FCC Test Report

FCC EVALUATION REPORT FOR CERTIFICATION	
Project Reference No.	231034
Product	BlueTooth Speaker
Brand Name	N/A
Model	BS1130US
Alternate Model	N/A
Tested according to	FCC Rules and Regulations Part 15 Subpart C 2012 15.247, ANSI C63.4-2003

Tested in period	2013-02-04
Issued date	2013-02-20
Name and address of the Test House	Nemko Shanghai Ltd. 9A No. 528 Ruiqing Road, PuDong New Area, Shanghai, China P.C. Phone : +86 21 5072 0988 Fax : +86 21 5072 0950
Tested by	2013-02-04
Zone Peng	***date***
Verified by	2013-02-20
Daria Liu	***date***

Contents of This Report

1. Client Information

1.1 Applicant

Company Name:	**Acoustic Arc international Ltd.**
Company Address:	**Unit 311B, 3/F., IC Development Centre,6 Science Park West Avenue, Hong Kong Science Park,Shatin,New Territories, Hong Kong**

1.2 Manufacturer

Company Name:	**Acoustic Arc international Ltd.**
Company Address:	**Unit 311B, 3/F., IC Development Centre,6 Science Park West Avenue, Hong Kong Science Park,Shatin,New Territories, Hong Kong**

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 15C.

2. Equipment under Test (EUT)

2.1 Identification of EUT

Category:	BlueTooth Speaker
Model Name:	BS1130US
Alternate model:	N/A
Brand name:	N/A
Technical data (Rating, etc.):	As below

2.2 Detail spec:

Carrier Frequency：2402MHz~2480MHz

Number of Channel：79

Output Power：5.78dBm

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

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

Antenna Type：Intergral Antenna

Antenna gain：0 dBi

AC ADAPTER:
Trade mark :KPTEC
Model :K15S090110U
Input: 100-240Vac 50/60Hz 0.5A Cl.II
Output: 9.0VDC 1.1A

2.3 Additional Information Related to Testing

CHL : CH 1 2402MHz

CHM : CH 39 2441MHz

CHH : CH 79 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-1

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	20-25°C	15 – 35 ºC
Relative humidity	45-55%	30 - 60%
Atmospheric pressure	101.2 kPa -101.3kPa	86-106kPa

3.3 Operating During Test

Test mode:120VAC 60Hz

TM1 : continuance TX MODE GFSK CH 1

TM2 : continuance TX MODE GFSK CH 39

TM3: continuance TX MODE GFSK CH 79

TM4: continuance TX MODE 8DPSK CH 1

TM5: continuance TX MODE 8DPSK CH 39

TM6: continuance TX MODE 8DPSK CH 79

TM7: continuance TX MODE π/4 DQPSK CH 1

TM8: continuance TX MODE π/4 DQPSK CH 39

TM9: continuance TX MODE π/4 DQPSK CH 79

TM10: Hopping on CH 1

TM11: Hopping on CH 79

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.
And 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.

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. Radiated Electromagnetic Disturbances

5.1 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 (for CW mode only) .

Test at CW mode

5.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	EMI Test Receiver	Jul. 04 2012	ESU26	GTS203	R&S
☒	BiConiLog Antenna	Feb. 26 2013	VULB9163	GTS214	SCHWARZBECK
☒	Horn Antenna	Feb. 26 2013	BBHA9120D	GTS215	SCHWARZBECK
☒	Horn Antenna	Feb. 26 2013	BBHA9170	GTS216	SCHWARZBECK
☒	Coaxial Cable	Apr. 01 2012	N/A	GTS213	GTS
☒	Coaxial Cable	Apr. 01 2012	N/A	GTS211	GTS
☒	Coaxial cable	Apr. 01 2012	N/A	GTS210	GTS
☒	Coaxial Cable	Apr. 01 2012	N/A	GTS212	GTS
☒	Amplifier	Jul. 04 2012	8347A	GTS204	HP

5.3 Test Result

Connect mode	Antenna Polarity	Remark	Test Data	Test Result
CHL	Horizontal	30MHz-25GHz	Diagram 5-1	Pass
	Vertical	30MHz-25GHz	Diagram 5-2	Pass
CHM	Horizontal	30MHz-25GHz	Diagram 5-3	Pass
	Vertical	30MHz-25GHz	Diagram 5-4	Pass
CHH	Horizontal	30MHz-25GHz	Diagram 5-5	Pass
	Vertical	30MHz-25GHz	Diagram 5-6	Pass

Remark:

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

1) All modes of operation were investigated and GFSK found as the worst -case emission and is reported.
2) All restriction band have been tested at both CHL,M and H with GFSK ,8DPSK andπ/4 DQPSK modulation , only reported the worse case as plots shown as below

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 :

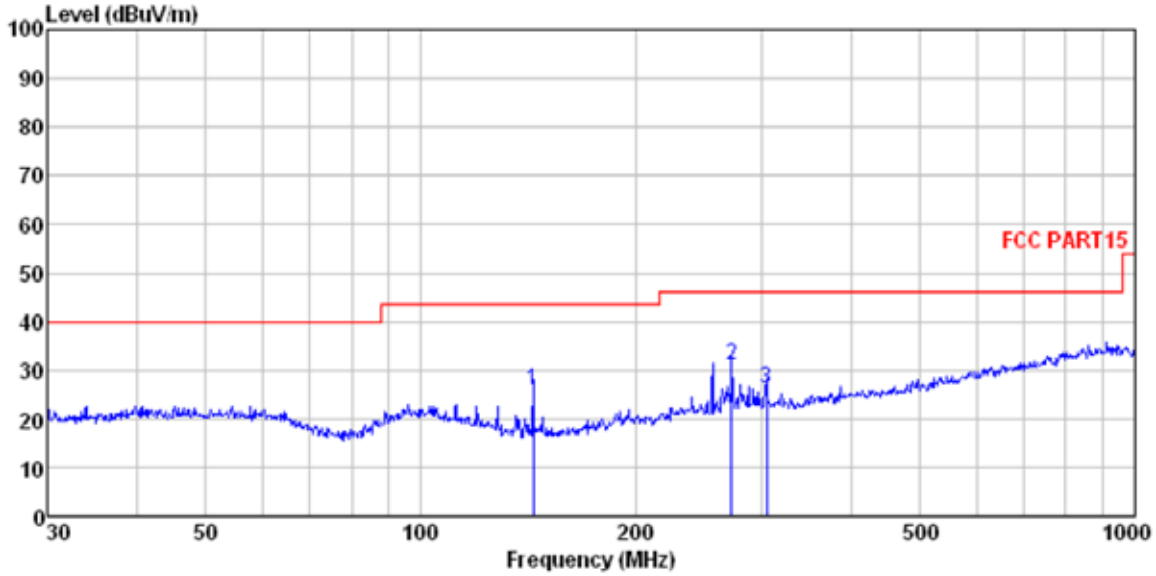
The limit of 15.209(a) of 3 meter distance is

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)		/	/

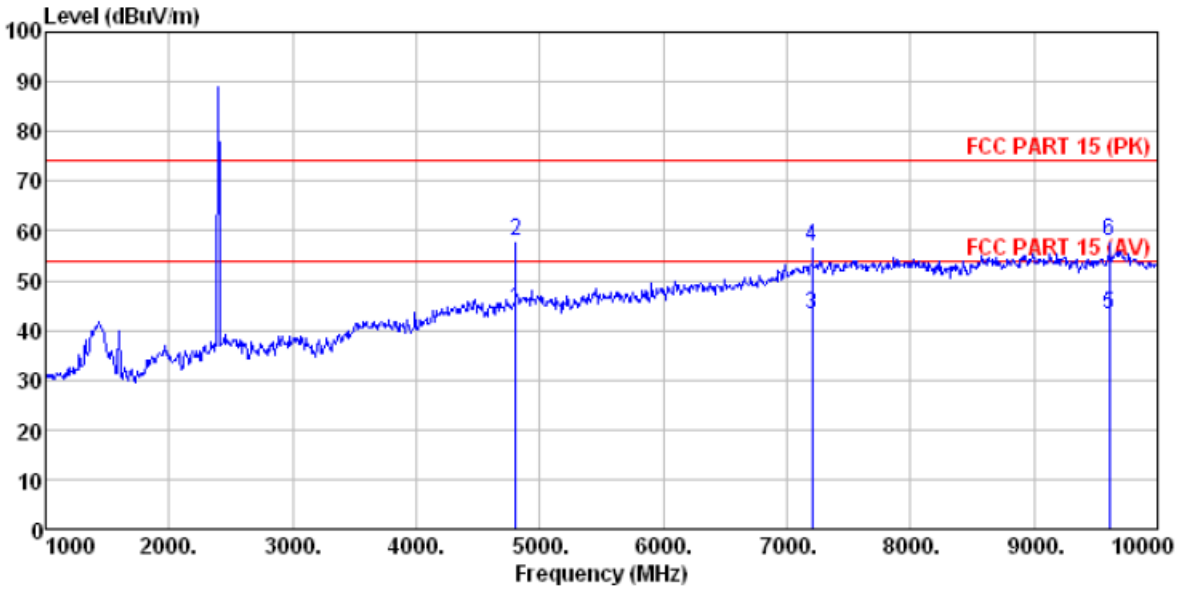
15.205 Restricted bands of operation:

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])

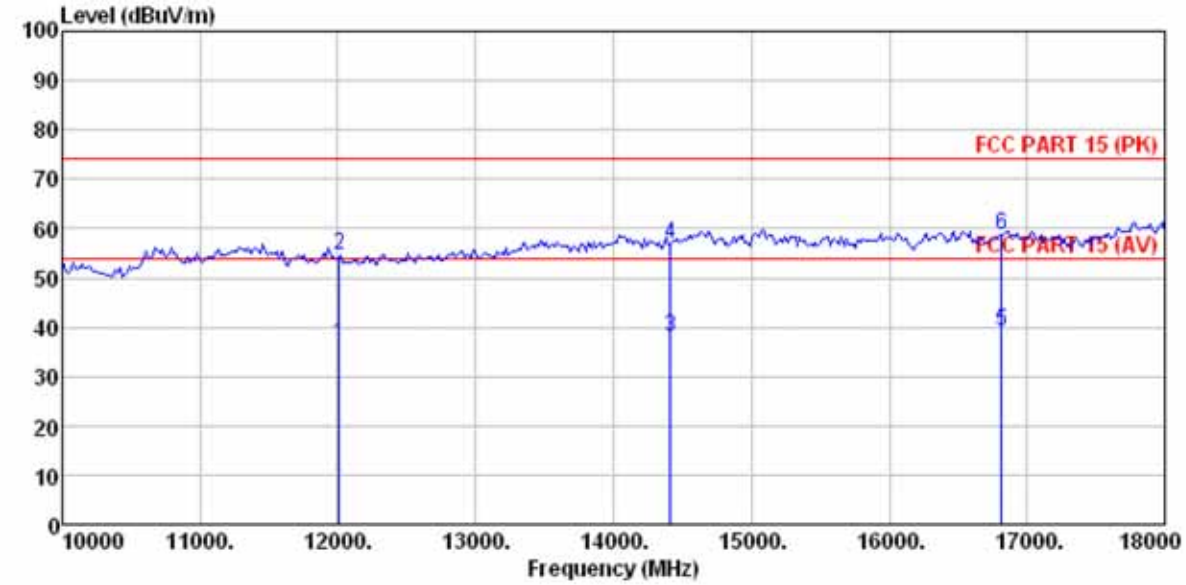
5.3.1 Diagram 5-1



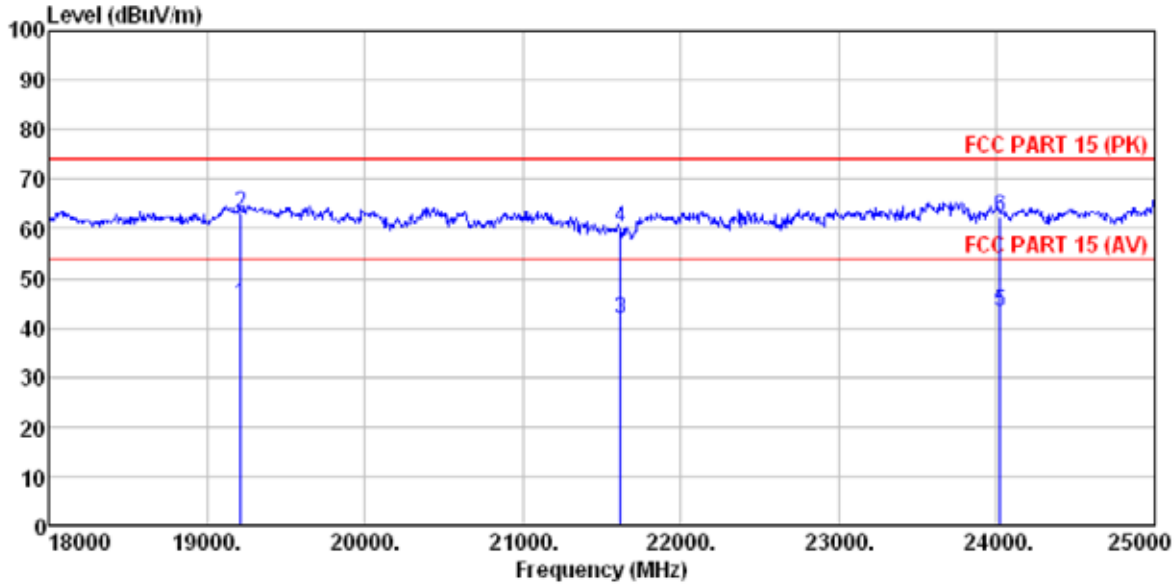
	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	143.830	45.13	11.23	1.53	31.96	25.93	43.50	-17.57	QP
2	272.278	45.51	15.50	2.24	32.17	31.08	46.00	-14.92	QP
3	304.610	39.98	16.14	2.38	32.16	26.34	46.00	-19.66	QP



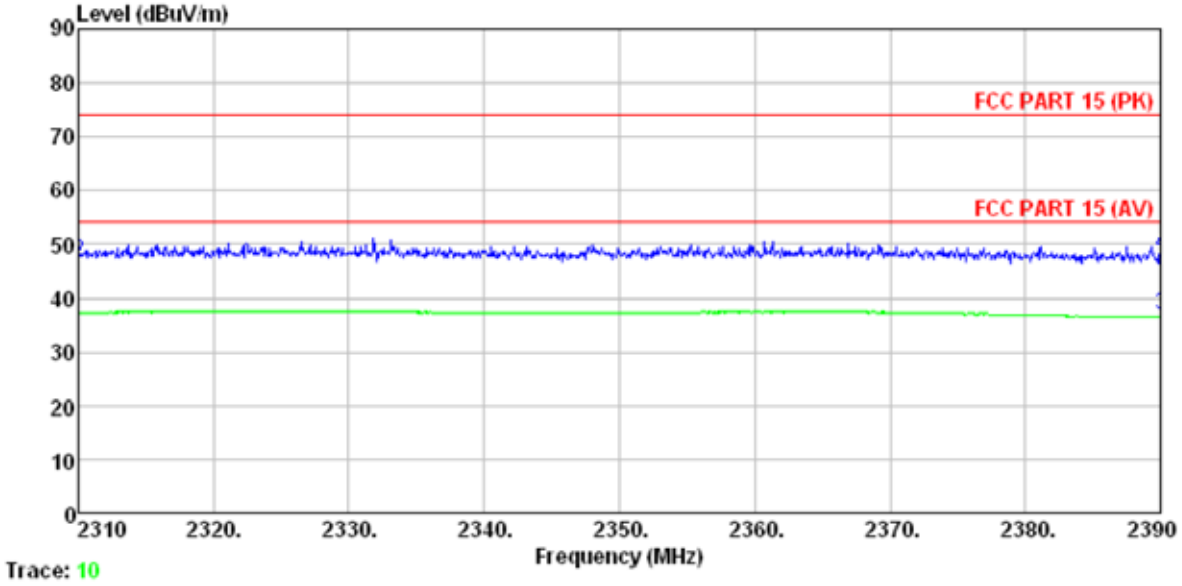
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4804.000	28.14	31.78	8.60	24.20	44.32	54.00	-9.68	Average
2	4804.000	41.64	31.78	8.60	24.20	57.82	74.00	-16.18	Peak
3	7206.000	21.89	36.15	11.65	26.46	43.23	54.00	-10.77	Average
4	7206.000	35.62	36.15	11.65	26.46	56.96	74.00	-17.04	Peak
5	9608.000	16.35	37.95	14.14	25.45	42.99	54.00	-11.01	Average
6	9608.000	31.17	37.95	14.14	25.45	57.81	74.00	-16.19	Peak



	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	12010.000	7.55	39.08	15.03	25.04	36.62	54.00	-17.38	Average
2	12010.000	25.71	39.08	15.03	25.04	54.78	74.00	-19.22	Peak
3	14412.000	2.55	42.41	17.15	24.27	37.84	54.00	-16.16	Average
4	14412.000	21.42	42.41	17.15	24.27	56.71	74.00	-17.29	Peak
5	16814.000	4.12	41.78	18.77	25.46	39.21	54.00	-14.79	Average
6	16814.000	23.68	41.78	18.77	25.46	58.77	74.00	-15.23	Peak



	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	19216.000	2.45	50.71	18.75	27.16	44.75	54.00	-9.25	Average
2	19216.000	20.74	50.71	18.75	27.16	63.04	74.00	-10.96	Peak
3	21618.000	-0.67	50.75	19.18	27.41	41.85	54.00	-12.15	Average
4	21618.000	17.50	50.75	19.18	27.41	60.02	74.00	-13.98	Peak
5	24020.000	0.30	50.41	20.17	27.66	43.22	54.00	-10.78	Average
6	24020.000	19.44	50.41	20.17	27.66	62.36	74.00	-11.64	Peak



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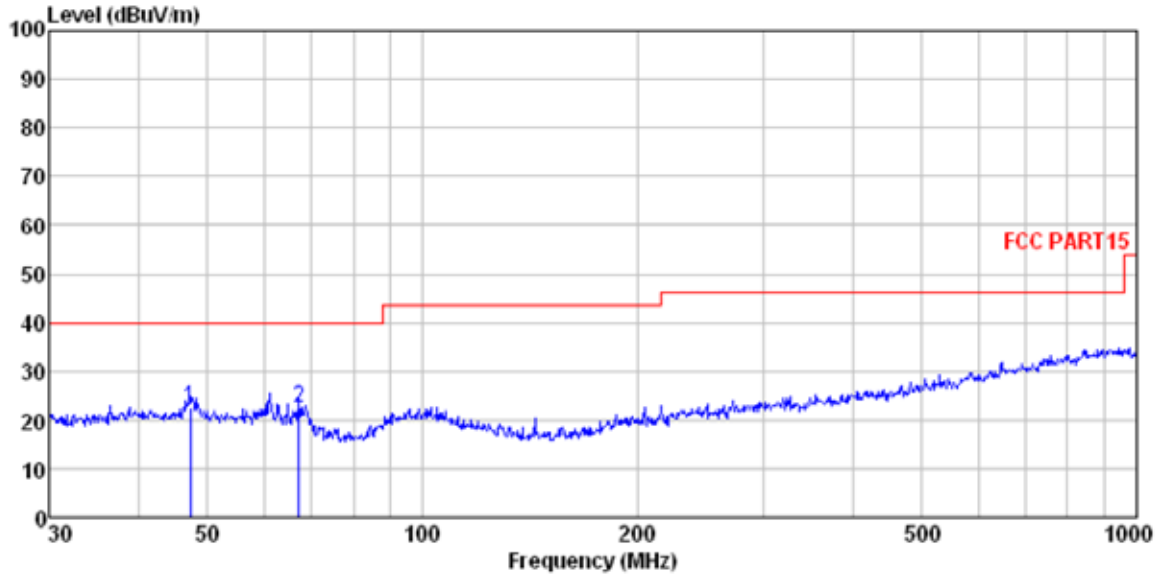
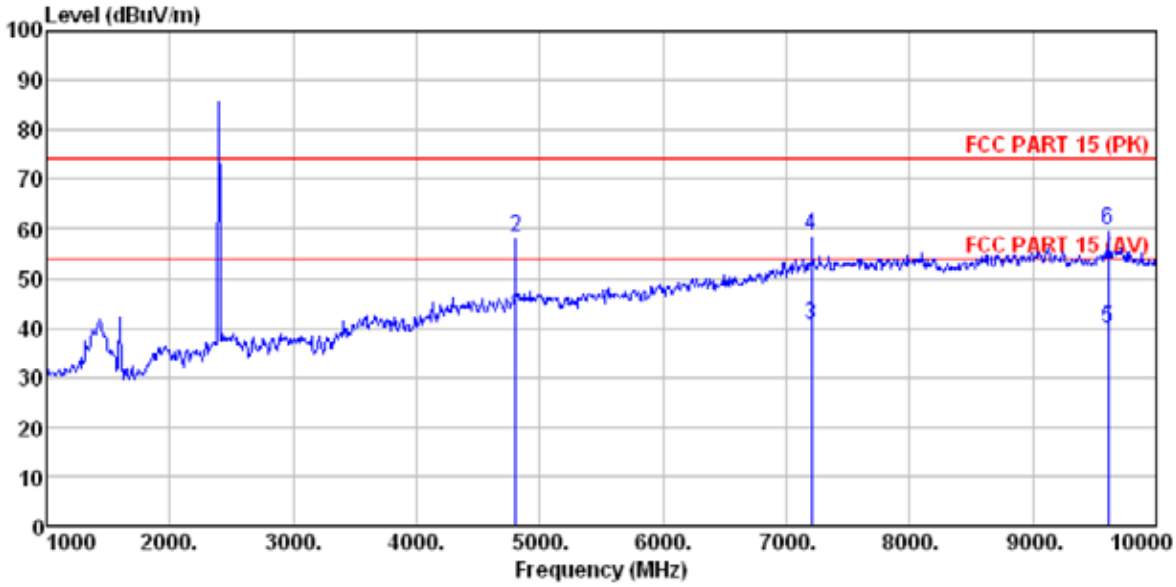
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	32.86	27.91	5.30	30.37	35.70	54.00	-18.30	Average
2	2310.000	43.86	27.91	5.30	30.37	46.70	74.00	-27.30	Peak
3	2390.000	34.21	27.59	5.38	30.18	37.00	54.00	-17.00	Average
4	2390.000	45.21	27.59	5.38	30.18	48.00	74.00	-26.00	Peak

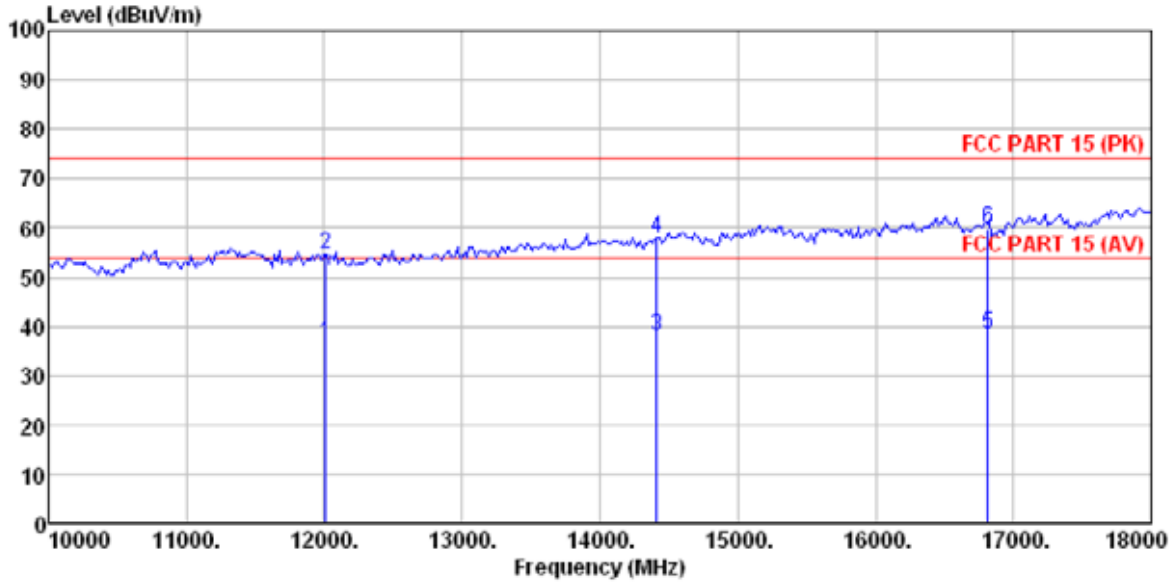
5.3.2 Diagram 5-2



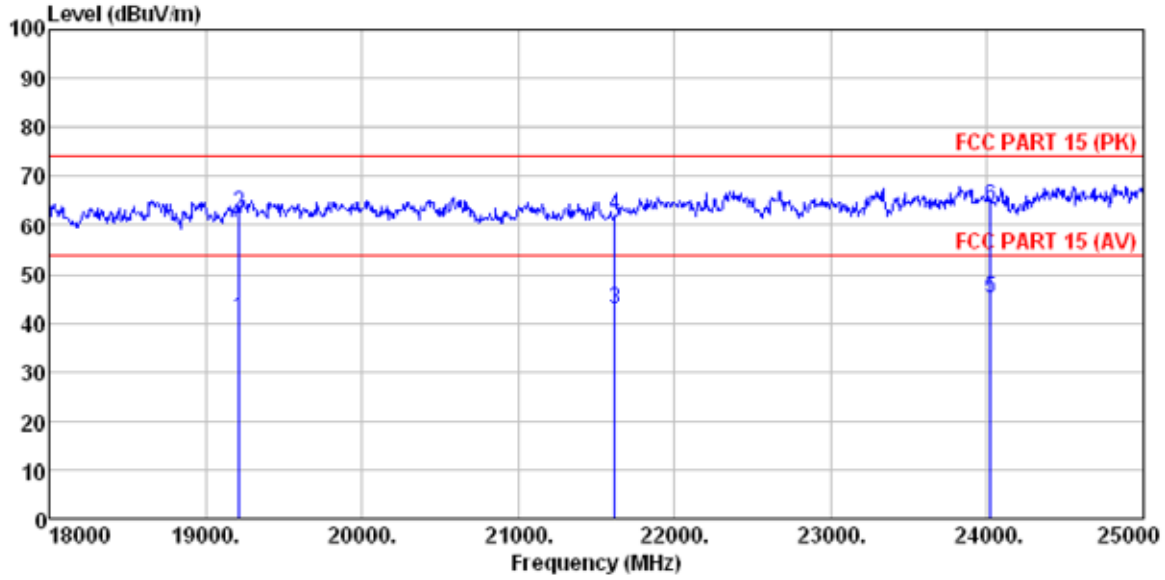
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	47.326	37.33	16.52	0.74	31.98	22.61	40.00	-17.39	QP
2	67.202	39.93	13.57	0.92	31.90	22.52	40.00	-17.48	QP



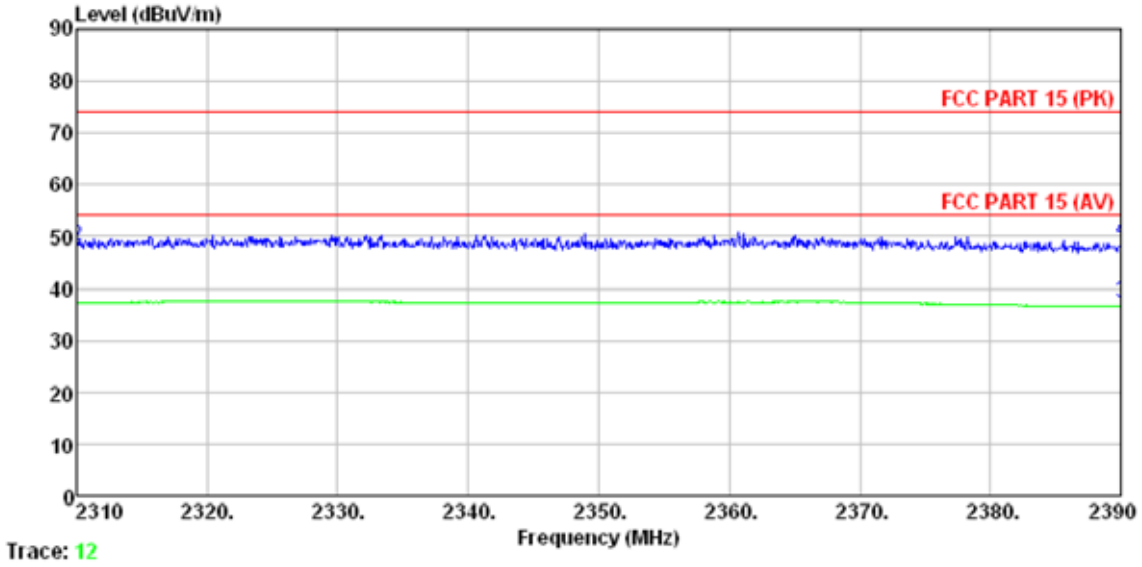
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4804.000	26.36	31.78	8.60	24.20	42.54	54.00	-11.46	Average
2	4804.000	42.09	31.78	8.60	24.20	58.27	74.00	-15.73	Peak
3	7206.000	19.16	36.15	11.65	26.46	40.50	54.00	-13.50	Average
4	7206.000	37.25	36.15	11.65	26.46	58.59	74.00	-15.41	Peak
5	9608.000	13.36	37.95	14.14	25.45	40.00	54.00	-14.00	Average
6	9608.000	33.23	37.95	14.14	25.45	59.87	74.00	-14.13	Peak



	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	12010.000	7.37	39.08	15.03	25.04	36.44	54.00	-17.56	Average
2	12010.000	25.63	39.08	15.03	25.04	54.70	74.00	-19.30	Peak
3	14412.000	2.66	42.41	17.15	24.27	37.95	54.00	-16.05	Average
4	14412.000	22.48	42.41	17.15	24.27	57.77	74.00	-16.23	Peak
5	16814.000	3.34	41.78	18.77	25.46	38.43	54.00	-15.57	Average
6	16814.000	24.68	41.78	18.77	25.46	59.77	74.00	-14.23	Peak



	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	19216.000	-0.79	50.31	18.75	27.16	41.11	54.00	-12.89	Average
2	19216.000	20.45	50.31	18.75	27.16	62.35	74.00	-11.65	Peak
3	21618.000	0.01	51.09	19.18	27.41	42.87	54.00	-11.13	Average
4	21618.000	19.05	51.09	19.18	27.41	61.91	74.00	-12.09	Peak
5	24020.000	0.79	51.55	20.17	27.66	44.85	54.00	-9.15	Average
6	24020.000	19.80	51.55	20.17	27.66	63.86	74.00	-10.14	Peak



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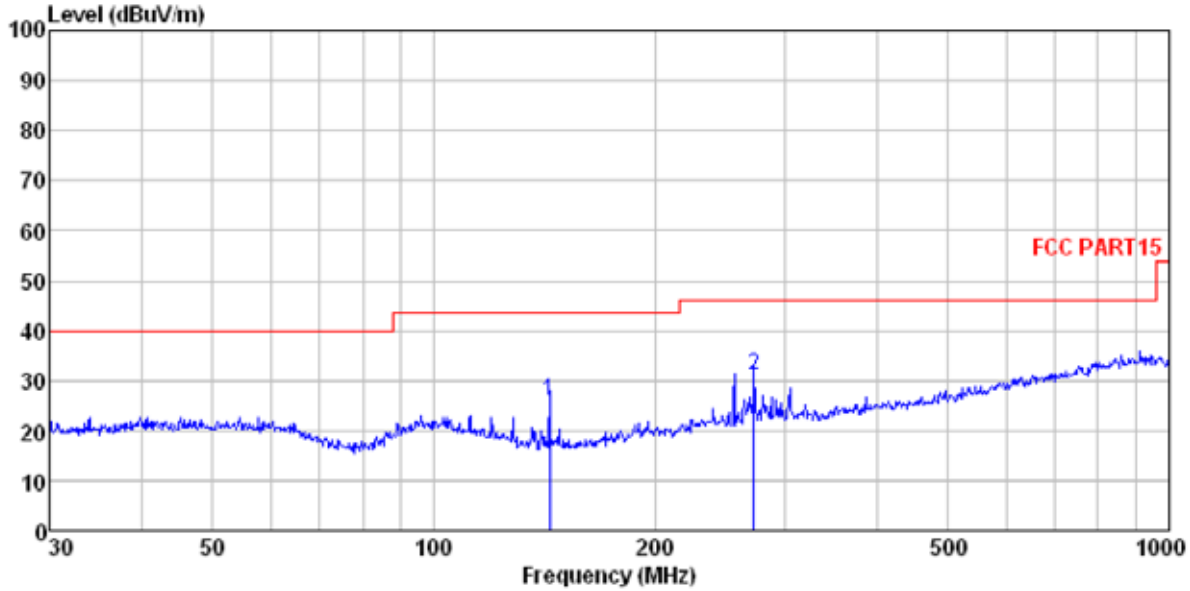
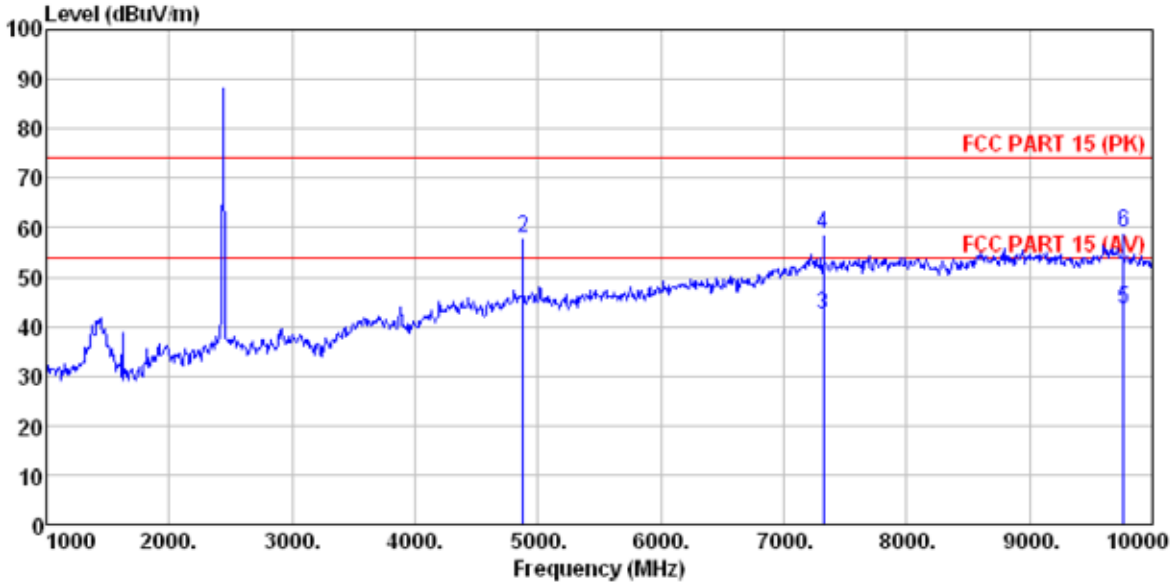
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2310.000	33.40	27.91	5.30	30.37	36.24	54.00	-17.76	Average
2	2310.000	45.40	27.91	5.30	30.37	48.24	74.00	-25.76	Peak
3	2390.000	34.53	27.59	5.38	30.18	37.32	54.00	-16.68	Average
4	2390.000	46.53	27.59	5.38	30.18	49.32	74.00	-24.68	Peak

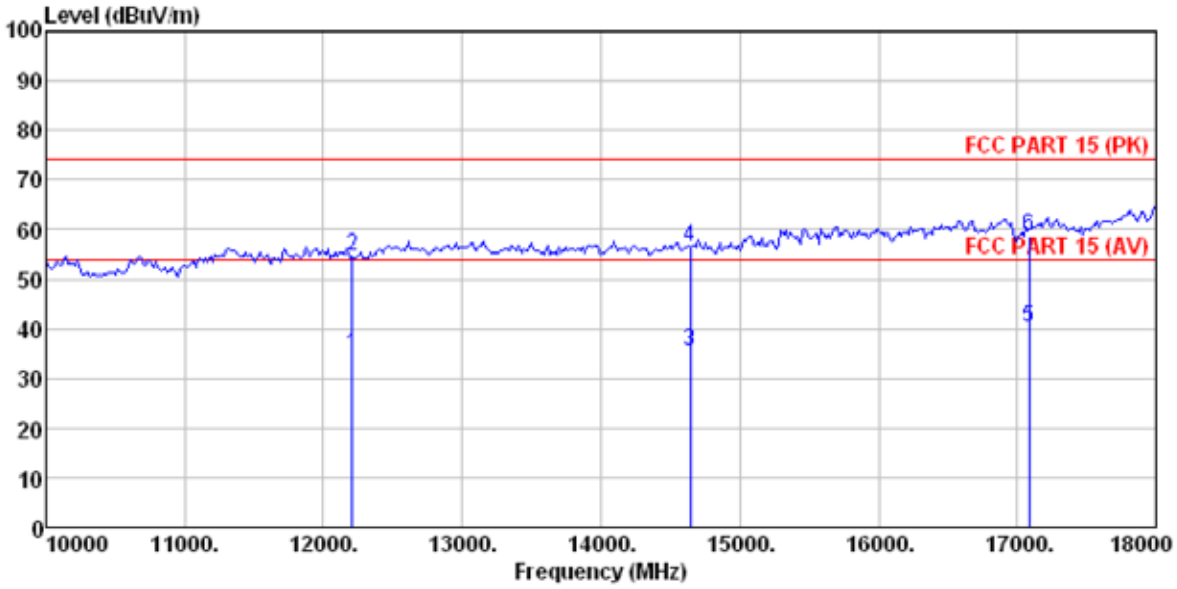
5.3.3 Diagram 5-3



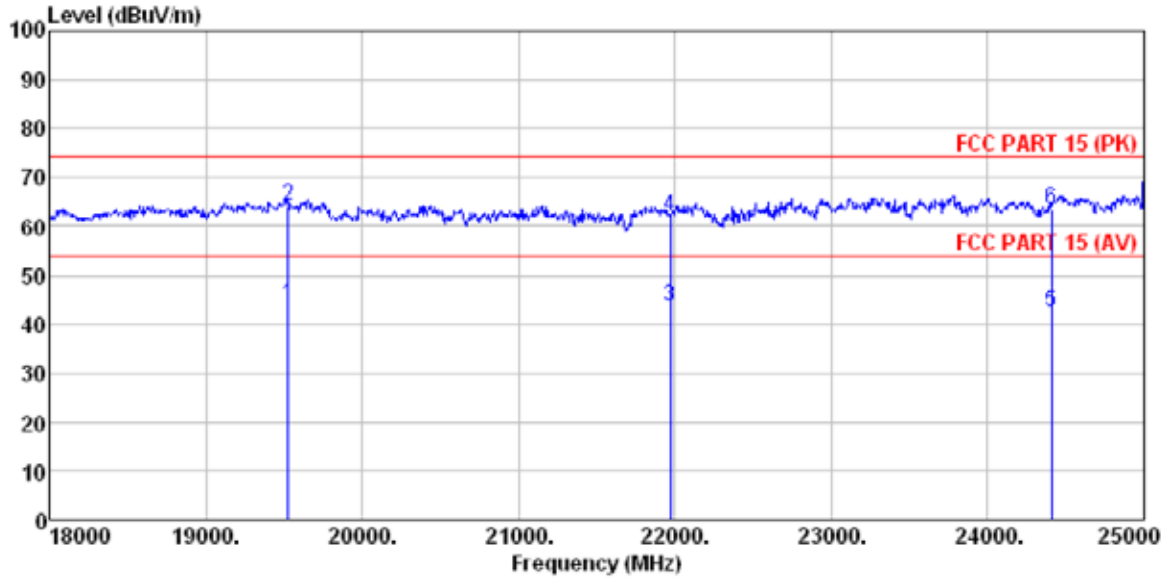
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	143.830	45.13	11.23	1.53	31.96	25.93	43.50	-17.57	QP
2	272.278	45.51	15.50	2.24	32.17	31.08	46.00	-14.92	QP



