



**FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 6**

TEST REPORT

Report Number. : 12212365-E1V1

Applicant : RACHIO INC,
1321 15 ST.
DENVER, CO 80202, U.S.A.

FCC ID : 2AOTB-RFLOW
IC : 23555-RFLOW

EUT Description : WIRELESS FLOW METER

Test Standard(s) : FCC 47 CFR PART 15 SUBPART B
ICES-003 ISSUE 6

Date Of Issue:

April 20, 2018

Prepared by:

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
V1	04/20/18	Initial Issue	--

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RACHIO, INC.
1321 15 ST
DENVER, CO 80202, U.S.A.

EUT DESCRIPTION: WIRELESS FLOW METER

MODEL: RACHFLOW

SERIAL NUMBER: 001

DATE TESTED: APRIL 11, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR PART 15 SUBPART B	Complies
ICES-003 ISSUE 6	Complies

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

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

Approved & Released For
UL Verification Services Inc By:



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OPERATIONS LEADER
UL Verification Services Inc.

Prepared By:



Ray Li
EMC Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2014.

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 checked="" type="checkbox"/> Chamber A(IC: 2324B-1)	<input type="checkbox"/> Chamber D(IC: 22541-1)
<input type="checkbox"/> Chamber B(IC: 2324B-2)	<input type="checkbox"/> Chamber E(IC: 22541-2)
<input type="checkbox"/> Chamber C(IC: 2324B-3)	<input type="checkbox"/> Chamber F(IC: 22541-3)
	<input type="checkbox"/> Chamber G(IC: 22541-4)
	<input type="checkbox"/> Chamber H(IC: 22541-5)

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. Chambers A through C are covered under Industry Canada 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.

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 Wireless Flow Meter which is operating in frequency range 903.8-922.2MHz and powered by two AA batteries, 3VDC.

GENERAL INFORMATION

Highest frequency generated or used by the EUT	922.2 MHz
Power Requirements	3 VDC

5.2. TEST CONFIGURATIONS

The following configuration was tested:

EUT Configuration	Description
Typical	Standalone Powered by 2 AA batteries; 3Vdc

5.3. MODE(S) OF OPERATION

Mode	Description
Normal Mode	The EUT was set to Rx mode.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was 9.
The test utility software used during testing was Tera Term Ver 4.79.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

