FCC RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Bluetooth Speaker

ISSUED TO
Voxx Accessories Corp.

3502 Woodview Trace, Suite 220, Indianapolis, IN. 46268

Prepared by: Tu Lang
Tu Lang
(Reporting Specialist)
Date 2014.01.15

Approved by: Li Lei
Li Lei
(Project Manager)
Date 2014.01.15

Report No.:	BL-13C00A-601
EUT Type:	Bluetooth Speaker
Model Name:	SP900-A
Brand Name:	AR/808
FCC ID:	VIX-SP900
Test Standard:	47 CFR Part 15, Subpart C
Test conclusion:	PASS
Test Date:	Dec 13, 2013 – Dec 24, 2013
Date of Issue:	Jan 15, 2014

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Revision History

Version	Issue Date	Revisions
Rev. 01	Jan 15, 2014	Initial Issue

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6683 3402
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen CTL Testing Technology Co., Ltd
Address	Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen, China
Accreditation Certificate	The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are **970318** The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are **9618B**
Description	All measurement facilities used to collect the measurement data are located at Floor 1-A, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Test Environment Condition

Ambient Temperature	19 to 25 ℃
Ambient Relative Humidity	45 to 55 %
Ambient Pressure	N/A (Not applicable)

1.4 Announce

(1) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(2) The test report is invalid if there is any evidence and/or falsification.

(3) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(4) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant

Applicant	Voxx Accessories Corp.
Address	3502 Woodview Trace, Suite 220, Indianapolis, IN. 46268

2.2 Manufacturer

Manufacturer	Smart Power Industrial Ltd
Address	Building Four, Huaguan Industrial Zone, Zhangqi Road, Qiping Village, Guanlan Town, Shenzhen City, Guangdong Province, China

2.3 General Description for Equipment under Test (EUT)

EUT Type	Bluetooth Speaker
Model Name	SP9000-A
Hardware Version	N/A
Software Version	N/A
Network/ Wireless connectivity	Bluetooth BR+EDR
Description	The HEX TL model number SP900 is an 808 branded wireless Bluetooth speaker that is able to stream music from any Bluetooth A2DP enabled device. The HEX TL also allows for wired audio via a 3.5 mm line in connector. The HEX TL is a 3 way speaker system that features both a mid-range and a tweeter along with a passive bass radiator in a very compact design. The speaker operates with a supplied power adaptor and also operates on 8 AA batteries (not supplied) giving it optimal flexibility in a variety of use cases whether at home or on the go. It features unparalleled sound in such a compact form with full range audio performance.

2.4 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

TX/ RX Operating Range	2400~2483.5MHz band f_c = 2402 MHz + N*1 MHz, where - f_c = “Operating Frequency” in MHz, - N = “Channel Number” with the range from 0 to 78.	
Modulation Type	Carrier	Frequency Hopping Spread Spectrum
	Digital	GFSK, π/4-DQPSK, 8DPSK
Antenna Type	Patch Antenna	
Antenna Gain	0dBi	

2.5 Ancillary Equipment

Ancillary Equipment 1	AC Adapter (Charger for Battery)	
	Brand Name	JFEC
	Model No	JF012WR-1200100UH
	Serial No	(n.a. marked #1 by test site)
	Rated Input	~ 100-240V, 350mA, 50/60Hz
	Rated Output	⎓12V

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (12-30-13 Edition)	Miscellaneous Wireless Communications Services
2	FCC PUBLIC NOTICE DA 00-705 (Mar. 30, 2000)	Filling and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
3	ANSI C63.4-2003/2009	American National Standard for Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4	ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass Note 1
2	Number of Hopping Frequency	15.247(a)	ANNEX A.1	Pass
3	Peak Output Power	15.247(b)	ANNEX A.2	Pass
4	Occupied Bandwidth	15.247(a)	ANNEX A.3	Pass
5	Carrier Frequency Separation	15.247(a)	ANNEX A.4	Pass
6	Time of Occupancy (Dwell time)	15.247(a)	ANNEX A.5	Pass
7	Conducted Spurious Emission	15.247(d)	ANNEX A.6	Pass
8	Conducted Emission	15.207	ANNEX A.7	Pass
9	Radiated Spurious Emission	15.209 15.247(c)	ANNEX A.8	Pass
10	Band Edge	15.247(d)	ANNEX A.9	Pass
Note 1: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.				

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
Normal Temperature, Normal Voltage (NTNV)	Ambient	DC 12V	Ambient

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2013.05.10	2014.05.09
Attenuator (20dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	R&S	HMP2020	018141664	2013.07.06	2014.07.07
Test Antenna-Loop	SCHWARZBECK	FMZB 1519	1519-037	2013.07.03	2014.07.02
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2013.07.03	2014.07.02
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2013.07.02	2014.07.01
Test Antenna-Horn	R&S	HL050S7	72681	2013.07.02	2014.07.01
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2013.10.07	2014.10.06
EMI Test Receiver	R&S	ESRP	101036	2013.06.04	2014.06.03
Artificial Mains Network	SCHWARZBECK	NSLK8127	8127-687	2013.06.04	2014.06.03

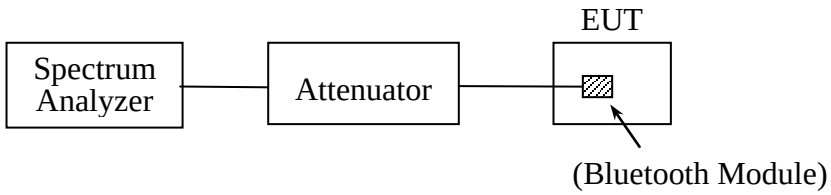
4.3 Test Configurations

Test Configurations (TC) NO.	Description	
	Signal Description	Operating Frequency
Transmitter		
TC01	GFSK modulation, package type DH5, hopping on	--
TC02	GFSK modulation, package type DH5, hopping off	Ch No. 0/ 2402MHz
TC03	GFSK modulation, package type DH5, hopping off	Ch No. 39/ 2441MHz
TC04	GFSK modulation, package type DH5, hopping off	Ch No. 78/ 2480MHz
TC05	π/4-DQPSK modulation, package type DH5, hopping on	--
TC06	π/4-DQPSK modulation, package type DH5, hopping off	Ch No. 0/ 2402MHz

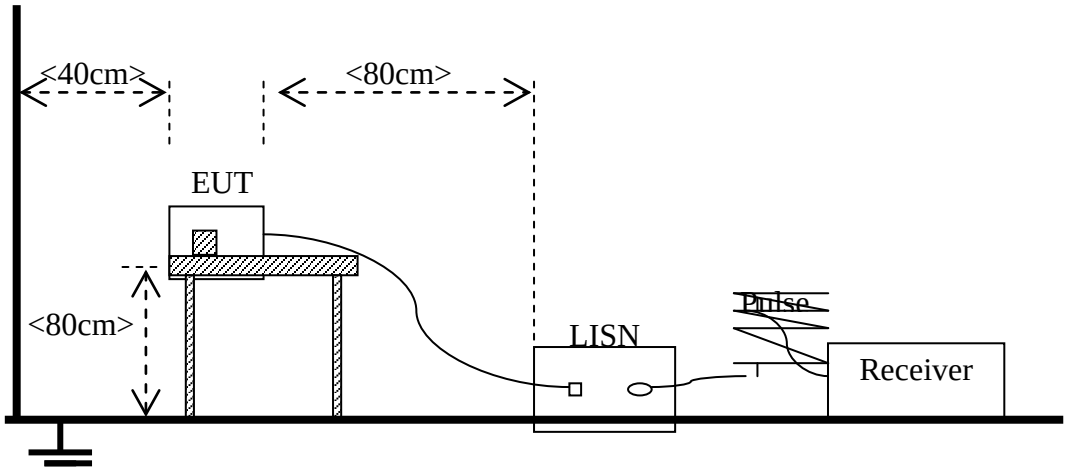
TC07	π/4-DQPSK modulation, package type DH5, hopping off	Ch No. 39/ 2441MHz
TC08	π/4-DQPSK modulation, package type DH5, hopping off	Ch No. 78/ 2480MHz
TC09	8DPSK modulation, package type DH5, hopping on	--
TC10	8DPSK modulation, package type DH5, hopping off	Ch No. 0/ 2402MHz
TC11	8DPSK modulation, package type DH5, hopping off	Ch No. 39/ 2441MHz
TC12	8DPSK modulation, package type DH5, hopping off	Ch No. 78/ 2480MHz

4.4 Test Setups

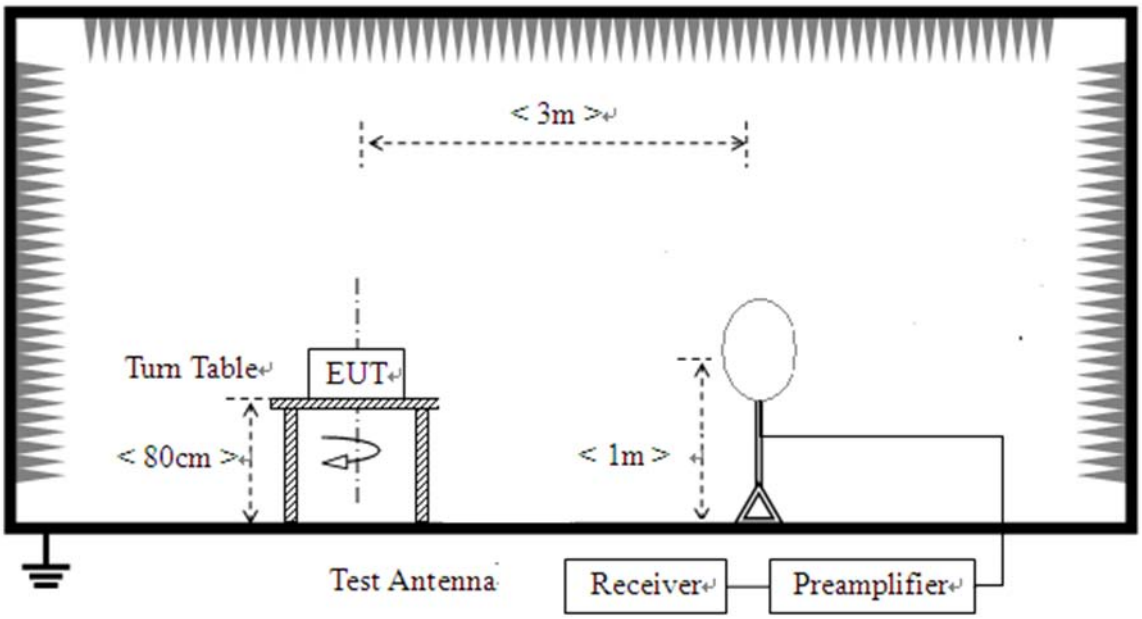
Test Setup 1- RF Conducted Test Setup



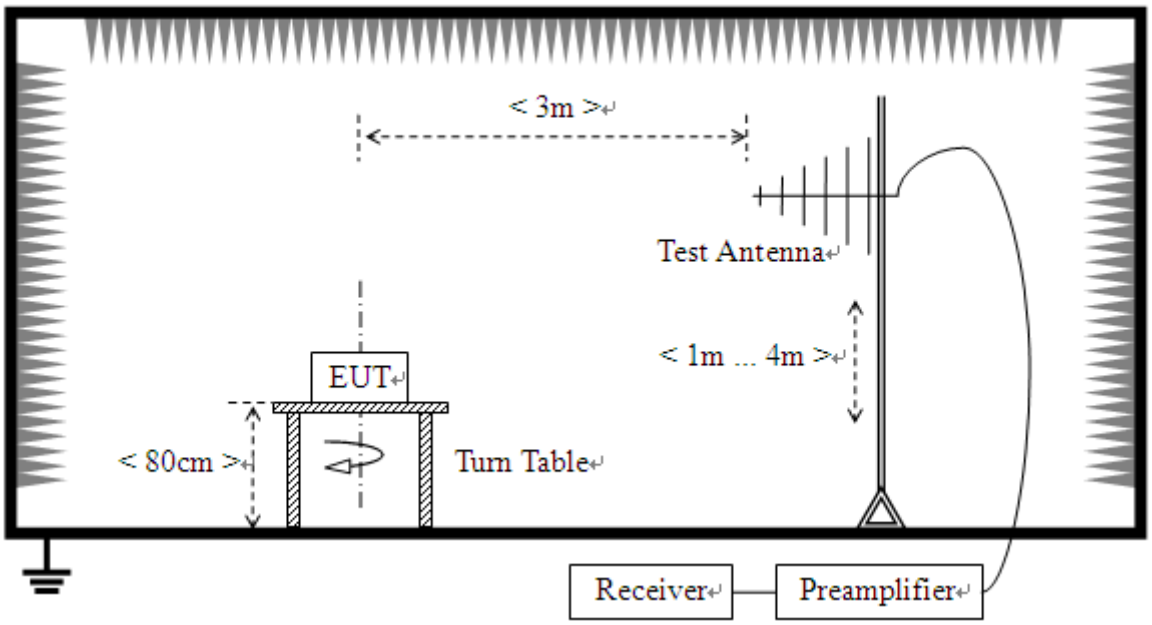
Test Setup 2 - Conducted Emission Test Setup



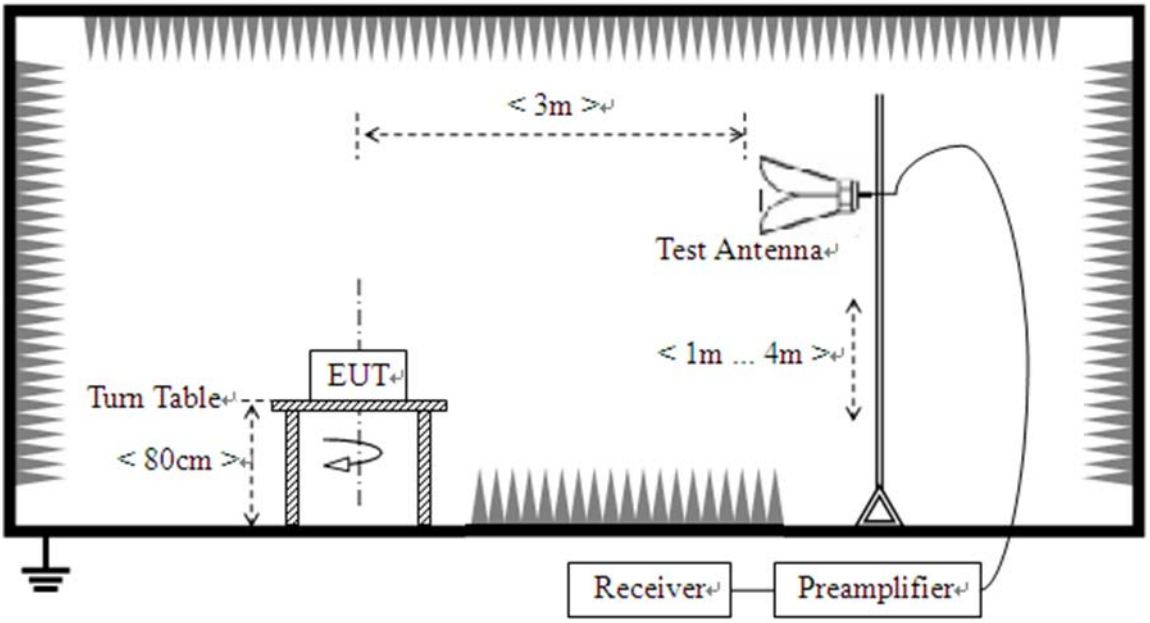
Test Setup 3–Radiated Spurious Emission Test Setup_1



Test Setup 4– Radiated Spurious Emission Test Setup_2



Test Setup 5– Radiated Spurious Emission Test Setup_3



4.5 Test Conditions

Test Case	Test Conditions		
	Test Env.	Test Setup Note 1	Test Configuration Note 2
Number of Hopping Frequency	NTNV	Test Setup 1	TC01, TC05, TC09
Peak Output Power	NTNV	Test Setup 1	TC02, TC03, TC04, TC06,TC07,TC08, TC10, TC11, TC12
Occupied Bandwidth	NTNV	Test Setup 1	TC03, TC07, TC011
Carrier Frequency Separation	NTNV	Test Setup 1	TC01, TC05, TC09
Time of Occupancy (Dwell time)	NTNV	Test Setup 1	TC01, TC05, TC09
Conducted Spurious Emission	NTNV	Test Setup 1	TC02, TC03, TC04, TC06,TC07,TC08, TC10, TC11, TC12
Conducted Emission	NTNV	Test Setup 2	TC02, TC03, TC04, TC06,TC07,TC08, TC10, TC11, TC12
Radiated Emission	NTNV	Test Setup 3 Test Setup 4 Test Setup 5	TC02, TC03, TC04, TC06,TC07,TC08, TC10, TC11, TC12
Band Edge	NTNV	Test Setup 5	TC02, TC04, TC06,TC08, TC10, TC12
Note: 1. Please refer to section 4.4 for test setup details. 2. Please refer to section 4.3 for test setup details.			

5 TEST ITEMS

5.1 Number of Hopping Frequency

5.1.1 Limit

FCC §15.247(a)(1)(iii)

Frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

5.1.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation
RBW ≥ 1% of the span
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.2 Peak Output Power

5.2.1 Test Limit

FCC §15.247(b)

For frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt.

5.2.2 Test Procedure

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module. The lowest, middle and highest channel were tested by Power meter.

5.3 Occupied Bandwidth

5.3.1 Limit

FCC §15.247(a)

The 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1%=20dB) taking the total RF output power.

5.3.2 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW ≥ 1% of the 20 dB bandwidth
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.4 Carrier Frequency Separation

5.4.1 Limit

FCC §15.247(a)

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

5.4.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

5.5 Time of Occupancy (Dwell time)

5.5.1 Limit

FCC §15.247(a)

Frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

5.5.2 Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel
RBW = 1 MHz
VBW ≥ RBW
Sweep = as necessary to capture the entire dwell time per hopping channel
Detector function = peak
Trace = max hold

The average time of occupancy on any channel within the Period can be calculated with formulas (for DH5 package type):

{Total of Dwell} = {Pulse Time} * (1600 / 6) / {Number of Hopping Frequency} * {Period}

{Period} = 0.4s * {Number of Hopping Frequency}

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

5.6 Conducted Spurious Emission

5.6.1 Limit

FCC §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.

5.6.2 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize

5.7 Conducted Emission

5.7.1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.7.2 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

5.8 Radiated Spurious Emission

5.8.1 Limit

FCC §15.209&15.247(c)

Radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

1. For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

2. For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.8.2 Test Procedure

The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.9 Band Edge

5.9.1 Limit

FCC §15.209&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.

5.9.2 Test Procedure

Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation

RBW ≥ 1% of the span

VBW ≥ RBW

Sweep = auto

Detector function = peak /AV

Trace = max hold

Allow the trace to stabilize.

E [dBμV/m] =UR + AT + AFactor [dB]; AT =LCable loss [dB]-Gpreamp [dB]

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

AFactor: Antenna Factor at 3m

ANNEX A TEST RESULTS

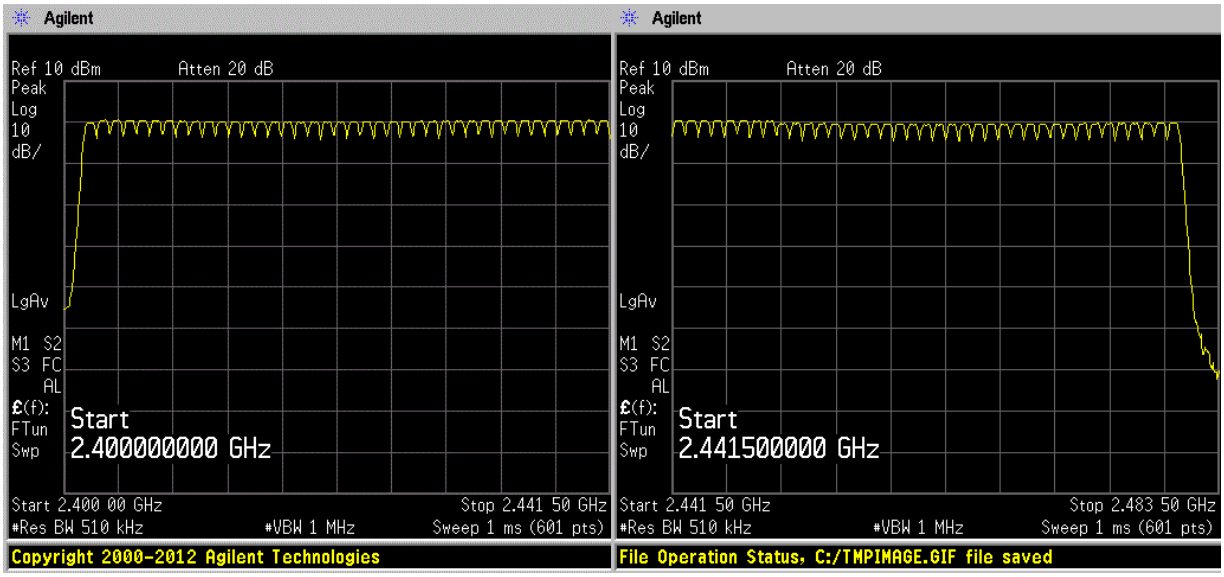
A.1 Number of Hopping Frequency

Test Data

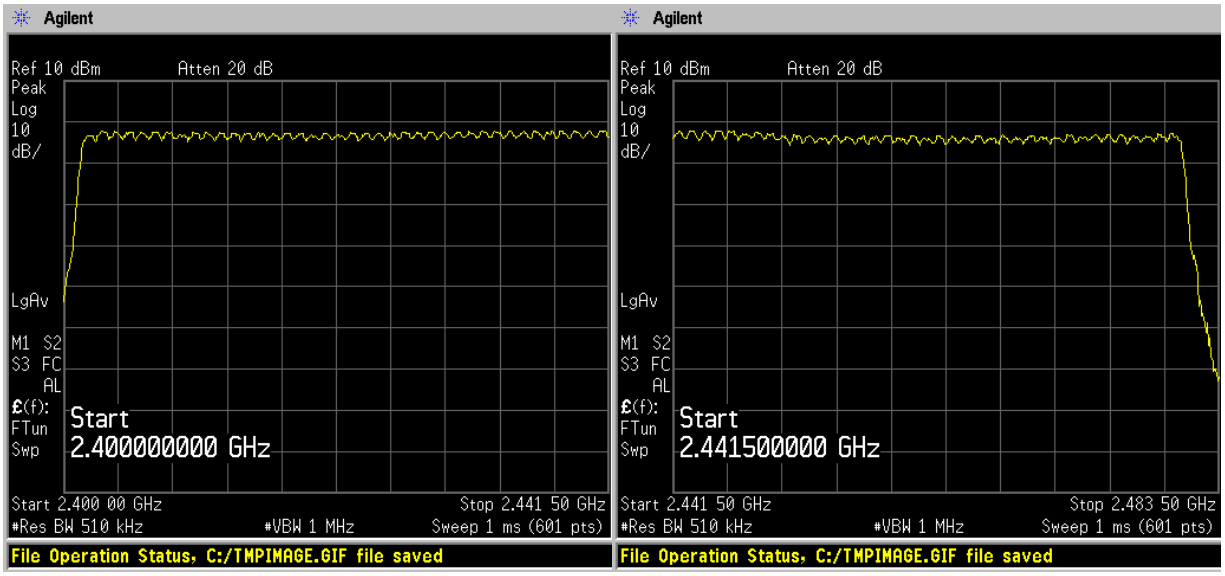
Test Mode	Frequency Band (MHz)	Channel Numbers	Limits	Verdict
GFSK	2402-2480	79	≥15	Pass
π/4DQPSK	2402-2480	79	≥15	Pass
8-DPSK	2402-2480	79	≥15	Pass

Test Plots

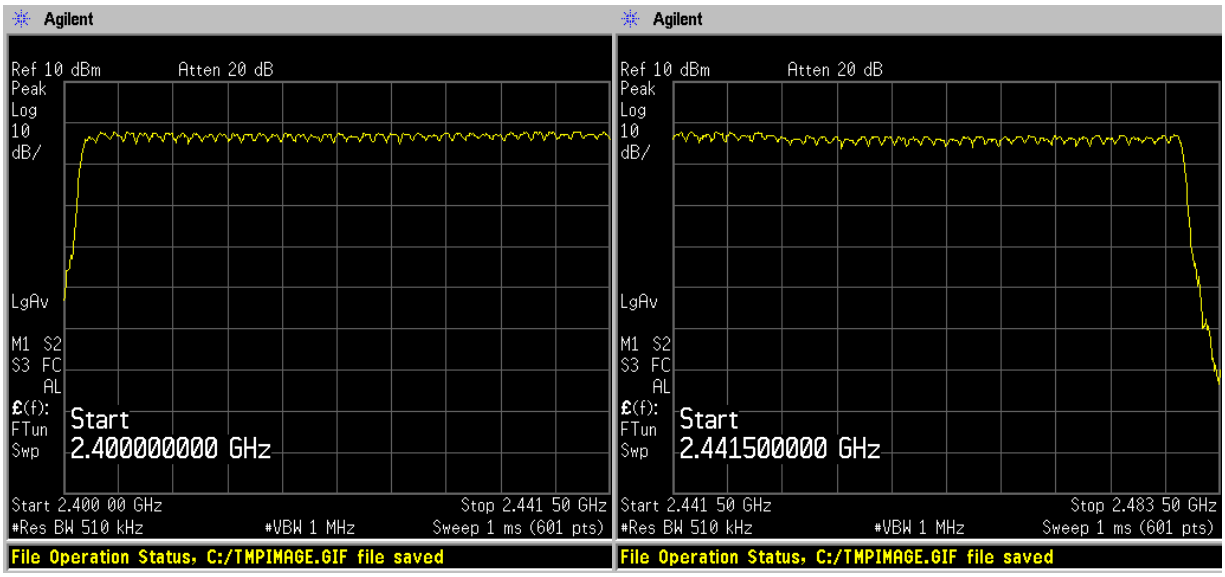
GFSK Mode



π/4 DQPSK Mode



8-DPSK Mode


Agilent
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
AL
£(f):
FTun
Swp
Start
2.400000000 GHz
Start 2.400 00 GHz
Stop 2.441 50 GHz
#Res BW 510 kHz
#VBW 1 MHz
Sweep 1 ms (601 pts)
File Operation Status, C:/TMPIMAGE.GIF file saved
Agilent
Ref 10 dBm
Atten 20 dB
Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
AL
£(f):
FTun
Swp
Start
2.441500000 GHz
Start 2.441 50 GHz
Stop 2.483 50 GHz
#Res BW 510 kHz
#VBW 1 MHz
Sweep 1 ms (601 pts)
File Operation Status, C:/TMPIMAGE.GIF file saved

