



**L.S. Compliance, Inc.**

W66 N220 Commerce Court  
Cedarburg, WI 53012  
262-375-4400 Fax: 262-375-4248

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**Compliance Testing of the  
Johnson Outdoors' "Co-Pilot" Transmitter**

**Prepared For:**

Johnson Outdoors, Inc.  
Attn.: Mr. Paul Salmon  
1531 E. Madison Avenue  
Mankato, MN 56002-8129

**Test Report Number:**

302371 TX

**Test Date:**

October 11<sup>th</sup>, 2002

*All results of this report relate only to the items that were tested. This report may not be reproduced, except in full, without written approval of L.S. Compliance, Inc.*

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## 1. L.S. Compliance in Review

L. S. Compliance, Inc. is located in Cedarburg, Wisconsin – United States.

We may be contacted by:

Mail: L. S. Compliance, Inc.  
W66 N220 Commerce Court  
Cedarburg, Wisconsin 53102

Phone: 262-375-4400  
Fax: 262-375-4248  
E-Mail: [eng@lsr.com](mailto:eng@lsr.com)

As an EMC testing laboratory, our accreditation and assessments are recognized through the following:

### **A2LA – American Association for Laboratory Accreditation**

Accreditation based on ISO/IEC 17025: 2001

With electrical (EMC) Scope of Accreditation

A2LA Certificate Number: **1255.01**

### **U.S. Conformity Assessment Body (CAB) Validation**

Validated by the European Commission as a U.S. conformity assessment Body operating under the U.S./EU, Mutual Recognition Agreement (MRA) operating under the European Union EMC Directive 89/336/EEC, Article 10.2

Date of Validation: **January 16, 2001**

### **Federal Communications Commission (FCC) – USA**

Listing of 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948

FCC Registration Number: **90756**

Listing of 3 and 10 Meter OATS based on 47CFR 2.948

FCC Registration Number: **90757**

### **Industry Canada**

On-file, 3 Meter Semi-Anechoic Chamber based on 47CFR 2.948

File Number: **IC 3088**

On-file 3 and 10 meter OATS based on RSS-210




File Number: **IC 3088-A**

## 2. A2LA Certificate of Accreditation








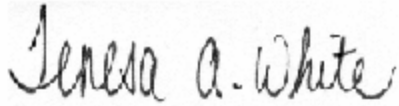
### 3. A2LA Scope of Accreditation

		<b>American Association for Laboratory Accreditation</b>	
<p style="text-align: center;"><u>SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999</u></p>			
<p style="text-align: center;">L.S. COMPLIANCE, INC. W66 N220 Commerce Court Cedarburg, WI 53012 James Blaha Phone: 262 375 4400</p>			
<p style="text-align: center;"><b>ELECTRICAL (EMC)</b></p>			
Valid to: January 31, 2003		Certificate Number: 1255-01	
In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:			
<u>Test</u>	<u>Test Method(s)</u>		
Conducted Emissions Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438		
Radiated Emissions	Code of Federal Regulations (CFR) 47, FCC Method Parts 15 and 18 using ANSI C63.4; EN: 55011, 55022, 55081-1, 55081-2; CISPR: 11, 22; CNS 13438		
Conducted Immunity Fast Transients/Burst	IEC: 1000-4-4, 801-4; EN: 61000-4-4, 50082-1, 50082-2		
Surge	IEC: 1000-4-5, 801-5; ENV 50142; EN: 61000-4-5, 50082-1, 50082-2		
RF Fields	IEC: 1000-4-6, 801-6; ENV 50141; EN: 61000-4-6, 50082-1, 50082-2		
Voltage Dips/Interruptions	IEC 1000-4-11; EN: 61000-4-11, 50082-1, 50082-2		
Radiated Immunity RF Fields	IEC: 801-3, 1000-4-3; ENV 50140; EN: 61000-4-3, 50082-1, 50082-2		
RF Fields (50 Hz)	IEC 1000-4-8; EN 61000-4-8		
RF Fields (Pulse Mode)	EN: 50082-1, 50082-2; ENV 50204		
Electrostatic Discharge (ESD)	IEC: 1000-4-2, 801-2; BSEN 60801-2; EN: 61000-4-2, 50082-1, 50082-2		
(A2LA Cert. No. 1255.01) 06/26/01			
5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644-3248 • Fax: 301-662 2974		Page 1 of 1 	

