Excellence in Compliance Testing

Certification Test Report

FCC ID: X6P-0003072
IC: 8832A-0003072

FCC Rule Part: 15.249
IC Radio Standards Specification: RSS-210

ACS Report Number: 09-0074.W06.11.B

Manufacturer: HomeRun Holdings Corporation
Model: WDHA-30

Test Begin Date: August 31, 2009
Test End Date: February 8, 2010

Report Issue Date: February 8, 2010

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

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This report contains pages

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1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product Description

1.2.1 General

The Home Manager ST is a wireless home appliance which allows the user to schedule events to occur. These events could be the front lights of the home to come on at night, the irrigation system to turn on and off, the thermostat to begin cooling the house before coming home, or any item that might have a schedule.

The WDHA-30 operates on a single channel at 908.42 MHz.

Manufacturer Information:
HomeRun Holdings Corp.
6370 Mt. Pleasant St. NW
North Canton OH 44720
USA

Test Sample Serial Number(s):
ACS#1

Test Sample Condition:
The test sample was provided in working order with no visible defects.

Operating Voltage:
The WDHA-30 operates off a 5V DC power supply.

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use

The Home Manager ST is a complete wireless home solutions interface.

1.3 Test Methodology and Considerations

The WDHA-30 was tested as a Class B PC peripheral. All usable ports were populated per ANSI C63.4.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO/IEC 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 894540
Industry Canada Lab Code: 4175A
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

