FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

BLUETOOTH BASE

MODEL NUMBER: CSEB-01

FCC ID: AL8-CSEB01
IC: 457A-CSEB01

REPORT NUMBER: 13U15293-2C

ISSUE DATE: AUGUST 06, 2013

Prepared for
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SANTA CRUZ, CA 95060

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/15/13	Initial Issue	G. Quizon
A	08/02/13	Editorial and technical revisions and corrections.	G. Quizon
B	08/02/13	Editorial and technical revisions and corrections.	G. Quizon
C	08/06/13	Revised AFH no. of channels per client instruction.	G. Quizon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PLANTRONICS.
345 ENCINAL ST,
SANTA CRUZ, CA 95060

EUT DESCRIPTION: BLUETOOTH BASE

MODEL: CSEB-01

SERIAL NUMBER: 001

DATE TESTED: 06/26/2013 to 07/15/2013

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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
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George Quizon
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Lieu Nguyen
EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL Verification Services Inc. 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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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 BLUETOOTH BASE

The radio module is manufactured by Plantronics.

5.1. 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	4.88	3.08
2402 - 2480	Pi/4QPSK	Covered by the the worst case modulation, Enchanced 8PSK	
2402 - 2480	Enhanced 8PSK	5.17	3.29

5.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a integral printed, with a maximum gain of 2.8 dBi

5.3. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Ver. GF.

The test utility software used during testing was CSR Bluesuite 2.4.

5.4. WORST-CASE CONFIGURATION AND MODE

The EUT is a base station. The EUT was oriented in an upright orientation (Y-orientation), similar to the orientation it would have in normal application; see setup photos for details.

The worst-case data rate for each mode is determined to be as follows, based on input from the manufacturer of the radio:

GFSK mode: 1 Mb/s.
8PSK mode: 3 Mb/s

For radiated emissions below 1 GHz and AC Line Conducted Emissions, the worst-case configuration is determined to be the mode and the channel with the highest conducted output power.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop	Dell	Latitude D600	CNOT9369486435255652
AC Adapter	Dell	LA90PS0-00	CNODF266716158554A57
UART	Plantronics	N/A	N/A

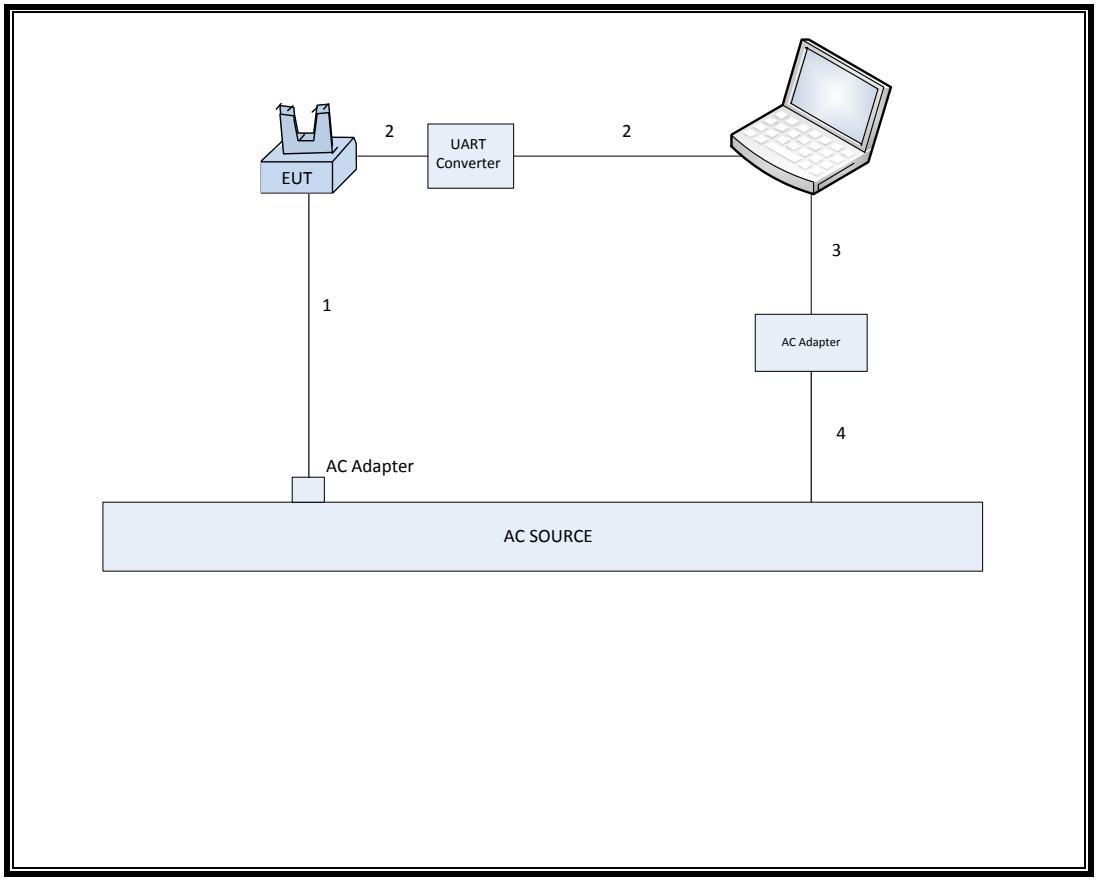
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	USB	Shielded	0.7	
2	Parallel	2	Soldered to UART	Shielded	1.5	
3	DC	1	Barrel	Shielded	0.7	
4	AC	1	2P	Shielded	1.8	

TEST SETUP

The EUT was tested as an external module where continuous driven by the support UART card connected to a host Laptop PC via USB cable. 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**	**Asset**	**Cal Date**	**Cal Due**
Power Meter	Agilent / HP	N1911A	MY45100242	07/27/12	07/27/13
Peak / Average Power Sensor	Agilent / HP	E9323A	US40411556	07/26/12	07/26/13
PXA Signal Analyzer	Agilent / HP	N9030A	T313	01/22/13	01/22/14
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	05/22/13	05/22/14
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	03/23/13	03/23/14
Antenna, Horn, 18 GHz	EMCO	3115	C00945	11/12/12	11/12/13
Antenna, Horn, 18 GHz	ETS	3117	C01005	04/23/12	02/21/14
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00580	01/14/13	01/14/14
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/12	10/22/13
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	11/01/12	11/01/13
Band Reject Filter	Micro-tronics	BRM50702	N02684	C.N.R	
Antenna Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	12/07/12	12/07/13

7. ANTENNA PORT TEST RESULTS

7.1. DUTY CYCLE

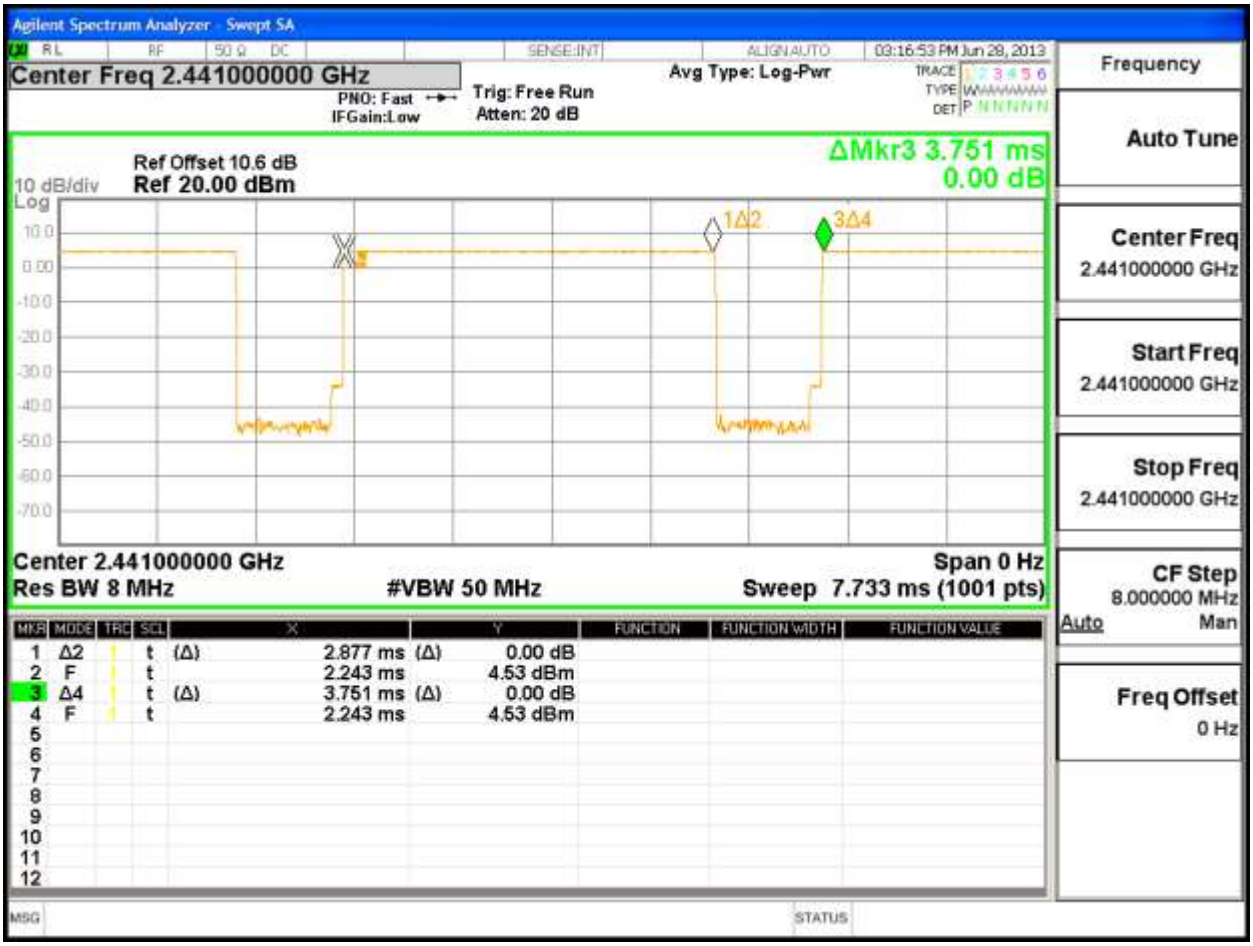
LIMITS

None; for reporting purposes only.

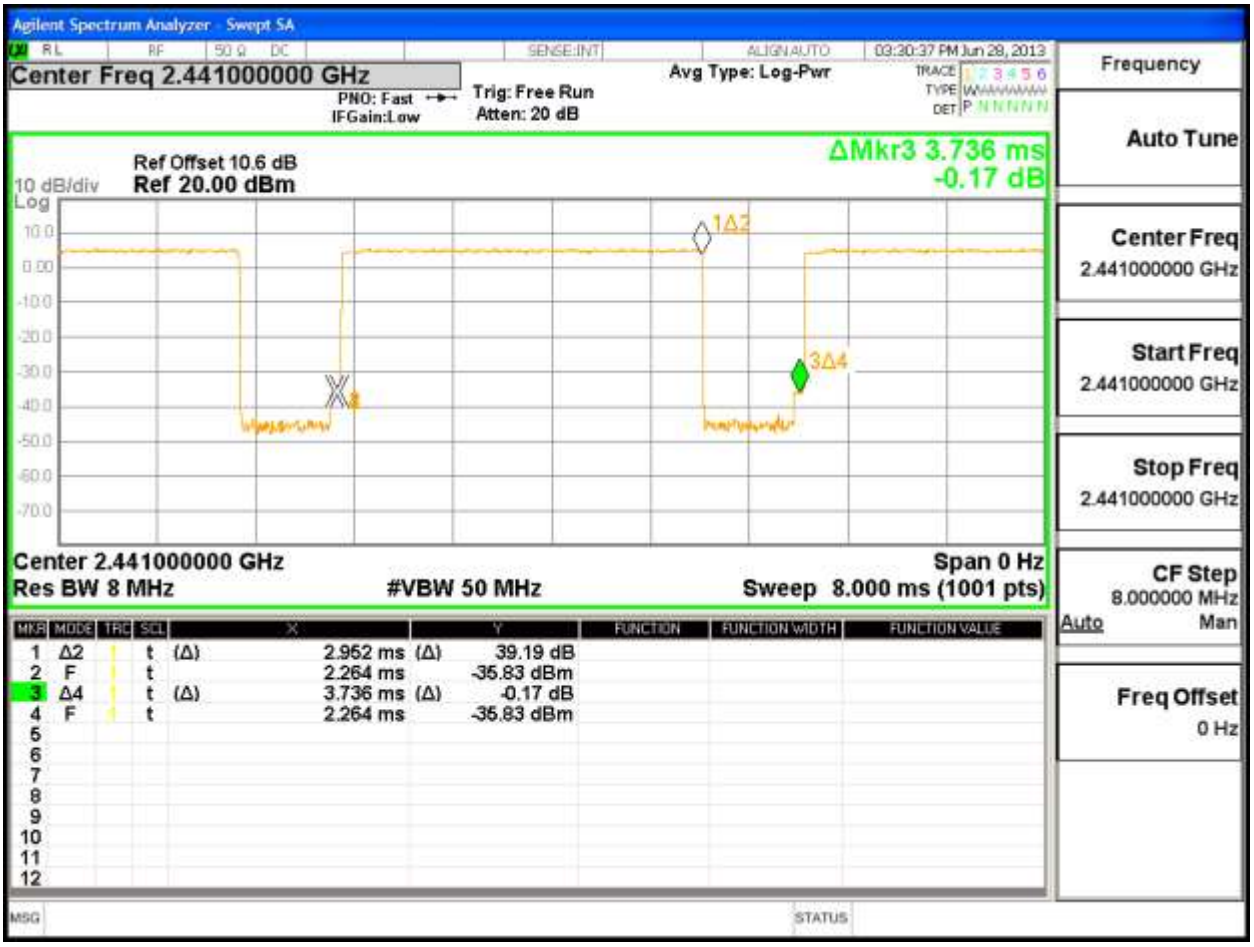
RESULTS

Mode	Tx on (usec)	Tx on + Tx off (usec)	Duty Cycle (%)	Correction Factor (dB)
Basic GFSK	2877	3751	76.70	1.15
Enhanced 8PSK	2952	3736	79.01	1.02

DUTY CYCLE GFSK MODE



DUTY CYCLE 8PSK



7.2. BASIC DATA RATE GFSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

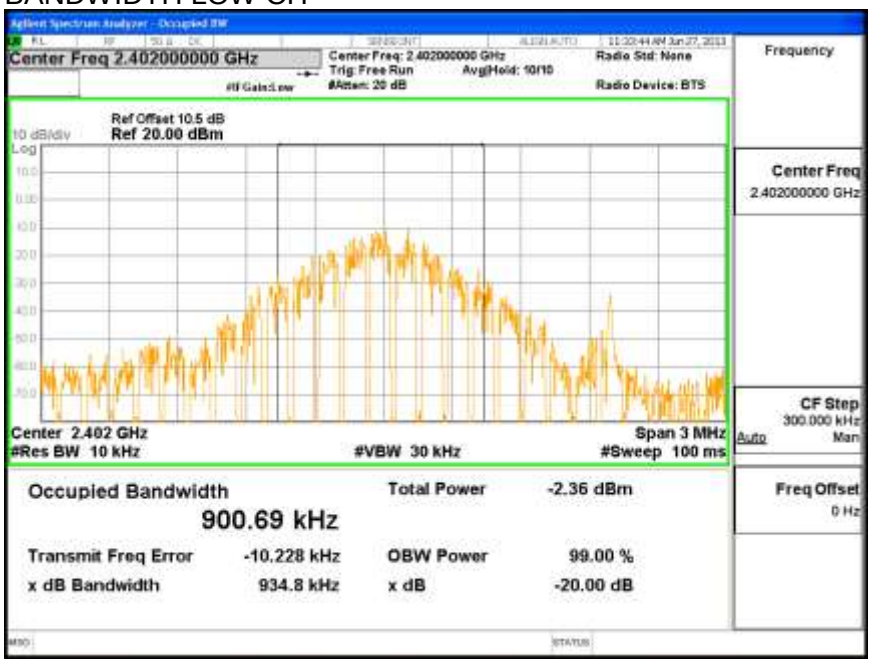
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

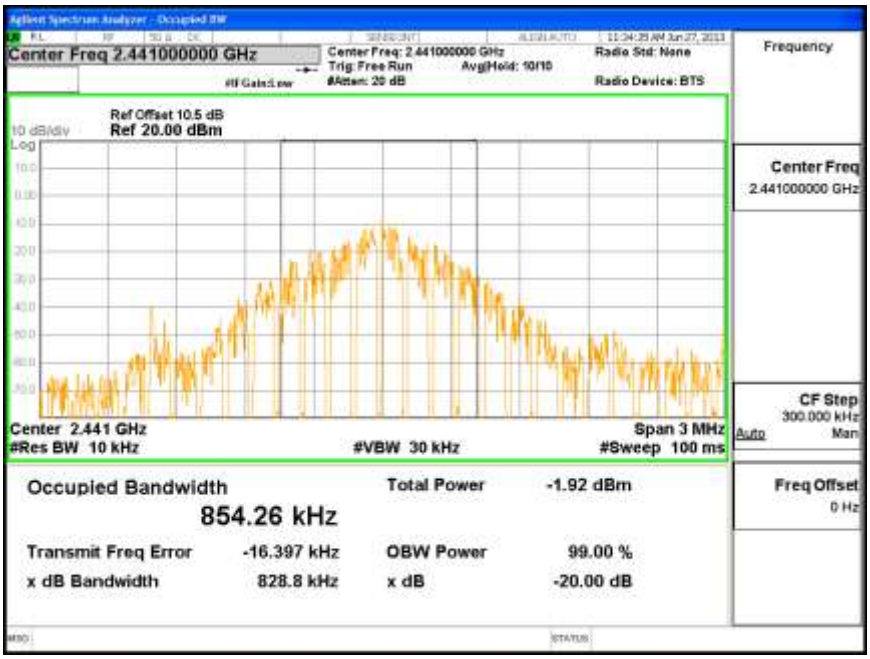
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	934.8	900.69
Middle	2441	828.8	854.26
High	2480	835.2	873.57

20 dB AND 99% BANDWIDTH

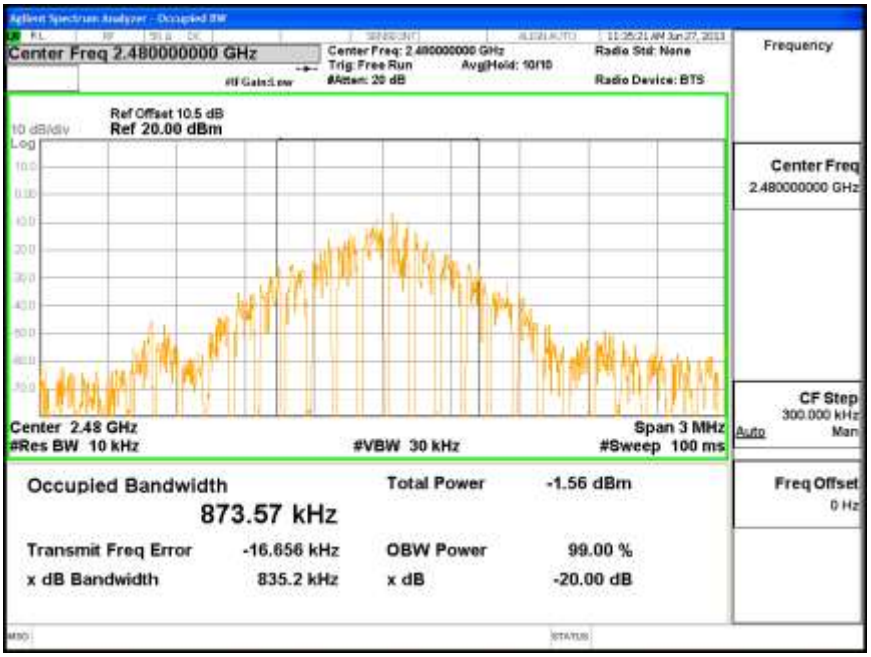
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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.

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

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION

7.2.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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.

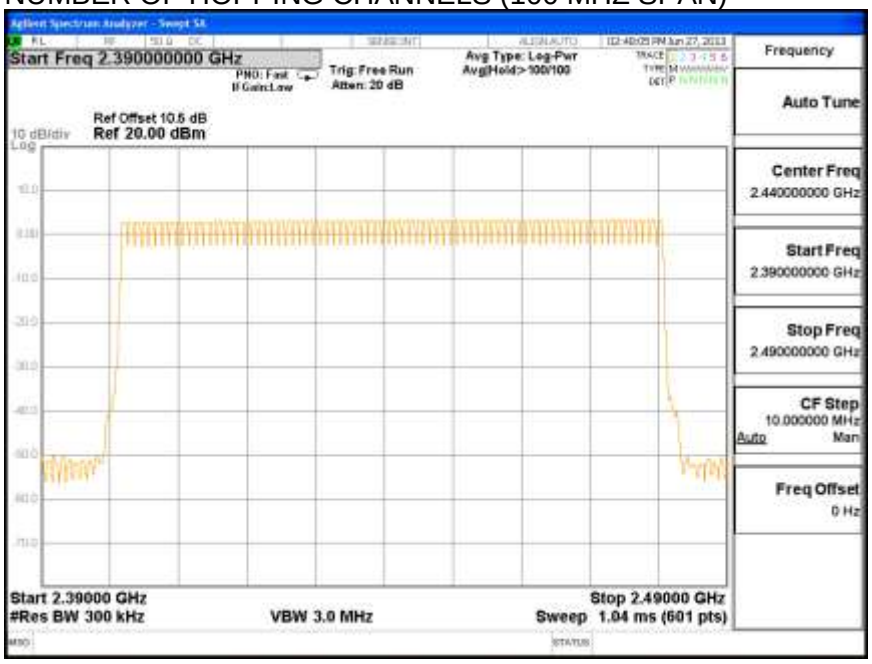
RESULTS

Normal Mode: 79 Channels observed.

