

# Masimo Corporation

## Rad 7C+

Report No. MASI0057.1

Report Prepared By



[www.nwemc.com](http://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: May , 2010  
Masimo Corporation  
Model: Rad 7C+

Emissions			
Test Description	Specification	Test Method	Pass/Fail
Maximum Permissible Exposure	FCC 2.1091:2009	OET Bulletin 65, Supplement C Ed 01-01	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.  
41 Tesla Ave.  
Irvine, CA 92618

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 (Site filing #2834B-2).

Approved By:  
  
Don Fecteau, IS Manager



NVLAP Lab Code: 200676-0

*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		



# Accreditations and Authorizations

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## 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.



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## 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

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## 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*)



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## 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.



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## 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).



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## 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).



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## 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).



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## 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.



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## 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



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## KCC

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



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## 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.



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## SCOPE

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

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



# Northwest EMC Locations



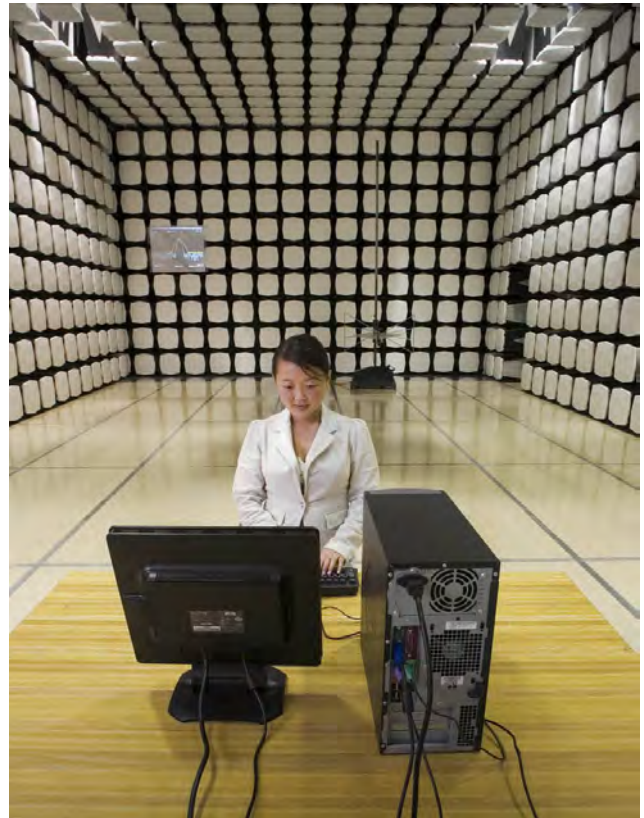
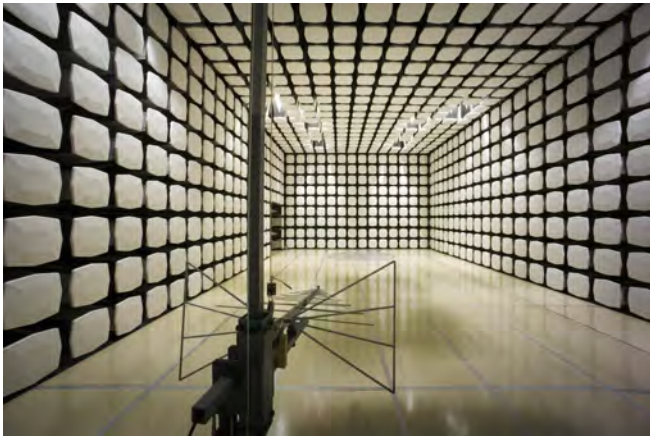
Oregon  
Labs EV01-EV12  
22975 NW Evergreen Pkwy  
Suite 400  
Hillsboro, OR 97124  
(503) 844-4066

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 339<sup>th</sup> 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

<b>Company Name:</b>	Masimo Corporation
<b>Address:</b>	40 Parker
<b>City, State, Zip:</b>	Irvine, CA 92618
<b>Test Requested By:</b>	Paul Lewandowski
<b>Model:</b>	Rad 7C+
<b>Receipt Date of Samples:</b>	May 3, 2010
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage

## Information Provided by the Party Requesting the Test

## Functional Description of the EUT (Equipment Under Test):

One 802.11a/b/g radio module installed in a medical monitoring device that will be connected to hospital wireless network.

