

FCC Part 15 Subpart B and C Compliance Test Report

Applicant Name: J.S. Foster Corporation

Product Name: Active Beacon

Model No.: AB400

FCC ID: RCV-AB400

Date of Test Report: August 27, 2003

Date of Test completion: August 26, 2003

Report Version: 1.1

Approvals		
Approved By	 Robert Stirling P.Eng	 Date

Report Revision		
Rev. #	Report Change	Date
1.1	Power Adjusted for 916 MHz	08/27/03

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1.0 General Information

1.1 EUT Description

Product Name	: Active Beacon
FCC ID	: RCV-AB400
Model No.	: AB400
Frequency Range	: 418 MHz, 916 MHz
Type of modulation	: OOK
Antenna Type	: Permanent 1/4 Wave whip antenna for each frequency
Antenna Gain	: +3dBi for both antennas
Product Software	: CWSD ver. 1.0.0
Power Adapter	: N/A Battery and Solar Panel Powered

1.2 Operational Description

These tests were performed with a modified unit. The unit was set to transmit constantly for the duration of the tests.

1.3 Test Facilities

Protocol EMC
28945 McTavish Rd.
Abbotsford B.C., Canada, V4X 2E7

Phone: 604-607-0012
Fax: 604-607-0019

FCC Registration Number 96437
Industry Canada Registration Number IC3384

1.4 Test System Details

The EUT does not require any auxiliary equipment for the testing.

1.5 EUT Modifications

There were no modifications required for this unit to comply with FCC Part 15 Subpart B and C.

1.6 EUT Testing Configuration

The EUT was in its normal operating mode for the duration of the testing.

1.7 Test Results

The Active Beacon complies with FCC Part 15 Subpart C.



2.0 Peak Radiated Output Power

2.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

2.2 Test Setup

The EUT's was placed in an open area test site and the fundamental of each frequency was maximized and measured to get the peak radiated power.

2.3 Limits

The peak power should be less than 80.3 dB μ V/m for 418 MHz and 82.0 dB μ V/m for 915 MHz.

2.4 Test Standard

FCC CFR47, Part 15, Subpart B

2.5 Test Results

Product : Active Beacon
Test Item : Peak Radiated Output Power
Test Site : Protocol EMC
Test Mode : 418 MHz

Frequency (MHz)	Measurement	Required Limit	Result
418.0	76.0 dB μ V/m	80.3 dB μ V/m	-4.3

2.6 Test Results

Product : Active Beacon
Test Item : Peak Radiated Output Power
Test Site : Protocol EMC
Test Mode : 916 MHz

Frequency (MHz)	Measurement	Required Limit	Result
916.5	78.7 dB μ V/m	81.9 dB μ V/m	-3.2

3.0 Radiated Emissions

3.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

3.2 Test Setup

The EUT was placed in receive mode for the duration of the test. The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

3.3 Test Standard

FCC Part 15 Subpart C Section 15.209 Radiated emission limits.

3.4 Limits

Frequency (MHz)	Maximum Field Strength $\mu\text{V/m}$ at 3m	Maximum Field Strength $\text{dB}\mu\text{V/m}$ at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

3.5 Test Result

Product : Active Beacon
Test Item : Radiated Emissions
Test Site : Protocol EMC
Test Mode : Standby mode

Frequency (MHz)	Pol	Height (m)	Angle (deg)	Un Corr Pk (dB)	Tot Corr (dB)	Peak (dBuV/m)	DelLim-Pk FCC (dB)
40.788832	Vert	1.2	15	24.00	4.88	28.81	-11.19
40.844971	Vert	1.2	15	24.70	4.89	29.59	-10.41
40.897025	Vert	1.2	15	24.80	4.89	29.69	-10.31
67.232119	Vert	1.5	5	19.70	9.10	28.80	-11.20
67.274809	Vert	1.5	5	19.70	9.10	28.80	-11.20
108.977945	Vert	1.0	5	19.20	10.25	29.45	-14.05
109.604783	Vert	1.0	5	19.70	10.19	29.89	-13.61
113.075084	Vert	1.0	5	17.60	9.98	27.58	-15.92
113.750266	Vert	1.0	5	18.40	9.94	28.34	-15.16
121.556473	Vert	1.0	5	10.20	9.62	19.82	-23.68
125.972702	Vert	1.0	5	12.60	9.69	22.29	-21.21

4.0 Radiated Harmonic and Spurious Emissions

4.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/03
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

4.2 Test Setup

The EUT was placed in NORMAL transmit mode for the duration of the test. The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization.

