TEST REPORT

Reference No.	:	WTS14S0412831E
FCC ID	:	V8VCMS5
Applicant.....	:	SKYPINE ELECTRONICS (SHEN ZHEN) CO.,LTD.
Address.....	:	A1 Building, No.6 Xinxing Industrial Park, Xinhe Village, Fuyong Town, Baoan District, Shenzhen City
Manufacturer	:	The same as above
Address.....	:	The same as above
Product Name.....	:	Marine Audio Systems
Model No.	:	CMS5
Trademark……	:	Clarion
Standards.....	:	FCC CFR47 Part 15 Section 15.247:2012
Date of Receipt sample	:	Apr.04, 2013
Date of Test.....	:	Apr.9-16, 2014
Date of Issue.....	:	Jun. 03, 2014
Test Result.....	:	**Pass ***

*Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
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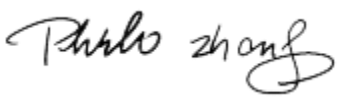
Compiled by:

Zero Zhou / Project Engineer

Approved by:



Philo Zhong / Manager

2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
Conduct Emission	15.207	N/A
20dB Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

3 Contents

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4 General Information

4.1 General Description of E.U.T.

Product Name : Marine Audio Systems

Model No. : CMS5

Operation Frequency : 2402MHz ~ 2480MHz, 79 channels in total

Type of Modulation : GFSK, Pi/4DQPSK, 8DPSK

The lowest oscillator : 32.768kHz

Antenna installation : internal permanent antenna

Antenna Gain : 0dBi

4.2 Details of E.U.T.

Technical Data : DC 12V,15A max

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	2	2403	3	2404	4	2405
5	2406	6	2407	7	2408	8	2409
9	2410	10	2411	11	2412	12	2413
13	2414	14	2415	15	2416	16	2417
17	2418	18	2419	19	2420	20	2421
21	2422	22	2423	23	2424	24	2425
25	2426	26	2427	27	2428	28	2429
29	2430	30	2431	31	2432	32	2433
33	2434	34	2435	35	2436	36	2437
37	2438	38	2439	39	2440	40	2441
41	2442	42	2443	43	2444	44	2445
45	2446	46	2447	47	2448	48	2449
49	2450	50	2451	51	2452	52	2453
53	2454	54	2455	55	2456	56	2457
57	2458	58	2459	59	2460	60	2461
61	2462	62	2463	63	2464	64	2465
65	2466	66	2467	67	2468	68	2469
69	2470	70	2471	71	2472	72	2473
73	2474	74	2475	75	2476	76	2477
77	2478	78	2479	79	2480	-	-

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting	2402MHz	2441MHz	2480MHz

4.5 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A-1**

  Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A-1, July 12, 2012.

- **FCC – Registration No.: 880581**

  Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

5 Equipment Used during Test

5.1 Equipments List

3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMC Analyzer	Agilent	E7405A	MY45114943	Sep.18,2013	Sep.17,2014
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Sep.18,2013	Sep.17,2014
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.20,2013	Apr.19,2014
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.18,2013	Sep.17,2014
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.20,2013	Apr.19,2014
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.20,2013	Apr.19,2014
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Mar.17,2014	Mar.16,2015
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.10,2014	Apr.09,2015

5.2 Measurement Uncertainty

Parameter	**Uncertainty**
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	N/A
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz
	56 dBμV between 0.5MHz & 5MHz
	60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)
Remark	This device powered by DC 12V, this test is not applicable.

7 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: DA 00-705

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

7.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 51.1 % RH

Atmospheric Pressure: 101.2kPa

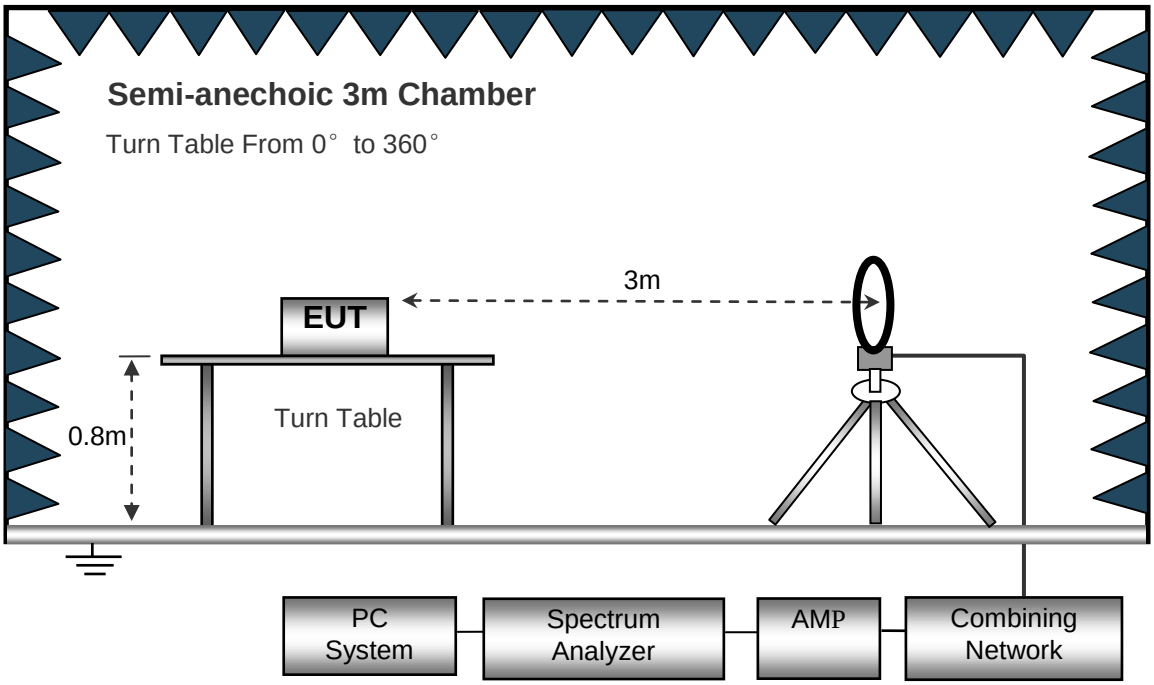
EUT Operation **:**

The test was performed in transmitting mode, the test data were shown in the report.

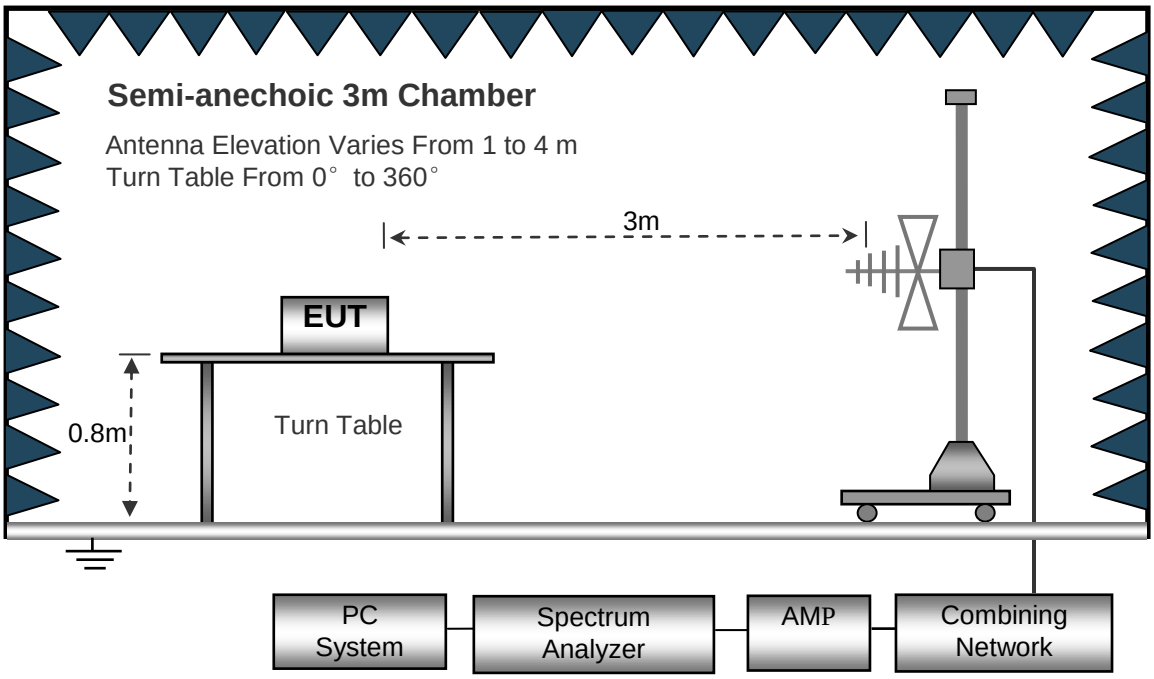
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003.

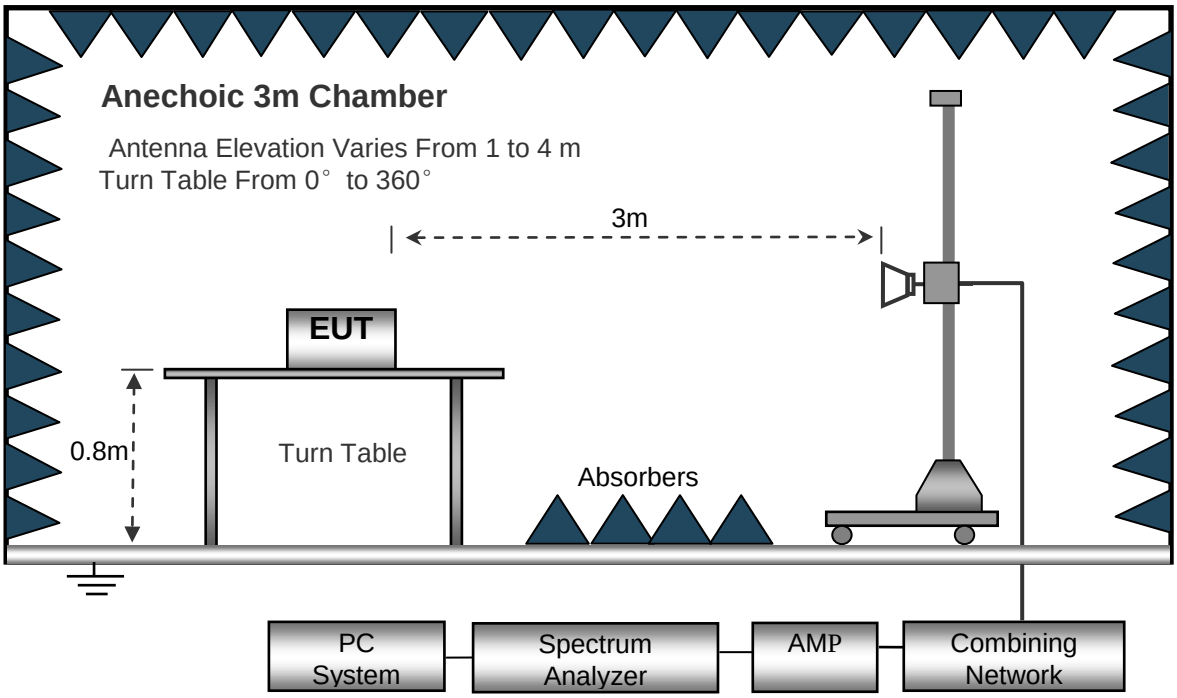
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz

Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

7.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

7.6 Summary of Test Results

Test Frequency: Below 30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency: 30MHz ~ 18GHz

Remark: only the worst data(GFSK modulation mode) were reported.

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel									
168.52	22.76	QP	354	1.7	H	11.19	33.95	40.00	-6.05
168.52	20.43	QP	220	1.2	V	11.19	31.62	40.00	-8.38
4804.00	53.66	PK	19	1.2	V	-1.06	52.60	74.00	-21.40
4804.00	43.24	Ave	19	1.2	V	-1.06	42.18	54.00	-11.82
7206.00	41.75	PK	320	1.6	H	1.33	43.08	74.00	-30.92
7206.00	37.44	Ave	320	1.6	H	1.33	38.77	54.00	-15.23
2315.80	46.84	PK	186	1.5	V	-13.19	33.65	74.00	-40.35
2315.80	38.91	Ave	186	1.5	V	-13.19	25.72	54.00	-28.28
2360.40	42.27	PK	262	1.2	H	-13.14	29.13	74.00	-44.87
2360.40	38.59	Ave	262	1.2	H	-13.14	25.45	54.00	-28.55
2498.17	42.84	PK	158	1.4	V	-13.08	29.76	74.00	-44.24
2498.17	38.74	Ave	158	1.4	V	-13.08	25.66	54.00	-28.34

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel									
168.52	23.77	QP	259	1.6	H	11.19	34.96	40.00	-5.04
168.52	20.16	QP	15	1.7	V	11.19	31.35	40.00	-8.65
4882.00	53.42	PK	32	1.4	V	-0.62	52.80	74.00	-21.20
4882.00	43.84	Ave	32	1.4	V	-0.62	43.22	54.00	-10.78
7323.00	40.64	PK	38	1.8	H	2.21	42.85	74.00	-31.15
7323.00	38.06	Ave	38	1.8	H	2.21	40.27	54.00	-13.73
2320.50	45.97	PK	128	1.1	V	-13.19	32.78	74.00	-41.22
2320.50	38.91	Ave	128	1.1	V	-13.19	25.72	54.00	-28.28
2389.55	42.50	PK	280	1.6	H	-13.14	29.36	74.00	-44.64
2389.55	36.79	Ave	280	1.6	H	-13.14	23.65	54.00	-30.35
2494.39	43.72	PK	341	1.8	V	-13.08	30.64	74.00	-43.36
2494.39	38.69	Ave	341	1.8	V	-13.08	25.61	54.00	-28.39

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel									
168.52	23.74	QP	264	1.4	H	11.19	34.93	40.00	-5.07
168.52	19.95	QP	2	1.5	V	11.19	31.14	40.00	-8.86
4960.00	53.47	PK	261	1.9	V	-0.24	53.23	74.00	-20.77
4960.00	43.72	Ave	261	1.9	V	-0.24	43.48	54.00	-10.52
7440.00	40.99	PK	317	1.7	H	2.84	43.83	74.00	-30.17
7440.00	38.88	Ave	317	1.7	H	2.84	41.72	54.00	-12.28
2344.27	45.42	PK	252	1.4	V	-13.19	32.23	74.00	-41.77
2344.27	38.73	Ave	252	1.4	V	-13.19	25.54	54.00	-28.46
2351.58	44.66	PK	113	1.8	H	-13.14	31.52	74.00	-42.48
2351.58	38.40	Ave	113	1.8	H	-13.14	25.26	54.00	-28.74
2493.62	44.74	PK	53	1.8	V	-13.08	31.66	74.00	-42.34
2493.62	37.02	Ave	53	1.8	V	-13.08	23.94	54.00	-30.06

Test Frequency :Above 18GHz

The measurements were more than 20 dB below the limit and not reported

8 Band Edge Measurement

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Test Mode:	Transmitting

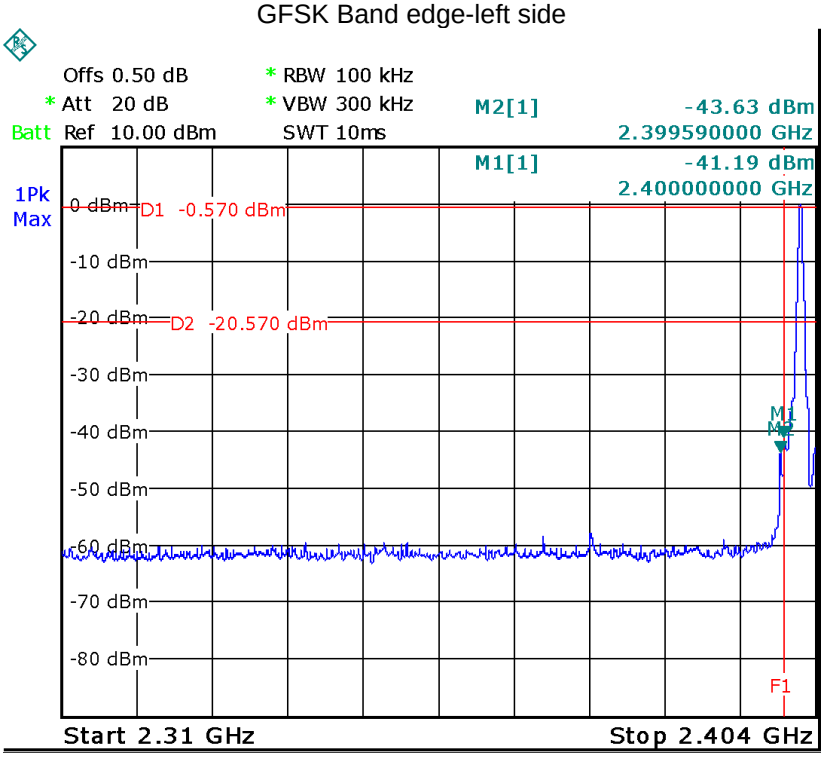
8.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
   Detector function = peak, Trace = max hold