#### 4. Validation Letter – U.S. Competent Body for EMC Directive 89/336/EEC

 1901-2001 NIST CENTENNIAL	 DEPARTMENT OF COMMERCE UNITED STATES OF AMERICA	<b>UNITED STATES DEPARTMENT OF COMMERCE</b> National Institute of Standards and Technology Gaithersburg, Maryland 20899-
January 16, 2001		
Mr. James J. Blaha L.S. Compliance Inc. W66 N220 Commerce Court Cedarburg, WI 53012-2636		
Dear Mr. Blaha:		
I am pleased to inform you that the European Commission has validated your organization's nomination as a U.S. Conformity Assessment Body (CAB) for the following checked (✓) sectoral annex(es) of the U.S.-EU Mutual Recognition Agreement (MRA).		
<input checked="" type="checkbox"/> Electromagnetic Compatibility-Council Directive 89/336/EEC, Article 10(2) <input type="checkbox"/> Telecommunication Equipment-Council Directive 98/13/EC, Annex III <input type="checkbox"/> Telecommunication Equipment-Council Directive 98/13/EC, Annex III and IV Identification Number: <input type="checkbox"/> Telecommunication Equipment-Council Directive 98/13/EC, Annex V Identification Number:		
This validation is only for the location noted in the address block, unless otherwise indicated below.		
<input checked="" type="checkbox"/> Only the facility noted in the address block above has been approved. <input type="checkbox"/> Additional EMC facilities: <input type="checkbox"/> Additional R&TTE facilities:		
Please note that an organization's validations for various sectors of the MRA are listed on our web site at <a href="http://ts.nist.gov/mra">http://ts.nist.gov/mra</a> . You may now participate in the conformity assessment activities for the operational period of the MRA as described in the relevant sectoral annex or annexes of the U.S.-EU MRA document.		
NIST will continue to work with you throughout the operational period. All CABs validated for the operational phase of the Agreement must sign and return the enclosed CAB declaration form, which states that each CAB is responsible for notifying NIST of any relevant changes such as accreditation status, liability insurance, and key staff involved with projects under the MRA. Please be sure that you fully understand the terms under which you are obligated to operate as a condition of designation as a CAB. As a designating authority, NIST is responsible for monitoring CAB performance to ensure continued competence under the terms of the MRA.		
		

5. Signature Page



November 21, 2002

Prepared By:

Teresa A. White, Document Coordinator

Date

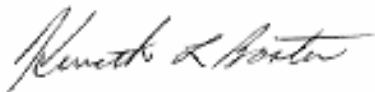


November 21, 2002

Tested By:

Abtin Spantman, EMC Engineer

Date



November 21, 2002

Approved By:

Kenneth L. Boston, EMC Lab Manager  
PE #31926 Licensed Professional Engineer  
Registered in the State of Wisconsin, United States

Date

## 6. Product and General Information

Manufacturer:	Johnson Outdoors
Model Number:	Co-Pilot Transmitter, Rev 5.0
Serial Number:	P11
Frequency Range:	434 MHz
Test Voltage:	3.0 VDC

### Environmental Conditions in the Test Lab:

Temperature:	20-25° C
Atmospheric Pressure:	86kPa-106kPa
Humidity:	30-60%

## 7. Introduction

On October 11<sup>th</sup>, 2002, a series of Radiated Emissions tests were performed on one sample of the Johnson Outdoors' "Co-Pilot" transmitter, Serial Number P11. This product operates by means of RF transmission of short burst of data containing a command code, in a simplex fashion. The transmitter is designed to operate with frequency modulation, at a center frequency of 433.92 MHz.

These tests were performed using the test procedure outlined in ANSI C63.4, 2001 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.231, for a periodic operation of a low power transmitter.

## 8. Purpose

The above-mentioned tests were performed in order to determine the compliance of the equipment under test (EUT), with limits contained in various provisions of Title 47CFR, FCC Part 15, including: 15.205, 15.209, 15.231a, 15.231b, and 15.231c.

All radiated emission tests were performed to measure the emissions in the frequency bands described in Section 12i of this report, and to determine whether said emissions are below the limits established by the aforementioned standards.

These tests were performed in accordance with the procedures described in the American National Standard for methods of measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4, 2001).

Also used as a reference, for the EMI Receiver specification, is the International Special Committee on Radio Interference – CISPR 16-1, 1999.



## 9. Product Description

The Johnson Outdoors' Co-Pilot system is an FM wireless trolling motor control system. The system allows the fisherman to control the direction and speed of the trolling motor by remote finger-tip control. This level of control is highly desirable in a fishing boat environment. The system allows the fisherman more control over his balance, provides the ability to track the fish by directing the boat with minimal distractions.

The system is composed of a small key-FOB transmitter, and a receiver assembly. The transmitter is designed for installation on the fishing rod, and is positioned on the rod for thumb control by the user. The receiver is designed to insert in an existing plug that is used for the motor-control input. Either a hand or foot controller would typically occupy this motor-control input-plug. The receiver can be used by itself, or in conjunction with the existing hand or foot controller. The receiver assembly then is bolted in to the current motor assembly.

### Detailed Description of Transmitter:

The system utilizes a standard RKE scheme, by translating the information from a touch-pad key-matrix into a packet of binary (Manchester-encoded) data. The encoded data is then sent to an FM transmitter IC, with a crystal controlled reference oscillator, for frequency-shift-keeping (FSK) mode of transmission.

The data packets are approximately 40ms in length, and composed of 45 data bits. The 45 bits are further broken down into 16 'preamble' bits, 13 'sync' bits, and 16 'data' bits. The bits are Manchester-encoded, with an encoded period of 848 $\mu$ s. The bits are transmitted using an encoded data rate of 1.2 kbits/sec (chip rate) using frequency modulation techniques at a peak deviation of 30 kHz.

The transmitter has an integral loop antenna, and operates on one CR2032 type 3.0VDC battery.

All buttons send one packet in any 100 ms window, and cease transmission immediately upon release, except for the steer left/right buttons. The steer left/right buttons send two additional packets after the buttons are released. In all cases, the transmissions cease well before the 5 second allotted window.

## 10. Test Requirements

The Johnson Outdoors' Co-Pilot transmitter was to be tested for radiated emissions, and compliance with the limits set forth by 47 CFR, Parts 15.205, 15.209, 15.231a, 15.231b, and 15.231c, for manually operated periodic transmitters, as well as for compliance with Industry Canada, RSS-210, for low power license-exempt radio-communication devices.