4.3 Test Standard

FCC CFR47, Part 15, Subpart C

4.4 Limits

Fundamental Limit = 418.0= 80.3 dB μ V/m
916.5= 81.9 dB μ V/m

Harmonics and Spurious Emissions = 20 dBc

Restricted Band Emissions = AVG 54 dB μ V/m

4.5 Test Result for 418 MHz Signal

Product : Active Beacon
 Test Item : Harmonic Emissions
 Test Site : Protocol EMC
 Test Mode : 418 MHz Transmit Mode

Harmonic	Frequency (MHz)	Polarity	Uncor Pk (dBμV)	Tot Corr (dB)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Delta Limit (dB)	dBc
1 st	418.0	Horz	57.0	19.0	76.0	80.3	-4.3	-
2 nd	836.0	Vert	10.6	27.0	37.6	56.0	-18.4	-38.4
3 rd	1254.0	Vert	7.5	32.1	39.6	56.0	-16.4	-36.4
4 th	1672.0	Vert	8.6	35.7	44.3	54.0	-9.7	-31.7
5 th	2090.0	Horz	36.3	9.2	45.5	56.0	-10.5	-30.5
6 th	2508.0	Horz	32.6	13.3	45.9	56.0	-10.1	-30.1
7 th	2927.0	Vert	31.5	13.1	44.6	56.0	-11.4	-31.4
8 th	3345.0	Horz	30.8	16.1	46.9	56.0	-9.1	-29.1
9 th	3763.0	Horz	29.9	19.2	49.1	54.0	-4.9	-26.9
10 th	4181.0	Horz	29.1	10.3	39.4	54.0	-14.6	-36.6

Note:

1 Receiver Settings (Peak Detector) RBW: 1 MHz VBW: 1 MHz

4.6 Test Result for 916 MHz Signal

Product : Active Beacon
 Test Item : Harmonic Emissions
 Test Site : Protocol EMC
 Test Mode : 916 MHz Transmit Mode

Harmonic	Frequency (MHz)	Polarity	Uncor Pk (dBμV)	Tot Corr (dB)	Peak (dBμV/m)	Peak Limit (dBμV/m)	Delta Limit (dB)	dBc
1 st	916.5	Vert	50.4	28.3	78.7	81.9	-3.2	-
2 nd	1833.0	Vert	16.8	37.1	53.9	58.7	-4.8	-24.8
3 rd	2749.5	Horz	33.9	9.7	43.6	74.0	-30.4	-35.1
4 th	3666.0	Horz	30.2	15.5	45.7	74.0	-28.3	-33.0
5 th	4582.5	Horz	28.9	21.6	50.5	74.0	-23.5	-28.2
6 th	5499.0	Vert	26.6	28.1	54.7	58.7	-4.0	-24.0
7 th	6415.5	Vert	30.6	27.4	58.0	58.7	-0.7	-20.7
8 th	7332.0	Vert	32.8	29.2	62.0	74.0	-12	-16.7
9 th	8248.5	Vert	31.8	31.9	63.7	74.0	-10.3	-15.0
10 th	9165.0	Vert	30.6	36.0	66.6	74.0	-7.4	-12.1

Note:

1 Receiver Settings (Peak Detector) RBW: 1 MHz VBW: 1 MHz
 2 Receiver Settings (Average Detector) RBW: 1 MHz VBW: 30 Hz

4.7 Test Result for 916 MHz Signal (Averaged signals for harmonics)

Harmonic	Frequency (MHz)	Polarity	Uncor Average (dBμV)	Tot Corr (dB)	Average (dBμV/m)	Limit (dBμV/m)	Delta Limit (dB)	dBc
8 th	7332.0	Horz	19.6	29.2	48.8	58.7	-9.9	-29.9
9 th	8248.5	Vert	18.6	31.9	50.5	58.7	-8.2	-28.2
10 th	9165.0	Horz	17.8	35.8	53.6	58.7	-5.1	-25.1