N/A

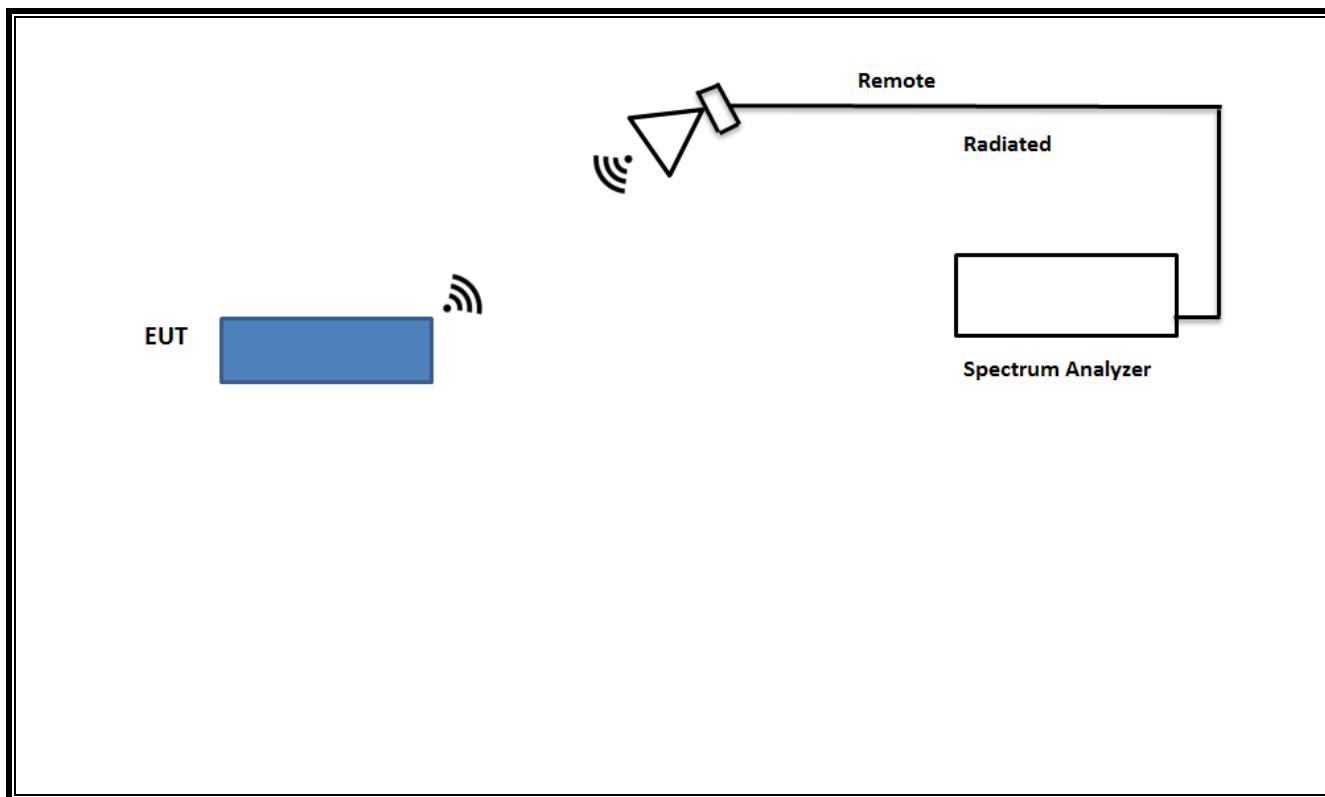
I/O CABLES

N/A

TEST SETUP

The EUT is a stand-alone unit and operating in the Receiver mode.

SETUP DIAGRAM



6. APPLICABLE EMISSIONS LIMITS AND TEST RESULTS

6.1. 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	T Number	Cal Date	Cal Due
Amplifier, 1 to 18 GHz	Miteq	AMF4D-01000800-30-29P	1573	04/03/2018	04/03/2019
Amplifier, 10KHz to 1GHz, 32dB	Agilent	8447D	15	08/14/2017	08/14/2018
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	862	06/09/2017	06/09/2018
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	130	10/16/2017	10/16/2018
PXA Spectrum Analyzer, 3Hz to 44GHz	Agilent	N9030A	906	02/16/2018	02/16/2019

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016

6.2. RADIATED EMISSIONS LIMITS AND RESULTS

LIMIT

FCC Part 15 Subpart B

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dB μ V/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