## 11. Summary of Test Report

The Johnson Outdoors' Co-Pilot transmitter was found to **MEET** the requirements as described within the specifications of Title 47 CFR, Part 15.231 and RSS-210, Section 6.1 for a low power transmitter.

## 12. Radiated Emission Test

### 12a. Test Setup

The equipment under test (EUT) was operated within the 3 Meter FCC listed Semi-Anechoic Chamber, located at L.S. Compliance, Inc., Cedarburg, Wisconsin. The EUT was placed on an 80cm high non-conductive pedestal, which was centered on the flush-mounted 2m diameter metal turntable. The test sample was operated in continuous transmit CW mode for the radiated emissions measurements, and in normal mode for all other measurements.

The EUT was configured to run in a continuous transmit CW mode during the 15.231a and 15.231b measurements. This unit was then returned to normal operation for testing of the data packet length and occupied bandwidth.

### 12b. Test Procedure

The fundamental and spurious (harmonic) emissions of the transmitter were tested for compliance to Title 47CFR, FCC Part 15.231a, and 15.231b limits for manually operated and non-periodic devices.

The EUT was tested from the lowest frequency generated by the transmitter (without going below 9kHz) to the 10<sup>th</sup> harmonic of the fundamental frequency generated by the device. The appropriate limits were also observed when the fundamental or spurious signals were located within any of the restricted bands as described in Part 15.205a.

The EUT was placed on an 80 cm high pedestal, with the Antenna Mast placed 3 m from the EUT. A Bi-conical Antenna was used to measure emissions from 30 MHz to 300 MHz, a Log Periodic antenna was used to measure emissions from 300 MHz to 1000 MHz, and a Double Ridged Waveguide Horn Antenna was used to measure emissions above 1 GHz.

The EUT was modified to produce a continuous CW signal. The resultant signals from the fundamental, harmonics, and spurious signals were maximized by rotating the turntable 360 degrees, and by raising and lowering the Antenna between 1 and 4 meters. The EUT was also given different orientations to determine the maximum signal levels, using both horizontal and vertical antenna polarities.

A CR 2032 3.1 V Lithium type battery was used to power the transmitters. The batteries were checked periodically during testing, and replaced with fresh batteries as necessary.

### 12c. Test Results

No significant emissions were found aside from the transmitter fundamental and harmonics. The units were scanned for emissions, over the range of 30 to 6000 MHz to establish compliance with Part 15.231 and 15.205 while in continuous transmit mode. At frequencies below the fundamental, no spurious signals, other than the noise floor of the system, could be found within 20dB of the limits. A numeric list of measured emissions appears in Section 12i.

#### **12d. Occupied Bandwidth**

In addition to measuring the levels of radiated emissions, the occupied bandwidth of the transmitter was measured. In accordance with FCC Part 15.231c, the 20dB bandwidth of the transmitted signal should be within a window of 0.25% of the center carrier frequency. The resolution bandwidth was set to the closest available filter setting on the HP 8546A EMI receiver that corresponded to 5% of the allowable bandwidth determined in the calculation mentioned above, without going below the resolution bandwidth of 10 kHz, as dictated in ANSI C63.4-2001 Section 13.1.7.

The sample was activated to transmit in normal mode and was placed on the aforementioned test configuration within the 3 Meter Chamber. The transmitted signal was received on a Log-Periodic Antenna and fed to the HP 8546A EMI receiver, where the fundamental frequency was displayed, and a plot of the occupied bandwidth was produced. Results can be seen in the following plots, and in Appendix A. An occupied bandwidth of 119kHz was observed, which is within the limits for this frequency (1.085 MHz).

#### **12e. Test Equipment Utilized, Radiated Emissions**

A list of the test equipment used for the tests can be found in Appendix B. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All antenna calibrations were performed at an N.I.S.T. traceable site, and the resultant correction factors were entered into the HP8546A EMI Receiver software base.