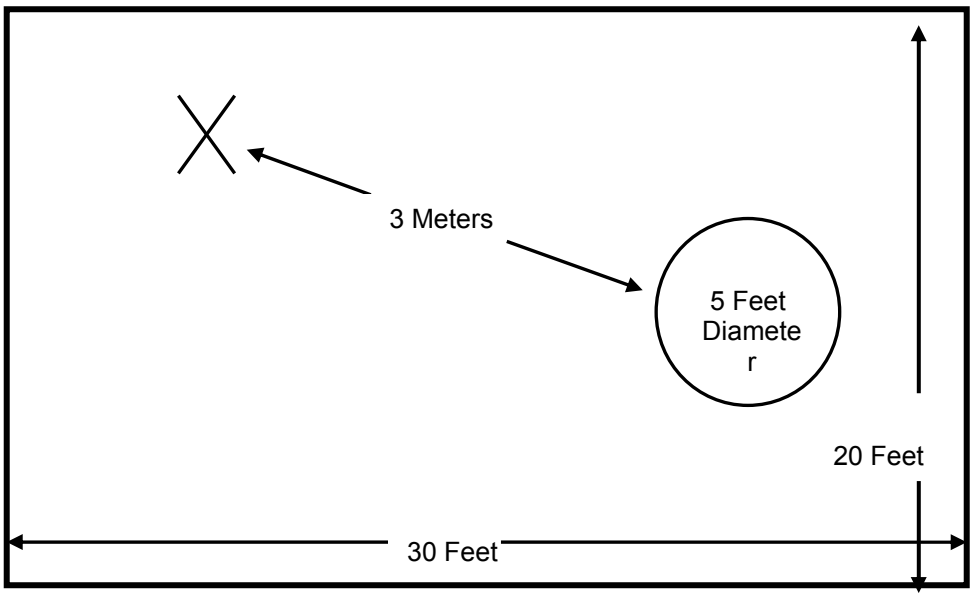

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

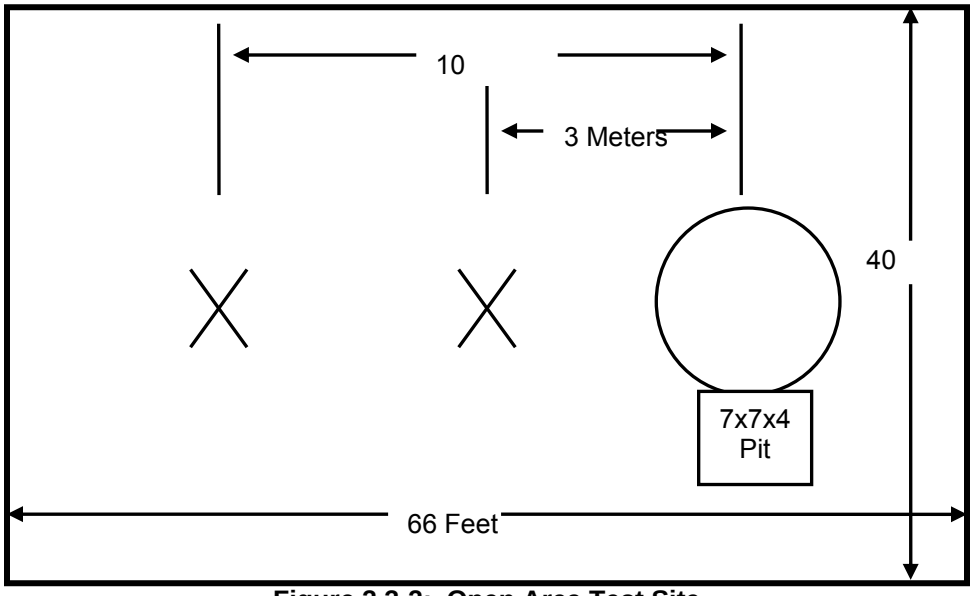

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the conducted emissions test site is shown below in figure 2.4-1:

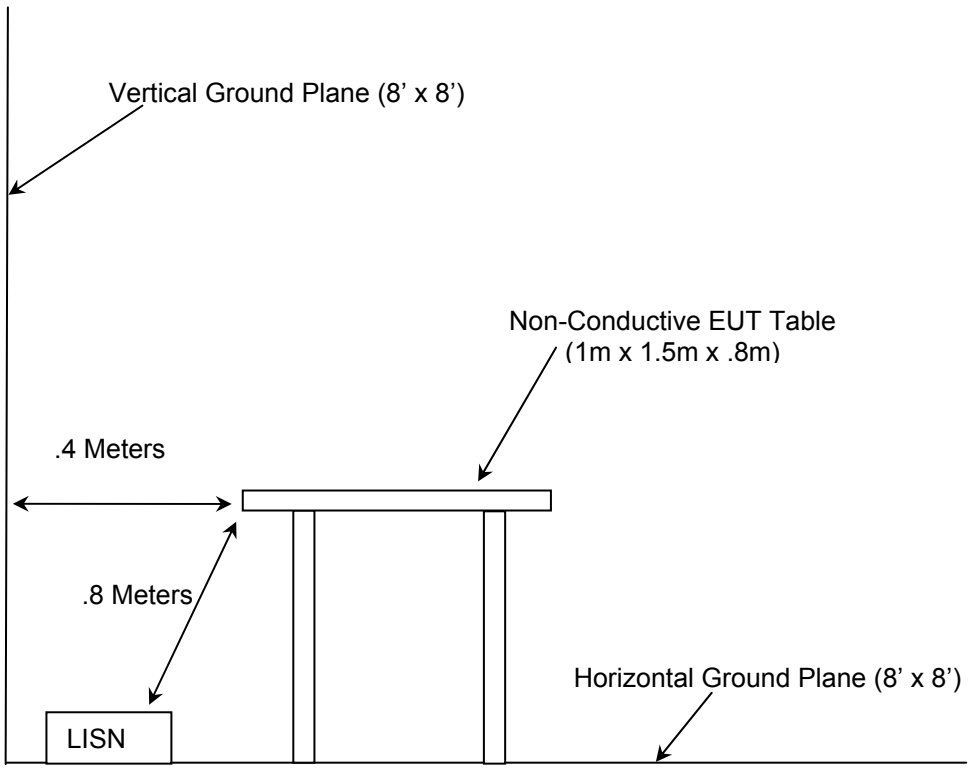

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2009
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2009
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

4.0 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	09-21-2010
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-21-2010
3	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	839379/011	02-02-2011
4	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	833827/003	02-02-2011
22	Agilent	Amplifiers	8449B	3008A00526	09-21-2009
25	Chase	Antennas	CBL6111	1043	09-02-2010
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-08-2010
40	EMCO	Antennas	3104 3211	3104 3211	01-27-2011
73	Agilent	Amplifiers	8447D	2727A05624	07-15-2010
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-25-2011 (See Note1)
193	ACS	Cable Set	OATS cable Set	0193	01-05-2011 (See Note1)
211	Eagle	Filters	C7RFM3NFNM	HLC-700	12-21-2010 (See Note1)
213	TEC	Amplifiers	PA 102	44927	12-21-2010 (See Note1)
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	09-21-2010
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2010 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2010 (See Note1)
337	Microwave Circuits	Filters	H1G513G1	282706	07-17-2010 (See Note1)
343	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	N/A	05-04-2010 (See Note1)
412	Electro Metrics	Antenna	LPA-25	1241	07-23-2010
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	01-26-2011 (See Note1)
430	Florida RF Cables	Cables	SMS-290AW-480-SMS	N/A	05-04-2010 (See Note1)

Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.
Note2: Items verified on an annual cycle. The date shown indicates the next verification due date.