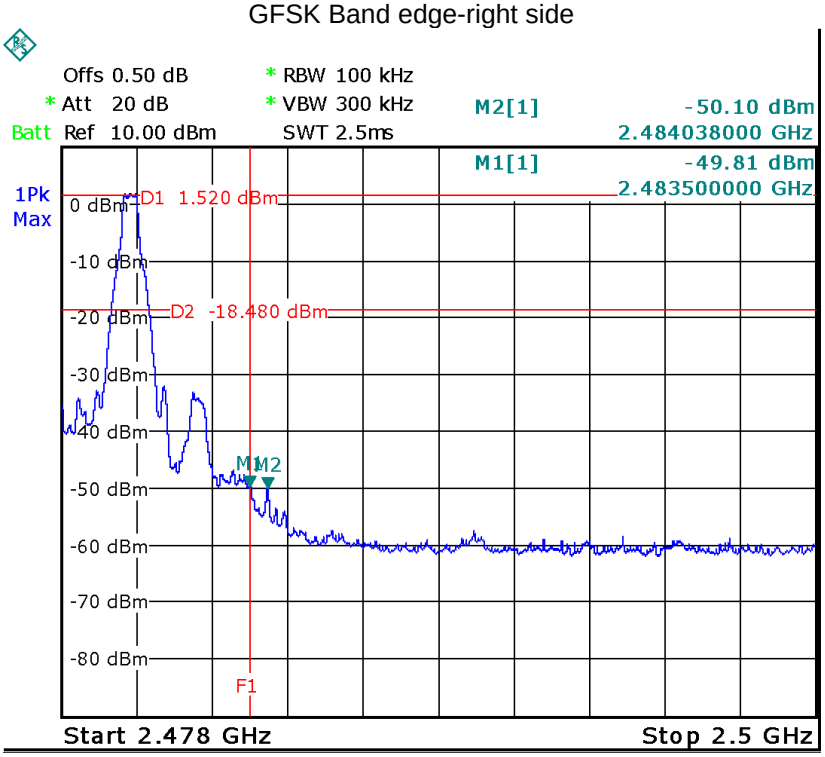
8.2 Test Result

Test plots

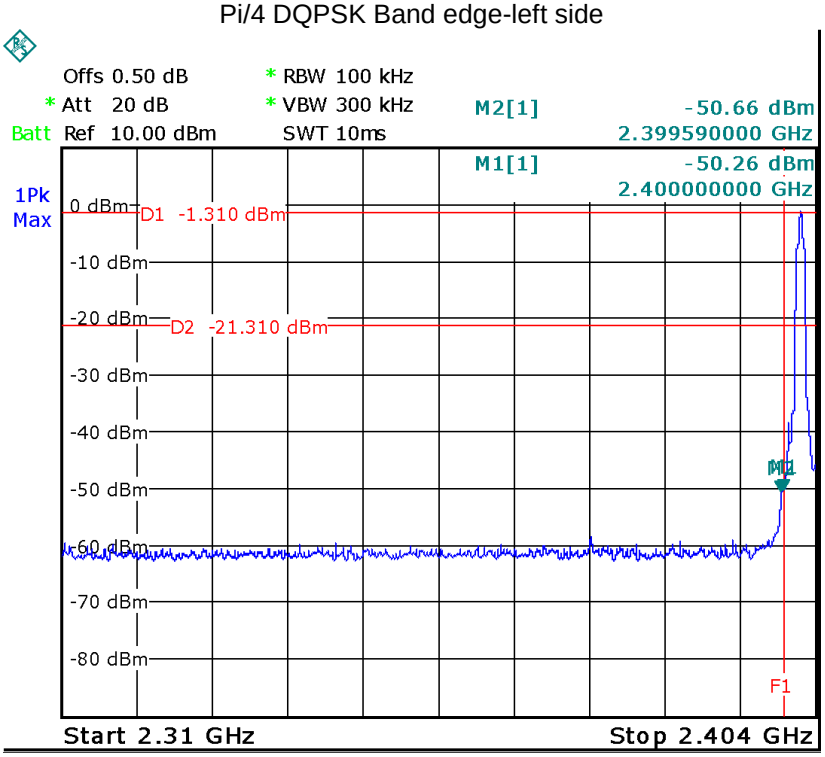
GFSK Band edge-left side



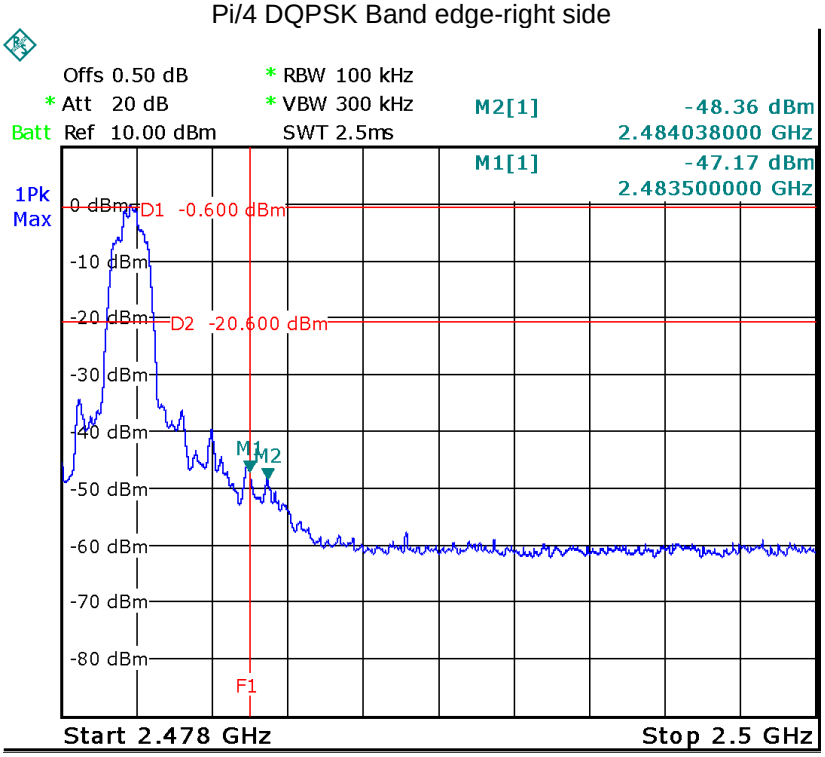
GFSK Band edge-right side



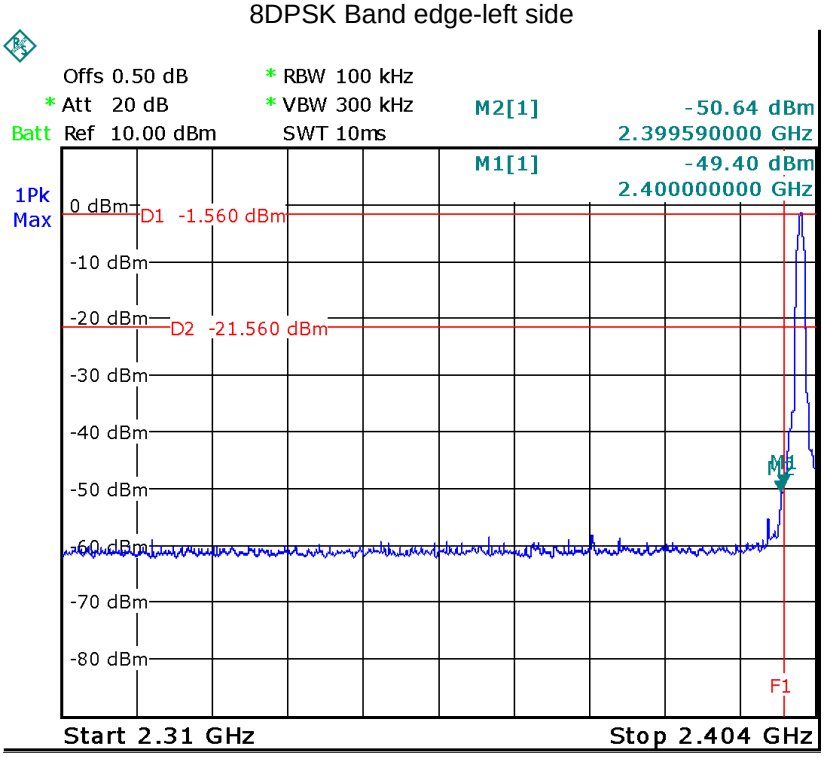
Pi/4 DQPSK Band edge-left side



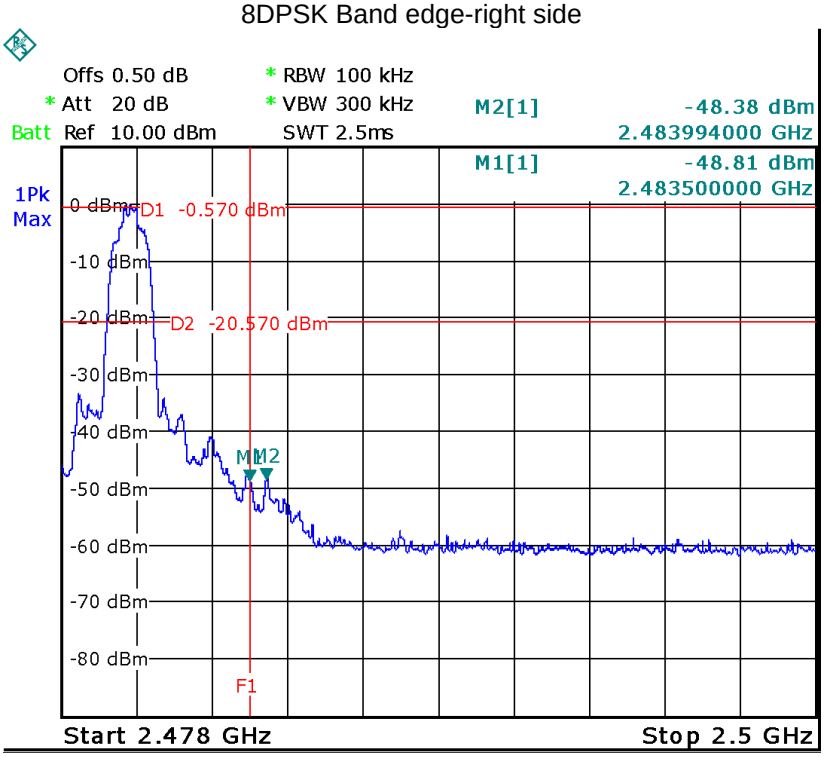
Pi/4 DQPSK Band edge-right side



8DPSK Band edge-left side



8DPSK Band edge-right side



9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

9.1 Test Procedure

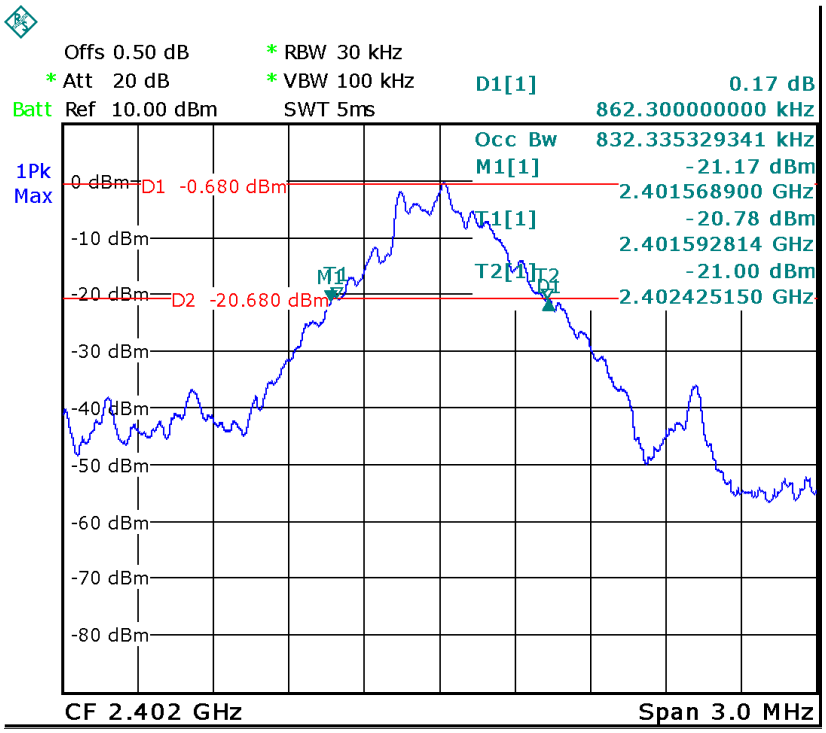
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 30kHz, VBW = 100kHz

9.2 Test Result

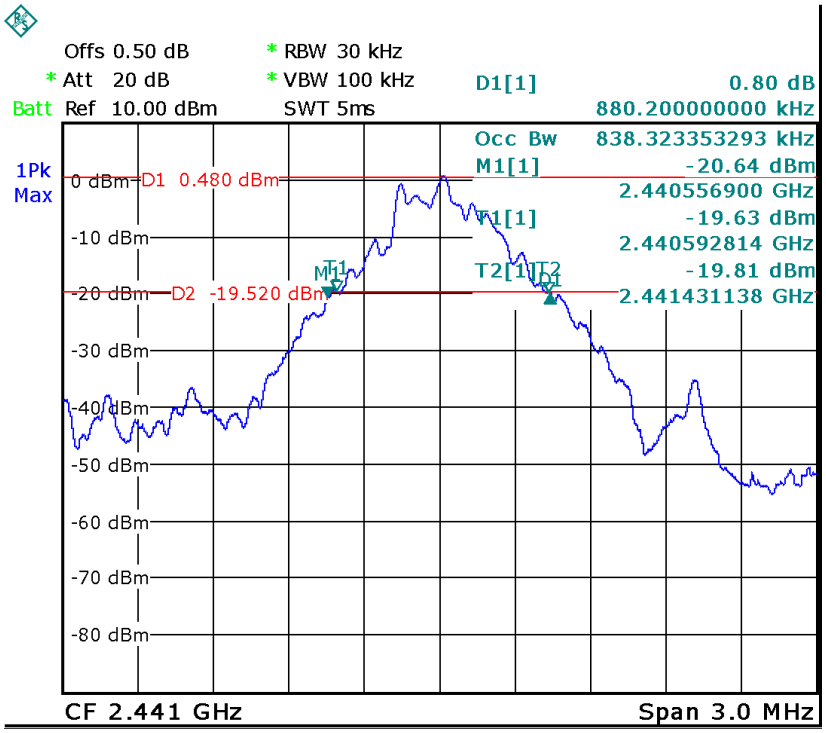
Modulation	Test Channel	Bandwidth
GFSK	Low	0.862MHz
GFSK	Middle	0.880MHz
GFSK	High	0.868MHz
Pi/4 DQPSK	Low	1.198MHz
Pi/4 DQPSK	Middle	1.222MHz
Pi/4 DQPSK	High	1.222MHz
8DPSK	Low	1.198MHz
8DPSK	Middle	1.216MHz
8DPSK	High	1.216MHz

Test plots

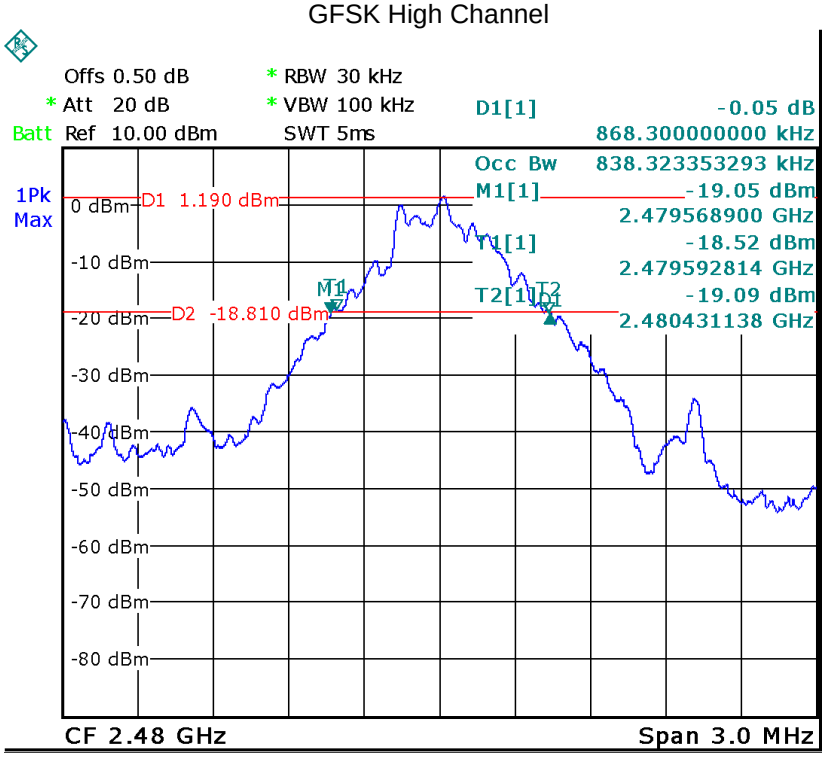
GFSK Low Channel



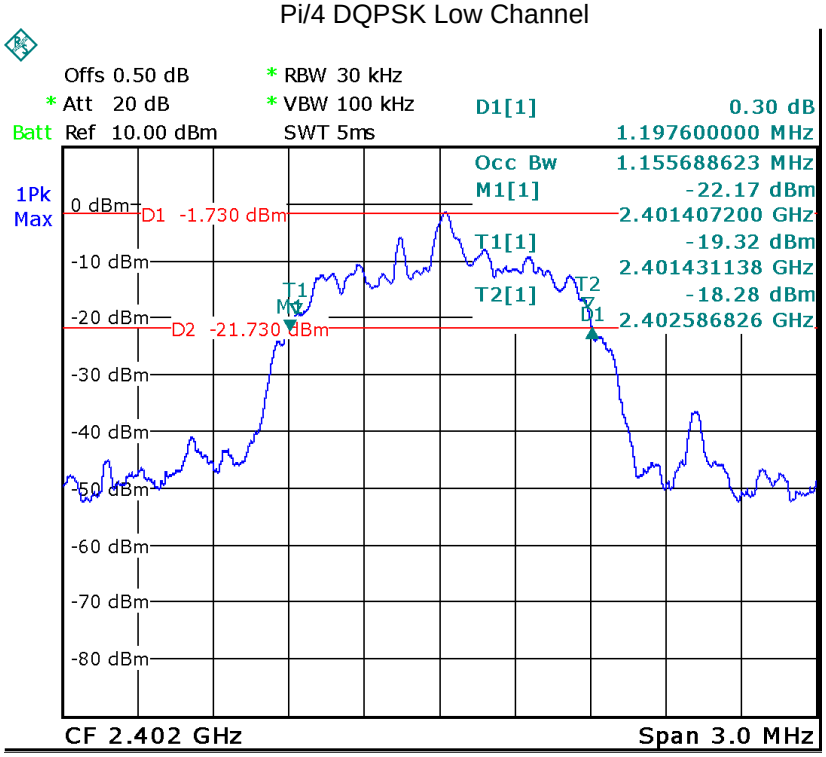
GFSK Middle Channel



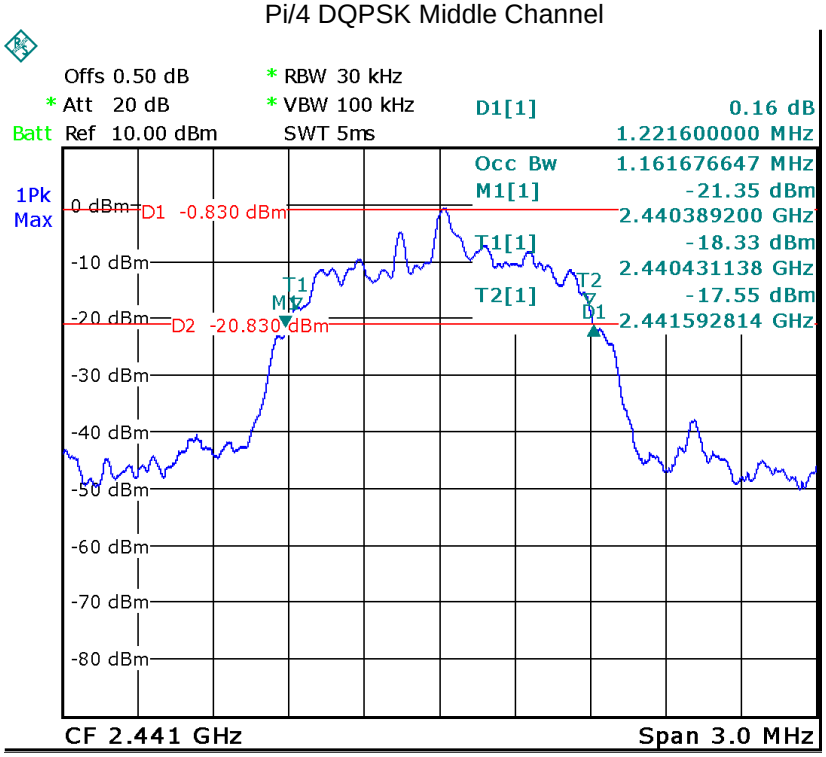
GFSK High Channel



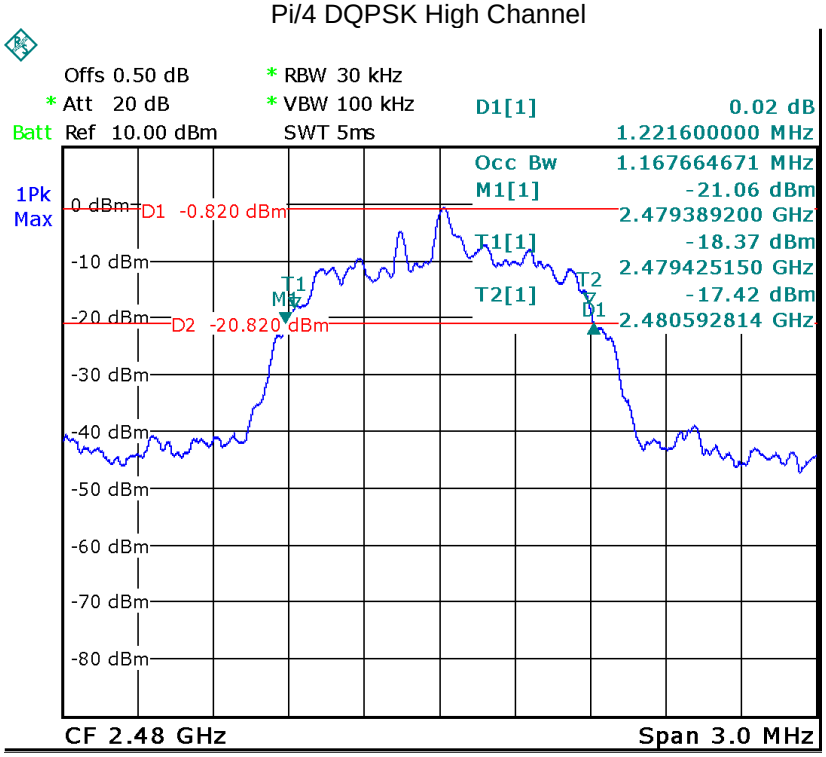
Pi/4 DQPSK Low Channel



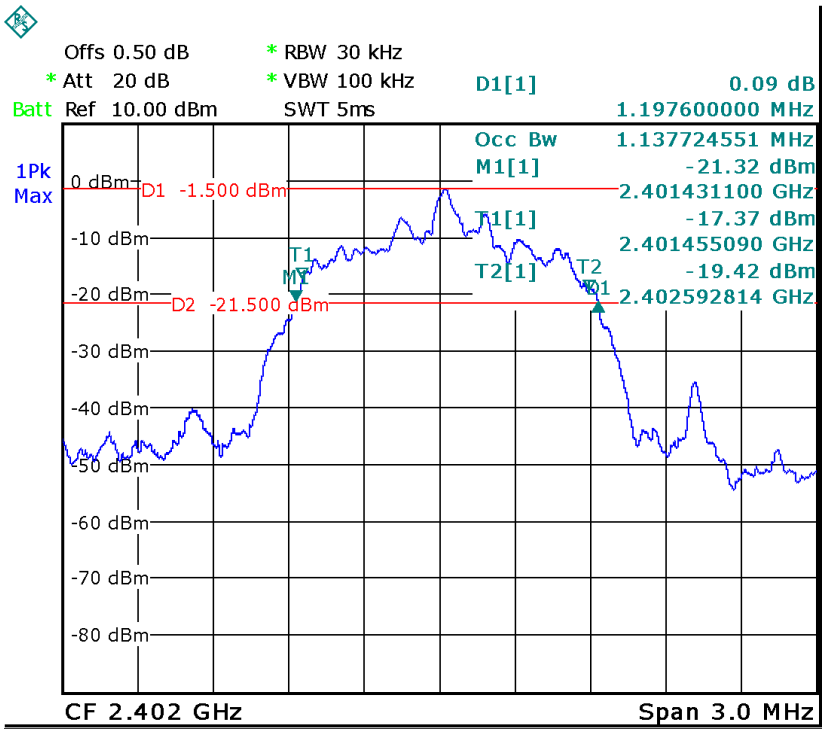
Pi/4 DQPSK Middle Channel



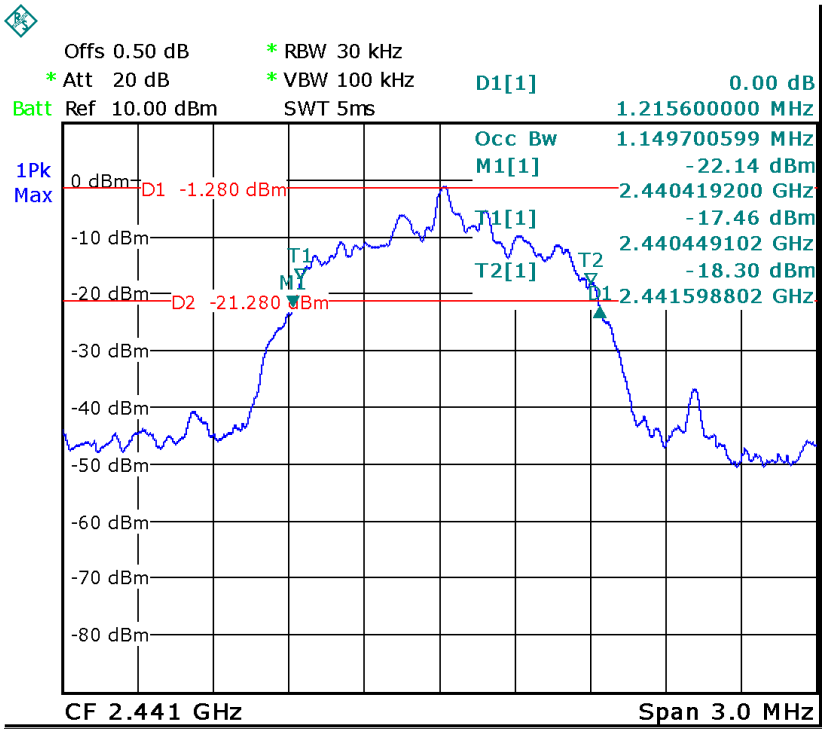
Pi/4 DQPSK High Channel



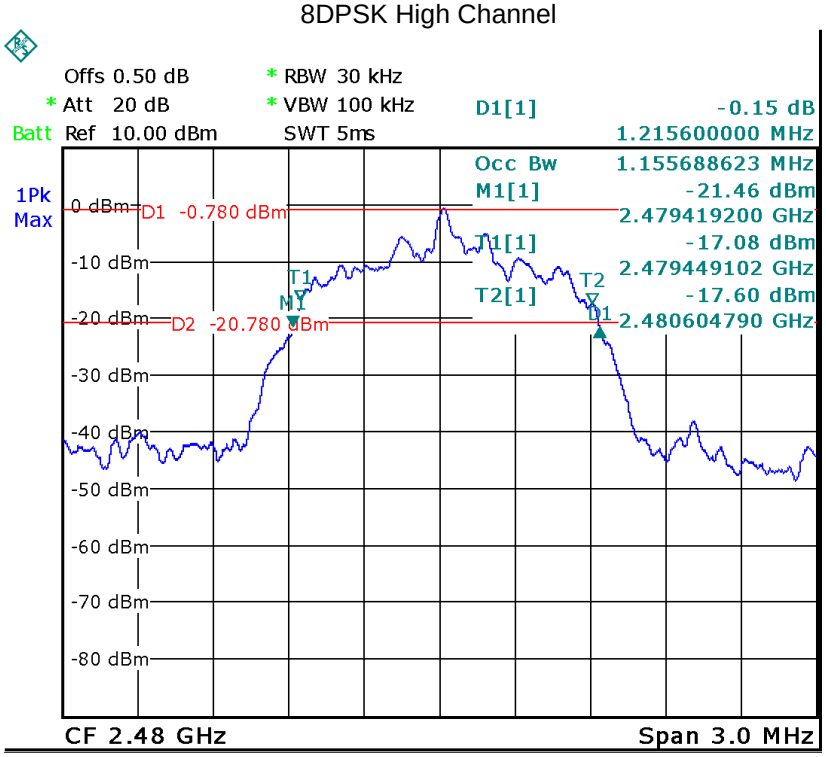
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result “Number of Hopping Frequency” of this document. The 0.125watts (20.97 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

