Excellence in Compliance Testing

Certification Test Report

FCC ID: Z4D173503
IC: 9973A-173503

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 14-2051.W04.1A

Applicant: Sunbeam Products, Inc. d/b/a Jarden Consumer Solutions
Model(s): 173503

Test Begin Date: **May 20, 2014**
Test End Date: **June 20, 2014**

Report Issue Date: July 14, 2014

ACCREDITED TESTING

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACLASS, ANSI, or any agency of the Federal Government.

Reviewed by:
Thierry Jean-Charles
EMC Engineer
Advanced Compliance Solutions, Inc.

This report contains 18 pages

TABLE OF CONTENTS

1 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 for a permissive change.

The purpose of the permissive change is to add new host configuration for the Model 173503. There are no hardware changes on the module.

1.2 Applicant Information

Sunbeam Products, Inc. d/b/a Jarden Consumer Solutions
2381 NW Executive ctr dr.
Boca Raton, FL 33433

1.3 Product Description

The model 173503, WeMo SMART module, is an 2.4 GHz IEEE 802.11b/g/n transceiver. The device is designed to provide some wireless functionality to appliances using Belkin's WASP (WeMo Appliance Software Protocol).

Technical Details

Mode of Operation:	WLAN 802.11b/g/n
Frequency Range:	802.11b/g: 2412 MHz - 2462 MHz
	802.11n 20 MHz: 2412 MHz - 2462 MHz
	802.11n 40 MHz: 2422 MHz - 2452 MHz
Number of Channels:	802.11b/g: 11
	802.11n 20 MHz: 11
	802.11n 40 MHz: 7
Channel Separation:	5 MHz
Modulations:	802.11b: CCK
	802.11g/n: OFDM
Antenna Type/Gain:	Printed Inverted F Antenna, 1.4 dBi
Input Power:	5 VDC

Model Number: 173503

Test Sample Serial Number(s): 221351S000018A

Test Sample Condition: The equipment was provided in good condition without any physical damage.

1.4 Test Methodology and Considerations

The EUT was configured with an RS232 cable adapter for programming purposes.

The EUT was evaluated for radiated and power line conducted emissions for all modes of operations using the worst data rate configuration determined during the original certification effort.

The radiated and power line conducted emissions evaluations were performed with the equipment integrated inside of a heater, as described in this document. The heater was in the idle state during the evaluation.

The EUT was programmed through the RS232 cable addapter using Hyperterminal communication. The settings and configurations for the final evaluation are provided below. The power settings used correspond to calibrated values stored in the EEPROM of the module at the factory.

Table 1.4-1: 802.1b/g/n Radio Test Configuration

Mode of Operation	Frequency (MHz)	Channel	Test Software Power Setting	Data Rate Setting)
802.11b	2412	1	9	MCS 3
	2437	6	8	
	2462	11	7	
802.11g	2412	1	9	MCS 0
	2437	6	8	
	2462	11	7	
802.11n 20 MHz	2412	1	9	
	2437	6	8	
	2462	11	7	
802.11n 40 MHz	2422	3	9	
	2437	6	8	
	2452	9	7	

Per the original filing, the integration of the module is limited to appliances exclusively. Therefore, the equipment is exempted from the requirements of FCC 15.109 and Industry Canada ICES-003, in accordance to FCC Section 15.103(d) and ICES-003 Section 4(d), respectively.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 475089
Industry Canada Lab Code: 4175C

