Intermec
*Technologies Corporation*
*EMC Test Laboratory*
*Cedar Rapids, IA*

# MEASUREMENT/TECHNICAL REPORT

## Intermec Technologies Corporation
## IV6 Transmitter Collocation of
## FCC ID: EHARFID915PCC-6 (IC: 1223A-RFIDPCC6)
## And
## FCC ID: HN2-C30XX (IC: 1223A-C30XX)

## REPORT NO: 041116-2

## DATE: November 16, 2004

| | |
|---|---|
| This report concerns: Original Grant _____ Class II Permissive Change ___X___ | |
| Equipment Type: 902-928 MHz Frequency Hopping Spread Spectrum Transceiver and 2400-2483.5 GHz Frequency Hopping Spread Spectrum Transceiver Collocation<br>FCC 15.247<br>Industry Canada RSS-210 Issue 5, RSS-102 Issue 1 | |
| Request issue of the grant immediately upon completion of review. | |
| Measurement procedure used: ANSI C63.4-2001 and as described within this test report. | |
| Report Prepared by:<br><br>Dave Fry<br>Intermec Technologies Corporation<br>EMC Test Lab<br>550 Second Street SE<br>Cedar Rapids, Iowa 52401<br>Phone: (319) 846-2415<br>FAX: (319) 846-2475 | Report Prepared For:<br><br>Jerry Johnson<br>Intermec Technologies Corporation<br>550 Second Street SE<br>Cedar Rapids, Iowa 52401<br>Phone: (319) 369-3100<br>FAX: (319) 369-3453 |

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APPENDIXES (may be file attachments for electronic applications of approval)



xxx = file extension .doc or .pdf

## 1.0 COMPLIANCE CERTIFICATION

**The electromagnetic compatibility test and data evaluations findings of this report have been prepared by the EMC Test Lab, Intermec Technologies Corporation, in accordance with applicable specifications instructions required per-**

| FCC SECTION | CANADA RSS-210 | TEST NAME |
|---|---|---|
| 15.33, 15.35 | 4.0 | Range of Meas., Meas. Detectors |
| 15.15, 15.31 | 5.3, 5.8, 9.0, 11.0 | General Requirements, Meas. Methods |
| 15.203, 15.204 | 5.5 | Antenna Description(s) |
| 2.925, 15.19 | 5.10 | Labeling |
| 15.21 | 5.11, 14.0 | Information to the User |
| 15.247 (a, b, c), 15.209 | 5.7-5.9.2 | Transmitter Characteristics |
| 15.207, 15.107 | 6.6, 7.4/3.2 | AC Line Conducted Emissions, TX, RX |
| 1.1307 (b)(1) | 14.0 & RSS-102 | RF Safety, Exposure Limits |

**The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the measurements of the test sample's electromagnetic compatibility characteristics as of the dates and at the times of the test under the conditions herein specified. The data presented herein is traceable to the National Institute of Standards and Technology.**

**This report is not an endorsement of the tested product by NVLAP or any agency of the U.S. Government.**

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**Intermec Technologies Corporation**
**EMC Test Laboratory**
**550 Second Street S.E.**
**Cedar Rapids, Iowa 52401**

**The scope of accreditations addressed in this report is limited to NVLAP codes:**

*[12/FCC15b]* ANSI C63.4 (2001) with FCC Method - 47 CFR Part 15, Subpart B: Unintentional Radiators

*[12/FCC15c]* ANSI C63.4 (2001) with FCC Method - 47 CFR Part 15, Subpart C: Intentional Radiators

*[12/T51]* AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997) Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

*[12/RSS210]*RSS-210, Issue 5 (November 2001)Low Power Licence-Exempt Radiocommunication Devices

*[12/RSS210a]* RSS-210, Issue 5, Amendment 2 (April 26, 2003)

EMC 017

Interference Technology International

Dave Fry — Date 01/20/05
Dave Fry (mm/dd/yy)
NCE, EMC Engineer III

Jerry Johnson — Date 1/21/05
Signature (mm/dd/yy)

Jerry Johnson Engineering Manager
Print Name and Title

CERTIFIED NARTE ENGINEER

National Association of Radio and Telecommunications Engineers

## 1.1 Measurement Uncertainties:

ESI 40 Receiver / Spectrum Analyzer

Radiated Emissions on 3 Meter Open Area Test Site

| | |
|---|---|
| 30-300 MHz | has an Expanded Measurement Uncertainty of + 3.04 -3.99 dB |
| 200-1000 MHz | has an Expanded Measurement Uncertainty of + 4.59 -3.01 dB |
| 1-5 GHz without pre-amp | has an Expanded Measurement Uncertainty of + 2.99 -2.93 dB |
| 1-5 GHz | has an Expanded Measurement Uncertainty of + 3.16 -3.11 dB |
| 5-18 GHz | has an Expanded Measurement Uncertainty of + 3.20 -3.15 dB |

Radiated Emissions on 1 Meter Open Area Test Site

| | |
|---|---|
| 18-26.5 GHz | has an Expanded Measurement Uncertainty of + 4.32 -2.64 dB |

