



**FCC 47 CFR PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

**FOR**

**Flood Sensor**

**MODEL NUMBER: FGFS-101**

**FCC ID: 2AA9MFGFS101**

**REPORT NUMBER: 10072441**

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Revision History

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Rev.	Issue Date	Revisions	Revised By
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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Fibar Group sp. z.o.o  
Ul. Lotnicza 1  
Poznan, Poland 60-453

**EUT DESCRIPTION:** Flood Sensor

**MODEL:** FGFS-101

**SERIAL NUMBER:** Prototype

**DATE TESTED:** September 12, 2013 – October 5, 2013

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C Part 15.249	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.

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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 Pflingsten 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: (MU shows 10m, but Emissions were extrapolated to 3m)

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 contains a 908MHz transceiver. It is Battery or DC powered

The radio is manufactured by Fibar Group

### 5.2. MAXIMUM OUTPUT E-FIELD STRENGTH

The transmitter has a maximum output peak E-field as follows:  
Data from section 7.2

Frequency Range (MHz)	Mode	Output PK E-field Strength (dBuV/m)
908	TX	88.65

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a copper trace type whip antenna  $\frac{1}{4}$  wavelength.

### 5.4. WORST-CASE CONFIGURATION AND MODE

The EUT was set in worst axis as found in preliminary testing. Config 1 battery powered with no external connections was found to be worst case.

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Use	Product Type	Manufacturer	Model	Comments
EUT	Sensor	Fibar	FGFS-101	None
AE	Power Supply	-	MW41-1200500	None

Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)

### I/O CABLES

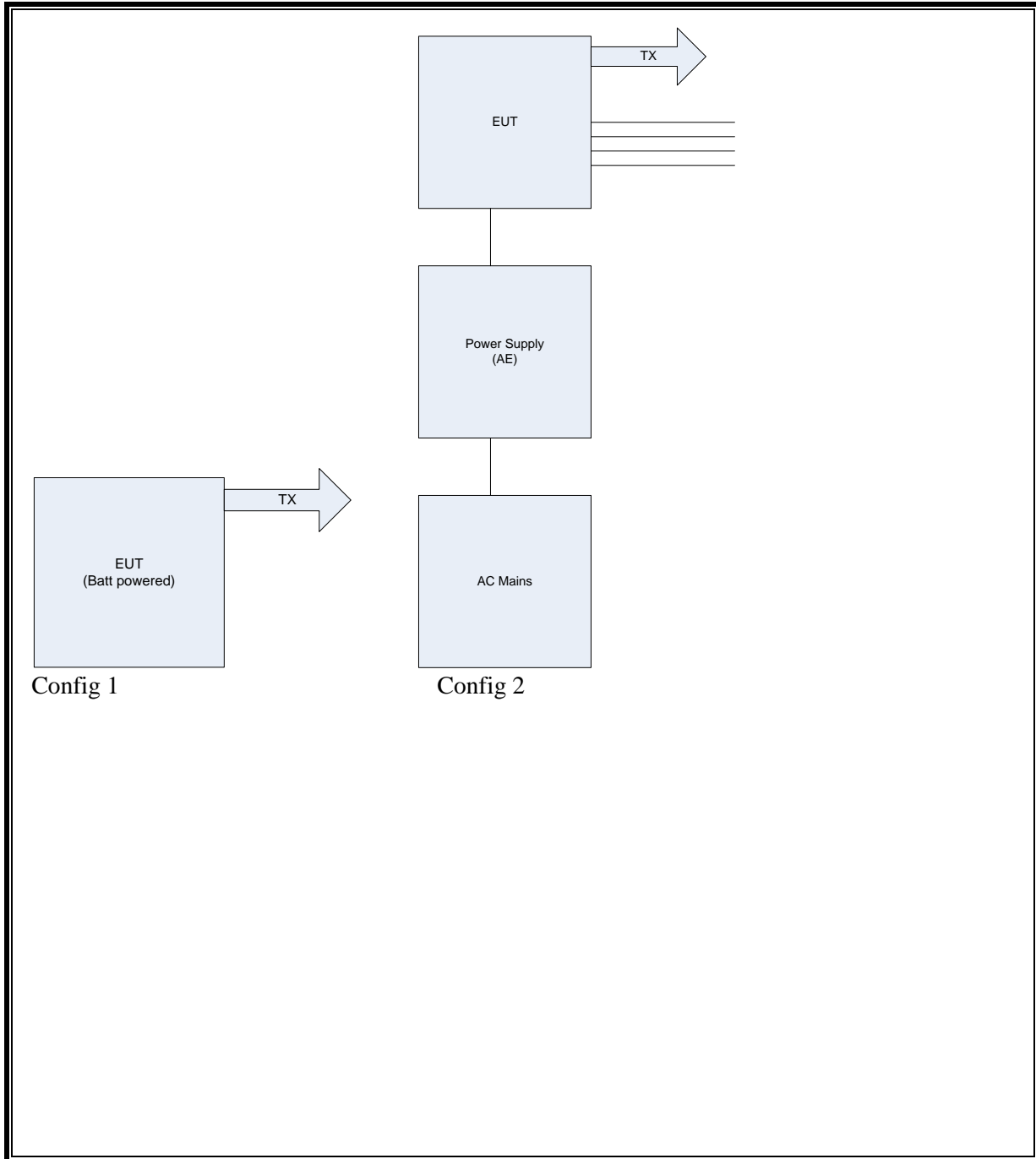
Port #	Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
0	Enclosure	N/E	—	—	None
1	DC input	AC	N	N	None
2	IO lines	IO	N	N	None

