FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

BLUETOOTH HEADSET

MODEL NUMBER: A1221

FCC ID: BCGA1221

REPORT NUMBER: 07U11077-1B

ISSUE DATE: JUNE 14, 2007

Prepared for
APPLE COMPUTER INC.
1 INFINITE LOOP
CUPERTINO, CA. 95014, USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/11/07	Initial Issue	T. Chan
B	06/14/07	Removed MPE Section	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE COMPUTER INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, USA

EUT DESCRIPTION: BLUETOOTH HEADSET

MODEL: A1221

SERIAL NUMBER: 2B7180000CC

DATE TESTED: MAY 24 TO JUNE 04, 2007

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth transceiver module operating in the 2400-2483.5 MHz band. Its radio module is manufactured by Foxlink.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

GFSK Modulation:

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	1.41	1.38

QPSK Modulation:

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	0.40	1.10

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a flat antenna, with a maximum gain of 1.07 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host laptop equipment during testing was BC4 firmware version 4253.

The test utility software used during testing was Blue Test, rev. 1.24.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2402 MHz.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
CBT Bluetooth Test	RHODE&SCHWARDZ	1153.9000.35	10/6/2174	N/A
LapTop	DELL	PP15L	14132551105	DoC

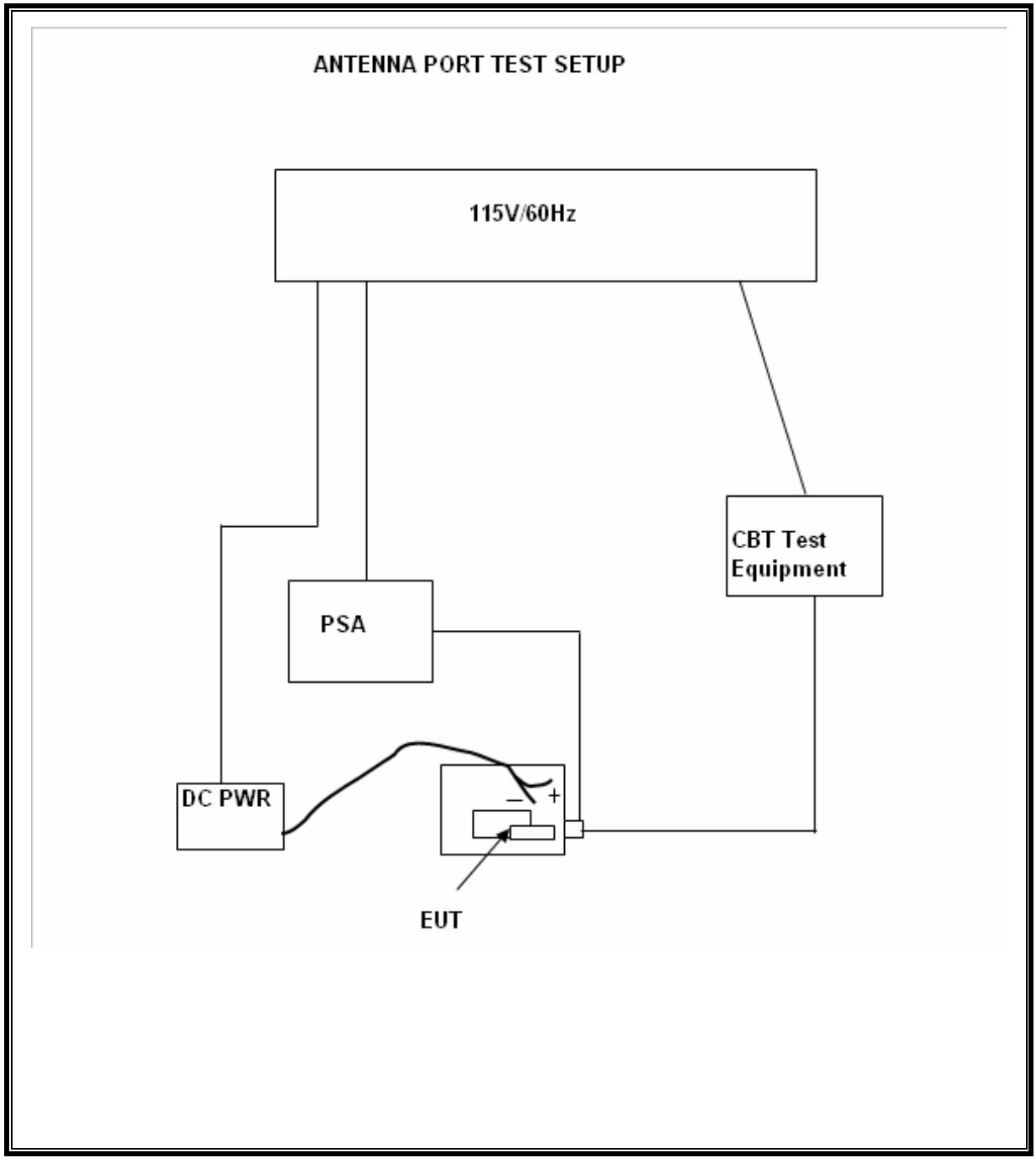
I/O CABLES

N/A

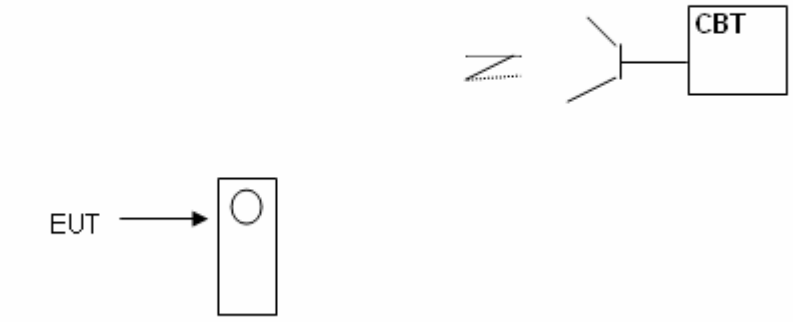
TEST SETUP

The EUT is installed in a test fixture connected to host laptop computer during the tests . Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



RADIATED EMISSIONS TEST SETUP



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
SA RF Section, 1.5 GHz	Agilent / HP	85680B	2814A04227	1/7/2008
Quasi-Peak Adaptor	Agilent / HP	85650A	3145A01654	1/21/08
SA Display Section 2	Agilent / HP	85662A	2816A16696	4/7/08
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	8/13/07
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42070220	11/26/07
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/08
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00369	8/1/07
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/07
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/07
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/18/07

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS

7.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

GFSK Modulation:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	923.441
Middle	2441	922.769
High	2480	922.739

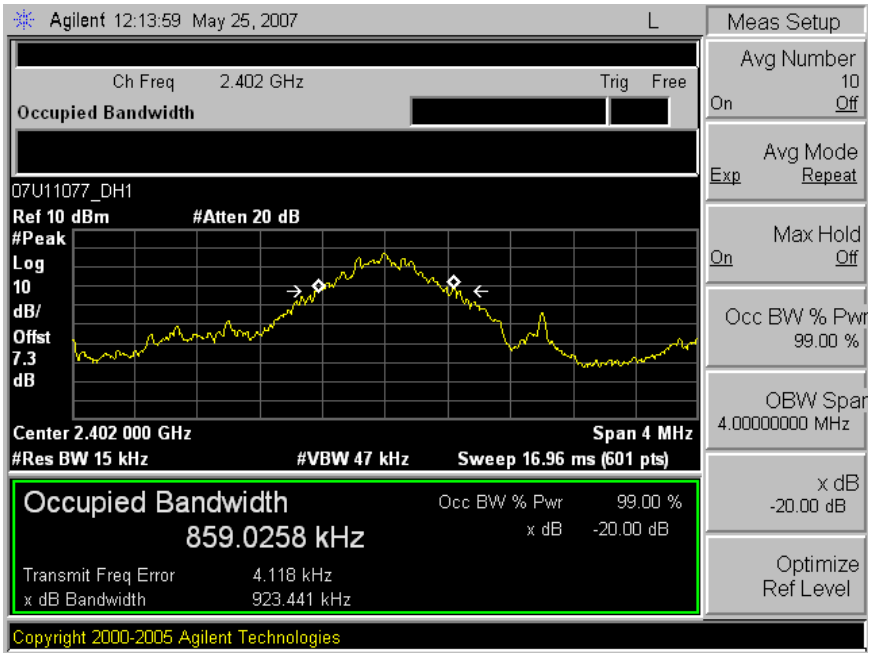
QPSK Modulation:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	1234
Middle	2441	1200
High	2480	1298

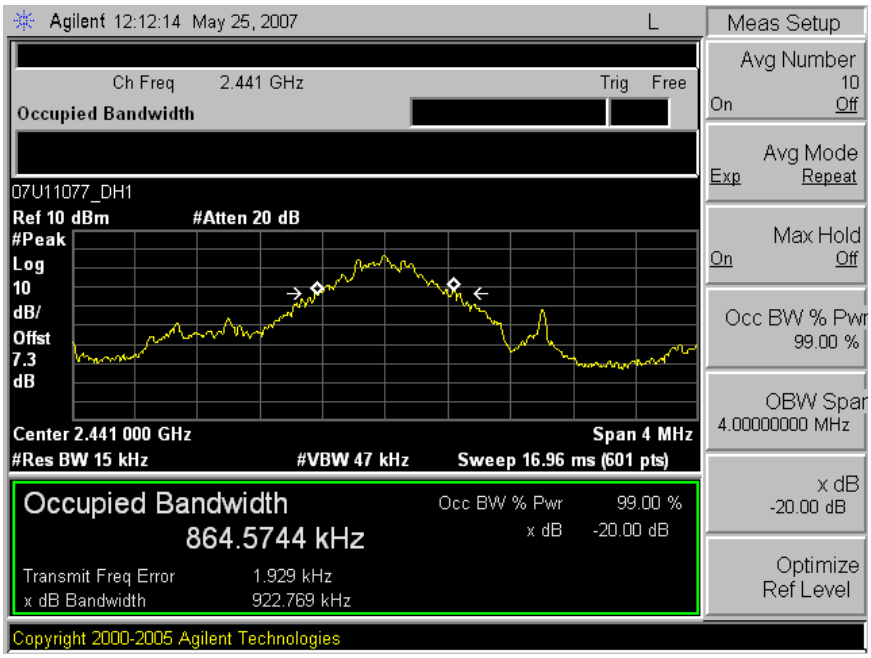
20 dB BANDWIDTH:

GFSK Modulation:

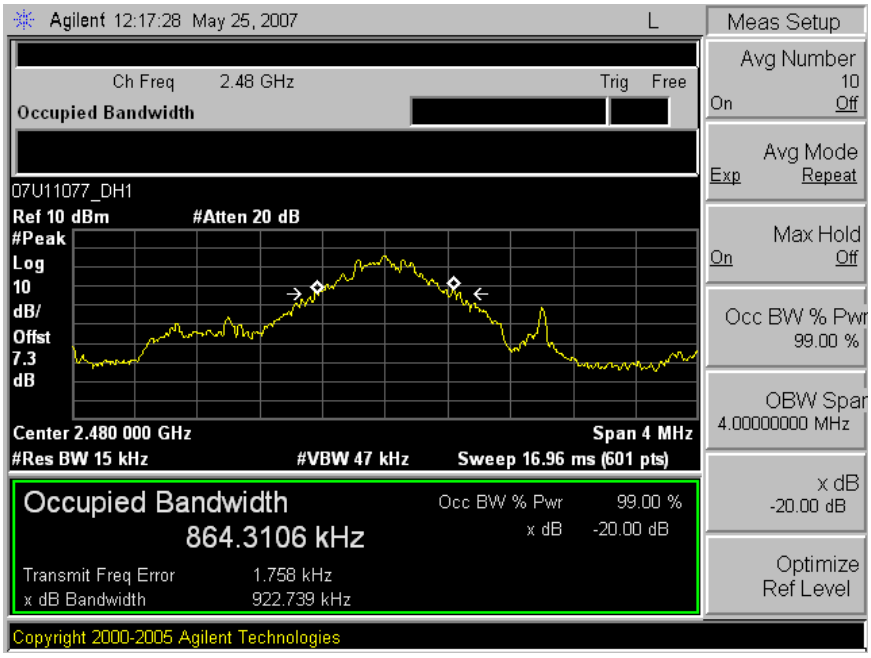
20 dB BANDWIDTH LOW CH



20 dB BANDWIDTH MID CH

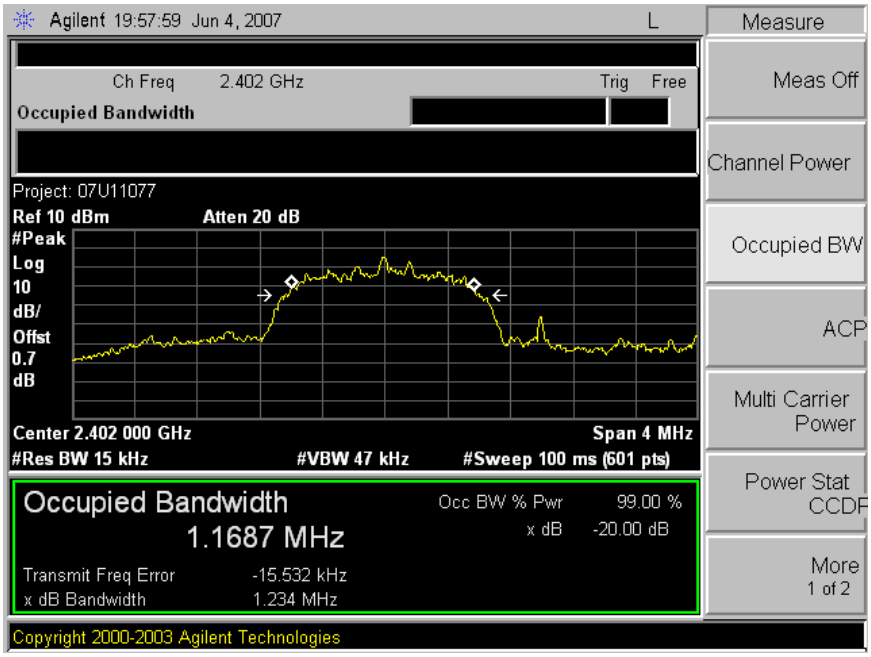


20 dB BANDWIDTH HIGH CH

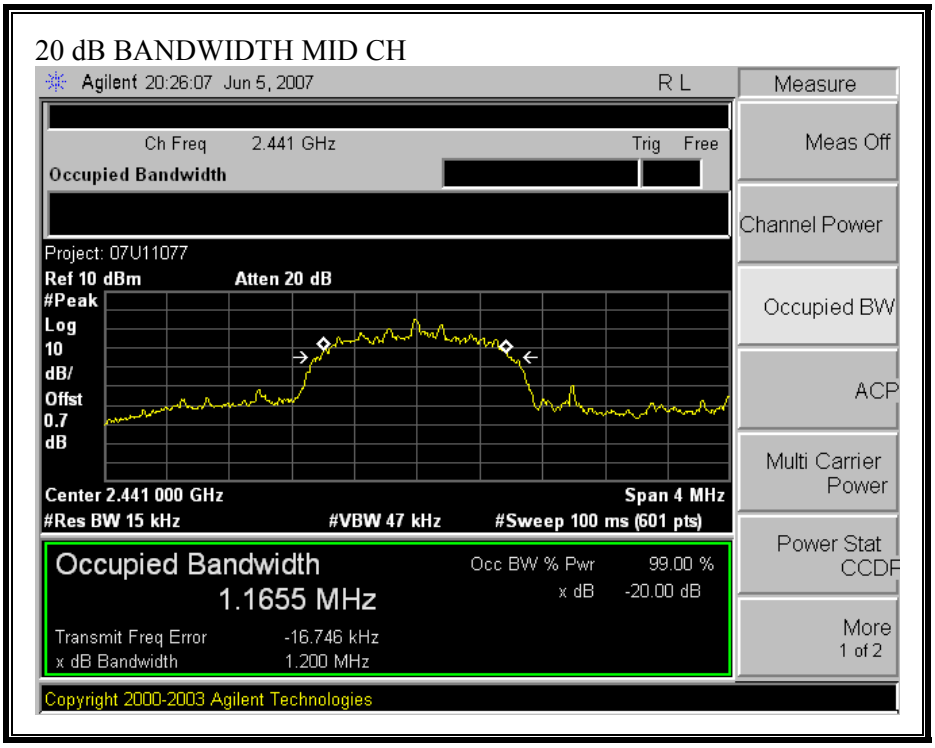


QPSK Modulation:

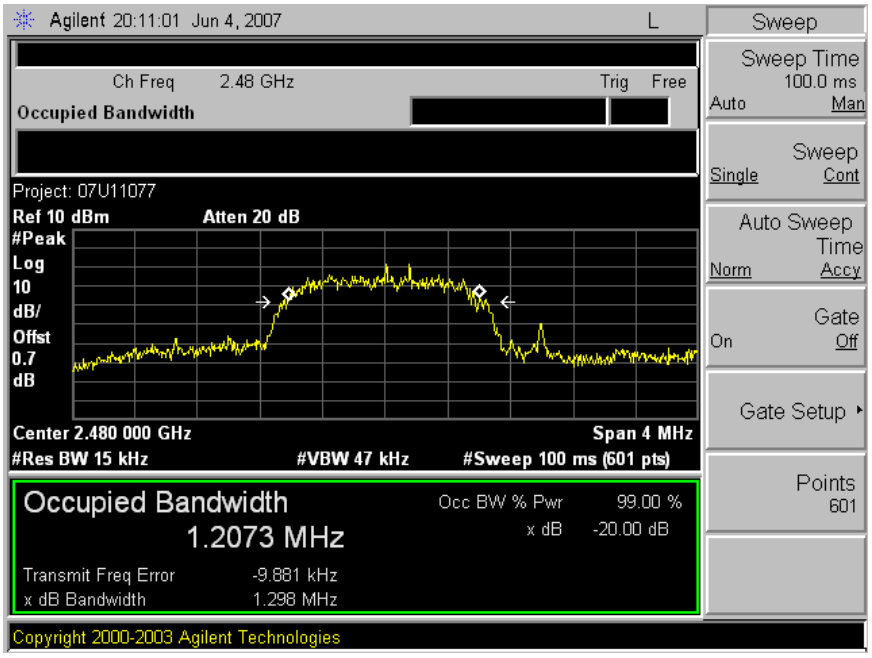
20 dB BANDWIDTH LOW CH



20 dB BANDWIDTH MID CH



20 dB BANDWIDTH HIGH CH



7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

§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 hoping channel, whichever is greater.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

