FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....	**: MWR1501002902**	
FCC ID.....	**: 2AAJDFORCE**	
Compiled by (position+printed name+signature)..:	File administrators Martin Ao	Martin
Supervised by (position+printed name+signature)..:	Test Engineer Martin Ao	Martin
Approved by (position+printed name+signature)..:	Manager Dixon Hao	Dixon
Date of issue.....:	Jan 28, 2015	

Representative Laboratory Name. :	**Maxwell International Co., Ltd.**
Address..... :	Room 509,Hongfa center building, Baoan District, Shenzhen, Guangdong, China
Testing Laboratory Name.....:	**Shenzhen CTL Testing Technology Co., Ltd.**
Address..... :	Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan,Shenzhen,China
Applicant's name.....:	**Etoway Technology Co., Ltd.**
Address..... :	Room 1005, Building A, Stars Plaza, #38 Hongli Road, Futian, Shenzhen China
Test specification..... :	
Standard.....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**
TRF Originator.....:	Maxwell International Co., Ltd.
Master TRF.....:	Dated 2011-05

Test item description.....:	Mobile Phone
Trade Mark.....:	Etoway
Manufacturer.....:	**ShenZhen Etoway Electronics Co., Ltd.**
Model/Type reference..... :	Force
Listed Models ..... :	/
Modulation Type..... :	GFSK,8DPSK,π/4DQPSK
Operation Frequency..... :	From 2402MHz to 2480MHz
Rating.....:	DC 3.70V
Hardware version.....:	CX26
Software version ..... :	D62_IVO_V139_PCB(CX26-MB-V0.1)_ETOWAY_NK_LANGUAGE(YXP)_FLASH(32 32)__20141104
Result.....:	**PASS**

TEST REPORT

Test Report No. :	MWR1501002902	Jan 28, 2015 Date of issue

Equipment under Test	:	Mobile Phone
Model /Type	:	Force
Listed Models	:	/
Applicant	:	**Etoway Technology Co., Ltd.**
Address	:	Room 1005, Building A, Stars Plaza, #38 Hongli Road, Futian, Shenzhen China
Manufacturer	:	**ShenZhen Etoway Electronics Co., Ltd.**
Address	:	Room 1005, Building A, Stars Plaza, #38 Hongli Road, Futian, Shenzhen China

Test Result:	**PASS**

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Jan 10, 2015
Testing commenced on	:	Jan 10, 2015
Testing concluded on	:	Jan 28, 2015

2.2. Product Description

The **Etoway Technology Co., Ltd.**'s Model: Force or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Mobile Phone
Model Number	Force
FCC ID	2AAJDFORCE
Modilation Type	GMSK for GSM/GPRS;
BT Operation frequency	2402MHz-2480MHz
BT Modulation Type	GFSK,8DPSK,π/4DQPSK
Antenna Type	Internal
GSM/EDGE/GPRS	Supported GPRS
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.40VDC to 4.20VDC (nominal: 3.70VDC)
GSM Operation Frequency Band	GSM 850MHz/ PCS 1900MHz
GSM Release Version	R99
GPRS operation mode	Class B
GPRS Multislot Class	12
EGPRS Multislot Class	Not Supported

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	120V / 60 Hz	○	115V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 3.70V

2.4. Short description of the Equipment under Test (EUT)

Force is subscriber equipment in the GSM system. The GSM/GPRS frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, GSM/GPRS protocol processing, voice, video MMS service etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

2.4.2 Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt	Type of Test
N01	356181064231135	CX26	D62_IVO_V139_PCB(CX26-MB-V0.1)_ETOWAY_NK_LANGUAGE(YXP)_FLASH(32	2015-01-10	Radio

			32)__20141104		
N02	356181064231136	CX26	D62_IVO_V139_PCB(CX26-MB-V0.1)_ETOWAY_NK_LANGUAGE(YXP)_FLASH(3232)__20141104	2015-01-10	SAR (EMF)

NOTE: We used two Samples only for facilitate testing. All test setup photos are the color difference form External/Internal Photo，But they are the same mode. There are 4 color, they are white, green, yellow and red..

2.5. EUT operation mode

The EUT has been tested under typical operating condition. There are EDR (Enhanced Data Rate) and BDR (Basic Data Rate)mode.The Applicant provides communication tools software to control the EUT for staying in continous transmitting and receiving mode for testing. There are 79 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel .

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	**2402**	**40**	**2442**
01	2403	41	2443
02	2404	42	2444
03	2405	43	2445
04	2406	44	2446
05	2407	45	2447
06	2408	46	2448
07	2409	47	2449
08	2410	48	2450
09	2411	49	2451
10	2412	50	2452
11	2413	51	2453
12	2414	52	2454
13	2415	53	2455
14	2416	54	2456
15	2417	55	2457
16	2418	56	2458
17	2419	57	2459
18	2420	58	2460
19	2421	59	2461
20	2422	60	2462
21	2423	61	2463
22	2424	62	2464
23	2425	63	2465
24	2426	64	2466
25	2427	65	2467
26	2428	66	2468
27	2429	67	2469
28	2430	68	2470
29	2431	69	2471
30	2432	70	2472
31	2433	71	2473
32	2434	72	2474
33	2435	73	2475
34	2436	74	2476
35	2437	75	2477
36	2438	76	2478
37	2439	77	2479
38	2440	**78**	**2480**
39	2441		

2.6. Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery
AE2	Charger

AE1
Model: C663907180T
Capacitance: 1000mAh
Nominal Voltage: 3.70V
AE2
Model: Force
Input:AC 100-240V 50/60Hz
Output:DC 5V 1A

*AE ID: is used to identify the test sample in the lab internally.

2.7. Related Submittal(s) / Grant (s)

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

2.8. Modifications

No modifications were implemented to meet testing criteria.

2.9. NOTE

1. The EUT is a Mobile Phone with GSM/GPRS and Bluetooth fuction,The functions of the EUT listed as below:

	Test Standards	Reference Report
GSM/GPRS	FCC Part 22/FCC Part 24	MWR1501002901
Bluetooth-EDR	FCC Part 15 C 15.247	MWR1501002902
USB Port	FCC Part 15 B	MWR1501002903
SAR	FCC Part 2 §2.1093	MWR1501002904

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen,China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

3.2. Test Facility

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

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. 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 970318, Dec 19, 2013

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Test Conditions

Test Case	Test Conditions	
	Configuration	Description
20dB Emission Bandwidth (EBW)	Meas. Method	ANSI C63.10:2009
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Ch00,TM1_DH5_Ch40,TM1_DH5_Ch78,TM2_2DH5_Ch00,TM2_2DH5_Ch40,TM2_2DH5_Ch78,TM3_3DH5_Ch00,TM3_3DH5_Ch40,TM3_3DH5_Ch78, TM4_DH5_Ch00,TM4_DH5_Ch19,TM4_DH5_Ch40.
Carrier Frequency Separation	Meas. Method	ANSI C63.10:2009
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Hop,TM2_2DH5_Hop,TM3_3DH5_Hop,
Number of Hopping Channel	Meas. Method	ANSI C63.10:2009
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Hop,TM2_2DH5_Hop,TM3_3DH5_Hop,
Time of Occupancy (Dwell Time)	Meas. Method	ANSI C63.10:2009
	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Ch40,TM2_2DH5_Ch40,TM3_3DH5_Ch40.
Maximum Peak Conducted Output Power	Meas. Method	ANSI C63.10:2009
	Test Environment	NTNV
	EUT Conf.	TM1_DH3_Ch00,TM1_DH3_Ch40,TM1_DH3_Ch78,TM2_2DH3_Ch00,TM2_2DH3_Ch40,TM2_2DH3_Ch78,TM3_3DH3_Ch00,TM3_3DH3_Ch40,TM3_3DH3_Ch78, TM4_DH3_Ch00,TM4_DH3_Ch40,TM4_DH3_Ch78.
Bandedge spurious emission (Conducted)	Meas. Method	ANSI C63.10:2009
	Test Environment	NTNV
	EUT Conf.	TM1_DH3_Ch00,TM1_DH3_Ch78,TM2_2DH3_Ch00,TM2_2DH3_Ch78, TM3_3DH3_Ch00,TM3_3DH3_Ch78. TM4_DH3_Ch00,TM4_DH3_Ch78.
Conducted RF Spurious	Meas. Method	ANSI C63.10:2009

Emission	Test Environment	NTNV
	EUT Conf.	TM1_DH5_Ch00, TM1_DH5_Ch40, TM1_DH5_Ch78, TM2_2DH5_Ch00, TM2_2DH5_Ch40, TM2_2DH5_Ch78, TM3_3DH5_Ch00, TM3_3DH5_Ch40, TM3_3DH5_Ch78. TM4_DH5_Ch00,TM4_DH5_Ch40,TM4_DH5_Ch78.
Radiated Emissions in the Restricted Bands	Meas. Method	ANSI C63.10:2009 30 MHz to 1 GHz: Pre: RBW=100kHz; VBW=300kHz; Det. = Peak. Final: RBW=120kHz; Det. = CISPR Quasi-Peak. 1 GHz to 26.5GHz: Average: RBW=1 MHz; VBW= 10Hz; Det. = Peak; Sweep-time= Auto; Trace = Single. Peak: RBW=1 MHz; VBW= 3 MHz; Det. = Peak; Sweep-time= Auto; Trace≥ MaxHold * 100.
	Test Environment	NTNV
	EUT Conf.	30 MHz-1GHz TM1_DH5_Ch00 (Worst Conf.).
		1-18 GHz: TM1_DH5_Ch00, TM1_DH5_Ch40, TM1_DH5_Ch78, (Worst Conf.).

Test Case	Test Conditions	
	Configuration	Description
AC Power Line Conducted Emissions	Measurement Method	AC mains conducted.
	Test Environment	NTNV
	EUT Configuration	TM1_DH5_Ch40. (Worst Conf.).

Note: For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

3.5. Test Description

FCC PART 15 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(1)(i)	20dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Peak Output Power	PASS
FCC Part 15.247(b)	Pseudorandom Frequency Hopping Sequence	PASS
FCC Part 15.247(a)(1)(iii)	Number of hopping frequency& Time of Occupancy	PASS
FCC Part 15.247(a)(1)	Frequency Separation	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge Compliance of RF Emission	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

Remark: The measurement uncertainty is not included in the test result.

3.6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTL Testing Technology Co., Ltd. is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-12.75 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 9KHz-30MHz	2.88 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Radiated Emissio 1~18GHz	5.16 dB	(1)
Radiated Emissio 18-40GHz	5.54 dB	(1)
Occupied Bandwidth	---------	(1)
Emission Mask	---------	(1)
Modulation Characteristic	---------	(1)
Transmitter Frequency Behavior	---------	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

3.7. Equipments Used during the Test

AC Power Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ENV216	101316	2014/07/02
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	103710	2014/07/02
3	Pulse Limiter	Com-Power	LIT-153	53226	2014/07/01
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
5	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2014/10/19

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2014/07/12
2	EMI TEST Receivcer	Rohde&Schwarz	ESCI3	103710	2014/07/02
3	EMI TEST Software	Audix	E3	N/A	N/A
4	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A
5	HORN ANTENNA	Sunol Sciences Corp.	DRH-118	A062013	2014/07/12
6	Amplifer	HP	8447D	3113A07663	2014/10/22
7	Preamplifier	HP	8349B	3155A00882	2014/07/03
8	Amplifer	Compliance Direction systems	PAP1-4060	129	2014/07/03
9	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2014/06/29
10	TURNTABLE	MATURO	TT2.0	----	N/A
11	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
12	Horn Antenna	SCHWARZBECK	BBHA9170	25849	2014/06/21
13	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2014/07/02
14	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2014/10/19
15	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2014/10/19

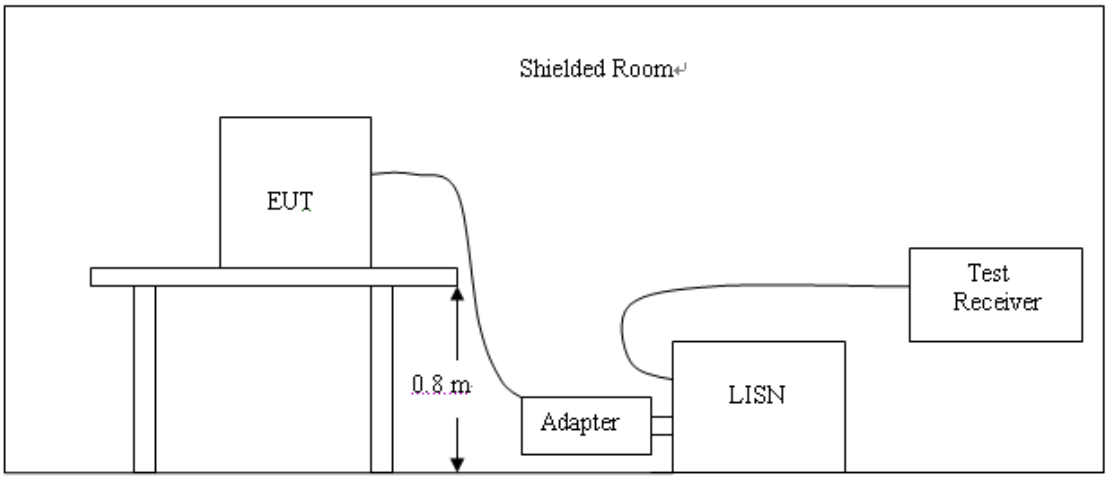
Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2014/07/02
2	Power Sensor	Rohde&Schwarz	NRR-Z81	256697	2014/07/02
3	MXA Signal Analyzer	Agilent	N9030A	MY53420615	2014/05/12
4	Coaxial Cables	WK CE Cable	N/A	N/A	2014/10/19

The Cal.Interval was one year

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2009.
2. Support equipment, if needed, was placed as per ANSI C63.10-2009
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
4. The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

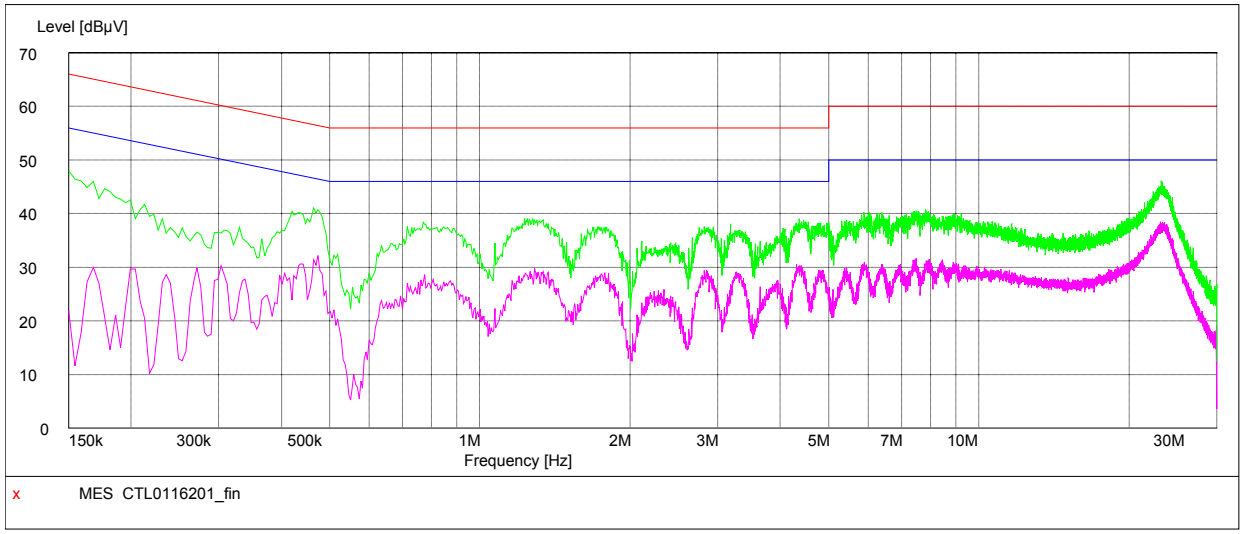
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

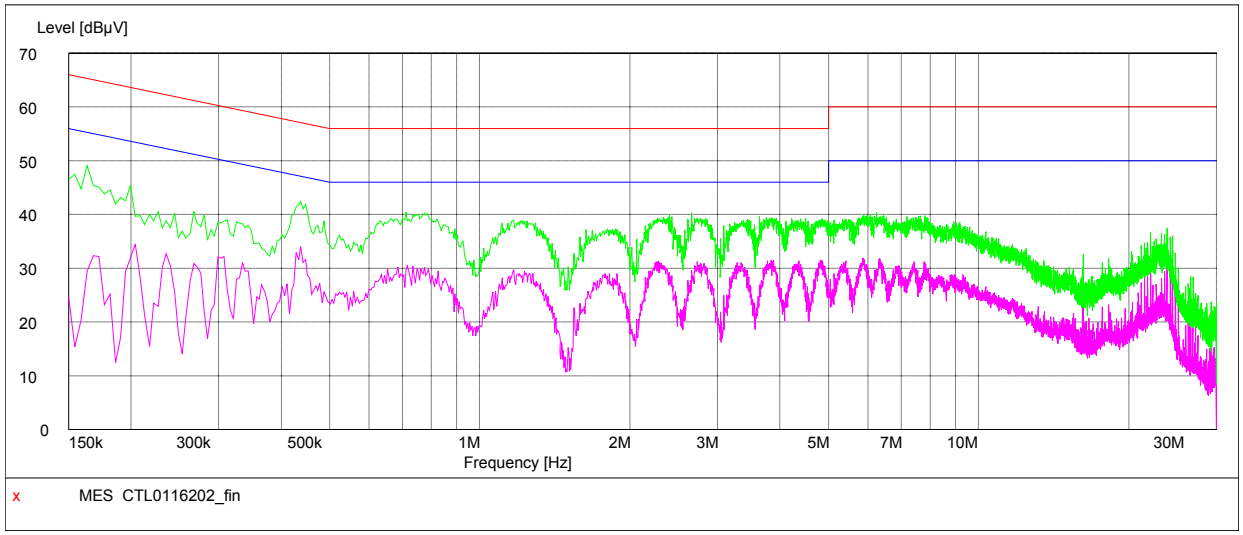
* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

Note: 1.We tested Conducted Emission of GFSK, π/4 DQPSK and 8DPSK mode from 0.15 KHz to 30MHz (DH1, DH3 and DH5) and all channels (low, middle and high), recorded the worst case data at GFSK DH5 middle channel.
2.:test voltage:120V/60Hz



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.474000	39.10	10.1	56	16.90	QP	L
1.288500	36.90	10.2	56	19.10	QP	L
23.235000	42.20	10.9	60	17.80	QP	L
0.474000	31.00	10.0	46	15.00	AV	L
4.344000	29.70	10.2	46	16.30	AV	L
23.194500	37.30	10.9	50	12.70	AV	L

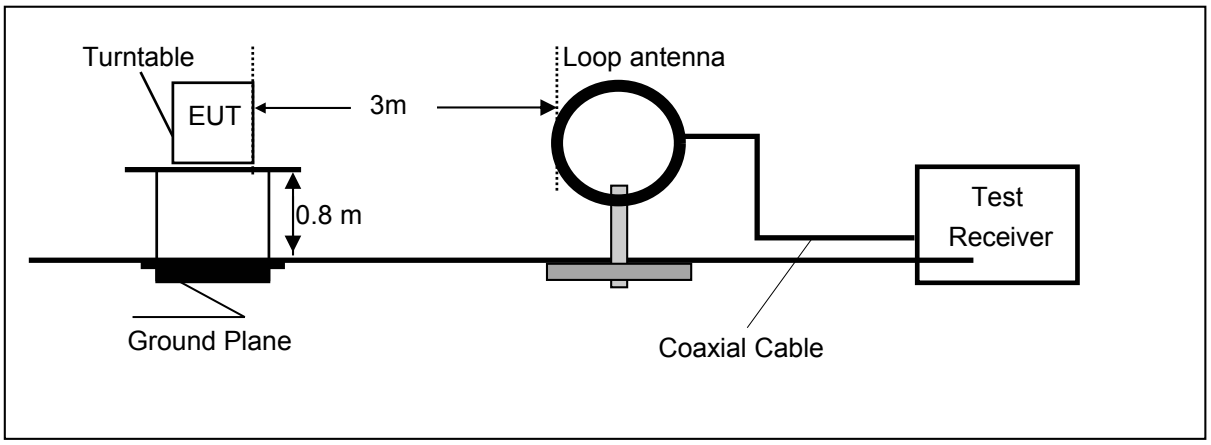


Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.442500	40.90	10.1	57	16.10	QP	N
1.162500	36.80	10.2	56	19.20	QP	N
23.910000	35.10	10.9	60	24.90	QP	N
0.442500	32.60	10.1	47	14.40	AV	N
3.822000	31.00	10.2	46	15.00	AV	N
23.910000	32.00	10.9	50	18.00	AV	N

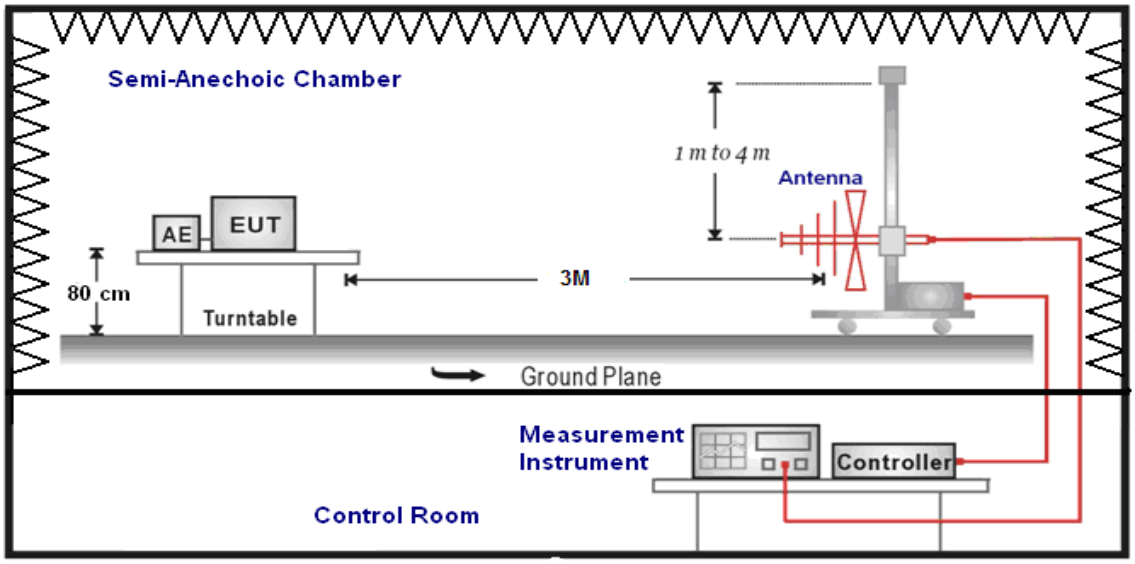
4.2. Radiated Emission

TEST CONFIGURATION

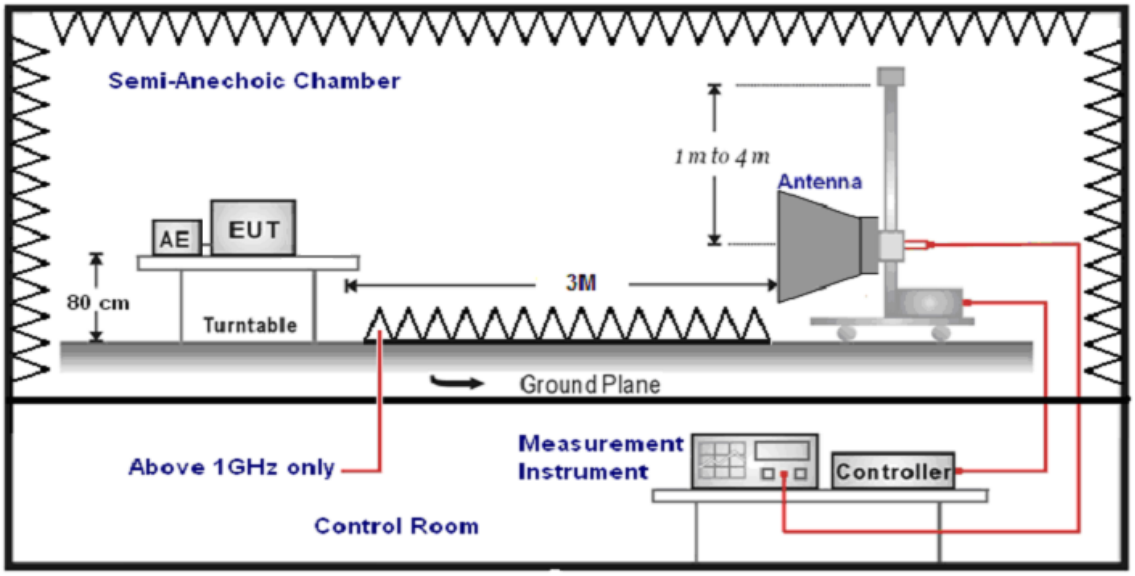
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768kHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

For example

Frequency (MHz)	FS (dBμV/m)	RA (dBμV/m)	AF (dB)	CL (dB)	AG (dB)	Transd (dB)
300.00	40	58.1	12.2	1.6	31.90	-18.1

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	300	20log(2400/F(KHz))+80	2400/F(KHz)
0.49-1.705	30	20log(24000/F(KHz))+40	24000/F(KHz)
1.705-30	30	20log(30)+40	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Remark:

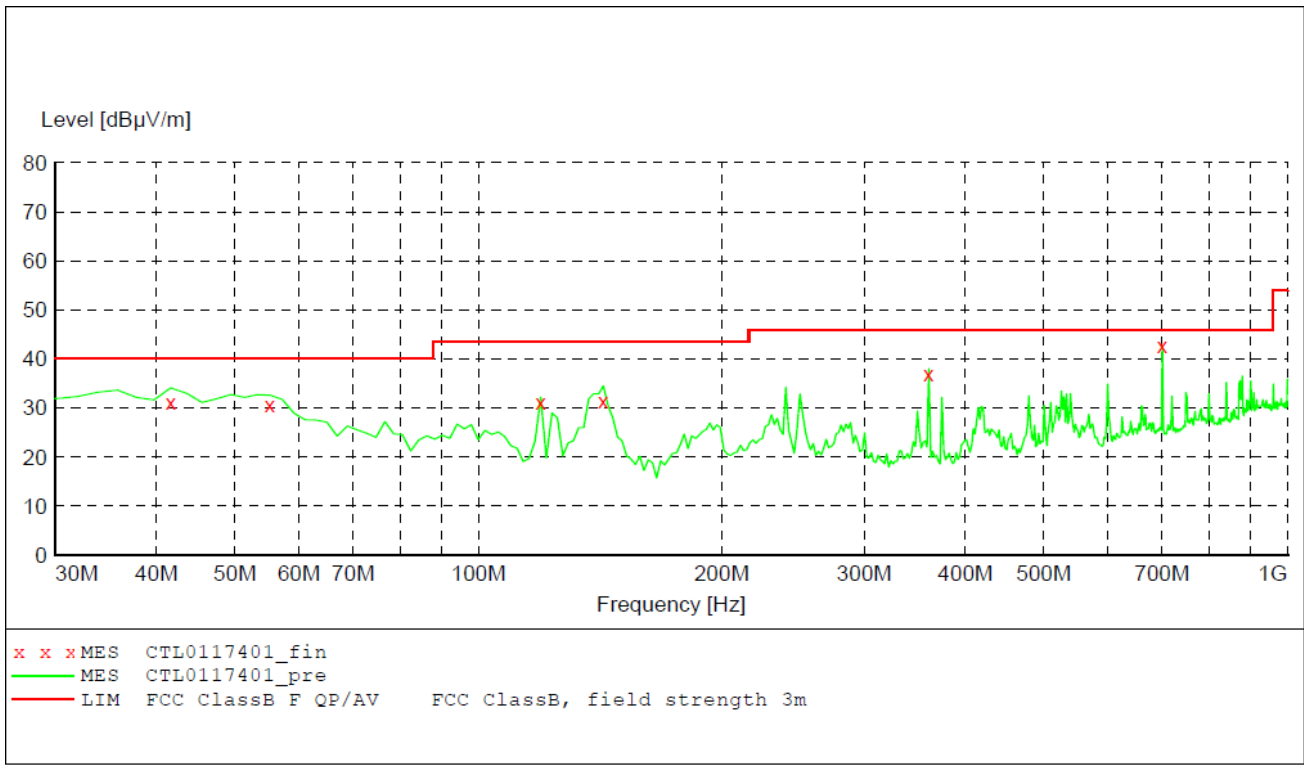
1. The radiated measurement are performed the each channel (low/mid/high) at all Packet type (DH1, DH3 and DH5) also for difference modulation type (GFSK, 8DPSK and π/4 DQPSK), recorded worst case at GFSK_DH5_Low channel (Channel 00) for below 1GHz and GFSK_DH5_Low channel (Channel 00), GFSK_DH5_Middle channel (Channel 40), GFSK_DH5_High channel (Channel 78).
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.