AC Line Conducted Emissions

| | |
|---|---|
| 0.15-30 MHz | has an Expanded Measurement Uncertainty of + 0.59 -0.44 dB |

Generator Substitution Radiated Measurements Using the 3 Meter Open Area Test Site

| | |
|---|---|
| 30-50 MHz | has an Expanded Measurement Uncertainty of + 2.94 -2.98 dB |
| 50-1000 MHz | has an Expanded Measurement Uncertainty of + 2.85 -2.86 dB |
| 1-12.5 GHz | has an Expanded Measurement Uncertainty of + 2.76 -2.81 dB |

Receiver and Transmitter Conducted, Generator Substitution Measurements with
HP83630A RF Generator and ESI 40 Receiver / Spectrum Analyzer

| | |
|---|---|
| 50-7000 MHz | has an Expanded Measurement Uncertainty of + 0.88 -0.88 dB |
| 7- 20 GHz | has an Expanded Measurement Uncertainty of + 1.01 -1.02 dB |
| 20-26.5 GHz | has an Expanded Measurement Uncertainty of + 1.23 -1.27 dB |
| 26.5-40 GHz | has an Expanded Measurement Uncertainty of + 1.55 -1.63 dB |

Receiver and Transmitter Direct Measurements of Conducted Emissions with
ESI 40 Receiver / Spectrum Analyzer

| | |
|---|---|
| 9 kHz-5 GHz | has an Expanded Measurement Uncertainty of + 0.56 -0.56 dB |
| 5-7 GHz | has an Expanded Measurement Uncertainty of + 0.74 -0.75 dB |
| 7-20 GHz | has an Expanded Measurement Uncertainty of + 1.16 -1.18 dB |
| 20-26.5 GHz | has an Expanded Measurement Uncertainty of + 1.40 -1.46 dB |
| 26.5-40 GHz | has an Expanded Measurement Uncertainty of + 1.73 -1.88 dB |

Confidence Statement
The measurement uncertainty statements above use a Coverage Factor K = 2.
The Coverage Factor K = 2 equates to an approximate confidence level of 95%.

# 2.0 GENERAL INFORMATION

## 2.1 Product Description

This report addresses collocation spurious emission and radio frequency exposure concerns while two radio modules operate simultaneously. The report shows collocation of the IM3, spread spectrum radio module operating as a frequency hopper in the 902-928 MHz radio band and the C30XX, a Bluetooth radio module operating as a frequency hopper in the 2400-2483.5 GHz radio band. The radios are housed with the same product however they each have their own antenna.

The IM3 915 MHz RFID is a radio used for communicating to RF Identification (RFID) tags operating in the same frequency band. The tags allow tracking and inventory of packages, laundry and pallets using RF energy to turn on, interrogate and write information to the RF tags. The integration of the IM3 radio within a rugged antenna creates the IV6 RFID reader. This vehicle mounted antenna operates on fork trucks within the industrial environment. The Bluetooth radio module, C30XX, is also integrated within the IV6, allows communications between the IV6 tag reader and the computer terminal mounted on the fork truck.

The IM3 radio continues to be manufactured by Intermec Technologies Corporation. The Bluetooth radio, C30XX, is manufactured by Mitsumi and sold to Intermec through a USA distributor.

This report shows the IV6 with both transmitters operating continues to comply with the FCC and Canadian requirements. Per Canada RSS-210 (5.18) recertification of is not required to co-locate these transmitters, this report addresses the concerns pointed out in paragraph (h).

> **5.18 Modular Construction**
> Transmitters or transceivers that are to be part of a host device may be constructed and certified in modular form, provided that they meet the following conditions:
>
> Host devices that contain separately certified modules do not need to be recertified, provided that they meet the following conditions:
>
> (h) The host device and all the separately certified modules it contains jointly meet the safety requirements of RSS-102, if applicable.

The Intermec IV6 RFID antenna-reader may be connected to an AC source for special applications, so AC conducted emissions testing are also presented.

The IV6 is intended for global marketing therefore must comply with CISPR 22 (EN55022) digital emissions. The Intermec, Cedar Rapids, EMC Test Lab will perform testing for compliance for digital emissions to the CISPR 22 Class A limits and issue separate reports. Based on these tests and reports the verification of compliance rules can be used for United States marketing. Canada will accept a self-declaration for compliance to ICES-003.

The radio module shown herein is a production model. The antennas listed herein are also production versions.

