



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT**

FOR

BLUETOOTH DONGLE

MODEL NUMBER: RSVLD-0502

FCC ID: B94RSVLD0502

REPORT NUMBER: 05U3207-1 REV. B

ISSUE DATE: FEBRUARY 2, 2005

Prepared for
**HEWLETT-PACKARD COMPANY
3000 HANOVER STREET, PALO ALTO
CA, 94304 USA.**

Prepared by
**COMPLIANCE ENGINEERING SERVICES, INC.
d.b.a.
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD,
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888**

NVLAP[®]
LAB CODE:200065-0

Revision History

<u>Rev.</u>	<u>Revisions</u>	<u>Revised By</u>
B	Removed original sections 7.1.6 and 7.2.6 MAXIMUM PERMISSIBLE EXPOSURE	Danielle Z.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY.....	6
4.1. MEASURING INSTRUMENT CALIBRATION.....	6
4.2. MEASUREMENT UNCERTAINTY.....	6
5. EQUIPMENT UNDER TEST.....	7
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT POWER	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS.....	8
5.4. SOFTWARE AND FIRMWARE	8
5.5. WORST-CASE CONFIGURATION AND MODE.....	8
5.6. DESCRIPTION OF TEST SETUP	9
6. TEST AND MEASUREMENT EQUIPMENT	11
7. LIMITS AND RESULTS	12
7.1. ANTENNA PORT CHANNEL TESTS FOR EUT WITH 8PSK MODULATION	12
7.1.1. 20 dB BANDWIDTH	12
7.1.2. HOPPING FREQUENCY SEPARATION.....	16
7.1.3. NUMBER OF HOPPING CHANNELS.....	18
7.1.4. AVERAGE TIME OF OCCUPANCY	22
7.1.5. PEAK OUTPUT POWER	30
7.1.6. AVERAGE POWER.....	34
7.1.7. PEAK POWER SPECTRAL DENSITY	35
7.1.8. CONDUCTED SPURIOUS EMISSIONS.....	39
7.2. ANTENNA PORT CHANNEL TESTS FOR EUT WITH GFSK MODULATION.....	48
7.2.1. 20 dB BANDWIDTH	48
7.2.2. HOPPING FREQUENCY SEPARATION.....	52
7.2.3. NUMBER OF HOPPING CHANNELS.....	54
7.2.4. AVERAGE TIME OF OCCUPANCY	58
7.2.5. PEAK OUTPUT POWER	66
7.2.6. AVERAGE POWER.....	70
7.2.7. PEAK POWER SPECTRAL DENSITY	71
7.2.8. CONDUCTED SPURIOUS EMISSIONS.....	75
7.3. RADIATED EMISSIONS.....	84
7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS.....	84
7.3.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ WITH 8PSK MODULATION.....	87
7.3.3. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ WITH GFSK MODULATION.....	96

7.3.4.	WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH 8PSK MODULATION	105
7.3.5.	WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH GFSK MODULATION	109
7.4.	<i>POWERLINE CONDUCTED EMISSIONS</i>	113
8.	SETUP PHOTOS	117

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: HEWLETT-PACKARD COMPANY
3000 HANOVER STREET
PALO ALTO, CA 94304, USA

EUT DESCRIPTION: BLUETOOTH DONGLE

MODEL: RSVLD-0502

SERIAL NUMBER: Proto001

DATE TESTED: JANUARY 18 - 24, 2005

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.

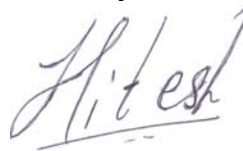
Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. 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:



HITESH H. SOLANKI
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 561F Monterey Road, Morgan Hill, 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.

The radio module is manufactured by BROADCOM CORPORATION.

5.2. MAXIMUM OUTPUT POWER

The transmitter while in 8PSK modulation mode has a maximum peak conducted output power as follows:

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	4.85	3.05

The transmitter while in GFSK modulation mode has a maximum peak conducted output power as follows:

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
2402 - 2480	2.94	1.97

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB type antenna, with a maximum gain of 0.298 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Flash_267_pa50_050107, pre-production version.

The EUT driver software installed in the host Laptop during testing was Broadcom BlueTool, ver 0.8.4.6.

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 2441 MHz.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacture	Model	Serial Number	FCC ID
LAPTOP	DELL	PP02X	W2138AD0	E2K24CLNS
AC ADAPTER	DELL	PA-1900-02D	DVT2 (Rev. X05)	N/A

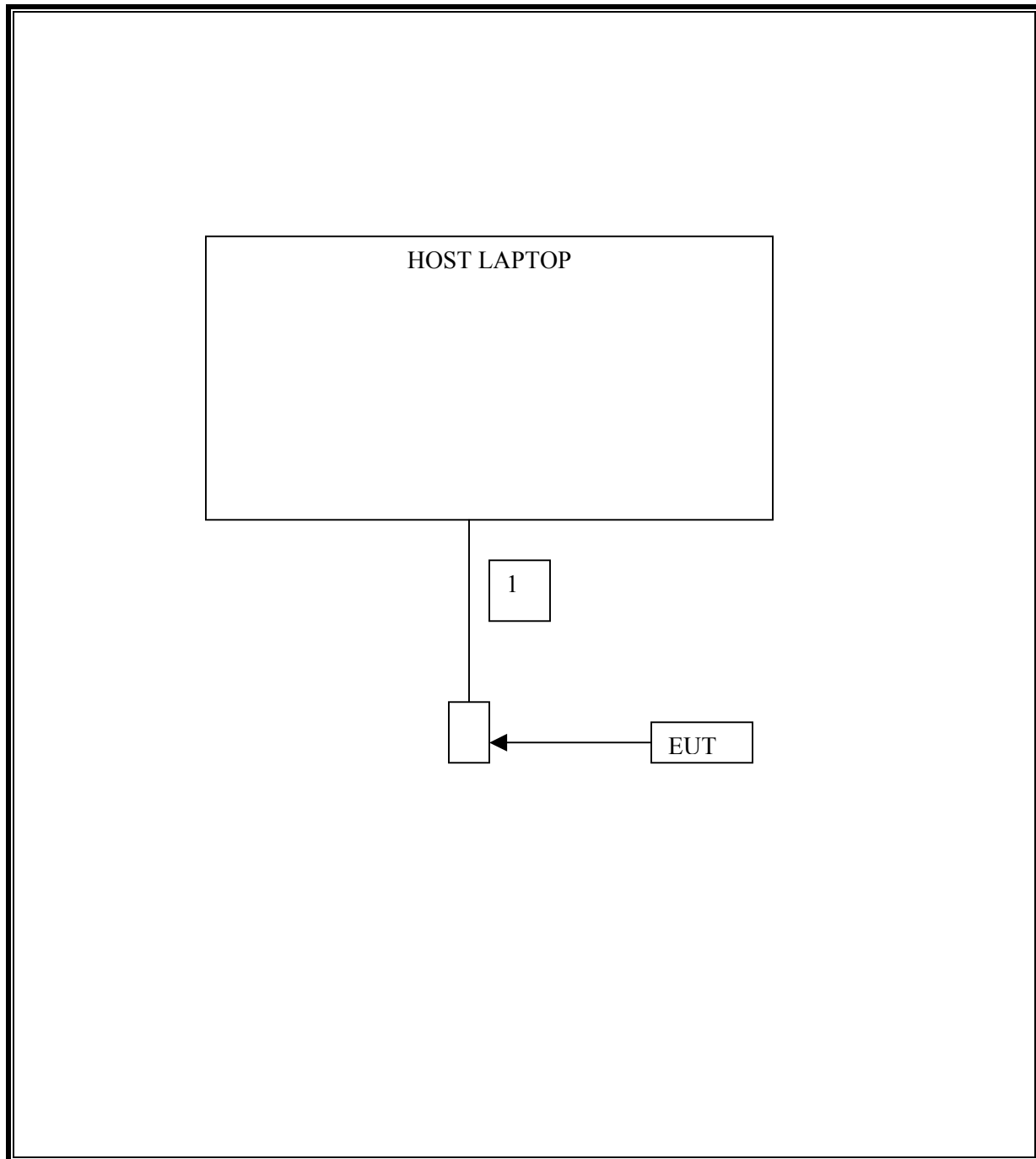
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identic Ports	Connector Type	Cable Type	Cable Length	Remarks
1	USB	1	USB	UN-SHIELDED	1m	N/A

TEST SETUP

The EUT was connected via a cable to the USB port of a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



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
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	1/6/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	9/12/2005
Antenna, Horn 18 ~ 26 GHz	ARA	SWH-28	1007	2/24/2005
Line Filter	Lindgren	LMF-3489	497	N.C.R.
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2005
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2006
30MHz--- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	9/15/2005
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
Spectrum Analyzer 20 Hz ~ 44 GHz	Agilent	E4446A	MY43360112	6/16/2005
2.4-2.5 Band Reject Filter	Micro Tronics	N/A	1	N/A

7. LIMITS AND RESULTS

7.1. ANTENNA PORT CHANNEL TESTS FOR EUT WITH 8PSK MODULATION

7.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

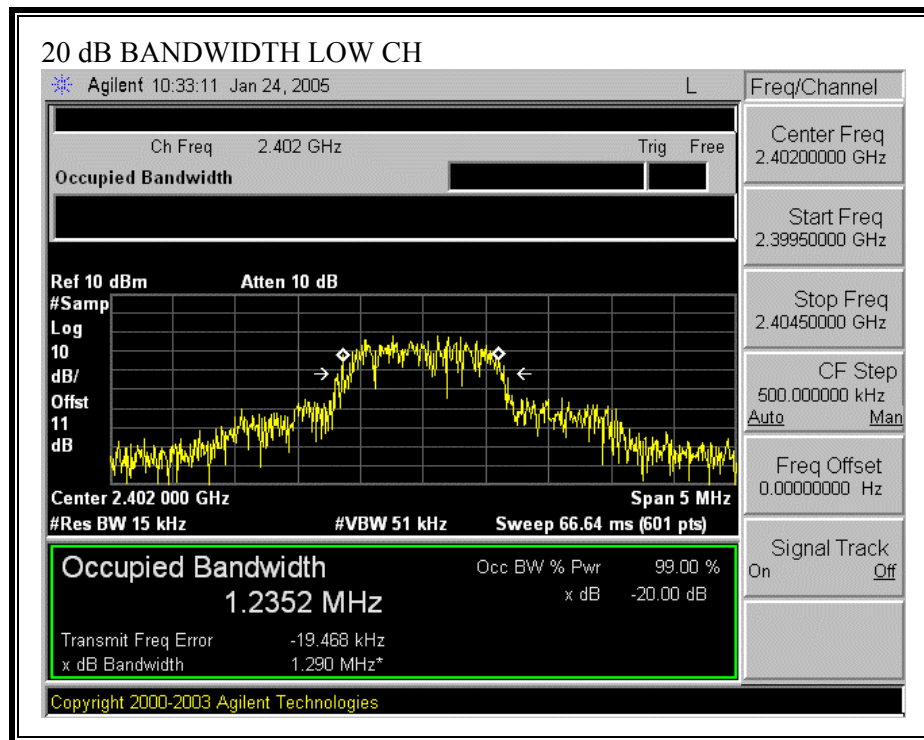
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

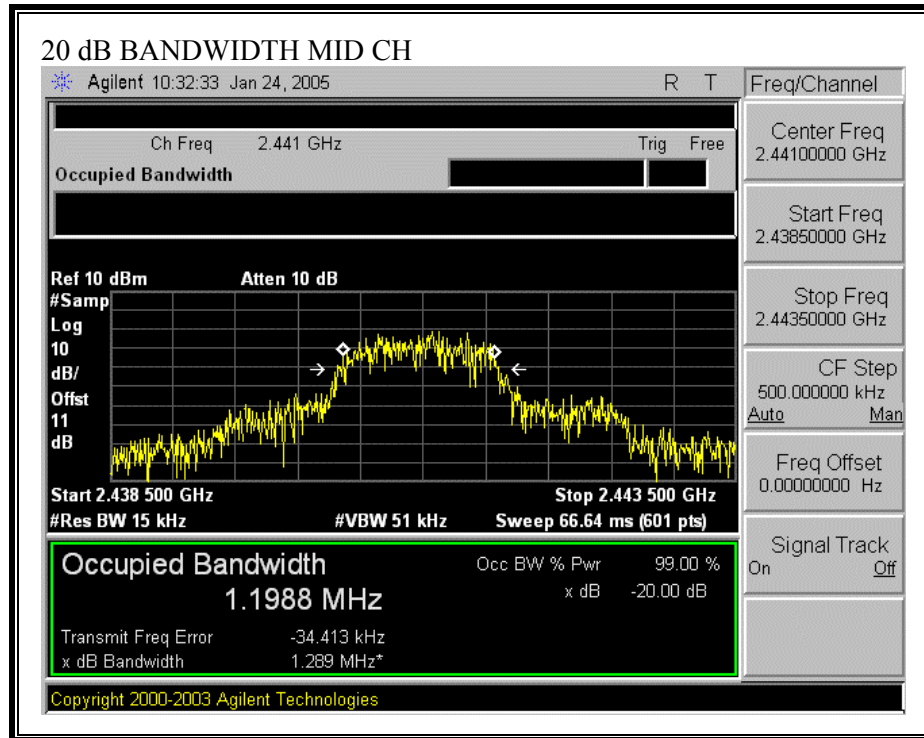
RESULTS

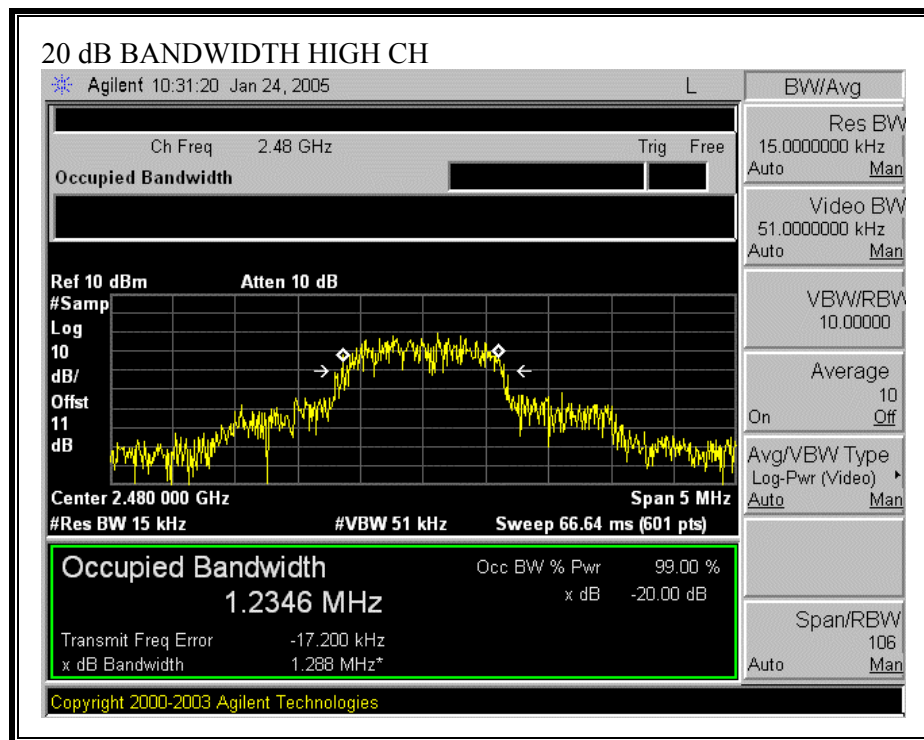
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	1290
Middle	2441	1289
High	2480	1288

20 dB BANDWIDTH







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 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.

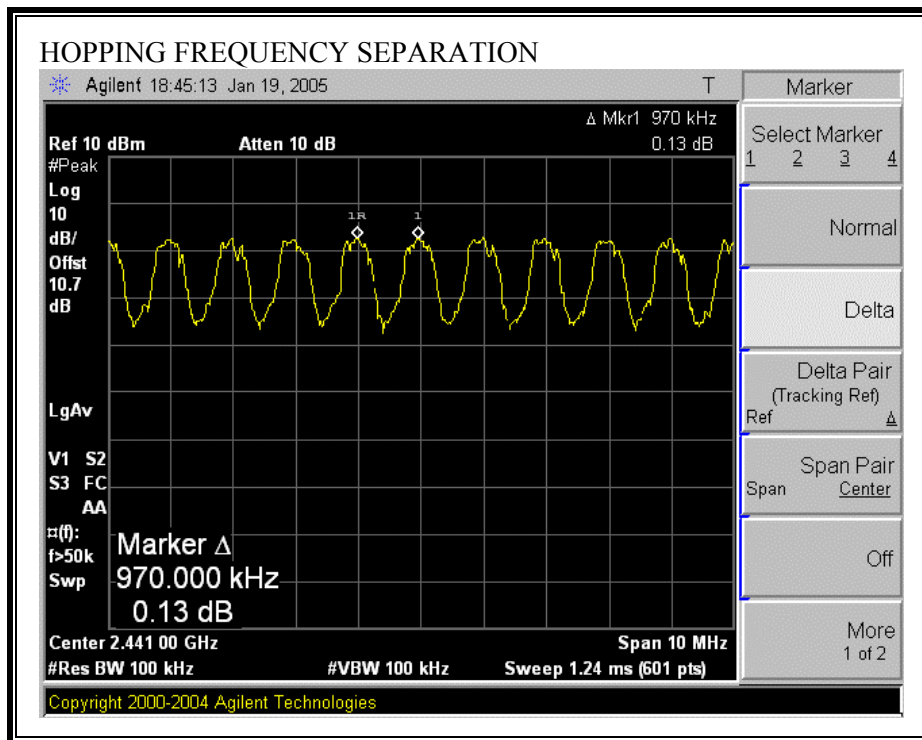
TEST PROCEDURE

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



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.

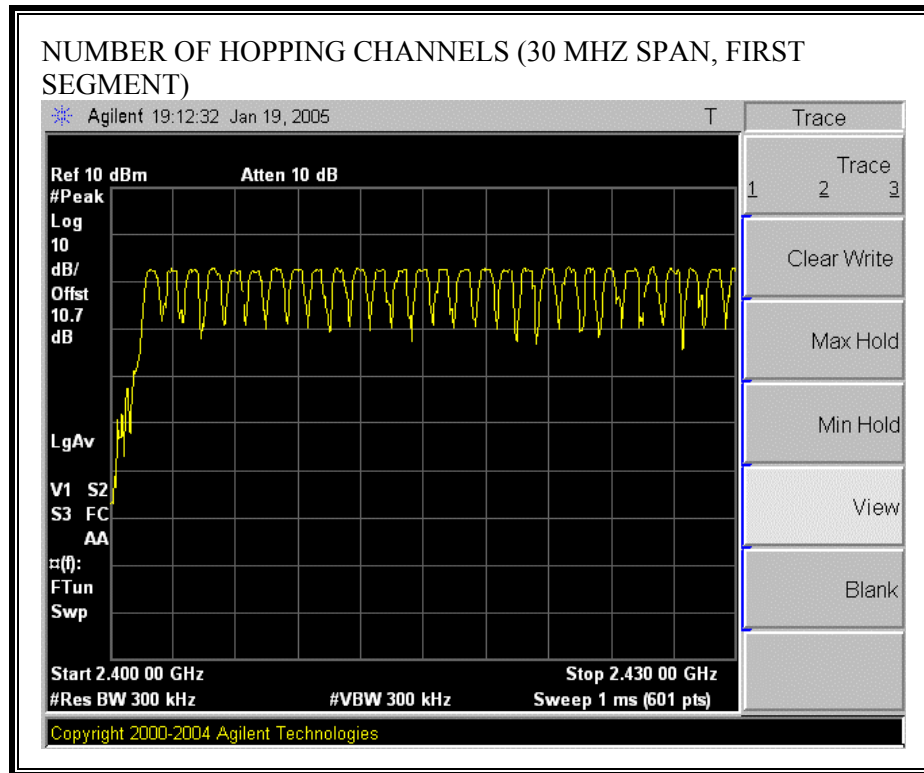
TEST PROCEDURE

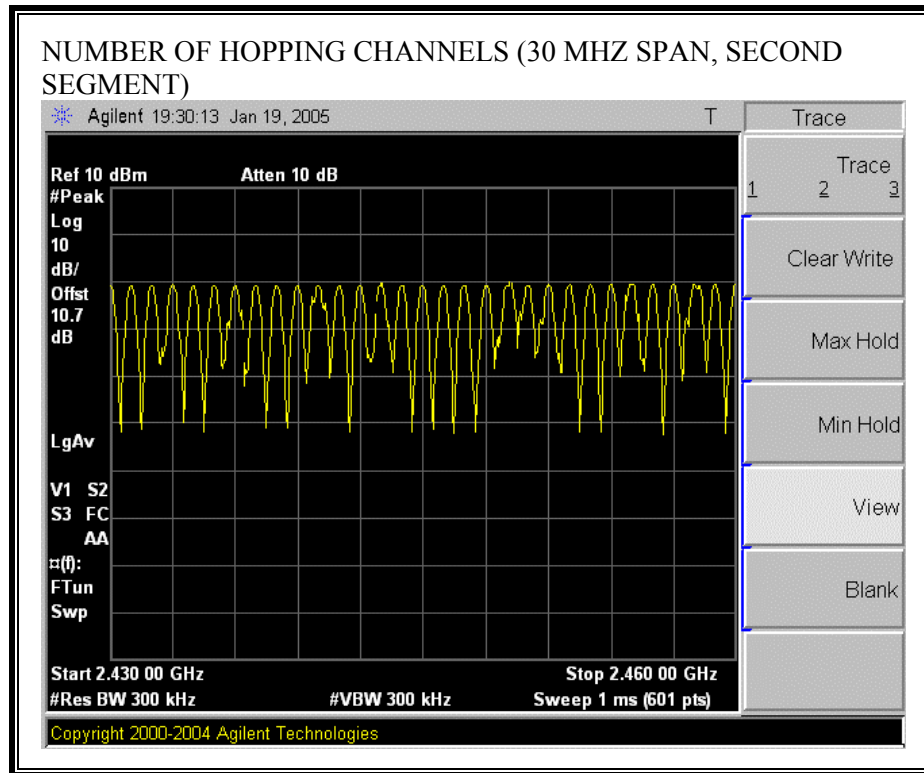
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

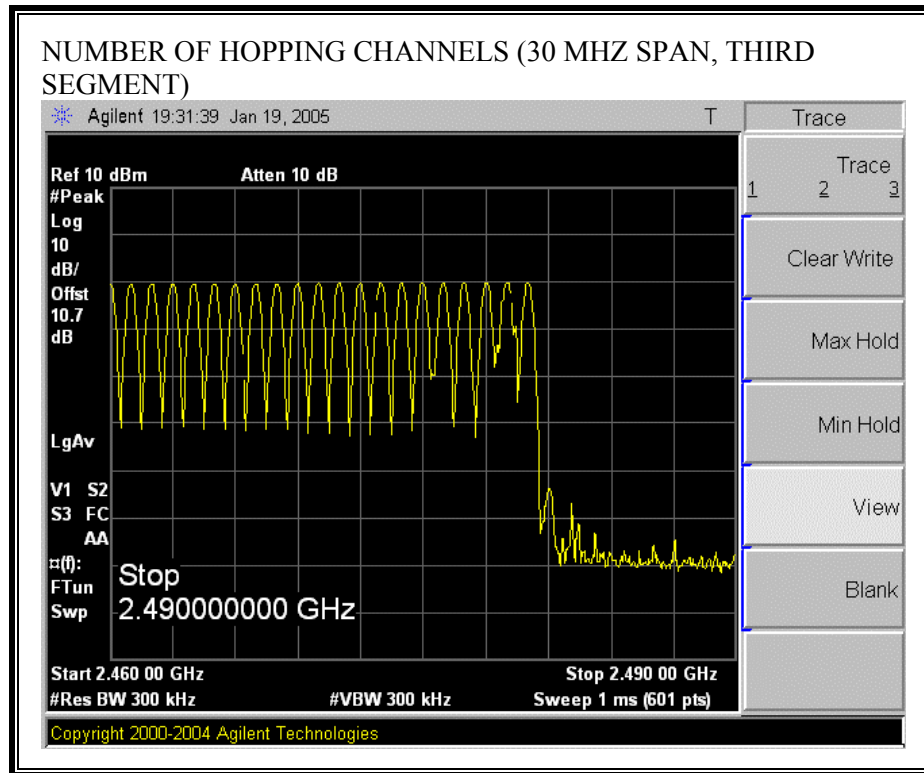
RESULTS

No non-compliance noted:

79 Channels observed.







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.

