LS Research, LLC
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COMPLIANCE TESTING OF:

Clapper Plus
RF Remote Control

Prepared For:

Joseph Enterprises
Attention: Mr. Mark Grossmeyer
415 California Street
San Francisco, CA 94104-2101
United States of America

Test Report Number:

306276-Tx-v4

Test Dates:

June 13TH and 14TH, 2006

Table of Contents

1. LS Research, LLC in Review

LS Research, LLC - Accreditations and Listing's

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 : 2005
with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: **1255.01**

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: **90756**

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: **IC 3088-A**

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: **IC 3088**

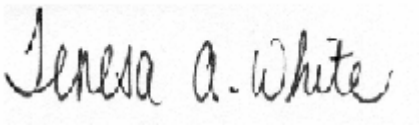
U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a **U. S. Competent Body** operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility –Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2)
Date of Validation: **January 16, 2001**

Validated by the European Commission as a **U.S. Notified Body** operating under the U.S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: **November 20, 2002**
Notified Body Identification Number: **1243**

2. Signature Page



Prepared By: **June 21, 2006**

Teresa A. White, Document Coordinator **Date**

Tested By: **June 21, 2006**

Abtin Spantman, EMC Engineer **Date**

Approved By: **June 21, 2006**

Brian E. Petted, VP of Engineering **Date**

3. Product and General Information

Manufacturer:	Joseph Enterprises					
Date(s) of Test:	June 13TH and 14TH, 2006					
Test Engineer(s):		Tom Smith	√	Abtin Spantman		Ken Boston
Model #:	Clapper Plus					
Serial #:	Engineering Sample 3					
Voltage:	3.0 VDC					
Operation Mode:	Normal operation and CW					

Environmental Conditions in the Test Lab:

Temperature:	23 °C
Atmospheric Pressure:	102 kPa
Humidity:	38 %

4. Introduction

On June 13TH and 14TH, 2006, a series of Conducted and Radiated Emissions tests were performed on one sample of the Joseph Enterprises, Model Number: "Clapper Plus", serial number: "Engineering Sample 3", here forth referred to as the "Equipment Under Test" or "EUT".

These tests were performed using the test procedure outlined in ANSI C63.4, 2003 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.231(b) for a periodic operation of a low power transmitter.

All Conducted and Radiated Emission tests were performed to measure the emissions in the frequency bands described later in 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, 2003). These tests were performed by Abtin Spantman, EMC Engineer of LS Research, LLC and witnessed by Mark Grossmeyer of Joseph Enterprises, Inc.

Also used as a reference for the EMI Receiver specification is the International Special Committee on Radio Interference – CISPR 16-1, 2003.

5. Product Description

System Overview:

The *"Clapper Plus"* is a controlled appliance switch system with two components of FOB transmitter and Base receiver. The Clapper Plus is an RF and sound controlled appliance switch system capable of controlling up to two switches. The *"Clapper Plus"* Base contains the circuitry to control the switches and also contains the receiver portion of the system. The Base is connected to the household AC Mains, at 120 VAC, and has the capability of switching two onboard outlets on and off on-demand. The *"Clapper Plus"* Base may be controlled via sound, as that of clapping hands, or by an RF signal from the RF Remote Control FOB transmitter. The user can also turn on and off appliance 1 by clapping two times. The user can turn on and off the appliance 2 by clapping three times.

The user can plug in one or two appliances in the Base (receiver) unit. They can turn on or off the appliances in two ways. The first is using the RF remote control. The control has one button for each appliance. Pressing the first button turns on appliance 1. Pressing the first button again turn off appliance 1. Pressing button 2 turns on appliance 2 and pressing it again turns it off.

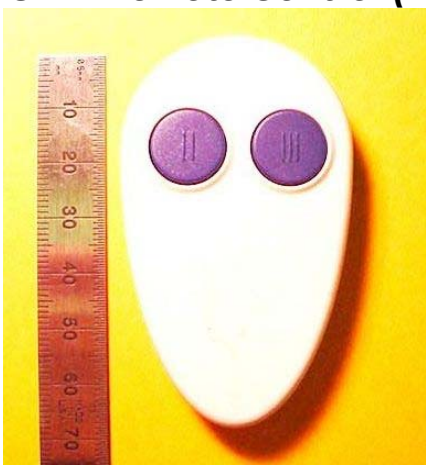
EUT Specifics:

The RF Remote Control (FOB) transmitter of this system is tested and the results are covered in this report.