2.2 Related Submittal(s)/Grants(s)

Original Grant FCC ID: EHARFID915PCC-6
Date of Grant: 09/27/2001

Original Grant FCC ID: HN2-C30XX
Date of Grant: Approx. 02/01/2005

2.3 Tested Systems Details

| Items tested: | | | |
|---|---|---|---|
| Model Number (Serial Number) | Regulatory Identity: | Description | Cable Description |
| Intermec IV6-915<br>PN: LC444-24266-023<br>SN: 309M0400023<br>Modified to run BT TX via 2nd RS232 cable. | Class A Verified,<br>Contains TX FCC ID: EHARFID915PCC–6 and HN2-C30XX<br>Canada IC: 1223A-RFIDPCC6 and 1223A-C30XX | RFID antenna with integrated 915 and 2450 MHz frequency hopping spread spectrum transmitters. | Both TX modules integrated within the IV6 antenna. No TX antenna cables are external. Intermec custom power - I/O port cable. |
| Intermec Power Supply<br>PN/MN: 065236<br>SN: 6044451 | - | universal supply<br>12VDC 1.7A | detachable shielded AC cord, unshielded DC cable |
| Remote controller to operate 915 PC-Card, IV6 antenna: | | | |
| Intermec CV60<br>Vehicle Computer<br>CN: CV60A20AB4001804<br>SN: 08900401036 | FCC DOC,<br>Contains TX FCC ID: HN2802MIG2 and EHABTM210<br>Canada IC: 1223A-802MIG2 and 1223A-BTM210 | Host computer | Remote from IV6 via RS232 to operate 915 MHz RFID radio. |
| Intermec Power Supply<br>PN: N.A.<br>MN: Skynet SNP-PA57<br>SN: 035228454 | - | universal supply<br>12VDC 4.2A | detachable shielded AC cord, shielded DC cable |
| Remote controller to operate C30XX BT radio within IV6 antenna: | | | |
| Dell Latitude Lap-top<br>PN: LM M166ST<br>SN: 7267346BYK8355A | IIRTS30 | Host computer | Remote from IV6 via RS232 to operate C30XX radio. IV6 BT radio modified to run via RS232 for TX test software. |
| Dell Charger TSA 8<br>PN: 99500-12961-75P-0544<br>SN: N.A. | - | universal charger<br>16.2VDC 2.6A | detachable shielded AC cord, unshielded DC cable |

## 2.4 Test Methodology

This section addresses the following: FCC Sections 15.15 General Requirements, 15.31 Measurement Standards, 15.33 Range of Measurement, and 15.35 Measurement Detectors

Industry Canada RSS-210 sections; 4.0 Instrumentation, 5.3 Test Method, 5.8 Measurement Bandwidths, 5.17, Digital Circuits Emissions, 6.3 Restricted Bands and Unwanted Emissions Frequencies, 9.0 AC Wireline Conducted Measurement Method, 11.0 Radiation Measurement Method

Per FCC rules 15.31 (k) the measurements on an intentional radiator operating over a range greater than 10 MHz requires testing on channels at the bottom, middle and top of the range of operation.

The test software of the IM3 and C30XX radios within the IV6 is capable of operating the radio continuously in transmit modes locked on channel or hop using a pre-programmed pseudo-random hop sequence. The test software is set to operate on channel low, middle or high. The transmitter test sends pseudo-random data continuously or CW on the selected channel.

| IM3 902.6 - 927.4 MHz RFID | C30XX Bluetooth 2402 – 2480 MHz |
|---|---|
| Channel 07 transmit = 902.625 MHz | Ch 01 transmit = 2402 MHz |
| Channel 40 transmit = 915.000 MHz | Ch 40 transmit = 2441 MHz |
| Channel 73 transmit = 927.375 MHz | Ch 79 transmit = 2480 MHz |

These channels represent the low, middle and highest channels of operation.

Per FCC regulations the transmitter emissions are measured to the $10^{th}$ harmonic, or 24.84 GHz. Canadian regulations for transmitters require testing to the $5^{th}$ harmonic. Receiver emissions are not presented here because the receiver is enabled with the transmitter during operation. All testing of the transmitter includes any spurious emissions the receiver may generate.

Where possible ANSI C63.4, 2001 is referenced during radiated and AC wireline conducted emissions testing. Details on measurement equipment, set-up, test details and calculations are presented within each specific test section.

Radiated emissions from 30 to 1000 MHz are tested at a three-meter distance using a Quasi-Peak detector with a 120 kHz measurement bandwidth (BW).

Radiated emissions from 1 to 24.84 GHz are tested at three-meter measurement distance with a preamplifier to improve the measurement sensitivity. Average measurements above 1 GHz are made with a spectrum analyzer on a 100 MHz span with Resolution BW 1 MHz and Video BW of 10 Hz. Peak measurements are made using the spectrum analyzer on a 100 MHz span with Resolution BW and Video BW of 1 MHz, these settings are detailed on the spreadsheet test results.

Refer to the test photographs in appendix G and test setup figures in section 8 for details.

## 2.5 TEST FACILITY:

The location of the open area test site and conducted measurement facility used to collect the test data is 90 West Cemetery Road, Fairfax, Iowa 52228. The laboratory is accredited with a scope covering the required measurements and was deemed competent to test and submit test data for equipment subject to verification, Declaration of Conformity, and certification under FCC Section 2.948(d).

The test site was also submitted to Industry Canada for the performance of radiated measurements and is reference by the file number IC 3909.

Test site also complies with CISPR Publication 22 for methods of measurements for radiated and conducted emissions testing.

## 3.0 PHOTOGRAPHS

- 3.1 External pictures appendix A. 041116A2.xxx
- 3.2 Internal pictures appendix C. 041116C2.xxx
- 3.3 Test setup pictures appendix G. 041116G2.xxx

## 4.0 PRODUCT LABELING AND INFORMATION TO THE USER

### 4.1 PRODUCT LABELING

Remains as originally filed. FCC identification for both transmitters will appear on the exterior of the IV6.