10.1 Test Procedure

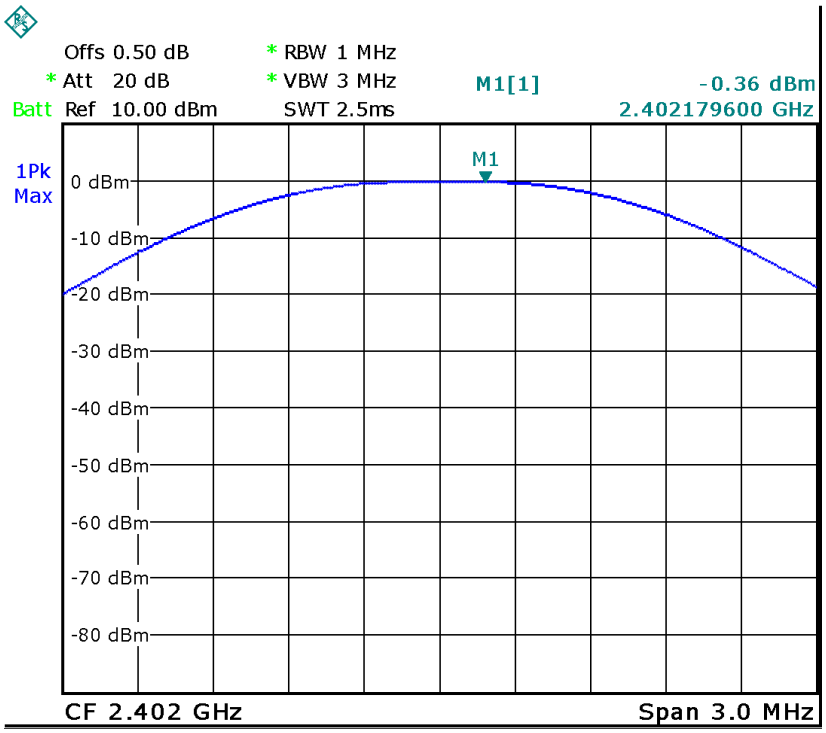
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW≥20dB bandwidth. VBW =3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result

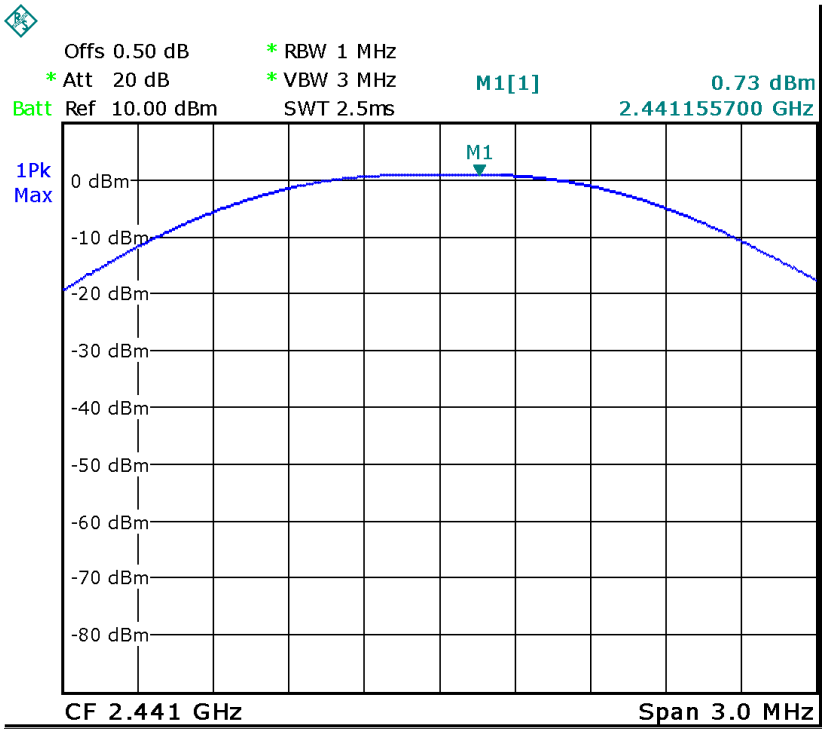
Modulation	Test Channel	Output Power (dBm)	Limit (dBm)
GFSK	Low	-0.36	30
GFSK	Middle	0.73	30
GFSK	High	1.49	30
Pi/4 DQPSK	Low	-0.68	30
Pi/4 DQPSK	Middle	-0.20	30
Pi/4 DQPSK	High	-0.04	30
8DPSK	Low	-0.94	30
8DPSK	Middle	-0.70	30
8DPSK	High	-0.15	30

Test plots

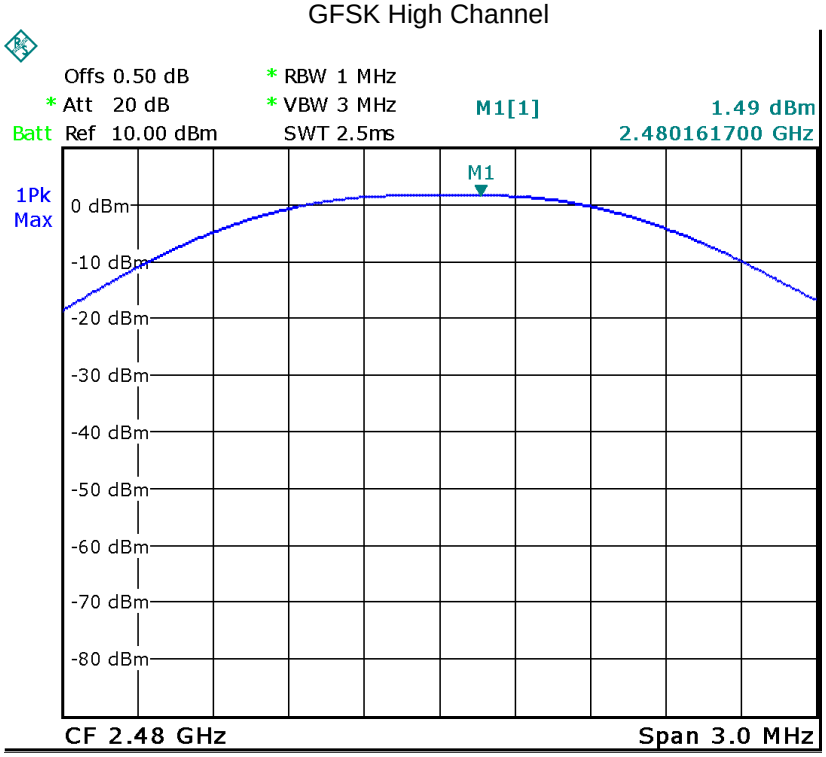
GFSK Low Channel



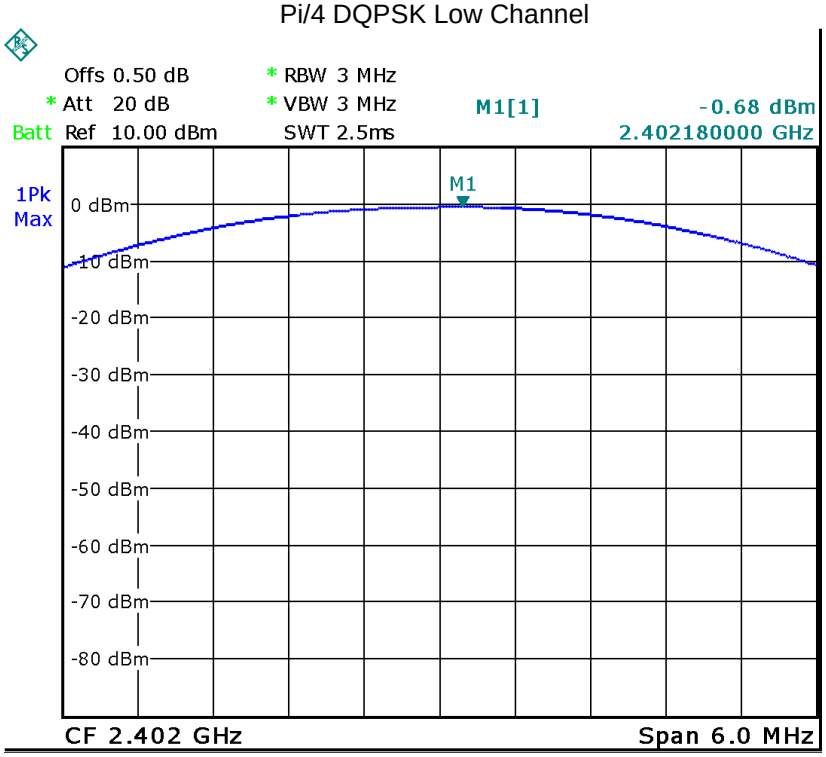
GFSK Middle Channel



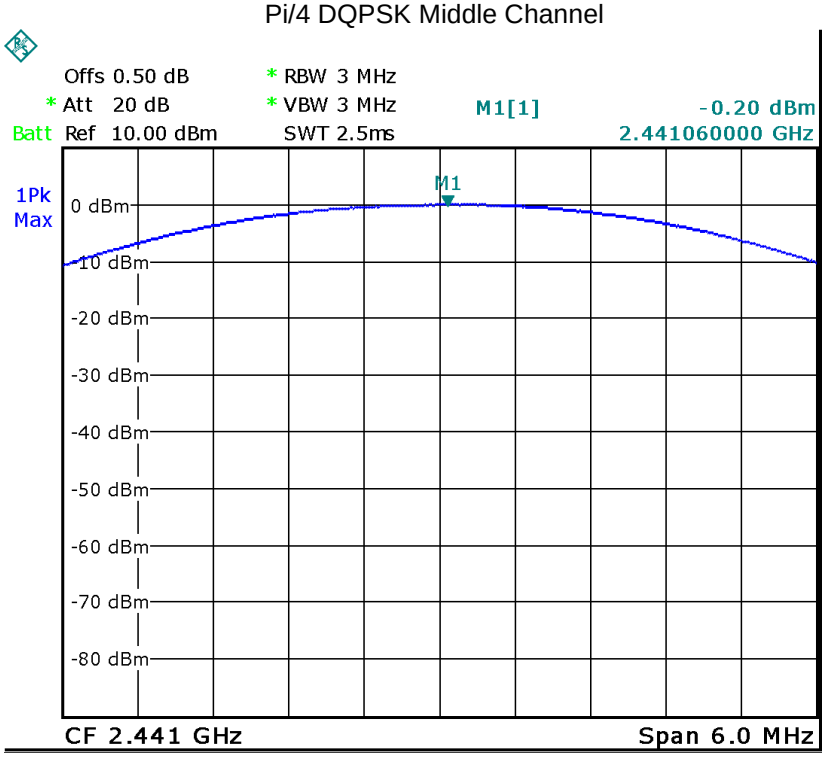
GFSK High Channel



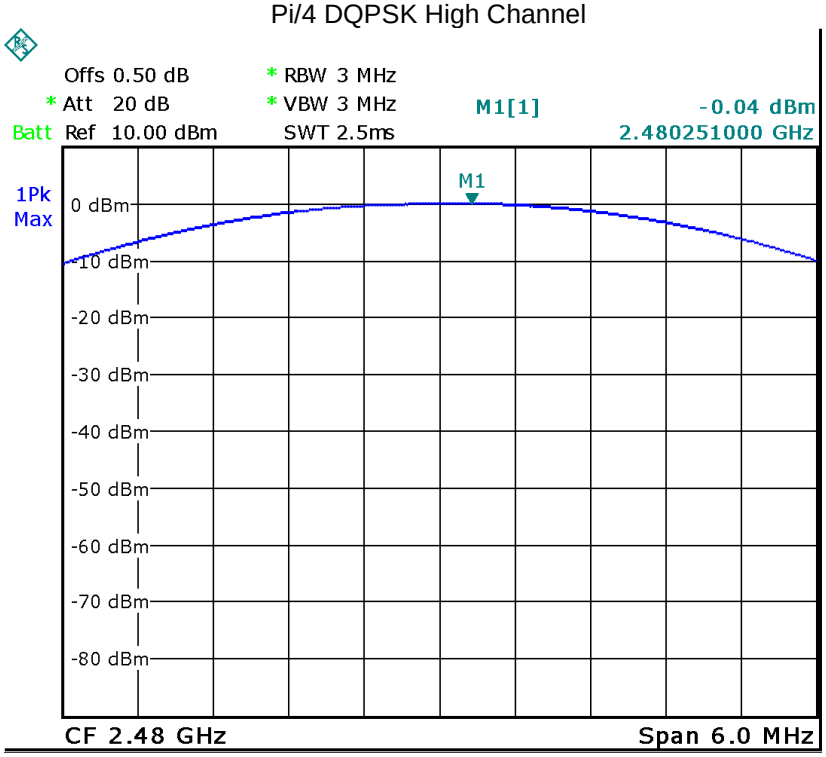
Pi/4 DQPSK Low Channel



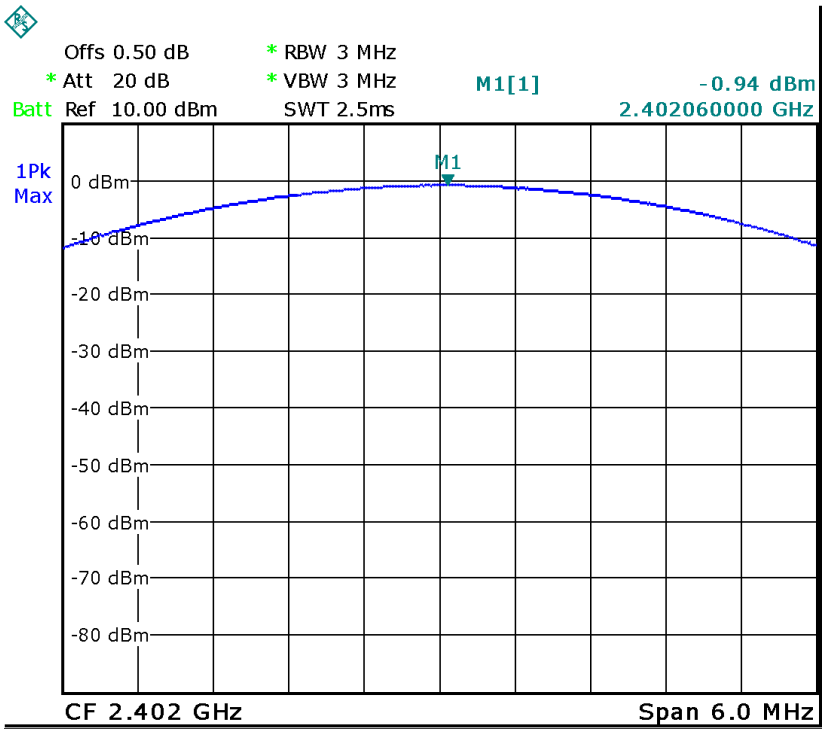
Pi/4 DQPSK Middle Channel



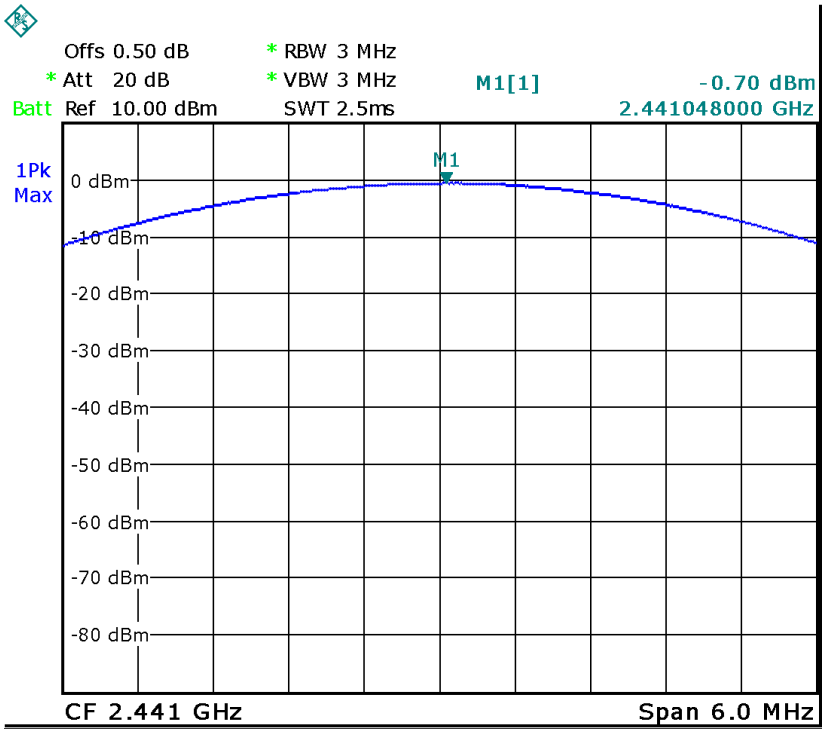
Pi/4 DQPSK High Channel



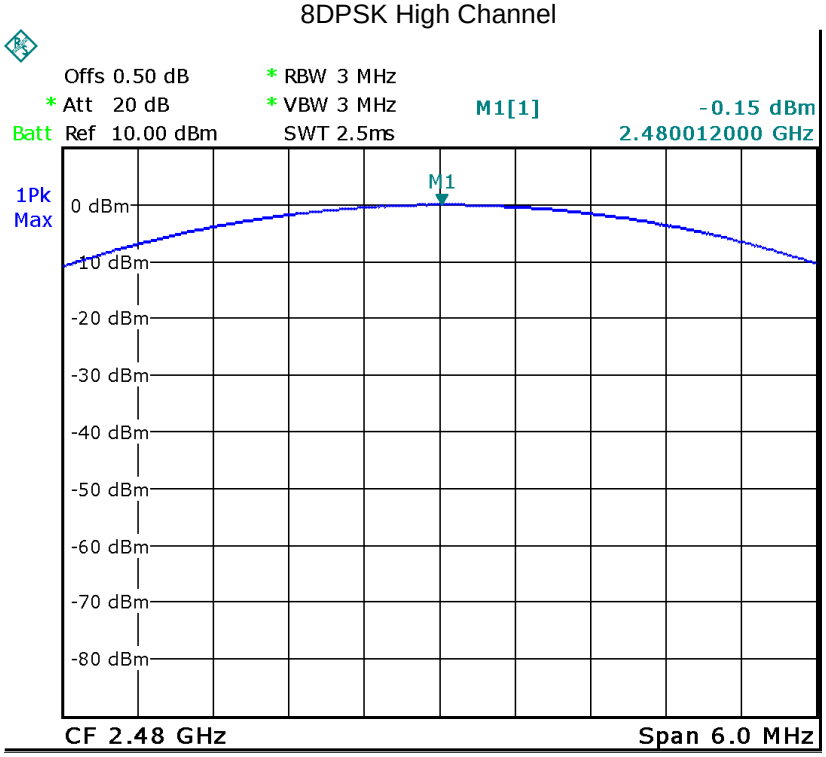
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



11 Hopping Channel Separation

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Limit: Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 1W.

Test Mode: Test in hopping transmitting operating mode.

11.1 Test Procedure

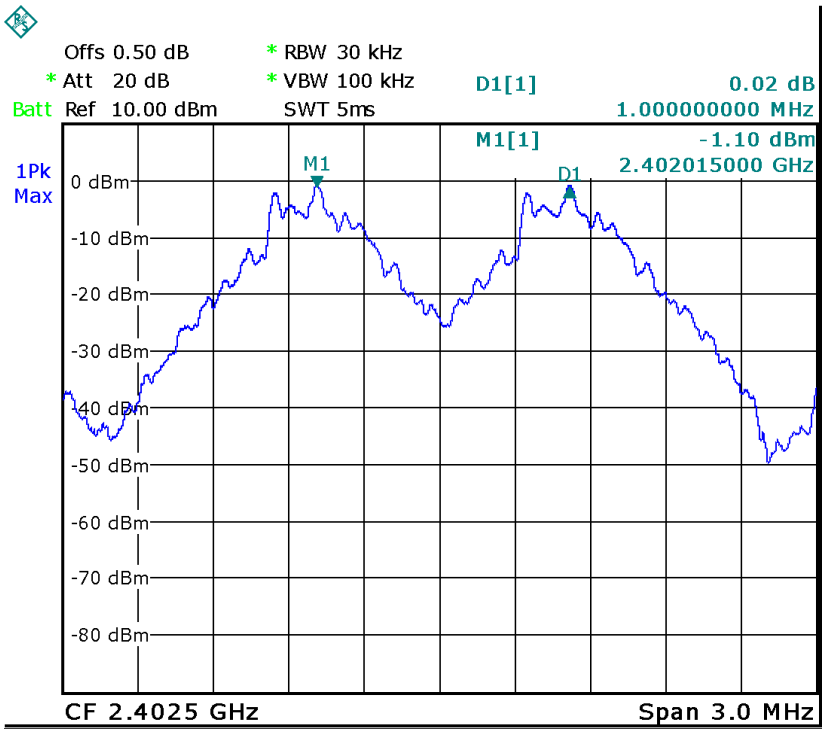
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30KHz. VBW = 100KHz , Span = 3MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.2 Test Result

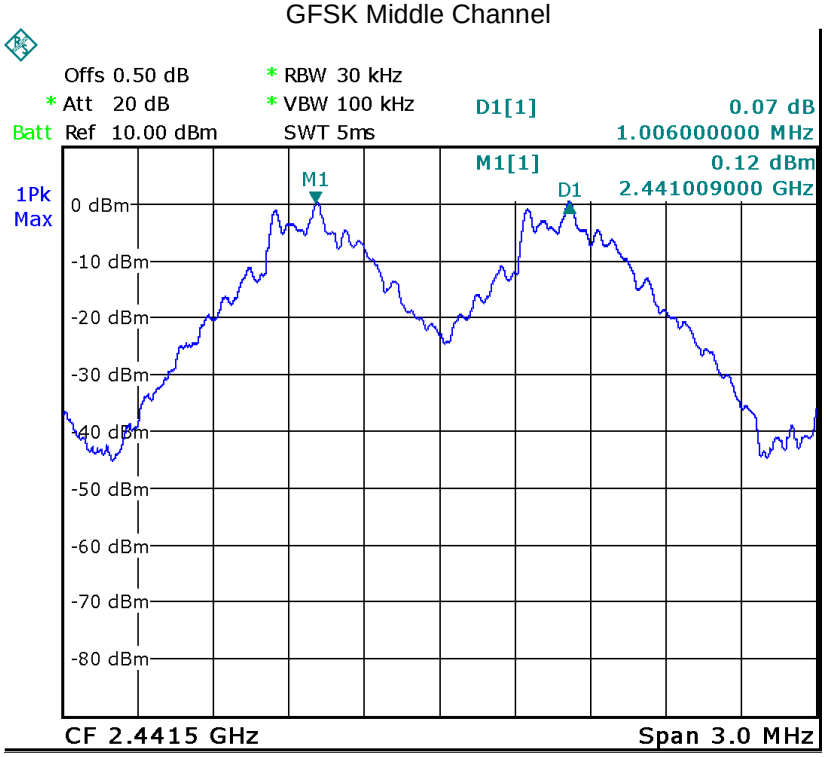
Modulation	Test Channel	Separation (MHz)	Result
GFSK	Low	1.000	PASS
GFSK	Middle	1.006	PASS
GFSK	High	1.000	PASS
Pi/4 DQPSK	Low	1.000	PASS
Pi/4 DQPSK	Middle	1.006	PASS
Pi/4 DQPSK	High	1.006	PASS
8DPSK	Low	1.000	PASS
8DPSK	Middle	1.000	PASS
8DPSK	High	1.000	PASS