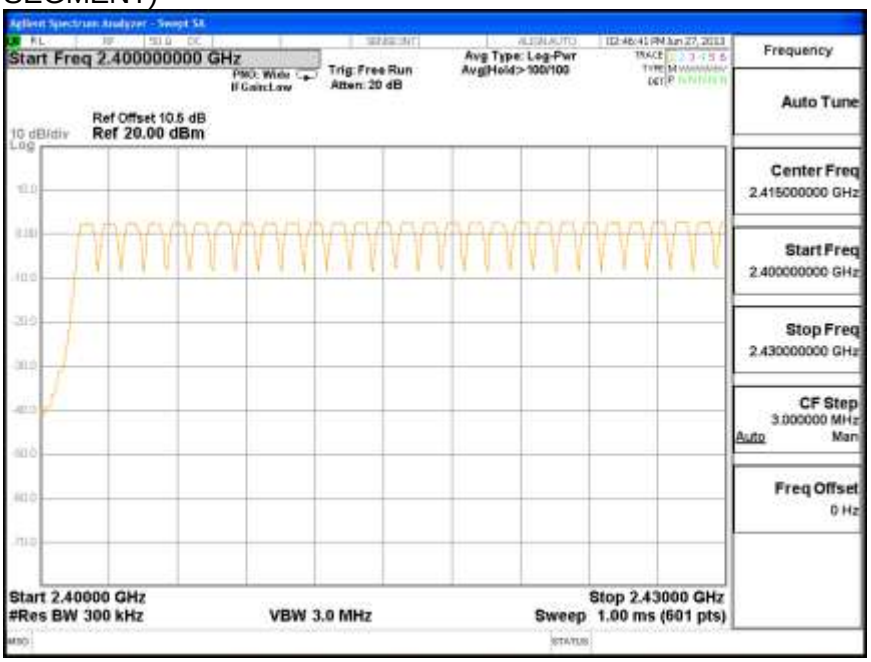
AFH Mode: 20 Channels declared.

NUMBER OF HOPPING CHANNELS

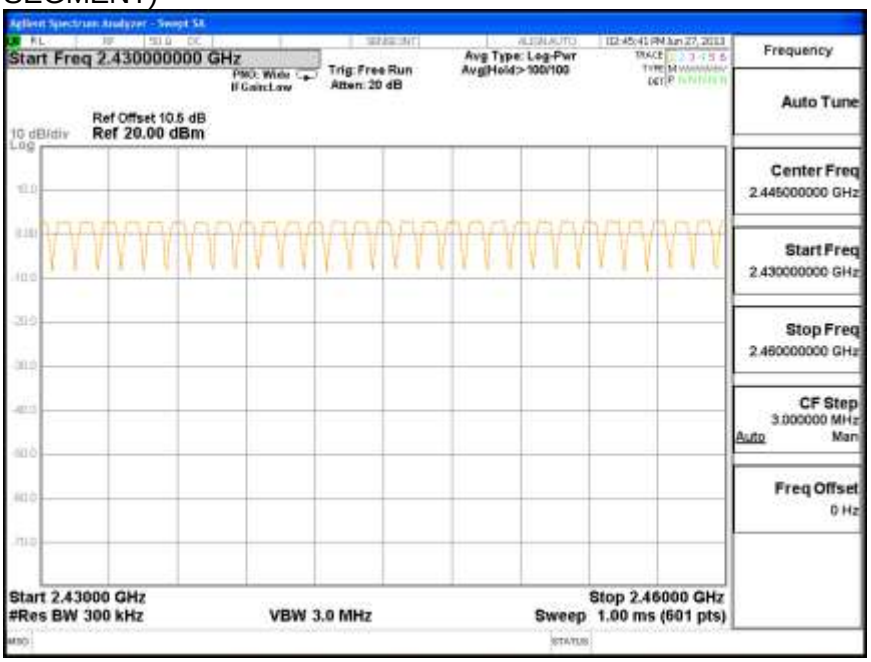
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



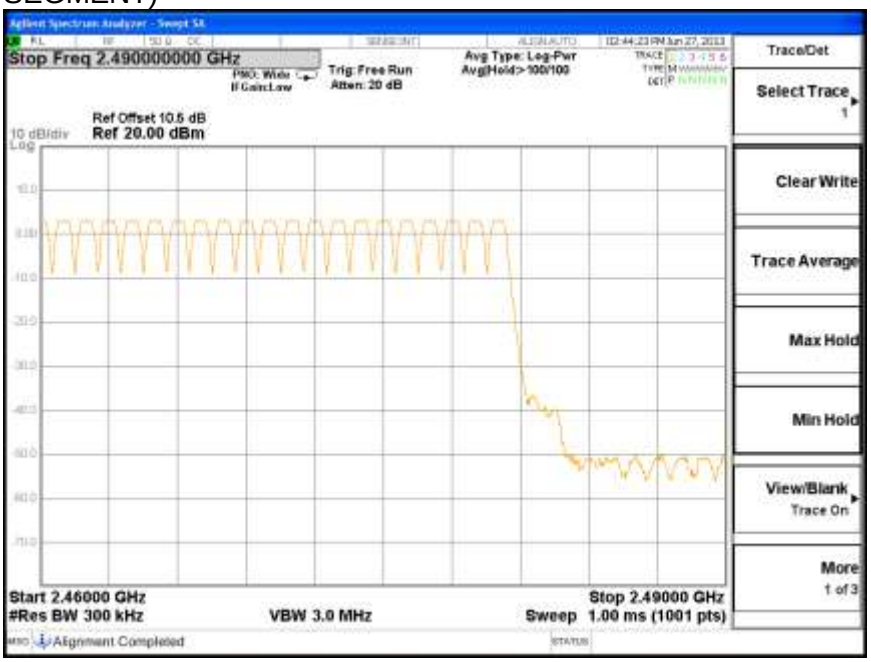
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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.

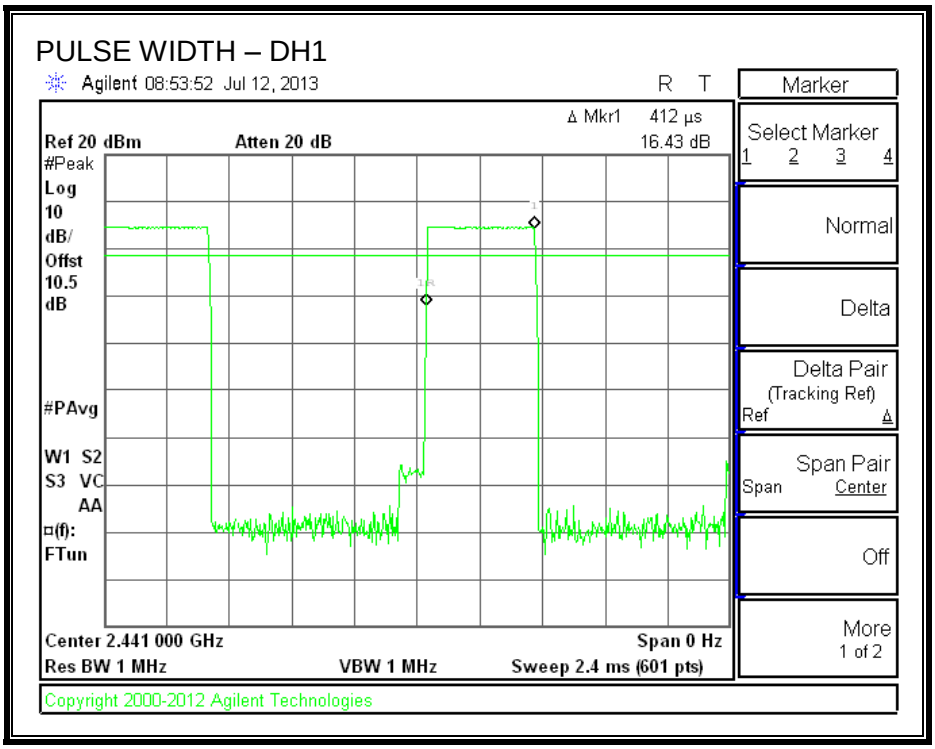
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

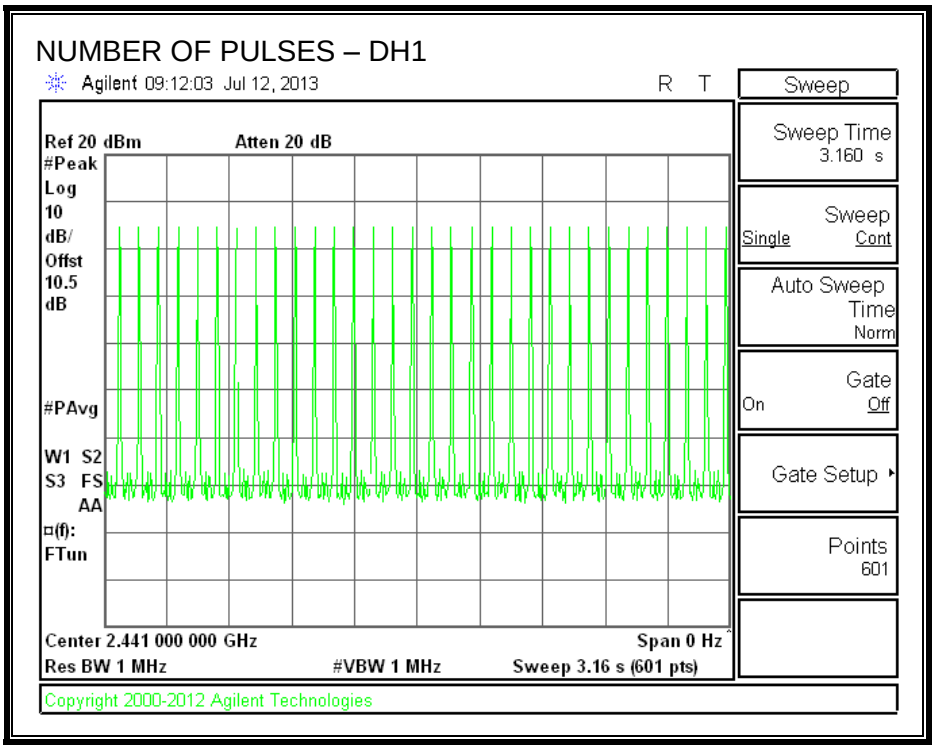
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.412	32	0.132	0.4	-0.268
DH3	1.66	16	0.266	0.4	-0.134
DH5	2.926	11	0.322	0.4	-0.078
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.412	8	0.033	0.4	-0.367
DH3	1.66	4	0.066	0.4	-0.334
DH5	2.926	2.8	0.082	0.4	-0.318

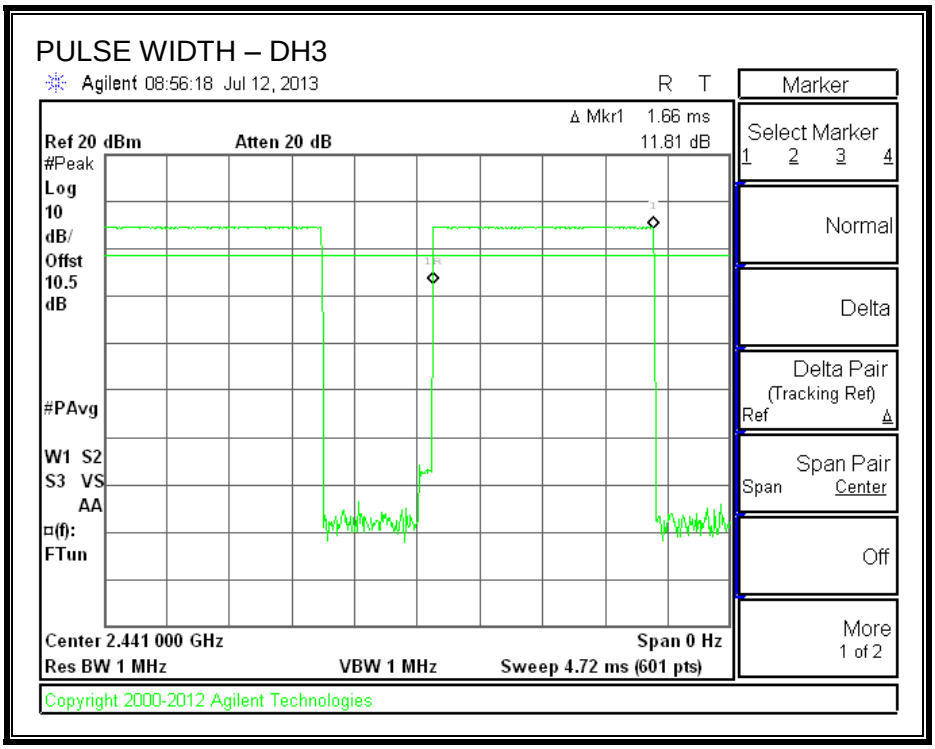
PULSE WIDTH - DH1



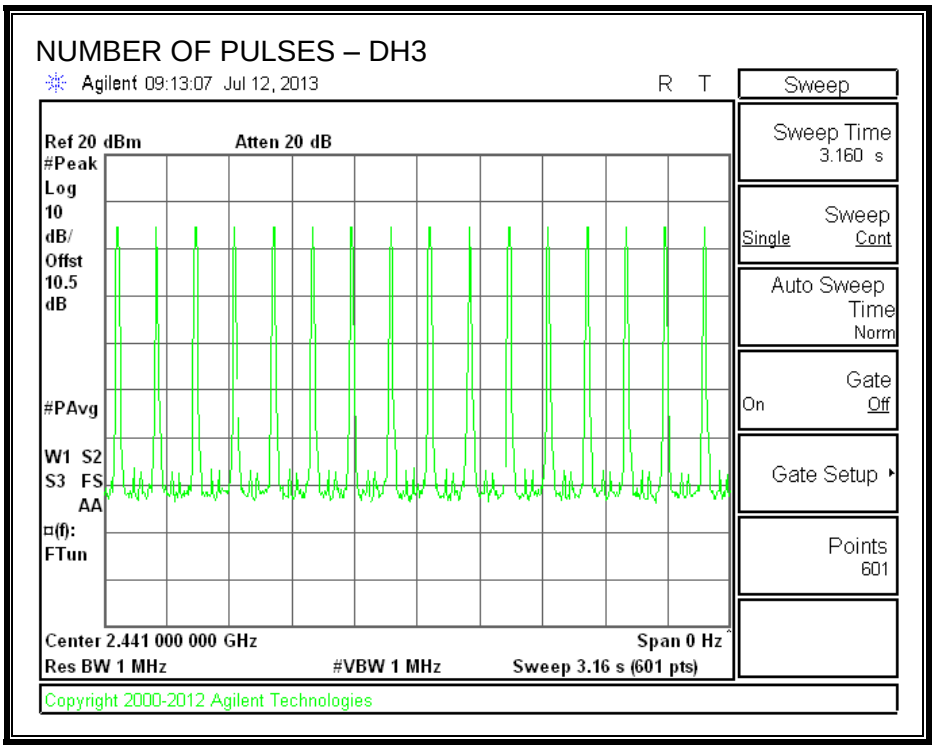
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



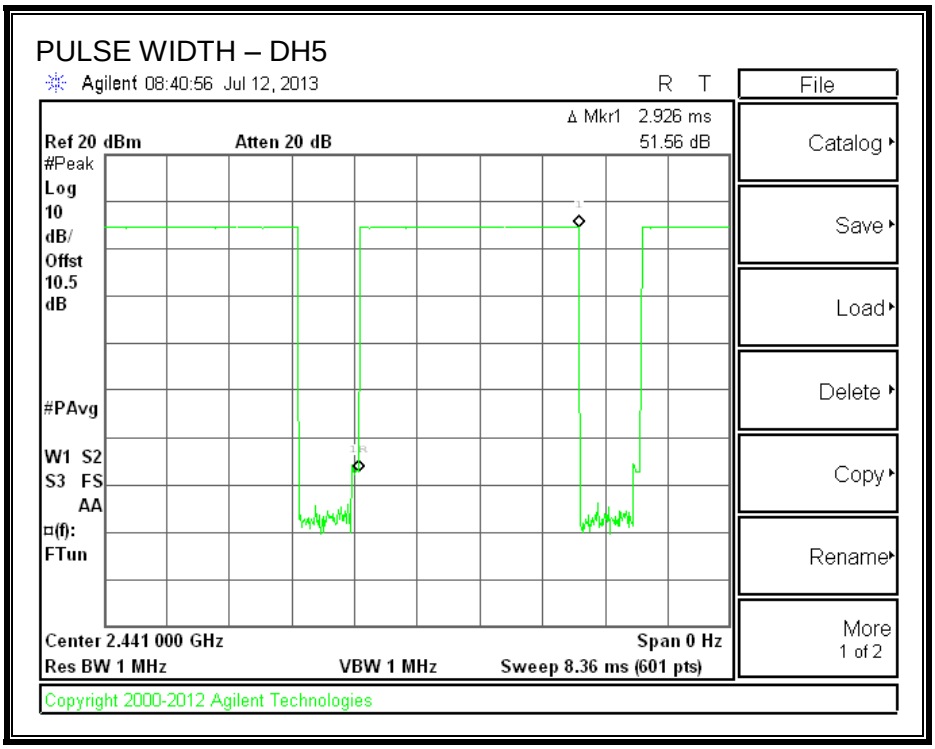
PULSE WIDTH – DH3



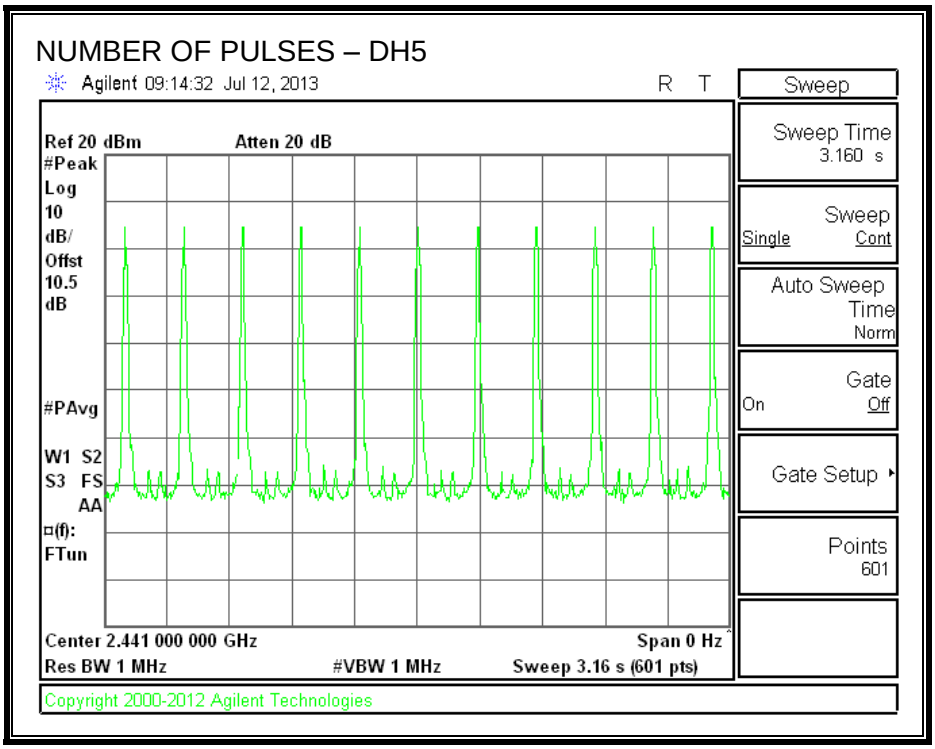
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

TEST PROCEDURE

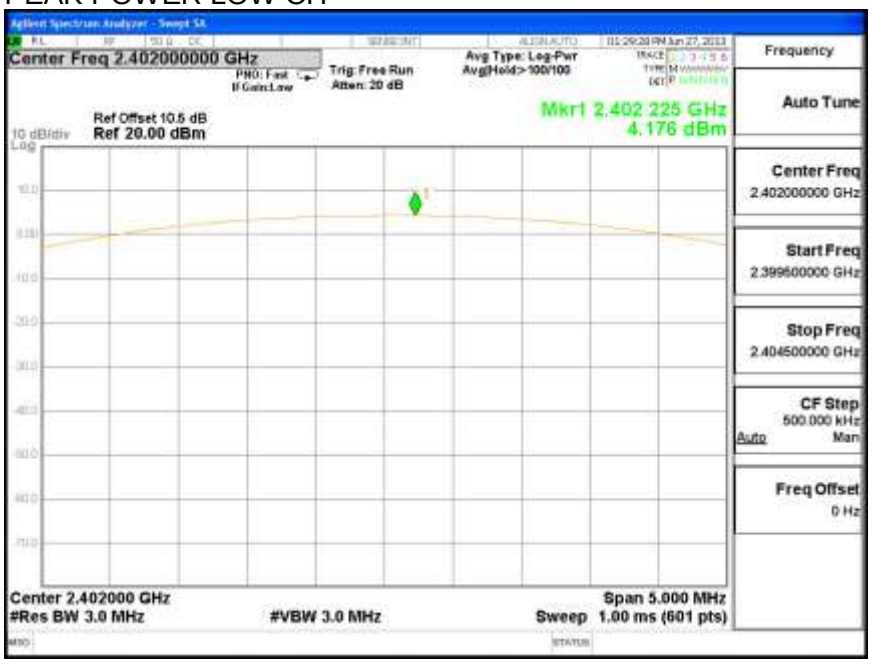
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

