

FCC Part 15 Subpart C

Industry Canada (IC) RSS-Gen Issue 2 / RSS210 Issue 7

TEST REPORT

Product : GPS Navigation System

Trade Name : TomTom

Model Number : DUB1

FCC ID : S4LDUB1

IC : 5767A-DUB1

Prepared for

TomTom International BV.

Rembrandtplein 35 1017 CT Amsterdam The Netherlands

Prepared by

Interocean EMC Technology Corp.

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Remark :

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The test results in the report only to the tested sample.

Statement of Compliance

Applicant: TomTom International BV.
Manufacturer: Tech-Giant (Shanghai) Computer Co., Ltd.
Product: GPS Navigation System
Model No.: DUB1
Tested Power Supply: Adapter: 120Vac, 60Hz
Car Charger: 12Vdc
Date of Final Test: Oct. 20, 2008

Configuration of Measurements and Standards Used :

FCC Rules and Regulations Part 15 Subpart C
RSS-210 Issue 7 : 2007

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

- Note:** 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of IETC

Report Issued: 2008/11/19

Project Engineer: Anya Lee Approved: Jerry Liu
Anya Lee Jerry Liu

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1 General Information

1.1 Description of Equipment Under Test

Product : GPS Navigation System

Model Number : DUB1

Applicant : **TomTom International BV.**
Rembrandtplein 35 1017 CT Amsterdam The Netherlands

Manufacturer : **Tech-Giant (Shanghai) Computer Co., Ltd.**
C#, No. 1, South Rongteng Road, Songjiang Export Processing Zone, Shanghai, China

Power Supply : **Adapter:**
Manufacturer: AK II, M/N: A10P1-05MP
Input: 100-240Vac, 47-63Hz, 0.3A
Output: 5Vdc, 2.0A
Power Cable: ☒Non-shielded ☒Un-detachable 1.8m ☒w/o core

Car Charger:
Manufacturer: Supa
Input: 12Vdc
Output: 5Vdc, 1.2A

Product information : **Interface Port:**
1. USB2.0/Power Port *1
2. Earphone Port *1

Data Cable:
USB/Power Cable (Foxlink): ☒Shielded ☒Detachable 0.8m ☒w/o core
USB/Power Cable (PORS WIRING): ☒Shielded ☒Detachable 0.8m ☒w/o core
USB/Power Cable (Huan Hsin): ☒Shielded ☒Detachable 0.8m ☒w/o core

Operating Frequency : 2402MHz ~ 2480MHz

Channel Number : 79 channels

Type of Modulation : GFSK ; $\pi/4$ DQPSK ; 8 DPSK

Antenna description : This device uses Chip antenna.

Antenna Gain	:	2dBi
Connector type	:	Chip

Sample Receive date : Aug. 04, 2008

Date of Test : Aug. 04~Oct. 20, 2008

1.2 Table for Carrier Frequencies

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

1.3 Test Facility

- Site Description** : ☒ RF Test Room ☒ OATS 2
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Site 1, 2 Location** : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.
- Site 3, 4 Location** : No. 12, Ruei-Shu Valley, Ruei-Ping Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.
- Site Filing** :
 - Federal Communication Commissions – USA
Registration No.: 96399 (OATS 1 & 2)
Registration No.: 518958 (OATS 3 & 4)
 - Voluntary Control Council for Interference by Information
Technology Equipment (VCCI) – Japan
Registration No. (Conducted Room): C-1094
Registration No. (Conducted Room): T-271
Registration No. (OATS 1): R-1040
Registration No. (OATS 2): R-1041
 - Industry Canada (IC)
Submission: 113543
 - Japan Electrical Safety & Environment Technology Laboratories (JET)
Registration No.: 04S03-01
- Site Accreditation** :
 - Bureau of Standards and Metrology and Inspection (BSMI) –
Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS13438 / CISPR22
SL2-R1-E-0026 for CNS13439 / CISPR13
SL2-R2-E-0026 for CNS13439 / CISPR13
SL2-A1-E-0026 for CNS13783-1 / CISPR14-1
 - TÜV NORD
Certificate No: TNTW0801R
 - Taiwan Accreditation Foundation (TAF)
Accrditation No.: 1113



1.4 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP30	100002	2008/12/14
Spectrum Analyzer	Agilent	8564EC	4046A00331	2009/04/11
Preamplifier	Agilent	8449B	3008A01434	2009/03/31
Preamplifier	SCHAFFNER	CA30100	2	2008/10/21
Horn Antenna	COM-POWER	AH-118	10081	2010/05/12
Horn Antenna	Schwarzbeck	BBHA 9120	9120D-583	2008/12/17
Horn Antenna	Schwarzbeck	BBHA 9170	213	2010/06/08
Wide Bandwidth Sensor	Anritsu	MA2491A	728133	2008/10/18
Power Meter	Anritsu	ML2495A	736010	2008/10/28
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2009/05/14
Signal Generator	Agilent	E8254A	US41140164	2009/05/21

Note: The above equipments are within the valid calibration period.

1.5 Summary of Measurement

Report Clause	FCC Rule Part	RSS Rule Part	Description	Results
3	15.247(a)(1)	RSS 210 A8.1	20dB Bandwidth	Pass
4	-----	RSP100	99% Occupied Bandwidth	Pass
5	15.247(a)(1)	RSS 210 A8.1	Carrier Frequency Separation	Pass
6	15.247(a)(1)	RSS 210 A8.1	Number of hopping frequencies	Pass
7	15.247(a)(1)	RSS 210 A8.1	Time of Occupancy (dwell time)	Pass
8	15.247(b)	RSS 210 A8.2	Maximum Peak output power	Pass
9	15.247(c)	RSS 210 A8.5	RF Conducted spurious emission	Pass
10	15.205, 15.209	RSS 210 A8.5	RF Radiated spurious emission	Pass
11	15.247(d)	RSS 210 A8.5	Emission on the Band Edge	Pass
12	15.247(b)	RSS 210 A8.5	AC Power Line Conducted Emission	Pass

1.6 Justification

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of the frequency band were all arrive limit requirement, thus we evaluate the EUT pass the specified test.

2 Test specifications

2.1 Test standard

The EUT was performed according to the procedures in:

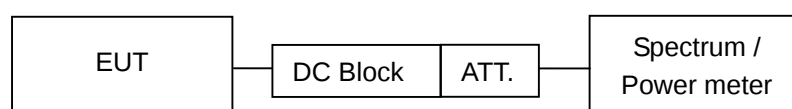
RSS-Gen (Issue 2 2007): General Requirements and Information for the Certification of Radiocommunication Equipment.

RSS-210 (Issue 7 2007): Low Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

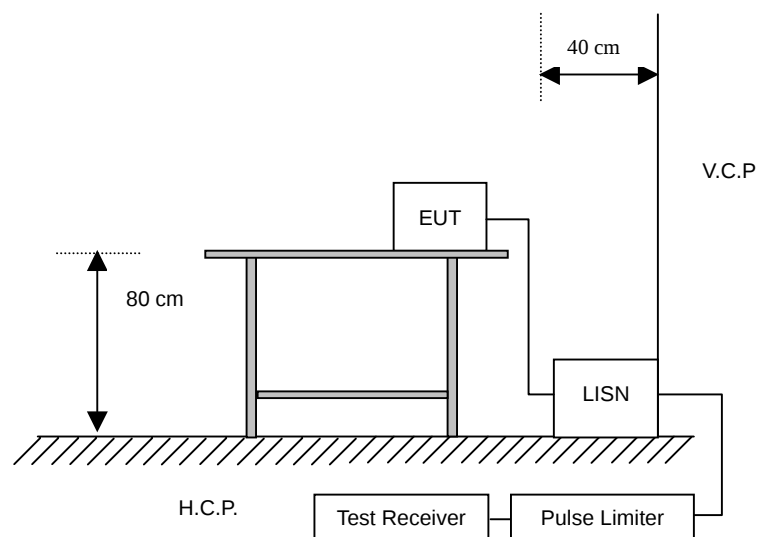
FCC Part 15 Subpart C

2.2 Configuration of Measurement

2.2.1 RF conducted measurement

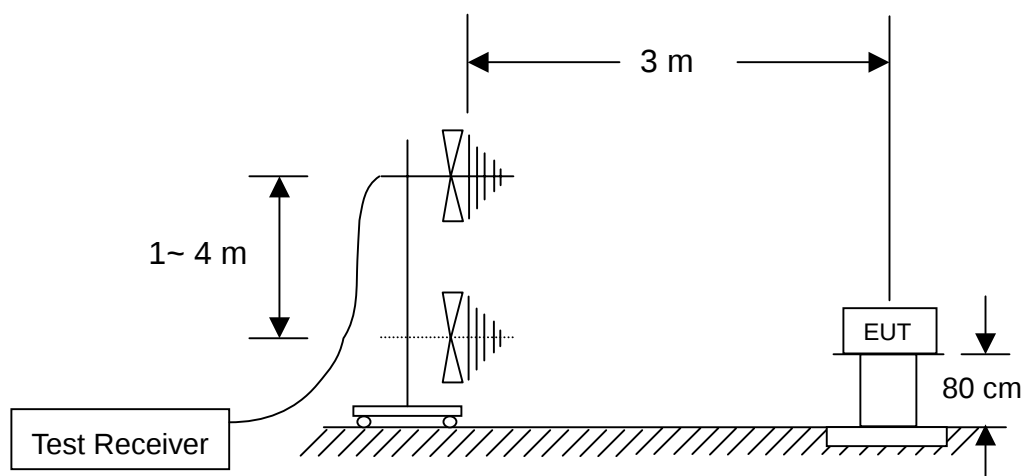


2.2.2 AC Power Line Conducted Emission

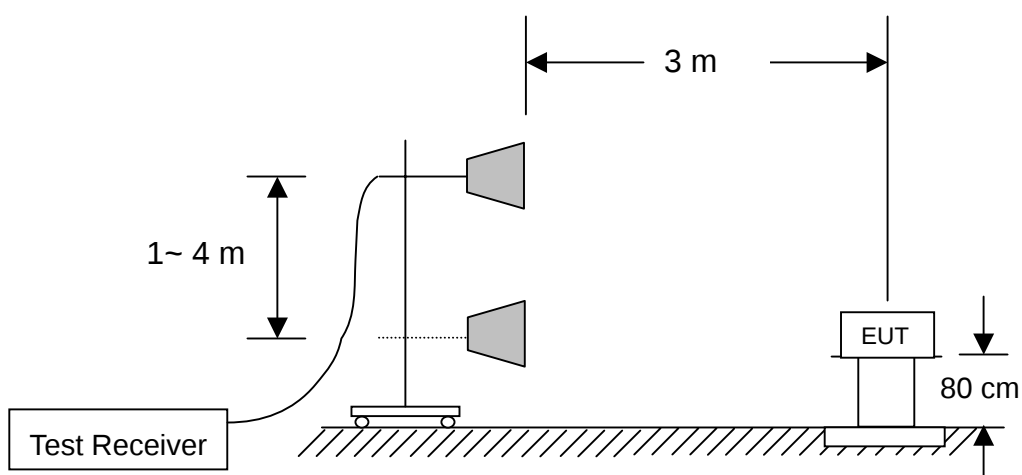


2.2.3 Radiated spurious emission

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



2.3 Test Procedure

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards:

ANSI C63.4: 2003

FHSS test procedure of FCC Public Notice DA 00-705

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

Carrier Frequency Separation

The carrier frequency separation per FCC Part15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at $\geq 1\%$ of the span, the video bandwidth $\geq$ RBW, and the SPAN was wide enough to capture the peaks of two adjacent channels.

Number of hopping frequencies

The number of hopping frequencies per FCC Part15.247(a)(1) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at $\geq 1\%$ of the span, the video bandwidth $\geq$ RBW, and the SPAN was the frequency band of operation.

Time of Occupancy (dwell time)

The time of occupancy (dwell time) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth $\geq$ RBW and the zero span function of spectrum analyzer was enable. The EUT has its hopping function enable.

Formula for Dwell time calculation:

Dwell time = time slot * hop rate * 1/s / 79 *31.6s

Maximum Output Power

The power output per was measured on the EUT using a 50ohm SMA cable connected to peak power meter via power sensor. Peak output power was read directly from power meter. The test was performed at 3 channels (lowest, middle and highest).

RF conducted spurious emissions

RF antenna conducted spurious emissions was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz. The measurements were performed from 30MHz to 25GHz.

RF Radiated spurious emission / Emission on the Band Edge

Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100kHz or greater for frequencies 30MHz to 1GHz, set 1MHz for frequencies above 1GHz.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and whole system. During the test, all cables were arranged to present worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

AC Power Line Conducted Emission

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

- 1) The EUT was placed 80cm height above ground on a non-conductive table and vertical conducting plane located 40cm to the rear of the EUT.
- 2) The EUT was connected to the main power through Line Impedance Stabilization Networks (LISN). This setup provided a 50ohm/50mH coupling impedance for the measuring equipment. The auxiliary equipment will place in secondary LISN.
- 3) Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.
- 4) The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

3 20dB Bandwidth test

3.1 Limit

No regulation limit, for reference purpose.

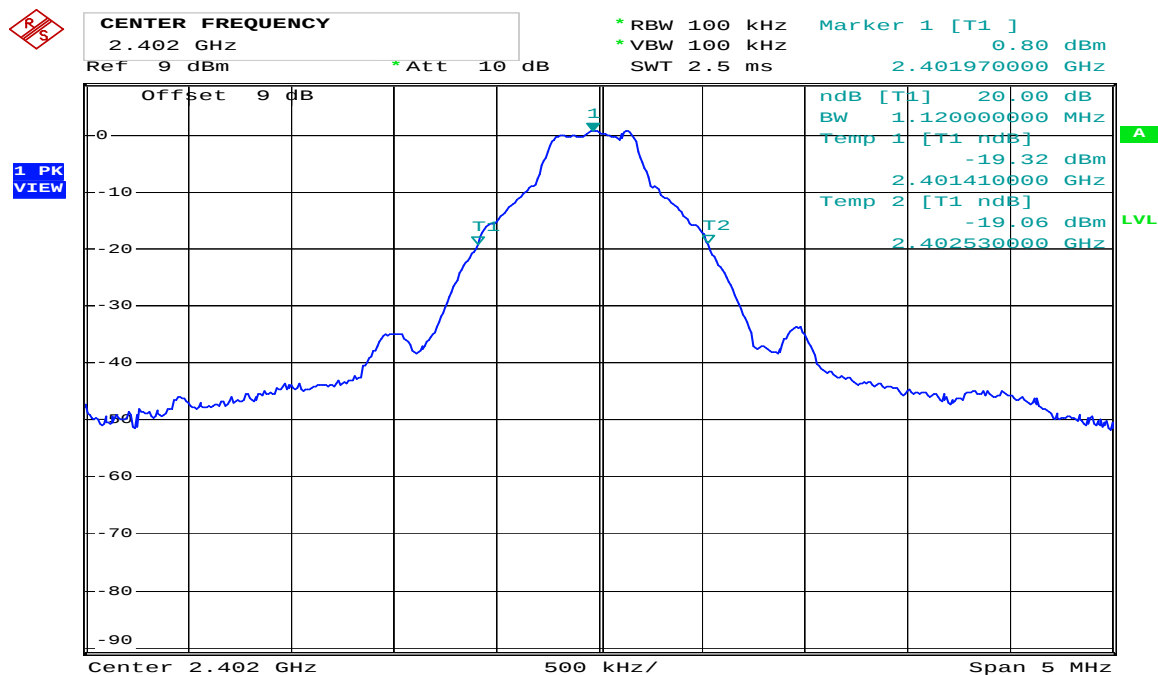
3.2 Test Result

PASS.

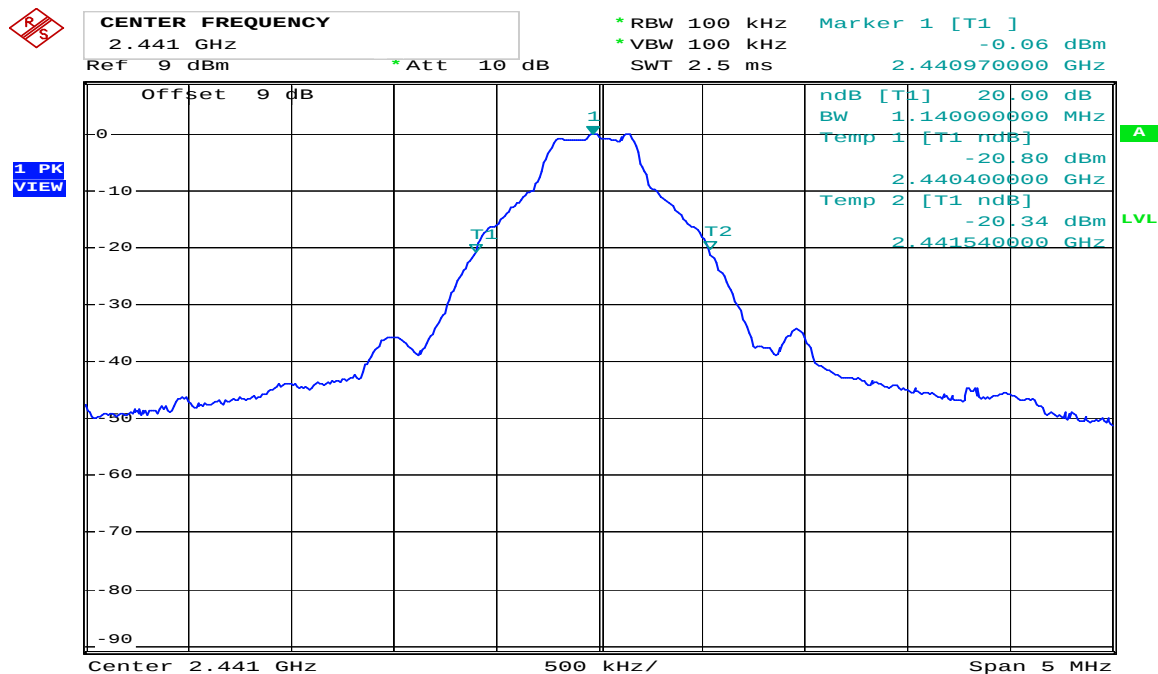
The final test plots are shown on as following pages.

Modulation type	Channel	Frequency	20dB Bandwidth (MHz)
GFSK	0	2402	1.12
	39	2441	1.14
	78	2480	1.13
$\pi / 4$ DQPSK	0	2402	1.38
	39	2441	1.38
	78	2480	1.38
8DPSK	0	2402	1.39
	39	2441	1.38
	78	2480	1.38