4.8 Test Result for 916 MHz Signal (Averaged signals in restricted band)

Harmonic	Frequency (MHz)	Polarity	Uncor Average (dBμV)	Tot Corr (dB)	Average (dBμV/m)	Average Limit (dBμV/m)	Delta Limit (dB)
8 th	7332.0	Horz	19.6	29.2	48.8	54.0	-5.2
9 th	8248.5	Vert	18.6	31.9	50.5	54.0	-3.5
10 th	9165.0	Horz	17.8	35.8	53.6	54.0	-0.4

5.0 Occupied Bandwidth

5.1 Test Equipment

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Microwave Amplifier	HP8349A	2512A00824	09/13/02	09/13/03
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

5.2 Test Setup

The EUT was placed in NORMAL transmit mode for the duration of the test. The EUT was rotated 360 degrees to determine the worst case angle for the maximum emissions level. The antenna was raised and lowered from 1 m to 4 m to find the maximum emissions level. Both horizontal and vertical antenna polarization were tested to find the worst case polarization. This test was performed at a distance of 3 m from the EUT to the measurement antenna.

5.3 Test Standard

FCC CFR47, Part 15, Subpart C

5.4 Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz, above 900 MHz the requirement is 0.5%. Bandwidth is determined at the points 20dB down from the modulated carrier. (FCC Part 15.231)

Calculation of 20dB Bandwidth and Result

The 20dB bandwidth limit = $0.0025 \times 418.0 \text{ MHz} = 1.045 \text{ MHz}$

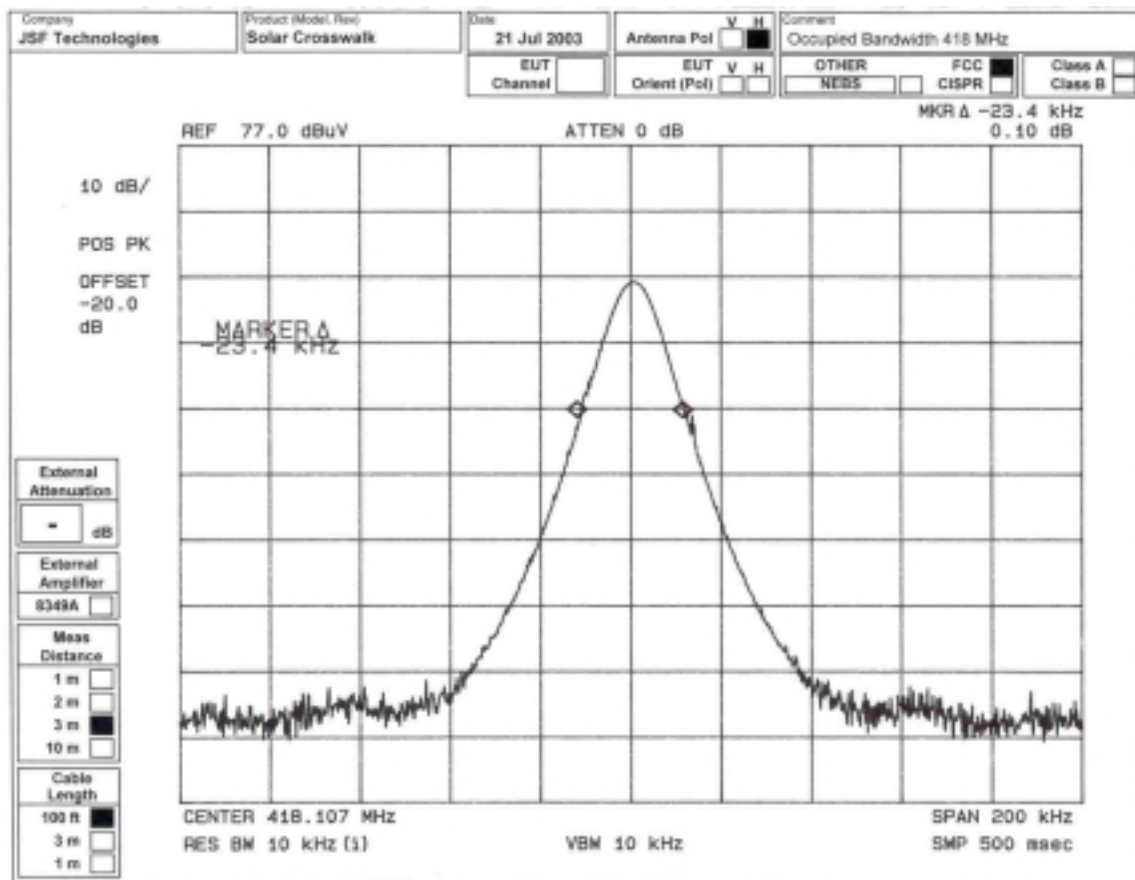
The 20dB bandwidth limit = $0.005 \times 916.5 \text{ MHz} = 4.58 \text{ MHz}$

