FCC PART 15, SUBPART C

TEST AND MEASUREMENT REPORT

For

Silver Spring Networks, Inc.

555 Broadway Street
Redwood City, CA 94063

FCC ID: OWS-NIC42

Report Type:	Product Type:
Original Report	Access Point/Relay

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1301284-247	Original Report	2013-03-27

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of Silver Spring Networks, and their product *FCC ID: OWS-NIC42*, model: *Bridge 4.0* or the "EUT" as referred to in this report. The EUT is an Access Point/Relay Using 900 MHz FHSS (FSK and GFSK), 2.4 GHz DSSS (OQPSK) and FHSS (GFSK) Technology.

Radio Mode of 900 MHz with GFSK modulation of 300 kbps data rate and 300 kHz channel spacing will not be operating in the United States. Instead, 300 kbps data rate for 900 MHz, GFSK modulation will use 400 kHz channel spacing. Radiated emissions compliance was checked for worst case band edge compliance using the 300 kHz channel plan. Please refer to section 2.2 and section 9 of the report for the radio modes and conducted output power respectively.

1.2 Mechanical Description of EUT

The EUT measures 14.4cm (L) x 12.1cm (W) x 5.4 cm (H) and weighs 0.7kg.

The test data gathered are from typical production samples, serial number: 0213400003 provided by manufacturer

1.3 Objective

This report is prepared on behalf of *Silver Spring Networks* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15.247 rules for Output Power, Antenna Requirements, 6 dB and 20 dB Bandwidth, and power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Hopping Channel Separation, Dwell Time, Number of Hopping Frequency Used, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2007, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2009.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

2.2 EUT Exercise Software

The test software used was called FHSSTEST Term, which was provided by Silver Spring Networks, was verified by Wei Sun to comply with the standard requirements being tested against.

Firmware: 03.03.8D.0D for operation.
83.03.8D.0D for test.

Radio Mode	Frequency (MHz)		
	Low Channel	Middle Channel	High Channel
900 MHz FSK Modulation 100 kbps data rate 300 kHz channel spacing	902.3	914.6	926.9
900 MHz GFSK Modulation 300 kbps data rate 400 kHz channel spacing	902.4	914.4	926.8
900 MHz GFSK Modulation 300 kbps data rate 300 kHz channel spacing	902.3	914.6	926.9
2.4 GHz GFSK Modulation 500 kbps data rate 800 kHz channel Spacing	2400.8	2440	2472.8
2.4 GHz GFSK Modulation 250 kbps data rate 800 kHz channel Spacing	2400.8	2440	2472.8
2.4 GHz OQPSK Modulation 1 Mbps data rate 5 MHz channel Spacing	2405	2440	2480

Note: *Radio Mode of 900 MHz with GFSK modulation of 300 kbps data rate and 300 kHz channel spacing will not be operating in the United States. Instead, 300 kbps data rate for 900 MHz, GFSK modulation will use 400 kHz channel spacing. Radiated emissions compliance was checked for worst case band edge compliance using the 300 kHz channel plan. Please refer to section 2.2 and section 9 of the report for the radio modes and conducted output power respectively.*

2.3 Special Equipment

There were no special accessories were required, included, or intended for use with EUT during these tests.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
BK Precision	DC Power Supply	1621A	D185052265

2.6 EUT Internal Configuration Details

Manufacturer	Description	Model	Serial Number
Silverspring Networks	Main PCB Board	174-0232-00	5112400001
Silverspring Networks	Rf Board	170-0227-01	17402270103
WP Wireless	True-Omni Antenna	WPANT30017-CA	1137

2.7 Interface Ports and Cables

Cable Description	Length (m)	To	From
Serial	1	EUT	Laptop
RF Cable	< 1	EUT	Spectrum Analyzer

2.8 EUT Power Supply Information

N/A

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
DSSS & FHSSS: FCC §15.247(i), §2.1091	RF Exposure	Compliant
DSSS & FHSSS: FCC §15.203	Antenna Requirement	Compliant
FCC §15.207(a)	AC Line Conducted Emissions	N/A
DSSS & FHSSS: FCC §15.247 (d)	Spurious Emissions at Antenna Port	Compliant
DSSS & FHSSS: FCC §15.209, §15.247 (d) FCC §15.205	Radiated Spurious Emissions including Restricted Band	Compliant
DSSS: FCC §15.247(a)(2)	6 dB Emission Bandwidth	Compliant
FHSS: FCC §15.247(a)(1)	20 dB Emission Bandwidth	Compliant
DSSS: FCC §15.247(b)(3) FHSS: FCC §15.247(a)(1)	Maximum Peak Output Power	Compliant
DSSS & FHSSS: FCC §15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
DSSS: FCC §15.247(e)	Power Spectral Density	Compliant
FHSS: FCC §15.247(a) (1)	Hopping Chanel Separation	Compliant
FHSS: FCC §15.247(b) (1)	Number of Hopping Frequency Used	Compliant
FHSS: FCC §15.247(a) (1) (iii)	Dwell Time	Compliant

N/A Note: EUT is DC powered.

4 FCC §15.247 (i), §2.1091 – RF Exposure

4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

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

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 MPE Results

Worst case in 900 MHz: 900 MHz FSK modulation, 100 kbps data rate. 300 kHz channel spacing

Maximum peak output power at antenna input terminal (dBm):	29.96
Maximum peak output power at antenna input terminal (mW):	990.83
Prediction distance (cm):	20
Prediction frequency (MHz):	902.3
Maximum Antenna Gain, typical (dBi):	3
Maximum Antenna Gain (numeric):	2.0
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.393
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.602

Worst case in 2.4 GHz: GFSK modulation, 500 kbps data rate. 800 kHz channel spacing

Maximum peak output power at antenna input terminal (dBm):	22.85
Maximum peak output power at antenna input terminal (mW):	192.75
Prediction distance (cm):	20
Prediction frequency (MHz):	2472.8
Maximum Antenna Gain, typical (dBi):	4
Maximum Antenna Gain (numeric):	2.51
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.096
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the MPE limit for uncontrolled exposure.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Antenna List

Manufacturers	Models/Name	Antenna Gain (dBi)
WP Wireless	WPANT30017-CA	3 @ 900 MHz 4 @ 2400 MHz

The EUT antenna consists of an N-Type male connector with maximum of 4 dBi; therefore, it complies with the antenna requirement.

6 FCC §2.1051, §15.247(d) – Spurious Emissions at Antenna Terminals

6.1 Applicable Standard

For FCC §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

6.2 Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for below 1GHz measurement and 1MHz for above 1GHz measurement. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Wei Sun on 2013-02-14 at RF site.

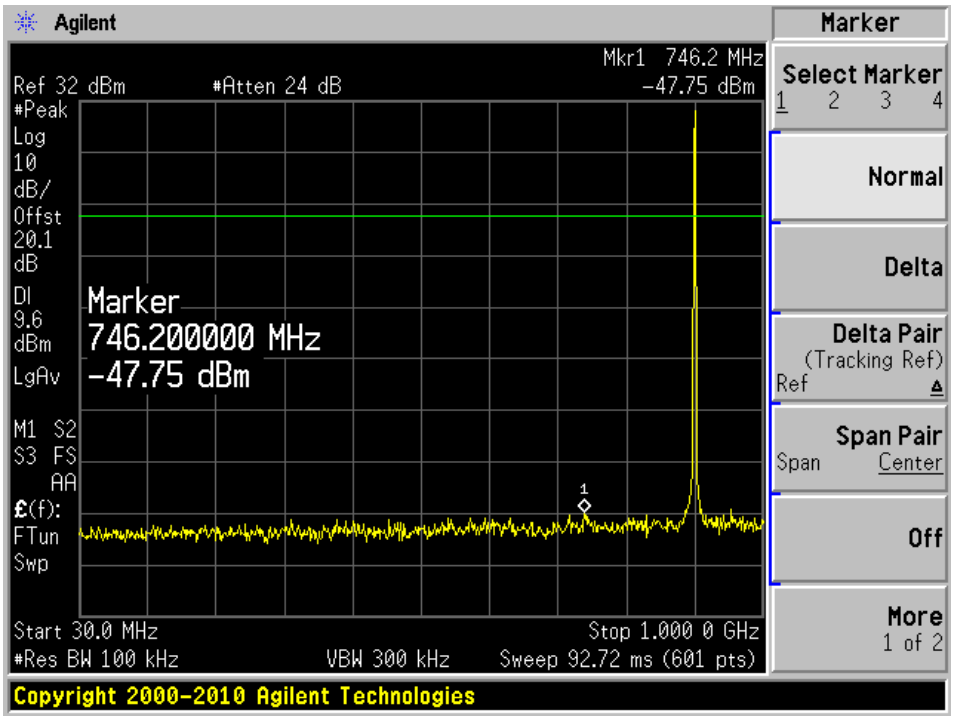
6.5 Test Results

Please refer to following plots of spurious emissions.

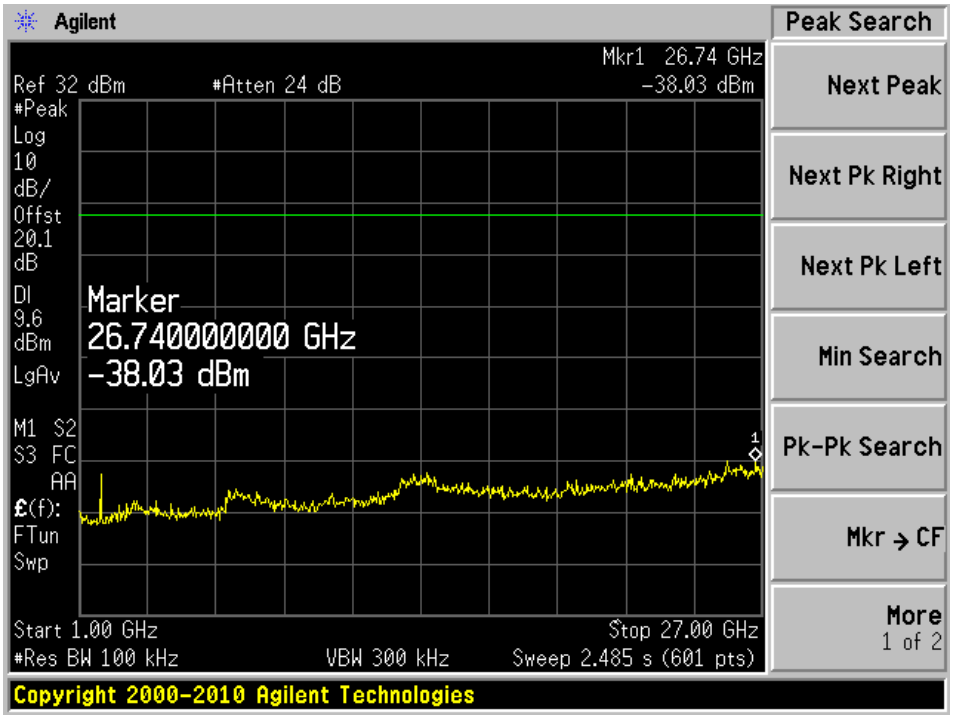
900 MHz FSK Modulation 100 kbps data rate 300 kHz channel spacing

Low Channel

30 MHz – 1 GHz

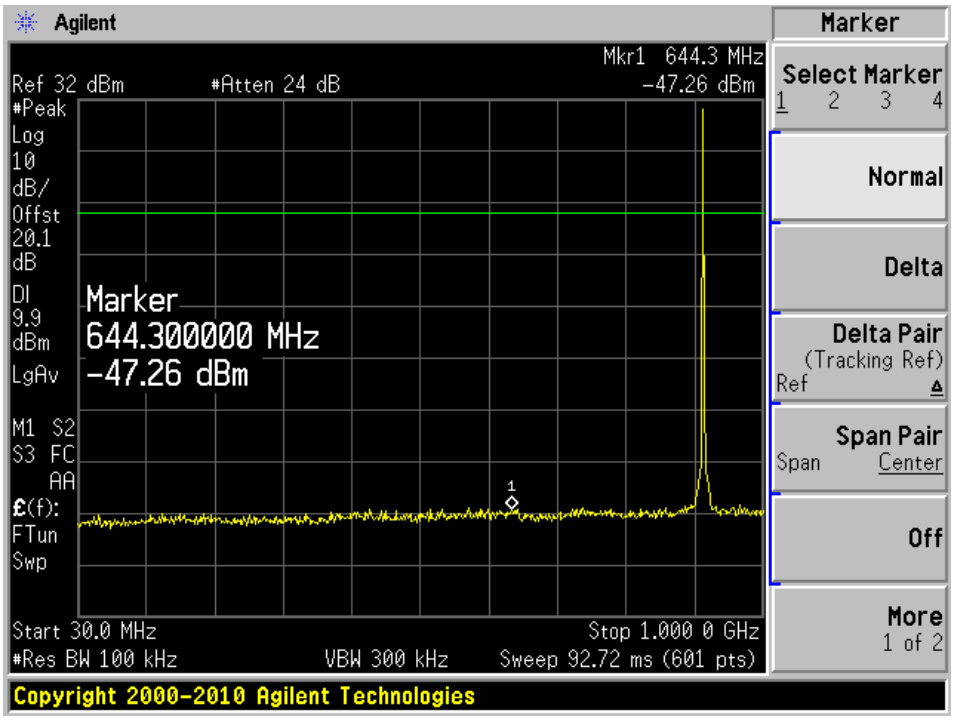


Above 1 GHz

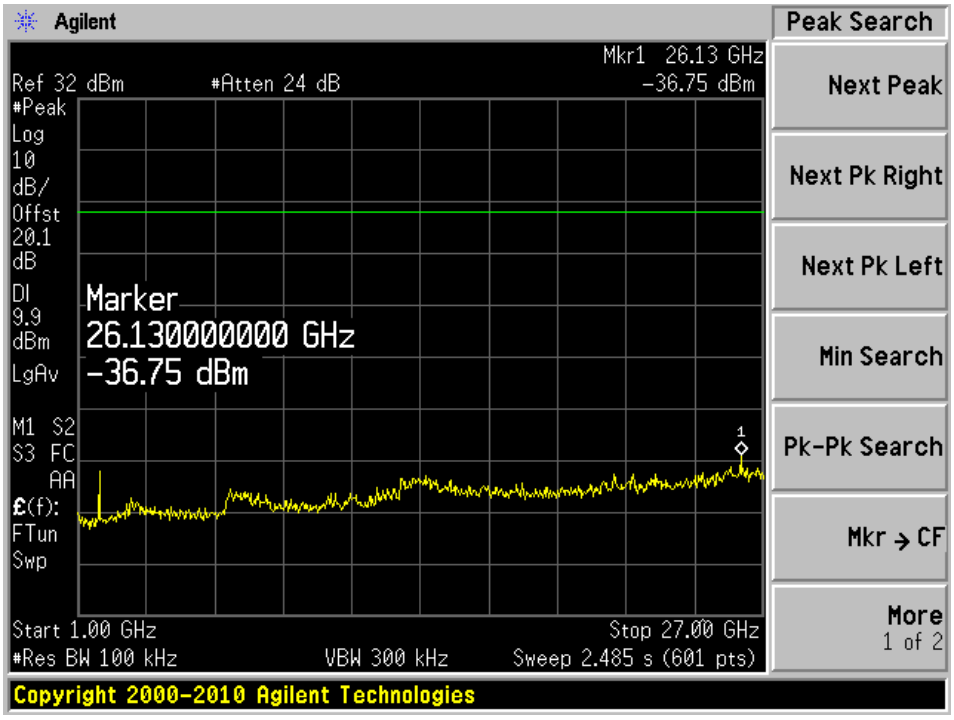


Middle Channel

30 MHz – 1 GHz

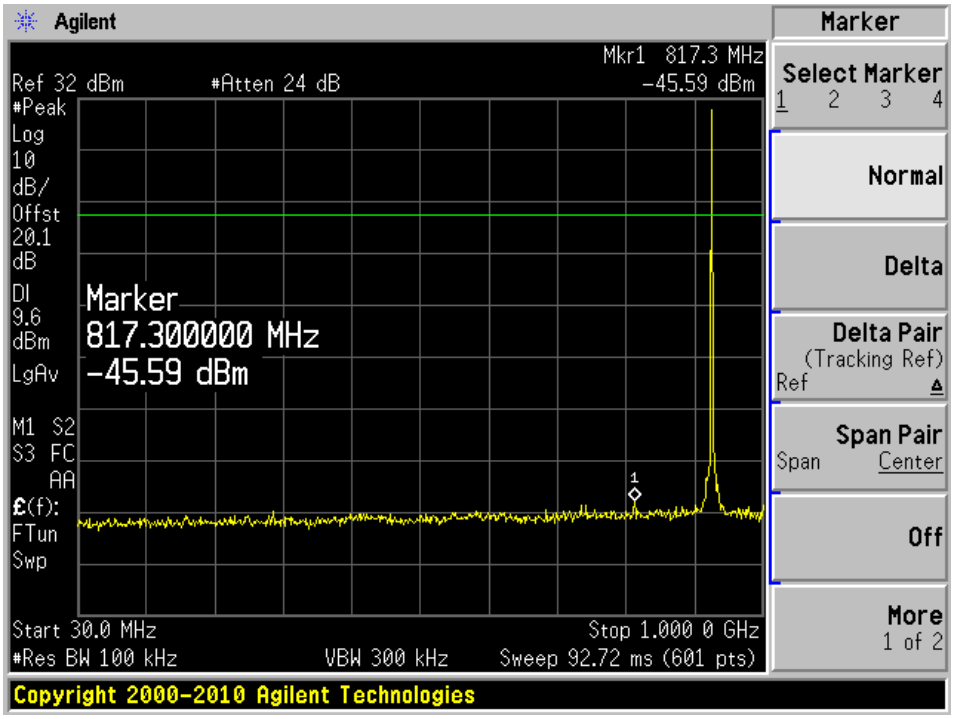


Above 1 GHz

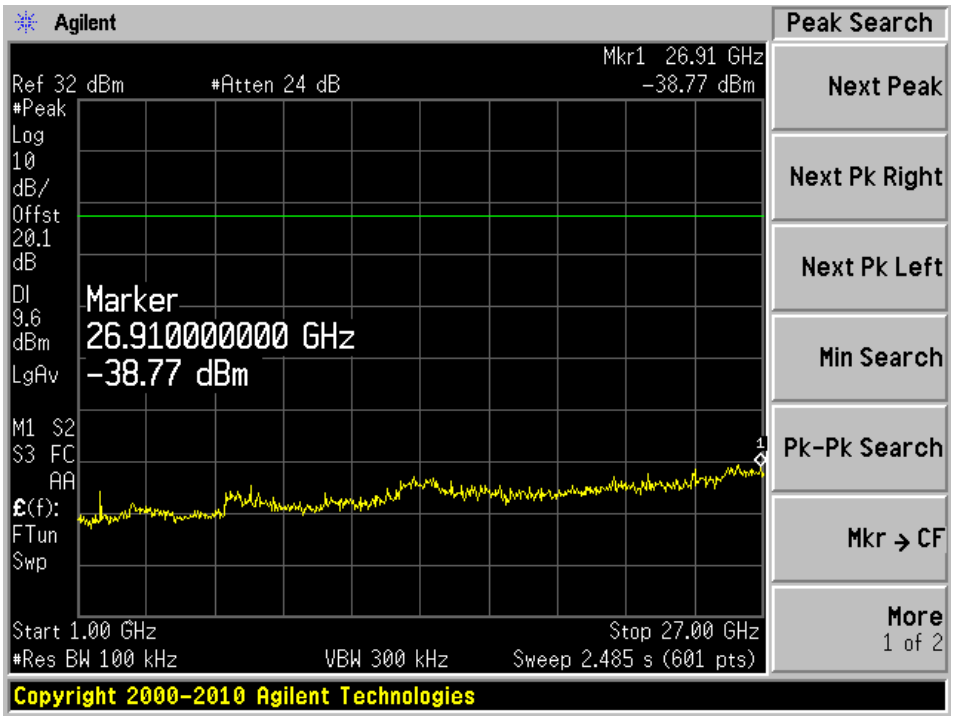


High Channel

30 MHz – 1 GHz



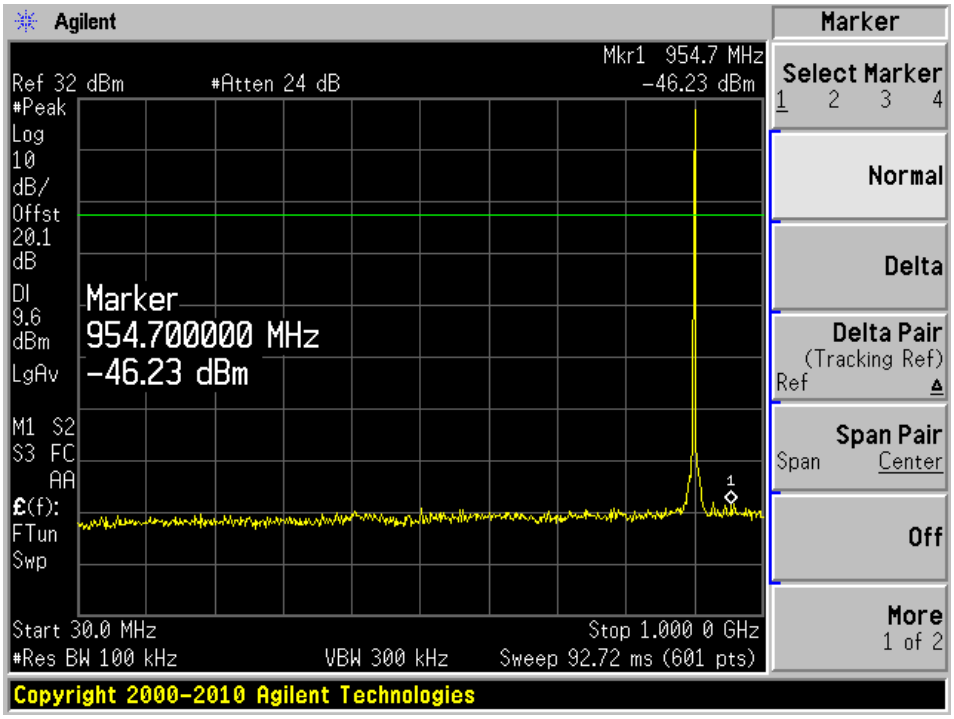
Above 1 GHz



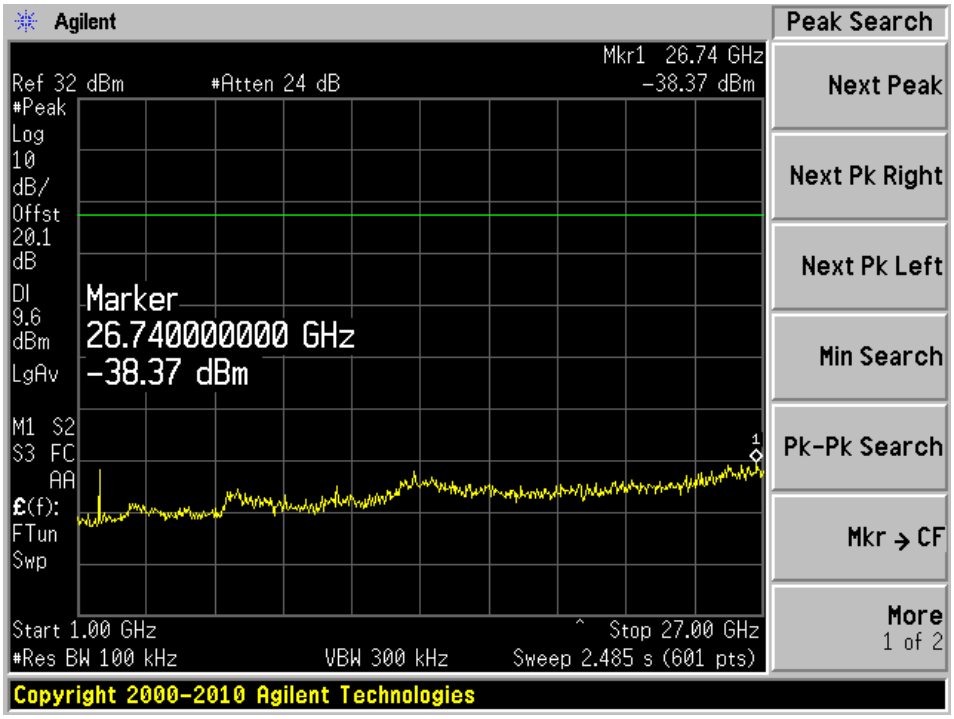
900 MHz GFSK Modulation 300 kbps data rate 400 kHz channel spacing

Low Channel

30 MHz – 1 GHz

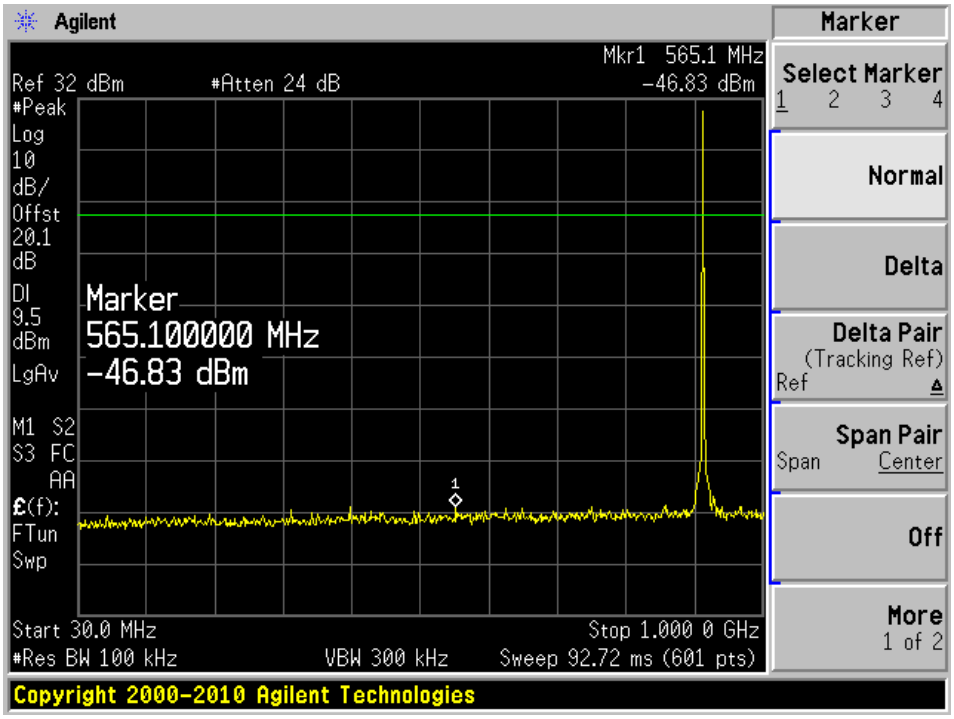


Above 1 GHz

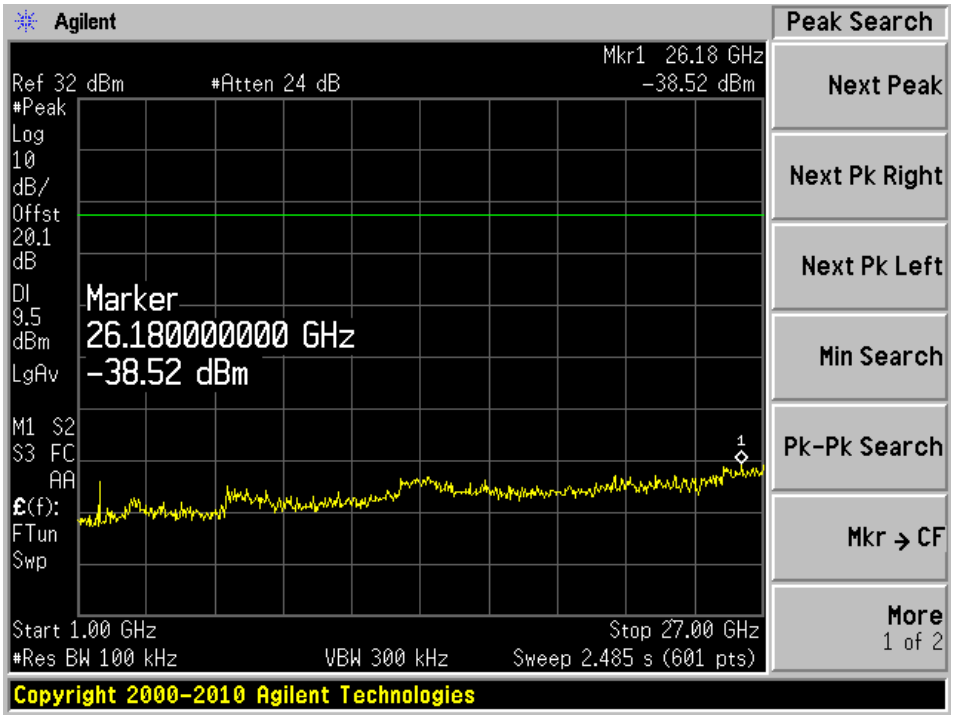


Middle Channel

30 MHz – 1 GHz

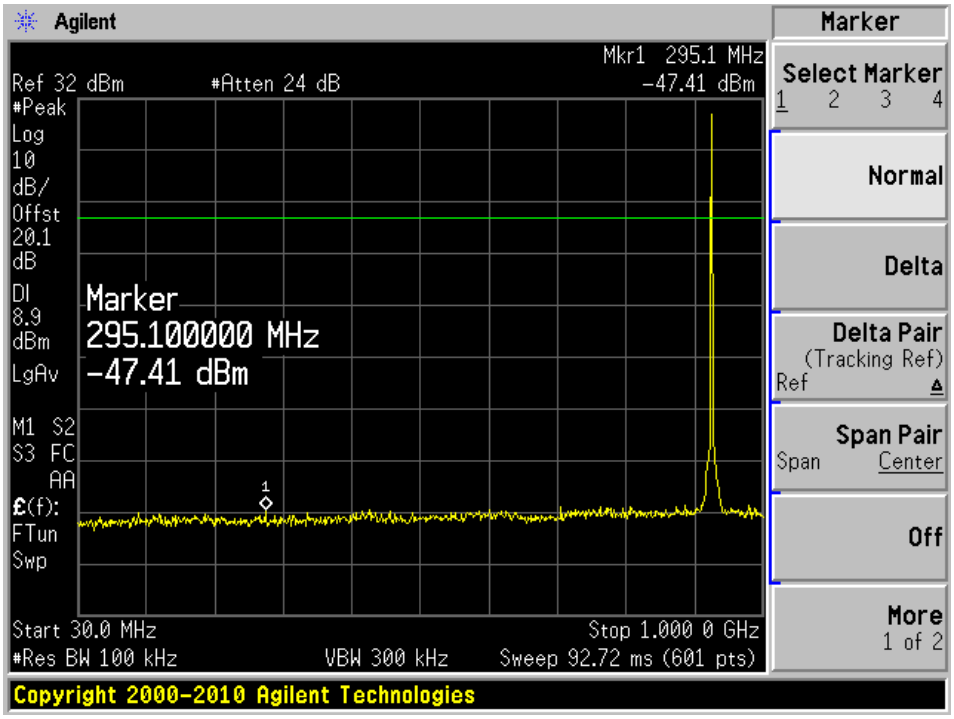


Above 1 GHz

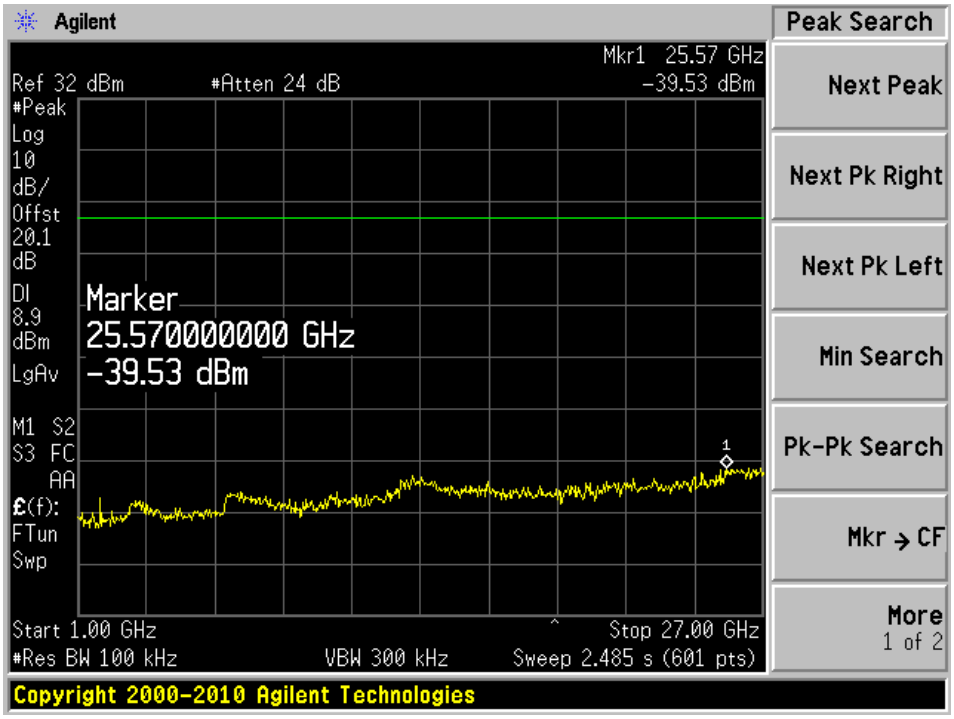


High Channel

30 MHz – 1 GHz



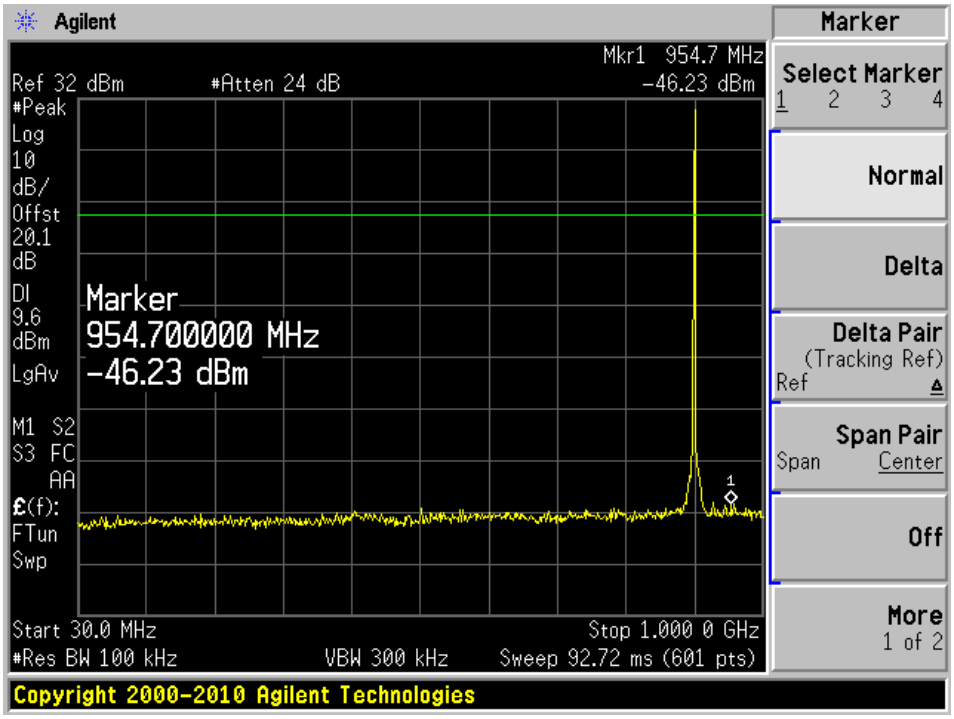
Above 1 GHz



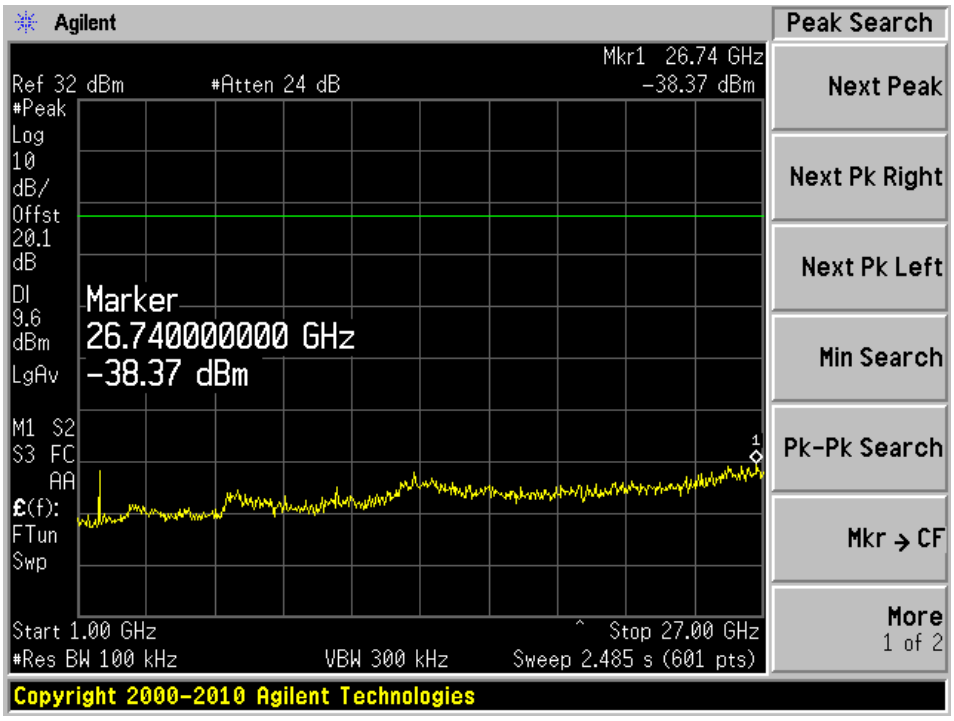
900 MHz GFSK Modulation 300 kbps data rate 300 kHz channel spacing

