

**DATE: 03 June 2009**

**I.T.L. (PRODUCT TESTING) LTD.**

**FCC Radio Test Report**

for

**Visonic Ltd.**

**Equipment under test:**

**Fully Supervised Wireless Alarm  
Control System**

**Powermax Express**

Written by: *E. Ever*  
E. Ever, Documentation

Approved by: *E. Ever*  
E. Ever, Test Engineer

Approved by: *I. Raz*  
I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.

## Measurement/Technical Report for Visonic Ltd.

### Fully Supervised Wireless Alarm Control System

#### Powermax Express

**FCC ID: WP3PMEXPRESS**

**IC ID: 1467C-PMEXPRESS**

03 June 2009

This report concerns:	Original Grant:	x
	Class I change:	
	Class II change:	

Equipment type: Part 15 Security/Remote Control Transceiver

47CFR15 Section 15231 (a-d)

Measurement procedure used is ANSI C63.4-2003.

Application for Certification  
prepared by:

Ishaishou Raz  
ITL (Product Testing) Ltd.  
Kfar Bin Nun  
D.N. Shimshon 99780  
Israel  
e-mail Sraz@itl.co.il

Applicant for this device:  
(different from "prepared by")

Arik Elshtein  
Visonic Ltd.  
Tel Aviv  
Habarzel 24  
Israel 69710  
Tel: +936-03-6456789  
e-mail: aelshtein@visonic.com

# TABLE OF CONTENTS

<b>1.</b>	<b>GENERAL INFORMATION-----</b>	<b>5</b>
1.1	Administrative Information.....	5
1.2	List of Accreditations.....	6
1.3	Product Description.....	7
1.4	Test Methodology.....	7
1.5	Test Facility.....	7
1.6	Measurement Uncertainty.....	7
<b>2.</b>	<b>PRODUCT LABELING -----</b>	<b>8</b>
<b>3.</b>	<b>SYSTEM TEST CONFIGURATION-----</b>	<b>9</b>
3.1	Justification.....	9
3.2	EUT Exercise Software.....	9
3.3	Special Accessories.....	9
3.4	Equipment Modifications.....	9
3.5	Configuration of Tested System.....	9
<b>4.</b>	<b>CONDUCTED AND RADIATED MEASUREMENT TEST SET-UP PHOTO-----</b>	<b>10</b>
<b>5.</b>	<b>CONDUCTED EMISSION DATA-----</b>	<b>12</b>
5.1	Test Specification.....	12
5.2	Test Procedure.....	12
5.3	Measured Data.....	12
5.4	Test Instrumentation Used, Conducted Measurement.....	15
<b>6.</b>	<b>AVERAGE FACTOR CALCULATION-----</b>	<b>16</b>
6.1	Test Instrumentation Used.....	18
<b>7.</b>	<b>PERIODIC OPERATION -----</b>	<b>19</b>
7.1	Specification.....	19
7.2	Requirements.....	19
7.3	Results.....	19
7.1	Test Instrumentation Used.....	22
<b>8.</b>	<b>FIELD STRENGTH OF FUNDAMENTAL-----</b>	<b>23</b>
8.1	Test Specification.....	23
8.2	Test Procedure.....	23
8.3	Measured Data.....	23
8.4	Test Instrumentation Used, Field Strength of Fundamental.....	27
<b>9.</b>	<b>SPURIOUS RADIATED EMISSIONS, 9 KHZ – 30 MHZ-----</b>	<b>28</b>
9.1	Test Specification.....	28
9.2	Test Procedure.....	28
9.3	Measured Data.....	28
9.4	Test Instrumentation Used, Radiated Measurements.....	29
9.5	Field Strength Calculation.....	30
<b>10.</b>	<b>SPURIOUS RADIATED EMISSIONS, 30 – 3500 MHZ-----</b>	<b>31</b>
10.1	Test Specification.....	31
10.2	Test Procedure.....	31
10.3	Test Data.....	32
10.4	Test Instrumentation Used.....	33
10.4	Test Instrumentation Used.....	33
<b>11.</b>	<b>INTERMODULATION -----</b>	<b>34</b>
11.1	Test Specification.....	34
11.2	Test Procedure.....	34
11.3	Test Data.....	35
11.4	Test Instrumentation Used.....	37

<b>12.</b>	<b>BANDWIDTH</b> -----	<b>38</b>
12.1	Test procedure .....	38
12.2	Results table.....	40
12.3	Test Equipment Used.....	41
<b>13.</b>	<b>COMPARISON REQUIREMENTS FCC WITH INDUSTRY CANADA</b> -----	<b>42</b>
<b>14.</b>	<b>APPENDIX B - CORRECTION FACTORS</b> -----	<b>43</b>
14.1	Correction factors for CABLE .....	43
14.2	Correction factors for CABLE .....	44
14.3	Correction factors for CABLE .....	45
14.4	Correction factors for CABLE .....	46
12.6	Correction factors for LOG PERIODIC ANTENNA .....	47
14.5	Correction factors for LOG PERIODIC ANTENNA .....	48
14.6	Correction factors for BICONICAL ANTENNA.....	49
14.7	Correction factors for BICONICAL ANTENNA.....	50
14.8	Correction factors for Double-Ridged Waveguide Horn .....	51
14.9	Correction factors for Horn Antenna .....	52
14.10	Correction factors for Horn Antenna .....	53
14.11	Correction factors for ACTIVE LOOP ANTENNA .....	54