The RF Remote Control (FOB) transmitter is a two button AM-OOK based transmitter. The frequency is SAW oscillator controlled, operating at a 433.9 MHz. The data, for both buttons, is 50 % duty square wave, nominally at 700 Hz, for 20 pulses. Button one adds an off period of 7 ms after the 20 pulses, and button two adds an off period of 14 ms after the 20 pulses. This sequence would repeat if the button is held in a depressed state until the user releases the button. The transmitter will therefore cease transmission within fractions of one second upon release of the buttons.

The RF Remote Control transmitter has a PCB trace loop antenna, and operates on one standard "CR2032" type 3.0 VDC battery. The RF Remote Control transmitter does not have any contingencies for connecting to the AC Mains or other antennas.

The Clapper Plus RF Remote Control (FOB) transmitter



6. Test Requirements

The EUT was tested for Conducted and Radiated Emissions, and for compliance with the limits set forth by FCC Title 47 CFR Parts 15.35, 15.205, 15.209, 15.231(a), 15.231(b) and 15.231(c) for manually operated periodic transmitters, as well as for compliance with Industry Canada RSS-210, for low power license-exempt radio-communication devices.

7. Summary of Test Report

The Equipment Under Test (EUT) was found to **MEET** the requirements as described within the specifications of FCC Title 47 CFR Part 15.231(b) and Industry Canada RSS-210 for a low power transmitter.

Some emissions are seen to be within 3.5 dB of their respective limits. As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

The enclosed test results pertain to the sample(s) of the test item listed, and only for the tests performed on the data sheets. Any subsequent modification or changes to the test items could invalidate the data contained herein, and could therefore invalidate the findings of this report.

8. Radiated Emissions Test

Test Setup

The EUT was operated within the 3 Meter FCC listed Semi-Anechoic Chamber, located at LS Research, LLC, in Cedarburg, Wisconsin. The EUT was placed on an 80cm high, non-conductive pedestal, which was centered on a flush-mounted 2m diameter metal turntable. The EUT was configured to run in a continuous CW transmit mode during the 15.231(a) and 15.231(b) measurements. The EUT was then returned to normal operation for measurements of the data packet length and occupied bandwidth.

Test Procedure

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

The EUT was tested from the lowest frequency generated by the transmitter (without going below 9 kHz) to the 10^{th} 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 FCC Part 15.205(a).

The EUT was placed on an 80cm high non-conductive pedestal, with the Antenna Mast placed 3 m from the EUT during measurements below 1 GHz, and at 1 meter separation from the EUT for measurements above 1 GHz. A Biconical 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 configured to operate in continuous c.w. transmit mode. 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 tested in three orthogonal orientations to determine the maximum signal levels, using both horizontal and vertical antenna polarities.

The battery voltage was monitored to ensure proper level, and replaced as necessary during the test sequence.

Test Results

No significant emissions were found, aside from the transmitter fundamental and harmonics. The unit was scanned for emissions over the range of 30 MHz to 5000 MHz to establish compliance with FCC Parts 15.231 and 15.205 while in a continuous CW transmit mode. At frequencies below the fundamental, no spurious signals, other than the noise floor of the system, could be found within 20 dB of the limits. A numeric list of measured emissions appears in the Data Chart(s) of this report.

Occupied Bandwidth

In addition to measuring the levels of Radiated Emissions, the Occupied Bandwidth of the transmitter was measured. In accordance with FCC Part 15.231(c), the 20 dB 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, then 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, 2003, Section 13.1.7.

The EUT was activated to transmit in a continuous (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 provided to the HP 8546A EMI Receiver, where the fundamental frequency was displayed, and a plot of the Occupied Bandwidth was produced. The measured Occupied Bandwidth of 430 kHz is within the calculated limit of 1085 kHz. Results can be seen in the Occupied Bandwidth scans in this report.

Test Equipment Utilized

A list of the test equipment used for the Radiated Emissions tests can be found in Appendix C of this report. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All antenna calibrations were performed at a N.I.S.T. traceable site, and the resultant correction factors were entered into the HP 8546A EMI Receiver software database.