3. HORN ANTENNA for the radiation emission test above 1G.
4. We tested both battery powered and powered by adapter charging mode at three orientate ones, recorded worst case at powered by adapter charging mode.
5. "---" means not recorded as emission levels lower than limit.

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Result
12.00	42.91	69.54	26.63	QP	PASS
24.00	44.69	69.54	24.85	QP	PASS

For 30MHz to 1000MHz



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Ant. Polar. H / V
41.660000	42.30	-11.2	31.10	40.00	8.90	QP	V
55.270000	48.40	-17.8	30.60	40.00	9.40	QP	V
119.420000	44.00	-12.8	31.20	40.00	12.30	QP	H
142.750000	46.90	-15.4	31.50	40.00	12.00	QP	H
360.460000	46.50	-9.5	37.00	40.00	9.00	QP	V
699.960000	44.80	-2.8	42.00	40.00	3.30	QP	H

For 1GHz to 25GHz

Low Channel @ Channel 00 @ 2402 MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4804.00	57.22	PK	74.00	16.78	1.00	13	55.14	31.58	7.00	36.5	2.08
2	4804.00	43.69	AV	54.00	10.31	1.00	13	41.61	31.58	7.00	36.5	2.08
3	7206.00	59.23	PK	74.00	14.77	1.00	279	48.57	37.06	8.90	35.3	10.66
4	7206.00	41.82	AV	54.00	12.18	1.00	279	31.16	37.06	8.90	35.3	10.66

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4804.00	53.44	PK	74.00	20.56	1.00	266	51.36	31.58	7.00	36.5	2.08
2	4804.00	40.59	AV	54.00	13.41	1.00	266	38.51	31.58	7.00	36.5	2.08
3	7206.00	55.16	PK	74.00	18.84	1.00	181	44.50	37.06	8.90	35.3	10.66
4	7206.00	40.22	AV	54.00	13.78	1.00	181	29.56	37.06	8.90	35.3	10.66

Middle Channel @ Channel 40 @ 2442 MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4884.00	58.45	PK	74.00	15.55	1.00	100	56.31	31.04	7.60	36.5	2.14
2	4884.00	44.01	AV	54.00	9.99	1.00	100	41.87	31.04	7.60	36.5	2.14
3	7326.00	60.23	PK	74.00	13.77	1.00	124	49.09	37.84	8.60	35.3	11.14
4	7326.00	42.07	AV	54.00	11.93	1.00	124	30.93	37.84	8.60	35.3	11.14

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4884.00	53.91	PK	74.00	20.09	1.00	150	51.77	31.04	7.60	36.5	2.14
2	4884.00	40.77	AV	54.00	13.23	1.00	150	38.63	31.04	7.60	36.5	2.14
3	7326.00	55.23	PK	74.00	18.77	1.00	244	44.09	37.84	8.60	35.3	11.14
4	7326.00	40.30	AV	54.00	13.70	1.00	244	29.16	37.84	8.60	35.3	11.14

High Channel @ Channel 78 @ 2480 MHz

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4960.00	58.87	PK	74.00	15.13	1.00	124	56.44	31.63	7.00	36.2	2.43
2	4960.00	44.24	AV	54.00	9.76	1.00	124	41.81	31.63	7.00	36.2	2.43
3	7340.00	60.33	PK	74.00	13.67	1.00	26	48.73	38.40	8.50	35.3	11.60
4	7340.00	42.12	AV	54.00	11.88	1.00	26	30.52	38.40	8.50	35.3	11.60

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M												
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
1	4960.00	53.96	PK	74.00	20.04	1.00	313	51.53	31.63	7.00	-36.2	2.43
2	4960.00	40.79	AV	54.00	13.21	1.00	313	38.36	31.63	7.00	-36.2	2.43
3	7340.00	55.52	PK	74.00	18.48	1.00	291	43.92	38.40	8.50	-35.3	11.60
4	7340.00	40.36	AV	54.00	13.64	1.00	291	28.76	38.40	8.50	-35.3	11.60

REMARKS: 1. Emission level (dBuV/m) =Raw Value (dBuV) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The average measurement was not performed when the peak measured data under the limit of average detection.

4.3. Maximum Peak Output Power

TEST CONFIGURATION

TEST PROCEDURE

According to ANSI C63.10:2009 Maximum peak conducted output power:Connent antenna port into power meter and reading Peak values.

LIMIT

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.

TEST RESULTS

Remark: We test maximum peak output power at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH3

4.3.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	4.04	30	PASS
40	2442	4.92	30	PASS
78	2480	5.77	30	PASS

Note: 1.The test results including the cable lose.

4.3.2 π/4 DQPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	3.88	21	PASS
40	2442	4.16	21	PASS
78	2480	5.47	21	PASS

Note: 1.The test results including the cable lose.

4.3.3 8DPSK Test Mode

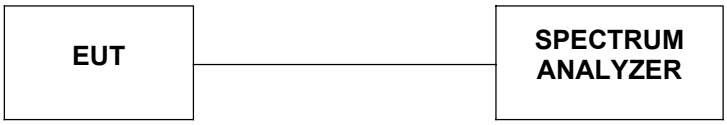
A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
00	2402	3.95	21	PASS
40	2442	4.55	21	PASS
78	2480	5.51	21	PASS

Note: 1.The test results including the cable lose.

4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30 KHz and VBW=100KHz.
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwith.

TEST RESULTS

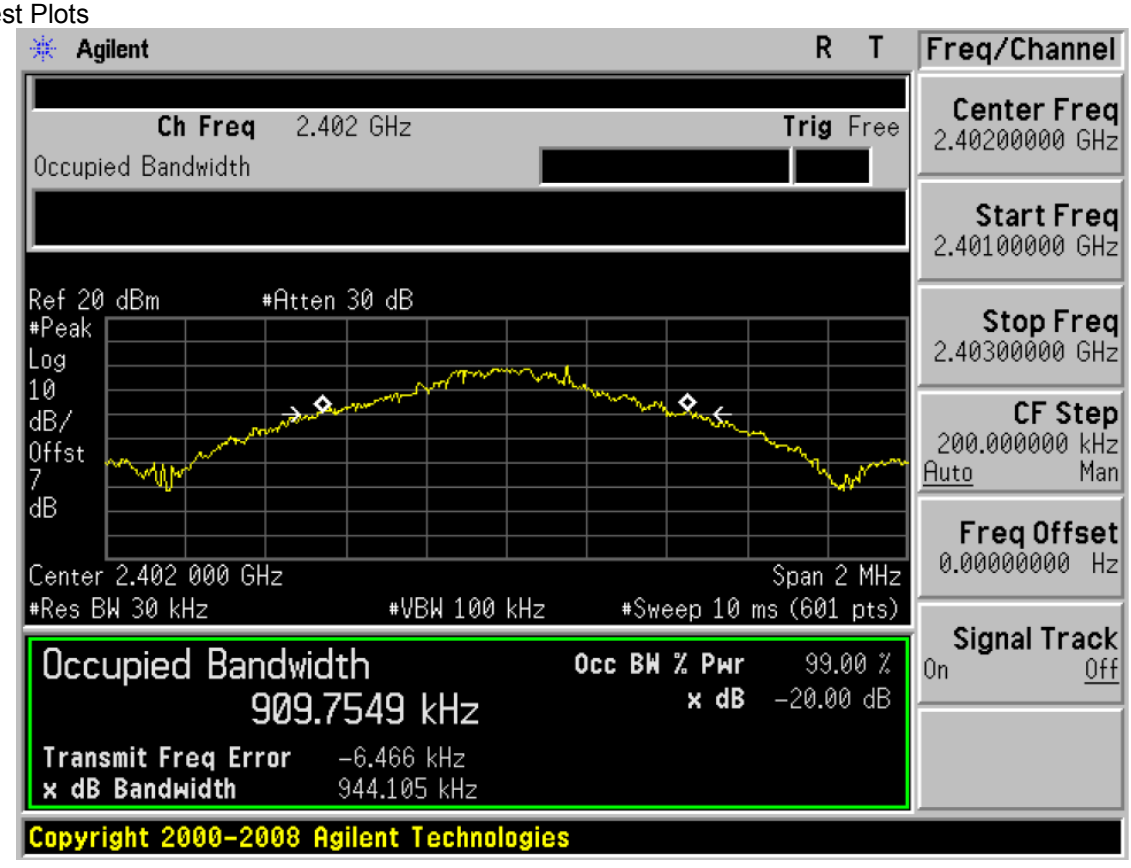
4.4.1 GFSK Test Mode

A. Test Verdict

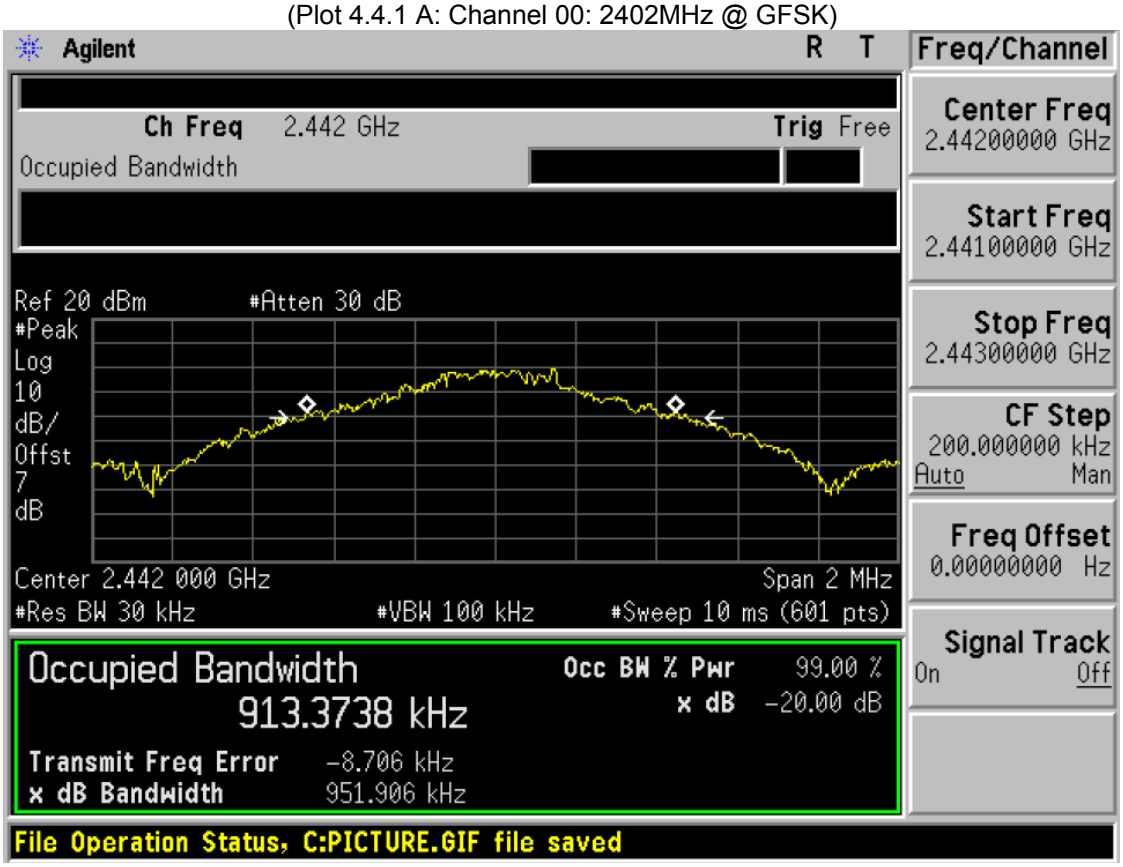
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot	Limits (MHz)	Verdict
00	2402	0.9441	Plot 4.4.1 A	/	PASS
40	2442	0.9519	Plot 4.4.1 B	/	PASS
78	2480	0.9719	Plot 4.4.1 C	/	PASS

Note: 1.The test results including the cable lose.

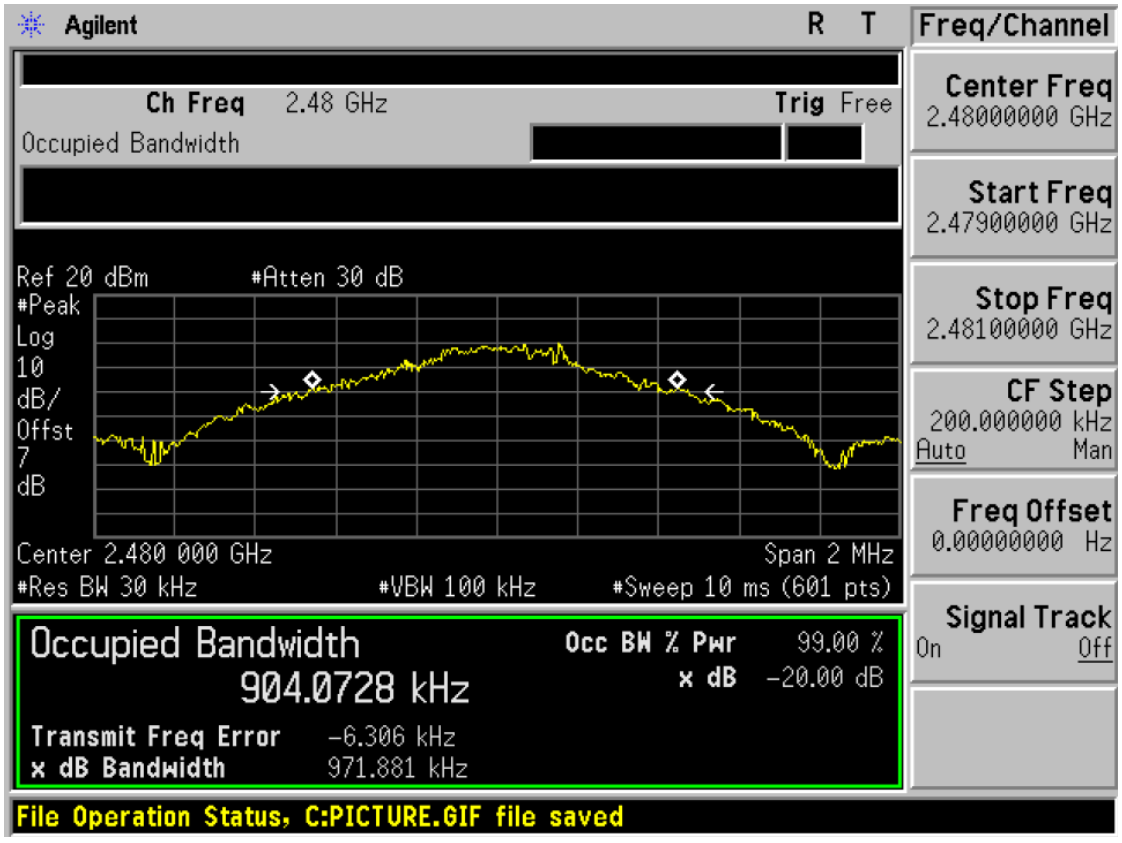
B. Test Plots



(Plot 4.4.1 A: Channel 00: 2402MHz @ GFSK)



(Plot 4.4.1 B: Channel 40: 2442MHz @ GFSK)



(Plot 4.4.1 C: Channel 78: 2480MHz @ GFSK)

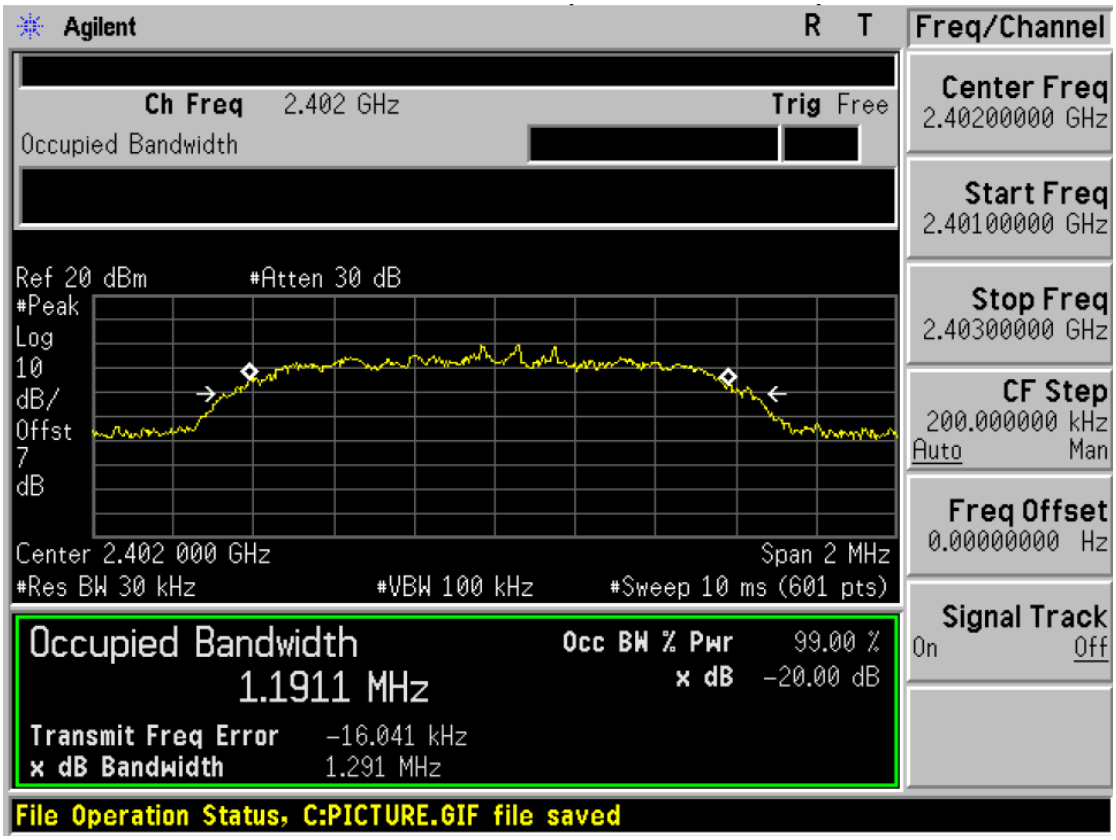
4.4.2 8DPSK Test Mode

A. Test Verdict

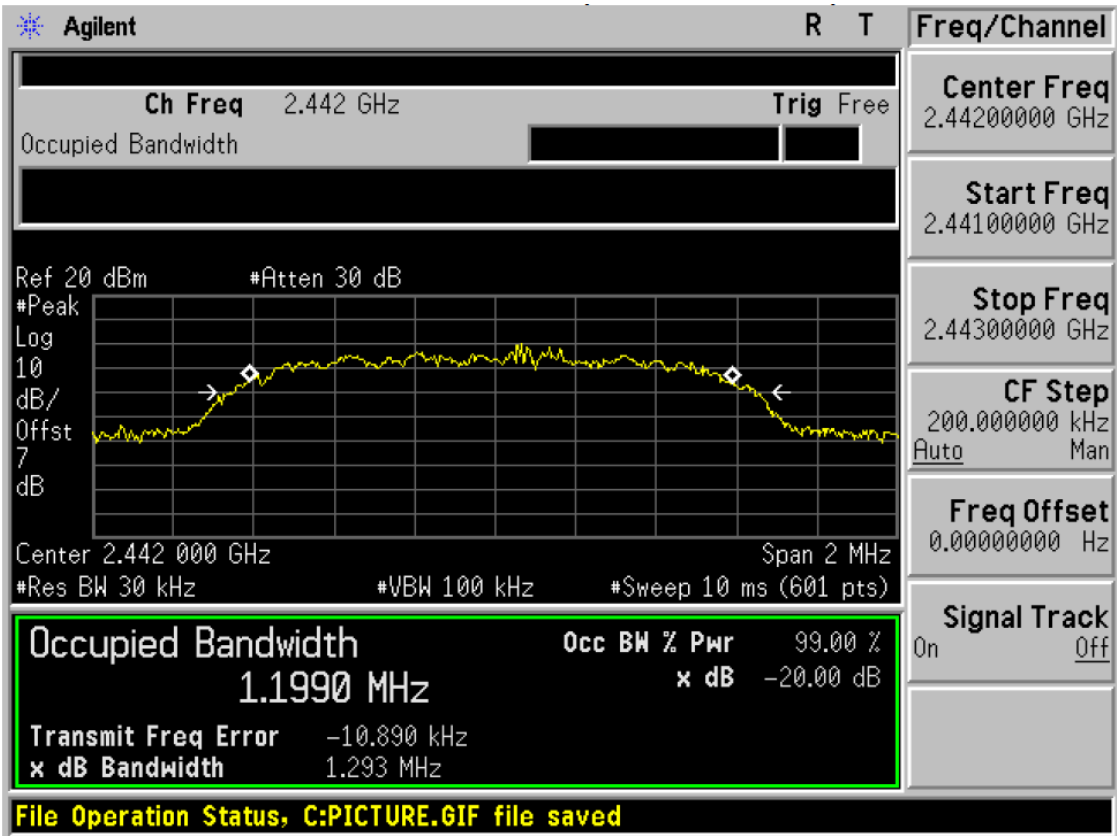
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot	Limits (MHz)	Verdict
00	2402	1.291	Plot 4.4.2 A	/	PASS
40	2442	1.293	Plot 4.4.2 B	/	PASS
78	2480	1.292	Plot 4.4.2 C	/	PASS

Note: 1.The test results including the cable lose.

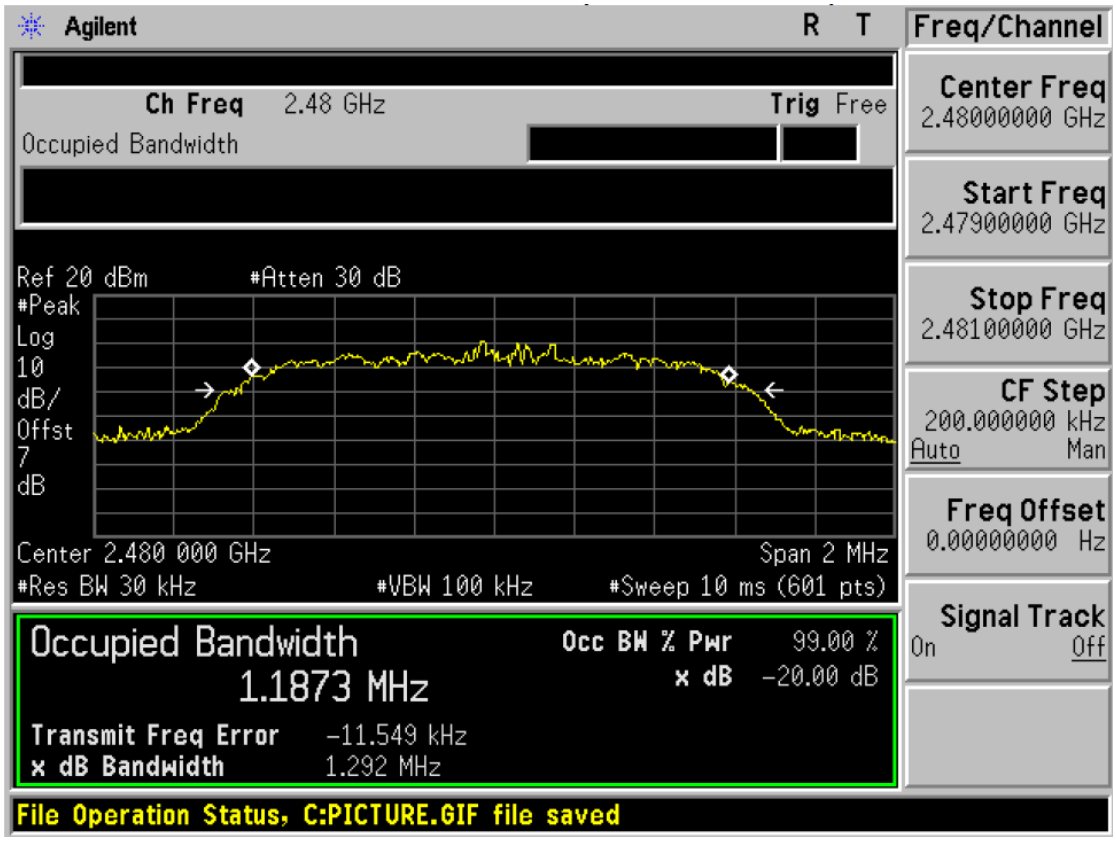
B. Test Plots



(Plot 4.4.2 A: Channel 00: 2402MHz @ 8DPSK)



(Plot 4.4.2 B: Channel 40: 2442MHz @ 8DPSK)



(Plot 4.4.2 C: Channel 78: 2480MHz @ 8DPSK)