	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	4882.000	25.54	31.85	8.67	24.10	41.96	54.00	-12.04	Average
2	4882.000	41.55	31.85	8.67	24.10	57.97	74.00	-16.03	Peak
3	7323.000	21.12	36.37	11.72	26.71	42.50	54.00	-11.50	Average
4	7323.000	37.24	36.37	11.72	26.71	58.62	74.00	-15.38	Peak
5	9764.000	16.24	38.35	14.25	25.36	43.48	54.00	-10.52	Average
6	9764.000	31.68	38.35	14.25	25.36	58.92	74.00	-15.08	Peak

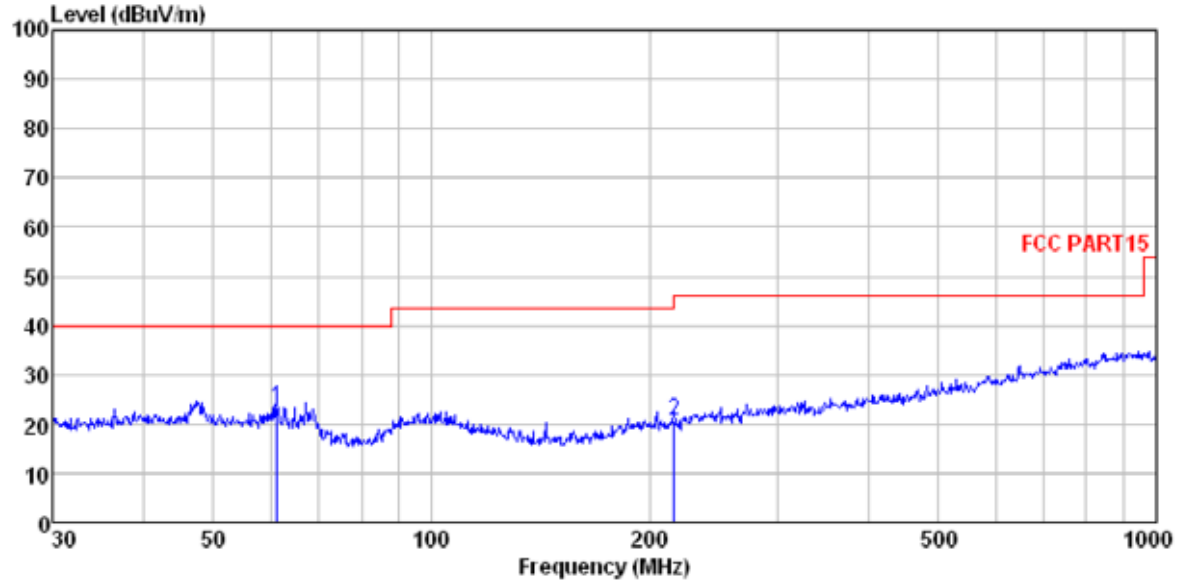


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	12205.000	5.56	38.92	15.16	24.96	34.68	54.00	-19.32	Average
2	12205.000	25.48	38.92	15.16	24.96	54.60	74.00	-19.40	Peak
3	14646.000	0.25	42.21	17.28	24.41	35.33	54.00	-18.67	Average
4	14646.000	21.36	42.21	17.28	24.41	56.44	74.00	-17.56	Peak
5	17087.000	2.58	44.30	18.99	25.59	40.28	54.00	-13.72	Average
6	17087.000	21.04	44.30	18.99	25.59	58.74	74.00	-15.26	Peak

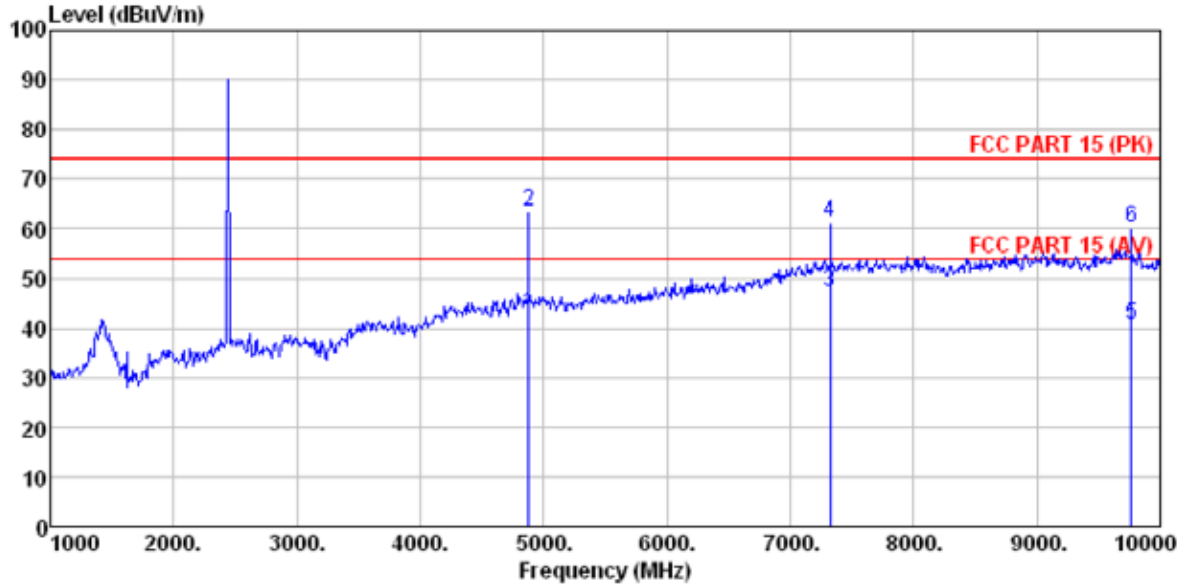


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	19528.000	1.40	50.77	18.84	27.20	43.81	54.00	-10.19	Average
2	19528.000	21.79	50.77	18.84	27.20	64.20	74.00	-9.80	Peak
3	21969.000	1.23	50.68	19.24	27.44	43.71	54.00	-10.29	Average
4	21969.000	19.58	50.68	19.24	27.44	62.06	74.00	-11.94	Peak
5	24410.000	-1.69	50.92	20.85	27.75	42.33	54.00	-11.67	Average
6	24410.000	19.34	50.92	20.85	27.75	63.36	74.00	-10.64	Peak

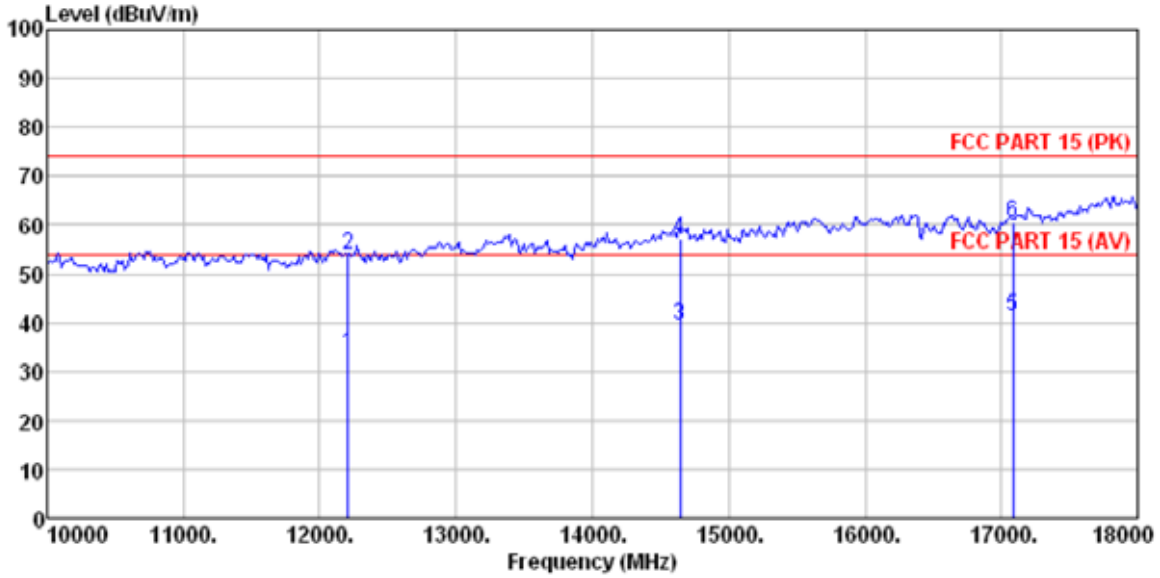
5.3.4 Diagram 5-4



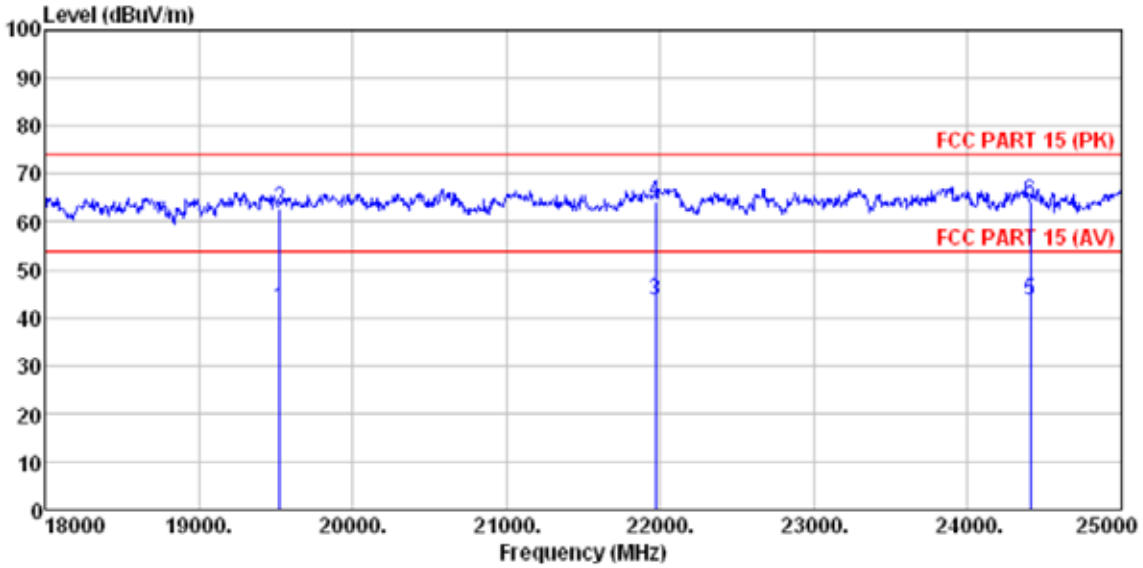
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	61.132	38.81	15.56	0.87	31.93	23.31	40.00	-16.69	QP
2	216.024	36.87	14.12	1.93	32.15	20.77	46.00	-25.23	QP



	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	4882.000	26.48	31.85	8.67	24.10	42.90	54.00	-11.10	Average
2	4882.000	47.14	31.85	8.67	24.10	63.56	74.00	-10.44	Peak
3	7323.000	26.01	36.37	11.72	26.71	47.39	54.00	-6.61	Average
4	7323.000	39.75	36.37	11.72	26.71	61.13	74.00	-12.87	Peak
5	9764.000	13.33	38.35	14.25	25.36	40.57	54.00	-13.43	Average
6	9764.000	32.81	38.35	14.25	25.36	60.05	74.00	-13.95	Peak

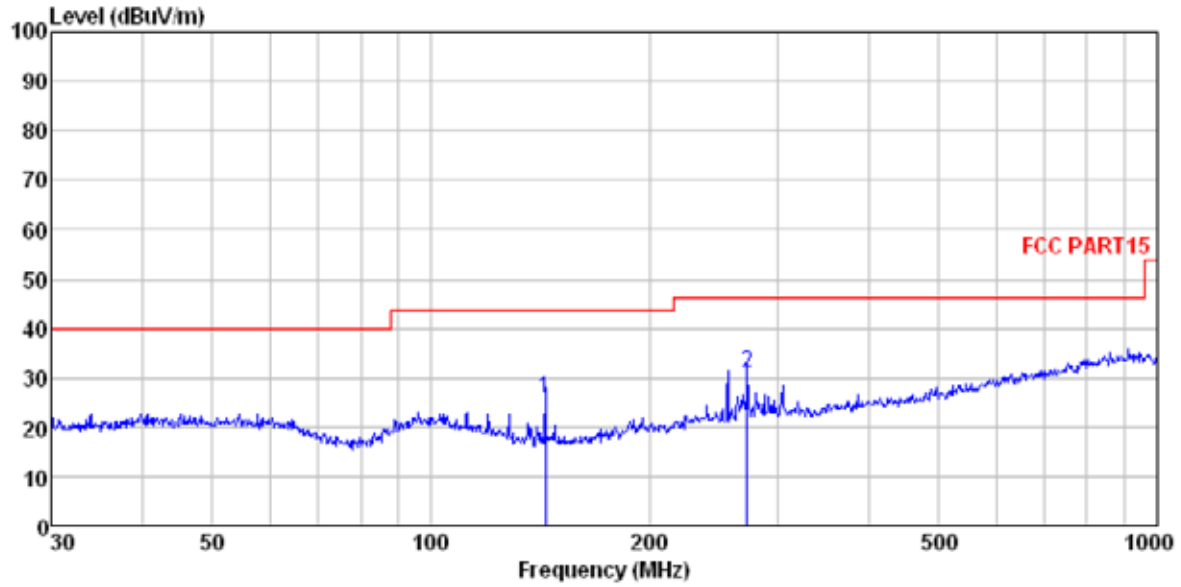


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	12205.000	4.33	38.92	15.16	24.96	33.45	54.00	-20.55	Average
2	12205.000	24.72	38.92	15.16	24.96	53.84	74.00	-20.16	Peak
3	14646.000	4.25	42.21	17.28	24.41	39.33	54.00	-14.67	Average
4	14646.000	22.29	42.21	17.28	24.41	57.37	74.00	-16.63	Peak
5	17087.000	3.59	44.30	18.99	25.59	41.29	54.00	-12.71	Average
6	17087.000	22.74	44.30	18.99	25.59	60.44	74.00	-13.56	Peak

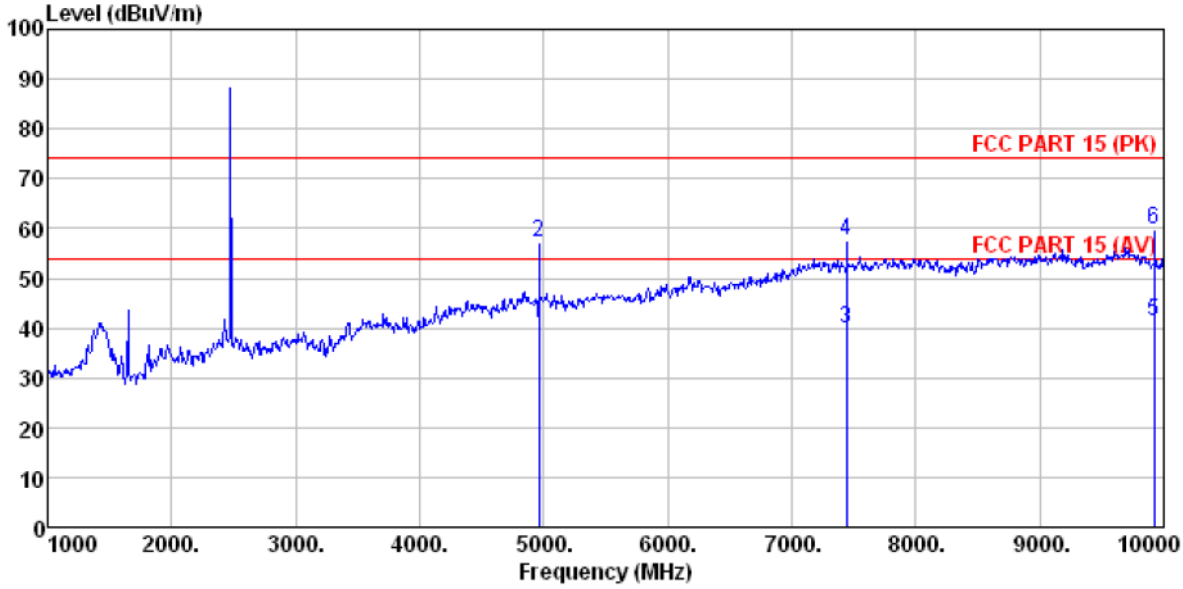


	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	19528.000	0.04	50.40	18.84	27.20	42.08	54.00	-11.92	Average
2	19528.000	20.78	50.40	18.84	27.20	62.82	74.00	-11.18	Peak
3	21969.000	0.48	51.23	19.24	27.44	43.51	54.00	-10.49	Average
4	21969.000	21.10	51.23	19.24	27.44	64.13	74.00	-9.87	Peak
5	24410.000	-1.45	51.77	20.85	27.75	43.42	54.00	-10.58	Average
6	24410.000	19.29	51.77	20.85	27.75	64.16	74.00	-9.84	Peak

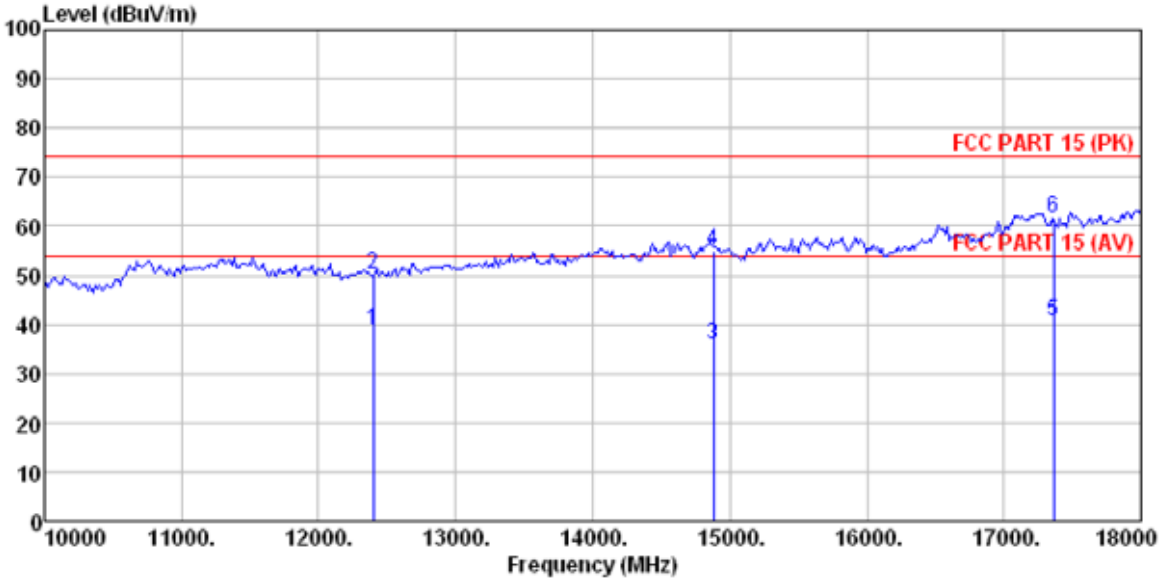
5.3.5 Diagram 5-5



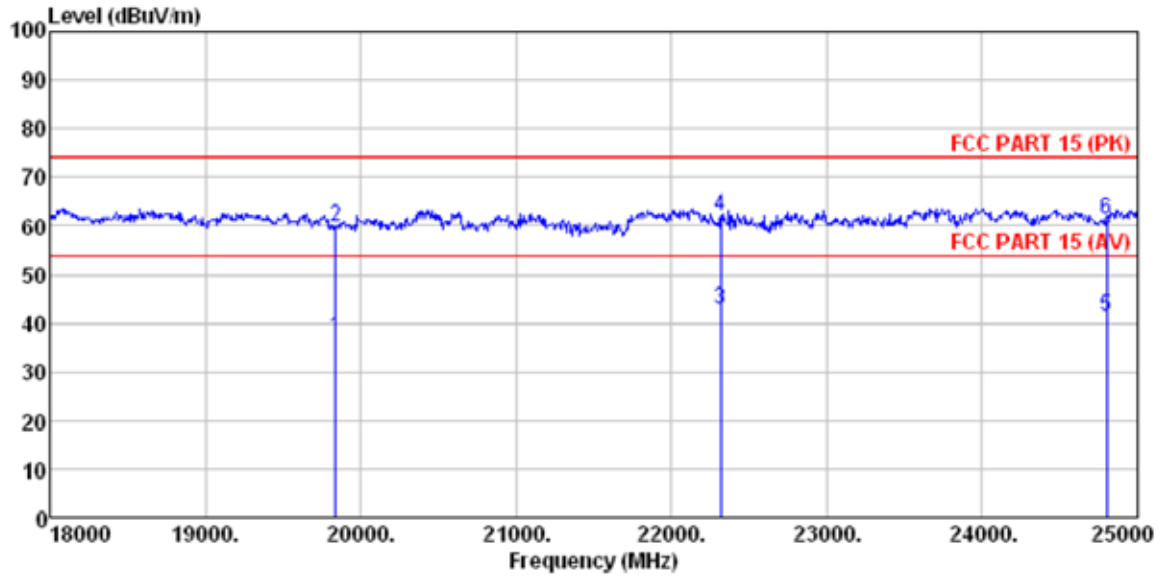
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	143.830	45.13	11.23	1.53	31.96	25.93	43.50	-17.57	QP
2	272.278	45.51	15.50	2.24	32.17	31.08	46.00	-14.92	QP



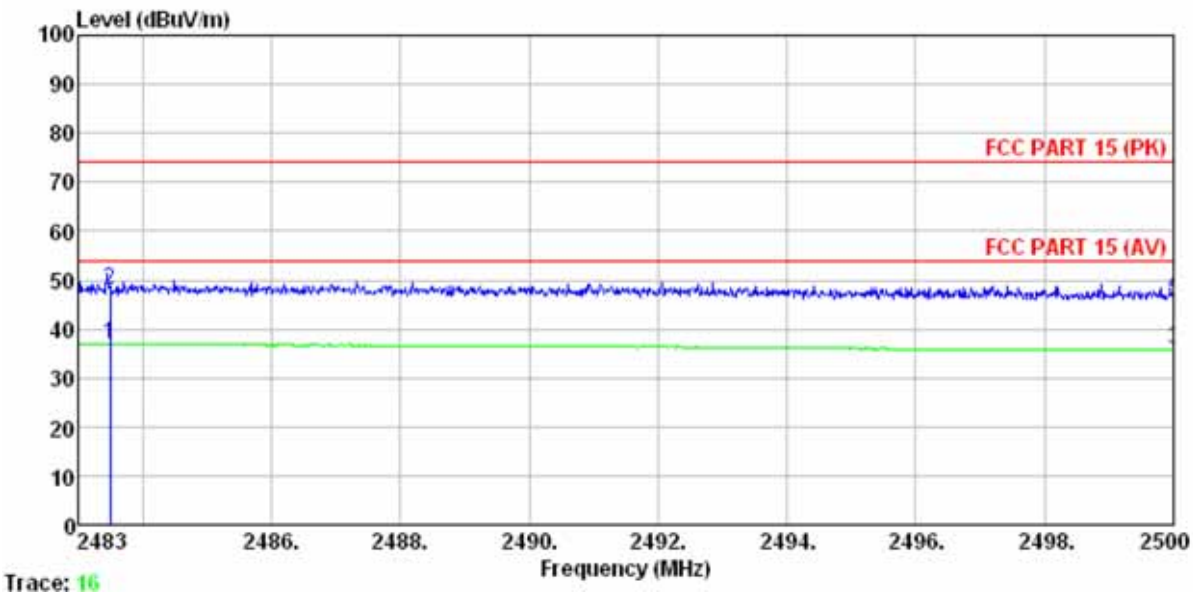
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4960.000	24.33	31.93	8.73	24.03	40.96	54.00	-13.04	Average
2	4960.000	40.70	31.93	8.73	24.03	57.33	74.00	-16.67	Peak
3	7440.000	18.44	36.59	11.79	27.03	39.79	54.00	-14.21	Average
4	7440.000	36.06	36.59	11.79	27.03	57.41	74.00	-16.59	Peak
5	9920.000	13.30	38.81	14.38	25.26	41.23	54.00	-12.77	Average
6	9920.000	31.84	38.81	14.38	25.26	59.77	74.00	-14.23	Peak



	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	12400.000	9.52	38.76	15.27	24.71	38.84	54.00	-15.16	Average
2	12400.000	20.89	38.76	15.27	24.71	50.21	74.00	-23.79	Peak
3	14880.000	1.35	41.52	17.39	24.54	35.72	54.00	-18.28	Average
4	14880.000	20.66	41.52	17.39	24.54	55.03	74.00	-18.97	Peak
5	17360.000	1.54	46.19	18.98	25.95	40.76	54.00	-13.24	Average
6	17360.000	22.30	46.19	18.98	25.95	61.52	74.00	-12.48	Peak



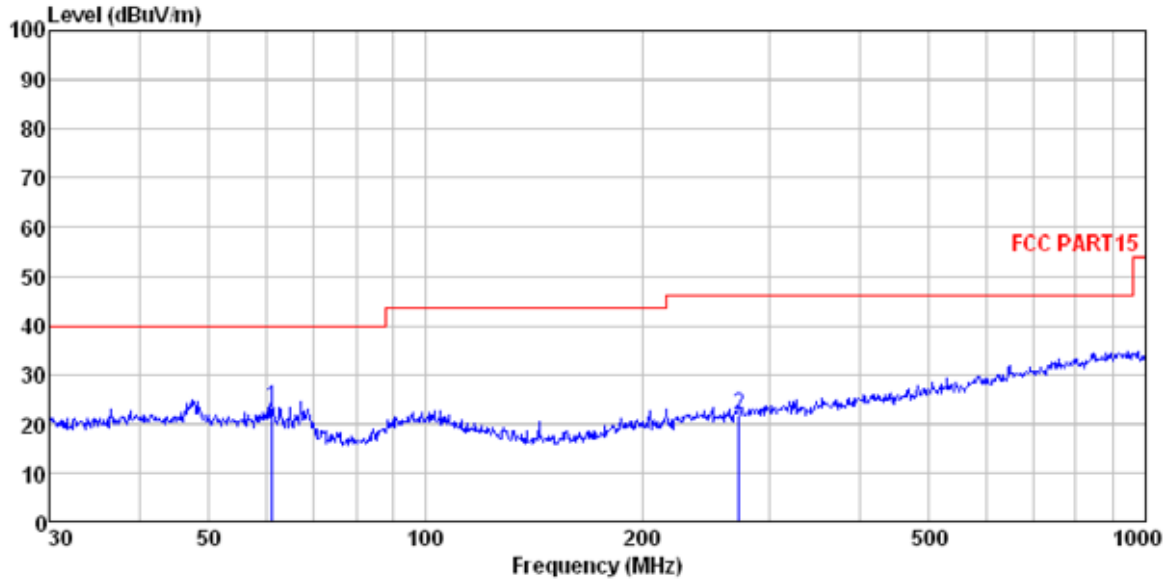
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	19840.000	-5.48	50.82	18.94	27.23	37.05	54.00	-16.95	Average
2	19840.000	17.24	50.82	18.94	27.23	59.77	74.00	-14.23	Peak
3	22320.000	0.24	50.76	19.34	27.47	42.87	54.00	-11.13	Average
4	22320.000	19.43	50.76	19.34	27.47	62.06	74.00	-11.94	Peak
5	24800.000	-3.70	51.43	21.54	27.83	41.44	54.00	-12.56	Average
6	24800.000	16.22	51.43	21.54	27.83	61.36	74.00	-12.64	Peak



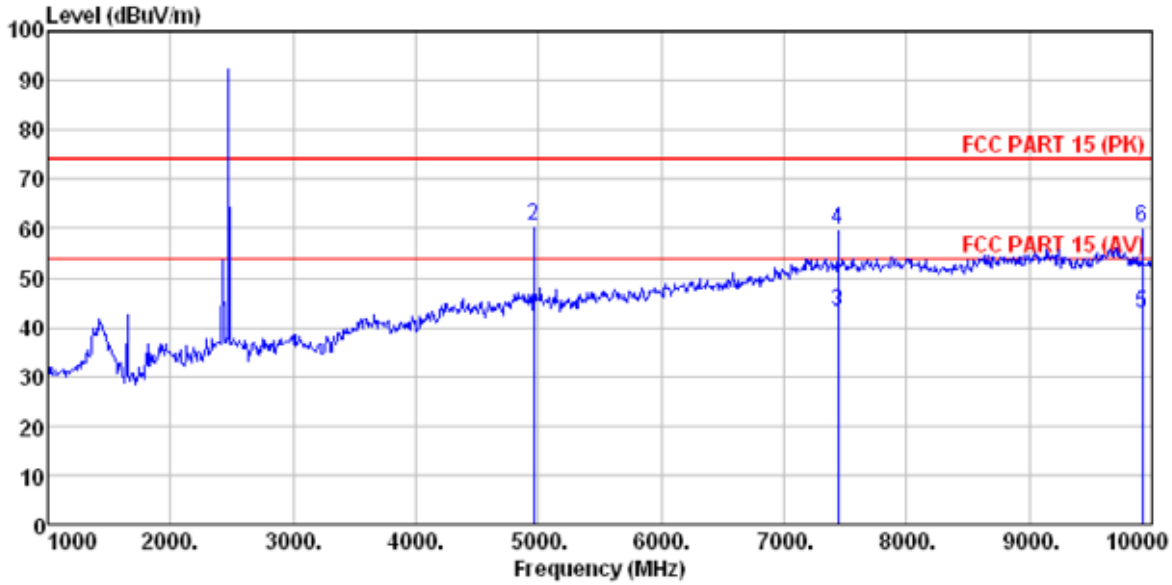
Trace: 16

	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	2483.493	33.74	27.53	5.47	29.93	36.81	54.00	-17.19	Average
2	2483.493	44.74	27.53	5.47	29.93	47.81	74.00	-26.19	Peak
3	2500.000	32.66	27.55	5.49	29.93	35.77	54.00	-18.23	Average
4	2500.000	43.66	27.55	5.49	29.93	46.77	74.00	-27.23	Peak

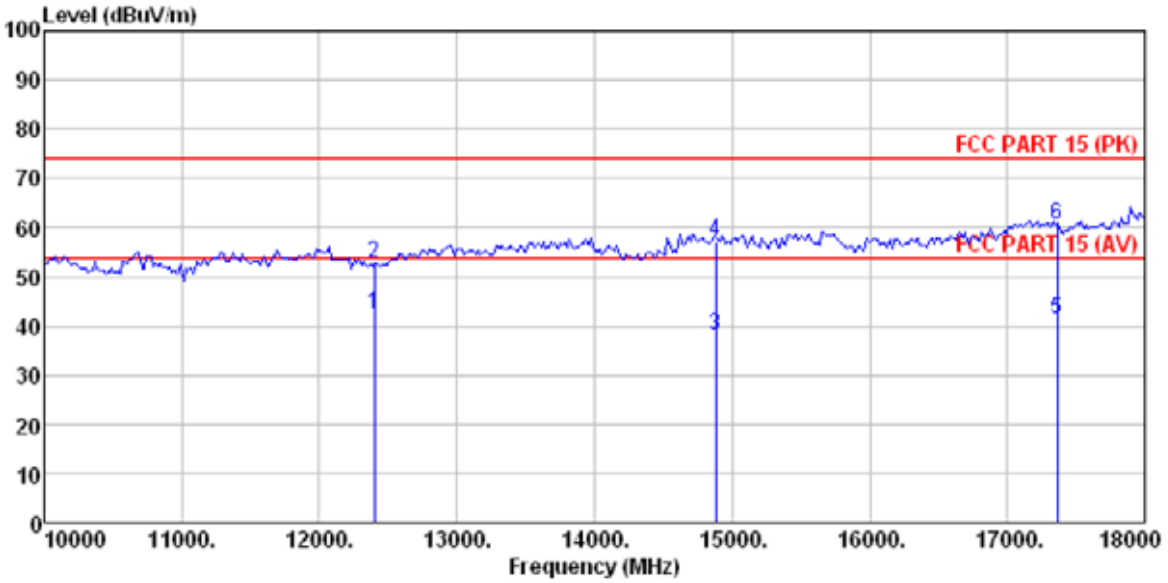
5.3.6 Diagram 5-6



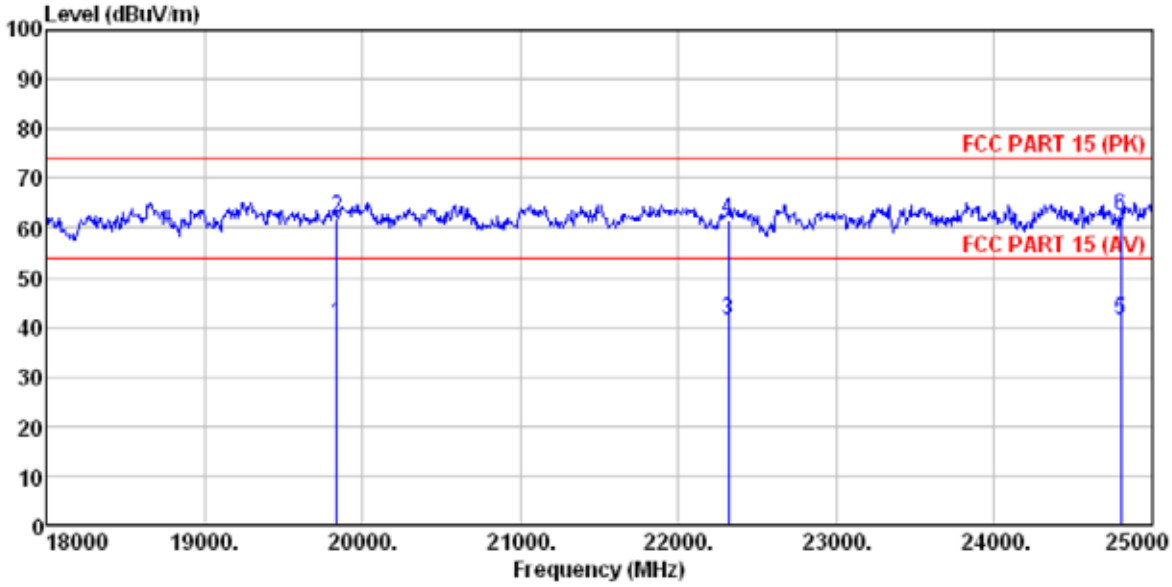
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	61.132	38.81	15.56	0.87	31.93	23.31	40.00	-16.69	QP
2	272.278	36.34	15.50	2.24	32.17	21.91	46.00	-24.09	QP



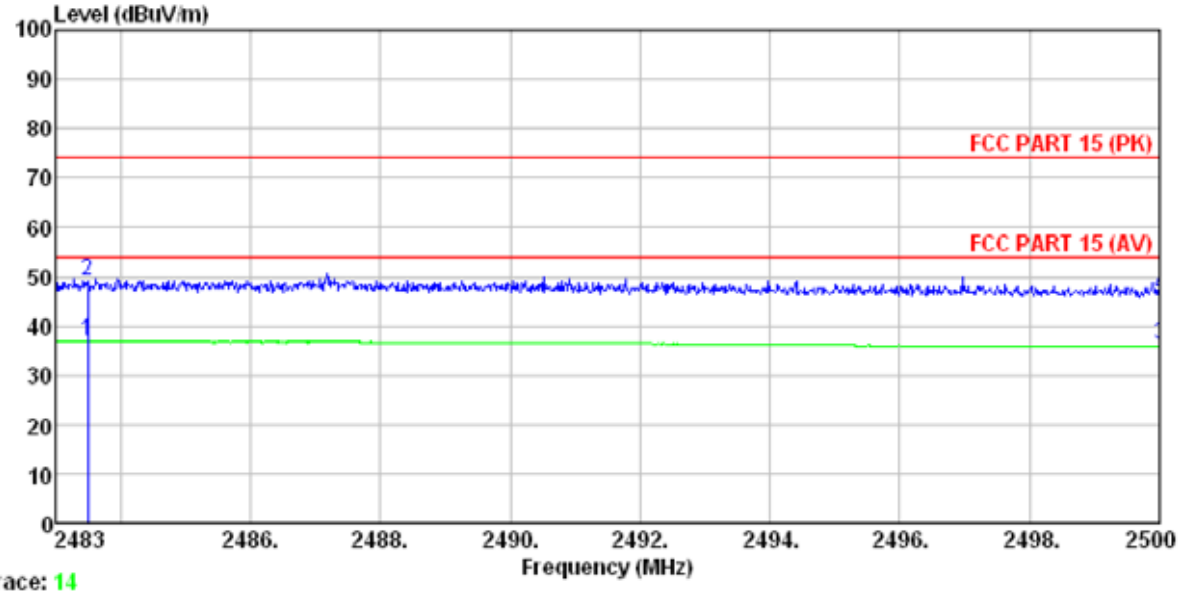
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	4960.000	25.59	31.93	8.73	24.03	42.22	54.00	-11.78	Average
2	4960.000	43.90	31.93	8.73	24.03	60.53	74.00	-13.47	Peak
3	7440.000	22.00	36.59	11.79	27.03	43.35	54.00	-10.65	Average
4	7440.000	38.39	36.59	11.79	27.03	59.74	74.00	-14.26	Peak
5	9920.000	14.88	38.81	14.38	25.26	42.81	54.00	-11.19	Average
6	9920.000	32.14	38.81	14.38	25.26	60.07	74.00	-13.93	Peak



	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	12400.000	12.99	38.76	15.27	24.71	42.31	54.00	-11.69	Average
2	12400.000	23.36	38.76	15.27	24.71	52.68	74.00	-21.32	Peak
3	14880.000	3.55	41.52	17.39	24.54	37.92	54.00	-16.08	Average
4	14880.000	22.87	41.52	17.39	24.54	57.24	74.00	-16.76	Peak
5	17360.000	2.21	46.19	18.98	25.95	41.43	54.00	-12.57	Average
6	17360.000	21.32	46.19	18.98	25.95	60.54	74.00	-13.46	Peak



	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	19840.000	-1.63	50.49	18.94	27.23	40.57	54.00	-13.43	Average
2	19840.000	19.70	50.49	18.94	27.23	61.90	74.00	-12.10	Peak
3	22320.000	-1.69	51.24	19.34	27.47	41.42	54.00	-12.58	Average
4	22320.000	18.50	51.24	19.34	27.47	61.61	74.00	-12.39	Peak
5	24800.000	-4.46	52.00	21.54	27.83	41.25	54.00	-12.75	Average
6	24800.000	16.54	52.00	21.54	27.83	62.25	74.00	-11.75	Peak



Trace: 14

	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	2483.493	33.87	27.53	5.47	29.93	36.94	54.00	-17.06	Average
2	2483.493	45.87	27.53	5.47	29.93	48.94	74.00	-25.06	Peak
3	2500.000	33.12	27.55	5.49	29.93	36.23	54.00	-17.77	Average
4	2500.000	43.12	27.55	5.49	29.93	46.23	74.00	-27.77	Peak

6. 20 dB bandwidth Test

6.1 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.

