REGULATORY COMPLIANCE REPORT

TITLE: FCC & IC Test Report; external antenna accessory out of a pit. 915MHz
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REV	CCO	DESCRIPTION OF CHANGE	DATE	APPROVALS	
001		INITIAL RELEASE		Engineering	
				Regulatory	

REVISION HISTORY

				Engineering	
				Engineering	
				Engineering	

Summary

Test Data Summary

External Antenna Accessory

FCC 15.247 / IC RSS-210
Spread Spectrum Transmitter, 910 – 920 MHz

FCC ID: EO960W IC:864D-60W

Device Model:
60W – Water Endpoint

Model Numbers:
MSE-0771-001

Serial Numbers:
Accessory has no Serial Number
60W, ERW-0771-201, used w/antenna: 57820447

OATS Registration Number: FCC 90716, IC 5615

Rule	Description	Max. Reading	Pass/Fail
Part 15.247(d) / RSS-210 A8.5	Spurious Emissions - Radiated	37.63dbc @ 6438.6 Mhz	Pass
Parts 15.205 & 15.209 / RSS-210 2.2, 2.6 Tables 1 & 2	Restricted Bands / Spurious Emissions - Radiated	46.50dbuV/m @ 4575Mhz	Pass
RSS-210 Gen 7.2.3	Receiver Spurious Emissions	emissions below noise floor of 19.9uV/m	Pass

Rule versions: *CC Part 1 (01-2006), FCC Part 2 (01-2006), FCC Part 15 (02-01-2006), RSS-102 (11-2005), RSS-210 Issue 7 (June 2007), RSS-Gen Issue 1 (09-2005).*
Reference docs: *ANSI C63.4-2003, DA 00-705 (03-30-2000), OET65 (08-1997), OET65C (06-2001), IEEE C95.3-2002.*

Cognizant Personnel

Name	Title
Roger Mulcahy	Test Technician
Jay Holcomb	Regulatory Manager
Steve Ivanca	Project Lead

15.247(d) / RSS-210 A8.5

Spurious Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits specified in Section 15.209 is not required.

Follow the procedure outlined in Annex A of this document.

Equipment Used	Serial Number	Cal Date	Due Date
AH systems preamplifier model number PAM 0126	135	12/8/2007	12/8/2008
EMCO 6502 Loop (9kHz to 30Mhz)	9509-2970	10/15/2008	10/15/2010
Emco 3110B Biconical (30MHz-to 300MHz)	9807-3129	10/04/2007	10/04/2009
Emco 3146 Log Periodic (200Mhz to 1GHz)	9203-3358	10/03/2007	10/03/2009
EMCO 3115 wave guide (1GHz-18GHz)	9205-3878	03/17/2008	03/17/2010
Huber&Suhner Sucoflex 40ft cable	220297001	12/03/2007	12/03/2009
Agilent E7405A EMC spectrum analyzer	MY45113415	08/07/2007	08/07/2009
Lindgren DB-4 Dipole (400Mhz-1GHz)	78573	09/02/2006	09/02/2008

Date	Tested by	Temperature/humidity
6/05/2008, 6/11/2008, 10/22/2008	Roger Mulcahy	19C / 66%

Frequency range investigated was 9 kHz to 9.2GHz.

Freq. MHz	Ant. Pos.	Level dBm	Level dBuV	Amplifier Gain dB	Ant. Factor dB	Cable Loss dB	**Peak Corrected Level dBuV/m**	emissions dBc
910	Vertical	-29.04	77.96	**0**	27.78	2.62	108.36	
910	Horizontal	-34.02	72.98	**0**	27.78	2.62	103.38	
915	Vertical	-28.23	78.77	**0**	27.82	2.63	109.22	
915	Horizontal	-33.76	73.24	**0**	27.82	2.63	103.69	
919.8	Vertical	-27.94	79.06	**0**	27.86	2.63	109.55	
919.8	Horizontal	-34.12	72.88	**0**	27.86	2.63	103.37	
6370	Vertical	-40.35	66.65	**36.63**	34.47	7.28	71.77	-37.78
6370	Horizontal	-42.02	64.98	**36.63**	34.47	7.28	70.1	-39.45
6405	Vertical	-40.33	66.67	**36.6**	34.48	7.3	71.85	-37.70
6405	Horizontal	-42.23	64.77	**36.6**	34.48	7.3	69.95	-39.60
6438.6	Vertical	-40.31	66.69	**36.58**	34.49	7.32	71.92	-37.63
6438.6	Horizontal	-42.43	64.57	**36.58**	34.49	7.32	69.8	-39.75

15.205, 15.209 / RSS-210 2.2, 2.6

Restricted Bands & Spurious Emissions

Only spurious emissions are permitted in any of the frequency bands listed below. The limits stated in 15.209 shall apply. Spurious emissions outside these bands shall also comply with the 15.209(a) limits.

Measure the field strength of all transmitter spurious emissions in the restricted bands listed below. Follow the procedure outlined in Annex A of this document.