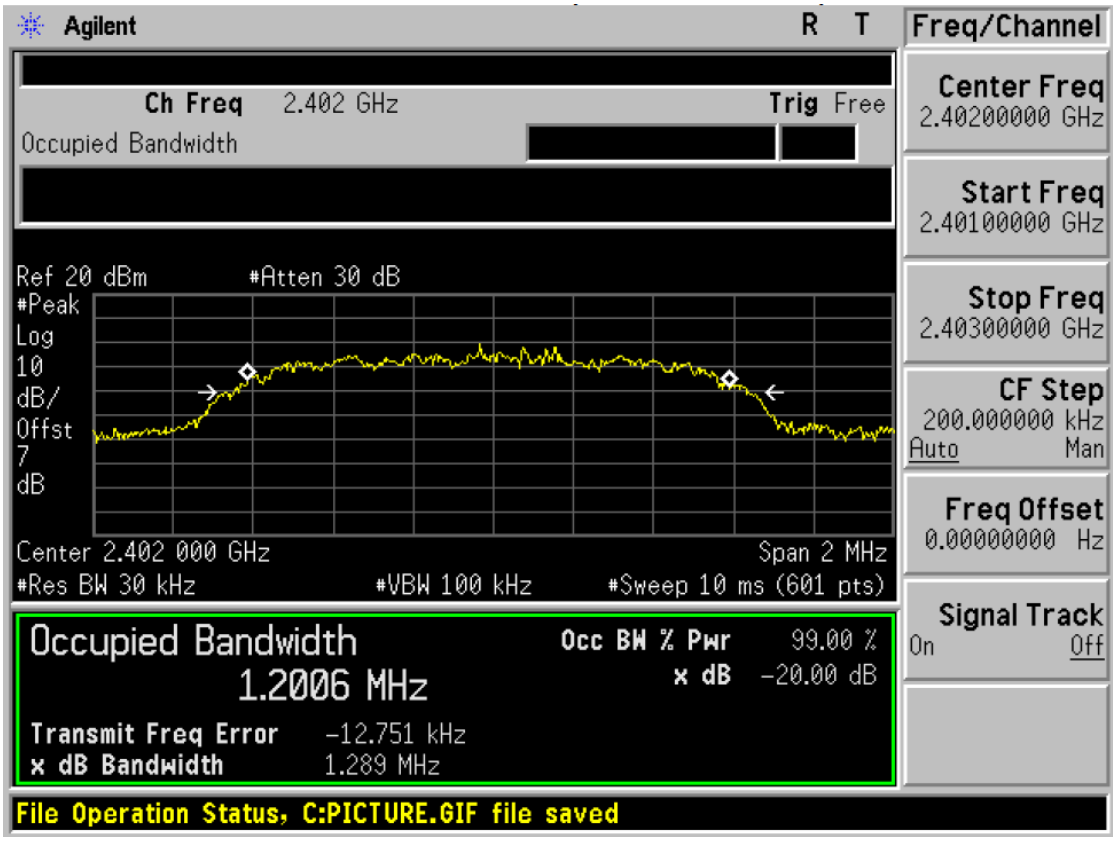
4.4.3 π/4DQPSKTest Mode

A. Test Verdict

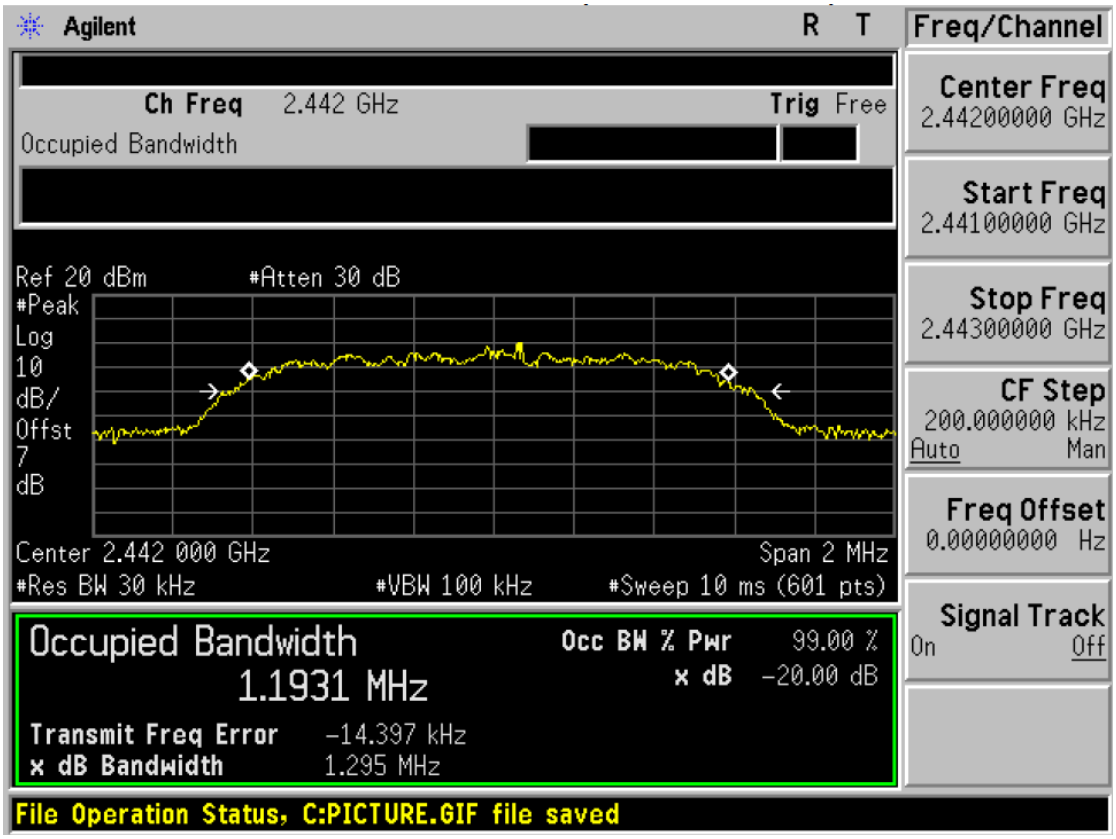
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Refer to Plot	Limits (MHz)	Verdict
00	2402	1.289	Plot 4.4.3 A	/	PASS
40	2442	1.295	Plot 4.4.3 B	/	PASS
78	2480	1.287	Plot 4.4.3 C	/	PASS

Note: 1.The test results including the cable lose.

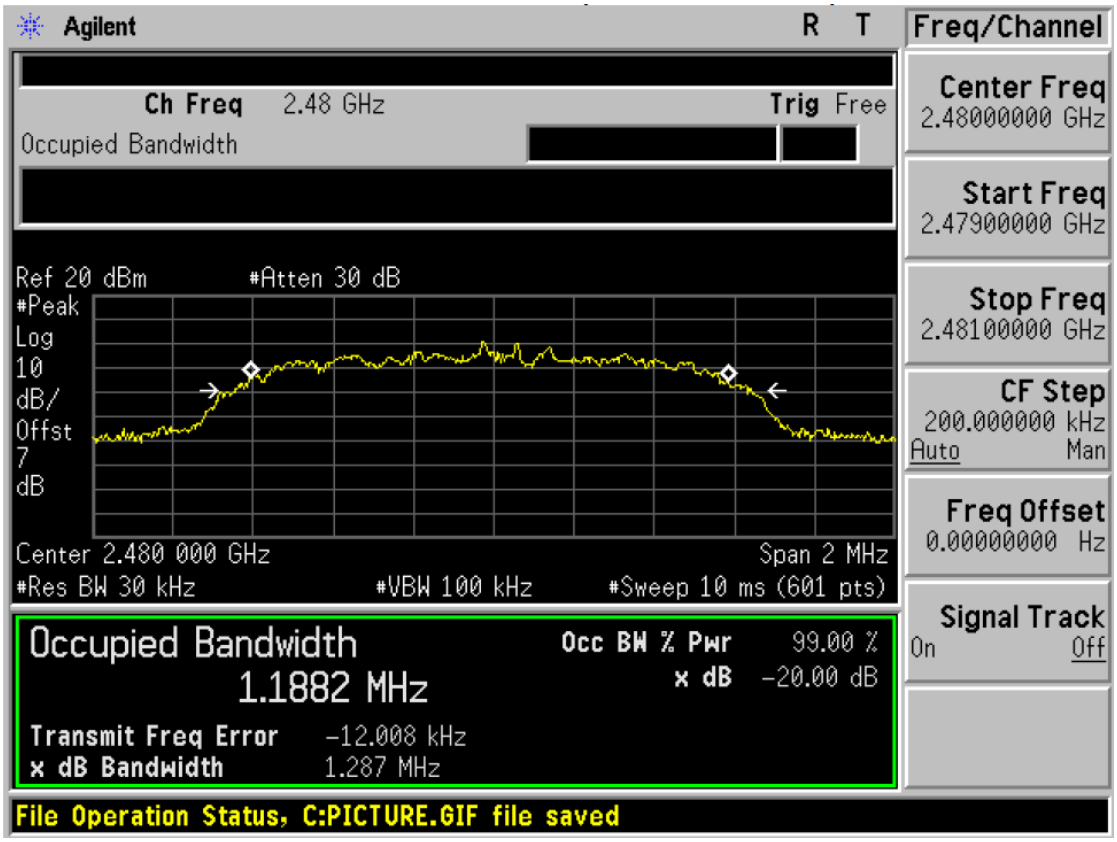
B. Test Plots



(Plot 4.4.3 A: Channel 00: 2402MHz @ π/4DQPSK)



(Plot 4.4.3 B: Channel 40: 2442MHz @π/4DQPSK)



(Plot 4.4.3 C: Channel 78: 2480MHz @π/4DQPSK)

4.5. Band Edge

Applicable Standard

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

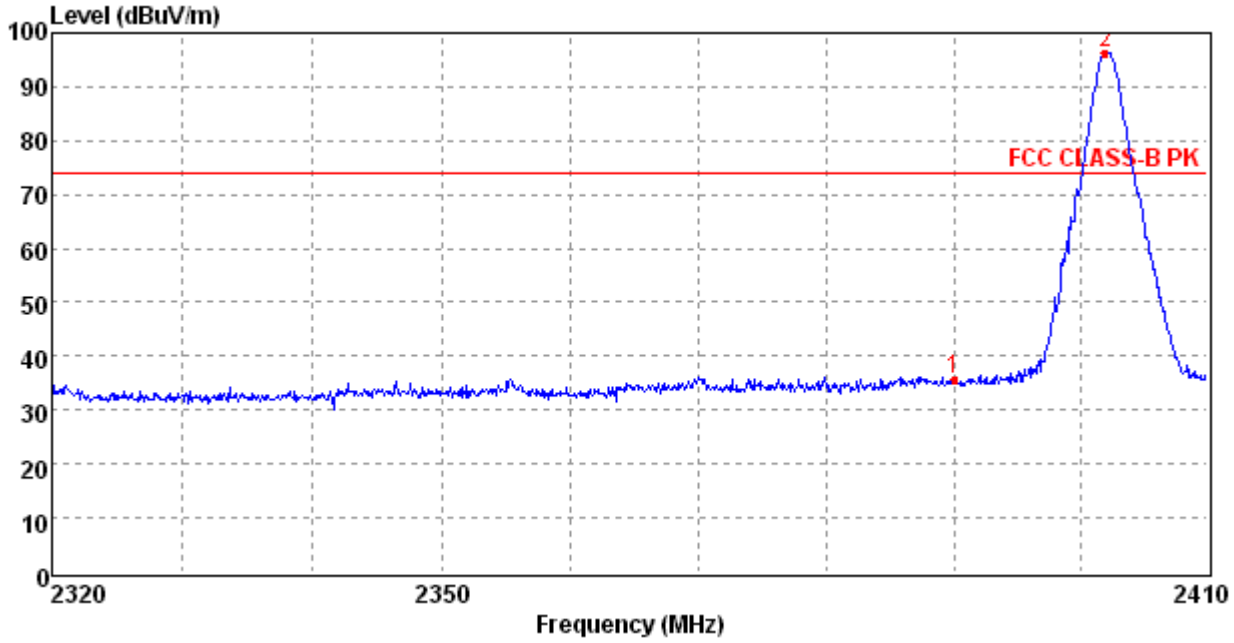
TEST RESULTS

Remark: 1. We test Band Edge at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH5.
2. “---” means not recorded as emission levels lower than limit.

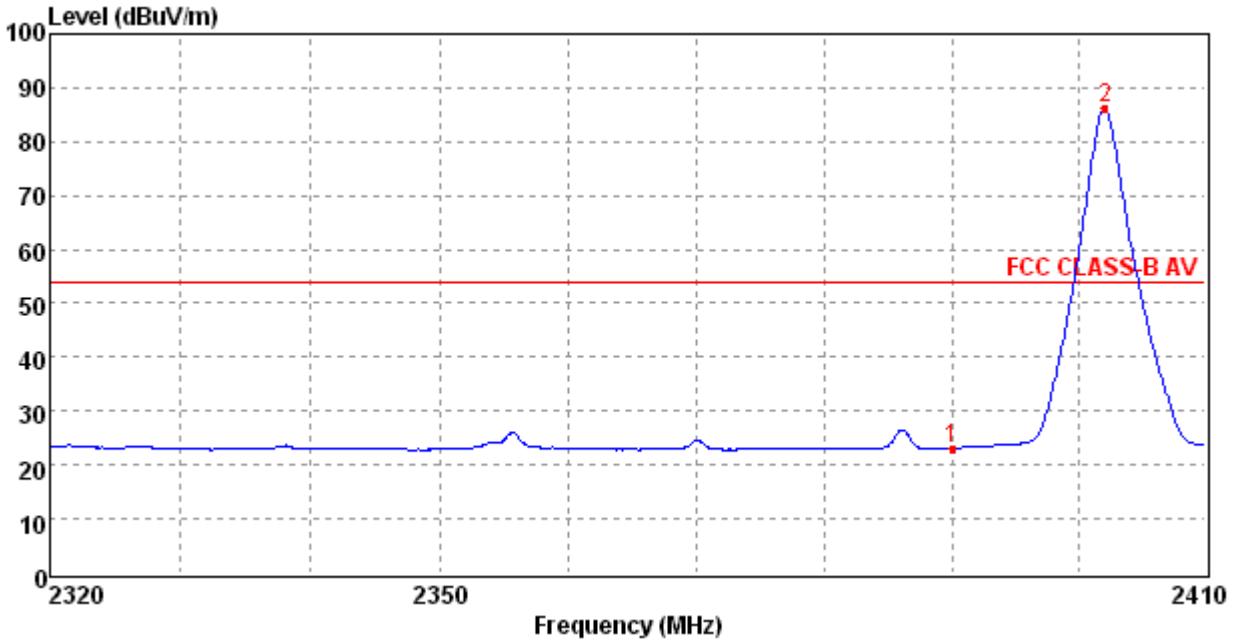
4.5.1 For Radiated Bandedge Measurement

Remark: we tested radiated bandedge at both hopping and no-hopping modes at Vertical and Horizontal antenna Polarization, recorded worst case at no-hopping mode.

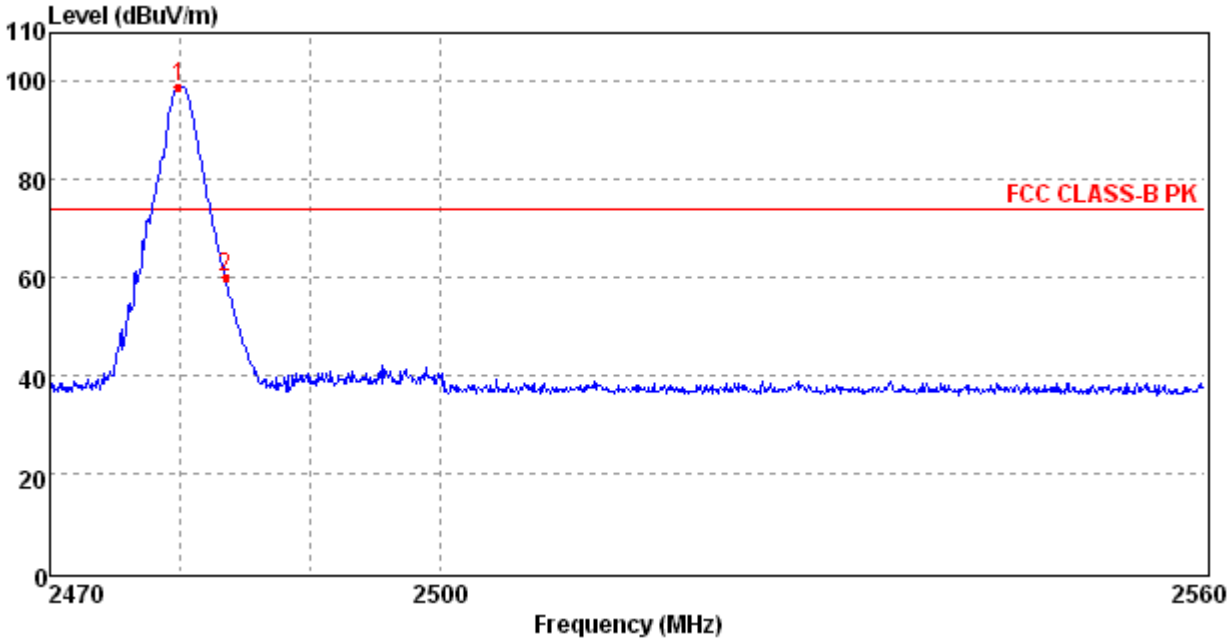
4.5.1.1 GFSK Test Mode



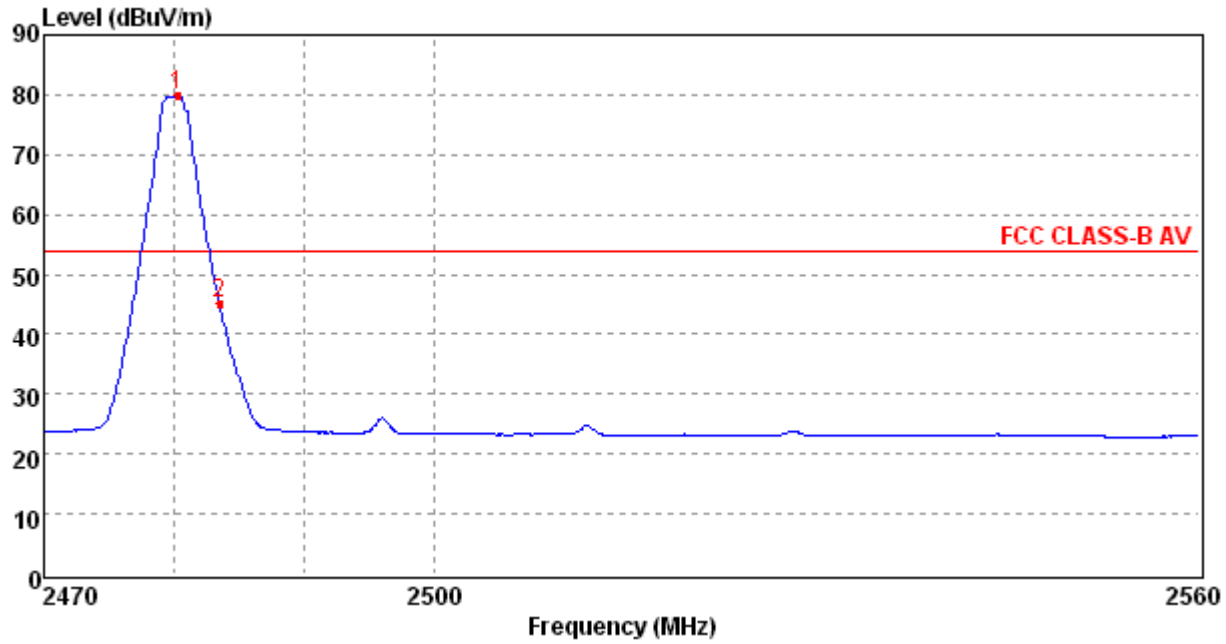
Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	2390.00	35.63	3.32	27.49	36.12	40.91	74.00	38.37	Hor	Peak
2	**2401.99**	**96.39**	**3.32**	**27.49**	**36.12**	**101.70**	**74.00**	**-22.39**	**Hor**	**Peak**



Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	2390.00	23.12	3.32	27.49	36.12	28.40	54.00	30.88	Hor	Average
2	**2402.10**	**86.32**	**3.32**	**27.49**	**36.12**	**91.63**	**54.00**	**-32.32**	**Hor**	Average

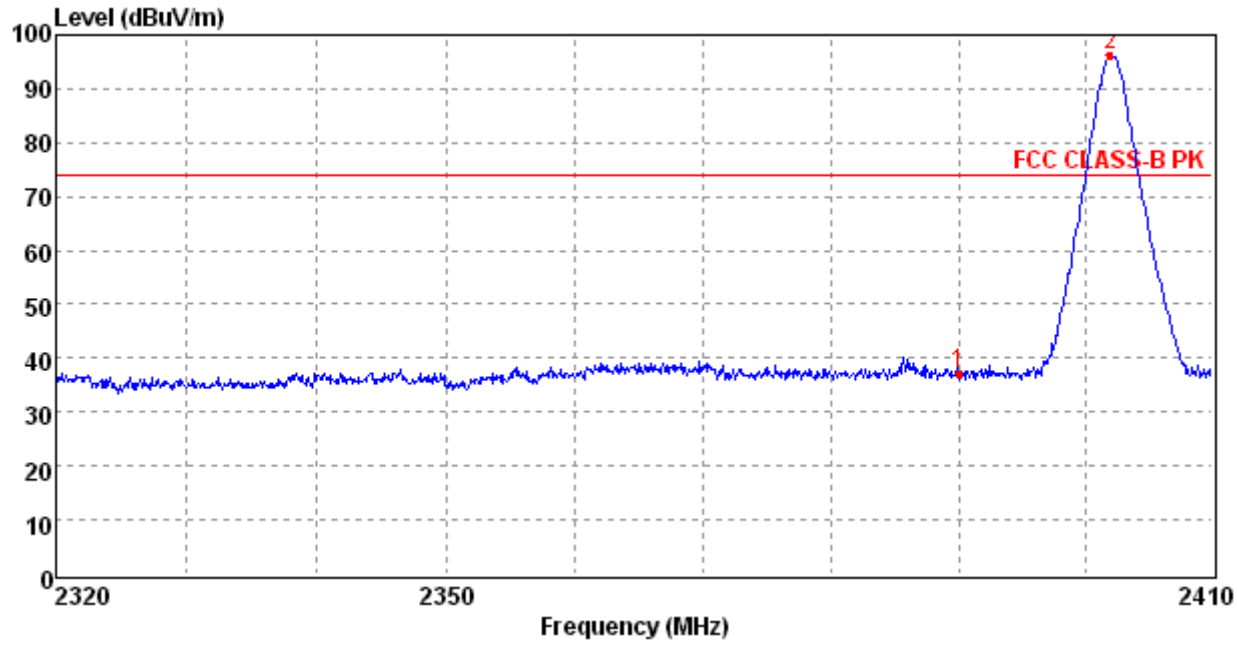


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	**2479.89**	**99.15**	**3.88**	**27.45**	**36.55**	**104.37**	**74.00**	**-25.15**	**Hor**	**Peak**
2	2483.50	60.25	3.88	27.45	36.55	65.47	74.00	13.75	Hor	Peak

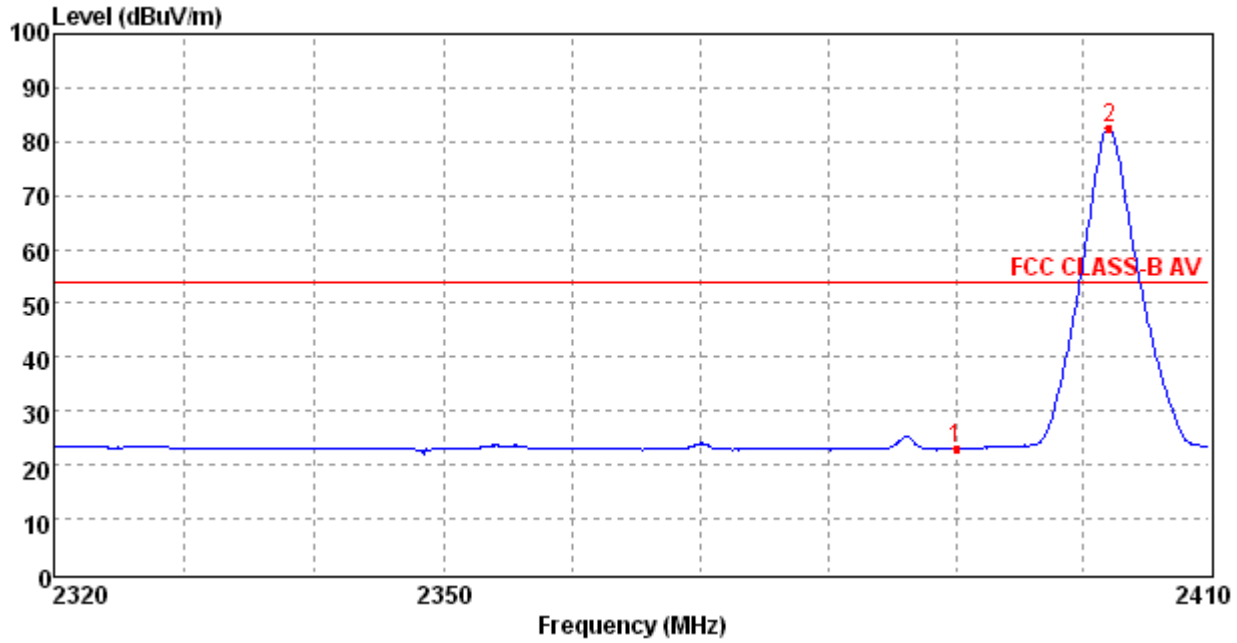


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	**2480.19**	**80.07**	**3.88**	**27.45**	**36.55**	**85.29**	**54.00**	**-26.07**	**Hor**	**Average**
2	2483.50	45.15	3.88	27.45	36.55	50.37	54.00	8.85	Hor	Average

