



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

**CERTIFICATION TEST REPORT**

**FOR**

**Wireless Pump**

**MODEL NUMBER: 6050B4150, 6060E4100**

**FCC ID: 2AAFY6050B4150**

**IC: 11144A-605B4150**

**REPORT NUMBER: 10005005A**

**ISSUE DATE: September 23, 2013**

*Prepared for*

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NVLAP Lab code: 100414-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	9/23/13	Initial Issue	M.Ferrer

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Fluid Handling  
8200 N Austin  
Morton Grove, IL 60053

**EUT DESCRIPTION:** Wireless Pump

**MODEL:** 6050B4150, 6050E4100

**SERIAL NUMBER:** 6

**DATE TESTED:** September 3, 2013 – September 13, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C Part 15.249	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex A2.9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:



BART MUCHA  
WiSE STAFF ENGINEER  
UL Verification Services Inc.

Tested By:



MICHAEL FERRER  
WiSE Project Lead  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

## 3. FACILITIES AND ACCREDITATION

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

UL NBK is accredited by NVLAP, Laboratory Code 100414-0.

## 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:

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	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
RF Power	dB	Power Meter	0.45dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 915MHz transceiver that is AC powered

The radio module is manufactured by Fluid Handling

The model #'s are the same electrically and are relabeled for the different manufacturer

### 5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

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

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)
915	TX	87.59

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a microstrip antenna, with a maximum gain of 0.3 dBi.

### 5.4. WORST-CASE CONFIGURATION AND MODE

The EUT was set in worst axis as found in preliminary testing.