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	DC Power Supply – 5VDC	Fairway Electronic Co.,LTD.	WRG10F-05AA	N/A
2	Laptop PC	Dell	610	CN-OD4571-48643-58H-0166
3	DC Power Supply – 19.5VDC	Dell	PA-1650-05D	CN-05U092-71615-4CQ-7E14
4	Printer	Lexmark	Z22	22365544870
5	DC Power Supply – 30VDC	Skynet	DND-3005A	17E0300
6	Mouse (Serial)	Logitech	N/A	LTR44202536
7	Mouse (USB)	N/A	H3003	N/A

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAMS

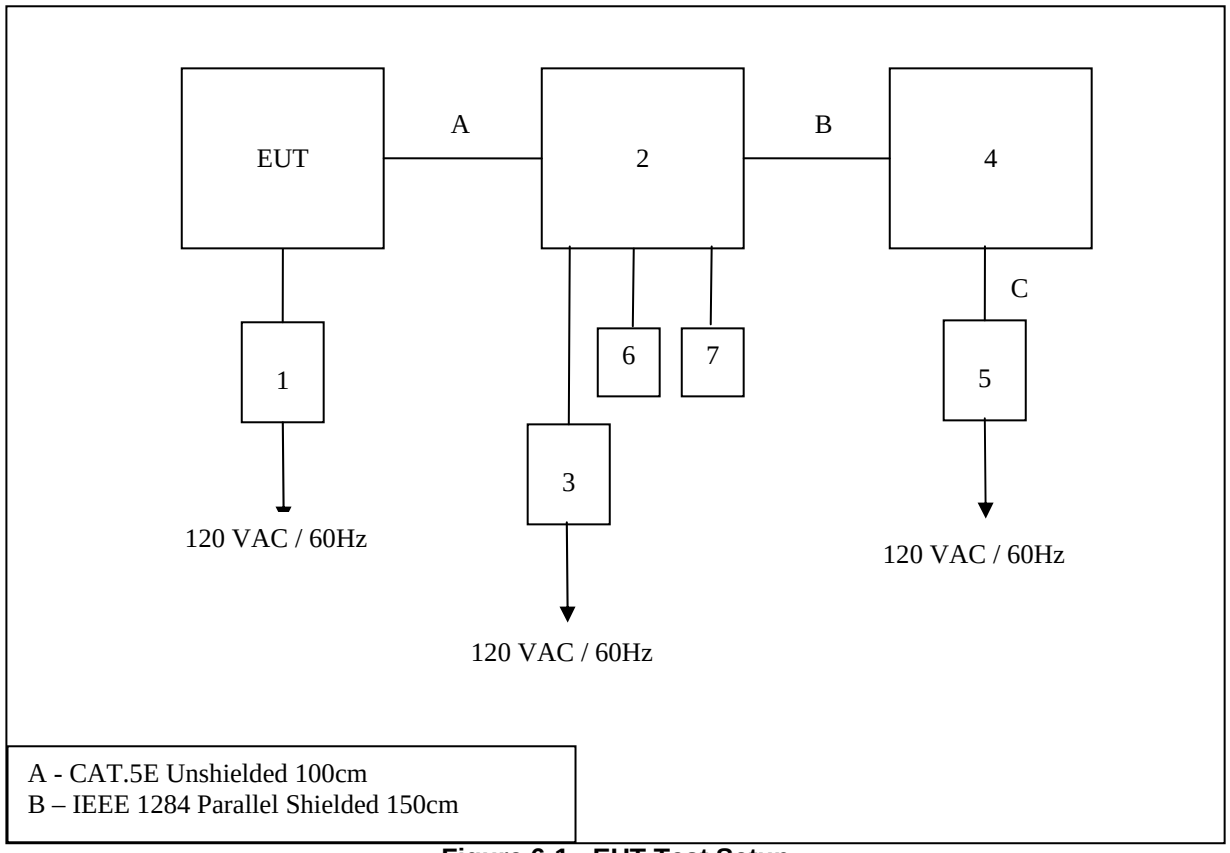

Figure 6-1: EUT Test Setup

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The WDHA-30 utilizes an integral PCB etched ¼ wavelength antenna with gain 0dBi.

7.2 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.2

7.2.1 Test Methodology

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

7.2.2 Test Results

Results of the test are shown below in and Tables 7.2.2-1 to 7.2.2-2.