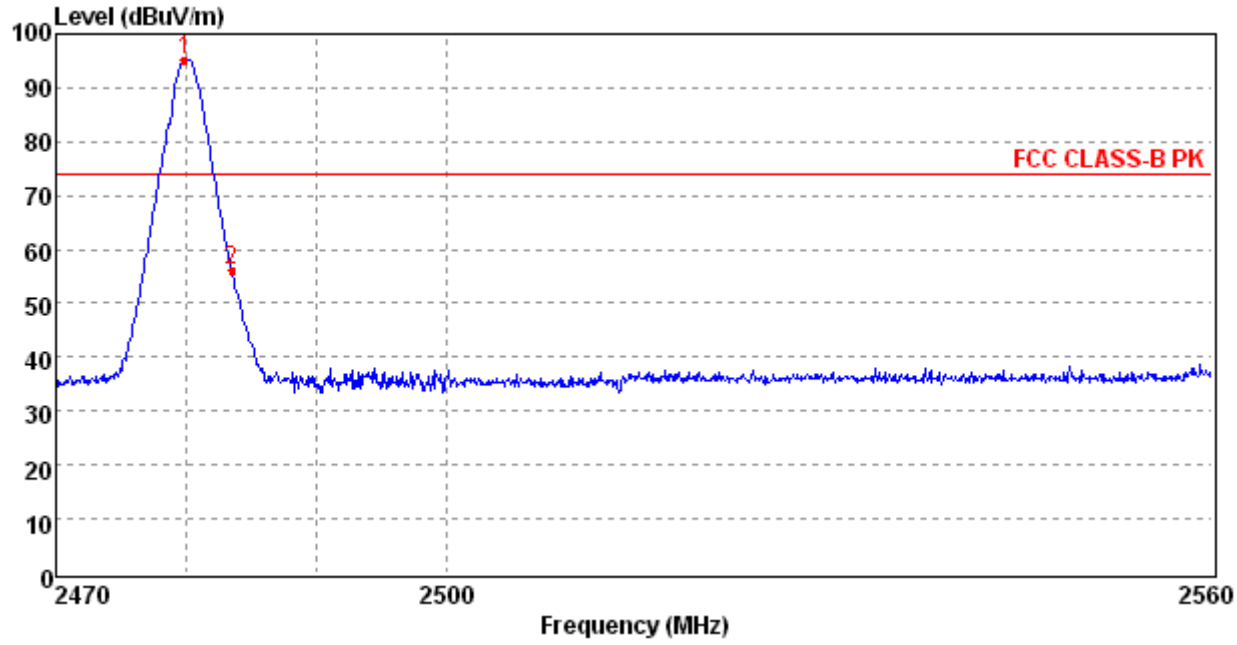
4.5.1.2 8DPSK Test Mode



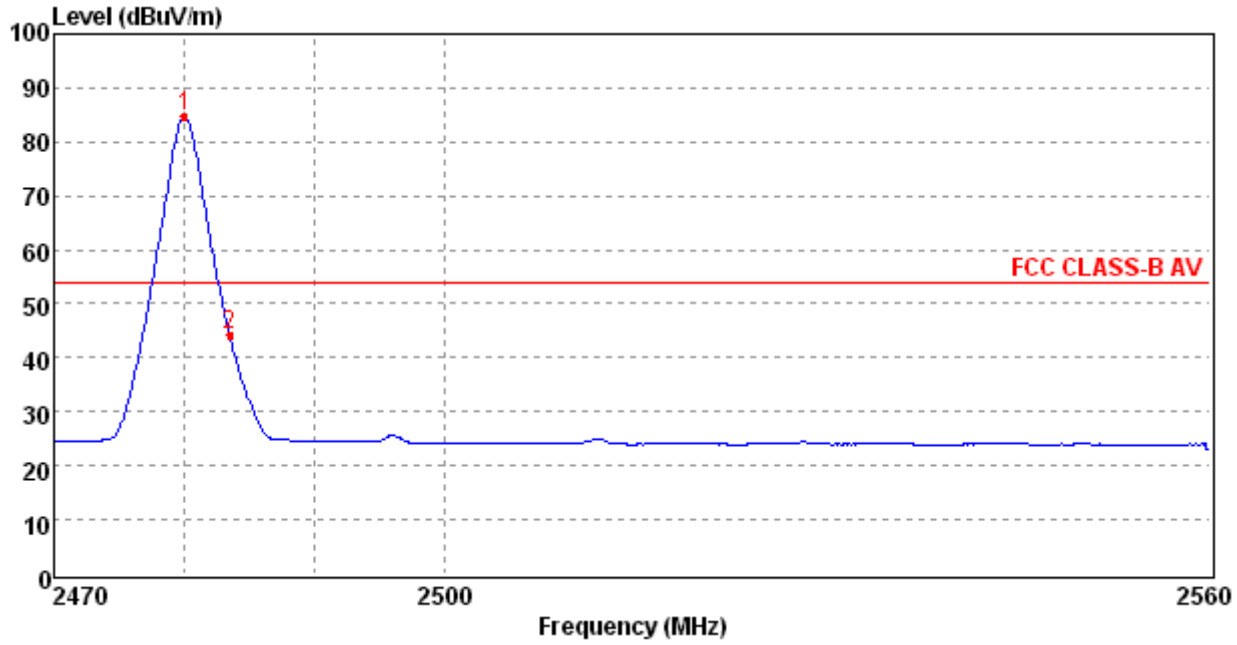
Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	2390.00	37.03	3.32	27.49	36.12	42.31	74.00	36.97	Hor	Peak
2	**2401.99**	**96.30**	**3.32**	**27.49**	**36.12**	**101.61**	**74.00**	**-22.30**	**Hor**	**Peak**



Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	2390.00	22.96	3.32	27.49	36.12	28.24	54.00	31.04	Hor	Average
2	**2402.05**	**82.69**	**3.32**	**27.49**	**36.12**	**88.00**	**54.00**	**-28.69**	**Hor**	Average

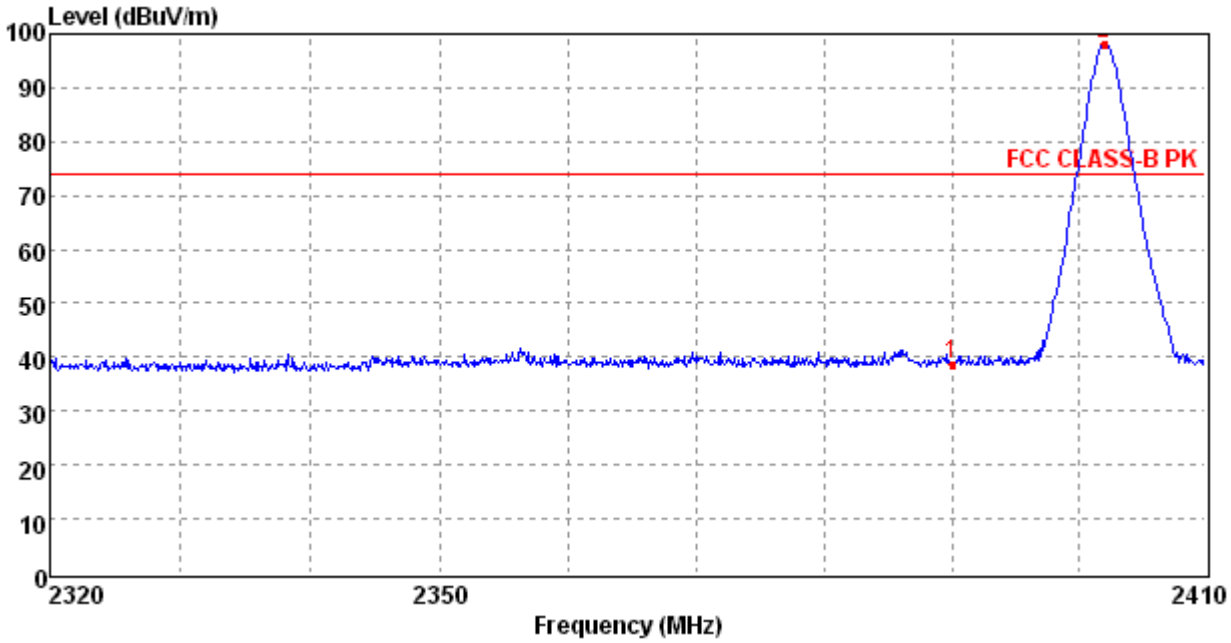


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	**2479.87**	**95.35**	**3.88**	**27.45**	**36.55**	**100.57**	**74.00**	**-21.35**	**Hor**	**Peak**
2	2483.50	56.27	3.88	27.45	36.55	61.49	74.00	17.73	Hor	Peak

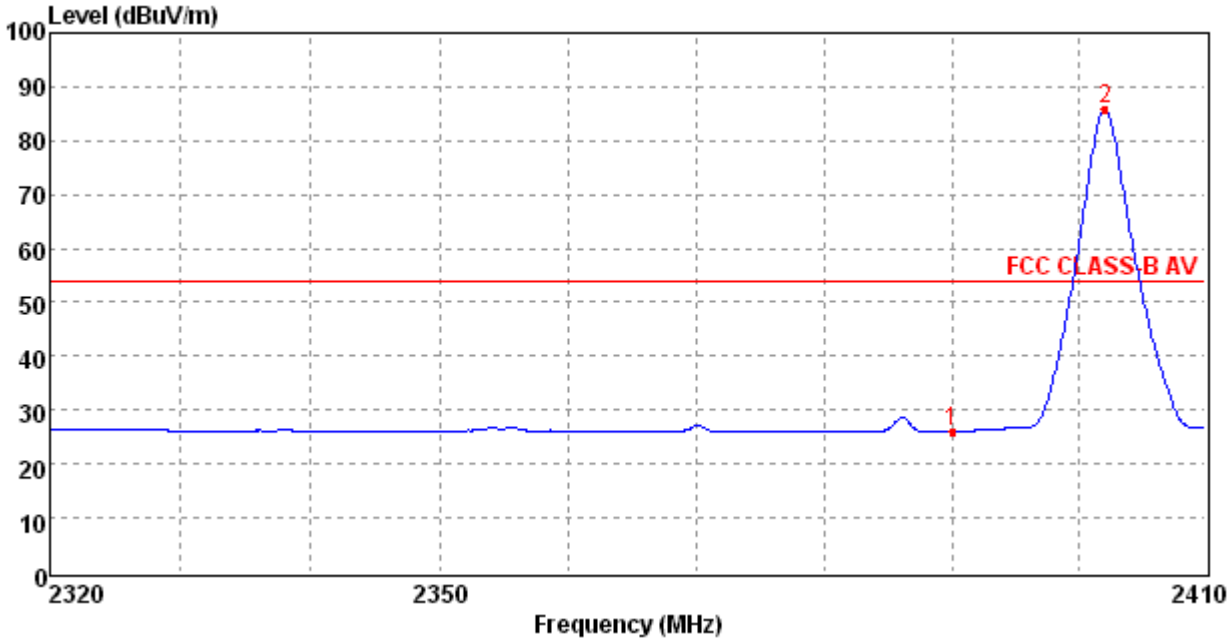


Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	**2480.09**	**84.63**	**3.88**	**27.45**	**36.55**	**89.85**	**54.00**	**-30.63**	**Hor**	**Average**
2	2483.50	44.27	3.88	27.45	36.55	49.49	54.00	9.73	Hor	Average

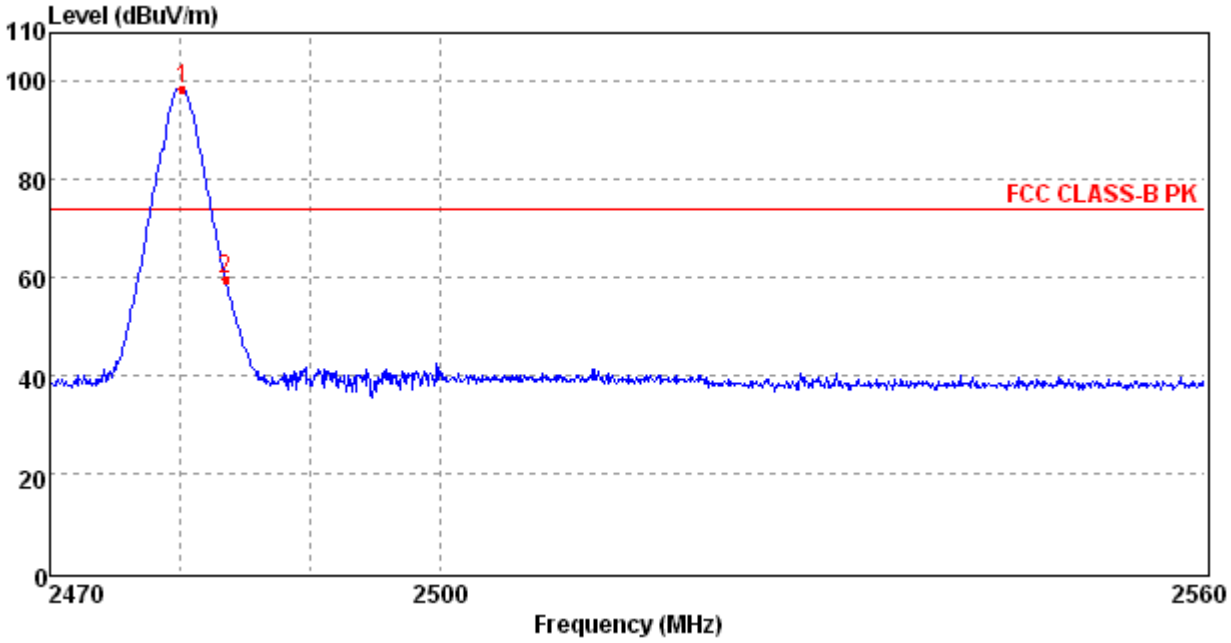
4.5.1.3 π/4DQPSK Test Mode



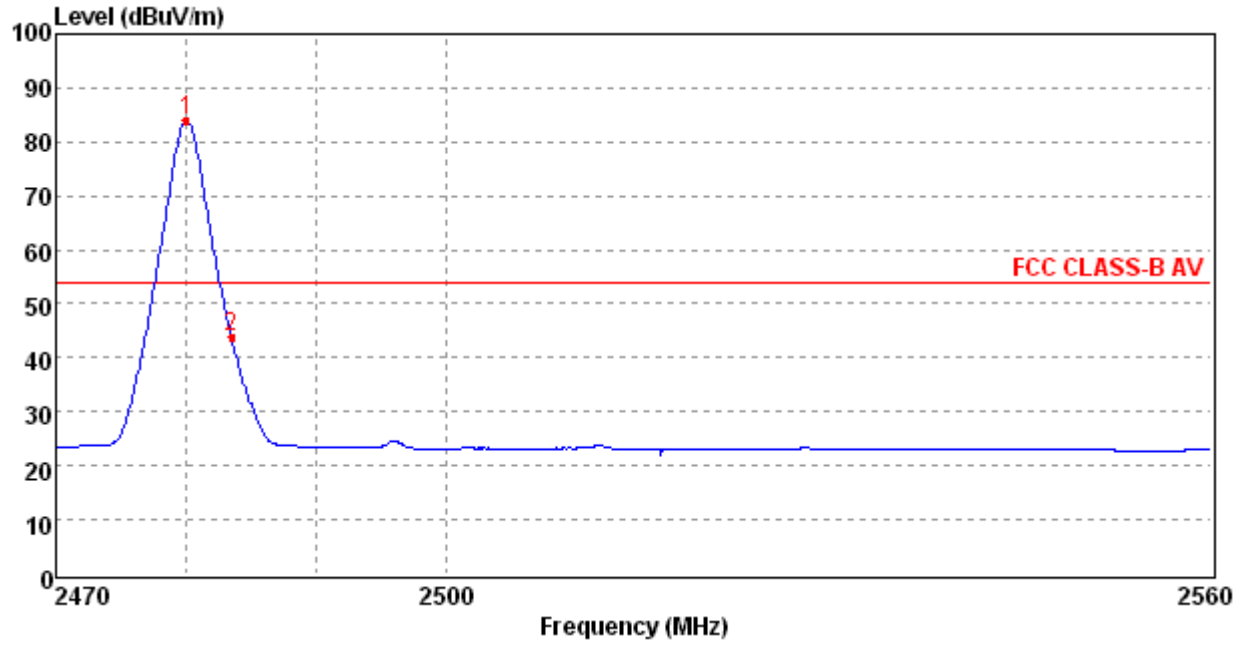
Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	2390.00	38.48	3.32	27.49	36.12	43.76	74.00	35.52	Hor	Peak
2	**2402.11**	**98.14**	**3.32**	**27.49**	**36.12**	**103.45**	**74.00**	**-24.14**	**Hor**	**Peak**



Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	2390.00	26.02	3.32	27.49	36.12	31.30	54.00	27.98	Hor	Average
2	**2402.05**	**85.99**	**3.32**	**27.49**	**36.12**	**91.30**	**54.00**	**-31.99**	**Hor**	Average



Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	**2480.11**	**98.68**	**3.88**	**27.45**	**36.55**	**103.90**	**74.00**	**-24.68**	**Hor**	**Peak**
2	2483.50	59.69	3.88	27.45	36.55	64.91	74.00	14.31	Hor	Peak



Mark	Frequency (MHz)	Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Reading Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Polarization	Detector
1	**2480.07**	**83.97**	**3.88**	**27.45**	**36.55**	**89.19**	**54.00**	**-29.97**	**Hor**	**Average**
2	2483.50	43.79	3.88	27.45	36.55	49.01	54.00	10.21	Hor	Average

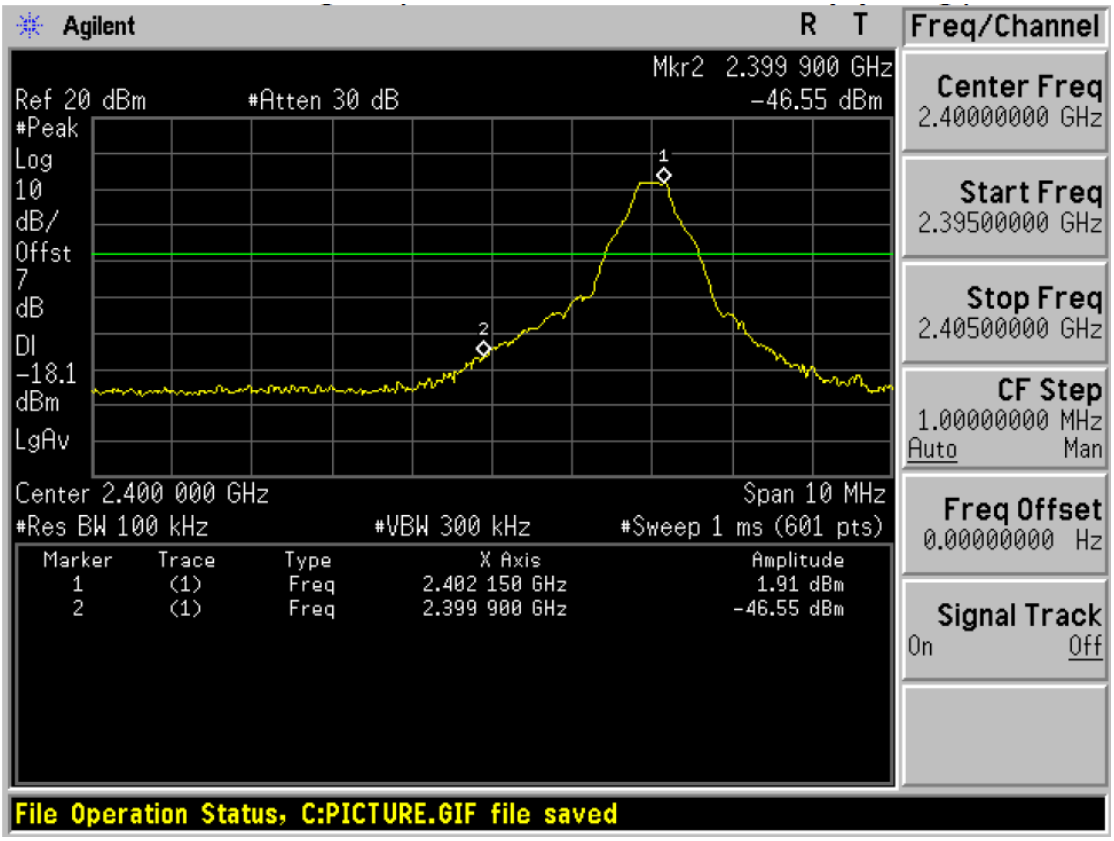
4.5.2 For Conducted Bandedge Measurement

4.5.2.1 GFSK Test Mode

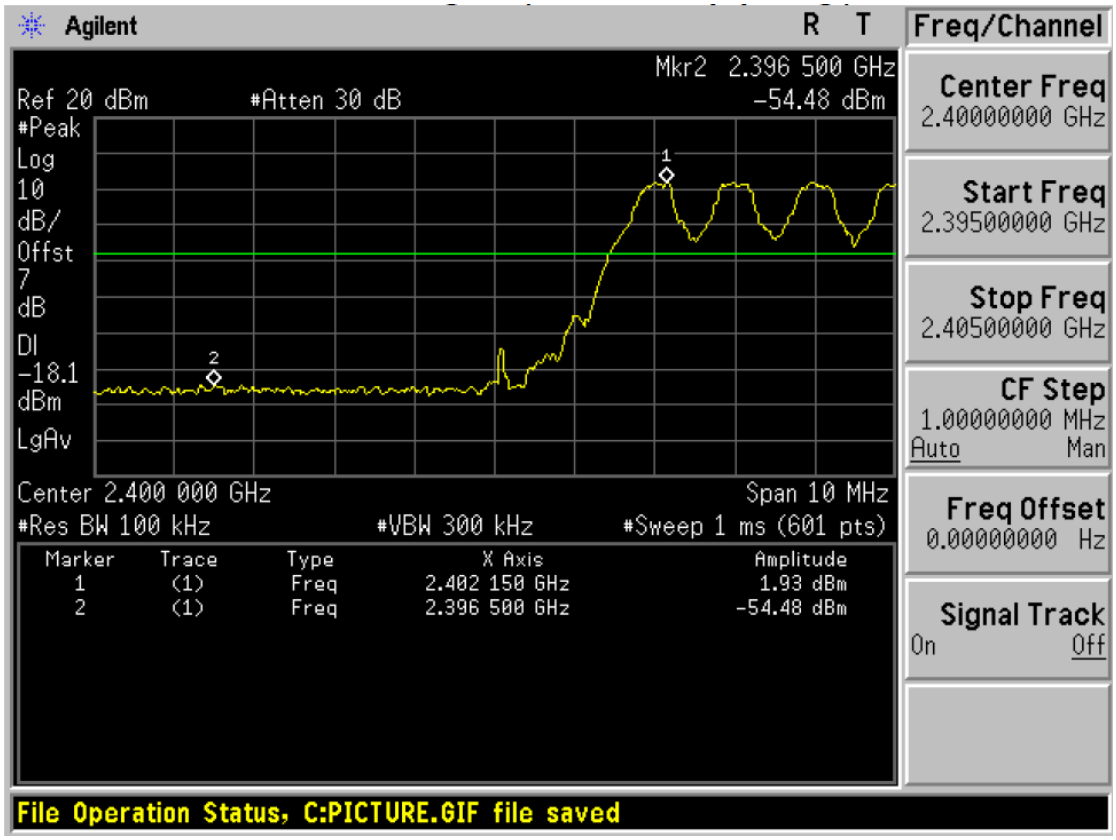
A. Test Verdict

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Detector	Limit (dBc)	Refer to Plot	Verdict
2400.00	-48.46	OFF	Peak	-20	Plot 4.5.2.1 A	PASS
2400.00	-56.41	ON	Peak	-20	Plot 4.5.2.1 B	PASS
2483.50	-55.47	OFF	Peak	-20	Plot 4.5.2.1 C	PASS
2483.50	-55.67	ON	Peak	-20	Plot 4.5.2.1 D	PASS

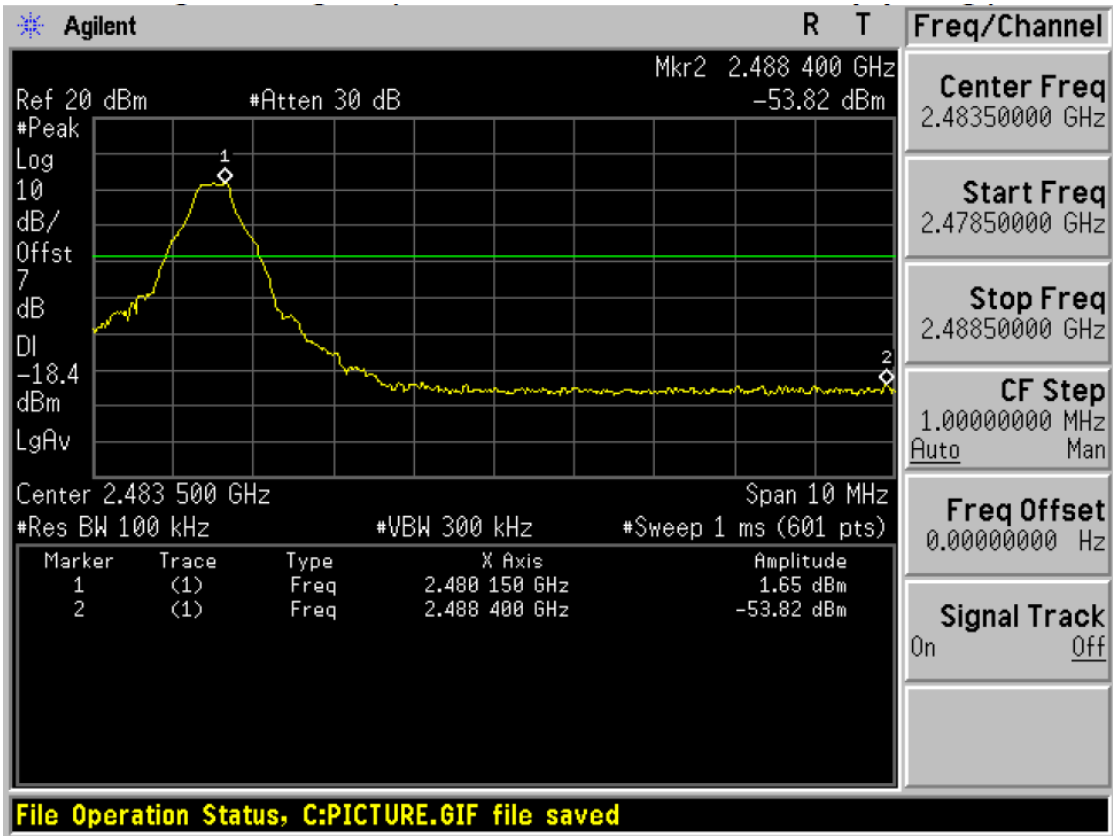
B. Test Plots



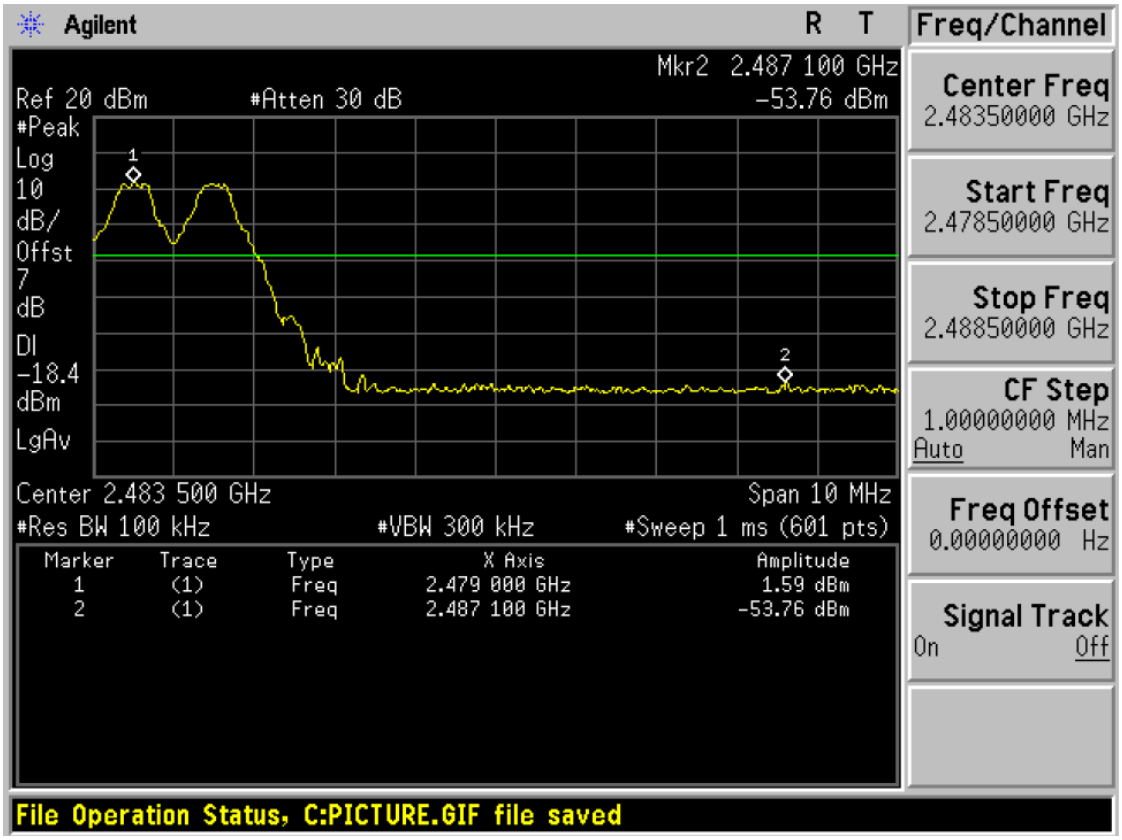
(Plot 4.5.2.1 A: Channel 00: 2402MHz @ GFSK)



