FCC PART 15 SUBPART C MEASURMENT AND TEST REPORT

For

Shenzhen Longxin Industry Co., Ltd.

Longxin Industry Park, Chuangye Road, the 3 rd Industry Estate Fenghuang, Fuyong Town, Bao'an District, Shenzhen City, Guangdong Province, China

E.U.T.: Bluetooth Speaker

Model Name: LX-836, TM-836, NE-628, V6, V100

Brand Name: N/A

FCC ID: 2AA4V0002

Report Number: NTC1309290F

Test Date(s): September 24, 2013 to October 14, 2013

Report Date(s): October 15, 2013

Prepared by

Dongguan Nore Testing Center Co., Ltd.
Building D, Gaosheng Science & Technology Park, Zhouxi Longxi Road, Nancheng District, Dongguan City, Guangdong, China

Tel: +86-769-22022444 Fax: +86-769-22022799

Prepared By	Approved & Authorized Signer
Chris Pan / Engineer	Sunm Lv / Q.A. Director

Note: This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part without prior written consent from Dongguan Nore Testing Center Co., Ltd. The test results referenced from this report are relevant only to the sample tested.

Table of Contents

1. GENERAL INFORMATION 4

1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST 4
1.2 RELATED SUBMITTAL(S) / GRANT (S) 5
1.3 TEST METHODOLOGY 5
1.4 EQUIPMENT MODIFICATIONS 5
1.5 SUPPORT DEVICE 5
1.6 TEST FACILITY AND LOCATION 5
1.7 SUMMARY OF TEST RESULTS 6

2. SYSTEM TEST CONFIGURATION 7

2.1 EUT CONFIGURATION 7
2.2 SPECIAL ACCESSORIES 7
2.3 DESCRIPTION OF TEST MODES 7
2.4 EUT EXERCISE 7

3. CONDUCTED EMISSIONS TEST 8

3.1 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 8
3.2 TEST CONDITION 8
3.3 MEASUREMENT RESULTS 8

4. RADIATED EMISSION TEST 11

4.1 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 11
4.2 MEASUREMENT PROCEDURE 12
4.3 LIMIT 13
4.4 MEASUREMENT RESULTS 14

5. CHANNEL SEPARATION TEST 18

5.1 MEASUREMENT PROCEDURE 18
5.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 18
5.3 MEASUREMENT RESULTS 18

6. 20DB BANDWIDTH 24

6.1 MEASUREMENT PROCEDURE 24
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 24
6.3 MEASUREMENT RESULTS 24

7. HOPPING CHANNEL NUMBER 30

7.1 MEASUREMENT PROCEDURE 30
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION) 30
7.3 MEASUREMENT RESULTS 30

8. TIME OF OCCUPANCY (DWELL TIME) 32

8.1 MEASUREMENT PROCEDURE 32
8.2 MEASUREMENT RESULTS 32

9. MAXIMUM PEAK OUTPUT POWER 32

9.1 MEASUREMENT PROCEDURE 38
9.2 MEASUREMENT RESULTS 38

10. BAND EDGE 38

10.1 MEASUREMENT PROCEDURE 44
10.2 LIMIT 44
10.3 MEASUREMENT RESULTS 44

11. ANTENNA APPLICATION 44

11.1 ANTENNA REQUIREMENT 51
11.2 MEASUREMENT RESULTS 51

12. CONDUCTED SPURIOUS EMISSIONS 52

12.1 MEASUREMENT PROCEDURE 52
12.2. MEASUREMENT RESULTS 52

13. TEST EQUIPMENT LIST 56

1. GENERAL INFORMATION

1.1 Product Description for Equipment under Test

This device is a BT speaker with AUX IN, Charging and BT functions. It's powered by DC 3.7V come from internal li-ion battery or DC 5V come from mini USB port. For more details features, please refer to User's Manual.

Manufacturer	:	Shenzhen Longxin Industry Co., Ltd.
Address	:	Longxin Industry Park, Chuangye Road, the 3 rd Industry Estate Fenghuang, Fuyong Town, Bao'an District, Shenzhen City, Guangdong Province, China
Frequency:	:	2402-2480MHz
Modulation	:	GFSK, π/4-DQPSK, 8DPSK
Number of Channel	:	79
Channel space	:	1MHz
Max RF Output Power	:	0.69mW (-1.64 dBm)
Antenna Type	:	PCB
Antenna Gain	:	0dBi (Declaration by applicant)
Power Supply	:	DC 5V come from mini USB port DC 3.7V come from internal li-ion battery
Model name	:	LX-836, TM-836, NE-628, V6, V100
Note:	:	All of them have the same circuit schematic, construction and critical components. Their difference in model name and color of enclosure.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2AA4V0002. filing to comply with Section 15.247 of the FCC Part 15 (2012), Subpart C Rule.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003) and DA 00-705. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters.

1.4 Equipment Modifications

Not available for this EUT intended for grant.

1.5 Support Device

Notebook PC	:	Manufacturer: IBM Corporation M/N: R50e S/N: L3-HZNGO P/N: 1834KDC
Adapter	:	Manufacturer: IBM Corporation M/N: 08K8210 Input: AC100-240V 50/60Hz 0.5-1.0A Output: DC 16V 4.5A

1.6 Test Facility and Location

Listed by FCC, August 02, 2011
The Certificate Registration Number is 665078.

Listed by Industry Canada, July 01, 2011
The Certificate Registration Number is 9743A-1.

Dongguan Nore Testing Center Co., Ltd. (Dongguan NTC Co., Ltd.)

Building D, Gaosheng Science & Technology Park,
Zhouxi Longxi Road, Nancheng District, Dongguan City,
Guangdong, China

1.7 Summary of Test Results

FCC Rules	Description Of Test	Result
§15.247(a)(1)	Channel Separation test	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Hopping Channel Number	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(b)	Max Peak output Power test	Compliant
§15.247(d)	Band edge test	Compliant
§15.207 (a)	AC Power Conducted Emission	Compliant
§15.247(d),§15.209, §15.205	Radiated Emission	Compliant
§15.203	Antenna Requirement	Compliant
§15.247(d)	Conducted Spurious Emission	Compliant

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 Special Accessories

Not available for this EUT intended for grant.

2.3 Description of test modes

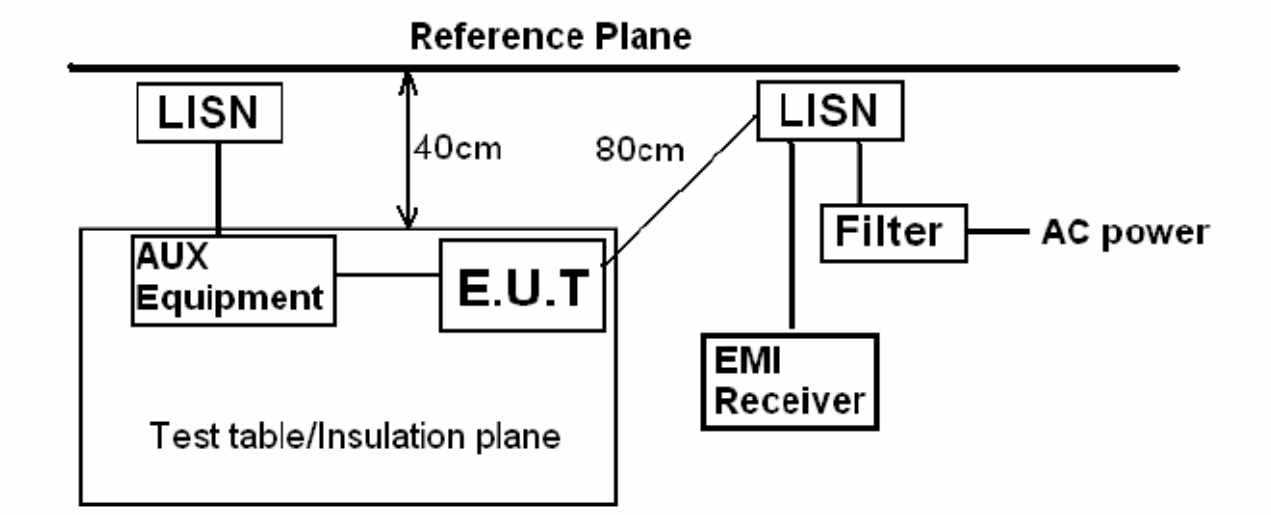
The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and normal mode is programmed. The Lowest, middle and highest channel were chosen for testing, and all packets DH1, DH3 and DH5 mode in all modulation type GFSK, π/4-DQPSK, 8DPSK were tested.

2.4 EUT Exercise

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

3. Conducted Emissions Test

3.1 Test SET-UP (Block Diagram of Configuration)



3.2 Test Condition

Test Requirement: FCC Part 15.207

Frequency Range: 150KHz ~ 30MHz

Detector: RBW 9KHz, VBW 30KHz

Operation Mode: Charging+BT Mode

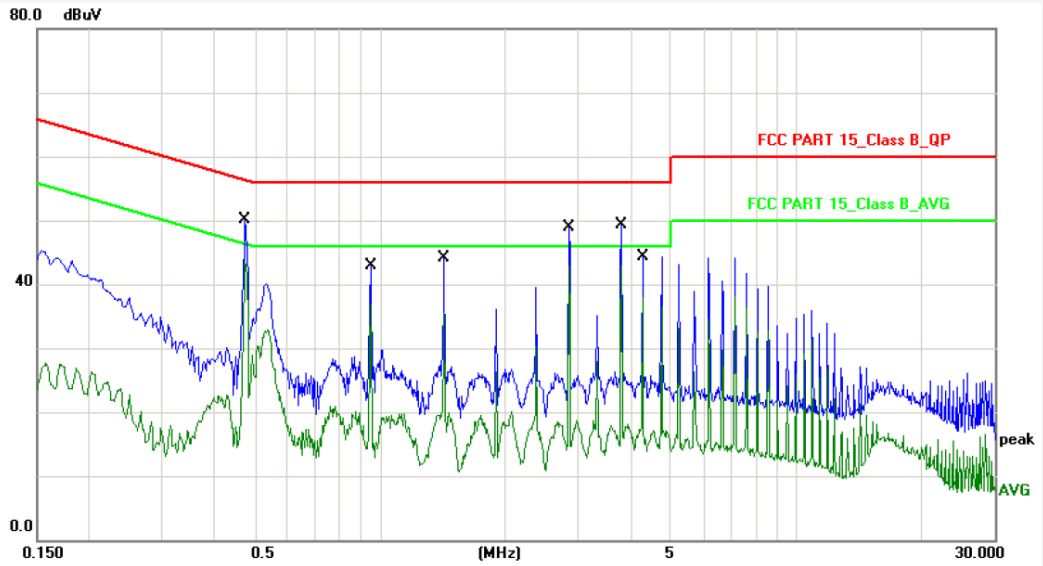
3.3 Measurement Results

Please refer to following plots.

Dongguan NTC Co., Ltd.
Tel: +86-769-22022444 Fax: +86-769-22022799
Web: Http://www.ntc-c.com

Site: Conduction

Test Time: 2013-10-9 16:16:28



Report No.:	LX-836		
Test Standard:	FCC PART 15_Class B_QP		
Test item:	Conducted Emission	Phase:	L1
Applicant:	Longxin	Temp.( )/Hum.(%):	26(C) / 60 %
Product:	Bluetooth Speaker	Power Rating:	AC 120V/60Hz
Model No.:	LX-836	Test Engineer:	Sance

Test Mode: Charging + BT Mode

Remark:

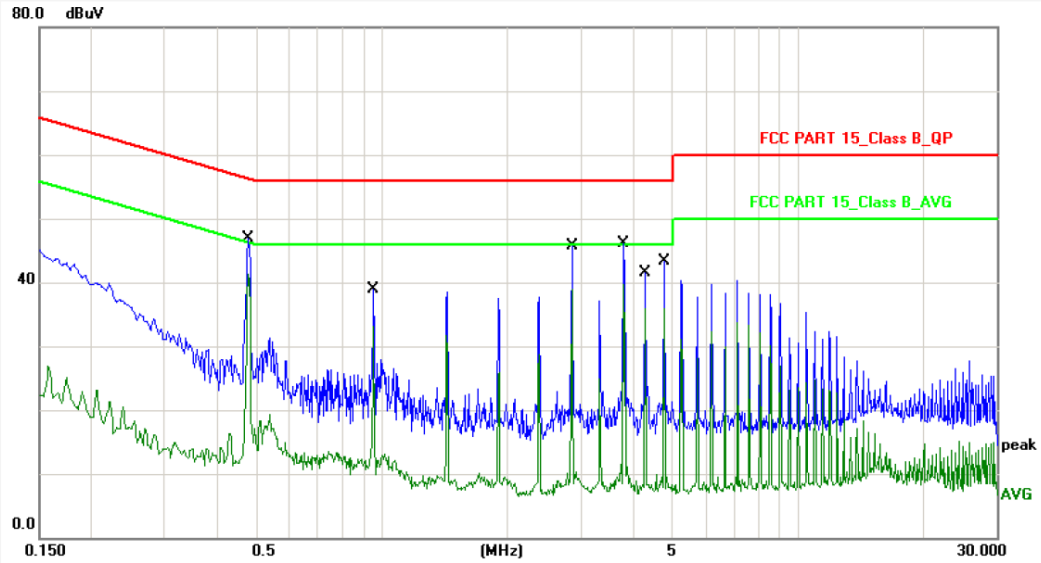
No.	Frequency (MHz)	Factor (dBuV)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.4740	10.80	38.50	49.30	56.44	-7.14	QP	P	
2	0.4740	10.80	32.30	43.10	46.44	-3.34	AVG	P	
3	0.9500	10.80	31.60	42.40	56.00	-13.60	QP	P	
4	0.9500	10.80	25.00	35.80	46.00	-10.20	AVG	P	
5	1.4260	10.80	32.70	43.50	56.00	-12.50	QP	P	
6	1.4260	10.80	24.10	34.90	46.00	-11.10	AVG	P	
7	2.8540	10.80	37.00	47.80	56.00	-8.20	QP	P	
8	2.8540	10.80	31.50	42.30	46.00	-3.70	AVG	P	
9	3.8060	10.80	37.50	48.30	56.00	-7.70	QP	P	
10	3.8060	10.80	31.50	42.30	46.00	-3.70	AVG	P	
11	4.2819	10.80	32.60	43.40	56.00	-12.60	QP	P	
12	4.2819	10.80	26.40	37.20	46.00	-8.80	AVG	P	

Note: Level=Reading+Factor.
Margin=Limit-Level.