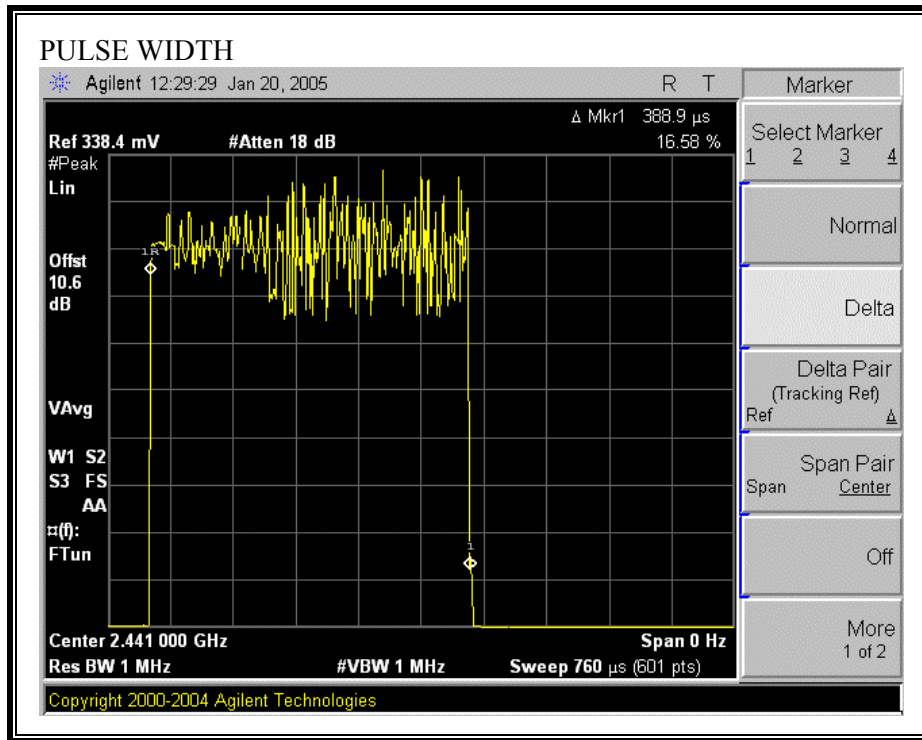
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

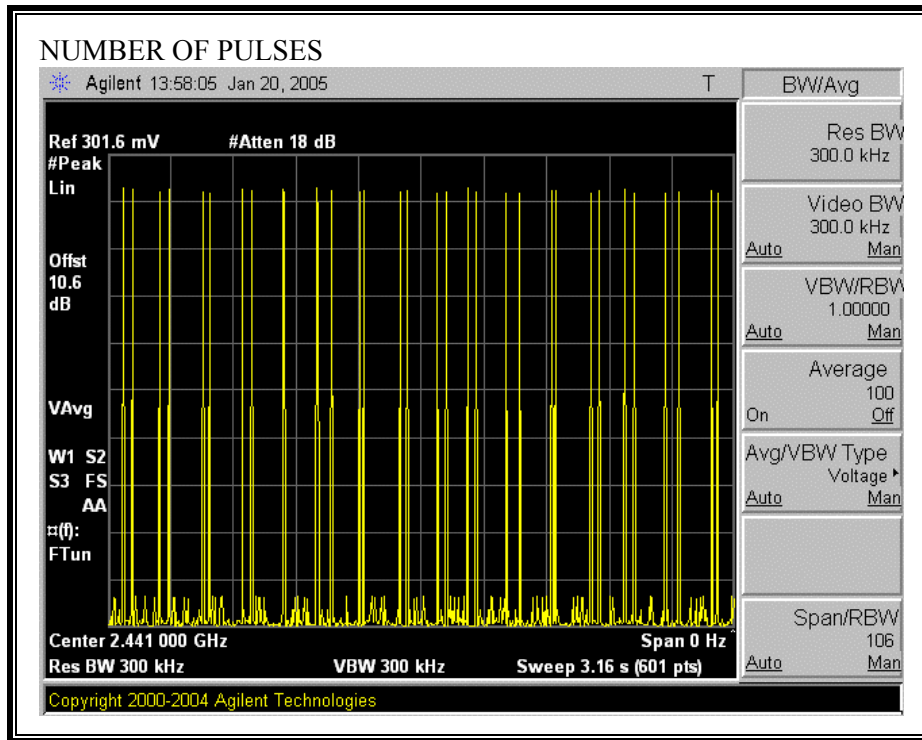
No non-compliance noted:

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
1	0.3889	31	0.121	0.4	0.279
3	1.642	20	0.328	0.4	0.072
5	2.892	12	0.347	0.4	0.053

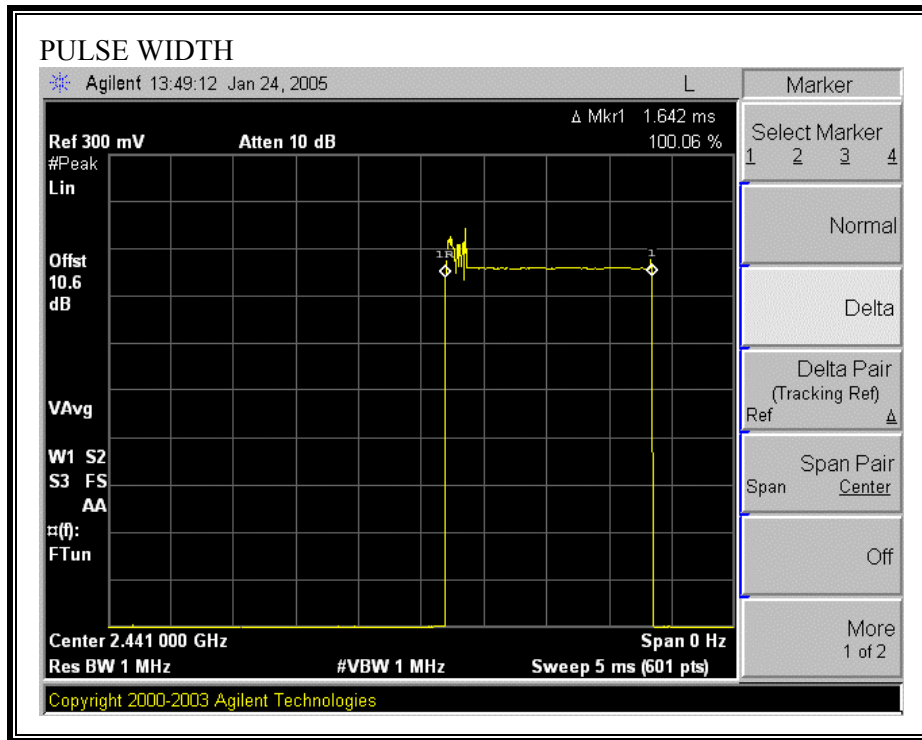
PULSE WIDTH (DH1 PACKET TYPE)



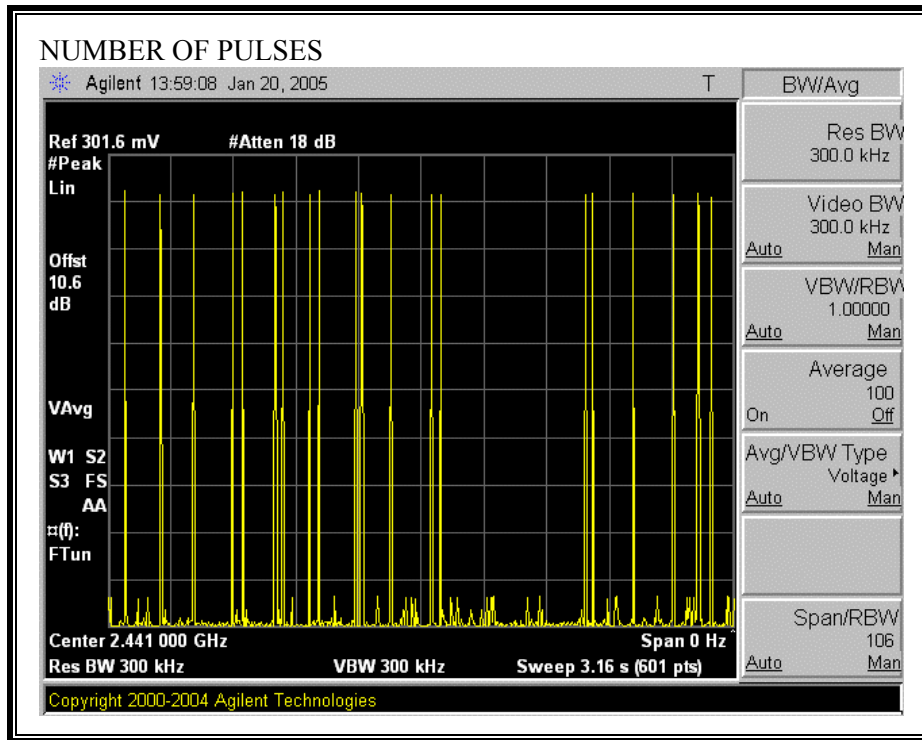
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH1 PACKET TYPE)



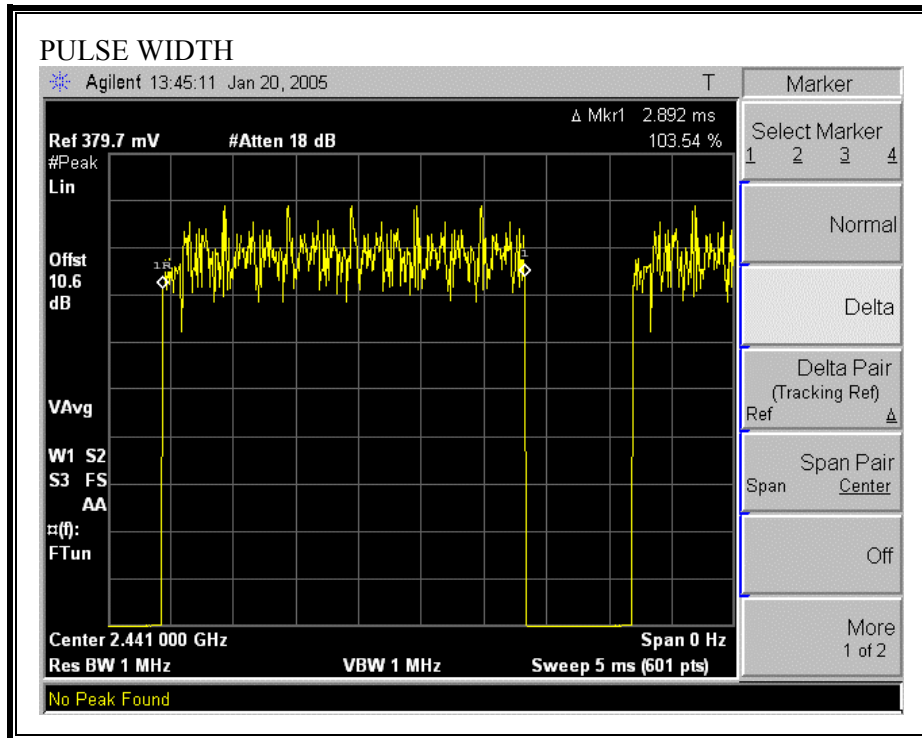
PULSE WIDTH (DH3 PACKET TYPE)



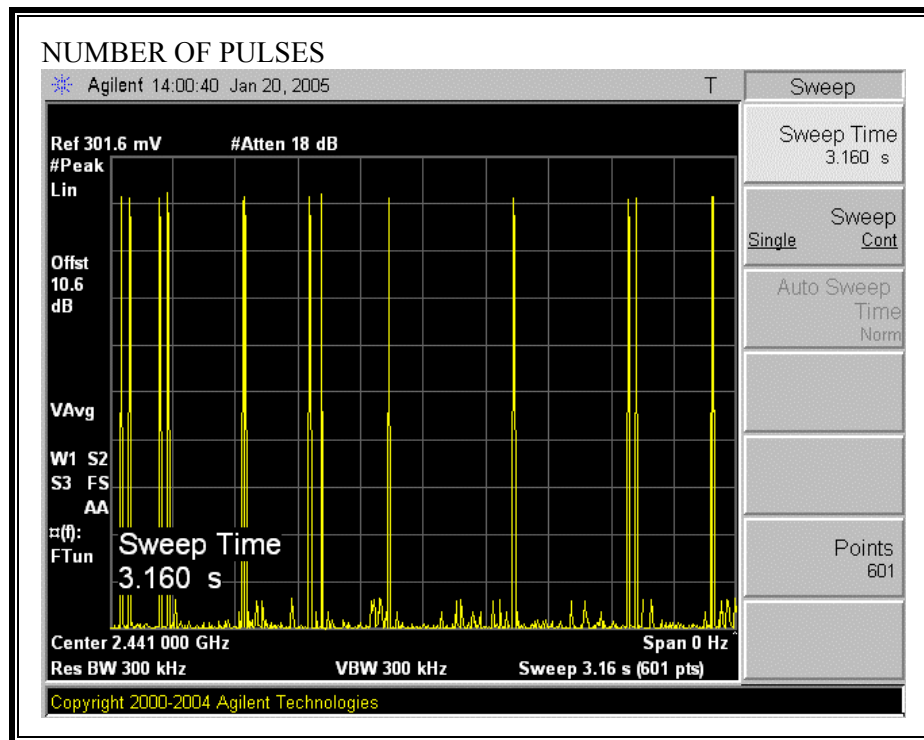
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH3 PACKET TYPE)



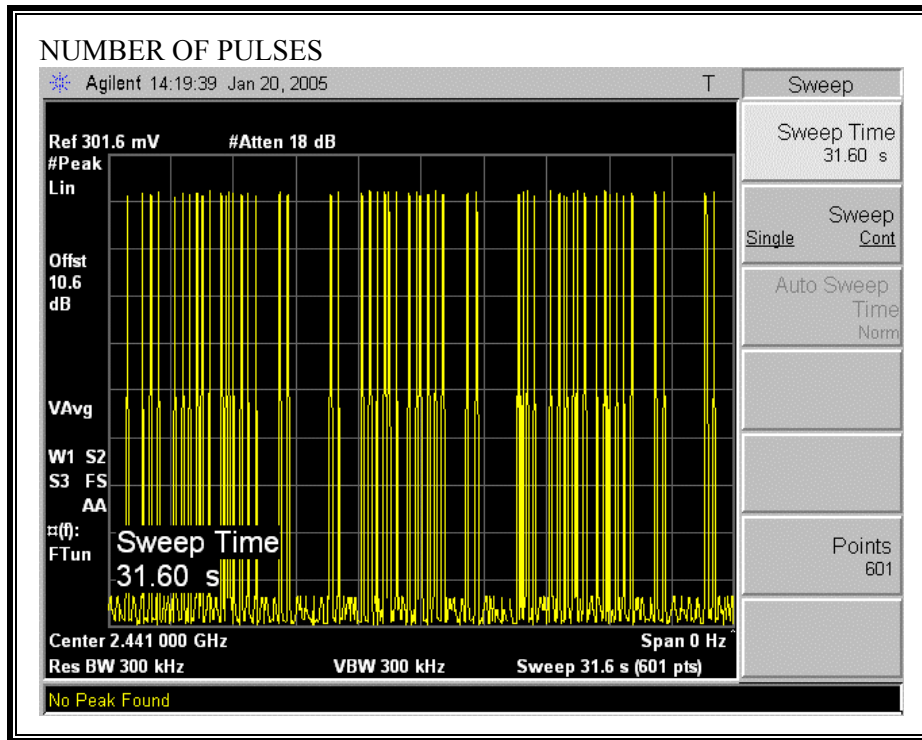
PULSE WIDTH (DH5 PACKET TYPE)



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH5 PACKET TYPE)



NUMBER OF PULSES IN 31.6 SECOND OBSERVATION PERIOD (DH5 PACKET TYPE)



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. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

§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 0.298 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

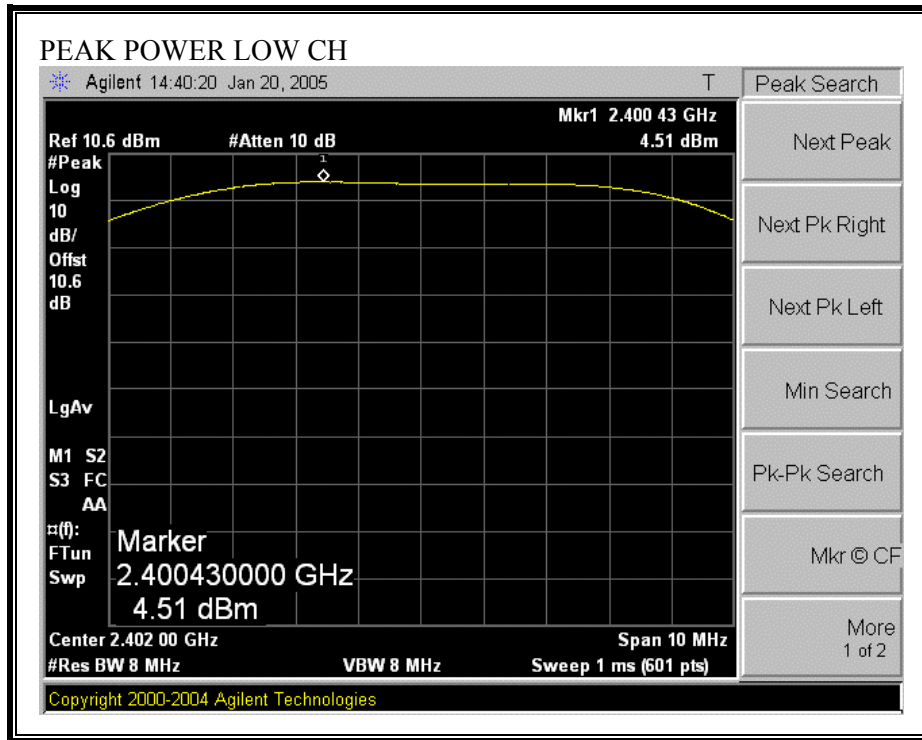
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

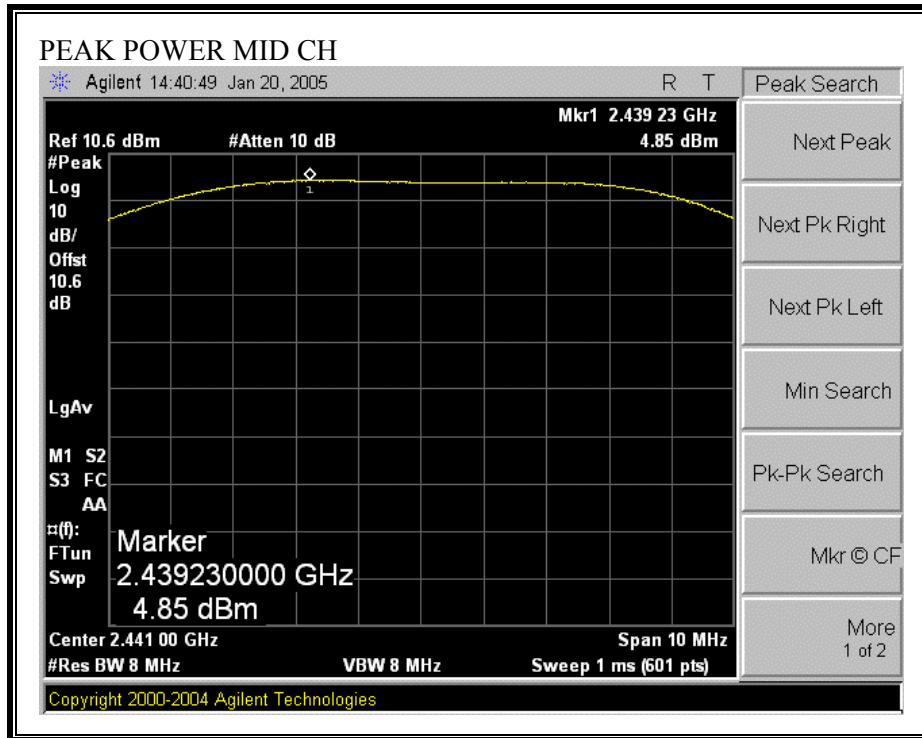
RESULTS

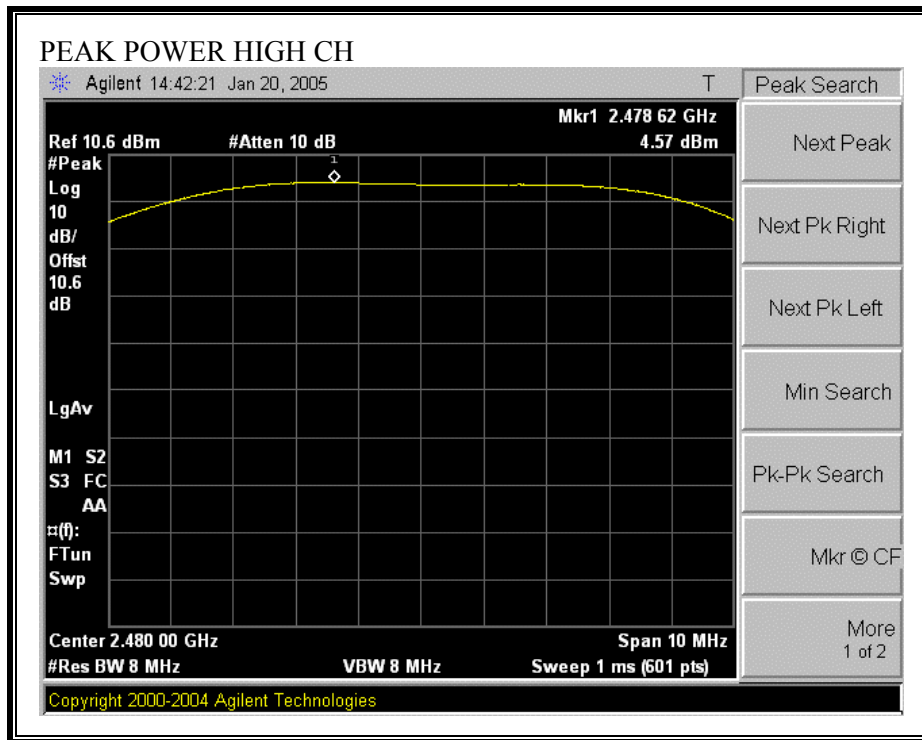
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.51	21	-16.46
Middle	2441	4.85	21	-16.12
High	2480	4.57	21	-16.40

OUTPUT POWER







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 10.6 dB (including 10 dB pad and 0.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	0.60
Middle	2441	1.02
High	2480	1.09

7.1.7. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak 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.

