

Nonin Medical, Inc

Saber

Report No. NONN0006

Report Prepared By



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

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EMC Test Report



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test
Last Date of Test: October 5, 2010
Nonin Medical, Inc
Model: Saber

Emissions			
Test Description	Specification	Test Method	Pass/Fail
Spurious Radiated Emissions	FCC 15.247:2010	ANSI C63.10:2009	Pass

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.
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).

Approved By:

Don Fecteau, IS Manager



NVLAP Lab Code: 200881-0

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		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.



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 2004/108/EC, and ANSI C63.4. 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
NVLAP LAB CODE 200881-0

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-Gen, Issue 2 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. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1*)



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.



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, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-1784, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634).



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 (US0017). 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



KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157)



VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.



SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>



Northwest EMC Locations



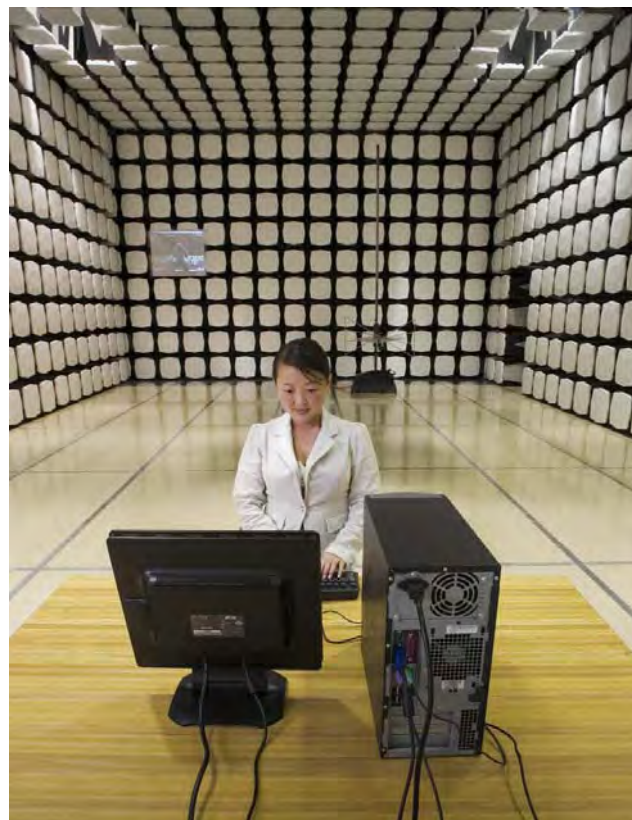
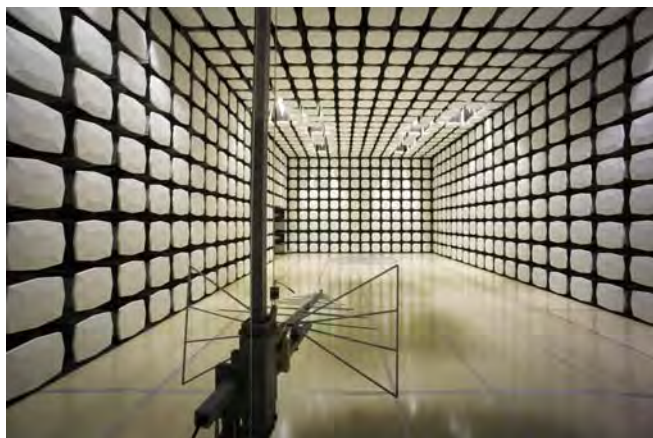
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796



Party Requesting the Test

Company Name:	Nonin Medical, Inc
Address:	13700 1st Avenue North
City, State, Zip:	Plymouth, MN 55441-5443
Test Requested By:	Brodie Pedersen
Model:	Saber
First Date of Test:	October 5, 2010
Last Date of Test:	October 5, 2010
Receipt Date of Samples:	September 14, 2010
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test**Functional Description of the EUT (Equipment Under Test):**

Saber Module in Model 7600

Testing Objective:

To demonstrate compliance of the module in the Model 7600 to FCC 15.247 spurious radiated emissions requirements.