Low Channel

30 MHz – 1 GHz

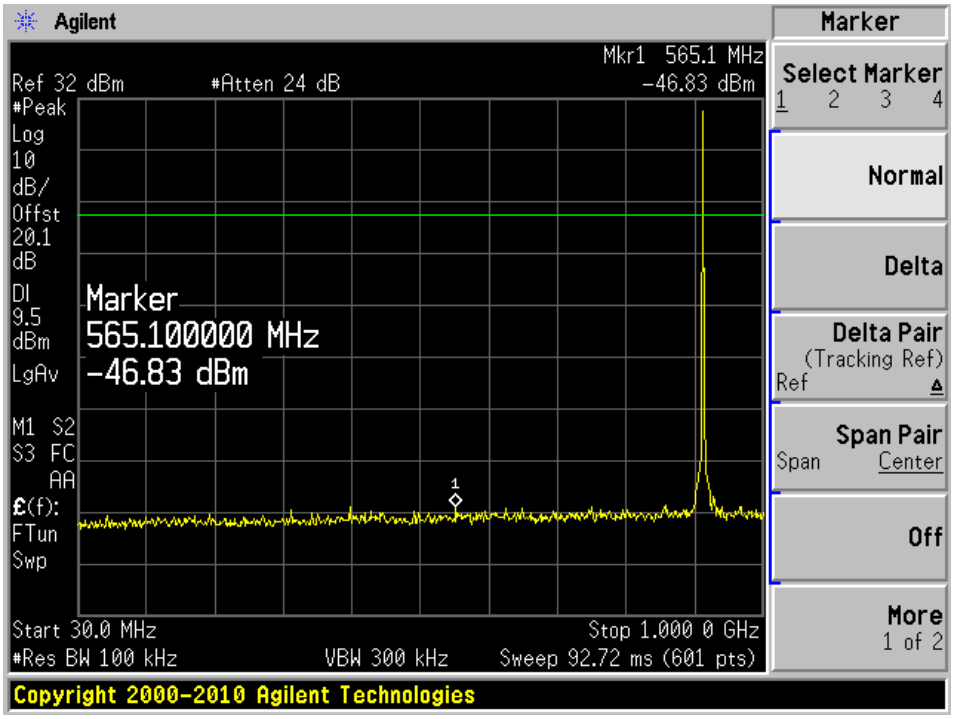


Above 1 GHz

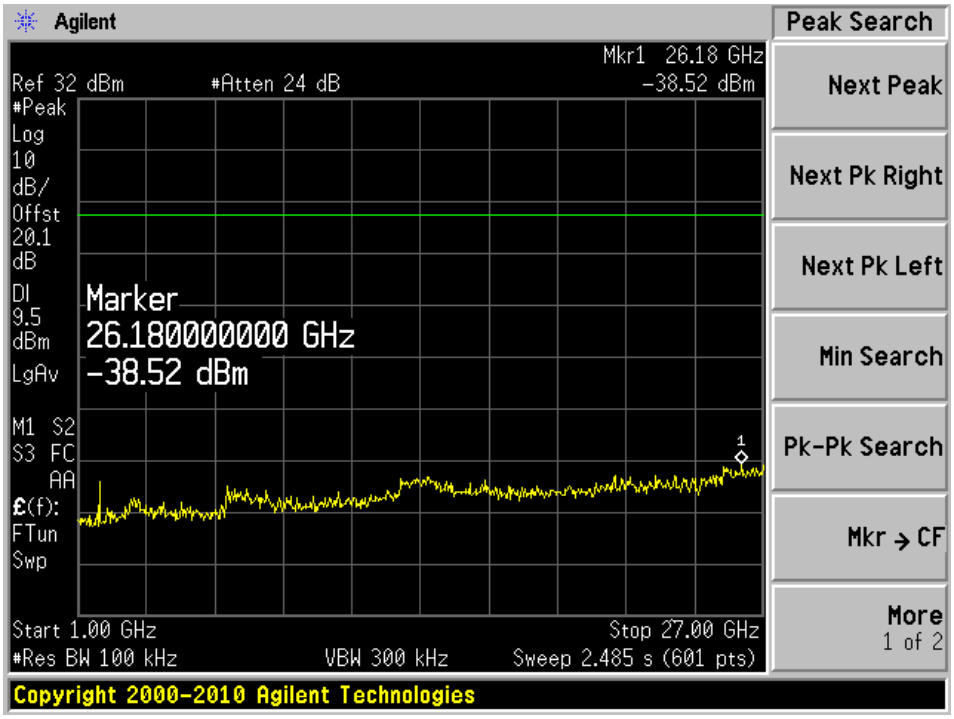


Middle Channel

30 MHz – 1 GHz

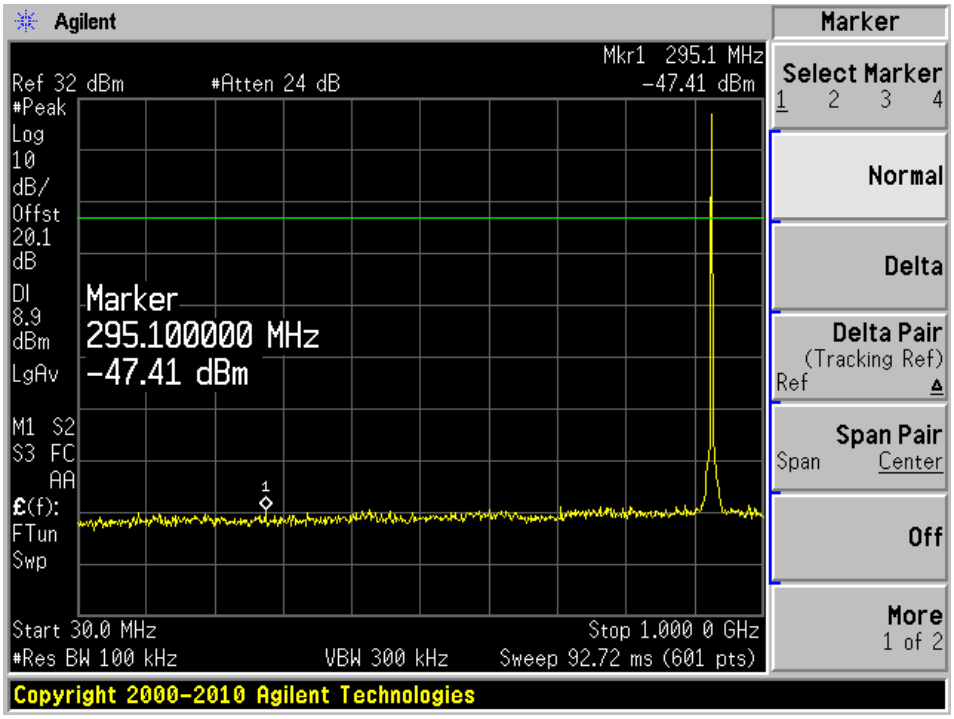


Above 1 GHz

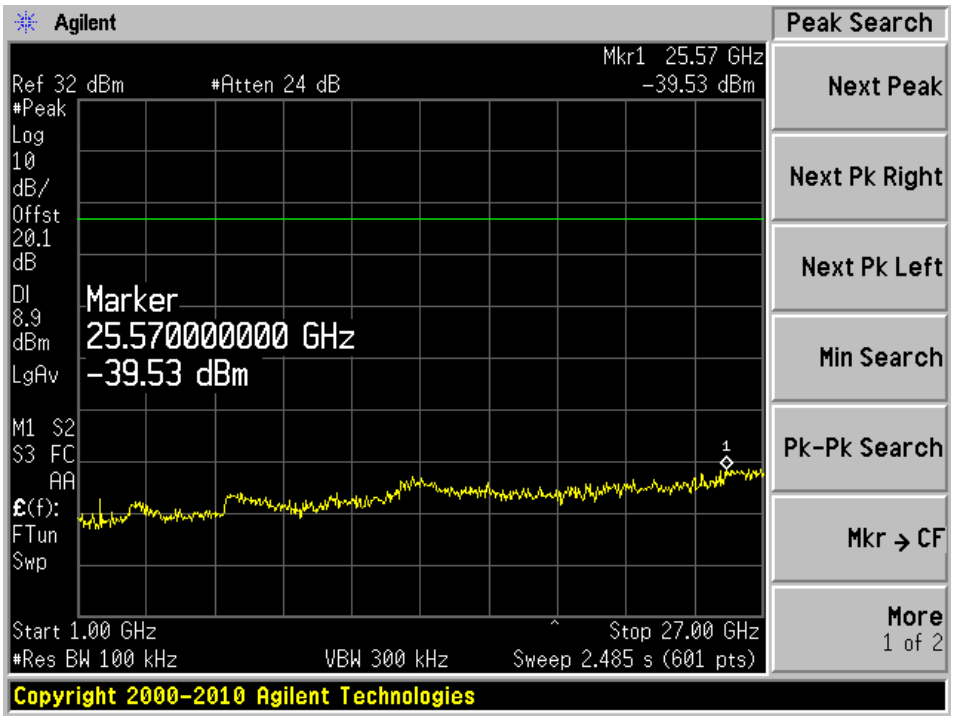


High Channel

30 MHz – 1 GHz



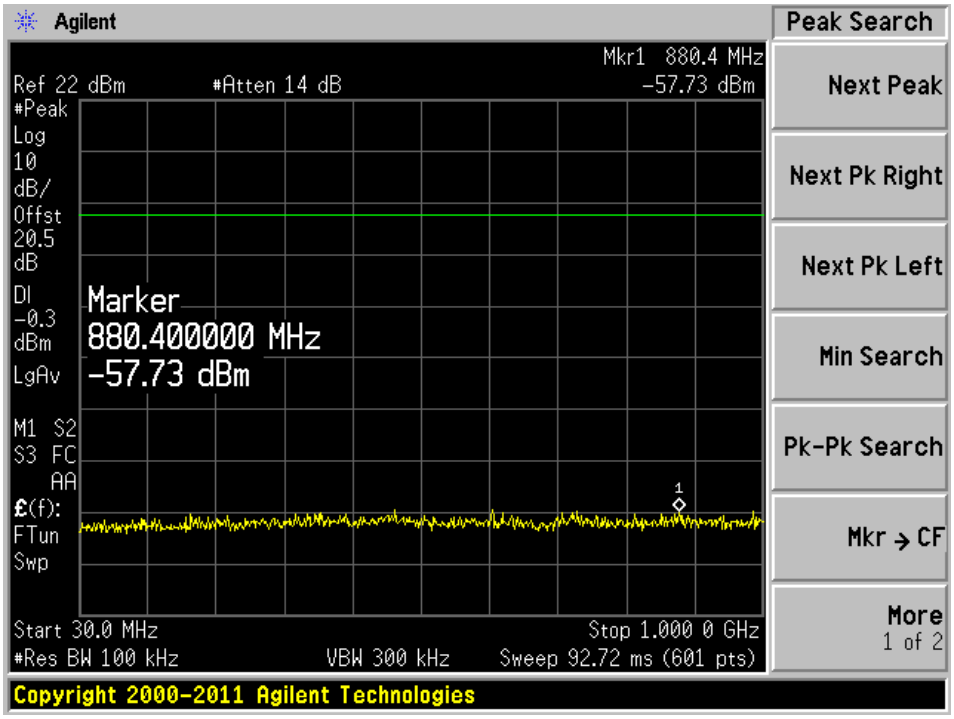
Above 1 GHz



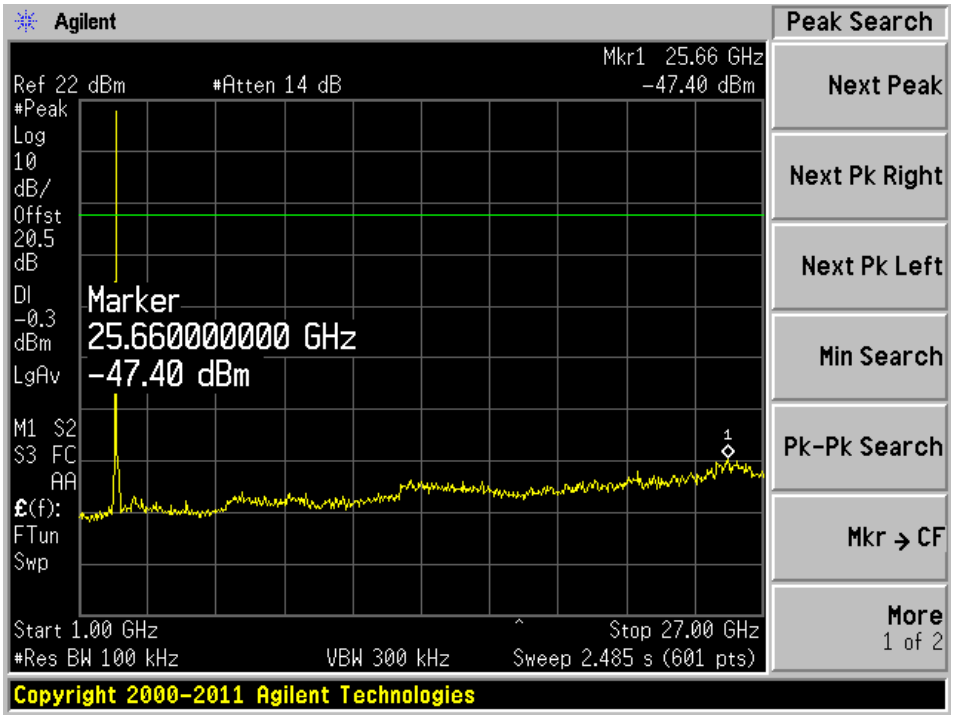
2.4 GHz GFSK Modulation 500 kbps data rate 800 kHz channel spacing

Low Channel

30 MHz – 1 GHz

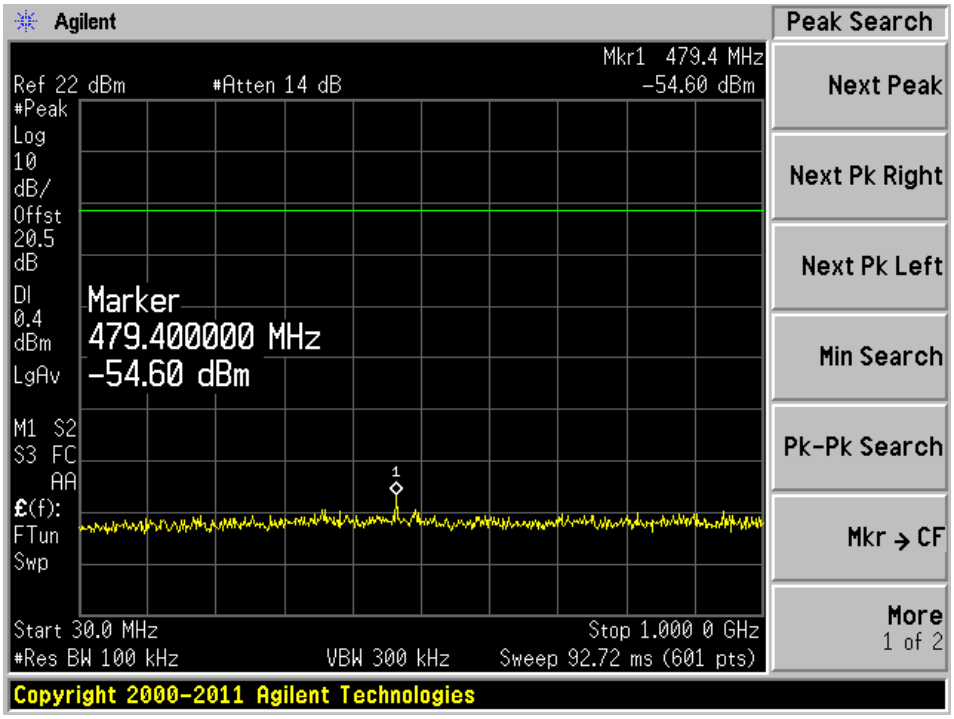


Above 1 GHz

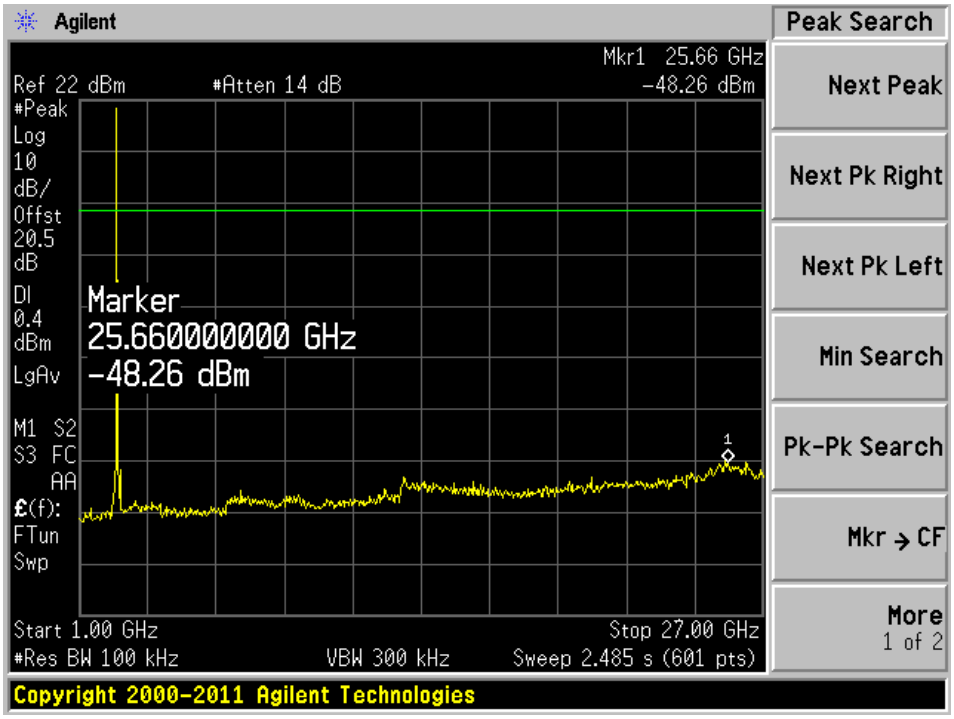


Middle Channel

30 MHz – 1 GHz

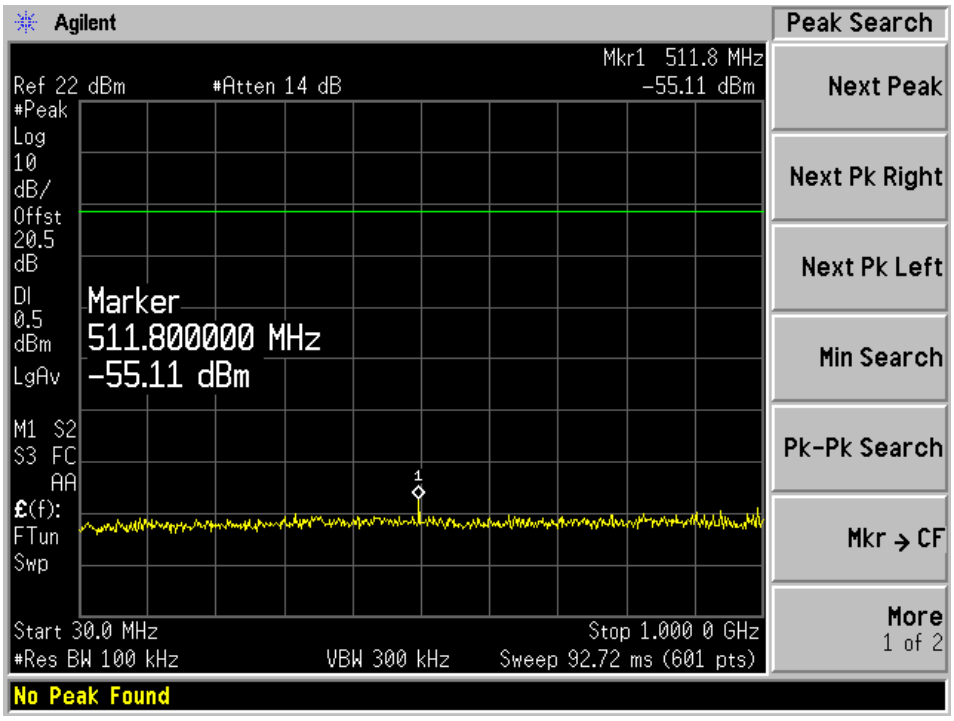


Above 1 GHz

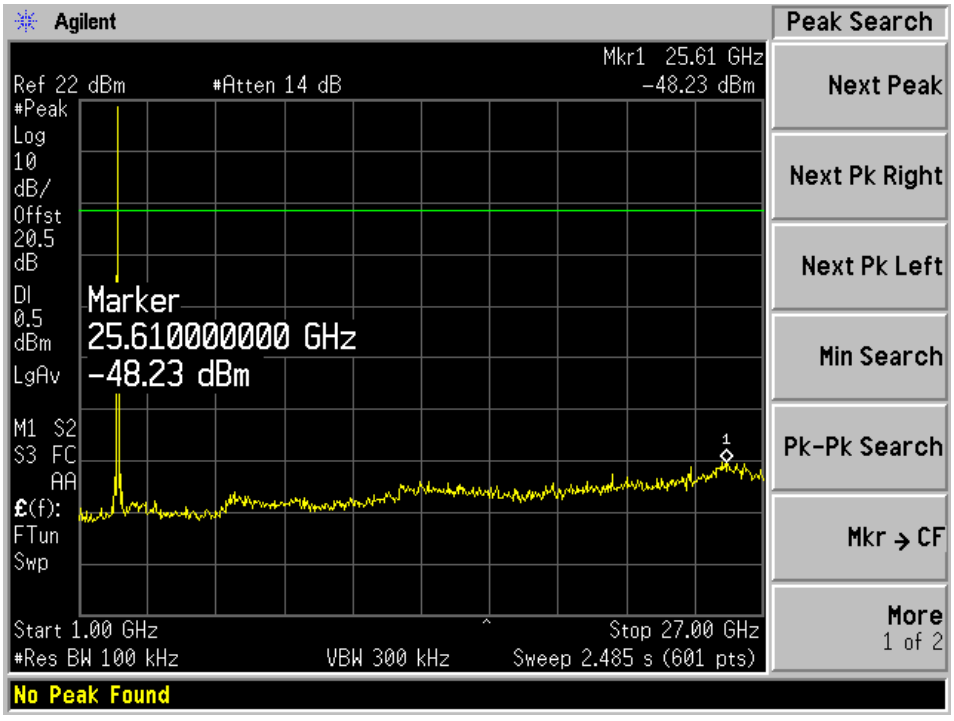


High Channel

30 MHz – 1 GHz



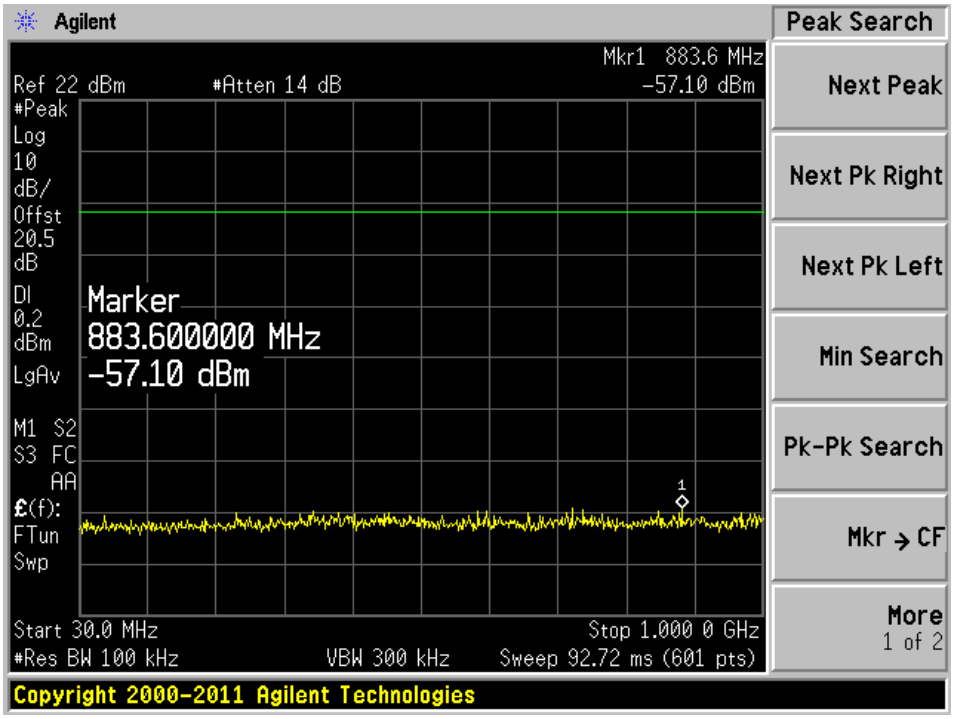
Above 1 GHz



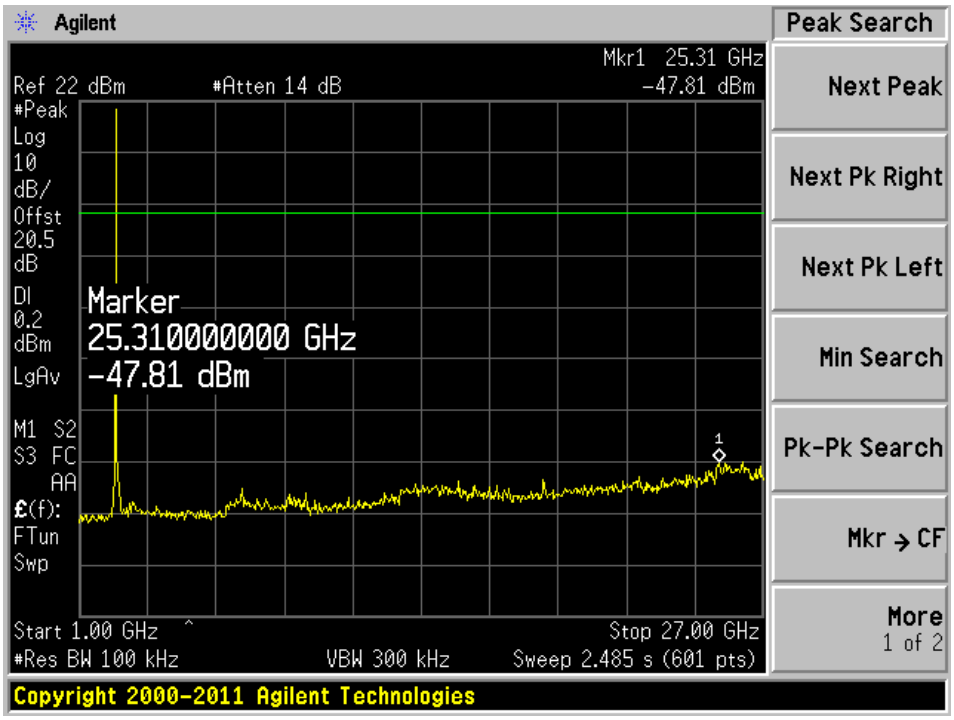
2.4 GHz GFSK Modulation 250 kbps data rate 800 kHz channel spacing

Low Channel

30 MHz – 1 GHz

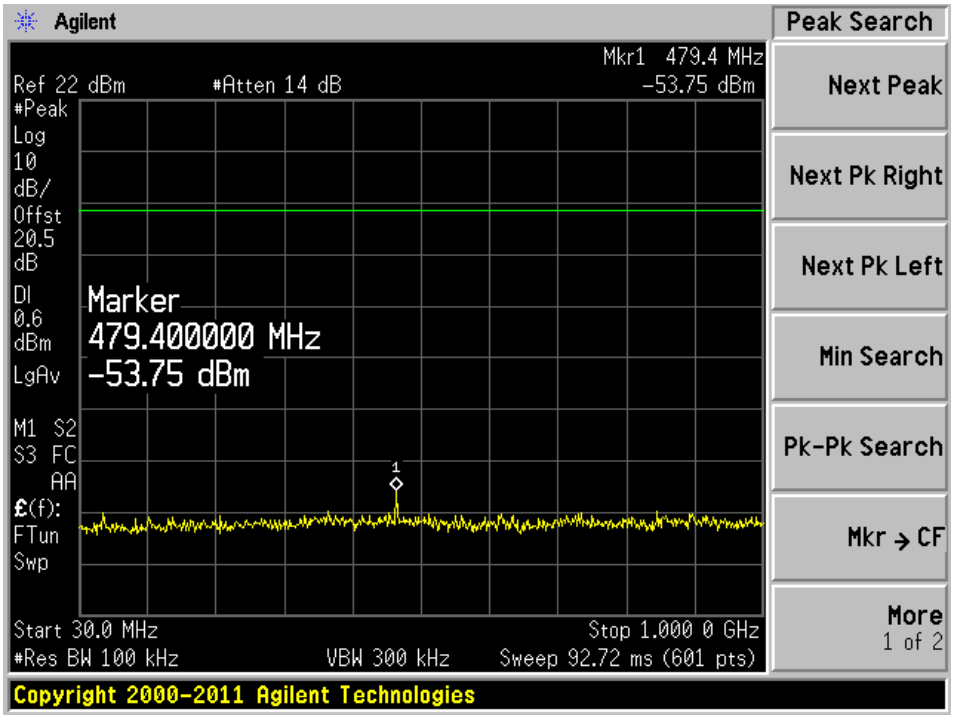


Above 1 GHz

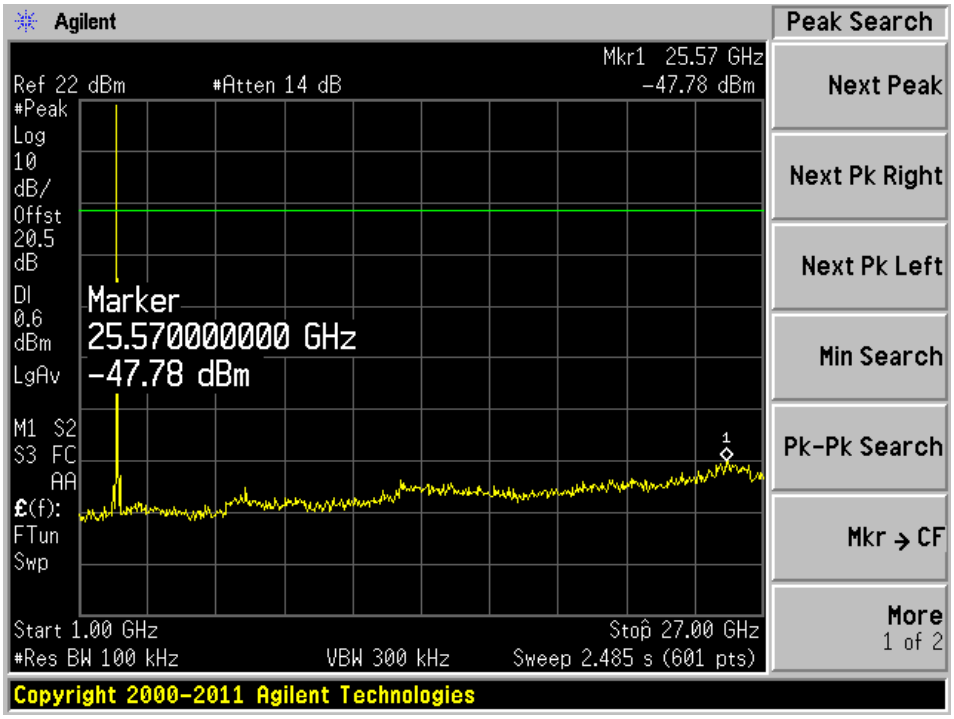


Middle Channel

30 MHz – 1 GHz

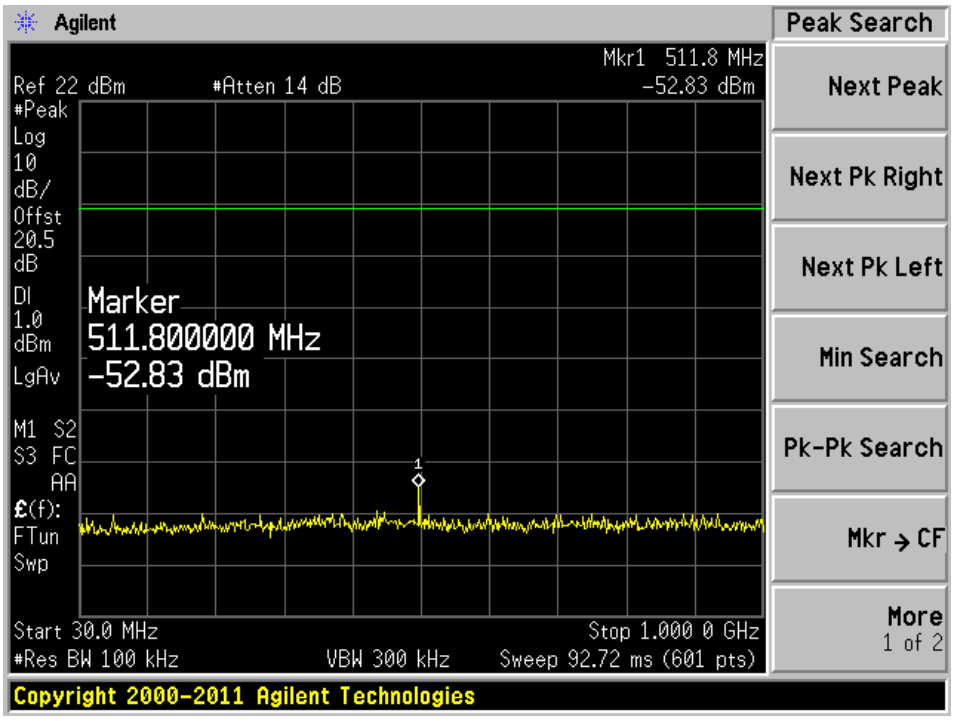


Above 1 GHz

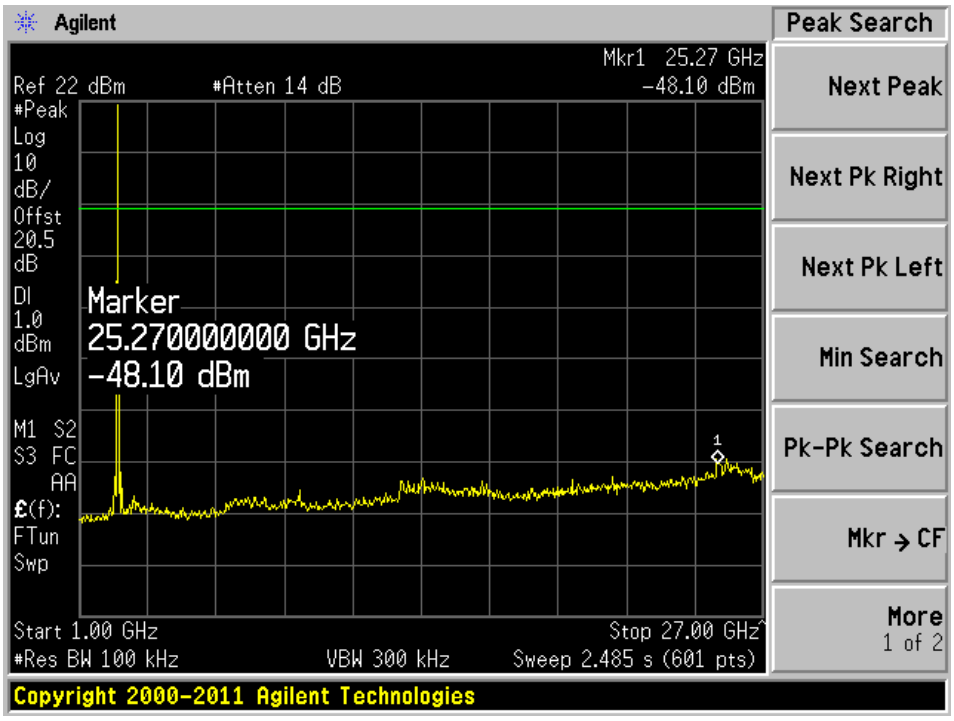


High Channel

30 MHz – 1 GHz



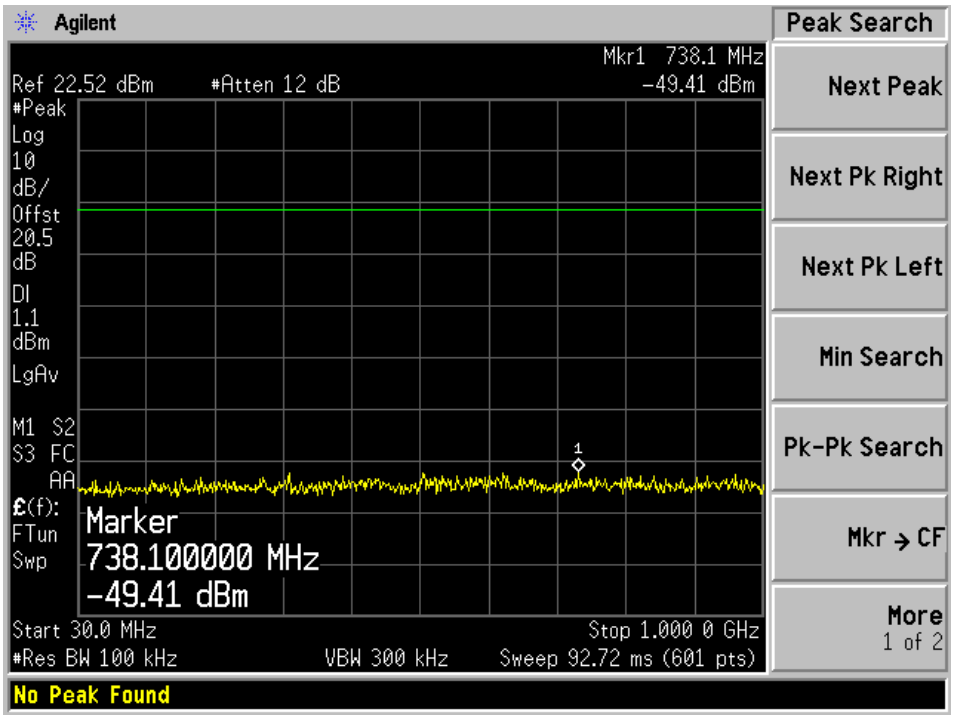
Above 1 GHz



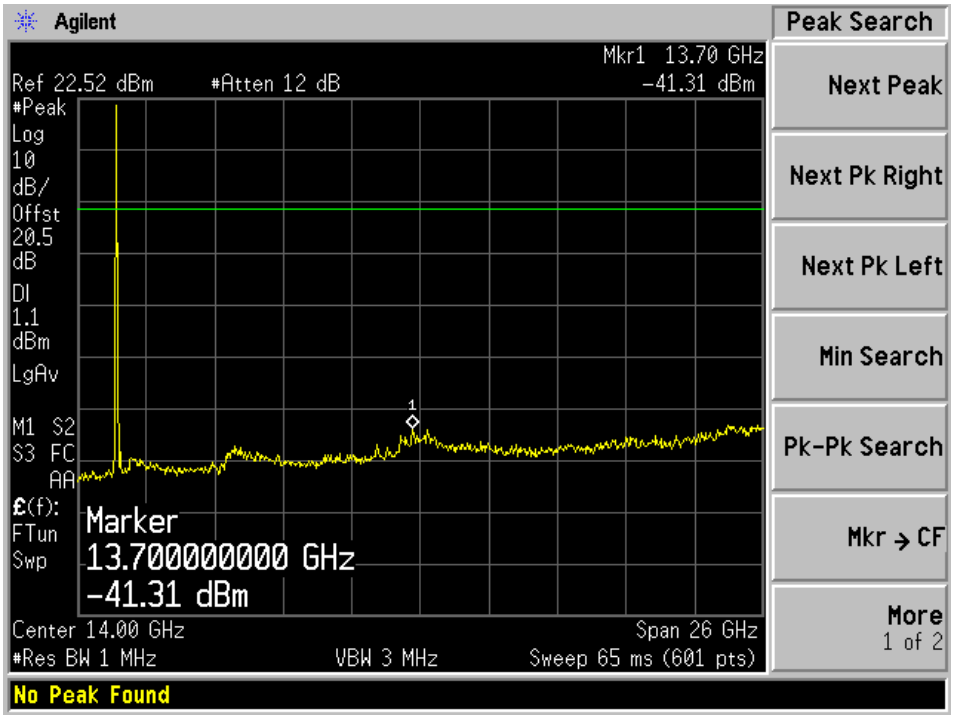
2.4 GHz OQSK Modulation 1 Mbps data rate 5 MHz channel spacing

Low Channel

30 MHz – 1 GHz

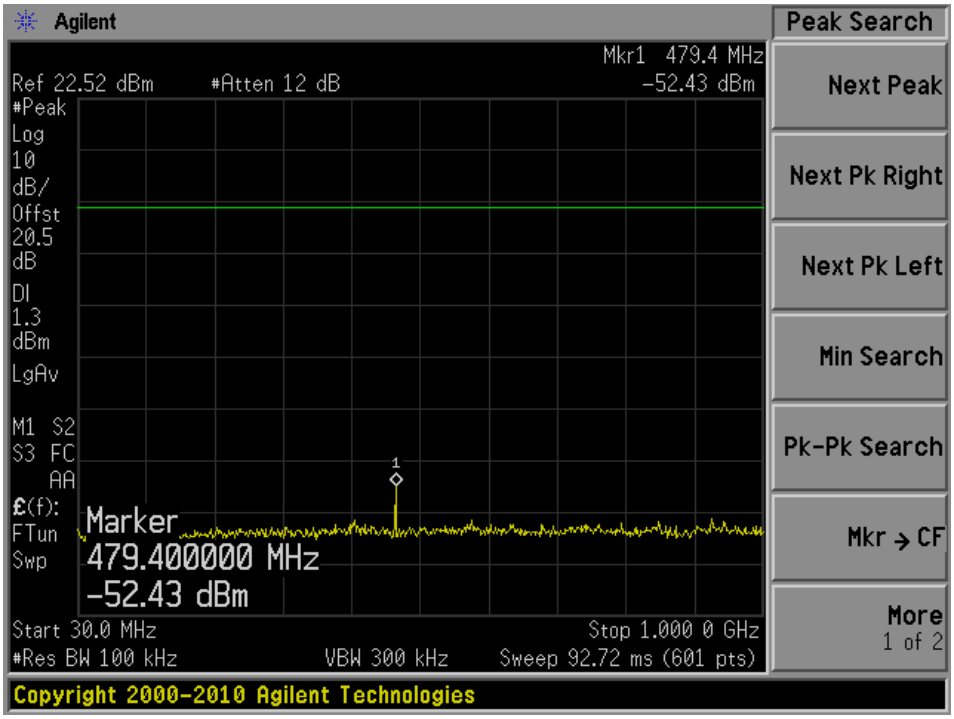


Above 1 GHz

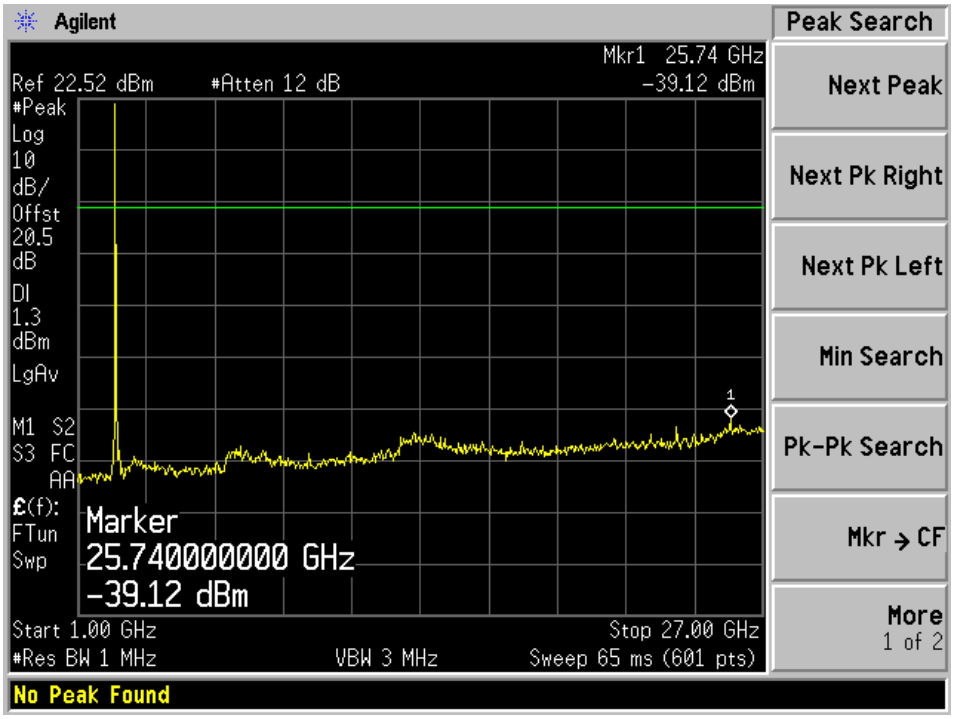


Middle Channel

30 MHz – 1 GHz

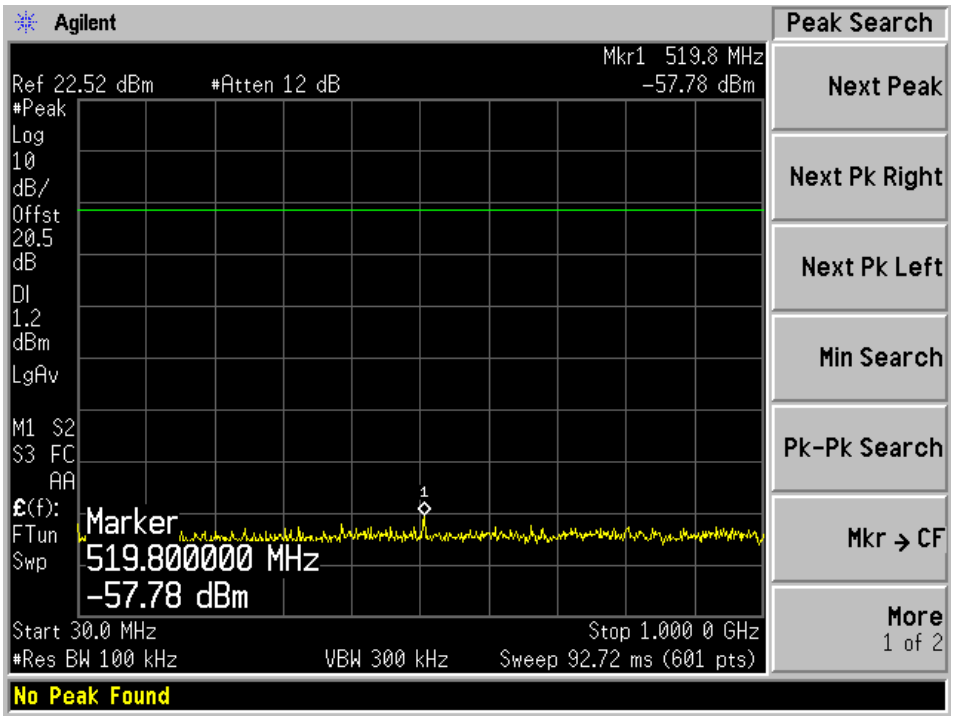


Above 1 GHz

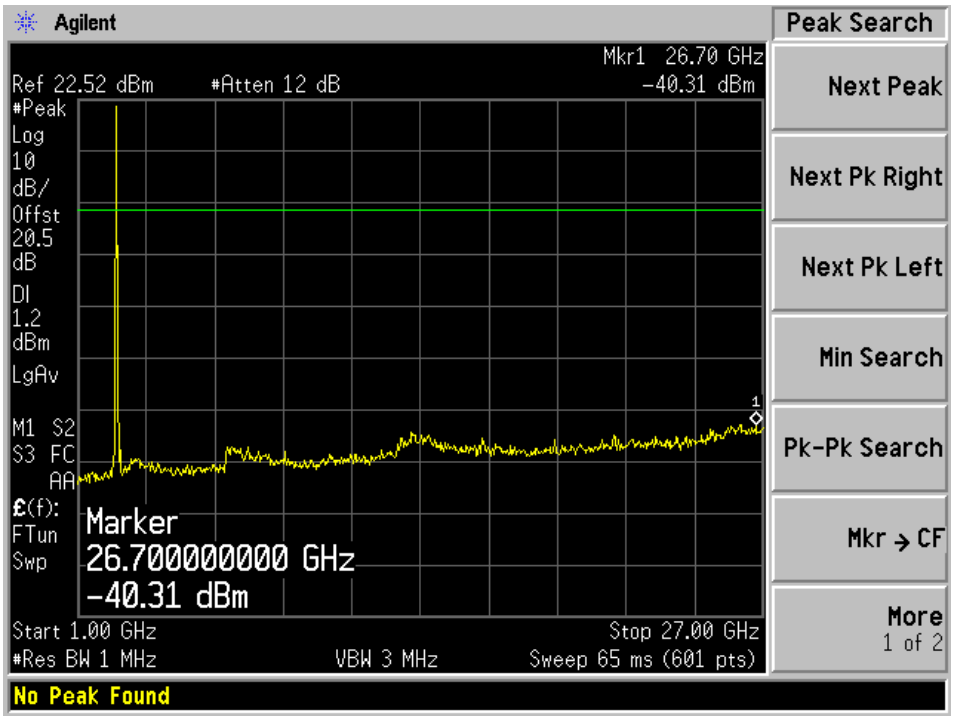


High Channel

30 MHz – 1 GHz



Above 1 GHz



7 FCC §15.205, §15.209 & §15.247(d) – Spurious Radiated Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a) and RSS-210: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.4-2009. The specification used was the FCC 15 Subpart C.

The spacing between the peripherals was 3 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

7.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

7.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

Margin = Corrected Amplitude - Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2012-08-15	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A06639	2012-06-09	1 year
Mini-Circuits	Pre-amplifier	ZVA-183-S	570400946	2012-05-09	1 year
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year
Sunol Science Corp	Horn Antenna	DHR-118	A052704	2012-02-24	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2012-03-22	1 year

Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

7.6 Test Environmental Conditions

Temperature:	21-24°C
Relative Humidity:	43-46%
ATM Pressure:	101-103kPa

The testing was performed by Wei Sun from 2013-01-18 to 2013-02-05 in 5 meter 3.

