Spectrum Design Solutions

LifeSense Wireless Gateway

FCC 15.231:2013 / FCC 15.231:2014

FCC 15.207:2013

Report #: SPCD0019.1

Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

WTD 12.5.23

Last Date of Test: September 8, 2014
Spectrum Design Solutions
Model: LifeSense Wireless Gateway

Emissions

Test Description	Specification	Test Method	Pass/Fail
Duty Cycle	FCC 15.231:2013	ANSI C63.10:2009	Pass
Occupied Bandwidth	FCC 15.231:2013	ANSI C63.10:2009	Pass
Field Strength of Fundamentals	FCC 15.231:2014	ANSI C63.10:2009	Pass
Spurious Radiated Emissions	FCC 15.231:2014	ANSI C63.10:2009	Pass
Powerline Conducted Emissions	FCC 15.207:2013	ANSI C63.4:2009	Pass

Deviations From Test Standards

None

Approved By:

Tim O'Shea, Operations Manager

NVLAP Lab Code: 200881-0

Test Facility

The measurement facility used to collect the data is located at:
Northwest EMC, Inc.
9349 W Broadway Ave.,
Brooklyn Park, MN 55445

Phone: (763) 425-2281 Fax: (763) 424-3469

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834E-1).

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

REV 2012.08.02

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

NORTHWEST EMC

REV 2012.05.24

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

KCC / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Hong Kong

OFTA – Recognized by OFTA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 as applicable), and are available upon request.

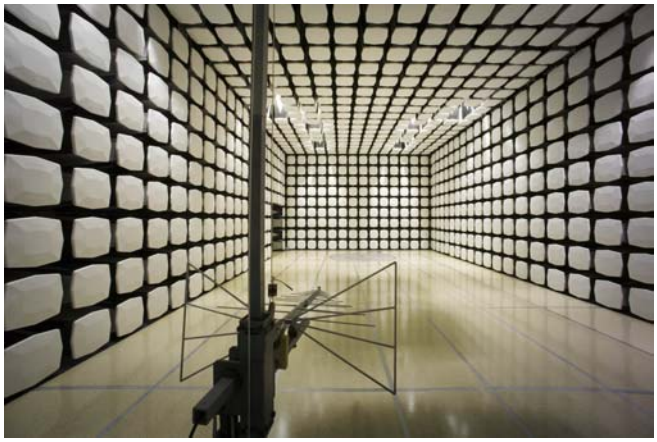
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

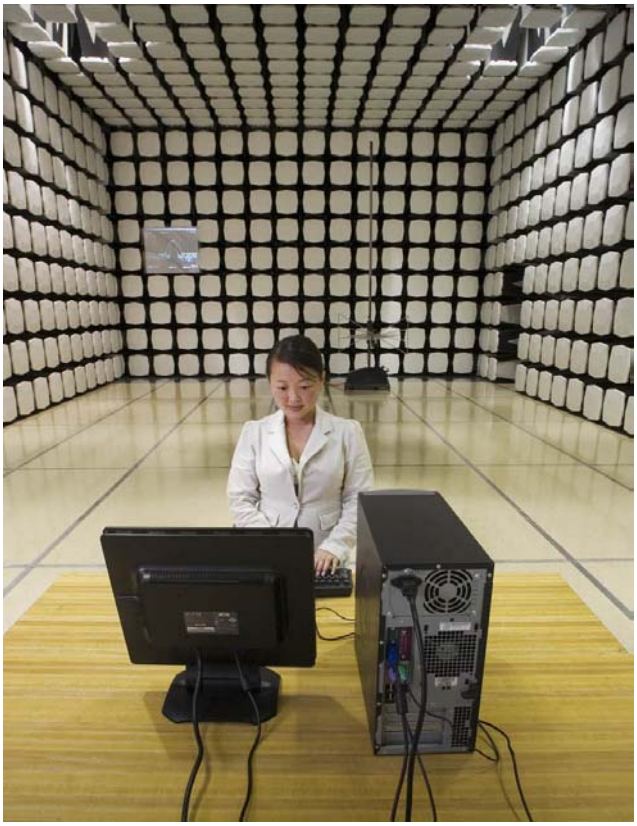
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	4.00	-4.00
AC Powerline Conducted Emissions (dB)	2.70	-2.70

FACILITIES

REV 2013.06.28

Oregon	California	New York	Minnesota	Washington
Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Labs NC01-05,SU02,SU07 19201 120th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0





PRODUCT DESCRIPTION

WTD 12.5.23

Client and Equipment Under Test (EUT) Information

Company Name:	Eaton Corporation
Address:	7945 Wallace Road
City, State, Zip:	Eden Prairie, MN 55344
Test Requested By:	John Capesius
Model:	LifeSense Wireless Gateway
First Date of Test:	June 28, 2013
Last Date of Test:	September 8, 2014
Receipt Date of Samples:	May 14, 2013
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
802.11 bgn wireless gateway operating as a DTS device in the 2.4 GHz band. It also contains a Low Power transceiver operating at 433 MHz. Modulation type is FSK

Testing Objective:
To demonstrate compliance under FCC 15.231 specifications.

CONFIGURATIONS

Configuration SPCD0019- 3

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LifeSense Wireless Gateway	Eaton Corporation	None	None
Wi-Fi Antenna	Laird	637113	20252637113B
Periodic Antenna	Taoglas	ISA.01.A301111	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Power Supply	MPJA	245	3920

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	Precision M4300	34619198365
Laptop Supply	Dell	HA65NS1-00	CN-OHN662-47890-85H-A68S

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	0.8m	No	Laptop Supply	AC Mains
DC Power	No	1.8m	Yes	Laptop	Laptop Supply
AC Power	No	1.8m	No	Power Supply	AC Mains
DC Power	No	1.4m	No	LifeSense Wireless Gateway	Power Supply
Ethernet	No	>3.0m	No	LifeSense Wireless Gateway	Laptop
Coax	No	4.0m	No	LifeSense Wireless Gateway	Wi-Fi Antenna
Coax	No	3.0m	No	LifeSense Wireless Gateway	Periodic Antenna
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATIONS

Configuration EATN0006- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
LifeSense Wireless Gateway	Eaton Corporation	E-EQOT-RR001-E	1022714006
Antenna	Taoglas	WA.500W.301151	None

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
WiFi Module	Taoglas	ISA.01.A.301111	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Power Supply	EZ	GP-4303D	TPY
Laptop	Hewlett-Packard	EliteBook 840	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Antenna Cable	Yes	300cm	No	Antenna	LifeSense Wireless Gateway
Wi-Fi Cable	Yes	295cm	No	WiFi Module	LifeSense Wireless Gateway
DC Power Cable	No	320cm	No	DC Power Supply	LifeSense Wireless Gateway
AC Power Cable	No	180cm	No	AC Mains	DC Power Supply
Ethernet Cable	No	215cm	No	LifeSense Wireless Gateway	Unterminated
RS232 Cable	Yes	>3m	No	LifeSense Wireless Gateway	Laptop

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/28/2013	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	6/28/2013	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	6/28/2013	Power Line Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.
4	9/8/2014	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	9/8/2014	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Duty Cycle

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24

TEST DESCRIPTION

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)
Where “On time” = N1L1 +N2L2 +….

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less, where T is the period of the pulse train.

The measured values for the EUT’s pulse train are as follows:

Period = 100 mSec

Pulsewidth of Pulse= 25.23 mSec

Number of Pulses = 1

Duty Cycle = 20 log [(1)(25.23)/100]= -11.96 dB

The duty cycle correction factor of –11.96 dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz.

The field strength of the fundamental (transmit) frequency meets the limits as defined in 47 CFR 15.231(b). It also meets the provisions in 15.35 for averaging pulsed emissions and for limiting peak emissions.

Duty Cycle

EUT:	LifeSense Wireless Gateway			Work Order:	SPCD0019
Serial Number:	None			Date:	06/28/13
Customer:	Spectrum Design Solutions			Temperature:	23.7°C
Attendees:	Jon Campbell			Humidity:	53%
Project:	None			Barometric Pres.:	1007.7
Tested by:	Trevor Buls	Power:	12VDC	Job Site:	MN05

TEST SPECIFICATIONS	Test Method
FCC 15.231:2013	ANSI C63.10:2009

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

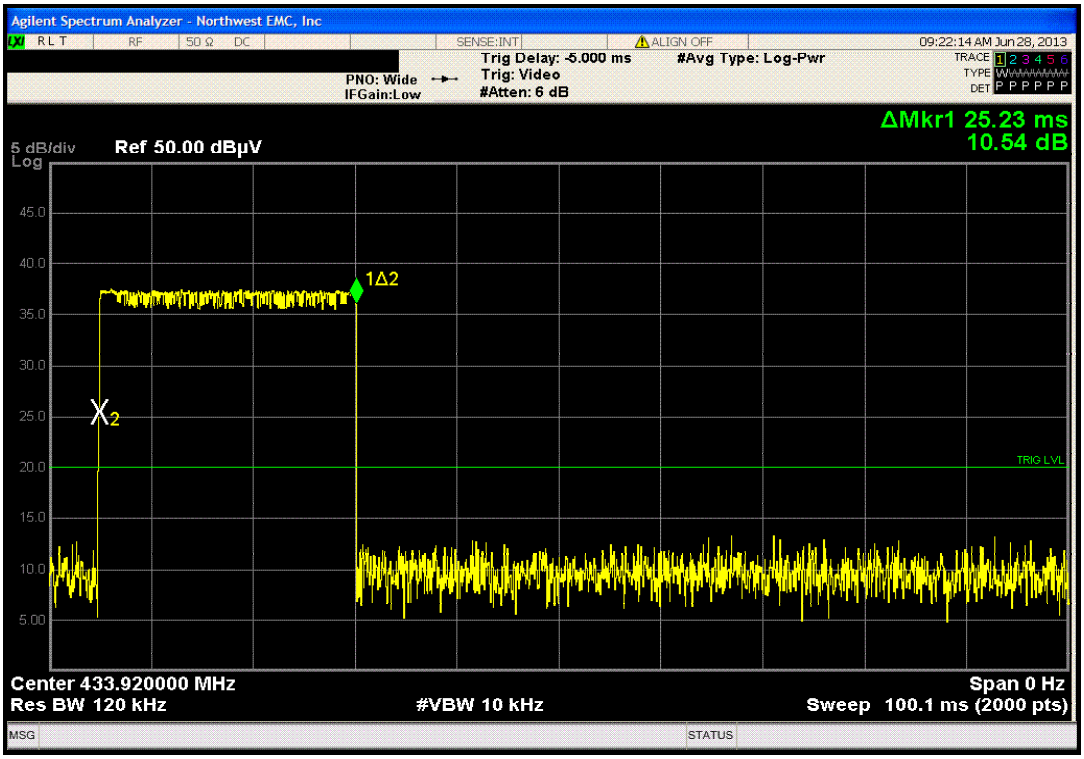
None

Configuration #	3	Signature	Trevor Buls

	Value	Time Scale	Duty Cycle	Limit	Result
Pulse Width	25.23 mS	100 mS	25.23%	N/A	N/A

Duty Cycle

Pulse Width						
		Value	Time Scale	Duty Cycle	Limit	Result
		25.23 mS	100 mS	25.23%	N/A	N/A



Occupied Bandwidth (-20dB)

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24

TEST DESCRIPTION

The occupied bandwidth was measured with the EUT configured for continuous modulated operation at its single transmit frequency. The spectrum analyzer's resolution bandwidth was >= 1% of the 20dB bandwidth and the video bandwidth was greater than or equal to the resolution bandwidth.

The 20 dB bandwidth of the transmit frequency is less than 0.25% of the center frequency.

Occupied Bandwidth (-20dB)

EUT:	LifeSense Wireless Gateway			Work Order:	SPCD0019
Serial Number:	None			Date:	06/28/13
Customer:	Spectrum Design Solutions			Temperature:	23.7°C
Attendees:	Jon Campbell			Humidity:	53%
Project:	None			Barometric Pres.:	1007.7
Tested by:	Trevor Buls	Power:	12VDC	Job Site:	MN05

TEST SPECIFICATIONS	Test Method
FCC 15.231:2013	ANSI C63.10:2009

COMMENTS

Limit is based on 0.25% of the fundamental frequency: 433.92 MHz * 0.25 = 1.085 MHz

DEVIATIONS FROM TEST STANDARD

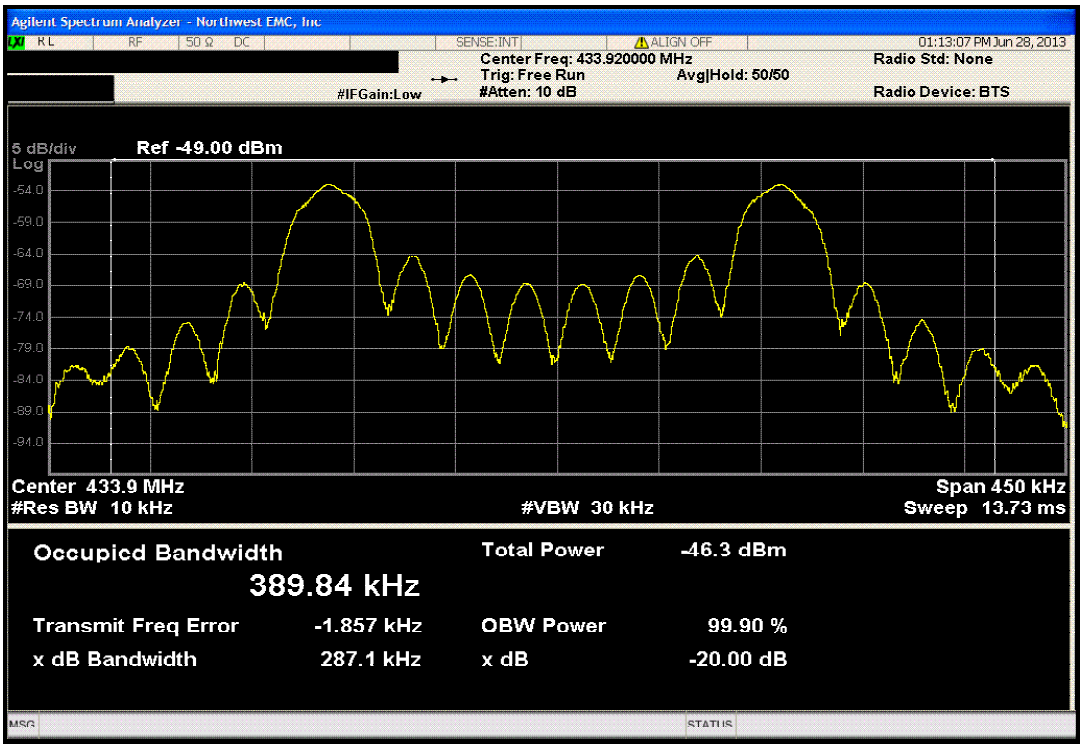
None

Configuration #	3	Signature	Trevor Buls

	Value	Limit	Result
433.92 MHz	287.093 kHz	≤ 1.085 MHz	Pass

Occupied Bandwidth (-20dB)

433.92 MHz						
				Value	Limit	Result
				287.093 kHz	≤ 1.085 MHz	Pass



FIELD STRENGTH OF FUNDAMENTAL

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 433.92 MHz CW

POWER SETTINGS INVESTIGATED

12VDC

CONFIGURATIONS INVESTIGATED

EATN0006-1

FREQUENCY RANGE INVESTIGATED

Start Frequency	433 MHz	Stop Frequency	435 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/14/2014	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was configured for continuous modulated operation at its single transmit frequency. The field strength of the transmit frequency was maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.10:2009).

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where “On time” = N1L1 +N2L2 +….

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less. Where T is the period of the pulse train.

The measured values for the EUT’s pulse train are as follows:

Period = 100 mSec
Pulsewidth of Type 1 Pulse = 25.23 mSec
Number of Type 1 Pulses = 1

Duty Cycle = 20 log [((1)(25.23))/100] = -11.96 dB

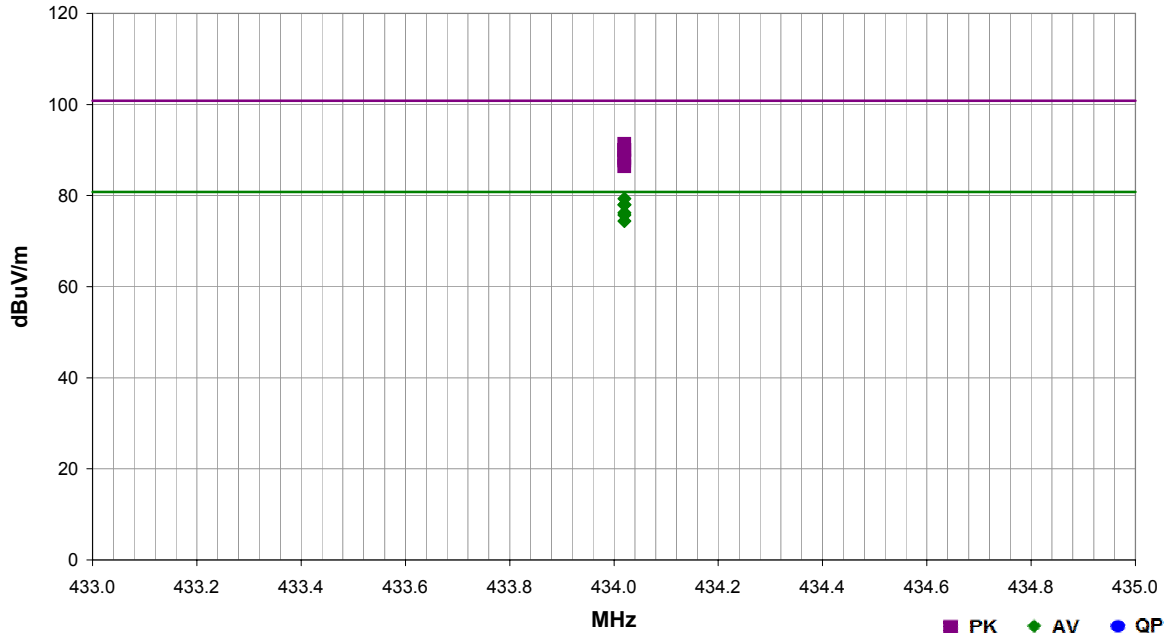
The duty cycle correction factor of –11.96 dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz.

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	EATN0006	**Date:**	09/08/14		
Project:	None	**Temperature:**	22.9 °C		
Job Site:	MN05	**Humidity:**	48.6% RH		
Serial Number:	None	**Barometric Pres.:**	1016.5 mbar	**Tested by:**	Trevor Buls
EUT:	LifeSense Wireless Gateway				
Configuration:	EATN0006-1				
Customer:	Eaton Corporation				
Attendees:	John Capesius				
EUT Power:	12VDC				
Operating Mode:	Transmitting 433.92 MHz CW				
Deviations:	None				
Comments:	Power 6				

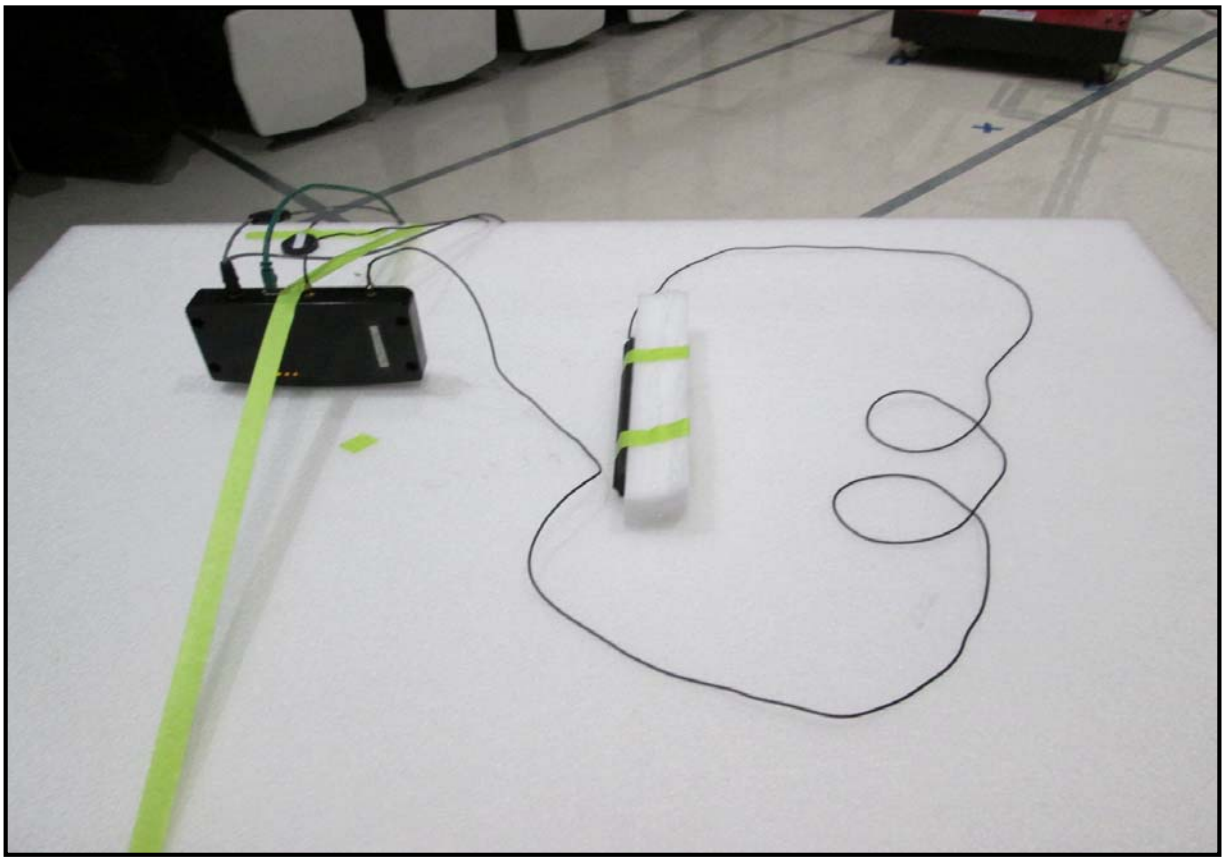
Test Specifications	**Test Method**
FCC 15.231:2014	ANSI C63.10:2009

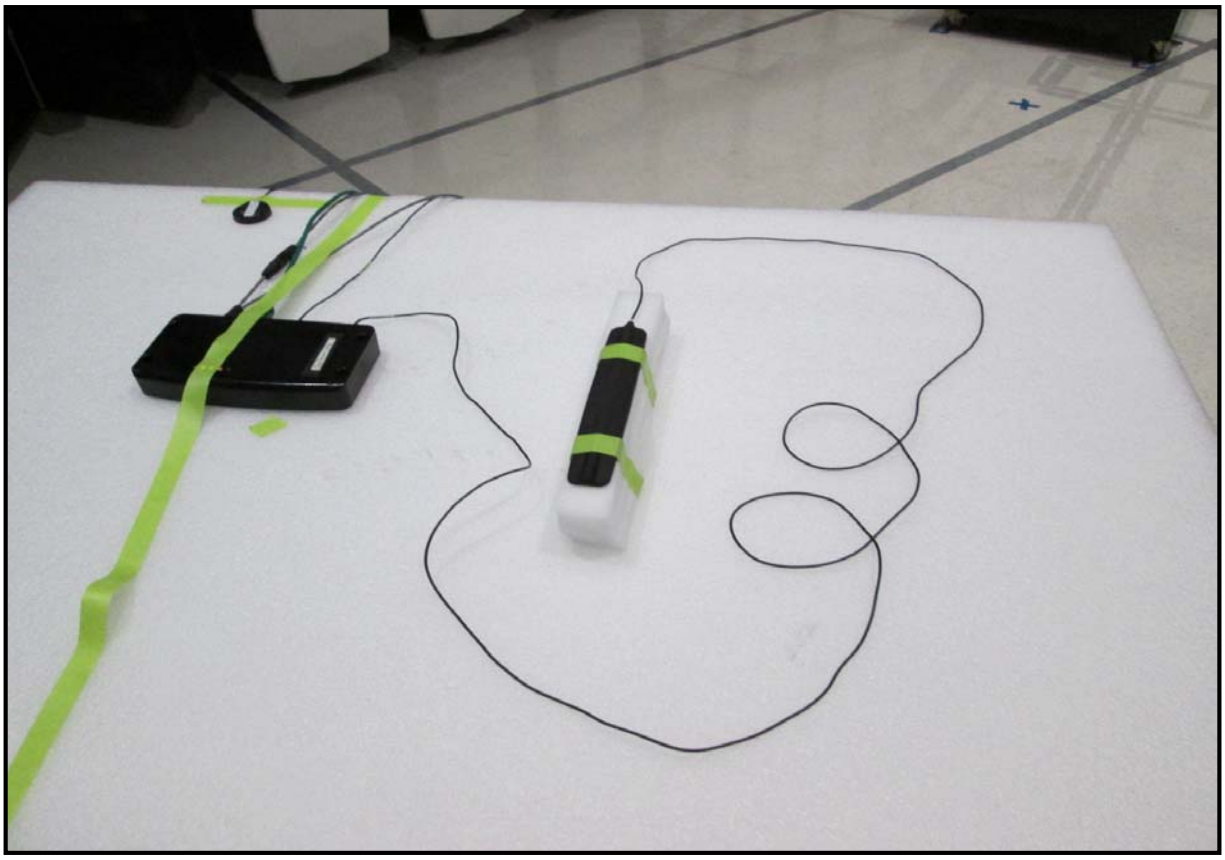
Run #	6	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



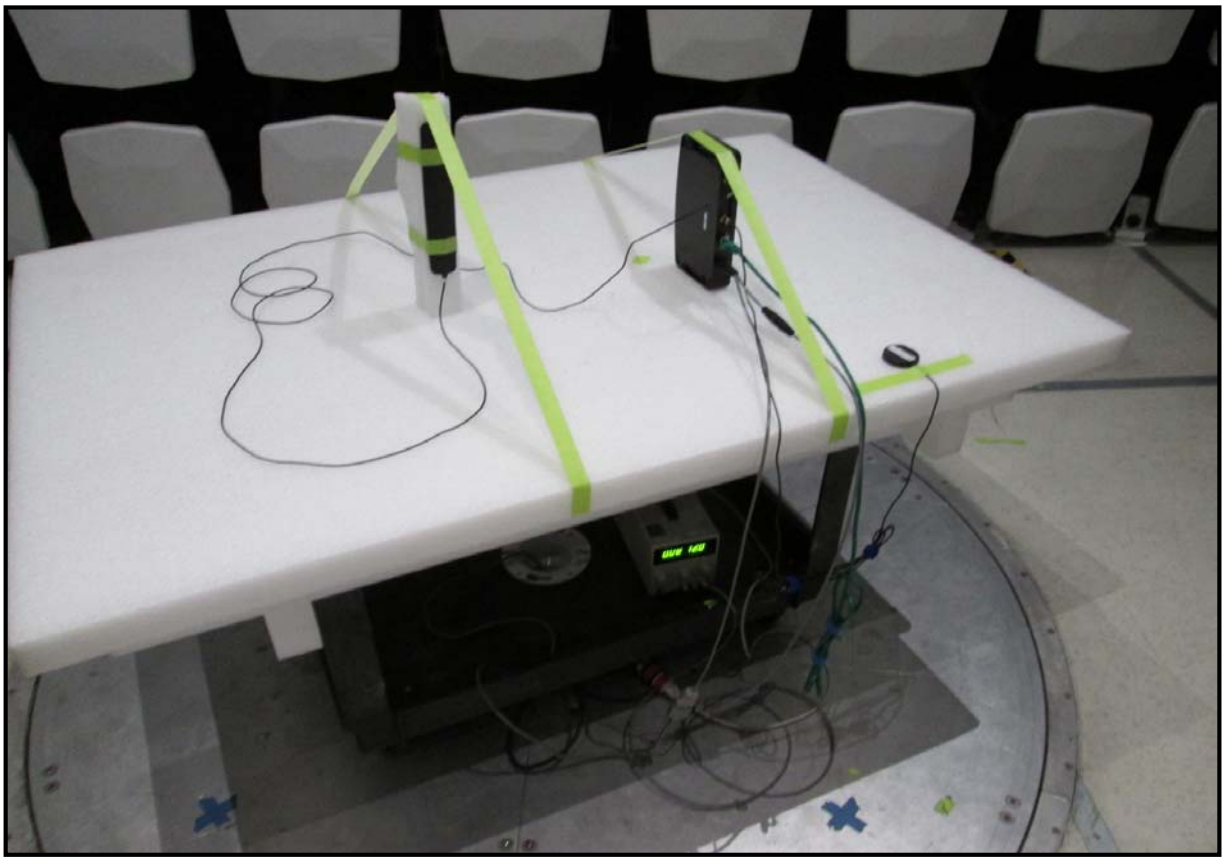
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
434.020	68.5	22.8	1.0	154.0	-12.0	0.0	Vert	AV	0.0	79.3	80.8	-1.5	EUT on side
434.020	67.2	22.8	1.0	204.0	-12.0	0.0	Horz	AV	0.0	78.0	80.8	-2.8	EUT on side
434.020	67.2	22.8	1.1	192.0	-12.0	0.0	Vert	AV	0.0	78.0	80.8	-2.8	EUT Vert
434.020	65.4	22.8	1.1	71.0	-12.0	0.0	Vert	AV	0.0	76.2	80.8	-4.6	EUT Horz
434.020	64.9	22.8	1.0	191.0	-12.0	0.0	Horz	AV	0.0	75.7	80.8	-5.1	EUT Vert
434.020	63.6	22.8	1.0	165.0	-12.0	0.0	Horz	AV	0.0	74.4	80.8	-6.4	EUT Horz
434.020	68.5	22.8	1.0	154.0		0.0	Vert	PK	0.0	91.3	100.8	-9.5	EUT on side
434.020	67.2	22.8	1.0	204.0		0.0	Horz	PK	0.0	90.0	100.8	-10.8	EUT on side
434.020	67.2	22.8	1.1	192.0		0.0	Vert	PK	0.0	90.0	100.8	-10.8	EUT Vert
434.020	65.4	22.8	1.1	71.0		0.0	Vert	PK	0.0	88.2	100.8	-12.6	EUT Horz
434.020	64.9	22.8	1.0	191.0		0.0	Horz	PK	0.0	87.7	100.8	-13.1	EUT Vert
434.020	63.6	22.8	1.0	165.0		0.0	Horz	PK	0.0	86.4	100.8	-14.4	EUT Horz

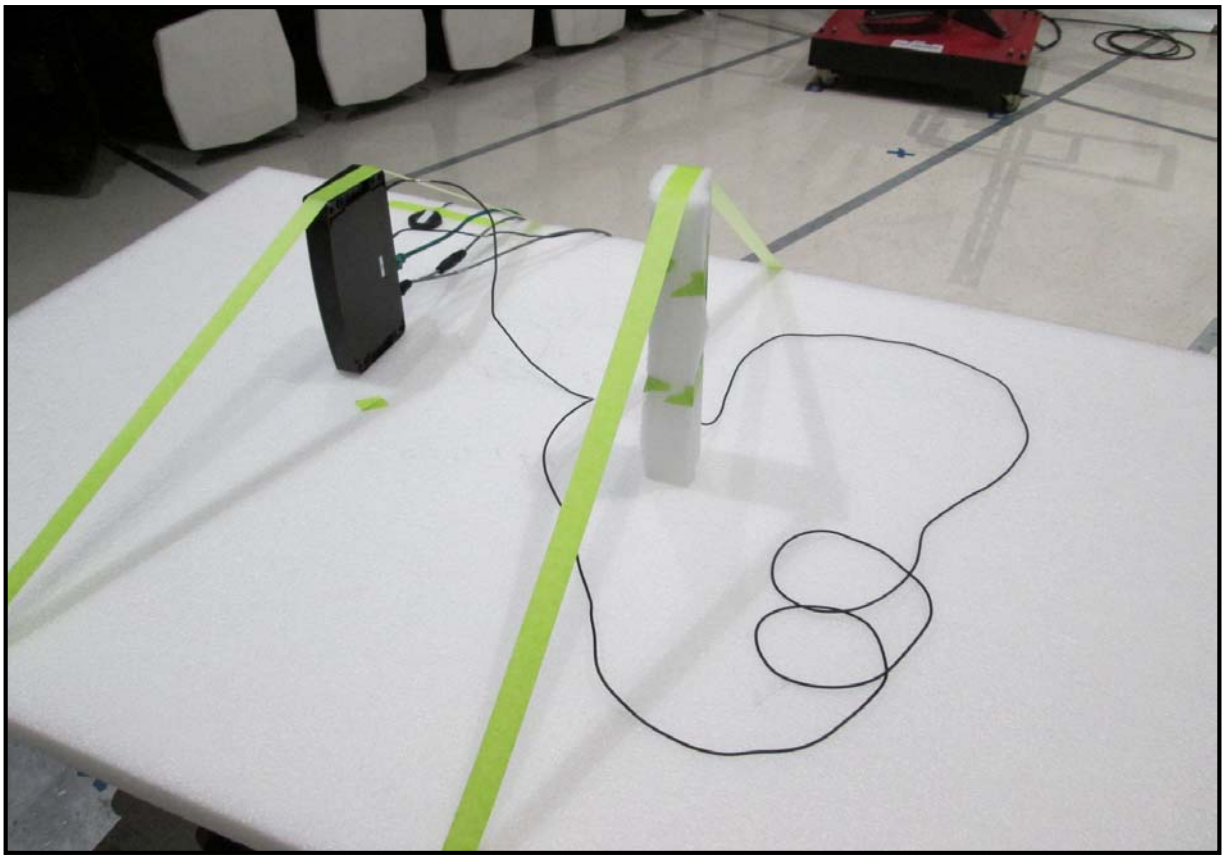
FIELD STRENGTH OF FUNDAMENTAL





FIELD STRENGTH OF FUNDAMENTAL





SPURIOUS RADIATED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting 433.92 MHz CW

POWER SETTINGS INVESTIGATED

12VDC

CONFIGURATIONS INVESTIGATED

EATN0006 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	5 GHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	3/14/2014	12 mo
Attenuator, 10db, 'SMA'	S.M. Electronics	SA18H-10	REN	5/15/2014	12 mo
MN05 Cables	ESM Cable Corp.	ɔuble Ridge Guide Horn Cab	MNI	3/14/2014	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AJA	6/3/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	3/14/2014	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	3/14/2014	12 mo
Antenna, Biconilog	Teseq	CBL 6141B	AYD	12/17/2013	24 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The single, integral antenna to be used with the EUT was tested. The EUT was configured for un-modulated, CW operation at its single transmit frequency. The field strength of the transmit frequency was maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.10:2009).

A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

To derive average emission measurements, a duty cycle correction factor per 15.35(c) was utilized:

Duty Cycle = On time/100 milliseconds (or the period, whichever is less)

Where “On time” = N1L1 +N2L2 +….

Where N1 is the number of type 1 pulses, L1 is length of type 1 pulses, N2 is the number of type 2 pulses, L2 is the length of type 2 pulses, etc.

Therefore, Duty Cycle = (N1L1 +N2L2 +…)/100mS or T, whichever is less. Where T is the period of the pulse train.

The measured values for the EUT’s pulse train are as follows:

Period = 100 mSec
Pulsewidth of Type 1 Pulse = 25.23 mSec
Number of Type 1 Pulses = 1

Duty Cycle = 20 log [((1)(25.23))/100] = -11.96 dB

The duty cycle correction factor of –11.96 dB was added to the peak readings to mathematically derive the average levels. Peak measurements were made with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz for measurements at or below 1GHz. Above 1GHz, a resolution bandwidth of 1MHz and a video bandwidth of 3MHz was used.

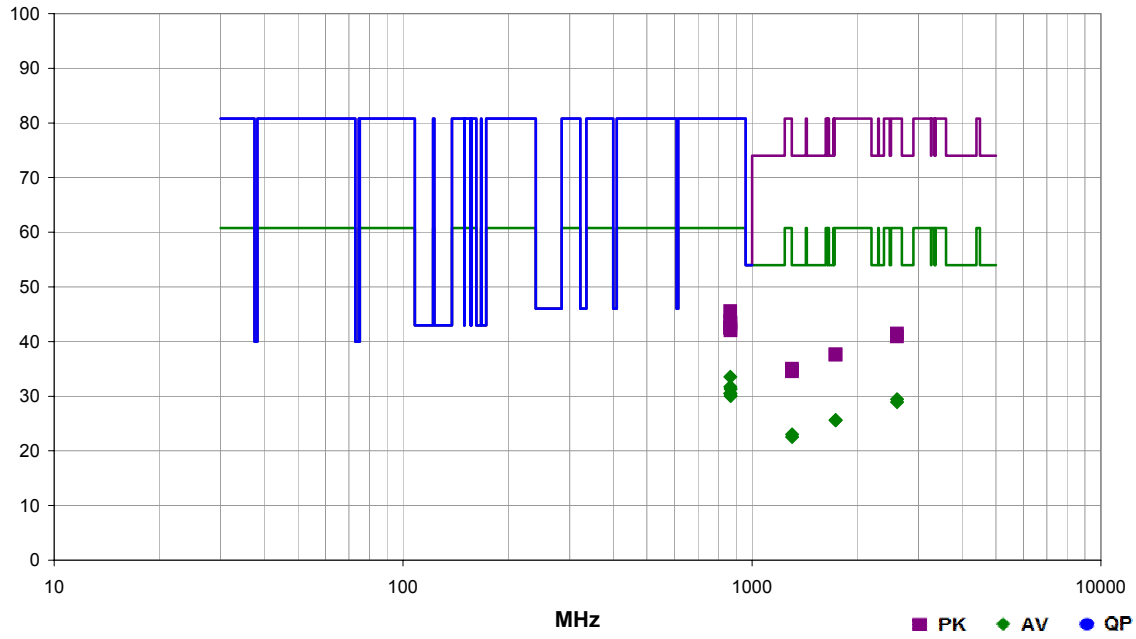
The field strength of the spurious emissions meet the limits as defined in 47 CFR 15.231(b). The spurious emissions also meet the provisions in 15.35 for averaging pulsed emissions and for limiting peak emissions. Further, spurious emissions meet the provisions of 15.205 using the measurement instrumentation specified in that section.

SPURIOUS RADIATED EMISSIONS

Work Order:	EATN0006	**Date:**	09/08/14	Trevor Buls	
Project:	None	**Temperature:**	22.9 °C		
Job Site:	MN05	**Humidity:**	48.6% RH		
Serial Number:	None	**Barometric Pres.:**	1016.5 mbar	**Tested by:**	Trevor Buls
EUT:	LifeSense Wireless Gateway				
Configuration:	1				
Customer:	Eaton Corporation				
Attendees:	John Capesius				
EUT Power:	12VDC				
Operating Mode:	Transmitting 433.92 MHz CW				
Deviations:	None				
Comments:	None				

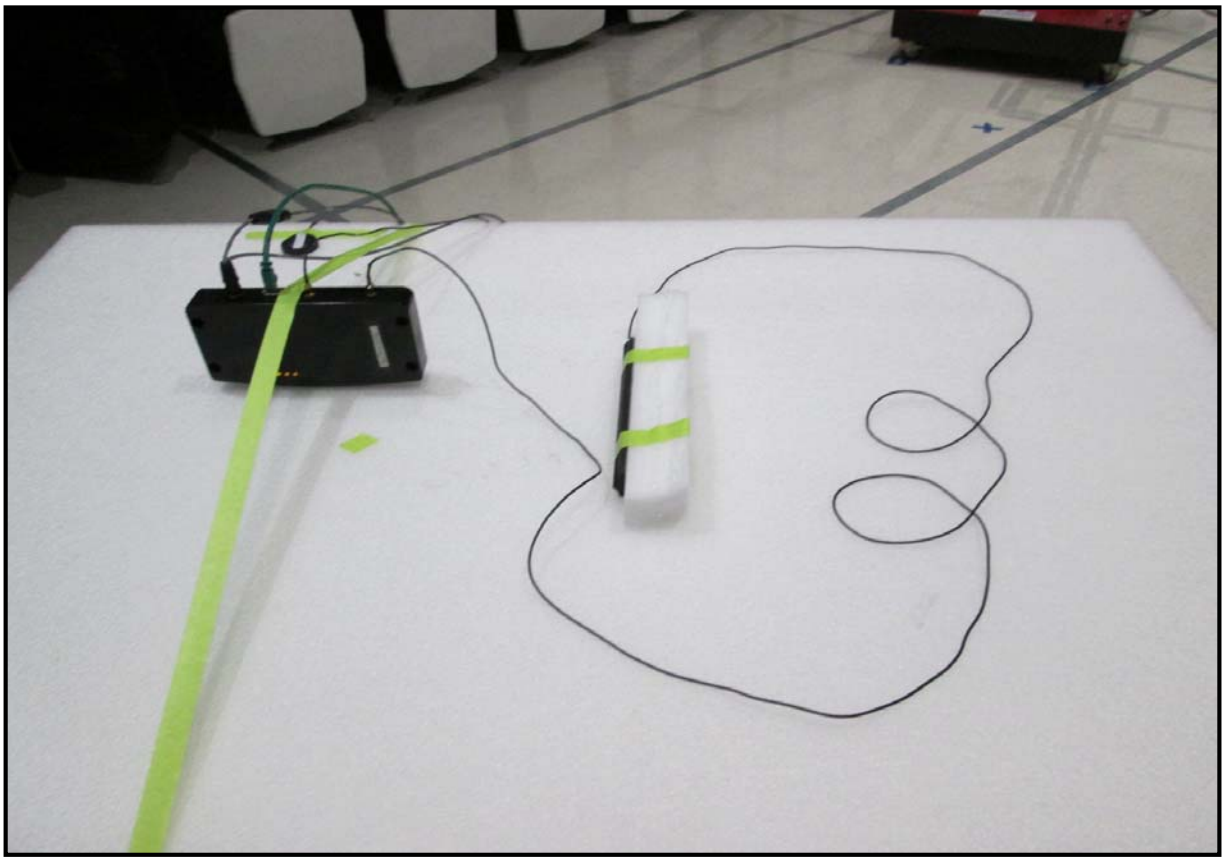
Test Specifications	**Test Method**
FCC 15.231(b):2014	ANSI C63.10:2009

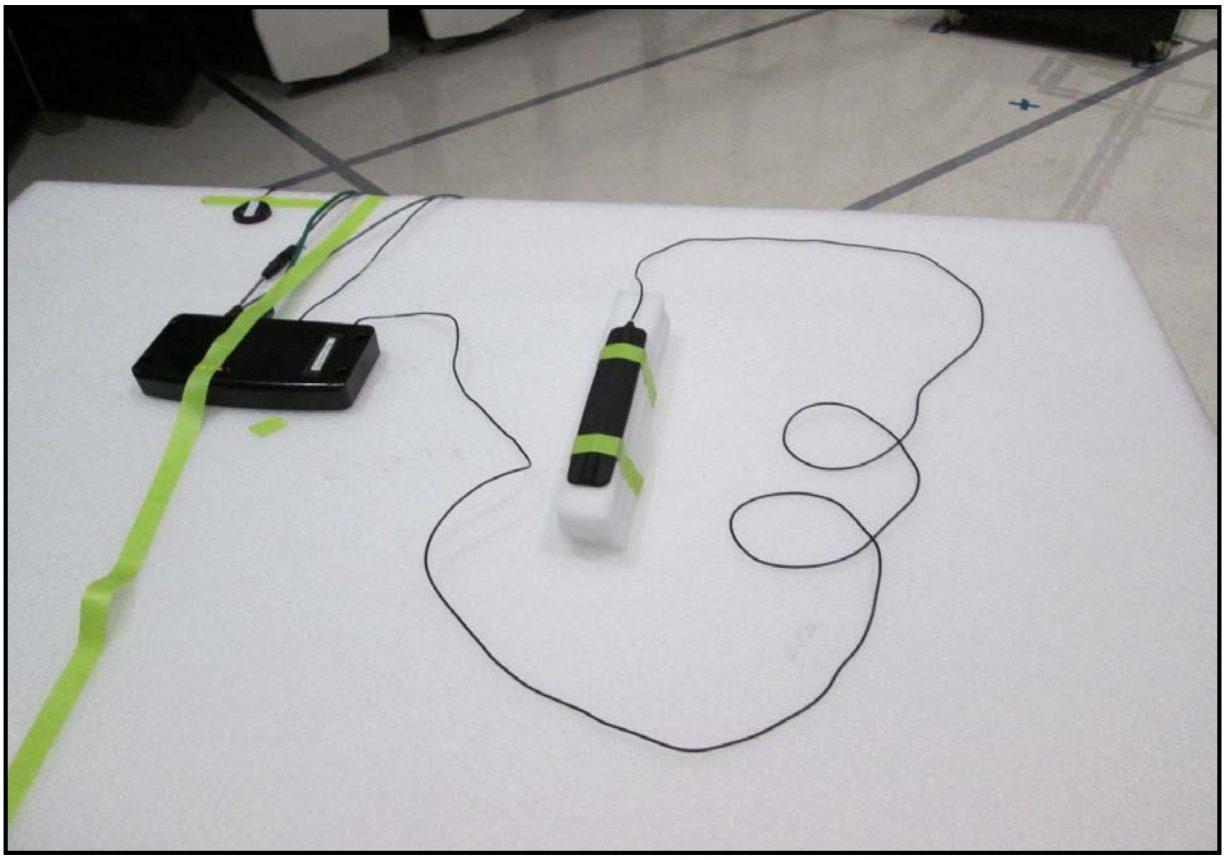
Run #	2	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



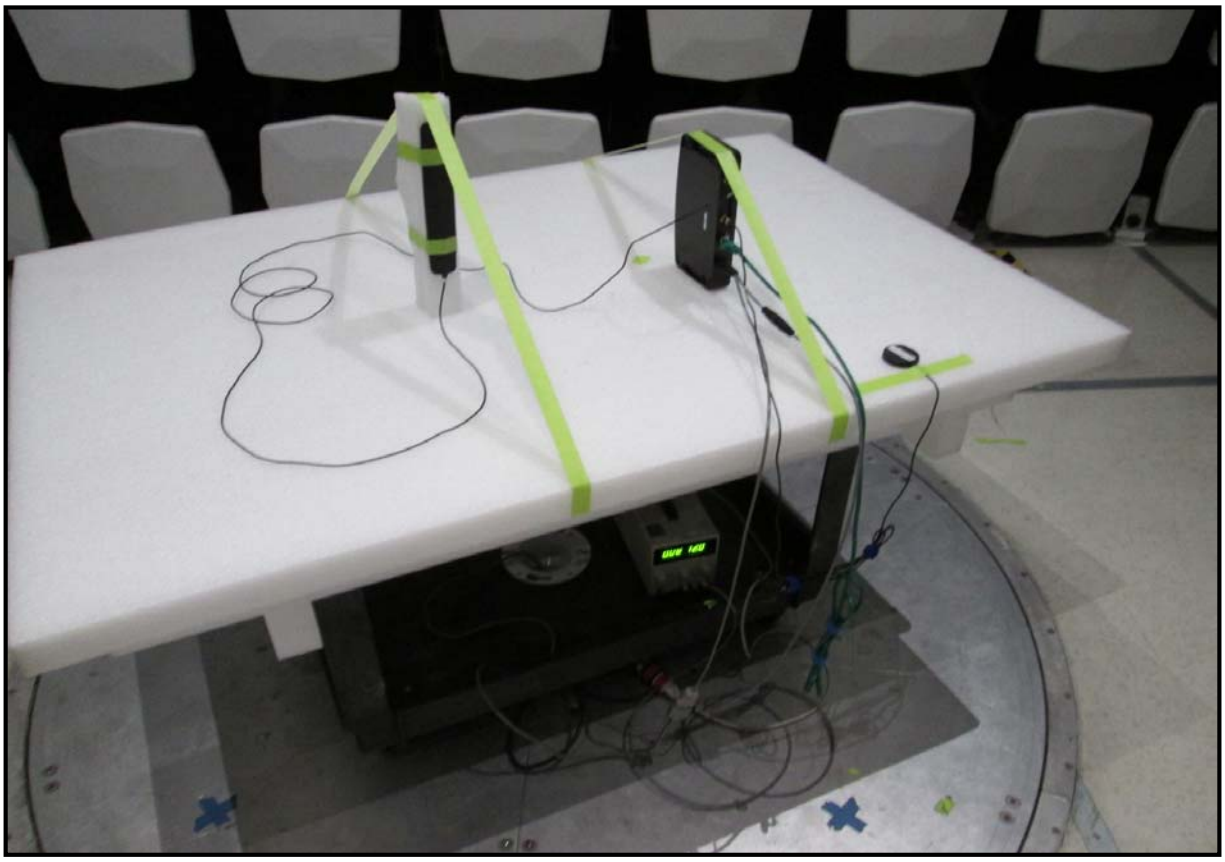
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
867.655	26.0	9.5	1.0	202.0	-12.0	10.0	Horz	AV	0.0	33.5	60.6	-27.1	EUT horz
867.650	24.2	9.5	1.0	10.0	-12.0	10.0	Horz	AV	0.0	31.7	60.6	-28.9	EUT on side
868.015	23.8	9.5	1.0	59.0	-12.0	10.0	Vert	AV	0.0	31.3	60.6	-29.3	EUT vert
867.625	23.0	9.5	1.0	181.0	-12.0	10.0	Vert	AV	0.0	30.5	60.6	-30.1	EUT horz
866.950	23.0	9.5	1.5	205.0	-12.0	10.0	Vert	AV	0.0	30.5	60.6	-30.1	EUT on side
869.020	22.5	9.6	1.0	21.0	-12.0	10.0	Horz	AV	0.0	30.1	60.6	-30.5	EUT vert
1302.260	40.7	-5.7	1.4	330.0	-12.0	0.0	Horz	AV	0.0	23.0	54.0	-31.0	EUT on side
2604.303	43.7	-2.3	1.0	160.0	-12.0	0.0	Horz	AV	0.0	29.4	60.8	-31.4	EUT on side
1302.743	40.2	-5.7	1.0	157.0	-12.0	0.0	Vert	AV	0.0	22.5	54.0	-31.5	EUT on side
2604.095	43.2	-2.3	1.0	19.0	-12.0	0.0	Vert	AV	0.0	28.9	60.8	-31.9	EUT on side
1736.088	42.9	-5.2	1.0	95.0	-12.0	0.0	Horz	AV	0.0	25.7	60.8	-35.1	EUT on side
1736.155	42.8	-5.2	1.0	360.0	-12.0	0.0	Vert	AV	0.0	25.6	60.8	-35.2	EUT on side
867.655	26.0	9.5	1.0	202.0		10.0	Horz	PK	0.0	45.5	80.8	-35.3	EUT horz
867.650	24.2	9.5	1.0	10.0		10.0	Horz	PK	0.0	43.7	80.8	-37.1	EUT on side
868.015	23.8	9.5	1.0	59.0		10.0	Vert	PK	0.0	43.3	80.8	-37.5	EUT vert
867.625	23.0	9.5	1.0	181.0		10.0	Vert	PK	0.0	42.5	80.8	-38.3	EUT horz
866.950	23.0	9.5	1.5	205.0		10.0	Vert	PK	0.0	42.5	80.8	-38.3	EUT on side
869.020	22.5	9.6	1.0	21.0		10.0	Horz	PK	0.0	42.1	80.8	-38.7	EUT vert
1302.260	40.7	-5.7	1.4	330.0		0.0	Horz	PK	0.0	35.0	74.0	-39.0	EUT on side
2604.303	43.7	-2.3	1.0	160.0		0.0	Horz	PK	0.0	41.4	80.8	-39.4	EUT on side

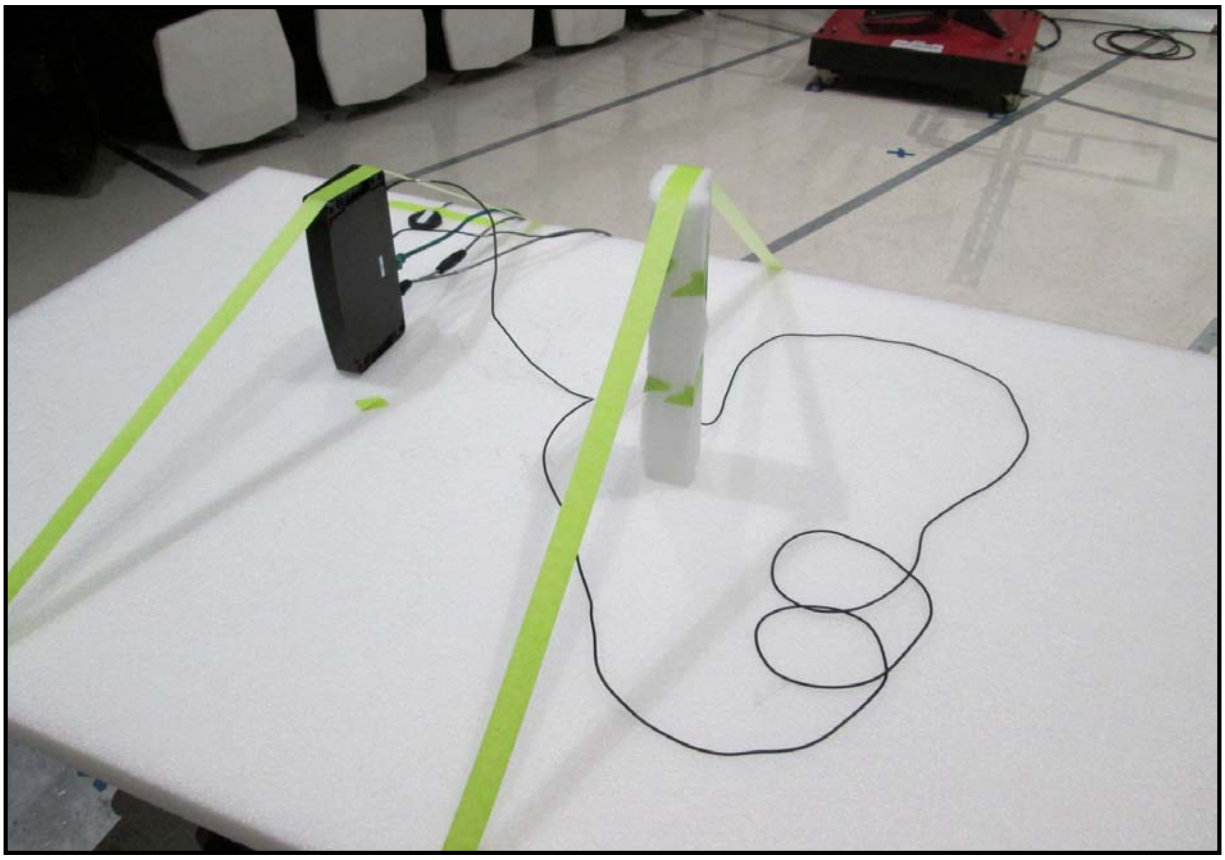
SPURIOUS RADIATED EMISSIONS





SPURIOUS RADIATED EMISSIONS





POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the only channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10-2009.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESCI	ARG	04/01/2013	12 mo
MN03 Cables	ESM Cable Corp.	Conducted Cables	MNC	01/17/2013	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HGN	05/31/2012	24 mo
Attenuator 20dB, BNC	Fairview Microwave	SA01B-20	AQP	08/15/2012	12 mo
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	05/24/2013	12 mo
ISN	Teseq	T8000	NIM	11/26/2012	24 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.94 dB	-2.94 dB

CONFIGURATIONS INVESTIGATED

SPCD0019-3

MODES INVESTIGATED

Transmit Mode at 433.92 MHz.

NORTHWEST EMC

WTD.2013.06.13, PSA-ESCI 2012.12.14, PSA-ESCI Version 2013.2.20

POWERLINE CONDUCTED EMISSIONS

EUT:	LifeSense Wireless Gateway	Work Order:	SPCD0019
Serial Number:	None	Date:	06/28/2013
Customer:	Spectrum Design Solutions	Temperature:	23.7°C
Attendees:	Jon Campbell	Relative Humidity:	54.5%
Customer Project:	None	Bar. Pressure:	1008.4 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	12VDC	Configuration:	SPCD0019-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2013	ANSI C63.10:2009

TEST PARAMETERS

Run #:	5	Line:	Positive Lead	Ext. Attenuation (dB):	20

COMMENTS

Data below is representative of the intentional emissions.

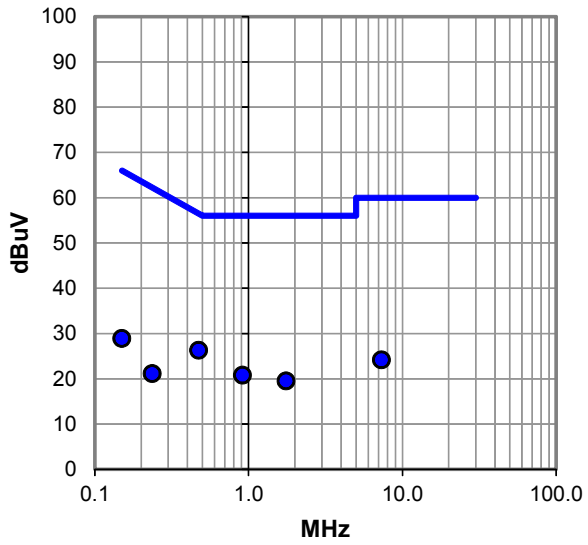
EUT OPERATING MODES

Transmit Mode at 433.92 MHz.

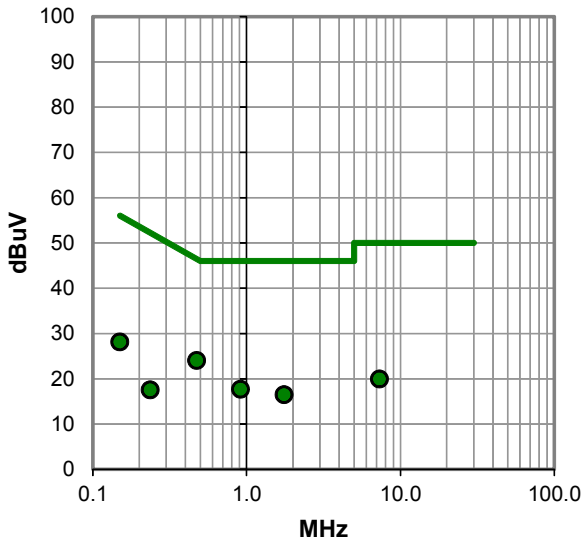
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #5

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.473	6.1	20.2	26.3	56.5	-30.2
0.915	0.6	20.2	20.8	56.0	-35.2
7.312	3.6	20.5	24.1	60.0	-35.9
1.758	-0.8	20.3	19.5	56.0	-36.5
0.150	8.7	20.2	28.9	66.0	-37.1
0.237	0.9	20.2	21.1	62.2	-41.1

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.473	3.8	20.2	24.0	46.5	-22.5
0.150	7.9	20.2	28.1	56.0	-27.9
0.915	-2.5	20.2	17.7	46.0	-28.3
1.758	-3.8	20.3	16.5	46.0	-29.5
7.312	-0.6	20.5	19.9	50.0	-30.1
0.237	-2.7	20.2	17.5	52.2	-34.7

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	LifeSense Wireless Gateway	Work Order:	SPCD0019
Serial Number:	None	Date:	06/28/2013
Customer:	Spectrum Design Solutions	Temperature:	23.7°C
Attendees:	Jon Campbell	Relative Humidity:	54.5%
Customer Project:	None	Bar. Pressure:	1008.4 mb
Tested By:	Trevor Buls	Job Site:	MN03
Power:	12VDC	Configuration:	SPCD0019-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2013	ANSI C63.10:2009

TEST PARAMETERS

Run #:	6	Line:	Negative Lead	Ext. Attenuation (dB):	20

COMMENTS

Data below is representative of the intentional emissions.

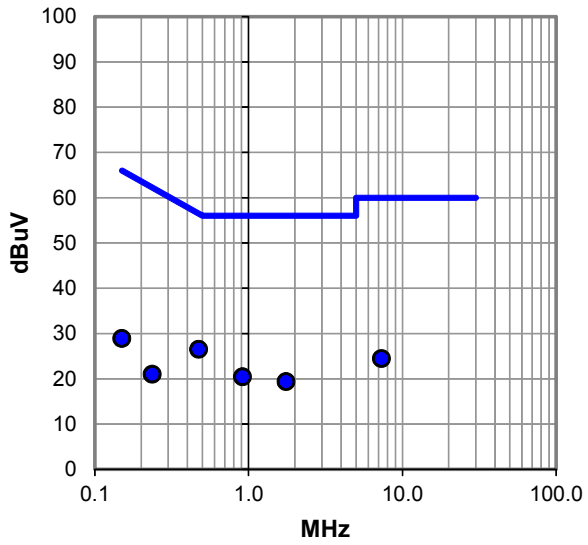
EUT OPERATING MODES

Transmit Mode at 433.92 MHz.

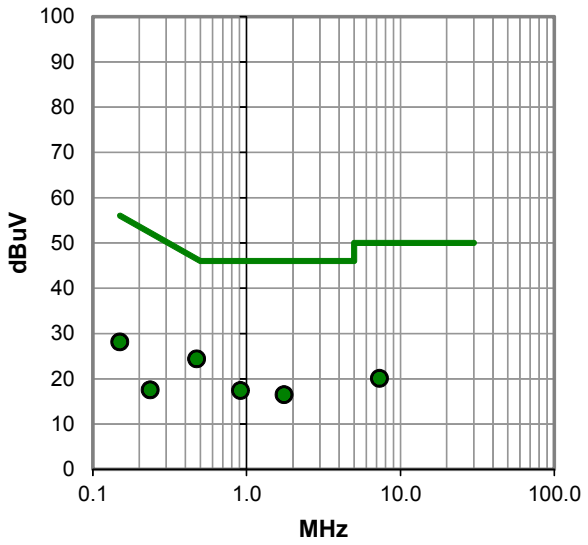
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #6

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.473	6.3	20.2	26.5	56.5	-30.0
7.312	3.9	20.5	24.4	60.0	-35.6
0.915	0.2	20.2	20.4	56.0	-35.6
1.758	-0.9	20.3	19.4	56.0	-36.6
0.150	8.7	20.2	28.9	66.0	-37.1
0.237	0.8	20.2	21.0	62.2	-41.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.473	4.2	20.2	24.4	46.5	-22.1
0.150	7.9	20.2	28.1	56.0	-27.9
0.915	-2.8	20.2	17.4	46.0	-28.6
1.758	-3.8	20.3	16.5	46.0	-29.5
7.312	-0.5	20.5	20.0	50.0	-30.0
0.237	-2.7	20.2	17.5	52.2	-34.7

CONCLUSION

Pass

Tested By