Note:  
 AC = AC Power Port                      DC = DC Power Port                      N/E = Non-Electrical  
 I/O = Signal Input or Output Port (Not Involved in Process Control)  
 TP = Telecommunication Ports

### 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.

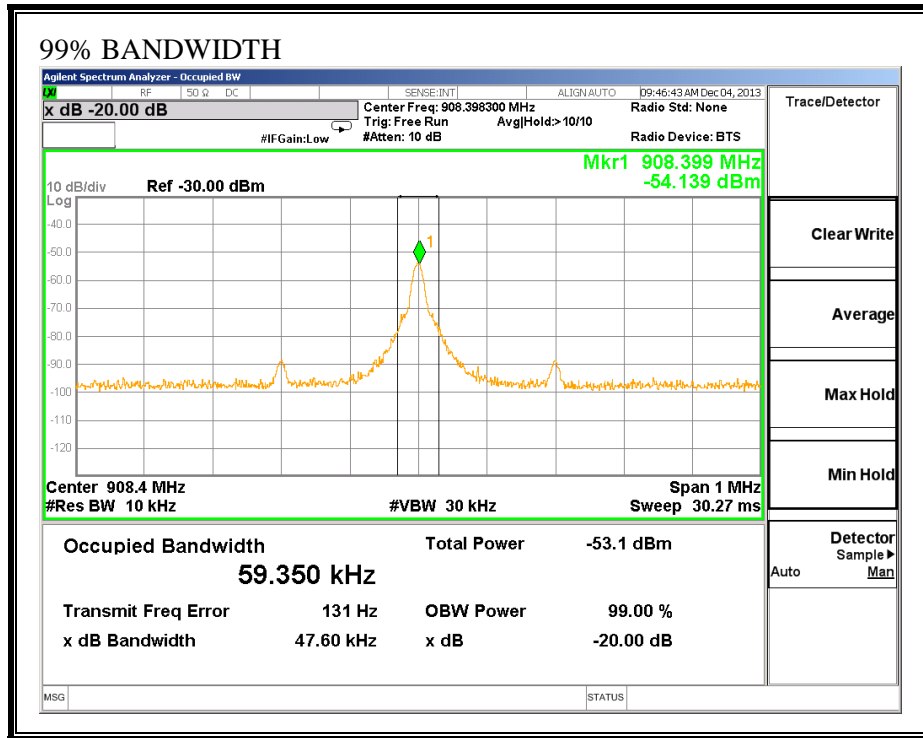
#### TEST PROCEDURE

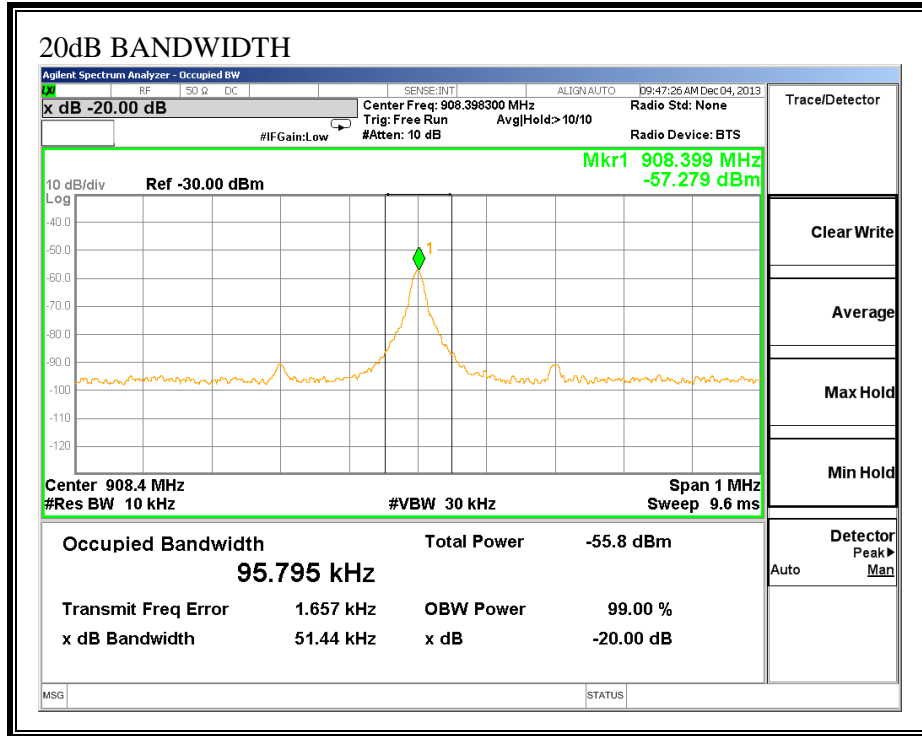
The transmitter output is connected to the spectrum analyzer. The RBW is set to 10kHz bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth and 20dB function is utilized.