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505 1	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

Equipment Used	Serial Number	Cal Date	Due Date
AH systems preamplifer model number PAM 0126	135	12/8/2007	12/8/2008
EMCO 6502 Loop (9kHz to 30Mhz)	9509-2970	10/15/2008	10/15/2010
Emco 3110B Biconical (30MHz-to 300MHz)	9807-3129	10/04/2007	10/04/2009
Emco 3146 Log Periodic (200Mhz to 1GHz)	9203-3358	10/03/2007	10/03/2009
Emco 3115 wave guide (1GHz to 18GHz)	9205-3878	03/17/2008	03/17/2010
Huber&Suhner Sucoflex 40ft cable	220297001	12/03/2007	12/03/2009
Agilent E7405A EMC specturm analyzer	MY45113415	08/07/2007	08/07/2009

Date	Tested by	Temperature/humidity
6/05/2008, 6/07/2008, 10/22/2008	Roger Mulcahy	19C / 66%

. A Duty Cycle Correction Factor (20log(dwell time/100mS)) was applied to show compliance to the 15.209 limit.

$$20\log\left(\frac{5.925mS}{100mS}\right) = -24.55dB$$

The maximum allowed correction factor is 20 dB.

Freq.	Ant.	Peak Level	Peak Level	Amplifier Gain	Ant. Factor	Cable Loss	Duty Cycle Correction	Average Corrected Level	Limit	Margin
MHz	Pos.	dBm	dBuV	dB	dB	dB	dB	dBuV/m	dBuV/m	dB
4550	Vertical	-43.39	63.61	36.28	32.29	6.09	20	45.71	54	8.29
4550	Horizontal	-42.84	64.16	36.28	32.29	6.09	20	46.26	54	7.74
4575	Vertical	-43.62	63.38	36.3	32.33	6.11	20	45.52	54	8.48
4575	Horizontal	-42.64	64.36	36.3	32.33	6.11	20	46.5	54	7.5
4599	Vertical	-44.11	62.89	36.31	32.38	6.13	20	45.09	54	8.91
4599	Horizontal	-43.04	63.96	36.31	32.38	6.13	20	46.16	54	7.84

RSS-Gen 7.2.3 Receiver Spurious Emission Limits

7.2.3.2 Radiated Measurement

All spurious emissions shall comply with the limits of Table 1.

Receiver Spurious Emissions

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate. Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions. Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port. If the receiver is super-regenerative, stabilize it by coupling to it an un-modulated carrier on the receiver frequency (antenna conducted measurement) or by transmitting an un-modulated carrier on the receiver frequency from an antenna in the proximity of the receiver (radiated measurement). Taking care not to overload the receiver, vary the amplitude and frequency of the stabilizing signal to obtain the highest level of the spurious emissions from the receiver. For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

Receiver Spurious Emission Standard

The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1b. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for spurious emission measurements below 1.0 GHz, and 1.0 MHz for measurements above 1.0 GHz.

Table 1a - Spurious Emission Limits for Receivers

Equipment Used	Serial Number	Cal Date	Due
Spectrum Analyzer	MY45113415	7-Aug-07	7-Aug-09
Huber&Suhner 18 inch. Sma to Sma	220060 002	3-Dec-07	3-Dec-09
Huber&Suhner 40 foot cable	220297 001	3-Dec-07	3-Dec-09
AH systems preamplifer model number PAM 0126	135	12/8/2007	12/8/2008
Hewlett Packard 8593E Spectrum Analyzer	3543A02032	2-Oct-07	2-Oct-08
Emco 3110B Biconical (30MHz-to 300MHz)	9807-3129	04oct07	04oct09
Emco 3146 Log Periodic (200Mhz to 1GHz)	9203-3358	03oct07	03oct09
Emco 3115 double ridge waveguide (1Ghz - 18GHz)	9205-3878	17mar08	17mar10
Andrew Heliax length 10 Ft. dia.1/2 inch (pre scan for OATS testing)	FSJ4-50B	N/A	N/A

Date	Temp/Humidity ºF / %	Tested by
7/10/2008	78/67	Roger Mulcahy

Frequency range investigated was 30MHz to 9.2 GHz. Emissions from the Receiver were below the noise floor.

Table 1b

Spurious Frequency (MHz)	dvuV/m	Field Strength (microvolt/m at 3 meters)
Noise floor	26	19.953
30-88	40	100
88-216	43.5	150
216-960	46	200
Above 960	53.9	500

ANNEX A

Field Strength Measurement Procedure

This test measures the field strength of radiated emissions using a spectrum analyzer and a receiving antenna in accordance with ANSI C63.4-2003. During the test, the EUT is to be placed on a non-conducting support at 80 cm above the horizontal ground plane of the OATS. The horizontal distance between the antenna and the EUT is to be exactly 3 meters. Levels below 1 GHz are to be measured with the spectrum analyzer resolution bandwidth at 120 kHz and levels at or above 1 GHz are to be measured with the spectrum analyzer resolution bandwidth at 1 MHz.

1) The antenna correction factor, preamplifier gain (if the preamplifier is installed), and cable loss are stored in tables in the EMC analyzer and the level at the analyzer is the corrected level in dbuV/m.
2) Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.
3) If appropriate, manipulate the system cables to produce the highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
4) Rotate the EUT 360° to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat step 3). Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
5) Move the antenna over its fully allowed range of travel to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to step 3) with the antenna fixed at this height. Otherwise, move the antenna to the height that repeats the highest amplitude observation and proceed.
6) Change the polarity of the antenna and repeat step 3), step 4), and step 5). Compare the resulting suspected highest amplitude signal with that found for the other polarity. Select and note the higher of the two signals.
7) The final maximized level displayed on the EMC analyzer is the field strength.