Dongguan NTC Co., Ltd.
Tel: +86-769-22022444 Fax: +86-769-22022799
Web: Http://www.ntc-c.com

Site: Conduction

Test Time: 2013-10-9 16:19:23



Report No.:	LX-836		
Test Standard:	FCC PART 15_Class B_QP		
Test item:	Conducted Emission	Phase:	N
Applicant:	Longxin	Temp.( )/Hum.(%):	26(C) / 60 %
Product:	Bluetooth Speaker	Power Rating:	AC 120V/60Hz
Model No.:	LX-836	Test Engineer:	Sance

Test Mode: Charging + BT Mode

Remark:

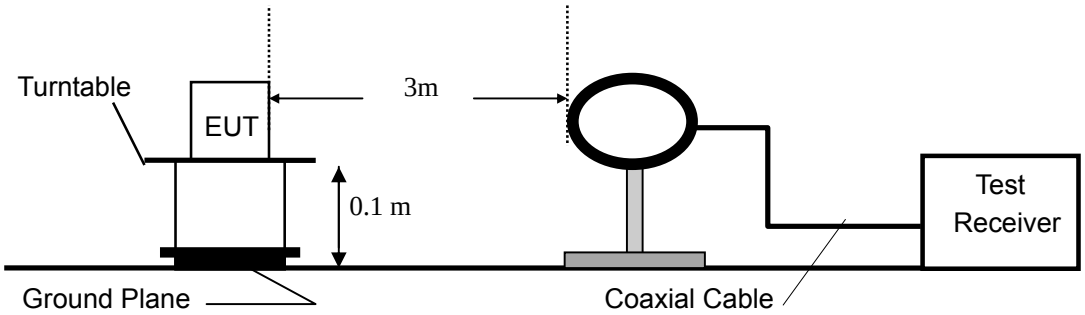
No.	Frequency (MHz)	Factor (dBuV)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.4780	10.80	35.30	46.10	56.37	-10.27	QP	P	
2	0.4780	10.80	30.70	41.50	46.37	-4.87	AVG	P	
3	0.9540	10.80	27.50	38.30	56.00	-17.70	QP	P	
4	0.9540	10.80	22.10	32.90	46.00	-13.10	AVG	P	
5	2.8620	10.80	34.10	44.90	56.00	-11.10	QP	P	
6	2.8620	10.80	27.00	37.80	46.00	-8.20	AVG	P	
7	3.8180	10.80	34.90	45.70	56.00	-10.30	QP	P	
8	3.8180	10.80	27.80	38.60	46.00	-7.40	AVG	P	
9	4.2938	10.80	29.90	40.70	56.00	-15.30	QP	P	
10	4.2938	10.80	24.10	34.90	46.00	-11.10	AVG	P	
11	4.7699	10.80	31.80	42.60	56.00	-13.40	QP	P	
12	4.7699	10.80	24.50	35.30	46.00	-10.70	AVG	P	

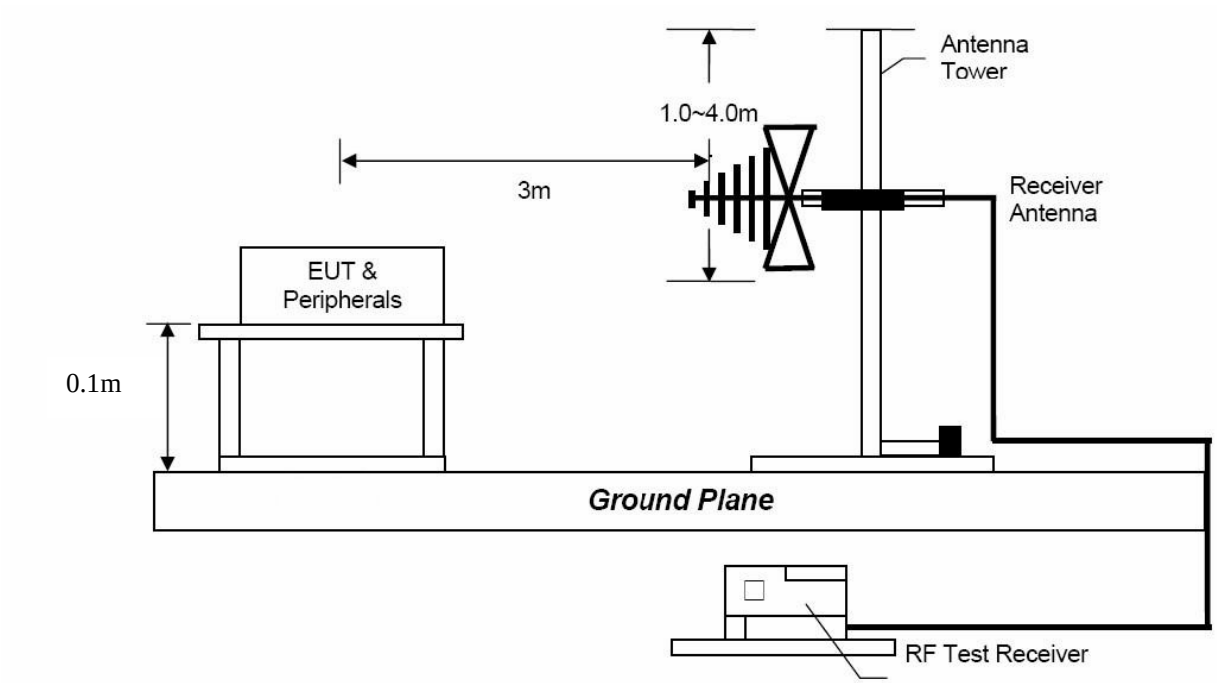
Note: Level=Reading+Factor.
Margin=Limit-Level.

4. Radiated Emission Test

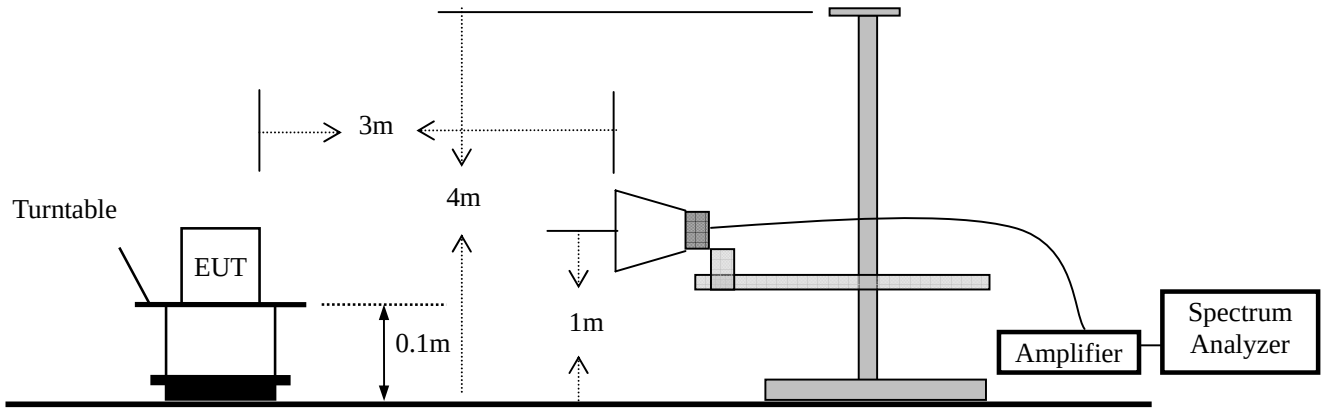
4.1 Test SET-UP (Block Diagram of Configuration)

4.1.1 Radiated Emission Test Set-Up, Frequency Below 30MHz





4.1.2 Radiated Emission Test Set-Up, Frequency above 1GHz



4.2 Measurement Procedure

a. The EUT was placed on the top of a rotating table 0.1 meters above the ground at a 3 meter semi- anechoic chamber room. 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 height of antenna 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. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode.

4.3 Limit

Frequency range MHz	Distance Meters	Field Strengths Limit (15.209) μV/m
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
1.705 ~ 30	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960	3	500

Remark：(1) Emission level (dB)μV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

(4) The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

4.4 Measurement Results

Operation Mode:	TX		
Frequency Range:	9KHz~1GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Sance
Test Date :	October 10, 2013		

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)	Limit 3m (dBuV/m)	Margin (dB)	Note
179.3799	H	29.80	43.50	-13.70	QP
191.9900	H	34.70	43.50	-8.80	QP
203.6299	H	33.60	43.50	-9.90	QP
222.0600	H	31.60	46.00	-14.40	QP
227.8800	H	34.10	46.00	-11.90	QP
239.5200	H	34.40	46.00	-11.60	QP
59.1000	V	26.30	40.00	-13.70	QP
115.3600	V	26.90	43.50	-16.60	QP
143.4900	V	27.20	43.50	-16.30	QP
203.6299	V	28.90	43.50	-14.60	QP
233.6999	V	31.80	46.00	-14.20	QP
239.5200	V	38.40	46.00	-7.60	QP

Other emissions are lower than 10dB below the allowable limit.

Note: (1) Quasi-Peak detector is used except for others stated.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : ±3.7dB.

Modulation:	8DPSK (the worst case) (Low Frequency: 2402MHz)		
Operation Mode:	TX Mode (Low)	Test Date :	October 10, 2013
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Sance

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4804	H	59.06	50.04	74.00	54.00	-14.94	-3.96
7206	H	58.04	50.64	74.00	54.00	-15.96	-3.36
9608	H	58.80	51.50	74.00	54.00	-15.20	-2.50
12010	H	58.73	49.72	74.00	54.00	-15.27	-4.28
4804	V	57.75	50.32	74.00	54.00	-16.25	-3.68
7206	V	55.45	50.48	74.00	54.00	-18.55	-3.52
9608	V	56.47	51.24	74.00	54.00	-17.53	-2.76
12010	V	57.12	50.04	74.00	54.00	-16.88	-3.96

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : ±3.7dB

Modulation:	8DPSK (the worst case) (Mid Frequency: 2441MHz)		
Operation Mode:	TX Mode (Mid)	Test Date :	October 10, 2013
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Sance

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4882	H	60.39	50.61	74.00	54.00	-13.61	-3.39
7323	H	60.55	50.21	74.00	54.00	-13.45	-3.79
9764	H	59.20	49.47	74.00	54.00	-14.80	-4.53
12205	H	59.78	50.12	74.00	54.00	-14.22	-3.88
4882	V	59.80	49.26	74.00	54.00	-14.20	-4.74
7323	V	58.63	50.21	74.00	54.00	-15.37	-3.79
9764	V	58.79	50.15	74.00	54.00	-15.21	-3.85
12205	V	57.40	50.57	74.00	54.00	-16.60	-3.43

Other harmonics emissions are lower than 10dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : ±3.7dB

Modulation:	8DPSK (the worst case) (High Frequency: 2480MHz)		
Operation Mode:	TX Mode (High)	Test Date :	October 10, 2013
Frequency Range:	1-25GHz	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Measured Distance:	3m	Test By:	Sance

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV)		Limit 3m(dBuV/m)		Margin(dB)	
		PK	AV	PK	AV	PK	AV
4960	V	58.65	50.54	74.00	54.00	-15.35	-3.46
7440	V	57.60	49.97	74.00	54.00	-16.40	-4.03
9920	V	57.82	50.58	74.00	54.00	-16.18	-3.42
12400	V	57.80	49.07	74.00	54.00	-16.20	-4.93
4960	H	59.21	50.94	74.00	54.00	-14.79	-3.06
7440	H	58.76	49.53	74.00	54.00	-15.24	-4.47
9920	H	57.47	50.78	74.00	54.00	-16.53	-3.22
12400	H	58.70	50.40	74.00	54.00	-15.30	-3.60

Other harmonics emissions are lower than 10dB below the allowable limit.

Note: (1) All Readings are Peak Value and AV.
(2) Emission Level= Reading Level+Probe Factor +Cable Loss
(3) Measurement uncertainty : ±3.7dB

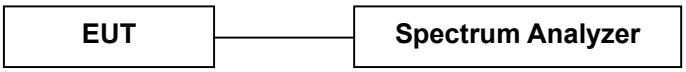
5. Channel Separation test

5.1 Measurement Procedure

Minimum Hopping Channel Carrier Frequency Separation, FCC Rule 15.247(a)(1):

Connect EUT antenna terminal to the spectrum analyzer with a low loss cable, and using the MARKER and Max-Hold function to record the separation of two adjacent channels.

5.2 Test SET-UP (Block Diagram of Configuration)

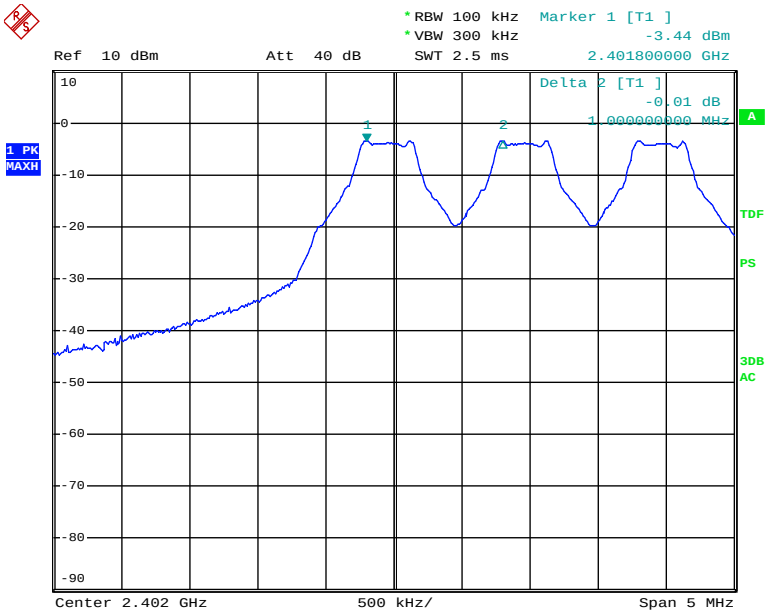


5.3 Measurement Results

Modulation:	GFSK, π/4-DQPSK, 8DPSK		
RBW:	100KHz	VBW:	300KHz
Packet:	DH5	Spectrum Detector:	PK
Test By:	Sance	Test Date :	October 11, 2013
Temperature :	25 ℃	Humidity :	50 %
Test Result:	PASS		

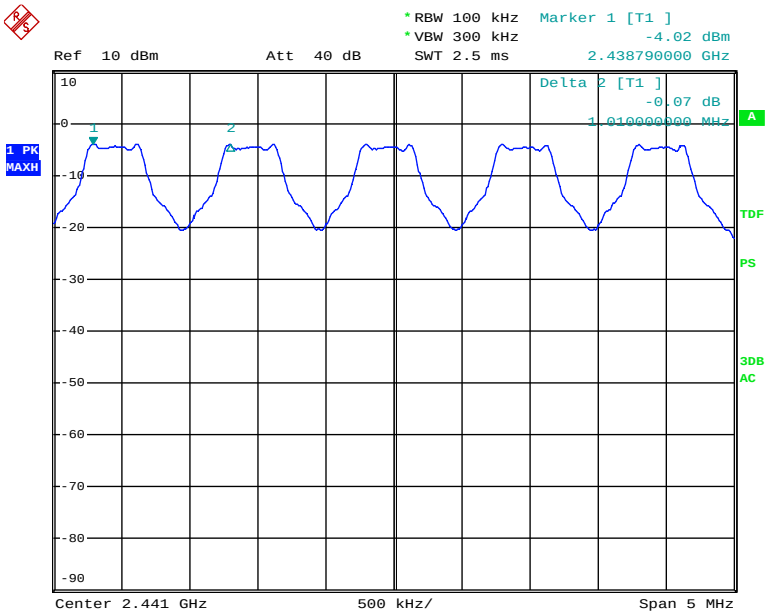
Channel number	Channel frequency (MHz)	Separation Read Value (KHz)	Separation Limit (KHz)
GFSK			
Lowest	2402	1000	>766.7
Middle	2441	1010	>766.7
Highest	2480	1000	>766.7
π/4-DQPSK			
Lowest	2402	1000	>920
Middle	2441	1010	>920
Highest	2480	1000	>920
8DPSK			
Lowest	2402	1010	>920
Middle	2441	1000	>920
Highest	2480	1000	>920