The connecting cables used were also measured for loss using a calibrated Signal Generator and the HP 8546A EMI Receiver. The resulting loss factors were entered into the HP 8546A EMI Receiver database. This allowed for automatic change in the antenna correction factor. The resulting data taken from the HP 8546A EMI Receiver is an actual reading and can be entered into the database as a corrected meter reading.

When a measurement is made 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 resultant average reading can then be compared to the appropriate limit in order to determine compliance with the limits. The HP 8546A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz).

Radiated Emissions Data Chart

3 Meter Measurements of Electromagnetic Radiated Emissions

Test Standard: FCC Parts 15.205, 15.209 and 15.231(b)

Frequency Range Inspected: 30 MHz to 5000 MHz

Manufacturer:	Joseph Enterprises							
Date(s) of Test:	June 13TH and 14TH, 2006							
Test Engineer:	√	Abtin Spantman		Tom Smith		Ken Boston		
Model #:	Clapper Plus							
Serial #:	Engineering Sample 3							
Voltage:	3.0 VDC							
Distance:	3 meters							
Configuration:	Normal operation and CW							
Detectors Used:		√	Peak		Quasi-Peak	√	Average	

Environmental Conditions in the Lab:
Temperature: 20 – 25°C
Atmospheric Pressure: 86 kPa – 106 kPa
Relative Humidity: 30 – 60 %

Test Equipment Used:
EMI Measurement Instrument: HP8546A
Biconical Antenna: EMCO #93110
Log Periodic Antenna: EMCO #93146
Horn Antenna: EMCO #3115
Spectrum Analyzer: Agilent E4407B

The table depicts the level of significant radiated emissions found:

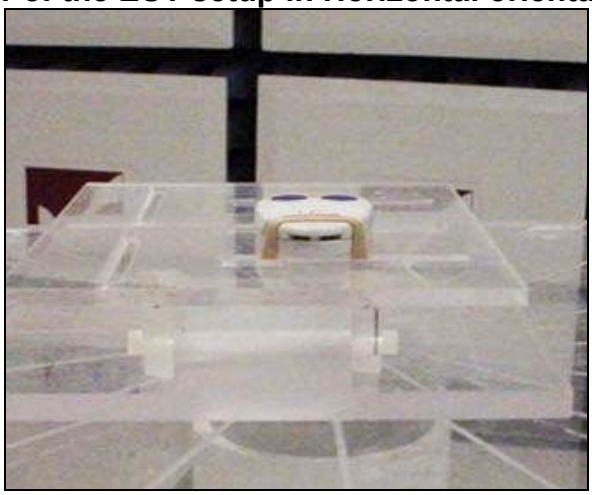
Frequency (MHz)	Ant./EUT Polarity	Height (meters)	Azimuth (0° - 360°)	Measured EFI (dBμV/m)	EFI Corrected For Averaging (dBμV/m)	15.231(b) Limit (dBμV/m)	Margin (dB)
433.9	V / V	1.30	260	81.8	74.3	80.8	6.5
867.8	V / V	1.25	250	61.3	53.8	60.8	7.0
1301.8	H / V	1.00	160	58.5	51.0	63.5	12.5
1735.7	H / V	1.00	160	60.4	52.9	70.3	17.4
2169.6	H / V	1.00	160	60.9	53.4	70.3	16.9
2603.5	V / V	1.00	170	46.3	38.8	70.3	31.5
3037.4	V / V	1.00	170	48.6	41.1	70.3	29.2
3471.4	V / V	1.00	170	56.6	49.1	70.3	21.2
3905.3	V / V	1.00	170	65.2	57.7	63.5	5.8
4339.2	V / V	1.00	170	67.8	60.3	63.5	3.2

Notes:

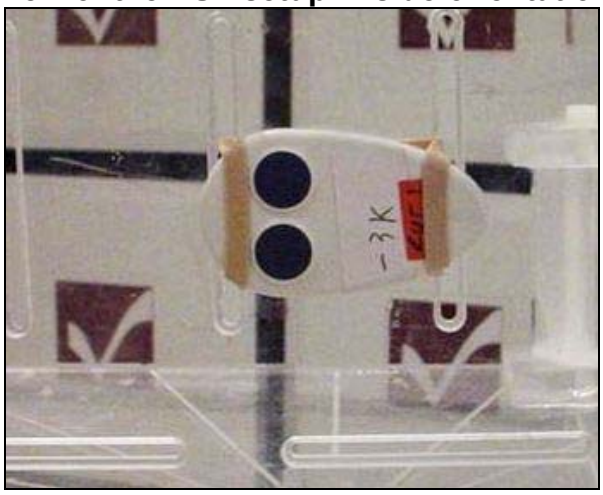
1) A Peak Detector was used in measurements of the fundamental and harmonics below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz.
2) Measurements above 1 GHz were made at a separation distance of 1 meter.
3) Measurement at receiver system noise floor.
4) A relaxation of the Peak EFI measurements by 7.5 dB is requested based on the average duty factor of the transmitter on-air-time. Justification for this request appears in the appendix section of this report, and is supported by measurements as documented in the body of this report.
5) Measurement of the fundamental and all harmonics were made with the EUT in CW mode.

View of the EUT setup in vertical orientation
(Highest emissions measured)

View of the EUT setup in Horizontal orientation



View of the EUT setup in side orientation



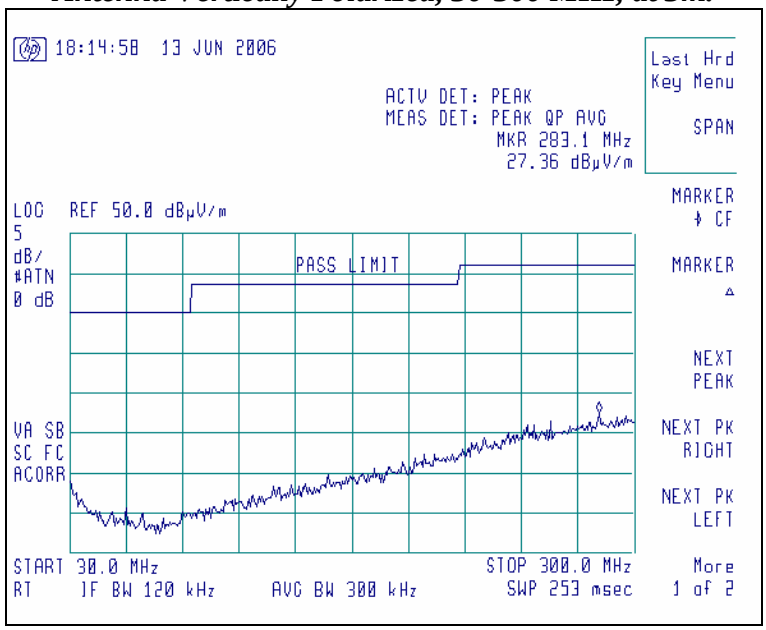
Front View of the EUT setup on the test pedestal

Screen Captures of Radiated RF Emissions:

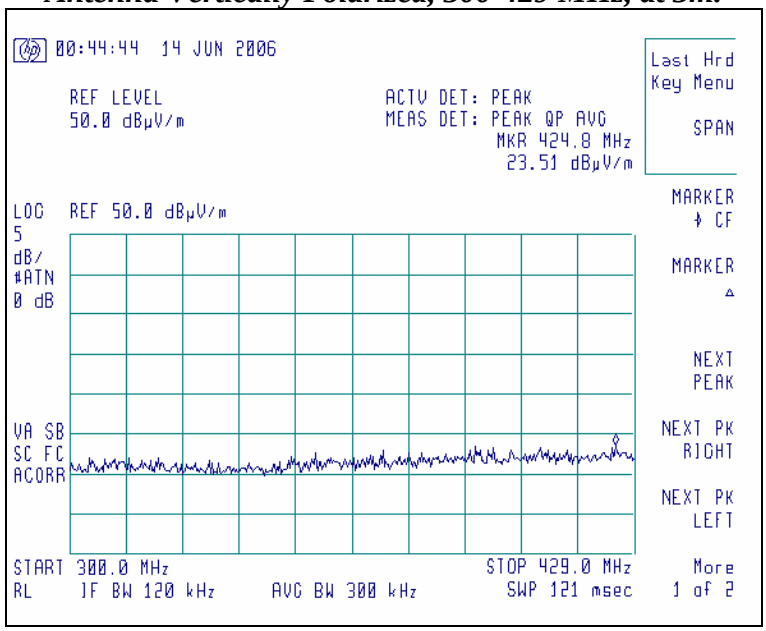
Please note these screen captures represent Peak Emissions. For radiated emission measurements, we utilize a Quasi-Peak detector function when measuring frequencies below 1 GHz, and an Average detector function when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured with the sense antennas both in vertical and horizontal polarity for worst case presentations.

