



CERTIFICATION TEST REPORT

Report Number : 11884395-E1V4

Applicant : Global Traffic Technologies, LLC
7800 Third Street North, Bldg. 100
Saint Paul, MN 55128-5441

Model : OpticomGPS5

FCC ID : VJB-OPTICOMGPS5

IC : 7275A-OPTICOM5

EUT Description : 2.4 GHz proprietary protocol radio

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS - 247 ISSUE 2
RSS-GEN ISSUE 4

Date Of Issue: JANUARY 16, 2018

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	12/14/17	Initial Issue	---
V2	01/03/18	Updated channel separation section Updated average time of occupancy section	Frank Ibrahim
V3	01/11/18	Updated average time of occupancy section Updated Test and Measurement Equipment List Added a note to BE plots to explain the second emission showing in the plots. Updated Description of Available Antennas section	Frank Ibrahim
V4	01/16/18	Updated antenna list section Corrected some typos	Frank Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Global Traffic Technologies, LLC
7800 Third Street North, Bldg. 100
Saint Paul, MN 55128-5441
U.S.A.

EUT DESCRIPTION: 2.4 GHz proprietary protocol radio

MODEL: OpticomGPS5

SERIAL NUMBER: 79-1000-1498-0

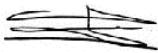
DATE TESTED: October 02, 2017 to January 11, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
ISED RSS-247 Issue 2	Pass
ISED RSS-GEN Issue 4	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 the U.S. government.

Approved & Released For
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Prepared By:



CONSUMER TECHNOLOGY DIVISION
Operations Leader
UL Verification Services Inc.

Jason Qian
CONSUMER TECHNOLOGY DIVISION
Test Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, RSS-GEN Issue 4, and RSS-247 Issue 2.

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
<input type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input checked="" type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input checked="" type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input type="checkbox"/> Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under Industry Canada company address code 22541 with site numbers 22541 -1 through 22541-5, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0 except for ISED RSS-247 Issue 2. The full scope of accreditation can be viewed at <http://ts.nist.gov/standards/scopes/2000650.htm>.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a vehicle communication module which uses minimum shift keying (MSK), 384 kbps data rate and hops to a new channel three times per second. It is a 2.4GHz proprietary protocol.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum output power as follows:

Frequency Range (MHz)	Mode	Output Power Peak (dBm)	Output Power Peak (mW)
2401.024 - 2476.800	MSK	26.61	458.14

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The device has five antennas as follows:

Manufacturer/model	Type	Spec Gain	Minimum cable length and cable loss	Effective antenna gain
Laird # MAF94192	PIFA	3.0 dBi	25' (4.5 dB cable loss)	-1.5 dBi
HOW TSEN # S-001-1	Dipole	2.6 dBi	N/A	2.6 dBi
Mobile Mark # DM2-2400/1575	Dome (monopole type)	2.5 dBi	15' (4.5m) integrated into the antenna, specification includes loss	2.5 dBi
Panorama # TRNBBG-7-27	Dome (monopole)	7.0 dBi	5m Panorama CS29 cable 3.5 dB loss	3.5 dBi
Mobile mark SMW-304	Monopole	5.0 dBi (includes 15' of cable loss)	30' Belden RF-195 cable Additional 15' of cable adds 2.7dB loss	2.3 dBi

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Radio Module Controller, Version 2.3

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz, above 18GHz, and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

The fundamental of the EUT was investigated in three orientations X, Y and Z. All final radiated testing was performed with the EUT in worst case orientation, which was found to be the "X-axis" for Dipole 2.6dBi, "Z-axis" for PIFA 3dBi, and "Y-axis" for Dome Monopole 7dBi. Please see section 10 for the setup photos for each antenna.

Worst-case data rate as provided by the client was 384kbps.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Laptop	Lenovo	T420	R8FDL9K
Adapter	Lenovo	DCWP CM-2	11S92P1156Z1ZDXN98T69U
Debug Board	Digi Wireless	-	79-1000-0751-0
Adapter	V-INFINITY	3A-251DN12	1241746

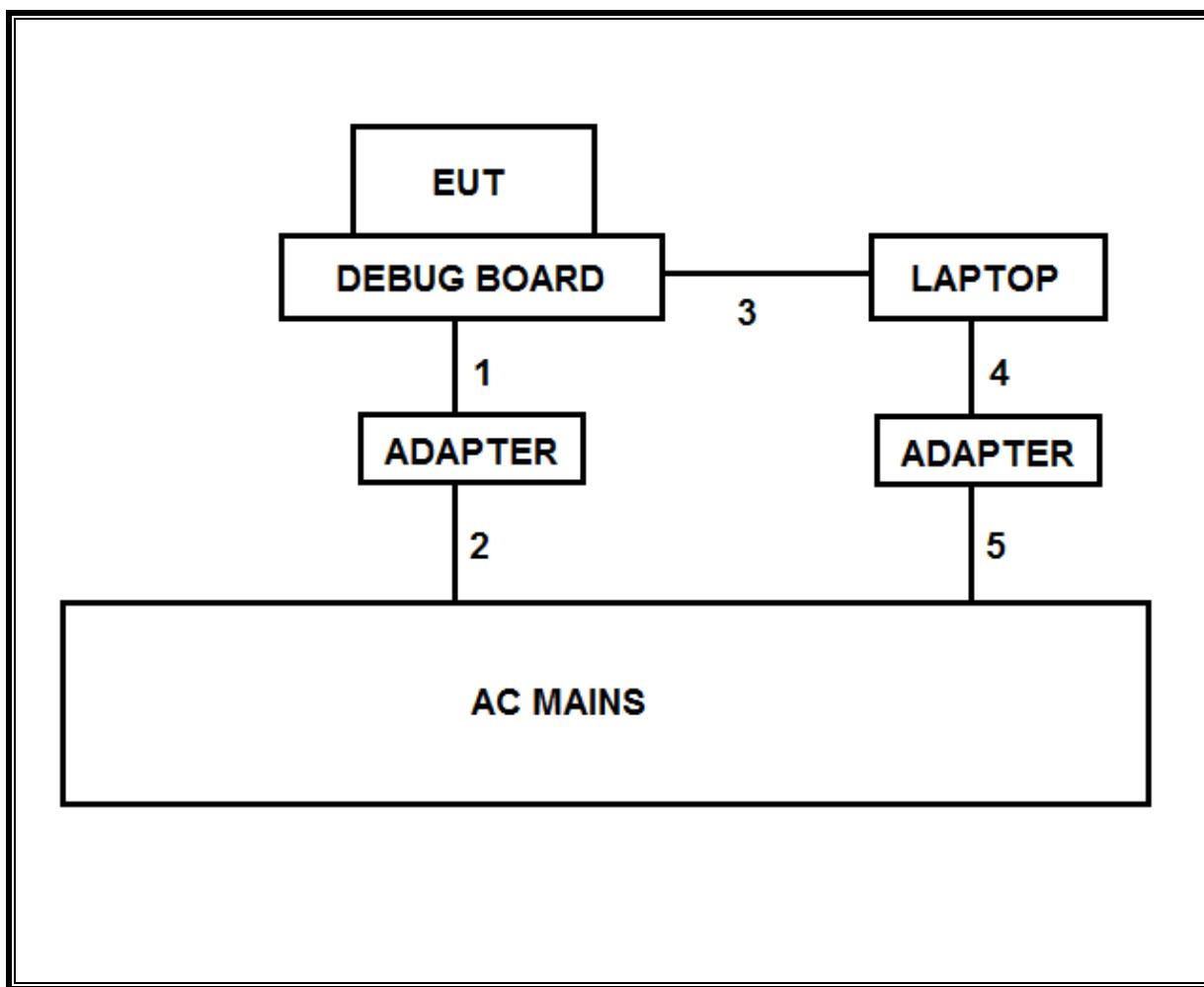
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	DC Power	1	DC	Unshielded	1	
2	AC Power	1	AC	Unshielded	1	
3	USB	1	USB	Unshielded	1	
4	DC Power	1	DC	Unshielded	1	
5	AC Power	1	AC	Unshielded	1	

TEST SETUP

The EUT is connected to a test laptop. Test software exercises the radio.

SETUP DIAGRAM FOR RADIATED 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 Due
Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB Pad	Sunol Sciences Corp.	JB3	T899	06/22/2018
Antenna, Active Loop 9kHz-30MHz	COM-POWER	AL-130R	T1866	10/10/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T711	01/30/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T712	01/30/2018
Antenna, Horn 18-26.5GHz	ARA	MWH-1826/B	T89	05/26/2018
Antenna, Horn 26.5-40GHz	ARA	MWH-2640/B	T446	06/12/2018
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1264	07/08/2018
Power Sensor, P – series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T413	06/20/2018
Amplifier, 1-26.5GHz	Agilent (Keysight) Technologies	8449B	T404	07/05/2018
Amplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1156	02/15/2018
Amplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1170	04/15/2018
Amplifier, 10kHz-1GHz	Agilent (Keysight) Technologies	8447D	T15	08/26/2018
Receiver, 10kHz-7GHz	ROHDE & SCHWARZ	ESR	T1436	01/06/2018
Amplifier, 1-26.5GHz	Miteq	AMF43-00101800-25-S-42	T493	02/15/2018
Amplifier, 1-26.5GHz	Miteq	AMF43-00101800-25-S-42	T931	04/15/2018
Amplifier, 26-40GHz	Miteq	TTA2640	T1864	09/21/2018
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent (Keysight) Technologies	E4440A	T146	07/22/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T907	01/23/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1454	12/15/2017
Band Reject Filter 2400-2500MHz	Micro-Tronics	BRM50702-02	T1784	5/16/2018
LISN	FISCHER	FCC-LISN-50/250-25-2-01	T1310	01/17/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T346	03/28/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T408	11/10/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB1	T243	11/12/2018

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016
Conducted Emissions Software	UL	UL EMC	Ver 9.5, May 26, 2015

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

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS

Based on manufacturer's declaration and data the duty cycle of the device under test is 3%.

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
MSK	3.000	100.000	0.030	3.0%	30.46	0.333

SMK



A single transmission, with an on-time of 3 ms.



Period greater than 100 ms demonstrated.

Average (Relaxation) Factor

Average Factor = $20 \times \log_{10}$ (Worst Case EUT On-time over X ms time window)

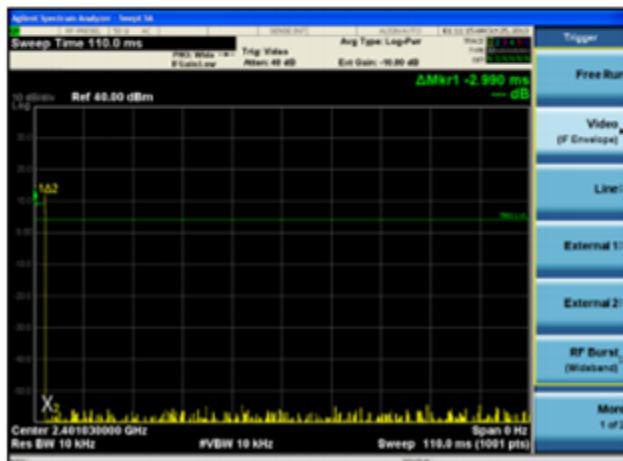
The transmit packet occupies 3 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

$$\text{Average Factor} = 20 \times \log_{10} (3 / 100 \text{ ms}) = -30.46$$

A relaxation factor of 30.46 dB would be allowable for this product.



A single transmission, with an on-time of 3 ms.



Period greater than 100 ms demonstrated.

7.2. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

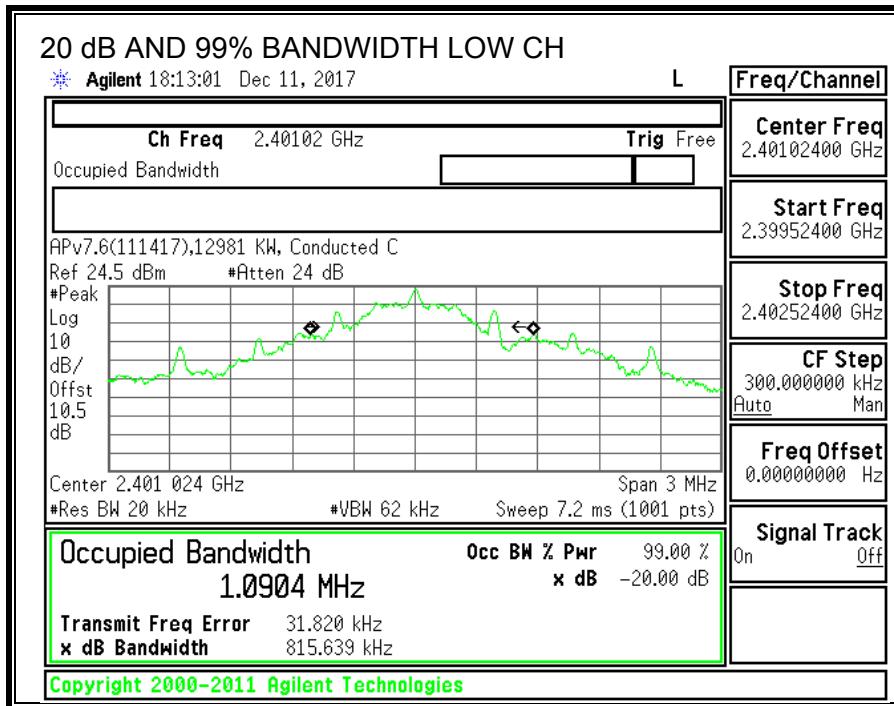
TEST PROCEDURE

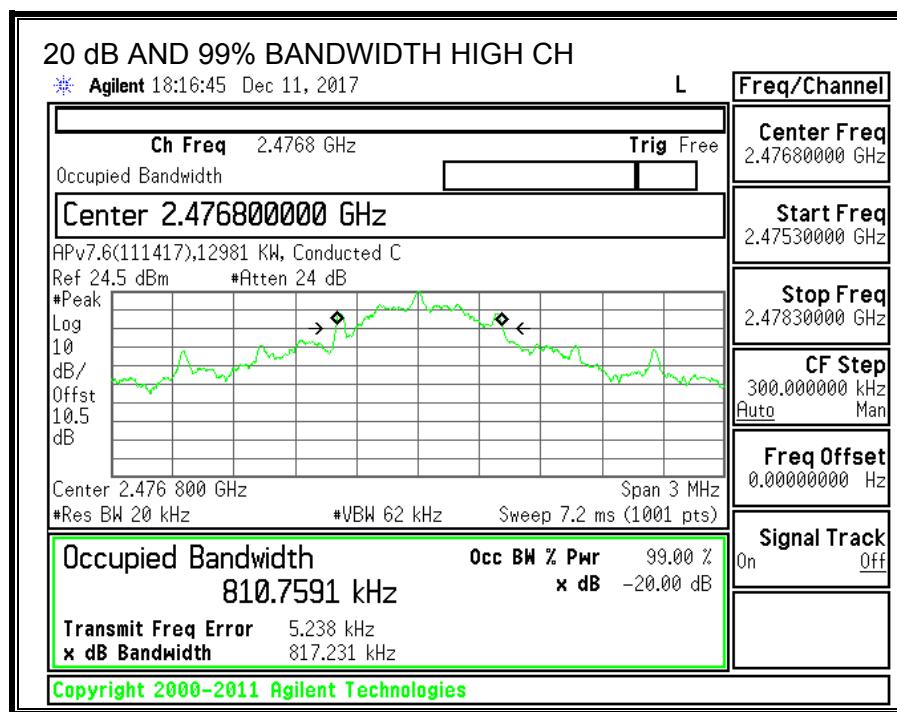
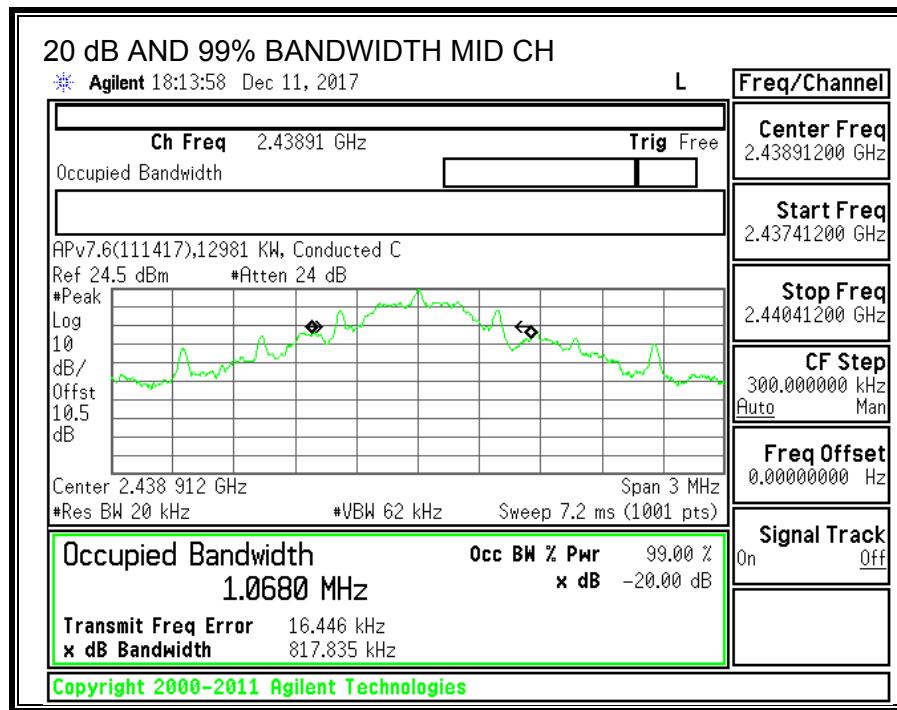
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

20dB and 99% BANDWIDTH

Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2401.024	815.639	1090.400
Mid	2438.912	817.835	1068.000
High	2476.800	817.231	810.759





7.3. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

RSS-247 (5.1) (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 plots, showing number of channels, were used to calculate channel spacing as shown in the results section below.

RESULTS

The plots, in section 7.4, show there are a total of 75, equally spaced channels between 2401.024 MHz and 2476.8 MHz. The channel spacing is therefore $(2476.8 - 2401.024) / 74 = 1024$ MHz

7.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

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

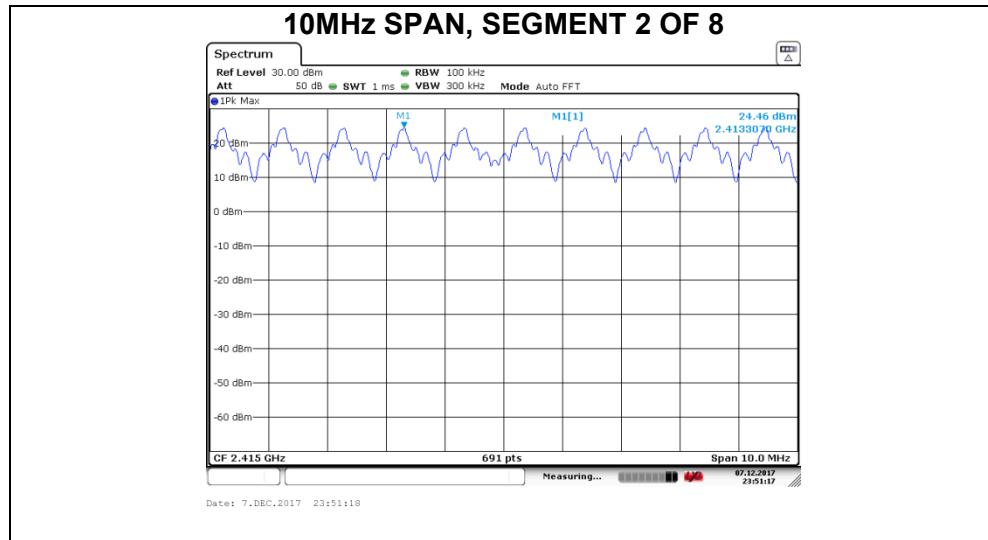
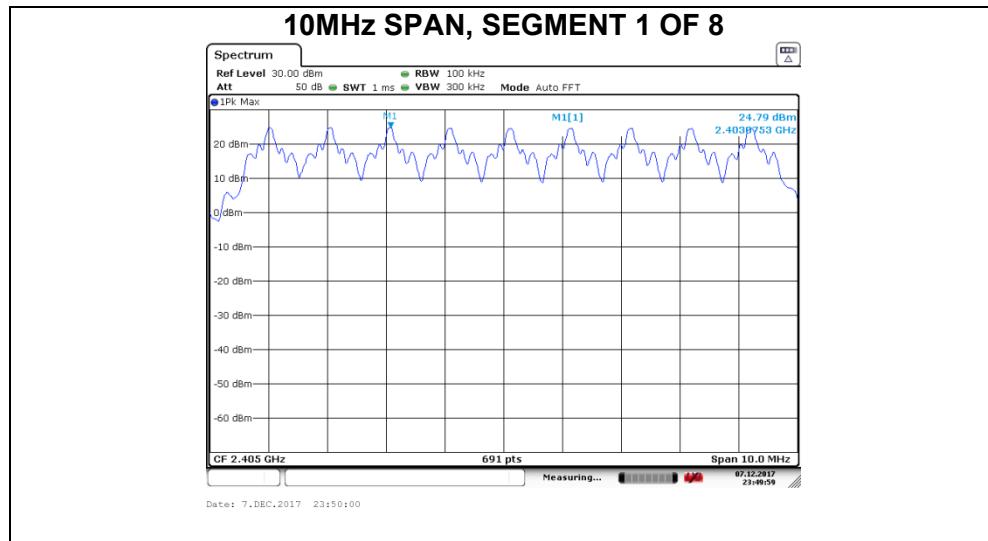
TEST PROCEDURE

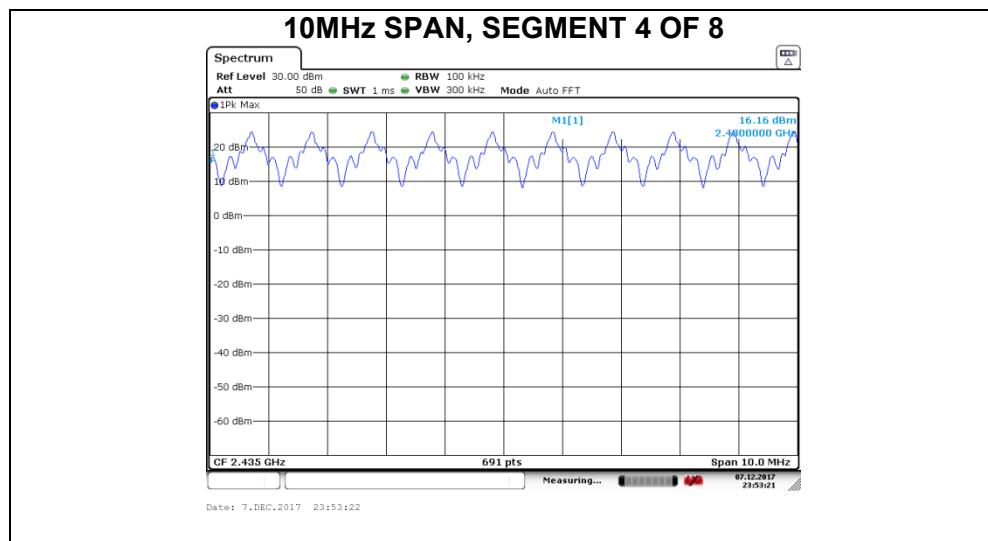
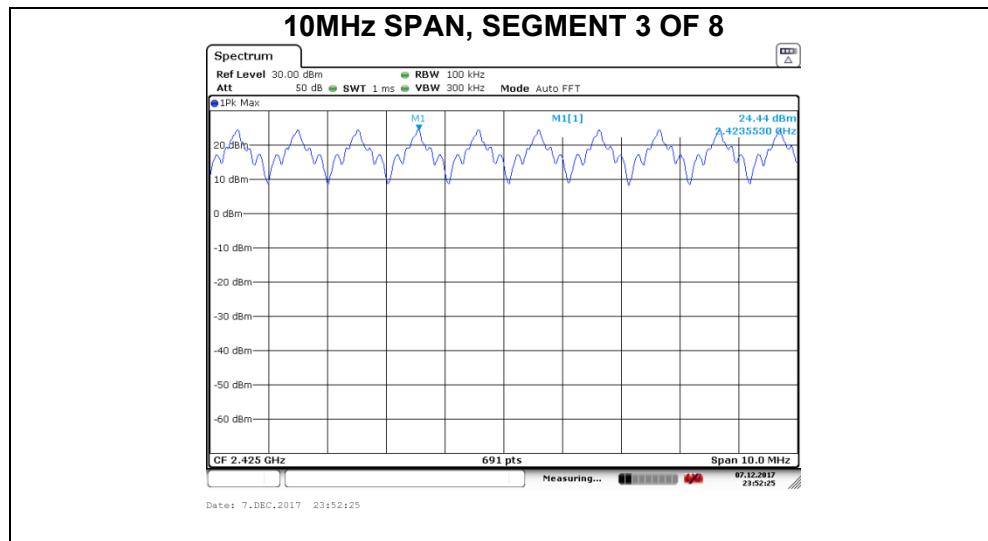
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

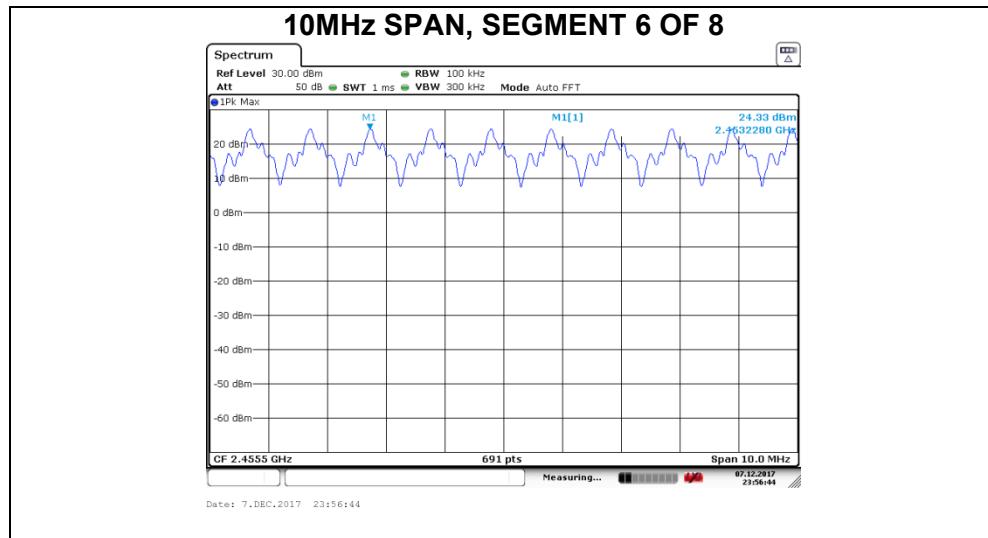
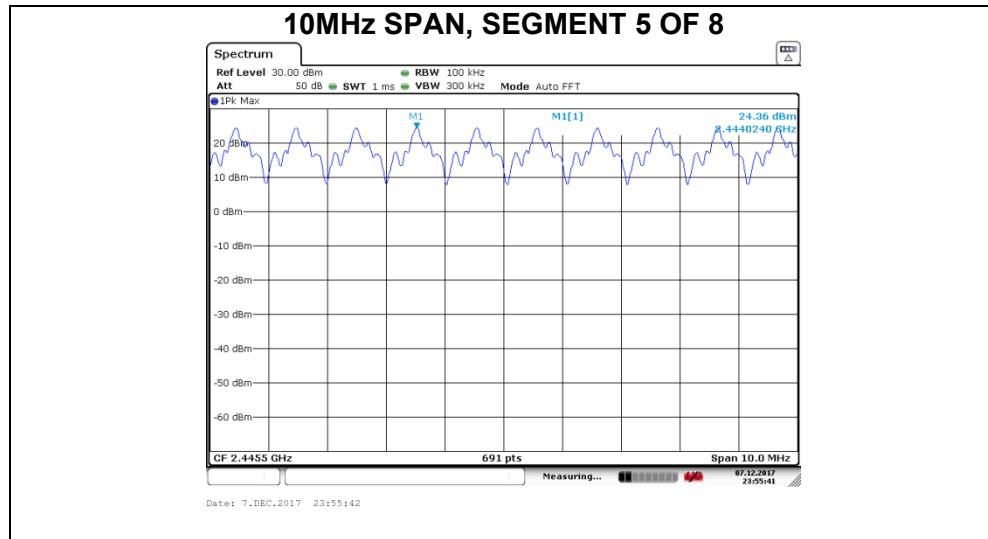
RESULTS

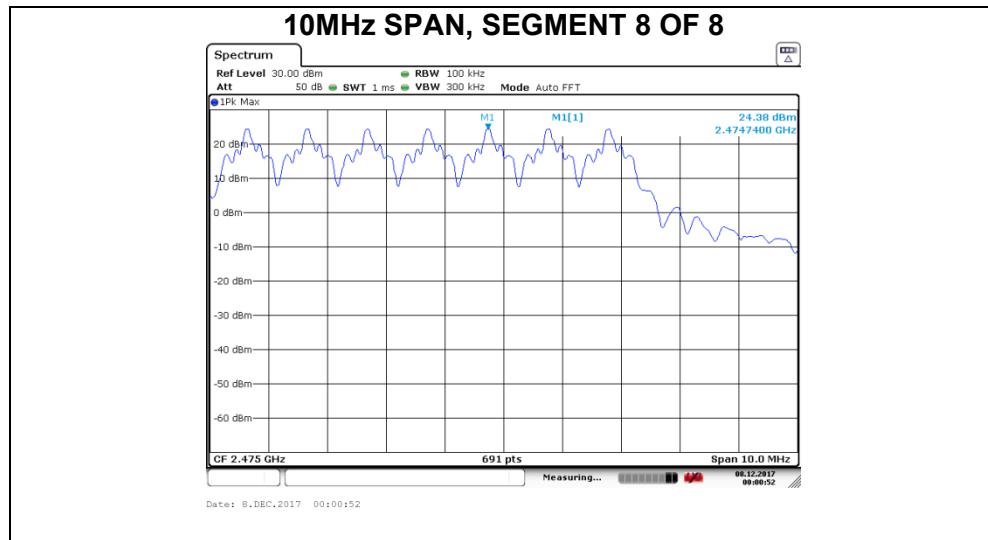
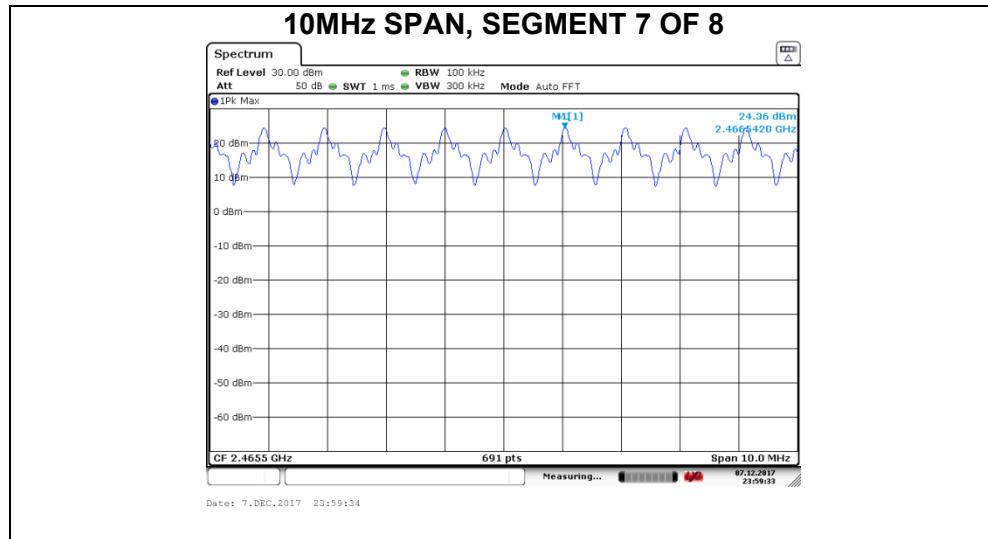
Based on manufacturer's declaration and the data provided below to the lab the number of channels for normal mode is 75 Channels.

NUMBER OF HOPPING CHANNELS









7.5. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (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

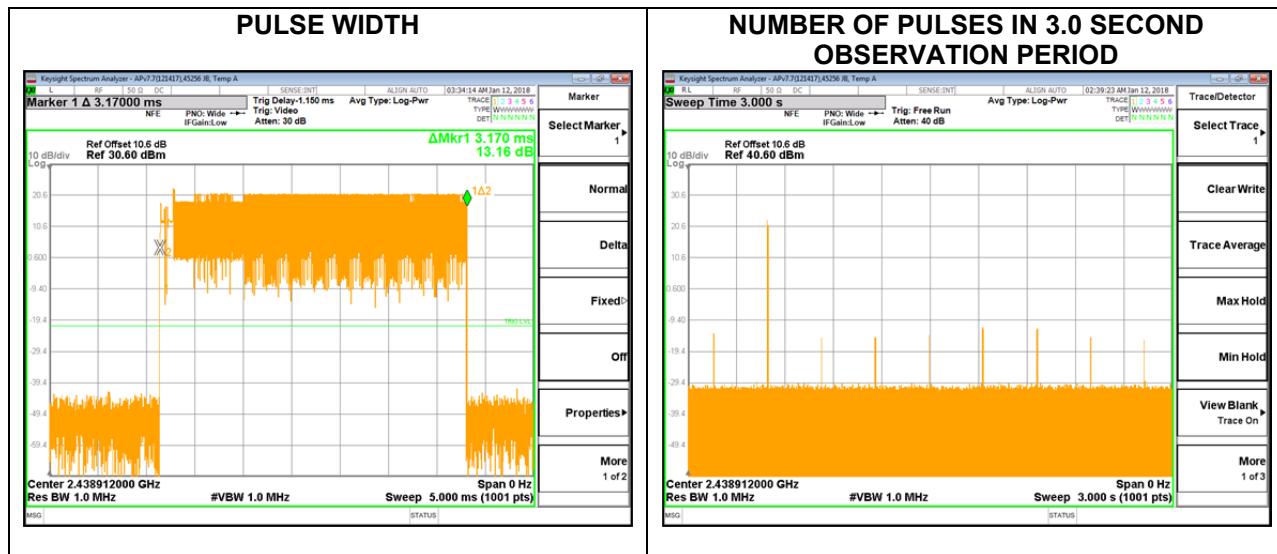
The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 30 second period (75 channels * 0.4 s) is equal to $10 * (\# \text{ of pulses in 3 s}) * \text{pulse width}$.

RESULTS

Normal Mode

Pulse Width (msec)	Number of Pulses in 3 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
3.17	1	0.0317	0.4	-0.3683



7.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

TEST PROCEDURE

The transmitter output is connected to a power meter.

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 a gated peak reading of power.

RESULTS:

Dipole 2.6dBi Antenna:

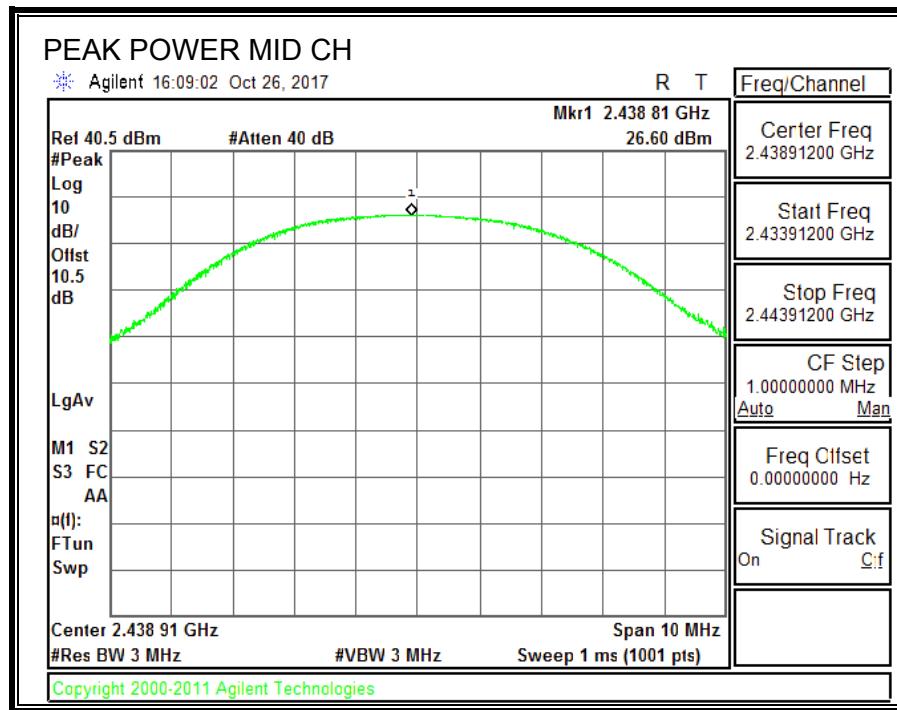
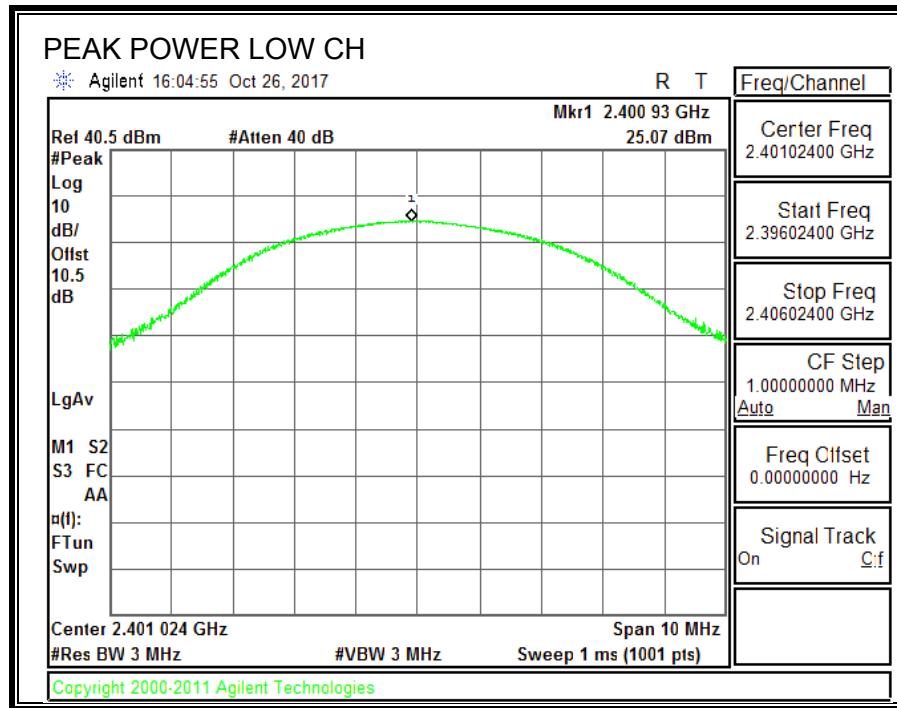
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2401.024	25.07	30	-4.93
Middle	2438.912	26.60	30	-3.40
High	2476.800	26.61	30	-3.39

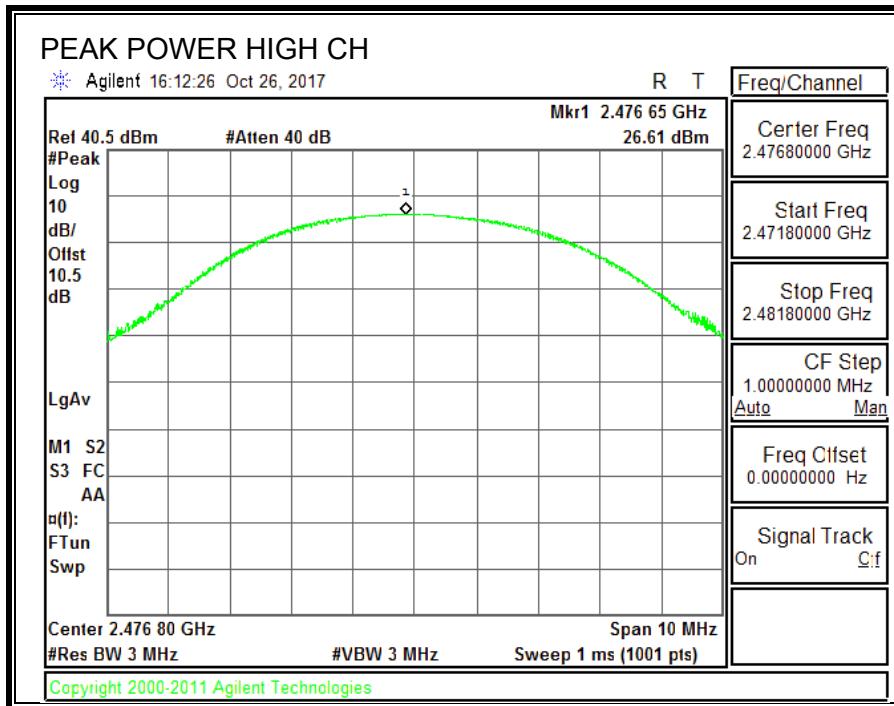
PIFA 3dBi Antenna:

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2401.024	25.07	30	-4.93
Middle	2438.912	26.60	30	-3.40
High	2476.800	26.61	30	-3.39

Dome Monopole 7dBi Antenna:

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2401.024	25.07	29	-3.93
Middle	2438.912	26.60	29	-2.40
High	2476.800	26.61	29	-2.39





7.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 5.5

Limit = -20 dBc

TEST PROCEDURE

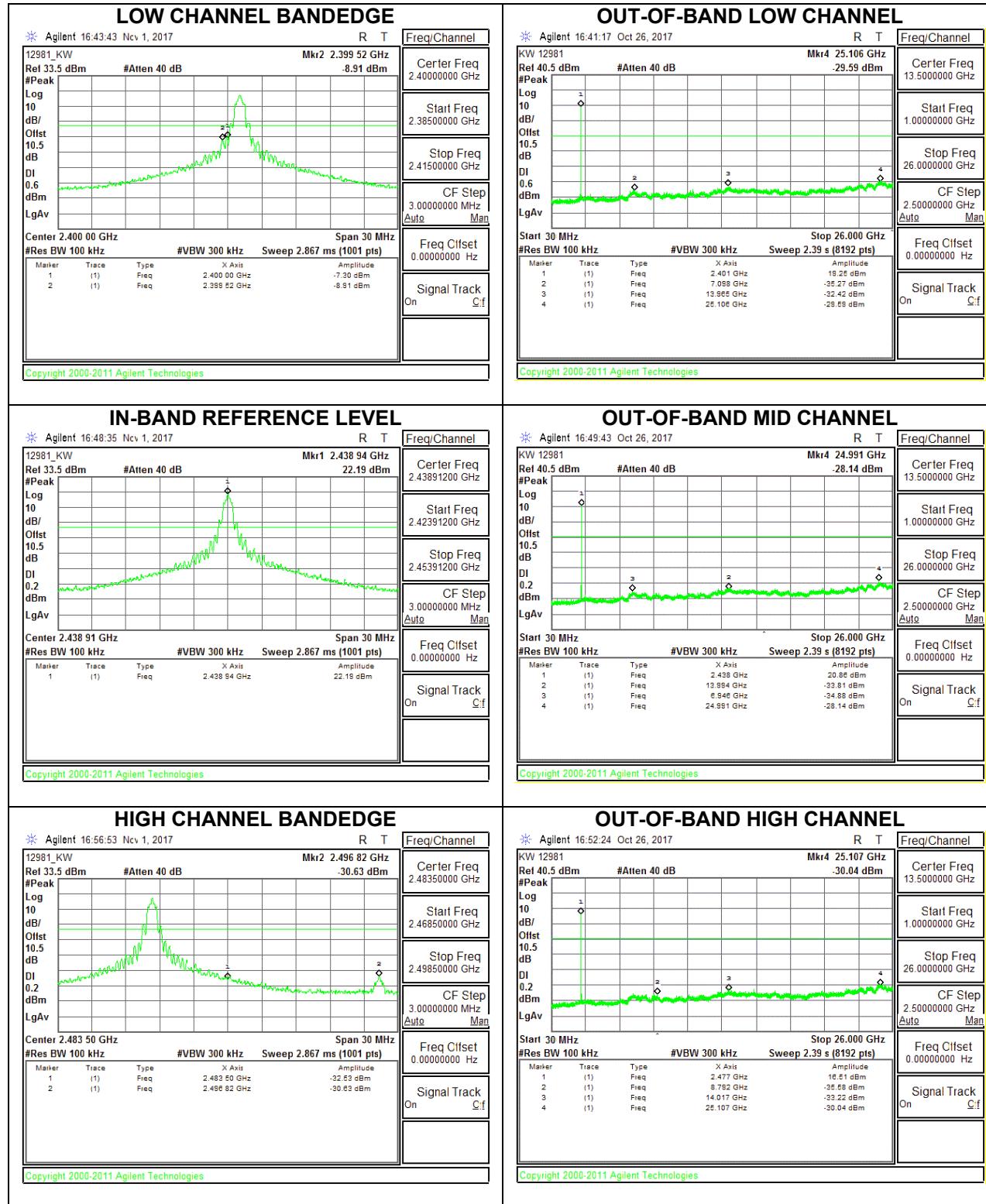
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

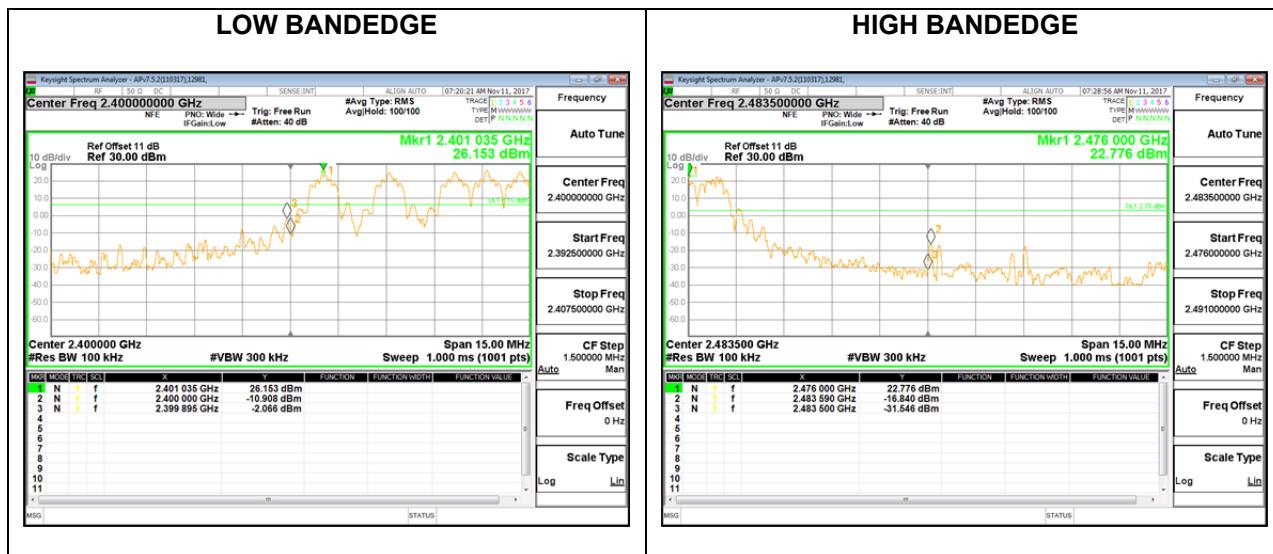
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

SPURIOUS EMISSIONS, NON HOPPING



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



8. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

IC RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
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 for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. 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 1/T (10 Hz) video bandwidth with peak detector for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

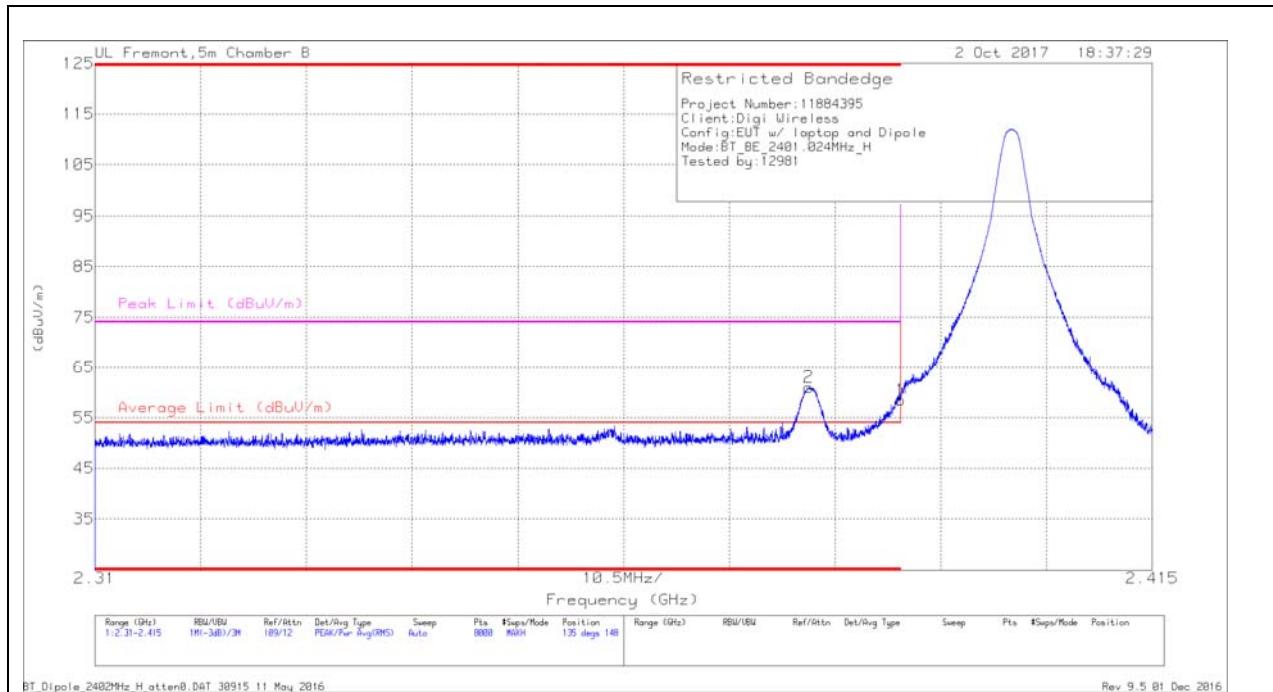
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.1. DIPOLE 2.6dBi ANTENNA

8.1.1. RADIATED EMISSIONS 1-18 GHz

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULTS



Note: the signal (marker 2) is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/Pad (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	45.68	Pk	32	-19.2	58.48	-	-	74	-15.52	135	148	H
			Av			38.48	54	-15.52	-	-			
2	* 2.381	48.33	Pk	31.9	-19.2	61.03	-	-	74	-12.97	135	148	H
			Av			41.03	54	-12.97	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

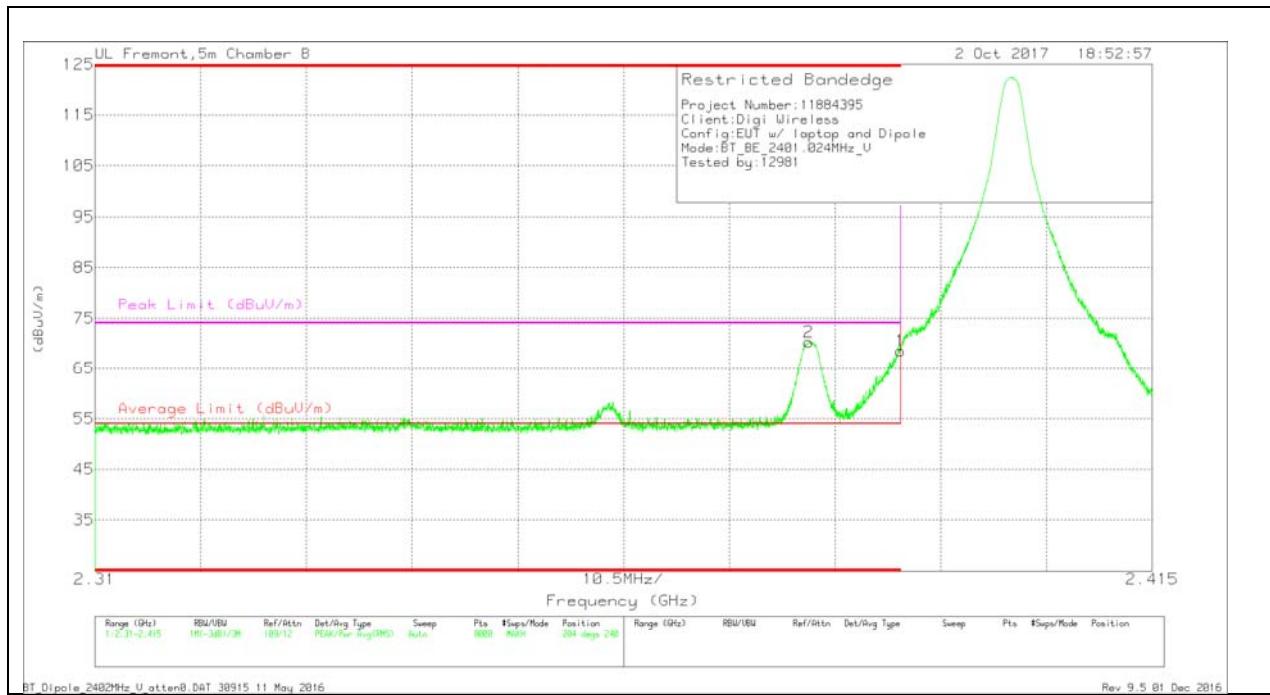
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

VERTICAL RESULTS



Note: the signal (marker 2) is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (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	55.72	Pk	32	-19.2	68.52	-	-	74	-5.48	204	240	V
2	* 2.381	57.63	Pk	31.9	-19.2	70.33	54	-5.48	-	-	204	240	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detector

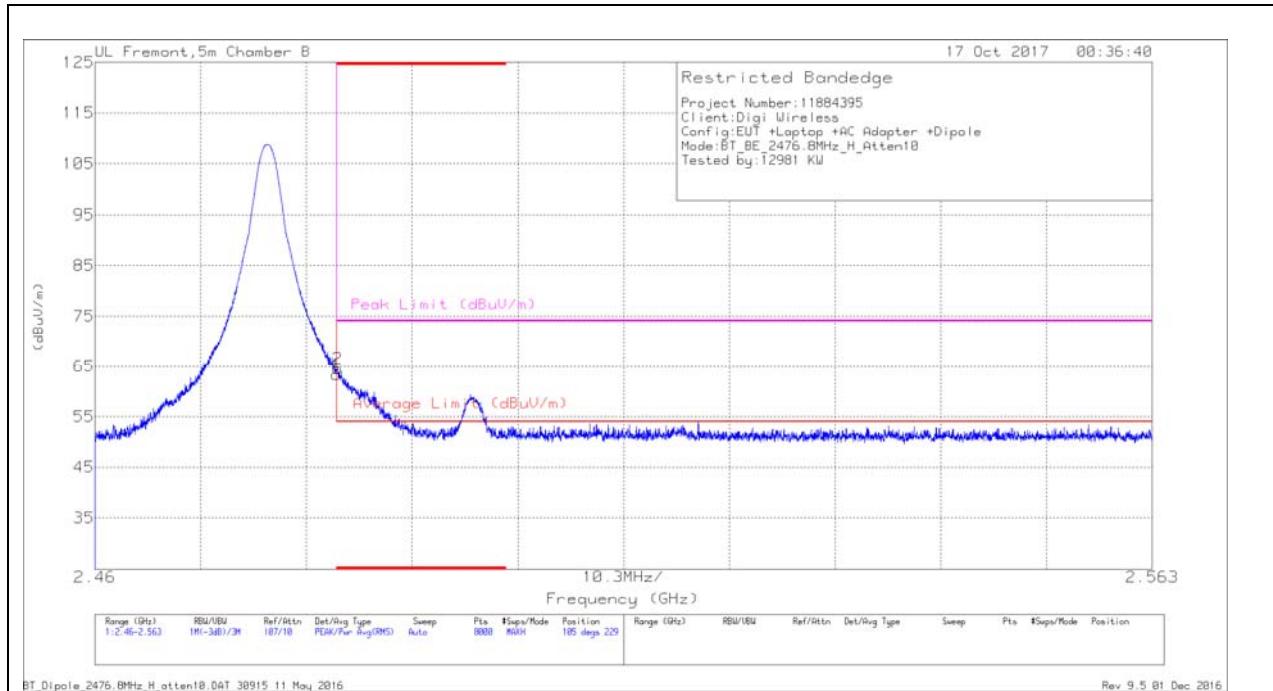
Duty Cycle Relaxation Factor = $20 \cdot \log(0.03) = -30.46$ dB,

* Average Reading = Peak Reading (dBuV/m) -30.46 dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

RESTRICTED BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULTS



Note: the second signal is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (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	51.59	Pk	32.5	-20.8	63.29	-	-	74	-10.71	105	229	H
2	* 2.484	52.9	Av	32.5	-20.8	43.29	54	-10.71	-	-	105	229	H
			Av			64.6	-	-	74	-9.4			
						44.6	54	-9.4	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

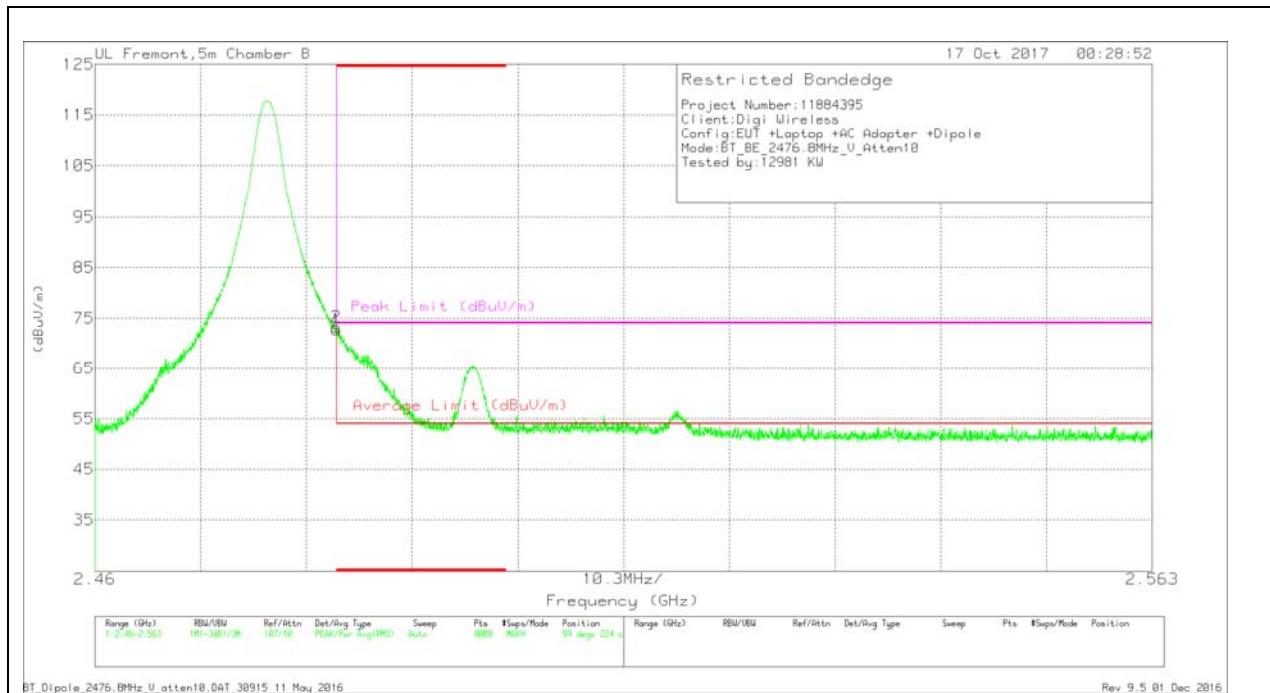
Av - Average detector

Duty Cycle Relaxation Factor = $20 \cdot \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

VERTICAL RESULTS



Note: the second signal is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (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	61.02	Pk	32.5	-20.8	72.72	-	-	74	-1.28	99	224	V
2	* 2.484	61.59	Pk	32.5	-20.8	73.29	54	-1.28	-	-	-	-	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detector

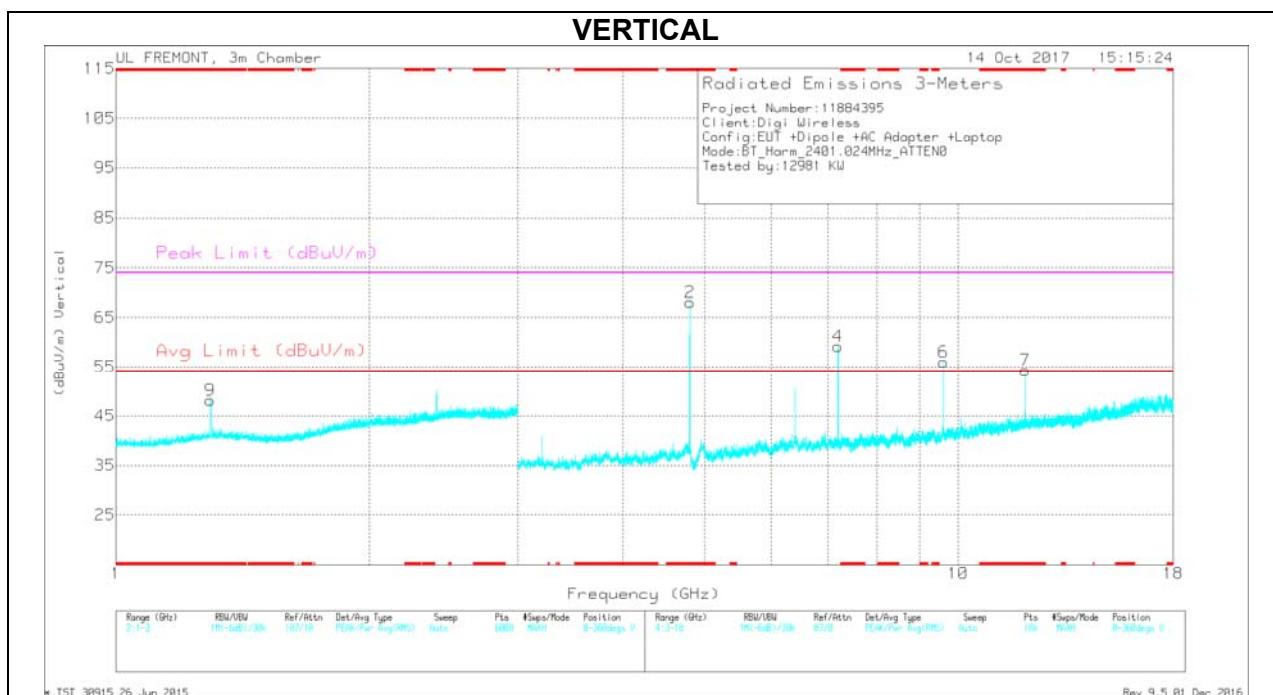
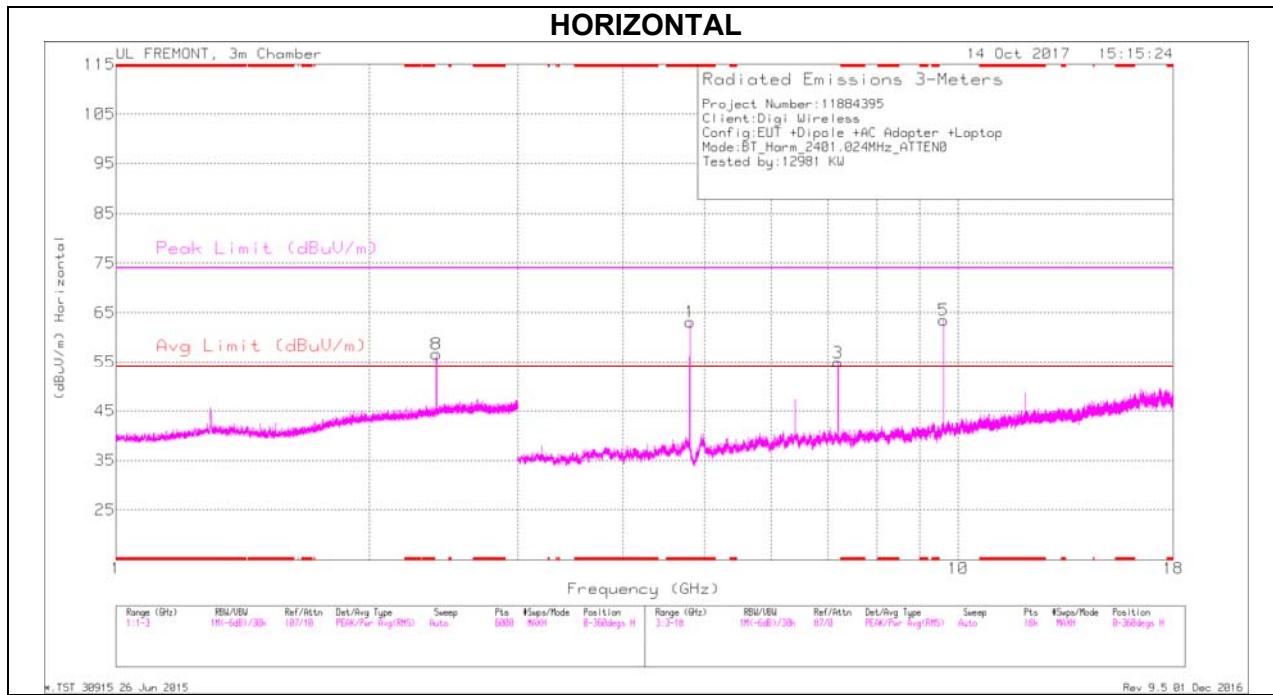
Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* 1.294	41.69	Pk	29.1	-22.6	48.19	74	-25.81	0-360	100	V
1	* 4.802	57.38	Pk	34	-28.3	63.08	74	-10.92	0-360	100	H
2	* 4.802	62.38	Pk	34	-28.3	68.08	74	-5.92	0-360	200	V
7	* 12.006	39.3	Pk	38.7	-23.7	54.3	74	-19.7	0-360	100	V
8	2.401	46.01	Pk	32	-21.4	56.61	-	-	0-360	200	H
3	7.203	43.92	Pk	35.6	-24.7	54.82	-	-	0-360	100	H
4	7.203	48.32	Pk	35.6	-24.7	59.22	-	-	0-360	200	V
5	9.604	48.97	Pk	36.7	-22.2	63.47	-	-	0-360	100	H
6	9.604	41.5	Pk	36.7	-22.2	56	-	-	0-360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.296	46.15	PK	29.1	-22.6	0.24	52.89	74	-21.11	-	-	306	365	V
		Av				32.89	-	-	54	-21.11			
* 4.802	60.74	PK	34	-28.3	0.38	66.82	74	-7.18	-	-	86	101	H
		Av				46.82	-	-	54	-7.18			
* 4.802	64.73	PK	34	-28.3	0.38	70.81	74	-3.19	-	-	68	276	V
		Av				50.81	-	-	54	-3.19			
* 12.006	42.66	PK	38.7	-23.7	0.42	58.08	74	-15.92	-	-	21	100	V
		Av				38.08	-	-	54	-15.92			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

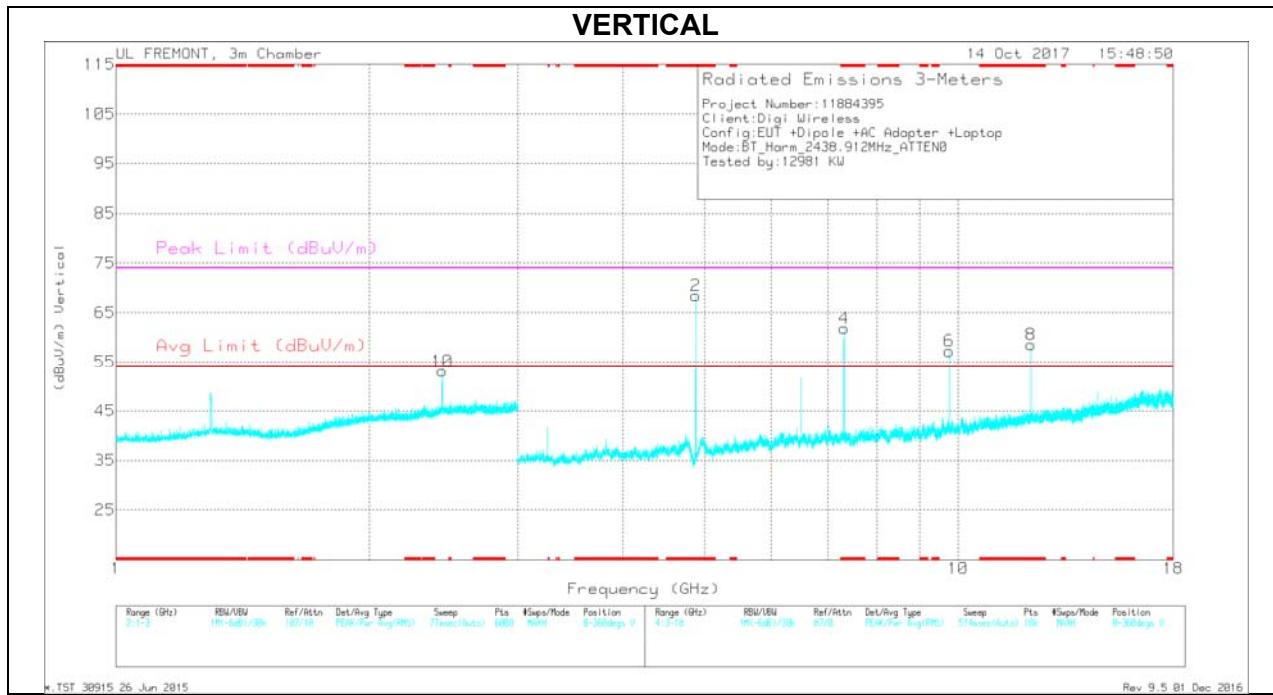
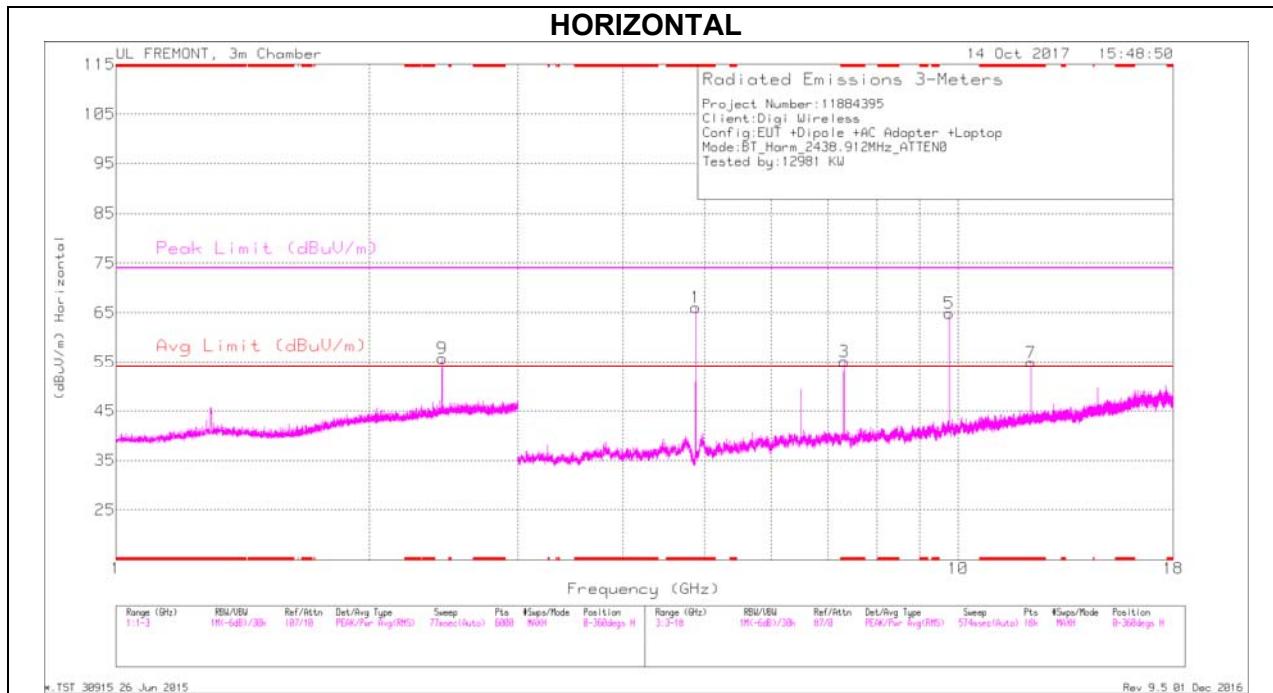
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

MID CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.878	59.94	Pk	34	-27.9	66.04	74	-7.96	0-360	100	H
3	* 7.317	46.59	Pk	35.5	-27	55.09	74	-18.91	0-360	100	H
7	* 12.195	39.83	Pk	38.8	-23.8	54.83	74	-19.17	0-360	100	H
2	* 4.878	62.34	Pk	34	-27.9	68.44	74	-5.56	0-360	200	V
4	* 7.316	53.3	Pk	35.5	-27	61.8	74	-12.2	0-360	200	V
8	* 12.195	43.54	Pk	38.8	-23.8	58.54	74	-15.46	0-360	100	V
9	2.439	44.66	Pk	32.2	-21.1	55.76	-	-	0-360	200	H
10	2.439	41.94	Pk	32.2	-21.1	53.04	-	-	0-360	200	V
5	9.755	51.07	Pk	36.9	-23.1	64.87	-	-	0-360	100	H
6	9.755	43.42	Pk	36.9	-23.1	57.22	-	-	0-360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.878	62.59	PK	34	-27.9	0.38	69.07	74	-4.93	-	-	85	100	H
		Av				49.07	-	-	54	-4.93			
* 7.317	49.86	PK	35.5	-27	0.3	58.66	74	-15.34	-	-	128	103	H
		Av				38.66	-	-	54	-15.34			
* 12.194	42.22	PK	38.8	-23.8	0.38	57.6	74	-16.4	-	-	32	119	H
		Av				37.6	-	-	54	-16.4			
* 4.878	64.41	PK	34	-27.9	0.38	70.89	74	-3.11	-	-	76	218	V
		Av				50.89	-	-	54	-3.11			
* 7.317	56.36	PK	35.5	-27	0.3	65.16	74	-8.84	-	-	102	180	V
		Av				45.16	-	-	54	-8.84			
* 12.194	46.39	PK	38.8	-23.8	0.38	61.77	74	-12.23	-	-	104	100	V
		Av				41.77	-	-	54	-12.23			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

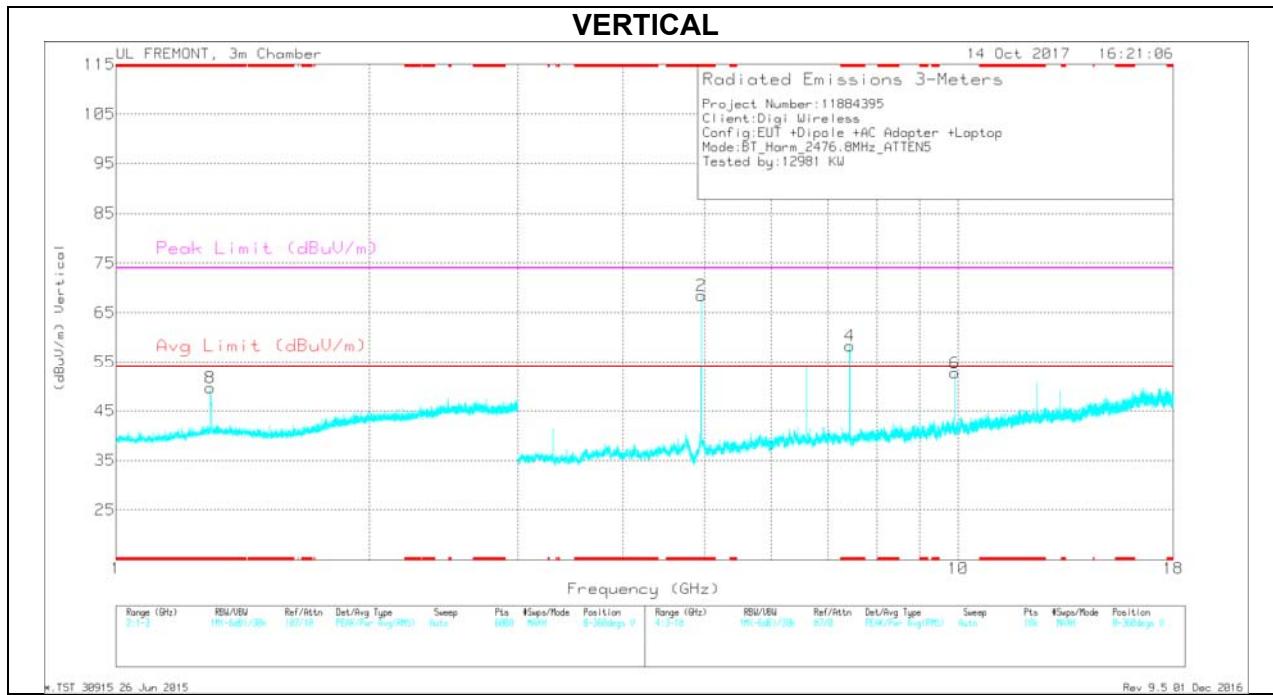
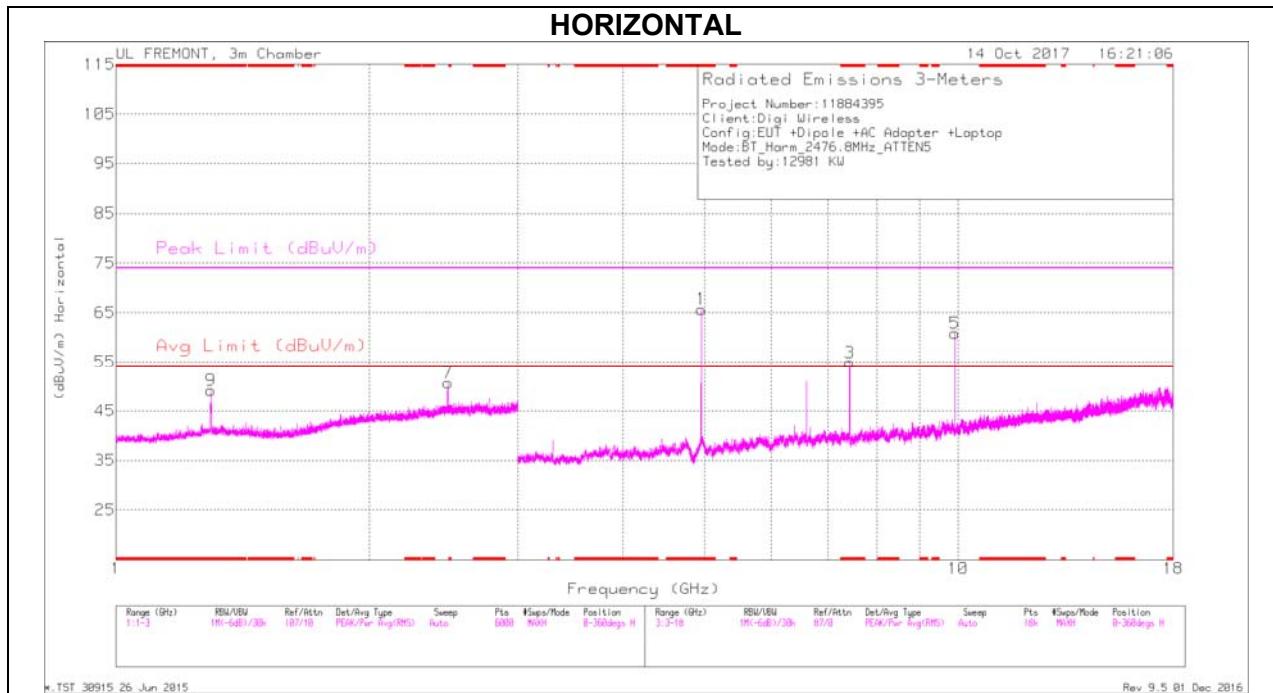
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

HIGH CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* 1.297	42.68	Pk	29.1	-22.6	49.18	74	-24.82	0-360	200	H
8	* 1.294	43.11	Pk	29.1	-22.6	49.61	74	-24.39	0-360	100	V
1	* 4.953	60.42	Pk	34.1	-28.8	65.72	74	-8.28	0-360	100	H
3	* 7.43	45.07	Pk	35.5	-25.7	54.87	74	-19.13	0-360	100	H
2	* 4.953	63.19	Pk	34.1	-28.8	68.49	74	-5.51	0-360	200	V
4	* 7.43	48.55	Pk	35.5	-25.7	58.35	74	-15.65	0-360	200	V
7	2.477	39.81	Pk	32.4	-21.5	50.71	-	-	0-360	200	H
5	9.907	46.72	Pk	36.9	-22.8	60.82	-	-	0-360	100	H
6	9.907	38.57	Pk	36.9	-22.8	52.67	-	-	0-360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.295	45.98	PK	29.1	-22.6	0.24	52.72	74	-21.28	-	-	39	377	H
		Av				32.72	-	-	54	-21.28			
* 1.296	44.68	PK	29.1	-22.6	0.24	51.42	74	-22.58	-	-	34	362	V
		Av				31.42	-	-	54	-22.58			
* 4.954	63.06	PK	34.1	-28.8	0.38	68.74	74	-5.26	-	-	0	100	H
		Av				48.74	-	-	54	-5.26			
* 7.43	49.29	PK	35.5	-25.7	0.29	59.38	74	-14.62	-	-	113	341	H
		Av				39.38	-	-	54	-14.62			
* 4.953	65.53	PK	34.1	-28.8	0.38	71.21	74	-2.79	-	-	26	238	V
		Av				51.21	-	-	54	-2.79			
* 7.431	51.78	PK	35.5	-25.7	0.29	61.87	74	-12.13	-	-	80	371	V
		Av				41.87	-	-	54	-12.13			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

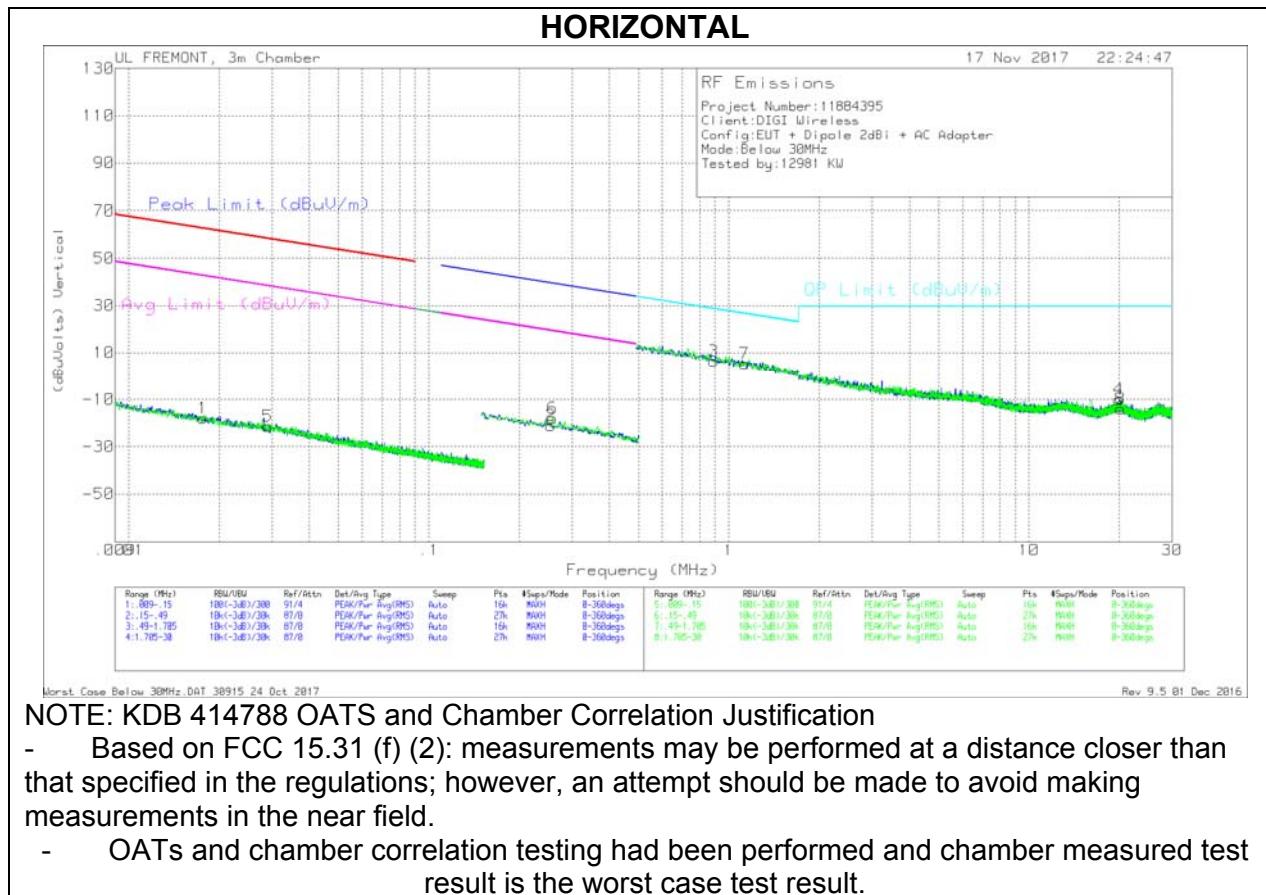
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

8.1.2. WORST-CASE RADIATED EMISSIONS 0.15-30 MHz



Trace Markers

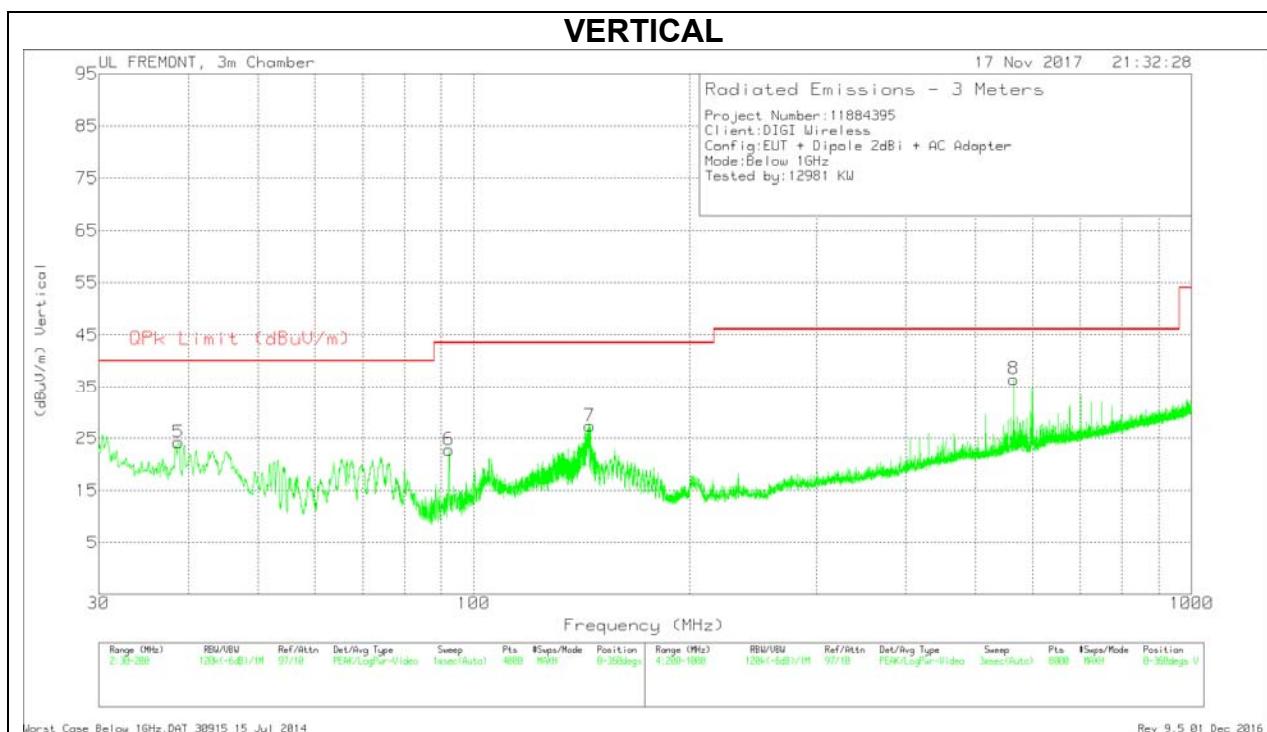
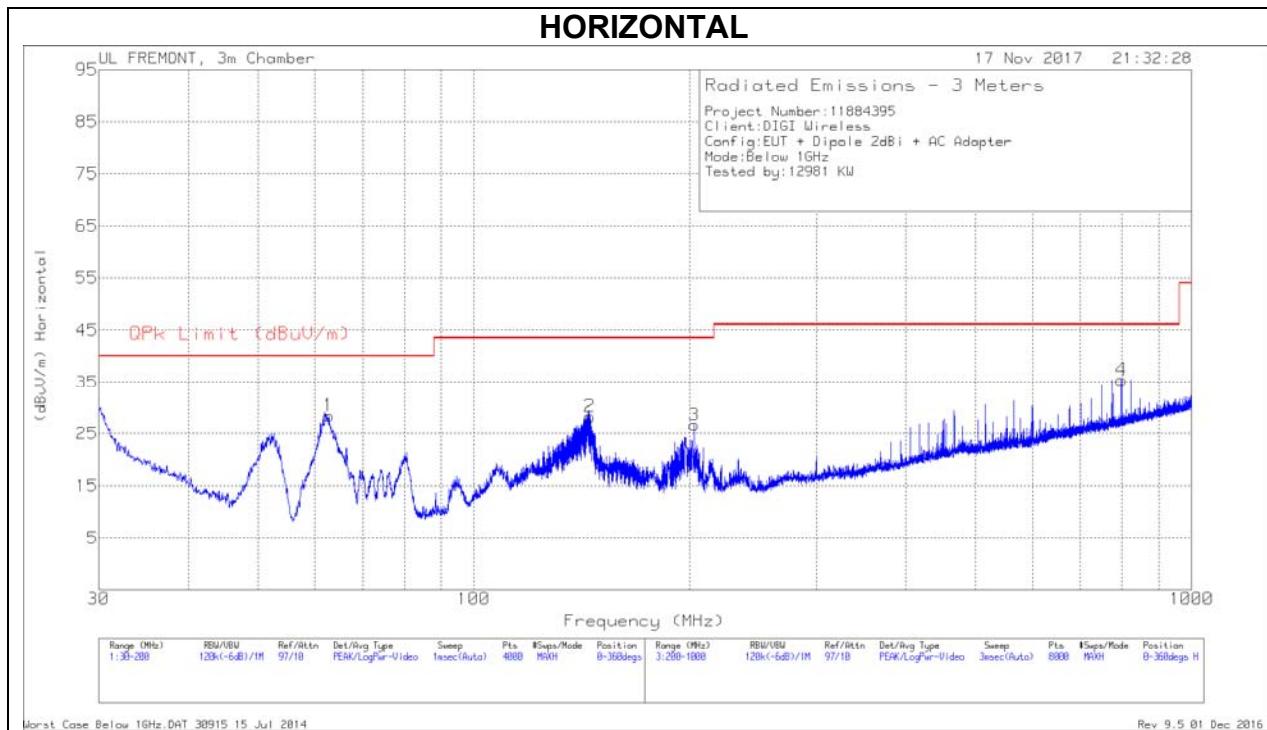
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0177	45.69	Pk	14.9	1.4	-80	-18.01	62.62	-80.63	42.62	-60.63	-	-	-	-	0-360
5	.02908	41.68	Pk	15.4	1.4	-80	-21.52	59.31	-79.83	38.31	-59.83	-	-	-	-	0-360
2	.25495	43.62	Pk	13.8	1.5	-80	-21.08	-	-	-	-	39.49	-60.57	19.49	-40.57	0-360
6	.25865	46.82	Pk	13.8	1.5	-80	-17.88	-	-	-	-	39.36	-57.24	19.36	-37.24	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.889	30.85	Pk	14.1	1.5	-40	6.45	28.64	-22.19	0-360
7	1.12696	29.51	Pk	14.3	1.5	-40	5.31	26.59	-21.28	0-360
4	19.90142	13.64	Pk	14.8	1.6	-40	-9.96	29.5	-39.46	0-360
8	20.17495	9.5	Pk	14.8	1.7	-40	-14	29.5	-43.5	0-360

Pk - Peak detector

8.1.3. WORST-CASE RADIATED EMISSIONS 30-1000 MHz

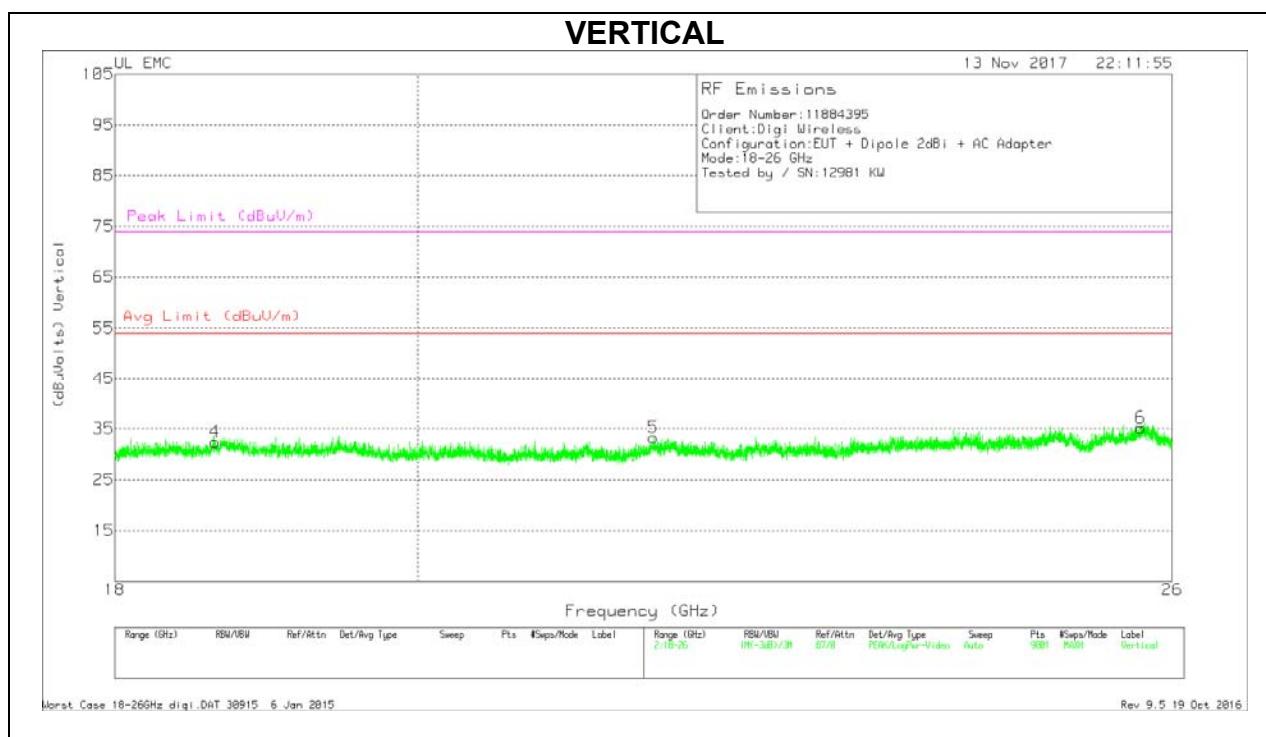
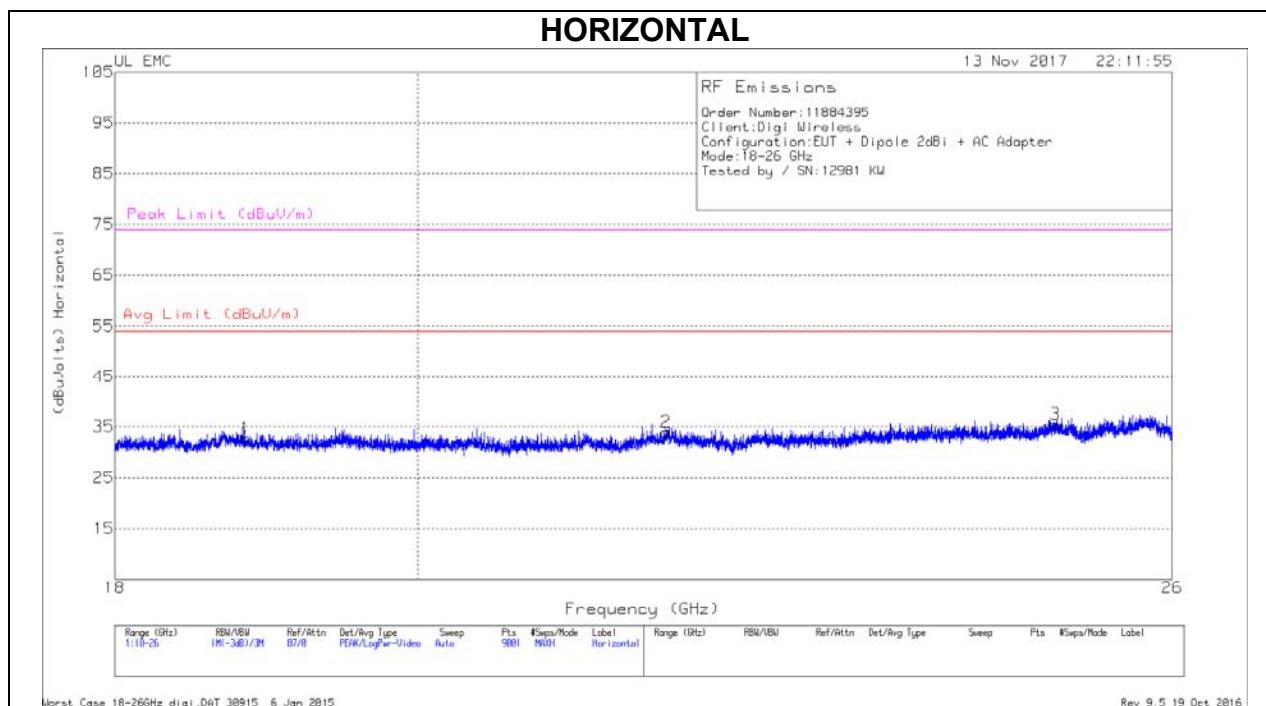


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	38.7573	36.34	Pk	18.9	-31	24.24	40	-15.76	0-360	100	V
1	62.776	47.42	Pk	11.7	-30.7	28.42	40	-11.58	0-360	100	H
6	92.3636	41.02	Pk	12.2	-30.4	22.82	43.52	-20.7	0-360	100	V
2	145.0348	41.32	Pk	16.8	-29.9	28.22	43.52	-15.3	0-360	300	H
7	145.0348	40.47	Pk	16.8	-29.9	27.37	43.52	-16.15	0-360	100	V
3	202.7004	40.12	Pk	16	-29.5	26.62	43.52	-16.9	0-360	100	H
8	565.2475	41.65	Pk	22.4	-27.5	36.55	46.02	-9.47	0-360	100	V
4	798.7778	36.91	Pk	25.1	-26.6	35.41	46.02	-10.61	0-360	100	H

Pk - Peak detector

8.1.4. WORST-CASE RADIATED EMISSIONS 18-26 GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.834	34.86	Pk	32.4	-25	-9.5	32.76	54	-21.24	74	-41.24
2	21.804	34.56	Pk	33.3	-24.4	-9.5	33.96	54	-20.04	74	-40.04
3	24.967	35.06	Pk	34.1	-24.2	-9.5	35.46	54	-18.54	74	-38.54
4	18.638	34.31	Pk	32.5	-24.9	-9.5	32.41	54	-21.59	74	-41.59
5	21.709	34.17	Pk	33.3	-24.7	-9.5	33.27	54	-20.73	74	-40.73
6	25.717	35.27	Pk	34.1	-24.7	-9.5	35.17	54	-18.83	74	-38.83

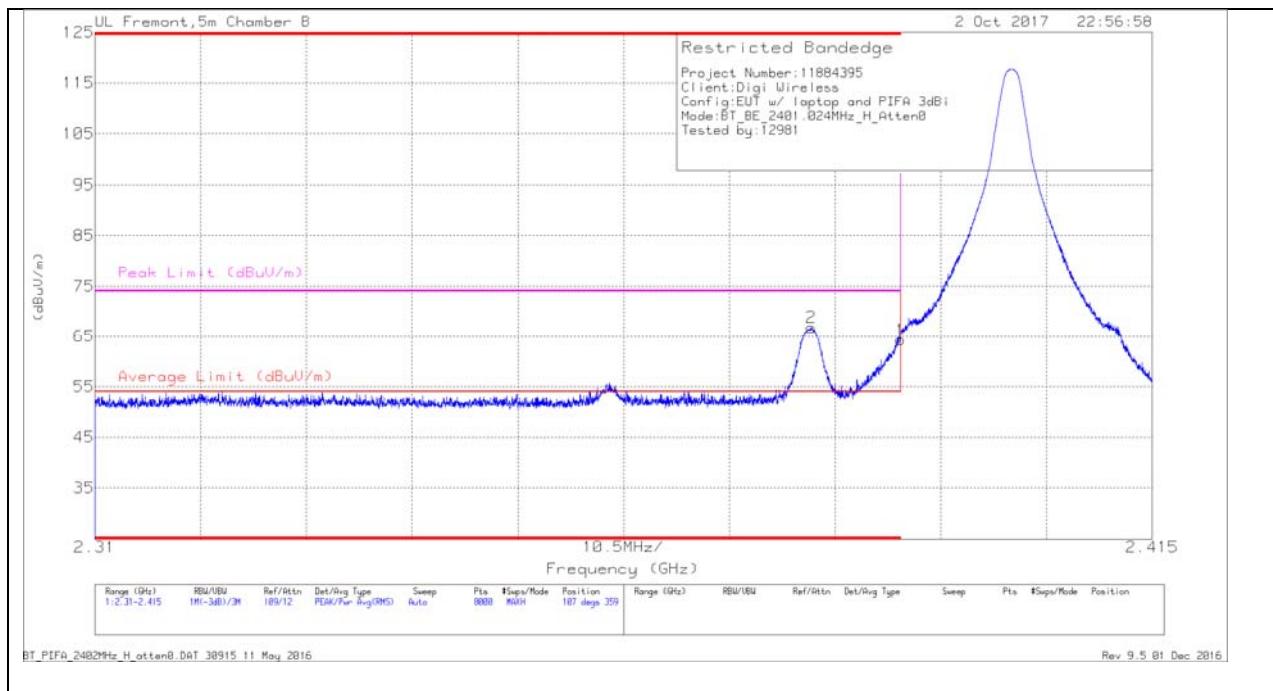
Pk - Peak detector

8.2. PIFA 3dBi ANTENNA

8.2.1. RADIATED EMISSIONS 1-18 GHz

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULTS



Note: the second signal (marker 2) is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (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	51.48	Pk	32	-19.2	64.28	-	-	74	-9.72	107	359	H
			Av			44.28	54	-9.72	-	-			
2	* 2.381	54.16	Pk	31.9	-19.2	66.86	-	-	74	-7.14	107	359	H
			Av			46.86	54	-7.14	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

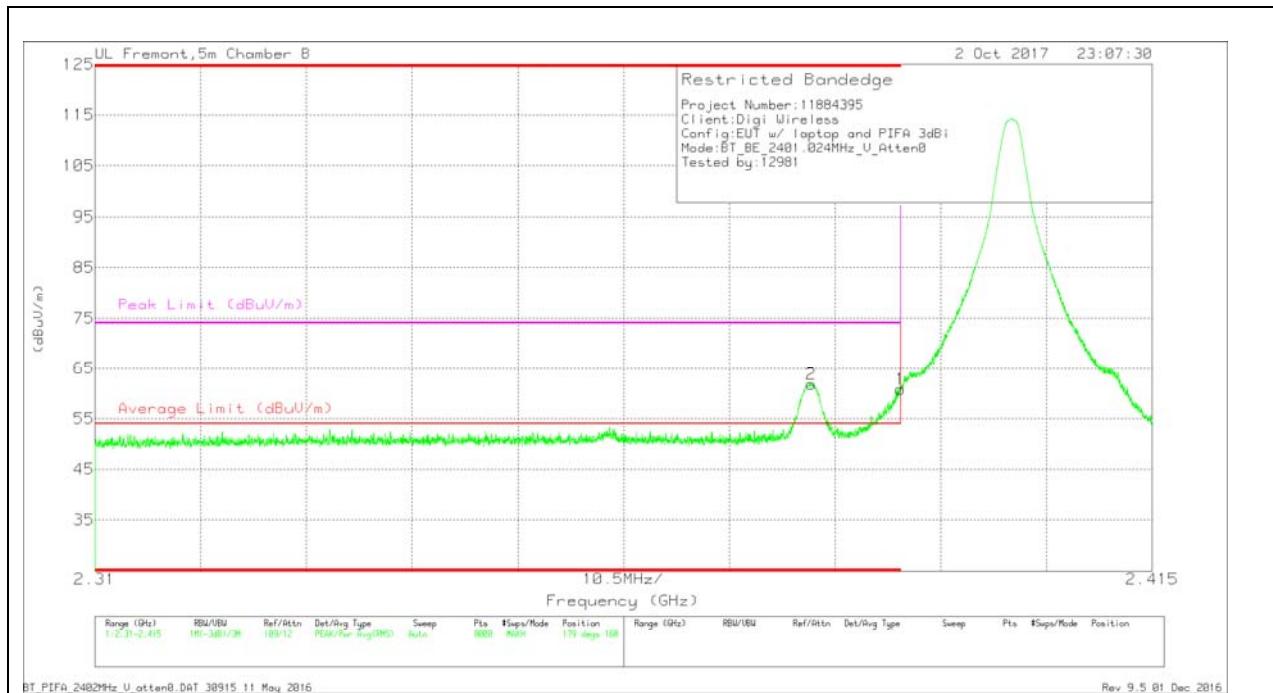
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

VERTICAL RESULTS



Note: the second signal (marker 2) is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBm)	Average Limit (dBm)	Margin (dB)	Peak Limit (dBm)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	48.06	Pk	32	-19.2	60.86	-	-	74	-13.14	179	168	V
			Av			40.86	54	-13.14	-	-			
2	* 2.381	49.19	Pk	31.9	-19.2	61.89	-	-	74	-12.11	179	168	V
			Av			41.89	54	-12.11	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detector

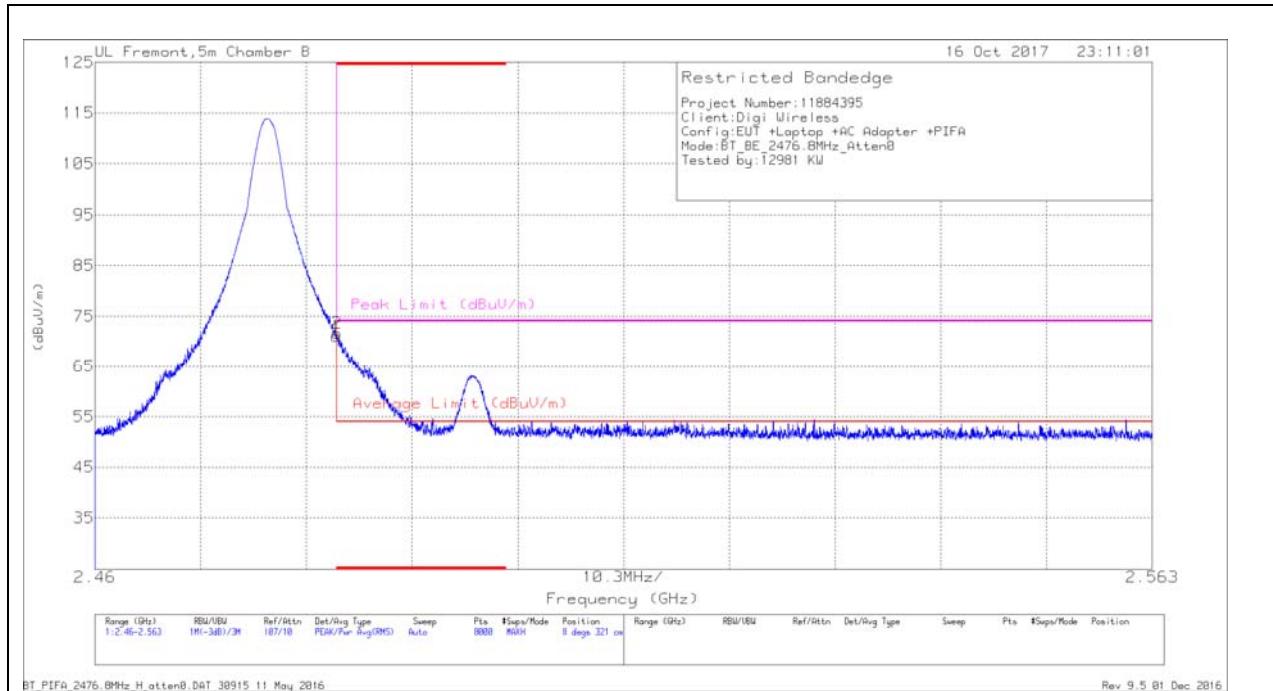
Duty Cycle Relaxation Factor = $20 \cdot \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBm) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

RESTRICTED BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULTS



Note: the second signal is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T111 (dB/m)	Amp/Cbl/Fltr/Pad (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	59.31	Pk	32.5	-20.8	71.01	-	-	74	-2.99	8	321	H
			Av			51.01	54	-2.99	-	-			
2	* 2.484	59.92	Pk	32.5	-20.8	71.62	-	-	74	-2.38	8	321	H
			Av			51.62	54	-2.38	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

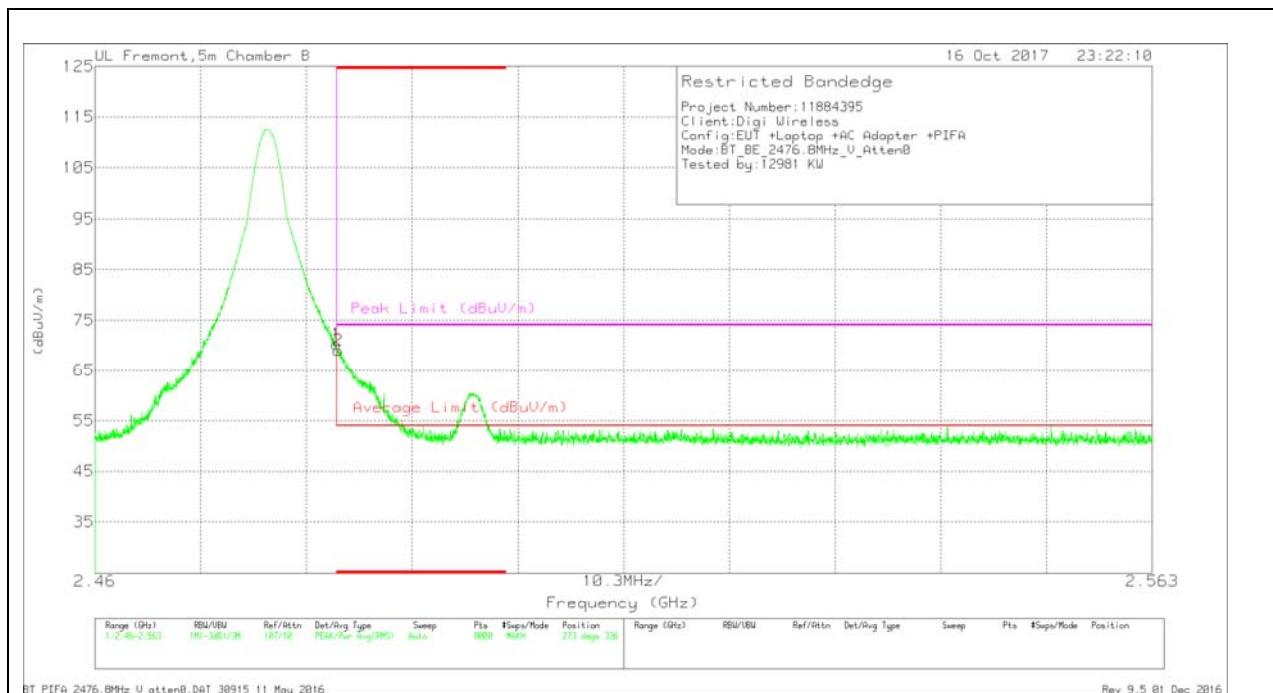
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

VERTICAL RESULTS



Note: the second signal is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBmV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBmV/m)	Average Limit (dBmV/m)	Margin (dB)	Peak Limit (dBmV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	58.54	Pk	32.5	-20.8	70.24	-	-	74	-3.76	273	336	V
2	* 2.484	57.38	Pk	32.5	-20.8	69.08	-	-	74	-4.92	273	336	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detector

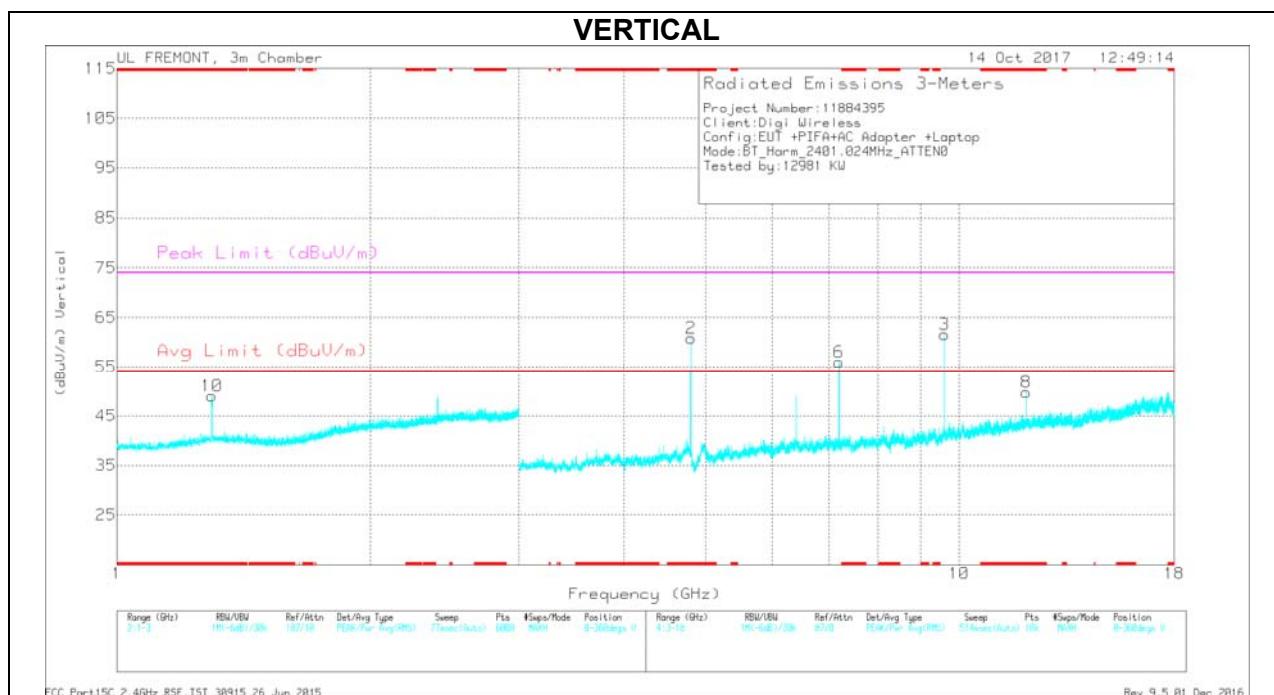
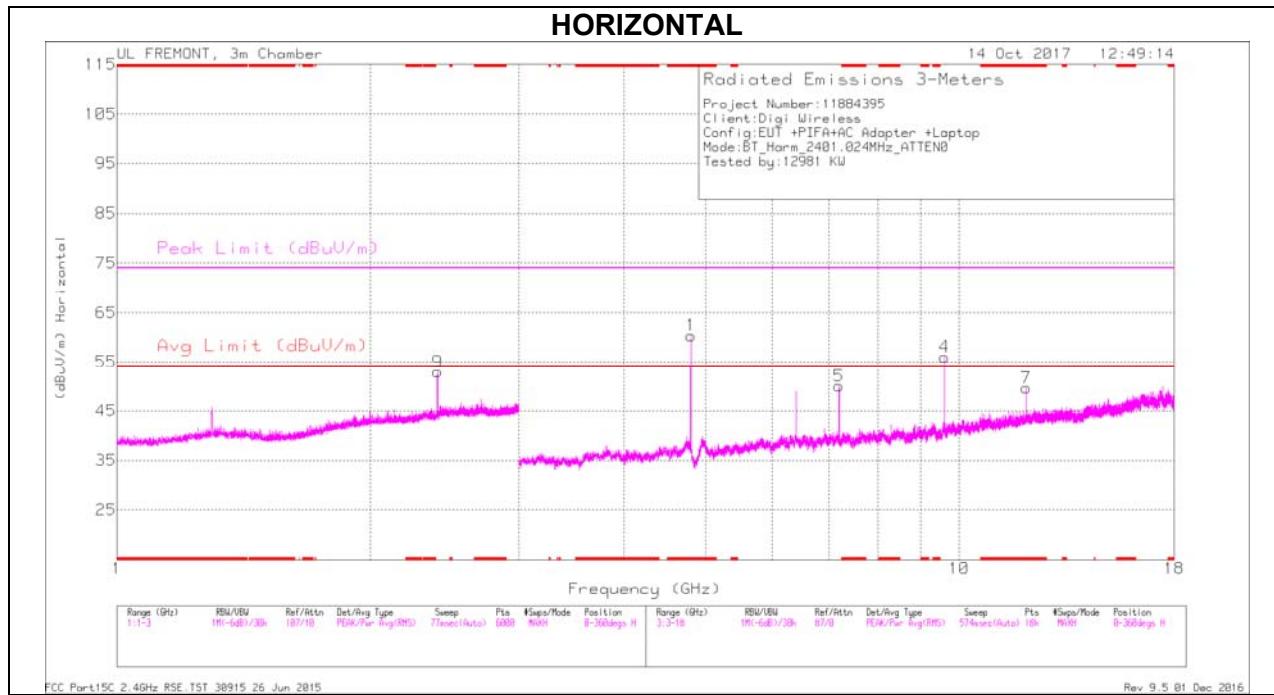
Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBmV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
10	* 1.297	42.57	Pk	29.1	-22.6	49.07	74	-24.93	0-360	200	V
1	* 4.802	54.69	Pk	34	-28.3	60.39	74	-13.61	0-360	200	H
7	* 12.006	34.63	Pk	38.7	-23.7	49.63	74	-24.37	0-360	200	H
2	* 4.802	55.19	Pk	34	-28.3	60.89	74	-13.11	0-360	200	V
8	* 12.006	34.81	Pk	38.7	-23.7	49.81	74	-24.19	0-360	100	V
9	2.401	42.41	Pk	32	-21.4	53.01	-	-	0-360	200	H
5	7.203	39.2	Pk	35.6	-24.7	50.1	-	-	0-360	200	H
6	7.203	45.16	Pk	35.6	-24.7	56.06	-	-	0-360	100	V
4	9.604	41.57	Pk	36.7	-22.2	56.07	-	-	0-360	200	H
3	9.604	47.05	Pk	36.7	-22.2	61.55	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.297	46.02	PK	29.1	-22.6	0.24	52.76	74	-21.24	-	-	347	324	V
		Av				32.76	-	-	54	-21.24			
* 4.802	63.77	PK	34	-28.3	0.38	69.85	74	-4.15	-	-	196	398	H
		Av				49.85	-	-	54	-4.15			
* 12.005	39.34	PK	38.7	-23.7	0.42	54.76	74	-19.24	-	-	232	241	H
		Av				34.76	-	-	54	-19.24			
* 12.006	40.34	PK	38.7	-23.7	0.42	55.76	74	-18.24	-	-	36	371	V
		Av				35.76	-	-	54	-18.24			
* 4.802	58.35	PK	34	-28.3	0.38	64.43	74	-9.57	-	-	242	198	V
		Av				44.43	-	-	54	-9.57			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

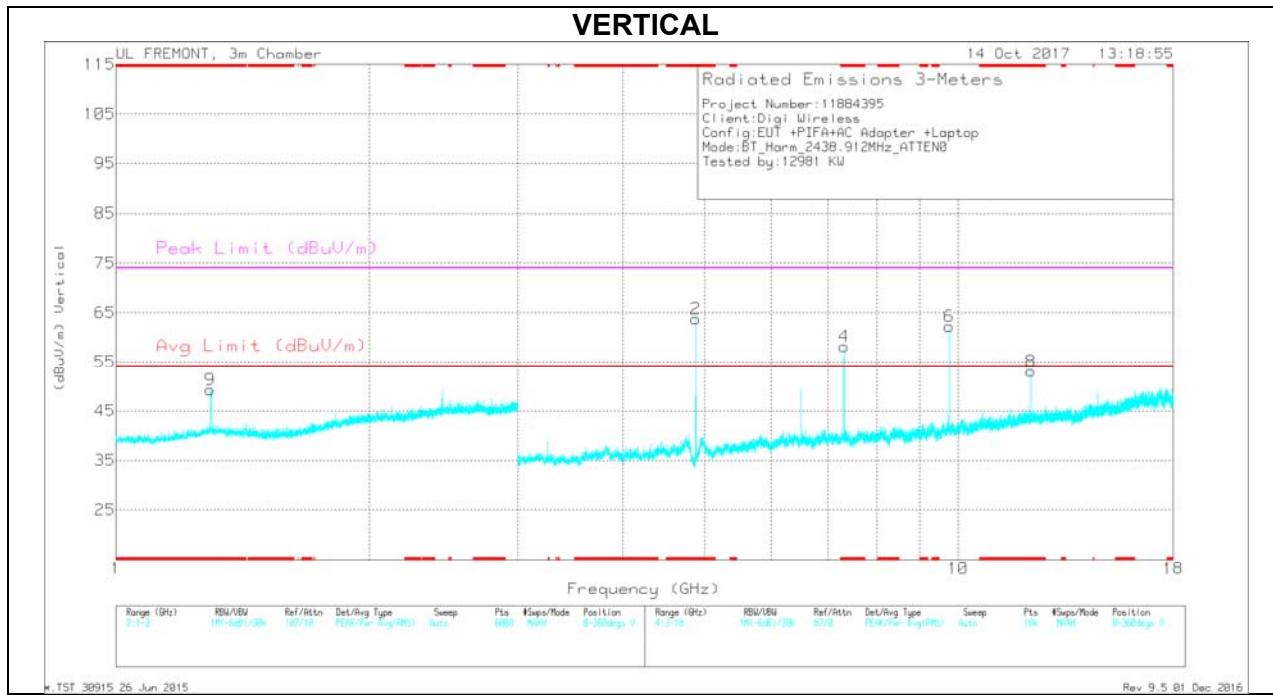
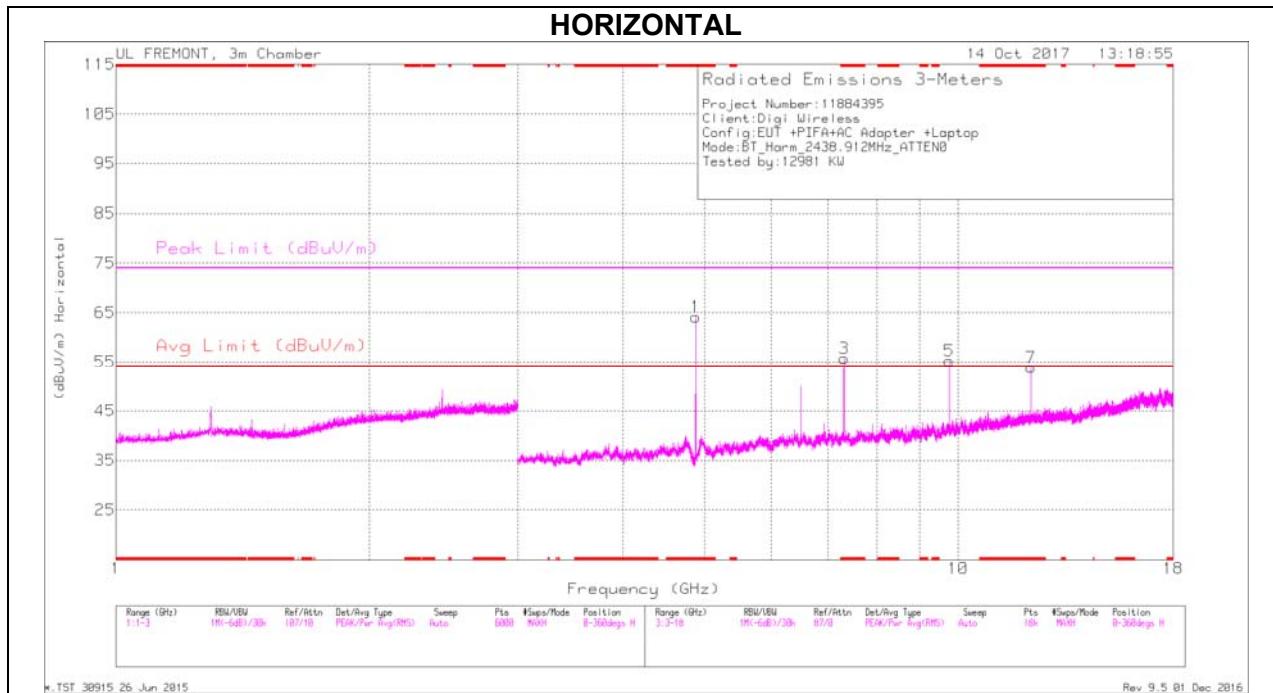
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

MID CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	* 1.294	42.84	Pk	29.1	-22.6	49.34	74	-24.66	0-360	200	V
1	* 4.878	58.01	Pk	34	-27.9	64.11	74	-9.89	0-360	200	H
3	* 7.317	47.24	Pk	35.5	-27	55.74	74	-18.26	0-360	200	H
7	* 12.195	38.82	Pk	38.8	-23.8	53.82	74	-20.18	0-360	200	H
2	* 4.878	57.7	Pk	34	-27.9	63.8	74	-10.2	0-360	200	V
4	* 7.317	49.72	Pk	35.5	-27	58.22	74	-15.78	0-360	200	V
8	* 12.195	38.14	Pk	38.8	-23.8	53.14	74	-20.86	0-360	200	V
5	9.755	41.4	Pk	36.9	-23.1	55.2	-	-	0-360	200	H
6	9.755	48.47	Pk	36.9	-23.1	62.27	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.293	40.48	PK	29	-22.6	0.24	47.12	74	-26.88	-	-	0	200	V
		Av				27.12	-	-	54	-26.88			
* 4.878	63.47	PK	34	-27.9	0.38	69.95	74	-4.05	-	-	193	323	H
		Av				49.95	-	-	54	-4.05			
* 7.317	51.91	PK	35.5	-27	0.29	60.7	74	-13.3	-	-	334	230	H
		Av				40.7	-	-	54	-13.3			
* 12.195	42.94	PK	38.8	-23.8	0.42	58.36	74	-15.64	-	-	232	246	H
		Av				38.36	-	-	54	-15.64			
* 4.878	62.31	PK	34	-27.9	0.38	68.79	74	-5.21	-	-	337	398	V
		Av				48.79	-	-	54	-5.21			
* 7.317	51.3	PK	35.5	-27	0.29	60.09	74	-13.91	-	-	260	397	V
		Av				40.09	-	-	54	-13.91			
* 12.195	45.83	PK	38.8	-23.8	0.42	61.25	74	-12.75	-	-	22	387	V
		Av				41.25	-	-	54	-12.75			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

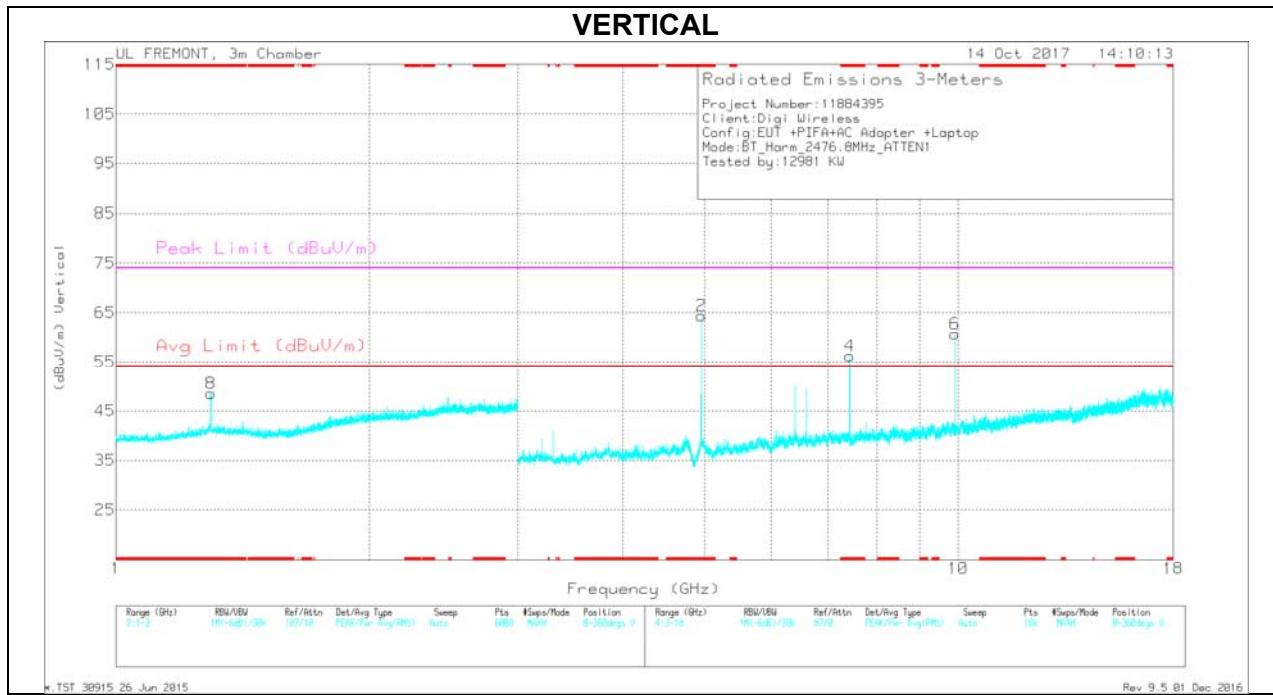
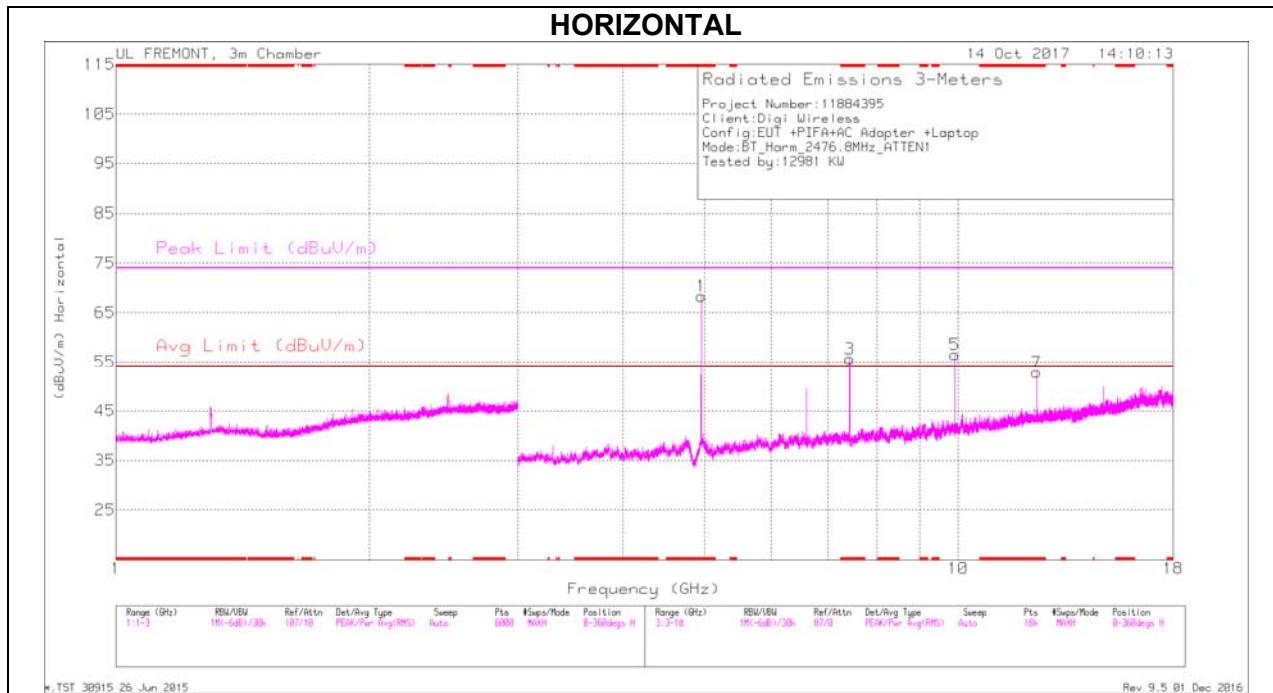
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

HIGH CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
8	* 1.297	42.01	Pk	29.1	-22.6	48.51	74	-25.49	0-360	200	V
1	* 4.953	63	Pk	34.1	-28.8	68.3	74	-5.7	0-360	200	H
3	* 7.43	45.84	Pk	35.5	-25.7	55.64	74	-18.36	0-360	100	H
7	* 12.385	37.71	Pk	38.9	-23.8	52.81	74	-21.19	0-360	200	H
2	* 4.953	59.09	Pk	34.1	-28.8	64.39	74	-9.61	0-360	200	V
4	* 7.43	46.48	Pk	35.5	-25.7	56.28	74	-17.72	0-360	200	V
5	9.907	42.36	Pk	36.9	-22.8	56.46	-	-	0-360	200	H
6	9.907	46.58	Pk	36.9	-22.8	60.68	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.297	44.64	PK	29.1	-22.6	0.24	51.38	74	-22.62	-	-	51	374	V
		Av				31.38	-	-	54	-22.62			
* 4.954	67.23	PK	34.1	-28.8	0.38	72.91	74	-1.09	-	-	208	360	H
		Av				52.91	-	-	54	-1.09			
* 7.43	49.13	PK	35.5	-25.7	0.29	59.22	74	-14.78	-	-	16	185	H
		Av				39.22	-	-	54	-14.78			
* 12.384	43.4	PK	38.9	-23.8	0.42	58.92	74	-15.08	-	-	273	373	H
		Av				38.92	-	-	54	-15.08			
* 7.43	52.94	PK	35.5	-25.7	0.29	63.03	74	-10.97	-	-	49	385	V
		Av				43.03	-	-	54	-10.97			
* 4.954	65.02	PK	34.1	-28.8	0.38	70.7	74	-3.3	-	-	223	316	V
		Av				50.8	-	-	54	-3.3			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

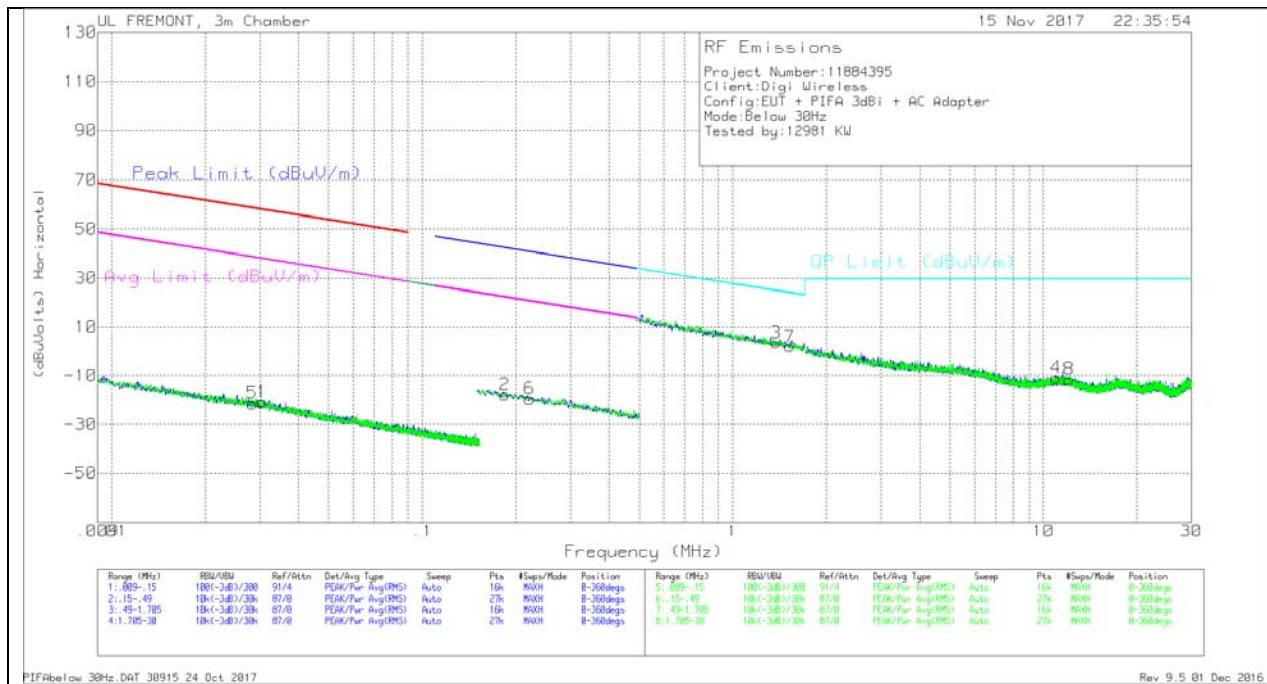
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

8.2.2. WORST-CASE RADIATED EMISSIONS 0.15-30 MHz



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.02837	41.85	Pk	15.4	1.4	-80	-21.35	58.53	-79.88	38.53	-59.88	-	-	-	-	0-360
1	.03049	42.13	Pk	15.5	1.4	-80	-20.97	57.9	-78.87	37.9	-58.87	-	-	-	-	0-360
2	.18441	46.59	Pk	13.9	1.5	-80	-18.01	-	-	-	-	42.3	-60.31	22.3	-40.31	0-360
6	.22166	45.11	Pk	13.9	1.5	-80	-19.49	-	-	-	-	40.7	-60.19	20.7	-40.19	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.37935	27.88	Pk	14.3	1.5	-40	3.68	24.84	-21.16	0-360
7	1.52649	26	Pk	14.4	1.5	-40	1.9	23.96	-22.06	0-360
4	10.98714	12.61	Pk	14.7	1.6	-40	-11.09	29.5	-40.59	0-360
8	12.09906	12.2	Pk	14.7	1.6	-40	-11.5	29.5	-41	0-360

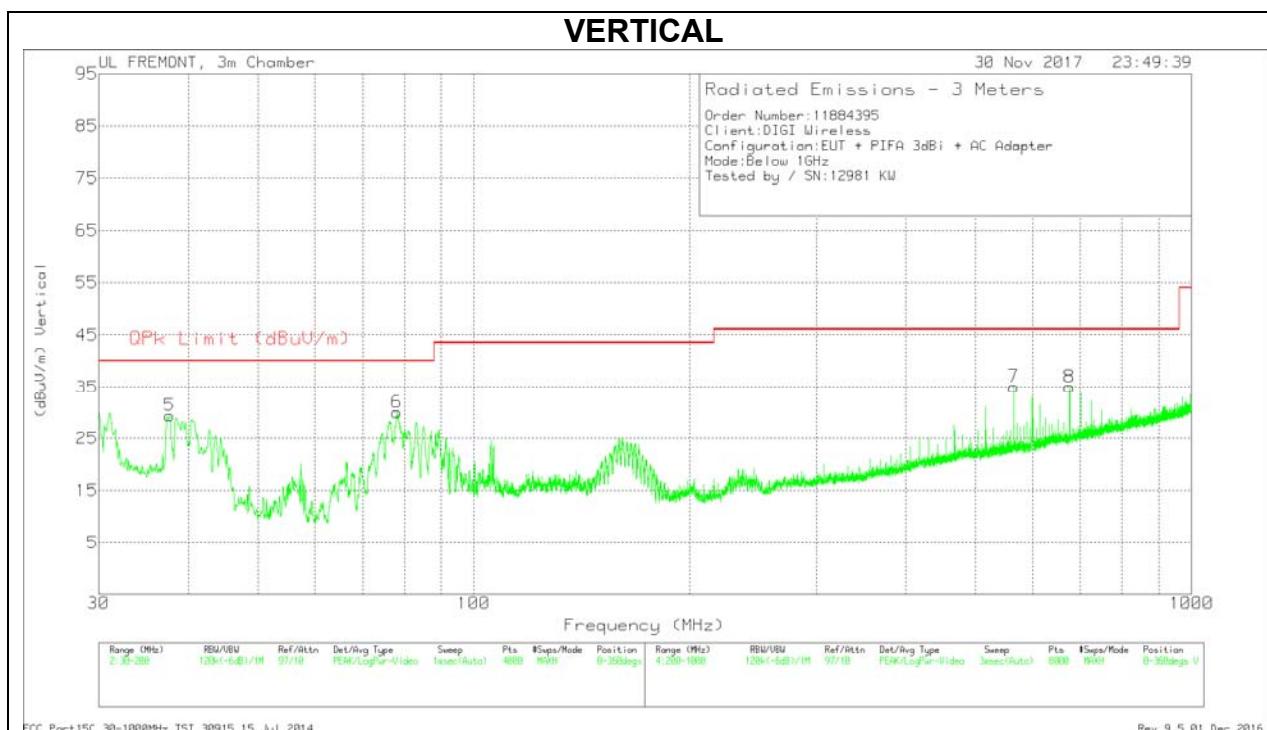
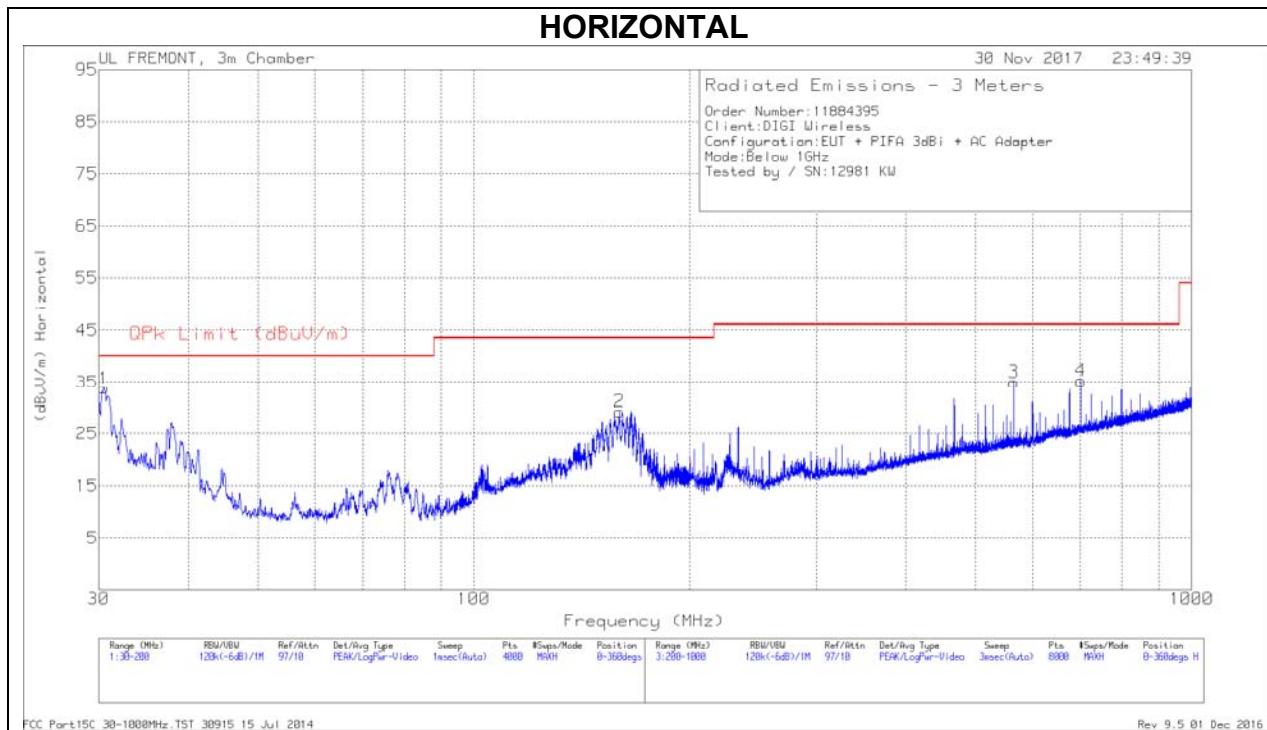
Pk - Peak detector

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	38.7573	36.34	Pk	18.9	-31	24.24	40	-15.76	0-360	100	V
1	62.776	47.42	Pk	11.7	-30.7	28.42	40	-11.58	0-360	100	H
6	92.3636	41.02	Pk	12.2	-30.4	22.82	43.52	-20.7	0-360	100	V
2	145.0348	41.32	Pk	16.8	-29.9	28.22	43.52	-15.3	0-360	300	H
7	145.0348	40.47	Pk	16.8	-29.9	27.37	43.52	-16.15	0-360	100	V
3	202.7004	40.12	Pk	16	-29.5	26.62	43.52	-16.9	0-360	100	H
8	565.2475	41.65	Pk	22.4	-27.5	36.55	46.02	-9.47	0-360	100	V
4	798.7778	36.91	Pk	25.1	-26.6	35.41	46.02	-10.61	0-360	100	H

Pk - Peak detector

8.2.3. WORST-CASE RADIATED EMISSIONS 30-1000 MHz

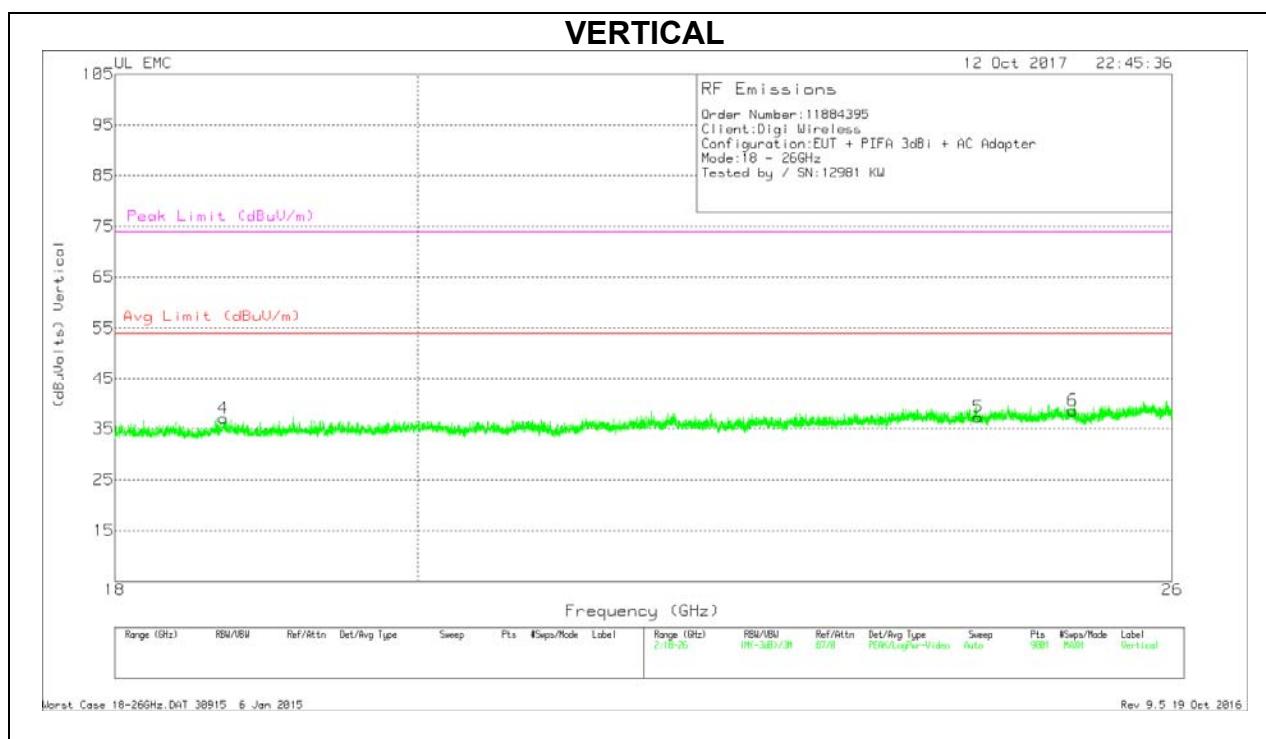
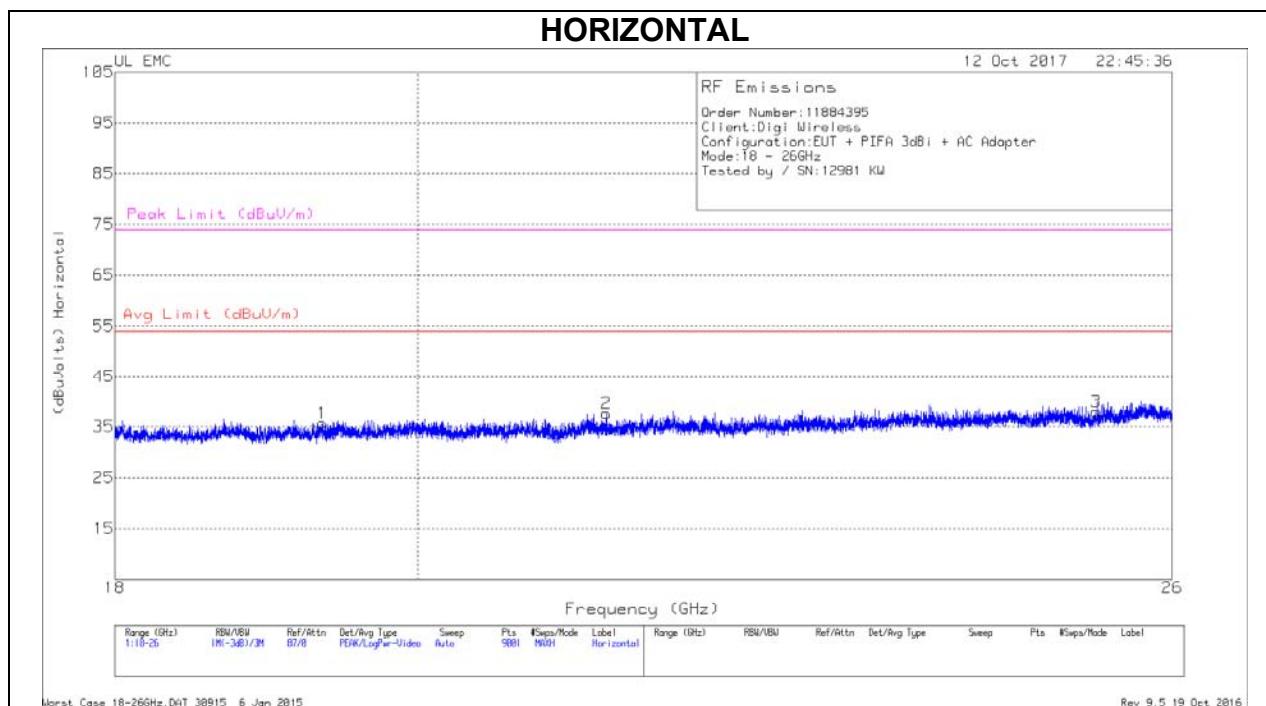


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.5101	39.76	Pk	25.1	-31.1	33.76	40	-6.24	0-360	100	H
5	37.6945	40.89	Pk	19.5	-31	29.39	40	-10.61	0-360	100	V
6	78.0799	48.8	Pk	11.7	-30.5	30	40	-10	0-360	100	V
2	159.5523	42.68	Pk	16.2	-29.7	29.18	43.52	-14.34	0-360	200	H
3	565.2475	39.84	Pk	22.6	-27.5	34.94	46.02	-11.08	0-360	200	H
7	565.2475	39.94	Pk	22.6	-27.5	35.04	46.02	-10.98	0-360	100	V
8	675.8619	38.39	Pk	23.8	-27.2	34.99	46.02	-11.03	0-360	100	V
4	700.4651	38.02	Pk	24.2	-27	35.22	46.02	-10.8	0-360	100	H

Pk - Peak detector

8.2.4. WORST-CASE RADIATED EMISSIONS 18-26 GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.348	37.51	Pk	32.4	-24.7	-9.5	35.71	54	-18.29	74	-38.29
2	21.356	39.57	Pk	33.1	-25.5	-9.5	37.67	54	-16.33	74	-36.33
3	25.319	38.56	Pk	33.6	-24.7	-9.5	37.96	54	-16.04	74	-36.04
4	18.692	38.35	Pk	32.5	-24.3	-9.5	37.05	54	-16.95	74	-36.95
5	24.303	37.47	Pk	33.6	-24.3	-9.5	37.27	54	-16.73	74	-36.73
6	25.117	38.78	Pk	33.9	-24.6	-9.5	38.58	54	-15.42	74	-35.42

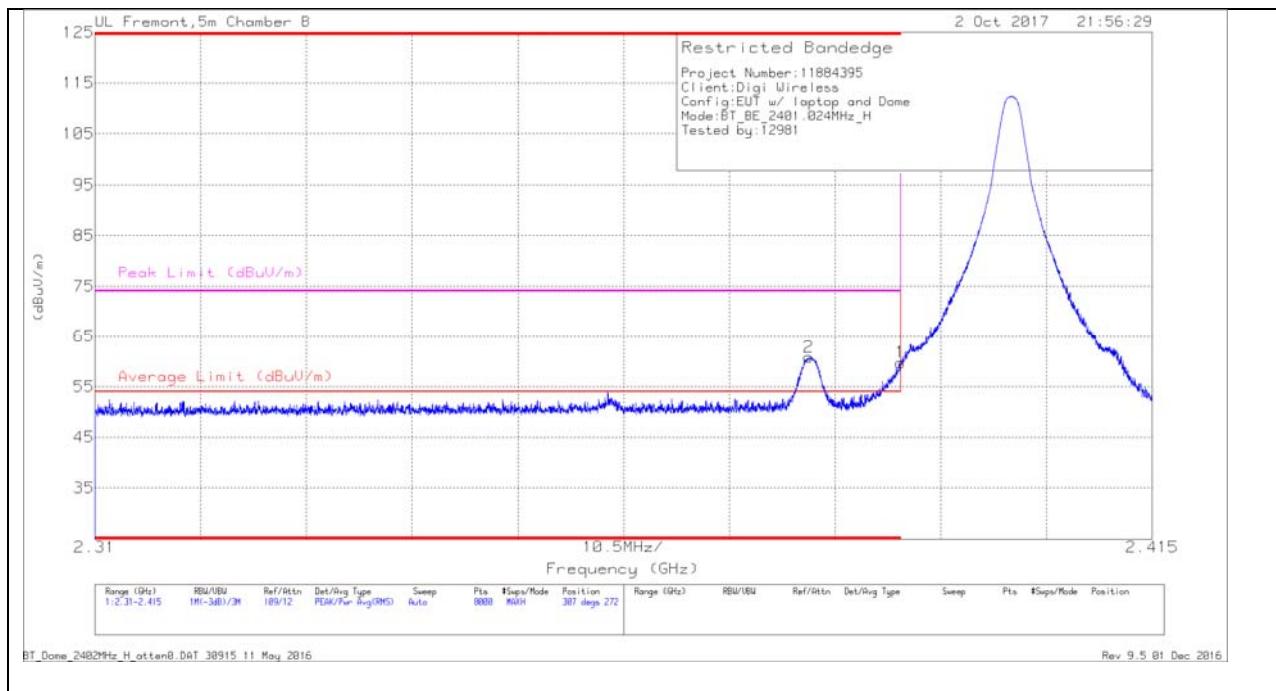
Pk - Peak detector

8.3. DOME MONOPOLE 7dBi ANTENNA

8.3.1. RADIATED EMISSIONS 1-18 GHz

RESTRICTED BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULTS



Note: the second signal (marker 2) is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (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	46.99	Pk	32	-19.2	59.79	-	-	74	-14.21	307	272	H
			Av			39.79	54	-14.21	-	-			
2	* 2.381	48.17	Pk	31.9	-19.2	60.87	54	-13.13	74	-13.13	307	272	H
			Av			40.87	-	-	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

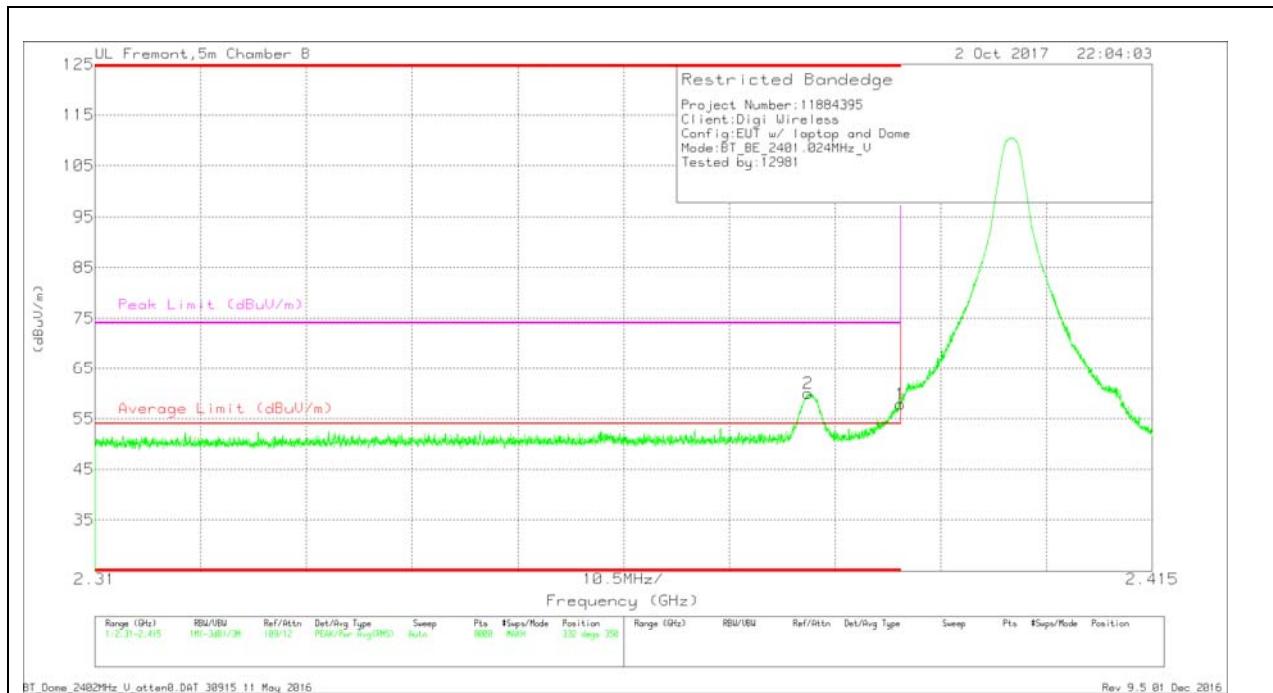
Av - Average detector

Duty Cycle Relaxation Factor = $20 \times \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

VERTICAL RESULTS



Note: the second signal (marker 2) is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBmV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBmV/m)	Average Limit (dBmV/m)	Margin (dB)	Peak Limit (dBmV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	45.09	Pk	32	-19.2	57.89	-	-	74	-16.11	332	350	V
			Av			37.89	54	-16.11	-	-			
2	* 2.381	47.28	Pk	31.9	-19.2	59.98	-	-	74	-14.02	332	350	V
			Av			39.98	54	-14.02	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detector

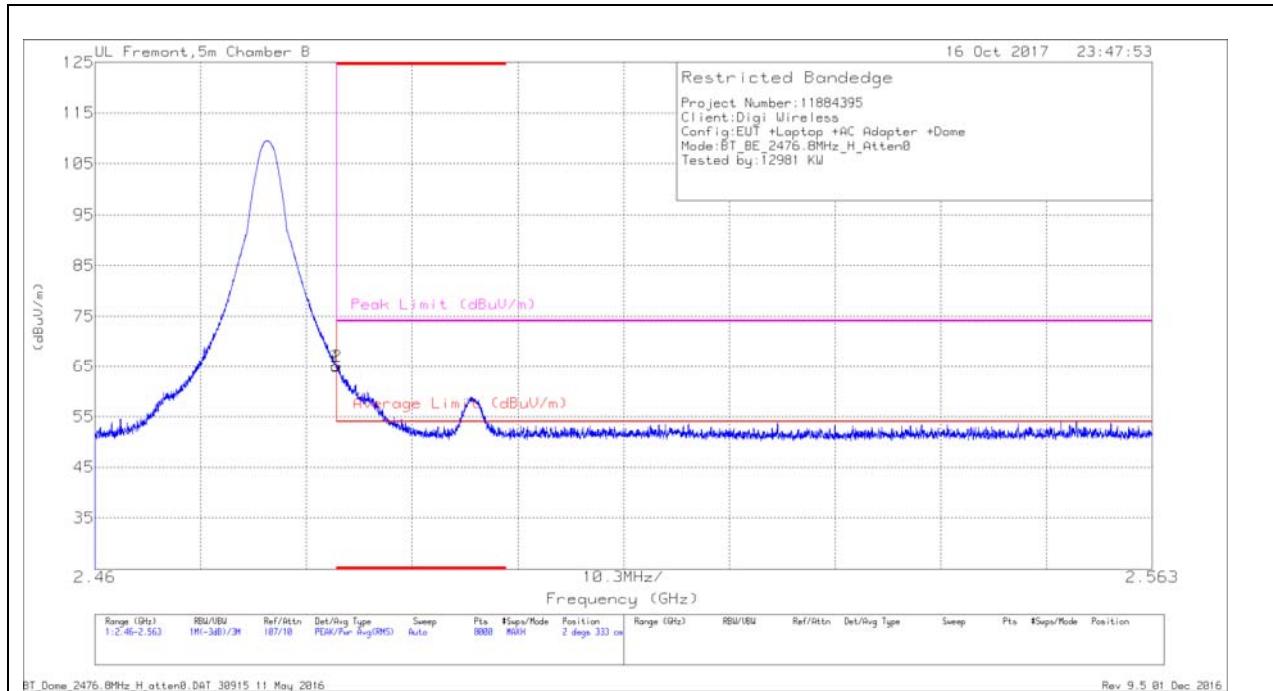
Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBmV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

RESTRICTED BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULTS



Note: the second signal is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T111 (dB/m)	Amp/Cbl/Fltr/Pad (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	53.22	Pk	32.5	-20.8	64.92	-	-	74	-9.08	2	333	H
			Av			44.92	54	-9.08	-	-			
2	* 2.484	53.41	Pk	32.5	-20.8	65.11	-	-	74	-8.89	2	333	H
			Av			45.11	54	-8.89	-	-			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

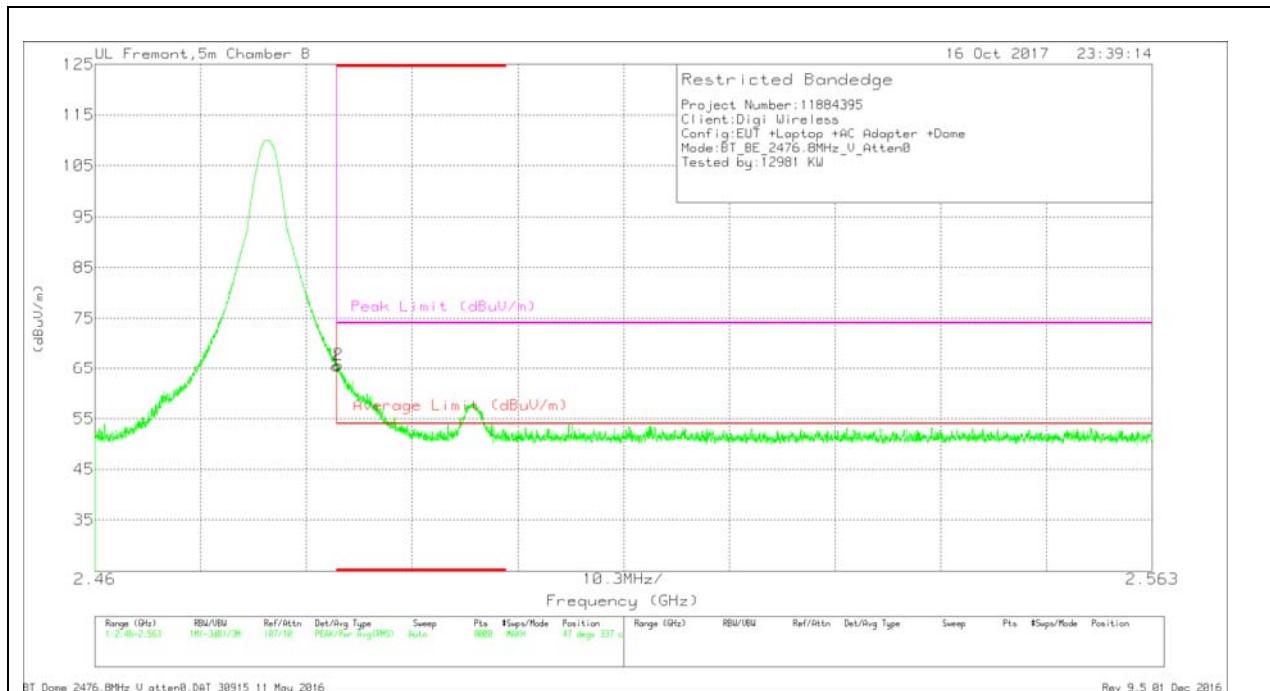
Av - Average detector

Duty Cycle Relaxation Factor = $20 \cdot \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

VERTICAL RESULTS



Note: the second signal is related to the fundamental and therefore as the peak value is below the peak limit the average value, after accounting for duty factor of > 20dB, will also be below the average limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cbl/Fltr/Pad (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	53.7	Pk	32.5	-20.8	65.4	-	-	74	-8.6	47	337	V
2	* 2.484	54.05	Pk	32.5	-20.8	65.75	54	-8.6	-	-	-	-	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Average detector

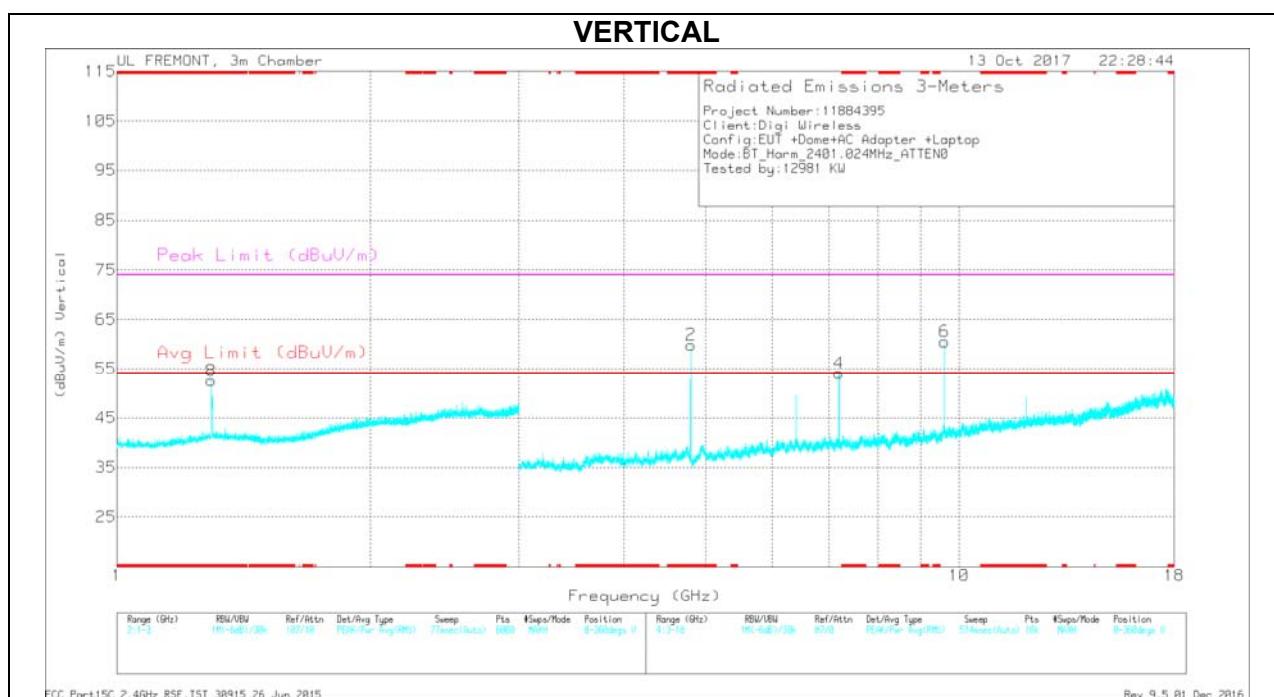
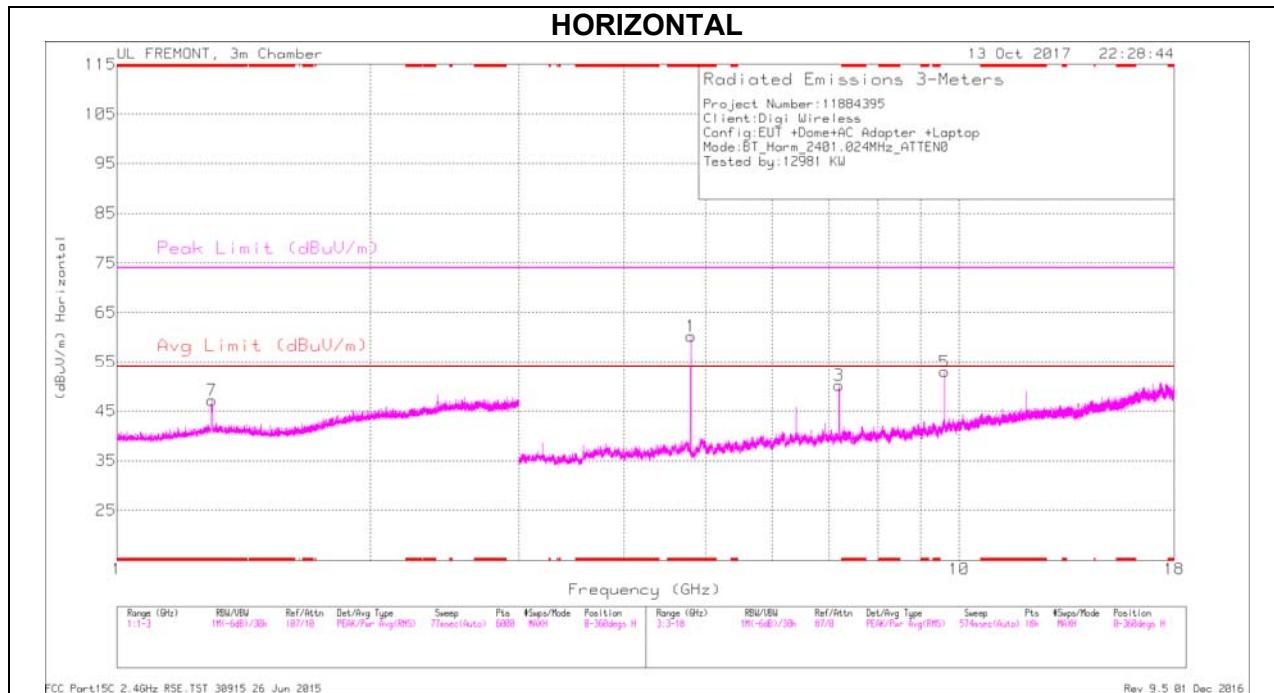
Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	* 1.297	40.59	Pk	29.1	-22.6	47.09	74	-26.91	0-360	100	H
8	* 1.294	46.09	Pk	29.1	-22.6	52.59	74	-21.41	0-360	200	V
1	* 4.802	54.52	Pk	34	-28.3	60.22	74	-13.78	0-360	200	H
2	* 4.802	54.18	Pk	34	-28.3	59.88	74	-14.12	0-360	200	V
3	7.203	39.28	Pk	35.6	-24.7	50.18	-	-	0-360	200	H
4	7.203	43.24	Pk	35.6	-24.7	54.14	-	-	0-360	100	V
5	9.604	38.49	Pk	36.7	-22.2	52.99	-	-	0-360	100	H
6	9.604	46.02	Pk	36.7	-22.2	60.52	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.296	46.56	PK	29.1	-22.6	0.24	53.3	74	-20.7	-	-	33	389	H
		Av				33.3	-	-	54	-20.7			
* 1.295	45.76	PK	29.1	-22.6	0.24	52.5	74	-21.5	-	-	179	342	V
		Av				32.5	-	-	54	-21.5			
* 4.802	58.55	PK	34	-28.3	0.38	64.63	74	-9.37	-	-	191	291	H
		Av				44.63	-	-	54	-9.37			
* 4.802	56.66	PK	34	-28.3	0.38	62.74	74	-11.26	-	-	188	248	V
		Av				42.74	-	-	54	-11.26			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

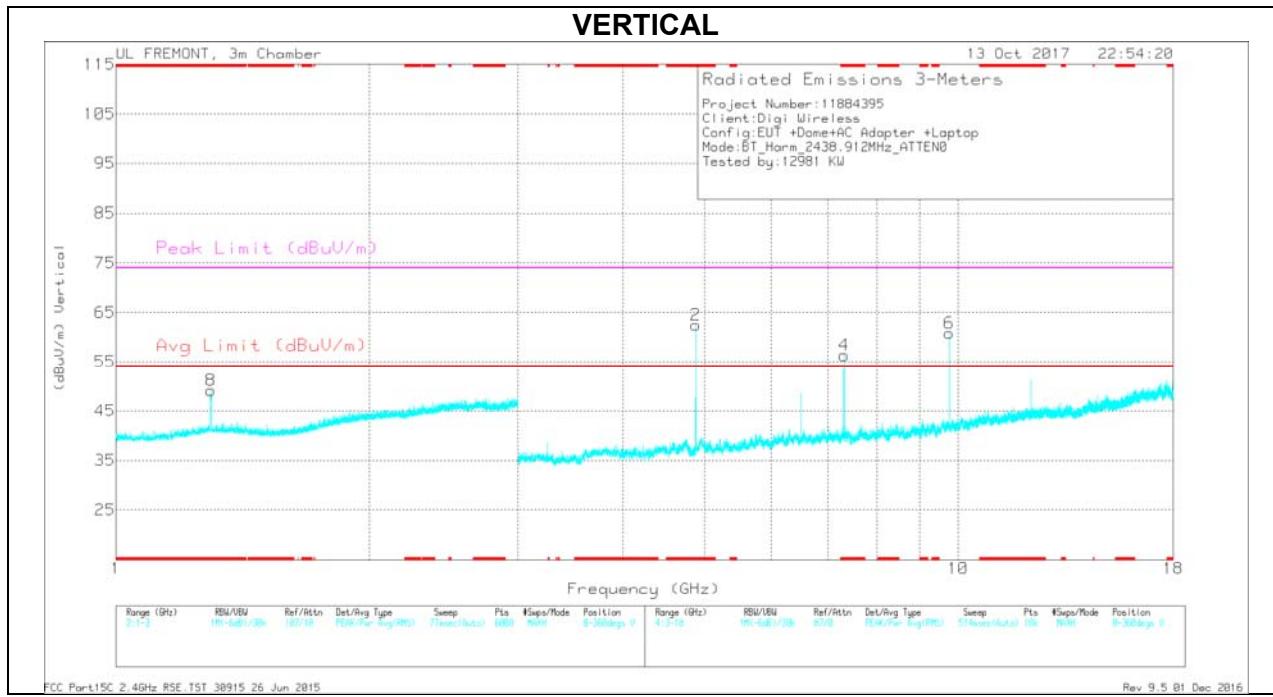
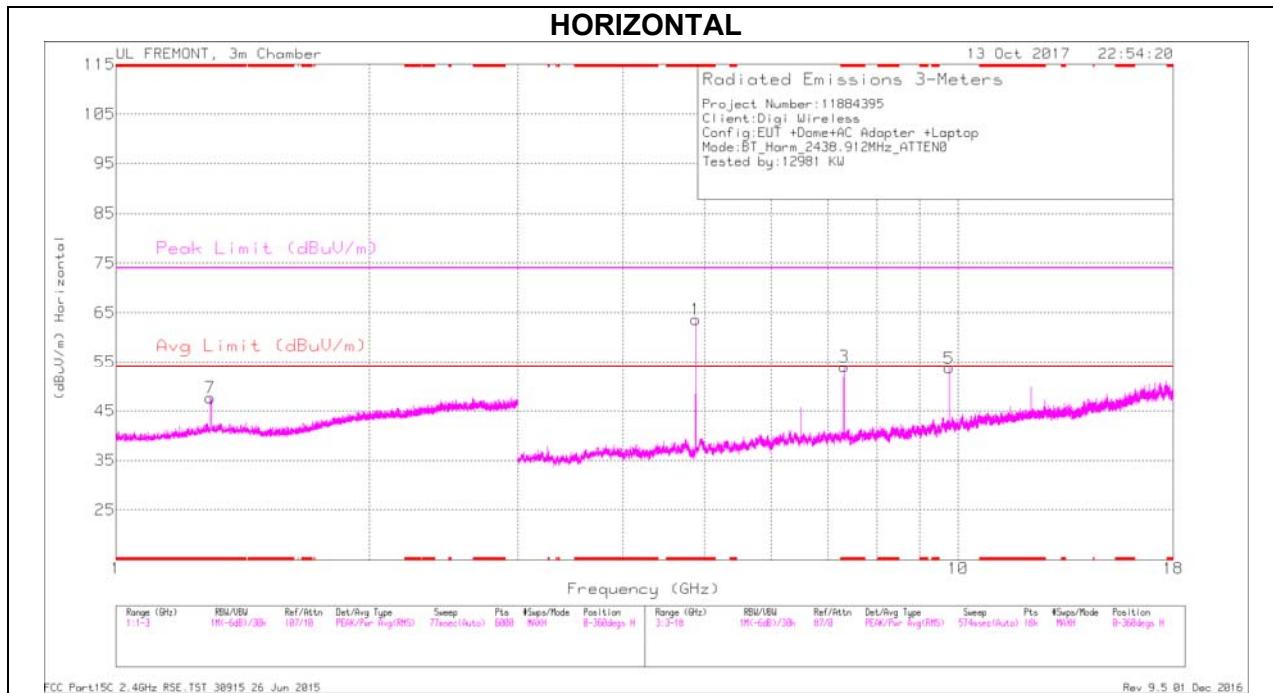
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

MID CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7	* 1.294	41.14	Pk	29.1	-22.6	47.64	74	-26.36	0-360	100	H
8	* 1.297	42.66	Pk	29.1	-22.6	49.16	74	-24.84	0-360	200	V
1	* 4.878	57.53	Pk	34	-27.9	63.63	74	-10.37	0-360	200	H
3	* 7.317	45.54	Pk	35.5	-27	54.04	74	-19.96	0-360	200	H
2	* 4.878	56.43	Pk	34	-27.9	62.53	74	-11.47	0-360	200	V
4	* 7.317	47.83	Pk	35.5	-27	56.33	74	-17.67	0-360	100	V
5	9.755	39.88	Pk	36.9	-23.1	53.68	-	-	0-360	100	H
6	9.755	46.98	Pk	36.9	-23.1	60.78	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.294	43.4	PK	29.1	-22.6	0.24	50.14	74	-23.86	-	-	52	263	H
		Av				30.14	-	-	54	-23.86			
* 1.297	48.48	PK	29.1	-22.6	0.24	55.22	74	-18.78	-	-	3	232	V
		Av				35.22	-	-	54	-18.78			
* 4.878	62.21	PK	34	-27.9	0.38	68.69	74	-5.31	-	-	193	266	H
		Av				48.69	-	-	54	-5.31			
* 4.878	61.22	PK	34	-27.9	0.38	67.7	74	-6.3	-	-	340	338	V
		Av				47.7	-	-	54	-6.3			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

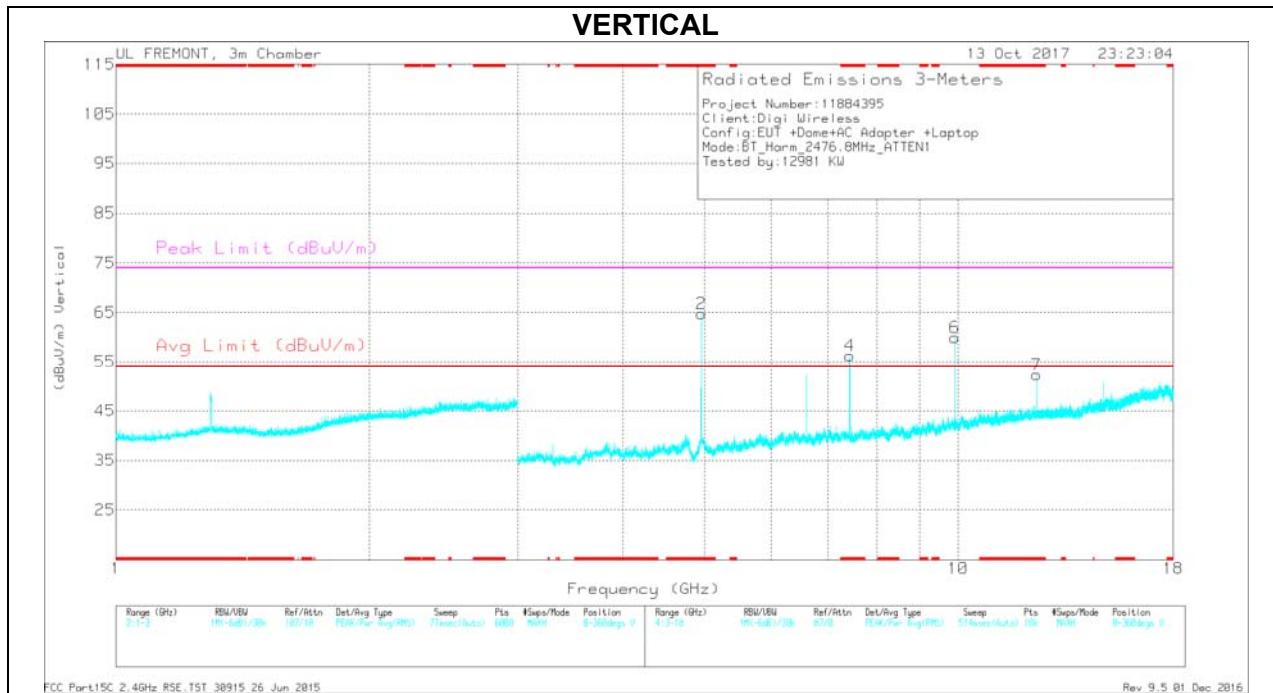
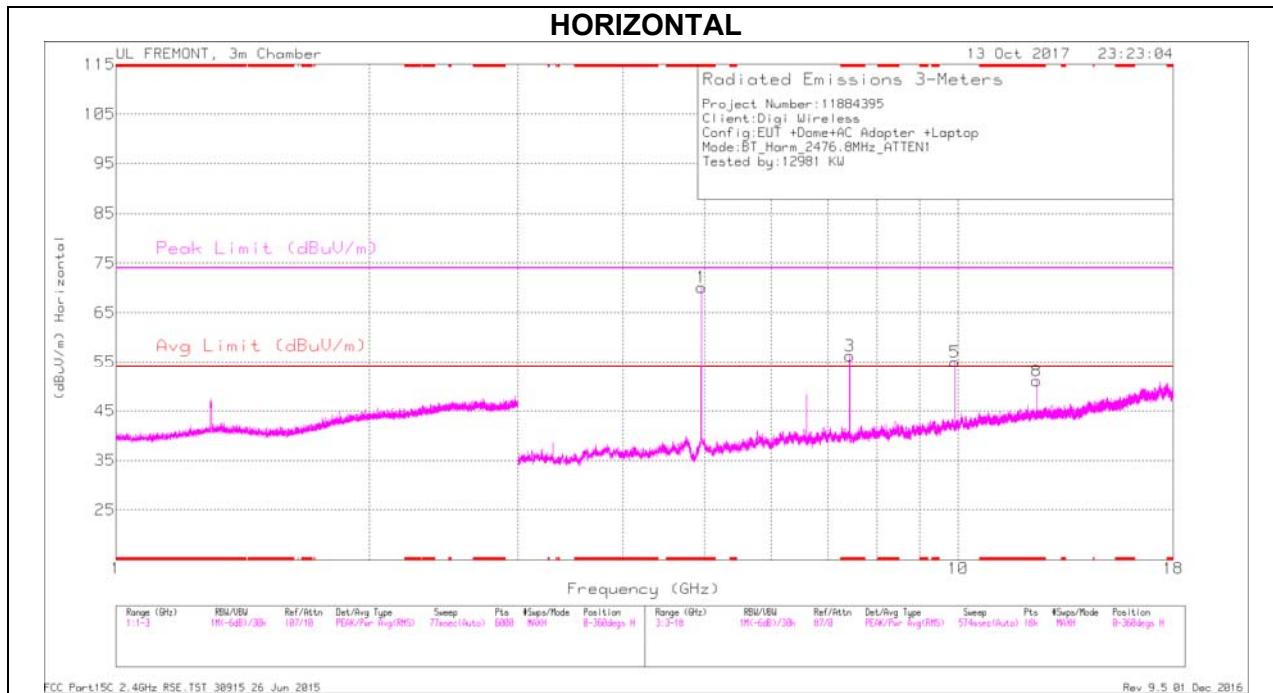
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

HIGH CHANNEL RESULTS



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.953	64.8	Pk	34.1	-28.8	70.1	74	-3.9	0-360	200	H
3	* 7.43	46.51	Pk	35.5	-25.7	56.31	74	-17.69	0-360	200	H
8	* 12.385	36	Pk	38.9	-23.8	51.1	74	-22.9	0-360	200	H
2	* 4.953	59.42	Pk	34.1	-28.8	64.72	74	-9.28	0-360	200	V
4	* 7.43	46.48	Pk	35.5	-25.7	56.28	74	-17.72	0-360	100	V
7	* 12.385	37.21	Pk	38.9	-23.8	52.31	74	-21.69	0-360	200	V
5	9.907	40.87	Pk	36.9	-22.8	54.97	-	-	0-360	200	H
6	9.907	45.89	Pk	36.9	-22.8	59.99	-	-	0-360	200	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Filter Loss (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.954	67.59	PK	34.1	-28.8	0.38	73.27	74	-0.73	-	-	201	285	H
		Av				53.27	-	-	54	-0.73			
* 7.43	50.85	PK	35.5	-25.7	0.29	60.94	74	-13.06	-	-	68	335	H
		Av				40.94	-	-	54	-13.06			
* 12.384	42.76	PK	38.9	-23.8	0.42	58.28	74	-15.72	-	-	32	371	H
		Av				38.28	-	-	54	-15.72			
* 4.954	63.65	PK	34.1	-28.8	0.38	69.33	74	-4.67	-	-	185	168	V
		Av				49.33	-	-	54	-4.67			
* 7.43	50.6	PK	35.5	-25.7	0.29	60.69	74	-13.31	-	-	45	356	V
		Av				40.69	-	-	54	-13.31			
* 12.384	44.16	PK	38.9	-23.8	0.42	59.68	74	-14.32	-	-	281	369	V
		Av				39.68	-	-	54	-14.32			

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - Peak detector

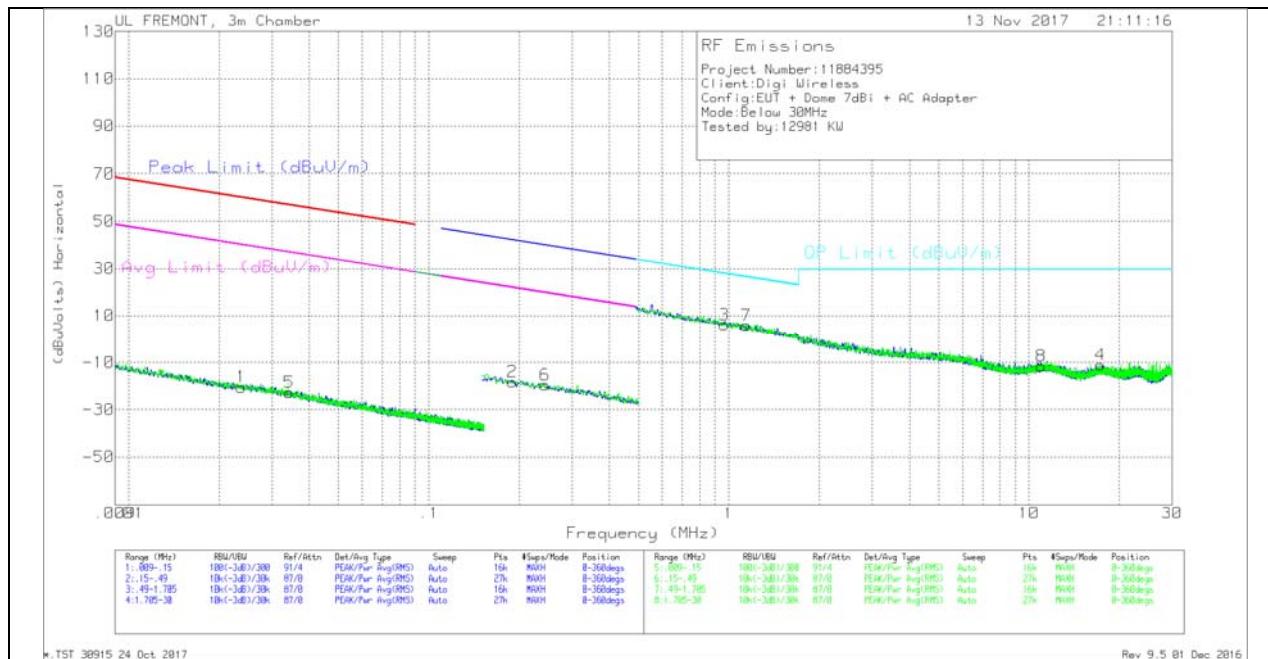
Av - Average detector

Duty Cycle Relaxation Factor = $20 * \log(0.03) = -30.46$ dB, which is less than -20dB. Therefore, a duty cycle relaxation factor of -20 dB would be allowable for this project as the worst case.

* Average Reading = Peak Reading (dBuV/m) -20dB

Note: Radiated peak result is based on 100% duty cycle sample; average reading = peak reading + DCCF

8.3.2. WORST-CASE RADIATED EMISSIONS 0.15-30 MHz



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	0.2369	43.12	Pk	15	1.4	-80	-20.48	60.09	-80.57	40.09	-60.57	-	-	-	-	0-360
5	0.3429	40.76	Pk	15.2	1.4	-80	-22.64	56.88	-79.52	36.88	-59.52	-	-	-	-	0-360
2	0.1892	46.44	Pk	13.9	1.5	-80	-18.16	-	-	-	-	42.05	-60.21	22.05	-40.21	0-360
6	0.24401	45.05	Pk	13.9	1.5	-80	-19.55	-	-	-	-	39.87	-59.42	19.87	-39.42	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	0.96576	30.5	Pk	14.2	1.5	-40	6.2	27.92	-21.72	0-360
7	1.14345	30.12	Pk	14.3	1.5	-40	5.92	26.46	-20.54	0-360
8	10.98661	12.09	Pk	14.7	1.6	-40	-11.61	29.5	-41.11	0-360
4	17.2919	12.73	Pk	14.5	1.6	-40	-11.17	29.5	-40.67	0-360

Pk - Peak detector

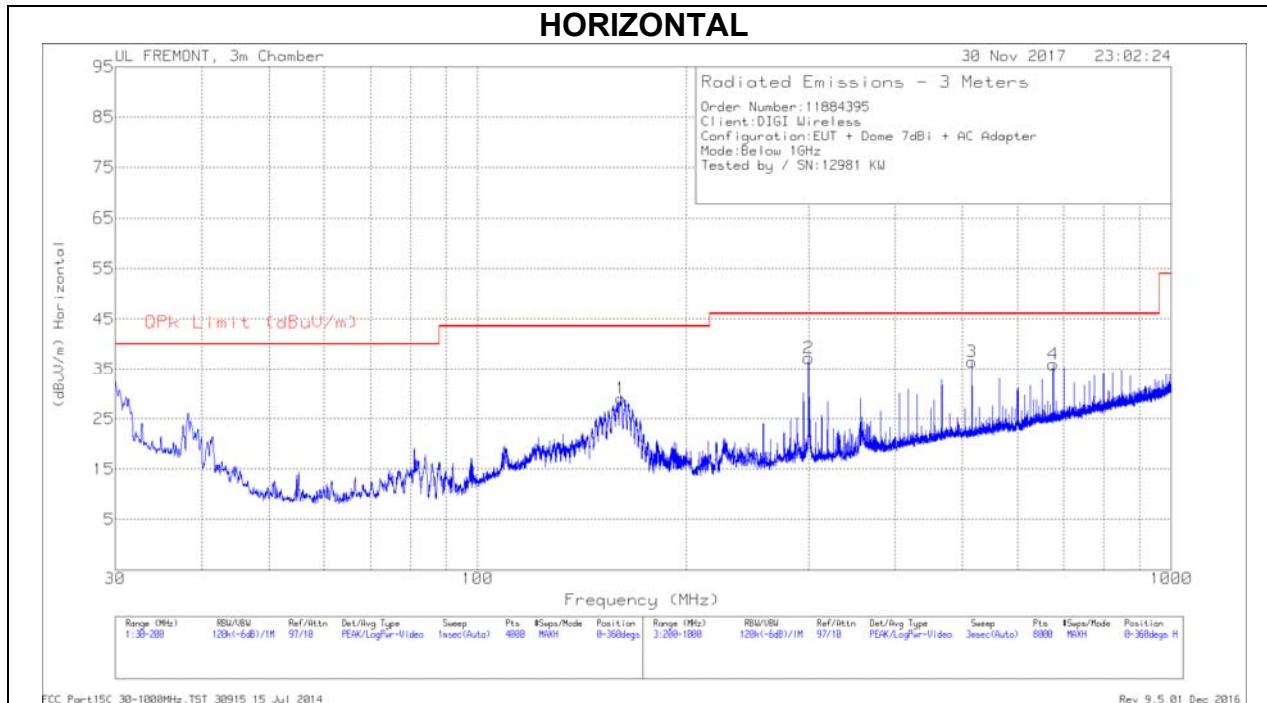
Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	38.7573	36.34	Pk	18.9	-31	24.24	40	-15.76	0-360	100	V
1	62.776	47.42	Pk	11.7	-30.7	28.42	40	-11.58	0-360	100	H
6	92.3636	41.02	Pk	12.2	-30.4	22.82	43.52	-20.7	0-360	100	V
2	145.0348	41.32	Pk	16.8	-29.9	28.22	43.52	-15.3	0-360	300	H
7	145.0348	40.47	Pk	16.8	-29.9	27.37	43.52	-16.15	0-360	100	V
3	202.7004	40.12	Pk	16	-29.5	26.62	43.52	-16.9	0-360	100	H
8	565.2475	41.65	Pk	22.4	-27.5	36.55	46.02	-9.47	0-360	100	V
4	798.7778	36.91	Pk	25.1	-26.6	35.41	46.02	-10.61	0-360	100	H

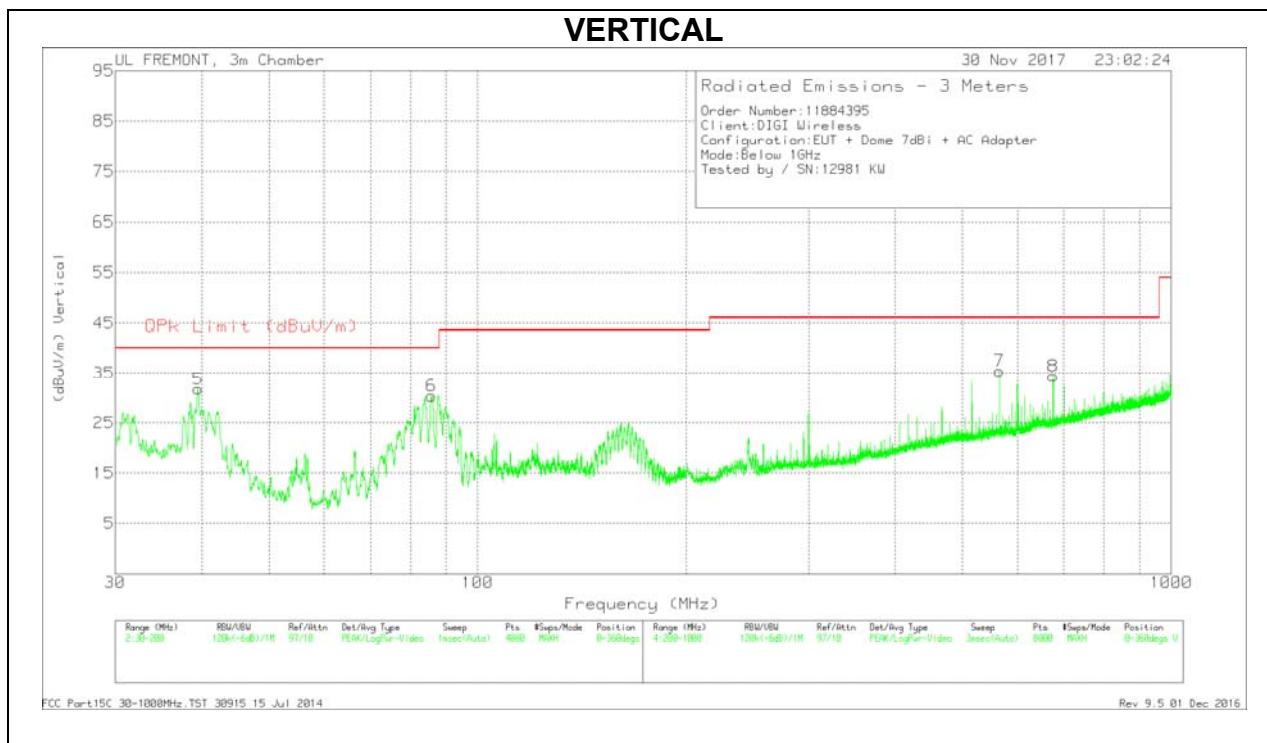
Pk - Peak detector

8.3.3. WORST-CASE RADIATED EMISSIONS 30-1000 MHz

HORIZONTAL



VERTICAL

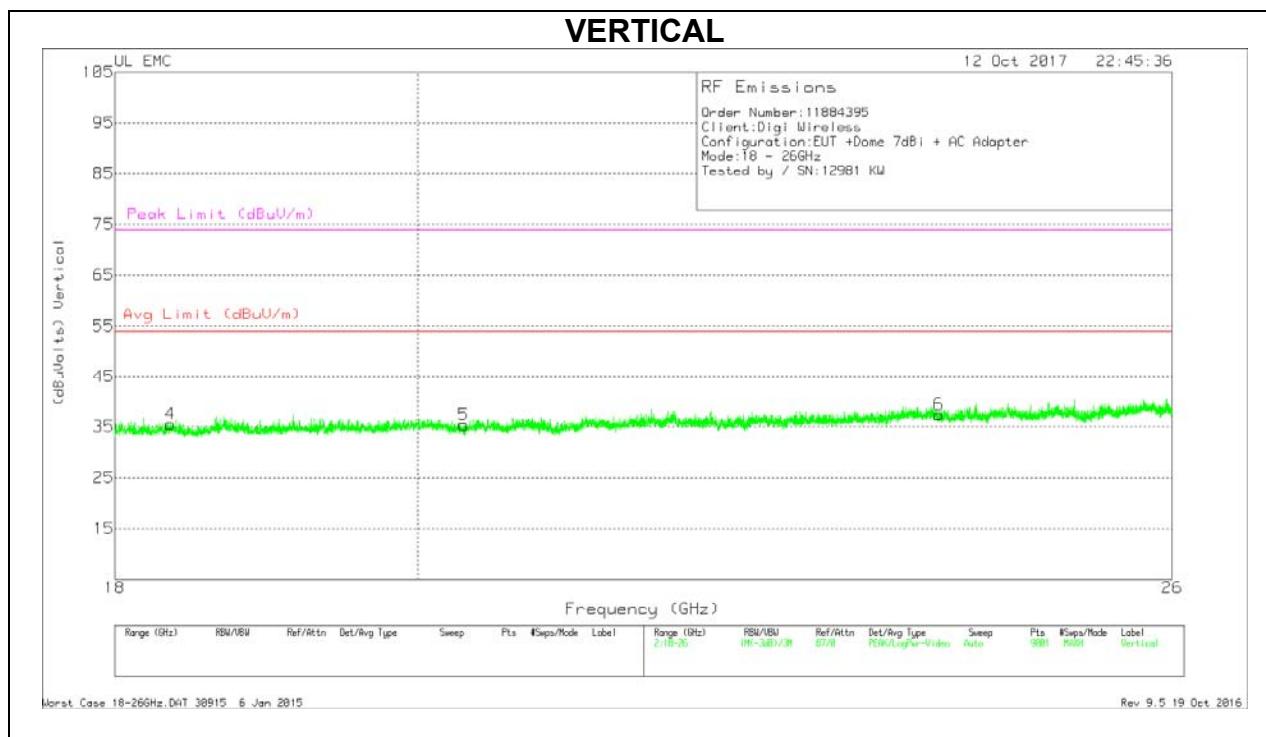
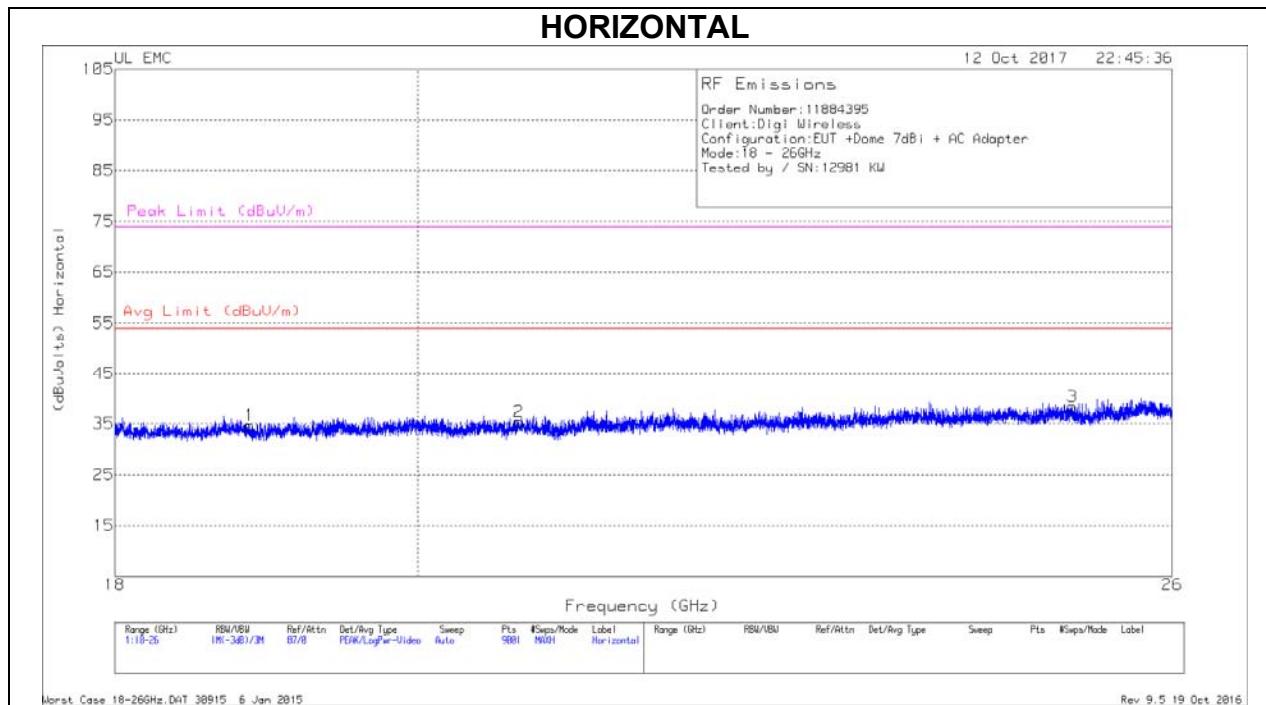


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	39.5225	44.45	Pk	18.2	-30.9	31.75	40	-8.25	0-360	100	V
6	85.8169	49.45	Pk	11.3	-30.4	30.35	40	-9.65	0-360	100	V
1	160.7638	42.54	Pk	16.2	-29.7	29.04	43.52	-14.48	0-360	200	H
2	300.013	48.52	Pk	17.4	-28.7	37.22	46.02	-8.8	0-360	100	H
3	516.1411	42.27	Pk	21.7	-27.5	36.47	46.02	-9.55	0-360	200	H
7	565.2475	40.33	Pk	22.6	-27.5	35.43	46.02	-10.59	0-360	100	V
4	675.8619	39.38	Pk	23.8	-27.2	35.98	46.02	-10.04	0-360	100	H
8	675.8619	37.77	Pk	23.8	-27.2	34.37	46.02	-11.65	0-360	100	V

Pk - Peak detector

8.3.4. WORST-CASE RADIATED EMISSIONS 18-26 GHz



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.864	36.93	Pk	32.4	-25.2	-9.5	34.63	54	-19.37	74	-39.37
2	20.713	37.24	Pk	32.8	-25.2	-9.5	35.34	54	-18.66	74	-38.66
3	25.113	38.48	Pk	33.9	-24.5	-9.5	38.38	54	-15.62	74	-35.62
4	18.35	37.79	Pk	32.4	-25.2	-9.5	35.49	54	-18.51	74	-38.51
5	20.323	37.67	Pk	32.6	-25.4	-9.5	35.37	54	-18.63	74	-38.63
6	23.973	37.79	Pk	33.3	-24.2	-9.5	37.39	54	-16.61	74	-36.61

Pk - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	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

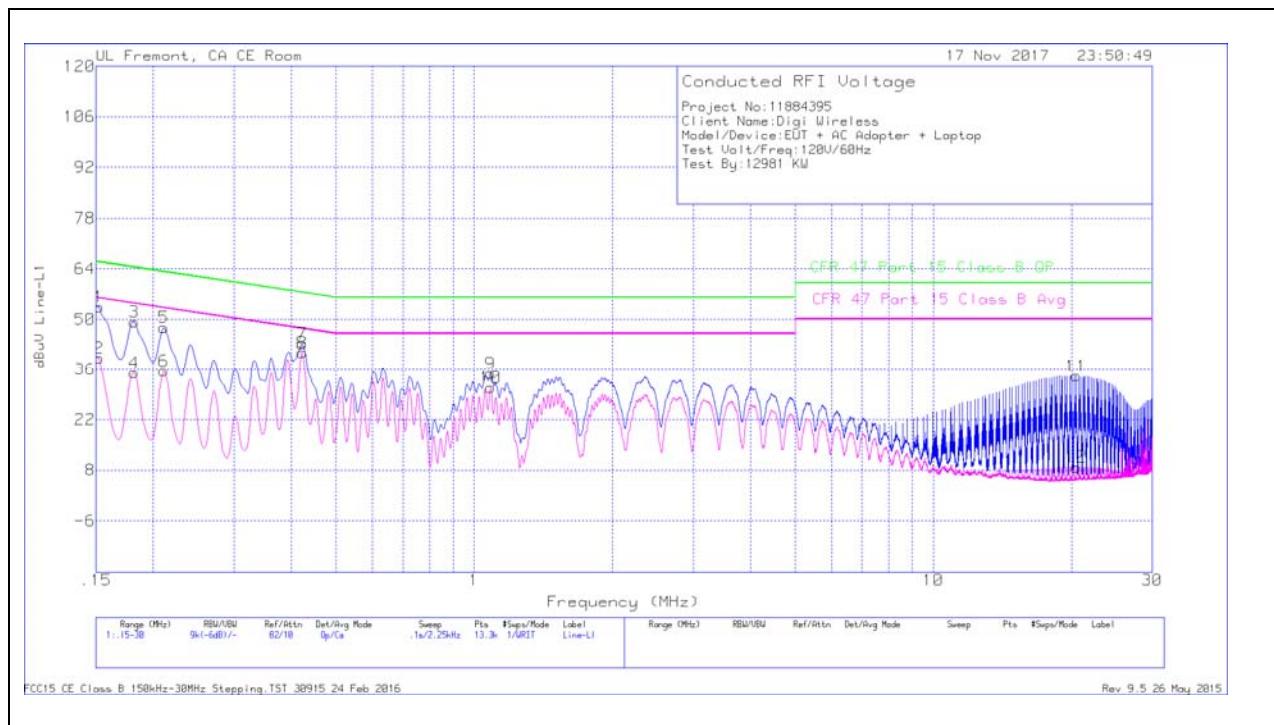
The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

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

RESULTS

LINE 1 RESULTS



WORST EMISSIONS

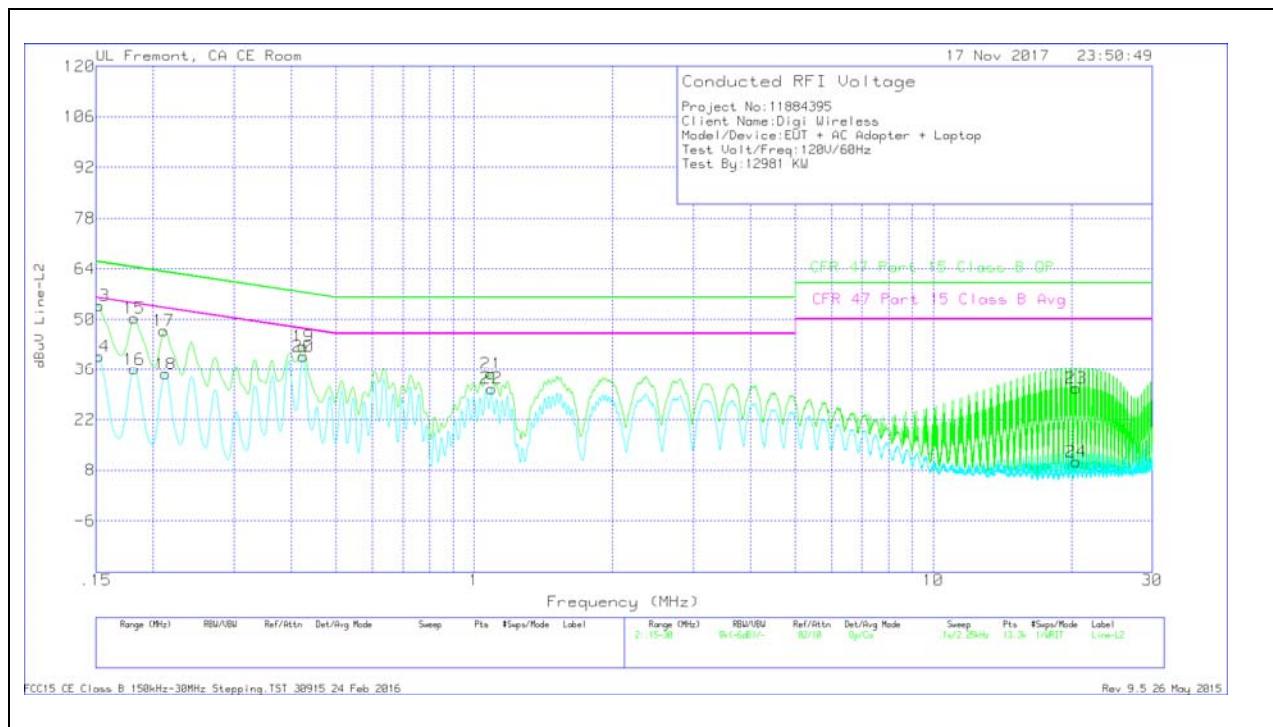
Trace Markers

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.15225	43.22	Qp	.1	0	10.1	53.42	65.88	-12.46	-	-
2	.15225	29.03	Ca	.1	0	10.1	39.23	-	-	55.88	-16.65
3	.1815	39.16	Qp	0	0	10.1	49.26	64.42	-15.16	-	-
4	.1815	24.94	Ca	0	0	10.1	35.04	-	-	54.42	-19.38
5	.21075	37.58	Qp	0	0	10.1	47.68	63.18	-15.5	-	-
6	.21075	25.41	Ca	0	0	10.1	35.51	-	-	53.18	-17.67
7	.42225	33.1	Qp	0	0	10.1	43.2	57.4	-14.2	-	-
8	.42225	30.64	Ca	0	0	10.1	40.74	-	-	47.4	-6.66
9	1.08375	24.67	Qp	0	.1	10.1	34.87	56	-21.13	-	-
10	1.08375	20.65	Ca	0	.1	10.1	30.85	-	-	46	-15.15
11	20.48325	23.31	Qp	.1	.3	10.4	34.11	60	-25.89	-	-
12	20.48325	-1.91	Ca	.1	.3	10.4	8.89	-	-	50	-41.11

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

Trace Markers

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBm)	Det	LISN L2	LC Cables C2&C3	Limiter (dB)	Corrected Reading dBm	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
13	.15225	43.71	Qp	0	0	10.1	53.81	65.88	-12.07	-	-
14	.15225	29.72	Ca	0	0	10.1	39.82	-	-	55.88	-16.06
15	.1815	40.25	Qp	0	0	10.1	50.35	64.42	-14.07	-	-
16	.1815	26.01	Ca	0	0	10.1	36.11	-	-	54.42	-18.31
17	.21075	36.75	Qp	0	0	10.1	46.85	63.18	-16.33	-	-
18	.213	24.64	Ca	0	0	10.1	34.74	-	-	53.09	-18.35
19	.4245	32.39	Qp	0	0	10.1	42.49	57.36	-14.87	-	-
20	.4245	29.58	Ca	0	0	10.1	39.68	-	-	47.36	-7.68
21	1.08825	24.59	Qp	0	.1	10.1	34.79	56	-21.21	-	-
22	1.0905	20.42	Ca	0	.1	10.1	30.62	-	-	46	-15.38
23	20.48325	20.01	Qp	0	.3	10.4	30.71	60	-29.29	-	-
24	20.48325	-.34	Ca	0	.3	10.4	10.36	-	-	50	-39.64

Qp - Quasi-Peak detector

Ca - CISPR average detection