#### RESULTS

Channel	Frequency (kHz)
99%	59.35
20dB	51.44

**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.

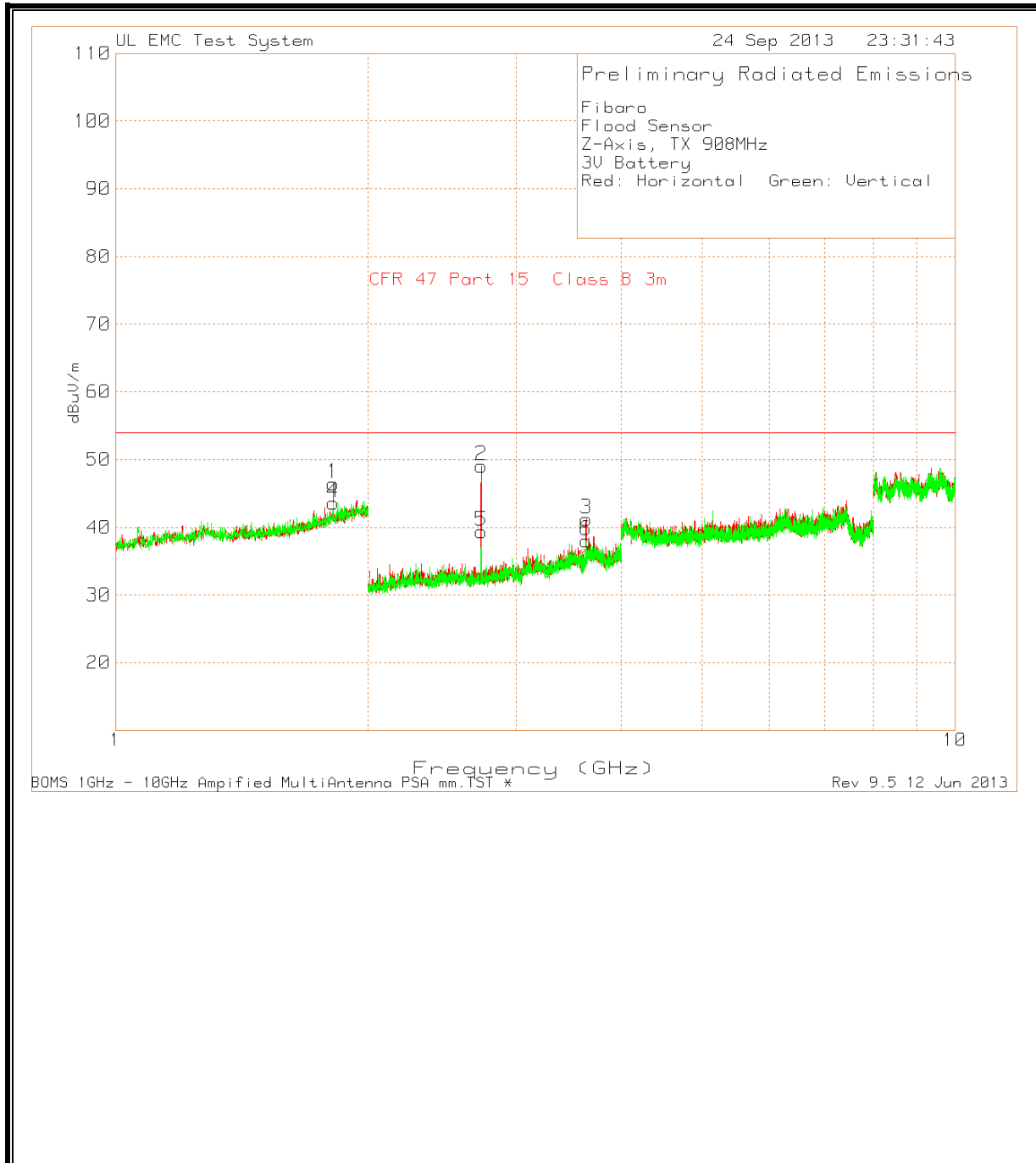
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490 .....	2400/F(kHz)	300
0.490-1.705 .....	24000/F(kHz)	30
1.705-30.0 .....	30	30
30-88 .....	100 **	3
88-216 .....	150 **	3
216-960 .....	200 **	3
Above 960 .....	500	3

\*\* 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**

Fibaro												
Model: Flood Sensor												
Y and Z Axis, Worst Case.												
Fundamental Measurements												
yellow power supply used for 12VDC												
3V Internal battery used on other												
Radiated Emission Data												
LogP Horizontal 200 - 1000MHz												
Test Frequency (MHz)	Meter Reading (dBuV)	Detector	UPA6109 SN1060 EMC4258 3M dB/m	3 meter with LogP Emissions Ca dB	Corrected Reading dB(uVolts/meter)	Fundamental Limit	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity	Notes	
908.3952	51.83	QP	23	10	84.83	94	-9.17	195	137	H	3	
908.3952	53.58	QP	23	10	86.58	94	-7.42	237	119	V	3	
908.3952	55.65	QP	23	10	88.65	94	-5.35	60	102	H	1	
908.3952	46.58	QP	23	10	79.58	94	-14.42	169	171	V	1	
Notes:												
1 - Z-Axis battery no wires												
3 - Y-Axis with 12VDC yellow power supply and wires connected												
QP - Quasi-Peak detector												