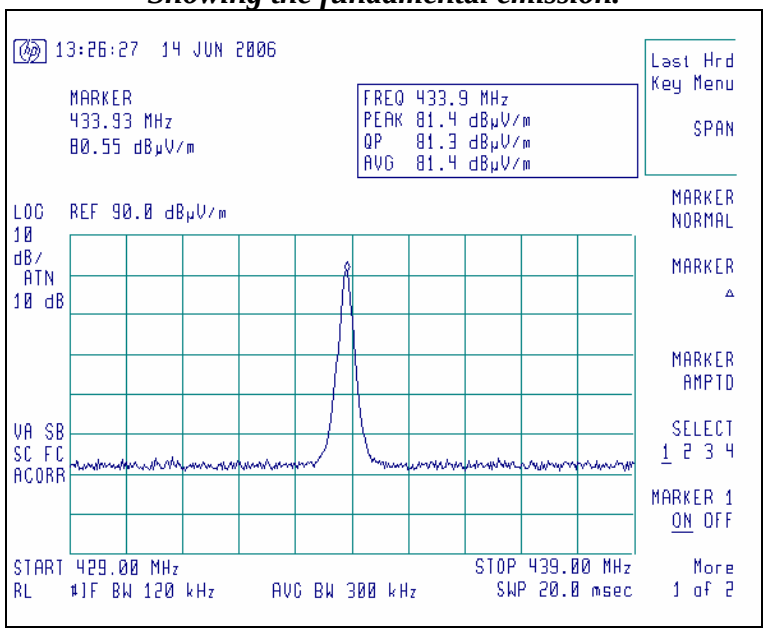
Antenna Vertically Polarized, 30-300 MHz, at 3m.



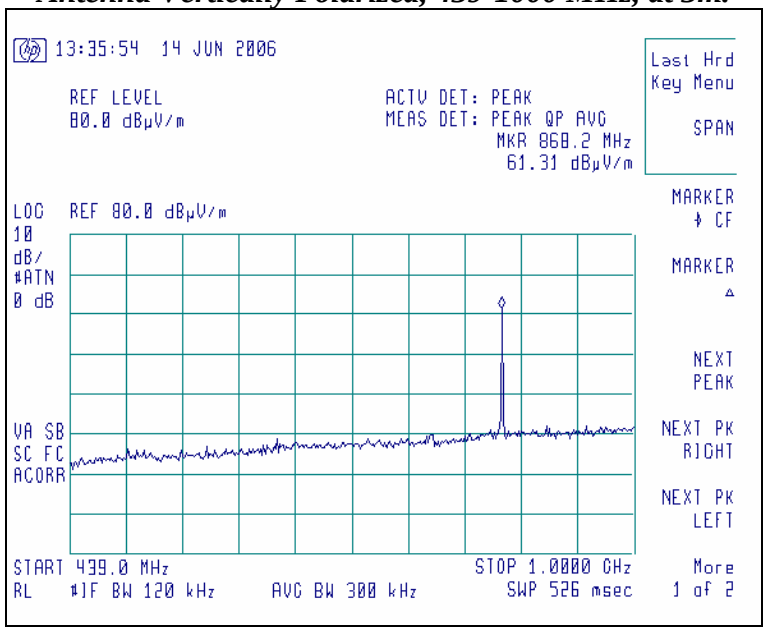
Antenna Vertically Polarized, 300-429 MHz, at 3m.



Antenna Vertically Polarized, 429-439 MHz, at 3m, Showing the fundamental emission.