GFSK Lowest Channel



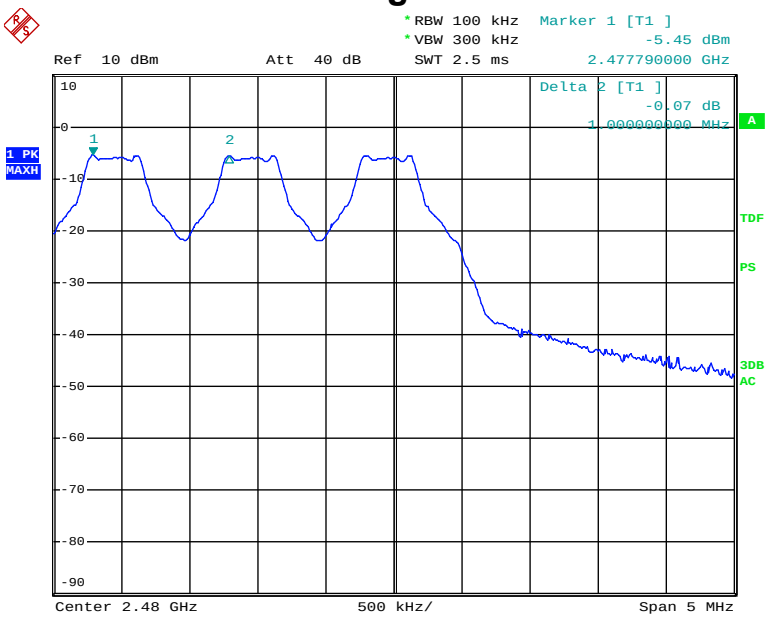
Date: 11.OCT.2013 21:22:10

GFSK Middle Channel



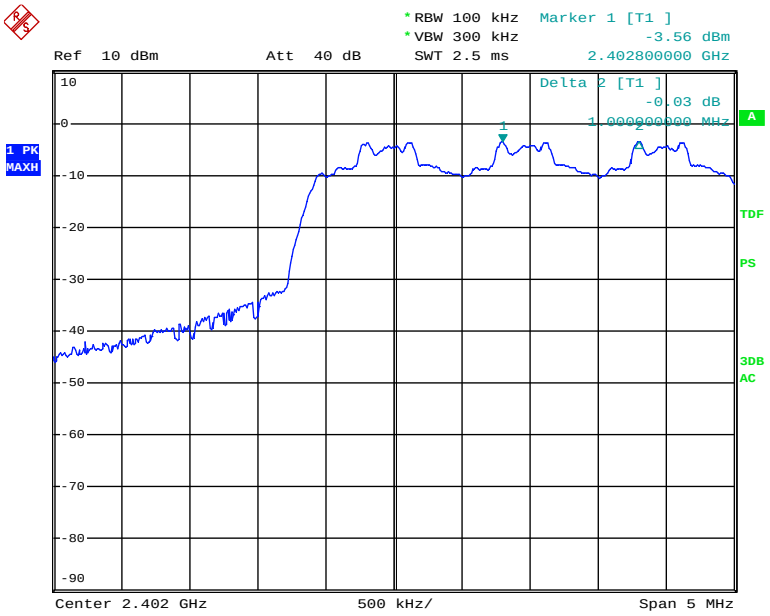
Date: 11.OCT.2013 21:30:54

GFSK Highest Channel



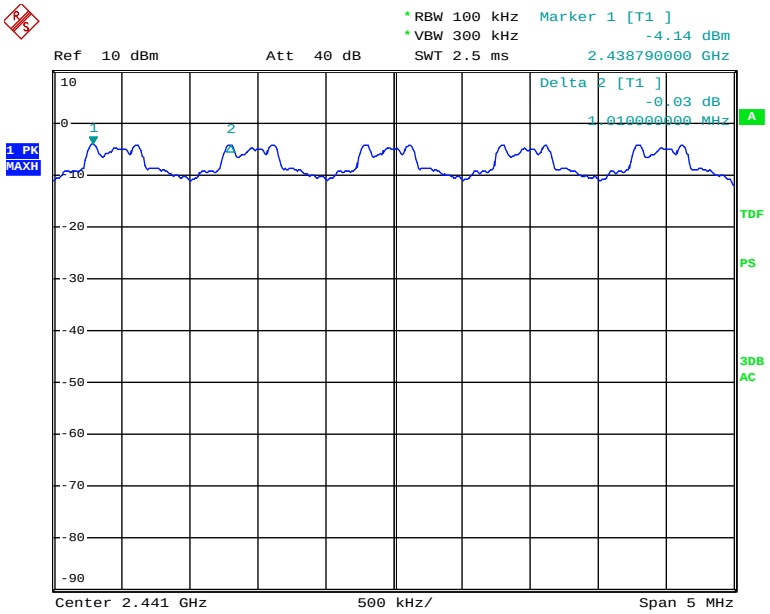
Date: 11.OCT.2013 21:33:58

π/4-DQPSK Lowest Channel



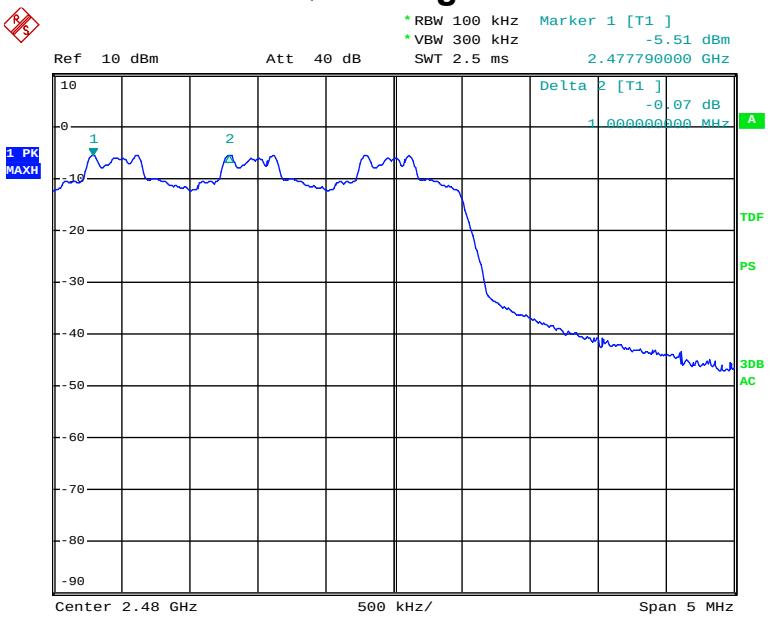
Date: 11.OCT.2013 21:38:01

π/4-DQPSK Middle Channel



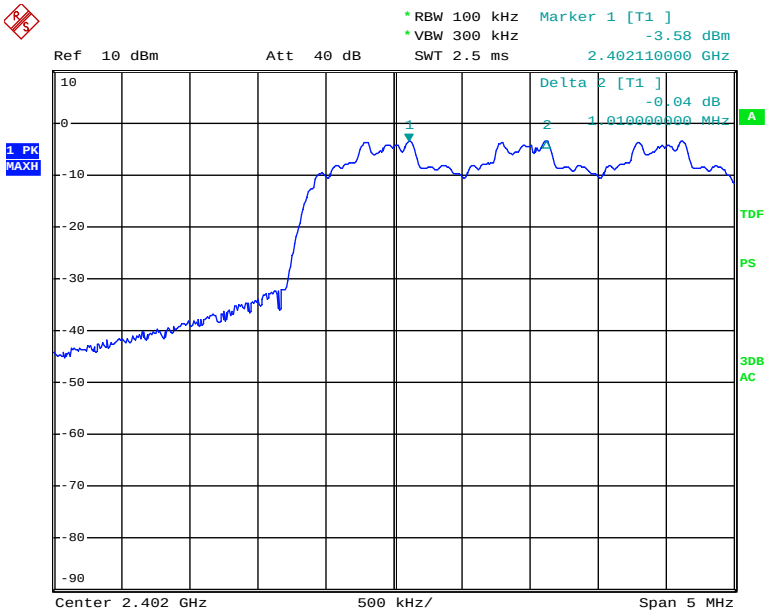
Date: 11.OCT.2013 21:44:47

π/4-DQPSK Highest Channel



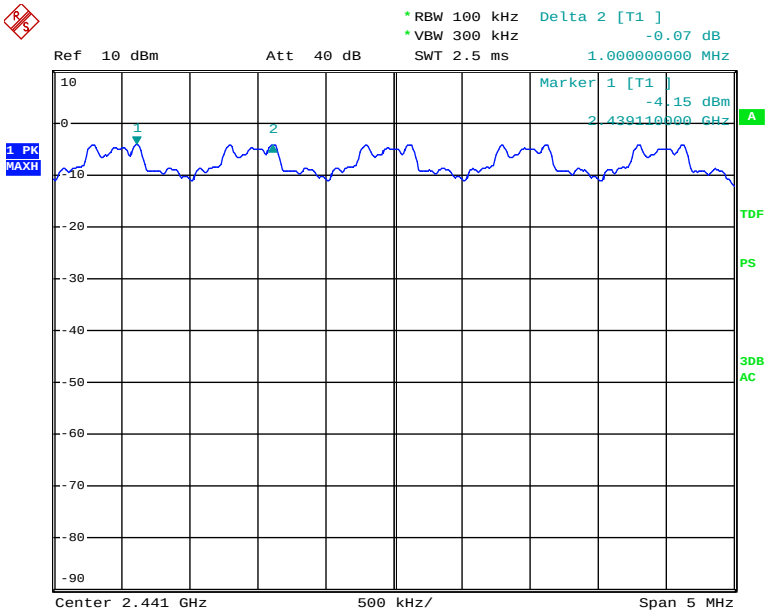
Date: 11.OCT.2013 21:48:33

8DPSK Lowest Channel



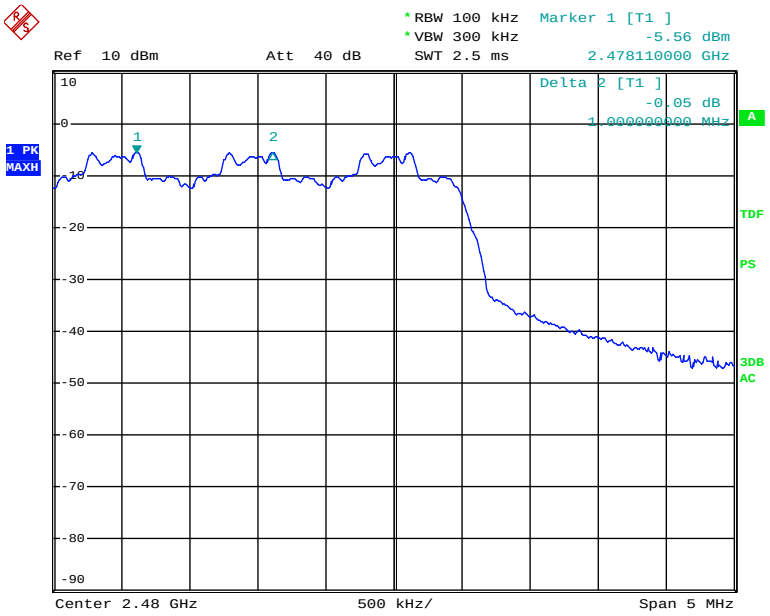
Date: 11.OCT.2013 21:52:29

8DPSK Middle Channel



Date: 11.OCT.2013 21:58:53

8DPSK Highest Channel



Date: 11.OCT.2013 22:03:04

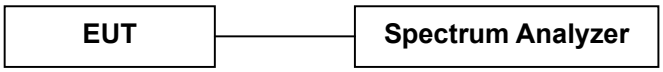
6. 20dB Bandwidth

6.1 Measurement Procedure

Maximum 20dB RF Bandwidth, FCC Rule 15.247(a)(1):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. Use the spectrum 20dB down delta function to measure the bandwidth.

6.2 Test SET-UP (Block Diagram of Configuration)



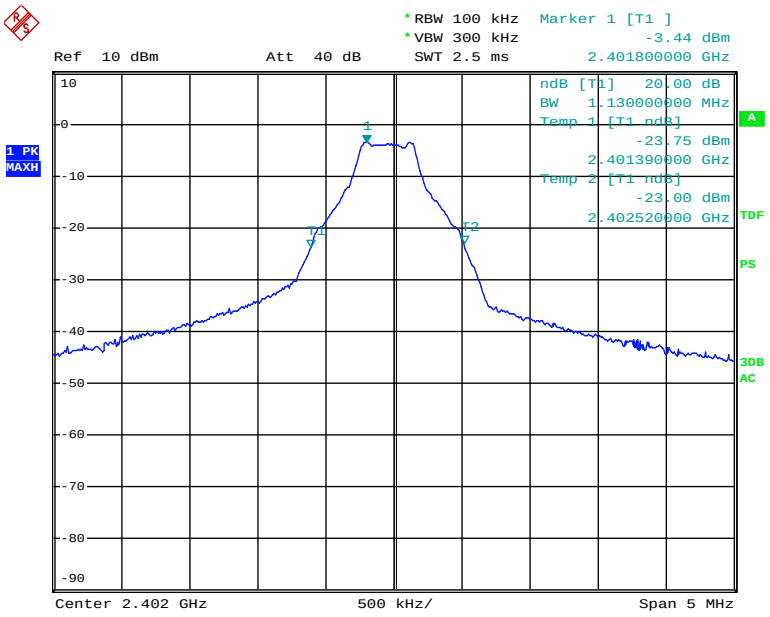
6.3 Measurement Results

Refer to attached data chart.

Modulation:	GFSK, π/4-DQPSK, 8DPSK		
RBW:	100KHz	VBW:	300KHz
Packet:	DH5	Spectrum Detector:	PK
Test By:	Sance	Test Date :	October 11, 2013
Temperature :	25 ℃	Humidity :	50 %
Test Result:	PASS		

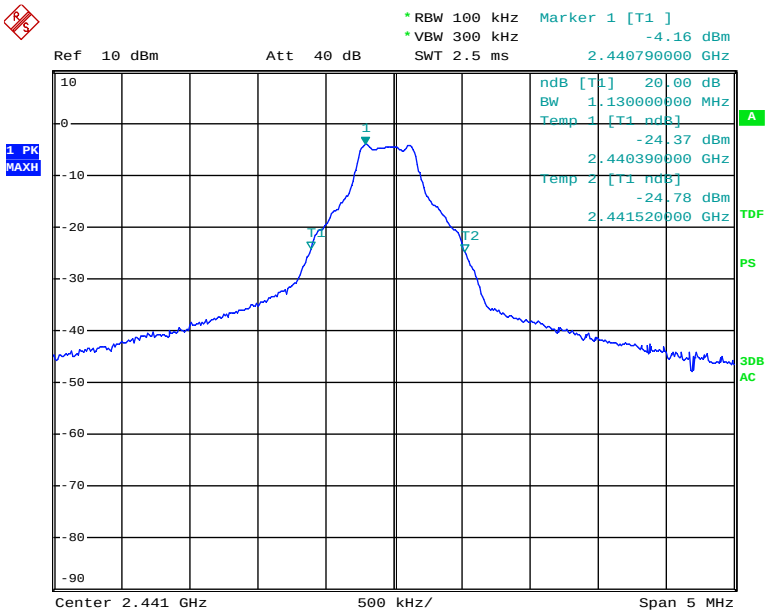
Channel frequency (MHz)	20dB Down BW(kHz)
GFSK	
2402	1130
2441	1130
2480	1130
π/4-DQPSK	
2402	1370
2441	1360
2480	1360
8DPSK	
2402	1370
2441	1380
2480	1380