### 4.2 INFORMATION TO THE USER

The appendix H shows the compliance insert for the IV6 with the IM3 and C30XX radio modules (041116H2.xxx). This document insert is shipped with each product.

## 5.0 BLOCK DIAGRAM

Block diagram for each transmitter remains as originally filed.

## 6.0 THEORIES OF OPERATION

Theory of operation for each transmitter remains as originally filed.

## 7.0 SCHEMATICS

Schematics for each radio layout remains as originally filed.

# 8.0 EMISSIONS TEST DATA

The following tests and results are recorded within this section.

Antenna Description

RF Safety, Exposure Limits; supporting appendix D, 041116D2.XXX

AC Wireline Conducted Emissions; supporting appendix E, 041116E2.XXX

Out of Band Emissions, Transmitter Radiated; supporting appendix F, 041116F2.XXX

EQUIPMENT: IV6

NAME OF TEST: Antenna Description

FCC RULE NUMBER: 15.203, 15.204
CANADA RSS-210 Par.: 5.5

MINIMUM STANDARD:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Gain in excess of 6 dBi shall be added to the measured RF power before using the specified power limits.

TEST PROCEDURE: Inspection

TEST EQUIPMENT: Not applicable

PERFORMED BY: Dave Fry Date: December 16, 2004

SET UP: Not applicable

TEST RESULTS:
The antennas used on both transmitters do not have external connectors; both transmitters are enclosed within the IV6 product. The IM3 remains as originally filed with the MMCX miniature connector.

The C30XX uses an integral chip antenna as part of the module.

Antenna descriptions for the IV6 for each radio are filed with the original grant or Class II Permissive change reports, they are not being repeated here.

EQUIPMENT: IV6

NAME OF TEST: RF Exposure Safety

FCC RULE NUMBER: **1.1307 Actions that may have significant environmental effect, for which Environmental Assessments (EAs) must be prepared.**

**1.1310 Radiofrequency radiation exposure limits.**

The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in § 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of § 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, ''Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation.''

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| **(A) Limits for Occupational/Controlled Exposures** | | | | |
| 0.3–3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0–30 | 1842/f | 4.89/f | *($900/f^2$) | 6 |
| 30–300 | 61.4 | 0.163 | 1.0 | 6 |
| 300–1500 | | | f/300 | 6 |
| 1500–100,000 | | | 5 | 6 |
| **(B) Limits for General Population/Uncontrolled Exposure** | | | | |
| 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 |
| 1500–100,000 | | | 1.0 | 30 |

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/ controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be ex-posed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**2.1091 Radiofrequency radiation exposure evaluation: mobile devices.**

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular § 1.1307(b).

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20-centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily relocated, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement.

Per FCC TCB Training April 3, 2002, Devices operating in multiple frequency bands.

When RF exposure evaluation is required for TCB approval

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."

CANADA RSS-210 Par.: 14.0 (see RSS-102)

CANADA RSS-102

4.2 Exemption power levels for portable radios are: - Operation at frequencies below 1.0 GHz with an output power equal to or less than 200 milliwatts (mW); - Operation at frequencies between 1.0 and 2.2 GHz with an output power equal to or less than 100 mW.

4.3 Mobile radios (not portables, see 2.2 for definition) are exempt from RF evaluation if the operating frequency is below 1.5 GHz with effective radiated power (ERP) of 1.5 watts or less (i.e. EIRP of 2.5 watts or less) or above 1.5 GHz with ERP of 3 watts or less (i.e. EIRP of 5 watts or less).

Exposures produced by such radios shall not exceed the exposure limits (see section 3 below) specified in Health Canada's Safety Code 6. Health Canada's address is 775 Brookfield Road, Ottawa, Ontario Canada K1A 1C1; Tel: (613) 954-6699/ Fax: (613) 941-1734; e-mail: alice_mackinnon@hc-sc.gc.ca.

HEALTH CANADA SAFETY CODE 6, 99-EHD-237

**Table 5**

**Exposure Limits for Persons Not Classed As RF and Microwave Ex-Posed Workers (Including the General Public)**

| 1<br>Frequency<br>(MHz) | 2<br>Electric Field Strength; rms<br>(V/m) | 3<br>Magnetic Field Strength; rms<br>(A/m) | 4<br>Power Density<br>($W/m^2$) | 5<br>Averaging Time<br>(min) |
|---|---|---|---|---|
| 0.003–1 | 280 | 2.19 | | 6 |
| 1–10 | $280/f$ | $2.19/f$ | | 6 |
| 10–30 | 28 | $2.19/f$ | | 6 |
| 30–300 | 28 | 0.073 | 2* | 6 |
| 300–1 500 | $1.585f^{0.5}$ | $0.0042f^{0.5}$ | $f/150$ | 6 |
| 1 500–15 000 | 61.4 | 0.163 | 10 | 6 |
| 15 000–150 000 | 61.4 | 0.163 | 10 | $616\,000/f^{1.2}$ |
| 150 000–300 000 | $0.158f^{0.5}$ | $4.21 \times 10^{-4} f^{0.5}$ | $6.67 \times 10^{-5} f$ | $616\,000/f^{1.2}$ |

* Power density limit is applicable at frequencies greater than 100 MHz.
**Notes:** 1. Frequency, $f$, is in MHz.
2. A power density of 10 W/ $m^2$ is equivalent to 1 mW/ $cm^2$.
3. A magnetic field strength of 1 A/ m corresponds to 1. 257 microtesla (μT) or 12. 57 milligauss (mG).

