Intermec Technologies Corporation

IM4

Report No. ITRM0331

FCC 2.1091: Maximum Permissible Exposure Level

Report Prepared By Northwest EMC Inc.

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Certificate of Evaluation

Date of Evaluation October 15, 2012

Intermec Technologies Corporation

Model: IM4

Emissions

Description of Evaluation	Specification	Evaluation Method	Pass/Fail
Maximum Permissible Exposure	FCC 2.1091:2012	OET Bulletin 65, Supplement C Ed 01-01	**Pass**

Approved By:

Don Facteau, IS Manager

NVLAP Lab Code: 200630-0

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.

NORTHWEST EMC
REV 2012.05.24

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

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

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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.

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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.

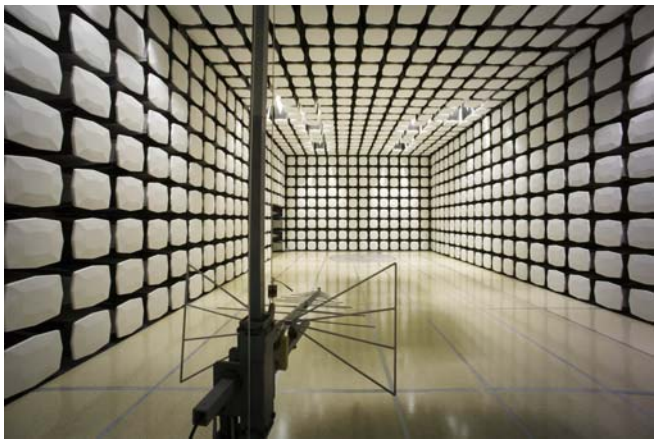
SCOPE

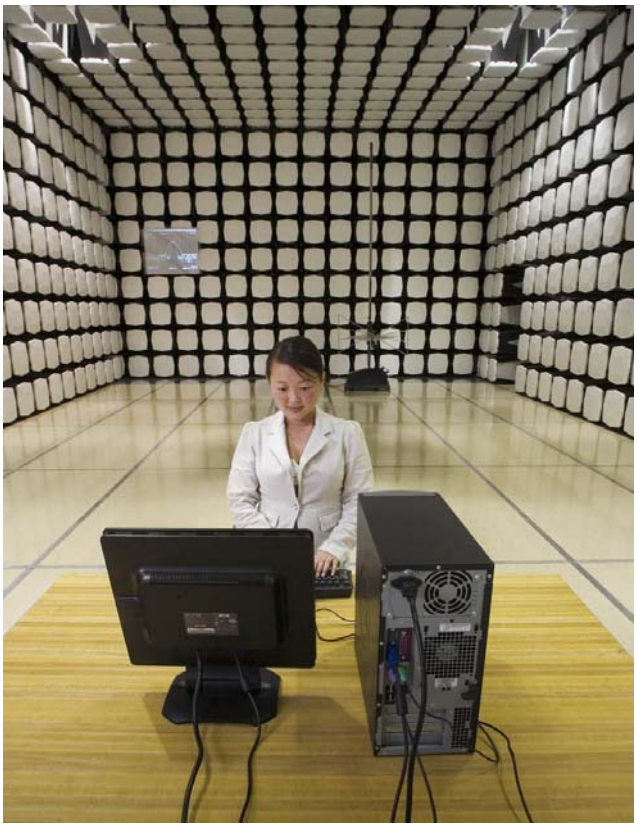
For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

LOCATIONS

REV 2012.05.24

Oregon	California	New York	Minnesota	Washington
Labs EV01-EV12 22975 NW Evergreen Pkwy, #400 Hillsboro, OR 97124 (503) 844-4066	Labs OC01-OC13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs WA01-WA04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Labs MN01-MN08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Labs SU01-SU07 14128 339th Ave. SE Sultan, WA 98294 (360) 793-8675
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





Product Description

Client and Equipment Under Test (EUT) Information

Company Name:	Intermec Technologies Corporation
Address:	6001 36th Avenue West
City, State, Zip:	Everett, WA 98203
Test Requested By:	Dave Fry
Model:	IM4
Date of Evaluation:	October 15, 2012

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
The IM4 is a 902.75 MHz – 927.25 MHz RFID radio module using FHSS. The IM4 radio module is contained within the IP30 hand scanner and is co-located with CK3R and CK3X hand held computers when they are mounted in the IP30

