FCC Test Report

FCC EVALUATION REPORT FOR CERTIFICATION	
Project Reference No.	274749
Product	Tablet PC
Brand Name	XTRATECH
Model	W850
Alternate Model	N/A
Tested according to	FCC Rules and Regulations Part 15 Subpart C 2013, 15.247 ANSI C63.4-2009

Tested in period	2014-12-25 to 2014-12-30
Issued date	2014-12-31
Name and address of the Test House	Nemko Shanghai Ltd Shenzhen Branch Unit CD, Floor 10, Tower 2, Kefa Road 8#, Hi-Technology Park, Nanshan District, Shenzhen, China Phone : +86 755 8221 0420 Fax : +86 755 8221 3363
Tested by	Zone Peng 2014-12-31 ***Zone Peng*** ***date***
Verified by	Daria Liu 2014-12-31 ***Daria Liu*** ***date***

Contents of This Report

1. Client Information

1.1 Applicant

Company Name:	South Holdings Industrial Limited
Company Address:	Building 1, Hao'er JiaShiTai Industrial Park, FengTang Rd., Tangwei, FuYong Town, Bao'an District, Shenzhen, 518103, China

1.2 Manufacturer

Company Name:	South Holdings Industrial Limited
Company Address:	Building 1, Hao'er JiaShiTai Industrial Park, FengTang Rd., Tangwei, FuYong Town, Bao'an District, Shenzhen, 518103, China

1.3 Scope

●Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.247.

2. Equipment under Test (EUT)

2.1 Identification of EUT

Category:	Bluetooth
Name:	Tablet PC
Model Name:	W850
Alternate model:	N/A
Brand name:	XTRATECH

2.2 Detail spec:

Carrier Frequency：2402MHz~2480MHz

Number of Channel：79

Output Power：2.89dBm

Modulation Type：Bluetooth(GFSK, π/4 DQPSK, 8DPSK)

Mode of operation (duplex, simplex, half duplex) ：duplex

Antenna Type：Intergral Antenna

Antenna gain：1.31 dBi

AC/DC Adapter: *KA24-0503000US*
Input: 100-240V~, 50/60Hz, 0.55A max. Class II
Output: 5Vdc,300mA

2.3 Additional Information Related to Testing

CHL : 2402MHz

CHM : 2441MHz

CHH : 2480MHz

3. General Test Conditions

3.1 Location

Global United Technology Services Co., Ltd. -- Nemko ELA 632

2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

FCC Registration No.:600491

IC Registration No.9079A-2

Note: all test are witnessed by NEMKO engineer

3.2 Operating Environment

All tests and measurements were performed in a shielded enclosure or a controlled environment suitable for the tests conducted. The climatic conditions in the test area are automatically controlled and recorded continuously.

Parameters	Recording during test	Accepted deviation
Ambient temperature	20-21°C	15 – 35 ºC
Relative humidity	45-50%	30 - 60%
Atmospheric pressure	101.1 kPa -101.2kPa	86-106kPa

3.3 Operating During Test

Test mode: 5Vdc 3A Full charged battery

TM1 : continuance TX MODE

TM2: Hopping on mode

Remark : When measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, have been performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. No findable change appear.
For Radiated emission test : The EUT have been tested at X,Y,Z axial direction, Only list the worse result.
Only choose the worse mode to be the representative test mode.

3.4 Test Equipment

The test equipments used in testing are calibrated on a regular basis. For most of the testing equipments accredited calibration is conducted once a year. For certain equipment the calibration interval is longer. Between the calibrations all test equipment are controlled and verified on a regular basis. The test equipments used are defined in each test section of this report.

A.E. used during testing:

1. HDMI cable: detachable, shielded with electric conductivity fabric and 2 magnetic core fixed at both end of the HDMI line (1m).
2. Earphone: detachable, un-shield with a magnetic core at the jack end (0.8m).
   manufacture: Aoni, model no: MP-105 (FCC VOC)
3. AC power cable: detachable, un-shield (1.5m)
3. Monitor: manufacture: AOC, model no: V22T (FCC DOC)
4: SD CARD: manufacture:Sony, model no: SR-32C4 (FCC DOC)
5: USB cable: detachable, shielded (0.2m)

4. Measurement Uncertainty

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95 %.

Conducted Emission : 0.15~30MHz 3.45dB

Radiated Emission: 30MHz~1000MHz 4.50dB

1GHz-18GHz 4.70dB

5. Conducted Emission (150 KHz to 30 MHz)

5.1 Test Procedure

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50
*-Decreases with the logarithm of the frequency.		

5.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Shielding Room	Jul. 04 2015	7.0(L)x3.0(W)x3.0(H)	GTS252	ZhongYu Electron
☒	EMI Test Receiver	Jul. 04 2015	ESCS30	1102.4500K30	Rohde & Schwarz
☒	10dB Pulse Limita	Jul. 04 2015	N/A	GTS224	Rohde & Schwarz
☒	LISN	Jul. 04 2015	NSLK 8127	8127549	SCHWARZBECK
☒	Coaxial Cable	Apr. 01 2015	N/A	N/A	GTS

5.3 Test Result

The EUT was placed on a non-metallic table, 80cm above the ground plane. The other peripheral devices power cord connected to the power mains through another line impedance stabilization network.In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4-2009 on conducted Emission test.

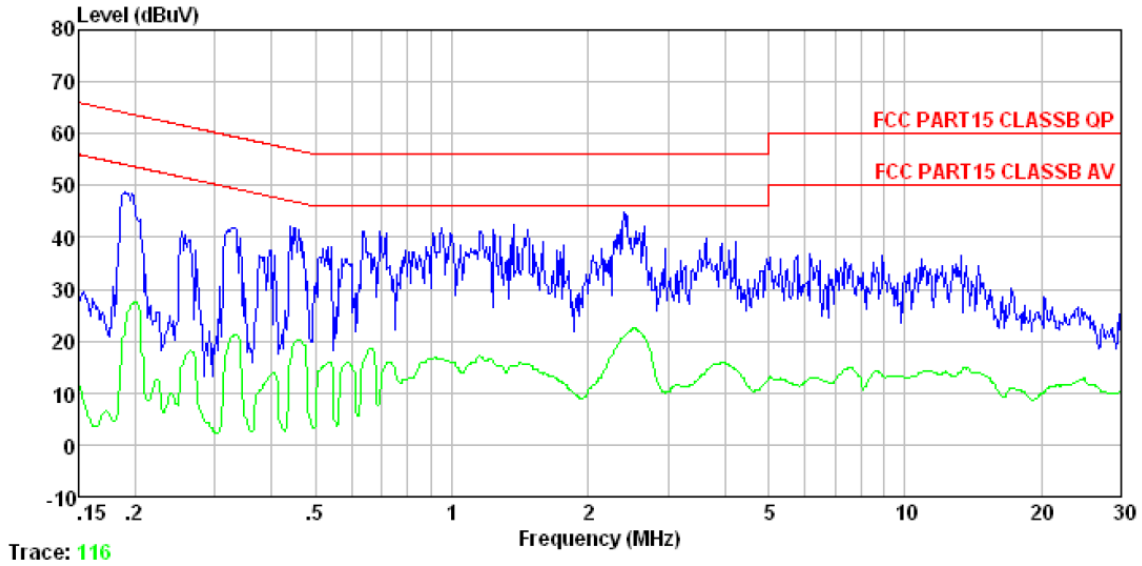
Preview measurements:
0.15 MHz to 30 MHz
Receiver settings: PK&AV detector
RBW:9 kHz

Final measurement:
0.15 MHz to 30 MHz
Receiver settings:QP&AV detector

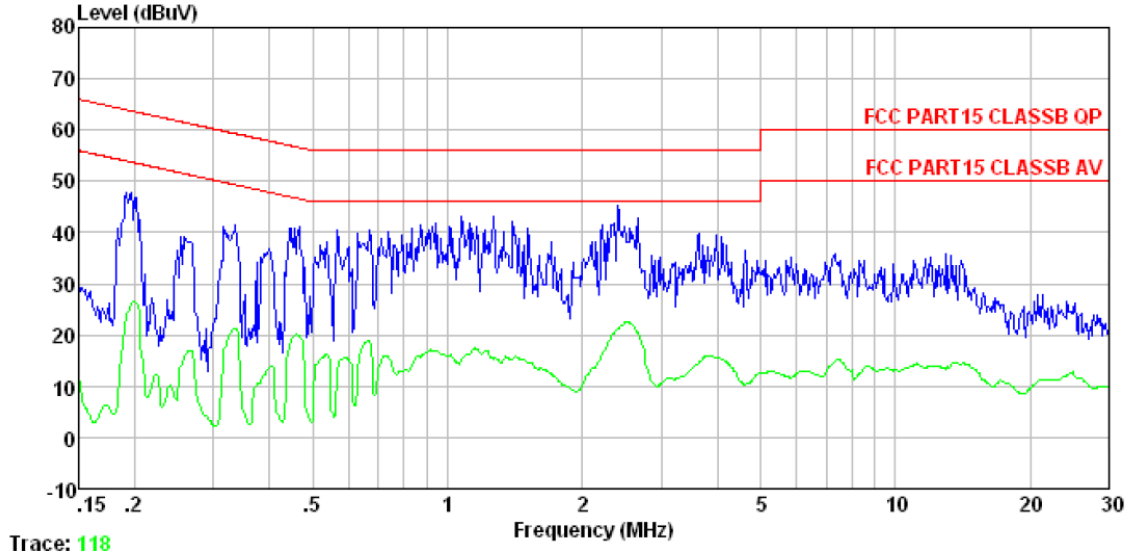
Test mode	Power Line	Test Data	Test Result
TX MODE	Line	Diagram 5-1	Pass
	Neutral	Diagram 5-2	Pass

NOTES:
1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are reported.
3: If PK value is lower than AV limit then no reading value listed in report .If QP value is Lower than AV limit ,then AV value don't listed in report.

5.3.1 Diagram 5-1



5.3.2 Diagram 5-2



6. Radiated Electromagnetic Disturbances

6.1 Test Procedure

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast.

The EUT were rotated 0 to 360 degree and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. The test result are reported as below.

For below 1GHz

RBW=120 kHz; VBW=300KHz.The frequency range from 30MHz to 1000MHz is checked using QP detector .

For above 1GHz. The frequency range from 1GHz to 25GHz(10^{th} harmonics) is checked.

RBW=1MHz ; VBW=1MHz,PK detector for peak emissions measurement above 1GHz

RBW=1MHz ; VBW=10Hz, PK detector for average emissions measure above 1GHz

6.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	EMI Test Receiver	Jul. 04 2015	ESU26	GTS203	R&S
☒	BiConiLog Antenna	Feb. 26 2015	VULB9163	GTS214	SCHWARZBECK
☒	Horn Antenna	Feb. 25 2015	BBHA9120D	GTS215	SCHWARZBECK
☒	Coaxial Cable	Apr. 01 2015	N/A	GTS213	GTS
☒	Coaxial Cable	Apr. 01 2015	N/A	GTS211	GTS
☒	Coaxial Cable	Apr. 01 2015	N/A	GTS211	GTS
☒	Coaxial cable	Apr. 01 2015	N/A	GTS210	GTS
☒	Amplifier	Jul. 04 2015	8347A	GTS204	HP

6.3 Test Result

Mode	Freq range		Test ANT polarity	Diagram	Test Result
TX	30MHz-1GHz:		H	6-1	Pass
	30MHz-1GHz:		V	6-2	Pass
Mode	**Freq range**	**Channel**	**Test ANT polarity**	**Diagram**	**Test Result**
8DPSK	1GHz-18GHz	CH LOW	H	6-3	Pass
	1GHz-18GHz	CH LOW	V	6-4	Pass
	1GHz-18GHz	CH MID	H	6-5	Pass
	1GHz-18GHz	CH MID	V	6-6	Pass
	1GHz-18GHz	CH HIGH	H	6-7	Pass
	1GHz-18GHz	CH HIGH	V	6-8	Pass
Mode	**Freq range**	**Channel**	**Test ANT polarity**	**Diagram**	**Test Result**
π/4 DQPSK	1GHz-18GHz	CH LOW	H	6-9	Pass
	1GHz-18GHz	CH LOW	V	6-10	Pass
	1GHz-18GHz	CH MID	H	6-11	Pass
	1GHz-18GHz	CH MID	V	6-12	Pass
	1GHz-18GHz	CH HIGH	H	6-13	Pass
	1GHz-18GHz	CH HIGH	V	6-14	Pass
Mode	**Freq range**	**Channel**	**Test ANT polarity**	**Diagram**	**Test Result**
GFSK	1GHz-18GHz	CH LOW	H	6-15	Pass
	1GHz-18GHz	CH LOW	V	6-16	Pass
	1GHz-18GHz	CH MID	H	6-17	Pass
	1GHz-18GHz	CH MID	V	6-18	Pass
	1GHz-18GHz	CH HIGH	H	6-19	Pass
	1GHz-18GHz	CH HIGH	V	6-20	Pass

Restricted band test:Only worse case is reported

Mode	Freq range	Channel	Test ANT polarity	Diagram	Test Result
GFSK	Restricted band	CH LOW	H	6-21	Pass
		CH LOW	V	6-22	Pass
		CH HIGH	H	6-23	Pass
		CH HIGH	V	6-24	Pass
Mode	**Freq range**	**Channel**	**Test ANT polarity**	**Diagram**	**Test Result**
π/4 DQPSK	Restricted band	CH LOW	H	6-25	Pass
		CH LOW	V	6-26	Pass
		CH HIGH	H	6-27	Pass
		CH HIGH	V	6-28	Pass

Mode	Freq range	Channel	Test ANT polarity	Diagram	Test Result
8DPSK	Restricted band	CH LOW	H	6-29	Pass
		CH LOW	V	6-30	Pass
		CH HIGH	H	6-31	Pass
		CH HIGH	V	6-32	Pass

Remark:
If PK value is lower than AV limit , then Both PK and AV deem to comply their own limit .

1) GFSK ,8DPSK and π/4 DQPSK of operation were investigated , only the worse mode are reported.
2) All restriction band have been tested at both CHL, M and H, only reported the worse case as plots shown as below
3) No emission found at 9kHz to 30MHz and 18GHz to 25GHz.

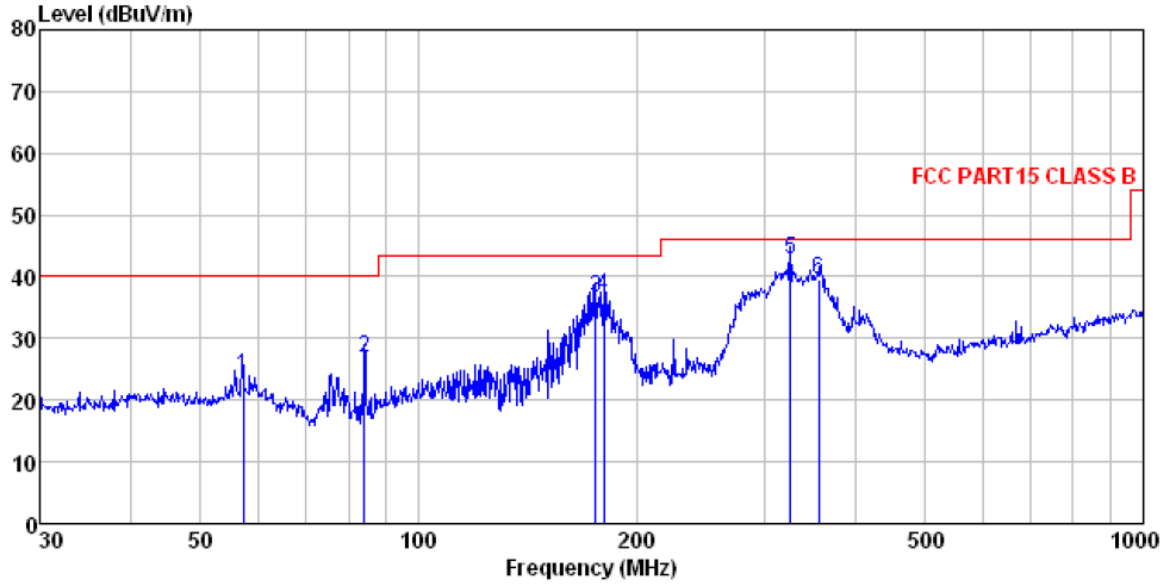
NOTES:
1.All modes were measured and the worst case emission was reported.
2. H =Horizontal V=Vertical
3. Emission = Reading +Antenna Factor + Cable Loss –Amp Factor
4. Emission level dBμV = 20 log Emission level μV/m
5. The lower limit shall apply at the transition frequencies
6. All the emissions appearing within 15.205 Restricted bands shall not exceed the limits shown in 15.209,all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.
Remark :
The limit of 15.209(a) of 3 meter distance is

Frequency MHz	Distance m	Field strength		Distance m	Field strength dBμV/m(QP)
		μV/m	dBμV/m(QP)		
30-88	3	100	40.0	10	30.0
88-216	3	150	43.5	10	33.5
216-960	3	200	46.0	10	36.0
960-1000	3	500	54.0	10	44.0
Above 1000	3	74.0 dBμV/m (PK) 54.0 dBμV/m (AV)		/	/

15.205 Restricted bands of operation:

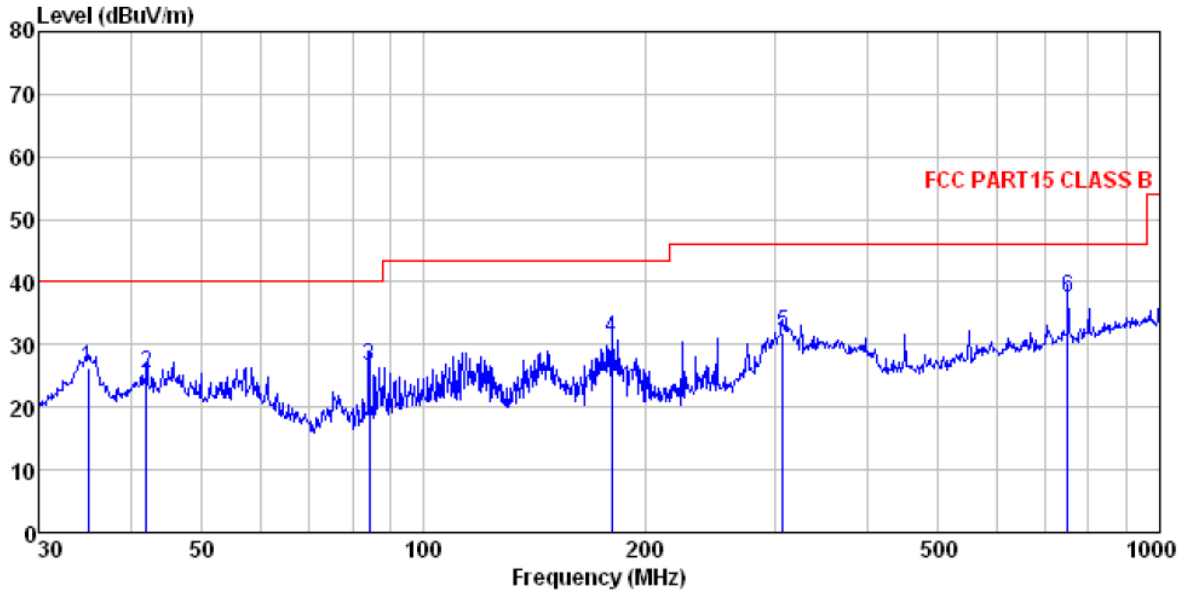
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

6.3.1 Diagram 6-1



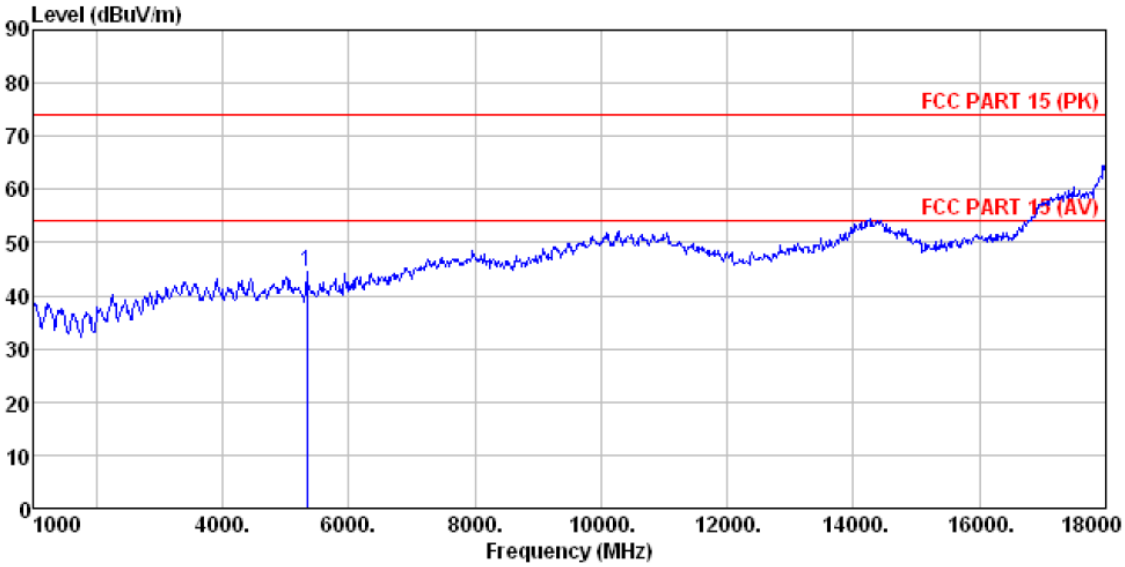
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	57.191	40.06	14.87	0.84	31.94	23.83	40.00	-16.17	QP
2	84.110	45.64	12.02	1.06	31.74	26.98	40.00	-13.02	QP
3	175.652	55.68	11.36	1.72	32.07	36.69	43.50	-6.81	QP
4	180.017	55.54	11.68	1.74	32.08	36.88	43.50	-6.62	QP
5	325.596	56.75	15.59	2.49	32.09	42.74	46.00	-3.26	QP
6	356.676	52.55	16.38	2.65	32.00	39.58	46.00	-6.42	QP

6.3.2 Diagram 6-2



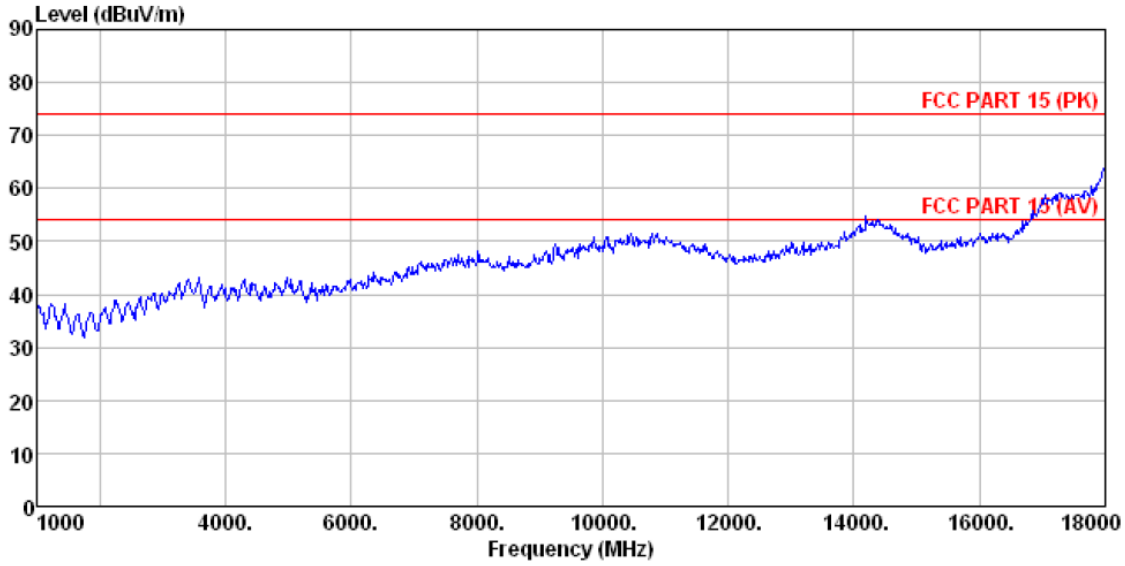
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	35.005	43.39	14.30	0.61	32.06	26.24	40.00	-13.76	QP
2	42.007	41.05	15.57	0.69	32.04	25.27	40.00	-14.73	QP
3	84.405	45.02	12.16	1.07	31.74	26.51	40.00	-13.49	QP
4	180.017	49.71	11.68	1.74	32.08	31.05	43.50	-12.45	QP
5	307.831	46.40	15.17	2.40	32.15	31.82	46.00	-14.18	QP
6	750.108	43.11	21.43	4.28	31.26	37.56	46.00	-8.44	QP

6.3.3 Diagram 6-3

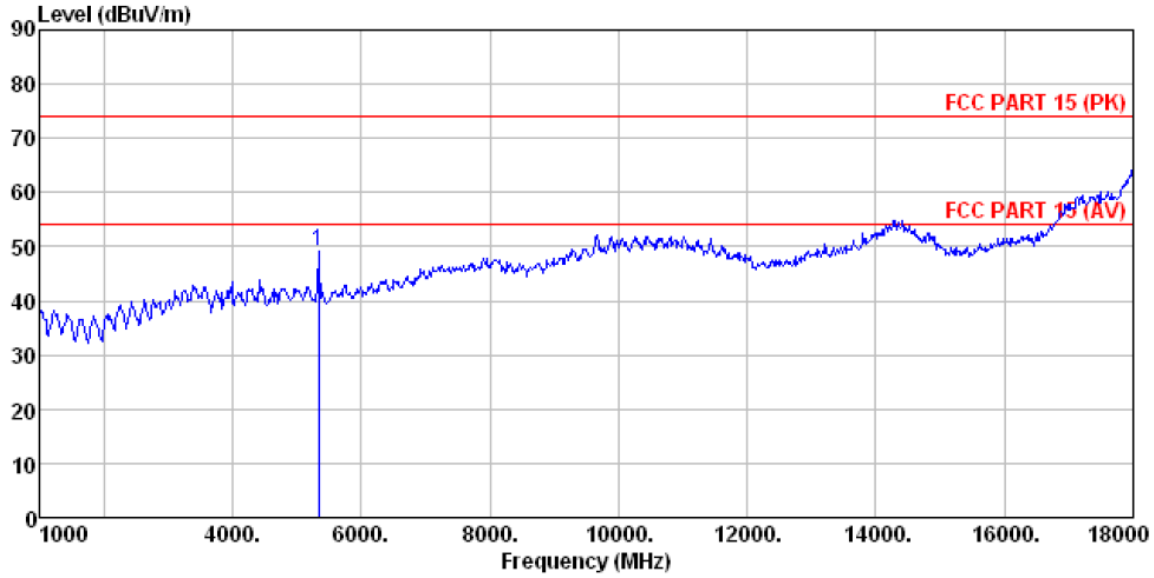


	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	5335.000	35.74	31.73	9.26	32.35	44.38	74.00	-29.62	Peak

6.3.4 Diagram 6-4

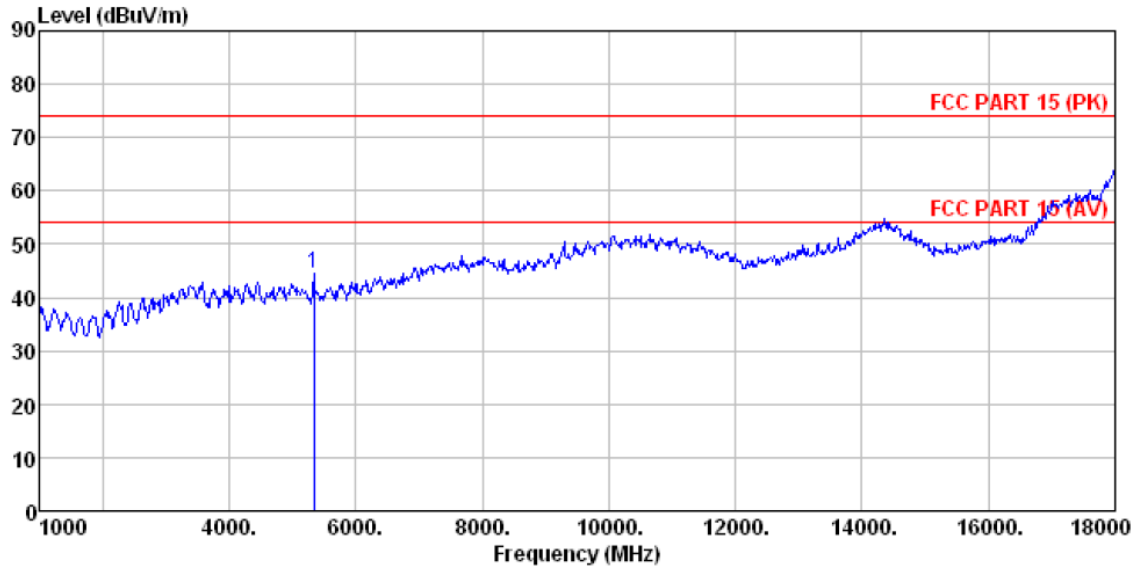


6.3.5 Diagram 6-5



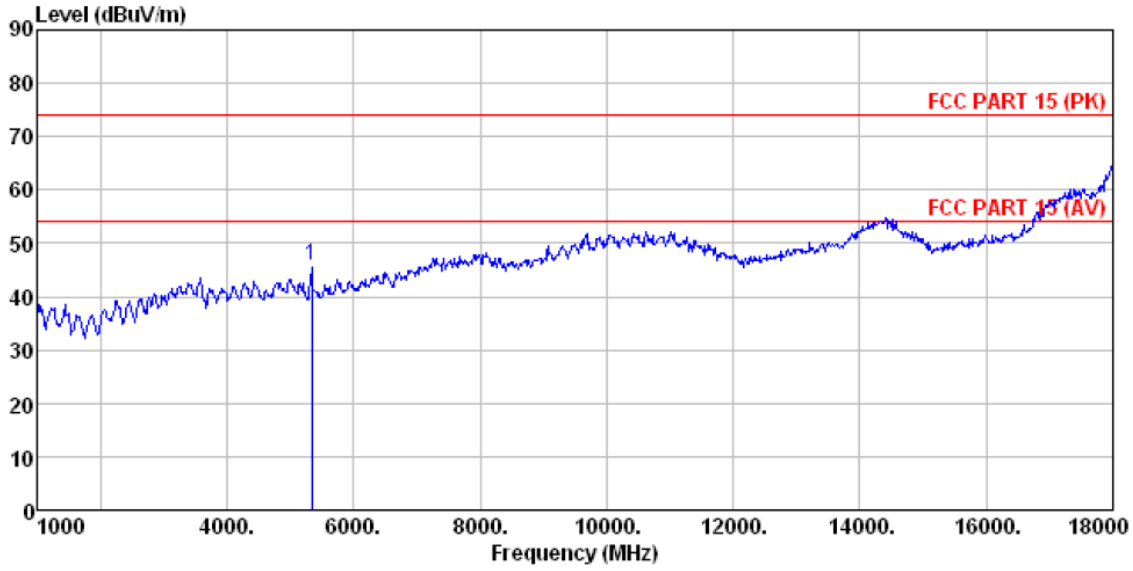
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	5335.000	40.42	31.73	9.26	32.35	49.06	74.00	-24.94	Peak

6.3.6 Diagram 6-6



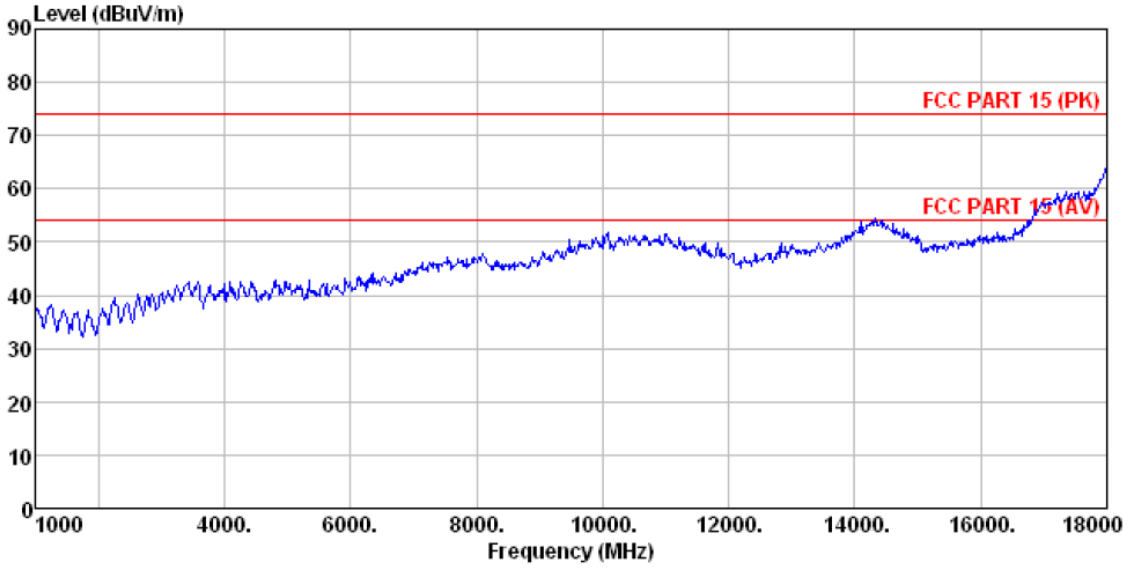
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	5335.000	35.76	31.73	9.26	32.35	44.40	74.00	-29.60	Peak