2.11 (b) Where the electromagnetic radiation consists of a number of frequencies in the same or different frequency bands shown in Column 1 of Table 1, then the ratio of the measured value at each frequency to the limit at that given frequency shown in Column 2, 3, or 4 shall be determined

and the sum of all ratios thus obtained for all frequencies shall not exceed unity when averaged spatially and over time. For field strength measurements, the measured values and the limits shall be squared before determining the ratios. The limit, as applied to multiple frequencies, can be expressed as:

$$\sum_{f\,=\,3\,kHz}^{300\,GHz} R_f \le 1 ,$$

where $f$ is the frequency for which measurements were taken and, where the electric or magnetic field strength is measured,

$$R_f = \left( \frac{Measured\ Value\ of\ Field\ Strength\ at\ f}{Exposure\ Limit\ of\ Field\ Strength\ at\ f} \right)^2 ,$$

or where the power density is measured,

$$R_f = \frac{Measured\ Value\ of\ Power\ Density\ at\ f}{Exposure\ Limit\ of\ Power\ Density\ at\ f} ,$$

MINIMUM STANDARD: 915 MHz and 2450 MHZ transmitters utilized in workplaces are considered “General Public” exposures. The limits are defined in the tables above.

EXEMPTIONS: Transmitters operating under FCC rules 47 CFR 15.247 are categorically excluded from routine environmental evaluation or subject to environmental evaluation under FCC rules 47 CFR 1.1307.

Industry Canada as stated in CANADA RSS-102 paragraph 4.3, exempt mobile transmitters operating under 2.5 watts EIRP at frequencies below 1.5 GHz and mobile transmitters operating above 1.5 GHz with less than 5 watts EIRP.

PERFORMED BY: Dave Fry Date: January 16, 2004

USER INFORMATION: Observe the appendix H (041116H2.xxx) that shows the warning information delivered with each RFID scanner.

MPE DATA: Observe the appendix D (041116D2.xxx) that shows the transmitter RF exposure calculations. The transmitter is exempt from routine environmental evaluation per FCC rules.

Canada RSS-102 does require an evaluation of exposure. The primary transmitter operates at a power of 2.75 watts EIRP.

The table below shows the calculations of each radio and the frequency band of operation. The ratio of the limit for each frequency band is summed as described in the specifications defined above.

| Transmitter FCC ID: Antenna Description | Antenna Type | Antenna Part No. | Transmit Freq. (MHz) | Peak Conducted Power (mW) | Gain (dBi) | Pwr Density @ 20cm $mW/cm^2$ | Pwr Density Limit $mW/cm^2$ | Power Density Ratio |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| FCC ID: EHARFID915 PCC-6 RFID panel | panel | NA | 915 | 1000.0 | 4.4 | 0.5479 | 0.61 | 0.8983 |
| FCC ID: HN2-C30XX Internal | chip | NA | 2450 | 26.7 | 2.17 | 0.0088 | 1.0 | 0.0088 |
| | | | | | | | | |
| | | | | | | | ratio limit | |
| Total | | | | | | | 1.0 | 0.9070 |

Mobile Transmitter Usage Justification

The IV6 normal operation keeps the operator as well as nearby persons greater than the 20-cm spacing to comply with the RF exposure requirements.

Calculations show compliance for RF exposure levels during normal operation for RFID tag read/write operations. The user initiates RFID transmitter operation when scanning items. During normal operation the operator intent is to interrogate RFID tags on items. Normal operation directs the radio antenna away from the user and nearby persons. Making the operator aware of the potential for exposure the warning statement below will be included with each IV6 RFID reader.

WARNING: per the FCC and Canada RF (radio frequency) exposure requirements,
(1) The IV6 antennas must be installed as recommended by Intermec Technologies to ensure compliance to RF exposure requirements. Correct antenna mounting is fully described within the Intermec IV6 Users Guide.
(2) When installing and using Intermec Technologies the IV6 RFID tag interrogator, a 20-cm (8-inch) passing distance must be maintained from any body part of the user or near by persons and the antenna. The antenna must not be touched during transmitter operation.
(3) RF safety requirements mandate this device cannot be co-located with other transmitters.