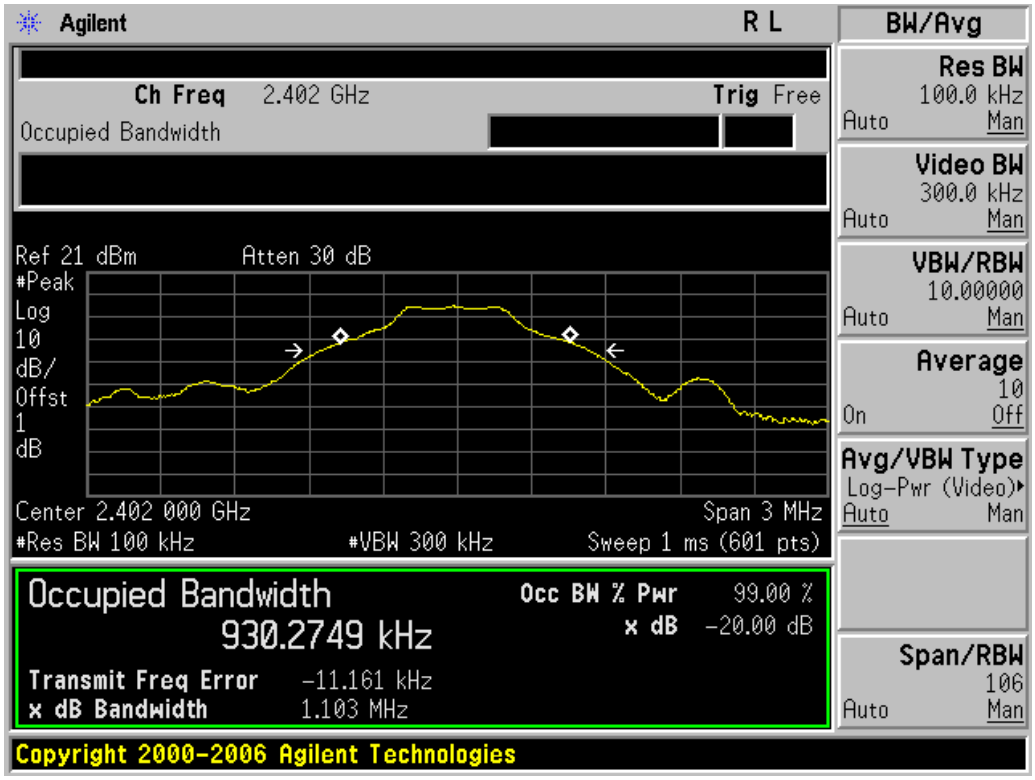
6.2 Measurement Equipment

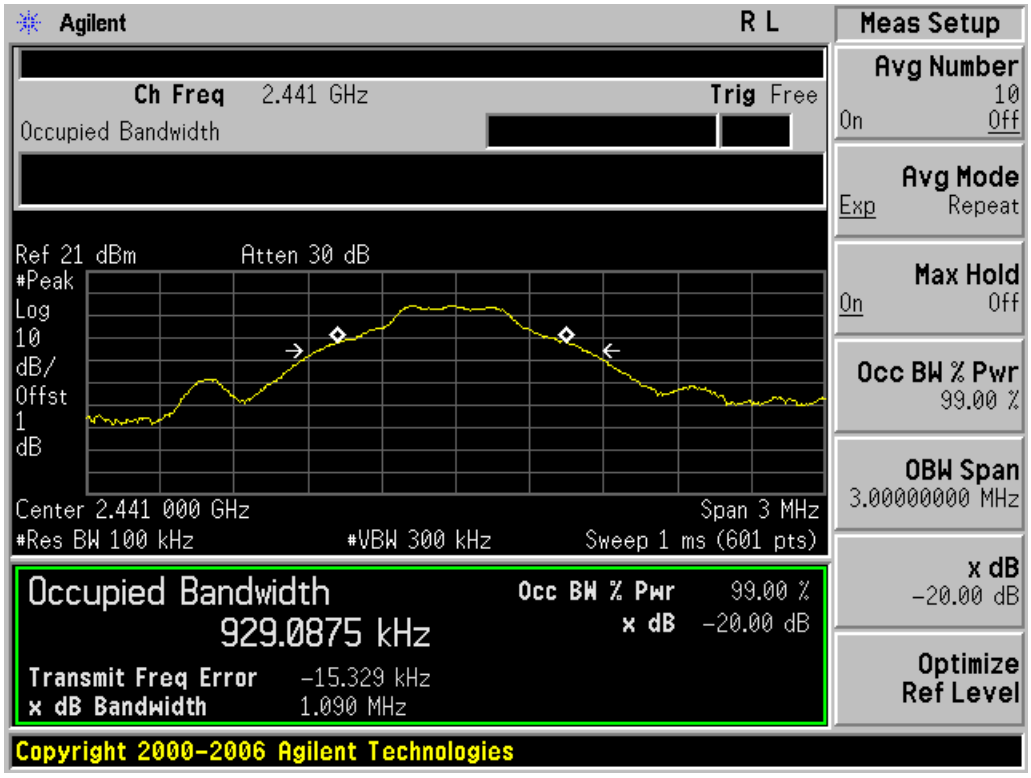
	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum	Dec. 06 2012	E4440A	MY42510313	Agilent

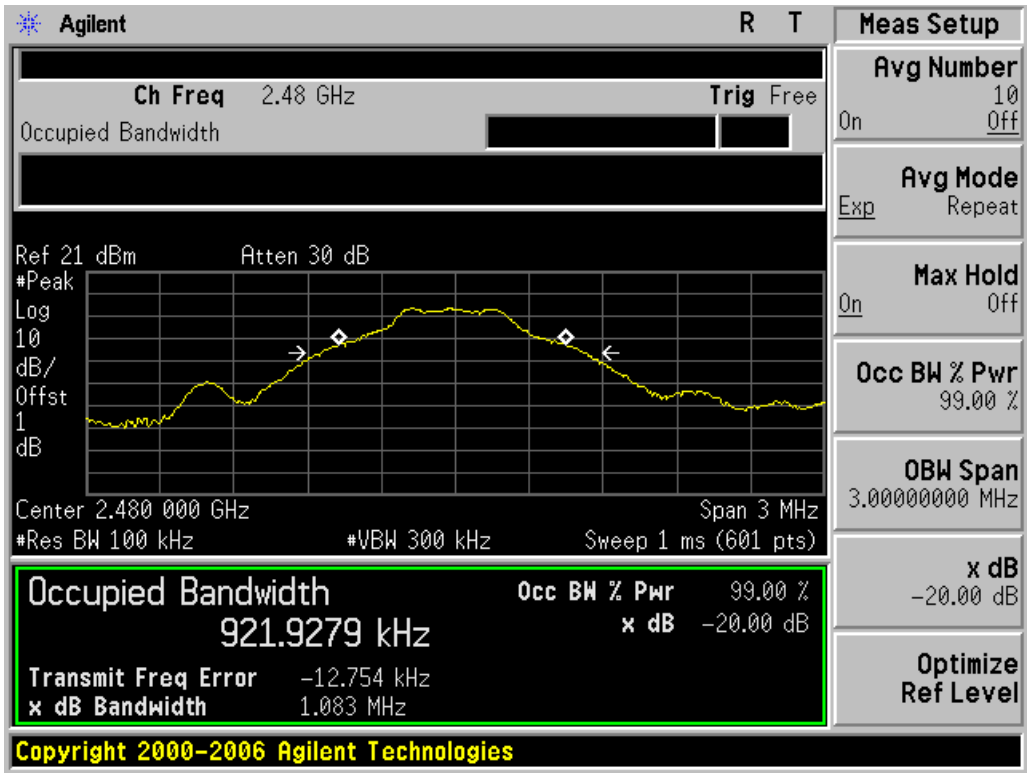
6.3 Test Result:

Modulation	Channel	20dB bandwidth (MHz)
GFSK	CHL	1.103
	CHM	1.090
	CHH	1.083

GFSK diagrams are as below:

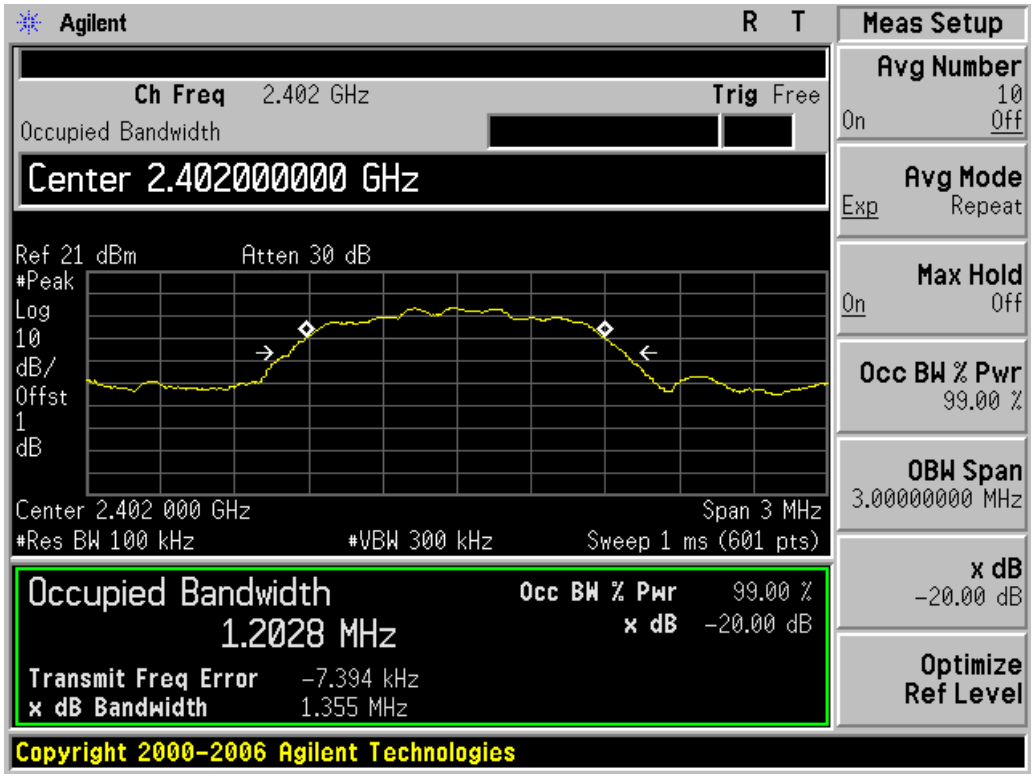


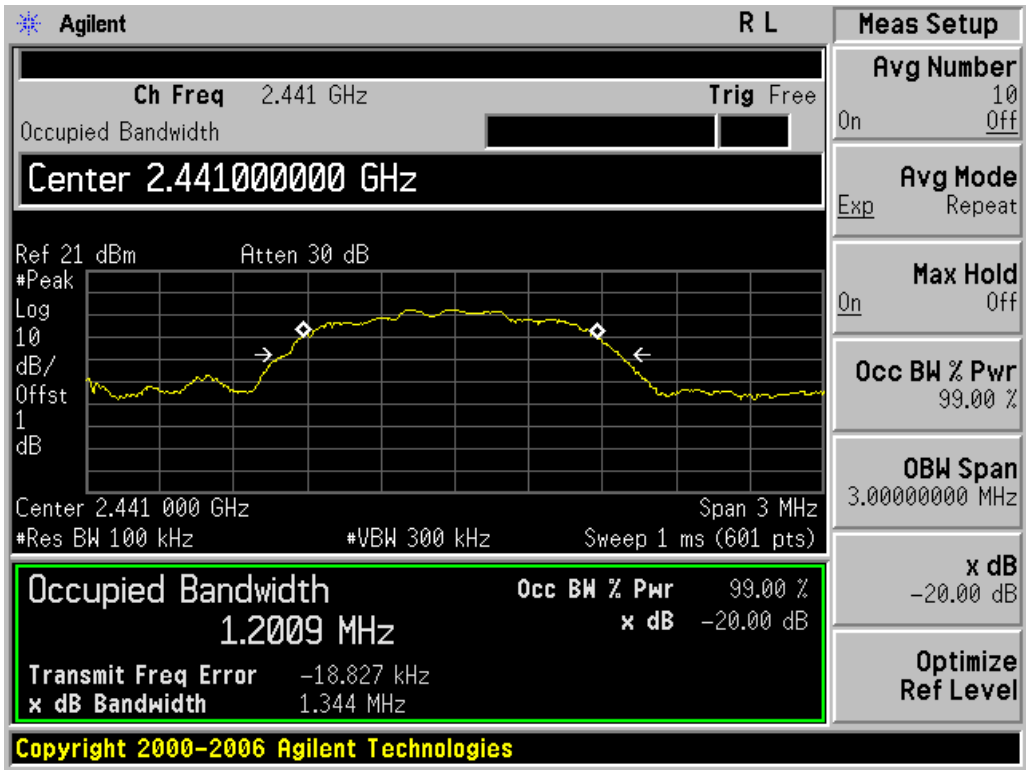

Agilent
R L
Meas Setup
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Avg Number
10
On Off
Avg Mode
Exp Repeat
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Max Hold
On Off
Occ BW % Pwr
99.00 %
Center 2.441 000 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
OBW Span
3.00000000 MHz
Occupied Bandwidth
929.0875 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -15.329 kHz
x dB Bandwidth 1.090 MHz
x dB
-20.00 dB
Optimize
Ref Level
Copyright 2000-2006 Agilent Technologies

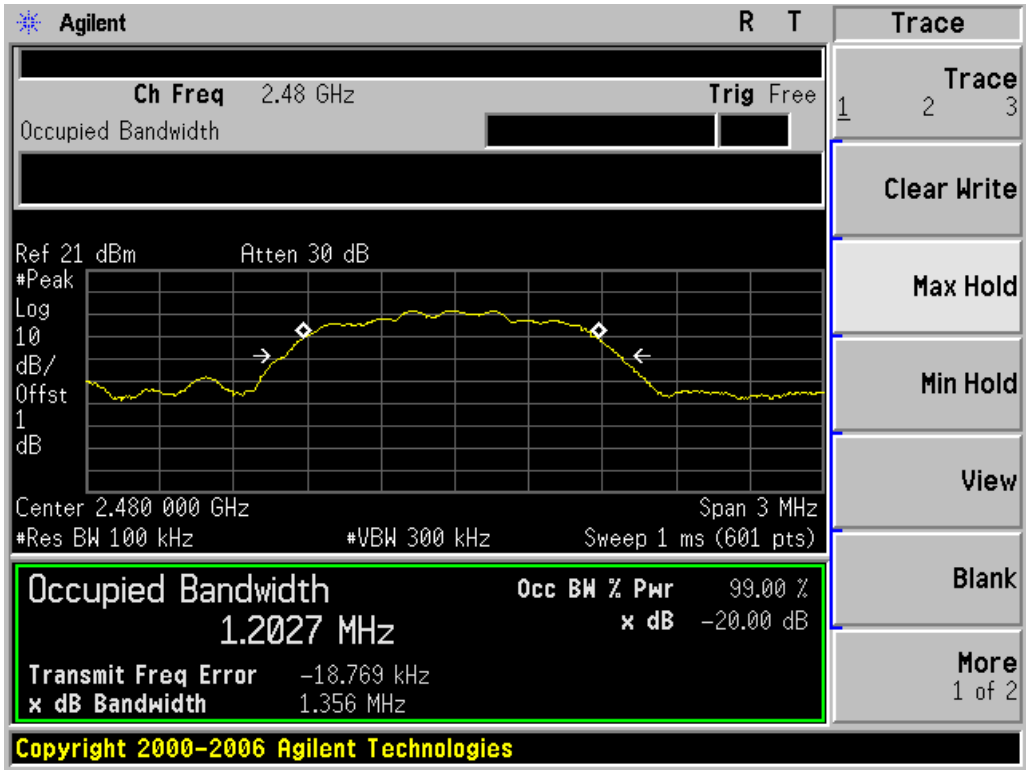

Agilent
R T
Meas Setup
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Avg Number
10
On Off
Avg Mode
Exp Repeat
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Max Hold
On Off
Occ BW % Pwr
99.00 %
Center 2.480 000 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
OBW Span
3.00000000 MHz
Occupied Bandwidth
921.9279 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -12.754 kHz
x dB Bandwidth 1.083 MHz
x dB
-20.00 dB
Optimize
Ref Level
Copyright 2000-2006 Agilent Technologies

Modulation	Channel	20dB bandwidth(MHz)
8DPSK	CHL	1.355
	CHM	1.344
	CHH	1.356

8DPSK diagrams are as below:

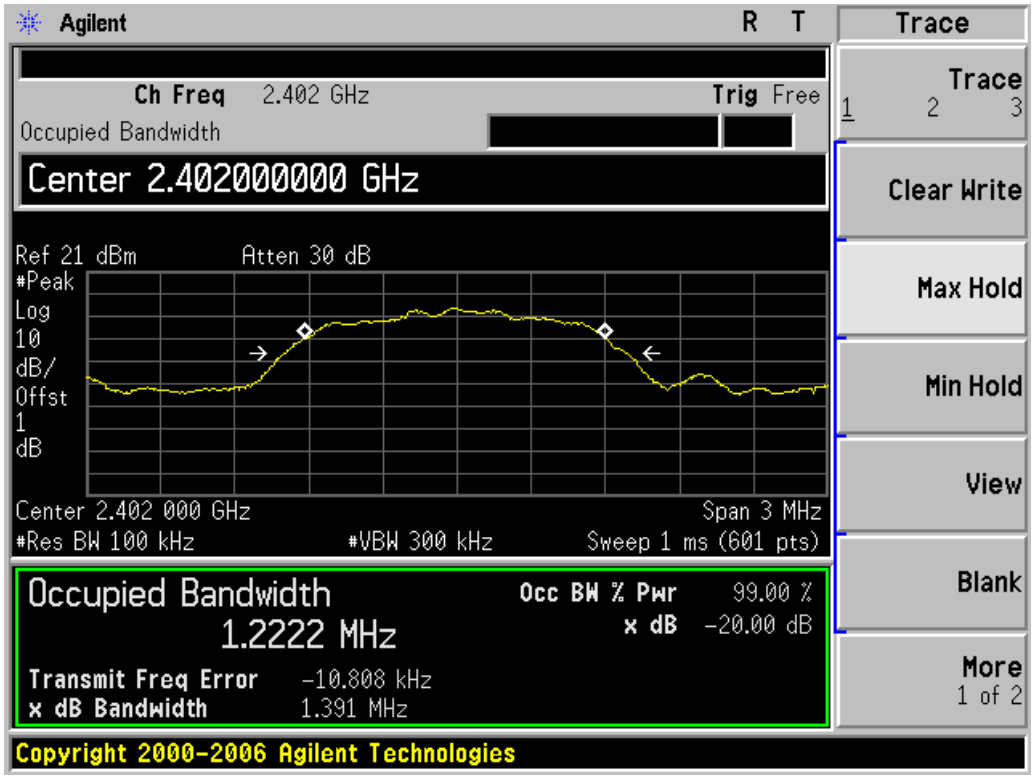


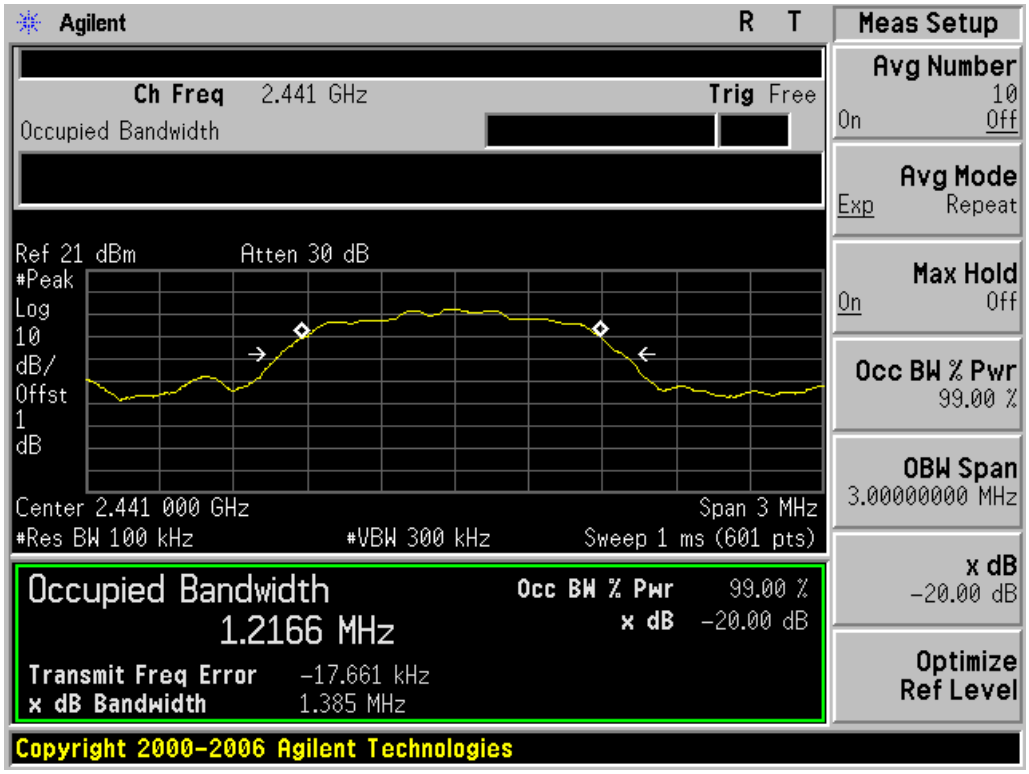


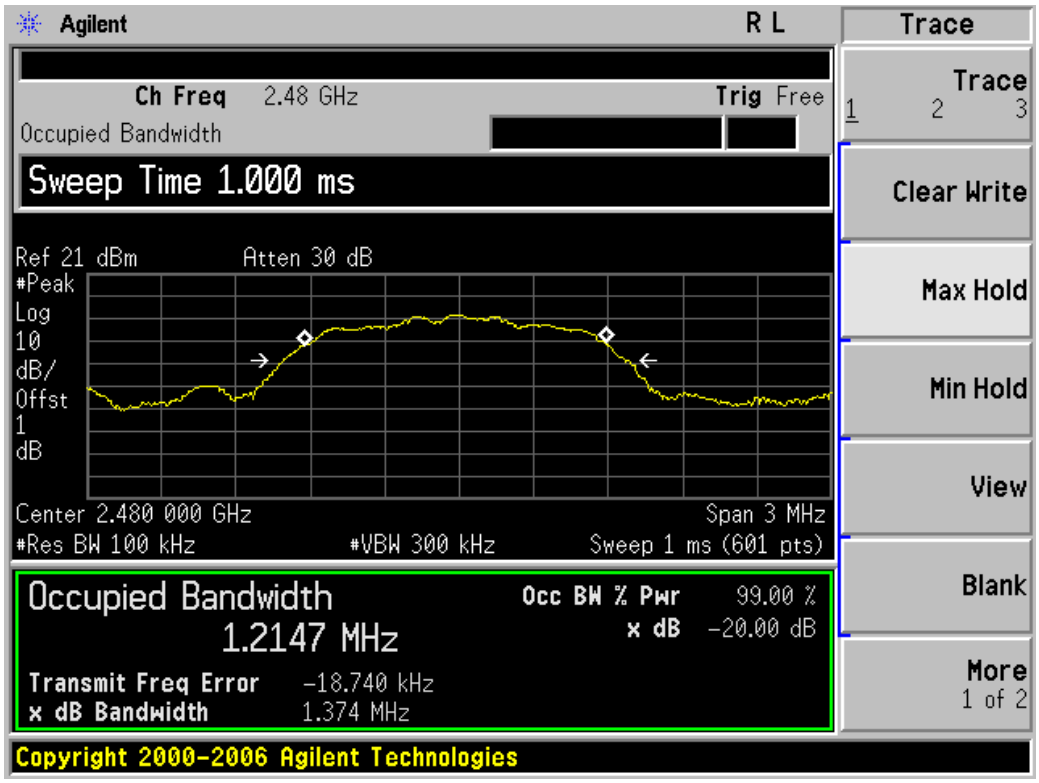


Modulation	Channel	20dB bandwidth (MHz)
π/4 DQPSK	CHL	1.391
	CHM	1.385
	CHH	1.374

π/4 DQPSK diagrams are as below:




Agilent
R T
Meas Setup
Ch Freq 2.441 GHz
Trig Free
Occupied Bandwidth
Avg Number
10
On Off
Avg Mode
Exp Repeat
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Max Hold
On Off
Occ BW % Pwr
99.00 %
OBW Span
3.00000000 MHz
Center 2.441 000 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
x dB
-20.00 dB
Occupied Bandwidth
1.2166 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -17.661 kHz
x dB Bandwidth 1.385 MHz
Optimize Ref Level
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Trace
Ch Freq 2.48 GHz
Trig Free
Occupied Bandwidth
Trace
1 2 3
Sweep Time 1.000 ms
Clear Write
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Max Hold
Min Hold
View
Center 2.480 000 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
Blank
More
1 of 2
Occupied Bandwidth
1.2147 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -18.740 kHz
x dB Bandwidth 1.374 MHz
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7. Band Edge Compliance Test

7.1 Test Procedure

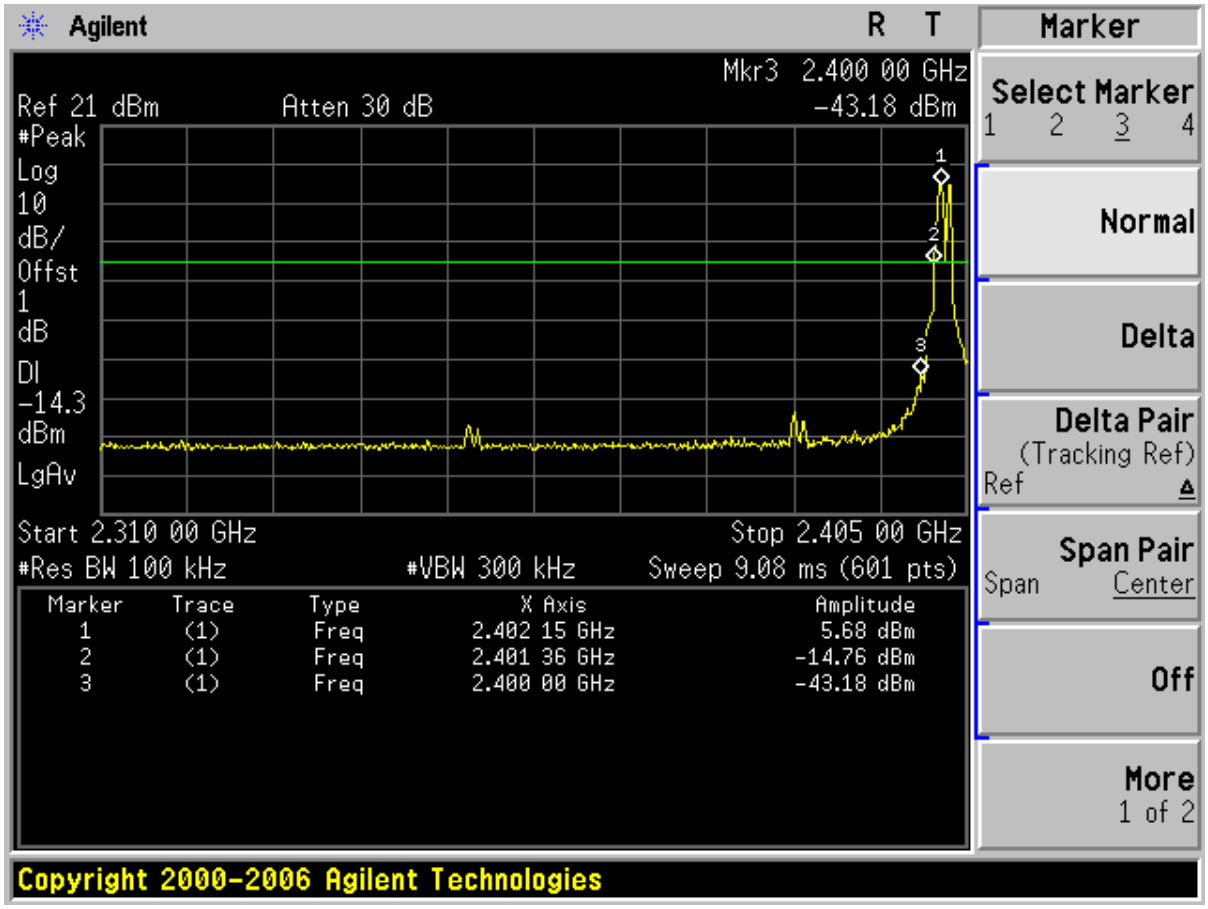
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains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

7.2 Measurement Equipment

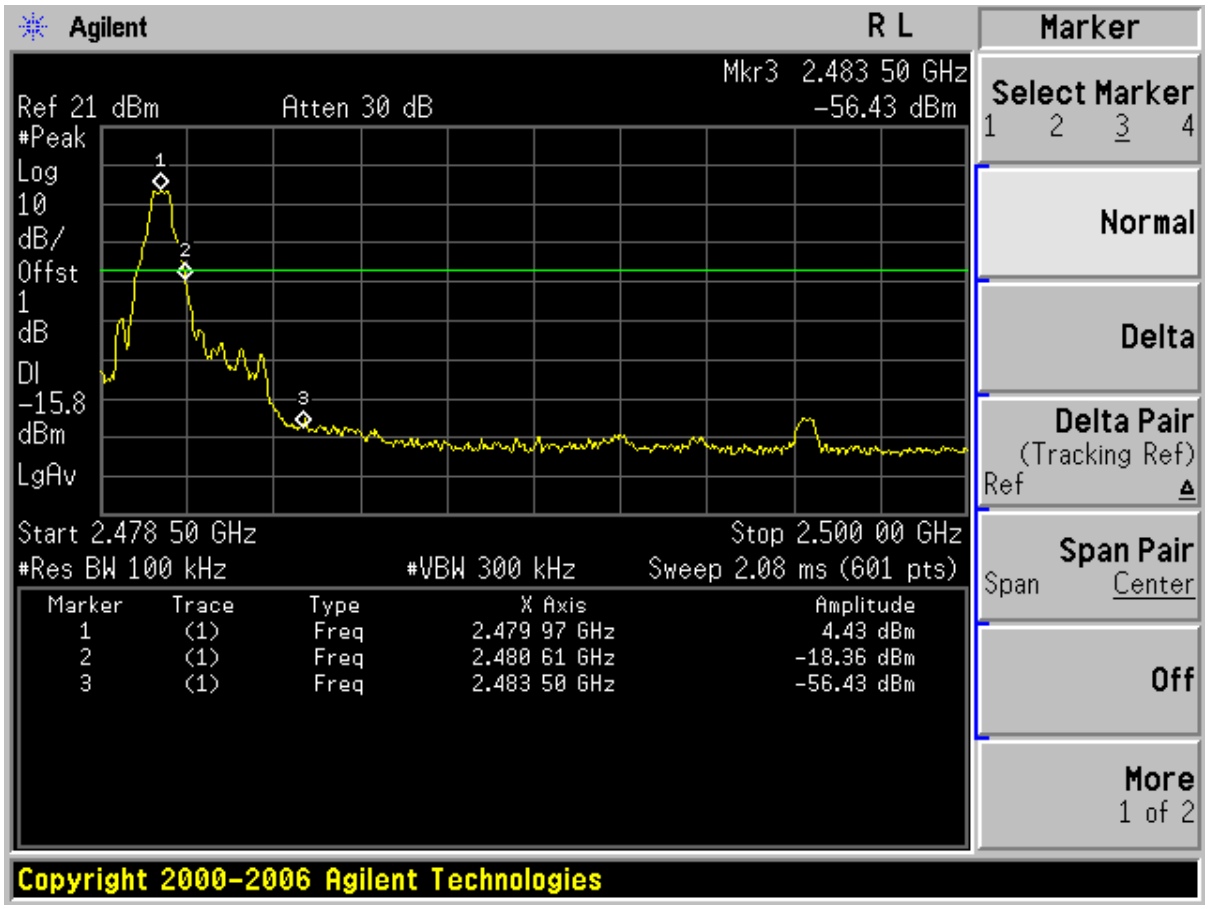
	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum	Dec. 06 2012	E4440A	MY42510313	Agilent

7.3 Test Result

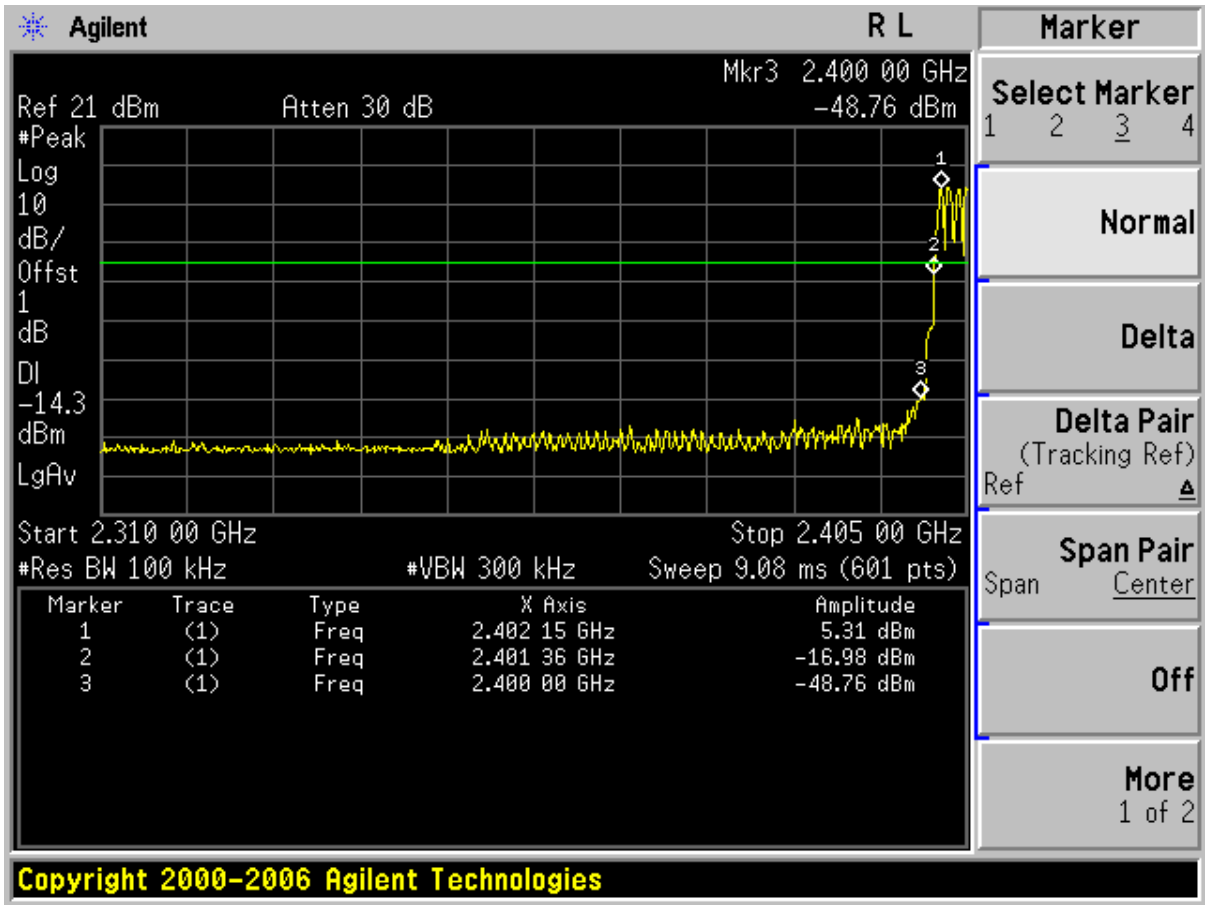
GFSK Hoppping off CHL :



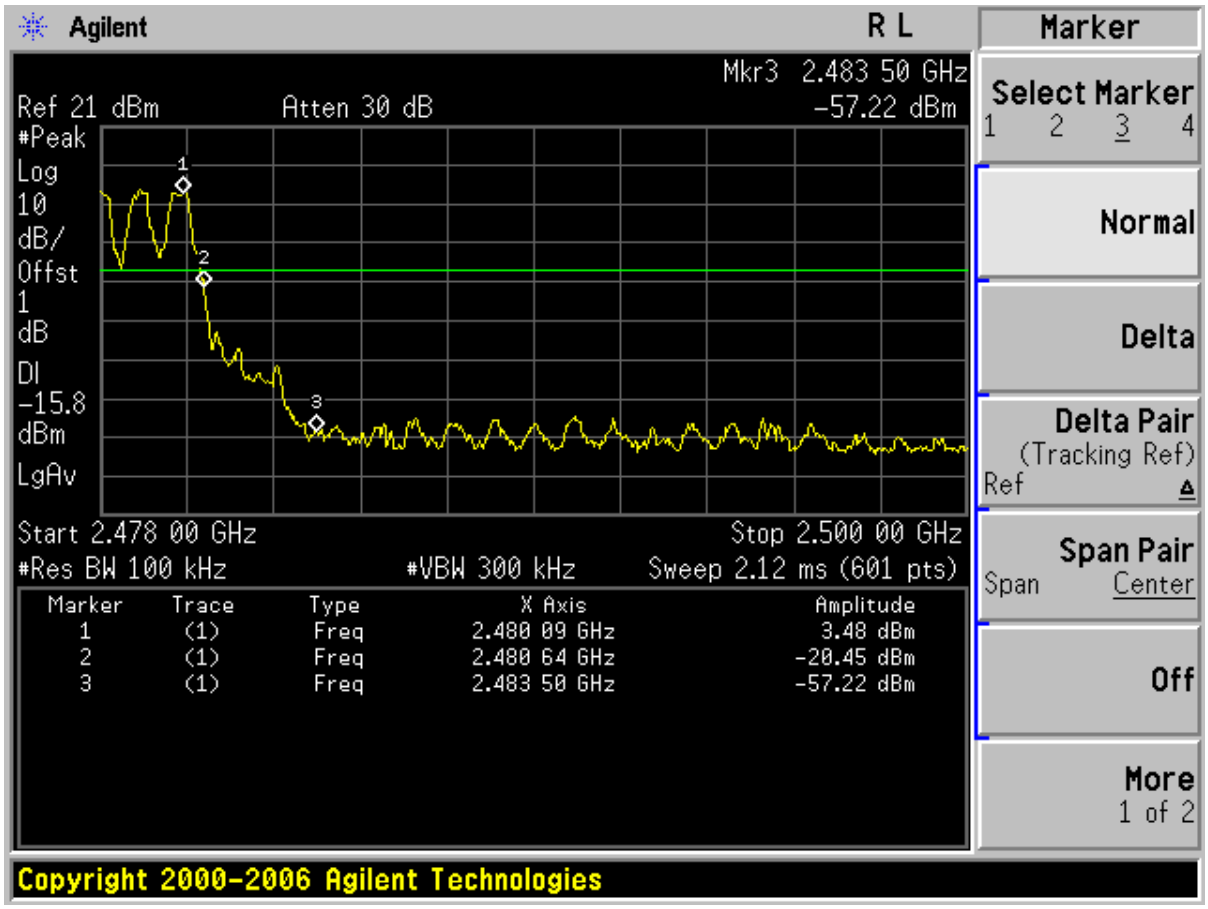
GFSK Hoppping off CHH :