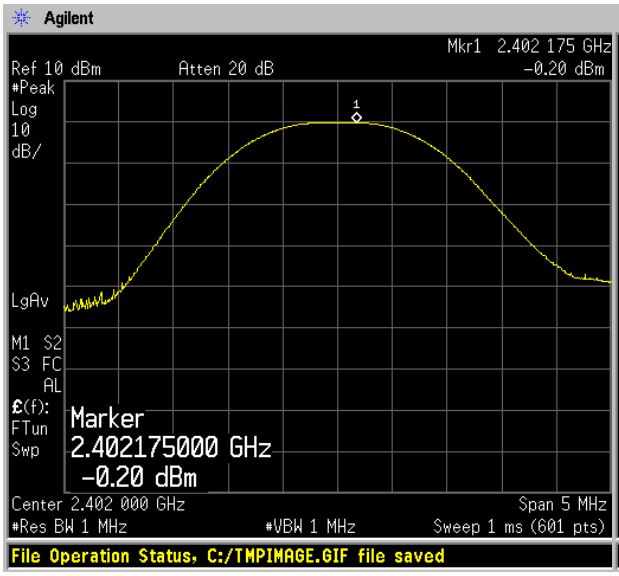
A.2 Peak Output Power

Test Data

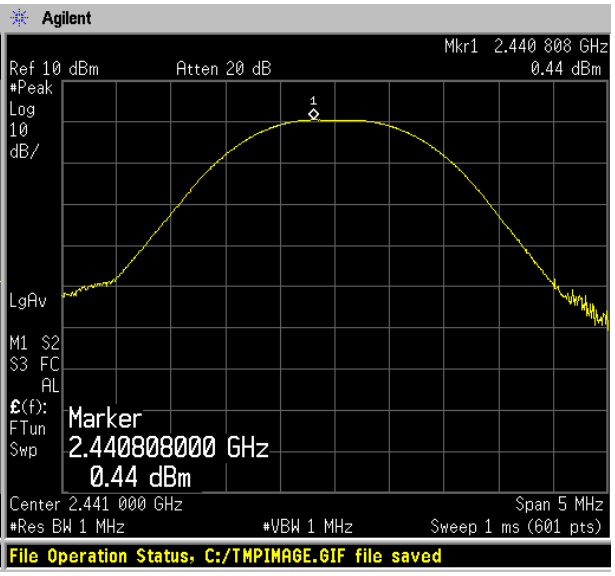
Test Mode	Chan.	Fre. (MHz)	Reading (dBm)	Factor (dB)	Output Peak Power		Limit (dBm)	Verdict
					dBm	W		
GFSK	0	2402	-0.20	6.48	6.28	0.004246	30 (1W)	Pass
	39	2441	0.44	6.49	6.93	0.004931		Pass
	78	2480	-0.22	6.50	6.28	0.004246		Pass
π/4 DQPSK	0	2402	-3.10	6.48	3.38	0.002177		Pass
	39	2441	-1.97	6.49	4.52	0.002831		Pass
	78	2480	-2.36	6.50	4.14	0.002594		Pass
8-DPSK	0	2402	-3.03	6.48	3.45	0.002213		Pass
	39	2441	-1.90	6.49	4.59	0.002877		Pass
	78	2480	-2.23	6.50	4.27	0.002673		Pass

Test Plots

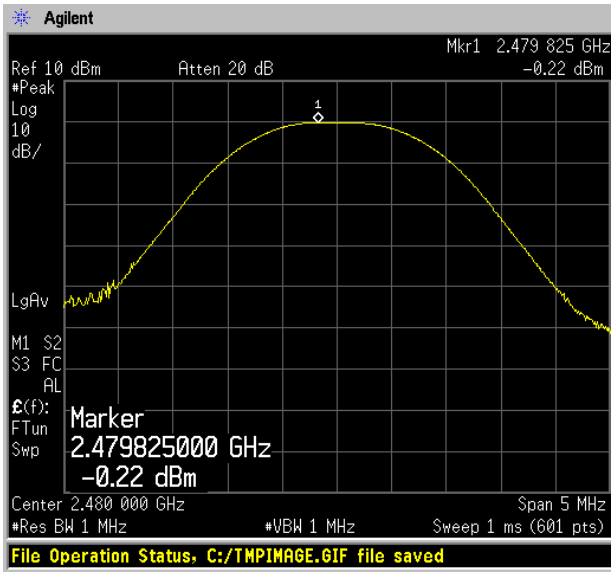
GFSK Mode



Low Channel

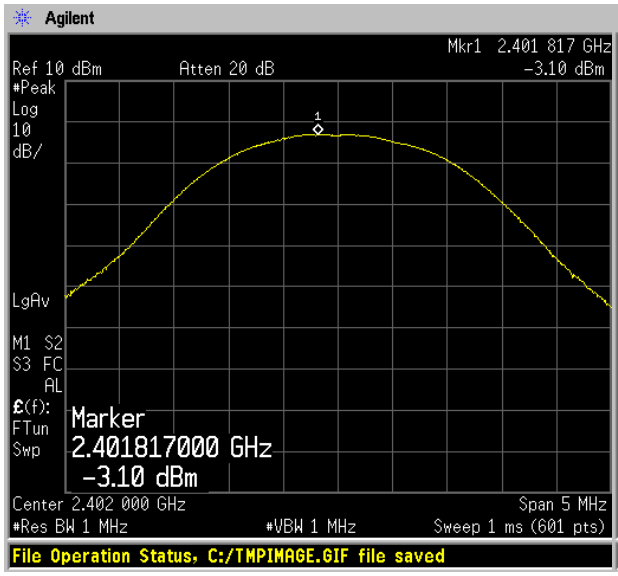


Middle Channel



High Channel

π/4 DQPSK Mode



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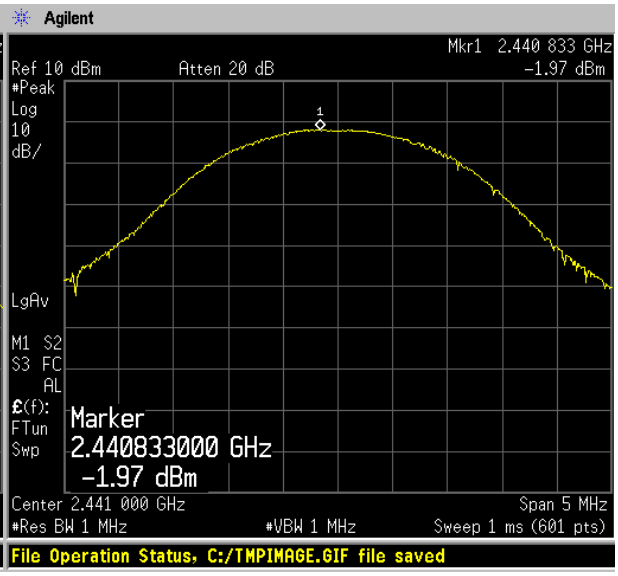
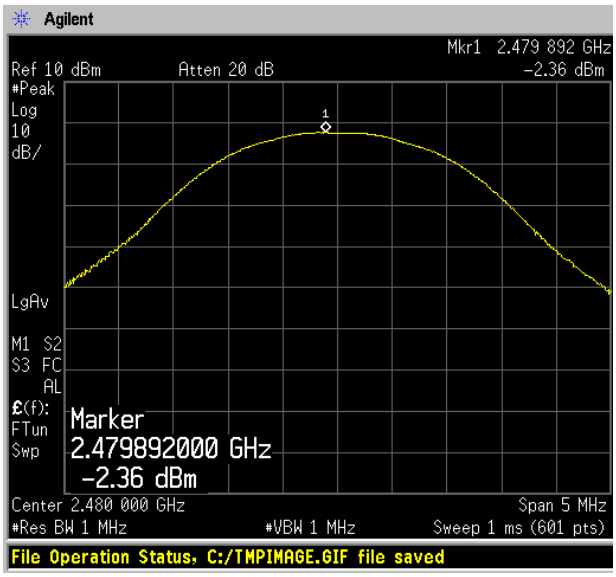
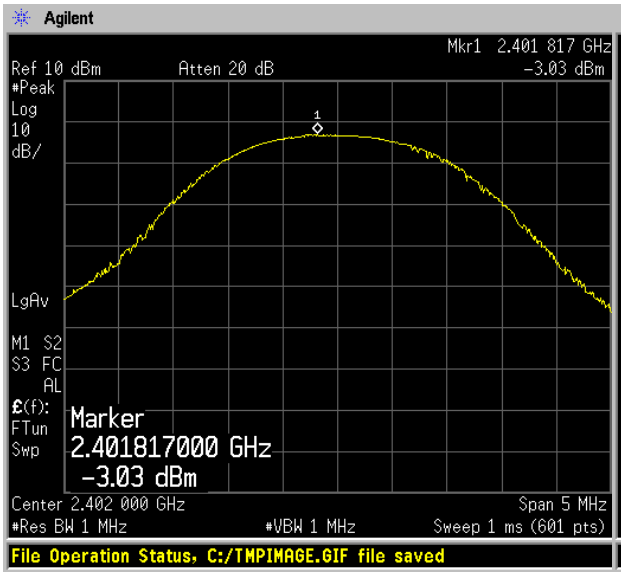


Middle Channel

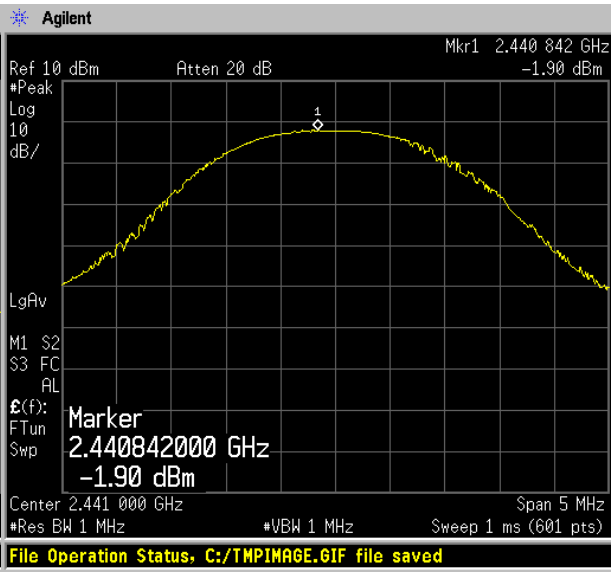


High Channel

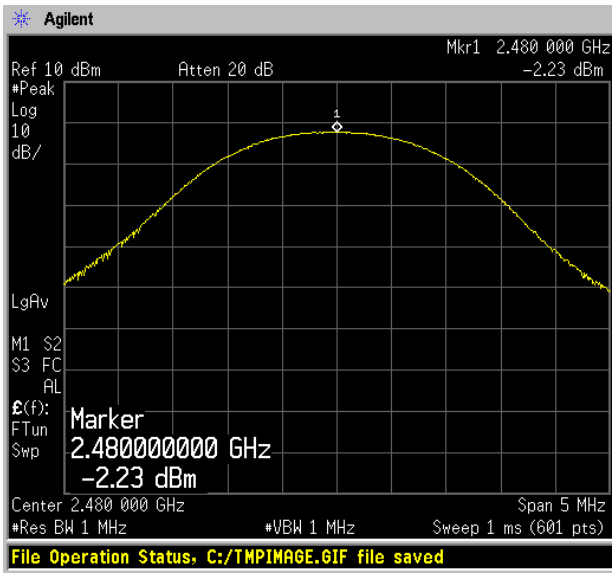
8-DPSK Mode



Low Channel



Middle Channel



High Channel

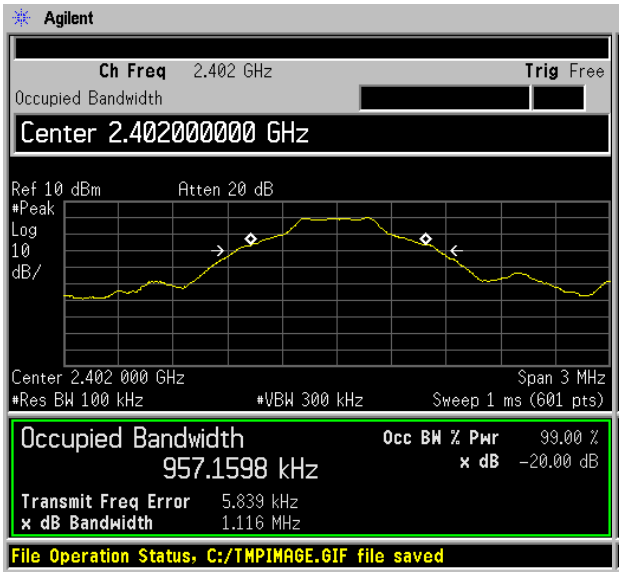
A.3 Occupied Bandwidth

Test Data

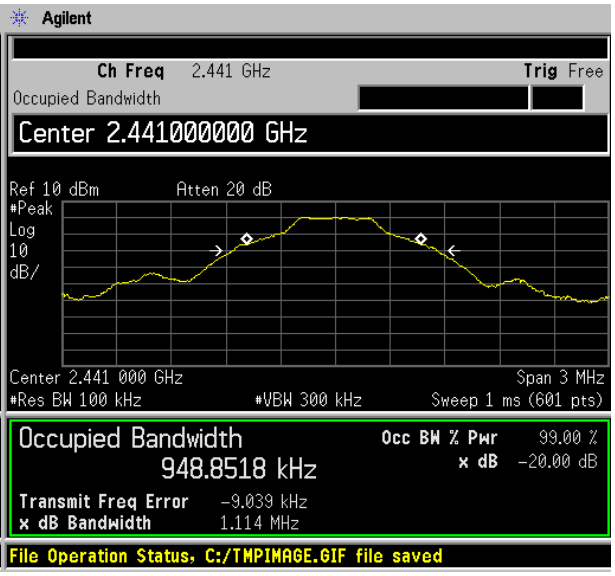
Test Mode	Channel	Frequency (MHz)	99% Bandwidth (MHz)	20 dB Bandwidth (MHz)	Verdict
GFSK	0	2402	0.957	1.116	Pass
	39	2441	0.949	1.114	Pass
	78	2480	0.951	1.118	Pass
π/4 DQPSK	0	2402	1.226	1.374	Pass
	39	2441	1.217	1.377	Pass
	78	2480	1.219	1.381	Pass
8-DPSK	0	2402	1.214	1.379	Pass
	39	2441	1.226	1.390	Pass
	78	2480	1.226	1.378	Pass

Test Plots

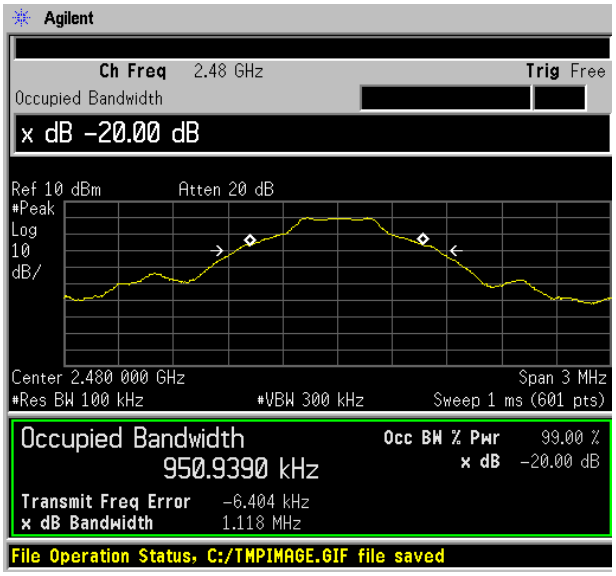
GFSK Mode



Low Channel

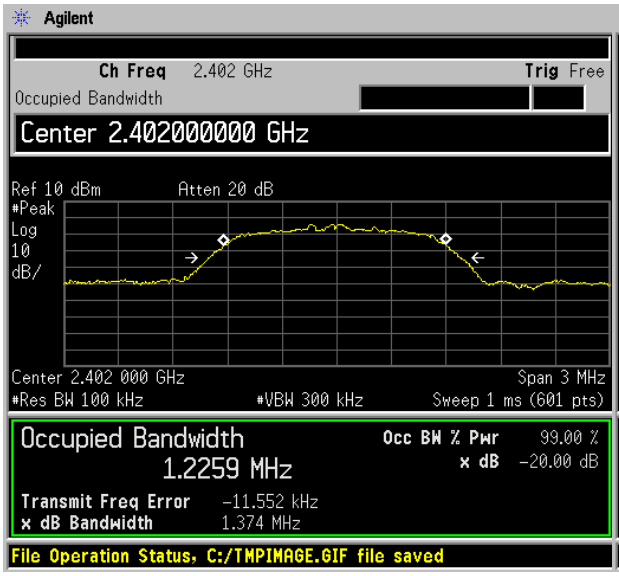


Middle Channel

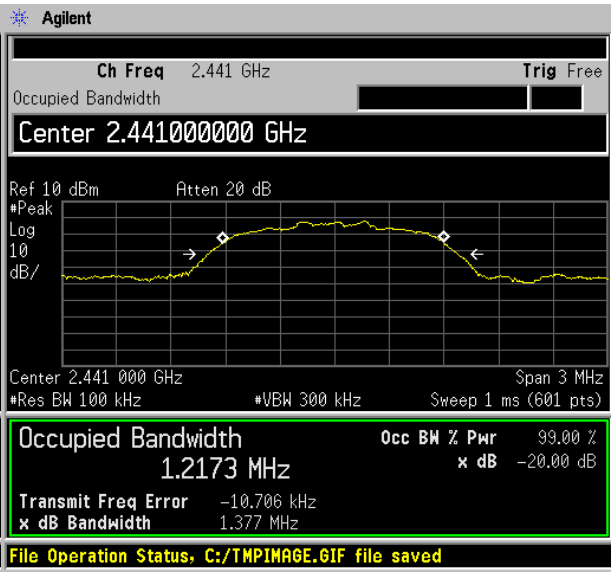


High Channel

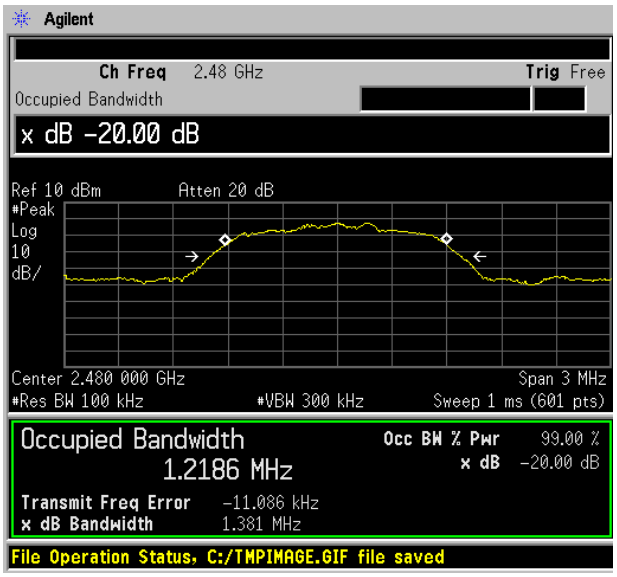
π/4 DQPSK Mode



Low Channel

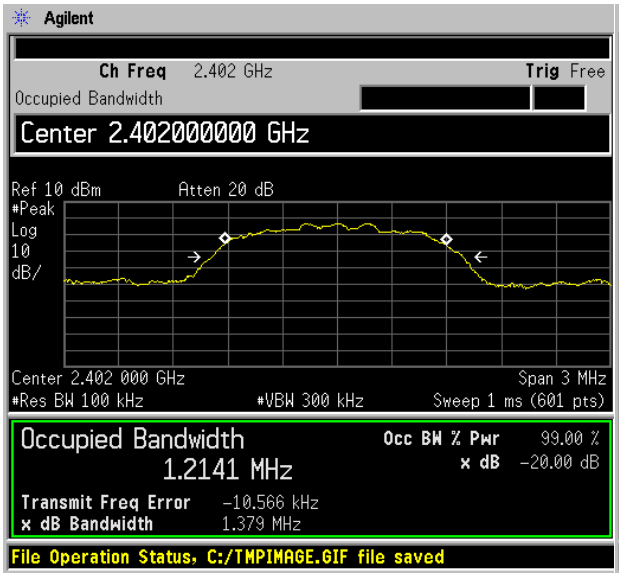


Middle Channel

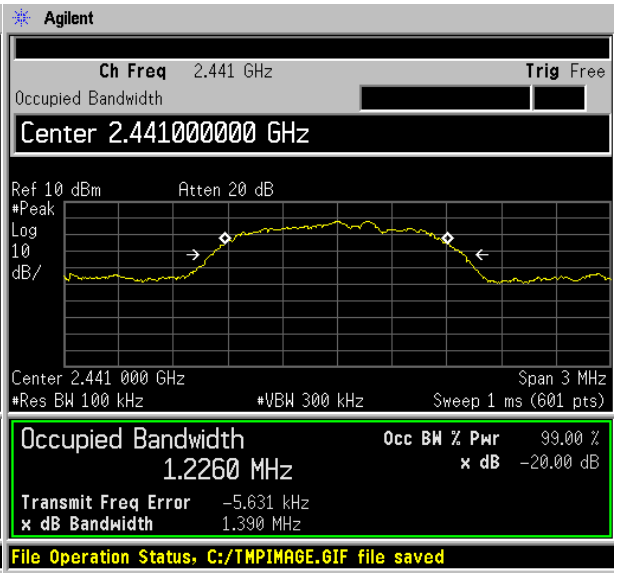


High Channel

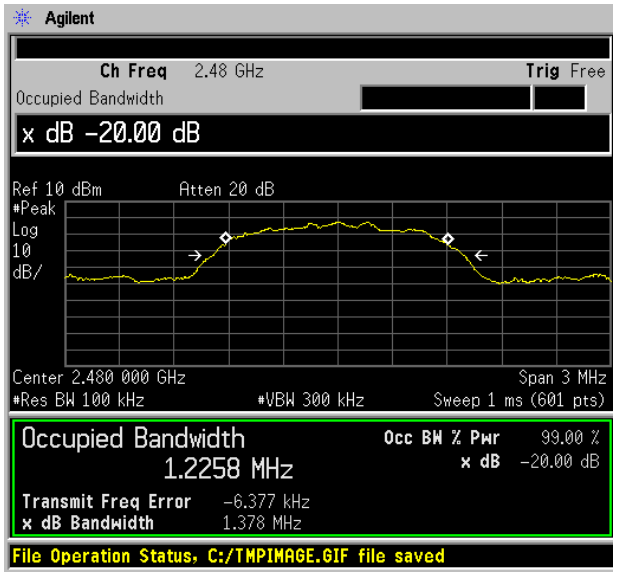
8-DPSK Mode



Low Channel



Middle Channel



High Channel

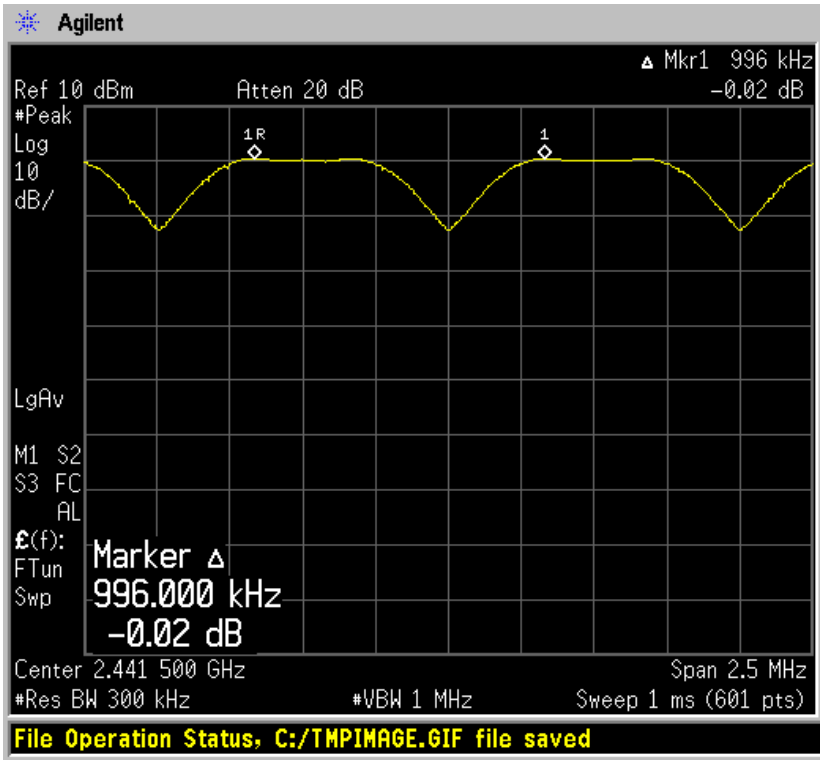
A.4 Carrier Frequency Separation

Test Data

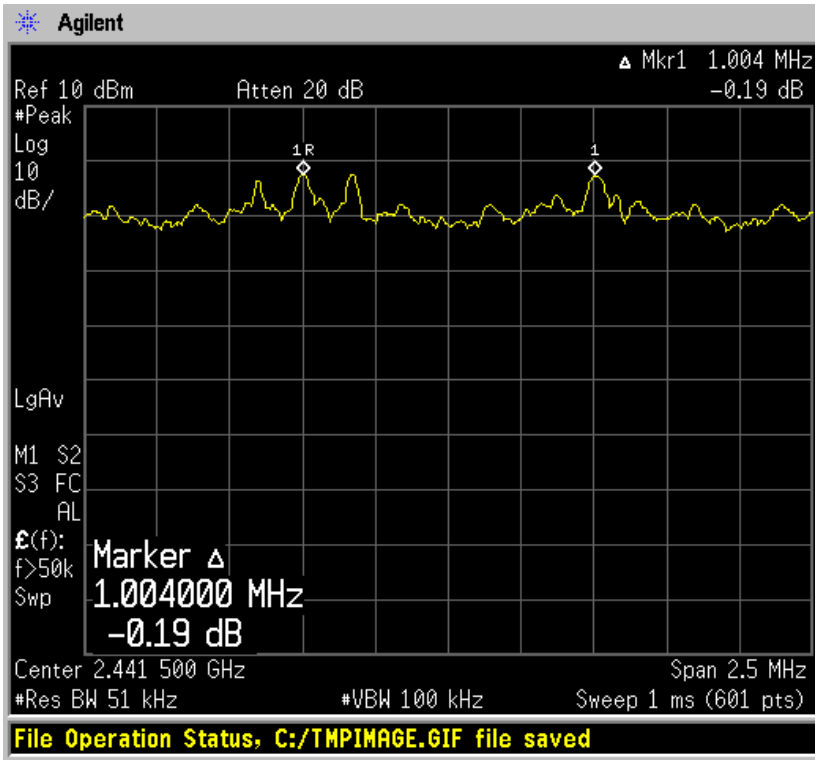
Test Mode	Fre. Separation (MHz)	Limits	Limits (≥two-thirds 20 dB bandwidth)	Verdict
GFSK	0.996	≥25KHz	0.746MHz	Pass
π/4 DQPSK	1.004	≥25KHz	0.923MHz	Pass
8-DPSK	0.983	≥25KHz	0.931MHz	Pass