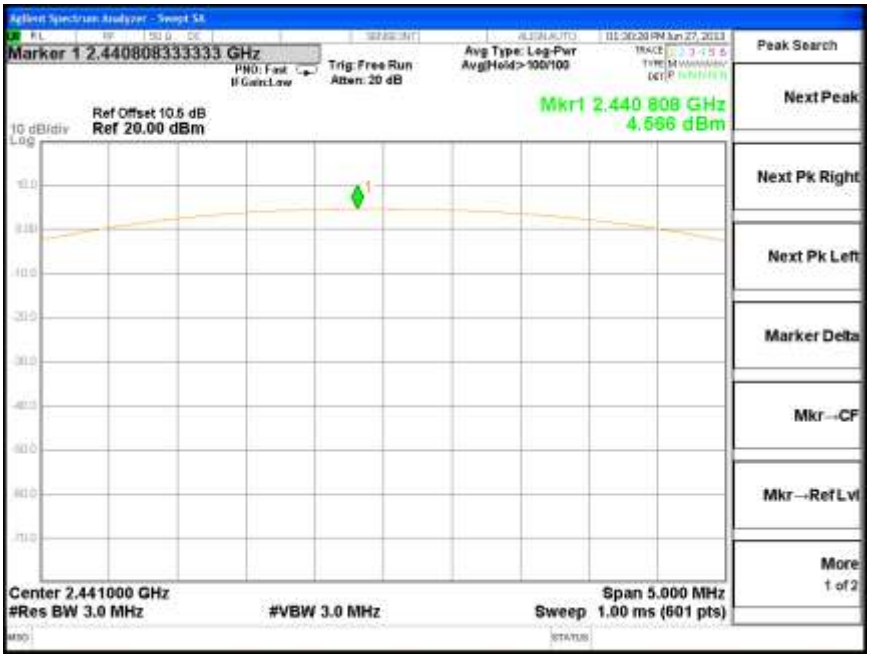
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.18	30	-25.82
Middle	2441	4.57	30	-25.43
High	2480	4.88	30	-25.12

OUTPUT POWER

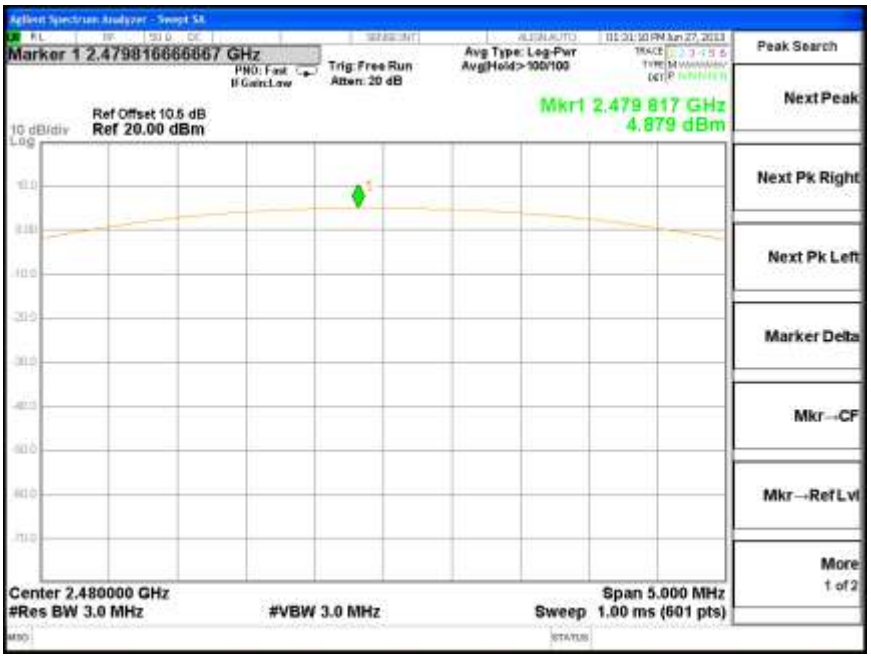
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



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 10.5 dB (including 10 dB pad and 0.5 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	2.51
Middle	2441	2.81
High	2480	3.16

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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.

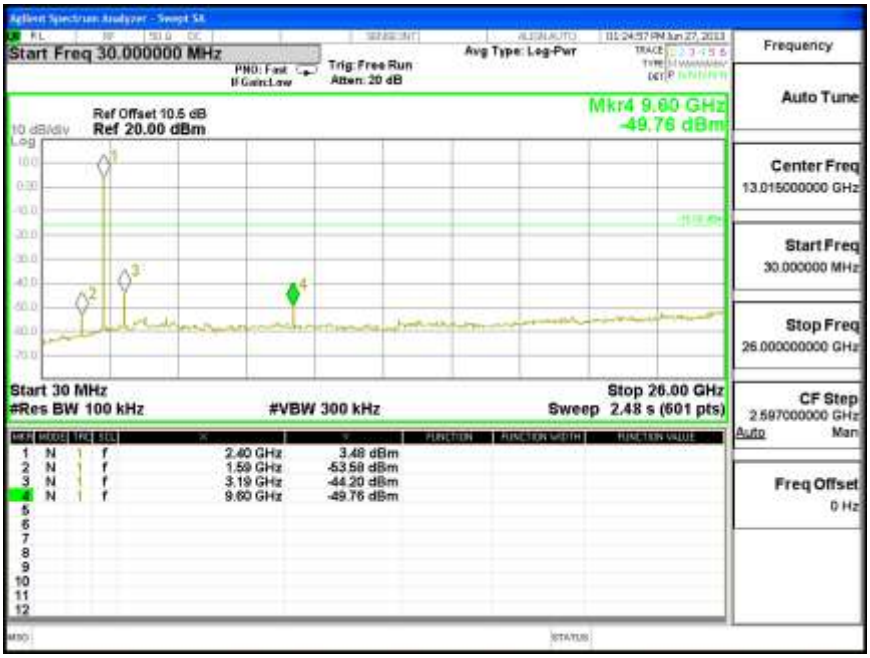
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

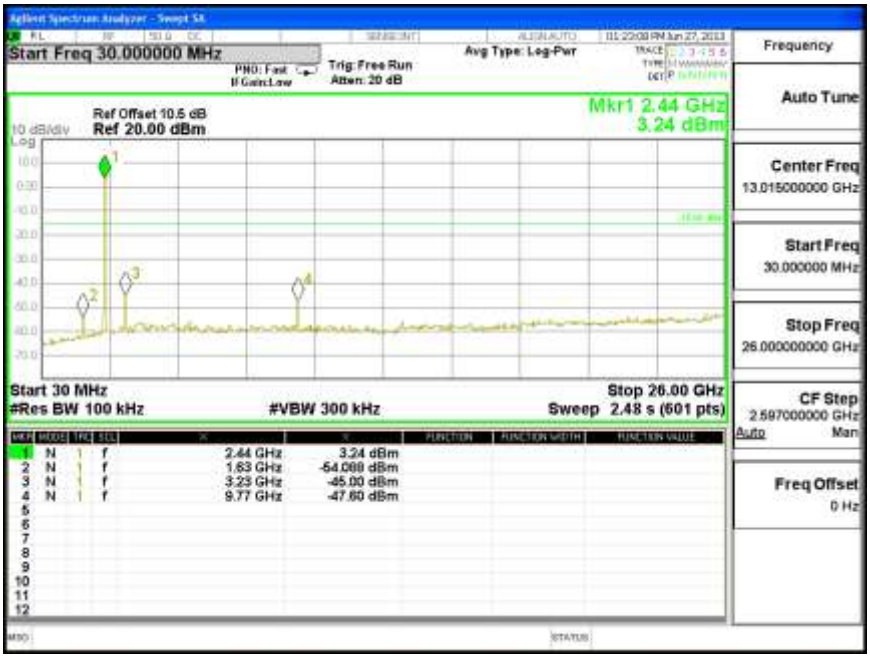
LOW CHANNEL SPURIOUS



SPURIOUS EMISSIONS, MID CHANNEL

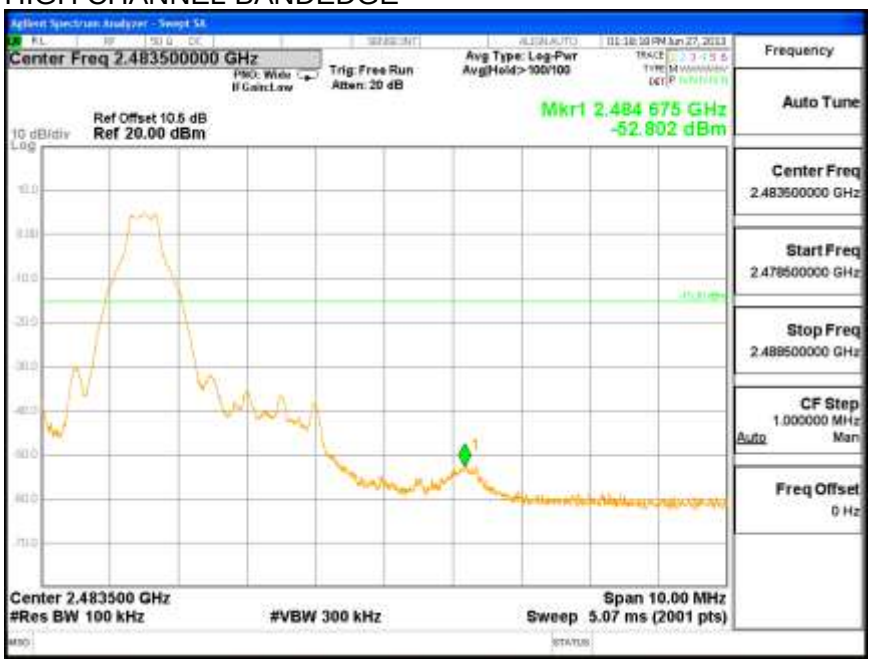
MID CHANNEL REFERENCE

MID CHANNEL SPURIOUS

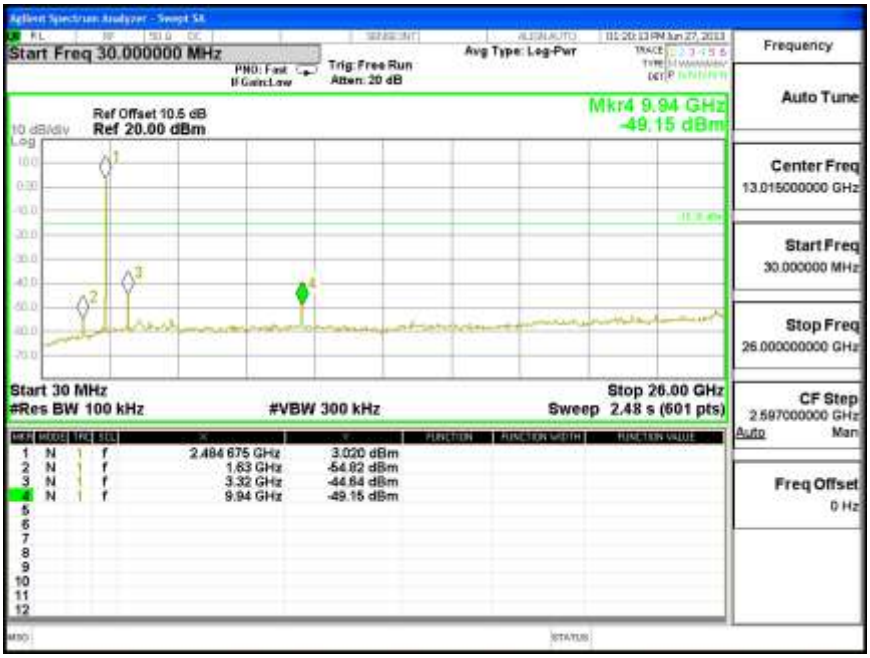


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



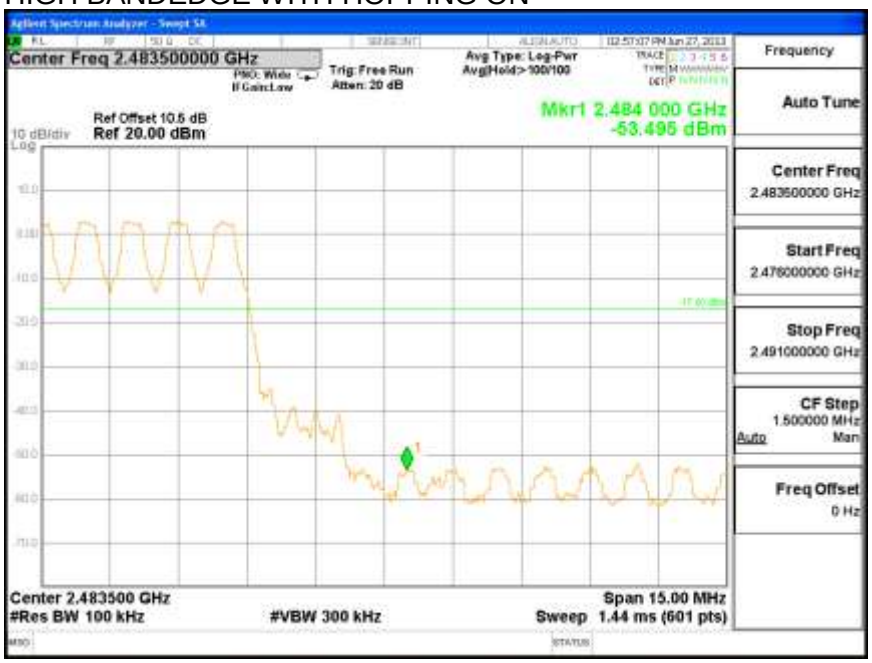
HIGH CHANNEL SPURIOUS



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON

HIGH BANDEDGE WITH HOPPING ON



7.3. ENHANCED DATA RATE 8PSK MODULATION

7.3.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

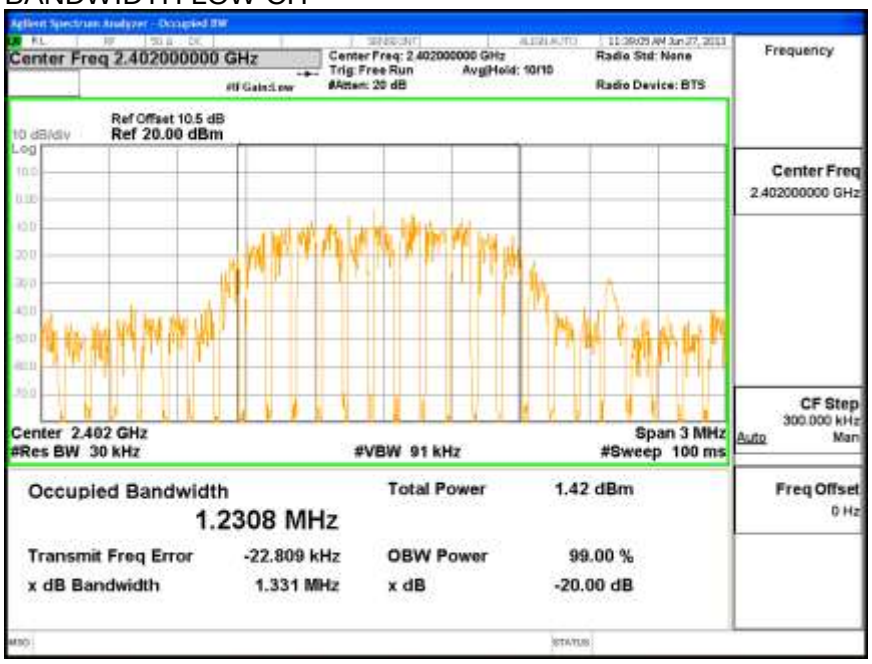
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

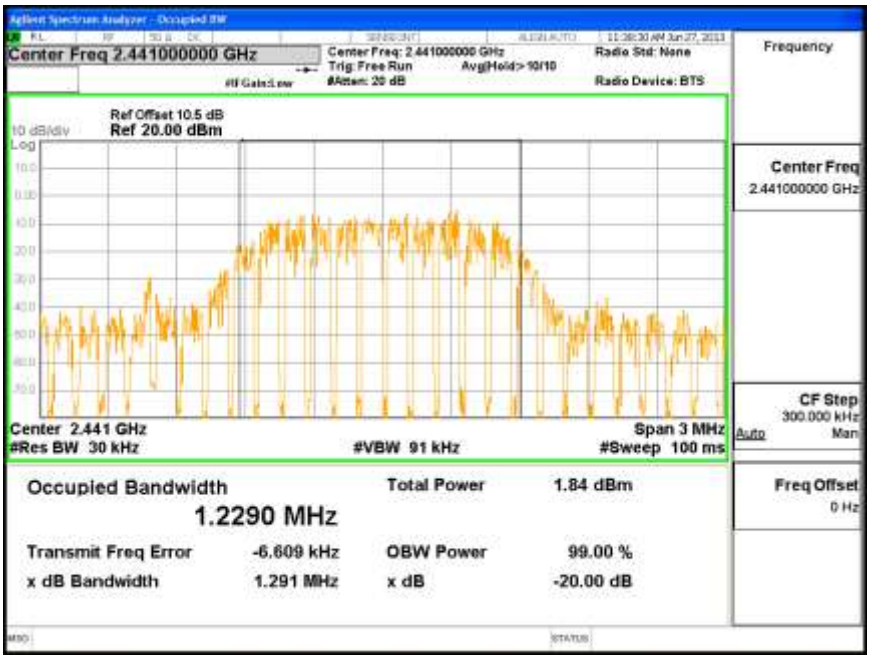
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1331	1230.8
Middle	2441	1291	1229
High	2480	1309	1251.4

20 dB AND 99% BANDWIDTH

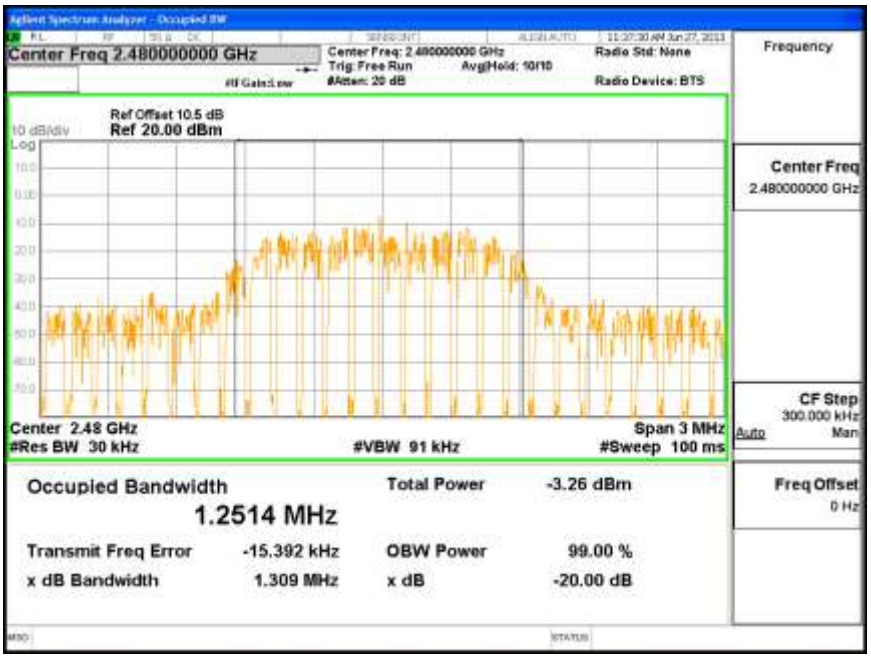
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.3.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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.

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

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION

7.3.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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.

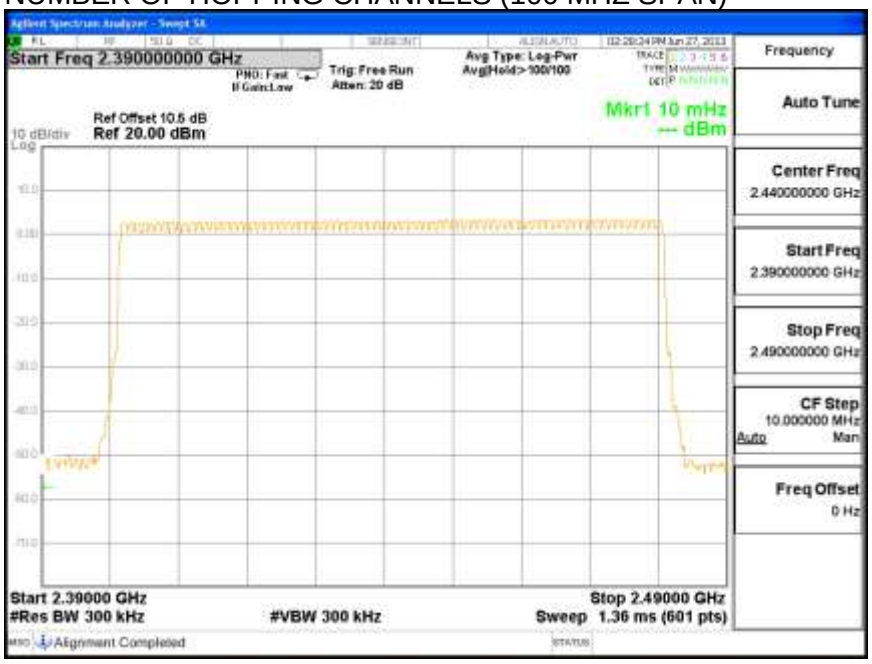
RESULTS

Normal Mode: 79 Channels observed.