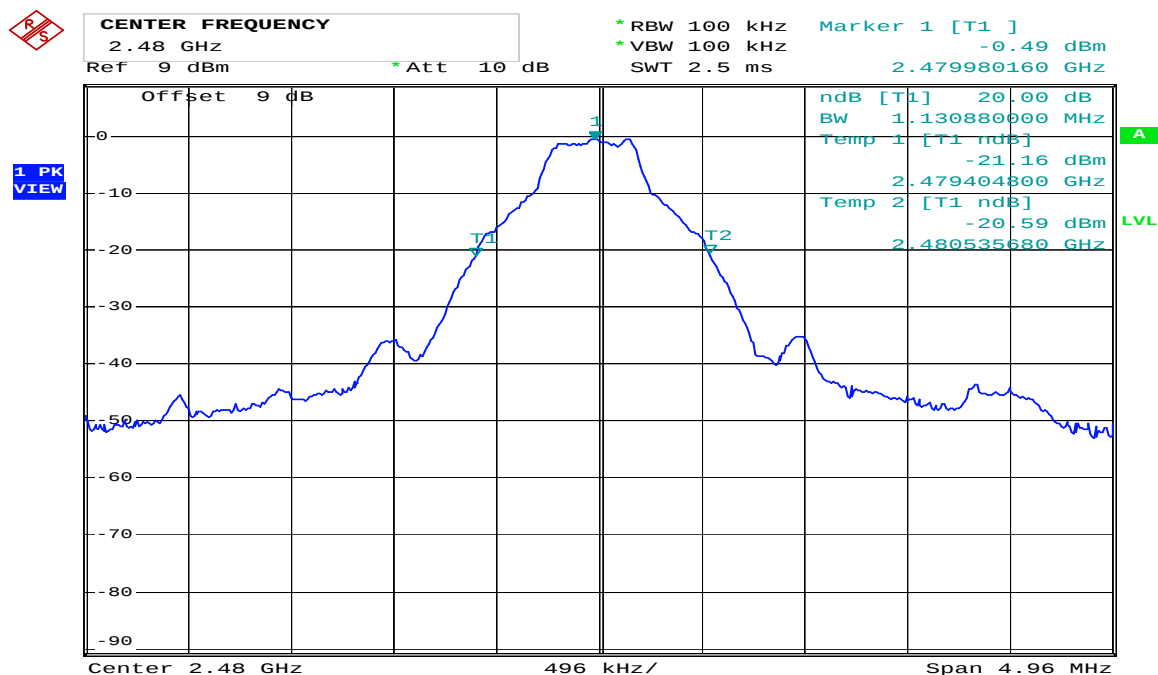
20dB Bandwidth GFSK 2402MHz



20dB Bandwidth GFSK 2441MHz

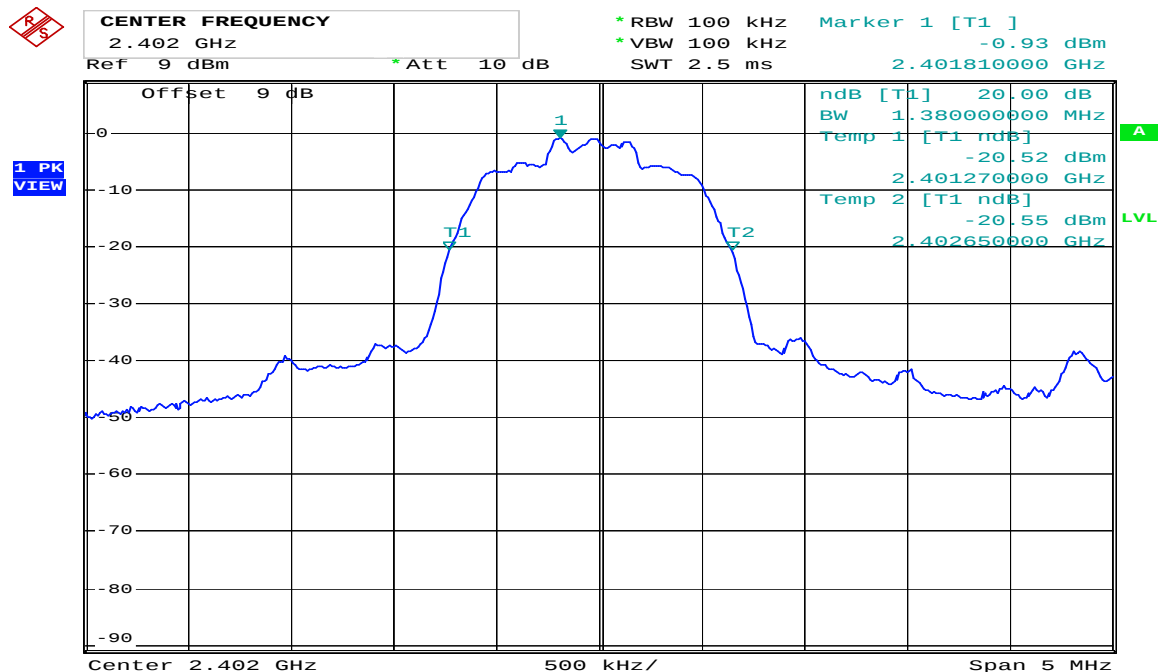


20dB Bandwidth GFSK 2480MHz



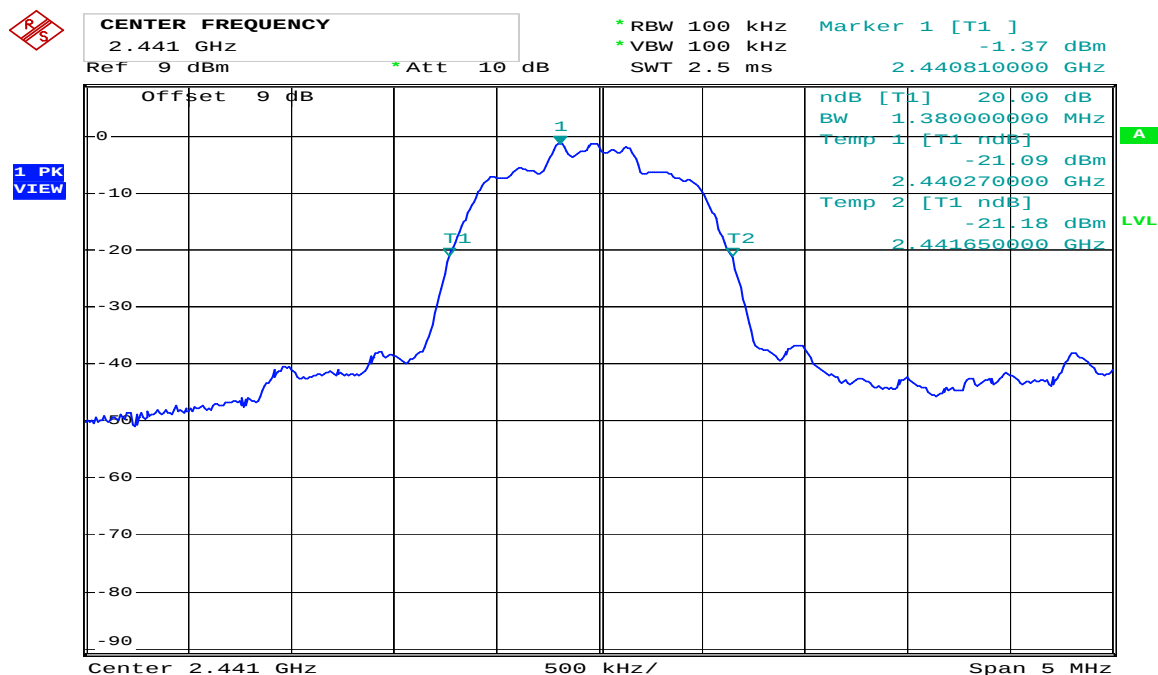
Comment: GFSK 20dB Bandwidth
Date: 13.AUG.2008 14:51:06

20dB Bandwidth $\pi/4$ DQPSK 2402MHz



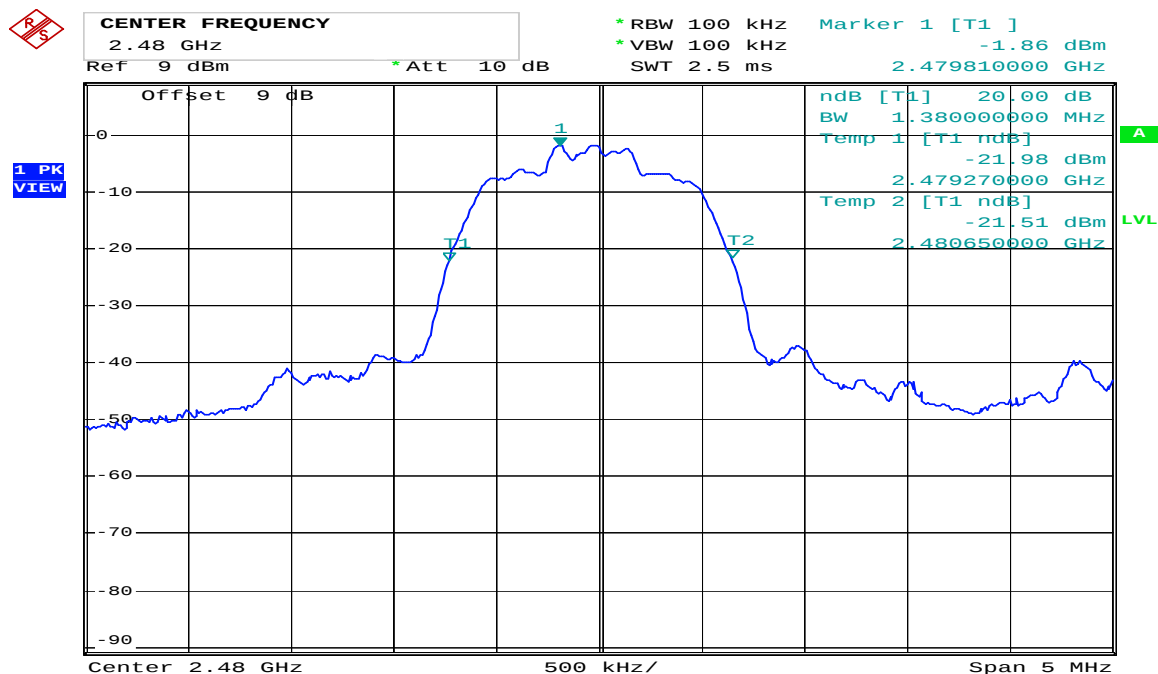
Comment: $\pi/4$ DQPSK 20dB Bandwidth
Date: 13.AUG.2008 15:01:54

20dB Bandwidth $\pi/4$ DQPSK 2441MHz



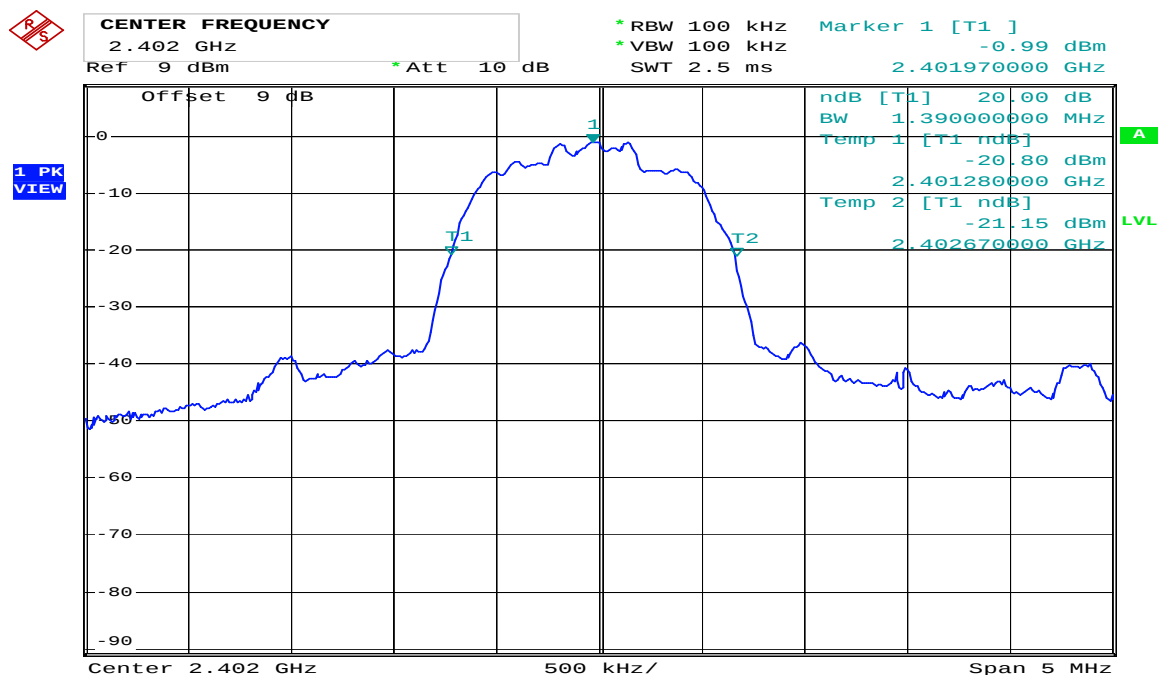
Comment: $\pi/4$ DQPSK 20dB Bandwidth
Date: 13.AUG.2008 14:57:00

20dB Bandwidth $\pi/4$ DQPSK 2480MHz



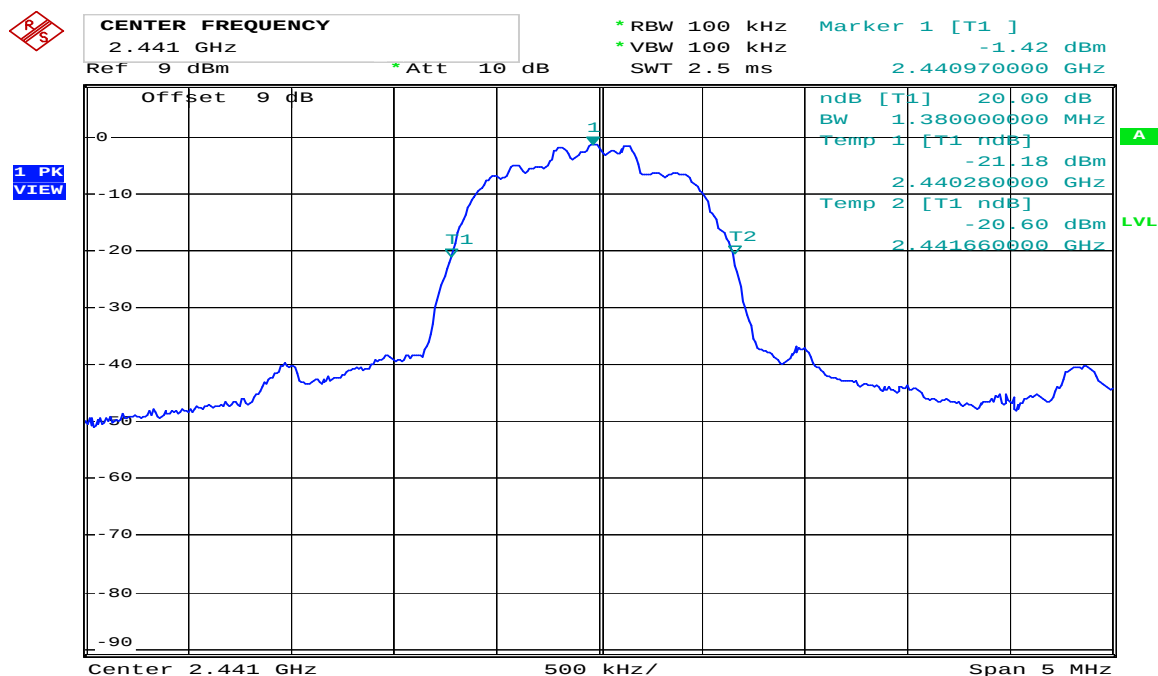
Comment: $\pi/4$ DQPSK 20dB Bandwidth
Date: 13.AUG.2008 14:54:13

20dB Bandwidth 8DPSK 2402MHz



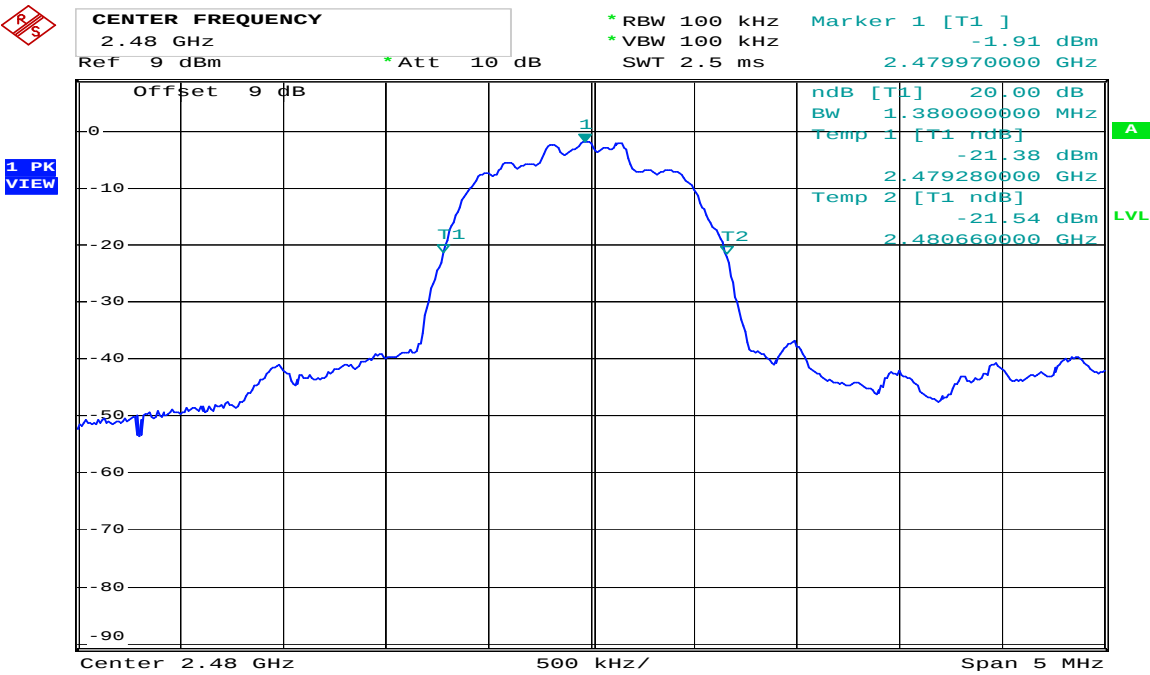
Comment: 8DPSK 20dB Bandwidth
Date: 13.AUG.2008 15:04:35

20dB Bandwidth 8DPSK 2441MHz



Comment: 8DPSK 20dB Bandwidth
Date: 13.AUG.2008 15:07:05

20dB Bandwidth 8DPSK 2480MHz



Comment: 8DPSK 20dB Bandwidth
Date: 13.AUG.2008 15:09:44

4 99% Occupied Bandwidth

4.1 Limit

No regulation limit, for reference purpose.

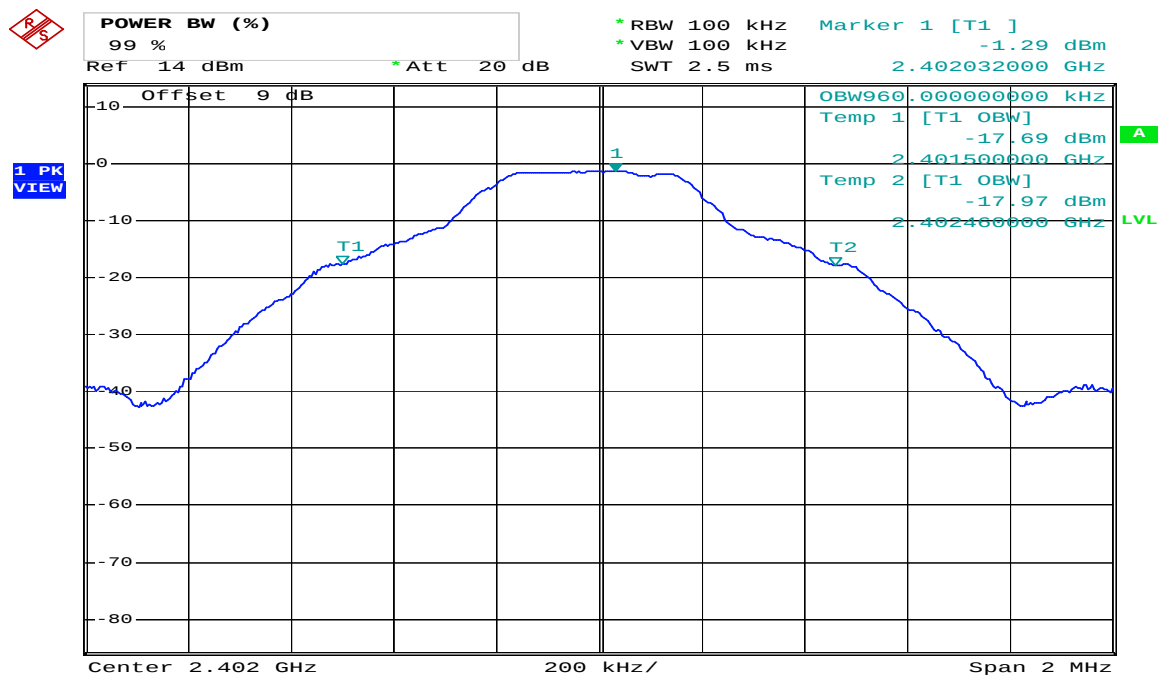
4.2 Test Result

PASS.

The final test plots are shown on as following pages.

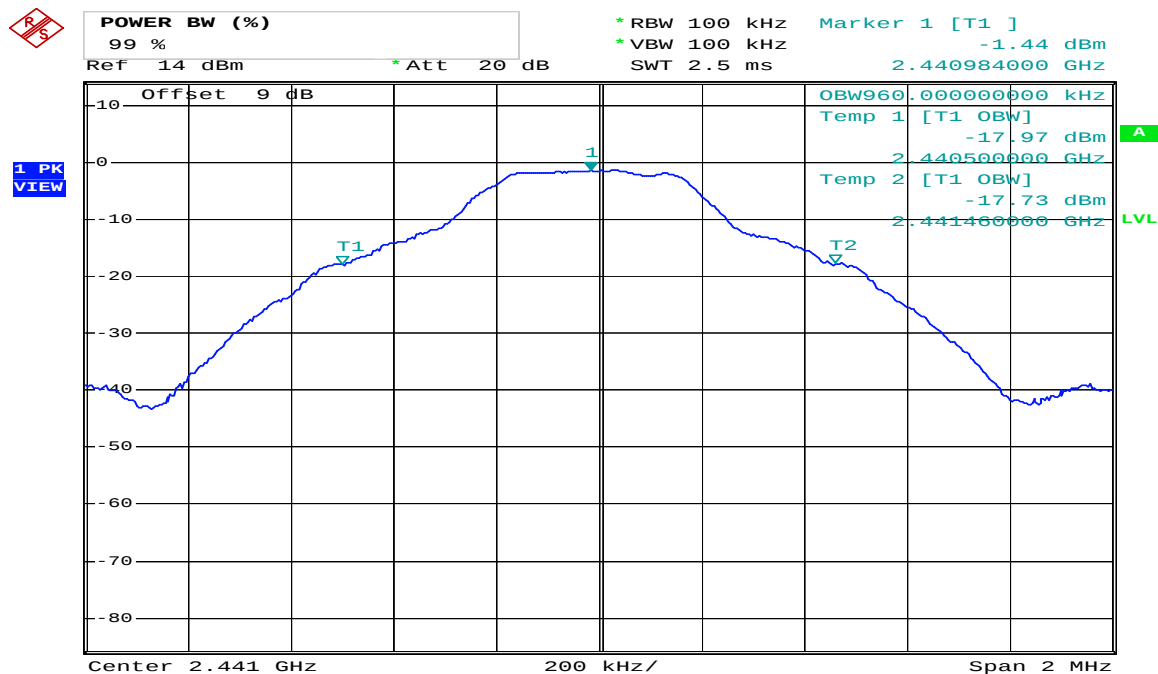
Modulation type	Channel	Frequency	99% OBW (MHz)
GFSK	0	2402	0.96
	39	2441	0.96
	78	2480	0.96
$\pi / 4$ DQPSK	0	2402	1.24
	39	2441	1.23
	78	2480	1.23
8DPSK	0	2402	1.24
	39	2441	1.24
	78	2480	1.24

