



FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

BT3.0+EDR, 802.11 b/g/n 1x1 HT20, GSM850/1900 & WCDMA850 Bar phone

MODEL NUMBER: GT-B5510B

FCC ID: A3LGTB5510B

REPORT NUMBER: 11I13982-3

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Prepared for

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NVLAP LAB CODE 200065-0

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SAMSUNG ELECTRONICS CO., LTD
416, MAETAN 3-DONG, YEONGTONG-GU
SUWON-CITY, GYEONGGI-DO 443-742, SOUTH KOREA

EUT DESCRIPTION: BT3.0+EDR, 802.11 B/G/N 1X1 HT20, GSM850/1900,
WCDMA850MHZ BAR PHONE WITH HOTSPOTS AND VOIP
SUPPORTED

MODEL: GT-B5510B

SERIAL NUMBER: F1 202D (Conducted Unit), F1 202C (Radiated Unit)

DATE TESTED: SEPTEMBER 01-06, 2011

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:



FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:



CHIN PANG
EMC ENGINEER
UL CCS

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.

UL 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a BT3.0+EDR, 802.11 b/g/n 1x1 HT20, GSM850/1900, WCDMA850MHz Bar phone with hotspots and VOIP supported.

The radio module is manufactured by Samsung.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	8.91	7.78
2402 - 2480	Enhanced 8PSK	8.30	6.76

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, with a maximum gain of 2.56dBi for 2.4 GHz band.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was B5510L.010, rev 1.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power; radiated emissions 30-1000 MHz and power line conducted emissions were performed with the EUT set to transmit at the channel with highest output power.

Since the EUT is a portable device, the three orientations; X, Y and Z, and EUT with headset and power adapter were investigated and it was found that the worst orientation among them was EUT in the X orientation with headset and an AC Adapter connected.

5.6. DESCRIPTION OF TEST SETUP**SUPPORT EQUIPMENT**

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Samsung	ETAOU10EBE	SC3ZA16MS/7-E	DoC
Earphone	Samsung	N/A	FT032B	NA

I/O CABLES (CONDUCTED SETUP)

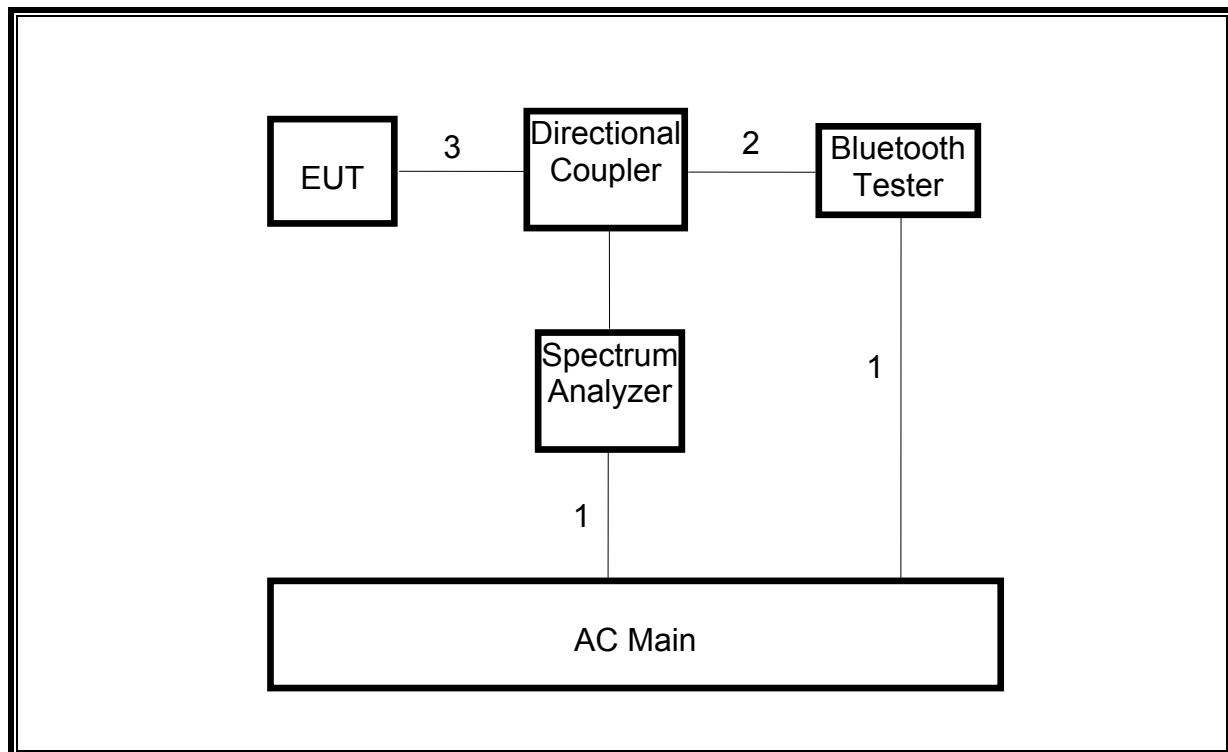
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US 115V	Un-shielded	2.0 m	NA
2	RF	1	SMA	Shielded	0.6 m	NA
3	RF	1	EUT	Un-shielded	0.2 m	NA

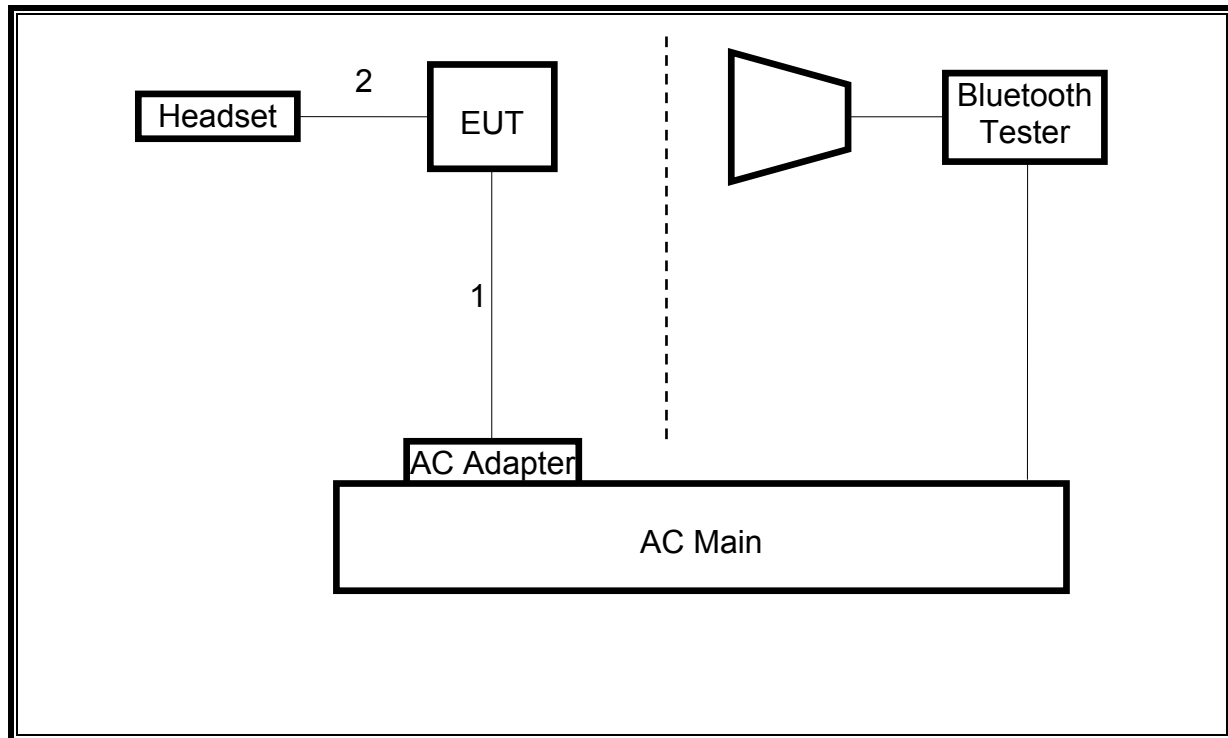
I/O CABLES (RADIATED SETUP)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Un-shielded	2m	NA
2	Jack	1	Earphone	Un-shielded	2m	Volume Control on Cable

TEST SETUP

The EUT is connected to Bluetooth tester via a directional coupler during the tests.

SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)

SETUP DIAGRAM FOR TESTS (RADIATED 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	Asset	Cal Due
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	01/19/12
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01161	12/07/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07/12/12
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/16/12
Bluetooth Test	R&S	CBT	NA	04/22/12
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	07/28/12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11
EMI Test Receiver, 9 kHz-7	R & S	ESCI 7	1000741	07/06/12
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/04/11
Peak Power Meter	Agilent / HP	E4416A	C00963	12/04/11
Directional Coupler, 18 GHz	Krytar	1817	N02656	CNR

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB BANDWIDTH

LIMIT

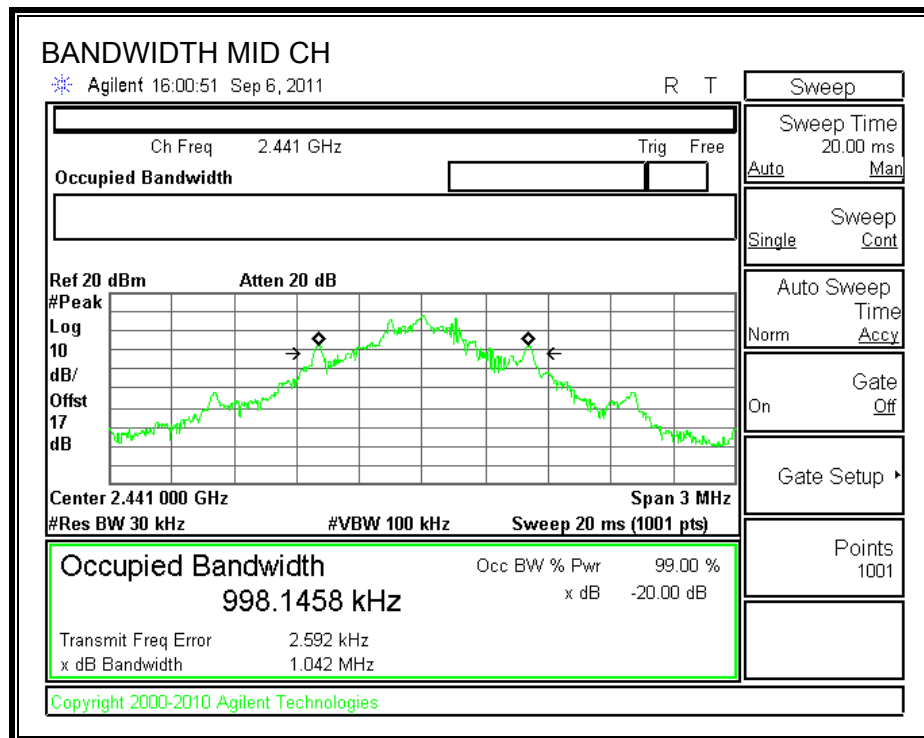
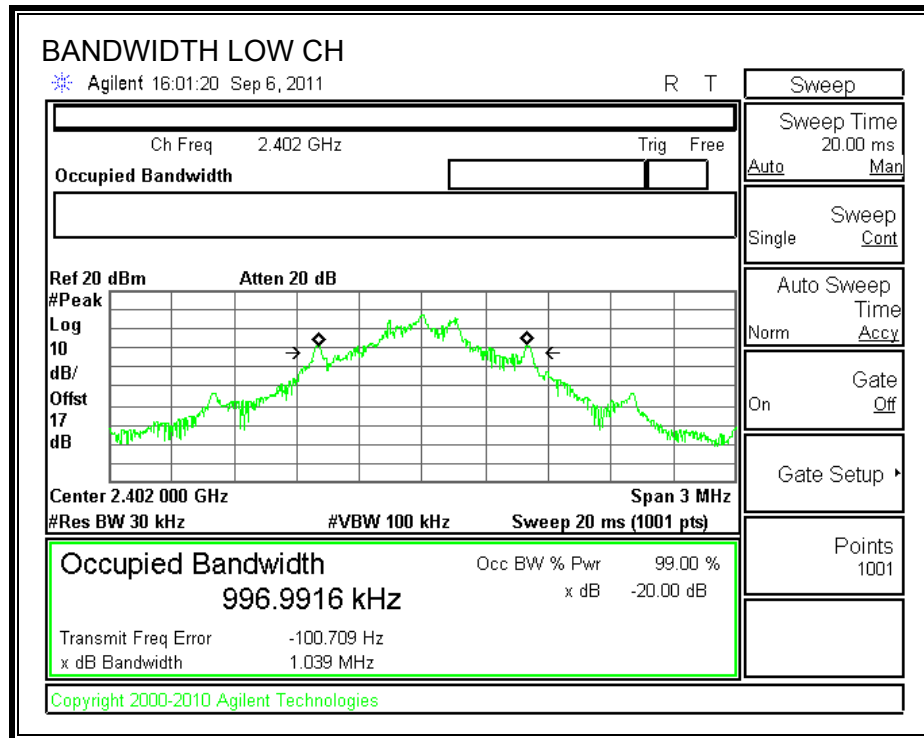
None; for reporting purposes only.

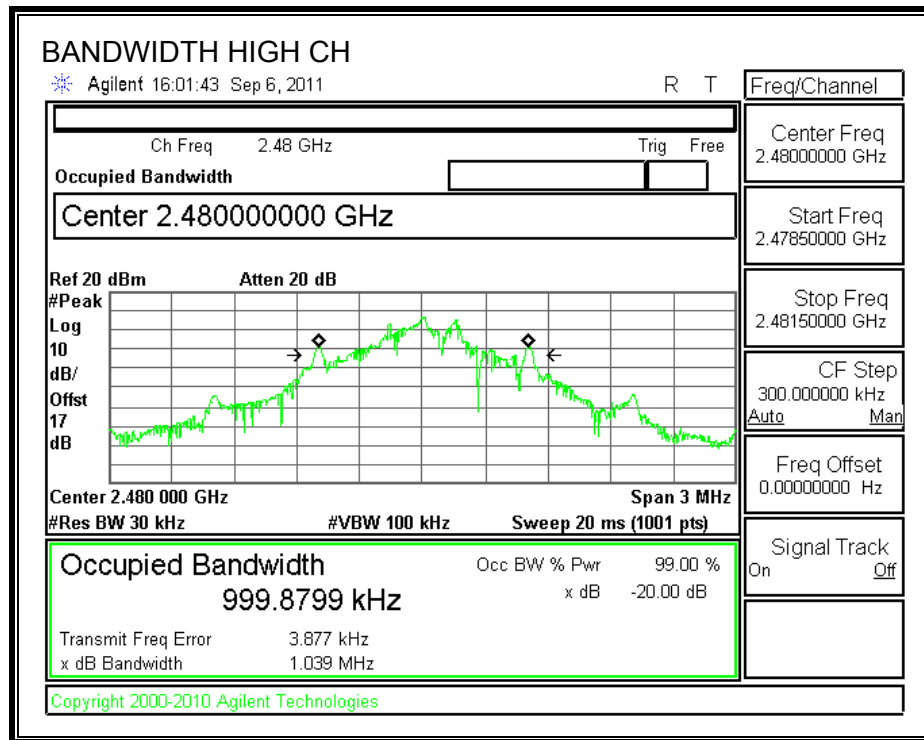
TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	1.039
Middle	2441	1.042
High	2480	1.039

20 dB BANDWIDTH



7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

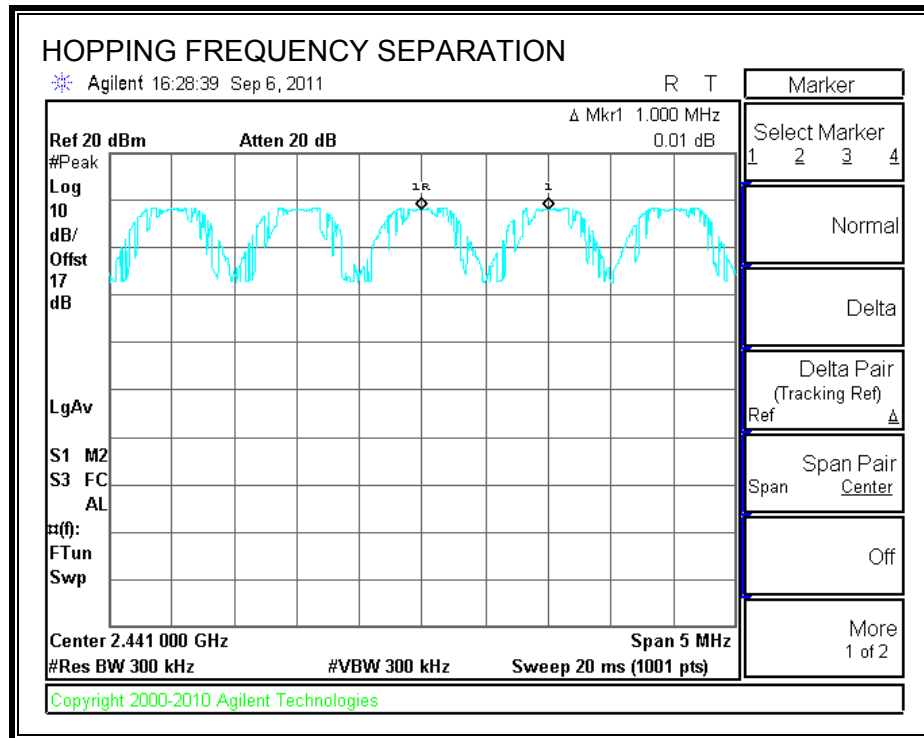
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION

7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

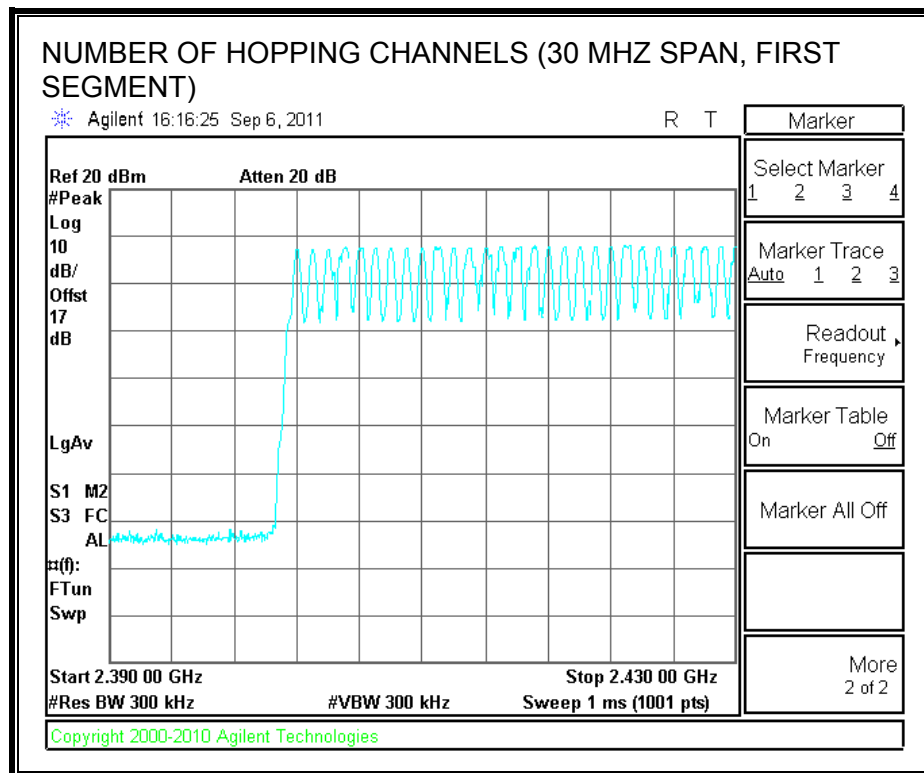
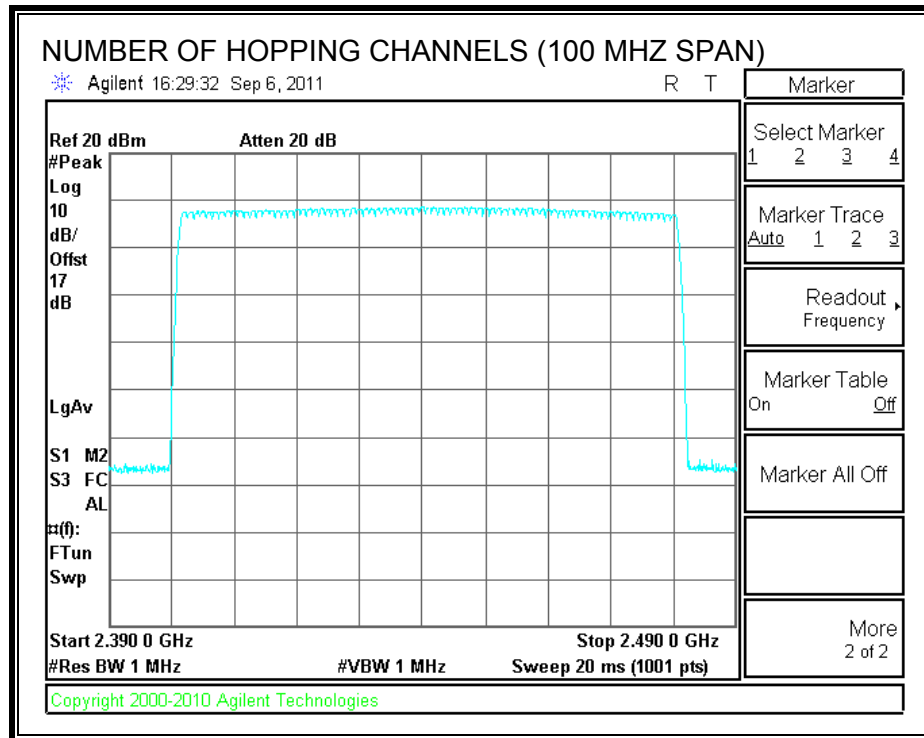
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