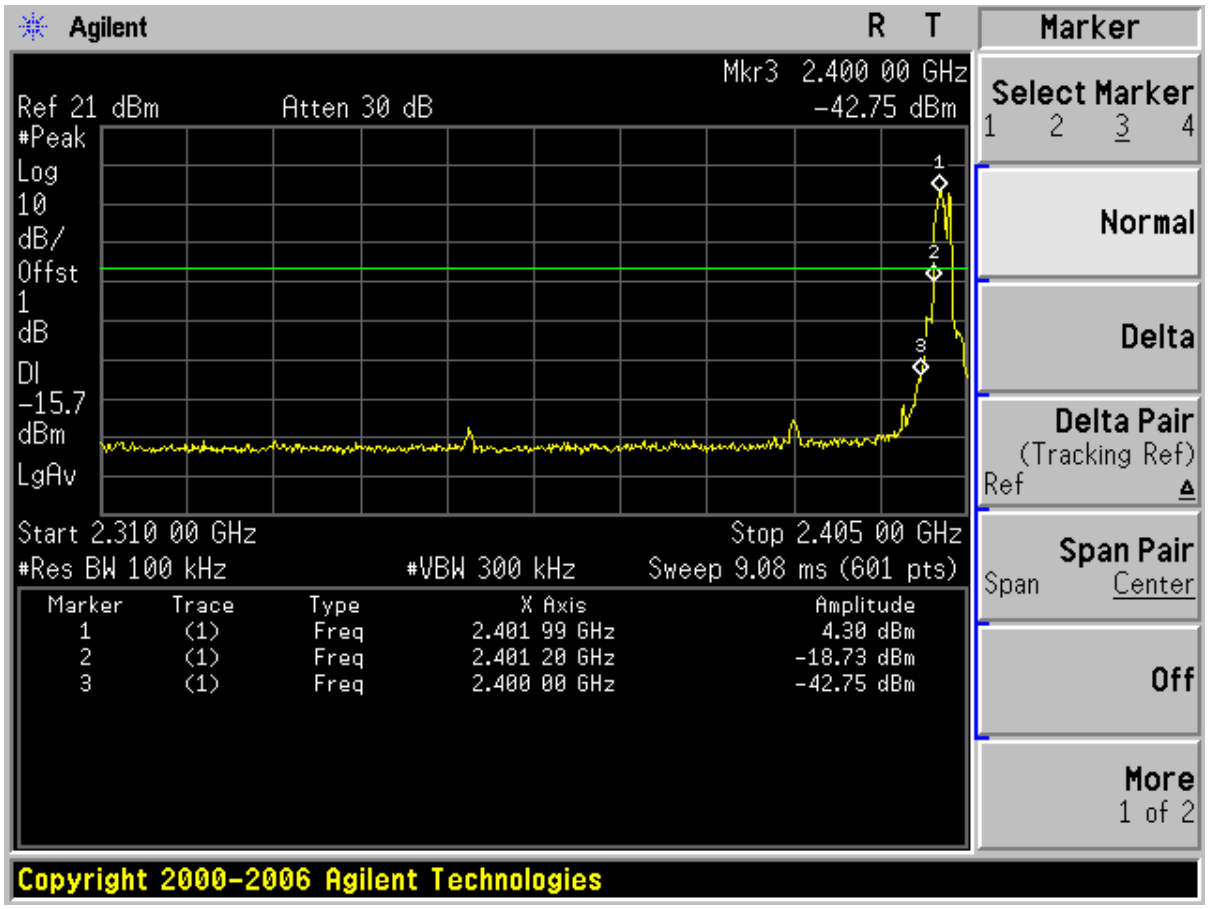
GFSK Hopping on CHL:



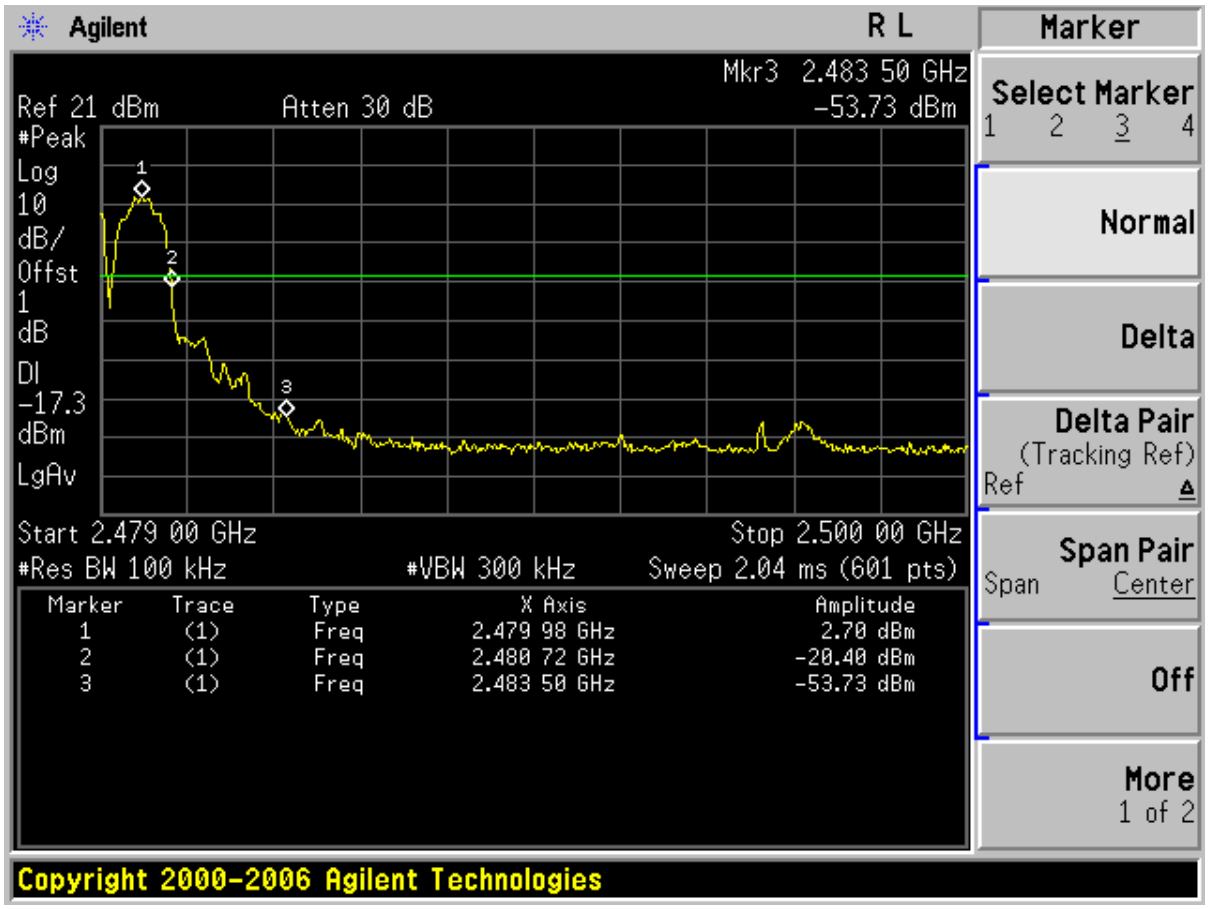
GFSK Hopping on CHH:



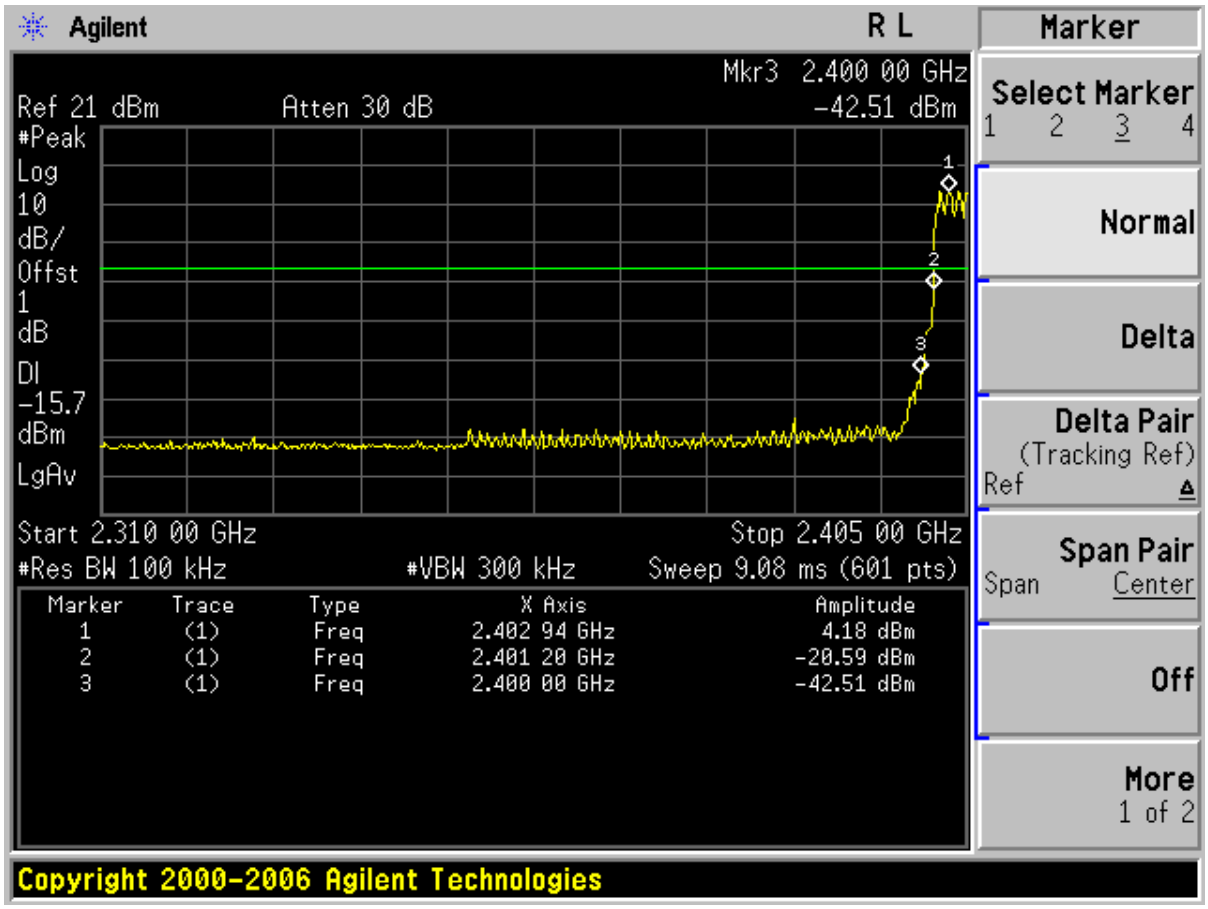
8DPSK Hopping off CHL :



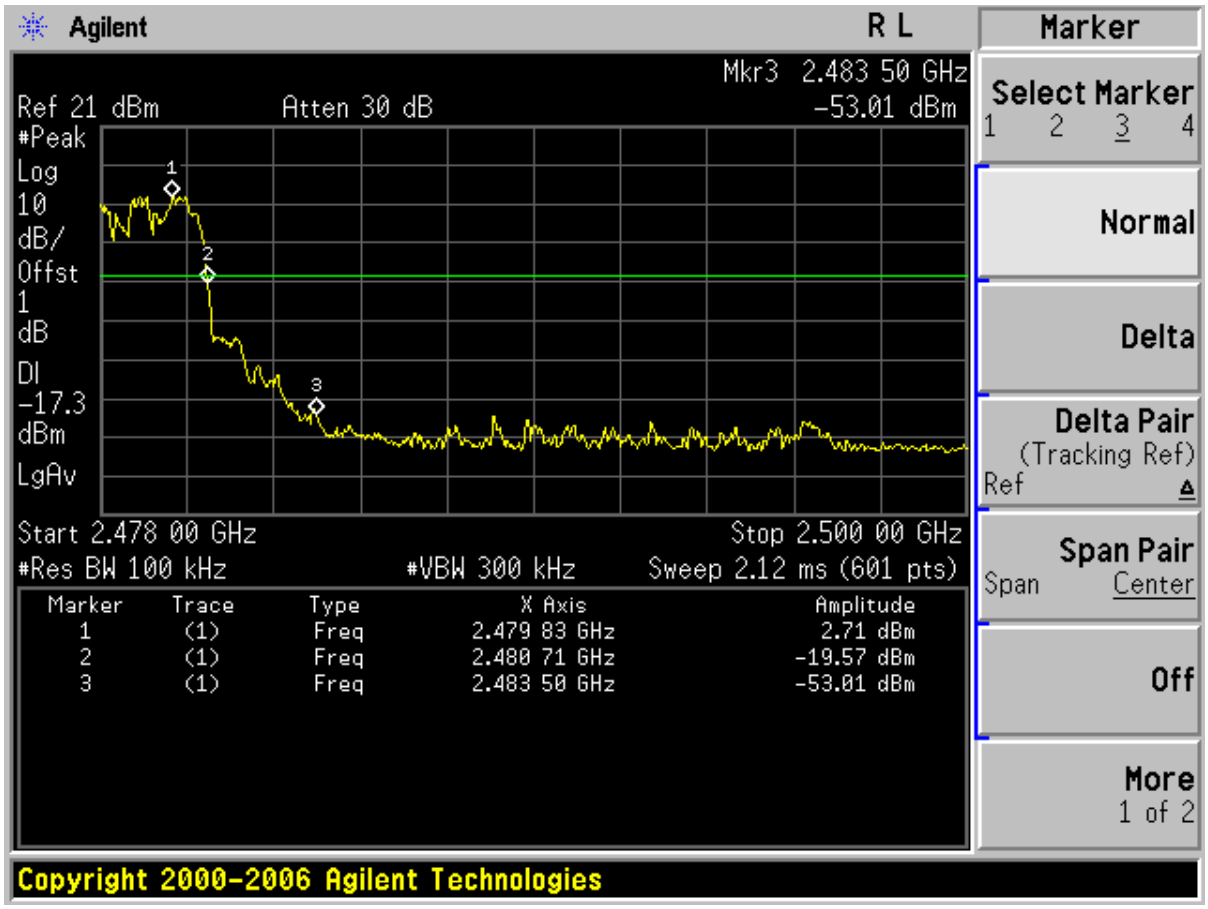
8DPSK Hopping off CHH :



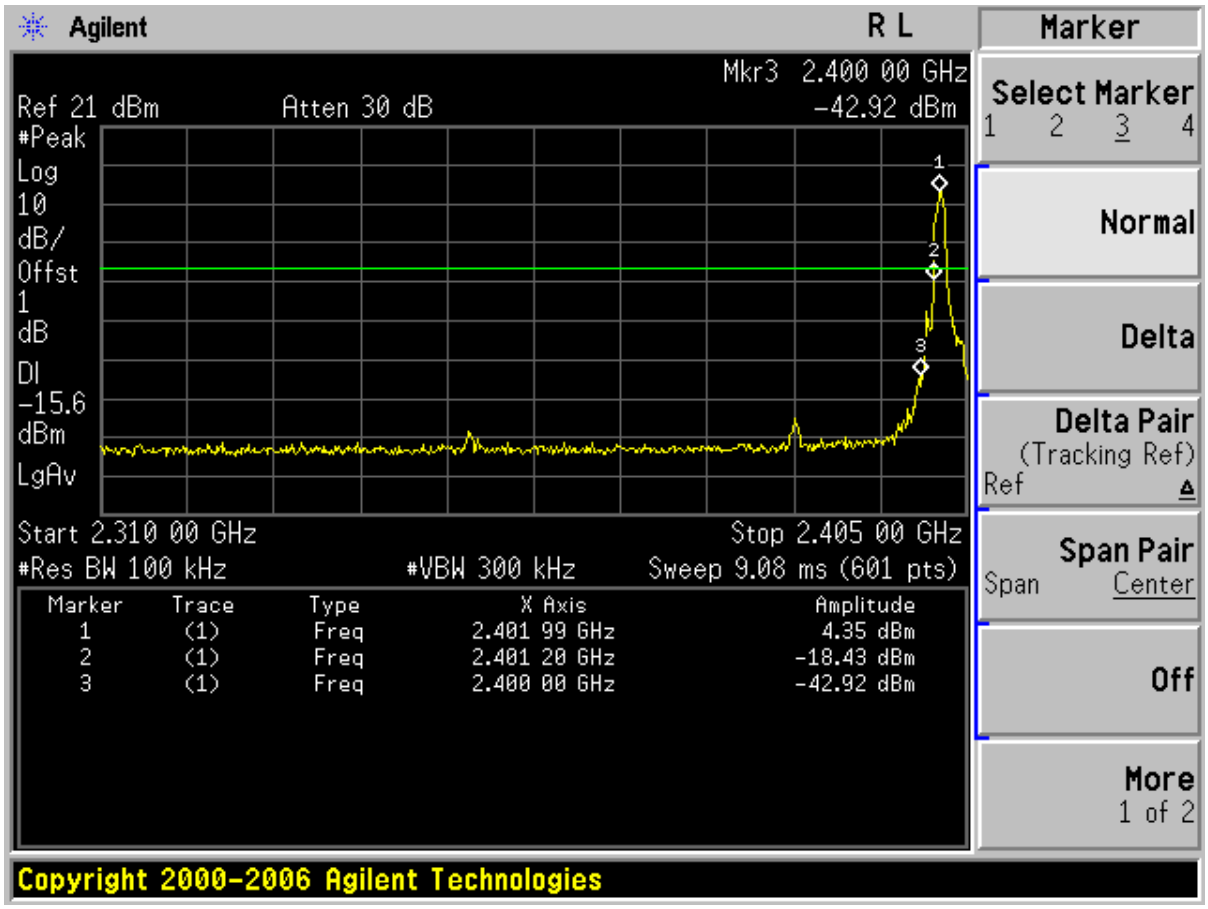
8DPSK Hopping on CHL :



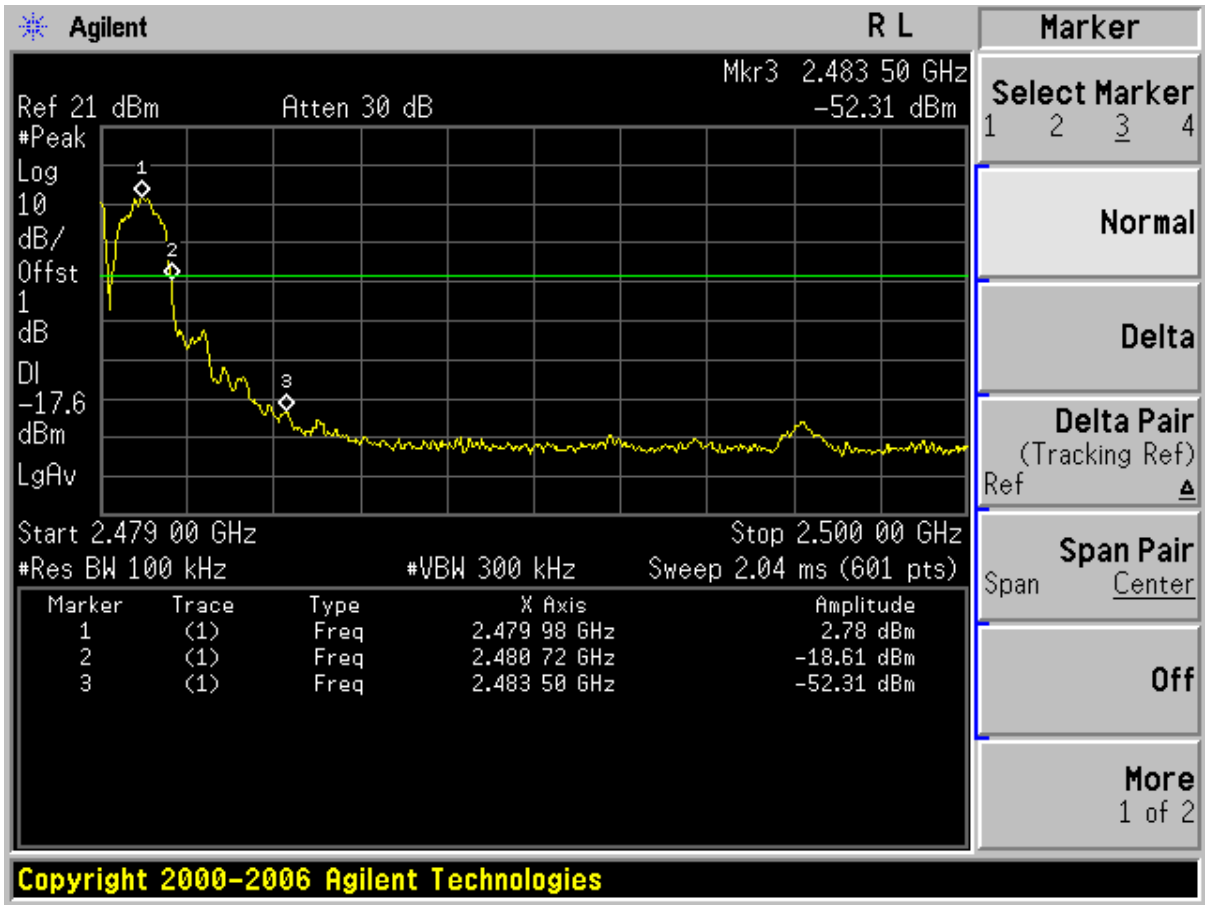
8DPSK Hopping on CHH :



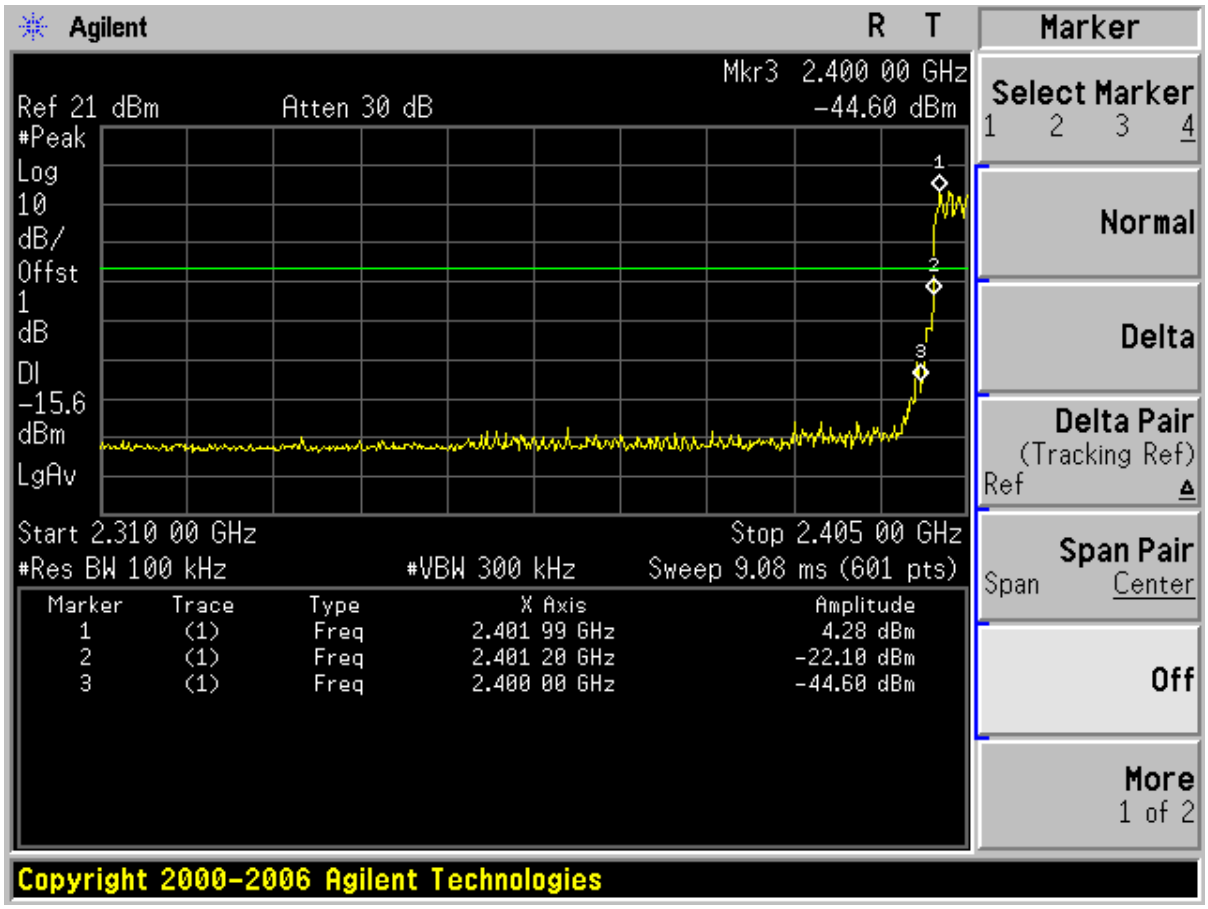
π/4 DQPSK Hopping off CHL :



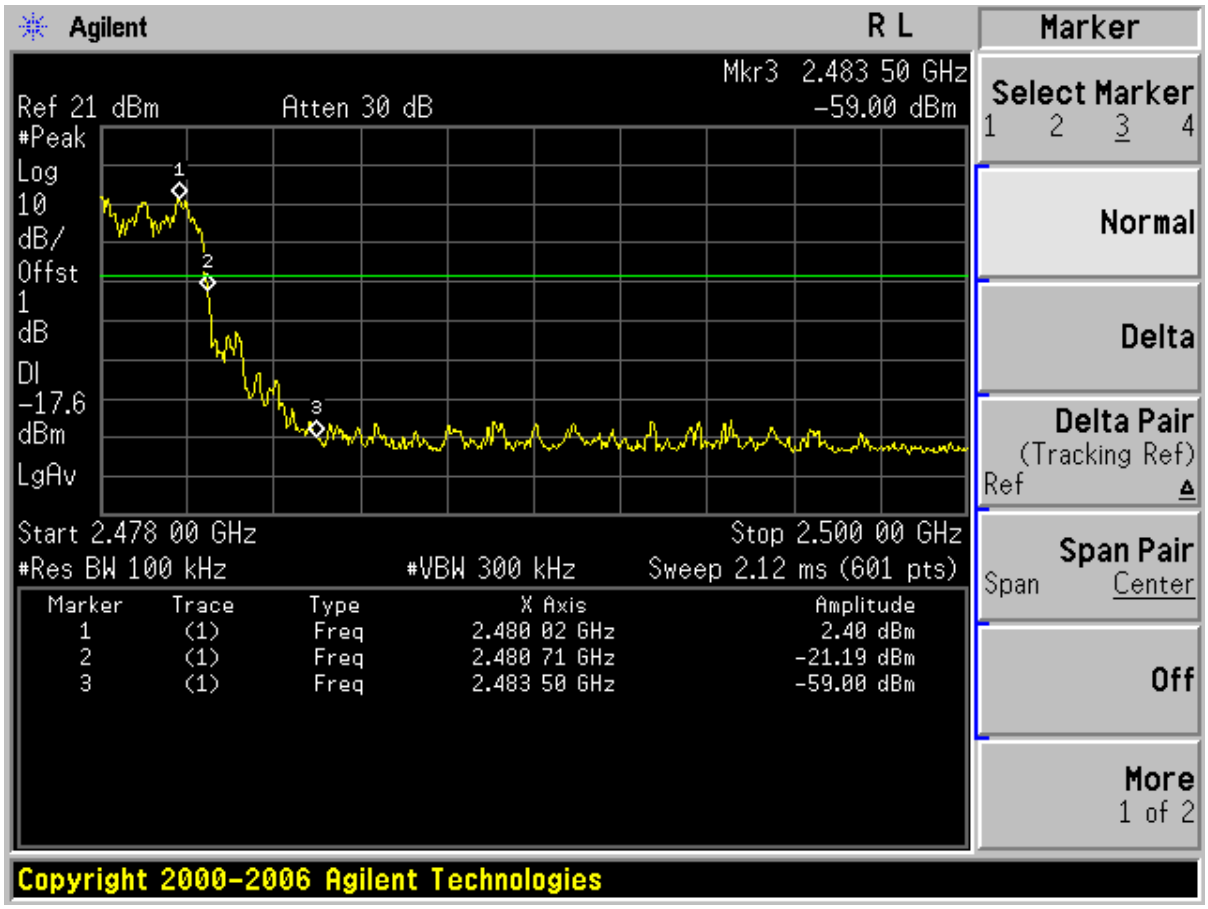
π/4 DQPSK Hopping off CHH :



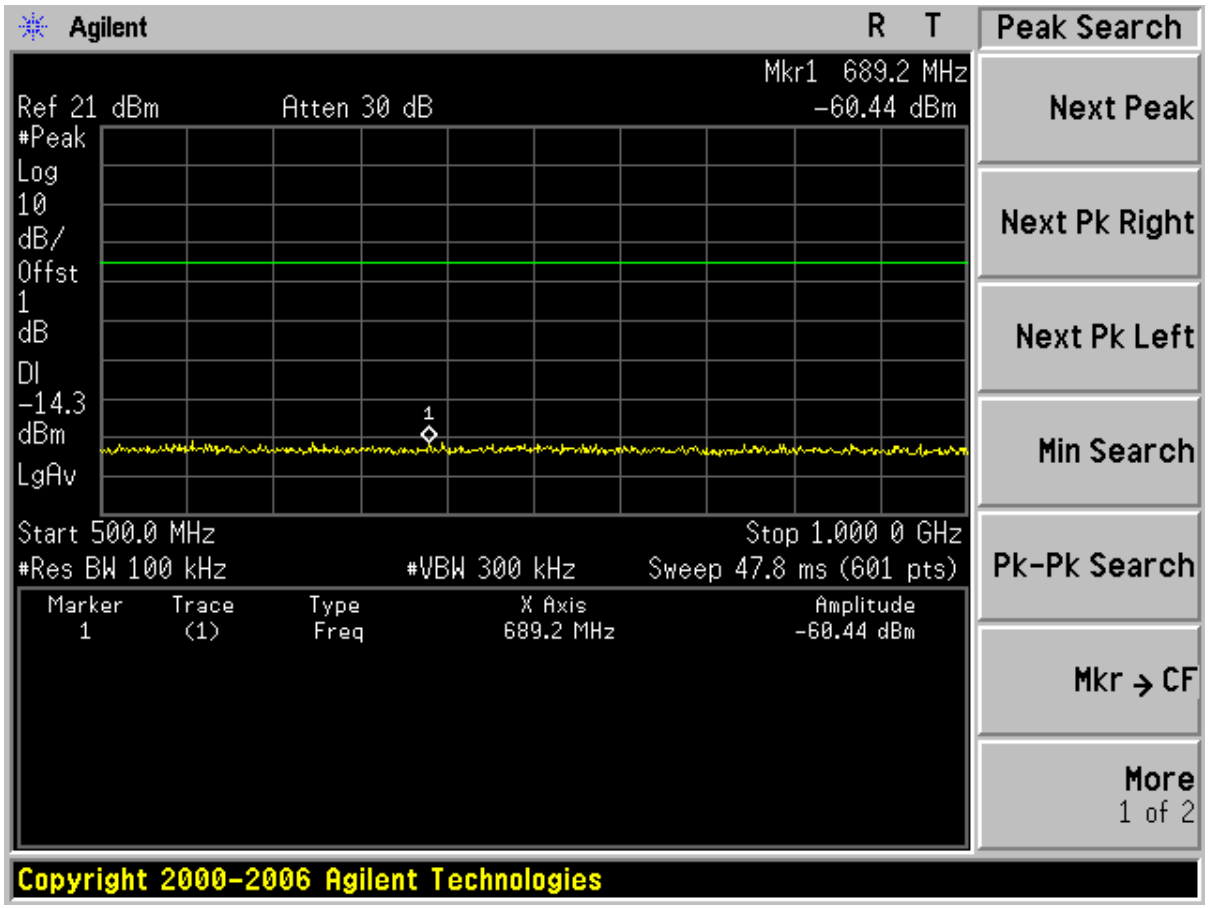
π/4 DQPSK Hopping on CHL :

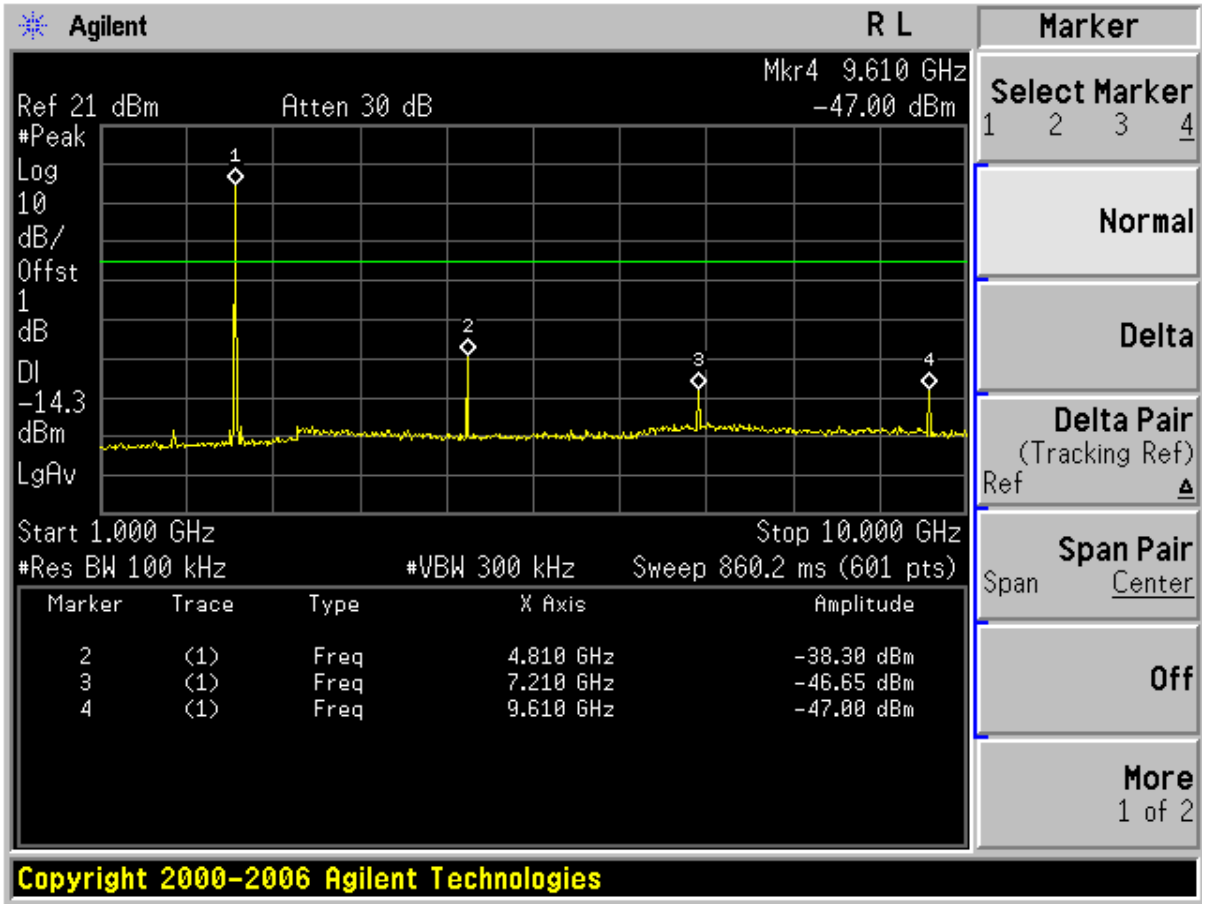


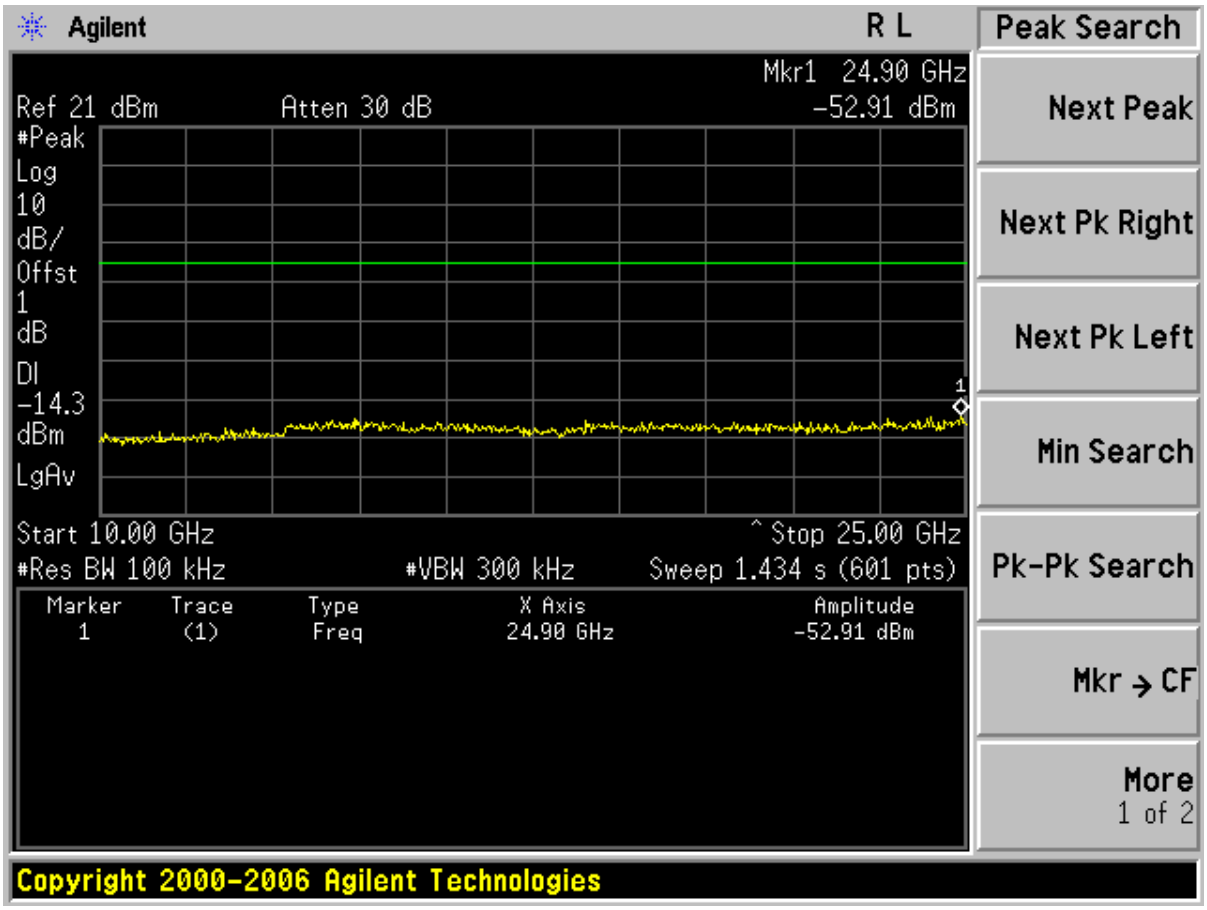
π/4 DQPSK Hopping on CHH :



