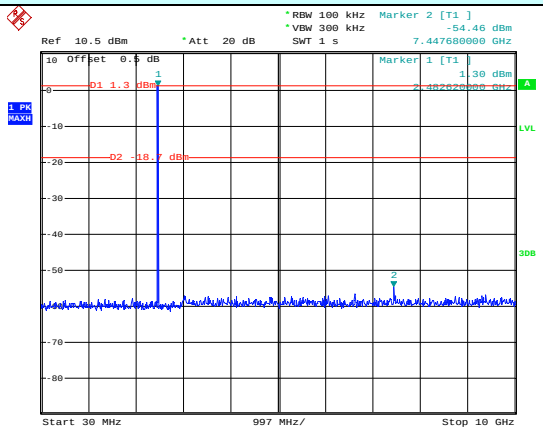


30MHz~10GHz

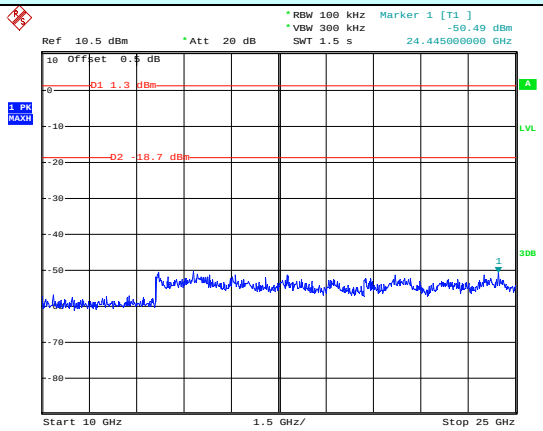


10GHz~25GHz

Highest channel



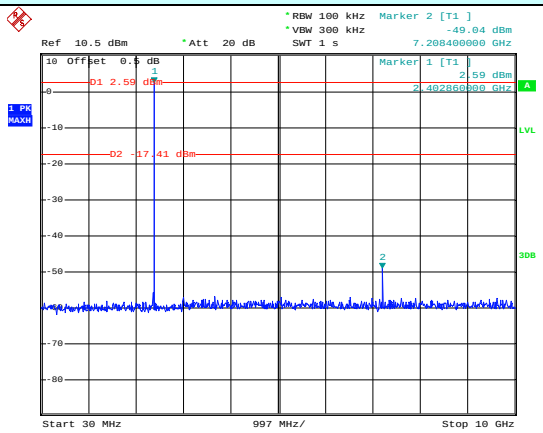
30MHz~10GHz



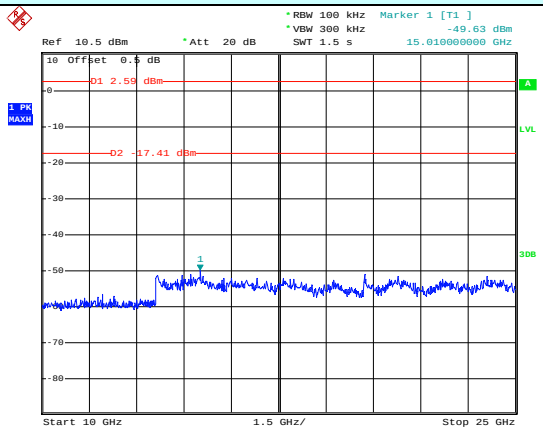
10GHz~25GHz

8DPSK

Lowest channel

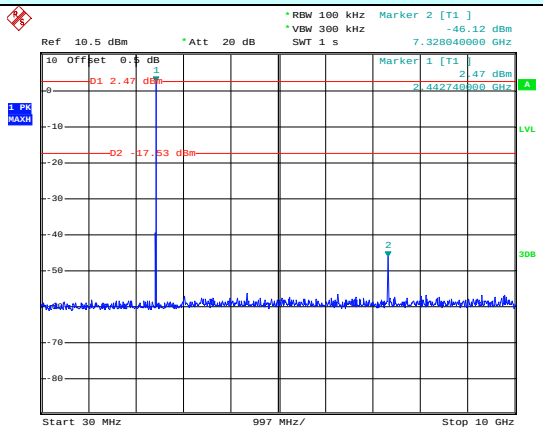


30MHz~10GHz

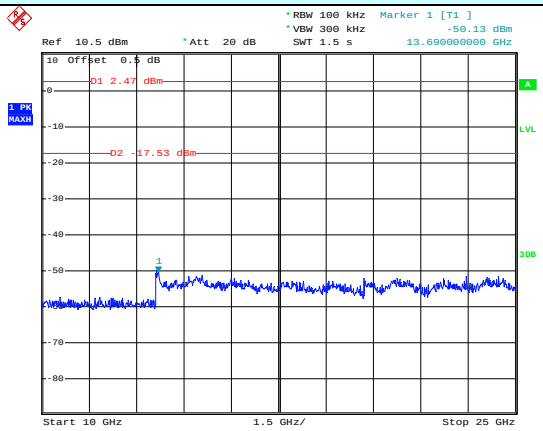


10GHz~25GHz

Middle channel

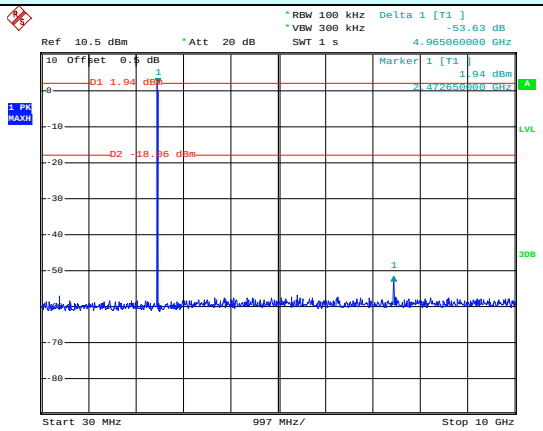


30MHz~10GHz

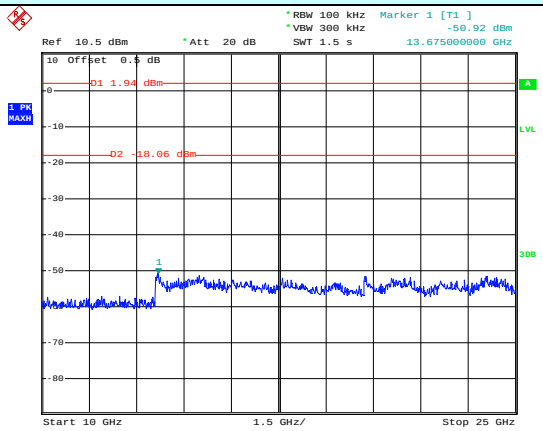


10GHz~25GHz

Highest channel

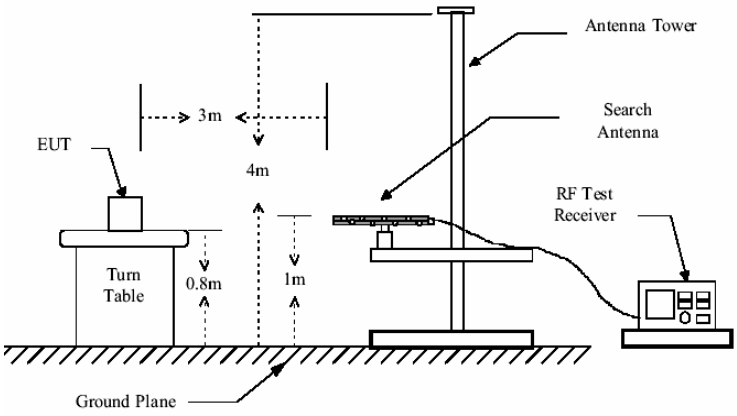


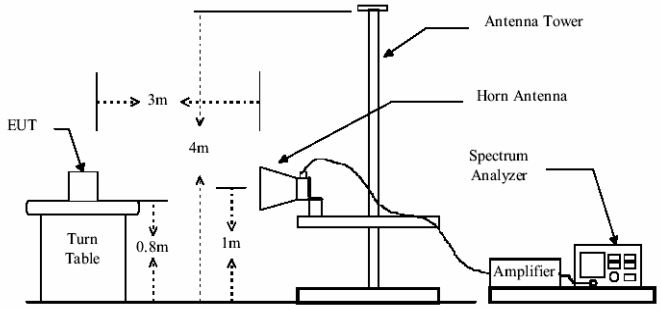
30MHz~10GHz



10GHz~25GHz

5.10.2 Radiated Emission Method

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2003</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><th>Frequency</th><th>Detector</th><th>RBW</th><th>VBW</th><th>Remark</th></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th>Frequency</th><th>Limit (dBuV/m @3m)</th><th>Remark</th></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test setup:</td><td>Below 1GHz
 

Above 1GHz
 

</td></tr>
</table>

Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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 margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
Test Instruments:	Refer to section 5.7 for details
Test mode:	Non-hopping mode
Test results:	Pass

Remark:

1. *During the test, pre-scan the GFSK, π/4-DQPSK, 8DPSK modulation, and found the 8DPSK modulation is the worst case.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis is the worst case.*

Measurement data:

Below 1GHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
31.84	45.89	12.32	0.85	26.47	32.59	40.00	-7.41	Vertical
44.27	36.64	13.55	1.28	27.72	23.75	40.00	-16.25	Vertical
65.34	37.23	10.57	1.38	29.73	19.45	40.00	-20.55	Vertical
100.93	38.81	13.06	1.95	30.07	23.75	43.50	-19.75	Vertical
143.83	39.51	8.22	2.44	29.32	20.85	43.50	-22.65	Vertical
174.42	34.23	9.29	2.69	27.72	18.49	43.50	-25.01	Vertical
45.06	33.95	13.55	1.29	27.81	20.98	40.00	-19.02	Horizontal
93.44	41.83	12.58	2.02	30.08	26.35	43.50	-17.15	Horizontal
99.88	40.68	13.16	1.94	30.09	25.69	43.50	-17.81	Horizontal
142.82	41.17	8.21	2.43	29.33	22.48	43.50	-21.02	Horizontal
176.27	38.61	9.42	2.70	27.42	23.31	43.50	-20.19	Horizontal
207.12	38.88	10.80	2.86	29.78	22.76	43.50	-20.74	Horizontal

Above 1GHz

Test channel:	Lowest	Level:	Peak

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	44.56	31.78	5.32	24.09	57.57	74.00	-16.43	Vertical
7206.00	40.45	36.15	6.87	26.38	57.09	74.00	-16.91	Vertical
9608.00	35.66	37.95	8.94	25.40	57.15	74.00	-16.85	Vertical
4804.00	42.46	31.78	5.32	24.09	55.47	74.00	-18.53	Horizontal
7206.00	35.32	36.15	6.87	26.38	51.96	74.00	-22.04	Horizontal
9608.00	26.55	37.95	8.94	25.40	48.04	74.00	-25.96	Horizontal

Test channel:	Lowest	Level:	Average

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4804.00	30.25	31.78	5.32	24.09	43.26	54.00	-10.74	Vertical
7206.00	28.13	36.15	6.87	26.38	44.77	54.00	-9.23	Vertical
9608.00	20.25	37.95	8.94	25.40	41.74	54.00	-12.26	Vertical
4804.00	34.14	31.78	5.32	24.09	47.15	54.00	-6.85	Horizontal
7206.00	16.25	36.15	6.87	26.38	32.89	54.00	-21.11	Horizontal
9608.00	14.26	37.95	8.94	25.40	35.75	54.00	-18.25	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means average level is not recorded when its peak level is less than average limit.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	Middle	Level:	Peak

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	46.66	31.85	5.40	24.01	59.90	74.00	-14.10	Vertical
7323.00	42.55	36.37	6.91	26.62	59.21	74.00	-14.79	Vertical
9764.00	37.76	38.35	9.01	25.29	59.83	74.00	-14.17	Vertical
4882.00	44.56	31.85	5.40	24.01	57.80	74.00	-16.20	Horizontal
7323.00	37.42	36.37	6.91	26.62	54.08	74.00	-19.92	Horizontal
9764.00	28.65	38.35	9.01	25.29	50.72	74.00	-23.28	Horizontal

Test channel:	Middle	Level:	Average

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	31.80	31.85	5.40	24.01	45.04	54.00	-8.96	Vertical
7323.00	26.83	36.37	6.91	26.62	43.49	54.00	-10.51	Vertical
9764.00	18.83	38.35	9.01	25.29	40.90	54.00	-13.10	Vertical
4882.00	33.71	31.85	5.40	24.01	46.95	54.00	-7.05	Horizontal
7323.00	28.83	36.37	6.91	26.62	45.49	54.00	-8.51	Horizontal
9764.00	22.17	38.35	9.01	25.29	44.24	54.00	-9.76	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means average level is not recorded when its peak level is less than average limit.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

Test channel:	Highest	Level:	Peak

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	42.32	31.93	5.47	23.93	55.79	74.00	-18.21	Vertical
7440.00	38.28	36.59	6.95	26.95	54.87	74.00	-19.13	Vertical
9920.00	33.48	38.81	9.07	25.22	56.14	74.00	-17.86	Vertical
4960.00	41.26	31.93	5.47	23.93	54.73	74.00	-19.27	Horizontal
7440.00	34.25	36.59	6.95	26.95	50.84	74.00	-23.16	Horizontal
9920.00	27.36	38.81	9.07	25.22	50.02	74.00	-23.98	Horizontal

Test channel:	Highest	Level:	Average

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	30.68	31.93	5.47	23.93	44.15	54.00	-9.85	Vertical
7440.00	25.71	36.59	6.95	26.95	42.30	54.00	-11.70	Vertical
9920.00	17.71	38.81	9.07	25.22	40.37	54.00	-13.63	Vertical
4960.00	32.59	31.93	5.47	23.93	46.06	54.00	-7.94	Horizontal
7440.00	27.71	36.59	6.95	26.95	44.30	54.00	-9.70	Horizontal
9920.00	21.05	38.81	9.07	25.22	43.71	54.00	-10.29	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means average level is not recorded when its peak level is less than average limit.*
3. *The emission levels of other frequencies are very lower than the limit and not show in test report.*