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C standard's radiated emissions limits, and had the worst margin of:

30-1000 MHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-8.71	124.575	Horizontal	900 MHz FSK modulation 100kbps 300 kHz channel spacing High channel

Above 1 GHz:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-0.99	2483.5	Vertical	2.4 GHz GFSK Modulation 1Mbps data rate 5MHz channel spacing

Please refer to the following table and plots for specific test result details

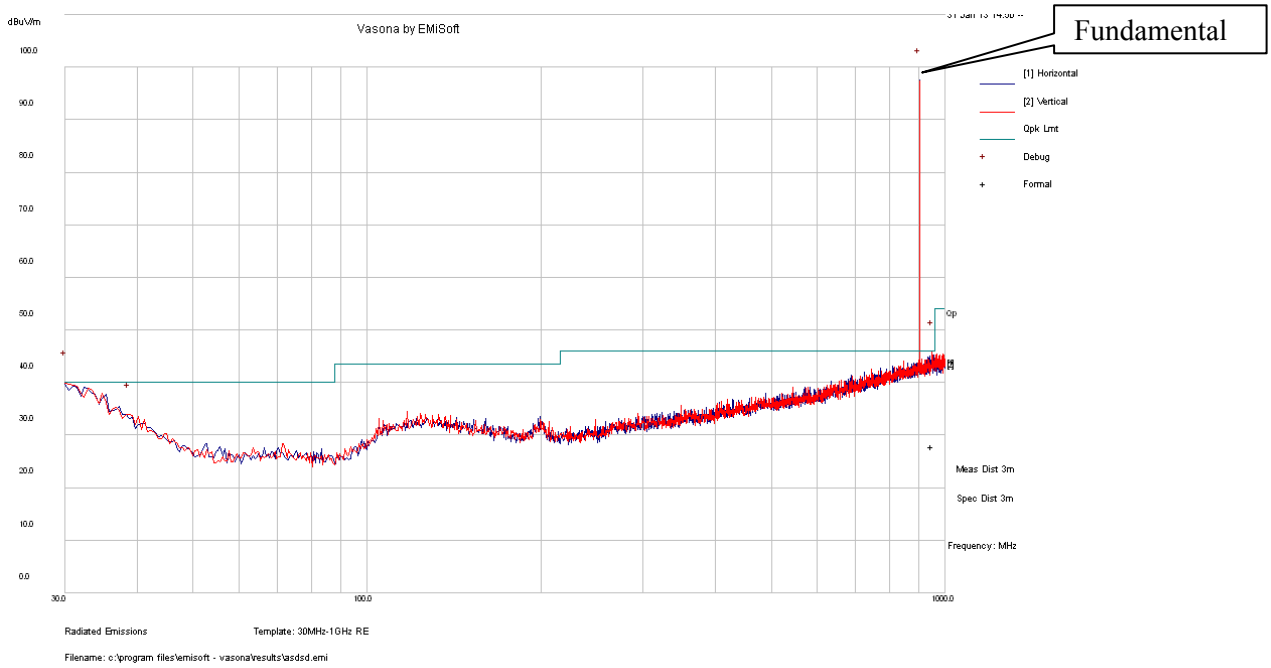
7.8 Radiated Emissions Test Data and Plots

Radiated Emission at 3 meters

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

Low Channel

30 MHz -1000 MHz



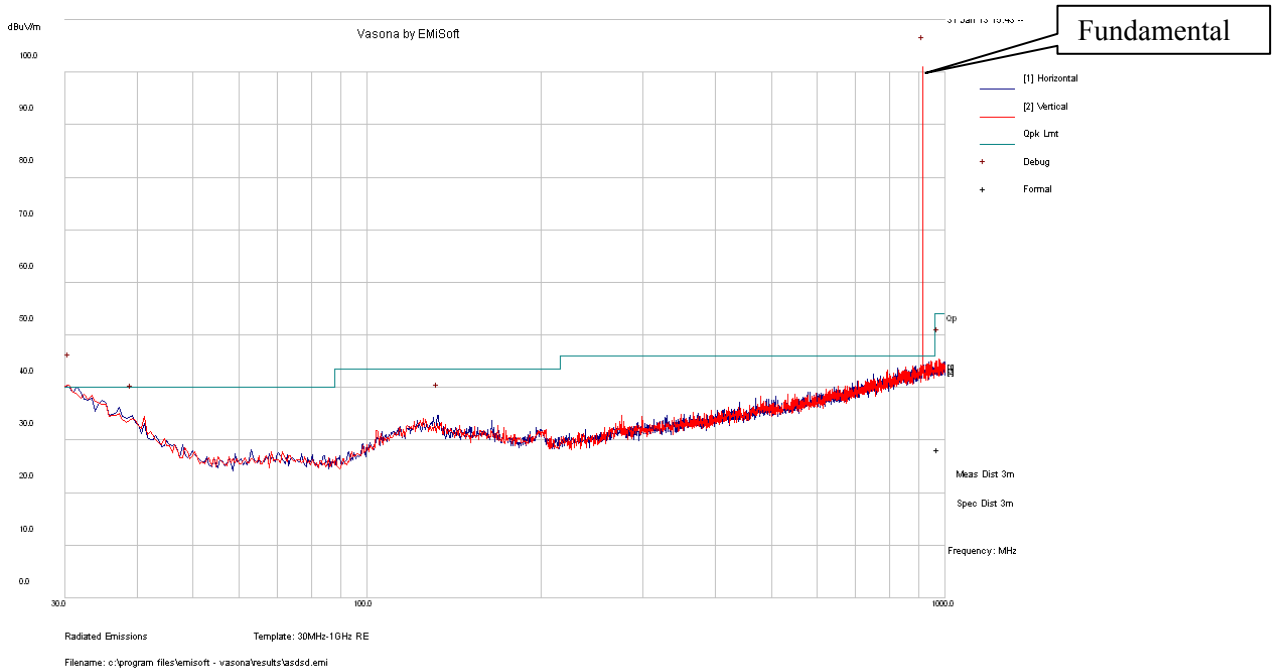
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
947.3705	28.8	260	V	101	46	-17.20

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel ,902.3 MHz, measured at 3 meters											
902.3	103.73	96	100	V	22.8	1.84	0	128.37	-	-	Fund/Peak
902.3	103.67	96	100	V	22.8	1.84	0	128.31	-	-	Fund/Ave
902.3	94.04	72	166	H	22.8	1.84	0	118.68	-	-	Fund/Peak
902.3	93.91	72	166	H	22.8	1.84	0	118.55	-	-	Fund/Ave
1804.6	52.15	320	102	V	27.2	3.31	27.67	54.99	108.37	-53.38	Harm/Peak
1804.6	49.71	250	100	H	27.2	3.31	27.67	52.55	98.68	-46.13	Harm/Peak
2706.9	32	0	100	V	27.21	3.99	27.85	35.35	74	-38.65	Harm/Peak
2706.9	20	0	100	V	27.21	3.99	27.85	23.35	54	-30.65	Harm/Ave
2706.9	32	0	100	H	27.21	3.99	27.85	35.35	74	-38.65	Harm/Peak
2706.9	20	0	100	H	27.21	3.99	27.85	23.35	54	-30.65	Harm/Ave
3609.2	36.25	40	119	V	31.54	4.78	27.96	44.61	74	-29.39	Harm/Peak
3609.2	25.81	40	119	V	31.54	4.78	27.96	34.17	54	-19.83	Harm/Ave
3609.2	32	0	100	H	31.54	4.78	27.96	40.36	74	-33.64	Harm/Peak
3609.2	20	0	100	H	31.54	4.78	27.96	28.36	54	-25.64	Harm/Ave
4511.5	37.91	37	125	V	32.47	5.49	27.88	47.99	74	-26.01	Harm/Peak
4511.5	32.44	37	125	V	32.47	5.49	27.88	42.52	54	-11.48	Harm/Ave
4511.5	37.16	178	100	H	32.47	5.49	27.88	47.24	74	-26.76	Harm/Peak
4511.5	31.01	178	100	H	32.47	5.49	27.88	41.09	54	-12.91	Harm/Ave

Middle Channel

30 MHz -1000 MHz



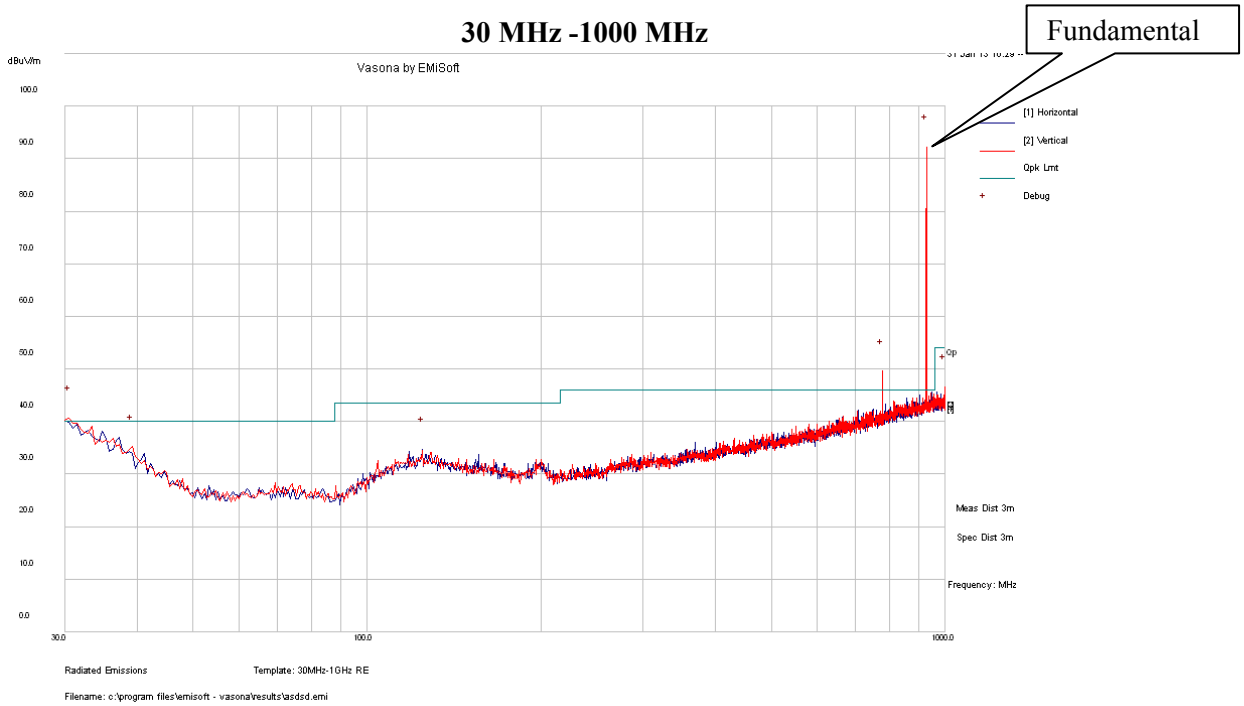
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
973.368	29.18	122	V	231	54	-24.82

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel ,914.6 MHz, measured at 3 meters											
914.6	103.34	90	100	V	22.9	1.85	0	128.09	-	-	Fund/Peak
914.6	103.29	90	100	V	22.9	1.85	0	128.04	-	-	Fund/Ave
914.6	90.46	273	117	H	22.9	1.85	0	115.21	-	-	Fund/Peak
914.6	90.41	273	117	H	22.9	1.85	0	115.16	-	-	Fund/Ave
1829.2	46.22	315	100	V	27.2	3.37	27.68	49.11	108.09	-58.98	Harm/Peak
1829.2	41.74	252	100	H	27.2	3.37	27.68	44.63	95.21	-50.58	Harm/Peak
2743.8	32	0	100	V	29.21	4.09	27.83	37.47	74	-36.53	Harm/Peak
2743.8	20	0	100	V	29.21	4.09	27.83	25.47	54	-28.53	Harm/Ave
2743.8	32	0	100	H	29.21	4.09	27.83	37.47	74	-36.53	Harm/Peak
2743.8	20	0	100	H	29.21	4.09	27.83	25.47	54	-28.53	Harm/Ave
3658.4	36.1	36	122	V	32.07	4.77	27.96	44.98	74	-29.02	Harm/Peak
3658.4	25.07	36	122	V	32.07	4.77	27.96	33.95	54	-20.05	Harm/Ave
3658.4	32	0	100	H	32.07	4.77	27.96	40.88	74	-33.12	Harm/Peak
3658.4	20	0	100	H	32.07	4.77	27.96	28.88	54	-25.12	Harm/Ave
4573	36.75	330	100	V	33.09	5.49	27.81	47.52	74	-26.48	Harm/Peak
4573	30.47	330	100	V	33.09	5.49	27.81	41.24	54	-12.76	Harm/Ave
4573	36.63	180	100	H	33.09	5.49	27.81	47.4	74	-26.6	Harm/Peak
4573	30.29	180	100	H	33.09	5.49	27.81	41.06	54	-12.94	Harm/Ave

High Channel

30 MHz -1000 MHz



Quasi-Peak Measurements:

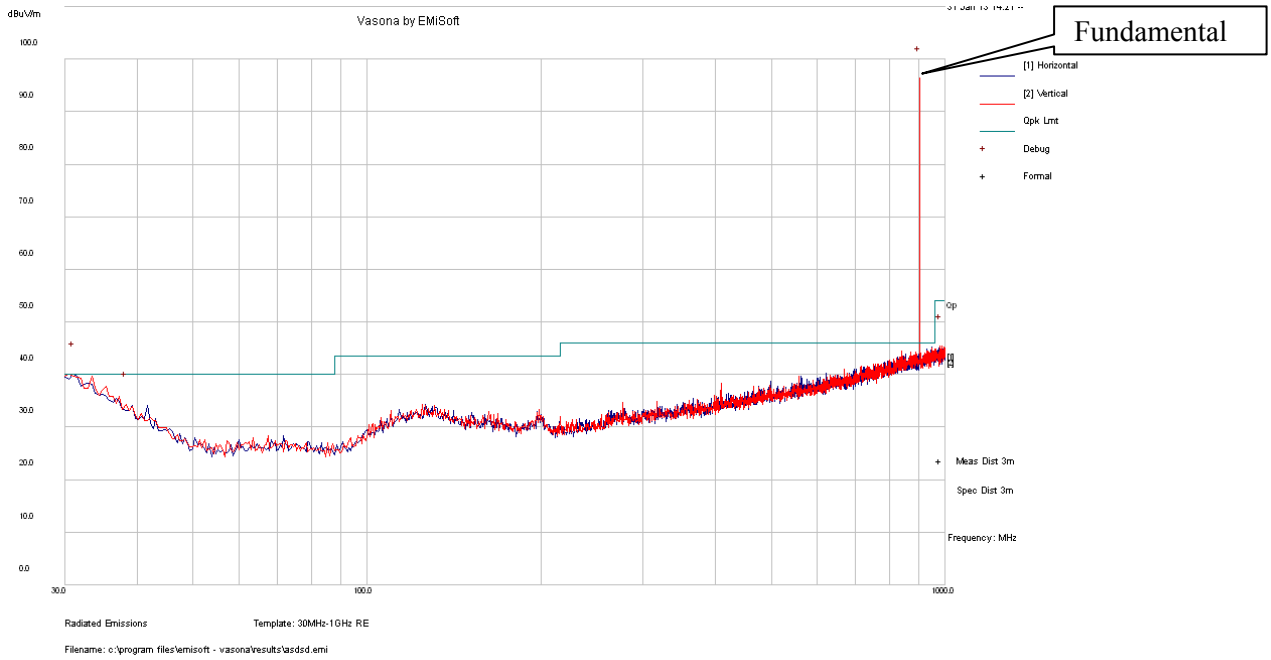
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
124.575	34.79	300	H	0	43.5	-8.71

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel ,926.9 MHz, measured at 3 meters											
926.9	103.39	169	100	V	23.1	1.85	0	128.34	-	-	Fund/Peak
926.9	103.22	169	100	V	23.1	1.85	0	128.17	-	-	Fund/Ave
926.9	90.2	304	100	H	23.1	1.85	0	115.15	-	-	Fund/Peak
926.9	90.15	304	100	H	23.1	1.85	0	115.1	-	-	Fund/Ave
1853.8	47.89	204	100	V	27.77	3.36	27.73	51.29	108.34	-57.05	Harm/Peak
1853.8	42.15	126	100	H	27.77	3.36	27.73	45.55	95.15	-49.6	Harm/Peak
2780.7	32	0	100	V	29.26	4.2	27.81	37.65	74	-36.35	Harm/Peak
2780.7	20	0	100	V	29.26	4.2	27.81	25.65	54	-28.35	Harm/Ave
2780.7	32	0	100	H	29.26	4.2	27.81	37.65	74	-36.35	Harm/Peak
2780.7	20	0	100	H	29.26	4.2	27.81	25.65	54	-28.35	Harm/Ave
3707.6	35.99	36	116	V	32.07	4.78	27.96	44.88	74	-29.12	Harm/Peak
3707.6	26.48	36	116	V	32.07	4.78	27.96	35.37	54	-18.63	Harm/Ave
3707.6	32	0	100	H	32.07	4.78	27.96	40.89	74	-33.11	Harm/Peak
3707.6	20	0	100	H	32.07	4.78	27.96	28.89	54	-25.11	Harm/Ave
4634.5	35.75	331	100	V	32.47	5.49	27.74	45.97	74	-28.03	Harm/Peak
4634.5	27.22	331	100	V	32.47	5.49	27.74	37.44	54	-16.56	Harm/Ave
4634.5	35.84	191	122	H	32.47	5.49	27.74	46.06	74	-27.94	Harm/Peak
4634.5	28.45	191	122	H	32.47	5.49	27.74	38.67	54	-15.33	Harm/Ave

900 MHz GFSK Modulation, 300 kbps data rate, 300 kHz (worst case between 300 and 400 kHz channel spacing) channel spacing

Low Channel

30 MHz -1000 MHz



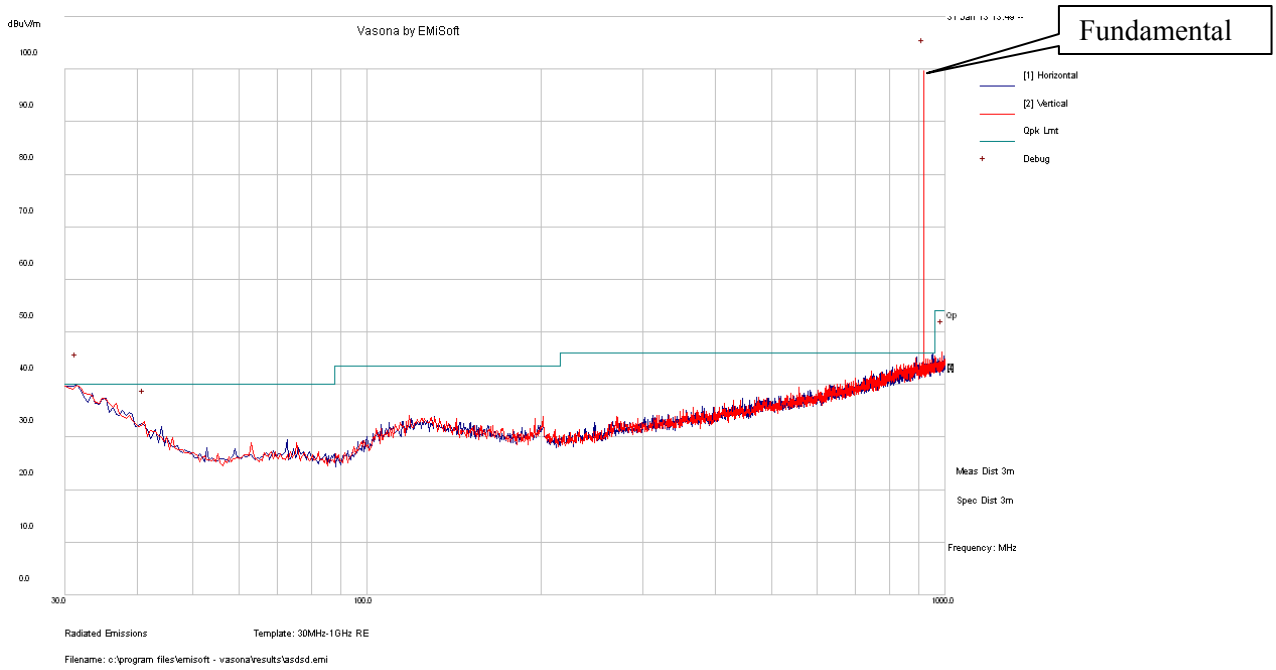
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
980.3515	24.6	287	V	153	54	-29.40

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel ,902.3 MHz, measured at 3 meters											
902.3	103.41	94	100	V	22.8	1.84	0	128.05	-	-	Fund/Peak
902.3	103.35	94	100	V	22.8	1.84	0	127.99	-	-	Fund/Ave
902.3	93.45	83	166	H	22.8	1.84	0	118.09	-	-	Fund/Peak
902.3	93.31	83	166	H	22.8	1.84	0	117.95	-	-	Fund/Ave
1804.6	52.37	311	100	V	27.2	3.31	27.67	55.21	108.05	-52.84	Harm/Peak
1804.6	49.88	45	100	H	27.2	3.31	27.67	52.72	98.09	-45.37	Harm/Peak
2706.9	32	0	100	V	27.21	3.99	27.85	35.35	74	-38.65	Harm/Peak
2706.9	20	0	100	V	27.21	3.99	27.85	23.35	54	-30.65	Harm/Ave
2706.9	32	0	100	H	27.21	3.99	27.85	35.35	74	-38.65	Harm/Peak
2706.9	20	0	100	H	27.21	3.99	27.85	23.35	54	-30.65	Harm/Ave
3609.2	36.11	33	115	V	31.54	4.78	27.96	44.47	74	-29.53	Harm/Peak
3609.2	25.79	33	115	V	31.54	4.78	27.96	34.15	54	-19.85	Harm/Ave
3609.2	32	0	100	H	31.54	4.78	27.96	40.36	74	-33.64	Harm/Peak
3609.2	20	0	100	H	31.54	4.78	27.96	28.36	54	-25.64	Harm/Ave
4511.5	38.48	40	118	V	32.47	5.49	27.88	48.56	74	-25.44	Harm/Peak
4511.5	33.31	40	118	V	32.47	5.49	27.88	43.39	54	-10.61	Harm/Ave
4511.5	36.23	170	100	H	32.47	5.49	27.88	46.31	74	-27.69	Harm/Peak
4511.5	29.76	170	100	H	32.47	5.49	27.88	39.84	54	-14.16	Harm/Ave

Middle Channel

30 MHz -1000 MHz



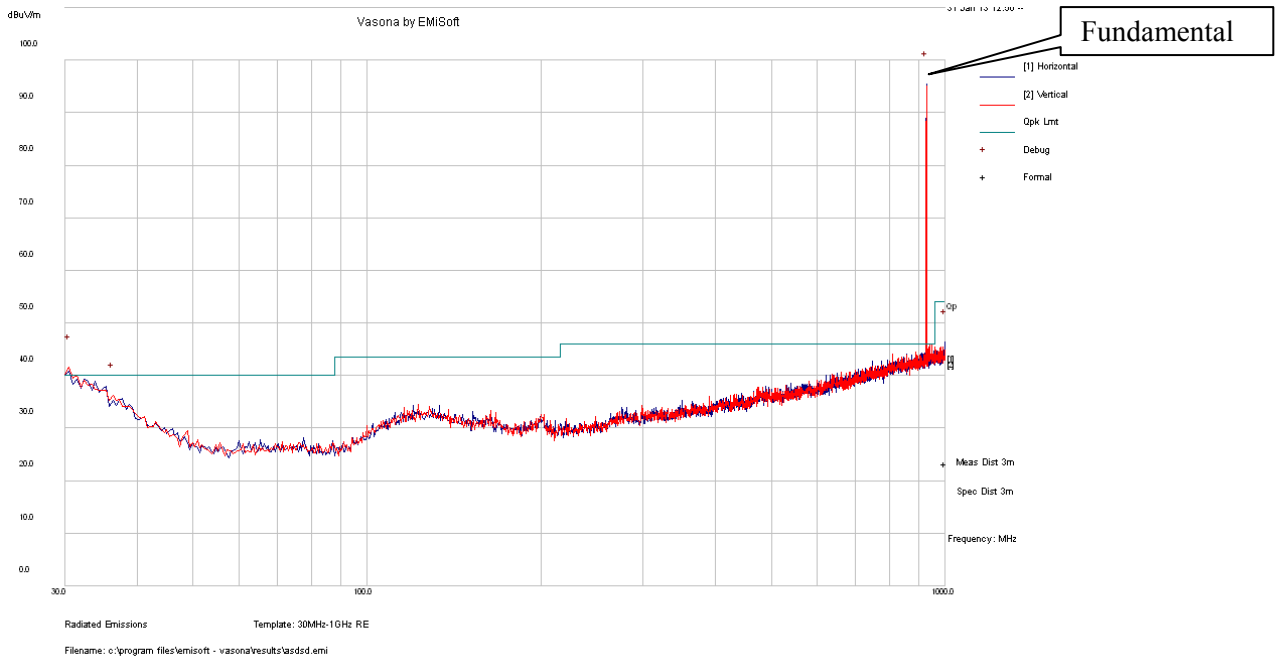
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
987.4315	25.61	253	V	130	54	-28.39

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel ,914.6 MHz, measured at 3 meters											
914.6	102.95	92	100	V	22.9	1.85	0	127.7	-	-	Fund/Peak
914.6	102.79	92	100	V	22.9	1.85	0	127.54	-	-	Fund/Ave
914.6	92.92	75	100	H	22.9	1.85	0	117.67	-	-	Fund/Peak
914.6	92.88	75	100	H	22.9	1.85	0	117.63	-	-	Fund/Ave
1829.2	47.09	61	100	V	27.2	3.37	27.68	49.98	107.7	-57.72	Harm/Peak
1829.2	41.28	174	100	H	27.2	3.37	27.68	44.17	97.67	-53.5	Harm/Peak
2743.8	32	0	100	V	29.21	4.09	27.83	37.47	74	-36.53	Harm/Peak
2743.8	20	0	100	V	29.21	4.09	27.83	25.47	54	-28.53	Harm/Ave
2743.8	32	0	100	H	29.21	4.09	27.83	37.47	74	-36.53	Harm/Peak
2743.8	20	0	100	H	29.21	4.09	27.83	25.47	54	-28.53	Harm/Ave
3658.4	36.63	47	100	V	32.07	4.77	27.96	45.51	74	-28.49	Harm/Peak
3658.4	24.72	47	100	V	32.07	4.77	27.96	33.6	54	-20.4	Harm/Ave
3658.4	32	0	100	H	32.07	4.77	27.96	40.88	74	-33.12	Harm/Peak
3658.4	20	0	100	H	32.07	4.77	27.96	28.88	54	-25.12	Harm/Ave
4573	36.11	4	144	V	33.09	5.49	27.81	46.88	74	-27.12	Harm/Peak
4573	29.1	4	144	V	33.09	5.49	27.81	39.87	54	-14.13	Harm/Ave
4573	35.31	311	100	H	33.09	5.49	27.81	46.08	74	-27.92	Harm/Peak
4573	28.19	311	100	H	33.09	5.49	27.81	38.96	54	-15.04	Harm/Ave

High Channel

30 MHz -1000 MHz



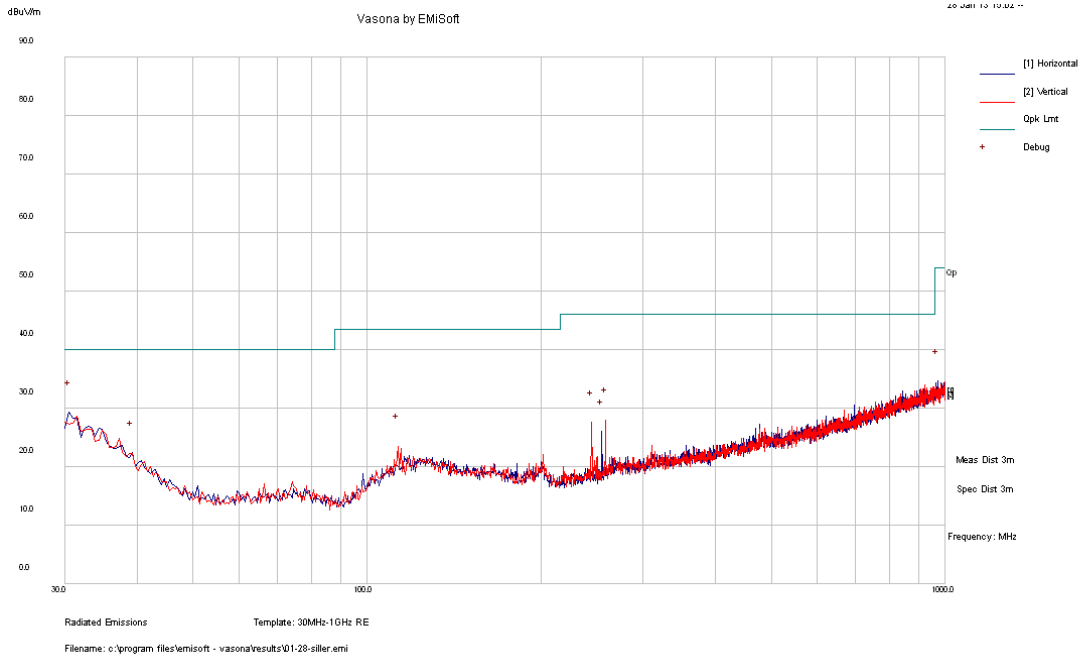
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
999.43	24.35	254	H	181	54	-29.65

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel ,926.9 MHz, measured at 3 meters											
926.9	103.47	167	100	V	23.1	1.85	0	128.42	-	-	Fund/Peak
926.9	103.35	167	100	V	23.1	1.85	0	128.3	-	-	Fund/Ave
926.9	90.21	19	100	H	23.1	1.85	0	115.16	-	-	Fund/Peak
926.9	90.05	19	100	H	23.1	1.85	0	115	-	-	Fund/Ave
1853.8	47.02	57	108	V	27.77	3.36	27.73	50.42	108.42	-58	Harm/Peak
1853.8	42.18	78	100	H	27.77	3.36	27.73	45.58	95.16	-49.58	Harm/Peak
2780.7	32	0	100	V	29.26	4.2	27.81	37.65	74	-36.35	Harm/Peak
2780.7	20	0	100	V	29.26	4.2	27.81	25.65	54	-28.35	Harm/Ave
2780.7	32	0	100	H	29.26	4.2	27.81	37.65	74	-36.35	Harm/Peak
2780.7	20	0	100	H	29.26	4.2	27.81	25.65	54	-28.35	Harm/Ave
3707.6	35.29	36	119	V	32.07	4.78	27.96	44.18	74	-29.82	Harm/Peak
3707.6	25.39	36	119	V	32.07	4.78	27.96	34.28	54	-19.72	Harm/Ave
3707.6	32	0	100	H	32.07	4.78	27.96	40.89	74	-33.11	Harm/Peak
3707.6	20	0	100	H	32.07	4.78	27.96	28.89	54	-25.11	Harm/Ave
4634.5	35.57	30	100	V	32.47	5.49	27.74	45.79	74	-28.21	Harm/Peak
4634.5	27.31	30	100	V	32.47	5.49	27.74	37.53	54	-16.47	Harm/Ave
4634.5	35.71	191	107	H	32.47	5.49	27.74	45.93	74	-28.07	Harm/Peak
4634.5	27.98	191	107	H	32.47	5.49	27.74	38.2	54	-15.8	Harm/Ave

2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

30 MHz -1000 MHz



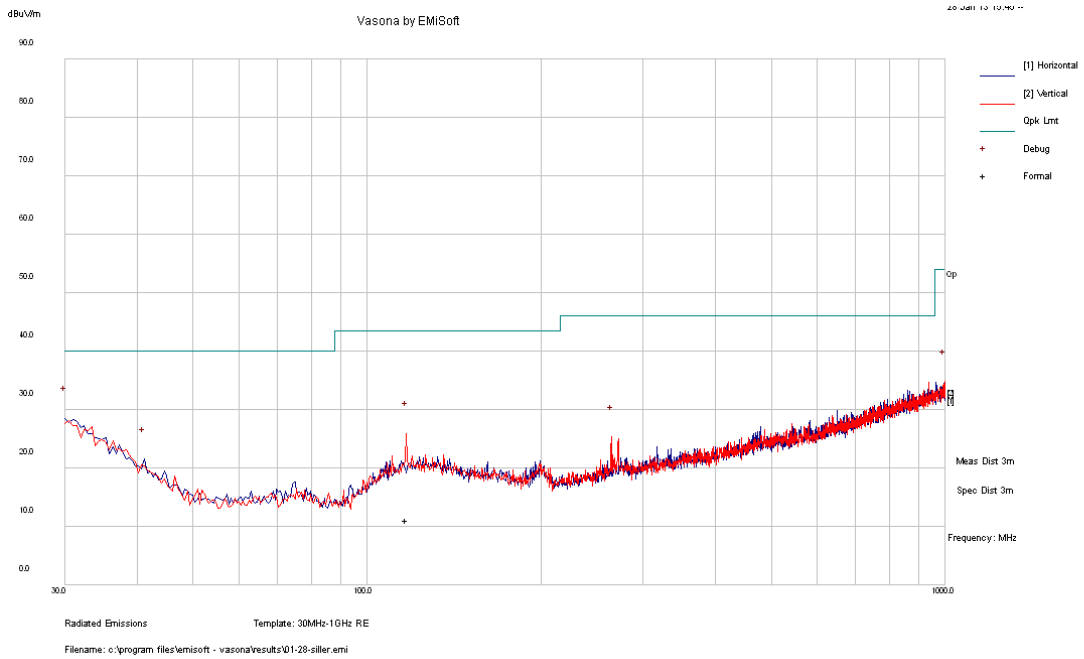
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
253.8315	18.12	187	V	262	46	-27.88

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel ,2400.8 MHz, measured at 3 meters											
2400.8	85.46	243	100	V	28.84	3.12	0	117.42	-	-	Fund/Peak
2400.8	85.34	243	100	V	28.84	3.12	0	117.3	-	-	Fund/Ave
2400.8	75.02	244	165	H	28.84	3.12	0	106.98	-	-	Fund/Peak
2400.8	74.87	244	165	H	28.84	3.12	0	106.83	-	-	Fund/Ave
4801.6	30	0	100	V	33.1	4.56	27.78	39.88	74	-34.12	Harm/Peak
4801.6	17	0	100	V	33.1	4.56	27.78	26.88	54	-27.12	Harm/Ave
4801.6	30	0	100	H	33.1	4.56	27.78	39.88	74	-34.12	Harm/Peak
4801.6	17	0	100	H	33.1	4.56	27.78	26.88	54	-27.12	Harm/Ave
7202.4	39.07	42	144	V	35.89	5.49	27.59	52.86	97.42	-44.56	Harm/Peak
7202.4	38.28	321	116	H	35.89	5.49	27.59	52.07	86.98	-34.91	Harm/Peak
9603.2	39.44	23	100	V	37.95	6.54	27.05	56.88	97.42	-40.54	Harm/Peak
9603.2	34.04	320	100	H	37.95	6.54	27.05	51.48	86.98	-35.5	Harm/Peak
12004	30	0	100	V	39.29	7.78	27.02	50.05	74	-23.95	Harm/Peak
12004	17	0	100	V	39.29	7.78	27.02	37.05	54	-16.95	Harm/Ave
12004	30	0	100	H	39.29	7.78	27.02	50.05	74	-23.95	Harm/Peak
12004	17	0	100	H	39.29	7.78	27.02	37.05	54	-16.95	Harm/Ave
2390	32.1	133	100	V	28.84	3.12	0	64.06	74	-9.94	Spur/Peak
2390	19.04	133	100	V	28.84	3.12	0	51	54	-3	Spur /Ave
2390	23	0	100	H	28.84	3.12	0	54.96	74	-19.04	Spur /Peak
2390	12	0	100	H	28.84	3.12	0	43.96	54	-10.04	Spur /Ave

Middle Channel

30 MHz -1000 MHz



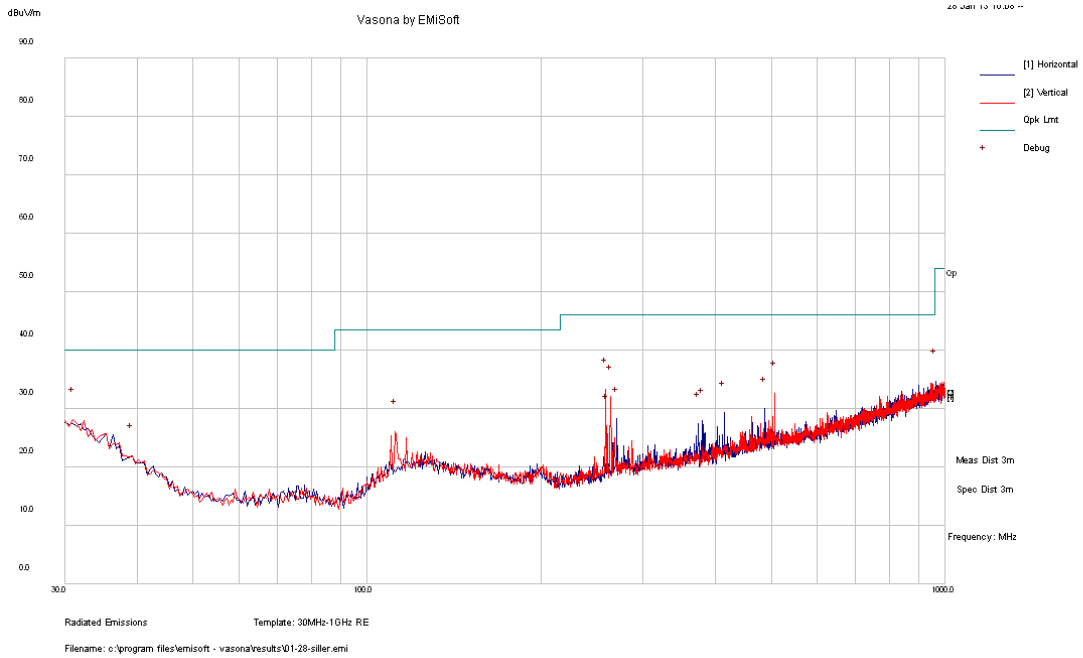
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
116.9978	11.16	254	V	254	43.5	-32.34

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel ,2440 MHz, measured at 3 meters											
2440	76.3	247	127	H	28.84	3.25	0	108.39	-	-	Fund/Peak
2440	85.9	236	100	V	28.84	3.25	0	117.99	-	-	Fund/Ave
2440	85.7	236	100	V	28.84	3.25	0	117.79	-	-	Fund/Peak
2440	77.41	245	162	H	28.84	3.25	0	109.5	-	-	Fund/Ave
4880	30	0	100	V	33.27	4.54	27.67	40.14	74	-33.86	Harm/Peak
4880	17	0	100	V	33.27	4.54	27.67	27.14	54	-26.86	Harm/Ave
4880	30	0	100	H	33.27	4.54	27.67	40.14	74	-33.86	Harm/Peak
4880	17	0	100	H	33.27	4.54	27.67	27.14	54	-26.86	Harm/Ave
7320	40.25	30	132	V	36.37	5.57	27.51	54.68	74	-19.32	Harm/Peak
7320	35.87	30	132	V	36.37	5.57	27.51	50.3	54	-3.7	Harm/Ave
7320	37.39	197	100	H	36.37	5.57	27.51	51.82	74	-22.18	Harm/Peak
7320	30.57	197	100	H	36.37	5.57	27.51	45	54	-9	Harm/Ave
9760	38.46	252	100	V	38.25	6.58	26.98	56.31	97.99	-41.68	Harm/Peak
9760	35.66	339	100	H	38.25	6.58	26.98	53.51	89.5	-35.99	Harm/Peak
12200	34.1	109	109	V	38.98	7.89	26.99	53.98	74	-20.02	Harm/Peak
12200	24.1	109	109	V	38.98	7.89	26.99	43.98	54	-10.02	Harm/Ave
12200	34.61	18	100	H	38.98	7.89	26.99	54.49	74	-19.51	Harm/Peak
12200	24.13	18	100	H	38.98	7.89	26.99	44.01	54	-9.99	Harm/Ave

High Channel

30 MHz -1000 MHz



Quasi-Peak Measurements:

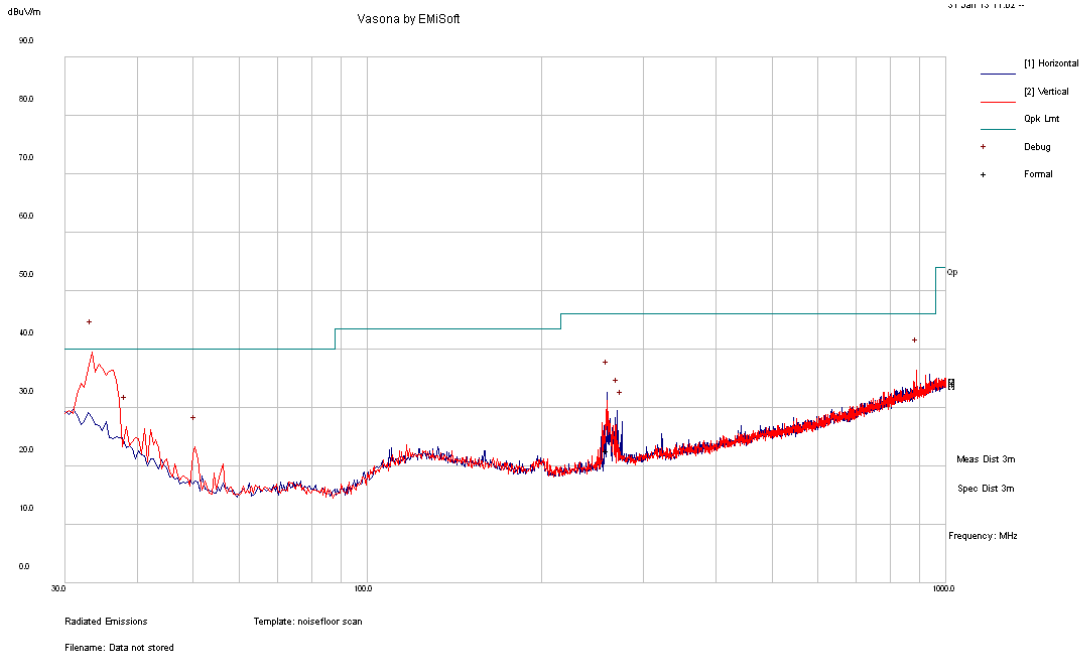
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
258.5173	25.06	109	V	62	46	-20.94

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel ,2472.8 MHz, measured at 3 meters											
2472.8	85.59	95	100	V	29.07	3.25	0	117.91	-	-	Fund/Peak
2472.8	85.34	95	100	V	29.07	3.25	0	117.66	-	-	Fund/Ave
2472.8	79.27	249	162	H	29.07	3.25	0	111.59	-	-	Fund/Peak
2472.8	79.09	249	162	H	29.07	3.25	0	111.41	-	-	Fund/Ave
4945.6	30	0	100	V	33.51	4.52	27.7	40.33	74	-33.67	Harm/Peak
4945.6	17	0	100	V	33.51	4.52	27.7	27.33	54	-26.67	Harm/Ave
4945.6	30	0	100	H	33.51	4.52	27.7	40.33	74	-33.67	Harm/Peak
4945.6	17	0	100	H	33.51	4.52	27.7	27.33	54	-26.67	Harm/Ave
7418.4	41.56	26	114	V	36.57	5.66	27.53	56.26	74	-17.74	Harm/Peak
7418.4	37.56	26	114	V	36.57	5.66	27.53	52.26	54	-1.74	Harm/Ave
7418.4	39.51	352	119	H	36.57	5.66	27.53	54.21	74	-19.79	Harm/Peak
7418.4	34.55	352	119	H	36.57	5.66	27.53	49.25	54	-4.75	Harm/Ave
9891.2	34.5	337	100	V	38.46	6.67	27.01	52.62	97.91	-45.29	Harm/Peak
9891.2	31.22	202	100	H	38.46	6.67	27.01	49.34	91.59	-42.25	Harm/Peak
12364	34.25	37	100	V	38.79	7.97	26.92	54.09	74	-19.91	Harm/Peak
12364	24.04	37	100	V	38.79	7.97	26.92	43.88	54	-10.12	Harm/Ave
12364	35	9	100	H	38.79	7.97	26.92	54.84	74	-19.16	Harm/Peak
12364	25.68	9	100	H	38.79	7.97	26.92	45.52	54	-8.48	Harm/Ave
2483.5	32.99	157	100	V	29.07	3.25	0	65.31	74	-8.69	Spur/Peak
2483.5	18.77	157	100	V	29.07	3.25	0	51.09	54	-2.91	Spur /Ave
2483.5	23	0	100	H	29.07	3.25	0	55.32	74	-18.68	Spur /Peak
2483.5	12	0	100	H	29.07	3.25	0	44.32	54	-9.68	Spur /Ave