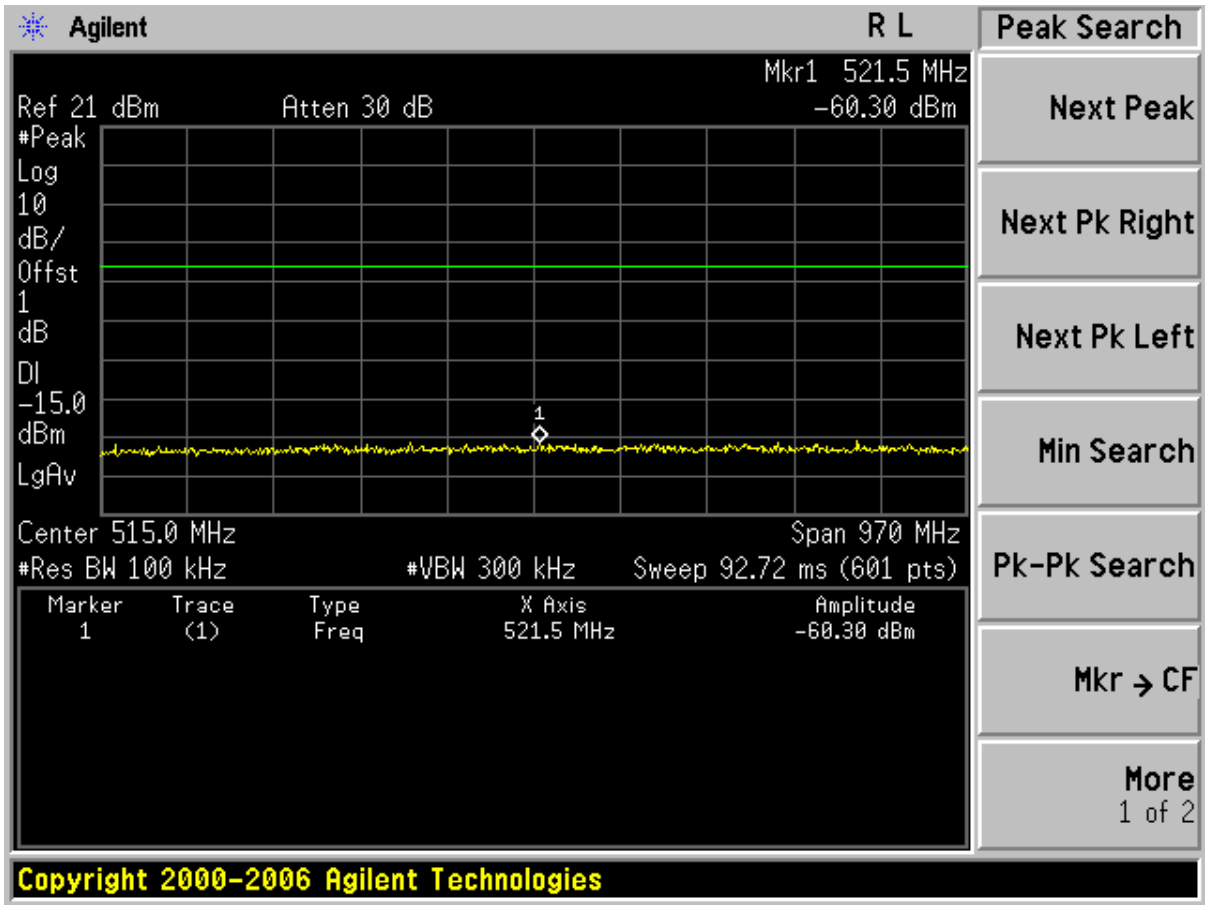
GFSK CHL :

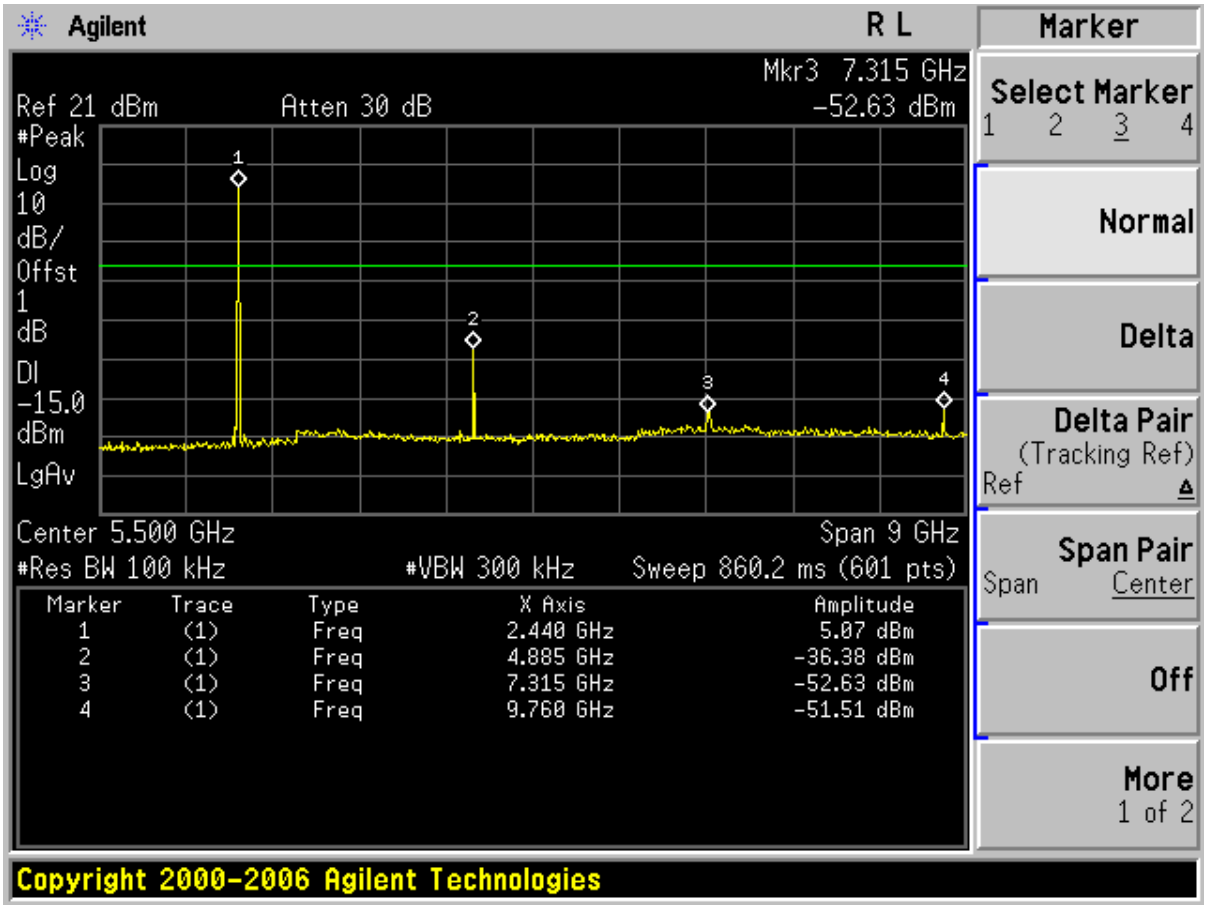

Agilent
R T
Peak Search
Mkr1 689.2 MHz
Ref 21 dBm
Atten 30 dB
-60.44 dBm
Next Peak
#Peak
Log
10
dB/
Offst
1
dB
Next Pk Right
Dl
-14.3
dBm
Next Pk Left
LgAv
Min Search
Start 500.0 MHz
Stop 1.000 0 GHz
Pk-Pk Search
#Res BW 100 kHz
#VBW 300 kHz
Sweep 47.8 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 689.2 MHz -60.44 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

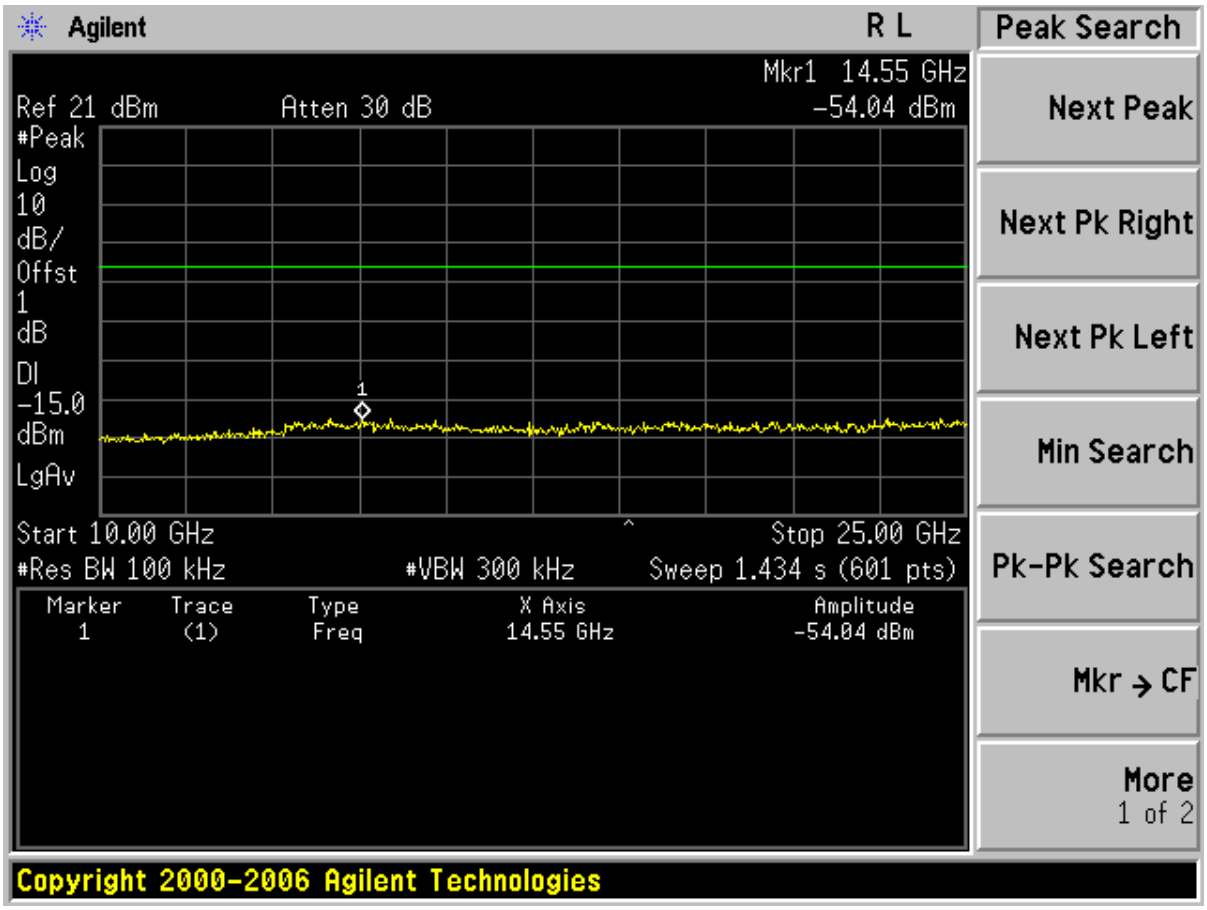

Agilent
R L
Marker
Mkr4 9.610 GHz
Ref 21 dBm
Atten 30 dB
-47.00 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-14.3
dBm
LgAv
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
2 (1) Freq 4.810 GHz -38.30 dBm
3 (1) Freq 7.210 GHz -46.65 dBm
4 (1) Freq 9.610 GHz -47.00 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 24.90 GHz
Ref 21 dBm
Atten 30 dB
-52.91 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-14.3
dBm
LgAv
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 24.90 GHz -52.91 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

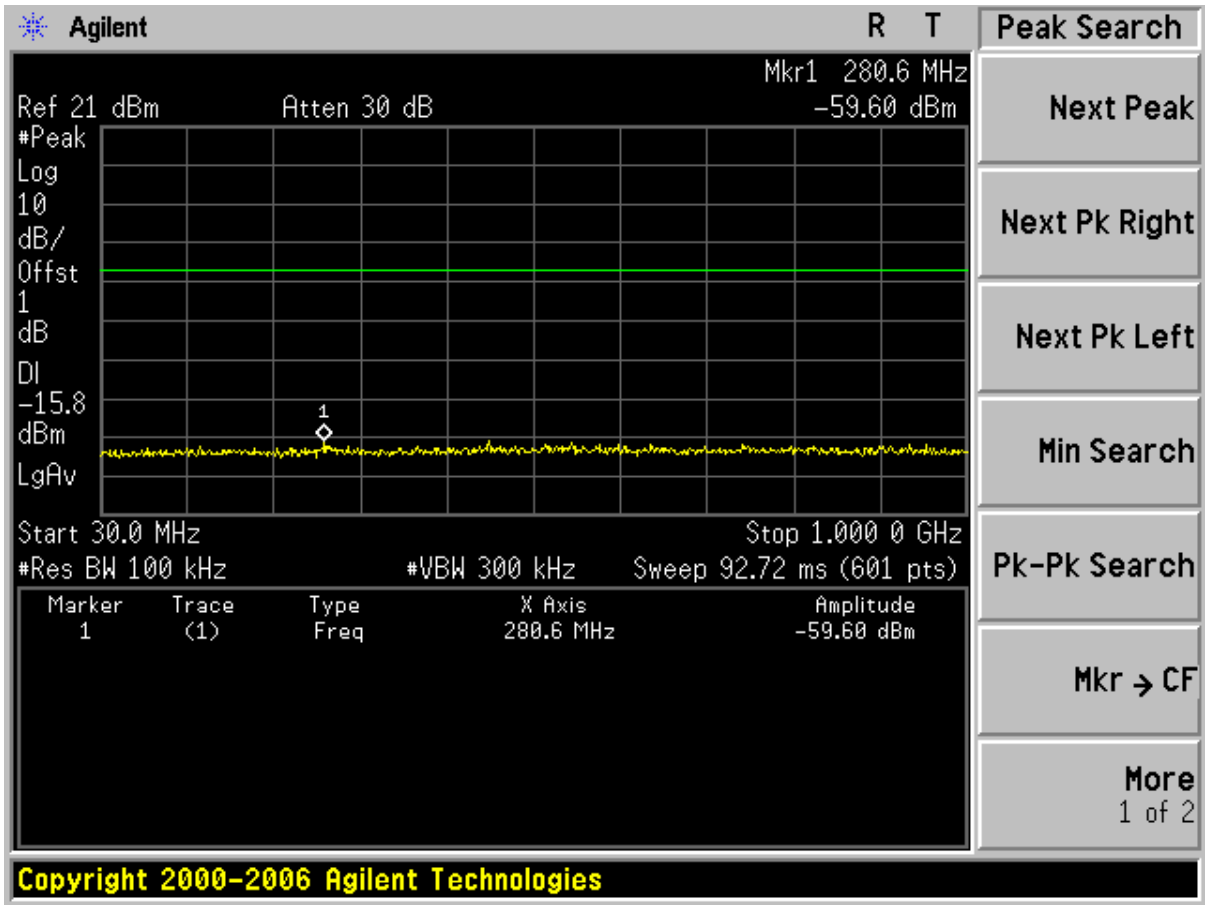
GFSK CHM:

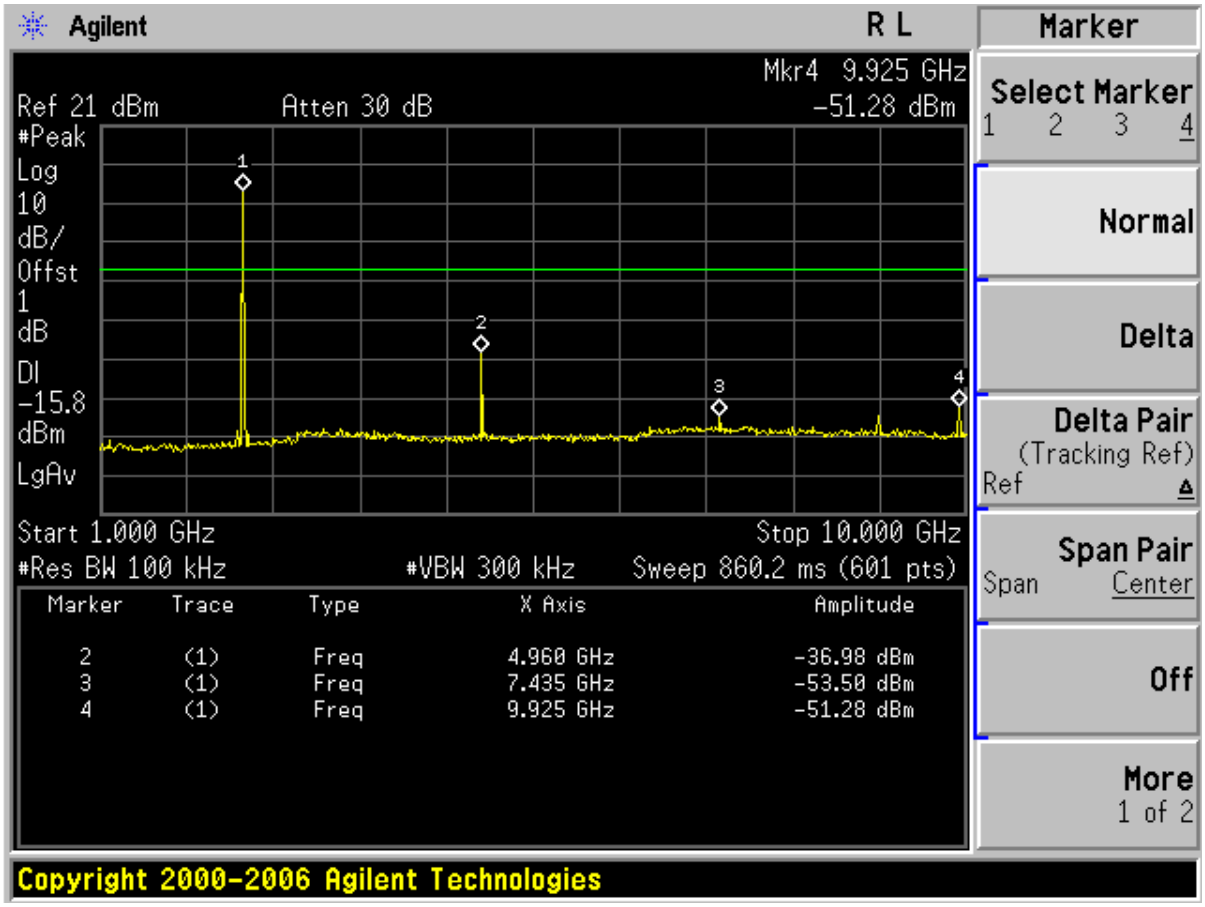

Agilent
R L
Peak Search
Mkr1 521.5 MHz
Ref 21 dBm
Atten 30 dB
-60.30 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.0
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 515.0 MHz
Span 970 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 521.5 MHz -60.30 dBm
Copyright 2000-2006 Agilent Technologies

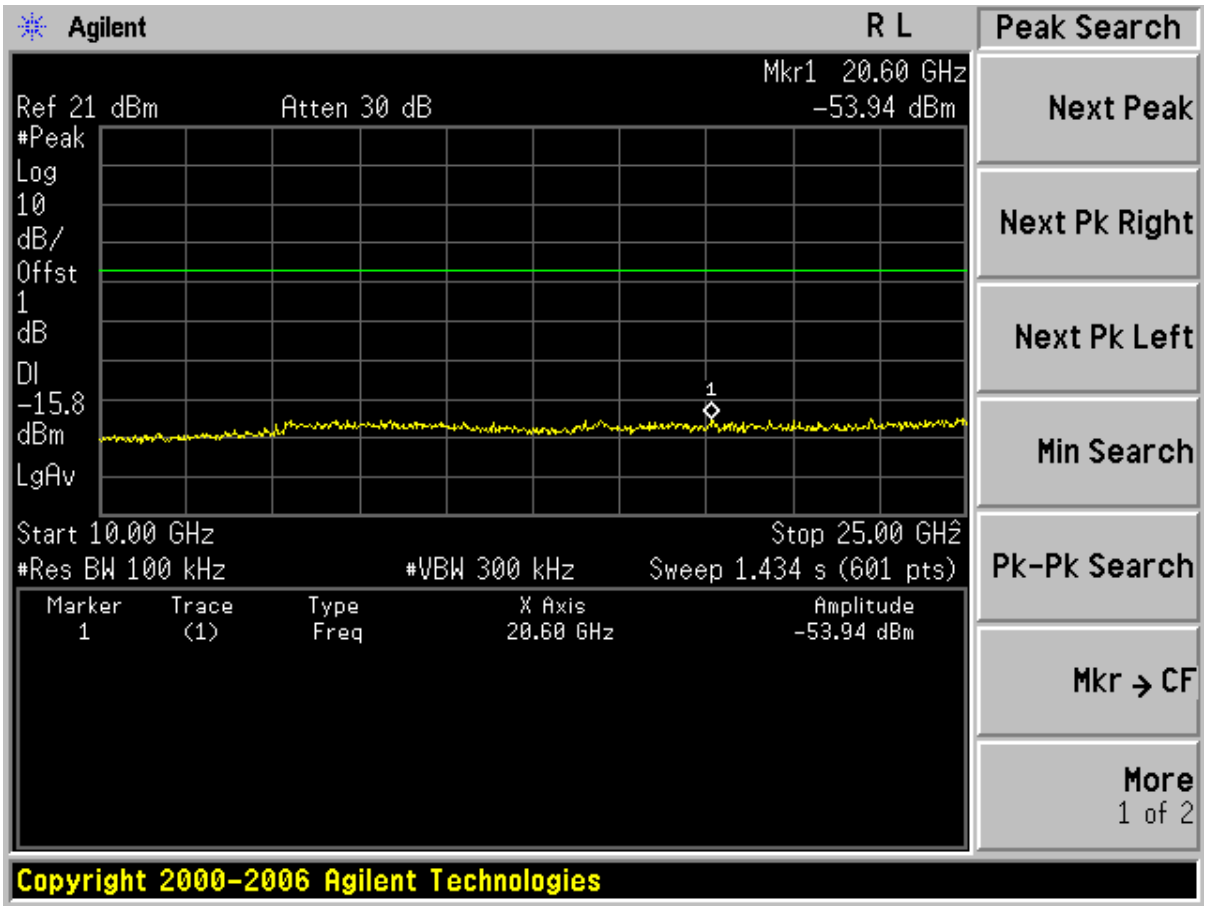

Agilent
R L
Marker
Mkr3 7.315 GHz
Ref 21 dBm
Atten 30 dB
-52.63 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.0
dBm
LgAv
Center 5.500 GHz
Span 9 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.440 GHz 5.07 dBm
2 (1) Freq 4.885 GHz -36.38 dBm
3 (1) Freq 7.315 GHz -52.63 dBm
4 (1) Freq 9.760 GHz -51.51 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 14.55 GHz
Ref 21 dBm
Atten 30 dB
-54.04 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.0
dBm
LgAv
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 14.55 GHz -54.04 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

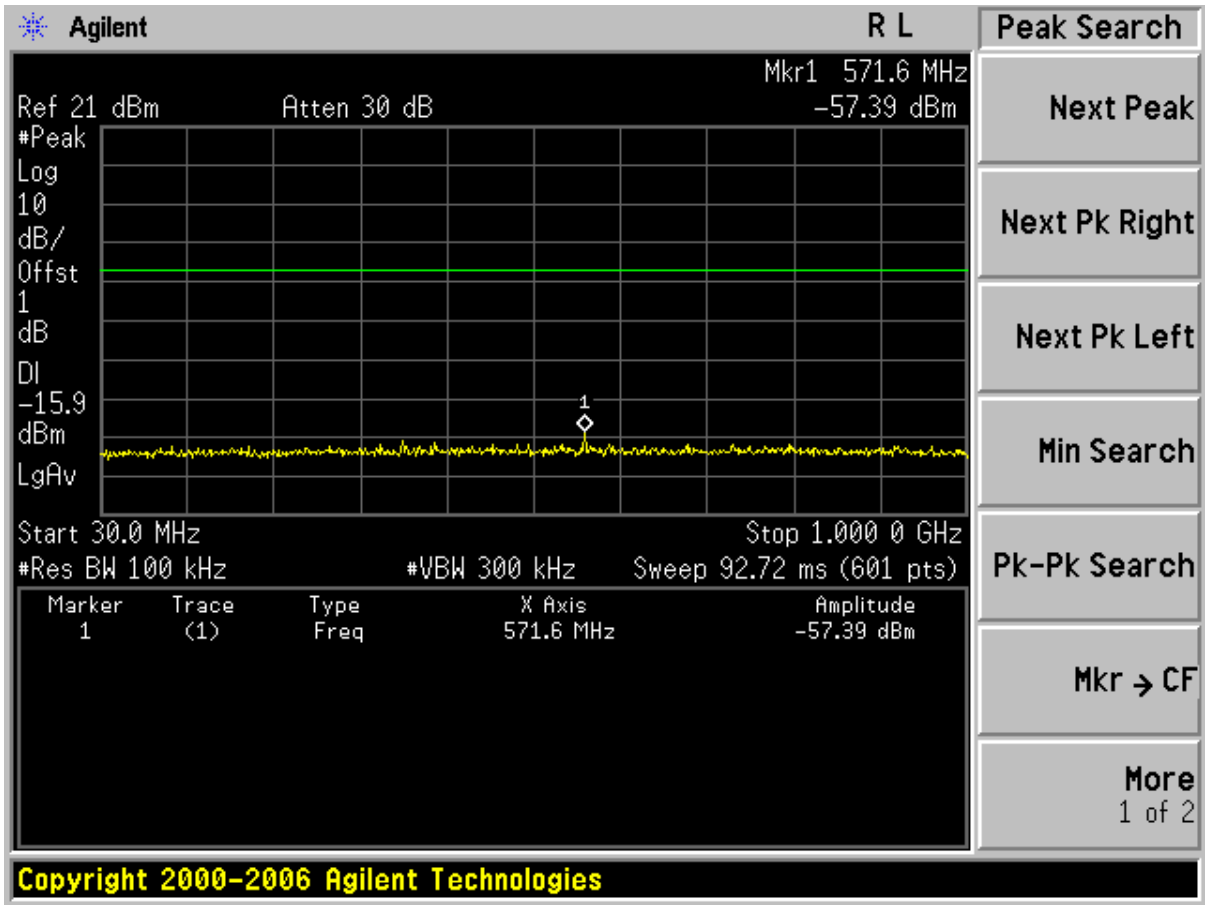
GFSK CHH:

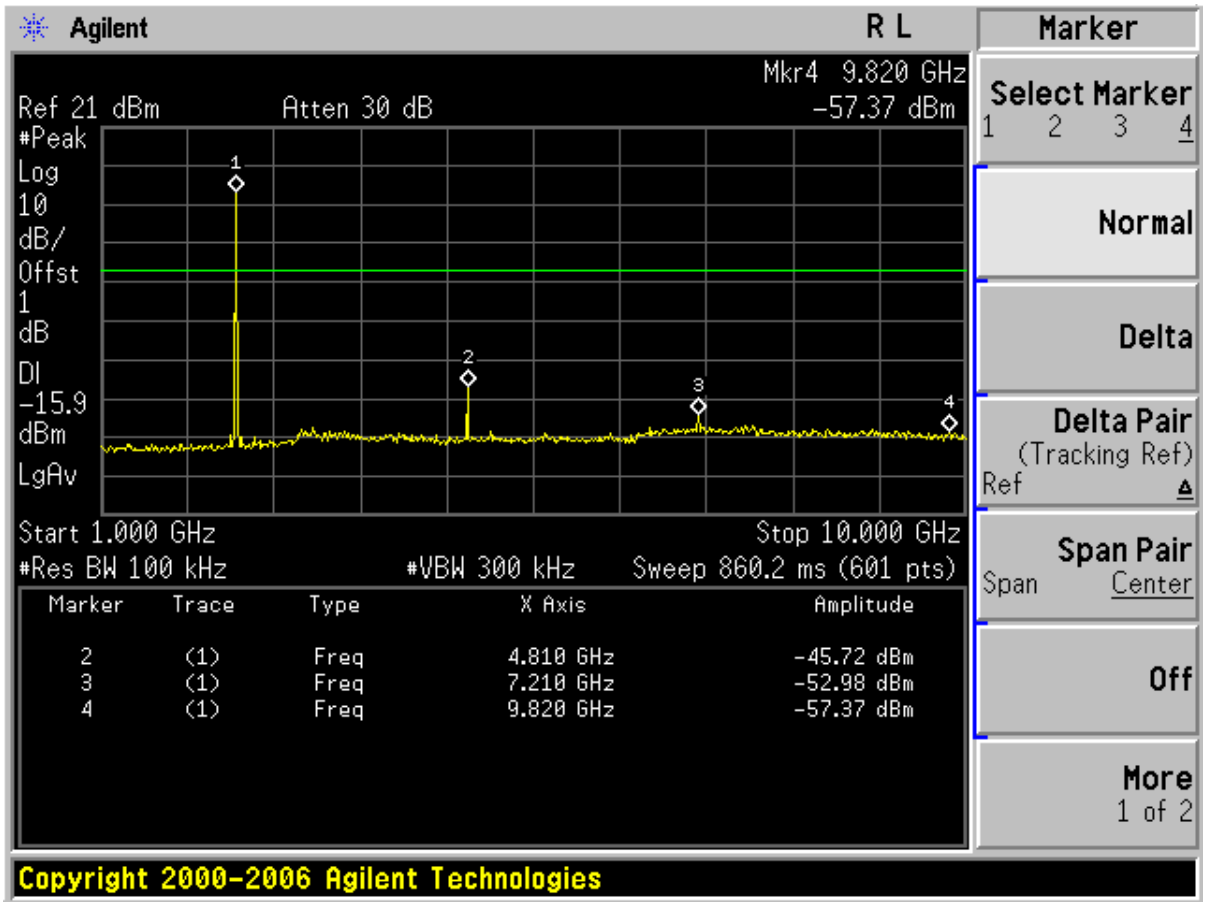

Agilent
R T
Peak Search
Mkr1 280.6 MHz
Ref 21 dBm
Atten 30 dB
-59.60 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.8
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Pk-Pk Search
Marker Trace Type X Axis Amplitude
1 (1) Freq 280.6 MHz -59.60 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

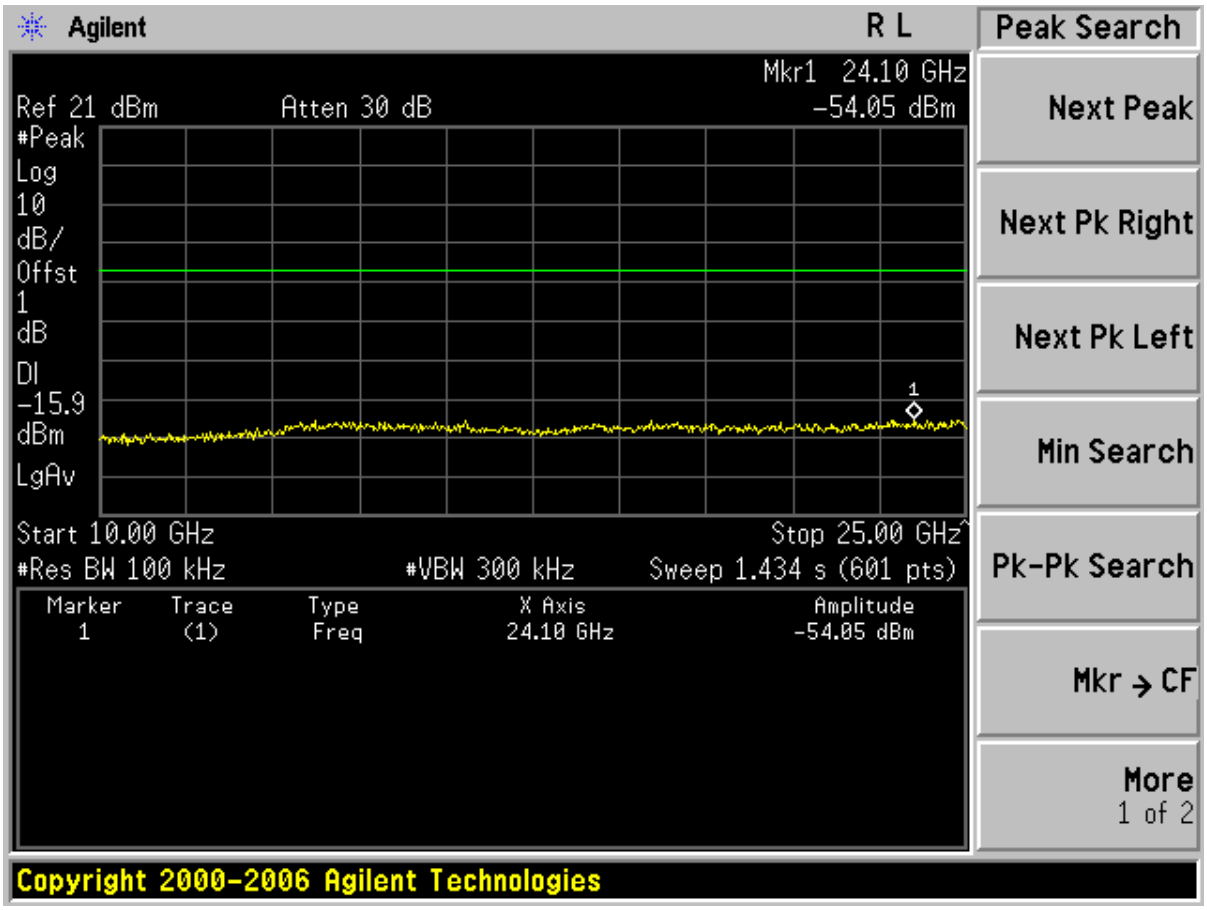

Agilent
R L
Marker
Mkr4 9.925 GHz
Ref 21 dBm
Atten 30 dB
-51.28 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.8
dBm
LgAv
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
2 (1) Freq 4.960 GHz -36.98 dBm
3 (1) Freq 7.435 GHz -53.50 dBm
4 (1) Freq 9.925 GHz -51.28 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 20.60 GHz
Ref 21 dBm
Atten 30 dB
-53.94 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.8
dBm
LgAv
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 20.60 GHz -53.94 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

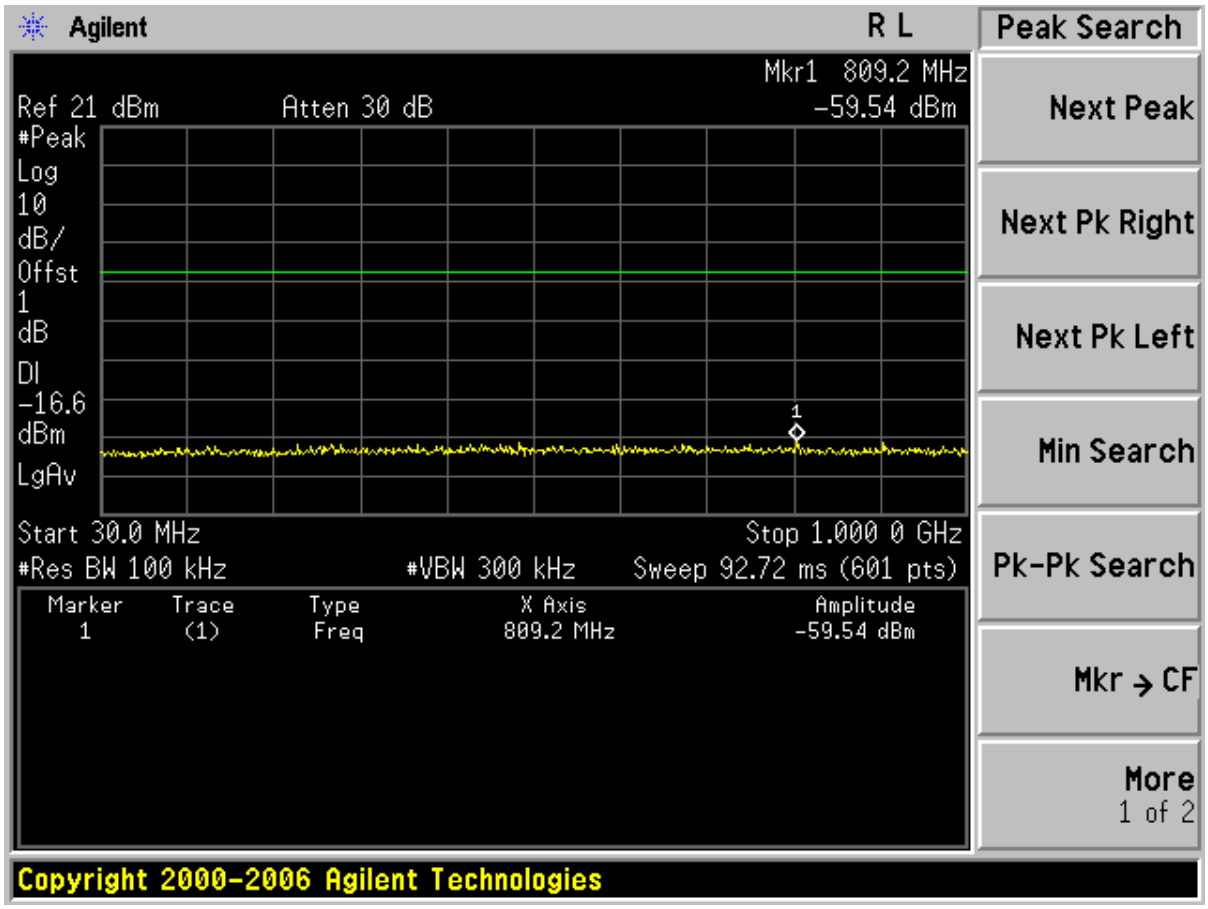
8DPSK CHL:

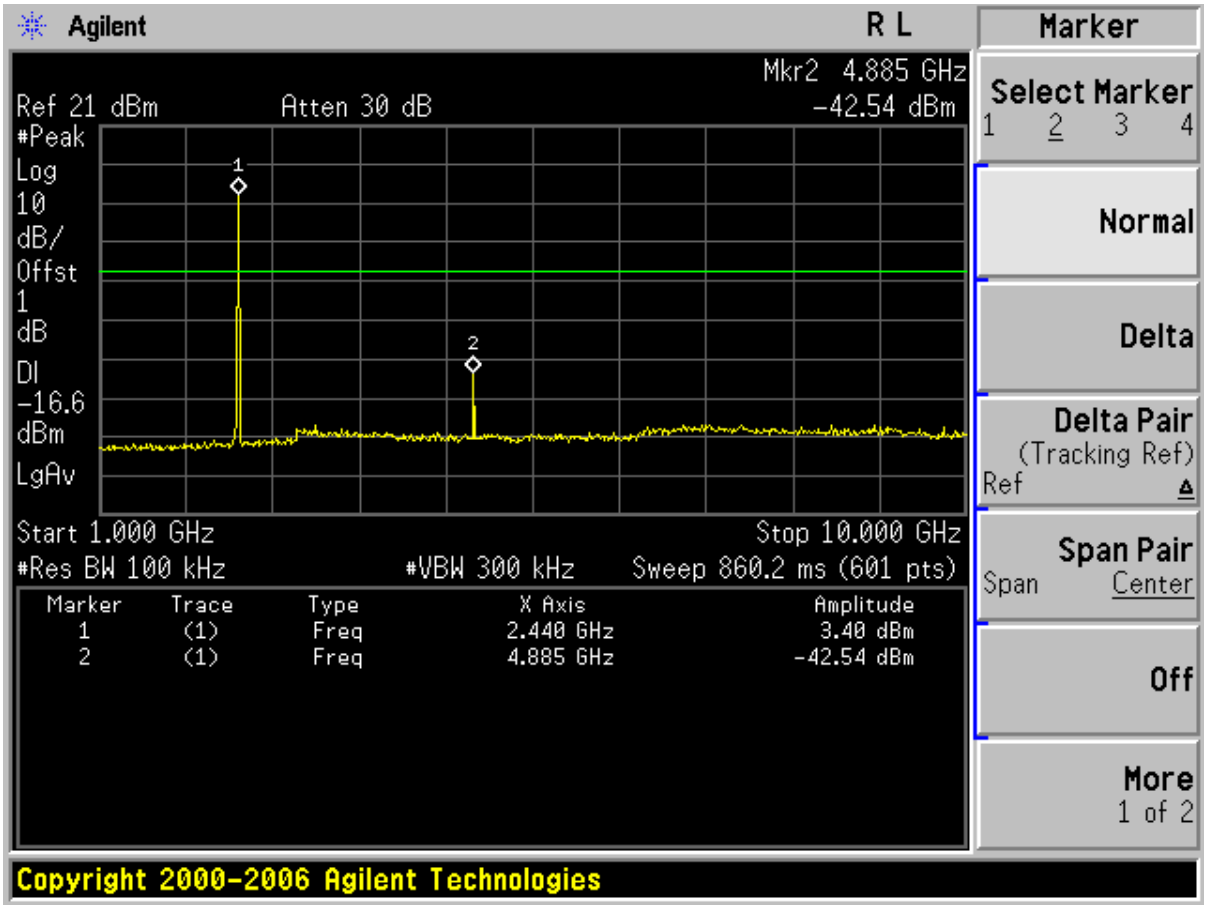

Agilent
R L
Peak Search
Mkr1 571.6 MHz
Ref 21 dBm
Atten 30 dB
-57.39 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.9
dBm
LgAv
1
Next Peak
Next Pk Right
Next Pk Left
Min Search
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Pk-Pk Search
Marker
Trace
Type
X Axis
Amplitude
1
(1)
Freq
571.6 MHz
-57.39 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