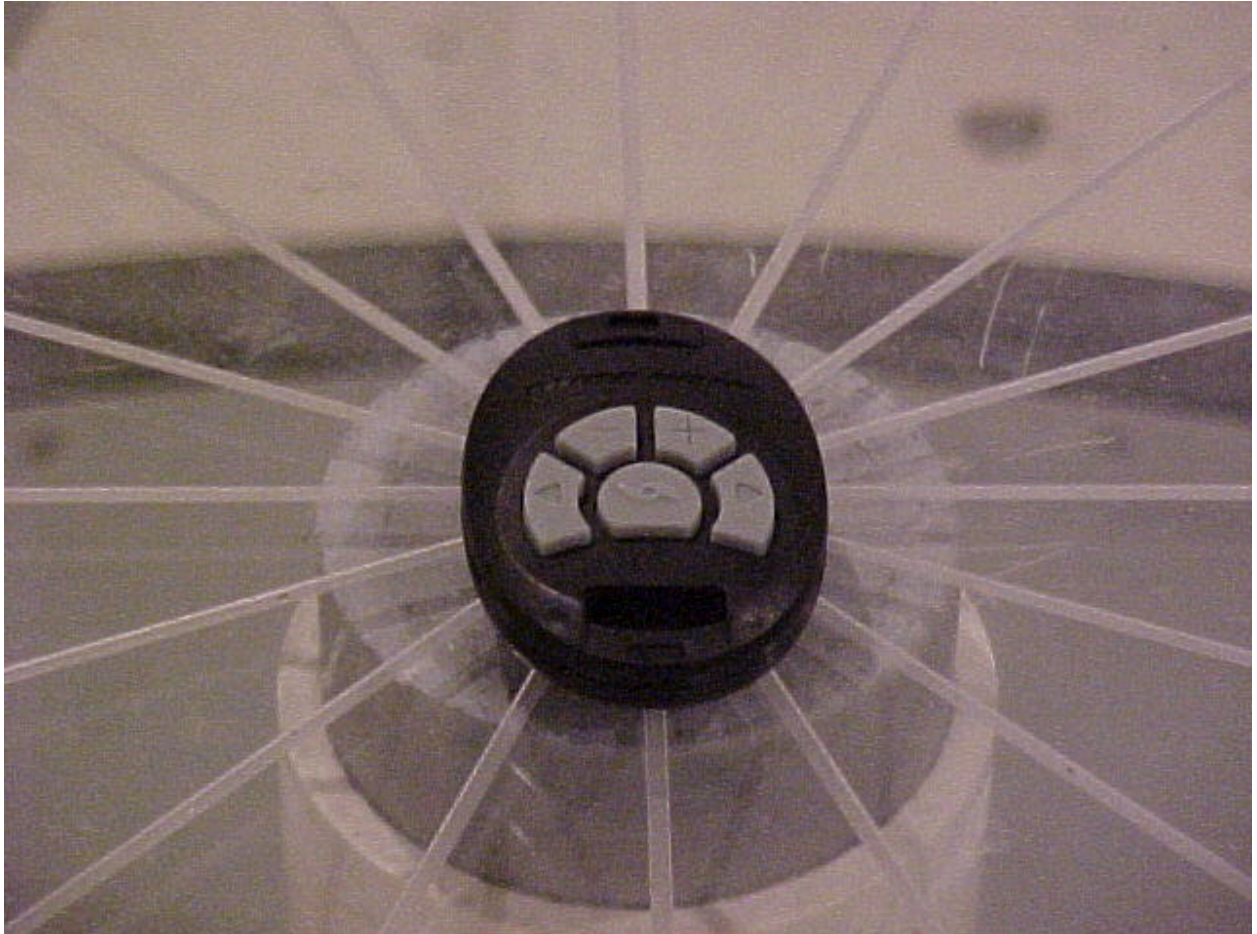
The connecting cables used were also measured for loss using a calibrated Signal Generator and the HP8546A EMI Receiver. The resulting loss factors were entered into the HP8546A EMI Receiver database. This allowed for automatic change in the antenna correction factor. The resulting data taken from the HP8546A EMI Receiver is an actual reading and can be entered into the database as a corrected meter reading.

When a reading is taken using the peak detector, a duty cycle correction factor can be applied for conversion to an average reading. This operation can be used when measuring short-duration bursts of data transmission, under FCC Part 15.231. The resulting average reading can then compared to the appropriate limit in order to determine compliance. The HP8546A EMI Receiver was operated with a bandwidth of 120 kHz when receiving signals below 1 GHz, and with a bandwidth of 1 MHz when receiving signals above 1 GHz, in accordance with CISPR 16.

The Peak, Quasi-Peak and Average detector functions were all used.

12f. Photo of Setup for Radiated Emissions Test

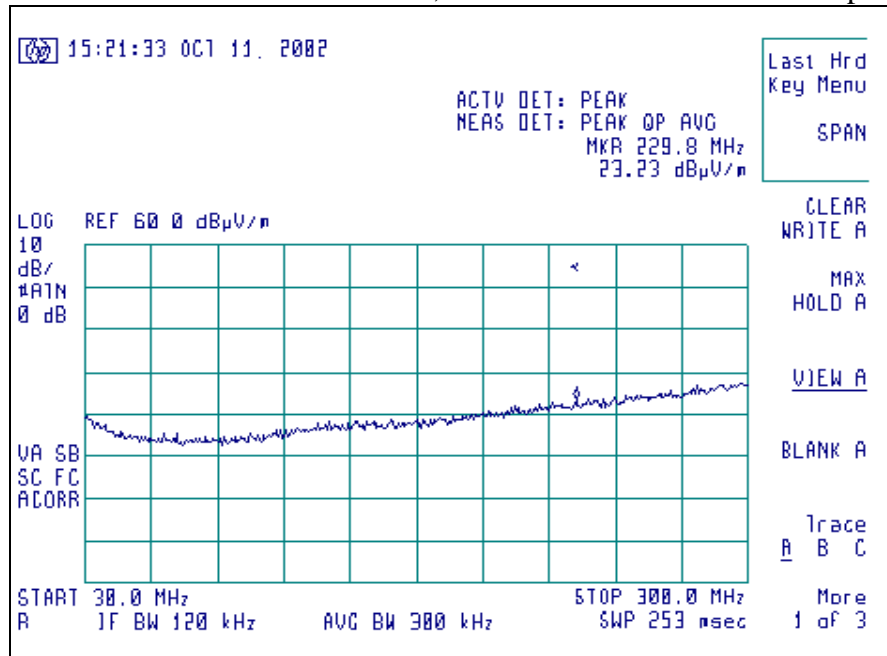
EUT placed in horizontal orientation inside the 3 Meter Semi-Anechoic Chamber