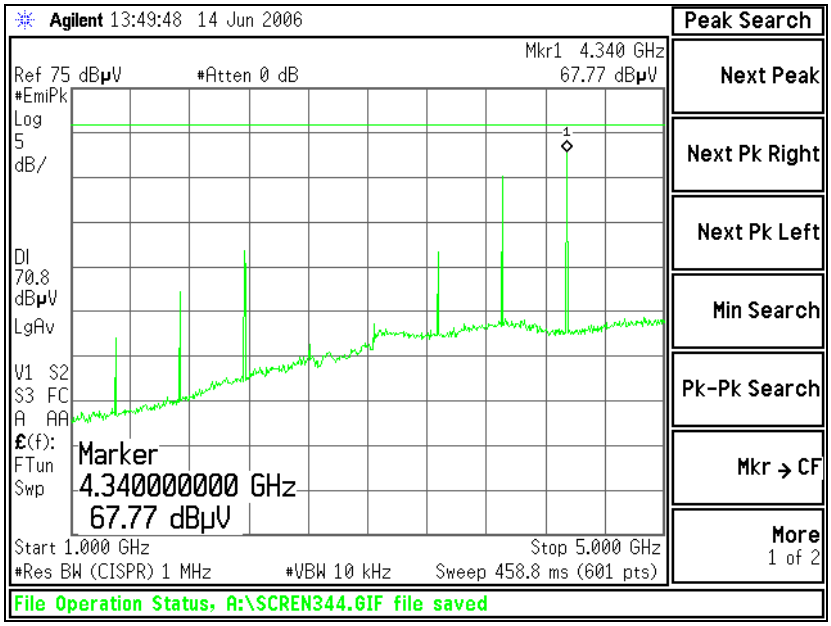


Antenna Vertically Polarized, 439-1000 MHz, at 3m.



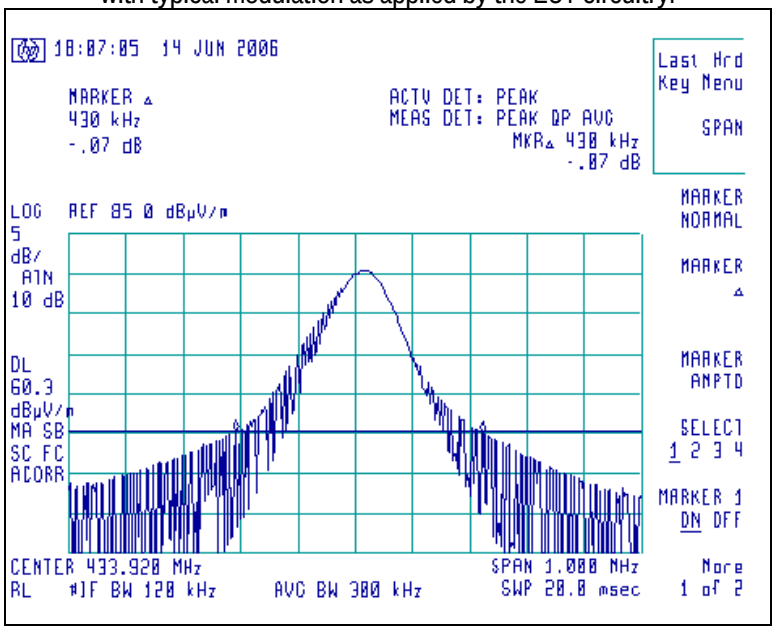
Antenna Vertically Polarized, 1000-5000 MHz, at 1m.

Measurement of the fundamental and all harmonics were made with the EUT in CW mode