(Plot 4.5.2.1 B: Hopping Mode @ GFSK)



(Plot 4.5.2.1 C: Channel 78: 2480MHz @ GFSK)



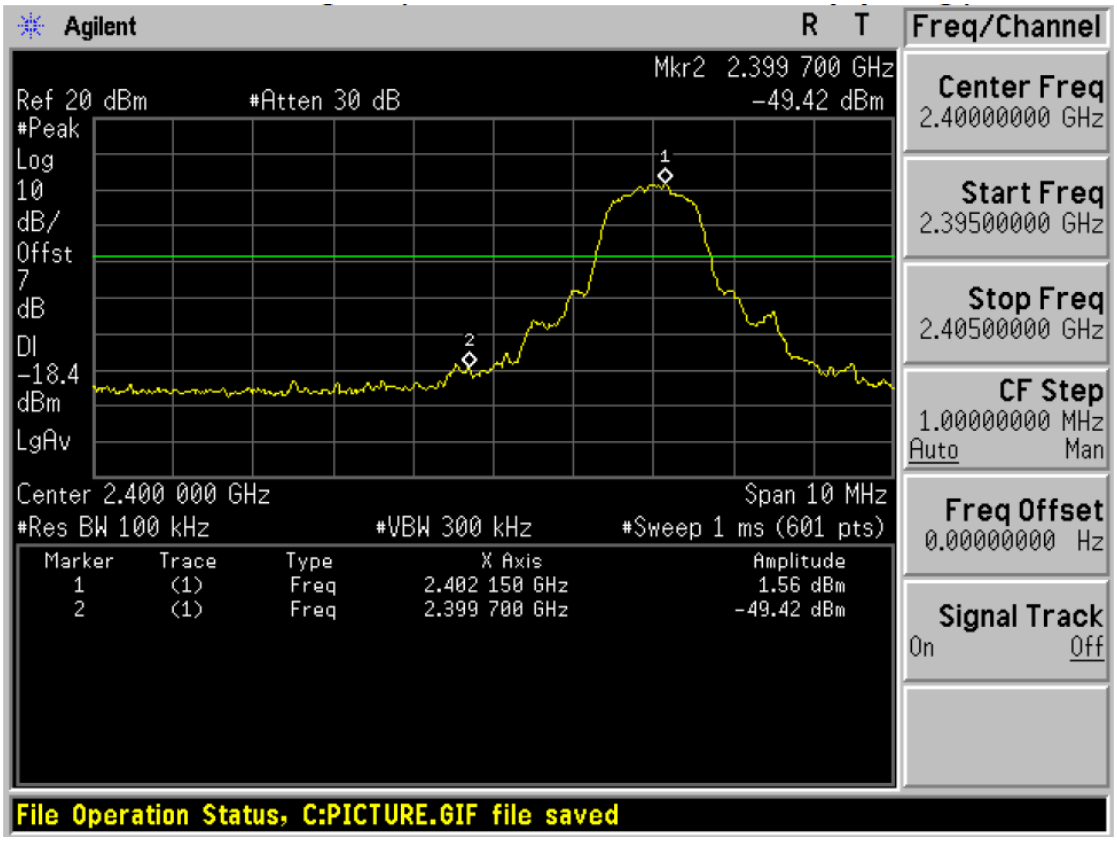
(Plot 4.5.2.1 D: Hopping Mode @ GFSK)

4.5.2.2 8DPSK Test Mode

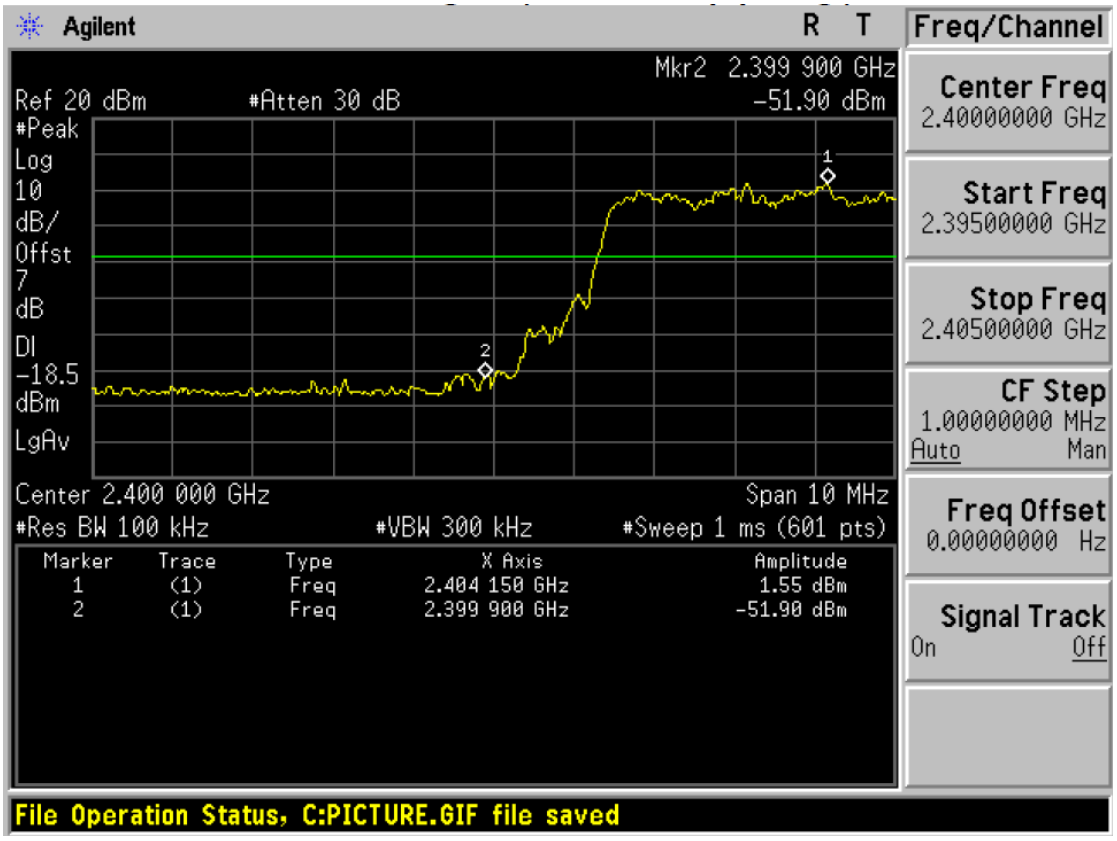
A. Test Verdict

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Detector	Limit (dBc)	Refer to Plot	Verdict
2400.00	-50.98	OFF	Peak	-20	Plot 4.5.2.2 A	PASS
2400.00	-53.45	ON	Peak	-20	Plot 4.5.2.2 B	PASS
2483.50	-56.02	OFF	Peak	-20	Plot 4.5.2.2 C	PASS
2483.50	-54.54	ON	Peak	-20	Plot 4.5.2.2 D	PASS

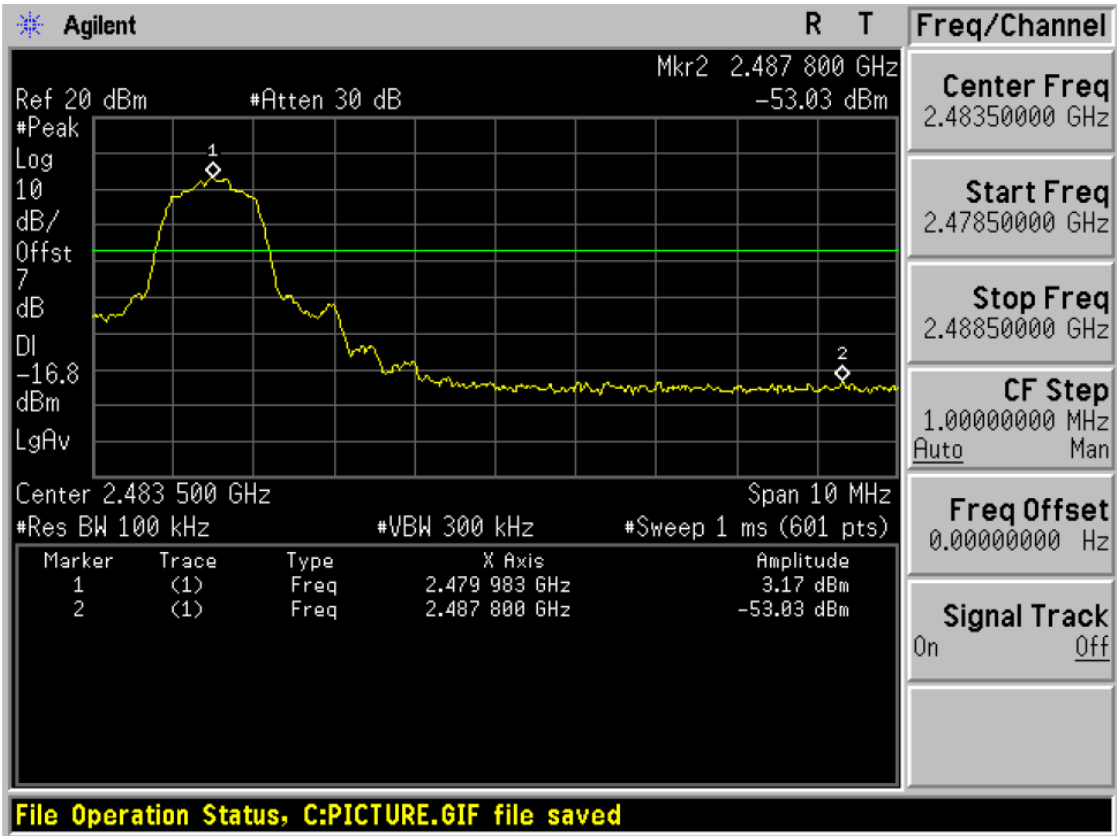
B. Test Plots



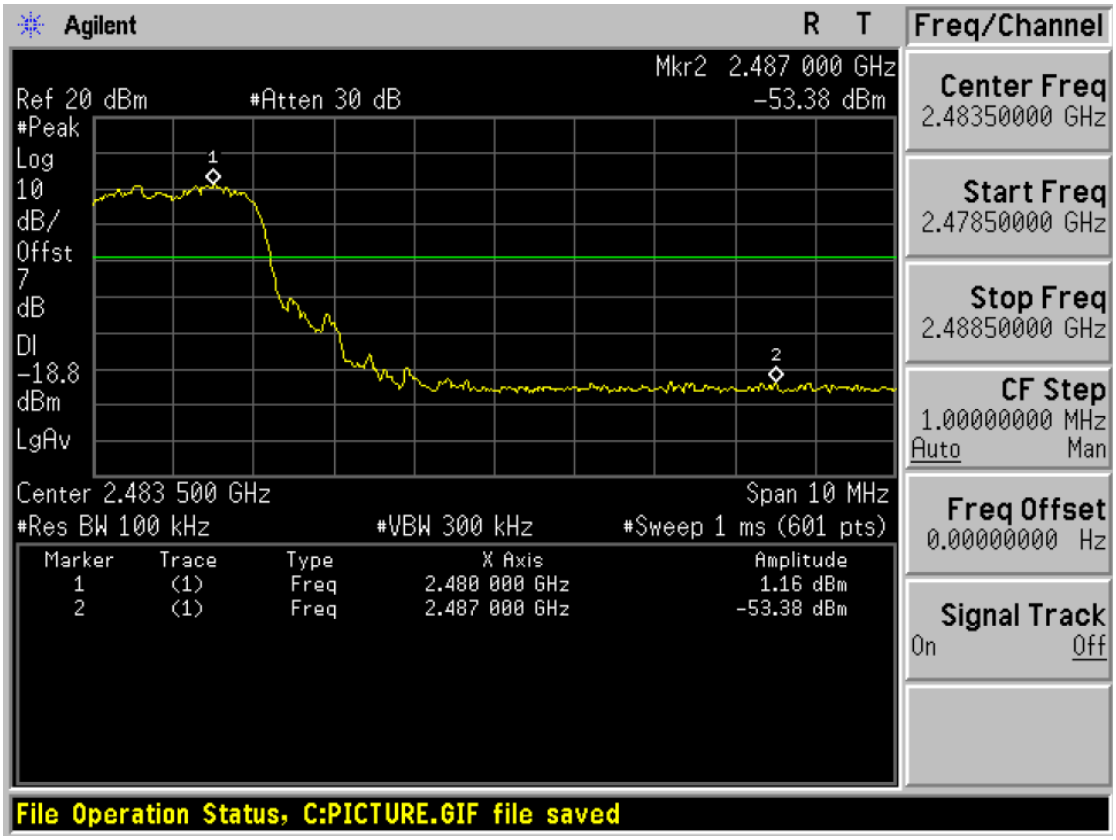
(Plot 4.5.2.2 A: Channel 00: 2402MHz @ 8DPSK)



(Plot 4.5.2.2 B: Hopping Mode @ 8DPSK)



(Plot 4.5.2.2 C: Channel 78: 2480MHz @ 8DPSK)



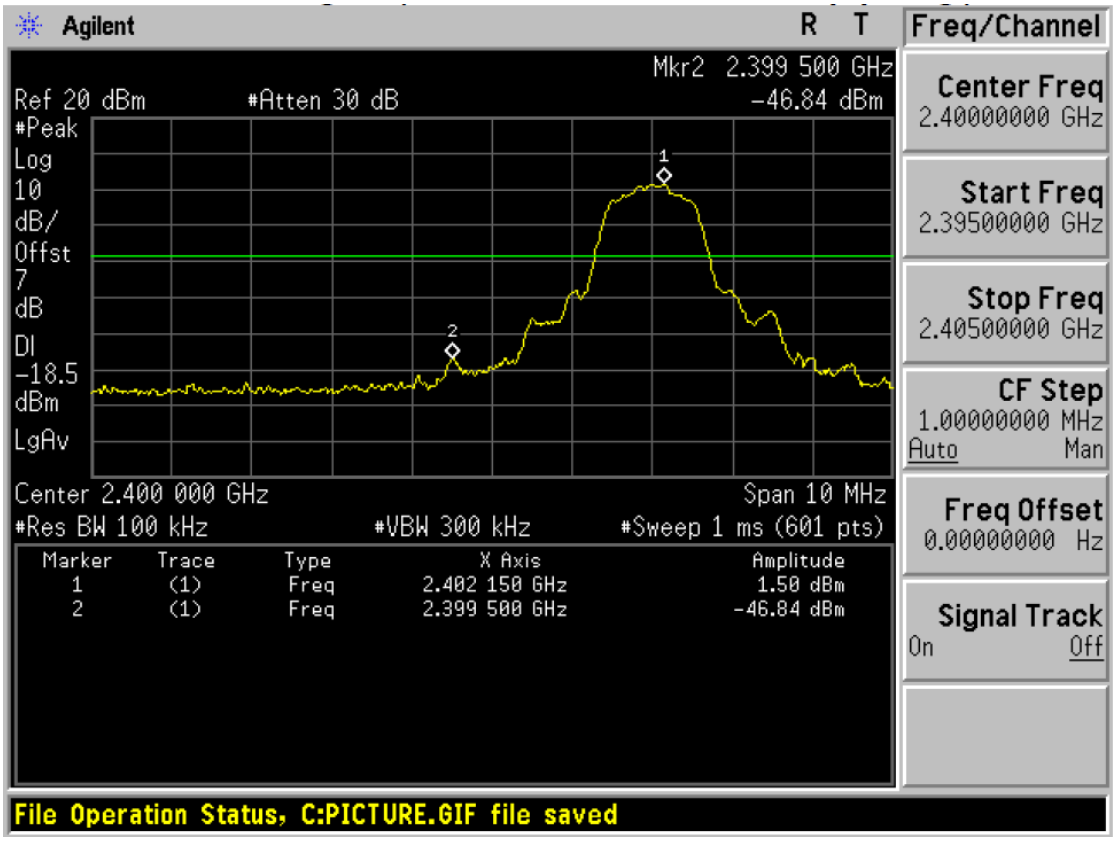
(Plot 4.5.2.2 D: Hopping Mode @ 8DPSK)

4.5.2.3 π/4DQPSK Test Mode

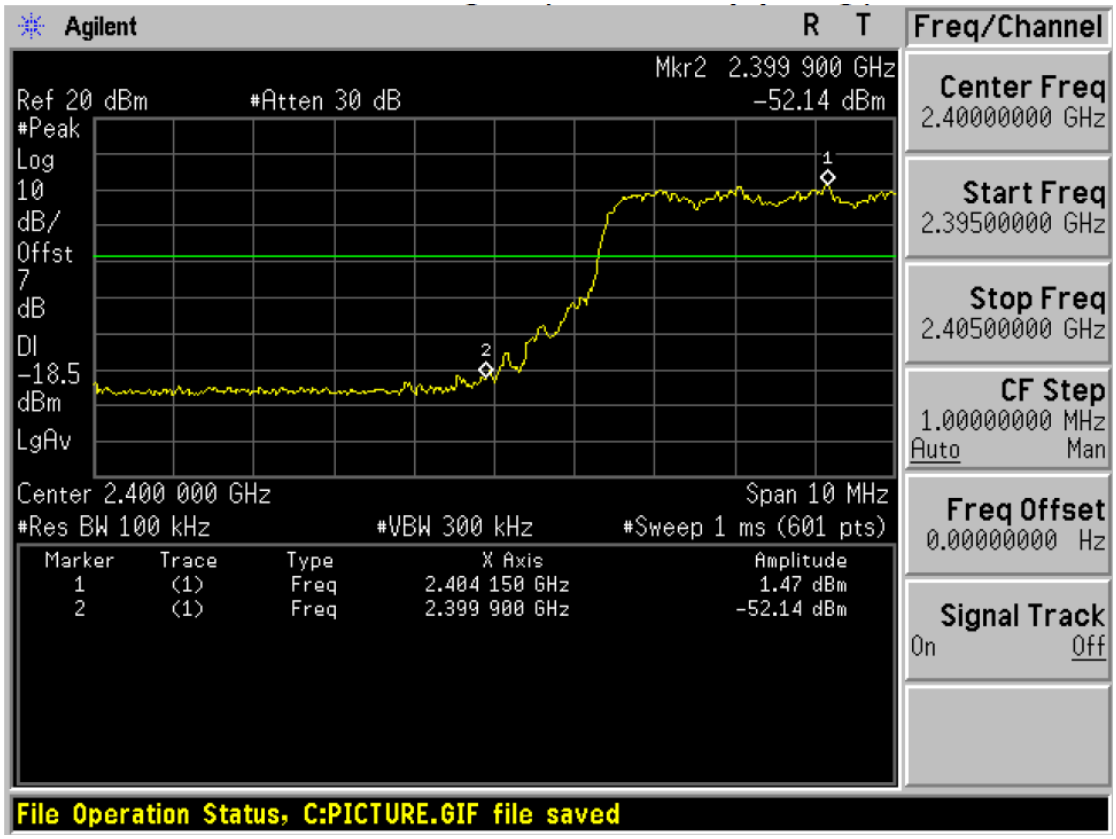
A. Test Verdict

Frequency (MHz)	Delta Peak to Band emission (dBc)	Hoping Mode	Detector	Limit (dBc)	Refer to Plot	Verdict
2400.00	-48.34	OFF	Peak	-20	Plot 4.5.2.3 A	PASS
2400.00	-53.61	ON	Peak	-20	Plot 4.5.2.3 B	PASS
2483.50	-56.64	OFF	Peak	-20	Plot 4.5.2.3 C	PASS
2483.50	-53.47	ON	Peak	-20	Plot 4.5.2.3 D	PASS

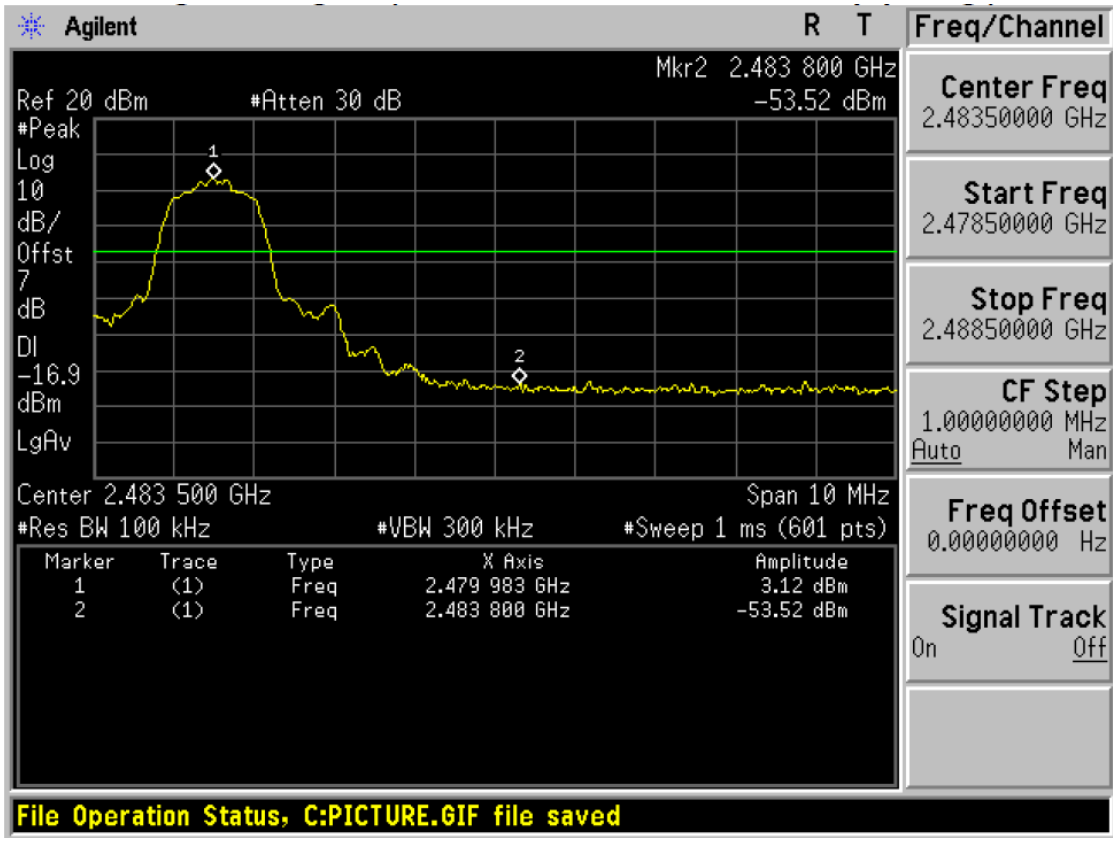
B. Test Plots



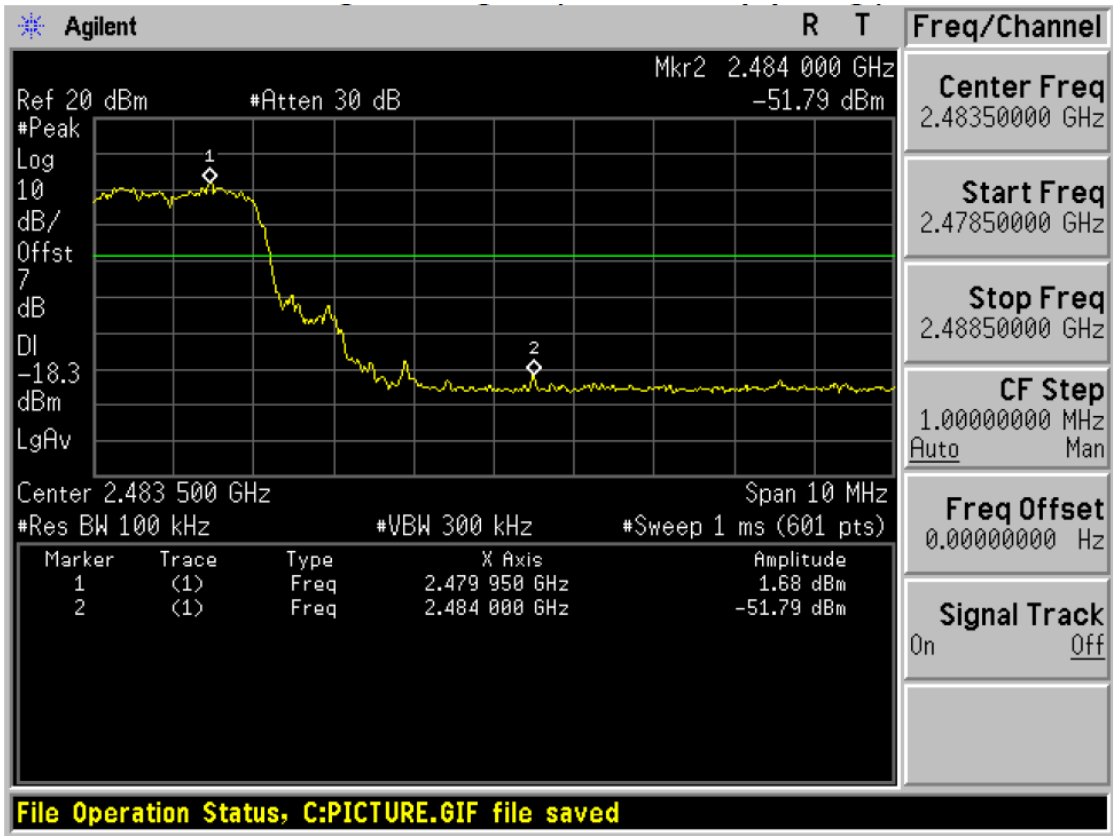
(Plot 4.5.2.3 A: Channel 00: 2402MHz @ π/4DQPSK)



(Plot 4.5.2.3 B: Hopping Mode @π/4DQPSK)



(Plot 4.5.2.3 C: Channel 78: 2480MHz @ π/4DQPSK)



(Plot 4.5.2.3 D: Hopping Mode @π/4DQPSK)

4.6. Frequency Separation

TEST CONFIGURATION

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz.