Test plots

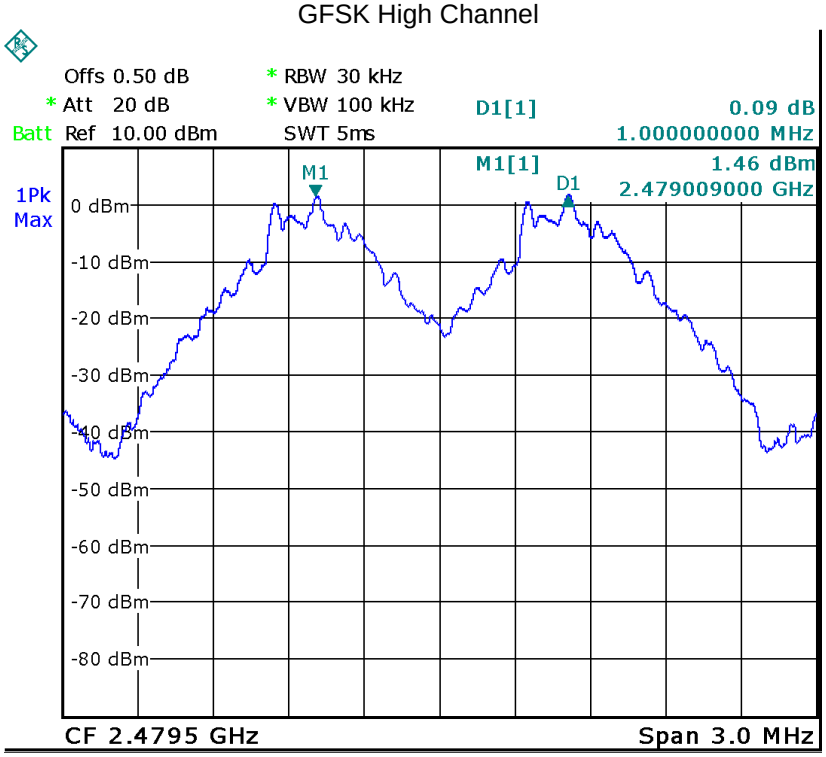
GFSK Low Channel



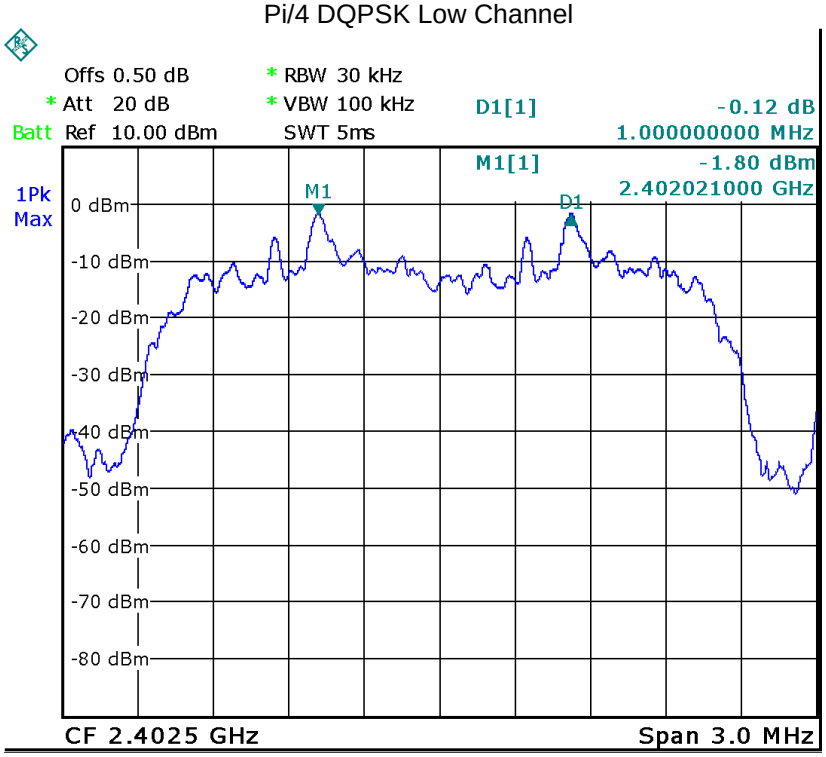
GFSK Middle Channel



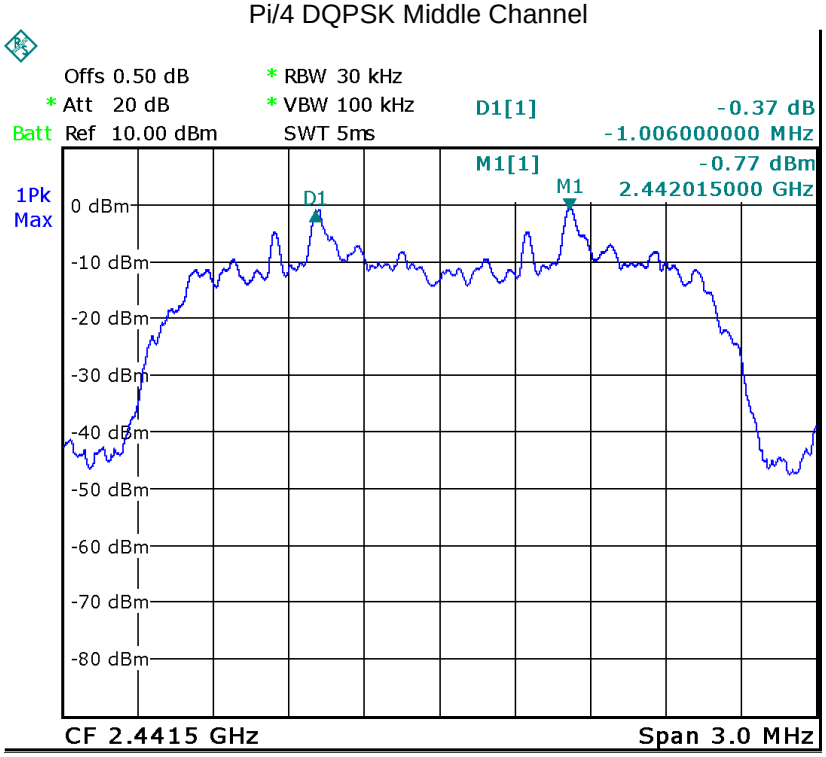
GFSK High Channel



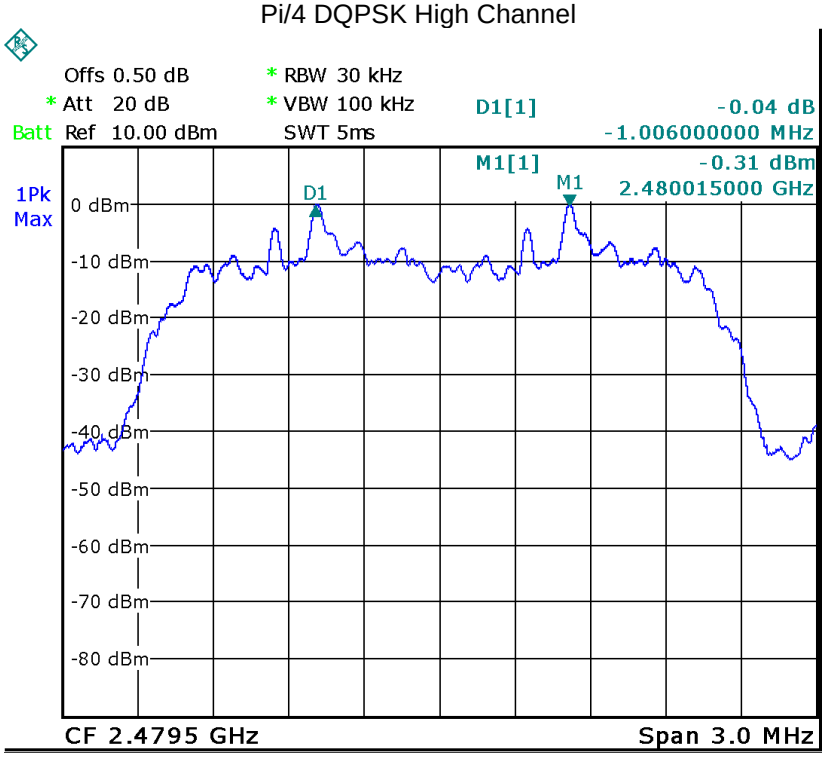
Pi/4 DQPSK Low Channel



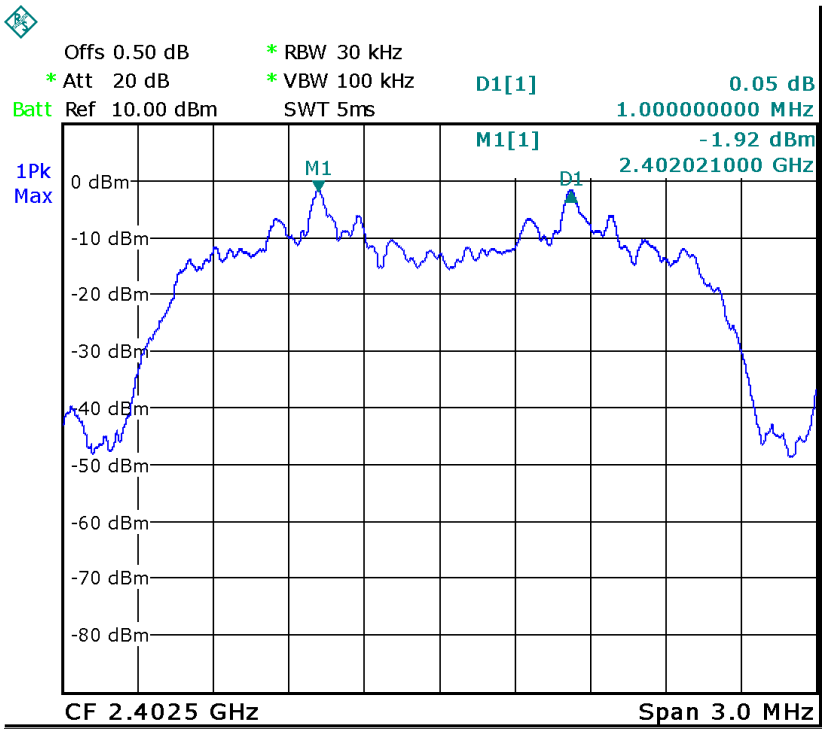
Pi/4 DQPSK Middle Channel



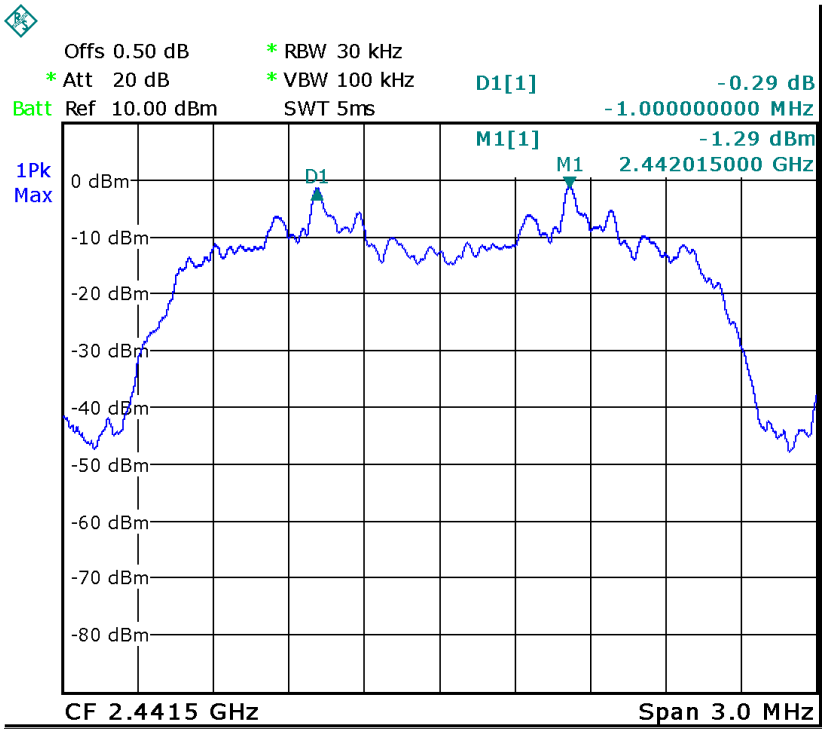
Pi/4 DQPSK High Channel



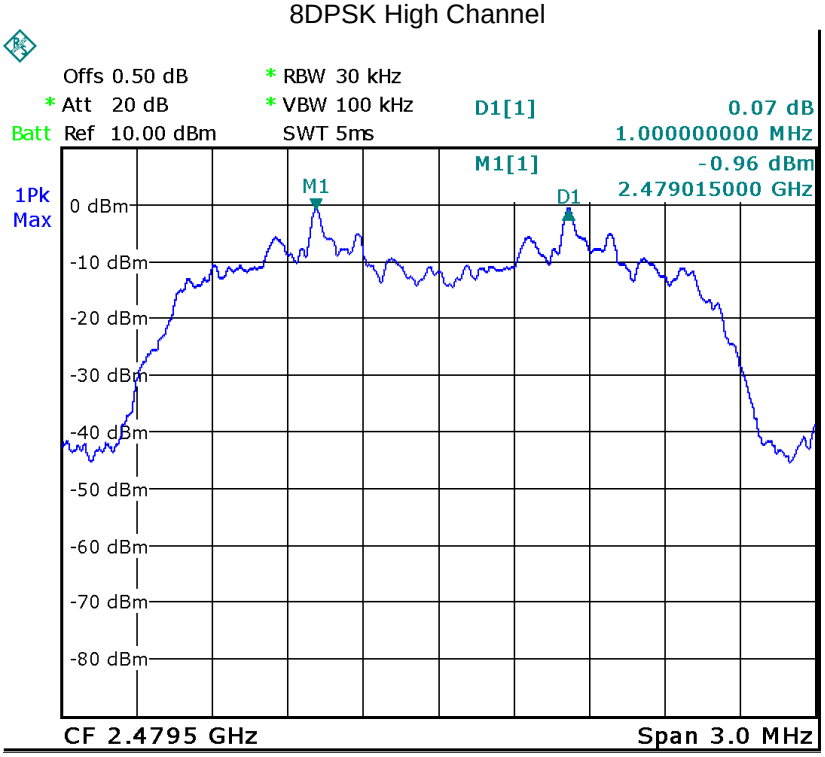
8DPSK Low Channel



8DPSK Middle Channel



8DPSK High Channel



12 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

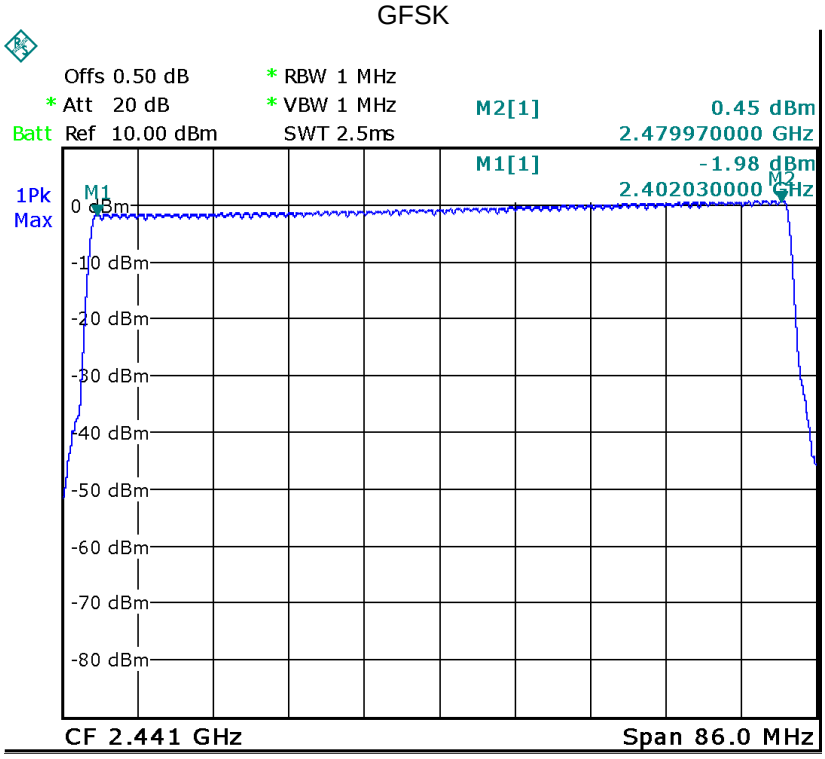
12.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 1MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.483GHz. Sweep=auto;

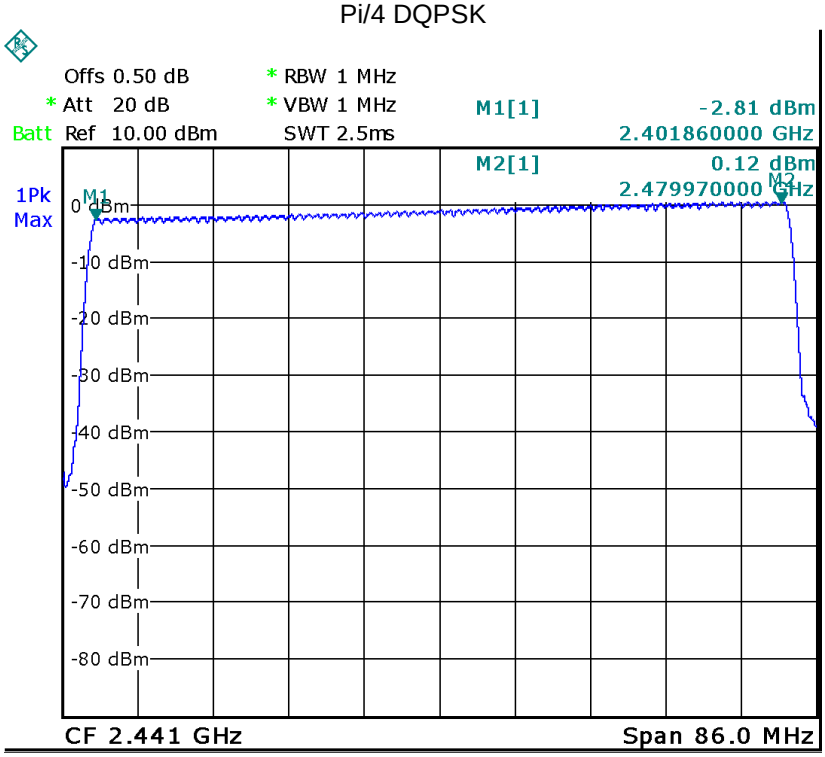
12.2 Test Result

Test Plots: 79 Channels in total

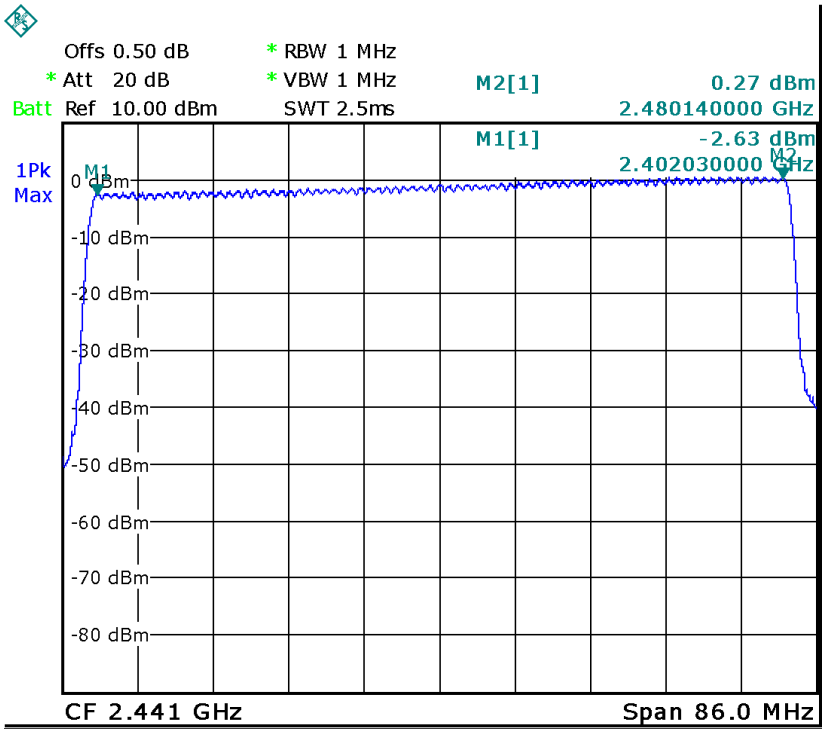
GFSK



Pi/4 DQPSK



8DPSK



13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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.
Test Mode:	Test in hopping transmitting operating mode.

13.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set spectrum analyzer span = 0. Centred on a hopping channel;

3. Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.