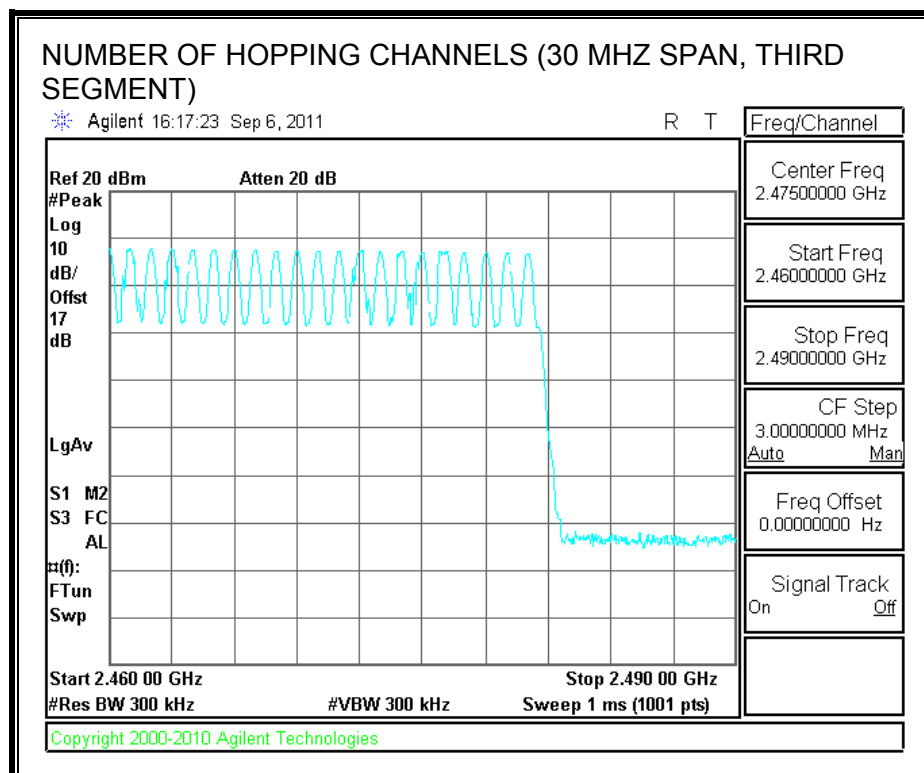
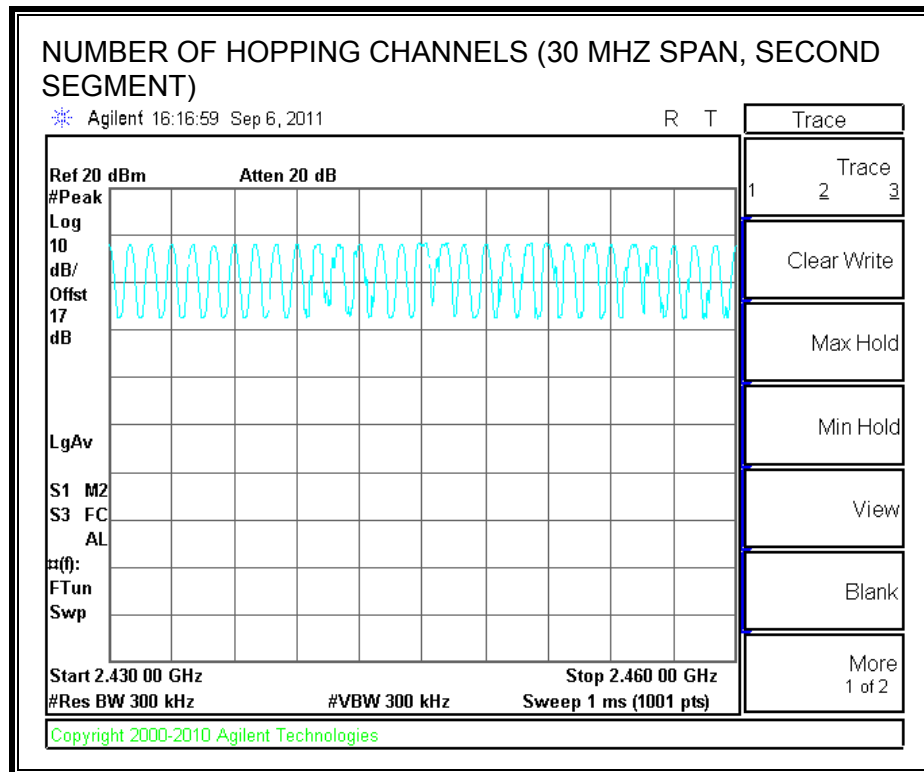
TEST PROCEDURE

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 a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

79 Channels observed.

NUMBER OF HOPPING CHANNELS



7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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

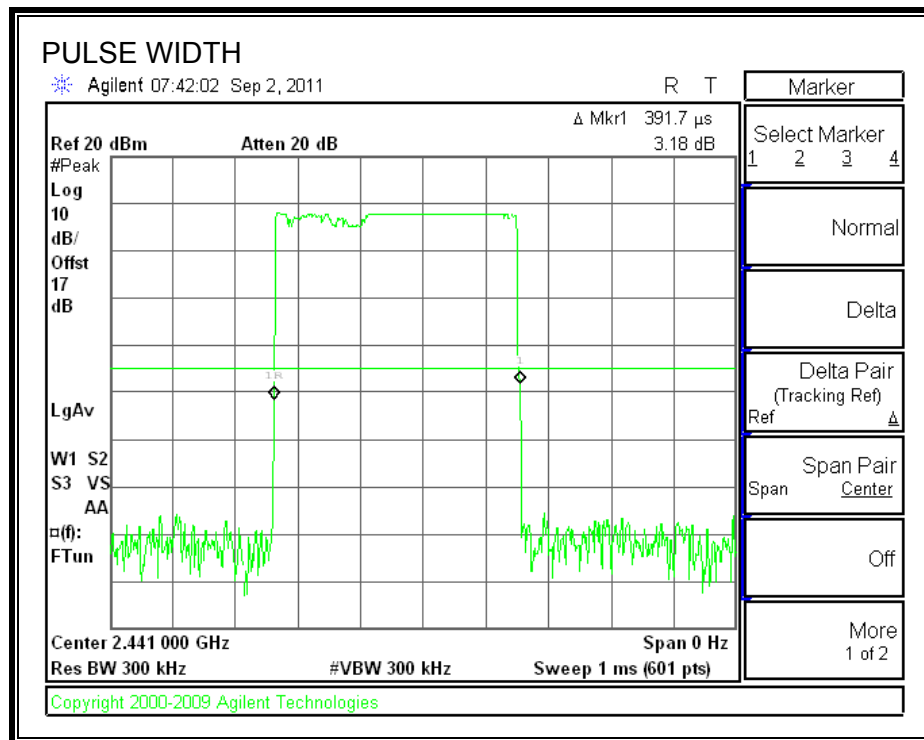
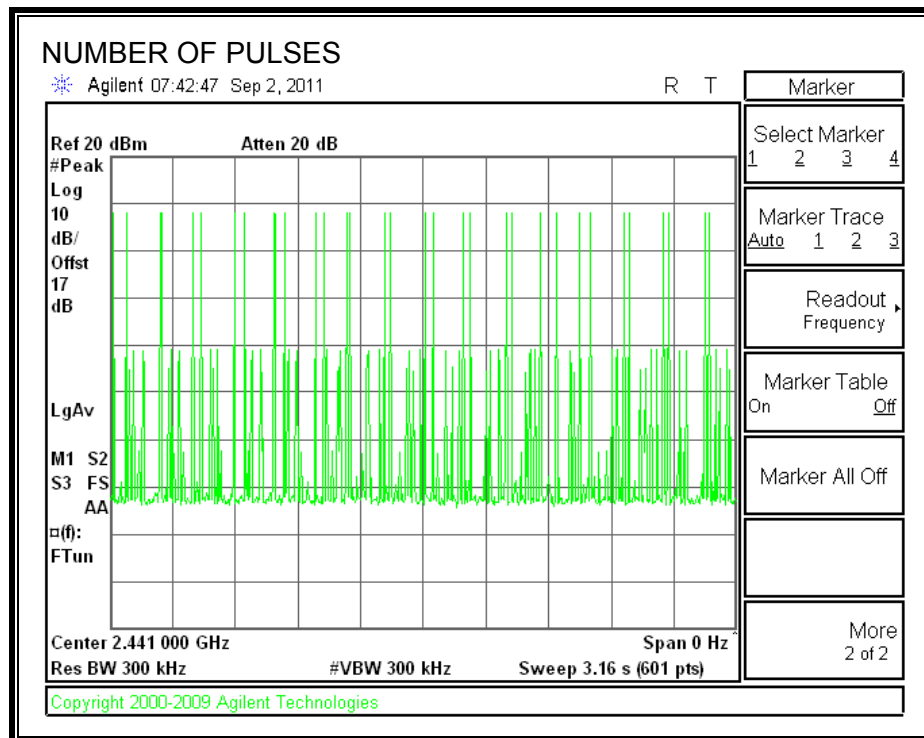
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

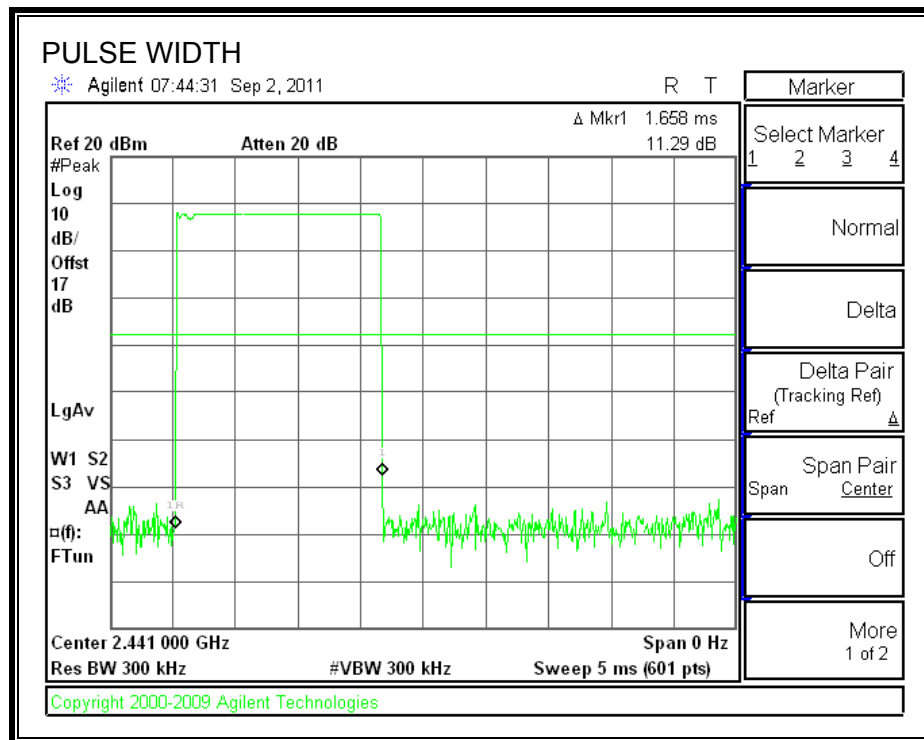
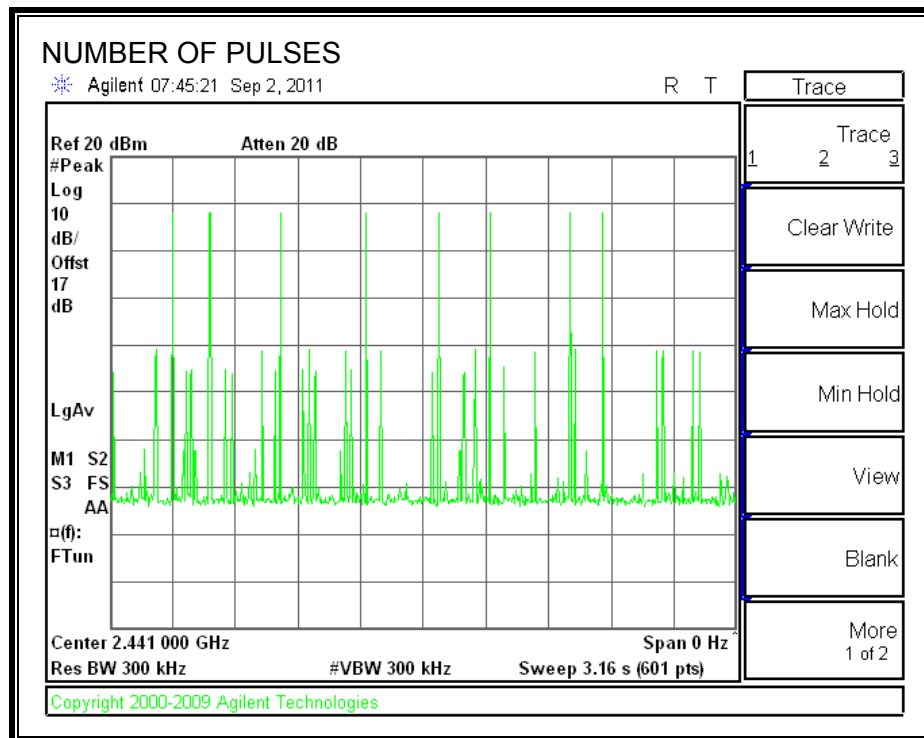
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

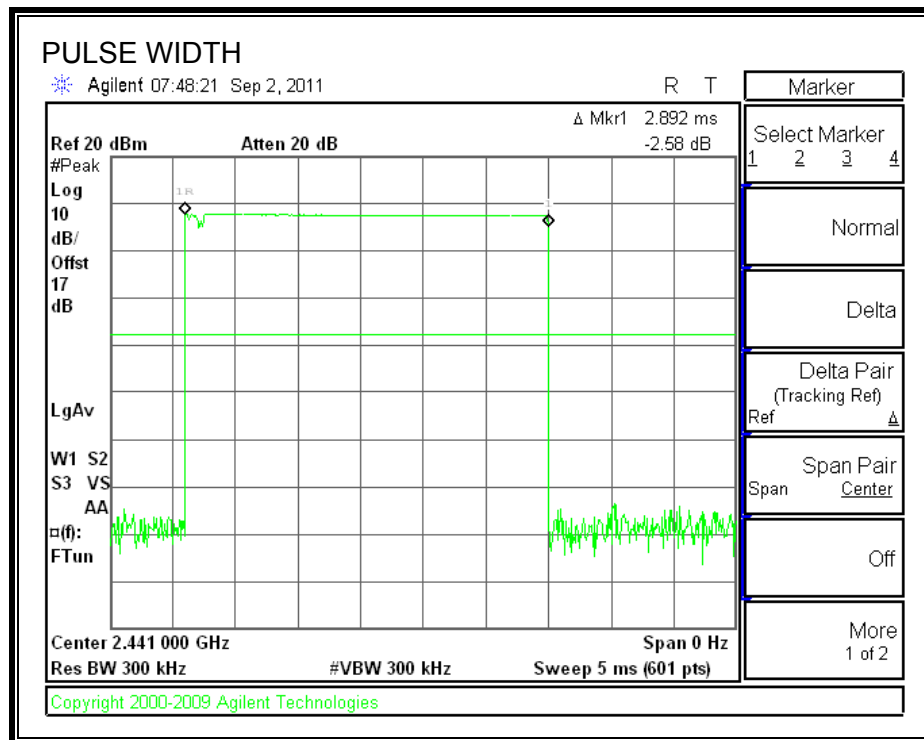
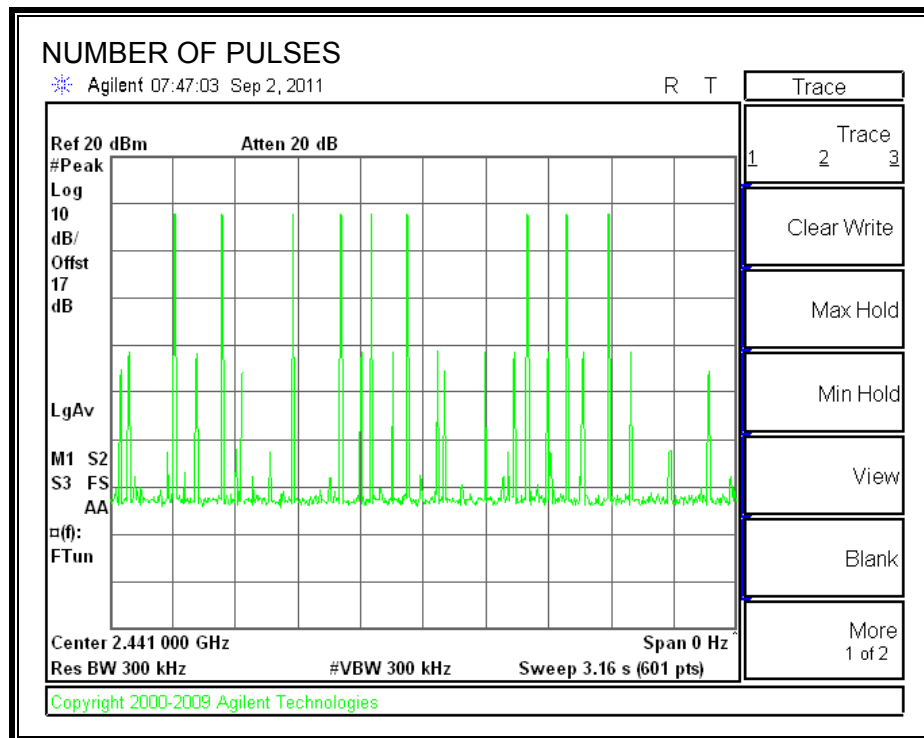
RESULTS

GFSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3917	32	0.1253	0.4	-0.2747
DH3	1.6580	9	0.1492	0.4	-0.2508
DH5	2.8920	9	0.2603	0.4	-0.1397

PULSE WIDTH, DH1**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

PULSE WIDTH, DH3**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

PULSE WIDTH, DH5**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

7.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

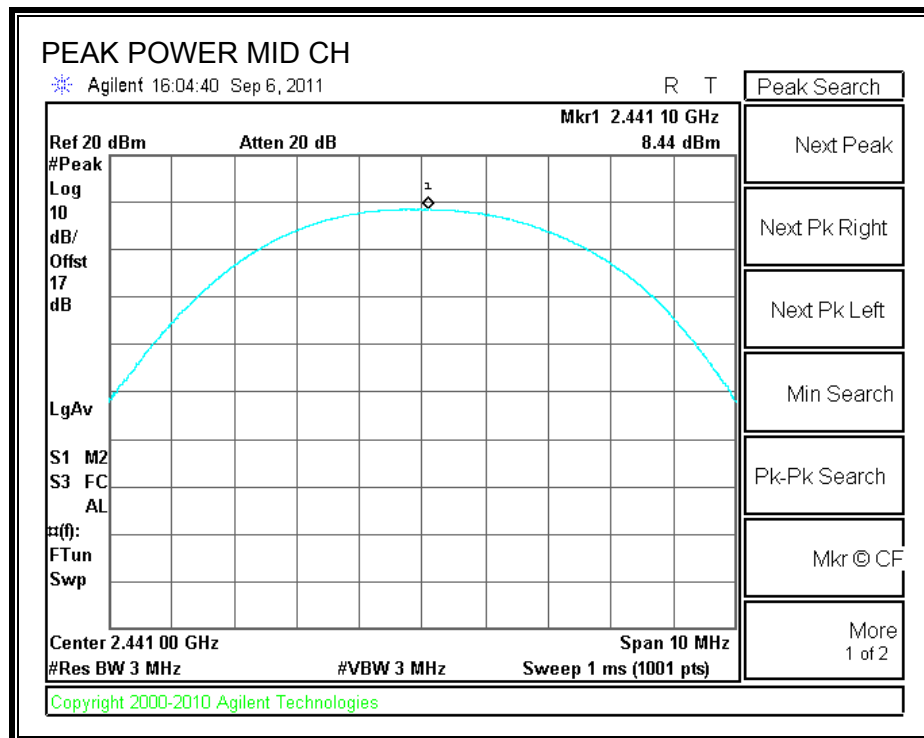
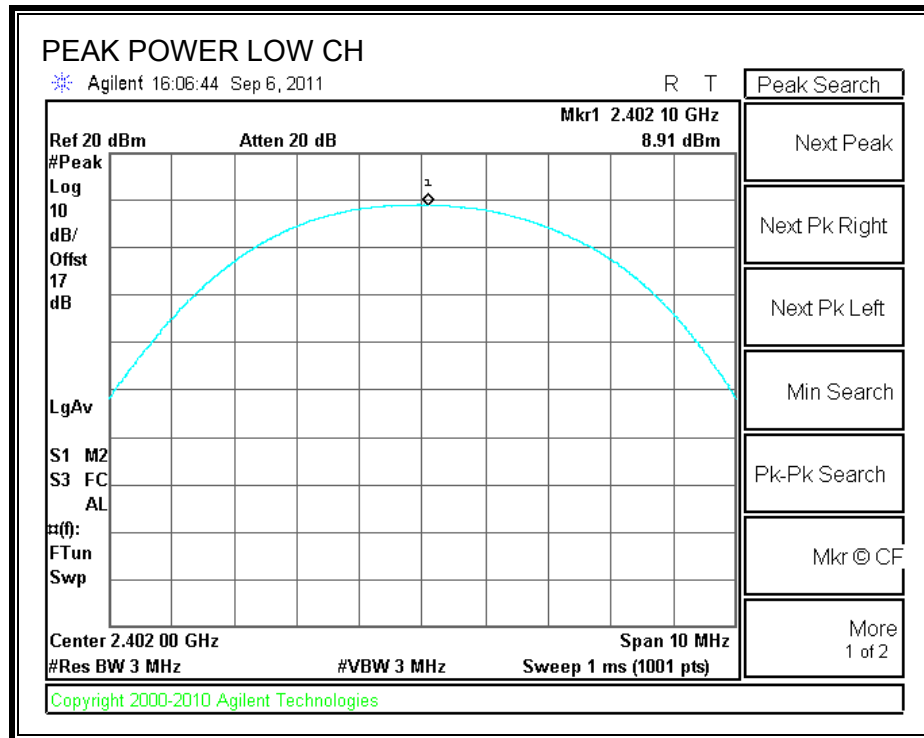
The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