Table 7.2.2-1: Line 1 Conducted EMI Results

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.528	47.2	10	56	8.8	L1	FLO	QP
0.876	37	10	56	19	L1	FLO	QP
0.936	38	10	56	18	L1	FLO	QP
1.344	36.1	10	56	19.9	L1	FLO	QP
1.644	36.6	10	56	19.4	L1	FLO	QP
2.334	33.7	10	56	22.3	L1	FLO	QP
3.324	31.5	9.9	56	24.5	L1	FLO	QP
3.504	35.1	9.9	56	20.9	L1	FLO	QP
3.762	35.2	9.9	56	20.8	L1	FLO	QP
4.956	34.7	10	56	21.3	L1	FLO	QP
0.522	39.8	10	46	6.2	L1	FLO	AVG
0.894	24.9	10	46	21.1	L1	FLO	AVG
0.936	29.6	10	46	16.4	L1	FLO	AVG
1.38	23.9	10	46	22.1	L1	FLO	AVG
1.632	28	10	46	18	L1	FLO	AVG
2.37	24.4	10	46	21.6	L1	FLO	AVG
3.3	21.1	9.9	46	24.9	L1	FLO	AVG
3.462	27.2	9.9	46	18.8	L1	FLO	AVG
3.774	27.1	9.9	46	18.9	L1	FLO	AVG
4.974	26.9	10	46	19.1	L1	FLO	AVG

Table 7.2.2-2: Line 2 Conducted EMI Results

Frequency (MHz)	Level (dBuV)	Transducer (dB)	Limit (dBuV)	Margin (dB)	Line	PE	Detector
0.174	46.1	9.9	65	18.6	L2	FLO	QP
0.522	47.9	10	56	8.1	L2	FLO	QP
0.642	36.6	10	56	19.4	L2	FLO	QP
0.93	38.1	10	56	17.9	L2	FLO	QP
1.278	36.2	10	56	19.8	L2	FLO	QP
1.608	35.4	10	56	20.6	L2	FLO	QP
2.742	35.1	10	56	20.9	L2	FLO	QP
3.06	35.4	9.9	56	20.6	L2	FLO	QP
3.456	35.6	9.9	56	20.4	L2	FLO	QP
4.98	35.9	10	56	20.1	L2	FLO	QP
0.228	32.1	9.9	53	20.5	L2	FLO	AVG
0.522	40.7	10	46	5.3	L2	FLO	AVG
0.648	24.7	10	46	21.3	L2	FLO	AVG
0.936	29.8	10	46	16.2	L2	FLO	AVG
1.272	28.2	10	46	17.8	L2	FLO	AVG
1.62	26.9	10	46	19.1	L2	FLO	AVG
2.73	27.5	10	46	18.5	L2	FLO	AVG
3.072	28	9.9	46	18	L2	FLO	AVG
3.516	25.9	9.9	46	20.1	L2	FLO	AVG
4.95	28.7	10	46	17.3	L2	FLO	AVG

7.3 Radiated Emissions – FCC: Section 15.109(Unintentional Radiation) IC: RSS-210 2.6

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 5GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, peak and average measurements are taken with the RBW and VBW were set to 1MHz and 3MHz respectively.

7.3.2 Test Results

Results of the test are given in Table 7.3.2-1 below:

Table 7.3.2-1: Radiated Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
41.593		46.24	H	-12.43	---------	33.81	--------	40.0	---------	6.2
43.76		48.20	H	-13.56	---------	34.64	--------	40.0	---------	5.4
62.33		49.59	H	-19.60	---------	29.99	--------	40.0	---------	10.0
99.993		41.24	V	-14.50	---------	26.74	--------	43.5	---------	16.8
399.982		46.16	V	-7.60	---------	38.56	--------	46.0	---------	7.4
499.982		47.46	H	-5.10	---------	42.36	--------	46.0	---------	3.6
798.089		33.60	V	-0.40	---------	33.20	--------	46.0	---------	12.8
699.973		35.60	V	-1.80	---------	33.80	--------	46.0	---------	12.2

* Note: All emissions above 700MHz were not detected above the noise floor of the measurement equipment and therefore attenuated below the permissible limit.

7.4 Occupied Bandwidth – FCC: Section 15.215 IC: RSS-GEN 4.6.1

7.4.1 Test Methodology

The spectrum analyzer span was set to 2 to 3 times the estimated bandwidth of the emission. The RBW was to ≥ 1% of the estimated emission bandwidth. The trace was set to max hold with a peak detector active. Bandwidth is determined at the points 20 dB down from the modulated carrier. The 99% bandwidth was also measured and reported in Section 7.4.2 below.