4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

13.2 Test Result

DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

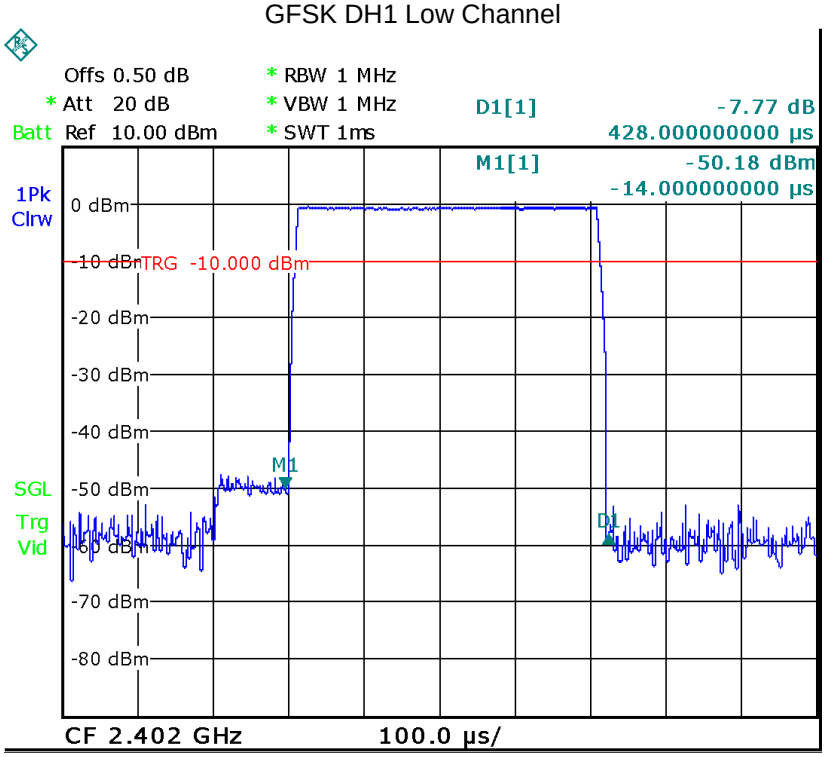
DH1 Packet permit maximum 1600 / 79 /2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

Data Packet	Dwell Time(s)
DH5	1600/79/6*0.4*79*(MkrDelta)/1000
DH3	1600/79/4*0.4*79*(MkrDelta)/1000
DH1	1600/79/2*0.4*79*(MkrDelta)/1000
Remark: Mkr Delta is once pulse time.	

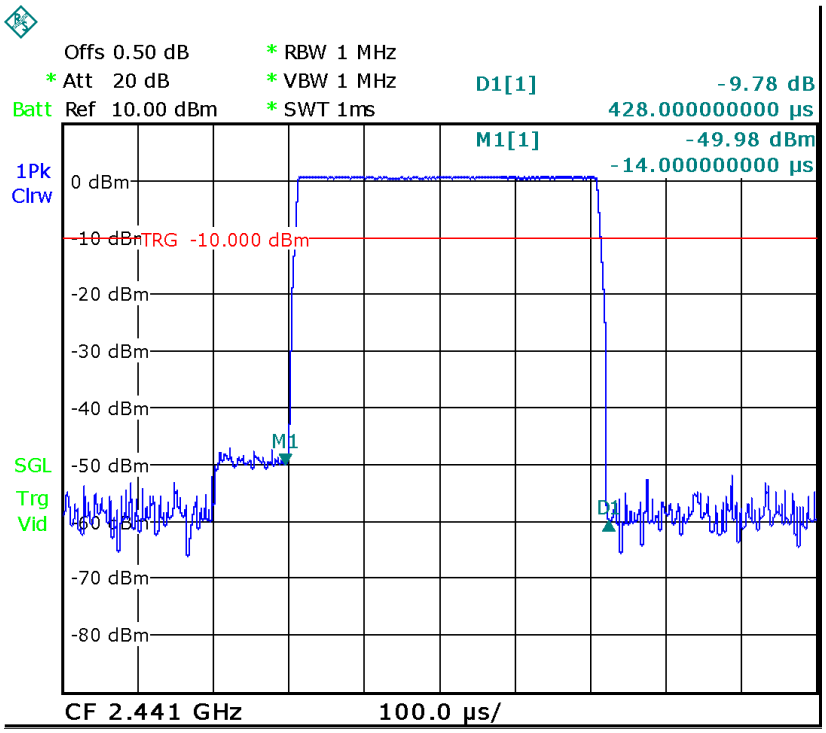
Modulation	Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	DH1	Low	0.428	0.137	0.4
		middle	0.428	0.137	0.4
		High	0.428	0.137	0.4
	DH3	Low	1.702	0.272	0.4
		middle	1.702	0.272	0.4
		High	1.702	0.272	0.4
	DH5	Low	2.956	0.315	0.4
		middle	2.956	0.315	0.4
		High	2.956	0.315	0.4
Pi/4DQPSK	DH1	Low	0.440	0.141	0.4
		middle	0.440	0.141	0.4
		High	0.440	0.141	0.4
	DH3	Low	1.708	0.273	0.4
		middle	1.708	0.273	0.4
		High	1.708	0.273	0.4
	DH5	Low	2.972	0.317	0.4
		middle	2.972	0.317	0.4
		High	2.972	0.317	0.4
8DPSK	DH1	Low	0.442	0.141	0.4
		middle	0.442	0.141	0.4
		High	0.440	0.141	0.4
	DH3	Low	1.708	0.273	0.4
		middle	1.708	0.273	0.4
		High	1.708	0.273	0.4
	DH5	Low	2.980	0.318	0.4
		middle	2.980	0.318	0.4
		High	2.980	0.318	0.4