GFSK Lowest Channel



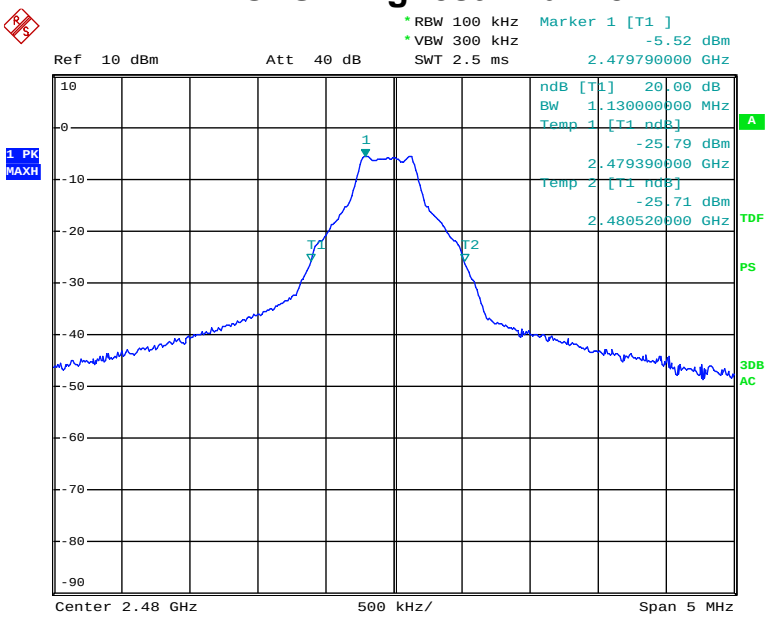
Date: 11.OCT.2013 21:20:25

GFSK Middle Channel



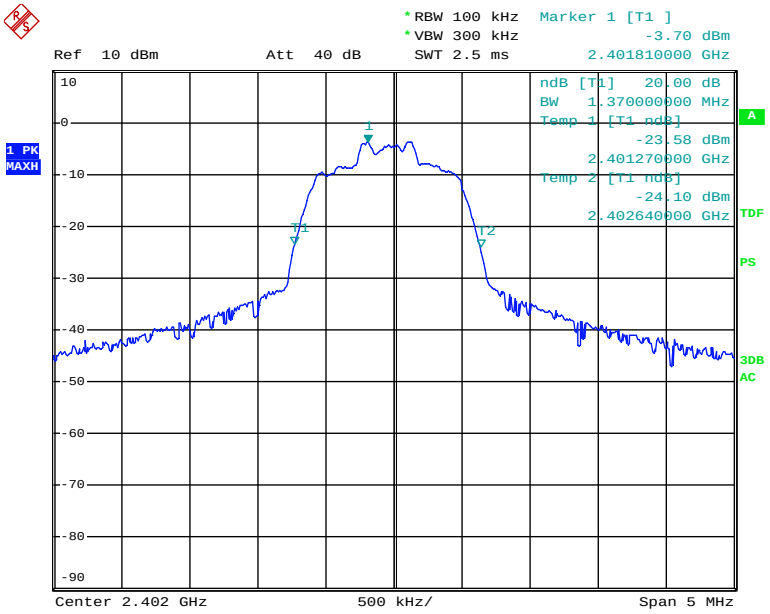
Date: 11.OCT.2013 21:24:06

GFSK Highest Channel



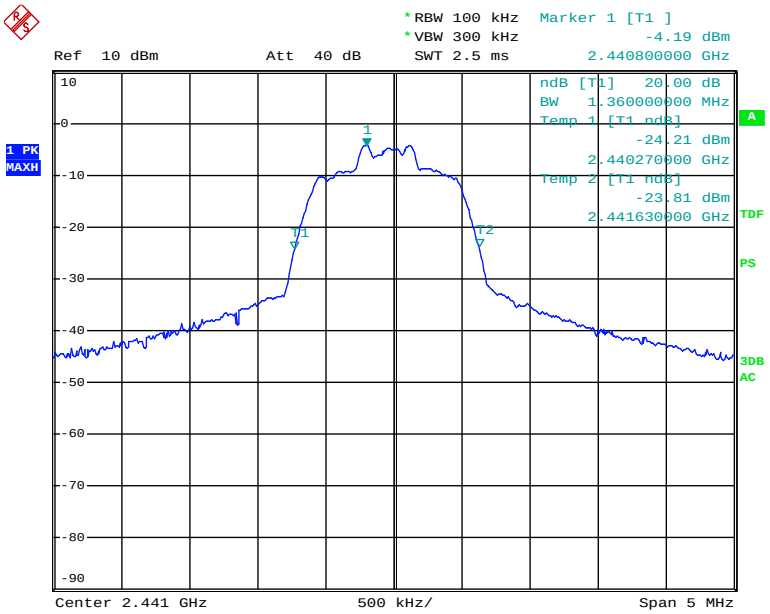
Date: 11.OCT.2013 21:32:09

π/4-DQPSK Lowest Channel



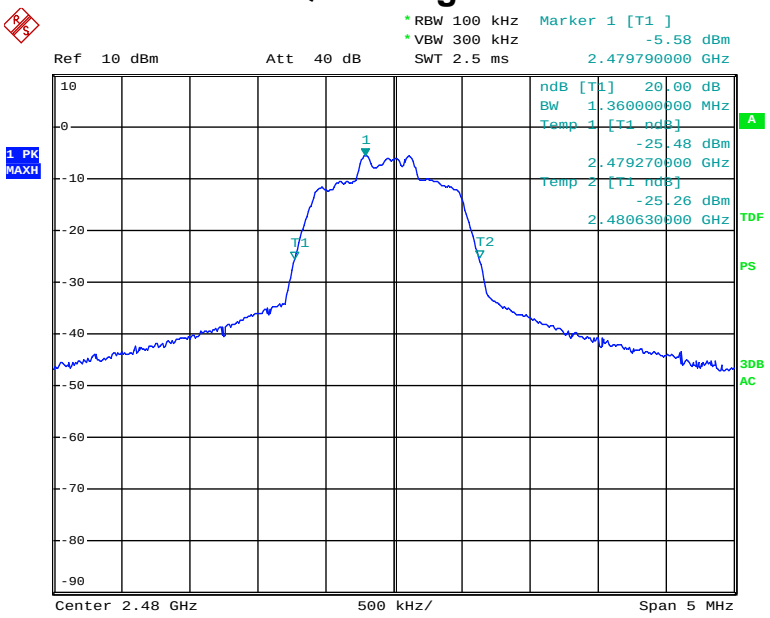
Date: 11.OCT.2013 21:35:58

π/4-DQPSK Middle Channel



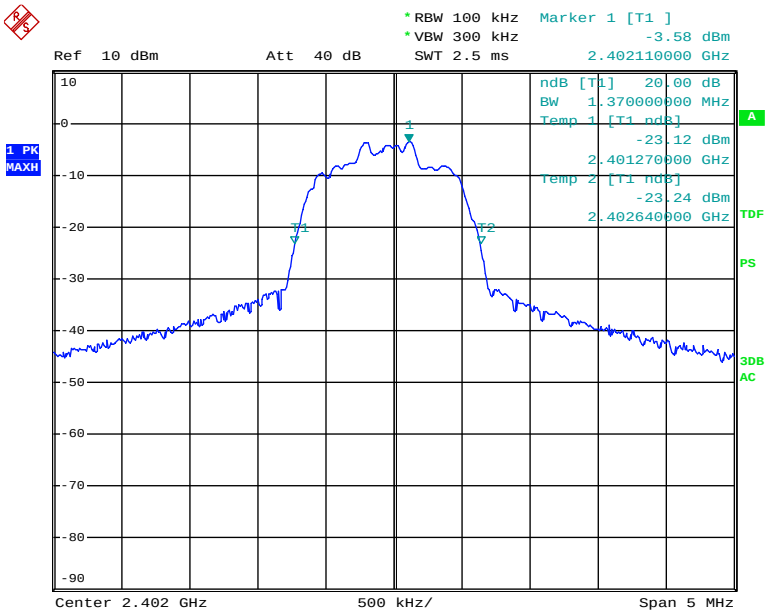
Date: 11.OCT.2013 21:39:55

π/4-DQPSK Highest Channel



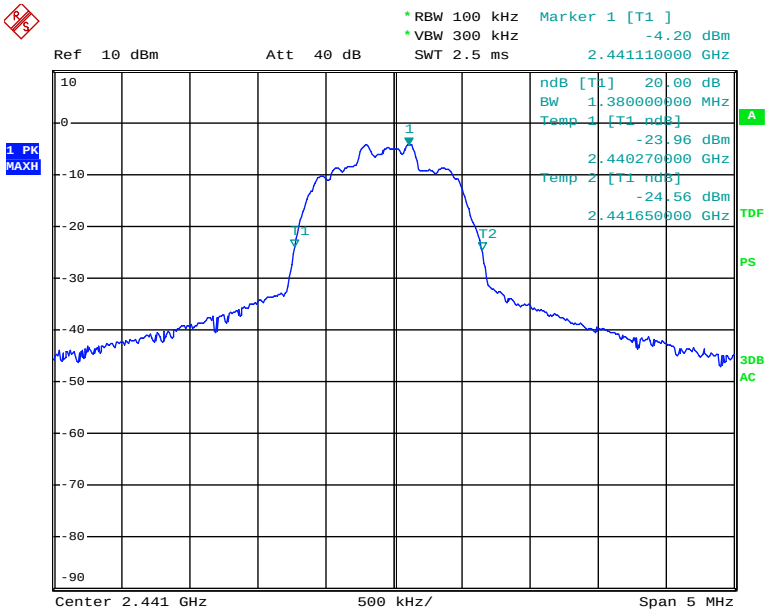
Date: 11.OCT.2013 21:46:31

8DPSK Lowest Channel



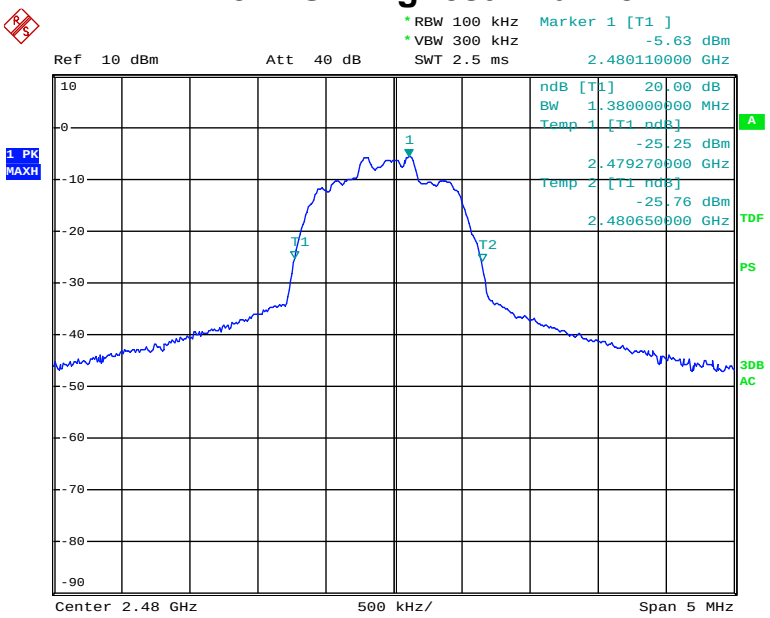
Date: 11.OCT.2013 21:50:24

8DPSK Middle Channel



Date: 11.OCT.2013 21:54:28

8DPSK Highest Channel



Date: 11.OCT.2013 22:01:11

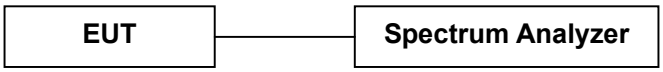
7. Hopping Channel Number

7.1 Measurement Procedure

Minimum Number of Hopping Frequencies, FCC Rule 15.247(a)(1)(iii):

Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum, and the spectrum analyzer set to MAX HOLD readings were taken for 3-5 minutes. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

7.2 Test SET-UP (Block Diagram of Configuration)



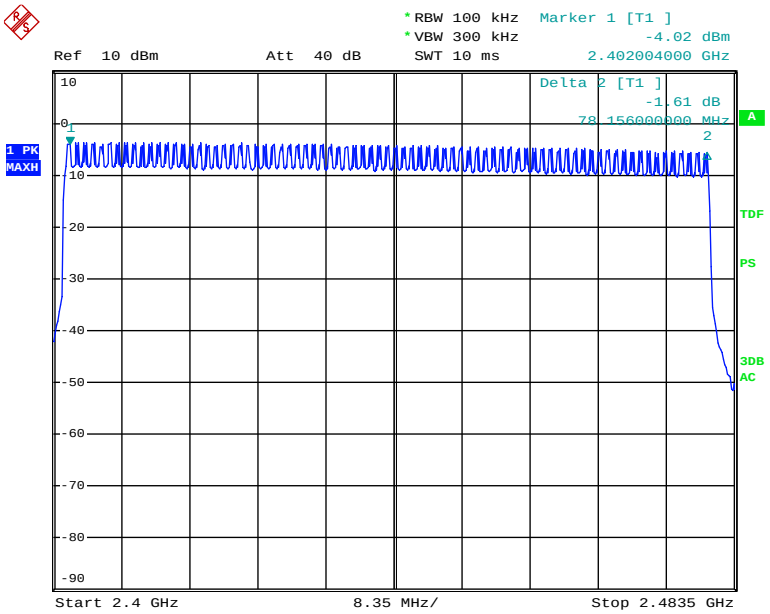
7.3 Measurement Results

Modulation	GFSK, π/4-DQPSK, 8DPSK		
RBW:	100KHz	VBW:	300KHz
Packet:	DH5	Spectrum Detector:	PK
Test By:	Sance	Test Date :	October 12, 2013
Temperature :	25 ℃	Humidity :	50%
Test Result:	PASS		

Hopping Channel Frequency Range	Number of Hopping Channels	Limit
2402-2480	79	≥15

The worst case: 8DPSK

8DPSK



Date: 12.OCT.2013 13:11:04

8. Time of Occupancy (Dwell Time)

8.1 Measurement Procedure

Average Channel Occupancy Time, FCC Ref:15.247(a)(1)(iii):

Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. The spectrum analyzer center frequency was set to one of the known hopping channels. The Sweep was set to 10 ms, the SPAN was set to Zero SPAN. The time duration of the transmissions so captured was measured with the Marker Delta function

8.2 Measurement Results

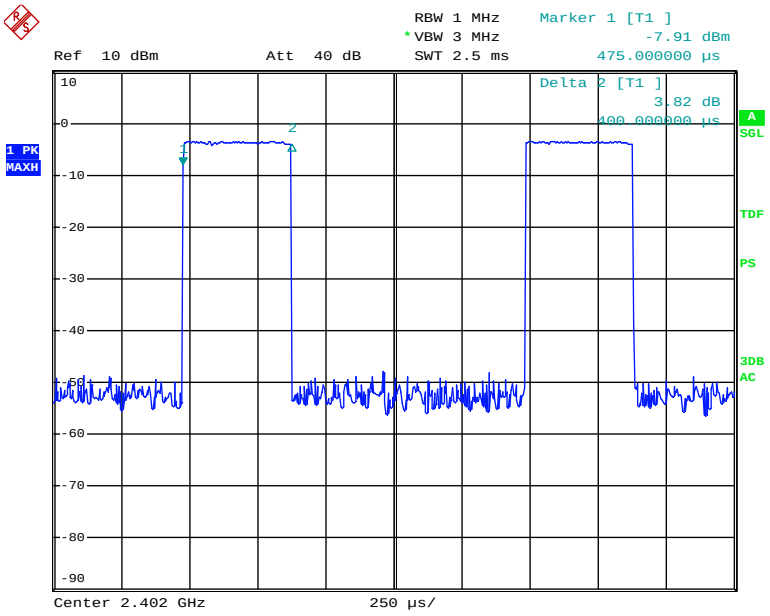
The maximum number of hopping channels in 31.6s (0.4s/Channel x 79 Channel)

Refer to attached data chart.