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

2.3 Radiated & Conducted Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

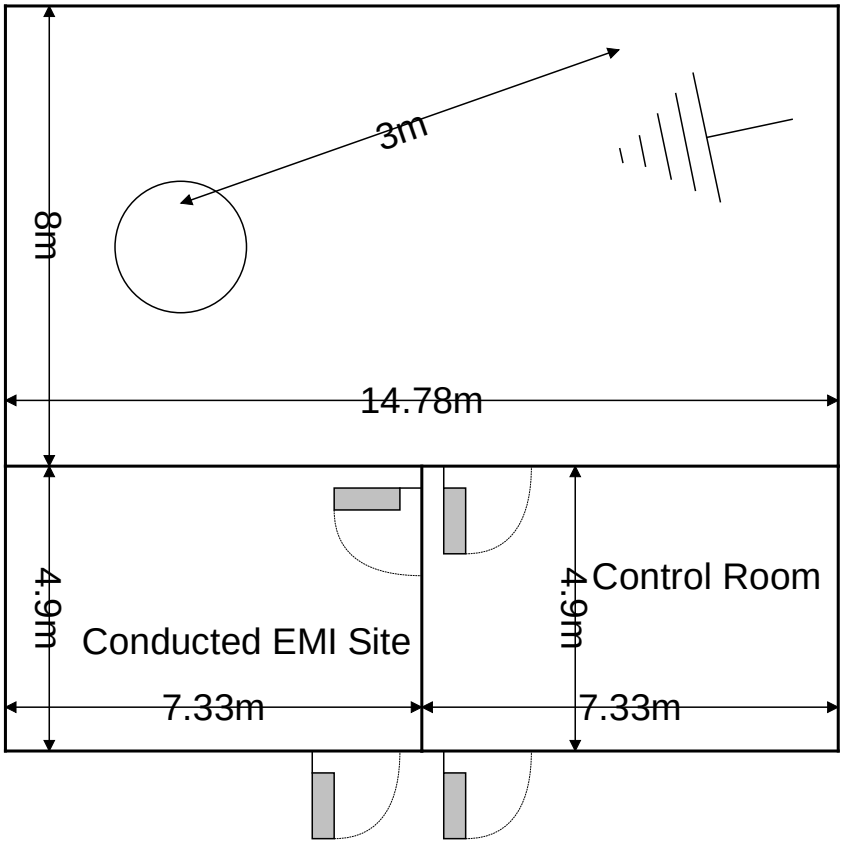

Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m^3. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

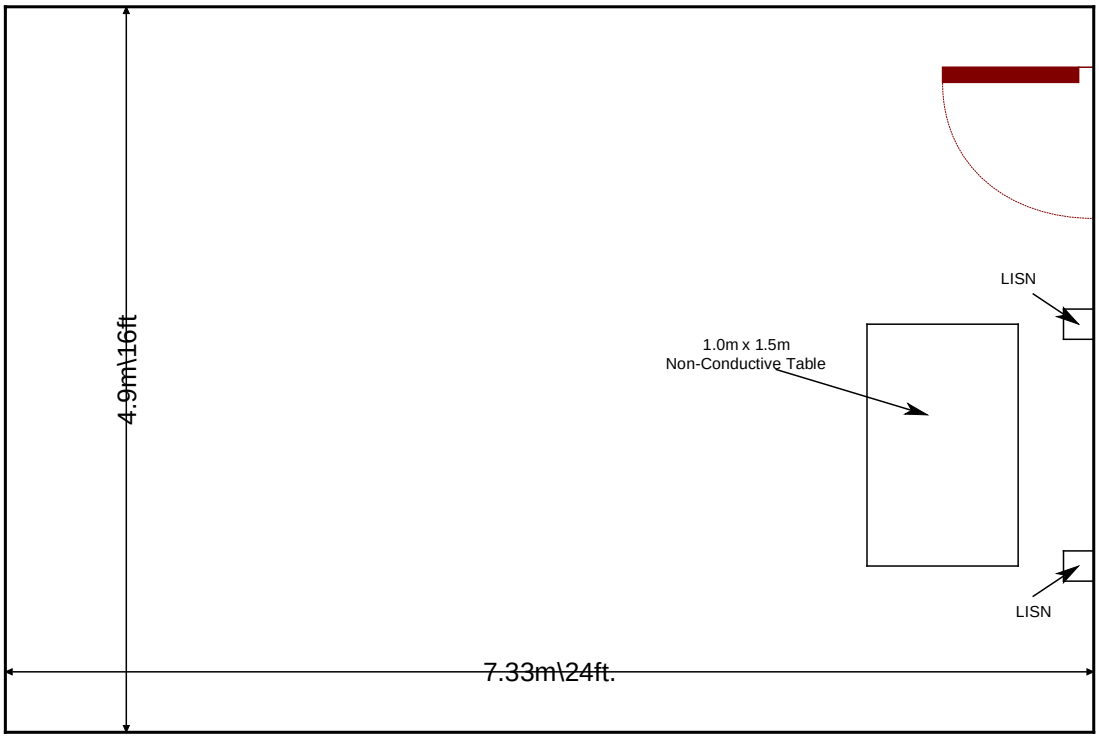

Figure 2.3.2-1: AC Mains Conducted EMI Site

3 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 9 kHz to 40 GHz.
- ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2014.
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2014
- KDB Publication No. 558074 D01 DTS Meas Guidance v03r01 – Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under 15.247, June 5, 2014.
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8 December 2010.
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