WARNING: Canada procedures defined in RSS-210
"The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb"

EQUIPMENT: IV6

NAME OF TEST: TX, RX AC Wireline Conducted Emissions

FCC RULE NUMBER: 15.209 (a)
CANADA RSS-210 Par: 6.6-7.4

MINIMUM STANDARD: FCC Rules § 15.207 Conducted limits.
(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of emission (MHz) | Conducted limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15–0.5 | 66 to 56* | 56 to 46* |
| 0.5–5 | 56 | 46 |
| 5–30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

Canada RSS-210 6.6, 7.4 This is a measurement of the extent of unwanted emissions conducted back into the AC electrical network by LPDs. Note that this test is only for unwanted emissions and not the wanted conducted emissions of AC Carrier Current devices described in section 8.3. This test applies when the device has any one or more of the following characteristics:
(i) The carrier frequency is within 0.45-30 MHz; (ii) The equipment power supply contains switching circuitry (any frequency); (iii) Internal clock or local oscillator frequency is within 0.45-30 MHz.

To claim test exemption, the engineering brief or test report shall contain a statement that the conditions of test exemption are met. More information on this is in section 9. The test on the transmitter may be combined with the test of section 7.4 on the receiver.

(a) On any frequency or frequencies within the band of 0.45-30 MHz, the measured RF voltage (CISPR meter) shall not exceed 250 microvolts (across 50 ohms).
(b) Transmitters marketed for use only in a commercial, industrial or business environment and not intended for use in homes are permitted a limit of 1000 microvolts (0.45 - 1.705 MHz) and 3000 microvolts (1.705 - 30 MHz).

TEST PROCEDURE: As referenced in ANSI C63.4-2001, place the EUT on a wooden table inside a shield room. Connect the AC power supply to the LISN mounted on the floor behind the table. Measure from .15 to 30 MHz the conducted emissions while the radio is transmitting, then repeat with the radio in receive mode. Preliminary testing was made using a spectrum analyzer to determine the maximum emissions placement of the EUT. Final measurements were made and plots of the conducted emissions were produced. The spectrum analyzer was used in a pre-scan and swept the frequency range from .15 to 30 MHz using the peak detector as compared to the FCC Class B limit.

Quasi-peak measurements of the highest emissions were made with the test receiver. The tabulated data is contained with the measurement data section.

Refer to appendix A for photographs of the maximum emissions placement of the EUT during AC wireline conducted testing.

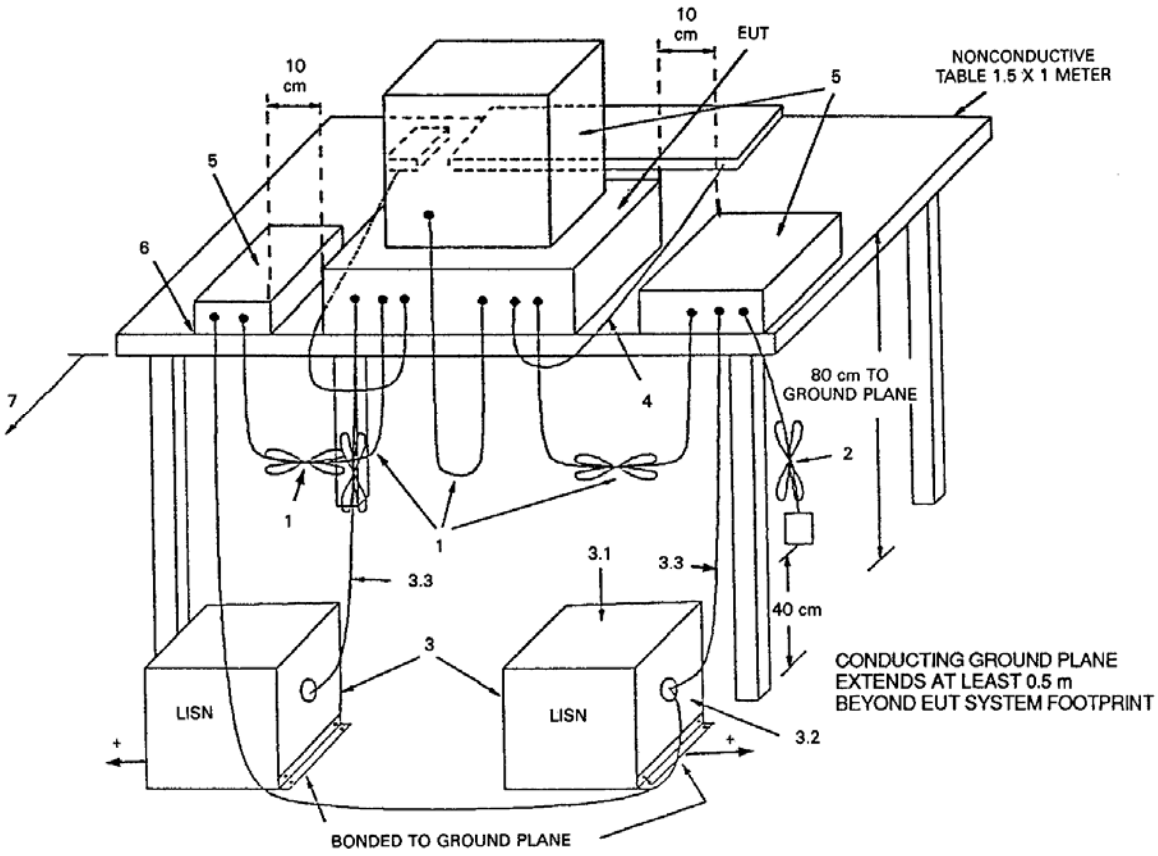
General and Environmental Conditions

For FCC and Industry Canada, testing was performed within a shield room, setup as described in ANSI C63.4-2001 section 5.2. The EUT was powered by single phase 120 Volts ~ 60 Hz AC power.