LIMIT

According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

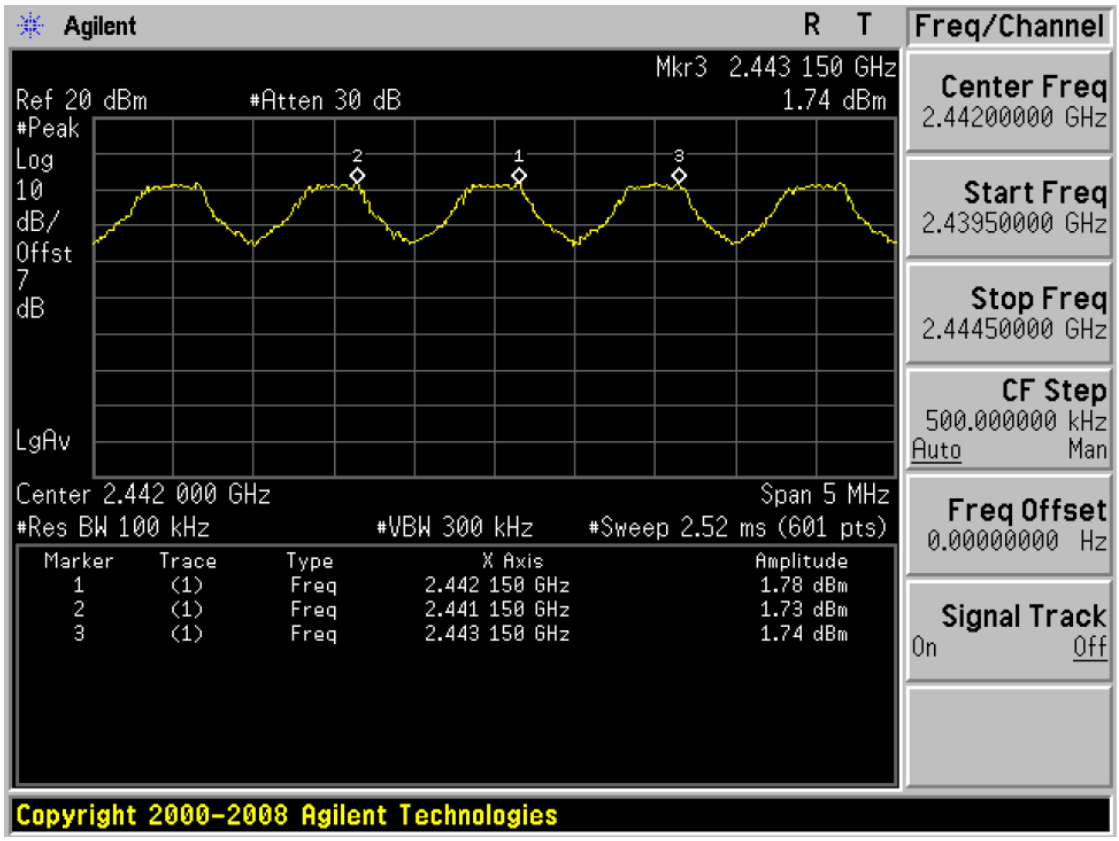
Remark: 1. We test Frequency Separation at difference Packet Type (DH1, DH3 and DH5) and all test channels, recorded worst case at DH5 and middle channel.

4.6.1 GFSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict
39	2441	1.000	Plot 4.6.1 A	0.9719	PASS
40	2442				

B. Test Plots



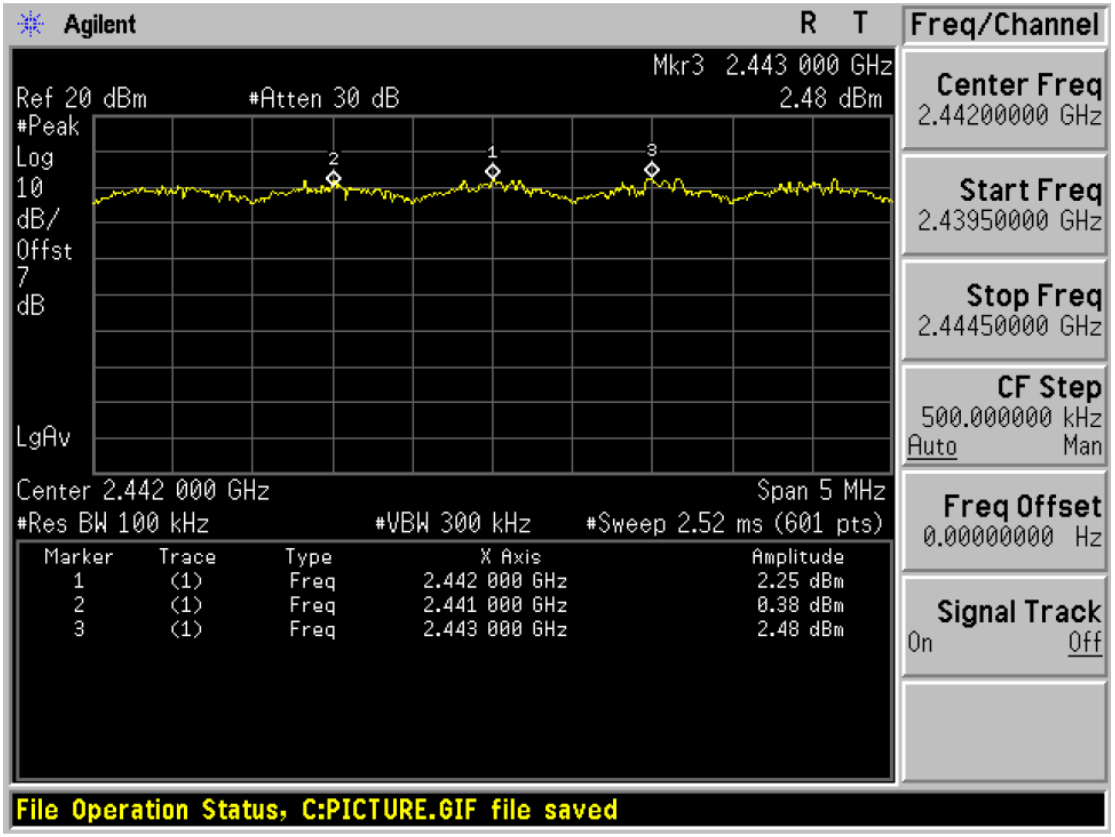
(Plot 4.6.1 A: Channel 40: 2442MHz @ GFSK)

4.6.2 8DPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict
39	2441	1.000	Plot 4.6.2 A	0.862	PASS
40	2442				

B. Test Plots



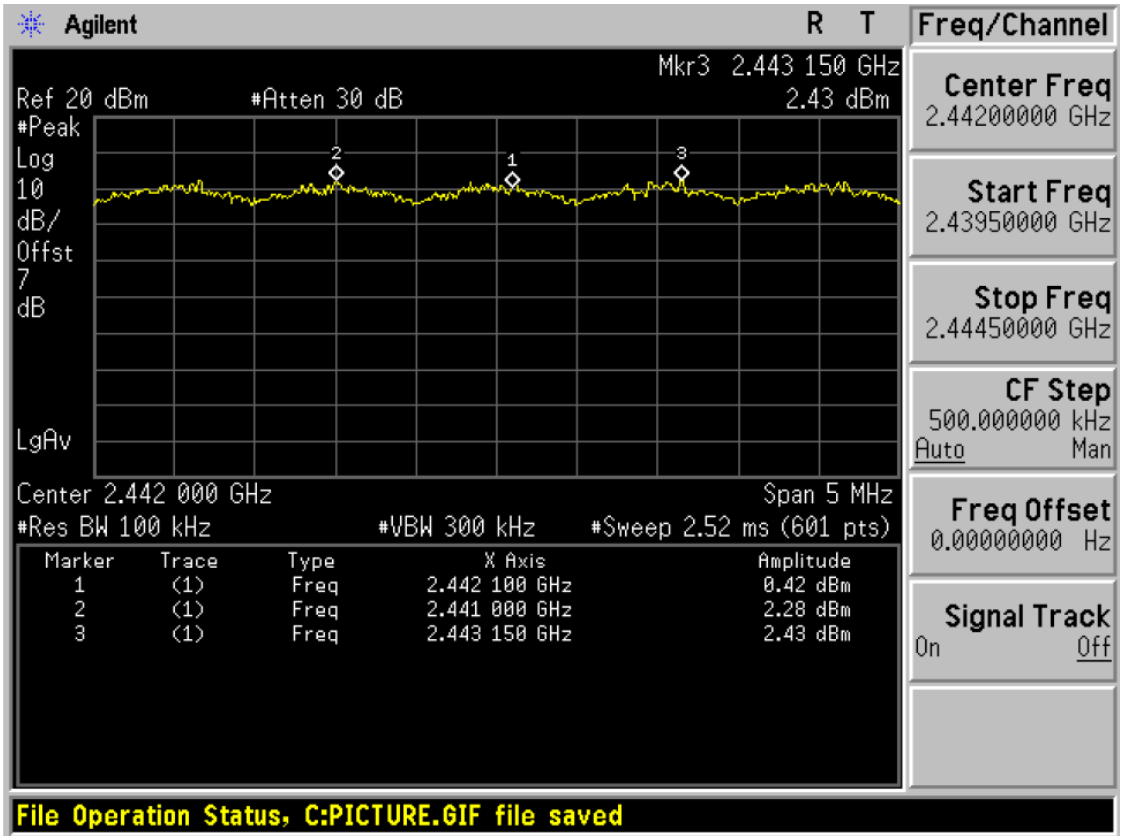
(Plot 4.6.2 A: Channel 40: 2442MHz @ 8DPSK)

4.6.3 π/4DQPSK Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Channel Separation (MHz)	Refer to Plot	Limits (MHz)	Verdict
39	2441	1.000	Plot 4.6.3 A	0.863	PASS
40	2442				

B. Test Plots



(Plot 4.6.3 A: Channel 40: 2442MHz @ π/4DQPSK)

4.7. Number of hopping frequency

TEST CONFIGURATION

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 2400MHz to 2483.5MHz with RBW=100 KHz and VBW=300KHz.

LIMIT

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

TEST RESULTS

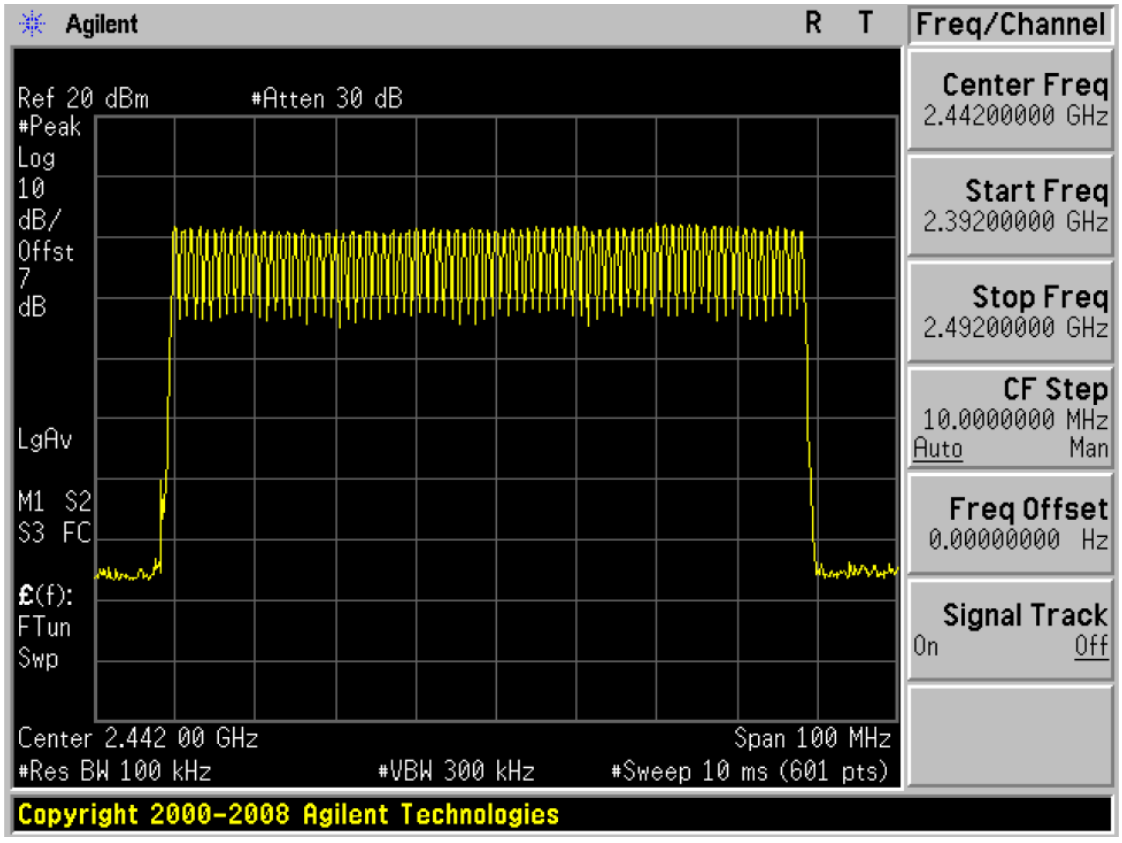
Remark: 1. We test Frequency Separation at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH5.

4.7.1 GFSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.7.1 A1	≥15	PASS

B. Test Plots



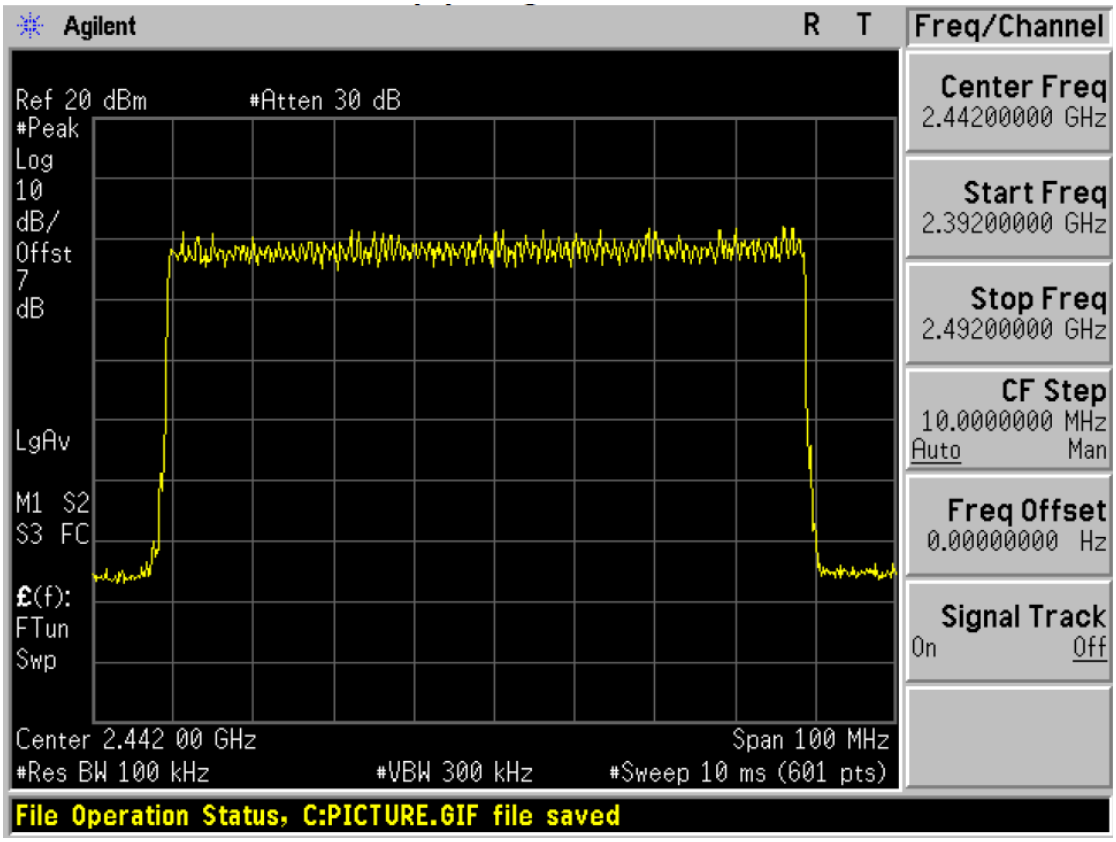
(Plot 4.7.1 A1: @ GFSK)

4.7.2 8DPSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.7.2 A1	≥15	PASS

B. Test Plots



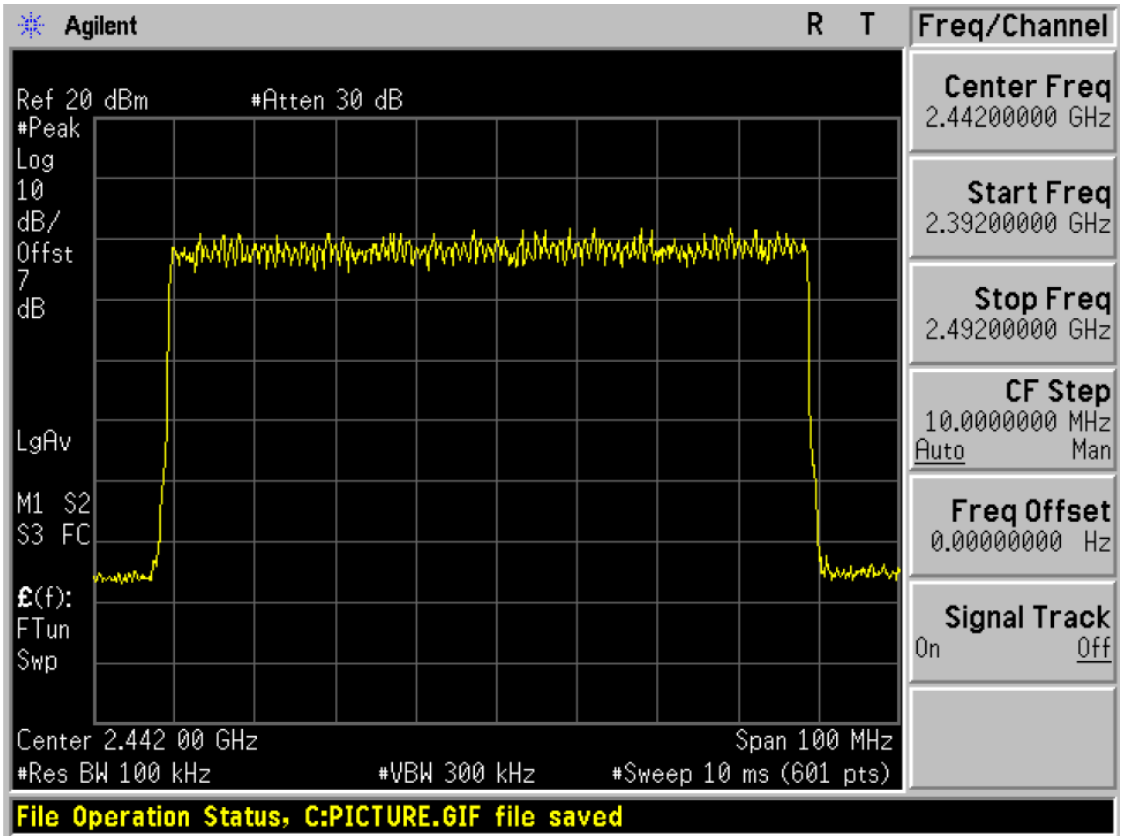
(Plot 4.7.2 A1: @ 8DPSK)

4.7.3 π/4DQPSK Test Mode

A. Test Verdict

Hopping Channel Frequency Range (MHz)	Number of Hopping Channel	Refer to Plot	Limit	Verdict
2400-2483.5	79	Plot 4.7.3 A1	≥15	PASS

B. Test Plots



(Plot 4.7.3 A1: @ π/4DQPSK)

4.8. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz,Span=0Hz.

LIMIT

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation:0.4[s]*hopping number=0.4[s]*79[ch]=31.6[s*ch];
The burst width [ms/hop/ch], which is directly measured, refers to the duration on one channel hop.
The hops per second for all channels: The selected EUT Conf uses a slot type of 5-Tx&1-Rx and a hopping rate of 1600 [ch*hop/s] for all channels. So the final hopping rate for all channels is 1600/6=266.67 [ch*hop/s]
The hops per second on one channel: 266.67 [ch*hops/s]/79 [ch]=3.38 [hop/s];
The total hops for all channels within the dwell time calculation duration: 3.38 [hop/s]*31.6[s*ch]=106.67 [hop*ch];
The dwell time for all channels hopping: 106.67 [hop*ch]*Burst Width [ms/hop/ch].

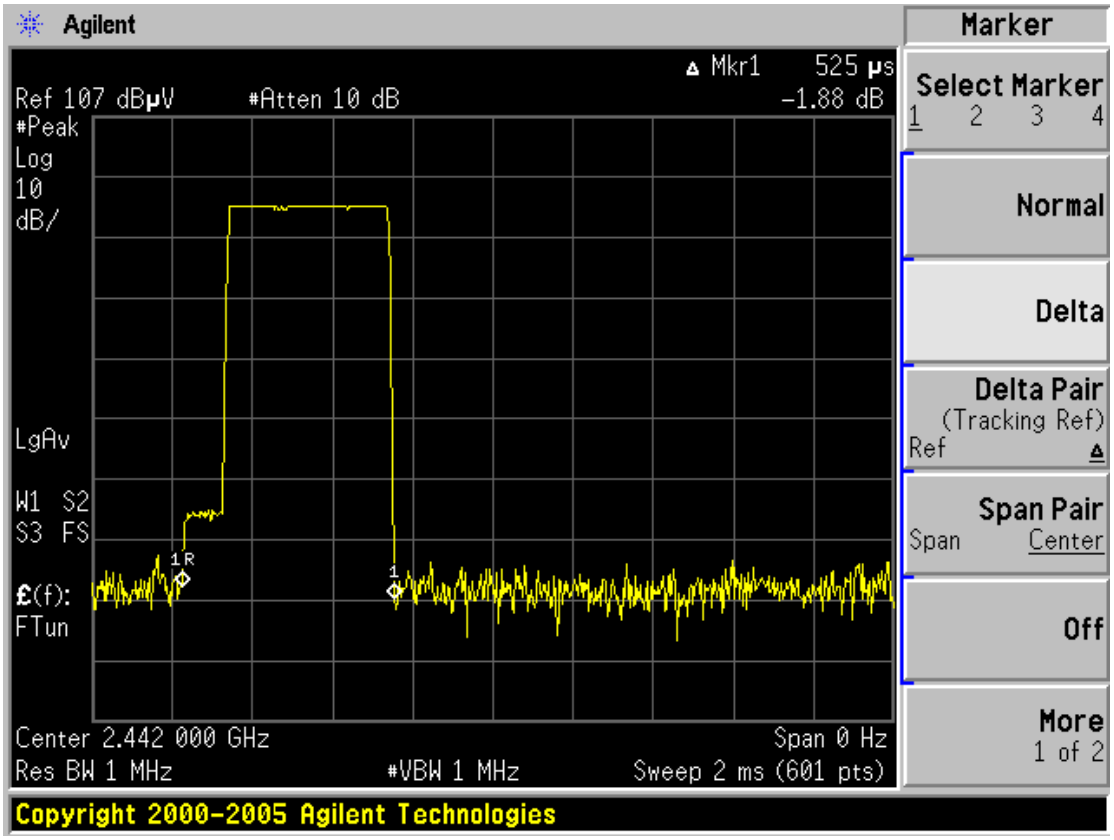
Remark: 1. We test Frequency Separation at all test channels, recorded worst case at middle channel.

4.8.1 GFSK Test Mode

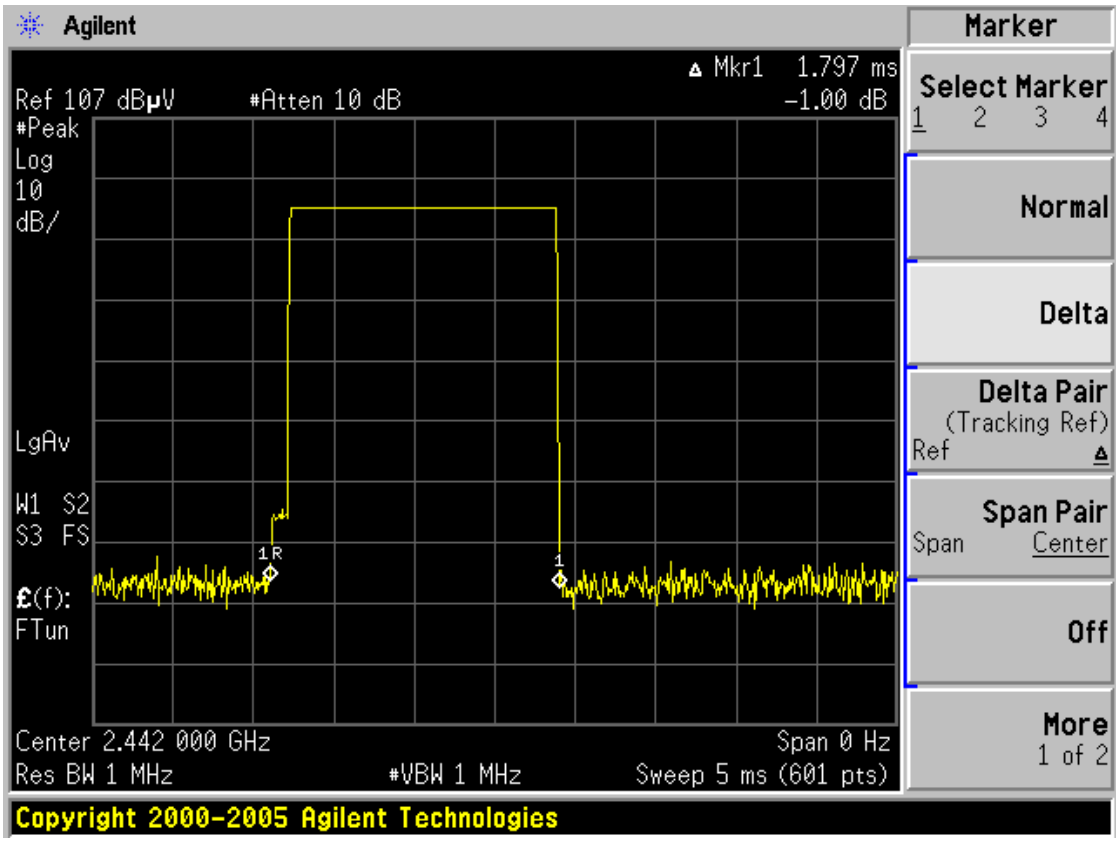
A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict
DH1	2442	0.405	0.1296	0.4	Plot 4.8.1 A	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second					
DH3	2442	1.797	0.2875	0.4	Plot 4.8.1 B	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second					
DH5	2442	2.900	0.3093	0.4	Plot 4.8.1 C	PASS
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second					

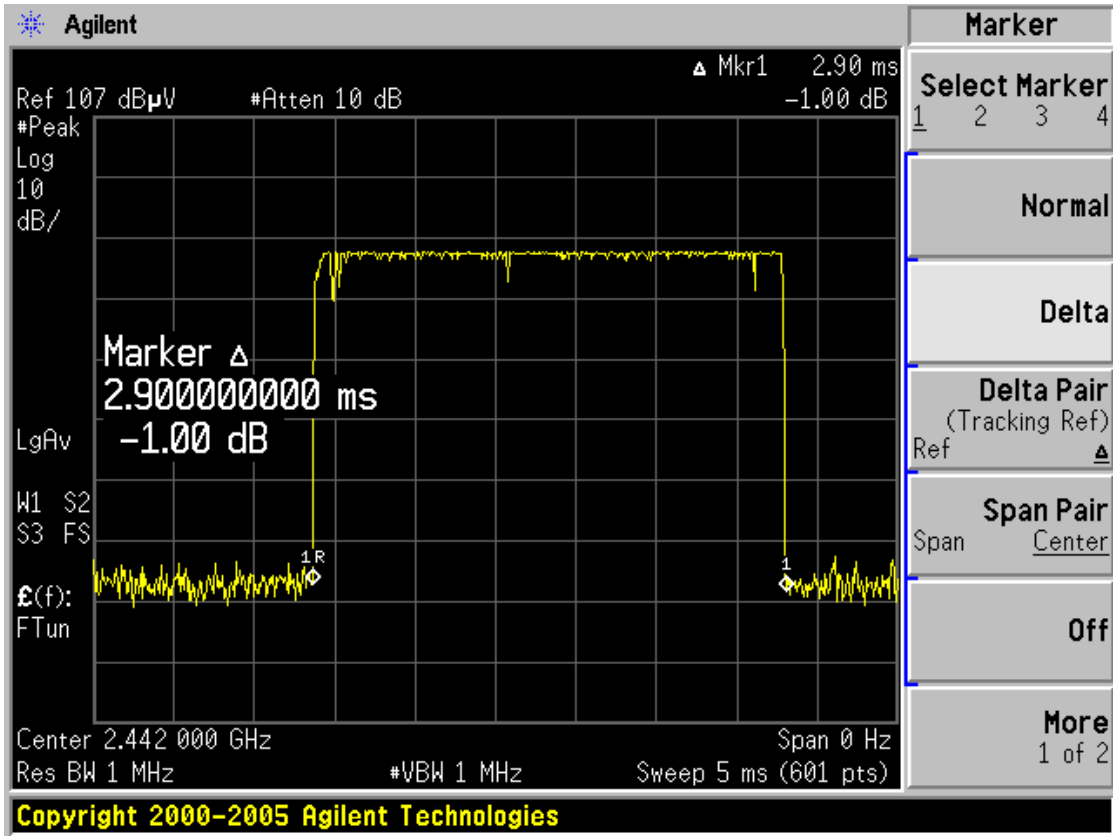
B. Test Plots



(Plot 4.8.1.A: Channel 40: 2442MHz @ GFSK @ DH1)