4 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

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/8/2013	1/8/2015
2002	EMCO	3108	Antennas	2147	11/22/2013	11/22/2015
2004	EMCO	3146	Antennas	1385	11/22/2013	11/22/2015
2006	EMCO	3115	Antennas	2573	4/24/2013	4/24/2015
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	12/31/2013	12/31/2014
2022	EMCO	LISN3825/2R	LISN	1095	9/9/2013	9/9/2015
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	2/27/2014	2/27/2015
2044	QMI	N/A	Cables	2044	12/31/2013	12/31/2014
2045	ACS Boca	Conducted Cable Set	Cable Set	2045	1/1/2014	1/1/2015
2070	Mini Circuits	VHF-8400+	Filter	2070	1/1/2014	1/1/2015
2072	Mini Circuits	VHF-3100+	Filter	30737	1/1/2014	1/1/2015
2076	Hewlett Packard	HP5061-5458	Cables	2076	12/31/2013	12/31/2014
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/31/2013	12/31/2014
2089	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00214	12/16/2013	12/16/2014
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
3004	Teseq	CFL 9206A	Attenuators	34720	10/21/2013	10/21/2015

NCR = No Calibration Required

5 SUPPORT EQUIPMENT

Table 5-1: EUT and Support Equipment – Radiated and Power Line Emission Setup

Item #	Type Device	Manufacturer or Responsible Party	Model/Part #	Serial #
1	EUT	Belkin	173503	221351S000018A
2	Heater (Host)	Jarden Consumer Solutions	XRH7404WE	ACS#1
3	Isolation Transformer	Tripp-Lite	IS250	A420102B2

Notes:
The isolation transformer was used per the manufacturer request to allow programming of the module in the host configuration. For the power line conducted emissions of evaluation, the isolation transformer was on the AC mains input side of the LISN.

Table 5-2: Cable Description – Radiated and Power Line Emission Setup

Cable #	Cable Type	Length	Shield	Termination
A	Power Cord	1.9 m	No	Heater to Isolation Transformer
B	Power Cord	2 m	No	Isolation Transformer to AC Mains
C	RS232 3-Wire cable	0.07 m	No	None

Note: Cable C was implemented on the EUT for programming purposes only. It is not a representative configuration of the equipment.