# 1. General Information

## 1.1 Administrative Information

Manufacturer:	Visonic Ltd.
Manufacturer's Address:	Habarzel 24 Tel Aviv Israel 69710 Tel: +936-03-6456789 Fax: +936-03-6456788
Manufacturer's Representative:	Arik Elshtein
Equipment Under Test (E.U.T):	Fully Supervised Wireless Alarm Control System
Equipment Model No.:	Powermax Express
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	04/02/2009
Start of Test:	04/02/2009
End of Test:	17/03/2009
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Sub-part C

## **1.2 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

### 1.3 **Product Description**

The PowerMax Express is a user and installer-friendly, 29-zone fully-supervised wireless control system. The PowerMax Express includes an optional partition feature. Partitioning allows you to have up to four independently controllable areas with different user codes assigned to each partition. A partition can be armed or disarmed regardless of the status of the other partitions within the system.

**Arming Modes:** AWAY, HOME, AWAY-INSTANT, HOMEINSTANT, LATCHKEY, FORCED, BYPASS.

**Alarm Types:** Silent alarm, siren alarm (future option) or sounder (internal) alarm, in accordance with zone attributes.

**Siren Signals:** Continuous (intrusion / 24 hours / panic); triple pulse - pause - triple pulse (fire).

### 1.4 **Test Methodology**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### 1.5 **Test Facility**

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

### 1.6 **Measurement Uncertainty**

Conducted Emission

The uncertainty for this test is  $\pm 2$  dB.

Radiated Emission

The Open Site complies with the  $\pm 4$  dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

## 2. Product Labeling

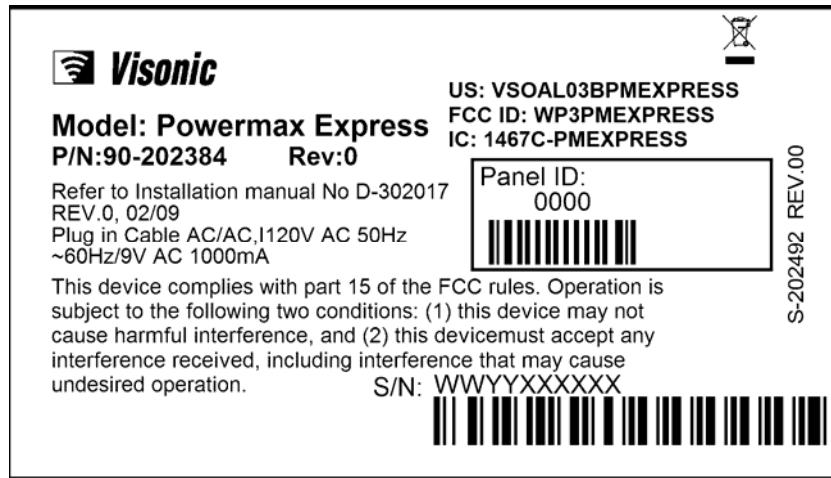


Figure 1. FCC Label

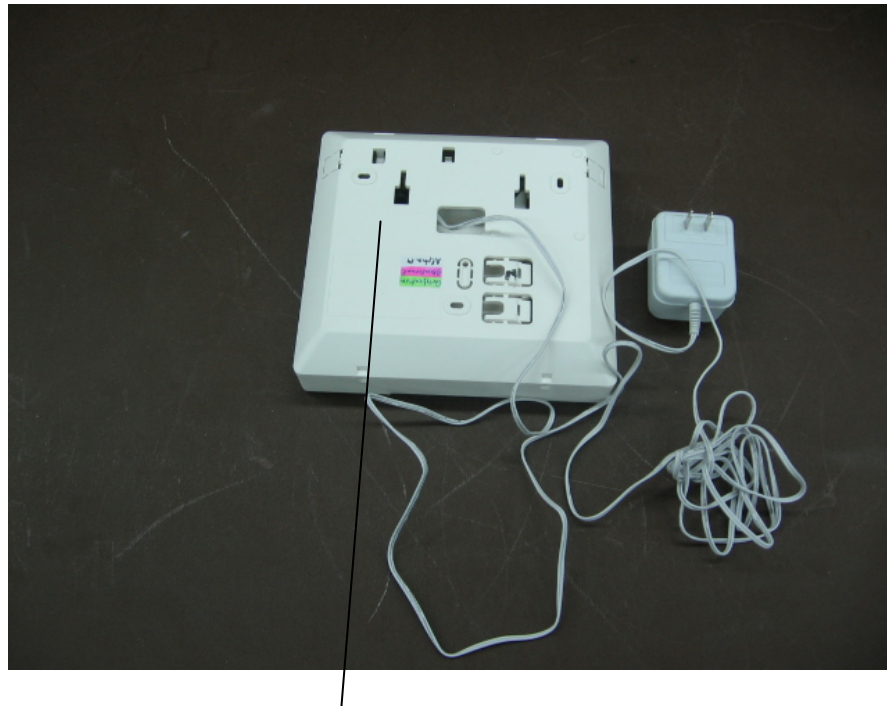


Figure 2. Location of Label on EUT



## 3. System Test Configuration

### 3.1 *Justification*

Radiated emission screening was performed in 3 orthogonal orientations. The worst case orientation was the vertical position.