6.3.7 Diagram 6-7

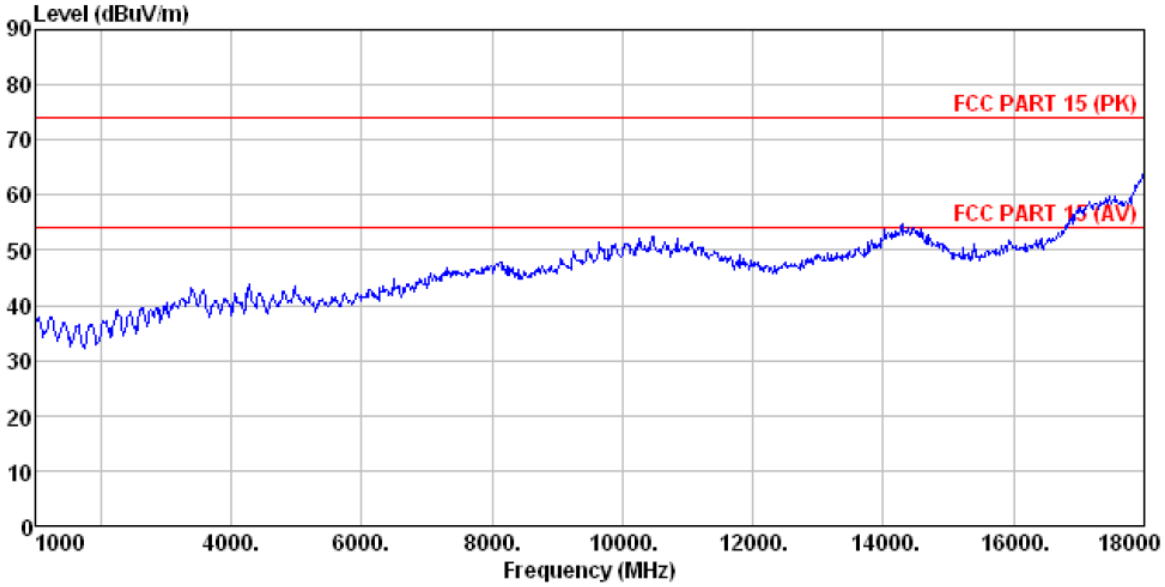


	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	5335.000	37.03	31.73	9.26	32.35	45.67	74.00	-28.33	Peak

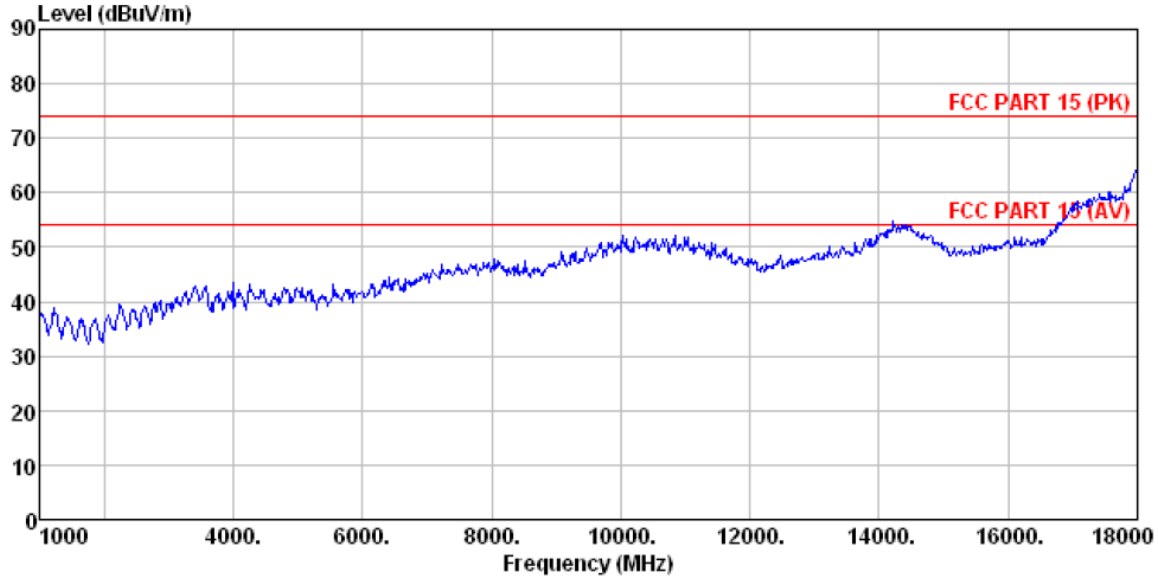
6.3.8 Diagram 6-8



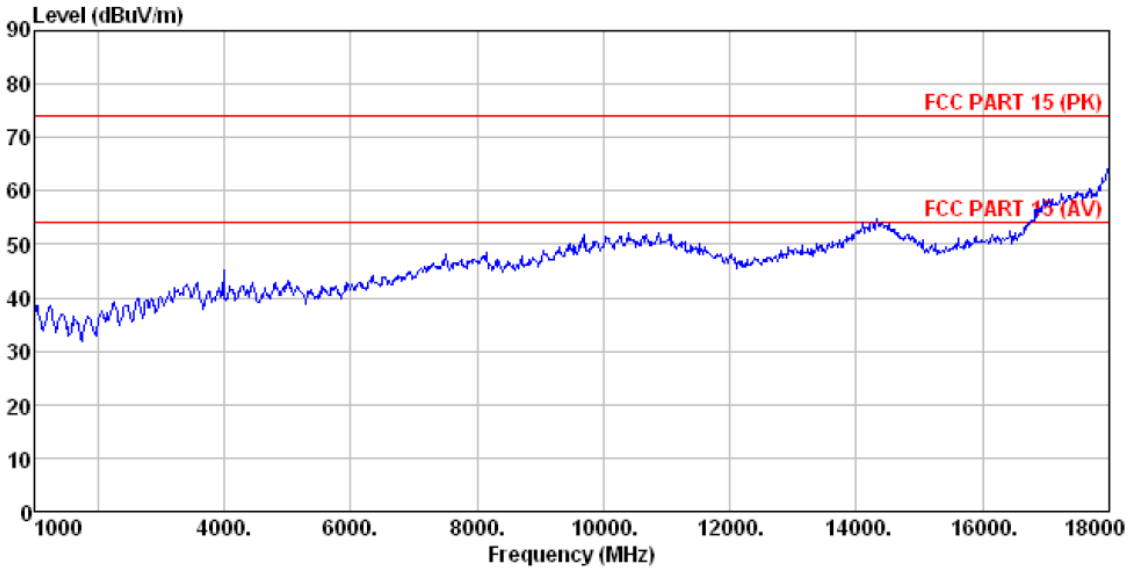
6.3.9 Diagram 6-9



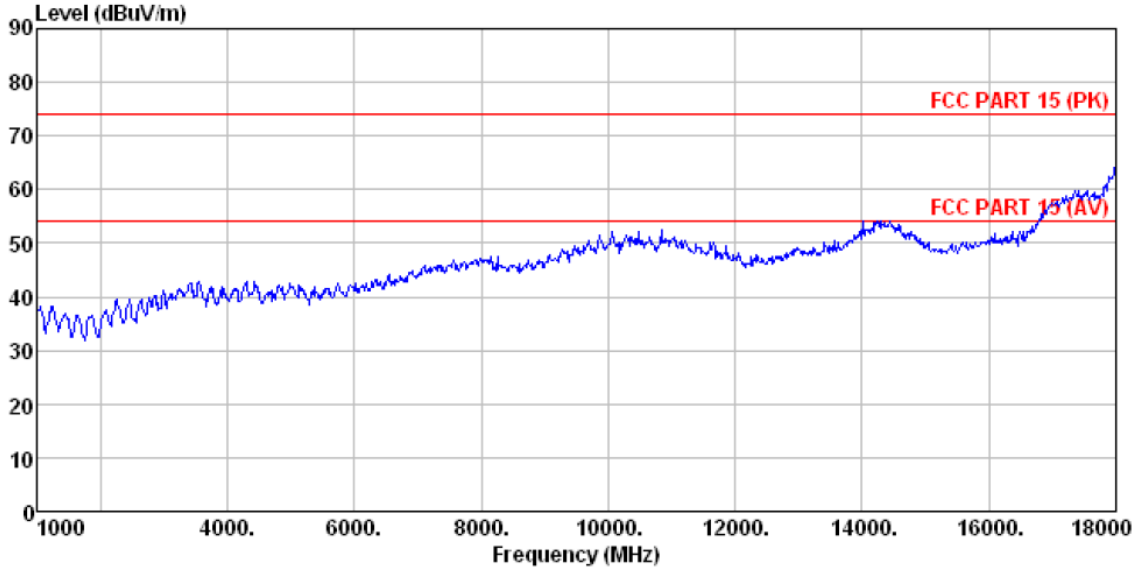
6.3.10 Diagram 6-10



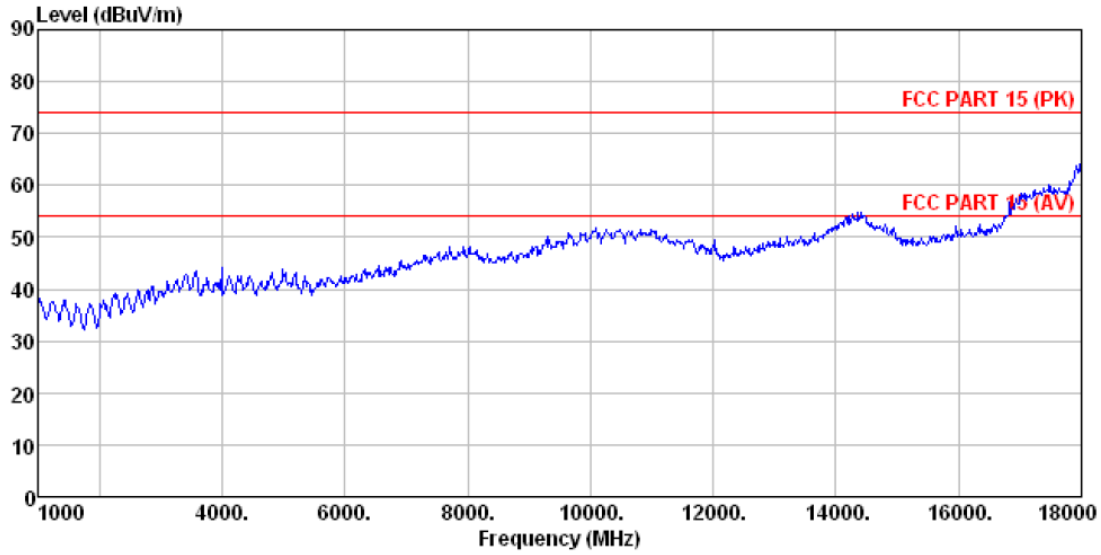
6.3.11 Diagram 6-11



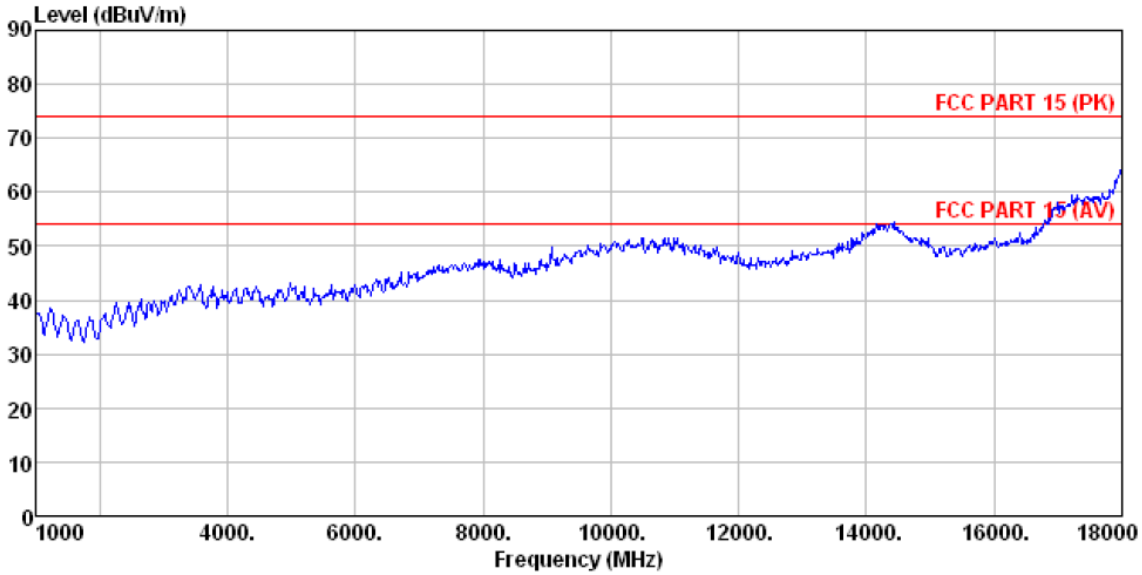
6.3.12 Diagram 6-12



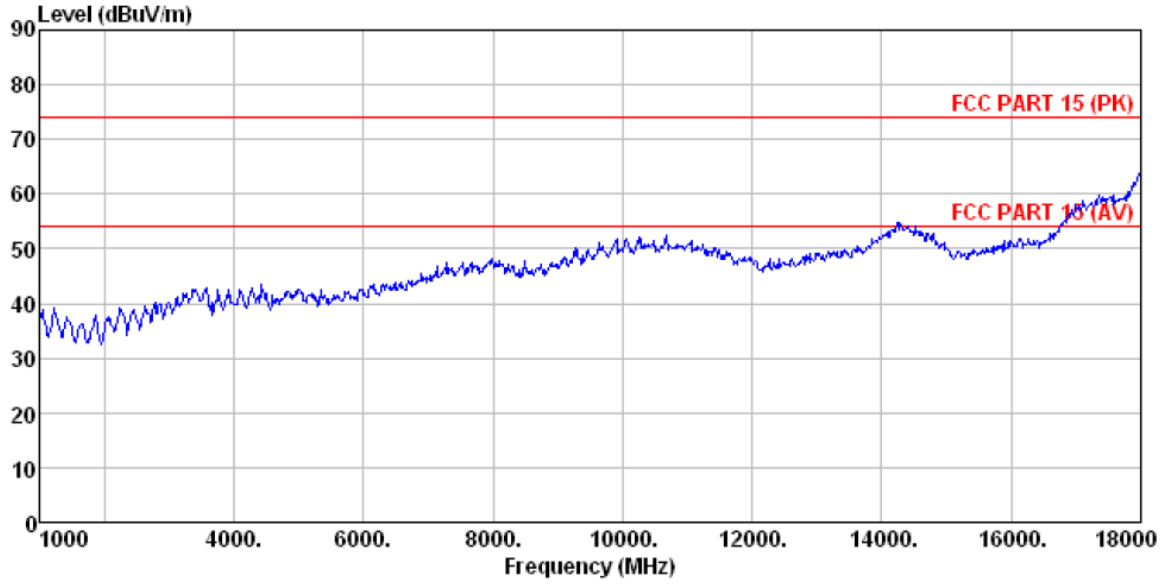
6.3.13 Diagram 6-13



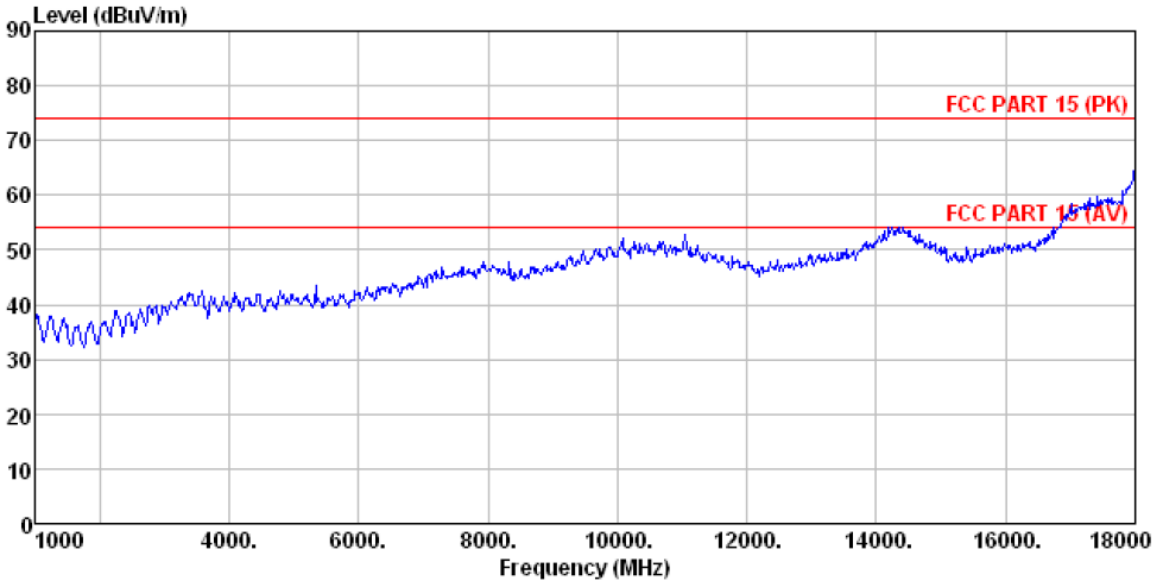
6.3.14 Diagram 6-14



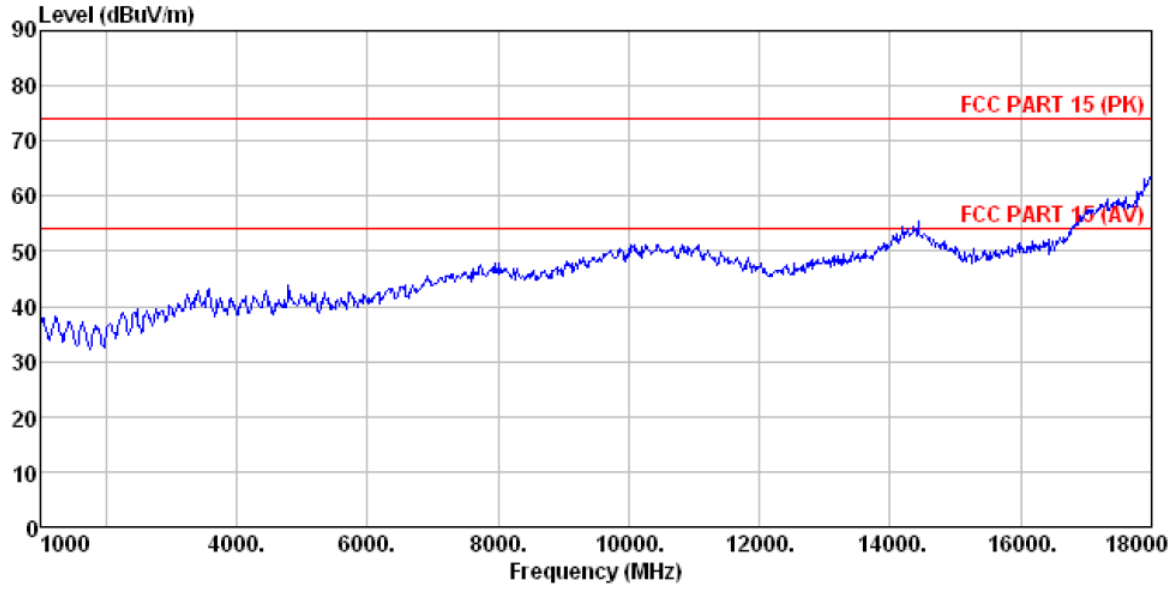
6.3.15 Diagram 6-15



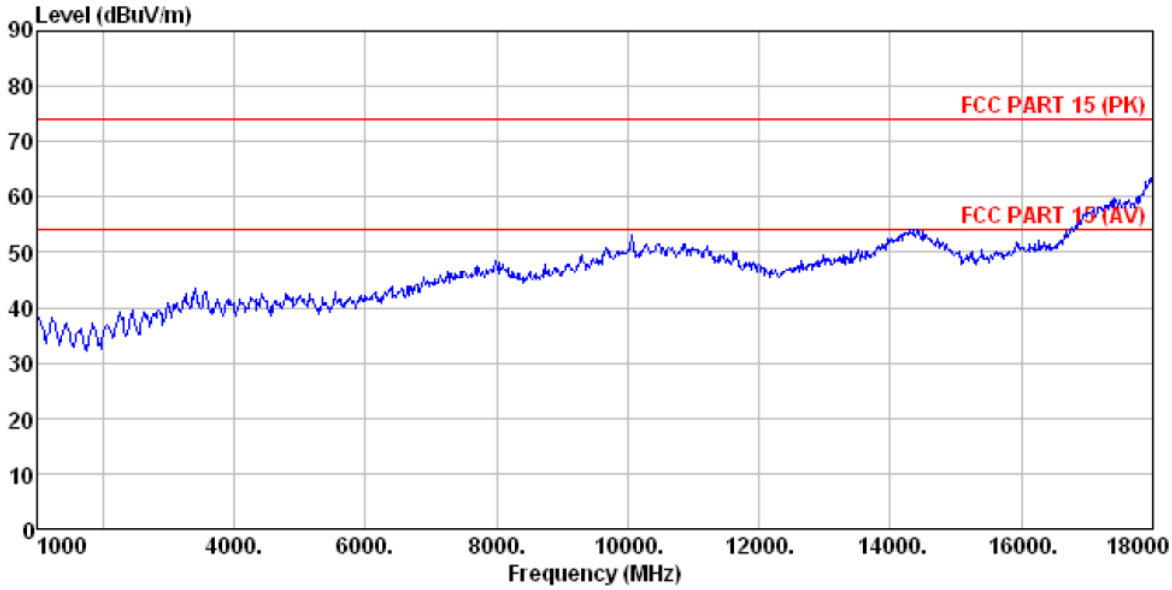
6.3.16 Diagram 6-16



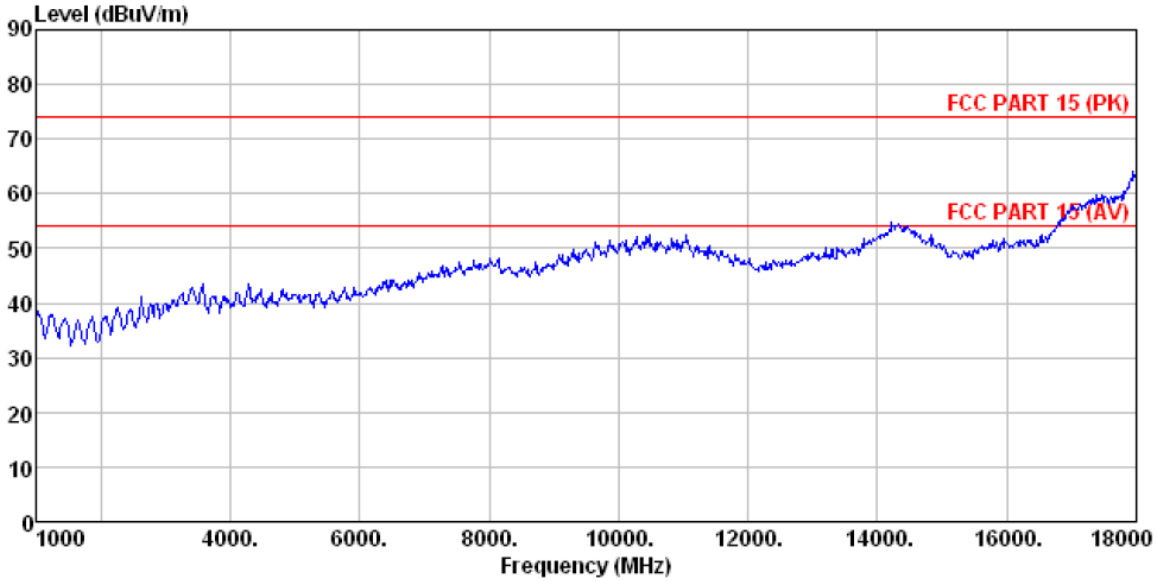
6.3.17 Diagram 6-17



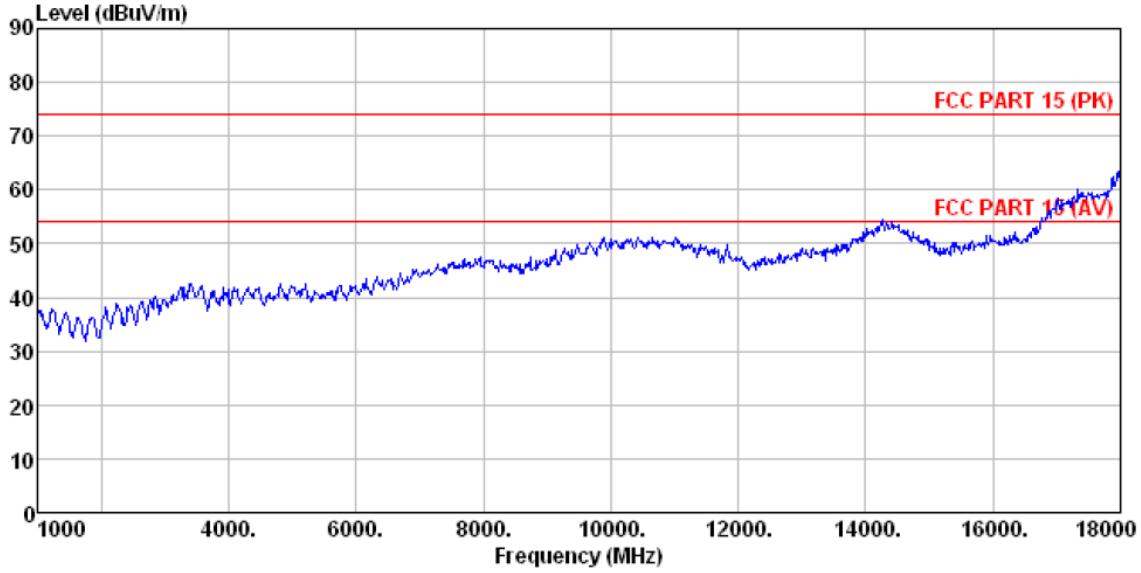
6.3.18 Diagram 6-18



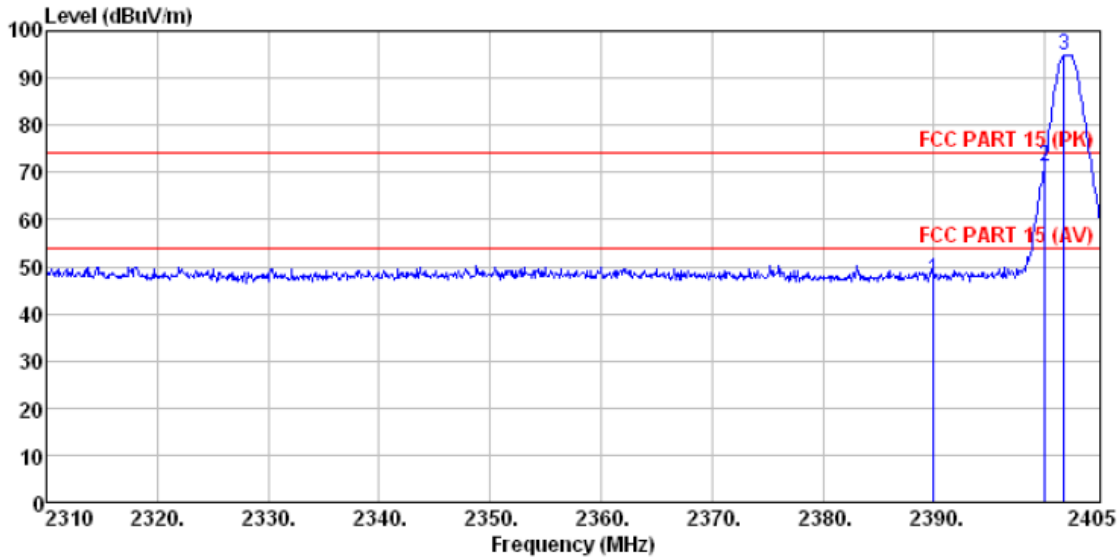
6.3.19 Diagram 6-19



6.3.20 Diagram 6-20

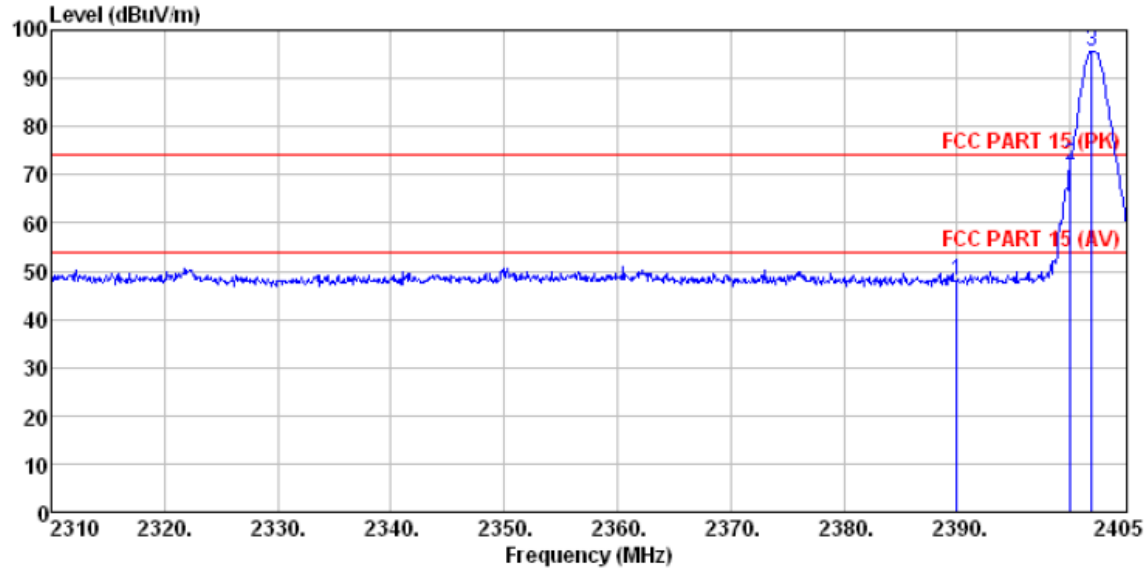


6.3.21 Diagram 6-21



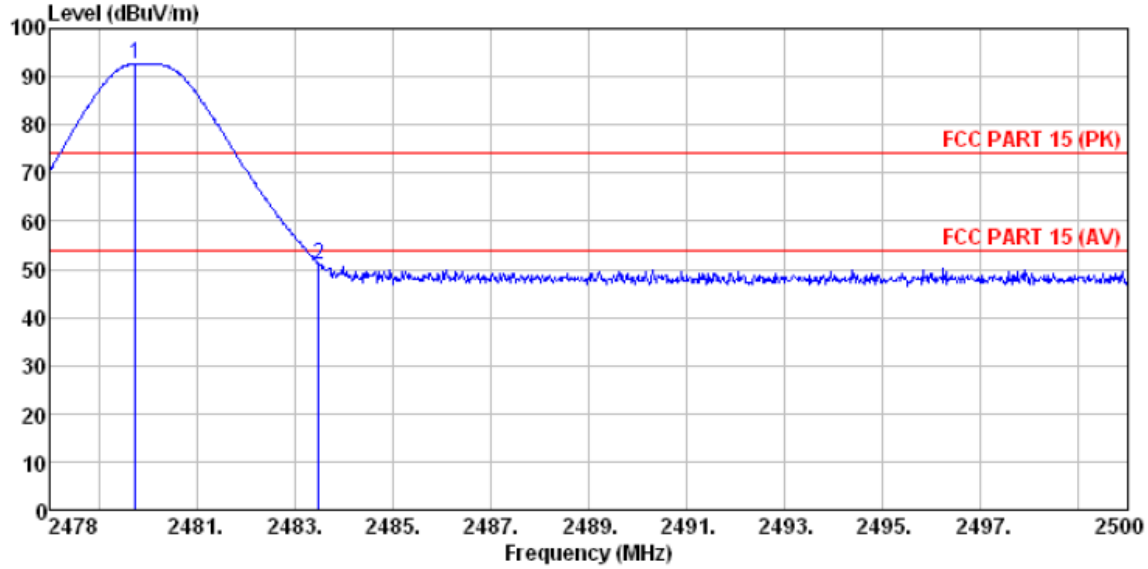
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	44.49	27.59	5.38	30.18	47.28	74.00	-26.72	Peak
2	2400.000	68.50	27.58	5.39	30.18	71.29	74.00	-2.71	Peak
3 *	2401.770	92.22	27.58	5.39	30.18	95.01			Peak