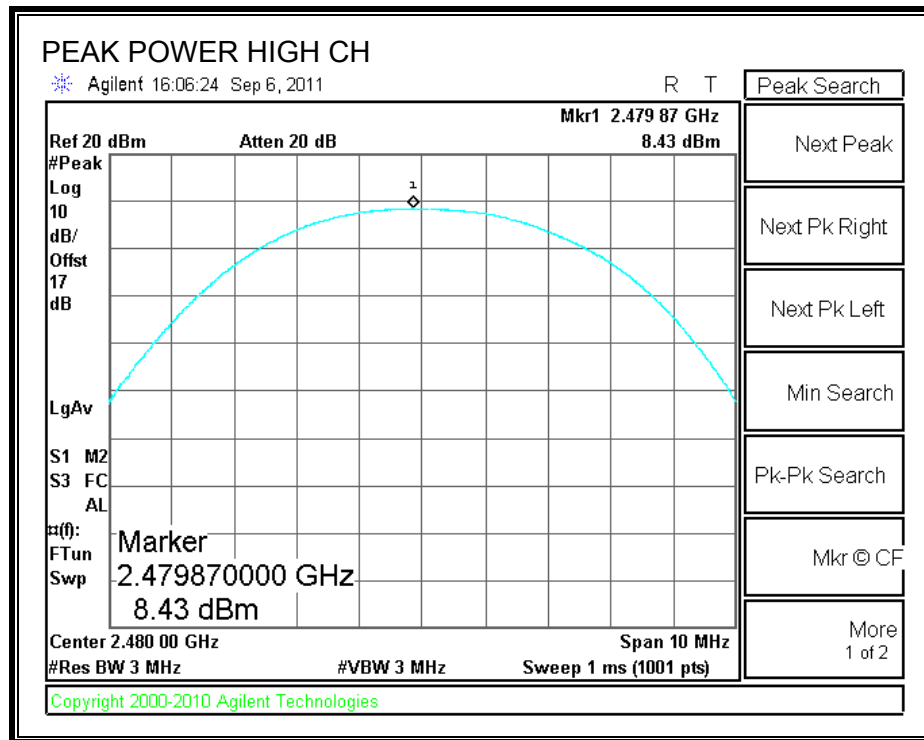
TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.91	30	-21.09
Middle	2441	8.44	30	-21.56
High	2480	8.43	30	-21.57

OUTPUT POWER



7.1.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.8B (including 10 dB pad and 0.8dB 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	6.70
Middle	2441	6.00
High	2480	6.00

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

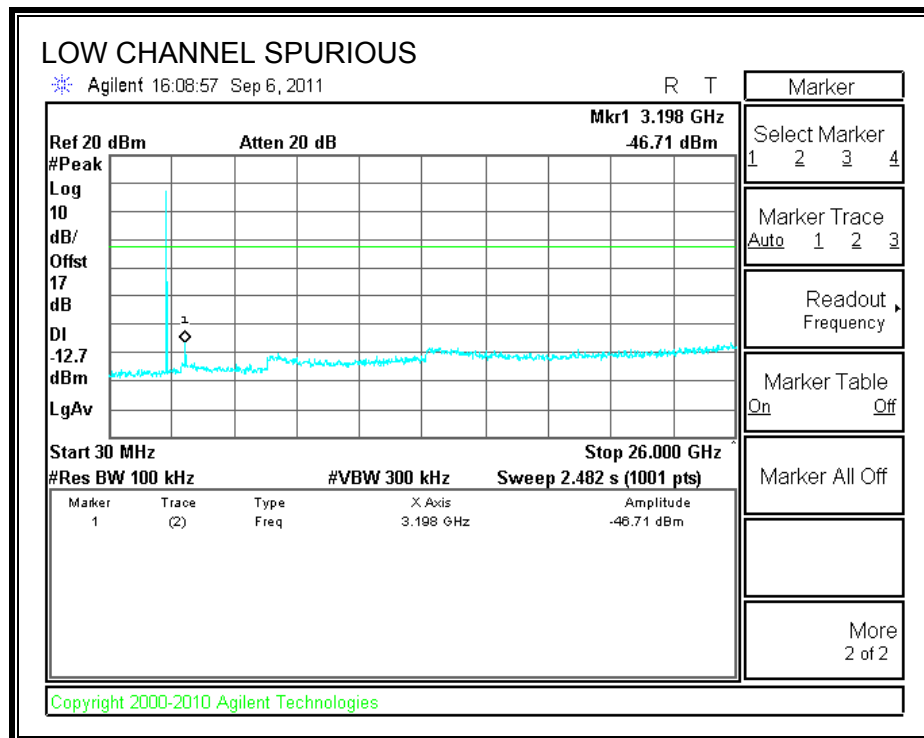
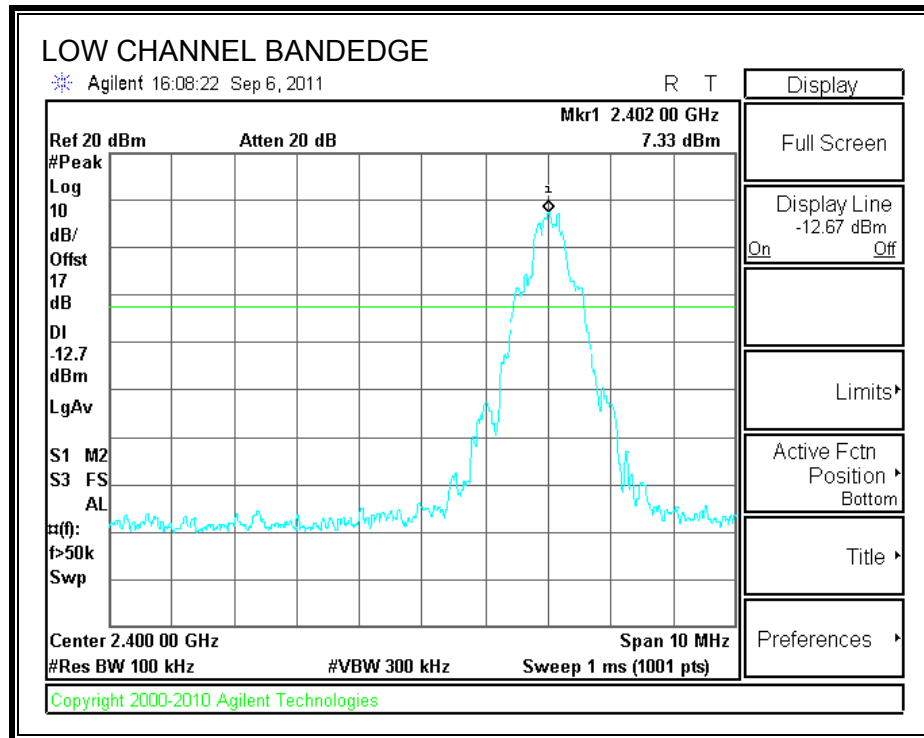
TEST PROCEDURE

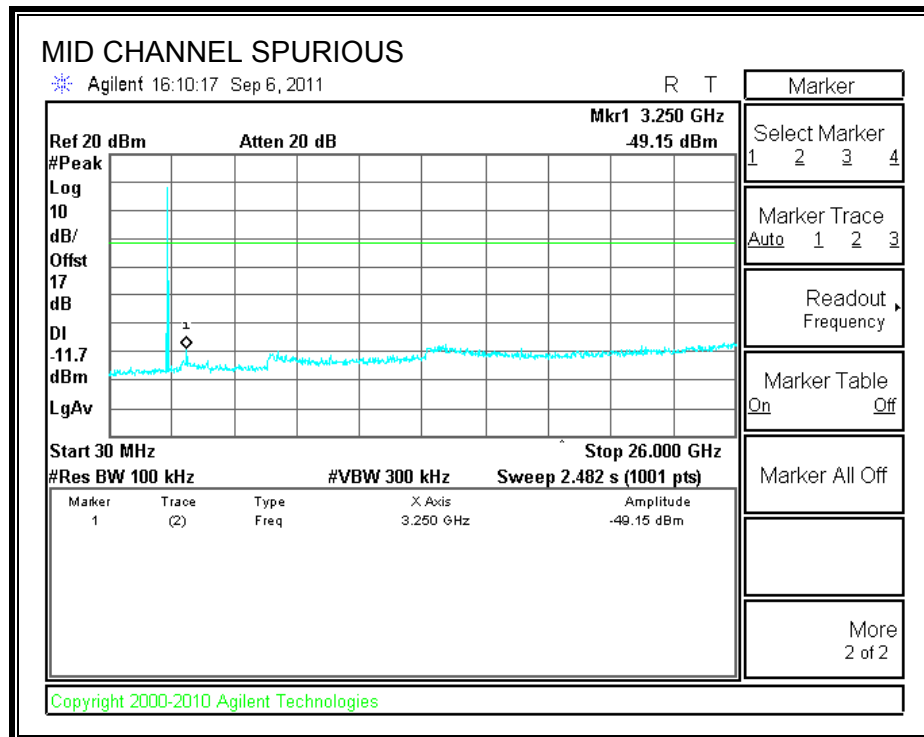
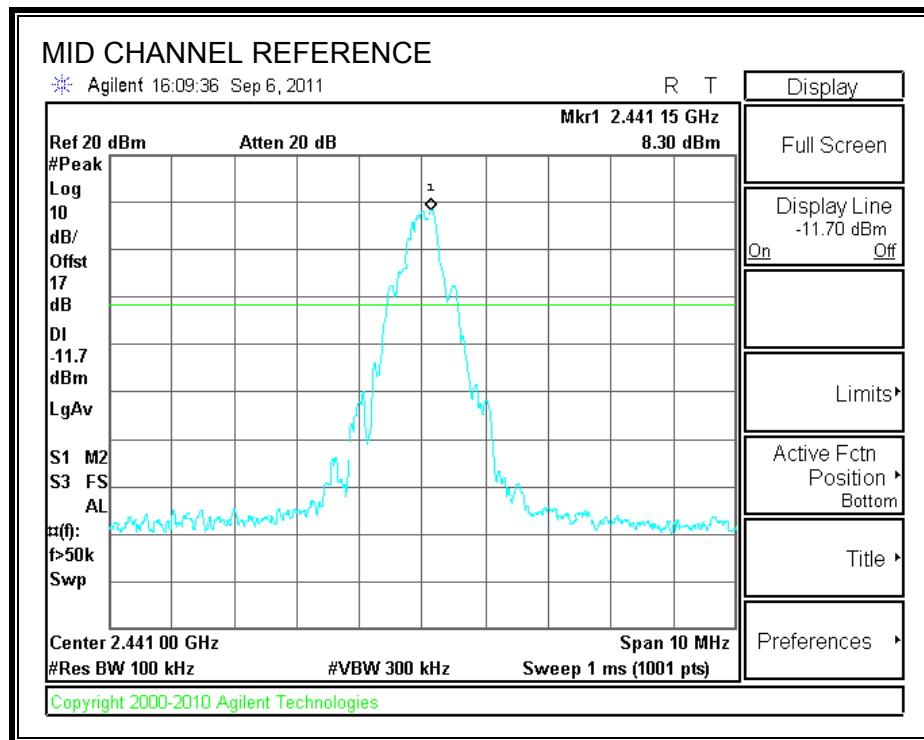
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

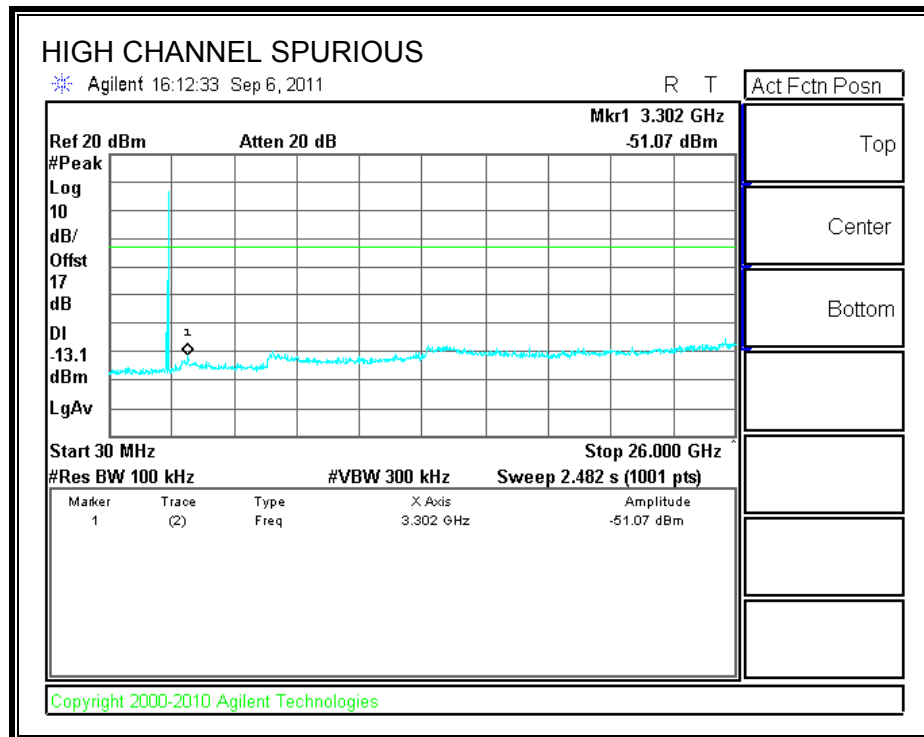
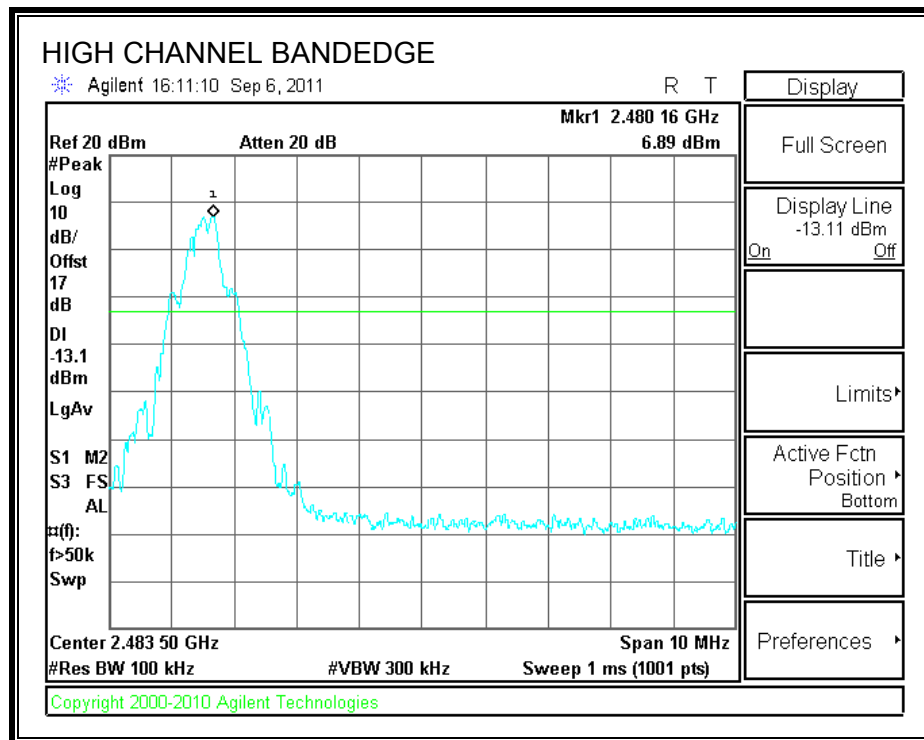
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

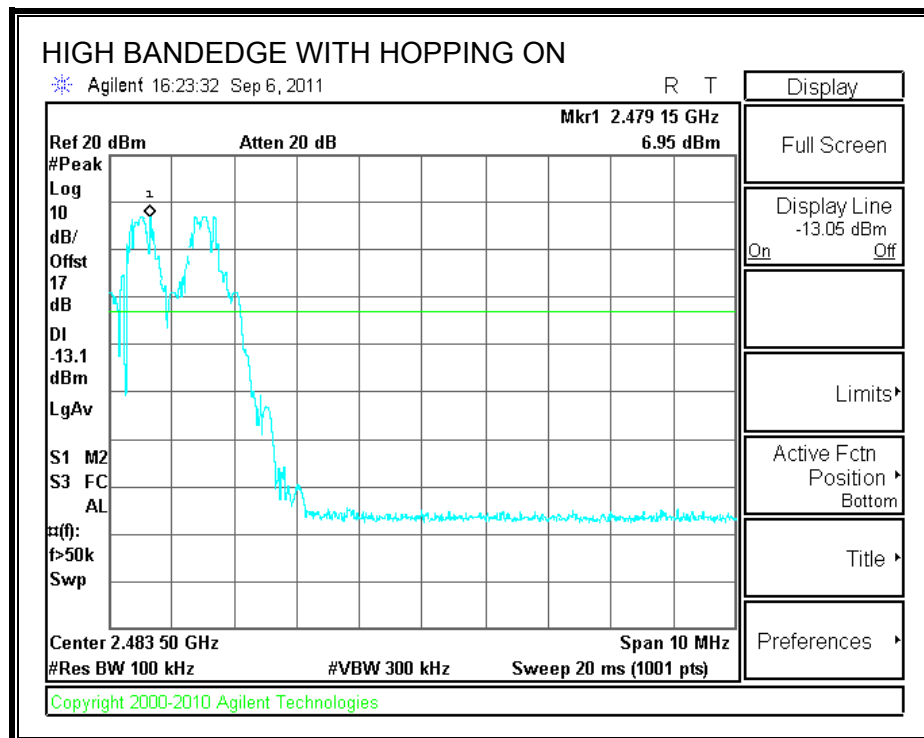
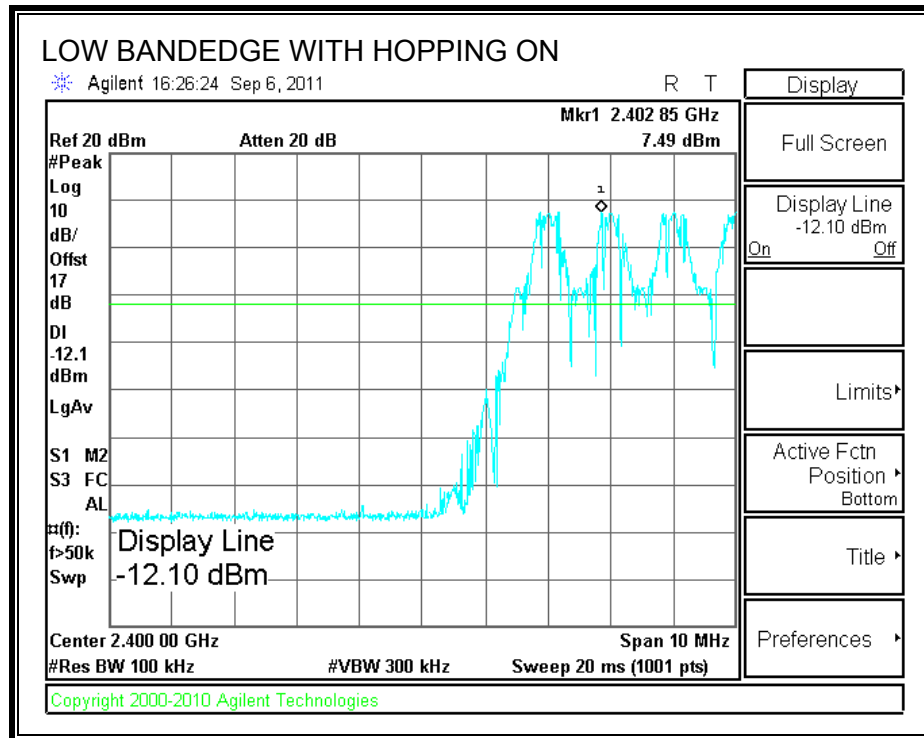
The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

SPURIOUS EMISSIONS, MID CHANNEL

SPURIOUS EMISSIONS, HIGH CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB BANDWIDTH

LIMIT

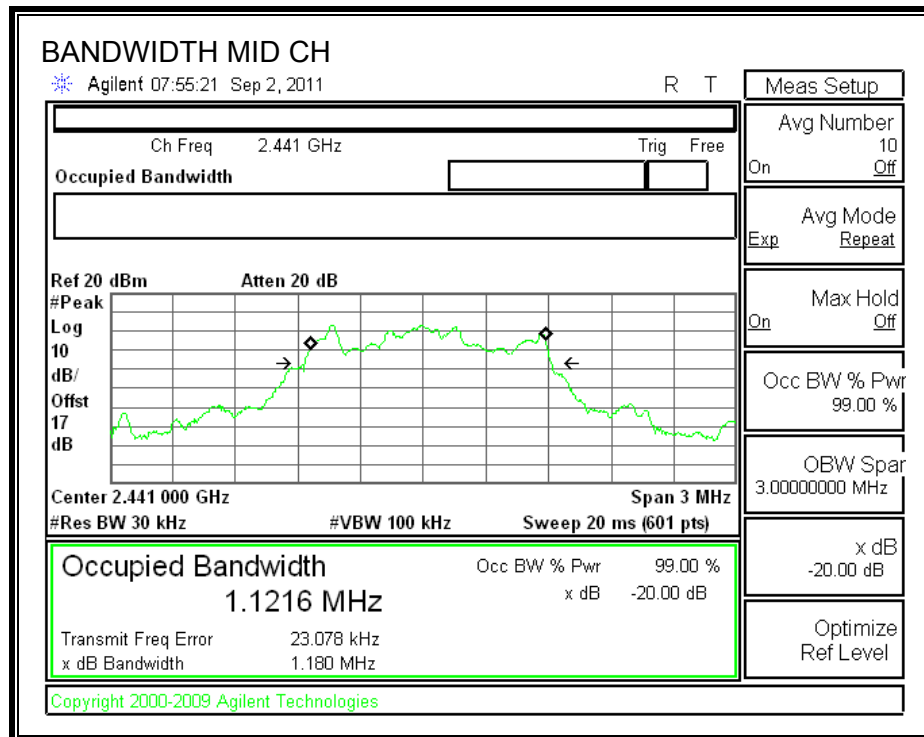
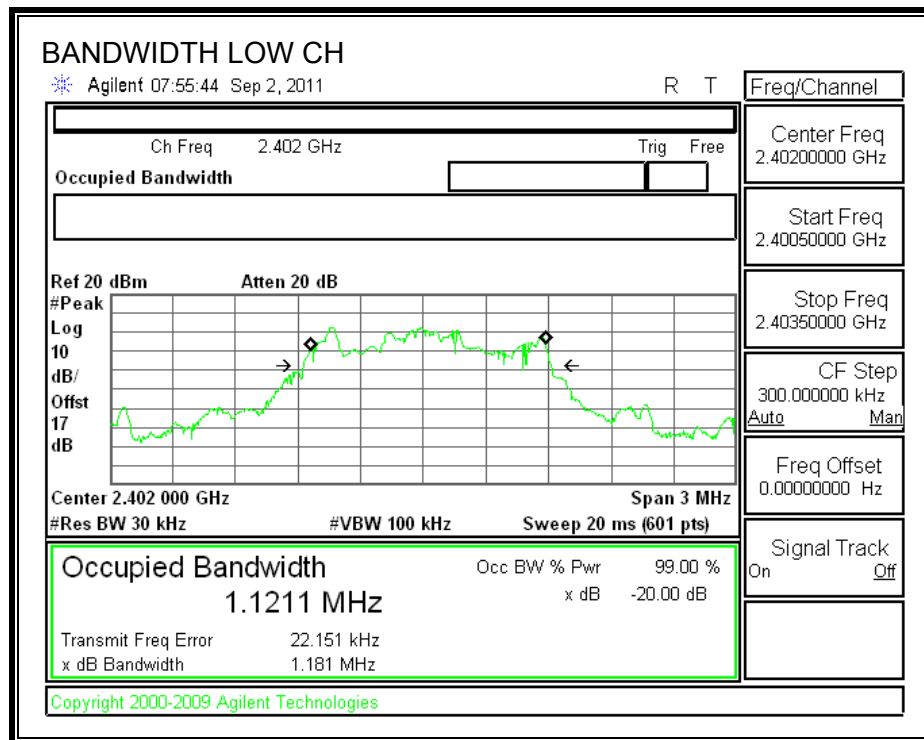
None; for reporting purposes only.

