FCC 47 CFR PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Syringe Module with BT LE Transceiver

MODEL NUMBER: 6117

FCC ID: 2AHUPSS

REPORT NUMBER: 11162668B

ISSUE DATE: August 2, 2016

Prepared for
OSPREY MEDICAL INC
5600 ROWLAND ROAD, SUITE 250
MINNETONKA, MN 55343
USA

Prepared by
UL LLC
333 Pfingsten Rd.
Northbrook, IL 60062
TEL: (847) 272-8800

NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	August 2, 2016	Initial Issue	BM

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Osprey Medical Inc.
5600 Rowland Road, Suite 250
Minnetonka, MN 55343

EUT DESCRIPTION: Syringe with BTLE transceiver.

MODEL: 6117

SERIAL NUMBER: non-serilized

DATE TESTED: March 2016 to August 2016

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

UL LLC 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 LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC 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 LLC By:

Michael Ferrer
Program Manager
UL LLC

Tested By:

Bart Mucha
Staff Engineer
UL LLC

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 333 Pfingsten Road, Northbrook, IL 60062 USA.

UL NBK is accredited by NVLAP, Laboratory Code 100414-0. The full scope of accreditation can be viewed at http://ts.nist.gov

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

Sample Calculations
Radiated Field Strength and Conducted Emissions data contained within this report is calculated on the following basis:
Field Strength (dBuV/m) = Meter Reading (dBuV) + AF (dB/m) - Gain (dB) + Cable Loss (dB)
Conducted Voltage (dBuV) = Meter Reading (dBuV) + Cable Loss (dB) + LISN IL (dB)
Conducted Current (dBuA) = Meter Reading (dBuV) + Cable Loss (dB) - Transducer Factor (dBohms)

4.3. MEASUREMENT UNCERTAINTY

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

Test	Range	Equipment	Uncertainty k=2
Radiated Emissions	30-200MHz	Bicon 10m Horz	4.27dB
Radiated Emissions	30-200MHz	Bicon 10m Vert	4.28dB
Radiated Emissions	200-1000MHz	LogP 10m Horz	3.33dB
Radiated Emissions	200-1000MHz	LogP 10m Vert	3.39dB
Radiated Emissions	30-200MHz	Bicon 3m Horz	3.30dB
Radiated Emissions	30-130MHz	Bicon 3m Vert	4.84dB
Radiated Emissions	130-200MHz	Bicon 3m Vert	4.94dB
Radiated Emissions	200-1000MHz	LogP 3m Horz	3.46dB
Radiated Emissions	200-1000MHz	LogP 3m Vert	4.98dB
Radiated Emissions	1-6GHz	Horn	5.02dB
Radiated Emissions	6-18GHz	Horn	5.34dB
Radiated Emissions	18-26GHz	Horn	6.60dB
Conducted Ant Port	30MHz-26GHz	Spectrum Analyzer	2.94

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a BTLE transceiver used in a syringe device.

5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:

Frequency Range (MHz)	Mode	Output Power Peak E-field Strength (dBuV/m)
2402-2480	BT LE (syringe)	87.77

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna is incorporated into the circuit board.

5.4. SOFTWARE AND FIRMWARE

The PC software utility was Texas Instruments (TI) HCI Tester ver 2.3.5.0 in the TI Bluetooth Tools 5.2.0 utility pack running on a Windows 10 laptop.

The firmware and BLE stack was TI ver. 1.4.0 set in “Production Test Mode” to create a worst case transmission scenario (see Section 5.5).

5.5. WORST-CASE CONFIGURATION AND MODE

For syringe it was determined that worst case was when EUT was oriented in Z - Axis

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

None

I/O CABLES

None

TEST SETUP

The EUT is standalone device powered by a single AAAA battery.

SETUP DIAGRAM FOR TESTS

6. TEST AND MEASUREMENT EQUIPMENT

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

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20160102	20170131
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20151118	20161118
Bicon Antenna	Chase	VBA6106A	EMC4078	20151228	20161231
Log-P Antenna	Chase	UPA6109	EMC4313	20160122	20170131
Antenna Array	UL	BOMS	EMC4276	20151115	20161115
Spectrum Analyzer	Agilent	N9030A (PXA)	EMC4360	20160108	20170131

7. TEST RESULTS FOR SYRINGE

7.1.1. 99% BANDWIDTH and 20dB Bandwidth

LIMITS

None; for reporting purposes only.

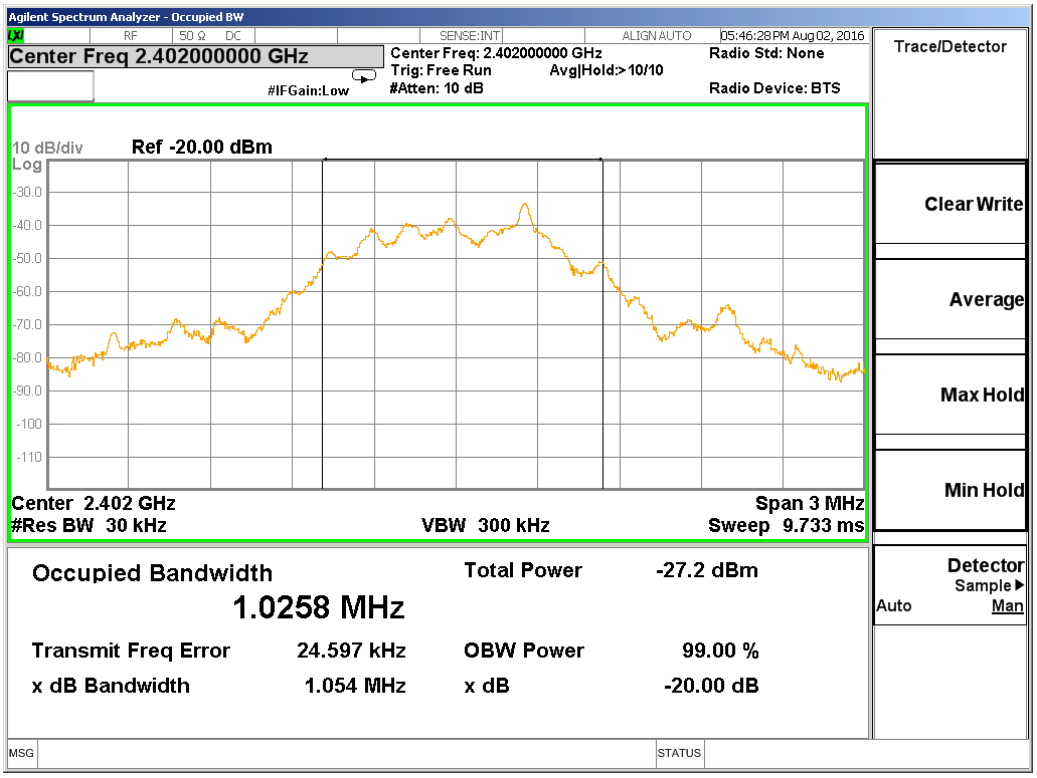
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

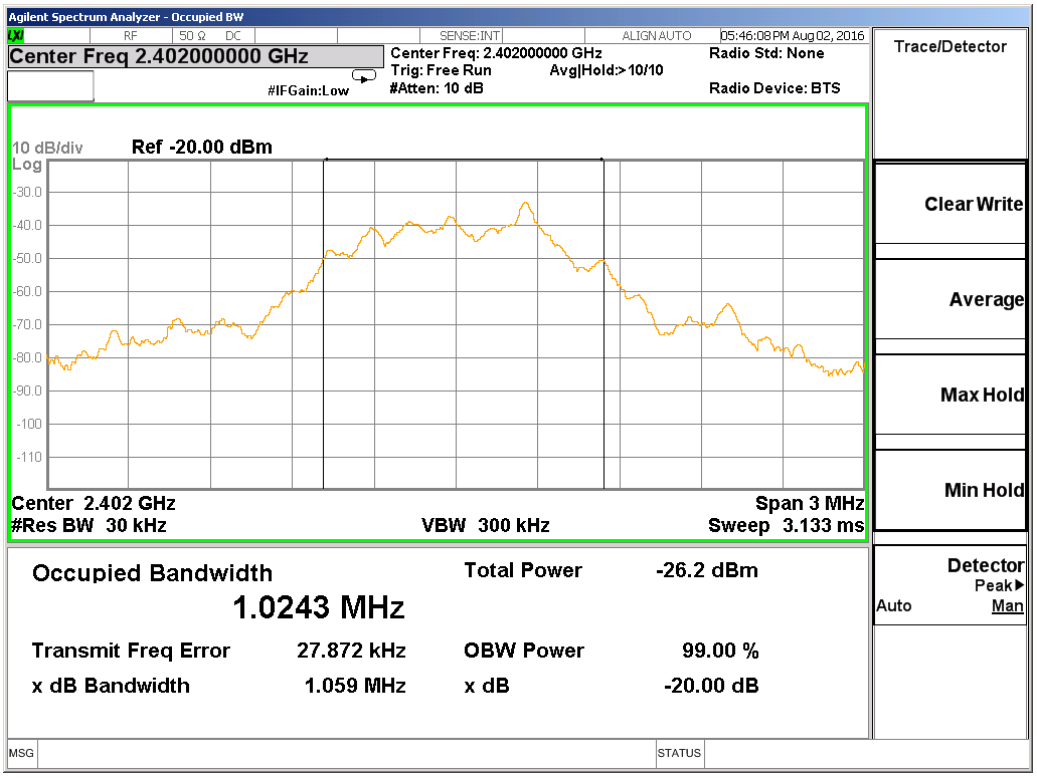
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)	20dB Bandwidth (MHz)
Low	2402	1.026	1.059
Middle	2440	1.025	1.064
High	2480	1.025	1.062

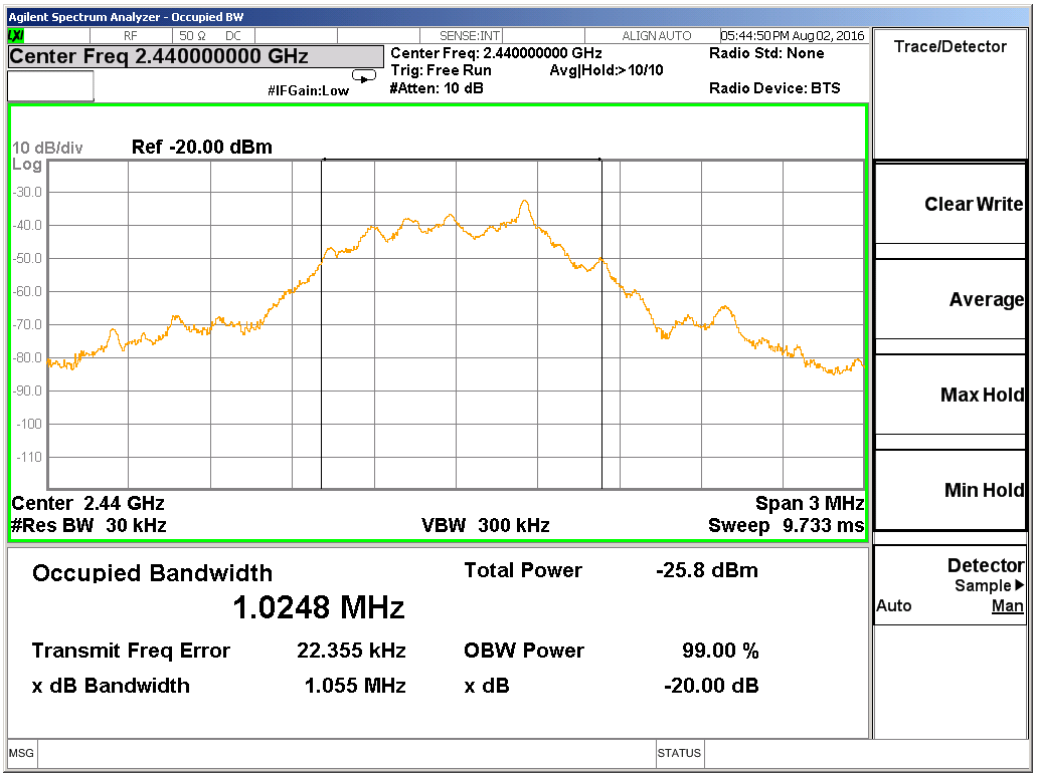
Low Channel 99% BANDWIDTH



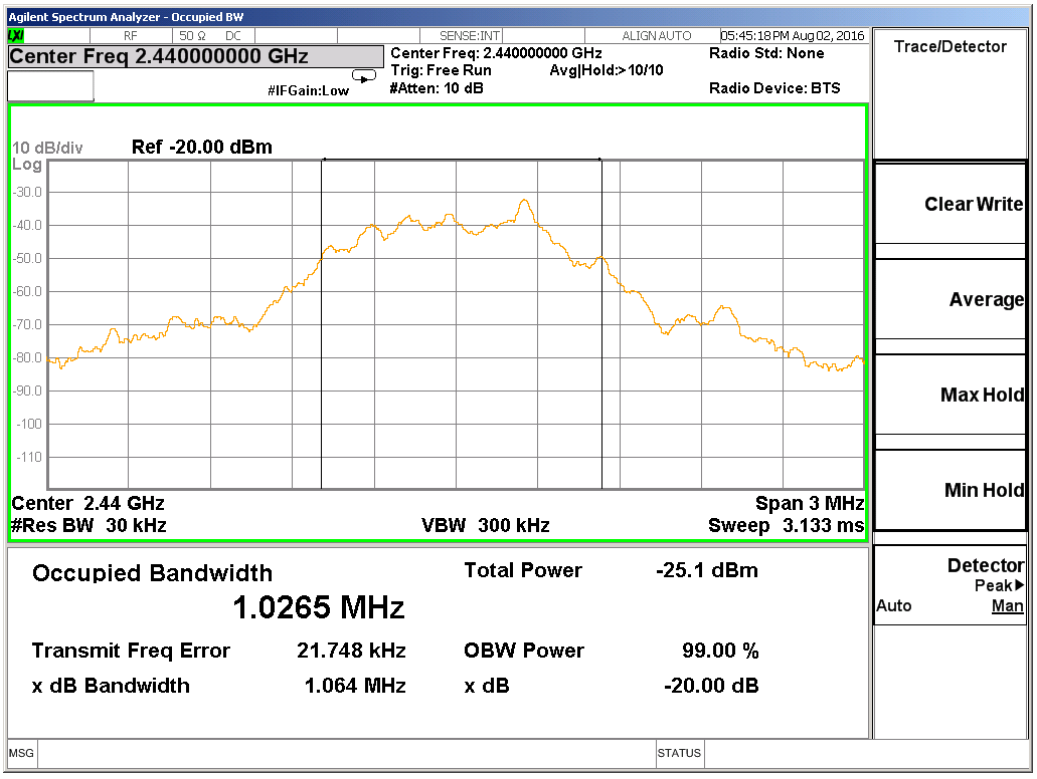
Low Channel 20dB Bandwidth



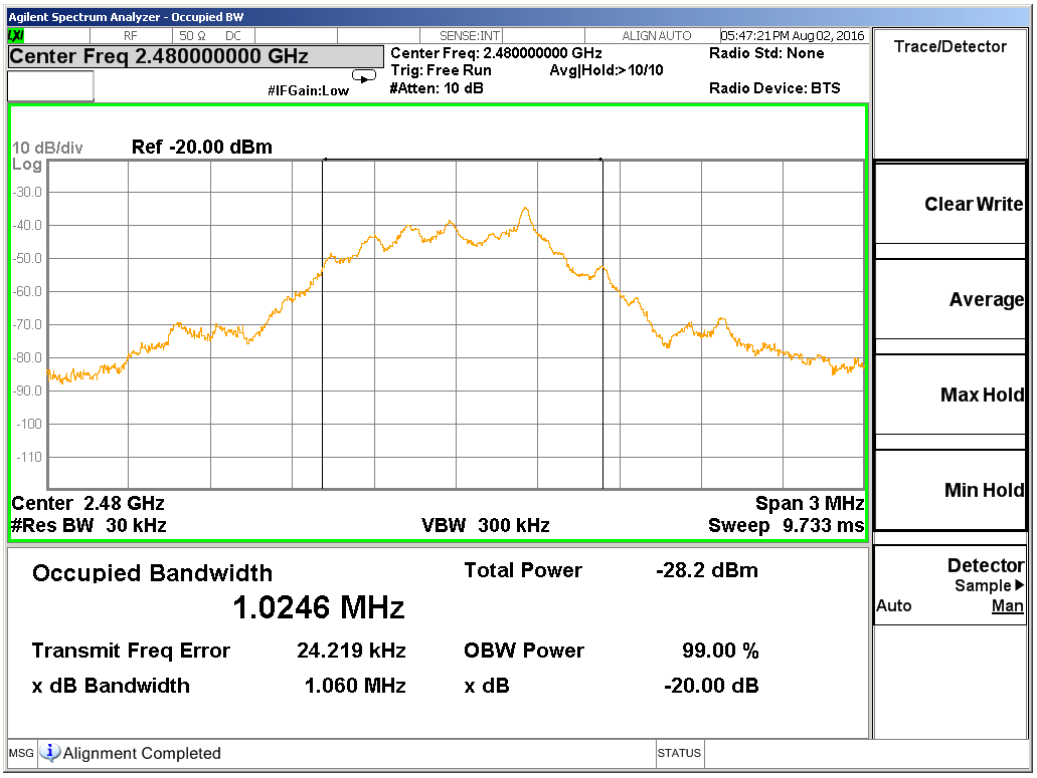
Middle Channel 99% BANDWIDTH



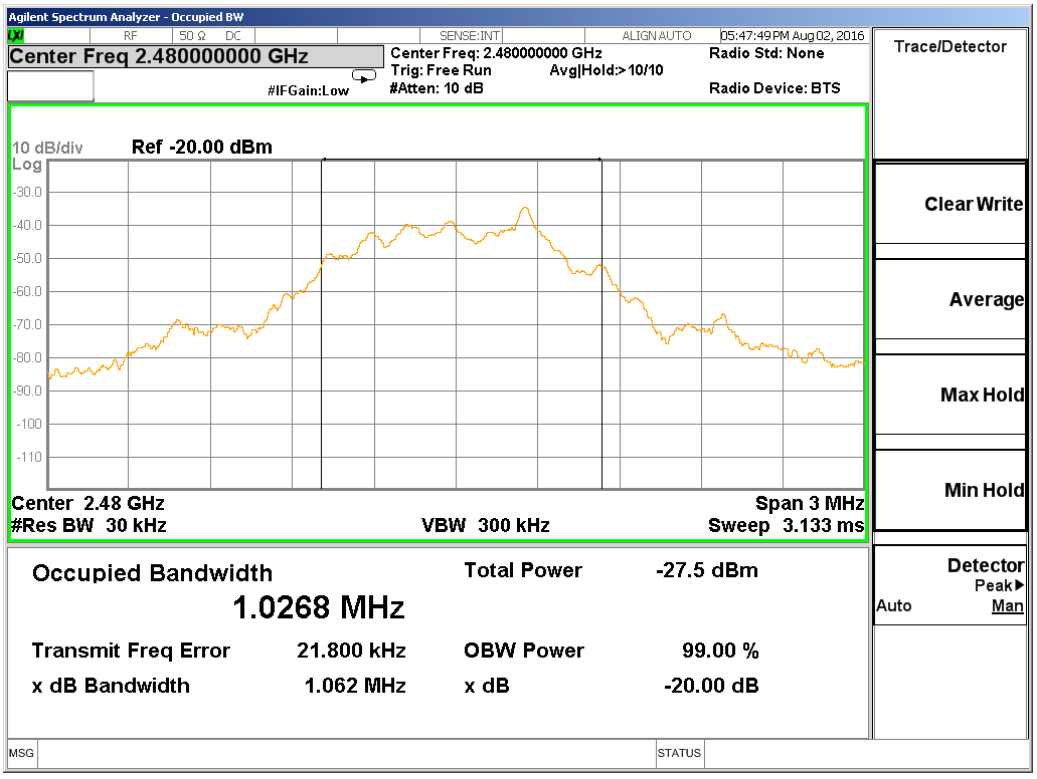
Middle Channel 20dB Bandwidth



High Channel 99% BANDWIDTH



High Channel 20dB Bandwidth



7.2. RADIATED EMISSIONS

MEASUREMENT METHODS

Since there is no specific measurement guidance defined for the below referenced standards therefore measurements were conducted per FCC KDB: 558074 D01 DTS Meas Guidance v03r04, Power RMS with trace averaging and duty cycle correction.

LIMIT

FCC 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz.
(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

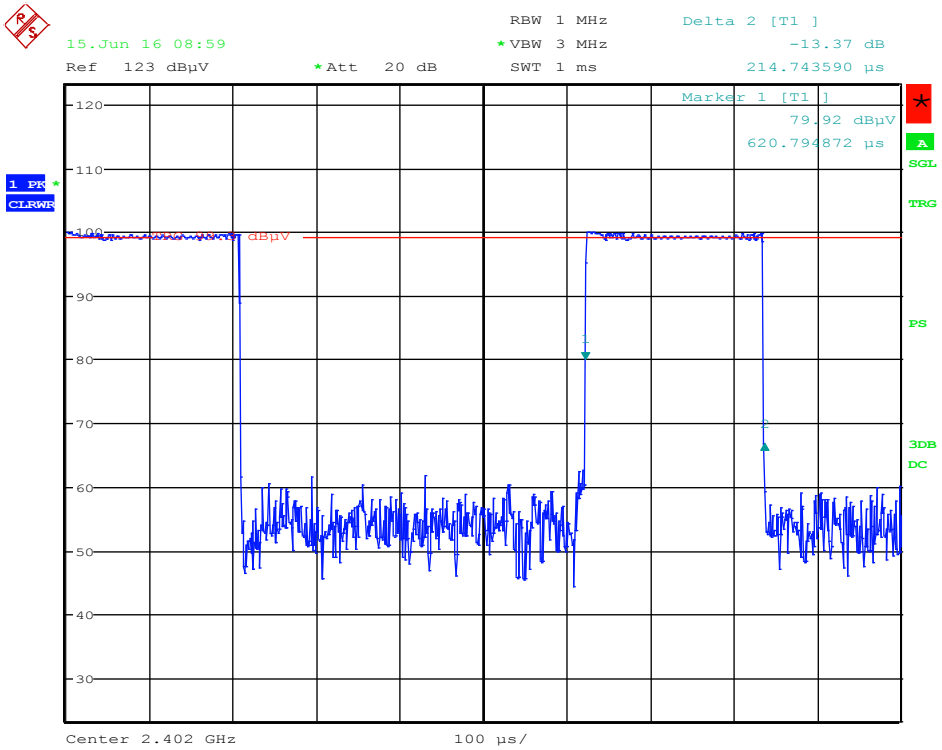
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

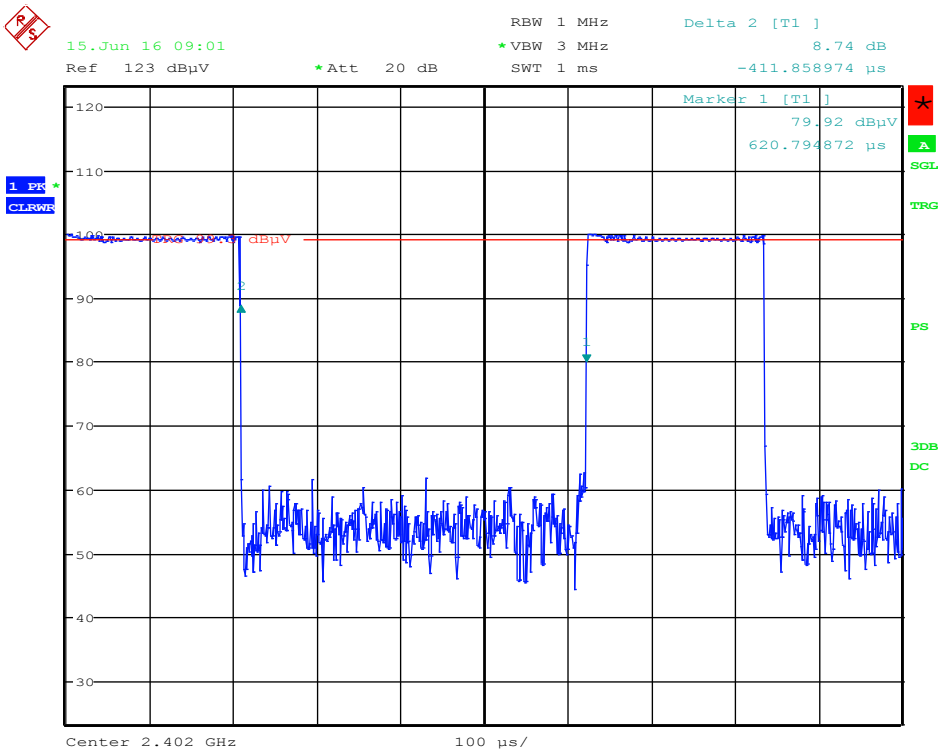
RESULTS

7.2.1. Duty Cycle



TX On Time 214.74uS
TX Period 626.6uS
Power RMS DC =
10*log(1/(TXon/TXperiod)
= 4.65dB

Voltage AV DC =
20*log(1/(TXon/TXperiod)
= 9.3dB



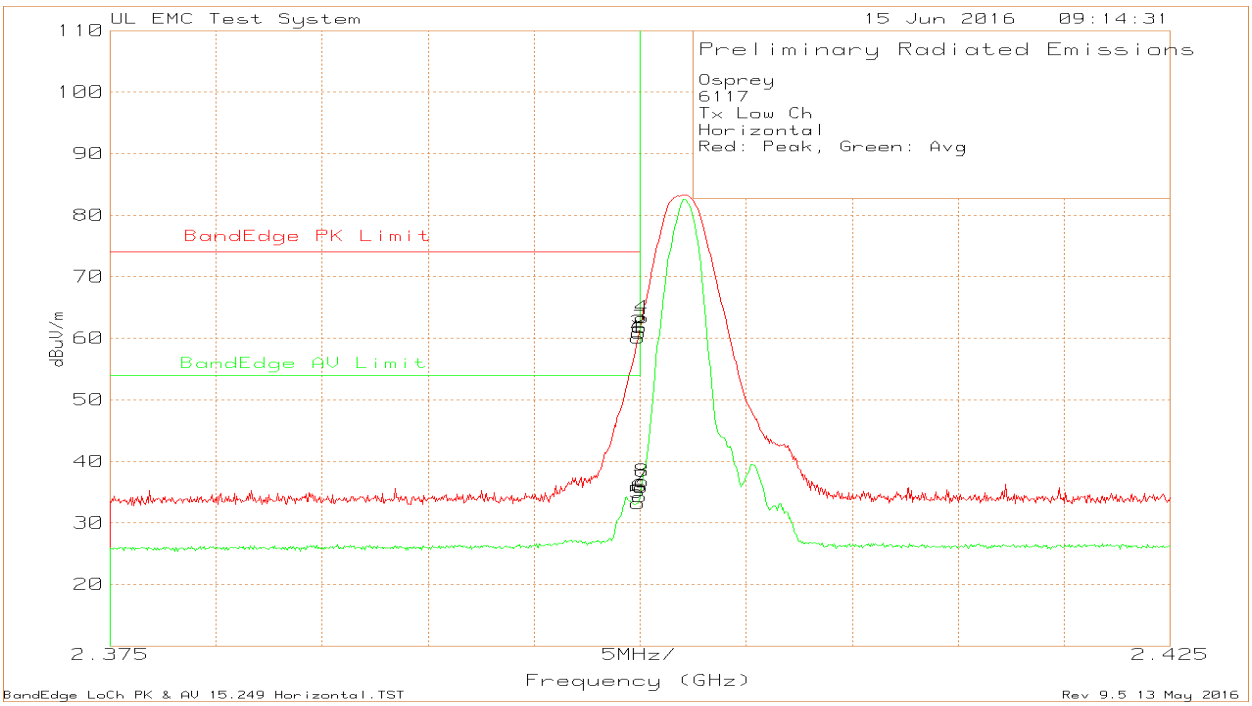
7.2.2. FUNDAMENTAL FREQUENCY RADIATED EMISSION

Worst Case Fundamental Emissions

Osprey											
6117 - Syringe											
Z-Axis											
Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Duty Cycle dB	Level dBuV/m	Limit dBuV/m	Margin dB	Azimuth [Degs]	Height [cm]	Polarity
2.4021	112.47	Pk	21.8	-51.11	-	83.16	114	-30.84	216	130	H
2.402	107.78	RMS	21.8	-51.11	4.65	83.12	94	-10.88	216	130	H
2.4021	101.16	Pk	21.8	-51.11	-	71.85	114	-42.15	130	100	V
2.4022	96.76	RMS	21.8	-51.11	4.65	72.1	94	-21.9	130	100	V
2.4401	60.73	Pk	21.9	4.72	-	87.35	114	-26.65	34	150	H
2.4401	56.5	RMS	21.9	4.72	4.65	87.77	94	-6.23	34	150	H
2.4403	46.88	Pk	21.9	4.72	-	73.5	114	-40.5	335	100	V
2.4402	42.1	RMS	21.9	4.72	4.65	73.37	94	-20.63	335	100	V
2.4801	115.55	Pk	22	-51.37	-	86.18	114	-27.82	46	131	H
2.4802	110.62	RMS	22	-51.37	4.65	85.9	94	-8.1	46	131	H
2.48	105.82	Pk	22	-51.37	-	76.45	114	-37.55	110	100	V
2.4801	102.36	RMS	22	-51.37	4.65	77.64	94	-16.36	110	100	V
PK - Peak Detector											
RMS - Power RMS Detector											
* All measurements are conducted with the sample in Z-Axis. This was established as wors case based on peliminary measurements.											

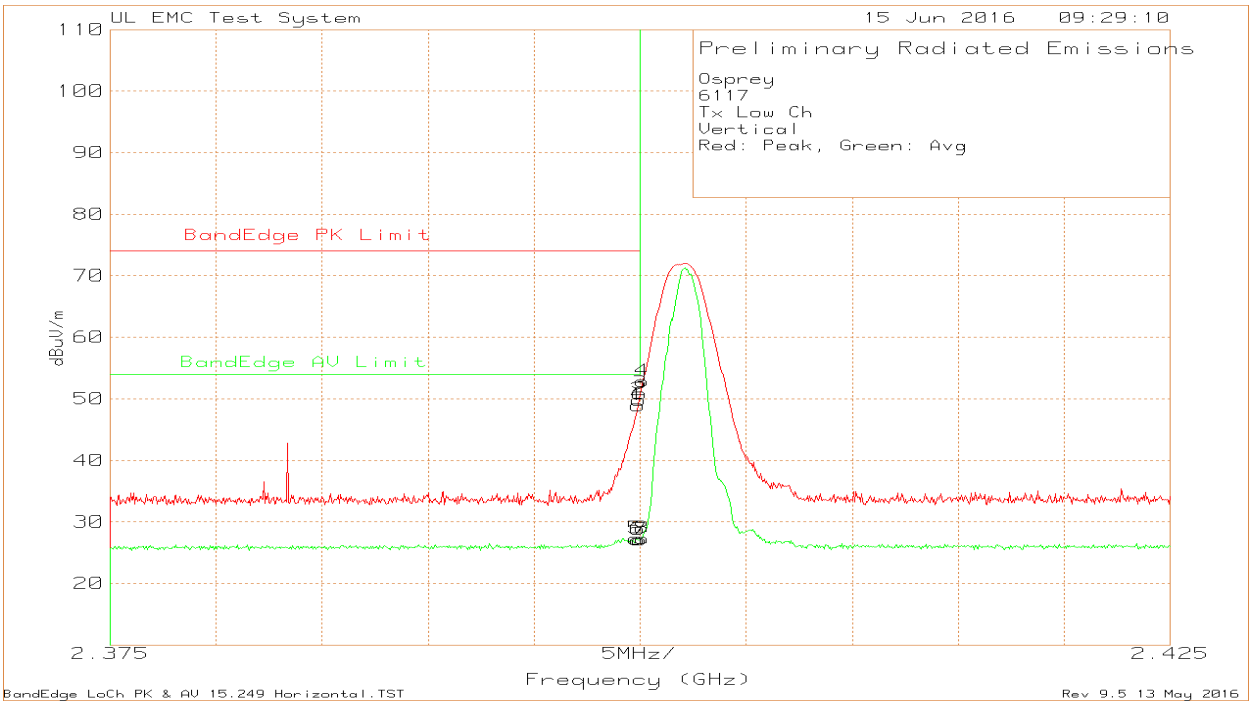
7.2.3. TRANSMITTER RESTRICTED BAND EDGES

BANDEDGE (LOW CHANNEL, HORIZONTAL)



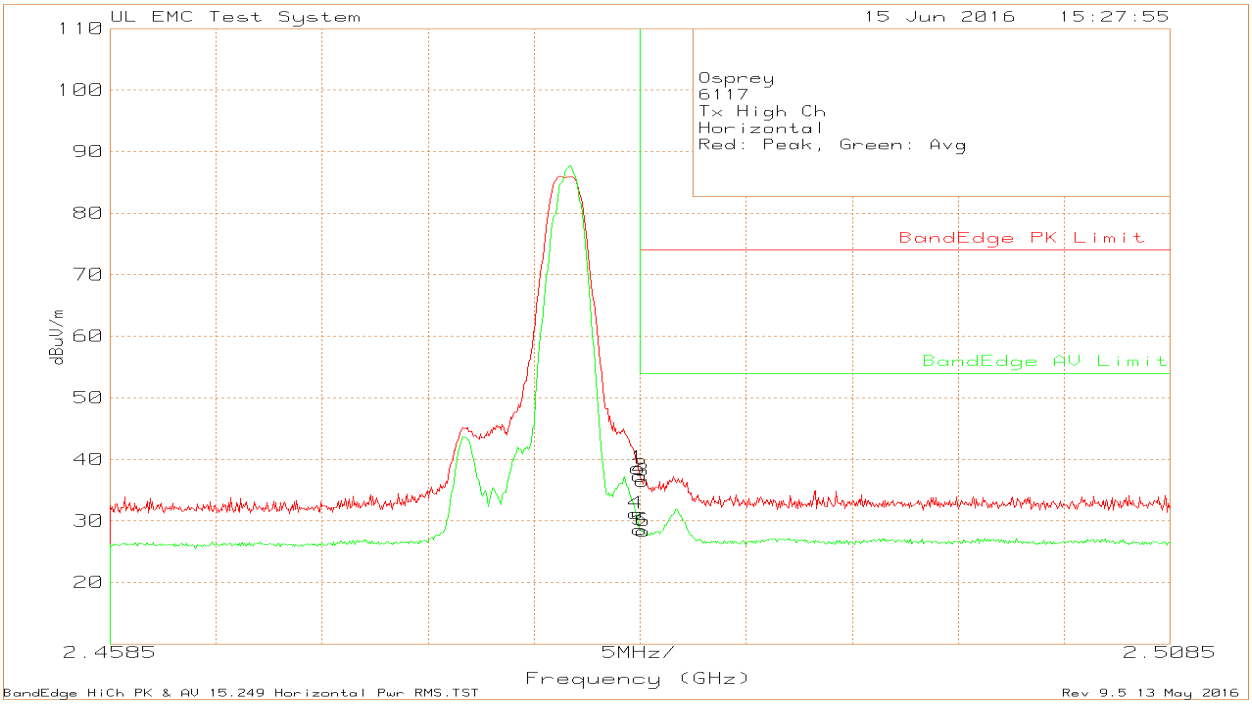
Osprey												
6117 - Syringe												
Tx Low Ch												
Horizontal												
Trace Markers												
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Duty Cycle Factor dB	Path Factor dB	Level dBuV/m	Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.3999	89.36	Pk	21.8	-	-51.1	60.06	74	-13.94	216	130	H
2	2.4	90.2	Pk	21.8	-	-51.1	60.9	74	-13.1	216	130	H
3	2.4	91.08	Pk	21.8	-	-51.1	61.78	74	-12.22	216	130	H
4	2.4001	92.67	Pk	21.8	-	-51.1	63.37	-	-	216	130	H
5	2.3999	57.84	RMS	21.8	4.7	-51.1	33.24	54	-20.76	216	130	H
6	2.4	58.9	RMS	21.8	4.7	-51.1	34.3	54	-19.7	216	130	H
7	2.4001	60.37	RMS	21.8	4.7	-51.1	35.77	-	-	216	130	H
8	2.4001	61.34	RMS	21.8	4.7	-51.1	36.74	-	-	216	130	H
Pk - Peak detector												
RMS - RMS detection												

BANDEDGE (LOW CHANNEL, VERTICAL)



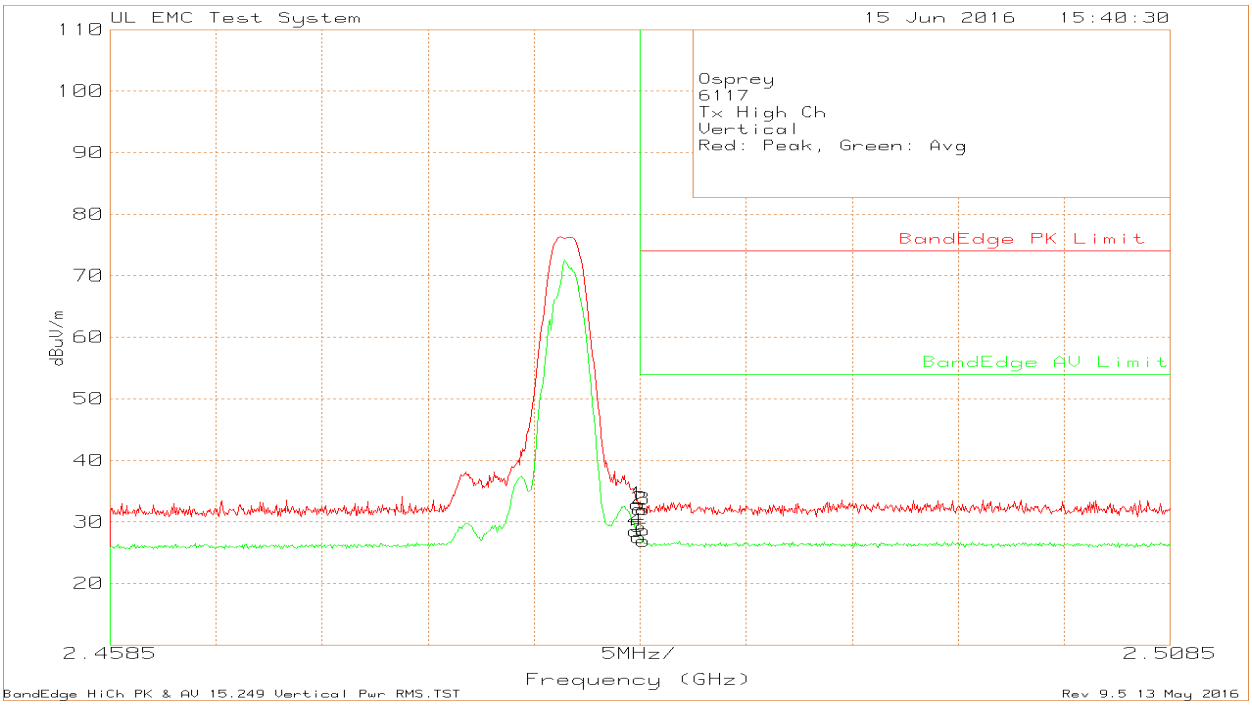
Osprey												
6117 - Syringe												
Tx Low Ch												
Vertical												
Trace Markers												
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Duty Cycle Factor dB	Path Factor dB	Level dBuV/m	Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.3999	78.26	Pk	21.8	-	-51.1	48.96	74	-25.04	130	100	V
2	2.4	79.15	Pk	21.8	-	-51.1	49.85	74	-24.15	130	100	V
3	2.4	80.2	Pk	21.8	-	-51.1	50.9	74	-23.1	130	100	V
4	2.4001	82.18	Pk	21.8	-	-51.1	52.88	-	-	130	100	V
5	2.3998	51.91	RMS	21.8	4.7	-51.1	27.31	54	-26.69	130	100	V
6	2.3999	51.71	RMS	21.8	4.7	-51.1	27.11	54	-26.89	130	100	V
7	2.4	51.7	RMS	21.8	4.7	-51.1	27.1	54	-26.9	130	100	V
8	2.4001	51.92	RMS	21.8	4.7	-51.1	27.32	-	-	130	100	V
Pk - Peak detector												
RMS - RMS detection												

BANDEDGE (HIGH CHANNEL, HORIZONTAL)



Osprey												
6117 - Syringe												
Tx High Ch												
Horizontal												
Trace Markers												
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Duty Cycle Factor dB	Path Factor dB	Level dBuV/m	Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4834	67.8	Pk	22.1	-	-51.34	38.56	-	-	46	131	H
2	2.4835	66.56	Pk	22.1	-	-51.34	37.32	74	-36.68	46	131	H
3	2.4836	65.78	Pk	22.1	-	-51.34	36.54	74	-37.46	46	131	H
4	2.4833	55.87	RMS	22	4.7	-51.34	31.23	-	-	46	131	H
5	2.4835	53.14	RMS	22.1	4.7	-51.34	28.6	54	-25.4	46	131	H
6	2.4837	52.89	RMS	22.1	4.7	-51.34	28.35	54	-25.65	46	131	H
Pk - Peak detector												
RMS - RMS detection												

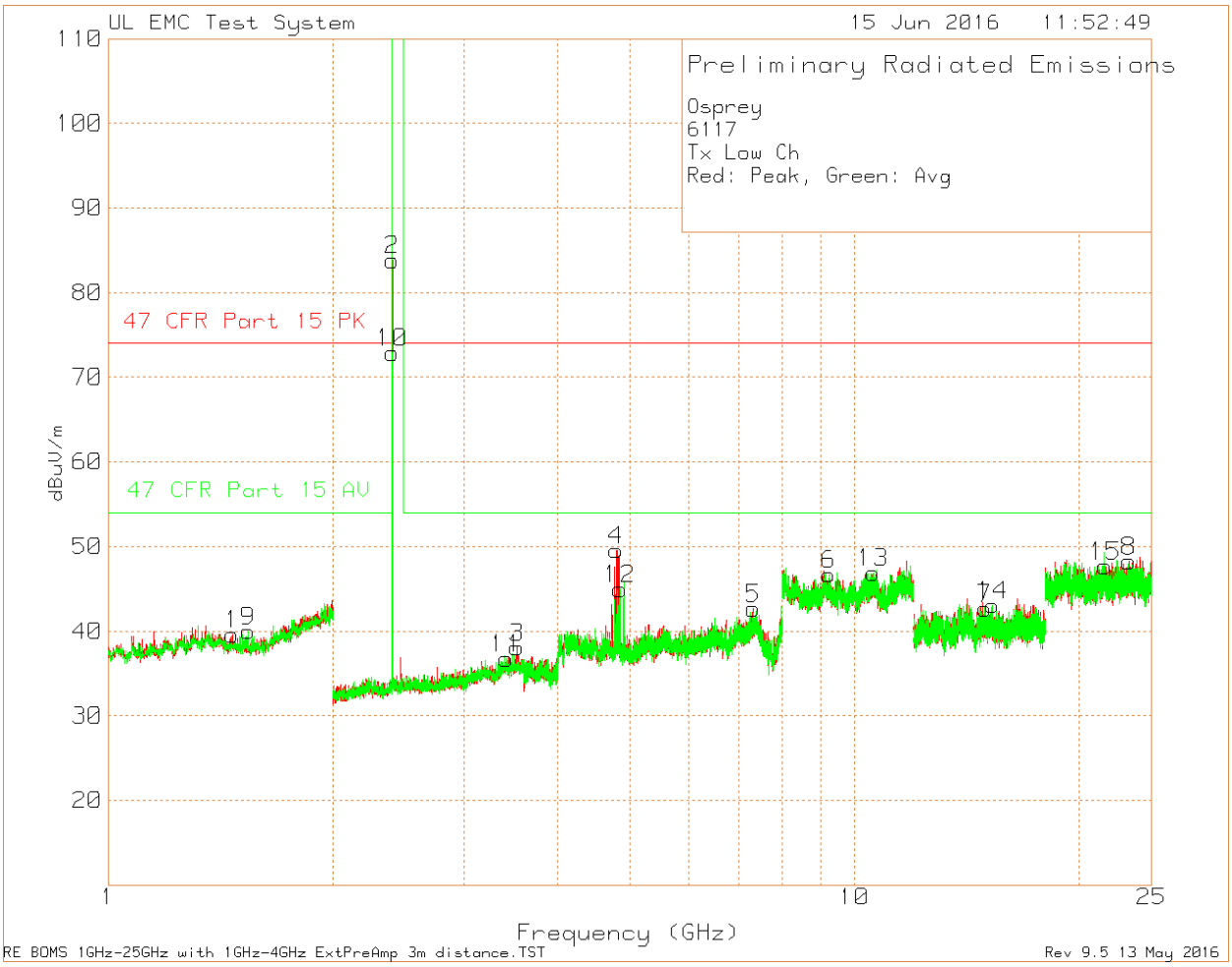
BANDEDGE (HIGH CHANNEL, VERTICAL)



Osprey												
6117 - Syringe												
Tx High Ch												
Vertical												
Trace Markers												
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Duty Cycle Factor dB	Path Factor dB	Level dBuV/m	Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	2.4834	62.12	Pk	22.1	-	-51.34	32.88	-	-	110	100	V
2	2.4835	61.32	Pk	22.1	-	-51.34	32.08	74	-41.92	110	100	V
3	2.4837	61.27	Pk	22.1	-	-51.34	32.03	74	-41.97	110	100	V
4	2.4833	53.18	RMS	22	4.7	-51.34	28.54	-	-	110	100	V
5	2.4835	52.06	RMS	22.1	4.7	-51.34	27.52	54	-26.48	110	100	V
6	2.4837	51.48	RMS	22.1	4.7	-51.34	26.94	54	-27.06	110	100	V
Pk - Peak detector												
RMS - RMS detection												

7.2.4. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz

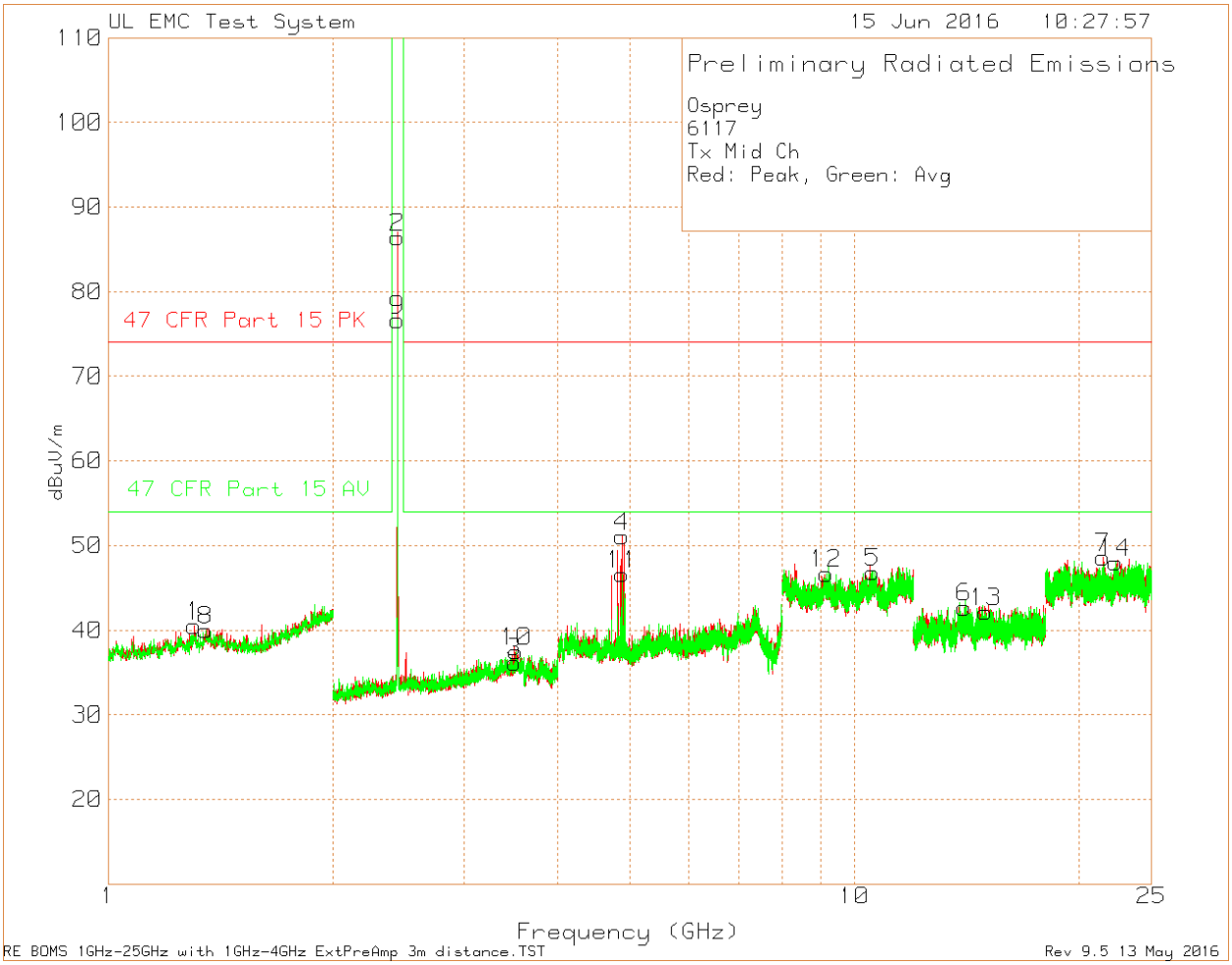
Low Channel - Plot



Low Channel - Data

Osprey													
6117 - Syringe													
Tx Low Ch													
Trace Markers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.466	67.49	Pk	28.4	-56.28	39.61	74	-34.39	54	-14.39	0-360	101	H
2	2.402	113.18	RMS	21.8	-51.11	83.87	-	-	-	-	0-360	99	H
3	3.528	64.63	RMS	23.4	-49.95	38.08	74	-35.92	54	-15.92	0-360	150	H
4	4.796	73.46	Pk	27.7	-51.59	49.57	74	-24.43	54	-4.43	0-360	102	H
5	7.319	58.07	Pk	30.6	-46.01	42.66	74	-31.34	54	-11.34	0-360	148	H
6	9.238	58.23	Pk	36.4	-47.92	46.71	74	-27.29	54	-7.29	0-360	100	H
7	14.958	43.97	Pk	39.8	-41.1	42.67	74	-31.33	54	-11.33	0-360	99	H
8	23.319	52.43	Pk	40.3	-44.49	48.24	74	-25.76	54	-5.76	0-360	100	H
9	1.54	67.62	Pk	28.1	-55.72	40	74	-34	54	-14	0-360	100	V
10	2.402	102.2	Pk	21.8	-51.11	72.89	-	-	-	-	0-360	100	V
11	3.416	63.68	Pk	23.5	-50.43	36.75	74	-37.25	54	-17.25	0-360	100	V
12	4.847	68.36	Pk	27.7	-51.1	44.96	74	-29.04	54	-9.04	0-360	99	V
13	10.594	57.7	Pk	36.3	-47.08	46.92	74	-27.08	54	-7.08	0-360	100	V
14	15.307	43.63	Pk	40	-40.54	43.09	74	-30.91	54	-10.91	0-360	100	V
15	21.665	53.26	Pk	40.4	-45.97	47.69	74	-26.31	54	-6.31	0-360	100	V
Radiated Emission Data													
	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	4.7936	74.36	Pk	27.7	-51.6	50.46	74	-23.54	54	-3.54	60	100	H
	4.8461	69.1	Pk	27.7	-51.11	45.69	74	-28.31	54	-8.31	243	100	V
Pk - Peak detector													

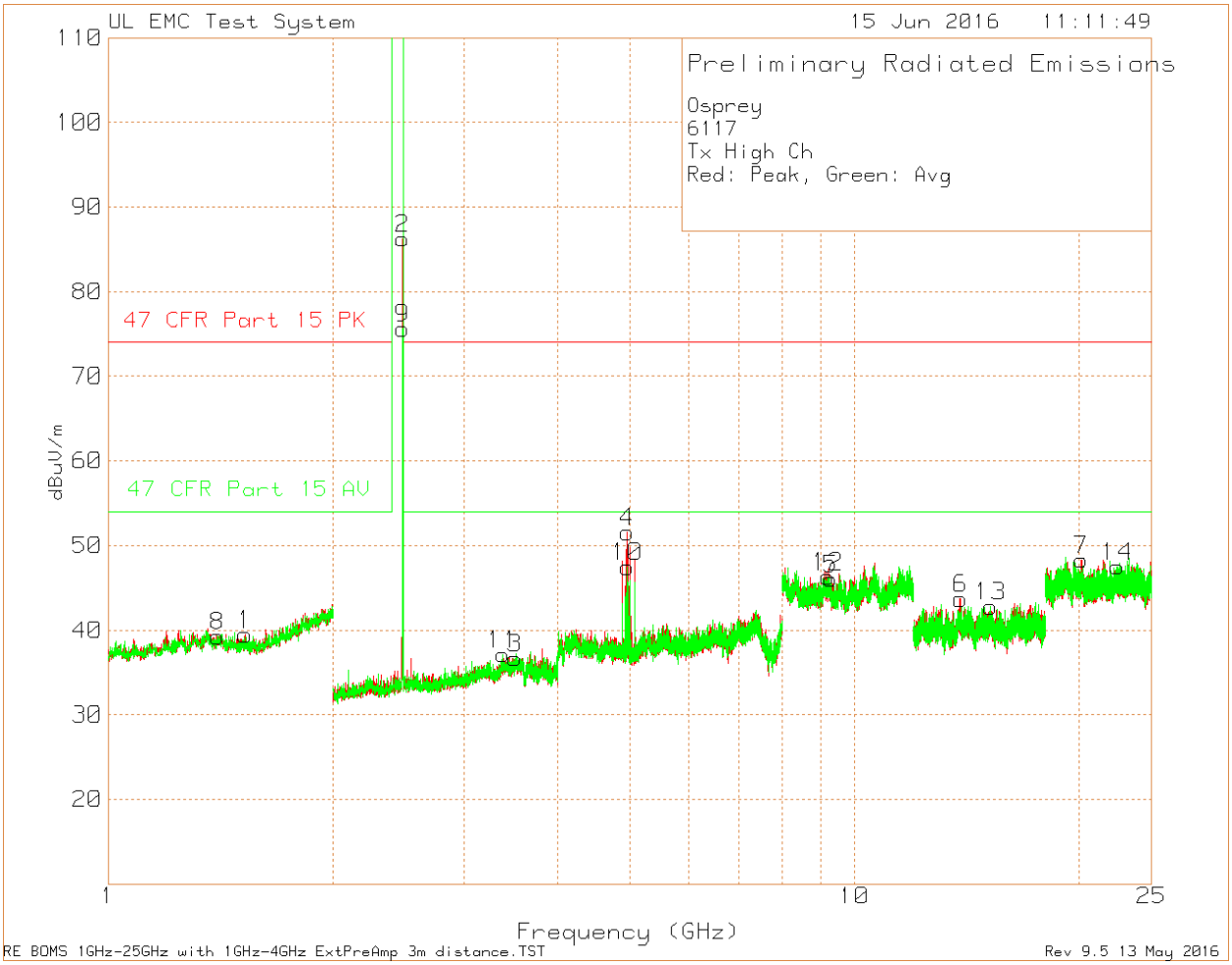
Middle Channel – Plot



Middle Channel Data

Osprey													
6117 - Syringe													
Tx Mid Ch													
Trace Markers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.303	68.59	Pk	28.9	-57.01	40.48	74	-33.52	54	-13.52	0-360	150	H
2	2.439	115.93	Pk	21.9	-51.41	86.42	-	-	-	-	0-360	150	H
3	3.503	62.83	Pk	23.5	-50.13	36.2	74	-37.8	54	-17.8	0-360	150	H
4	4.882	74.15	Pk	27.7	-50.77	51.08	74	-22.92	54	-2.92	0-360	148	H
5	10.57	57.67	Pk	36.3	-47.13	46.84	74	-27.16	54	-7.16	0-360	150	H
6	14.027	45.72	Pk	39.9	-42.92	42.7	74	-31.3	54	-11.3	0-360	150	H
7	21.53	54.36	Pk	40.3	-46.07	48.59	74	-25.41	54	-5.41	0-360	100	H
8	1.35	67.55	Pk	29	-56.57	39.98	74	-34.02	54	-14.02	0-360	150	V
9	2.44	106.16	Pk	21.9	-51.42	76.64	-	-	-	-	0-360	100	V
10	3.52	63.98	Pk	23.4	-49.89	37.49	74	-36.51	54	-16.51	0-360	150	V
11	4.882	69.67	Pk	27.7	-50.77	46.6	74	-27.4	54	-7.4	0-360	150	V
12	9.163	58.75	Pk	36.3	-48.37	46.68	74	-27.32	54	-7.32	0-360	100	V
13	14.983	43.57	Pk	39.8	-41.2	42.17	74	-31.83	54	-11.83	0-360	100	V
14	22.364	53.33	Pk	40.5	-45.83	48	74	-26	54	-6	0-360	100	V
Radiated Emission Data													
	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	4.882	75.03	Pk	27.7	-50.77	51.96	74	-22.04	54	-2.04	63	150	H
	4.8822	71.44	Pk	27.7	-50.77	48.37	74	-25.63	54	-5.63	270	259	V
Pk - Peak detector													

High Channel – Plot

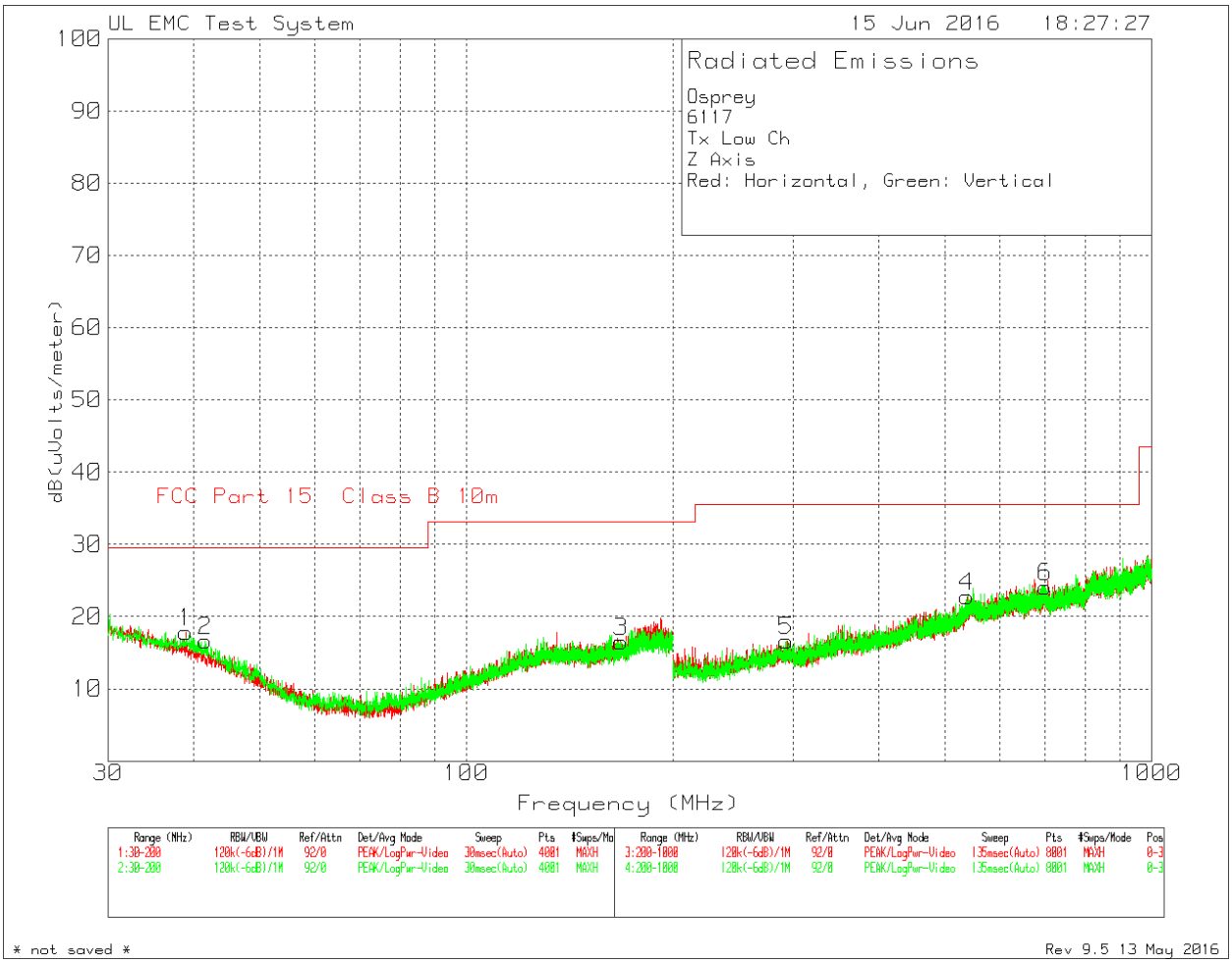


High Channel Marker Data

Osprey													
6117 - Syringe													
Tx High Ch													
Trace Markers													
Marker No.	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.524	67.06	Pk	28.1	-55.69	39.47	74	-34.53	54	-14.53	0-360	209	H
2	2.48	115.64	Pk	22	-51.37	86.27	-	-	-	-	0-360	209	H
3	3.506	63.27	Pk	23.5	-50.08	36.69	74	-37.31	54	-17.31	0-360	209	H
4	4.958	73.76	Pk	27.8	-49.98	51.58	74	-22.42	54	-2.42	0-360	102	H
5	9.297	58.68	Pk	36.4	-49.03	46.05	74	-27.95	54	-7.95	0-360	209	H
6	13.874	46.75	Pk	39.9	-42.94	43.71	74	-30.29	54	-10.29	0-360	100	H
7	20.144	56.96	Pk	40.2	-48.83	48.33	74	-25.67	54	-5.67	0-360	100	H
8	1.401	66.78	Pk	29	-56.51	39.27	74	-34.73	54	-14.73	0-360	100	V
9	2.48	105	Pk	22	-51.37	75.63	-	-	-	-	0-360	99	V
11	3.38	63.95	Pk	23.3	-50.1	37.15	74	-36.85	54	-16.85	0-360	149	V
10	4.958	69.67	Pk	27.8	-49.98	47.49	74	-26.51	54	-6.51	0-360	150	V
12	9.212	57.79	Pk	36.4	-47.88	46.31	74	-27.69	54	-7.69	0-360	99	V
13	15.2215	43.98	Pk	39.9	-41.09	42.79	74	-31.21	54	-11.21	0-360	150	V
14	22.513	52.55	Pk	40.5	-45.52	47.53	74	-26.47	54	-6.47	0-360	100	V
Radiated Emission Data													
	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	Path Factor dB	Level dBuV/m	Peak Limit dBuV/m	Margin (dB)	Average Limit dBuV/m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
	4.9579	74.53	Pk	27.8	-49.98	52.35	74	-21.65	54	-1.65	60	100	H
	4.958	70.37	Pk	27.8	-49.98	48.19	74	-25.81	54	-5.81	241	104	V
Pk - Peak detector													

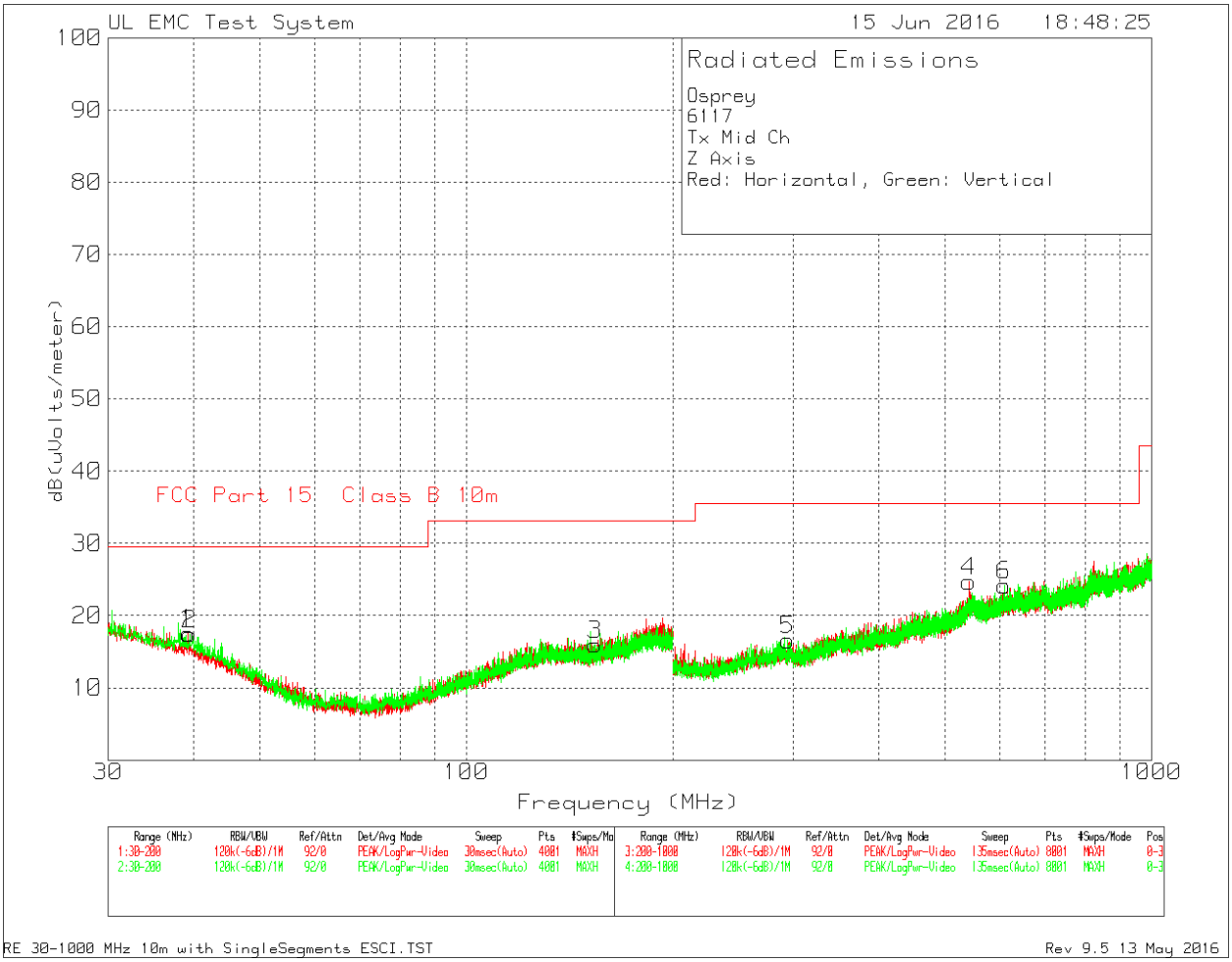
7.2.5. WORST-CASE BELOW 1 GHz

Radiated Emissions 30MHz – 1GHz Low Channel



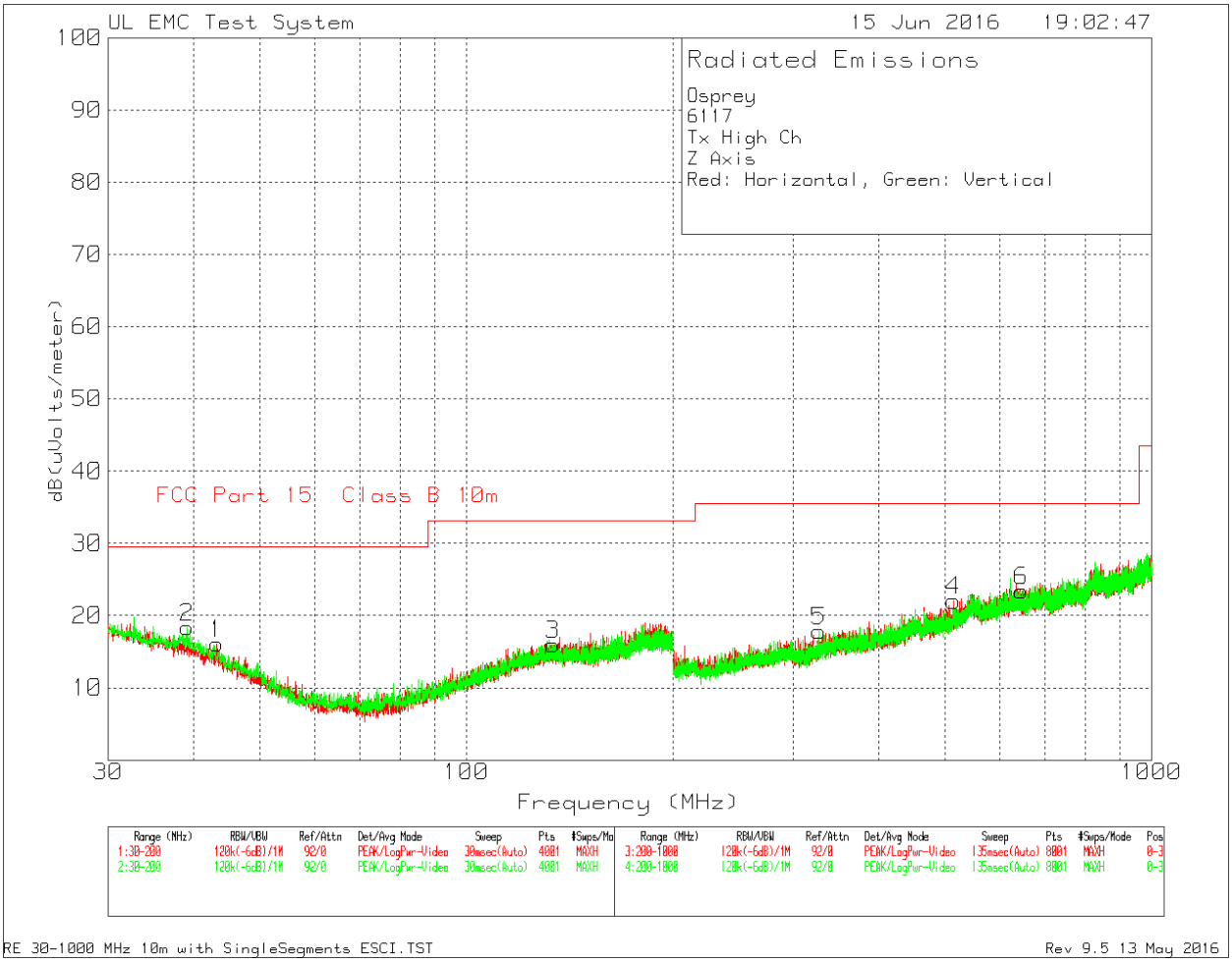
* no emissions recorded

Radiated Emissions 30MHz – 1GHz Middle Channel



* no emissions recorded

Radiated Emissions 30MHz – 1GHz High Channel



* no emissions recorded