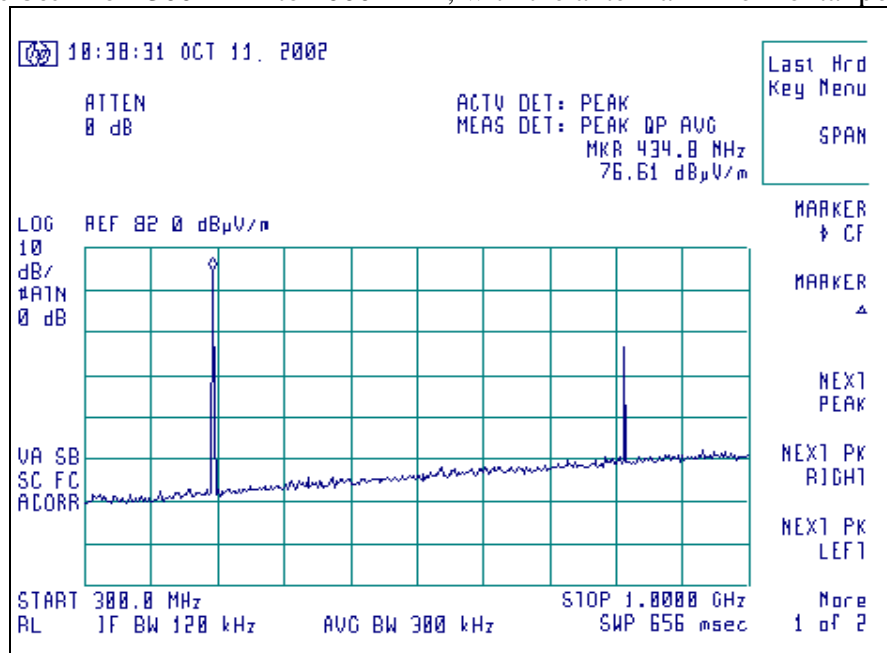


## 12g. Signature Scans – Radiated Emissions

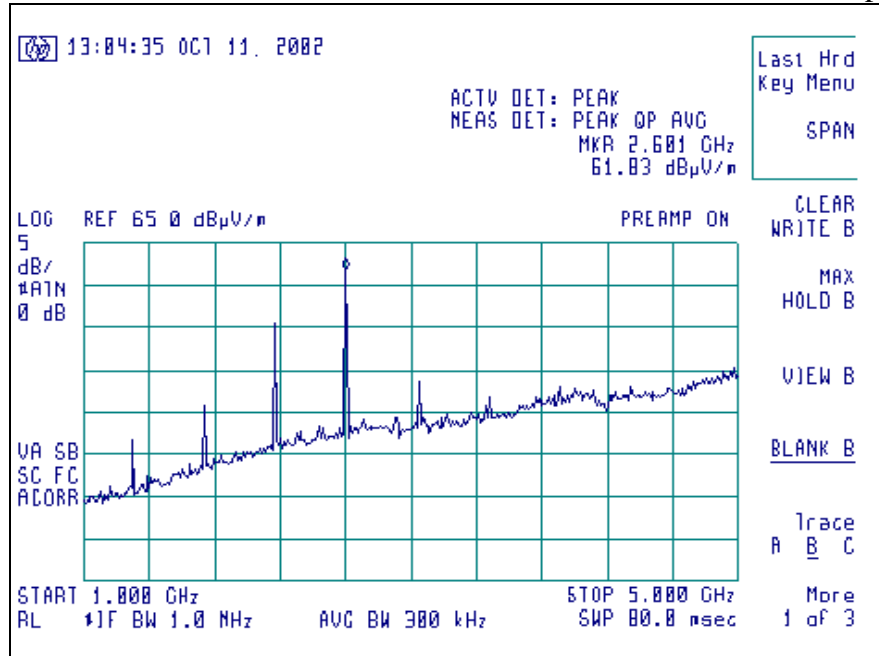
Signature Scan from 30 MHz to 300 MHz, with the antenna in Horizontal polarization



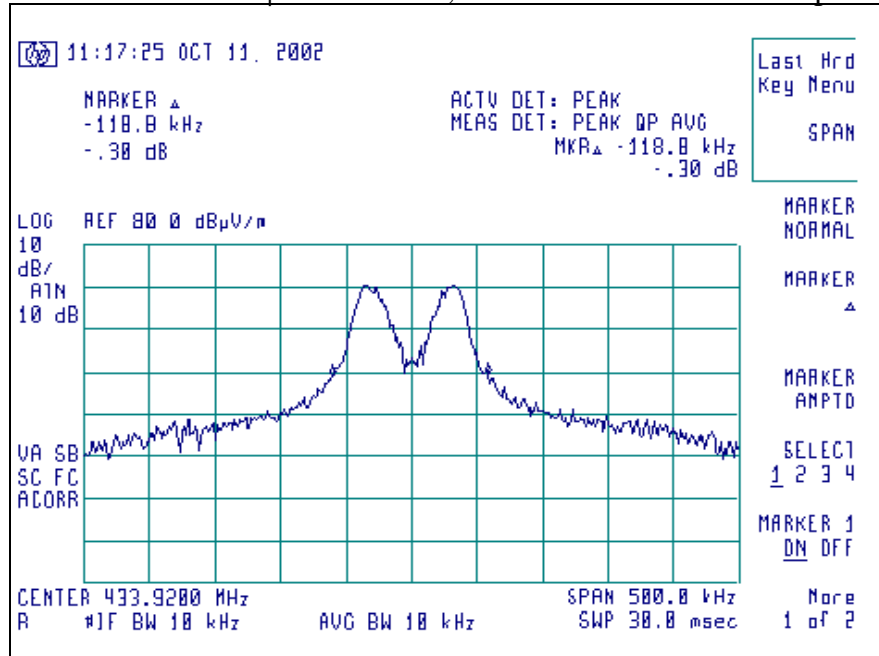
Signature Scan from 300 MHz to 1000 MHz, with the antenna in Horizontal polarization