Test Plots

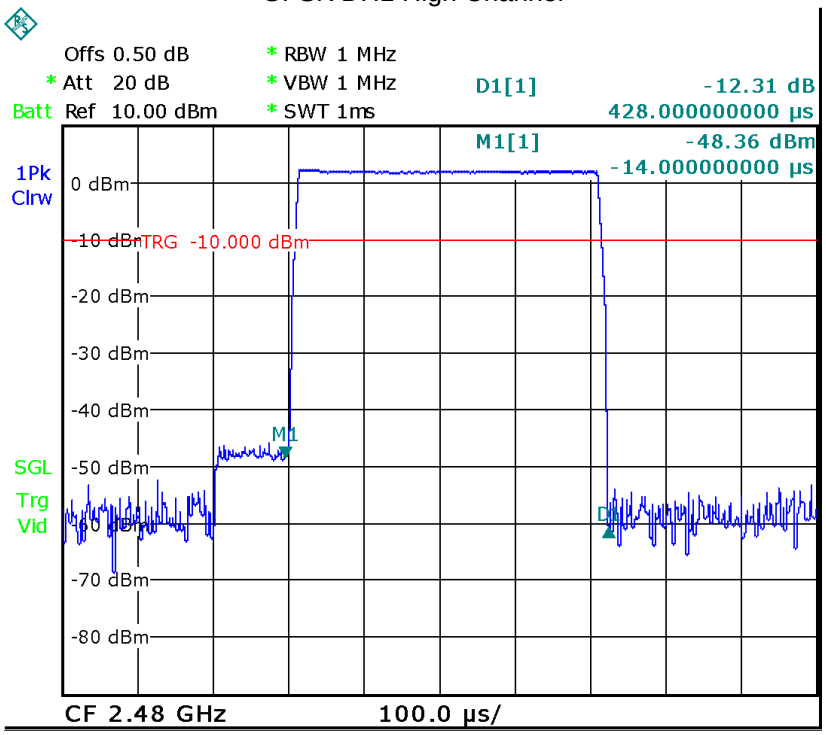
GFSK DH1 Low Channel



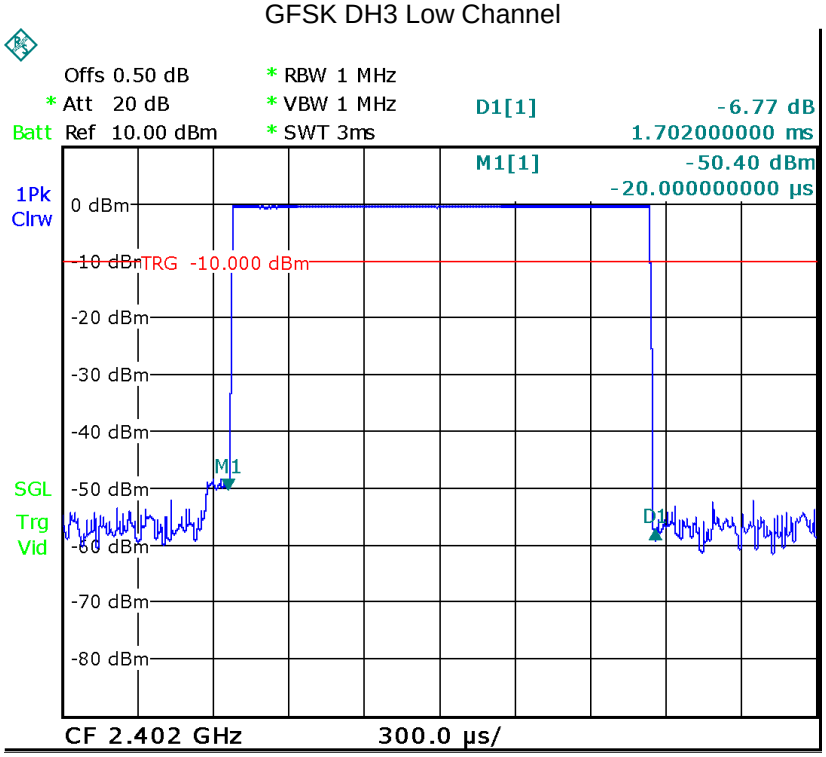
GFSK DH1 Middle Channel



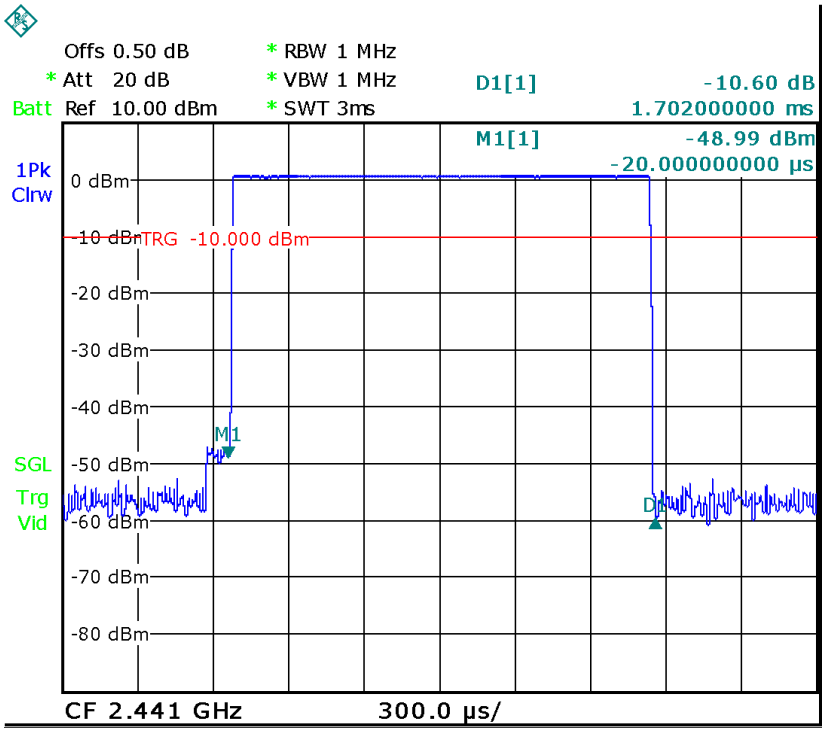
GFSK DH1 High Channel



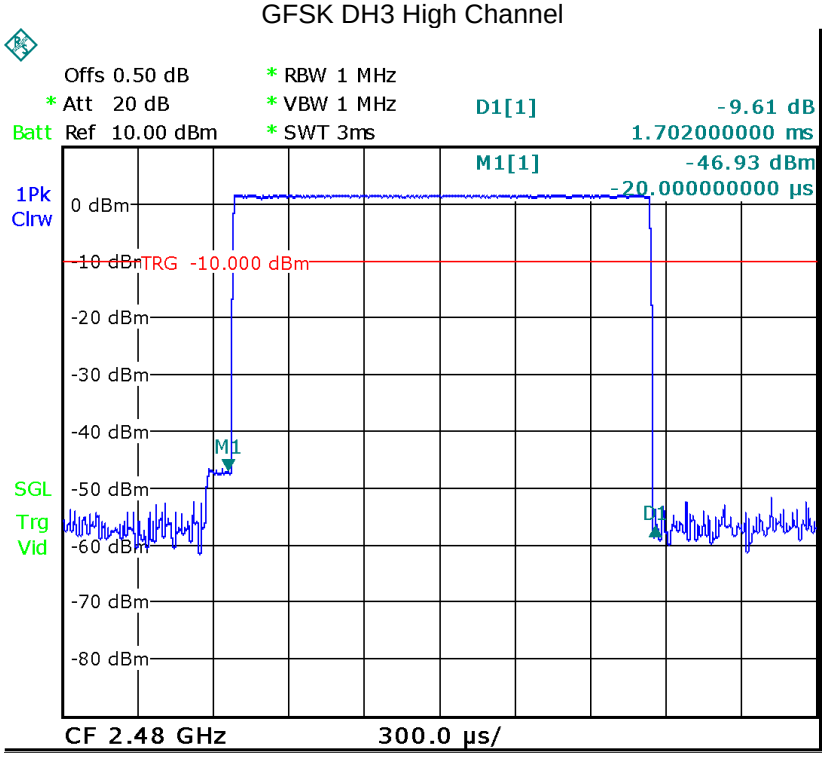
GFSK DH3 Low Channel



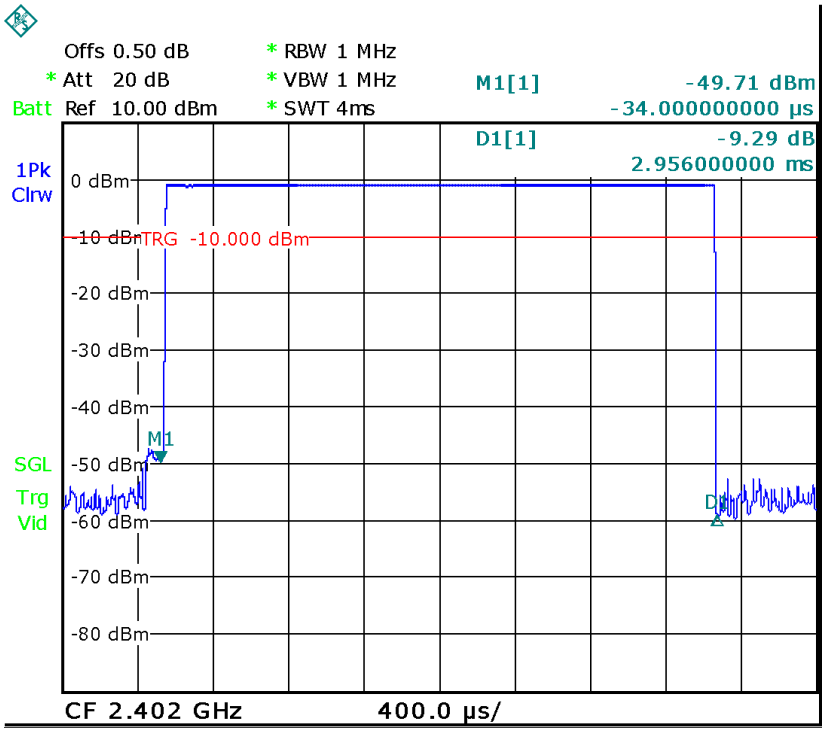
GFSK DH3 Middle Channel



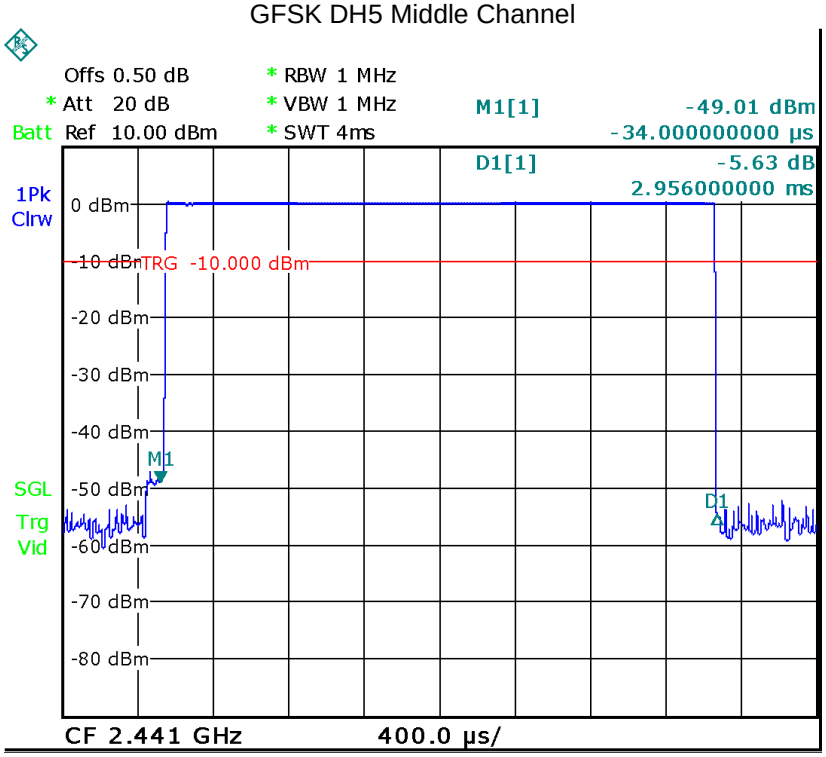
GFSK DH3 High Channel



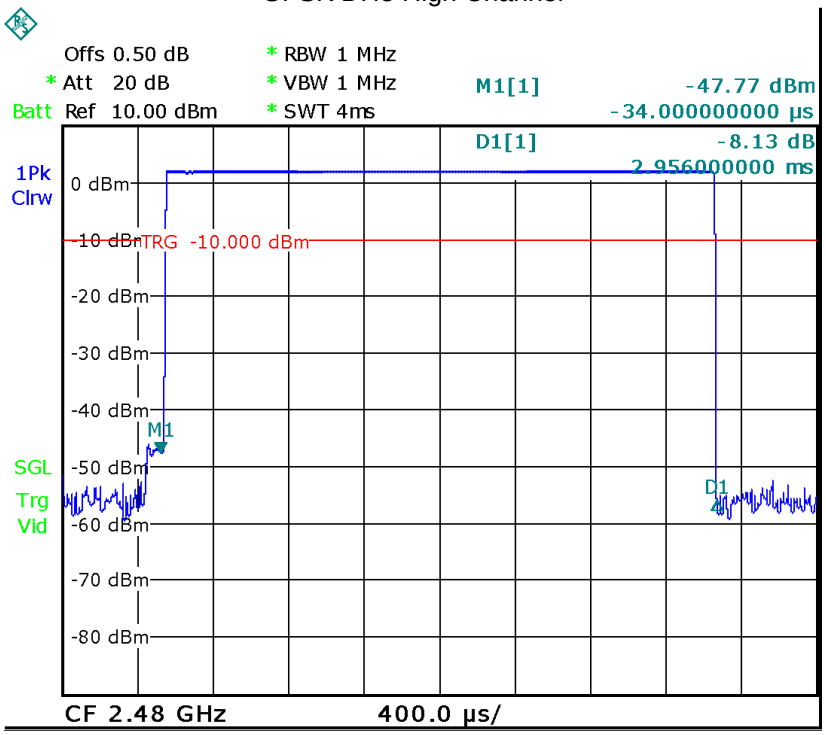
GFSK DH5 Low Channel



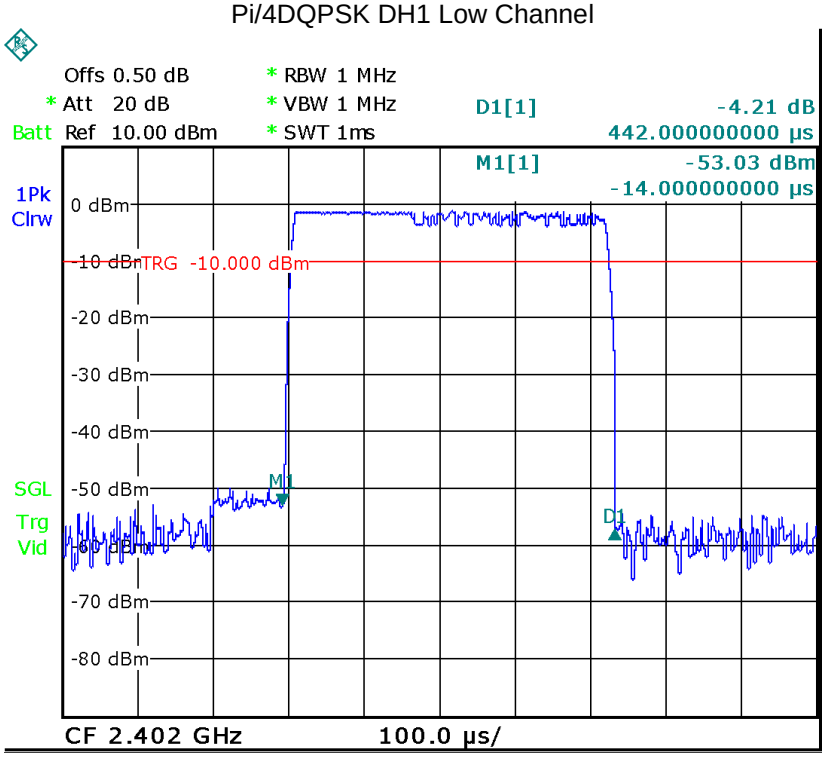
GFSK DH5 Middle Channel



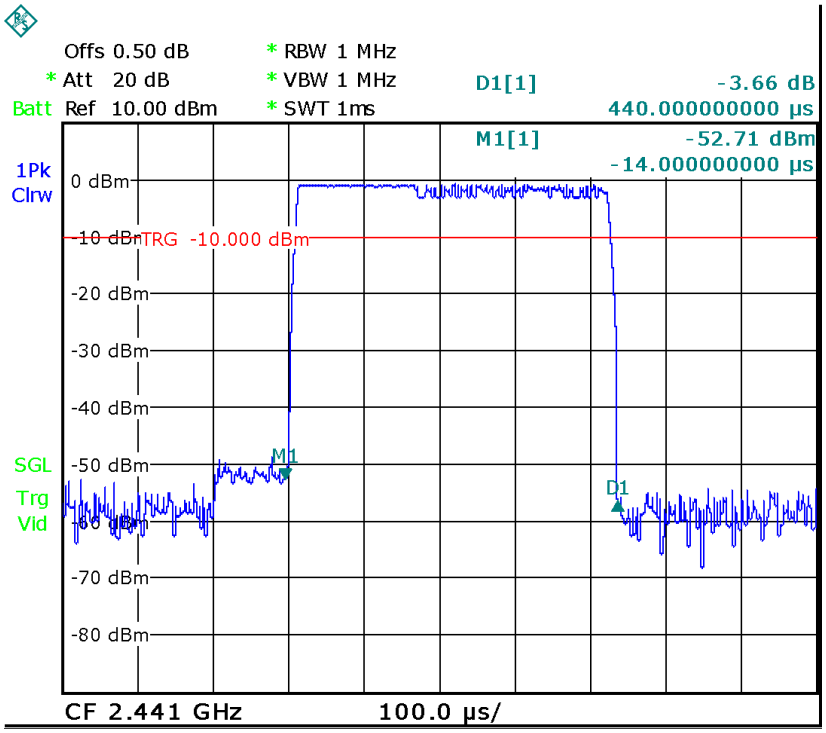
GFSK DH5 High Channel



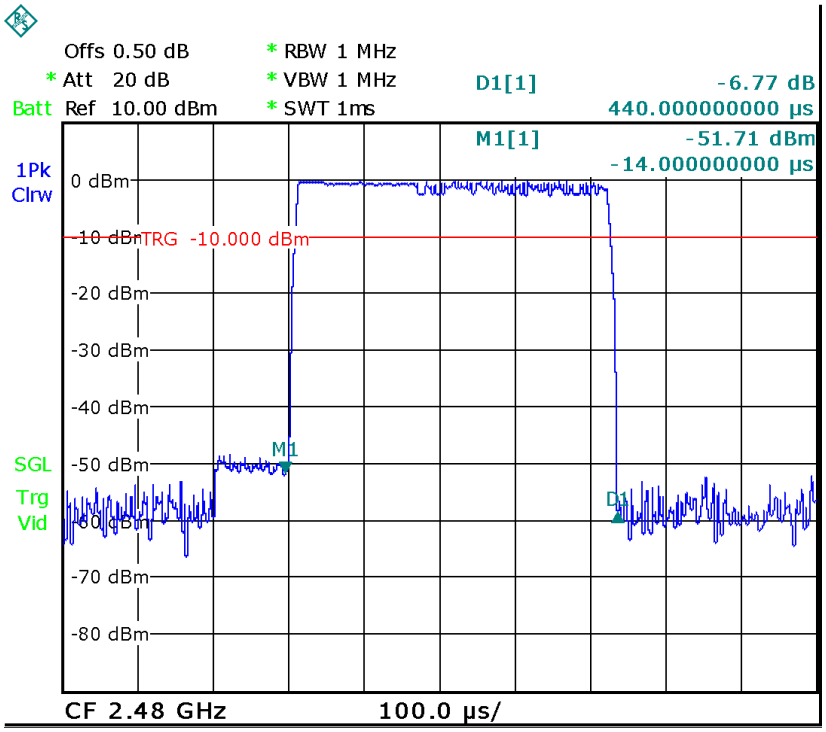
Pi/4DQPSK DH1 Low Channel



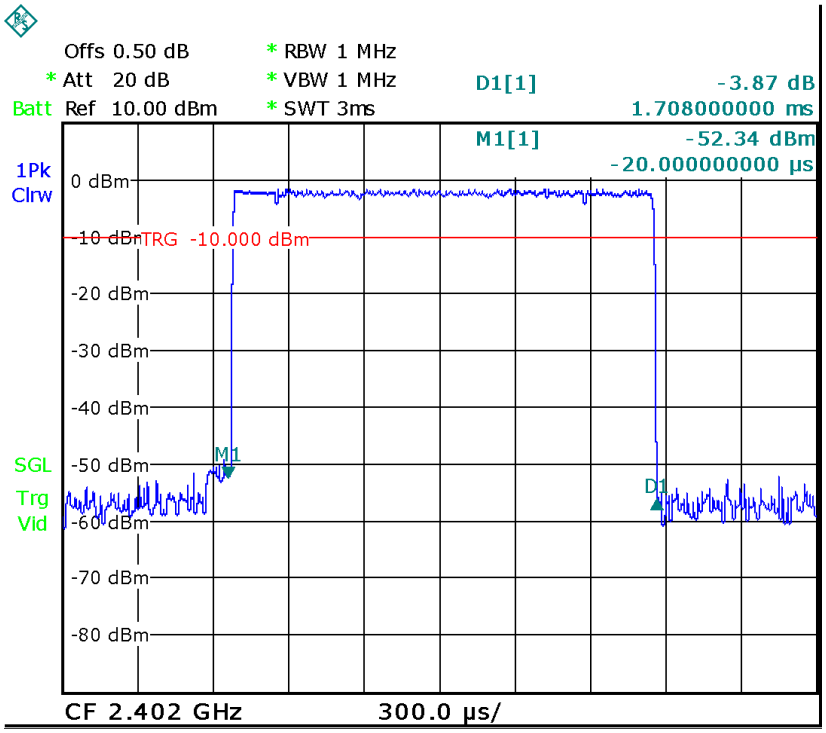
Pi/4DQPSK DH1 Middle Channel



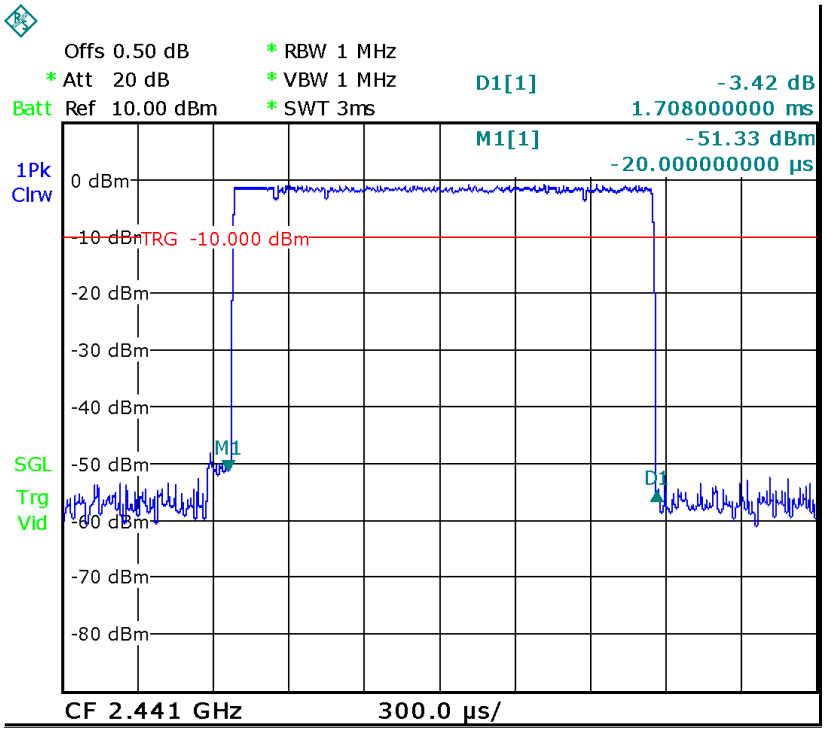
Pi/4DQPSK DH1 High Channel



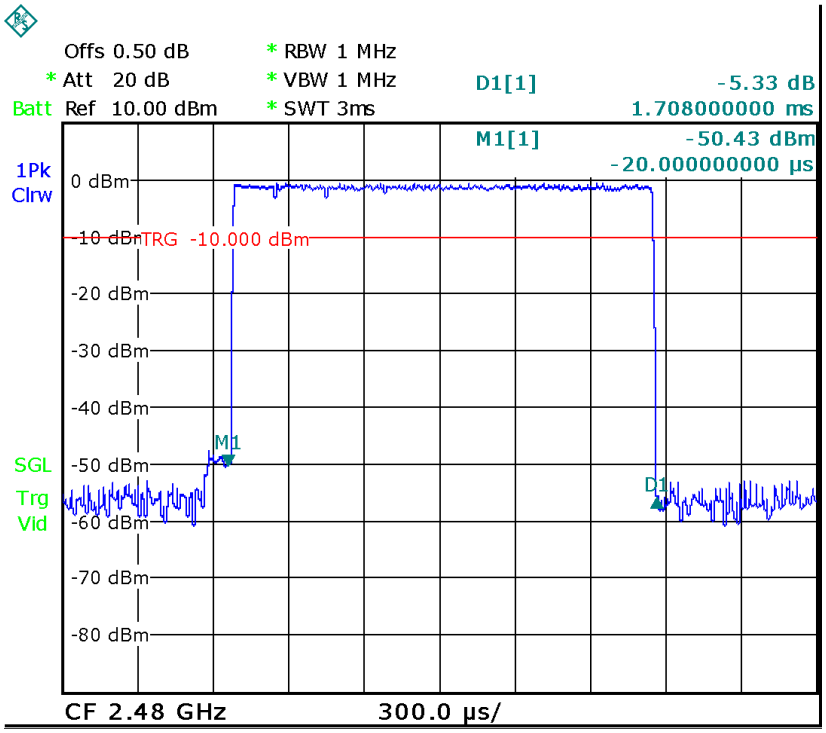
Pi/4DQPSK DH3 Low Channel



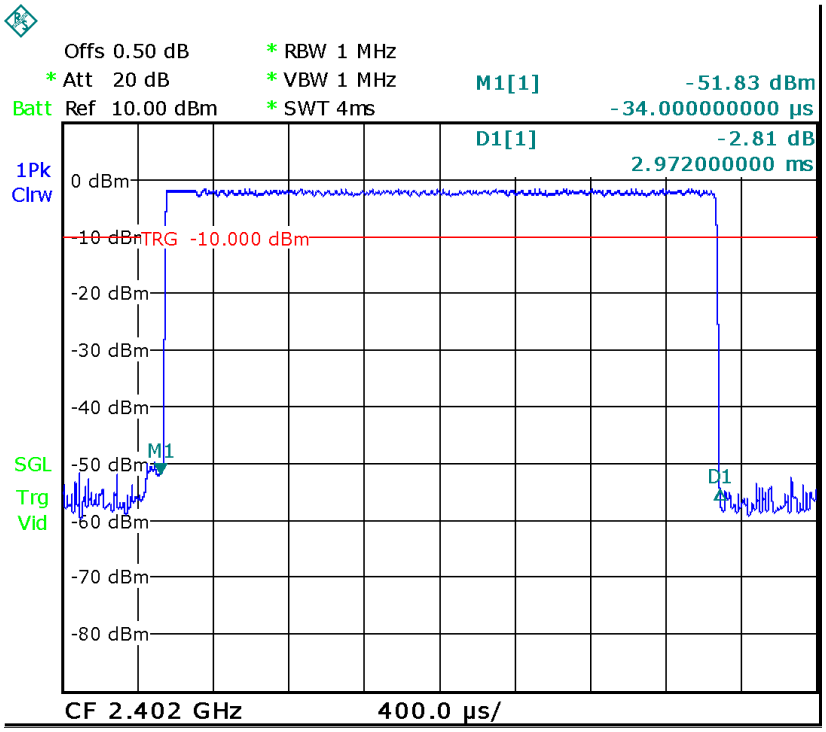
Pi/4DQPSK DH3 Middle Channel



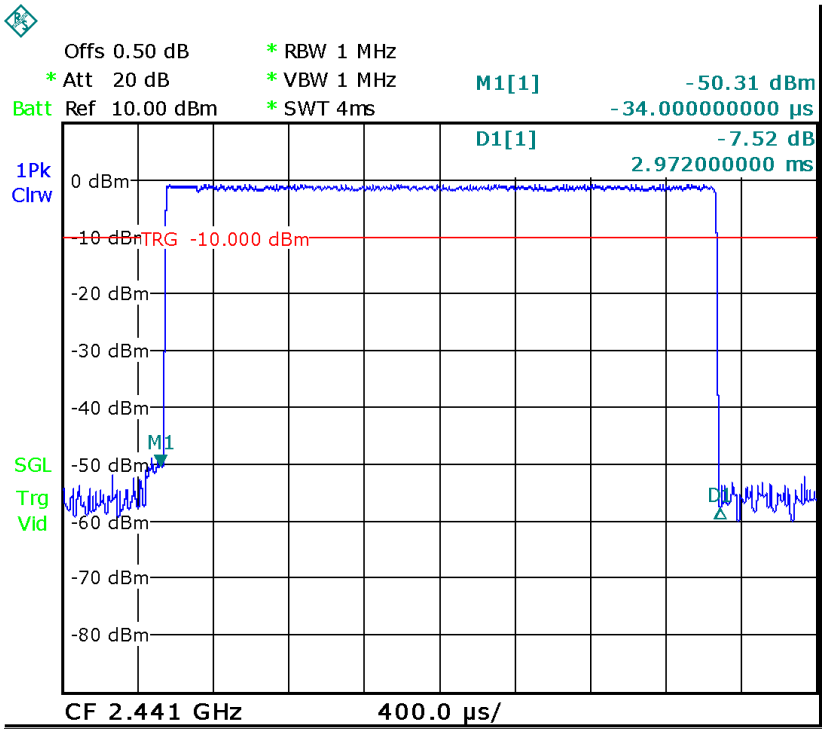
Pi/4DQPSK DH3 High Channel



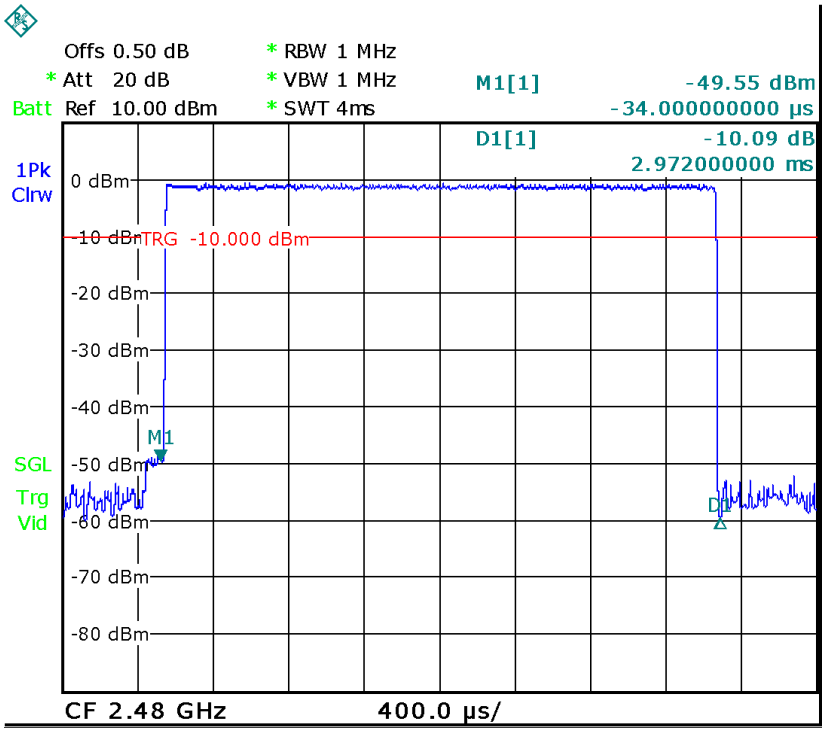
Pi/4DQPSK DH5 Low Channel



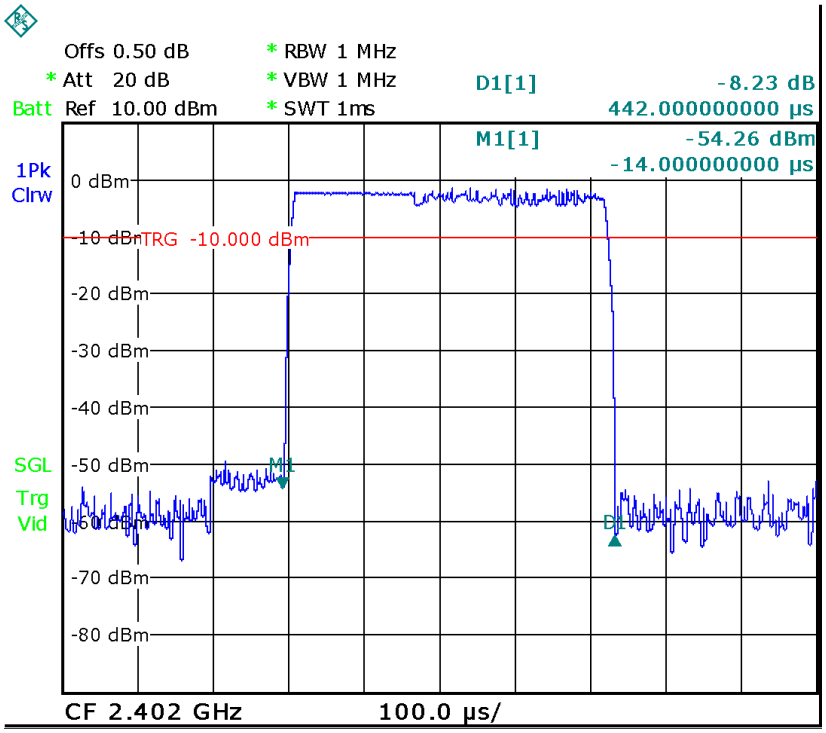
Pi/4DQPSK DH5 Middle Channel



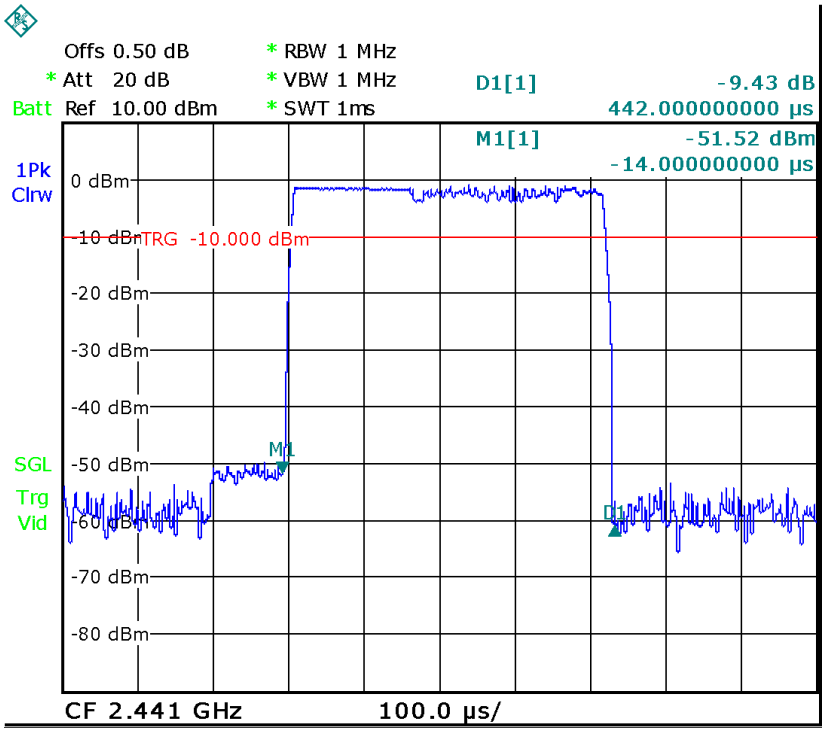
Pi/4DQPSK DH5 High Channel



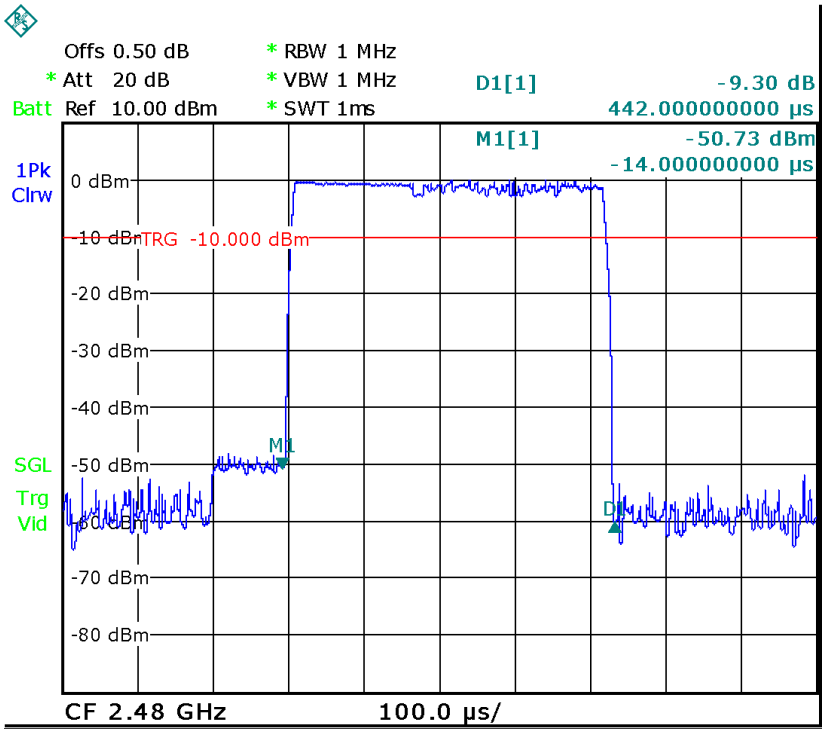
8DPSK DH1 Low Channel



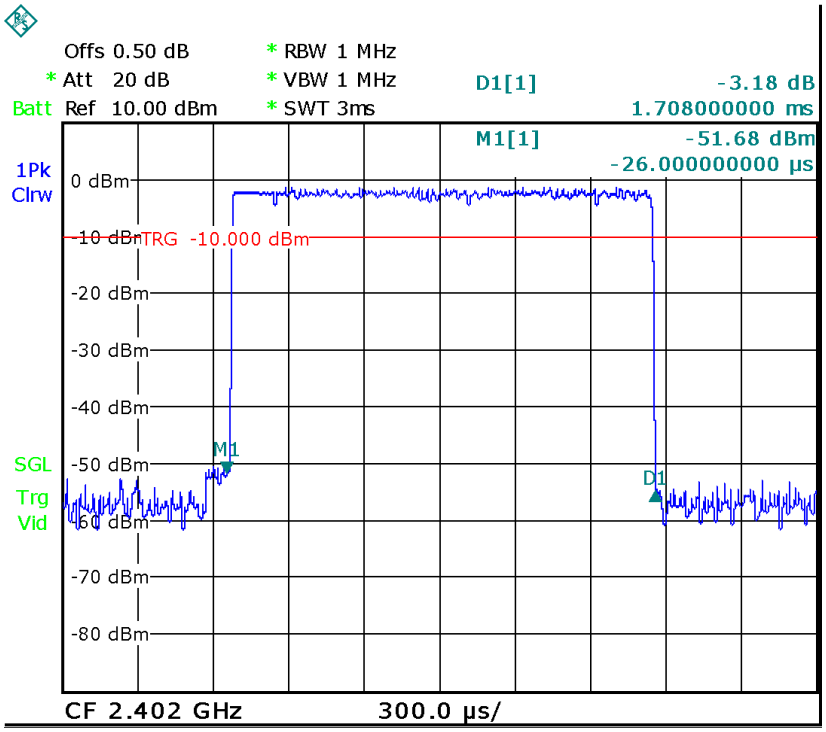
8DPSK DH1 Middle Channel