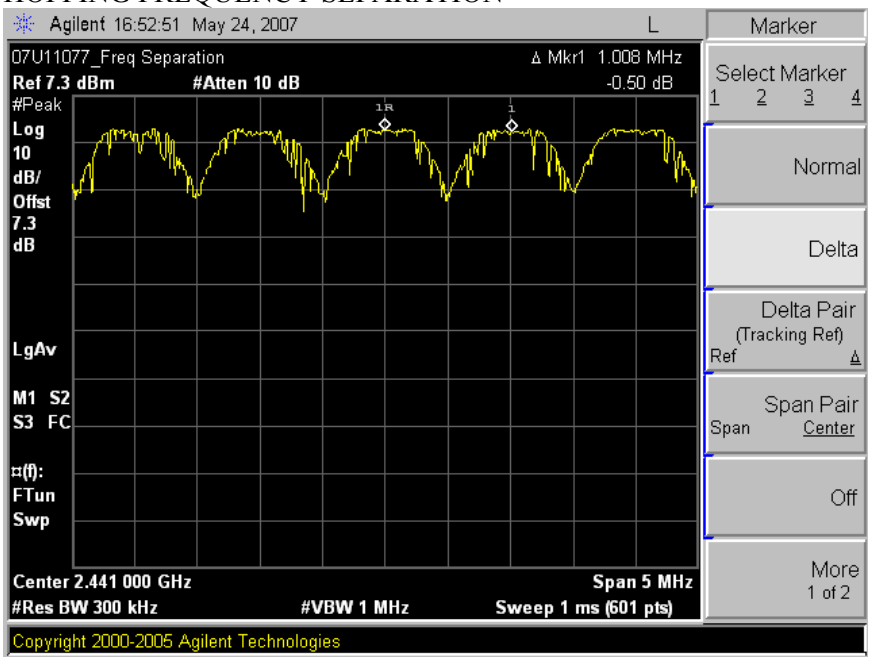
RESULTS

No non-compliance noted:

HOPPING FREQUENCY SEPARATION

GFSK Modulation

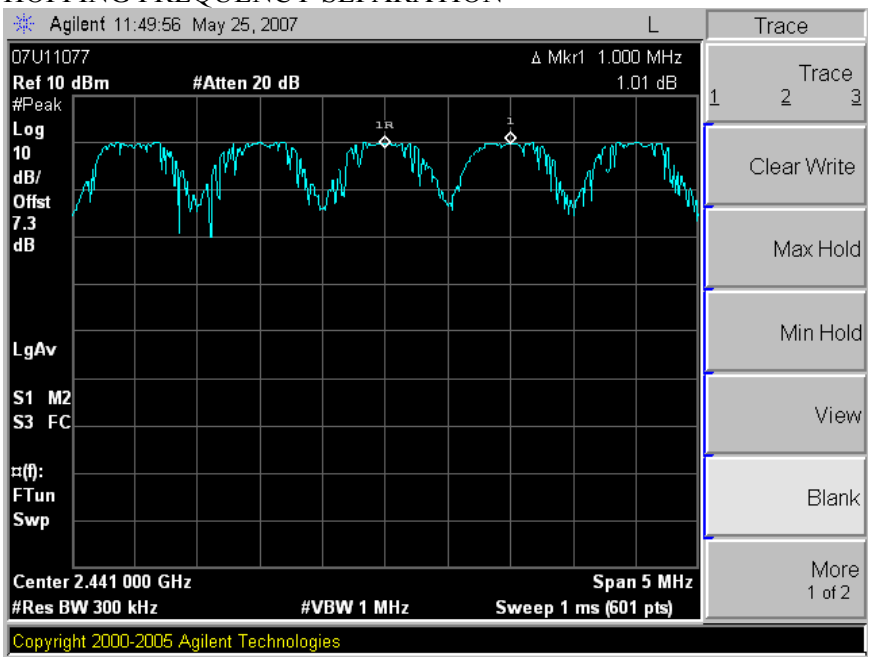
HOPPING FREQUENCY SEPARATION



HOPPING FREQUENCY SEPARATION

QPSK Modulation

HOPPING FREQUENCY SEPARATION



7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

RESULTS

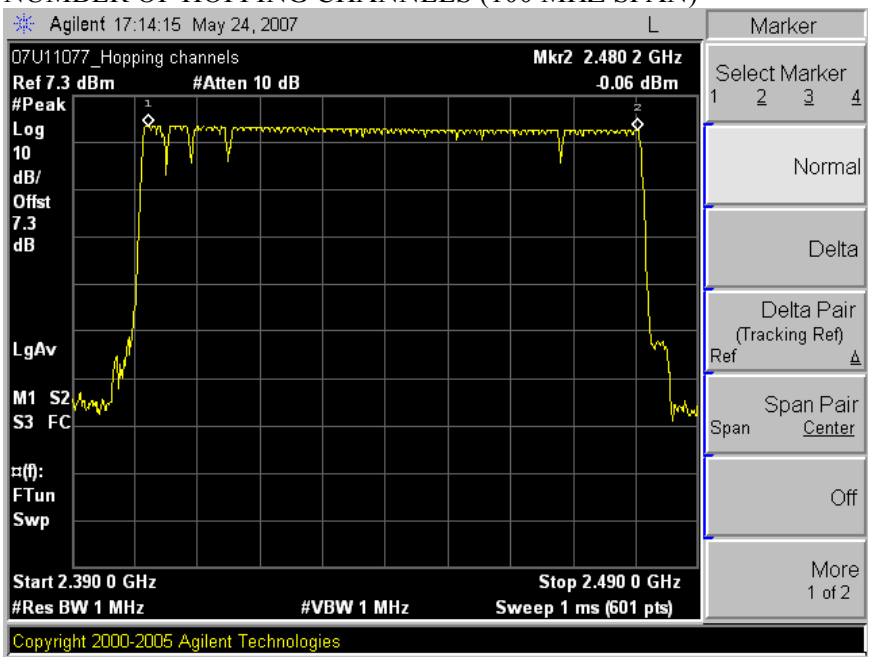
No non-compliance noted:

79 Channels observed.

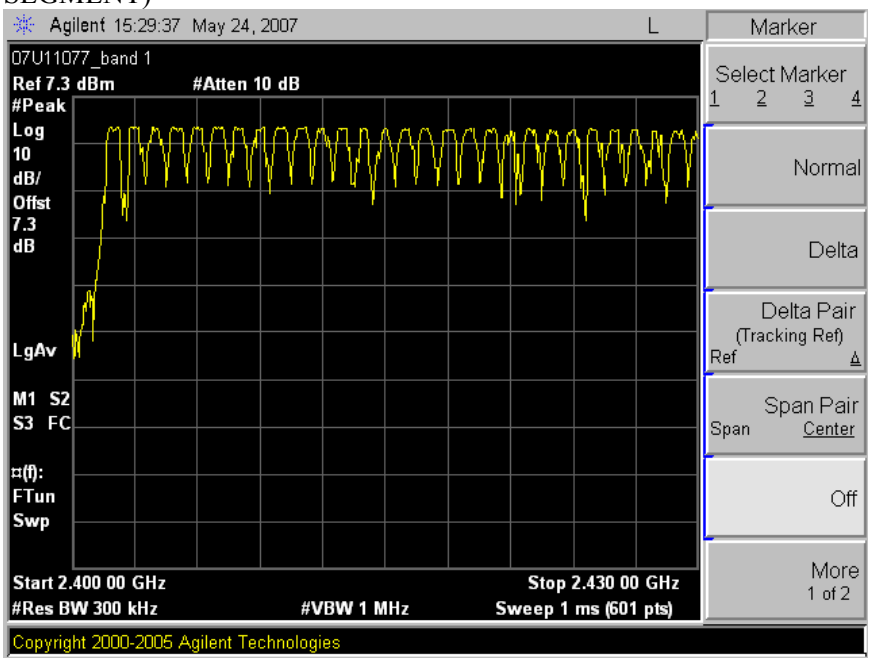
GFSK Modulation

NUMBER OF HOPPING CHANNELS

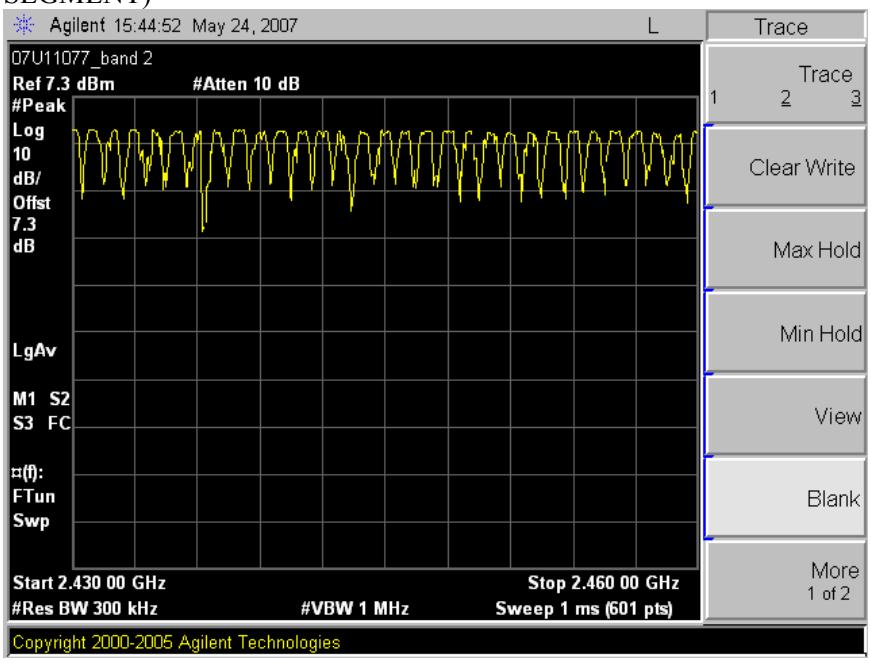
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



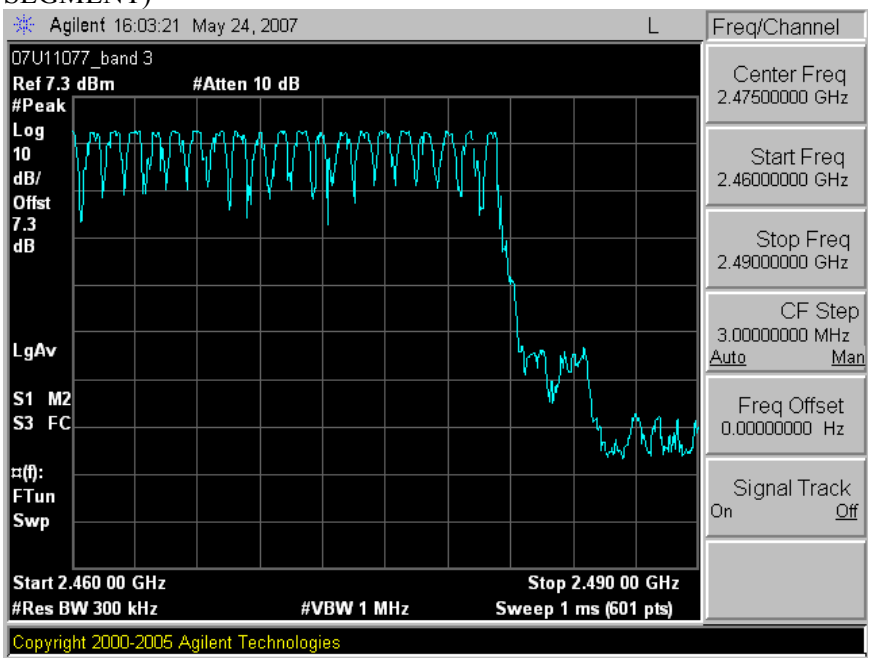
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



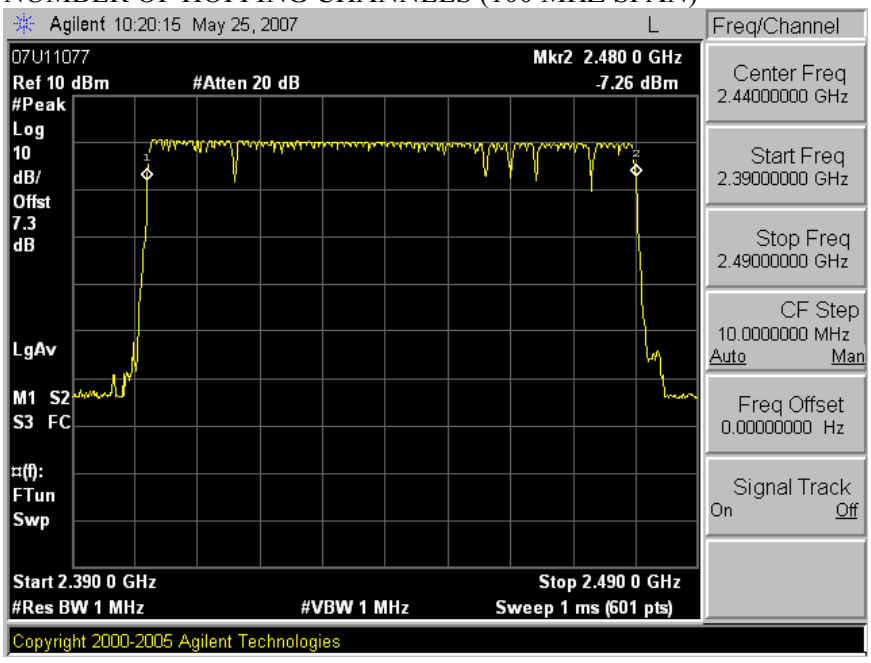
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



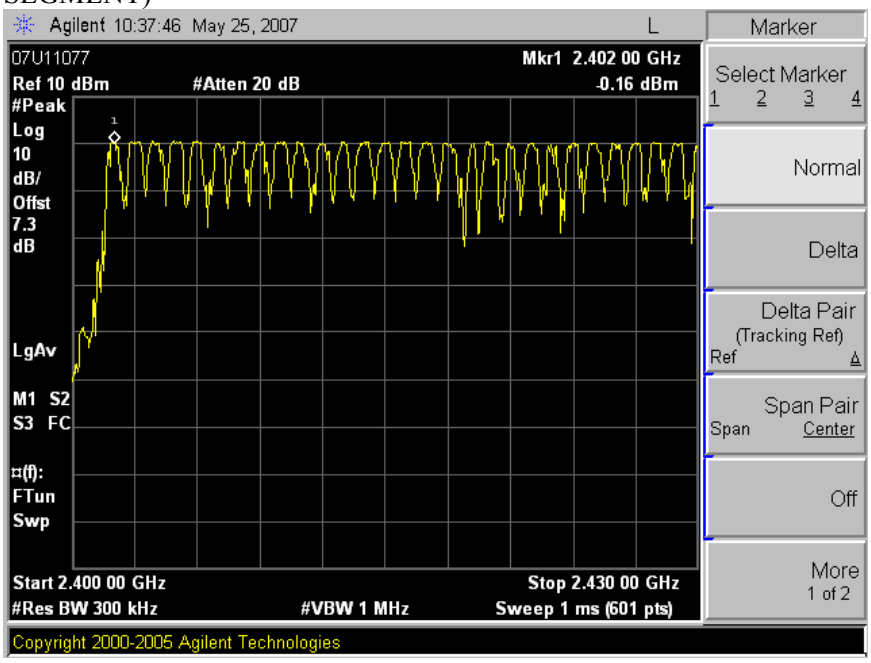
QPSK Modulation

NUMBER OF HOPPING CHANNELS

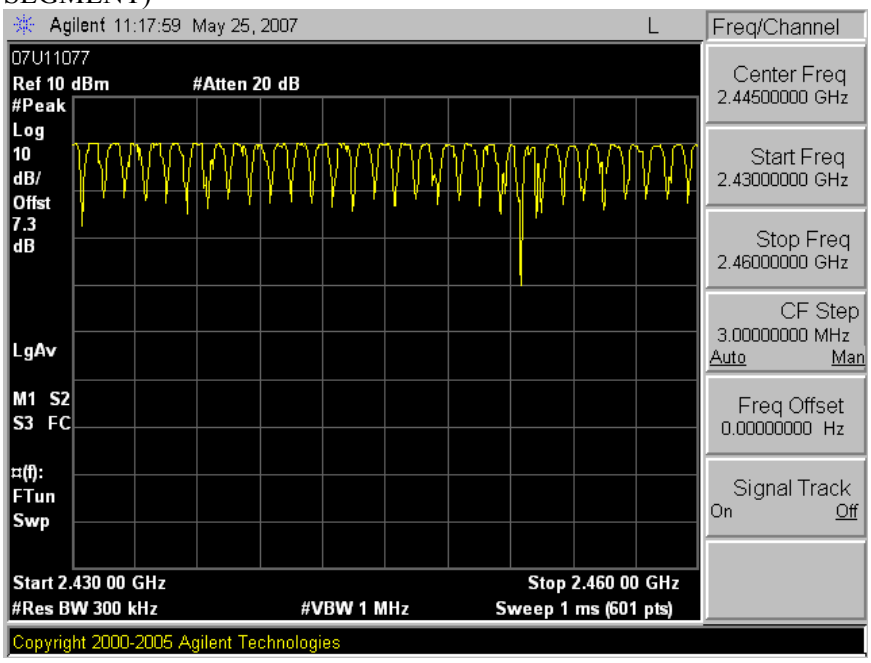
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