Signature Scan from 1000 MHz to 6000 MHz, with the antenna in Horizontal polarization

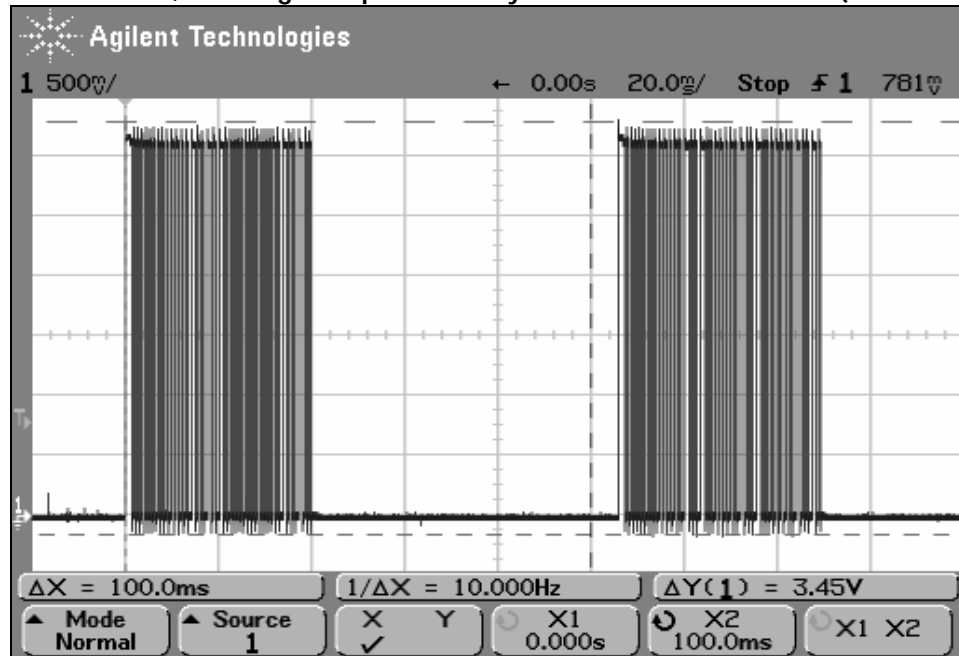


Signature Scans of the Occupied Bandwidth, with antenna in Horizontal polarization