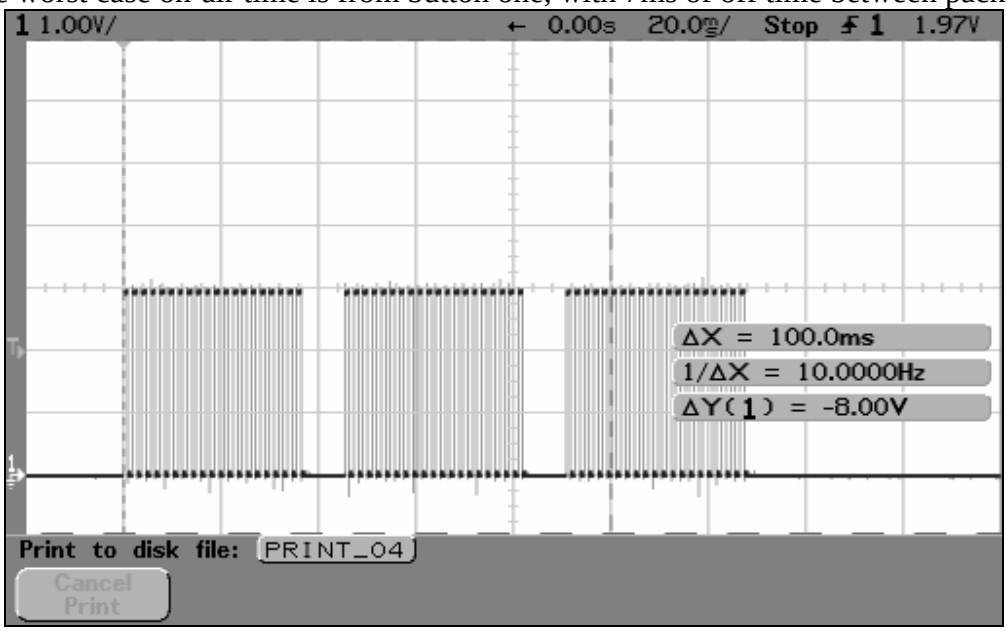
Occupied Bandwidth

Measurement of the Occupied Bandwidth was made with the EUT in continuous transmit mode, with typical modulation as applied by the EUT circuitry.

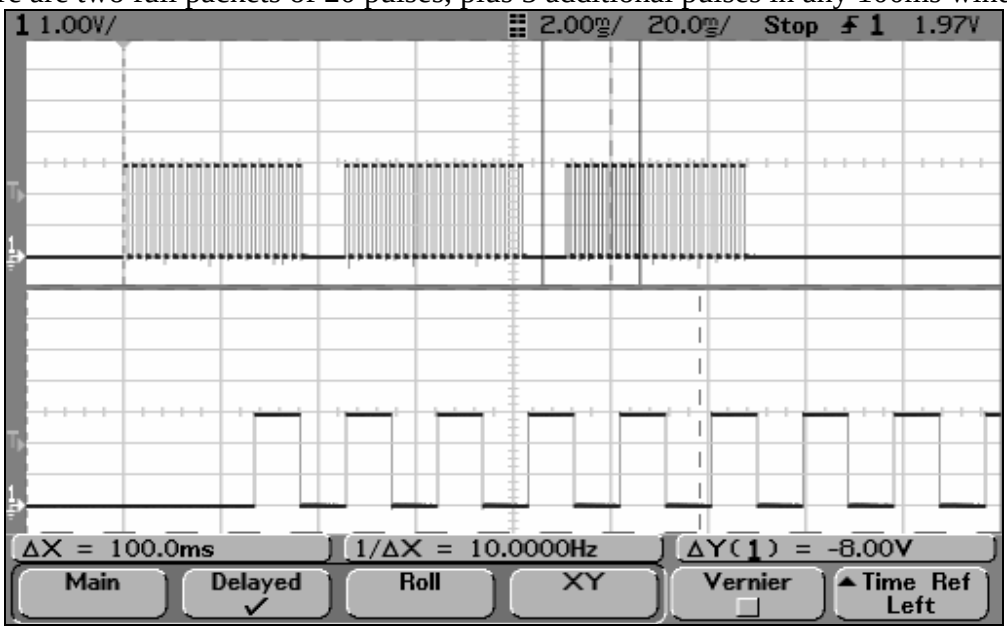


Data Packet Detail - Radiated Emissions, 100 ms Window

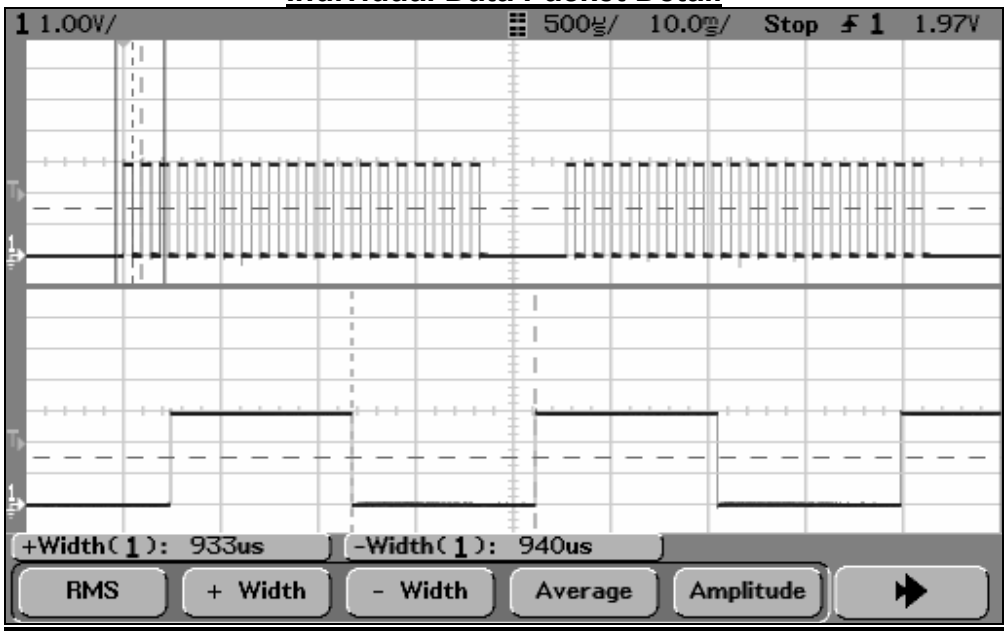
The worst case on-air time is from button one, with 7ms of off time between packets.