Modulation :	GFSK, π/4-DQPSK, 8DPSK		
RBW :	1MHz	VBW :	3MHz
Spectrum Detector:	PK	Test By:	Sance
Temperature :	25 ℃	Humidity :	50%
Test Date :	October 11, 2013	Test Result:	PASS

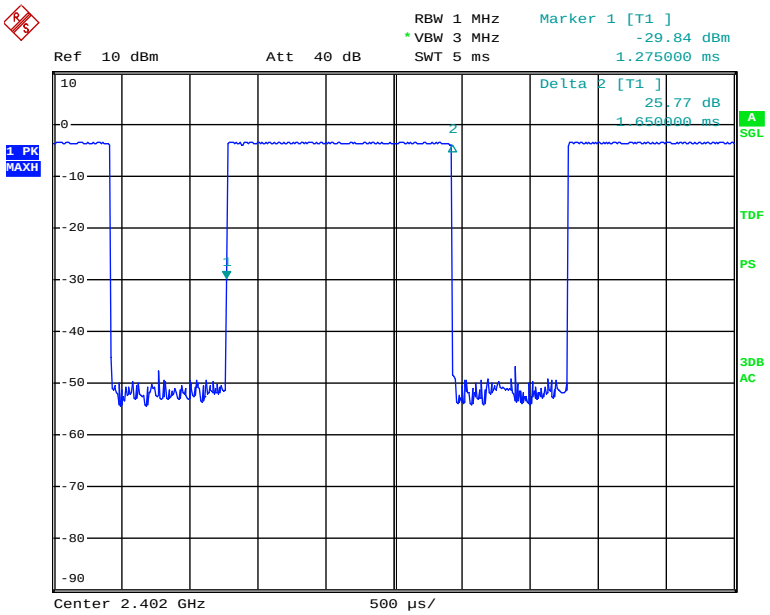
Packet	Frequency (MHz)	Result (msec)	Limit (msec)
GFSK			
DH1	2402	0.400(ms)*(1600/(2*79))*31.6=128.0	400
DH3	2402	1.650(ms)*(1600/(4*79))*31.6=264.0	400
DH5	2402	2.910(ms)*(1600/(6*79))*31.6=310.4	400
π/4-DQPSK			
2-DH1	2402	0.400(ms)*(1600/(2*79))*31.6=128.0	400
2-DH3	2402	1.660(ms)*(1600/(4*79))*31.6=265.6	400
2-DH5	2402	2.910(ms)*(1600/(6*79))*31.6=310.4	400
8DPSK			
3-DH1	2402	0.400(ms)*(1600/(2*79))*31.6=128.0	400
3-DH3	2402	1.650(ms)*(1600/(4*79))*31.6=264.0	400
3-DH5	2402	2.910(ms)*(1600/(6*79))*31.6=310.4	400

GFSK DH1



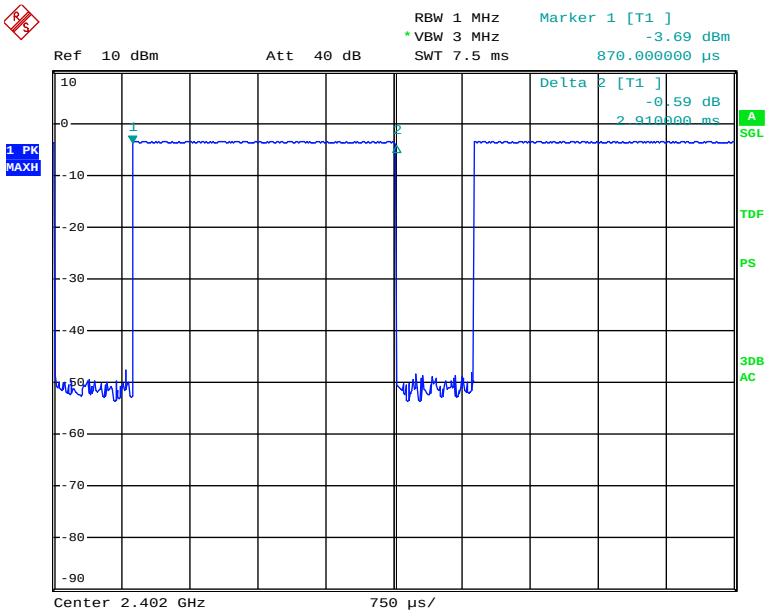
Date: 11.OCT.2013 22:39:31

GFSK DH3



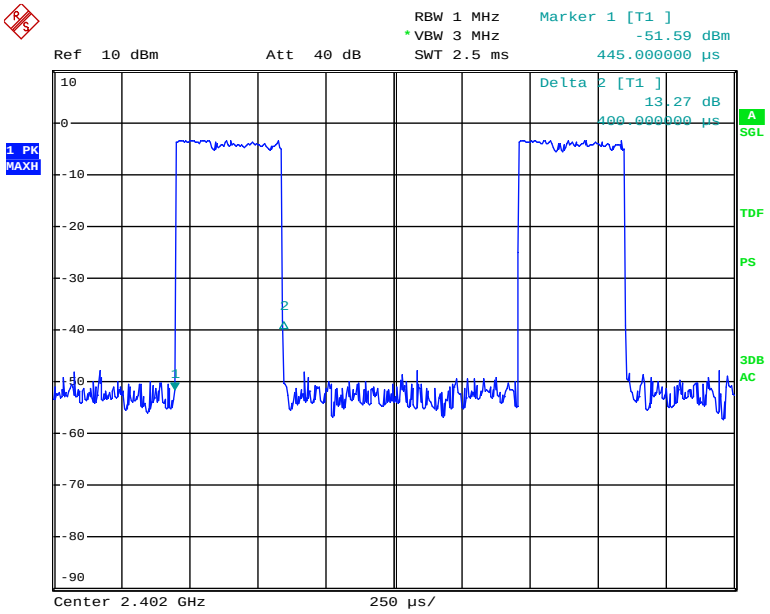
Date: 11.OCT.2013 22:40:05

GFSK DH5



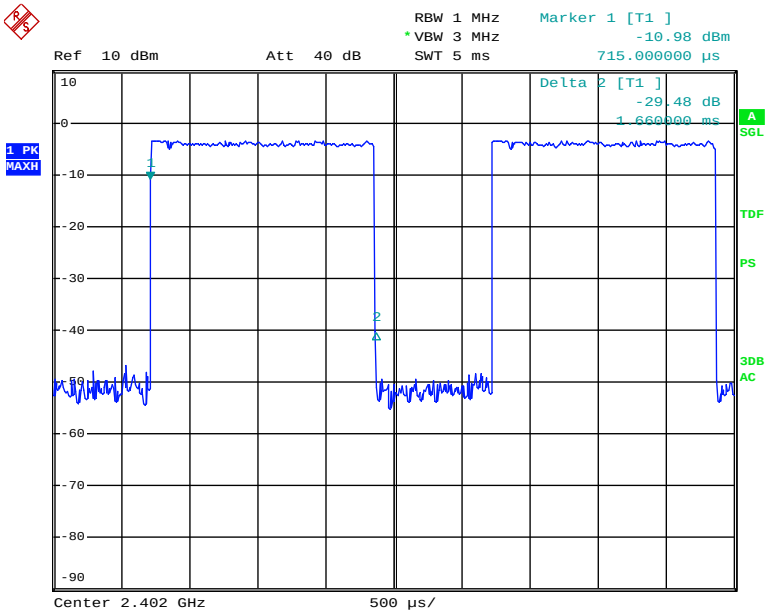
Date: 11.OCT.2013 22:40:27

π/4-DQPSK 2-DH1



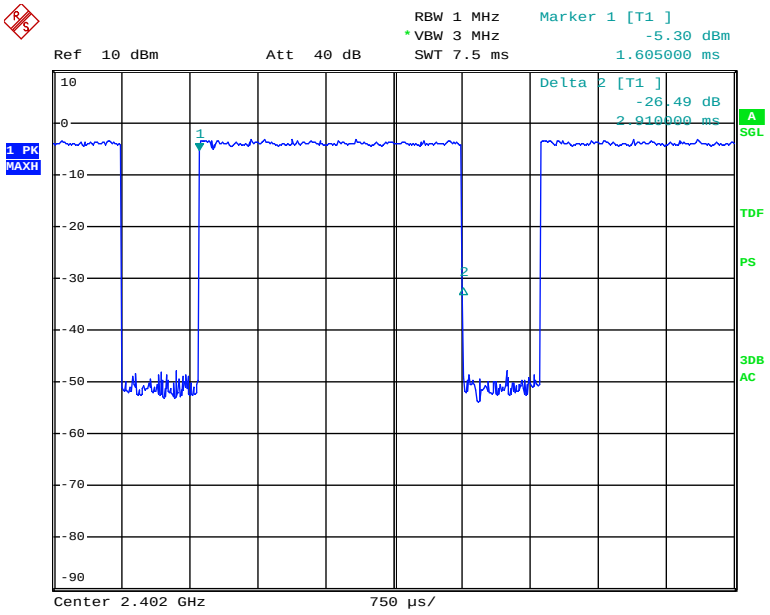
Date: 11.OCT.2013 22:40:52

π/4-DQPSK 2-DH3



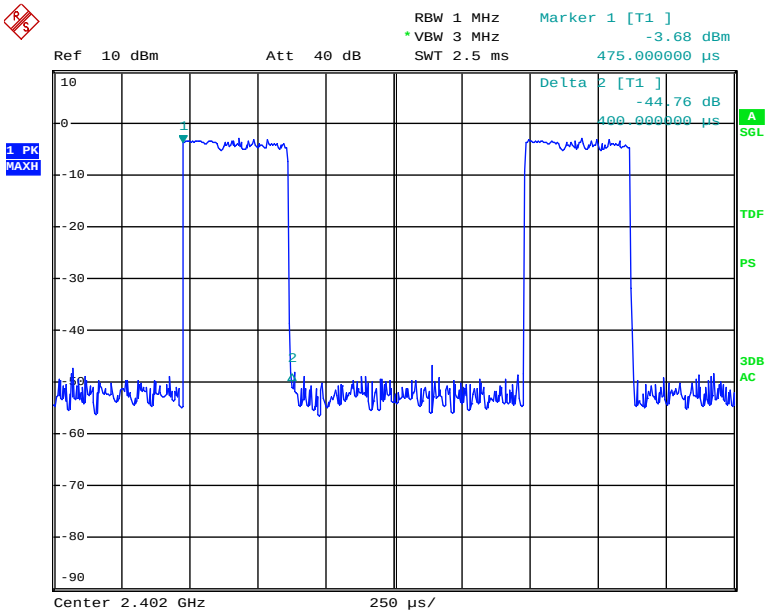
Date: 11.OCT.2013 22:41:15

π/4-DQPSK 2-DH5



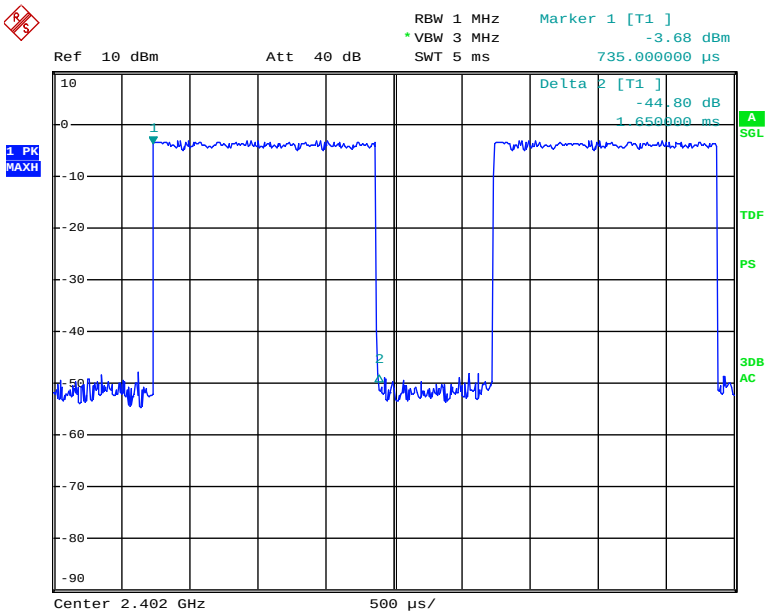
Date: 11.OCT.2013 22:41:46

8DPSK 3-DH1



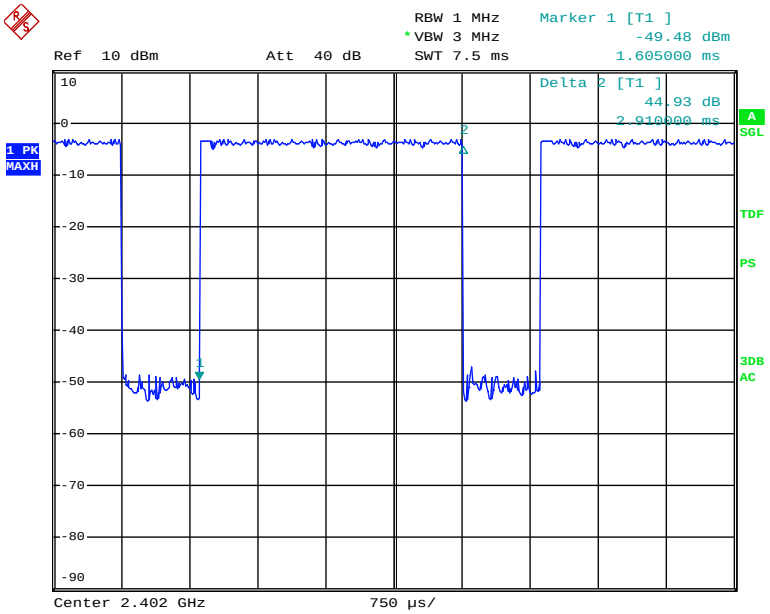
Date: 11.OCT.2013 22:42:13

8DPSK 3-DH3



Date: 11.OCT.2013 22:42:40

8DPSK 3-DH5



Date: 11.OCT.2013 22:43:10

9. MAXIMUM PEAK OUTPUT POWER

9.1 Measurement Procedure

Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(1):

Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum. The analyzer was set for RBW > 20dB bandwidth and power was read directly in dBm. Cable loss was considered during this measurement.

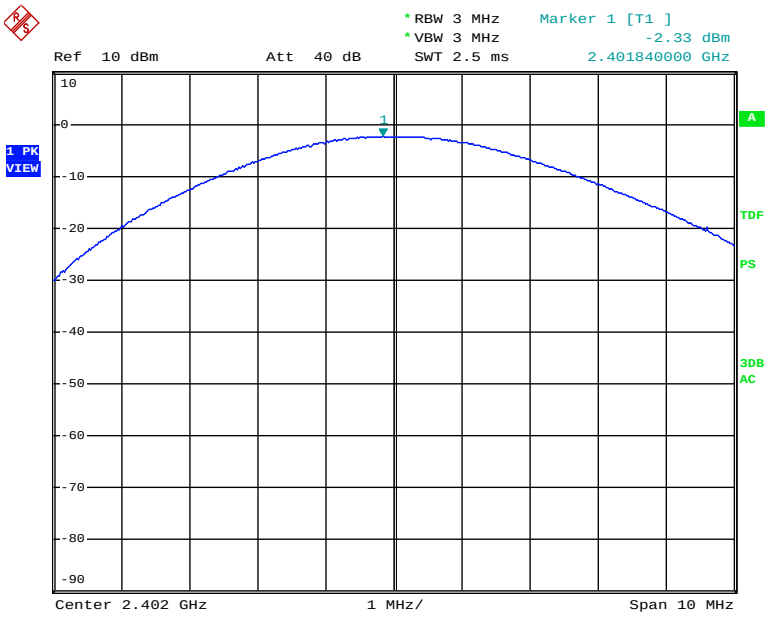
9.2 Measurement Results

Refer to attached data chart.