(Plot 4.8.1.B: Channel 40: 2442MHz @ GFSK @ DH3)



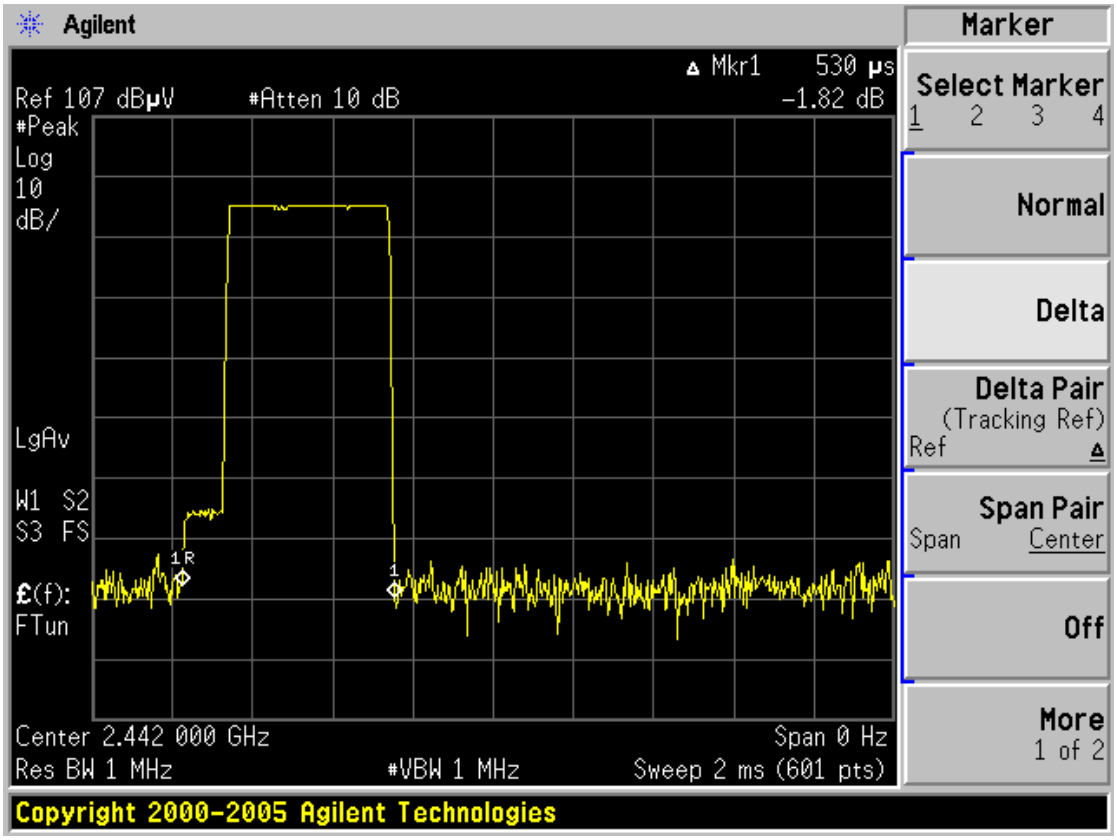
(Plot 4.8.1.C: Channel 40: 2442MHz @ GFSK @ DH5)

4.8.2 8DPSK Test Mode

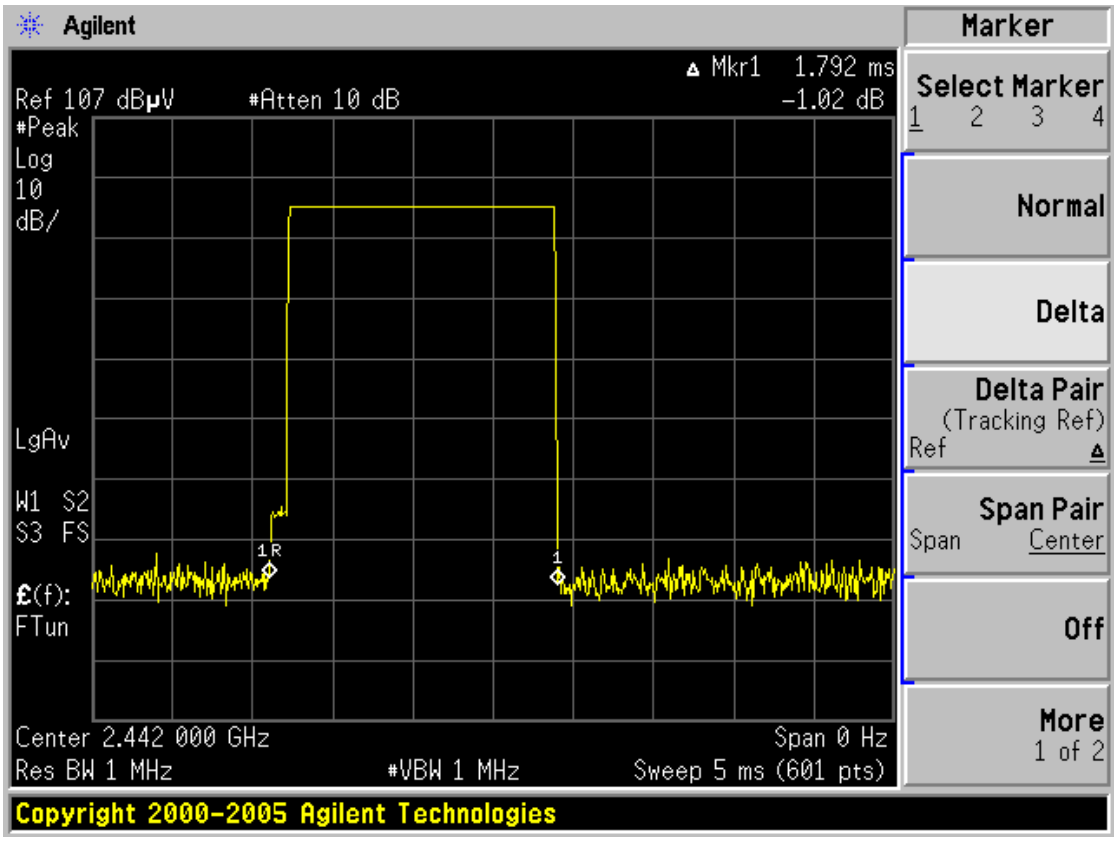
A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict
DH1	2442	0.530	0.1696	0.4	Plot 4.8.2 A	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second					
DH3	2442	1.792	0.2867	0.4	Plot 4.8.2 B	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second					
DH5	2442	2.950	0.3147	0.4	Plot 4.8.2 C	PASS
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second					

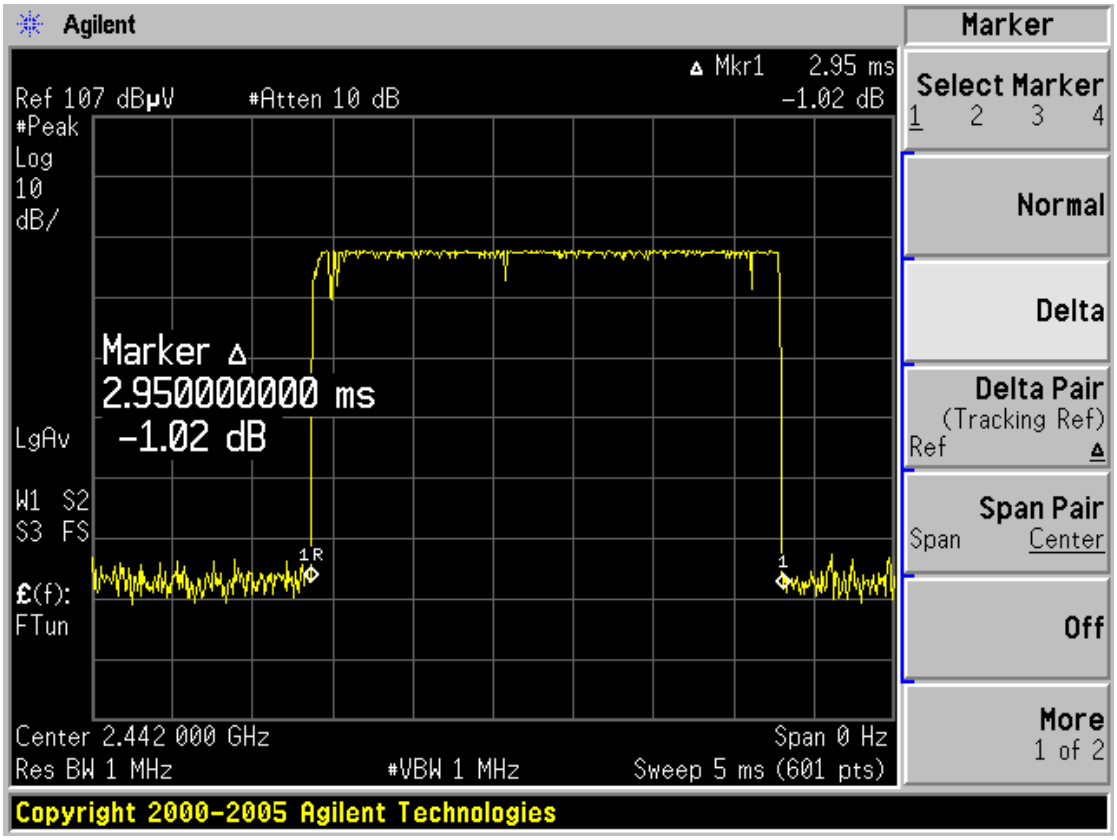
B. Test Plots



(Plot 4.8.2.A: Channel 40: 2442MHz @ 8DPSK @ DH1)



(Plot 4.8.2.B: Channel 40: 2442MHz @ 8DPSK @ DH3)



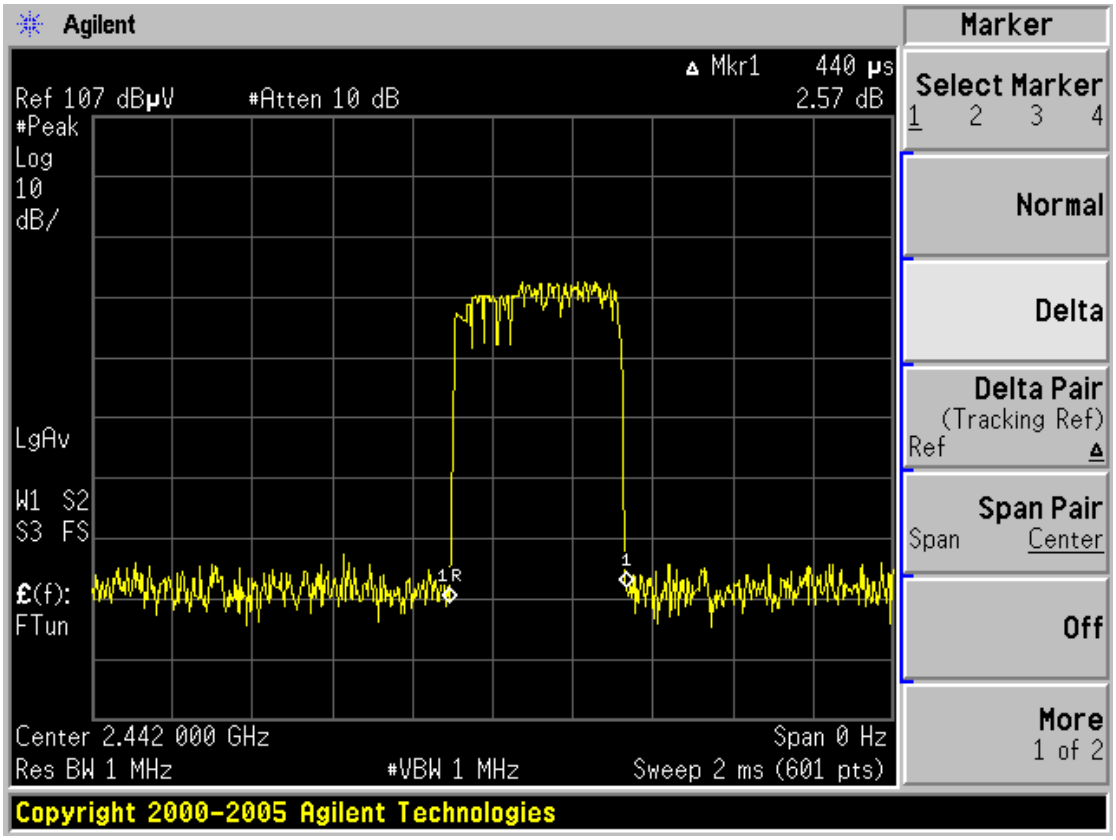
(Plot 4.8.2.C: Channel 40: 2442MHz @ 8DPSK @ DH5)

4.8.3 π/4DQPSK Test Mode

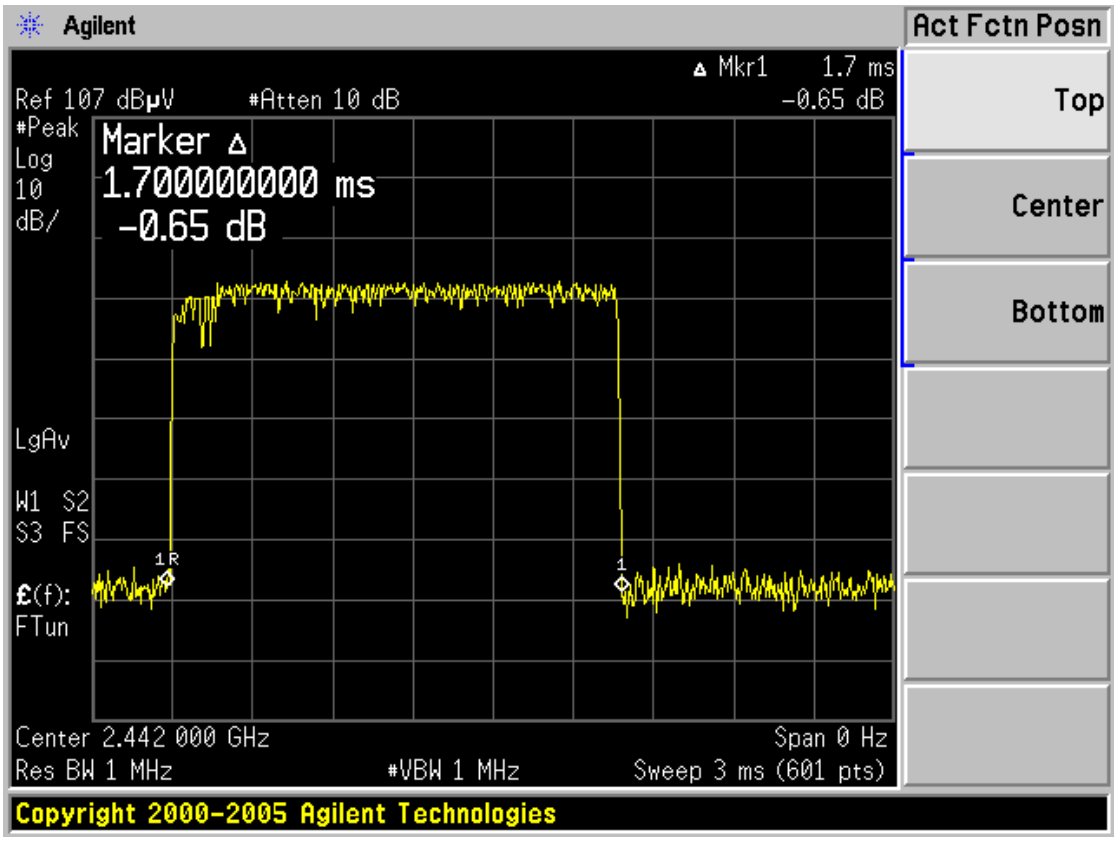
A. Test Verdict

Mode	Frequency (MHz)	Pulse Width (ms)	Dwell Time (S)	Limit (S)	Refer to Plot	Verdict
DH1	2442	0.440	0.1408	0.4	Plot 4.8.3 A	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second					
DH3	2442	1.700	0.2720	0.4	Plot 4.8.3 B	PASS
	Note: Dwell time=Pulse time (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second					
DH5	2442	3.050	0.3253	0.4	Plot 4.8.3 C	PASS
	Note: Dwell time=Pulse Time (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second					

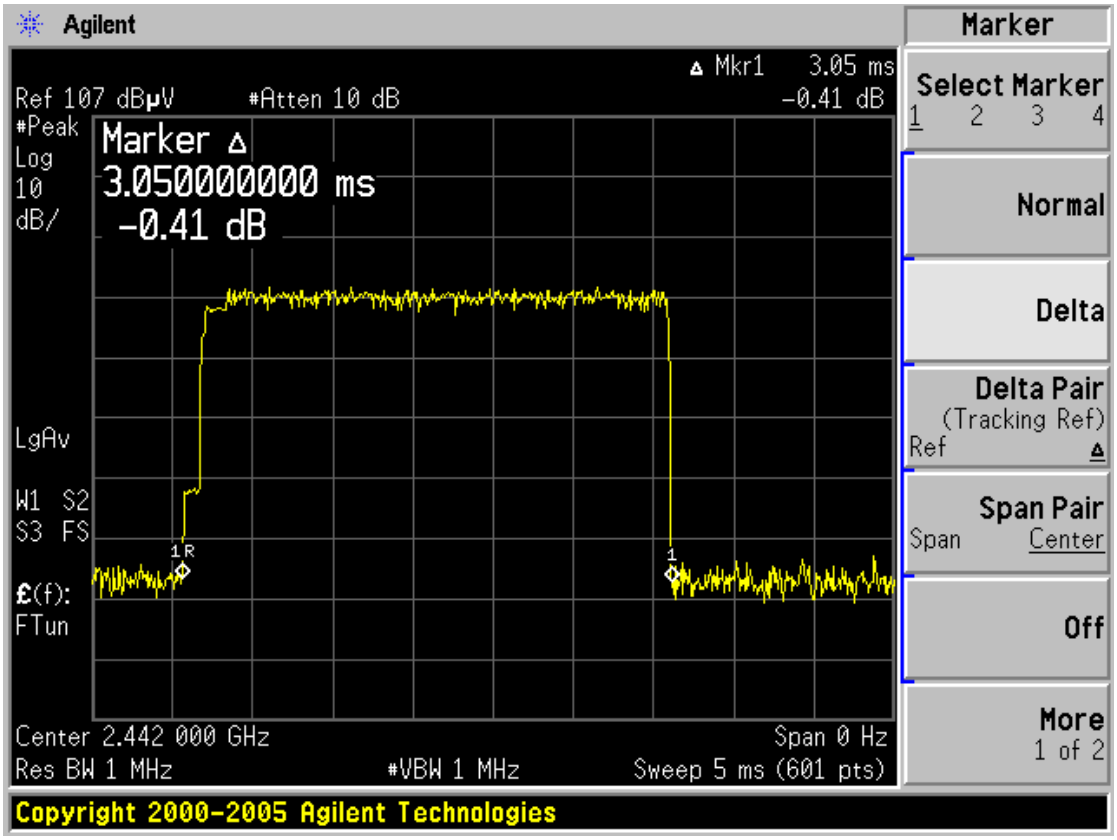
B. Test Plots



(Plot 4.8.3.A: Channel 40: 2442MHz @ π/4DQPSK @ DH1)



(Plot 4.8.3.B: Channel 40: 2442MHz @ π/4DQPSK @ DH3)



(Plot 4.8.3.C: Channel 40: 2442MHz @ π/4DQPSK @ DH5)

4.9. Spurious RF Conducted Emission

TEST CONFIGURATION

TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2009 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBM= 300KHz to measure the peak field strength , and measurement frequency range from 9KHz to 26.5GHz.

LIMIT

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS

Remark: 1. We test conducted emissions at difference Packet Type (DH1, DH3 and DH5), recorded worst case at DH3.

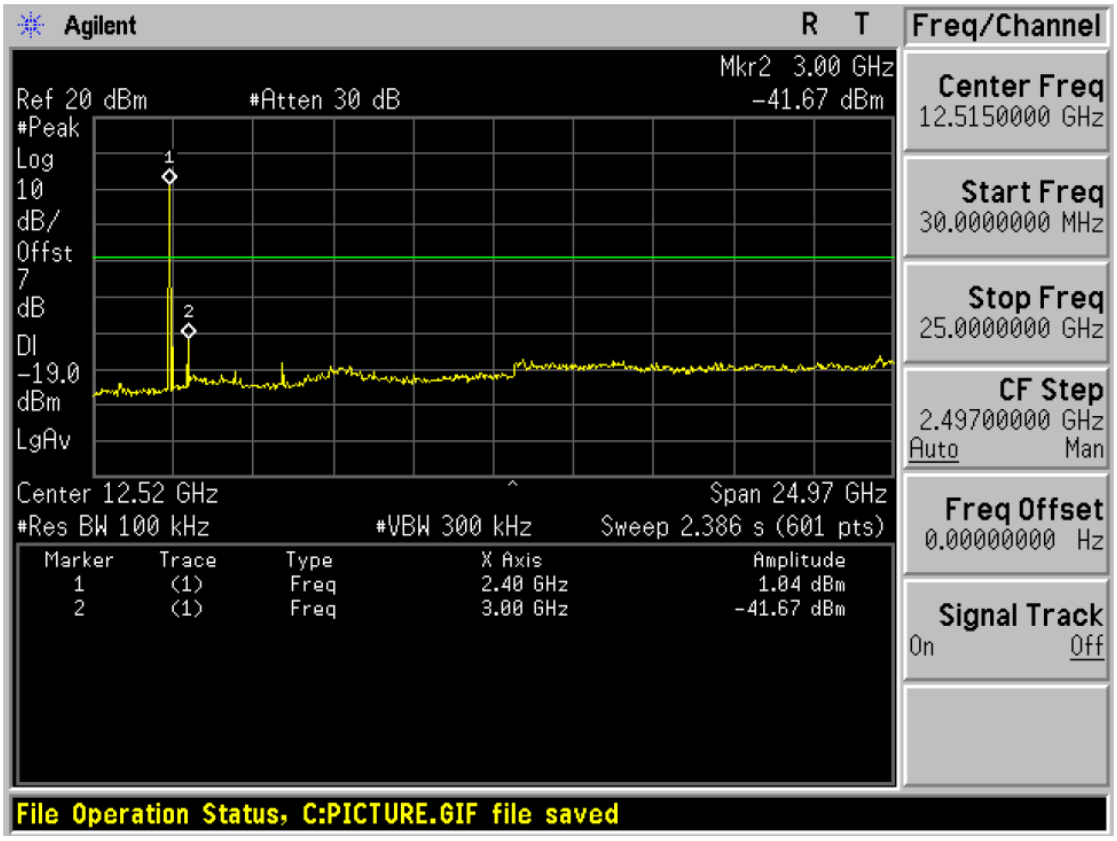
4.9.1 GFSK Test Mode

A. Test Verdict

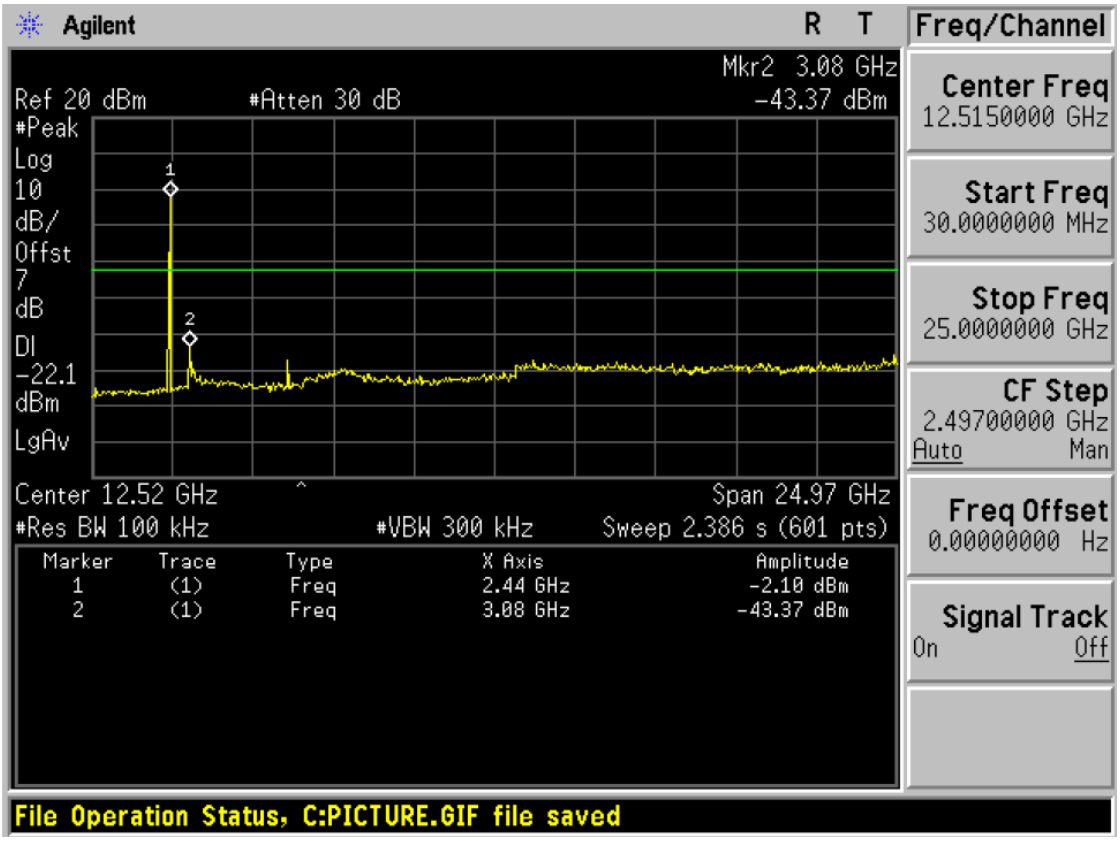
Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
00	2402	1GHz-25GHz	Plot 4.9.1 A1	-20	PASS
40	2442	1GHz-25GHz	Plot 4.9.1 B1	-20	PASS
78	2480	1GHz-25GHz	Plot 4.9.1 C1	-20	PASS

Note: 1. The test results including the cable lose.

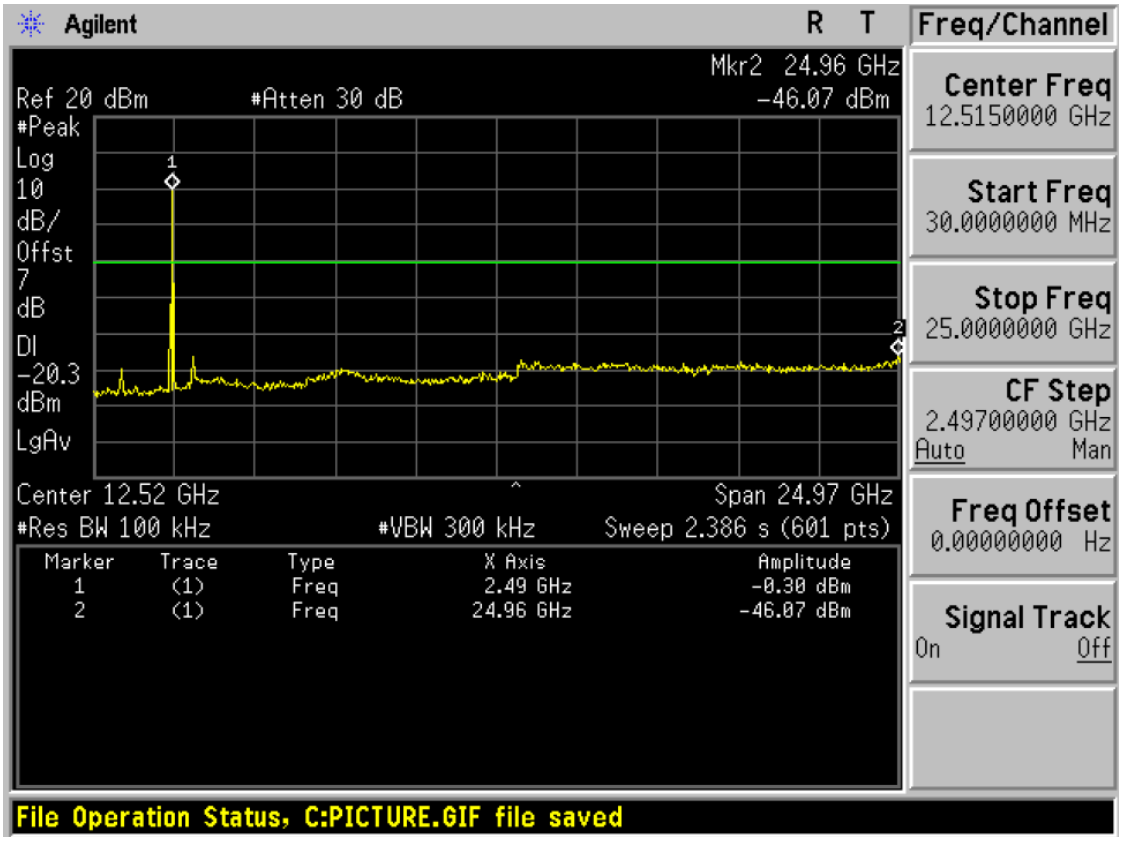
B. Test Plots



(Plot 4.9.1 A1: Channel 00: 2402MHz @ GFSK)



(Plot 4.9.1 B1: Channel 40: 2442MHz @ GFSK)



(Plot 4.9.1 C1: Channel 78: 2480MHz @ GFSK)

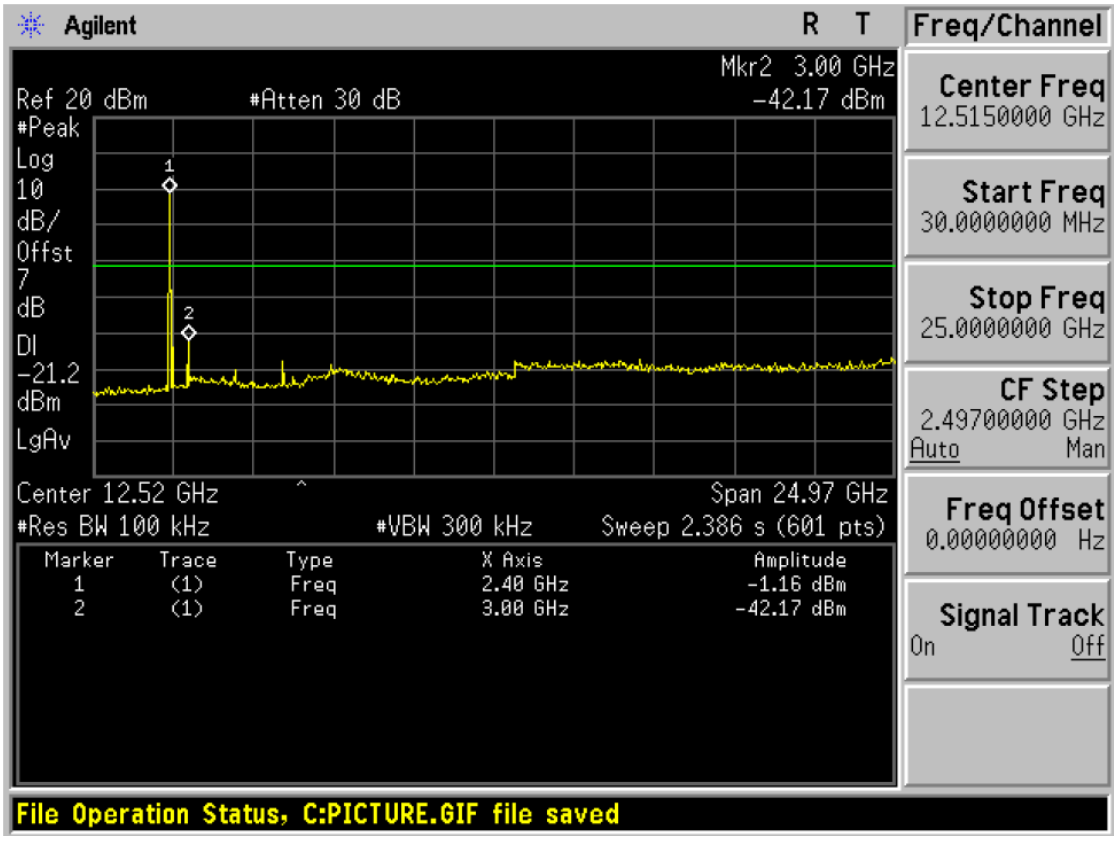
4.9.2 π/4DQPSK Test Mode

A. Test Verdict

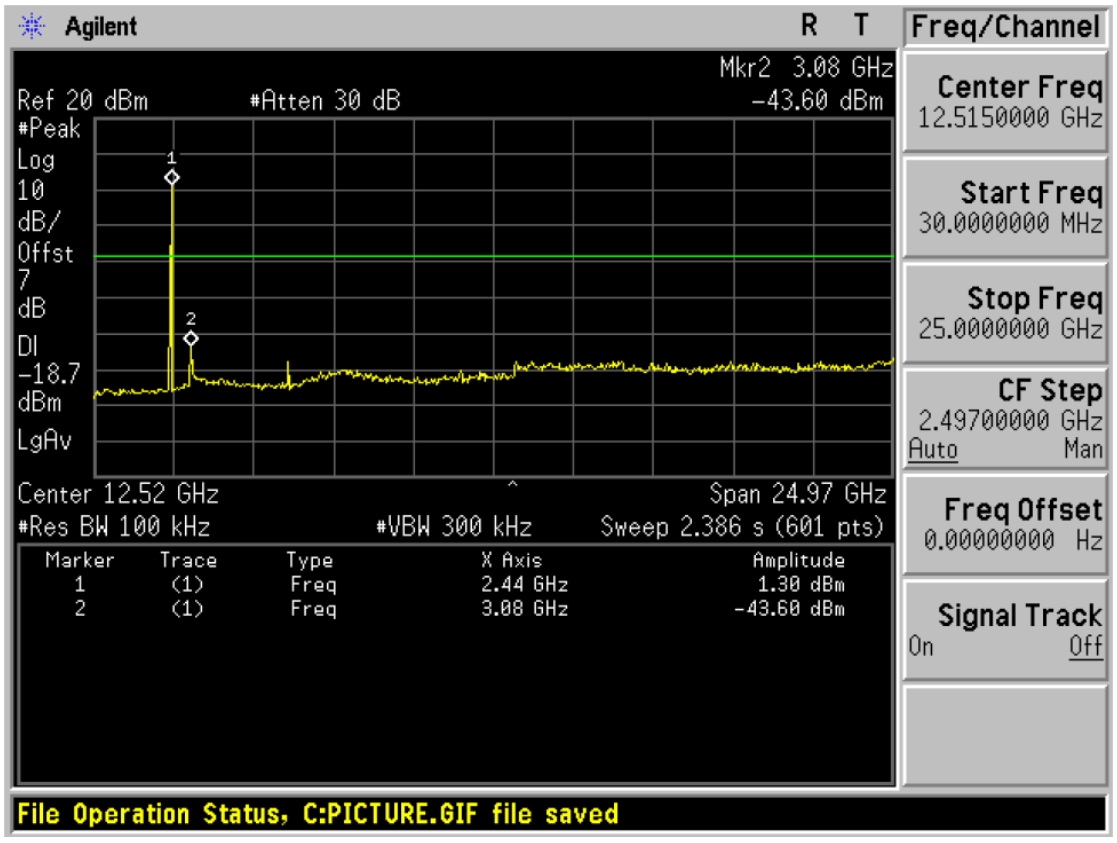
Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
00	2402	1GHz-25GHz	Plot 4.9.2 A3	-20	PASS
40	2442	1GHz-25GHz	Plot 4.9.2 B3	-20	PASS
78	2480	1GHz-25GHz	Plot 4.9.2 C3	-20	PASS

Note: 1. The test results including the cable lose.

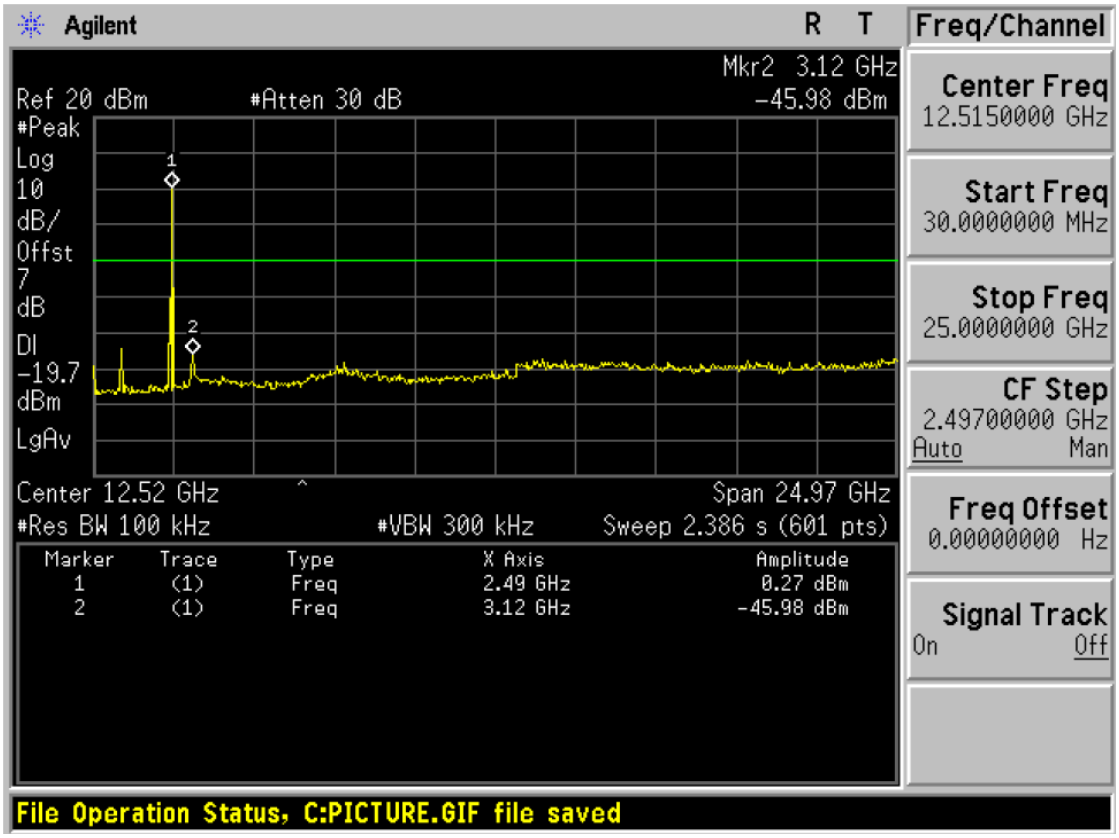
B. Test Plots



(Plot 4.9.2 A1: Channel 00: 2402MHz @ π/4DQPSK)



(Plot 4.9.2 B1: Channel 40: 2442MHz @ π/4DQPSK)



(Plot 4.9.2 C1: Channel 78: 2480MHz @ π/4DQPSK)

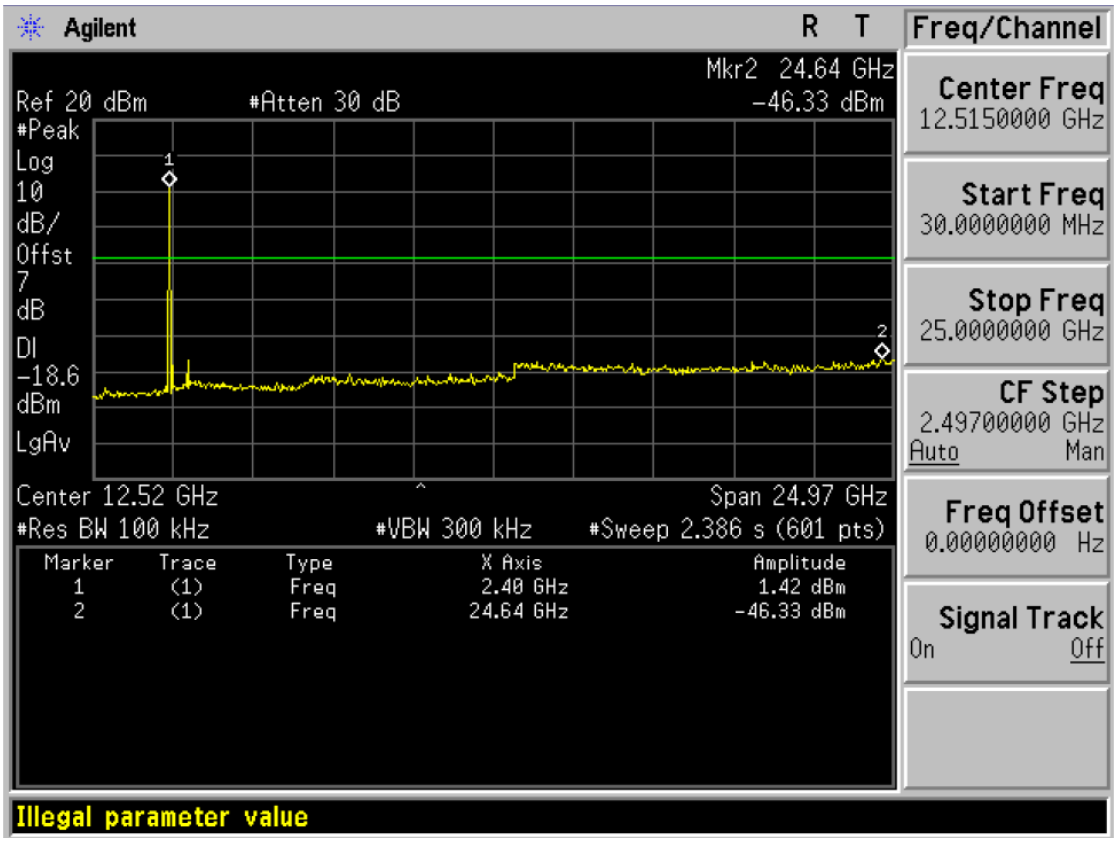
4.9.3 8DPSK Test Mode

A. Test Verdict

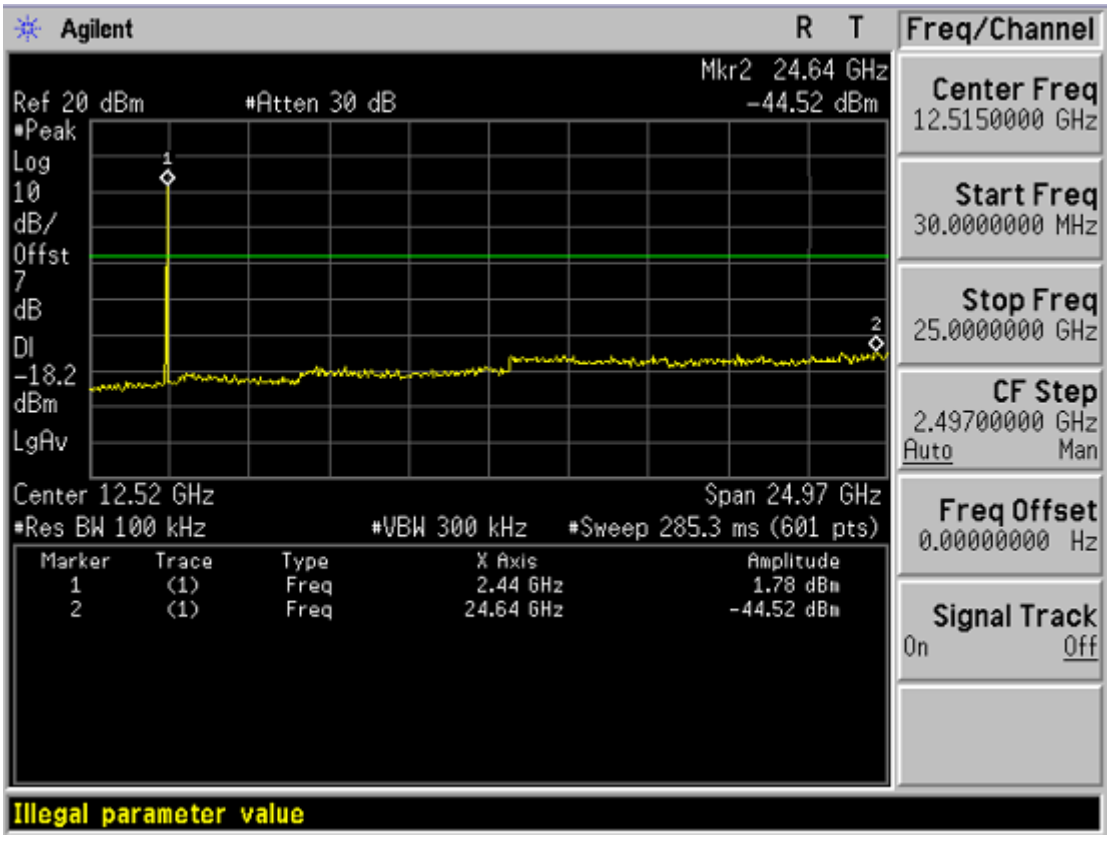
Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
00	2402	1GHz-25GHz	Plot 4.9.3 A1	-20	PASS
40	2442	1GHz-25GHz	Plot 4.9.3 B1	-20	PASS
78	2480	1GHz-25GHz	Plot 4.9.3 C1	-20	PASS

Note: 1. The test results including the cable lose.

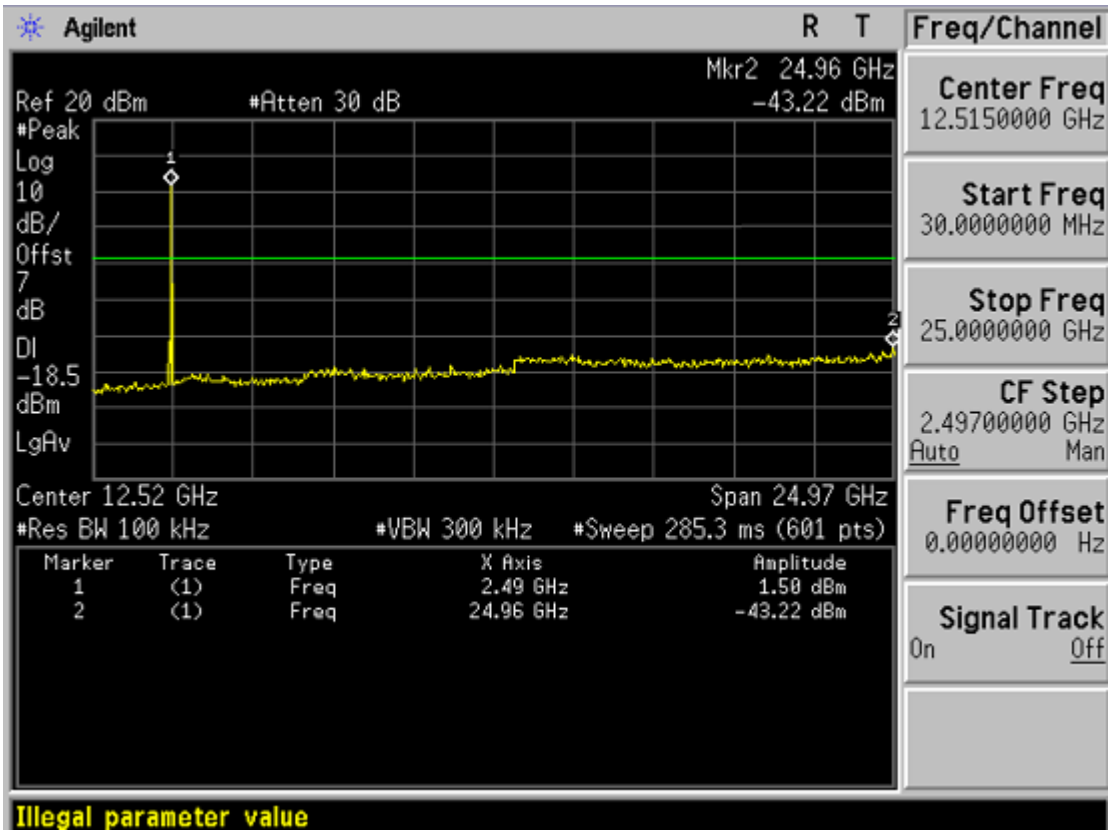
B. Test Plots



(Plot 4.9.3 A1: Channel 00: 2402MHz @ 8DPSK)



(Plot 4.9.3 B1: Channel 40: 2442MHz @ 8DPSK)



(Plot 4.9.3 C1: Channel 78: 2480MHz @ 8DPSK)

4.10. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

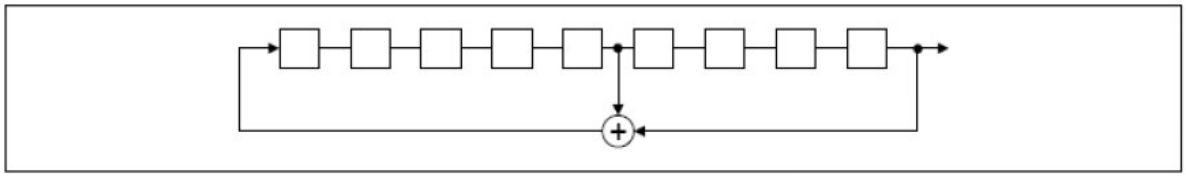
For 47 CFR Part 15C section 15.247 (a)(1) requirement:

Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence Requirement

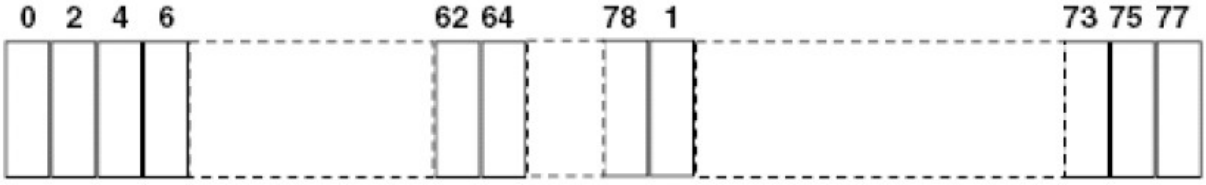
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the frist stage.The sequence begins with the frist one of 9 consecutive ones,for example:the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

4.11. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

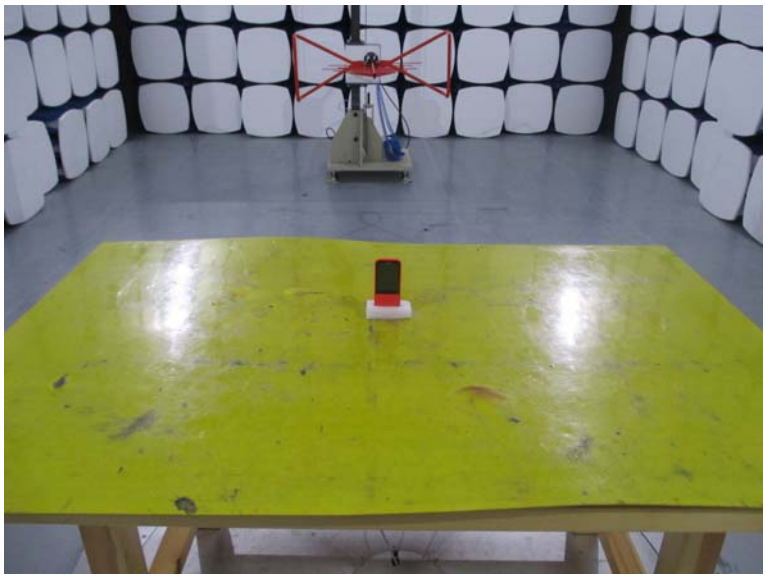
Refer to statement below for compliance.

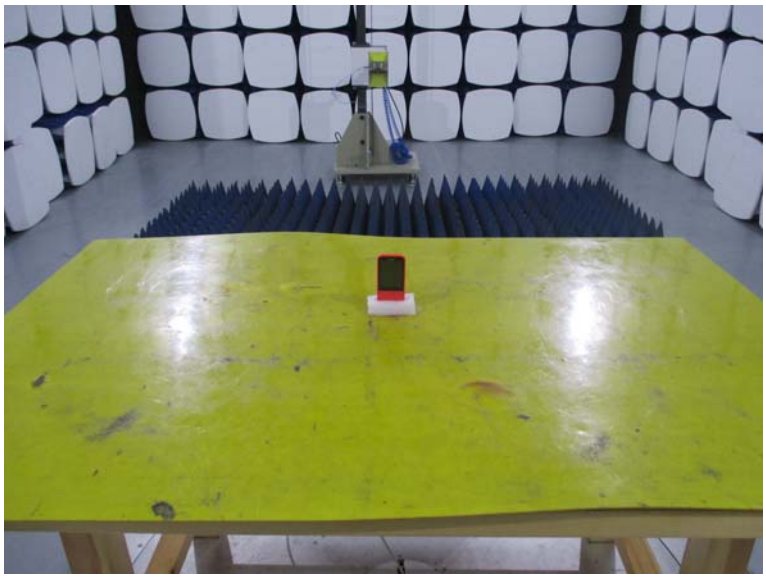
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The maximum antenna gain of BT uesed was 0.00 dBi.

5. Test Setup Photos of the EUT





.....End of Report.....