Home Comfort Zone

Smart Controller SC-03

May 03, 2007

Report No. HOCZ0013

EMC Test Report

Report Prepared By

NORTHWEST EMC

www.nwemc.com
1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Issue Date: May 03, 2007
Home Comfort Zone
Model: Smart Controller SC-03

Emissions				
Test Description	**Specification**	**Test Method**	**Pass**	**Fail**
Field Strength of Fundamental	FCC 15.231:2006	ANSI C63.4:2003	☒	☐
Spurious Radiated Emissions	FCC 15.231:2006	ANSI C63.4:2003	☒	☐
Occupied Bandwidth	FCC 15.231:2006	ANSI C63.4:2003	☒	☐
Duty Cycle	FCC 15.231:2006	ANSI C63.4:2003	☒	☐

Modifications made to the product
See the Modifications section of this report

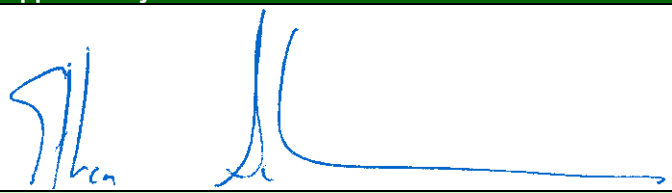
Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada.

Approved By:

Ethan Schoonover, Sultan Lab Manager

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 Number	Description	Date	Page Number
00	None		

Accreditations and Authorizations

FCC: Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP: Northwest EMC, Inc. is accredited under the United States Department of Commerce, National Institute of Standards and Technology, and National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 89/336/EEC, ANSI C63.4, MIL-STD 461E, DO-160D and SAE J1113. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

NVLAP LAB CODE 200629-0
NVLAP LAB CODE 200630-0
NVLAP LAB CODE 200676-0
NVLAP LAB CODE 200761-0

Industry Canada: Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS 212, Issue 1 (Provisional) and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements.

CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

TÜV Product Service: Included in TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories, available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements. Certificate No. USA0604C.

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

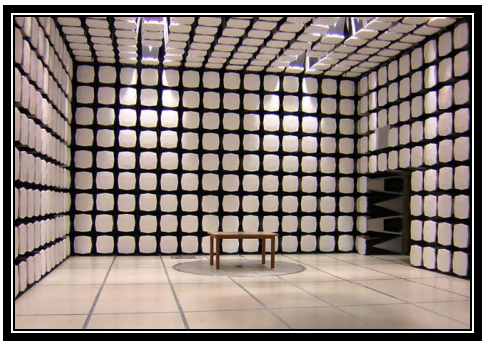
VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, C-2687, T-289, and R-2318, Irvine: R-1943, C-2766, and T-298, Sultan: R-871, C-1784, and T-294).*

BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.

GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

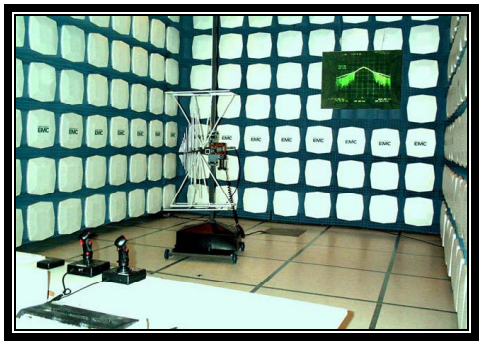
SCOPE

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



California – Orange County Facility
Labs OC01 – OC13

41 Tesla Ave. Irvine, CA 92618
(888) 364-2378 Fax: (503) 844-3826



Oregon – Evergreen Facility
Labs EV01 – EV11

22975 NW Evergreen Pkwy. Suite 400 Hillsboro, OR 97124
(503) 844-4066 Fax: (503) 844-3826

Washington – Sultan Facility
Labs SU01 – SU07

14128 339th Ave. SE Sultan, WA 98294
(888) 364-2378

Party Requesting the Test

Company Name:	Home Comfort Zone
Address:	8239 Cirrus Drive
City, State, Zip:	Beaverton, OR 97008
Test Requested By:	Zac Wheeler
Model:	Smart Controller SC-03
First Date of Test:	January 26, 2007
Last Date of Test:	April 26, 2007
Receipt Date of Samples:	January 26, 2007
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):

Low power transmitter with a separate receiver.

Testing Objective:

Low power transmitter with a separate receiver operating at 418 MHz. The transmitter is Installed in customer houses to periodically transmit temperature and command sequences from user button presses. It uses a PCB trace antenna (-6 dBi). Seeking TCB certification under 15.231(e). The receiver is installed on a wall and linked to the main control system via RS485. It uses a Dipole antenna. The device is powered by alkaline batteries. There is no provision for connection to the AC mains, either directly or indirectly through another device. The receiver DoC report was completed under HOCZ0003.

EUT Photo

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	1/26/2007	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	4/26/2007	Field Strength of Fundamental	Modified from delivered configuration. Initial or No Modification	22 nH and 6.8 pF tank circuit. Modification done by Customer.	EUT remained at Northwest EMC following the test.
3	4/26/2007	Spurious Radiated Emissions	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.
4	4/26/2007	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2006	13
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
Pre-Amplifier	Miteq	AM-1616-1000	AOL	12/29/2006	13
EV01 cables c,g, h			EVA	12/29/2006	13

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

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.

NORTHWEST EMC

OCCUPIED BANDWIDTH

XMit 2007.03.30

EUT:	Smart Controller SC-03			Work Order:	HOCZ0013
Serial Number:	None			Date:	04/26/07
Customer:	Home Comfort Zone			Temperature:	24°C
Attendees:	Zac Wheeler			Humidity:	31%
Project:	None			Barometric Pres.:	30.28
Tested by:	Rod Peloquin	Power:	Battery	Job Site:	EV01

TEST SPECIFICATIONS	Test Method
FCC 15.231:2006	ANSI C63.4:2003

COMMENTS

Modulated in typical operational mode

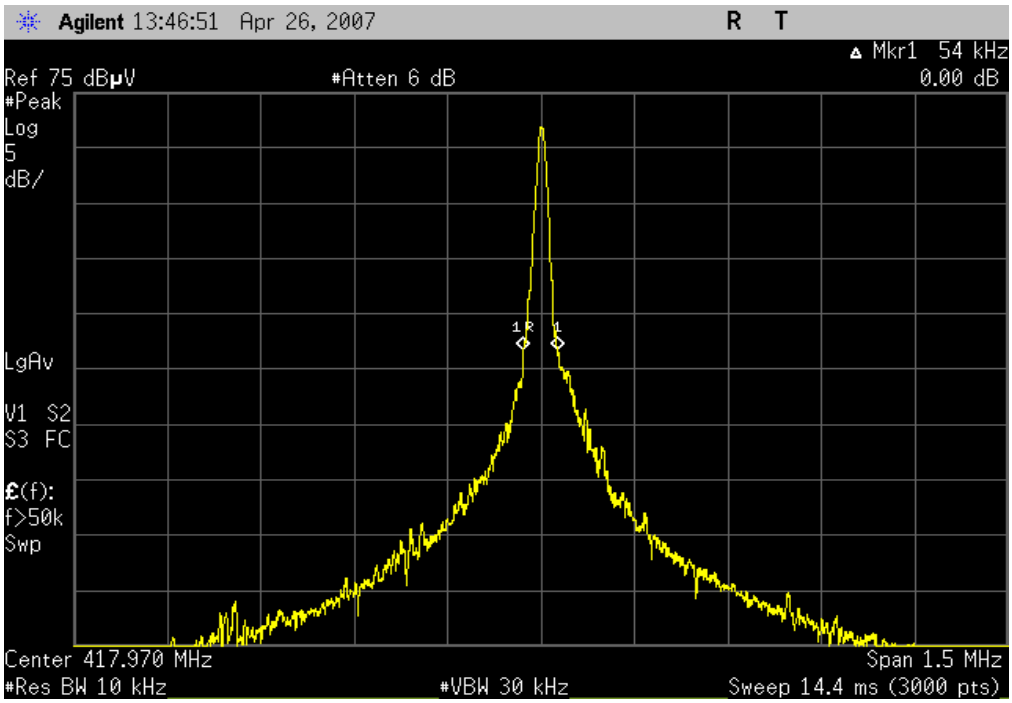
DEVIATIONS FROM TEST STANDARD

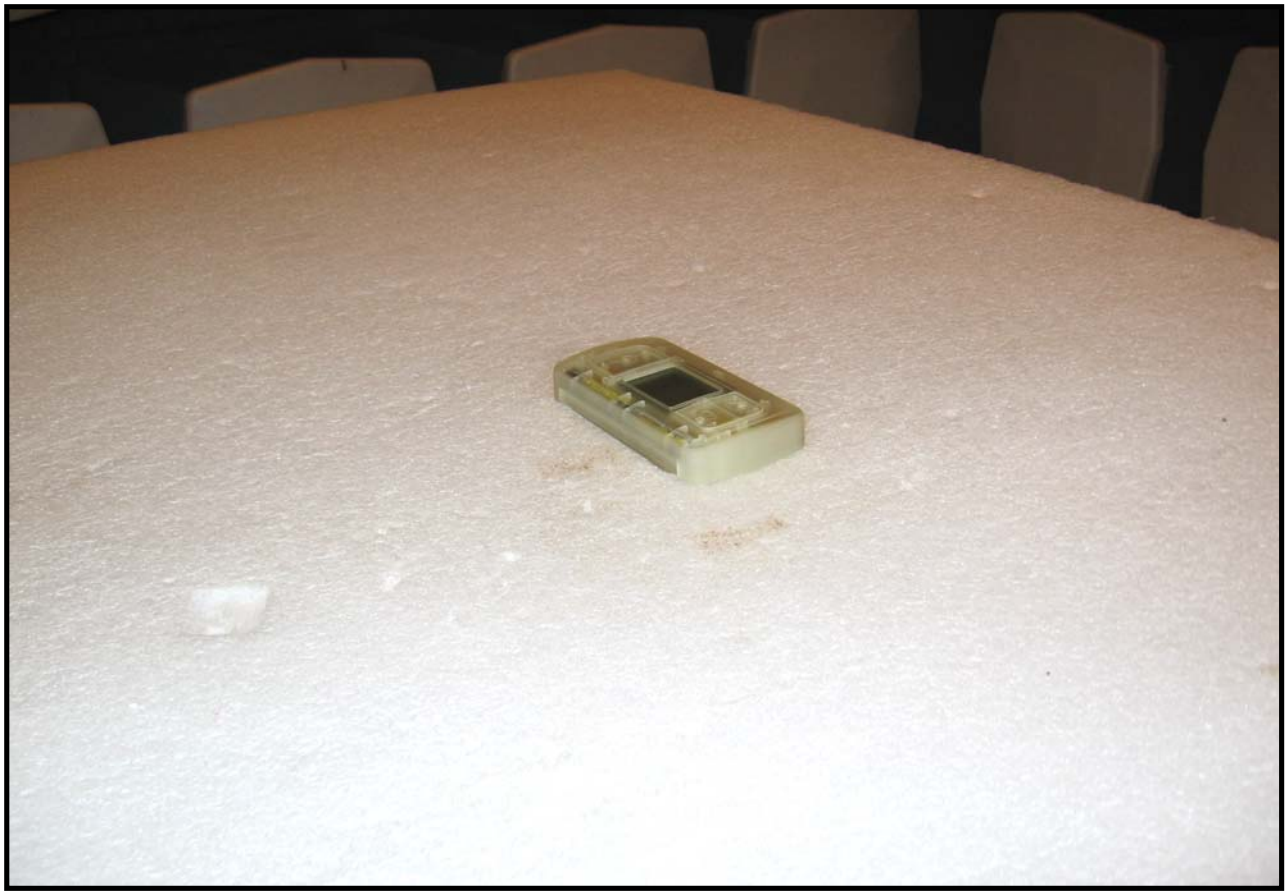
Configuration #	1	Signature

	Value	Limit	Results
OCCUPIED BANDWIDTH	54 kHz	1.045 MHz	Pass

OCCUPIED BANDWIDTH

OCCUPIED BANDWIDTH					
Result:	Pass	**Value:**	54 kHz	**Limit:**	1.045 MHz





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.

MODES OF OPERATION
Transmitting without modulation

POWER SETTINGS INVESTIGATED
Battery

FREQUENCY RANGE INVESTIGATED			
Start Frequency	417 MHz	Stop Frequency	419 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
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2006	13
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
EV01 cables c,g, h			EVA	12/29/2006	13

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
Measurements were made using the bandwidths and detectors specified. No video filter was used.				

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

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 C63.4:2003).

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 = 73.31 mSec
Pulsewidth of Type 1 Pulse = 0.320 mSec
Pulsewidth of Type 2 Pulse = 0.675 mSec
Pulsewidth of Type 3 Pulse = 1.475 mSec
Number of Type 1 Pulses = 44
Number of Type 2 Pulses = 22
Number of Type 3 Pulses = 2

Duty Cycle = 20 log [((44)(0.32) + (22)(0.675) + (2)(1.475))/73.31] = -7.2 dB

The duty cycle correction factor of –7.2 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.

NORTHWEST EMC

FIELD STRENGTH OF FUNDAMENTAL

PSA 2007.01.31
EMI 2006.12.20

EUT:	Smart Controller SC-03	Work Order:	HOCZ0013
Serial Number:	None	Date:	04/26/07
Customer:	Home Comfort Zone	Temperature:	21
Attendees:	Zac Wheeler	Humidity:	42%
Project:	None	Barometric Pres.:	30.28
Tested by:	Rod Peloquin	Power: Battery	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.231:2006	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

22 nH and 6.8 pF

EUT OPERATING MODES

Transmitting without modulation

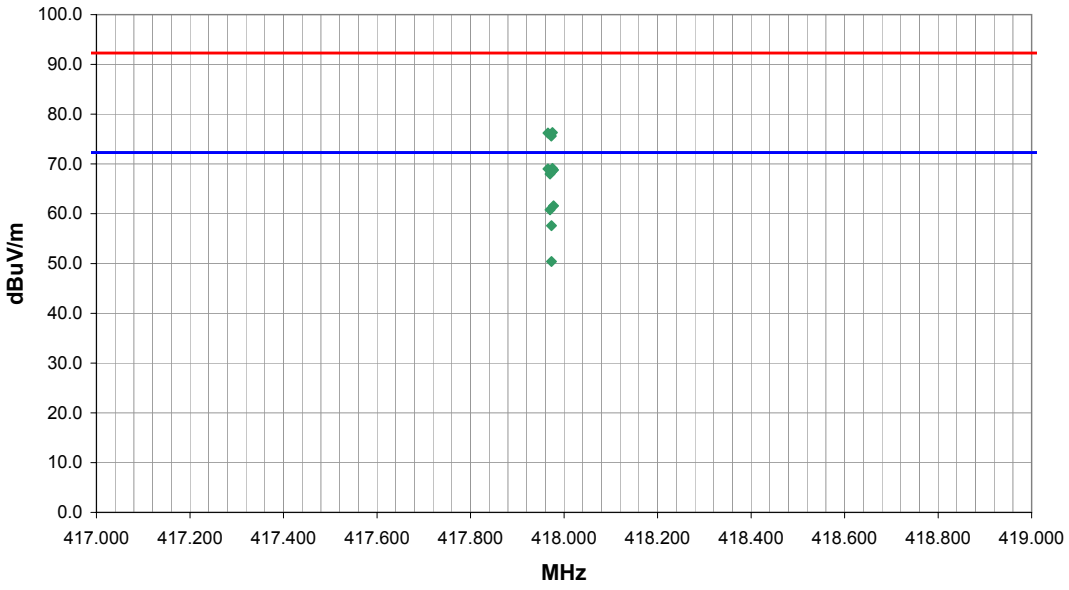
DEVIATIONS FROM TEST STANDARD

No deviations.

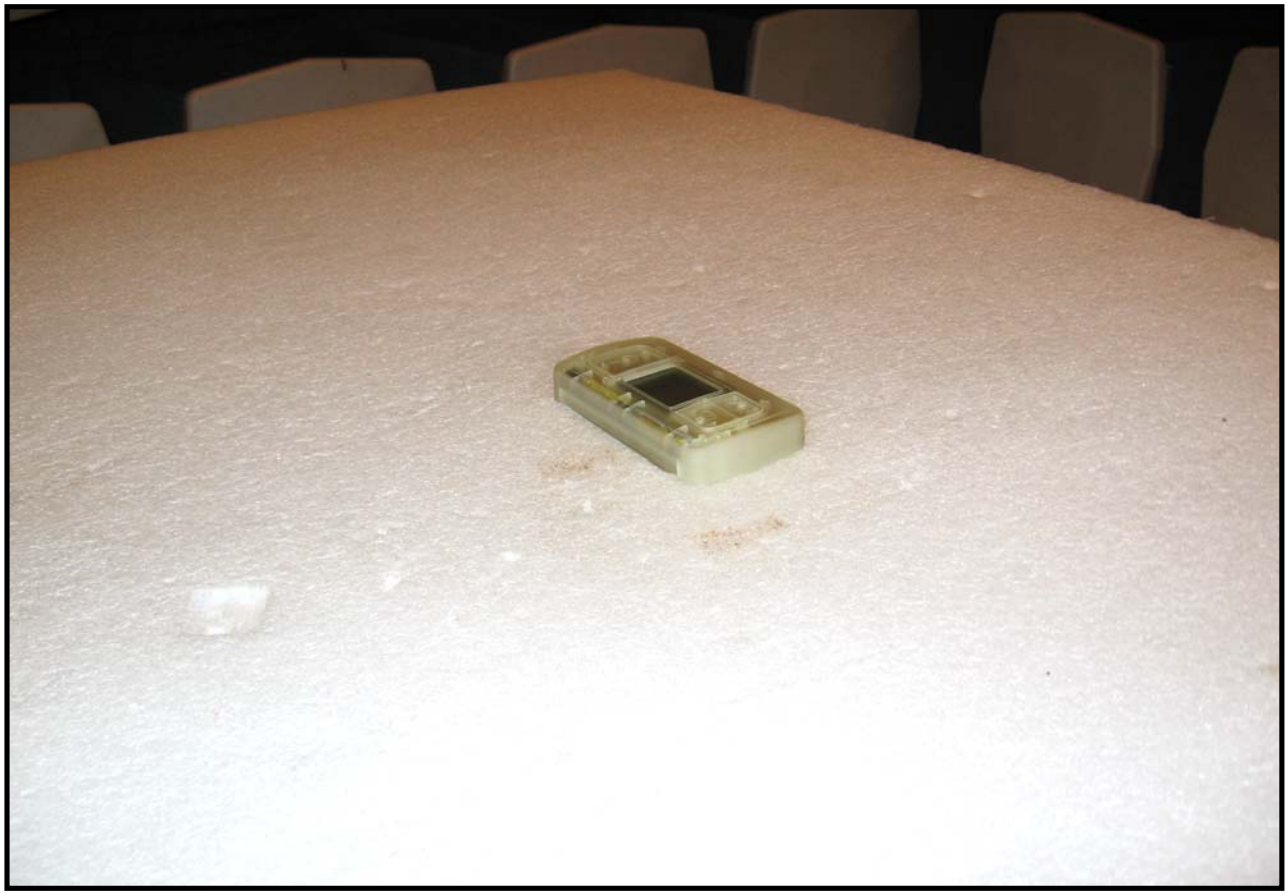
Run #	4
Configuration #	1
Results	Pass

NVLAP Lab Code 200630-0

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
417.975	50.7	25.6	329.0	1.0	7.2	0.0	H-Bilog	AV	0.0	69.1	72.3	-3.2	EUT horizontal
417.966	50.6	25.6	79.0	1.3	7.2	0.0	V-Bilog	AV	0.0	69.0	72.3	-3.3	EUT on end
417.973	50.0	25.6	253.0	1.3	7.2	0.0	V-Bilog	AV	0.0	68.4	72.3	-3.9	EUT vertical
417.978	43.2	25.6	169.0	1.6	7.2	0.0	H-Bilog	AV	0.0	61.6	72.3	-10.7	EUT vertical
417.970	42.4	25.6	189.0	3.8	7.2	0.0	H-Bilog	AV	0.0	60.8	72.3	-11.5	EUT on end
417.975	50.7	25.6	329.0	1.0	0.0	0.0	H-Bilog	PK	0.0	76.3	92.3	-16.0	EUT horizontal
417.966	50.6	25.6	79.0	1.3	0.0	0.0	V-Bilog	PK	0.0	76.2	92.3	-16.1	EUT on end
417.973	50.0	25.6	253.0	1.3	0.0	0.0	V-Bilog	PK	0.0	75.6	92.3	-16.7	EUT vertical
417.973	32.0	25.6	59.0	1.0	7.2	0.0	V-Bilog	AV	0.0	50.4	72.3	-21.9	EUT horizontal
417.978	43.2	25.6	169.0	1.6	0.0	0.0	H-Bilog	PK	0.0	68.8	92.3	-23.5	EUT vertical
417.970	42.4	25.6	189.0	3.8	0.0	0.0	H-Bilog	PK	0.0	68.0	92.3	-24.3	EUT on end
417.973	32.0	25.6	59.0	1.0	0.0	0.0	V-Bilog	PK	0.0	57.6	92.3	-34.7	EUT horizontal



FIELD STRENGTH OF FUNDAMENTAL

FIELD STRENGTH OF SPURIOUS 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.

MODES OF OPERATION

Transmitting without modulation

POWER SETTINGS INVESTIGATED

Battery

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
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2006	13
High Pass Filter	Micro-Tronics	HPM50111	HFO	12/29/2006	13
Pre-Amplifier	Miteq	AM-1616-1000	AOL	12/29/2006	13
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	5/12/2006	13
Antenna, Horn	EMCO	3115	AHC	8/24/2006	12
EV01 cables c,g, h			EVA	12/29/2006	13
EV01 cables g,h,j			EVB	12/29/2006	13

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

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

TEST DESCRIPTION

The antenna to be used with the EUT was tested. The EUT was configured for continuous modulated operation at its single transmit frequency. The field strength of the spurious radiated emissions were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.4:2003).

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 = 73.31 mSec
Pulsewidth of Type 1 Pulse = 0.320 mSec
Pulsewidth of Type 2 Pulse = 0.675 mSec
Pulsewidth of Type 3 Pulse = 1.475 mSec
Number of Type 1 Pulses = 44
Number of Type 2 Pulses = 22
Number of Type 3 Pulses = 2

Duty Cycle = 20 log [((44)(0.32) + (22)(0.675) + (2)(1.475))/73.31] = -7.2 dB

The duty cycle correction factor of –7.2 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.

NORTHWEST EMC

FIELD STRENGTH OF SPURIOUS EMISSIONS

PSA 2007.01.31
EMI 2006.12.20

EUT:	Smart Controller SC-03	Work Order:	HOCZ0013
Serial Number:	None	Date:	04/26/07
Customer:	Home Comfort Zone	Temperature:	21
Attendees:	Zac Wheeler	Humidity:	42%
Project:	None	Barometric Pres.:	30.28
Tested by:	Rod Peloquin	Power: Battery	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.231:2006	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

22 nH and 6.8 pF

EUT OPERATING MODES

Transmitting without modulation

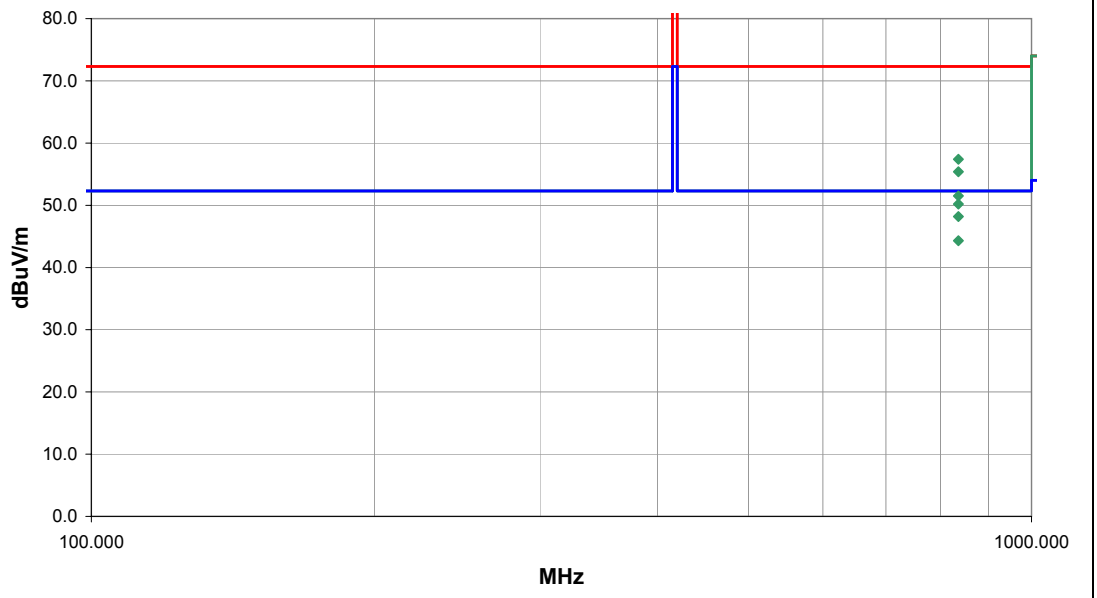
DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	3
Configuration #	1
Results	Pass

NVLAP Lab Code 200630-0

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
835.941	45.3	12.1	28.0	1.2	7.2	0.0	H-Bilog	AV	0.0	50.2	52.3	-2.1	EUT horizontal
835.937	43.3	12.1	44.0	1.5	7.2	0.0	V-Bilog	AV	0.0	48.2	52.3	-4.1	EUT vertical
835.947	39.4	12.1	170.0	1.4	7.2	0.0	V-Bilog	AV	0.0	44.3	52.3	-8.0	EUT on end
835.941	45.3	12.1	28.0	1.2	0.0	0.0	H-Bilog	PK	0.0	57.4	72.3	-14.9	EUT horizontal
835.937	43.3	12.1	44.0	1.5	0.0	0.0	V-Bilog	PK	0.0	55.4	72.3	-16.9	EUT vertical
835.947	39.4	12.1	170.0	1.4	0.0	0.0	V-Bilog	PK	0.0	51.5	72.3	-20.8	EUT on end

NORTHWEST EMC

FIELD STRENGTH OF SPURIOUS EMISSIONS

PSA 2007.01.31
EMI 2006.12.20

EUT:	Smart Controller SC-03			Work Order:	HOCZ0013
Serial Number:	None			Date:	04/26/07
Customer:	Home Comfort Zone			Temperature:	21
Attendees:	Zac Wheeler			Humidity:	42%
Project:	None			Barometric Pres.:	30.28
Tested by:	Rod Peloquin	Power:	Battery	Job Site:	EV01

TEST SPECIFICATIONS	Test Method
FCC 15.231:2006	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

22 nH and 6.8 pF

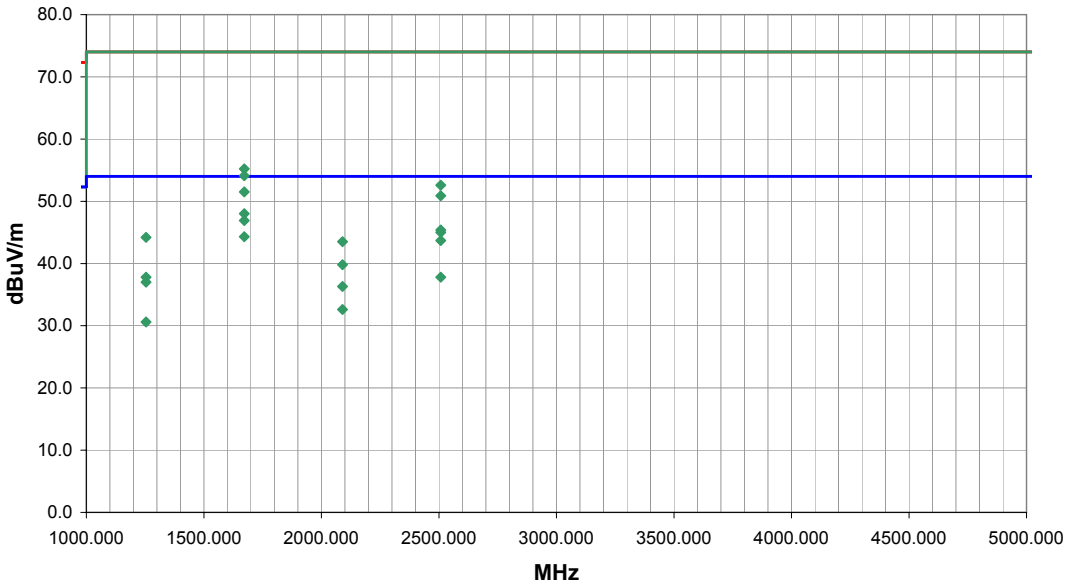
EUT OPERATING MODES

Transmitting without modulation

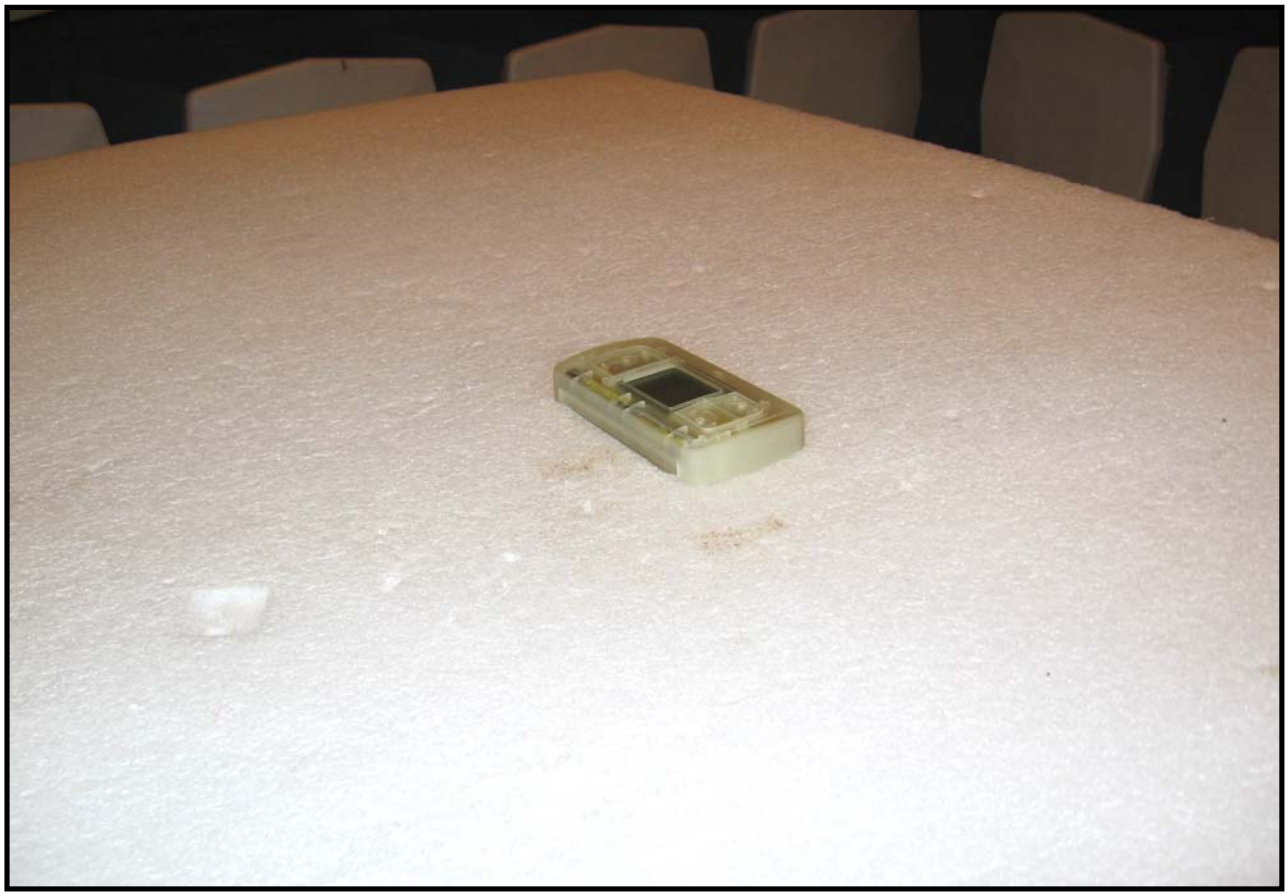
DEVIATIONS FROM TEST STANDARD

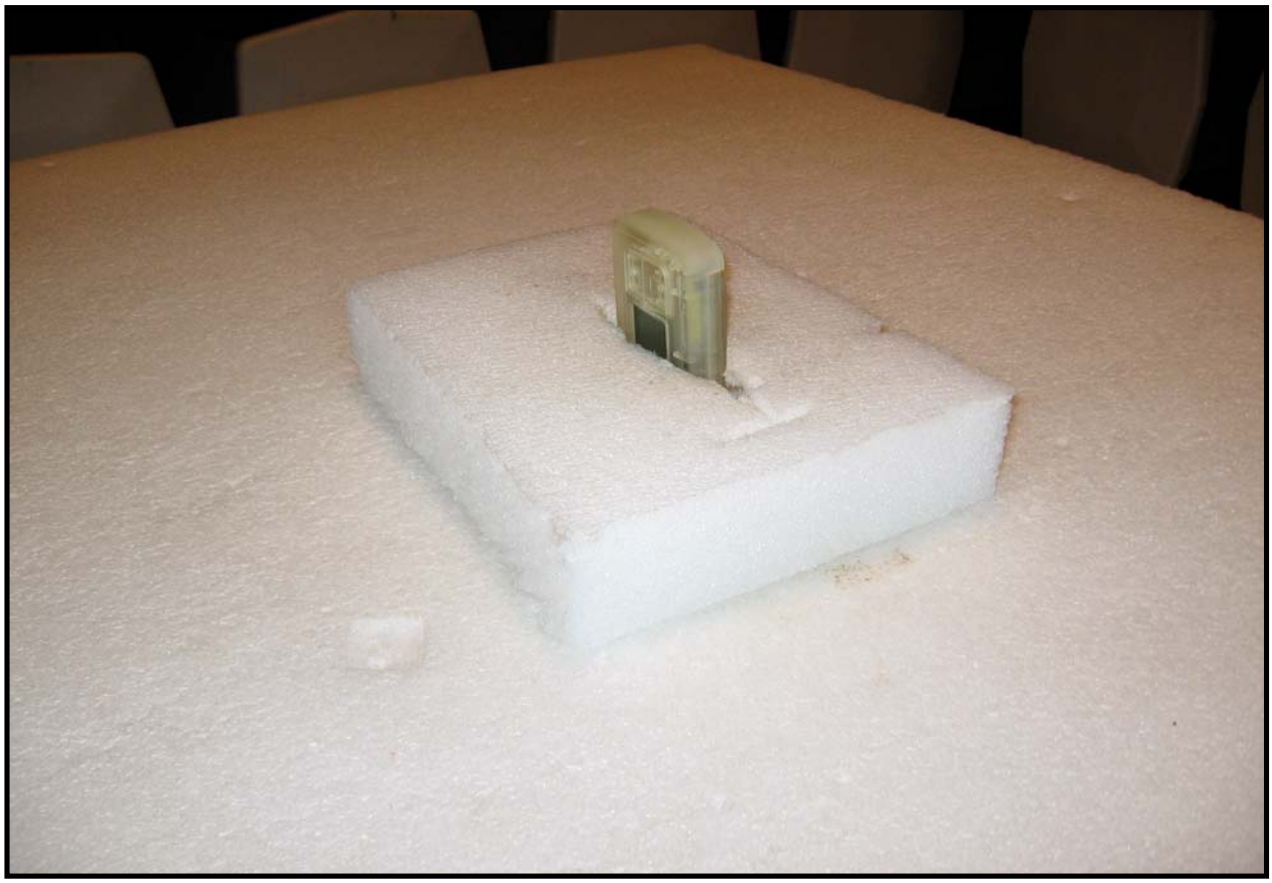
No deviations.

Run #	5		
Configuration #	1		
Results	Pass	NVLAP Lab Code 200630-0	*Signature*



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
1671.869	59.3	-4.1	113.0	1.3	7.2	0.0	H-Horn	AV	0.0	48.0	54.0	-6.0	EUT horizontal
1671.854	58.2	-4.1	253.0	1.1	7.2	0.0	V-Horn	AV	0.0	46.9	54.0	-7.1	EUT vertical
2507.758	52.7	-0.1	71.0	1.2	7.2	0.0	H-Horn	AV	0.0	45.4	54.0	-8.6	EUT horizontal
1671.761	55.6	-4.1	308.0	1.1	7.2	0.0	V-Horn	AV	0.0	44.3	54.0	-9.7	EUT on end
2507.675	51.0	-0.1	304.0	1.2	7.2	0.0	V-Horn	AV	0.0	43.7	54.0	-10.3	EUT vertical
2507.760	45.1	-0.1	304.0	1.1	7.2	0.0	V-Horn	AV	0.0	37.8	54.0	-16.2	EUT on end
1253.916	50.1	-5.9	328.0	1.0	7.2	0.0	H-Horn	AV	0.0	37.0	54.0	-17.0	EUT horizontal
2089.770	45.1	-1.6	72.0	1.1	7.2	0.0	H-Horn	AV	0.0	36.3	54.0	-17.7	EUT horizontal
1671.869	59.3	-4.1	113.0	1.3	0.0	0.0	H-Horn	PK	0.0	55.2	74.0	-18.8	EUT horizontal
1671.854	58.2	-4.1	253.0	1.1	0.0	0.0	V-Horn	PK	0.0	54.1	74.0	-19.9	EUT vertical
2089.786	41.4	-1.6	155.0	1.0	7.2	0.0	V-Horn	AV	0.0	32.6	54.0	-21.4	EUT vertical
2507.758	52.7	-0.1	71.0	1.2	0.0	0.0	H-Horn	PK	0.0	52.6	74.0	-21.4	EUT horizontal
1671.761	55.6	-4.1	308.0	1.1	0.0	0.0	V-Horn	PK	0.0	51.5	74.0	-22.5	EUT on end
2507.675	51.0	-0.1	304.0	1.2	0.0	0.0	V-Horn	PK	0.0	50.9	74.0	-23.1	EUT vertical
1254.228	43.7	-5.9	236.0	1.0	7.2	0.0	V-Horn	AV	0.0	30.6	54.0	-23.4	EUT vertical
2507.760	45.1	-0.1	304.0	1.1	0.0	0.0	V-Horn	PK	0.0	45.0	74.0	-29.0	EUT on end
1253.916	50.1	-5.9	328.0	1.0	0.0	0.0	H-Horn	PK	0.0	44.2	74.0	-29.8	EUT horizontal
2089.770	45.1	-1.6	72.0	1.1	0.0	0.0	H-Horn	PK	0.0	43.5	74.0	-30.5	EUT horizontal
2089.786	41.4	-1.6	155.0	1.0	0.0	0.0	V-Horn	PK	0.0	39.8	74.0	-34.2	EUT vertical
1254.228	43.7	-5.9	236.0	1.0	0.0	0.0	V-Horn	PK	0.0	37.8	74.0	-36.2	EUT vertical





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
Spectrum Analyzer	Agilent	E4407B	AAU	12/8/2006	13
Near Field Probe	EMCO	7405	IPD	NCR	0

MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

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 = 73.31 mSec
Pulsewidth of Type 1 Pulse = 0.320 mSec
Pulsewidth of Type 2 Pulse = 0.675 mSec
Pulsewidth of Type 3 Pulse = 1.475 mSec
Number of Type 1 Pulses = 44
Number of Type 2 Pulses = 22
Number of Type 3 Pulses = 2

Duty Cycle = 20 log [((44)(0.32) + (22)(0.675) + (2)(1.475))/73.31] = -7.2 dB

The duty cycle correction factor of –7.2 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.

NORTHWEST EMC

DUTY CYCLE

XMit 2006.11.13

EUT:	Smart Controller SC-03			**Work Order:**	HOCZ0005
Serial Number:	None			**Date:**	01/26/07
Customer:	Home Comfort Zone			**Temperature:**	19°C
Attendees:	None			**Humidity:**	29%
Project:	None			**Barometric Pres.:**	30.15
Tested by:	Rod Peloquin	**Power:**		**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.231:2006	ANSI C63.4:2003

COMMENTS

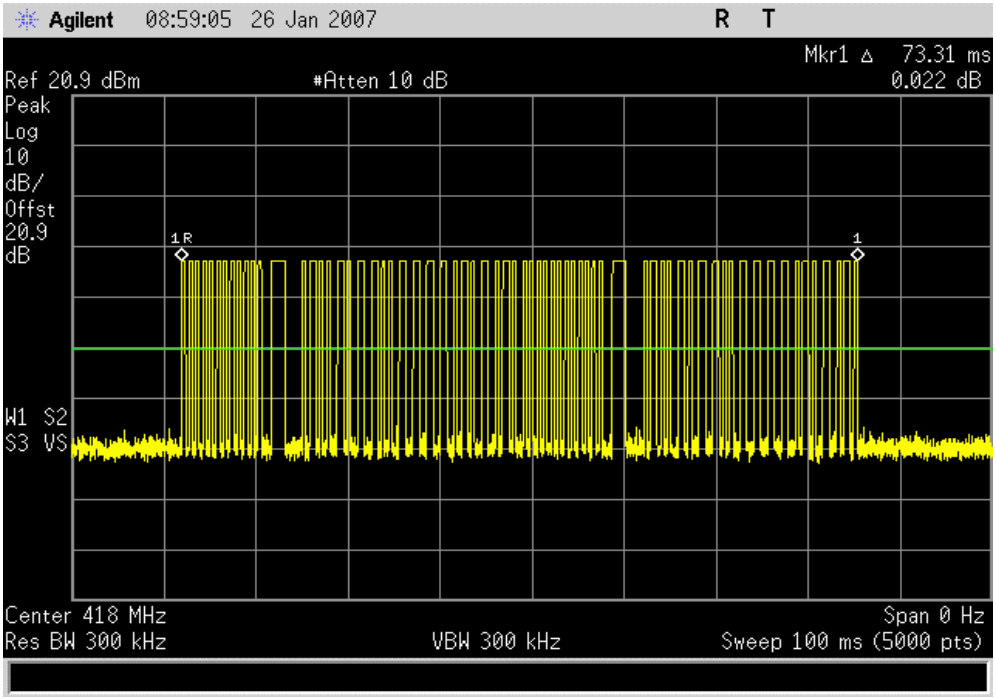
DEVIATIONS FROM TEST STANDARD

Configuration #	1	Signature

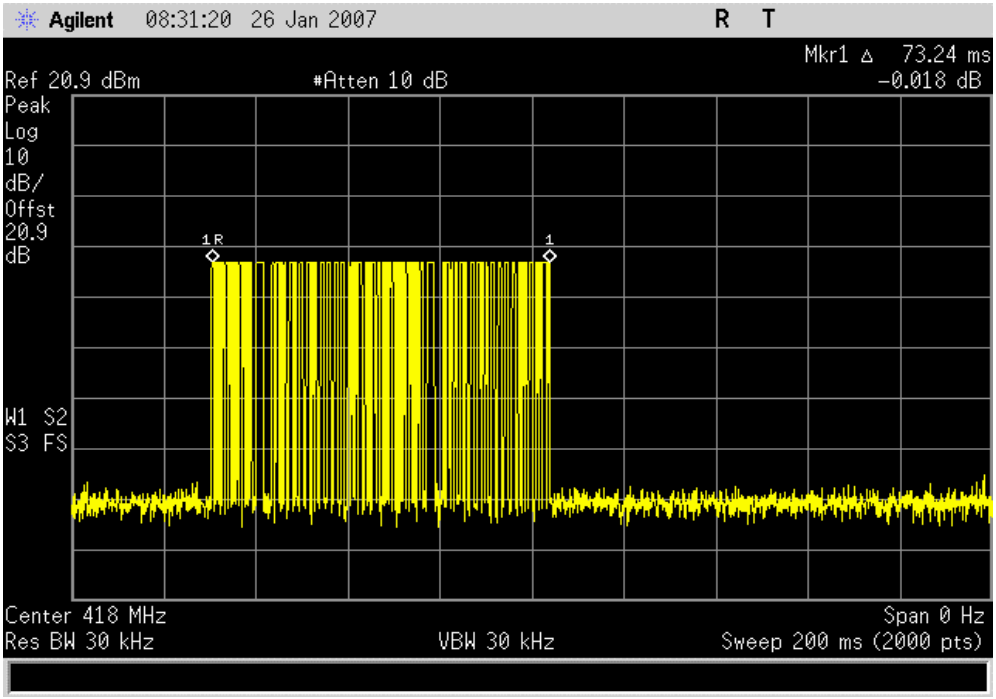
	Value	Limit	Results
Pulse Train	73.31 mS	≤ 100 mS	Pass
Duration	73.24 mS	≤ 100 mS	Pass
320 µS Pulse	320 µS	N/A	N/A
675 µS Pulse	675 µS	N/A	N/A
1.475 mS Pulse	1.475 mS	N/A	N/A
2.2 Sec Silent period	> 2.7 Seconds	≥ 2.2 Seconds	Pass

DUTY CYCLE

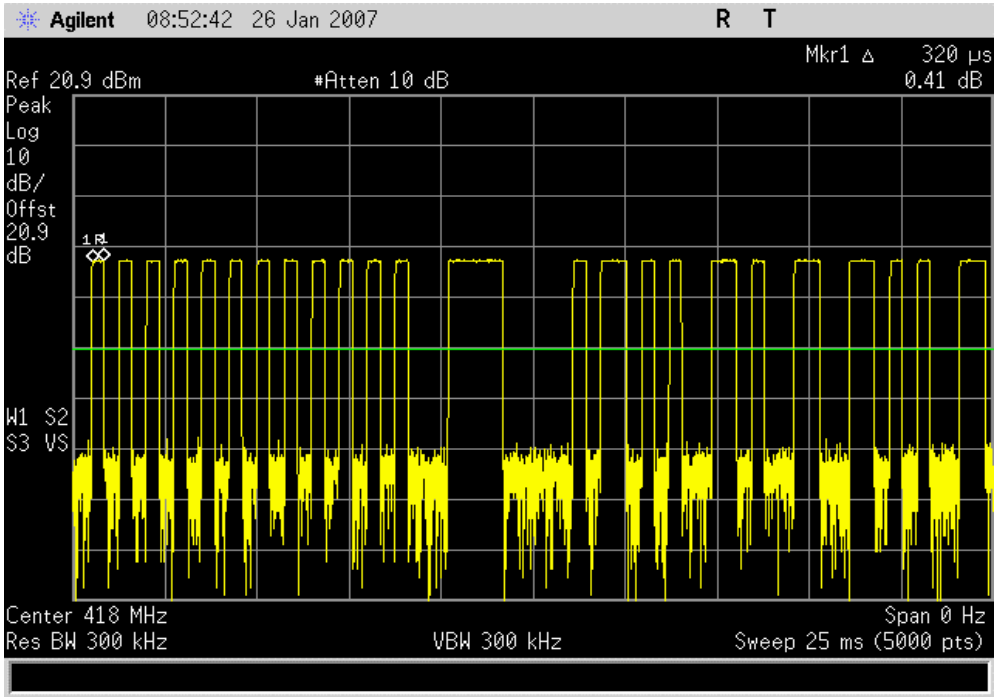
Pulse Train					
Result:	Pass	**Value:**	73.31 mS	**Limit:**	≤ 100 mS



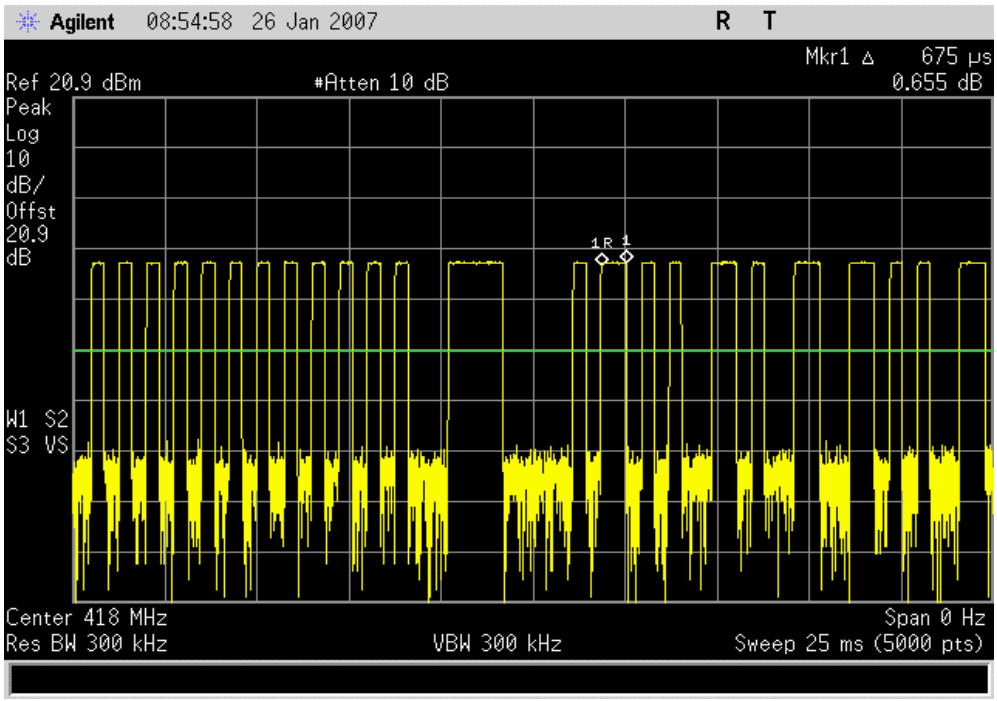
Duration					
Result:	Pass	**Value:**	73.24 mS	**Limit:**	≤ 100 mS



320 µS Pulse					
Result:	N/A	**Value:**	320 µS	**Limit:**	N/A

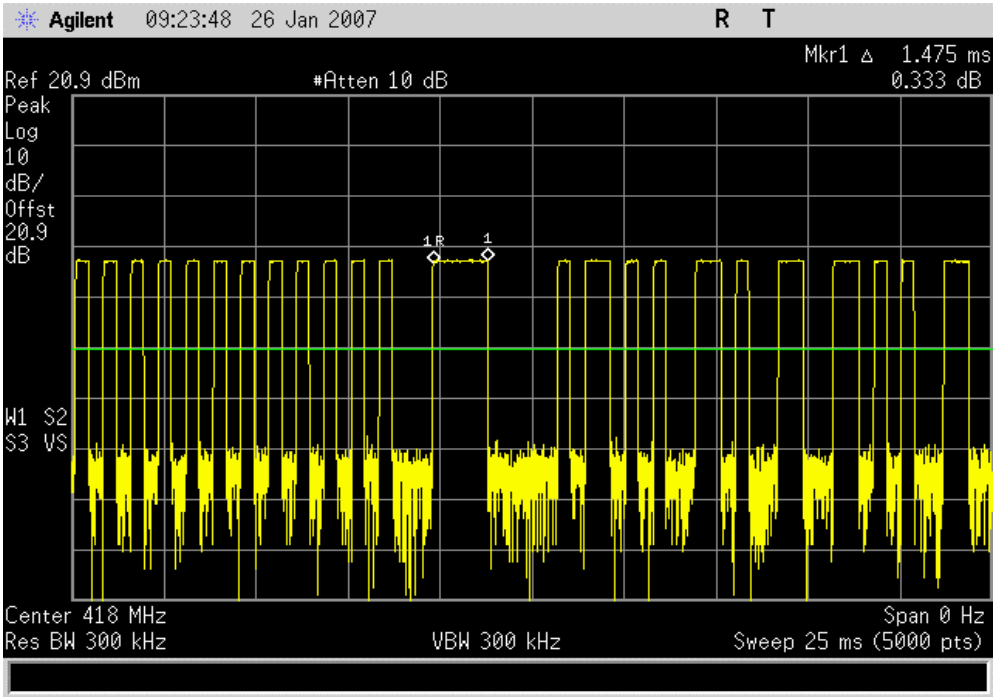


675 µS Pulse					
Result:	N/A	**Value:**	675 µS	**Limit:**	N/A

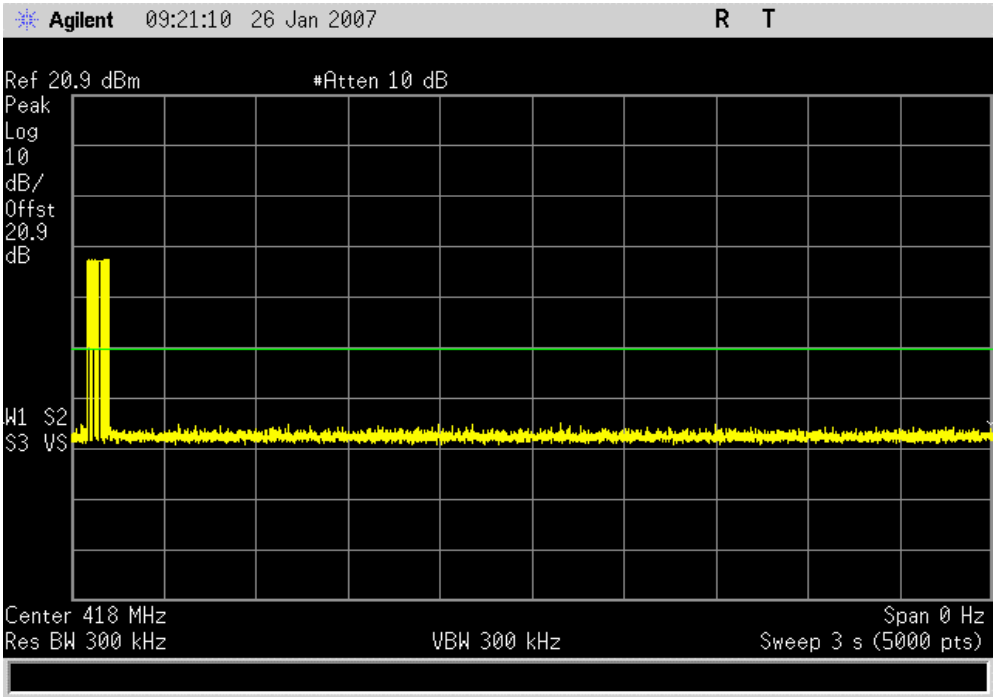


DUTY CYCLE

1.475 mS Pulse					
Result:	N/A	**Value:**	1.475 mS	**Limit:**	N/A



2.2 Sec Silent period					
Result:	Pass	**Value:**	> 2.7 Seconds	**Limit:**	≥ 2.2 Seconds

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