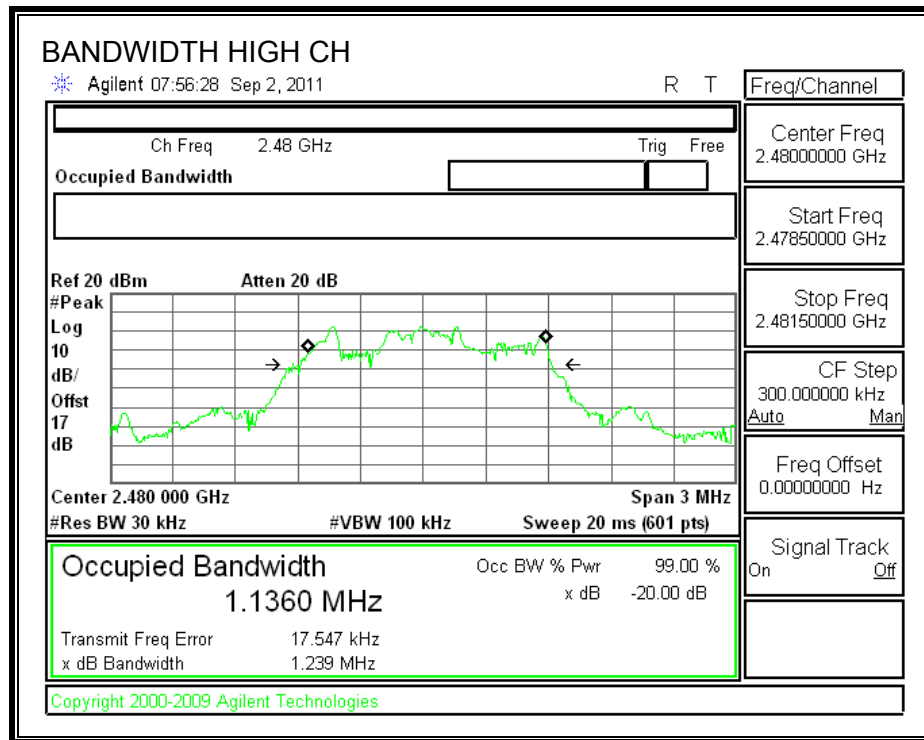
TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	1.181
Middle	2441	1.180
High	2480	1.239

20 dB BANDWIDTH



7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

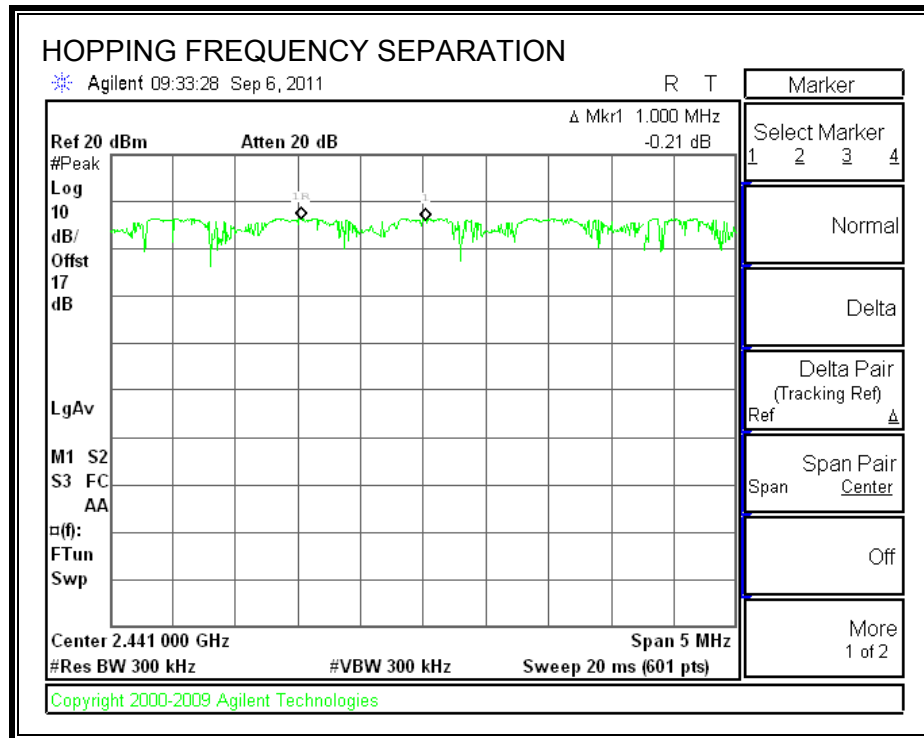
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION

7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

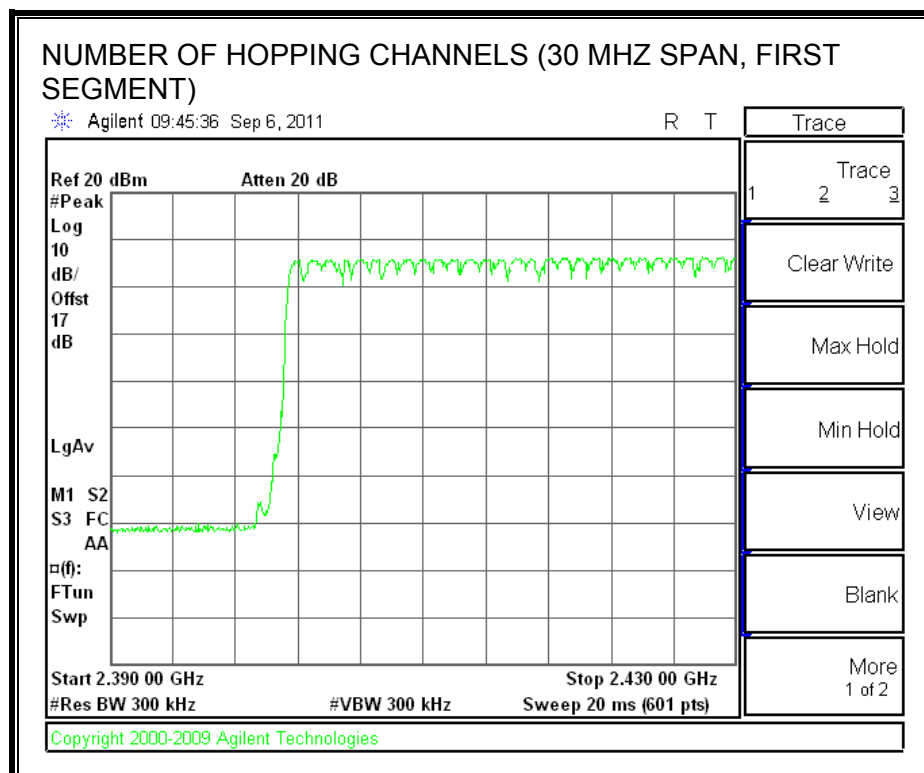
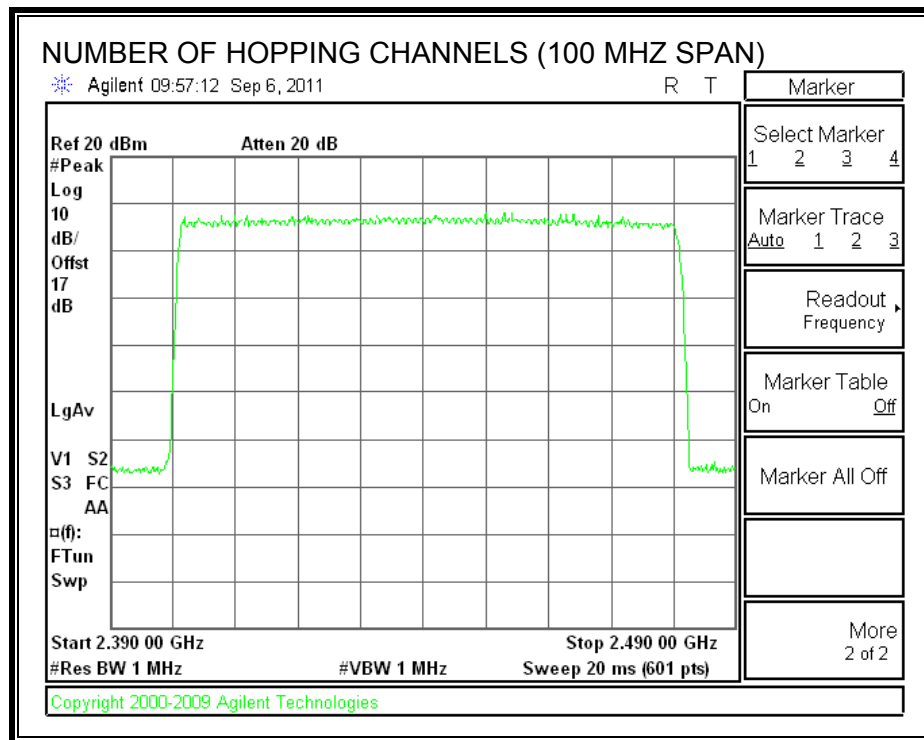
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

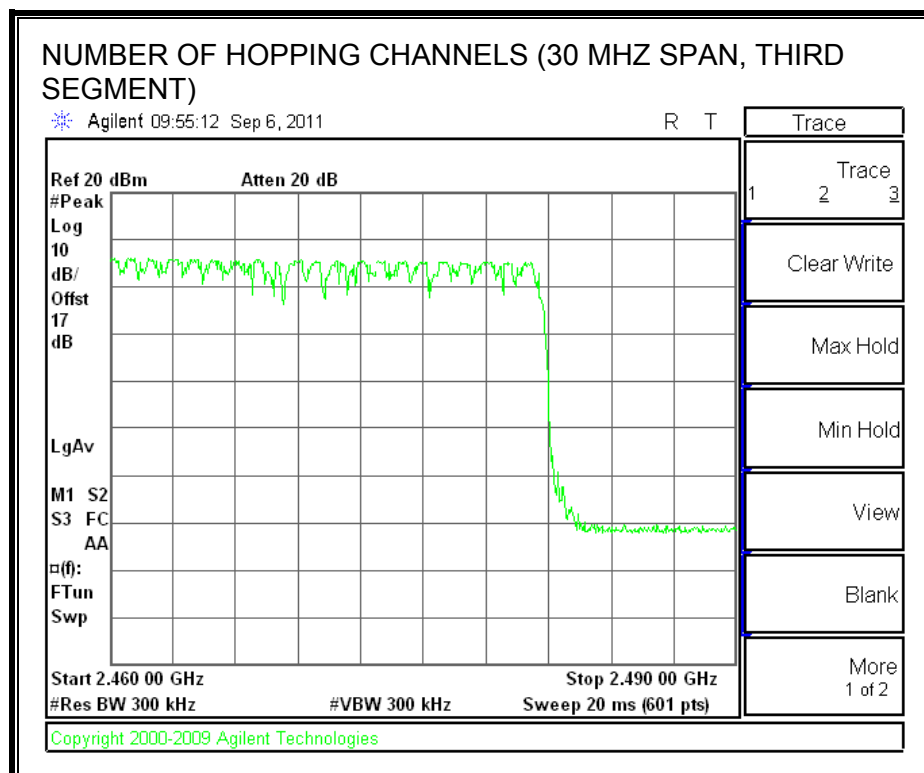
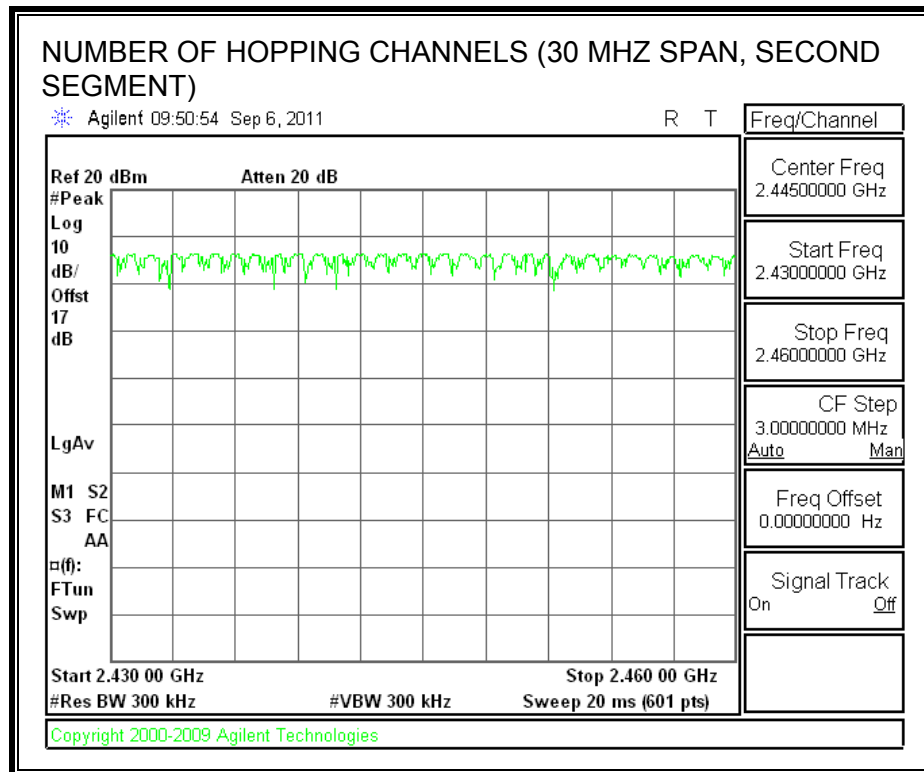
TEST PROCEDURE

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 a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

79 Channels observed.

NUMBER OF HOPPING CHANNELS



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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

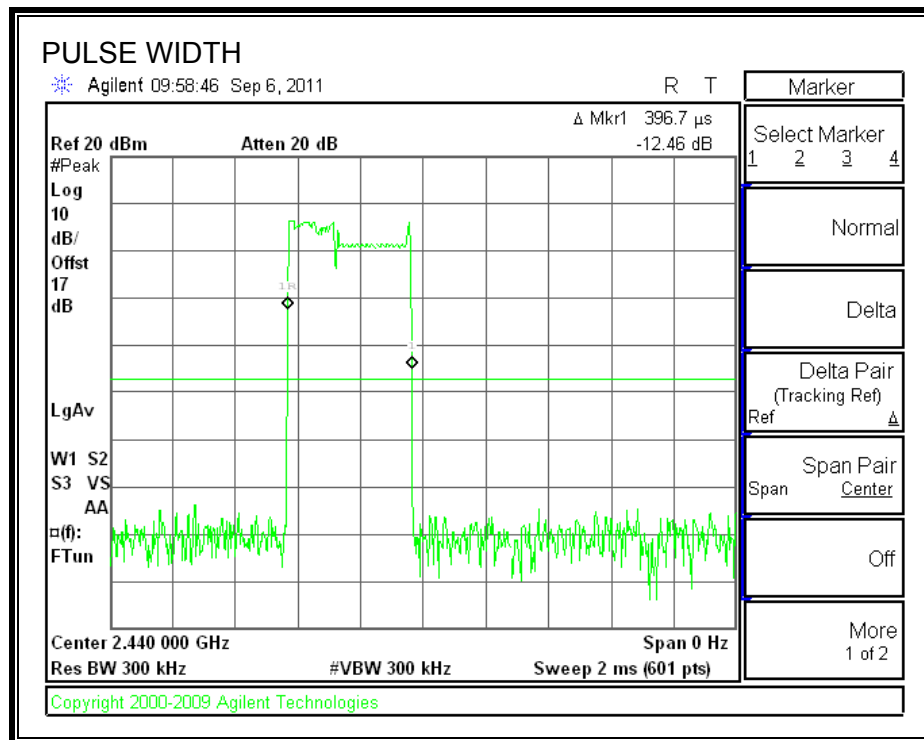
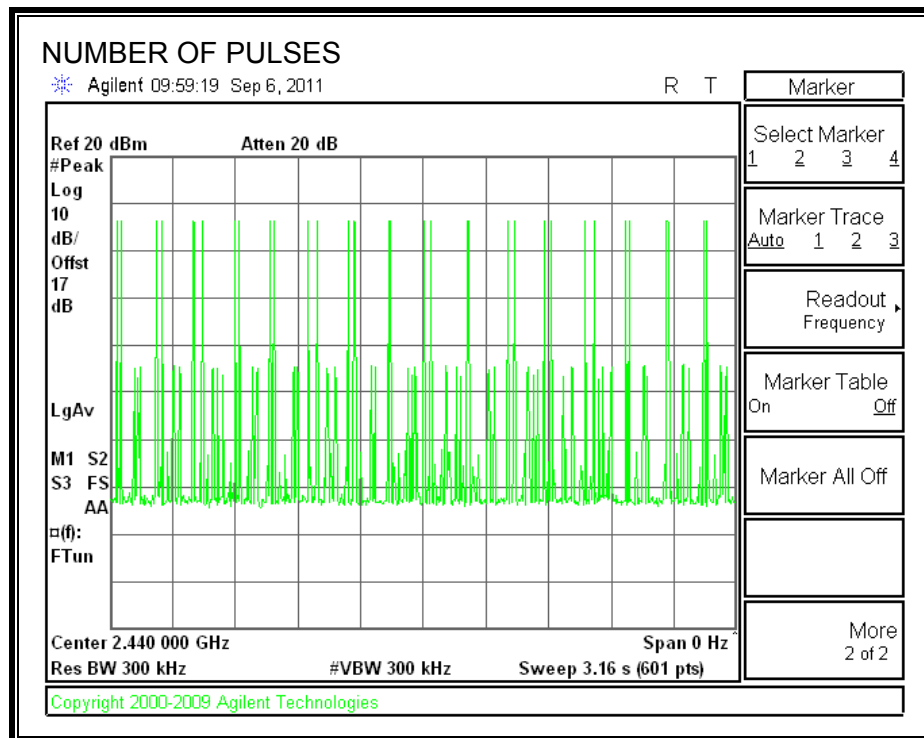
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

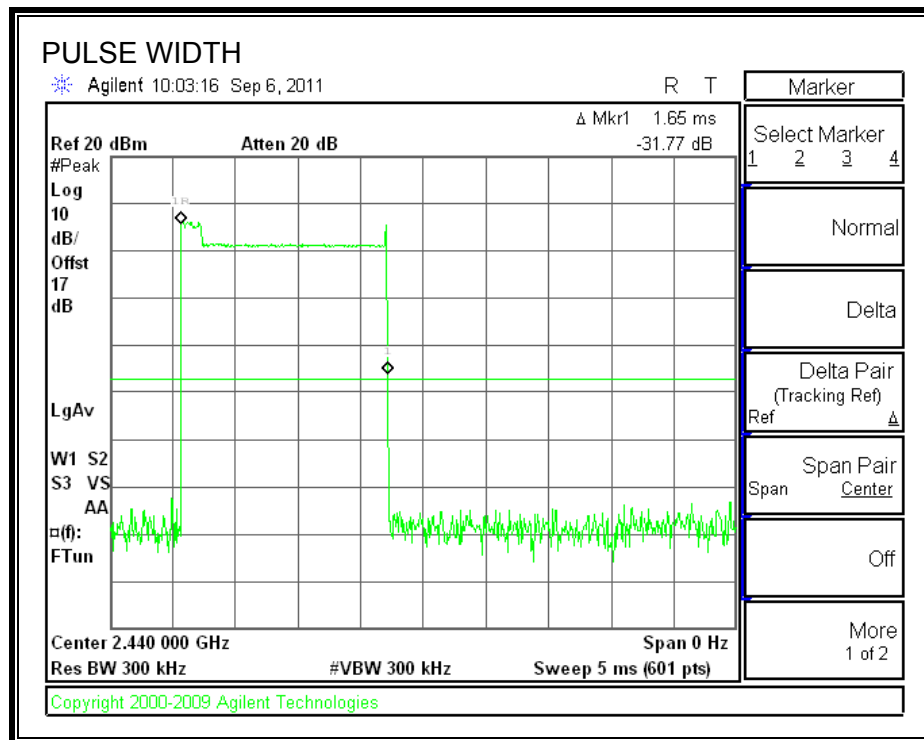
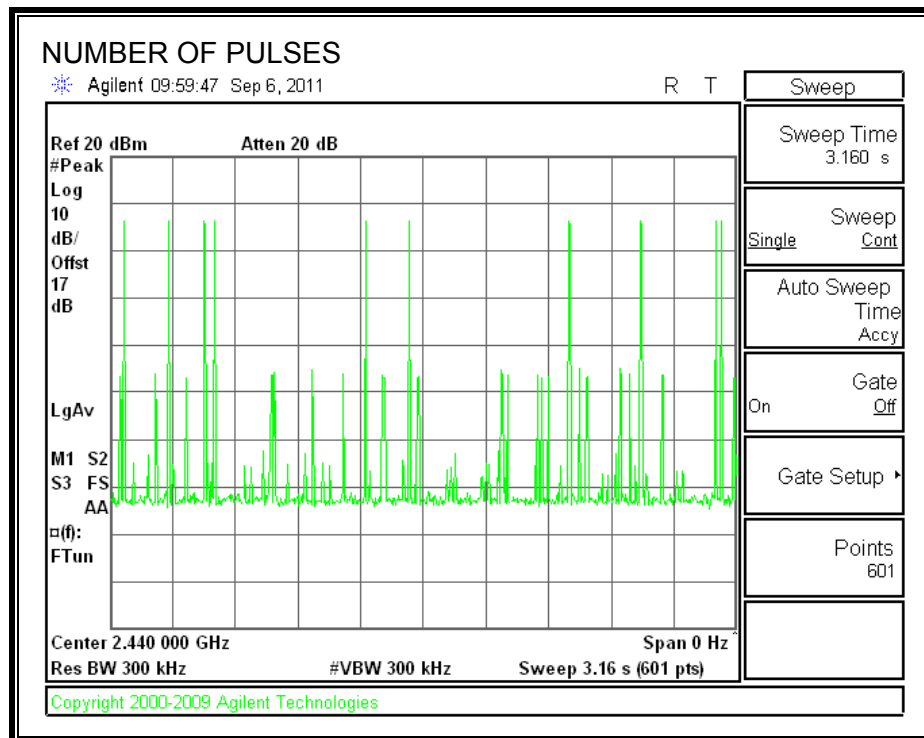
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