Modulation :	GFSK, π/4-DQPSK, 8DPSK		
RBW :	3MHz	VBW :	3MHz
Spectrum Detector:	PK	Test Date :	October 11, 2013
Test By:	Sance	Test Result:	PASS
Temperature :	25℃	Humidity :	50%

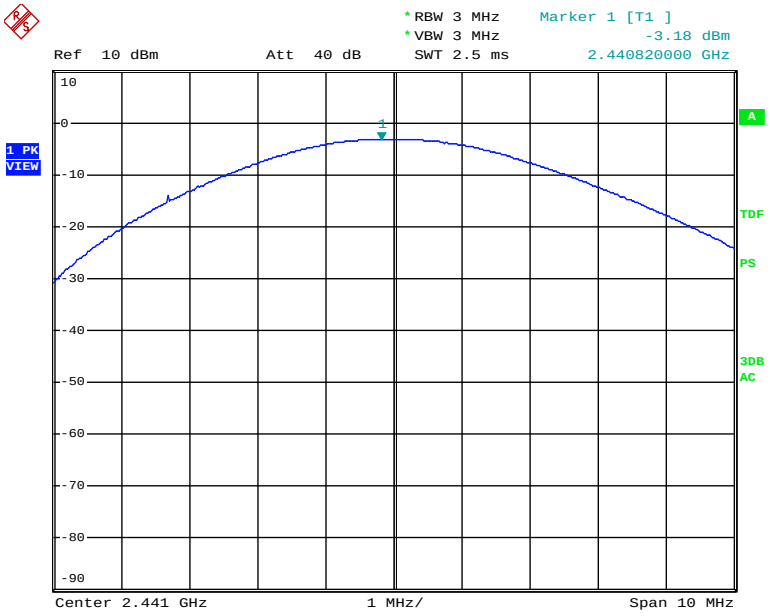
Channel Frequency (MHz)	Cable Loss dB	Peak Power output(mW)	Peak Power output(dBm)	Peak Power Limit(dBm)	Pass/Fail
GFSK					
2402.00	1.5	0.58	-2.33	21	PASS
2441.00	1.5	0.48	-3.18	21	PASS
2480.00	1.5	0.35	-4.61	21	PASS
π/4-DQPSK					
2402.00	1.5	0.65	-1.88	21	PASS
2441.00	1.5	0.56	-2.51	21	PASS
2480.00	1.5	0.41	-3.92	21	PASS
8DPSK					
2402.00	1.5	0.69	-1.64	21	PASS
2441.00	1.5	0.59	-2.32	21	PASS
2480.00	1.5	0.42	-3.81	21	PASS

GFSK Lowest Channel



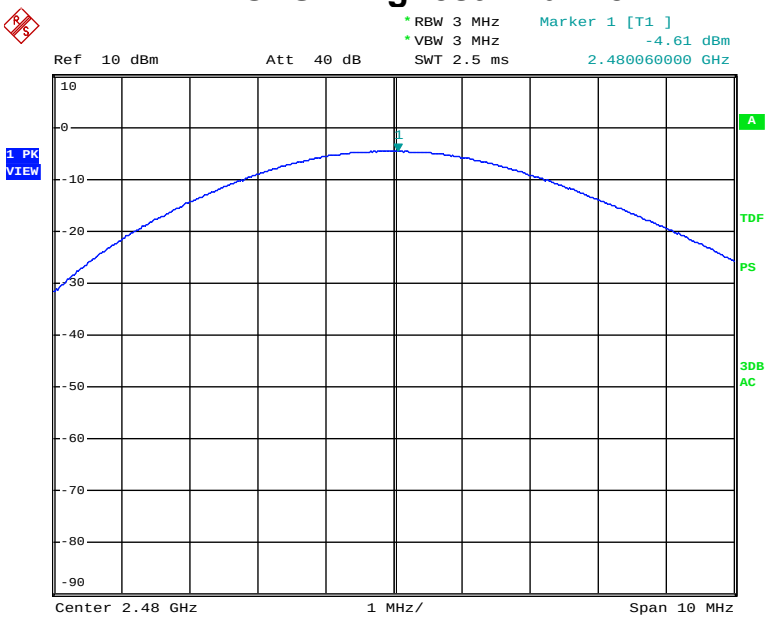
Date: 11.OCT.2013 22:45:10

GFSK Middle Channel



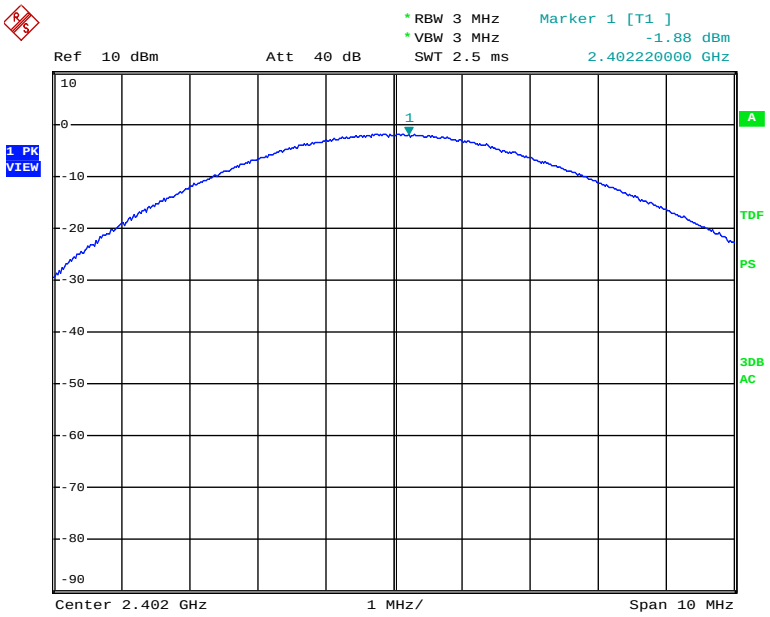
Date: 11.OCT.2013 22:45:36

GFSK Highest Channel



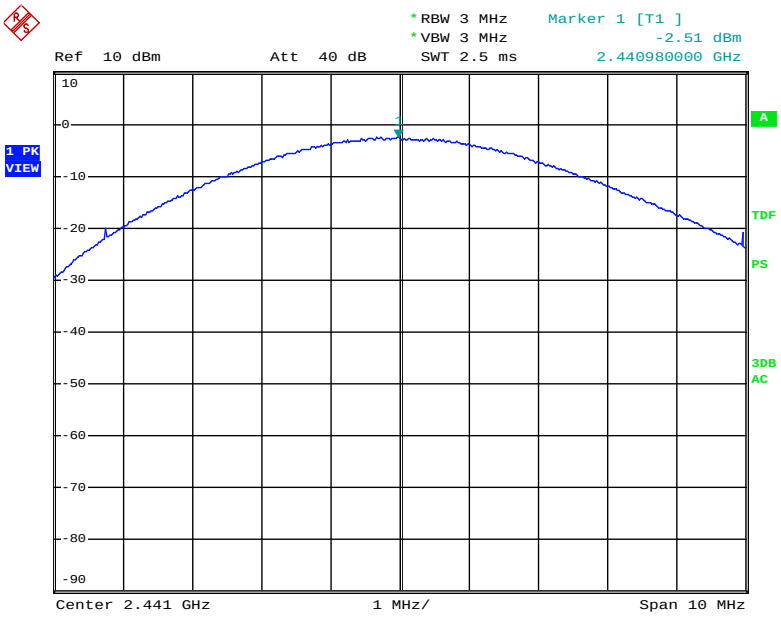
Date: 11.OCT.2013 22:45:58

π/4-DQPSK Lowest Channel



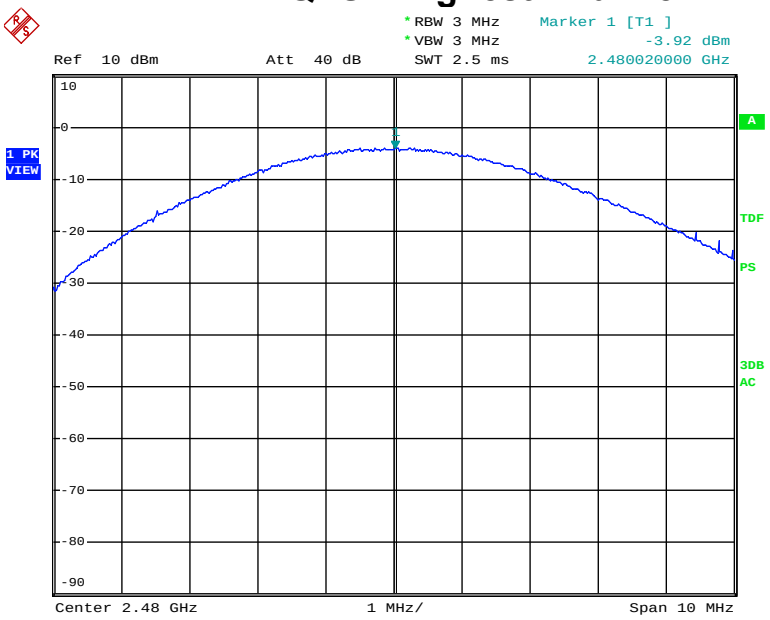
Date: 11.OCT.2013 22:46:25

π/4-DQPSK Middle Channel



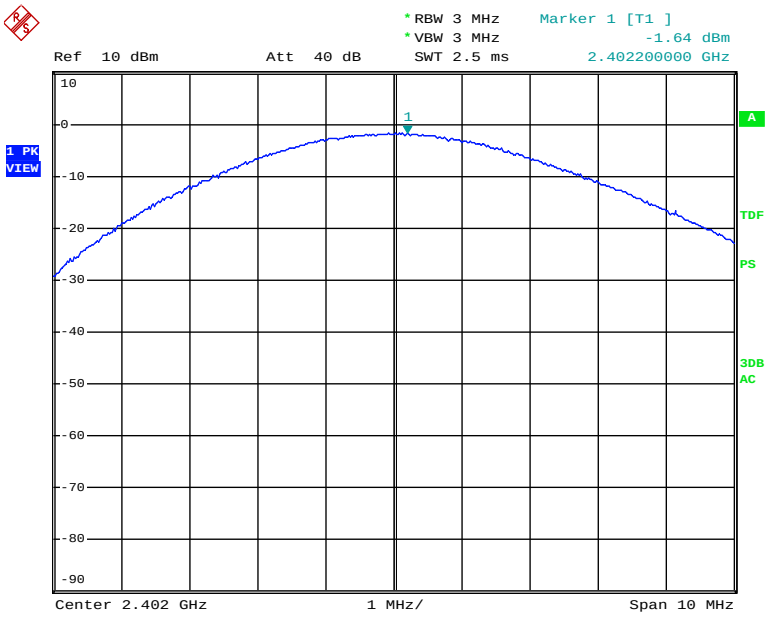
Date: 11.OCT.2013 22:46:42

π/4-DQPSK Highest Channel



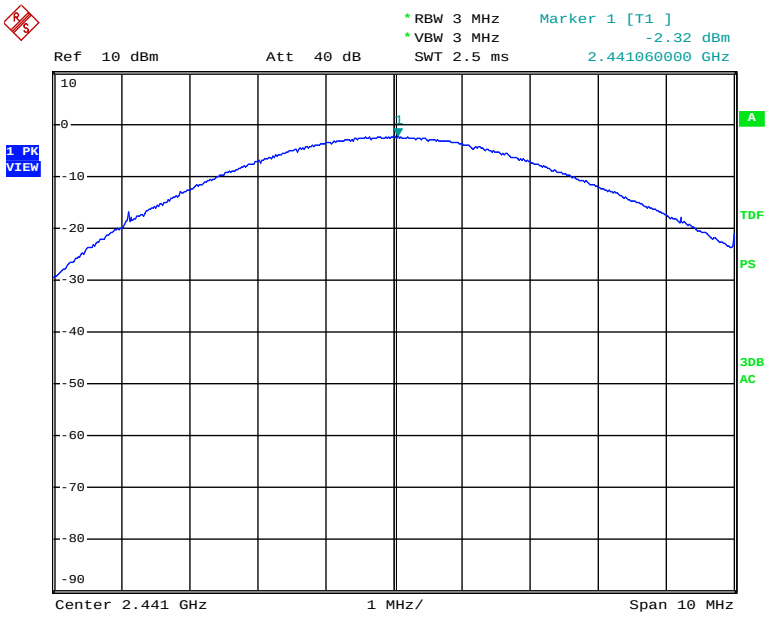
Date: 11.OCT.2013 22:47:07

8DPSK Lowest Channel



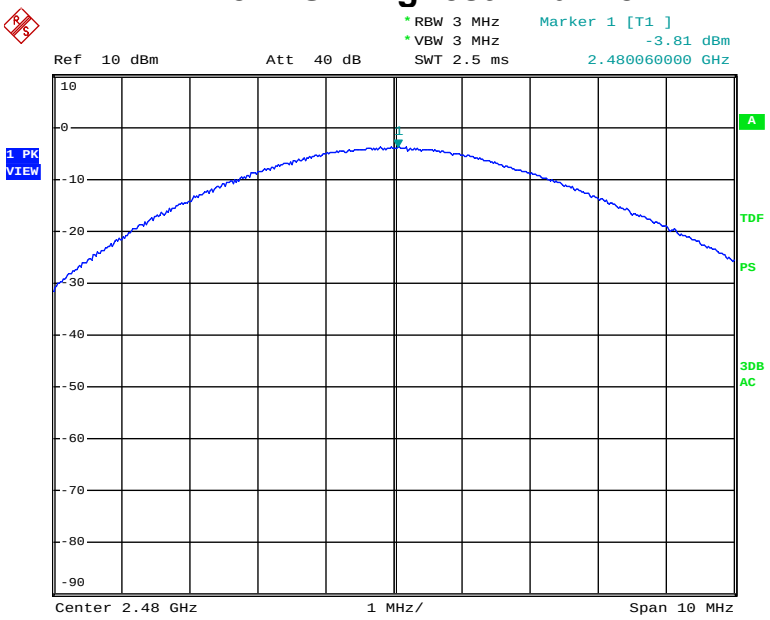
Date: 11.OCT.2013 22:47:29

8DPSK Middle Channel



Date: 11.OCT.2013 22:47:53

8DPSK Highest Channel



Date: 11.OCT.2013 22:48:11

10. Band Edge

10.1 Measurement Procedure

Out of Band Conducted Emissions, FCC Rule 15.247(d):

(1) For RF Conducted: The transmitter output is connected to spectrum analyzer. The resolution bandwith is set to100KHz, and the video bandwith set to 300KHz.

(2) For Radiated Emission: Same as 4.2 Radiated Emission Measurement procedure.

10.2 Limit

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

10.3 Measurement Results

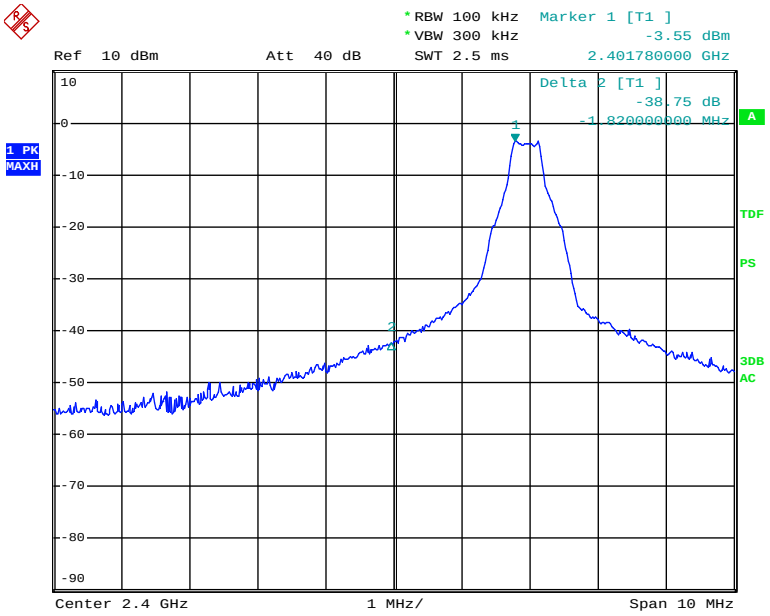
Please see below test table and plots.
For Radiated Emission

8DPSK: (the worst case)