99% Occupied Bandwidth GFSK 2402MHz



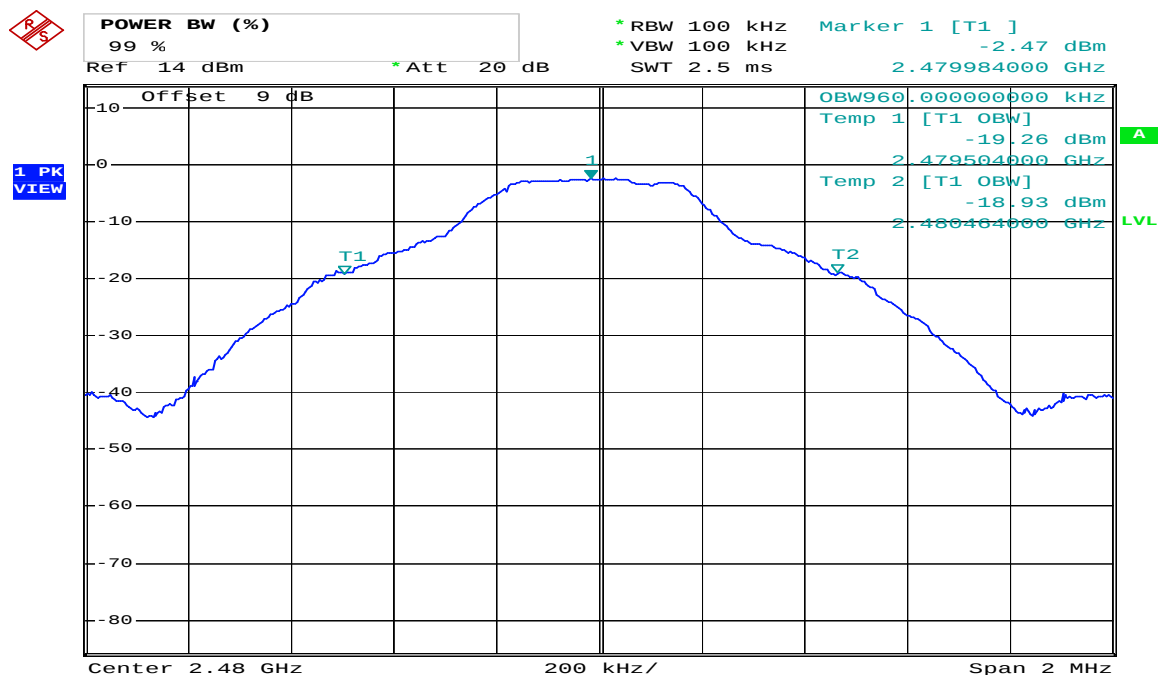
Comment: OBW 2402MHz
Date: 13.AUG.2008 18:39:36

99% Occupied Bandwidth GFSK 2441MHz



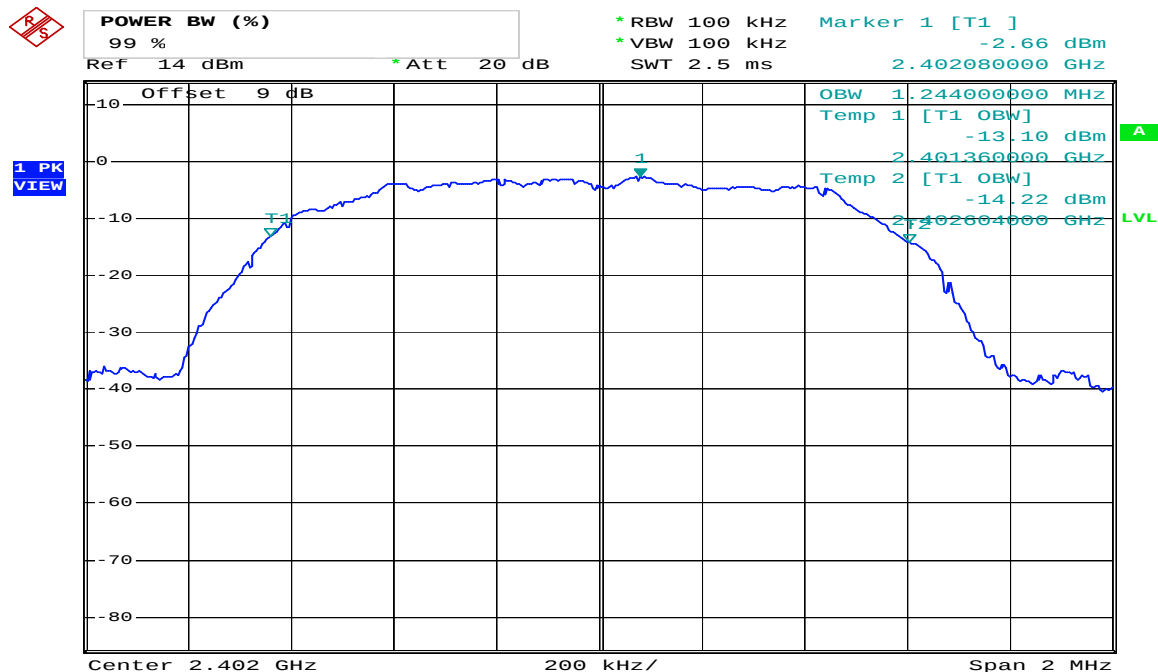
Comment: OBW 2441MHz
Date: 13.AUG.2008 18:40:26

99% Occupied Bandwidth GFSK 2480MHz



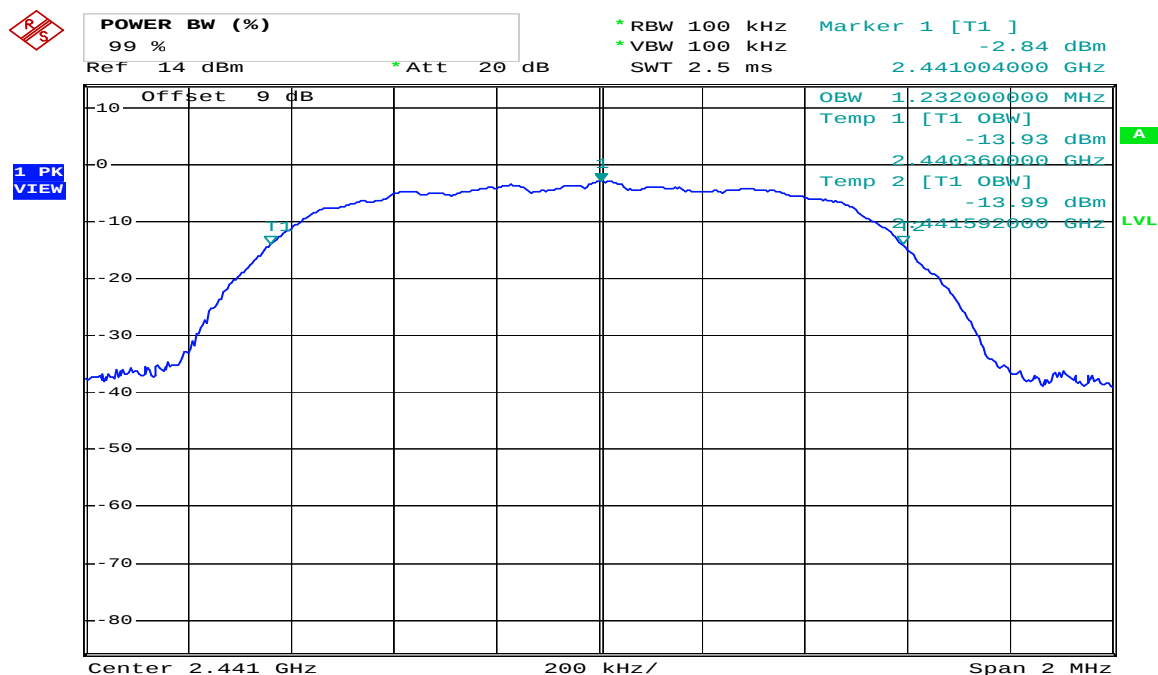
Comment: OBW 2480MHz
Date: 13.AUG.2008 18:41:19

99% Occupied Bandwidth $\pi/4$ DQPSK 2402MHz



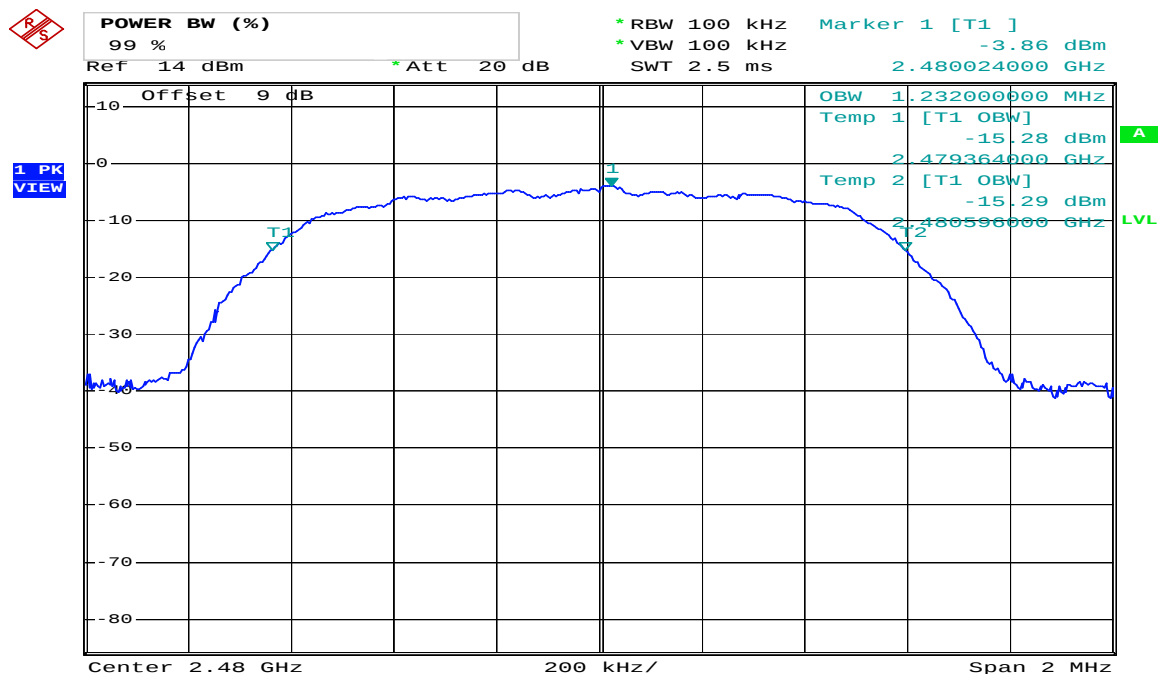
Comment: OBW 2402MHz
Date: 13.AUG.2008 18:49:48

99% Occupied Bandwidth $\pi/4$ DQPSK 2441MHz



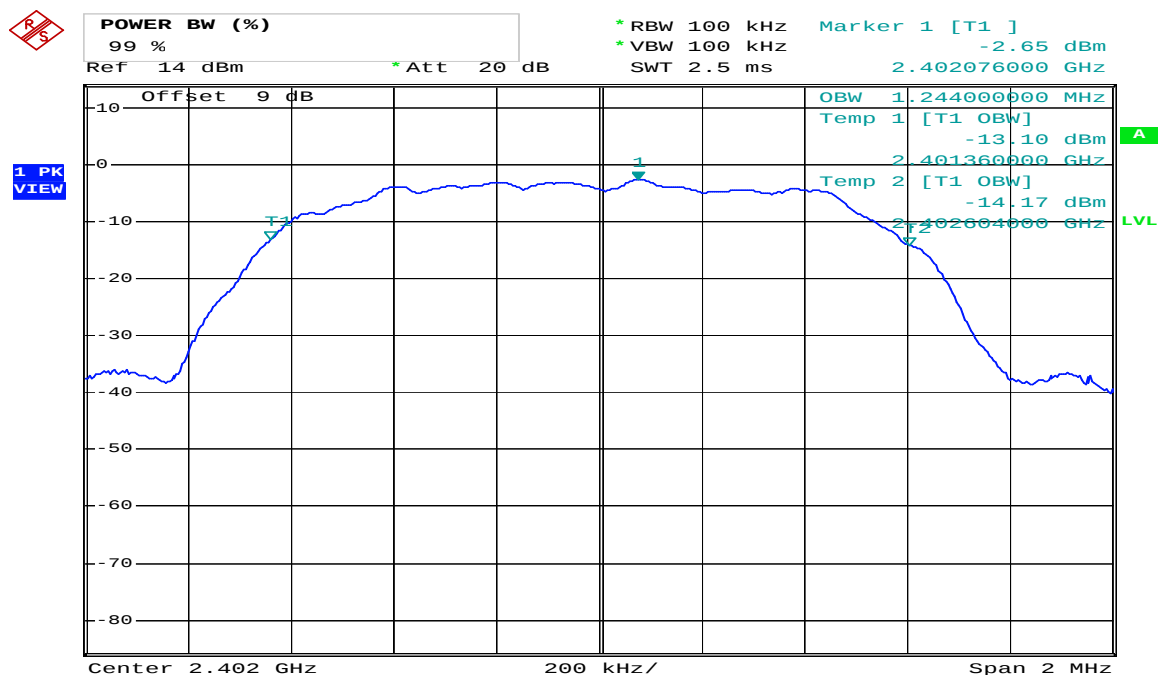
Comment: OBW 2441MHz
Date: 13.AUG.2008 18:45:33

99% Occupied Bandwidth $\pi/4$ DQPSK 2480MHz



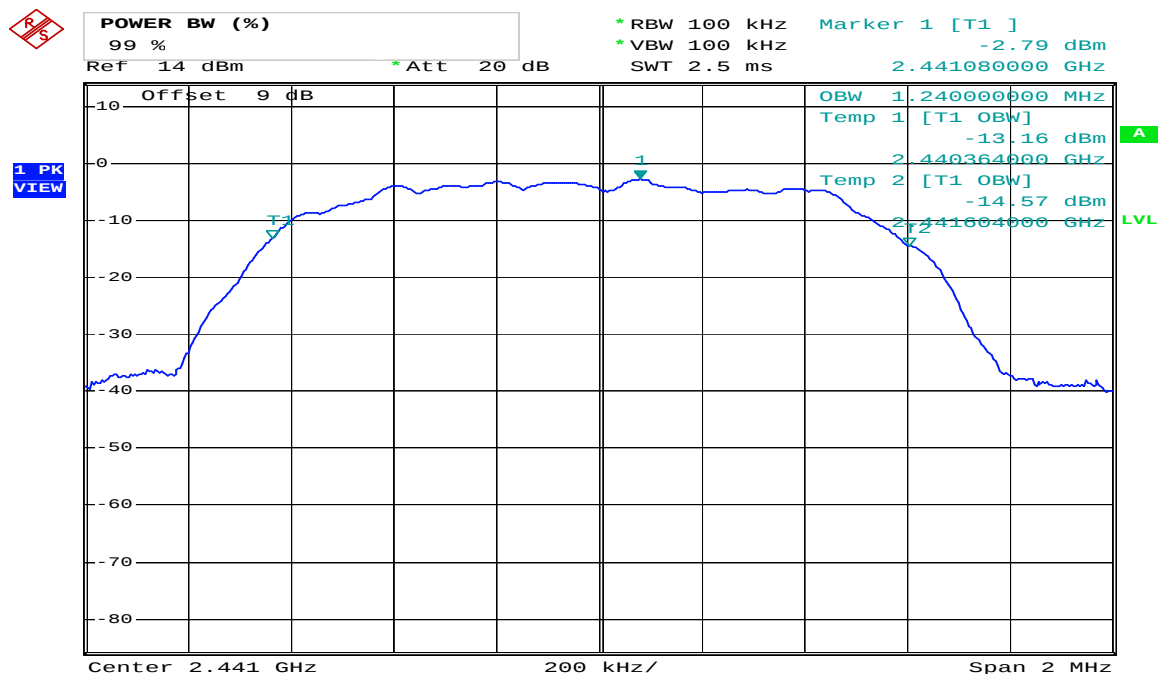
Comment: OBW 2480MHz
Date: 13.AUG.2008 18:44:25

99% Occupied Bandwidth 8DPSK 2402MHz



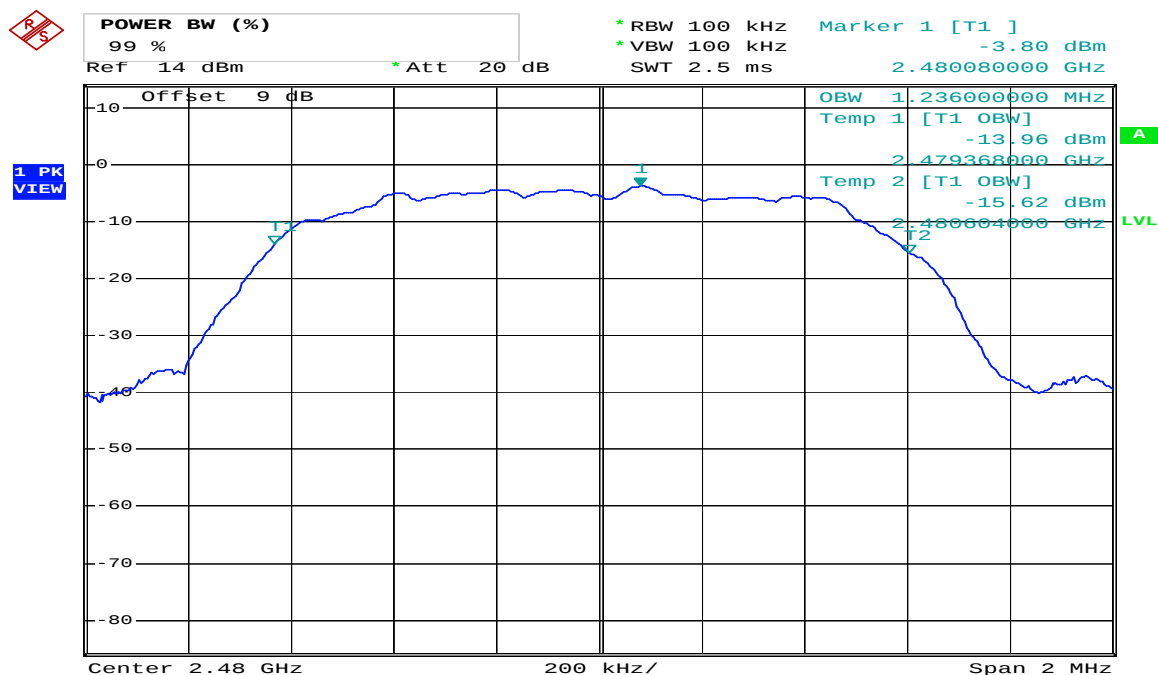
Comment: OBW 2402MHz
Date: 13.AUG.2008 18:50:27

99% Occupied Bandwidth 8DPSK 2441MHz



Comment: OBW 2441MHz
Date: 13.AUG.2008 18:51:27

99% Occupied Bandwidth 8DPSK 2480MHz



Comment: OBW 2480MHz
Date: 13.AUG.2008 18:52:36

5 Carrier Frequency Separation

5.1 Limit

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

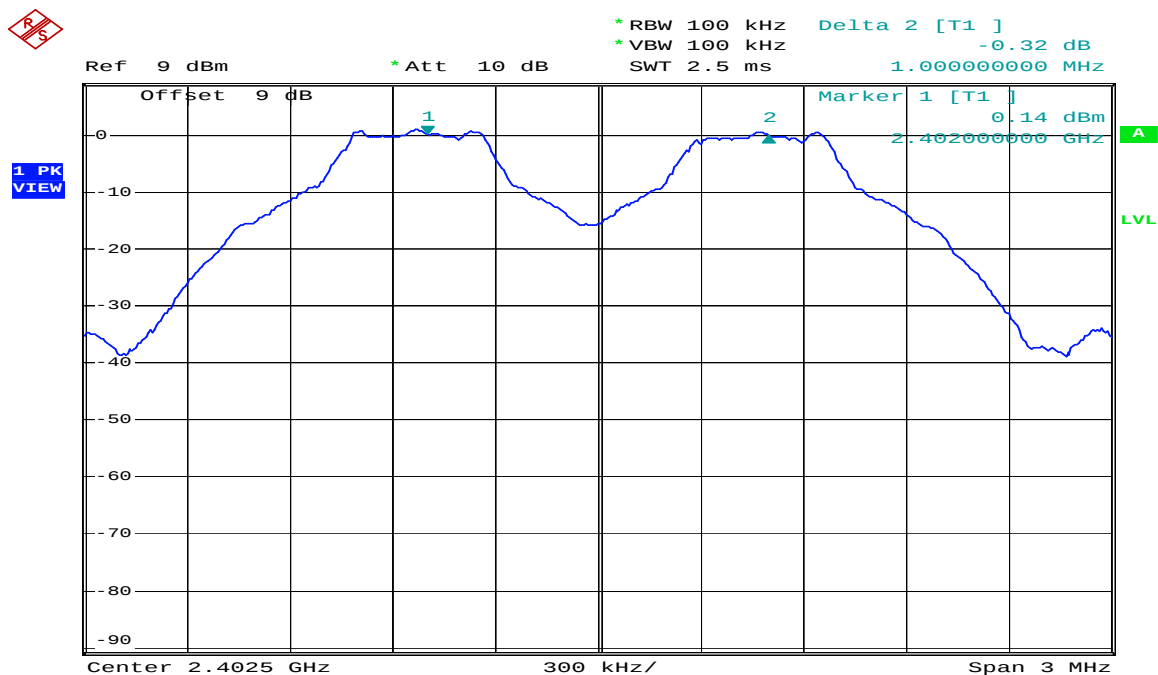
5.2 Test Result

PASS.

The final test data is shown on as following pages.