### 3.2 *EUT Exercise Software*

Manufacturing software was used for the tests.

### 3.3 *Special Accessories*

No special accessories were needed.

### 3.4 *Equipment Modifications*

No modifications were needed in order to achieve compliance

### 3.5 *Configuration of Tested System*

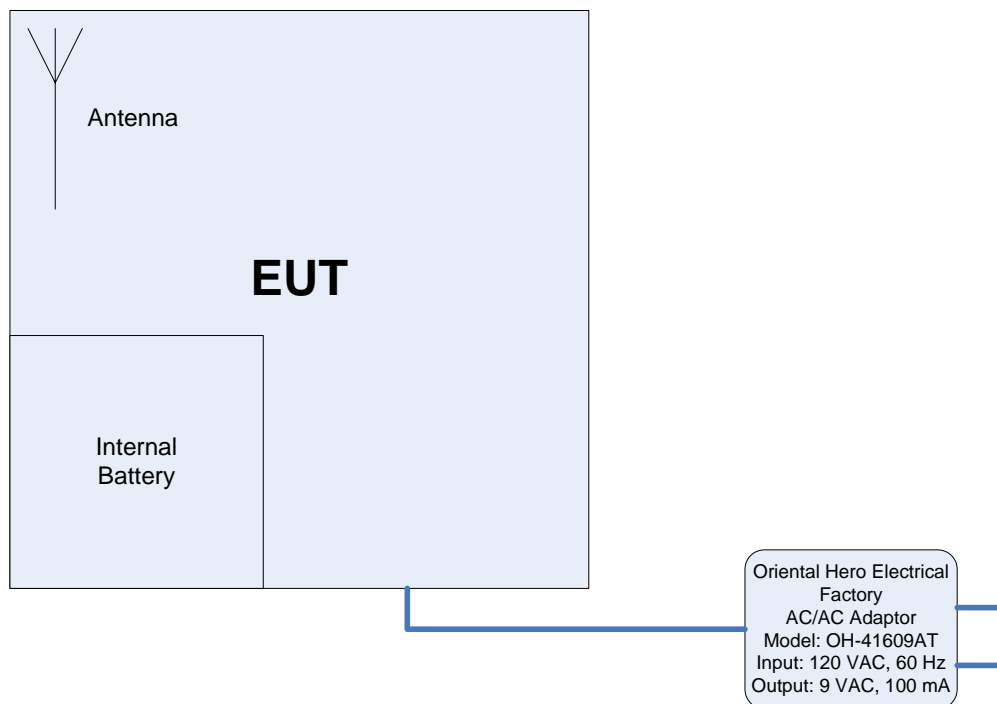


Figure 3. Configuration of Tested System

## 4. Conducted and Radiated Measurement Test Set-up Photo



Figure 4. Conducted Emission Test



Figure 5. Radiated Emission Test



**Figure 6. Inter-modulation Radiated Emission Test**

## 5. Conducted Emission Data

### 5.1 Test Specification

F.C.C., Part 15, Subpart C

### 5.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50  $\mu$ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

### 5.3 Measured Data

JUDGEMENT: Passed by 29.3 dB

The margin between the emission levels and the specification limit is, in the worst case, 29.3 dB for the phase line at 3.99 MHz and 29.3 dB at 3.99 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 7* to *Figure 8*.

TEST PERSONNEL:

Tester Signature: Char Ever Date: 22/04/2009

Typed/Printed Name: E. Ever

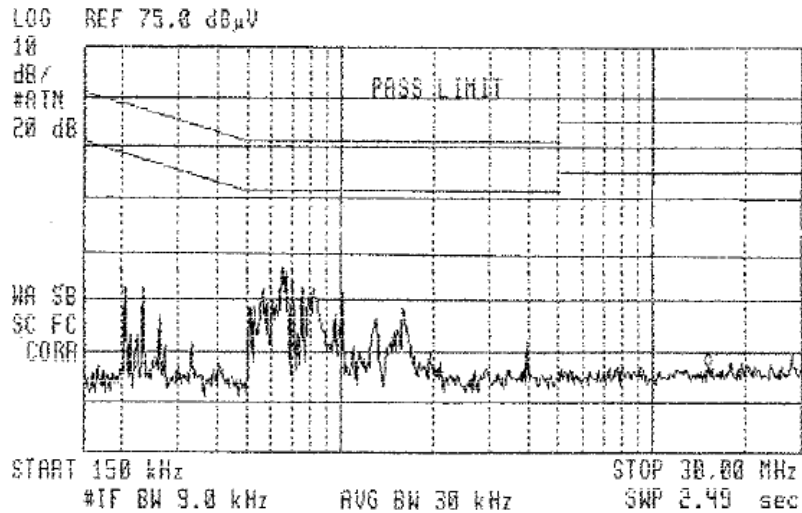
# Conducted Emission

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C  
 Lead: Phase  
 Detectors: Peak, Quasi-peak, Average

15:03:43 FEB 04, 2009

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 14.99 MHz  
 12.01 dBμV



Signal Number	Frequency (MHz)	Peak (dBμV)	QP (dBμV)	QP Delta L 1 (dB)	Av Delta L 2 (dB)	Corr (dB)
1	0.242694	12.9	10.3	-51.7	-51.2	0.0
2	0.450973	27.5	6.3	-50.6	-47.2	0.0
3	0.659705	12.8	7.2	-48.8	-44.8	0.0
4	1.354615	20.4	15.8	-40.2	-36.1	0.0
5	3.999959	21.6	18.8	-37.2	-29.3	0.0
6	10.480321	11.4	6.4	-53.6	-49.8	0.0

Figure 7. Detectors: Peak, Quasi-peak, AVERAGE .