§15.247 (f) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST PROCEDURE

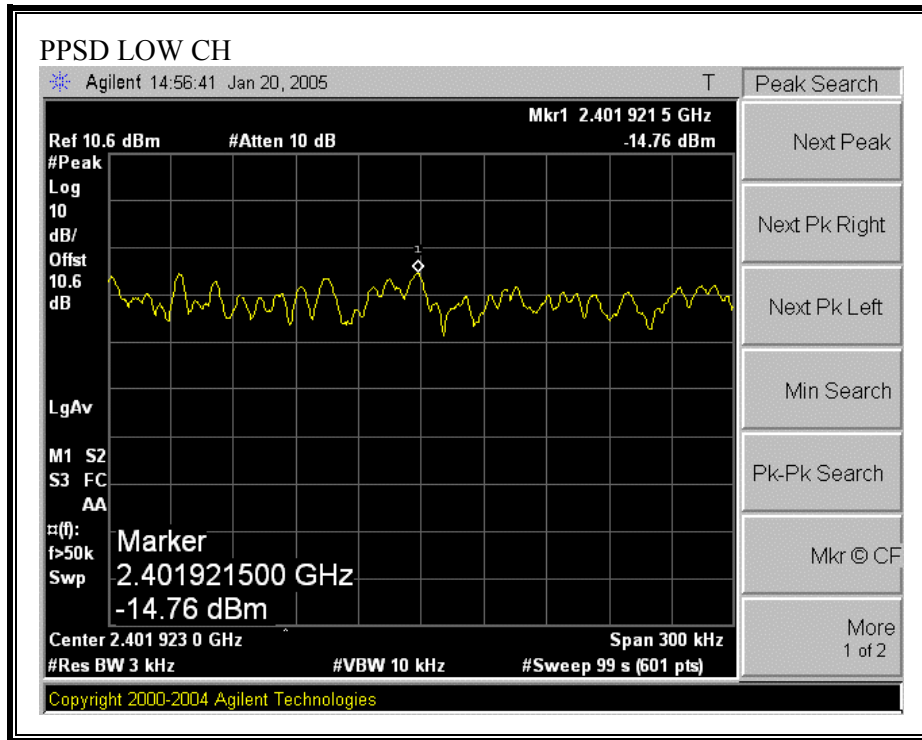
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

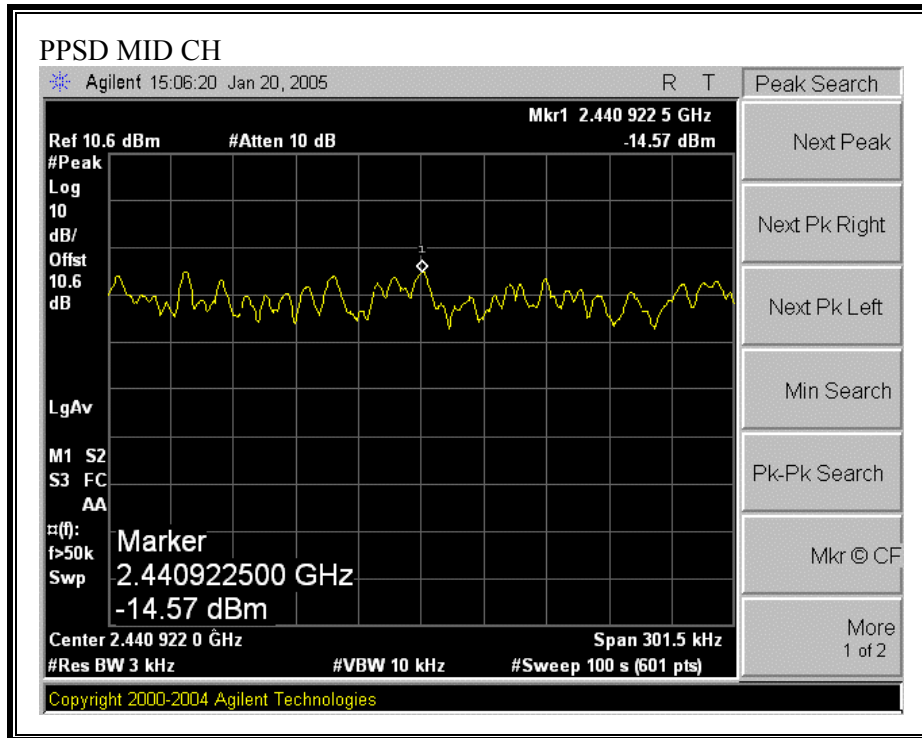
RESULTS

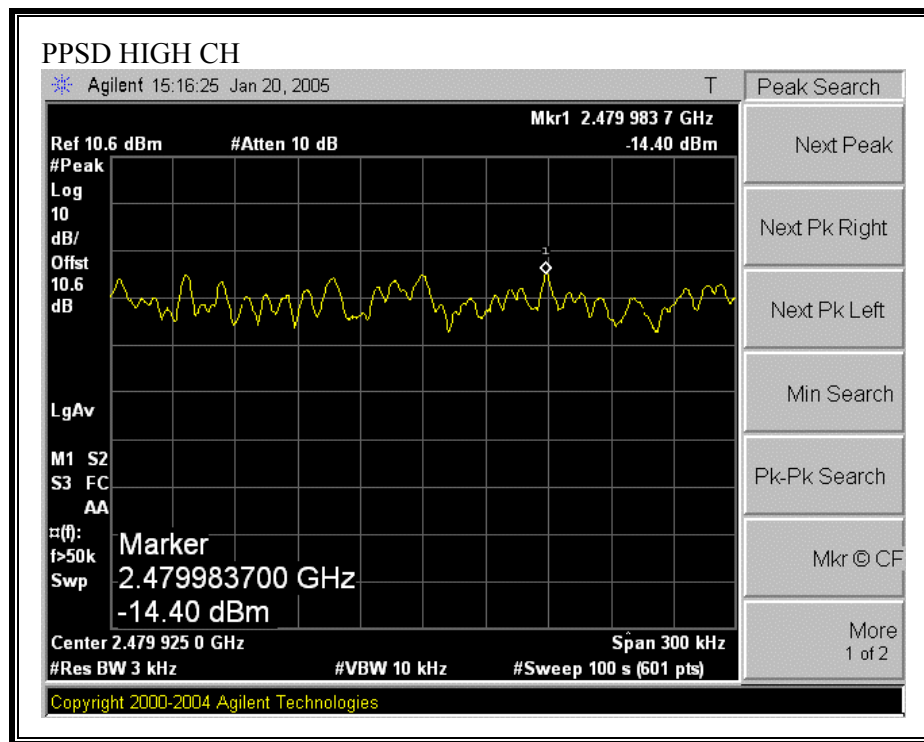
No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-14.76	8	-22.76
Middle	2441	-14.57	8	-22.57
High	2480	-14.40	8	-22.40

PEAK POWER SPECTRAL DENSITY







7.1.8. 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

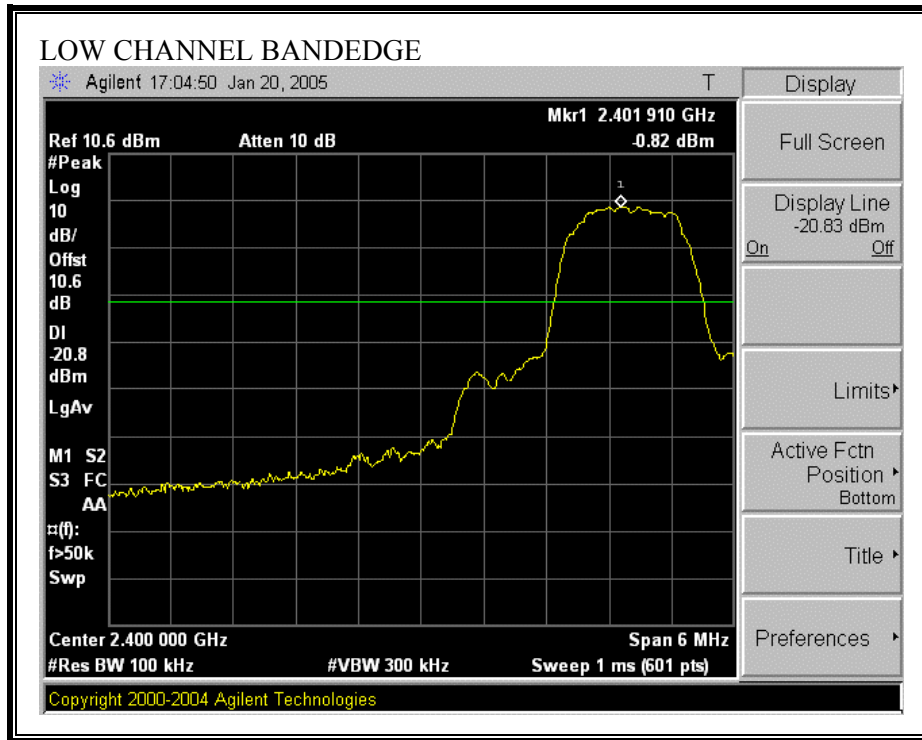
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

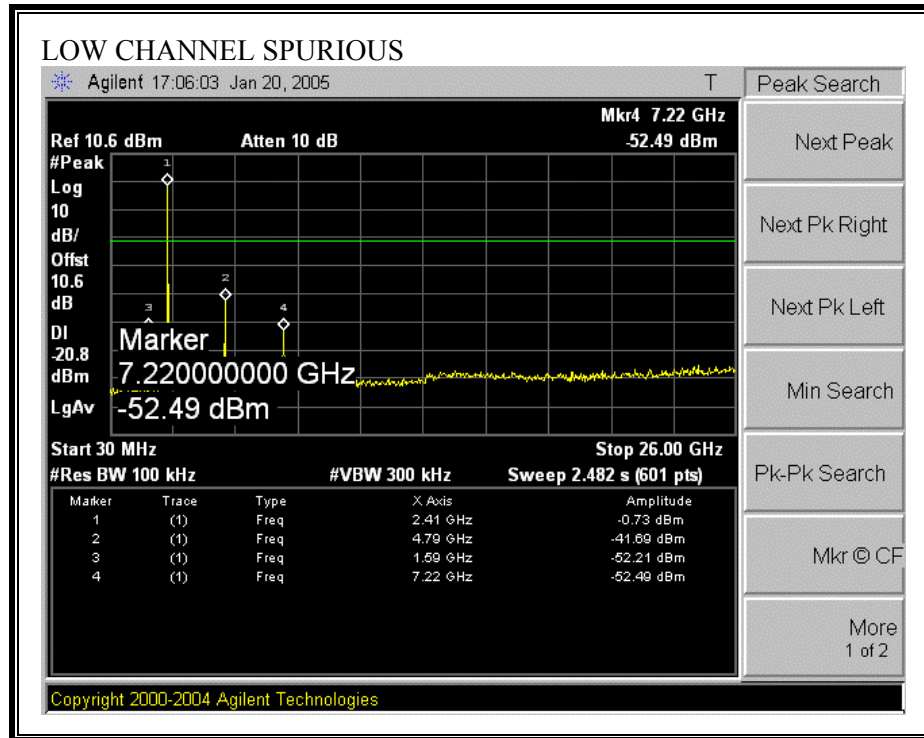
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

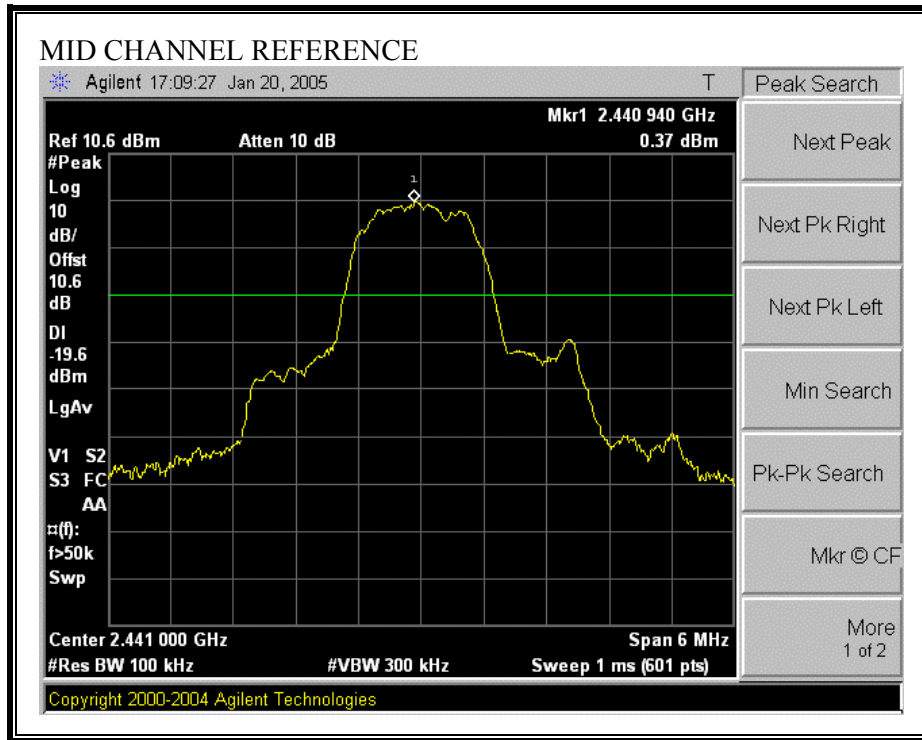
No non-compliance noted:

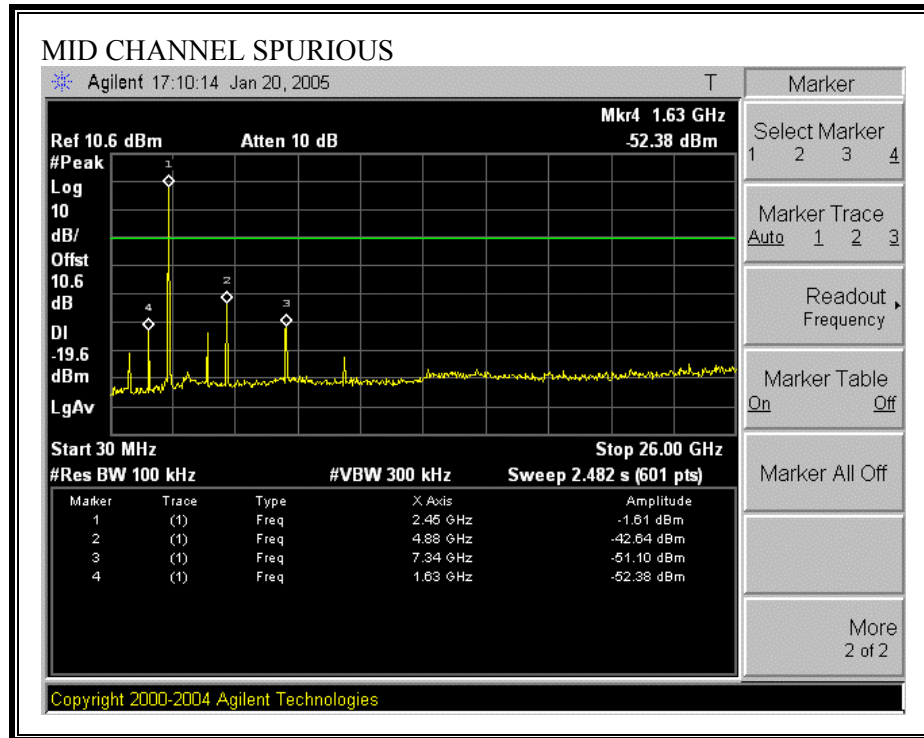
SPURIOUS EMISSIONS, LOW CHANNEL



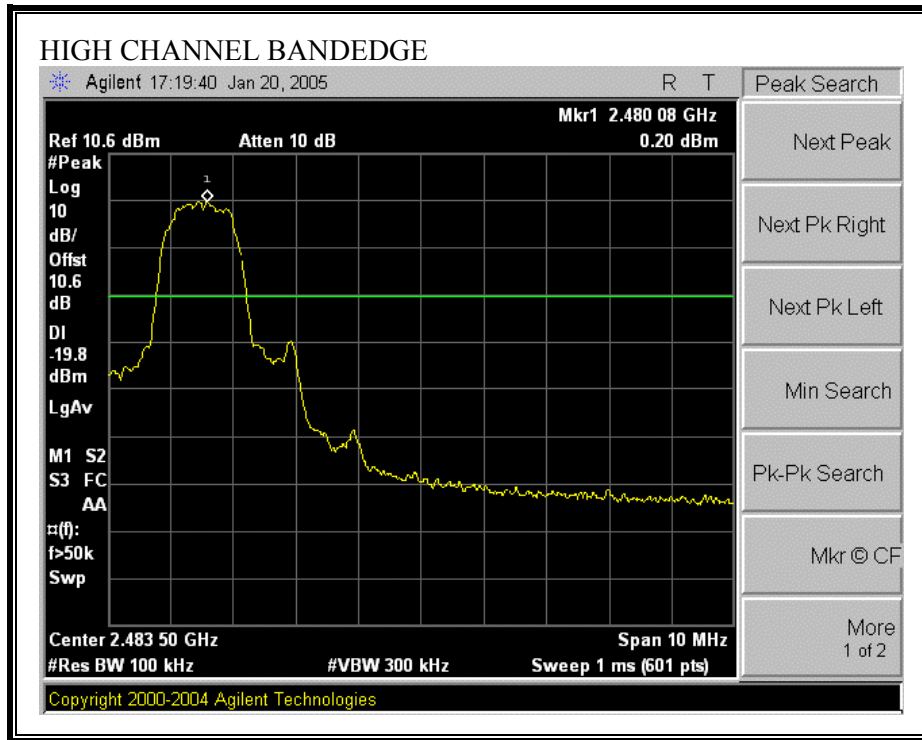


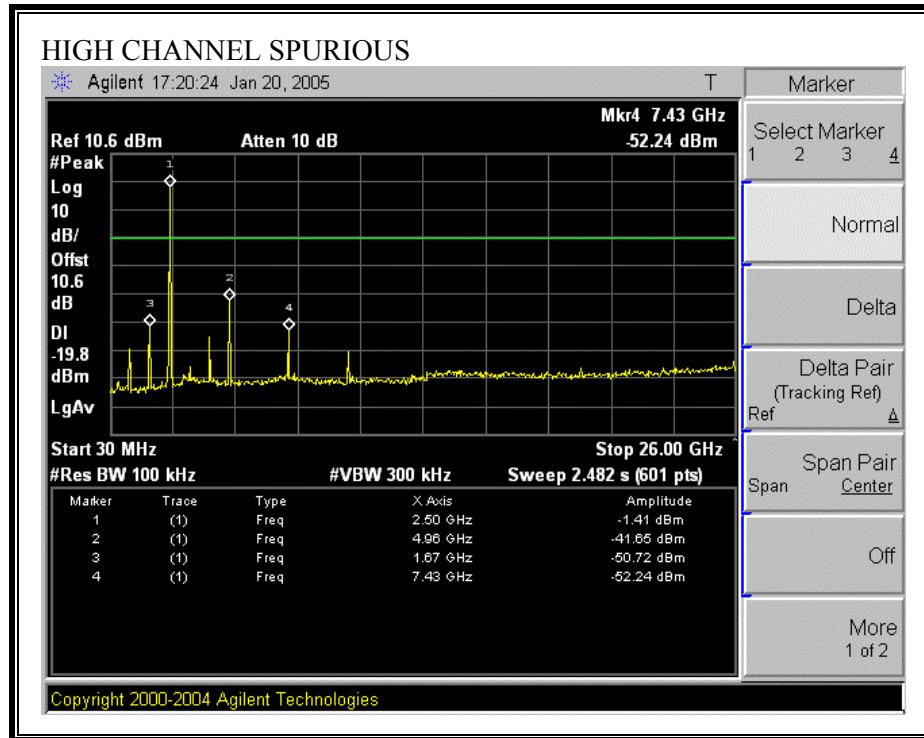
SPURIOUS EMISSIONS, MID CHANNEL



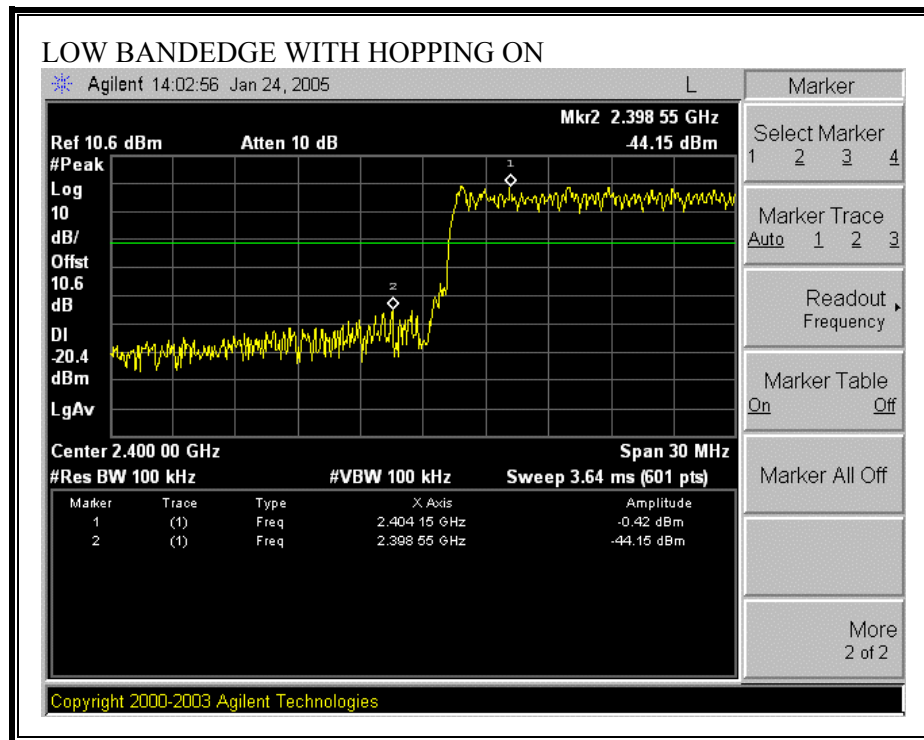


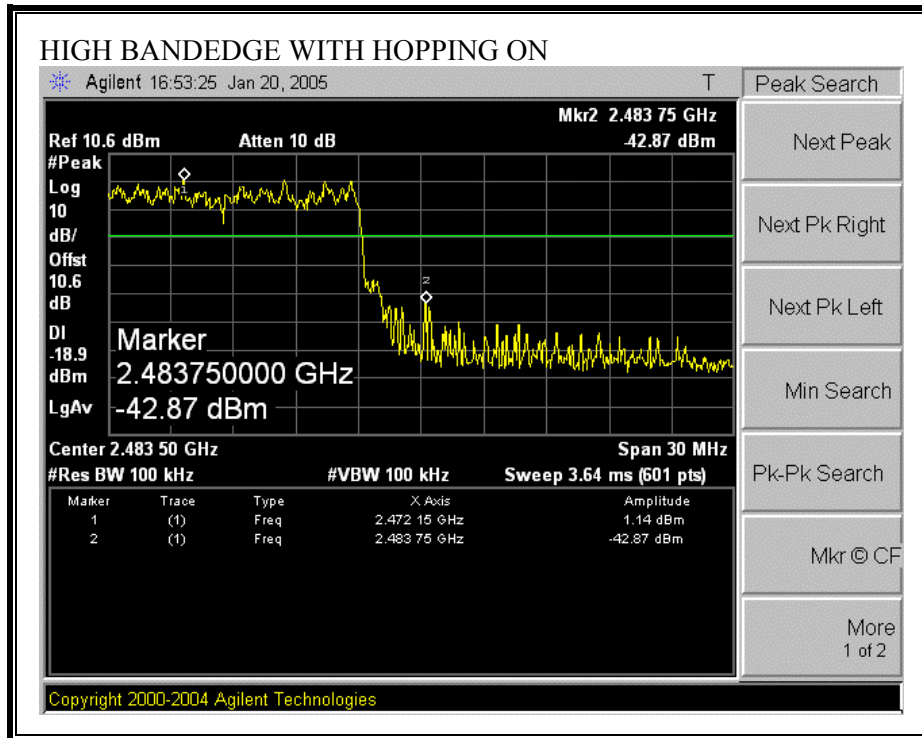
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.2. ANTENNA PORT CHANNEL TESTS FOR EUT WITH GFSK MODULATION

7.2.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

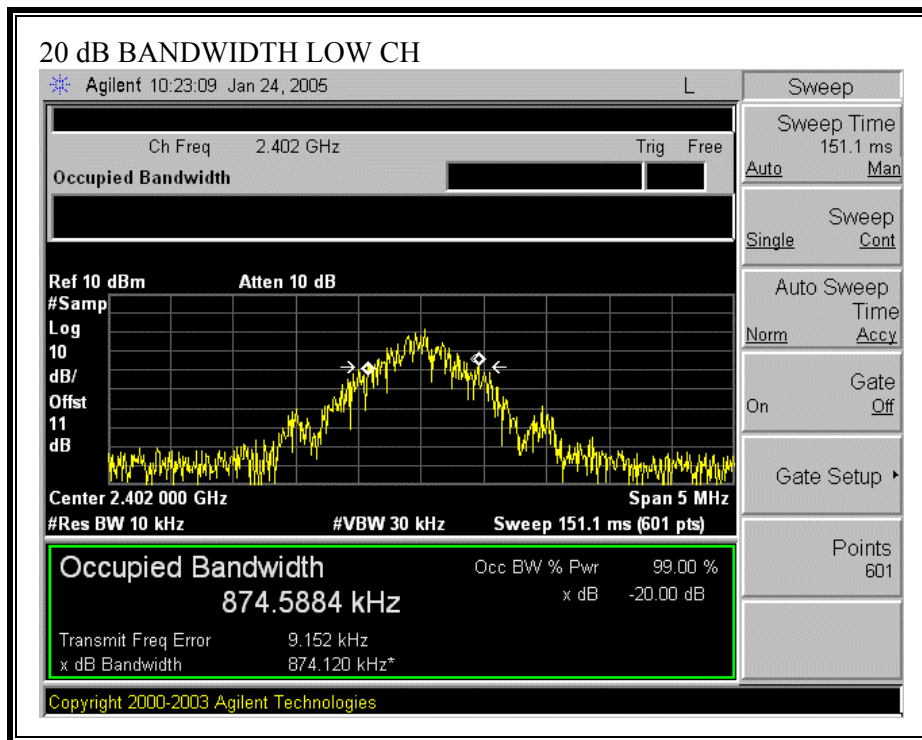
The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 20 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

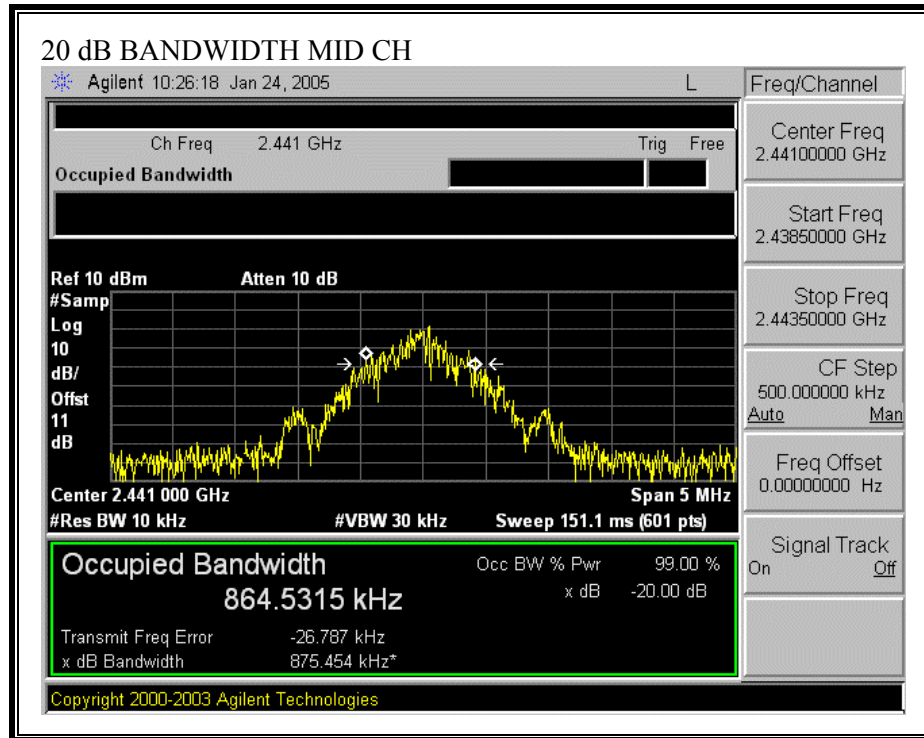
RESULTS

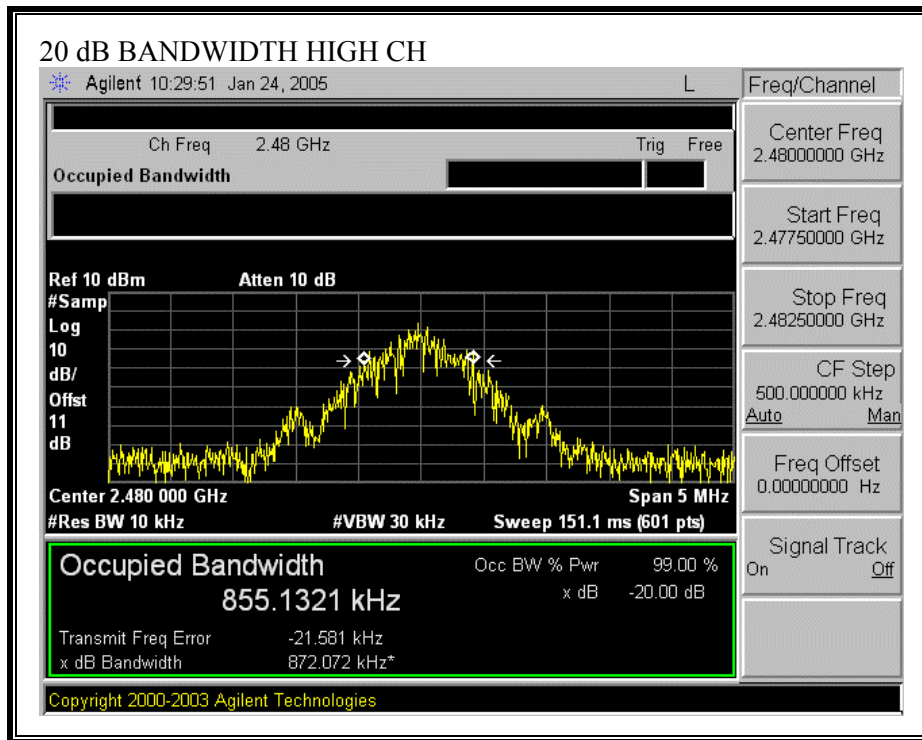
No non-compliance noted:

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	874.12
Middle	2441	875.454
High	2480	872.072

20 dB BANDWIDTH







7.2.2. 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 hopping channel, whichever is greater.