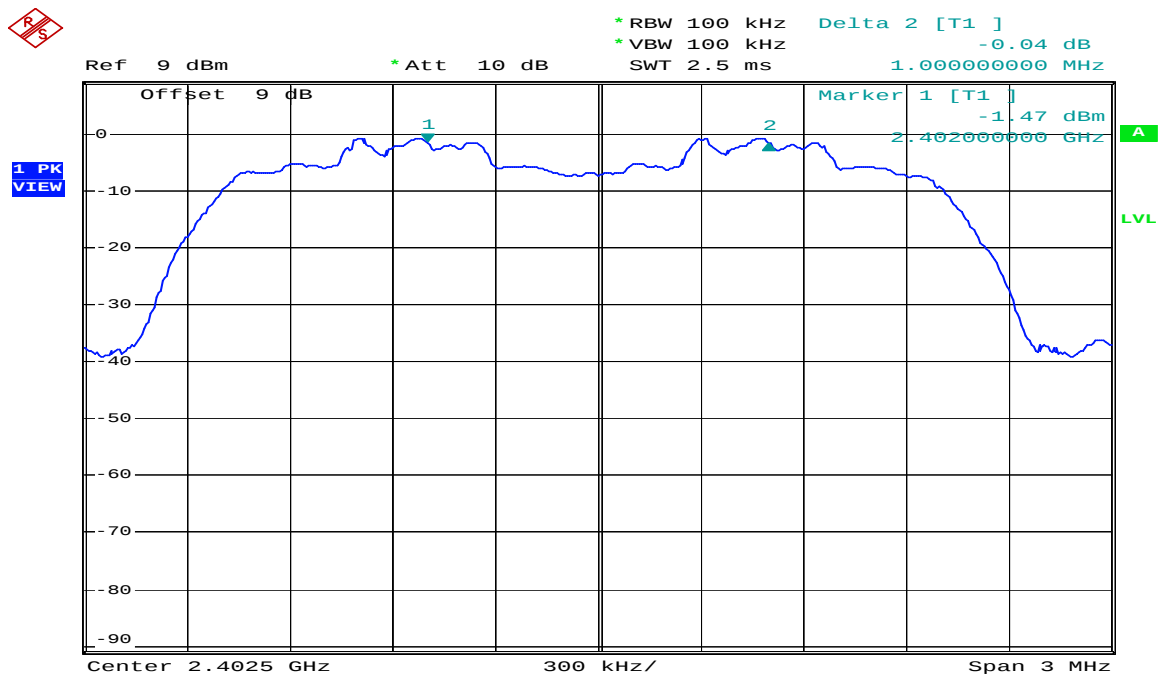
Modulation	Frequency	Carrier Frequency Separation (MHz)
GFSK	2402-2403	1
$\pi/4$ DQPSK	2402-2403	1
8 DPSK	2402-2403	1

GFSK Separation



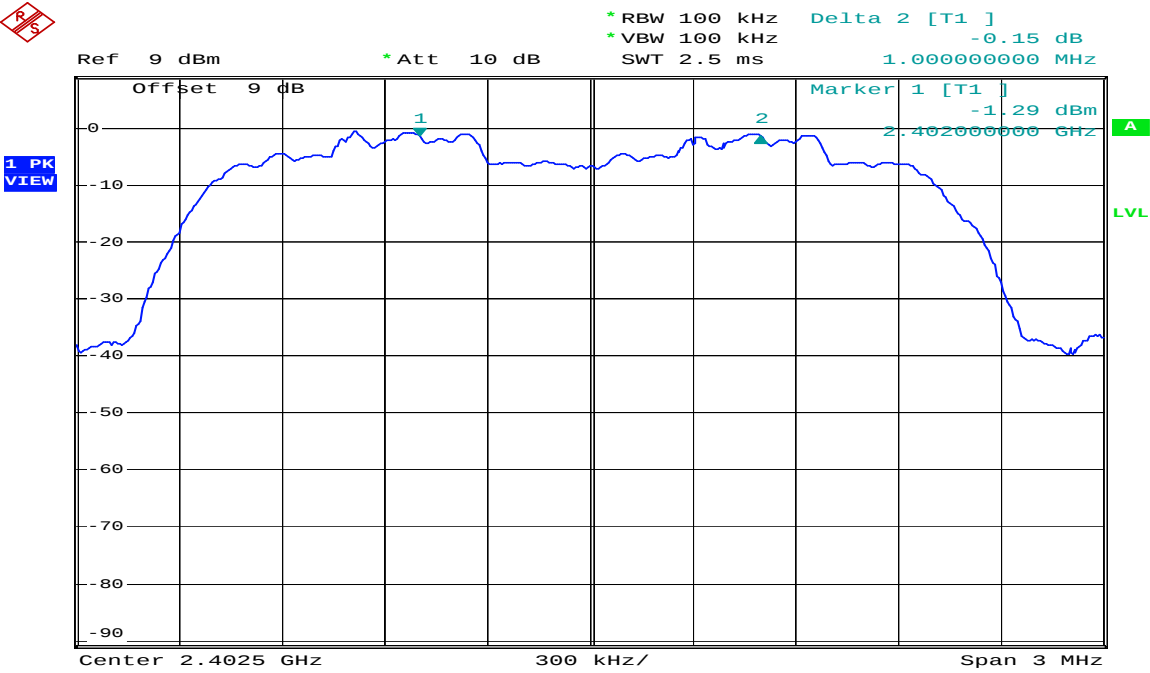
Comment: GFSK Separation CH1-2
Date: 13.AUG.2008 16:45:36

$\pi/4$ DQPSK Separation



Comment: $\pi/4$ DQPSK Separation CH1-2
Date: 13.AUG.2008 16:42:56

8 DPSK Separation



Comment: 8DPSK Separation CH1-2
Date: 13.AUG.2008 16:40:11

6 Number of hopping frequencies

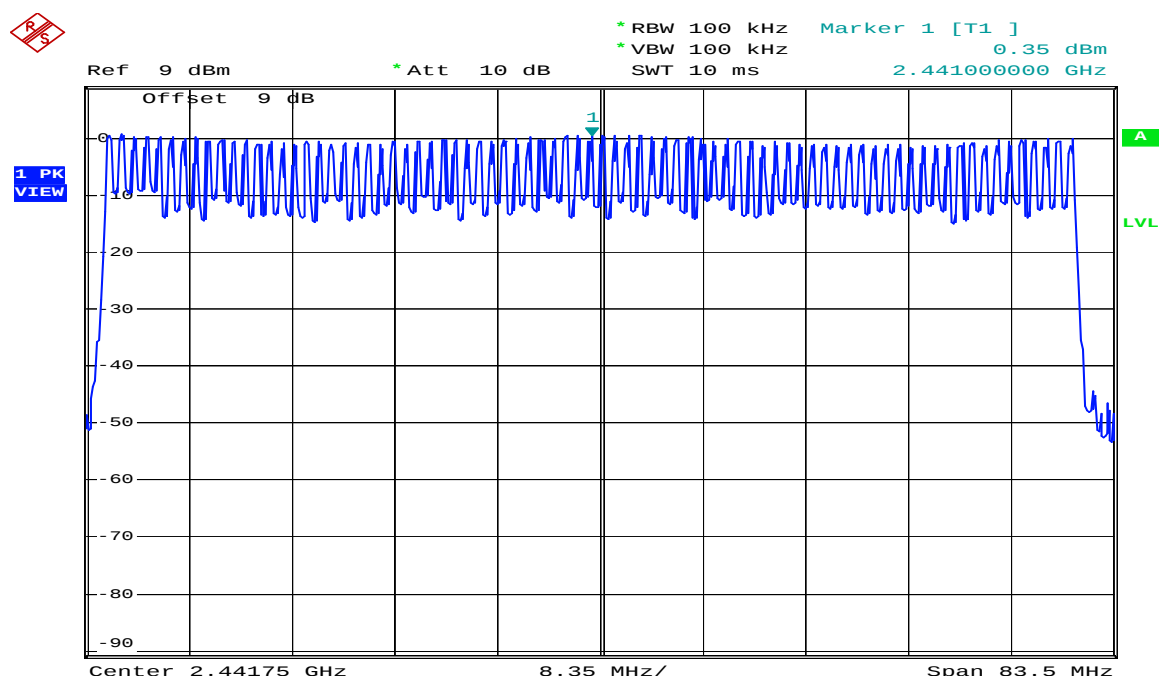
6.1 Test Result

PASS.

The final test data is shown on as below.

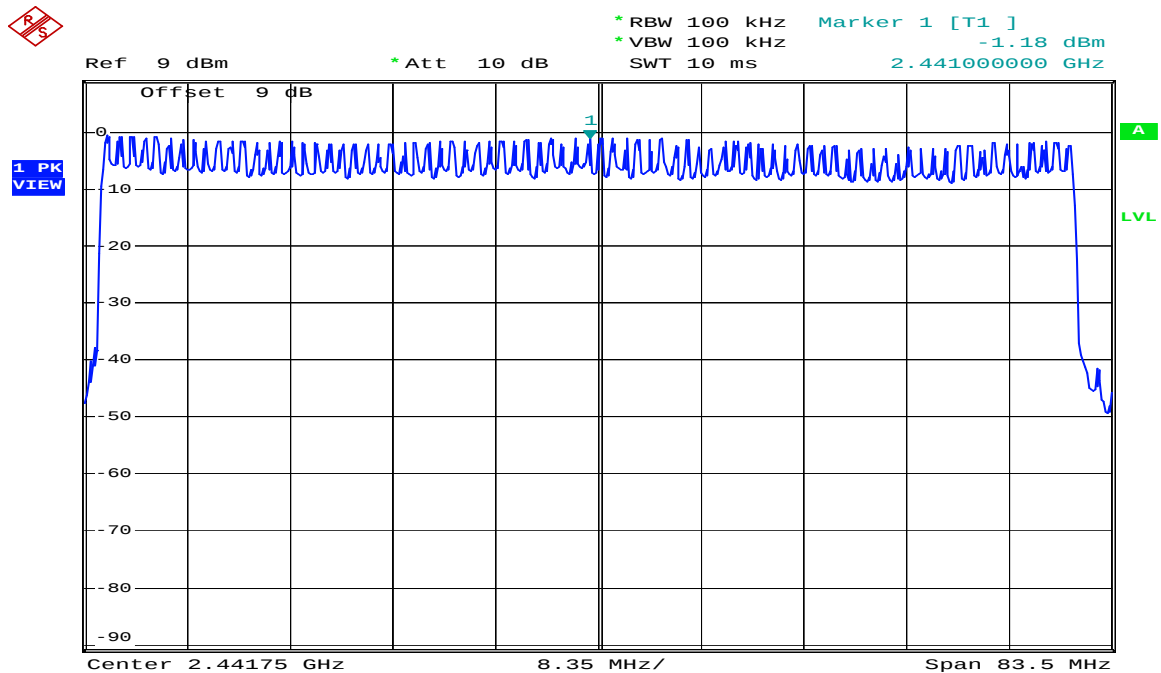
Modulation	No. of Hopping CH.
GFSK	79
$\pi/4$ DQPSK	79
8 DPSK	79

GFSK channel number



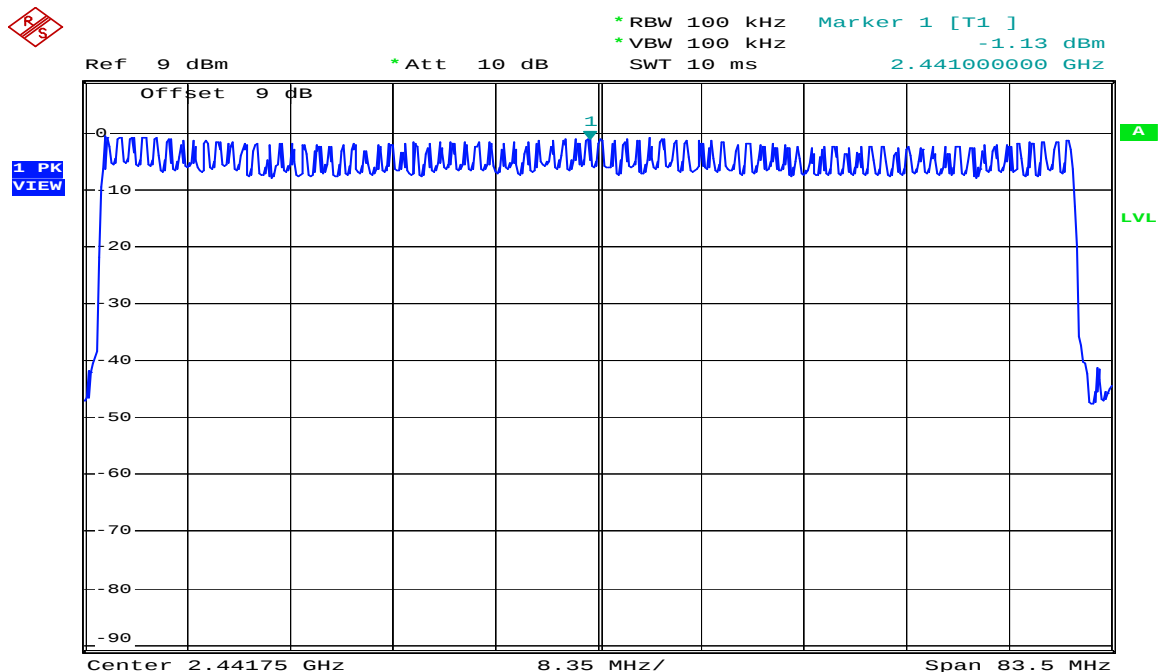
Comment: GFSK Channel Number
Date: 13.AUG.2008 16:13:24

$\pi/4$ DQPSK channel number



Comment: $\pi/4$ DQPSK Channel Number
Date: 13.AUG.2008 16:09:03

8 DPK channel number



Comment: 8DPK Channel Number
Date: 13.AUG.2008 15:54:44

7 Time of Occupancy (dwell time)

7.1 Limit

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 second within a period of 0.4 second 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.

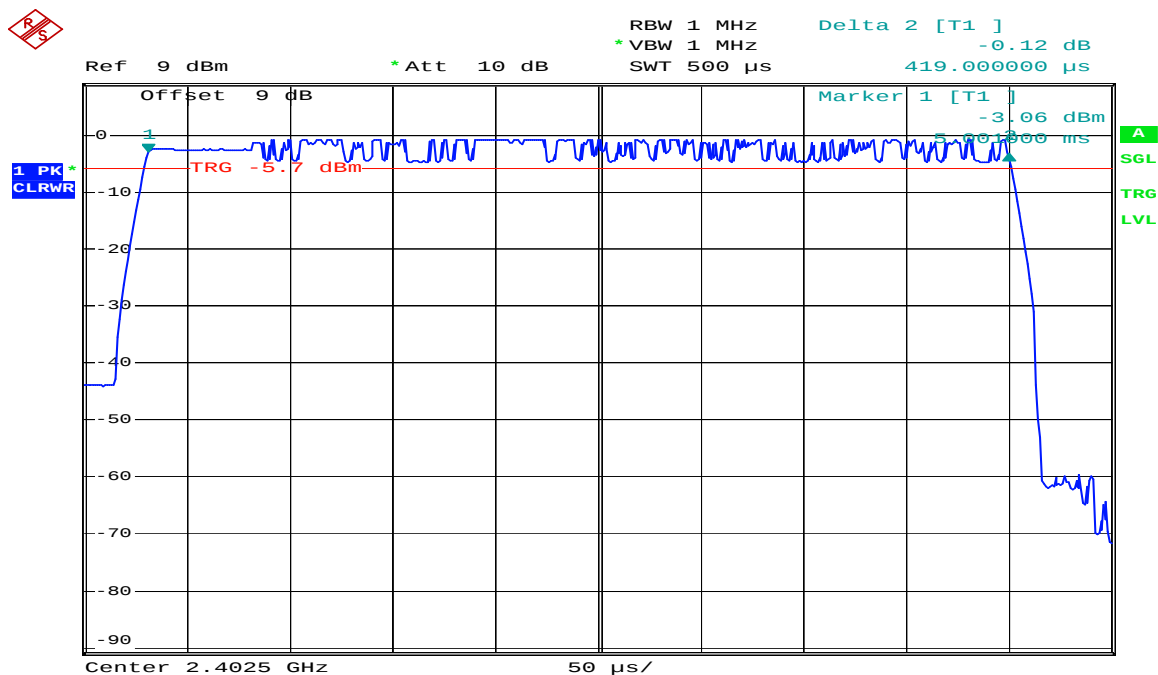
7.2 Test Result

PASS.

The final test data is shown on as following pages.

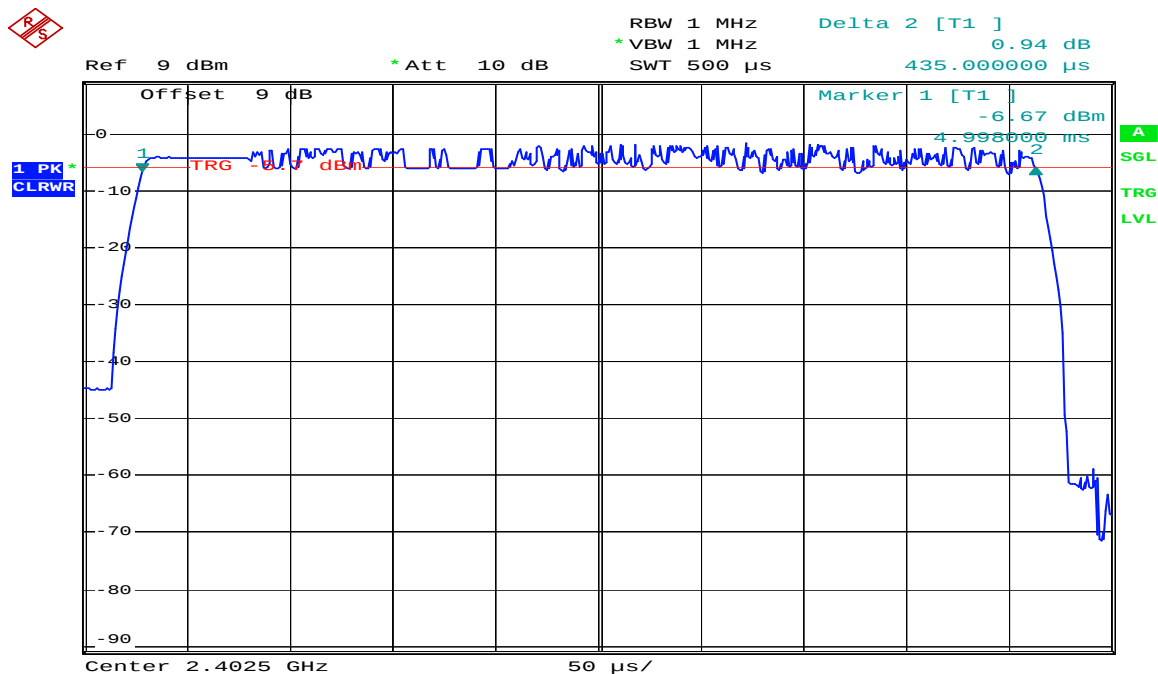
Dwell Time Test						
Modulation Type	Packet Type	Time Slot Length (ms)	Hop Rate (Hz)	Dwell Time (s)	Limit (s)	Test Result
GFSK	DH1	0.419	800	0.134	<0.4	PASS
	DH3	1.690	400	0.270	<0.4	PASS
	DH5	2.943	266	0.314	<0.4	PASS
$\pi/4$ DQPSK	DH1	0.435	800	0.139	<0.4	PASS
	DH3	1.704	400	0.273	<0.4	PASS
	DH5	2.947	266	0.314	<0.4	PASS
8 DPSK	DH1	0.436	800	0.140	<0.4	PASS
	DH3	1.700	400	0.272	<0.4	PASS
	DH5	2.944	266	0.314	<0.4	PASS

GFSK DH1 Dwell time



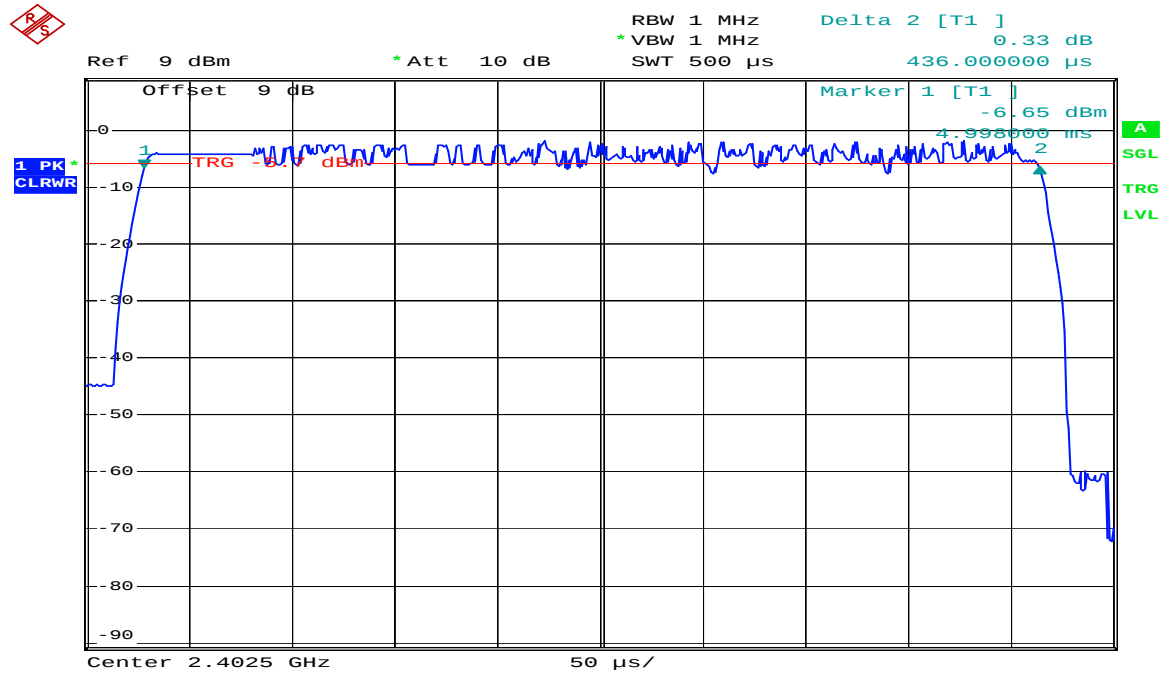
Comment: GFSK DH1 Time slot
Date: 13.AUG.2008 16:54:08