6.3.22 Diagram 6-22



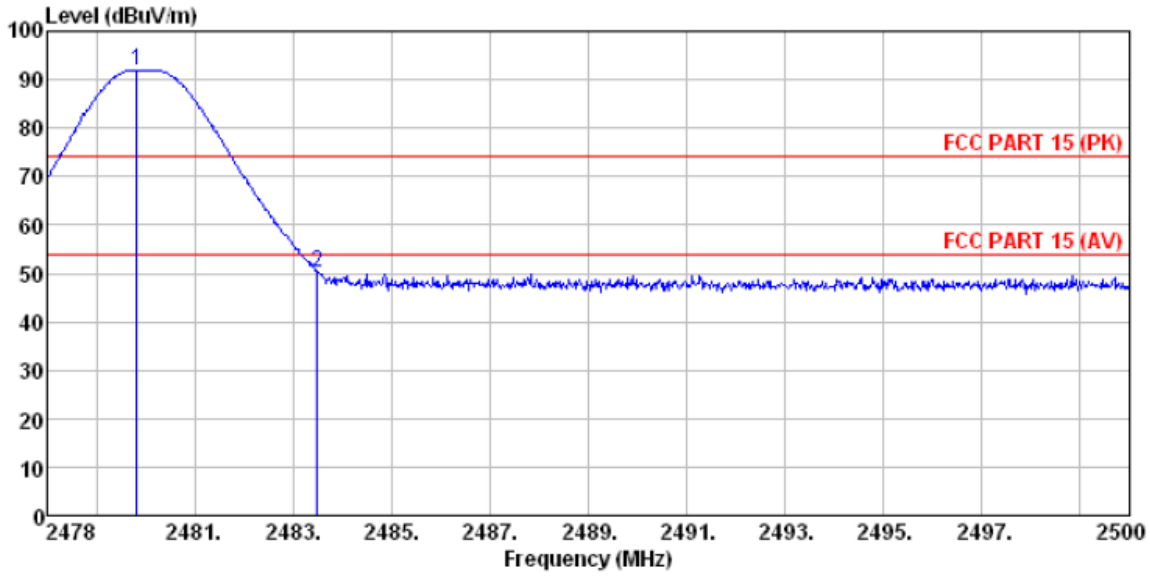
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	45.17	27.59	5.38	30.18	47.96	74.00	-26.04	Peak
2	2400.000	69.21	27.58	5.39	30.18	72.00	74.00	-2.00	Peak
3 *	2401.865	92.80	27.58	5.39	30.18	95.59			Peak

6.3.23 Diagram 6-23



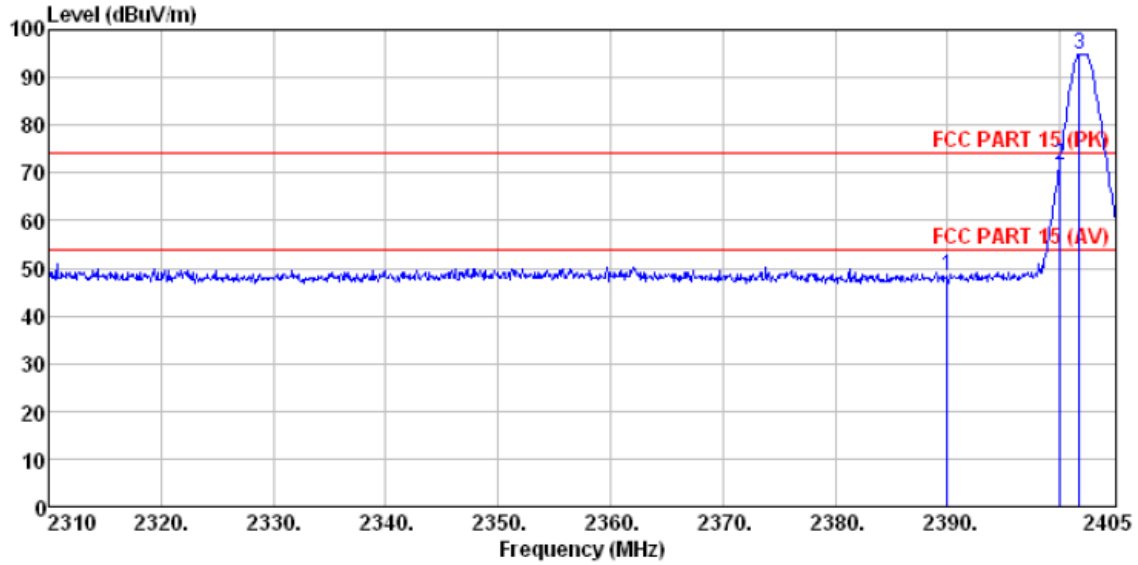
		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	*	2479.760	89.58	27.52	5.47	29.93	92.64	74.00	18.64	Peak
2		2483.500	47.86	27.53	5.47	29.93	50.93	74.00	-23.07	Peak

6.3.24 Diagram 6-24



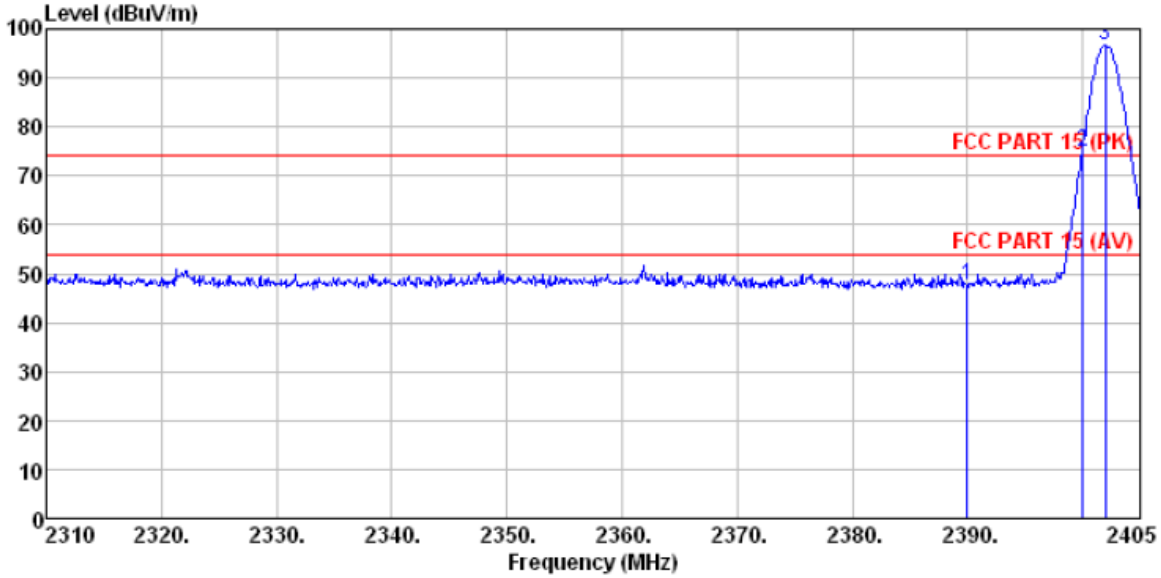
		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	*	2479.826	88.92	27.52	5.47	29.93	91.98			Peak
2		2483.500	47.19	27.53	5.47	29.93	50.26	74.00	-23.74	Peak

6.3.25 Diagram 6-25



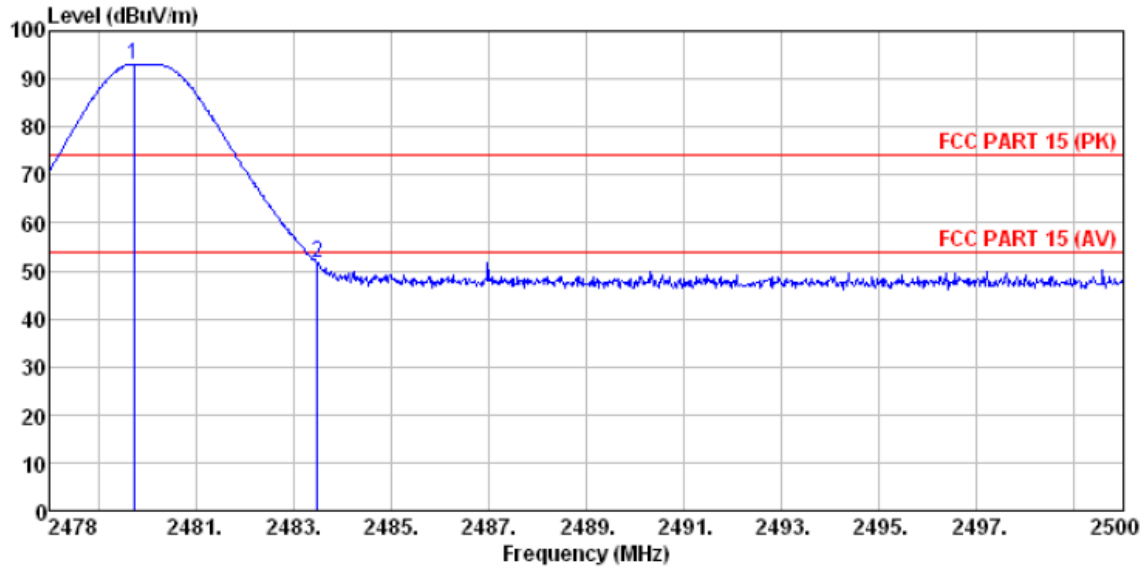
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	45.51	27.59	5.38	30.18	48.30	74.00	-25.70	Peak
2	2400.000	68.62	27.58	5.39	30.18	71.41	74.00	-2.59	Peak
3 *	2401.770	92.20	27.58	5.39	30.18	94.99			Peak

6.3.26 Diagram 6-26



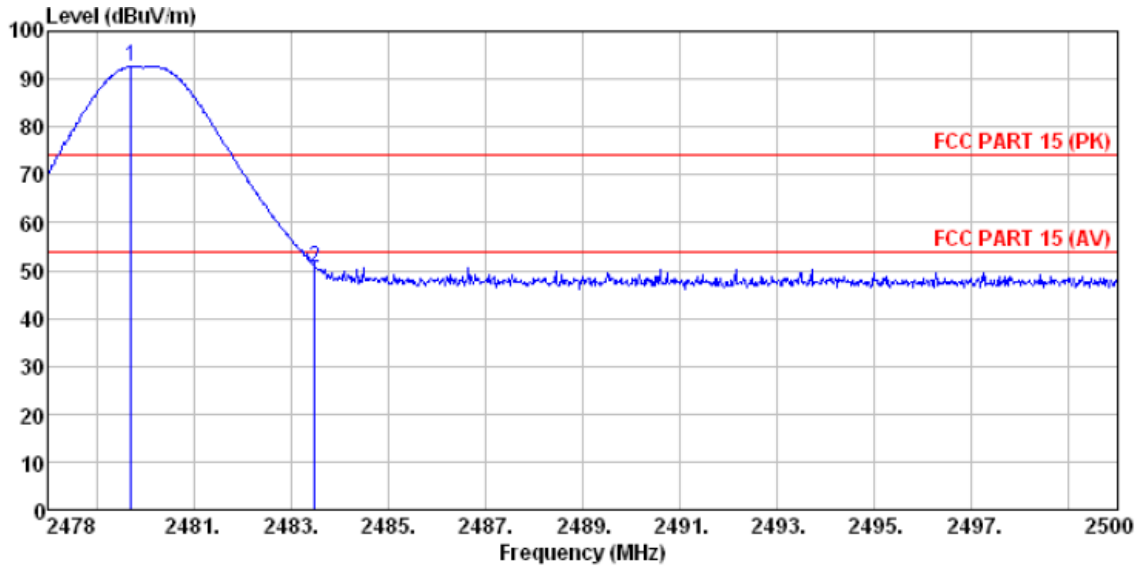
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	44.79	27.59	5.38	30.18	47.58	74.00	-26.42	Peak
2 *	2400.000	72.21	27.58	5.39	30.18	75.00			Peak
3 *	2401.960	93.74	27.58	5.39	30.18	96.53			Peak

6.3.27 Diagram 6-27



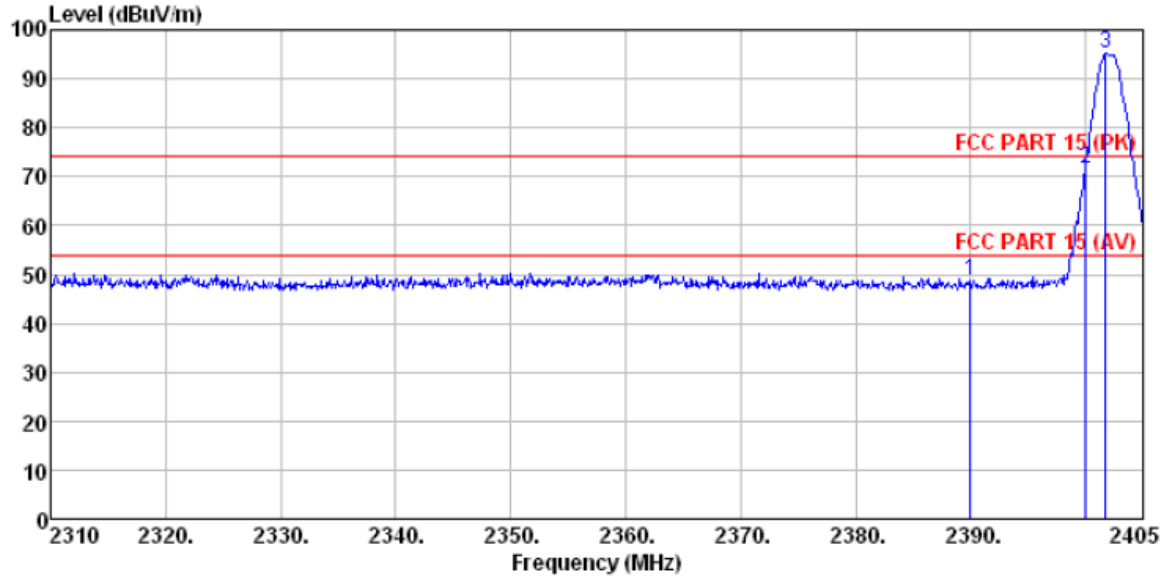
		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	*	2479.738	90.10	27.52	5.47	29.93	93.16			Peak
2		2483.500	48.43	27.53	5.47	29.93	51.50	74.00	-22.50	Peak

6.3.28 Diagram 6-28



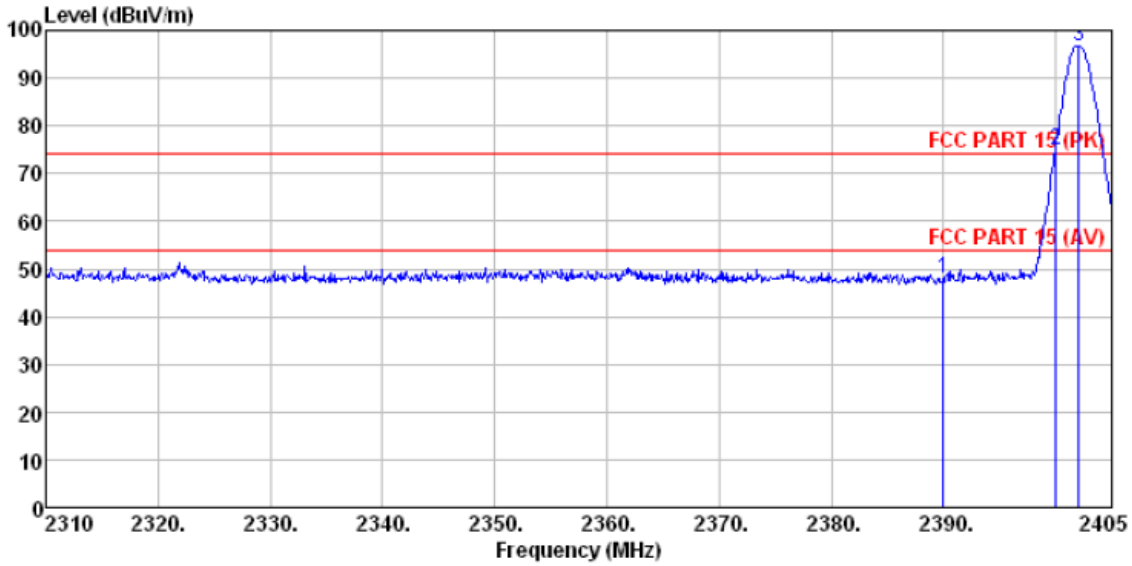
	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 *	2479.716	89.56	27.52	5.47	29.93	92.62			Peak
2	2483.500	47.60	27.53	5.47	29.93	50.67	74.00	-23.33	Peak

6.3.29 Diagram 6-29



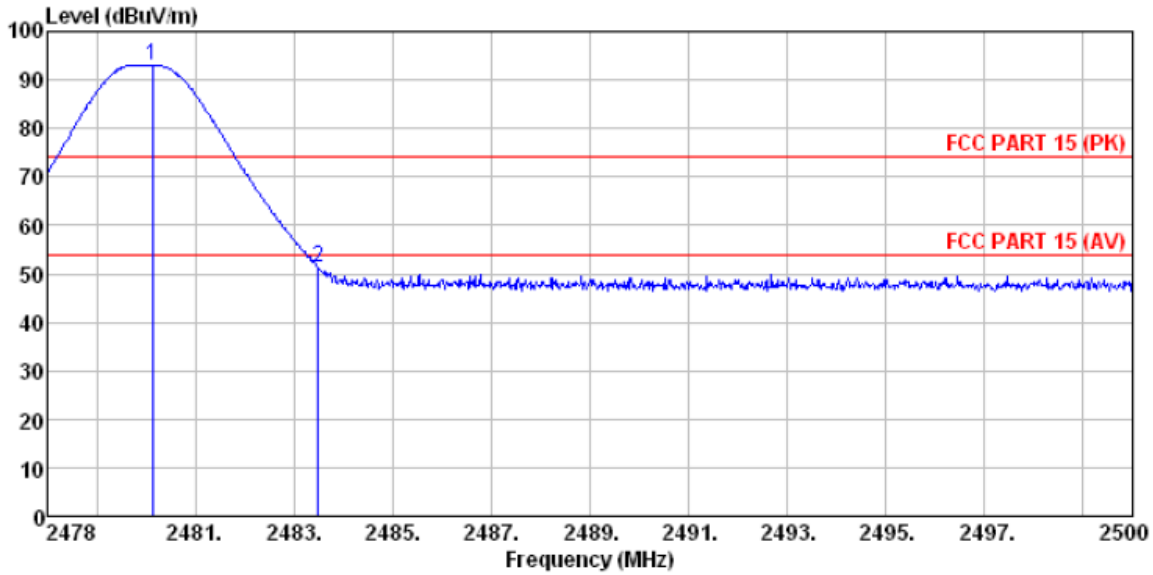
		Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1		2390.000	45.94	27.59	5.38	30.18	48.73	74.00	-25.27	Peak
2		2400.000	68.63	27.58	5.39	30.18	71.42	74.00	-2.58	Peak
3	*	2401.770	92.39	27.58	5.39	30.18	95.18			Peak

6.3.30 Diagram 6-30



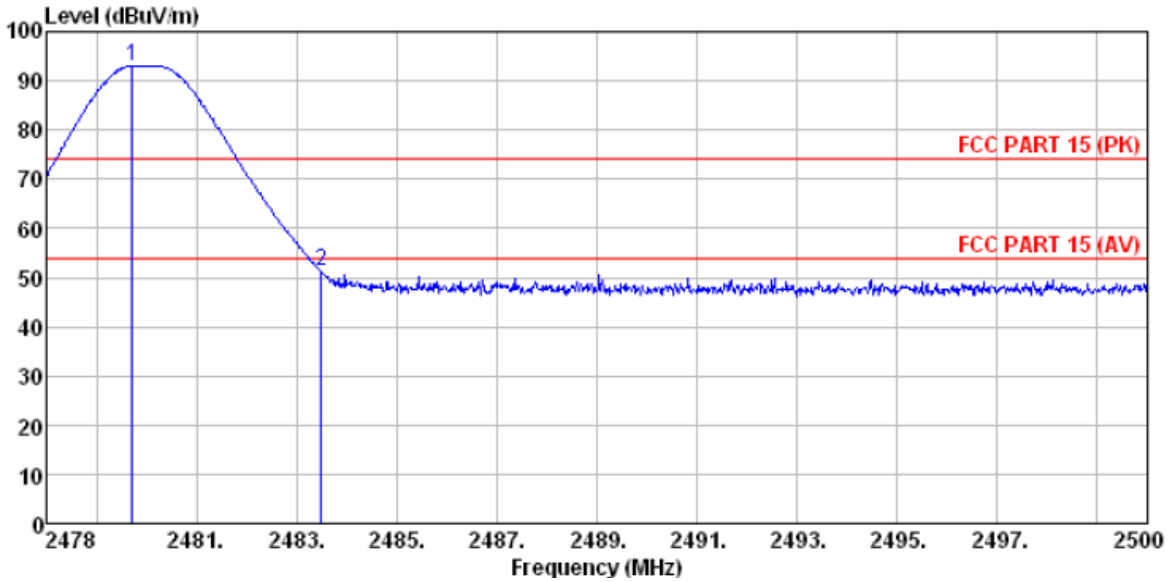
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2390.000	45.02	27.59	5.38	30.18	47.81	74.00	-26.19	Peak
2 *	2400.000	72.13	27.58	5.39	30.18	74.92			Peak
3 *	2402.055	94.03	27.58	5.39	30.18	96.82			Peak

6.3.31 Diagram 6-31



	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 *	2480.134	90.07	27.52	5.47	29.93	93.13			Peak
2	2483.500	48.16	27.53	5.47	29.93	51.23	74.00	-22.77	Peak

6.3.32 Diagram 6-32



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 *	2479.716	90.03	27.52	5.47	29.93	93.09			Peak
2	2483.500	48.25	27.53	5.47	29.93	51.32	74.00	-22.68	Peak

7. 20 dB bandwidth Test

7.1 Test Procedure

Clause 15.215(c) 20dB Bandwidth:

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

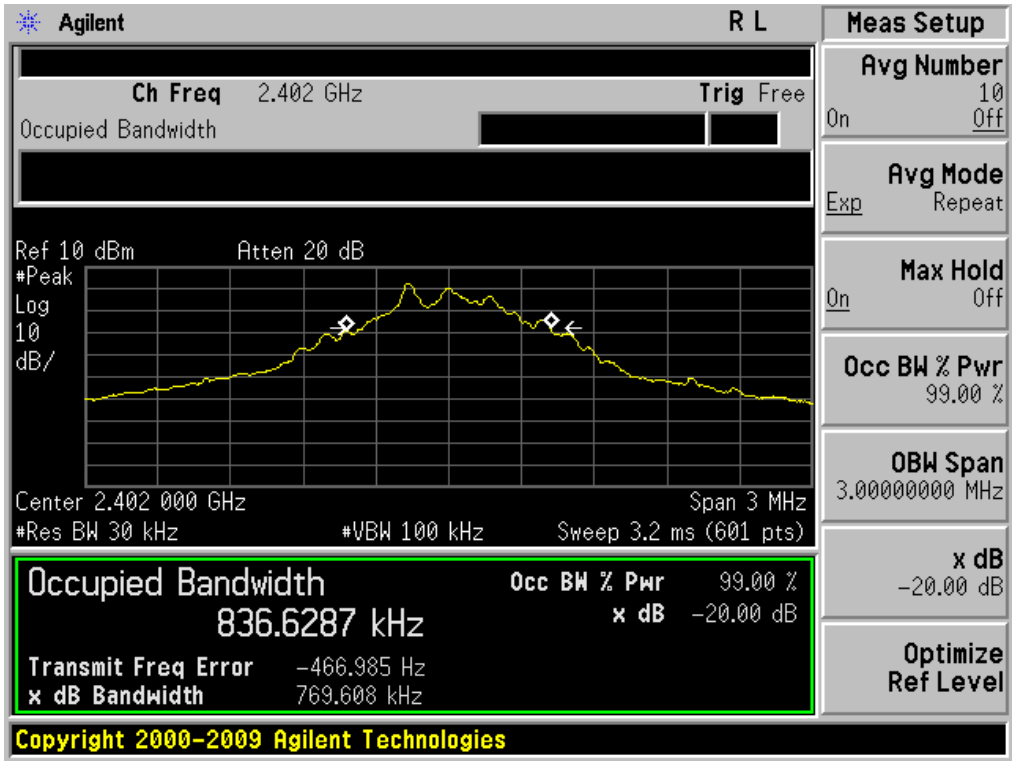
7.2 Measurement Equipment

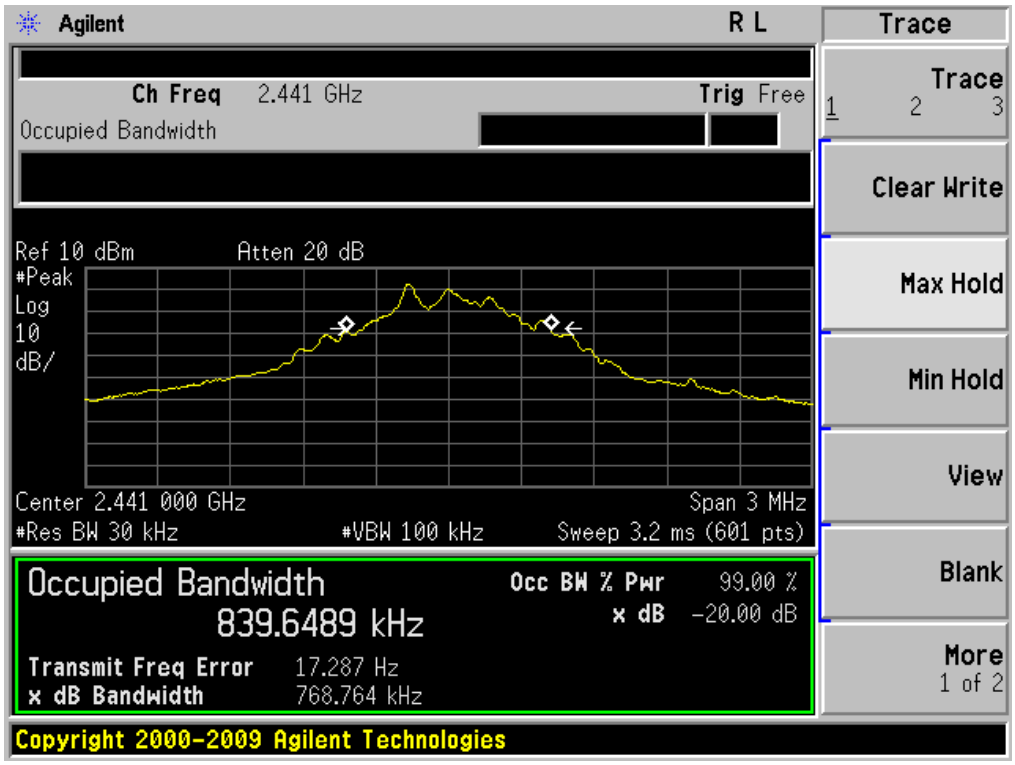
	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	Dec. 04 2015	E4440A	GTS533	Agilent

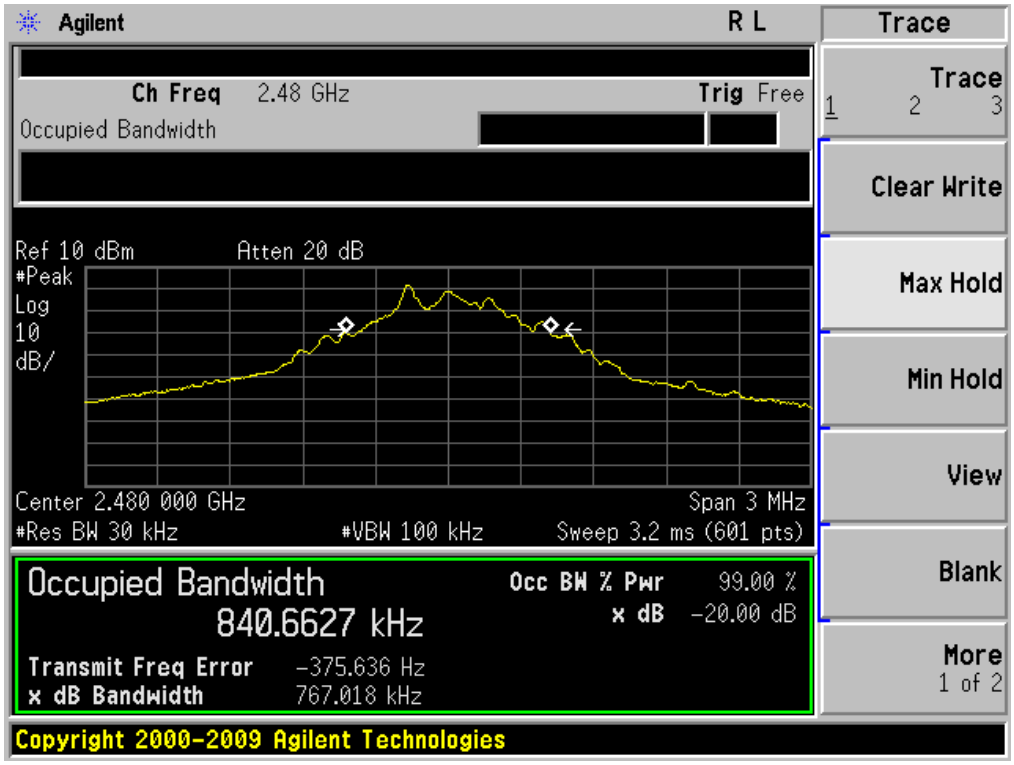
7.3 Test Result:

Modulation	Channel	20dB bandwidth (kHz)	99% bandwidth (kHz)
GFSK	CHL	769.608	836.6287
	CHM	768.764	839.6489
	CHH	767.018	840.6627

GFSK diagrams are as below:

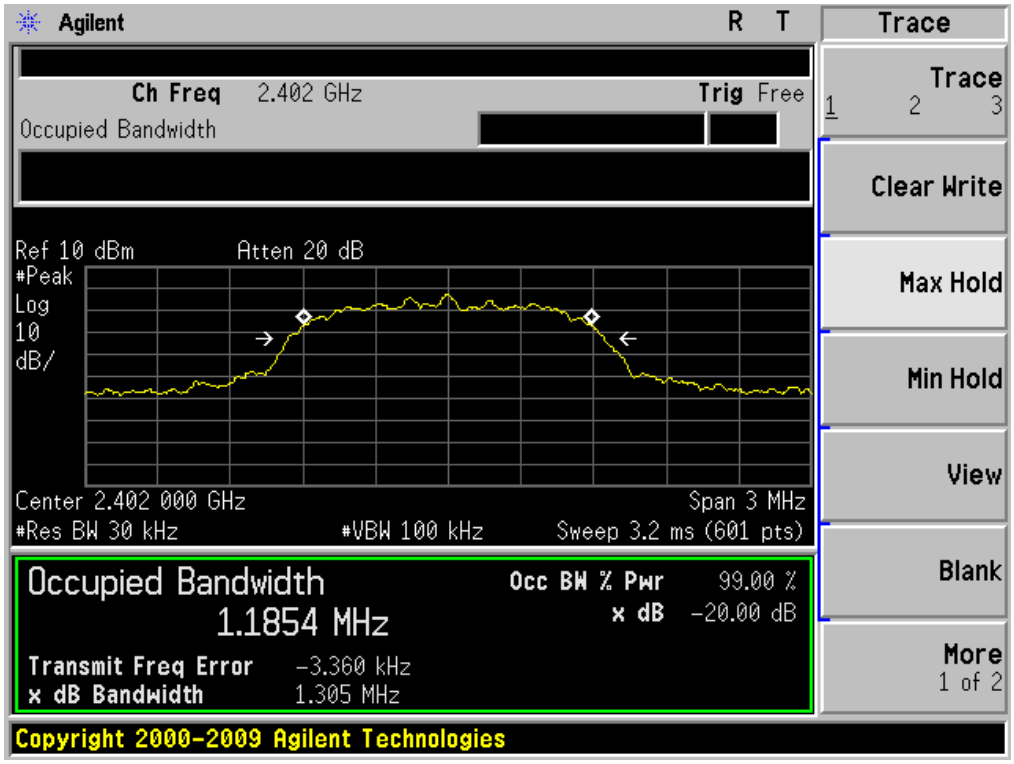

Agilent
R L
Meas Setup
Ch Freq 2.402 GHz
Trig Free
Occupied Bandwidth
Avg Number
10
On Off
Avg Mode
Exp Repeat
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Max Hold
On Off
Occ BW % Pwr
99.00 %
OBW Span
3.00000000 MHz
Center 2.402 000 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 3.2 ms (601 pts)
x dB
-20.00 dB
Occupied Bandwidth
836.6287 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -466.985 Hz
x dB Bandwidth 769.608 kHz
Optimize
Ref Level
Copyright 2000-2009 Agilent Technologies