7.4.2 Test Results

The 20 dB bandwidth was determined to be 68.4 kHz. The frequency band designated under Part 15.249 is 902 - 928MHz, therefore the 20dB bandwidth is contained within the frequency band designated under this rule part. Results are shown below in Table 7.4.2-1 and Figures 7.4.2-1 through 7.4.2-2.

Table 7.4.2-1 – Occupied Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	99% OBW (kHz)
908.42	68.4	87.0

Figure 7.4.2-1: 20dB Bandwidth

Figure 7.4.2-2: 99% Occupied Bandwidth

7.5 Fundamental Field Strength – FCC: Section 15.249(a) IC: RSS-210 A2.9(a)

7.5.1 Test Methodology

The fundamental field strength was evaluated at the single operating frequency of 908.42 MHz in the 902MHz to 928MHz frequency range.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For fundamentals below 1GHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz. For fundamentals above 1GHz, peak and average measurements were made using a resolution bandwidth (RBW) of 1 MHz and a video bandwidth (VBW) of 3 MHz.

7.5.2 Test Results

Results are shown below in table 7.5.2-1 below:

Table 7.5.2-1: Fundamental Field Strength

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
908.42	---------	88.37	H	2.74	---------	91.11	--------	94.0	---------	2.9
908.42	---------	81.74	V	2.14	---------	83.88	--------	94.0	---------	10.1

7.6 Band-Edge Compliance and Spurious Emissions – FCC: Section 15.249 IC: RSS-210 A2.9

7.6.1 Band-Edge Compliance – FCC: Section 15.249(d) IC: RSS-210 A2.9(b)

7.6.1.1 Test Methodology

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Compliance for the lower and upper band-edge was determined using the radiated mark-delta method as outlined in FCC DA 00-705. The radiated field strength of the fundamental emission was first determined and then the mark-delta method was used to determine the field strength of the band-edge emissions as compared to the emission limits of 15.209.

7.6.1.2 Test Results

Band-edge compliance is displayed in Table 7.6.1.2-1 and Figures 7.6.1.2-1 to 7.6.1.2-2.

Table 7.6.1.2-1: Band-edge Marker Delta Method

Frequency (MHz)	Uncorrected Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Level (dBuV/m)		Marker-Delta (dB)	Band-Edge Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg		pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
908.42	---------	88.37	H	2.74	---------	91.11	59.04	-------	32.07	---------	46	-------	13.93
908.42	---------	81.74	V	2.14	---------	83.88	51.06	-------	32.82	---------	46	-------	13.18