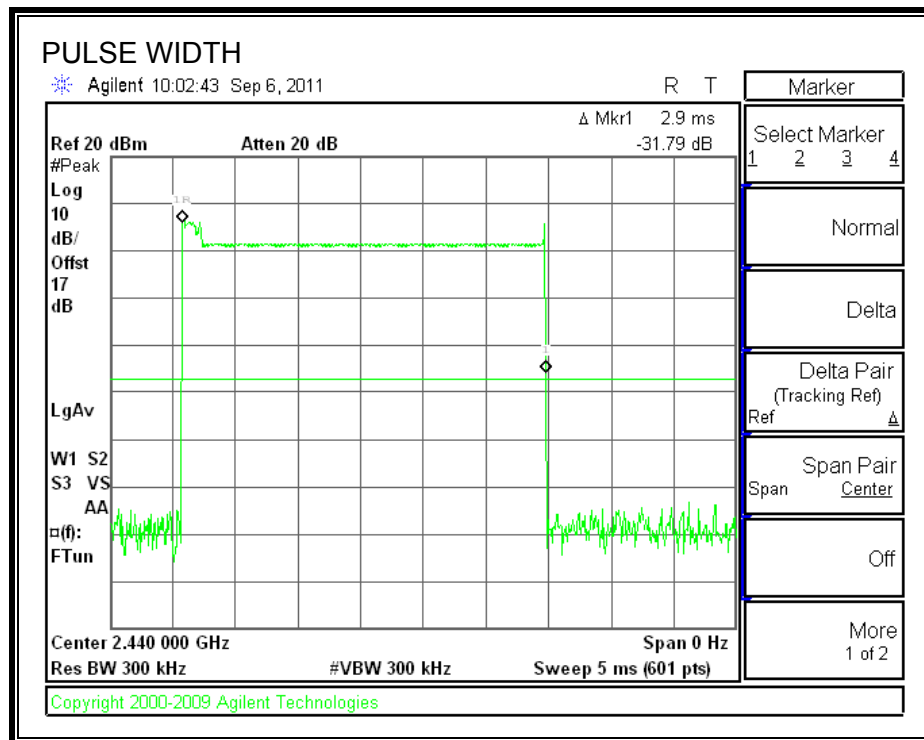
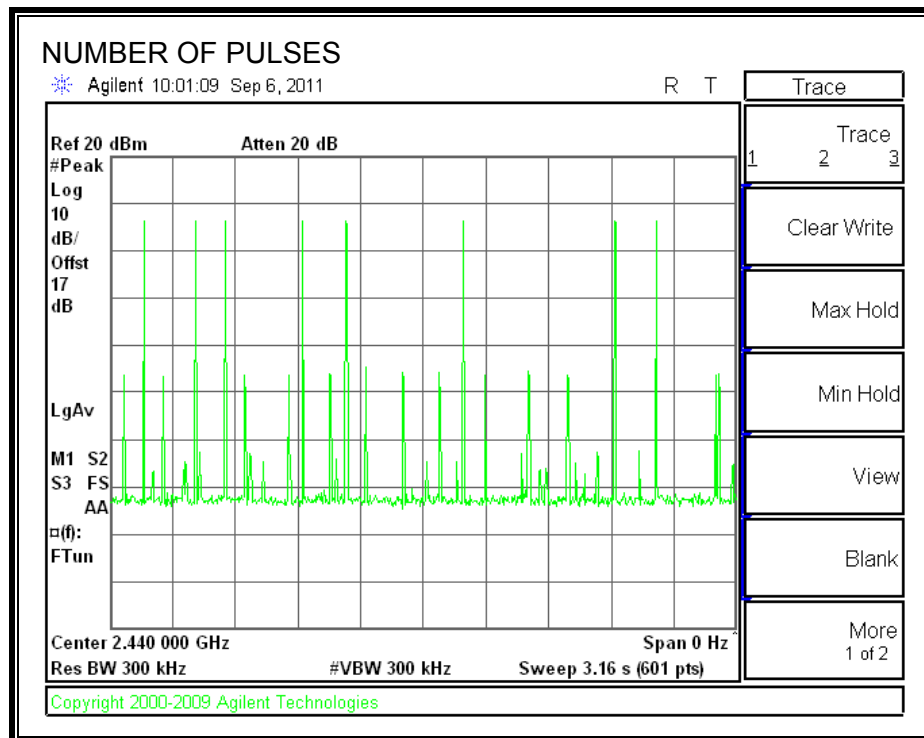
RESULTS

8PSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.3967	32	0.1269	0.4	-0.2731
DH3	1.6500	12	0.1980	0.4	-0.2020
DH5	2.9000	10	0.2900	0.4	-0.1100

PULSE WIDTH, 3DH1**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

PULSE WIDTH, 3DH3**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

PULSE WIDTH, DH5**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

The maximum antenna gain is less than 6 dBi, therefore the limit is 30 dBm.

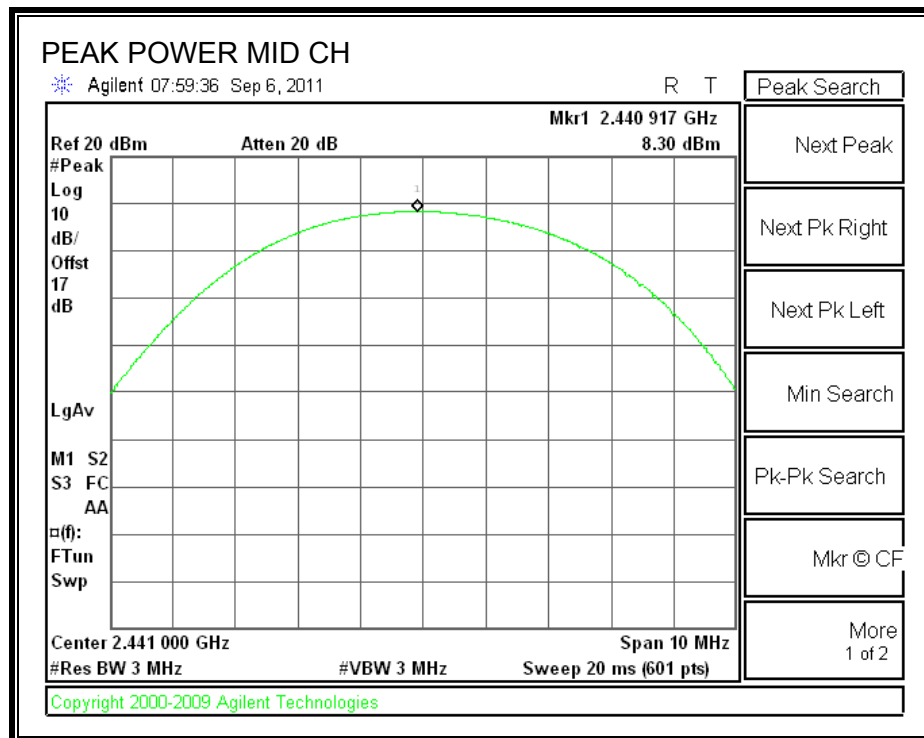
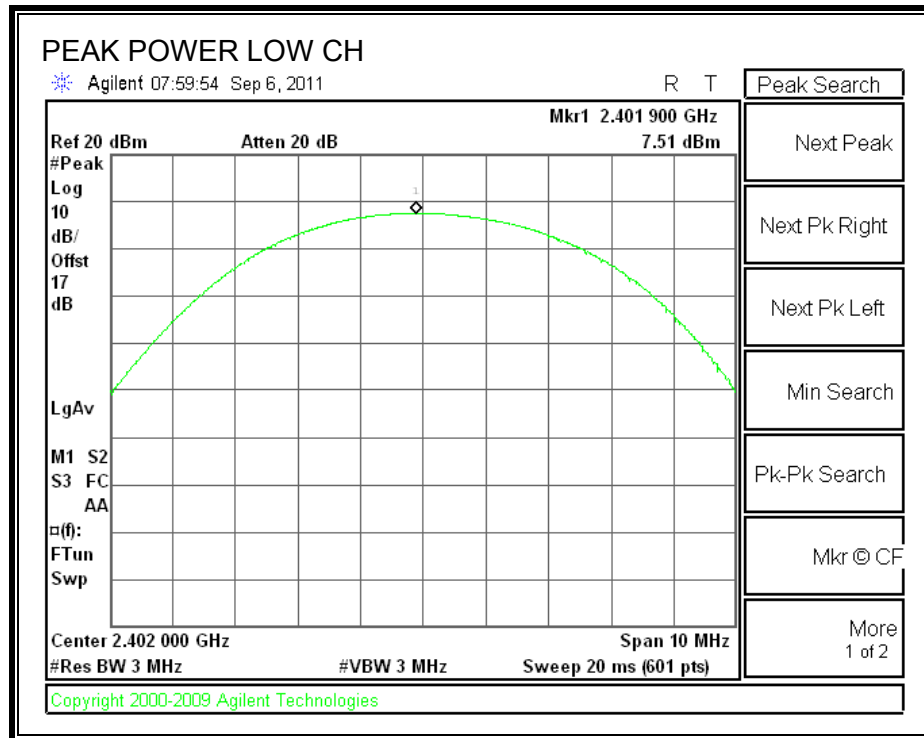
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

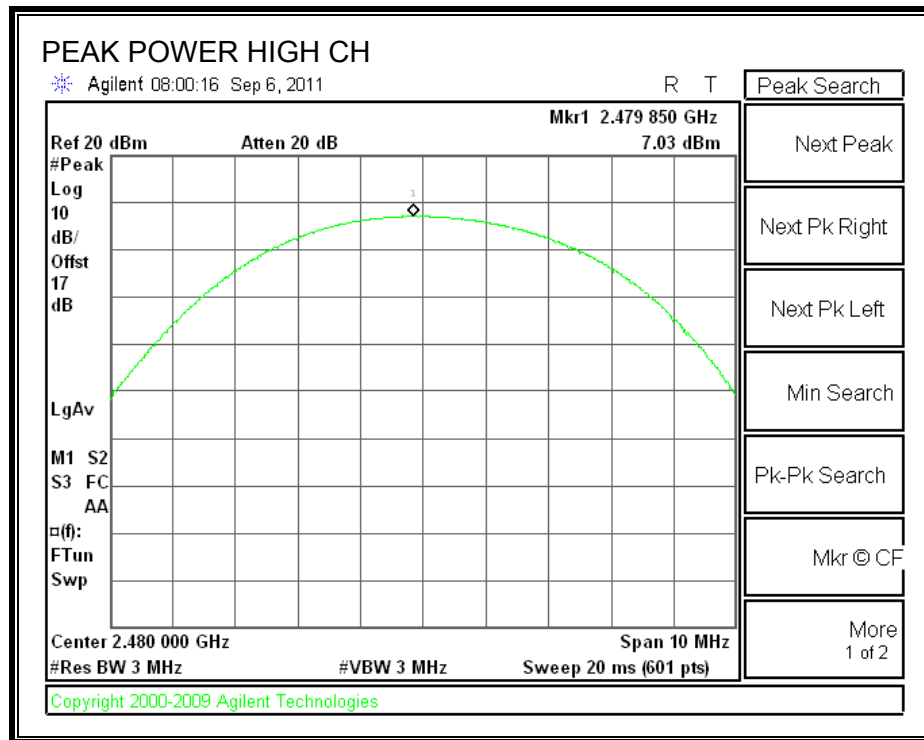
TEST PROCEDURE

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

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.51	21	-13.46
Middle	2441	8.30	21	-12.67
High	2480	7.03	21	-13.94

OUTPUT POWER



7.2.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.8B (including 10 dB pad and 0.8dB 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	4.80
Middle	2441	5.50
High	2480	4.20

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

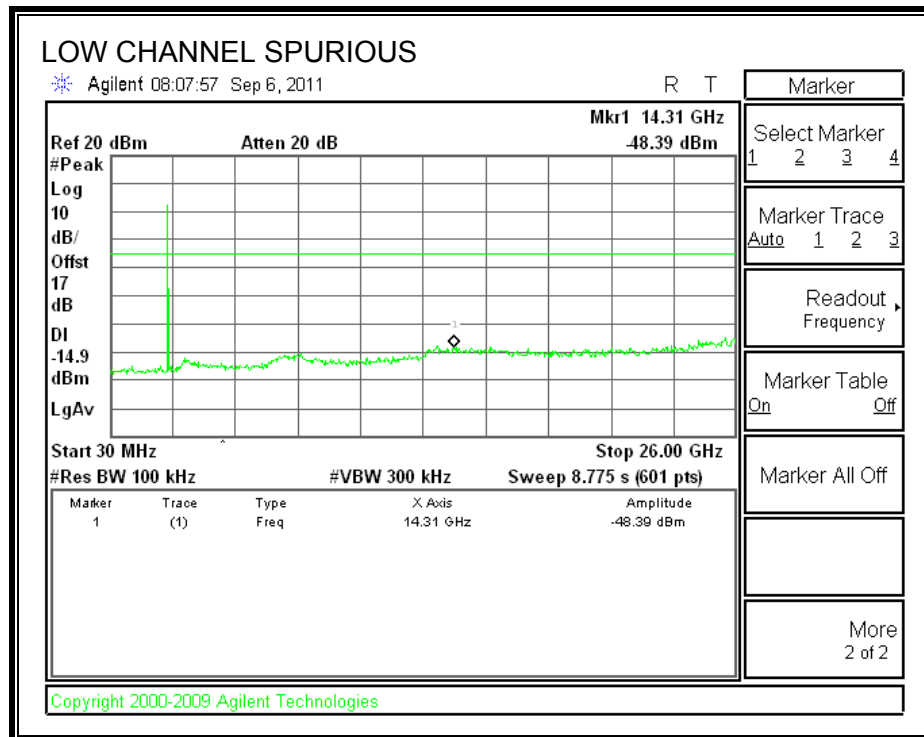
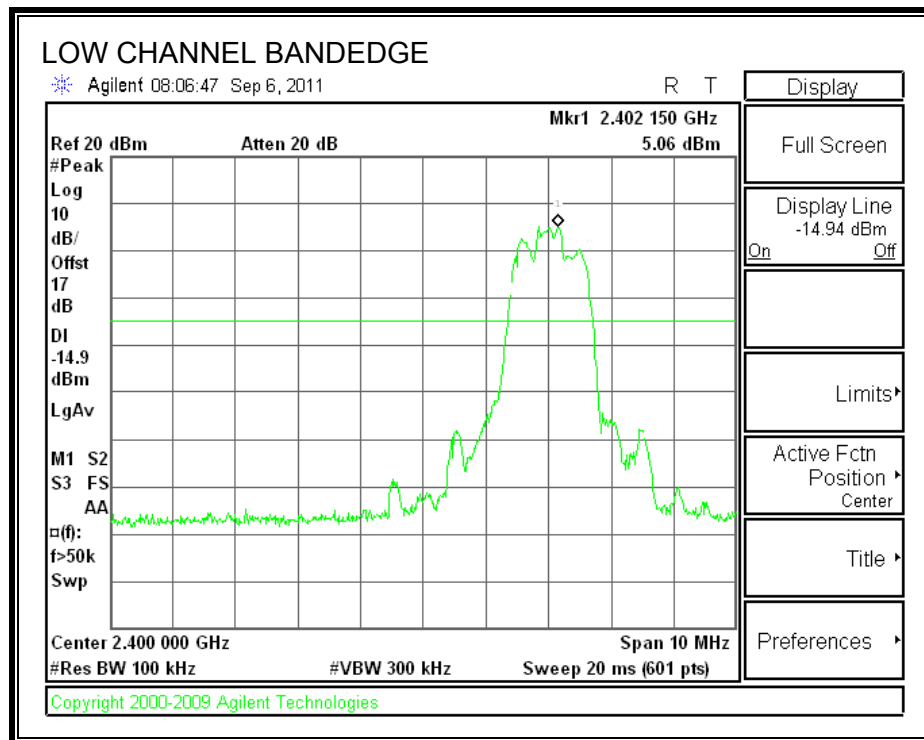
TEST PROCEDURE

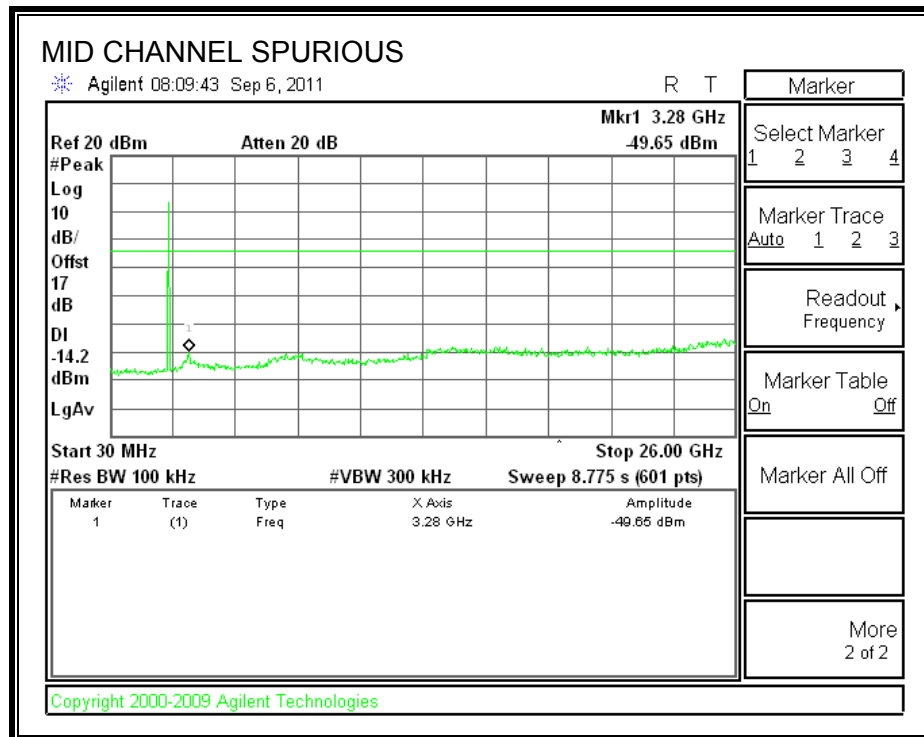
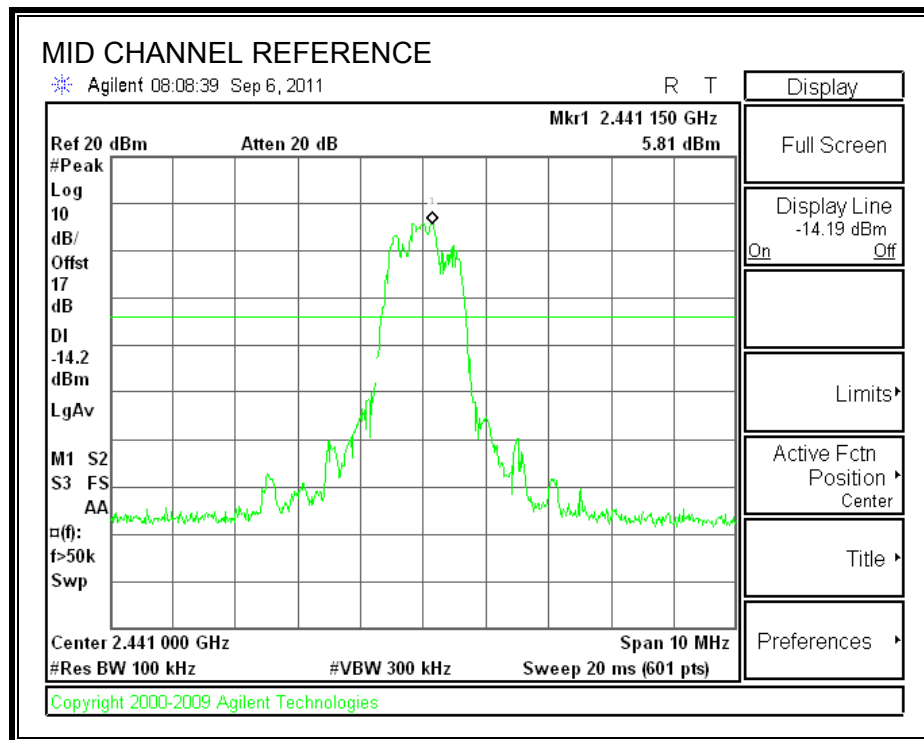
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