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

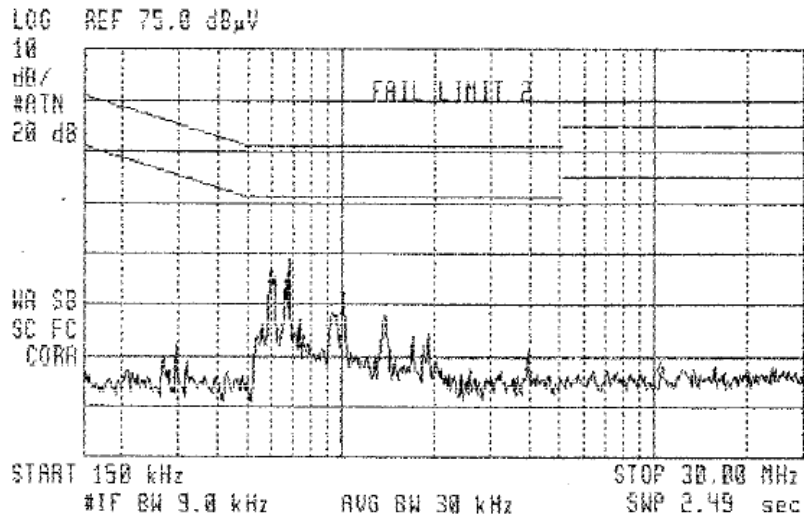
# Conducted Emission

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C  
 Lead: Neutral  
 Detectors: Peak, Quasi-peak, Average

15:12:09 FEB 04, 2009

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 10.40 MHz  
 11.04 dBμV



Signal Number	Frequency (MHz)	Peak (dBμV)	QP (dBμV)	QP Delta L 1 (dB)	Av Delta L 2 (dB)	Corr (dB)
1	0.203793	18.2	-1.8	-65.3	-62.9	0.0
2	0.450967	13.5	7.6	-49.3	-46.0	0.0
3	0.659701	12.0	7.4	-48.6	-44.7	0.0
4	1.354613	12.0	6.7	-49.3	-45.5	0.0
5	3.999959	21.4	18.8	-37.2	-29.3	0.0
6	10.400321	11.2	6.4	-53.5	-49.8	0.0

Figure 8. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

#### 5.4 Test Instrumentation Used, Conducted Measurement

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Last Calibration Date</b>	<b>Period</b>
LISN	Fischer	FCC-LISN-2A	127	March 3, 2009	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2009	1 Year
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2008	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A



## 6. Average Factor Calculation

1. Transmission pulse duration = 713usec
2. Burst duration = 1.05msec
3. Time between bursts = 805msec , >100ms

$$4. \text{ Average Factor} = 20 \log \left[ \frac{\text{Pulse duration}}{\text{Pulse period}} \right]$$

$$\text{Average Factor} = 20 \log \left[ \frac{0.713}{1.05} \right] = -3.36dB$$

17:55:32 FEB 08, 2009

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 713.00 μsec  
.54 dB

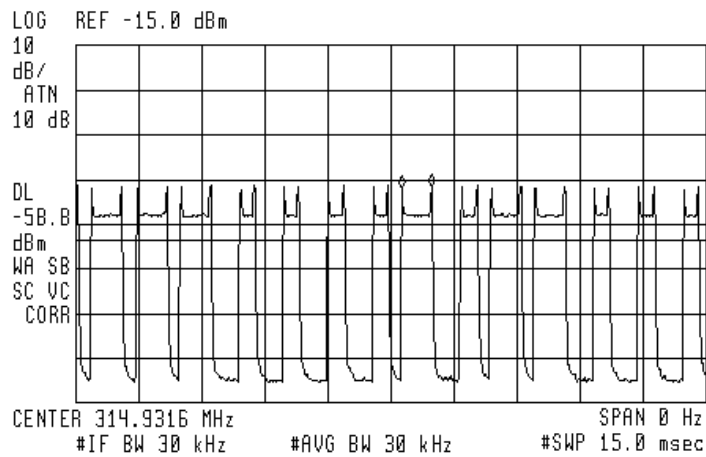
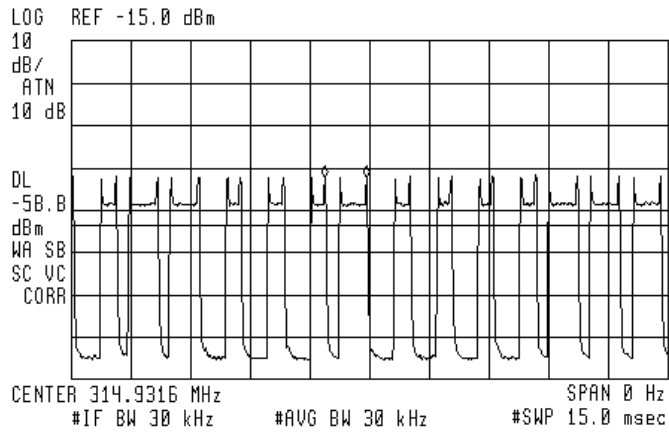