## **5.5. DESCRIPTION OF TEST SETUP**

### **SUPPORT EQUIPMENT**

EUT – Pump  
Operates at 120VAC 60Hz

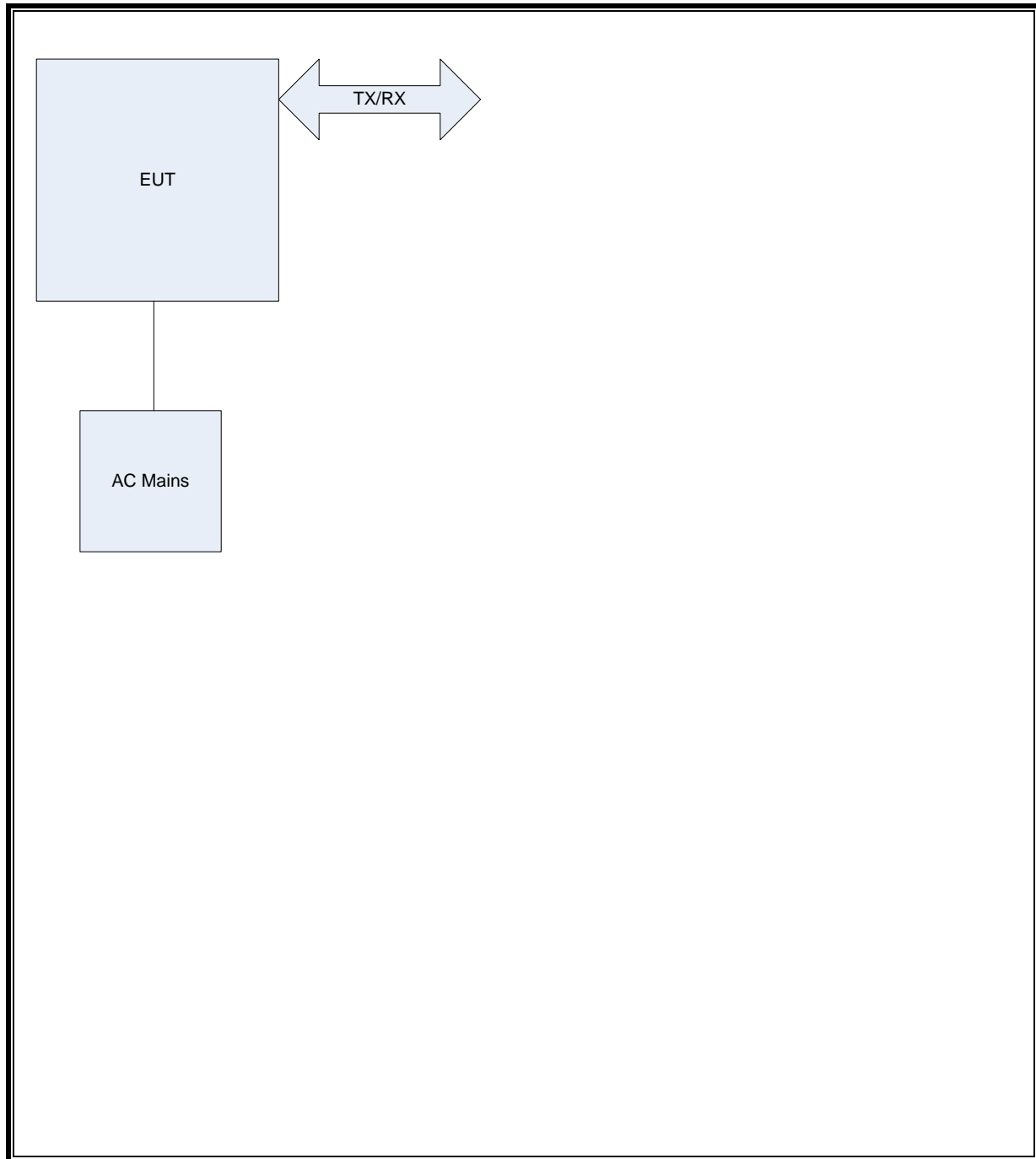
### **I/O CABLES**

AC Cable

### **TEST SETUP**

The EUT is programmed for continuous TX mode.

**SETUP DIAGRAM FOR TESTS**





## 6. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	Manufacturer	Model	Asset	Cal Date	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESU	EMC4323	20121227	20131231
Bicon Antenna	Chase	VBA6106A	EMC4078	20130213	20140228
Log-P Antenna	Chase	UPA6109	EMC4258	20121015	20131030
Spectrum Analyzer	Rhode & Schwarz	FSEK	EMC4182	20121226	20131231
Antenna Array	UL	BOMS	EMC4276	20111227	20131231
Spectrum Analyzer	Agilent	N9030A	EMC4360	20121226	20131226
Near Field Antenna	EMCO	-	-	-	-
EMI Test Receiver	Rohde & Schwarz	ESCI	EMC4328	20121230	20131230
LISN	Solar	8602-50-TS-50-N	EMC4052	20130115	20140116
LISN	Solar	8602-50-TS-50-N	EMC4064	20130115	20140116

## 7. TEST RESULTS

### 7.1.1. 99%, 20dB BANDWIDTH

#### LIMITS

None; for reporting purposes only.