Test Plots

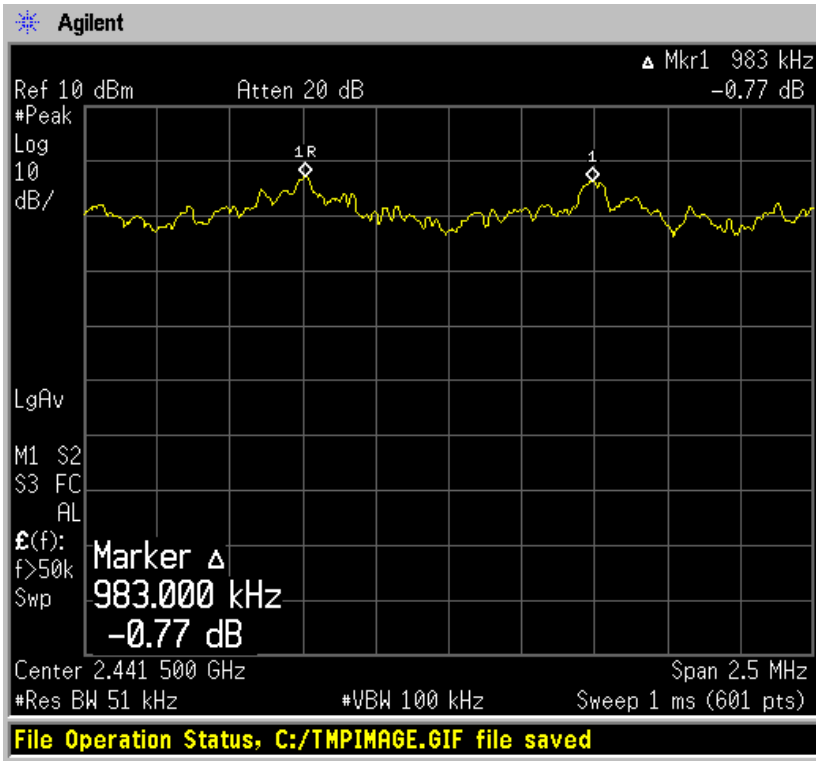
GFSK Mode



π/4 DQPSK Mode



8-DPSK Mode



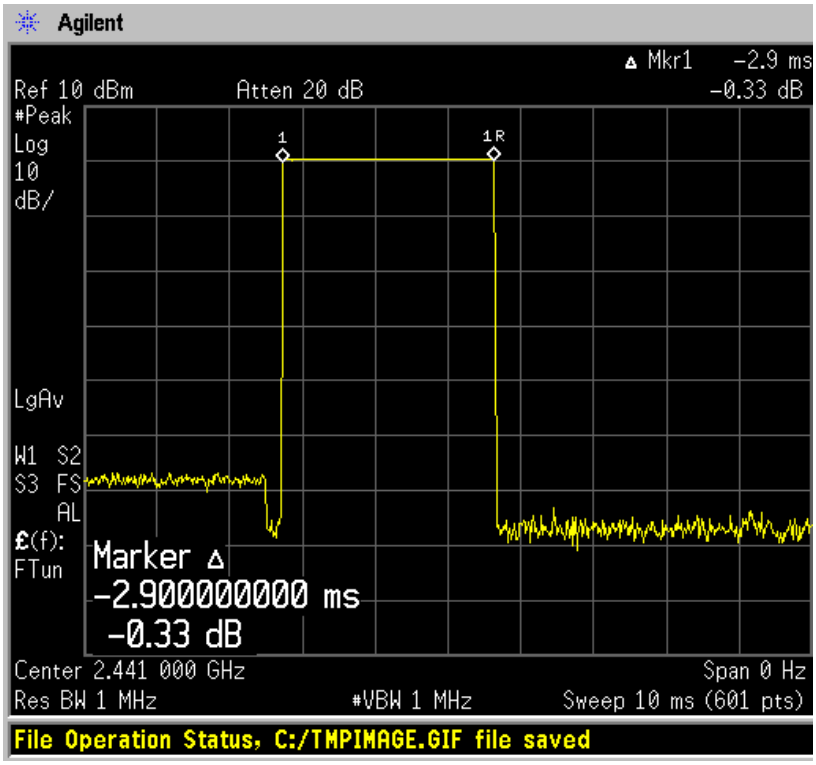
A.5 Time of Occupancy (Dwell time)

Test Data

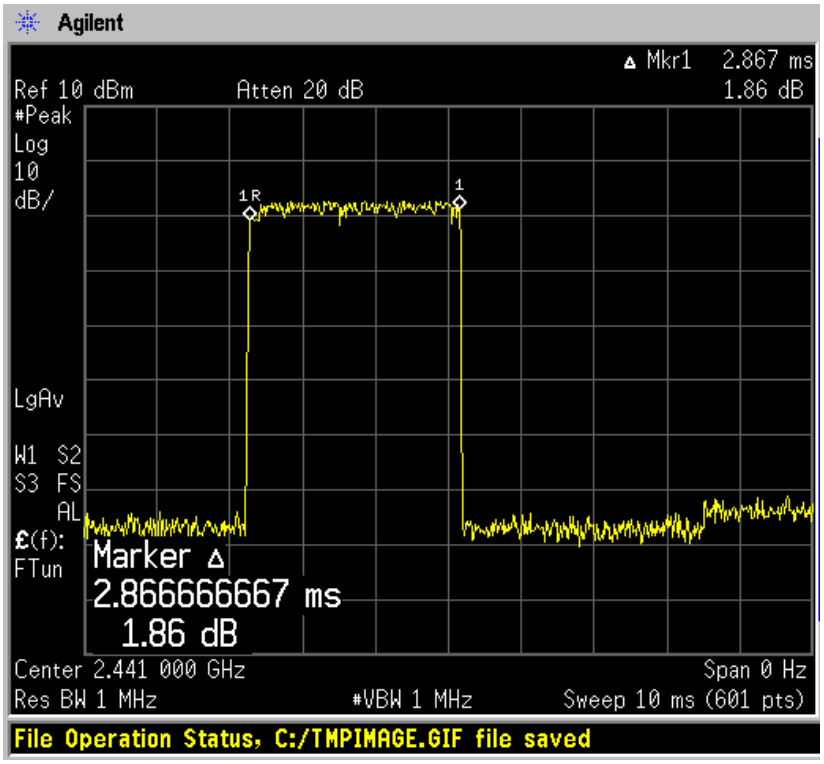
Test Mode	Pulse Time (ms)	Total of Dwell Time (ms)	Limits (ms)	Verdict
GFSK	2.900	309.3	400	Pass
π/4 DQPSK	2.867	305.8	400	Pass
8-DPSK	2.917	311.1	400	Pass

Test Plots

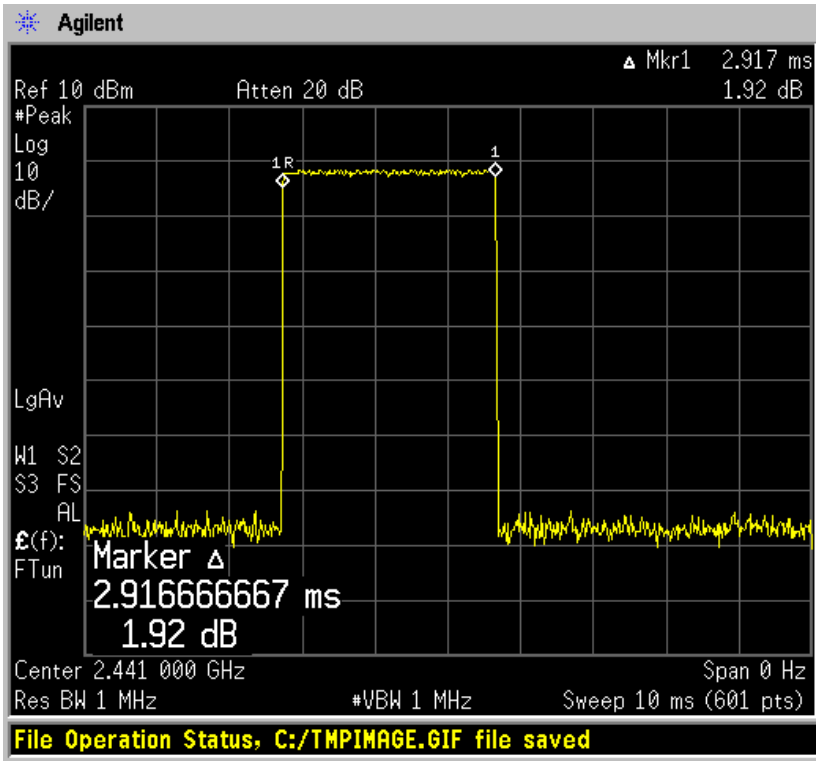
GFSK Mode



π/4 DQPSK Mode



8-DPSK Mode



A.6 Conducted Spurious Emission

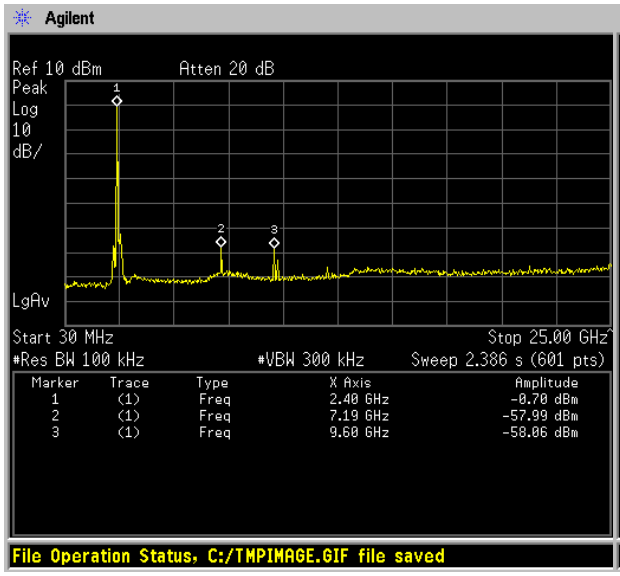
Test Data

GFSK Mode						
No.	Frequency (GHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Verdict
Tx: 2402MHz						
1	2.40	-0.70	6.5	5.8	N/A	Pass
2	7.19	-57.99	7.2	-50.79	-14.2	Pass
3	9.60	-58.06	7.6	-50.46	-14.2	Pass
Tx: 2441MHz						
1	2.44	-0.05	6.5	6.45	N/A	Pass
2	7.31	-50.88	7.2	-43.68	-13.55	Pass
3	9.77	-58.64	7.6	-51.04	-13.55	Pass
4	12.22	-56.05	8.2	-47.85	-13.55	Pass
Tx: 2480MHz						
1	2.49	-0.73	6.5	5.77	N/A	Pass
2	7.44	-52.19	7.2	-44.99	-14.23	Pass
3	9.60	-60.77	7.6	-53.17	-14.23	Pass
4	12.39	-53.79	8.2	-45.59	-14.23	Pass
∏/4-DQPSK Mode						
No.	Frequency (GHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Verdict
Tx: 2402MHz						
1	2.40	-4.48	6.5	2.02	N/A	Pass
2	9.60	-58.11	7.6	-50.51	-17.98	Pass
Tx: 2441MHz						
1	2.44	-3.24	6.5	3.26	N/A	Pass
2	7.31	-57.01	7.2	-49.81	-16.74	Pass
3	9.77	-60.29	7.6	-52.69	-16.74	Pass
4	12.22	-66.09	8.2	-57.89	-16.74	Pass
Tx: 2480MHz						
1	2.49	-3.94	6.5	2.56	N/A	Pass
2	7.44	-57.82	7.2	-50.62	-17.44	Pass
3	9.60	-59.61	7.6	-52.01	-17.44	Pass
4	12.39	-62.62	8.2	-54.42	-17.44	Pass
8-DPSK Mode						
No.	Frequency (GHz)	Reading (dBm)	Factor (dB)	Level (dBm)	Limit (dBm)	Verdict
Tx: 2402MHz						
1	2.40	-7.31	6.5	-0.81	N/A	Pass
2	9.60	-58.19	7.6	-50.59	-20.81	Pass
Tx: 2441MHz						
1	2.44	-4.86	6.5	1.64	N/A	Pass

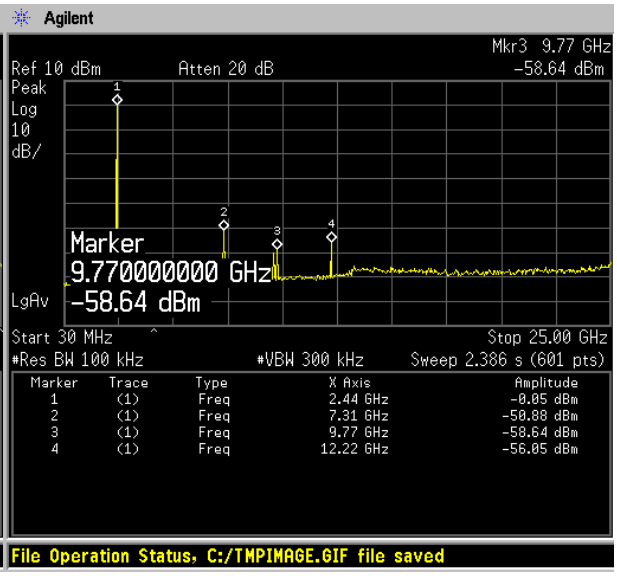
2	7.31	-59.44	7.2	-52.24	-18.36	Pass
3	9.77	-60.16	7.6	-52.56	-18.36	Pass
Tx: 2480MHz						
1	2.49	-7.04	6.5	-0.54	N/A	Pass
2	7.44	-60.15	7.2	-52.95	-20.54	Pass
3	9.60	-60.15	7.6	-52.55	-20.54	Pass
4	12.39	-64.78	8.2	-56.58	-20.54	Pass

Test Plots

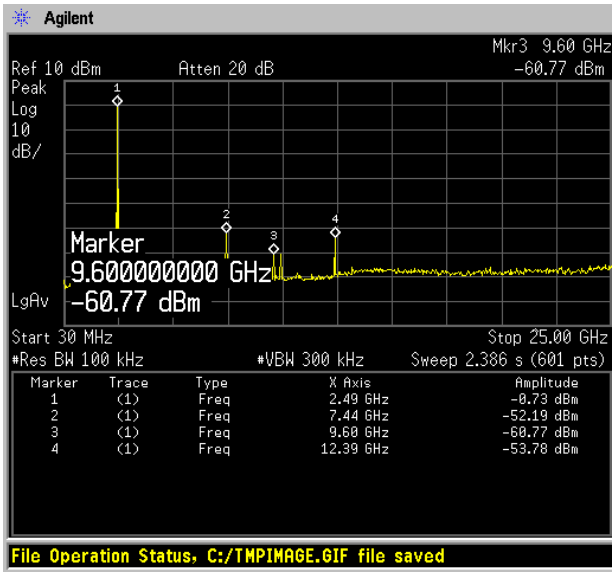
GFSK Mode



Low Channel

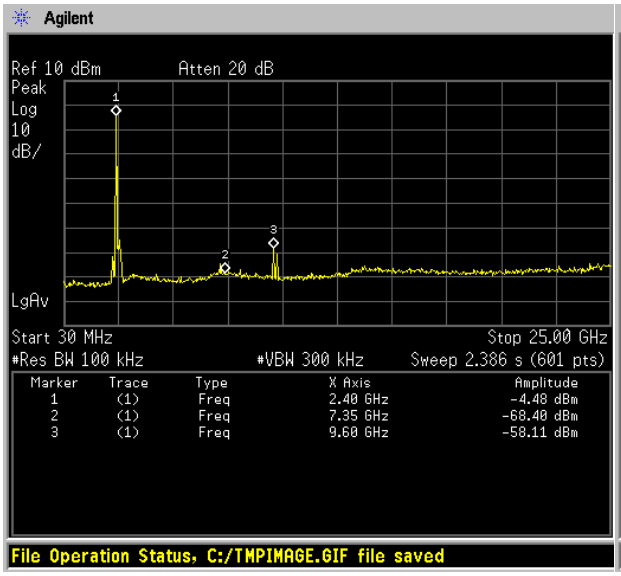


Middle Channel

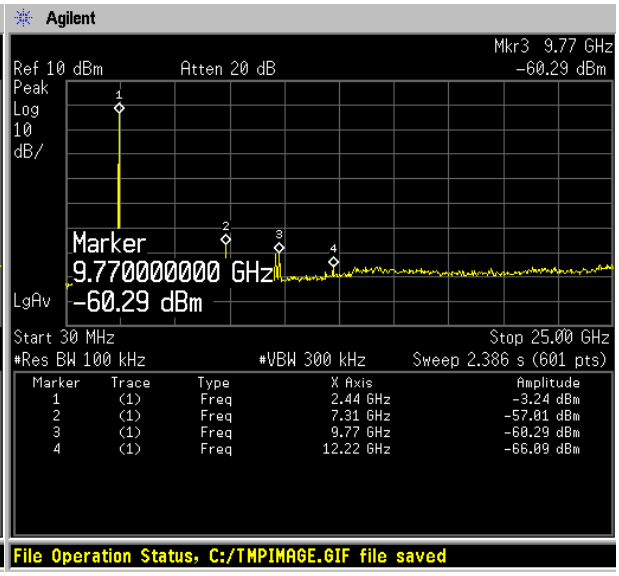


High Channel

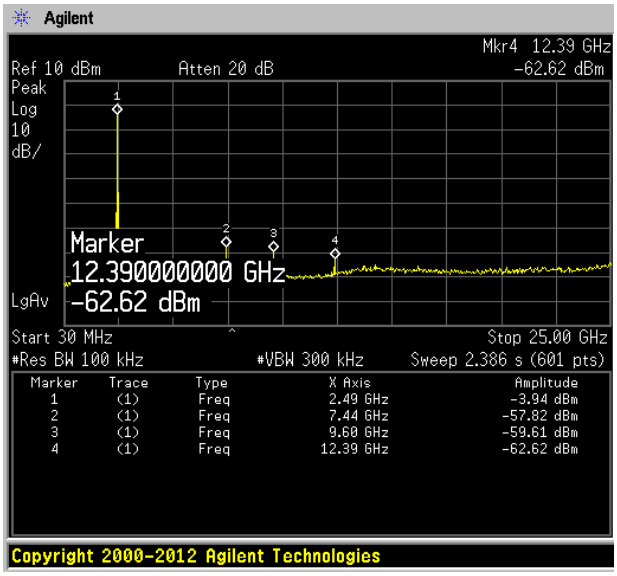
∏/4-DQPSK Mode



Low Channel

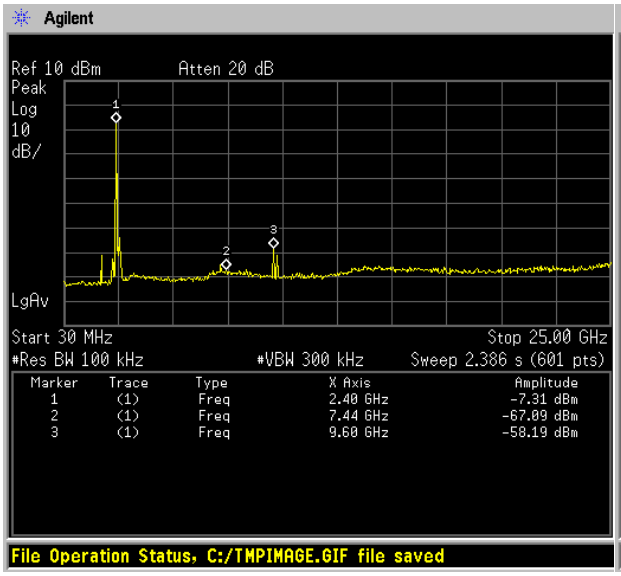


Middle Channel

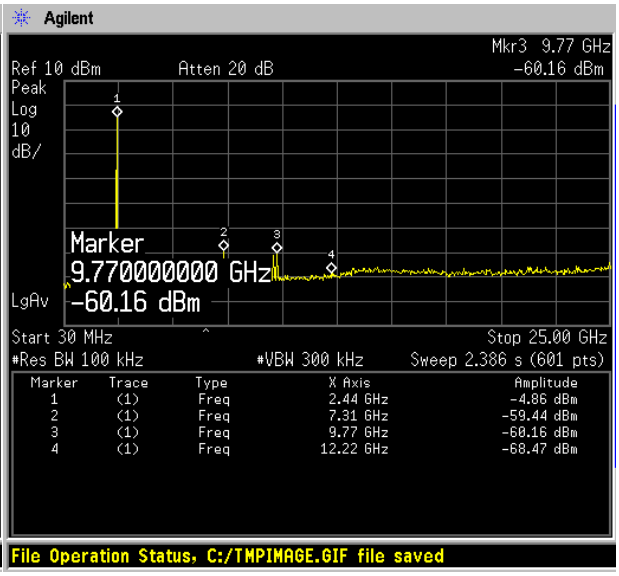


High Channel

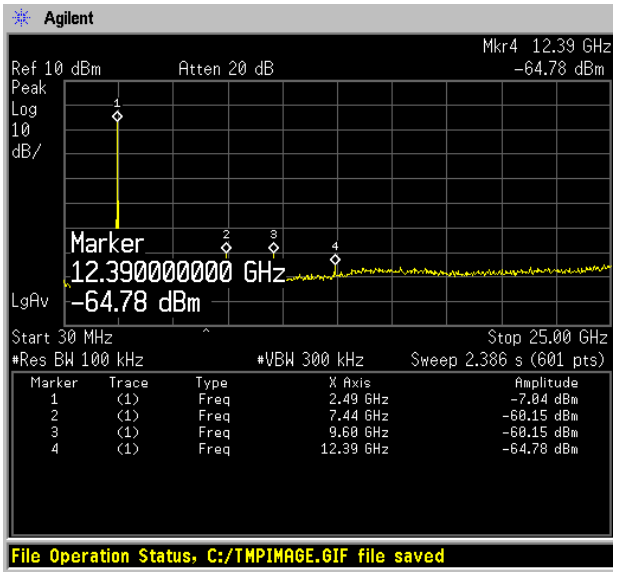
8-DPSK Mode



Low Channel



Middle Channel



High Channel

A.7 Conducted Emission

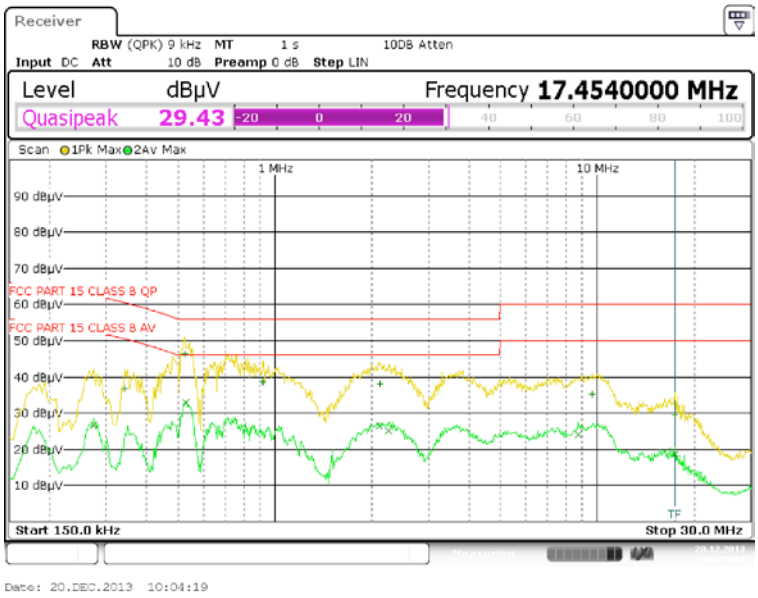
Note: Only the worst test results were recorded in this report.