Figure 9. Transmission pulse duration = 713usec



17:57:32 FEB 08, 2009

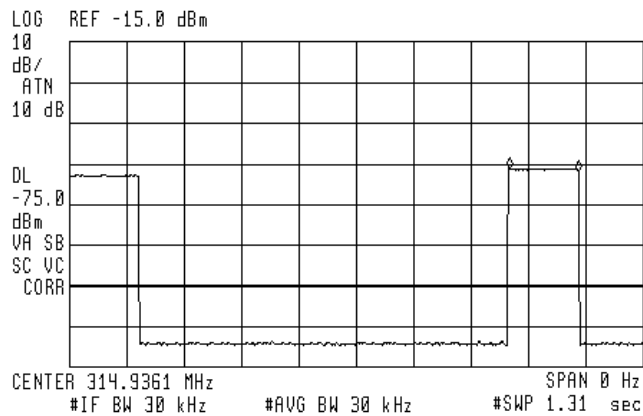
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 1.0500 msec  
.00 dB



**Figure 10. Burst duration = 1.05 msec**

17:43:40 FEB 08, 2009

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKRΔ 156.87 msec  
-.49 dB



**Figure 11. Time between bursts = 156.87msec , >100ms**

### 6.1 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A



# Periodic Operation

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(a)

16:52:51 FEB 08, 2009

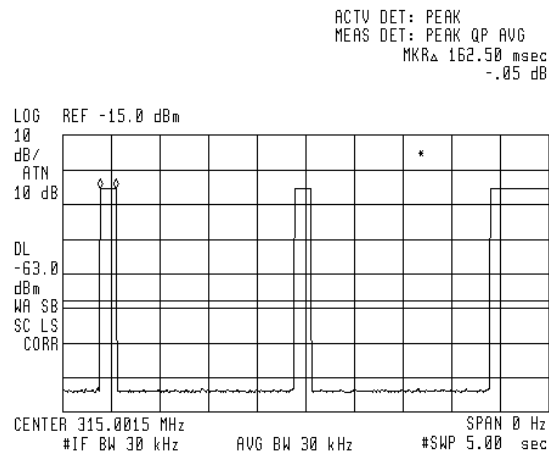


Figure 12. Automatically operated transmission Pulse 1 (162.50 msec)

16:55:07 FEB 08, 2009

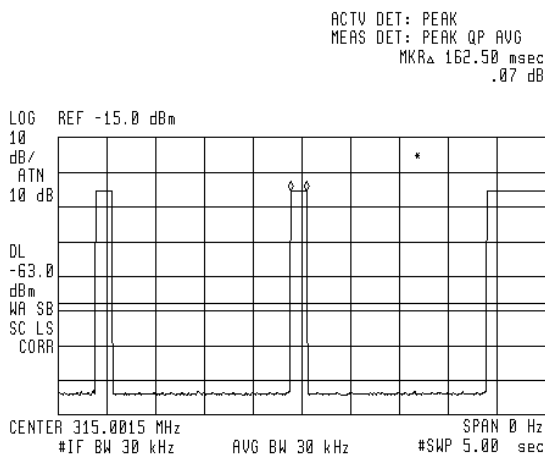


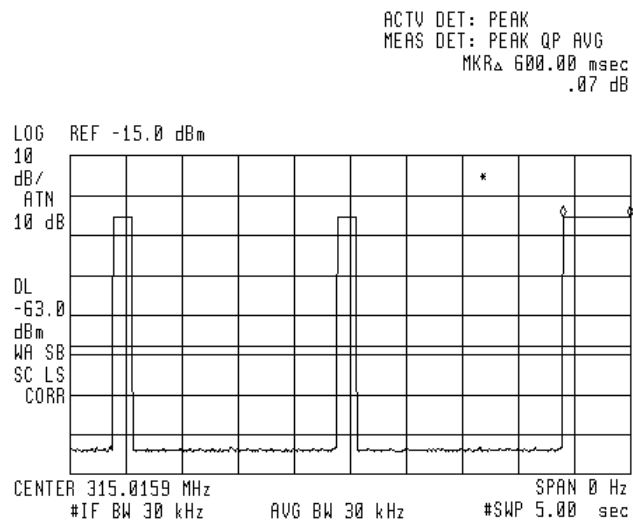
Figure 13. Automatically operated transmission Pulse 2 (162.50 msec.)