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

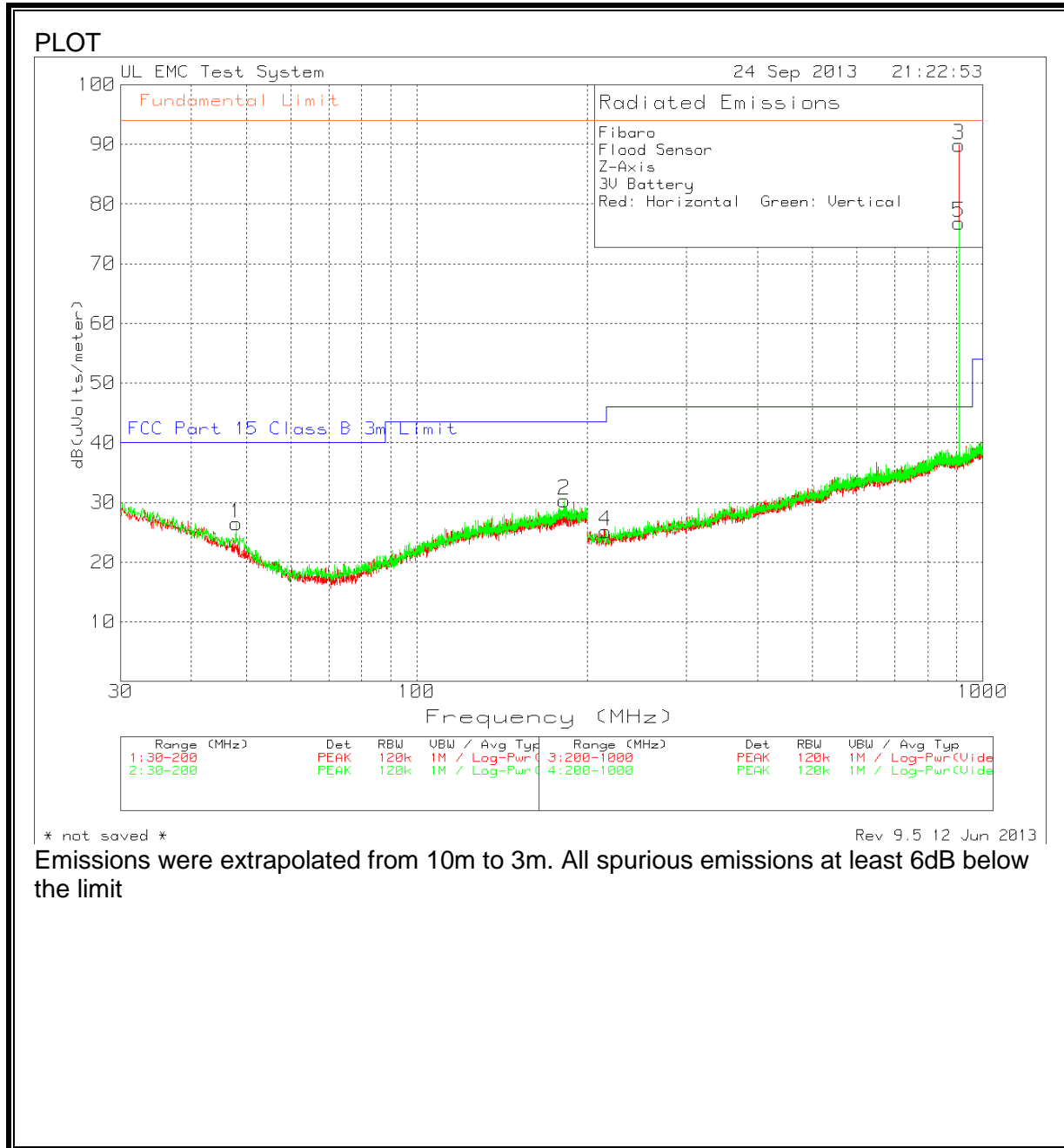




Fibaro											
Flood Sensor											
Z-Axis, TX 908MHz											
3V Battery											
Red: Horizontal Green: Vertical											
	Test Frequency (GHz)	Meter Reading (dBuV)	Detector	Antenna Factor dB/m	BOMS Factor (dB)	Corrected Reading dBuV/m	CFR 47 Part 15 Class B 3m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity
1	1.817	15.6	PK	26.9	3.98	46.48	54	-7.52	0-360	100	H
2	2.725	77.68	PK	22.1	-50.66	49.12	54	-4.88	0-360	99	H