TEST PROCEDURE

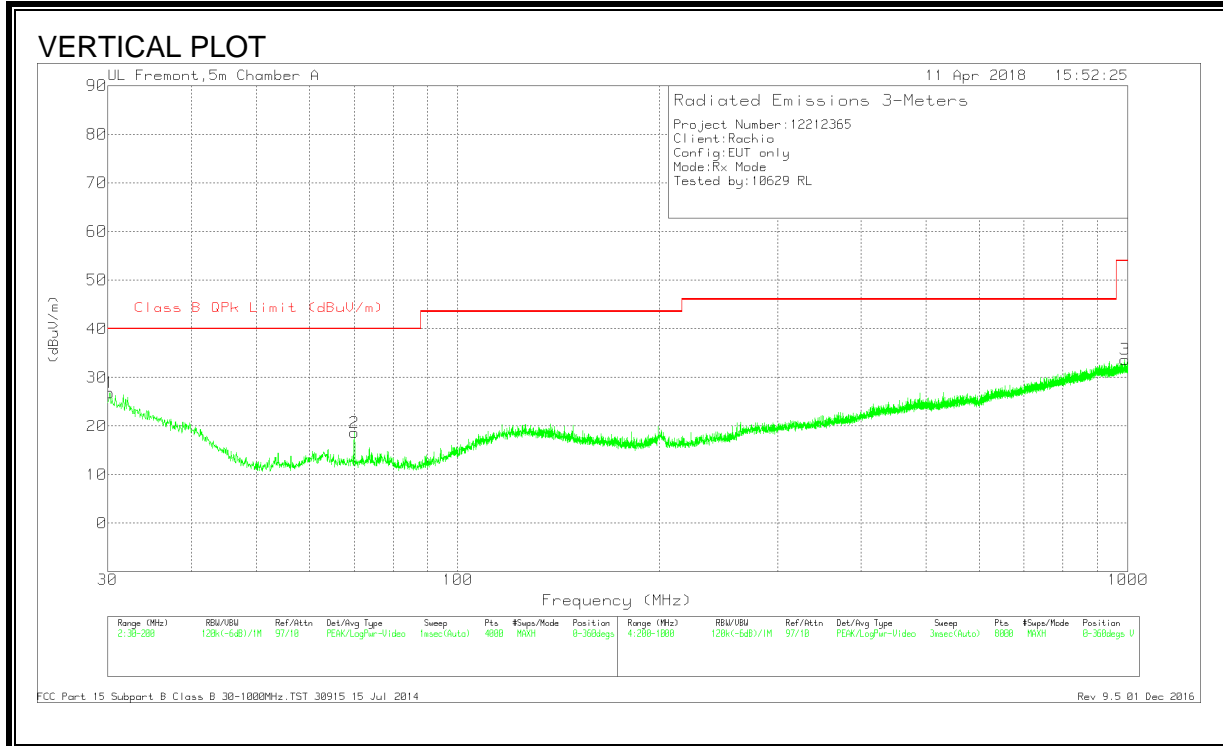
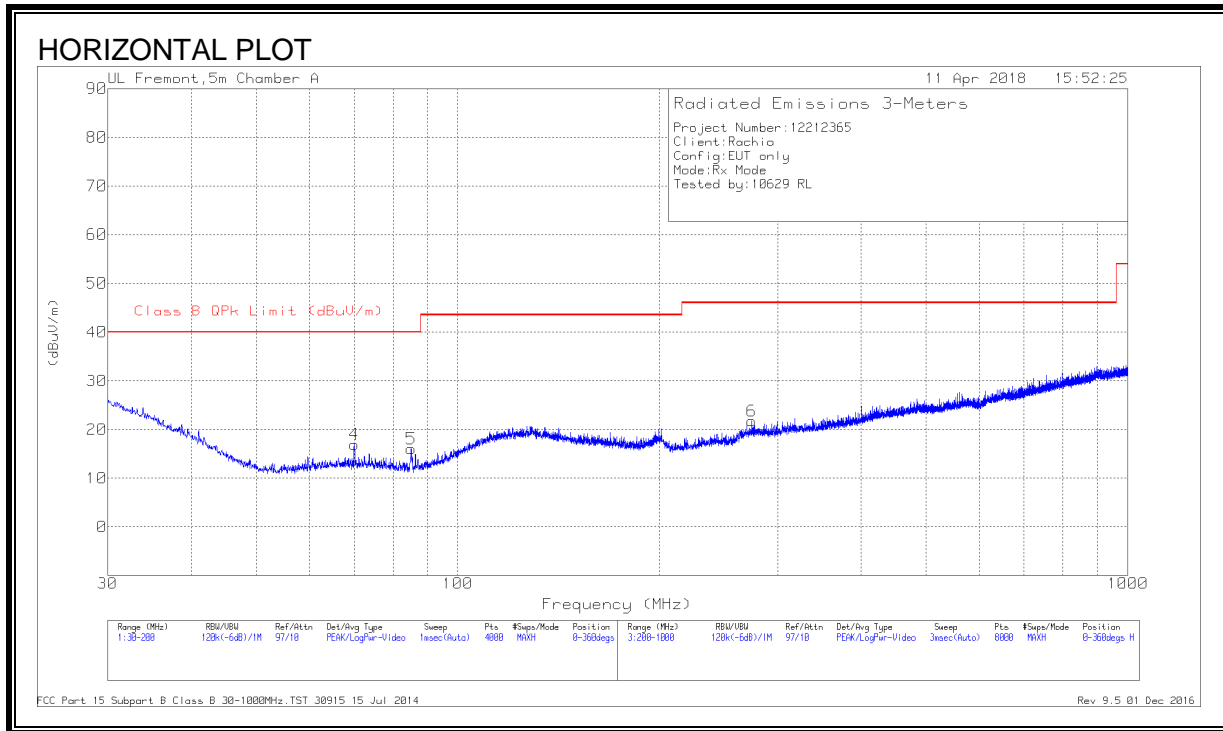
ANSI C63.4: 2014