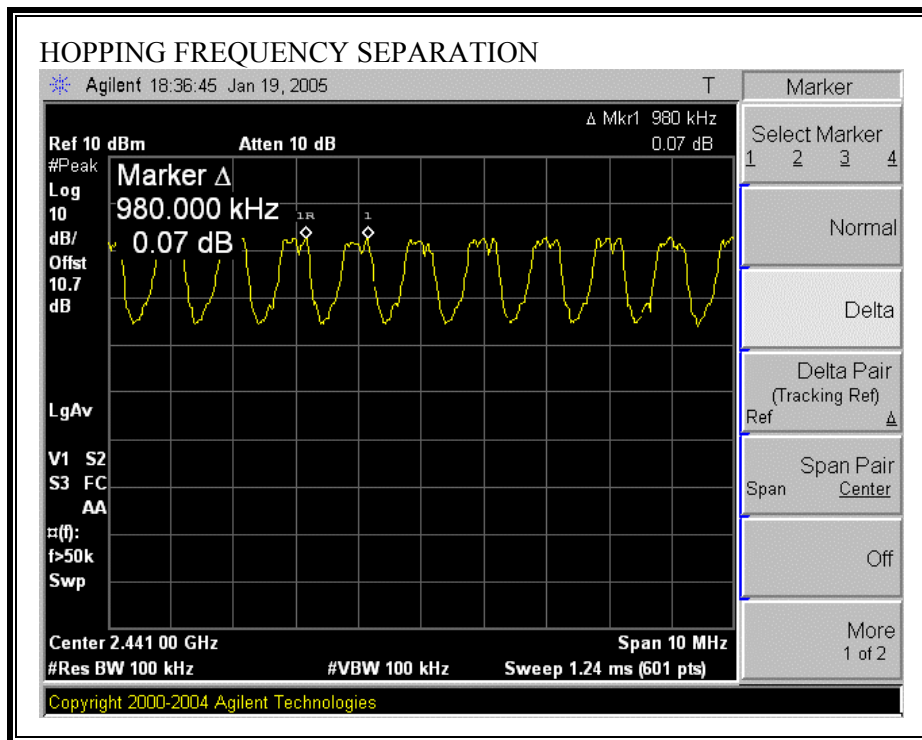
TEST PROCEDURE

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



7.2.3. 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.

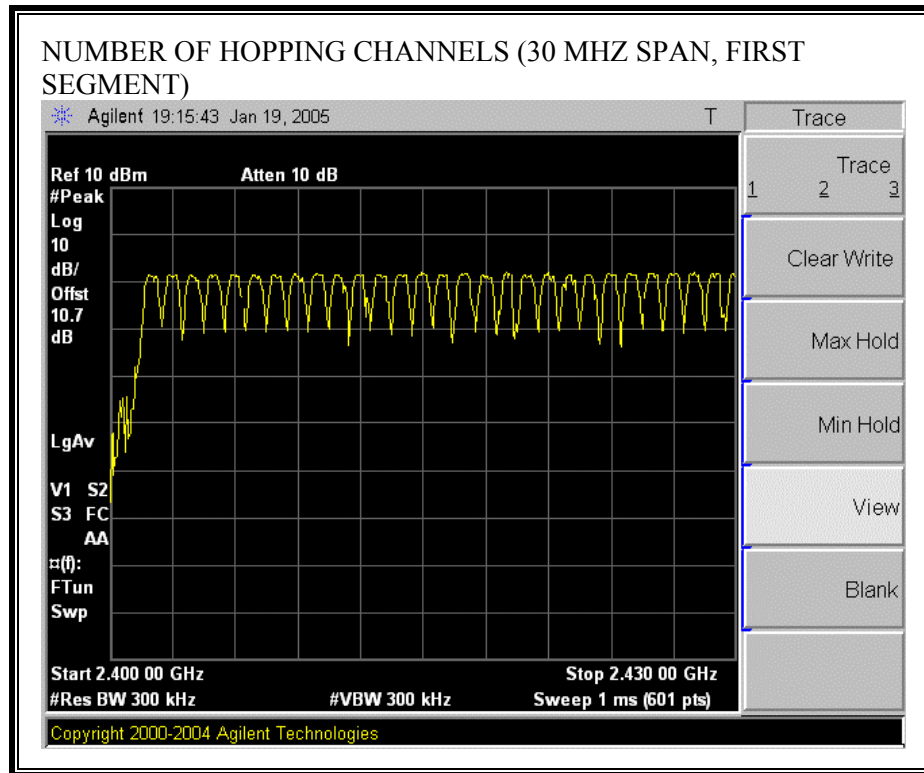
TEST PROCEDURE

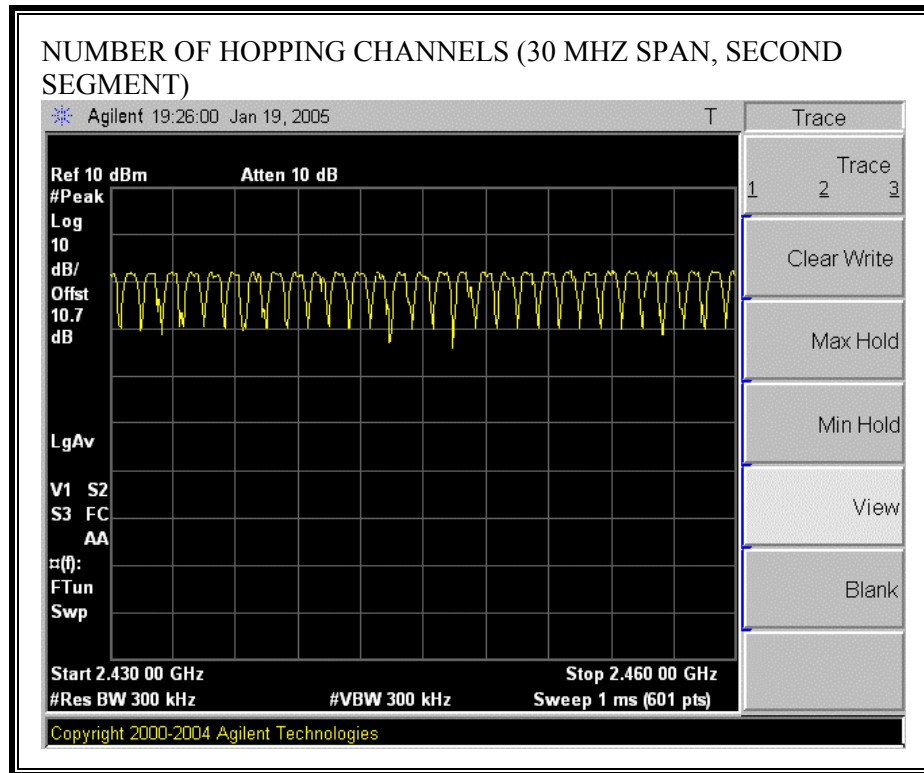
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1 % of the span. The analyzer is set to Max Hold.

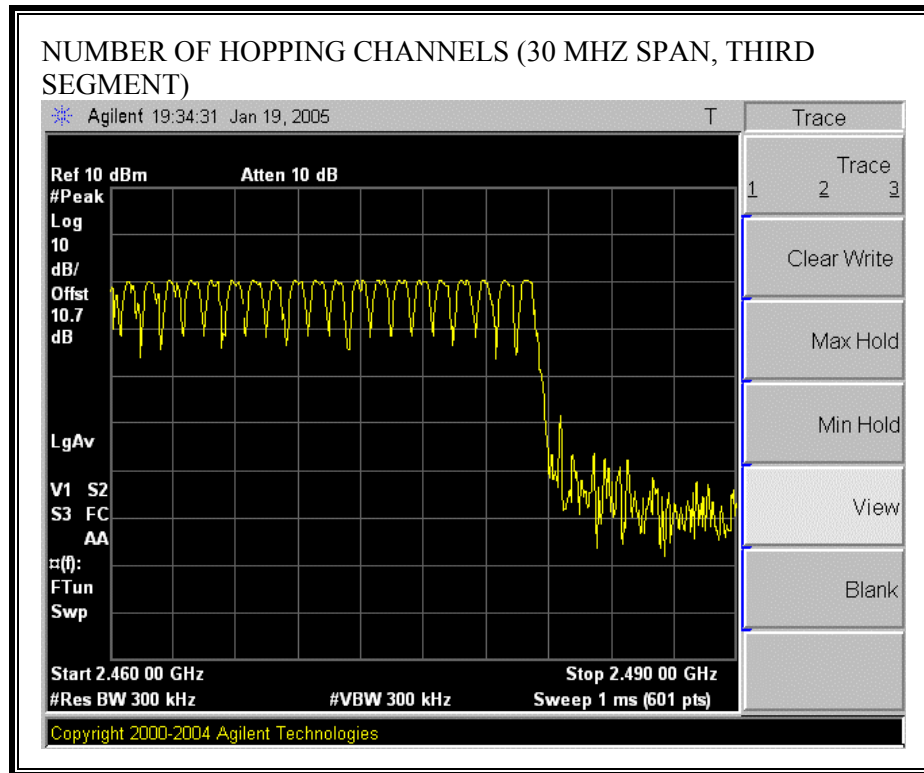
RESULTS

No non-compliance noted:

79 Channels observed.







7.2.4. 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.

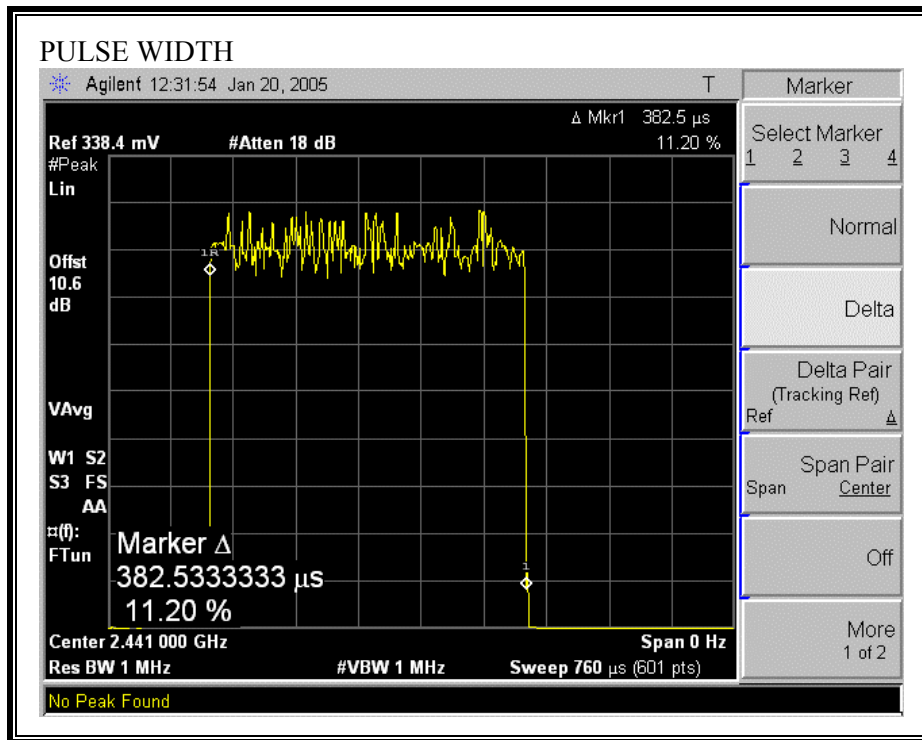
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

RESULTS

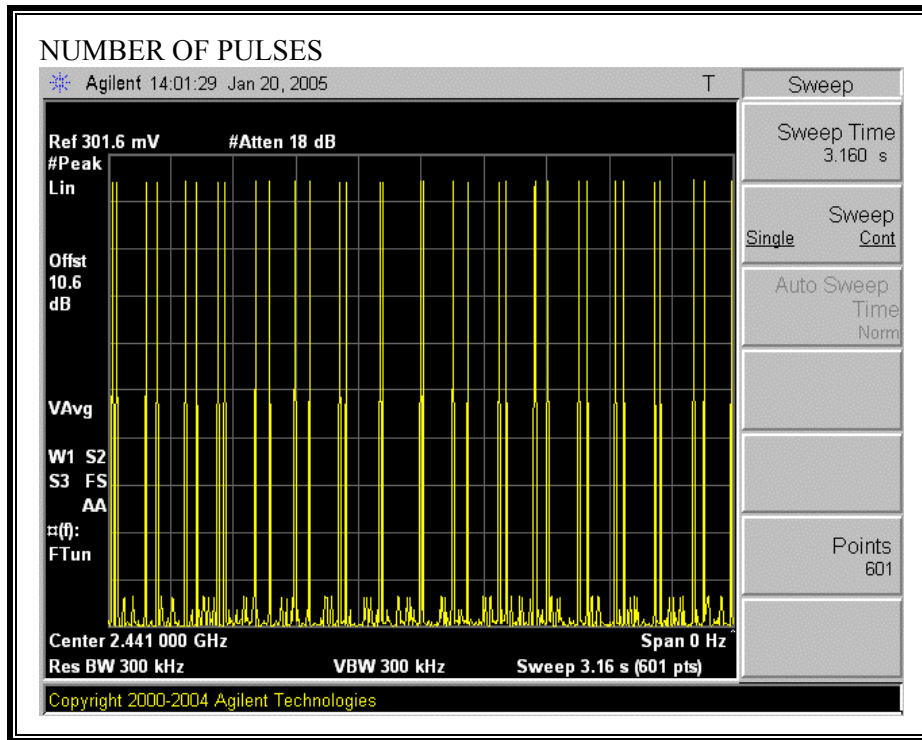
No non-compliance noted:

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
1	0.3825	31	0.119	0.4	0.281
3	1.64	18	0.295	0.4	0.105
5	2.883	12	0.346	0.4	0.054

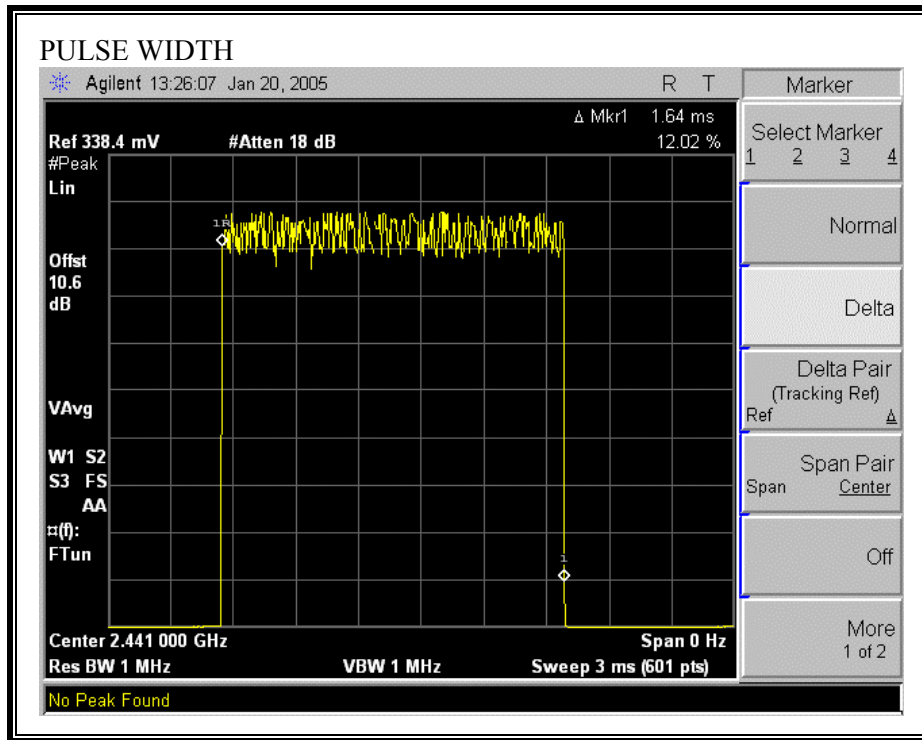
PULSE WIDTH (DH1 PACKET TYPE)



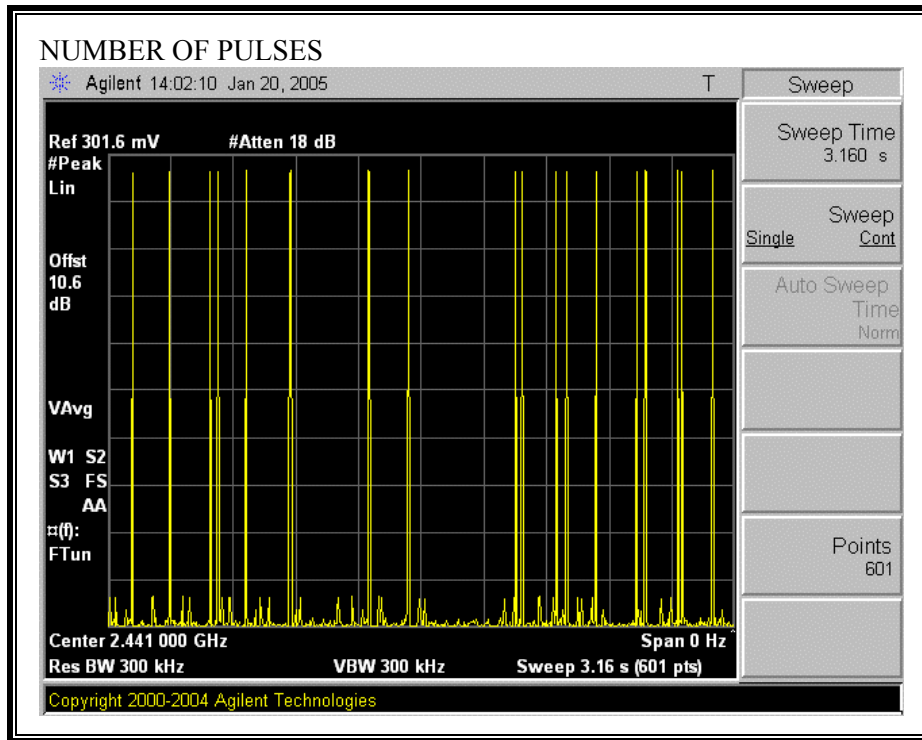
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH1 PACKET TYPE)



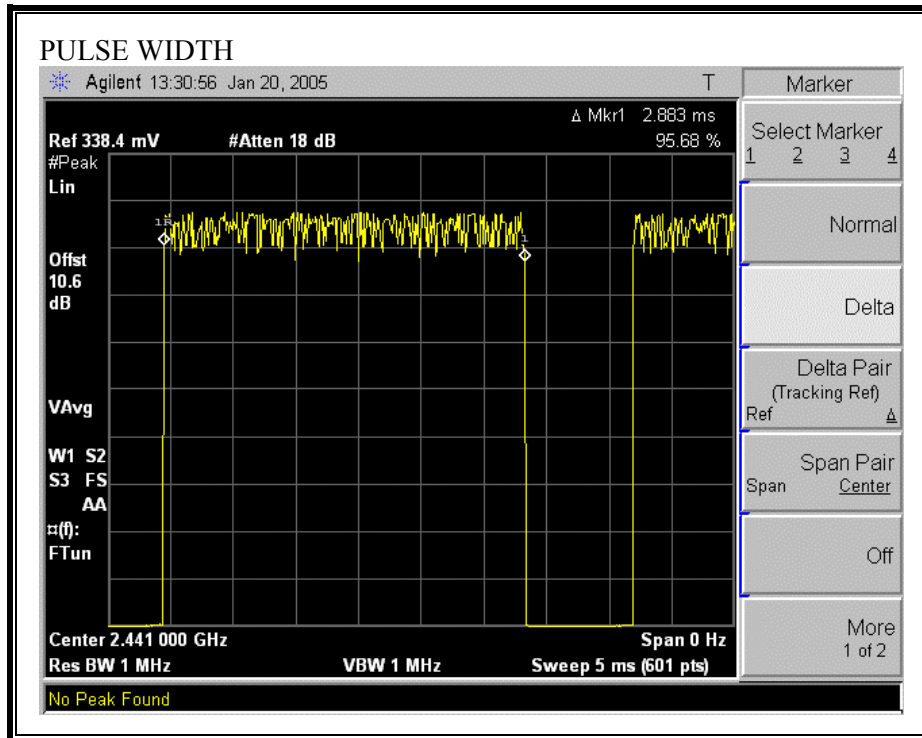
PULSE WIDTH (DH3 PACKET TYPE)



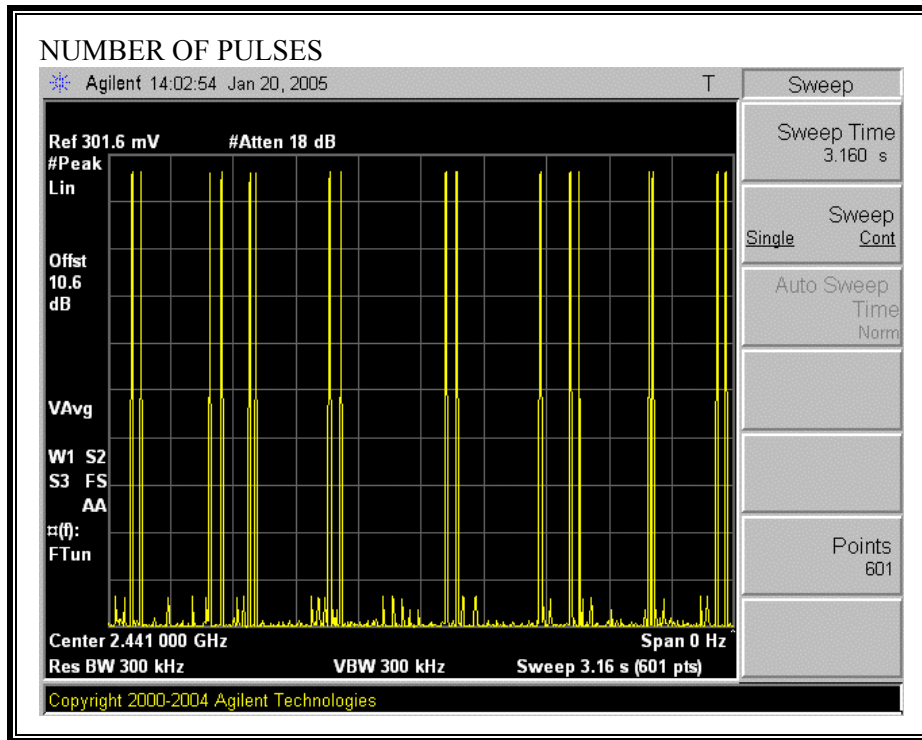
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH3 PACKET TYPE)