$\pi/4$ DQPSK DH1 Dwell time



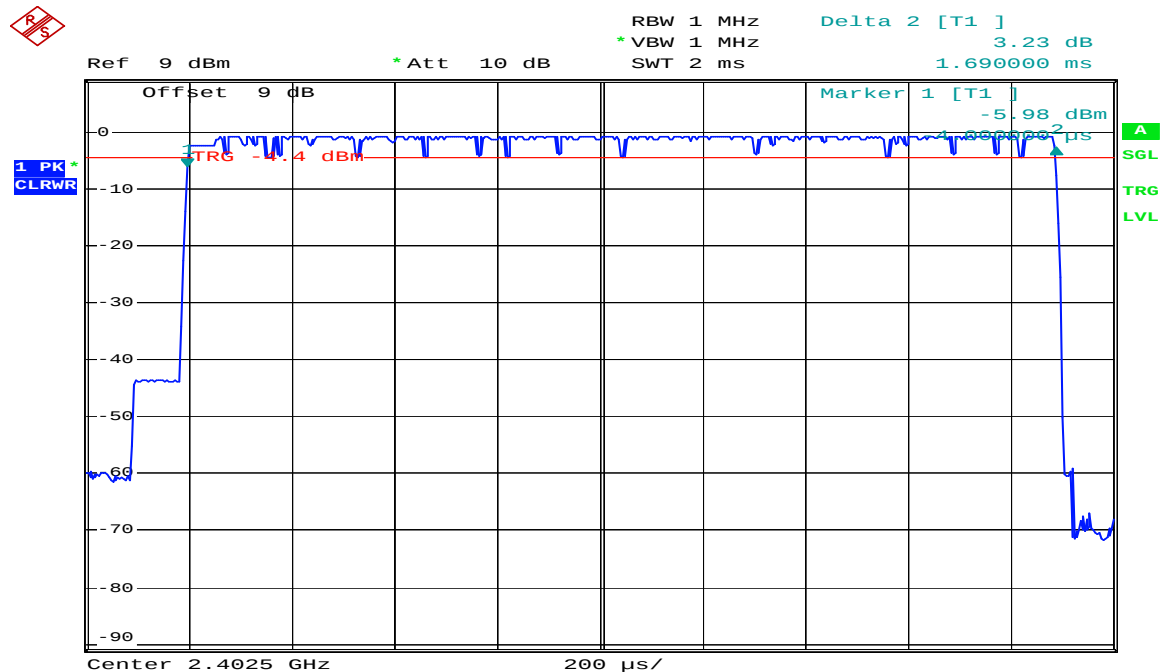
Comment: $\pi/4$ DQPSK DH1 Time slot
Date: 13.AUG.2008 16:56:03

8 DPDK DH1 Dwell time

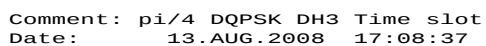


Comment: 8DPSK DH1 Time slot
Date: 13.AUG.2008 16:57:22

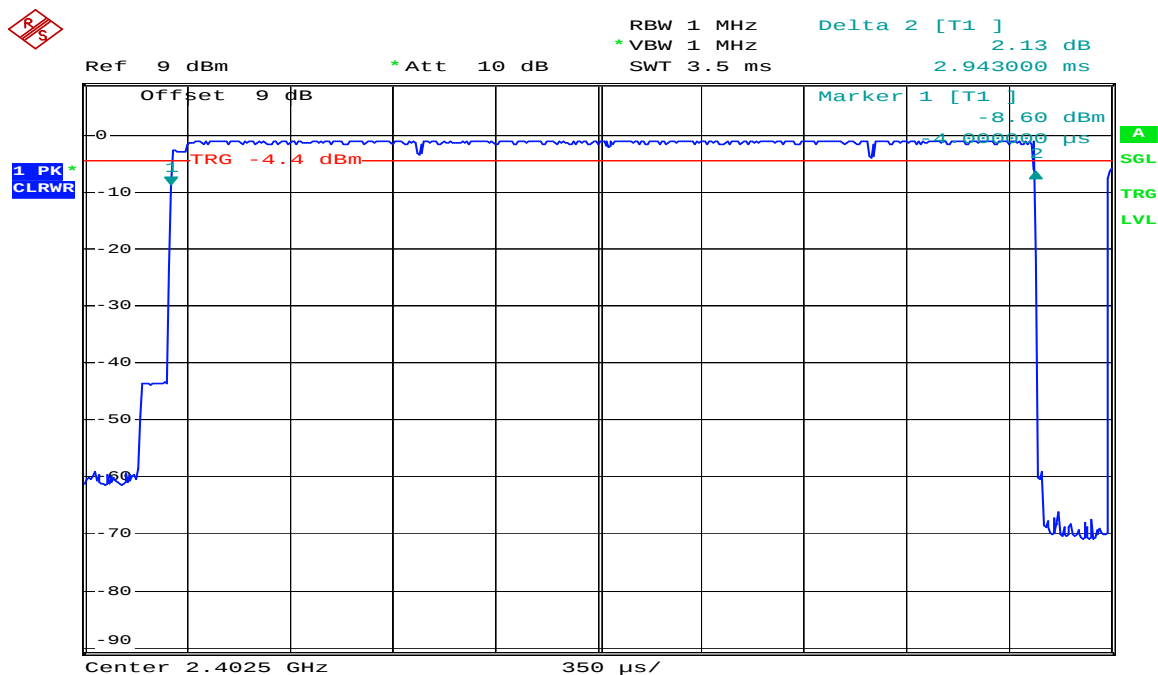
GFSK DH3 Dwell time



Comment: GFSK DH3 Time slot
Date: 13.AUG.2008 17:10:25

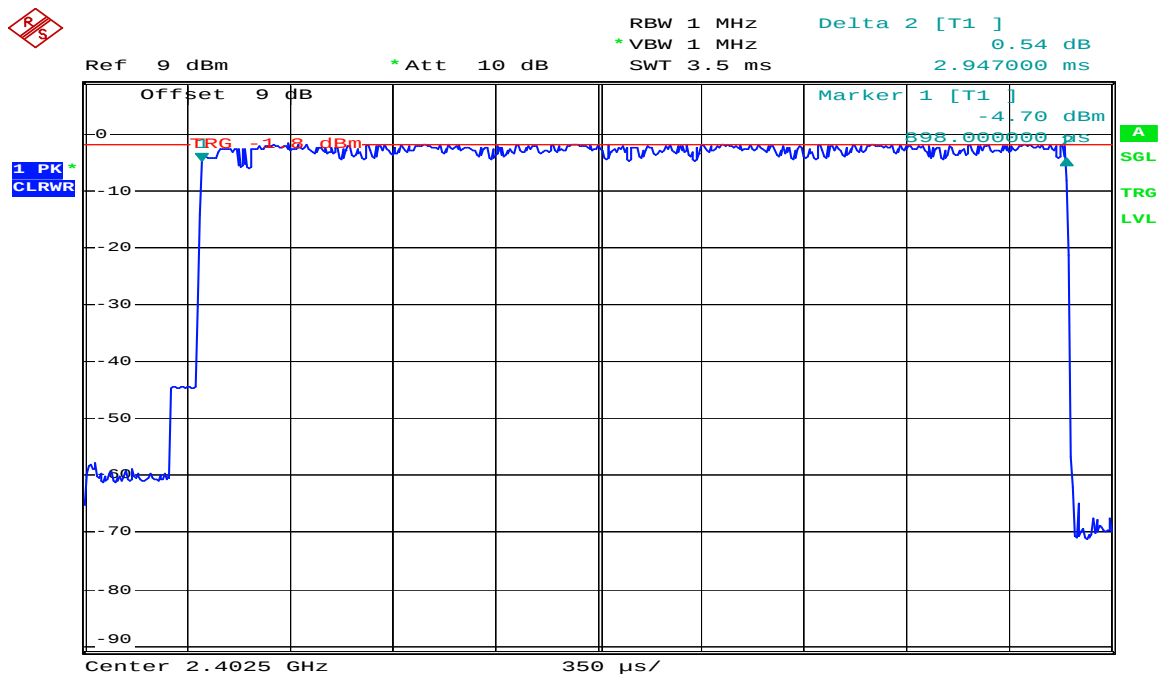


GFSK DH5 Dwell time



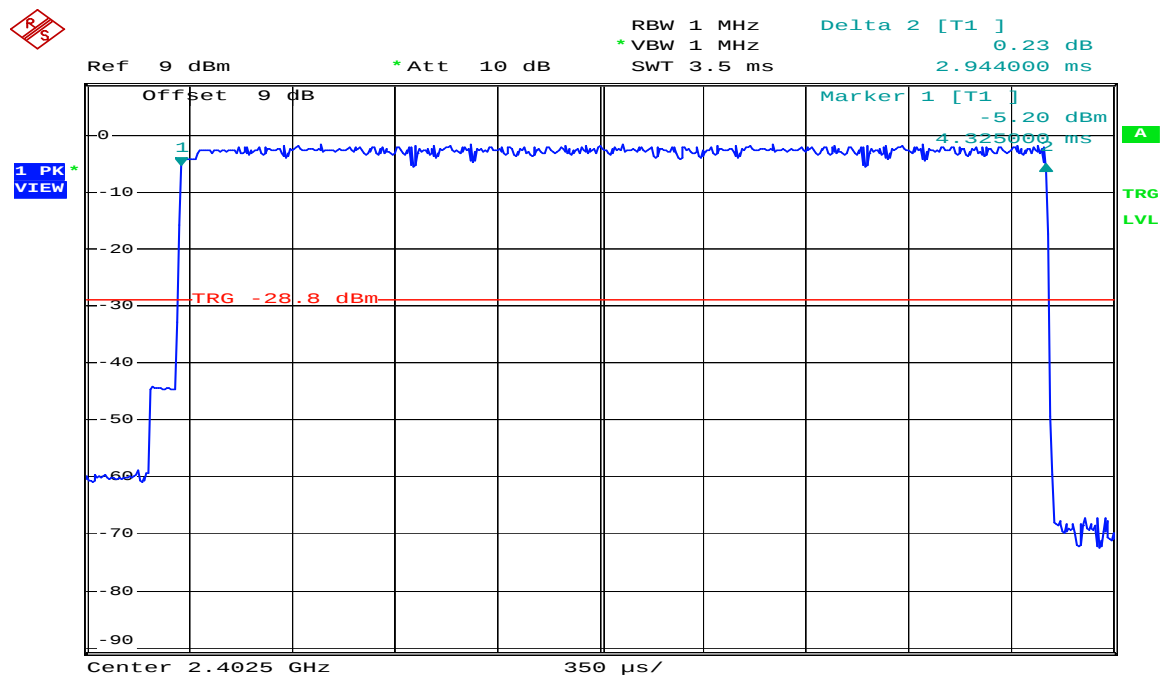
Comment: GFSK DH5 Time slot
Date: 13.AUG.2008 17:13:24

$\pi/4$ DQPSK DH5 Dwell time



Comment: $\pi/4$ DQPSK DH5 Time slot
Date: 13.AUG.2008 17:19:12

8 DPDK DH5 Dwell time



Comment: 8DPSK DH5 Time slot
Date: 13.AUG.2008 17:22:36

8 Maximum Output Power

8.1 Limit

For frequency hopping systems operating in the 2400-2483.5MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt.

For all other frequency hopping systems in the 2400-2483.5MHz band: 0.125 watts.

8.2 Test Result

PASS.

The final test data is shown on as following pages.

Mode: GFSK DH5					
CH	Temp. (°C)	Test Voltage (Vac)	Maximum transmit power (dBm)	Limit (dBm)	Margin (dB)
0	25	120	-0.61	30	-30.61
39	25	120	-0.87	30	-30.87
78	25	120	-1.33	30	-31.33

Mode: $\pi/4$ DQPSK DH5					
CH	Temp. (°C)	Test Voltage (Vac)	Maximum transmit power (dBm)	Limit (dBm)	Margin (dB)
0	25	120	-0.57	21	-21.57
39	25	120	-0.67	21	-21.67
78	25	120	-1.44	21	-22.44

Mode: 8DPSK DH5					
CH	Temp. (°C)	Test Voltage (Vac)	Maximum transmit power (dBm)	Limit (dBm)	Margin (dB)
0	25	120	-0.35	21	-21.35
39	25	120	-0.96	21	-21.96
78	25	120	-1.59	21	-22.59

9 RF Conducted spurious emission

9.1 Limit

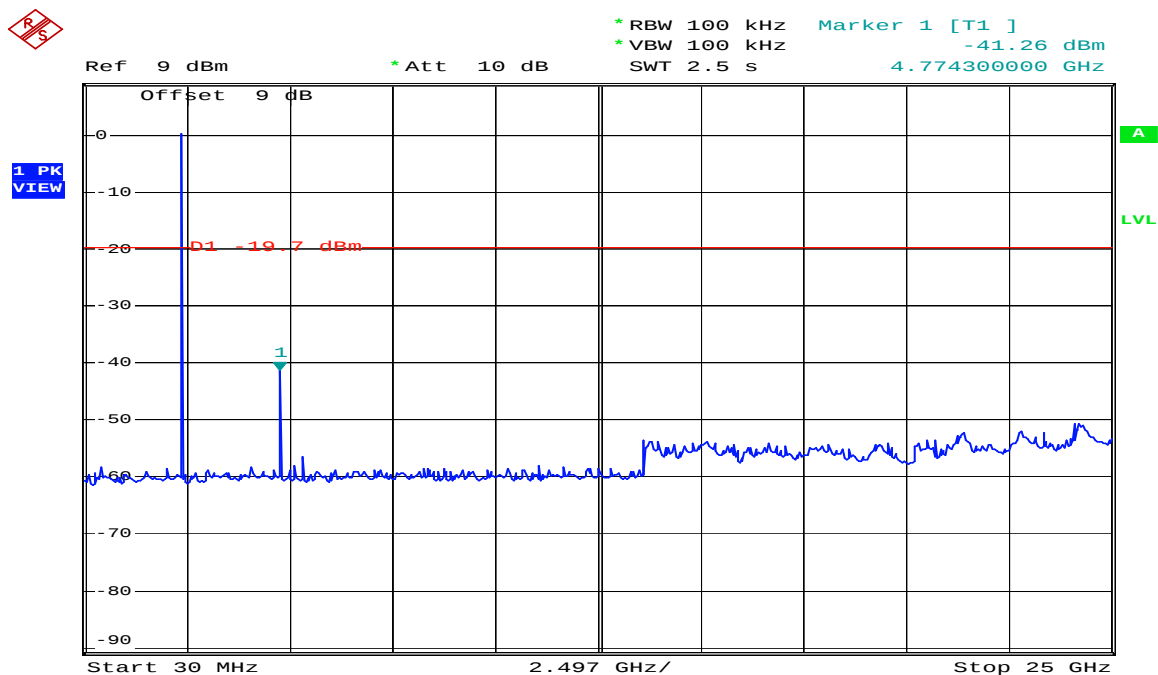
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

9.2 Test Result

PASS.

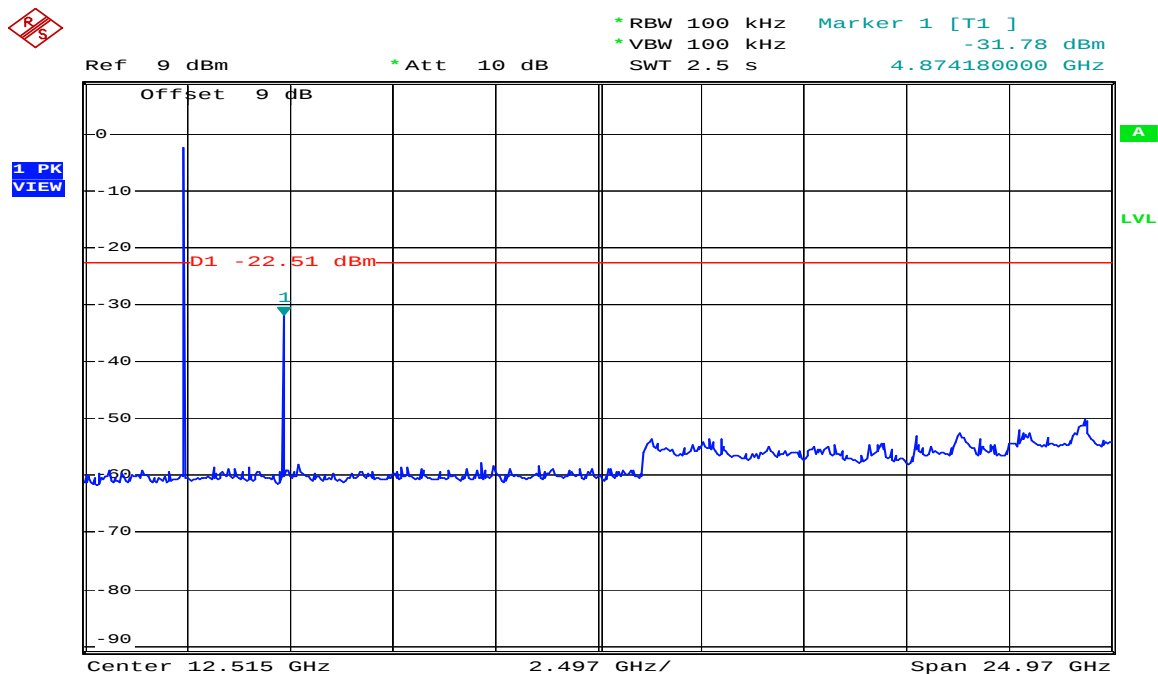
The final test data is shown on as following pages.

GFSK 2402MHz Conducted spurious



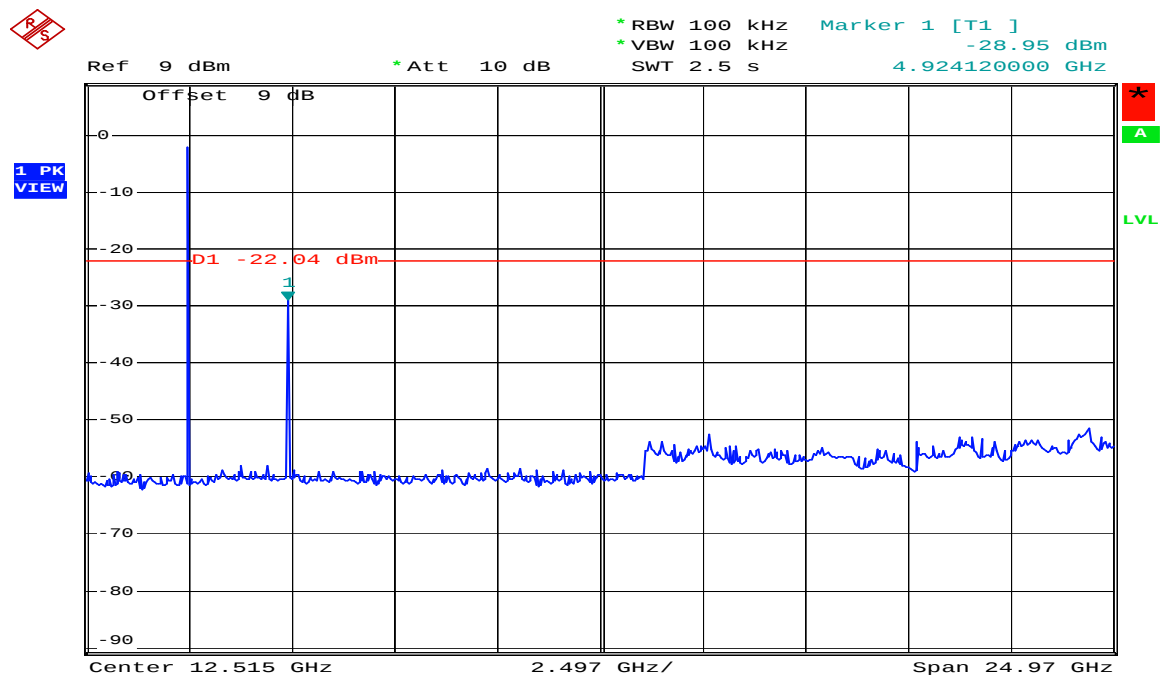
Comment: GFSK CH1 Conducted spurious
Date: 13.AUG.2008 16:19:45

GFSK 2441MHz Conducted spurious



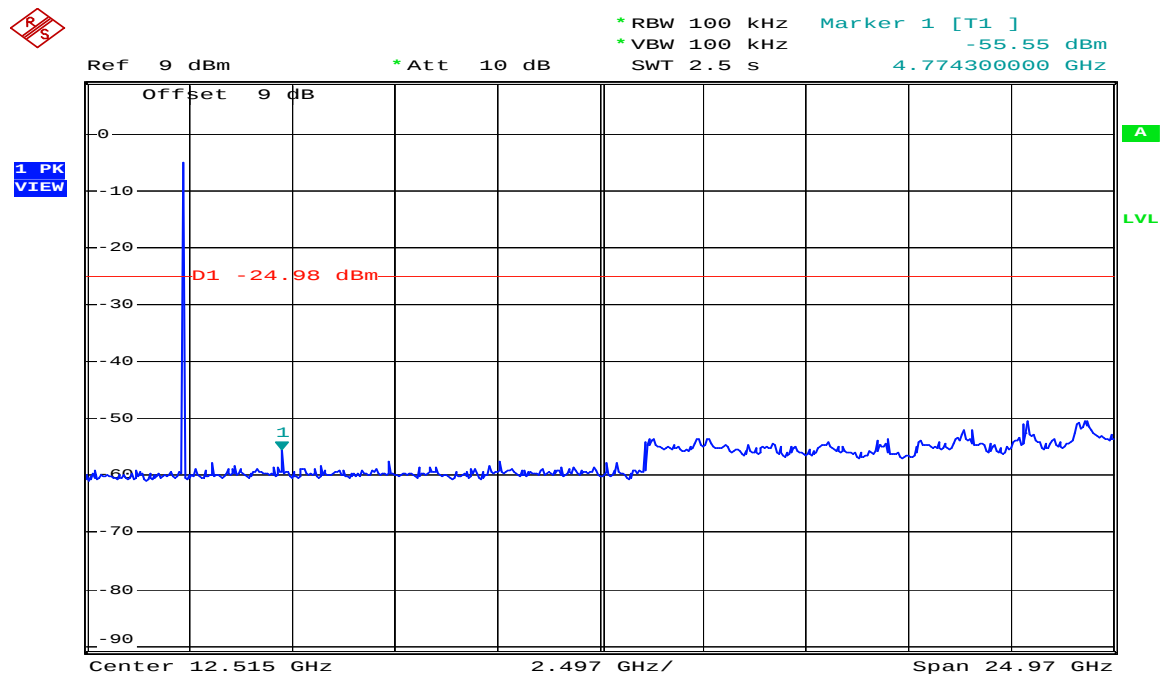
Comment: GFSK CH40 Conducted spurious
Date: 13.AUG.2008 16:22:00