3	3.634	67.62	PK	23.3	-49.72	41.2	54	-12.8	0-360	99	H
4	1.817	12.75	PK	26.9	3.98	43.63	54	-10.37	0-360	100	V
5	2.725	67.99	PK	22.1	-50.66	39.43	54	-14.57	0-360	149	V
6	3.633	64.48	PK	23.3	-49.75	38.03	54	-15.97	0-360	149	V
Test Frequency (GHz)	Meter Reading (dBuV)	Detector	EMCO316 1-02 S/N 99061052 3m UL	BOMS Factor (dB)	Corrected Reading dBuV/m	CFR 47 Part 15 Class B 3m	Margin (dB)	Azimuth [Degs]	Height [cm]	Polarity	
2.7251	78.41	PK	22.1	-50.66	49.85	54	-4.15	26	112	H	
2.7252	77.14	LnAv	22.1	-50.66	48.58	54	-5.42	26	112	H	
PK - Peak detector											
LnAv - Linear Average detector											

### 7.2.2. WORST-CASE BELOW 1 GHz

#### SPURIOUS EMISSIONS 30 TO 1000 MHz



## 8. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

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

Frequency of emission (MHz)	Conducted Limit (dB $\mu$ V)	
	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:

**WORST EMISSIONS**

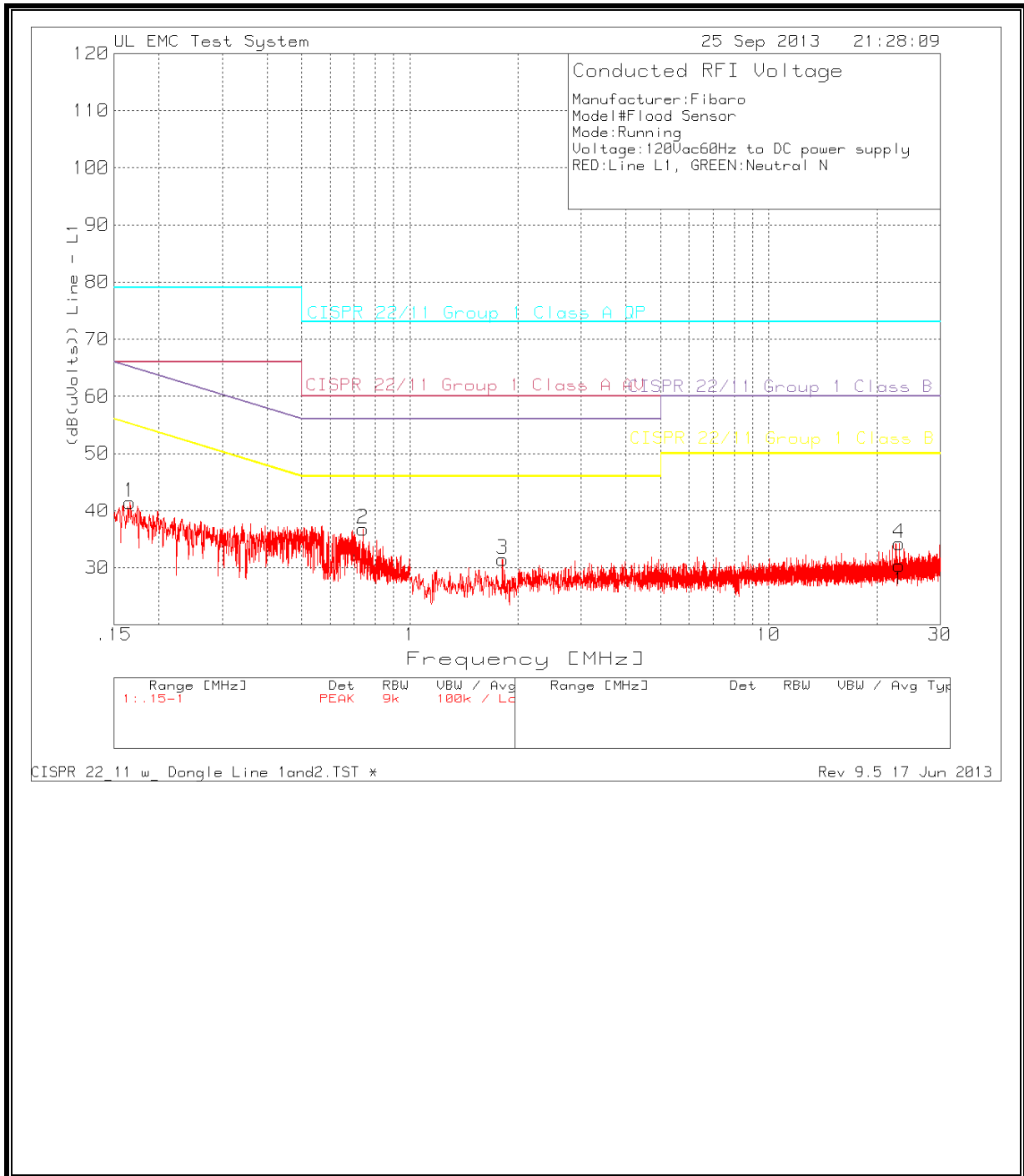
Manufacturer:Fibaro  
 Model#Flood Sensor  
 Mode:Running  
 Voltage:120Vac60Hz to DC power supply  
 RED:Line L1, GREEN:Neutral N