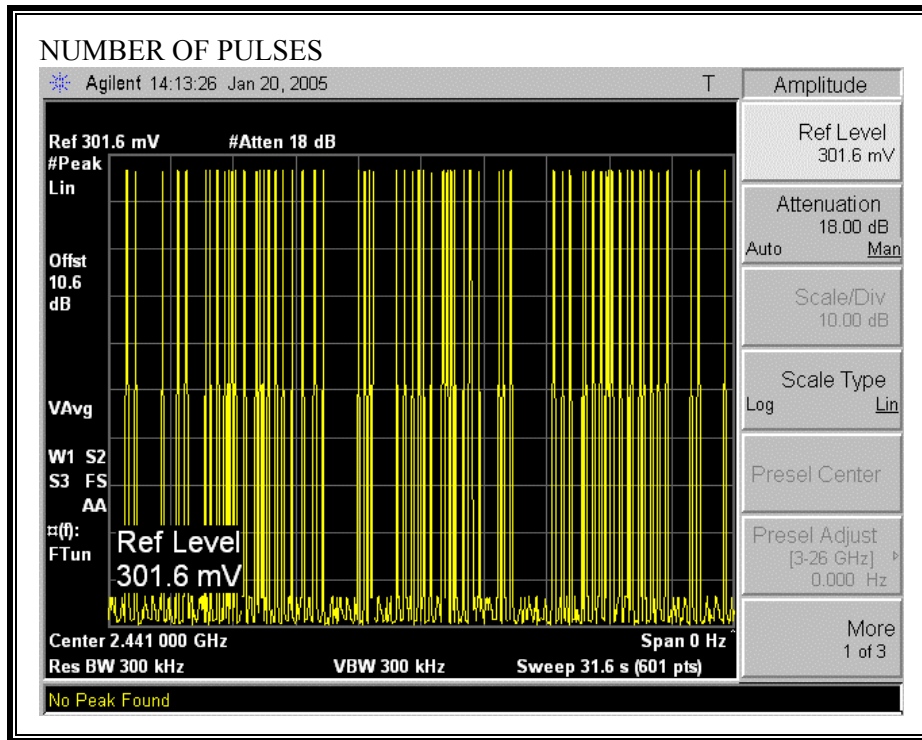
PULSE WIDTH (DH5 PACKET TYPE)



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD (DH5 PACKET TYPE)



NUMBER OF PULSES IN 31.6 SECOND OBSERVATION PERIOD (DH5 PACKET TYPE)



7.2.5. 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 0.298 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

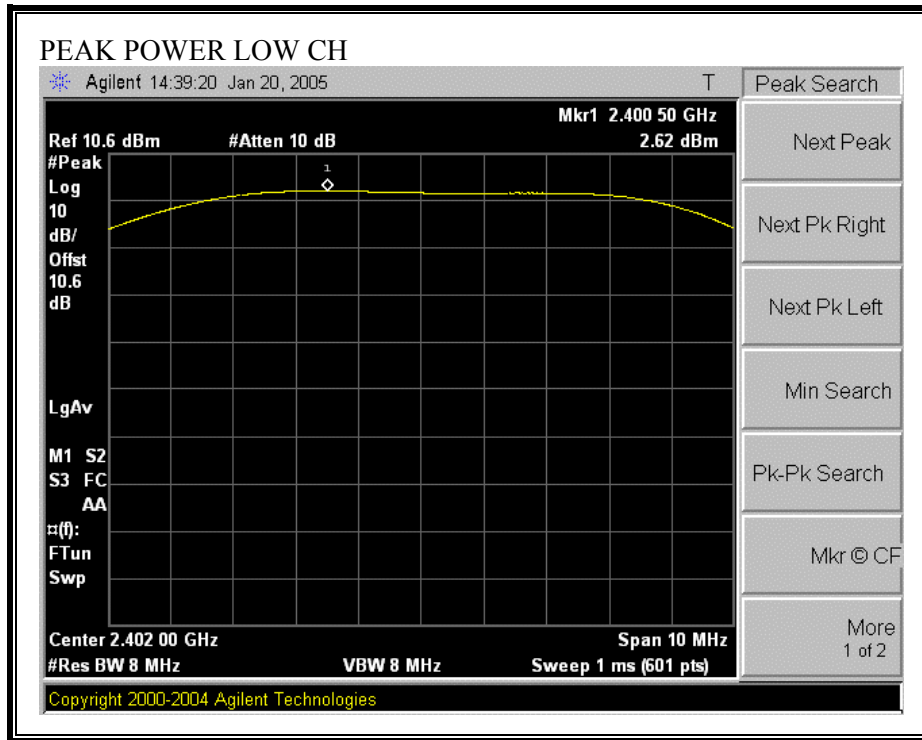
The transmitter output is connected to a spectrum analyzer and the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

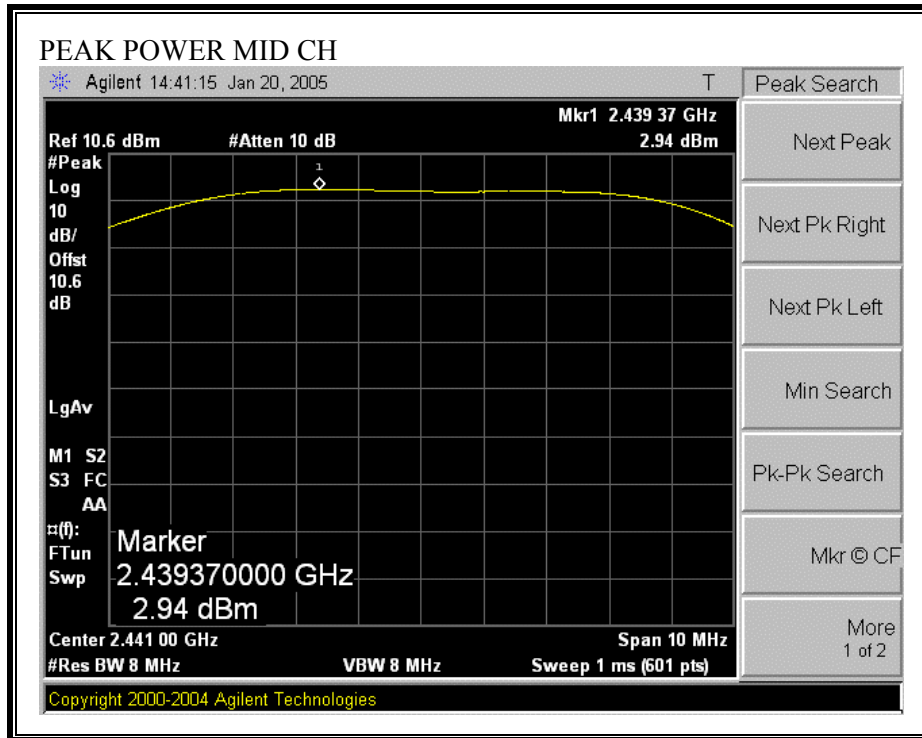
RESULTS

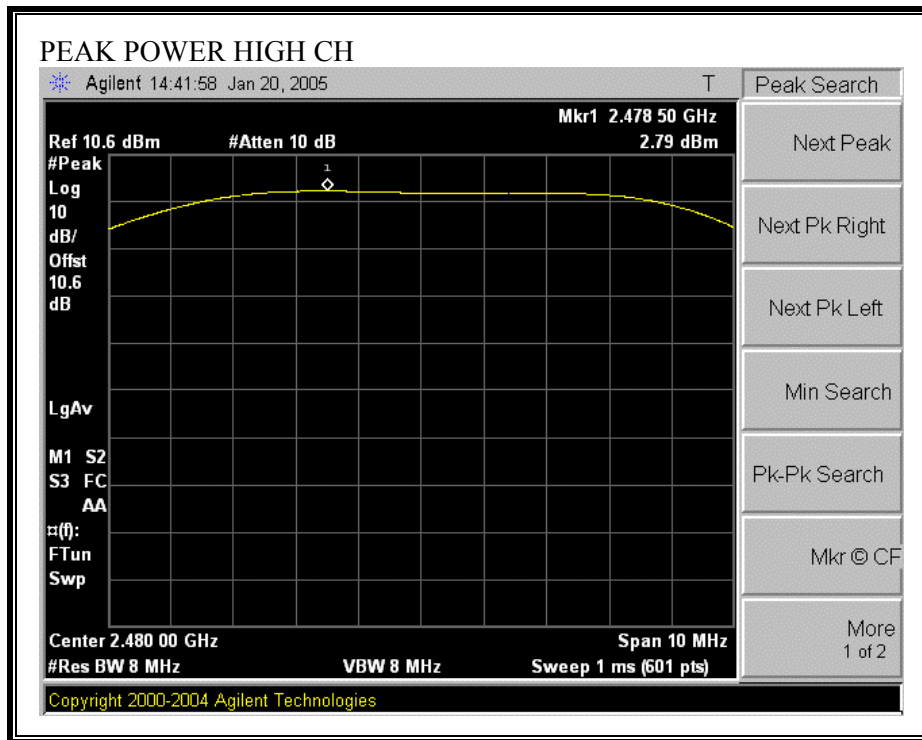
No non-compliance noted:

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	2.62	30	-27.38
Middle	2441	2.94	30	-27.06
High	2480	2.79	30	-27.21

OUTPUT POWER







7.2.6. 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 10.6 dB (including 10 dB pad and 0.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	1.09
Middle	2441	1.48
High	2480	1.56

7.2.7. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak 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.

§15.247 (f) The digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST PROCEDURE

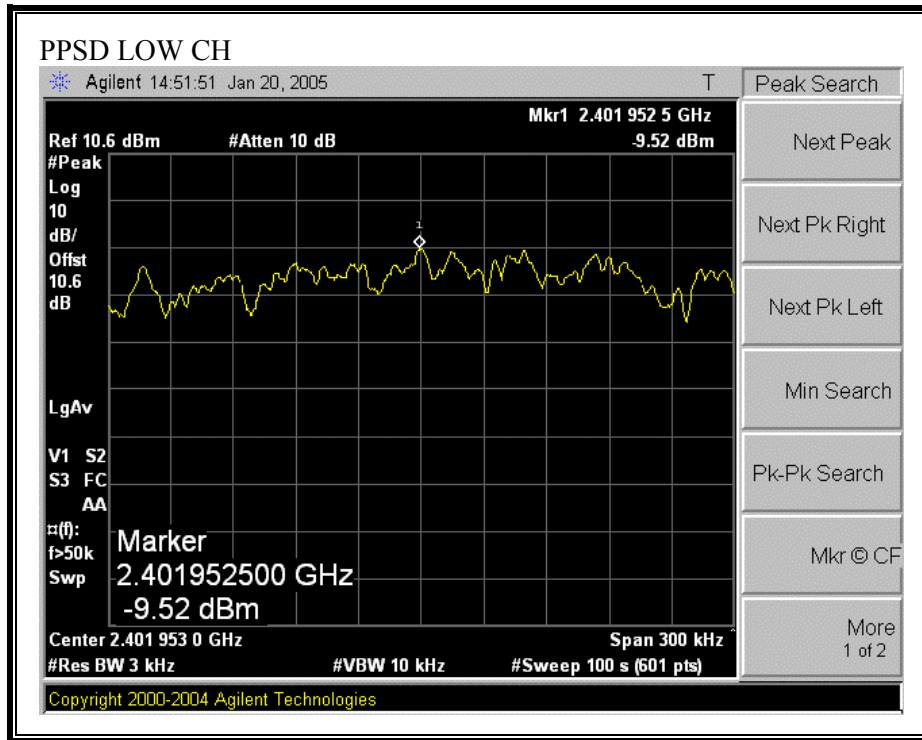
The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

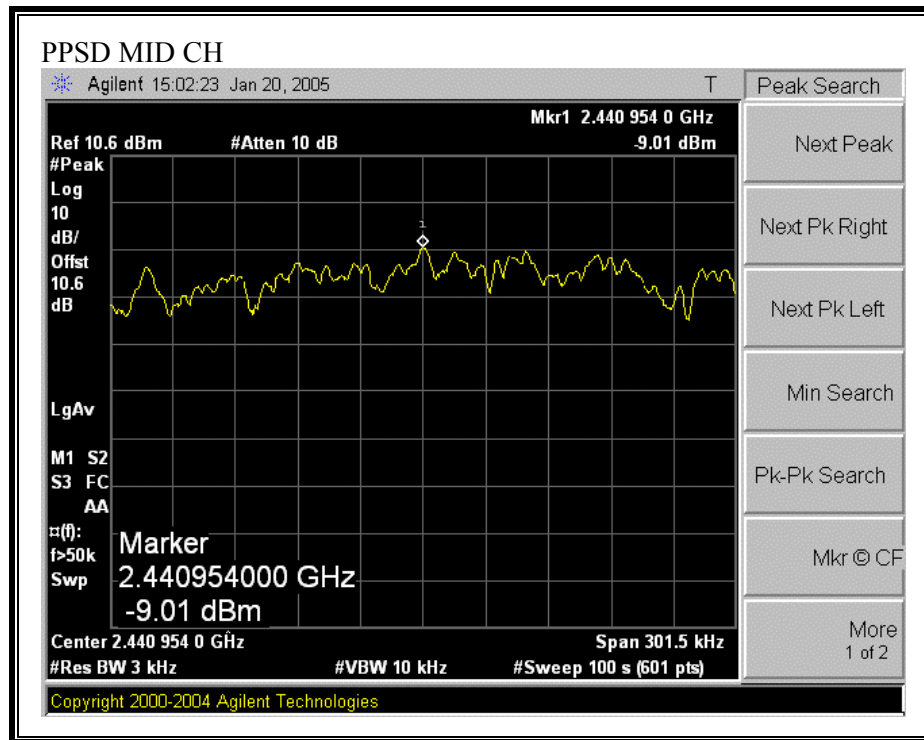
RESULTS

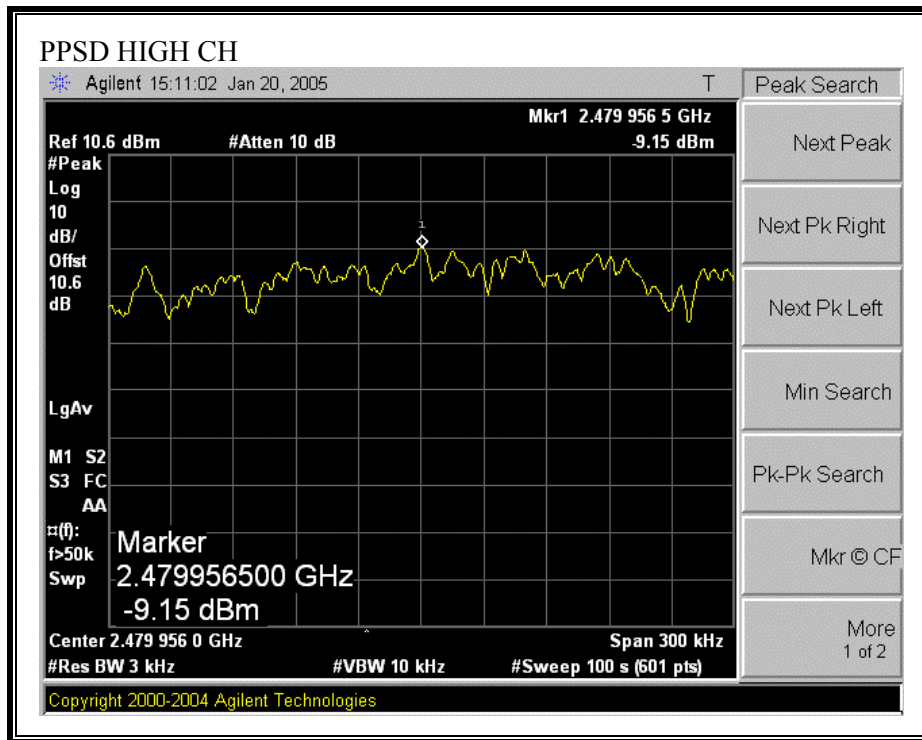
No non-compliance noted:

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2402	-9.52	8	-17.52
Middle	2441	-9.01	8	-17.01
High	2480	-9.15	8	-17.15

PEAK POWER SPECTRAL DENSITY







7.2.8. 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

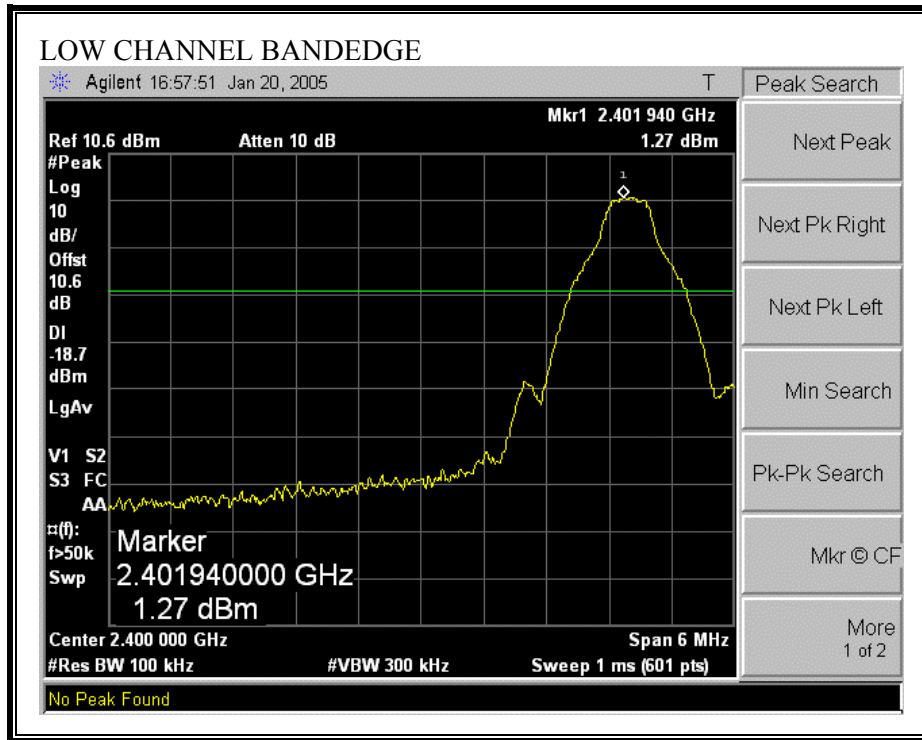
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

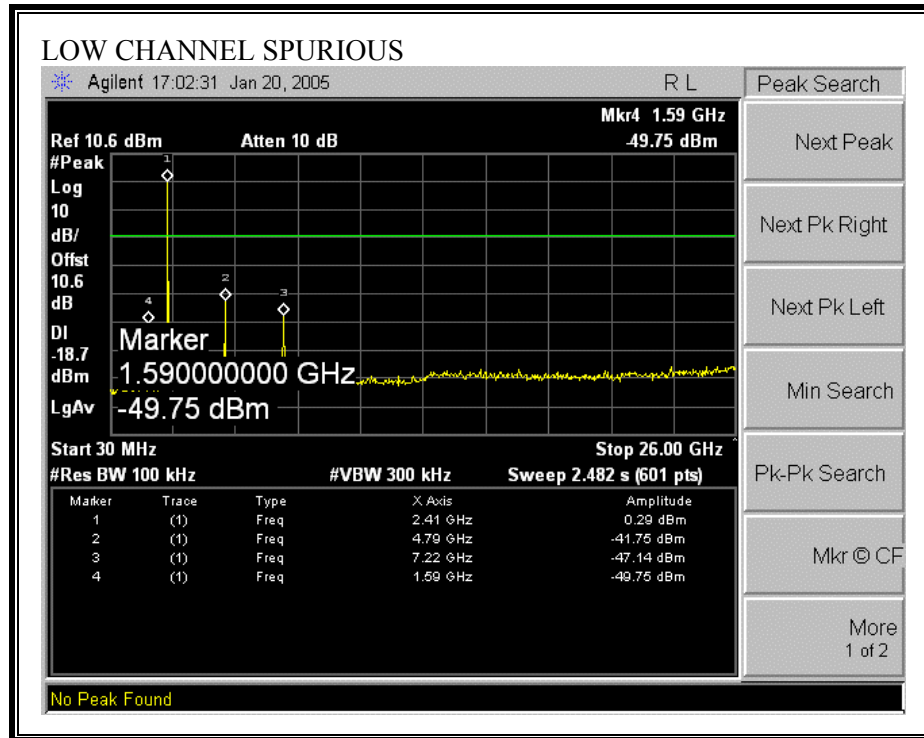
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

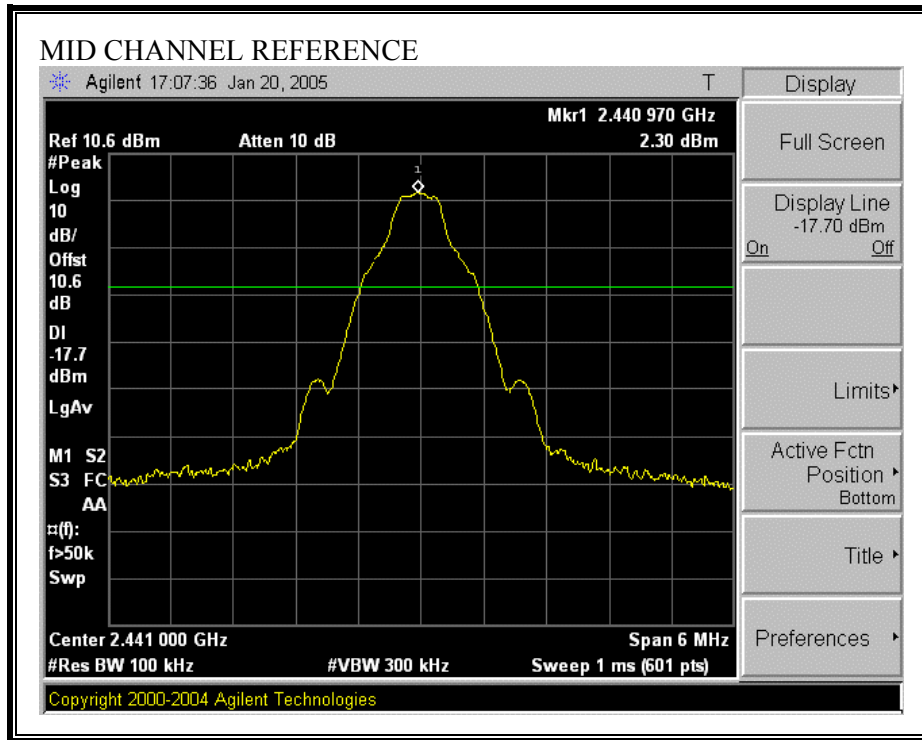
No non-compliance noted:

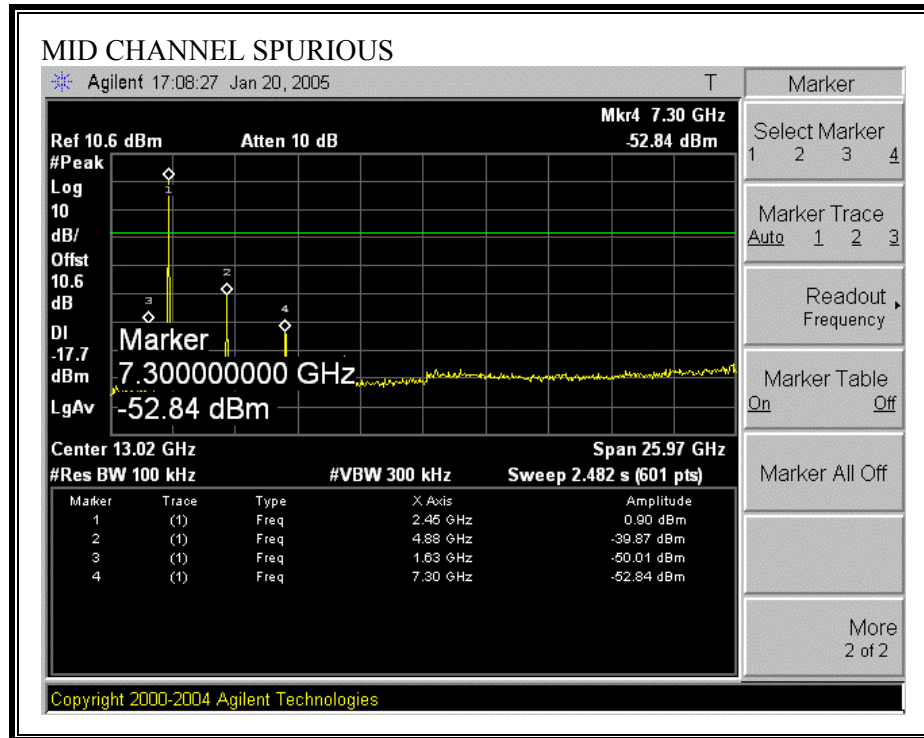
SPURIOUS EMISSIONS, LOW CHANNEL



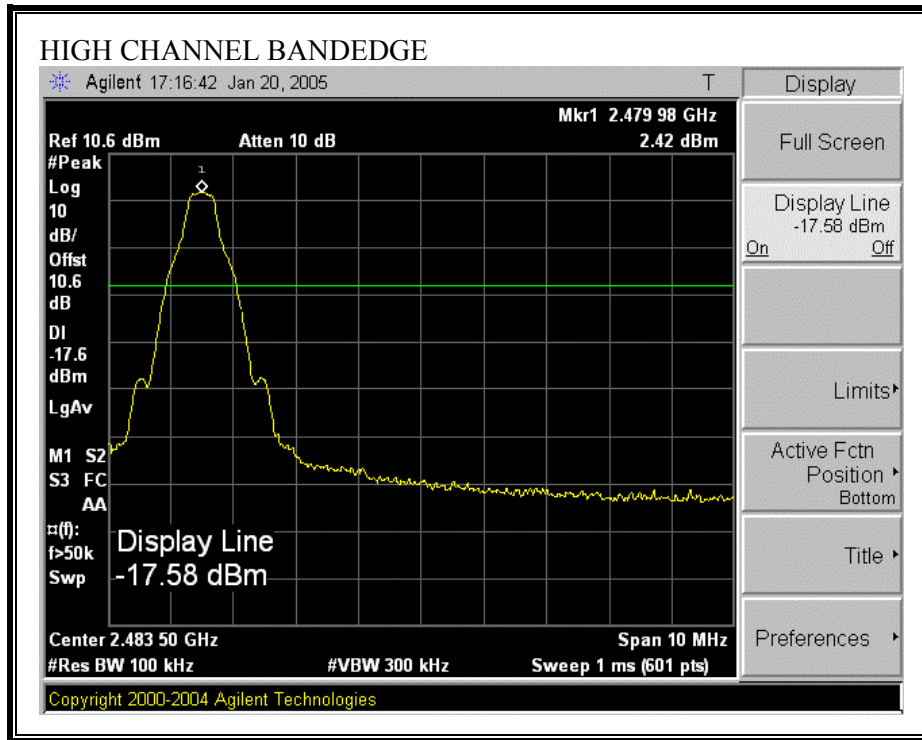


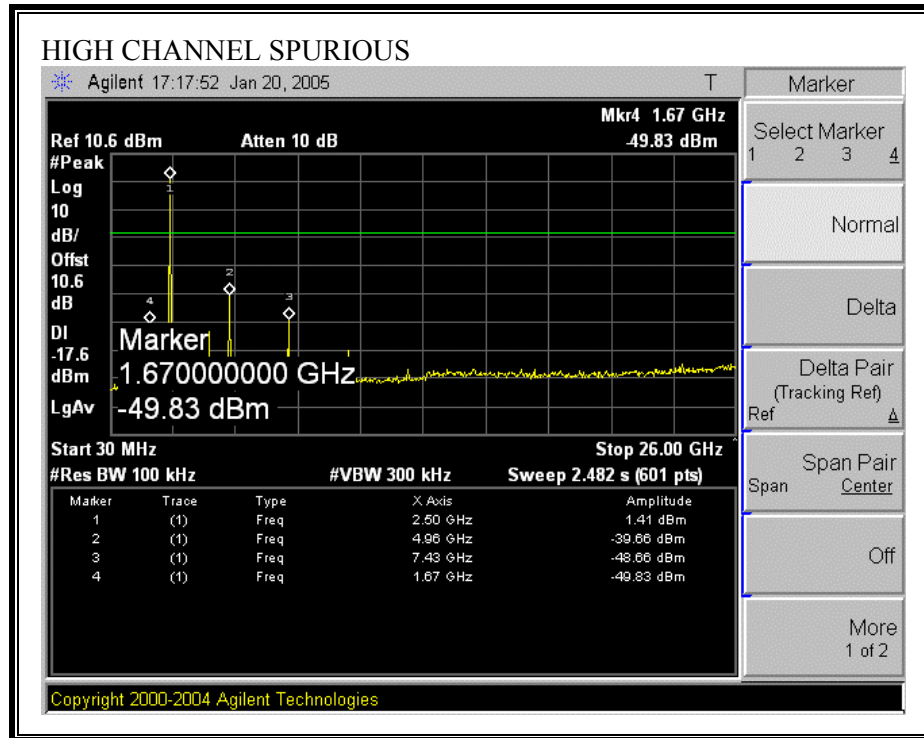
SPURIOUS EMISSIONS, MID CHANNEL



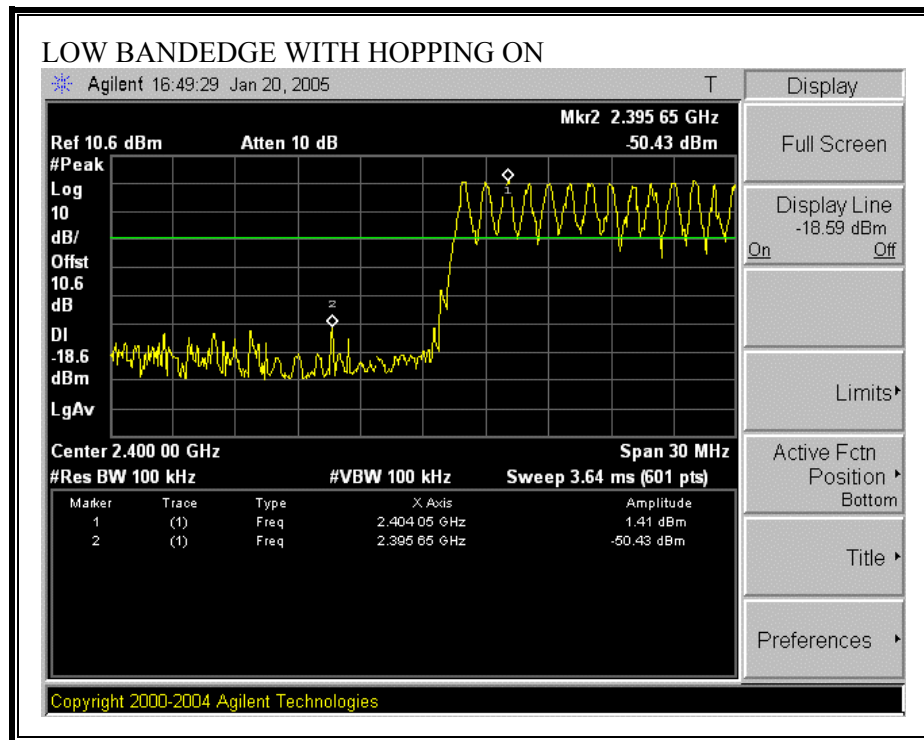


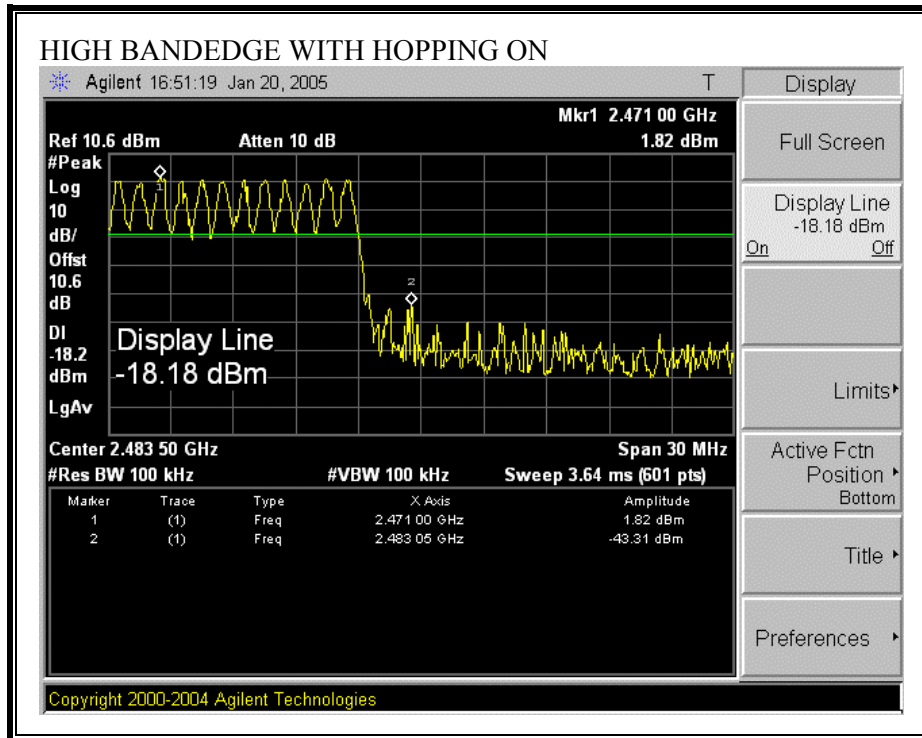
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.3. RADIATED EMISSIONS

7.3.1. 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.

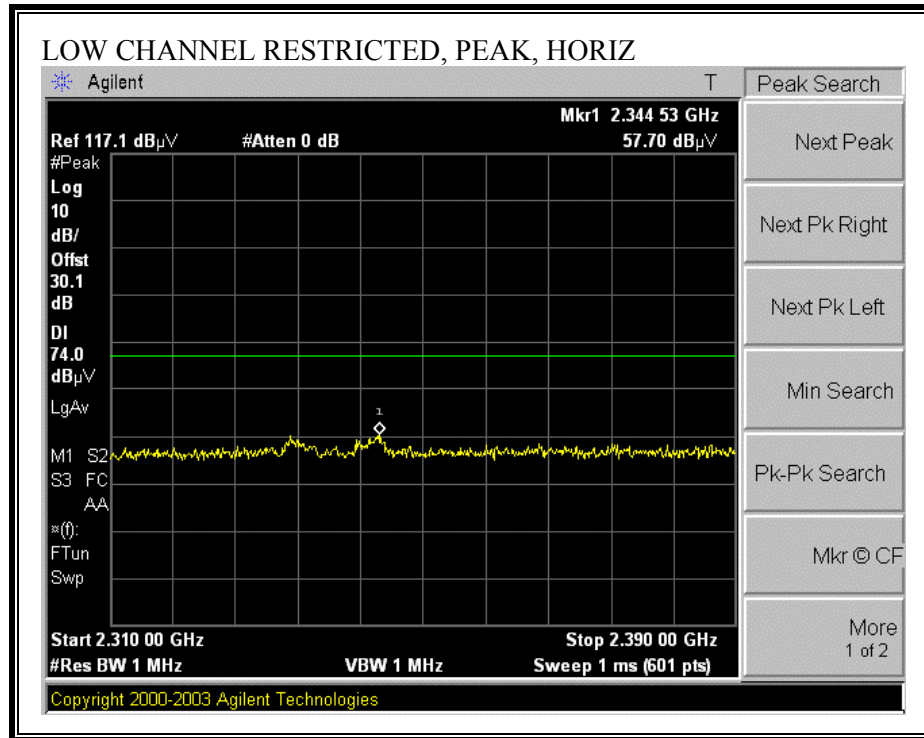
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

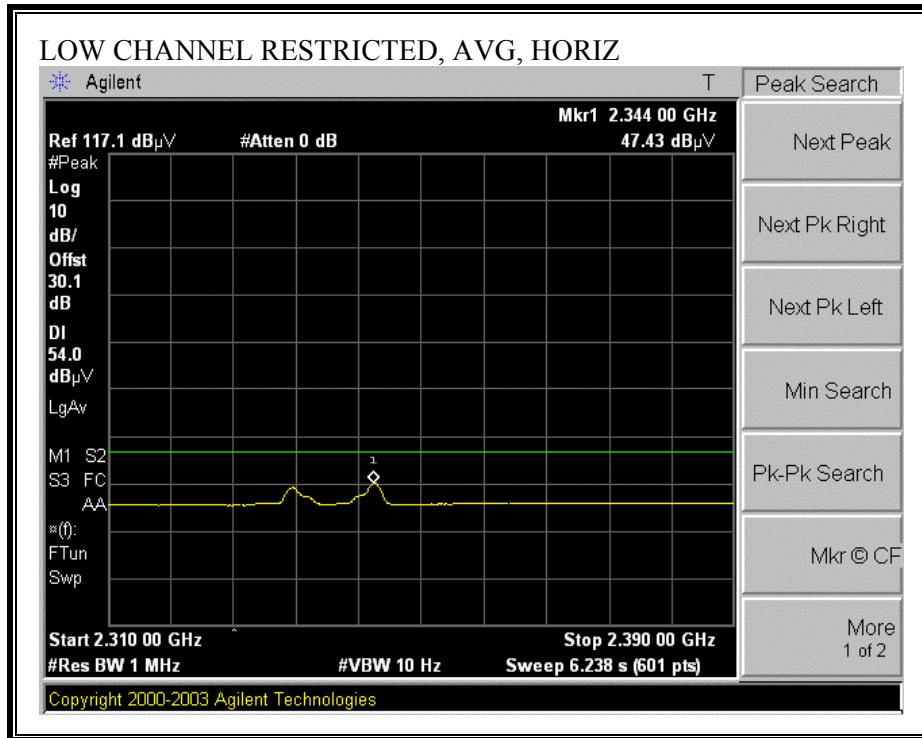
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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.

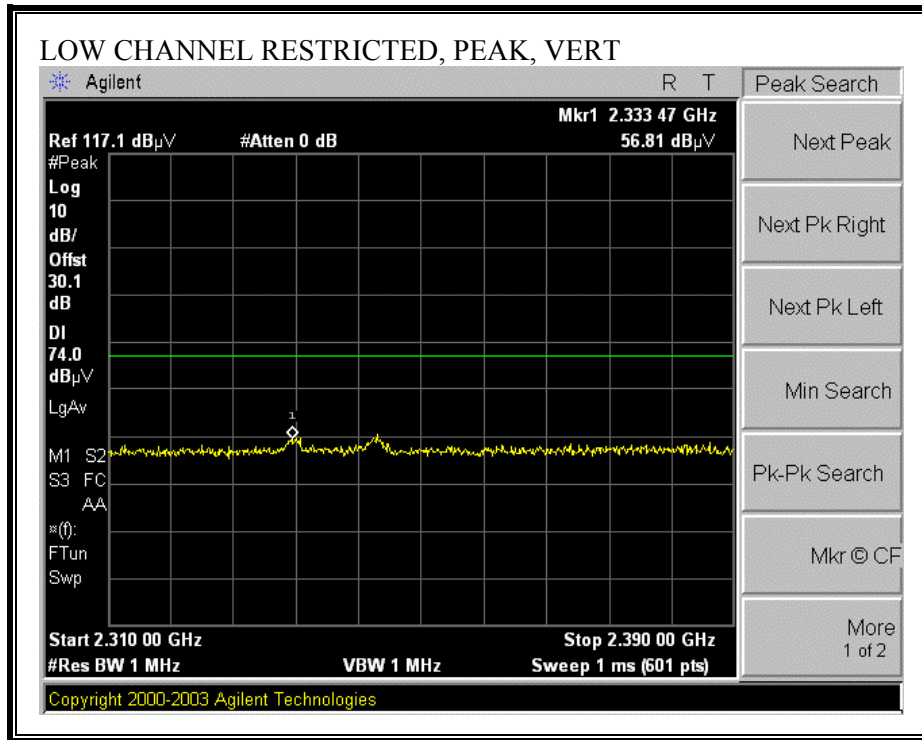
7.3.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ WITH 8PSK MODULATION

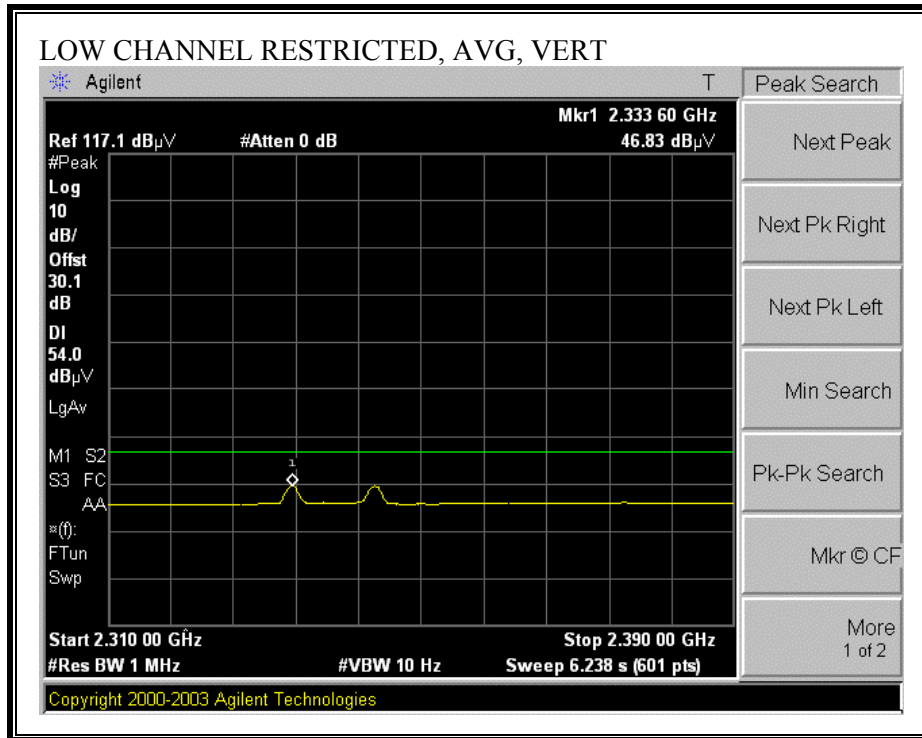
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



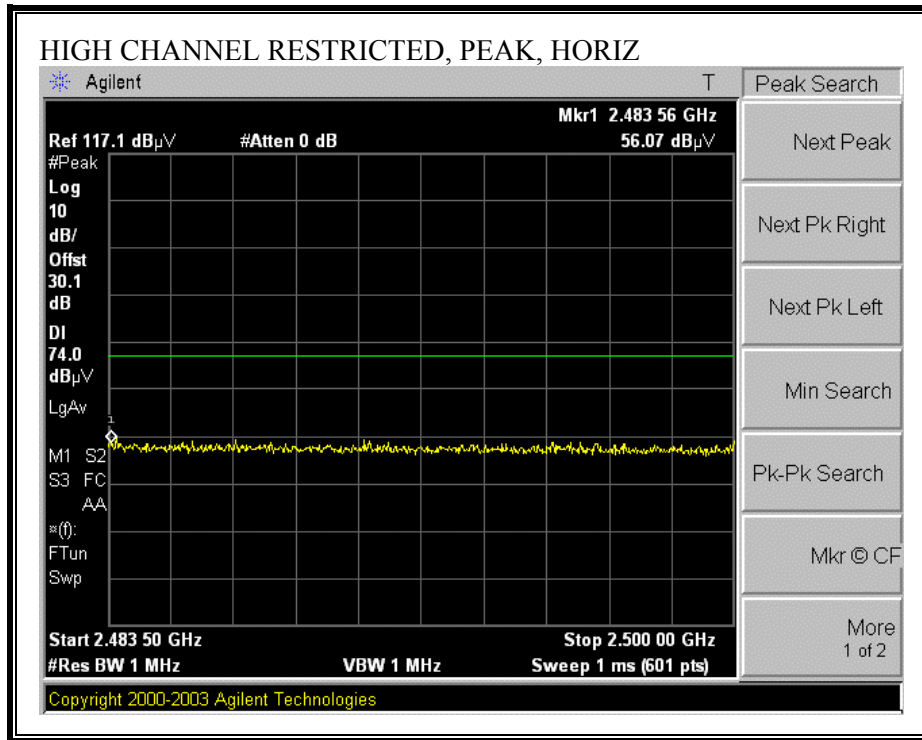


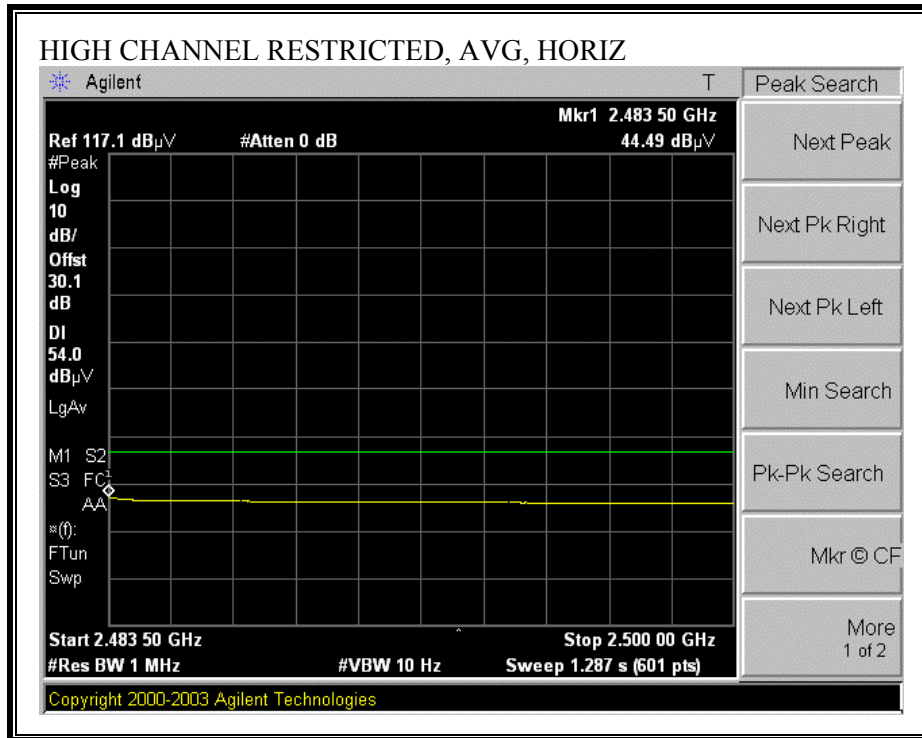
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