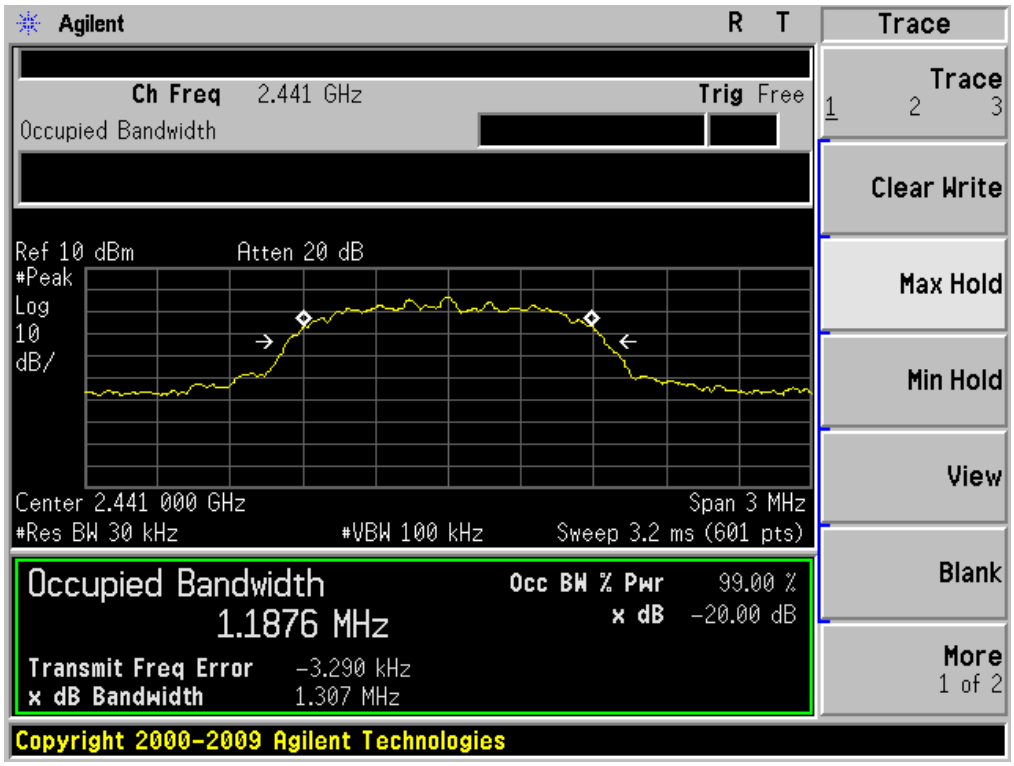

Agilent
R L
Trace
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Trace
1 2 3
Clear Write
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.441 000 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 3.2 ms (601 pts)
Blank
Occupied Bandwidth
839.6489 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
More
1 of 2
Transmit Freq Error 17.287 Hz
x dB Bandwidth 768.764 kHz
Copyright 2000-2009 Agilent Technologies

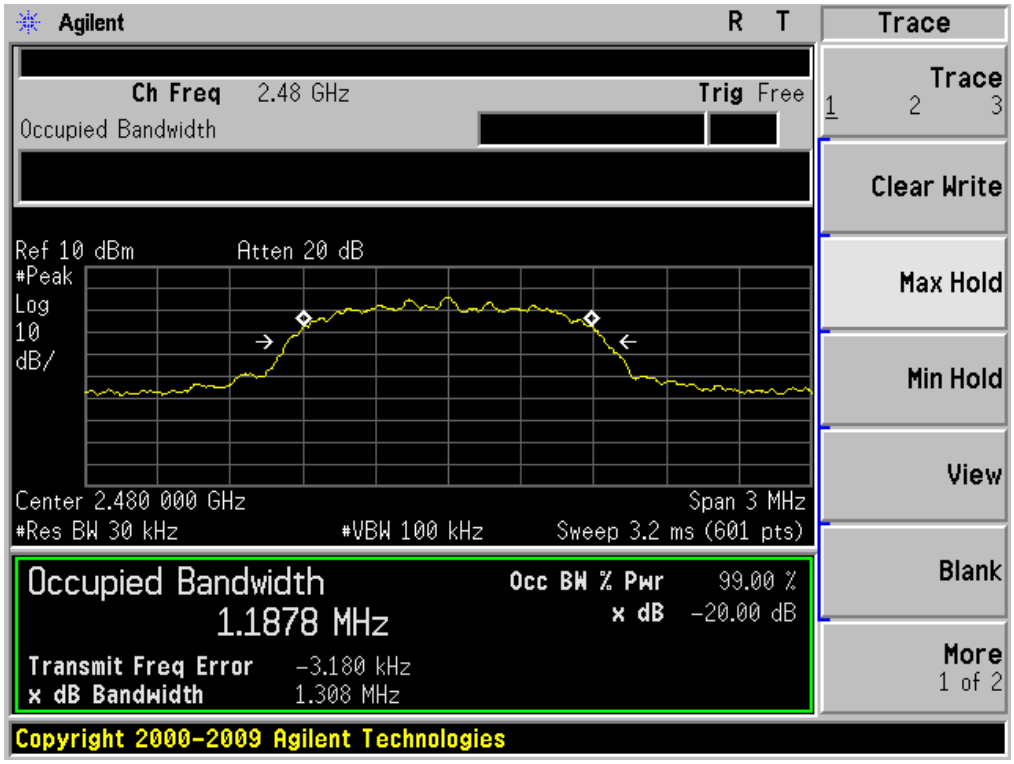

Agilent
R L
Trace
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Trace
1 2 3
Clear Write
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.480 000 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 3.2 ms (601 pts)
Blank
Occupied Bandwidth
840.6627 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -375.636 Hz
x dB Bandwidth 767.018 kHz
More
1 of 2
Copyright 2000-2009 Agilent Technologies

Modulation	Channel	20dB bandwidth(MHz)	99% bandwidth(MHz)
8DPSK	CHL	1.305	1.1854
	CHM	1.307	1.1876
	CHH	1.308	1.1878

8DPSK diagrams are as below:

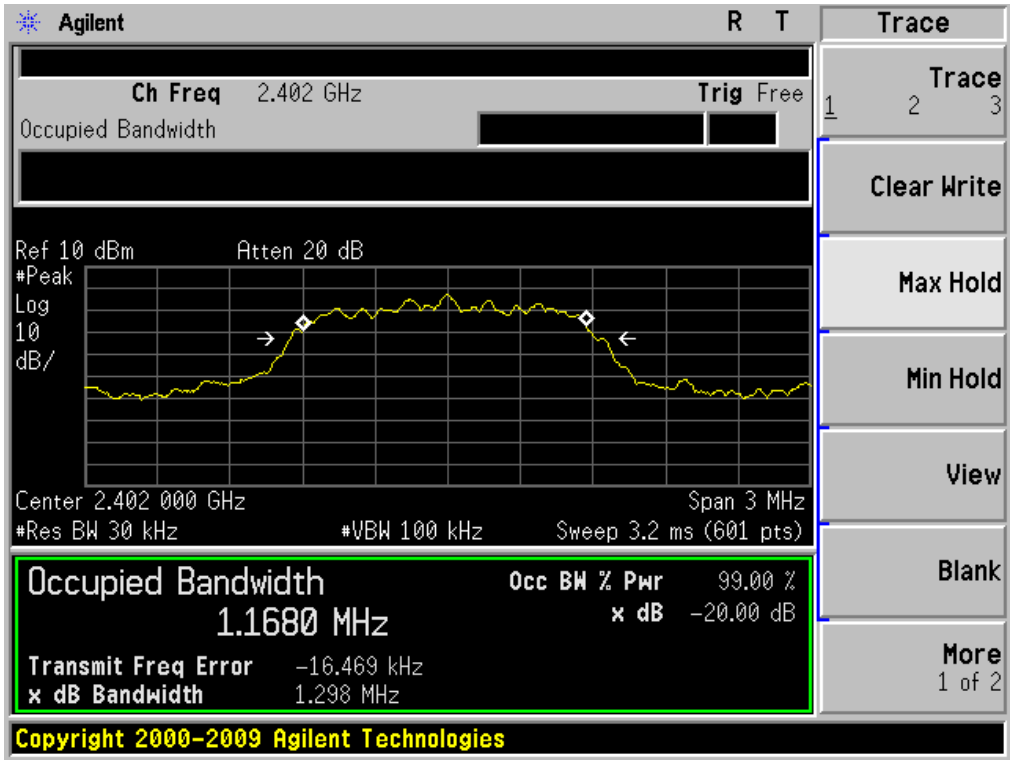


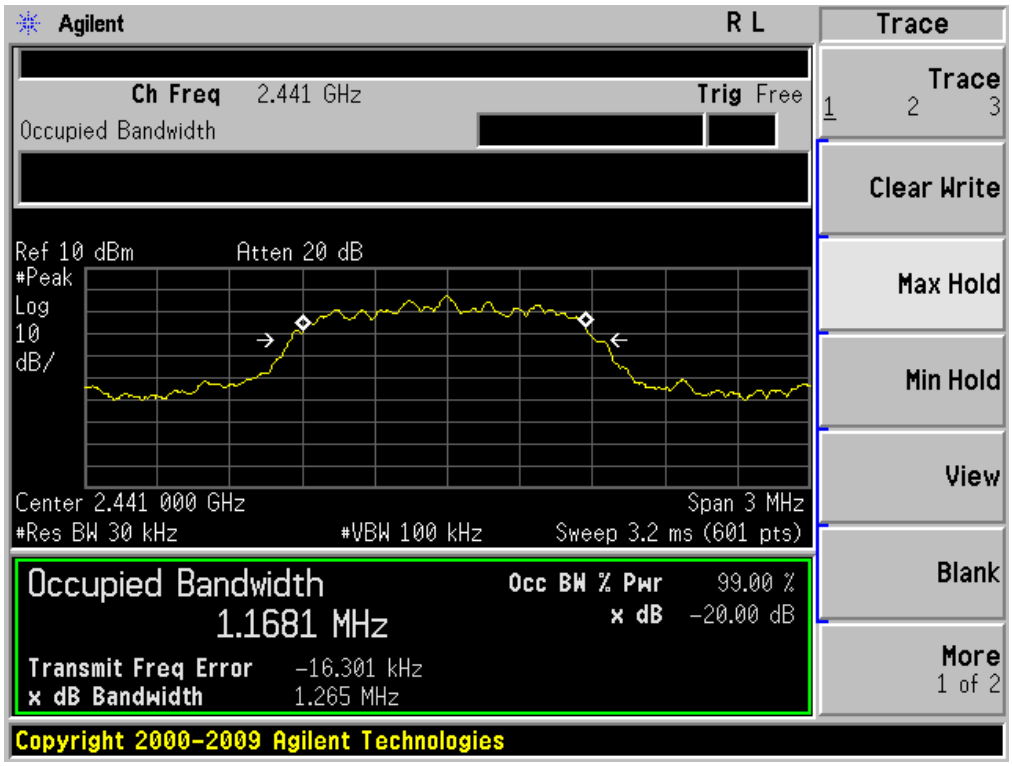


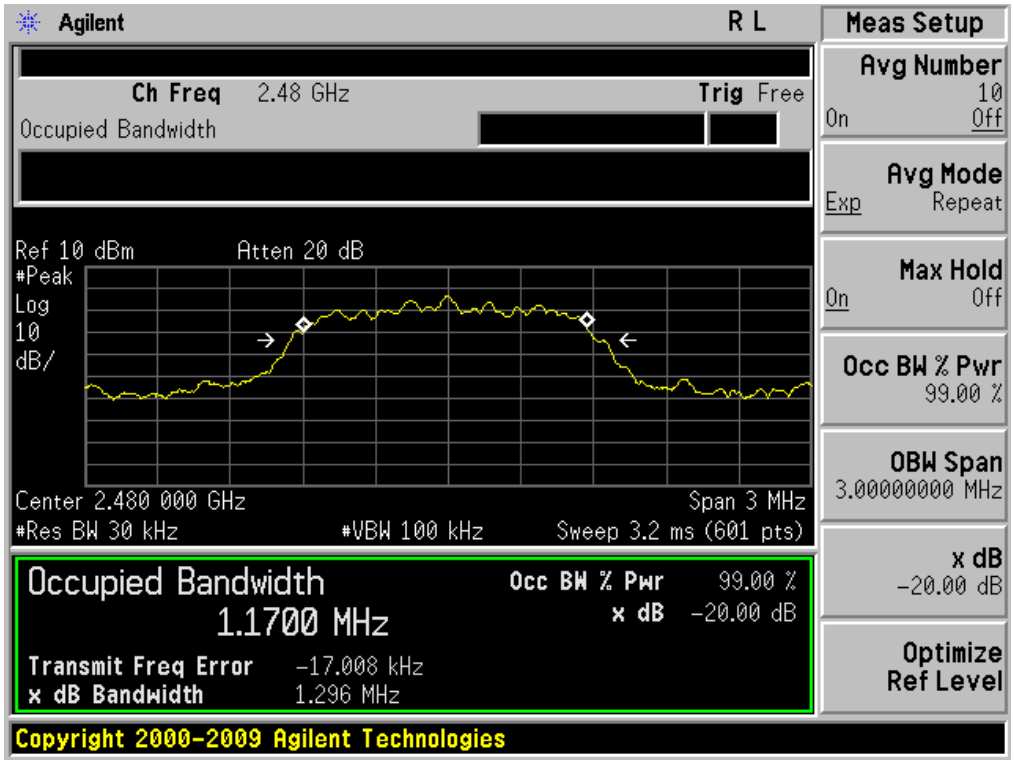

Agilent
R T
Trace
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Trace
1 2 3
Clear Write
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Max Hold
Min Hold
View
Center 2.480 000 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 3.2 ms (601 pts)
Blank
Occupied Bandwidth
1.1878 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -3.180 kHz
x dB Bandwidth 1.308 MHz
More
1 of 2
Copyright 2000-2009 Agilent Technologies

Modulation	Channel	20dB bandwidth(MHz)	99% bandwidth(MHz)
π/4 DQPSK	CHL	1.298	1.1680
	CHM	1.265	1.1681
	CHH	1.296	1.1700

π/4 DQPSK diagrams are as below:






Agilent
R L
Meas Setup
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Avg Number
10
On Off
Avg Mode
Exp Repeat
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
Max Hold
On Off
Occ BW % Pwr
99.00 %
OBW Span
3.00000000 MHz
Center 2.480 000 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 3.2 ms (601 pts)
x dB
-20.00 dB
Occupied Bandwidth
1.1700 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -17.008 kHz
x dB Bandwidth 1.296 MHz
Optimize
Ref Level
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8. Band Edge Compliance Test

8.1 Test Procedure

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

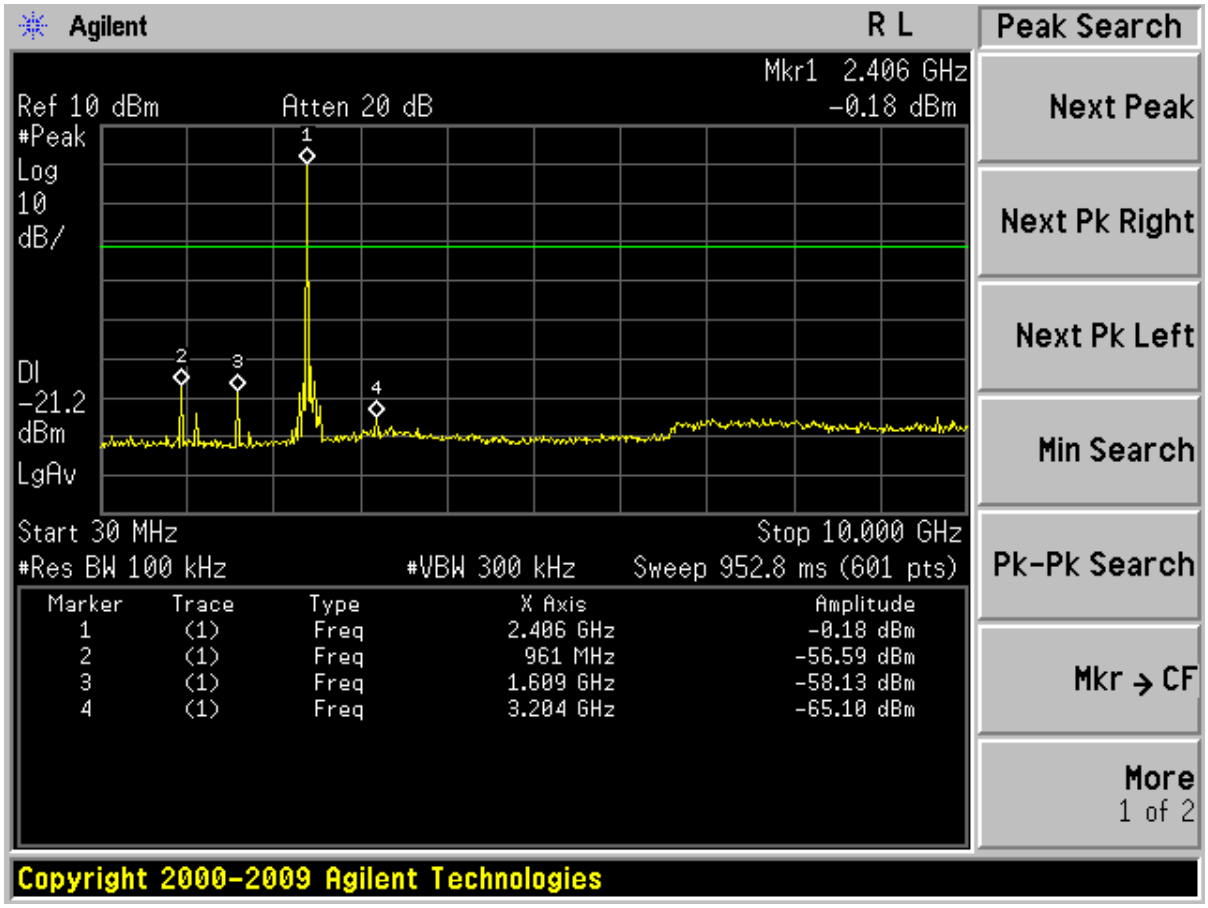
8.2 Measurement Equipment

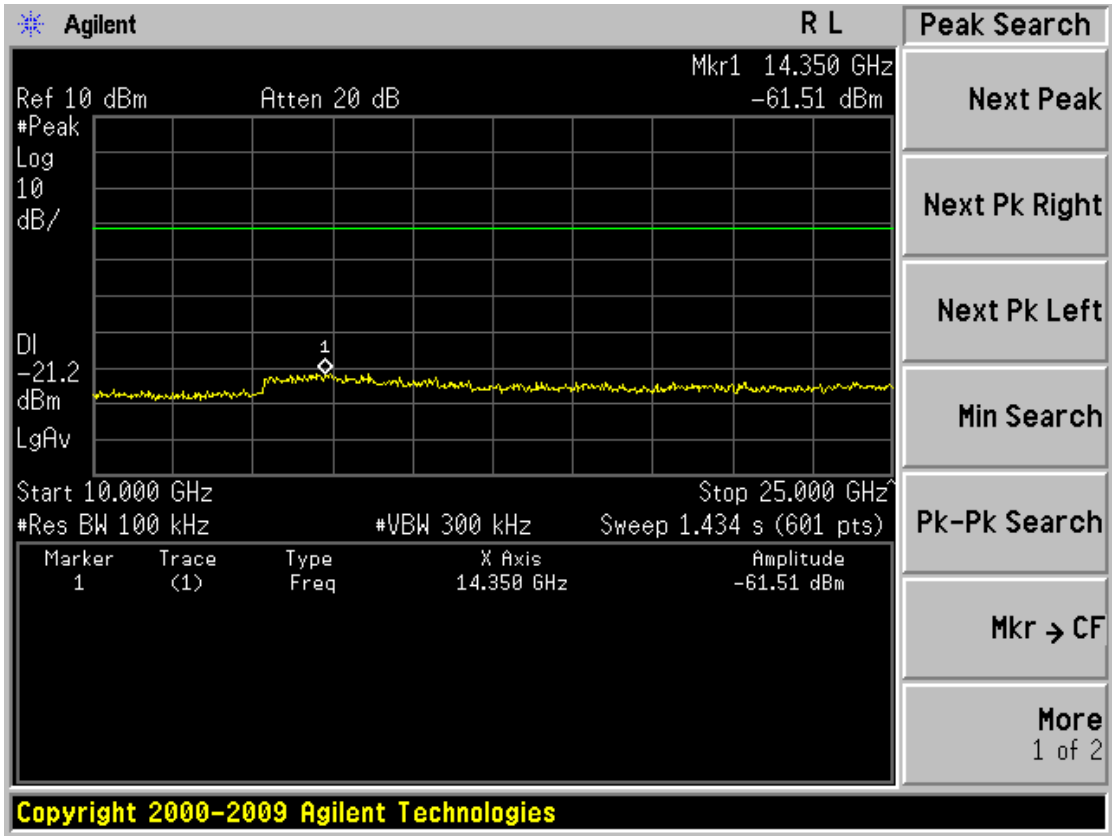
	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	Dec. 04 2015	E4440A	GTS533	Agilent

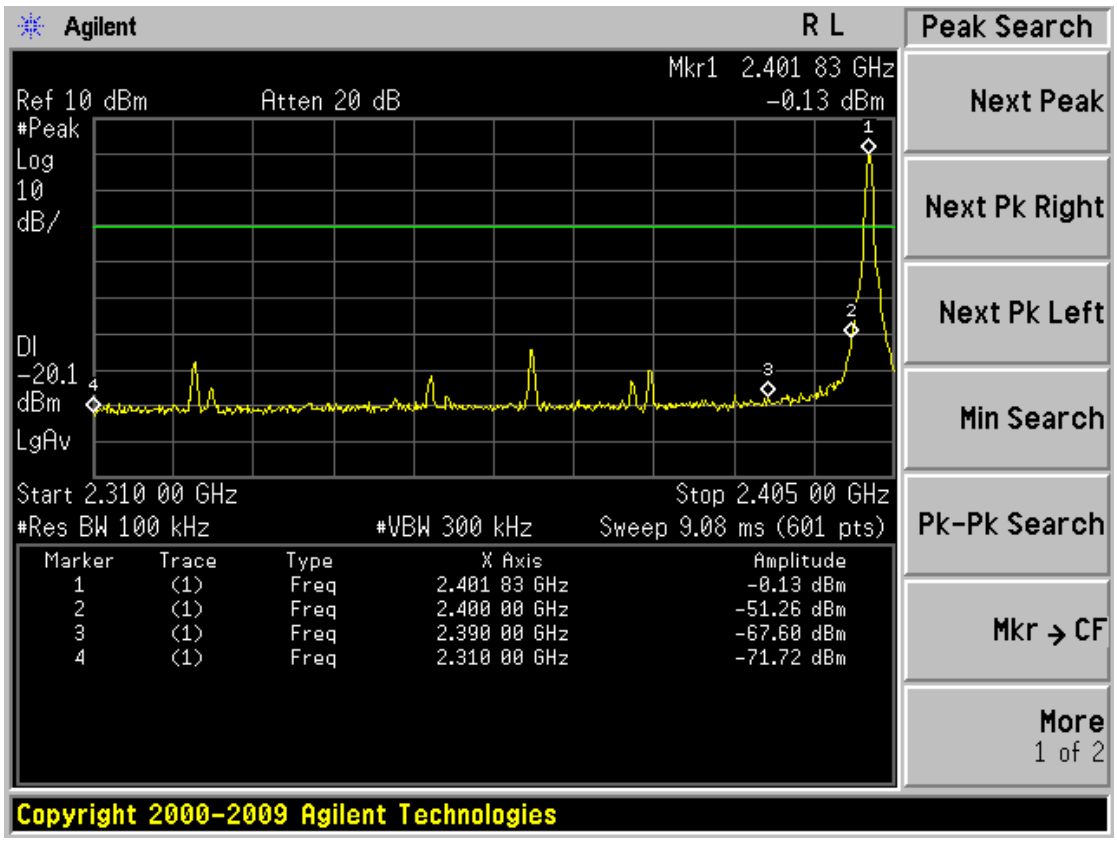
8.3 Test Result

Remark: Only list the worse result in the report.

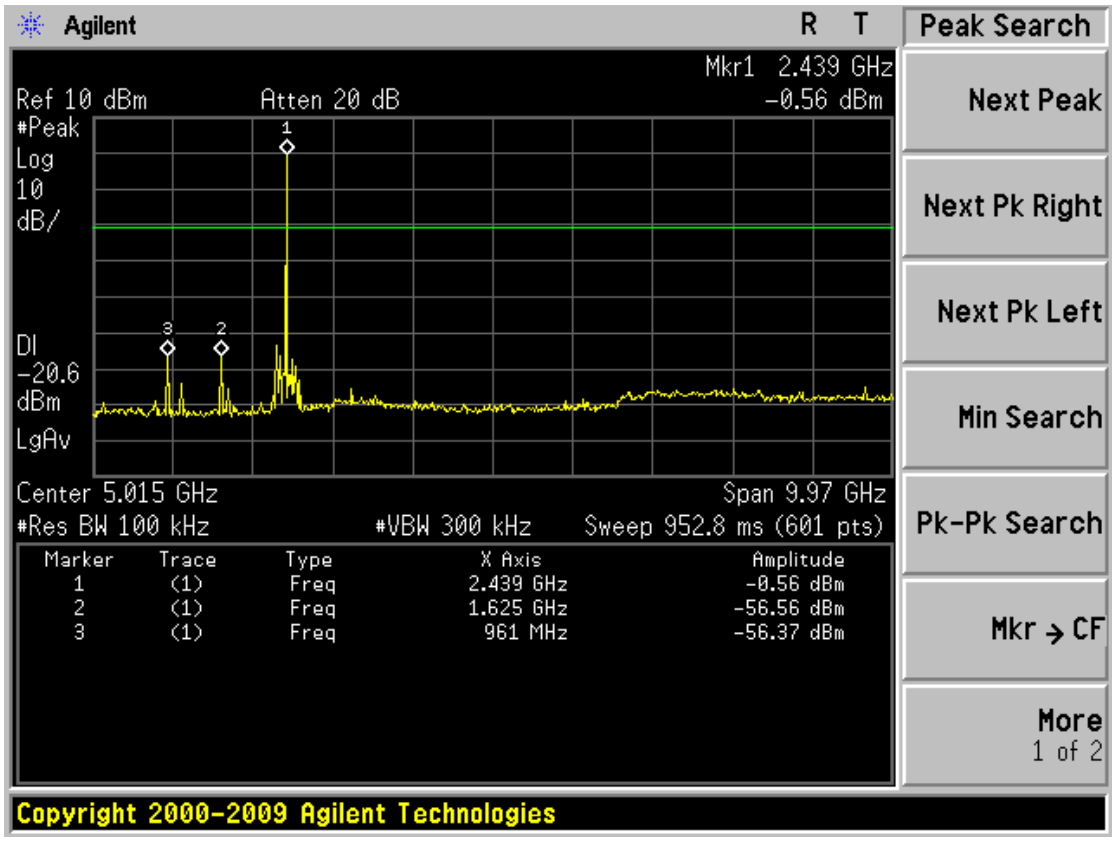
GFSK Hopping off CHL :

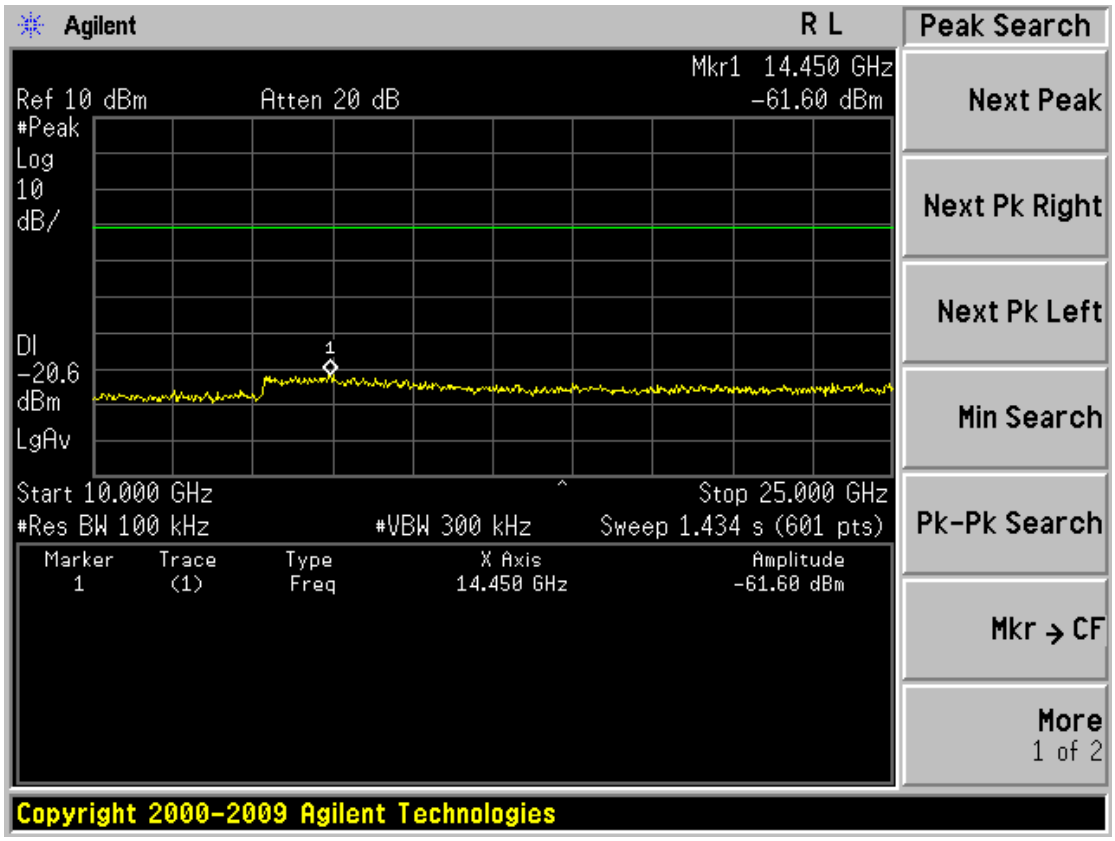



Agilent
R L
Peak Search
Mkr1 14.350 GHz
Ref 10 dBm
Atten 20 dB
-61.51 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Dl
-21.2
dBm
LgAv
Start 10.000 GHz
Stop 25.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 14.350 GHz -61.51 dBm
Copyright 2000-2009 Agilent Technologies