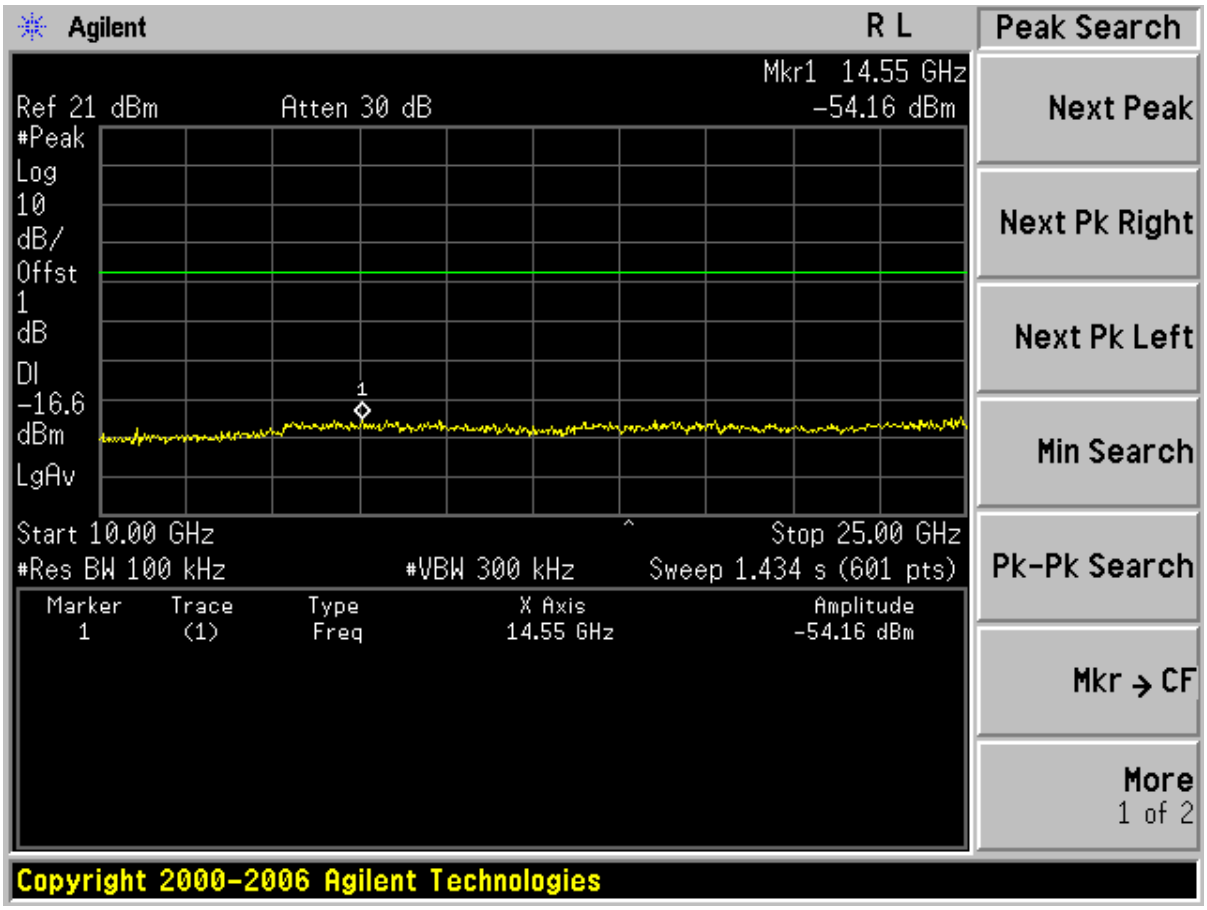

Agilent
R L
Marker
Mkr4 9.820 GHz
-57.37 dBm
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.9
dBm
LgAv
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 10.000 GHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
2 (1) Freq 4.810 GHz -45.72 dBm
3 (1) Freq 7.210 GHz -52.98 dBm
4 (1) Freq 9.820 GHz -57.37 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 24.10 GHz
-54.05 dBm
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Dl
-15.9
dBm
LgAv
Start 10.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 24.10 GHz -54.05 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

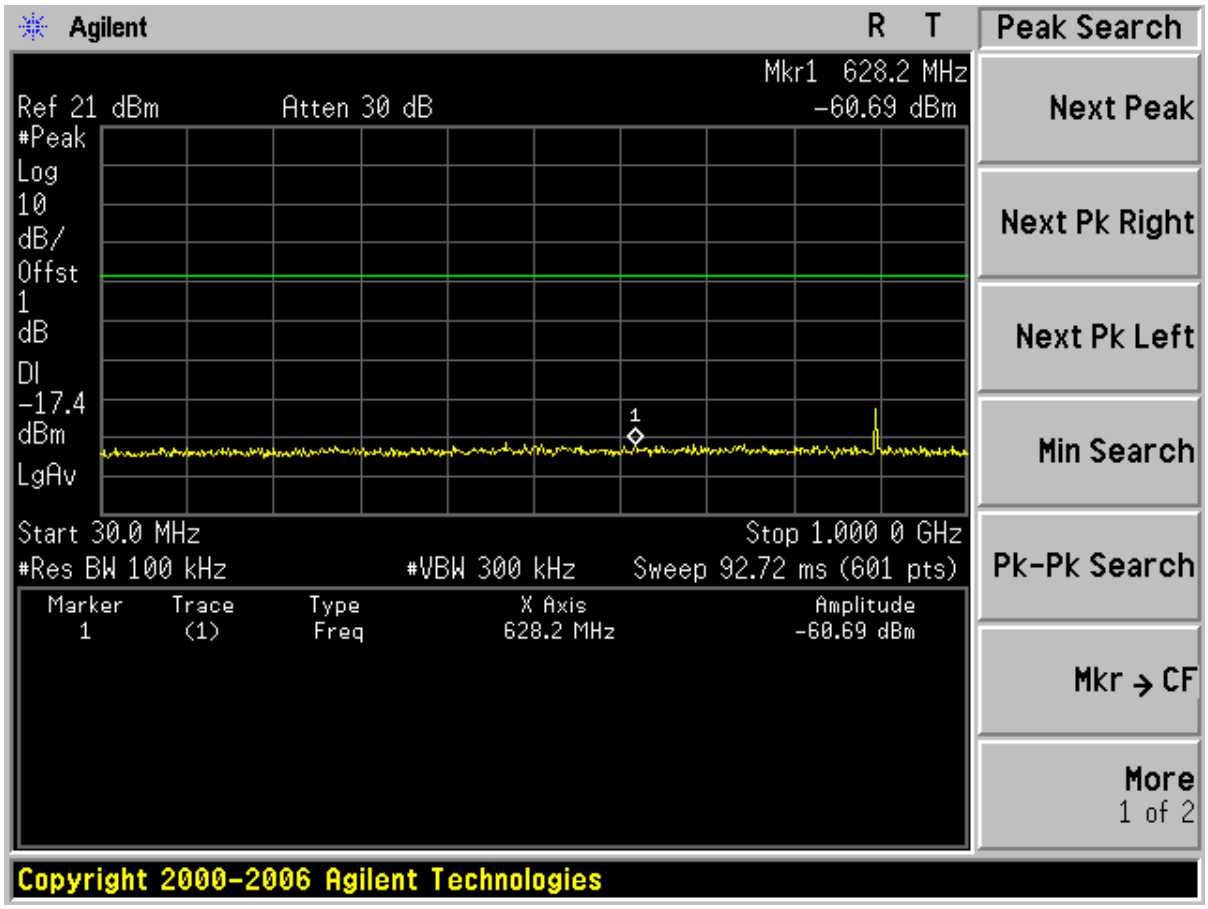
8DPSK CHM:

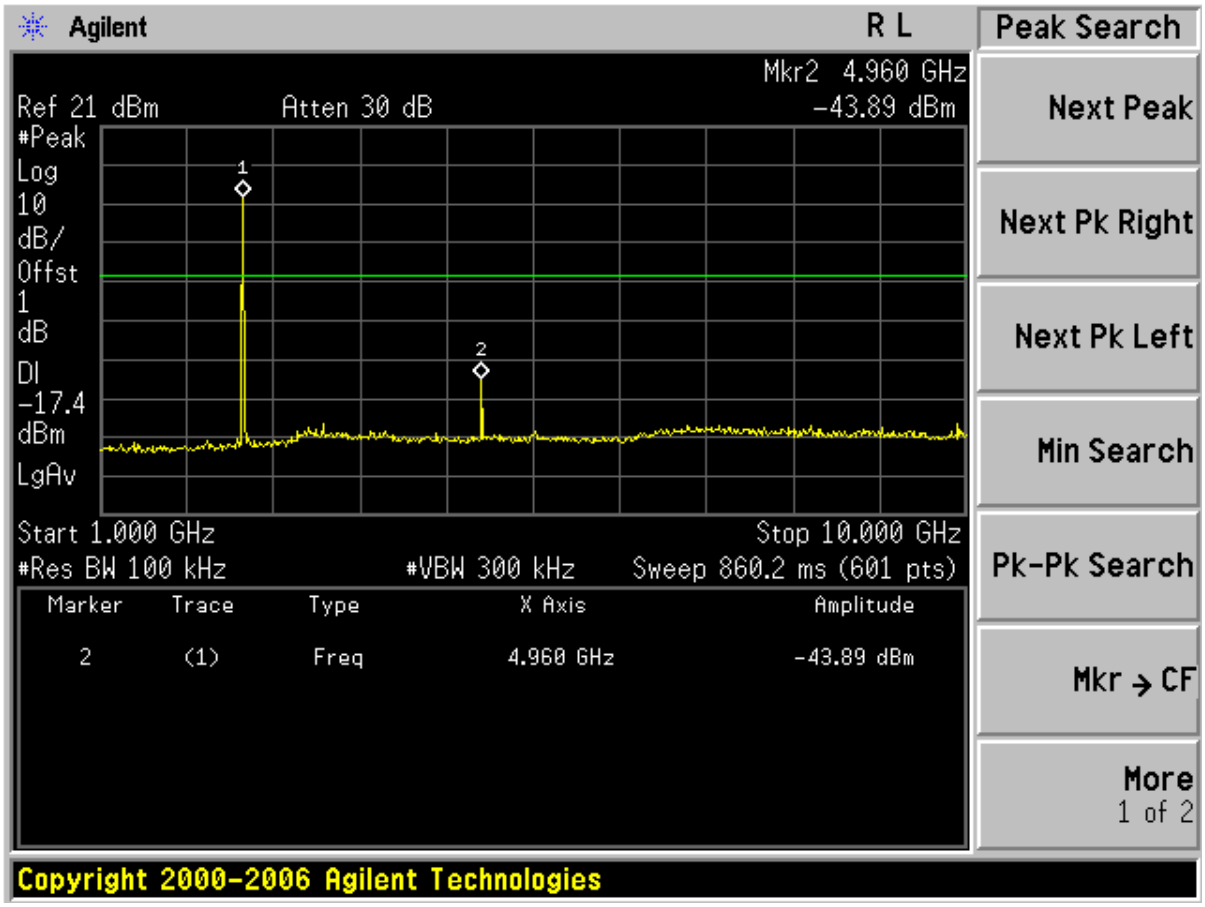

Agilent
R L
Peak Search
Mkr1 809.2 MHz
Ref 21 dBm
Atten 30 dB
-59.54 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-16.6
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Pk-Pk Search
Marker
Trace
Type
X Axis
Amplitude
1
(1)
Freq
809.2 MHz
-59.54 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

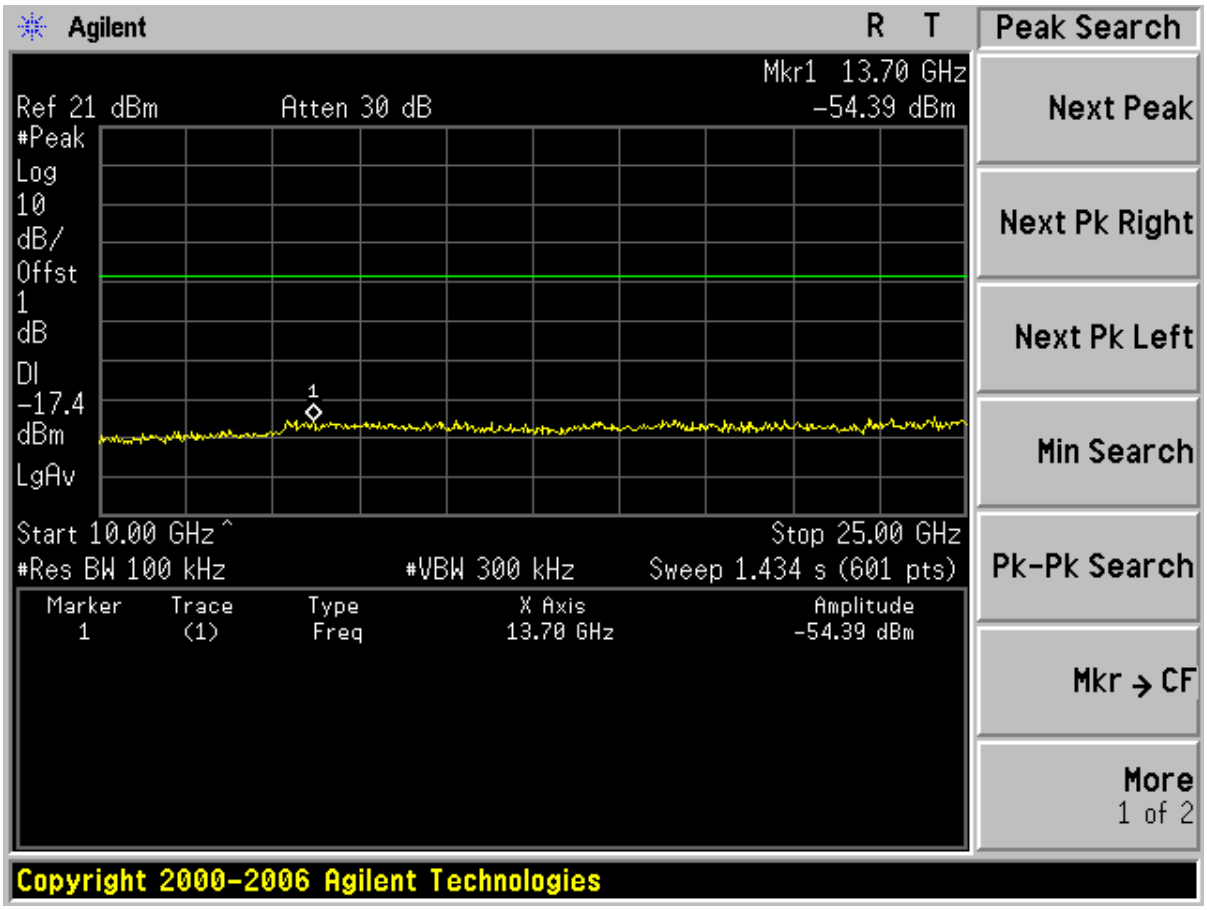

Agilent
R L
Marker
Mkr2 4.885 GHz
Ref 21 dBm
Atten 30 dB
-42.54 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-16.6
dBm
LgAv
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.440 GHz 3.40 dBm
2 (1) Freq 4.885 GHz -42.54 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 14.55 GHz
Ref 21 dBm
Atten 30 dB
-54.16 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-16.6
dBm
LgAv
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 14.55 GHz -54.16 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

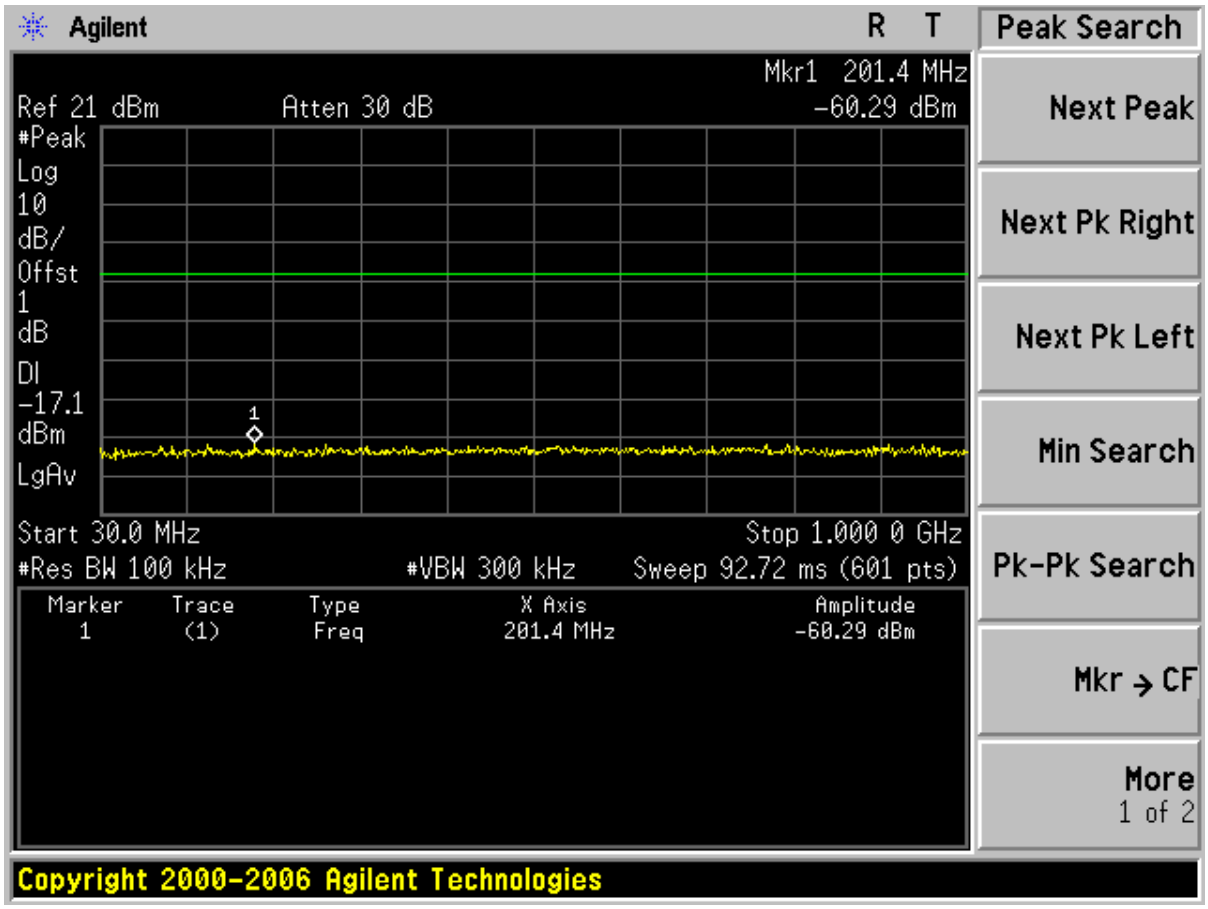
8DPSK CHH:

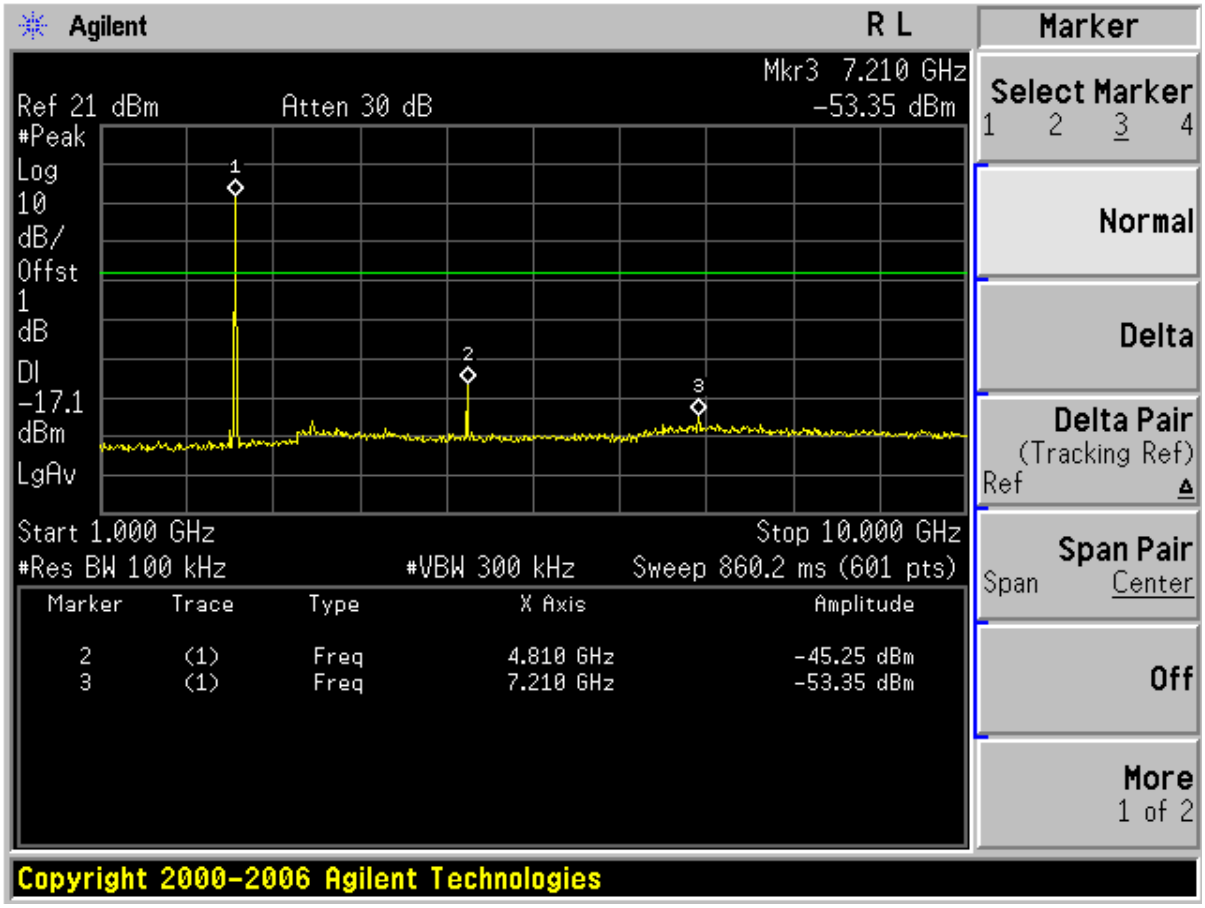

Agilent
R T
Peak Search
Mkr1 628.2 MHz
Ref 21 dBm
Atten 30 dB
-60.69 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.4
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Pk-Pk Search
Marker Trace Type X Axis Amplitude
1 (1) Freq 628.2 MHz -60.69 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

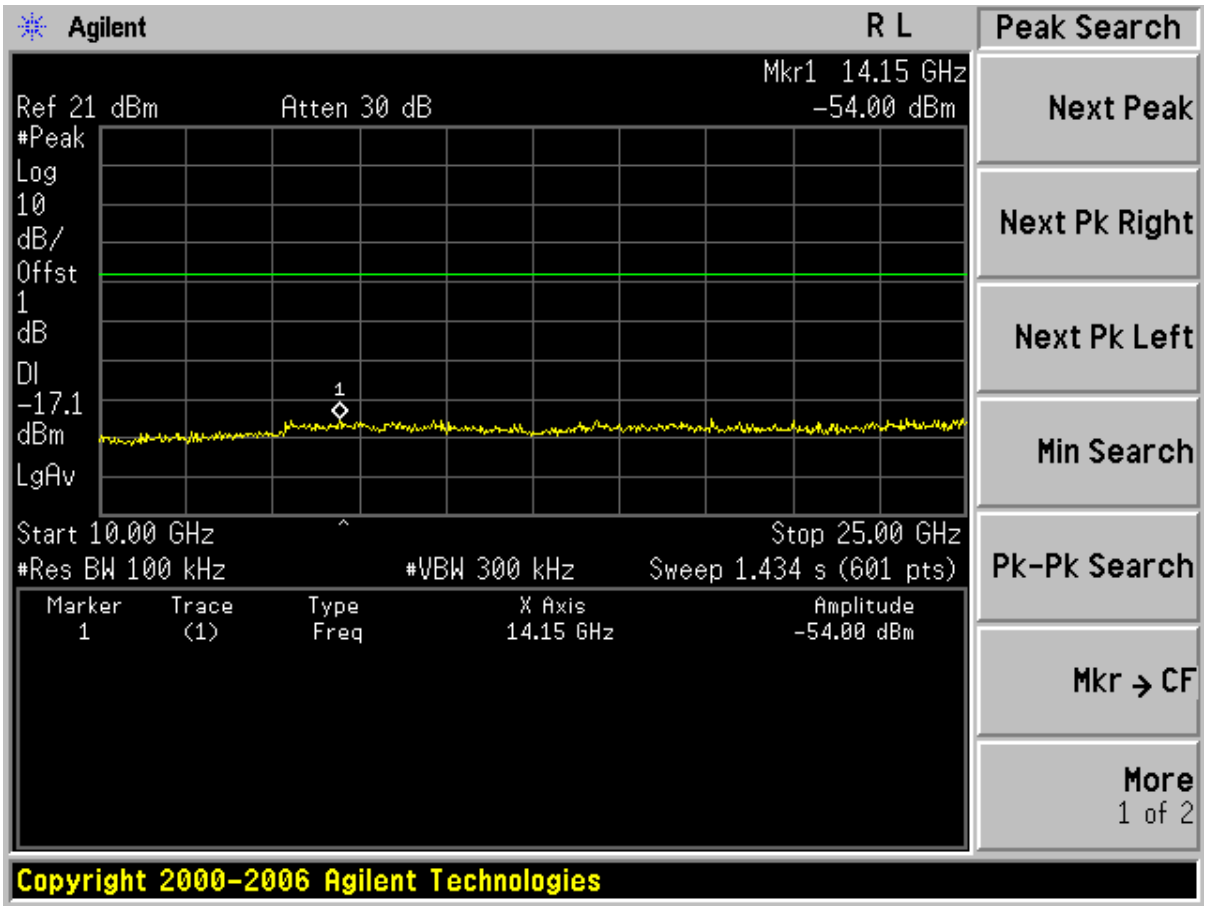

Agilent
R L
Peak Search
Mkr2 4.960 GHz
Ref 21 dBm
Atten 30 dB
-43.89 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.4
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
2 (1) Freq 4.960 GHz -43.89 dBm
Copyright 2000-2006 Agilent Technologies


Agilent
R T
Peak Search
Mkr1 13.70 GHz
Ref 21 dBm
Atten 30 dB
-54.39 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.4
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 13.70 GHz -54.39 dBm
Copyright 2000-2006 Agilent Technologies

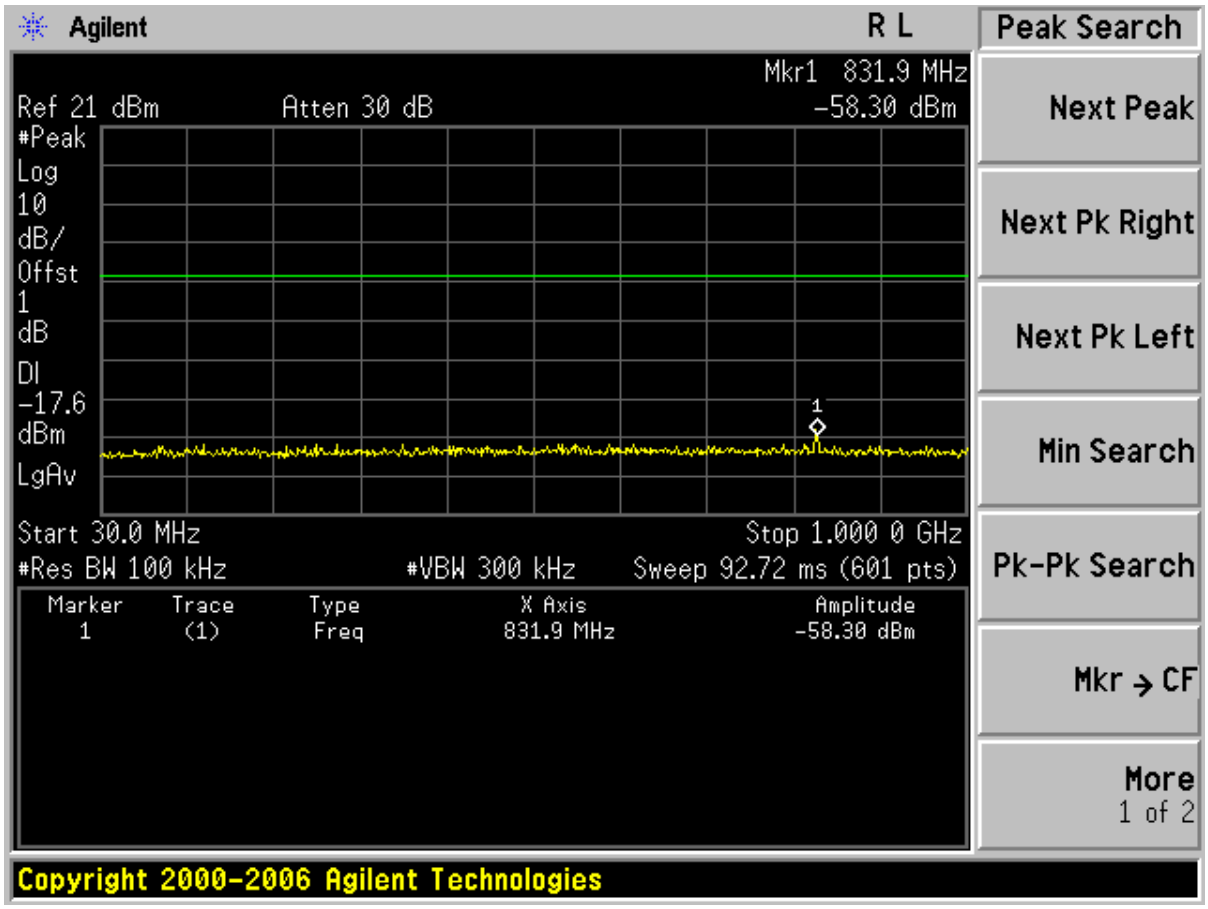
π/4 DQPSK CHL:

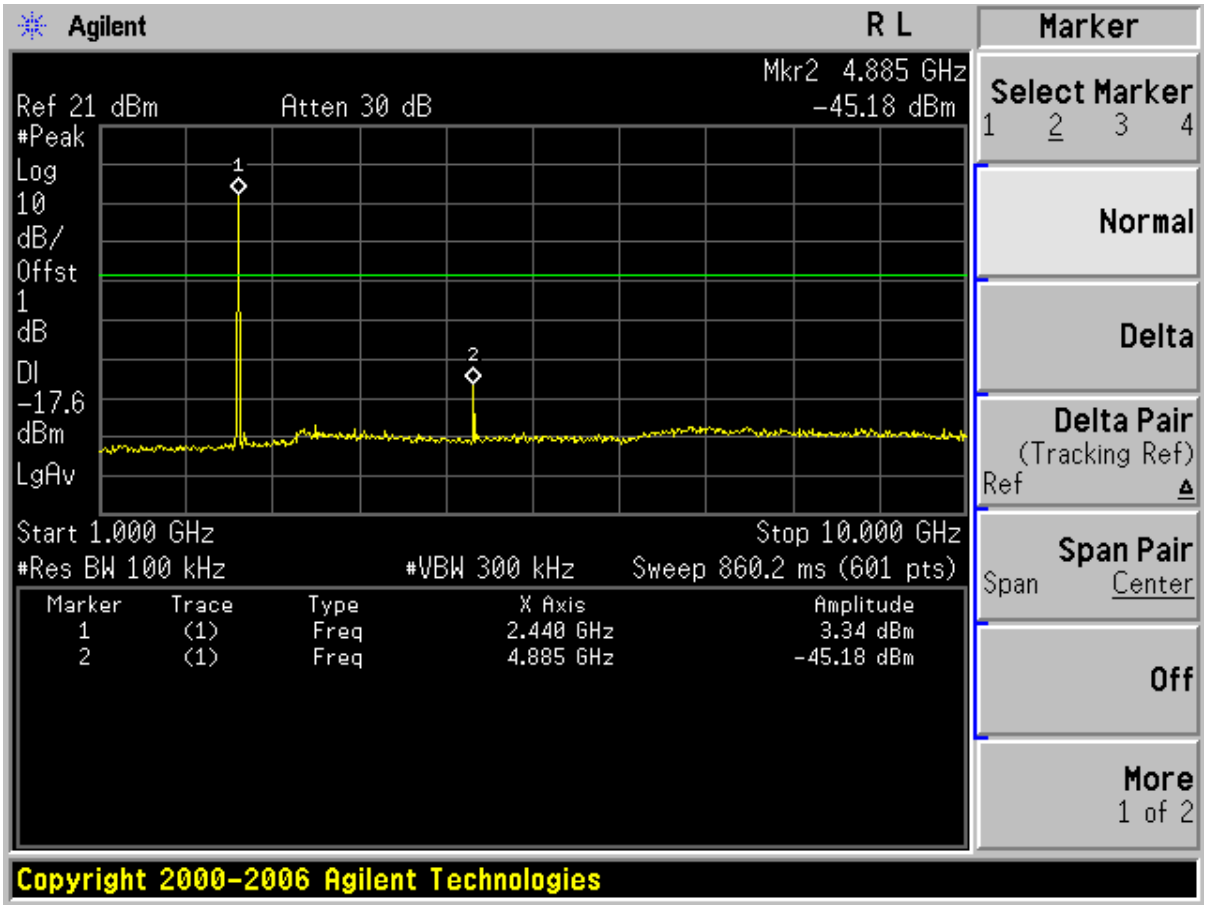

Agilent
R T
Peak Search
Mkr1 201.4 MHz
Ref 21 dBm
Atten 30 dB
-60.29 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.1
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 201.4 MHz -60.29 dBm
Copyright 2000-2006 Agilent Technologies

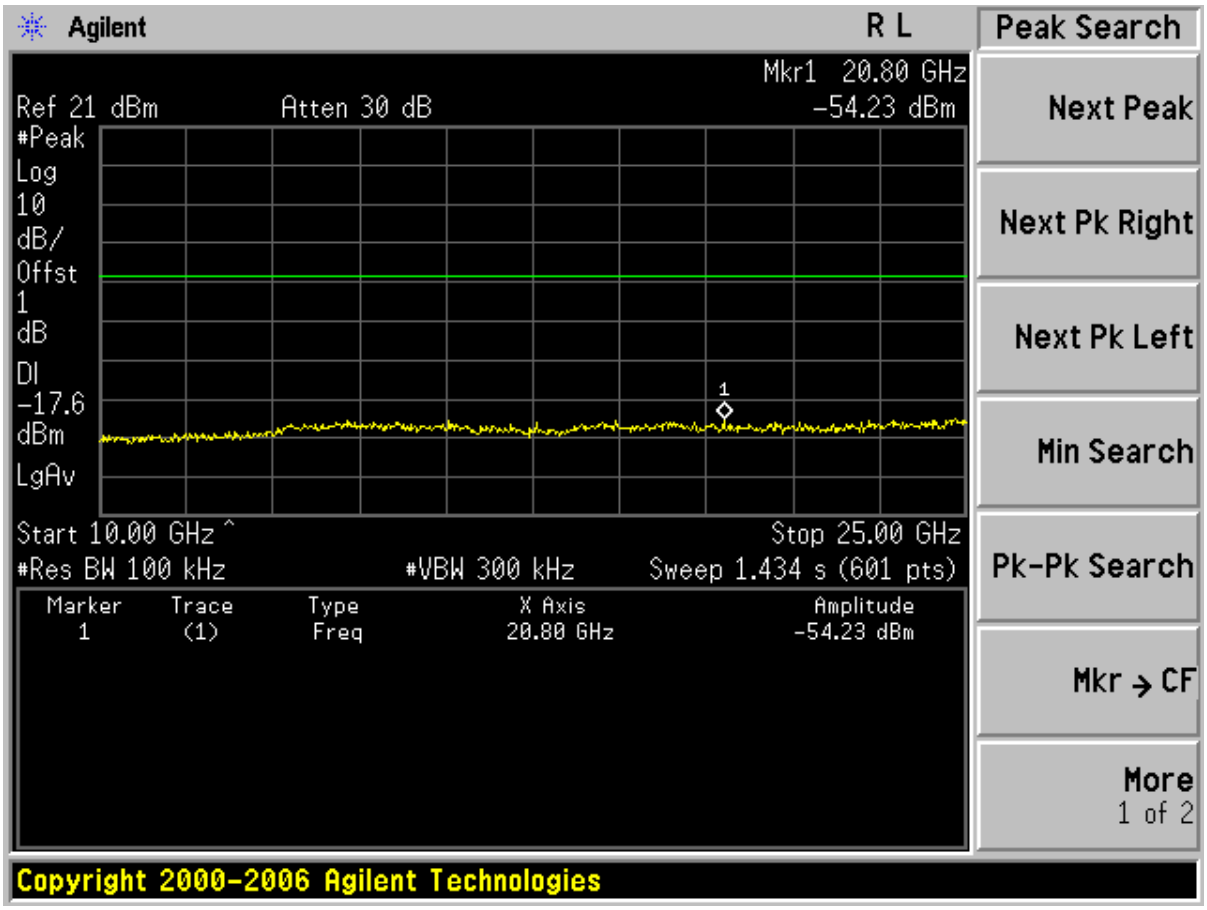

Agilent
R L
Marker
Mkr3 7.210 GHz
Ref 21 dBm
Atten 30 dB
-53.35 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.1
dBm
LgAv
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
2 (1) Freq 4.810 GHz -45.25 dBm
3 (1) Freq 7.210 GHz -53.35 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 14.15 GHz
Ref 21 dBm
Atten 30 dB
-54.00 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.1
dBm
LgAv
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 14.15 GHz -54.00 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