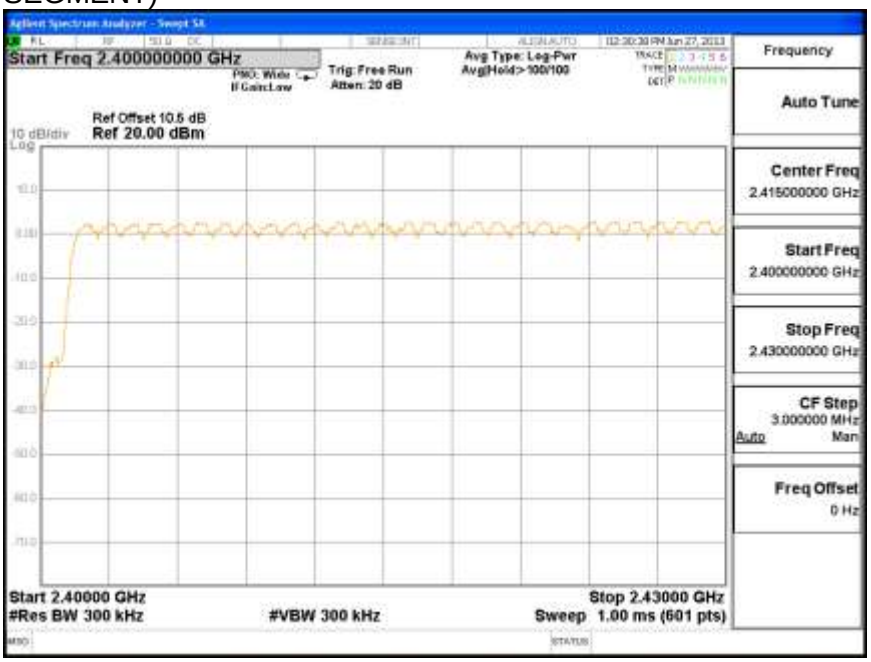
AFH Mode: 20 Channels declared

NUMBER OF HOPPING CHANNELS

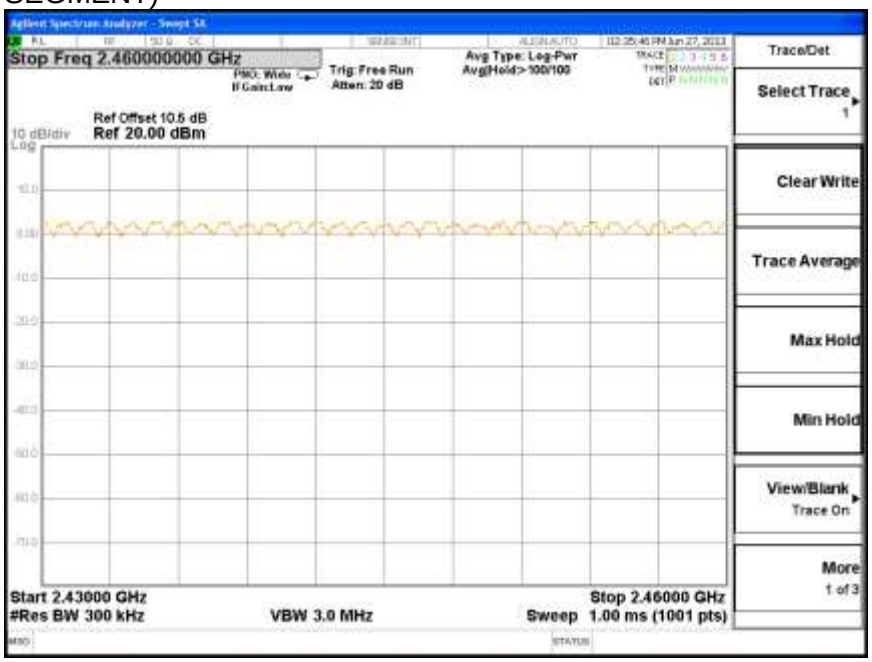
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



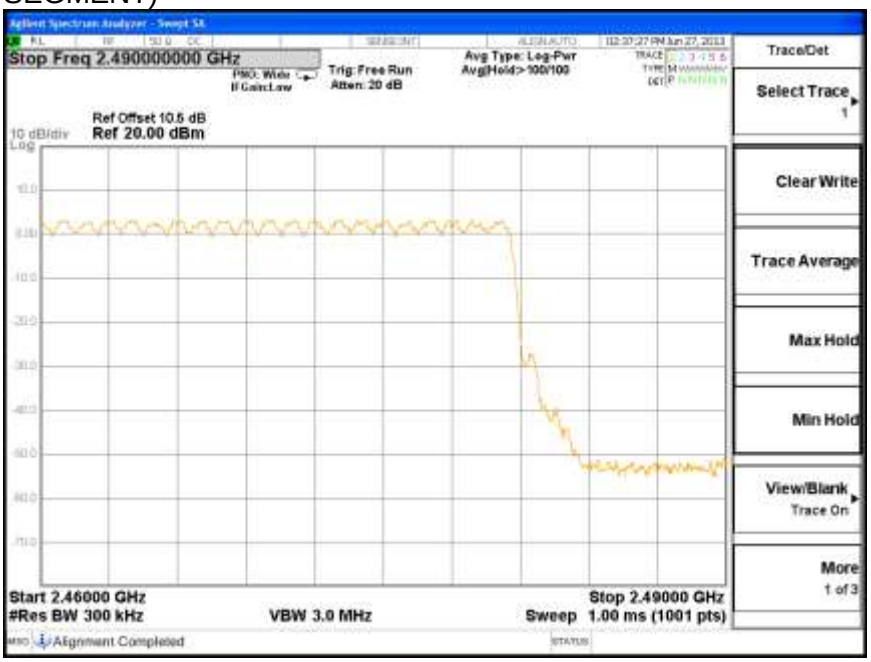
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



7.3.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

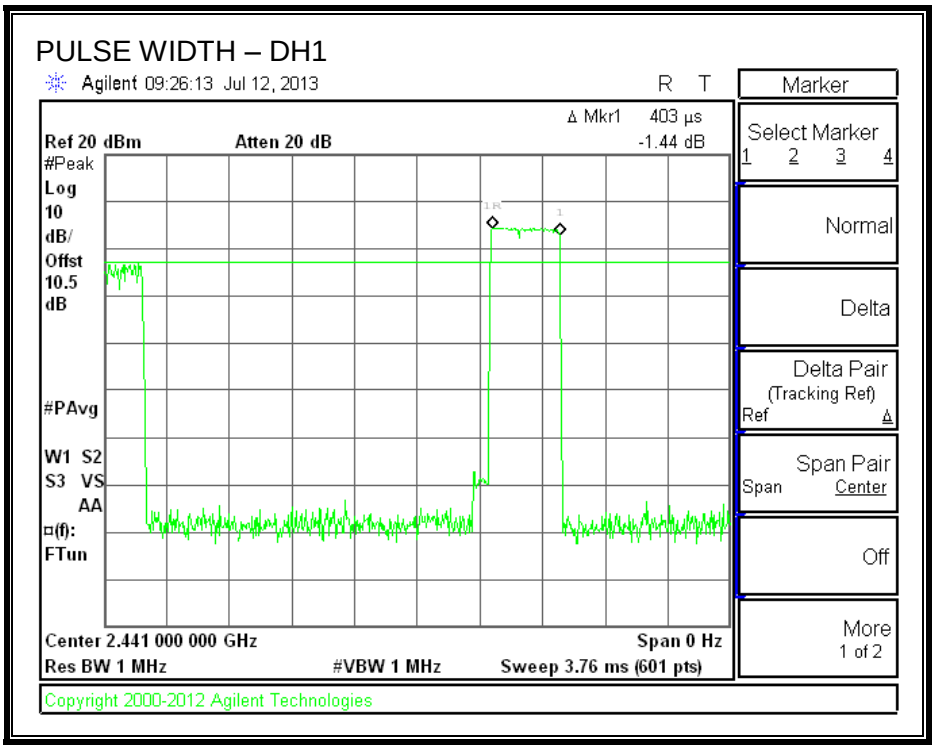
Time Of Occupancy = 10 * xx pulses * yy msec = zz msec

8PSK (EDR) Mode

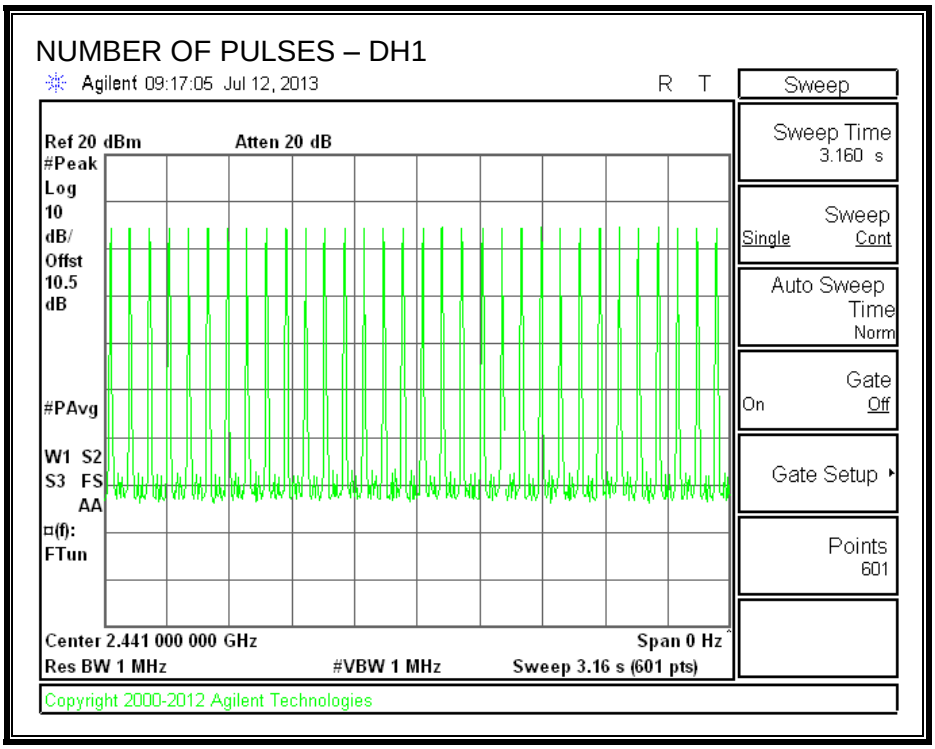
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.403	32	0.129	0.4	-0.271
DH3	1.66	16	0.266	0.4	-0.134
DH5	2.917	11	0.321	0.4	-0.079

Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate on page 25 demonstrates compliance with channel occupancy when AFH is employed.

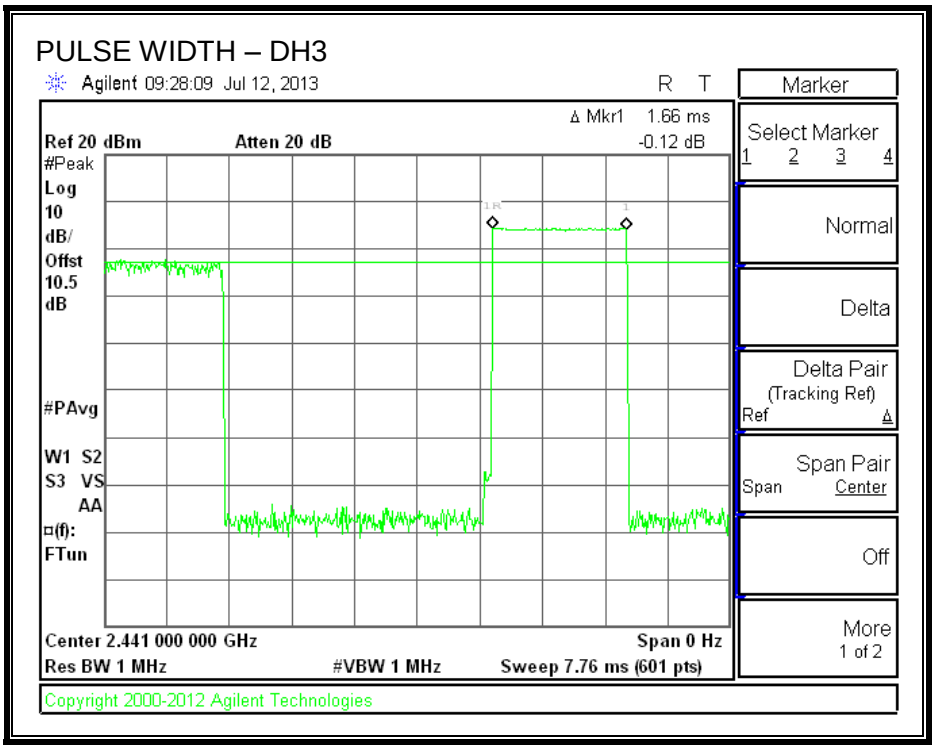
PULSE WIDTH - DH1



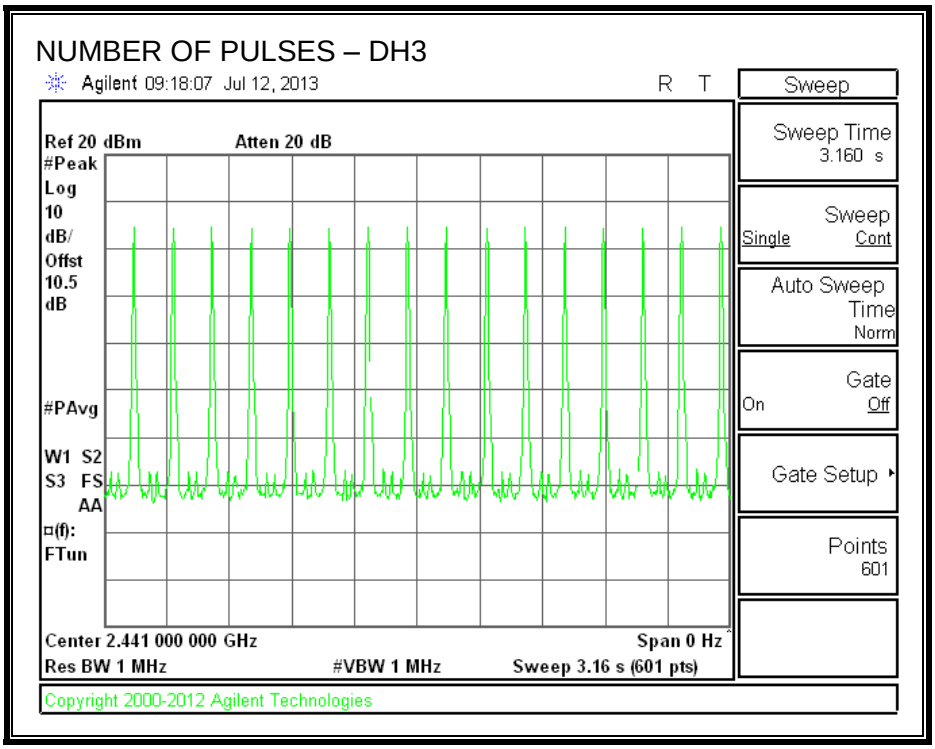
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



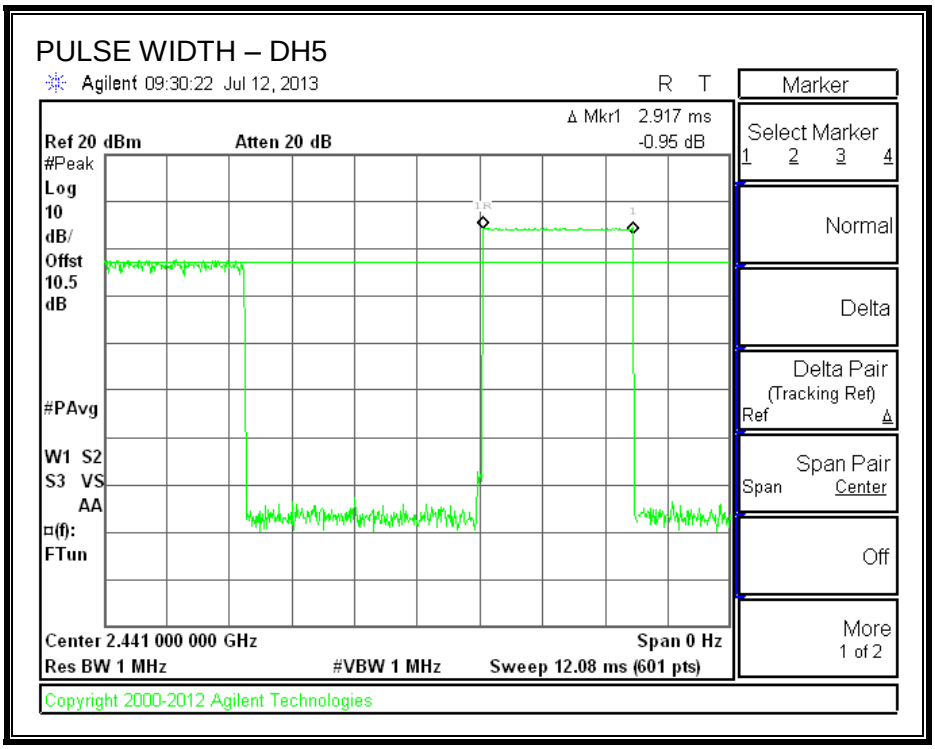
PULSE WIDTH – DH3



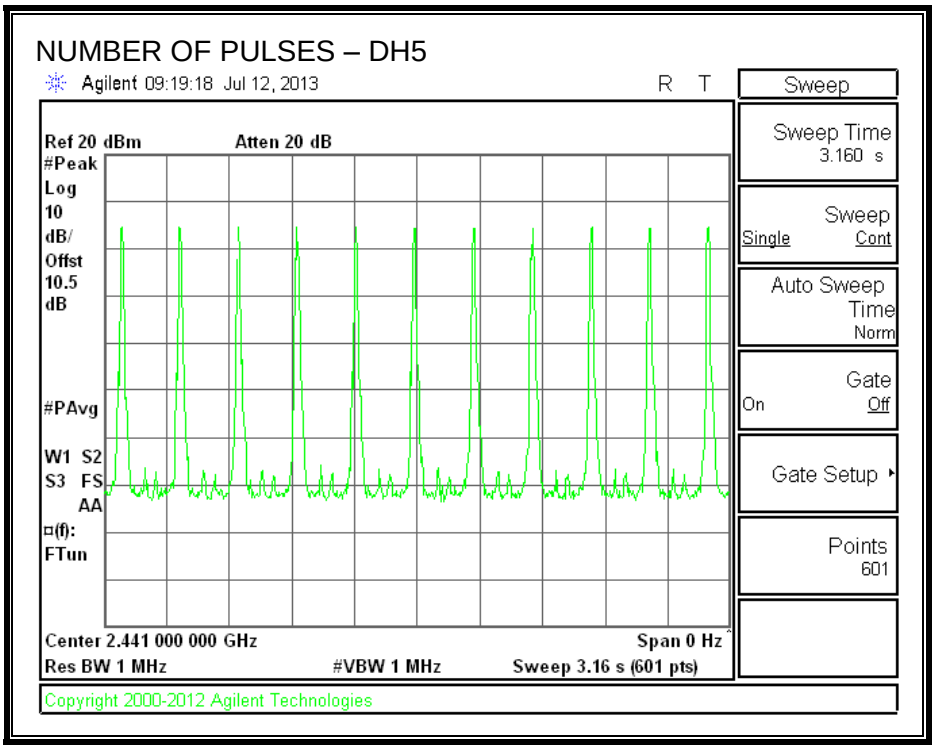
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.3.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

TEST PROCEDURE

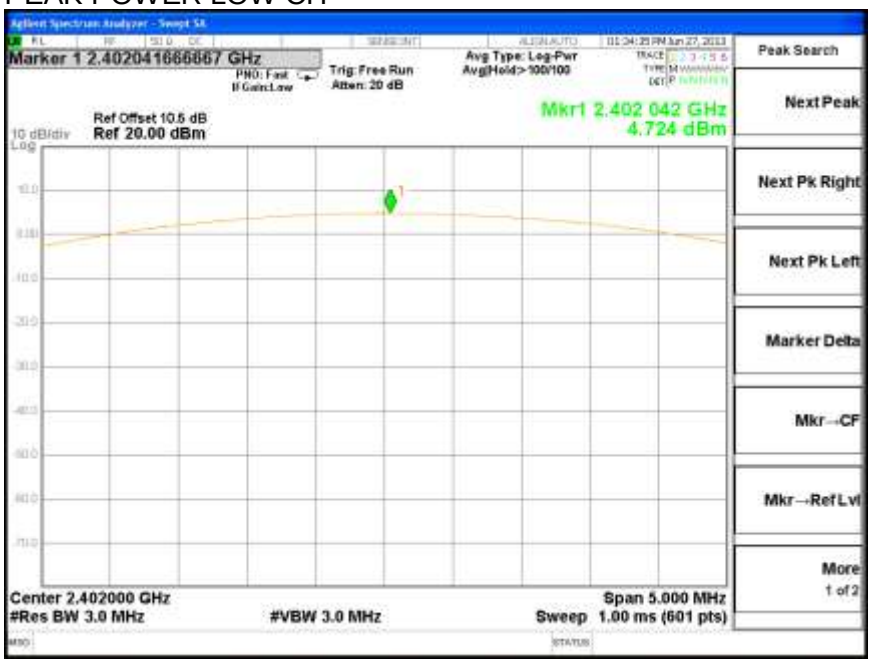
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