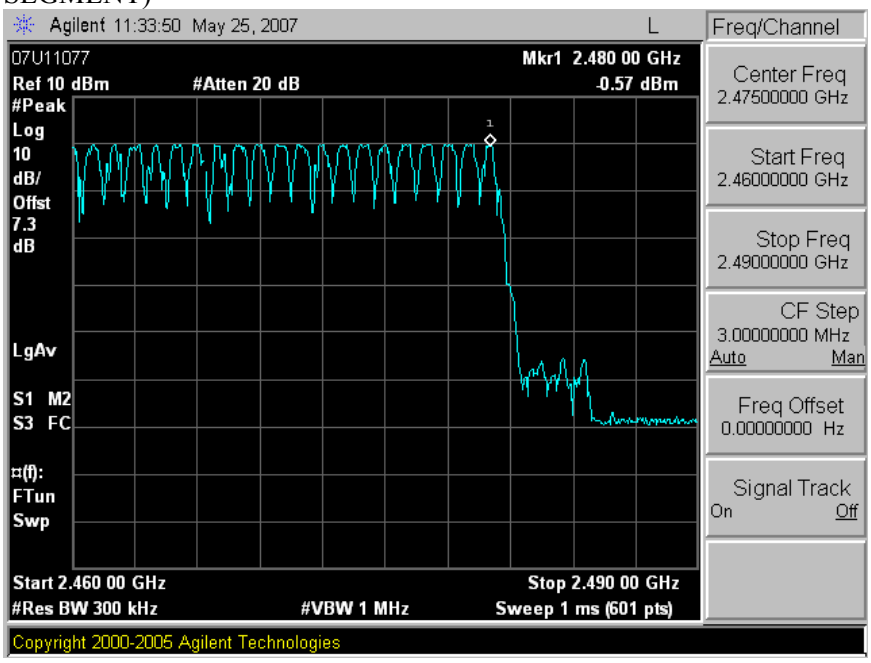
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

§15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping 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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

No non-compliance noted:

GFSK Modulation

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.397	37	0.147	0.4	0.253
DH3	1.625	16	0.260	0.4	0.140
DH5	2.875	11	0.316	0.4	0.084

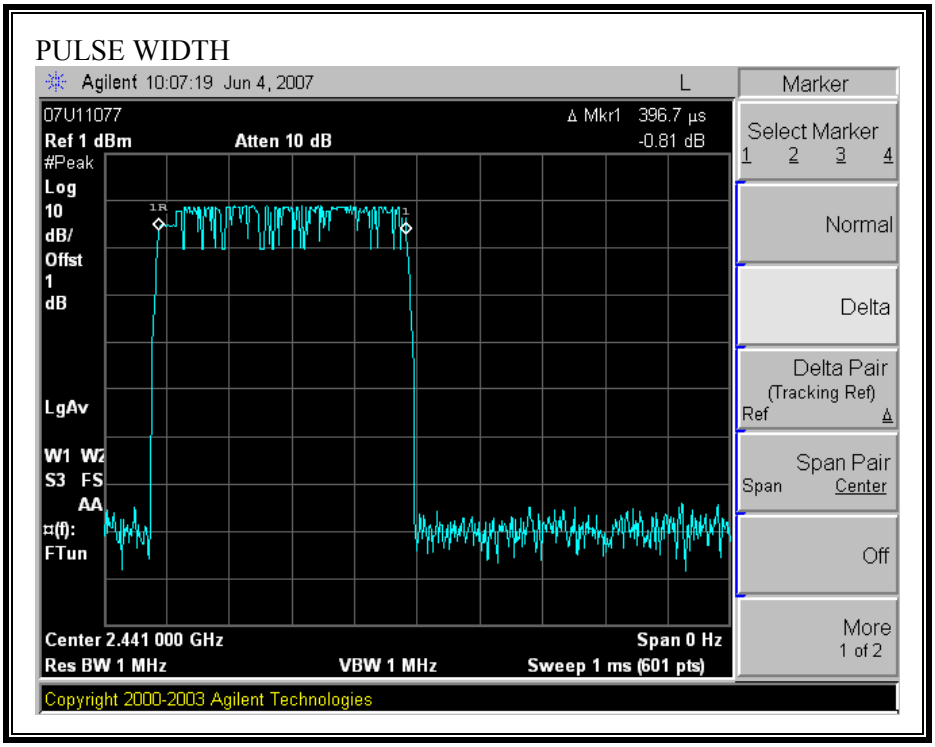
QPSK Modulation

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
2-DH1	0.4003	32	0.128	0.4	0.272
2-DH3	1.663	16	0.266	0.4	0.134
2-DH5	2.899	11	0.319	0.4	0.081

GFSK MODULATION:

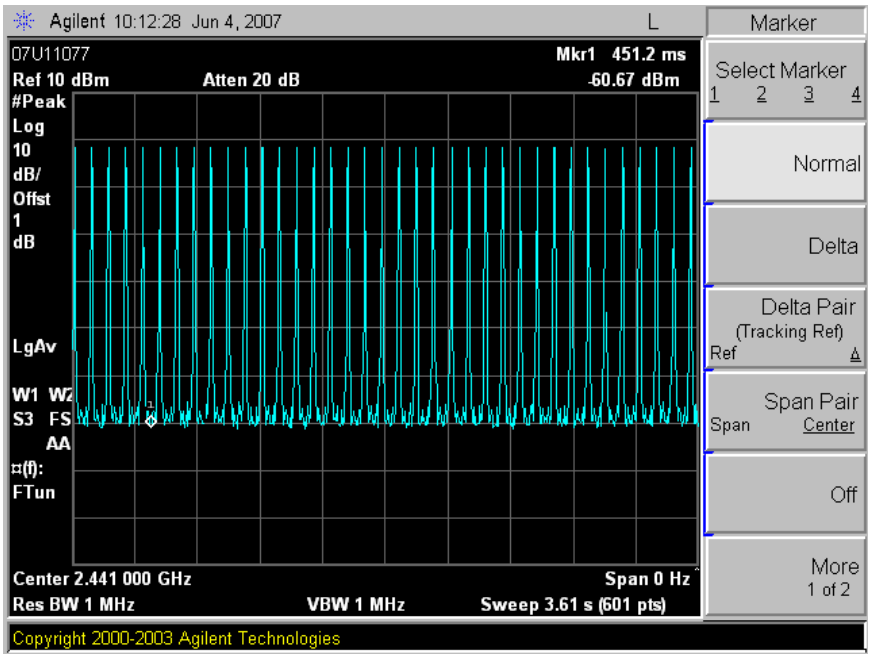
DH1 Mode:

PULSE WIDTH



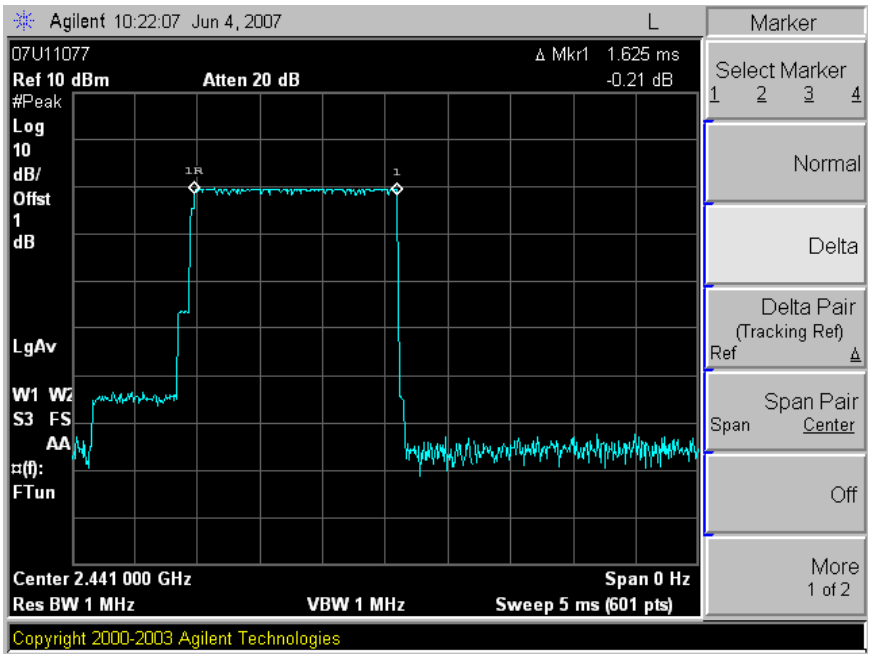
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

NUMBER OF PULSES



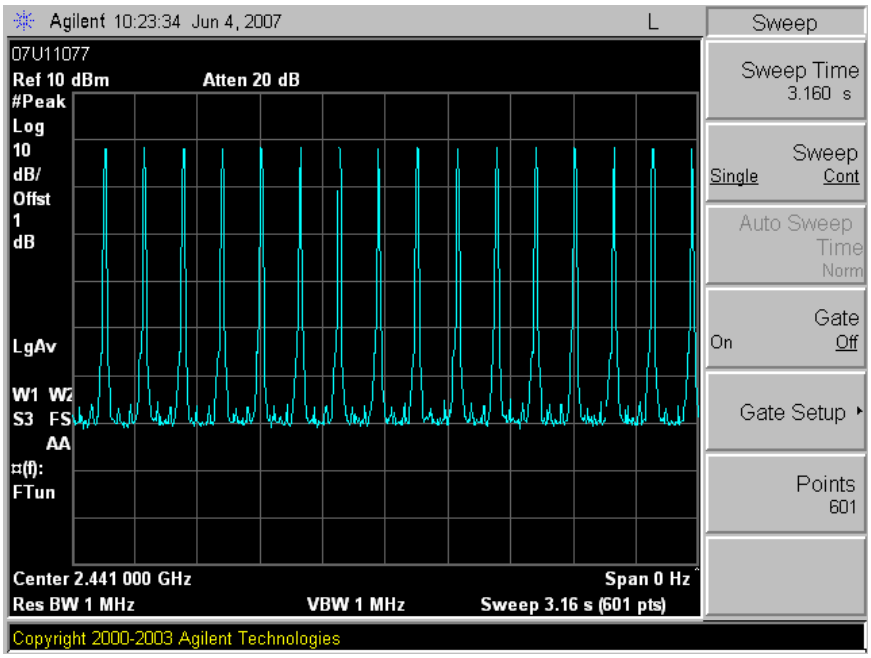
DH3 Mode:

PULSE WIDTH



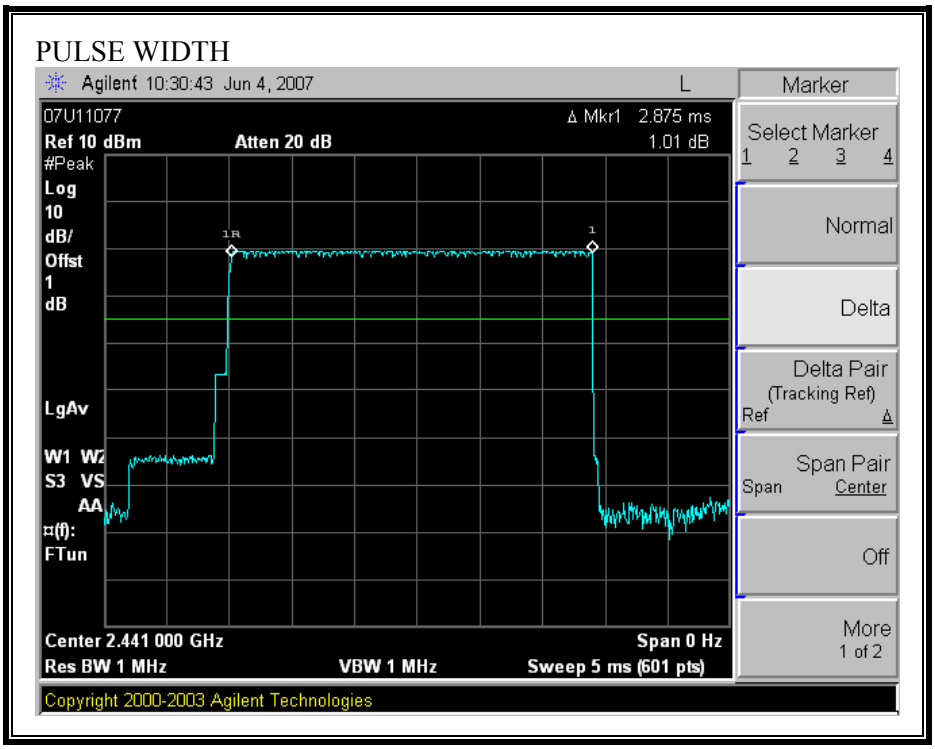
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

NUMBER OF PULSES



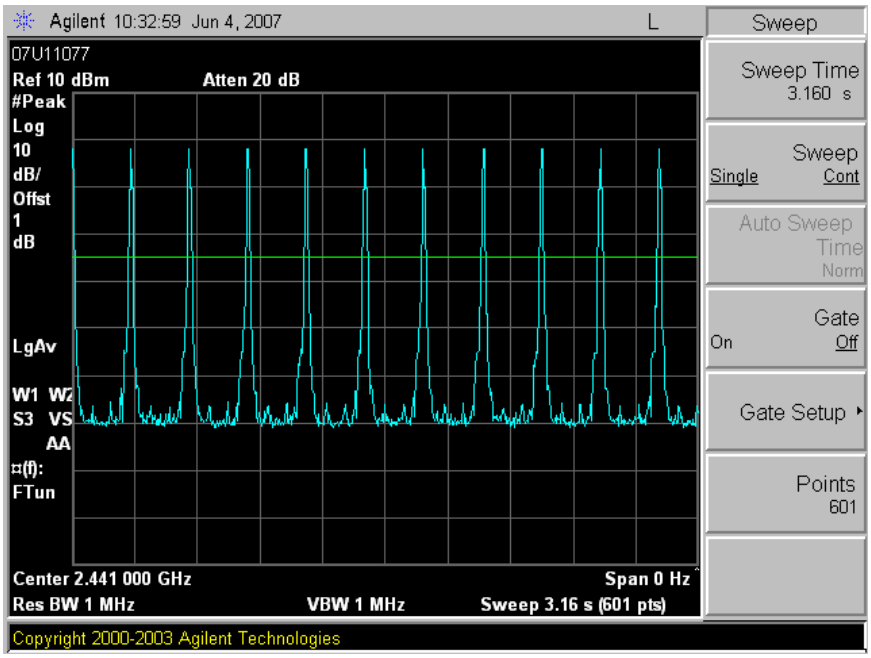
DH5 Mode:

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

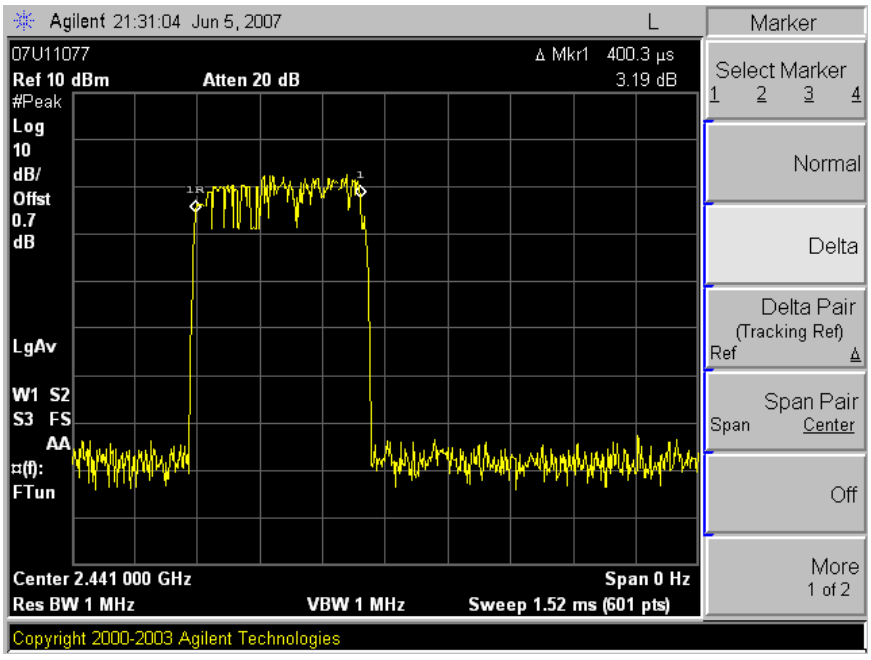
NUMBER OF PULSES



QPSK MODULATION:

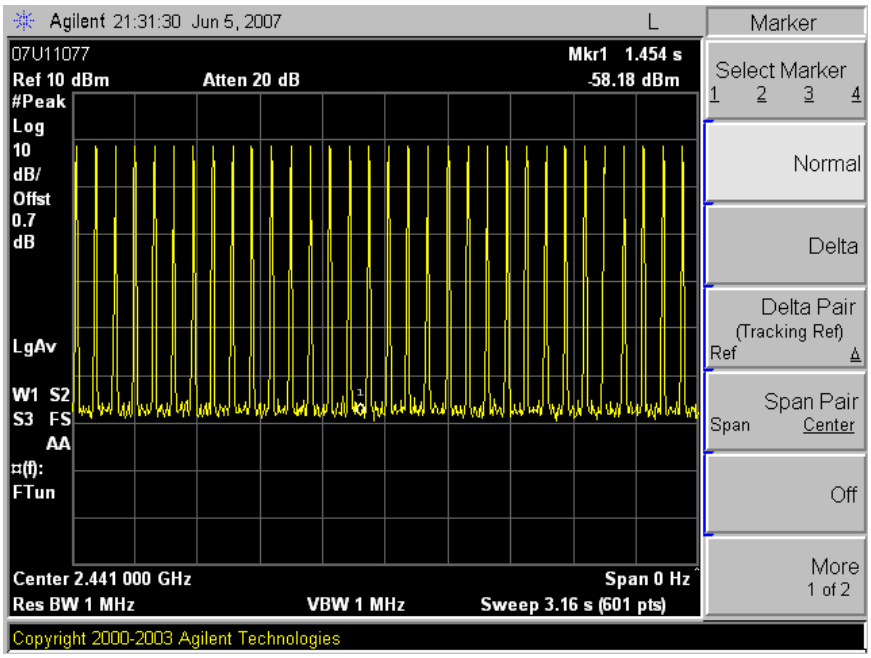
2-DH1 Mode:

PULSE WIDTH



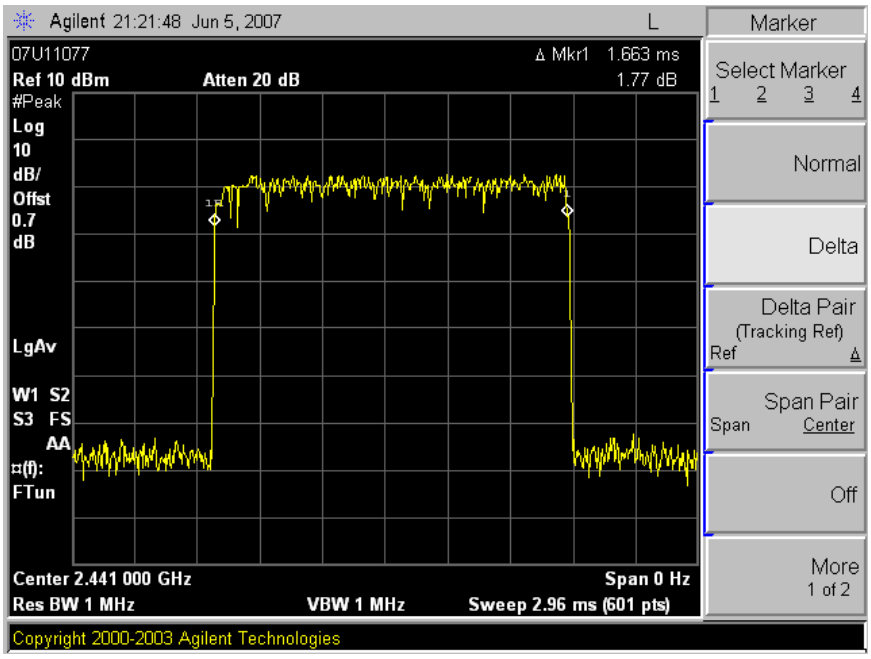
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

NUMBER OF PULSES



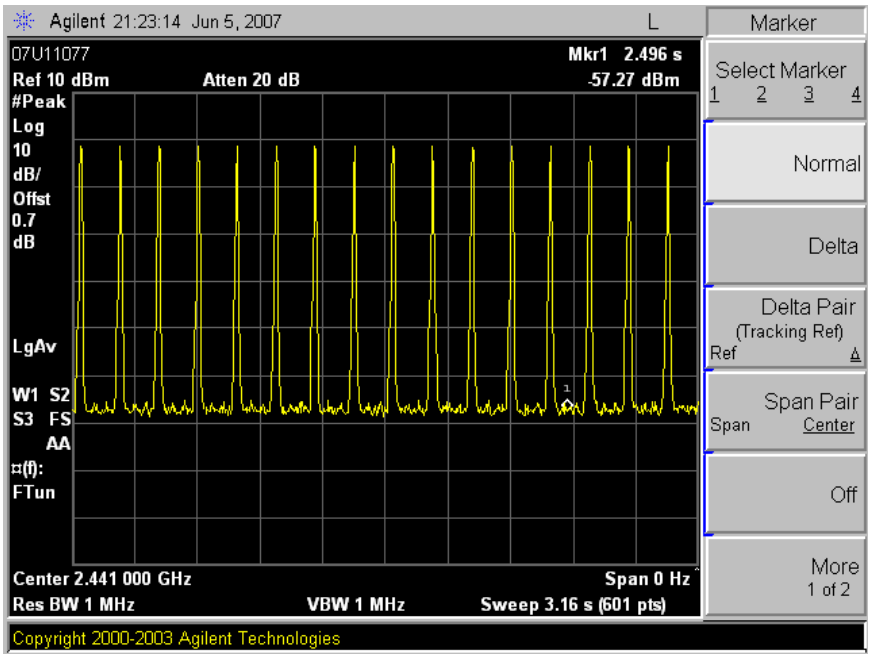
2-DH3 Mode:

PULSE WIDTH



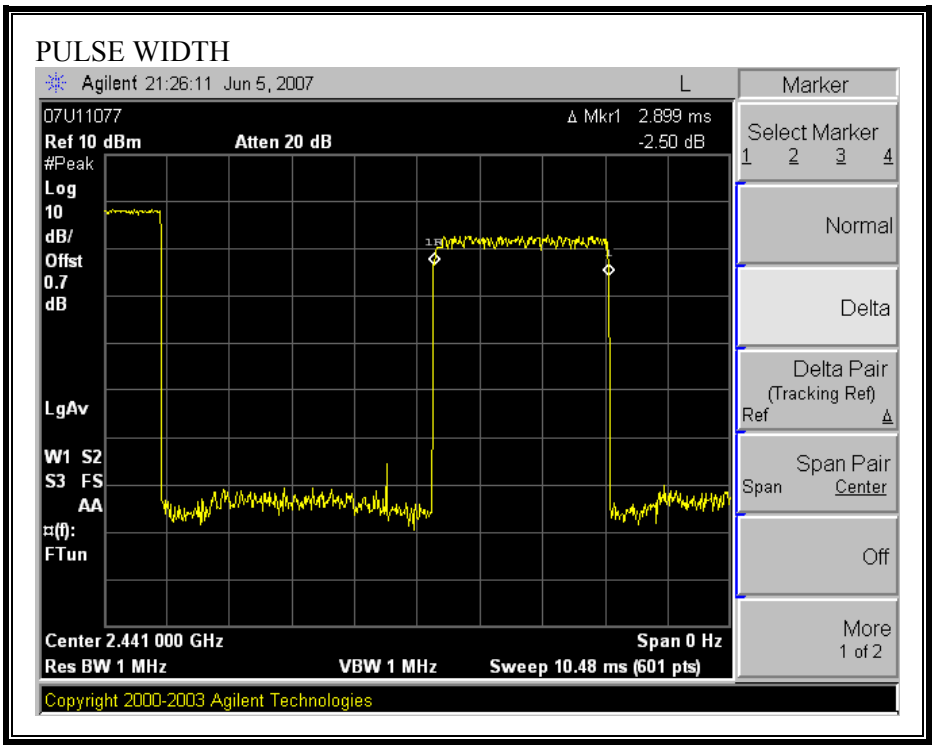
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

NUMBER OF PULSES



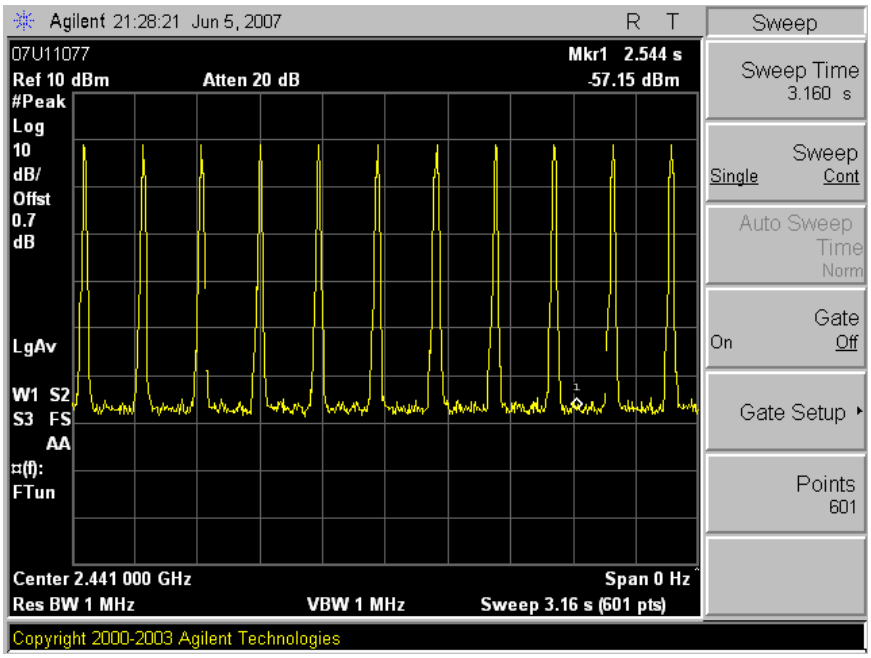
2-DH5 Mode:

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

NUMBER OF PULSES



7.1.5. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 1.0 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

No non-compliance noted:

GFSK Modulation:

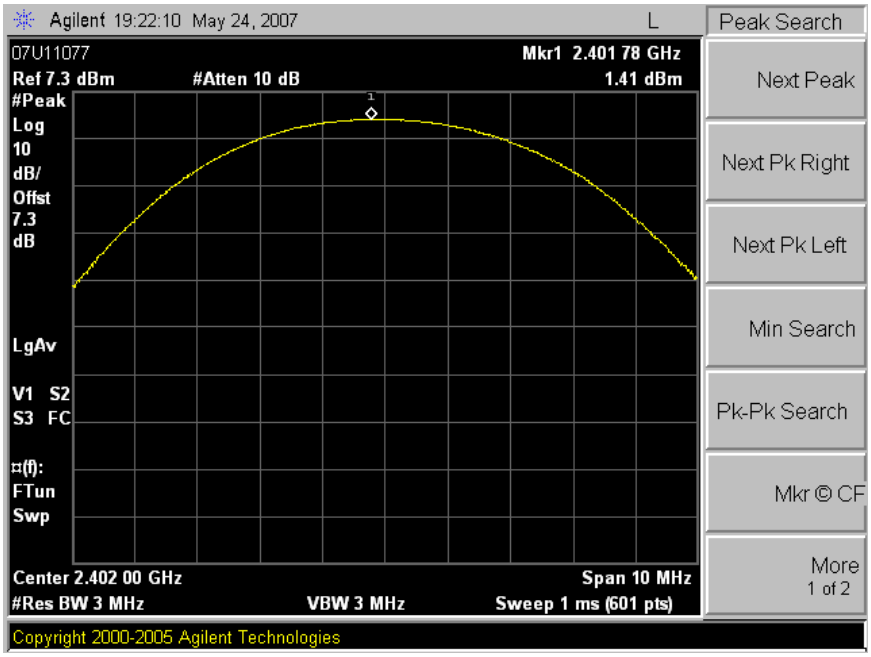
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.41	30	-28.59
Middle	2441	0.36	30	-29.64
High	2480	-0.04	30	-30.04

QPSK Modulation:

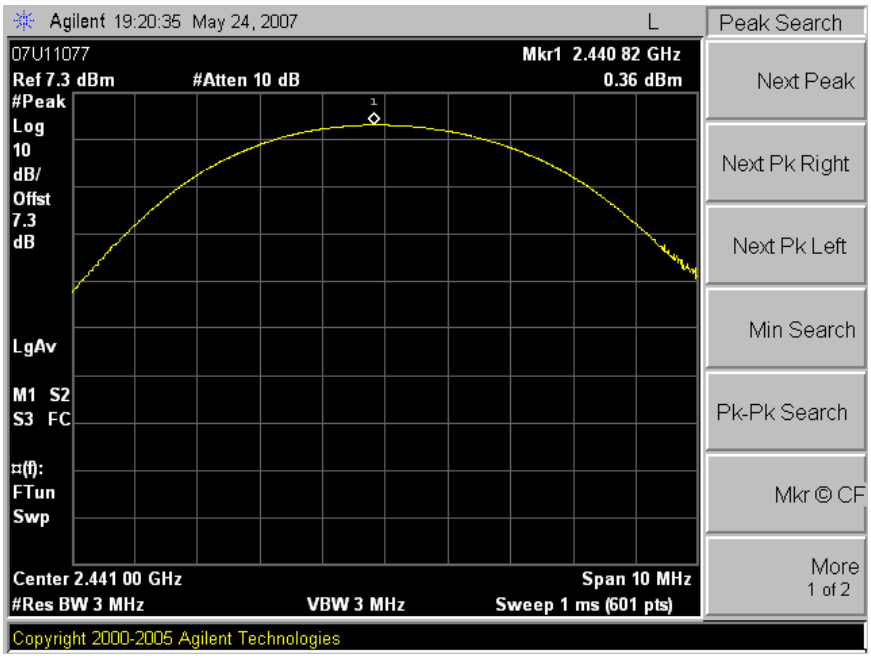
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.40	30	-29.60
Middle	2441	-0.20	30	-30.20
High	2480	-0.25	30	-30.25

GFSK Modulation:

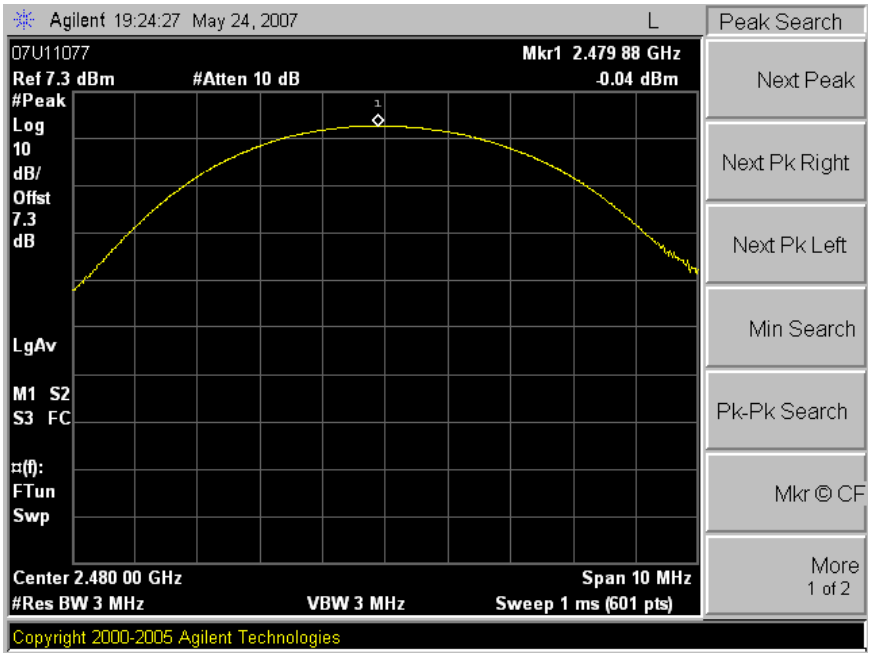
PEAK POWER LOW CH



PEAK POWER MID CH

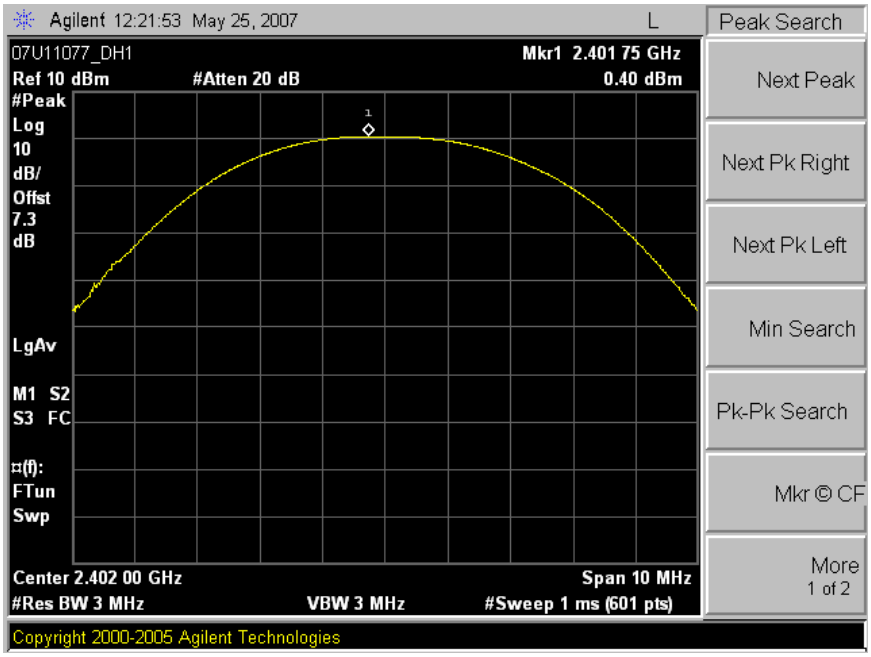


PEAK POWER HIGH CH

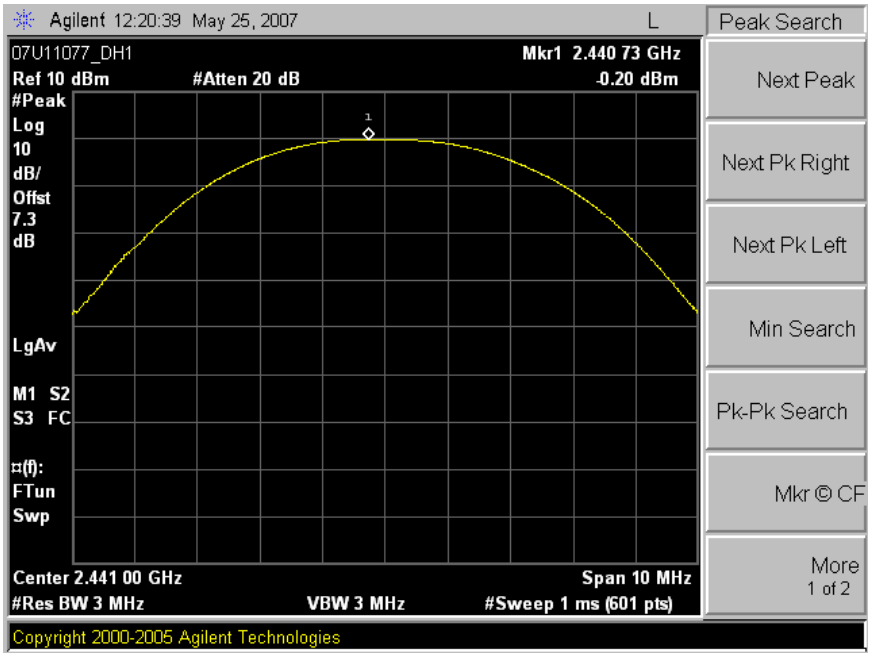


QPSK Modulation:

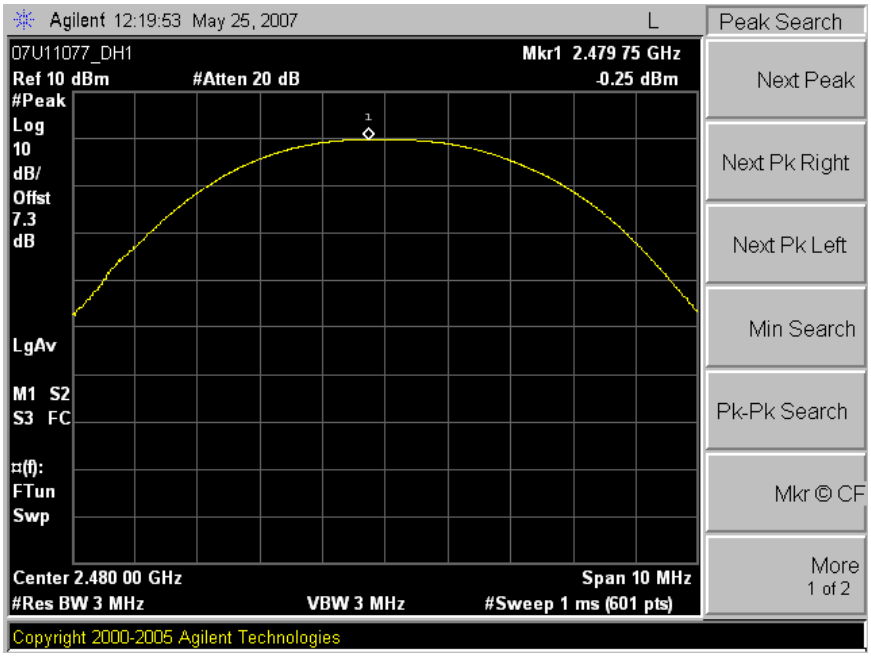
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.1.6. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 1 dB was entered as an offset in the power meter to allow for direct reading of power.