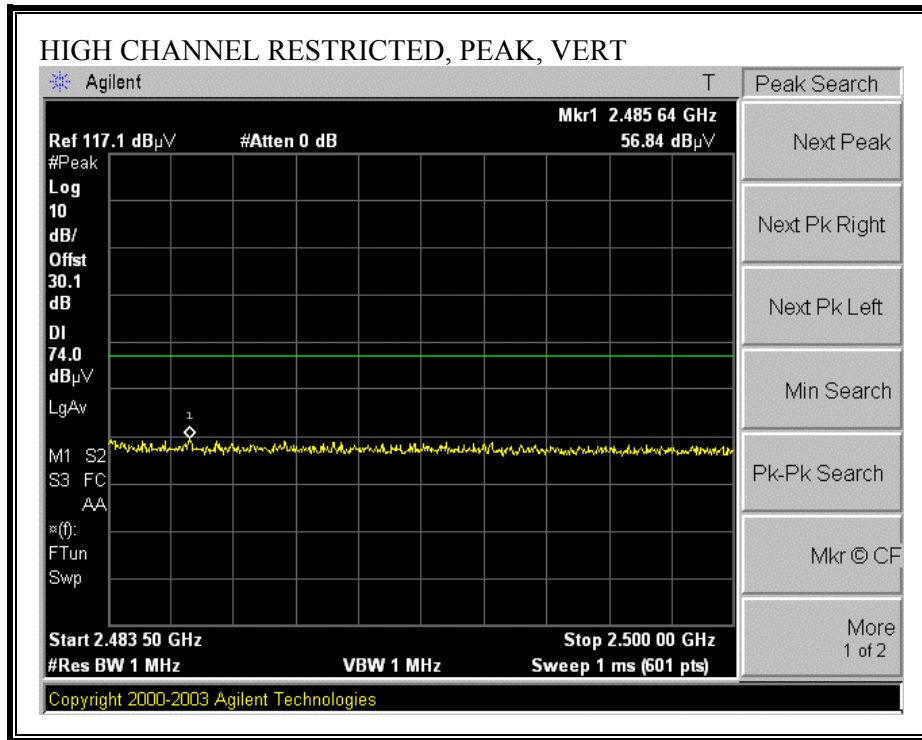


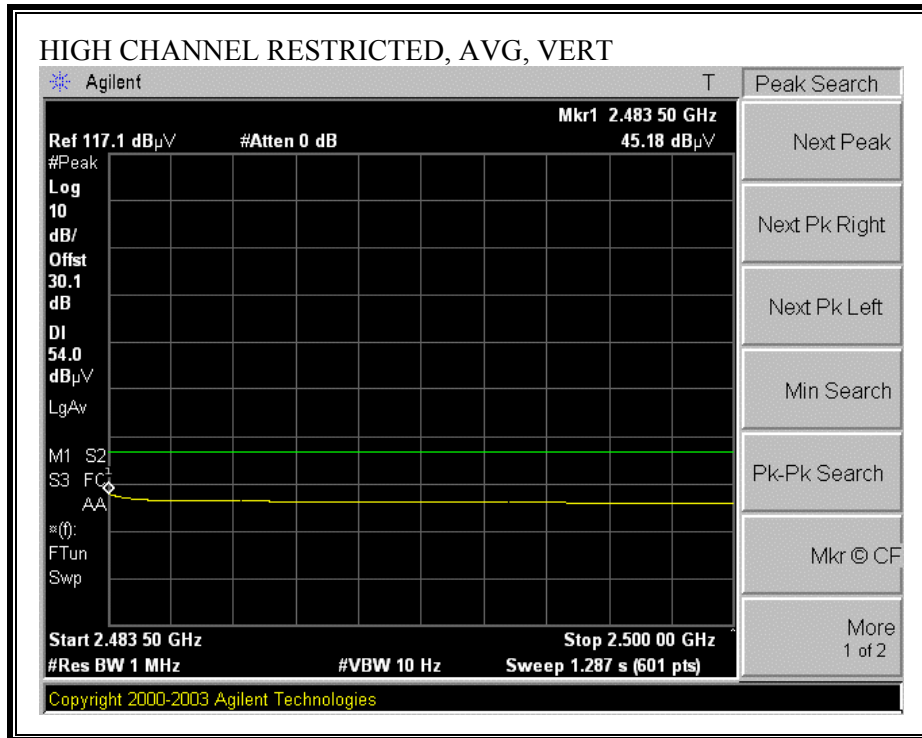
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



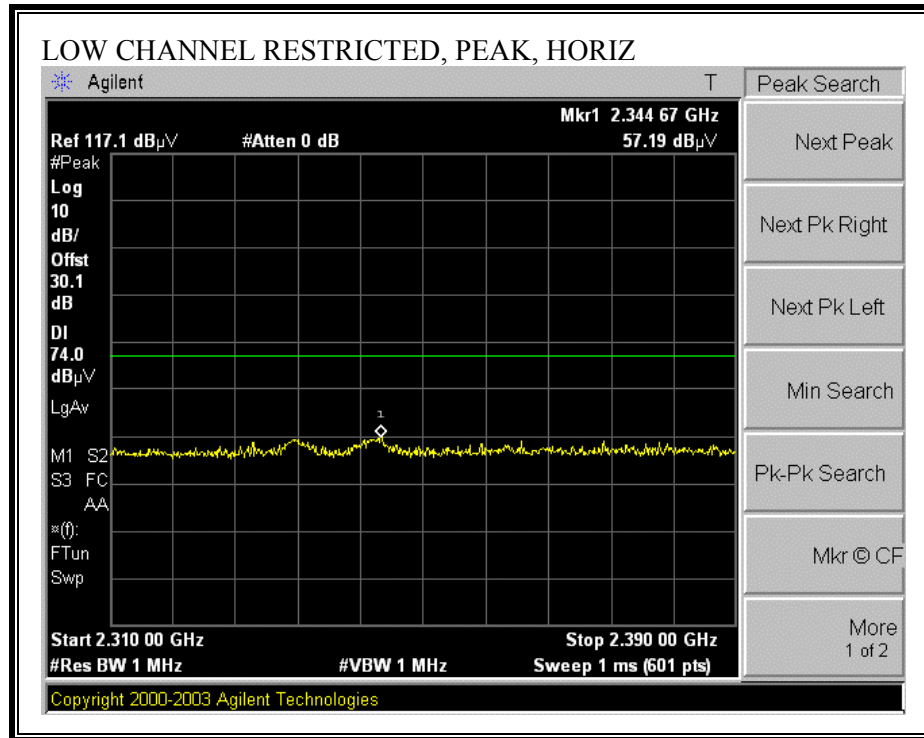


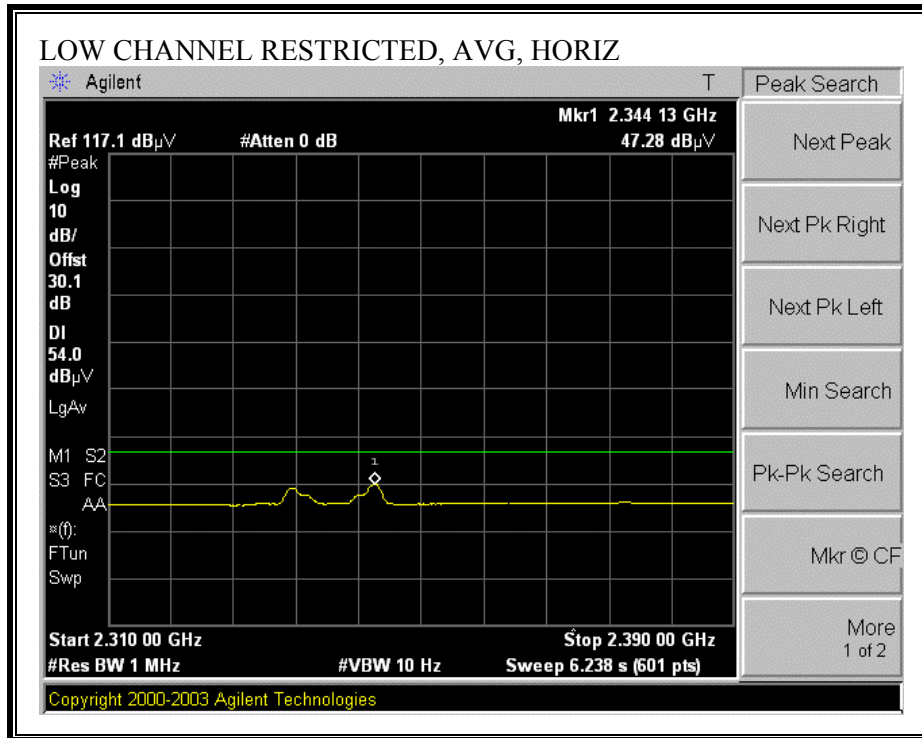
HARMONICS AND SPURIOUS EMISSIONS

01/19/05 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr: Hitesh H. Solanki Project #: 05U3207 Company: HEWLETT PACKARD COMPANY EUT Descrip.: HP BLUETOOTH DONGLE EUT M/N: RSVLD-0502 Test Target: FCC CLASS B Mode Oper: TRANSMIT W/O HOPPING, 8PSK MODULATION															
Test Equipment:															
EMCO Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T86 Miteq 924341						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz			
				4_Hitesh		12_Hitesh				R_001		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	Fldr 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	50.3	38.9	33.0	4.4	-44.0	0.0	0.0	43.8	32.4	74	54	-30.2	-21.6	V
7.206	3.0	49.9	39.5	35.8	6.1	-45.0	0.0	0.0	46.8	36.4	74	54	-27.2	-17.6	V
4.804	3.0	52.7	43.3	33.0	4.4	-44.0	0.0	0.0	46.2	36.8	74	54	-27.8	-17.2	H
7.206	3.0	51.7	40.5	35.8	6.1	-45.0	0.0	0.0	48.6	37.4	74	54	-25.4	-16.6	H
MIDDLE CHANNEL															
4.882	3.0	50.4	39.2	33.0	4.5	-44.1	0.0	0.0	43.8	32.6	74	54	-30.2	-21.4	V
7.323	3.0	51.3	39.6	35.9	6.2	-45.0	0.0	0.0	48.4	36.7	74	54	-25.6	-17.3	V
4.882	3.0	52.9	43.7	33.0	4.5	-44.1	0.0	0.0	46.3	37.1	74	54	-27.7	-16.9	H
7.323	3.0	49.9	38.1	35.9	6.2	-45.0	0.0	0.0	47.0	35.2	74	54	-27.0	-18.8	H
HIGH CHANNEL															
4.960	3.0	50.5	38.4	33.0	4.5	-44.2	0.0	0.0	43.9	31.8	74	54	-30.1	-22.2	V
7.440	3.0	50.8	38.9	36.1	6.3	-45.0	0.0	0.0	48.2	36.3	74	54	-25.8	-17.7	V
4.960	3.0	53.1	43.6	33.0	4.5	-44.2	0.0	0.0	46.5	37.0	74	54	-27.5	-17.0	H
7.440	3.0	50.8	38.7	36.1	6.3	-45.0	0.0	0.0	48.2	36.1	74	54	-25.8	-17.9	H
No other emissions were detected up to 10th harmonics.															
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								

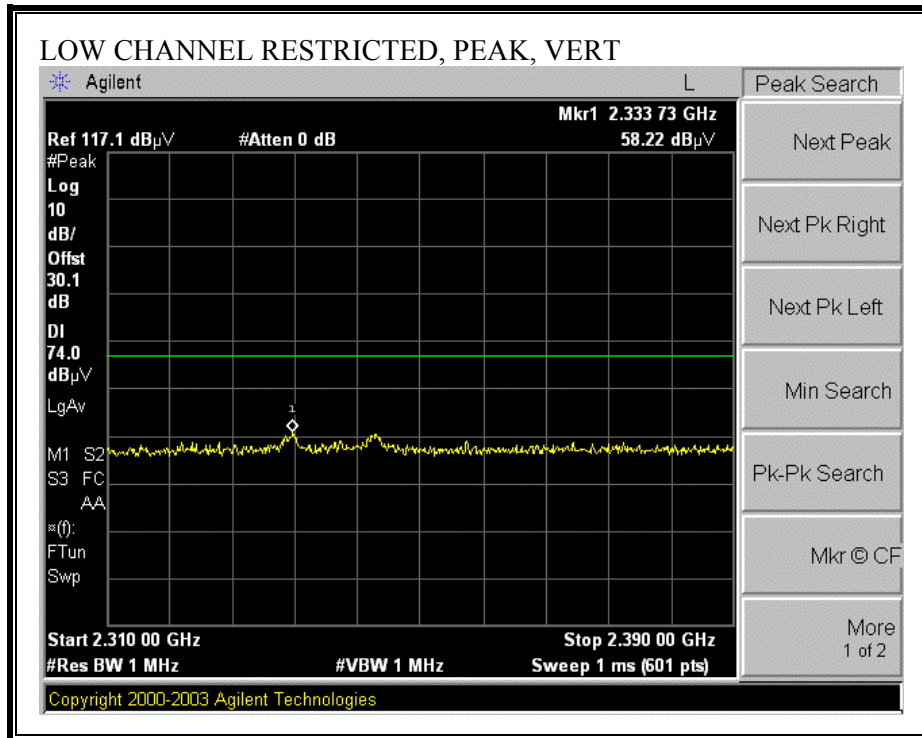
7.3.3. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ WITH GFSK MODULATION

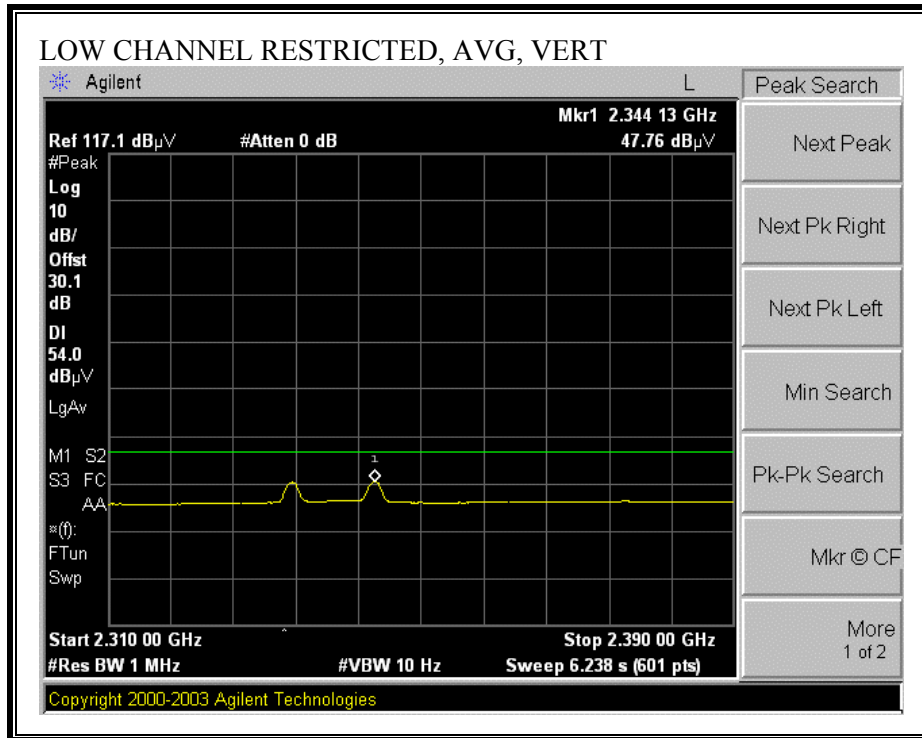
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



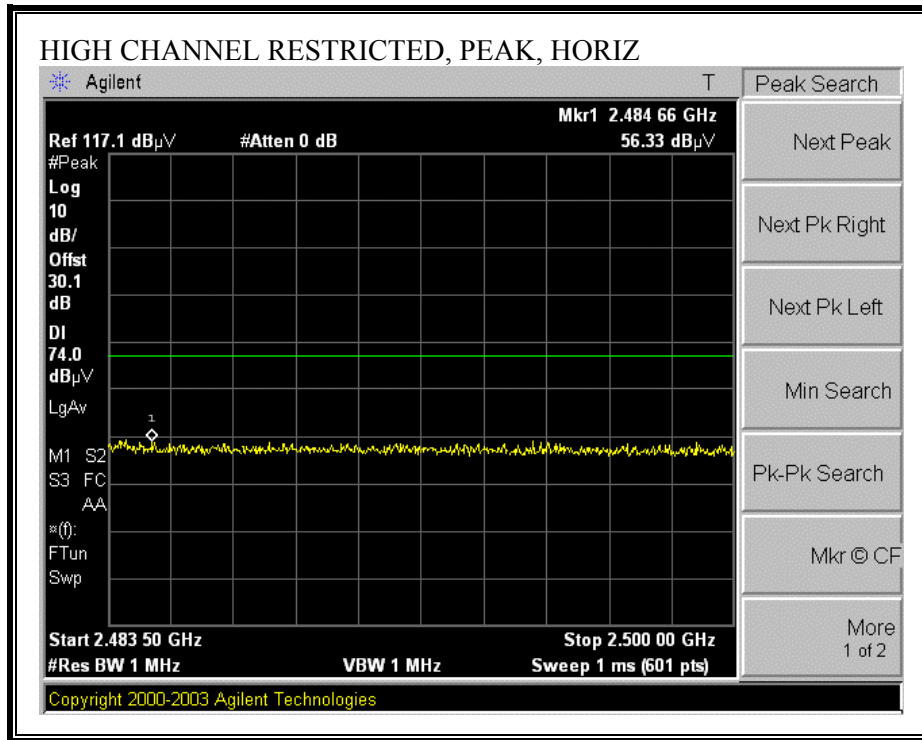


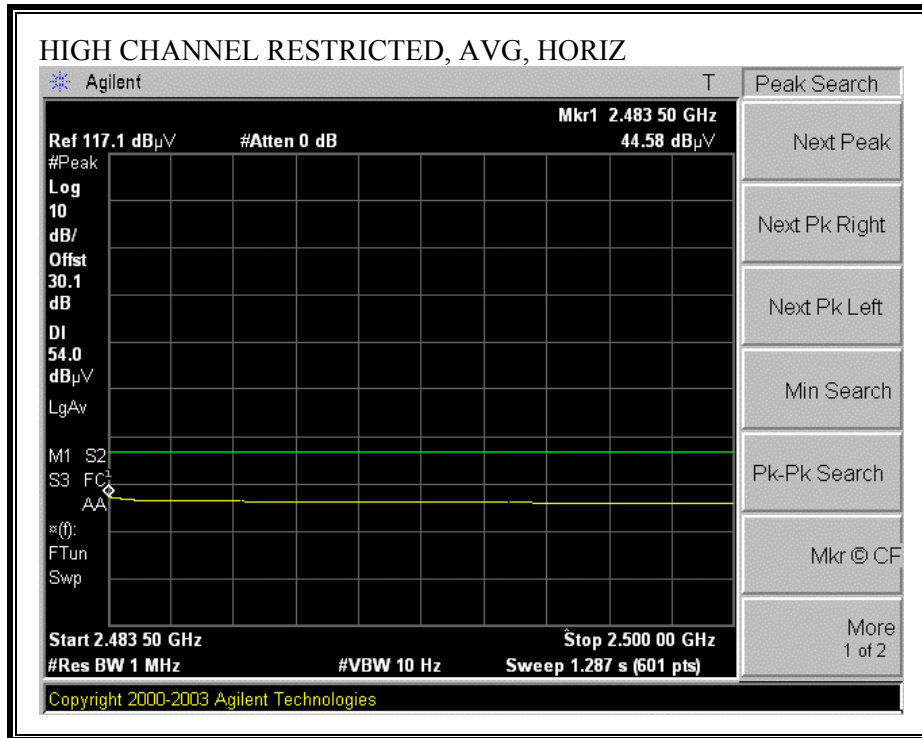
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



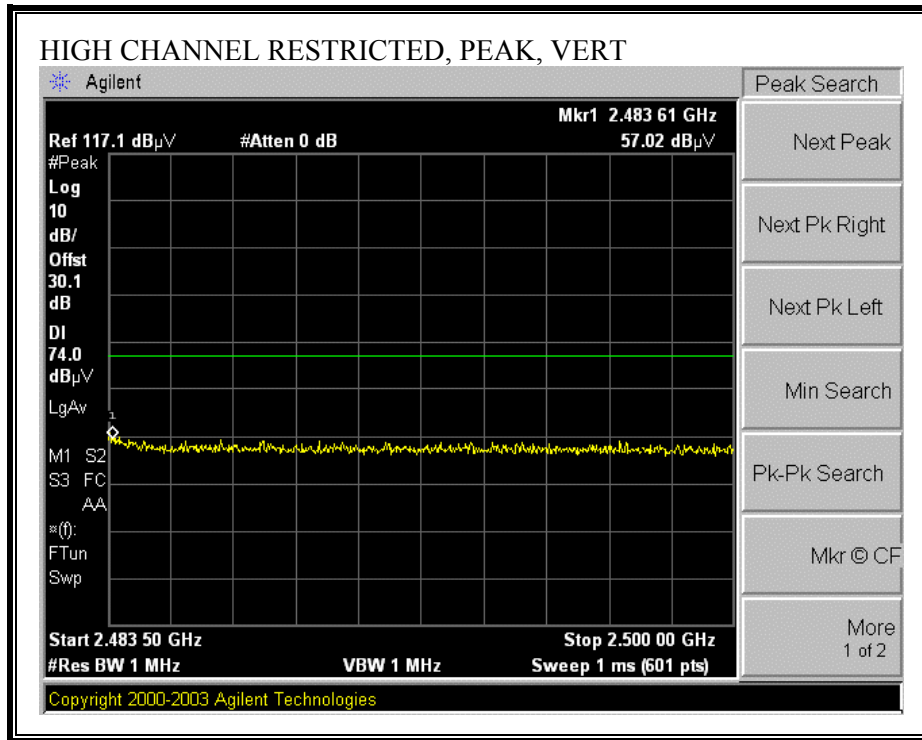


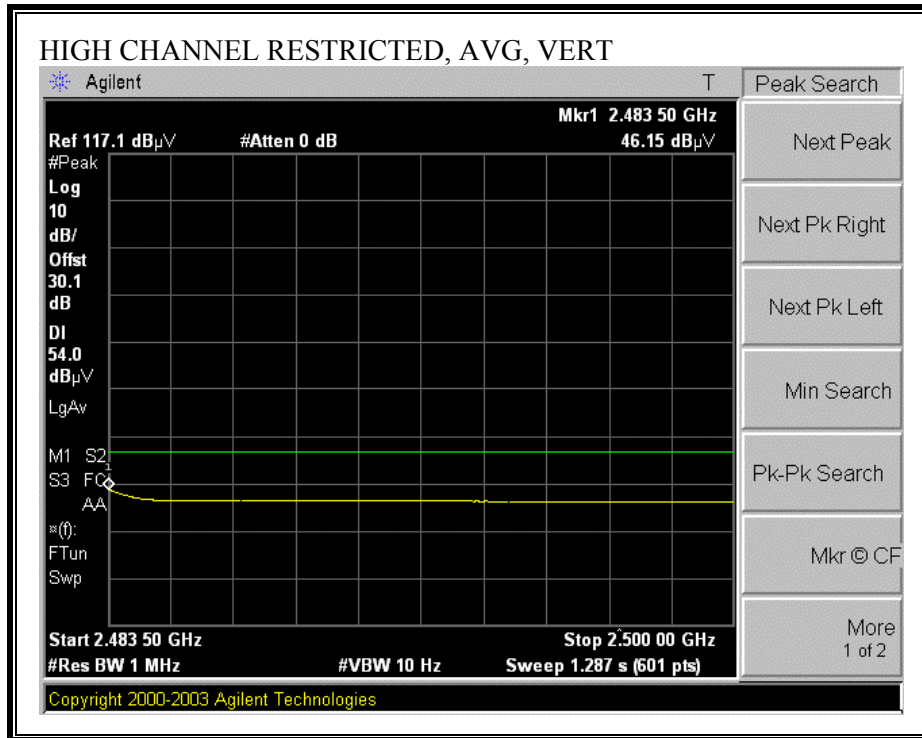
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