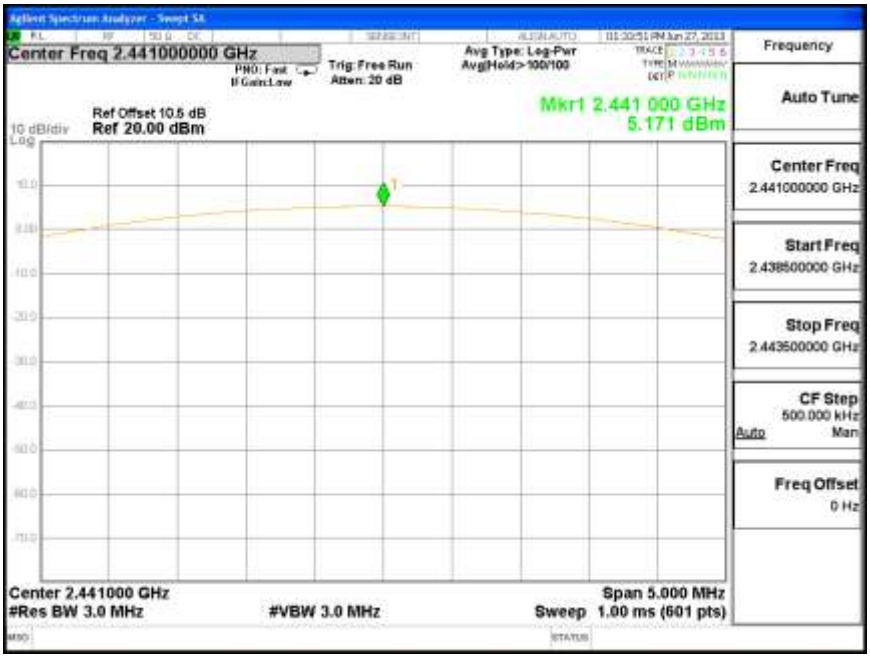
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.72	30	-25.28
Middle	2441	5.17	30	-24.83
High	2480	4.11	30	-25.89

OUTPUT POWER

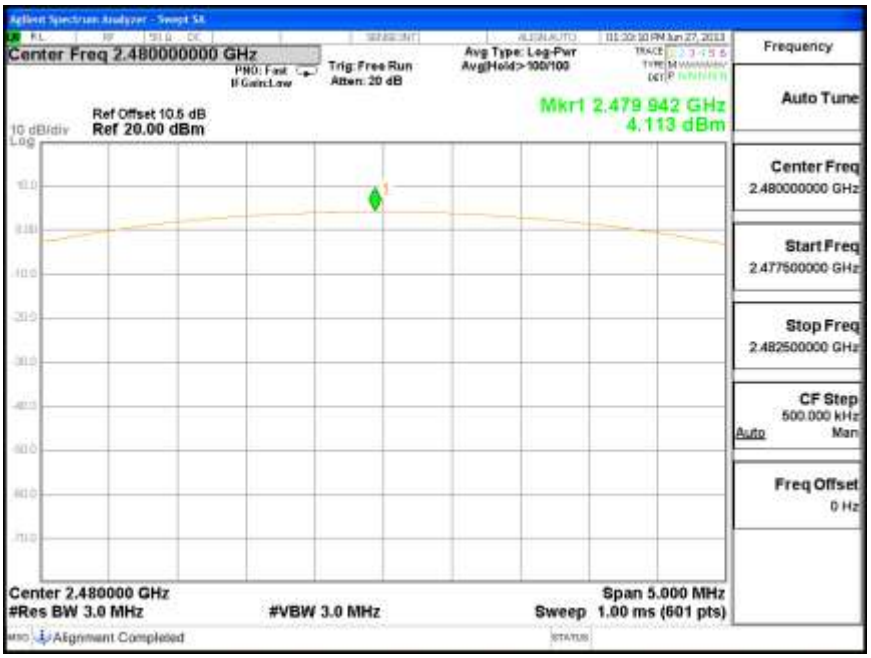
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



7.3.6. 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 10.5 dB (including 10 dB pad and 0.5 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	1.42
Middle	2441	1.90
High	2480	2.17

7.3.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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.

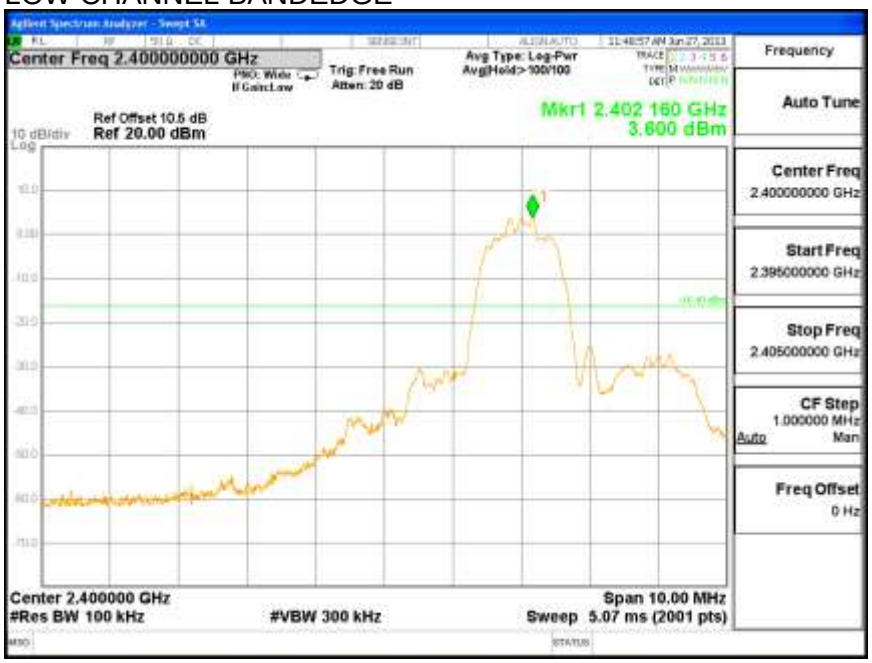
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

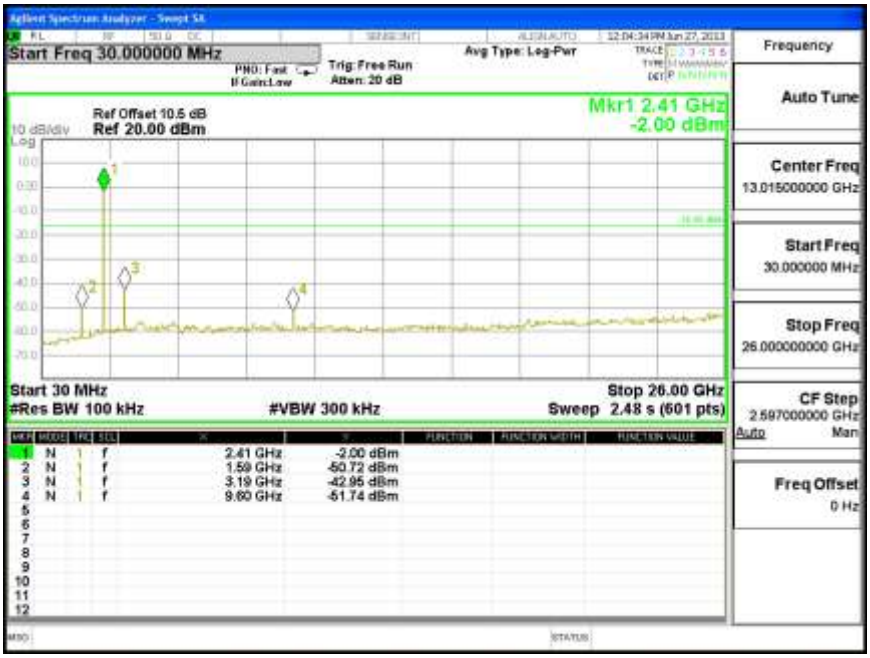
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE



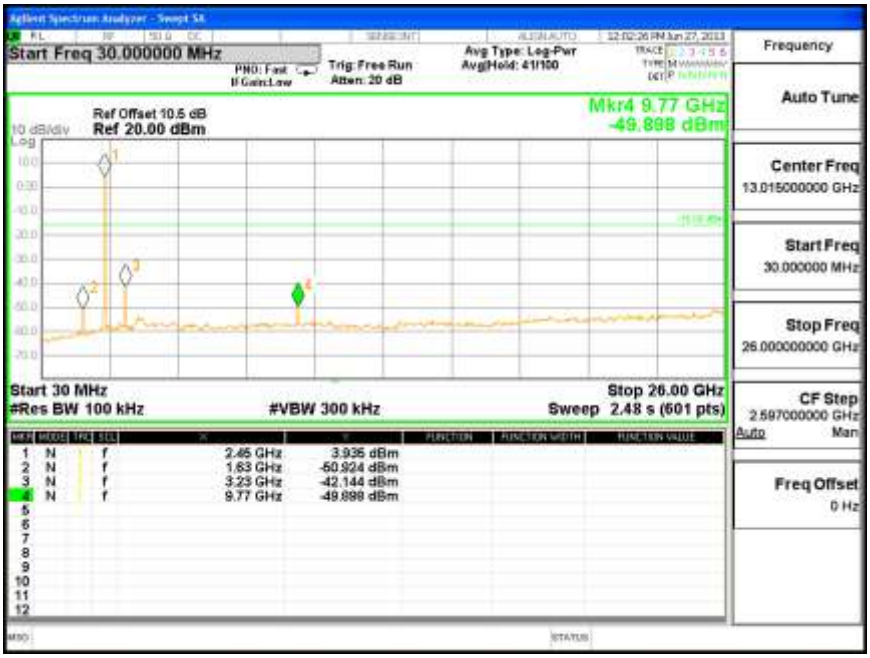
LOW CHANNEL SPURIOUS



SPURIOUS EMISSIONS, MID CHANNEL

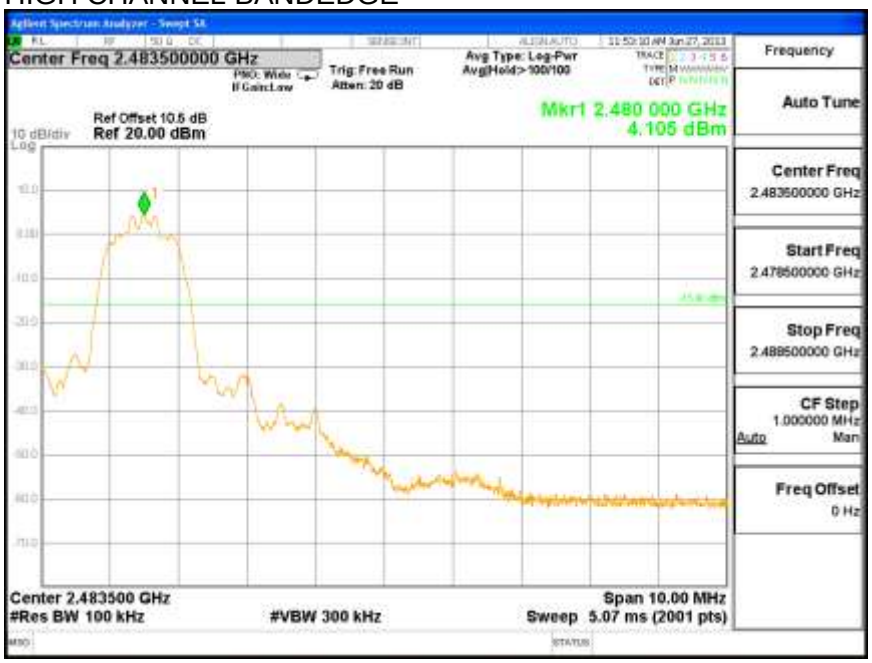
MID CHANNEL REFERENCE

MID CHANNEL SPURIOUS

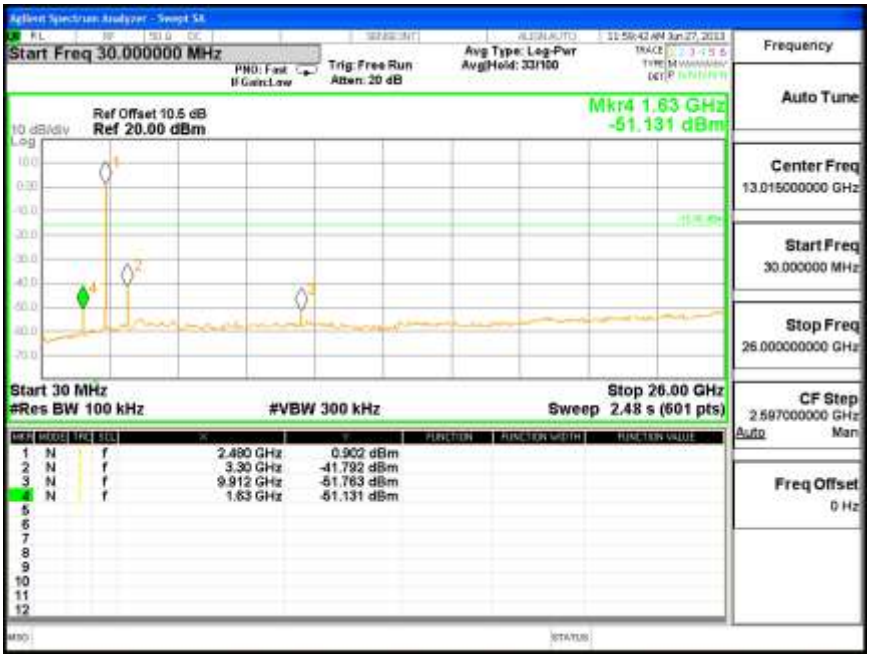


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE



HIGH CHANNEL SPURIOUS



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON

HIGH BANDEDGE WITH HOPPING ON

8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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 3 MHz for peak measurements with and 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.

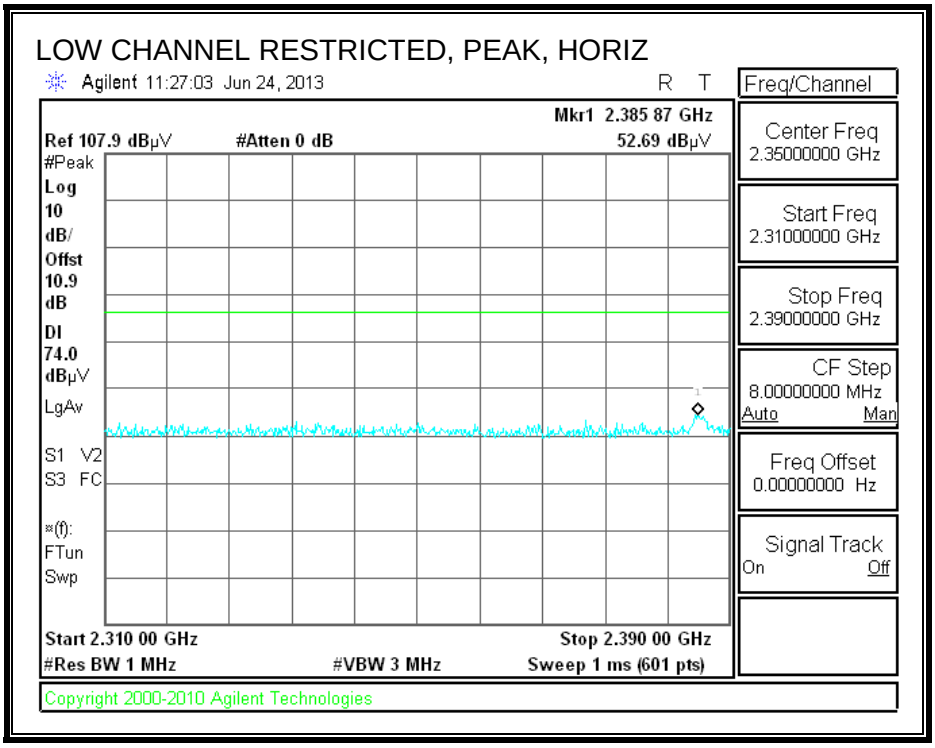
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESULTS

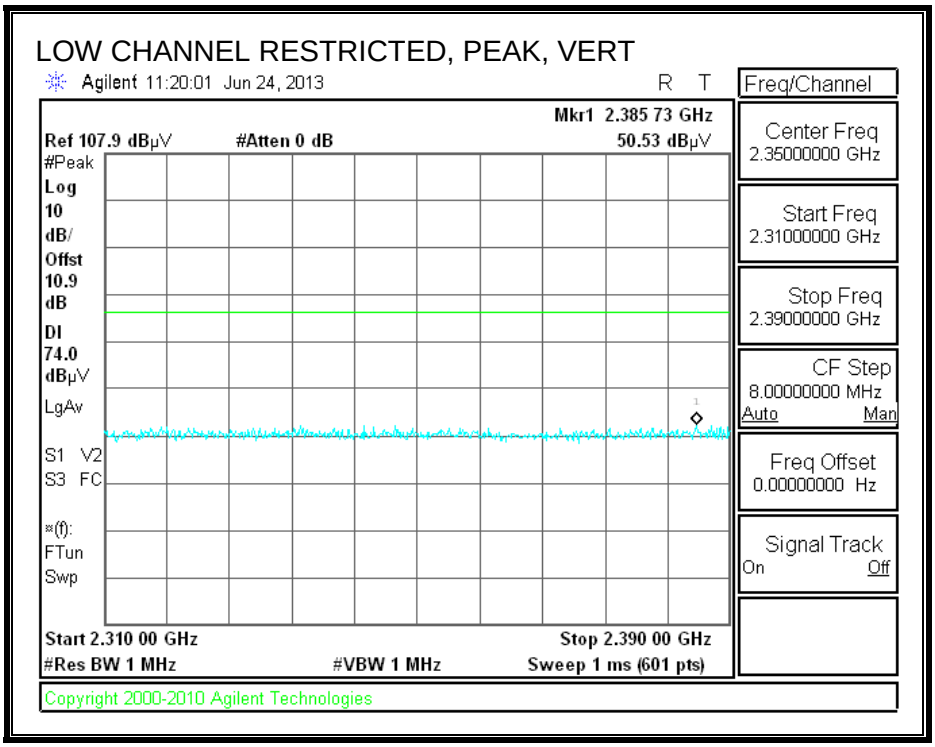
Frequency (MHz)	Field Strength (dBuV/m)	Detector	Polarity (H/V)	Limit (dBuV/m)	Margin (dB)	Comments
LOW CHANNEL						
2385.87	52.69	Peak	H	54.0	-1.3	Peak reading, average limit*
2385.73	50.5	Peak	V	54.0	-3.5	Peak reading, average limit*
HIGH CHANNEL						
2483.64	53.07	Peak	H	54.0	-0.93	Peak reading, average limit*
2499.07	51.36	Peak	V	54.0	-2.64	Peak reading, average limit*
* Peak reading is below the average limit, therefore average measurements are not required.						