There are two full packets of 20 pulses, plus 5 additional pulses in any 100ms window.



Individual Data Packet Detail



(20+20+5) pulses x 933 micro-seconds per pulse = 42 ms of on-air time in 100 ms window.

9. Conducted Emissions Test (AC Line)

This device does not have any contingencies for connection to the AC Mains. No testing was performed for conducted RF emissions onto AC Mains.

APPENDIX A

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

FIELD STRENGTH OF FUNDAMENTAL FREQUENCIES:
The calculation involves a linear interpolation of 3750 to 12500 µV/m over 260-470 MHz, where field strength of the fundamental frequency (f_0) when $260 \leq f_0 \leq 470$ 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 Parts 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 µV/m over 260 to 470 MHz, where field strength of the harmonic frequencies ($2 f_0$, $3 f_0$…) when $260 \leq f_0 \leq 470$ MHz, can be found by: $375 + 4.1667(f_0 - 260)$, where f_0 is in MHz.

At fundamental frequency f_0 = 433.92 MHz
Fundamental Limit: 3750 + 41.6667 (433.92-260) = 10,996.67 µV/m @ 3m
Harmonic Limit: 375 + 4.1667 (433.92-260) = 1,099.67 µV/m @ 3m
Above 470 MHz, the limit on the spurious and harmonic emissions is 1,250 µV/m @ 3m.

Frequency (MHz)	Fundamental Limit (µV/m @ 3m)	Fundamental Limit (dBµV/m @ 3m)	Harmonic Limit (µV/m @3m)	Harmonic Limit (dBµV/m @ 3m)
433.92	10,996.7	80.8	1099.7	60.8

APPENDIX B

CALCULATIONS OF DUTY FACTOR RELAXATION AND OCCUPIED BANDWIDTH

For a graphical presentation of the data packets from the transmitter, refer to the Data Packet Detail in previous sections of this report. 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)
For this product, multiple transmit packets can fit within any 100 ms window. As shown in previous sections of this report, up to two full packets plus five pulses can fit in any 100 ms window. Each pulse was measured at 933µs. Therefore, the worst-case relaxation factor allowance is calculated as:

(20+20+5) pulses x 933 micro-seconds per pulse = 42 ms of on-air time in 100 ms window.

Average Factor = 20 * Log_{10} (42.0 / 100.0 ms) = -7.53 dB

A relaxation factor of 7.5 dB would be allowable for this product.

OCCUPIED BANDWIDTH CALCULATIONS

FCC Part 15.231(c) 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 MHz 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 x 433.92 MHz = 1.085 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 430 kHz.
The EUT sample had an occupied bandwidth within the limits expressed by FCC part 15.231c.

APPENDIX C

TEST EQUIPMENT LIST

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/27/05	9/27/06
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/27/05	9/27/06
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/27/05	9/27/06
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/07/05	12/07/06
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	12/29/05	12/29/06
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/29/05	9/29/06
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/29/05	9/29/06
EE960073	Agilent	E4446A	US45300564	Spectrum Analyzer	2/01/06	2/01/07
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

Note 1 - Equipment calibrated within a traceable system.

Uncertainty Statement

This uncertainty represents an expanded uncertainty
expressed at approximately the 95% confidence level, using a coverage factor of k=2.

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 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V