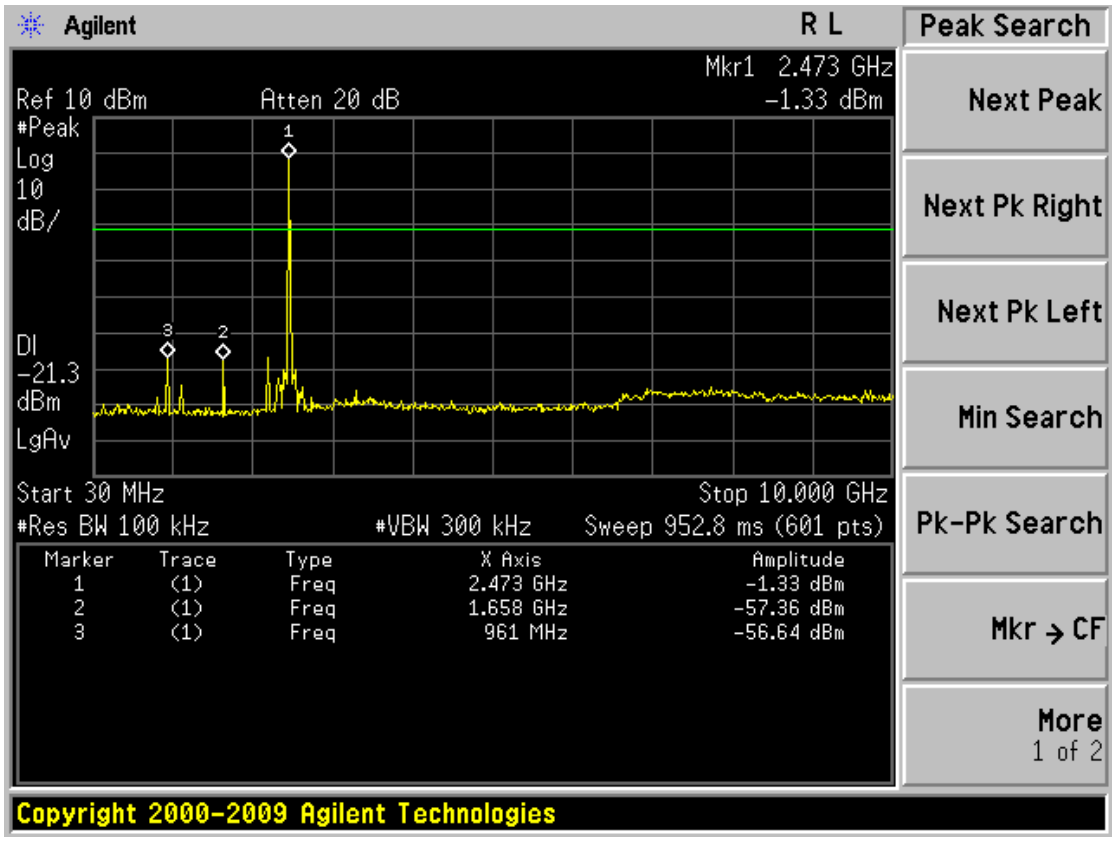

Agilent
R L
Peak Search
Mkr1 2.401 83 GHz
Ref 10 dBm
Atten 20 dB
-0.13 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Dl
-20.1
dBm
LgAv
Start 2.310 00 GHz
Stop 2.405 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.08 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.401 83 GHz -0.13 dBm
2 (1) Freq 2.400 00 GHz -51.26 dBm
3 (1) Freq 2.390 00 GHz -67.60 dBm
4 (1) Freq 2.310 00 GHz -71.72 dBm
Copyright 2000-2009 Agilent Technologies

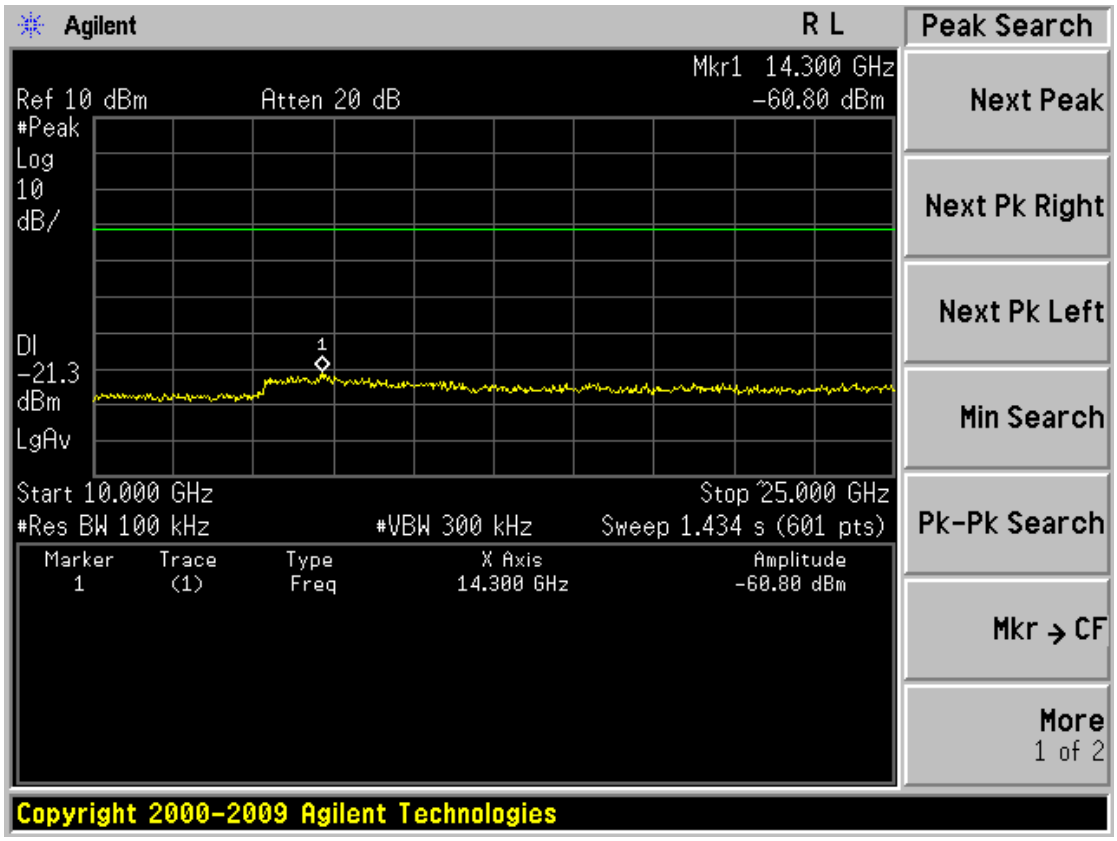
GFSK Hopping off CHM:

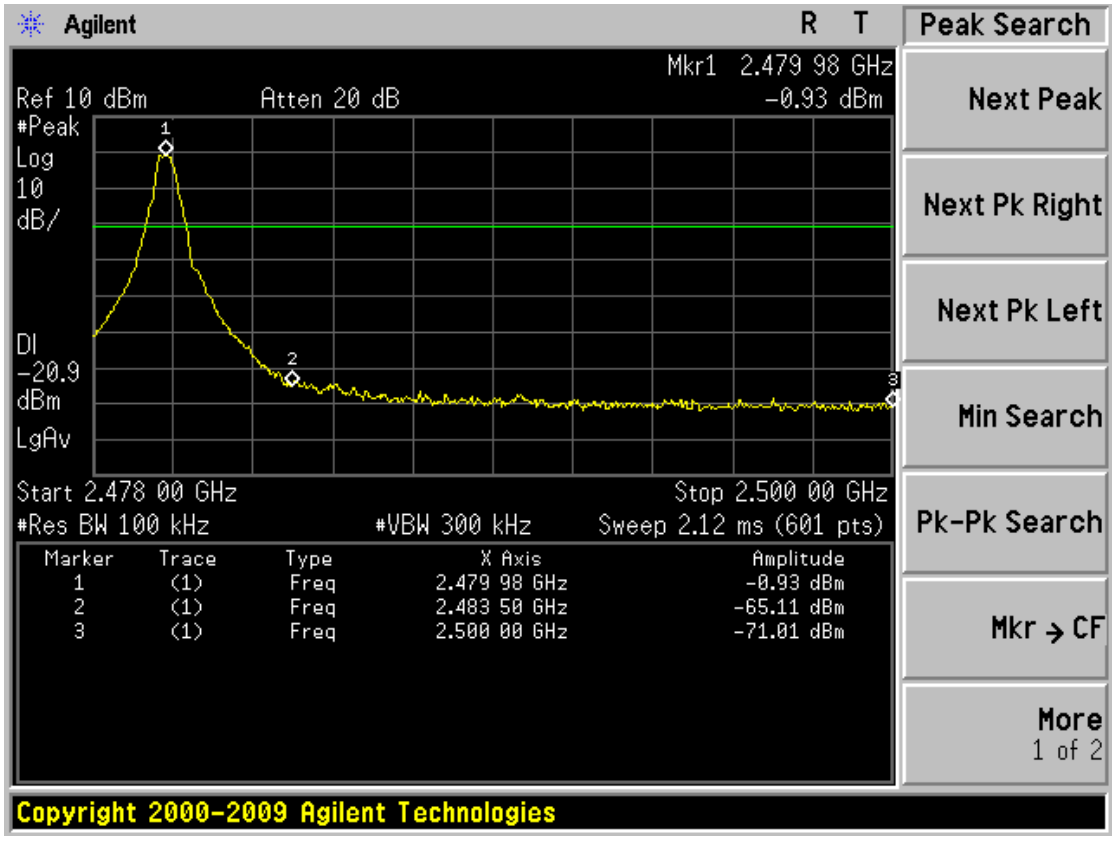




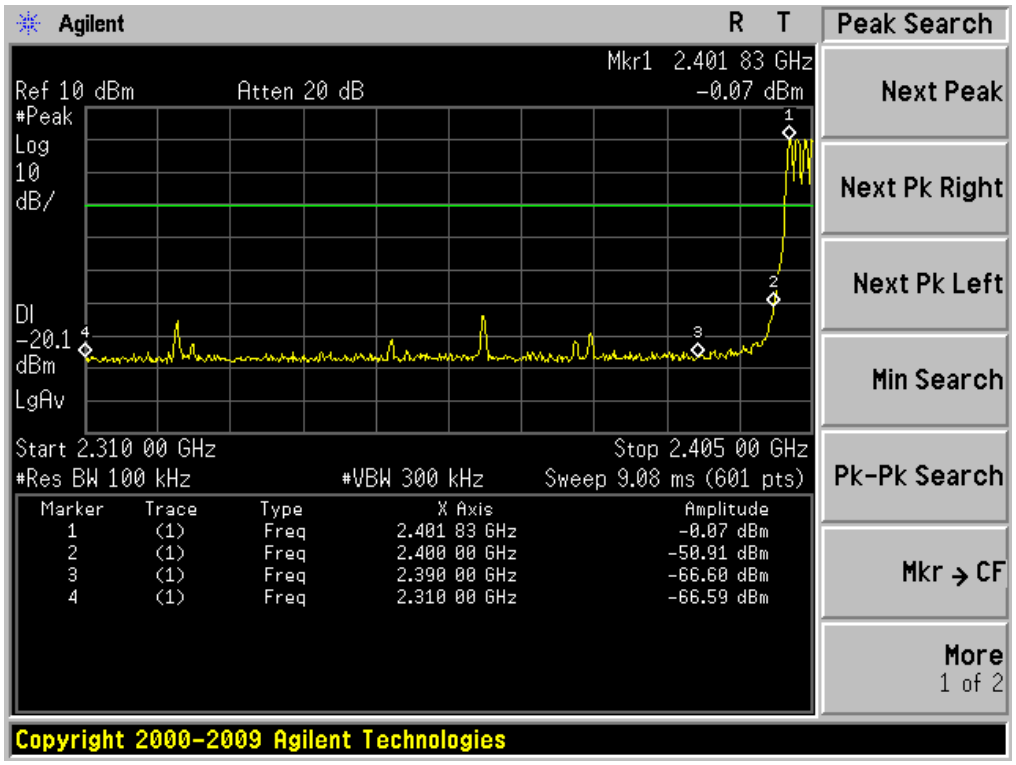
GFSK Hopping off CHH :



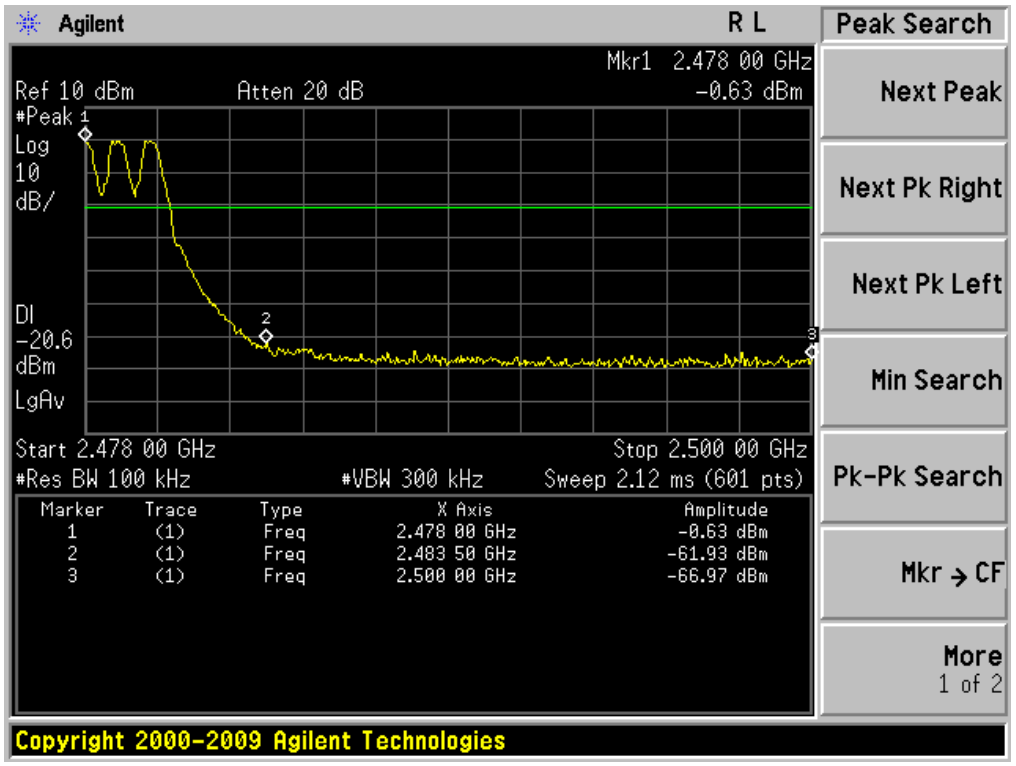



Agilent
R T
Peak Search
Mkr1 2.479 98 GHz
Ref 10 dBm
Atten 20 dB
-0.93 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Dl
-20.9
dBm
LgAv
Start 2.478 00 GHz
Stop 2.500 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.12 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.479 98 GHz -0.93 dBm
2 (1) Freq 2.483 50 GHz -65.11 dBm
3 (1) Freq 2.500 00 GHz -71.01 dBm
Copyright 2000-2009 Agilent Technologies

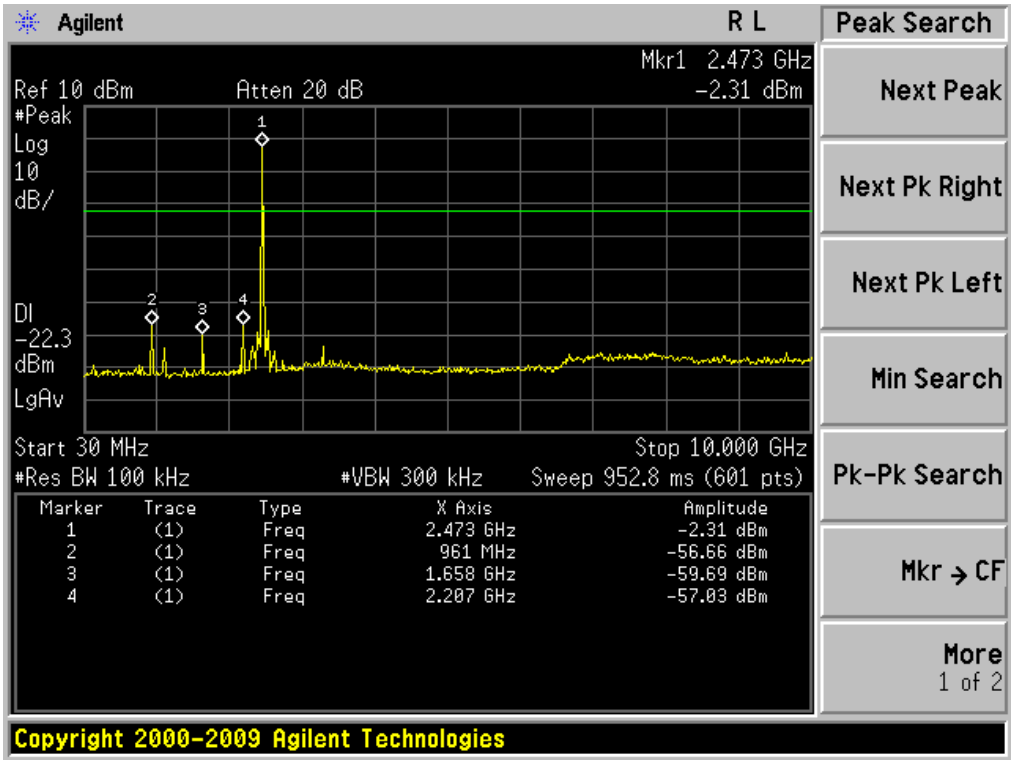
GFSK Hopping on CHL :

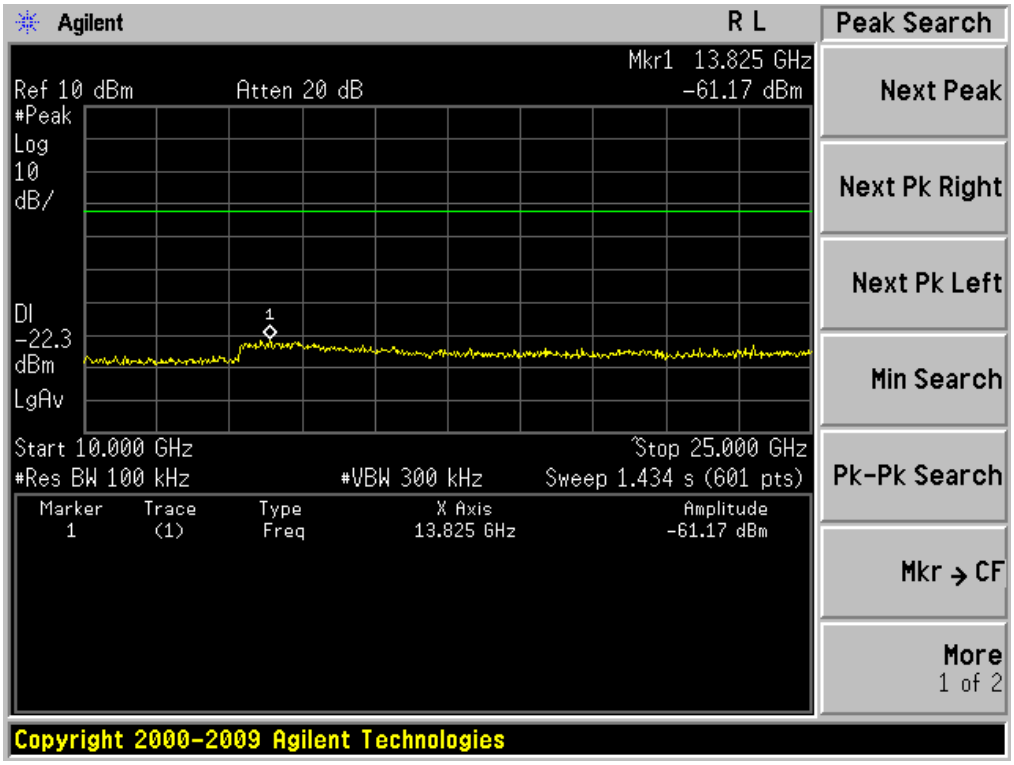


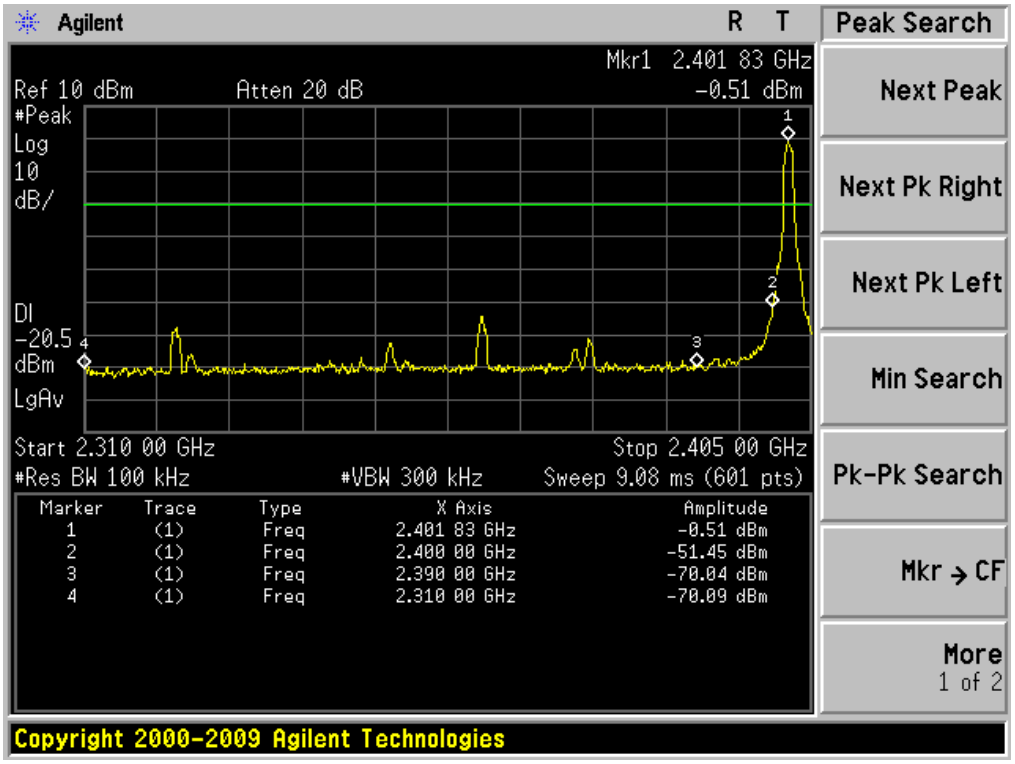
GFSK Hopping on CHH :



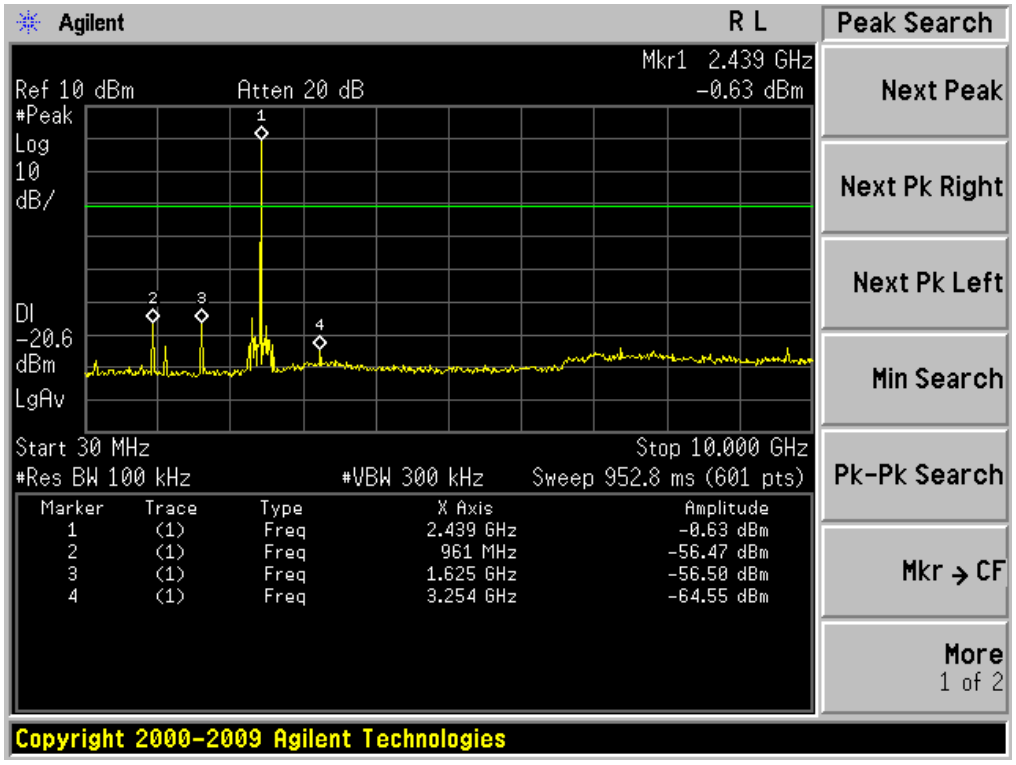
8DPSK Hopping off CHL :

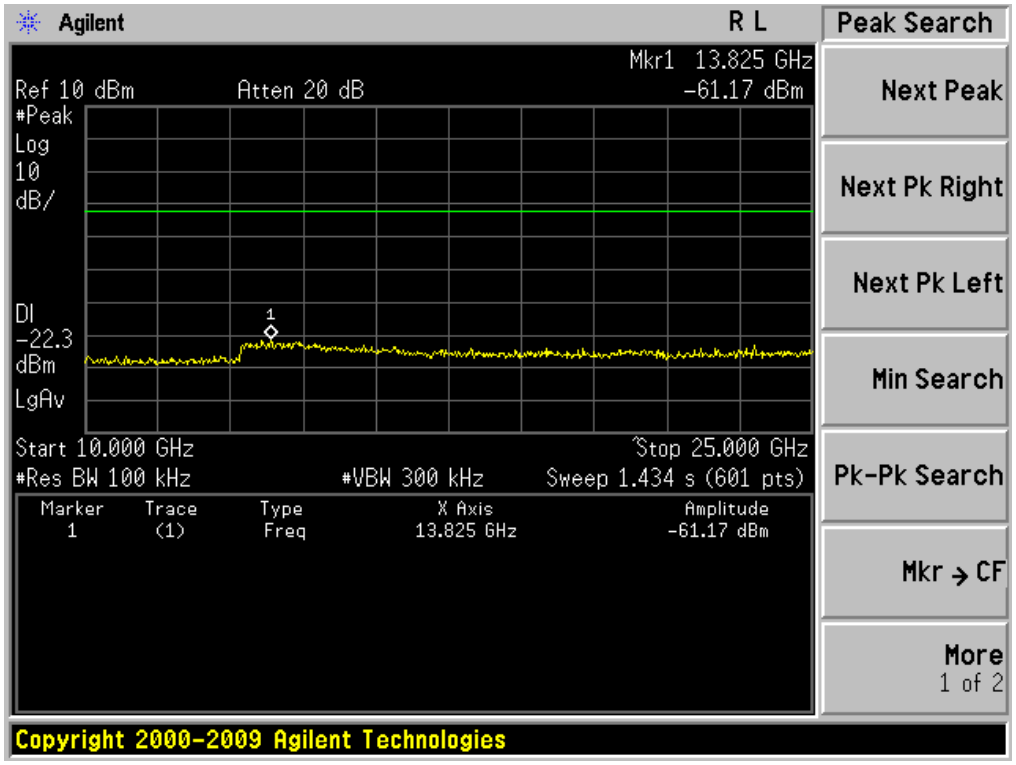




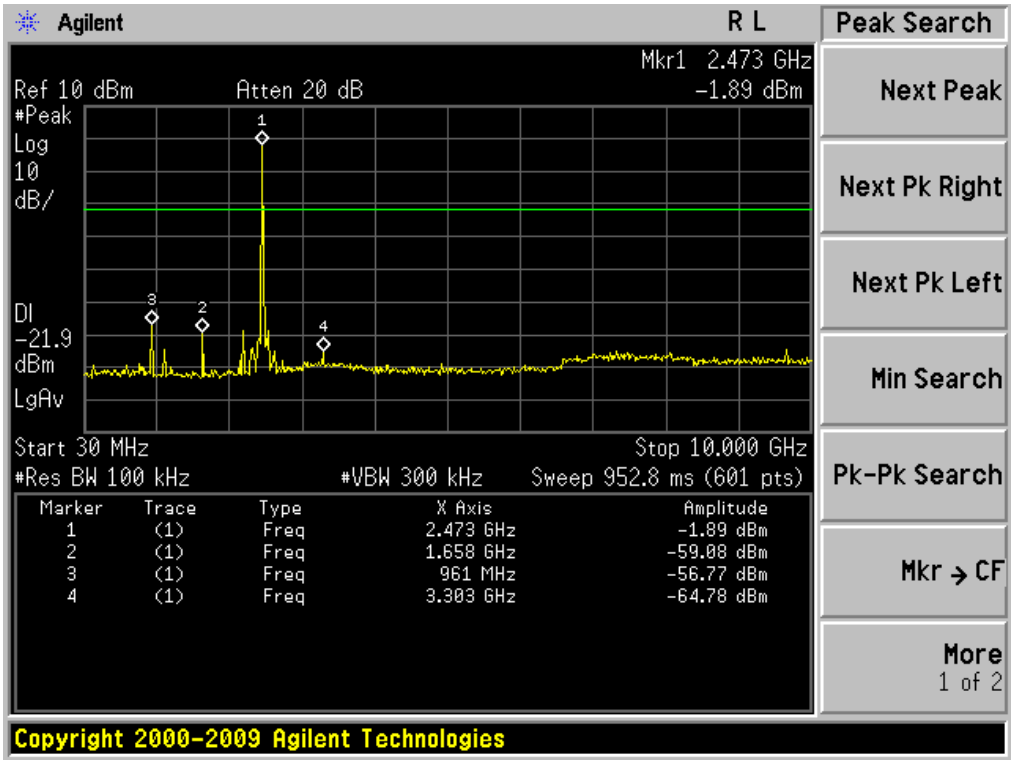

Agilent
R T
Peak Search
Mkr1 2.401 83 GHz
Ref 10 dBm
Atten 20 dB
-0.51 dBm
Next Peak
#Peak
Log
10
dB/
Next Pk Right
Next Pk Left
Dl
-20.5
dBm
Min Search
LgAv
Start 2.310 00 GHz
Stop 2.405 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.08 ms (601 pts)
Pk-Pk Search
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.401 83 GHz -0.51 dBm
2 (1) Freq 2.400 00 GHz -51.45 dBm
3 (1) Freq 2.390 00 GHz -70.04 dBm
4 (1) Freq 2.310 00 GHz -70.09 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2009 Agilent Technologies

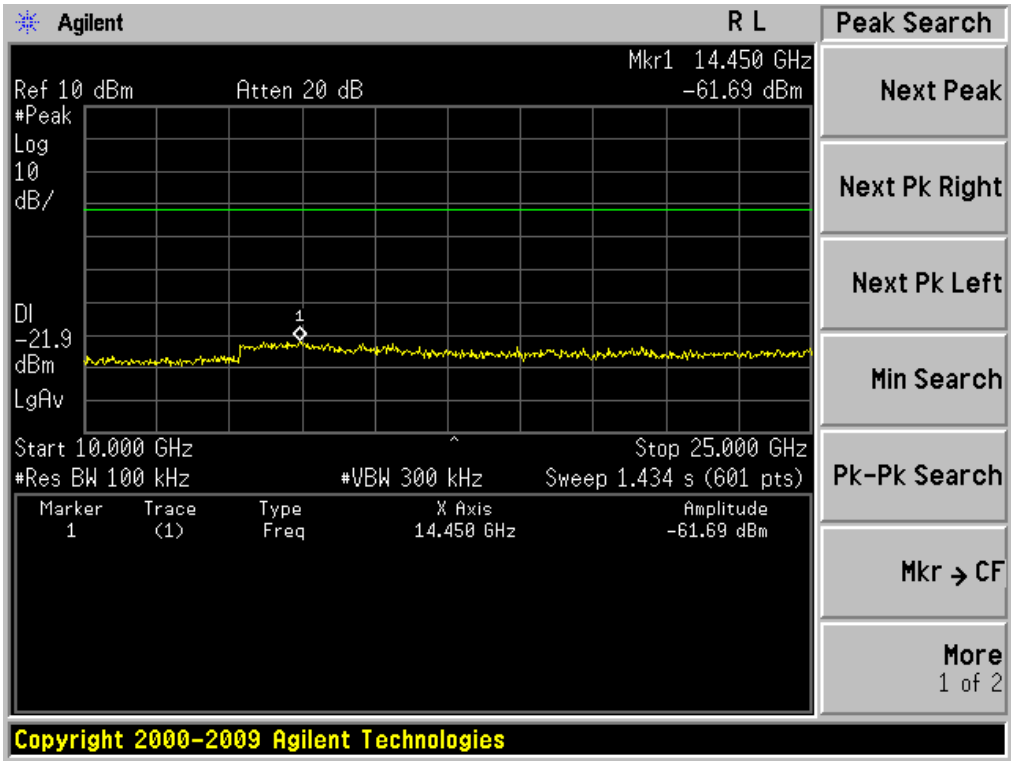
8DPSK Hopping off CHM :