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

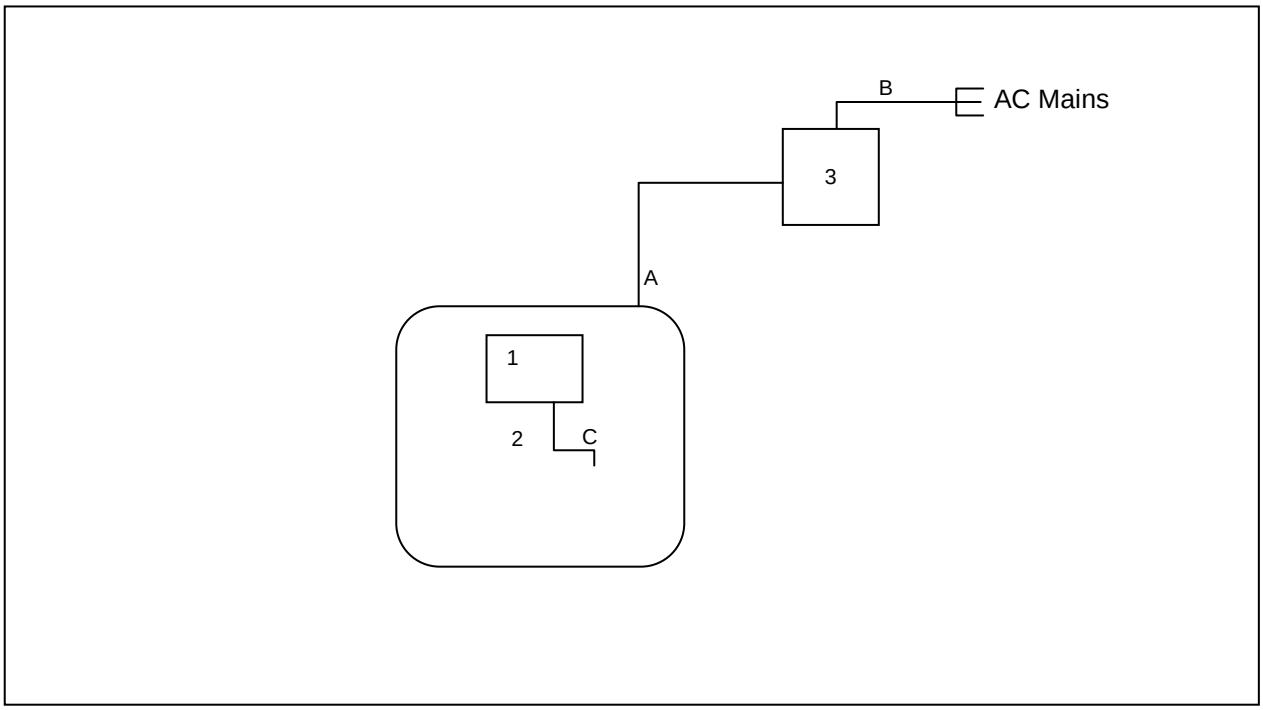

Figure 6-1: Radiated and Power Line Emission Setup

7 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 model 173503 uses a printed inverted F antenna that is etched on the PCB. The antenna cannot be removed without permanently damaging the unit, thus meeting the requirements of FCC section 15.203.

7.2 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC: RSS-210 A8.5

7.2.1 Radiated Spurious Emissions into Restricted Frequency Bands - FCC 15.205, 15.209; IC: RSS-210 2.2, RSS-Gen 7.2.2, 7.2.5

7.2.1.1 Measurement Procedure

Radiated emissions tests were made over the frequency range of 30 MHz to 26 GHz, 10 times the highest fundamental frequency. Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209.

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 1000 MHz, peak measurements are made with RBW of 1 MHz and VBW of 3 MHz. Average measurements are performed in the linear scale using VBW of 30 Hz over a 5 second sweep.

7.2.1.2 Measurement Results

Radiated band-edge and spurious emissions found in the restricted frequency bands of 30MHz to 26 GHz are reported in the tables below.

Table 7.2.1.2-1: Radiated Emissions Independent of the Carrier Modes of Operation

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
169	35.96	29.25	H	-12.24	---------	17.01	--------	43.5	---------	26.5
240	45.15	42.76	H	-13.80	---------	28.96	--------	46.0	---------	17.0
240	43.12	39.60	V	-13.80	---------	25.80	--------	46.0	---------	20.2
403.5	40.44	37.31	H	-9.06	---------	28.25	--------	46.0	---------	17.7
402.9	36.07	32.74	V	-9.06	---------	23.68	--------	46.0	---------	22.3
960	40.66	35.24	H	1.31	---------	36.55	--------	46.0	---------	9.5
960	43.05	33.99	V	1.31	---------	35.30	--------	46.0	---------	10.7
1440	66.88	61.83	H	-13.23	53.65	48.60	74.0	54.0	20.4	5.4
1440	63.60	54.83	V	-13.23	50.37	41.60	74.0	54.0	23.6	12.4
1680	65.37	58.79	H	-11.65	53.72	47.14	74.0	54.0	20.3	6.9
1680	61.06	50.36	V	-11.65	49.41	38.71	74.0	54.0	24.6	15.3
1200	62.70	54.88	V	-15.02	47.68	39.86	74.0	54.0	26.3	14.1
1200	63.95	55.98	H	-15.02	48.93	40.96	74.0	54.0	25.1	13.0
3600	46.83	35.81	V	-2.52	44.31	33.29	74.0	54.0	29.7	20.7

Note: The emissions recorded above were observed to be independent of the mode of operation of the equipment under test.