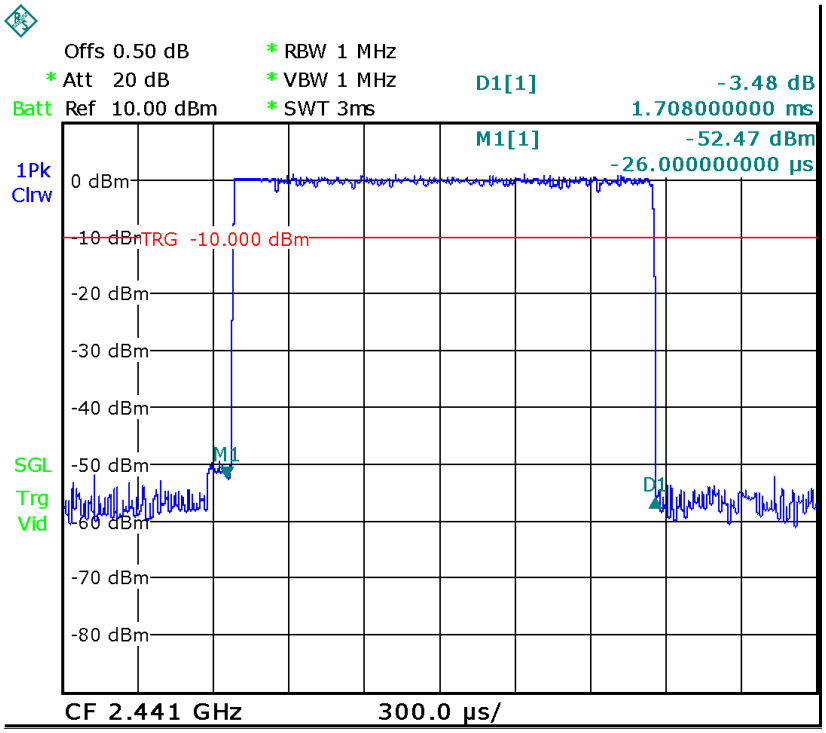
8DPSK DH1 High Channel



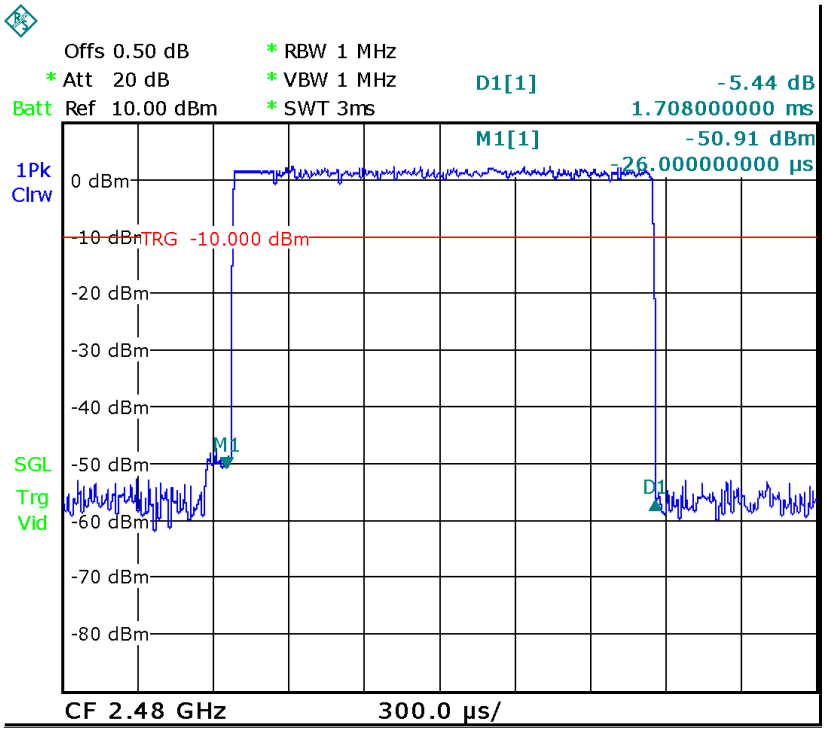
8DPSK: DH3 Low Channel



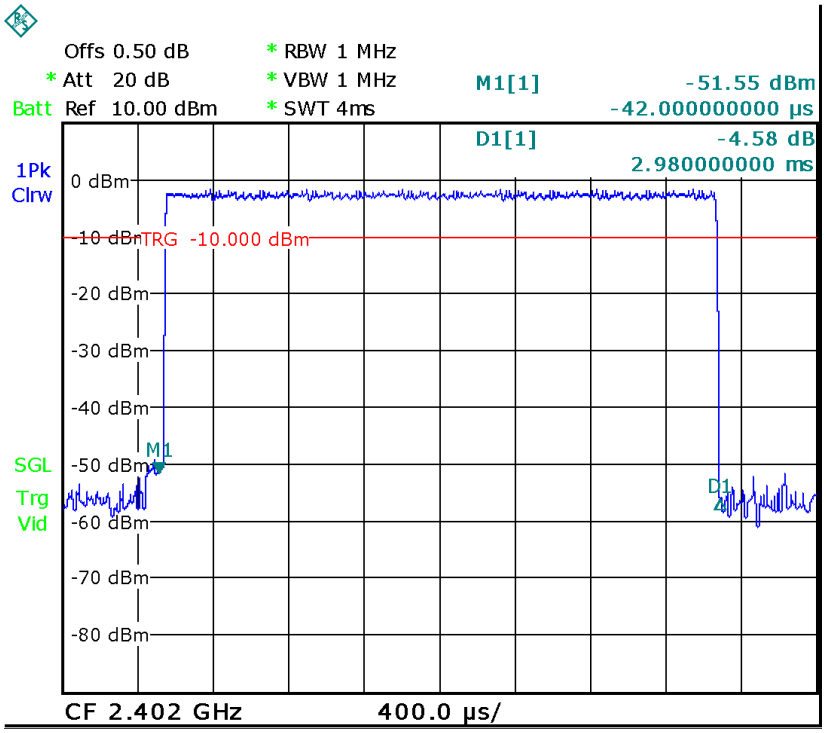
8DPSK DH3 Middle Channel



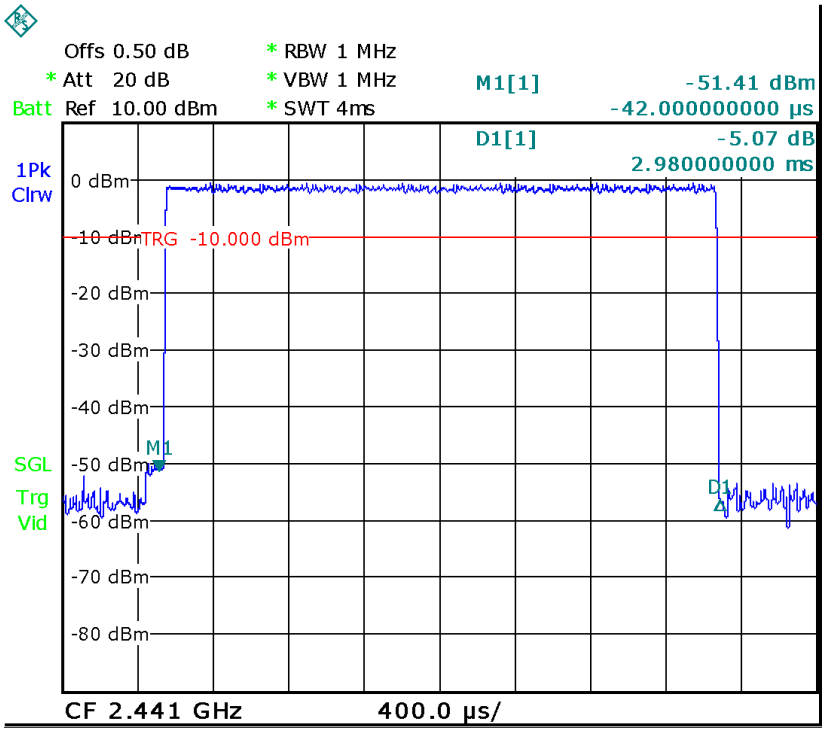
8DPSK DH3 High Channel



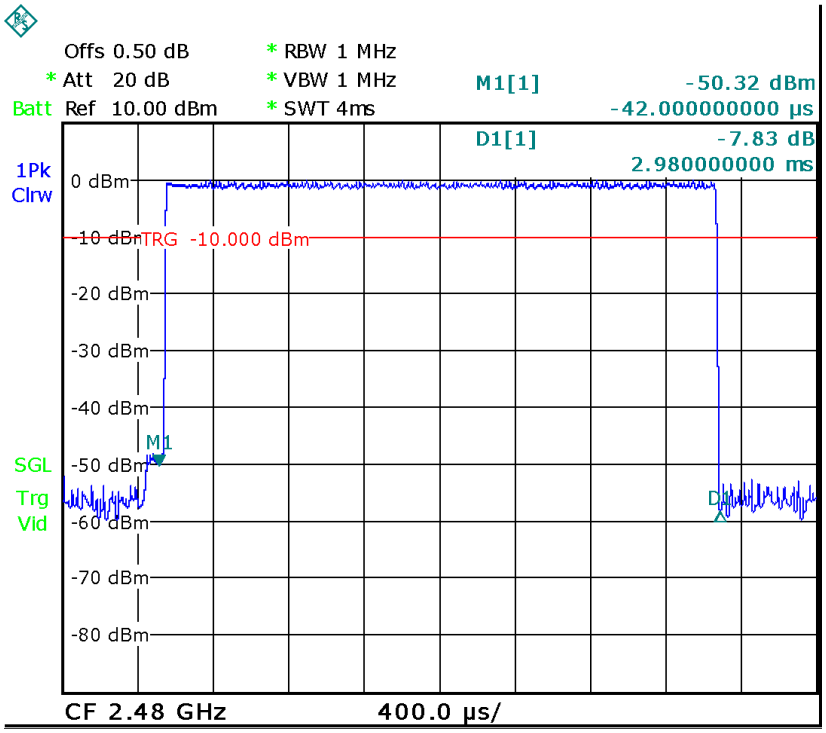
8DPSK DH5 Low Channel



8DPSK DH5 Middle Channel



8DPSK DH5 High Channel



14 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, 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. This product has a internal permanent antenna (The whorl is non-standard, it only apply to this model), fulfil the requirement of this section.

15 RF Exposure

Test Requirement: FCC Part 1.1307

Evaluation Method: FCC Part 2.1091

15.1 Requirements

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

15.2 The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

15.3 MPE Calculation Method

E (V/m) $= \frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) $= \frac{E^2}{377}$

E = Electric field (V/m)
P = Peak RF output power (W)
G = EUT Antenna numeric gain (numeric)
d = Separation distance between radiator and human body (m)
The formula can be changed to

Pd $= \frac{30 \times P \times G}{377 \times d^2}$

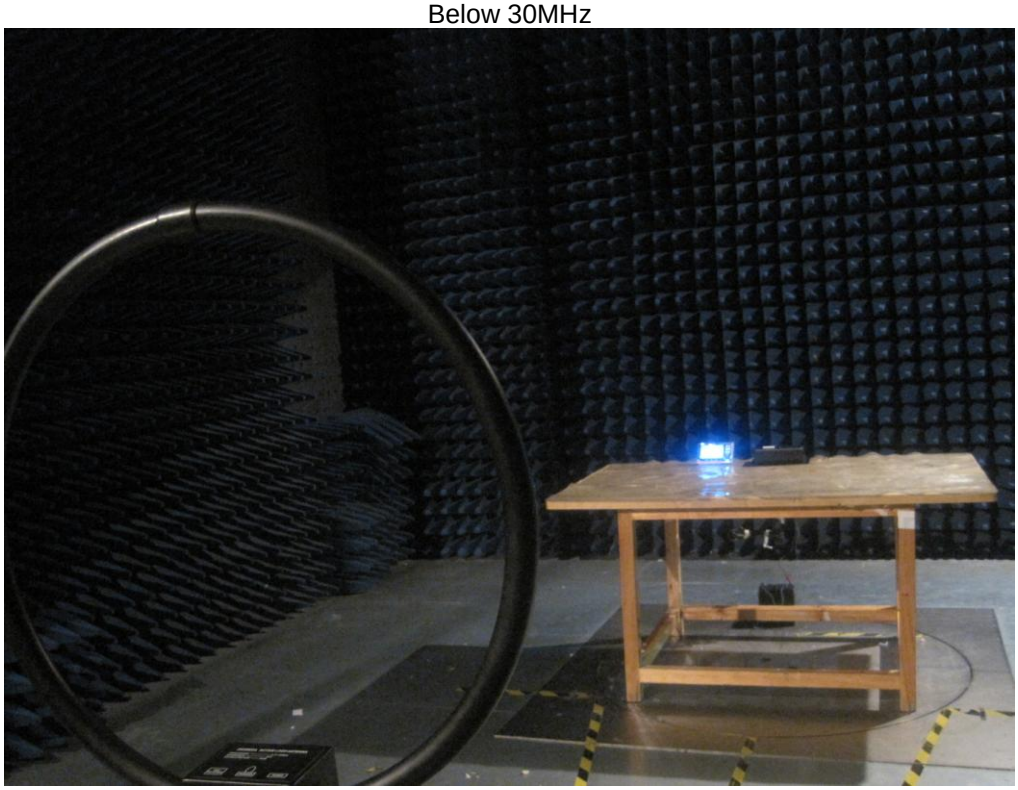
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (mW/cm2)	Limit of Power Density (mW/cm2)
1.000	1.49	1.409	0.000280	1