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



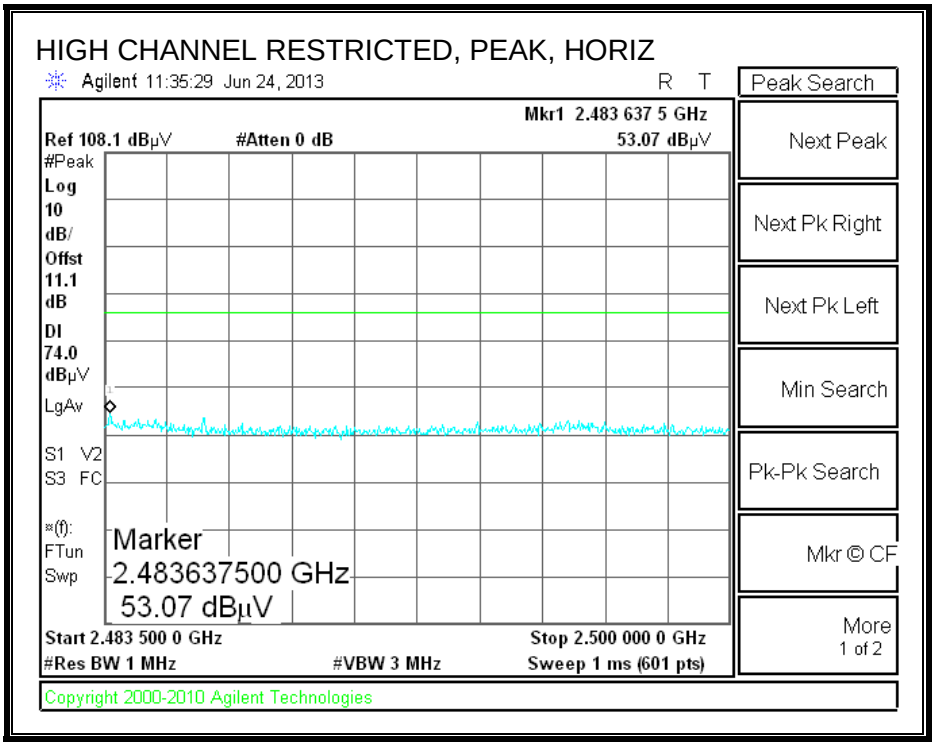
Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



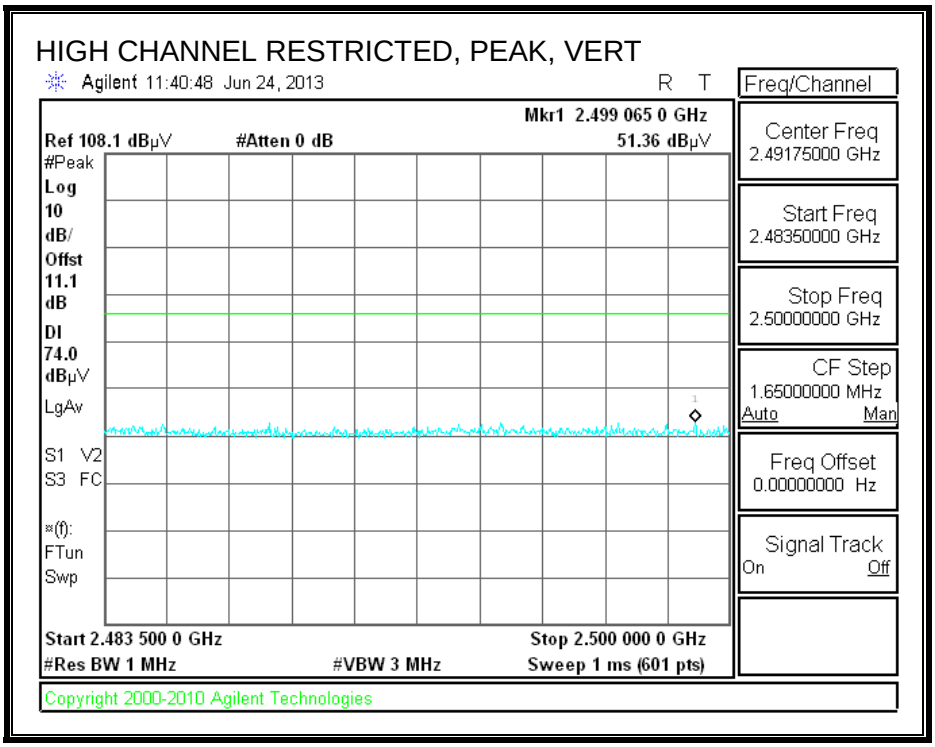
Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

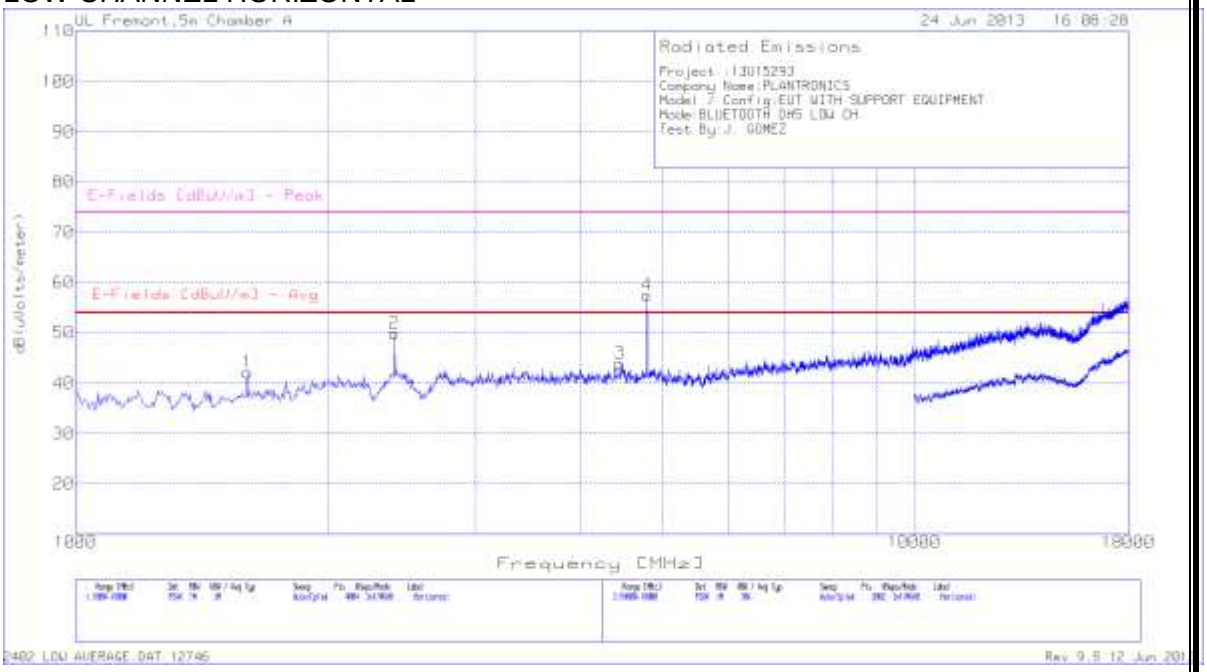
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



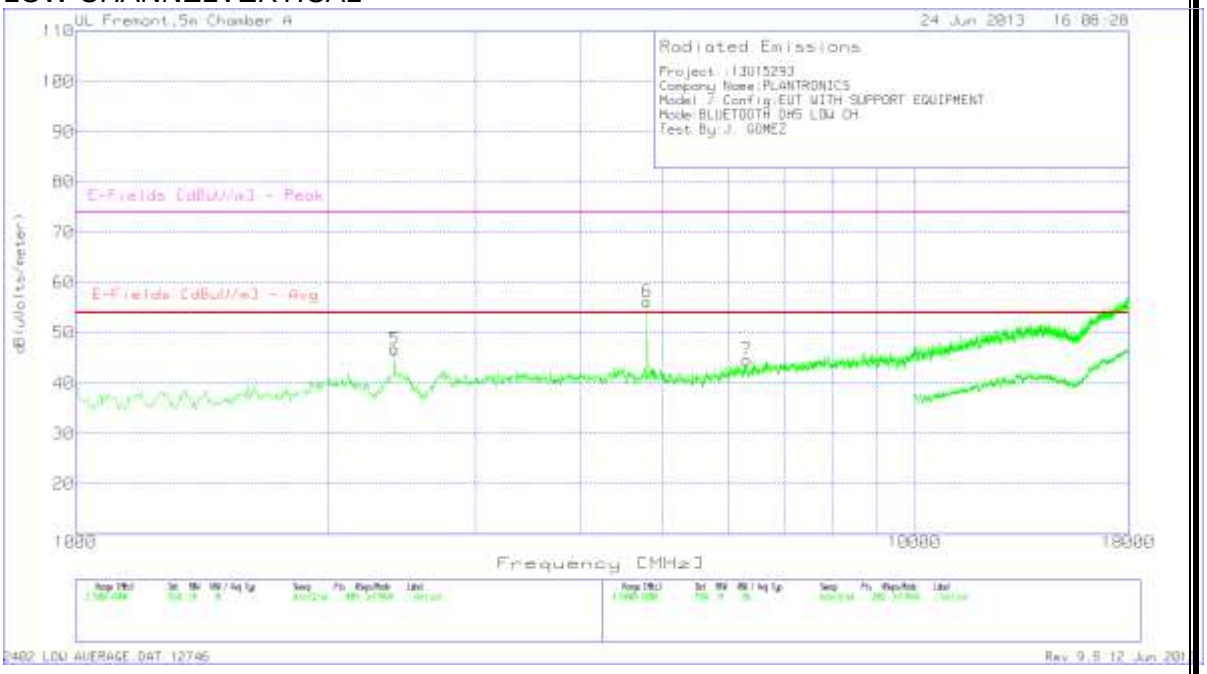
Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNELVERTICAL



HORIZONTAL VERTICAL DATA

Trace Markers

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height (cm)	Polarity
1.603	44.03	PK	29	-35.2	3.8	0.5	42.13	53.97	-11.84	74	-31.87	200	Horz
2.401	47.56	PK	32.3	-35	4.6	0.5	49.96	53.97	-4.01	74	-24.04	138	Horz
4.457	37.27	PK	34.4	-34.9	6.7	0.5	43.97	53.97	-10	74	-30.03	200	Horz
4.801	50.24	PK	34.7	-34.9	7	0.5	57.54	**53.97**	**3.57**	74	-16.46	138	Horz
2.401	44.44	PK	32.3	-35	4.6	0.5	46.84	53.97	-7.13	74	-27.16	100	Vert
4.801	48.91	PK	34.7	-34.9	7	0.5	56.21	**53.97**	**2.24**	74	-17.79	100	Vert
6.317	34.87	PK	36	-35	8.2	0.5	44.57	53.97	-9.4	74	-29.43	200	Vert

- Peak detector

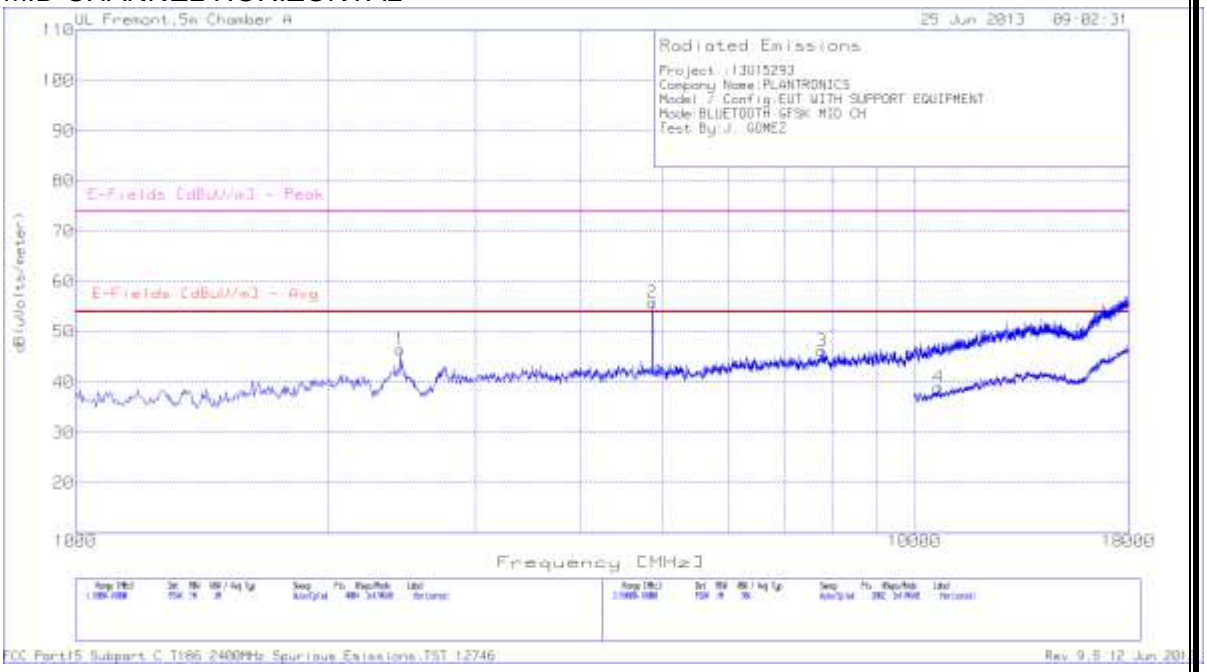
Radiated Emissions **DCCF=1.11 not accounted for**

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.804	43.24	RMS	34.7	-34.9	7	0.5	50.54	53.97	-3.43	74	-23.46	333	136	Horz
4.804	45.3	RMS	34.7	-34.9	7	0.5	52.6	53.97	-1.37	74	-21.4	162	122	Vert

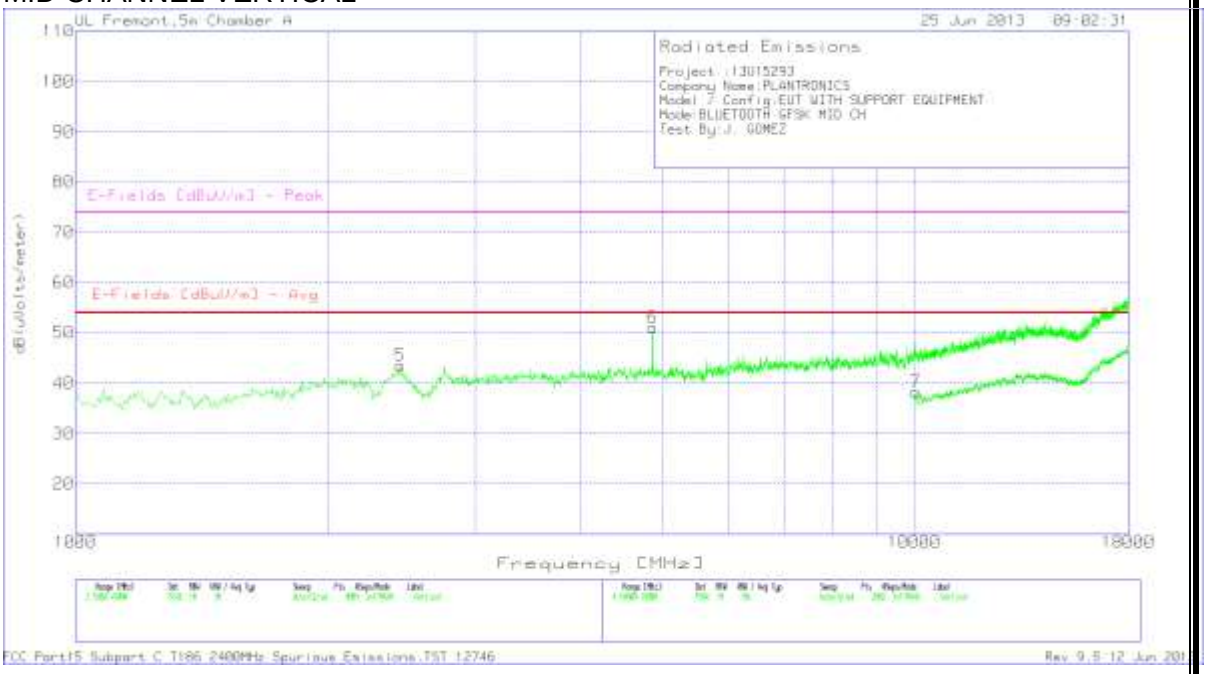
RMS - RMS detection

2402 LOW AVERAGE.DAT 12746Rev 9.5 12 Jun 2013

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



HORIZONTAL VERTICAL DATA

Trace Markers

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] Peak	Margin (dB)	Height (cm)	Polarity
2.44	43.88	PK	32.4	-35	4.7	0.5	46.48	53.97	-7.49	74	-27.52	100	Horz
4.877	48.56	PK	34.6	-34.9	7.1	0.5	55.86	**53.97**	**1.89**	74	-18.14	100	Horz
7.761	35.51	PK	36.2	-35.1	9.1	0.5	46.21	53.97	-7.76	74	-27.79	200	Horz
2.44	40.84	PK	32.4	-35	4.7	0.5	43.44	53.97	-10.53	74	-30.56	100	Vert
4.877	43.8	PK	34.6	-34.9	7.1	0.5	51.1	53.97	-2.87	74	-22.9	100	Vert
10.688	23.55	PK	38.3	-34.2	10.8	0.5	38.95	53.97	-15.02	74	-35.05	200	Horz
10.044	24.26	PK	37.8	-34.8	10.5	0.5	38.26	53.97	-15.71	74	-35.74	200	Vert

· Peak detector

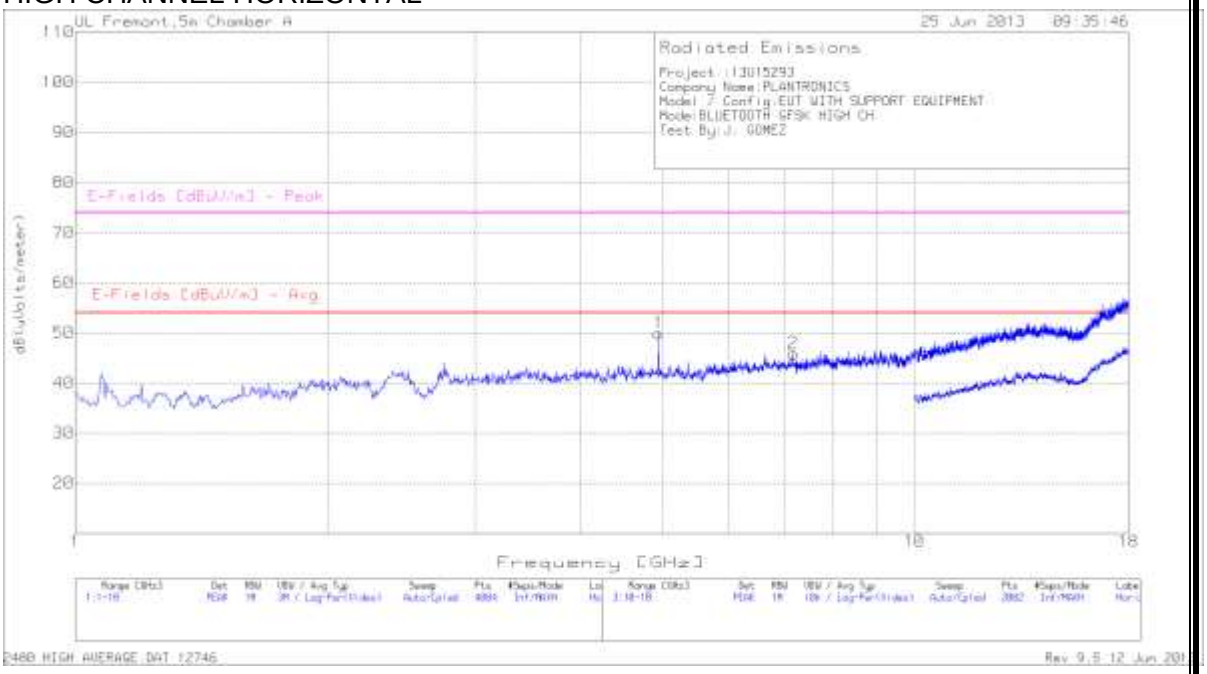
Radiated Emissions **DCCF=1.11 not accounted for**

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts /meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] Peak	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.882	37.45	RMS	34.6	-34.9	7.1	0.5	44.75	53.97	-9.22	74	-29.25	70	184	Horz
4.882	34.92	RMS	34.6	-34.9	7.1	0.5	42.22	53.97	-11.75	74	-31.78	164	106	Vert

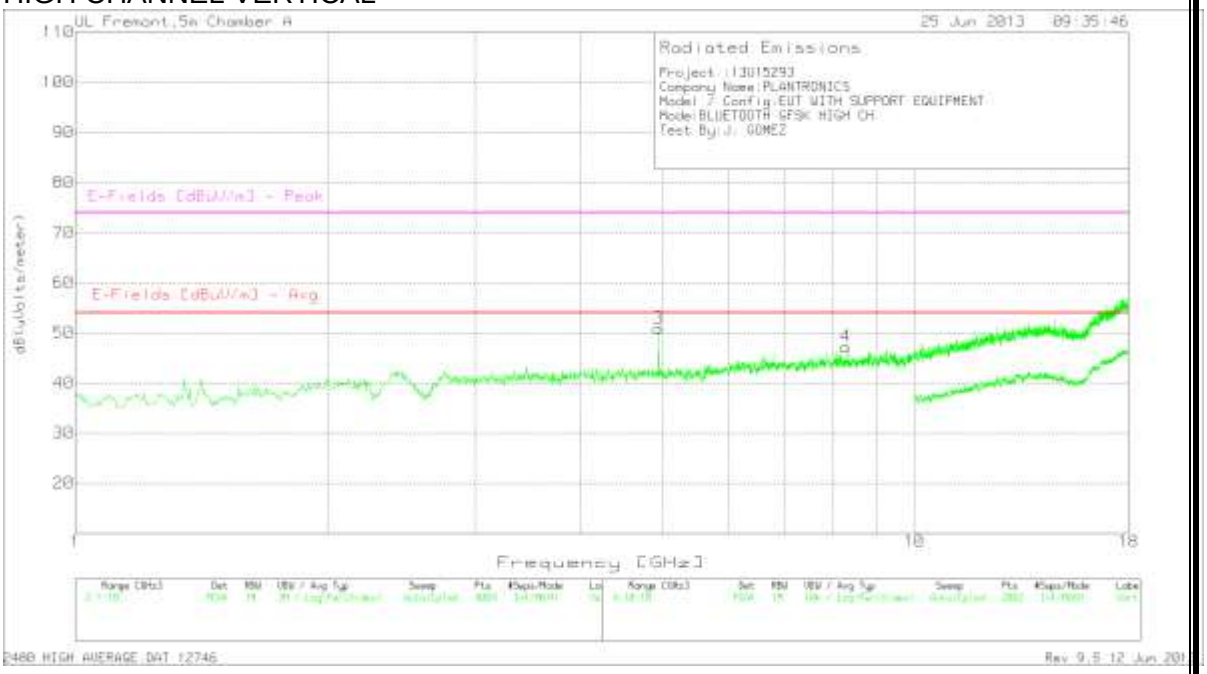
RMS - RMS detection

FCC Part15 Subpart C T186 2400MHz Spurious Emissions.TST 12746Rev 9.5 12 Jun 2013