GFSK 2480MHz Conducted spurious



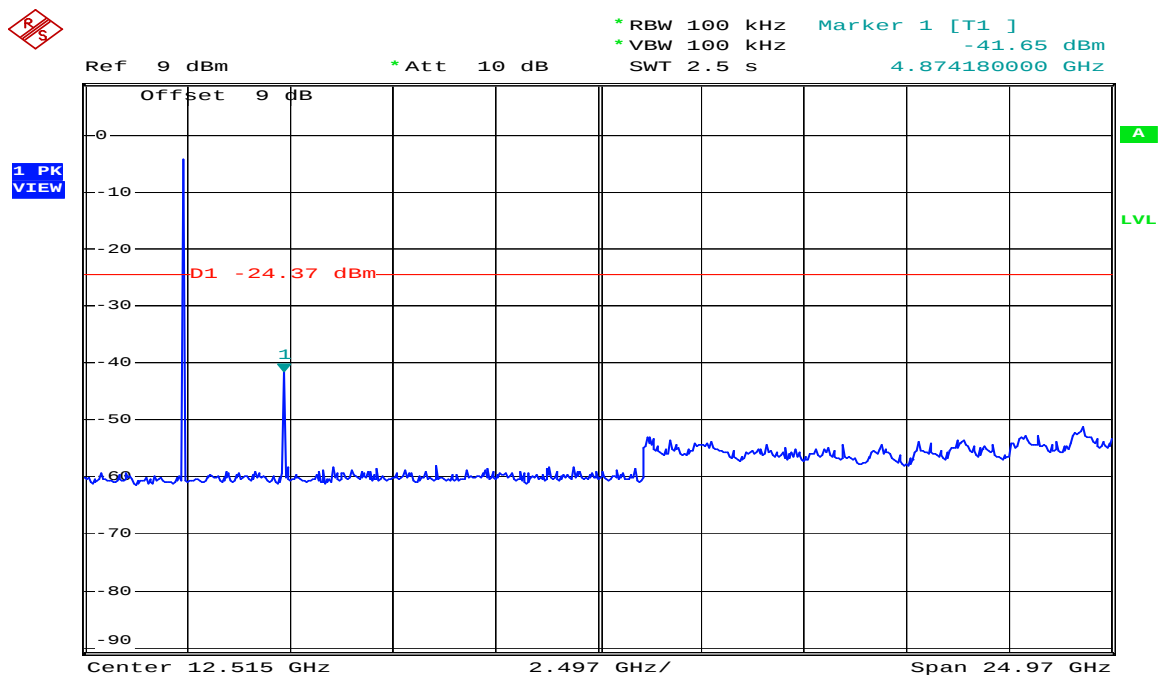
Comment: GFSK CH79 Conducted spurious
Date: 13.AUG.2008 16:23:43

$\pi/4$ DQPSK 2402MHz Conducted spurious



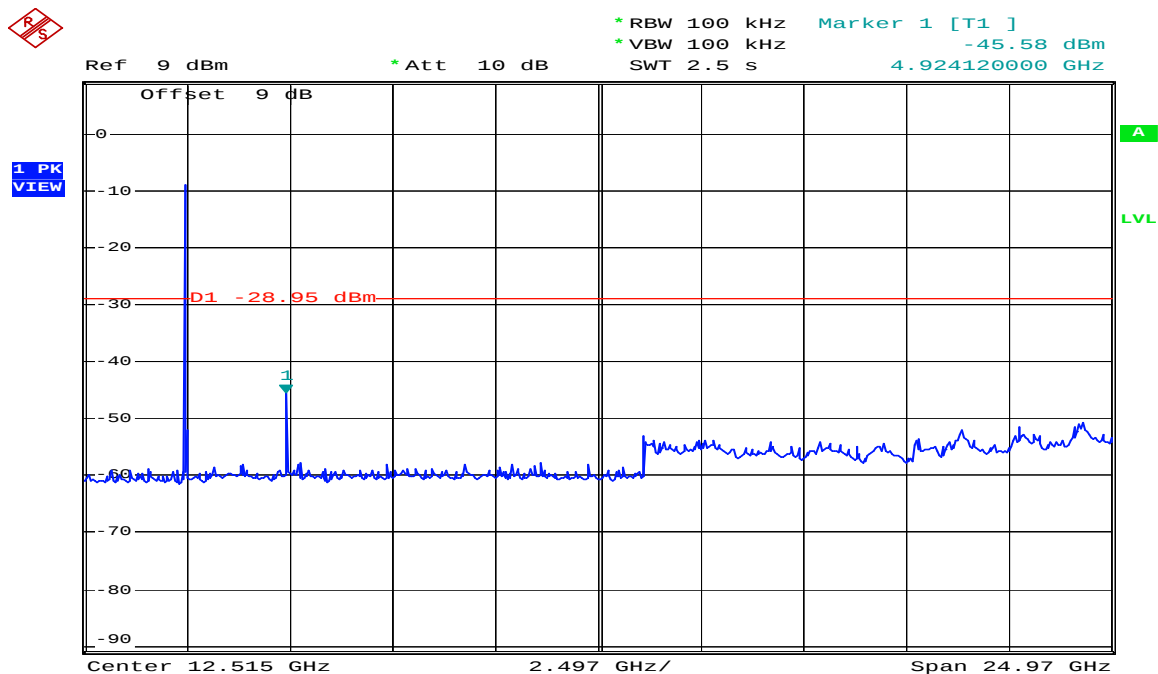
Comment: $\pi/4$ DQPSK CH1 Conducted spurious
Date: 13.AUG.2008 16:28:19

$\pi/4$ DQPSK 2441MHz Conducted spurious



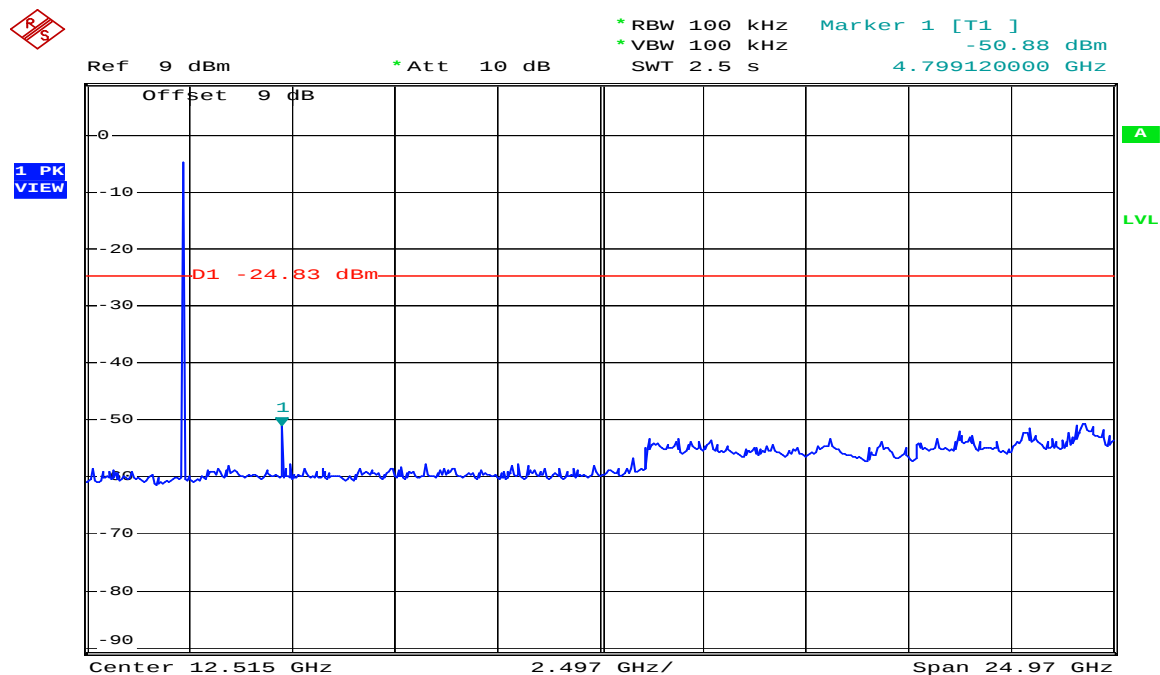
Comment: $\pi/4$ DQPSK CH40 Conducted spurious
Date: 13.AUG.2008 16:26:31

$\pi/4$ DQPSK 2480MHz Conducted spurious



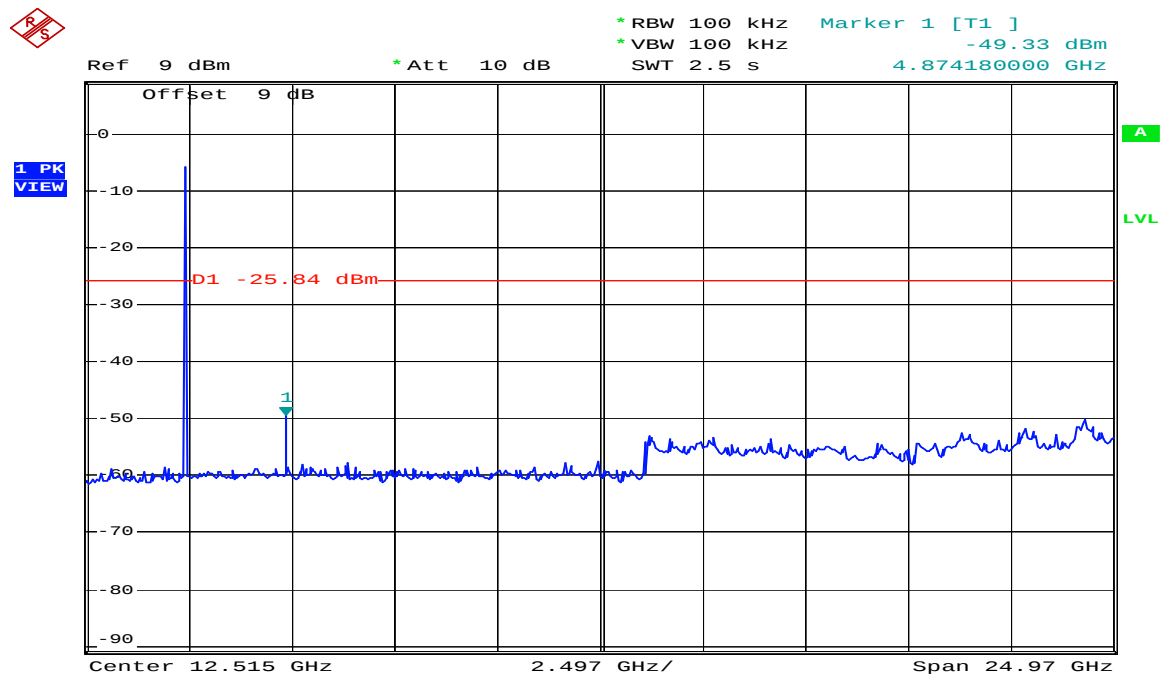
Comment: $\pi/4$ DQPSK CH79 Conducted spurious
Date: 13.AUG.2008 16:25:24

8 DPSK 2402MHz Conducted spurious



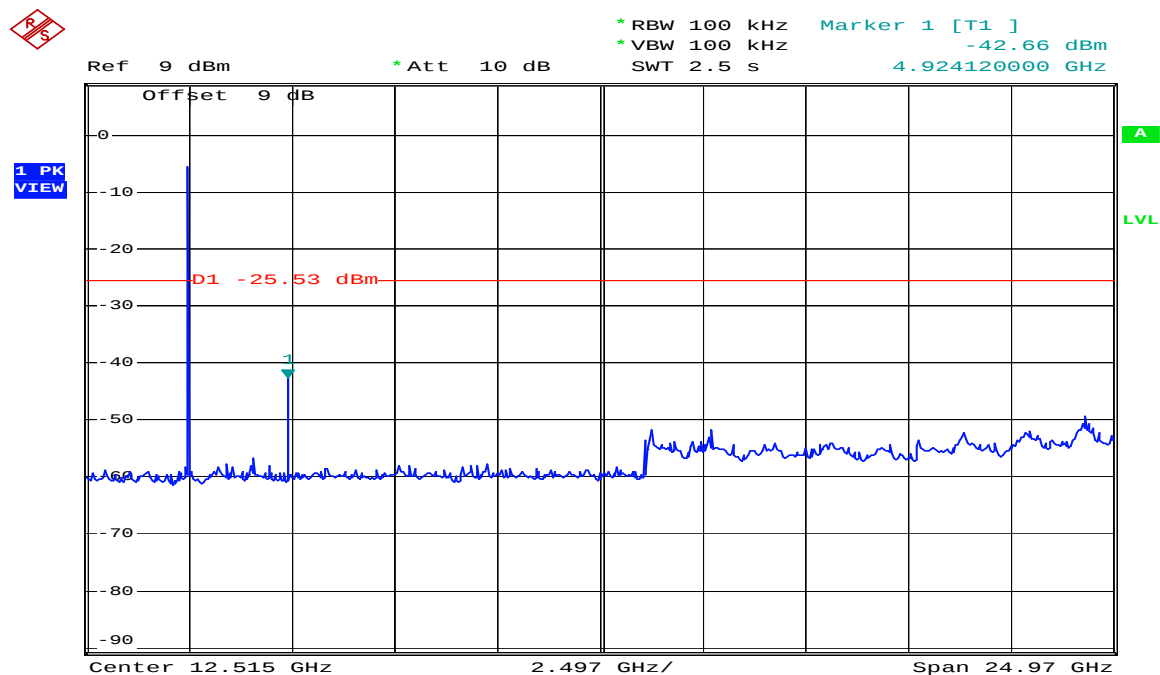
Comment: 8DPSK CH1 Conducted spurious
Date: 13.AUG.2008 16:30:36

8 DPSK 2441MHz Conducted spurious



Comment: 8DPSK CH40 Conducted spurious
Date: 13.AUG.2008 16:31:44

8 DPSK 2480MHz Conducted spurious



Comment: 8DPSK CH79 Conducted spurious
Date: 13.AUG.2008 16:32:48

10 RF Radiated spurious emission test

10.1 Limit

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands¹ (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (μV/m)	Limit (dBμV/m @ 3m)
0.009-0.490	2400/FkHz @ 300m	67.6-20*log ₁₀ (FkHz) @ 300m
0.490-1.705	24000/FkHz @ 30m	87.6-20*log ₁₀ (FkHz) @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (μV/m @ 3m)	Limit (dBμV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

10.2 Test Result

PASS.

The final test data is shown on as following pages.

Remark : After verifying GFSK, $\pi/4$ DQPSK and 8 DPSK modulation mode, the worst case was caused at GFSK mode. The worst case was record in this report.

Radiated Emission below 1GHz

Transmitter Mode

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
220.251	H	51.10	28.92	11.73	33.91	46.00	-12.09	QP
315.000	H	46.80	28.97	17.57	35.40	46.00	-10.60	QP
458.180	H	45.80	29.09	22.71	39.42	46.00	-6.58	QP
630.000	H	36.90	28.30	27.39	35.99	46.00	-10.01	QP
791.980	H	38.70	28.05	29.40	40.05	46.00	-5.95	QP
116.950	V	54.83	28.82	14.05	40.06	43.50	-3.44	QP
144.000	V	53.30	28.83	14.69	39.16	43.50	-4.34	QP
185.210	V	48.12	28.91	11.81	31.02	43.50	-12.48	QP
200.250	V	38.30	28.92	11.64	21.02	43.50	-22.48	QP
553.250	V	38.40	28.69	26.42	36.13	46.00	-9.87	QP

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss

Radiated Emission below 1GHz

Receiving Mode

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
222.325	H	46.33	28.96	12.00	29.37	46.00	-16.63	QP
315.000	H	40.05	28.97	17.57	28.65	46.00	-17.35	QP
456.004	H	39.26	29.09	22.71	32.88	46.00	-13.12	QP
188.960	V	43.28	28.91	11.81	26.18	43.50	-17.32	QP
201.320	V	32.65	28.92	11.64	15.37	43.50	-28.13	QP
554.990	V	32.51	28.69	26.42	30.24	46.00	-15.76	QP

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss

Radiated Emission above 1GHz

GFSK 2402MHz								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
4804.00	H	45.00	35.61	37.47	46.86	54	-7.14	PK
4804.00	V	44.96	35.61	37.47	46.82	54	-7.18	PK

GFSK 2441MHz								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
4882.00	H	45.14	35.38	37.59	47.35	54	-6.65	PK
4882.00	V	44.69	35.38	37.59	46.90	54	-7.10	PK

GFSK 2480MHz								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamp (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
4960.00	H	45.83	35.76	37.72	47.79	54	-6.21	PK
4960.00	V	45.53	35.76	37.72	47.49	54	-6.51	PK

Remark : Corrected Level = Reading + Correction Factor – Preamp
Correction Factor = Antenna Factor + Cable Loss

11 Emission on the Band Edge

11.1 Limit

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

11.2 Test Result

PASS.

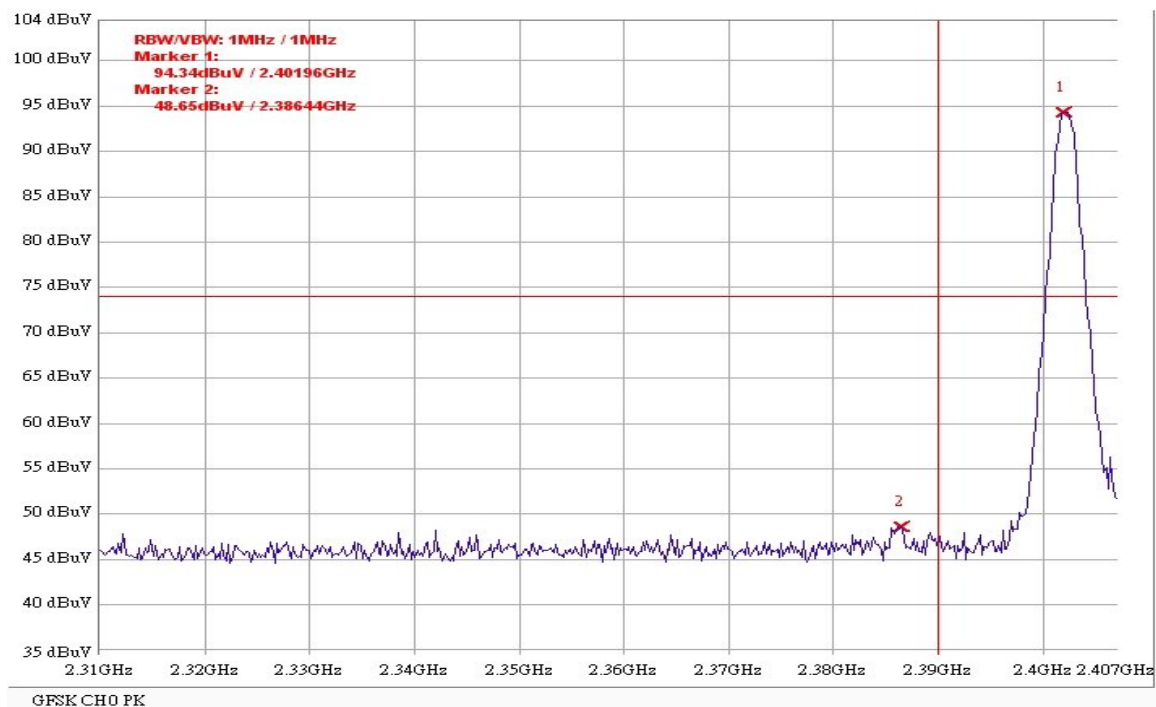
The final test data is shown on as following pages.