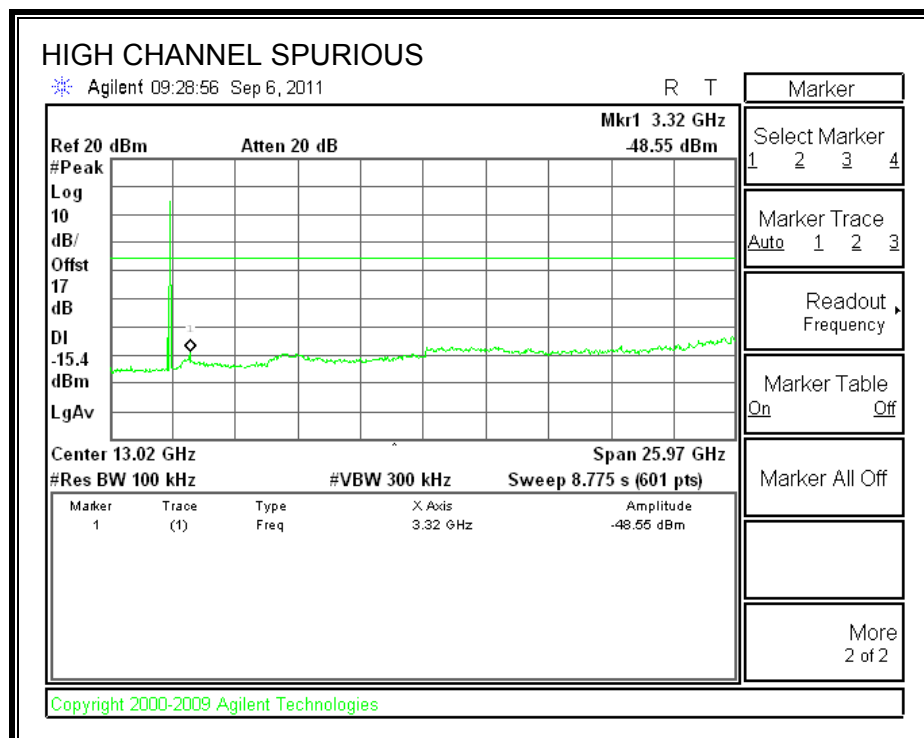
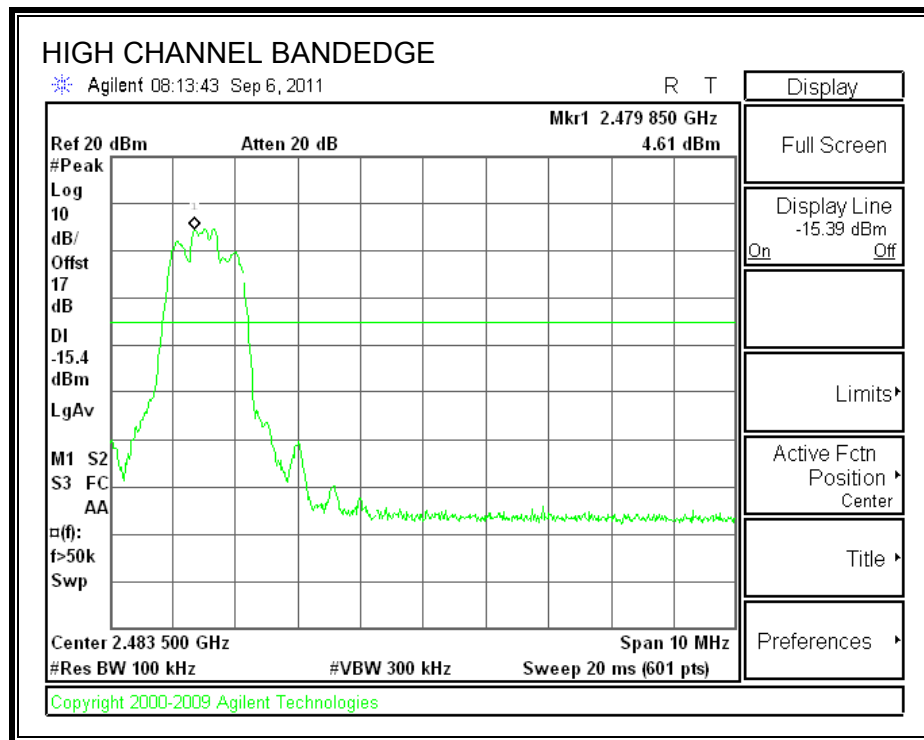
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

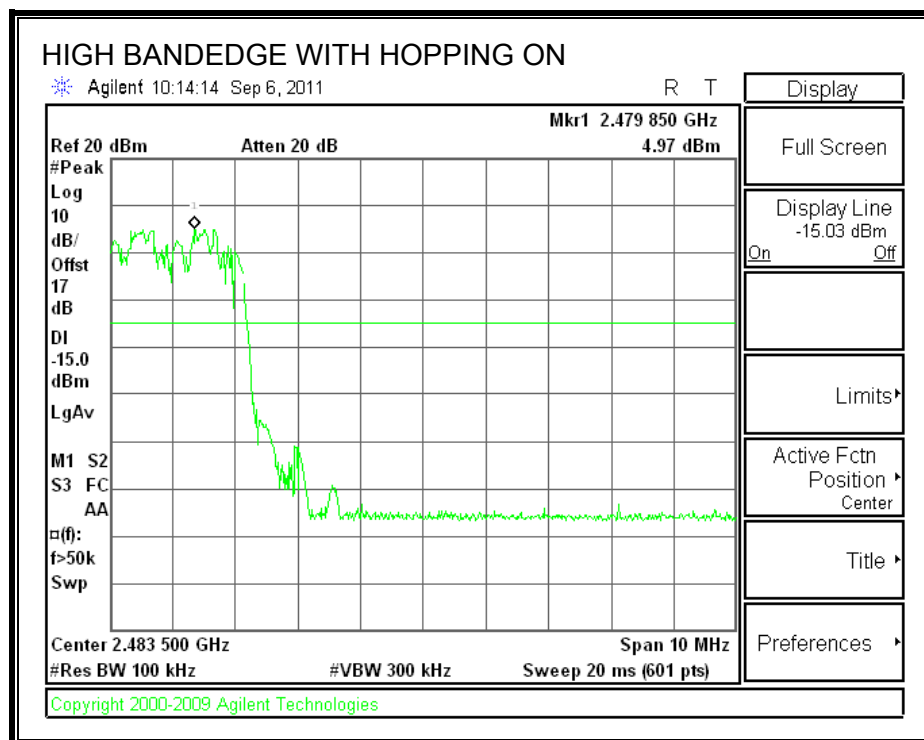
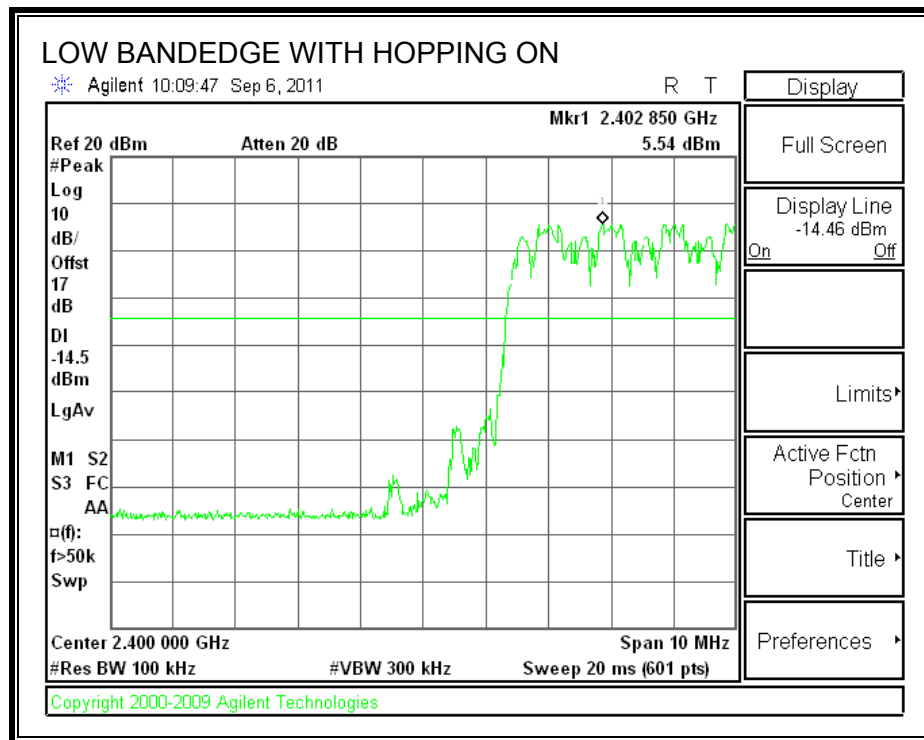
The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

SPURIOUS EMISSIONS, MID CHANNEL

SPURIOUS EMISSIONS, HIGH CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

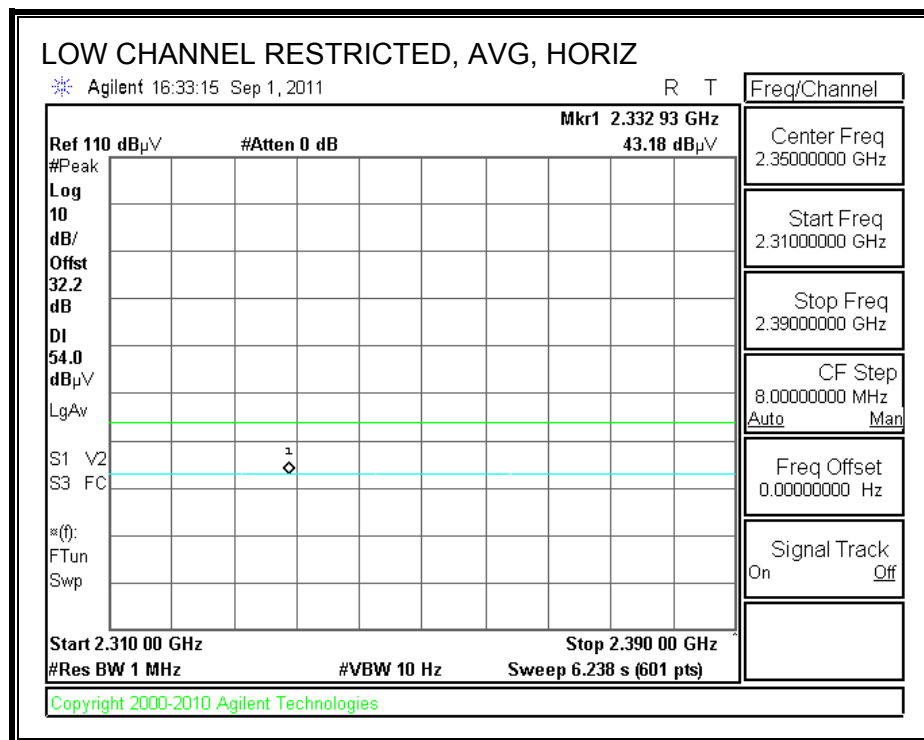
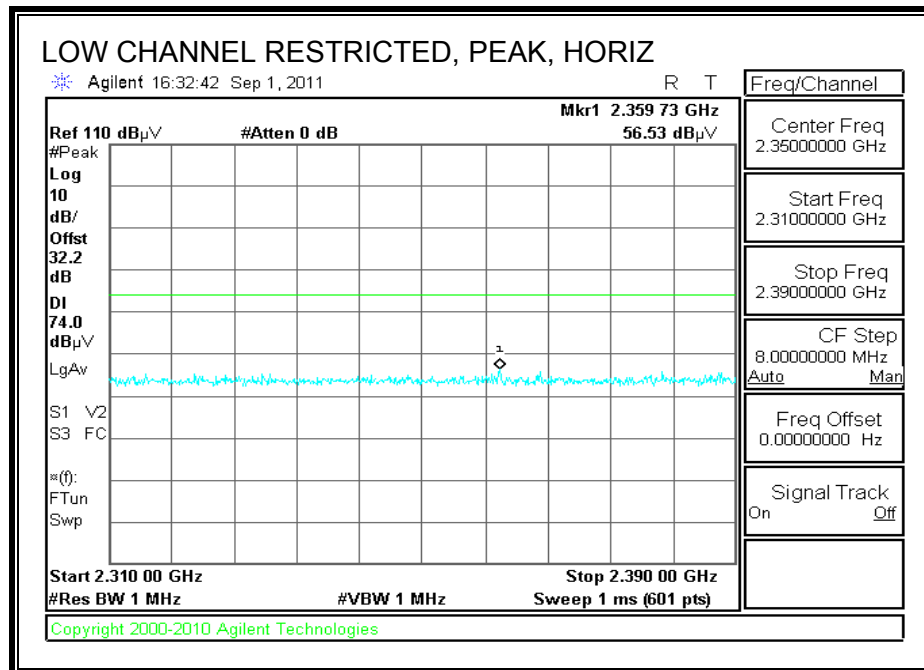
The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

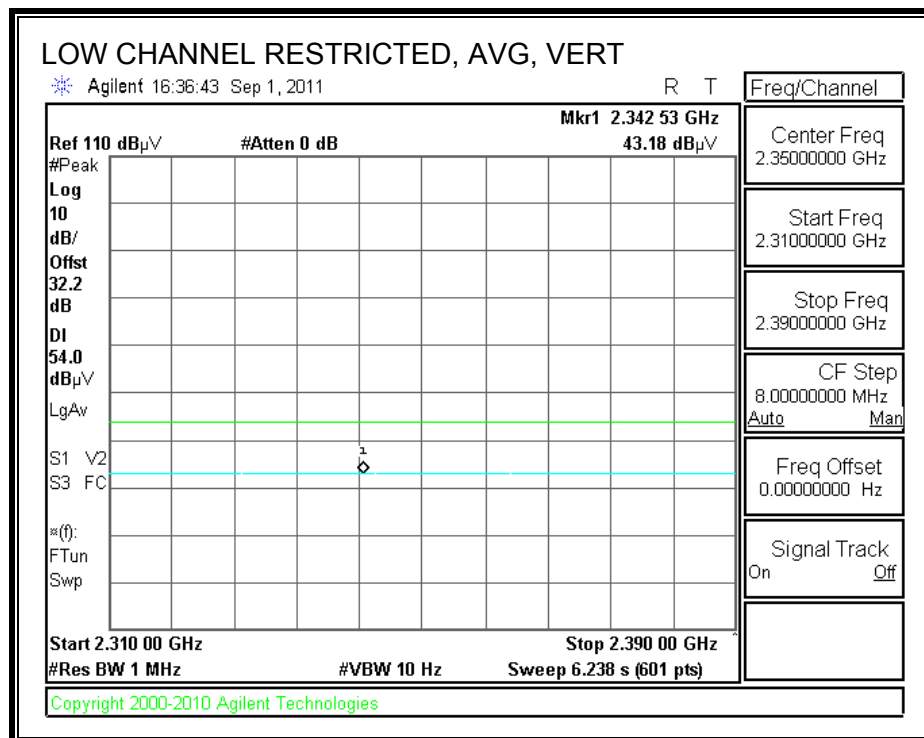
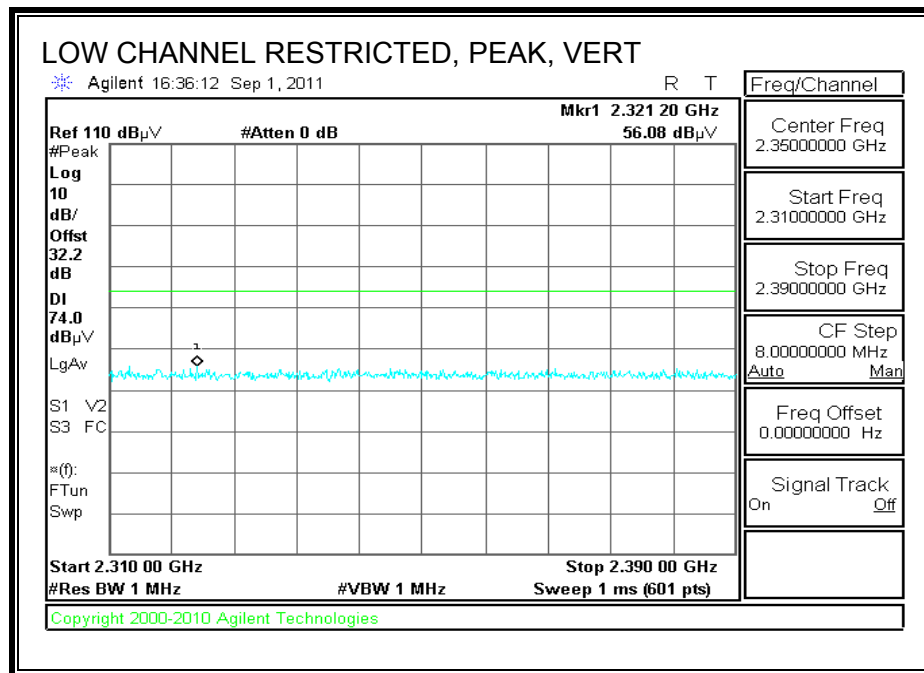
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

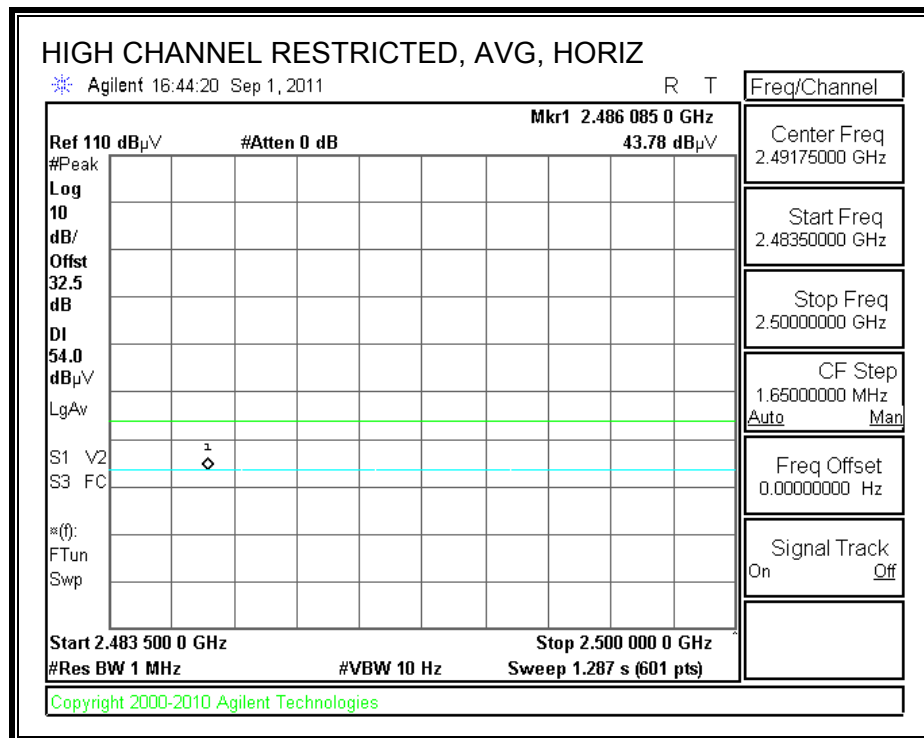
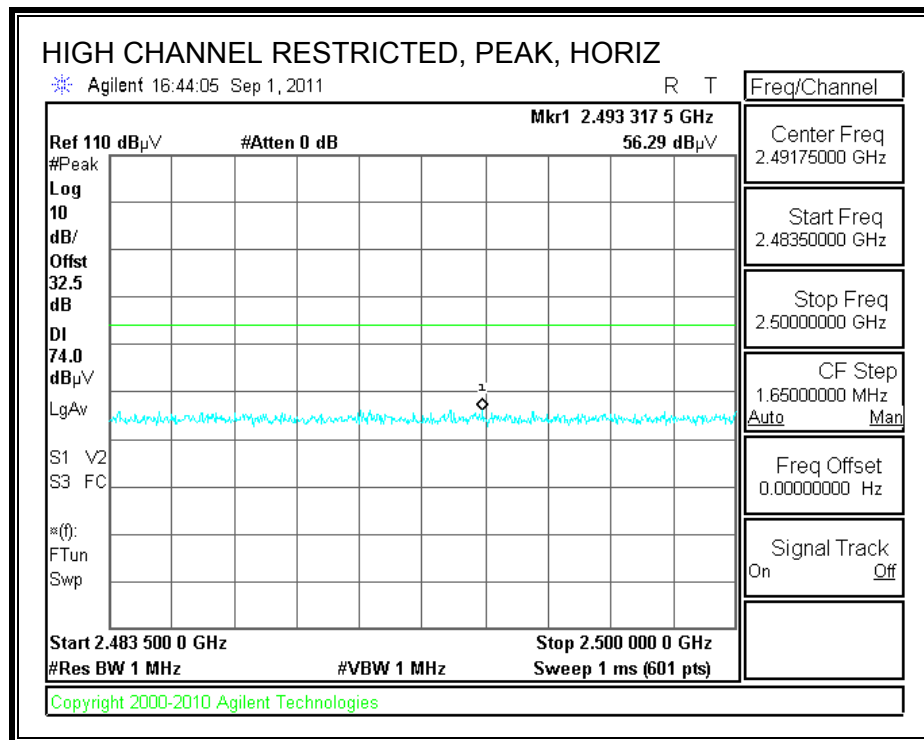
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

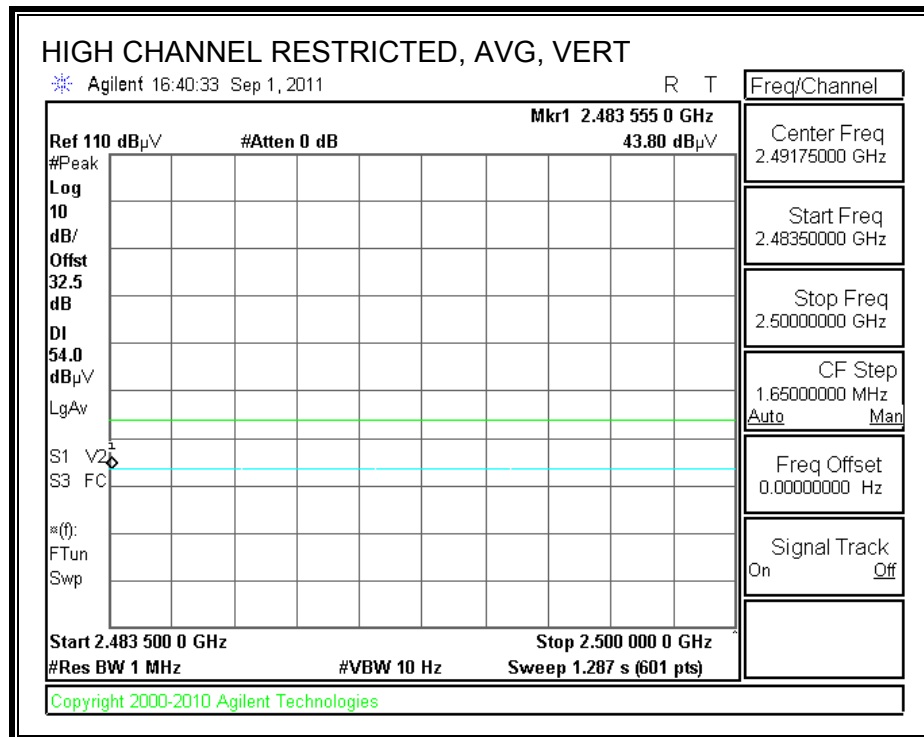
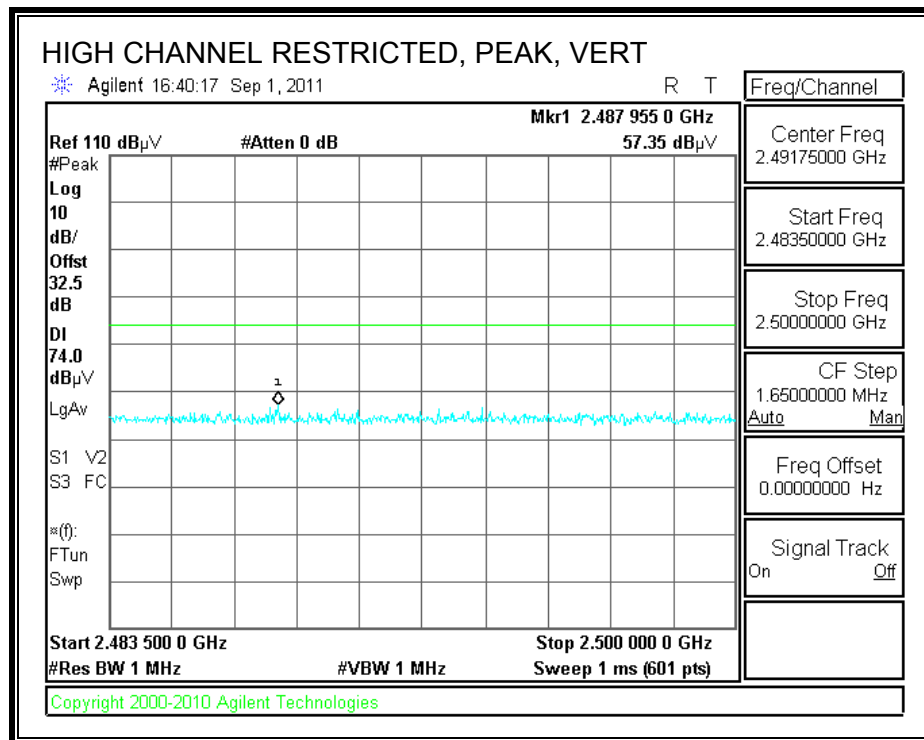
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The 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.