The highest frequency generated or used in the EUT is 922.2MHz therefore the frequency range was investigated from 30 MHz to 5 GHz.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

RESULTS

6.2.1. RADIATED EMISSIONS 30 TO 1000 MHz



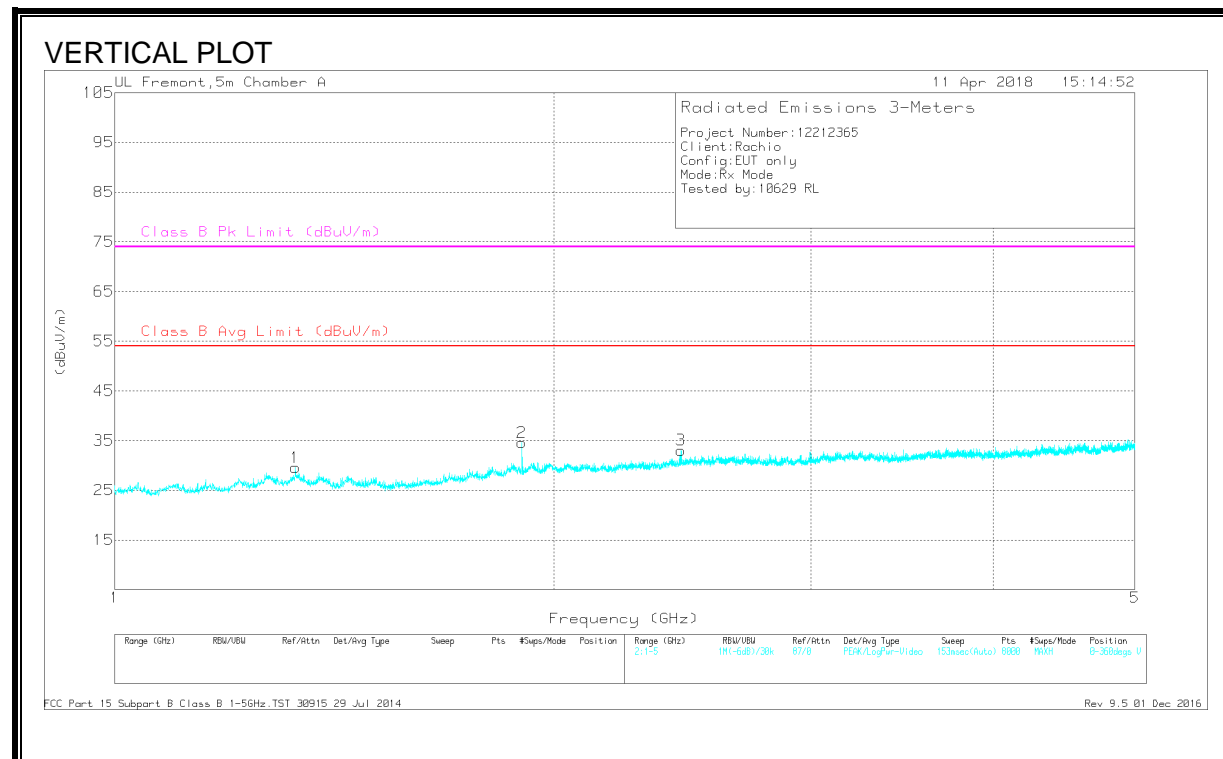
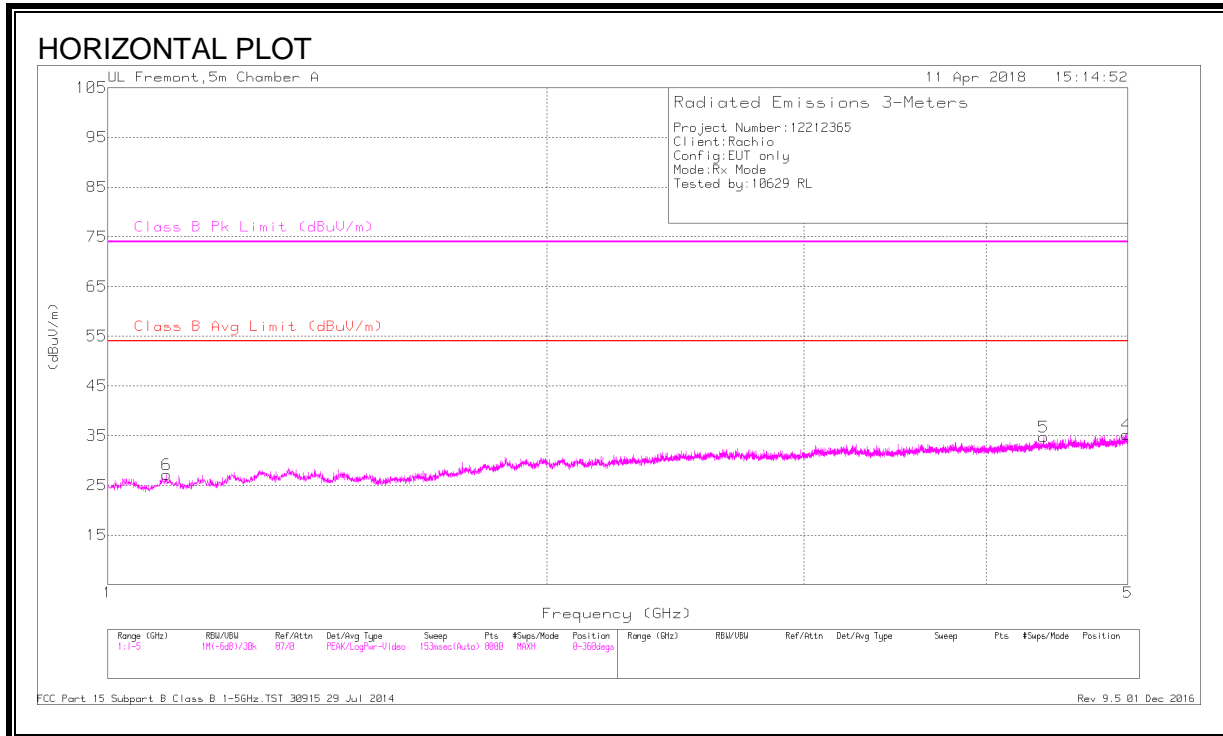
HORIZONTAL AND VERTICAL DATA