Environmental conditions at the time of testing were a temperature 25 C, pressure 30.1 inches and relative humidity of 43 %.

| | | |
|---|---|---|
| TEST EQUIPMENT: | LISN | Rohde & Schwarz, ESH3.Z5 |
| | EMI Test Receiver | Rohde & Schwarz, ESI-40 |
| PERFORMED BY: | Dave Fry | Date: Dec. 14, 2004 |

NAME OF TEST: AC Wireline Conducted Emissions, TX and RX




+LISNs may have to be moved to the side to meet 3.3 below.

**LEGEND:**

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.
3. EUT connected to one LISN. Unused LISN connectors shall be terminated in 50 Ω LISN can be placed on top of, or immediately beneath, ground plane.

3.1 All other equipment powered from second LISN.
3.2 Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
3.3 LISN at least 80 cm from nearest part of EUT chassis.

Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the host.

4. Non-EUT components being tested.
5. Rear of EUT, including peripherals, shall be all aligned and flush with rear of tabletop.
6. Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the floor ground plane.

Test Configuration
Tabletop Equipment Conducted Emissions

NAME OF TEST: AC Wireline Conducted Emissions, TX and RX

CALCULATIONS AND CONVERSION FACTORS:

The conducted emissions are calculated using the following. The receiver reading is added to the correction factor "Transd (dB)" (includes LISN insertion loss, RF cable loss and filter loss (if used)) to create “Level (dBµV)”. The “LIMIT” is subtracted from “Level” to show "Margin". Margin will be displayed as a positive margin below the limit.

The conversion for calculating dB (µV) to microvolts (µV) follows.

dB(µV) to µV (dB (µV) / 20 ) anti log = µV

µV to dB (µV) 20 (log µV) = dB (µV)

TEST RESULTS: Complies with FCC and Industry Canada (IC) requirements while operated at 120 VAC. Listed below are the operation configuration and AC voltage.

MEASURED DATA: Judgment: For FCC testing; PASSED, see the following tabulated results. Detailed plots are shown in appendix E, 041116E2.XXX.

Unless otherwise noted, all final measurements are made using an average or quasi-peak detector and a 9 kHz measurement bandwidth with the data being compared to the CISPR quasi-peak and average limit.

## IV6 and Intermec 065236 Power Supply AC Wireline Conducted Emissions

*MEASUREMENT RESULT: "CE L1_fin AV"*

12/14/04 9:48AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.396000 | 31.60 | 0.00 | 47.90 | 16.30 | L1 | GND |
| 0.498000 | 28.50 | 0.00 | 46.00 | 17.50 | L1 | GND |
| 6.360000 | 38.40 | 0.20 | 50.00 | 11.60 | L1 | GND |
| 9.588000 | 39.20 | 0.20 | 50.00 | 10.80 | L1 | GND |
| 9.846000 | 38.50 | 0.20 | 50.00 | 11.50 | L1 | GND |

MEASUREMENT RESULT: "CE L1_fin QP"

12/14/04 9:48AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.198000 | 41.20 | 0.00 | 63.70 | 22.50 | L1 | GND |
| 0.396000 | 34.60 | 0.00 | 57.90 | 23.30 | L1 | GND |
| 1.890000 | 32.90 | 0.20 | 56.00 | 23.10 | L1 | GND |
| 6.360000 | 39.40 | 0.20 | 60.00 | 20.60 | L1 | GND |
| 9.588000 | 39.40 | 0.20 | 60.00 | 20.60 | L1 | GND |
| 9.846000 | 38.90 | 0.20 | 60.00 | 21.10 | L1 | GND |

MEASUREMENT RESULT: "CE N_fin AV"

12/14/04 9:57AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 0.396000 | 33.10 | 0.00 | 47.90 | 14.80 | N | GND |
| 0.498000 | 31.10 | 0.00 | 46.00 | 14.90 | N | GND |
| 4.926000 | 34.00 | 0.20 | 46.00 | 12.00 | N | GND |
| 9.588000 | 40.50 | 0.30 | 50.00 | 9.50 | N | GND |
| 9.846000 | 39.60 | 0.30 | 50.00 | 10.40 | N | GND |

MEASUREMENT RESULT: "CE N_fin QP"

12/14/04 9:57AM

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE |
|---|---|---|---|---|---|---|
| 4.926000 | 34.20 | 0.20 | 56.00 | 21.80 | N | GND |
| 9.588000 | 40.60 | 0.30 | 60.00 | 19.40 | N | GND |
| 9.846000 | 40.20 | 0.30 | 60.00 | 19.80 | N | GND |

EQUIPMENT: IV6

NAME OF TEST: Out of Band Emissions

FCC RULE NUMBER: 15.247 (c)
MINIMUM STANDARD:
(c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

The following is an excerpt from the FCC / TCB Training Workshop, Day 2 (10/23/2002).

7) What should be the compliance strategy for a self collocated device?