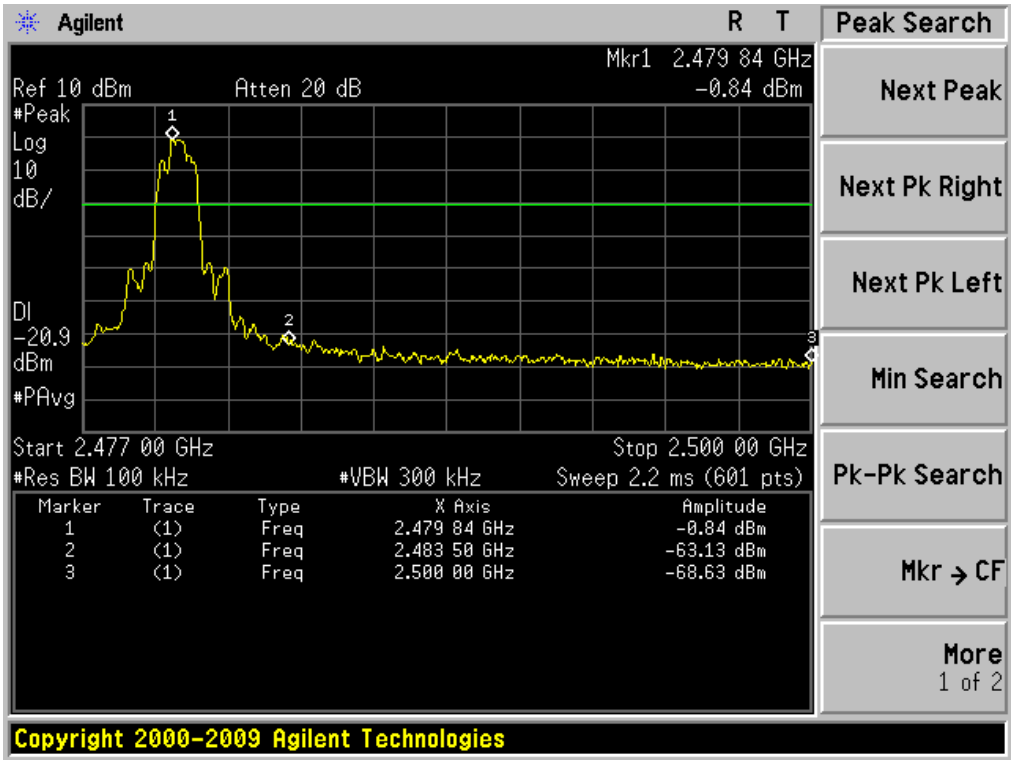




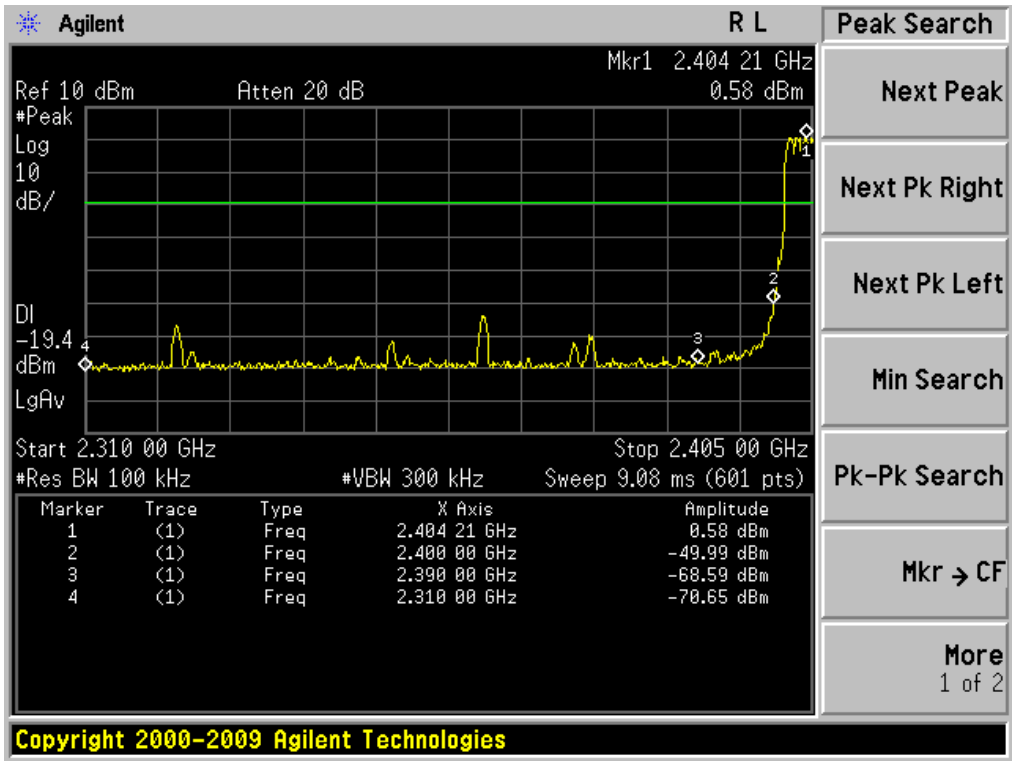
8DPSK Hopping off CHH :



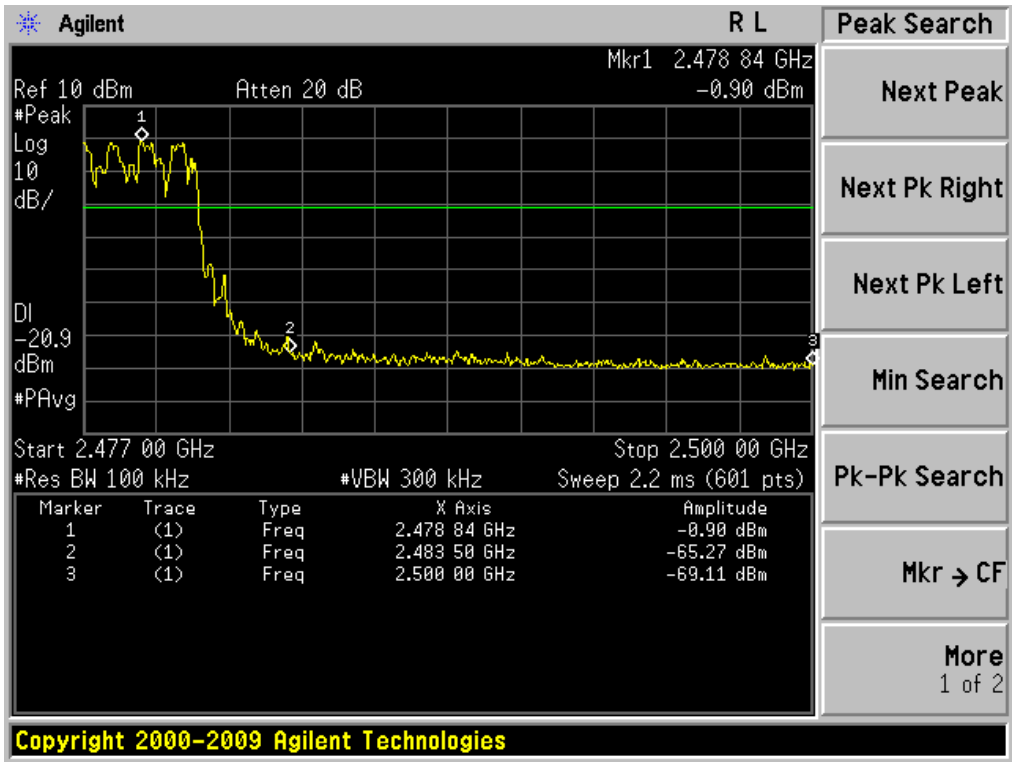



Agilent
R T
Peak Search
Mkr1 2.479 84 GHz
Ref 10 dBm
Atten 20 dB
-0.84 dBm
Next Peak
#Peak
Log
10
dB/
Next Pk Right
Next Pk Left
Dl
-20.9
dBm
#PAvg
Min Search
Start 2.477 00 GHz
Stop 2.500 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.2 ms (601 pts)
Pk-Pk Search
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.479 84 GHz -0.84 dBm
2 (1) Freq 2.483 50 GHz -63.13 dBm
3 (1) Freq 2.500 00 GHz -68.63 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2009 Agilent Technologies

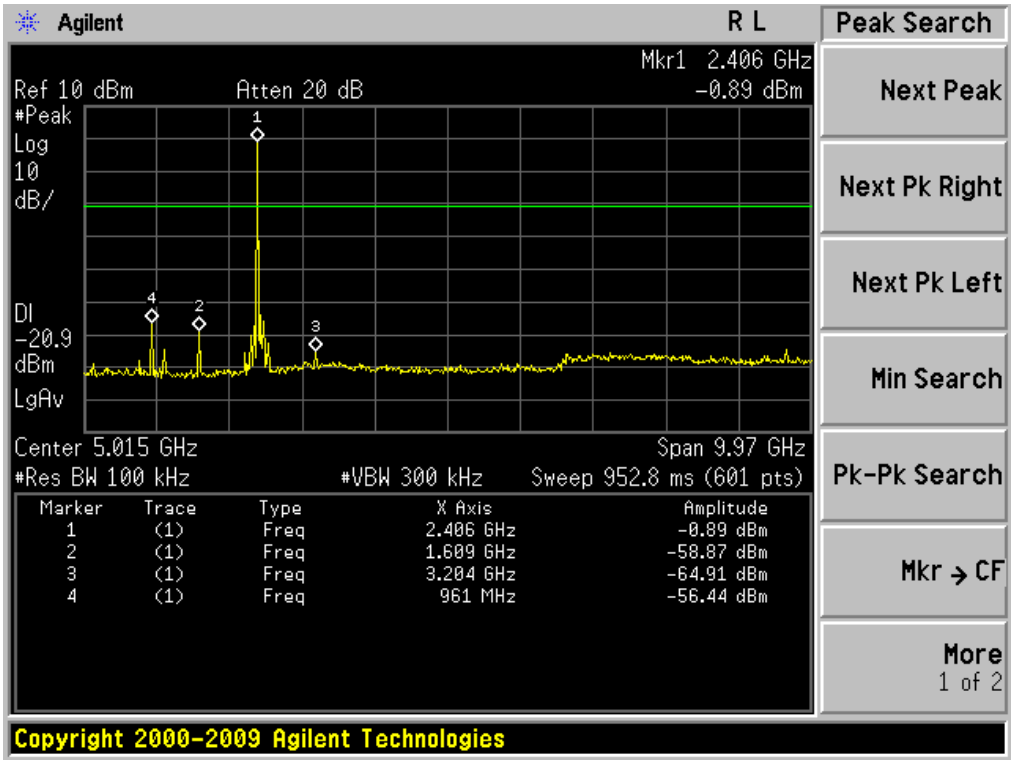
8DPSK Hopping on CHL :

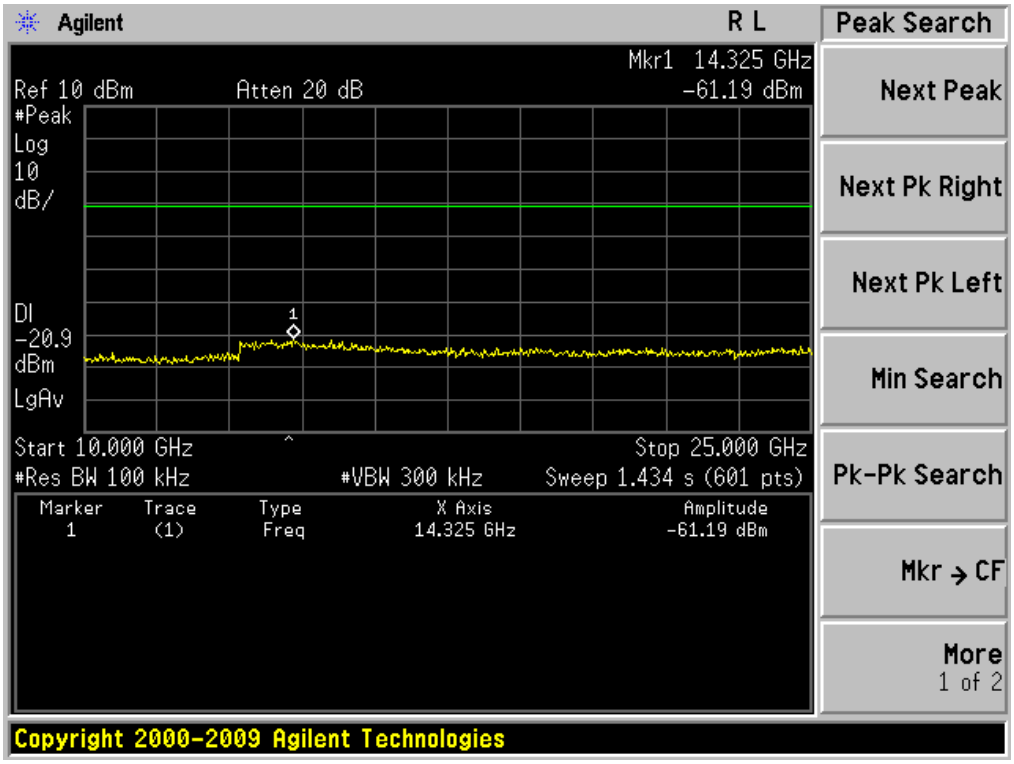


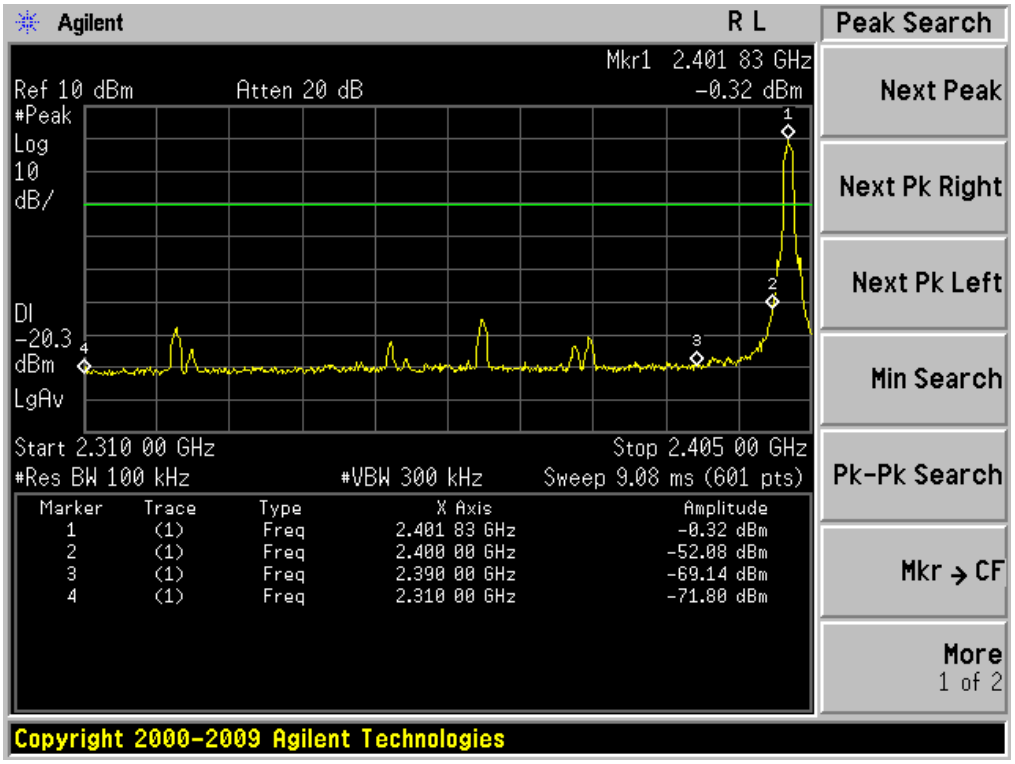
8DPSK Hopping on CHH :



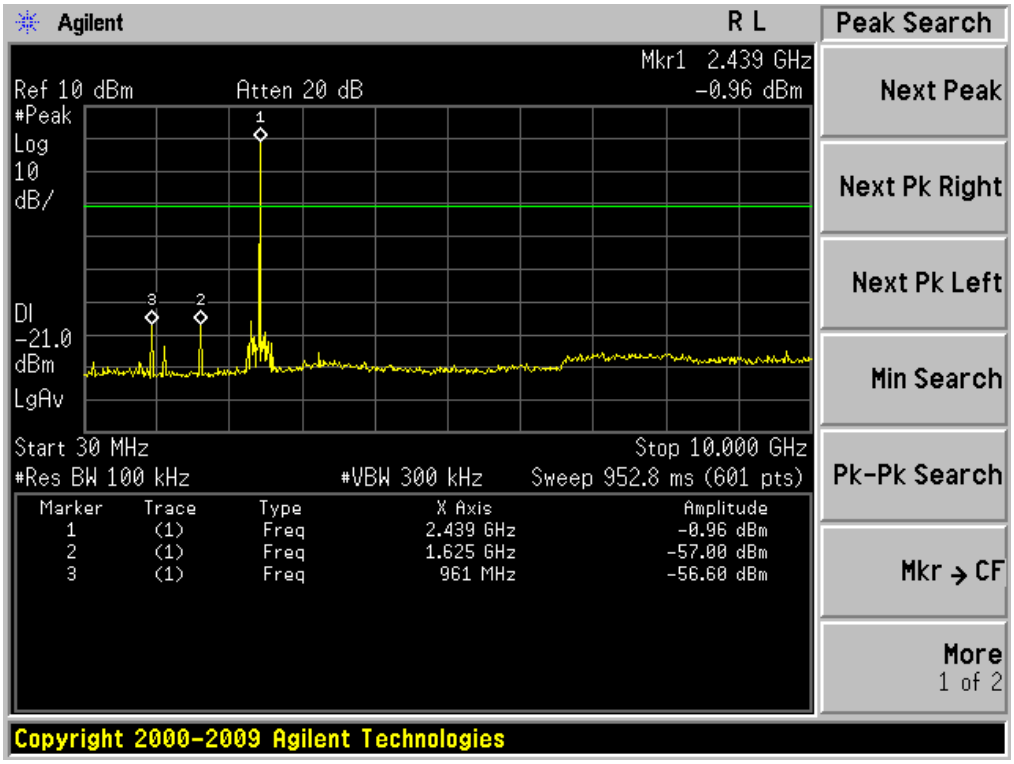
π /4 DQPSK Hopping off CHL :

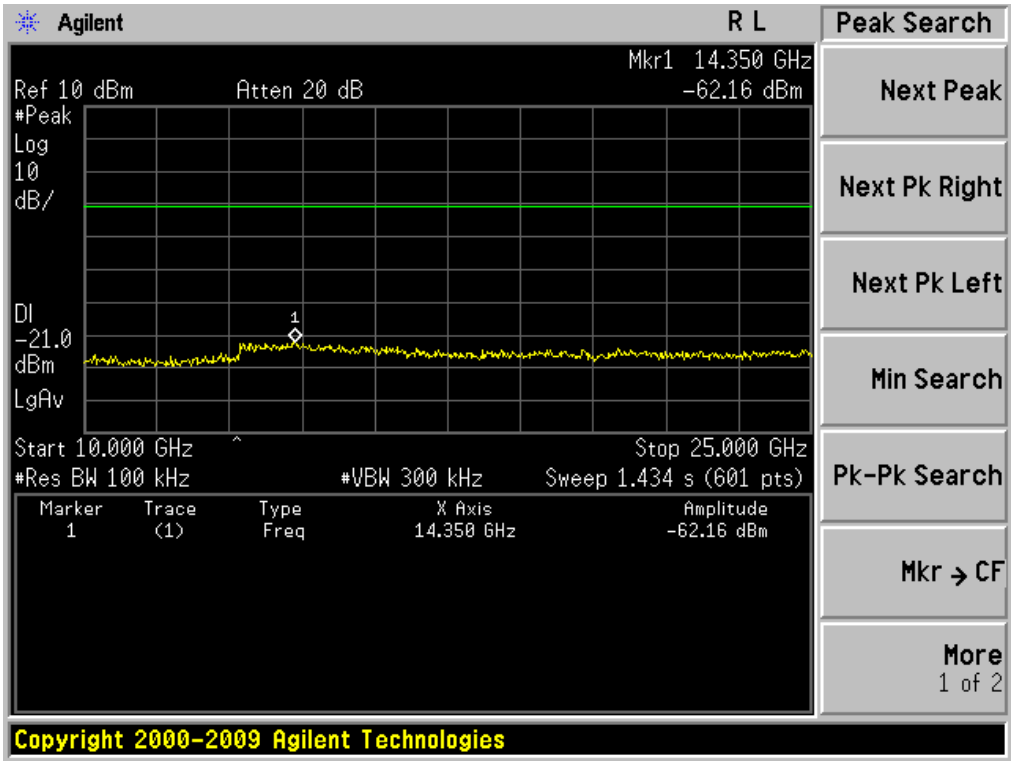




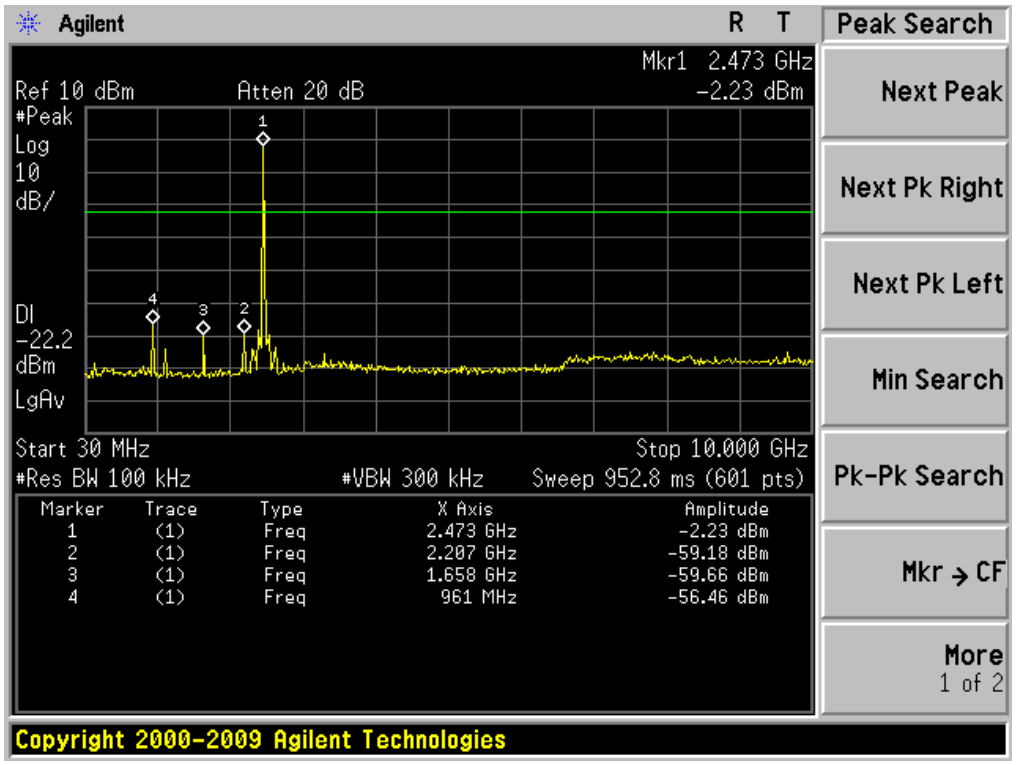

Agilent
R L
Peak Search
Mkr1 2.401 83 GHz
Ref 10 dBm
Atten 20 dB
-0.32 dBm
#Peak
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Dl
-20.3
dBm
LgAv
Start 2.310 00 GHz
Stop 2.405 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 9.08 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.401 83 GHz -0.32 dBm
2 (1) Freq 2.400 00 GHz -52.08 dBm
3 (1) Freq 2.390 00 GHz -69.14 dBm
4 (1) Freq 2.310 00 GHz -71.80 dBm
Copyright 2000-2009 Agilent Technologies

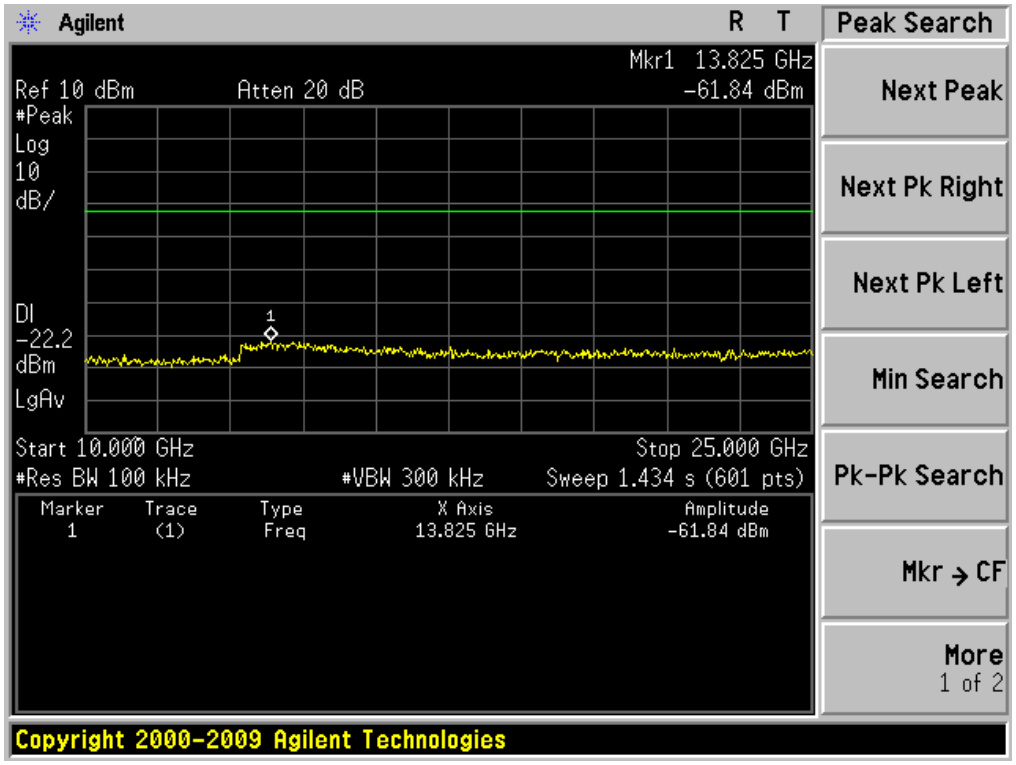
π /4 DQPSK Hopping off CHM :

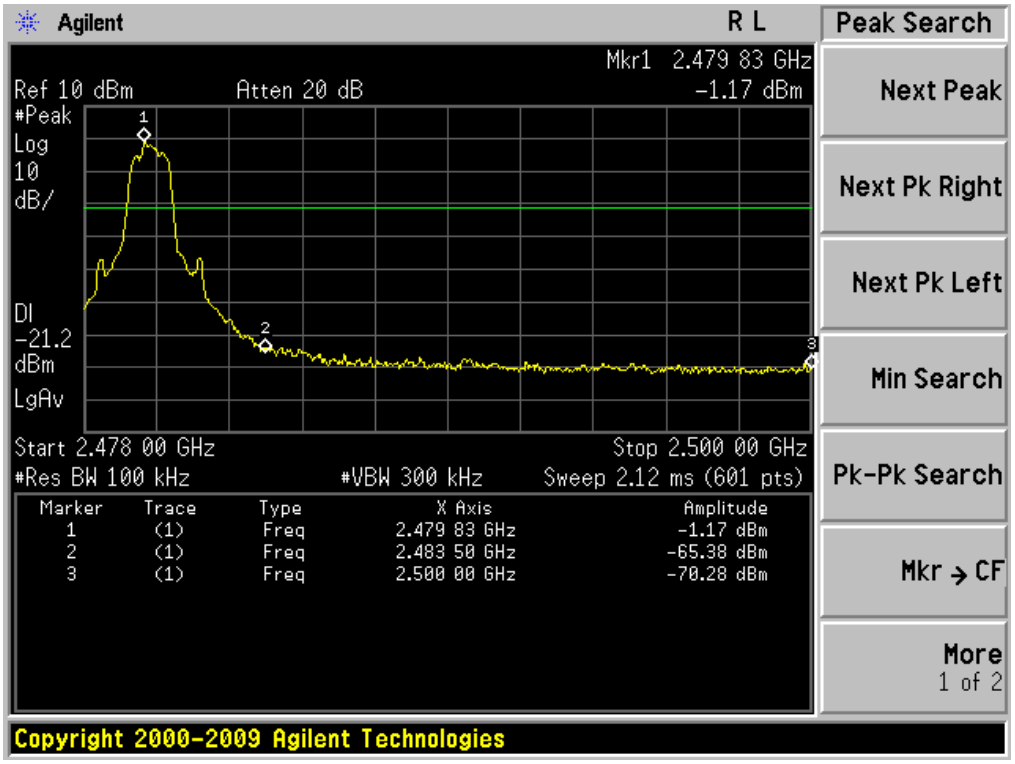




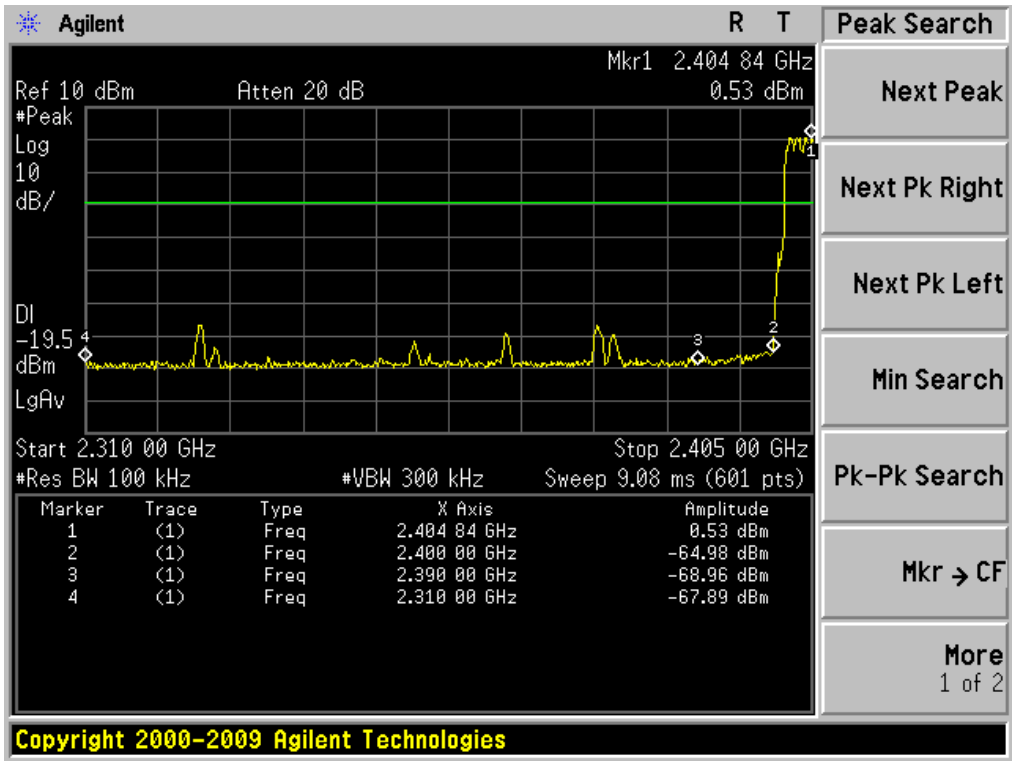
π /4 DQPSK Hopping off CHH :



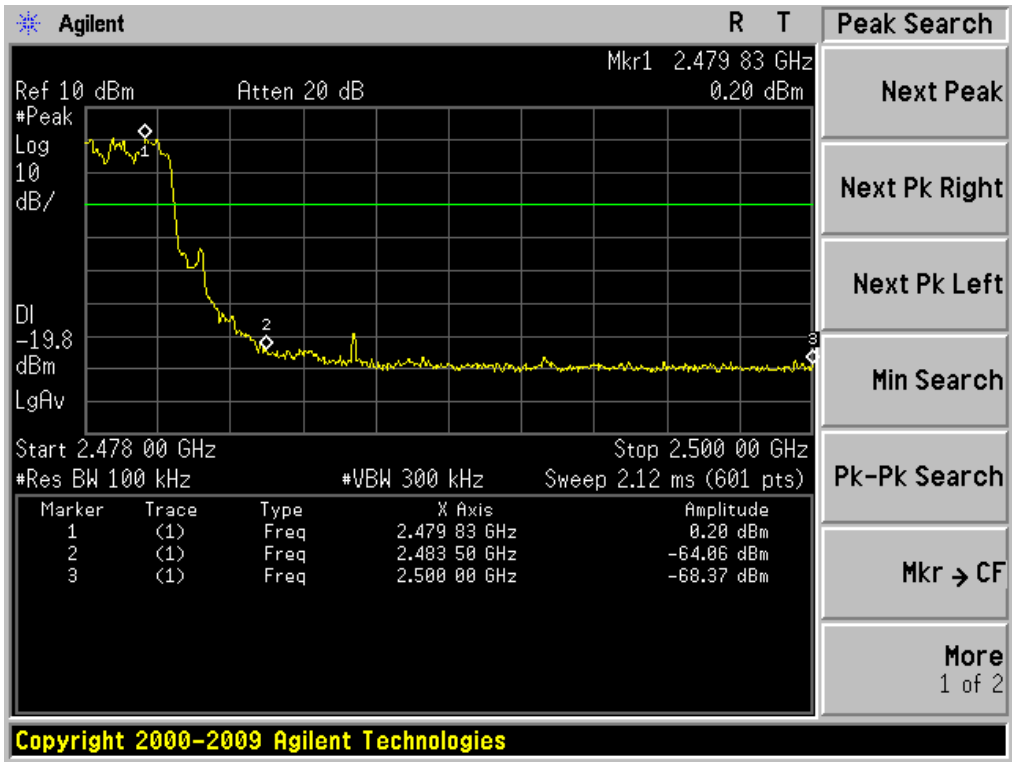



Agilent
R L
Peak Search
Mkr1 2.479 83 GHz
Ref 10 dBm
Atten 20 dB
-1.17 dBm
Next Peak
#Peak
Log
10
dB/
Next Pk Right
Next Pk Left
DI
-21.2
dBm
LgAv
Min Search
Start 2.478 00 GHz
Stop 2.500 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 2.12 ms (601 pts)
Pk-Pk Search
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.479 83 GHz -1.17 dBm
2 (1) Freq 2.483 50 GHz -65.38 dBm
3 (1) Freq 2.500 00 GHz -70.28 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2009 Agilent Technologies

π /4 DQPSK Hopping on CHL :



π /4 DQPSK Hopping on CHH :



9. Carrier Frequency Separation Test

9.1 Test Procedure

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

The peak detector was used with 100 kHz/300 kHz RBW/VBW

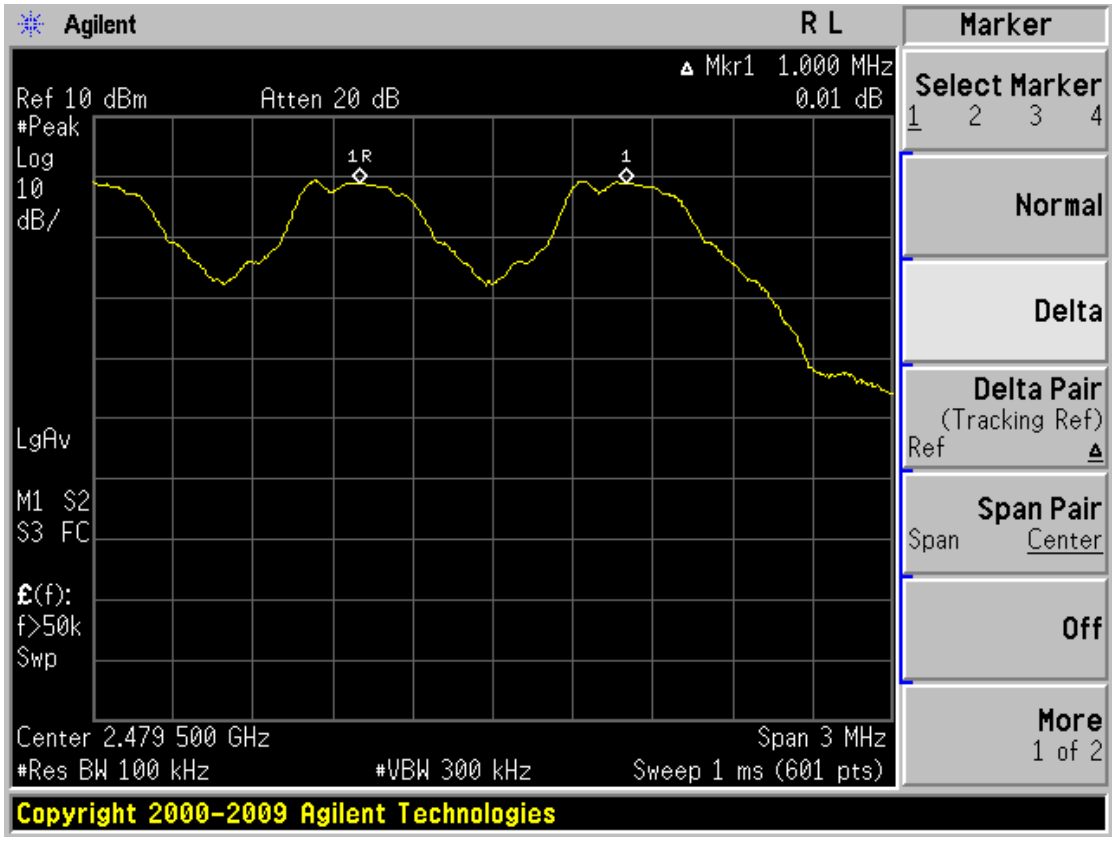
9.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	Dec. 04 2015	E4440A	GTS533	Agilent

9.3 Test Result

Widest channel bandwidth was **1308**kHz. So Two-thirds is **872**kHz and greater than 25kHz .