802.11b

Table 7.2.1.2-2: Radiated Spurious Emissions Tabulated Data

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
Low Channel (2412 MHz)										
2390	59.43	46.97	H	-8.00	51.43	38.97	74.0	54.0	22.6	15.0
2390	66.40	53.50	V	-8.00	58.40	45.50	74.0	54.0	15.6	8.5
4824	48.89	34.90	V	-0.21	48.68	34.69	74.0	54.0	25.3	19.3
Middle Channel (2437 MHz)										
4874	47.72	34.59	V	-0.06	47.66	34.53	74.0	54.0	26.3	19.5
High Channel (2462 MHz)										
2483.5	61.84	48.35	H	-7.61	54.23	40.74	74.0	54.0	19.8	13.3
2483.5	62.57	48.74	V	-7.61	54.96	41.13	74.0	54.0	19.0	12.9
4924	44.91	33.38	H	0.09	45.00	33.47	74.0	54.0	29.0	20.5
4924	46.16	33.76	V	0.09	46.25	33.85	74.0	54.0	27.7	20.1

Note: All emissions above 4924 MHz were attenuated below the limits and the noise floor of the measurement equipment.

802.11g

Table 7.2.1.2-3: Radiated Spurious Emissions Tabulated Data

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
Low Channel (2412 MHz)										
2390	62.84	46.44	H	-8.00	54.84	38.44	74.0	54.0	19.2	15.6
2390	68.60	50.95	V	-8.00	60.60	42.95	74.0	54.0	13.4	11.0
4824	45.37	33.38	H	-0.21	45.16	33.17	74.0	54.0	28.8	20.8
Middle Channel (2437 MHz)										
4874	45.42	33.14		-0.06	45.36	33.08	74.0	54.0	28.6	20.9
High Channel (2462 MHz)										
2483.5	69.13	49.47	H	-7.61	61.52	41.86	74.0	54.0	12.5	12.1
2483.5	70.30	50.04	V	-7.61	62.69	42.43	74.0	54.0	11.3	11.6
4924	45.73	33.07	V	0.09	45.82	33.16	74.0	54.0	28.2	20.8

Note: All emissions above 4924 MHz were attenuated below the limits and the noise floor of the measurement equipment.

802.11n 20 MHz

Table 7.2.1.2-4: Radiated Spurious Emissions Tabulated Data

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
Low Channel (2412 MHz)										
2390	61.78	46.75	H	-8.00	53.78	38.75	74.0	54.0	20.2	15.2
2390	69.16	51.38	V	-8.00	61.16	43.38	74.0	54.0	12.8	10.6
4824	46.12	33.35	V	-0.21	45.91	33.14	74.0	54.0	28.1	20.9
Middle Channel (2437 MHz)										
4874	46.11	33.21	V	-0.06	46.05	33.15	74.0	54.0	28.0	20.9
High Channel (2462 MHz)										
2483.5	68.10	48.86	H	-7.61	60.49	41.25	74.0	54.0	13.5	12.7
2483.5	72.37	53.16	V	-7.61	64.76	45.55	74.0	54.0	9.2	8.4
4924	44.90	32.96	V	0.09	44.99	33.05	74.0	54.0	29.0	20.9

Note: All emissions above 4924 MHz were attenuated below the limits and the noise floor of the measurement equipment.

802.11n 40 MHz

Table 7.2.1.2-5: Radiated Spurious Emissions Tabulated Data

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
Low Channel (2422 MHz)										
2390	68.79	50.08	H	-8.00	60.79	42.08	74.0	54.0	13.2	11.9
2390	75.00	57.44	V	-8.00	67.00	49.44	74.0	54.0	7.0	4.6
4844	45.63	32.79	V	-0.15	45.48	32.64	74.0	54.0	28.5	21.4
Middle Channel (2437 MHz)										
Noise Floor										
High Channel (2452 MHz)										
2483.5	75.75	56.95	H	-7.61	68.14	49.34	74.0	54.0	5.9	4.7
2483.5	76.48	57.44	V	-7.61	68.87	49.83	74.0	54.0	5.1	4.2

Note: All emissions above 4844 MHz were attenuated below the limits and the noise floor of the measurement equipment.

7.2.1.3 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: 59.43+ (-8.0) = 51.43 dBµV/m
Margin: 74 dBµV/m – 51.43 dBµV/m = 22.6 dB

Example Calculation: Average
Corrected Level: 46.97 + (-8.0) = 38.97 dBµV/m
Margin: 54 dBµV/m – 38.97 dBµV/m = 15.0 dB

7.3 Power Line Conducted Emissions – FCC: Section 15.207 IC: RSS-Gen 7.2.4

7.3.1 Measurement Procedure

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

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

7.3.2 Measurement Results

Results are shown below.