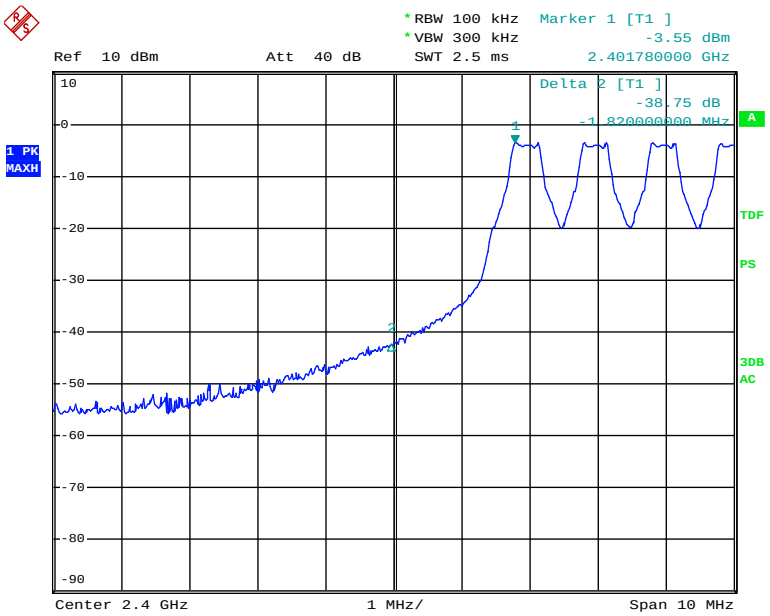
Frequency (MHz)	Polarity	Level		Limited		Margin		Result
		PK	AV	PK	AV	PK	AV	
8DPSK								
2399.940	H	60.24	49.57	74.00	54.00	-13.76	-4.43	PASS
2398.270	V	63.44	47.65	74.00	54.00	-10.56	-6.35	PASS
2484.430	H	62.98	48.23	74.00	54.00	-11.02	-5.77	PASS
2486.240	V	63.54	49.93	74.00	54.00	-10.46	-4.07	PASS

For RF Conducted

GFSK Lowest Channel

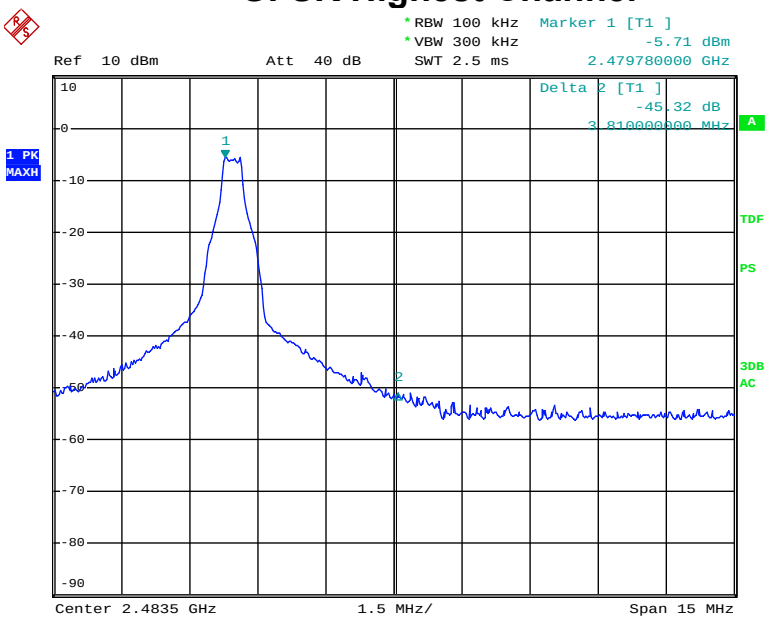


Date: 11.OCT.2013 22:05:04

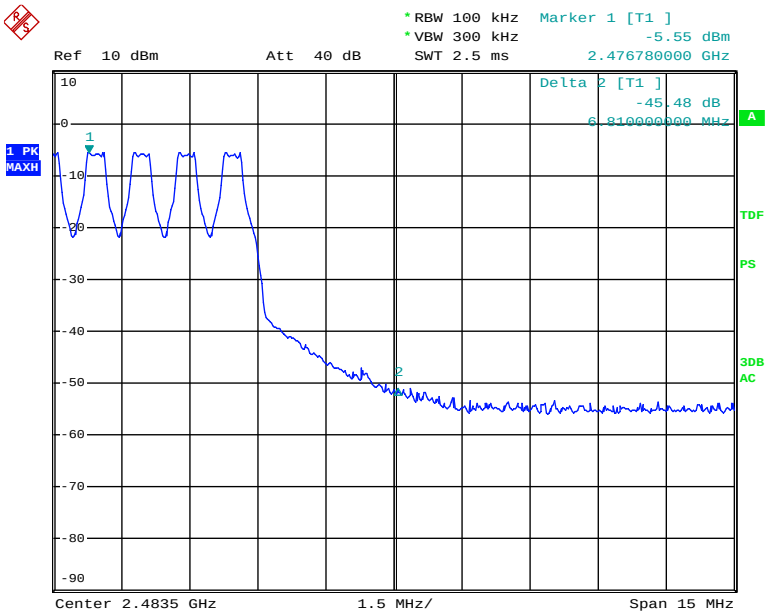


Date: 11.OCT.2013 22:07:48

GFSK Highest Channel

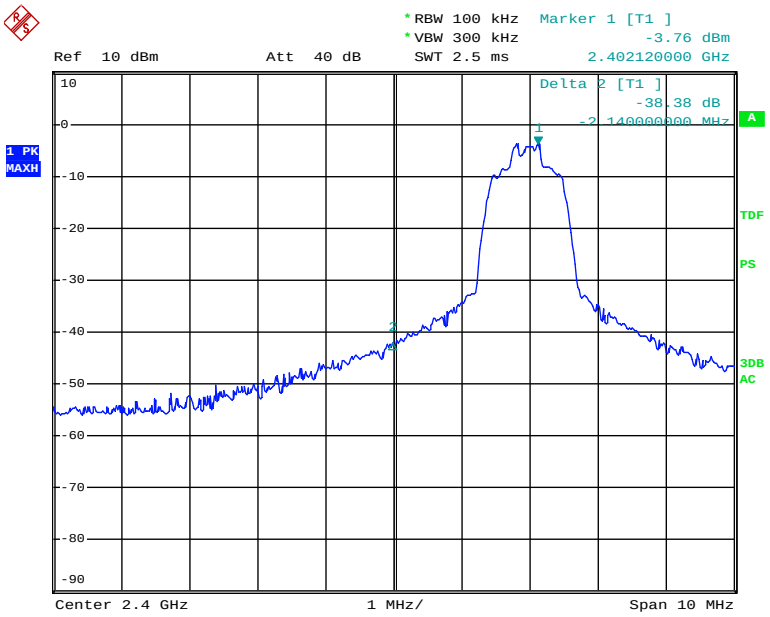


Date: 11.OCT.2013 22:21:27

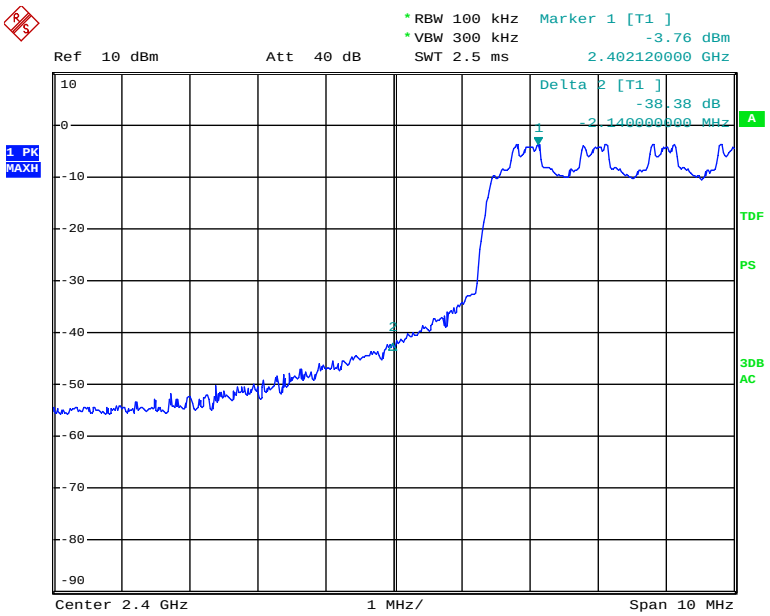


Date: 11.OCT.2013 22:25:05

π/4-DQPSK Lowest Channel

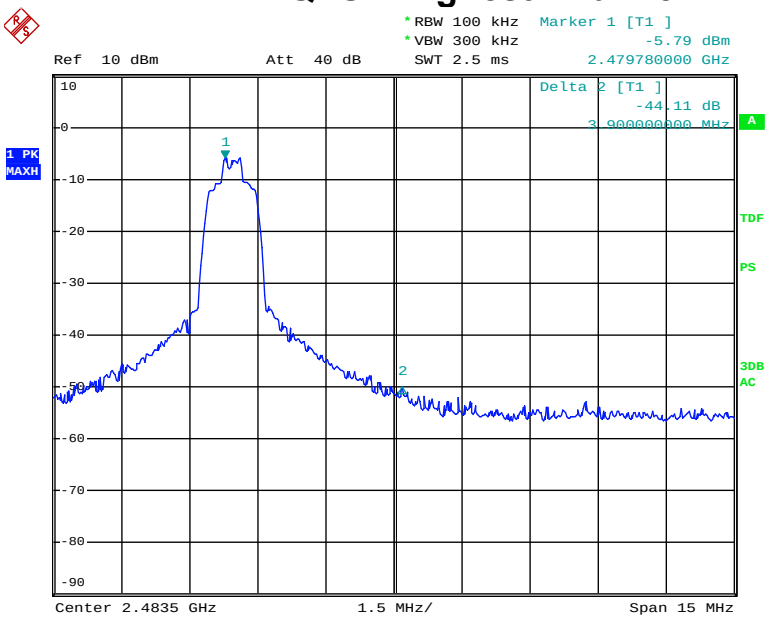


Date: 11.OCT.2013 22:10:11

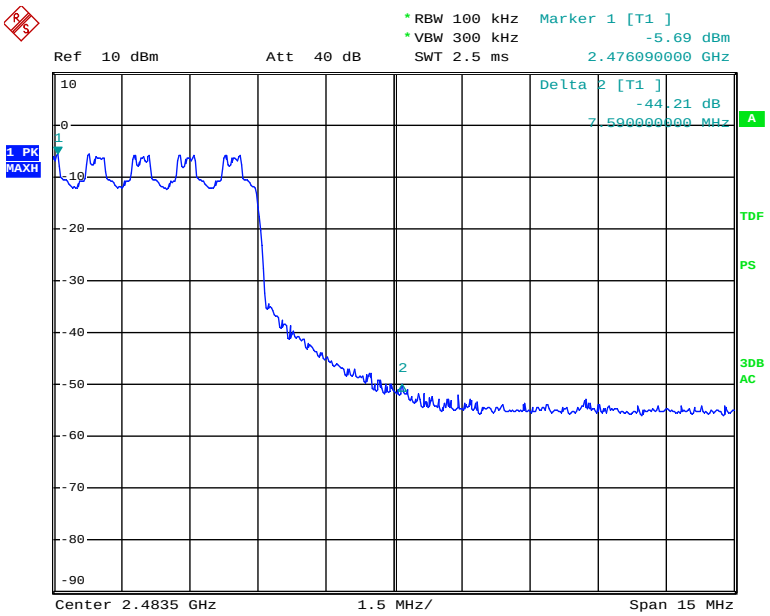


Date: 11.OCT.2013 22:13:05

π/4-DQPSK Highest Channel

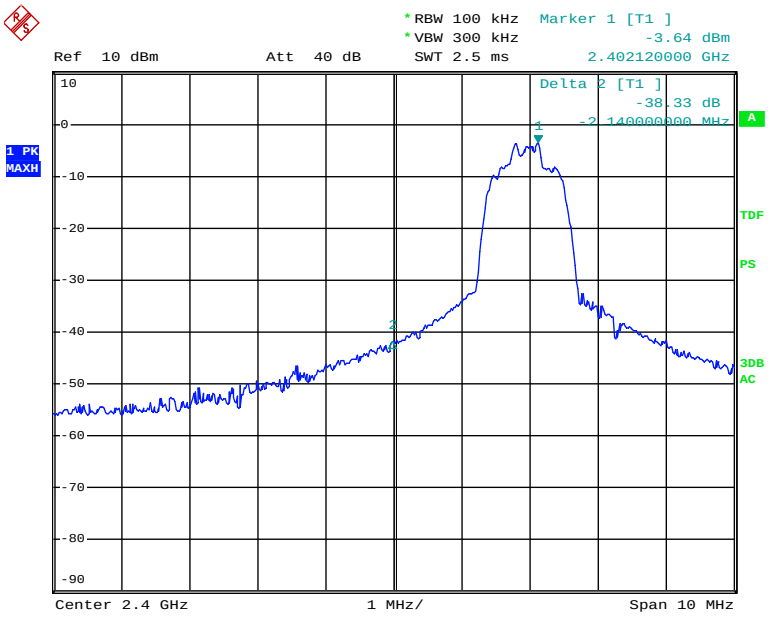


Date: 11.OCT.2013 22:26:59

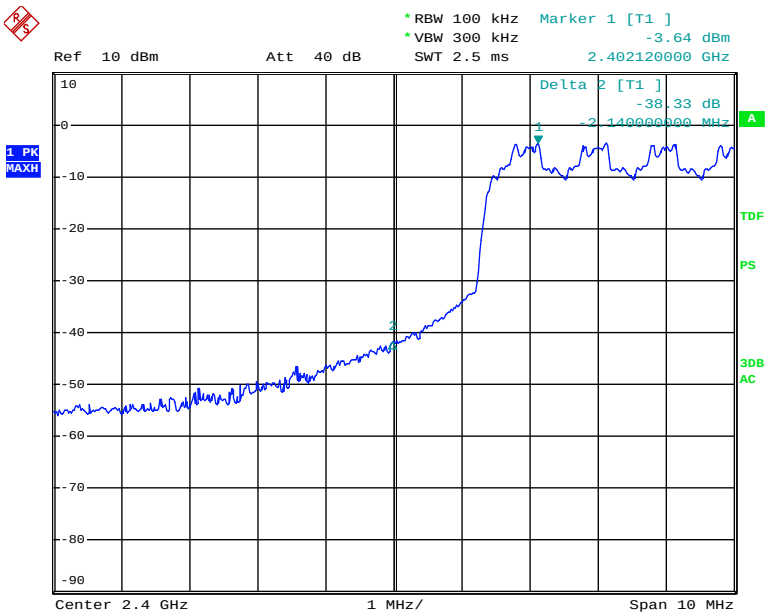


Date: 11.OCT.2013 22:30:33

8DPSK Lowest Channel

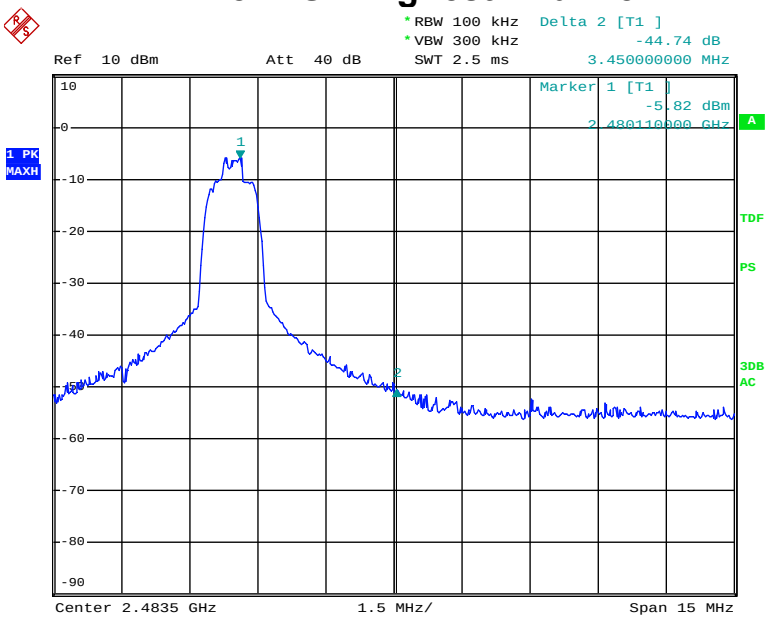


Date: 11.OCT.2013 22:15:49

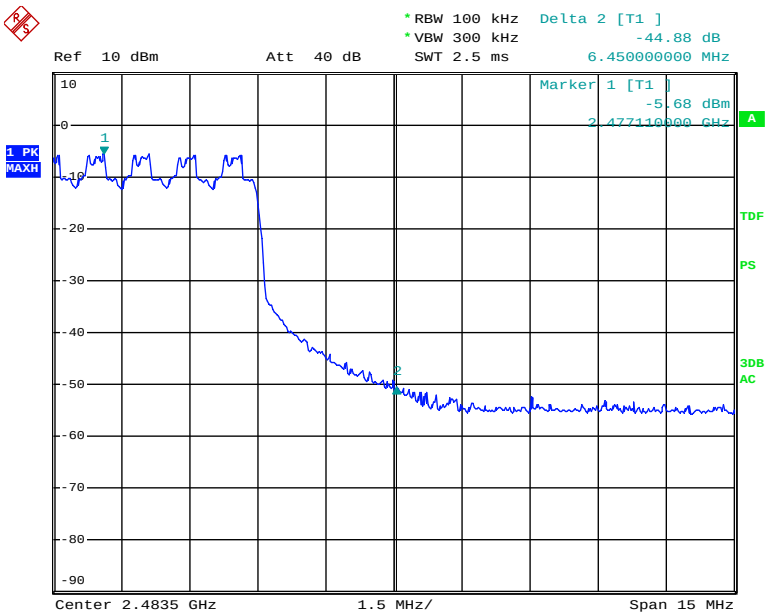


Date: 11.OCT.2013 22:19:15

8DPSK Highest Channel



Date: 11.OCT.2013 22:32:57



Date: 11.OCT.2013 22:37:17

11. Antenna Application

11.1 Antenna requirement

According to of FCC part 15C section 15.203 and 15.240:

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.
Systems operating in the 2400-2483.5MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

11.2 Measurement Results

The antenna is integrated on the main PCB and no consideration of replacement, and the best case gain of the antenna is 0dBi. So, the antenna is consider meet the requirement.