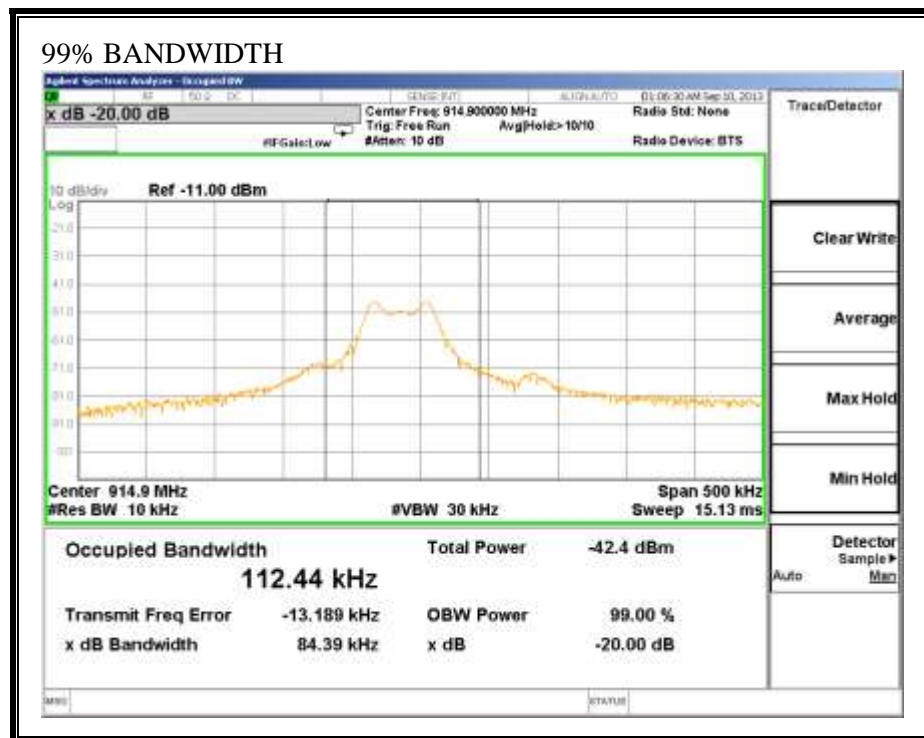
#### TEST PROCEDURE

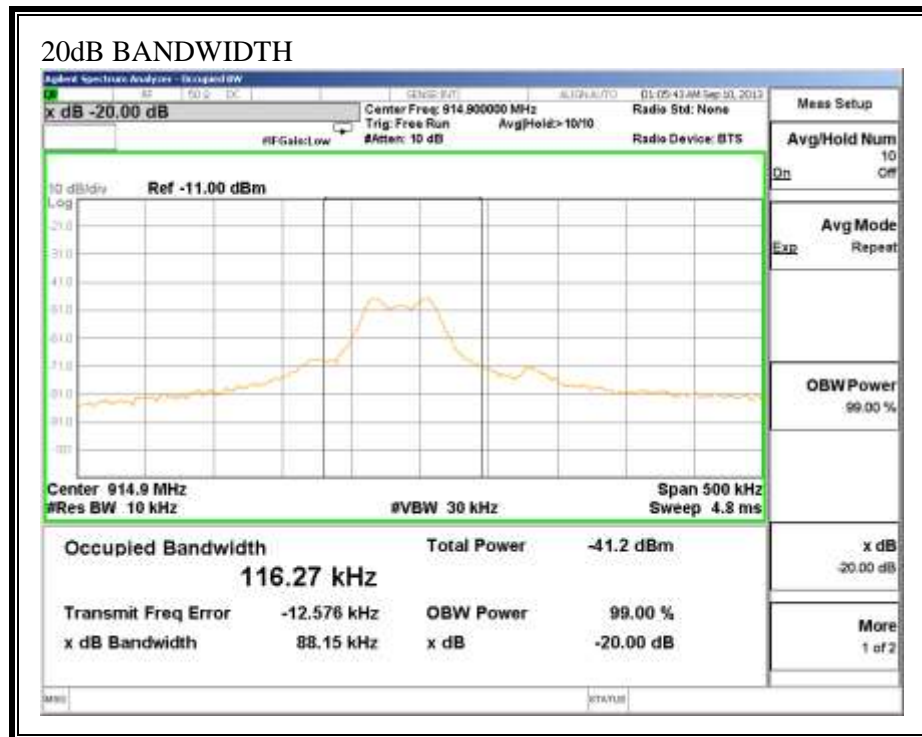
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

Channel	Frequency (kHz)
99%	112.44
20dB	88.15

## 99% BANDWIDTH





## 7.2. RADIATED EMISSIONS

### TEST PROCEDURE

ANSI C63.4

### LIMIT

IC RSS-210, A2.9  
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:

Limit is 3m

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

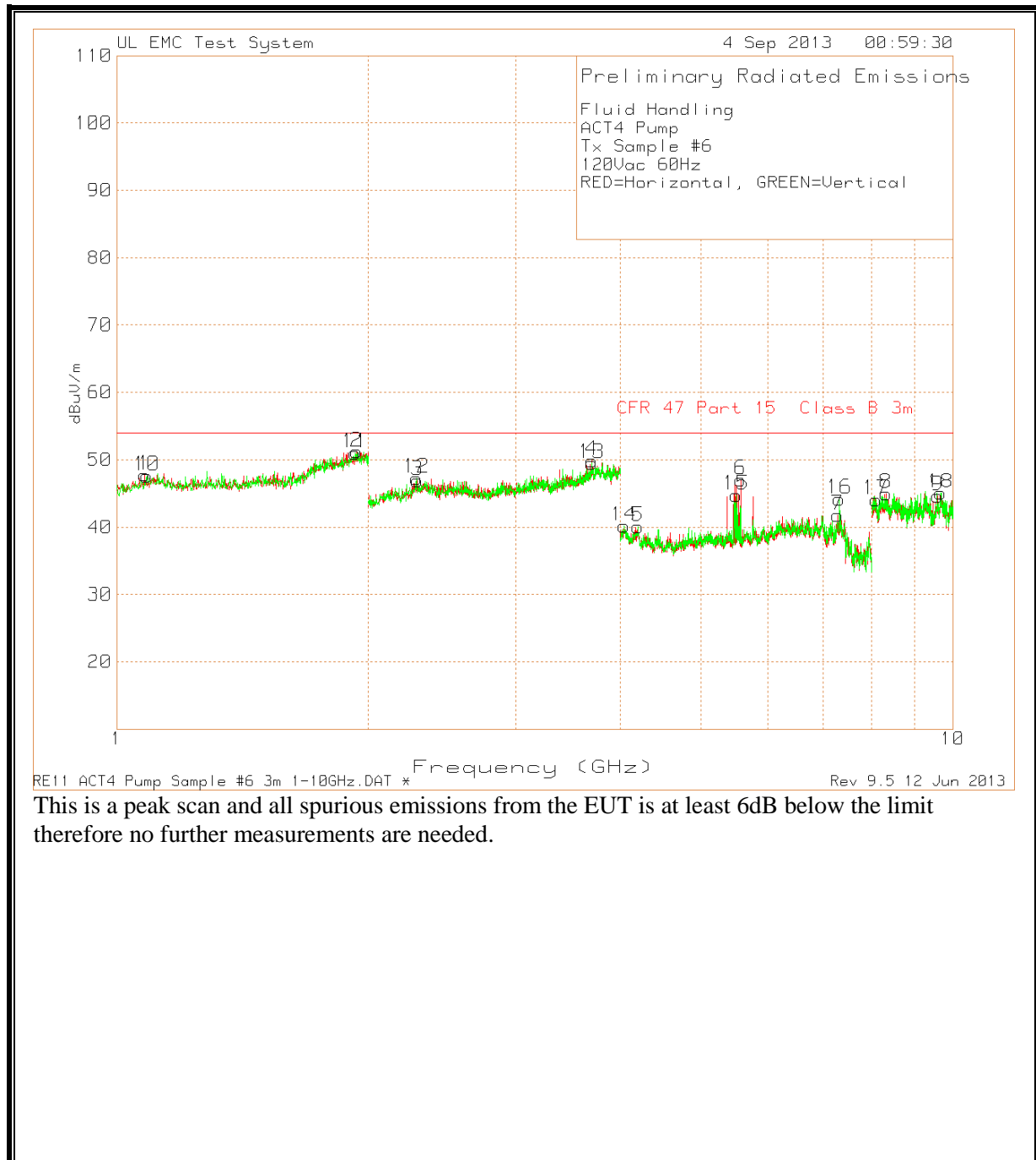
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Field strength (microvolts/meter)	Measure- ment dis- tance (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.

Fluid Handling												
ACT4 Pump												
Tx Sample #6												
120Vac60Hz												
Test Frequency	Meter Reading (dBuV)	Detector	UPA6109 SN1060 EMC4258 3M (dB/m)	3 meter with LogP Emissions Ca (dB)	Corrected Reading dB(uVolts/ meter)	CFR 47 Part 15 Class B 3m (dBuV/m)	Margin (dB)	Azimuth [Degr]	Height [cm]	Polarity	Notes	
914.865385	54.49	QP	23.1	10	87.59	94	-6.41	23	158	Horz	3	
914.865385	47.92	QP	23.1	10	81.02	94	-12.98	130	102	Vert	3	
914.865385	50.18	QP	23.1	10	83.28	94	-10.72	99	121	Vert	2	
914.865385	48.81	QP	23.1	10	81.91	94	-12.09	326	104	Horz	2	
914.865385	51.61	QP	23.1	10	84.71	94	-9.29	345	102	Horz	1	
914.865385	52	QP	23.1	10	85.1	94	-8.9	0	103	Horz	1	
Notes:												
1 - Y-Axis												
2 - X-Axis												
3 - Z-Axis												
QP - Quasi-Peak detector												