## Periodic Operation

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(a)

16:57:37 FEB 08, 2009



**Figure 14. Automatically operated transmission Pulse 3 (600.00 msec.)**

**Total transmission time in 5 seconds [162.5 msec + 162.5 msec +600 msec = 925 msec.]**

**Supervised transmissions (3 Pulses during transmission = 925 msec in 1 hour)**

**Note:** See Section 1.3 Product Description for further alarm operation details.

### **7.1 Test Instrumentation Used**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration</b>	<b>Period</b>
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year

## 8. Field Strength of Fundamental

### 8.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.231(b)

### 8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (315 MHz) and Peak Detection.

The turntable and antenna mast were adjusted for maximum level reading on the EMI receiver.

The measurement was performed for vertical and horizontal polarizations of the test antenna.

The average result is:

Peak Level(dB $\mu$ V/m) + E.U.T. Duty Cycle Factor, in 100msec time window (dB)

### 8.3 Measured Data

JUDGEMENT: Passed by 2.5 dB

The EUT met the FCC Part 15, Subpart C, Section 15.231(b) specification requirements.

The details of the highest emissions are given in *Figure 15* to *Figure 17*.

TEST PERSONNEL:

Tester Signature: *E. Ever* Date: 22/04/2009

Typed/Printed Name: E. Ever

## Field Strength of Fundamental

E.U.T Description Fully Supervised Wireless Alarm  
Control System  
Type Powermax Express  
Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(b)

Antenna Polarization: Horizontal/Vertical

Test Distance: 3 meters

Detector: Peak

Freq.	Pol.	Peak Amp	Average Factor	AVG Result	AVG Specification	Margin
(MHz)	V/H	(dB $\mu$ V/m)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
315.00	H	76.5	-3.36	73.1	75.6	-2.5
315.00	V	67.0	-3.36	63.6	75.6	-12.0

**Figure 15. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL/VERTICAL. Detector: Peak**

### Notes:

1. Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.
2. "Peak Amp." (dB $\mu$ V/m) included the "Correction Factors".
3. "Correction Factors" (dB) = Test Antenna Correction Factor(dB) + Cable Loss.
4. "Average Factor =  $20 \log [(burst\ duration/100msec)*Num\ of\ burst\ within\ 100msec]$  =  $20 \log [(0.713/1.05)]$  = -3.36
5. "Average Result" (dB $\mu$ V/m)=Peak Amp. (dB $\mu$ V/m)+D.C.F. (dB)



# Field Strength of Fundamental

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

Specification: F.C.C., Part 15, Subpart C, 15.231(b)

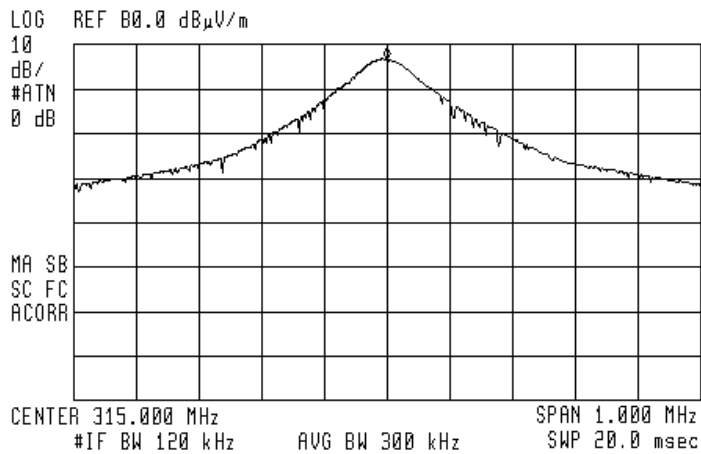
Antenna Polarization: Horizontal

Test Distance: 3 meters

Detectors: Peak, Quasi-peak, Average

16:44:16 FEB 19, 2009

ACTV DET: PEAK  
 MEAS DET: PEAK QP AVG  
 MKR 315.000 MHz  
 76.4B dBμV/m



**Figure 16. Field Strength of Fundamental. Antenna Polarization: HORIZONTAL.  
 Detectors: Peak, Quasi-peak, Average**

# Field Strength of Fundamental

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

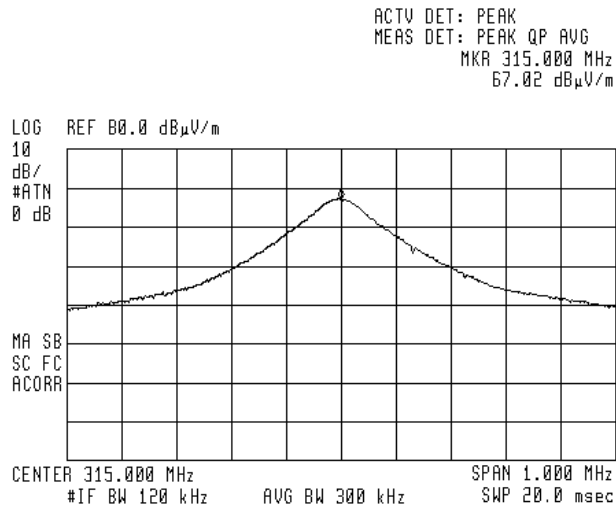
Specification: F.C.C., Part 15, Subpart C, 15.231(b)

Antenna Polarization: Vertical

Test Distance: 3 meters

Detectors: Peak, Quasi-peak, Average

16:38:46 FEB 19, 2009



**Figure 17. Field Strength of Fundamental. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak, Average**

#### 8.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## 9. Spurious Radiated Emissions, 9 kHz – 30 MHz

### 9.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

### 9.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 10 meters.

### 9.3 Measured Data

JUDGEMENT: Passed

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

No signals emanating from the EUT were found in this range.