Mode : GFSK					
CH	Restrict Freq. Band (MHz)	Detector Mode	Maximum level (dB μ V/m)	Limit (dBm)	Margin (dB)
0	2310~2390	PK	48.65	74	-25.35
		AV	38.46	54	-15.54
78	2483.5~2500	PK	51.57	74	-22.43
		AV	44.50	54	-9.50

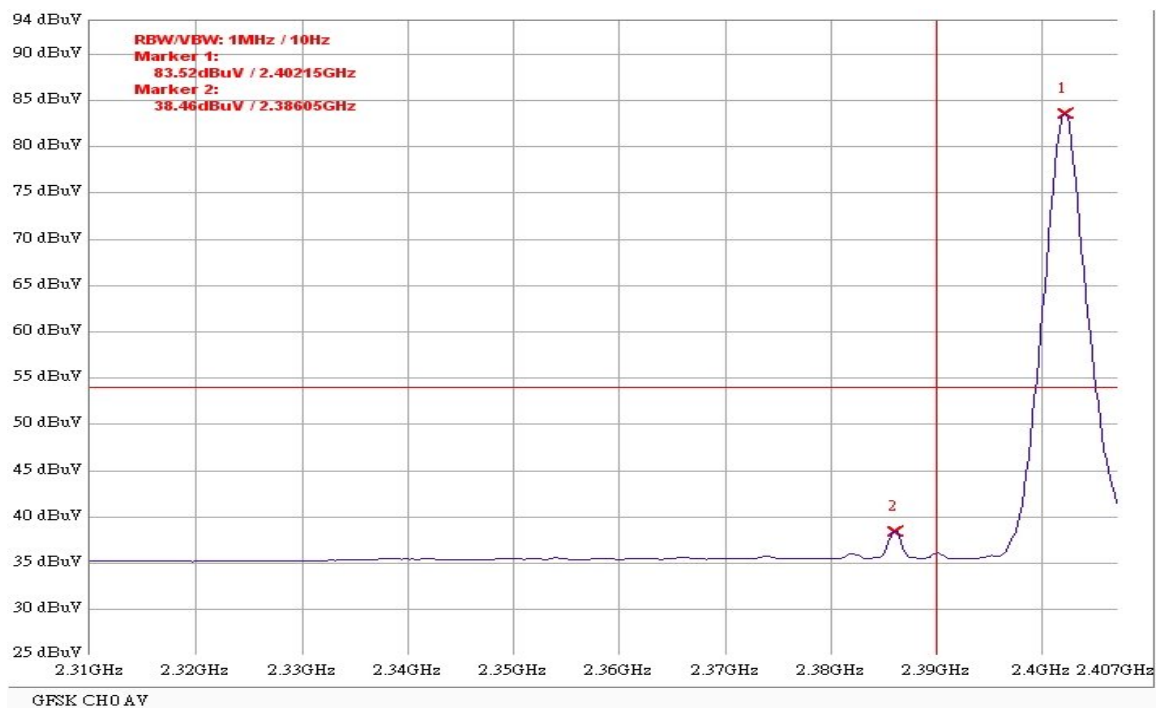
Mode : $\pi/4$ DQPSK					
CH	Restrict Freq. Band (MHz)	Detector Mode	Maximum level (dB μ V/m)	Limit (dBm)	Margin (dB)
0	2310~2390	PK	48.87	74	-25.13
		AV	37.73	54	-16.27
78	2483.5~2500	PK	53.51	74	-20.49
		AV	43.74	54	-10.26

Mode : 8 DPSK					
CH	Restrict Freq. Band (MHz)	Detector Mode	Maximum level (dB μ V/m)	Limit (dBm)	Margin (dB)
0	2310~2390	PK	49.04	74	-24.96
		AV	37.15	54	-16.85
78	2483.5~2500	PK	53.30	74	-20.70
		AV	43.97	54	-10.03