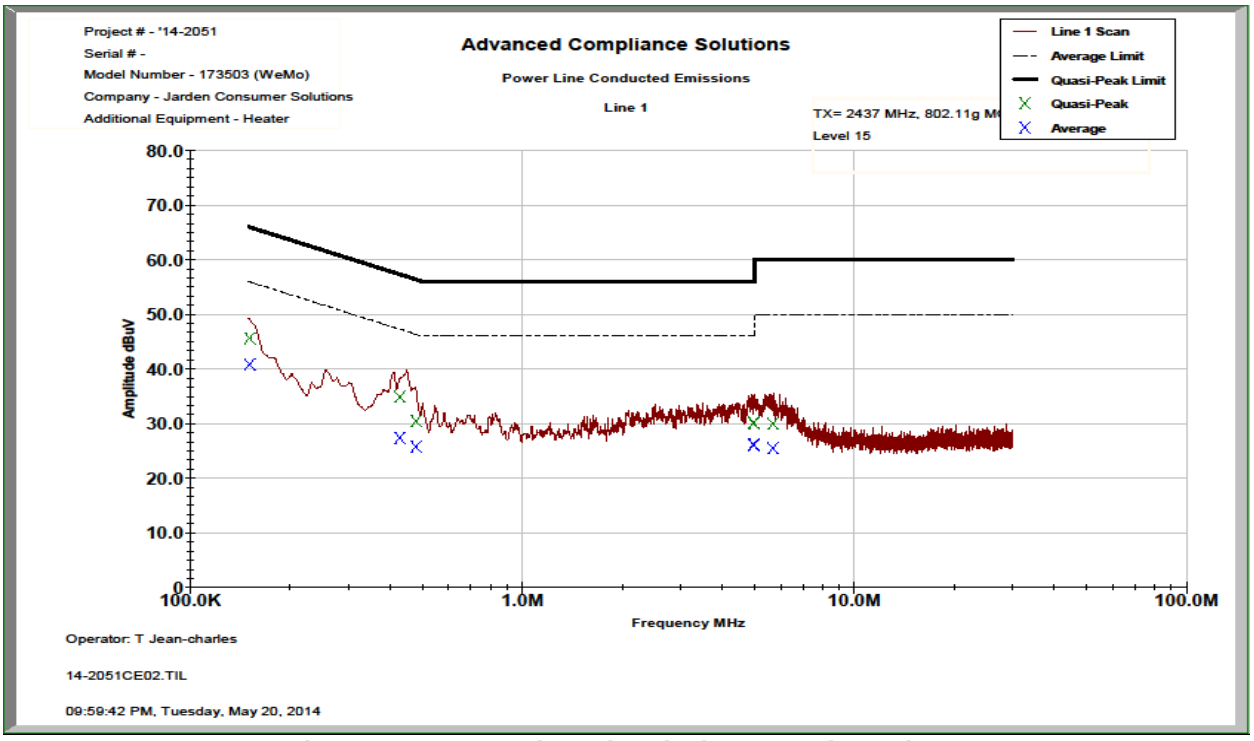

Figure 7.3.2-1: Conducted Emissions Results – Line 1

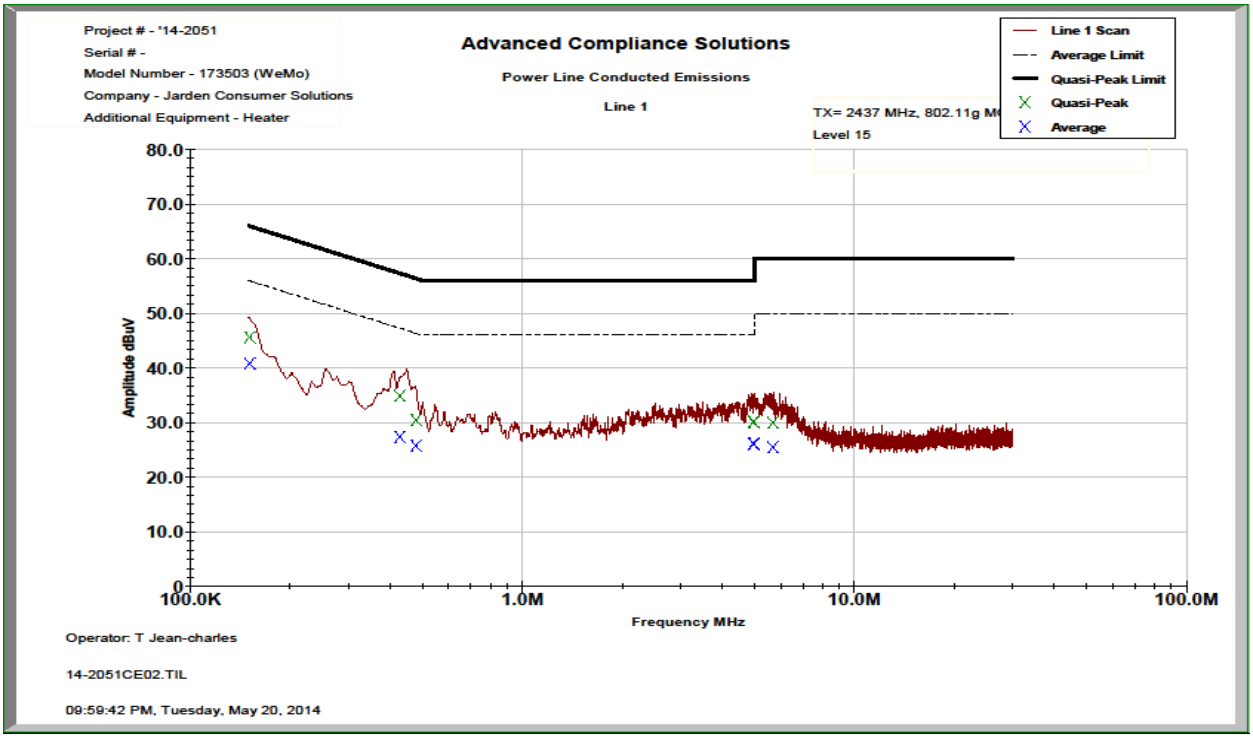

Figure 7.3.2-2: Conducted Emissions Results – Line 2

Table 7.3.2-1: Conducted EMI Results

☒ Line 1 ☒ Line 2 ☐ Line 3
☐ Line 4
☐ To Ground ☒ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: 14-2051CE02
Power Supply Description: N/A

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.151238	35.538	30.731	10.10	45.63	40.83	65.93	55.93	20.3	15.1
0.4285	24.813	17.324	10.08	34.89	27.40	57.28	47.28	22.4	19.9
0.48	20.349	15.708	10.08	30.43	25.79	56.34	46.34	25.9	20.6
4.98	19.692	15.831	10.28	29.97	26.11	56.00	46.00	26.0	19.9
4.9801	19.784	15.733	10.28	30.06	26.01	56.00	46.00	25.9	20.0
5.69702	19.554	15.074	10.36	29.92	25.44	60.00	50.00	30.1	24.6
Line 2									
0.152294	36.52	31.152	10.08	46.60	41.23	65.87	55.87	19.3	14.6
0.2719	28.211	25.477	10.07	38.28	35.55	61.06	51.06	22.8	15.5
0.443725	27.688	25.149	10.05	37.74	35.20	56.99	46.99	19.3	11.8
0.479999	20.389	15.903	10.05	30.44	25.96	56.34	46.34	25.9	20.4
2.07025	18.252	14.462	10.14	28.39	24.60	56.00	46.00	27.6	21.4
4.98	19.667	15.574	10.24	29.91	25.81	56.00	46.00	26.1	20.2
4.9801	19.7	15.64	10.24	29.94	25.88	56.00	46.00	26.1	20.1
5.53285	20.458	16.37	10.32	30.77	26.69	60.00	50.00	29.2	23.3
20.1295	8.699	4.213	10.84	19.54	15.06	60.00	50.00	40.5	34.9
29.2039	8.091	3.549	11.22	19.31	14.77	60.00	50.00	40.7	35.2

8 CONCLUSION

In the opinion of ACS, Inc., the model 173503 meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 for the test procedures documented in the test report.

END REPORT