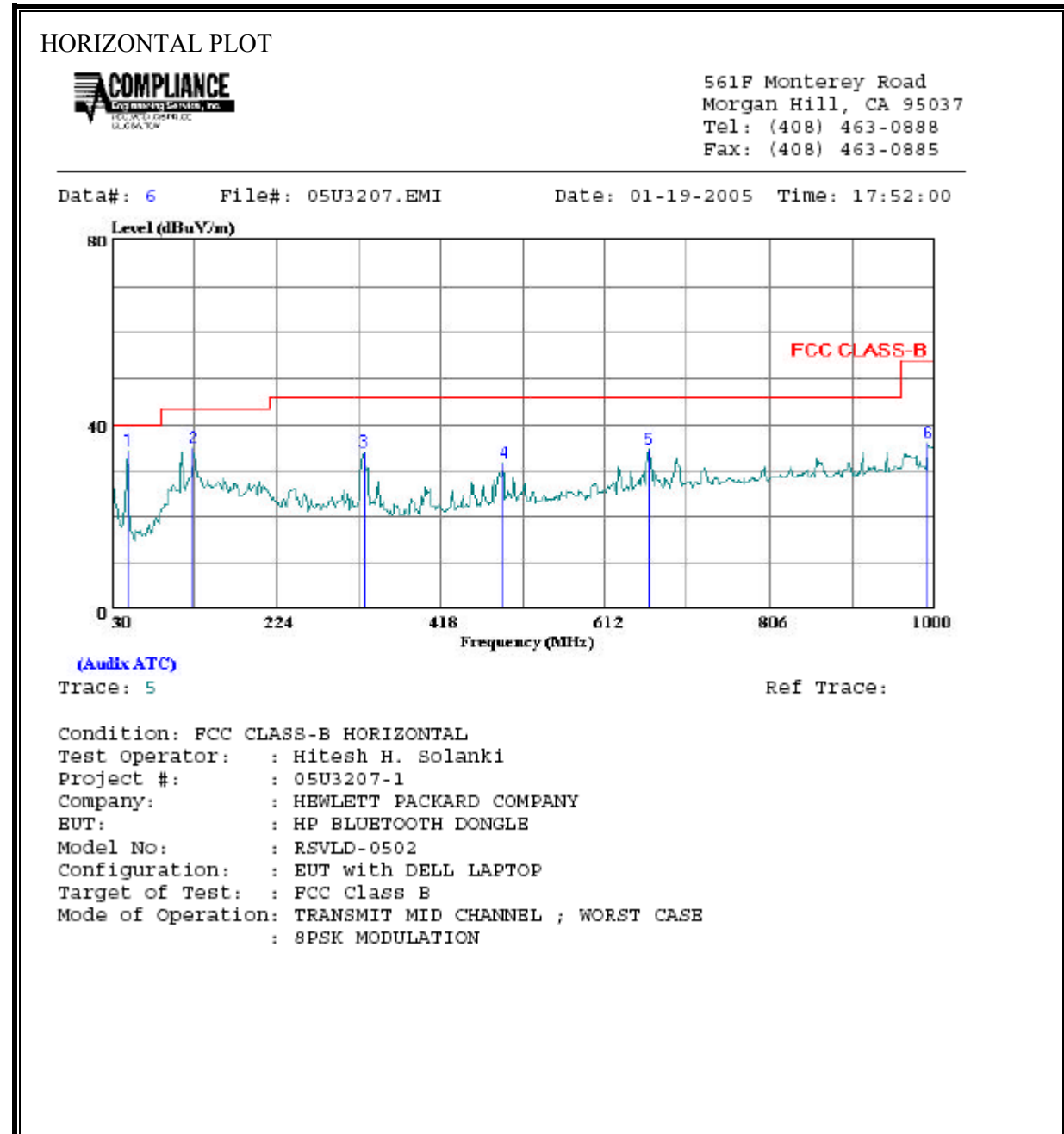


HARMONICS AND SPURIOUS EMISSIONS

01/19/05 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site															
Test Engr:		Hitesh H. Solanki													
Project #:		05U3207													
Company:		HEWLETT PACKARD COMPANY													
EUT Descrip.:		HP BLUETOOTH DONGLE													
EUT M/N:		RSVLD-0502													
Test Target:		FCC CLASS B													
Mode Oper:		TRANSMIT W/O HOPPING, GFSK MODULATION													
Test Equipment:															
EMCO Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T86 Miteq 924341						FCC 15.209							
Hi Frequency Cables															
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz			
				4_Hitesh		12_Hitesh				R_001		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	Filtr 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	53.2	42.4	33.0	4.4	-44.0	0.0	0.0	46.7	35.9	74	54	-27.3	-18.1	V
7.206	3.0	54.5	45.7	35.8	6.1	-45.0	0.0	0.0	51.4	42.6	74	54	-22.6	-11.4	V
4.804	3.0	55.7	50.2	33.0	4.4	-44.0	0.0	0.0	49.2	43.7	74	54	-24.8	-10.3	H
7.206	3.0	54.3	46.8	35.8	6.1	-45.0	0.0	0.0	51.2	43.7	74	54	-22.8	-10.3	H
MIDDLE CHANNEL															
4.882	3.0	53.8	45.7	33.0	4.5	-44.1	0.0	0.0	47.2	39.1	74	54	-26.8	-14.9	V
7.323	3.0	52.4	43.8	35.9	6.2	-45.0	0.0	0.0	49.5	40.9	74	54	-24.5	-13.1	V
4.882	3.0	55.4	50.0	33.0	4.5	-44.1	0.0	0.0	48.8	43.4	74	54	-25.2	-10.6	H
7.323	3.0	50.8	40.5	35.9	6.2	-45.0	0.0	0.0	47.9	37.6	74	54	-26.1	-16.4	H
HIGH CHANNEL															
4.960	3.0	53.3	47.0	33.0	4.5	-44.2	0.0	0.0	46.7	40.4	74	54	-27.3	-13.6	V
7.440	3.0	51.4	41.3	36.1	6.3	-45.0	0.0	0.0	48.8	38.7	74	54	-25.2	-15.3	V
4.960	3.0	53.9	48.1	33.0	4.5	-44.2	0.0	0.0	47.3	41.5	74	54	-26.7	-12.5	H
7.440	3.0	51.2	40.2	36.1	6.3	-45.0	0.0	0.0	48.6	37.6	74	54	-25.4	-16.4	H
No other emissions were detected up to 10th harmonics.															
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										

7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH 8PSK MODULATION

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



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	48.430	52.05	-17.60	34.45	40.00	-5.55	Peak
2	126.030	47.31	-12.54	34.77	43.50	-8.73	Peak
3	327.790	45.31	-11.13	34.18	46.00	-11.82	Peak
4	492.690	38.86	-7.38	31.48	46.00	-14.52	Peak
5	664.380	38.47	-3.88	34.59	46.00	-11.41	Peak
6	992.240	36.48	-0.40	36.08	54.00	-17.92	Peak

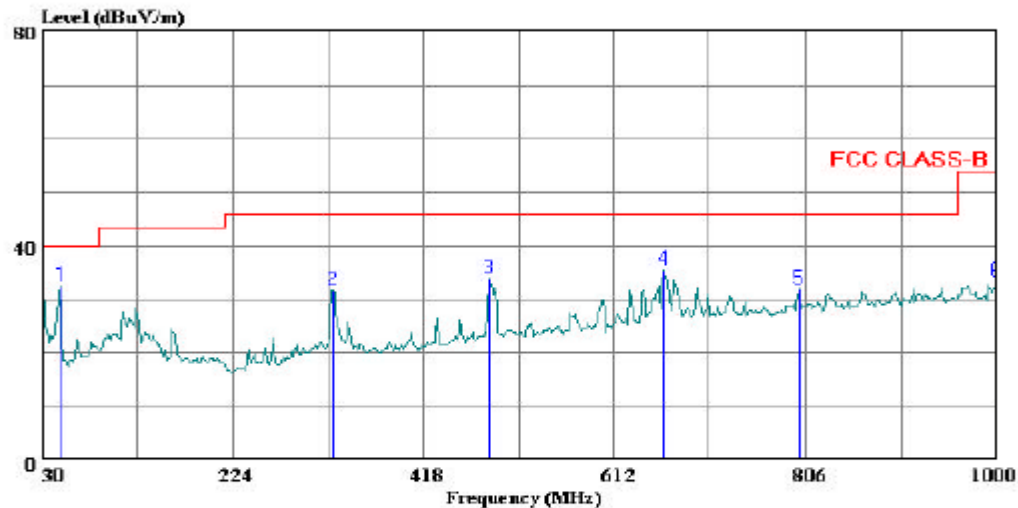
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 8 File#: 05U3207.EMI Date: 01-19-2005 Time: 18:02:10



(Auxiliary ATC)

Trace: 7

Ref Trace:

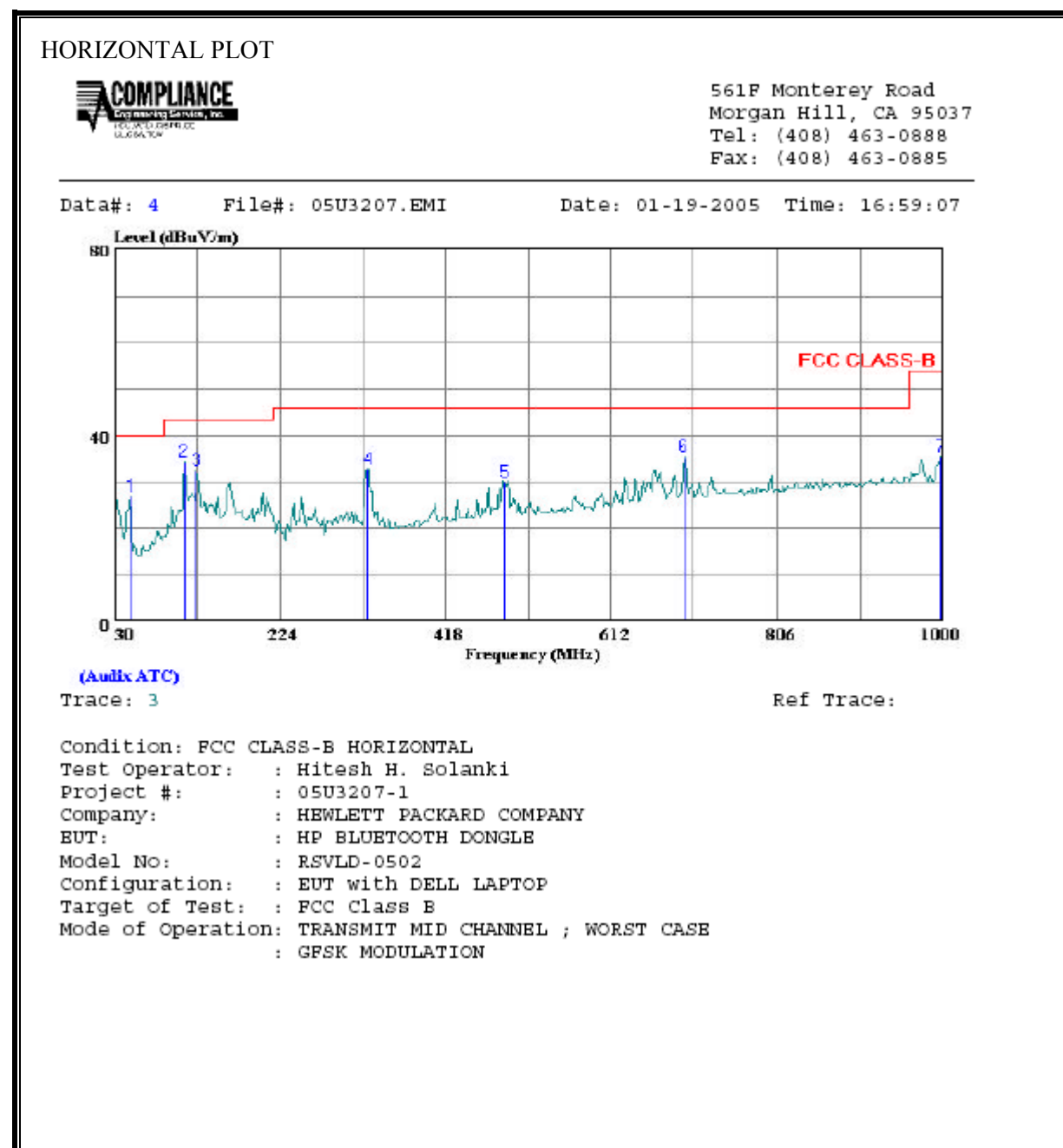
Condition: FCC CLASS-B VERTICAL
Test Operator: : Hitesh H. Solanki
Project #: : 05U3207-1
Company: : HEWLETT PACKARD COMPANY
EUT: : HP BLUETOOTH DONGLE
Model No: : RSVLD-0502
Configuration: : EUT with DELL LAPTOP
Target of Test: : FCC Class B
Mode of Operation: TRANSMIT MID CHANNEL ; WORST CASE
: 8PSK MODULATION

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	48.430	49.94	-17.60	32.34	40.00	-7.66	Peak
2	325.850	42.65	-11.17	31.48	46.00	-14.52	Peak
3	484.930	41.23	-7.54	33.69	46.00	-12.31	Peak
4	662.440	39.34	-3.97	35.37	46.00	-10.63	Peak
5	798.240	33.74	-1.82	31.92	46.00	-14.08	Peak
6	999.030	33.92	-0.56	33.36	54.00	-20.64	Peak

7.3.5. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH GFSK MODULATION

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



HORIZONTAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	48.430	44.54	-17.60	26.94	40.00	-13.06	Peak
2	111.480	48.26	-13.98	34.28	43.50	-9.22	Peak
3	126.030	44.91	-12.54	32.37	43.50	-11.13	Peak
4	326.820	43.74	-11.15	32.59	46.00	-13.41	Peak
5	487.840	37.32	-7.48	29.84	46.00	-16.16	Peak
6	698.330	38.80	-3.25	35.55	46.00	-10.45	Peak
7	997.090	36.05	-0.50	35.55	54.00	-18.45	Peak

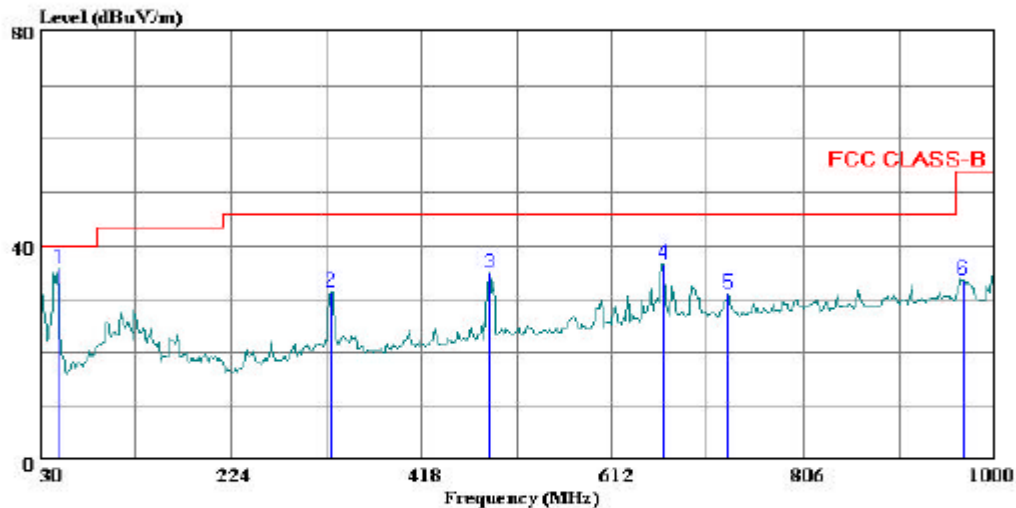
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 2 File#: 05U3207.EMI Date: 01-19-2005 Time: 16:53:10



(Auxiliary ATC)

Trace: 1

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Hitesh H. Solanki
Project #: : 05U3207-1
Company: : HEWLET PACKARD COMPANY
EUT: : HP BLUETOOTH DONGLE
Model No: : RSVLD-0502
Configuration: : EUT with DELL LAPTOP
Target of Test: : FCC Class B
Mode of Operation: TRANSMIT MID CHANNEL ; WORST CASE
: GFSK MODULATION

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	48.430	53.31	-17.60	35.71	40.00	-4.29	Peak
2	325.850	42.34	-11.17	31.17	46.00	-14.83	Peak
3	487.840	42.25	-7.48	34.77	46.00	-11.23	Peak
4	664.380	40.30	-3.88	36.42	46.00	-9.58	Peak
5	730.340	33.84	-2.74	31.10	46.00	-14.90	Peak
6	967.990	34.17	-0.54	33.63	54.00	-20.37	Peak

7.4. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

^{*} Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

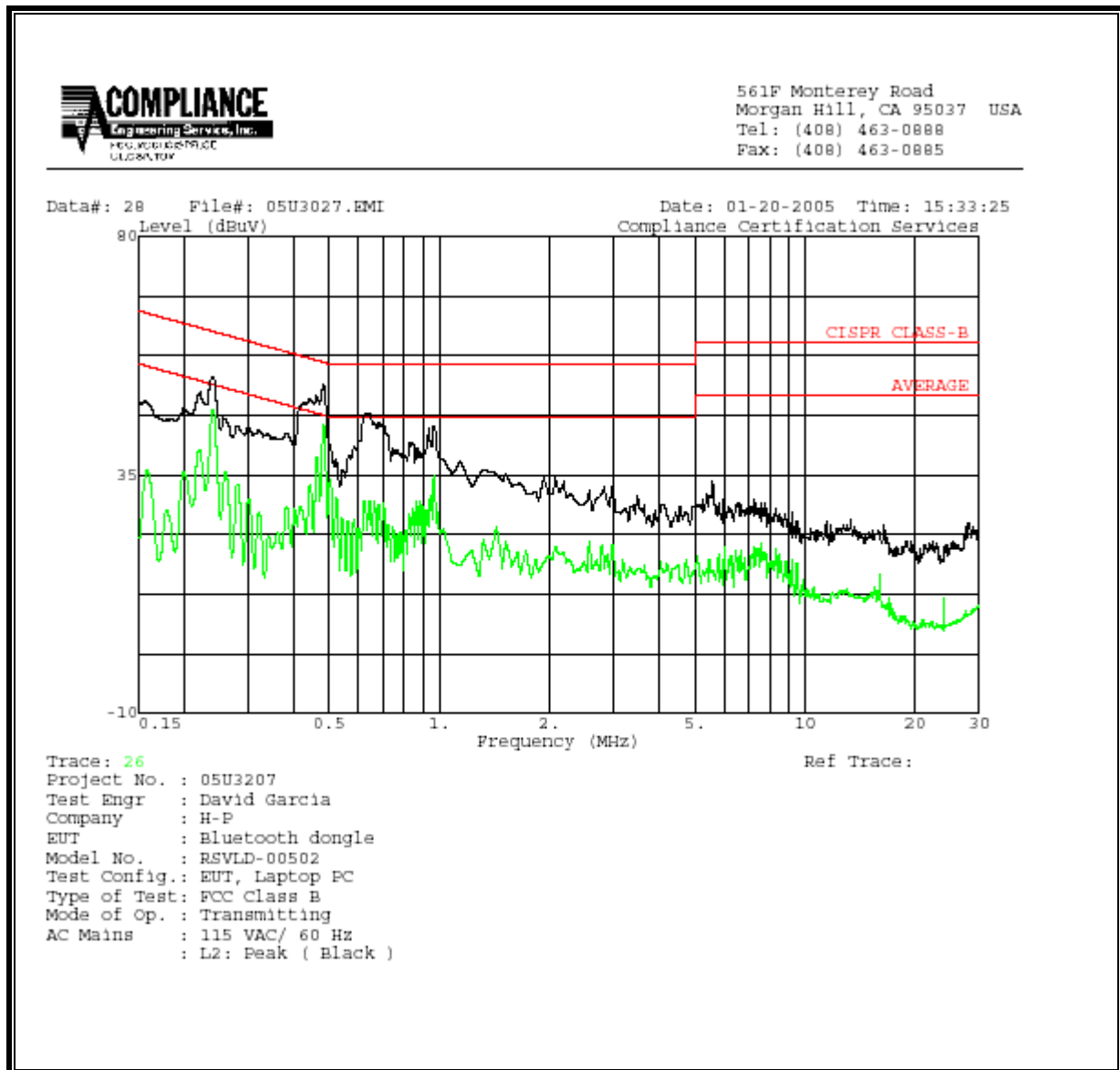
RESULTS

No non-compliance noted:

6 WORST EMISSIONS

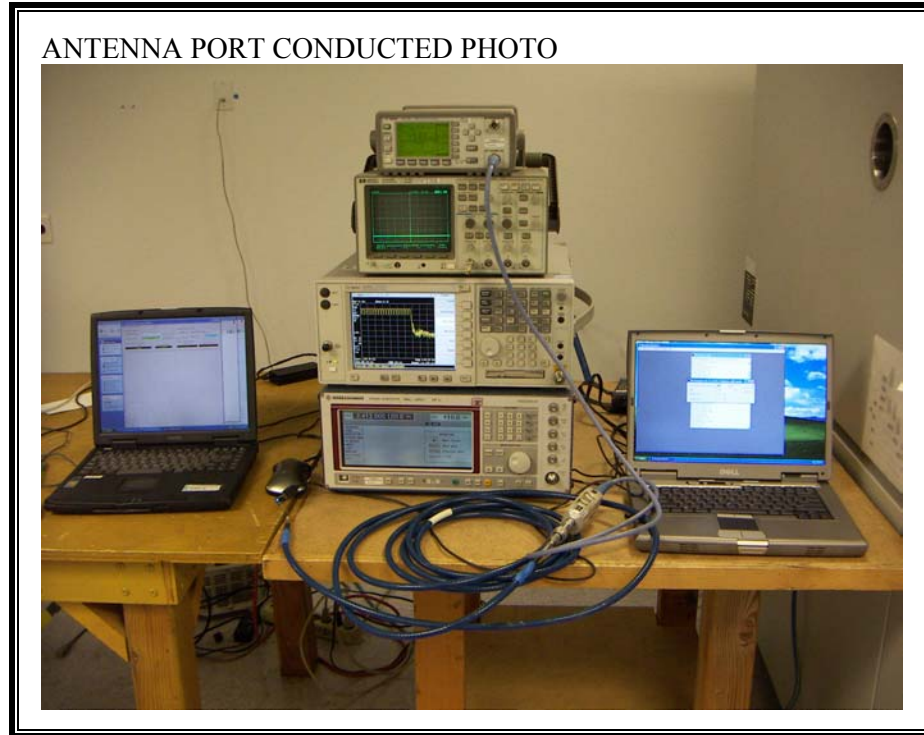
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.24	54.72	--	47.98	0.00	62.17	52.17	-7.45	-4.19	L1
0.48	52.53	--	44.72	0.00	56.36	46.36	-3.83	-1.64	L1
0.63	47.56	--	31.30	0.00	56.00	46.00	-8.44	-14.70	L1
0.24	53.52	--	47.26	0.00	62.13	52.13	-8.61	-4.87	L2
0.48	51.94	--	44.40	0.00	56.32	46.32	-4.38	-1.92	L2
0.63	46.76	--	30.02	0.00	56.00	46.00	-9.24	-15.98	L2
6 Worst Data									

LINE 2 RESULTS

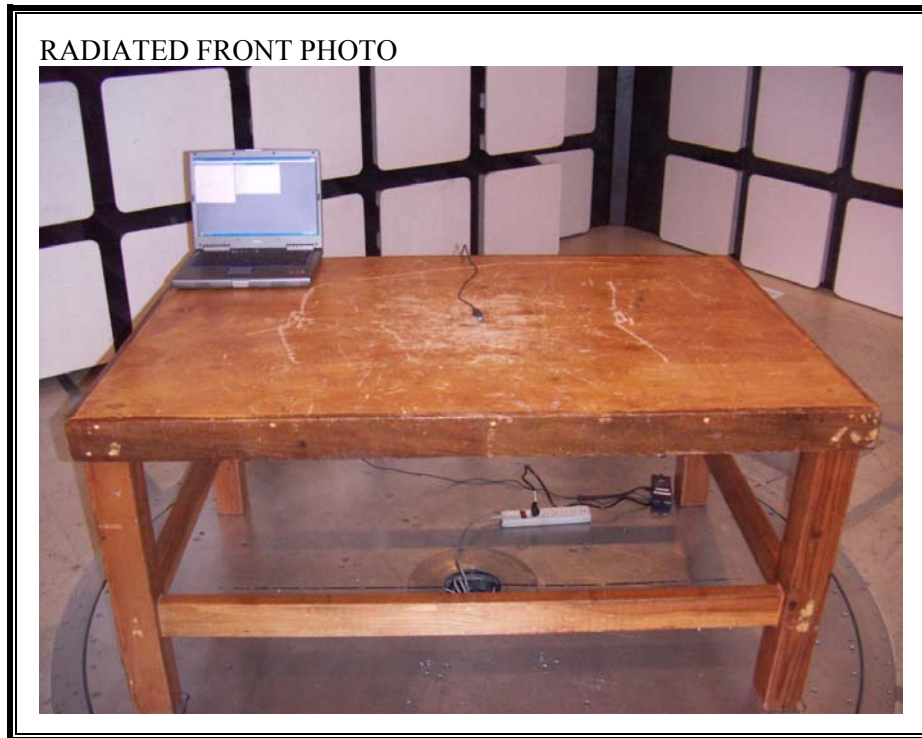


8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



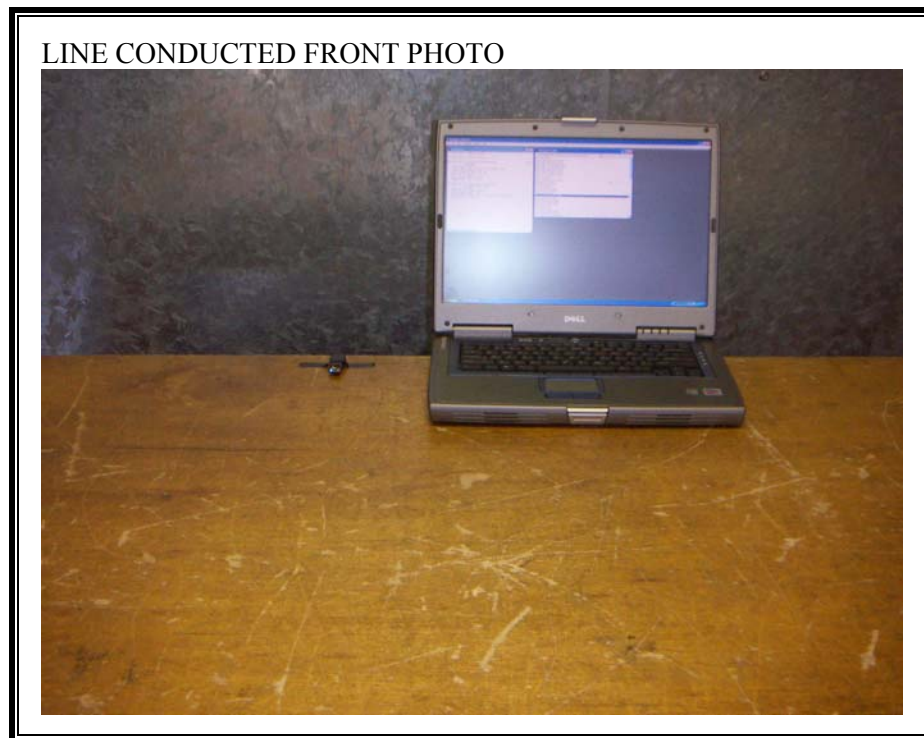
RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



LINE CONDUCTED BACK PHOTO



END OF REPORT