## Testing Objective:

To demonstrate compliance with FCC requirements for RF exposure for 2.1091 mobile devices.

## EUT Photo







## OVERVIEW

Human exposure to RF emissions from mobile devices (47 CFR §2.1091) may be evaluated based on the MPE limits adopted by the FCC for electric and magnetic field strength and/or power density, as appropriate, since exposures are assumed to occur at distances of 20 cm or more from persons. ANSI C95.1-1992 specifies a minimum separation distance of 20 cm for performing reliable field measurements to determine adherence to MPE limits. If the minimum separation distance between a transmitter and nearby persons is more than 20 cm under normal operating conditions, compliance with MPE limits may be determined at such distance from the transmitter. When applicable, operation instructions and prominent warning labels may be used to alert the exposed persons to maintain a specified distance from the transmitter or to limit their exposure durations and usage conditions to ensure compliance. If the use of warning labels on a transmitter is not effective or desirable, the alternative of performing SAR evaluation with the device at its closest range to persons under normal operating conditions may be used. The field strength and power density limits adopted by the FCC are based on whole-body averaged exposure and the assumption of RF field levels relate most accurately to estimating whole-body averaged SAR. This means some local values of exposures exceeding the stated field strength and power density limits may not necessarily imply non-compliance if the spatial average of spatially averaged RF fields over the exposed portions of a person's body does not exceed the limits.

## COMPLIANCE WITH 47 CFR 15.247(i)

*"Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter."*

The EUT will only be used with a separation distance of 20 centimeters or greater between the antenna and the body of the user or nearby persons and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b). The highest gain antenna has a gain of 2 dBi. The maximum peak conducted output power is 28.9 mW. The maximum peak radiated power is 45.8 mW (EIRP). Per 47 CFR 1.1310, the EUT meets the General Population / Uncontrolled exposure limits listed in Table 1.

## COMPLIANCE WITH 47 CFR 15.407(f)

*"U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request."*

The EUT will only be used with a separation distance of 20 centimeters or greater between the antenna and the body of the user or nearby persons and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b). The highest gain antenna has a gain of 3 dBi. The maximum peak conducted output power is 19.4 mW. The maximum peak radiated power is 38.7 mW (EIRP). Per 47 CFR 1.1310, the EUT meetst the General Population / Uncontrolled exposure limits listed in Table 1. The fundamental emissions and unwanted emissions meet all applicable FCC requirements for RF exposure.

## COMPLIANCE WITH FCC KDB 447498 D01 Mobile Portable RF Exposure V04

The WiFi and Bluetooth radios are mobile transmitters and their antennas are greater than 5 cm from each other and all other simultaneous transmitting antennas.

"KDB 447498 D01 Mobile Portable RF Exposure v04" provides the procedures, requirements, and authorization policies for mobile and portable devices. Item #8 best fits the exosure condition described in this report. Since these mobile devices are categorically excluded from routine evaluation; per footnotes 1 and 32 of KDB 447498, simple calculations may be used to estimate the power density to demonstrate compliance with 47 CFR 1.1310 requirements. The attached estimate shows MPE limits are met for simultaneous transmission at a 20 cm boundary.

## FCC LIMITS FOR MPE

Limits for General Population /Uncontrolled Expsoure: 47 CFR 1.1310

Frequency Range (MHz)	Electric Field (V/m)	Magnetic Field (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30 - 300	27.5	0.073	0.2	30
300 - 1500			f/1500	30
1500 - 100000			1	30

f = frequency in MHz

\* = Plane-wave equivalent power density

## METHOD OF EVALUATION

The exposure level at a 20 cm distance from the EUT's transmitting antenna is calculated using the general equation:

$$S = \frac{P * G}{4 * \pi * R^2}$$

Where: S = power density (mW/cm<sup>2</sup>)

P = power input to the antenna (mW)

G = numeric power gain relative to an isotropic radiator


R = distance to the center of the radiation of the antenna (20 cm = limit for MPE estimates)

P\*G = EIRP

Solving for S, the maximum power density 20 cm from the transmitting antenna is summarized in the following table:

## EMC

## Maximum Permissible Exposure (MPE)

EUT:	Radical 7C+	Work Order:	MASI0057
Serial Number:	E00680	Date:	05/28/10
Customer:	Masimo	Temperature:	21°C
Attendees:	None	Humidity:	43%
Project:	None	Barometric Pres.:	1024.9 mb
Evaluated by:	Greg Kiemel	Power:	120V, 60 Hz
		Job Site:	EV06
<b>SPECIFICATIONS</b>		Method	
FCC 15.247 (DTS):2010		OET Bulletin 65, Supplement C Ed 01-01	
FCC 15.407:2010		OET Bulletin 65, Supplement C Ed 01-01	
<b>COMMENTS</b>			
None			
<b>DEVIATIONS FROM TEST STANDARD</b>			
No Deviations			
		Signature 	

Radio	Antenna Type	Antenna Manufacturer	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 20 cm (mW/cm <sup>2</sup> )	General Population Exposure Limit from 1.1310 (mW/cm <sup>2</sup> )	Ratio of Power Density to the Exposure Limit
WiFi	Chip	Laird Technologies	WIC2452-A	2412	28.88	2	0	0.009	1	0.00911
	Chip	Laird Technologies	WIC2452-A	2437	28.52	2	0	0.009	1	0.00899
	Chip	Laird Technologies	WIC2452-A	2462	26.74	2	0	0.008	1	0.00843
	Chip	Laird Technologies	WIC2452-A	5180	17.5	3	0	0.007	1	0.00695
	Chip	Laird Technologies	WIC2452-A	5240	19.23	3	0	0.008	1	0.00763
	Chip	Laird Technologies	WIC2452-A	5745	17.69	3	0	0.007	1	0.00702
	Chip	Laird Technologies	WIC2452-A	5785	19.13	3	0	0.008	1	0.00759
	Chip	Laird Technologies	WIC2452-A	5805	19.38	3	0	0.008	1	0.00769
Bluetooth	Chip	Antenna	0839	2400	2.5	3	0	0.001	1	0.00099

### Worst Case Co-located Exposure Conditions

#### One WiFi Radio with One Bluetooth Radio

Per Note 24 shown below, the Sum of Worst Case Power Ratios cannot exceed 1.0

Wi-Fi	Bluetooth	Wi-Fi Transmit Frequency (MHz)	Sum of Worst Case Ratios (Power Density to the Exposure Limit)	FCC Limit for Sum of Worst Case Ratios	
0.00911	0.00099	2400	0.01010	1.0	PASS
0.00763	0.00099	5240	0.00863	1.0	PASS
0.00769	0.00099	5805	0.00869	1.0	PASS

The results shown in the above table are equivalent to the Sum of the EIRP of the Two Co-located Transmitters (EIRP TX1

### Excerpts from TCB Training, April 3, 2002, "Mobile Transmitters", Slide 6:

"Devices operating in multiple frequency bands

When RF exposure evaluation is required for TCB approval  
 o Separate antennas – estimated minimum separation distances may be considered for the frequency bands that do not require evaluation or TCB approval, however, the estimated distance should take into account the effect of co-located transmitters. (Note 24)

Note 24 According to multiple frequency exposure criteria, the ratio of field strength or power density to the applicable exposure limit at the exposure location should be determined for each transmitter and the sum of these ratios must not exceed 1.0 for the location to be compliant."

The sum of the ratios (power density to the exposure limit) does not exceed 1.0; therefore, the exposure condition is compliant with FCC rules.