Result : Pass. Carrier Frequency Separation=1MHz[GFSK (worse case)] > **872**kHz



10. Output Power Test

10.1 Test Procedure

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 W. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 W.
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

10.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	Dec. 04 2015	E4440A	GTS533	Agilent

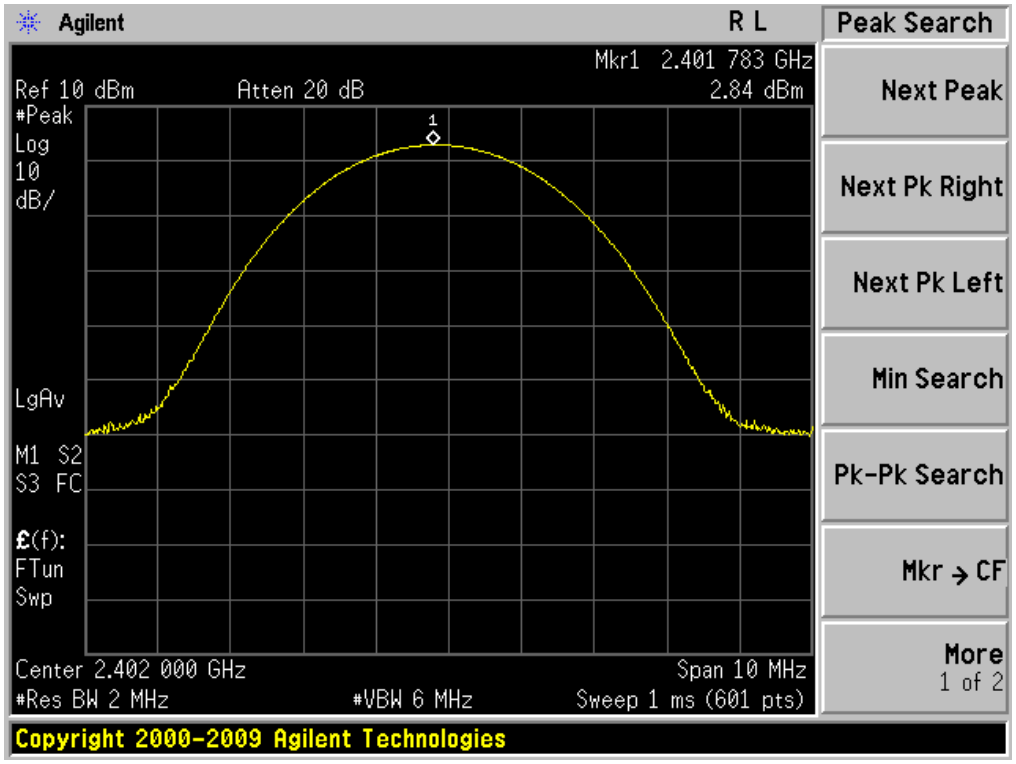
10.3 Test Result

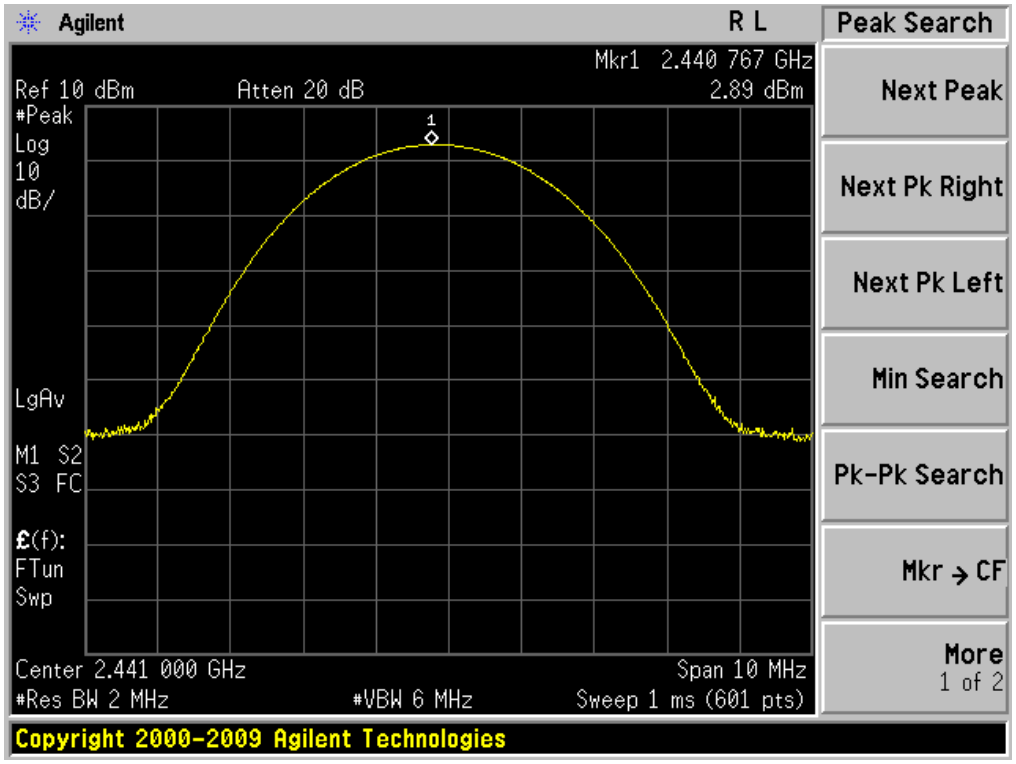
Remark : 1:RBW=2MHz VBW=6MHz PK detector for GFSK

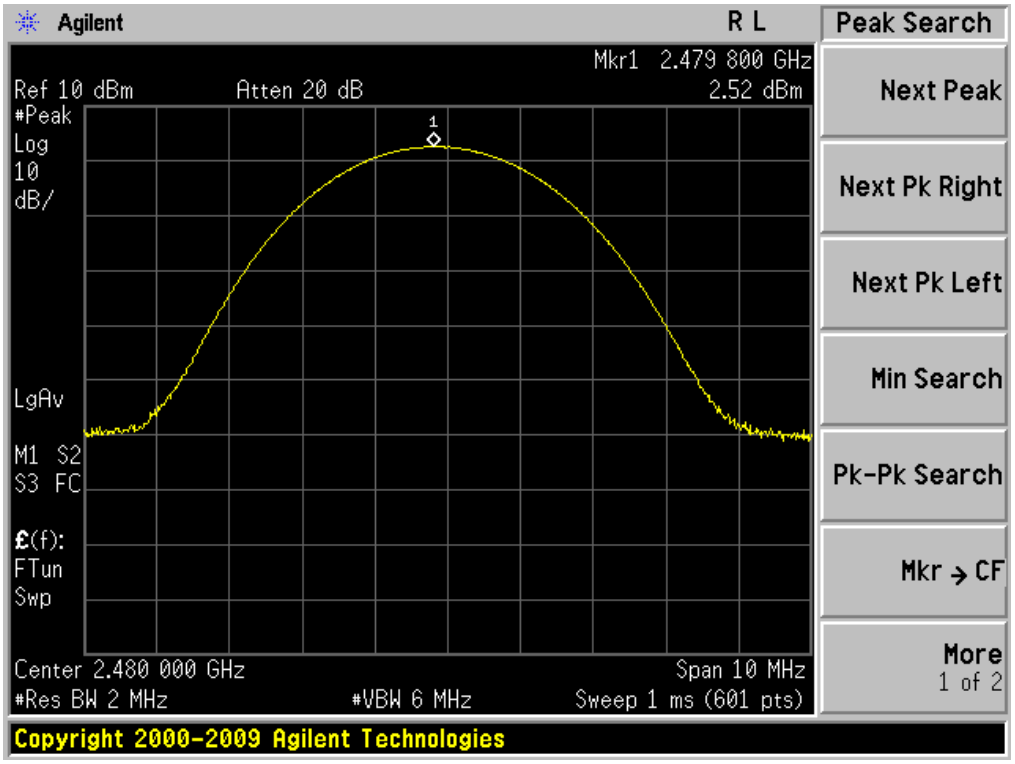
GFSK:

Frequency, MHz	Result Output power, dBm	<Power Limit, dBm
2402	2.84	30.00
2441	2.89	30.00
2480	2.52	30.00

Diagram of GFSK is as below:





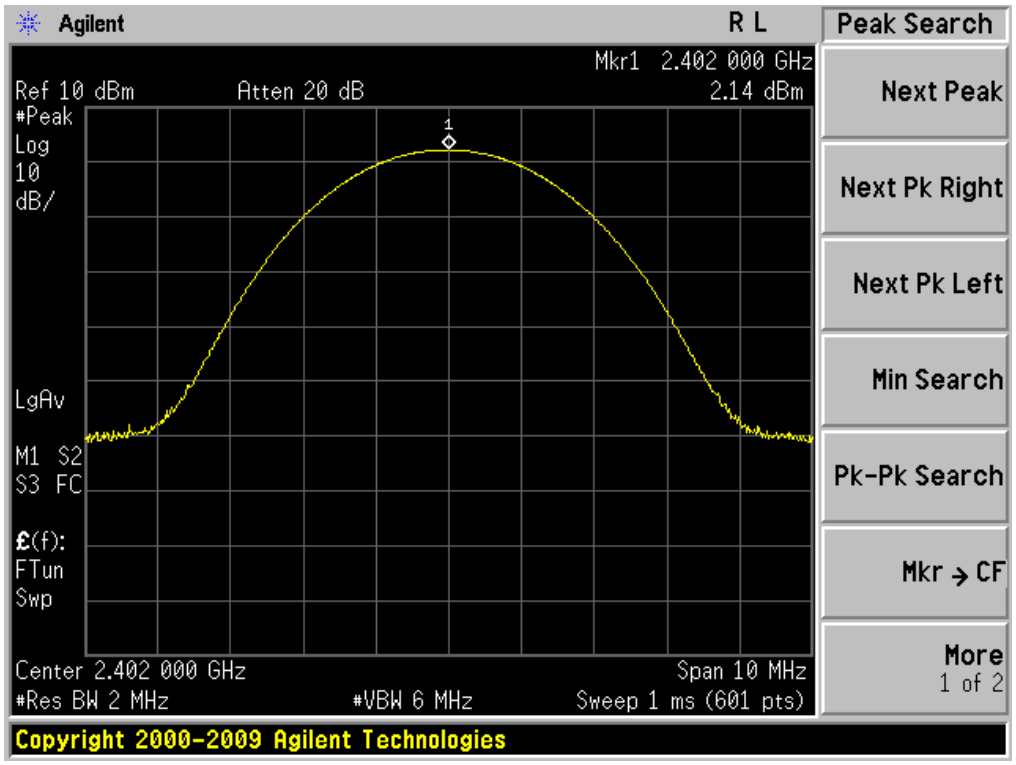

Agilent
R L
Peak Search
Mkr1 2.479 800 GHz
2.52 dBm
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.480 000 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2009 Agilent Technologies

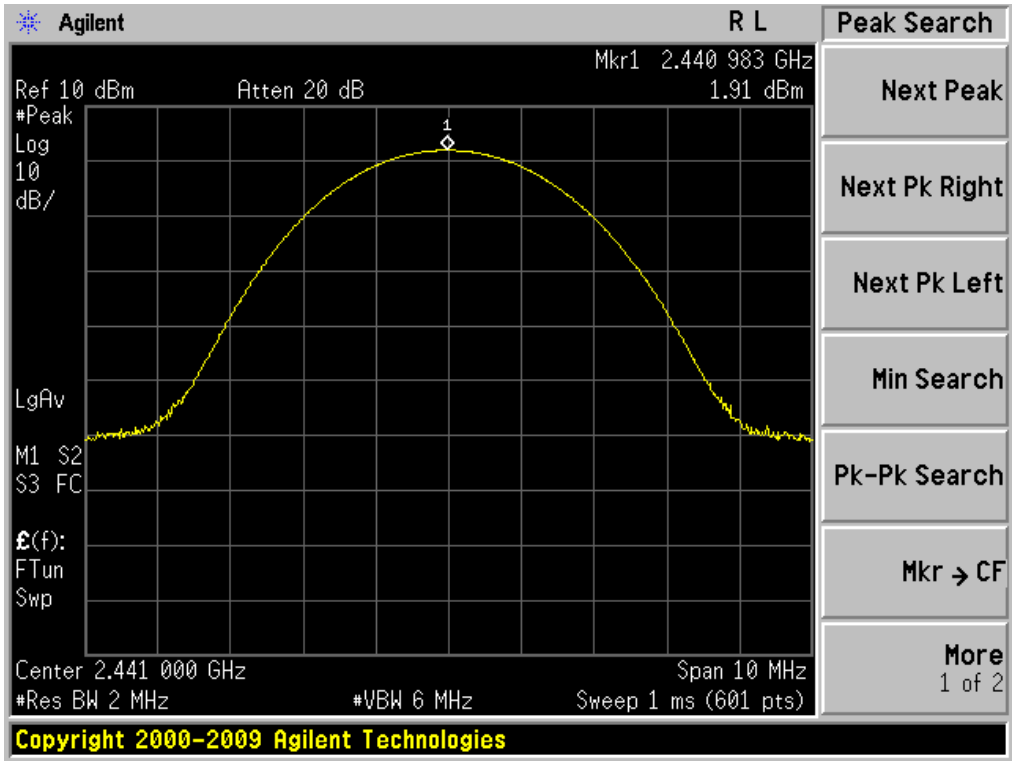
Remark : 1:RBW=2MHz VBW=6MHz PK detector for 8DPSK

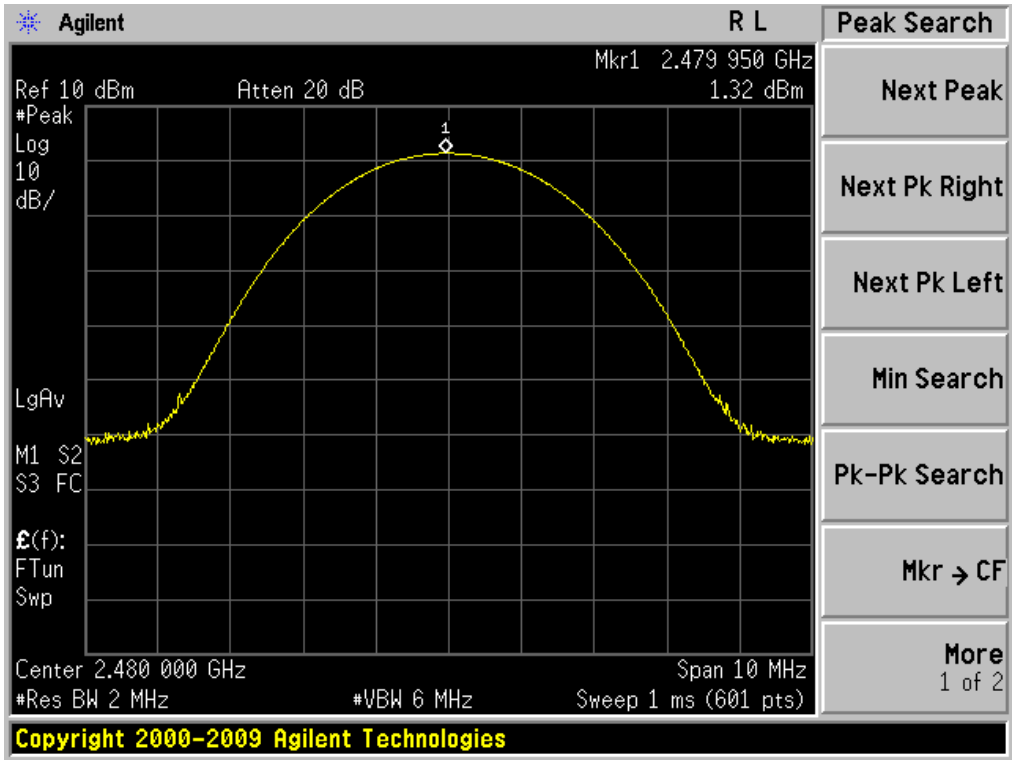
8DPSK:

Frequency, MHz	Result Output power, dBm	<Power Limit, dBm
2402	2.14	30.00
2441	1.91	30.00
2480	1.32	30.00

Diagram of 8DPSK is as below:




Agilent
R L
Peak Search
Mkr1 2.440 983 GHz
1.91 dBm
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.441 000 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2009 Agilent Technologies

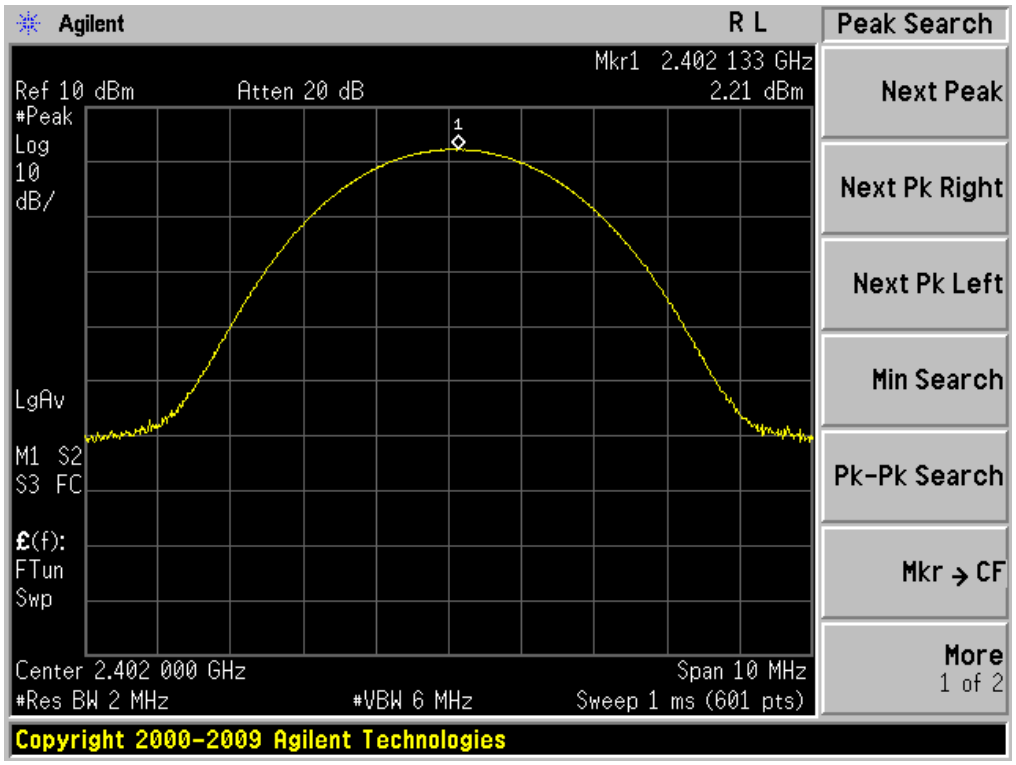

Agilent
R L
Peak Search
Mkr1 2.479 950 GHz
1.32 dBm
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.480 000 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2009 Agilent Technologies

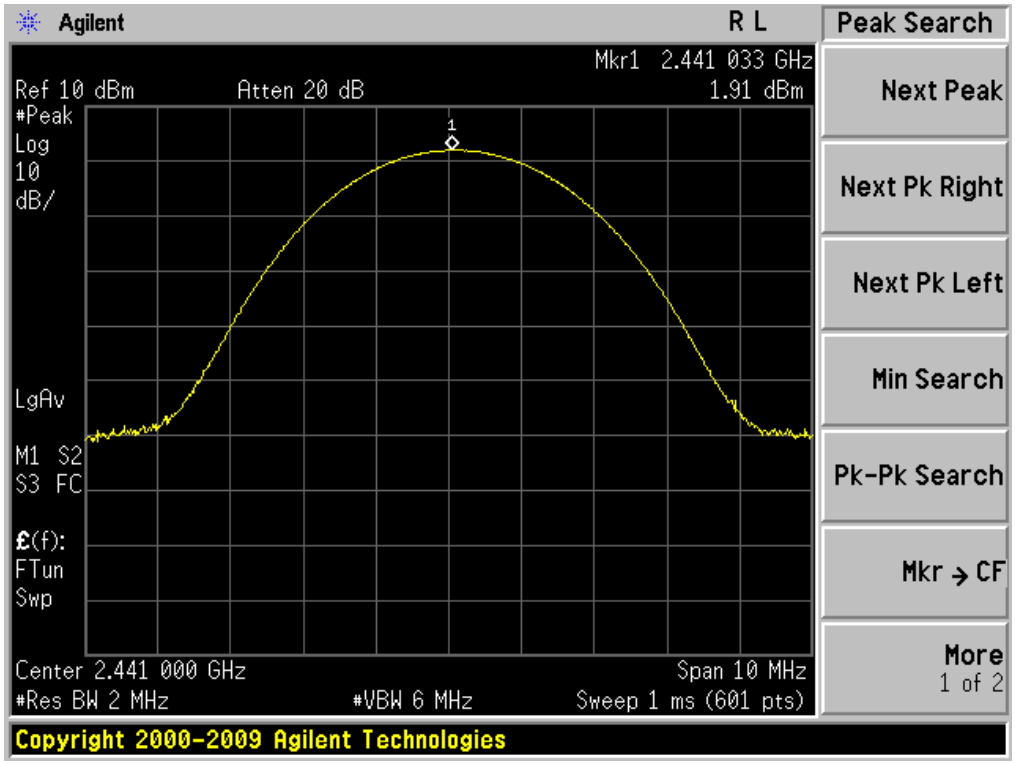
Remark : 1:RBW=2MHz VBW=6MHz PK detector for π/4 DQPSK

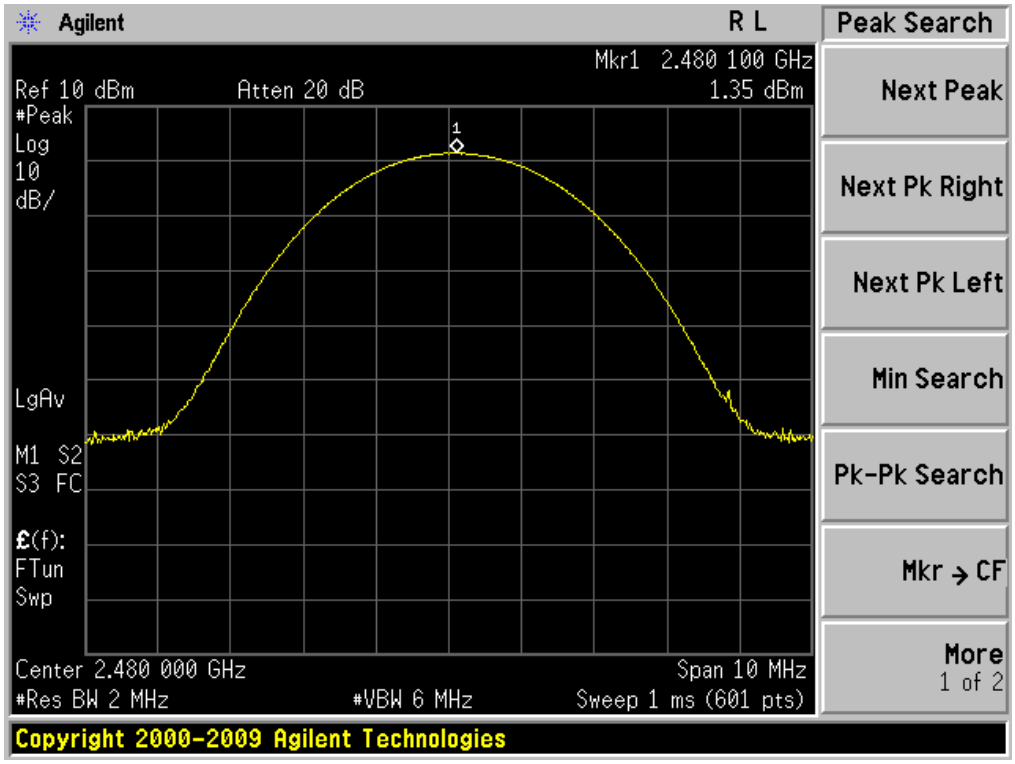
π/4 DQPSK:

Frequency, MHz	Result Output power, dBm	<Power Limit, dBm
2402	2.21	30.00
2441	1.91	30.00
2480	1.35	30.00

Diagram of π/4 DQPSK is as below:




Agilent
R L
Peak Search
Mkr1 2.441 033 GHz
1.91 dBm
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.441 000 GHz
#Res BW 2 MHz
#VBW 6 MHz
Span 10 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2009 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 2.480 100 GHz
1.35 dBm
Ref 10 dBm
Atten 20 dB
#Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.480 000 GHz
#Res BW 2 MHz
#VBW 6 MHz
Span 10 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2009 Agilent Technologies

11. NUMBER OF HOPPING FREQUENCY TEST

11.1 Test Procedure

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 1 5 channels are used.