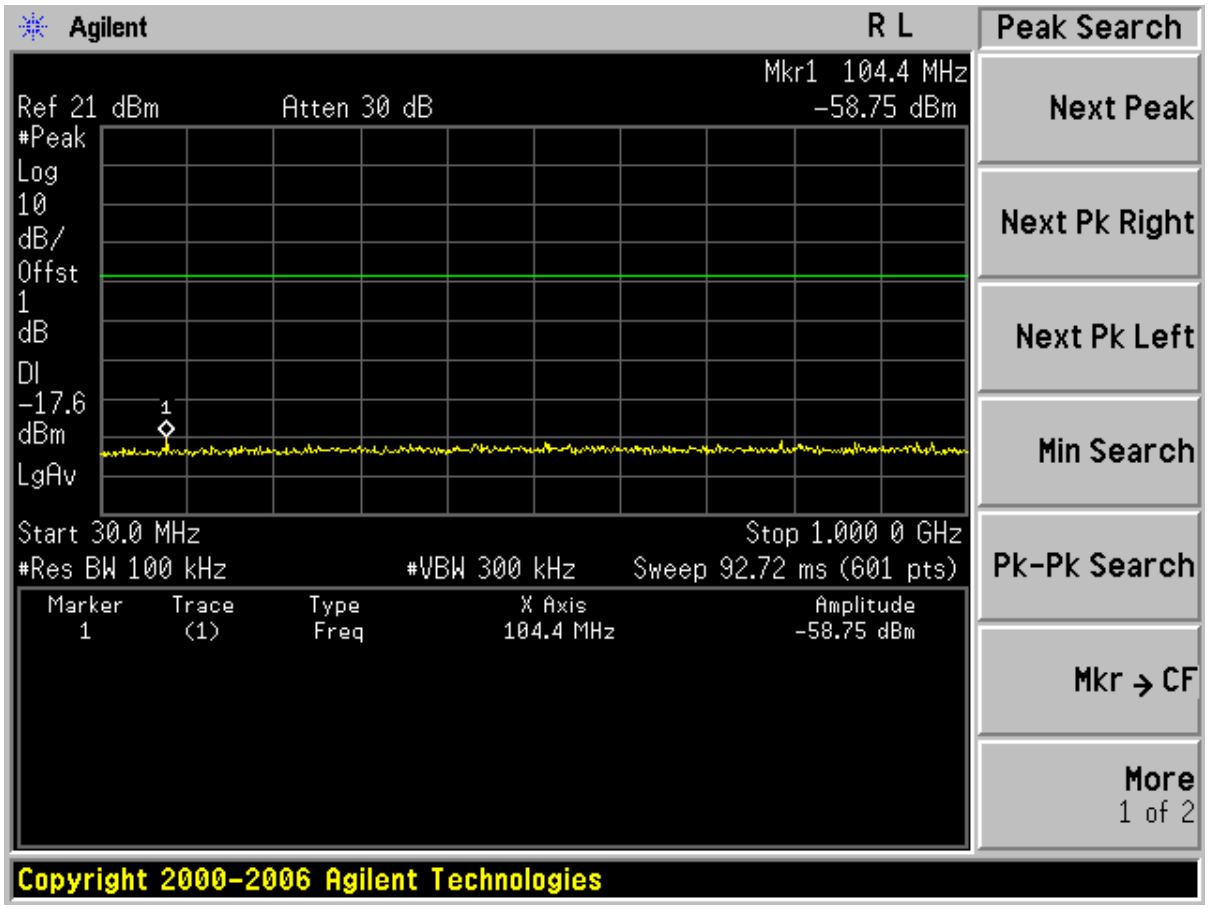
π/4 DQPSK CHM:

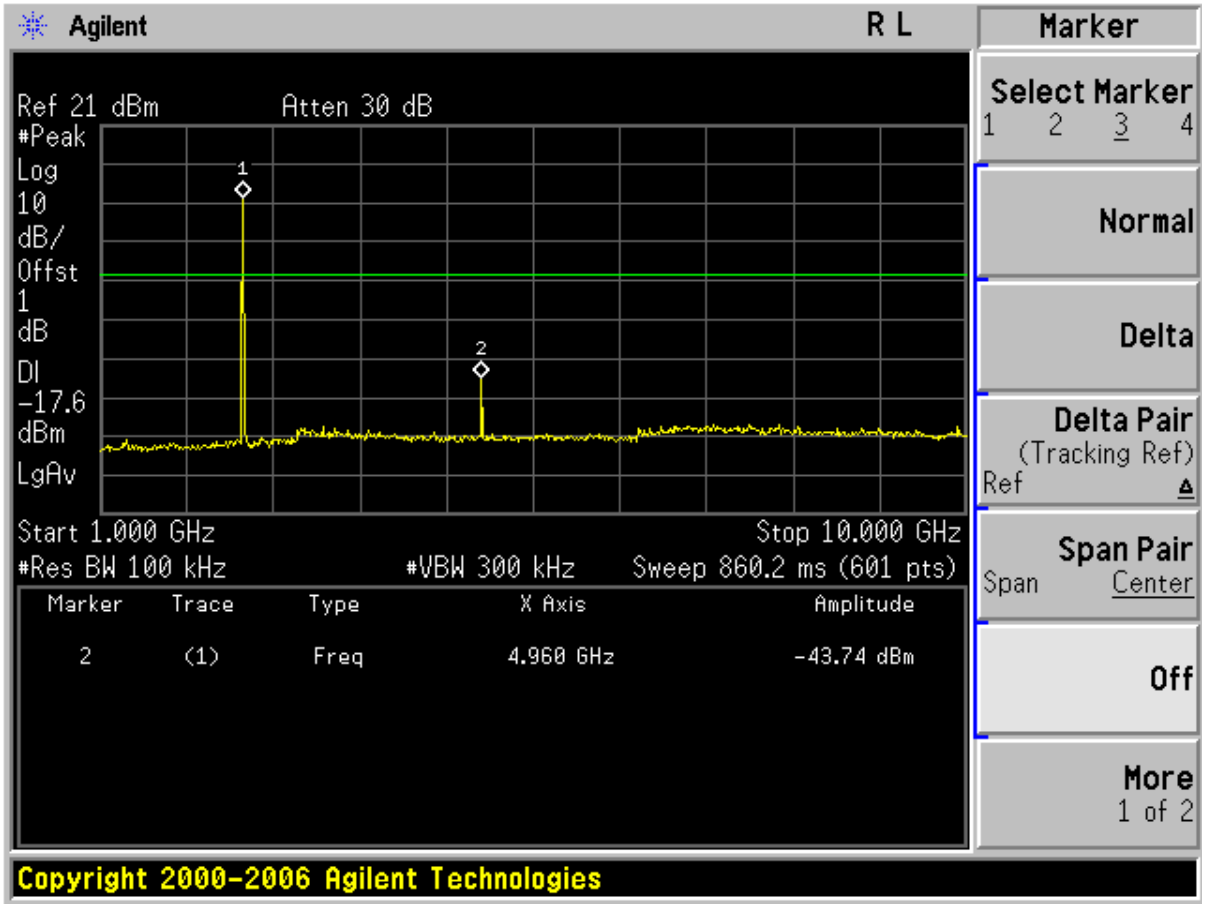

Agilent
R L
Peak Search
Mkr1 831.9 MHz
Ref 21 dBm
Atten 30 dB
-58.30 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
LgAv
1
Next Peak
Next Pk Right
Next Pk Left
Min Search
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Pk-Pk Search
Marker
Trace
Type
X Axis
Amplitude
1
(1)
Freq
831.9 MHz
-58.30 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

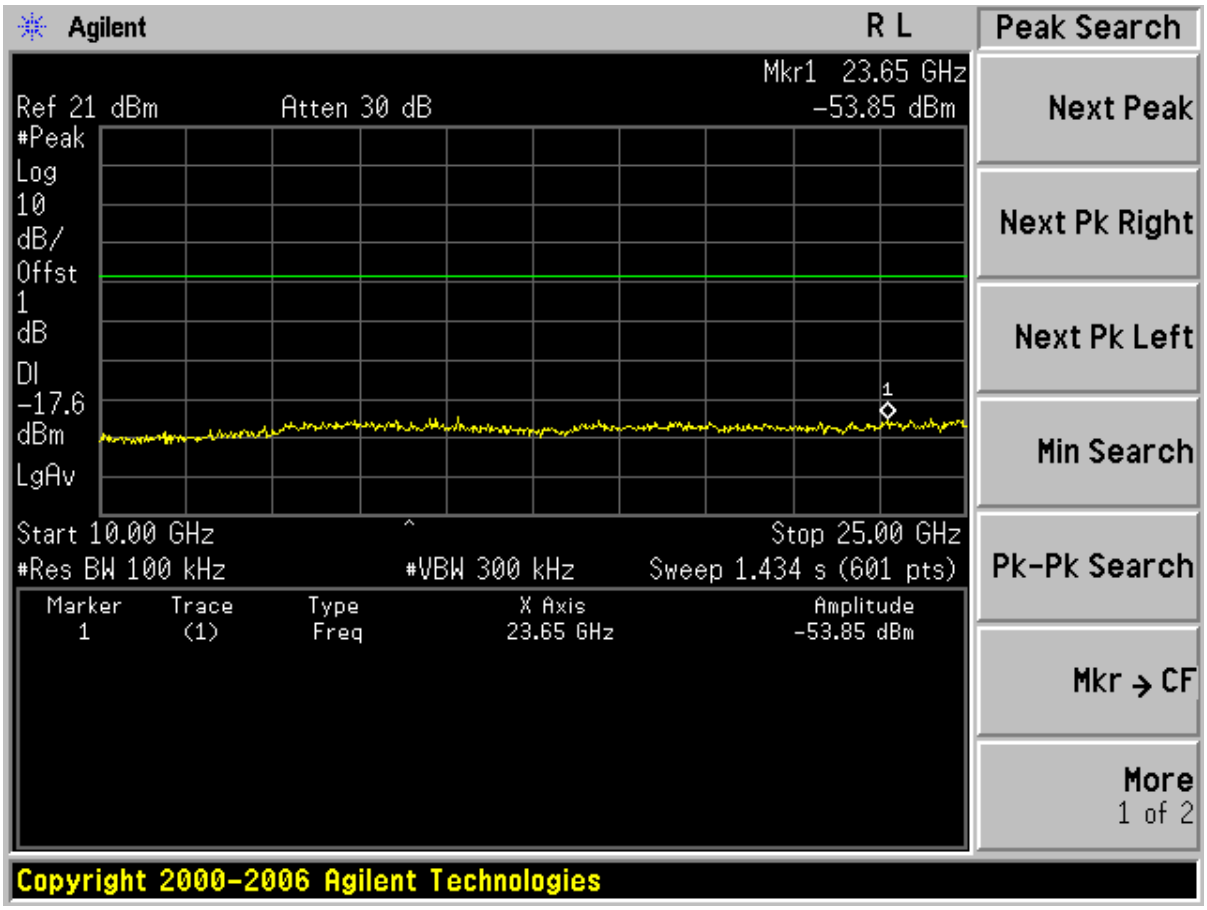

Agilent
R L
Marker
Mkr2 4.885 GHz
Ref 21 dBm
Atten 30 dB
-45.18 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
LgAv
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.440 GHz 3.34 dBm
2 (1) Freq 4.885 GHz -45.18 dBm
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 20.80 GHz
Ref 21 dBm
Atten 30 dB
-54.23 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
LgAv
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 20.80 GHz -54.23 dBm
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies

π/4 DQPSK CHH :


Agilent
R L
Peak Search
Mkr1 104.4 MHz
Ref 21 dBm
Atten 30 dB
-58.75 dBm
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
LgAv
1
Next Peak
Next Pk Right
Next Pk Left
Min Search
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 92.72 ms (601 pts)
Pk-Pk Search
Marker
1
Trace
(1)
Type
Freq
X Axis
104.4 MHz
Amplitude
-58.75 dBm
Mkr → CF
More
1 of 2
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Marker
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
LgAv
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Start 1.000 GHz
Stop 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 860.2 ms (601 pts)
Marker Trace Type X Axis Amplitude
2 (1) Freq 4.960 GHz -43.74 dBm
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 23.65 GHz
-53.85 dBm
Ref 21 dBm
Atten 30 dB
#Peak
Log
10
dB/
Offst
1
dB
Dl
-17.6
dBm
LgAv
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Start 10.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.434 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 23.65 GHz -53.85 dBm
Copyright 2000-2006 Agilent Technologies

8. Carrier Frequency Separation Test

8.1 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

8.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum	Dec. 06 2012	E4440A	MY42510313	Agilent

8.3 Test Result

Channel separation is refered to 8.3.1 to 8.3.3

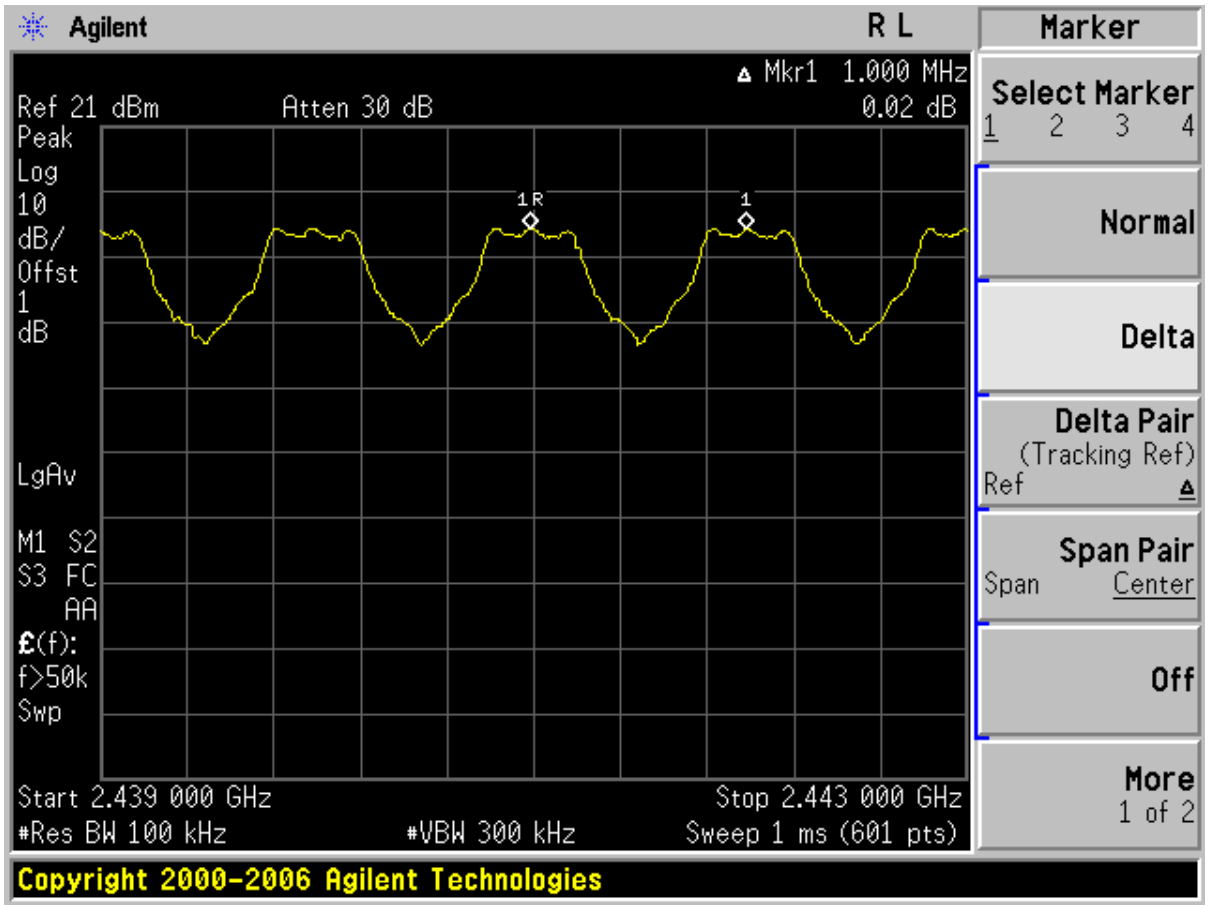
Widest channel bandwidth was 1391kHz.

Two-thirds is 927.3kHz and greater than 25kHz .

Modulation	Channel separation, kHz	Minimum limit, kHz	Result
GFSK	1000kHz	927.3kHz	Pass
8DPSK	1000kHz	927.3kHz	Pass
π/4 DQPSK	1000kHz	927.3kHz	Pass

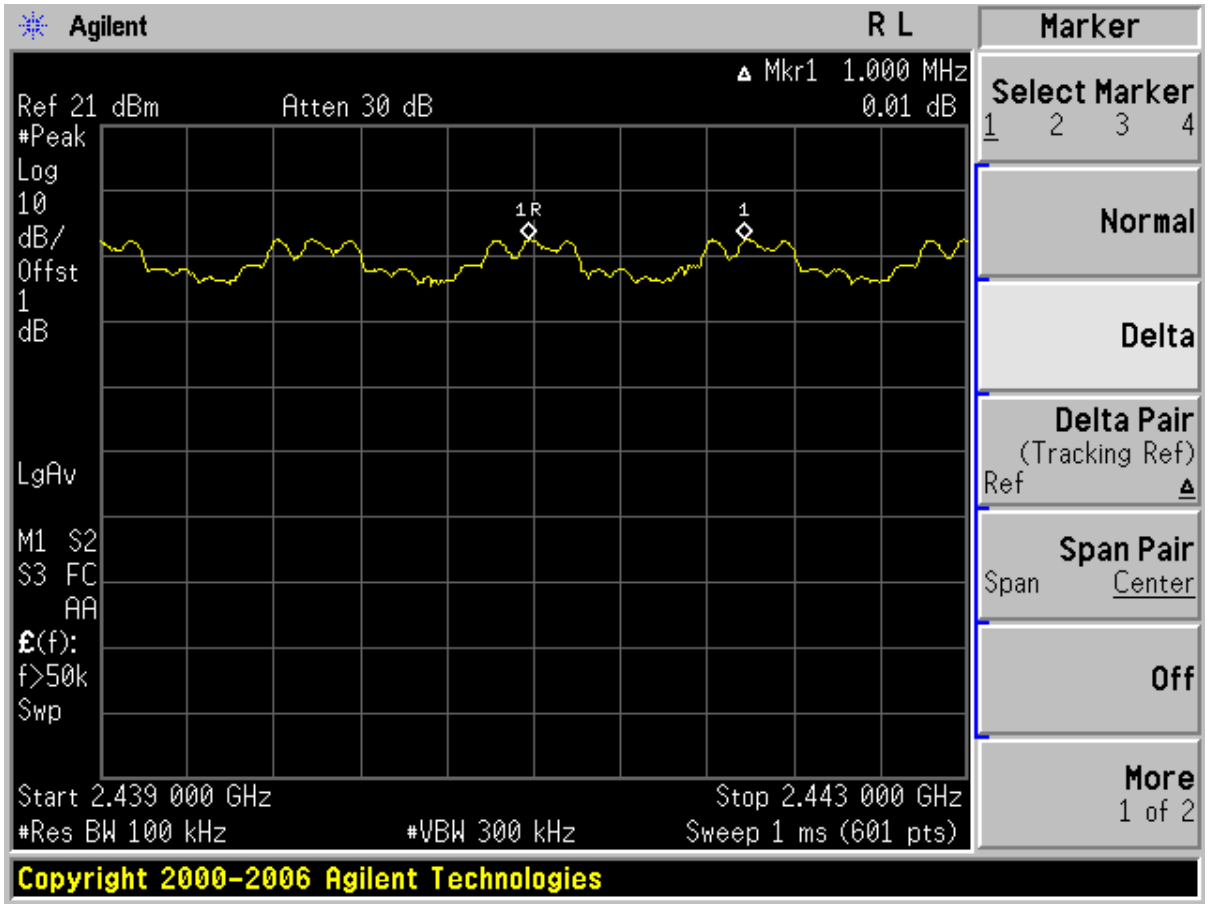
8.3.1 Diagram 8-1

GFSK :



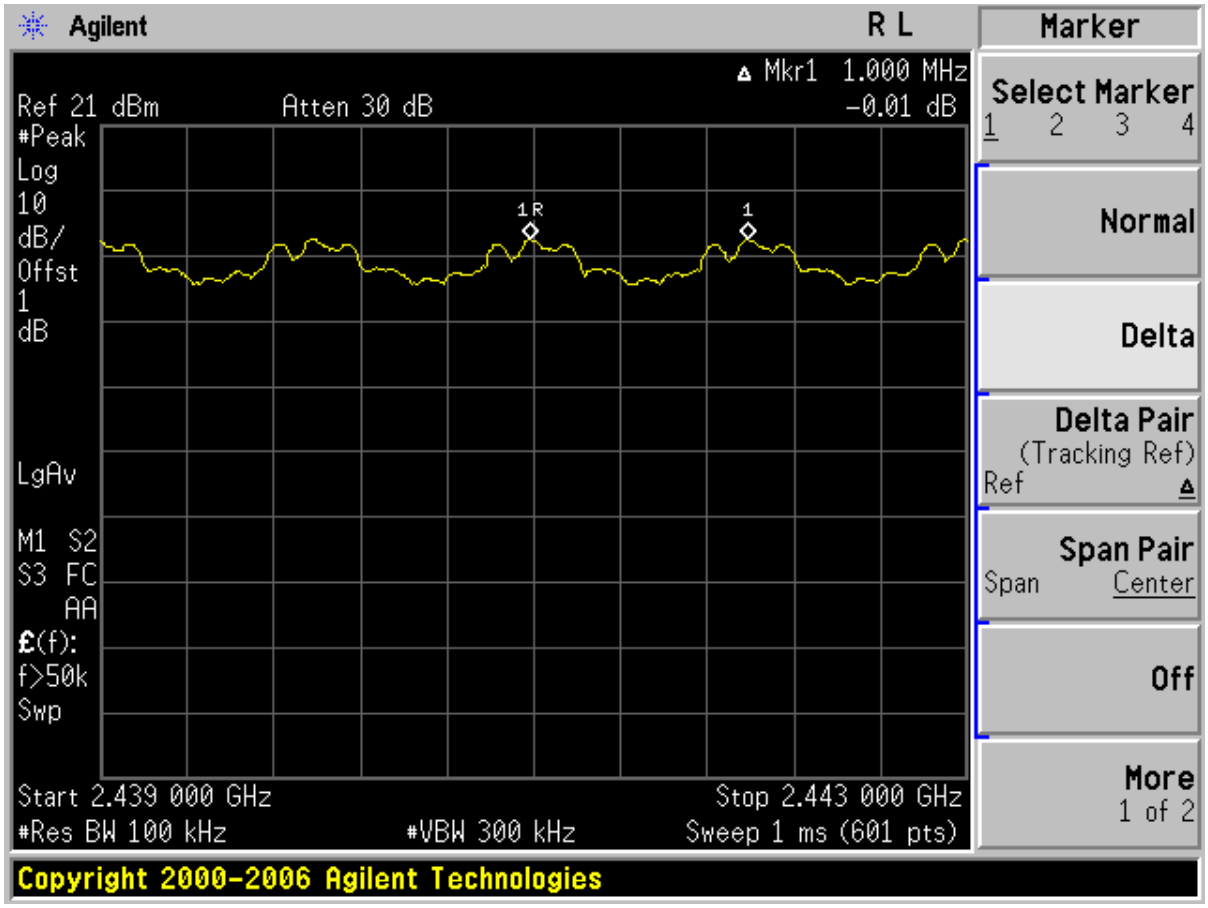
8.3.2 Diagram 8-2

8DPSK :



8.3.3 Diagram 8-3

π/4 DQPSK :



9. Output Power Test

9.1 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.

9.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum	Dec. 06 2012	E4440A	MY42510313	Agilent

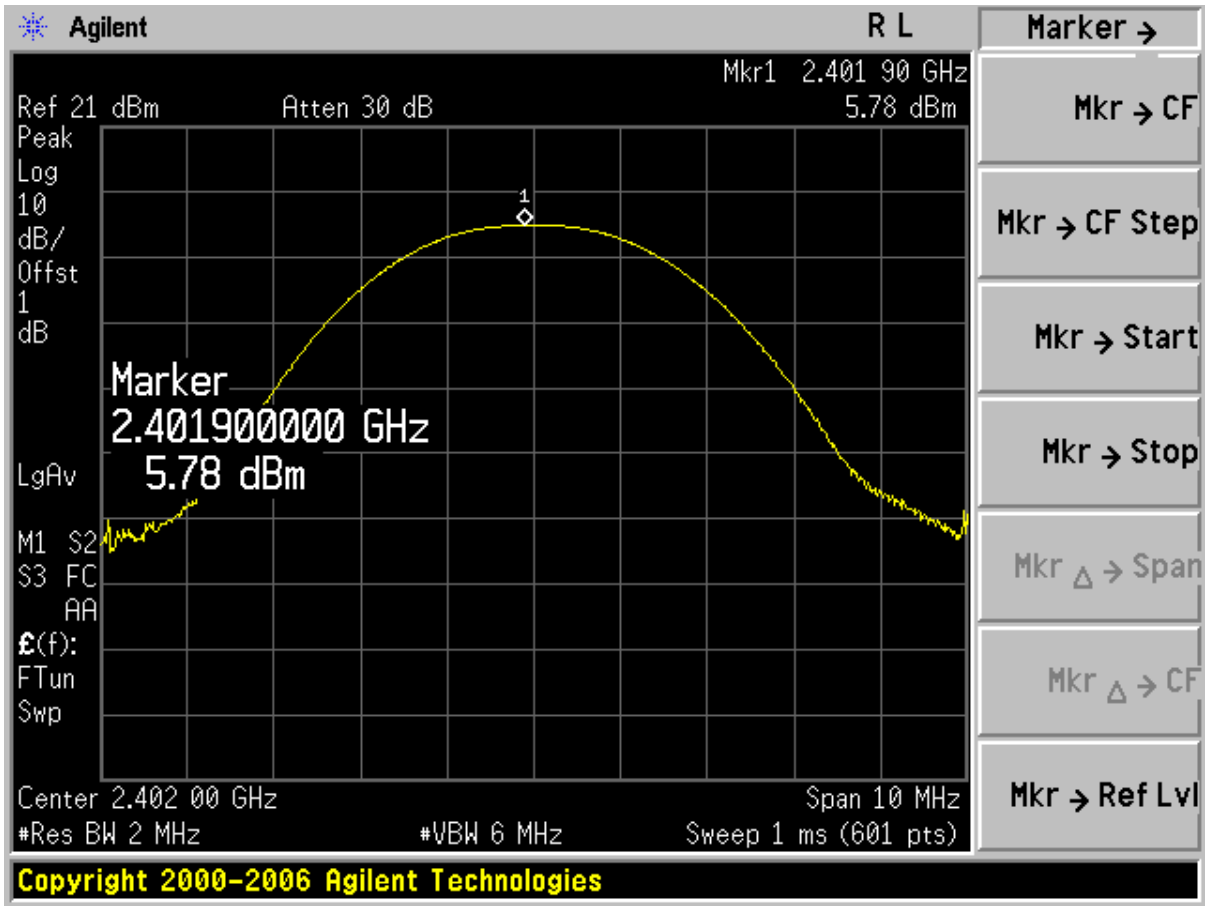
9.3 Test Result

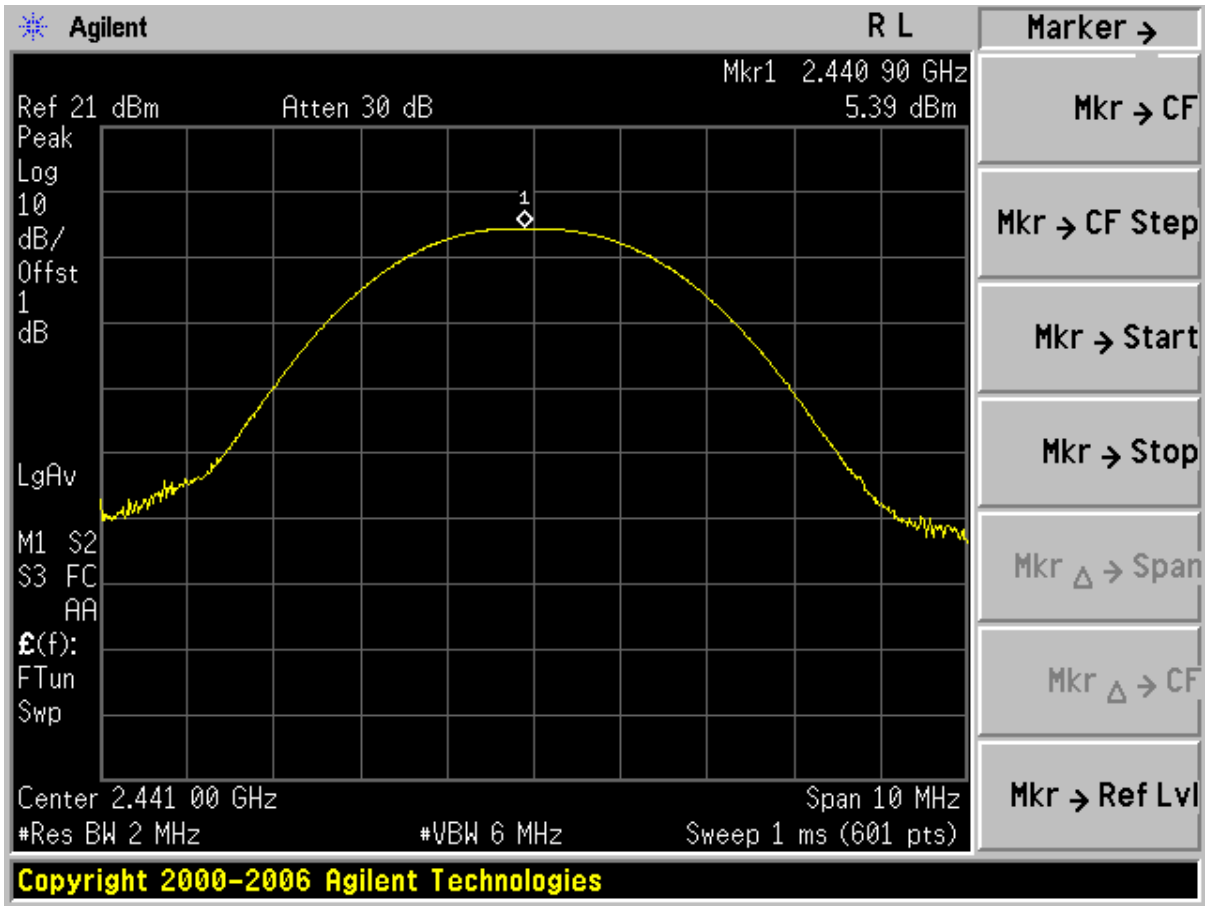
Remark : 1:RBW=2MHz VBW=6MHz PK detector
Cable loss 1dB have been set in spectrum setting offset .

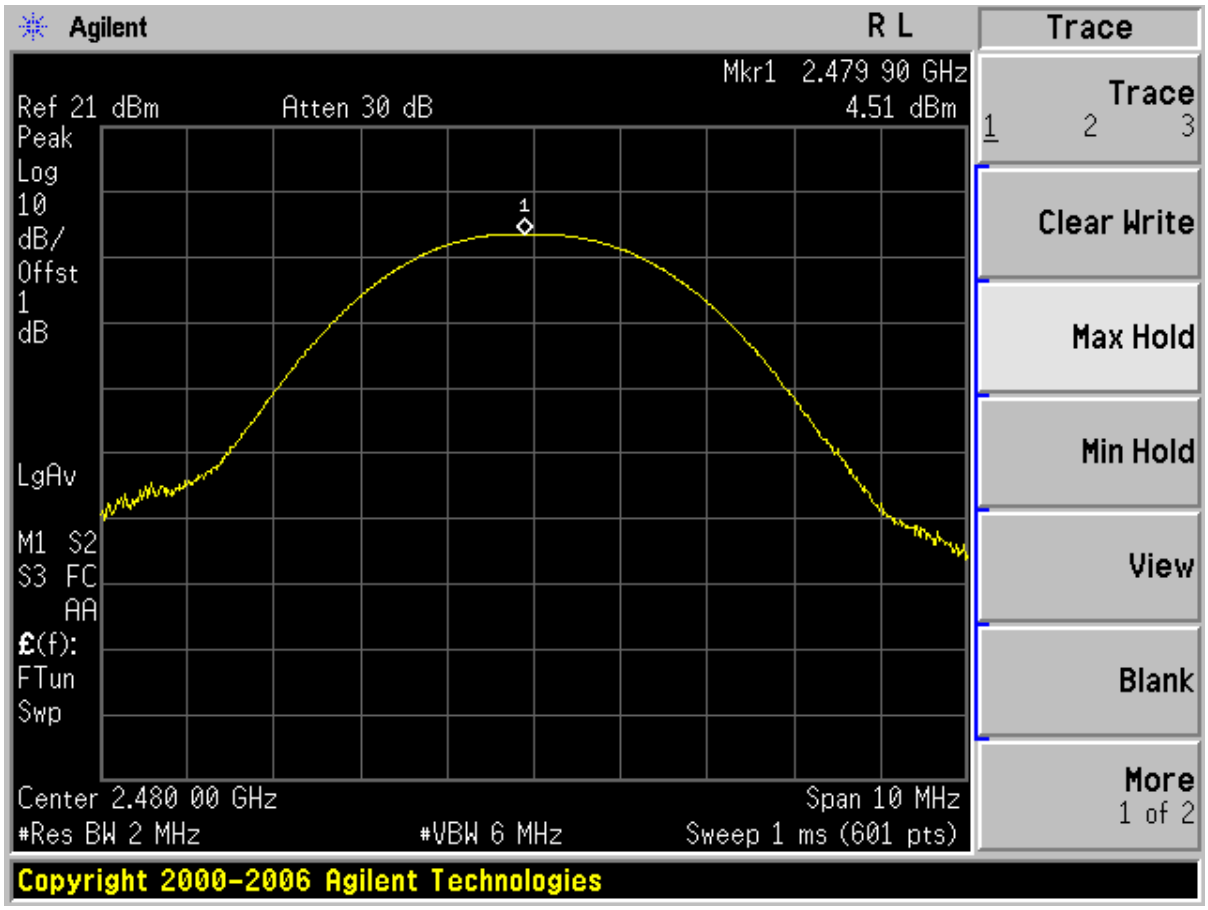
GFSK:

Frequency, MHz	Output power, dBm	Power Limit, dBm
2402	5.78	30.00
2441	5.39	30.00
2480	4.51	30.00

Diagram of GFSK is as below:


Agilent
R L
Marker →
Mkr1 2.401 90 GHz
5.78 dBm
Ref 21 dBm
Atten 30 dB
Peak
Log
10
dB/
Offst
1
dB
Marker
2.401900000 GHz
5.78 dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 2.402 00 GHz
#Res BW 2 MHz
#VBW 6 MHz
Span 10 MHz
Sweep 1 ms (601 pts)
Mkr → CF
Mkr → CF Step
Mkr → Start
Mkr → Stop
Mkr Δ → Span
Mkr Δ → CF
Mkr → Ref Lvl
Copyright 2000-2006 Agilent Technologies

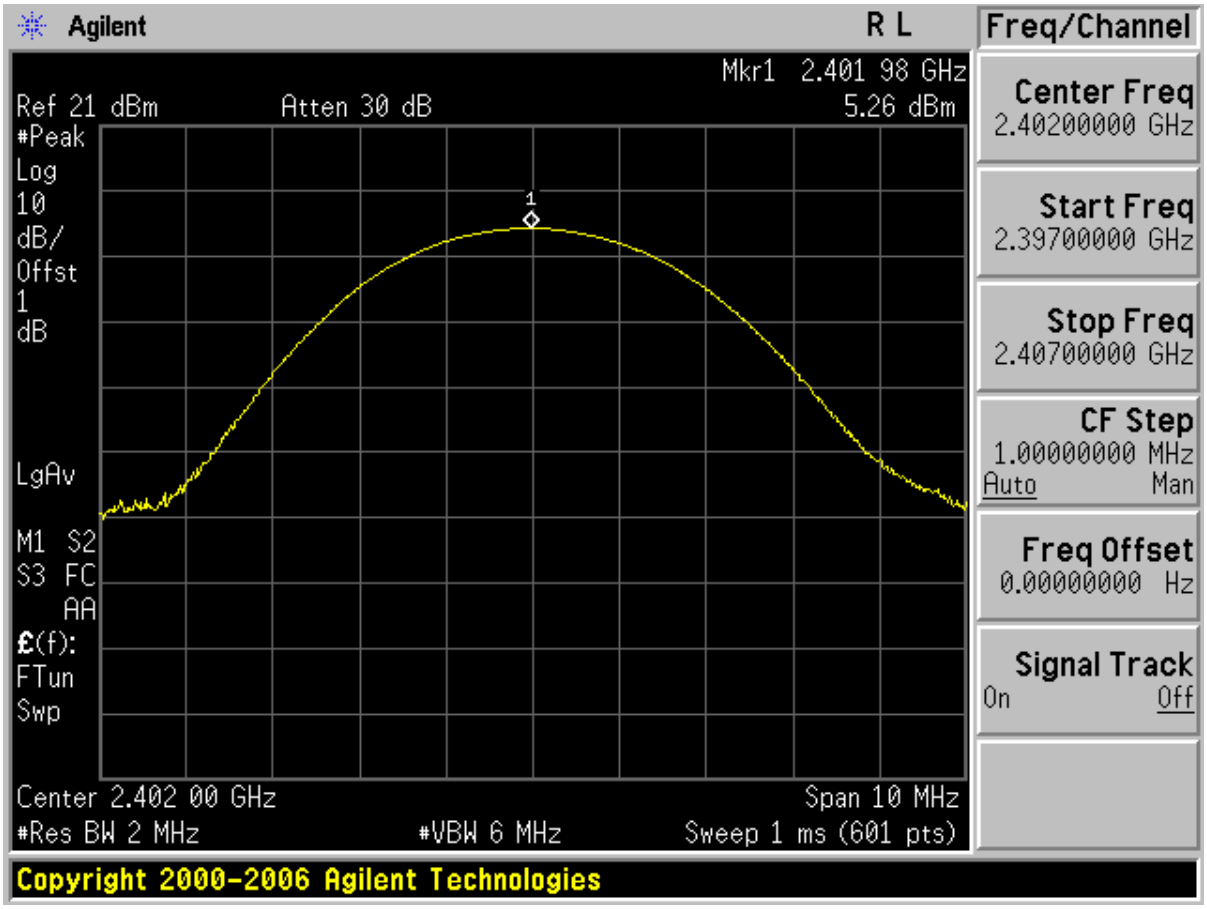

Agilent
R L
Marker →
Mkr1 2.440 90 GHz
5.39 dBm
Ref 21 dBm
Atten 30 dB
Peak
Log
10
dB/
Offst
1
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 2.441 00 GHz
#Res BW 2 MHz
#VBW 6 MHz
Span 10 MHz
Sweep 1 ms (601 pts)
Mkr → CF
Mkr → CF Step
Mkr → Start
Mkr → Stop
Mkr Δ → Span
Mkr Δ → CF
Mkr → Ref Lvl
Copyright 2000-2006 Agilent Technologies