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.2126	29.04	Pk	25.1	-27.3	26.84	40	-13.16	0-360	100	V
4	70.0029	31.55	Pk	12.1	-26.7	16.95	40	-23.05	0-360	300	H
2	70.0454	33.23	Pk	12.1	-26.7	18.63	40	-21.37	0-360	100	V
5	85.158	31.37	Pk	11.3	-26.6	16.07	40	-23.93	0-360	400	H
6	274.3097	29.17	Pk	17.3	-24.7	21.77	46.02	-24.25	0-360	300	H
3	990.3027	29.2	Pk	27.1	-22.6	33.7	53.97	-20.27	0-360	101	V

Pk - Peak detector

6.2.2. RADIATED EMISSIONS ABOVE 1GHZ



HORIZONTAL AND VERTICAL DATA

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6	1.096	40.66	Pk	27.7	-32.3	36.06	-	-17.94	74	-37.94	91	227	H
	1.096	26.76	Av	27.7	-32.3	22.16	54	-31.84	-	-	91	227	H
1	1.331	39.47	Pk	29.5	-32	36.97	-	-17.03	74	-37.03	268	214	V
	1.331	26.5	Av	29.5	-32	24	54	-30	-	-	268	214	V
2	1.9	38.03	Pk	31	-31.3	37.73	-	-16.27	74	-36.27	139	172	V
	1.9	25.06	Av	31	-31.3	24.76	54	-29.24	-	-	139	172	V
3	2.444	39.29	Pk	32.1	-30.5	40.89	-	-13.11	74	-33.11	158	239	V
	2.444	25.07	Av	32.1	-30.5	26.67	54	-27.33	-	-	158	239	V
5	4.38	36.52	Pk	33.7	-27.8	42.42	-	-11.58	74	-31.58	228	182	H
	4.38	23.22	Av	33.7	-27.8	29.12	54	-24.88	-	-	228	182	H
4	4.991	36.57	Pk	34.3	-27.7	43.17	-	-10.83	74	-30.83	316	148	H
	4.991	23.61	Av	34.3	-27.7	30.21	54	-23.79	-	-	316	148	H

Pk - Peak detector
 Av - Average detection