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

Maximum Permissible Exposure (MPE)

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 23 cm or more from persons. ANSI C95.1-1992 specifies a minimum separation distance of 23 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 23 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 2.1091

"Mobile devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services, the Satellite Communications Services, the General Wireless Communications Service, the Wireless Communications Service, the Maritime Services and the Specialized Mobile Radio Service authorized under subpart H of part 22 of this chapter, parts 24, 25, 26 and 27 of this chapter, part 80 of this chapter (ship earth stations devices only) and part 90 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or if they operate at frequencies above 1.5 GHz and their ERP is 3 watts or more. Unlicensed personal communications service devices, unlicensed millimeter wave devices and unlicensed NII devices authorized under §§15.253, 15.255, and 15.257, and subparts D and E of part 15 of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their ERP is 3 watts or more or if they meet the definition of a portable device as specified in §2.1093(b) requiring evaluation under the provisions of that section. All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§1.1307(c) and 1.1307(d) of this chapter. Applications for equipment authorization of mobile and unlicensed transmitting devices subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in paragraph (d) of this section as part of their application."

The EUT will only be used with a separation distance of 23 centimeters or greater between the antennas and the body of the user or nearby persons and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b). Per 47 CFR 1.1310, the EUT meets the General Population / Uncontrolled exposure limits listed in Table 1.

COMPLIANCE WITH FCC KDB 447498 D01 Mobile Portable RF Exposure V04

The IP30 is an RFID scan handle that clips to the backside of the handheld computer as an optional accessory. Communication between the computer and the scan handle is via Bluetooth. There is no electrical connection between the two devices.

"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 exposure condition described in this report. Since these mobile devices are categorically excluded from routine evaluation; per footnotes 1 and 33 of KDB

Maximum Permissible Exposure (MPE)

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 at a 23 cm boundary.

FCC LIMITS FOR MPE

Limits for General Population /Uncontrolled Exposure: 47 CFR 1.1310

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3 - 1.34	614	1.63	*(100)	30
1.34 - 30	824/f	2.19/f	*($180/f^2$)	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 23 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/cm2)
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 (23 cm = limit for MPE estimates)
P*G = EIRP

Solving for S, the maximum power density 23 cm from the transmitting antenna is summarized in the following table:

Maximum Permissible Exposure (MPE)

WD.12.29.11

EUT:	IM4			Work Order:	ITRM0331
Serial Number:	NA			Date:	10/15/12
Customer:	Intermec Technologies Corporation			Temperature (°C):	NA
Attendees:	NA			Rel. Humidity (%):	NA
Customer Project:	NA			Bar. Pres. (mb):	NA
Evaluated By:	Rod Peloquin	Power:		Job Site:	NA

TEST SPECIFICATIONS

Specification:	Method:
FCC 2.1091:2012	OET Bulletin 65, Supplement C Ed 01-01

COMMENTS

The IM4 radio module is contained within the IP30 hand scanner and is co-located with CK3R and CK3X hand held computers when they are mounted in the IP30

The IP30 RFID reader cannot operate while worn next to the body. The user is instructed to operate the reader from the hand, aimed toward the remote tags, and pull the trigger to engage the transmitter.

The attached pictures show the closest spacing between the users hands and the radio antennas contained in the handheld computers to be 6-cm. The closes spacing from the IP30 RFID antenna to the hand is 7-cm.

Since the spacing is greater than 5-cm between the antennas and the user's hands, SAR testing is not required. The following MPE estimates are used to demonstrate compliance of the IP30 – handheld computer configurations

DEVIATIONS FROM TEST STANDARD

None

Signature

Maximum Permissible Exposure (MPE)

RFID Radio located in IP30 hand grip scanner

The IP30 RFID Hand Grip transmitter is limited to 50% on/off time via software. Power is de-rated from 861 mW to 430.5 mW

Antenna Type	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 23 cm (mW/cm^2)	General Population Exposure Limit from 1.1310 (mW/cm^2)	Ratio of Power Density to the Exposure Limit
Yagi	N/A	915	430.5	5.2	0	0.214	0.610	0.3515

Worst Case Ratio of Power Density to the Exposure Limit = 0.352

FCC ID: EHA-BTM4

Bluetooth Radio located in IP30 hand grip scanner

Antenna Type	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 23 cm (mW/cm^2)	General Population Exposure Limit from 1.1310 (mW/cm^2)	Ratio of Power Density to the Exposure Limit
Microstrip	N/A	2450	9.64	0	0	0.001	1.000	0.0015

Worst Case Ratio of Power Density to the Exposure Limit = 0.0015

FCC ID: EHA-1007CP02

All transmitters for this model are filed under a single FCC ID

BT Radio located in CK3X hand held computer

Antenna Type	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 23 cm (mW/cm^2)	General Population Exposure Limit from 1.1310 (mW/cm^2)	Ratio of Power Density to the Exposure Limit
PCB Etch	N/A	2480	5.6	2.4	0	0.001	1.000	0.0015

Worst Case Ratio of Power Density to the Exposure Limit = 0.0015

WLAN Radio located in CK3X hand held computer

Antenna Type	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 23 cm (mW/cm^2)	General Population Exposure Limit from 1.1310 (mW/cm^2)	Ratio of Power Density to the Exposure Limit
PCB Etch	N/A	2462	202.3	2.4	0	0.053	1.000	0.0529
PCB Etch	N/A	5240	22.1	4.85	0	0.010	1.000	0.0102
PCB Etch	N/A	5320	22.9	4.85	0	0.011	1.000	0.0105
PCB Etch	N/A	5500	25.0	4.85	0	0.011	1.000	0.0115
PCB Etch	N/A	5745	57.4	4.85	0	0.026	1.000	0.0264

Worst Case Ratio of Power Density to the Exposure Limit = 0.0529

Maximum Permissible Exposure (MPE)

FCC ID: EHA-1007CP01

All transmitters for this model are filed under a single FCC ID

BT Radio located in CK3R hand held computer

Antenna Type	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 23 cm (mW/cm^2)	General Population Exposure Limit from 1.1310 (mW/cm^2)	Ratio of Power Density to the Exposure Limit
PCB Etch	N/A	2480	2.9	2.4	0	0.001	1.000	0.0008

Worst Case Ratio of Power Density to the Exposure Limit = 0.0008

WLAN Radio located in CK3R hand held computer

Antenna Type	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 23 cm (mW/cm^2)	General Population Exposure Limit from 1.1310 (mW/cm^2)	Ratio of Power Density to the Exposure Limit
PCB Etch	N/A	2462	199.5	2.4	0	0.052	1.000	0.0522

Worst Case Ratio of Power Density to the Exposure Limit = 0.0522

Worst Case Co-located Exposure Condition

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

Model 10007CP02 (CK3X Hand Held Mobile Computer) co-located with IP30 RFID scan handle.

RFID Radio in IP30 Worst Case Ratio of Power Density to the Exposure Limit	Bluetooth Radio in IP30 Worst Case Ratio of Power Density to the Exposure Limit	802.11 WLAN Radio in CK3X Worst Case Ratio of Power Density to the Exposure Limit	Bluetooth Radio in CK3X Worst Case Ratio of Power Density to the Exposure Limit	Sum of Worst Case Ratios (Power Density to the Exposure Limit)	FCC Limit for Sum of Worst Case Ratios	
0.35150	0.00150	0.05290	0.00150	0.40740	1.0	PASS

Model 10007CP01 (CK3R Hand Held Mobile Computer) co-located with IP30 RFID scan handle.

RFID Radio in IP30 Worst Case Ratio of Power Density to the Exposure Limit	Bluetooth Radio in IP30 Worst Case Ratio of Power Density to the Exposure Limit	802.11 WLAN Radio in CK3X Worst Case Ratio of Power Density to the Exposure Limit	Bluetooth Radio in CK3X Worst Case Ratio of Power Density to the Exposure Limit	Sum of Worst Case Ratios (Power Density to the Exposure Limit)	FCC Limit for Sum of Worst Case Ratios	
0.35150	0.00150	0.05220	0.00080	0.40600	1.0	PASS

The results shown in the above table are equivalent to the Sum of the EIRP of the all co-located transmitters (EIRP TX1 + EIRP TX2 + EIRP TX3 + EIRP TX4) compared to the exposure limit. The benefit of this method, is that accounts for transmitters operating at different frequencies against different exposure limits.

NOTE: Photos show a CK70 Hand held computer which is a similar form factor to the subject CK3.