2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

Low Channel

30 MHz -1000 MHz



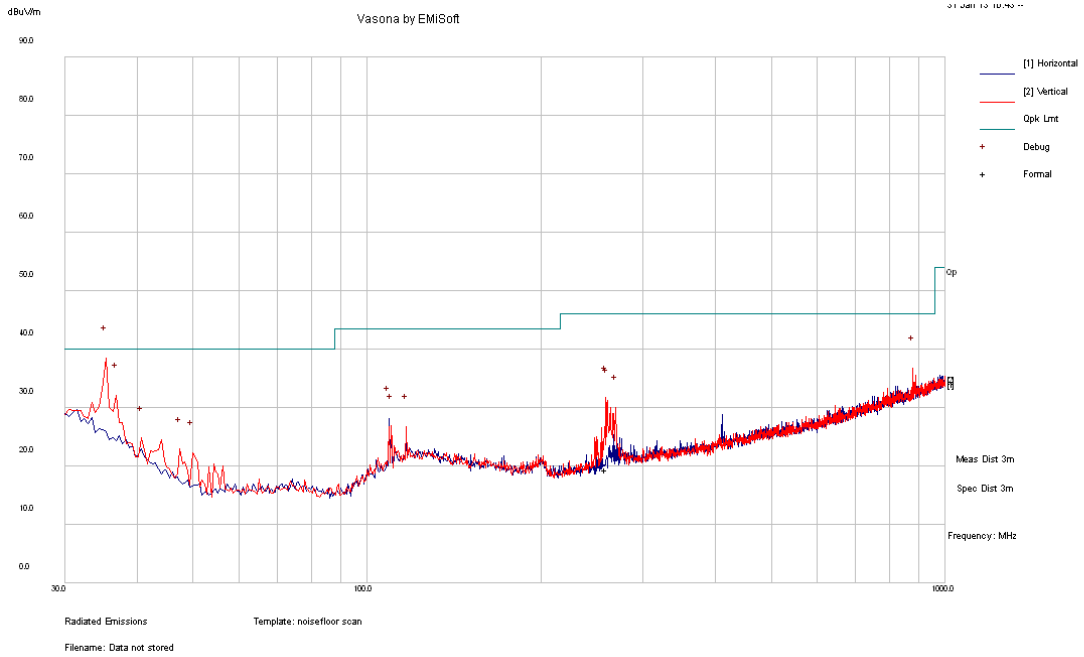
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
260.0088	22.73	166	H	153	46	-23.27

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel ,2400.8 MHz, measured at 3 meters											
2400.8	85.4	242	100	V	28.84	3.12	0	117.36	-	-	Fund/Peak
2400.8	85.27	242	100	V	28.84	3.12	0	117.23	-	-	Fund/Ave
2400.8	73.04	242	100	H	28.84	3.12	0	105	-	-	Fund/Peak
2400.8	72.91	242	100	H	28.84	3.12	0	104.87	-	-	Fund/Ave
4801.6	30	0	100	V	33.1	4.56	27.78	39.88	74	-34.12	Harm/Peak
4801.6	17	0	100	V	33.1	4.56	27.78	26.88	54	-27.12	Harm/Ave
4801.6	30	0	100	H	33.1	4.56	27.78	39.88	74	-34.12	Harm/Peak
4801.6	17	0	100	H	33.1	4.56	27.78	26.88	54	-27.12	Harm/Ave
7202.4	39.11	51	137	V	35.89	5.49	27.59	52.9	97.36	-44.46	Harm/Peak
7202.4	38.29	144	129	H	35.89	5.49	27.59	52.08	85	-32.92	Harm/Peak
9603.2	38.32	27	100	V	37.95	6.54	27.05	55.76	97.36	-41.6	Harm/Peak
9603.2	36.75	55	100	H	37.95	6.54	27.05	54.19	85	-30.81	Harm/Peak
12004	30	0	100	V	39.29	7.78	27.02	50.05	74	-23.95	Harm/Peak
12004	17	0	100	V	39.29	7.78	27.02	37.05	54	-16.95	Harm/Ave
12004	30	0	100	H	39.29	7.78	27.02	50.05	74	-23.95	Harm/Peak
12004	17	0	100	H	39.29	7.78	27.02	37.05	54	-16.95	Harm/Ave
2390	31.6	73	100	V	28.84	3.12	0	63.56	74	-10.44	Spur/Peak
2390	17.41	73	100	V	28.84	3.12	0	49.37	54	-4.63	Spur /Ave
2390	23	0	100	H	28.84	3.12	0	54.96	74	-19.04	Spur /Peak
2390	12	0	100	H	28.84	3.12	0	43.96	54	-10.04	Spur /Ave

Middle Channel

30 MHz -1000 MHz



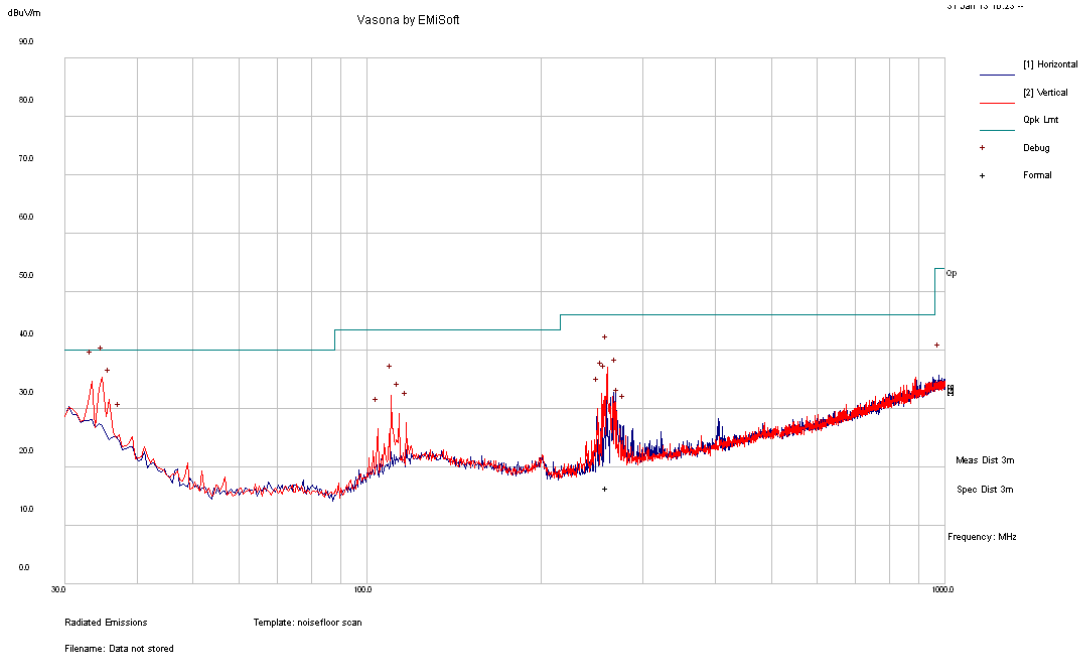
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
258.514	19.44	103	V	202	46	-25.56

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel ,2440 MHz, measured at 3 meters											
2440	85.86	236	100	V	28.84	3.25	0	117.95	-	-	Fund/Peak
2440	85.82	236	100	V	28.84	3.25	0	117.91	-	-	Fund/Ave
2440	76.44	247	127	H	28.84	3.25	0	108.53	-	-	Fund/Peak
2440	76.3	247	127	H	28.84	3.25	0	108.39	-	-	Fund/Ave
4880	30	0	100	V	33.27	4.54	27.67	40.14	74	-33.86	Harm/Peak
4880	17	0	100	V	33.27	4.54	27.67	27.14	54	-26.86	Harm/Ave
4880	30	0	100	H	33.27	4.54	27.67	40.14	74	-33.86	Harm/Peak
4880	17	0	100	H	33.27	4.54	27.67	27.14	54	-26.86	Harm/Ave
7320	41.5	27	124	V	36.37	5.57	27.51	55.93	74	-18.07	Harm/Peak
7320	38.19	27	124	V	36.37	5.57	27.51	52.62	54	-1.38	Harm/Ave
7320	37.86	224	110	H	36.37	5.57	27.51	52.29	74	-21.71	Harm/Peak
7320	32.02	224	110	H	36.37	5.57	27.51	46.45	54	-7.55	Harm/Ave
9760	34.6	41	100	V	38.25	6.58	26.98	52.45	97.95	-45.5	Harm/Peak
9760	31.17	12	100	H	38.25	6.58	26.98	49.02	88.53	-39.51	Harm/Peak
12200	33.5	25	110	V	38.98	7.89	26.99	53.38	74	-20.62	Harm/Peak
12200	23.16	25	110	V	38.98	7.89	26.99	43.04	54	-10.96	Harm/Ave
12200	33.94	22	113	H	38.98	7.89	26.99	53.82	74	-20.18	Harm/Peak
12200	24.99	22	113	H	38.98	7.89	26.99	44.87	54	-9.13	Harm/Ave

High Channel

30 MHz -1000 MHz



Quasi-Peak Measurements:

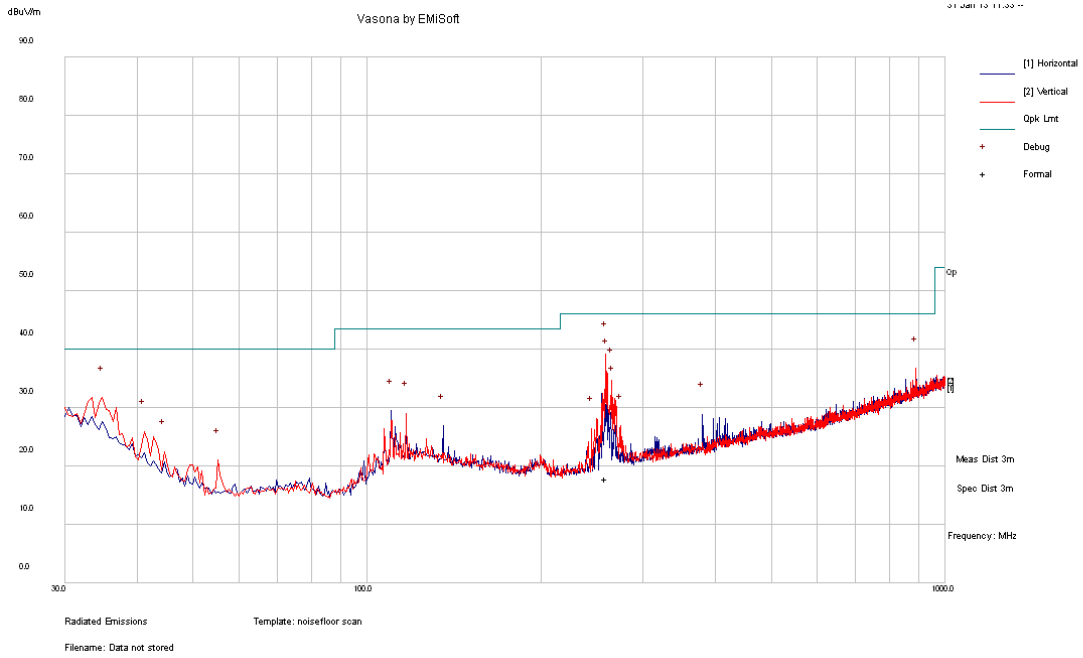
Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
260.23	16.44	247	V	252	46	-29.56

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel ,2472.8 MHz, measured at 3 meters											
2472.8	85.65	95	100	V	29.07	3.25	0	117.97	-	-	Fund/Peak
2472.8	85.55	95	100	V	29.07	3.25	0	117.87	-	-	Fund/Ave
2472.8	79.29	251	162	H	29.07	3.25	0	111.61	-	-	Fund/Peak
2472.8	79.06	251	162	H	29.07	3.25	0	111.38	-	-	Fund/Ave
4945.6	30	0	100	V	33.51	4.52	27.7	40.33	74	-33.67	Harm/Peak
4945.6	17	0	100	V	33.51	4.52	27.7	27.33	54	-26.67	Harm/Ave
4945.6	30	0	100	H	33.51	4.52	27.7	40.33	74	-33.67	Harm/Peak
4945.6	17	0	100	H	33.51	4.52	27.7	27.33	54	-26.67	Harm/Ave
7418.4	40.47	352	103	V	36.57	5.66	27.53	55.17	74	-18.83	Harm/Peak
7418.4	36.65	352	103	V	36.57	5.66	27.53	51.35	54	-2.65	Harm/Ave
7418.4	37.91	173	103	H	36.57	5.66	27.53	52.61	74	-21.39	Harm/Peak
7418.4	31.38	173	103	H	36.57	5.66	27.53	46.08	54	-7.92	Harm/Ave
9891.2	35.09	334	100	V	38.46	6.67	27.01	53.21	97.97	-44.76	Harm/Peak
9891.2	31.29	188	100	H	38.46	6.67	27.01	49.41	91.61	-42.2	Harm/Peak
12364	34.21	33	100	V	38.79	7.97	26.92	54.05	74	-19.95	Harm/Peak
12364	25.43	33	100	V	38.79	7.97	26.92	45.27	54	-8.73	Harm/Ave
12364	34.9	9	100	H	38.79	7.97	26.92	54.74	74	-19.26	Harm/Peak
12364	27.31	9	100	H	38.79	7.97	26.92	47.15	54	-6.85	Harm/Ave
2483.5	32.49	143	100	V	29.07	3.25	0	64.81	74	-9.19	Spur/Peak
2483.5	18.9	143	100	V	29.07	3.25	0	51.22	54	-2.78	Spur /Ave
2483.5	23	0	100	H	29.07	3.25	0	55.32	74	-18.68	Spur /Peak
2483.5	12	0	100	H	29.07	3.25	0	44.32	54	-9.68	Spur /Ave

2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

Low Channel

30 MHz -1000 MHz



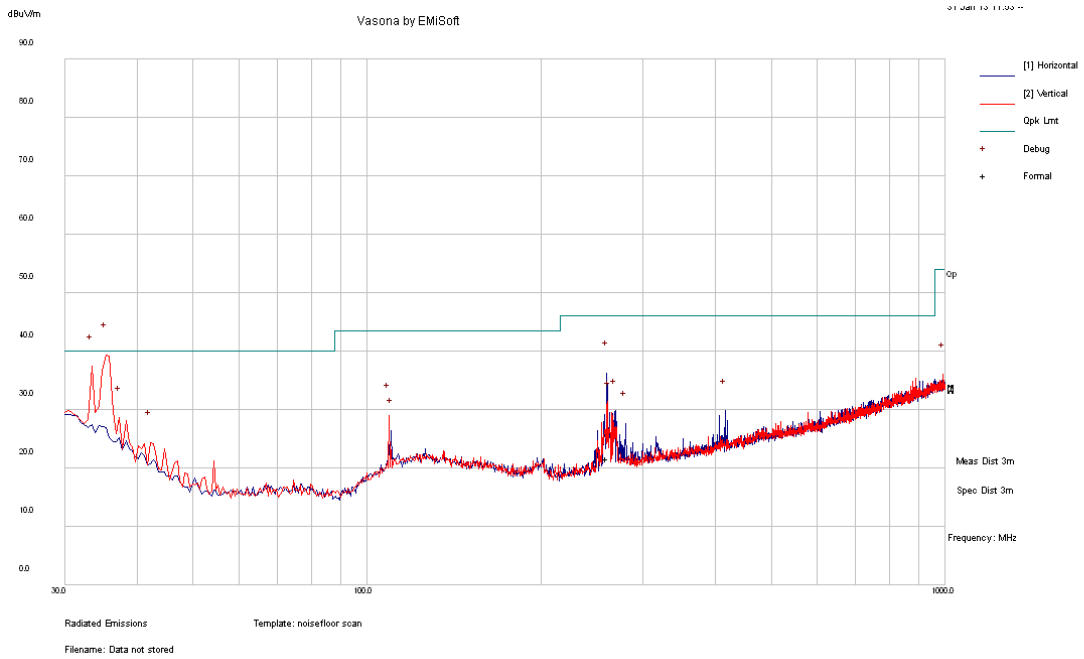
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
258.535	17.92	238	V	351	46	-28.08

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel ,2405 MHz, measured at 3 meters											
2405	86.62	135	100	V	28.84	3.12	0	118.58	-	-	Fund/Peak
2405	84.53	135	100	V	28.84	3.12	0	116.49	-	-	Fund/Ave
2405	73.62	146	100	H	28.84	3.12	0	105.58	-	-	Fund/Peak
2405	71.56	146	100	H	28.84	3.12	0	103.52	-	-	Fund/Ave
4810	32	0	100	V	33.1	4.56	27.78	41.88	74	-32.12	Harm/Peak
4810	20	0	100	V	33.1	4.56	27.78	29.88	54	-24.12	Harm/Ave
4810	32	0	100	H	33.1	4.56	27.78	41.88	74	-32.12	Harm/Peak
4810	20	0	100	H	33.1	4.56	27.78	29.88	54	-24.12	Harm/Ave
7215	38.06	44	100	V	35.89	5.49	27.59	51.85	98.58	-46.73	Harm/Peak
7215	36.97	241	100	H	35.89	5.49	27.59	50.76	85.58	-34.82	Harm/Peak
9620	35.49	0	110	V	37.95	6.54	27.02	52.96	98.58	-45.62	Harm/Peak
9620	34.11	252	100	H	37.95	6.54	27.02	51.58	85.58	-34	Harm/Peak
12025	32	0	100	V	39.29	7.78	26.99	52.08	74	-21.92	Harm/Peak
12025	20	0	100	V	39.29	7.78	26.99	40.08	54	-13.92	Harm/Ave
12025	34.88	0	100	H	39.29	7.78	26.99	54.96	74	-19.04	Harm/Peak
12025	22.09	0	100	H	39.29	7.78	26.99	42.17	54	-11.83	Harm/Ave
2390	34.47	78	100	V	28.84	3.12	0	66.43	74	-7.57	Spur/Peak
2390	20.87	78	100	V	28.84	3.12	0	52.83	54	-1.17	Spur /Ave
2390	23	0	100	H	28.84	3.12	0	54.96	74	-19.04	Spur /Peak
2390	12	0	100	H	28.84	3.12	0	43.96	54	-10.04	Spur /Ave

Middle Channel

30 MHz -1000 MHz



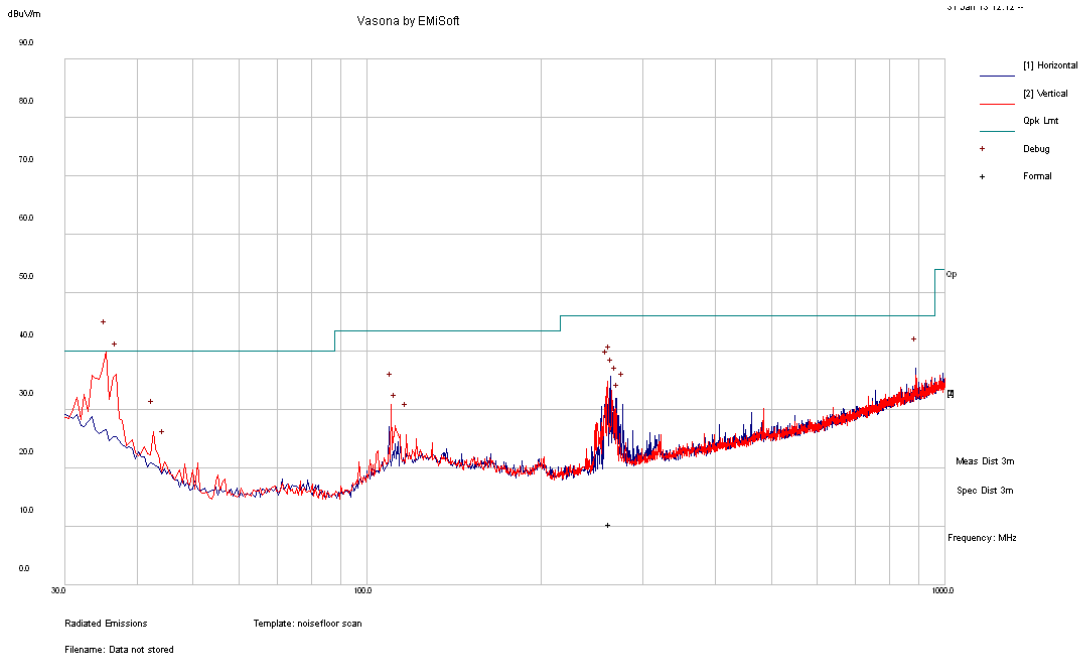
Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
259.9913	21.58	132	H	336	46	-24.42

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Middle Channel ,2440 MHz, measured at 3 meters											
2440	86.24	96	100	V	28.84	3.25	0	118.33	-	-	Fund/Peak
2440	84.22	96	100	V	28.84	3.25	0	116.31	-	-	Fund/Ave
2440	74.37	122	100	H	28.84	3.25	0	106.46	-	-	Fund/Peak
2440	72.33	122	100	H	28.84	3.25	0	104.42	-	-	Fund/Ave
4880	32	0	100	V	33.27	4.54	27.67	42.14	74	-31.86	Harm/Peak
4880	20	0	100	V	33.27	4.54	27.67	30.14	54	-23.86	Harm/Ave
4880	32	0	100	H	33.27	4.54	27.67	42.14	74	-31.86	Harm/Peak
4880	20	0	100	H	33.27	4.54	27.67	30.14	54	-23.86	Harm/Ave
7320	39.37	312	145	V	36.37	5.57	27.51	53.8	74	-20.2	Harm/Peak
7320	28.61	312	145	V	36.37	5.57	27.51	43.04	54	-10.96	Harm/Ave
7320	37.53	7	125	H	36.37	5.57	27.51	51.96	74	-22.04	Harm/Peak
7320	26.29	7	125	H	36.37	5.57	27.51	40.72	54	-13.28	Harm/Ave
9760	35.04	340	100	V	38.25	6.62	26.98	52.93	98.33	-45.4	Harm/Peak
9760	33.84	166	100	H	38.25	6.62	26.98	51.73	86.46	-34.73	Harm/Peak
12200	32	0	100	V	38.98	7.89	26.99	51.88	74	-22.12	Harm/Peak
12200	20	0	100	V	38.98	7.89	26.99	39.88	54	-14.12	Harm/Ave
12200	34.97	10	100	H	38.98	7.89	26.99	54.85	74	-19.15	Harm/Peak
12200	23.01	10	100	H	38.98	7.89	26.99	42.89	54	-11.11	Harm/Ave

High Channel

30 MHz -1000 MHz



Quasi-Peak Measurements:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Test Antenna		Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
		Height (cm)	Polarity (H/V)			
263.4743	10.49	243	H	37	46	-35.51

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
High Channel ,2480 MHz, measured at 3 meters											
2480	86.14	144	100	V	29.07	3.25	0	118.46	-	-	Fund/Peak
2480	83.79	144	100	V	29.07	3.25	0	116.11	-	-	Fund/Ave
2480	76.05	121	100	H	29.07	3.25	0	108.37	-	-	Fund/Peak
2480	73.92	121	100	H	29.07	3.25	0	106.24	-	-	Fund/Ave
4960	32	0	100	V	33.51	4.52	27.7	42.33	74	-31.67	Harm/Peak
4960	20	0	100	V	33.51	4.52	27.7	30.33	54	-23.67	Harm/Ave
4960	32	0	100	H	33.51	4.52	27.7	42.33	74	-31.67	Harm/Peak
4960	20	0	100	H	33.51	4.52	27.7	30.33	54	-23.67	Harm/Ave
7440	40.2	23	118	V	36.57	5.66	27.53	54.9	74	-19.1	Harm/Peak
7440	29.06	23	118	V	36.57	5.66	27.53	43.76	54	-10.24	Harm/Ave
7440	36.64	238	100	H	36.57	5.66	27.53	51.34	74	-22.66	Harm/Peak
7440	25.14	238	100	H	36.57	5.66	27.53	39.84	54	-14.16	Harm/Ave
9920	35.35	0	100	V	38.46	6.67	27.01	53.47	98.46	-44.99	Harm/Peak
9920	32.9	155	100	H	38.46	6.67	27.01	51.02	88.37	-37.35	Harm/Peak
12400	32	0	100	V	38.79	7.97	26.92	51.84	74	-22.16	Harm/Peak
12400	20	0	100	V	38.79	7.97	26.92	39.84	54	-14.16	Harm/Ave
12400	35.69	7	100	H	38.79	7.97	26.92	55.53	74	-18.47	Harm/Peak
12400	22.78	7	100	H	38.79	7.97	26.92	42.62	54	-11.38	Harm/Ave
2483.5	32.07	145	100	V	29.07	3.25	0	64.39	74	-9.61	Spur/Peak
2483.5	20.69	145	100	V	29.07	3.25	0	53.01	54	-0.99	Spur /Ave
2483.5	23	0	100	H	29.07	3.25	0	55.32	74	-18.68	Spur /Peak
2483.5	12	0	100	H	29.07	3.25	0	44.32	54	-9.68	Spur /Ave

8 FCC§15.247(a) (2) & §15.247(a) (1) – 6 dB, 20 dB & 99% Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a) (2), systems using digital modulation techniques may operate in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

According to FCC §15.247(a) (1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 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.

8.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB (20 dB) from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

8.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Wei Sun from 2013-02-26 at RF site.

8.5 Test Results

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (kHz)	Limit (kHz)
Low	902.3	208.364	230.9008	<500
Middle	914.6	208.004	204.1616	<500
High	926.9	208.250	205.1775	<500

900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing

Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (kHz)	Limit (kHz)
Low	902.4	322.547	315.7653	<500
Middle	914.4	322.936	316.2404	<500
High	926.8	323.504	317.1617	<500

2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (kHz)
Low	2400.8	519.712	514.0845
Middle	2440	519.654	514.1850
High	2472.8	520.330	514.5119

2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

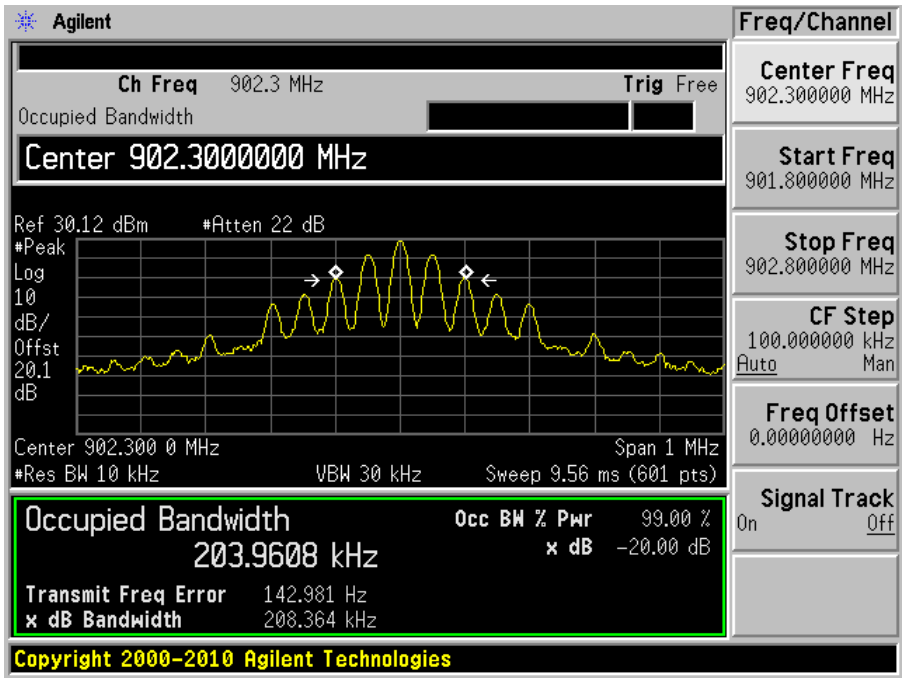
Channel	Frequency (MHz)	20 dB Emission Bandwidth (kHz)	99% Emission Bandwidth (kHz)
Low	2400.8	265.794	260.9159
Middle	2440	265.849	261.0344
High	2472.8	266.029	261.0889

2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

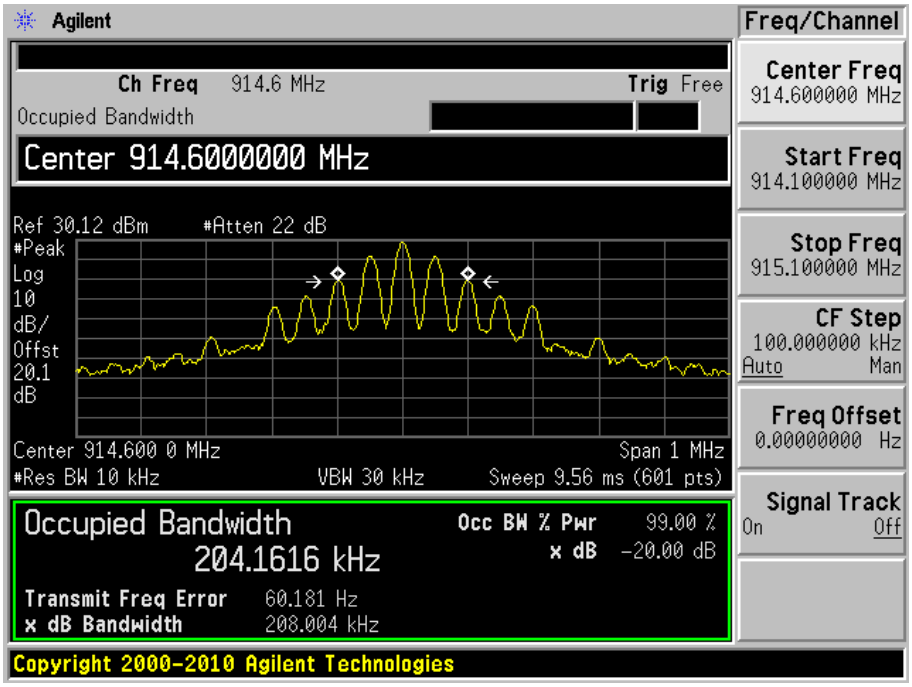
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Emission Bandwidth (MHz)	Limit (MHz)	Results
Low	2405	1.463	2.2681	> 0.5	Compliant
Middle	2440	1.468	2.3205	> 0.5	Compliant
High	2480	1.718	2.3690	> 0.5	Compliant

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

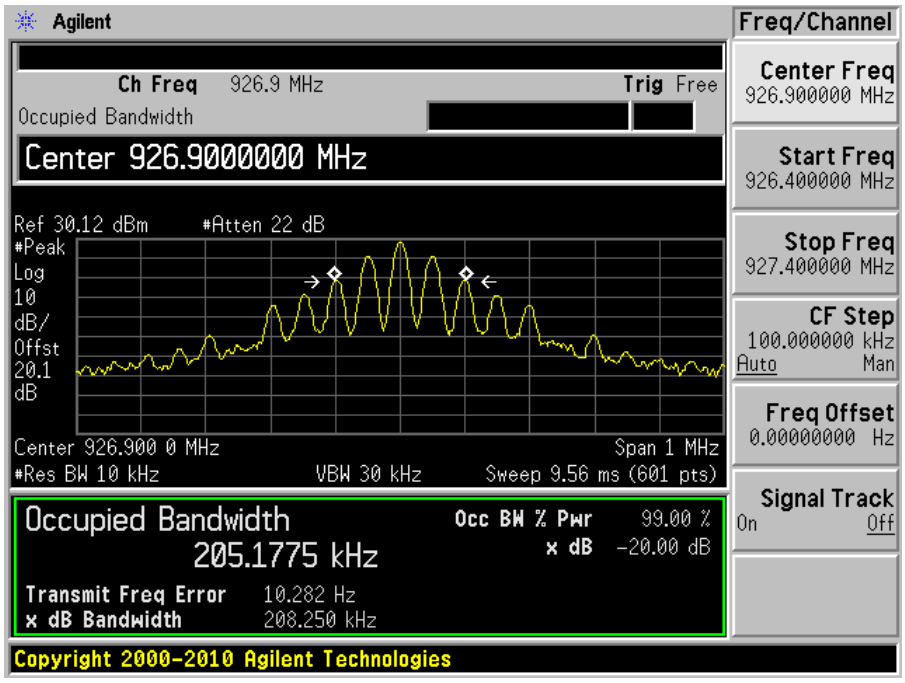
Low Channel



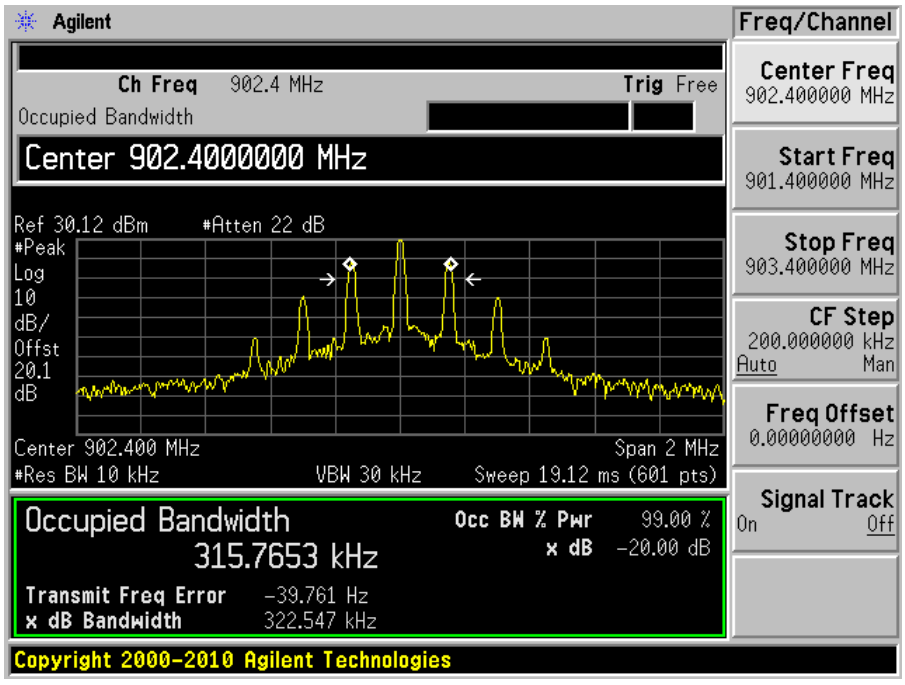
Middle Channel



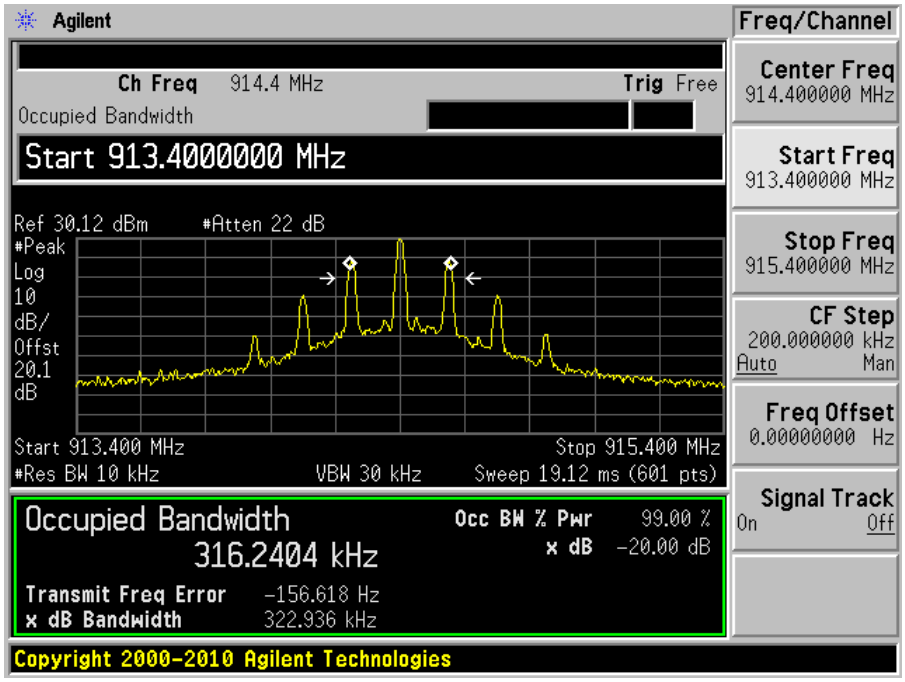
High Channel



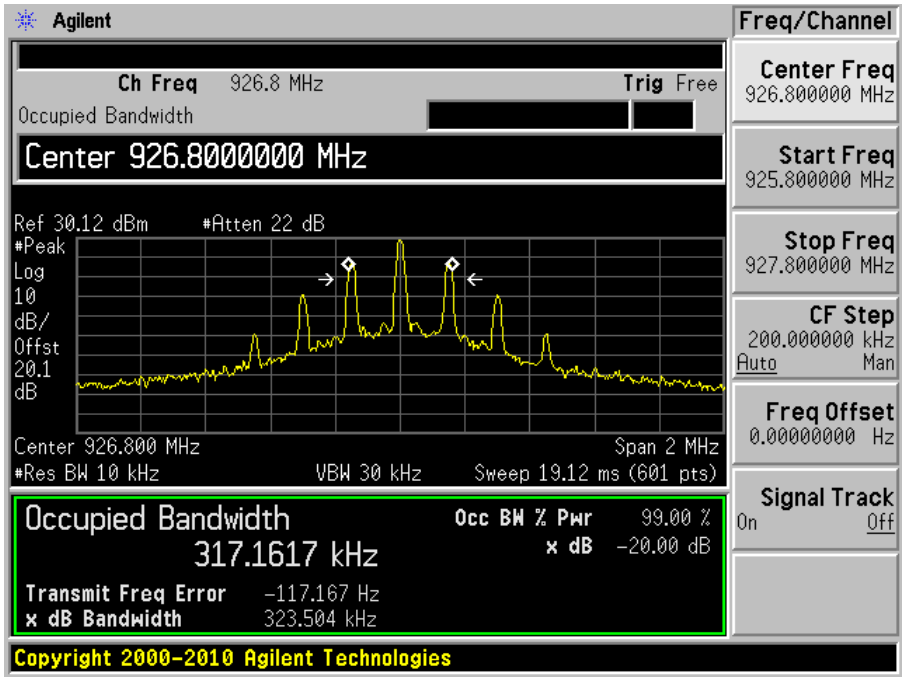
900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing
Low Channel



Middle Channel

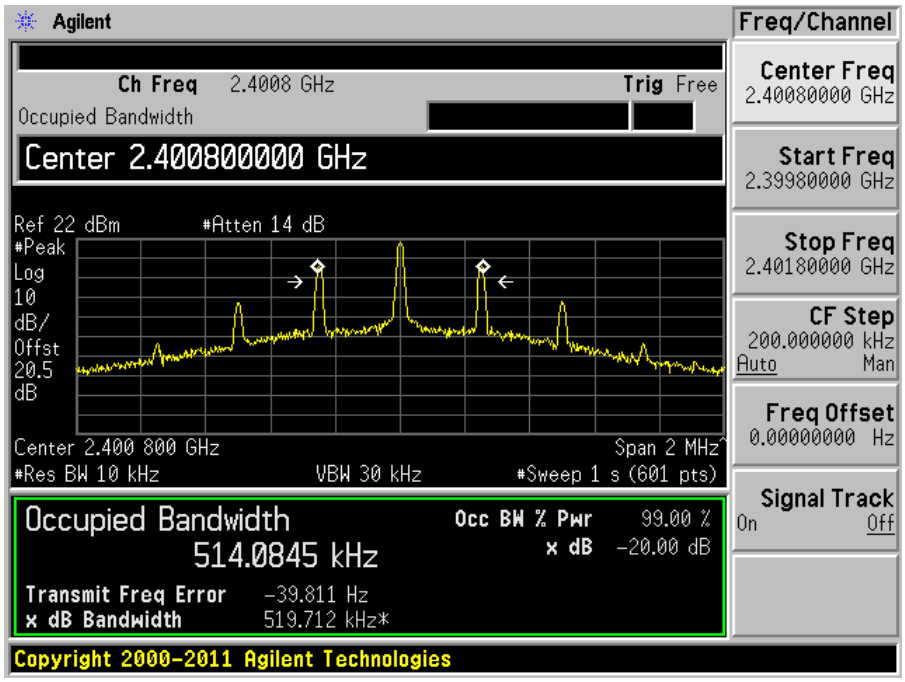


High Channel

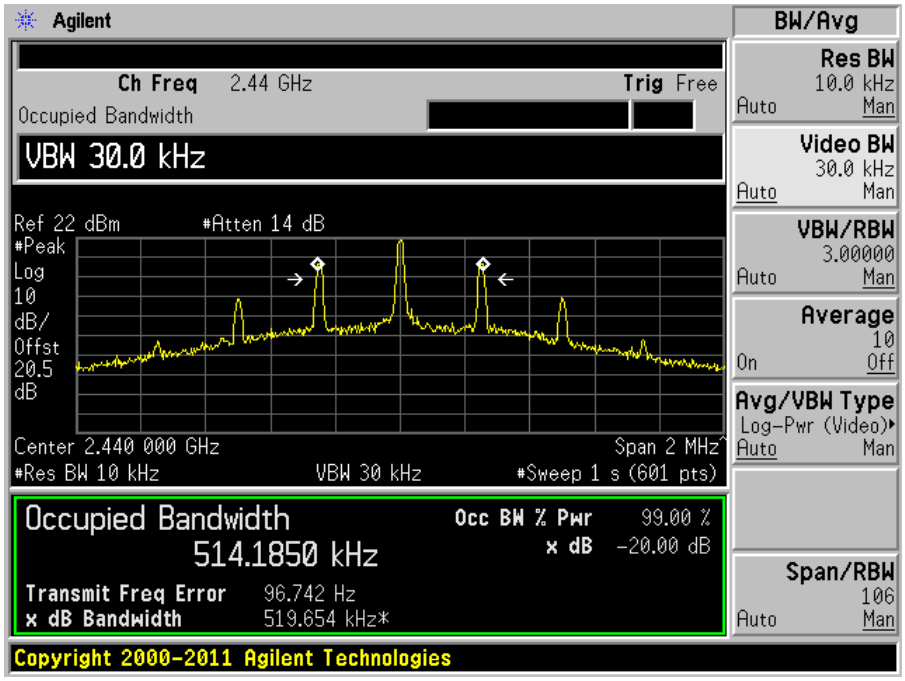


2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

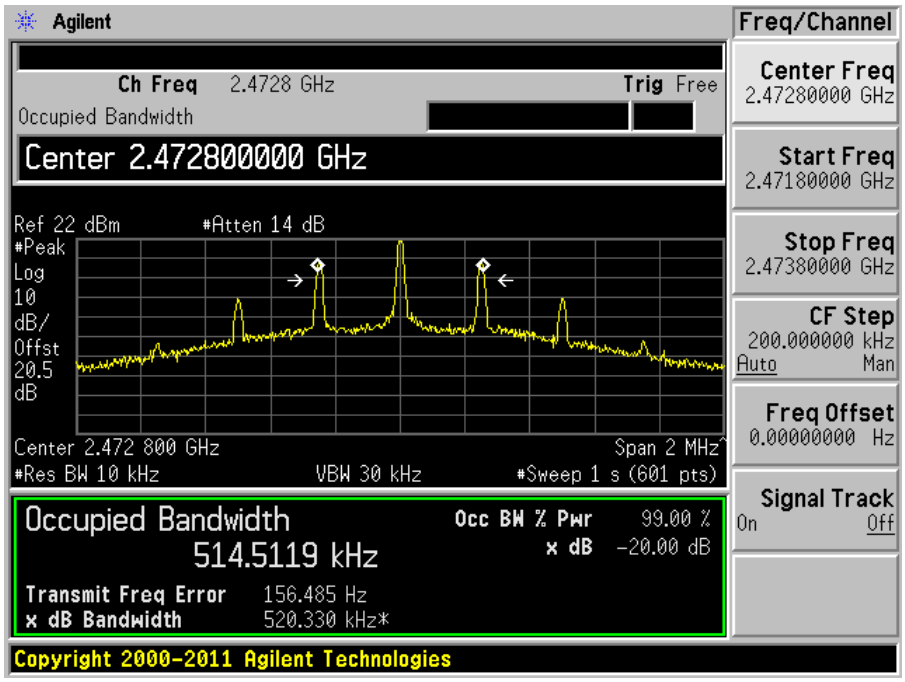
Low Channel



Middle Channel

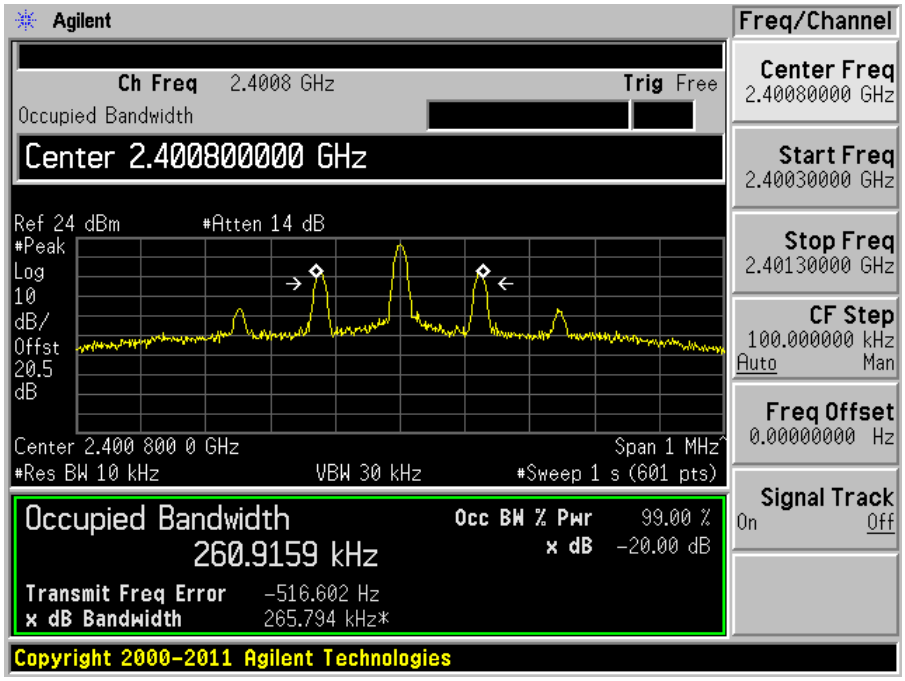


High Channel

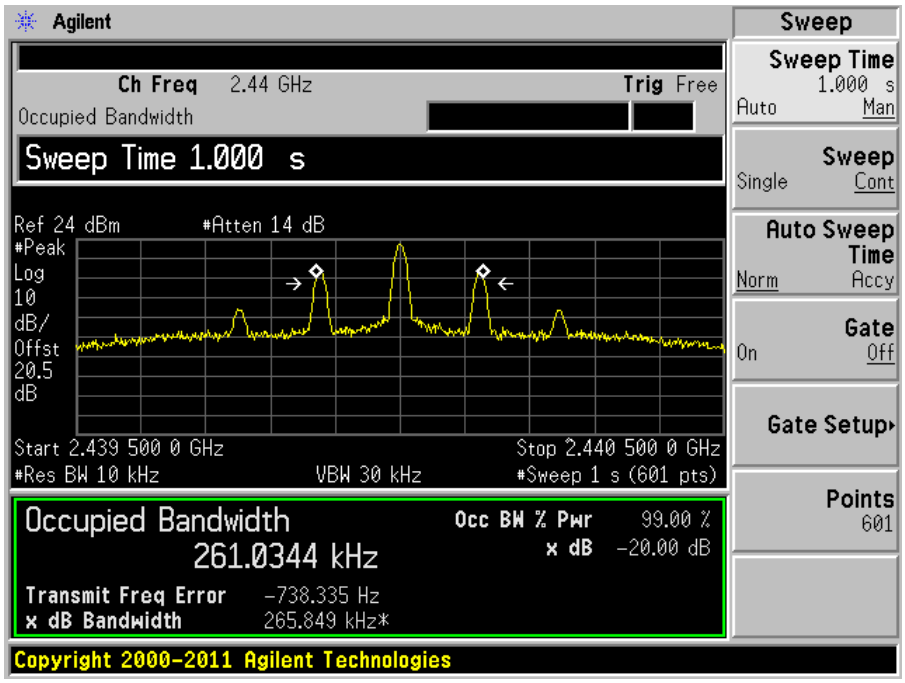


2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

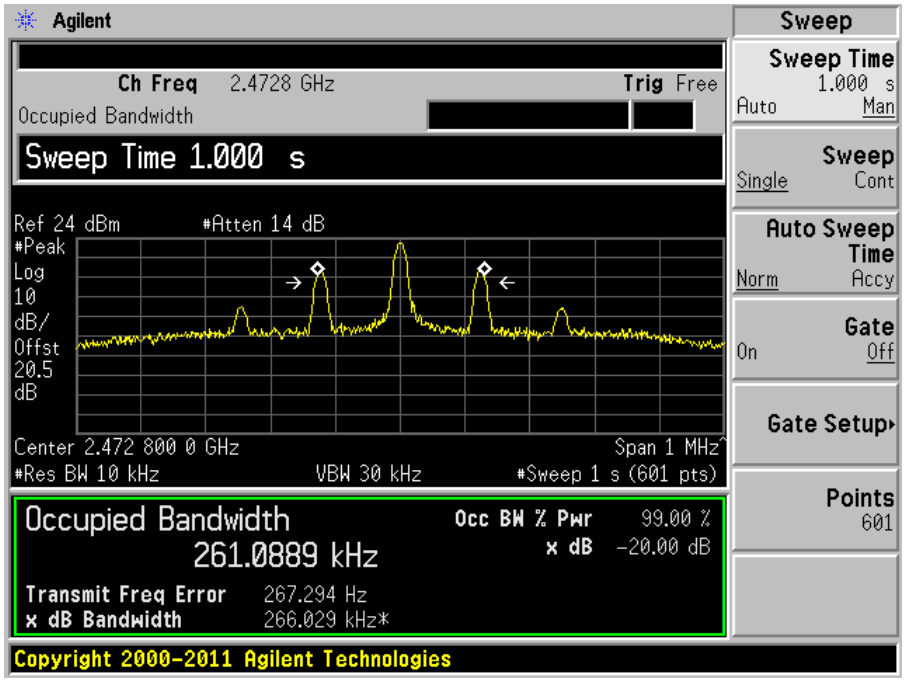
Low Channel



Middle Channel

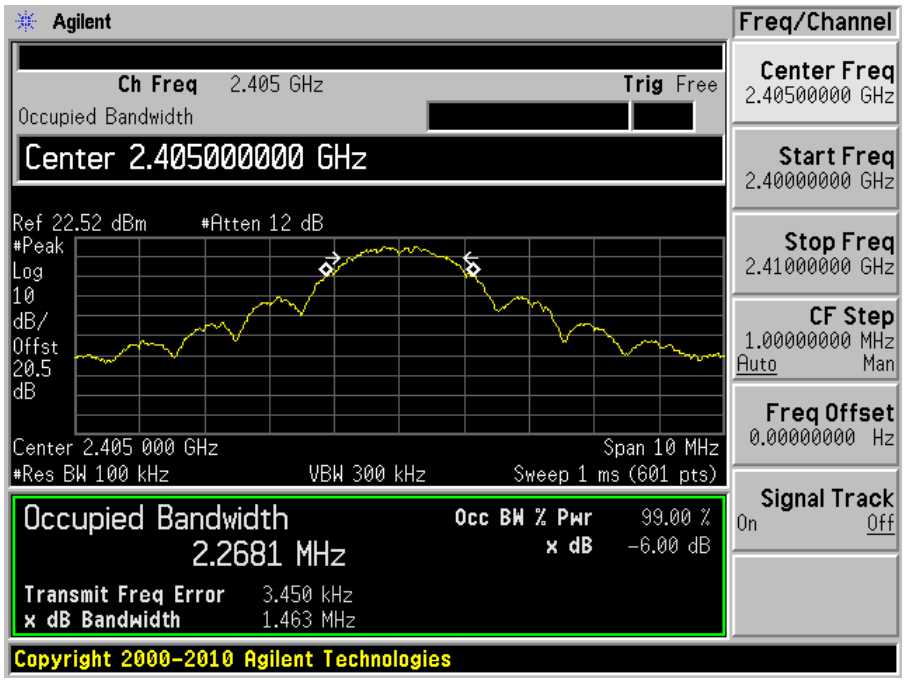


High Channel

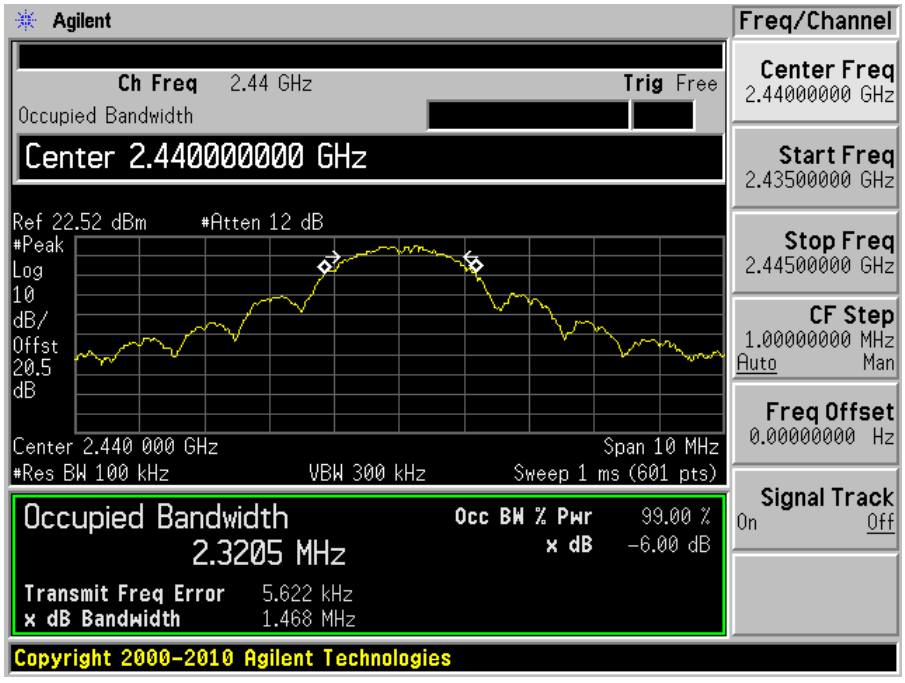


2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

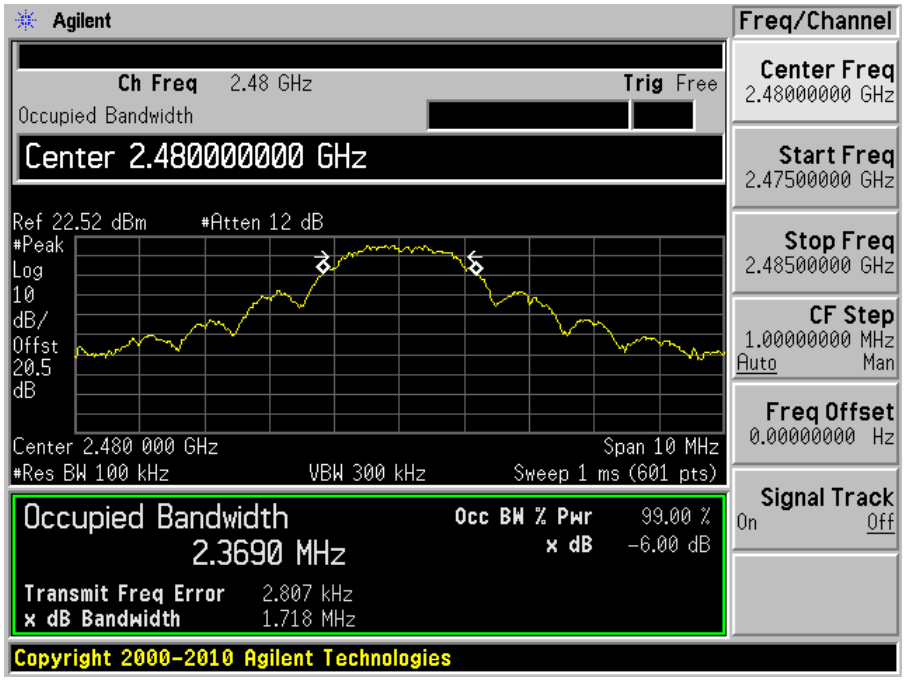
Low Channel



Middle Channel



High Channel



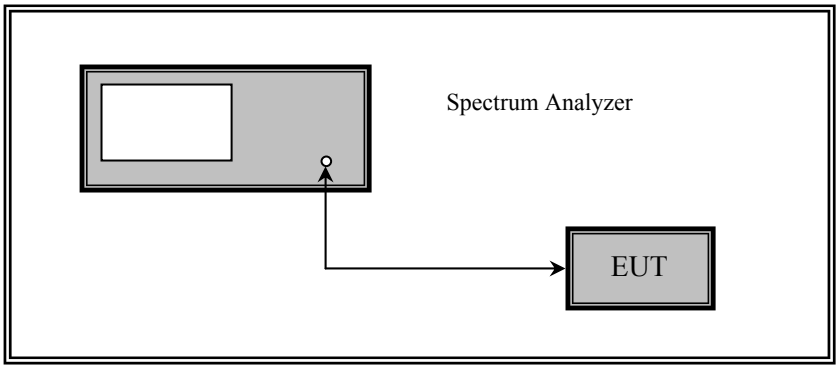
9 FCC §15.247(b) Peak Output Power Measurement

9.1 Applicable Standard

According to FCC §15.247(b) and for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

9.2 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Wei Sun on 2013-02-26 at RF site.

9.5 Test Results

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.3	29.96	30	-0.04
Middle	914.6	29.63	30	-0.37
High	926.9	29.25	30	-0.75

900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.4	29.94	30	-0.06
Middle	914.4	29.65	30	-0.35
High	926.8	29.00	30	-1.00

900 MHz GFSK Modulation, 300 kbps data rate, 300 kHz channel spacing

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	902.3	29.98	30	-0.02
Middle	914.6	29.49	30	-0.51
High	926.9	29.05	30	-0.95

2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	2400.8	21.18	30	-8.82
Middle	2440	20.10	30	-9.90
High	2472.8	22.41	30	-5.59

2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

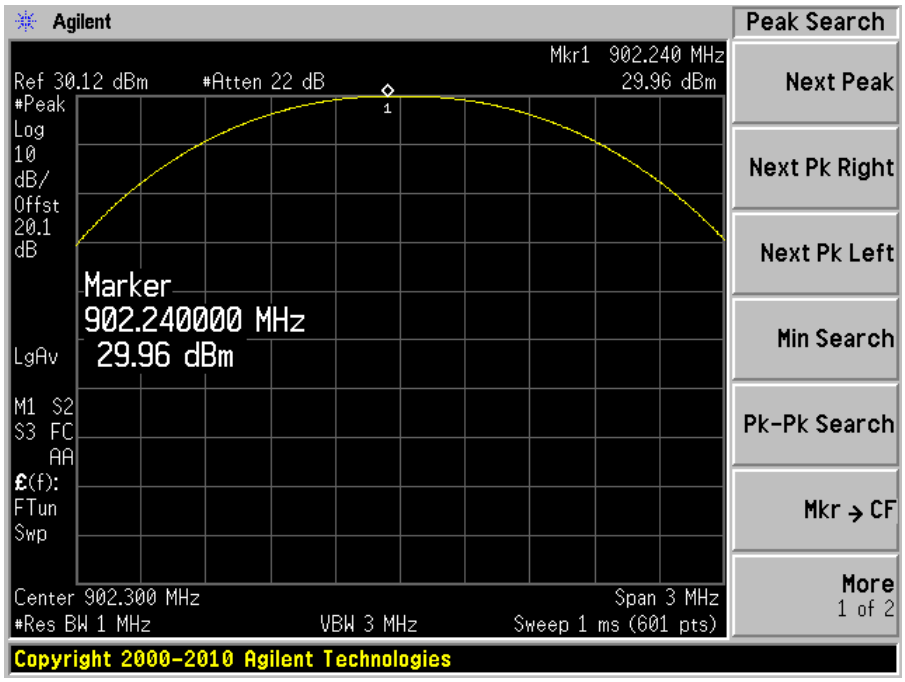
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	2400.8	20.30	30	-9.70
Middle	2440	18.53	30	-11.47
High	2472.8	21.36	30	-8.64

2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

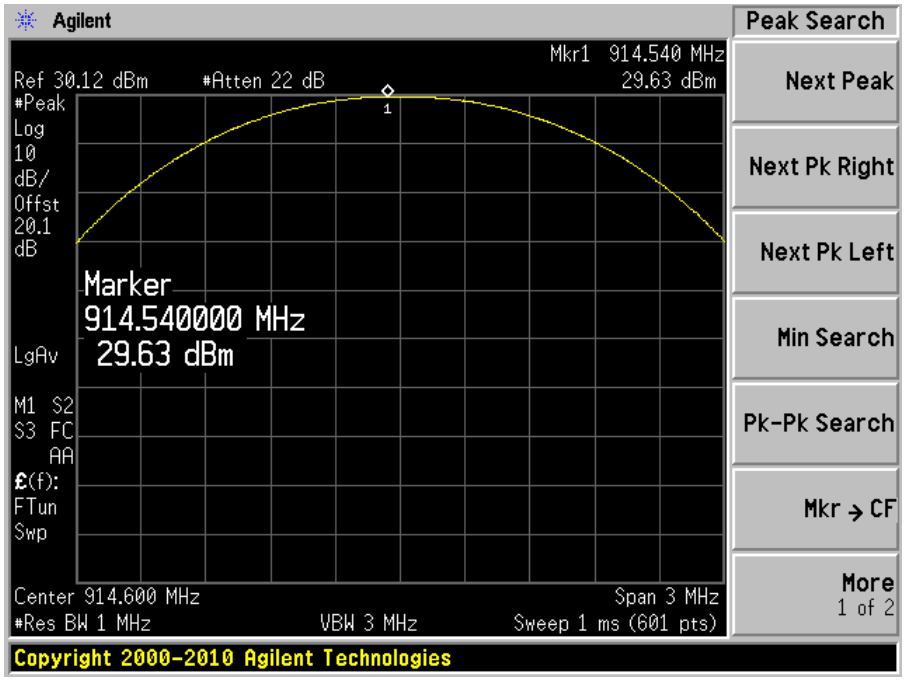
Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	2405	20.71	30	-9.29
Middle	2440	21.37	30	-8.63
High	2480	21.34	30	-8.66

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

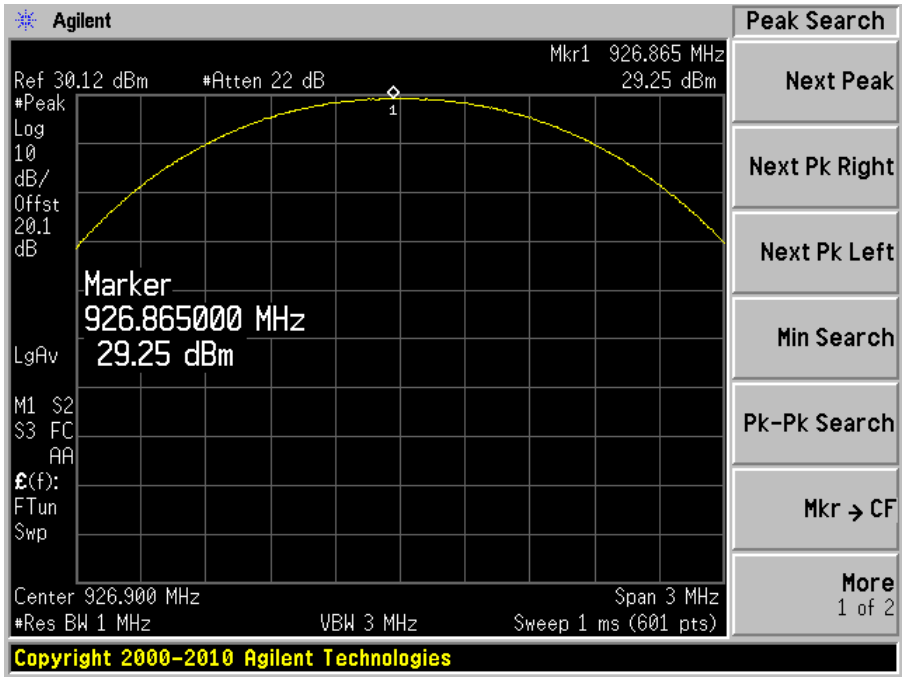
Low Channel



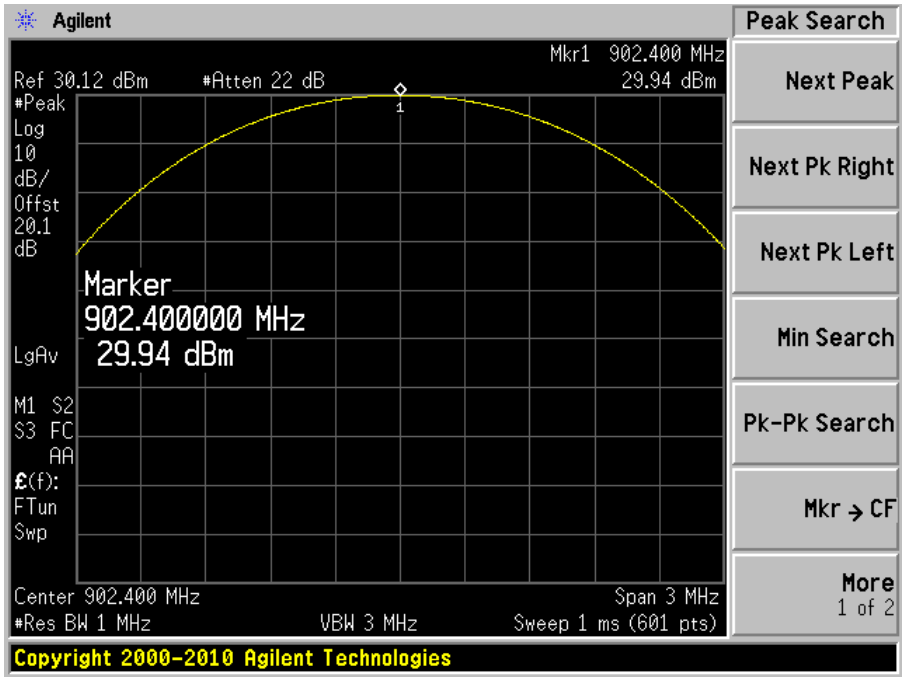
Middle Channel



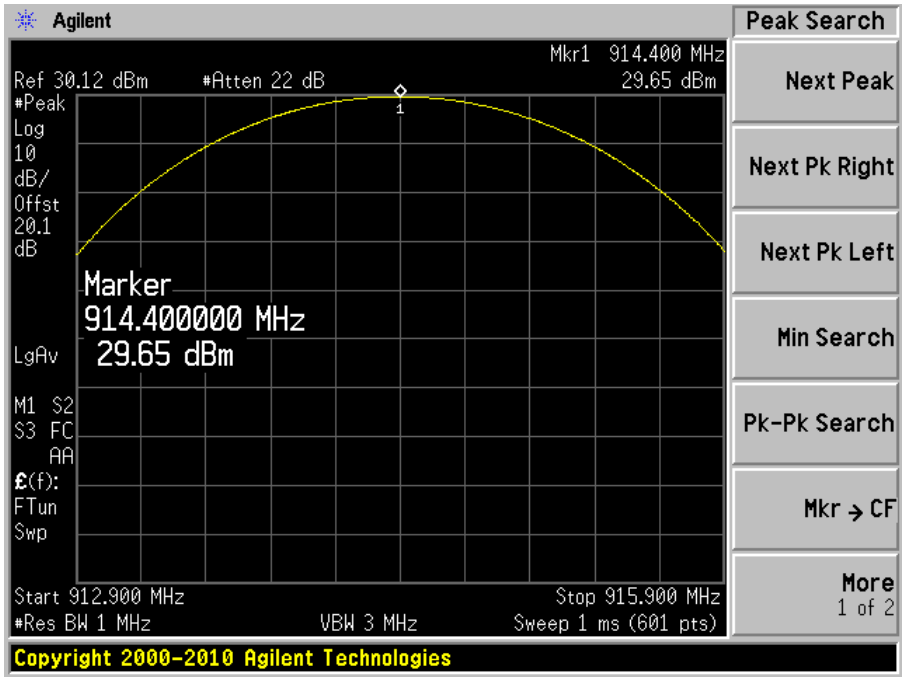
High Channel



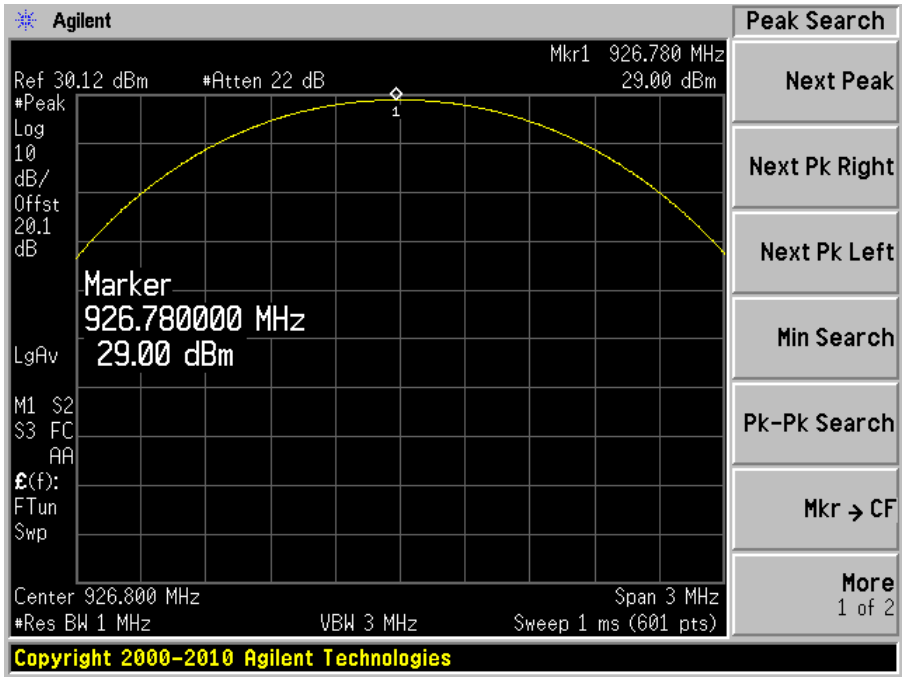
900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing
Low Channel



Middle Channel

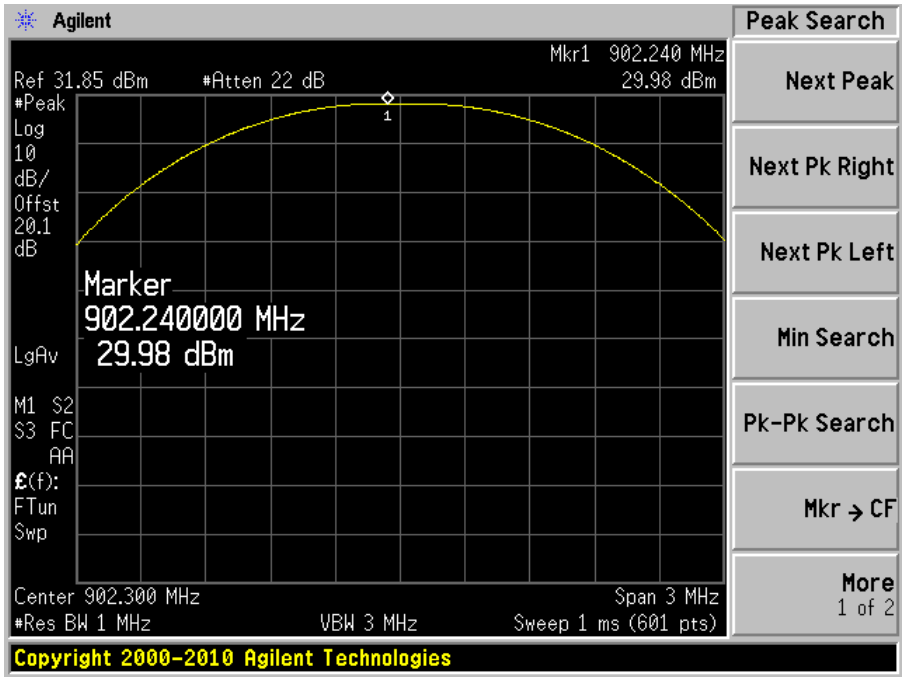


High Channel

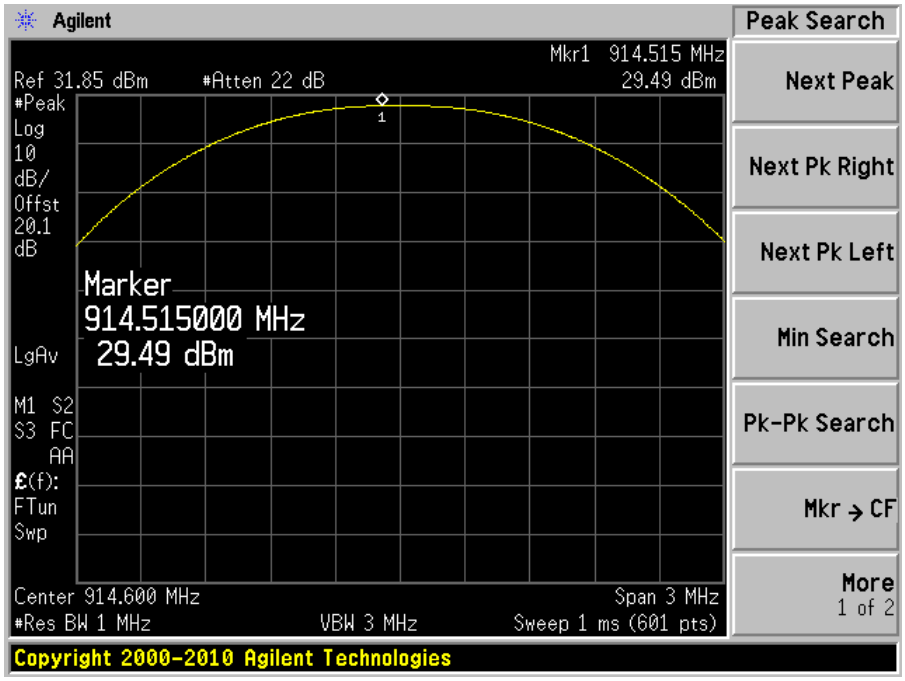


900 MHz GFSK Modulation, 300 kbps data rate, 300 kHz channel spacing

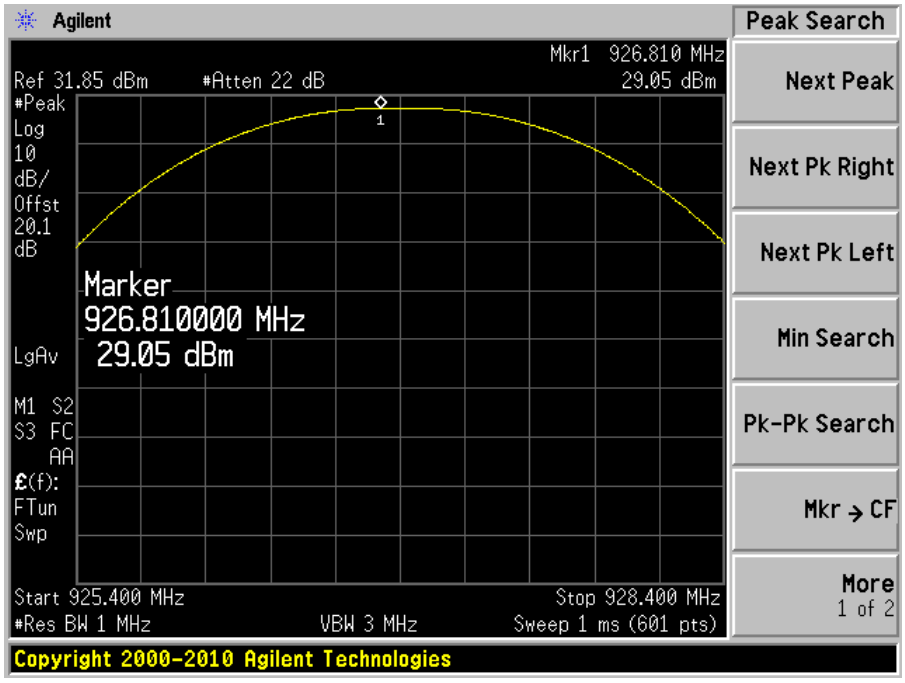
Low Channel



Middle Channel

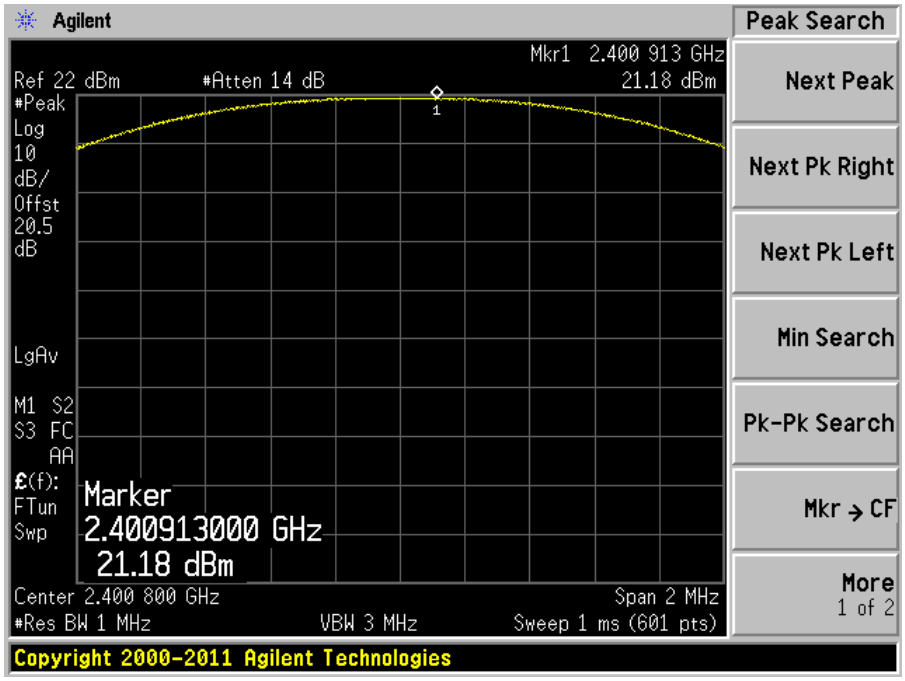


High Channel

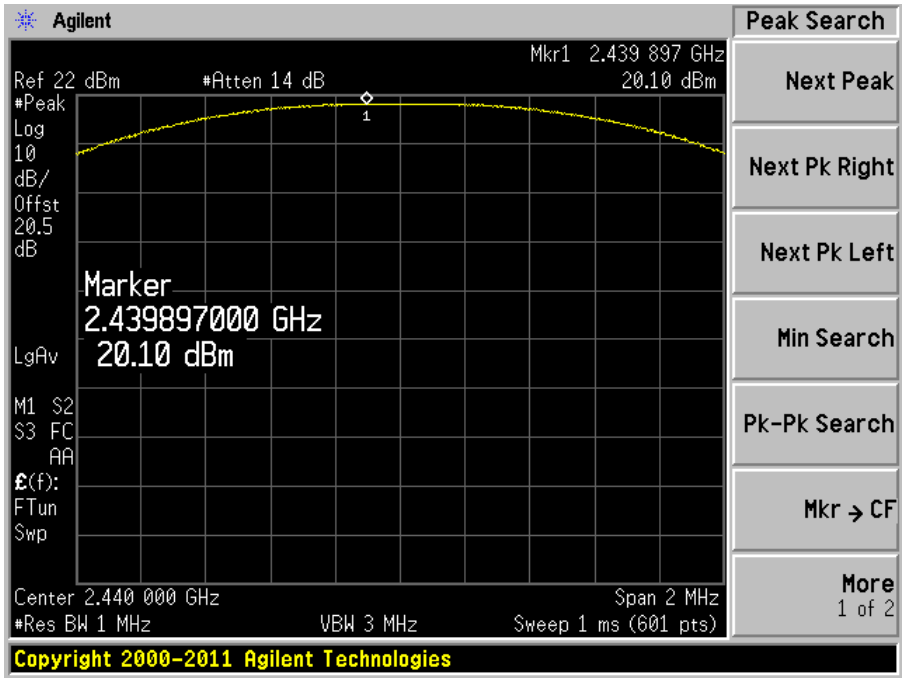


2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

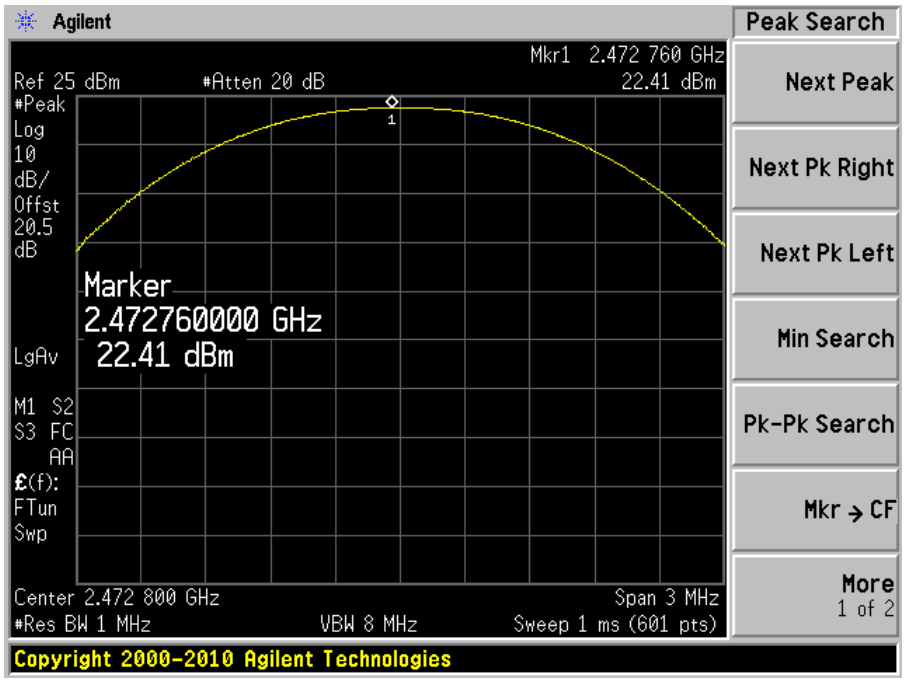
Low Channel



Middle Channel

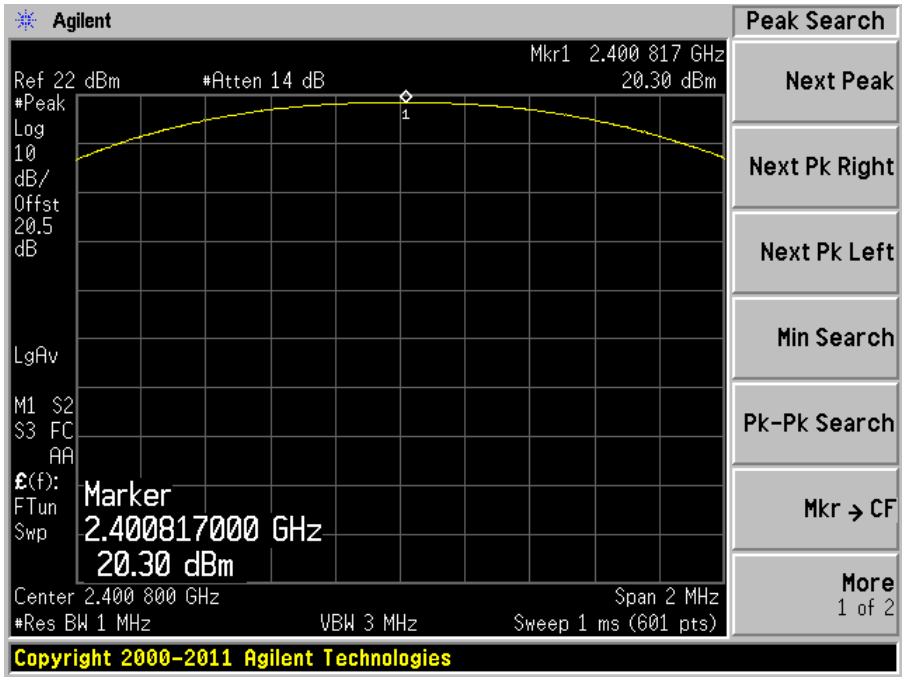


High Channel

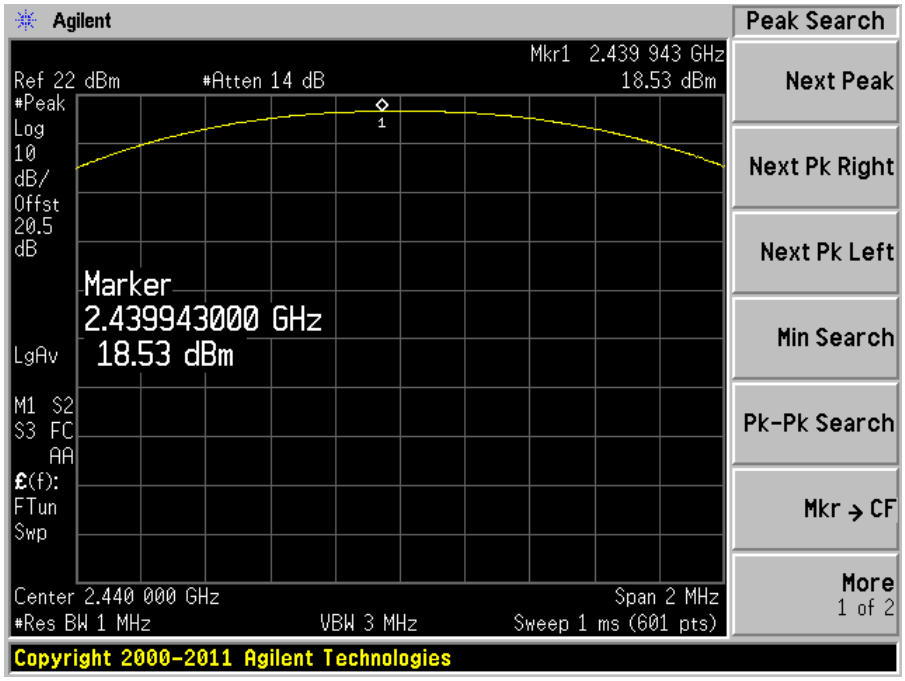


2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

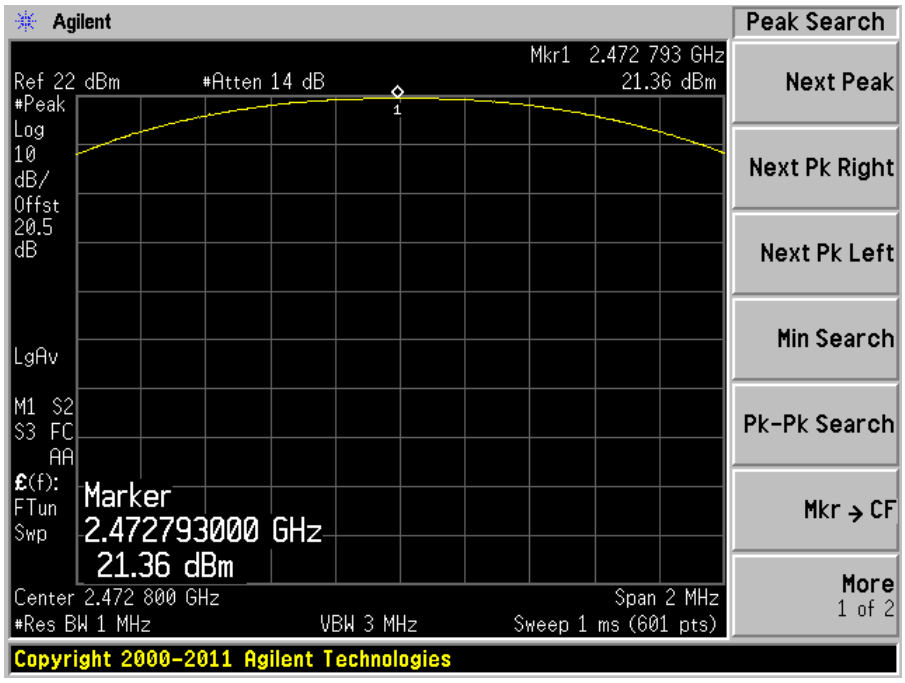
Low Channel



Middle Channel

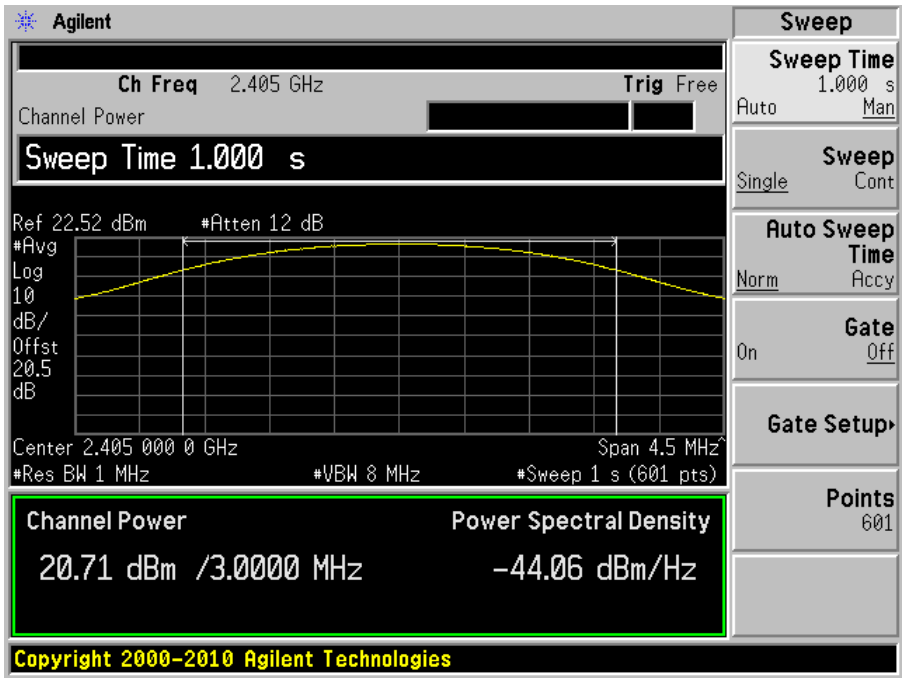


High Channel

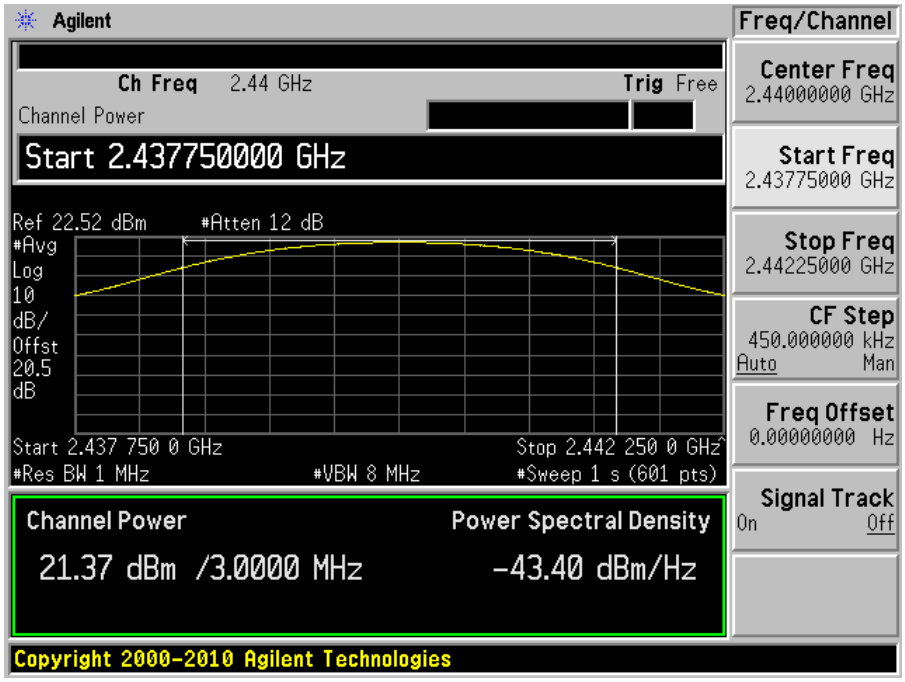


2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

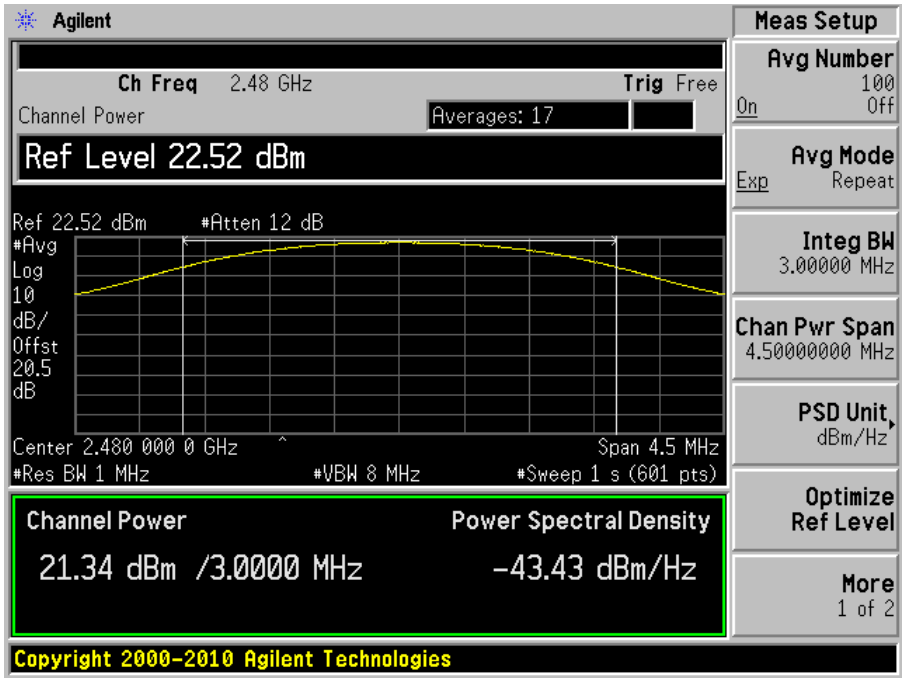
Low Channel



Middle Channel



High Channel



10 FCC §15.247(d) – 100 kHz Bandwidth of Band Edges

10.1 Applicable Standard

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

10.2 Measurement Procedure

For DTS Systems

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

For FHSS Systems

6. Span = Wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.
7. RBW equal or greater than 1% of the span.
8. VBW equal or greater than RBW.
9. Detector function = Peak.
10. Trace = Max hold