### 7.2.1. HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz



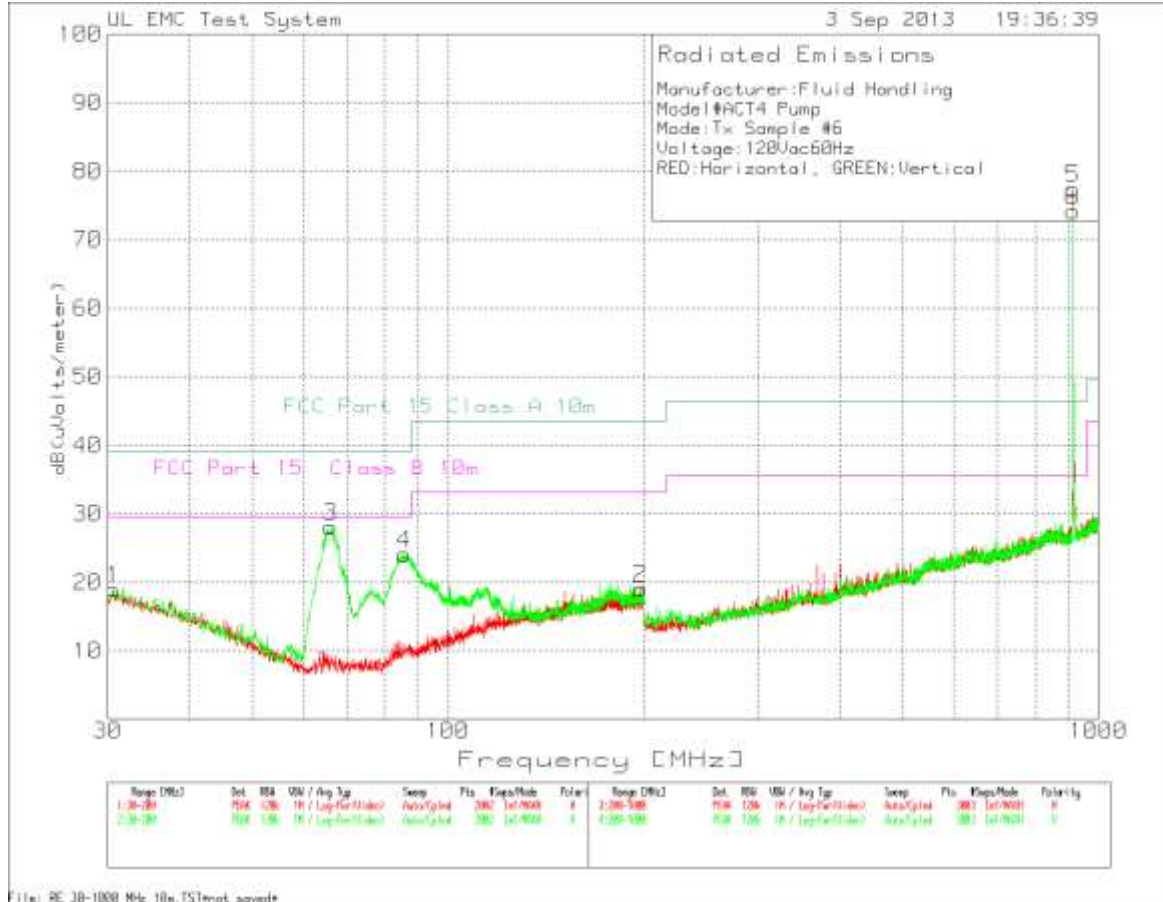
This is a peak scan and all spurious emissions from the EUT is at least 6dB below the limit therefore no further measurements are needed.



## 7.2.2. WORST-CASE BELOW 1 GHz

### SPURIOUS EMISSIONS 30 TO 1000 MHz

#### PLOT



Limits were extrapolated from 3m to 10m

Manufacturer:Fluid Handling  
Model#ACT4 Pump  
Mode:Tx Sample #6  
Voltage:120Vac60Hz  
RED:Horizontal, GREEN:Vertical

Trace Markers

Test	Meter	Transducer	Gain/Loss	Corrected	Limit:1	2	3	4
No. Frequency	Reading	Factor	Factor	Reading dB (uVolts/meter)				
[MHz]		[dB]	[dB]					
=====								
Bicon Horizontal	30 - 200MHz							
1 30.6797	31.47dBuV PK	17.6	-30.1	18.97	-	-	39.08	29.55
	Height:400 Horz		Margin [dB]		-	-	-20.11	-10.58
2 197.3663	31.82dBuV PK	16	-28.8	19.02	-	-	43.52	33.07
	Height:99 Horz		Margin [dB]		-	-	-24.5	-14.05
Bicon Vertical	30 - 200MHz							
3 66.1069	51.86dBuV PK	6.2	-30	28.06	-	-	39.08	29.55
	Height:249 Vert		Margin [dB]		-	-	-11.02	-1.49
4 85.6472	45.76dBuV PK	8.2	-29.9	24.06	-	-	39.08	29.55
	Height:249 Vert		Margin [dB]		-	-	-15.02	-5.49

LIMIT 3: FCC Part 15 Class A 10m  
LIMIT 4: FCC Part 15 Class B 10m

Manufacturer:Fluid Handling  
Model#ACT4 Pump  
Mode:Tx Sample #6  
Voltage:120Vac60Hz  
RED:Horizontal, GREEN:Vertical

Radiated Emission Data

Test	Meter	Transducer	Gain/Loss	Corrected	Limit:1	2	3	4	5
Frequency	Reading	Factor	Factor	ReadingdB (uVolts/meter)					
[MHz]		[dB]	[dB]						
=====									
Bicon Horizontal	30 - 200MHz								
66.0423	46.7dBuV QP	6.2	-30	22.9	-	-	39.08	29.55	-
Azimuth: 354	Height:252 Vert		Margin (dB):		-	-	-16.18	-6.65	-
85.7674	41.29dBuV QP	8.3	-29.9	19.69	-	-	39.08	29.55	-
Azimuth: 14	Height:147 Vert		Margin (dB):		-	-	-19.39	-9.86	-

LIMIT 3: FCC Part 15 Class A 10m  
LIMIT 4: FCC Part 15 Class B 10m

PK - Peak detector  
QP - Quasi-Peak detector

## 8. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207 (a)  
IC RSS-GEN, Section 7.2.2

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

### TEST PROCEDURE

ANSI C63.4

### RESULTS

No non-compliance noted:

## 6 WORST EMISSIONS

Manufacturer: Fluid Handling  
Model# Pump  
Mode: TX  
Voltage: 120V 60Hz  
Red: Line Green: Neutral

Trace Markers									
Test	Meter	Transducer	Gain/Loss	Corrected	Limit:1	2	3	4	
No. Frequency	Reading	Factor	Factor	Reading (dB(uVolts))					
[MHz]		[dB]	[dB]						
=====									
Line - L1 .15 - 1MHz -----									
1 .18026	42.25dBuV PK	.1	12.2	54.55	-	-	64.47	54.47	-
			Margin [dB]		-	-	-9.92	.08	-
2 .23918	36dBuV PK	.1	11.3	47.4	-	-	62.12	52.12	-
			Margin [dB]		-	-	-14.72	-4.72	-
3 .30267	31.98dBuV PK	.1	10.9	42.98	-	-	60.17	50.17	-
			Margin [dB]		-	-	-17.19	-7.19	-
4 .36149	29.56dBuV PK	.1	10.8	40.46	-	-	58.69	48.69	-
			Margin [dB]		-	-	-18.23	-8.23	-
Line - L2 .15 - 1MHz -----									
5 .1793	41.45dBuV PK	.1	12.3	53.85	-	-	64.52	54.52	-
			Margin [dB]		-	-	-10.67	-.67	-
6 .24003	35.69dBuV PK	.1	11.3	47.09	-	-	62.1	52.1	-
			Margin [dB]		-	-	-15.01	-5.01	-
7 .30034	32.11dBuV PK	.1	10.9	43.11	-	-	60.23	50.23	-
			Margin [dB]		-	-	-17.12	-7.12	-
8 .36085	27.3dBuV PK	.1	10.8	38.2	-	-	58.71	48.71	-
			Margin [dB]		-	-	-20.51	-10.51	-
LIMIT 3: CISPR 22/11 Group 1 Class B QP									
LIMIT 4: CISPR 22/11 Group 1 Class B AV									

PK - Peak detector

Quasi-peak Data									
Test	Meter	Transducer	Gain/Loss	Corrected	Limit:1	2	3	4	5
Frequency	Reading	Factor	Factor	Reading (dB(uVolts))					
[MHz]		[dB]	[dB]						
=====									
Line - L1 .15 - 1MHz									
.17996	40.25dBuV QP .1		12.2	52.55	-	-	64.49	54.49	-
			Margin (dB):		-	-	-11.94	-1.94	-
.23975	35.28dBuV QP .1		11.3	46.68	-	-	62.1	52.1	-
			Margin (dB):		-	-	-15.42	-5.42	-
.30174	30.3dBuV QP .1		10.9	41.3	-	-	60.19	50.19	-
			Margin (dB):		-	-	-18.89	-8.89	-
.36101	27.37dBuV QP .1		10.8	38.27	-	-	58.71	48.71	-
			Margin (dB):		-	-	-20.44	-10.44	-
Line - L2 .15 - 1MHz									
.17989	39.79dBuV QP .1		12.2	52.09	-	-	64.49	54.49	-
			Margin (dB):		-	-	-12.4	-2.4	-
.24007	34.24dBuV QP .1		11.3	45.64	-	-	62.09	52.09	-
			Margin (dB):		-	-	-16.45	-6.45	-
.30038	29.37dBuV QP .1		10.9	40.37	-	-	60.23	50.23	-
			Margin (dB):		-	-	-19.86	-9.86	-
.36035	24.66dBuV QP .1		10.8	35.56	-	-	58.72	48.72	-
			Margin (dB):		-	-	-23.16	-13.16	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

QP - Quasi-Peak detector

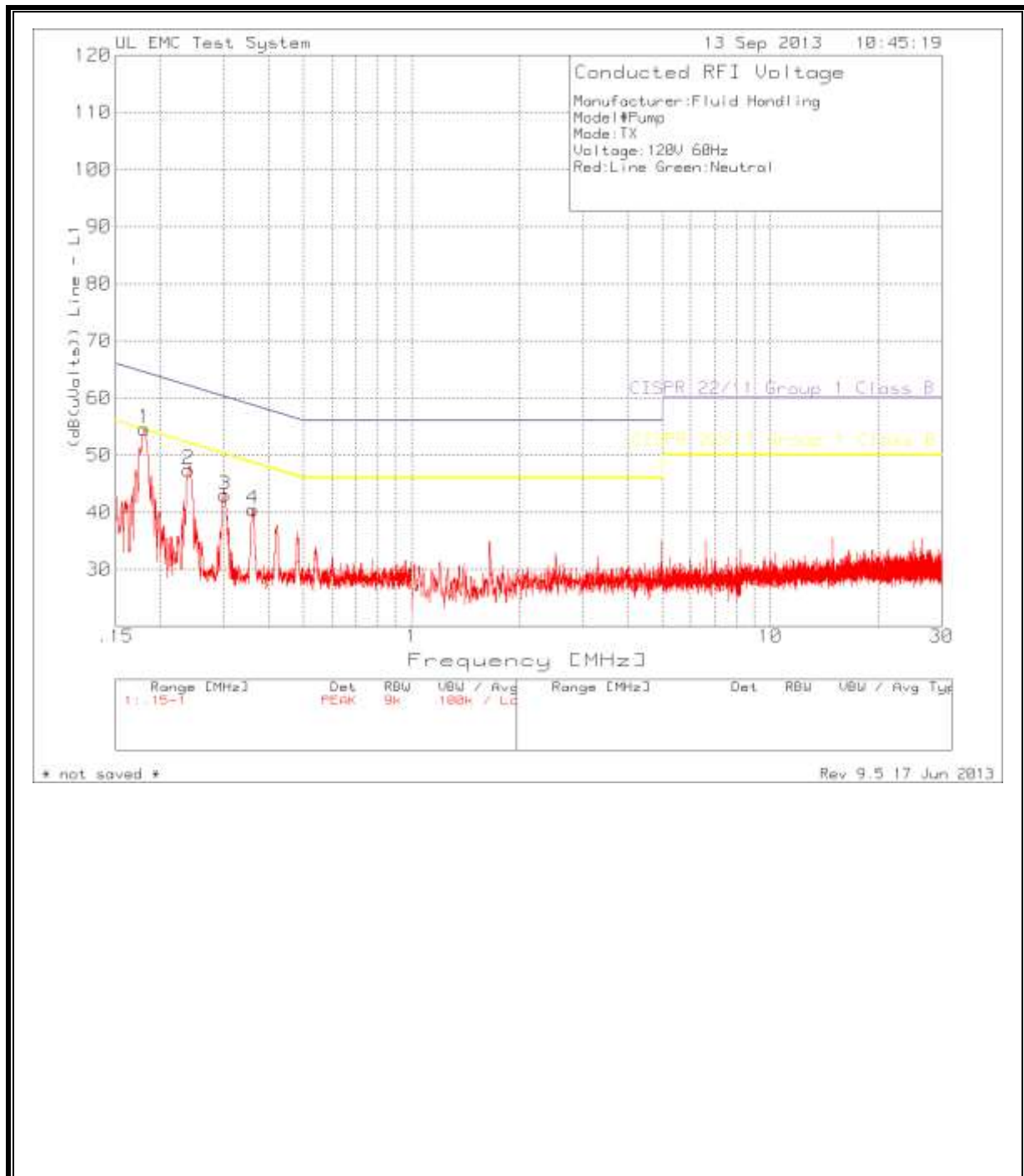
Manufacturer: Fluid Handling  
Model# Pump  
Mode: TX  
Voltage: 120V 60Hz  
Red: Line Green: Neutral

Average Data										
Test	Meter	Transducer	Gain/Loss	Corrected	Limit:1	2	3	4	5	
Frequency	Reading	Factor	Factor	Reading(dB(uVolts))						
[MHz]		[dB]	[dB]							
=====										
Line - L1 .15 - 1MHz										
.17996	20.56dBuV Av	.1	12.2	32.86	-	-	64.49	54.49	-	-
			Margin (dB):		-	-	-31.63	-21.63	-	-
.23975	17.17dBuV Av	.1	11.3	28.57	-	-	62.1	52.1	-	-
			Margin (dB):		-	-	-33.53	-23.53	-	-
.30174	15.25dBuV Av	.1	10.9	26.25	-	-	60.19	50.19	-	-
			Margin (dB):		-	-	-33.94	-23.94	-	-
.36101	15.19dBuV Av	.1	10.8	26.09	-	-	58.71	48.71	-	-
			Margin (dB):		-	-	-32.62	-22.62	-	-
Line - L2 .15 - 1MHz										
.17989	20.72dBuV Av	.1	12.2	33.02	-	-	64.49	54.49	-	-
			Margin (dB):		-	-	-31.47	-21.47	-	-
.24007	18.17dBuV Av	.1	11.3	29.57	-	-	62.09	52.09	-	-
			Margin (dB):		-	-	-32.52	-22.52	-	-
.30038	17.45dBuV Av	.1	10.9	28.45	-	-	60.23	50.23	-	-
			Margin (dB):		-	-	-31.78	-21.78	-	-
.36035	17.14dBuV Av	.1	10.8	28.04	-	-	58.72	48.72	-	-
			Margin (dB):		-	-	-30.68	-20.68	-	-

NOTE: "+" - Indicates an emission level in excess of the applicable limit (s).

Av - average detection  
LIMIT 3: CISPR 22/11 Group 1 Class B QP  
LIMIT 4: CISPR 22/11 Group 1 Class B AV

**LINE 1 RESULTS**



## LINE 2 RESULTS