11.2 Measurement Equipment

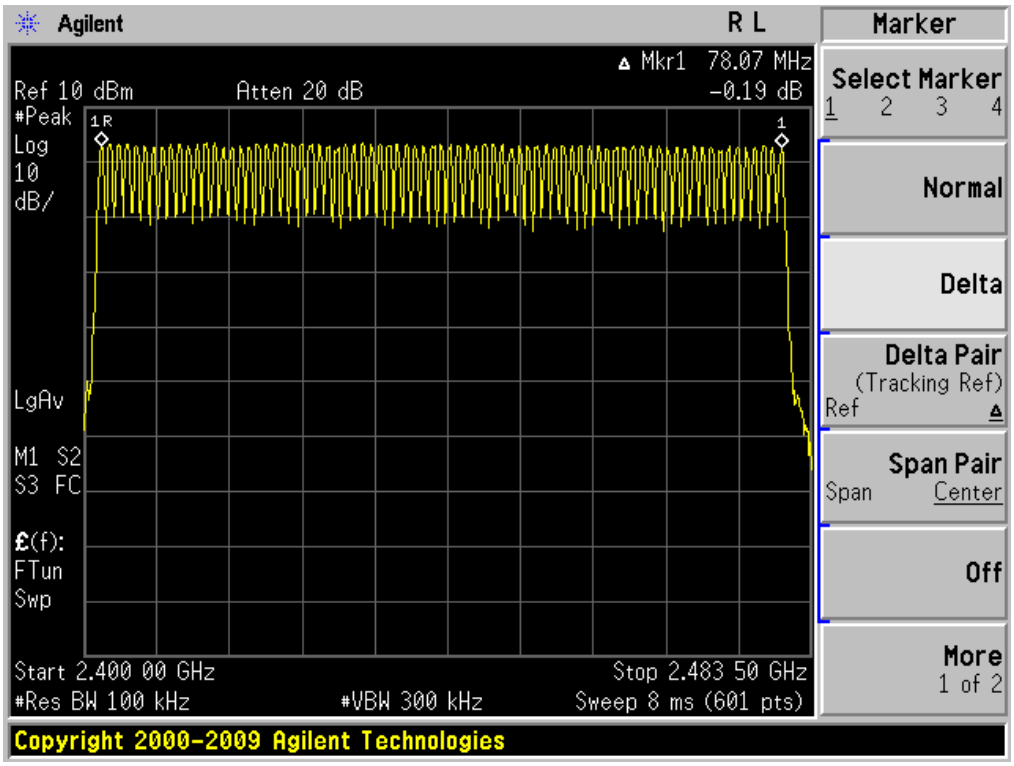
	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	Dec. 04 2015	E4440A	GTS533	Agilent

11.3 Test Result

Test mode: Transmitter Hopping on

Number of channels used	Minimum number of channels limit	Margin
79	15	64

11.3.1 Diagram



12. DWELL TIME TEST

12.1 Test Procedure

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

12.2 Measurement Equipment

	Equipment	Calibration due	Type	Serial No.	Manufacturer
☒	Spectrum Analyzer	Dec. 04 2015	E4440A	GTS533	Agilent

12.3 Test Result

Limit:

Total time of occupancy is 0.4 s within a period of time equals number of hopping channels employed multiplied by 0.4 s, which is 0.4 s within the period of time 0.4 × 79 = 31.6 s

Remark:

DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, total hops is 10.12 x 31.6 = 320

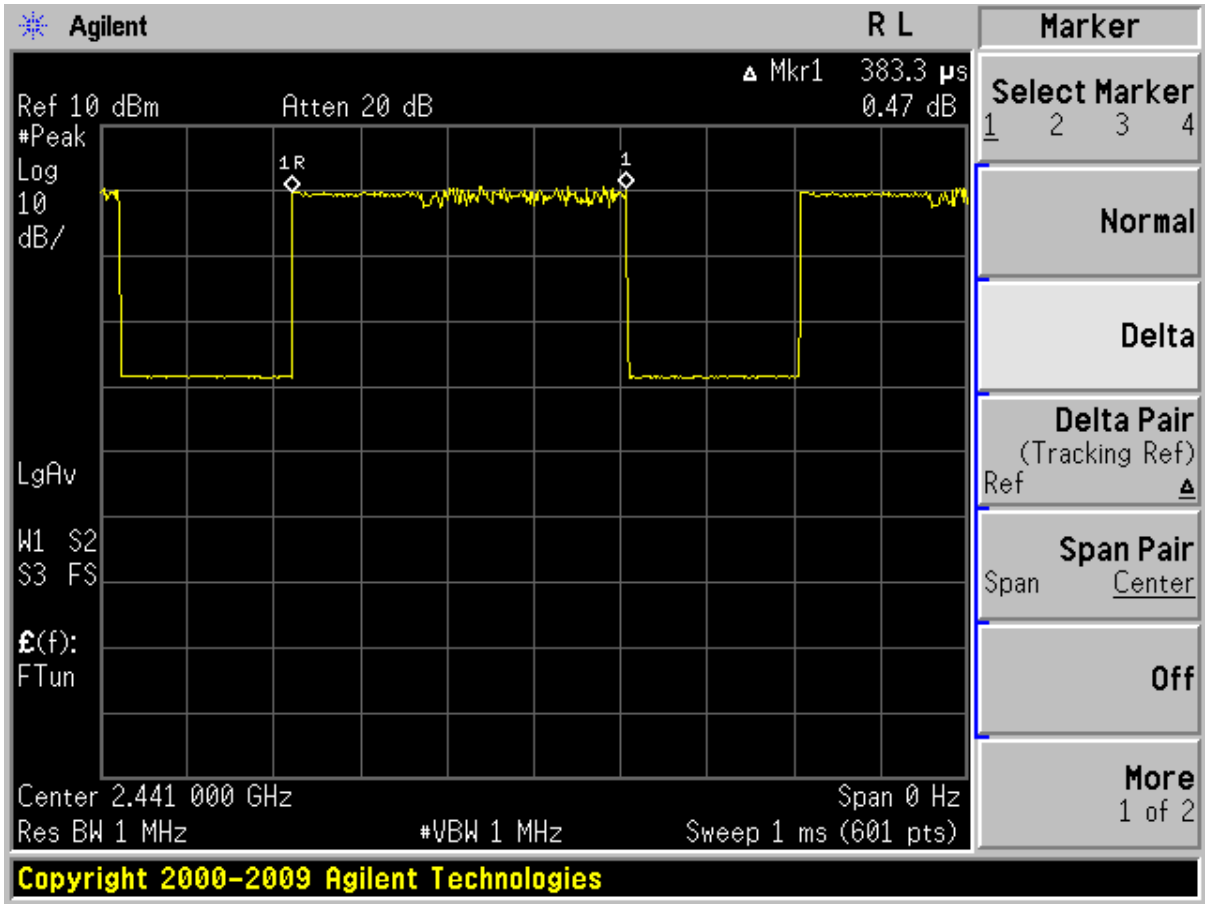
DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, total hops is 5.06 x 31.6 = 160

DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, total hops is 3.37 x 31.6 = 106.6

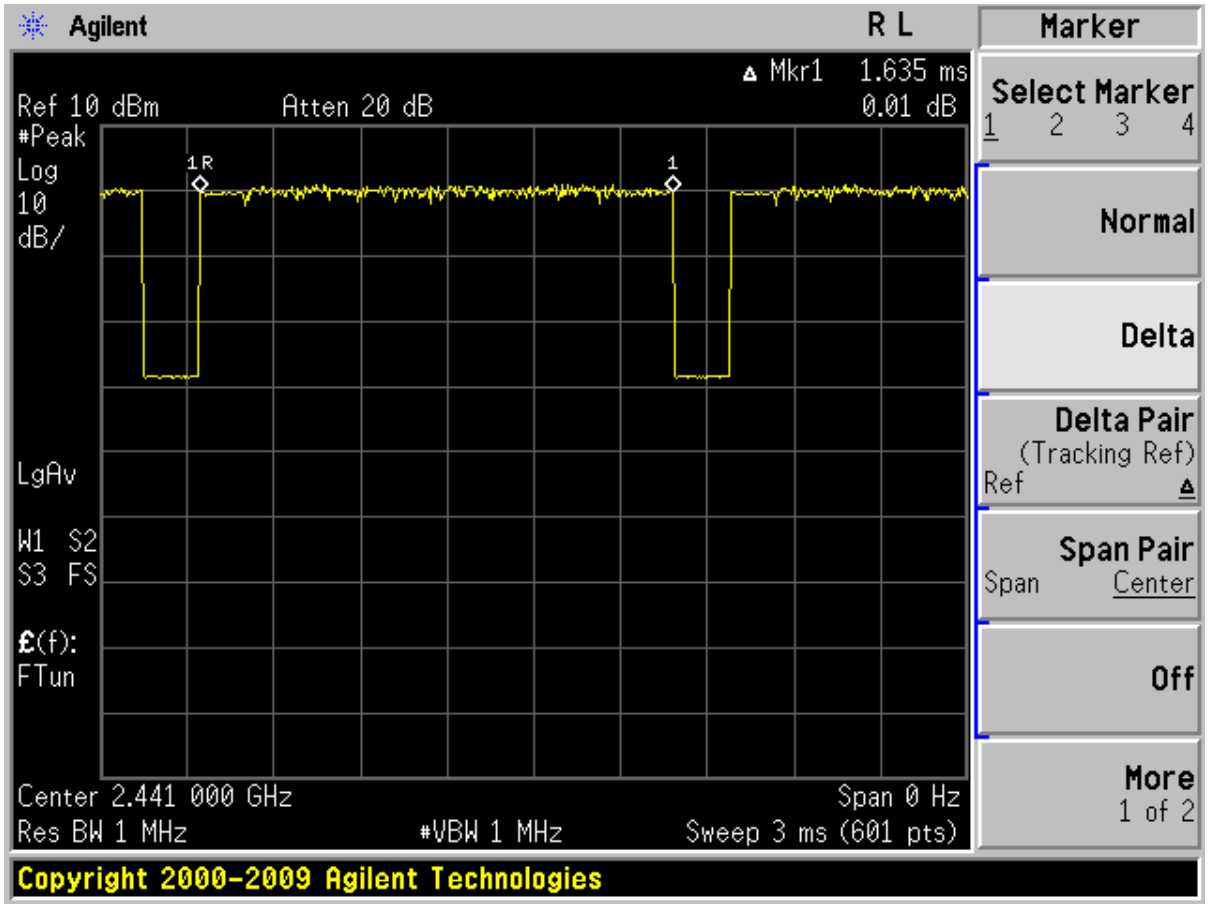
8DPSK

Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-1	122.656	400	320x 0.3833
DH3	11-2	261.600	400	160x 1.635
DH5	11-3	308.287	400	106.6x 2.892

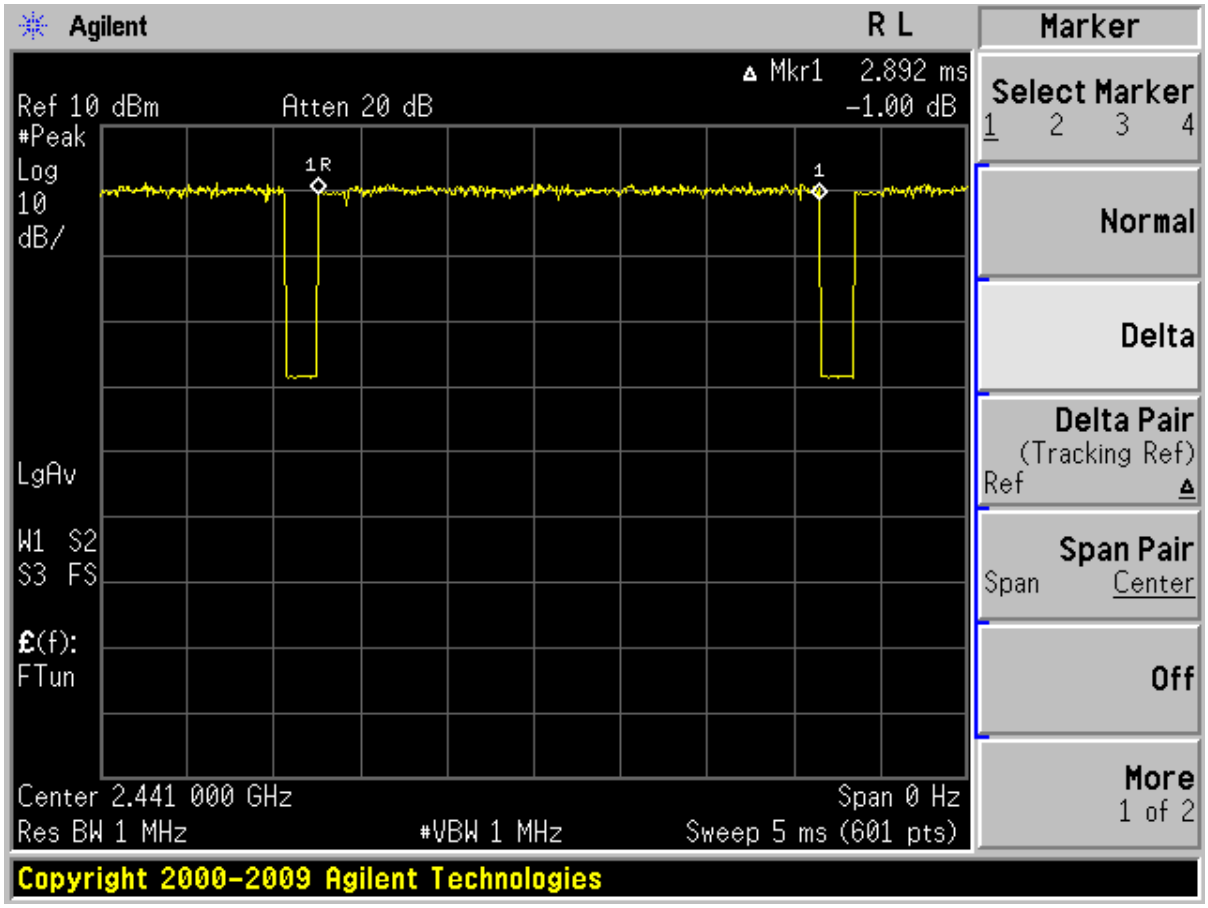
12.3.1 Diagram 11-1



12.3.2 Diagram 11-2



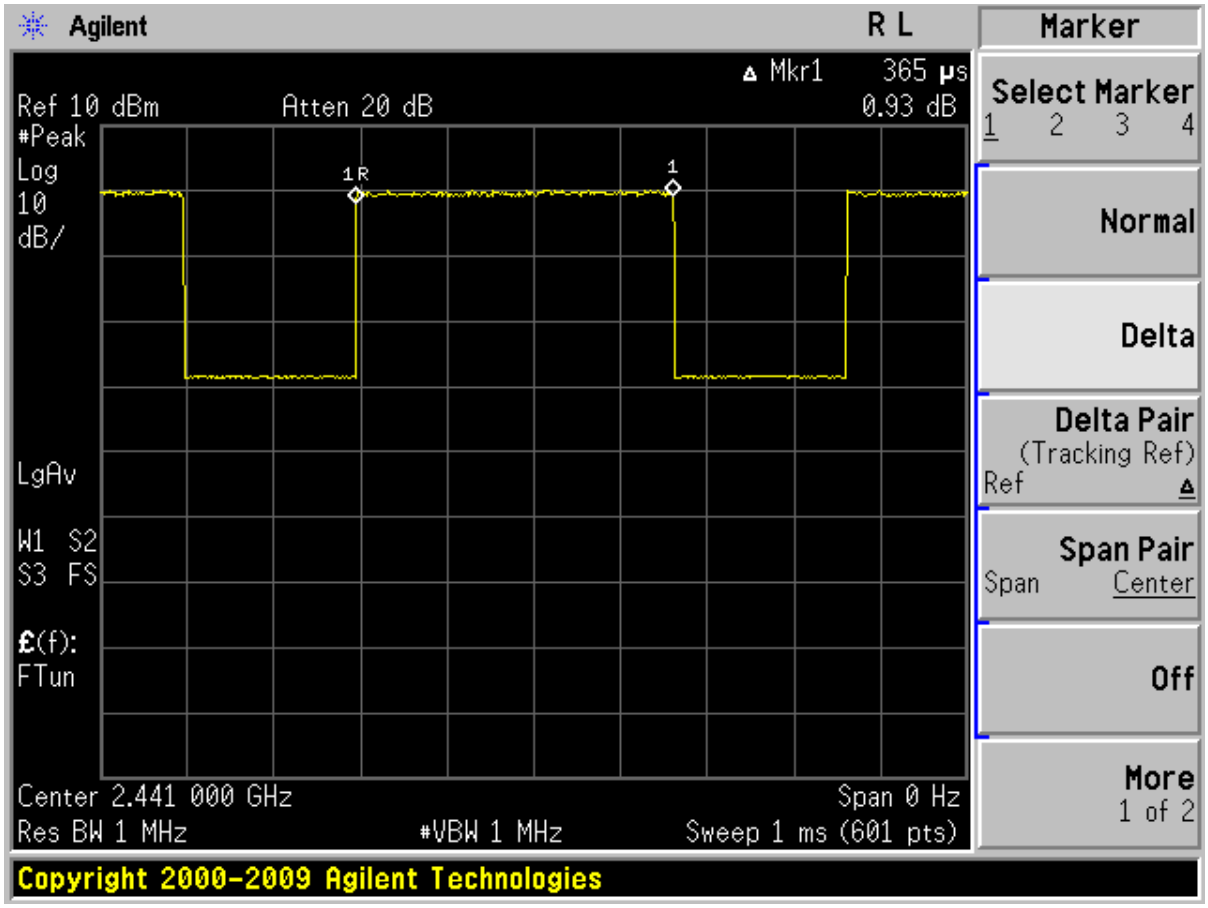
12.3.3 Diagram 11-3



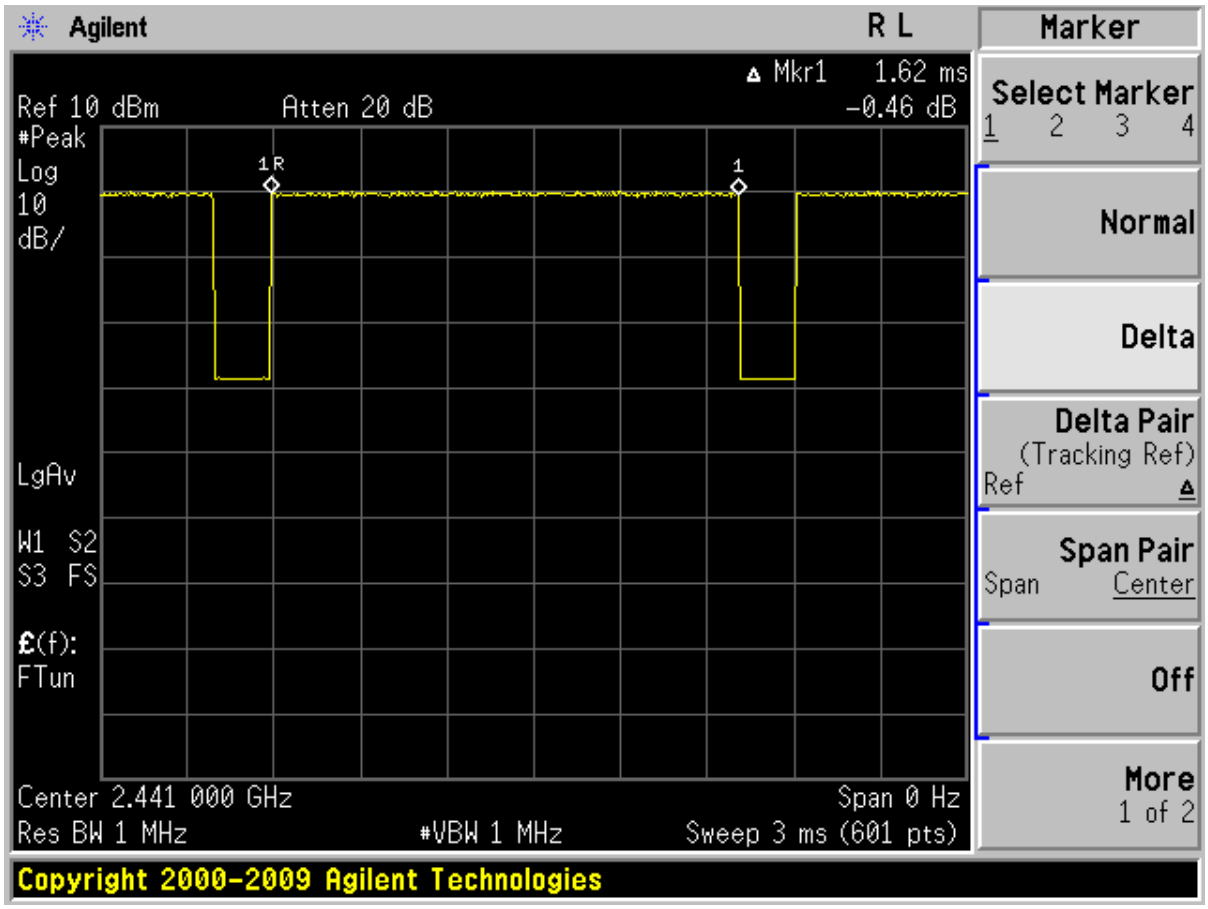
GFSK

Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-4	116.800	400	320x 0.365
DH3	11-5	259.200	400	160x 1.62
DH5	11-6	306.475	400	106.6x 2.875

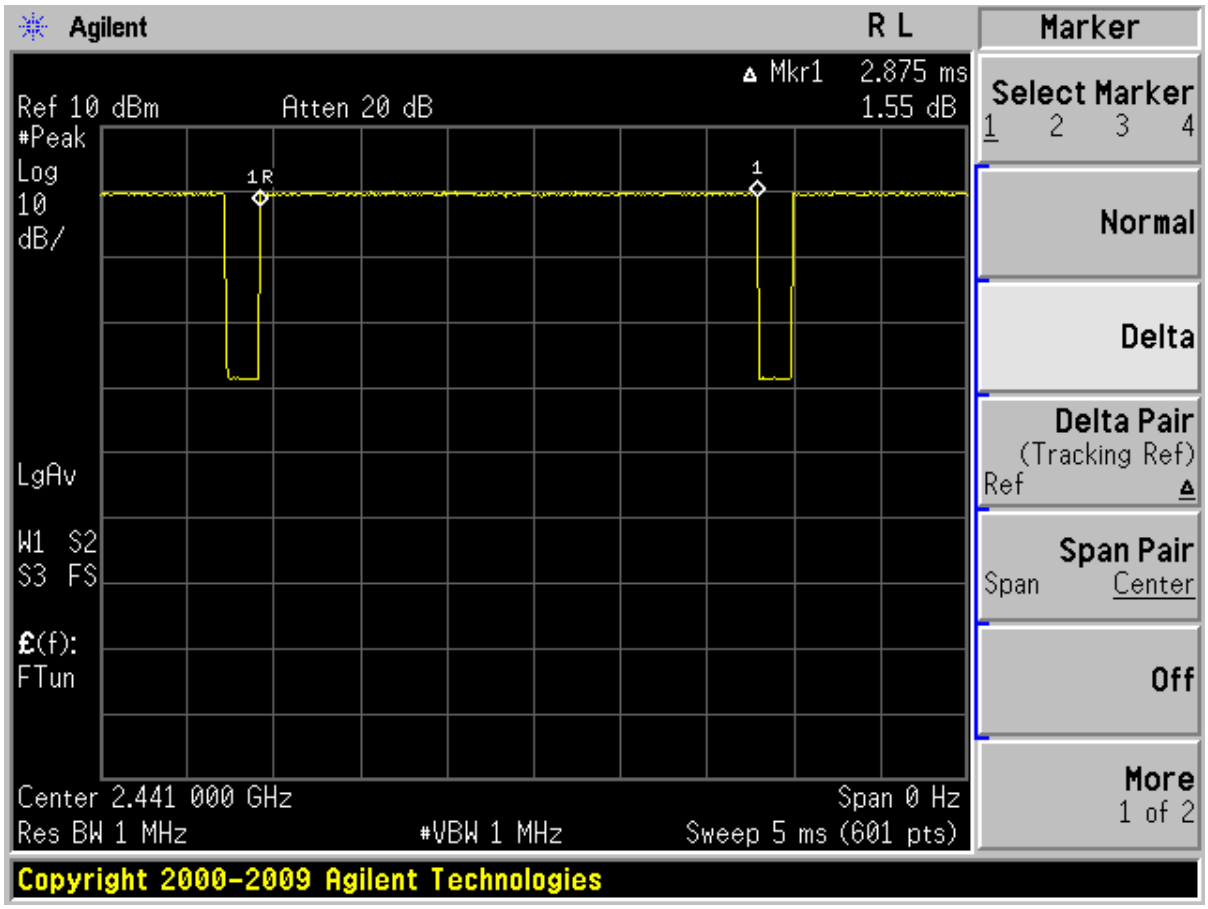
12.3.4 Diagram 11-4



12.3.5 Diagram 11-5



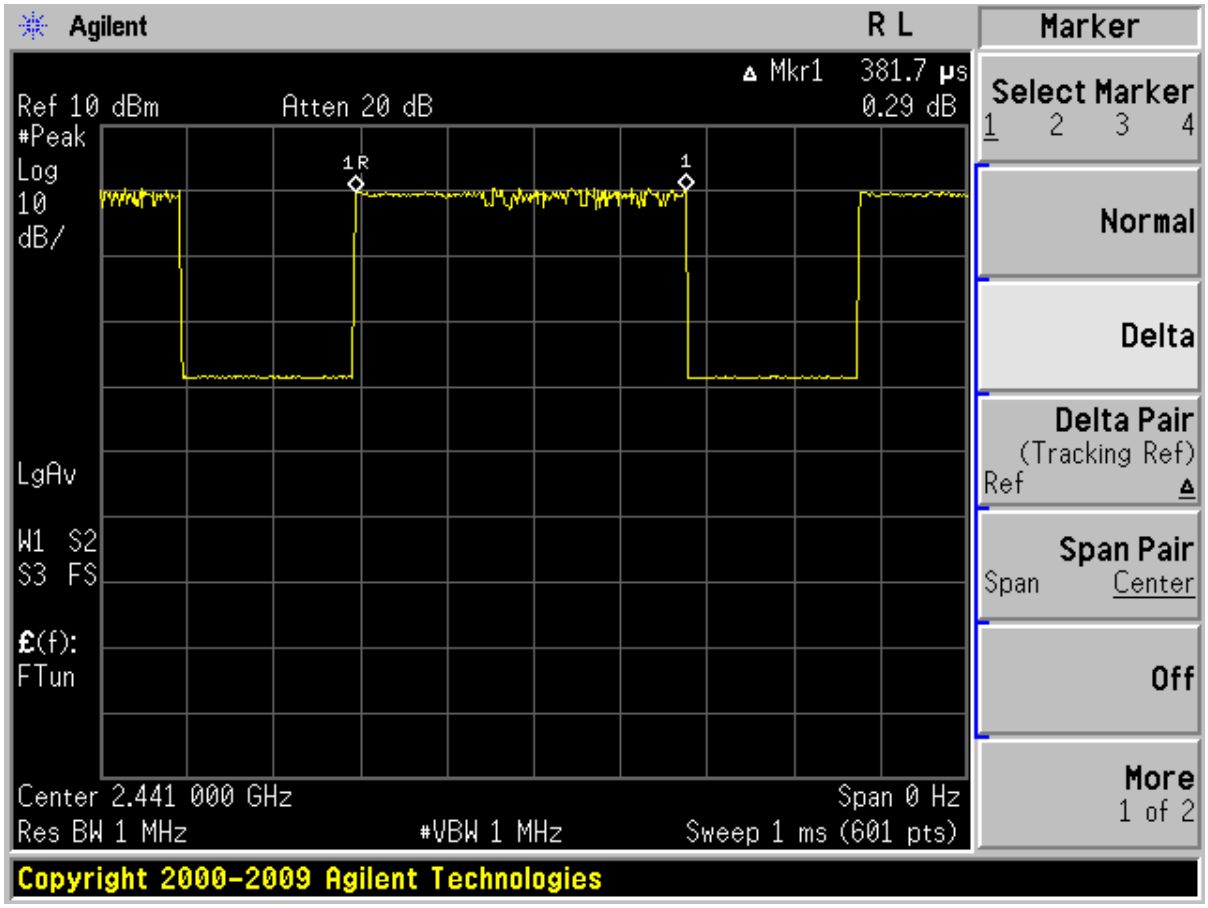
12.3.6 Diagram 11-6



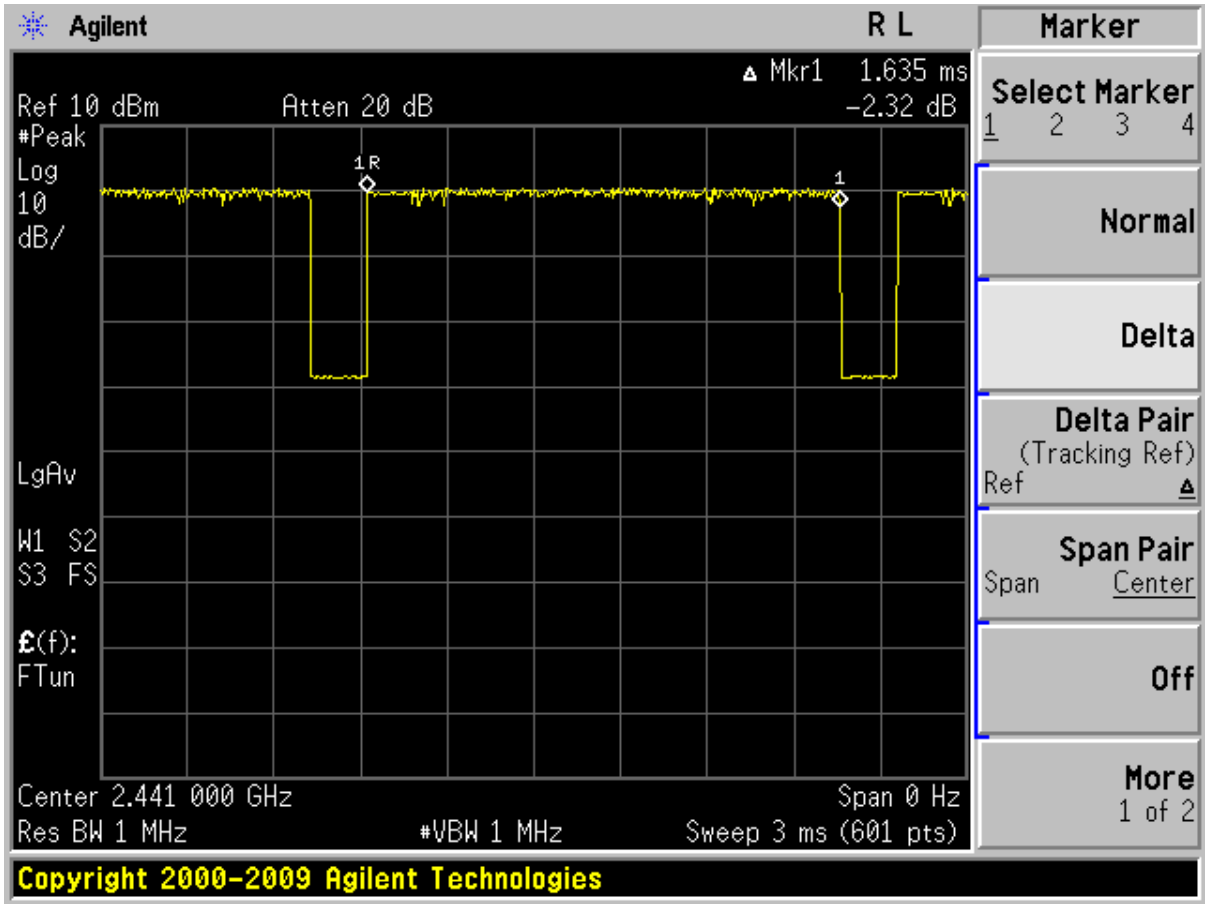
π/4 DQPSK

Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-7	122.144	400	320x 0.3817
DH3	11-8	261.600	400	160x 1.635
DH5	11-9	307.328	400	106.6x 2.883

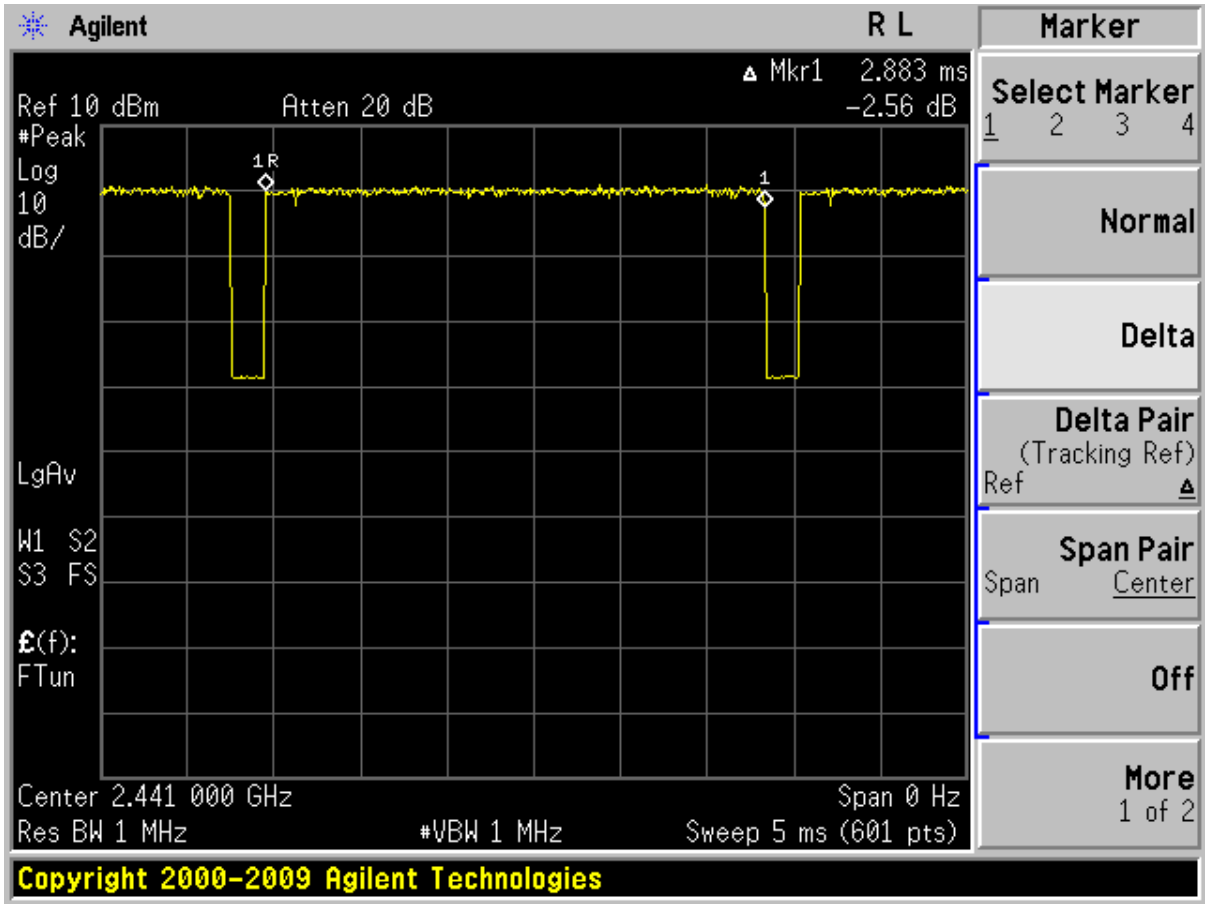
12.3.7 Diagram 11-7



12.3.8 Diagram 11-8



12.3.9 Diagram 11-9



13 Antenna requirement

13.1 Requirement

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 (b), 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.

13.2 Result

The antenna used for this product is Internal Patch antenna that no antenna other than that furnished by the responsible party shall be used with the device, The Antenna gain of this antenna is 1.31 dBi.

******END OF REPORT******