8.2. TRANSMITTER ABOVE 1 GHz**8.2.1. BASIC DATA RATE 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**High Frequency Measurement**

Compliance Certification Services, Fremont 5m Chamber

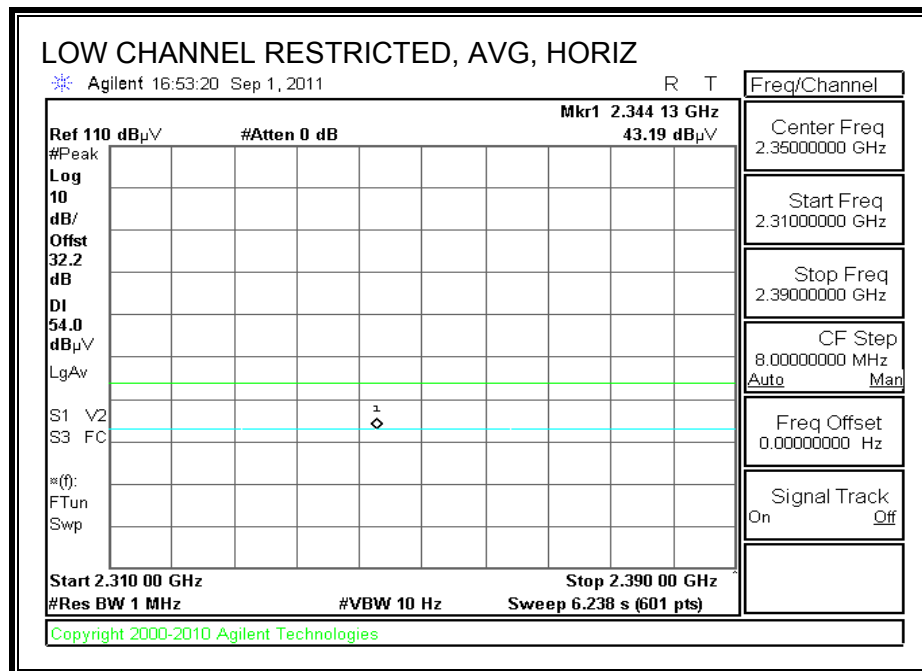
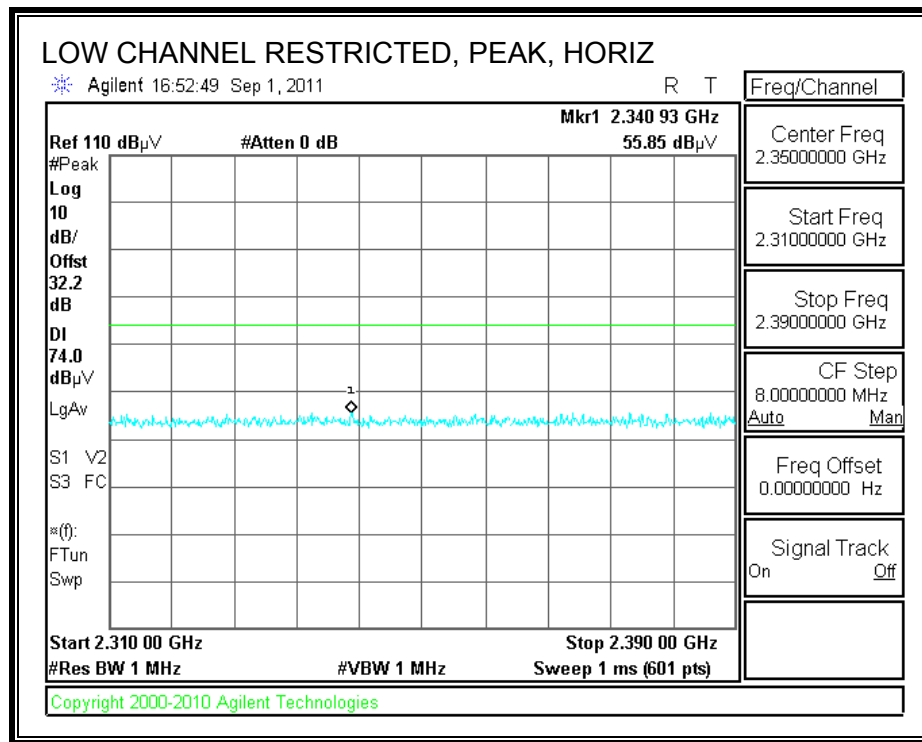
Test Engr: Chin Pang
 Date: 09-01-11
 Project #: 111139983
 Company: Samsung
 Test Target: FCC 15.247
 Mode Oper: BT, TX, GFSK

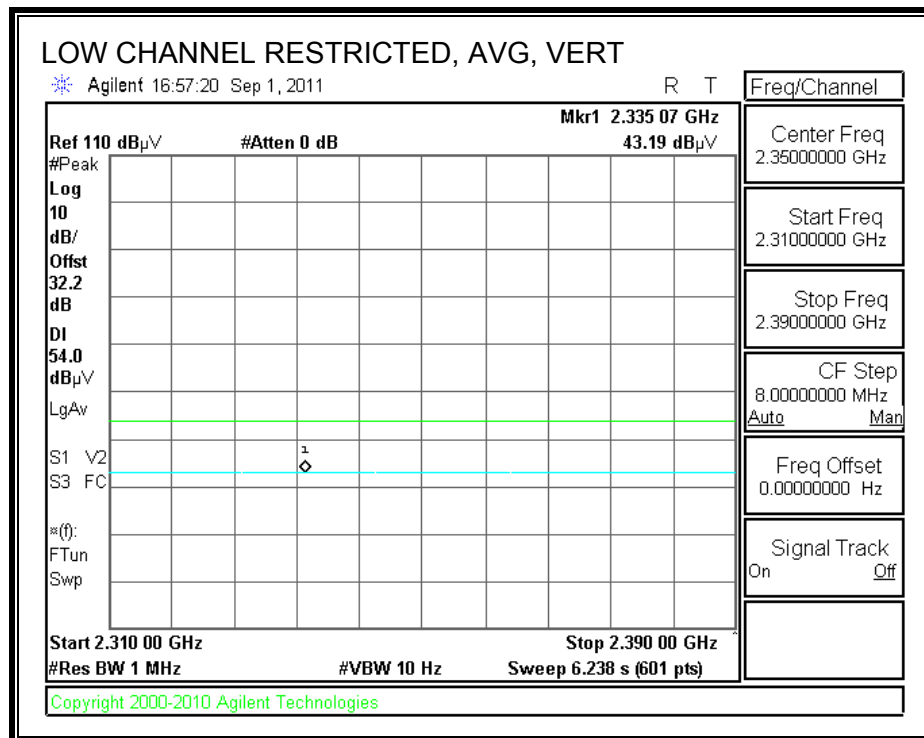
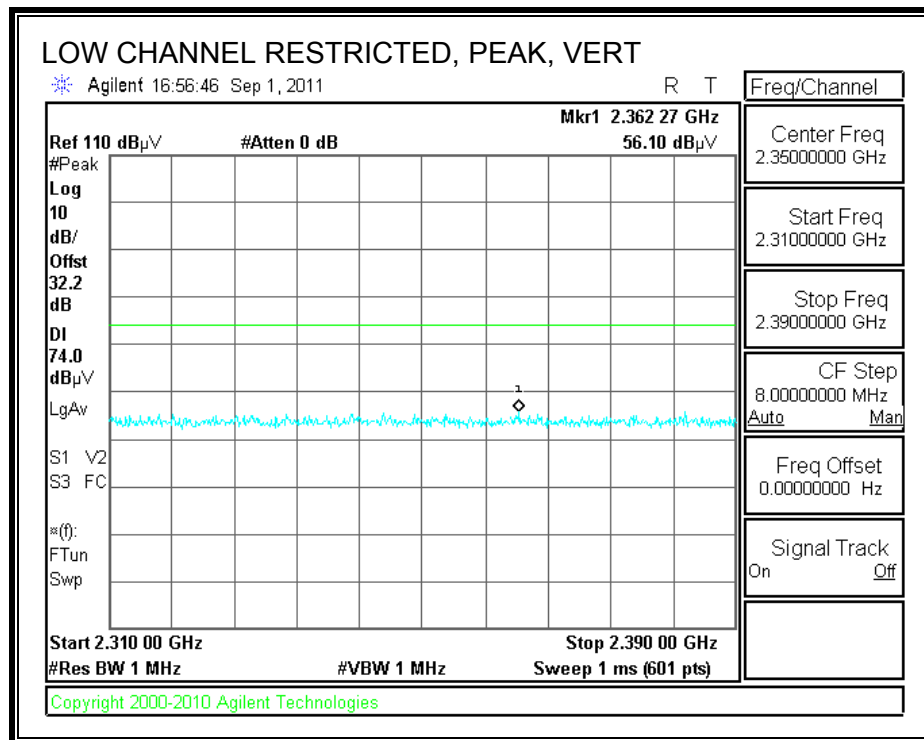
f Measurement Frequency Amp Preamp Gain Average Field Strength Limit
 Dist Distance to Antenna D Corr Distance Correct to 3 meters Peak Field Strength Limit
 Read Analyzer Reading Avg Average Field Strength @ 3 m Margin vs. Average Limit
 AF Antenna Factor Peak Calculated Peak Field Strength Margin vs.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

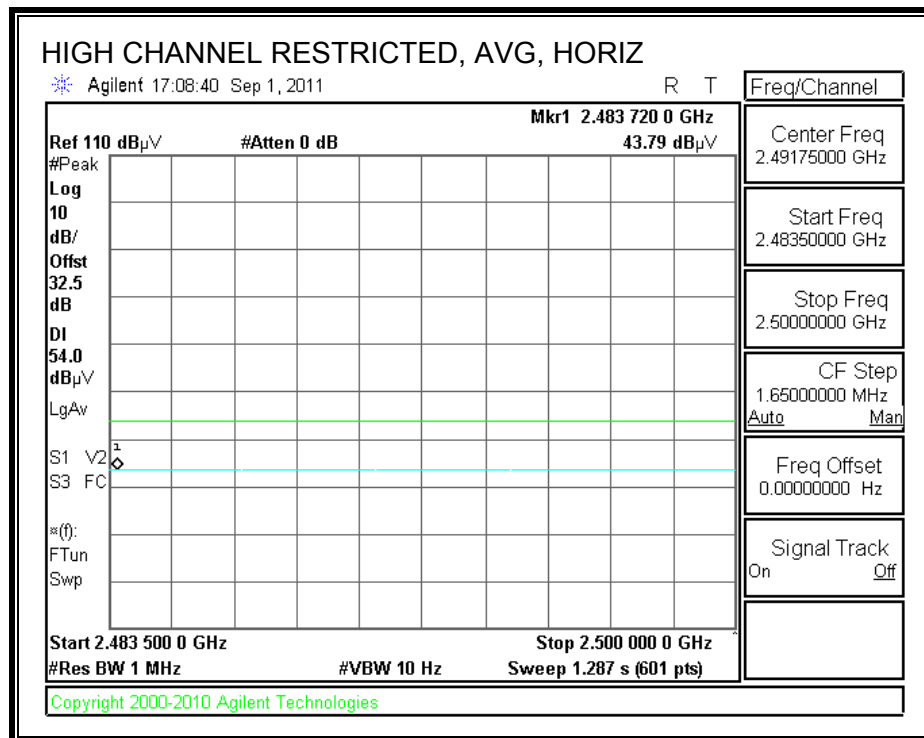
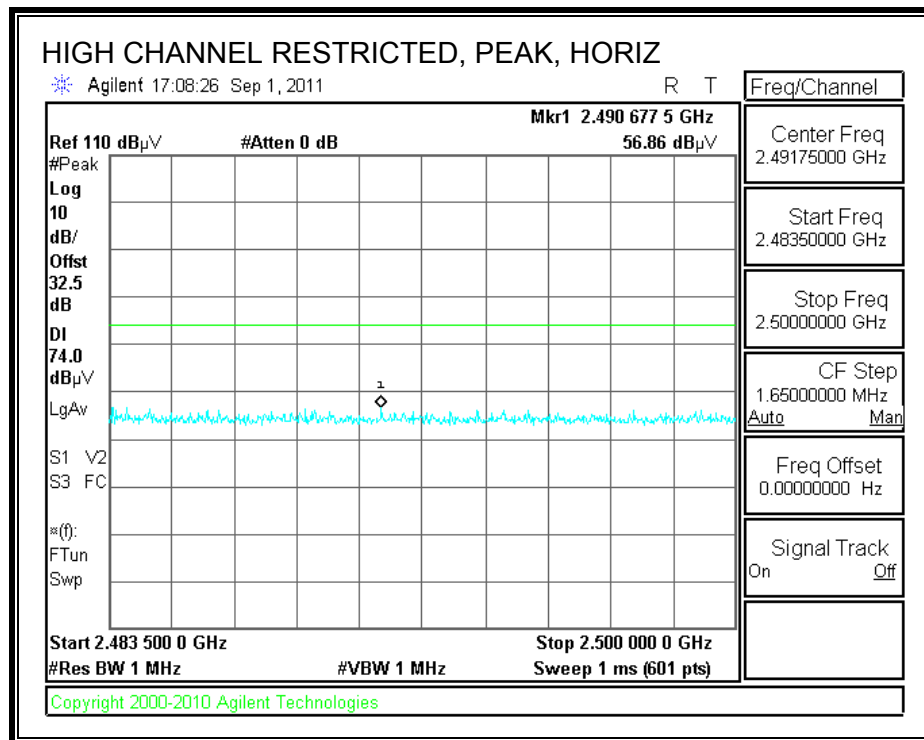
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol V/H	Det P/A/QP	Notes
Low Ch, 2402MHz													
4.804	3.0	48.1	33.1	6.3	-34.8	0.0	0.0	52.7	74.0	-21.3	H	P	
4.804	3.0	35.5	33.1	6.3	-34.8	0.0	0.0	40.1	54.0	-13.9	H	A	
4.804	3.0	49.5	33.1	6.3	-34.8	0.0	0.0	54.1	74.0	-19.9	V	P	
4.804	3.0	36.6	33.1	6.3	-34.8	0.0	0.0	41.2	54.0	-12.8	V	A	
Mid Ch, 2441MHz													
4.882	3.0	46.6	33.2	6.3	-34.8	0.0	0.0	51.4	74.0	-22.6	H	P	
4.882	3.0	34.6	33.2	6.3	-34.8	0.0	0.0	39.3	54.0	-14.7	H	A	
7.323	3.0	36.2	36.2	8.5	-34.9	0.0	0.0	45.9	74.0	-28.1	H	P	
7.323	3.0	24.3	36.2	8.5	-34.9	0.0	0.0	34.1	54.0	-19.9	H	A	
4.882	3.0	52.0	33.2	6.3	-34.8	0.0	0.0	56.7	74.0	-17.3	V	P	
4.882	3.0	37.7	33.2	6.3	-34.8	0.0	0.0	42.5	54.0	-11.5	V	A	
7.323	3.0	37.1	36.2	8.5	-34.9	0.0	0.0	46.9	74.0	-27.1	V	P	
7.323	3.0	24.1	36.2	8.5	-34.9	0.0	0.0	33.9	54.0	-20.1	V	A	
High Ch, 2480MHz													
4.960	3.0	44.4	33.3	6.4	-34.8	0.0	0.0	49.3	74.0	-24.7	H	P	
4.960	3.0	33.0	33.3	6.4	-34.8	0.0	0.0	37.9	54.0	-16.1	H	A	
7.440	3.0	36.3	36.4	8.5	-34.9	0.0	0.0	46.3	74.0	-27.7	H	P	
7.440	3.0	24.1	36.4	8.5	-34.9	0.0	0.0	34.0	54.0	-20.0	H	A	
4.960	3.0	50.6	33.3	6.4	-34.8	0.0	0.0	55.5	74.0	-18.5	V	P	
4.960	3.0	36.9	33.3	6.4	-34.8	0.0	0.0	41.8	54.0	-12.2	V	A	
7.440	3.0	36.0	36.4	8.5	-34.9	0.0	0.0	46.0	74.0	-28.0	V	P	
7.440	3.0	24.1	36.4	8.5	-34.9	0.0	0.0	34.0	54.0	-20.0	V	A	

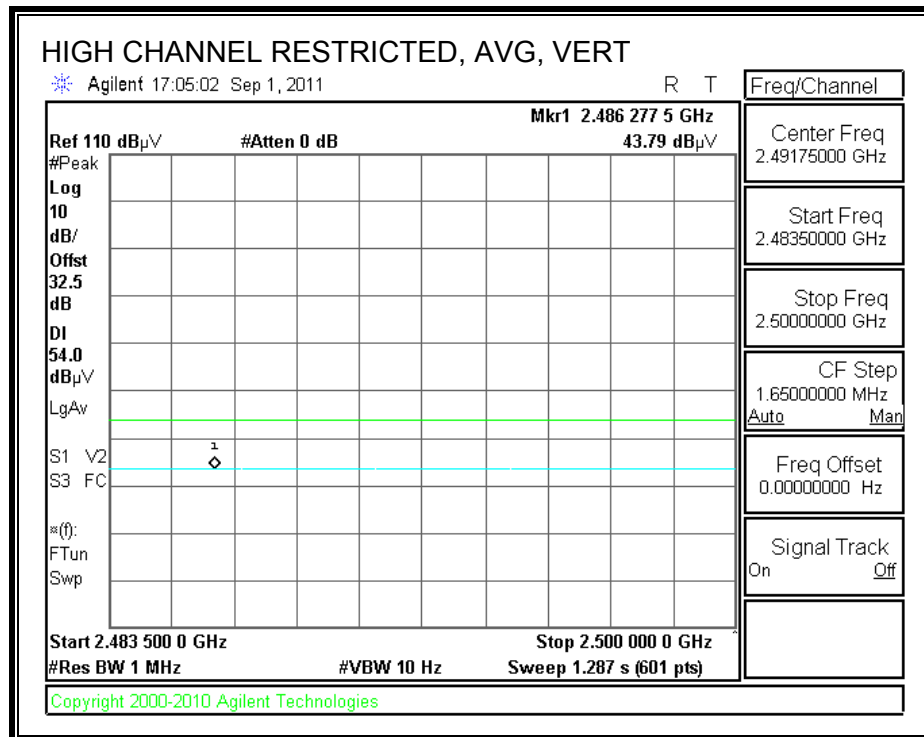
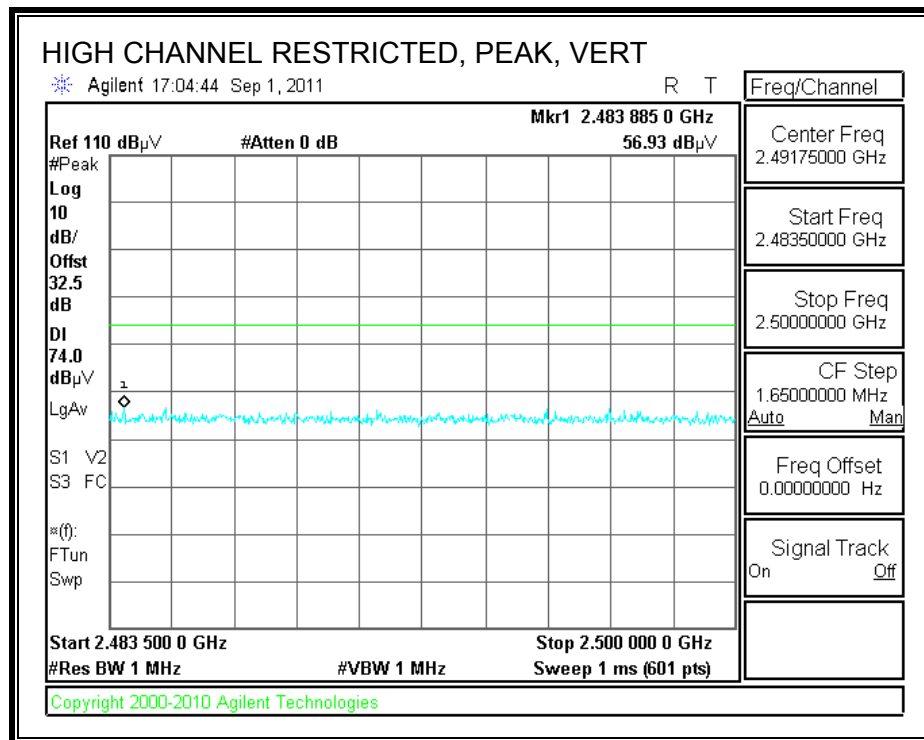
Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