12. Conducted Spurious Emissions

12.1 Measurement Procedure

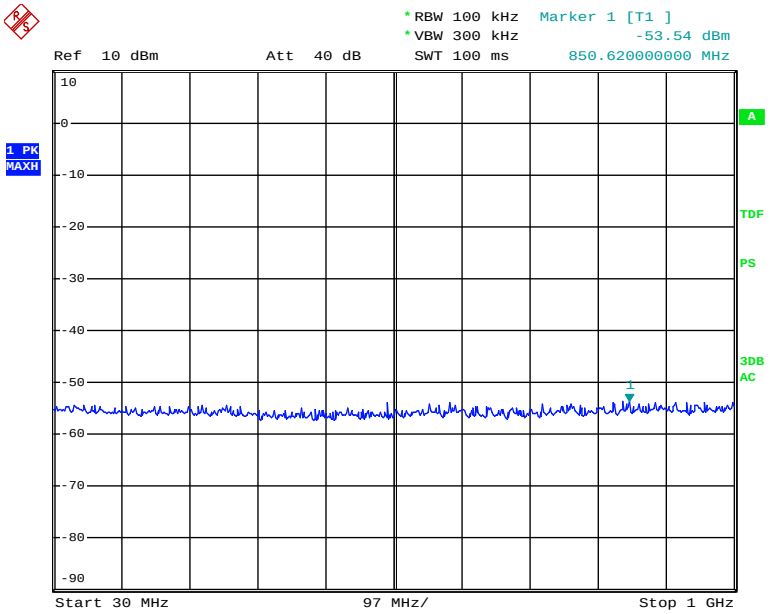
Out of Band Conducted Spurious Emissions, FCC Rule 15.247(d):

The transmitter output is connected to spectrum analyzer. All spurious emission and up tp the tenth harmonic was measured and they were found to be at least 20dB below the highest level of the desired power in the passband.

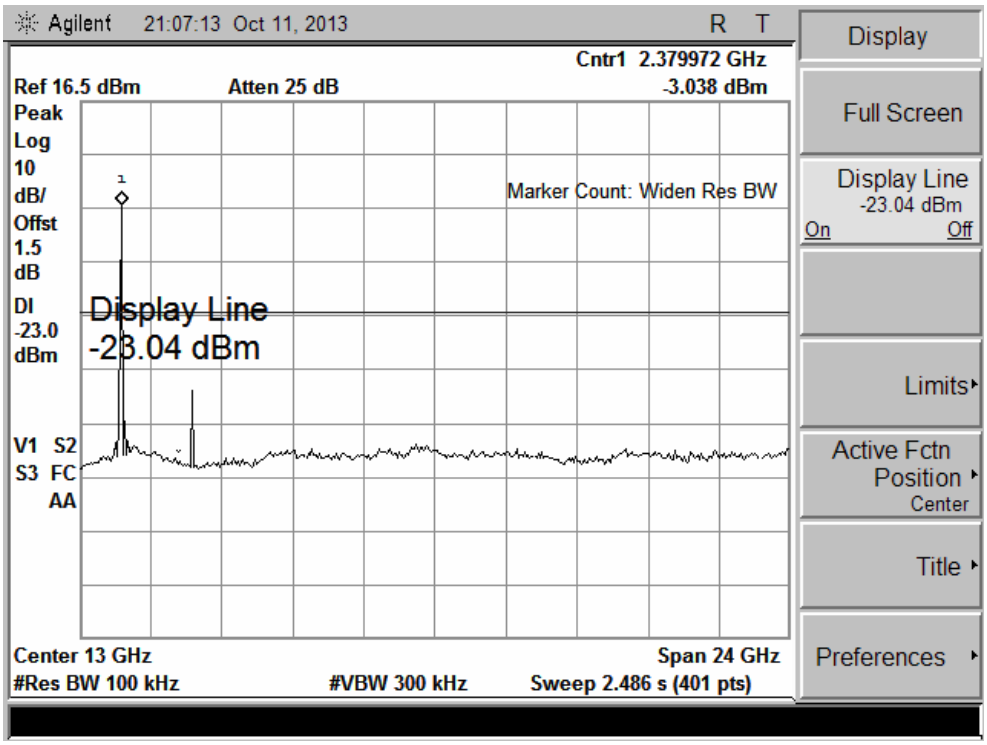
12.2 Measurement Results

Please refer to following plots, the worst case (8DPSK) was shown.

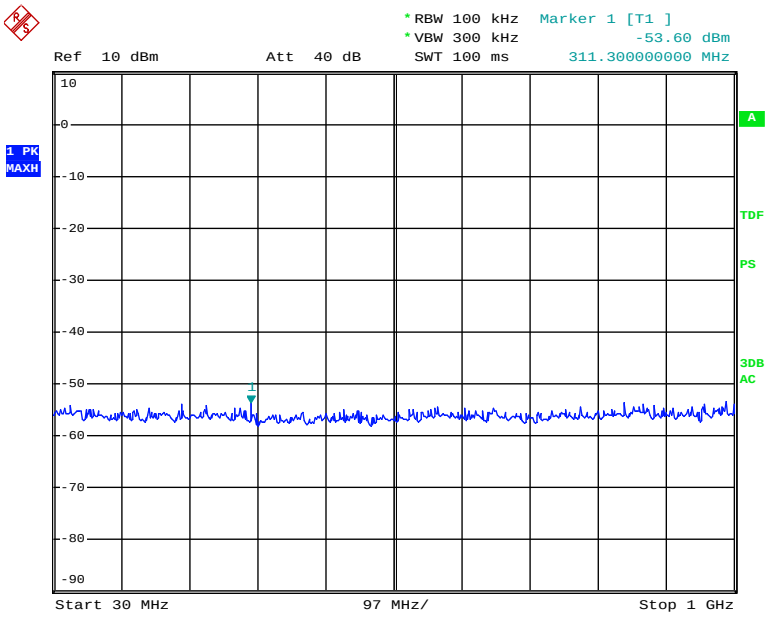
8DPSK Lowest Channel



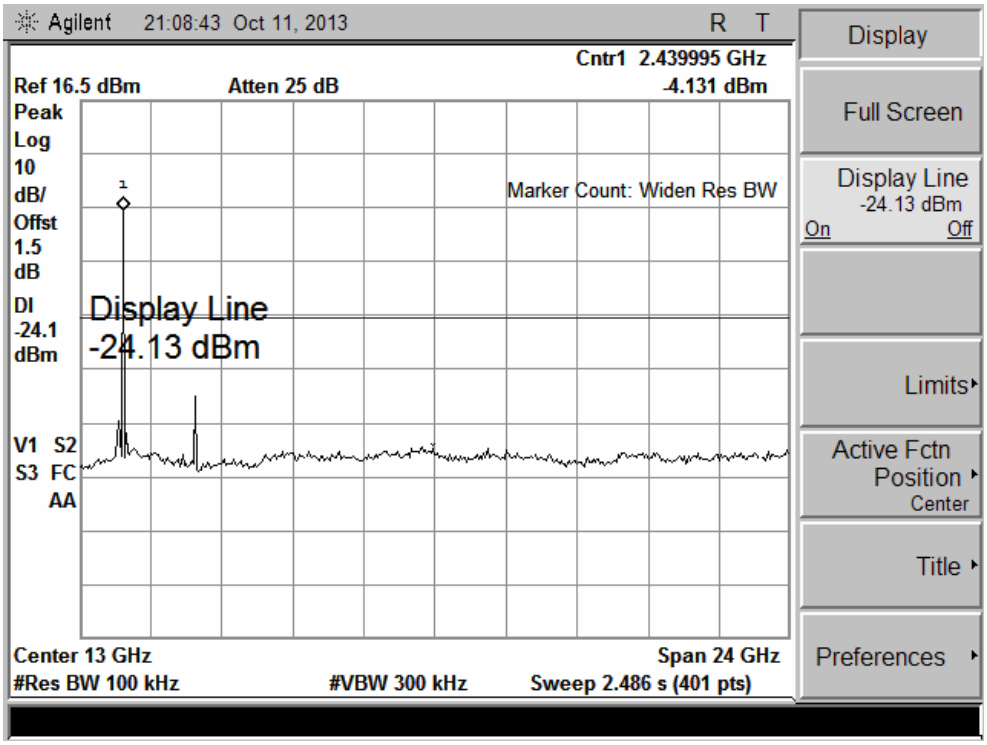
Date: 11.OCT.2013 22:38:07



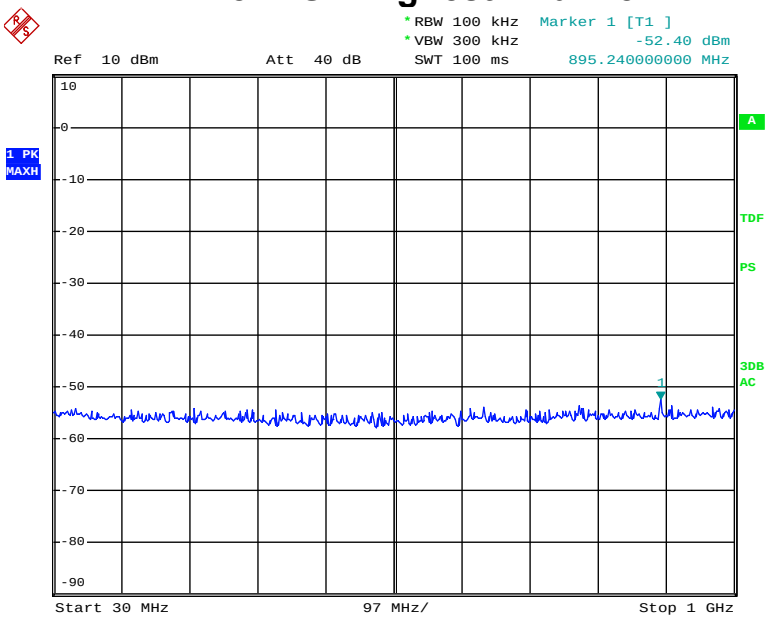
8DPSK Middle Channel



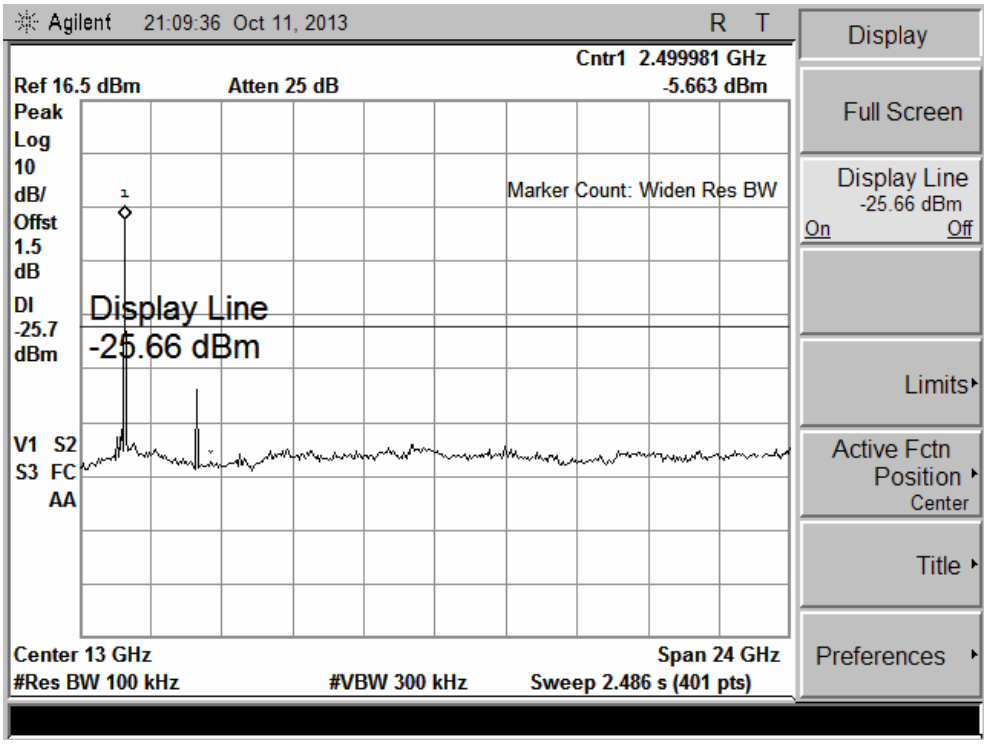
Date: 11.OCT.2013 22:38:19



8DPSK Highest Channel



Date: 11.OCT.2013 22:38:33



13. Test Equipment List

Description	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due Date
Test Receiver	Rohde & Schwarz	ESCI7	100837	Nov. 25, 2012	Nov. 24, 2013
Antenna	Schwarzbeck	VULB9162	9162-010	Nov. 28, 2012	Nov. 27, 2013
Positioning Controller	UC	UC 3000	N/A	N/A	N/A
Color Monitor	SUNSPO	SP-140A	N/A	N/A	N/A
Single Phase Power Line Filter	SAEMC	PF201A-32	110210	N/A	N/A
3 Phase Power Line Filter	SAEMC	PF401A-200	110318	N/A	N/A
DC Power Filter	SAEMC	PF301A-200	110245	N/A	N/A
Cable	Huber+Suhner	CBL2-NN-1M	22390001	Nov. 09, 2012	Nov. 08, 2013
Cable	Huber+Suhner	CIL02	N/A	Nov. 09, 2012	Nov. 08, 2013
Power Amplifier	HP	HP 8447D	1145A00203	Nov. 09, 2012	Nov. 08, 2013
Horn Antenna	Schwarzbeck	BBHA9170	9170-372	Oct.24, 2012	Oct.23, 2013
Horn Antenna	EMCO	3117	00062558	Oct. 19, 2012	Oct. 18, 2013
Loop antenna	Daze	ZA30900A	0708	Oct.11, 2013	Oct.10, 2014
Spectrum Analyzer	Agilent	E4408B	MY414407D	Apr. 29, 2013	Apr. 28, 2014
Pre-Amplifier	Agilent	8449B	3008A02964	Apr. 19, 2013	Apr. 18, 2014
L.I.S.N.	Rohde & Schwarz	ENV 216	101317	Nov. 09, 2012	Nov. 08, 2013