TEST PERSONNEL:

Tester Signature: Chav Ever Date: 22/04/2009

Typed/Printed Name: E. Ever

#### 9.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

## 9.5 **Field Strength Calculation**

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

- FS: Field Strength [dB $\mu$ v/m]
- RA: Receiver Amplitude [dB $\mu$ v]
- AF: Receiving Antenna Correction Factor [dB/m]
- CF: Cable Attenuation Factor [dB]

Example:  $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

## 10. Spurious Radiated Emissions, 30 – 3500 MHz

### 10.1 Test Specification

30 - 3500 MHz, F.C.C., Part 15, Subpart C

### 10.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3. See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3. The signals from the list of the highest emissions were verified and the list was updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 2.9 – 6 GHz, a spectrum analyzer including a low noise amplifier was used. The test distance was 3 meters. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The emissions were measured at a distance of 3 meters.

### 10.3 Test Data

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

No harmonics of the fundamental frequency were found in the frequency range of 30 MHz to 3500 MHz

TEST PERSONNEL:

Tester Signature: *Chan Ever*

Date: 22/04/2009

Typed/Printed Name: E. Ever



### 10.4 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	November 2, 2007	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## 11. Intermodulation

### 11.1 Test Specification

3<sup>rd</sup> Order Product

### 11.2 Test Procedure

The E.U.T was placed on a remote-controlled turntable on the open area test site. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in *Figure 6*.

The E.U.T. was configured to operate with both the RF Section and the GSM functioning. The RF Section operated at 315 MHz and the GSM operated at 850 MHz with the base station simulator P/N .

The emissions below 2.9 GHz were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range above 2.9 GHz, a spectrum analyzer including a low noise amplifier was used. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

The receiver and/or spectrum analyzer center frequency was set to the frequencies of the 3<sup>rd</sup> order intermodulation products, resulting from the transmitters' operation frequencies.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The emissions were measured at a distance of 3 meters.

### 11.3 Test Data

JUDGEMENT: Passed by 35.4 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

The margin between the emission level and the specification limit was 35.4 dB in the worst case at the frequency of 1572.86 MHz, vertical polarization.

TEST PERSONNEL:

Tester Signature: *E. Ever*

Date: 22/04/2009

Typed/Printed Name: E. Ever

## Intermodulation

E.U.T Description Fully Supervised Wireless Alarm Control System  
 Type Powermax Express  
 Serial Number: Not Designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 30 MHz to 5000 MHz  
 Antenna: 3 meters distance                              Detectors: Peak, Quasi-peak

Frequency (MHz)	Antenna Polarity (H/V)	Peak Amp (dBμV/m)	Specification (dBμV/m)	Margin (dB)
629.88	H	30.6	74.0	-43.4
945.14	H	35.3	74.0	-39.7
629.88	V	30.6	74.0	-43.4
944.96	V	36.1	74.0	-37.9
1258.89	V	37.8	74.0	-36.2
1572.86	V	38.6	74.0	-35.4

**Figure 18. Radiated Emission. Antenna Polarization: VERTICAL/HORIZONTAL.  
 Detectors: Peak, Quasi-peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Amp” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss

### 11.4 Test Instrumentation Used

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS- 0411N313	013	November 2, 2007	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 Year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	2 years
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## 12. Bandwidth

### 12.1 Test procedure

The transmitter unit operated with normal modulation. The spectrum analyzer was set to 30 kHz resolution BW and center frequency of the transmitter fundamental. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 20 dBc points.

The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on the modulation envelope.