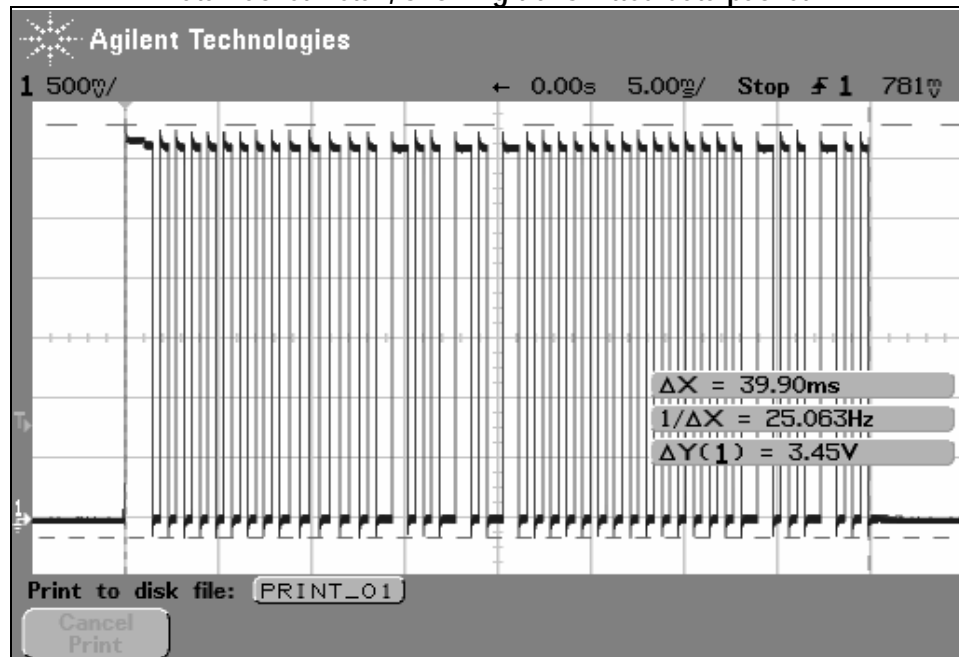


## 12h. Data Packet Detail – Radiated Emissions

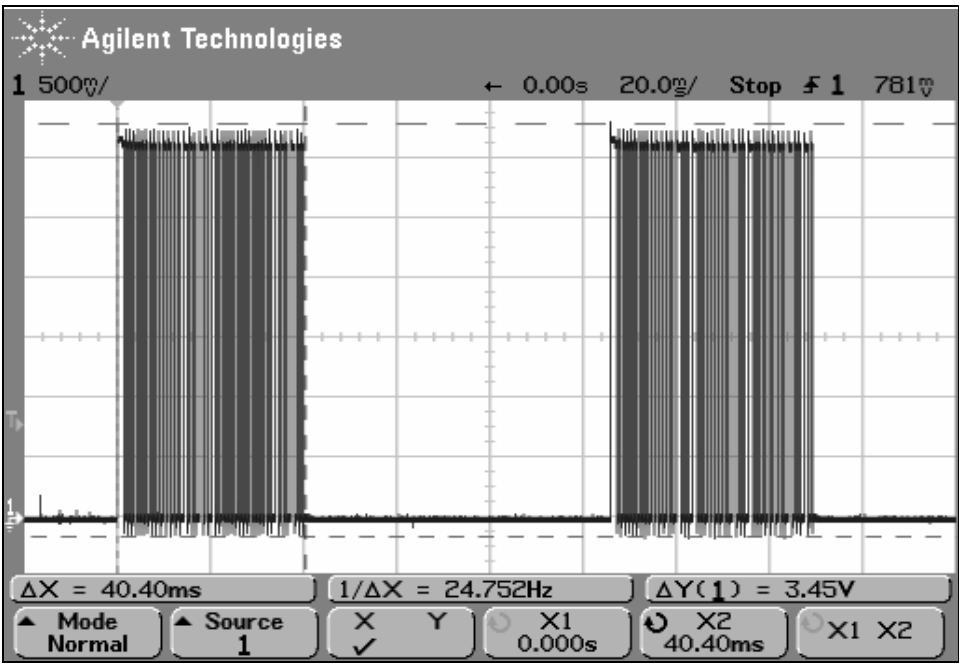
Data Packet Detail, showing occupation in any 100 Millisecond Window (200 ms shown)



Data Packet Detail, showing transmitted data packet.



**Data Packet Envelope, verifying the ability to take advantage of relaxation factor.**





**12i. Measurement of Electromagnetic Radiated Emission****Measurement of Electromagnetic Radiated Emission  
Within the 3 Meter Semi-Anechoic FCC Listed Chamber**

**Manufacturer:** Johnson Outdoors, Inc.  
**Date of Test:** October 11<sup>th</sup>, 2002  
**Model:** Co-Pilot Transmitter, Rev 5.0  
**Serial:** P11  
**Test**  
**Specifications:** 15.205, 15.209, 15.231a, 15.231b, and 15.231c.

<b>Distance:</b> 3 Meters			<b>Frequency Range Inspected:</b> 30 to 6000 MHz			
<b>Configuration:</b> Normal and CW modes						
<b>Detector(s) Used:</b>	√	Peak		Quasi-Peak		Average

**Test Equipment Used:**

EMI Receiver: HP 8546A	Log Periodic Antenna: EMCO 93146
Double-Ridged Horn Antenna: EMCO 3115	Biconical Antenna: EMCO 93110B

The following tables depict the level of significant fundamental and harmonic emissions found during the tests on the EUT. All other emissions were better than 20 dB below the limit.

Frequency (MHz)	Antenna Polarity	Height (Meters)	Azimuth (0?-360?)	EMI Meter Reading (dBµV/m)	15.231b Limit (dBµV/m)	Duty Cycle Relaxation Allowance (dB)	15.231b Limit with Allowed Relaxation (dBµV/m)	Margin (dB)
433.92	V	1.25	275	78.3	80.8	7.3	88.1	9.8
867.84	V	1.20	90	52.0	60.8	7.3	68.1	16.1
1301.76	H	1.00	35	46.8	54.0	7.3	61.3	14.5
1735.68	H	1.05	325	52.1	60.8	7.3	68.1	16.0
2169.60	H	1.00	245	53.2	60.8	7.3	68.1	14.9
2603.52	V	1.05	280	64.5	60.8	7.3	68.1	3.6
3037.44	H	1.00	275	59.6	60.8	7.3	68.1	8.5
3471.36	H	1.10	130	46.6	60.8	7.3	68.1	21.5
3905.28	V	1.30	85	51.1	54.0	7.3	61.3	10.2
4339.20	V	1.15	215	37.4	54.0	7.3	61.3	23.9

**Note:** Peak values measured, and duty cycle correction is applied.

## **12j. Test Results**

No significant emissions were found aside from the transmitter fundamental and several harmonics. The unit was scanned for emissions, over the range of 30 to 6000 MHz to establish compliance with Parts 15.205, 15.209, 15.231a, 15.231b, and 15.231c, while in continuous transmit mode. At frequencies below the fundamental, no spurious signals, other than the noise floor of the system could be found within 20dB of the limits.

## APPENDIX A

### Calculations

Manufacturer: Johnson Outdoors  
Model: Co-Pilot Transmitter, Rev 5.0  
Serial: P11

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#### **CALCULATION OF RADIATED EMISSIONS LIMITS FOR FCC PART 15.209, and 15.231(b) (260-470 MHz)**

##### **FIELD STRENGTH OF FUNDAMENTAL FREQUENCIES:**

The calculation involves a linear interpolation of 3750 to 12500  $\mu\text{V/m}$  over 260-470 MHz, where field strength of the fundamental frequency ( $f_0$ ) when 260=  $f_0$ =470 MHz, can be found by:  $3750 + 41.6667(f_0 - 260)$ , where  $f_0$  is in MHz.