CONFIGURATION 1 NONN0006

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Radio Module	Nonin Medical, Inc.	Saber	NA
Host Device	Nonin Medical, Inc.	7600	RD13151

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
7800PS Power Brick	Nonin Medical, Inc.	7800PS / GS-1638	RD13192
7600B POD 1	Nonin Medical, Inc.	7600B	501004205
7600B POD 2	Nonin Medical, Inc.	7600B	501040302
7600B POD 3	Nonin Medical, Inc.	7600B	501002253
7600B POD 4	Nonin Medical, Inc.	7600B	501004191
Cerebral Phantom 1	Nonin Medical, Inc.	6945-000	RD13214
Cerebral Phantom 2	Nonin Medical, Inc.	6945-000	RD12154
Cerebral Phantom 3	Nonin Medical, Inc.	6945-000	RD13213
Cerebral Phantom 4	Nonin Medical, Inc.	6945-000	RD12153
8000CA Sensor 1	Nonin Medical, Inc.	8000CA	None
8000CA Sensor 2	Nonin Medical, Inc.	8000CA	None
8000CA Sensor 3	Nonin Medical, Inc.	8000CA	None
8000CA Sensor 4	Nonin Medical, Inc.	8000CA	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power Cable	No	1.03 m	No	7800PS Power Brick	AC Mains
DC Power Cable	No	1.80 m	Yes	RG9SABER	7800PS Power Brick
Serial Cable	Yes	3.1 m	No	RG9SABER	Unterminated
Simulator Cable 1	No	0.43 m	No	7600B POD 1	8000CA Sensor 1
Simulator Cable 2	No	0.43 m	No	7600B POD 2	8000CA Sensor 2
Simulator Cable 3	No	0.43 m	No	7600B POD 3	8000CA Sensor 3
Simulator Cable 4	No	0.43 m	No	7600B POD 4	8000CA Sensor 4
7600 Trunk Cable- RD13215	No	1.56 m	No	RG9SABER	7600B PODS
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	10/5/2010	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

EMC**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

Transmit mode bluetooth High channel 2480 MHz.

Transmit mode bluetooth Mid channel 2440 MHz.

Transmit mode bluetooth Low channel 2402 MHz.

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

NONN0006 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	25 GHz
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SAMPLE CALCULATIONS

$$\text{Radiated Emissions: Field Strength} = \text{Measured Level} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain} + \text{Distance Adjustment Factor} + \text{External Attenuation}$$
TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	1/27/2010	13 mo
MN05 Cables	N/A	18-26GHz Standard Gain Horn Cable	EVD	1/27/2010	13 mo
Antenna, Horn	ETS	3160-09	AHG	NCR	0 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	7/19/2010	13 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	7/19/2010	13 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/19/2010	13 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	7/19/2010	13 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/19/2010	13 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	12/22/2009	24 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	1/15/2010	13 mo
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/19/2010	13 mo
Antenna, Biconilog	ETS Lindgren	3142D	AXO	12/30/2009	13 mo
Spectrum Analyzer	Agilent	E4446A	AAT	2/24/2010	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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 IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

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 for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axes, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna 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.

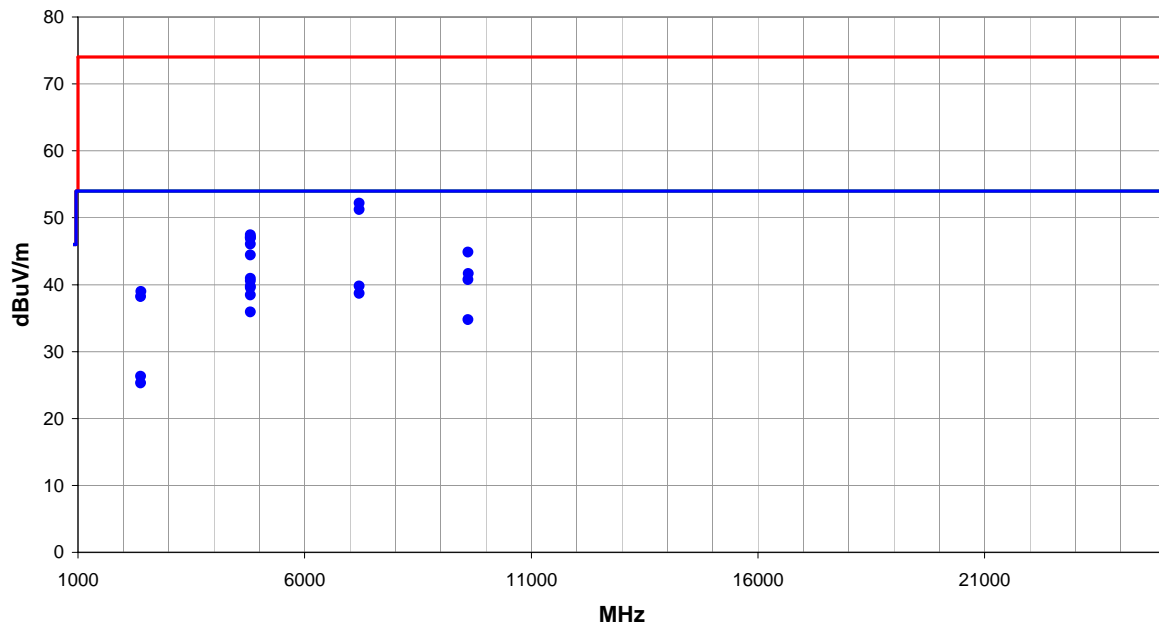
EMC

Spurious Radiated Emissions

Work Order:	NONN0006	Date:	10/05/10	<i>Trevor Buls</i>
Project:	None	Temperature:	22.61	
Job Site:	MN05	Humidity:	46.93	
Serial Number:	RD13151	Barometric Pres.:	1020.8	
EUT:	Saber			
Configuration:	1 - NONN0006-1			
Customer:	Nonin Medical, Inc			
Attendees:	Brodie Pedersen			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmit mode bluetooth Low channel 2402 MHz.			
Deviations:	None			
Comments:	None			

Test Specifications	Test Method
FCC 15.247:2010	ANSI C63.10:2009

Run #	17	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
4804.021	37.4	3.5	1.4	197.0	3.0	0.0	Vert	AV	0.0	40.9	54.0	-13.1
9608.010	50.1	-9.3	1.2	169.0	3.0	0.0	Horz	AV	0.0	40.8	54.0	-13.2
4804.038	37.0	3.5	1.5	192.0	3.0	0.0	Horz	AV	0.0	40.5	54.0	-13.5
7206.317	28.9	10.9	1.1	187.0	3.0	0.0	Vert	AV	0.0	39.8	54.0	-14.2
4804.038	36.2	3.5	1.6	201.0	3.0	0.0	Vert	AV	0.0	39.7	54.0	-14.3
4804.038	36.0	3.5	1.2	265.0	3.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5
7206.183	27.8	10.9	1.8	229.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3
4803.996	34.9	3.5	1.1	284.0	3.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6
4803.996	32.4	3.5	1.2	351.0	3.0	0.0	Horz	AV	0.0	35.9	54.0	-18.1
9607.993	44.1	-9.3	1.2	213.0	3.0	0.0	Vert	AV	0.0	34.8	54.0	-19.2
7206.125	41.3	10.9	1.1	187.0	3.0	0.0	Vert	PK	0.0	52.2	74.0	-21.8
7208.200	40.3	10.9	1.8	229.0	3.0	0.0	Horz	PK	0.0	51.2	74.0	-22.8
4804.129	43.9	3.5	1.6	201.0	3.0	0.0	Vert	PK	0.0	47.4	74.0	-26.6
4804.196	43.6	3.5	1.2	265.0	3.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9
4803.954	43.5	3.5	1.4	197.0	3.0	0.0	Vert	PK	0.0	47.0	74.0	-27.0
4803.763	43.4	3.5	1.5	192.0	3.0	0.0	Horz	PK	0.0	46.9	74.0	-27.1
2386.458	30.7	-4.4	1.3	197.0	3.0	0.0	Horz	AV	0.0	26.3	54.0	-27.7
4804.246	42.5	3.5	1.1	284.0	3.0	0.0	Vert	PK	0.0	46.0	74.0	-28.0
2386.475	29.7	-4.4	1.3	256.0	3.0	0.0	Vert	AV	0.0	25.3	54.0	-28.7
9607.952	54.2	-9.3	1.2	169.0	3.0	0.0	Horz	PK	0.0	44.9	74.0	-29.1

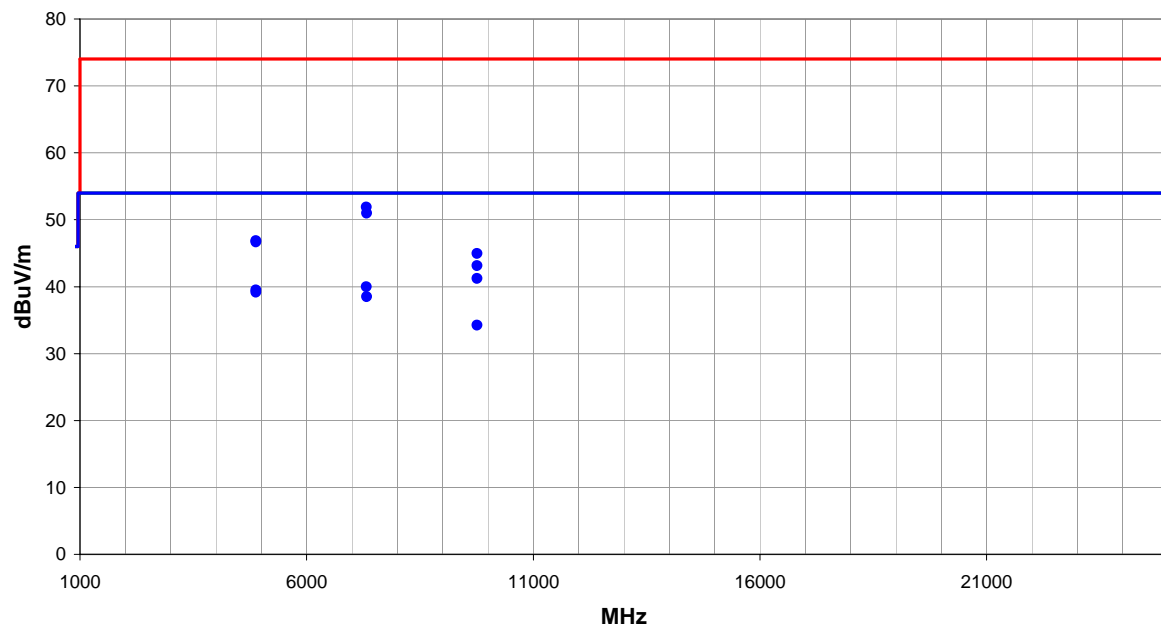
EMC

Spurious Radiated Emissions

Work Order:	NONN0006	Date:	10/05/10	<i>Trevor Buls</i>
Project:	None	Temperature:	22.61	
Job Site:	MN05	Humidity:	46.93	
Serial Number:	RD13151	Barometric Pres.:	1020.8	
EUT:	Saber			
Configuration:	1 - NONN0006-1			
Customer:	Nonin Medical, Inc			
Attendees:	Brodie Pedersen			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmit mode bluetooth Mid channel 2440 MHz.			
Deviations:	None			
Comments:	EUT Horizontal.			

Test Specifications FCC 15.247:2010	Test Method ANSI C63.10:2009
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Run #	25	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass
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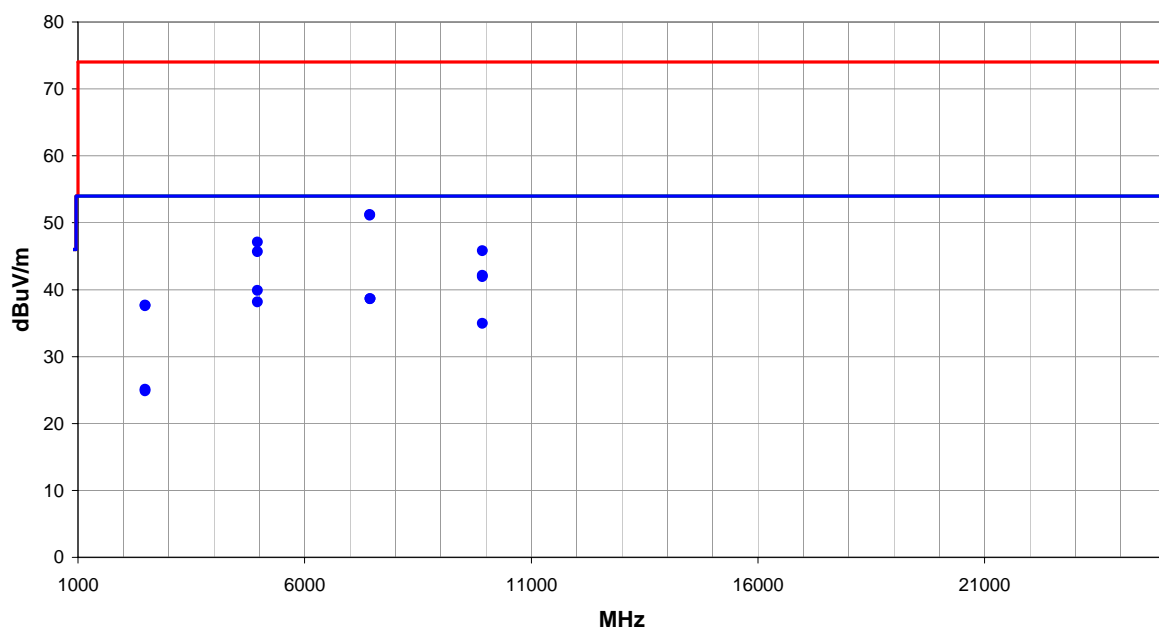
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
9760.008	50.3	-9.1	1.0	165.0	3.0	0.0	Horz	AV	0.0	41.2	54.0	-12.8
7320.142	28.3	11.7	1.3	204.0	3.0	0.0	Vert	AV	0.0	40.0	54.0	-14.0
4880.024	35.6	3.9	1.3	293.0	3.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5
4880.024	35.3	3.9	1.2	187.0	3.0	0.0	Vert	AV	0.0	39.2	54.0	-14.8
7322.425	26.8	11.7	2.4	289.0	3.0	0.0	Horz	AV	0.0	38.5	54.0	-15.5
9760.000	43.3	-9.1	1.3	181.0	3.0	0.0	Vert	AV	0.0	34.2	54.0	-19.8
7320.600	40.2	11.7	1.3	204.0	3.0	0.0	Vert	PK	0.0	51.9	74.0	-22.1
7321.700	39.3	11.7	2.4	289.0	3.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0
4879.941	43.0	3.9	1.2	187.0	3.0	0.0	Vert	PK	0.0	46.9	74.0	-27.1
4880.099	42.8	3.9	1.3	293.0	3.0	0.0	Horz	PK	0.0	46.7	74.0	-27.3
9759.742	54.0	-9.1	1.0	165.0	3.0	0.0	Horz	PK	0.0	44.9	74.0	-29.1
9759.942	52.2	-9.1	1.3	181.0	3.0	0.0	Vert	PK	0.0	43.1	74.0	-30.9

EMC

Spurious Radiated Emissions

Work Order:	NONN0006	Date:	10/05/10	<i>Trevor Buls</i>
Project:	None	Temperature:	22.61	
Job Site:	MN05	Humidity:	46.93	
Serial Number:	RD13151	Barometric Pres.:	1020.8	
EUT:	Saber			
Configuration:	1 - NONN0006-1			
Customer:	Nonin Medical, Inc			
Attendees:	Brodie Pedersen			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmit mode bluetooth High channel 2480 MHz.			
Deviations:	None			
Comments:	EUT Horizontal.			

Test Specifications FCC 15.247:2010					Test Method ANSI C63.10:2009		
Run #	21	Test Distance (m)	3	Antenna Height(s)	1-4m	Results	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
9920.015	50.7	-8.8	1.2	169.0	3.0	0.0	Horz	AV	0.0	41.9	54.0	-12.1
4960.023	35.7	4.2	1.3	183.0	3.0	0.0	Horz	AV	0.0	39.9	54.0	-14.1
7442.358	26.4	12.2	1.3	107.0	3.0	0.0	Horz	AV	0.0	38.6	54.0	-15.4
7442.308	26.4	12.2	1.0	135.0	3.0	0.0	Vert	AV	0.0	38.6	54.0	-15.4
4960.023	34.0	4.2	1.2	153.0	3.0	0.0	Vert	AV	0.0	38.2	54.0	-15.8
9920.015	43.7	-8.8	1.2	169.0	3.0	0.0	Vert	AV	0.0	34.9	54.0	-19.1
7440.842	39.0	12.2	1.3	107.0	3.0	0.0	Horz	PK	0.0	51.2	74.0	-22.8
7438.892	38.9	12.2	1.0	135.0	3.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9
4960.106	42.9	4.2	1.3	183.0	3.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9
9920.173	54.6	-8.8	1.2	169.0	3.0	0.0	Horz	PK	0.0	45.8	74.0	-28.2
4959.973	41.5	4.2	1.2	153.0	3.0	0.0	Vert	PK	0.0	45.7	74.0	-28.3
2483.413	29.5	-4.4	1.3	192.0	3.0	0.0	Vert	AV	0.0	25.1	54.0	-28.9
2483.073	29.3	-4.4	1.3	181.0	3.0	0.0	Horz	AV	0.0	24.9	54.0	-29.1
9920.007	50.9	-8.8	1.2	169.0	3.0	0.0	Vert	PK	0.0	42.1	74.0	-31.9
2484.780	42.1	-4.4	1.3	192.0	3.0	0.0	Vert	PK	0.0	37.7	74.0	-36.3
2484.627	42.0	-4.4	1.3	181.0	3.0	0.0	Horz	PK	0.0	37.6	74.0	-36.4