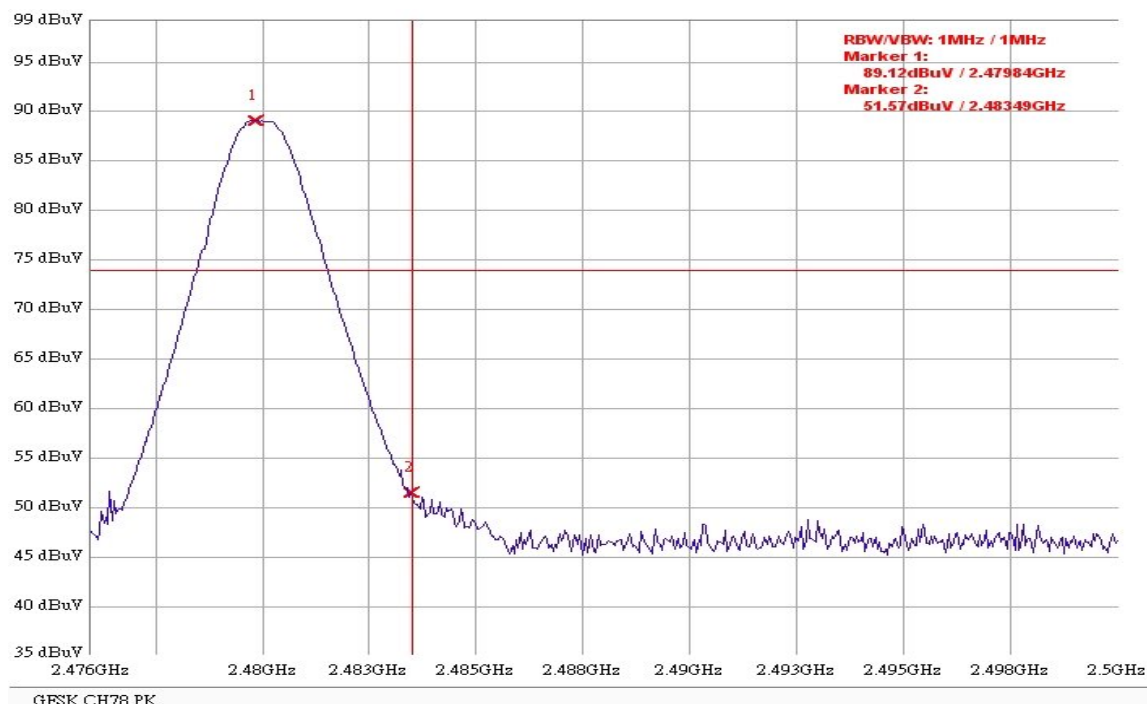
GFSK CH0 PK



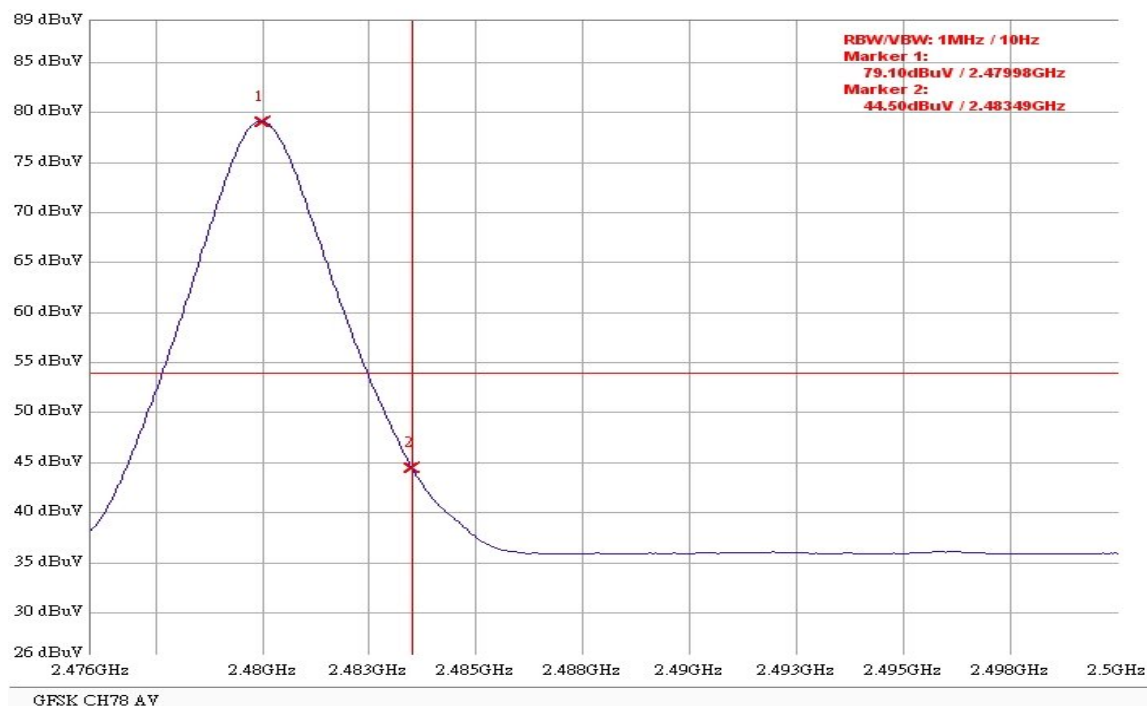
GFSK CH0 AV



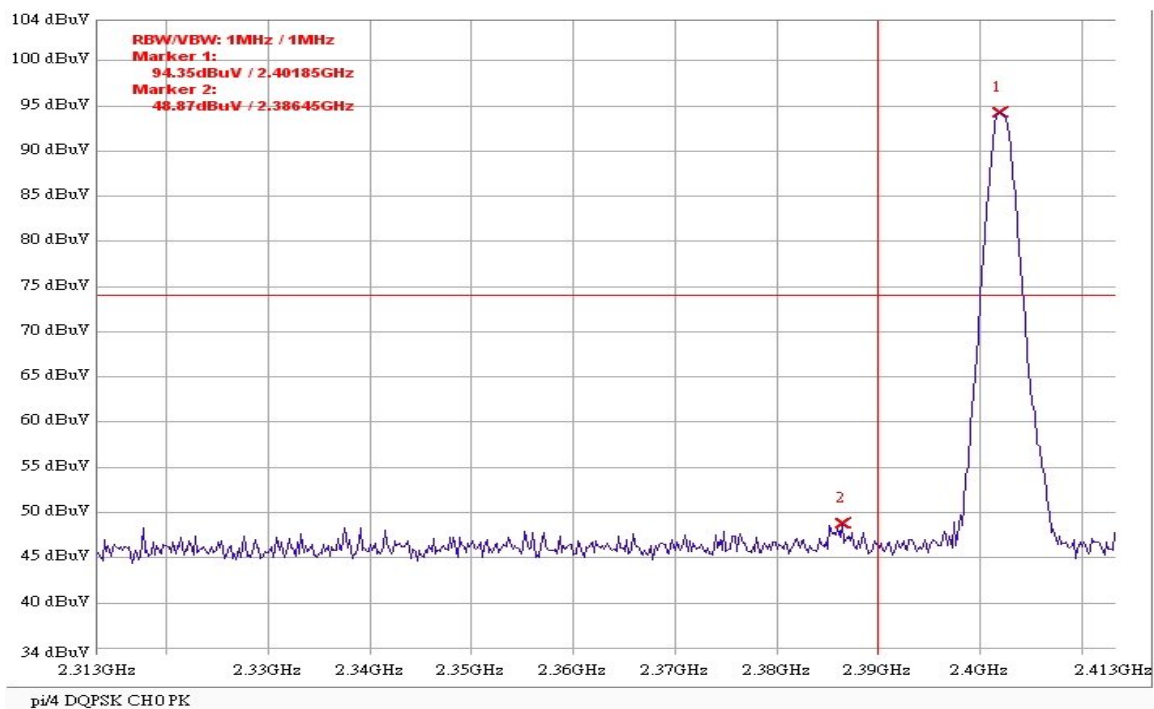
GFSK CH78 PK



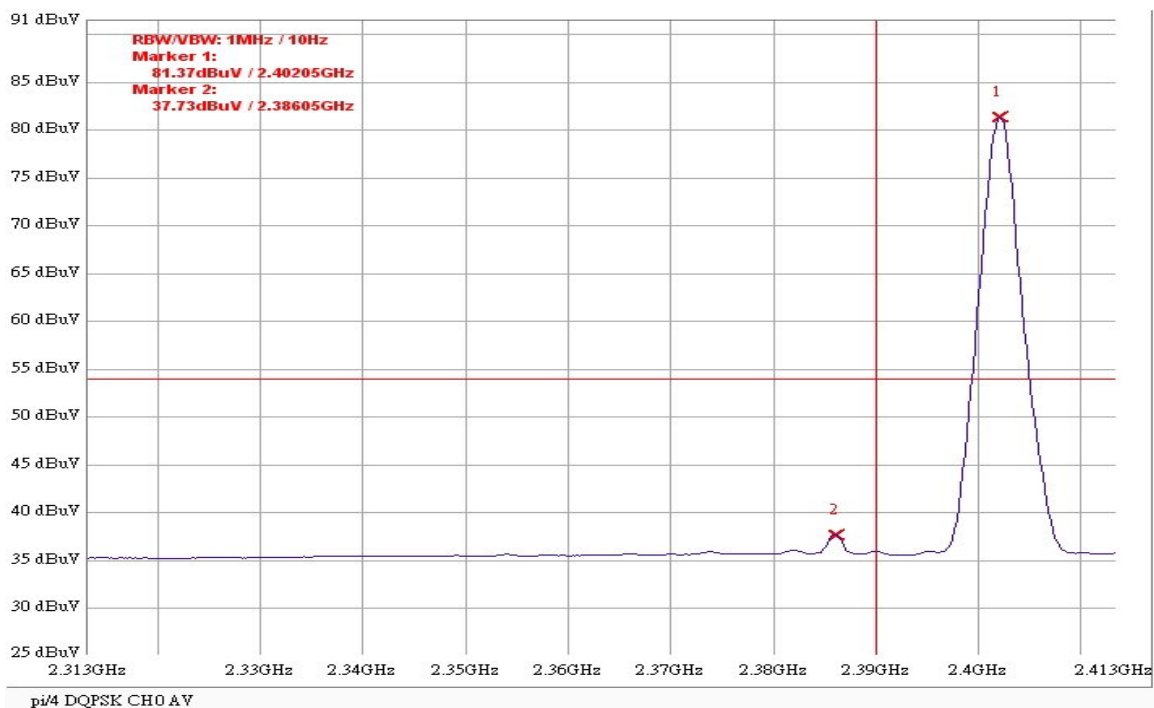
GFSK CH78 AV



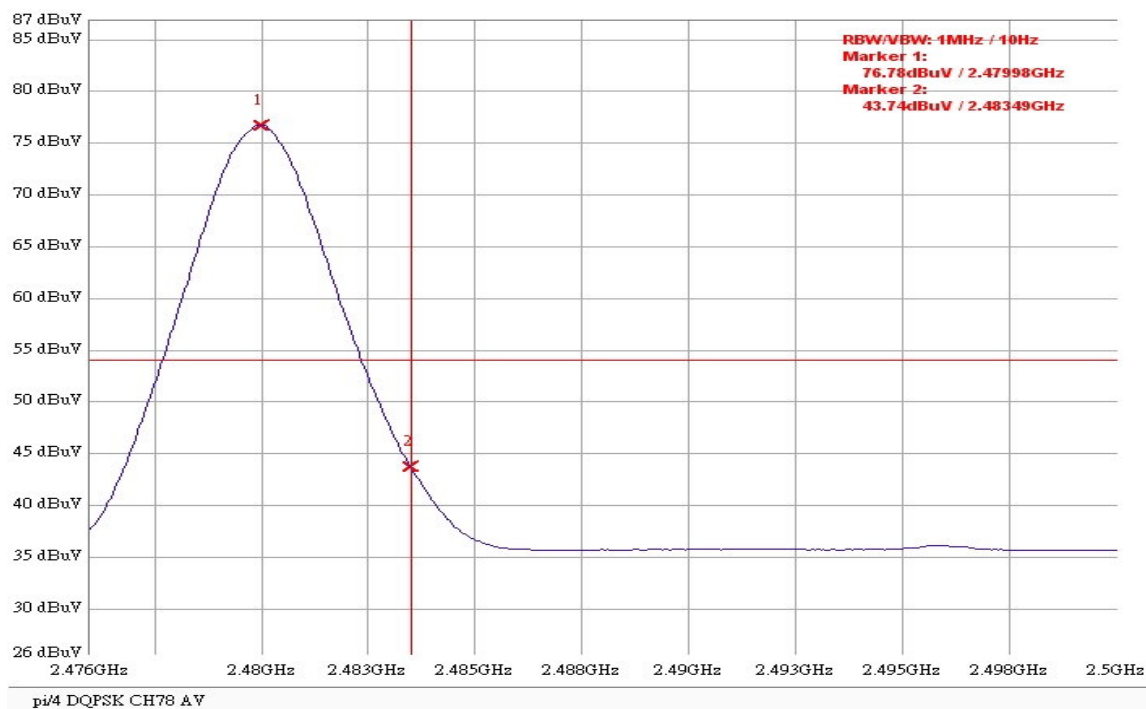
$\pi/4$ DQPSK CH0 PK



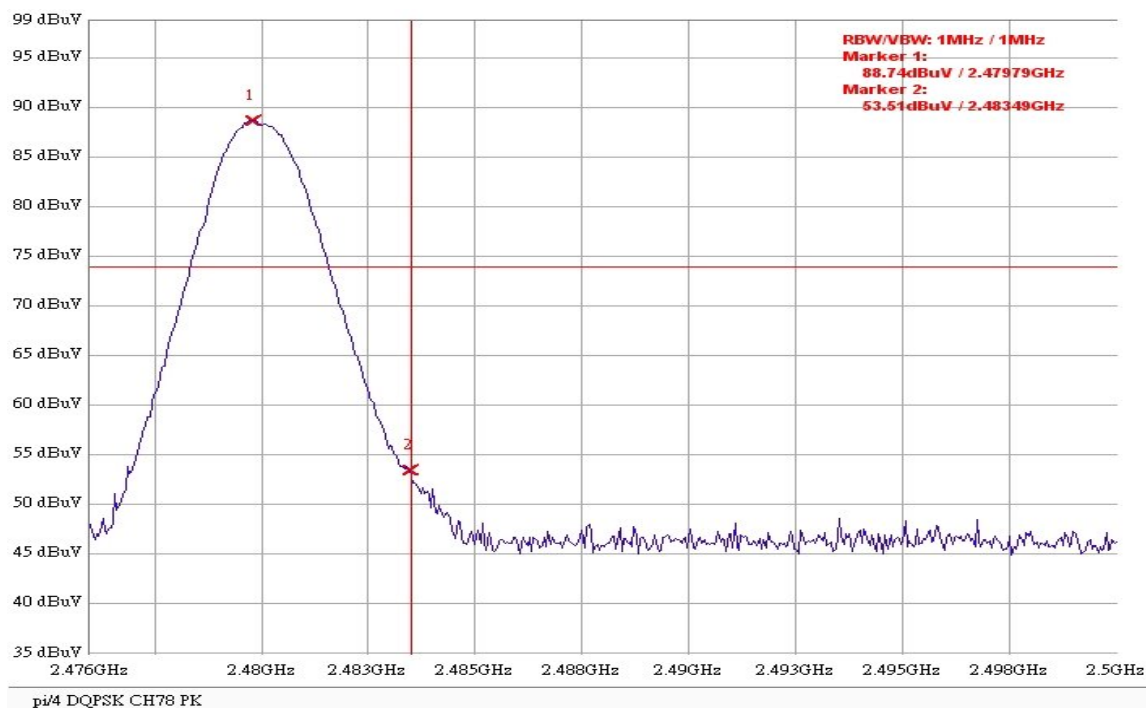
$\pi/4$ DQPSK CH0 AV



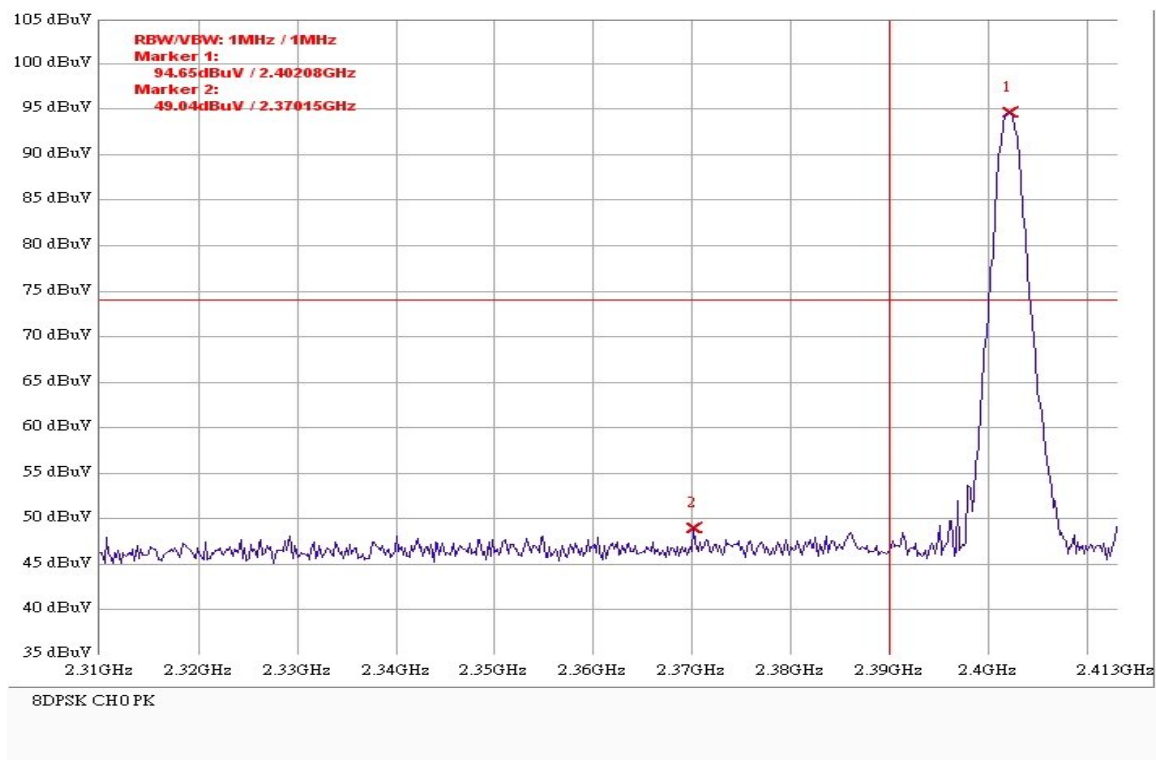
$\pi/4$ DQPSK CH78 PK



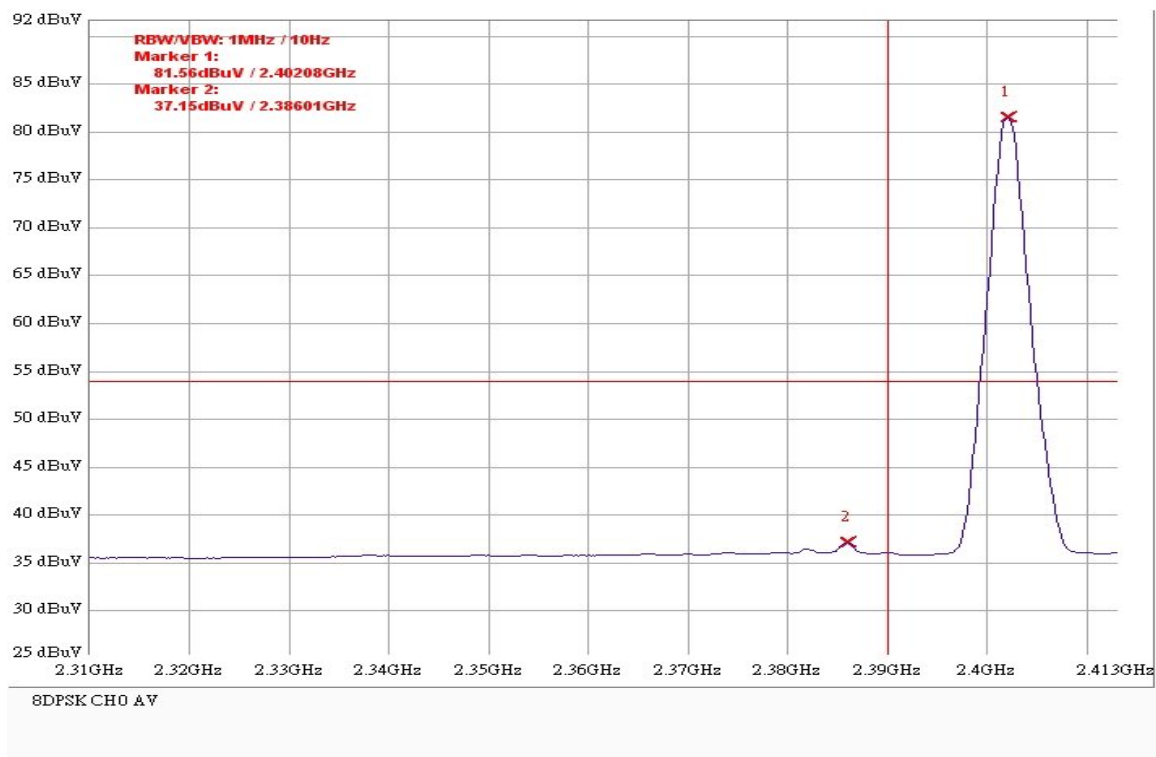
$\pi/4$ DQPSK CH78 PK



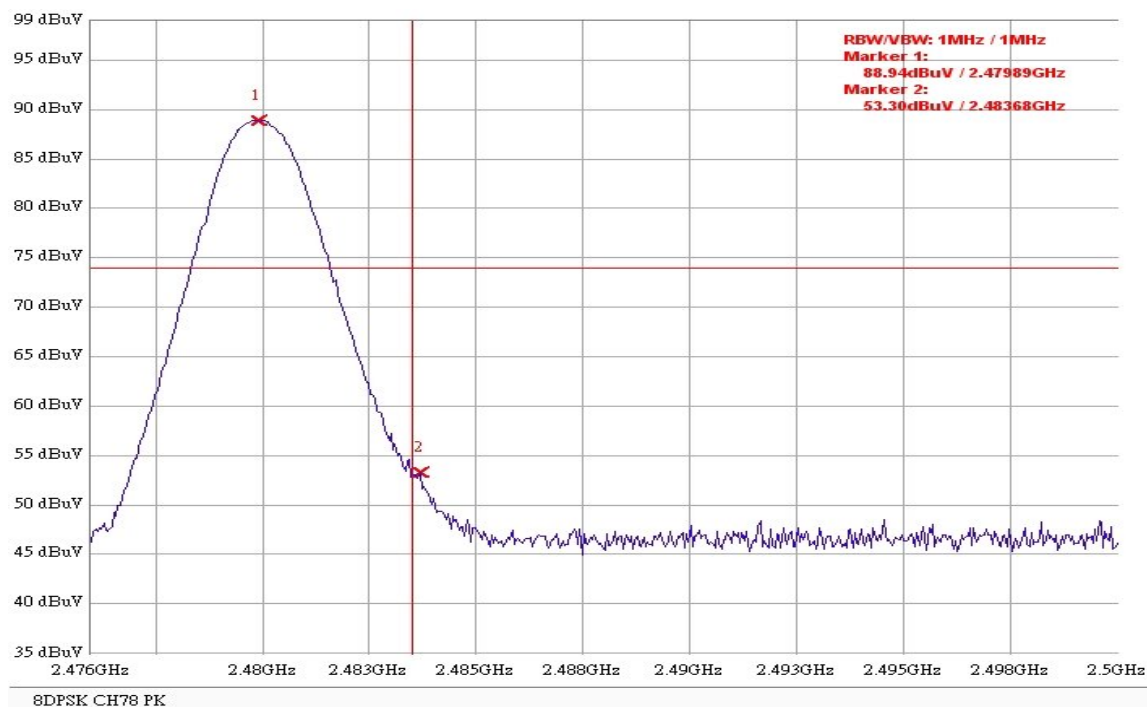
8DPSK CH0 PK



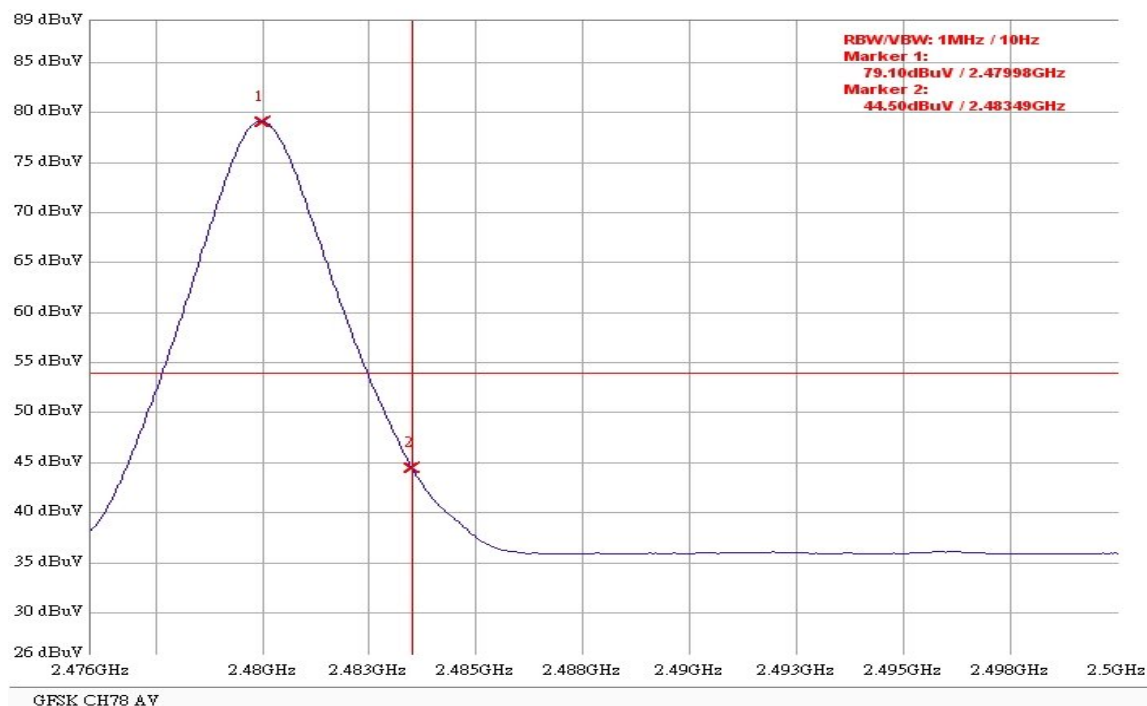
8DPSK CH0 AV



8DPSK CH78 PK



8DPSK CH78 AV



12 AC Power Line Conducted Emission

12.1 Limit

Frequency (MHz)	Quasi-Peak (dB μ V)	Average (dB μ V)
0.15 to 0.5	66 to 56	56 to 46
> 0.5 to 5	56	46
> 5 to 30	60	50
Note : The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

12.2 Test Result

PASS.

The final test data is shown on as following pages.

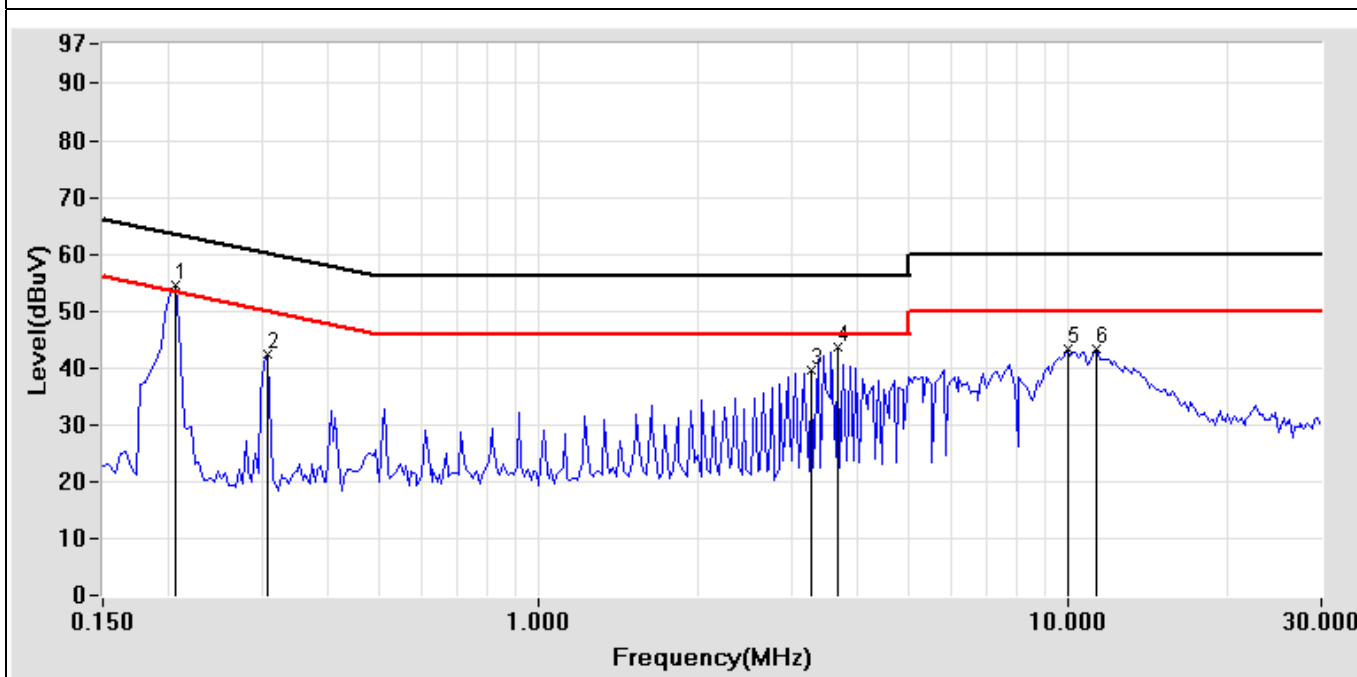
Power Line Conducted Test Data

EUT: GPS Navigation System	POLARITY: Line
CLIENT: TomTom	DISTANCE:
MODEL: DUB1	Serial No.:
RATING: 120V/60Hz	FILE/DATA#: TomTomemi/25
Temperature: 26.0 °C	OPERATOR: Terry
Humidity: 60 %	TEST SITE: Conduction1

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.205	0.13	54.13	43.70	54.26	43.83	63.41	53.41	-9.15	-9.58
0.306	0.13	42.51	31.70	42.64	31.83	60.08	50.08	-17.44	-18.25
3.255	0.25	39.98	37.58	40.23	37.83	56.00	46.00	-15.77	-8.17
3.662	0.27	42.93	40.20	43.20	40.47	56.00	46.00	-12.80	-5.53
9.970	0.54	41.14	35.99	41.68	36.53	60.00	50.00	-18.32	-13.47
11.291	0.60	41.52	36.59	42.12	37.19	60.00	50.00	-17.88	-12.81

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Mode 1: Operation Mode (Adapter)

Power Line Conducted Test Data

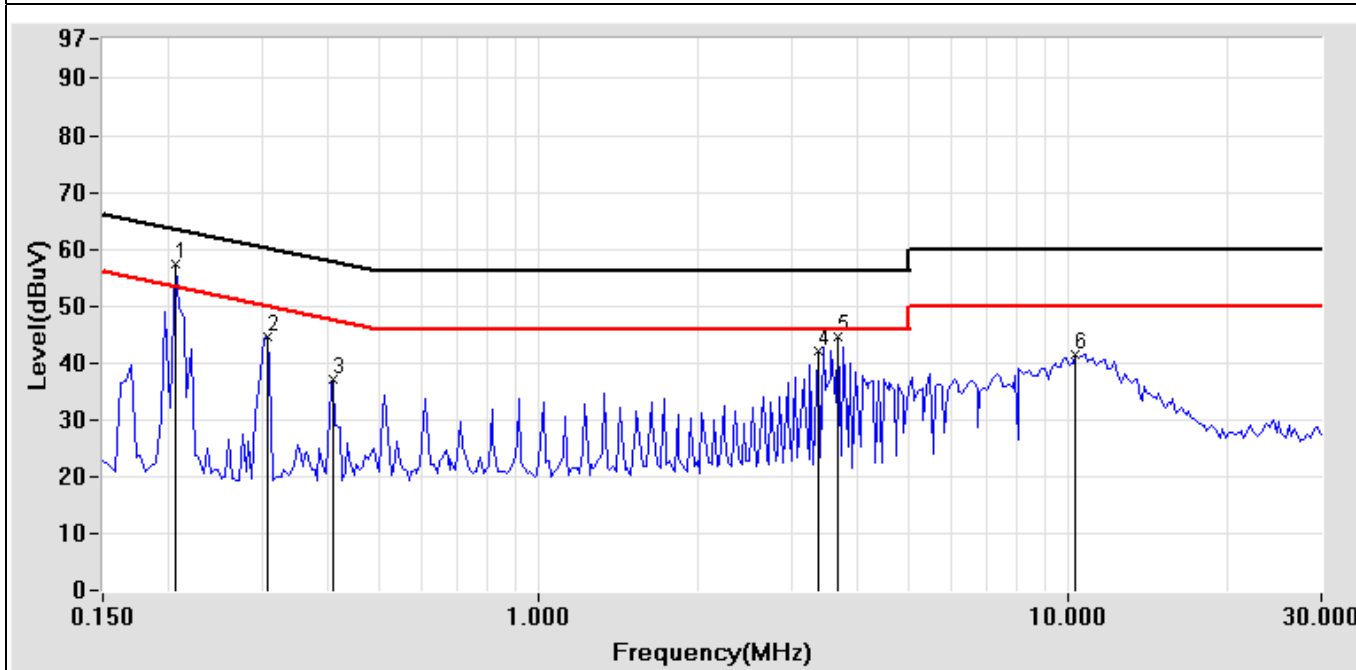
EUT: GPS Navigation System
CLIENT: TomTom
MODEL: DUB1
RATING: 120V/60Hz
Temperature: 26.0 °C
Humidity: 60 %

POLARITY: Neutral
DISTANCE:
Serial No.:
FILE/DATA#: TomTomemi/24
OPERATOR: Nigel
TEST SITE: Conduction1

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.205	0.13	56.42	45.90	56.55	46.03	63.41	53.41	-6.86	-7.38
0.306	0.13	44.47	34.70	44.60	34.83	60.08	50.08	-15.48	-15.25
0.408	0.14	36.50	30.96	36.64	31.10	57.69	47.69	-21.05	-16.59
3.357	0.19	41.90	39.70	42.09	39.89	56.00	46.00	-13.91	-6.11
3.662	0.19	43.23	40.57	43.42	40.76	56.00	46.00	-12.58	-5.24
10.267	0.45	40.20	35.30	40.65	35.75	60.00	50.00	-19.35	-14.25

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Mode 1: Operation Mode (Adapter)

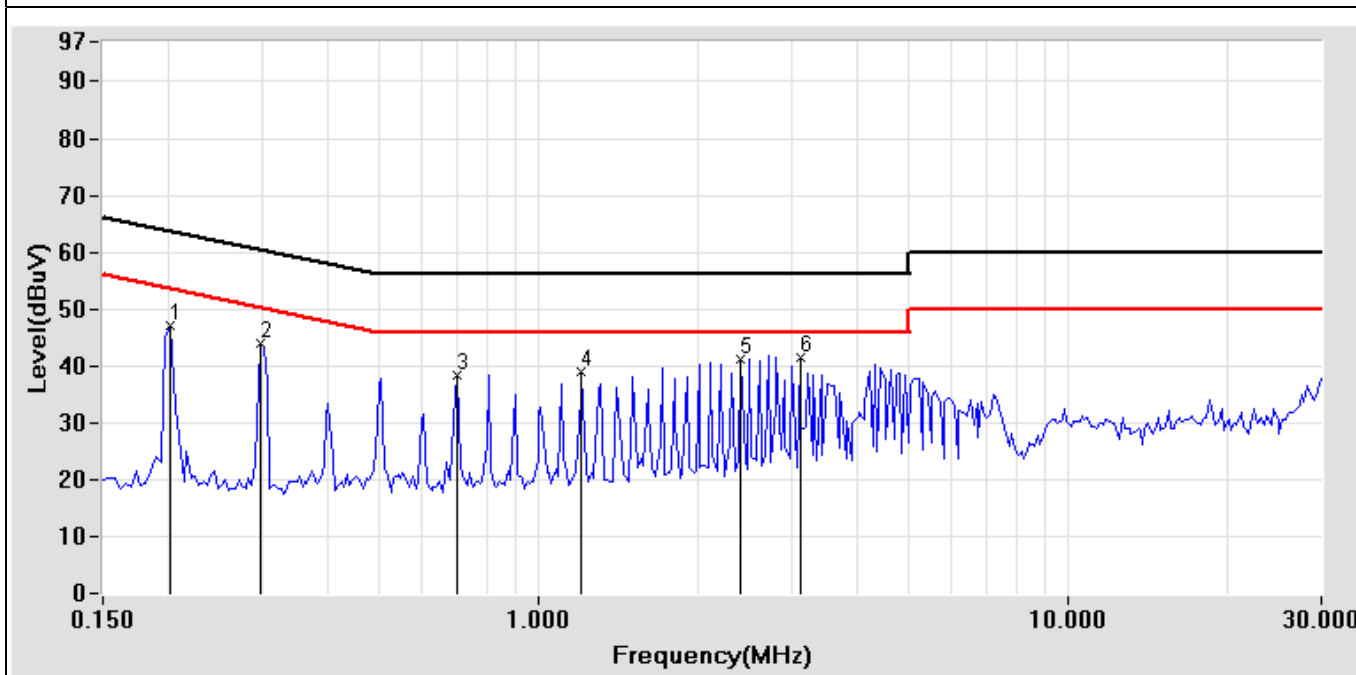
Power Line Conducted Test Data

EUT: GPS Navigation System	POLARITY: Line
CLIENT: TomTom	DISTANCE:
MODEL: DUB1	Serial No.:
RATING: Power from PC	FILE/DATA#: TomTomemi/17
Temperature: 24.0 °C	OPERATOR: Nigel
Humidity: 46 %	TEST SITE: Conduction1

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.201	0.13	45.82	37.19	45.95	37.32	63.57	53.57	-17.62	-16.25
0.298	0.13	42.52	31.05	42.65	31.18	60.30	50.30	-17.65	-19.12
0.701	0.14	37.81	31.66	37.95	31.80	56.00	46.00	-18.05	-14.20
1.201	0.16	38.13	31.71	38.29	31.87	56.00	46.00	-17.71	-14.13
2.404	0.21	39.49	34.41	39.70	34.62	56.00	46.00	-16.30	-11.38
3.107	0.25	40.10	34.86	40.35	35.11	56.00	46.00	-15.65	-10.89

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Mode 2: Link Mode (Power from PC) (USB Cable: Foxlink)

Power Line Conducted Test Data

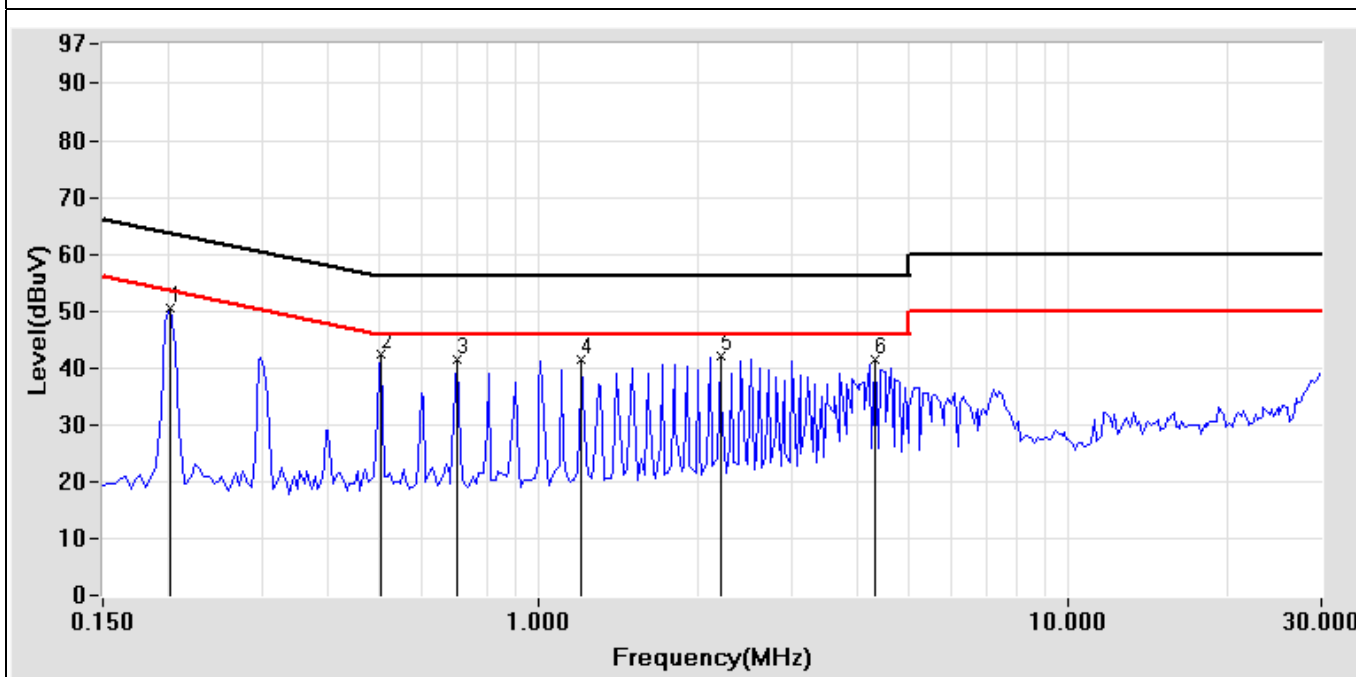
EUT: GPS Navigation System
CLIENT: TomTom
MODEL: DUB1
RATING: Power from PC
Temperature: 24.0 °C
Humidity: 46 %

POLARITY: Neutral
DISTANCE:
Serial No.:
FILE/DATA#: TomTomemi/16
OPERATOR: Nigel
TEST SITE: Conduction1

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.201	0.13	49.07	41.00	49.20	41.13	63.57	53.57	-14.37	-12.44
0.502	0.14	41.37	37.53	41.51	37.67	56.00	46.00	-14.49	-8.33
0.701	0.14	40.44	36.43	40.58	36.57	56.00	46.00	-15.42	-9.43
1.201	0.16	40.02	34.94	40.18	35.10	56.00	46.00	-15.82	-10.90
2.205	0.18	40.08	33.75	40.26	33.93	56.00	46.00	-15.74	-12.07
4.306	0.21	38.49	31.74	38.70	31.95	56.00	46.00	-17.30	-14.05

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Mode 2: Link Mode (Power from PC) (USB Cable: Foxlink)