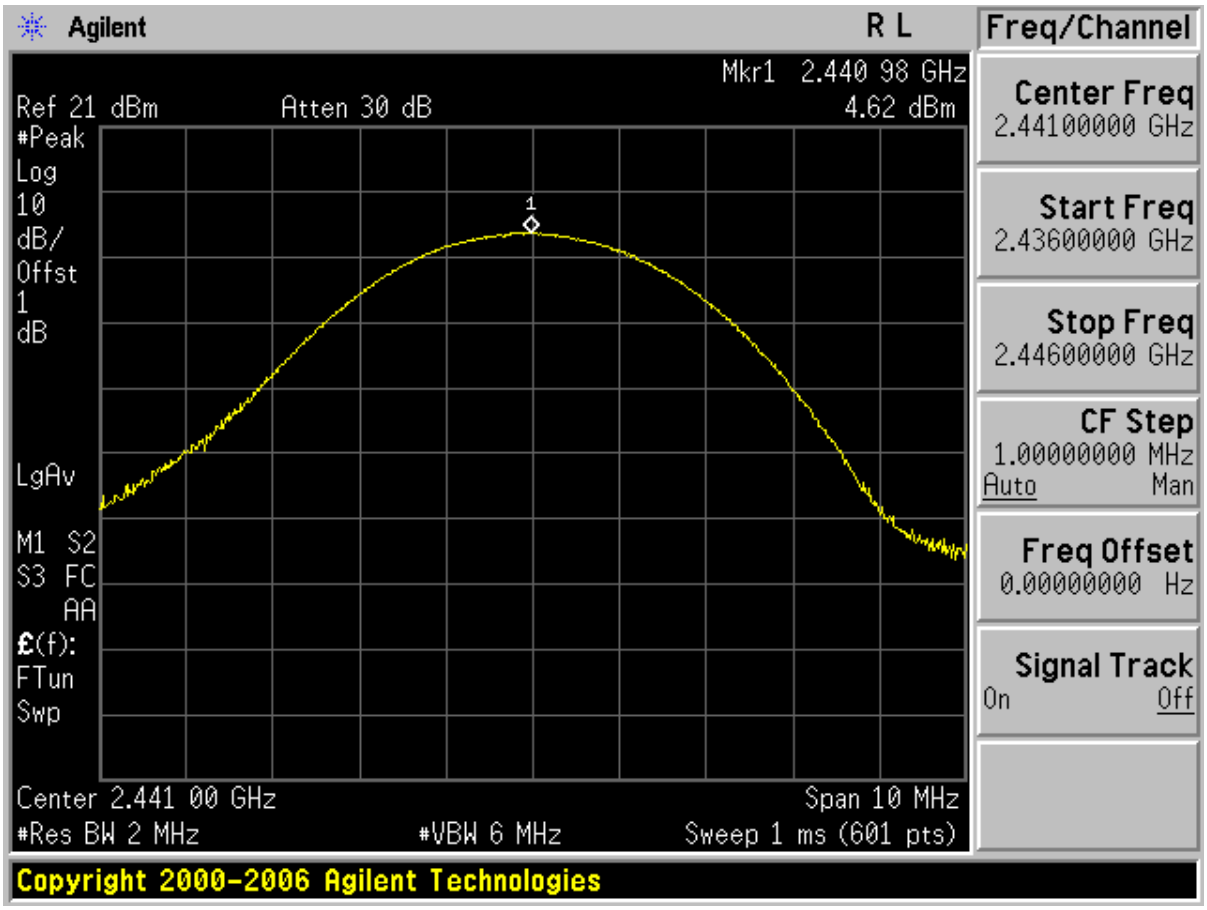


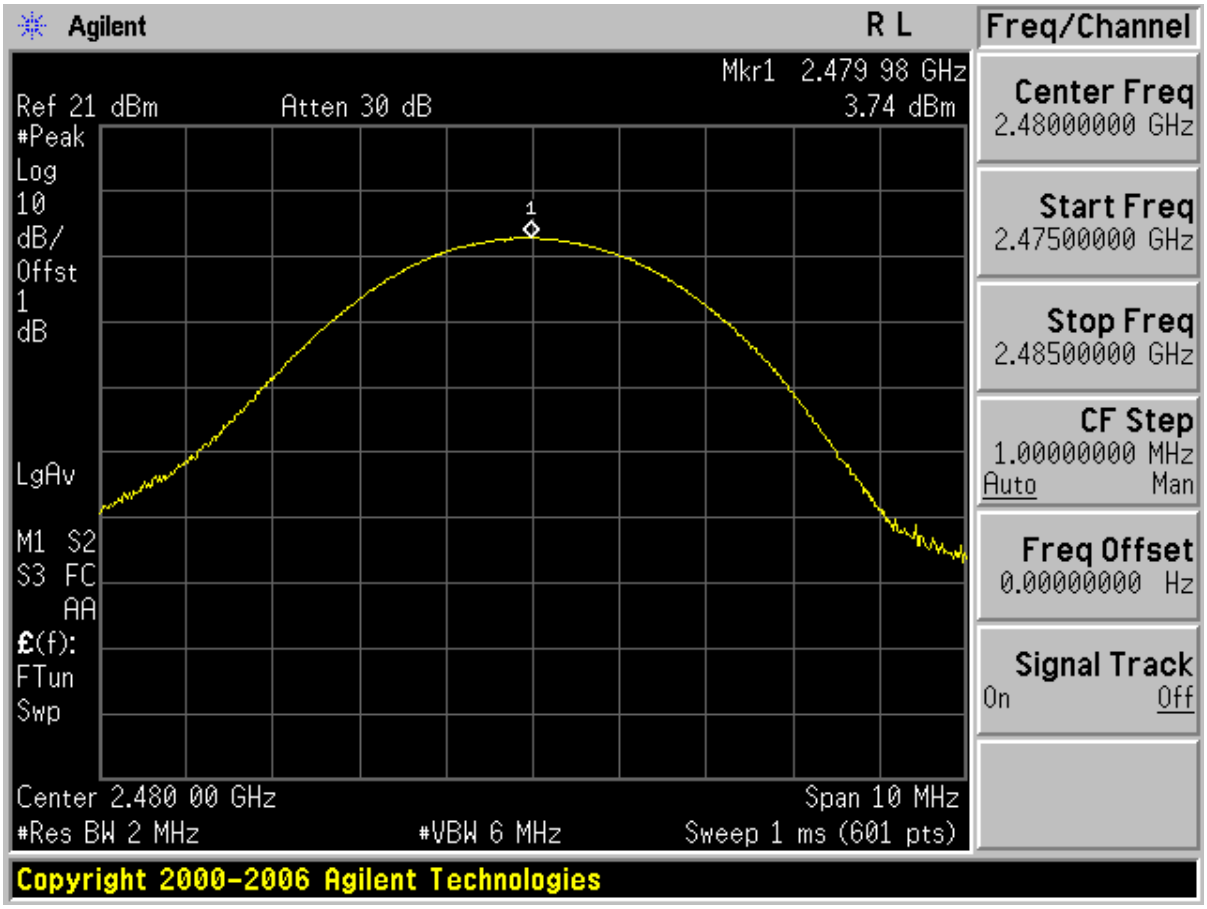
8DPSK:

Frequency, MHz	Output power, dBm	Power Limit, dBm
2402	5.26	30.00
2441	4.62	30.00
2480	3.74	30.00

Diagram of 8DPSK is as below:


Agilent
R L
Freq/Channel
Mkr1 2.401 98 GHz
Ref 21 dBm
Atten 30 dB
5.26 dBm
#Peak
Log
10
dB/
Offst
1
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center Freq
2.40200000 GHz
Start Freq
2.39700000 GHz
Stop Freq
2.40700000 GHz
CF Step
1.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 2.402 00 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2006 Agilent Technologies

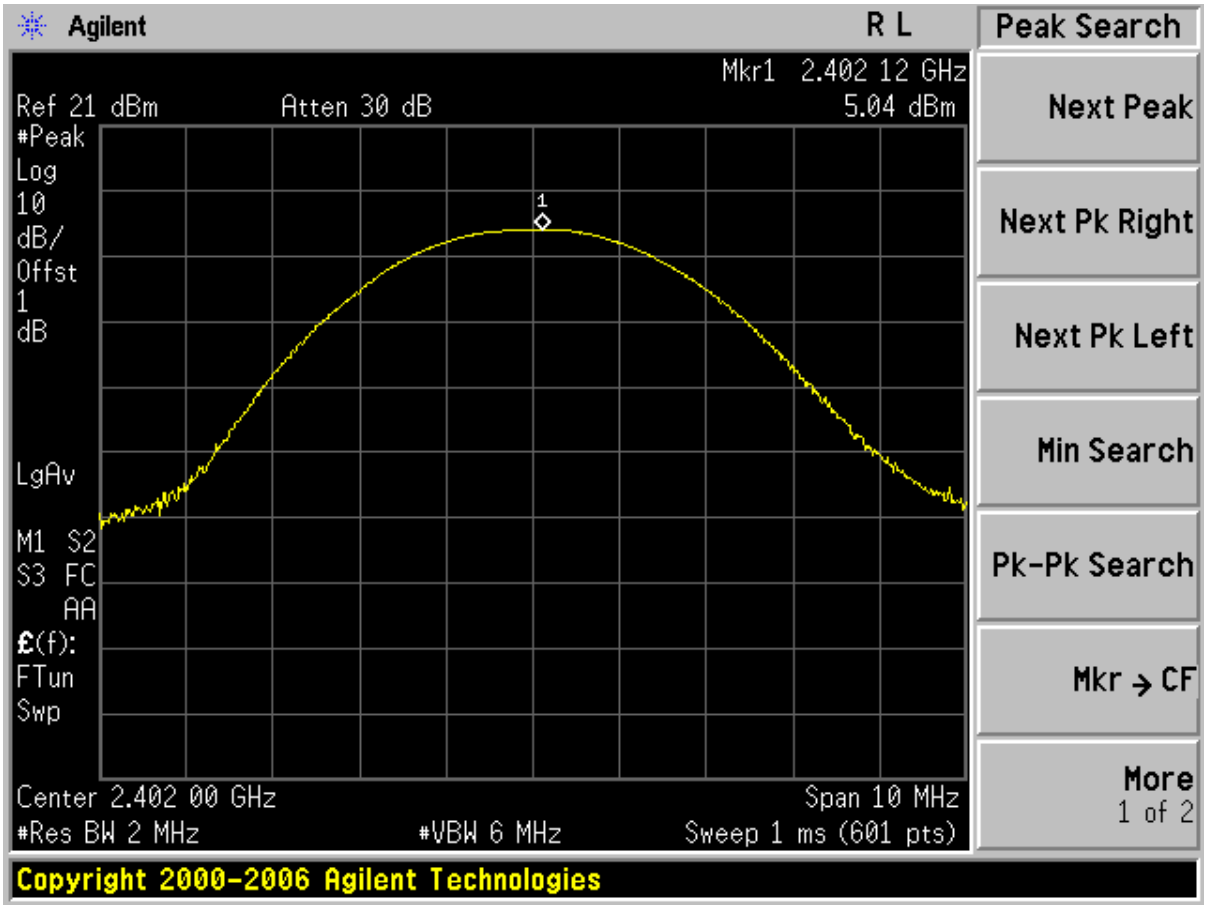

Agilent
R L
Freq/Channel
Mkr1 2.440 98 GHz
Ref 21 dBm
Atten 30 dB
4.62 dBm
#Peak
Log
10
dB/
Offst
1
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center Freq
2.44100000 GHz
Start Freq
2.43600000 GHz
Stop Freq
2.44600000 GHz
CF Step
1.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Center 2.441 00 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2006 Agilent Technologies

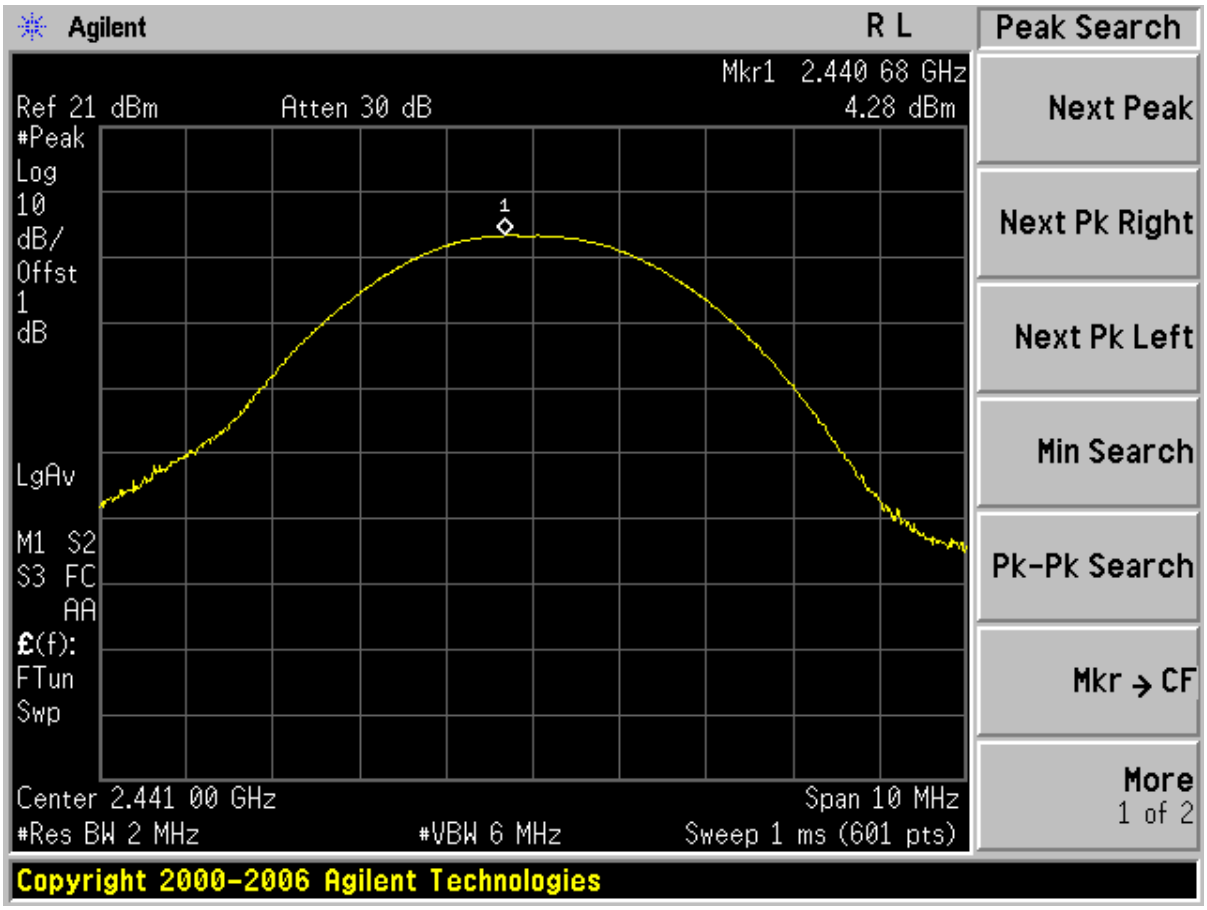


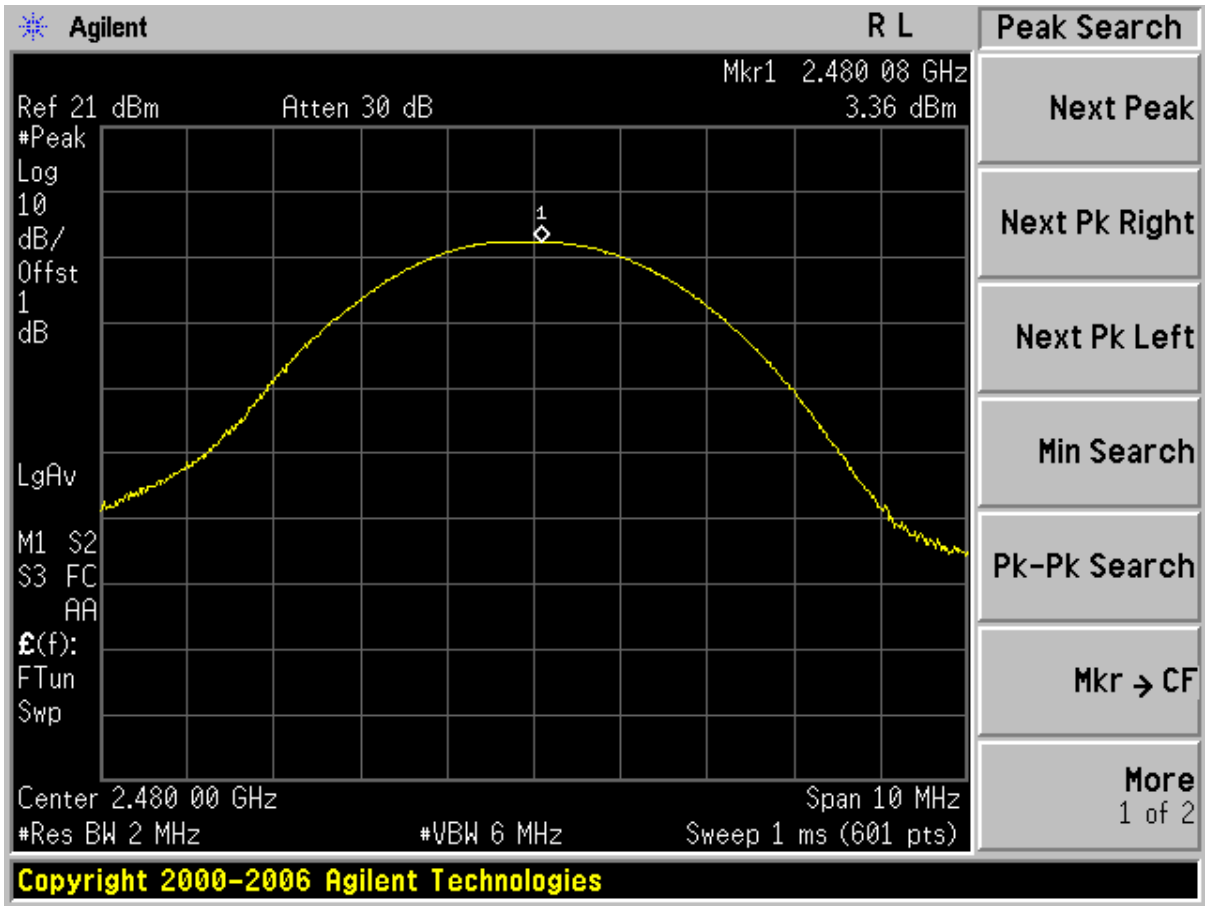
π/4 DQPSK:

Frequency, MHz	Output power, dBm	Power Limit, dBm
2402	5.04	30.00
2441	4.28	30.00
2480	3.36	30.00

Diagram of π/4 DQPSK is as below:


Agilent
R L
Peak Search
Mkr1 2.402 12 GHz
Ref 21 dBm
Atten 30 dB
5.04 dBm
#Peak
Log
10
dB/
Offst
1
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 2.402 00 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 2.440 68 GHz
Ref 21 dBm
Atten 30 dB
4.28 dBm
#Peak
Log
10
dB/
Offst
1
dB
LgAv
M1 S2
S3 FC
AA
£(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 00 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2006 Agilent Technologies


Agilent
R L
Peak Search
Mkr1 2.480 08 GHz
Ref 21 dBm
Atten 30 dB
3.36 dBm
#Peak
Log
10
dB/
Offst
1
dB
LgAv
M1 S2
S3 FC
AA
£(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 00 GHz
Span 10 MHz
#Res BW 2 MHz
#VBW 6 MHz
Sweep 1 ms (601 pts)
Copyright 2000-2006 Agilent Technologies

10. NUMBER OF HOPPING FREQUENCY TEST

10.1 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.

10.2 Measurement Equipment

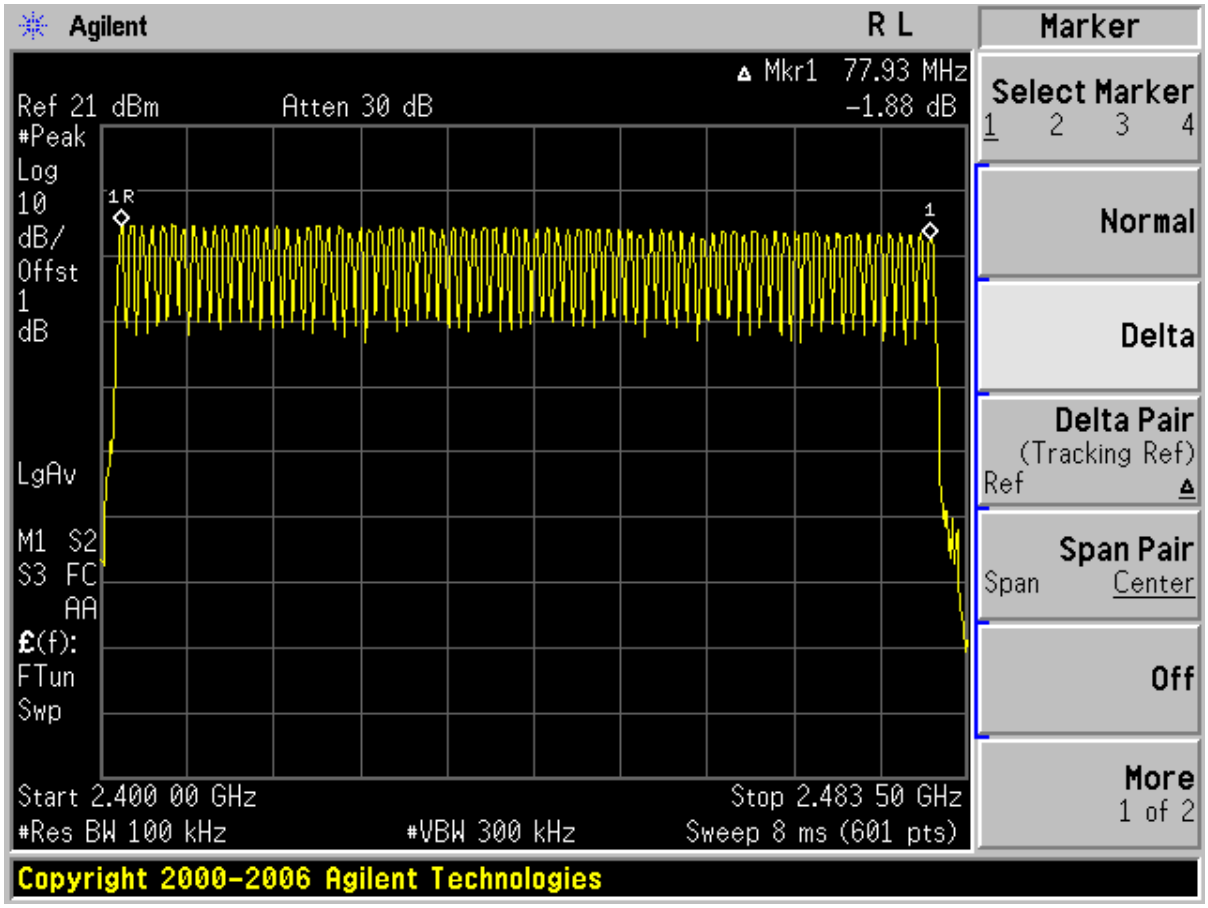
	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum	Dec. 06 2012	E4440A	MY42510313	Agilent

10.3 Test Result

Test mode: Transmitter Hopping on

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

10.3.1 Diagram



11. DWELL TIME 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 15 channels are used.

11.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Spectrum	Dec. 06 2012	E4440A	MY42510313	Agilent

11.3 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

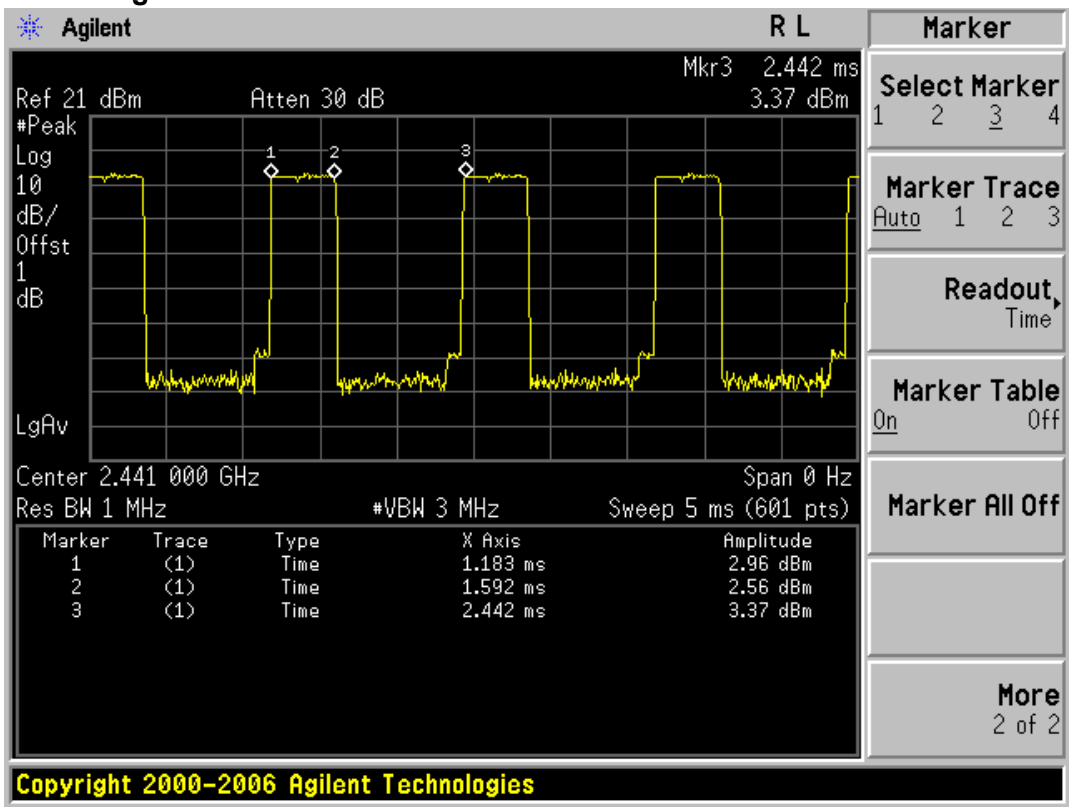
DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, total hops is 3.37 x 31.6 = 106.6

8DPSK

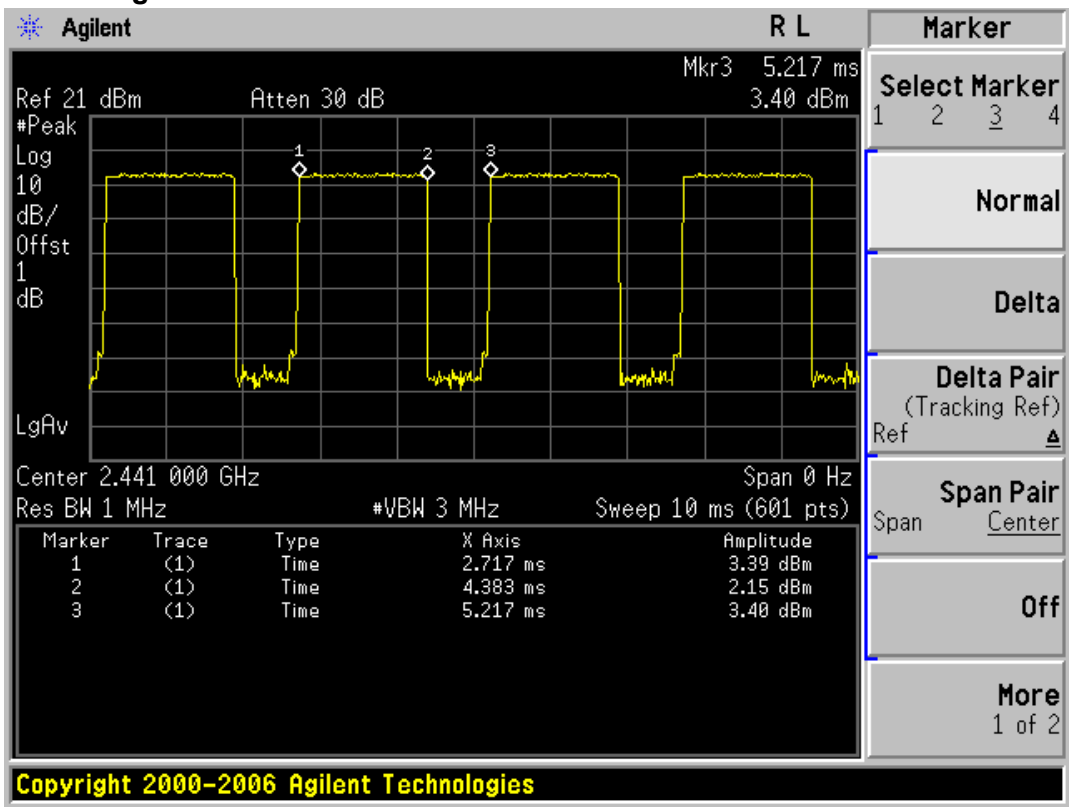
Grouping	Diagram	Time of occupancy ms	Limit ms	Remark
DH1	11-1	130.9	400	320x0.409
DH3	11-2	266.56	400	160x1.666
DH5	11-3	309.14	400	106.6x2.9

Remark : 8DPSK is the worse case found and reported.

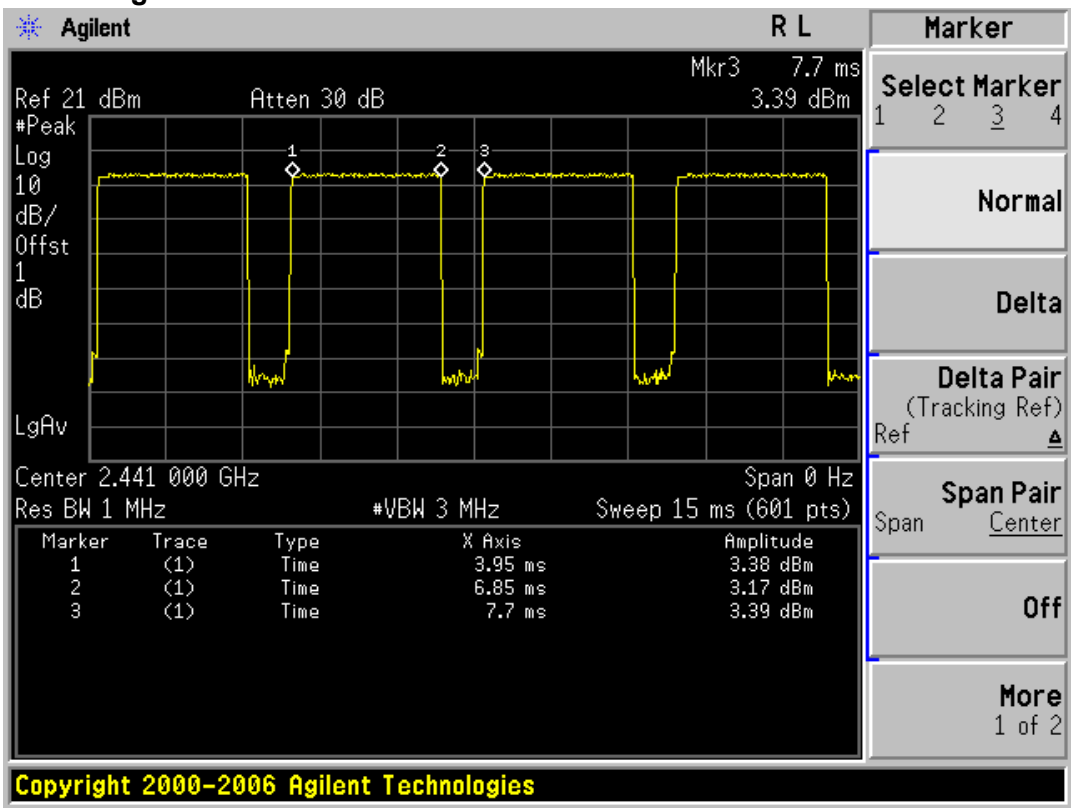
11.3.1 Diagram 11-1



11.3.2 Diagram 11-2



11.3.3 Diagram 11-3



12 POWER LINE CONDUCTED EMISSION TEST

12.1 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.		

12.2 Measurement Equipment

	Equipment	Last Calibration	Type	Serial No.	Manufacturer
☒	Shielding Room	Jul. 04 2012	7.0(L)x3.0(W)x3.0(H)	GTS252	ZhongYu Electron
☒	EMI Test Receiver	Jul. 04 2012	ESCS30	1102.4500K30	Rohde & Schwarz
☒	10dB Pulse Limita	Jul. 04 2012	N/A	GTS224	Rohde & Schwarz
☒	LISN	Jul. 04 2012	NSLK 8127	8127549	SCHWARZBECK MESS-ELEKTRONIK
☒	Coaxial Cable	Apr. 01 2012	N/A	N/A	GTS

12.3 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 C63.4-2003 on conducted Emission test.

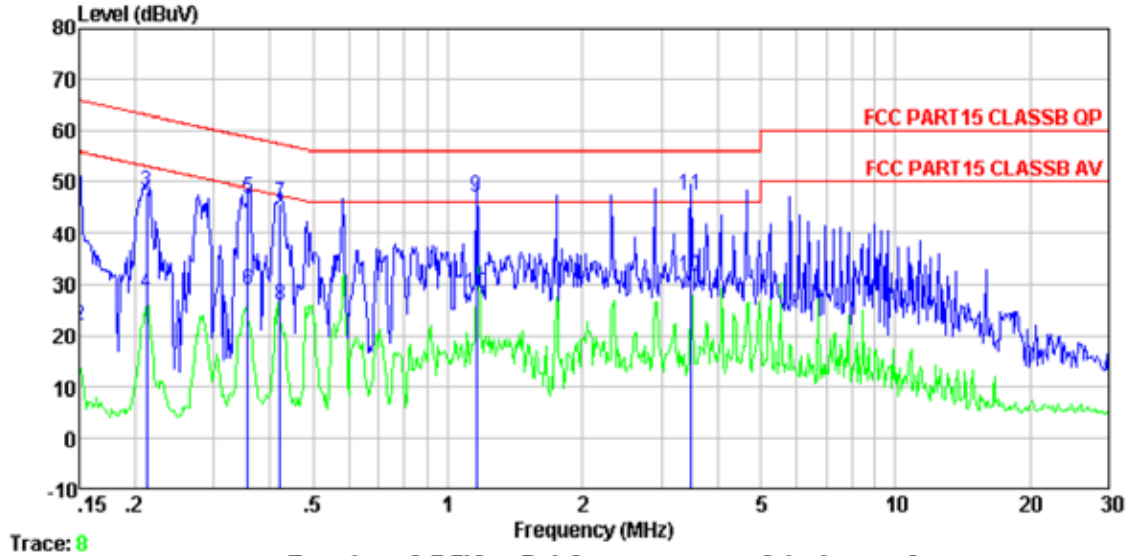
Preview measurements:
0.15 MHz to 30 MHz
Receiver settings: PK&AV detector
RBW:9 kHz

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 12-1	Pass
	Neutral	Diagram 12-2	Pass

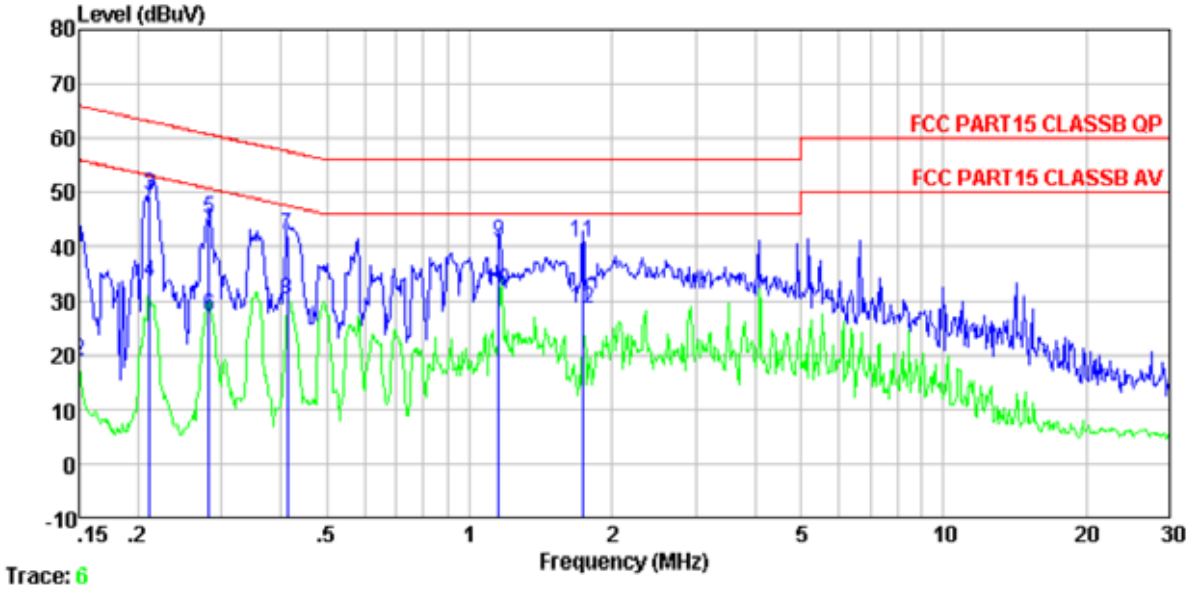
NOTES:
1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are reported.
3: If PK value is lower than AV limit then no reading value listed in report .If QP value is Lower than AV limit ,then AV value don't listed in report.

12.3.1 Diagram 12-1



	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	51.00	-0.26	0.10	50.84	66.00	-15.16	QP
2	0.150	22.11	-0.26	0.10	21.95	56.00	-34.05	Average
3	0.213	48.40	-0.23	0.10	48.27	63.10	-14.83	QP
4	0.213	28.43	-0.23	0.10	28.30	53.10	-24.80	Average
5	0.358	46.86	-0.22	0.10	46.74	58.78	-12.04	QP
6	0.358	28.92	-0.22	0.10	28.80	48.78	-19.98	Average
7	0.421	45.94	-0.21	0.10	45.83	57.42	-11.59	QP
8	0.421	25.95	-0.21	0.10	25.84	47.42	-21.58	Average
9	1.160	47.26	-0.21	0.10	47.15	56.00	-8.85	QP
10	1.160	28.33	-0.21	0.10	28.22	46.00	-17.78	Average
11	3.491	47.54	-0.27	0.10	47.37	56.00	-8.63	QP
12	3.491	31.62	-0.27	0.10	31.45	46.00	-14.55	Average

12.3.2 Diagram 12-2



Trace: 6

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	41.85	-0.13	0.10	41.82	66.00	-24.18	QP
2	0.150	18.97	-0.13	0.10	18.94	56.00	-37.06	Average
3	0.212	49.37	-0.09	0.10	49.38	63.14	-13.76	QP
4	0.212	33.52	-0.09	0.10	33.53	53.14	-19.61	Average
5	0.282	45.03	-0.09	0.10	45.04	60.76	-15.72	QP
6	0.282	27.24	-0.09	0.10	27.25	50.76	-23.51	Average
7	0.413	42.17	-0.08	0.10	42.19	57.59	-15.40	QP
8	0.413	30.33	-0.08	0.10	30.35	47.59	-17.24	Average
9	1.153	40.81	-0.09	0.10	40.82	56.00	-15.18	QP
10	1.153	31.85	-0.09	0.10	31.86	46.00	-14.14	Average
11	1.734	40.71	-0.11	0.10	40.70	56.00	-15.30	QP
12	1.734	28.69	-0.11	0.10	28.68	46.00	-17.32	Average

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 maximum peak gain of this antenna is 0dBi.

Appendix A Sample Label

Labelling Requirements

The sample label shown shall be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

END OF REPORT