5.5 Test Result 418 Channel

Product : Active Beacon
 Test Item : Occupied Bandwidth
 Test Site : Protocol EMC
 Test Mode : Transmit Mode

Frequency MHz	Measurement Level	Limit kHz	Result
418.0	23.4 kHz	1045.0	Pass

5.5.1 418 Channel Occupied Bandwidth Plot

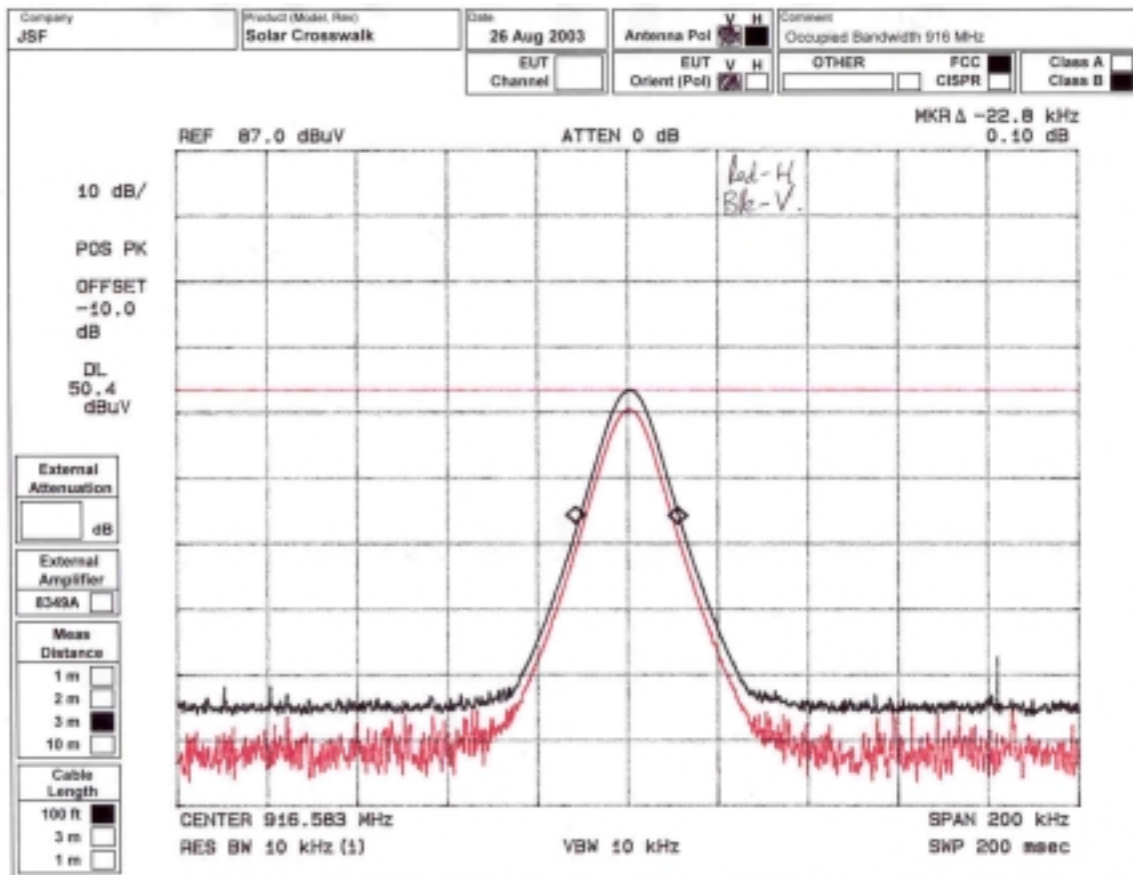


5.6 Test Result 916 Channel

Product : Active Beacon
 Test Item : Occupied Bandwidth
 Test Site : Protocol EMC
 Test Mode : Transmit Mode

Frequency MHz	Measurement Level	Limit kHz	Result
916.5	22.8 kHz	4580.0	Pass

5.6.1 916 Channel Occupied Bandwidth Plot



6.0 Test Photos

The Test photos are in an attached document.