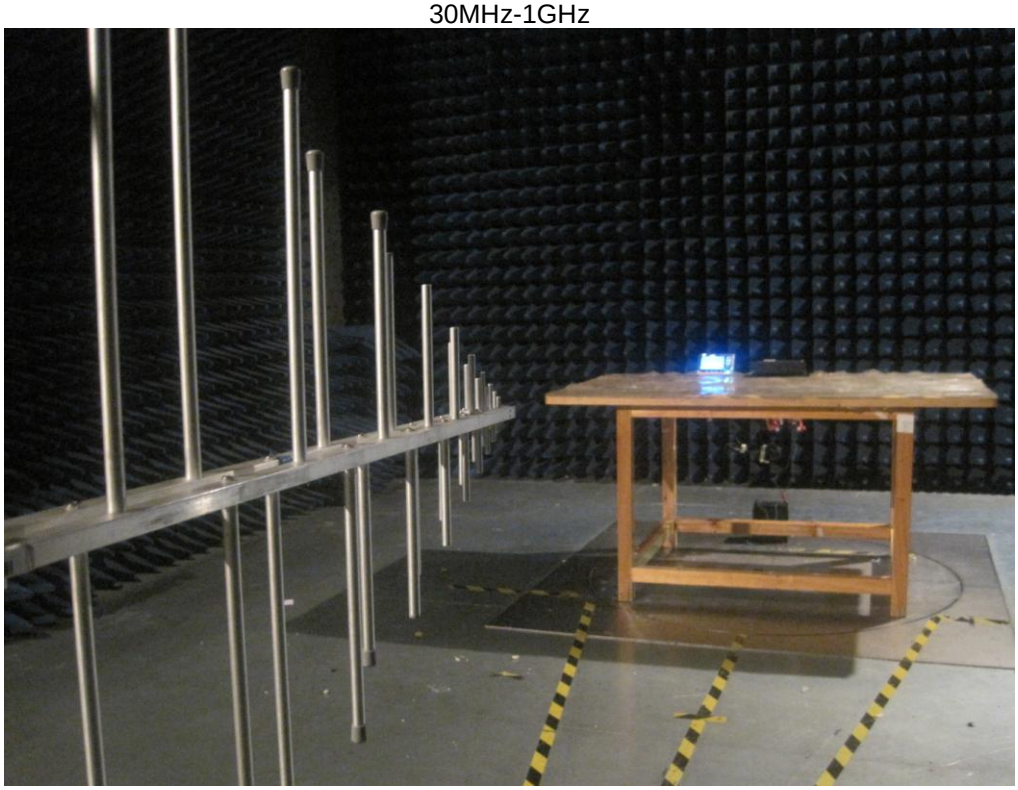
16 Photographs –Test Setup

16.1 Photograph – Radiation Spurious Emission Test Setup

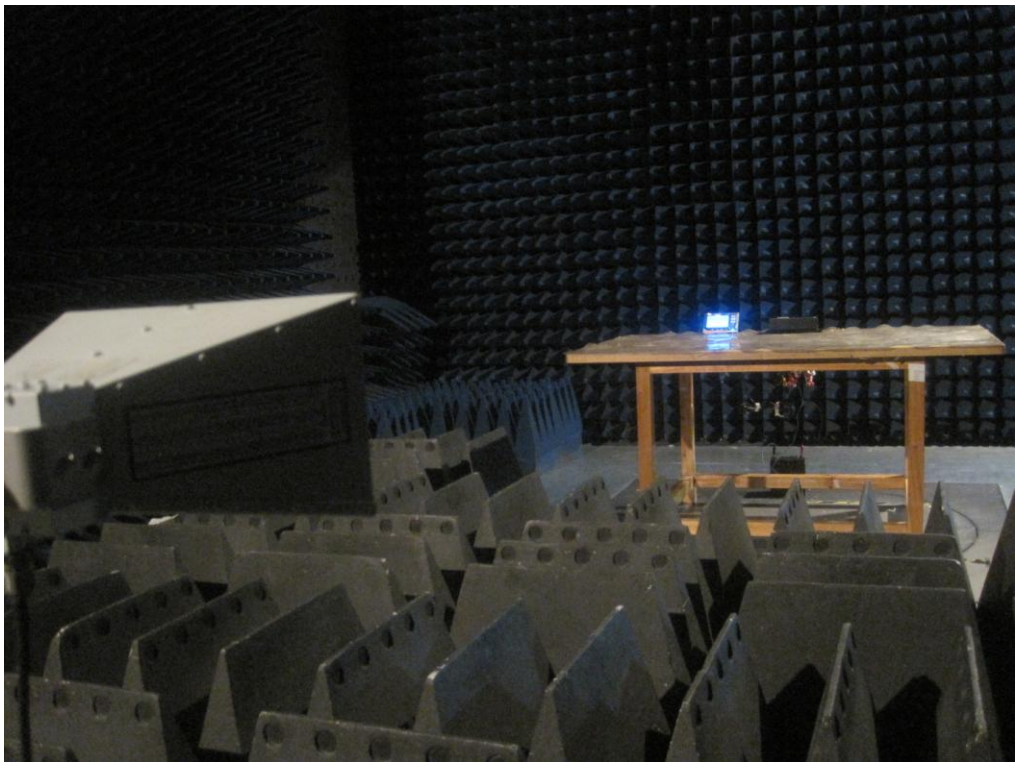
Below 30MHz

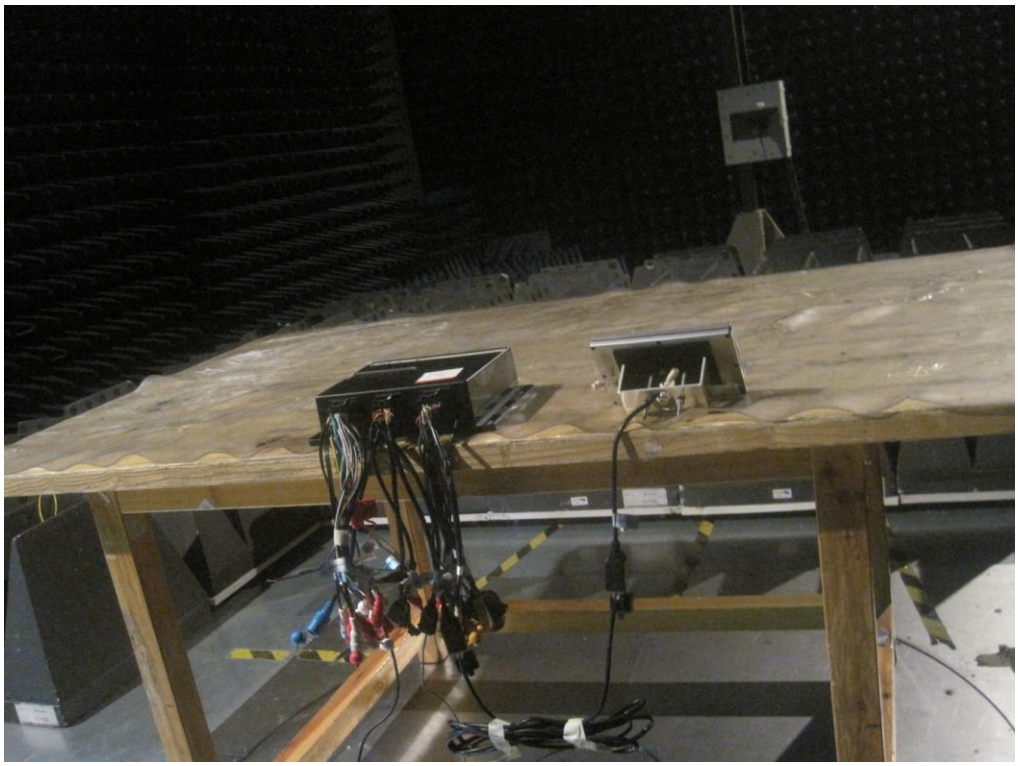


30MHz-1GHz



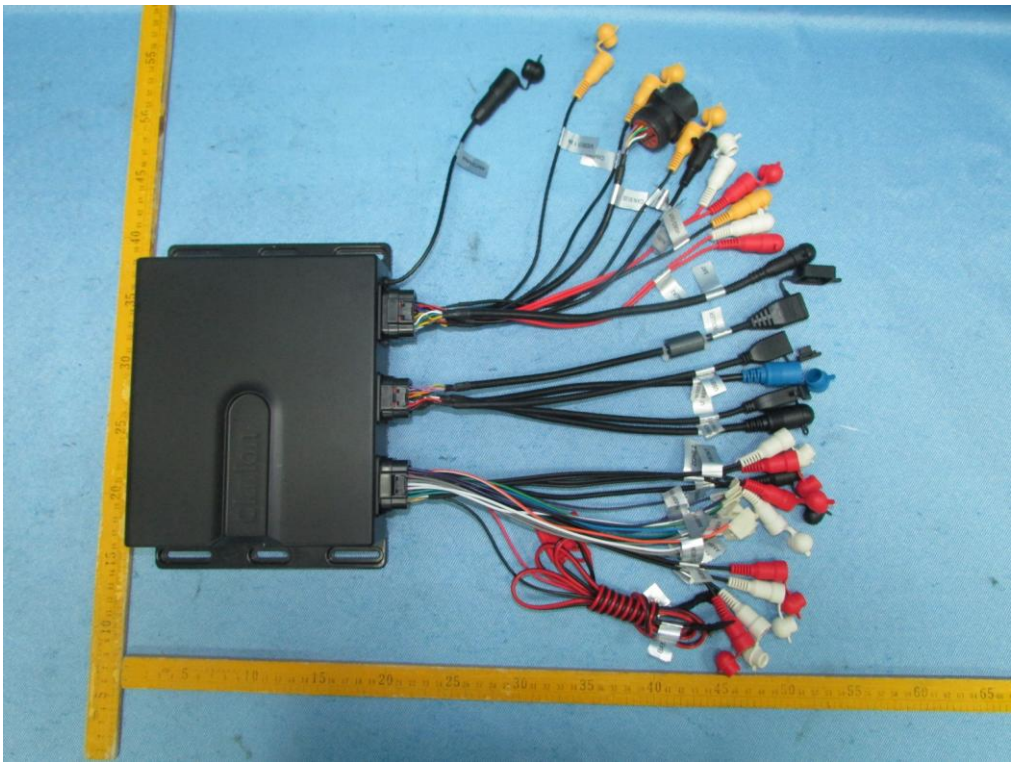
Above 1GHz

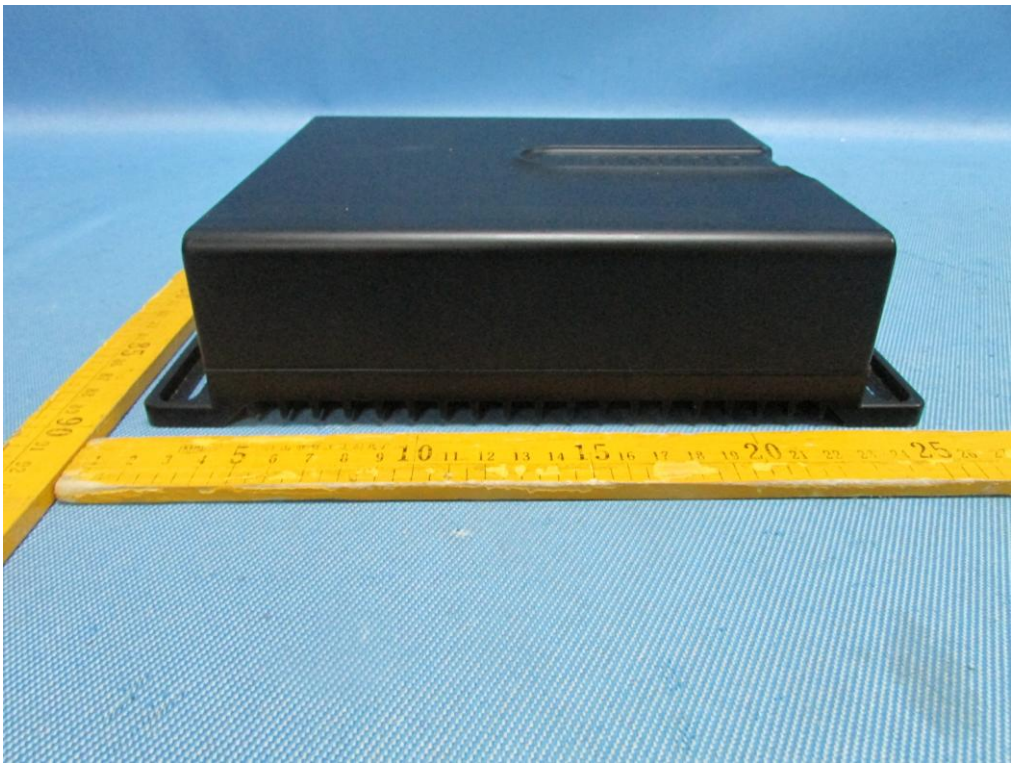


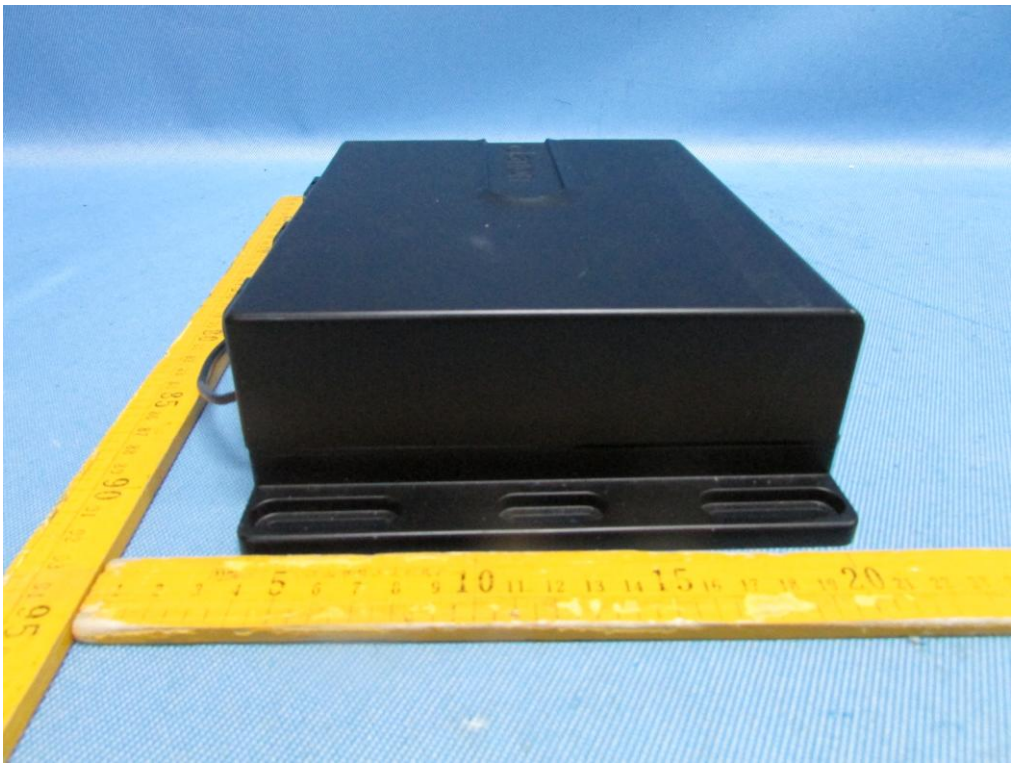


17 Photographs - Constructional Details

17.1 EUT- External View

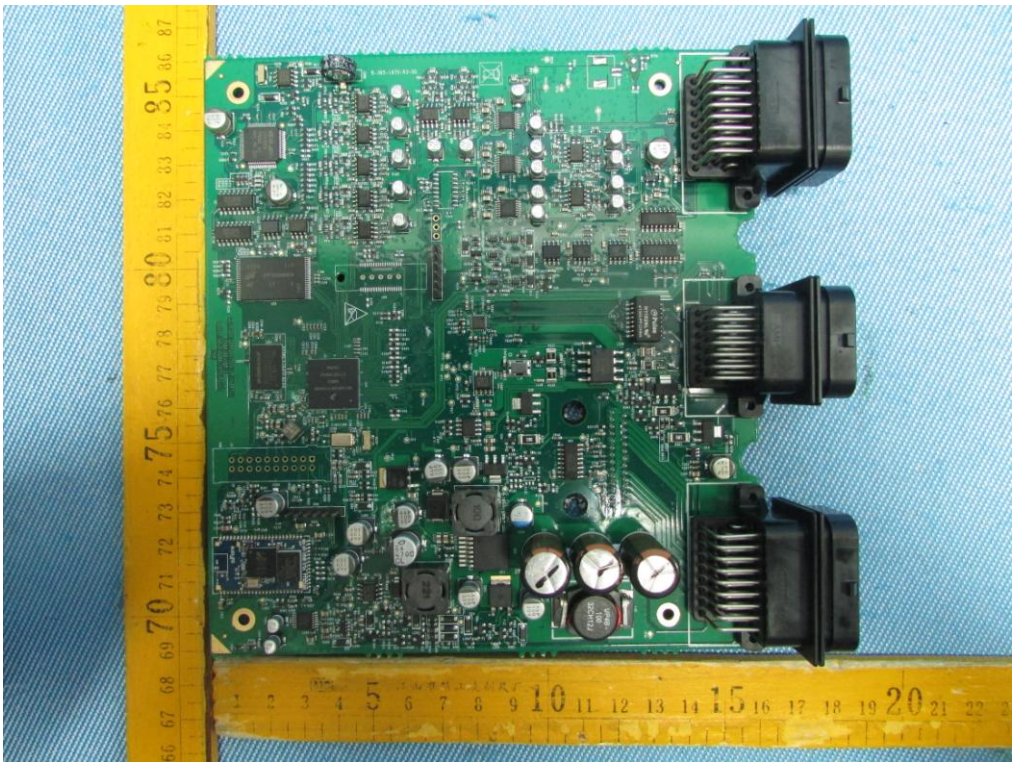


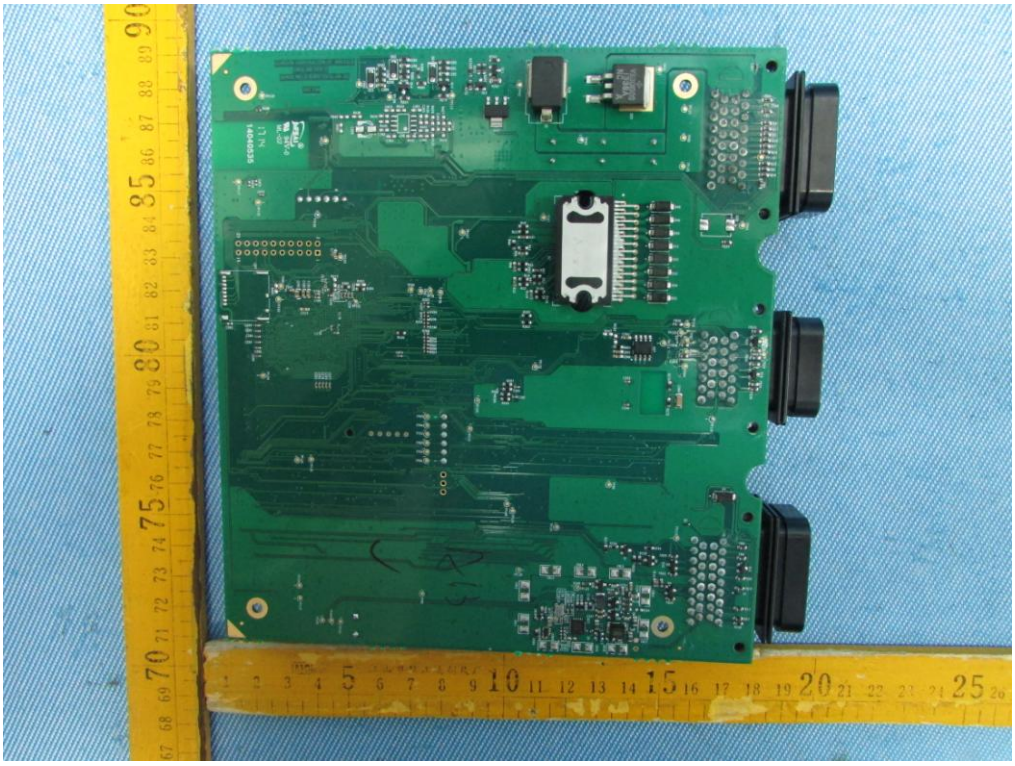




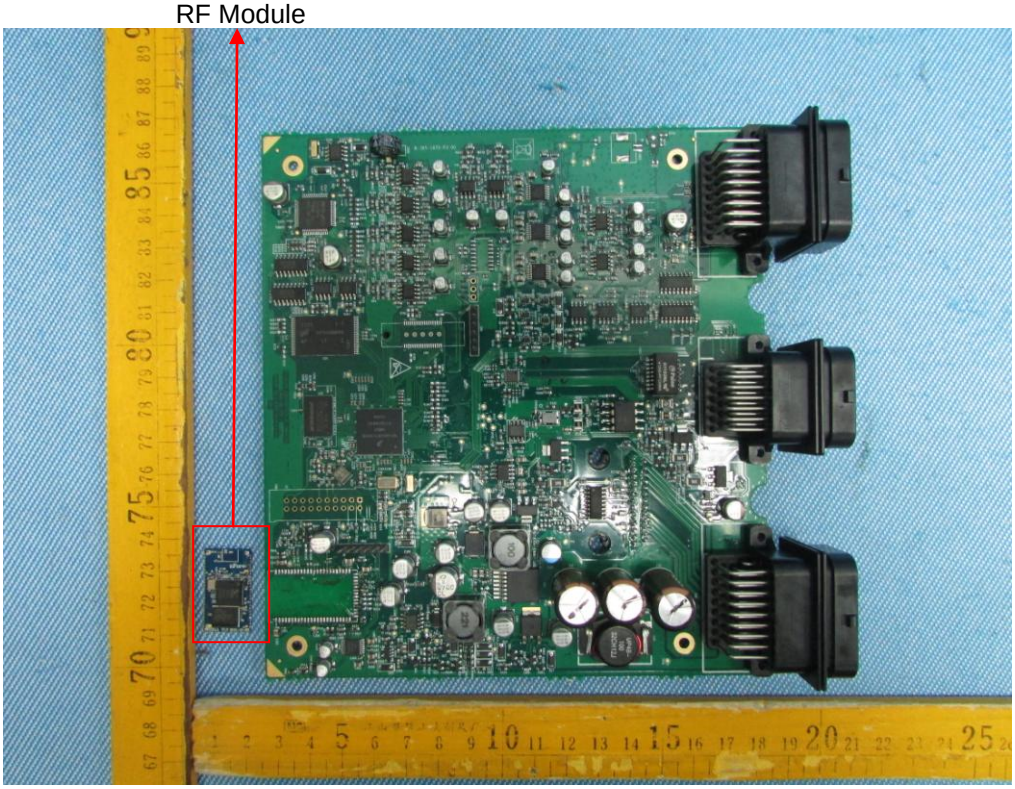

SRC
DISP AUDIO
MENU FAV
Bluetooth PANDORA
◄ SEEK
SEEK ►

17.2 EUT- Internal View





RF Module



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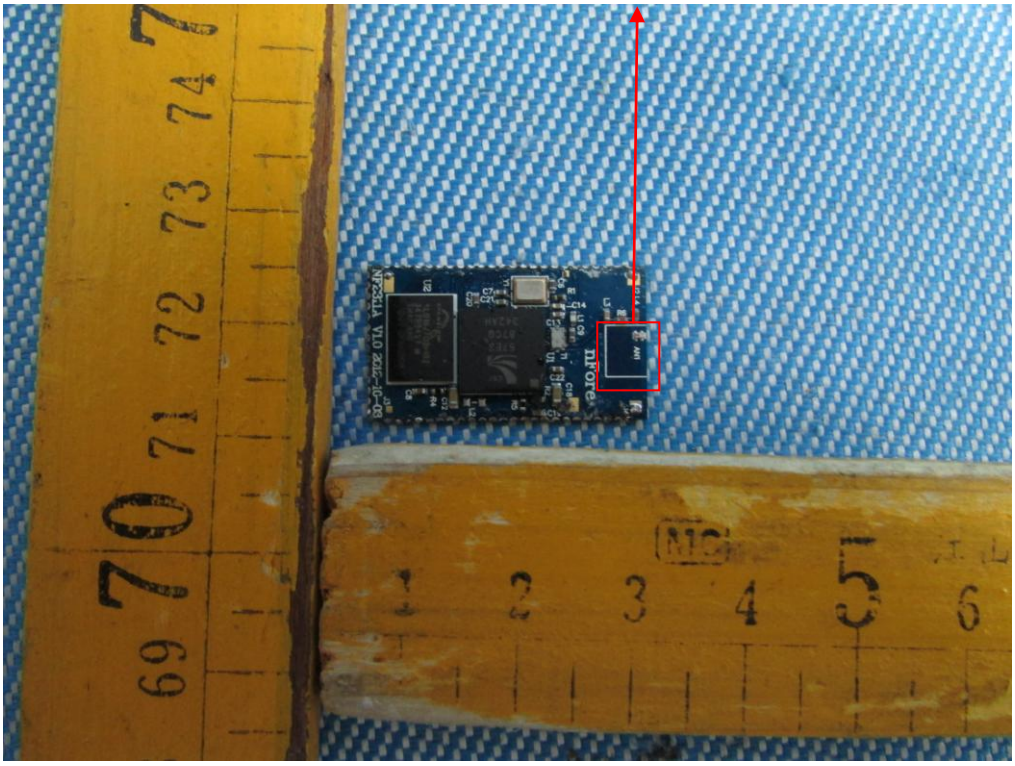


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NF2311A V1.0
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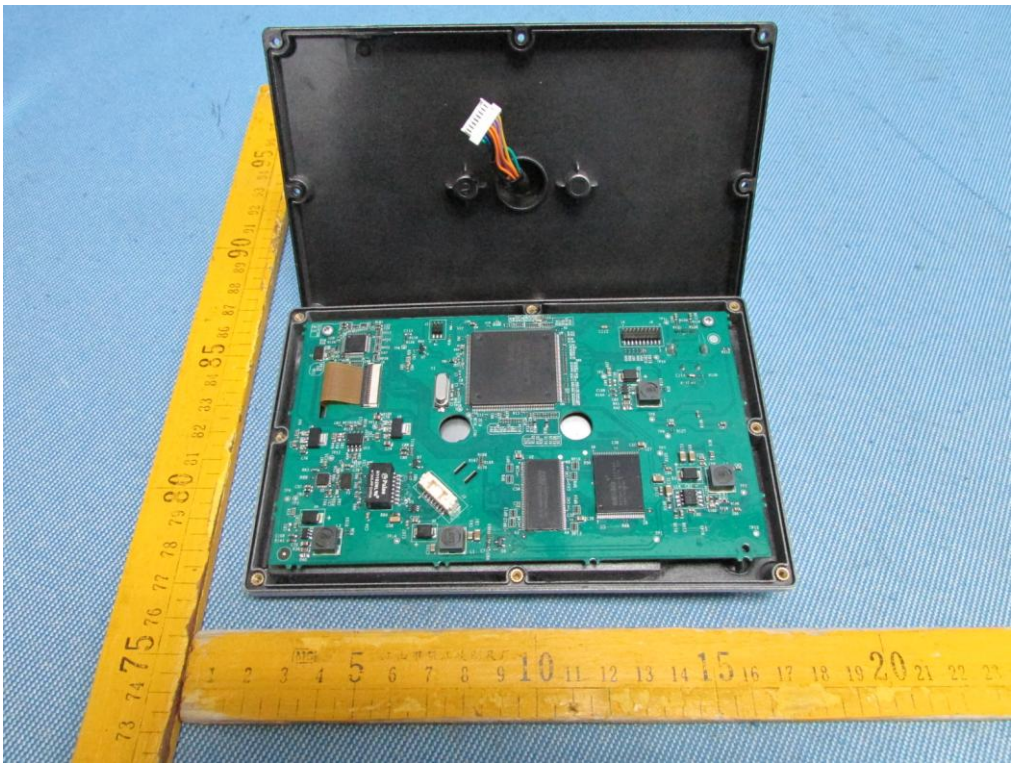

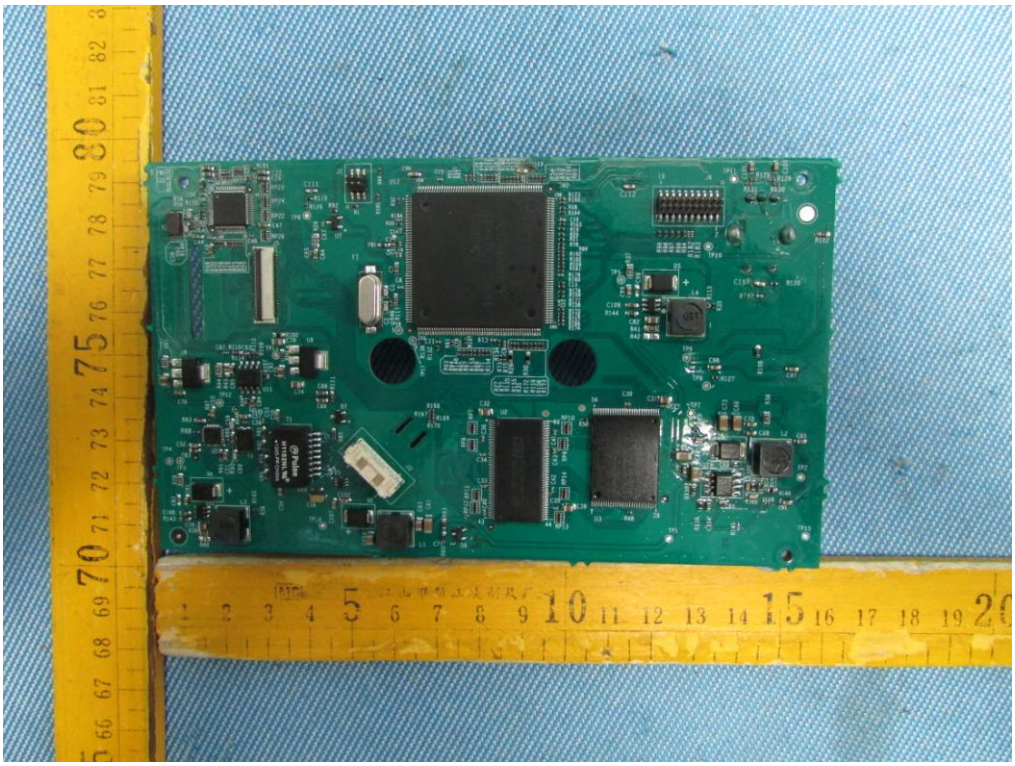

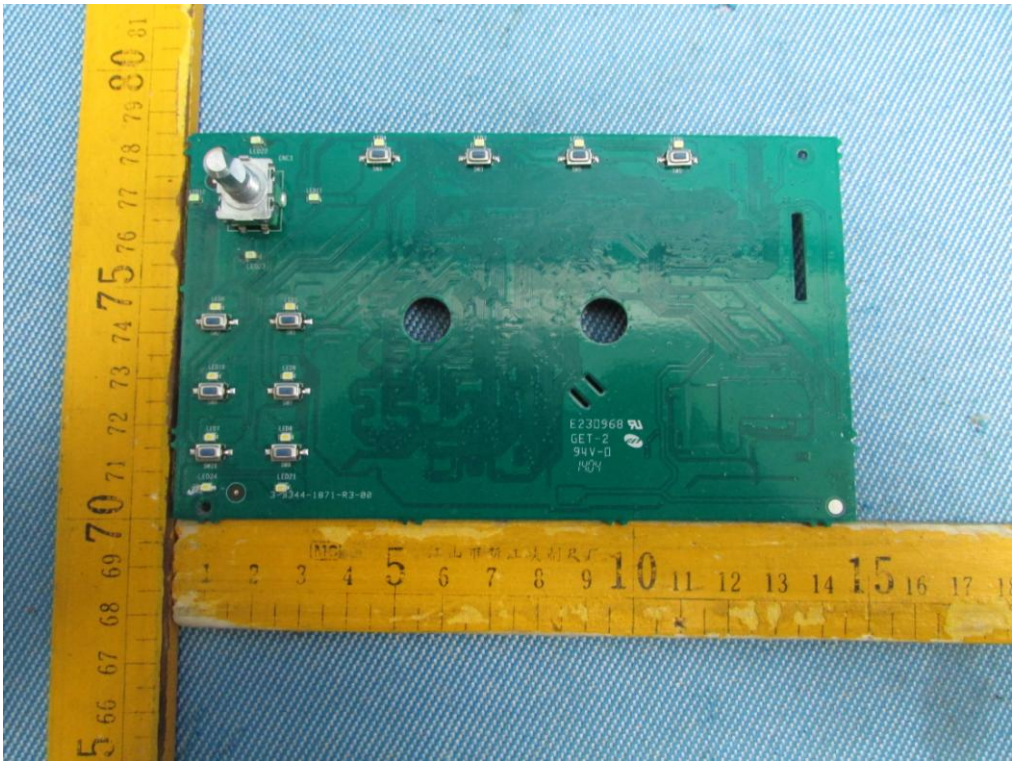

====== End of Report ======