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



HORIZONTAL VERTICAL DATA

Trace Markers

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.958	42.52	PK	34.6	-34.9	7.2	0.5	49.92	53.97	-4.05	74	-24.08	0-360	106	H
7.171	35.72	PK	35.8	-35	8.8	0.5	45.82	53.97	-8.15	74	-28.18	0-360	106	H
4.958	43.48	PK	34.6	-34.9	7.2	0.5	50.88	53.97	-3.09	74	-23.12	0-360	100	V
8.292	36.3	PK	36.1	-35.2	9.5	0.5	47.2	53.97	-6.77	74	-26.8	0-360	200	V

PK - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.96	33.41	RMS	34.6	-34.9	7.2	0.5	40.81	53.97	-13.16	74	-33.19	342	123	H
4.96	29.66	RMS	34.6	-34.9	7.2	0.5	37.06	53.97	-16.91	74	-36.94	88	101	V

RMS - RMS detection

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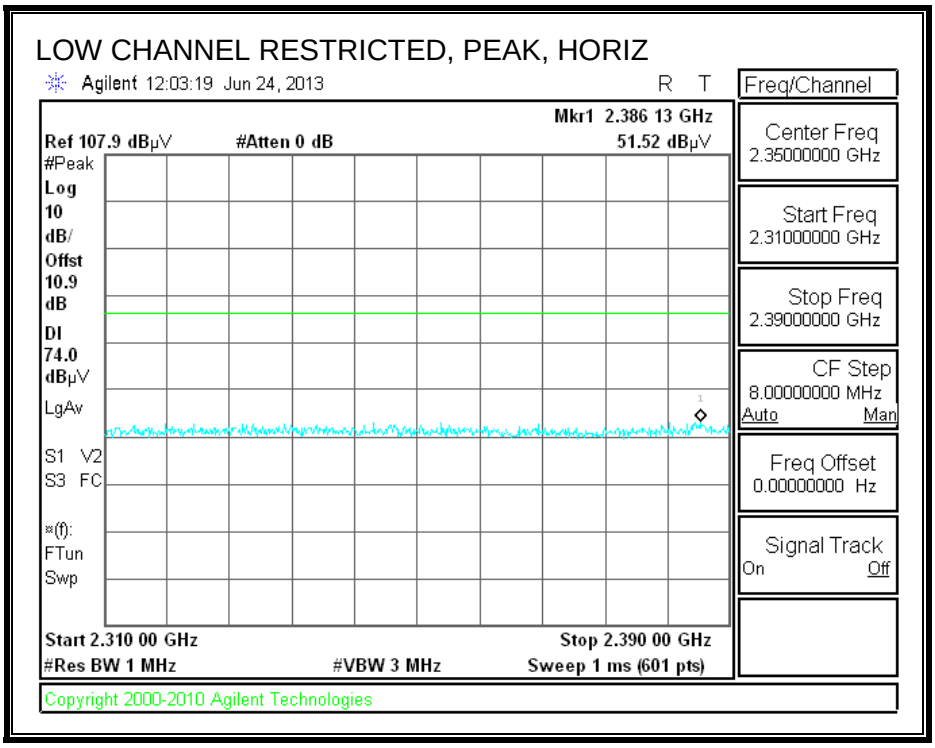
8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESULTS

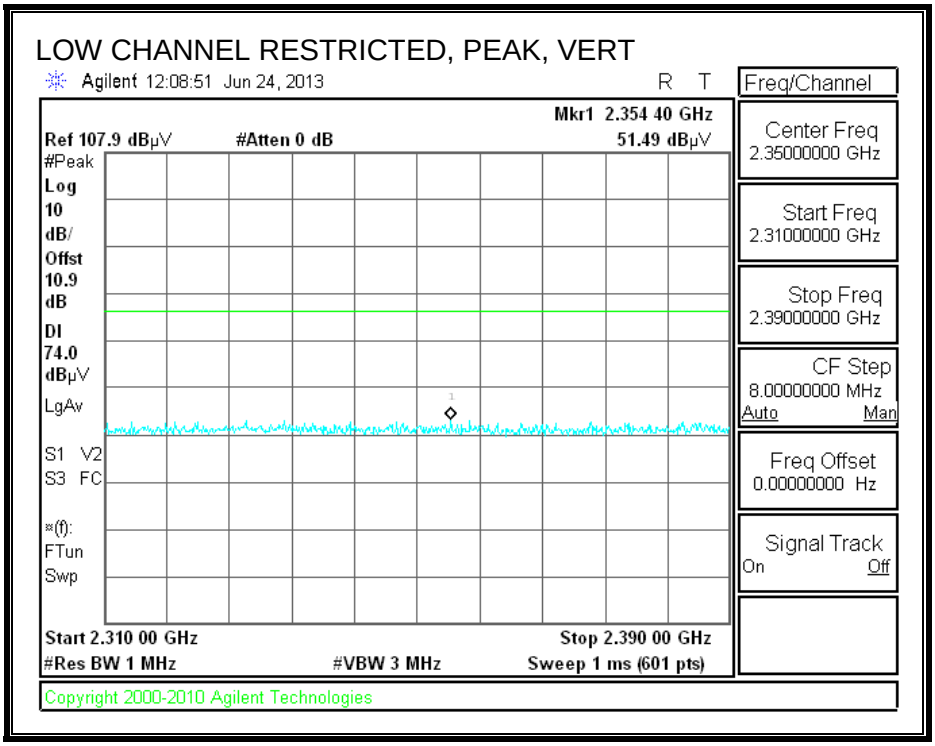
Frequency (MHz)	Field Strength (dBuV/m)	Detector	Polarity (H/V)	Limit (dBuV/m)	Margin (dB)	Comments
LOW CHANNEL						
2386.13	51.52	Peak	H	54.0	-2.5	Peak reading, average limit*
2354.40	51.49	Peak	V	54.0	-2.5	Peak reading, average limit*
HIGH CHANNEL						
2484.55	51.35	Peak	H	54.0	-2.65	Peak reading, average limit*
2484.38	51.42	Peak	V	54.0	-2.58	Peak reading, average limit*
* Peak reading is below the average limit, therefore average measurements are not required.						

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



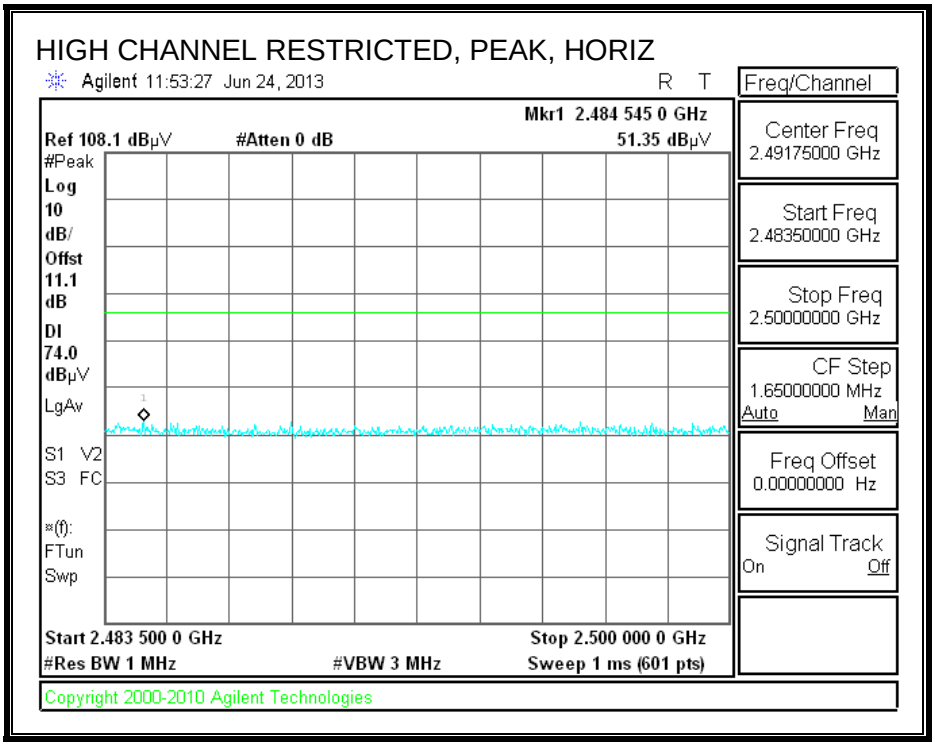
Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



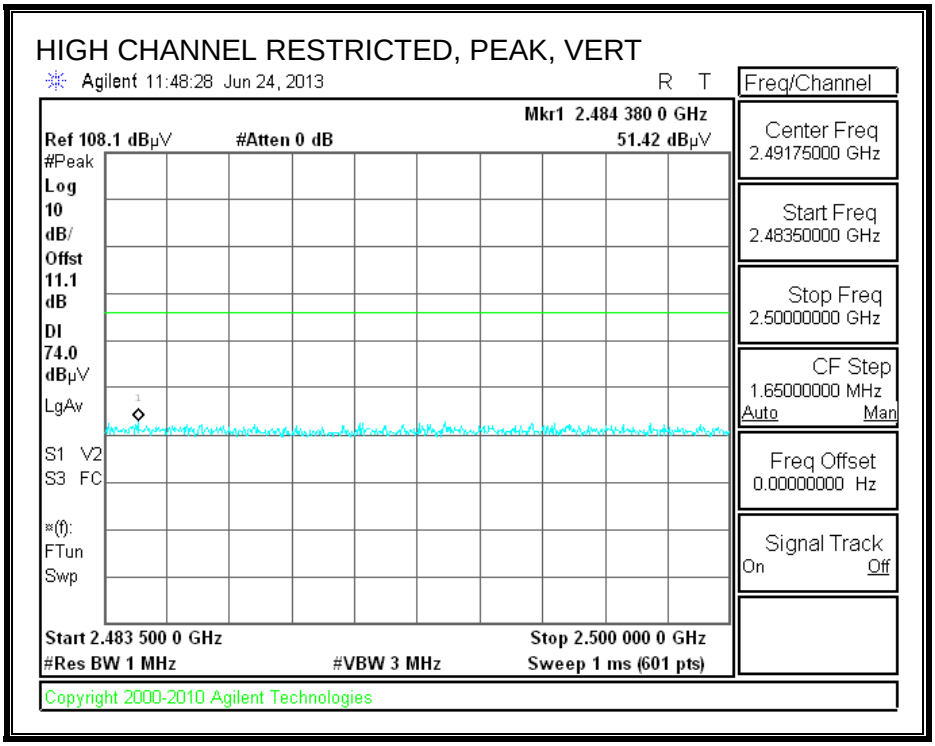
Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

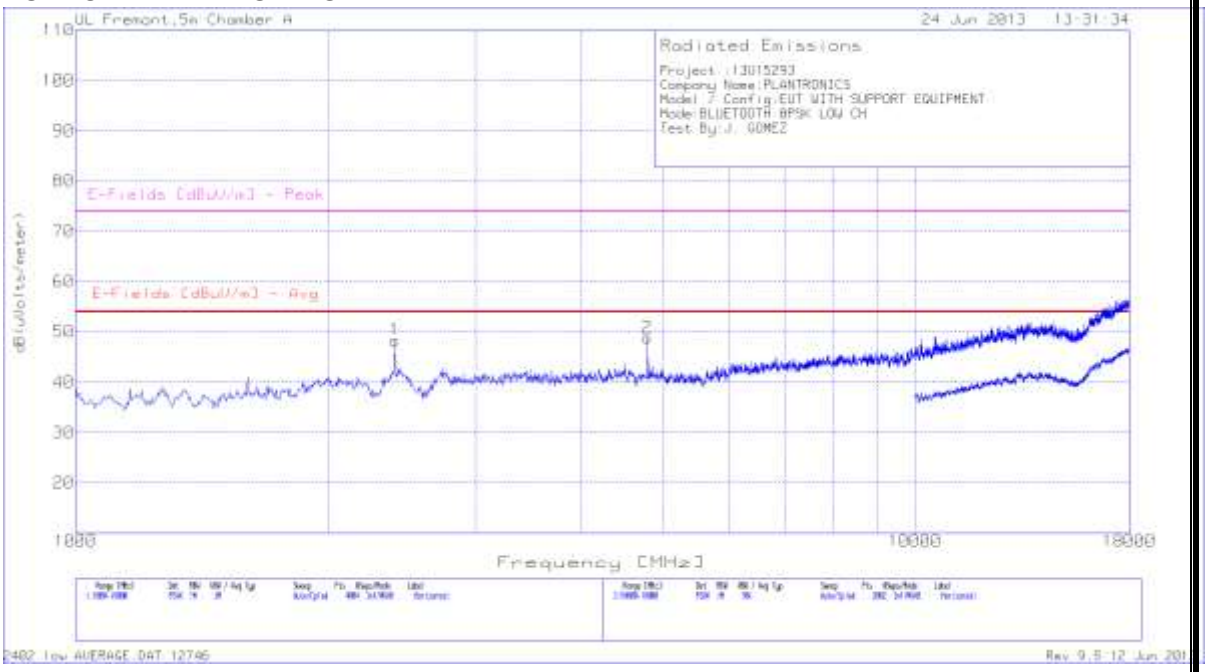
RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



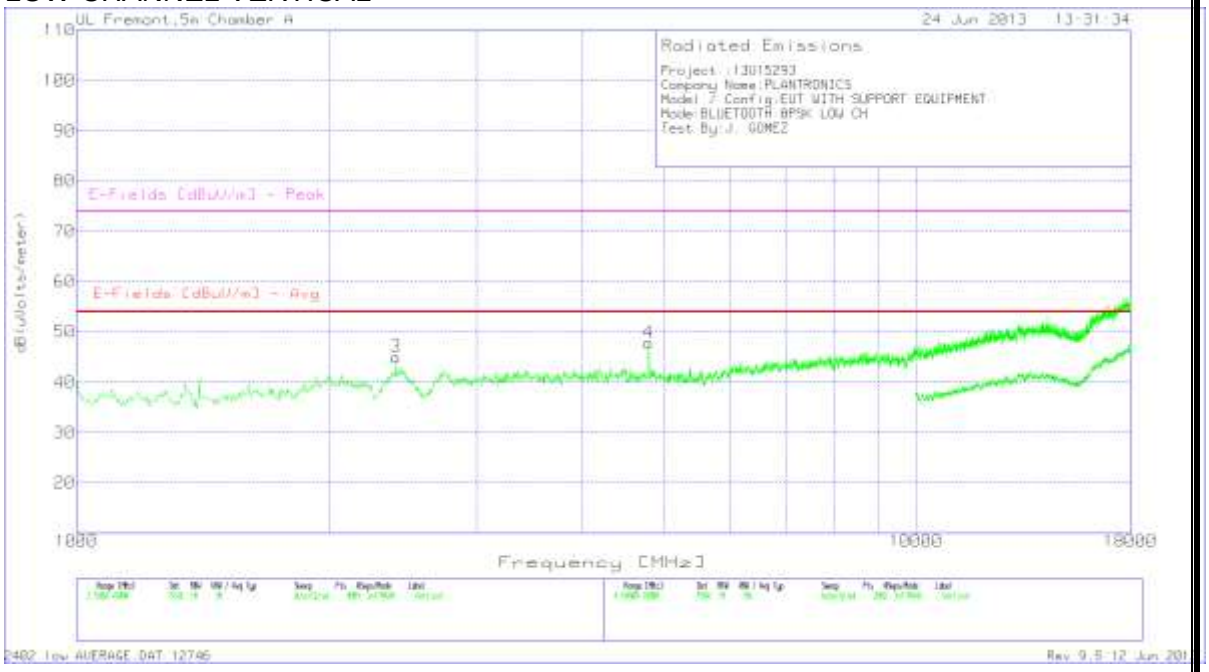
Pk measurement is less than the Avg limit of (54 dBuV). The average measurement was not made.

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



HORIZONTAL VERTICAL DATA

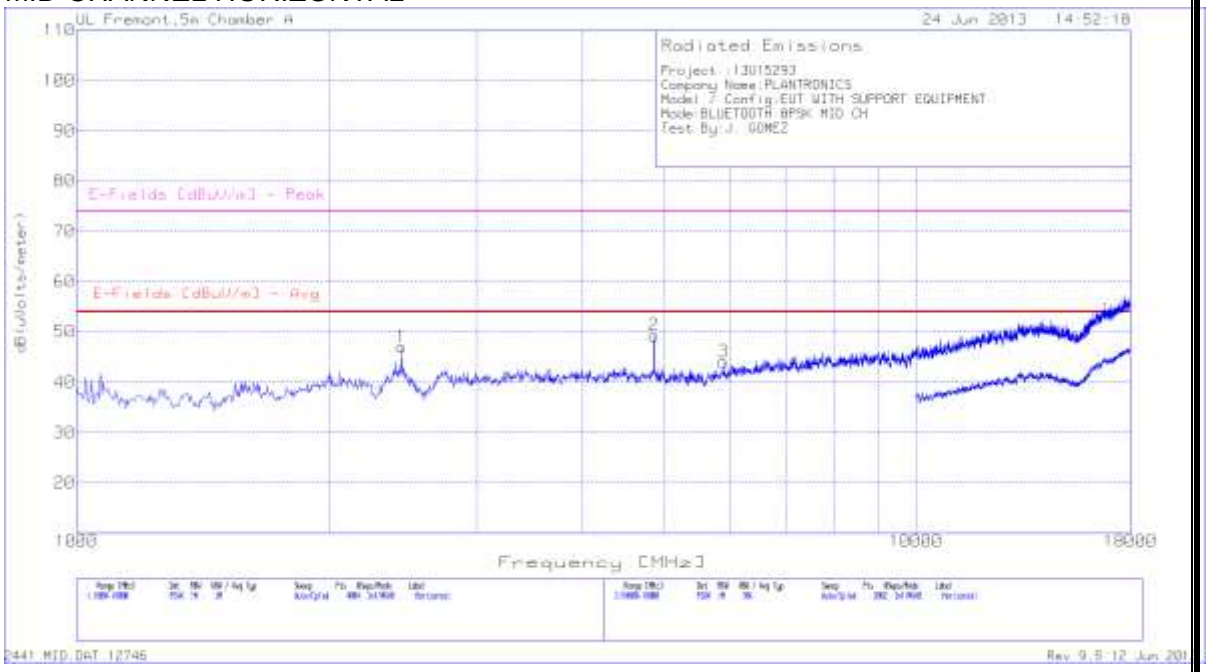
Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB (uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height (cm)	Polarity
2.401*	45.97	PK	32.3	-35	4.6	0.5	48.37	53.97	-5.6	74	-25.63	200	Horz
4.801	41.56	PK	34.7	-34.9	7	0.5	48.86	53.97	-5.11	74	-25.14	200	Horz
2.401*	42.63	PK	32.3	-35	4.6	0.5	45.03	53.97	-8.94	74	-28.97	200	Vert
4.801	40.54	PK	34.7	-34.9	7	0.5	47.84	53.97	-6.13	74	-26.16	100	Vert

* - Fundamental
PK - Peak detector
NEED TO ADD DCCF = 1.11

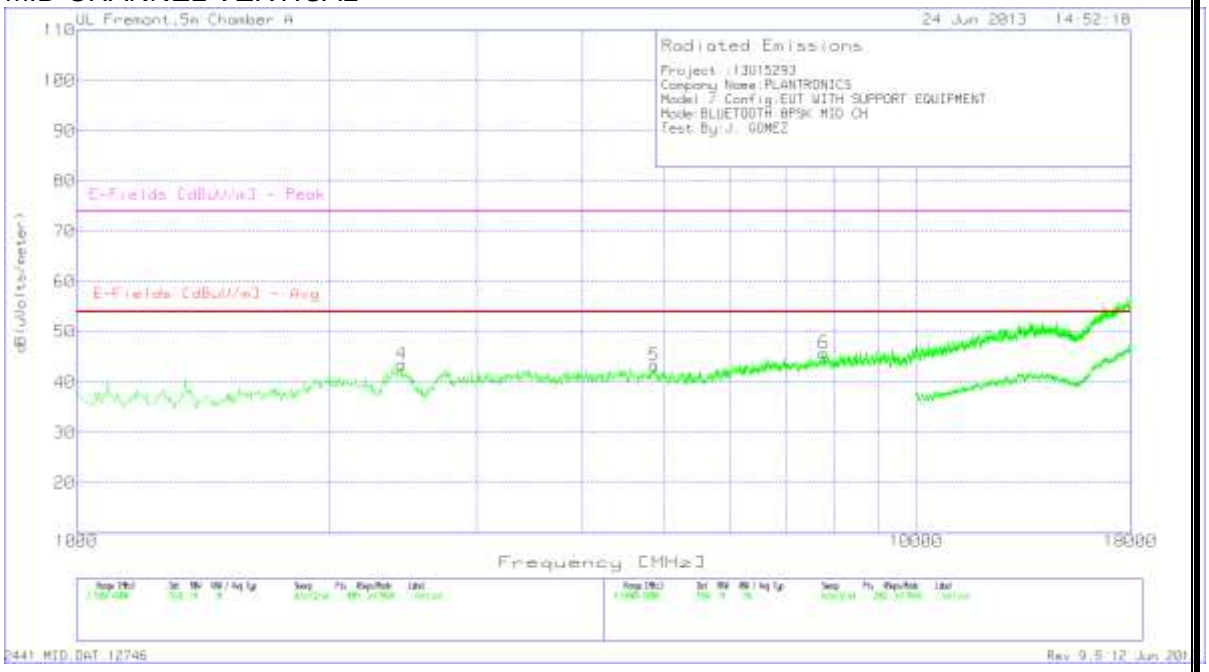
Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB (uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.804	36.59	RMS	34.7	-34.9	7	0.5	43.89	54	-10.11	74	-30.11	76	205	Horz