GFSK Modulation:

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	-3.45
Middle	2441	-3.68
High	2480	-4.28

QPSK Modulation:

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	-3.60
Middle	2441	-4.17
High	2480	-4.86

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

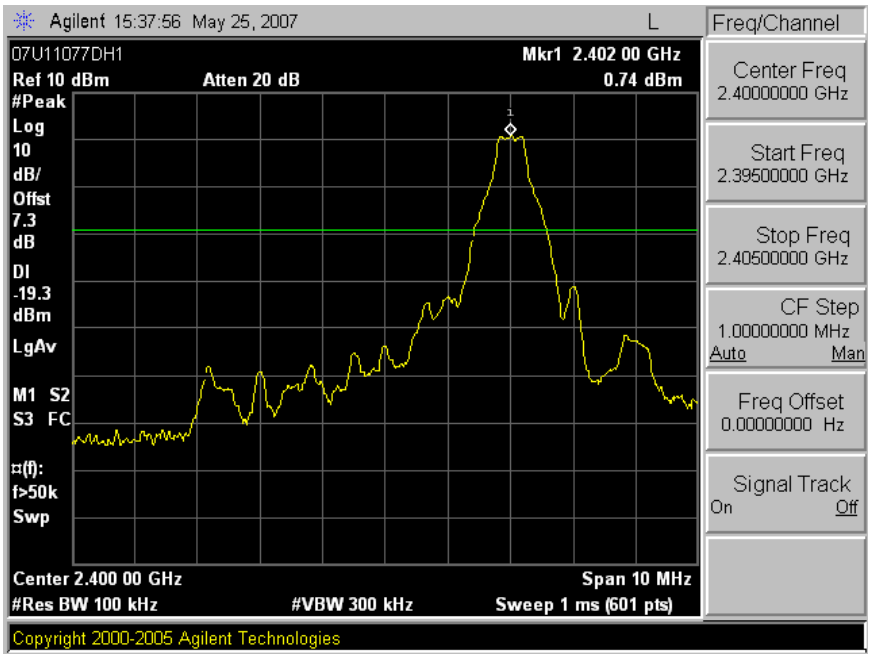
RESULTS

No non-compliance noted:

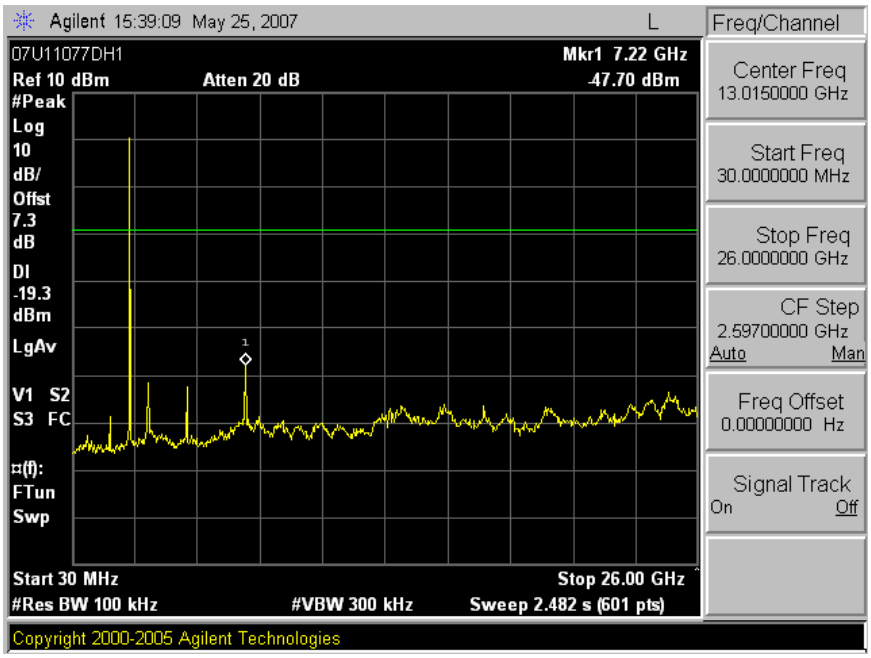
GFSK Modulation:

SPURIOUS EMISSIONS, LOW CHANNEL:

LOW CHANNEL BANDEDGE

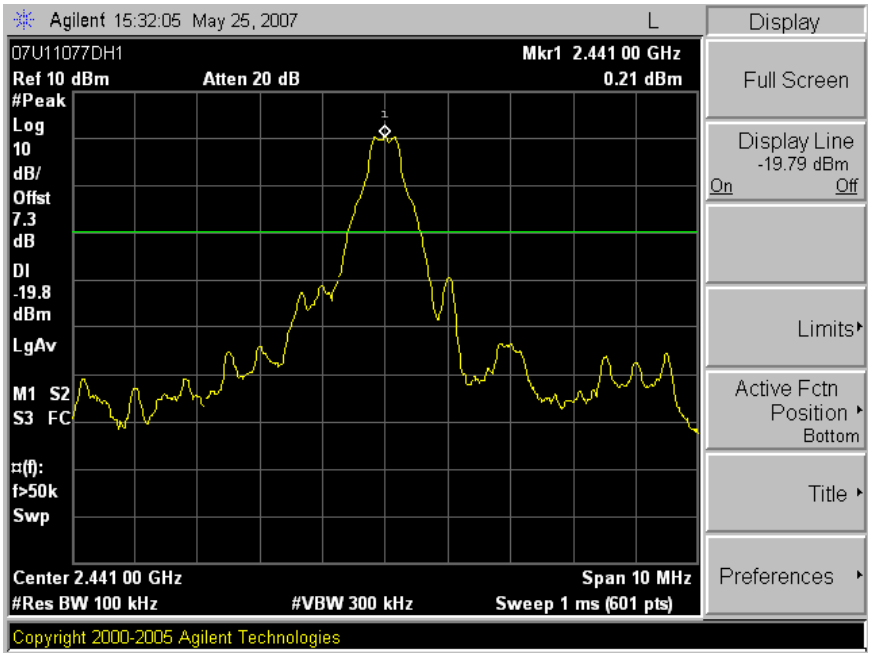


LOW CHANNEL SPURIOUS

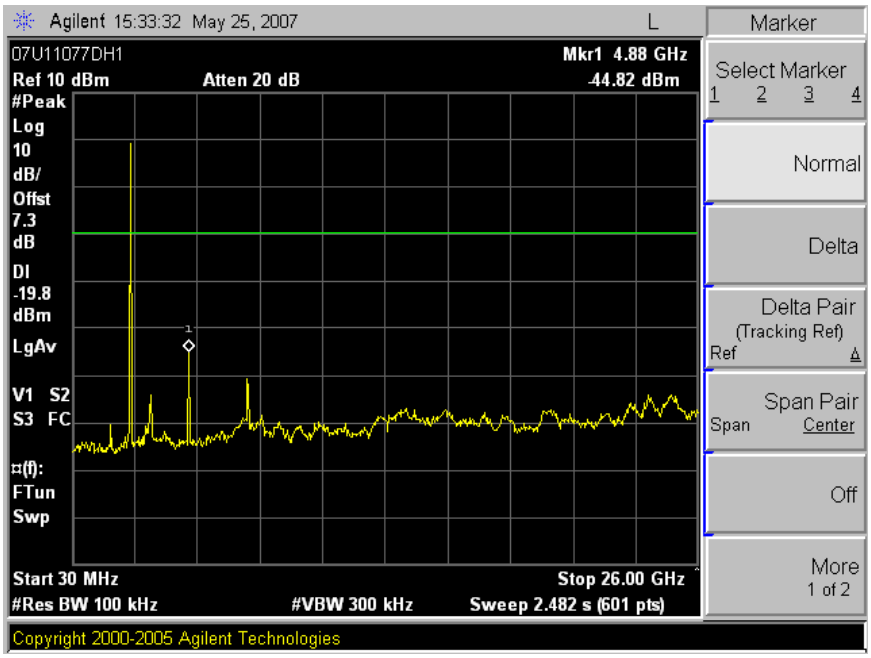


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

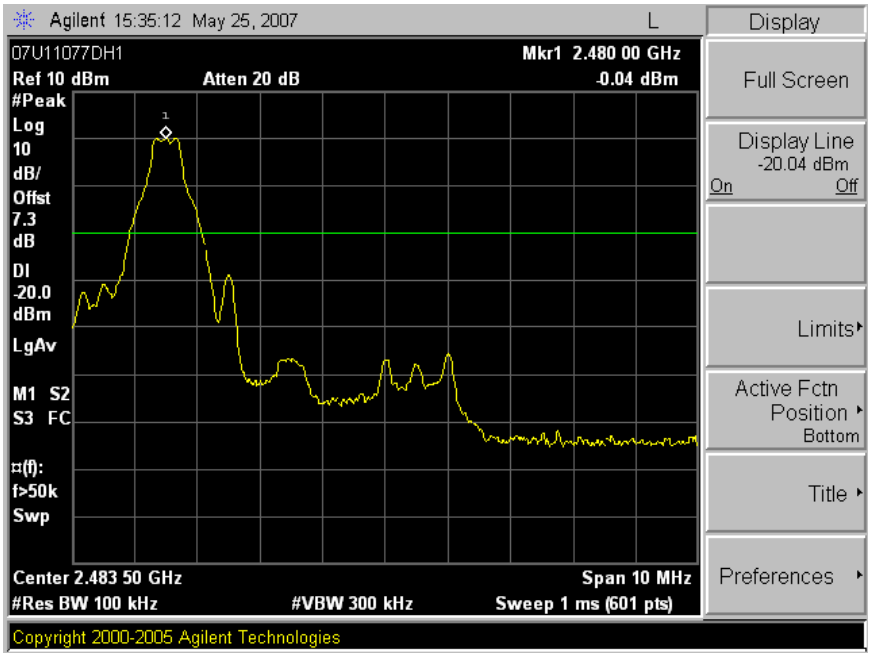


MID CHANNEL SPURIOUS

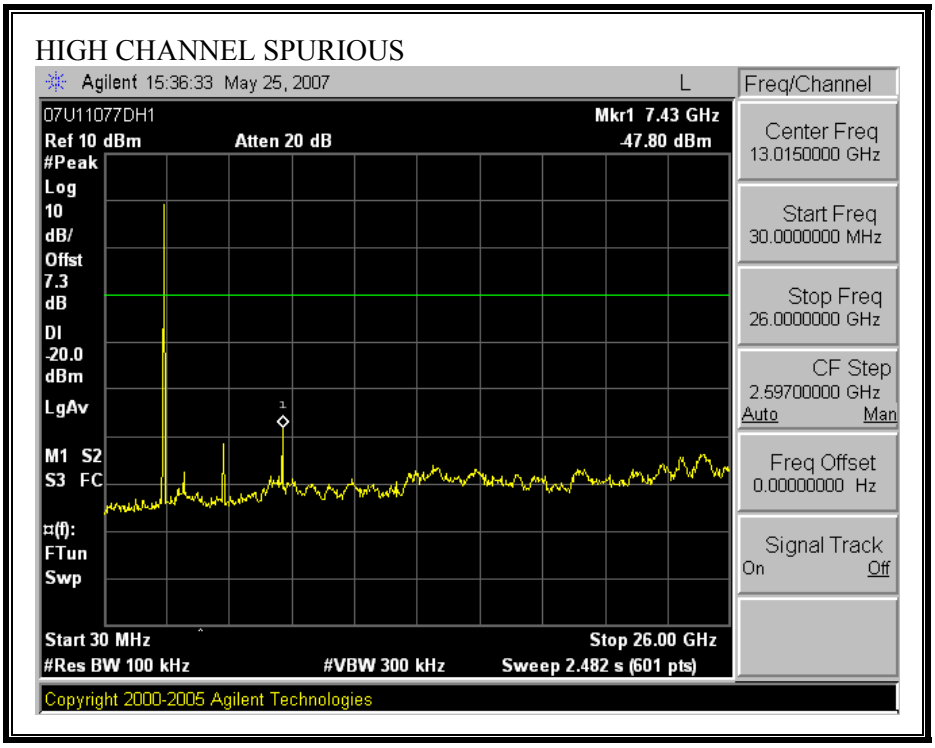


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

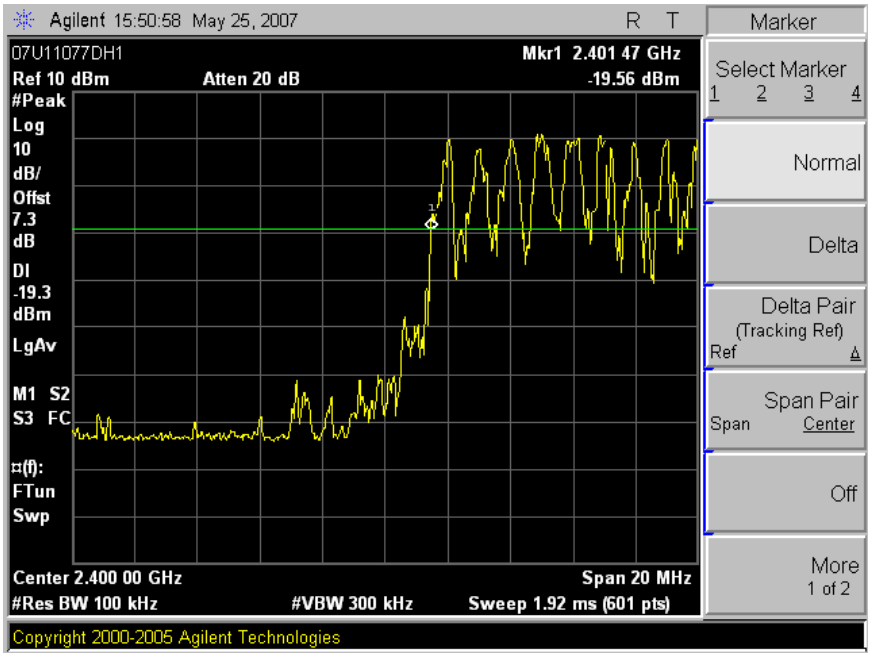


HIGH CHANNEL SPURIOUS

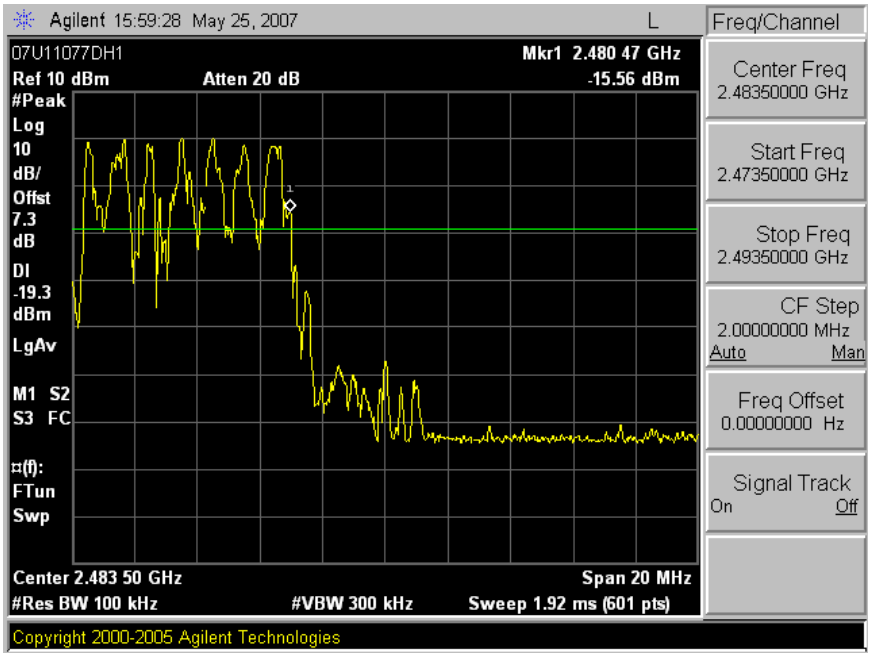


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



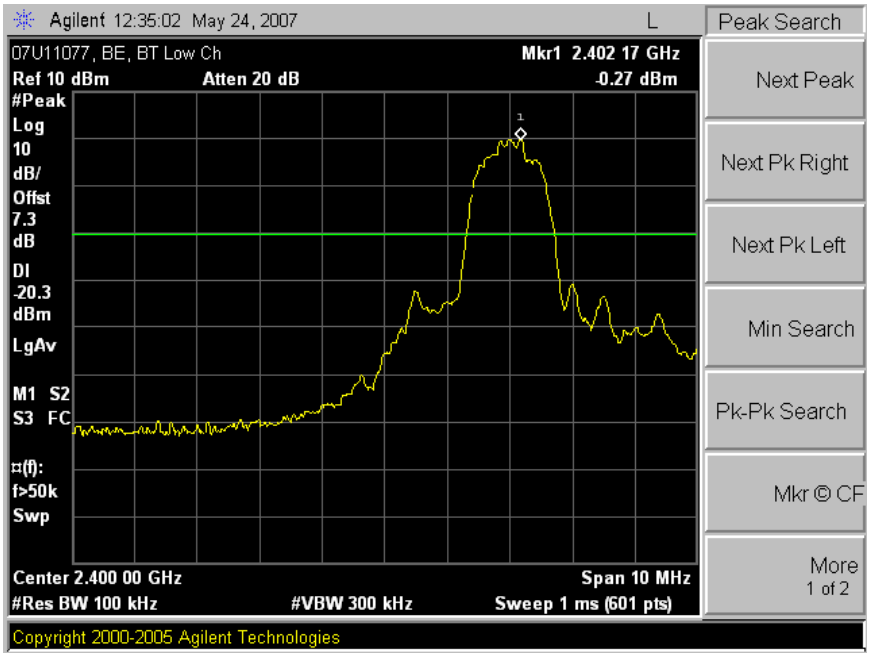
HIGH BANDEDGE WITH HOPPING ON



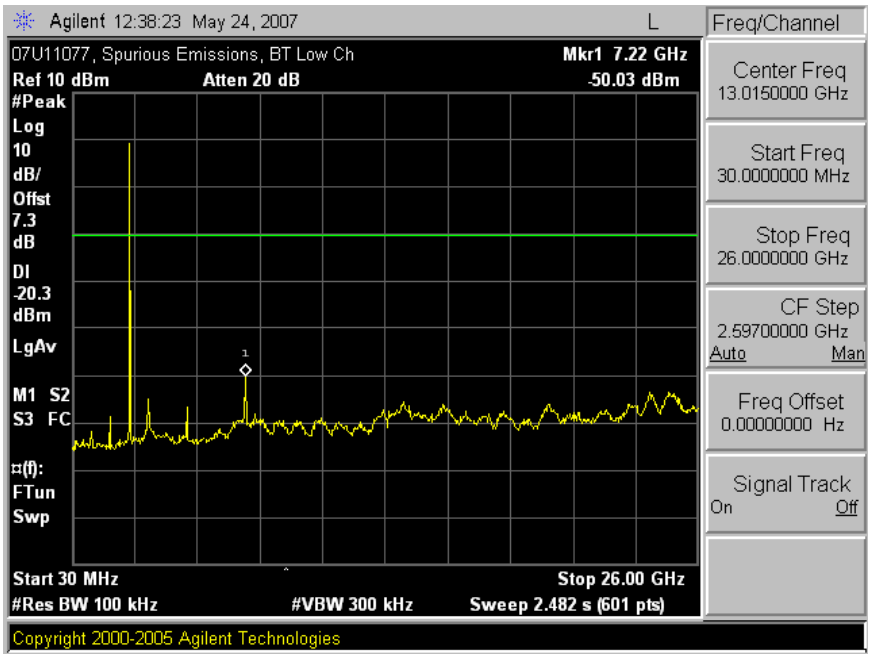
QPSK Modulation

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

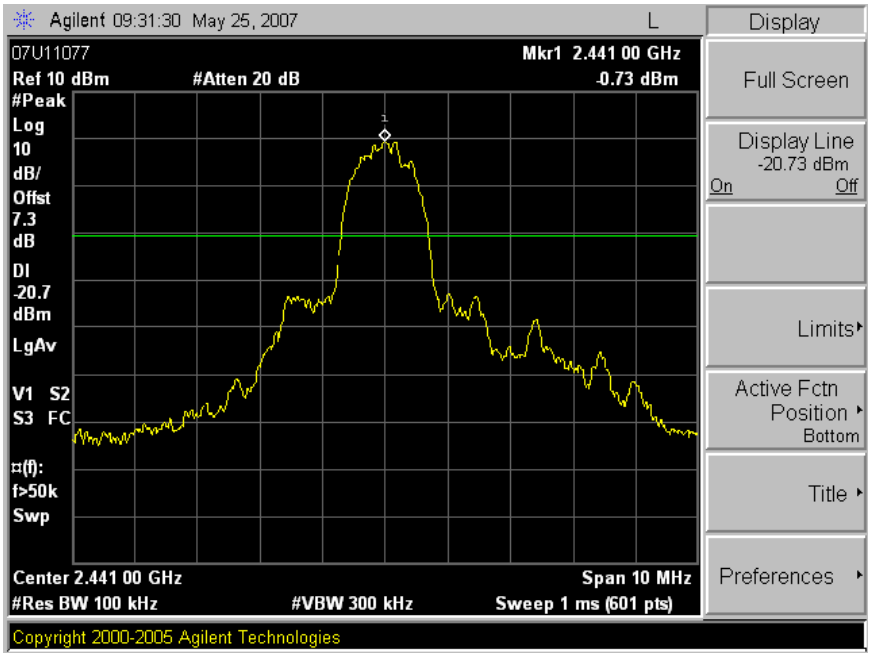


LOW CHANNEL SPURIOUS

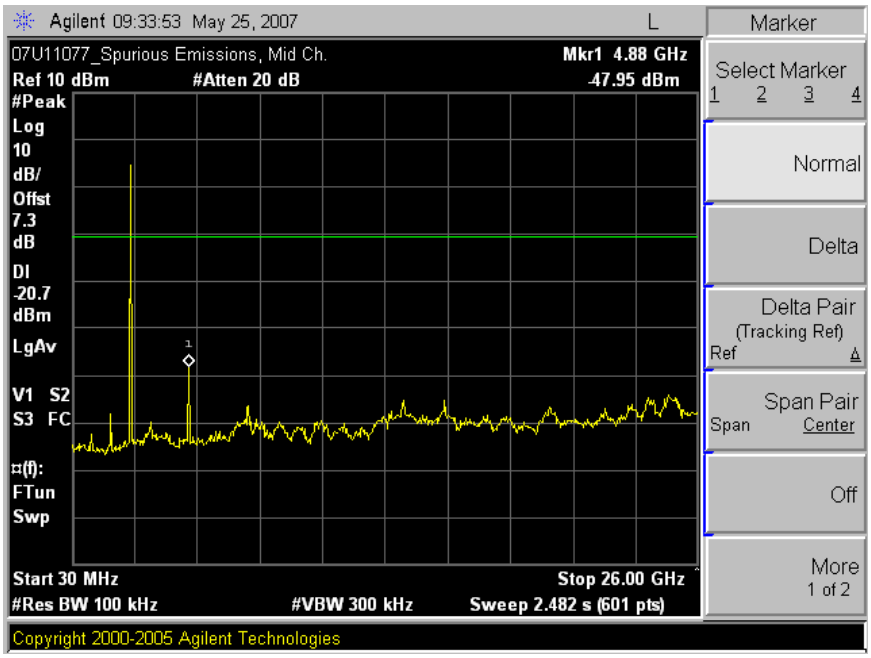


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

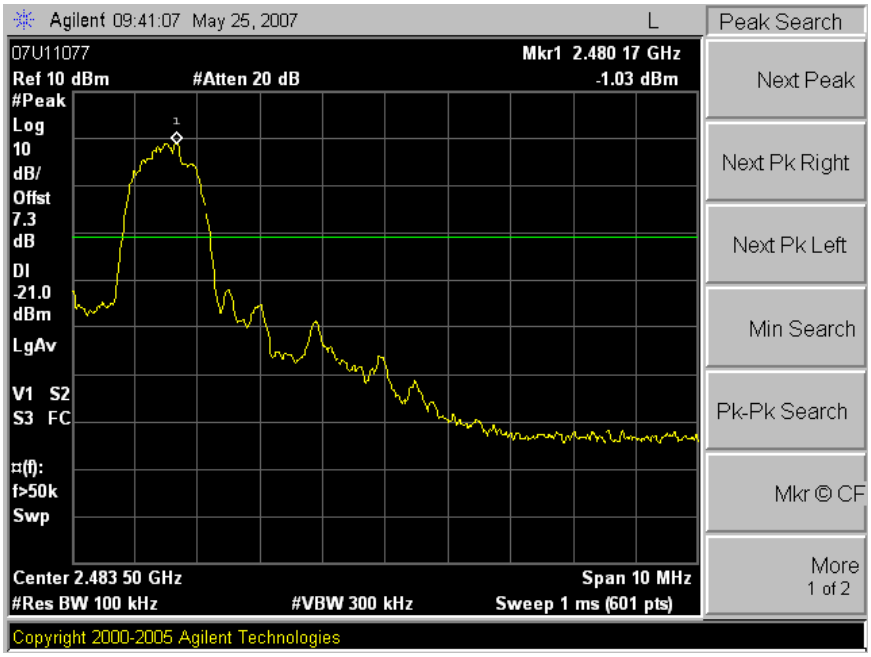


MID CHANNEL SPURIOUS

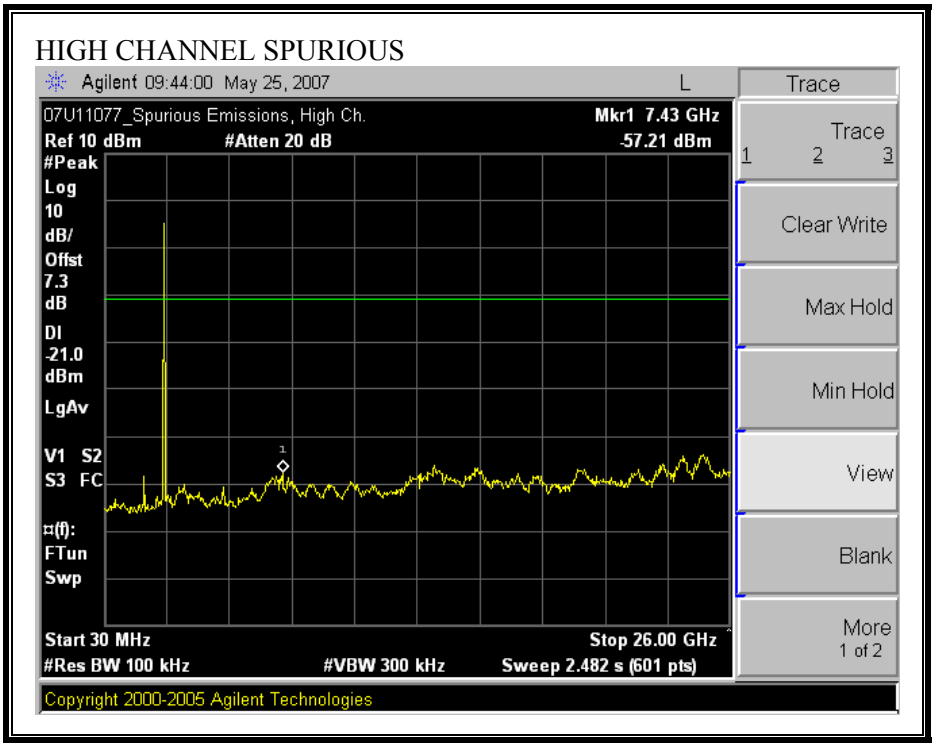


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

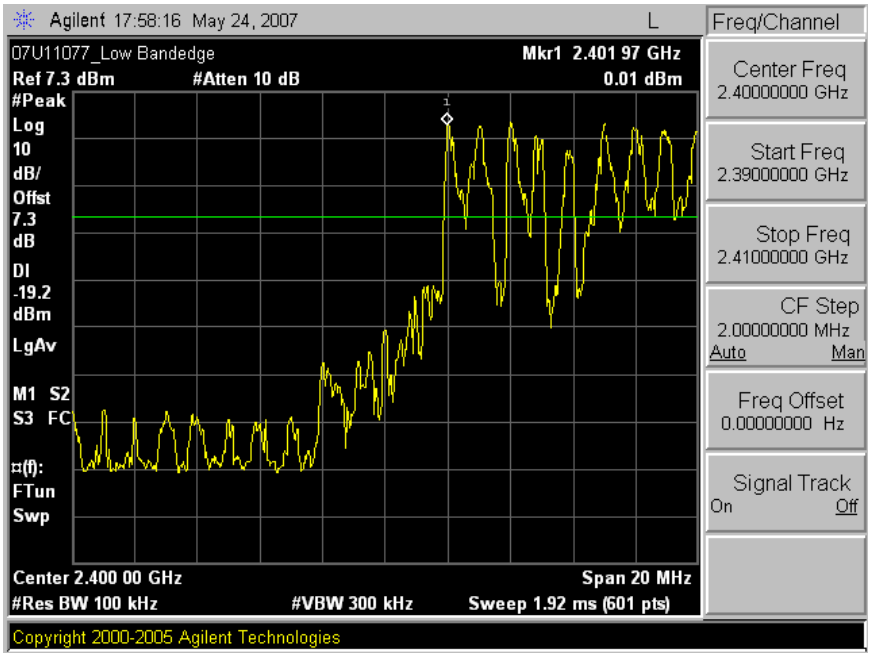


HIGH CHANNEL SPURIOUS

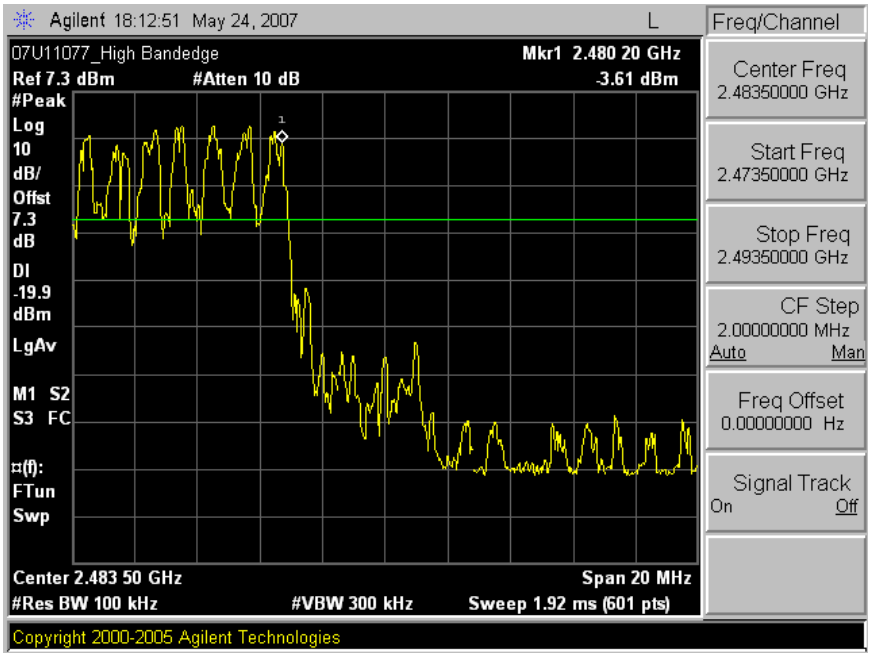


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.2. RADIATED EMISSIONS

7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown 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	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) 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 (microvolts/meter)	Measurement Distance (meters)
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.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

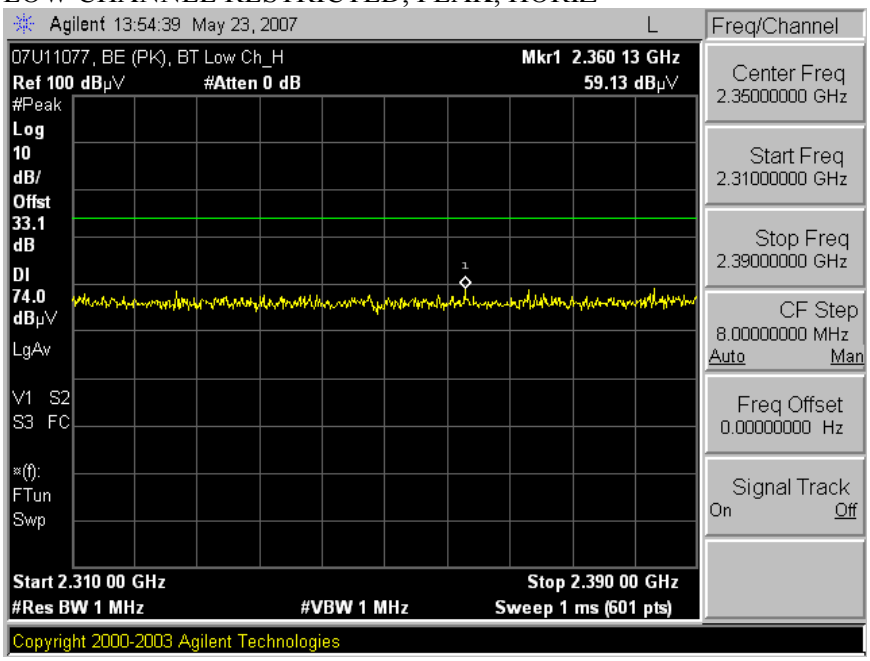
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

7.2.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ

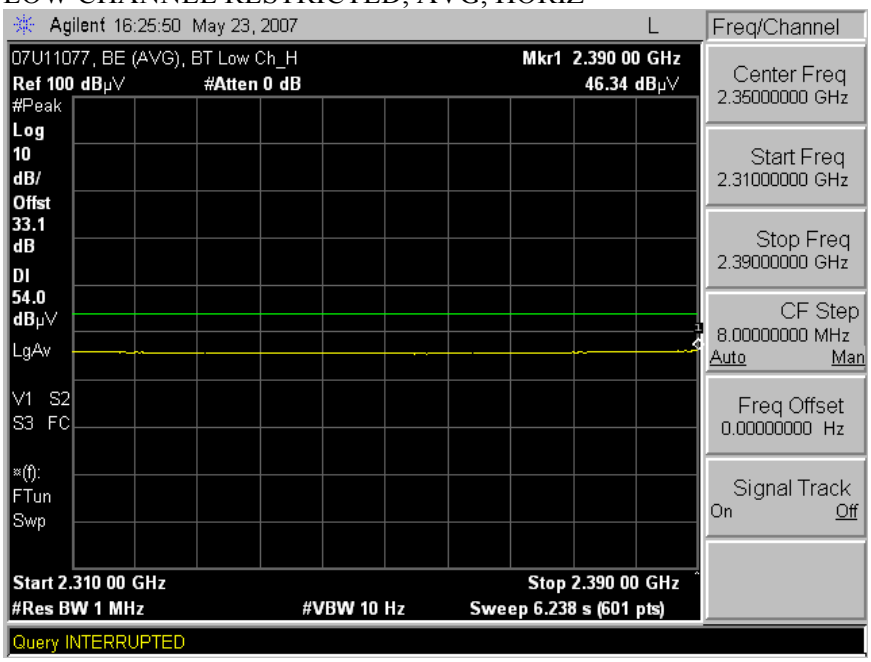
GFSK Modulation:

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, PEAK, HORIZ

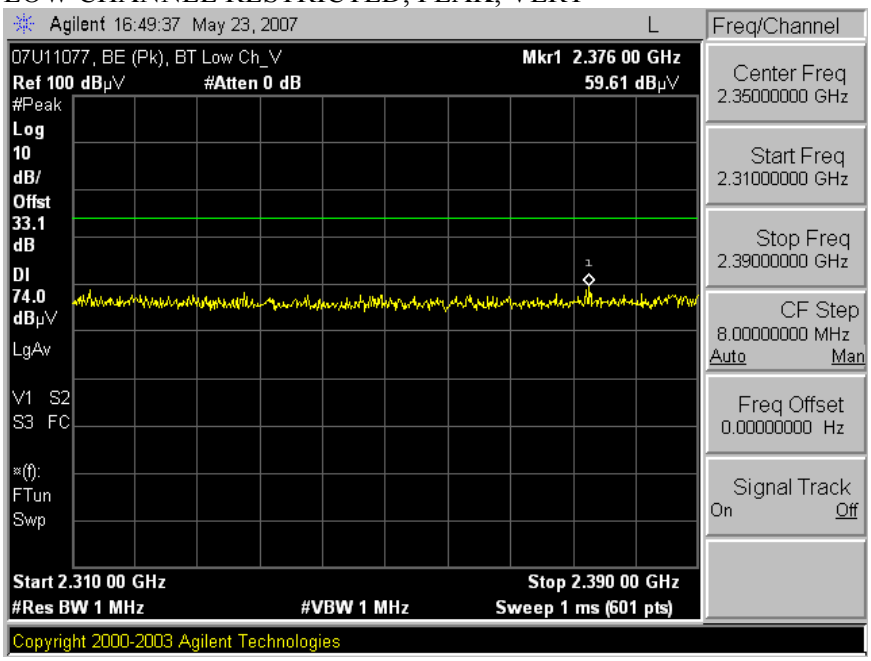


LOW CHANNEL RESTRICTED, AVG, HORIZ

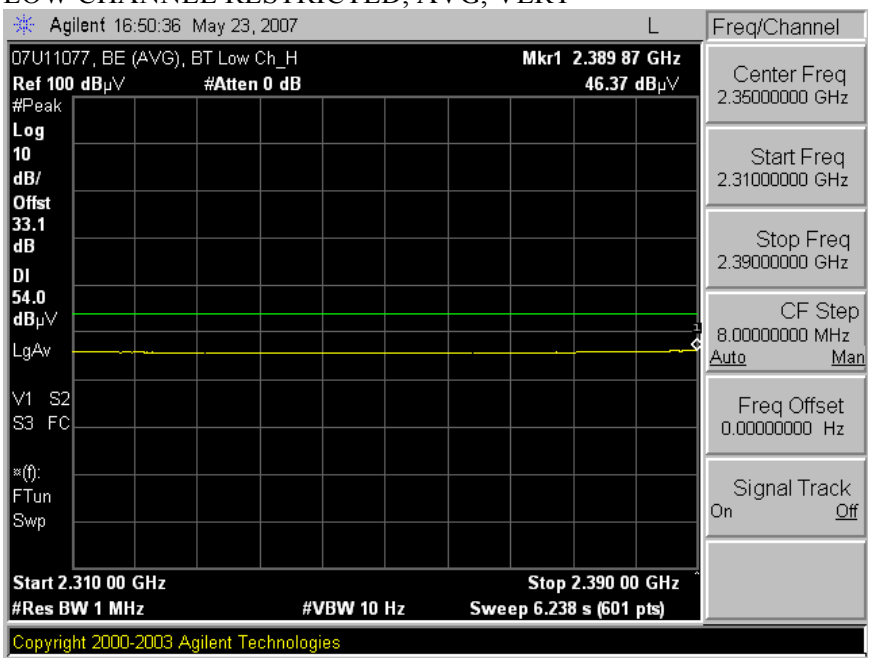


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK, VERT

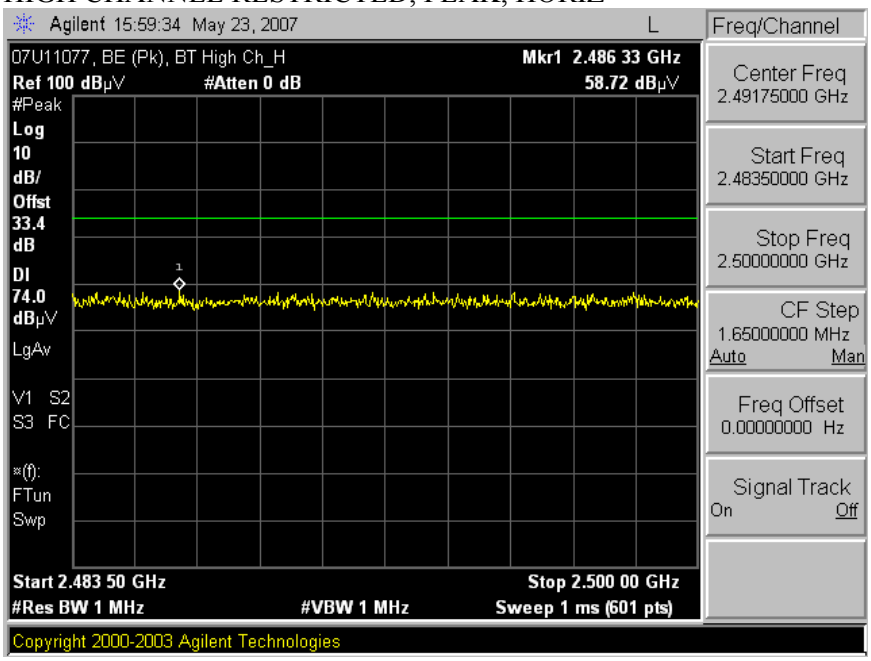


LOW CHANNEL RESTRICTED, AVG, VERT

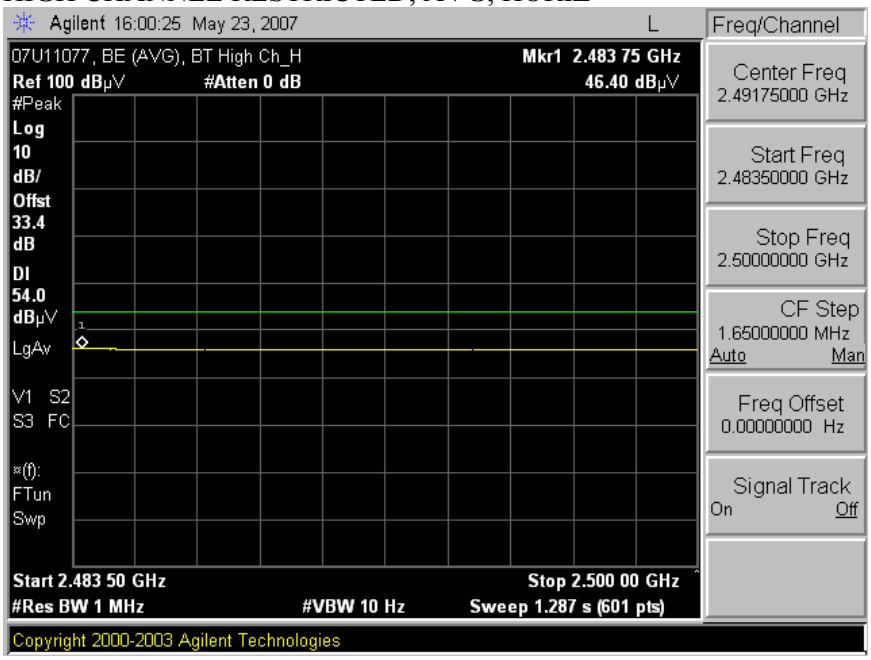


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

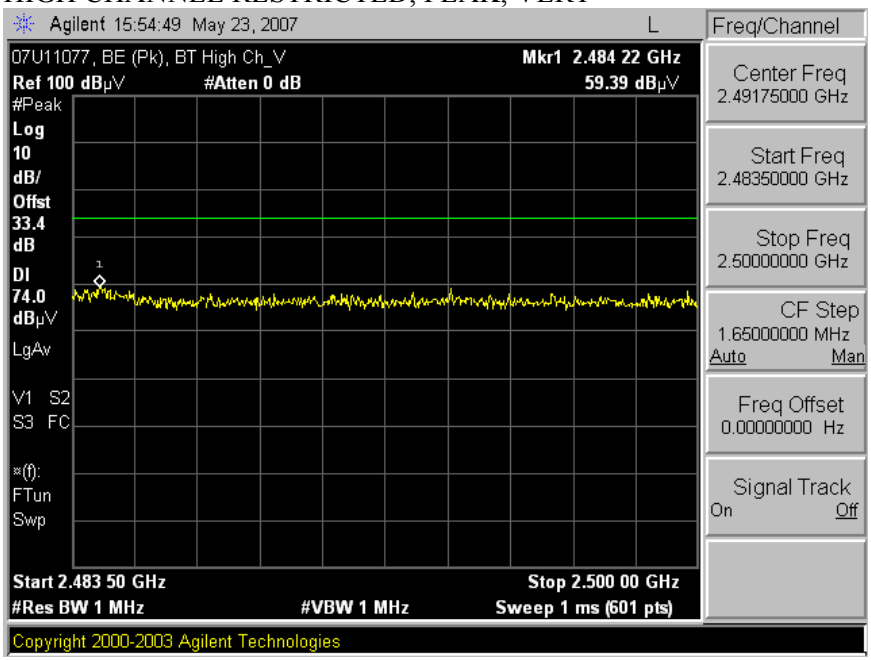


HIGH CHANNEL RESTRICTED, AVG, HORIZ

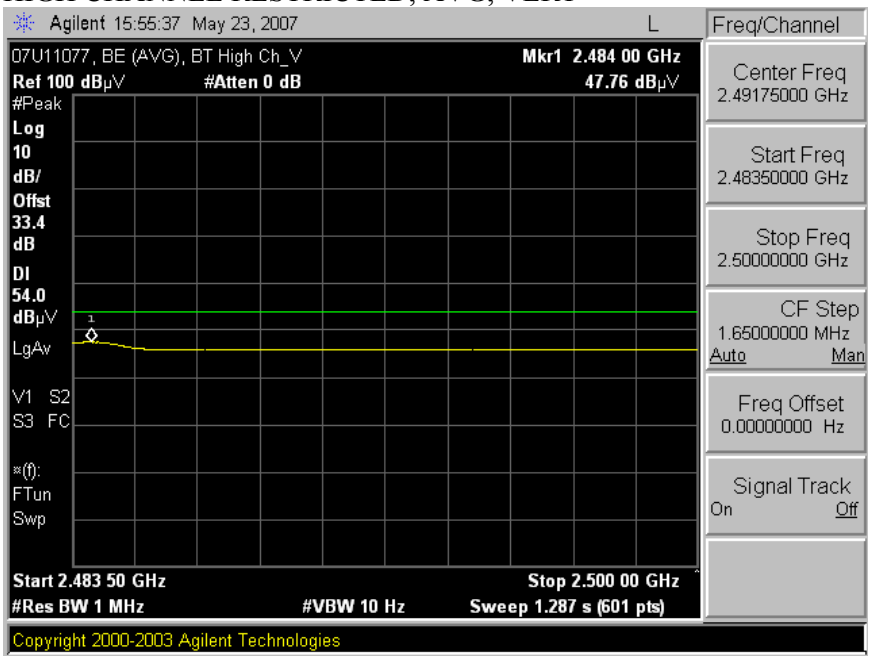


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5 meter Chamber A

Company: APPLE COMPUTER INC.
Project #: 07U11077
Date: May 23, 2007
Test Engineer: Thanh Nguyen
Configuration: EUT at worst position
Mode: Continuous Transmit GFSK mode.

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		Gordon 203134001	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel															
4.804	3.0	40.4	26.5	33.3	6.9	-36.5	0.0	0.6	44.6	30.7	74	54	-29.4	-23.3	V
7.206	3.0	38.8	27.6	34.9	8.4	-36.2	0.0	0.6	46.5	35.3	74	54	-27.5	-18.7	V
9.608	3.0	37.3	25.3	36.7	9.6	-36.9	0.0	0.8	47.6	35.6	74	54	-26.4	-18.4	Noise Floor
4.804	3.0	39.4	25.9	33.3	6.9	-36.5	0.0	0.6	43.7	30.2	74	54	-30.3	-23.8	H
7.206	3.0	39.4	26.2	34.9	8.4	-36.2	0.0	0.6	47.1	33.9	74	54	-26.9	-20.1	H
9.608	3.0	37.5	25.5	36.7	9.6	-36.9	0.0	0.8	47.7	35.7	74	54	-26.3	-18.3	Noise Floor
Mid Channel															
4.882	3.0	40.3	26.5	33.4	6.9	-36.5	0.0	0.6	44.8	30.9	74	54	-29.2	-23.1	V
7.323	3.0	39.3	25.5	35.0	8.4	-36.2	0.0	0.6	47.1	33.3	74	54	-26.9	-20.7	V
9.764	3.0	37.6	25.3	36.8	9.8	-37.0	0.0	0.8	48.0	35.7	74	54	-26.0	-18.3	Noise Floor
4.882	3.0	39.6	26.4	33.6	6.9	-36.5	0.0	0.6	44.3	31.1	74	54	-29.7	-22.9	H
7.323	3.0	38.5	30.3	35.3	8.4	-36.2	0.0	0.6	46.6	38.4	74	54	-27.4	-15.6	H
9.764	3.0	37.3	25.2	36.8	9.8	-37.0	0.0	0.8	47.7	35.6	74	54	-26.3	-18.4	Noise Floor
High Channel															
4.960	3.0	38.0	25.7	33.4	7.0	-36.5	0.0	0.6	42.6	30.3	74	54	-31.4	-23.7	V
7.440	3.0	38.4	25.1	35.1	8.5	-36.2	0.0	0.6	46.3	33.1	74	54	-27.7	-20.9	V
9.920	3.0	37.8	25.4	36.8	10.0	-37.1	0.0	0.8	48.4	36.0	74	54	-25.6	-18.0	Noise Floor
4.960	3.0	38.6	26.3	33.4	7.0	-36.5	0.0	0.6	43.2	30.9	74	54	-30.8	-23.1	H
7.440	3.0	38.8	35.8	35.1	8.5	-36.2	0.0	0.6	46.7	43.7	74	54	-27.3	-10.3	H
9.920	3.0	37.3	25.4	36.8	10.0	-37.1	0.0	0.8	47.9	35.9	74	54	-26.1	-18.1	Noise Floor
No other spurious emissions were detected above noise floor.															

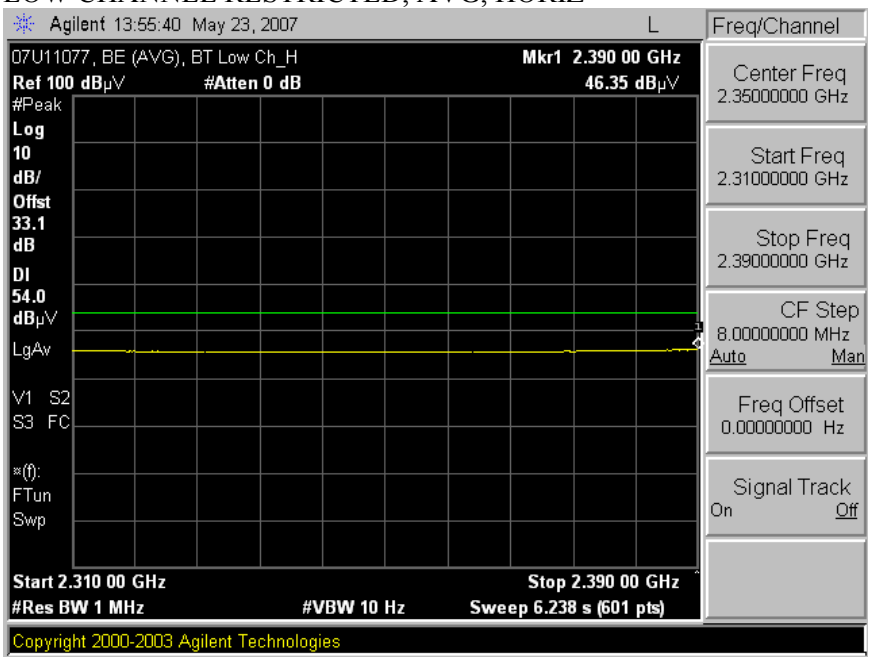
Rev. 5.1.6

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

QPSK Modulation:

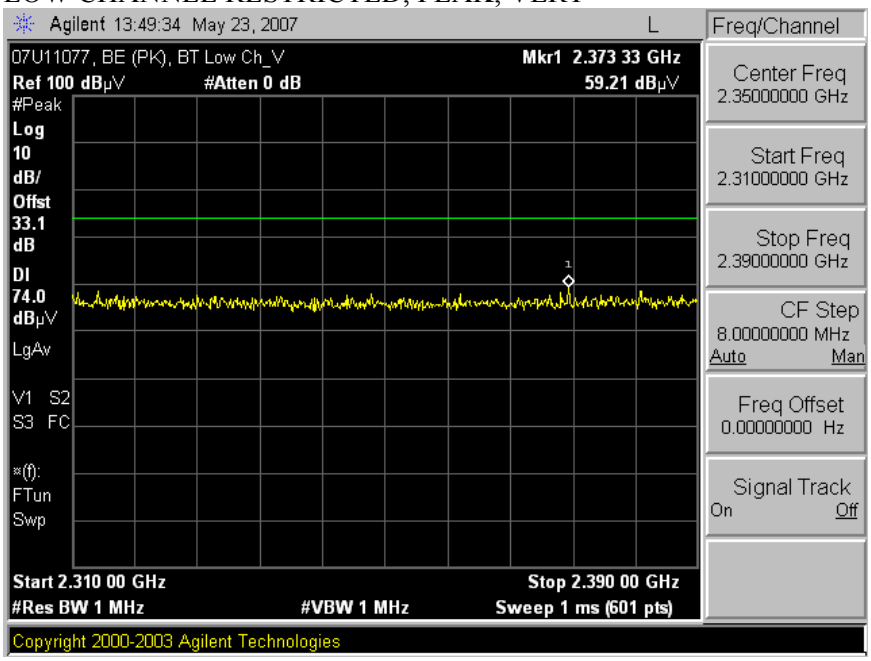
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL RESTRICTED, AVG, HORIZ