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

10.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

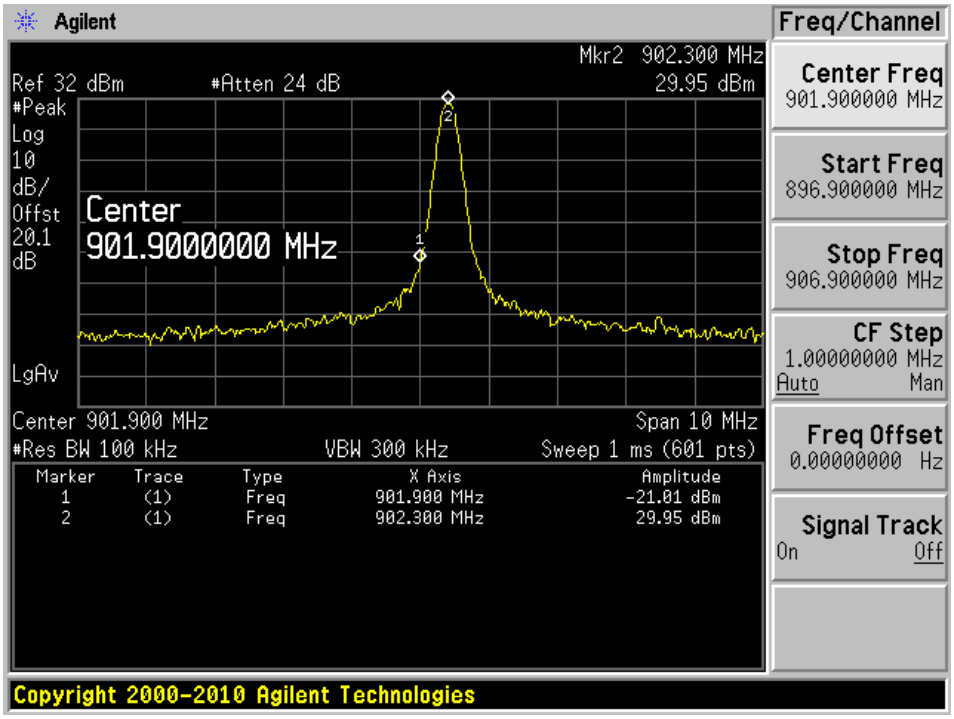
The testing was performed by Wei Sun on 2013-02-26 at RF site.

10.5 Test Results

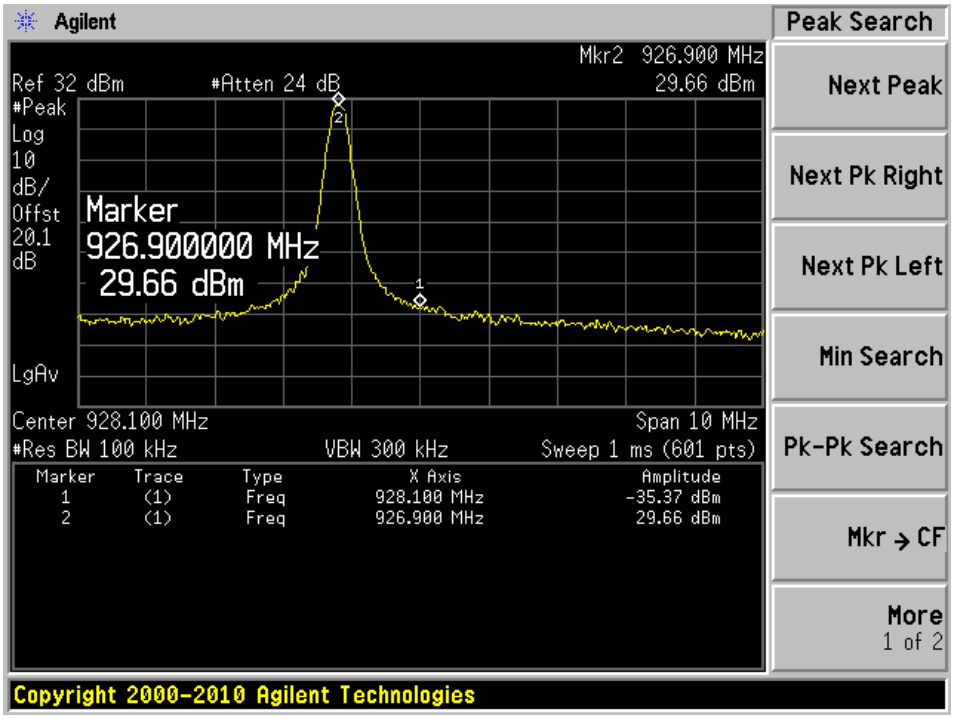
Please refer to following pages for plots of band edge.

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

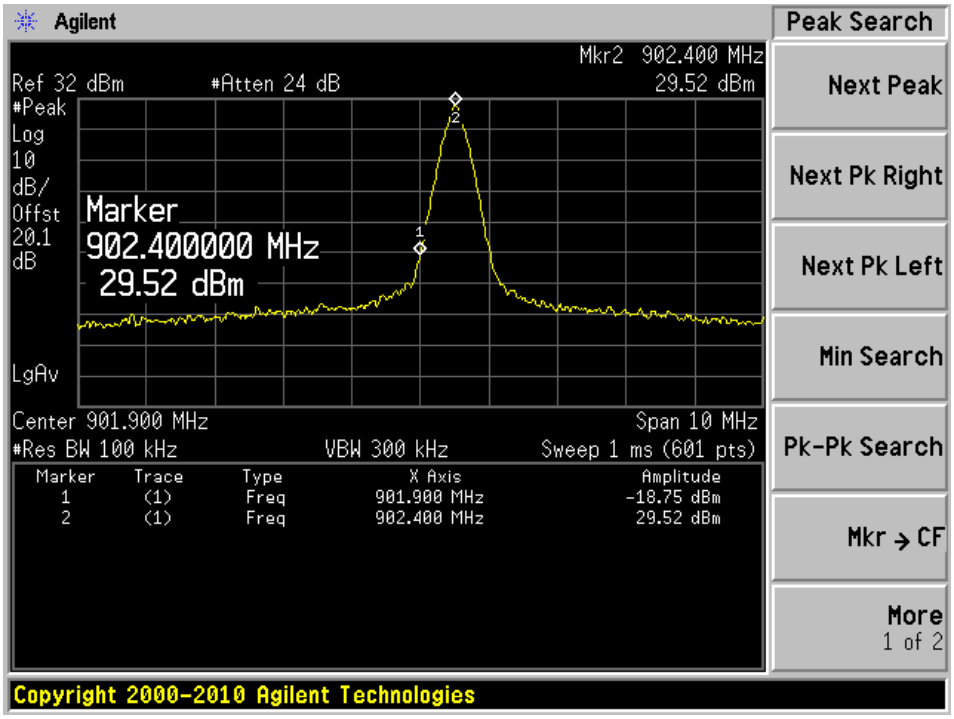
Low Channel



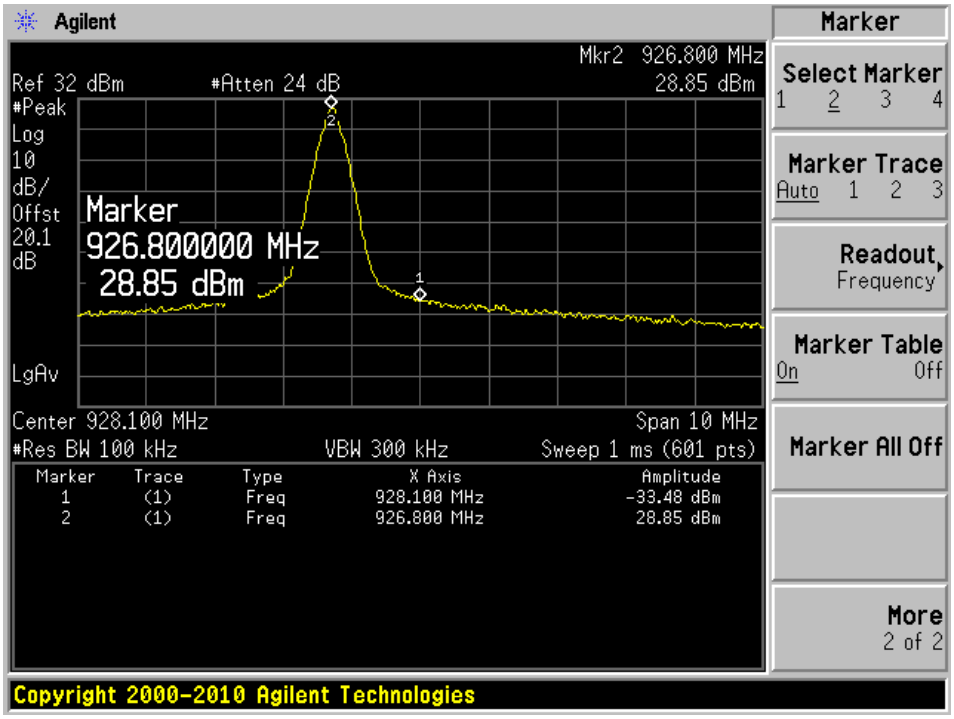
High Channel



900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing
Low Channel

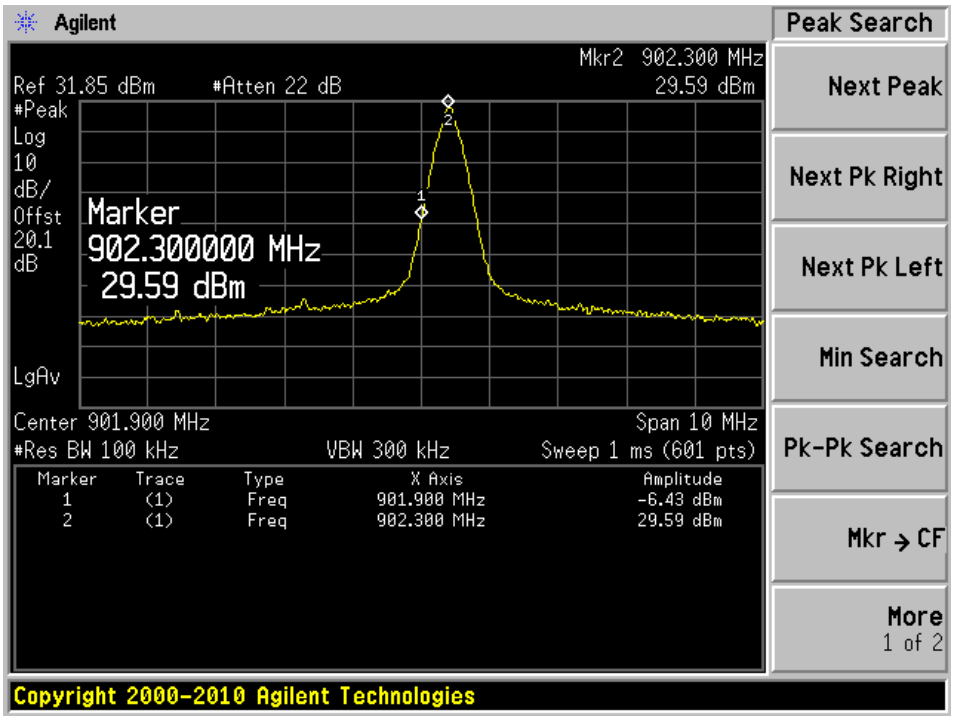


High Channel

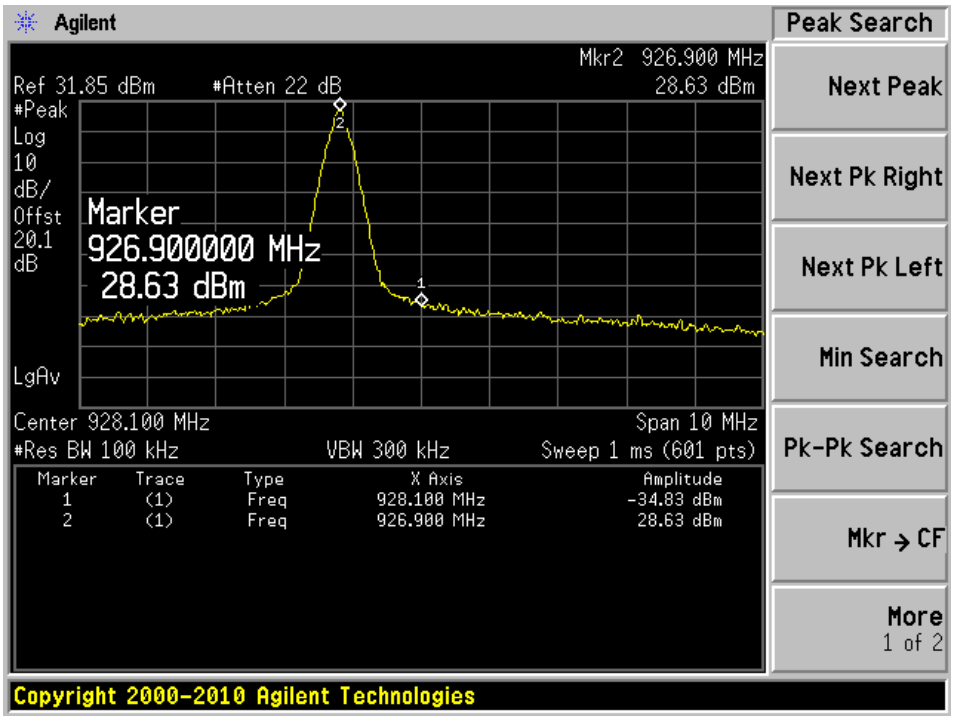


900 MHz GFSK Modulation, 300 kbps data rate, 300 kHz channel spacing

Low Channel

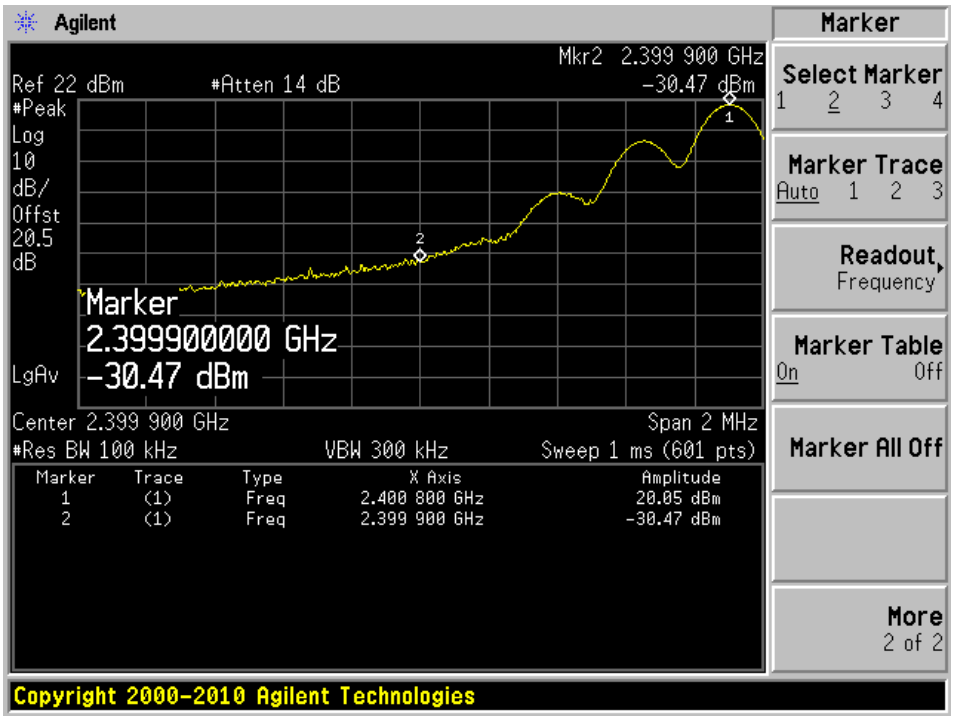


High Channel

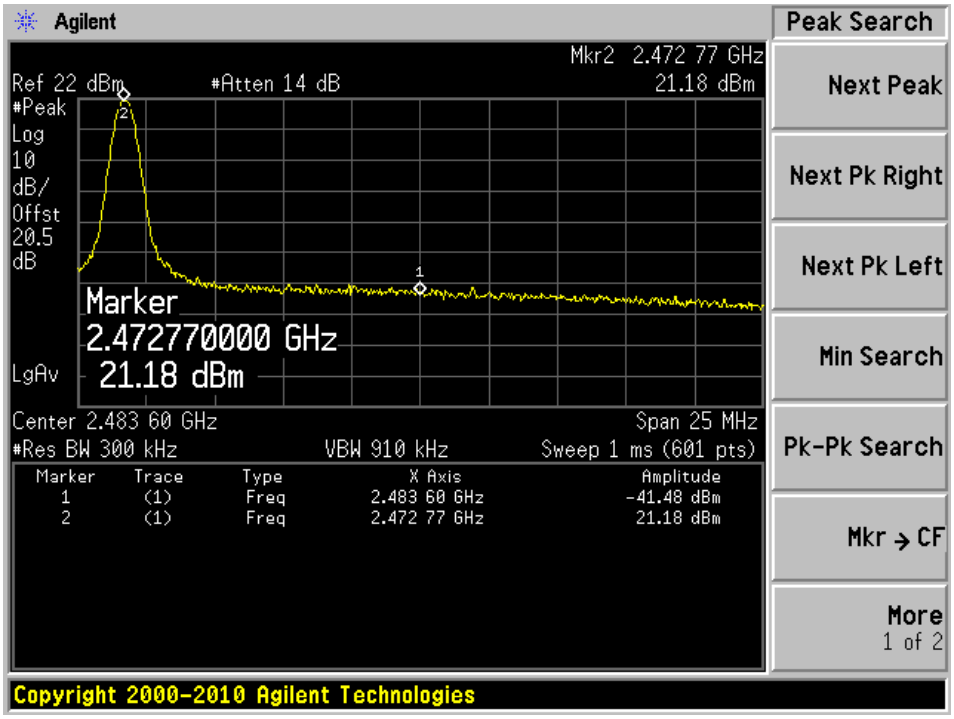


2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

Low Channel

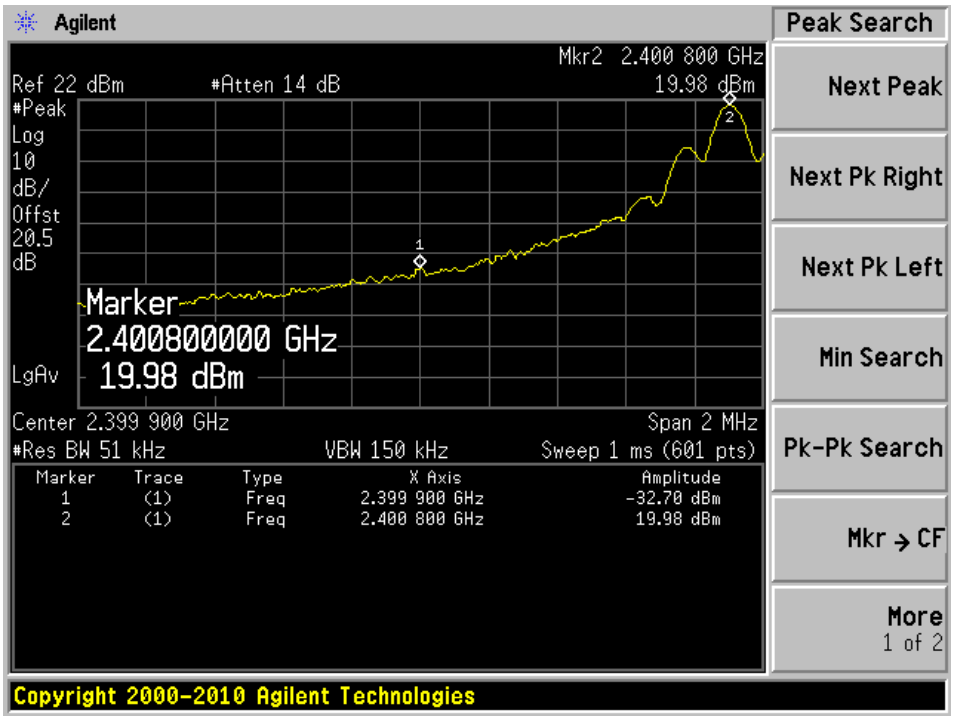


High Channel

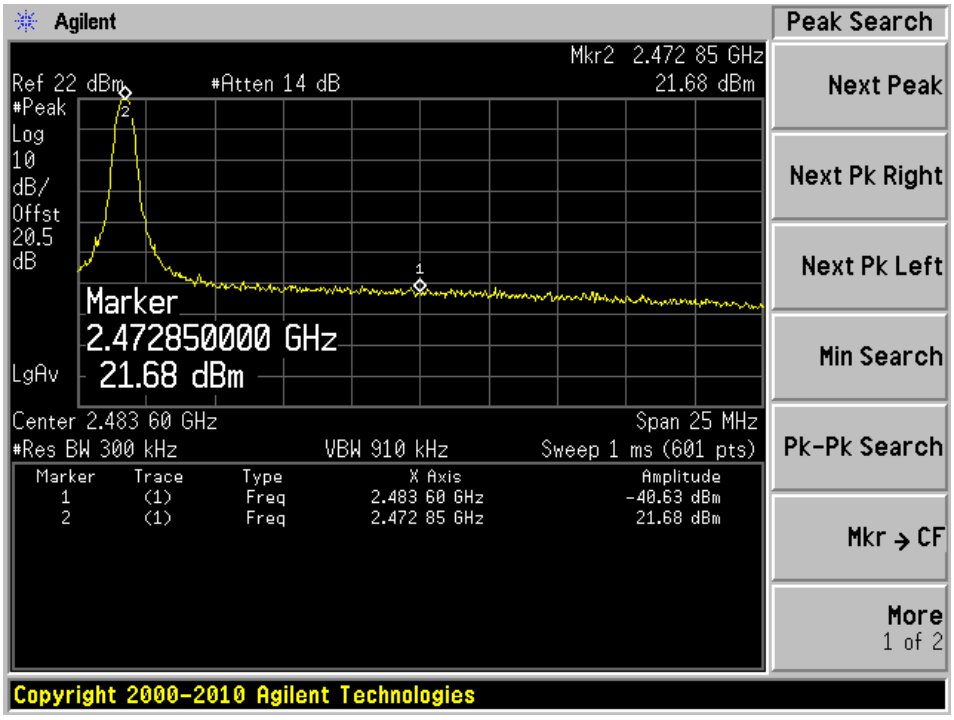


2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

Low Channel

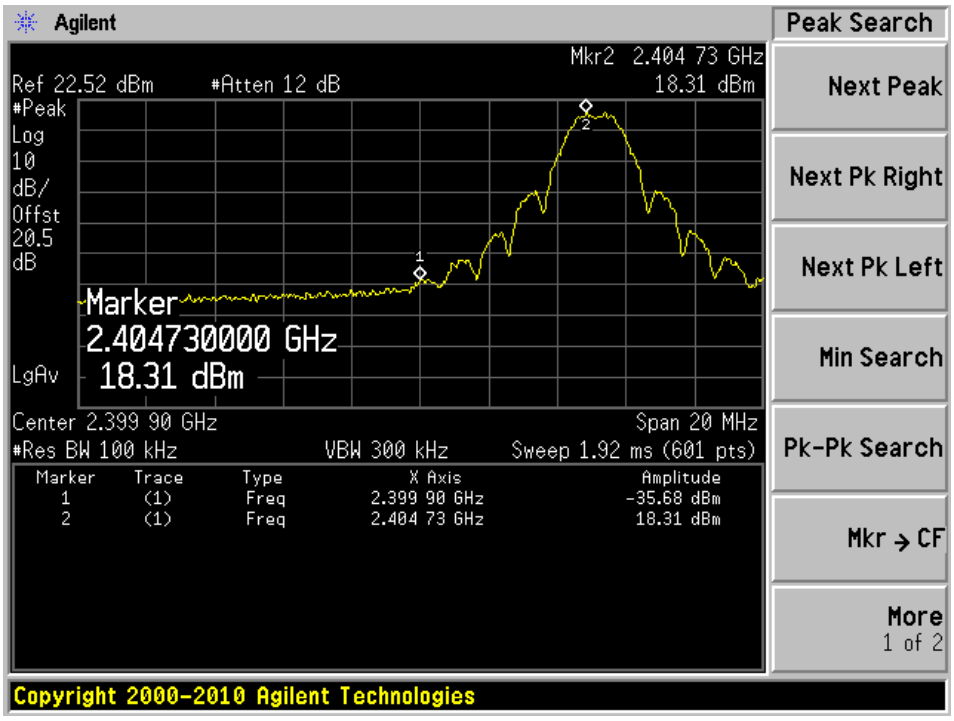


High Channel

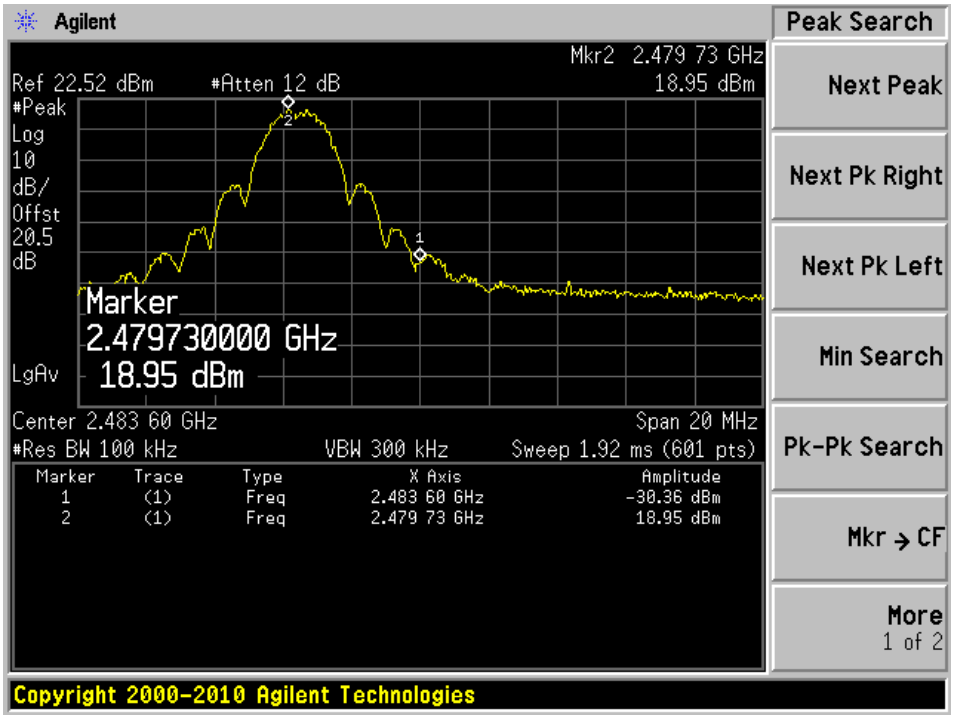


2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

Low Channel



High Channel



11 FCC §15.247(e) – Power Spectral Density

11.1 Applicable Standard

According to FCC §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

11.2 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW = 3 kHz.
4. Set the VBW ≥ 3 x RBW
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

11.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Wei on 2013-02-14 at RF site.

11.5 Test Results

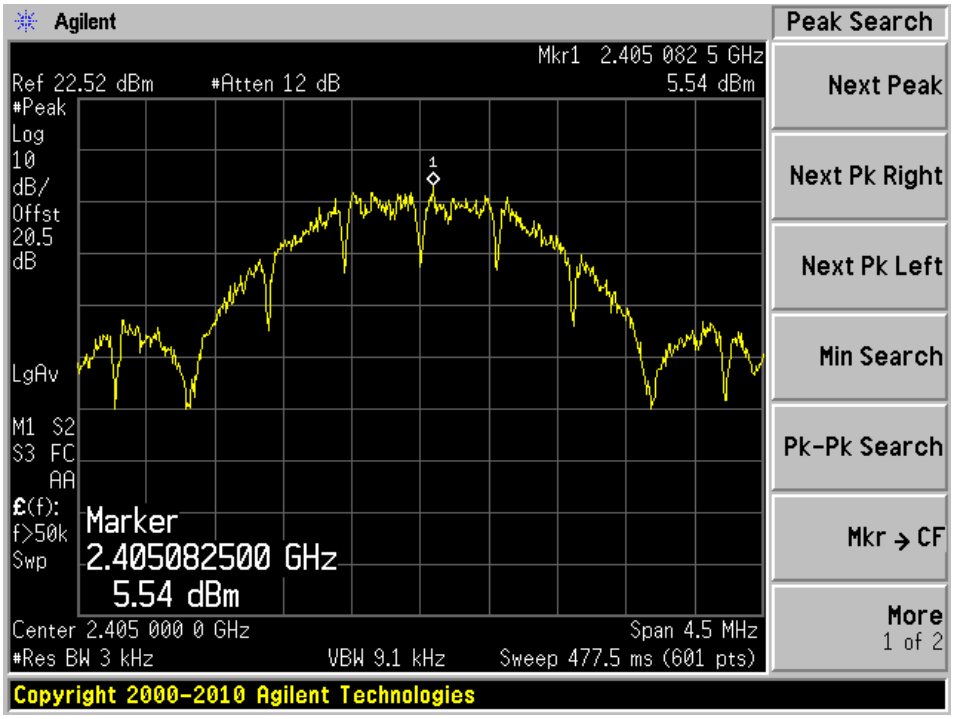
2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2405	5.54	8	2.46
Middle	2440	5.84	8	2.16
High	2480	5.91	8	2.09

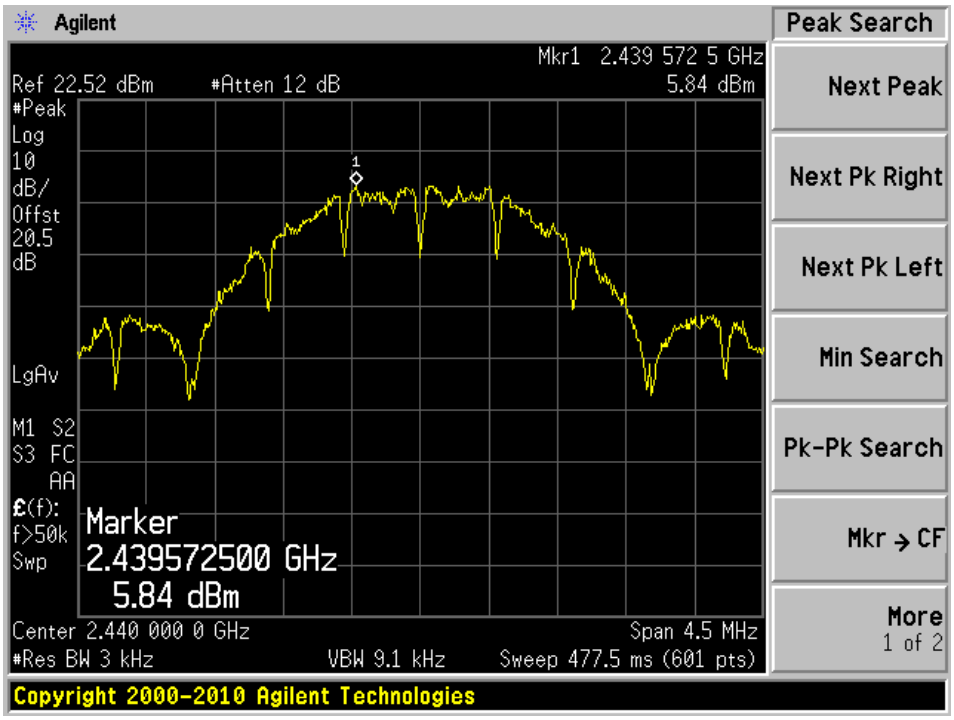
Please refer to the following plots for detailed test results:

2.4 GHz OQPSK Modulation, 1 Mbps data rate, 5 MHz channel spacing

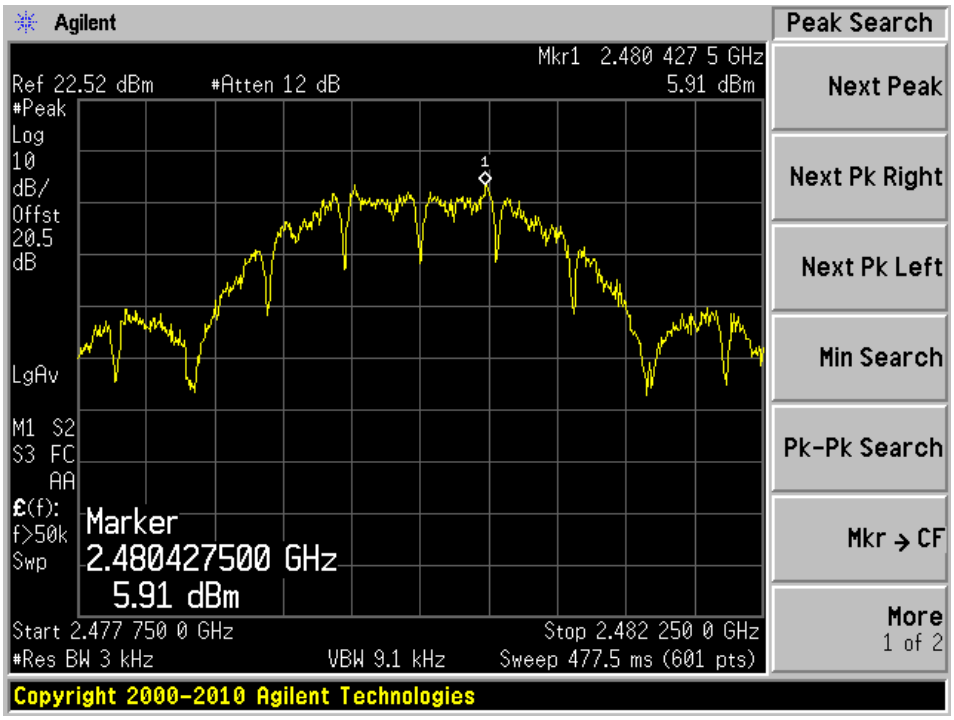
Low Channel



Middle Channel



High Channel



12 FCC §15.247(a) (1) – Hopping Channel Separation

12.1 Applicable Standard

According to FCC §15.247(e), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 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.

12.2 Measurement Procedure

1. Span = wide enough to capture the peaks of two adjacent channels.
2. Resolution Bandwidth ≥ 1% of the span.
3. Video Bandwidth ≥ RBW.
4. Sweep = auto.
5. Detector function = peak.
6. Trace = max hold.

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

12.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Wei on 2013-02-14 at RF site.