Trace Markers											
No.	Test Frequency [MHz]	Meter Reading	Transducer Factor [dB]	Gain/Loss Factor [dB]	Corrected Reading (dB(uVolts))	Limit:1	2	3	4	5	6
Line - L1 .15 - 1MHz -----											
1	.16614	27.91dBuV PK	.1	13.4	41.41	79	66	65.15	55.15	-	-
				Margin [dB]		-37.59	-24.59	-23.74	-13.74	-	-
2	.73946	26.13dBuV PK	.1	10.6	36.83	73	60	56	46	-	-
				Margin [dB]		-36.17	-23.17	-19.17	-9.17	-	-
Line - L1 1 - 30MHz -----											
3	1.81129	20.82dBuV PK	.1	10.6	31.52	73	60	56	46	-	-
				Margin [dB]		-41.48	-28.48	-24.48	-14.48	-	-
4	23.04246	22.51dBuV PK	.2	11.6	34.31	73	60	60	50	-	-
				Margin [dB]		-38.69	-25.69	-25.69	-15.69	-	-
Line - L2 .15 - 1MHz -----											
5	.16465	27.32dBuV PK	.1	13.5	40.92	79	66	65.23	55.23	-	-
				Margin [dB]		-38.08	-25.08	-24.31	-14.31	-	-
6	.62501	25.76dBuV PK	.1	10.6	36.46	73	60	56	46	-	-
				Margin [dB]		-36.54	-23.54	-19.54	-9.54	-	-
Line - L2 1 - 30MHz -----											
7	2.70226	21.7dBuV PK	.1	10.6	32.4	73	60	56	46	-	-
				Margin [dB]		-40.6	-27.6	-23.6	-13.6	-	-
8	21.65892	22.23dBuV PK	.4	11.5	34.13	73	60	60	50	-	-
				Margin [dB]		-38.87	-25.87	-25.87	-15.87	-	-

LIMIT 1: CISPR 22/11 Group 1 Class A QP  
 LIMIT 2: CISPR 22/11 Group 1 Class A AV  
 LIMIT 3: CISPR 22/11 Group 1 Class B QP  
 LIMIT 4: CISPR 22/11 Group 1 Class B AV  
 LIMIT 5: NONE  
 LIMIT 6: NONE

PK - Peak detector

**LINE 1 RESULTS**



**LINE 2 RESULTS**