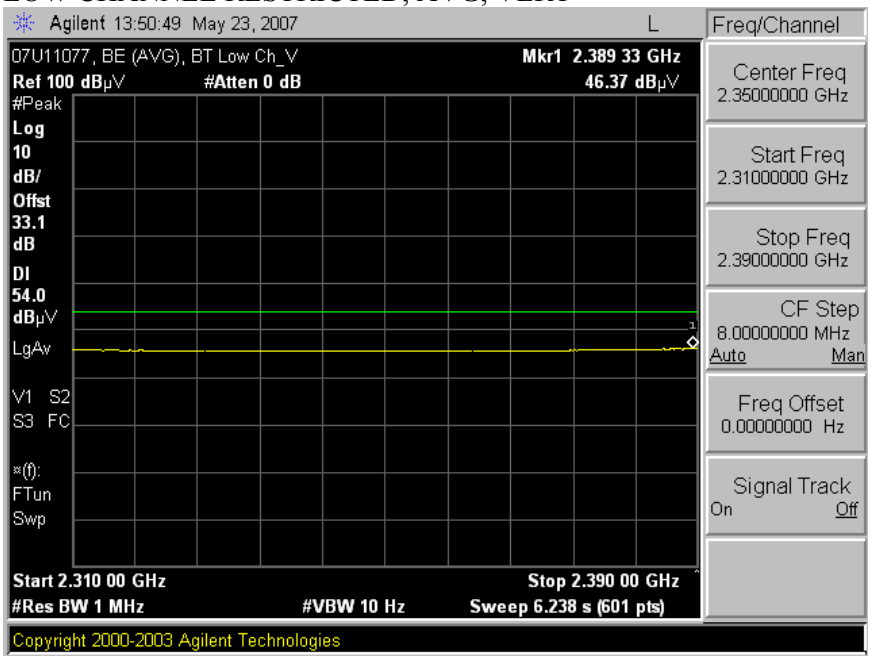


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL RESTRICTED, PEAK, VERT

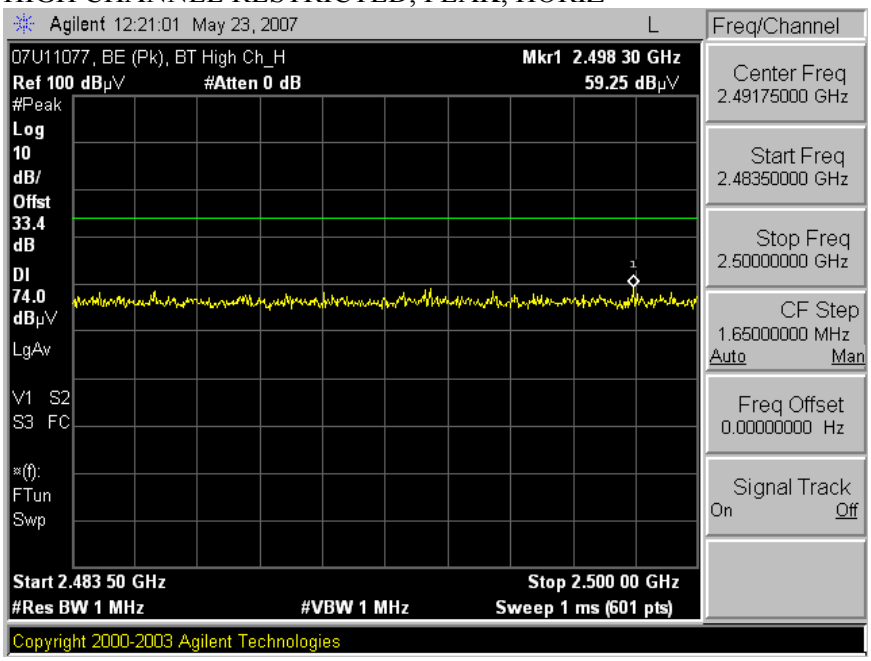


LOW CHANNEL RESTRICTED, AVG, VERT

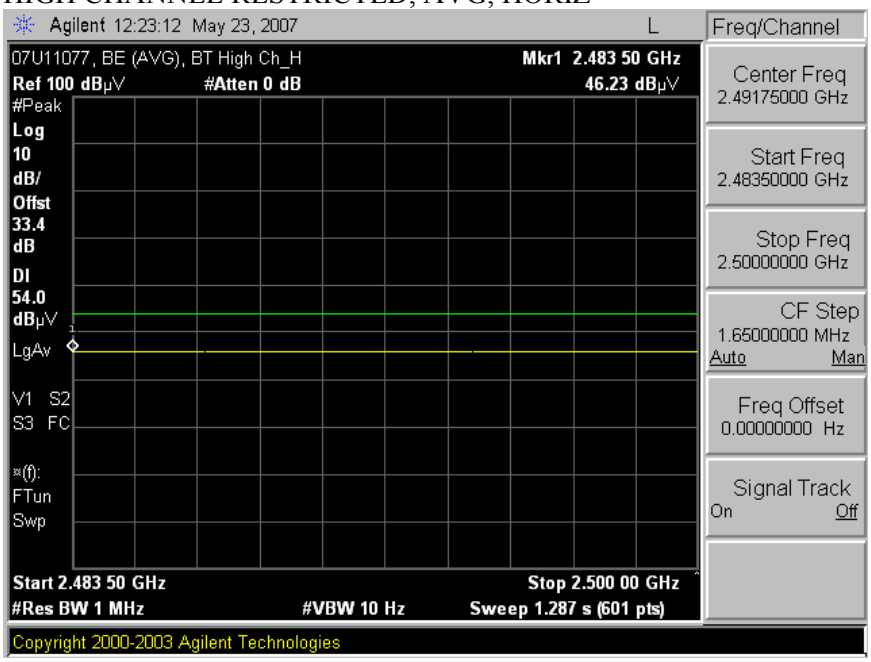


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL RESTRICTED, PEAK, HORIZ

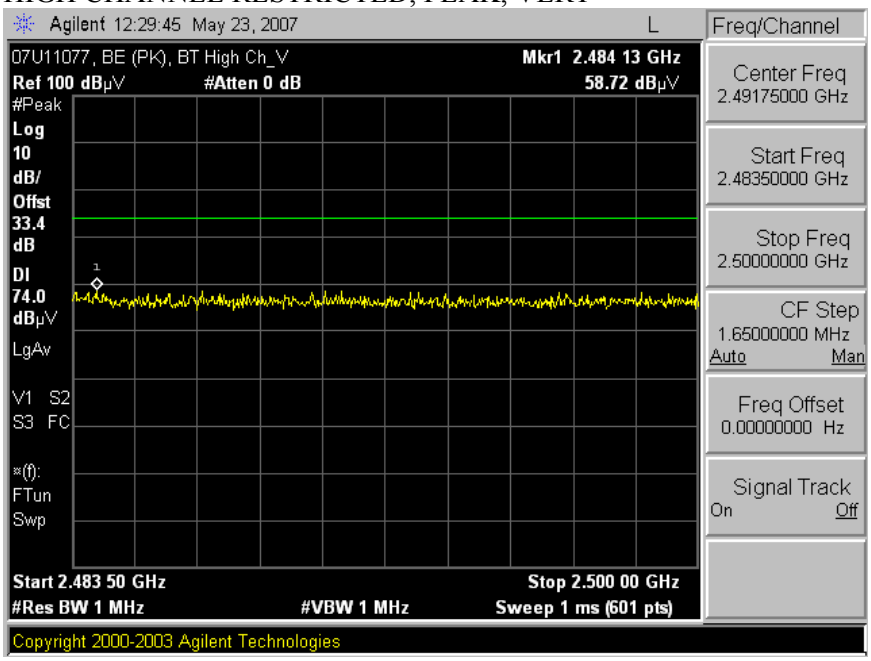


HIGH CHANNEL RESTRICTED, AVG, HORIZ

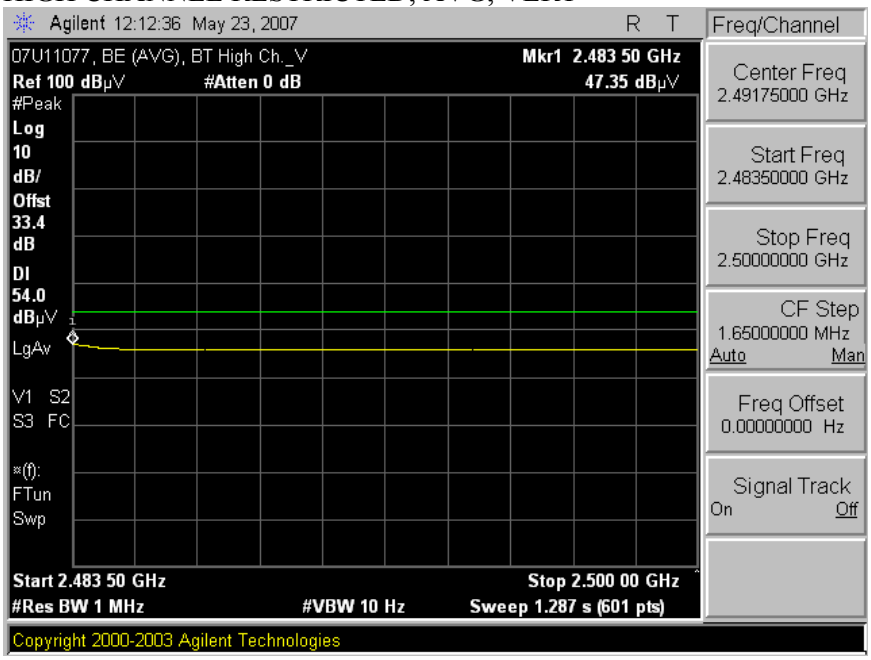


RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL RESTRICTED, PEAK, VERT



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5 meter Chamber A

Company: APPLE COMPUTER INC.
Project #: 07U11077
Date: May 23, 2007
Test Engineer: Thanh Nguyen
Configuration: EUT at worst position
Mode: Continuous Transmit 8DPQSK mode.

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		Gordon 203134001	HPF_4.0GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel															
4.804	3.0	40.1	26.8	33.3	6.9	-36.5	0.0	0.6	44.4	31.1	74	54	-29.6	-22.9	V
7.206	3.0	38.9	27.5	34.9	8.4	-36.2	0.0	0.6	46.6	35.2	74	54	-27.4	-18.8	V
9.608	3.0	37.1	24.9	36.7	9.6	-36.9	0.0	0.8	47.4	35.1	74	54	-26.6	-18.9	Noise Floor
4.804	3.0	39.2	26.7	33.3	6.9	-36.5	0.0	0.6	43.5	31.0	74	54	-30.5	-23.0	H
7.206	3.0	39.7	26.5	34.9	8.4	-36.2	0.0	0.6	47.4	34.2	74	54	-26.6	-19.8	H
9.608	3.0	37.4	25.3	36.7	9.6	-36.9	0.0	0.8	47.6	35.6	74	54	-26.4	-18.4	Noise Floor
Mid Channel															
4.882	3.0	40.2	26.4	33.4	6.9	-36.5	0.0	0.6	44.7	30.8	74	54	-29.3	-23.2	V
7.323	3.0	39.0	25.8	35.0	8.4	-36.2	0.0	0.6	46.8	33.6	74	54	-27.2	-20.4	V
9.764	3.0	37.8	24.8	36.8	9.8	-37.0	0.0	0.8	48.2	35.2	74	54	-25.8	-18.8	Noise Floor
4.882	3.0	39.6	26.3	33.4	6.9	-36.5	0.0	0.6	44.1	30.8	74	54	-29.9	-23.2	H
7.323	3.0	38.5	30.0	35.0	8.4	-36.2	0.0	0.6	46.4	37.8	74	54	-27.6	-16.2	H
9.764	3.0	37.2	24.8	36.8	9.8	-37.0	0.0	0.8	47.6	35.2	74	54	-26.4	-18.8	Noise Floor
High Channel															
4.960	3.0	38.8	26.0	33.4	7.0	-36.5	0.0	0.6	43.4	30.6	74	54	-30.6	-23.4	V
7.440	3.0	38.2	25.6	35.1	8.5	-36.2	0.0	0.6	46.1	33.6	74	54	-27.9	-20.4	V
9.920	3.0	36.9	25.1	36.8	10.0	-37.1	0.0	0.8	47.4	35.7	74	54	-26.6	-18.3	Noise Floor
4.960	3.0	38.4	26.0	33.4	7.0	-36.5	0.0	0.6	43.0	30.6	74	54	-31.0	-23.4	H
7.440	3.0	38.5	25.6	35.1	8.5	-36.2	0.0	0.6	46.4	33.5	74	54	-27.6	-20.5	H
9.920	3.0	37.4	25.1	36.8	10.0	-37.1	0.0	0.8	47.9	35.7	74	54	-26.1	-18.3	Noise Floor
No other spurious emissions were detected above noise floor.															

Rev. 5.1.6

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

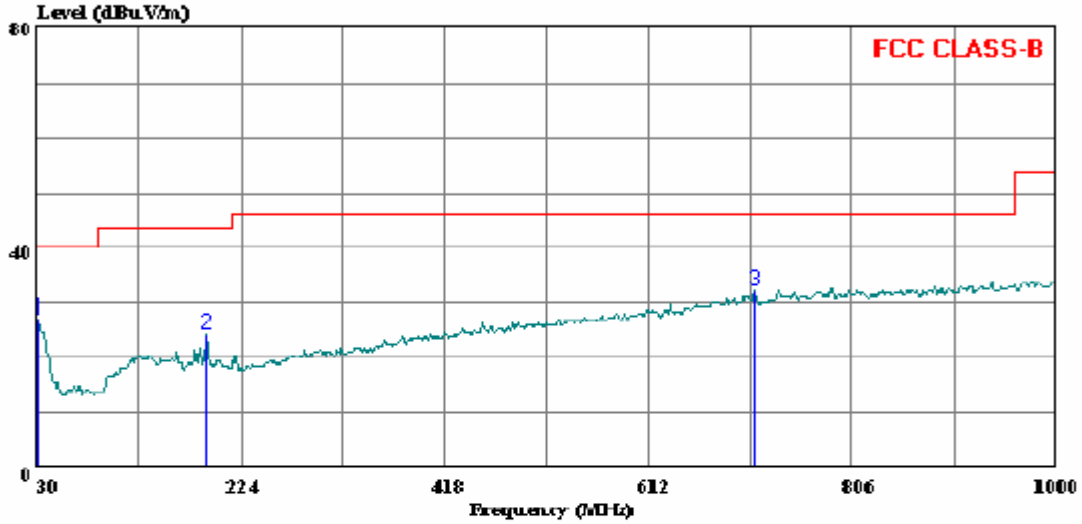
7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT& DATA

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 2 File#: 07U11077EMI.EMI Date: 05-25-2007 Time: 22:18:41



Trace: 1 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Project #: : 07U11077
Company: : Apple
Configuration:: EUT Alone
Mode : : Tx Worst Case (GFSK)
Target: : FCC Class B

Page: 1

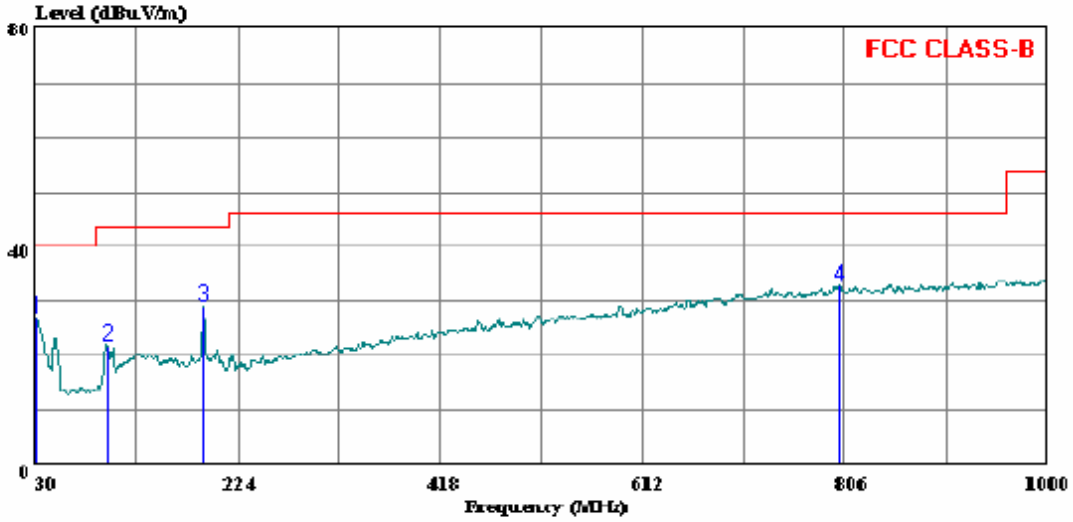
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	32.16	-5.30	26.86	40.00	-13.14	Peak
2	191.990	38.16	-14.01	24.15	43.50	-19.35	Peak
3	712.880	34.82	-2.67	32.15	46.00	-13.85	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT& DATA

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 4 File#: 07U11077EMI.EMI Date: 05-25-2007 Time: 22:26:09



Trace: 3 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Project #: : 07U11077
Company: : Apple
Configuration:: EUT Alone
Mode : : Tx Worst Case (GFSK)
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.000	32.20	-5.30	26.90	40.00	-13.10	Peak
2	98.870	38.79	-16.99	21.80	43.50	-21.70	Peak
3	191.990	43.25	-14.01	29.24	43.50	-14.26	Peak
4	800.180	34.53	-1.47	33.06	46.00	-12.94	Peak