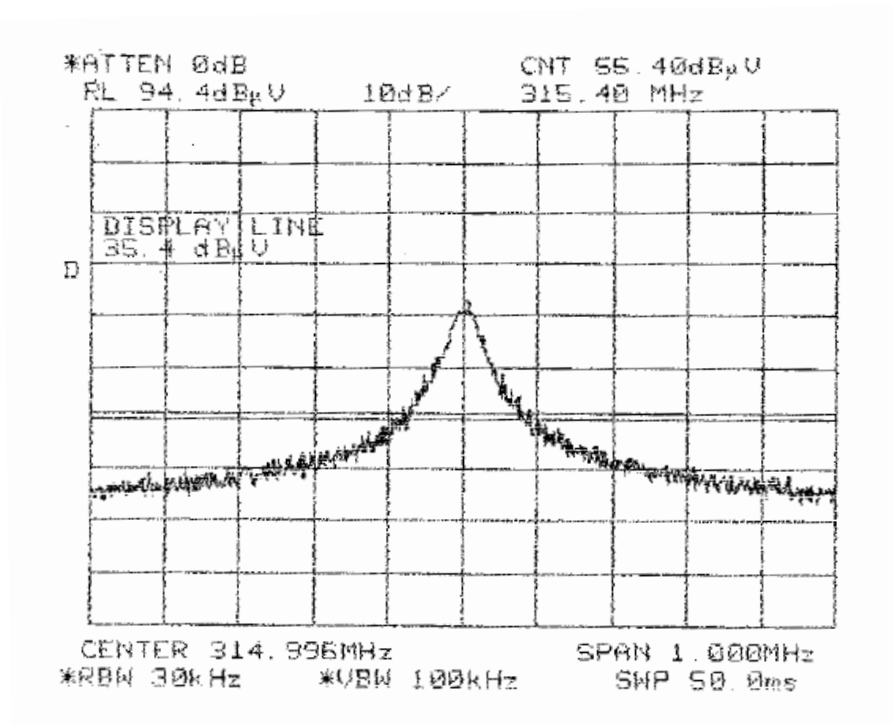


Figure 19  $F_{Center}$



## 12.2 Results table

E.U.T Description: Fully Supervised Wireless Alarm Control System  
Model: Powermax Express  
Serial Number: Not Designated  
Specification: F.C.C. Part 15, Subpart C: (15.231(c))

Bandwidth Reading (kHz)	Specification (1) (kHz)	Margin (kHz)
163	< 787	-624

**Figure 22 Bandwidth**

JUDGEMENT: Passed by 624 kHz

TEST PERSONNEL:

Tester Signature: *E. Ever* Date: 22/04/2009

Typed/Printed Name: E. Ever

(1) 0.25% of the E.U.T. fundamental frequency, Section 15.231(c).



### 12.3 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

### 13. Comparison requirements FCC with Industry Canada

<b>EUT</b>	<b>FCC Specification</b>	<b>According FCC Standard</b>	<b>IC Standard</b>
Powermax Express	<b>Periodic Operation</b>	<b>FCC Part 15.231 (a)(1-5)</b>	<b>RSS- 210 Section 2.6 Annex 1, A1.1.1</b>
	<b>Field Strength at Fundamental</b>	<b>FCC Part 15.231 (b)</b>	<b>RSS- 210 Annex 1 A1.1.2, Section 2.6</b>
	<b>Spurious Emissions and Intermodulation</b>	<b>FCC Part 15.231 (b)</b>	<b>RSS- 210 Section 2.6 Annex 1 A1.1.2</b>
	<b>Bandwidth</b>	<b>FCC Part 15.231 (c)</b>	<b>RSS- 210 Section 2.6 Annex 1 A1.1.3</b>

## 14. APPENDIX B - CORRECTION FACTORS

**14.1 Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.**

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

**NOTES:**

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

**14.2 Correction factors for CABLE**  
**from EMI receiver**  
**to test antenna**  
**at 3 meter range.**

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

*NOTES:*

- 1. The cable type is RG-8.*
- 2. The overall length of the cable is 10 meters.*

**14.3 Correction factors for CABLE**  
**from spectrum analyzer**  
**to test antenna above 2.9 GHz**

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

**NOTES:**

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

**14.4 Correction factors for CABLE**  
**from EMI receiver**  
**to test antenna**  
**at 10 meter range.**

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	9.8
20.0	0.8	1400.0	10.0
30.0	0.9	1600.0	11.3
40.0	1.2	1800.0	12.2
50.0	1.4	2000.0	13.1
60.0	1.6	2300.0	14.5
70.0	1.8	2600.0	15.9
80.0	1.9	2900.0	16.4
90.0	2.0		
100.0	2.1		
150.0	2.6		
200.0	3.2		
250.0	3.8		
300.0	4.2		
350.0	4.6		
400.0	5.1		
450.0	5.3		
500.0	5.6		
600.0	6.3		
700.0	7.0		
800.0	7.6		
900.0	8.0		
1000.0	8.7		

**NOTES:**

1. The cable type is RG-214.
2. The overall length of the cable is 34 meters.
3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

## 12.6 Correction factors for LOG PERIODIC ANTENNA

### Type LPD 2010/A at 3 and 10 meter ranges.

#### Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

#### Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

#### NOTES:

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range,  
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission  
Test EMI Receiver".

**14.5 Correction factors for**

**LOG PERIODIC ANTENNA**

**Type SAS-200/511  
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

**NOTES:**

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".



**14.6 Correction factors for BICONICAL ANTENNA  
Type BCD-235/B,  
at 3 meter range**

<b>FREQUENCY (MHz)</b>	<b>AFE (dB/m)</b>
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

**NOTES:**

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

**14.7 Correction factors for BICONICAL ANTENNA  
Type BCD-235/B,  
10 meter range**

<b>FREQUENCY (MHz)</b>	<b>AFE (dB/m)</b>
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

**NOTES:**

1. Antenna serial number is 1041.
2. The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

**14.8 Correction factors for Double-Ridged Waveguide Horn**

**Model: 3115, S/N 29845  
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENN A Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

**14.9 Correction factors for**

**Horn Antenna  
Model: SWH-28  
at 1 meter range.**

<b>FREQUENCY (GHz)</b>	<b>AFE (dB /m)</b>	<b>Gain (dB1)</b>
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

**14.10 Correction factors for****Horn Antenna  
Model: V637**

<b>FREQUENCY (GHz)</b>	<b>AFE (dB /m)</b>	<b>Gain (dB1)</b>
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

### 14.11 Correction factors for ACTIVE LOOP ANTENNA

**Model 6502**

**S/N 9506-2950**

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2