12.5 Test Results

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

Channel	Frequency (MHz)	Separation (kHz)	Limit > (20 dB bandwidth) (kHz)	Result
Low	902.3	299.9	208.364	Compliant
Middle	914.6	296.9	208.004	Compliant
High	926.9	294.2	208.250	Compliant

900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing

Channel	Frequency (MHz)	Separation (kHz)	Limit > (20 dB bandwidth) (kHz)	Margin (dB)
Low	902.4	401.0	322.547	Compliant
Middle	914.4	401.2	322.936	Compliant
High	926.7	399.2	323.504	Compliant

2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

Channel	Frequency (MHz)	Separation (kHz)	Limit > (20 dB bandwidth) (kHz)	Margin (dB)
Low	2400.8	803	519.712	Compliant
Middle	2440	803	519.654	Compliant
High	2472.8	803	520.330	Compliant

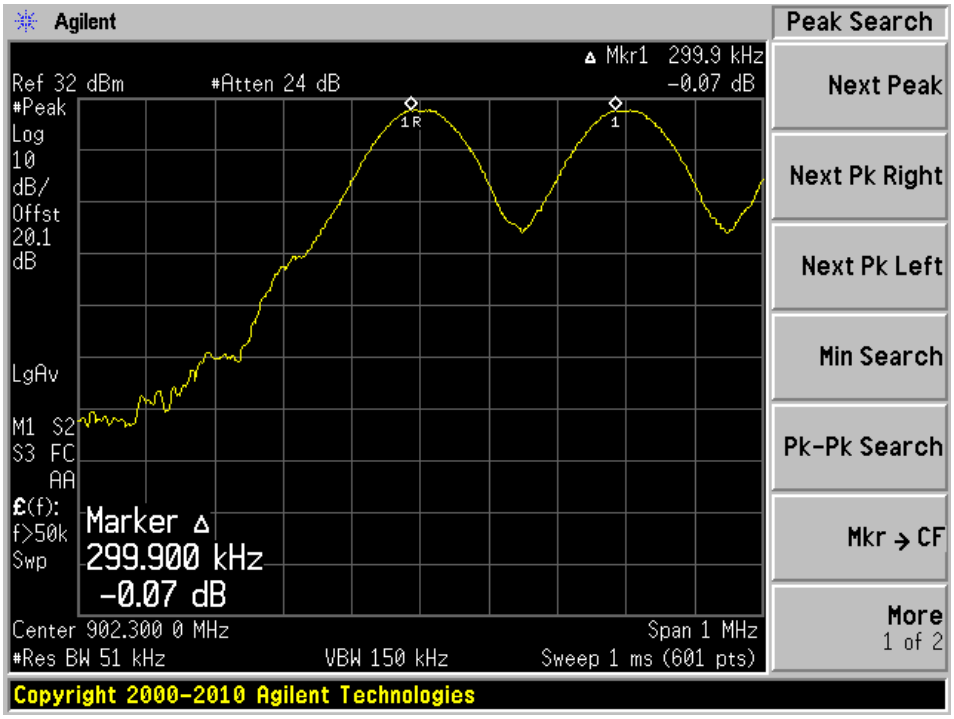
2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

Channel	Frequency (MHz)	Separation (kHz)	Limit > (20 dB bandwidth) (kHz)	Margin (dB)
Low	2400.8	803	265.794	Compliant
Middle	2440	803	265.849	Compliant
High	2472.8	803	266.029	Compliant

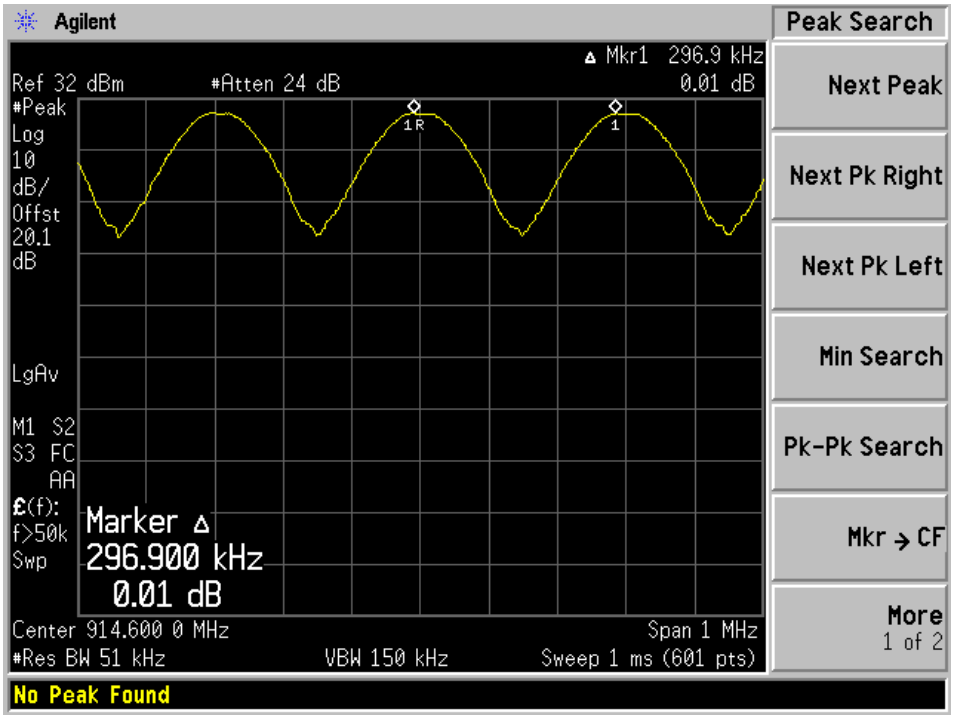
Please refer to the following plots for detailed test results:

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

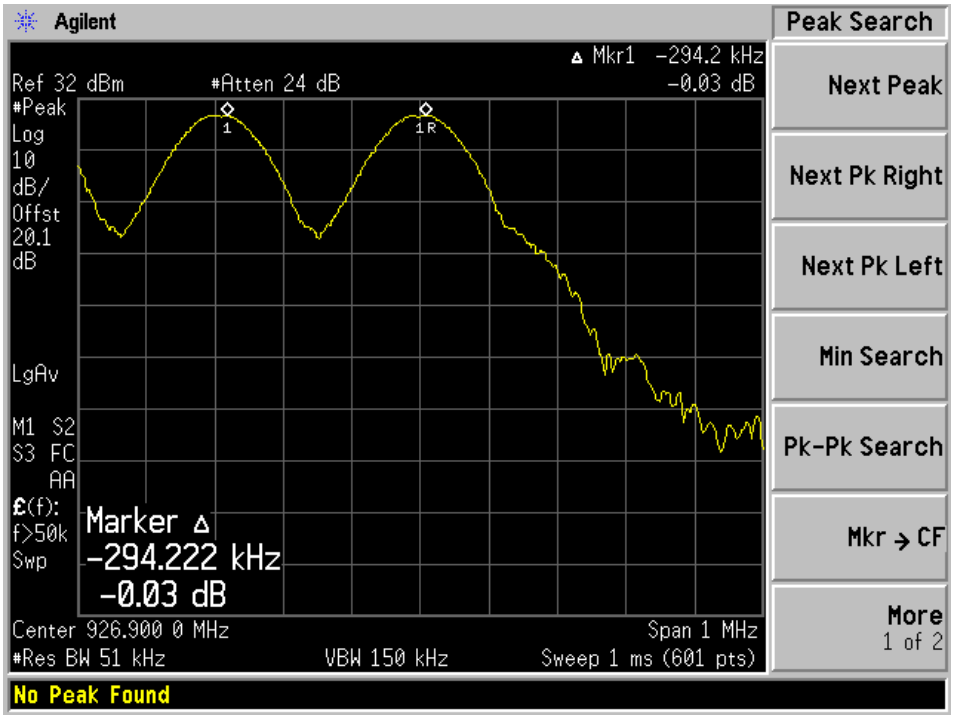
Low Channel



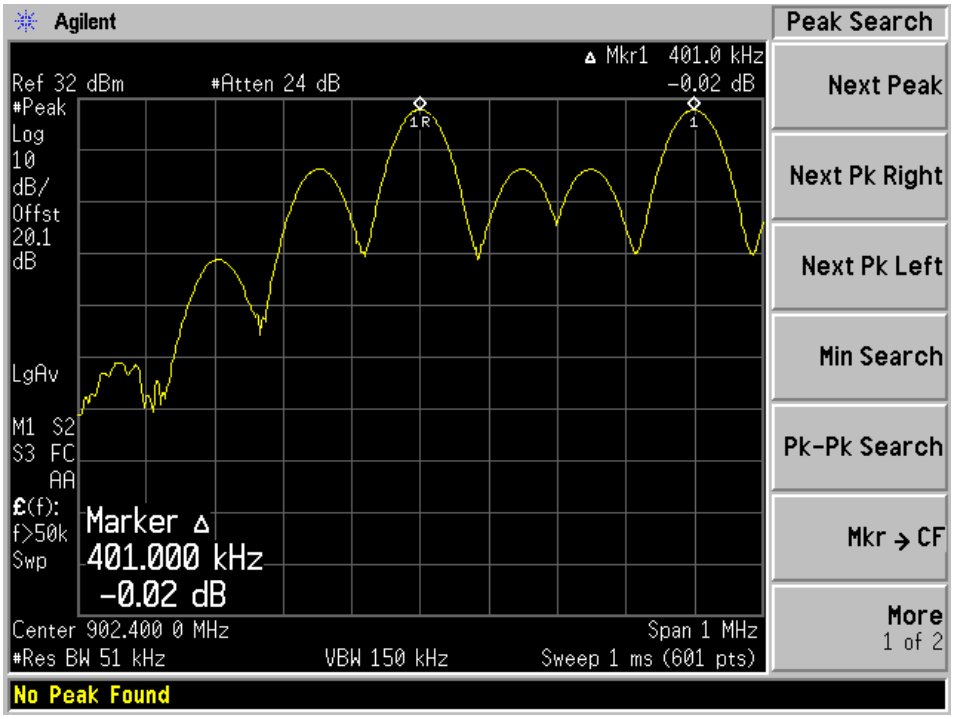
Middle Channel



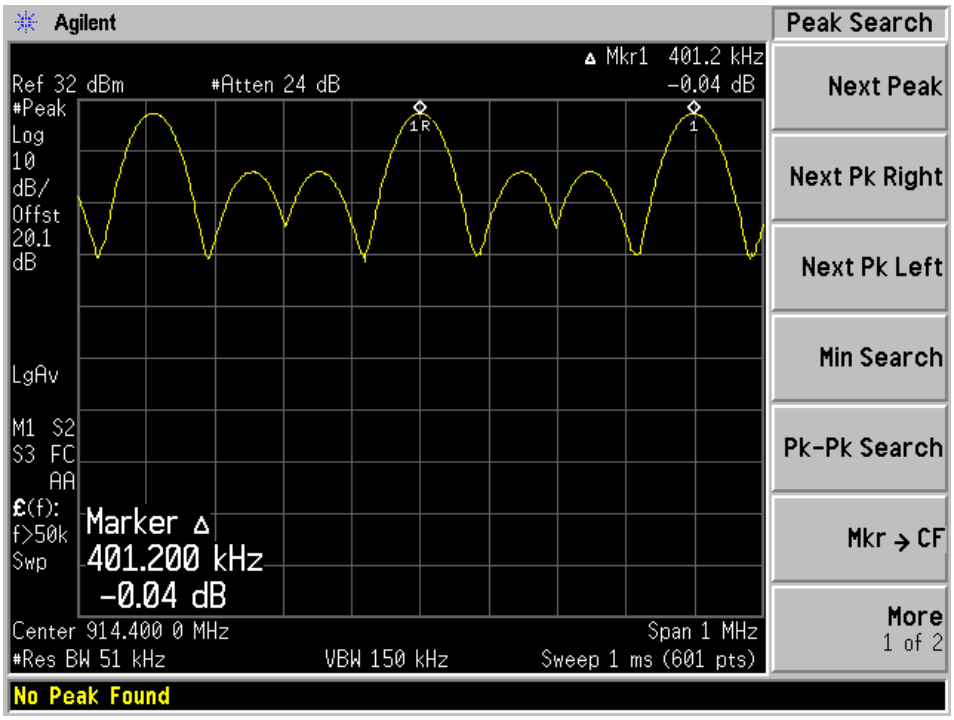
High Channel



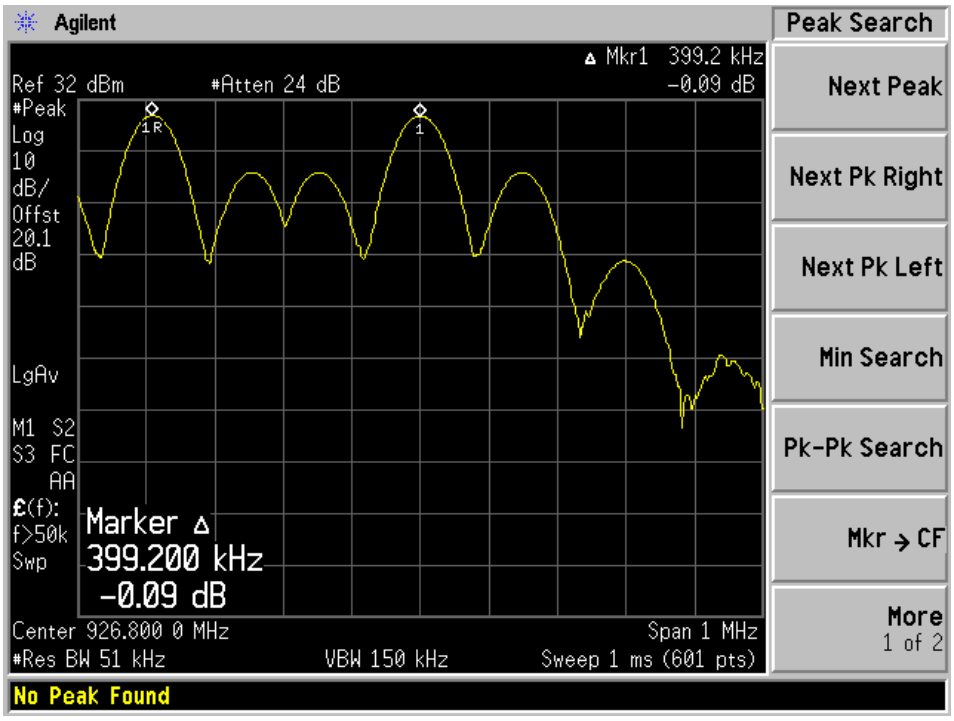
900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing
Low Channel



Middle Channel

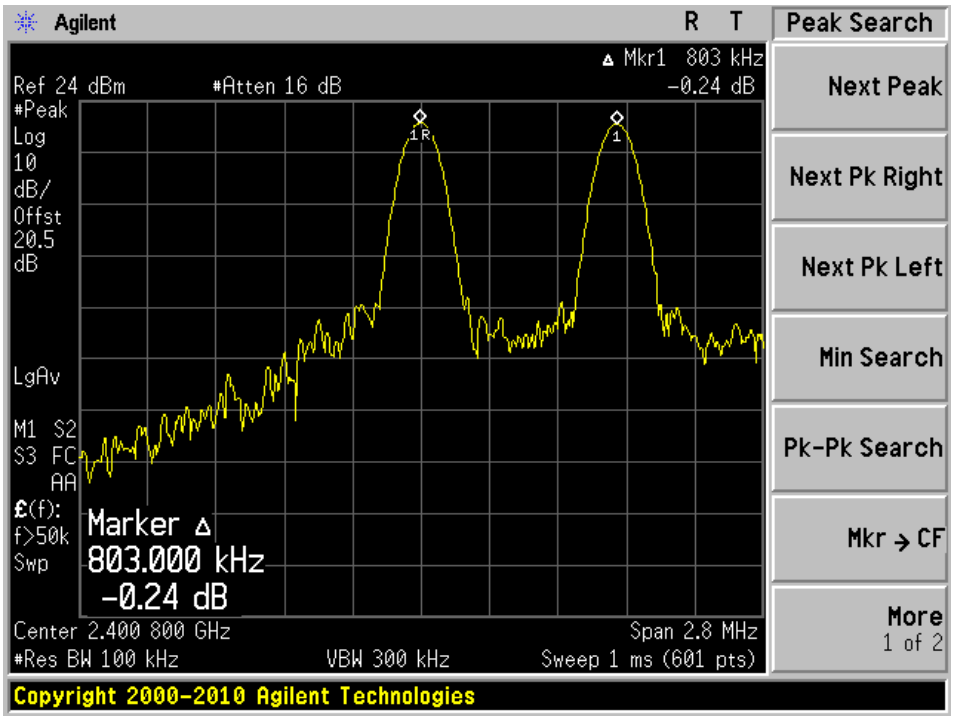


High Channel

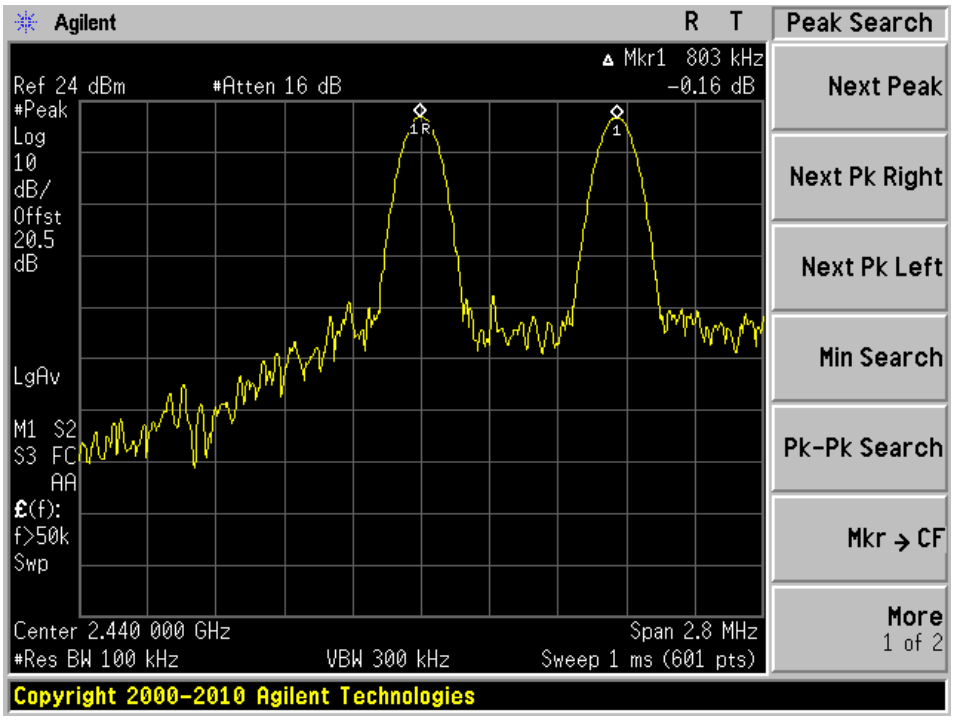


2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

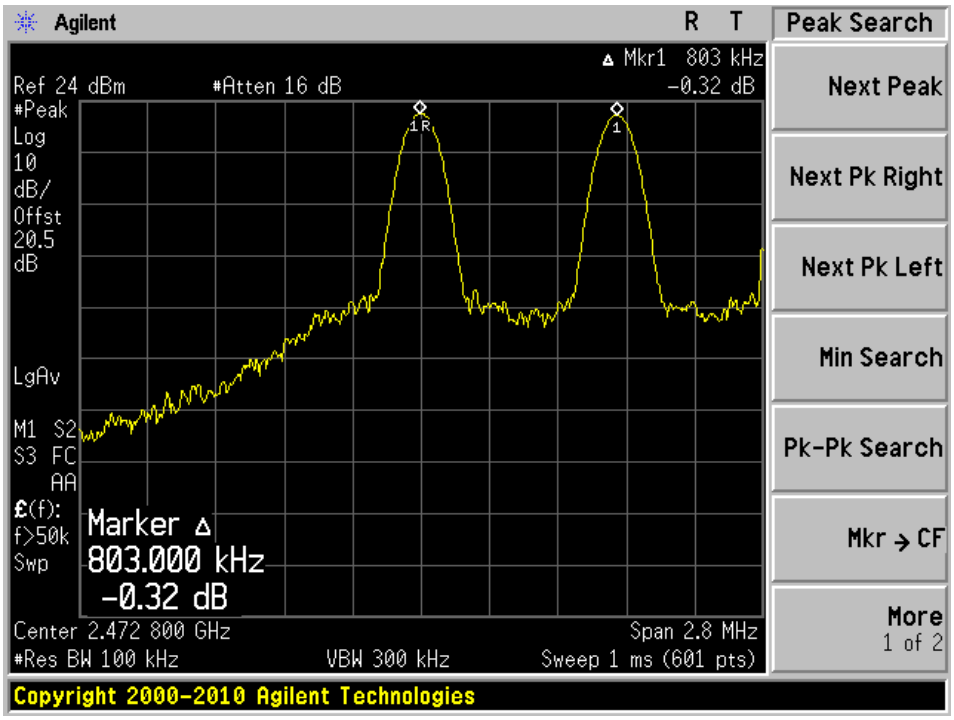
Low Channel



Middle Channel

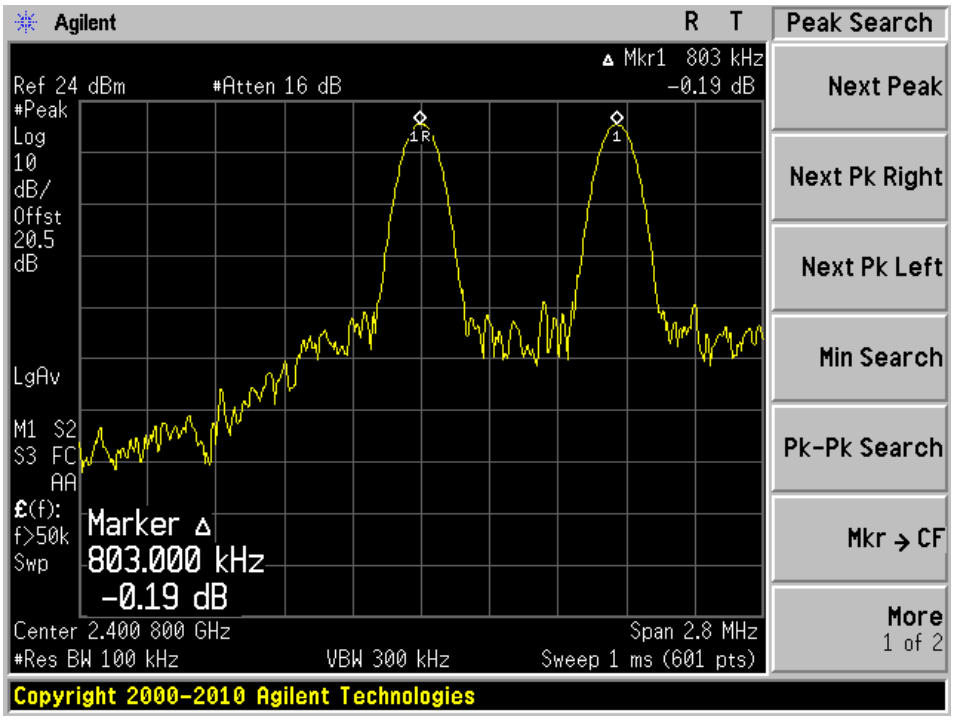


High Channel

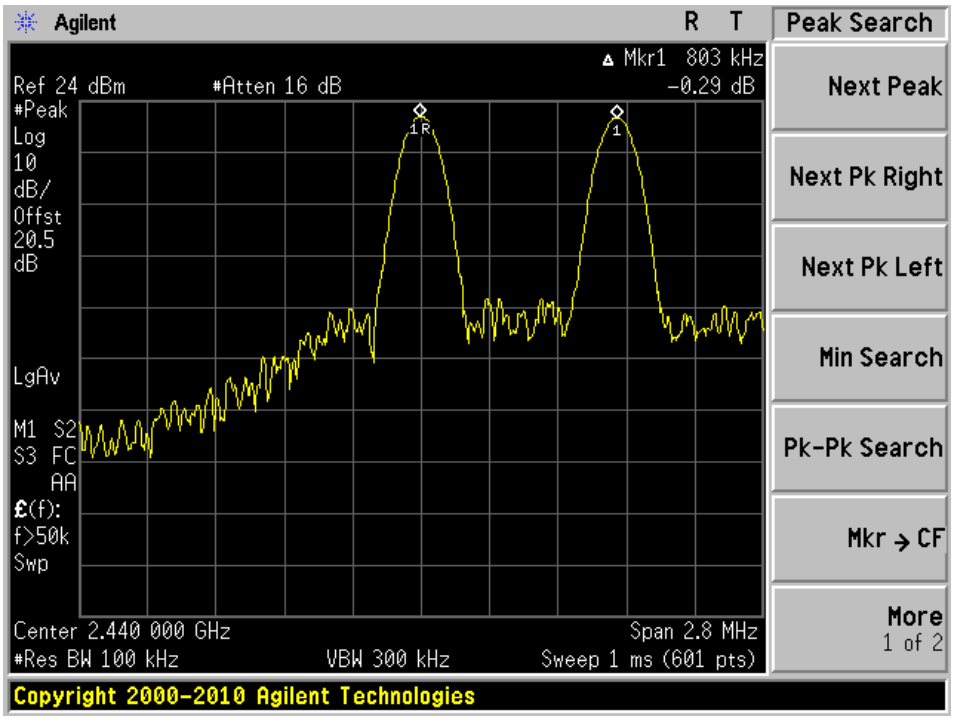


2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

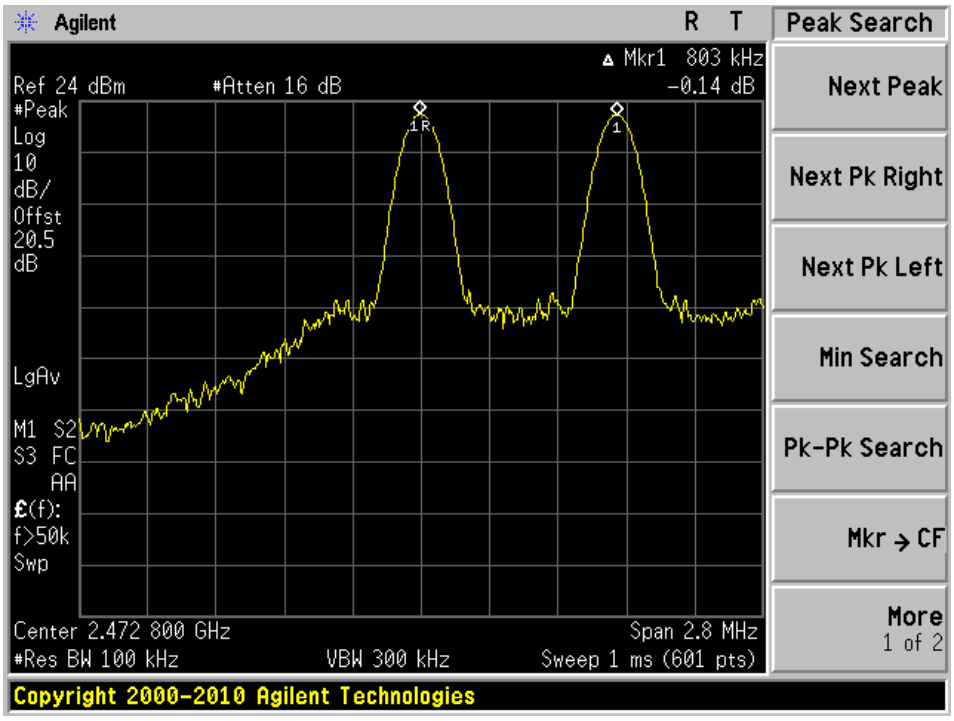
Low Channel



Middle Channel



High Channel



13 FCC §15.247(a) (1) (i) (iii) – Dwell Time

13.1 Applicable Standard

According to FCC §15.247(a) (1) (i) (iii), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

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.

13.2 Measurement Procedure

1. Span = Zero span, centered on a hopping channel.
2. RBW = 1 MHz.
3. VBW ≥ RBW.
4. Sweep = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = Peak.
6. Trace = Max hold.

13.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

13.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

The testing was performed by Wei on 2013-02-14 at RF site.

13.5 Test Results

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

Channel	Frequency (MHz)	Pulse width in 20 s (sec)	Limit Pulse (sec)/20 s	Result
Low	902.3	0.307	0.4	Compliant
Middle	914.6	0.307	0.4	Compliant
High	926.9	0.305	0.4	Compliant

900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing

Channel	Frequency (MHz)	Pulse width in 10 s (sec)	Limit Pulse (sec)/10 s	Result
Low	902.4	0.064	0.4	Compliant
Middle	914.4	0.063	0.4	Compliant
High	926.7	0.062	0.4	Compliant

2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

Channel	Frequency (MHz)	Pulse width (sec)	Limit 0.4 (sec)	Result
Low	2400.8	0.071	0.4	Compliant
Middle	2440	0.074	0.4	Compliant
High	2472.8	0.072	0.4	Compliant

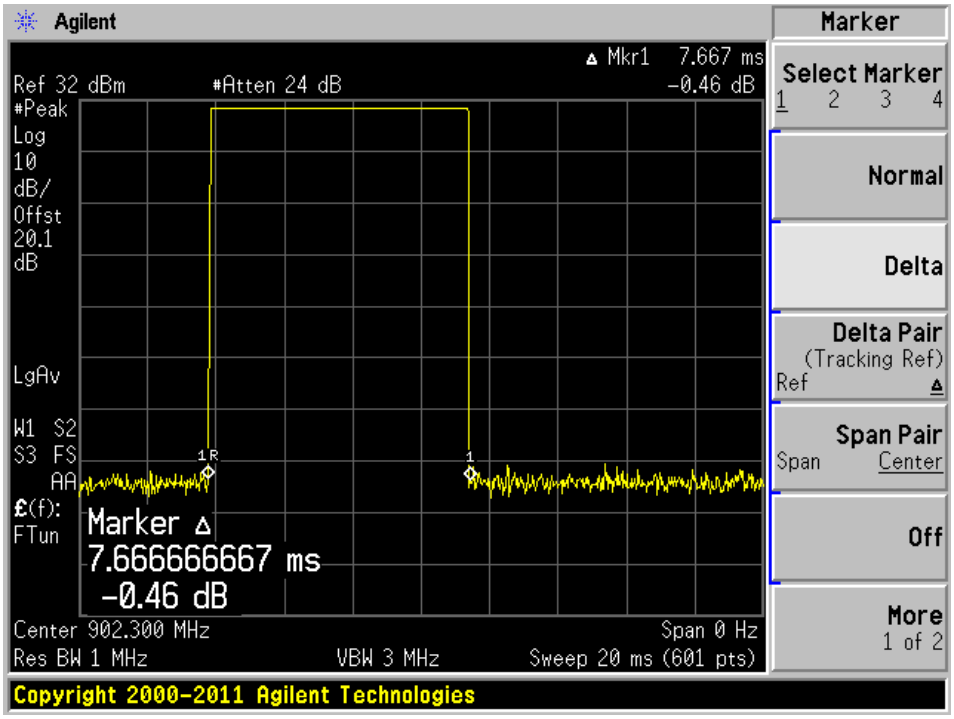
2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

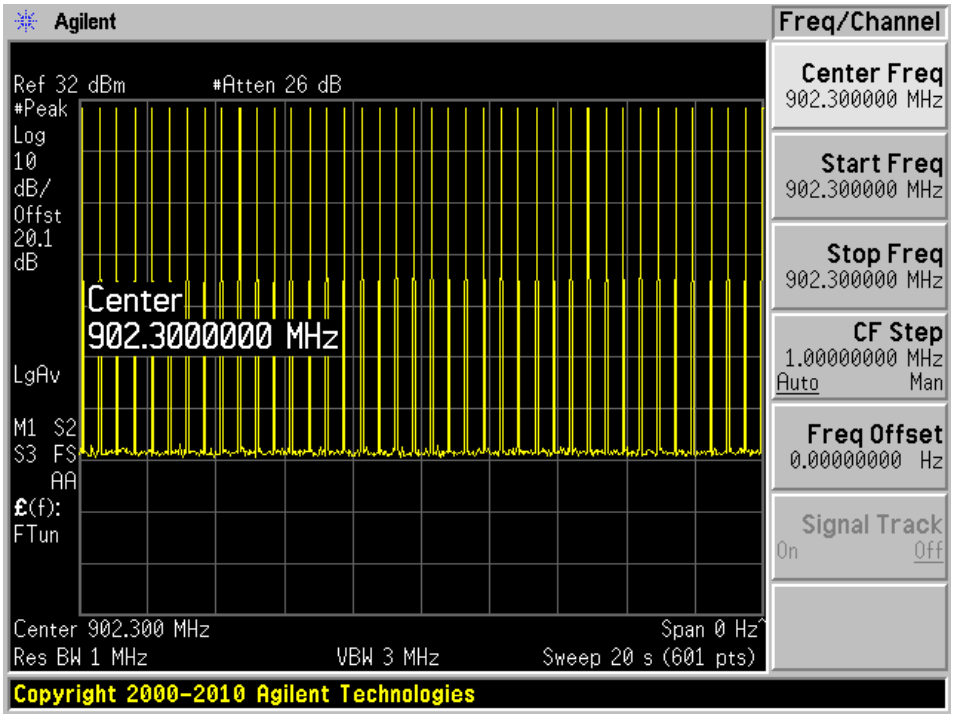
Channel	Frequency (MHz)	Pulse width (sec)	Limit 0.4 (sec)	Result
Low	2400.8	0.122	0.4	Compliant
Middle	2440	0.122	0.4	Compliant
High	2472.8	0.122	0.4	Compliant

Please refer to the following plots for detailed test results:

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

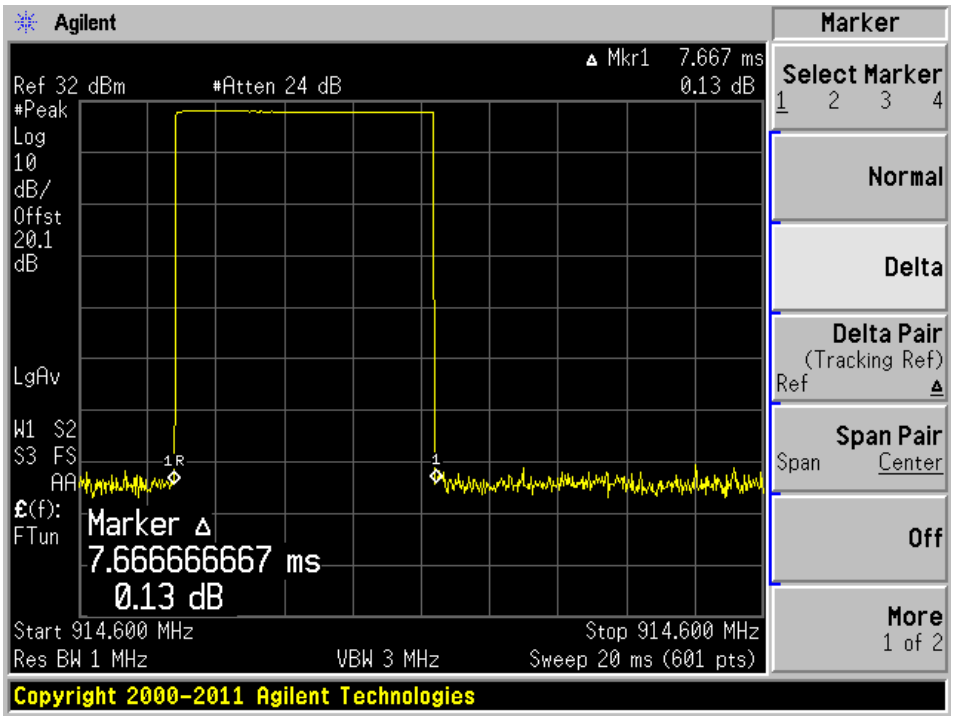
Low Channel

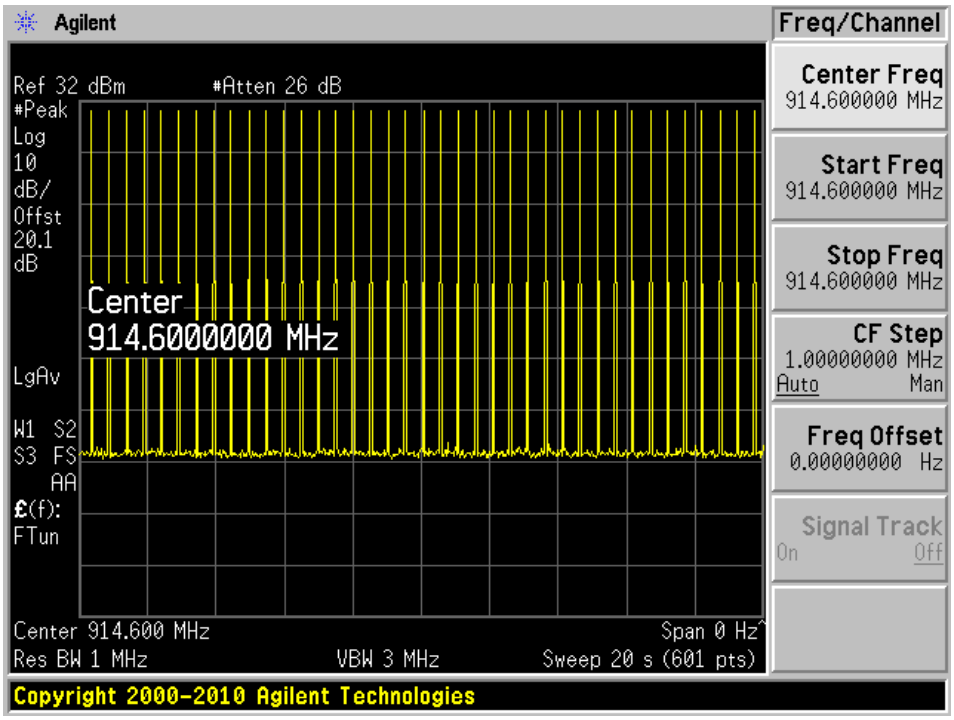




Dwell time = 40*7.667 ms = 306.68 ms

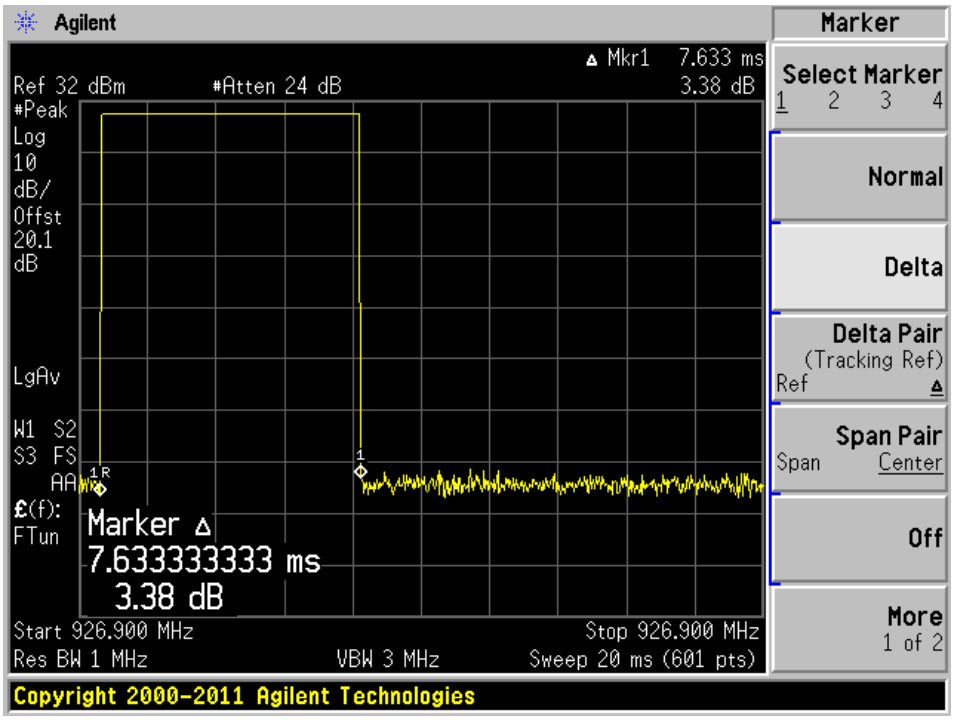
Middle Channel

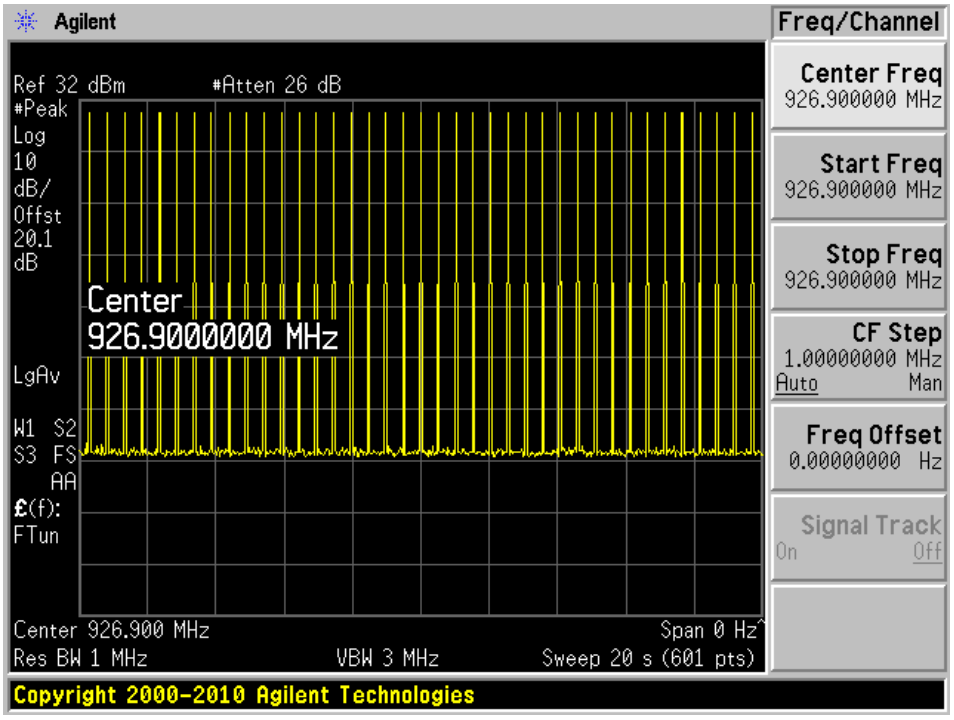




Dwell time = 40*7.667 ms = 306.68 ms

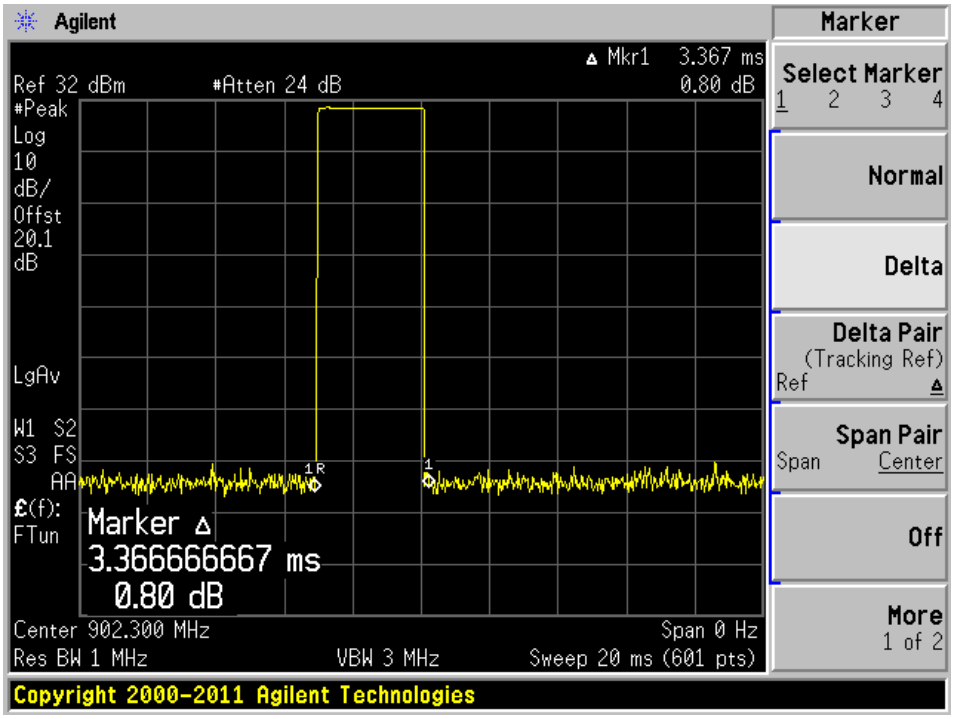
High Channel

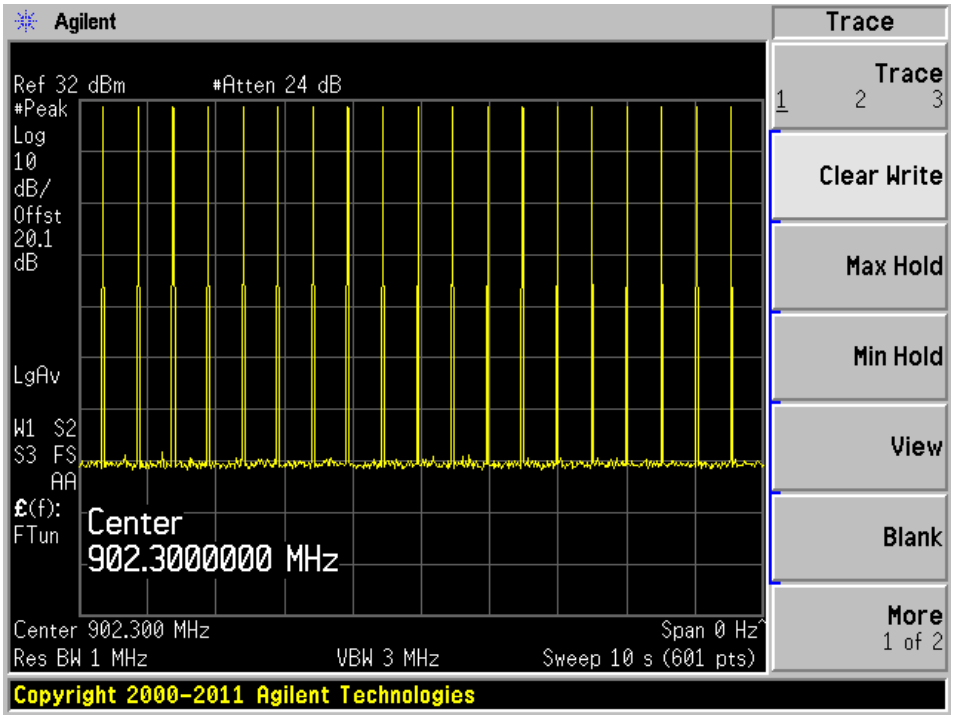




Dwell time = 40*7.633 ms = 305.32 ms

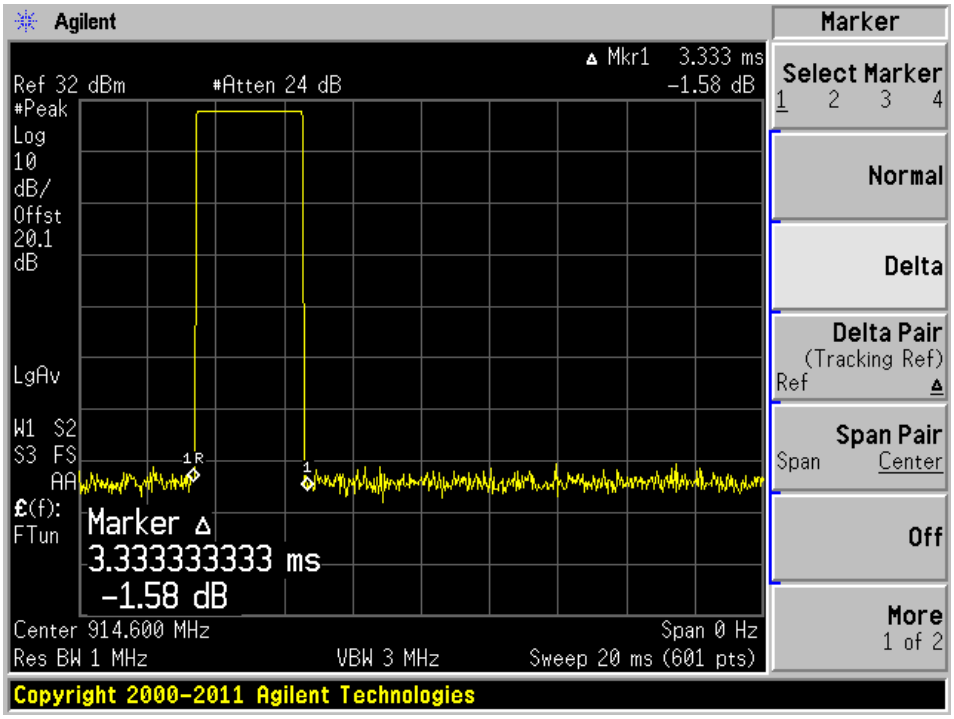
900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing
Low Channel