- RMS detection

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



HORIZONTAL VERTICAL DATA

Trace Markers

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height (cm)	Polarity
2.44	44.38	PK	32.4	-35	4.7	0.5	46.98	53.97	-6.99	74	-27.02	200	Horz
4.877	41.98	PK	34.6	-34.9	7.1	0.5	49.28	53.97	-4.69	74	-24.72	185	Horz
5.897	34.99	PK	35.6	-34.9	7.9	0.5	44.09	53.97	-9.88	74	-29.91	185	Horz
2.44	41	PK	32.4	-35	4.7	0.5	43.6	53.97	-10.37	74	-30.4	200	Vert
4.877	36.02	PK	34.6	-34.9	7.1	0.5	43.32	53.97	-10.65	74	-30.68	100	Vert
7.774	34.98	PK	36.2	-35.1	9.2	0.5	45.78	53.97	-8.19	74	-28.22	200	Vert

Peak detector
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	Corrected Reading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.882	24.13	RMS	34.6	-34.9	7.1	0.5	31.43	53.97	-22.54	74	-42.57	65	130	Horz

RMS - RMS detection
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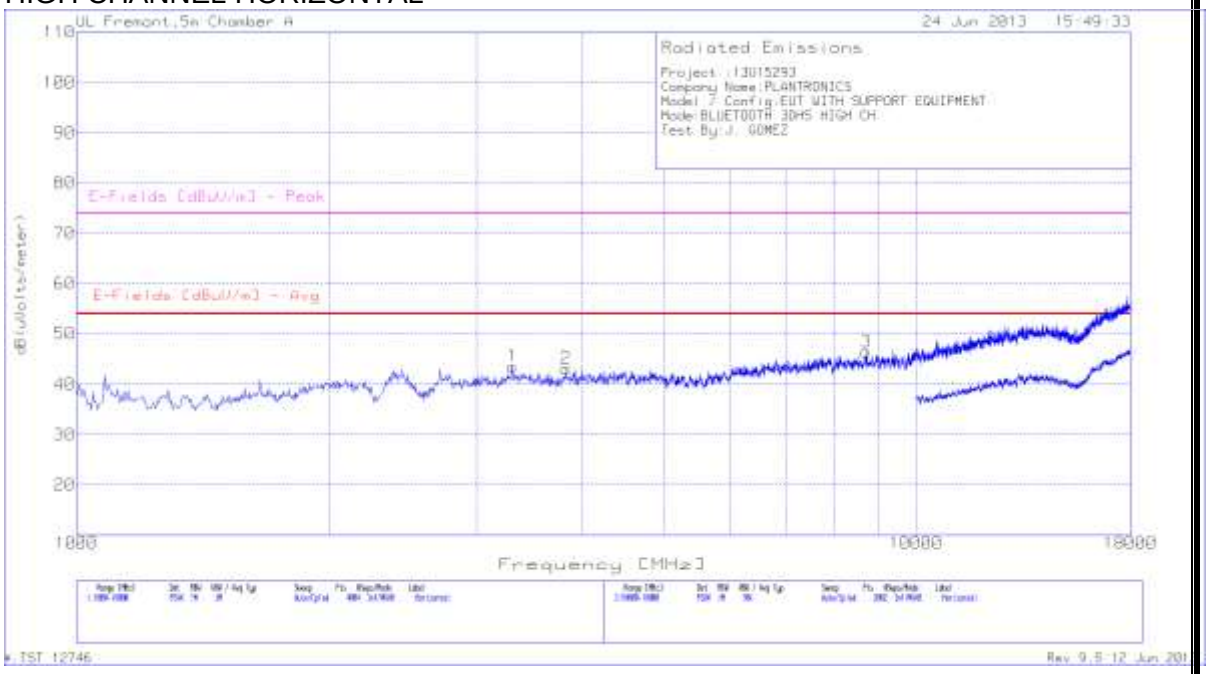
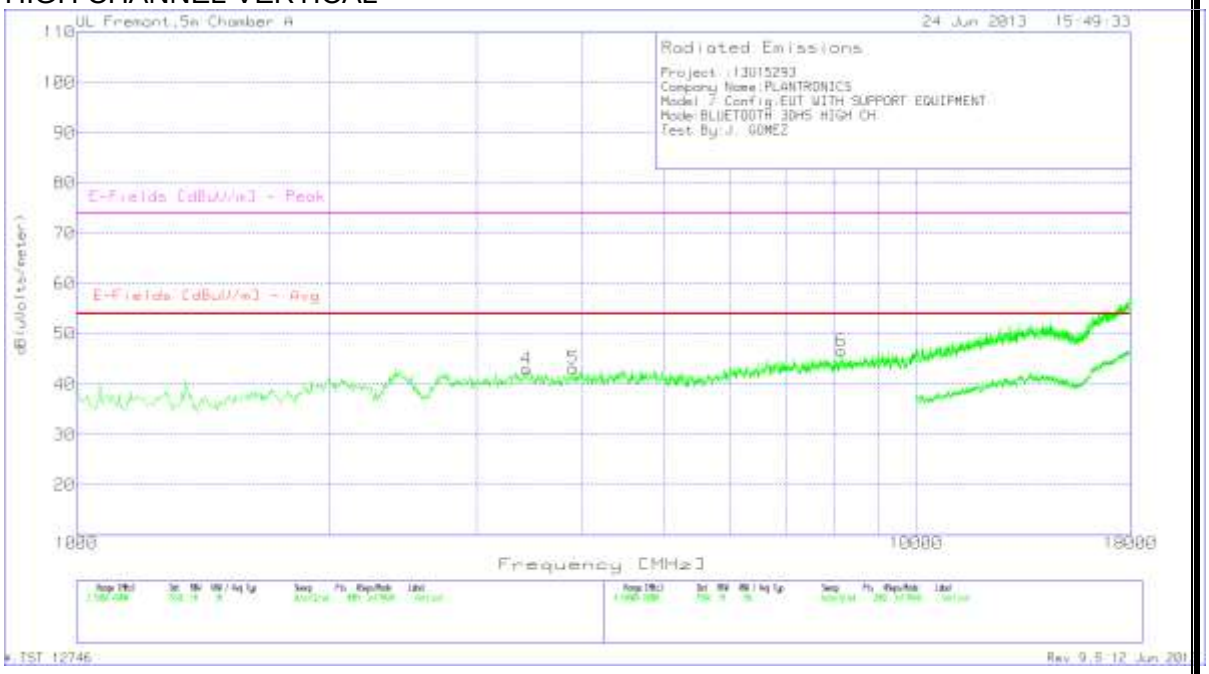
HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



HORIZONTAL VERTICAL DATA

Trace Markers

Frequency(GHz)	Meter Reading(dBuV)	Det	T345 Ant Factor [dB/m]	T145 Preamp Gain [dB]	Cable Factor [dB]	T186 BRF 2.4-2.5GHz	CorrectedReading dB(uVolts/meter)	E-Fields [dBuV/m] - Avg	Margin (dB)	E-Fields [dBuV/m] - Peak	Margin (dB)	Height (cm)	Polarity
3.306	39.22	PK	33.3	-35.1	5.6	0.5	43.52	53.97	-10.45	74	-30.48	200	Horz
3.828	37.57	PK	33.8	-34.9	6.1	0.5	43.07	53.97	-10.9	74	-30.93	104	Horz
8.725	35.03	PK	36.4	-35.2	9.7	0.5	46.43	53.97	-7.54	74	-27.57	104	Horz
3.438	38.63	PK	33.2	-35	5.7	0.5	43.03	53.97	-10.94	74	-30.97	100	Vert
3.905	37.62	PK	33.9	-34.9	6.1	0.5	43.22	53.97	-10.75	74	-30.78	200	Vert
8.143	35.8	PK	36.1	-35.2	9.4	0.5	46.6	53.97	-7.37	74	-27.4	100	Vert

PK - Peak detector

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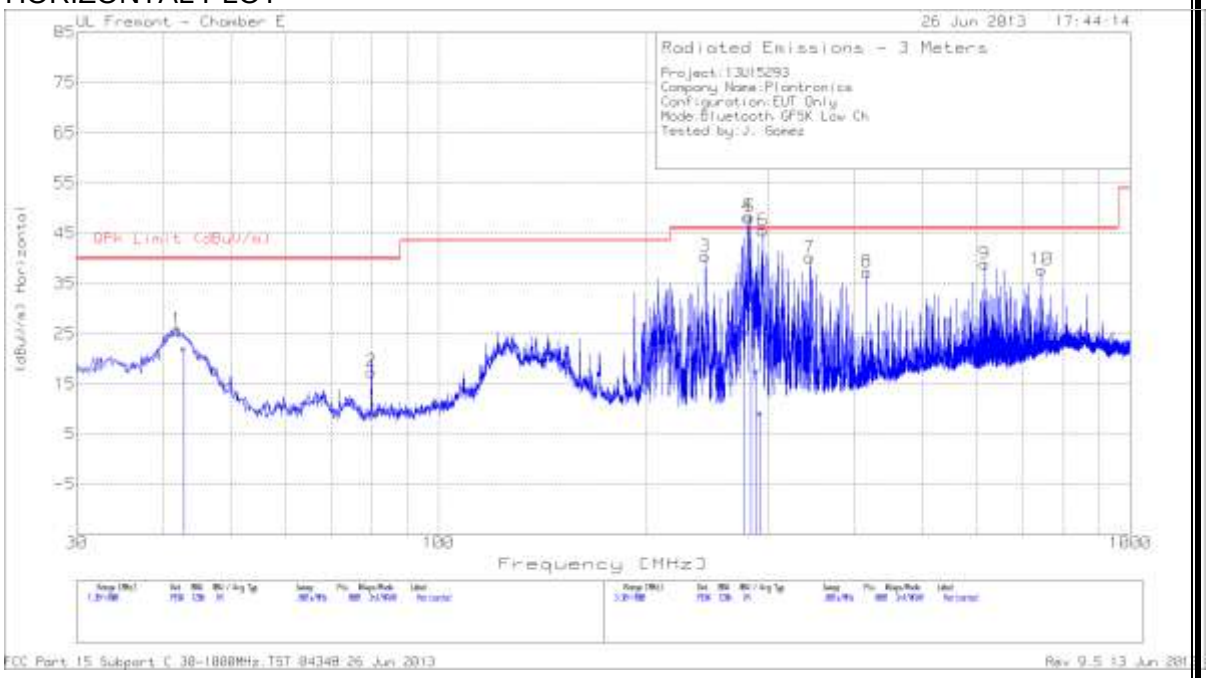
8.3. WORST-CASE BELOW 1 GHz

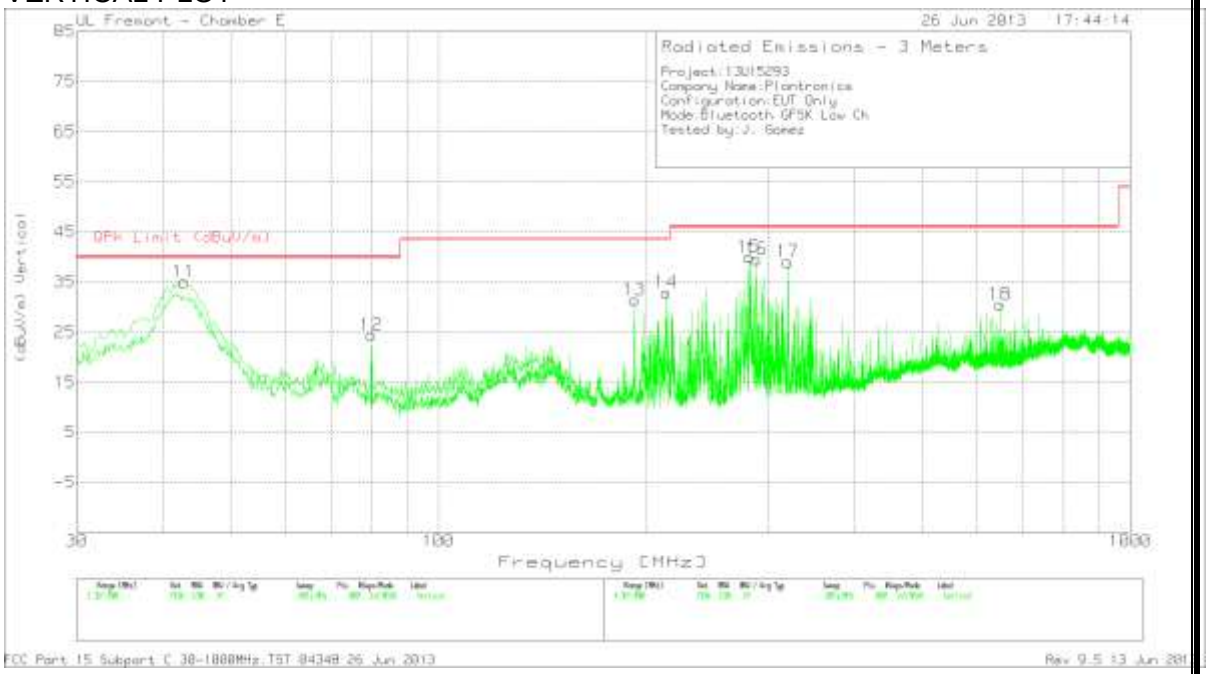
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarity
1	41.8825	40.48	PK	12.6	-27.3	25.78	40	-14.22	300	H
2	79.955	37.42	PK	7.7	-27.7	17.42	40	-22.58	200	H
3	242.915	55.42	PK	11.6	-26.6	40.42	46.02	-5.6	98	H
5	281.715	61.05	PK	13.5	-26.3	48.25	**46.02**	**2.23**	98	H
10	743.92	43.33	PK	20.7	-26.3	37.73	46.02	-8.29	98	H
11	42.8525	50.7	PK	11.8	-27.5	35	40	-5	100	V
12	79.955	44.4	PK	7.7	-27.7	24.4	40	-15.6	100	V
15	280.9875	52.74	PK	13.5	-26.3	39.94	46.02	-6.08	100	V
16	288.02	52.6	PK	13.4	-26.5	39.5	46.02	-6.52	100	V
17	319.7875	52.63	PK	13.9	-27.5	39.03	46.02	-6.99	100	V
4	279.6538	61.04	PK	13.5	-26.3	48.24	**46.02**	**2.22**	100	H
6	294.325	59.36	PK	13.3	-27.1	45.56	46.02	-.46	100	H
7	343.9163	53.58	PK	14.2	-27.6	40.18	46.02	-5.84	100	H
8	416.06	49.09	PK	15.9	-27.7	37.29	46.02	-8.73	100	H
9	615.88	46.86	PK	19	-26.9	38.96	46.02	-7.06	300	H
13	191.99	46.72	PK	11.4	-26.7	31.42	43.52	-12.1	200	V
14	213.33	50.08	PK	10.4	-27.6	32.88	43.52	-10.64	200	V
18	648.0113	38.31	PK	19.6	-27.4	30.51	46.02	-15.51	300	V

PK - Peak detector

Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
283.25	42.77	QP	13.5	-26.3	29.97	46.02	-16.05	309	141	H
42.8225	37.52	QP	11.8	-27.5	21.82	40	-18.18	314	169	V
277.3675	37.84	QP	13.4	-26.3	24.94	46.02	-21.08	325	166	H
287.9925	30.43	QP	13.4	-26.5	17.33	46.02	-28.69	268	242	H

QP – Quasi Peak

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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.

Highest output conducted power was measured when Tx is set to GFSK high-channel

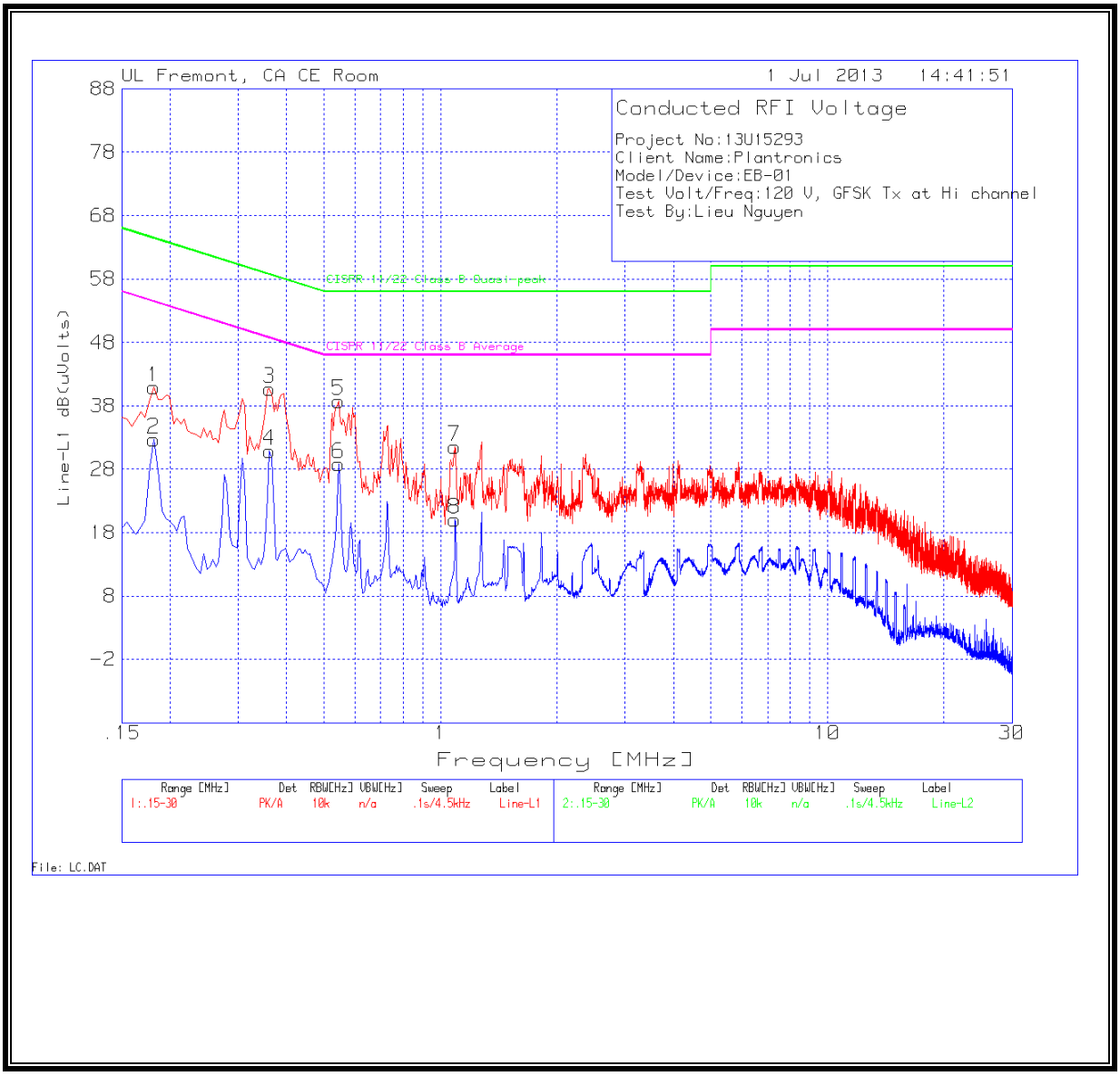
RESULTS

6 WORST EMISSIONS

Project No:13U15293
Client Name:Plantronics
Model/Device:EB-01
Test Volt/Freq:120 V, GFSK Tx at Hi channel
Test By:Lieu Nguyen

Test Frequency MHz	Meter Reading dBµV	Detector	LISN dB	Cable Loss dB	Corrected dB(µV)	CISPR 22 Class B QP Limit	Margin dB	CISPR 22 Class B Average Limit	Margin dB
Line-L1 .15 - 30MHz									
0.1815	40.78	PK	0.1	0	40.88	64.4	-23.52	-	-
0.1815	32.56	Av	0.1	0	32.66	-	-	54.4	-21.74
0.3615	40.61	PK	0.1	0	40.71	58.7	-17.99	-	-
0.3615	30.81	Av	0.1	0	30.91	-	-	48.7	-17.79
0.546	38.68	PK	0.1	0	38.78	56	-17.22	-	-
0.546	28.77	Av	0.1	0	28.87	-	-	46	-17.13
1.0905	31.43	PK	0.1	0	31.53	56	-24.47	-	-
1.0905	19.97	Av	0.1	0	20.07	-	-	46	-25.93
Line-L2 .15 - 30MHz									
0.1815	44.54	PK	0.1	0	44.64	64.4	-19.76	-	-
0.1815	31.09	Av	0.1	0	31.19	-	-	54.4	-23.21
0.384	44.55	PK	0.1	0	44.65	58.2	-13.55	-	-
0.384	12.62	Av	0.1	0	12.72	-	-	48.2	-35.48
0.546	42.47	PK	0.1	0	42.57	56	-13.43	-	-
0.546	27.59	Av	0.1	0	27.69	-	-	46	-18.31
1.095	37.29	PK	0.1	0	37.39	56	-18.61	-	-
1.095	18.98	Av	0.1	0	19.08	-	-	46	-26.92

LINE 1 RESULTS



LINE 2 RESULTS