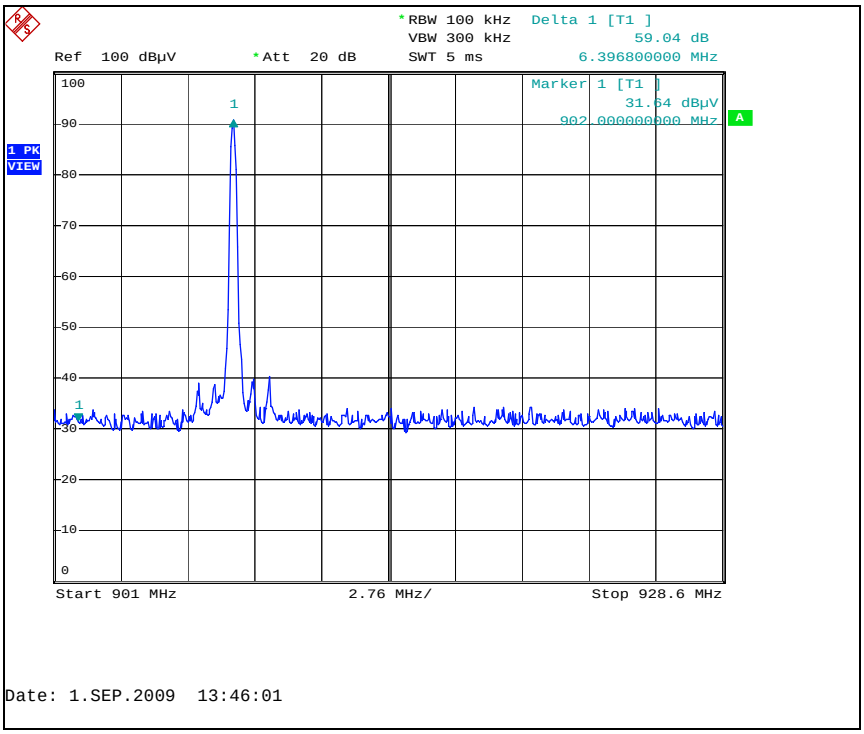

Figure 7.6.1.2-1 Band-edge – Hpol

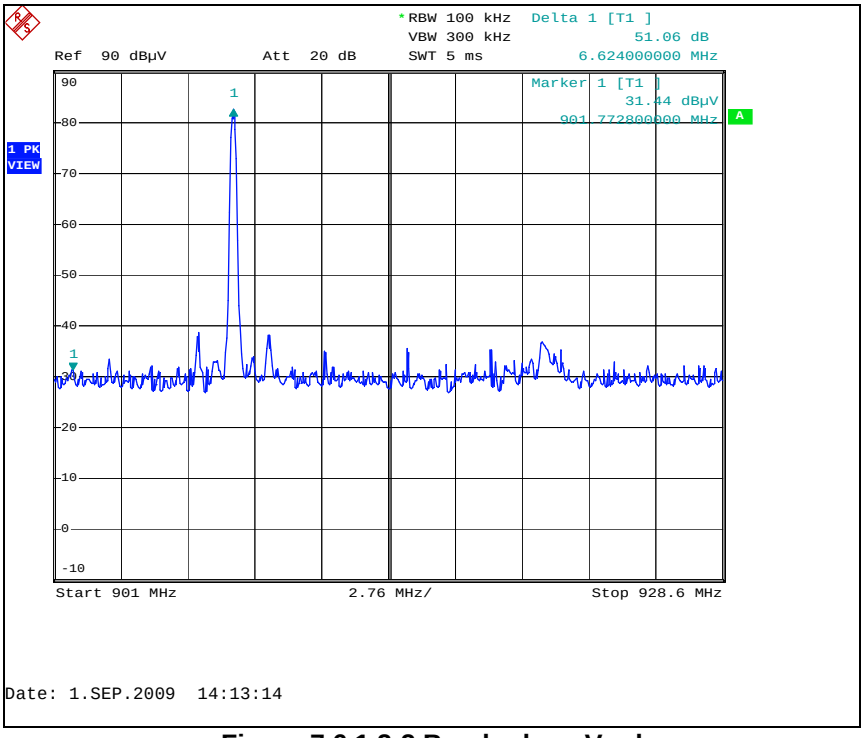

Figure 7.6.1.2-2 Band-edge - Vpol

7.6.2 Radiated Spurious Emissions – FCC: Section 15.249(a), (c); IC:RSS-210 A2.9(a)

7.6.2.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 10 GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz. For frequencies above 1000MHz, peak and average measurements were made using an RBW of 1 MHz and a VBW of 3MHz.

7.6.2.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced by a factor -4.44dB to account for the duty cycle of the EUT. The worst case duty cycle was determined to be 60% or 60ms with a 100ms period. The duty cycle correction factor is determined using the formula: 20log (0.60) = -4.44dB.

Justification for the duty cycle can be found in the theory of operation included in the application for certification.

7.6.2.3 Test Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in Table 7.6.2.3-1.

Table 7.6.2.3-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
1816.84	47.36	36.54	H	-3.79	43.57	28.31	74.0	54.0	30.4	25.7
1816.84	46.91	36.84	V	-3.79	43.12	28.61	74.0	54.0	30.9	25.4
2725.26	45.56	35.58	H	0.42	45.98	31.56	74.0	54.0	28.0	22.4
3633.68	50.62	43.93	H	3.28	53.90	42.77	74.0	54.0	20.1	11.2
3633.68	52.90	47.39	V	3.28	56.18	46.23	74.0	54.0	17.8	7.8

***** *The magnitude of all emissions not reported were below the noise floor of the measurement system.*

7.6.2.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U = Uncorrected Reading
R_C = Corrected Level
AF = Antenna Factor
CA = Cable Attenuation
AG = Amplifier Gain
DC = Duty Cycle Correction Factor

Example Calculation

PEAK:
Corrected Level: 47.36 - 3.79 = 43.57dBuV
Margin: 74dBuV – 43.57dBuV = 30.4dB

AVERAGE:
Corrected Level: 36.54 - 3.79 - 4.44= 28.31dBuV
Margin: 54dBuV – 28.31dBuV = 25.7dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the WDHA-30 manufactured by HomeRun Holdings Corporation meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT