FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

BLUETOOTH HEADSET

MODEL NUMBER: BackBeat FIT

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

REPORT NUMBER: 14U16884-1 Revision B

ISSUE DATE: FEBRUARY 17, 2014

Prepared for
PLANTRONICS, INC.
345 ENCINAL STREET
SANTA CRUZ, CA 95060, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	02/11/2014	Initial Issue	F. de Anda
A	02/12/2014	Updated test methodology	F. de Anda
B	02/17/2014	TCB corrections	F. de Anda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PLANTRONICS, INC.
345 ENCINAL STREET
SANTA CRUZ, CA. 95060, U.S.A.

EUT DESCRIPTION: BLUETOOTH HEADSET

MODEL: BackBeat FIT

SERIAL NUMBER: Radiated #93 & #96
Conducted #83 & #91

DATE TESTED: January 16, 2014-February 04, 2014

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
UL Verification Services Inc. By:

FRANCISCO DEANDA
PROJECT LEAD
UL Verification Services Inc.

Tested By:

TONY WAGONER
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 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☐ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☒ Chamber F

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 a Bluetooth Headset.

The radio module is manufactured by CSR

The manufacturer declares that they support AFH with a minimum of 20 channels, following the Bluetooth protocol to ensure compliance with the pseudo-hopping sequence and dwell time requirements of FCC 15.247.

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	6.54	4.51
2402 - 2480	8DPSK	4.62	2.90
2402 - 2480	DQPSK	4.47	2.80

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a folded dipole antenna, with a maximum gain of -5.4 dBi.

5.4. SOFTWARE AND FIRMWARE

Software and Firmware revision: P1M

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission 30-1000 MHz was performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

Power line conducted emission was performed with the EUT connected to a charging adapter; the EUT can't operate while being charged.

Three orthogonal orientations were investigated to find worst-case orientation; Y orientation is considered to be the worst case. Final radiated testing was performed with EUT in Y orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**S/N**	**FCC ID**
AC/DC adapter	Plantronics	SSA-4W5	1802455	DoC
DC Power Supply	Extech	382200	AT1493	NA

I/O CABLES

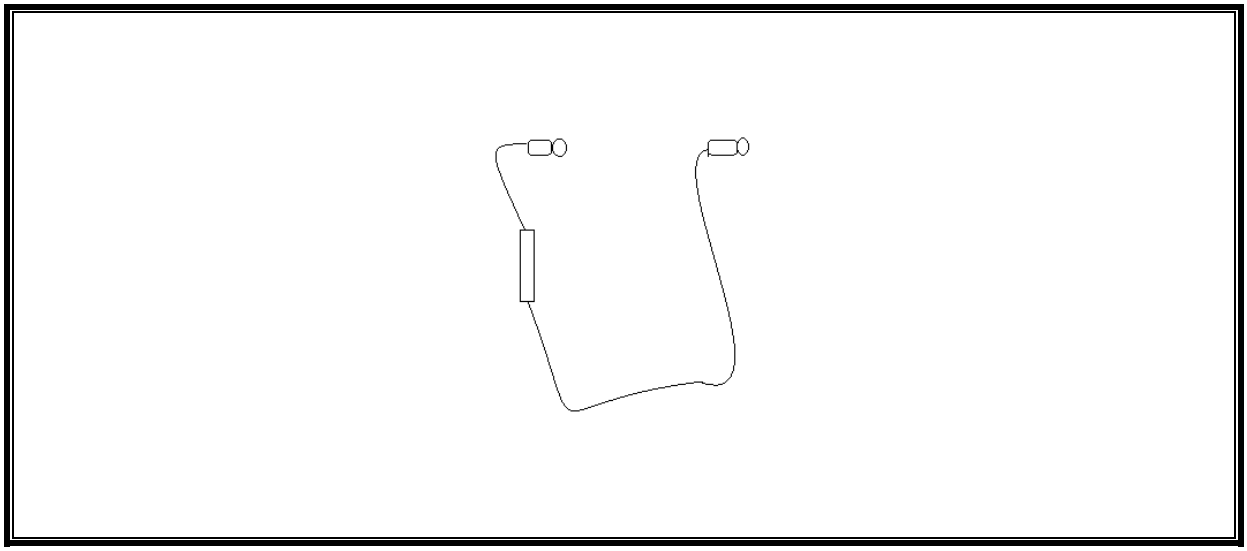
I/O CABLE LIST						
Cable No.	**Port**	**No. of identical ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	USB	1	USB	Shielded	1.2m	EUT Charger Cable

TEST SETUP

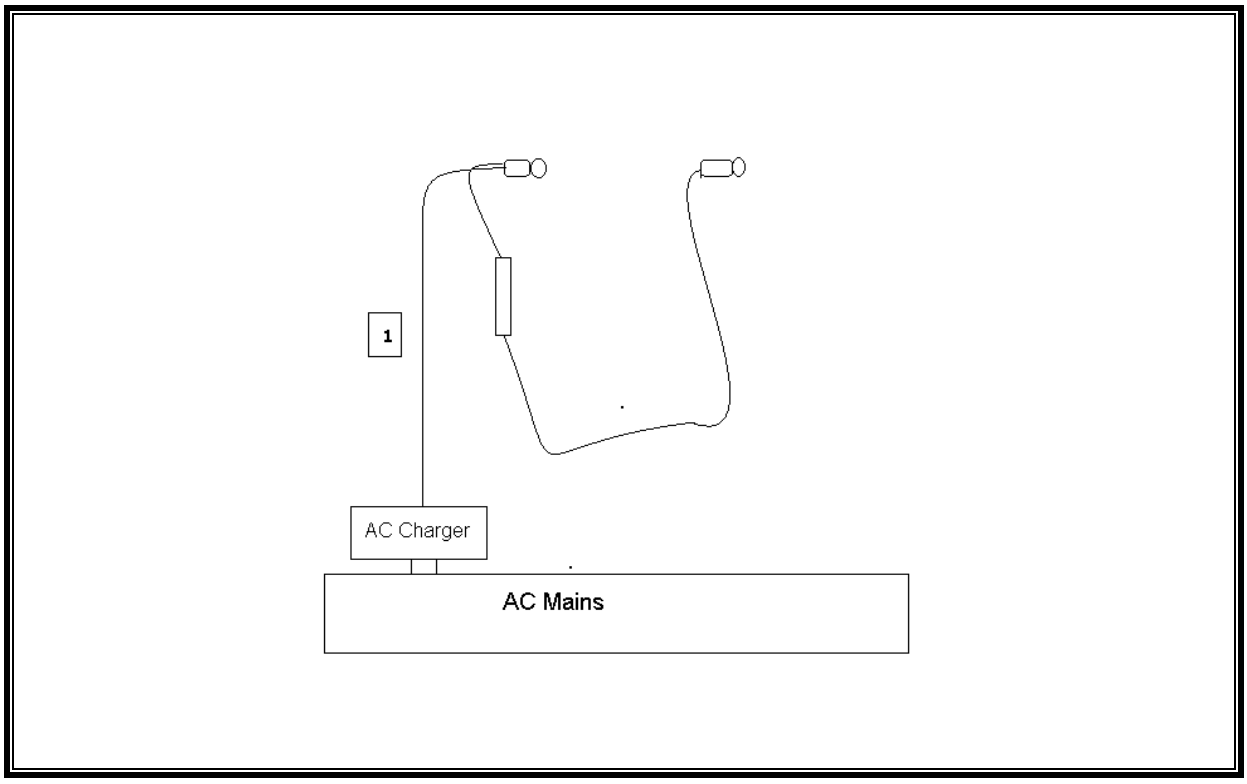
The EUT was set up in standalone, and charging mode as shown in the following diagrams;

TEST SETUP DIAGRAMS

Standalone mode



Charging mode



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 (Radiated)	Agilent	N9030A	F00129	2/22/2014
Spectrum Analyzer (Conducted)	Agilent	N9030A	F00126	12/10/2014
Antenna, Horn, 18-25 GHz	ARA	MWH-1826/B	1049	11/26/2014
Antenna, Horn, 1-18 GHz	ETS Lindgren	3117	C01005	3/20/2014
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	3/28/2014
High Pass Filter, fc: 3.0GHz, 50 Ohms	Micro-Tronics	HPM17543	F00181	8/24/2014
Low Pass Filter, fc: 5GHz, 50 Ohms	Micro-Tronics	LPS17541	F00175	8/24/2014
High Pass Filter, fc: 6GHz, 50 Ohms	Micro-Tronics	HPS17542	F00179	8/24/2014
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	8/20/2014
RF PreAmplifier, 1-18GHz	Miteq	3MF	F00354	8/24/2014
Preamp, 1000MHz	Sonoma	310N	N02891	12/30/2014
Single Channel PK Power Meter	Agilent	N1911A	F00022	4/3/2014
Wideband Power Sensor, 30MHz vbh	Agilent	N1921A	F00358	10/1/2014
CBT Bluetooth Tester	R & S	CBT	F00077	7/2/2014
EMI Test Receiver, 30 MHz	R & S	ESHS20	N02396	8/15/2014

7. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

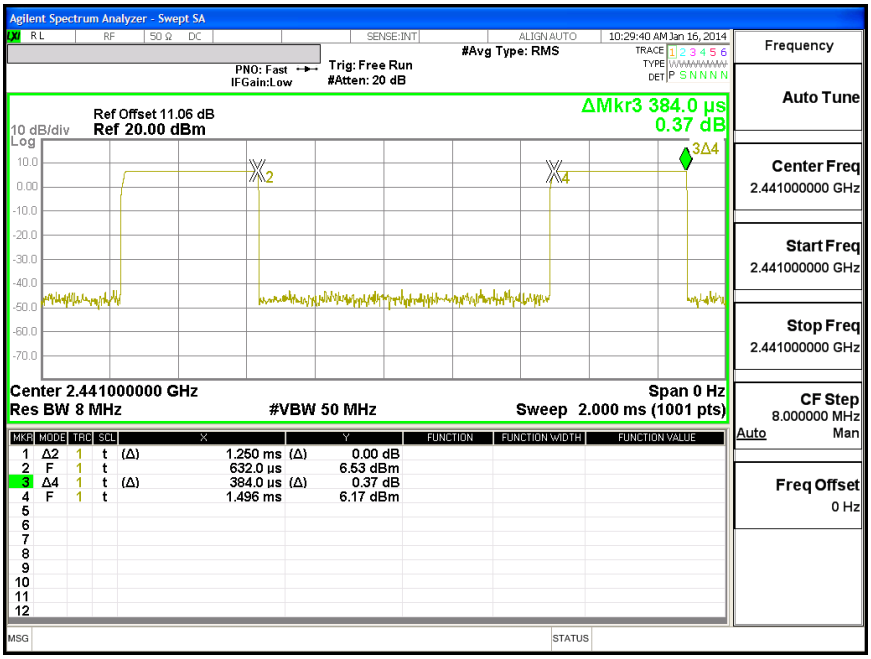
7.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4 GHz band (Hopping OFF)						
Bluetooth GFSK	0.384	1.250	0.307	30.72%	5.13	2.604
Bluetooth DQFSK	0.398	1.254	0.317	31.74%	4.98	2.513
Bluetooth 8DPSK	0.392	1.250	0.314	31.36%	5.04	2.551

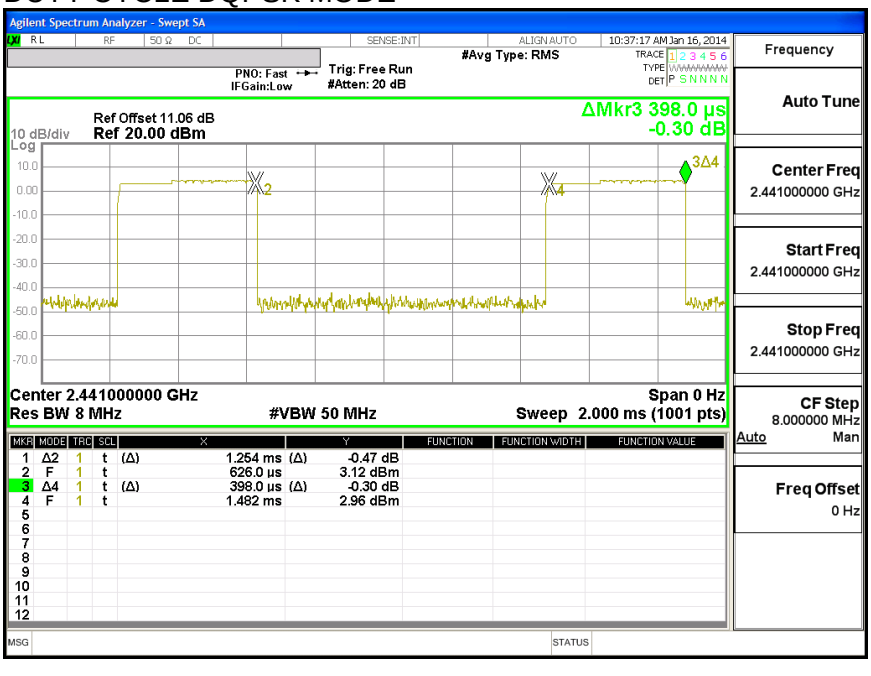
7.2. DUTY CYCLE PLOTS

HOPPING OFF

DUTY CYCLE GFSK MODE



DUTY CYCLE DQPSK MODE



DUTY CYCLE 8PSK MODE

8. ANTENNA PORT TEST RESULTS

8.1. BASIC DATA RATE GFSK MODULATION

8.1.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

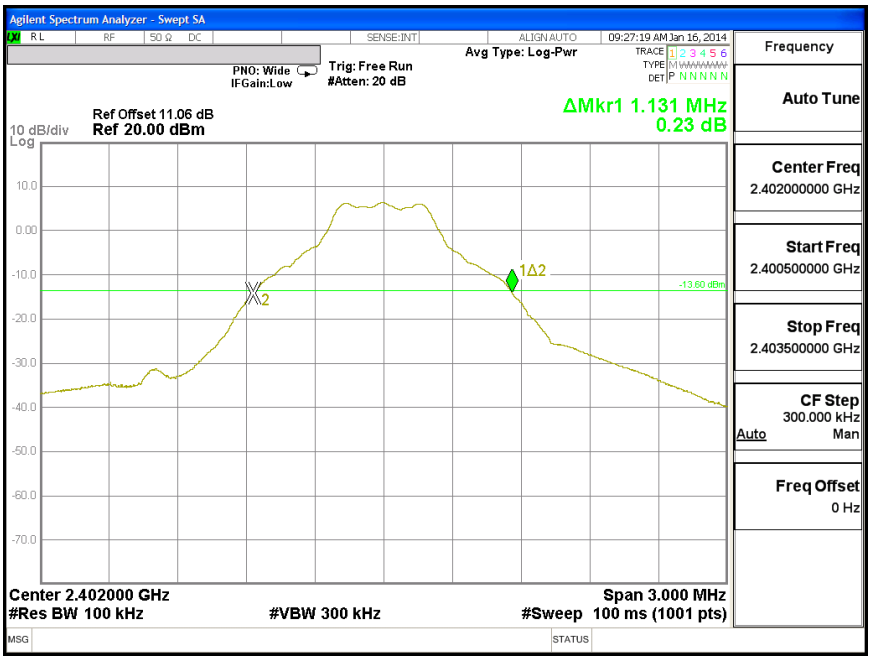
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

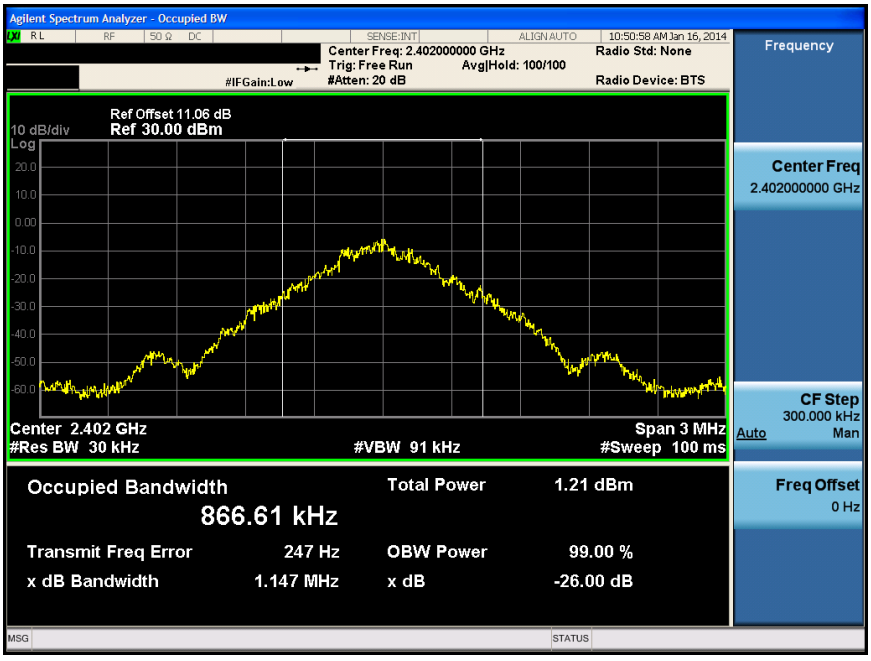
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1131	866.61
Middle	2441	1131	863.58
High	2480	1137.5	867.7

20 dB AND 99% BANDWIDTH

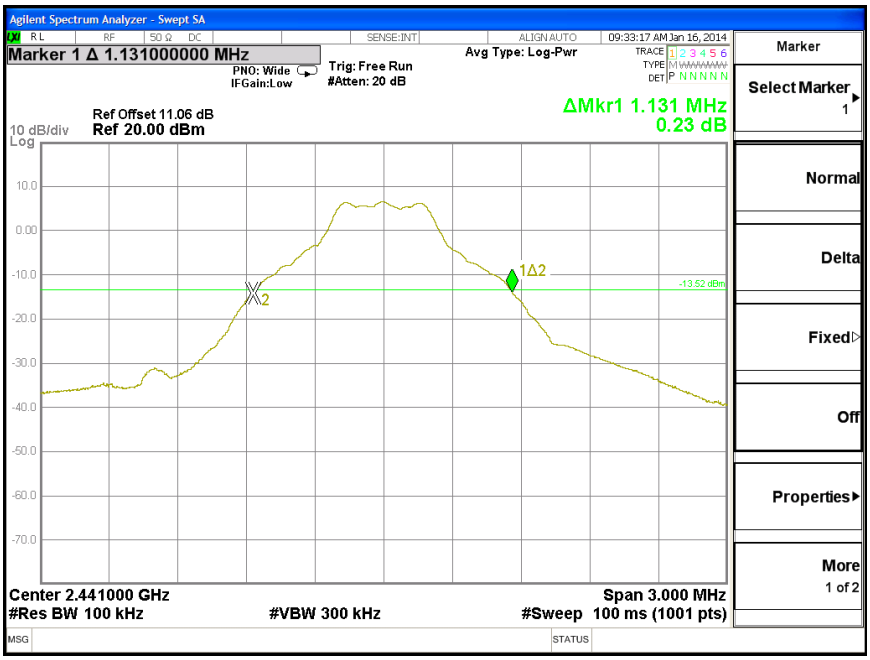
20dB BANDWIDTH LOW CH



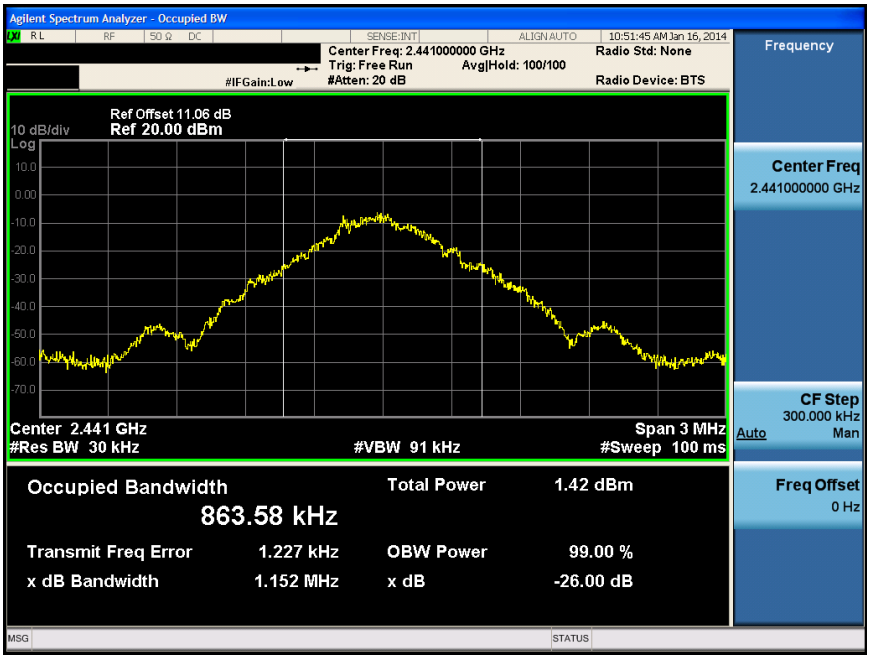
99% BANDWIDTH LOW CH



20dB BANDWIDTH MID CH

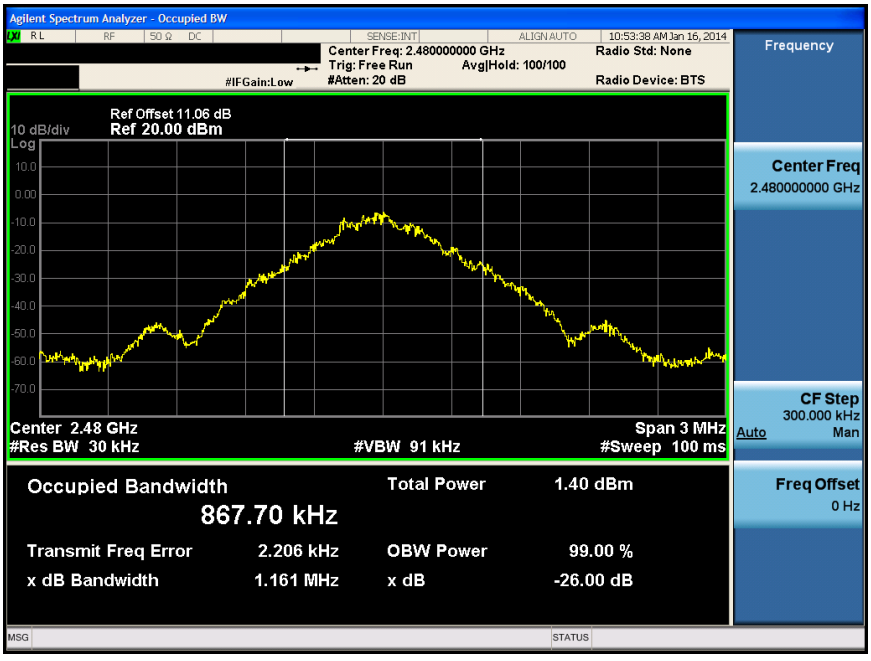


99% BANDWIDTH MID CH



20dB BANDWIDTH HIGH CH

99% BANDWIDTH HIGH CH



8.1.2. 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.

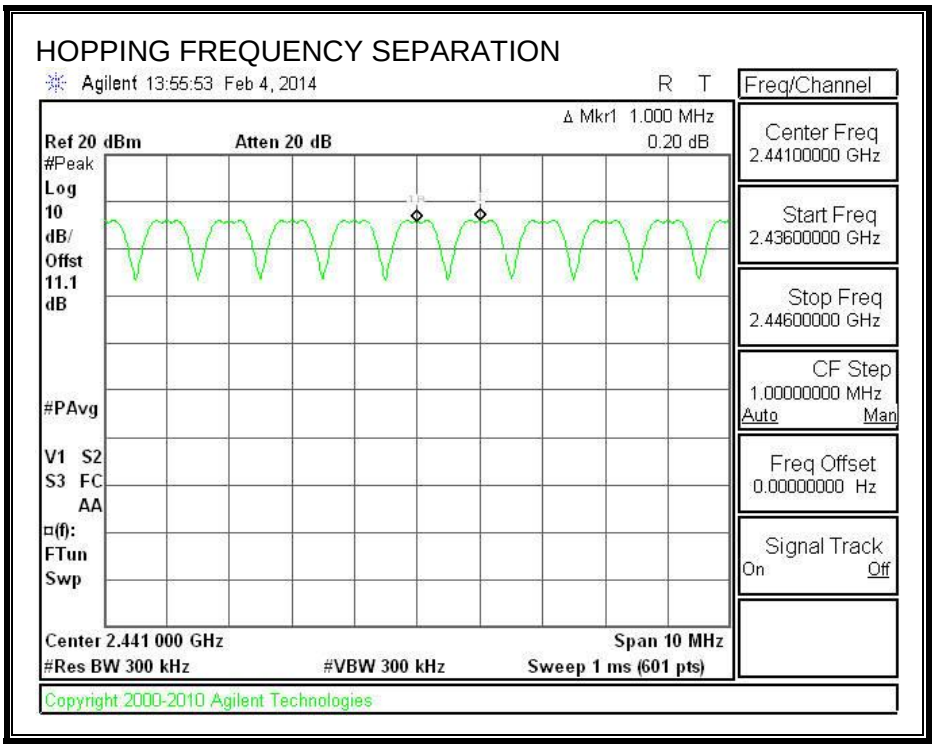
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION



8.1.3. 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.

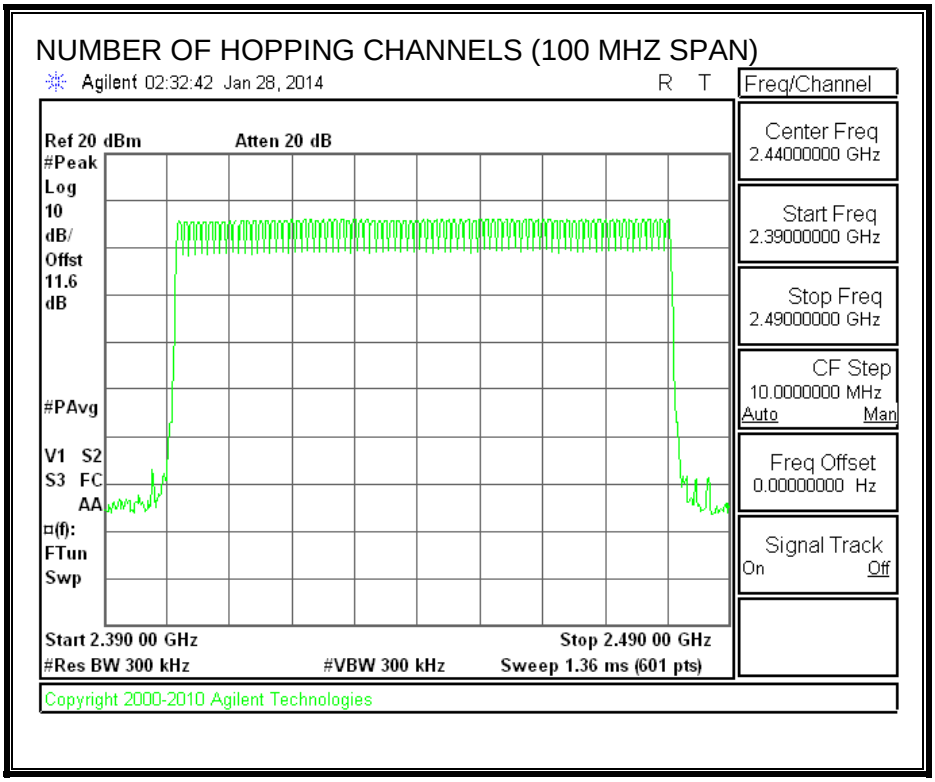
TEST PROCEDURE

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.

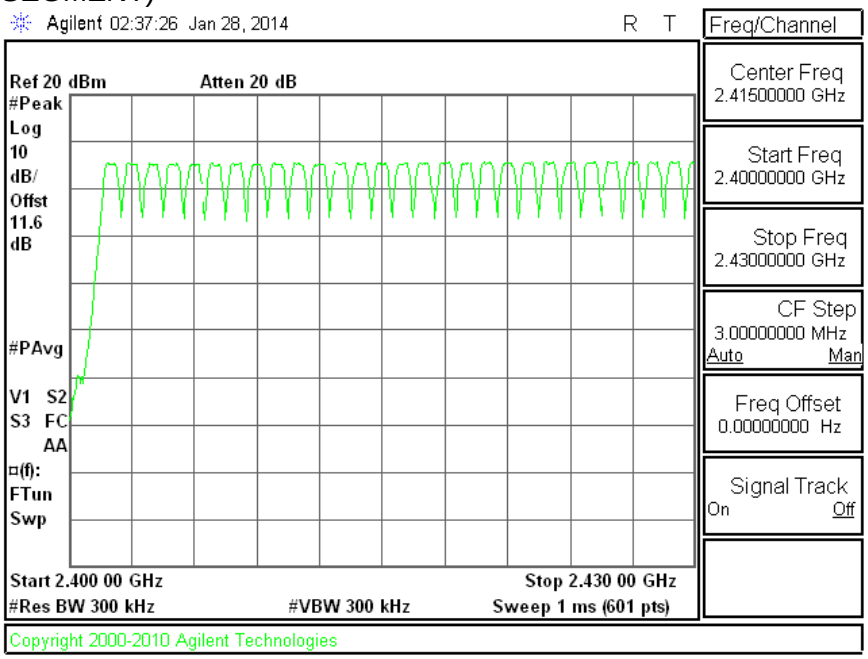
RESULTS

79 Channels observed.

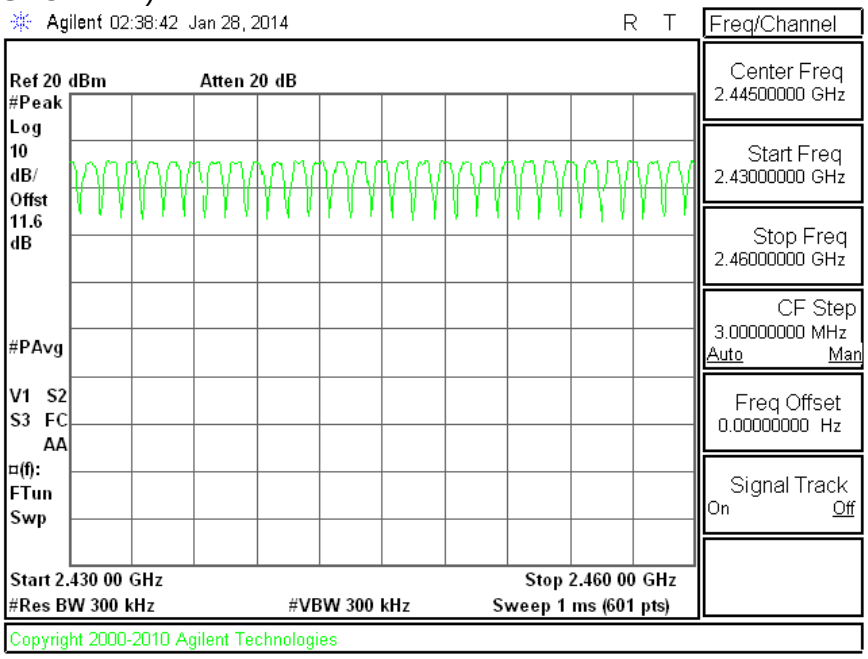
NUMBER OF HOPPING CHANNELS



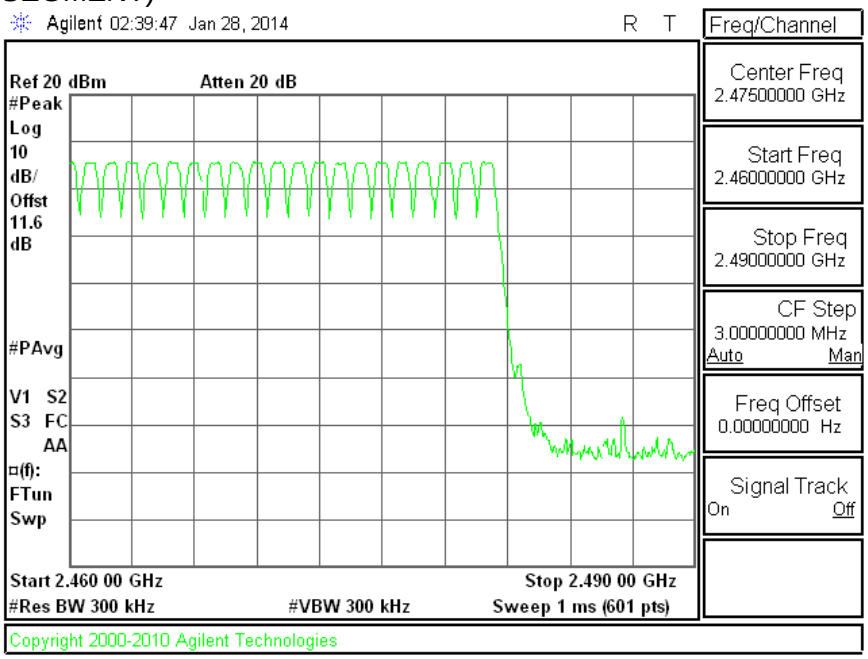
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.1.4. 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.

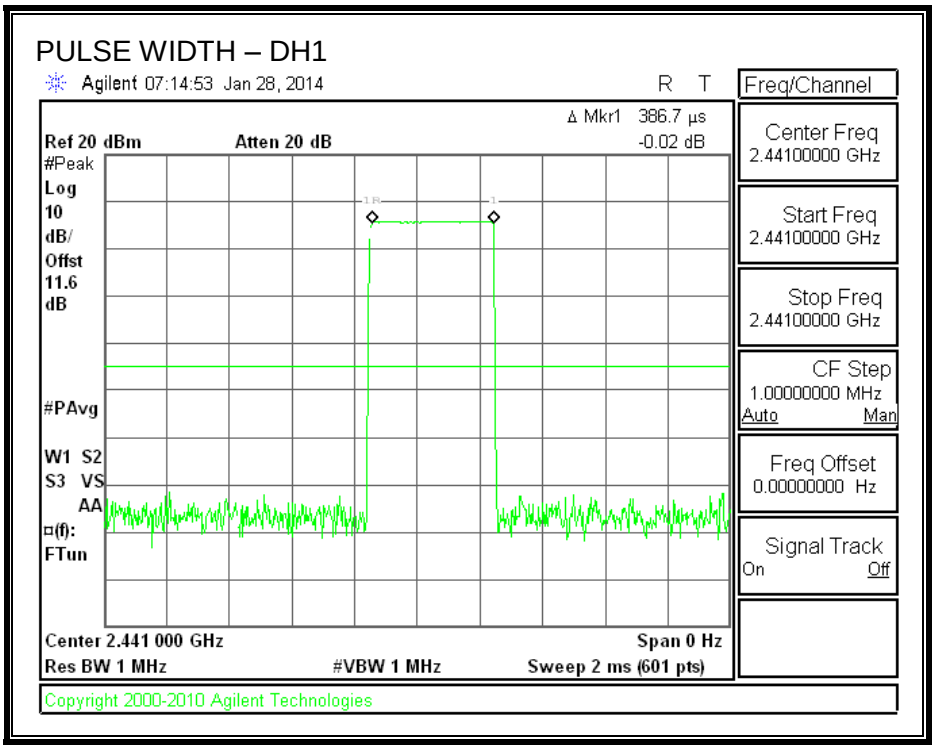
RESULTS

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

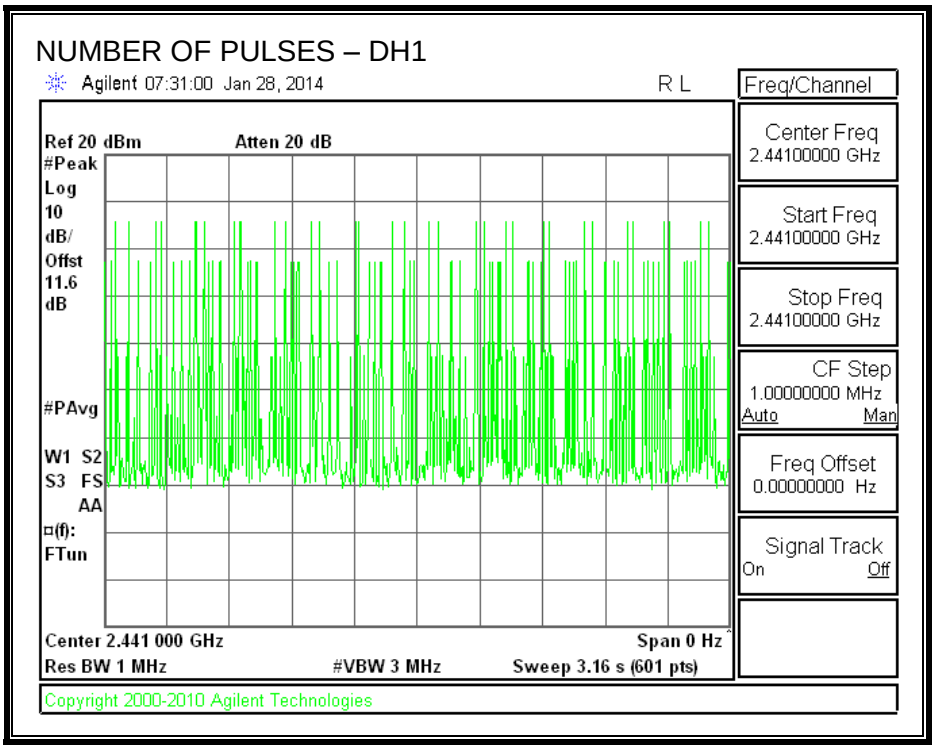
GFSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy	Limit (sec)	Margin (sec)
DH1	0.3867	31	0.120	0.4	-0.280
DH3	1.645	19	0.313	0.4	-0.087
DH5	2.892	10	0.289	0.4	-0.111

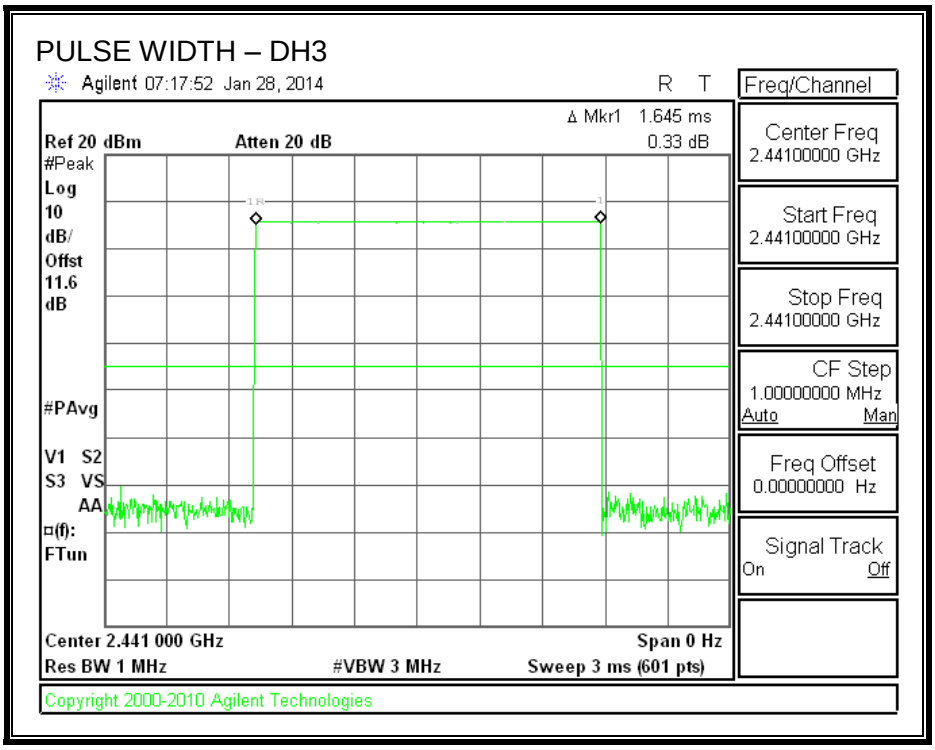
PULSE WIDTH – DH1



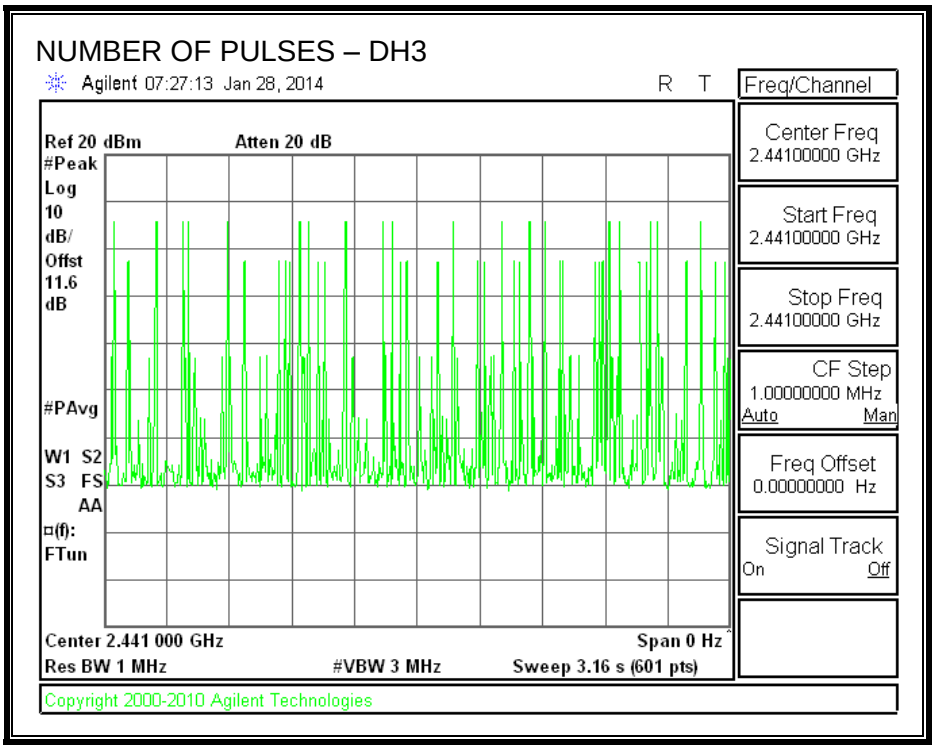
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



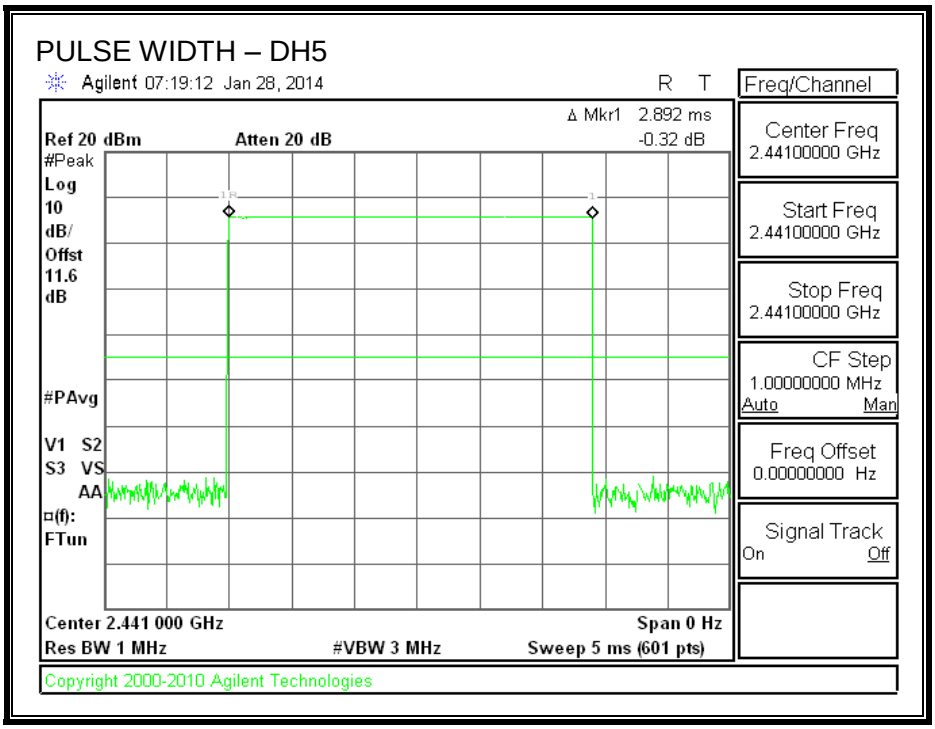
PULSE WIDTH – DH3



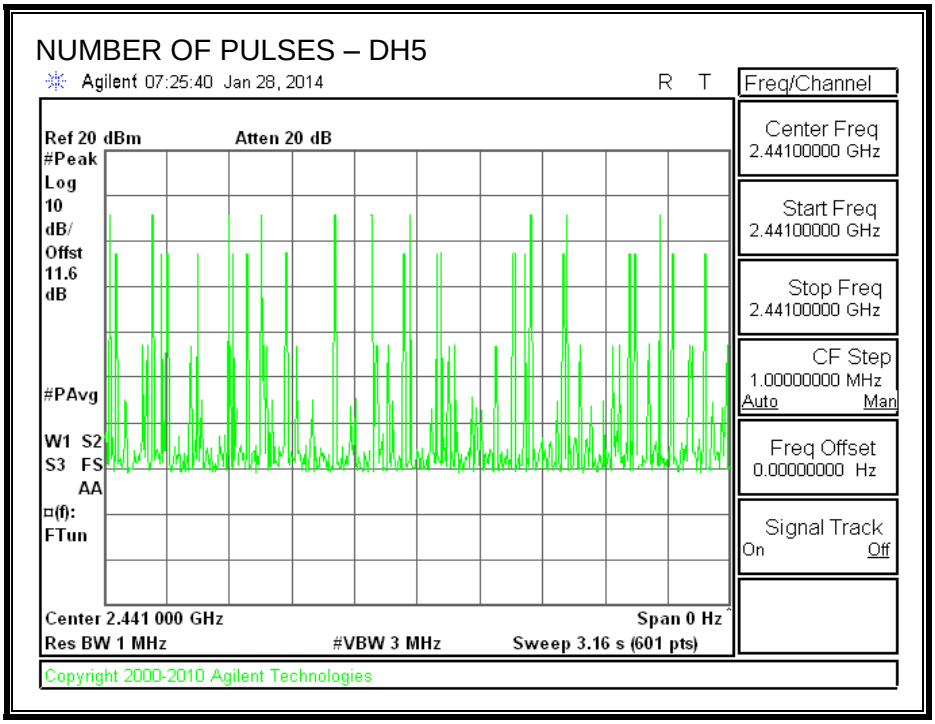
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 8 Clause A8.4

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

TEST PROCEDURE

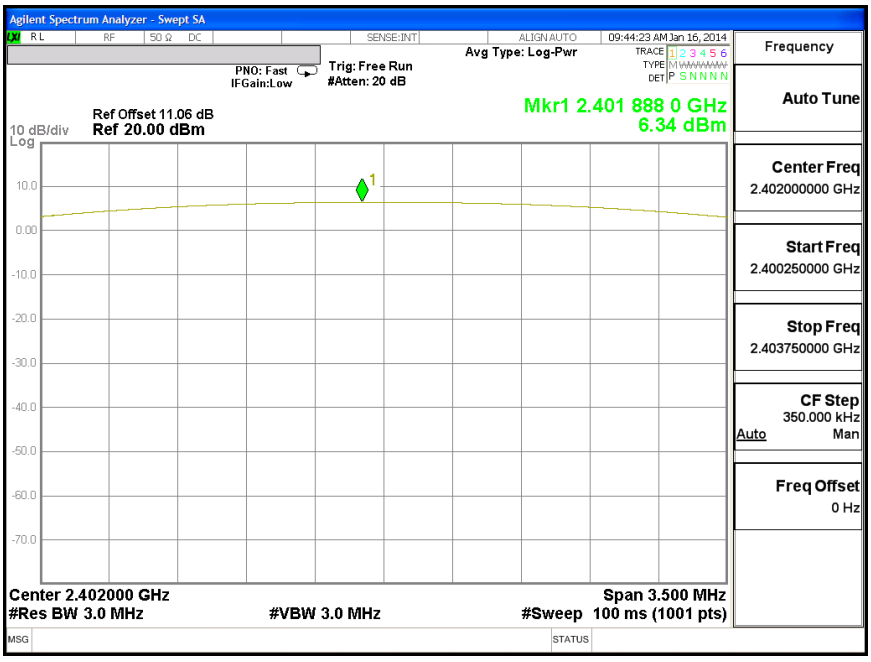
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

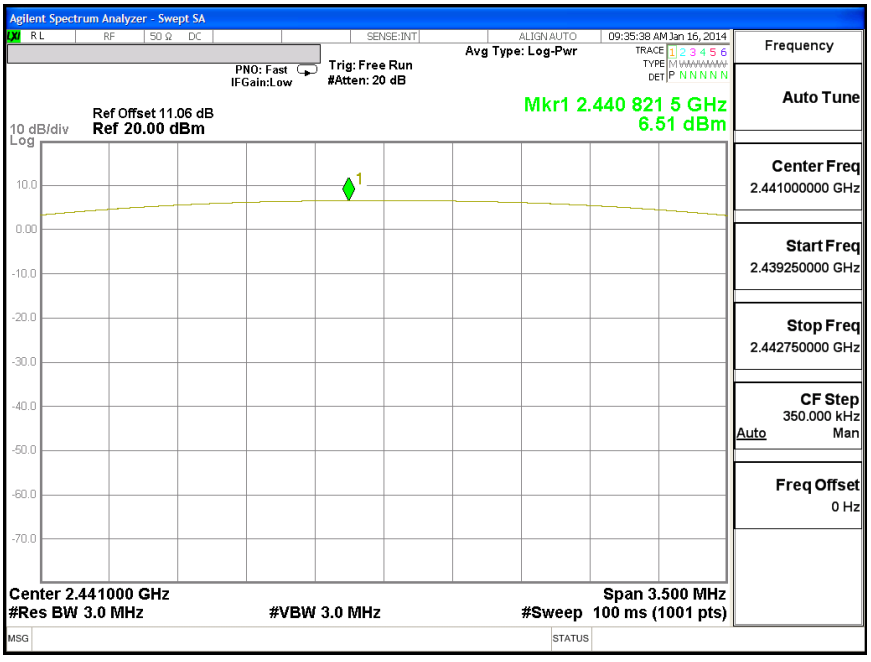
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.34	30	-23.66
Middle	2441	6.51	30	-23.49
High	2480	6.54	30	-23.46

OUTPUT POWER

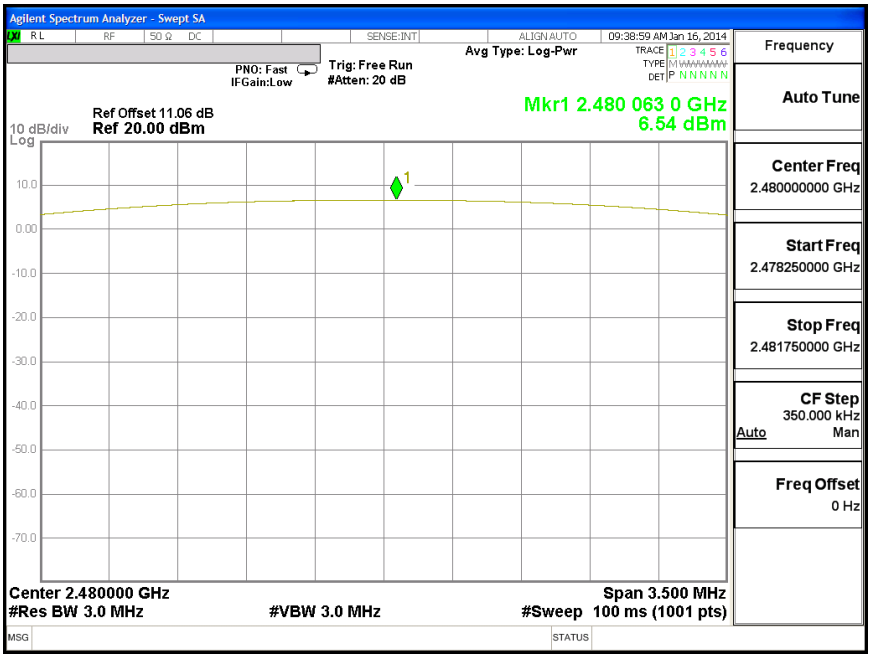
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



8.1.6. 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 11.05dB (including 10dB pad, 1.05dB 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	6.14
Middle	2441	6.33
High	2480	6.32

8.1.7. 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.

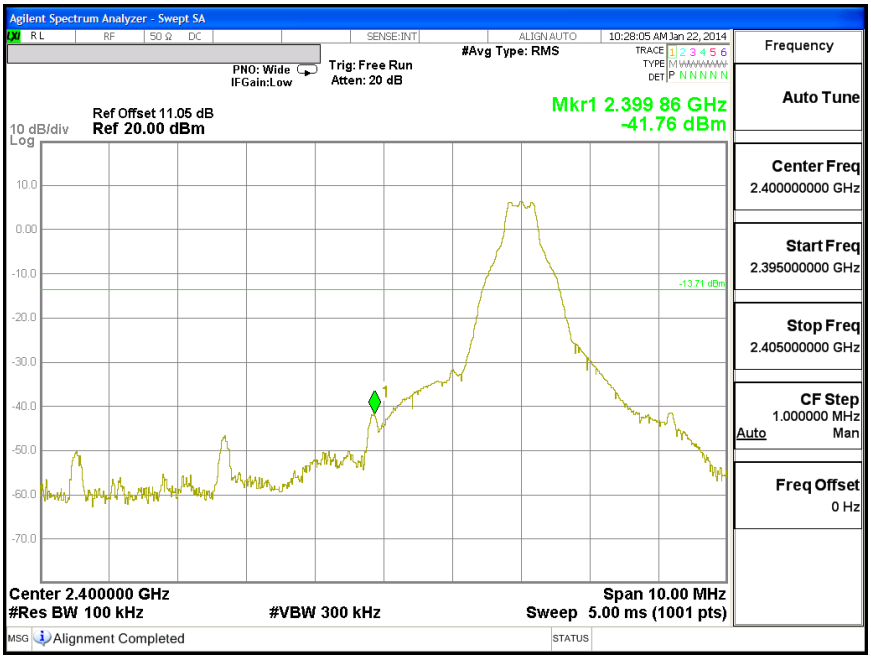
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

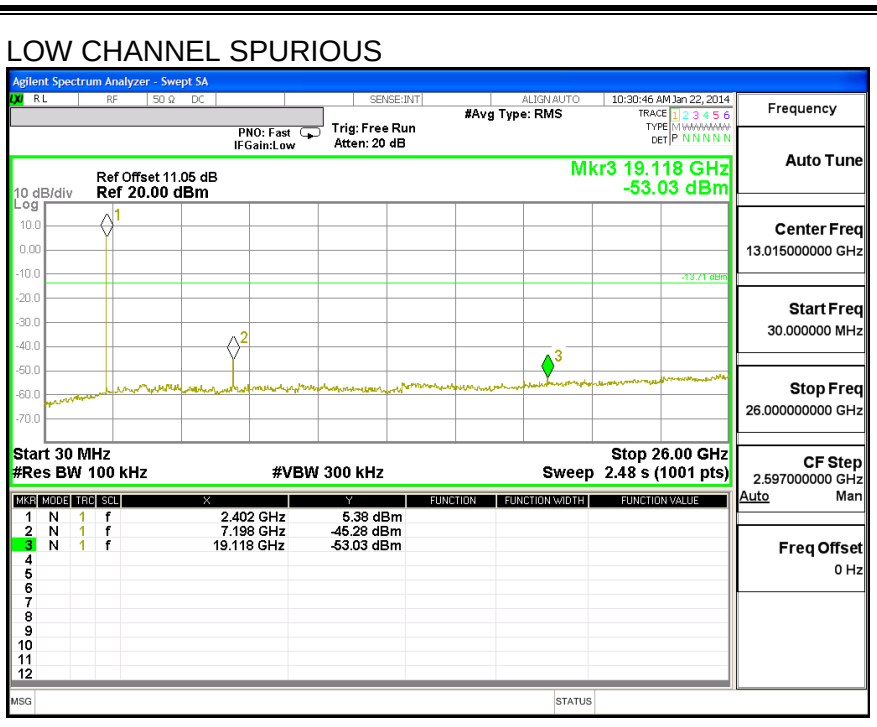
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

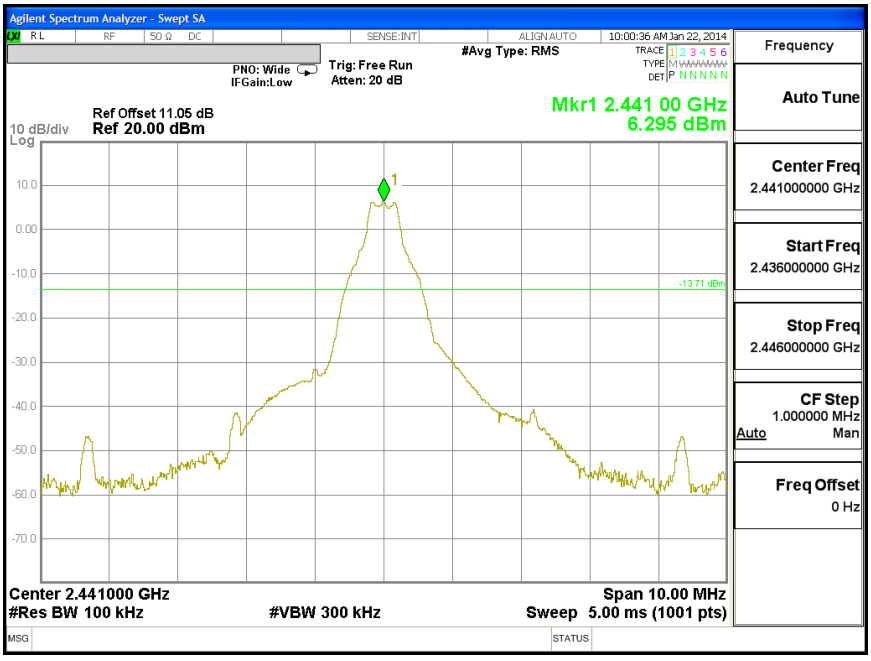


LOW CHANNEL SPURIOUS

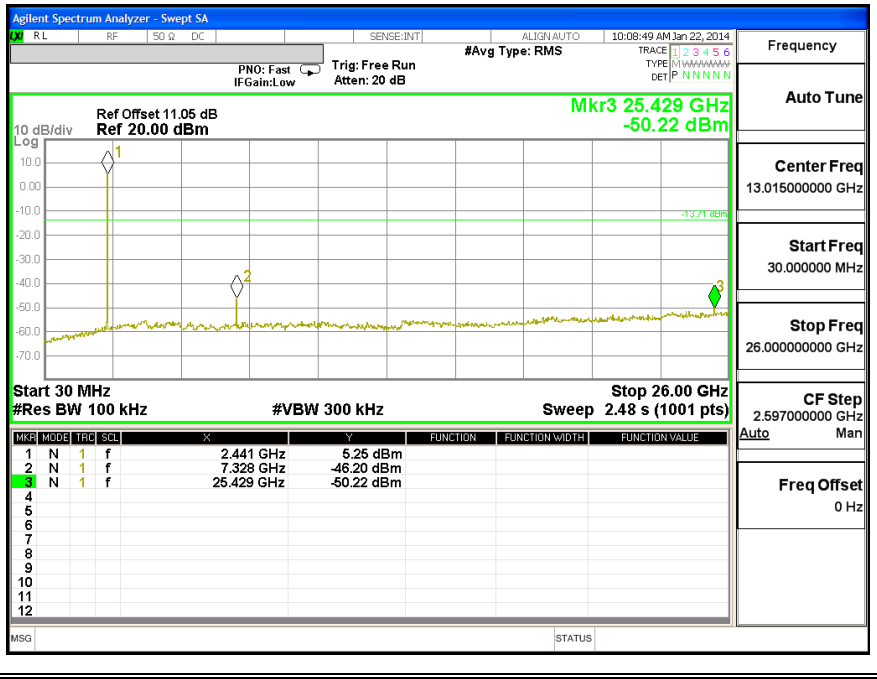


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

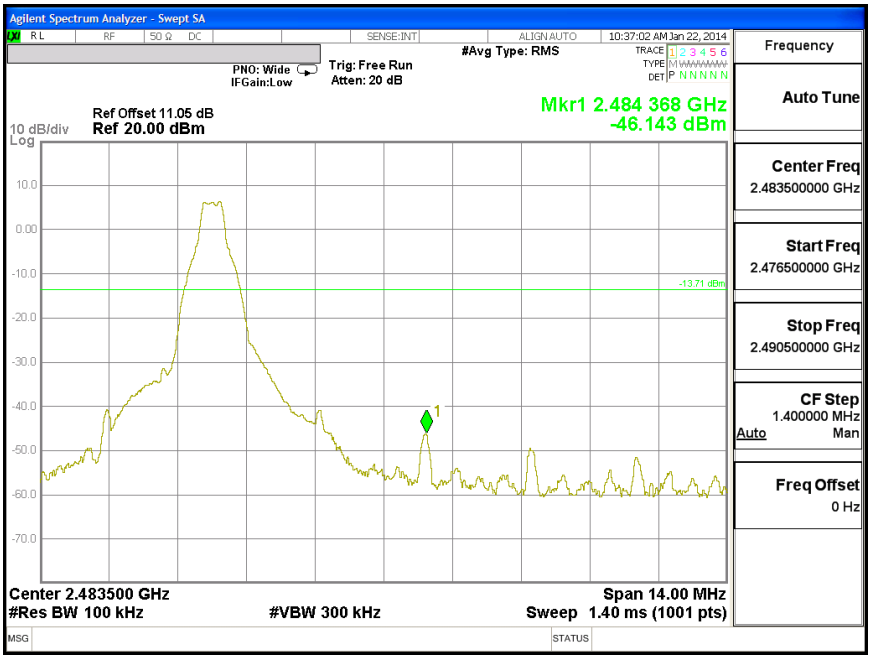


MID CHANNEL SPURIOUS

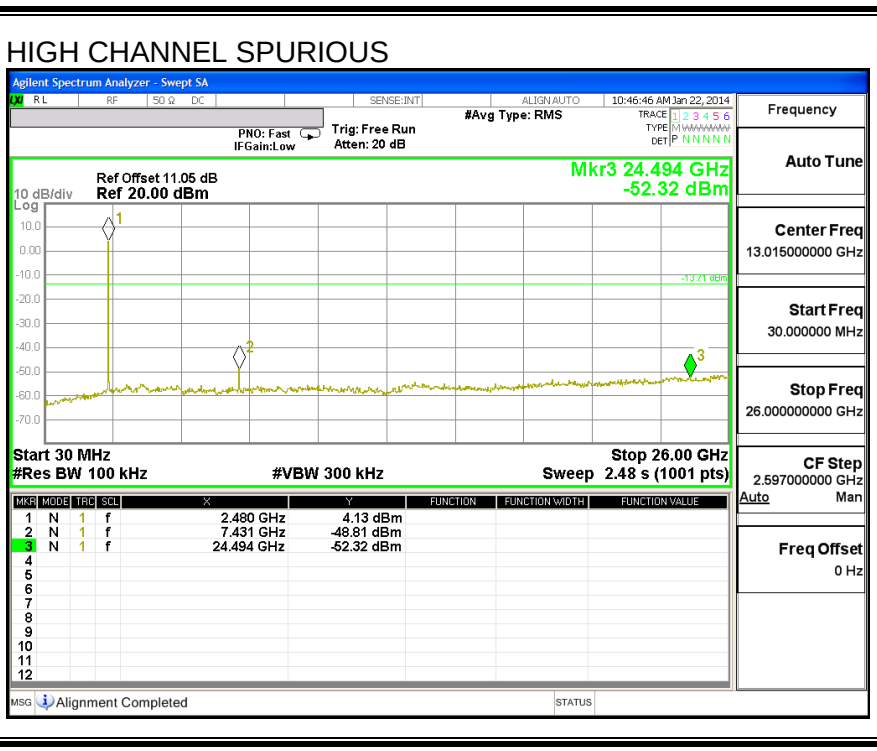


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

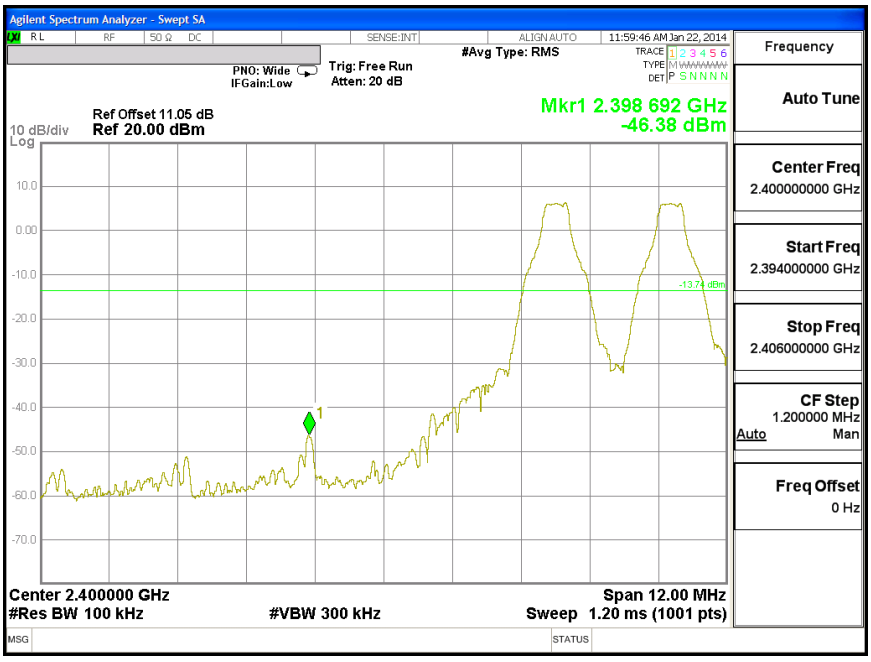


HIGH CHANNEL SPURIOUS

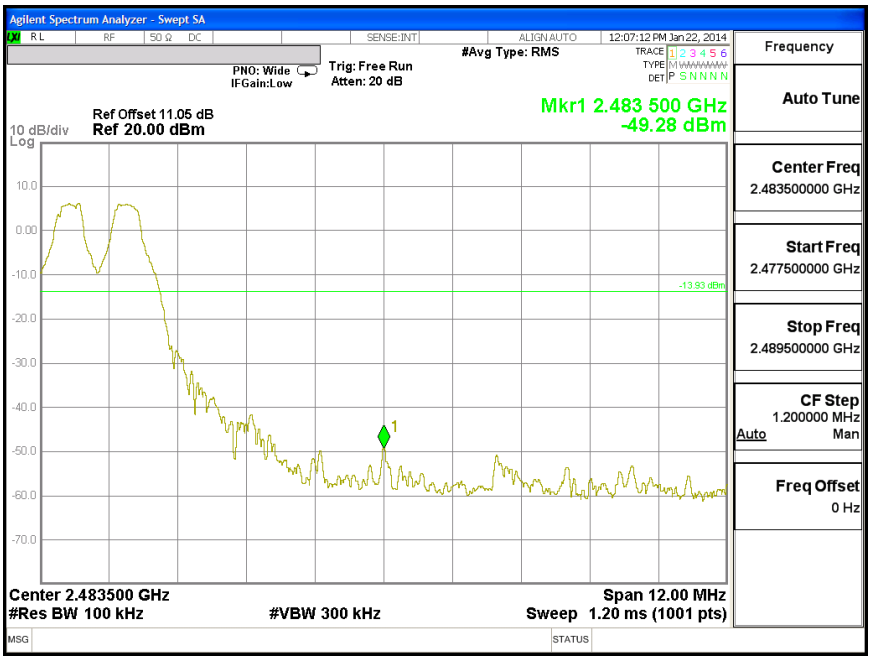


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8.2. ENHANCED DATA RATE 8DPSK MODULATION

8.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

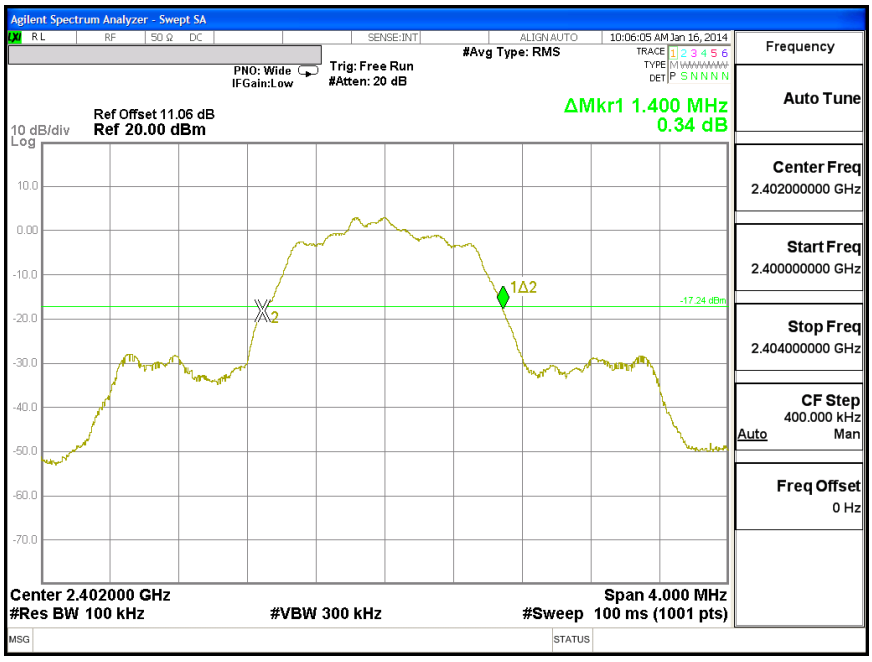
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

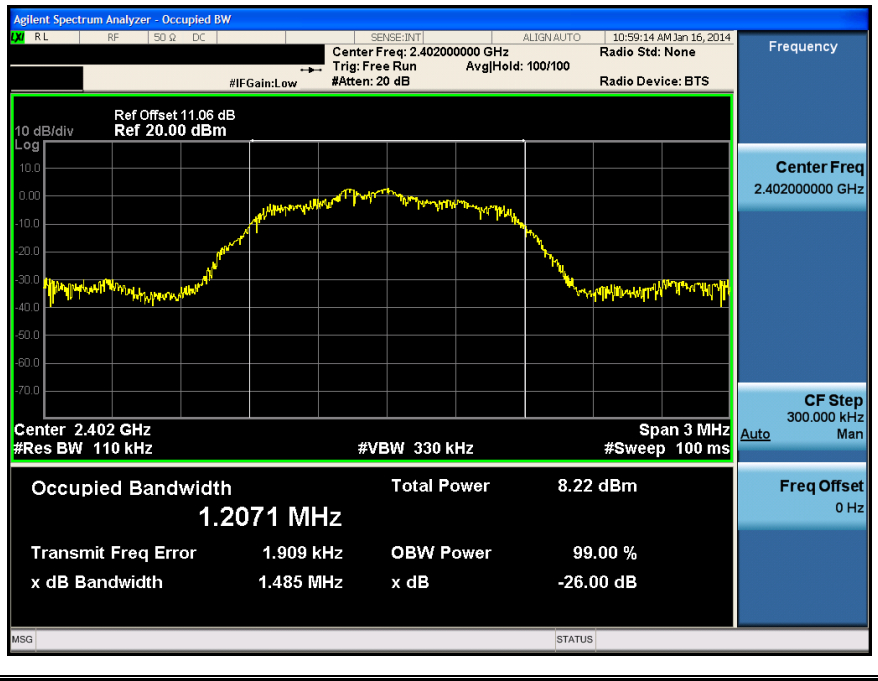
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.400	1.2071
Middle	2441	1.400	1.2138
High	2480	1.396	1.2119

20 dB AND 99% BANDWIDTH

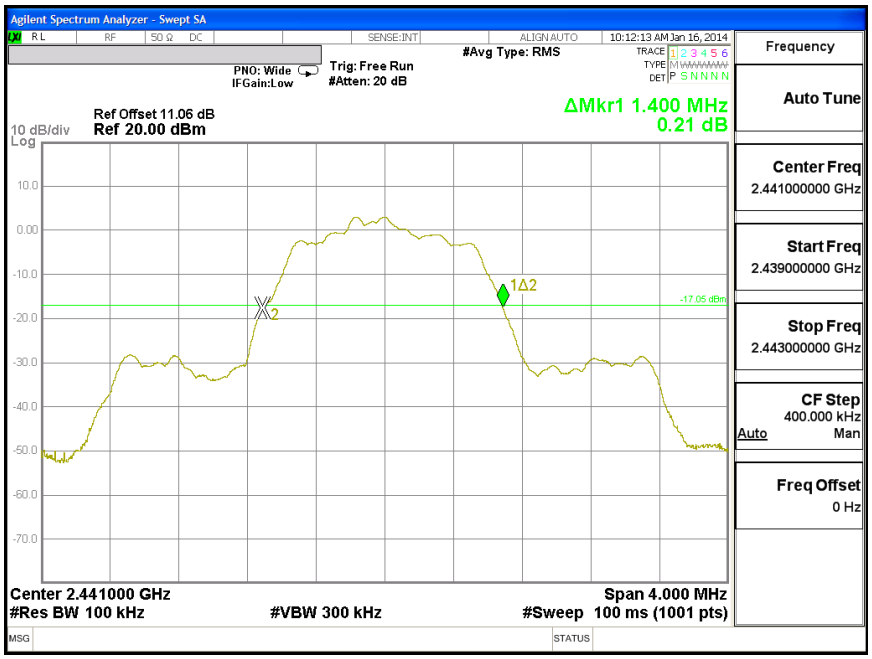
20dB BANDWIDTH LOW CH



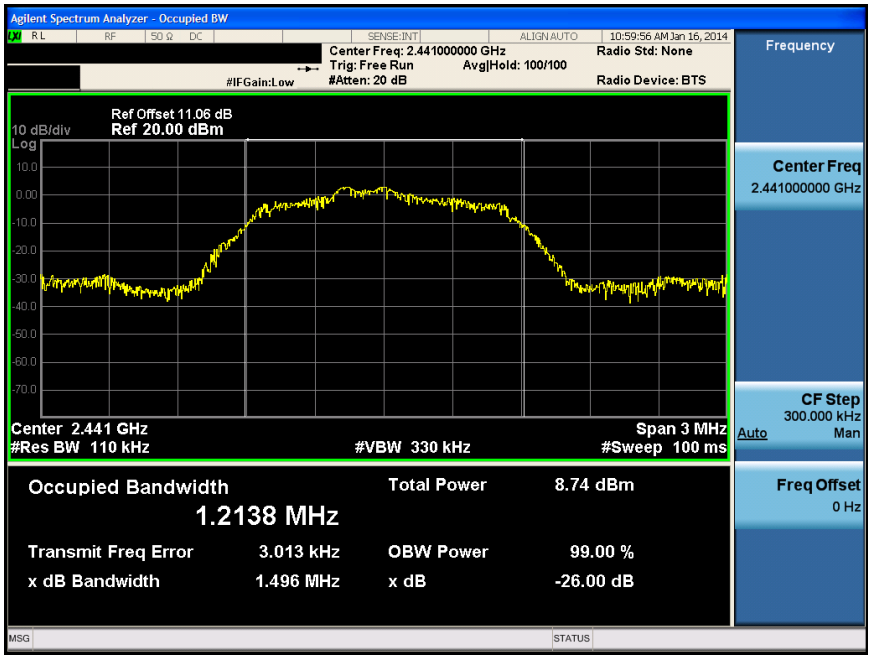
99% BANDWIDTH LOW CH



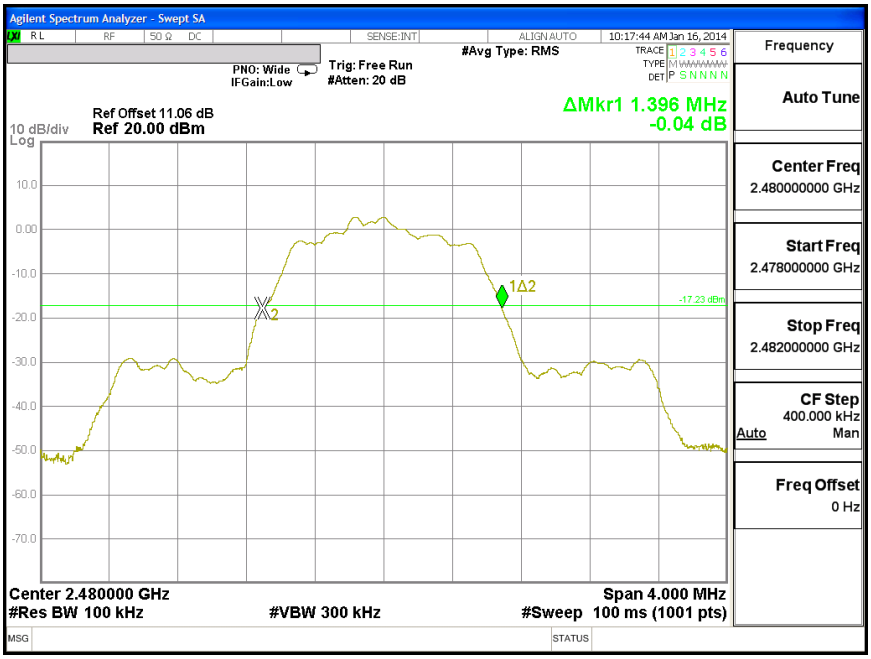
20dB BANDWIDTH MID CH



99% BANDWIDTH MID CH



20dB BANDWIDTH HIGH CH



99% BANDWIDTH HIGH CH

8.2.2. 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.

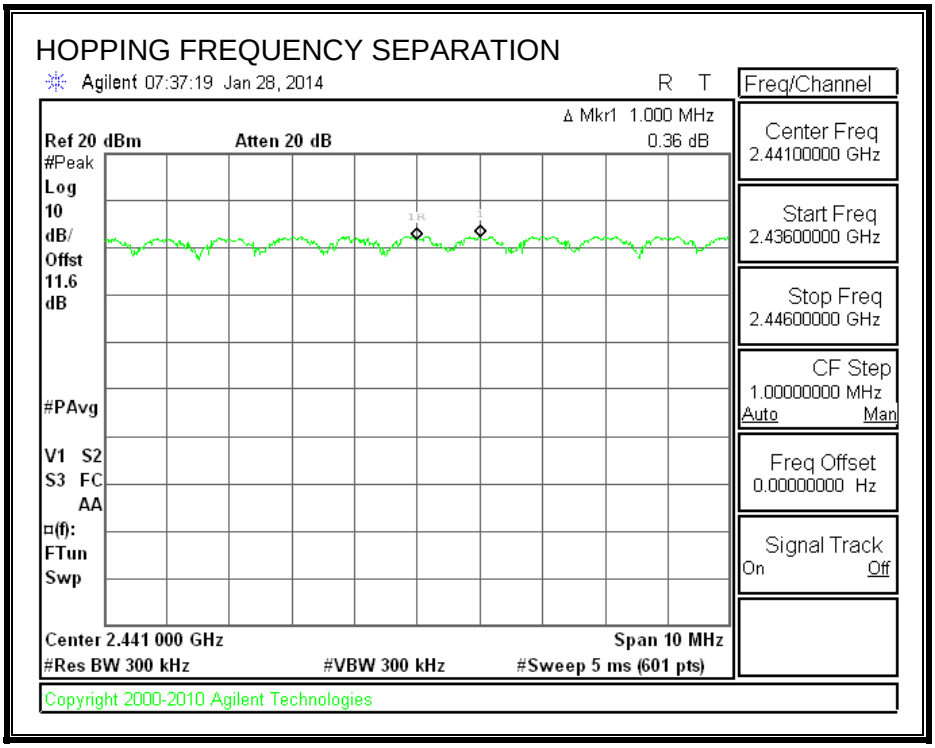
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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



8.2.3. 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

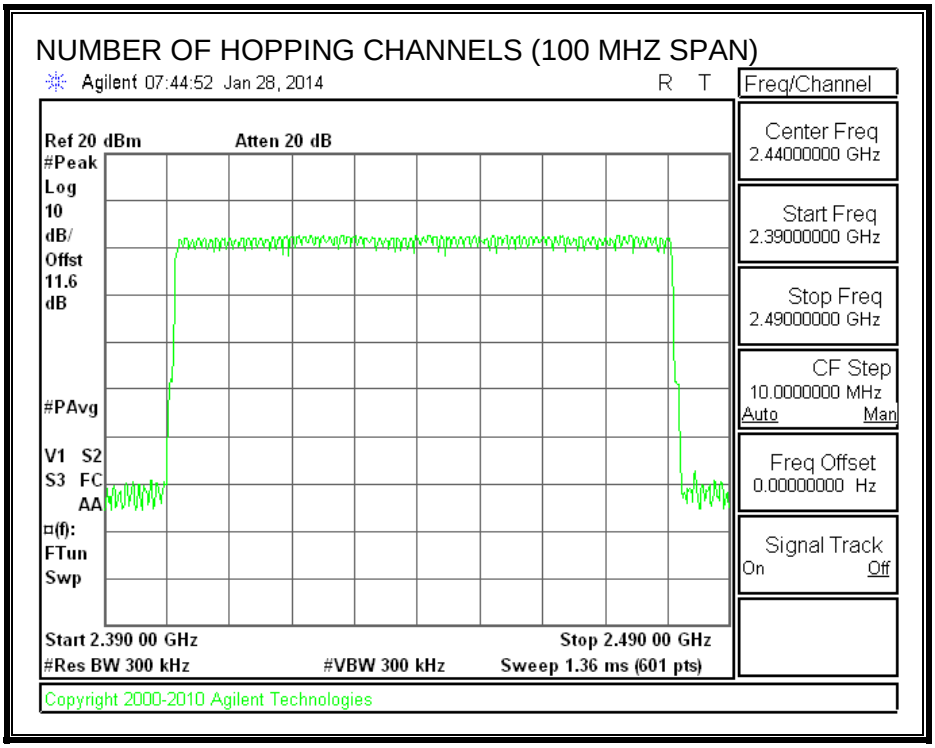
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

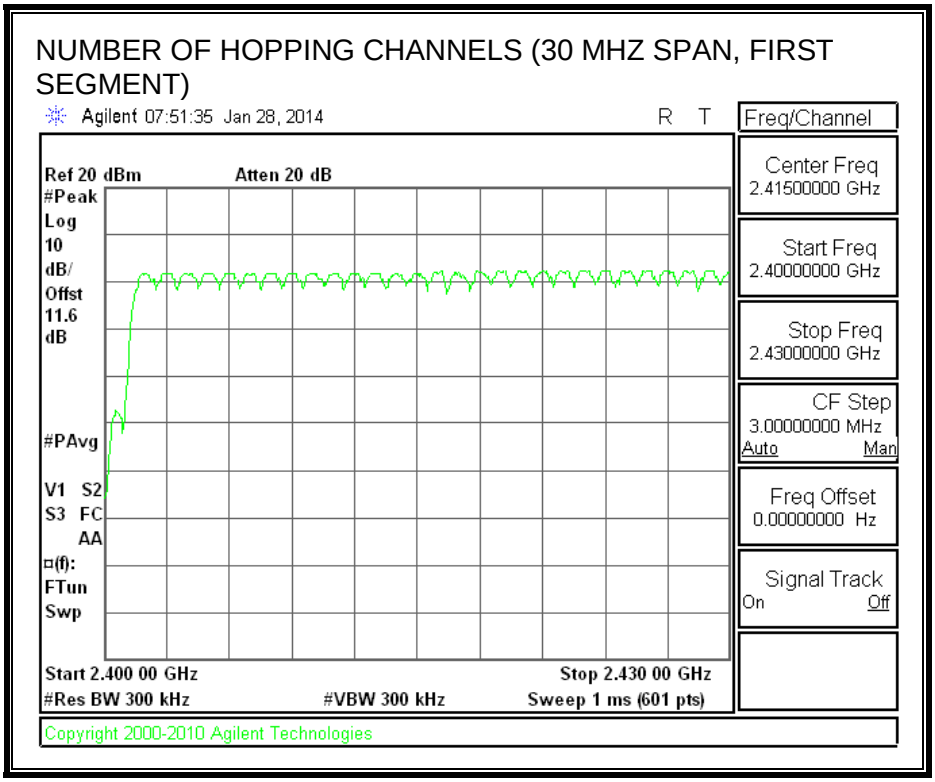
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

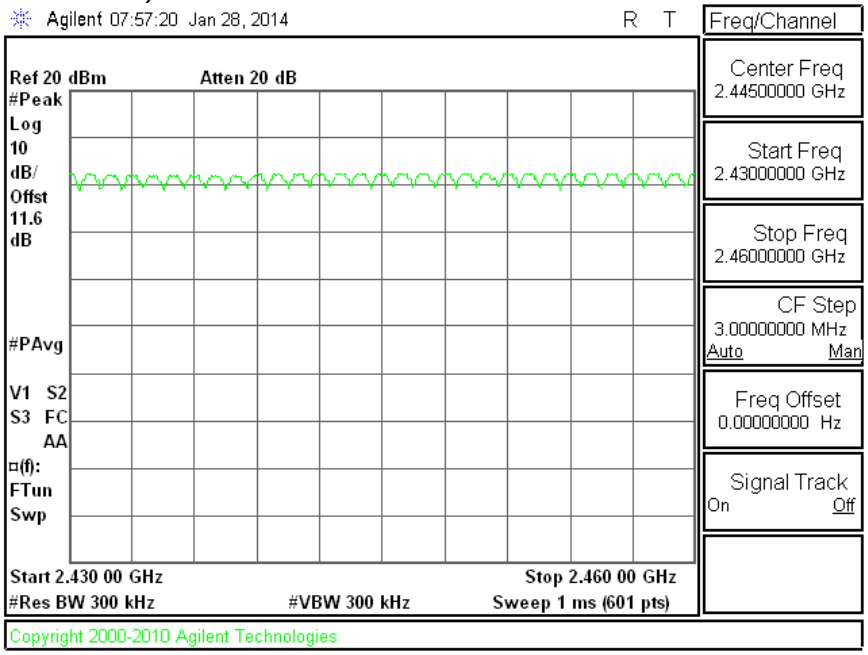
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



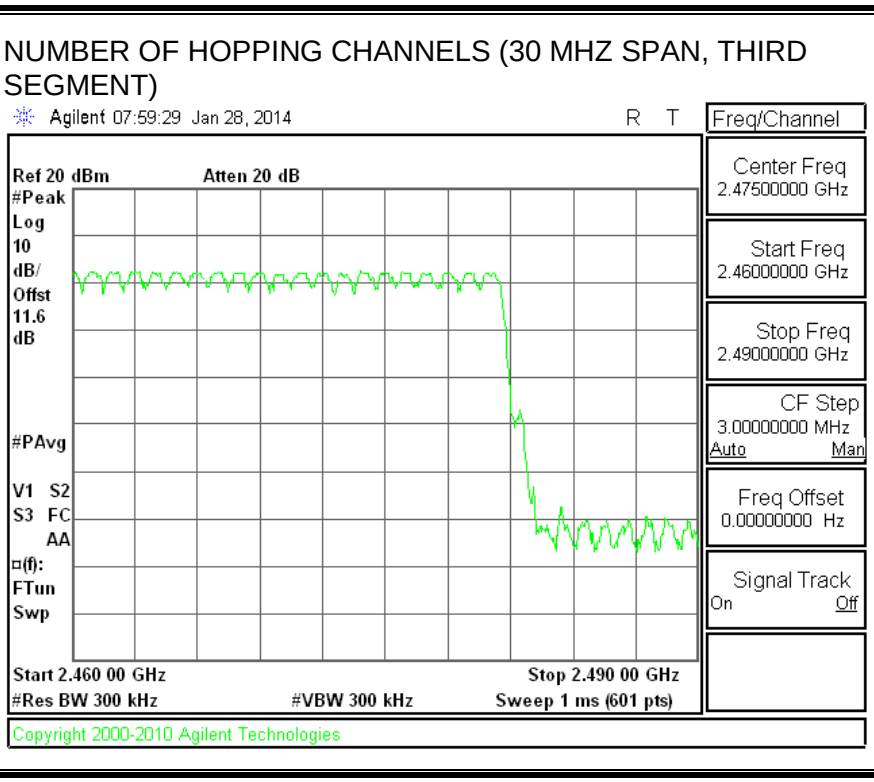
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.2.4. 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.

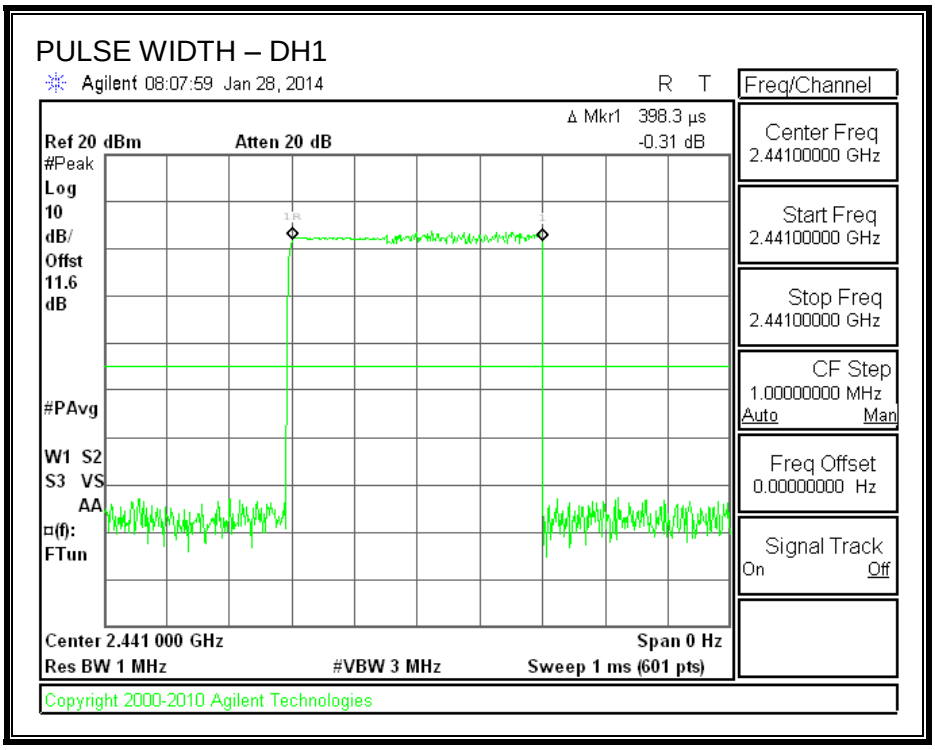
RESULTS

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

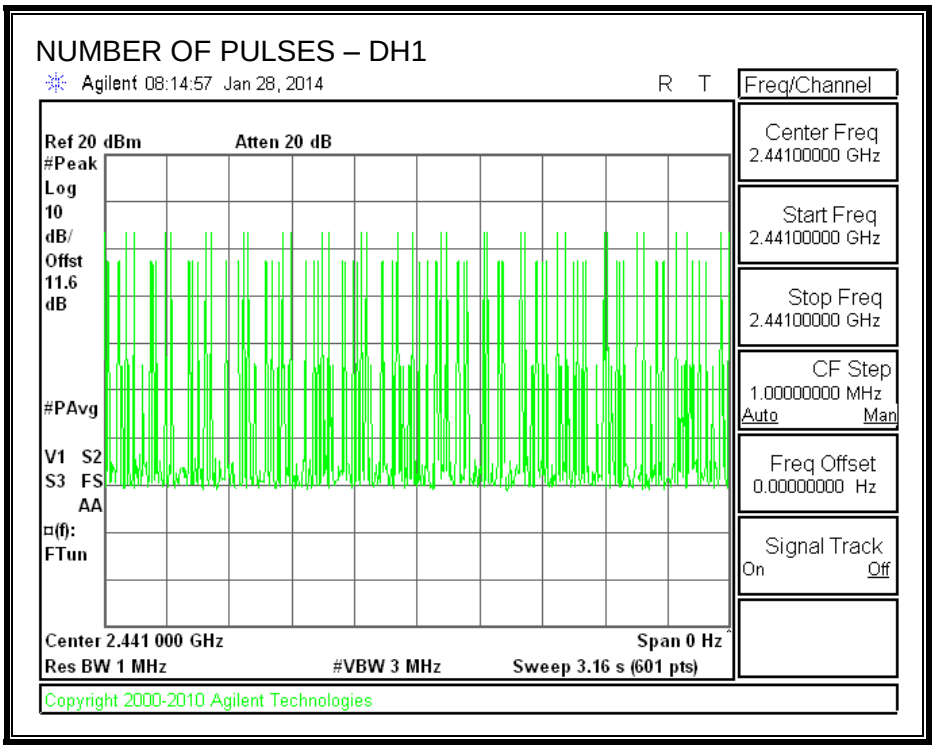
8DPSK

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy	Limit (sec)	Margin (sec)
DH1	0.3983	32	0.127	0.4	-0.273
DH3	1.65	16	0.264	0.4	-0.136
DH5	2.9	12	0.348	0.4	-0.052

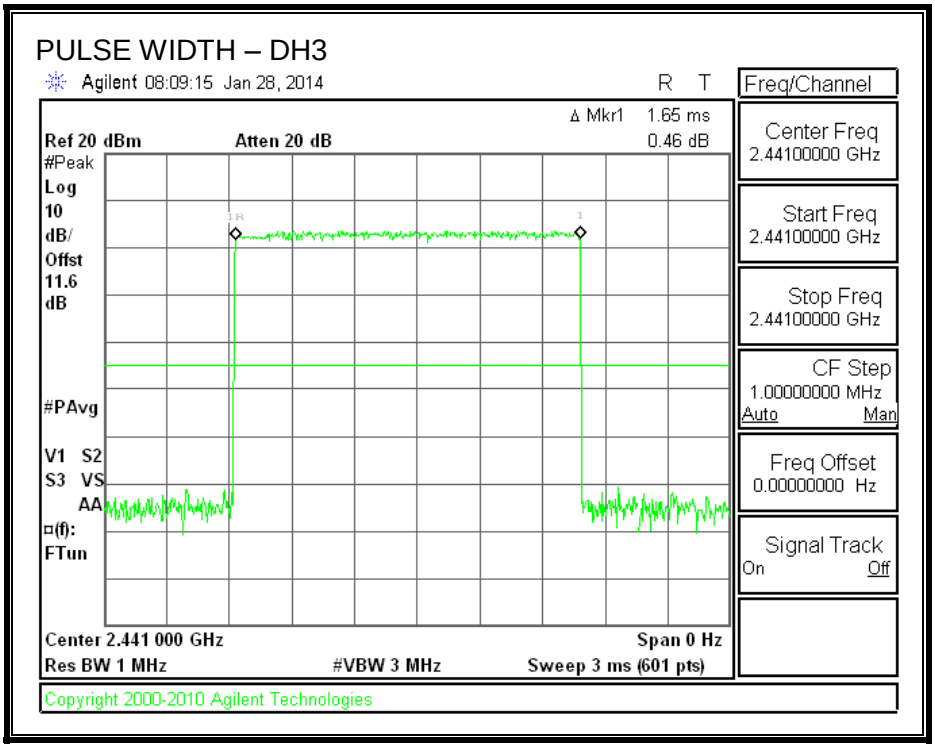
PULSE WIDTH – DH1



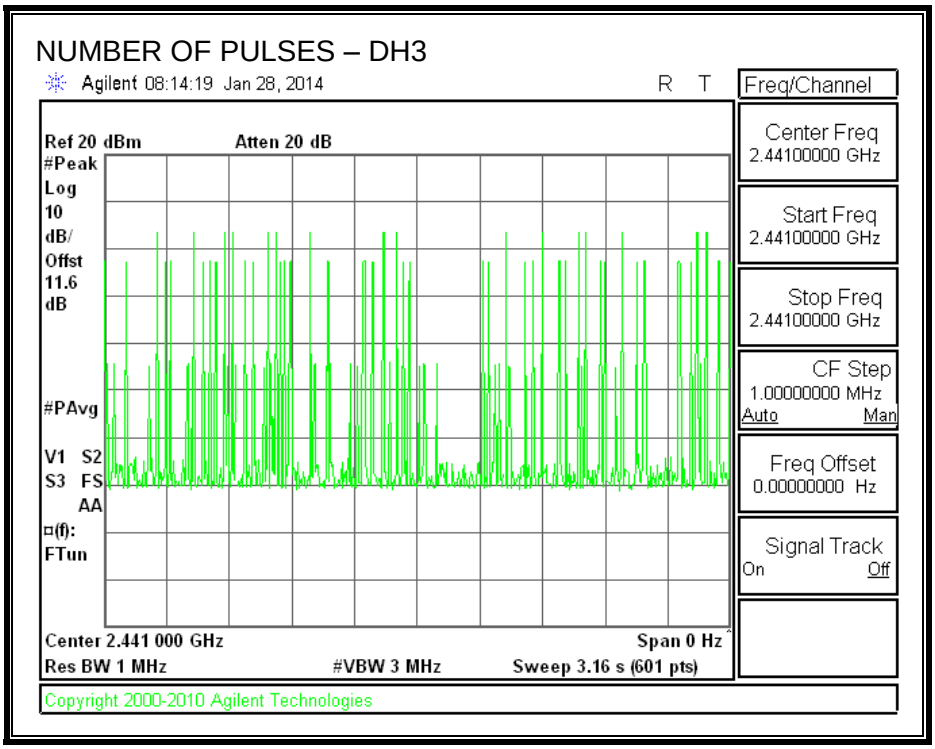
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



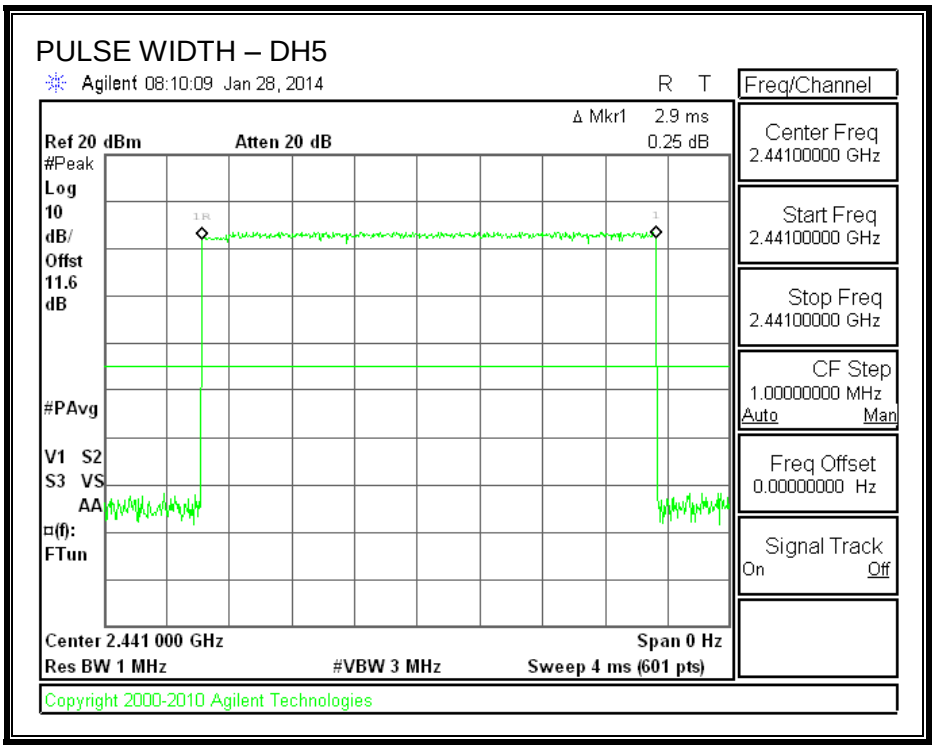
PULSE WIDTH – DH3



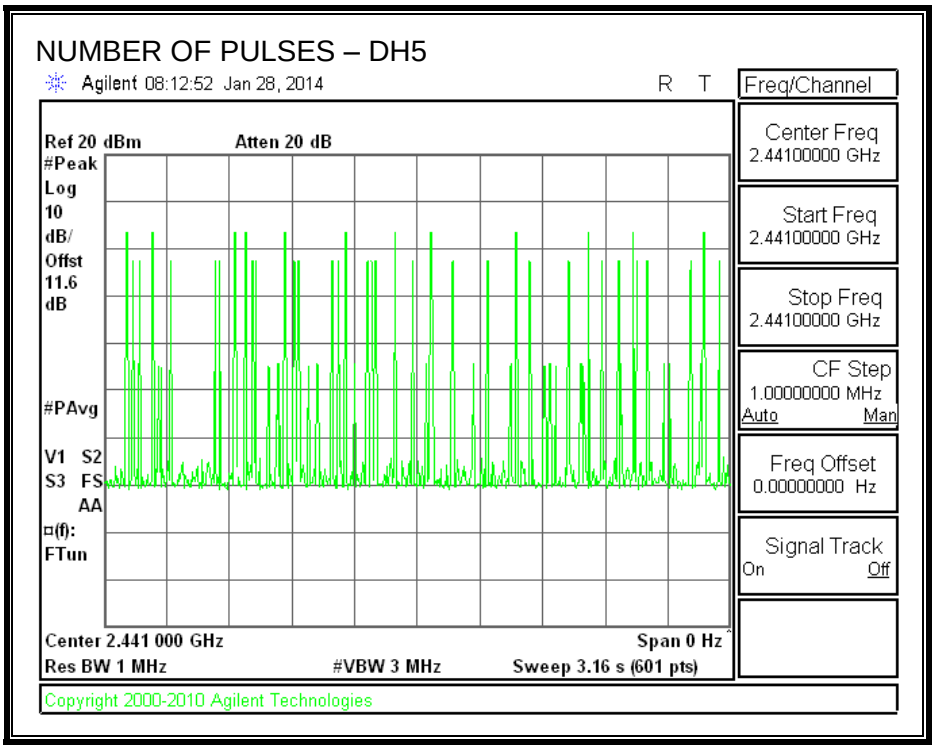
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.2.5. 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

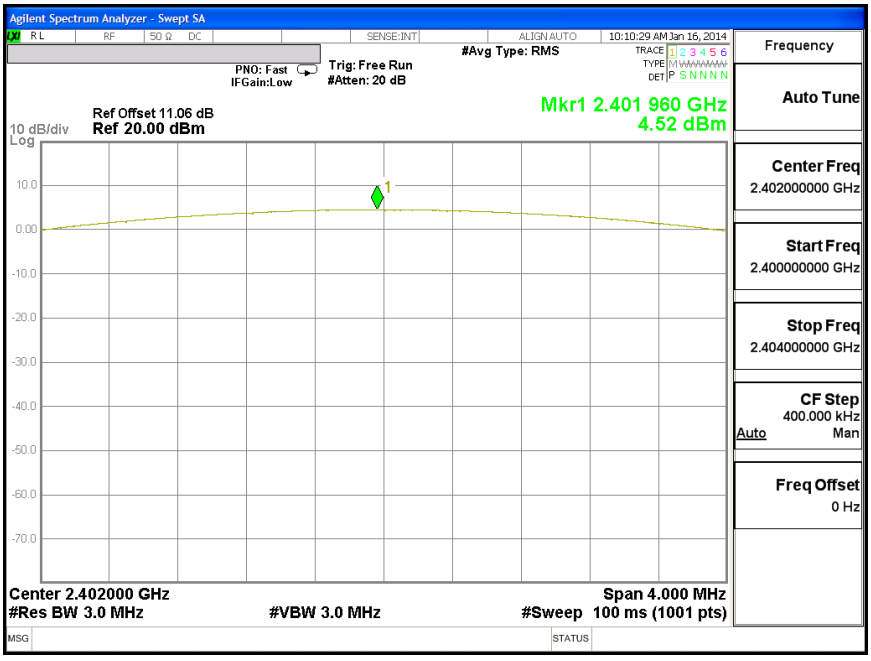
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

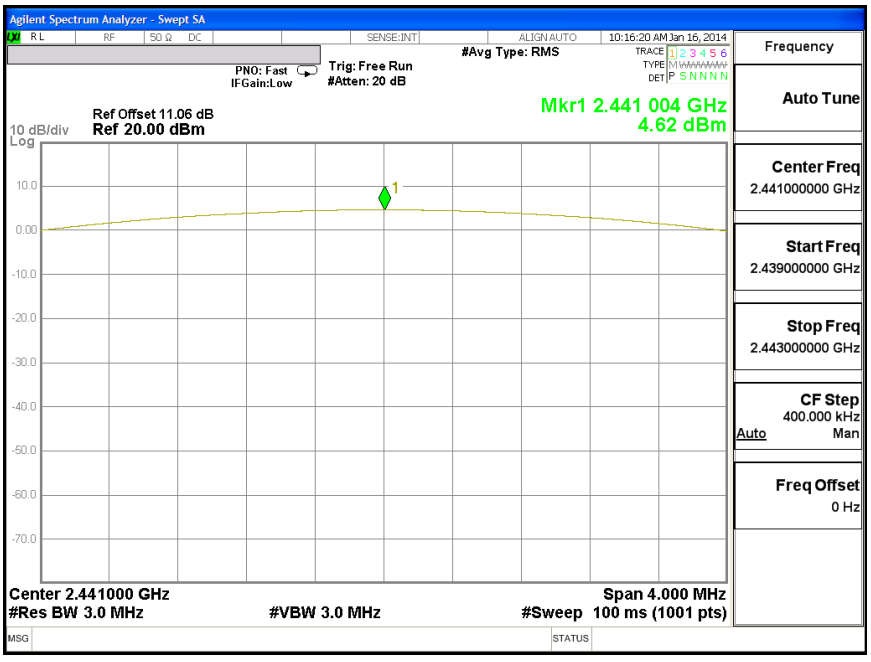
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.52	30	-25.48
Middle	2441	4.62	30	-25.38
High	2480	4.52	30	-25.48

OUTPUT POWER

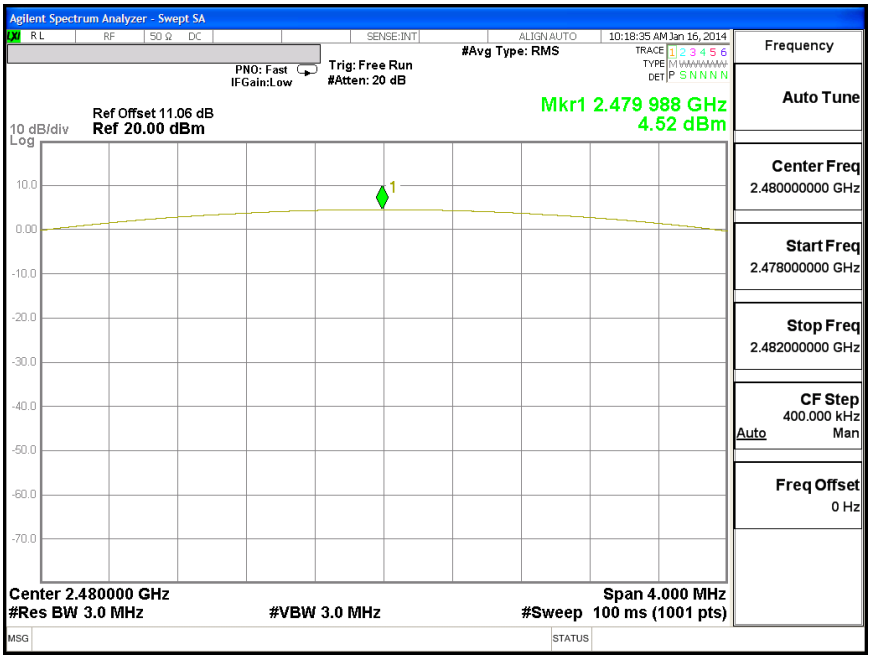
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



8.2.6. 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 11.05dB (including 10dB pad, 1.05dB 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	2.19
Middle	2441	2.59
High	2480	2.47

8.2.7. 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.

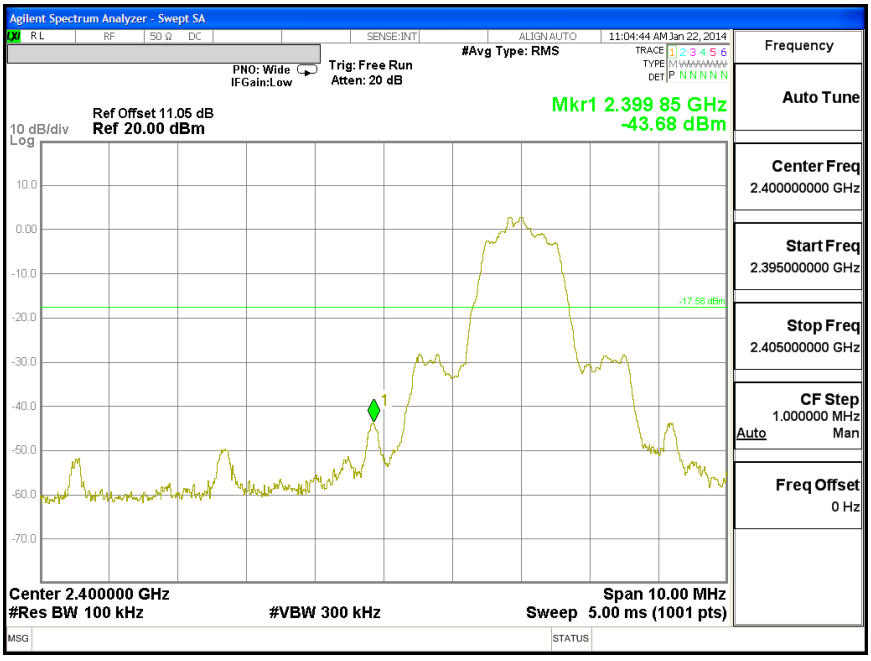
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

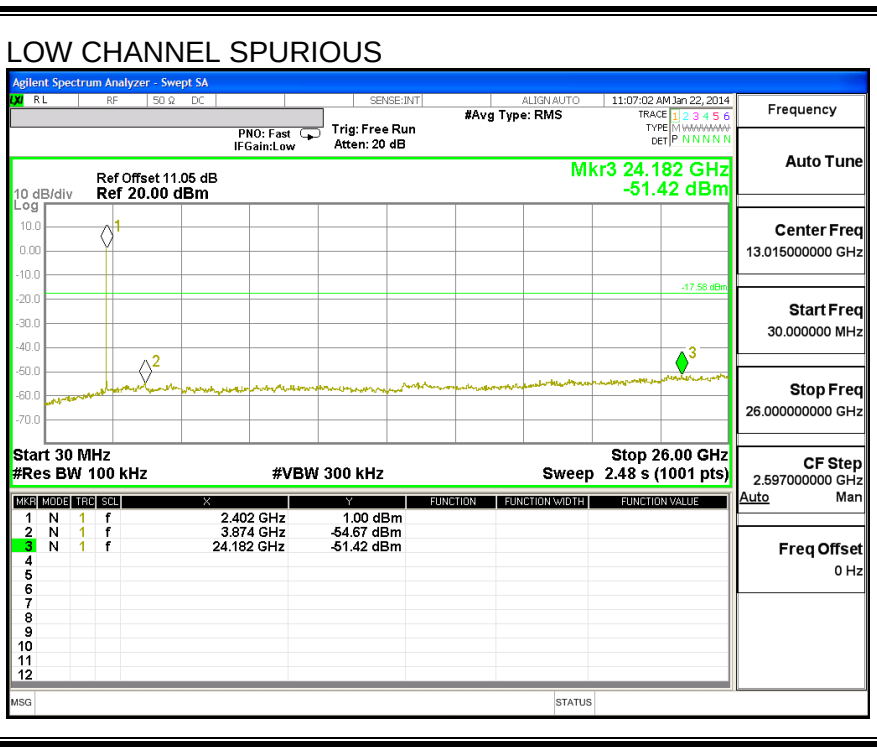
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

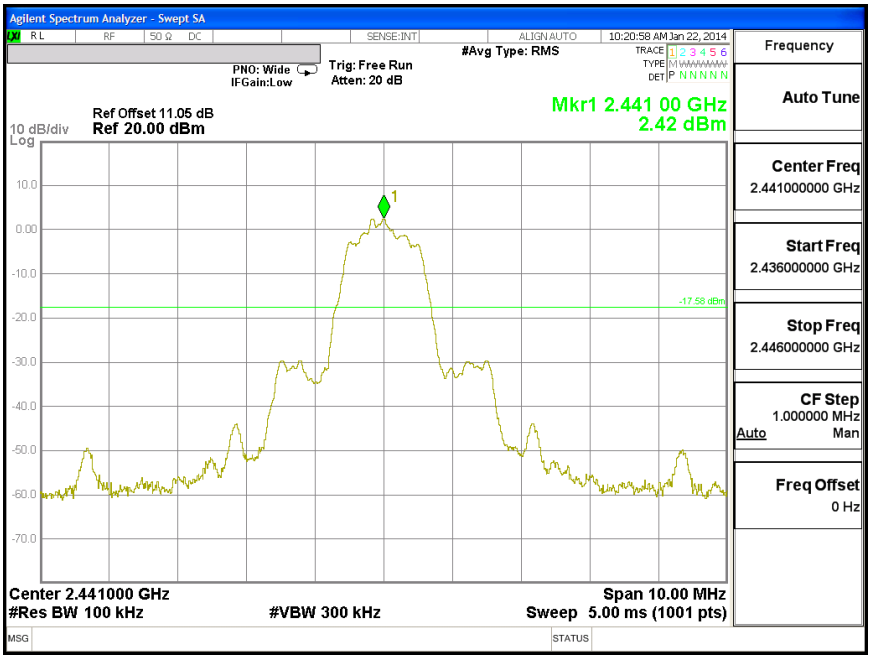


LOW CHANNEL SPURIOUS

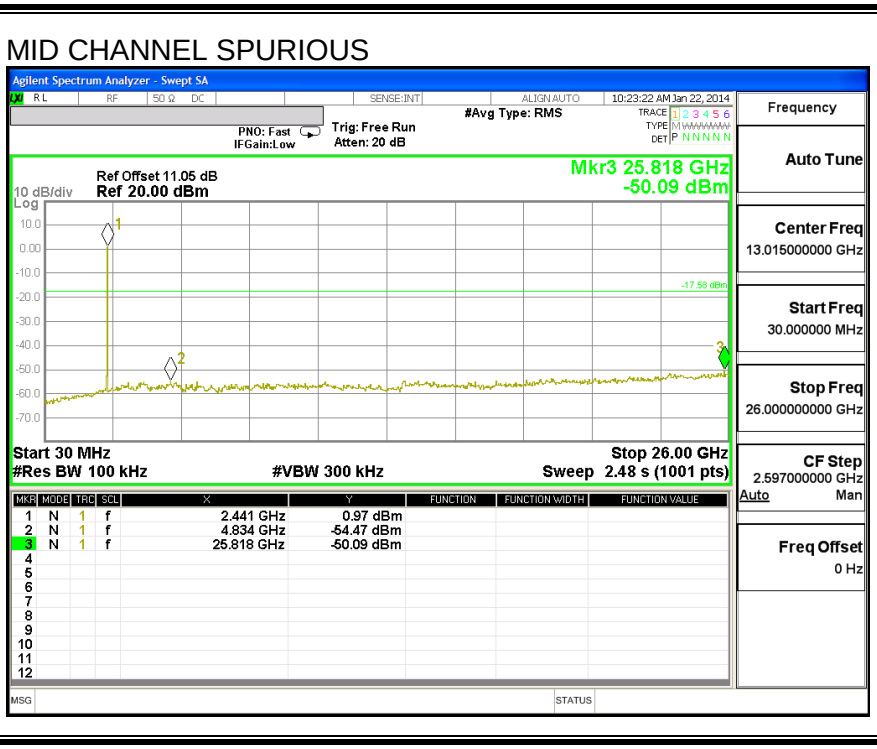


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

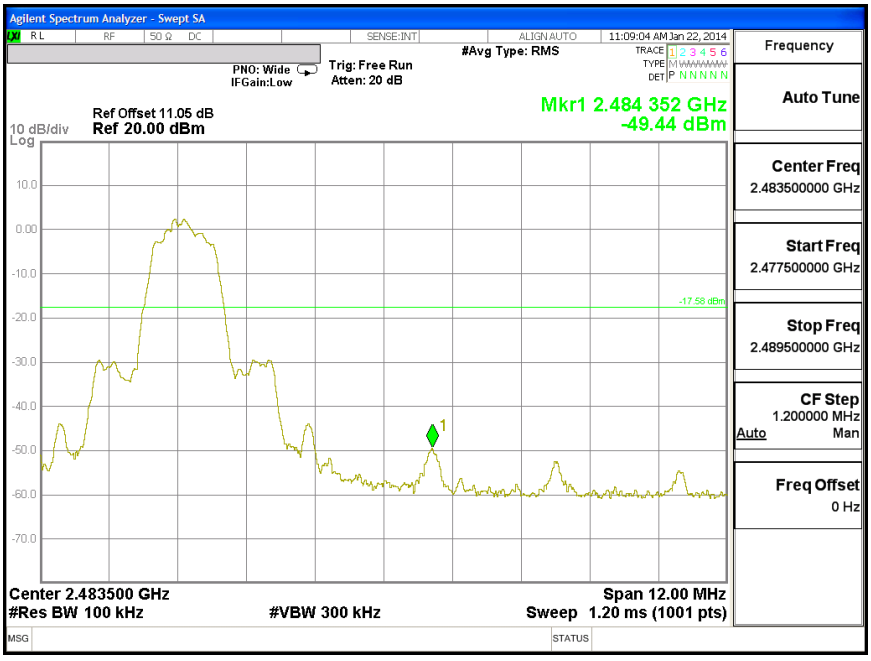


MID CHANNEL SPURIOUS

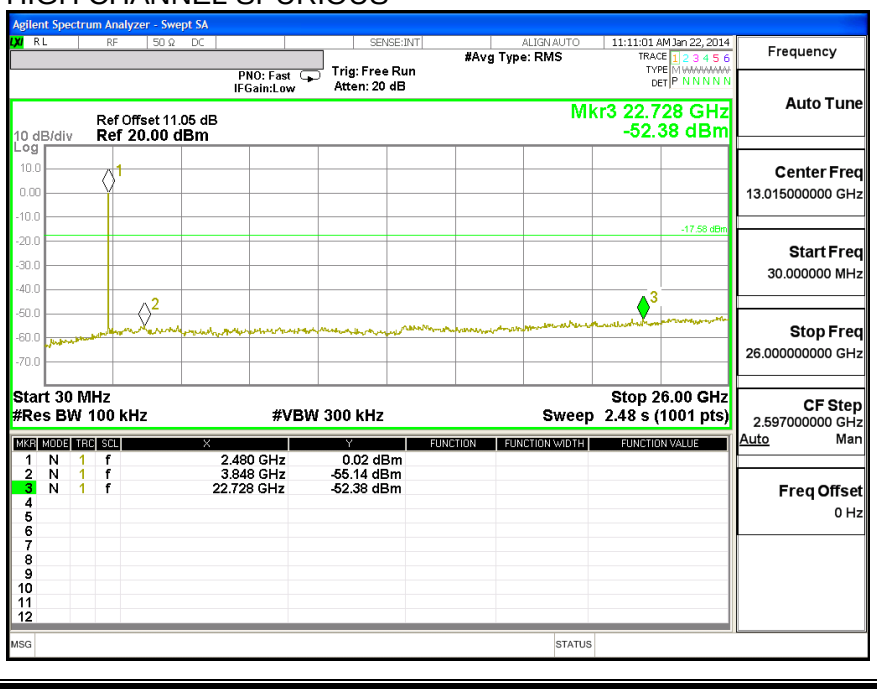


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

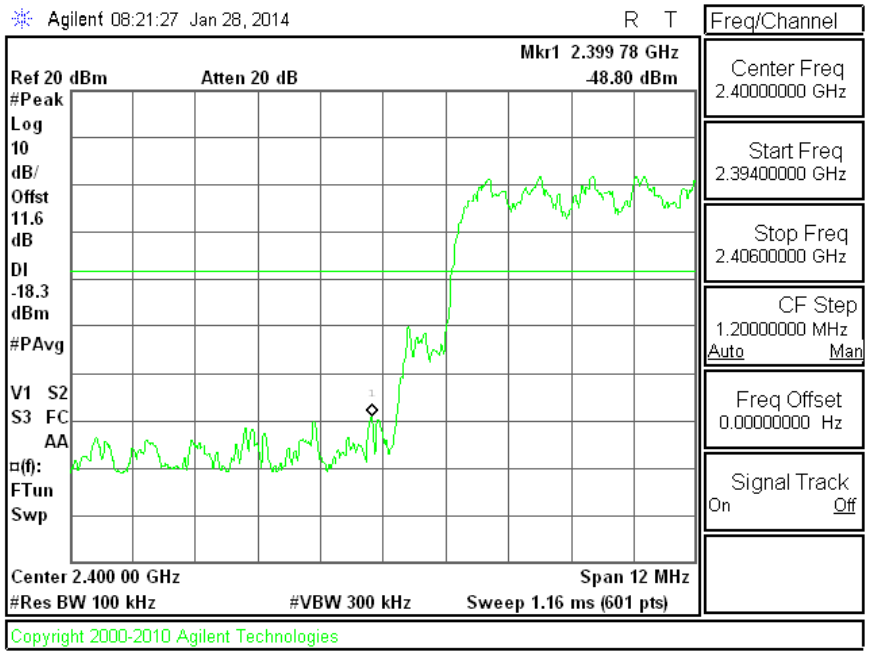


HIGH CHANNEL SPURIOUS

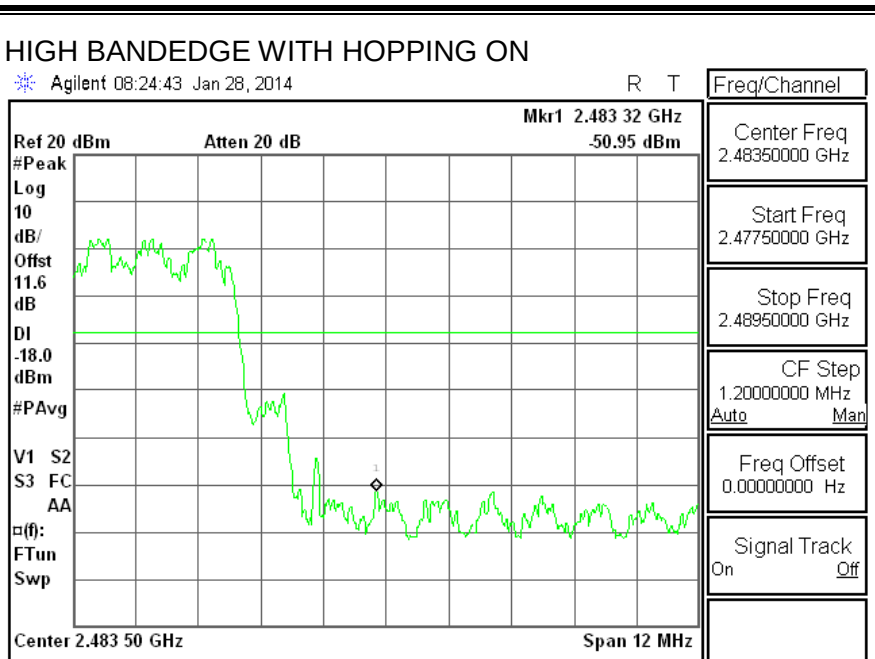


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8.3. ENHANCED DATA RATE DQPSK MODULATION

8.3.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

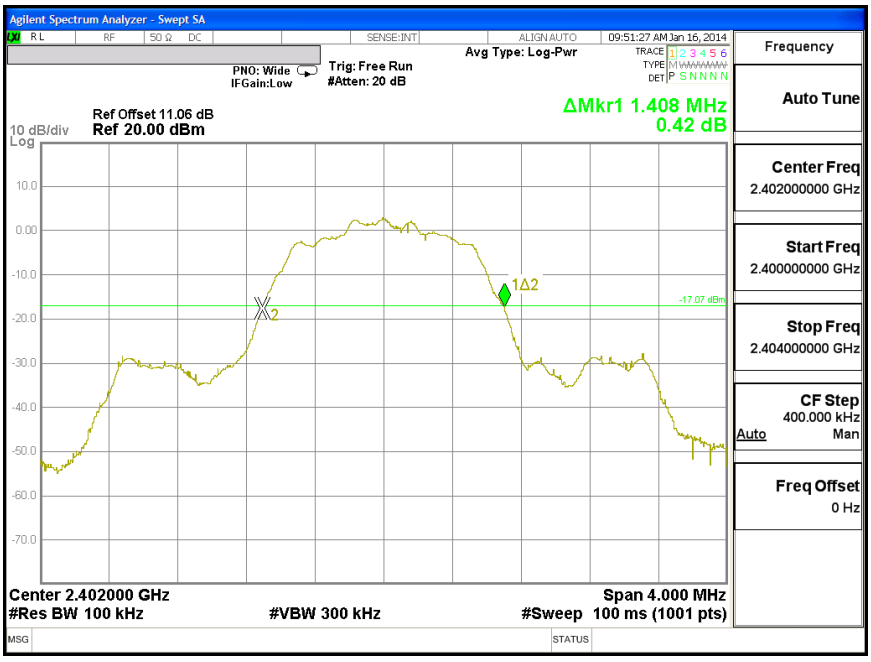
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

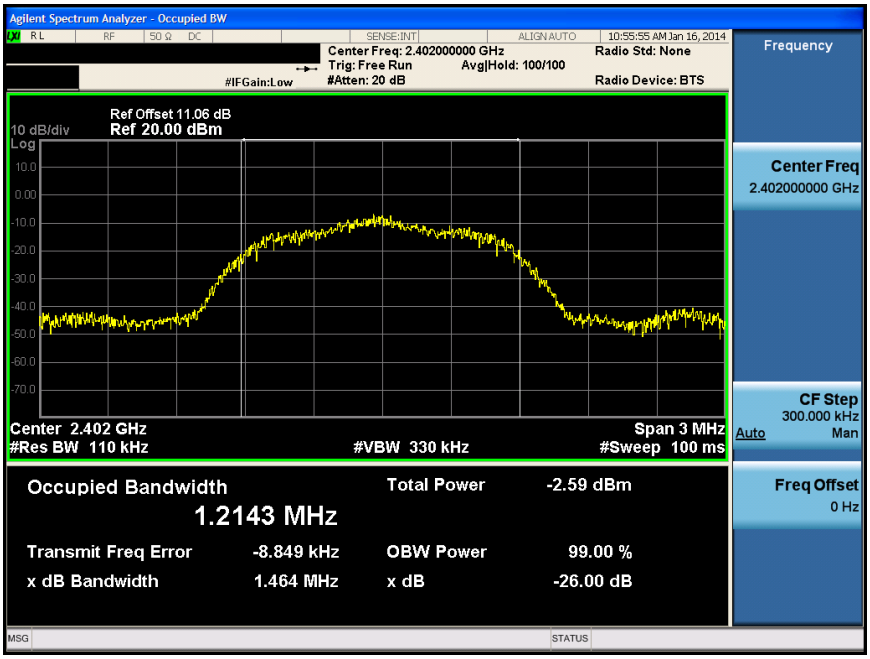
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.408	1.2143
Middle	2441	1.424	1.2136
High	2480	1.424	1.2176

20 dB AND 99% BANDWIDTH

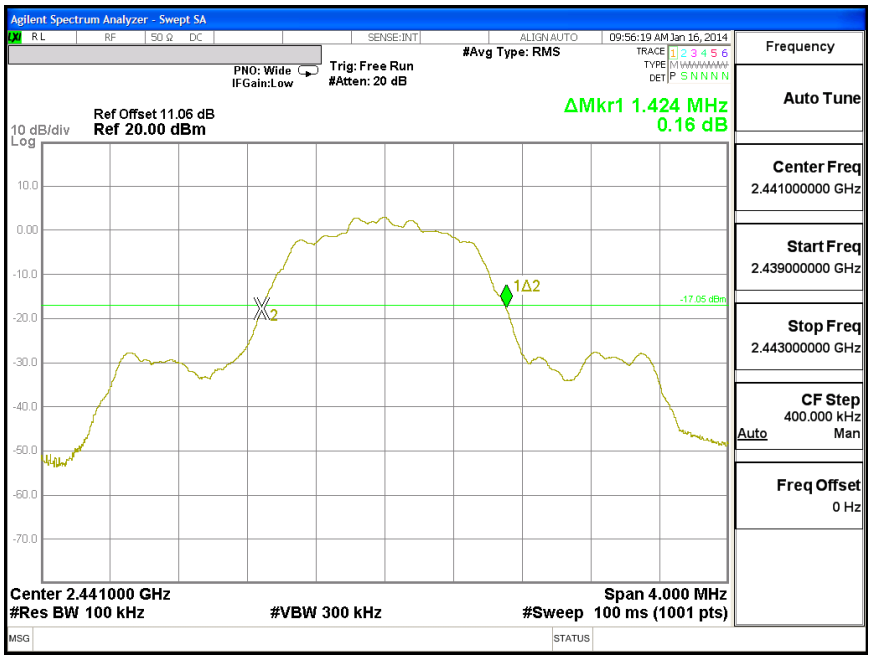
20dB BANDWIDTH LOW CH



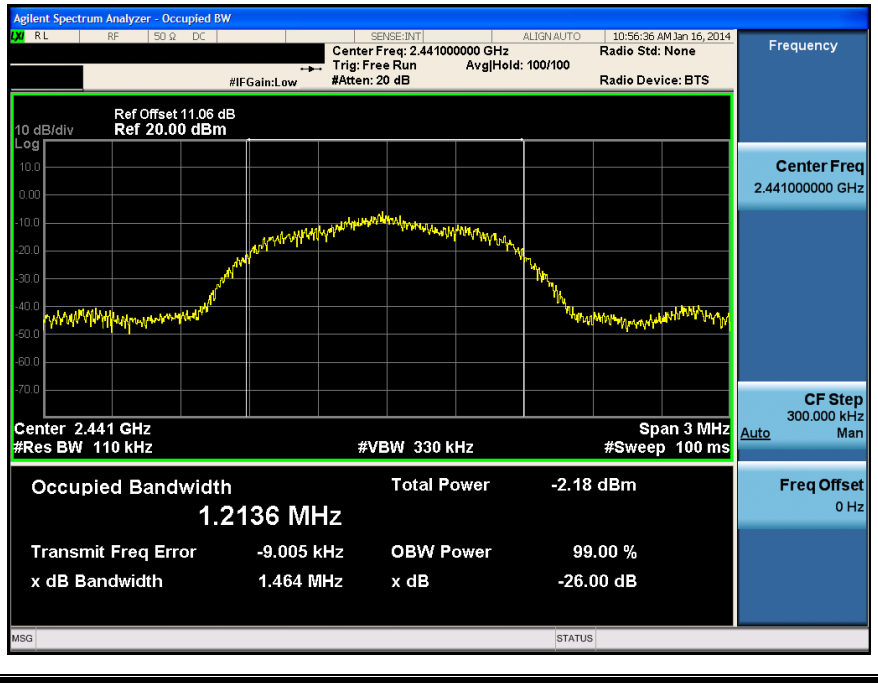
99% BANDWIDTH LOW CH



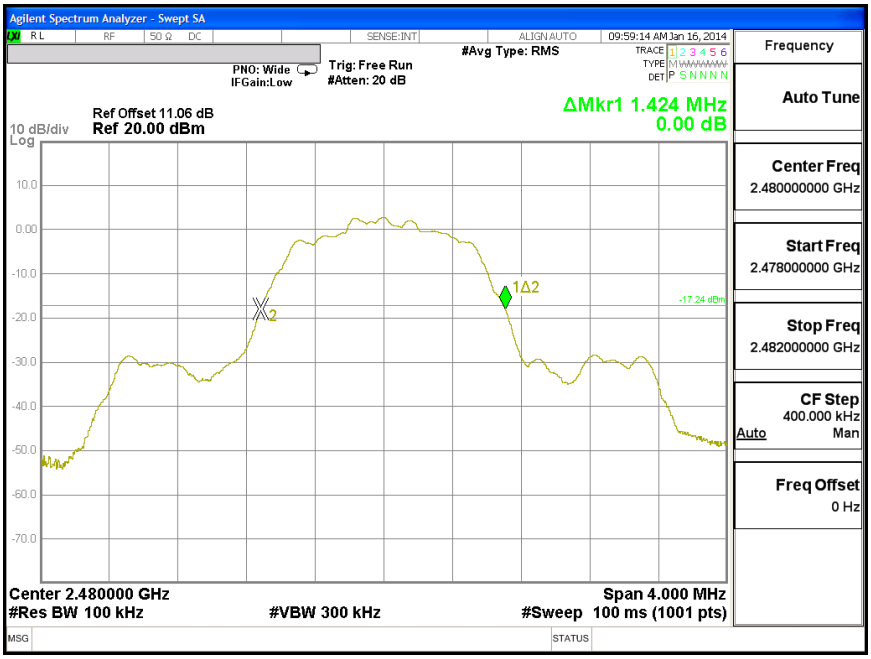
20dB BANDWIDTH MID CH



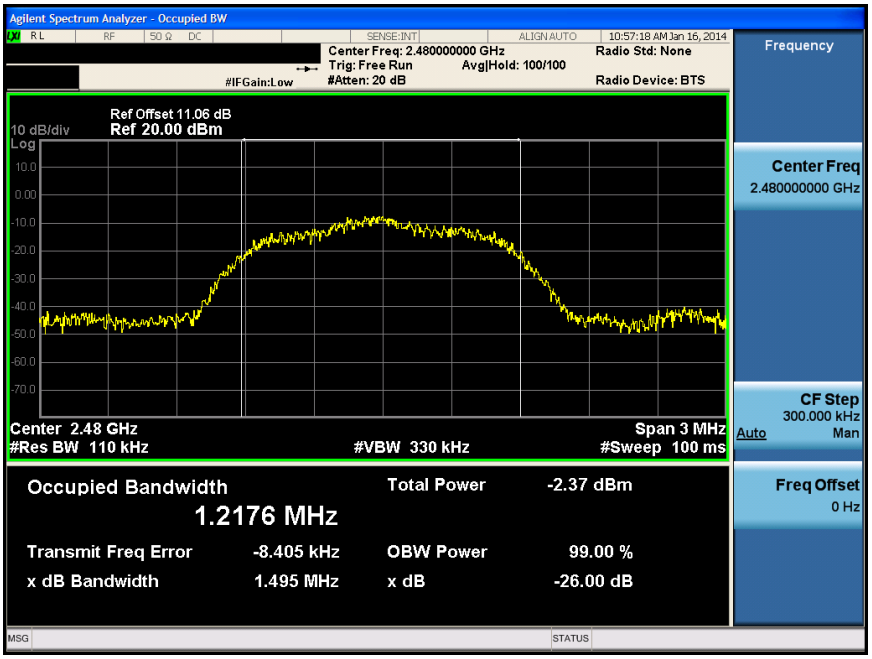
99% BANDWIDTH MID CH



20dB BANDWIDTH HIGH CH



99% BANDWIDTH HIGH CH



8.3.2. 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.

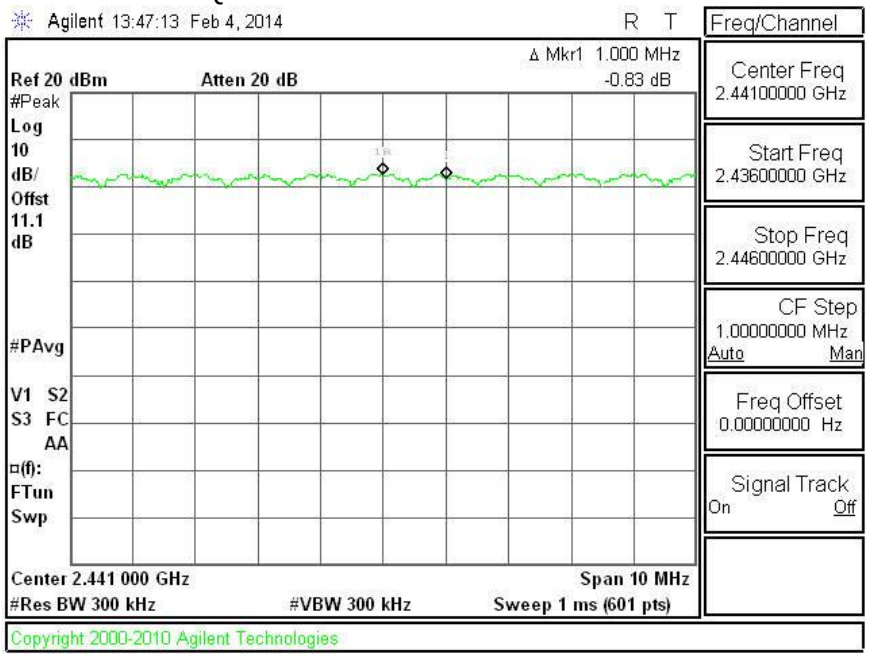
TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION



8.3.3. 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

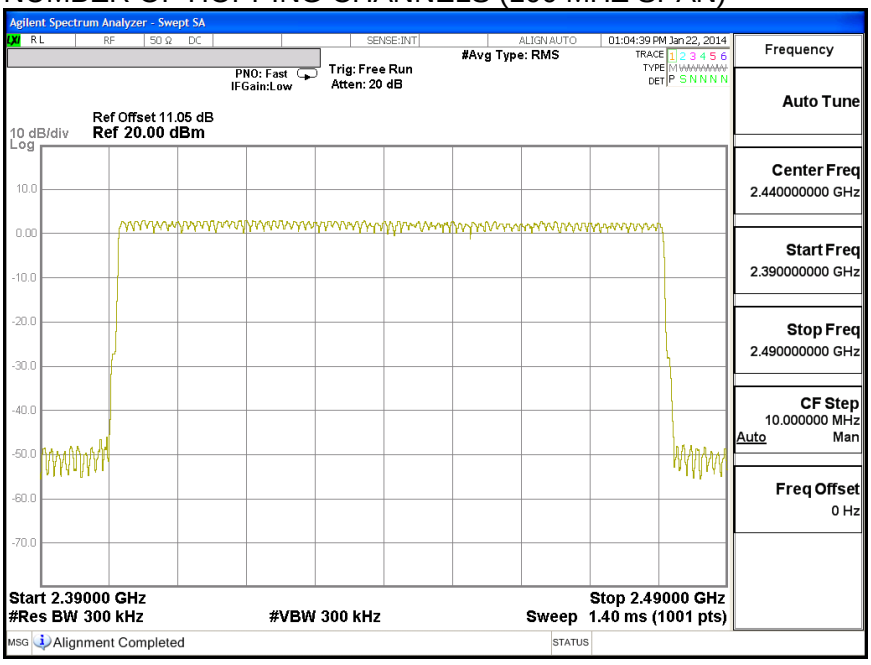
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

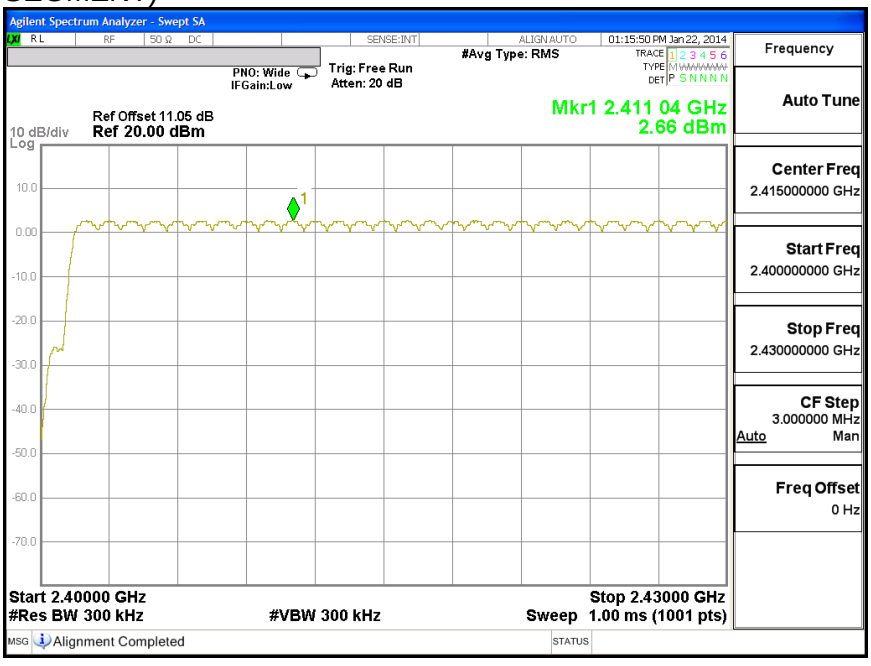
79 Channels observed.

NUMBER OF HOPPING CHANNELS

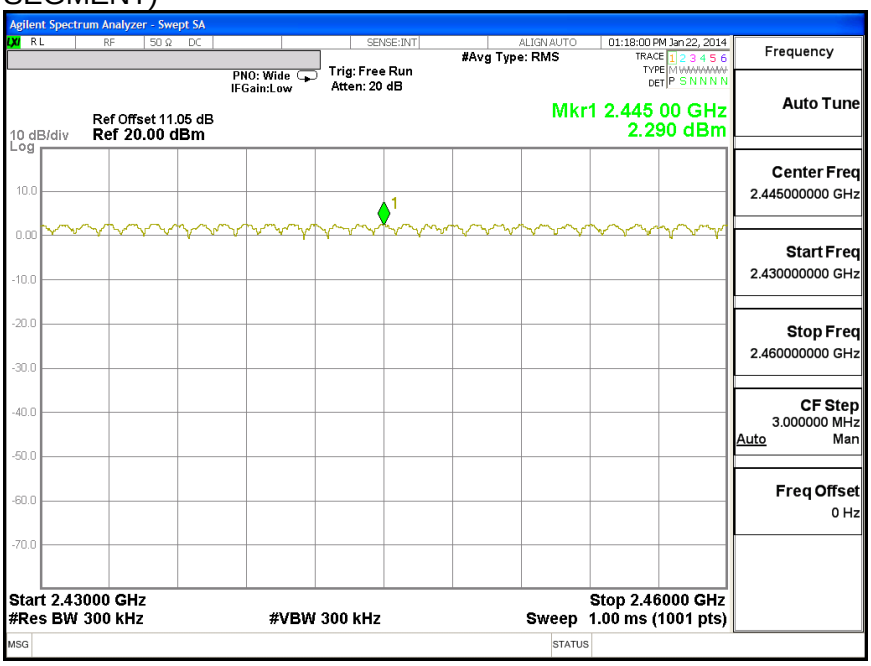
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



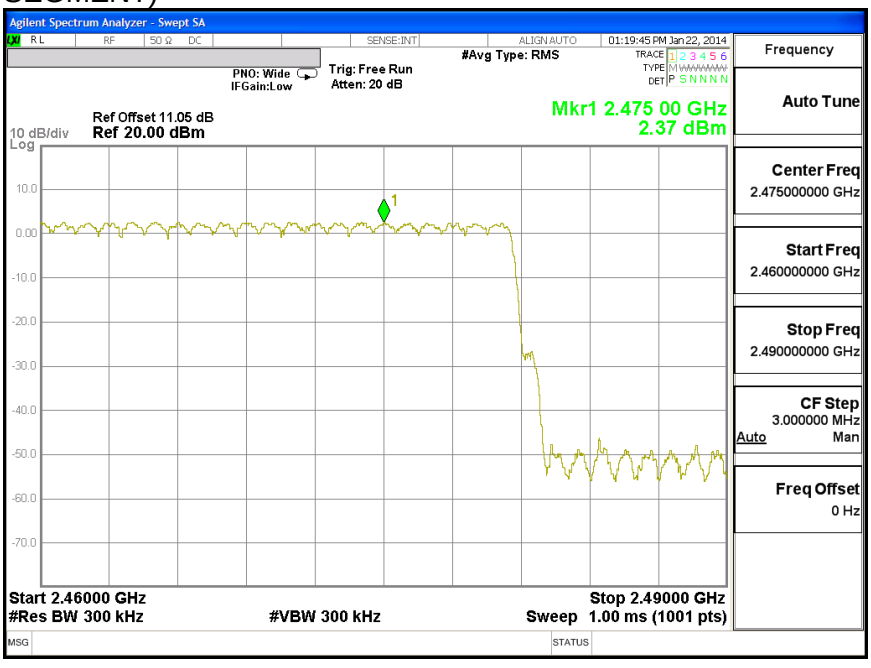
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



8.3.4. 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.

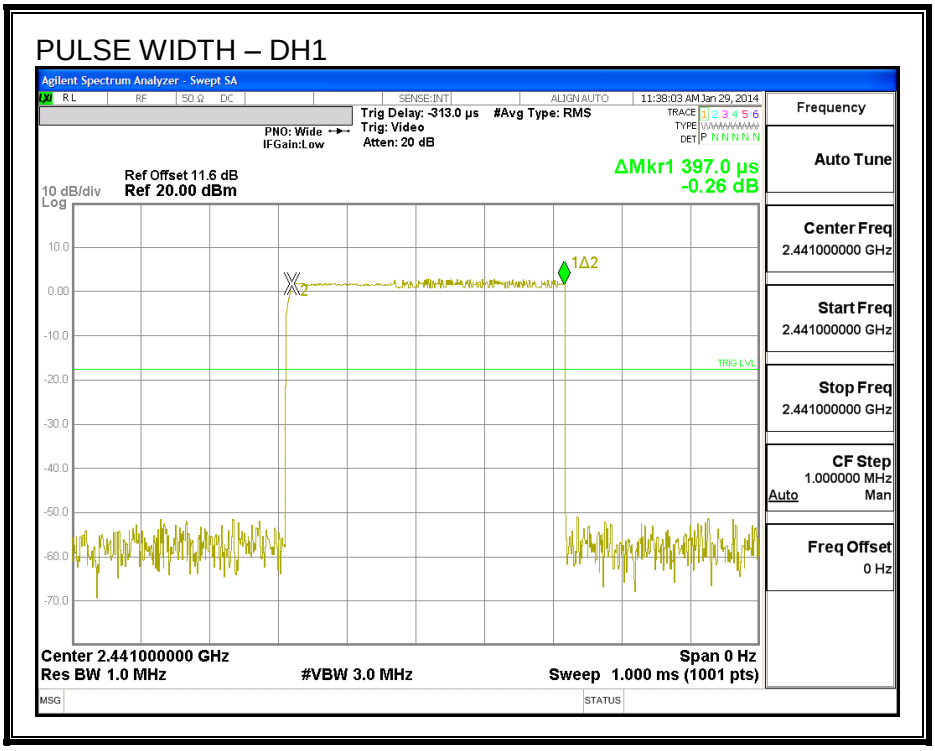
RESULTS

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

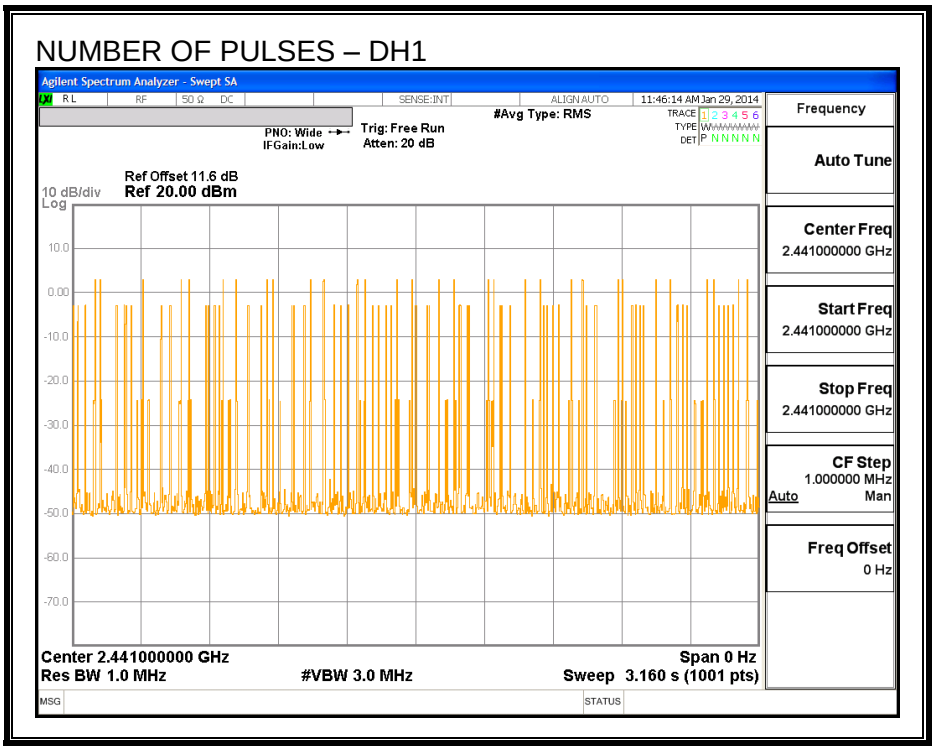
DQPSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.397	31	0.123	0.4	-0.277
DH3	1.647	14	0.231	0.4	-0.169
DH5	2.9	11	0.319	0.4	-0.081

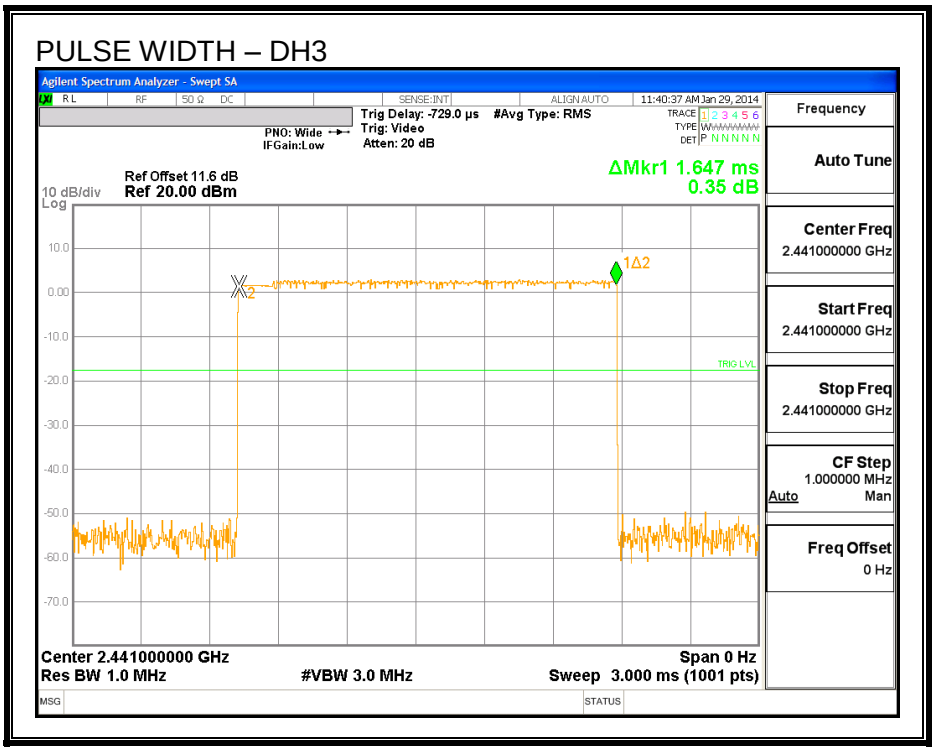
PULSE WIDTH – DH1



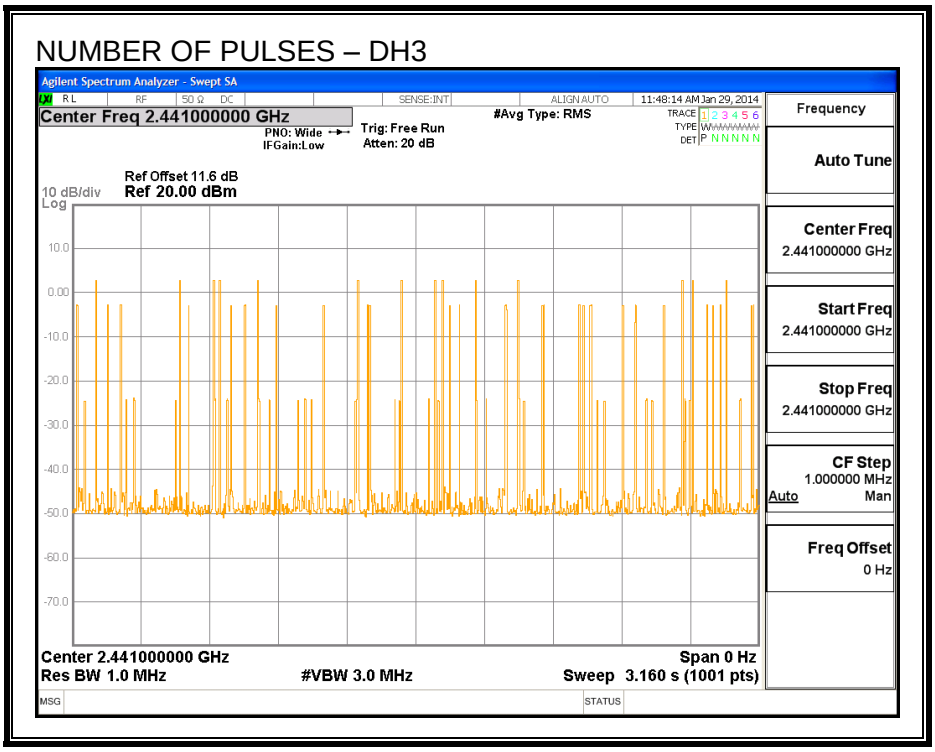
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



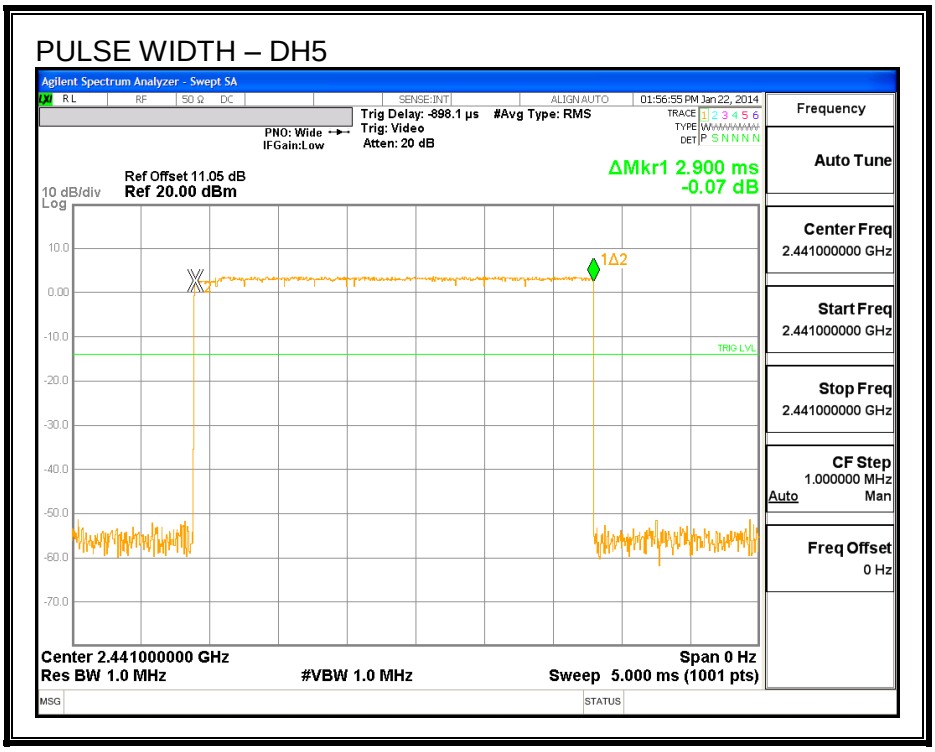
PULSE WIDTH – DH3



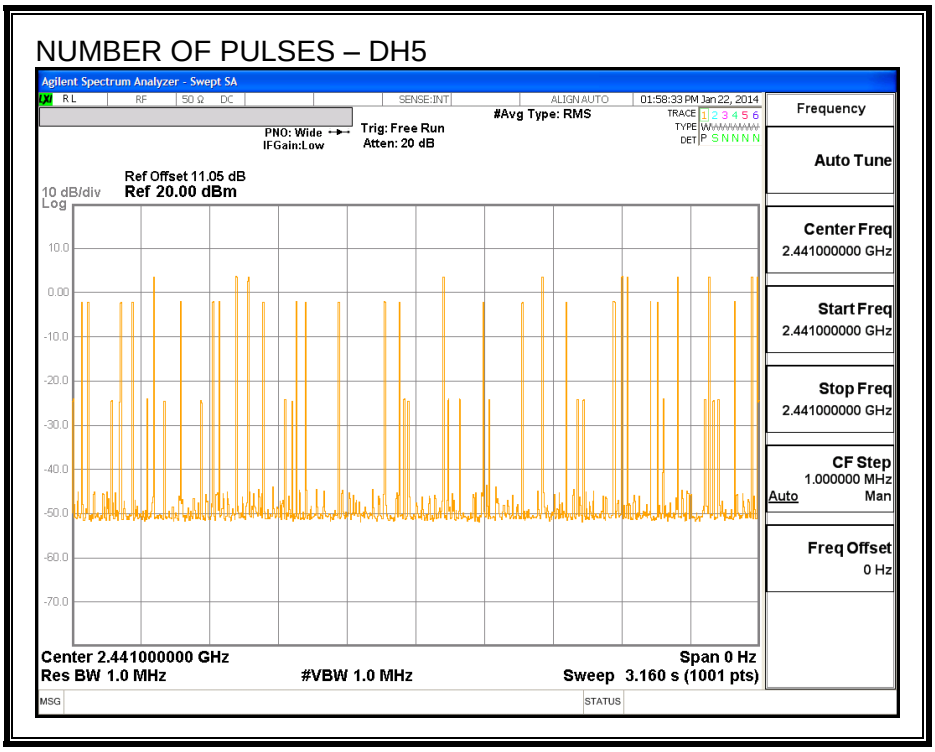
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



8.3.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 8 Clause A8.4

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

TEST PROCEDURE

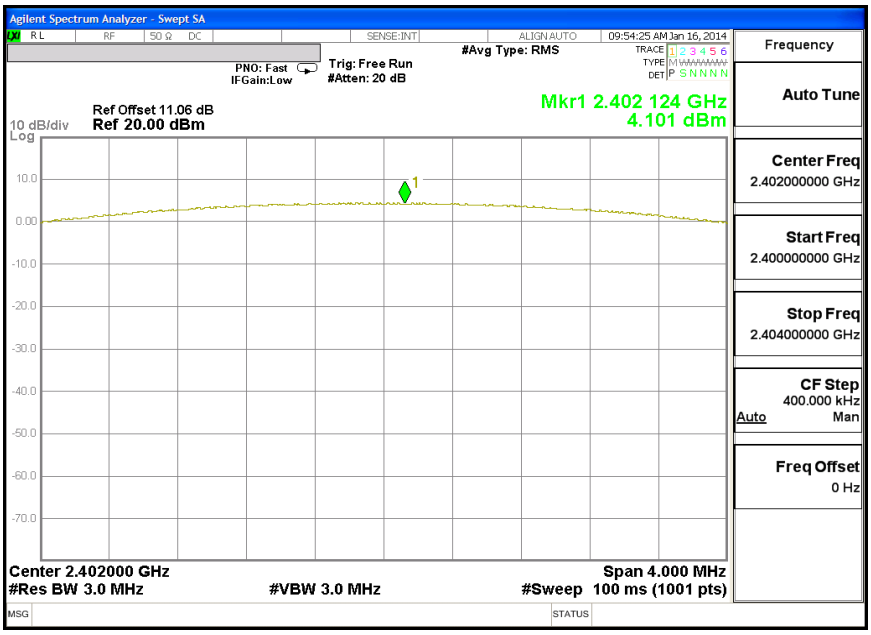
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

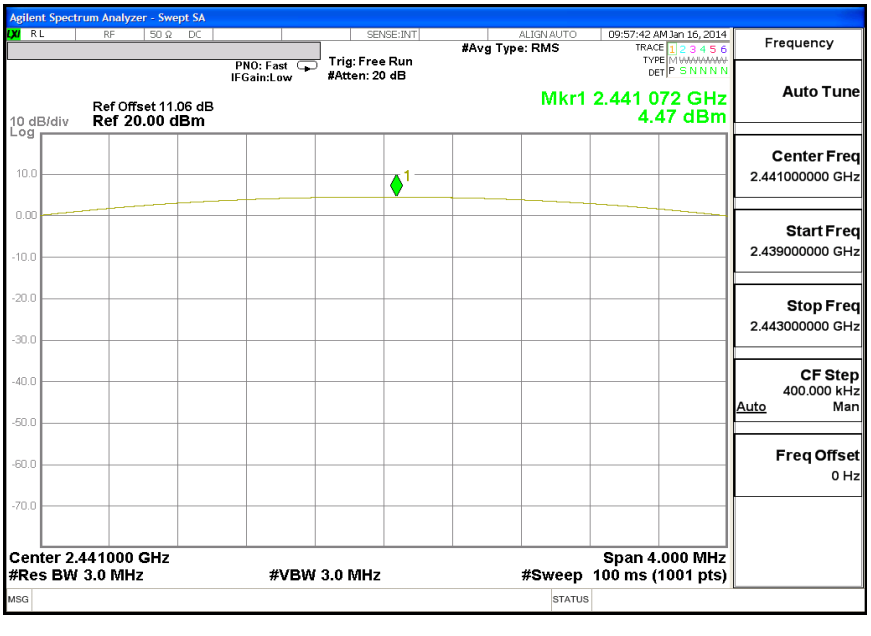
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.10	30	-25.90
Middle	2441	4.47	30	-25.53
High	2480	4.34	30	-25.66

OUTPUT POWER

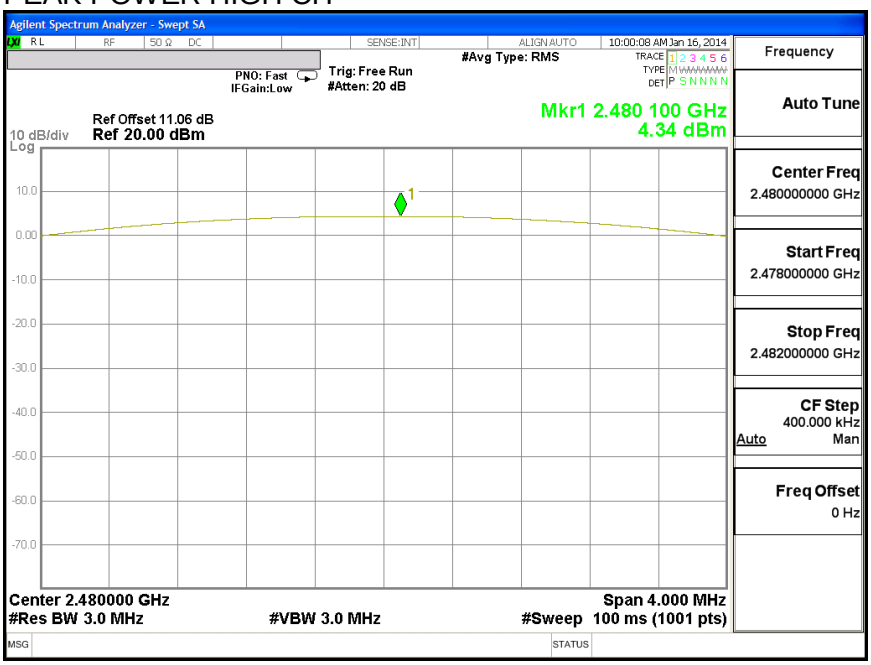
PEAK POWER LOW CH



PEAK POWER MID CH



PEAK POWER HIGH CH



8.3.6. 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 11.05dB (including 10dB pad, 1.05dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average (dBm)
Low	2402	2.09
Middle	2441	2.51
High	2480	2.38

8.3.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

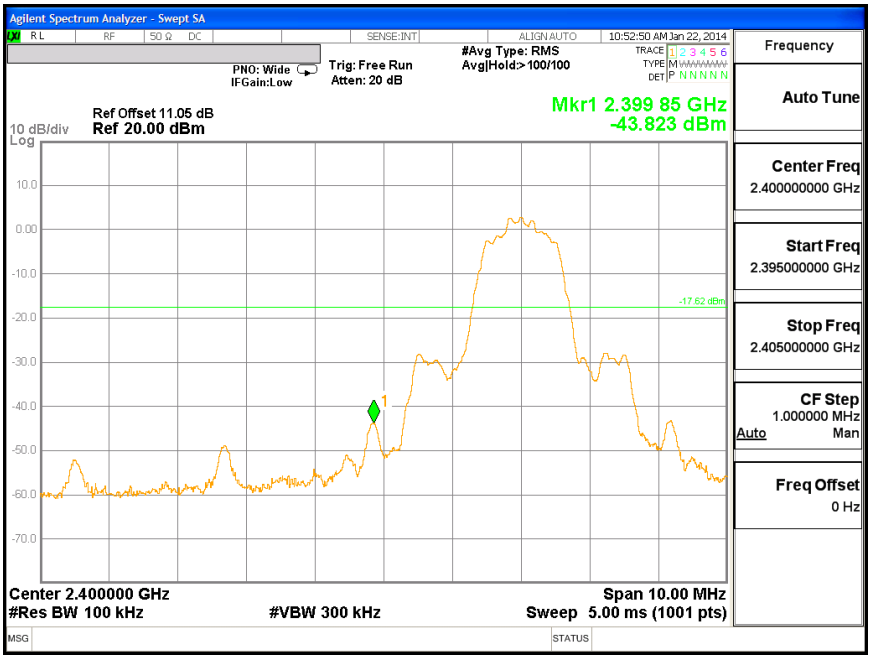
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

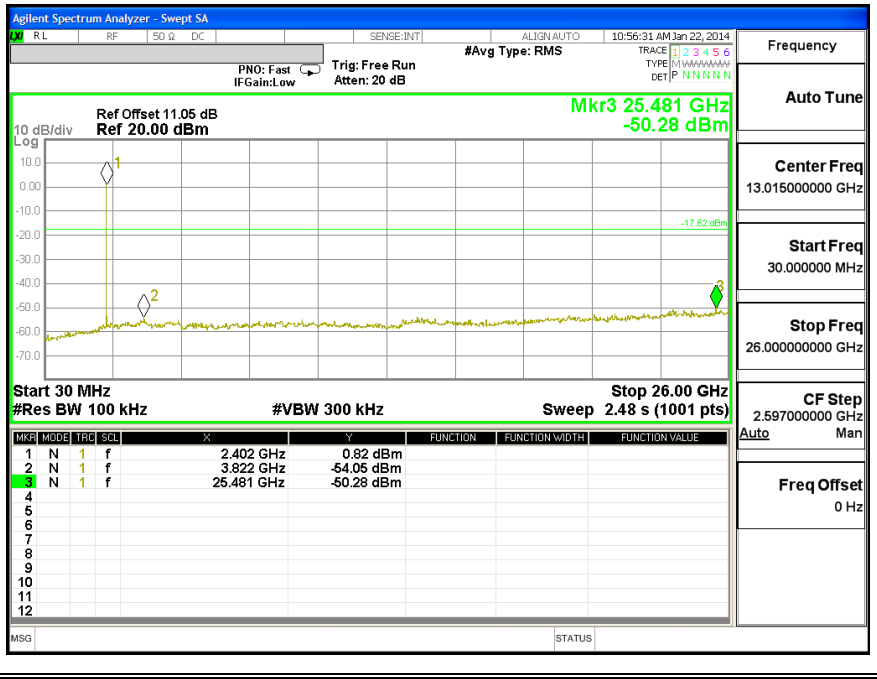
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

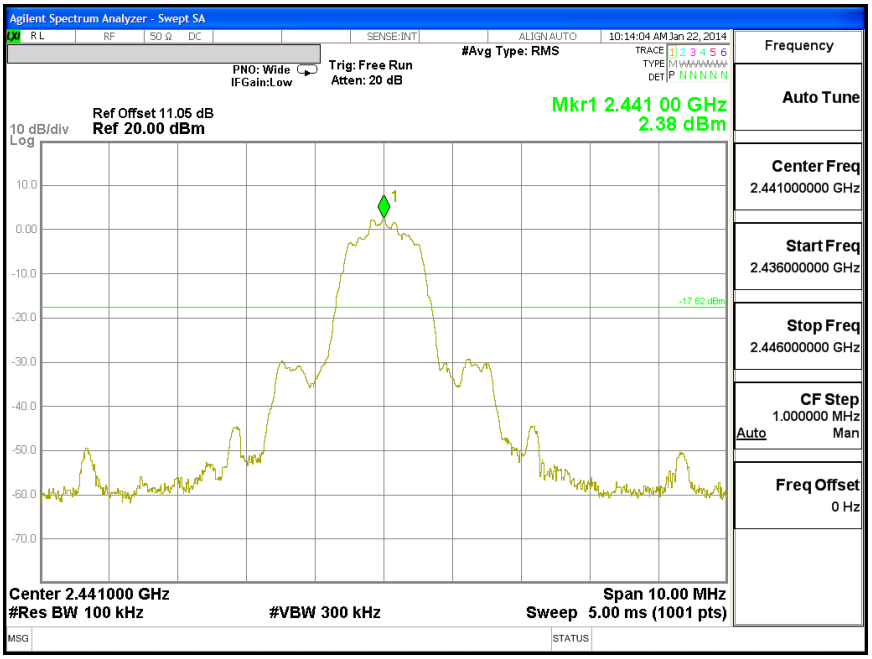


LOW CHANNEL SPURIOUS

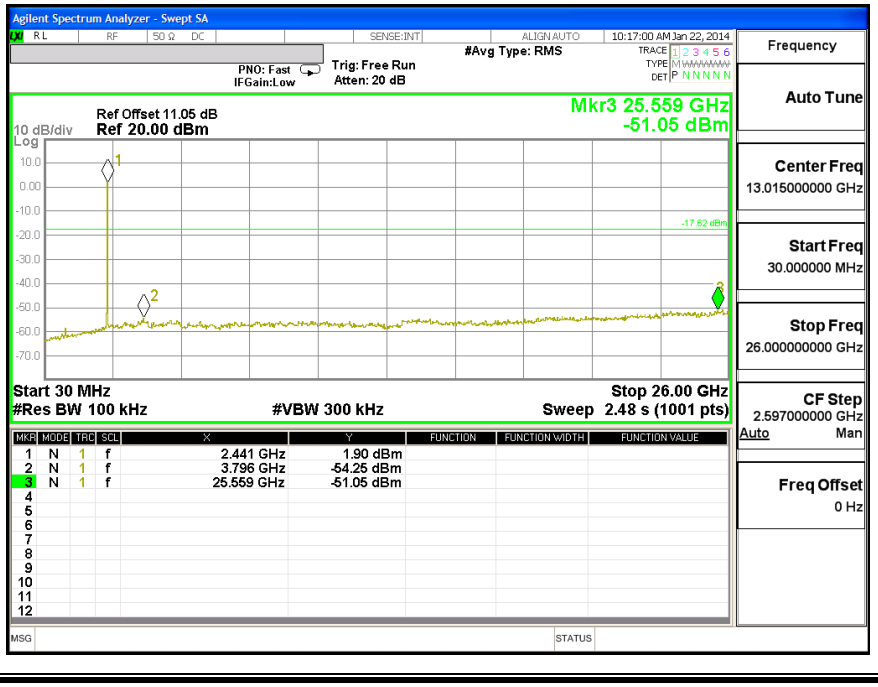


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL REFERENCE

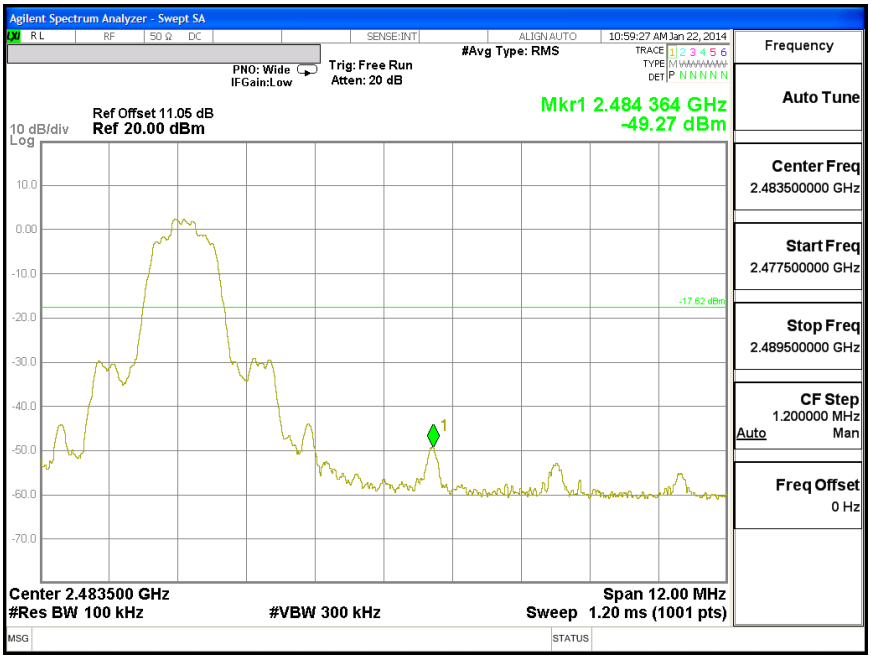


MID CHANNEL SPURIOUS

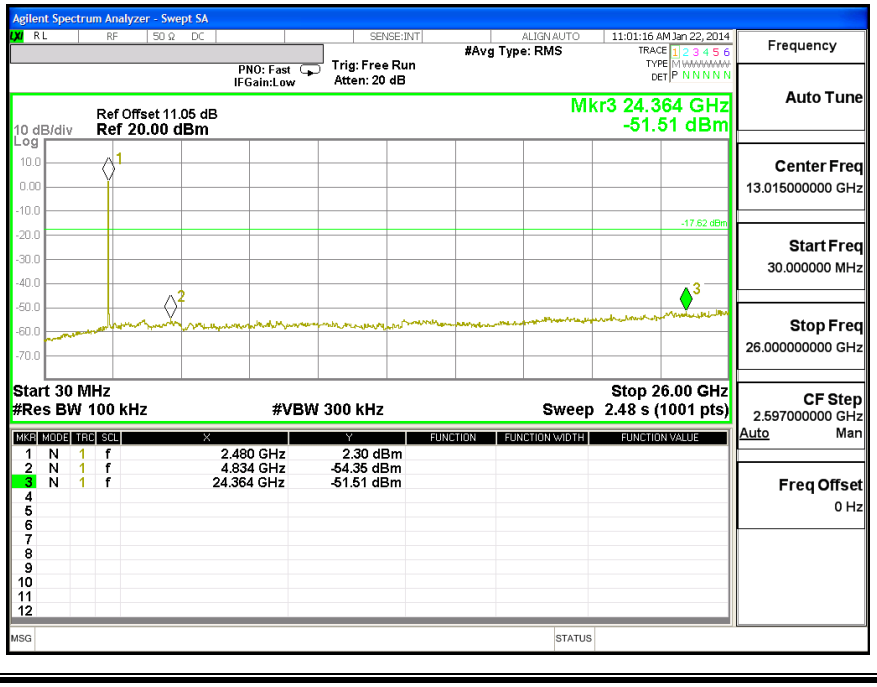


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

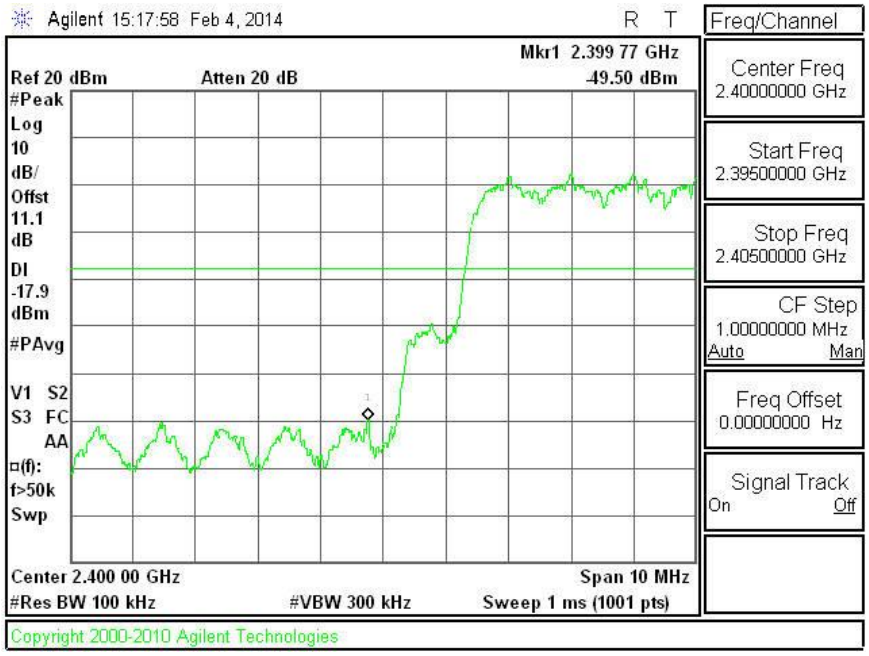


HIGH CHANNEL SPURIOUS

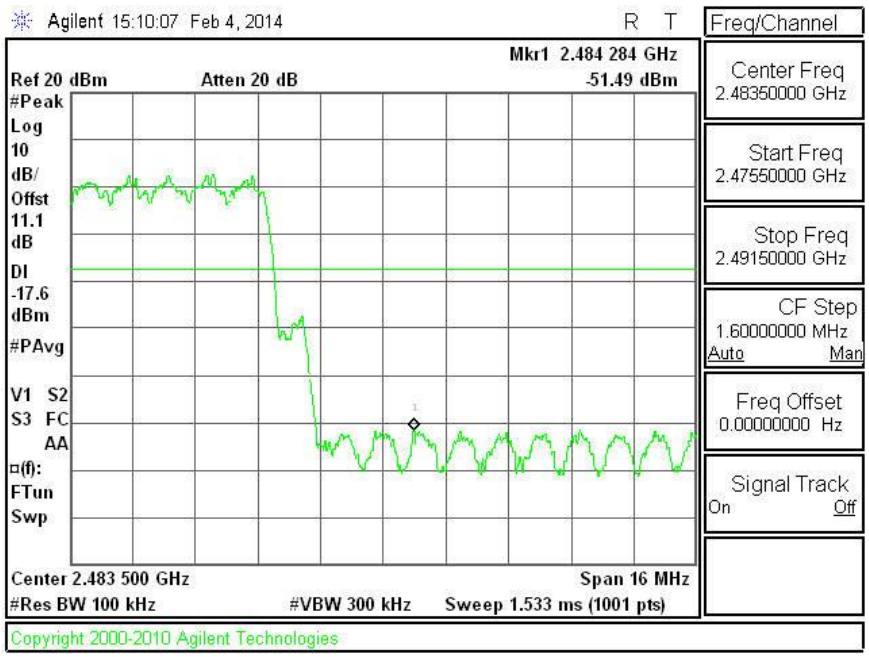


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



9. RADIATED TEST RESULTS

9.1. 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 and 1 MHz resolution bandwidth with 3MHz video bandwidth with average detector for average measurements.

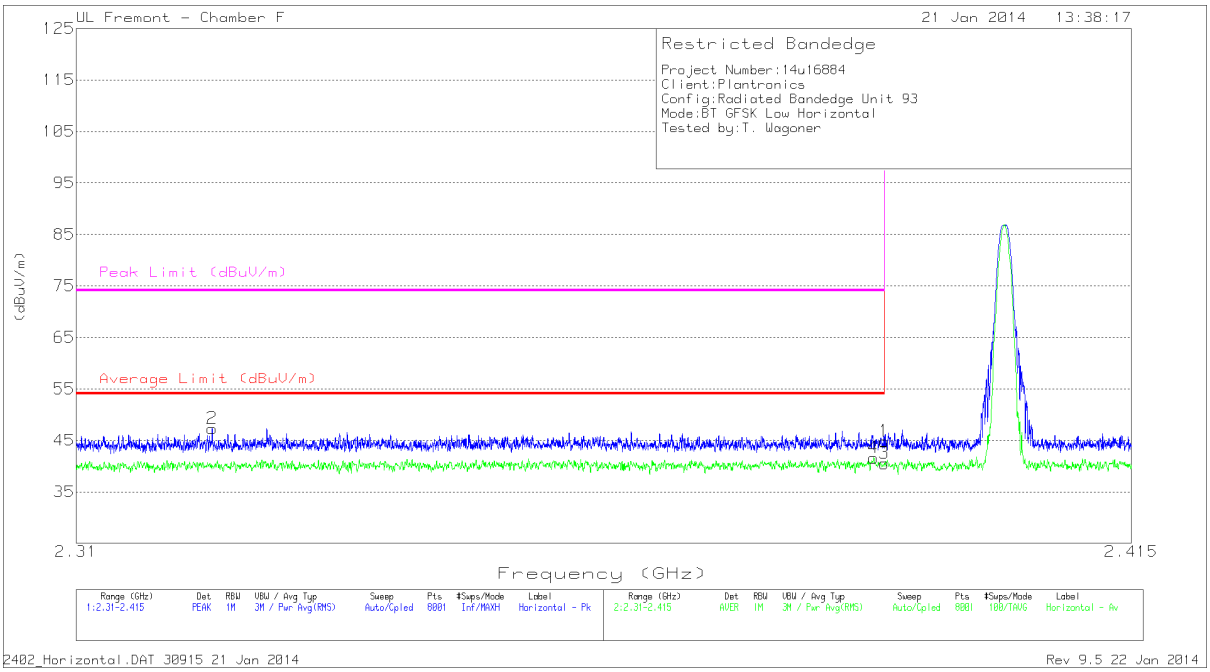
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

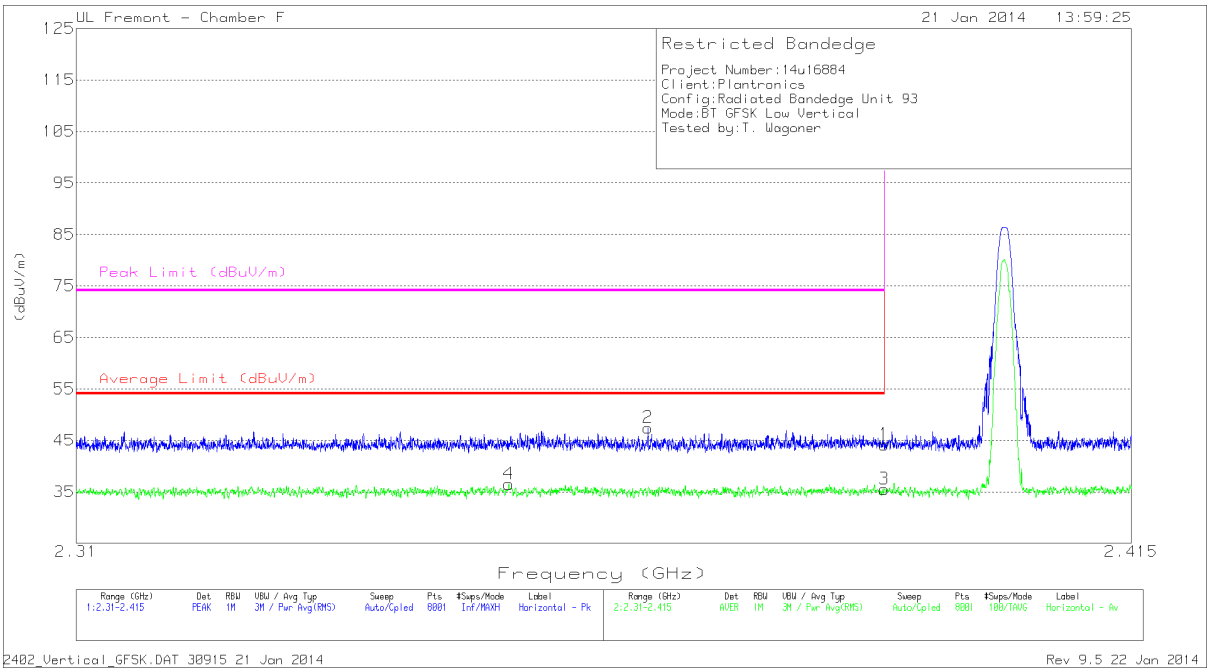


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	36.51	PK	32.1	-23.8	0	44.81	-	-	74	-29.19	94	261	H
2	2.323	38.79	PK	32	-23.5	0	47.29	-	-	74	-26.71	94	261	H
3	2.39	27.24	Mav1	32.1	-23.8	5.1	40.64	54	-13.36	-	-	94	261	H
4	2.389	28.32	Mav1	32.1	-23.8	5.1	41.72	54	-12.28	-	-	94	261	H

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

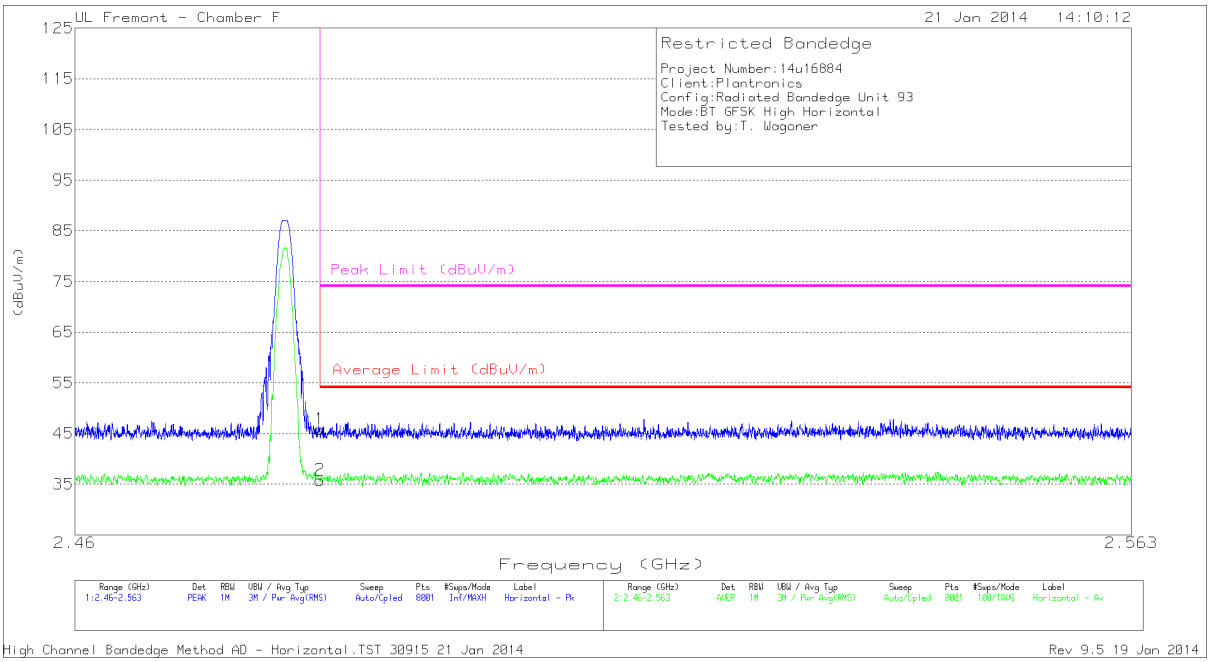


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. Corr. dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	35.86	PK	32.1	-23.8	0	44.16	-	-	74	-29.84	61	125	V
2	2.366	39.12	PK	32.1	-23.8	0	47.42	-	-	74	-26.58	61	125	V
3	2.39	27.22	MAv1	32.1	-23.8	5.1	40.62	54	-13.38	-	-	61	125	V
4	2.353	28.11	MAv1	32.1	-23.7	5.1	41.61	54	-12.39	-	-	61	125	V

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

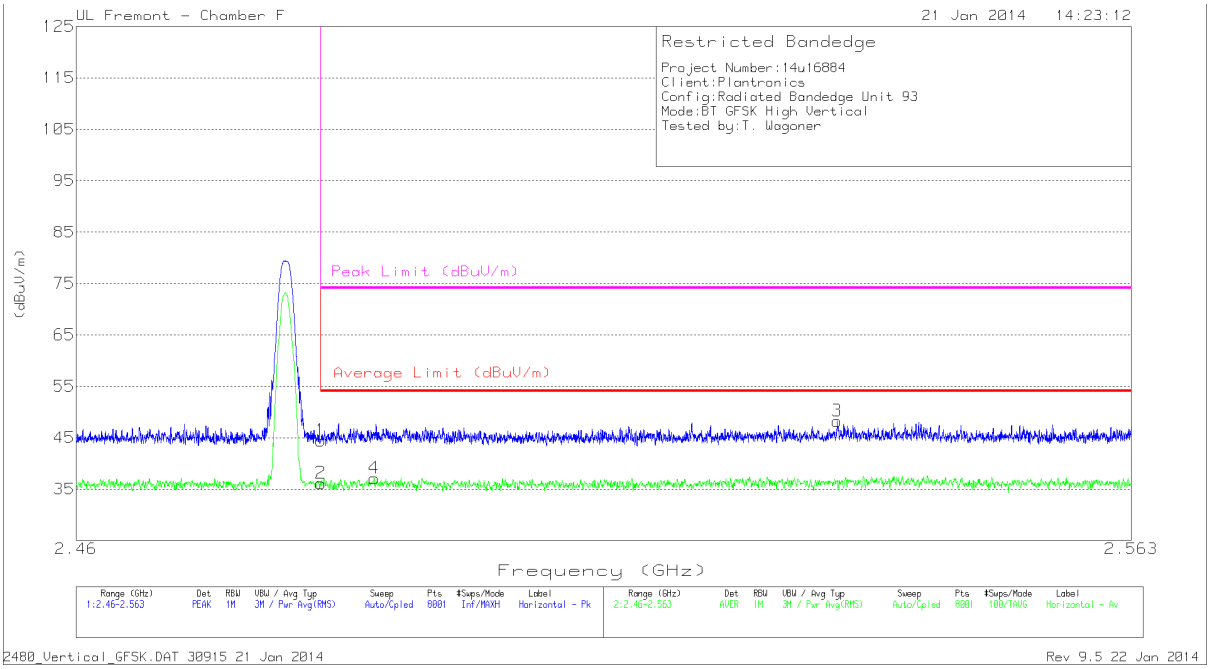


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	36.42	PK	32.4	-23	0	45.82	-	-	74	-28.18	201	140	H
2	2.484	26.38	MAv1	32.4	-23	5.1	40.88	54	-13.12	-	-	201	140	H

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



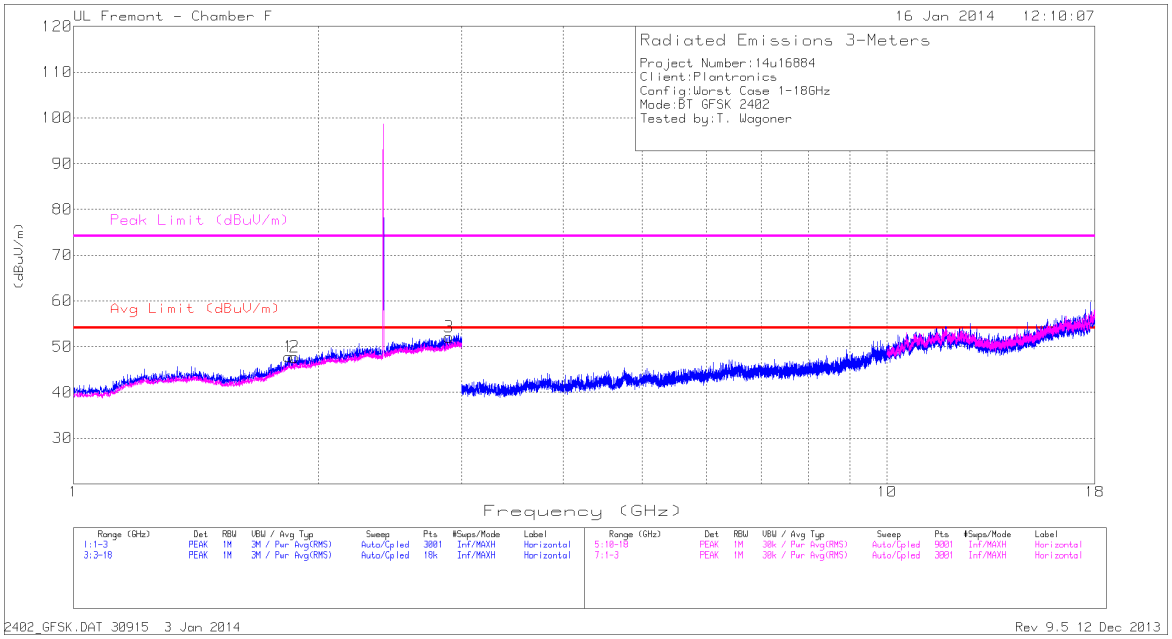
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	35.05	PK	32.4	-23	0	44.45	-	-	74	-29.55	311	268	V
3	2.534	38.52	PK	32.5	-22.8	0	48.22	-	-	74	-25.78	311	268	V
2	2.484	26.71	Mav1	32.4	-23	5.1	41.21	54	-12.79	-	-	311	268	V
4	2.489	27.51	Mav1	32.4	-22.8	5.1	42.21	54	-11.79	-	-	311	268	V

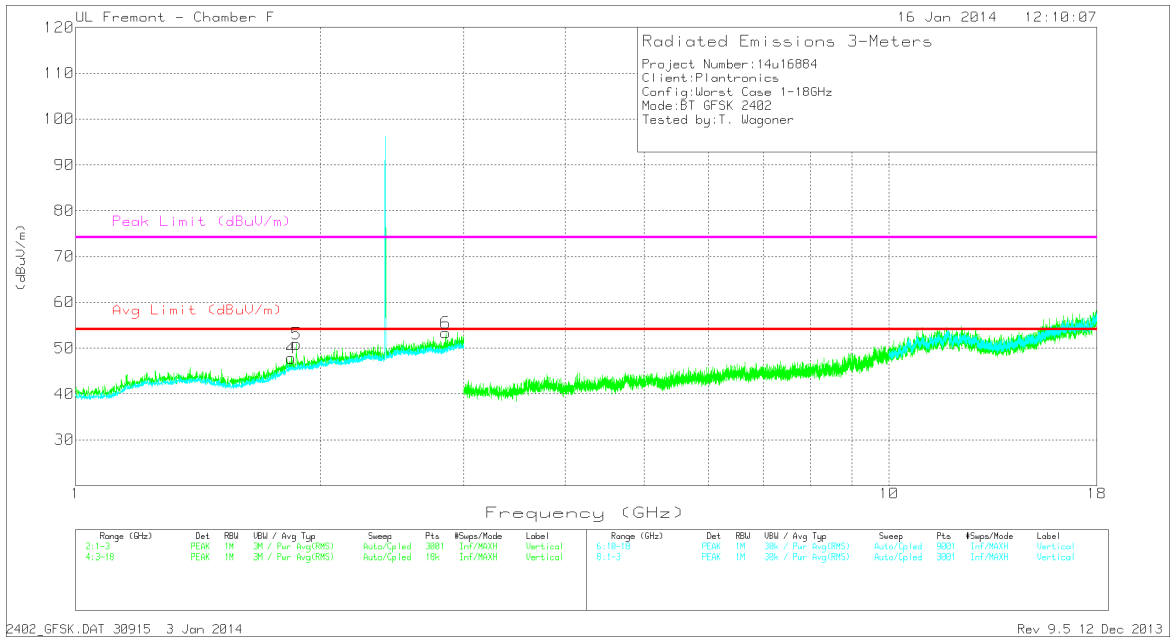
PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



Trace Markers

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 2.894	41.8	PK	32.9	-22.6	0	52.1	54	-1.9	74	-21.9	0-360	200	H
6	* 2.851	43.31	PK	32.8	-22.8	0	53.31	54	-.69	74	-20.69	0-360	201	V
1	1.839	41.48	PK	30.5	-24.2	0	47.78	54	-6.22	74	-26.22	0-360	98	H
4	1.841	41.42	PK	30.6	-24.2	0	47.82	54	-6.18	74	-26.18	0-360	201	V
2	1.869	41.32	PK	30.8	-24.4	0	47.72	54	-6.28	74	-26.28	0-360	200	H
5	1.87	44.5	PK	30.8	-24.4	0	50.9	54	-3.1	74	-23.1	0-360	101	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

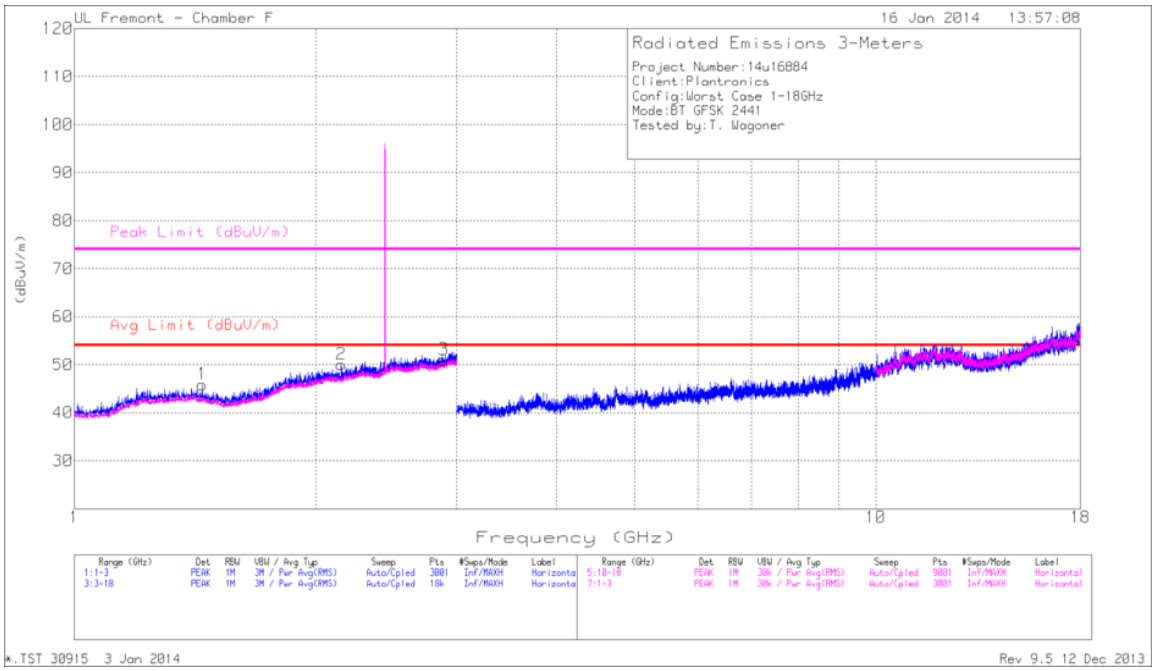
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.892	41.07	PK2	32.9	-22.6	0	51.37	54	-2.63	74	-22.63	64	208	H
* 2.895	30.68	MAv1	32.9	-22.5	5.1	46.18	54	-7.82	74	-27.82	64	208	H
* 2.853	42.12	PK2	32.8	-22.8	0	52.12	54	-1.88	74	-21.88	322	136	V
* 2.849	30.66	MAv1	32.8	-22.8	5.1	45.76	54	-8.24	74	-28.24	322	136	V
1.814	41.24	PK2	30.3	-24.6	0	46.94	54	-7.06	74	-27.06	325	299	V
1.818	30.71	MAv1	30.3	-24.5	5.1	41.61	54	-12.39	74	-32.39	325	299	V
1.879	41.97	PK2	30.9	-24.5	0	48.37	54	-5.63	74	-25.63	201	183	V
1.881	30.75	MAv1	30.9	-24.5	5.1	42.25	54	-11.75	74	-31.75	201	183	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

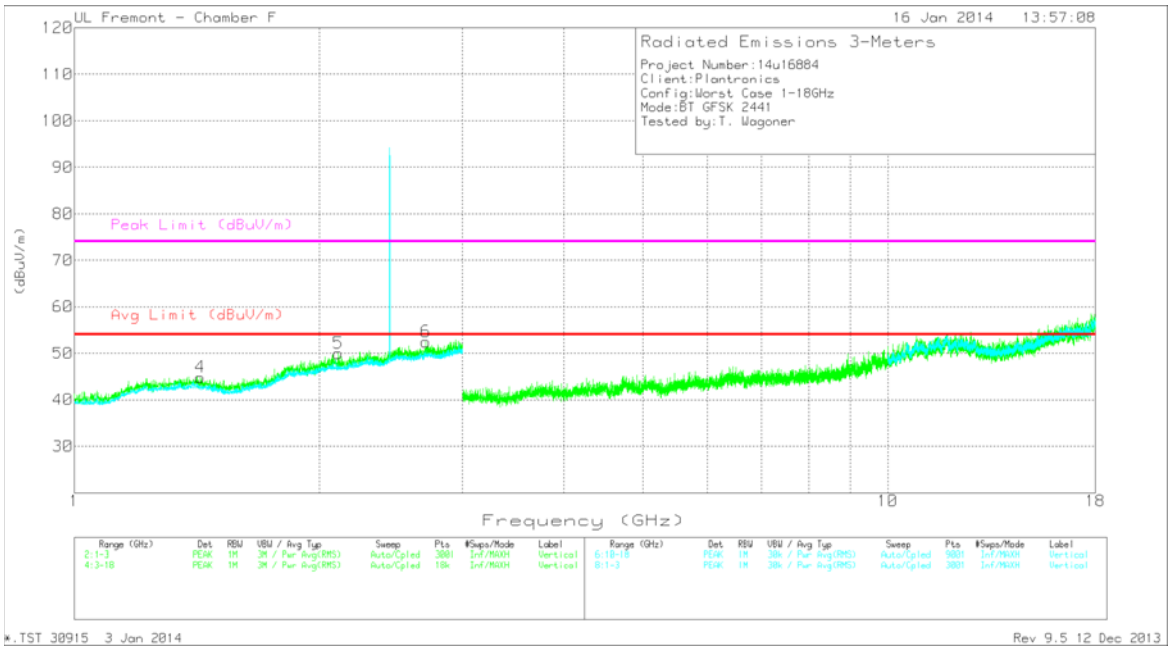
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.445	42.58	PK	29	-25.7	0	45.88	54	-8.12	74	-28.12	0-360	200	H
3	* 2.889	40.74	PK	32.9	-22.6	0	51.04	54	-2.96	74	-22.96	0-360	200	H
6	* 2.705	42.6	PK	32.6	-22.7	0	52.5	54	-1.5	74	-21.5	0-360	101	V
4	1.429	41.34	PK	29.1	-25.6	0	44.84	54	-9.16	74	-29.16	0-360	101	V
5	2.111	42.5	PK	31.6	-24.1	0	50	54	-4	74	-24	0-360	101	V
2	2.153	42.64	PK	31.7	-24.3	0	50.04	54	-3.96	74	-23.96	0-360	101	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK - Peak detector

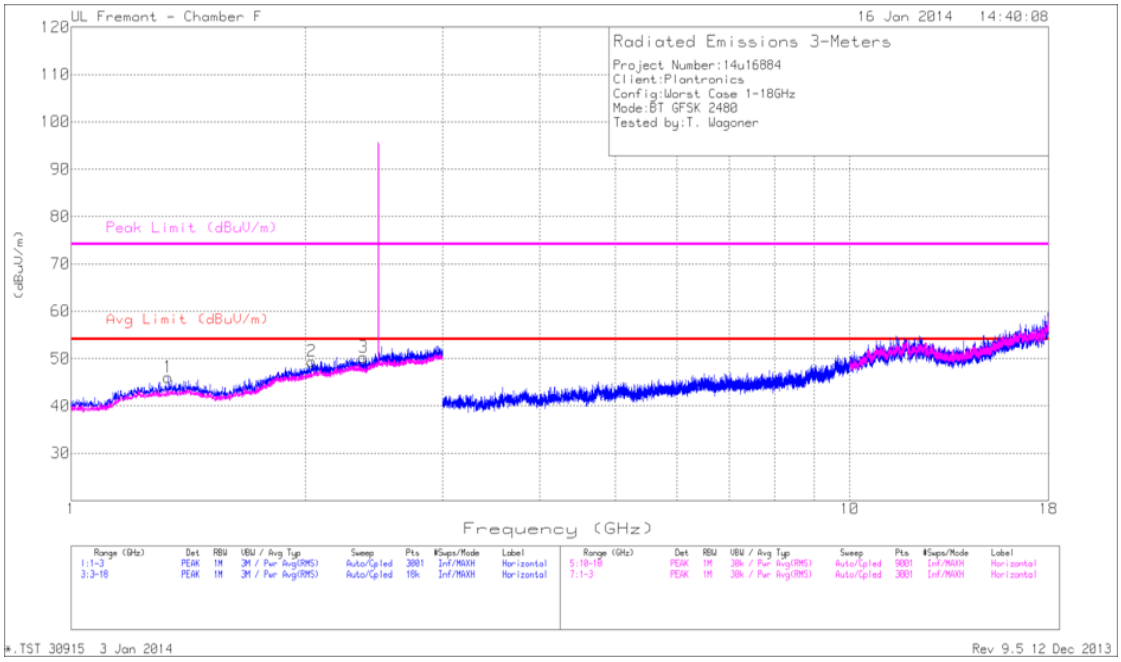
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.889	41.25	PK2	32.9	-22.6	0	51.55	54	-2.45	74	-22.45	303	263	H
* 2.891	30.66	MAv1	32.9	-22.7	5.1	45.96	54	-8.04	74	-28.04	303	263	H
* 2.702	42.3	PK2	32.6	-22.6	0	52.3	54	-1.7	74	-21.7	166	228	V
* 2.699	30.79	MAv1	32.6	-22.6	5.1	45.89	54	-8.11	74	-28.11	166	228	V
2.111	41.32	PK2	31.6	-24.1	0	48.82	54	-5.18	74	-25.18	4	271	V
2.111	30.22	MAv1	31.6	-24.1	5.1	42.82	54	-11.18	74	-31.18	4	271	V
2.154	41.56	PK2	31.7	-24.3	0	48.96	54	-5.04	74	-25.04	151	117	H
2.155	30.25	MAv1	31.7	-24.3	5.1	42.75	54	-11.25	74	-31.25	94	332	H

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

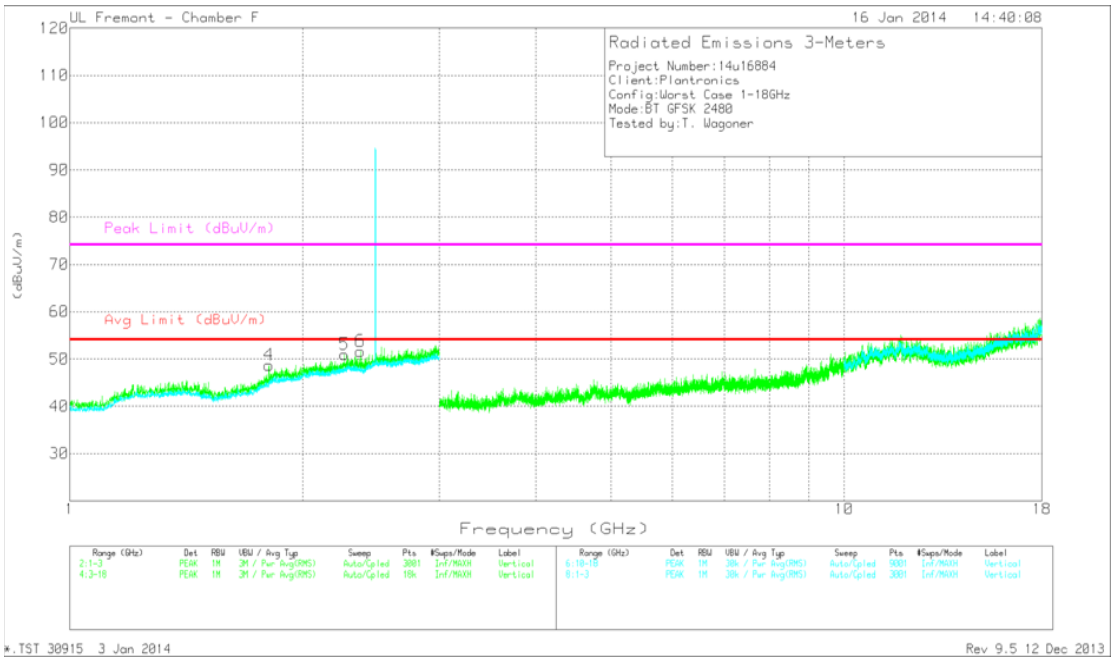
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.332	43.03	PK	29.8	-26.8	0	46.03	54	-7.97	74	-27.97	0-360	100	H
3	* 2.375	42.12	PK	32.1	-24	0	50.22	54	-3.78	74	-23.78	0-360	200	H
5	* 2.262	42.53	PK	31.9	-23.5	0	50.93	54	-3.07	74	-23.07	0-360	201	V
6	* 2.373	43.52	PK	32.1	-24	0	51.62	54	-2.38	74	-22.38	0-360	201	V
4	1.808	43.18	PK	30.2	-24.7	0	48.68	54	-5.32	74	-25.32	0-360	101	V
2	2.038	42.2	PK	31.6	-24.4	0	49.4	54	-4.6	74	-24.6	0-360	200	H

PK - Peak detector

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.373	41.2	PK2	32.1	-24	0	49.3	54	-4.7	74	-24.7	116	352	H
* 2.374	30.69	MAv1	32.1	-24	5.1	43.89	54	-10.11	74	-30.11	116	352	H
* 2.369	42.21	PK2	32.1	-24	0	50.31	54	-3.69	74	-23.69	131	395	V
* 2.368	30.73	MAv1	32.1	-24	5.1	43.93	54	-10.07	74	-30.07	131	395	V
* 2.263	41.42	PK2	31.9	-23.4	0	49.92	54	-4.08	74	-24.08	42	337	V
* 2.259	30.5	MAv1	31.9	-23.6	5.1	43.9	54	-10.1	74	-30.1	42	337	V
1.814	41.24	PK2	30.3	-24.6	0	46.94	54	-7.06	74	-27.06	325	299	V
1.818	30.71	MAv1	30.3	-24.5	5.1	41.61	54	-12.39	74	-32.39	325	299	V
2.038	42.51	PK2	31.6	-24.4	0	49.71	54	-4.29	74	-24.29	218	201	H
2.041	30.45	MAv1	31.6	-24.3	5.1	42.85	54	-11.15	74	-31.15	218	201	H

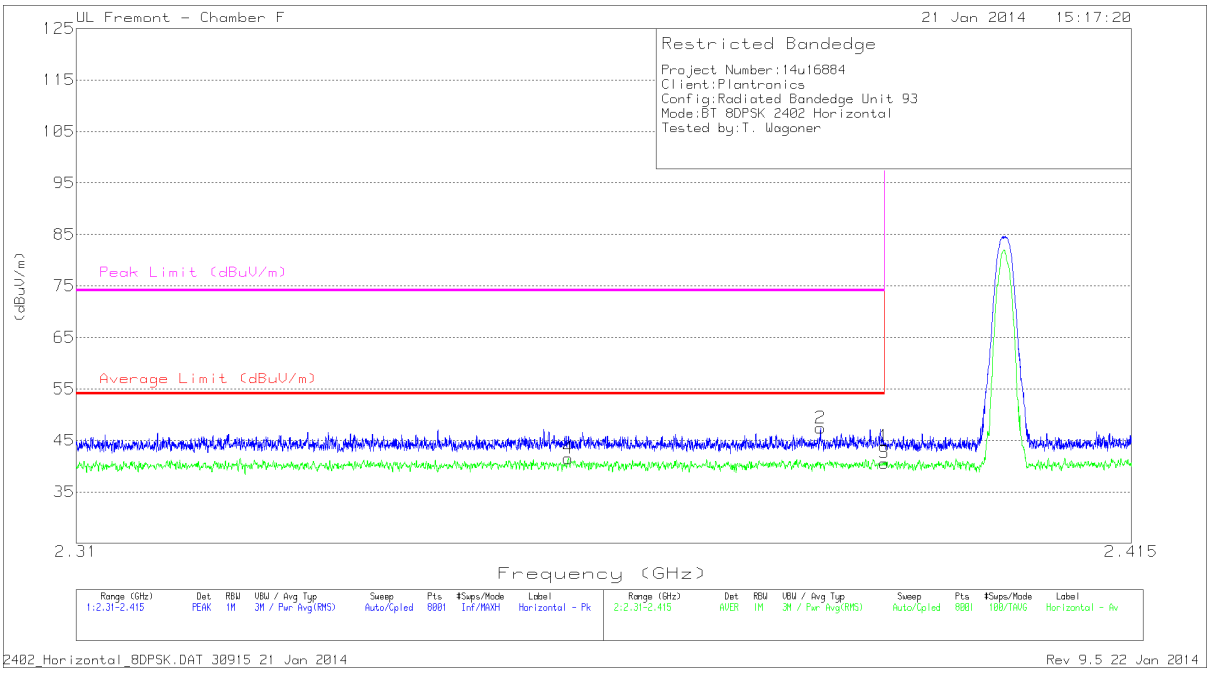
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.2.2. ENHANCED DATA RATE 8DPSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

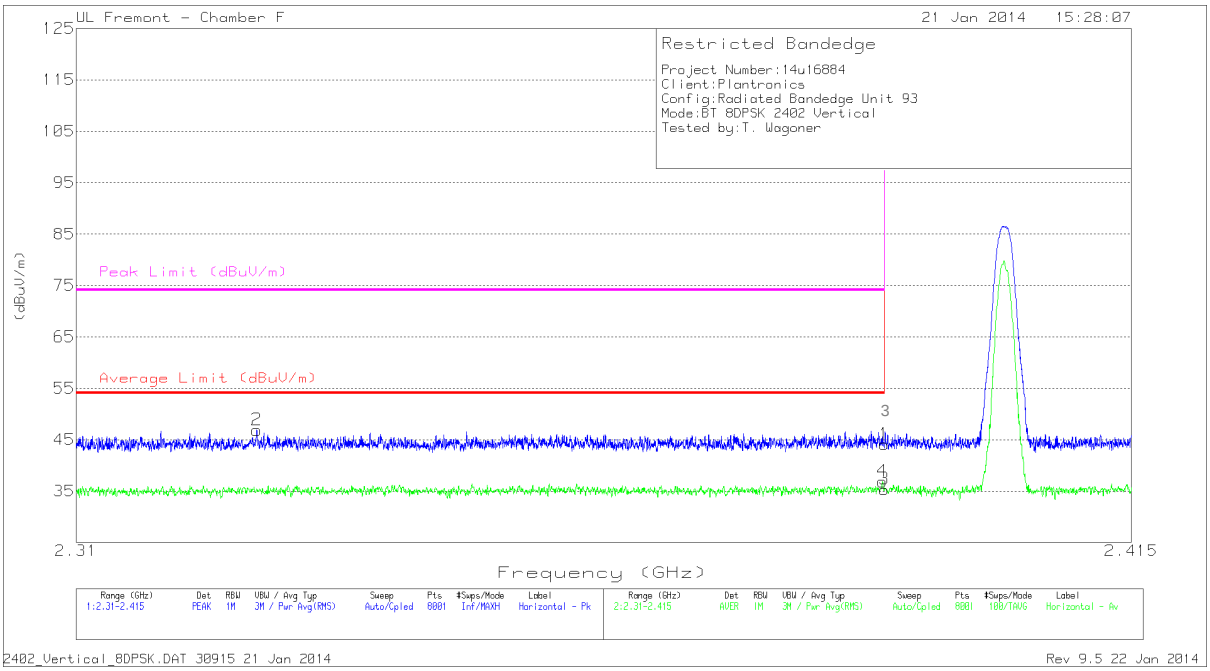


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	35.57	PK	32.1	-23.8	0	43.87	-	-	74	-30.13	278	154	H
2	2.384	39.1	PK	32.1	-23.8	0	47.4	-	-	74	-26.6	278	154	H
3	2.39	27.29	MAv1	32.1	-23.8	5	40.79	54	-13.21	-	-	278	154	H
4	2.358	28.02	MAv1	32.1	-23.6	5	41.72	54	-12.28	-	-	278	154	H

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

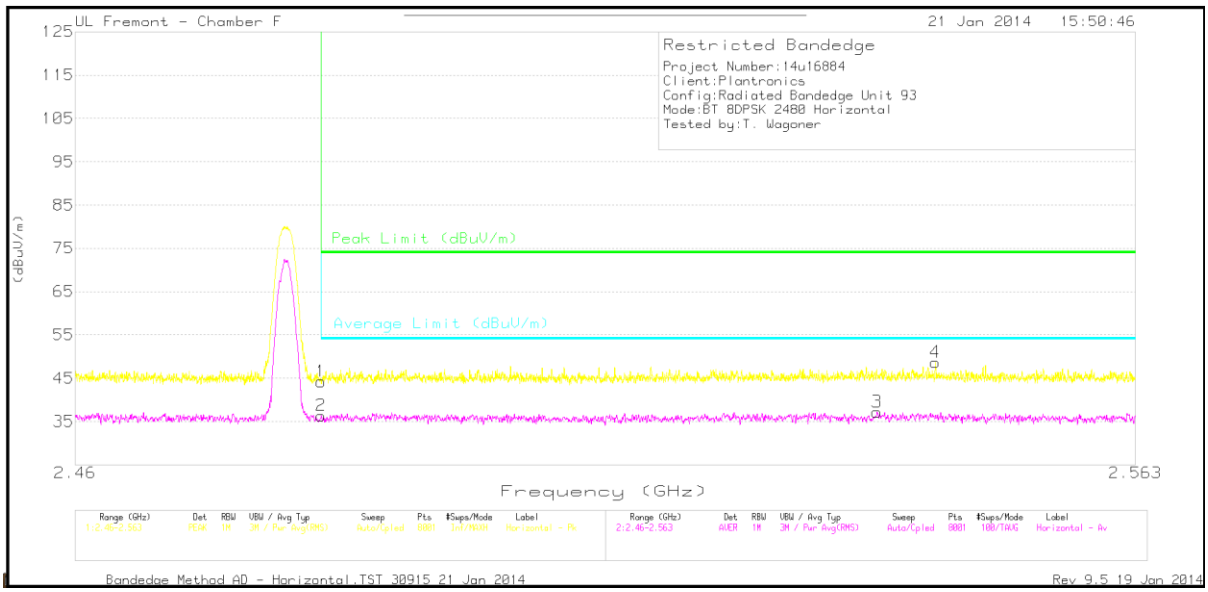


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	35.81	PK	32.1	-23.8	0	44.11	-	-	74	-29.89	319	230	V
2	2.328	38.39	PK	32	-23.5	0	46.89	-	-	74	-27.11	319	230	V
3	2.39	27.04	MAv1	32.1	-23.8	5	40.34	54	-13.46	-	-	319	230	V
4	2.39	28.58	MAv1	32.1	-23.8	5	41.88	54	-11.92	-	-	319	230	V

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

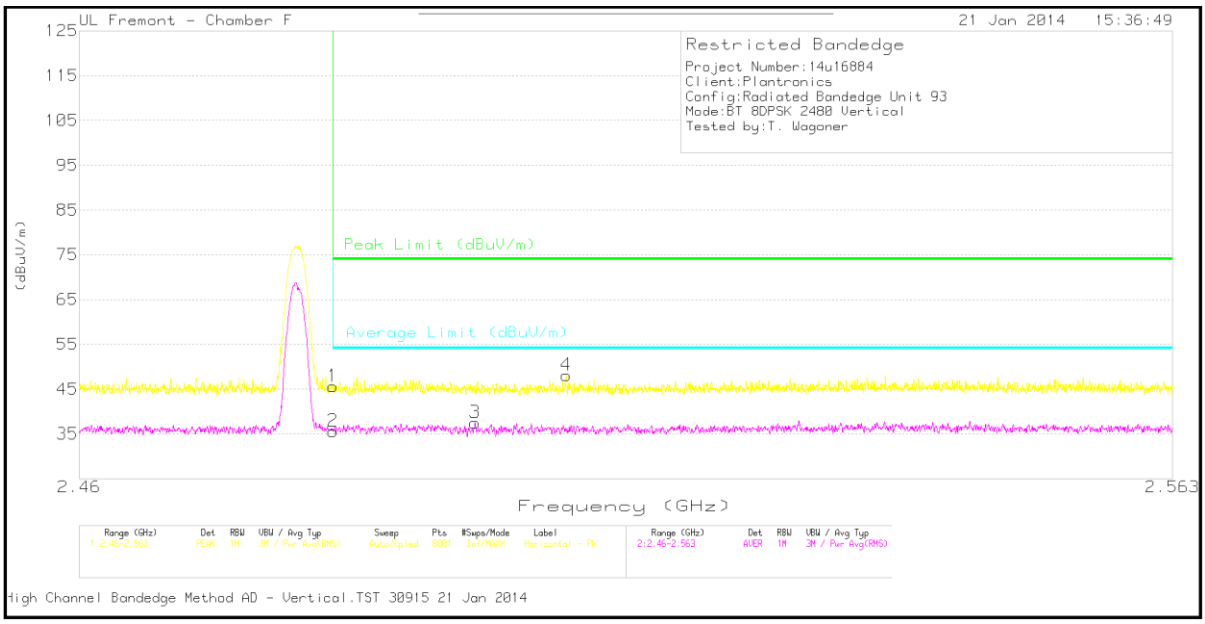


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. DB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	34.82	PK	32.4	-23	0	44.22	-	-	74	-29.78	1	366	H
4	2.543	39.04	PK	32.5	-22.9	0	48.64	-	-	74	-25.36	1	366	H
2	2.484	26.95	MAv1	32.4	-23	5	41.35	54	-12.65	-	-	1	366	H
3	2.538	27.48	MAv1	32.5	-22.8	5	42.18	54	-11.82	-	-	1	366	H

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



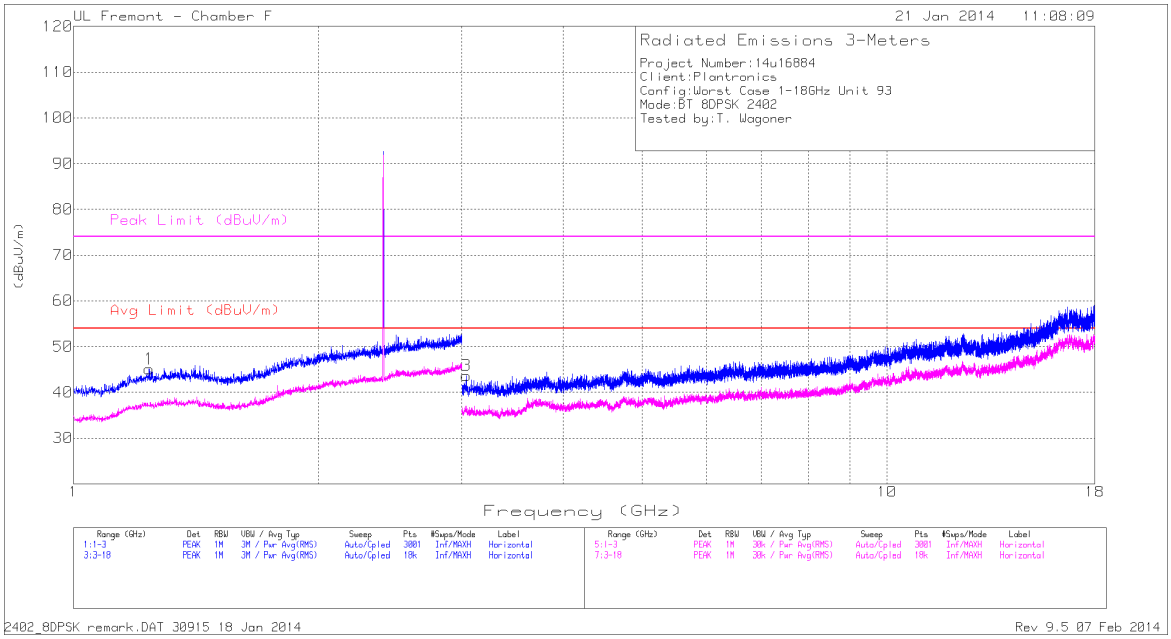
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. dB	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	36.22	PK	32.4	-23	0	45.62	-	-	74	-28.38	132	217	V
4	2.505	38.67	PK	32.5	-23.1	0	48.07	-	-	74	-25.93	132	217	V
2	2.484	26.17	MAv1	32.4	-23	5	40.57	54	-13.43	-	-	132	217	V
3	2.497	27.99	MAv1	32.5	-23	5	42.49	54	-11.51	-	-	132	217	V

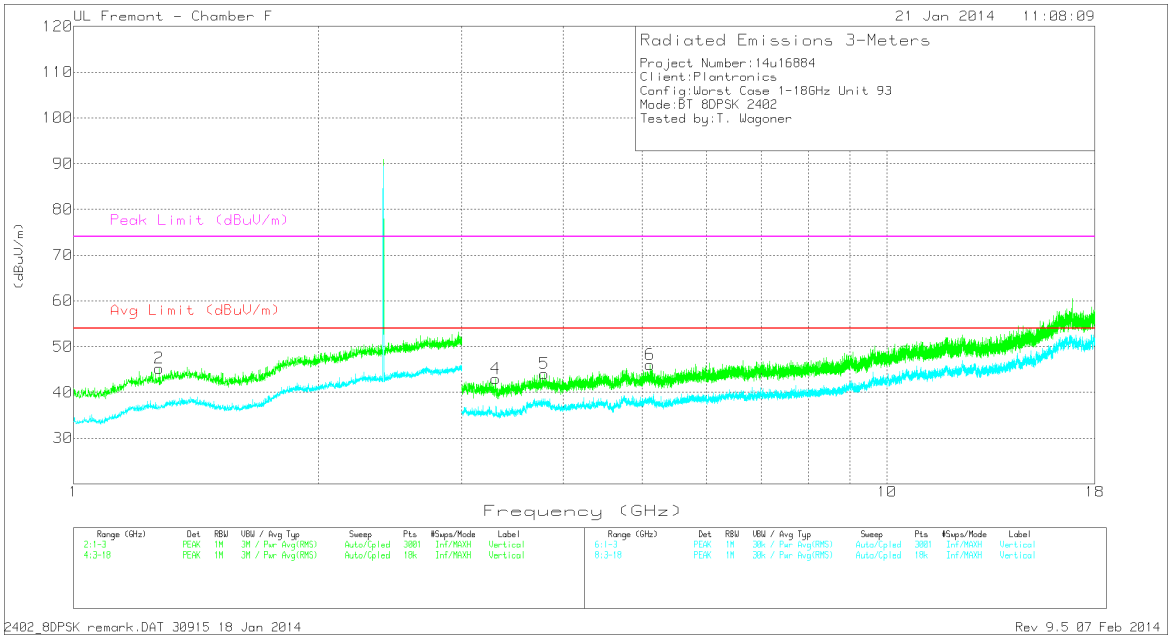
PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



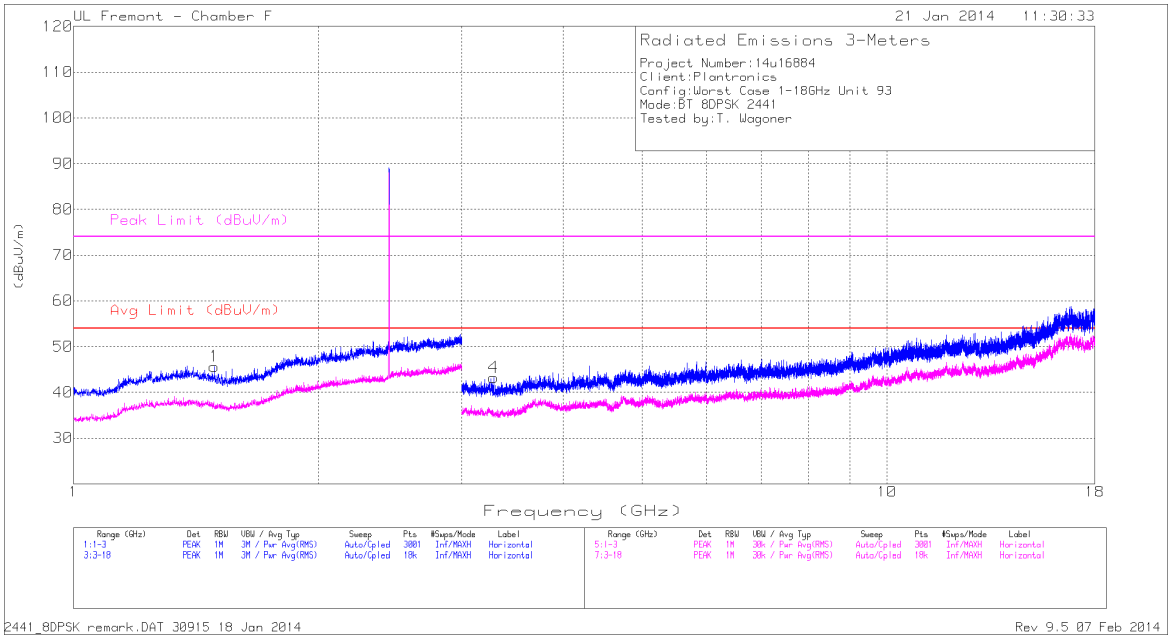
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.239	42.12	PK	29.5	-26.5	0	45.12	54	-8.88	74	-28.88	0-360	199	H
2	* 1.274	42.46	PK	29.8	-27	0	45.26	54	-8.74	74	-28.74	0-360	201	V
3	3.039	39.47	PK	33.2	-29	0	43.67	54	-10.33	74	-30.33	0-360	200	H
4	3.303	39.27	PK	33.1	-29.4	0	42.97	54	-11.03	74	-31.03	0-360	201	V
5	* 3.792	39.58	PK	33.6	-29.1	0	44.08	54	-9.92	74	-29.92	0-360	201	V
6	* 5.11	38.88	PK	34.2	-27	0	46.08	54	-7.92	74	-27.92	0-360	101	V

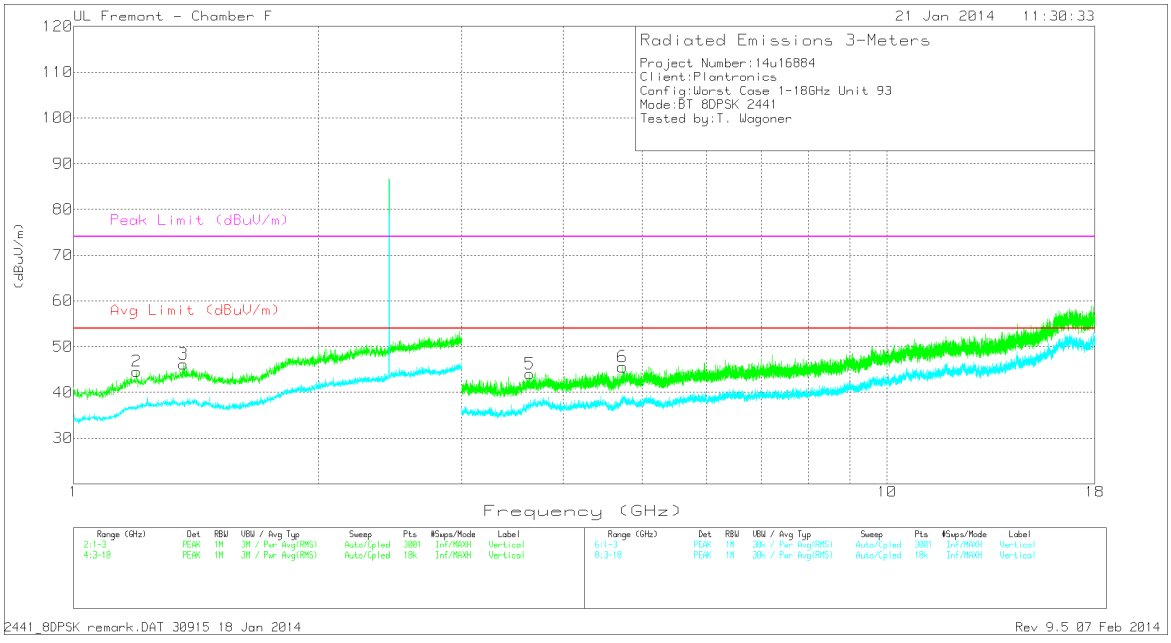
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
2402_8DPSK remark.DAT 30915 18 Jan 2014
Rev 9.5 07 Feb 2014

HARMONICS AND SPURIOUS EMISSIONS

MIDDLE CHANNEL HORIZONTAL



MIDDLE CHANNEL VERTICAL



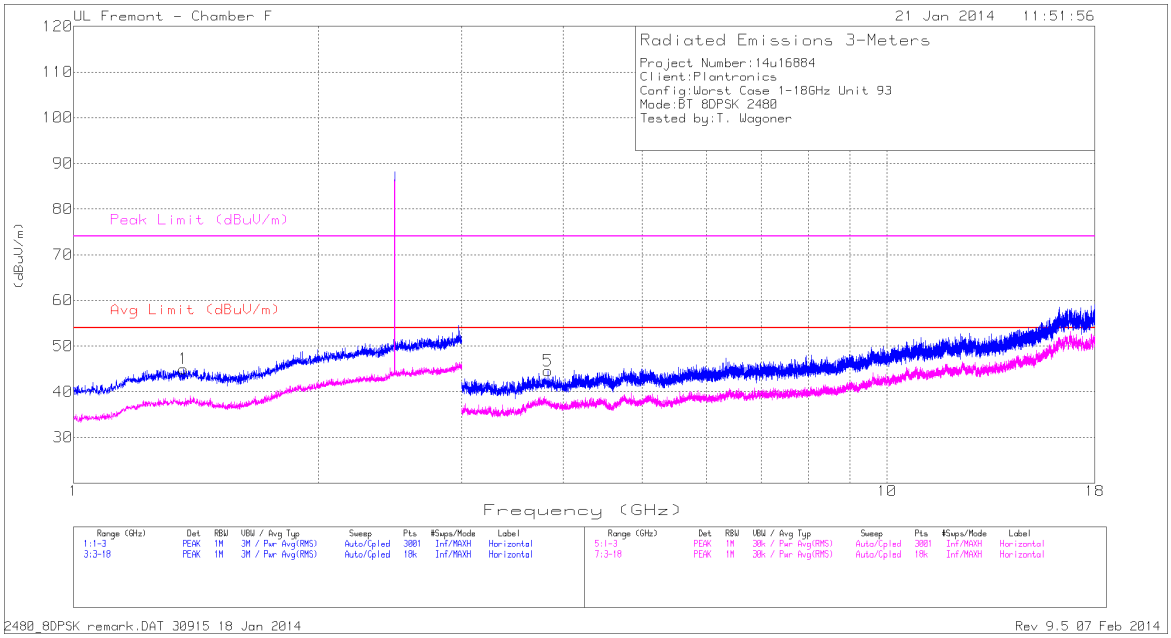
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.489	42.97	PK	28.8	-26.1	0	45.67	54	-8.33	74	-28.33	0-360	199	H
2	* 1.195	41.81	PK	29.2	-26.4	0	44.61	54	-9.39	74	-29.39	0-360	201	V
3	* 1.365	42.78	PK	29.5	-26.1	0	46.18	54	-7.82	74	-27.82	0-360	101	V
4	3.283	39.35	PK	33.1	-29.2	0	43.25	54	-10.75	74	-30.75	0-360	200	H
5	* 3.638	39.95	PK	33.7	-29.6	0	44.05	54	-9.95	74	-29.95	0-360	101	V
6	* 4.729	39.98	PK	34.1	-28.5	0	45.58	54	-8.42	74	-28.42	0-360	101	V

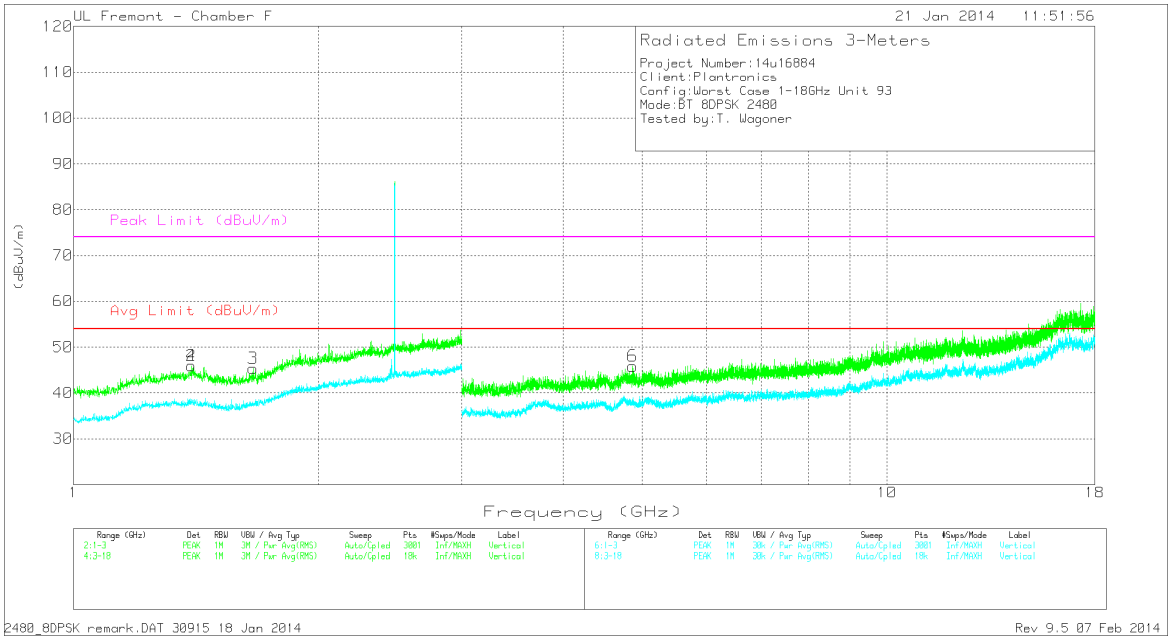
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
2441_8DPSK remark.DAT 30915 18 Jan 2014
Rev 9.5 07 Feb 2014

HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



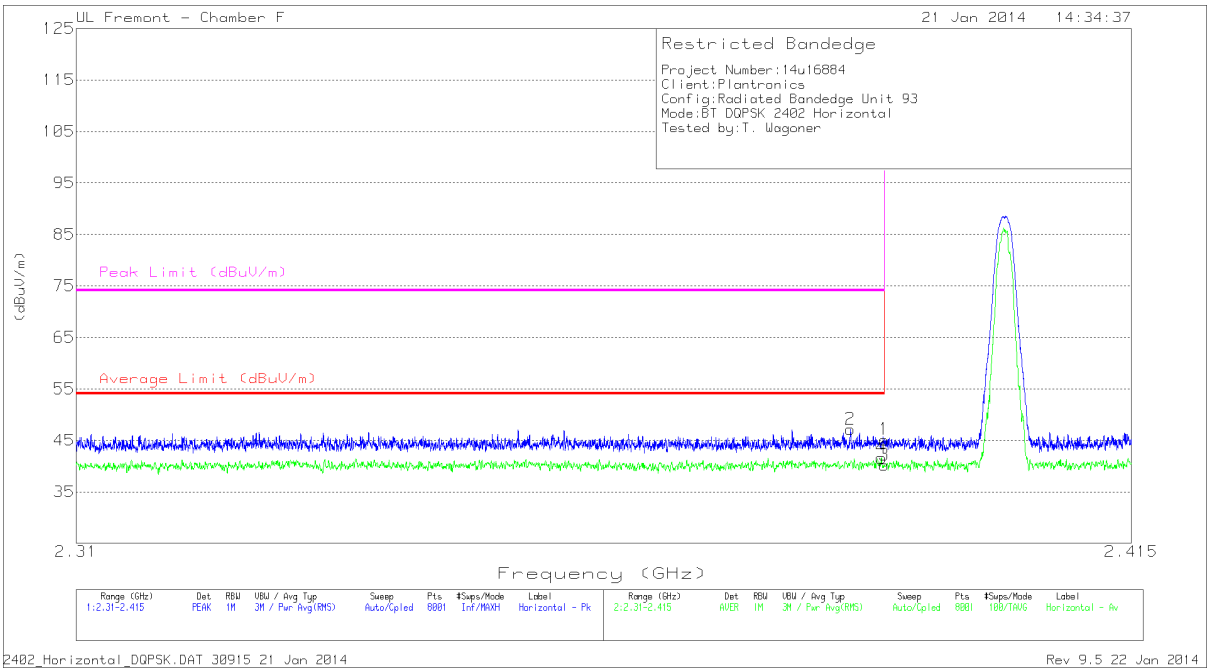
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.365	41.6	PK	29.5	-26.1	0	45	54	-9	74	-29	0-360	200	H
2	* 1.395	42.35	PK	29.2	-25.6	0	45.95	54	-8.05	74	-28.05	0-360	201	V
3	* 1.662	41.86	PK	28.6	-25.1	0	45.36	54	-8.64	74	-28.64	0-360	101	V
4	* 1.395	42.35	PK	29.2	-25.6	0	45.95	54	-8.05	74	-28.05	0-360	201	V
5	* 3.828	39.74	PK	33.6	-28.8	0	44.54	54	-9.46	74	-29.46	0-360	199	H
6	* 4.867	39.43	PK	34	-27.6	0	45.83	54	-8.17	74	-28.17	0-360	101	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
2480_8DPSK remark.DAT 30915 18 Jan 2014
Rev 9.5 07 Feb 2014

9.2.3. ENHANCED DATA RATE QPSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

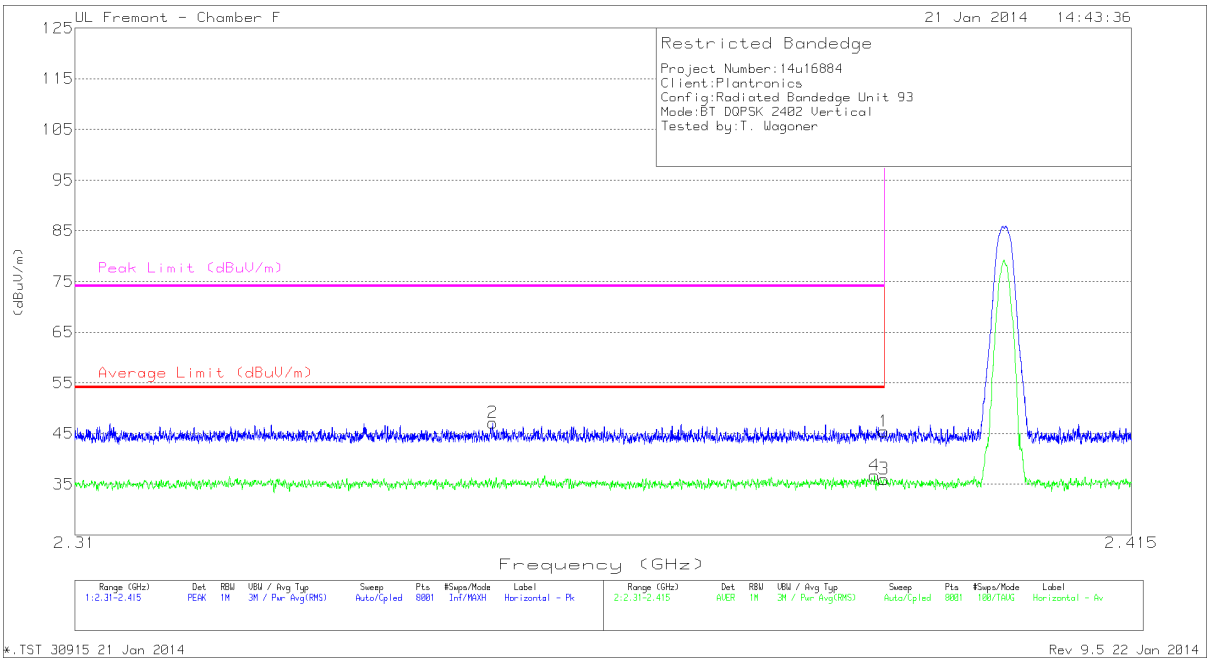


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	36.83	PK	32.1	-23.8	0	45.13	-	-	74	-28.87	255	253	H
2	2.387	38.85	PK	32.1	-23.8	0	47.15	-	-	74	-26.85	255	253	H
3	2.39	26.9	MAv1	32.1	-23.8	5	40.2	54	-13.8	-	-	255	253	H
4	2.39	28.31	MAv1	32.1	-23.8	5	41.61	54	-12.39	-	-	255	253	H

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

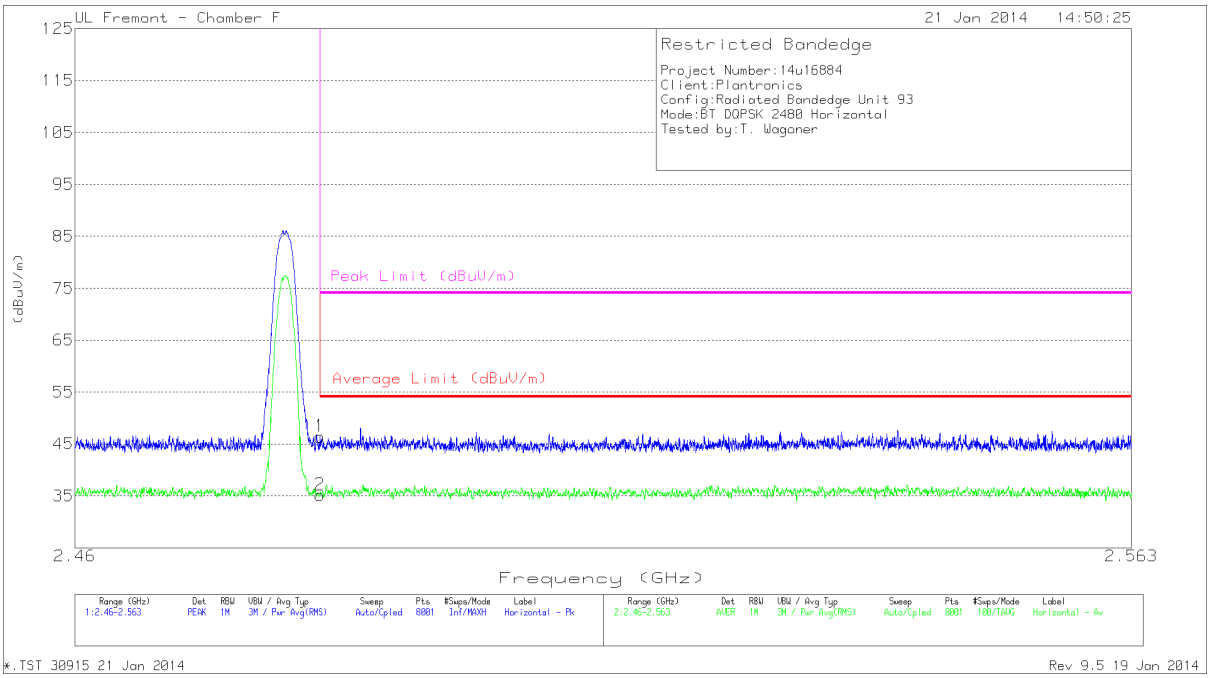


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	37.09	PK	32.1	-23.8	0	45.39	-	-	74	-28.61	14	203	V
2	2.351	38.72	PK	32.1	-23.7	0	47.12	-	-	74	-26.88	14	203	V
3	2.39	27.66	MAv1	32.1	-23.8	4.98	40.94	54	-13.06	-	-	14	203	V
4	2.389	28.4	MAv1	32.1	-23.8	4.98	41.68	54	-12.32	-	-	14	203	V

PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



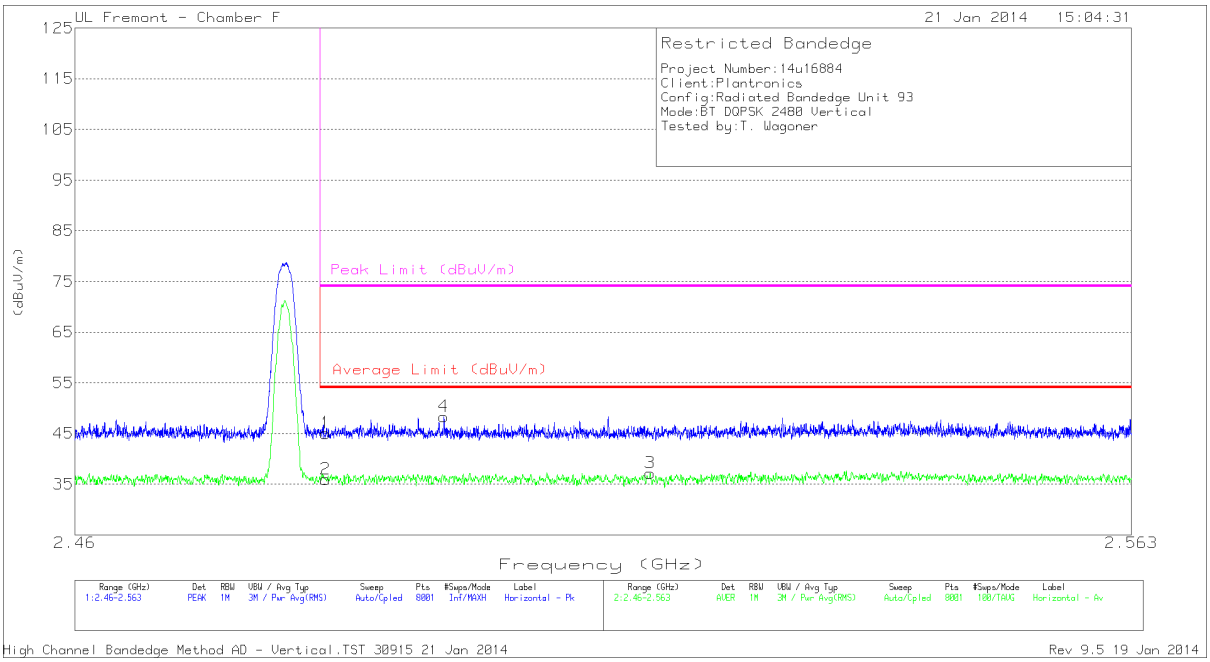
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	37.01	PK	32.4	-23	0	46.41	-	-	74	-27.59	70	239	H
2	2.484	25.73	MAv1	32.4	-23	4.98	40.23	54	-13.77	-	-	70	239	H

PK - Peak detector

RMS - RMS detection

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



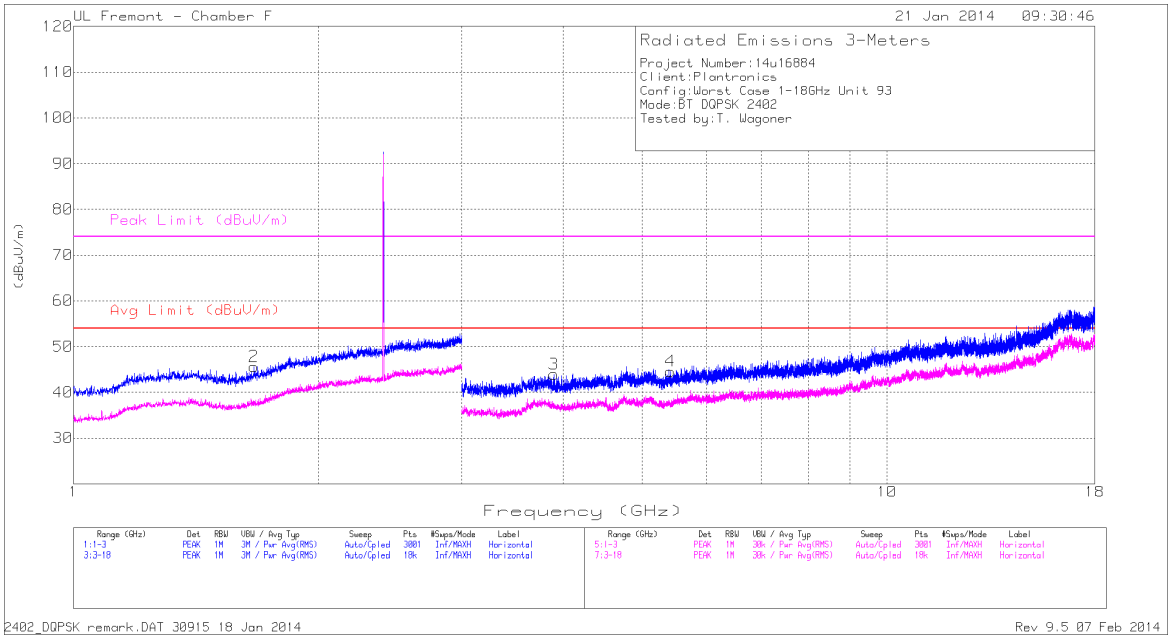
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	DC Corr. (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	35.54	PK	32.4	-22.9	0	45.04	-	-	74	-28.96	261	353	V
4	2.495	38.82	PK	32.5	-23	0	48.32	-	-	74	-25.68	261	353	V
2	2.484	26.55	MAv1	32.4	-23	4.98	40.93	54	-13.07	-	-	261	353	V
3	2.516	27.66	MAv1	32.5	-23	4.98	42.14	54	-11.86	-	-	261	353	V

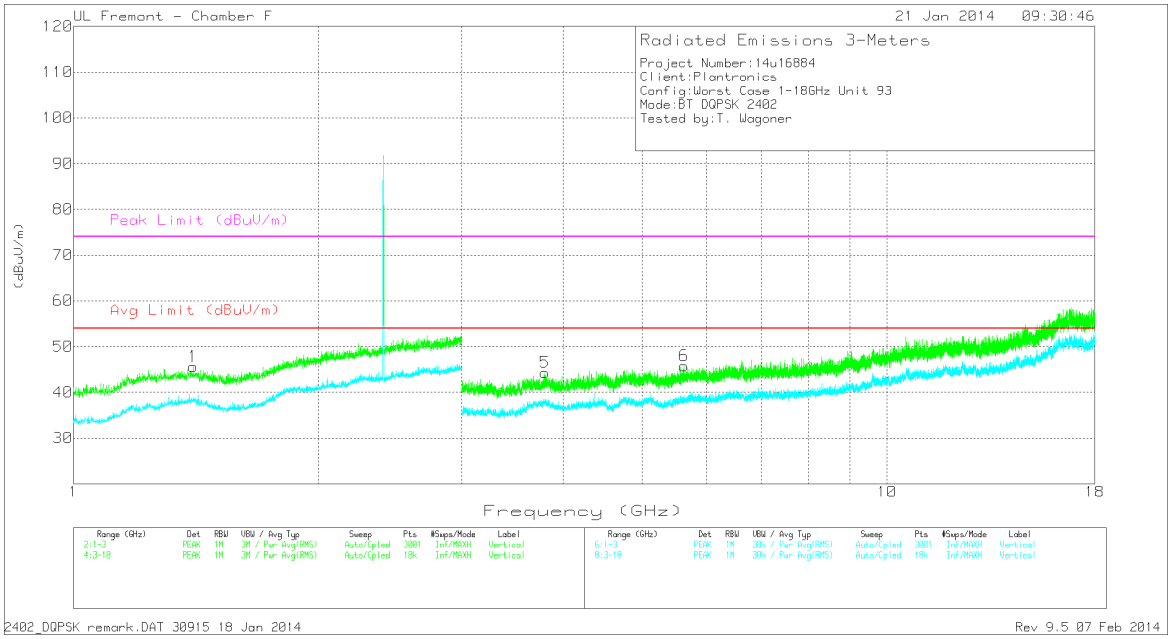
PK - KDB558074 Method: Maximum Peak
MAv1 - KDB558074 Option 1 Maximum RMS Average

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL



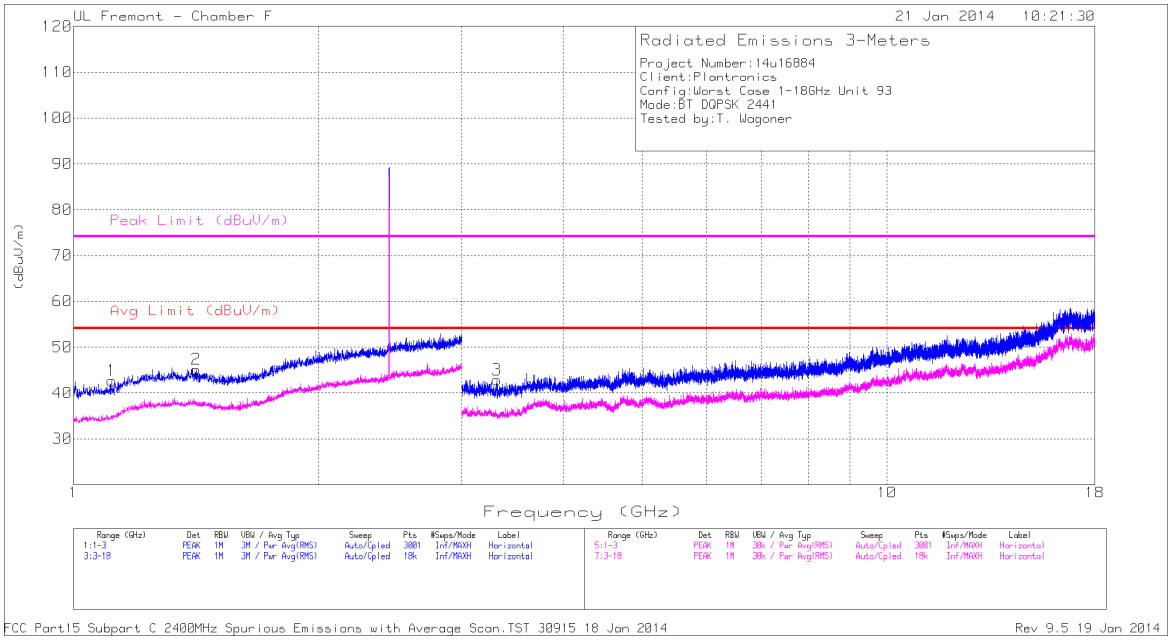
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 1.667	42.01	PK	28.6	-25	0	45.61	54	-8.39	74	-28.39	0-360	200	H
1	* 1.403	41.92	PK	29.2	-25.5	0	45.62	54	-8.38	74	-28.38	0-360	201	V
3	* 3.894	39.96	PK	33.5	-29.5	0	43.96	54	-10.04	74	-30.04	0-360	200	H
4	* 5.415	37.81	PK	34.6	-27.8	0	44.61	54	-9.39	74	-29.39	0-360	101	H
5	* 3.797	39.74	PK	33.6	-29	0	44.34	54	-9.66	74	-29.66	0-360	101	V
6	5.627	39.01	PK	34.8	-28	0	45.81	54	-8.19	74	-28.19	0-360	201	V

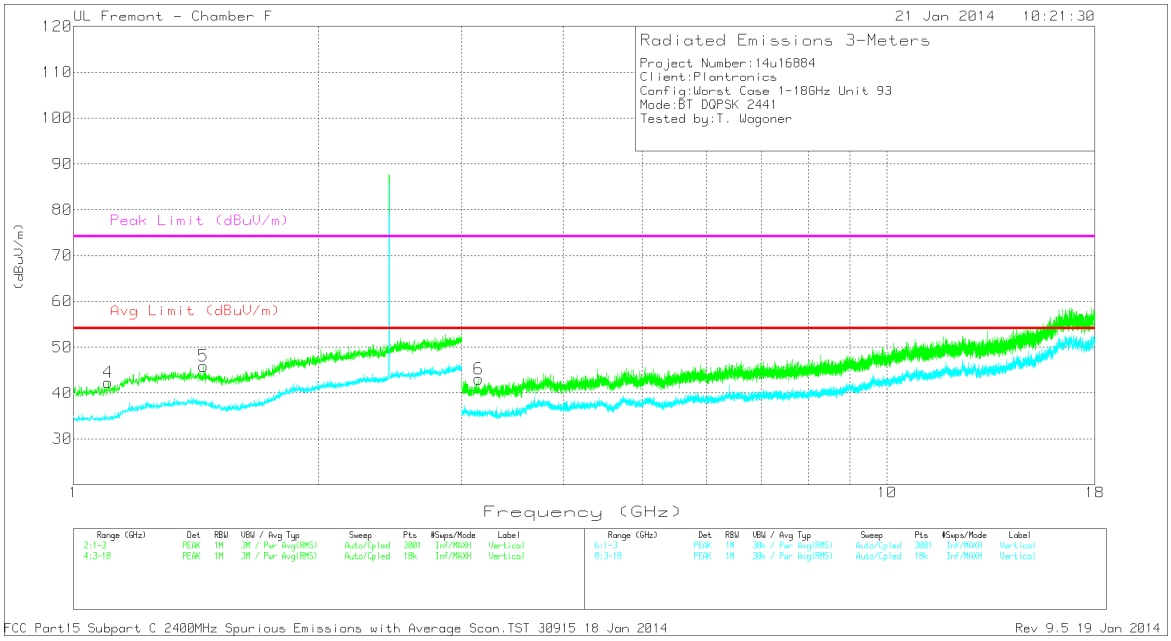
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
Radiated Emissions

HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL



Trace Markers

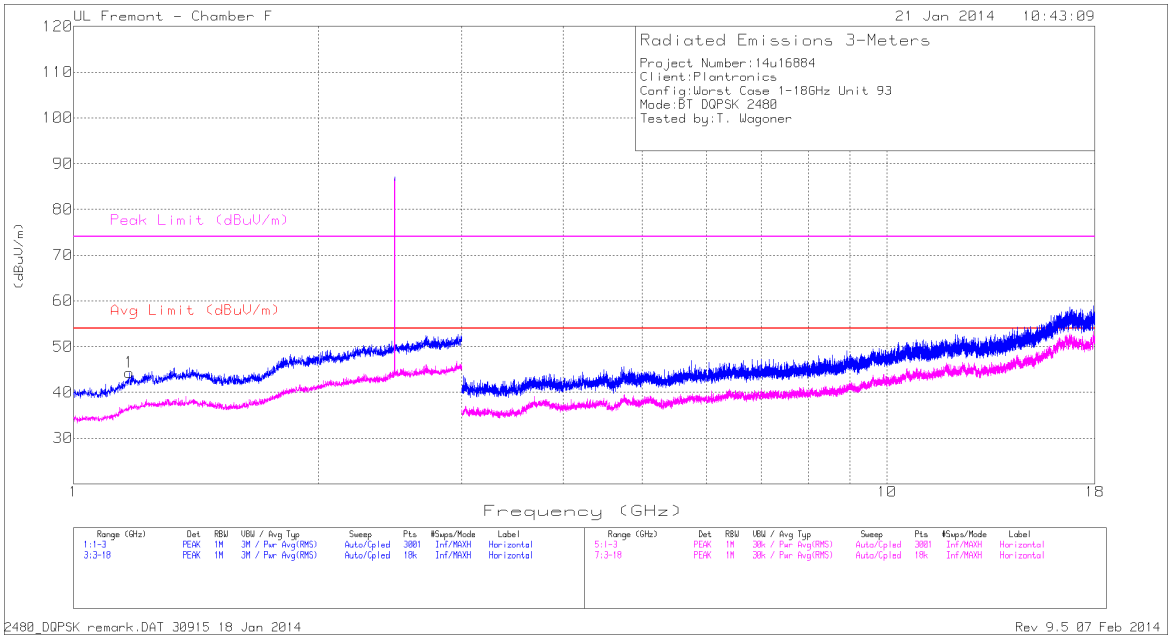
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr /Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.114	42.57	PK	27.8	-27.7	0	42.67	-	-	74	-31.33	0-360	200	H
2	* 1.415	41.44	PK	29.1	-25.4	0	45.14	-	-	74	-28.86	0-360	101	H
4	* 1.103	42.41	PK	27.7	-27.8	0	42.31	-	-	74	-31.69	0-360	201	V
5	* 1.445	42.46	PK	29	-25.6	0	45.86	-	-	74	-28.14	0-360	101	V
3	3.313	39.36	PK	33.1	-29.6	0	42.86	-	-	74	-31.14	0-360	101	H
6	3.147	39.67	PK	33.3	-29.9	0	43.07	-	-	74	-30.93	0-360	101	V

* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band

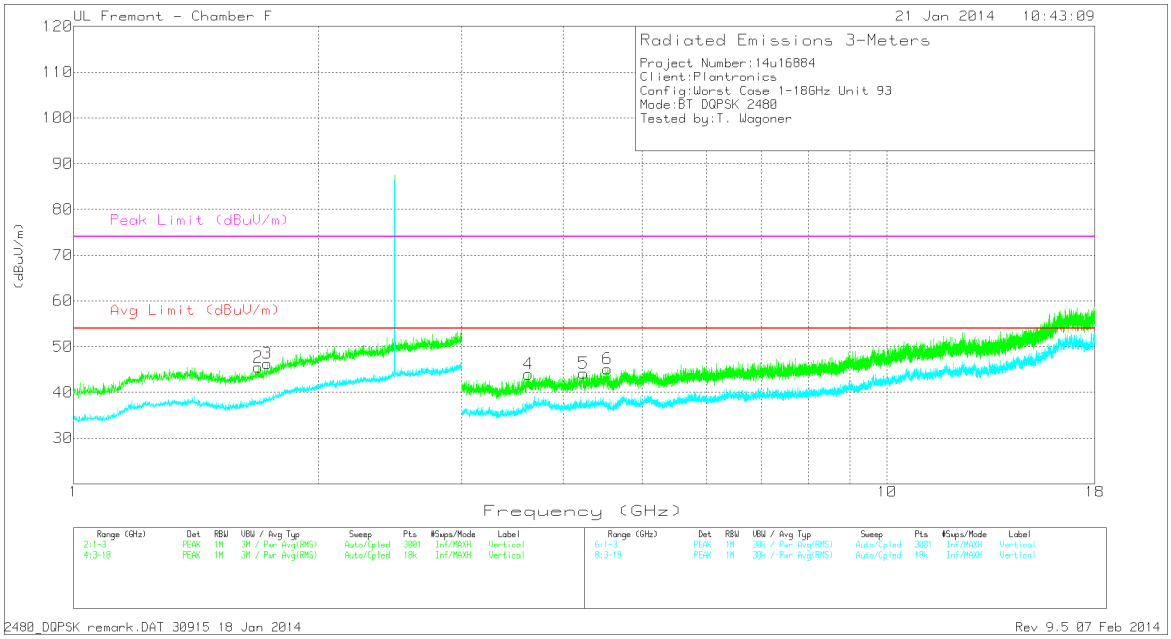
PK - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.171	42.03	PK	28.8	-26.5	0	44.33	54	-9.67	74	-29.67	0-360	101	H
2	* 1.686	41.97	PK	28.8	-25.3	0	45.47	54	-8.53	74	-28.53	0-360	201	V
3	1.73	42.34	PK	29.3	-25.3	0	46.34	54	-7.66	74	-27.66	0-360	201	V
4	* 3.623	39.68	PK	33.7	-29.4	0	43.98	54	-10.02	74	-30.02	0-360	201	V
5	* 4.236	39.48	PK	33.4	-28.7	0	44.18	54	-9.82	74	-29.82	0-360	101	V
6	* 4.533	39.73	PK	34	-28.6	0	45.13	54	-8.87	74	-28.87	0-360	201	V

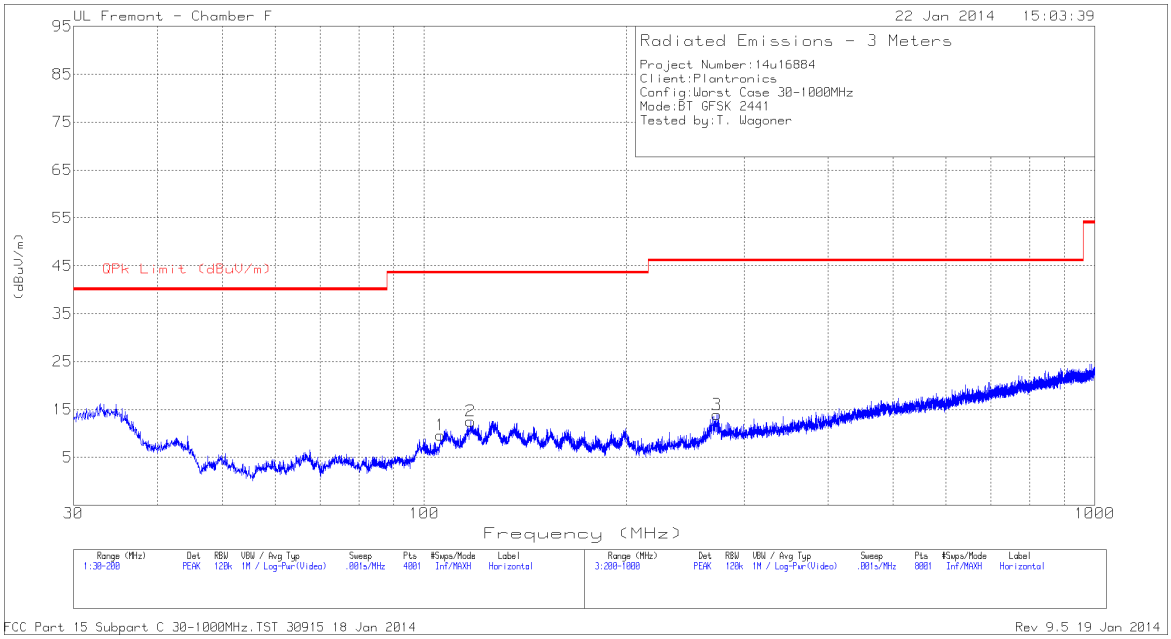
* - indicates frequency in CFR15.205/IC7.2.2 Restricted Band
PK - Peak detector
2480_DQPSK remark.DAT 30915 18 Jan 2014
Rev 9.5 07 Feb 2014

9.3. WORST-CASE BELOW 1 GHz

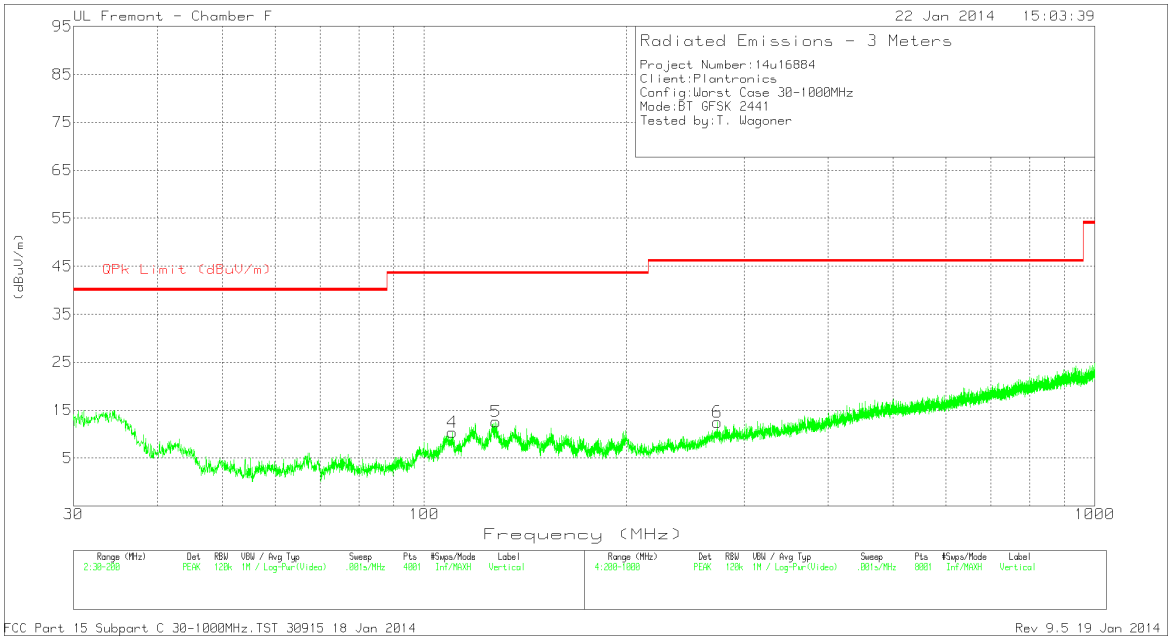
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

GFSK

HORIZONTAL PLOT



VERTICAL PLOT



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T122 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	105.735	28.66	PK	11.9	-30.9	9.66	43.52	-33.86	0-360	401	H
2	117.295	30.08	PK	13.8	-31.3	12.58	43.52	-30.94	0-360	401	H
4	110.155	28.85	PK	12.7	-31.2	10.35	43.52	-33.17	0-360	101	V
5	127.92	29.69	PK	14.2	-31.3	12.59	43.52	-30.93	0-360	101	V
3	273.3	31.21	PK	13.3	-30.6	13.91	46.02	-32.11	0-360	101	H
6	273.7	29.98	PK	13.3	-30.8	12.48	46.02	-33.54	0-360	100	V

PK - Peak detector

10. 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

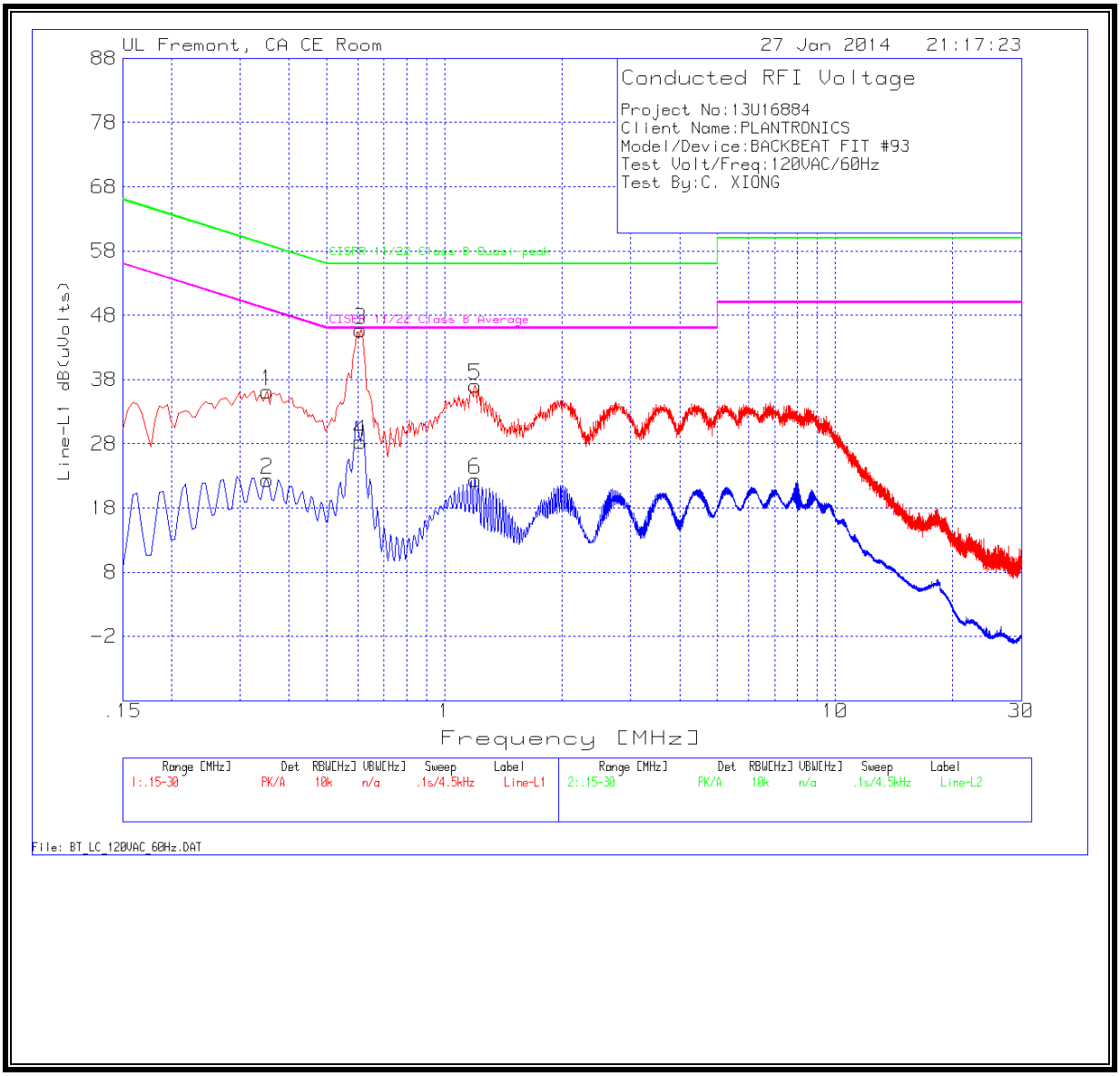
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

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

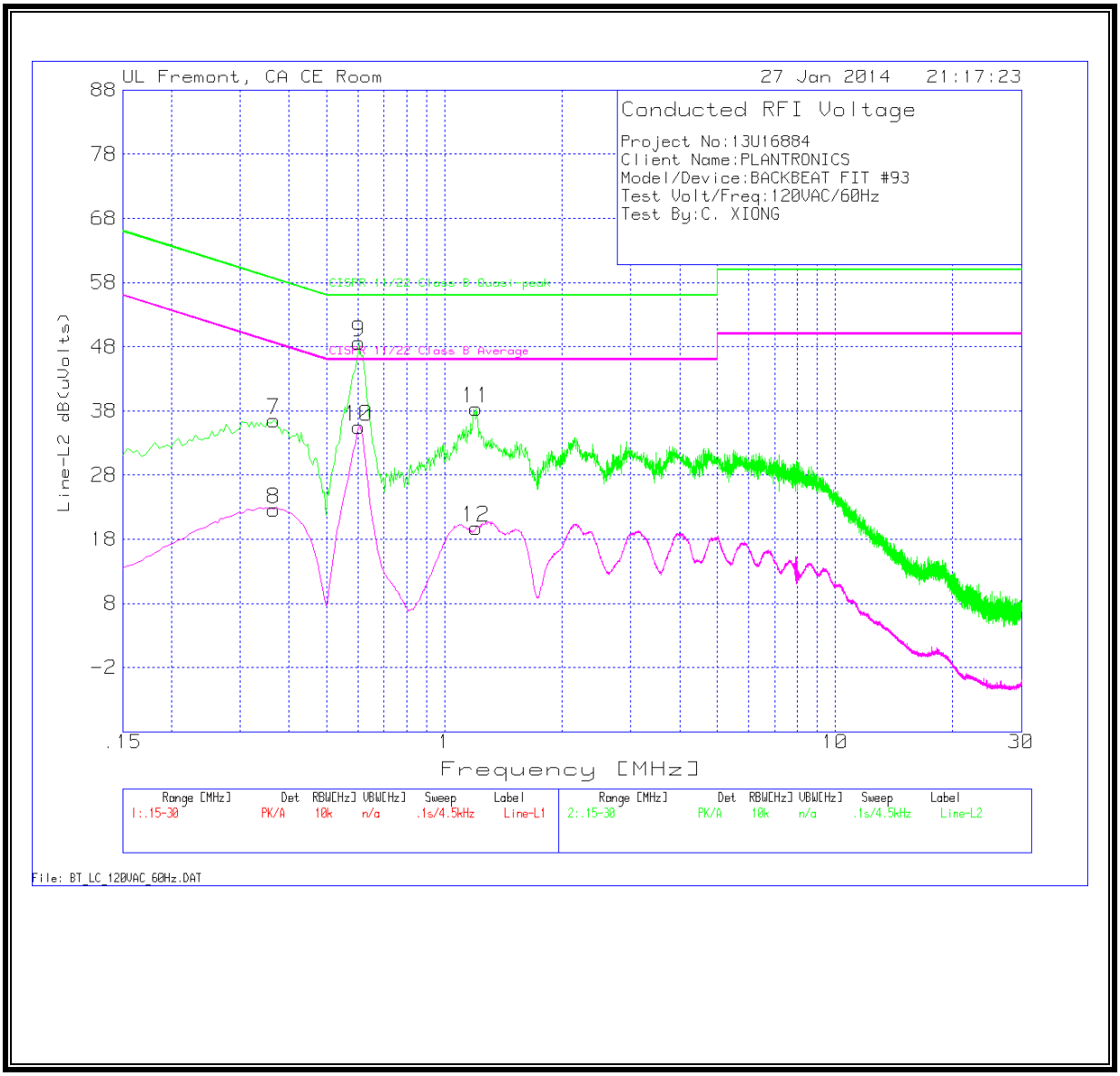
Line conducted data is recorded for both NEUTRAL and HOT lines.

WORST CASE GFSK

LINE 1 RESULTS



LINE 2 RESULTS



6 WORST EMISSIONS (120 V, 60 Hz)

Line-L1 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
1	.3525	35.68	PK	.5	0	36.18	58.9	-22.72	-	-
2	.3525	21.91	Av	.5	0	22.41	-	-	48.9	-26.49
3	.609	45.42	PK	.3	0	45.72	56	-10.28	-	-
4	.609	28.04	Av	.3	0	28.34	-	-	46	-17.66
5	1.1985	36.81	PK	.2	.1	37.11	56	-18.89	-	-
6	1.1985	22.12	Av	.2	.1	22.42	-	-	46	-23.58

Line-L2 .15 - 30MHz

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dB(uVolts)	CISPR 11/22 Class B Quasi-peak	Margin to Limit (dB)	CISPR 11/22 Class B Average	Margin to Limit (dB)
7	.366	36.01	PK	.5	0	36.51	58.6	-22.09	-	-
8	.366	22.17	Av	.5	0	22.67	-	-	48.6	-25.93
9	.6045	48.34	PK	.3	0	48.64	56	-7.36	-	-
10	.6045	35.21	Av	.3	0	35.51	-	-	46	-10.49
11	1.2075	38.17	PK	.2	0	38.37	56	-17.63	-	-
12	1.2075	19.6	Av	.2	0	19.8	-	-	46	-26.2

PK - Peak detector

Av - average detection

11. MAXIMUM PERMISSIBLE EXPOSURE

As the DUT is a portable device it was assessed in accordance using the standalone test exclusion guidelines of FCC KDB 447498 D01 General RF Exposure Guidance v05.

RF exposure evaluation was not required as determined in the following;

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

$f_{(GHz)}$ is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation[17]
The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz.
When the minimum *test separation distance* is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Antenna	Tx	Frequency (MHz)	Output power		Separation distance (mm)	SAR exclusion Threshold value	SAR exclusion Threshold Limit (1g SAR)
			dBm	mW			
Bluetooth	Bluetooth	2400	6.54	5	0	1.549	<3