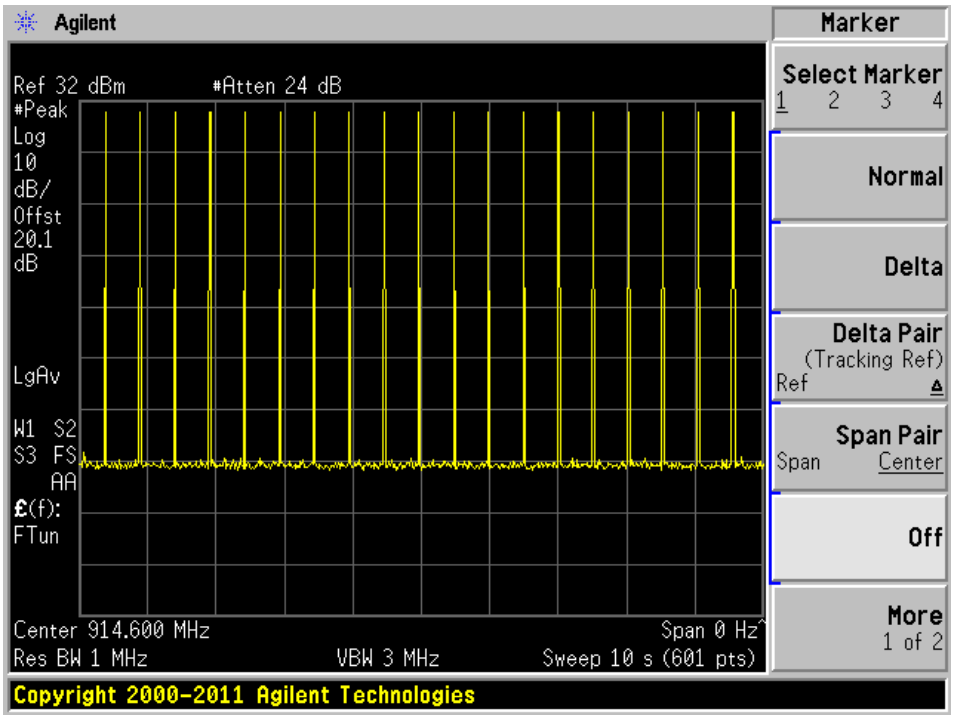




Dwell time = 19*3.367 ms = 63.973 ms

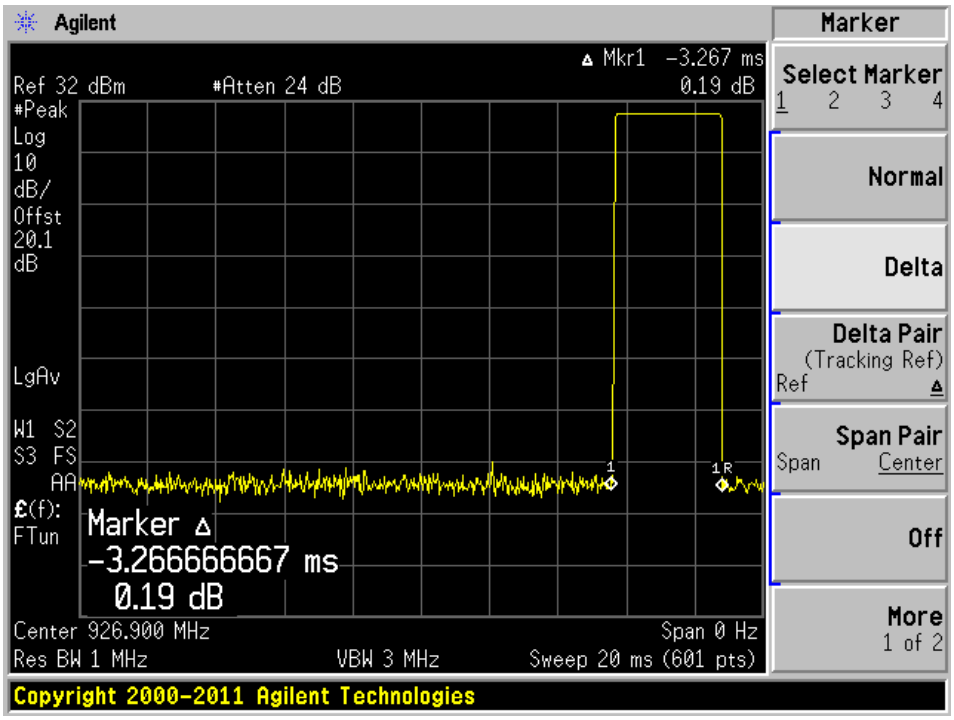
Middle Channel

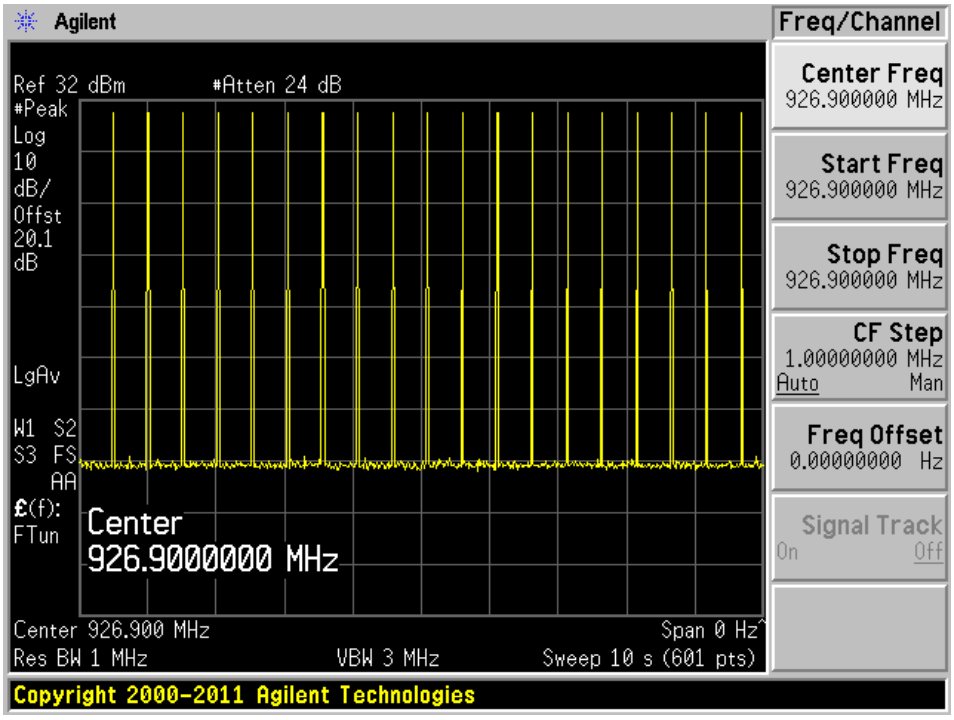




Dwell time = 19*3.333 ms = 63.327 ms

High Channel

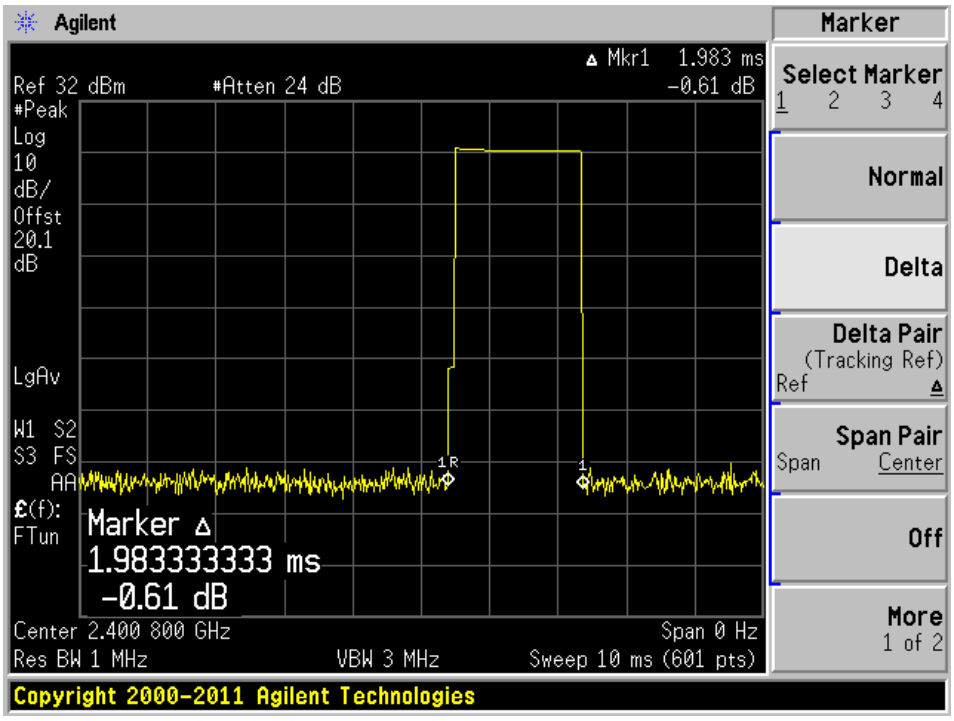




Dwell time = 19*3.267 ms = 62.073 ms

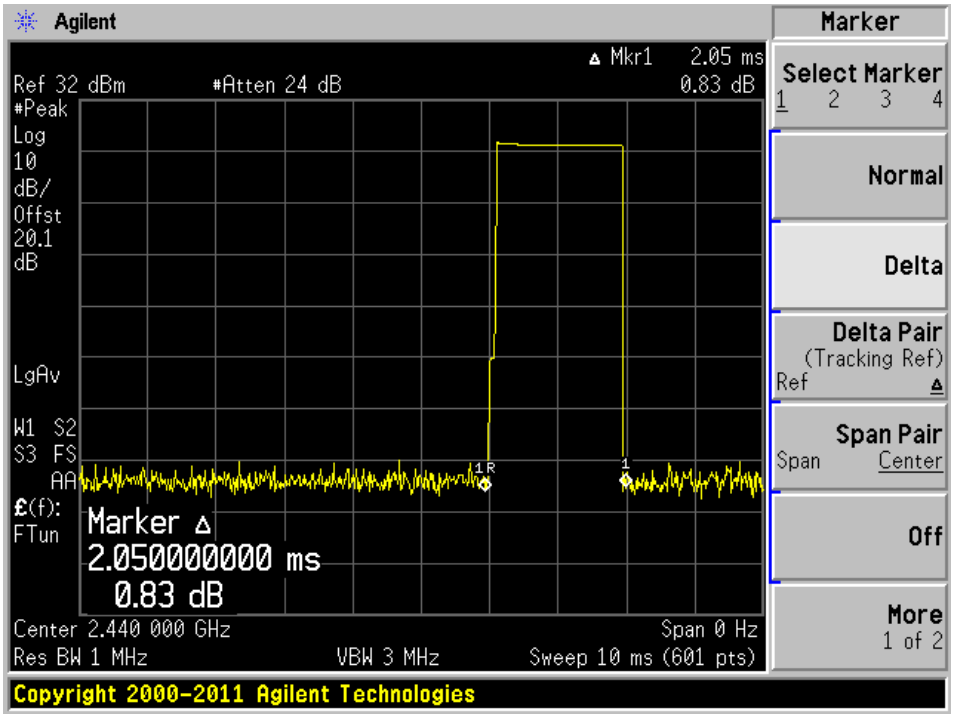
2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

Low Channel



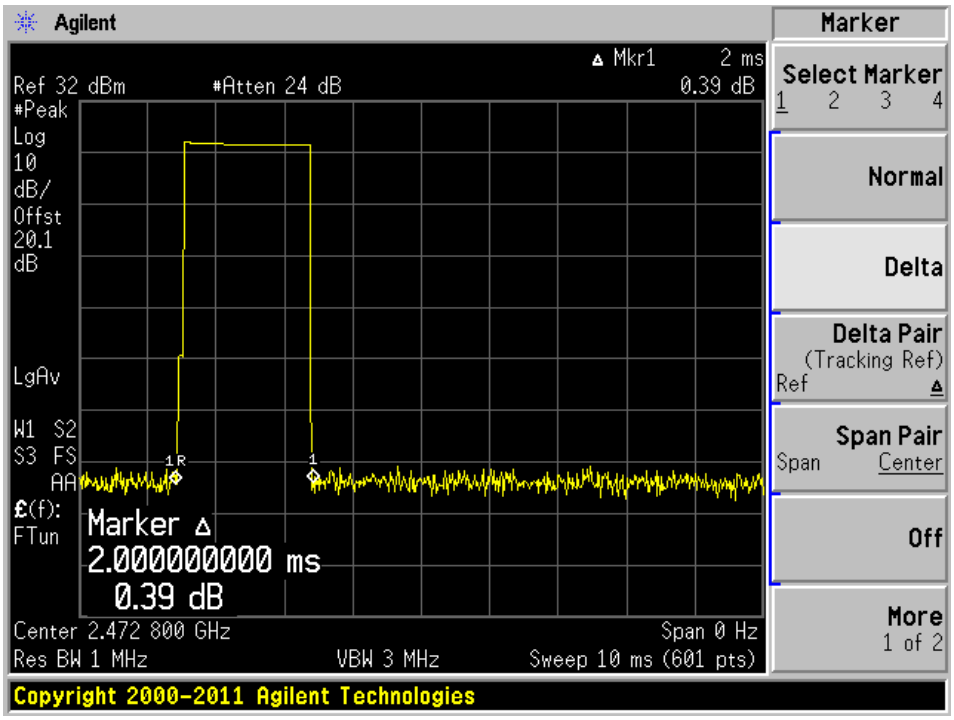
Dwell time = 90*1.983*0.4 ms = 71.388 ms

Middle Channel



Dwell time = 90*2.05*0.4 ms = 73.8 ms

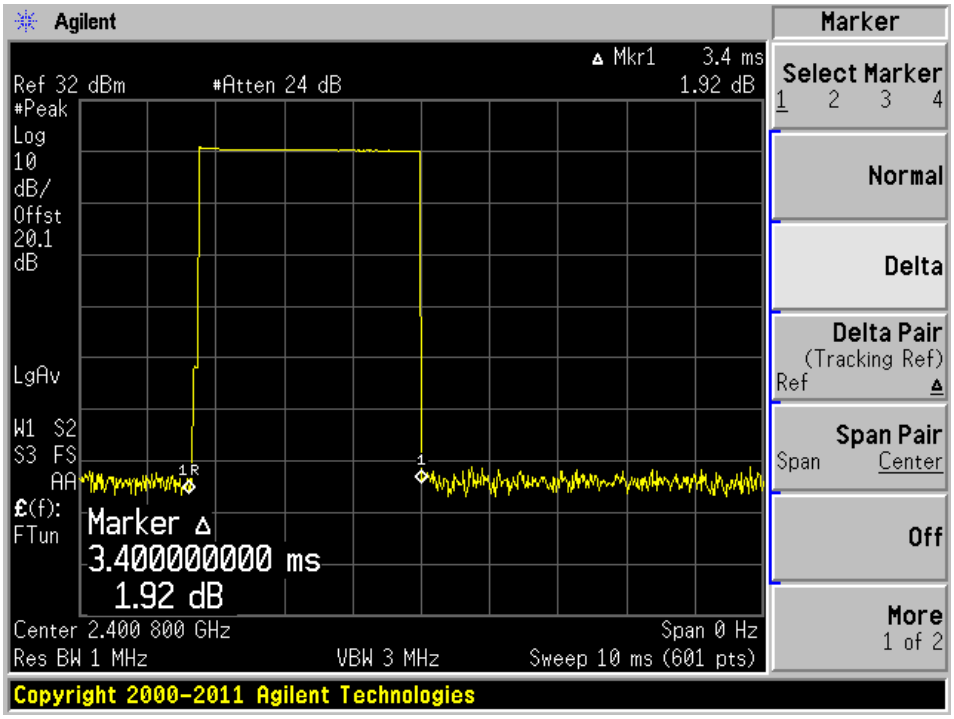
High Channel



Dwell time = 90*2*0.4 ms = 72 ms

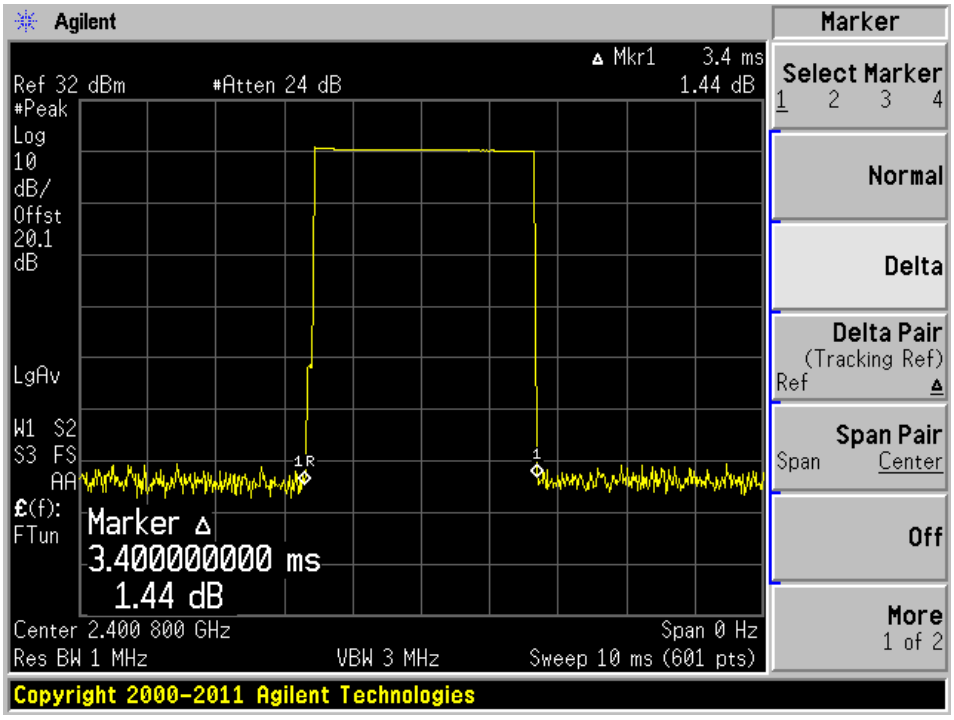
2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

Low Channel



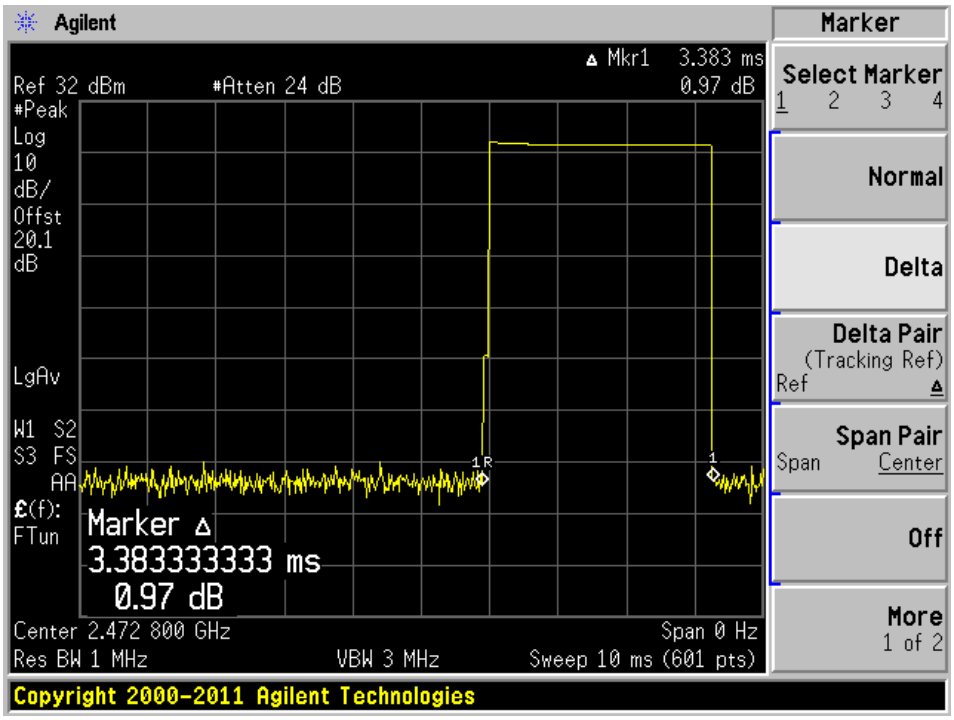
Dwell time = 90*3.4*0.4 ms = 122.4 ms

Middle Channel



Dwell time = 90*3.4*0.4 ms = 122.4 ms

High Channel



Dwell time = 90*3.383*0.4 ms = 121.788 ms

14 FCC §15.247(a) (1) (i) (iii) – Number of Hopping Channel Used

14.1 Applicable Standard

According to FCC §15.247(a) (1) (i) (iii), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

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.

14.2 Measurement Procedure

1. Span = the frequency band of operation.
2. RBW = ≥ 1% of the span.
3. VBW ≥ RBW.
4. Sweep = Auto.
5. Detector function = Peak.
6. Trace = Max hold.

14.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	US42221851	2012-02-28	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

14.4 Test Environmental Conditions

Temperature:	22-24 °C
Relative Humidity:	42-45 %
ATM Pressure:	101-102kPa

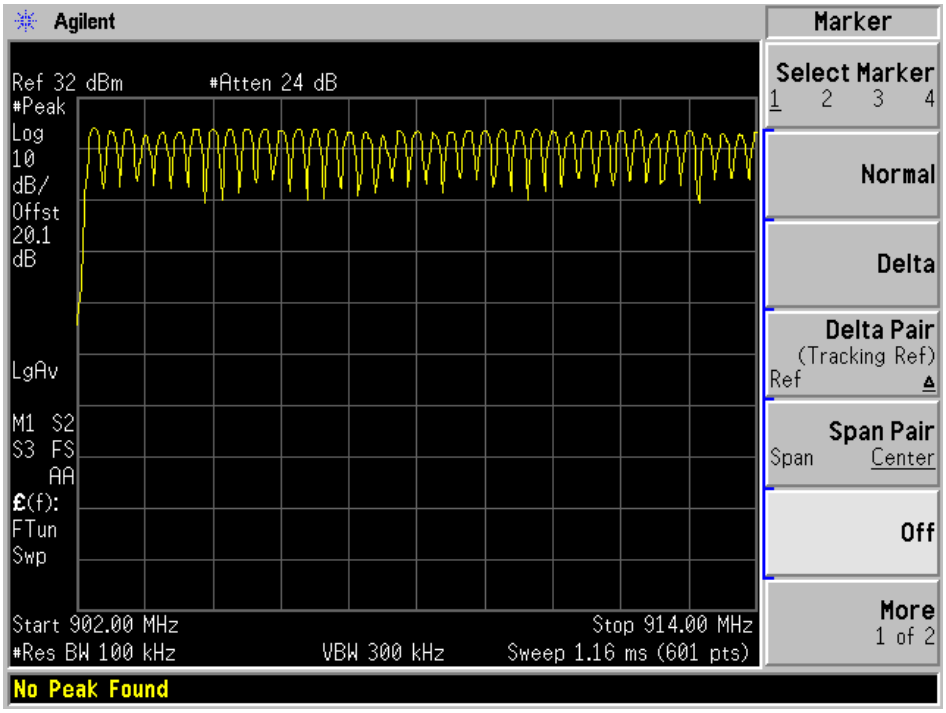
The testing was performed by Wei on 2013-02-14 at RF site.

14.5 Test Results

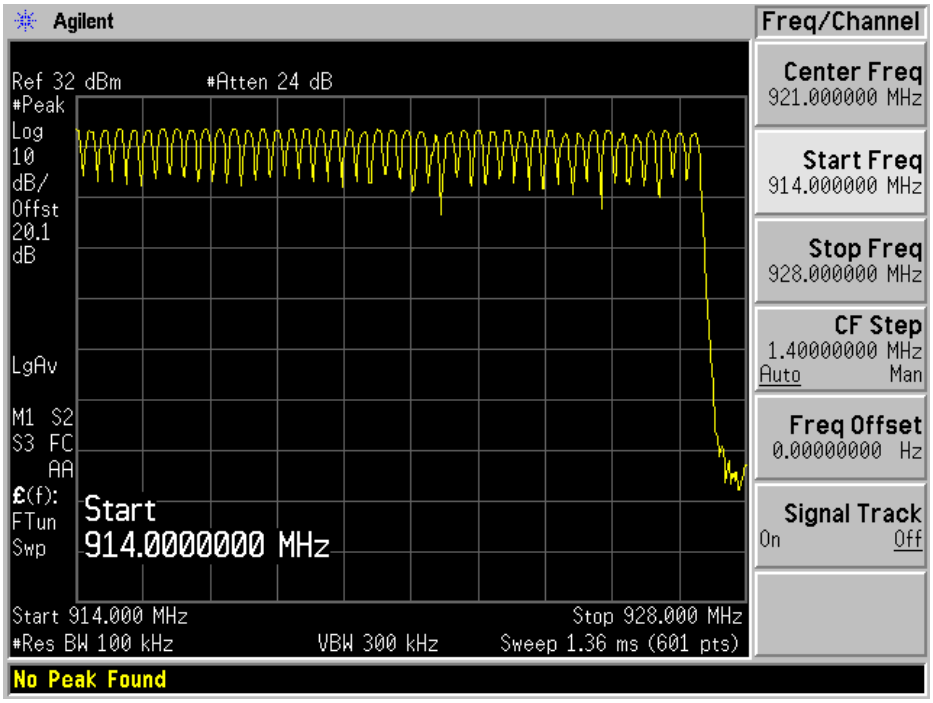
Please refer to the following plots for detailed test results:

900 MHz FSK Modulation, 100 kbps data rate, 300 kHz channel spacing

902 MHz to 914 MHz



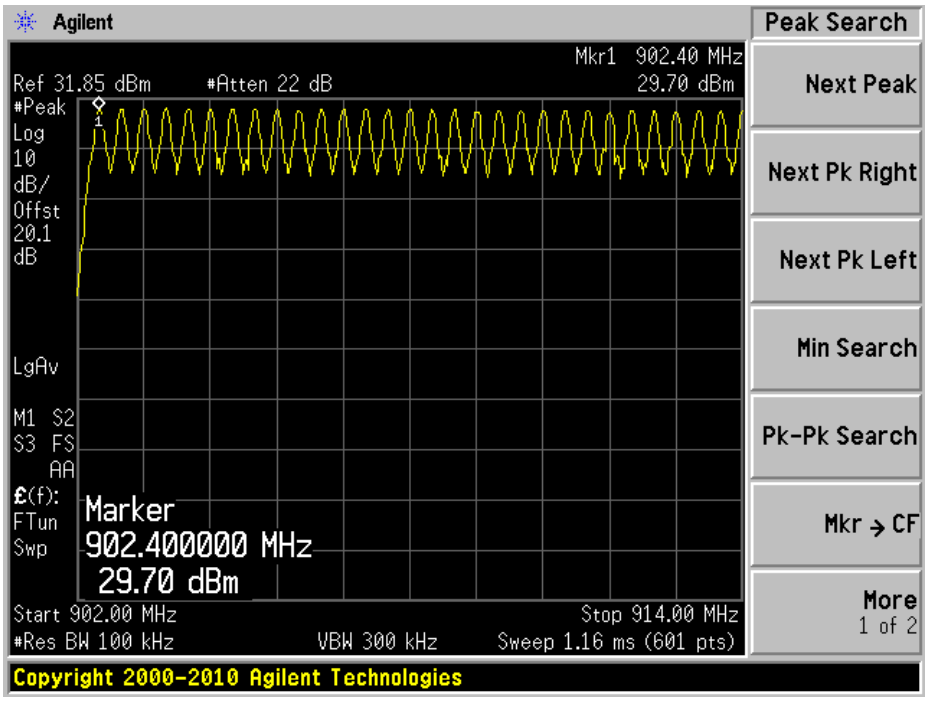
Total 40 Pulses



Total 43 Pulses

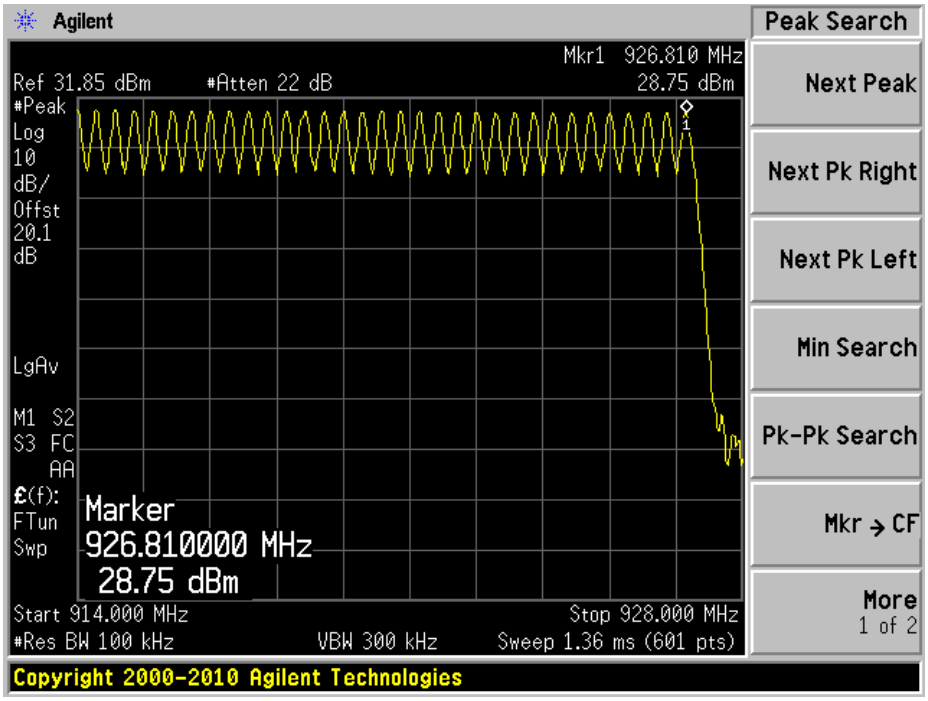
900 MHz GFSK Modulation, 300 kbps data rate, 400 kHz channel spacing

902 MHz to 914 MHz



Total 30 Pulses

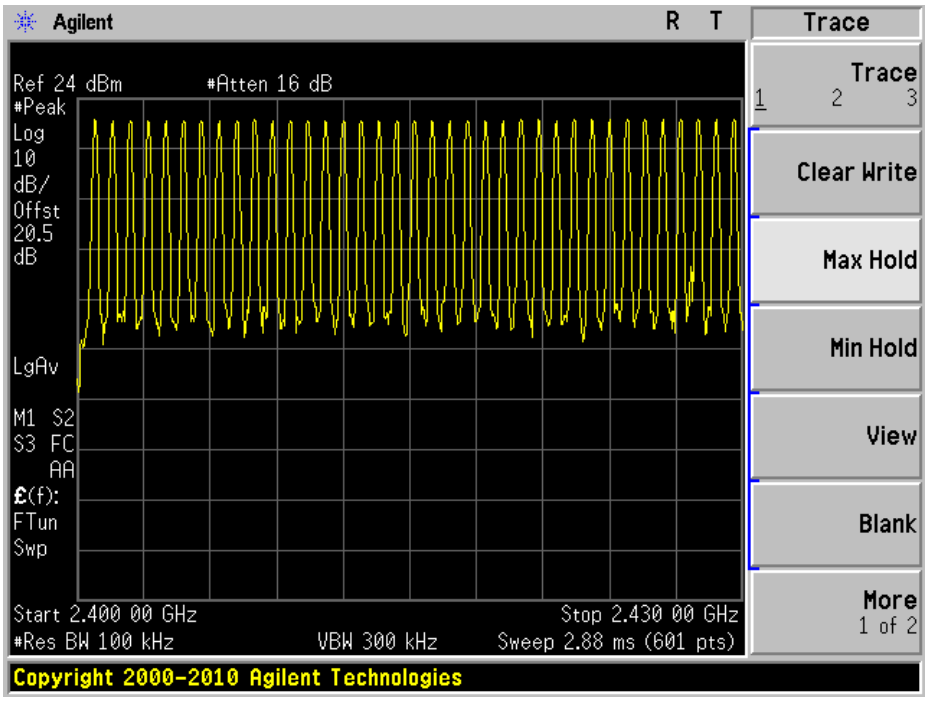
914 MHz to 928 MHz



Total 32 Pulses

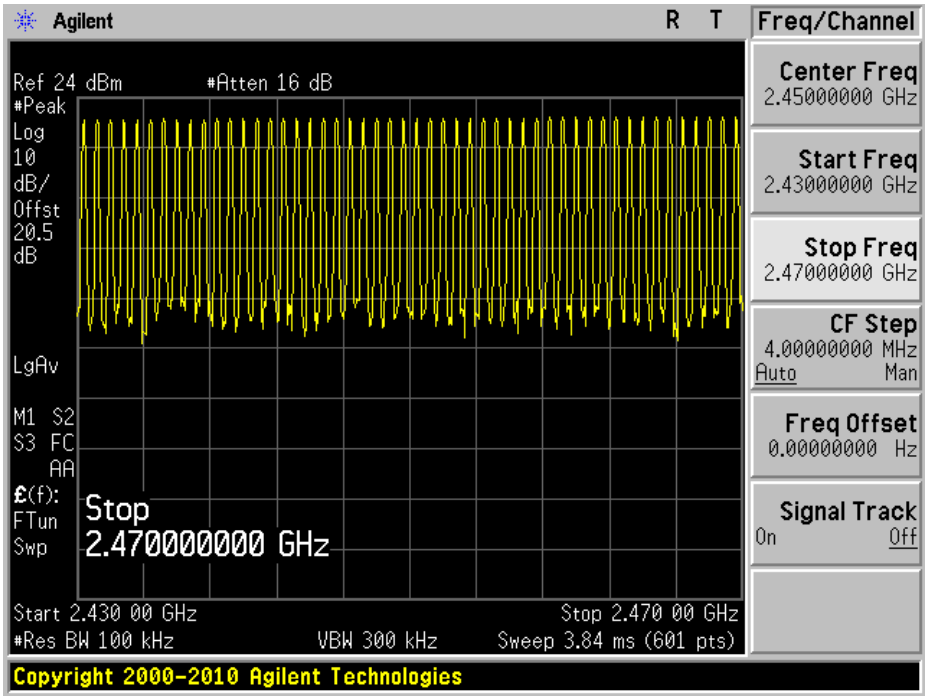
2.4 GHz GFSK Modulation, 500 kbps data rate, 800 kHz channel spacing

2400 MHz to 2430 MHz



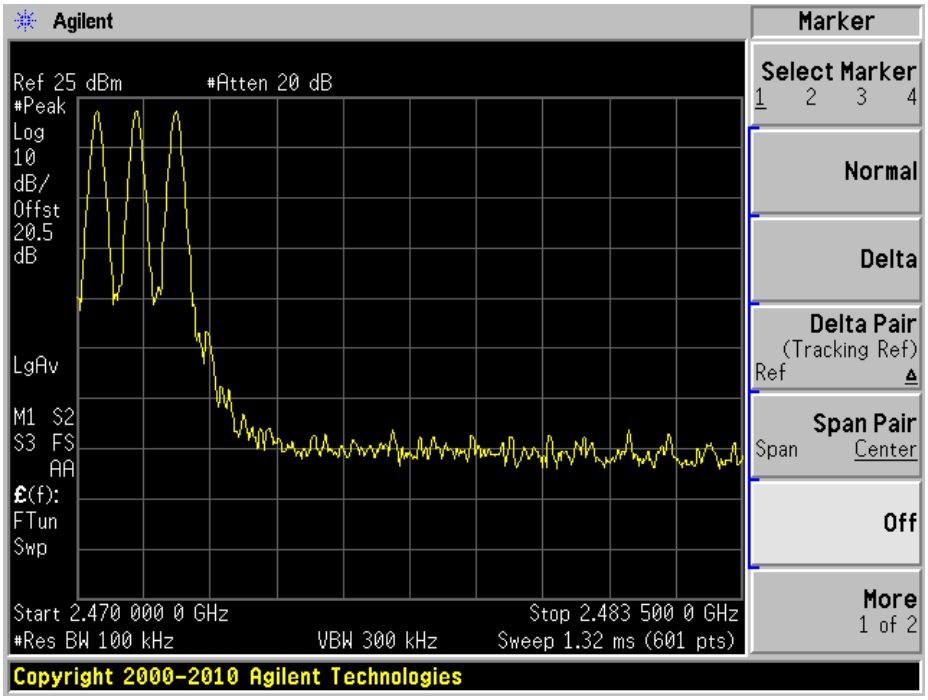
Total 37 Pulses

2430 MHz to 2470 MHz



Total 50 Pulses

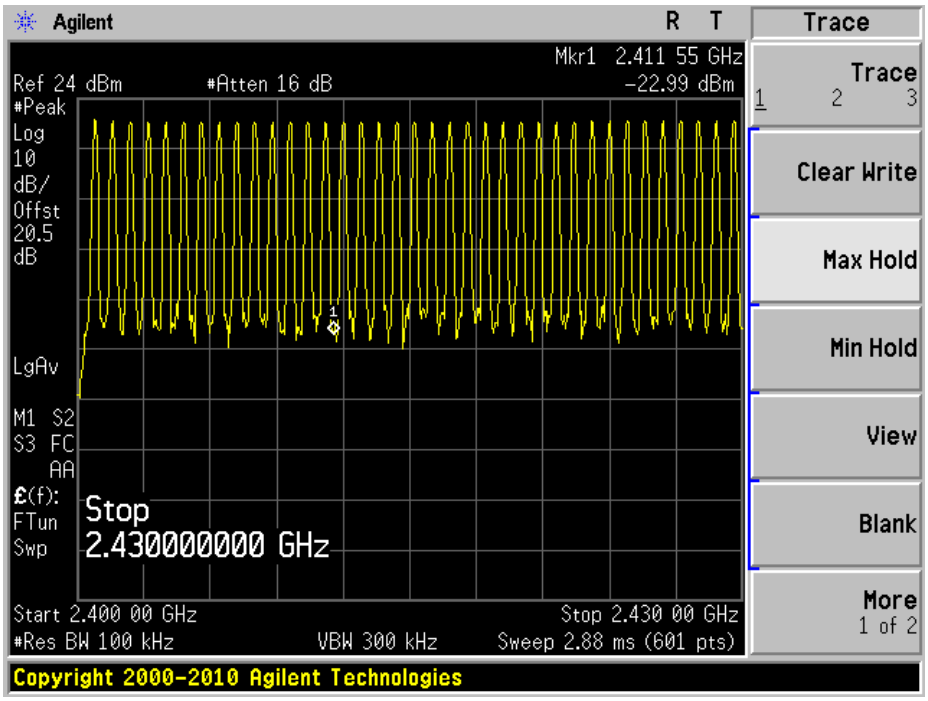
2470 MHz to 2483.5 MHz



Total 3 Pulses

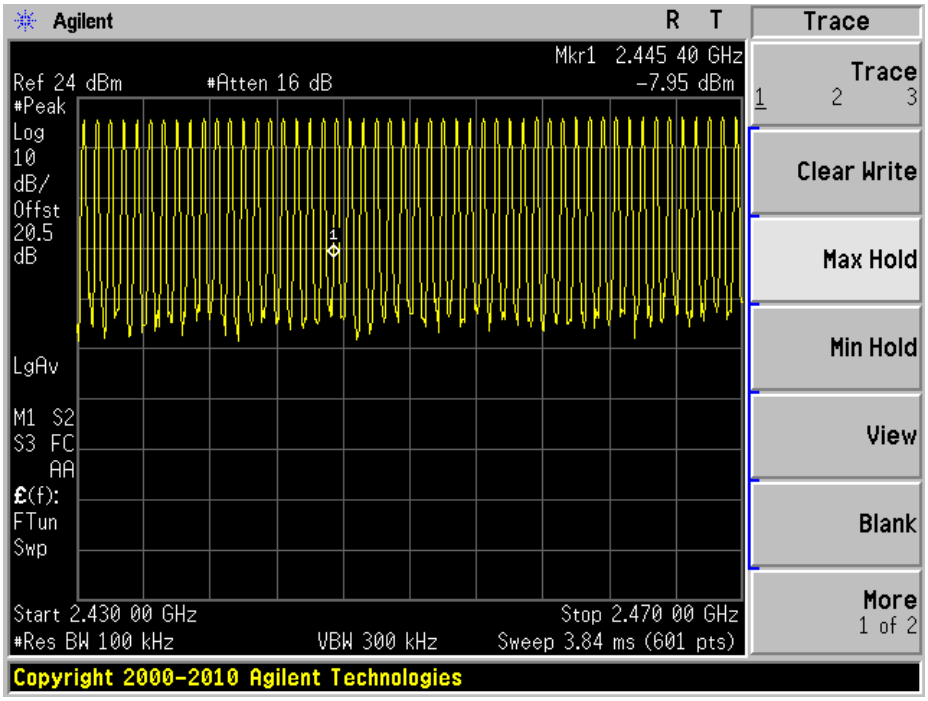
2.4 GHz GFSK Modulation, 250 kbps data rate, 800 kHz channel spacing

2400 MHz to 2430 MHz



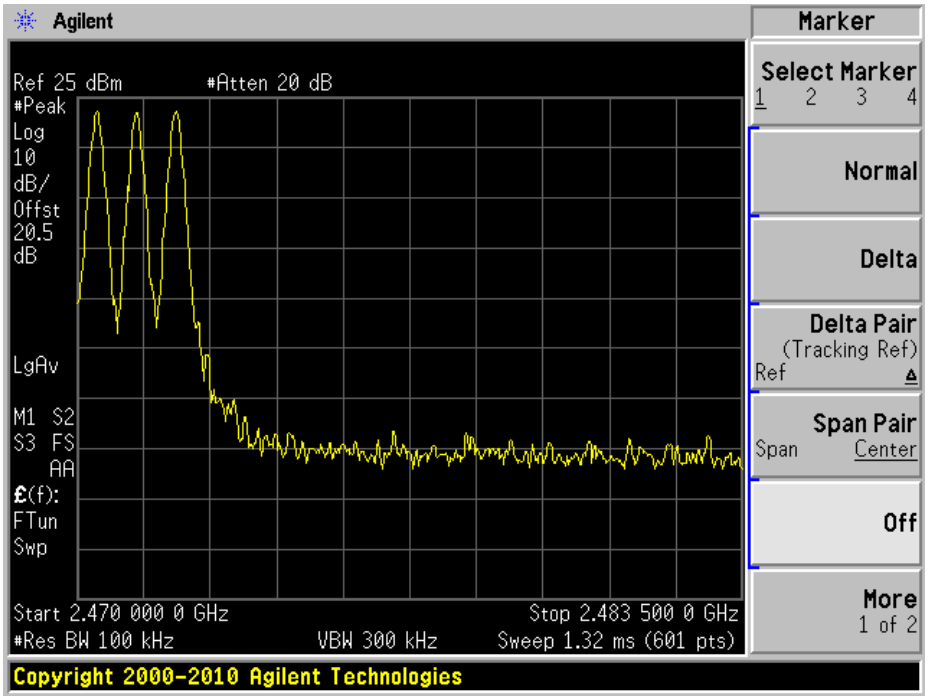
Total 37 Pulses

2430 MHz to 2470 MHz



Total 50 Pulses

2470 MHz to 2483.5 MHz



Total 3 Pulses

17.11 EUT – Antenna

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