8.2.2. ENHANCED DATA RATE 8PSK MODULATION**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HARMONICS AND SPURIOUS EMISSIONS**High Frequency Measurement**

Compliance Certification Services, Fremont 5m Chamber

Test Engr: Chin Pang

Date: 09-01-11

Project #: 11113983

Company: Samsung

Test Target: FCC 15.247

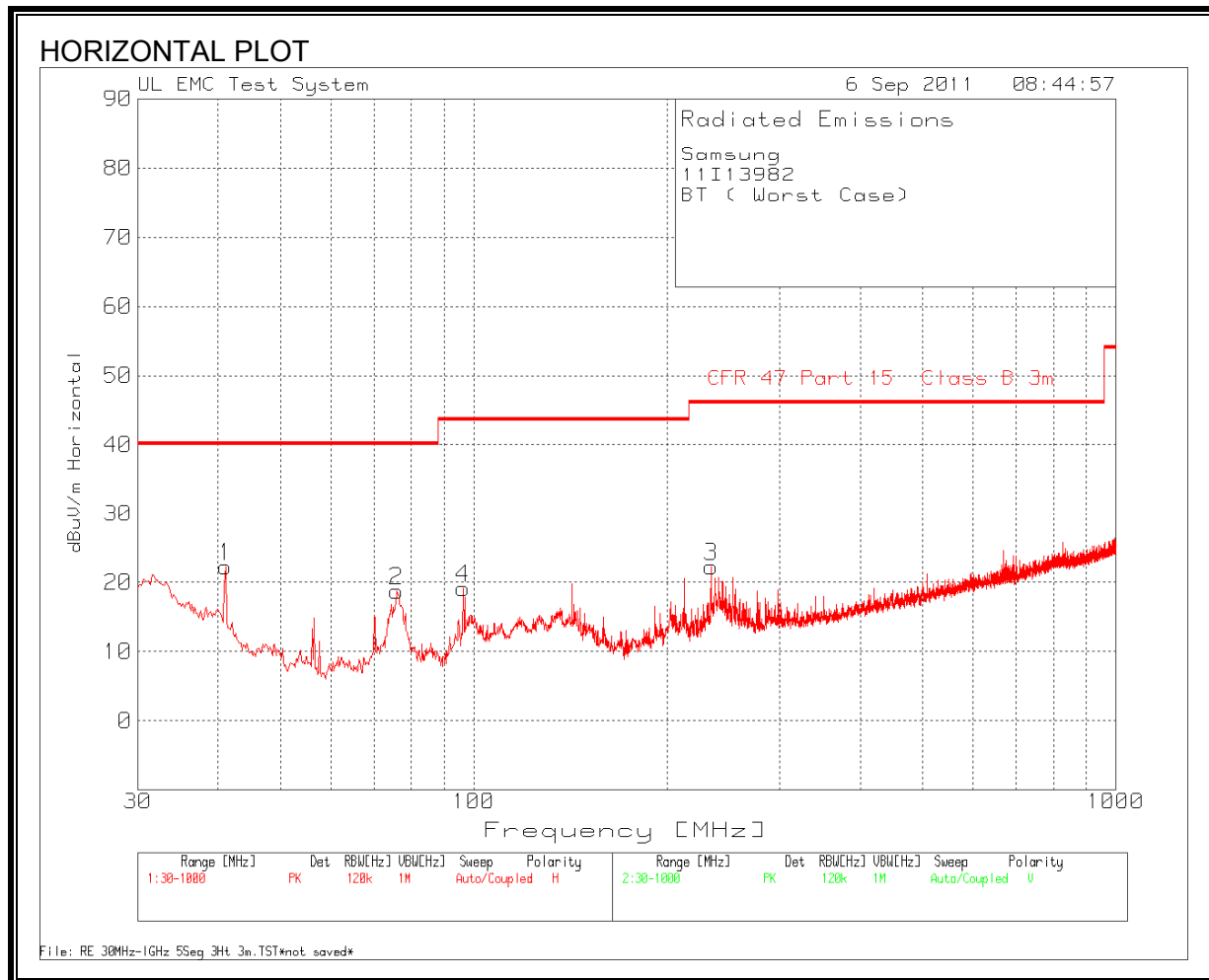
Mode Oper: BT, TX 8PSK

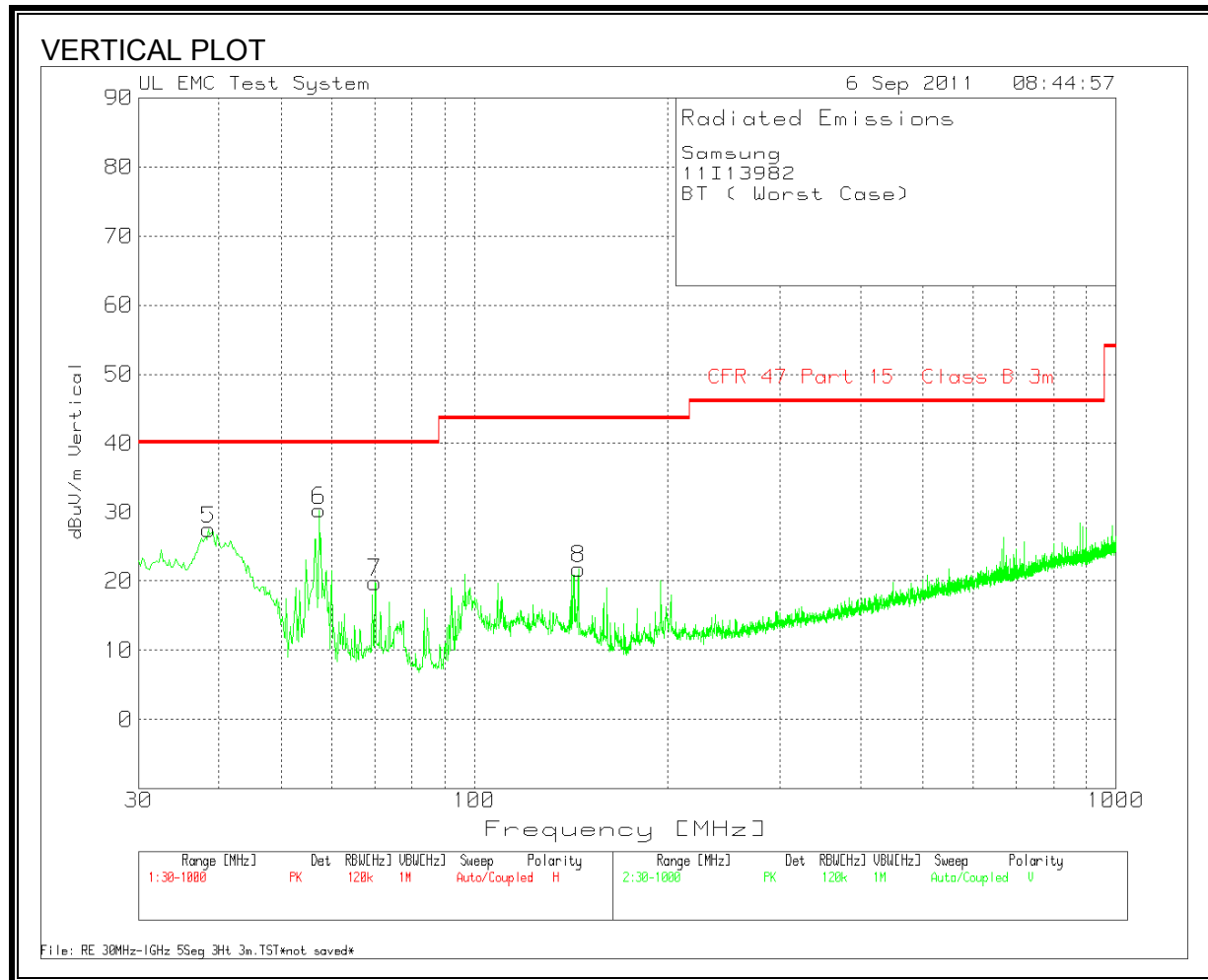
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs.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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2402MHz													
4.804	3.0	47.6	33.1	6.3	-34.8	0.0	0.0	52.2	74.0	-21.8	V	P	
4.804	3.0	39.9	33.1	6.3	-34.8	0.0	0.0	44.5	54.0	-9.5	V	A	
4.804	3.0	45.6	33.1	6.3	-34.8	0.0	0.0	50.2	74.0	-23.8	H	P	
4.804	3.0	37.8	33.1	6.3	-34.8	0.0	0.0	42.4	54.0	-11.6	H	A	
Mid Ch, 2441MHz													
4.882	3.0	49.2	33.2	6.3	-34.8	0.0	0.0	54.0	74.0	-20.0	V	P	
4.882	3.0	41.4	33.2	6.3	-34.8	0.0	0.0	46.1	54.0	-7.9	V	A	
7.323	3.0	36.3	36.2	8.5	-34.9	0.0	0.0	46.1	74.0	-27.9	V	P	
7.323	3.0	24.0	36.2	8.5	-34.9	0.0	0.0	33.8	54.0	-20.2	V	A	
4.882	3.0	45.5	33.2	6.3	-34.8	0.0	0.0	50.3	74.0	-23.7	H	P	
4.882	3.0	37.5	33.2	6.3	-34.8	0.0	0.0	42.2	54.0	-11.8	H	A	
7.323	3.0	36.1	36.2	8.5	-34.9	0.0	0.0	45.9	74.0	-28.1	H	P	
7.323	3.0	24.0	36.2	8.5	-34.9	0.0	0.0	33.8	54.0	-20.2	H	A	
High Ch, 2480MHz													
4.960	3.0	47.6	33.3	6.4	-34.8	0.0	0.0	52.5	74.0	-21.5	V	P	
4.960	3.0	39.7	33.3	6.4	-34.8	0.0	0.0	44.6	54.0	-9.4	V	A	
7.440	3.0	36.4	36.4	8.5	-34.9	0.0	0.0	46.4	74.0	-27.6	V	P	
7.440	3.0	24.1	36.4	8.5	-34.9	0.0	0.0	34.1	54.0	-19.9	V	A	
4.960	3.0	42.7	33.3	6.4	-34.8	0.0	0.0	47.6	74.0	-26.4	H	P	
4.960	3.0	34.3	33.3	6.4	-34.8	0.0	0.0	39.2	54.0	-14.8	H	A	
7.440	3.0	36.7	36.4	8.5	-34.9	0.0	0.0	46.7	74.0	-27.3	H	P	
7.440	3.0	24.2	36.4	8.5	-34.9	0.0	0.0	34.2	54.0	-19.8	H	A	

Rev. 4.1.2.7

Note: No other emissions were detected above the system noise floor.

8.3. WORST-CASE BELOW 1 GHz**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)**

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

DATA

Samsung									
11I13982									
BT (Worst Case)									
Range 1 30 - 1000MHz									
Frequency	Reading	Detector	5B Cable	T10 PreAn	T130 Bilcd	BuV/m	15B 3m	Margin	Polarity
41.0492	37.33	PK	0.9	-29.4	13.4	22.23	40	-17.77	Horz
75.9412	39.1	PK	1.2	-29.4	7.9	18.8	40	-21.2	Horz
234.3126	37.03	PK	2.1	-28.8	11.9	22.23	46	-23.77	Horz
96.295	37.95	PK	1.4	-29.3	9.1	19.15	43.5	-24.35	Horz
Range 2 30 - 1000MHz									
Frequency	Reading	Detector	5B Cable	T10 PreAn	T130 Bilcd	BuV/m	15B 3m	Margin	Polarity
38.5292	40.9	PK	0.9	-29.5	15.2	27.5	40	-12.5	Vert
57.3321	50.75	PK	1.1	-29.4	7.9	30.35	40	-9.65	Vert
69.9321	39.73	PK	1.2	-29.4	8.3	19.83	40	-20.17	Vert
145.3377	36.29	PK	1.7	-29.1	12.9	21.79	43.5	-21.71	Vert

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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.

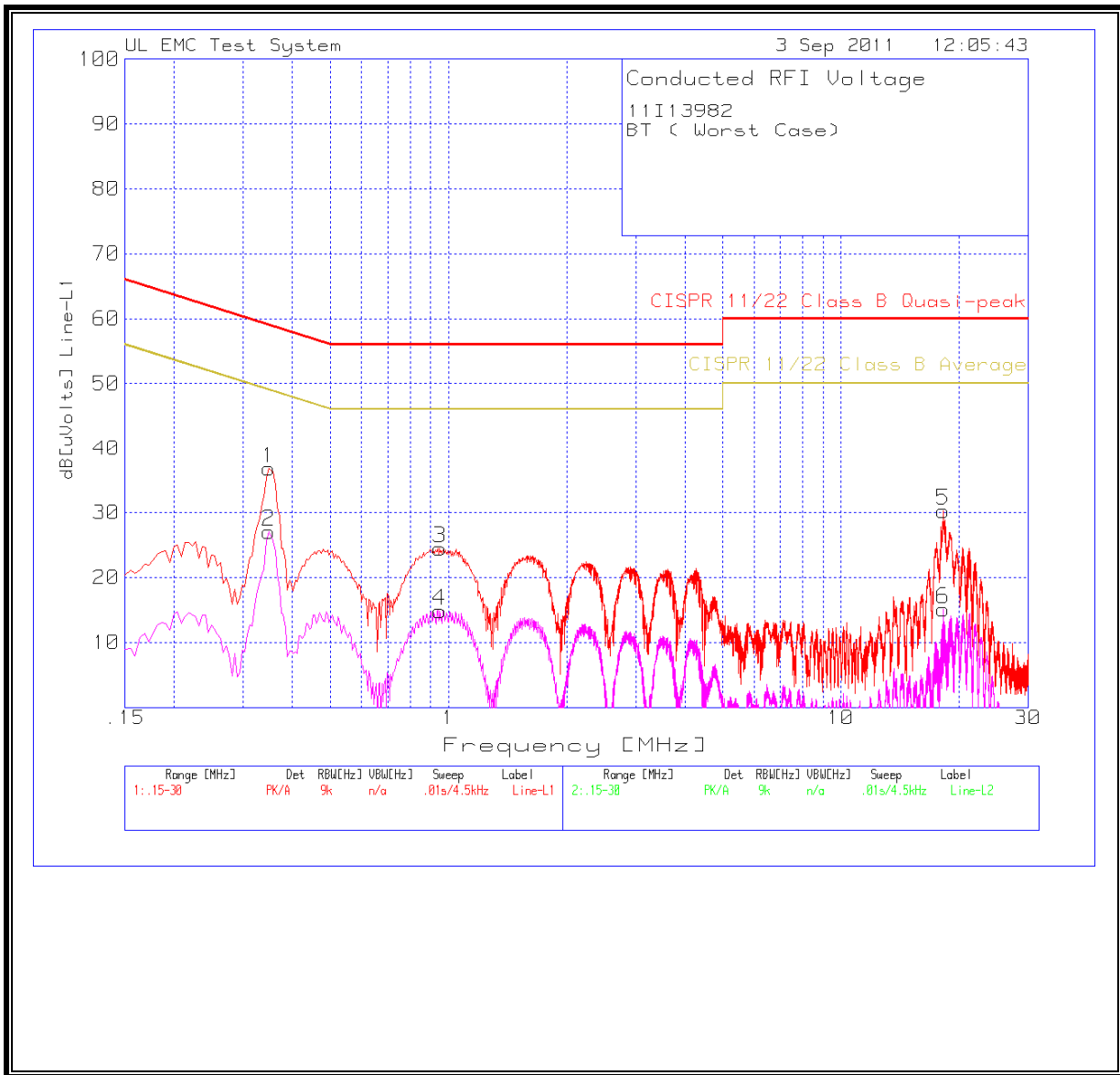
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

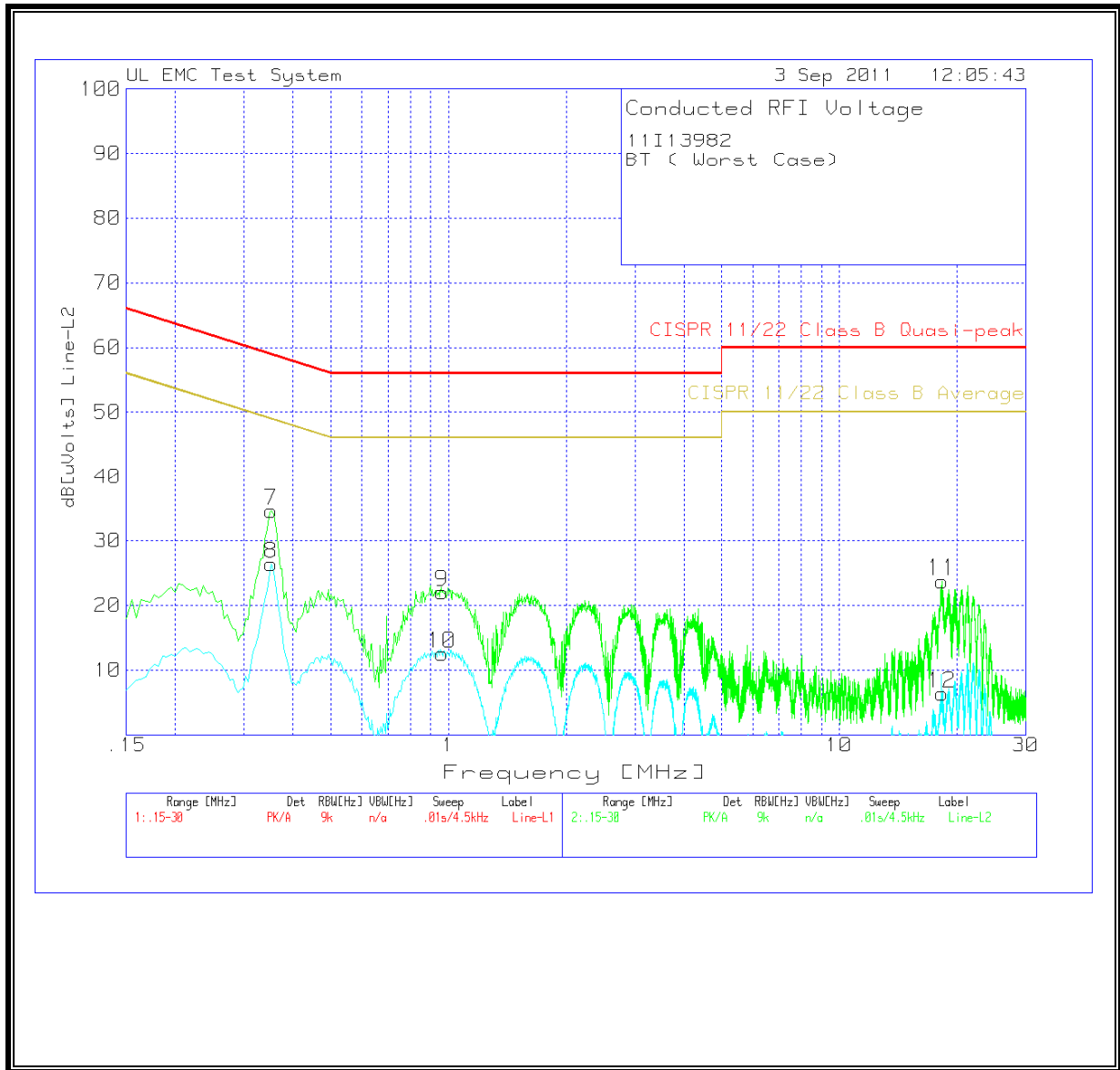
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

6 WORST EMISSIONS

11I13982									
BT (Worst Case)									
Line-L1 .15 - 30MHz									
Frequency	Reading	Detector	LISN [dB]	Cable [dB]	dB[uVolts]	CISPR B GMargin	CISPR B AMargin		
0.348	36.79	PK	0	0	36.79	59	-22.21	49	-12.21
0.348	27.01	Av	0	0	27.01	-	-	49	-21.99
0.951	24.5	PK	0	0	24.5	56	-31.5	46	-21.5
0.951	14.89	Av	0	0	14.89	-	-	46	-31.11
18.2445	30.31	PK	0	0	30.31	60	-29.69	50	-19.69
18.2445	15.08	Av	0	0	15.08	-	-	50	-34.92
Line-L2 .15 - 30MHz									
Frequency	Reading	Detector	LISN [dB]	Cable [dB]	dB[uVolts]	CISPR B GMargin	CISPR B AMargin		
0.3525	34.58	PK	0	0	34.58	58.9	-24.32	48.9	-14.32
0.3525	26.37	Av	0	0	26.37	-	-	48.9	-22.53
0.9645	21.99	PK	0	0	21.99	56	-34.01	46	-24.01
0.9645	12.57	Av	0	0	12.57	-	-	46	-33.43
18.3075	23.77	PK	0	0	23.77	60	-36.23	50	-26.23
18.3075	6.41	Av	0	0	6.41	-	-	50	-43.59

LINE 1 RESULTS

LINE 2 RESULTS

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5**Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m ²)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ f	2.19/ f		6
10–30	28	2.19/ f		6
30–300	28	0.073	2*	6
300–1 500	1.585 $f^{0.5}$	0.0042 $f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / $f^{1.2}$
150 000–300 000	0.158 $f^{0.5}$	4.21 x 10 ⁻⁴ $f^{0.5}$	6.67 x 10 ⁻⁵ f	616 000 / $f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, f , is in MHz.
 2. A power density of 10 W/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

$$S = \text{EIRP} / (4 * \pi * D^2)$$

where

S = Power density in W/m²

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m² is converted to units of mW/cm² by dividing by 10.

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \pi * S))$$

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m²

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

Single Chain and non-colocated transmitters								
Band	Mode	Separation Distance (m)	Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	IC Power Density (W/m ²)	FCC Power Density (mW/cm ²)
2.4 GHz	Bluetooth	0.20	6.70	-4.50	2.20	0.0017	0.0033	0.0003