##### **FIELD STRENGTH OF SPURIOUS/HARMONIC FREQUENCIES:**

The spurious and harmonic emissions are subject to the limits expressed in FCC 15.205, and 15.209, if within the restricted bands, and dictated by the following calculation elsewhere.

The calculation involves a linear interpolation of 375 to 1250  $\mu\text{V/m}$  over 260 to 470 MHz, where field strength of the harmonic frequencies ( $2f_0, 3f_0, \dots$ ), when 260=  $f_0$ =470 MHz, can be found by:  $375 + 4.1667(f_0 - 260)$ , where  $f_0$  is in MHz.

Above 470 MHz, the limit on the spurious and harmonic emissions is 1,250  $\mu\text{V/m}$  @ 3m.

At fundamental frequency  $f_0 = 433.92$  MHz

Fundamental Limit:	$3750 + 41.6667 (433.92 - 260) = 10,996.67 \mu\text{V/m @ 3m}$
Harmonic Limit:	$375 + 4.1667 (433.92 - 260) = 1,099.67 \mu\text{V/m @ 3m}$

Frequency (MHz)	Fundamental Limit ( $\mu\text{V/m @ 3m}$ )	Fundamental Limit (dB $\mu\text{V/m @ 3m}$ )	Harmonic Limit ( $\mu\text{V/m @ 3m}$ )	Harmonic Limit (dB $\mu\text{V/m @ 3m}$ )
433.92	10,996.7	80.8	1099.7	60.8

## DUTY CYCLE CORRECTION FACTOR CALCULATION

For a graphical presentation of the data packets from the transmitter, refer to Section 12h. These images were captured on an oscilloscope, while probing the data line, feeding into the transmitter. The transmitter was functioning in normal operating mode, and activated by pressing one of the transmit buttons.

### Average (Relaxation) Factor

Average Factor =  $20 * \log_{10}$  (Worst Case EUT On-time over 100 ms time window)

In this particular case, the transmit packet envelope can be used to calculate the relaxation factor. The worst case transmit packet occupies 43 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

Average Factor =  $20 * \log_{10}$  (43 ms / 100 ms) = -7.3

A relaxation factor of 7.3 dB would be allowable for this product.

## OCCUPIED BANDWIDTH CALCULATIONS

FCC part 15.231c states that the bandwidth of a manually operated device shall be no wider than 0.25% of the center frequency for devices operating between 70 and 900 MHz.

Said bandwidth is determined at the -20 dB reference to peak carrier points.

For 433.92 MHz, the 20 dB bandwidth is  $0.0025 * 433.92 \text{ MHz} = 1.085 \text{ MHz}$

Refer to the set of screen captures in section 12i, showing the actual occupied bandwidth of the transmitters as measured.

The measured occupied bandwidth for the transmitter sample was 119 kHz.

The EUT sample had an occupied bandwidth within the limits expressed by FCC part 15.231c.



## APPENDIX B

### Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Calibration Information	
					Date	Due Date
AA960007	EMCO	3115	9311-4138	Horn Antenna	08-23-01	08-23-02
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization	09-19-02	09-19-03
AA960014	Fischer	FCC-801-M3-25	148	Coupler-De-Coupler Network	09-20-02	09-20-03
AA960023	Werlatone	C3910	5167	Directional Coupler 40dB	06-19-01	Note 1*
AA960024	Pasternack	100 Watts	PE 7021-6	DC-1.5 GHz Attenuator	I/O	Note 1*
AA960050	Chase	BiCBL6140A	Bilog 1106	Bilog Antenna	06-19-01	Note 1*
AA960054	Giga-Tronics	80301A	1830164	Power Sensor	05-02-02	05-02-03
AA960074	Fischer	F2031-32mm	361	EM Injection Clamp	11-29-01	11-29-02
AA960076	Fischer	F201-32mm	347	Absorbing Clamp	08-29-02	08-29-03
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	09-19-02	09-19-03
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	09-19-02	09-19-03
CC00181C	HP	33120A	US36013549	Signal Generator	09-29-00	N/A
CC000221C	Agilent	E4407B	US39160256	Spectrum analyzer	09-24-01	09-24-02
EE960003	Amplifier Research	100W 1000M1A	19821	100 Watts Amp	06-19-01	Note 1*
EE960005	Giga-Tronics	8542C	1831450	Dual Channel Power Meter	09-19-02	09-19-03
EE960006	Haefely Trench	PESD 1600	H604079	ESD Gun	09-19-02	09-19-03
EE960007	Haefely Trench	P-line 1610	083732-19	Line Fluctuation Generator	09-19-02	09-19-03
EE960010	Haefely Trench	P-Surge-4	083061-08	Power Surge Generator	08-07-02	08-07-03
EE960011	Haefely Trench	PEFT 4010	083180-21	EFT/Burst Generator	09-19-02	09-19-03
EE960013	HP	8546A	3617A00320	Receiver RF Section	09-20-02	09-20-03
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	09-20-02	09-20-03
EE960015	HP	6843A	3531A-00145	AC Power Source/Analyzer	10-22-00	N/A
EE960016	Marconi	2024	112120/044	Signal Generator	09-19-02	09-19-03
EE960055	Amplifier Research	75A250	21952	75 Watts Amp	06-22-01	Note 1*

Note 1\* - Equipment calibrated within a traceable system.

### Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V