Test Data

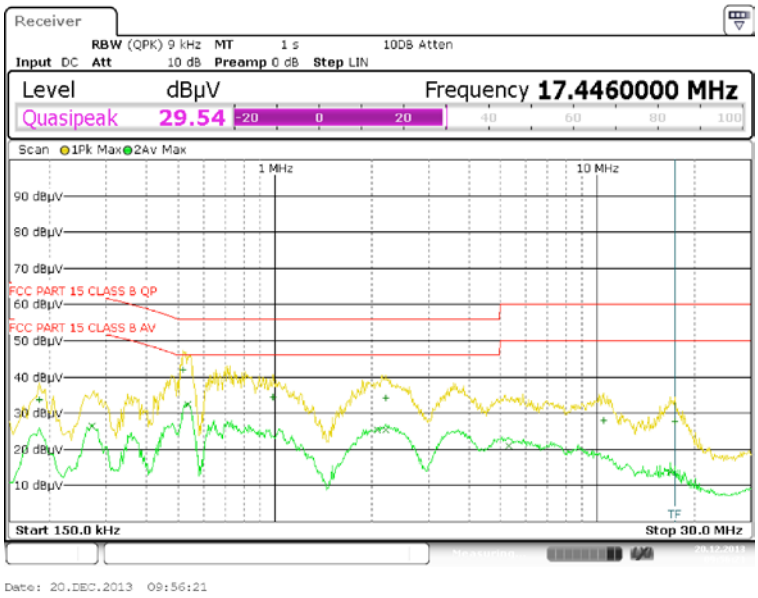
No.	Fre. (MHz)	Measurement Level (dBuV)	Limit (dBuV)	Margin (dB)	Phase	Detector	Verdict
1	0.274	26.78	52.46	-25.68	L	AV	Pass
2	0.342	36.71	60.51	-23.80	L	QP	Pass
3	0.526	46.33	56.00	-9.67	L	QP	Pass
4	0.530	32.92	46.00	-13.05	L	AV	Pass
5	0.918	38.65	56.00	-17.35	L	QP	Pass
6	2.106	26.37	46.00	-19.63	L	AV	Pass
7	2.122	38.16	56.00	-17.84	L	QP	Pass
8	2.254	25.24	46.00	-20.76	L	AV	Pass
9	8.710	24.03	50.00	-25.97	L	AV	Pass
10	9.634	35.17	60.00	-24.83	L	QP	Pass
11	17.446	18.66	50.00	-31.34	L	AV	Pass
12	17.454	29.58	60.00	30.42	L	QP	Pass

No.	Fre. (MHz)	Measurement Level (dBuV)	Limit (dBuV)	Margin (dB)	Phase	Detector	Verdict
1	0.186	33.77	64.97	-31.20	N	QP	Pass
2	0.270	26.38	52.57	-26.19	N	AV	Pass
3	0.518	41.94	56.00	-14.06	N	QP	Pass
4	0.538	32.40	46.00	-13.60	N	AV	Pass
5	0.990	34.53	56.00	-21.47	N	QP	Pass
6	2.086	25.35	46.00	-20.65	N	AV	Pass
7	2.210	34.31	56.00	-21.69	N	QP	Pass
8	2.210	25.31	46.00	-20.68	N	AV	Pass
9	5.322	20.93	50.00	-29.07	N	AV	Pass
10	10.470	27.96	60.00	-32.04	N	QP	Pass
11	16.846	13.84	50.00	-36.16	N	AV	Pass
12	17.446	27.63	60.00	-32.37	N	QP	Pass

Test Plots



(Phase: L)



(Phase:N)

A.8 Radiated Spurious Emissions

Note: No spurious emissions were detected below 30MHz, so only spurious emissions above 30MHz were recorded in the following test data and plots.

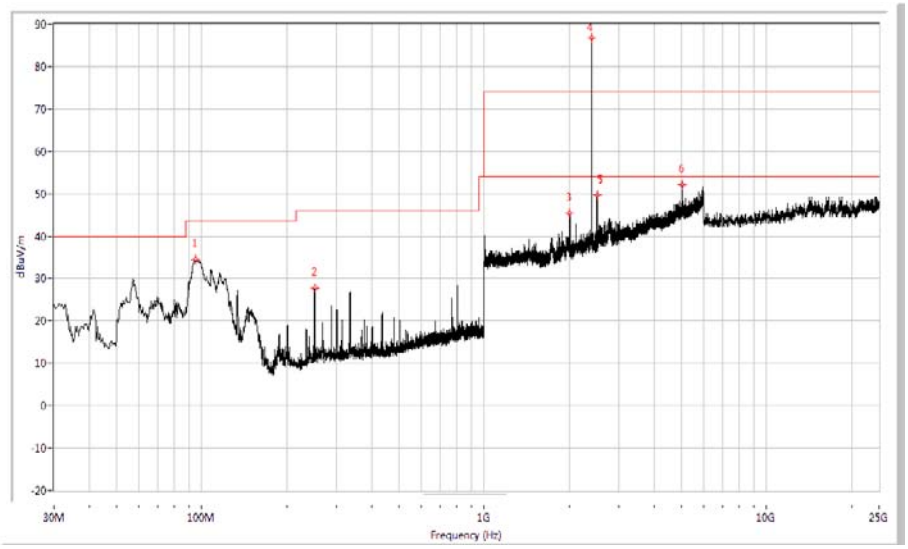
Test Data

Fre. (MHz)	Pk (dBuV)	QP (dBuV)	AV (dBuV)	Limit-PK (dBuV)	Limit-QP (dBuV)	Limit-AV (dBuV)	Antenna	Verdict
GFSK Mode-Low Channel								
95.216	34.45	--	--	--	43.5	--	Vertical	Pass
251.590	27.74	--	--	--	46.0	--	Vertical	Pass
2008.748	45.30	--	--	74.0	--	54.0	Vertical	Pass
2402.149	86.80	--	--	74.0	N/A	N/A	Vertical	N/A
2514.121	49.70	--	--	74.0	--	54.0	Vertical	Pass
5024.494	52.01	--	--	74.0	--	54.0	Vertical	Pass
89.883	29.61	--	--	--	43.5	--	Horizontal	PASS
251.590	35.77	--	--	--	46.0	--	Horizontal	PASS
1004.999	50.47	--	--	74.0	--	54.0	Horizontal	PASS
2402.149	84.46	--	--	74.0	N/A	N/A	Horizontal	N/A
2508.123	52.17	--	--	74.0	--	54.0	Horizontal	PASS
5032.742	51.30	--	--	74.0	--	54.0	Horizontal	PASS
GFSK Mode-Mid Channel								
133.764	31.47	--	--	--	43.5	--	Vertical	PASS
251.347	30.73	--	--	--	46.0	--	Vertical	PASS
2008.248	44.09	--	--	74.0	--	54.0	Vertical	PASS
2440.640	86.79	--	--	74.0	N/A	N/A	Vertical	N/A
2510.122	49.19	--	--	74.0	--	54.0	Vertical	PASS
5022.244	50.69	--	--	74.0	--	54.0	Vertical	PASS
250.620	35.89	--	--	--	46.0	--	Horizontal	PASS
1007.998	43.68	--	--	74.0	--	54.0	Horizontal	PASS
2010.747	48.75	--	--	74.0	--	54.0	Horizontal	PASS
2440.640	83.69	--	--	74.0	N/A	N/A	Horizontal	N/A
2509.623	52.53	--	--	74.0	--	54.0	Horizontal	PASS
5016.996	50.53	--	--	74.0	--	54.0	Horizontal	PASS
GFSK Mode-High Channel								
107.581	33.95	--	--	--	43.5	--	Vertical	PASS
251.590	30.54	--	--	--	46.0	--	Vertical	PASS
1005.499	46.52	--	--	74.0	--	54.0	Vertical	PASS
2008.248	47.04	--	--	74.0	--	54.0	Vertical	N/A
2479.630	84.82	--	--	74.0	N/A	N/A	Vertical	PASS
5025.244	50.60	--	--	74.0	--	54.0	Vertical	PASS
88.428	28.59	--	--	--	43.5	--	Horizontal	PASS
251.590	36.08	--	--	--	46.0	--	Horizontal	PASS
1676.331	47.13	--	--	74.0	--	54.0	Horizontal	PASS
2011.247	47.00	--	--	74.0	--	54.0	Horizontal	N/A
2479.630	82.93	--	--	74.0	N/A	N/A	Horizontal	PASS
5915.271	50.73	--	--	74.0	--	54.0	Horizontal	PASS

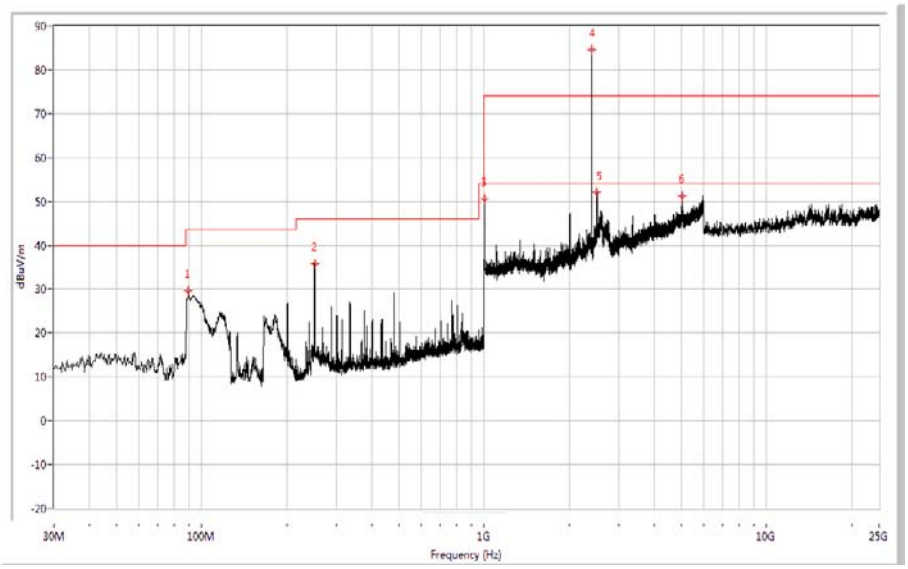
re. (MHz)	Pk (dBuV)	QP (dBuV)	AV (dBuV)	Limit-PK (dBuV)	Limit-QP (dBuV)	Limit-AV (dBuV)	Antenna	Verdict
π/4 DQPSK Mode-Low Channel								
94.489	35.04	--	--	--	43.5	--	Vertical	PASS
334.746	30.23	--	--	--	46.0	--	Vertical	PASS
2009.248	45.96	--	--	74.0	--	54.0	Vertical	PASS
2401.650	85.85	--	--	74.0	N/A	N/A	Vertical	N/A
2512.622	49.14	--	--	74.0	--	54.0	Vertical	PASS
5027.493	52.15	--	--	74.0	--	54.0	Vertical	PASS
89.155	27.90	--	--	--	43.5	--	Horizontal	PASS
251.347	36.41	--	--	--	46.0	--	Horizontal	PASS
2009.748	47.10	--	--	74.0	--	54.0	Horizontal	PASS
2401.650	84.72	--	--	74.0	N/A	N/A	Horizontal	N/A
2510.622	52.38	--	--	74.0	--	54.0	Horizontal	PASS
5016.246	51.49	--	--	74.0	--	54.0	Horizontal	PASS
π/4 DQPSK Mode-Mid Channel								
251.347	29.50	--	--	--	46.0	--	Vertical	PASS
1005.999	47.47	--	--	74.0	--	54.0	Vertical	PASS
2008.248	46.37	--	--	74.0	--	54.0	Vertical	PASS
2440.640	83.29	--	--	74.0	N/A	N/A	Vertical	N/A
2508.623	50.26	--	--	74.0	--	54.0	Vertical	PASS
5030.492	52.14	--	--	74.0	--	54.0	Vertical	PASS
250.862	36.24	--	--	--	46.0	--	Horizontal	PASS
1004.499	46.25	--	--	74.0	--	54.0	Horizontal	PASS
1673.832	46.96	--	--	74.0	--	54.0	Horizontal	PASS
2440.640	81.90	--	--	74.0	N/A	N/A	Horizontal	N/A
2515.621	52.21	--	--	74.0	--	54.0	Horizontal	PASS
5975.256	51.39	--	--	74.0	--	54.0	Horizontal	PASS
π/4 DQPSK Mode-High Channel								
111.702	35.49	--	--	--	43.5	--	Vertical	PASS
334.261	30.60	--	--	--	46.0	--	Vertical	PASS
2013.247	47.47	--	--	74.0	--	54.0	Vertical	PASS
2480.130	81.25	--	--	74.0	N/A	N/A	Vertical	N/A
5020.745	51.66	--	--	74.0	--	54.0	Vertical	PASS
14440.000	49.20	--	--	74.0	--	54.0	Vertical	PASS
250.620	36.13	--	--	--	46.0	--	Horizontal	PASS
1002.999	42.95	--	--	74.0	--	54.0	Horizontal	PASS
2013.247	46.87	--	--	74.0	--	54.0	Horizontal	PASS
2481.130	84.85	--	--	74.0	--	54.0	Horizontal	N/A
5022.244	51.29	--	--	74.0	--	54.0	Horizontal	PASS
5951.262	50.55	--	--	74.0	--	54.0	Horizontal	PASS

Fre. (MHz)	Pk (dBuV)	QP (dBuV)	AV (dBuV)	Limit-PK (dBuV)	Limit-QP (dBuV)	Limit-AV (dBuV)	Antenna	Verdict
8-DPSK Mode-Low Channel								
107.823	33.92	--	--	--	43.5	--	Vertical	PASS
251.105	27.74	--	--	--	46.0	--	Vertical	PASS
2010.747	46.20	--	--	74.0	--	54.0	Vertical	PASS
2402.149	86.74	--	--	74.0	N/A	N/A	Vertical	N/A
2511.122	48.87	--	--	74.0	--	54.0	Vertical	PASS
5026.743	50.07	--	--	74.0	--	54.0	Vertical	PASS
250.862	35.90	--	--	--	46.0	--	Horizontal	PASS
1005.999	43.17	--	--	74.0	--	54.0	Horizontal	PASS
2012.747	48.75	--	--	74.0	--	54.0	Horizontal	PASS
2401.650	85.09	--	--	74.0	N/A	N/A	Horizontal	N/A
2513.122	52.86	--	--	74.0	--	54.0	Horizontal	PASS
5033.492	52.20	--	--	74.0	--	54.0	Horizontal	PASS
8-DPSK Mode-Mid Channel								
106.368	34.89	--	--	--	43.5	--	Vertical	PASS
251.590	28.79	--	--	--	46.0	--	Vertical	PASS
2010.747	45.97	--	--	74.0	--	54.0	Vertical	PASS
2440.640	84.08	--	--	74.0	N/A	N/A	Vertical	N/A
2511.122	49.50	--	--	74.0	--	54.0	Vertical	PASS
5025.994	51.24	--	--	74.0	--	54.0	Vertical	PASS
89.883	28.13	--	--	--	43.5	--	Horizontal	PASS
251.590	35.92	--	--	--	46.0	--	Horizontal	PASS
1004.999	51.90	--	--	74.0	--	54.0	Horizontal	PASS
2441.140	81.31	--	--	74.0	N/A	N/A	Horizontal	N/A
2516.621	52.59	--	--	74.0	--	54.0	Horizontal	PASS
5940.765	50.76	--	--	74.0	--	54.0	Horizontal	PASS
8-DPSK Mode-High Channel								
109.278	32.83	--	--	--	43.5	--	Vertical	PASS
334.261	30.32	--	--	--	46.0	--	Vertical	PASS
2007.248	46.12	--	--	74.0	--	54.0	Vertical	PASS
2480.130	80.85	--	--	74.0	N/A	N/A	Vertical	N/A
5976.006	50.24	--	--	74.0	--	54.0	Vertical	PASS
14440.000	49.20	--	--	74.0	--	54.0	Vertical	PASS
250.620	36.13	--	--	--	46.0	--	Horizontal	PASS
1002.999	42.95	--	--	74.0	--	54.0	Horizontal	PASS
2013.247	46.87	--	--	74.0	--	54.0	Horizontal	PASS
2480.130	80.26	--	--	74.0	N/A	N/A	Horizontal	N/A
3351.662	47.13	--	--	74.0	--	54.0	Horizontal	PASS
5022.244	51.29	--	--	74.0	--	54.0	Horizontal	PASS

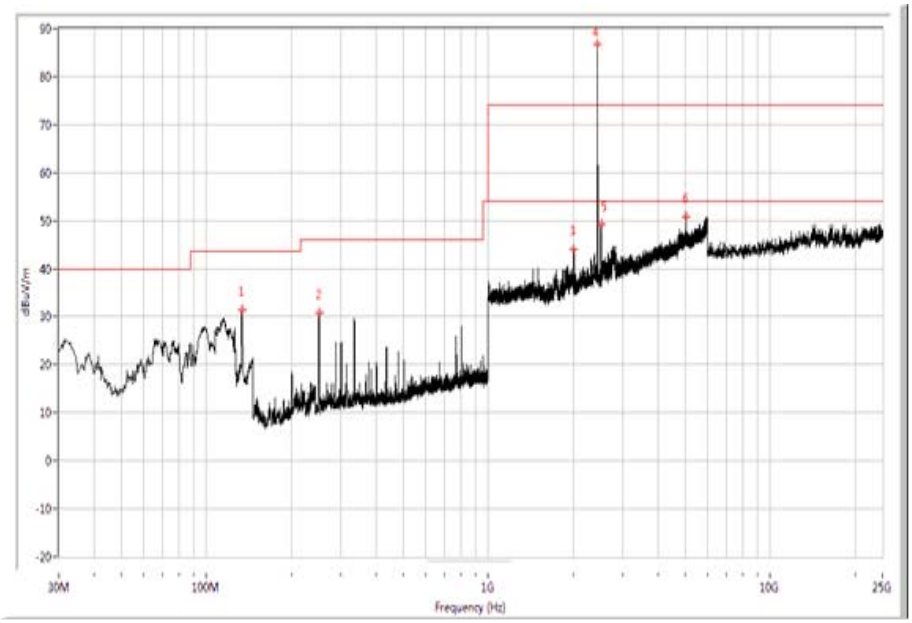
Test Plot



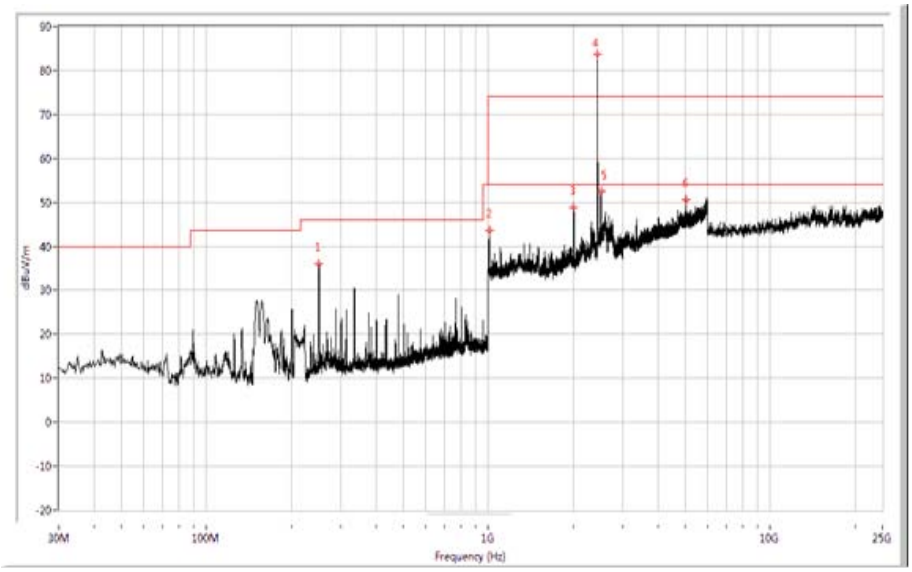
Plot A_GFSK Mode, Low Channel, ANT V



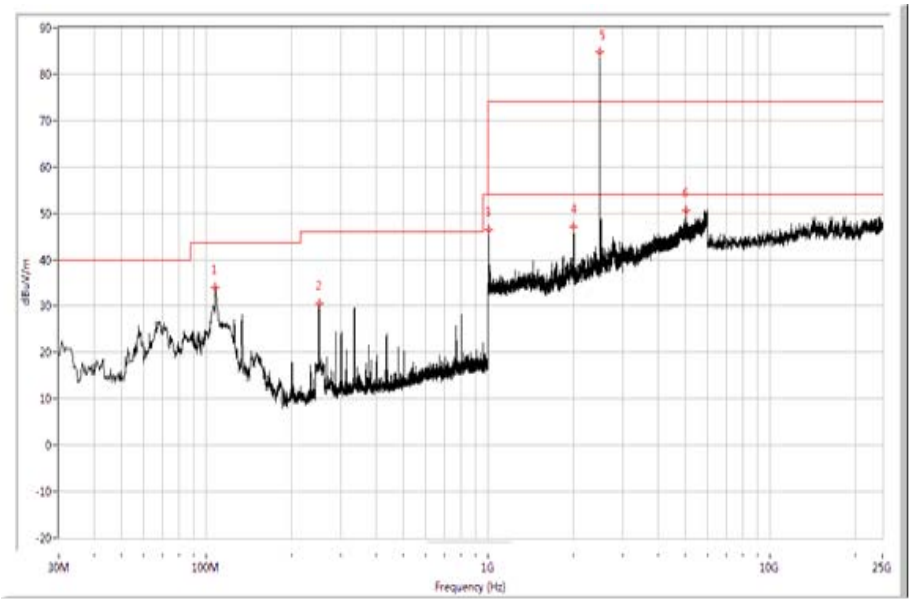
Plot B_GFSK Mode, Low Channel, ANT H



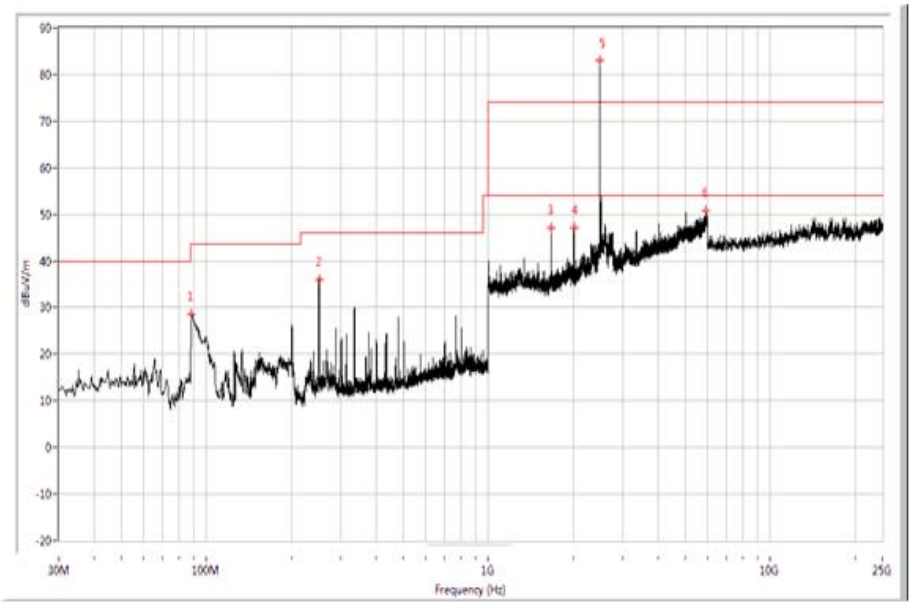
Plot C_GFSK Mode, Mid Channel, ANT V



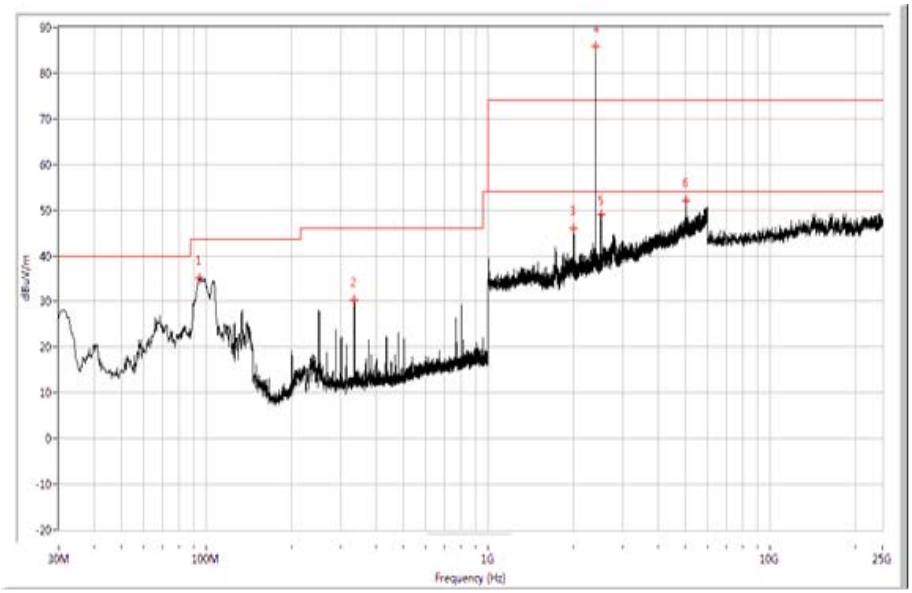
Plot D_GFSK Mode, Mid Channel, ANT H



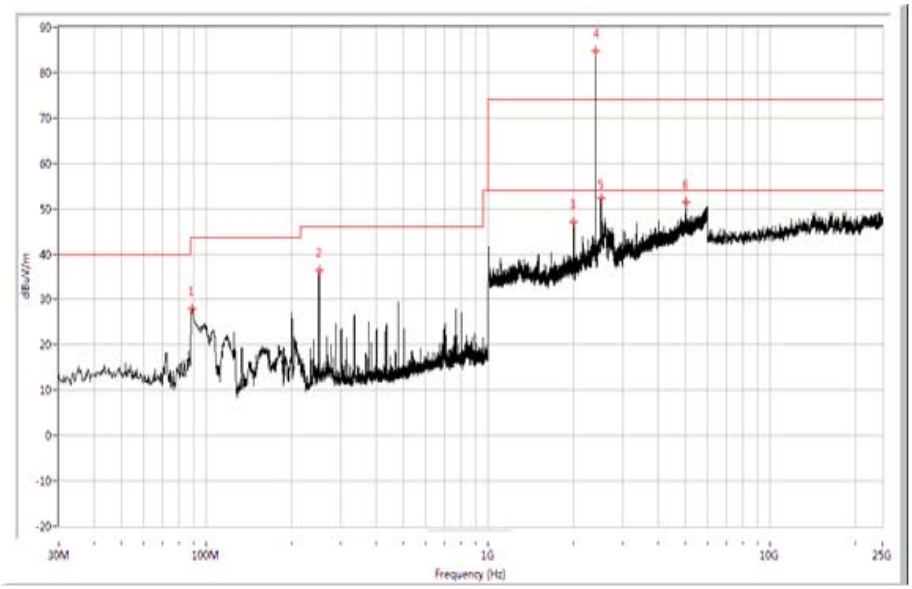
Plot E_GFSK Mode, High Channel, ANT V



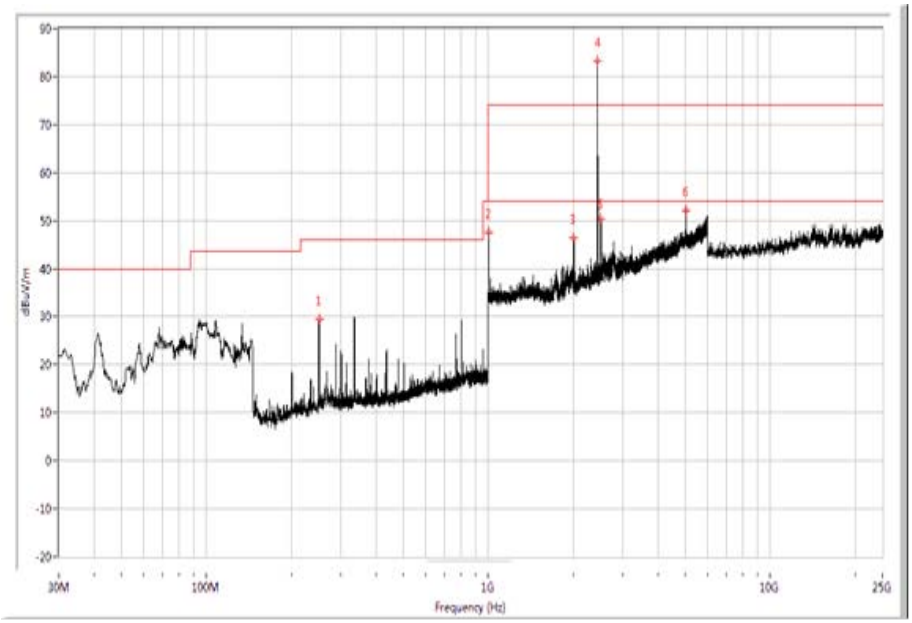
Plot F_GFSK Mode, High Channel, ANT H



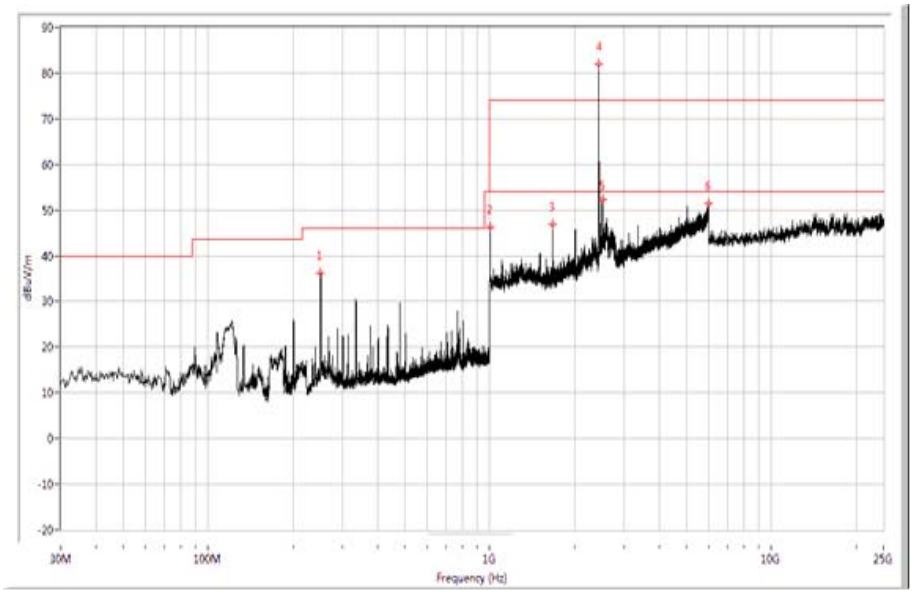
Plot G_π/4 DQPSK Mode, Low Channel, ANT H



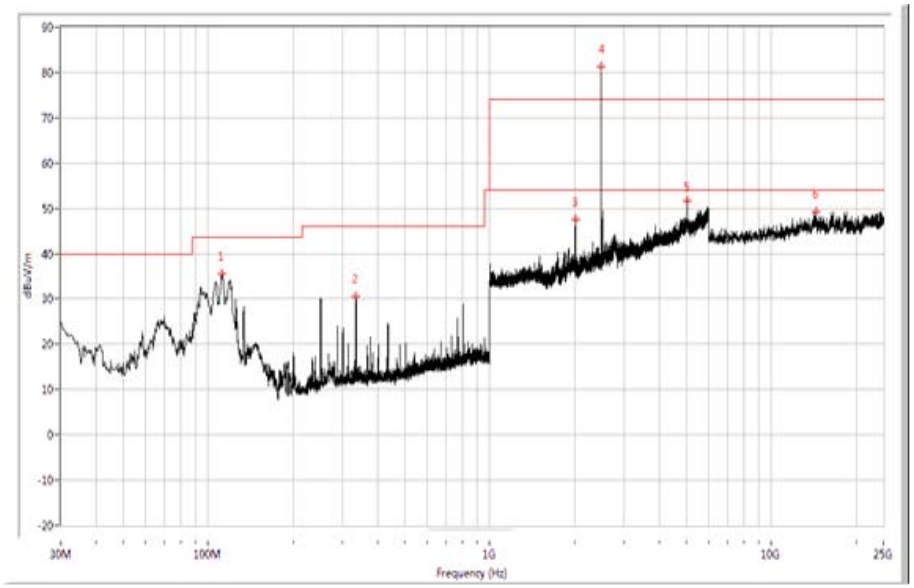
Plot H_π/4 DQPSK Mode, Low Channel, ANT H



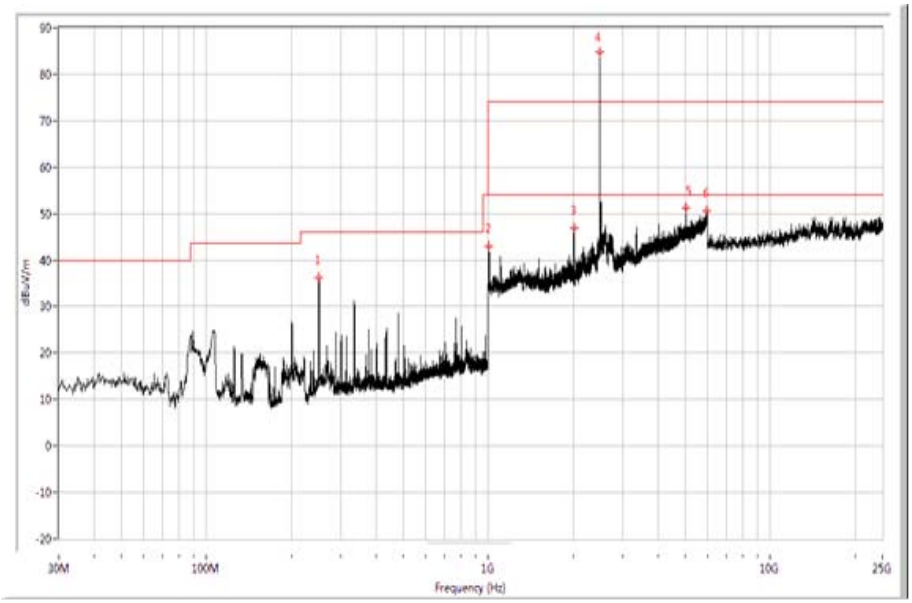
Plot I_π/4 DQPSK Mode, Mid Channel, ANT V



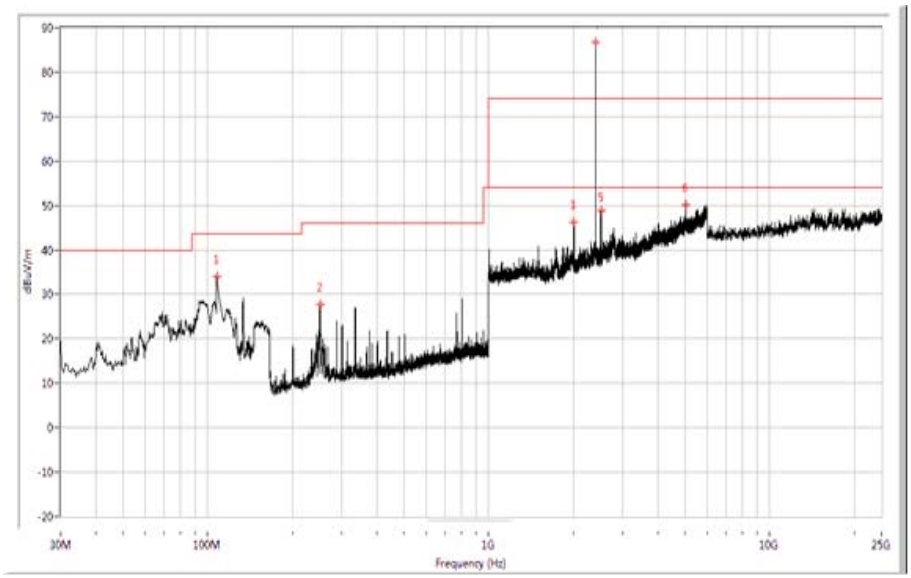
Plot J_π/4 DQPSK Mode, Mid Channel, ANT H



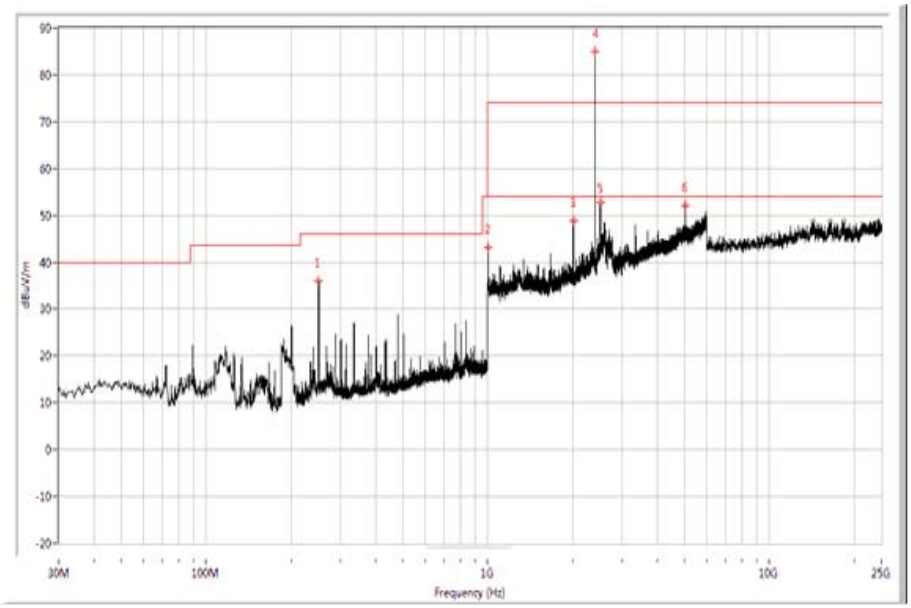
Plot K_π/4 DQPSK Mode, High Channel, ANT H



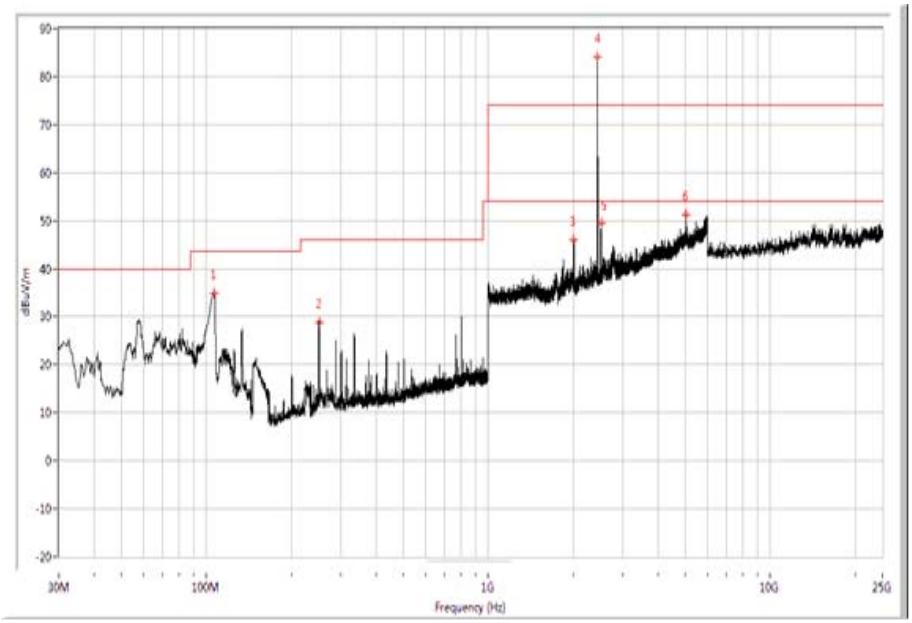
Plot L_π/4 DQPSK Mode, High Channel, ANT V



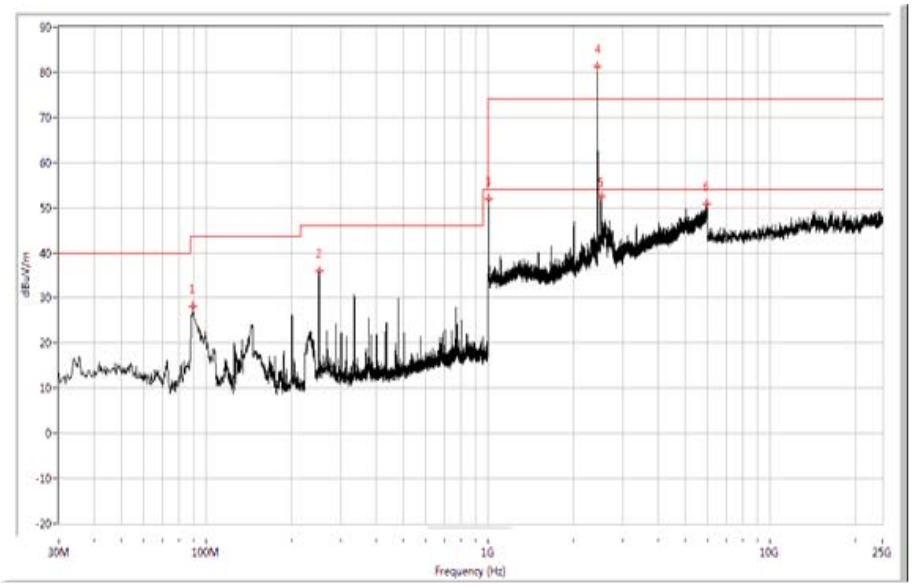
Plot M_8-DPSK Mode, Low Channel, ANT H



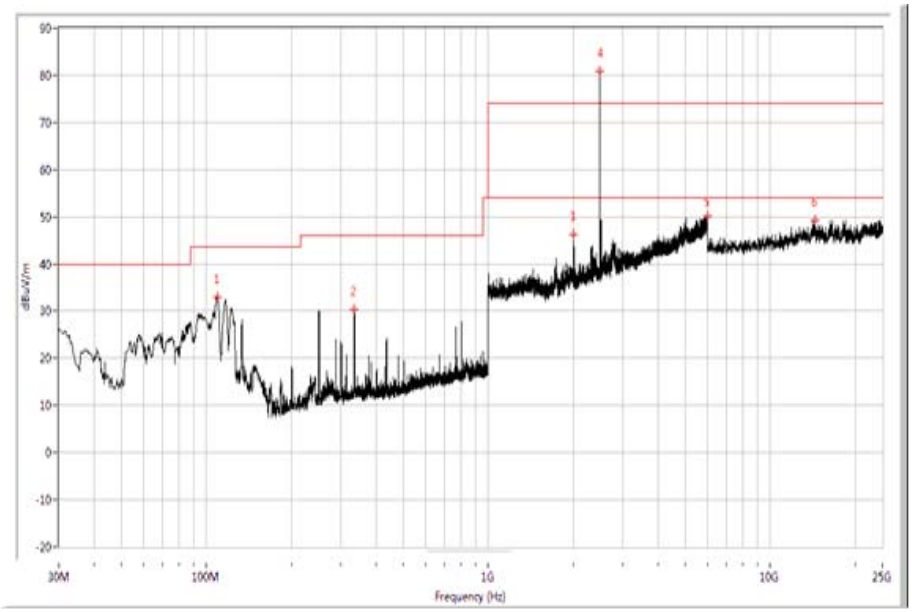
Plot N_8-DPSK Mode, Low Channel, ANT H



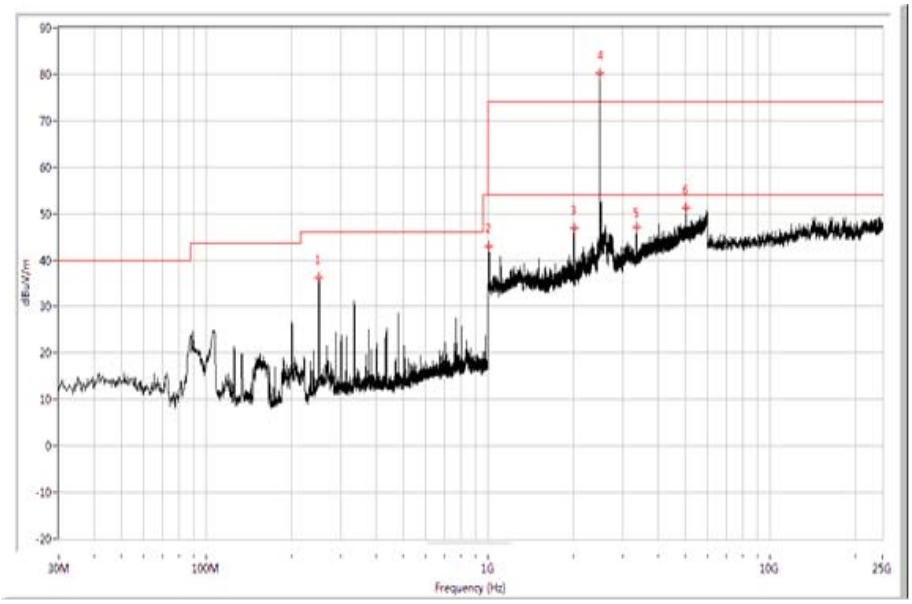
Plot O_8-DPSK Mode, Mid Channel, ANT V



Plot P_8-DPSK Mode, Mid Channel, ANT H



Plot Q_8-DPSK Mode, High Channel, ANT H



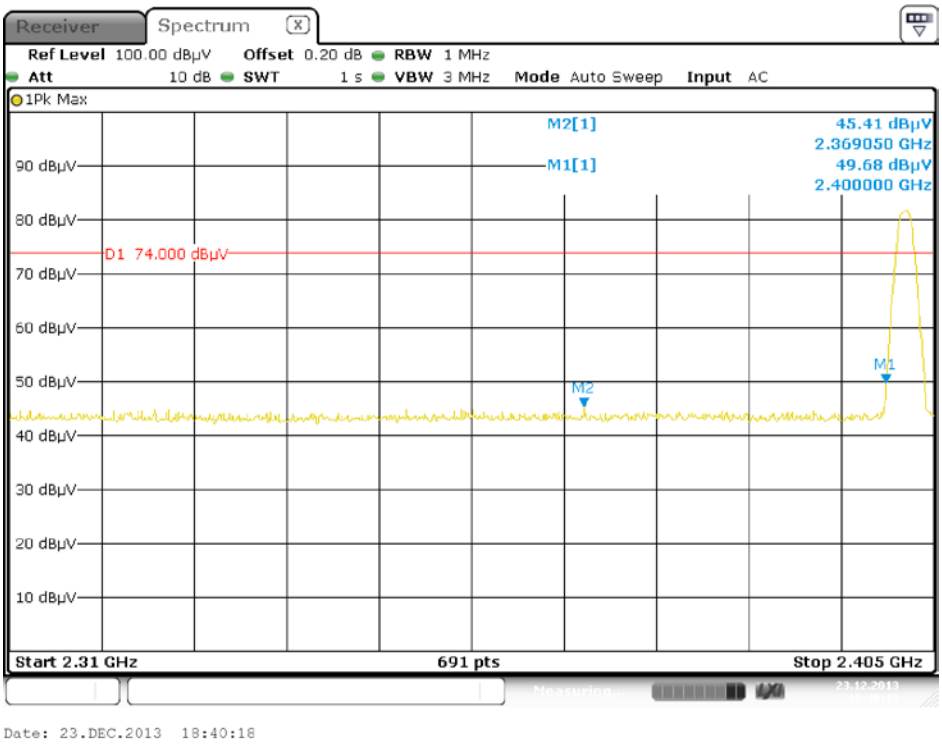
Plot R_8-DPSK Mode, High Channel, ANT V

A.9 Band Edge

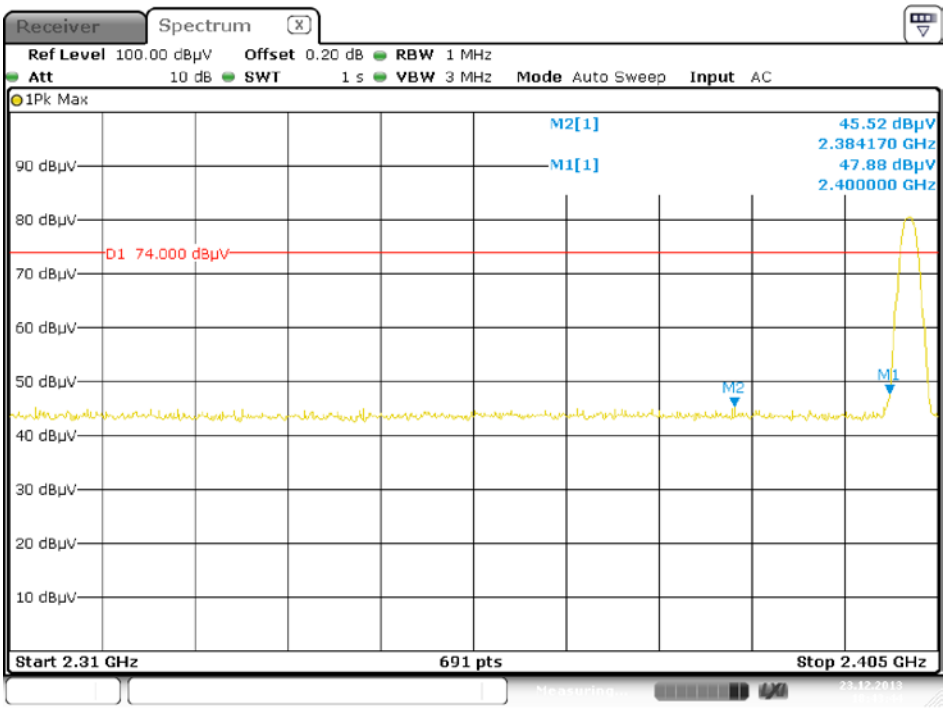
Test Data

The lowest and highest channels are tested to verify the band edge emissions. Please refer to the following the plots for emissions values.

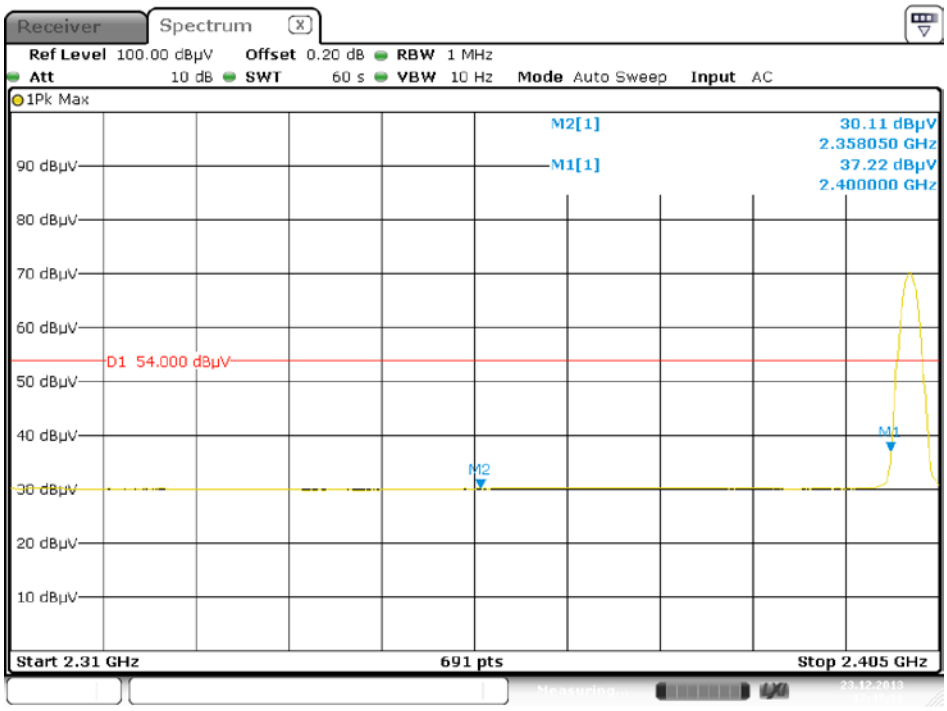
Test Plots



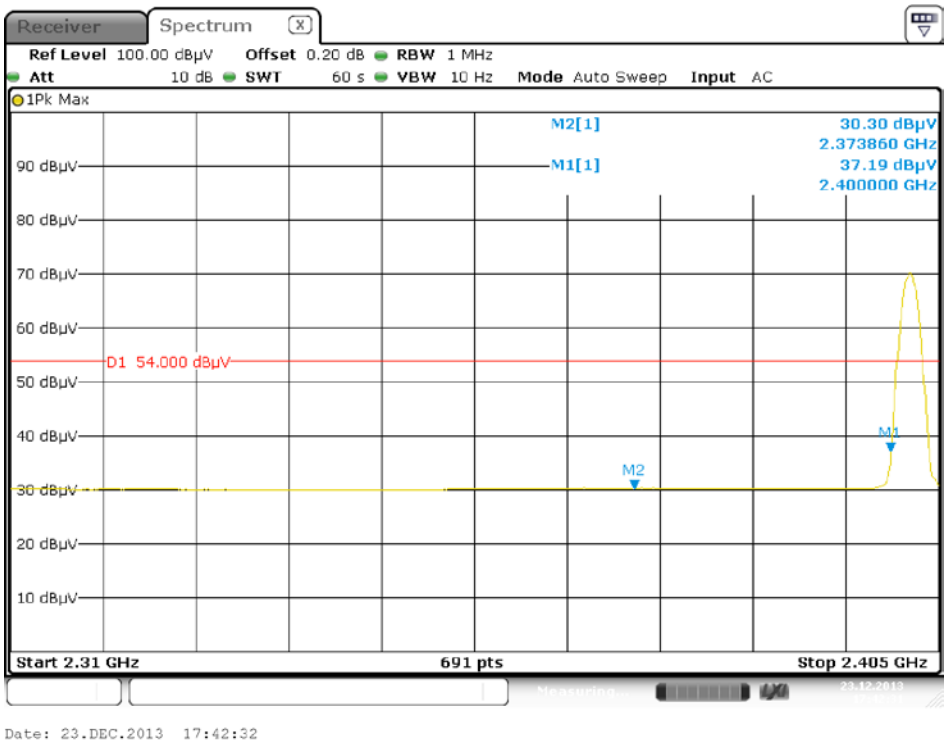
(GFSK CH Low, Vertical, Peak)



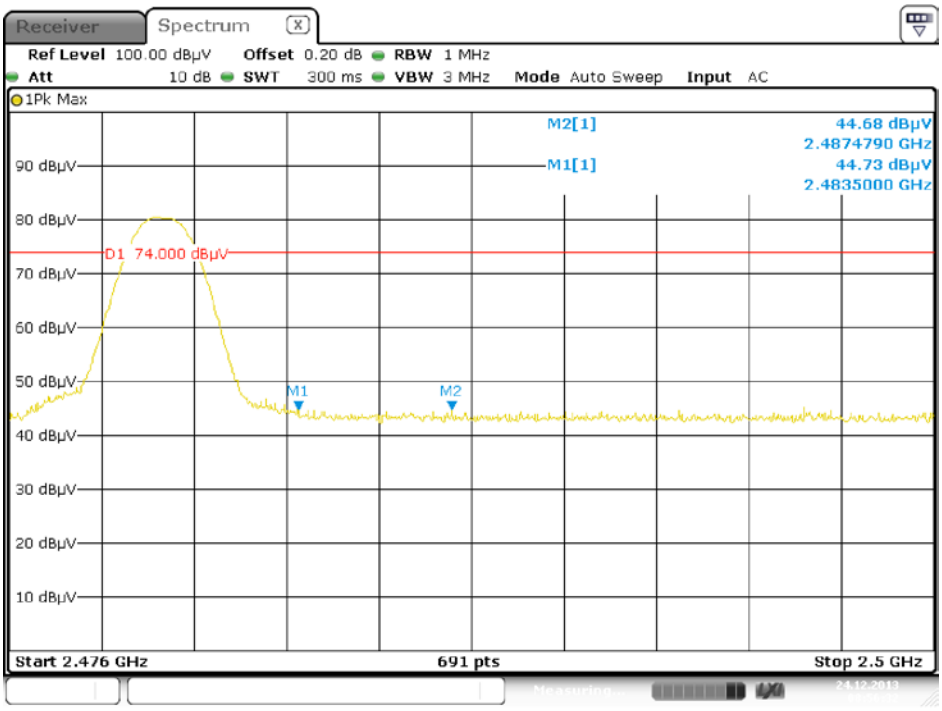
(GFSK CH Low, Horizontal, Peak)



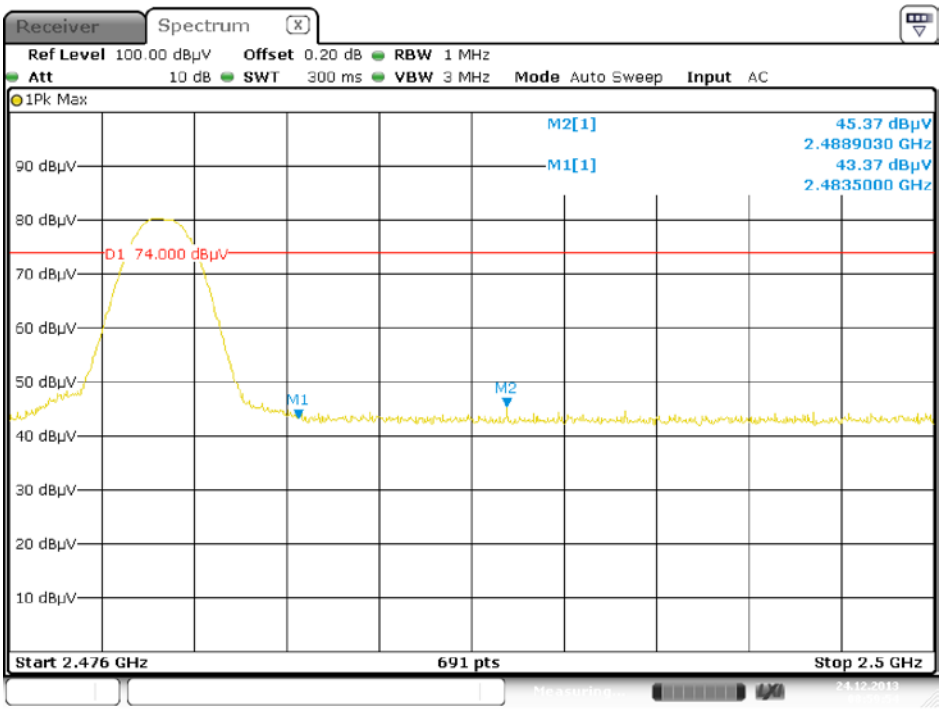
(GFSK CH Low, Vertical, Average)



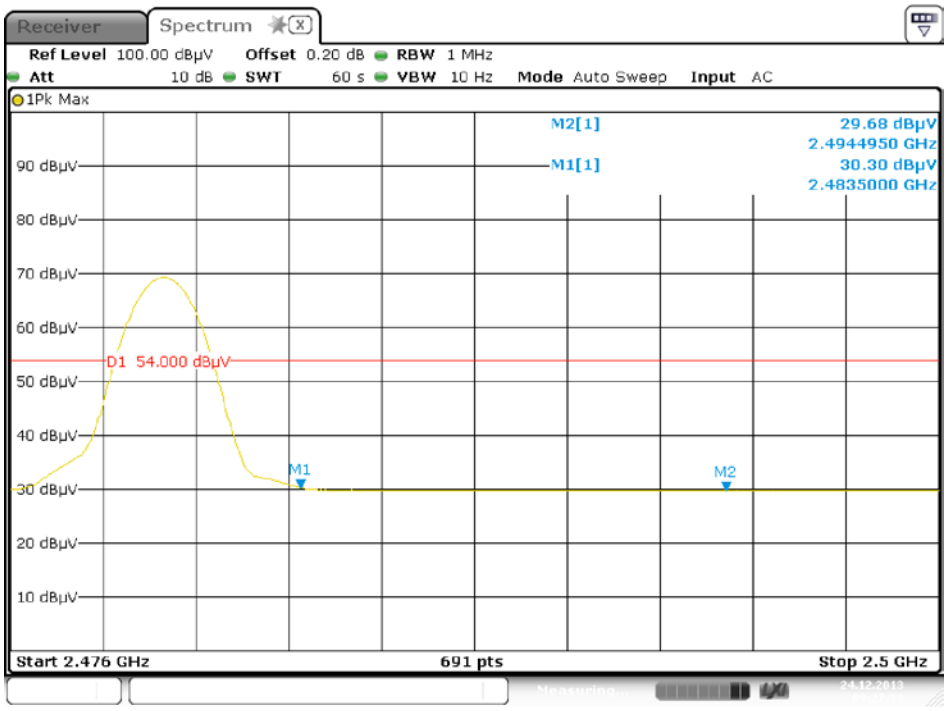
(GFSK CH Low, Horizontal, Average)



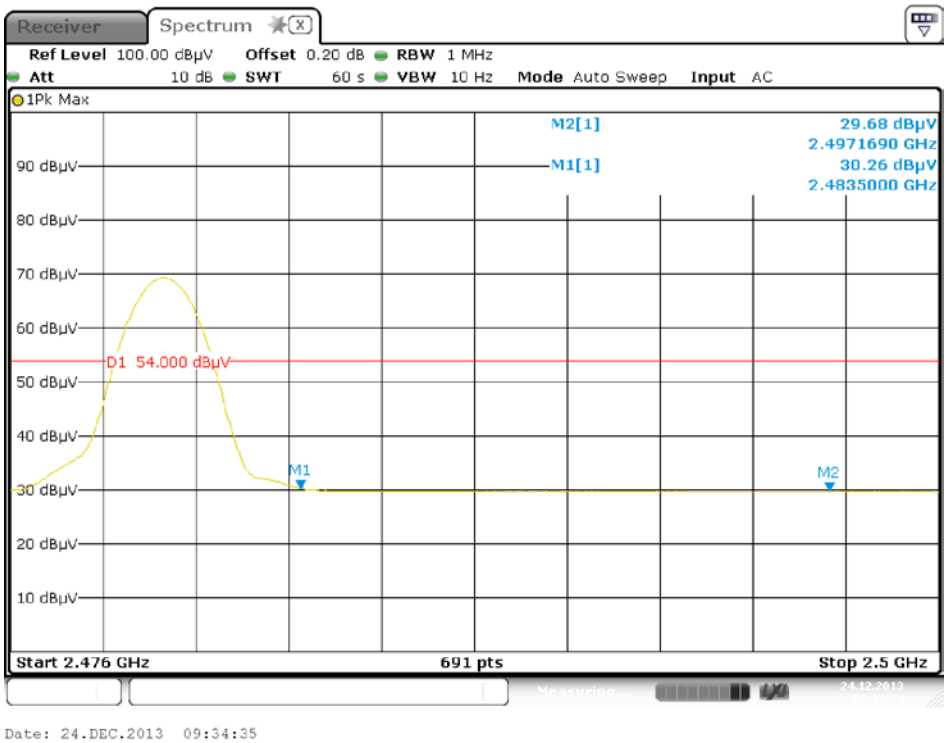
(GFSK CH High, Vertical, Peak)



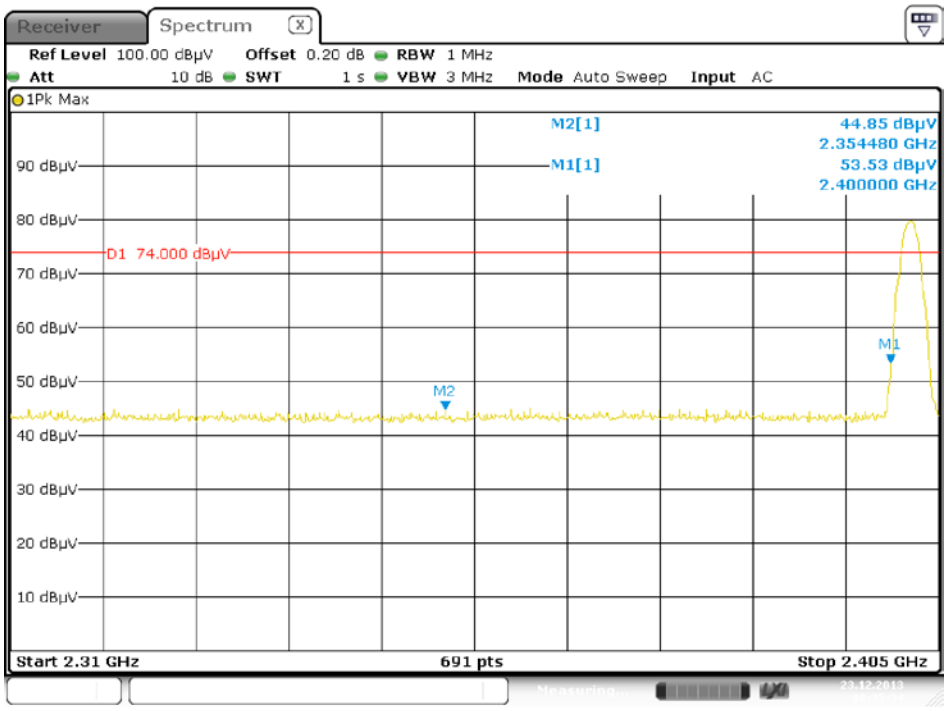
(GFSK CH High, Horizontal, Peak)



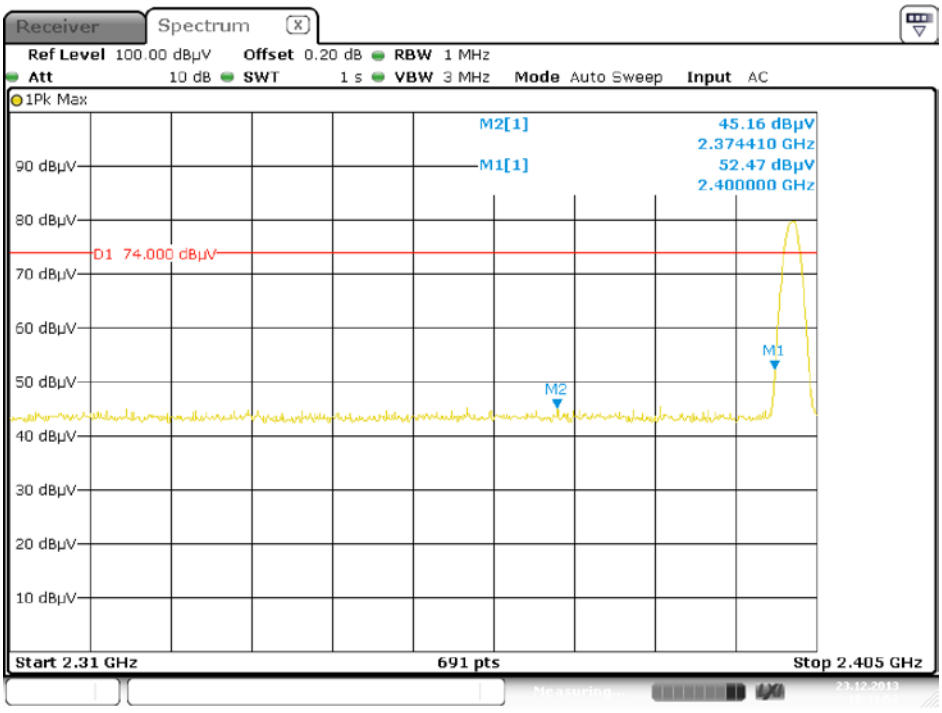
(GFSK CH High, Vertical, Average)



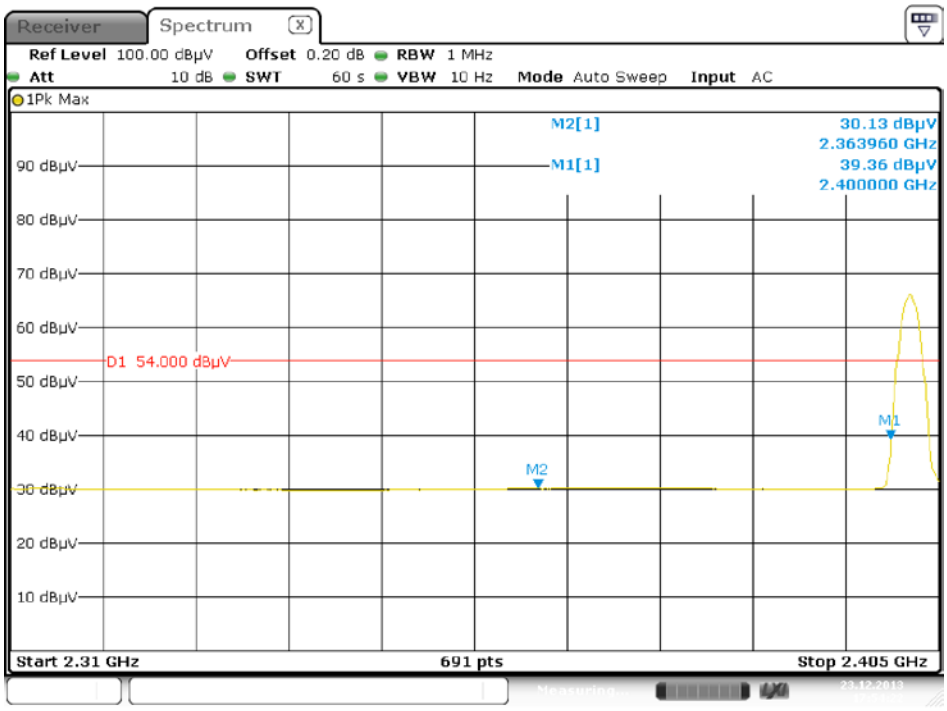
(GFSK CH High, Horizontal, Average)



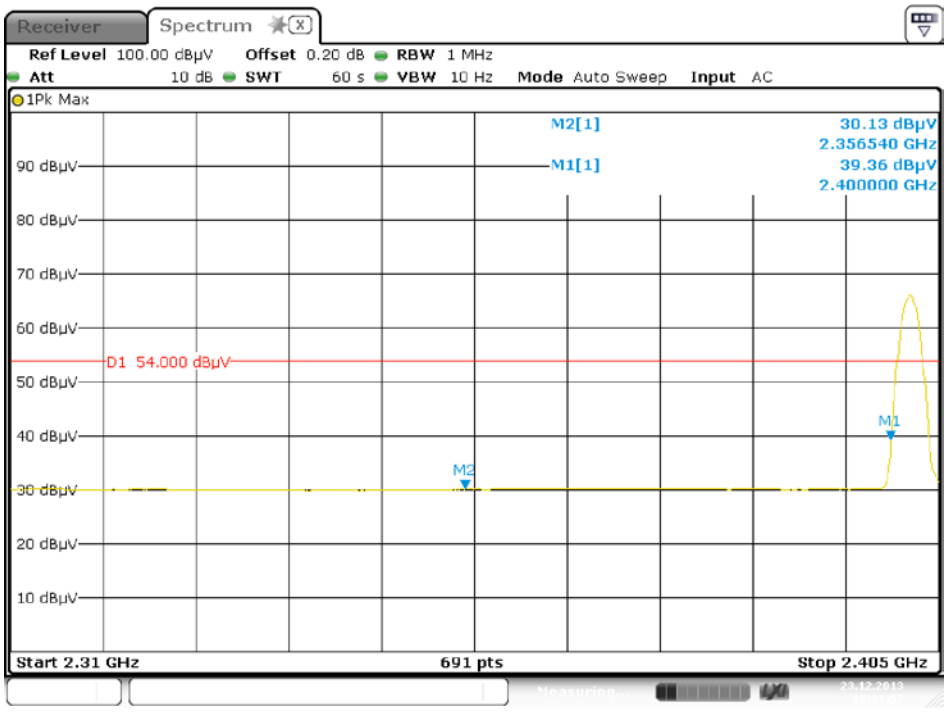
(π/4 DQPSK CH Low, Vertical, Peak)



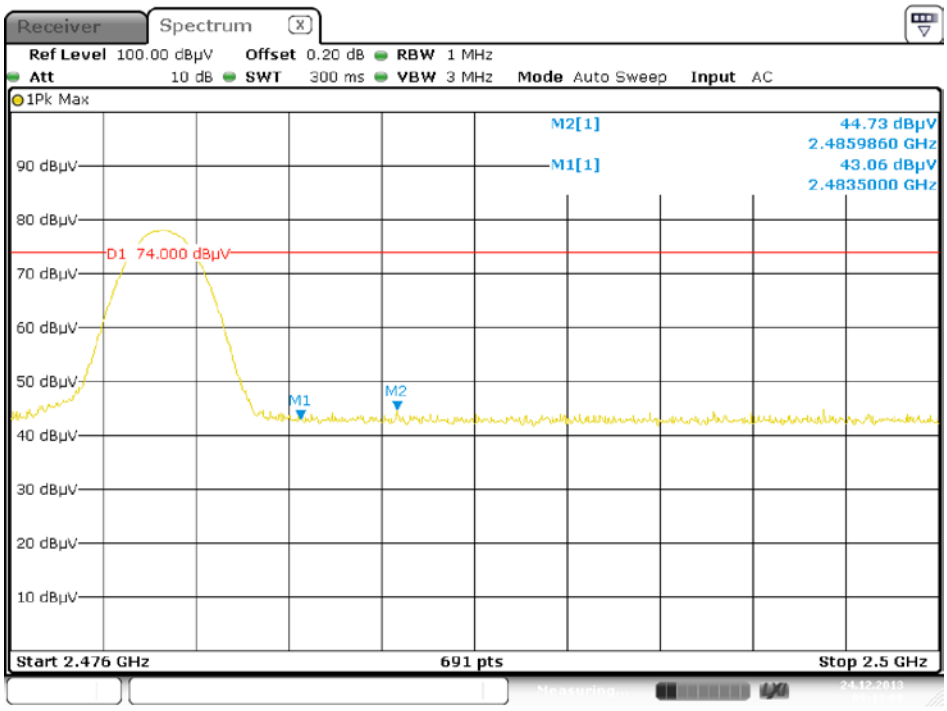
(π/4 DQPSK CH Low, Horizontal, Peak)



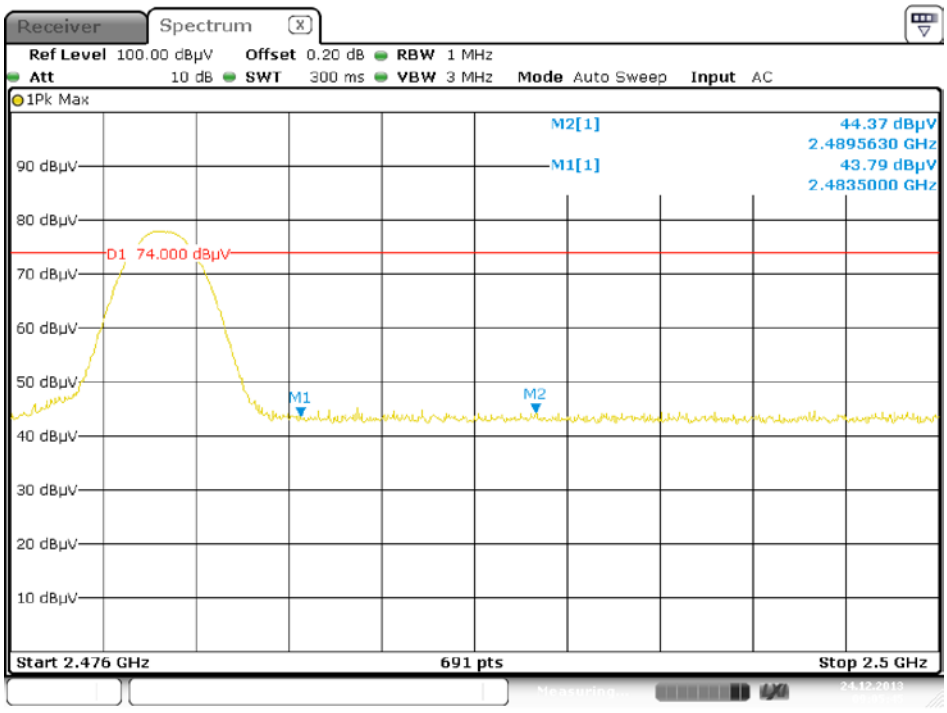
(π/4 DQPSK CH Low, Vertical, Average)



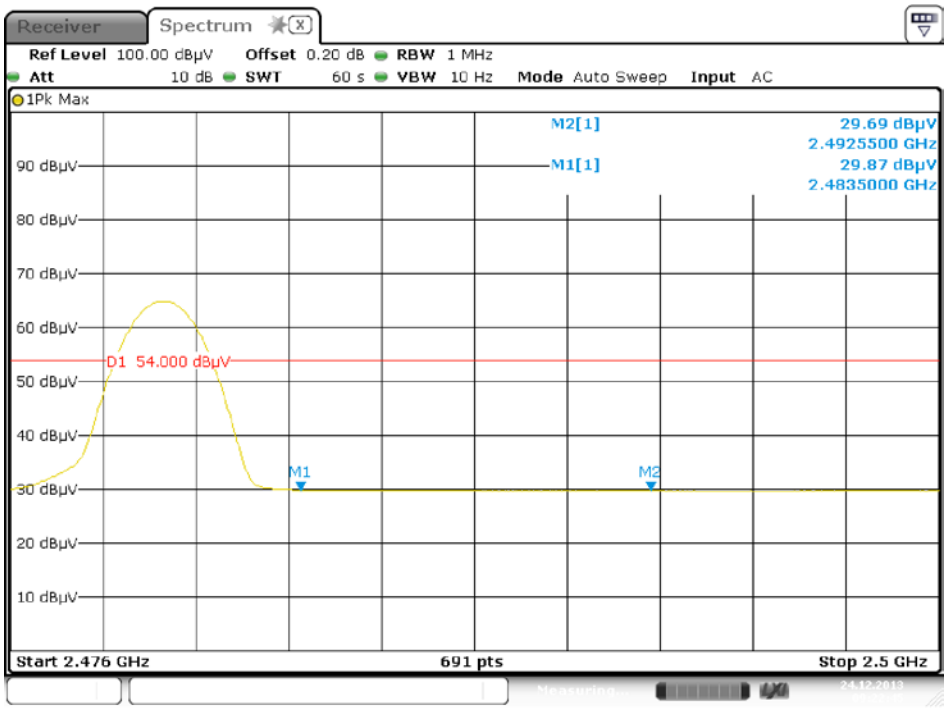
(π/4 DQPSK CH Low, Horizontal, Average)



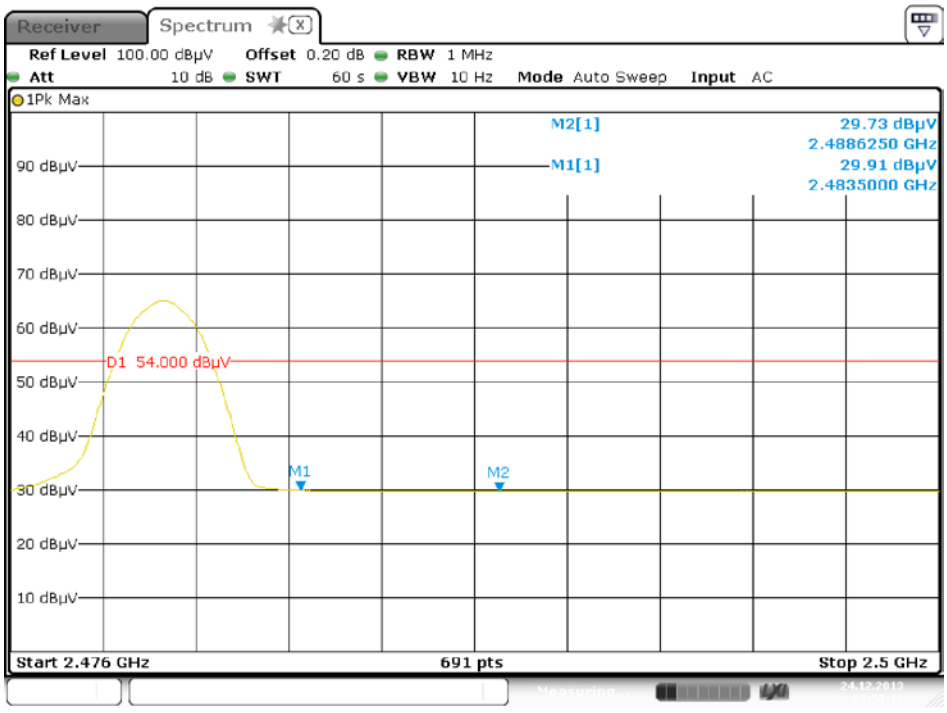
(π/4 DQPSK CH High, Vertical, Peak)



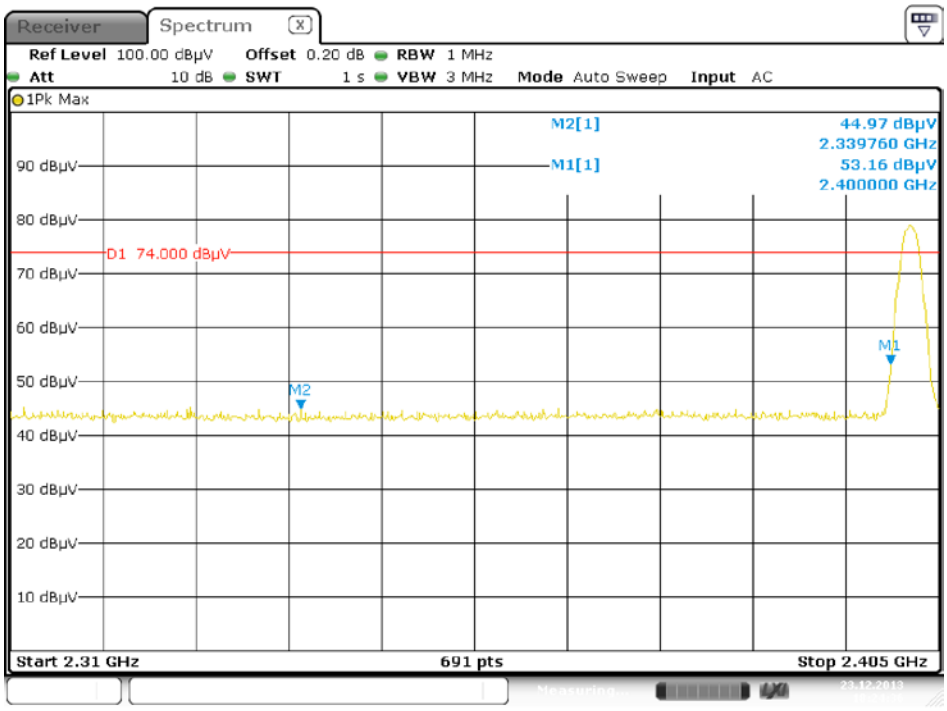
(π/4 DQPSK CH High, Horizontal, Peak)



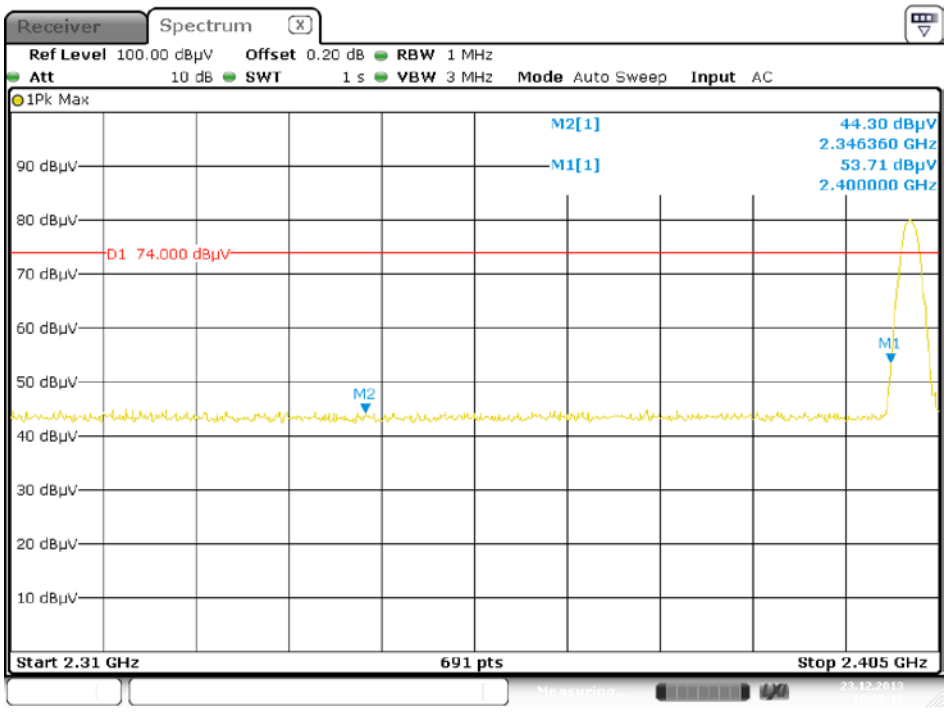
(π/4 DQPSK CH High, Vertical, Average)



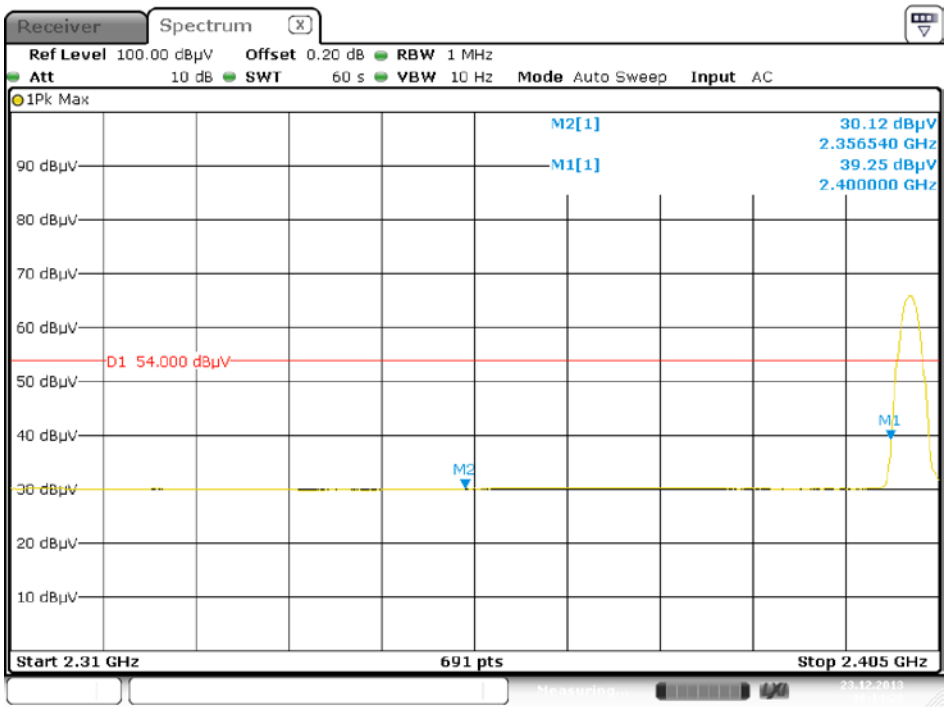
(π/4 DQPSK CH High, Horizontal, Average)



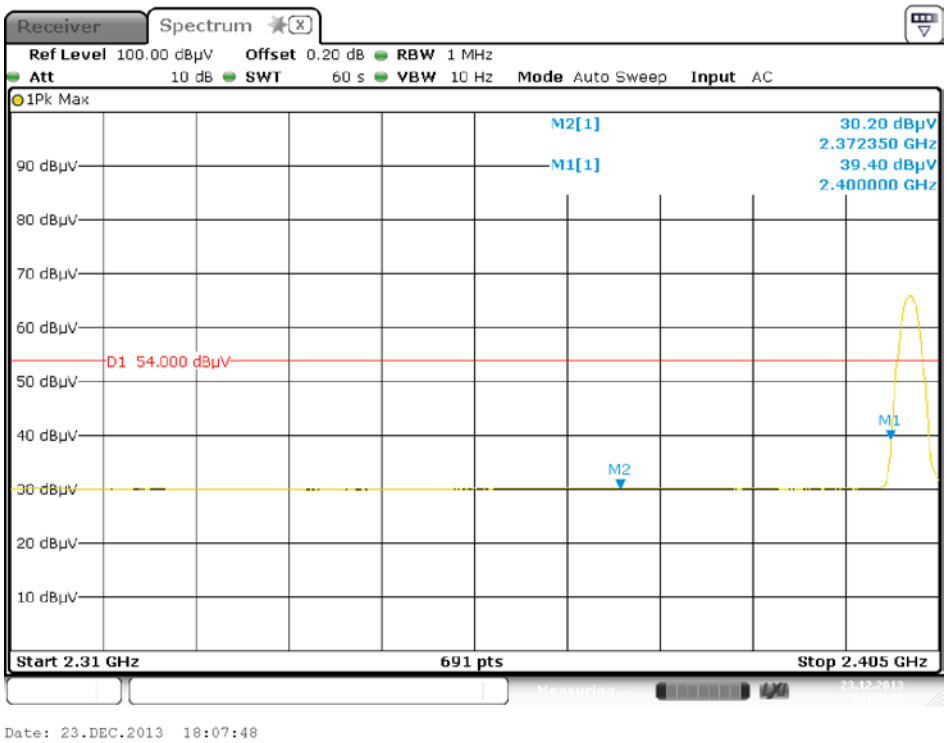
(8-DPSK CH Low, Vertical, Peak)



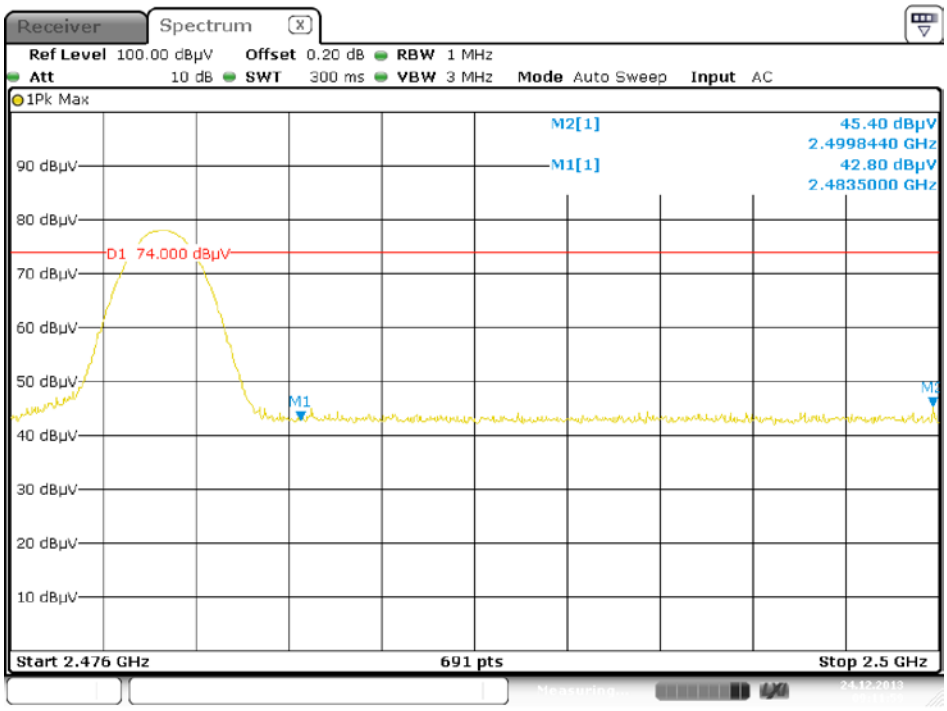
(8-DPSK CH Low, Horizontal, Peak)



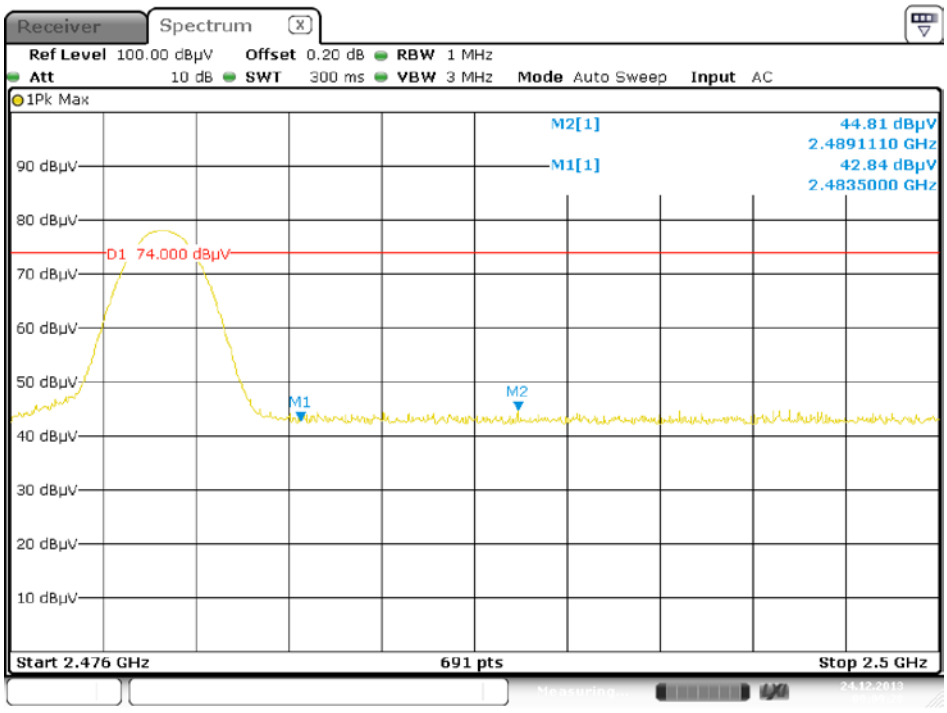
(8-DPSK CH Low, Vertical, Average)



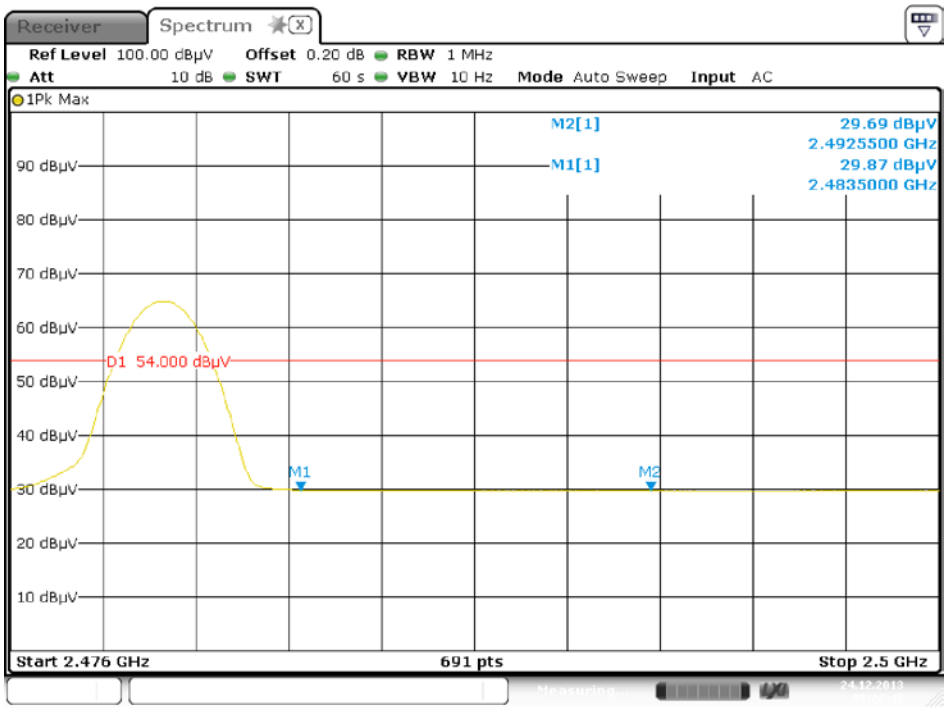
(8-DPSK CH Low, Horizontal, Average)



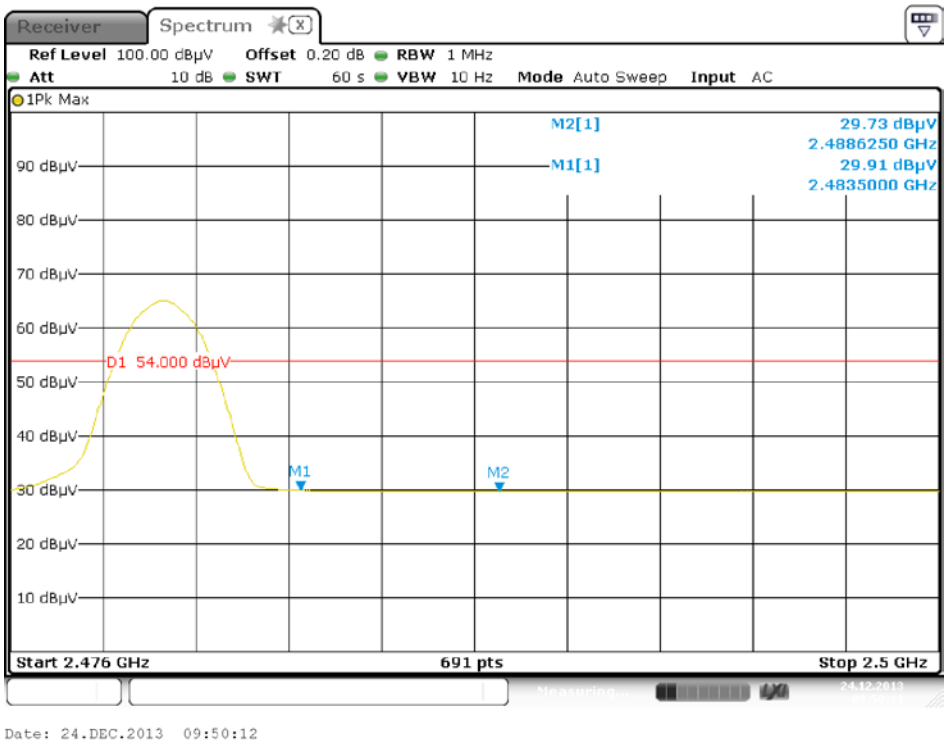
(8-DPSK CH High, Vertical, Peak)



(8-DPSK CH High, Horizontal, Peak)



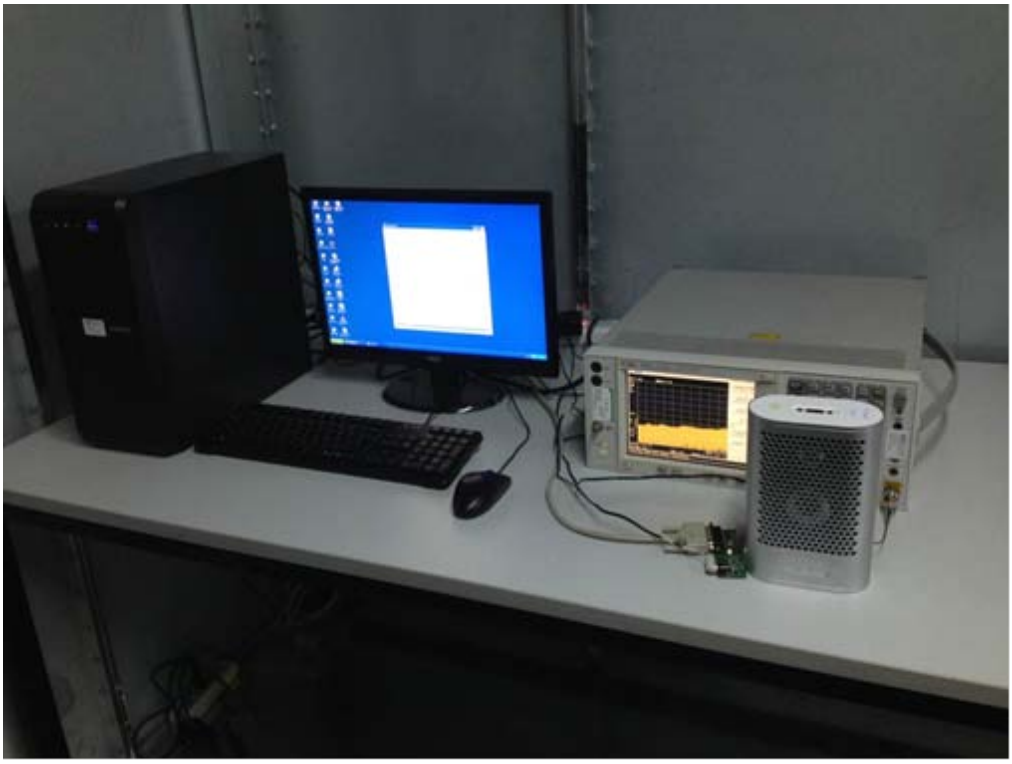
(8-DPSK CH High, Vertical, Average)



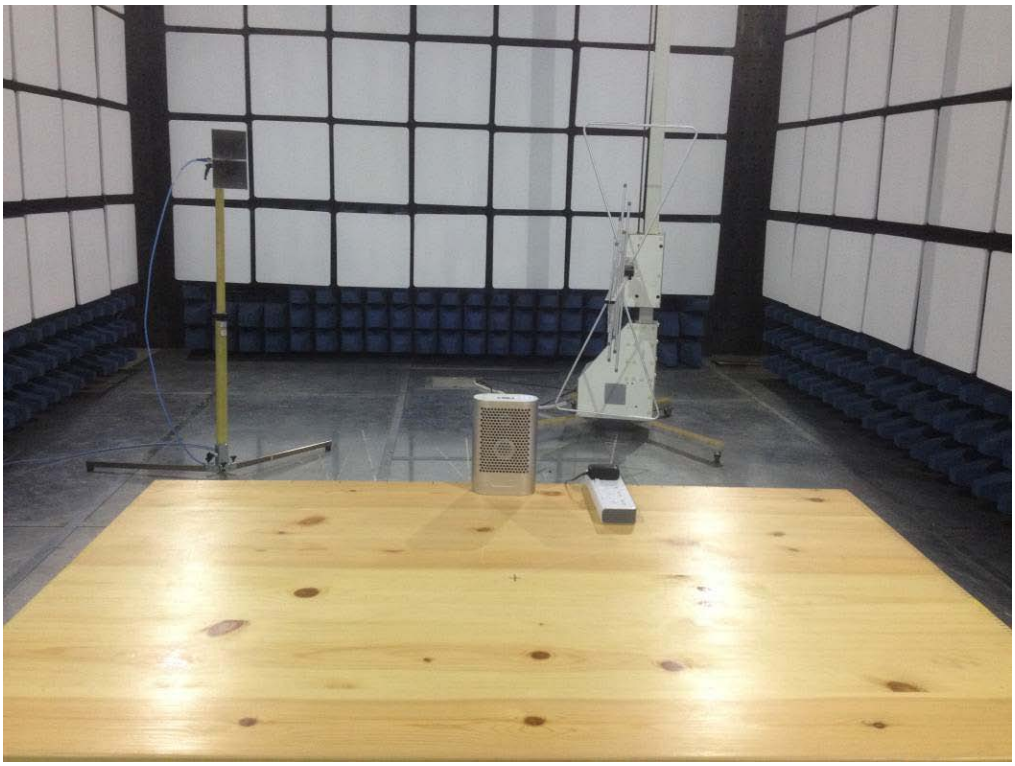
(8-DPSK CH High, Horizontal, Average)

ANNEX B TEST SETUP PHOTOS

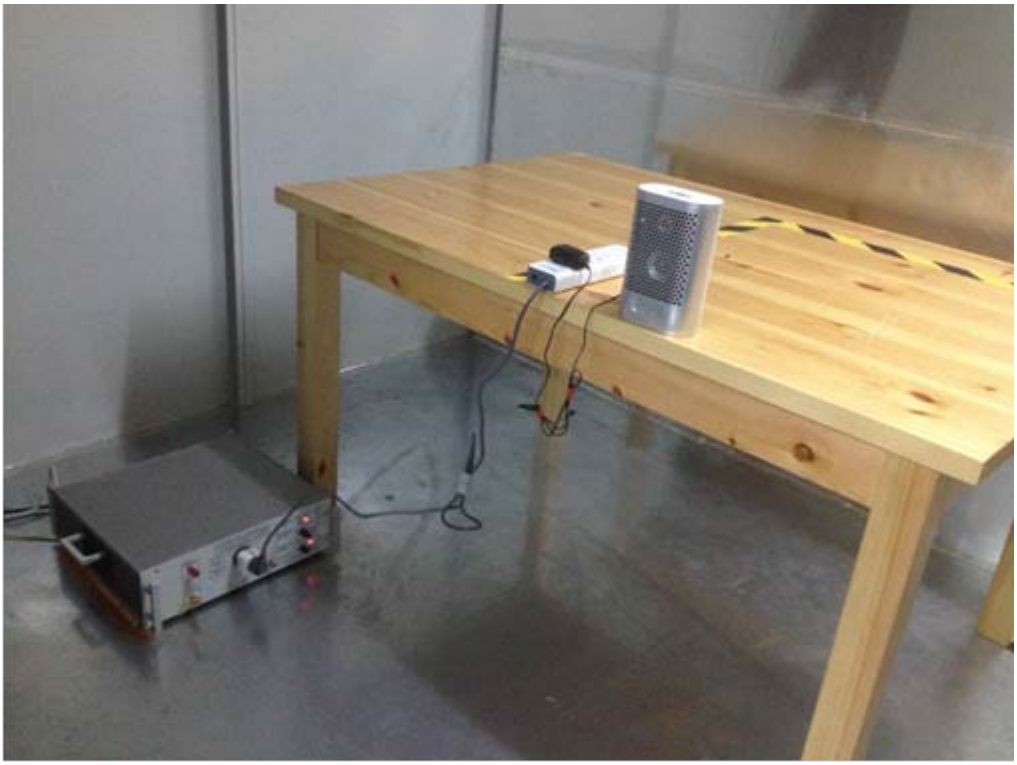
B.1 Conducted Test Photo



B.2 Radiated Test Photo



B.3 Conducted Emission Test Setup



ANNEX C EUT PHOTOS

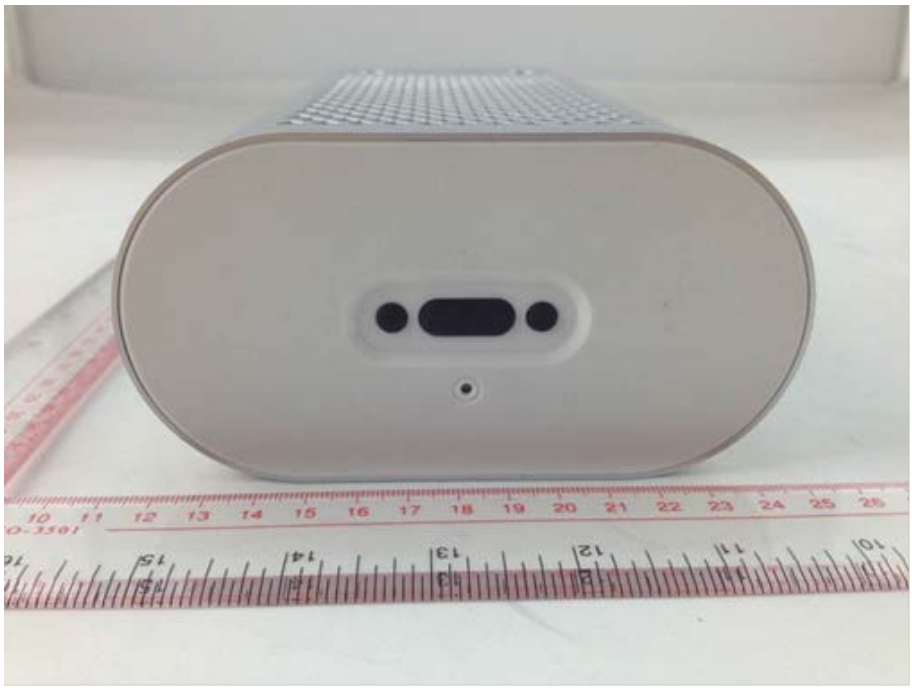
C.1 Appearance of the EUT

Front View of Sample

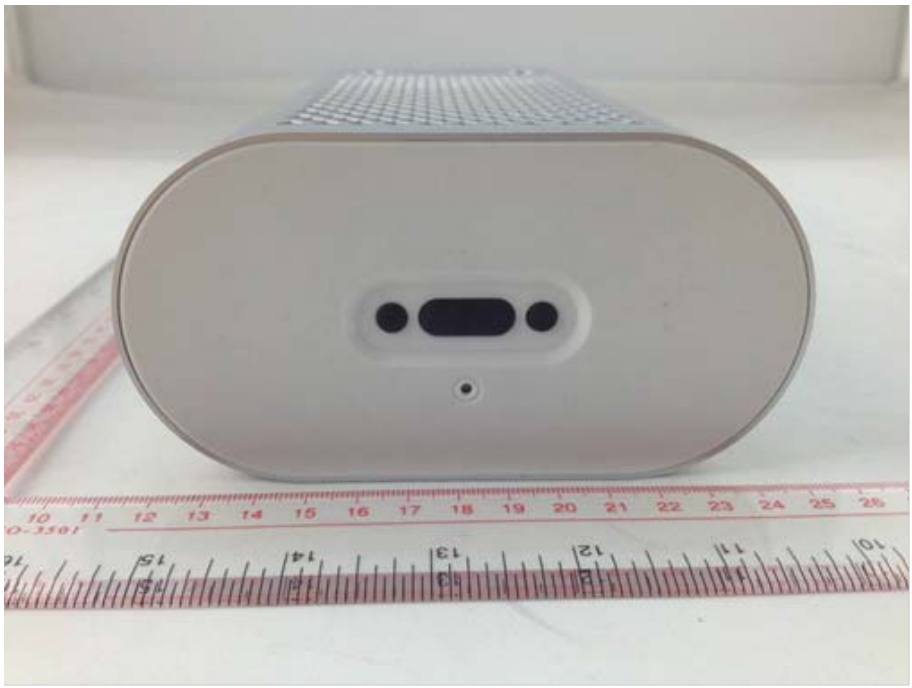
Back View of Sample

Left View of Sample

Right View of Sample



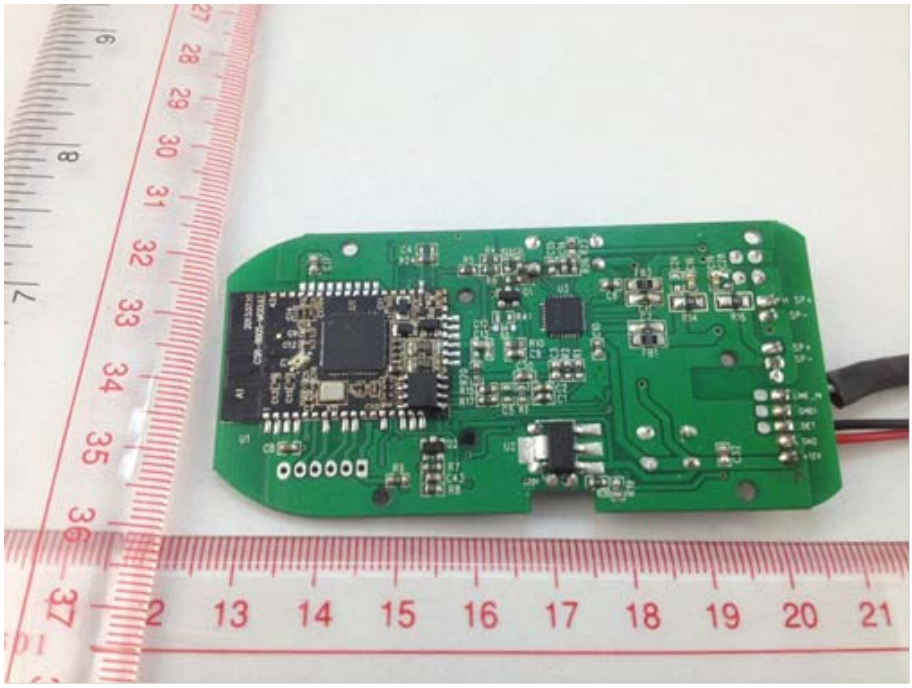
Up View of Sample

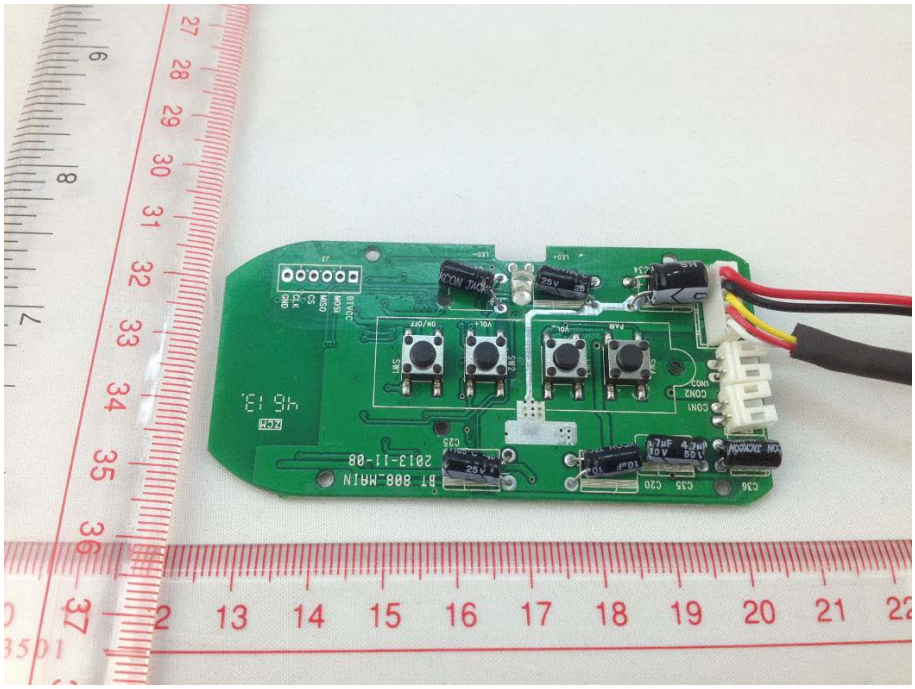


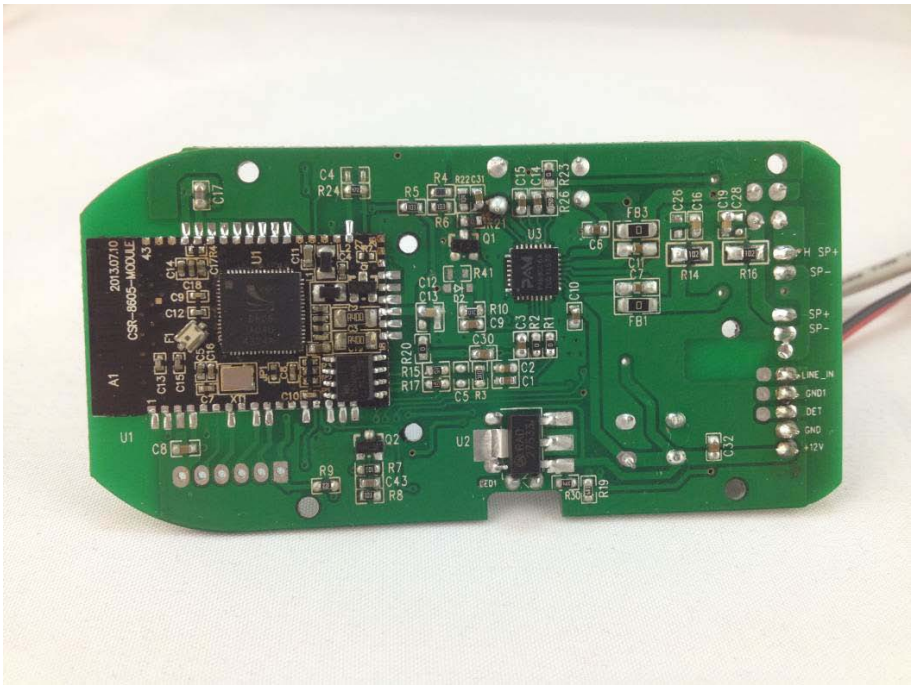
Down View of Sample

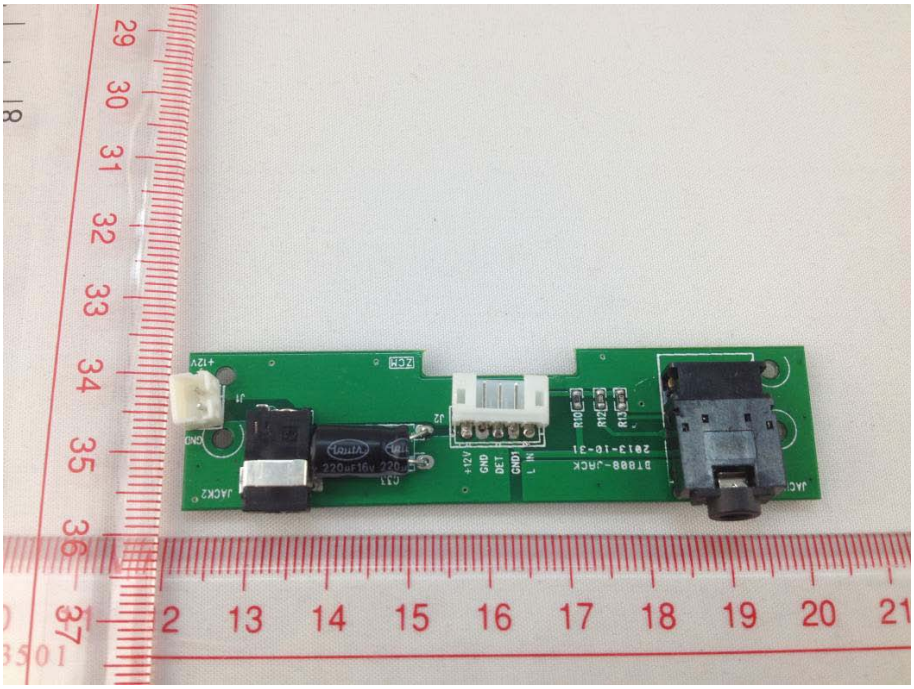
Photo of Charger

C.2 Inside of the EUT






CSR-8605-MODULE
U1
U2
U3
C8
R9
R7
R8
Q1
Q2
FB1
FB3
R14
R16
C32
H SP+
SP-
SP+
SP-
LINE_IN
GND1
DET
GND
+12V


+12V
GND
DET
GND1
LIN
BT888-JACK
2013-10-31
JACK2
29
30
31
32
33
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36
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2
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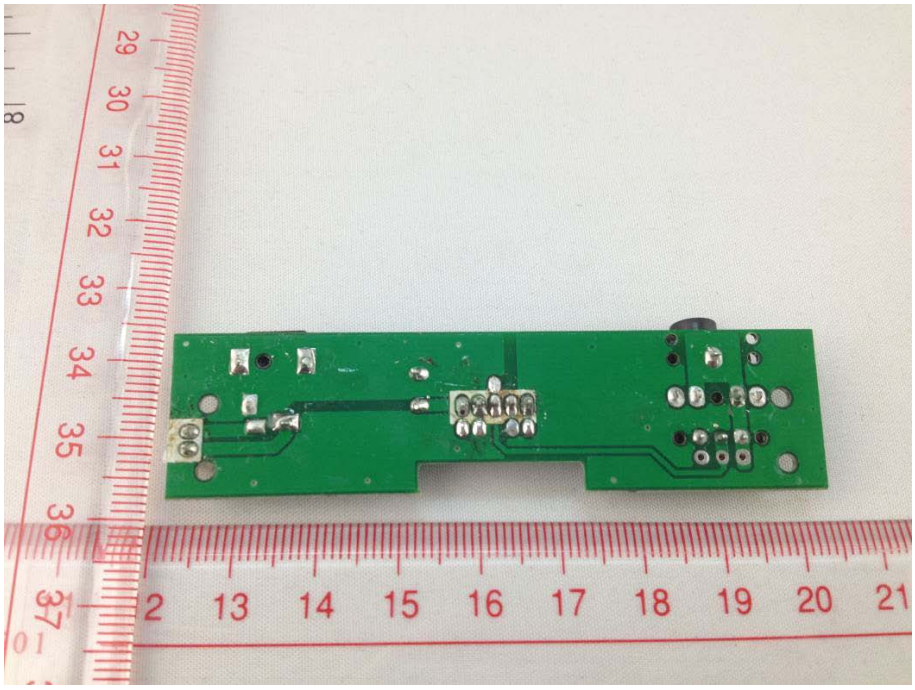
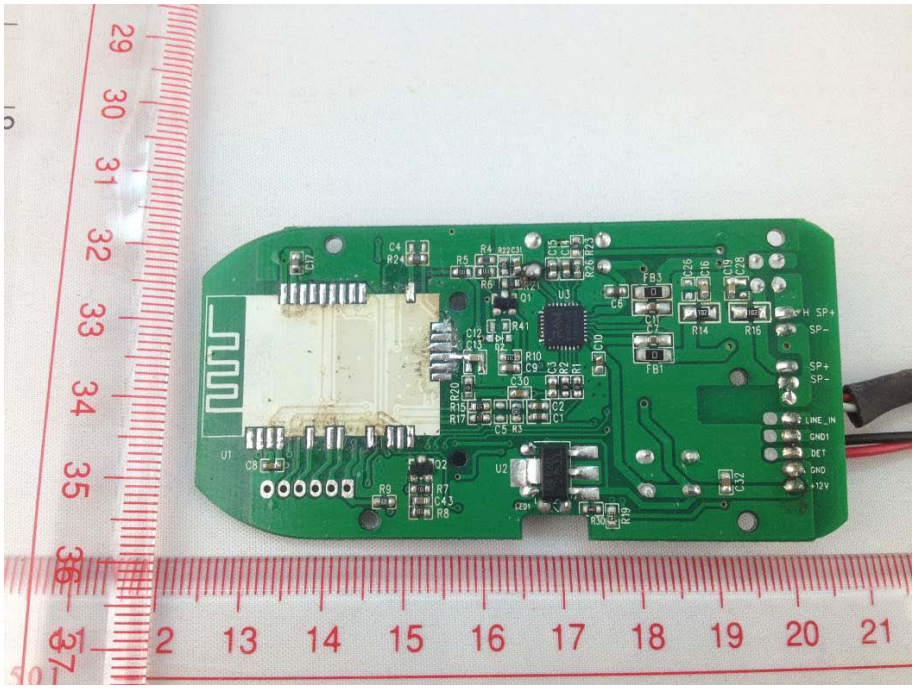
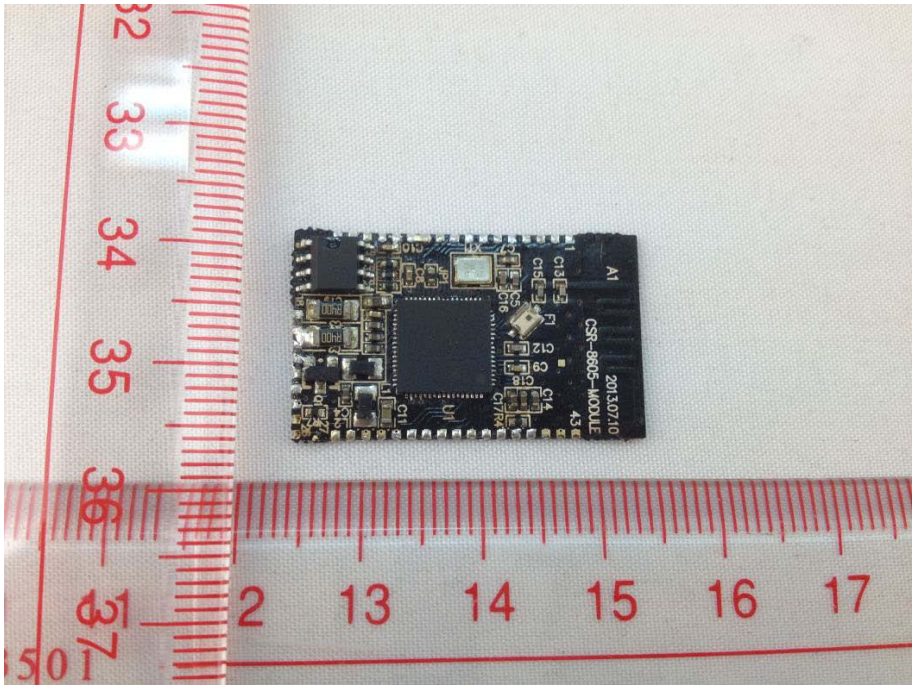
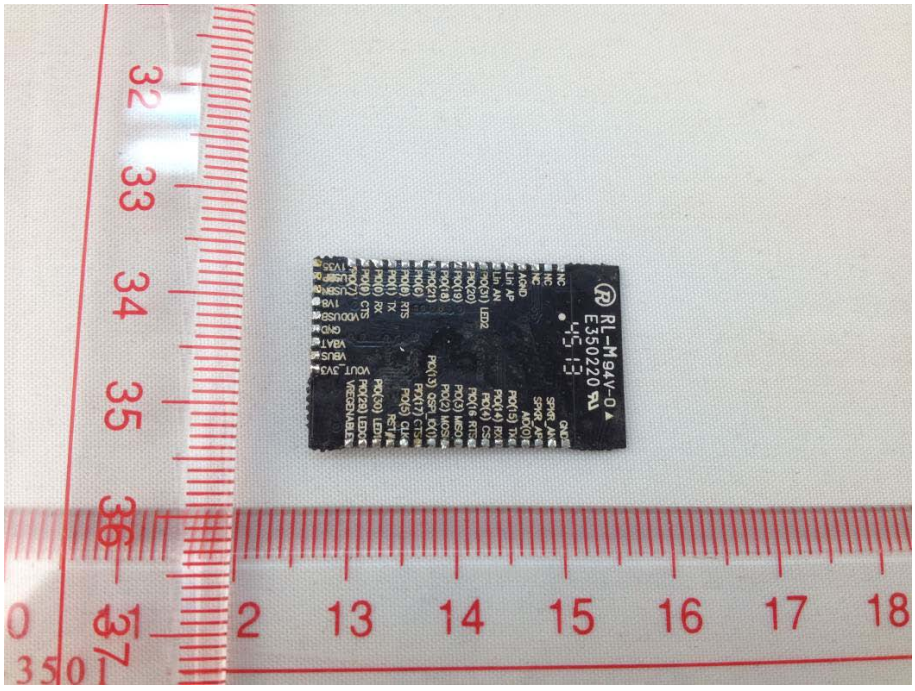
21









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