Limited modular approval would be the best strategy. The unit could have multiple labels such as "This device contains FCC ID:XXXYYY". Only the FCC identifiers for the actual installed modules can be on the device.

Multiple module labels can be combined into a single label.

When different transmitters are installed, a single label may be used to combine them. For example, "This device contains FCC ID: XXXYYY and aaabbb"

A combination of the above may also be used. For example,
This device contains two FCC ID: xxxyyy and one FCC ID:aaabbb"

The radios must be tested individually. Assuming that the radios do not share an antenna, only radiated tests for simultaneous transmission is required. If the radios share an antenna, antenna conducted measurements would also be required. Only one set of worst case simultaneous transmission data is going to be requested to be submitted at this time. The test engineer should indicate the worst case condition and provide justification as to why the worst case condition was chosen. The grantee should be reminded that even if the FCC requests one set of data, they are responsible for compliance for all modes of simultaneous transmission.

Aggregate power must be considered in RF exposure evaluation.

Radiated tests for simultaneous transmission is required only if any of the co-located transmitters can transmit simultaneously. If so, then the FCC policy stated above should be followed.
==========

CANADA RSS-210 Par.: 6.2.2, (o)(e1)
MINIMUM STANDARD:
(e1) **Out of Band Emissions:** In any 100 kHz bandwidth outside the operating frequency bands, between 30 MHz and 5 times the carrier frequency, the unwanted emission spectral density shall be either at least 20 dB below the inband spectral density, or shall not exceed the levels specified in Table 3, whichever is less stringent. **Note:** For frequency hopping systems, the inband density $S_i$ shall be measured with the hopping sequence stopped at the lowest channel and the highest channel in turn, as well as with the hopping running normally. The 20 dB shall be with reference to the lowest of the three $S_i$ values.

TEST PROCEDURE:

1. Create a spread sheet that shows the harmonics for the low, middle and high channel of each transmitter. Scan the spread sheet for channel harmonics that coincide. Also adjust the channels up or down per the radio channel step size to verify any spurious emissions that fall within a 1 MHz of each other. Record these channels and frequencies for investigation.

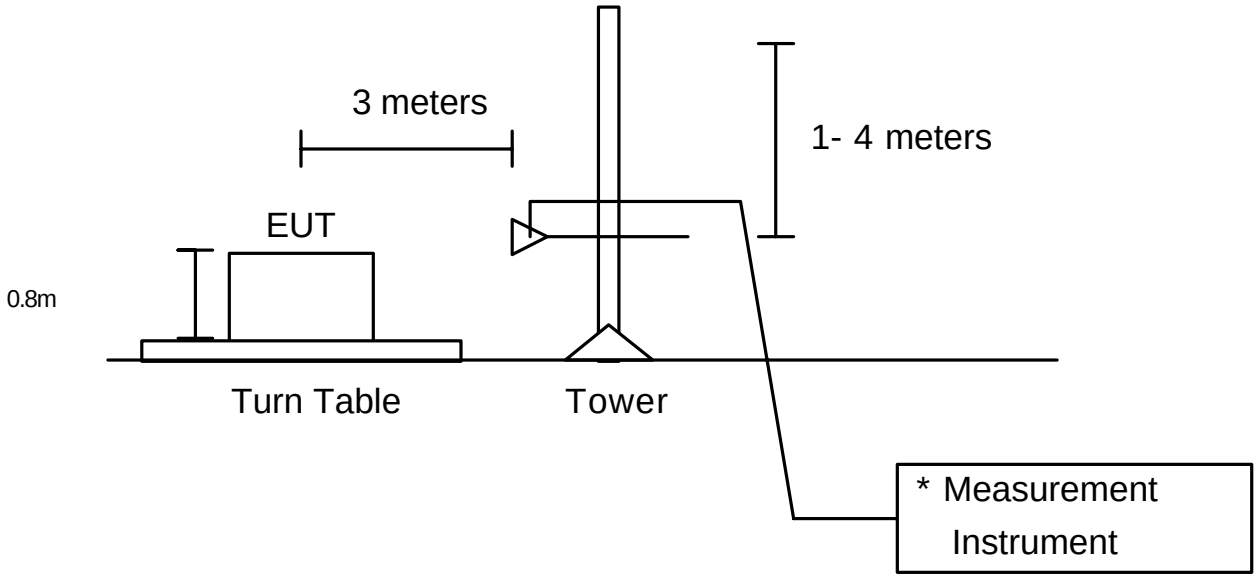
2. Record the radiated emissions using the testing methodology described in section 2.4 to measure the spurious emissions. Using the three-meter measurement distance and test receiver, scan and measure transmitter related spurious emissions from 30 to 1000 MHz. A measurement distance of three meters and an amplifier between the horn antenna and spectrum analyzer, measure emissions from1 – 25 GHz. Refer to section 2.4, Test Methodology, for more details on testing above 1000 MHz. Record emissions of simultaneous transmission. In the event emissions for simultaneous operation at 100 % duty cycle are over the AVERAGE limit, record the emission with each radio individually so the appropriate duty cycle reduction may be applied.

| | | |
|---|---|---|
| TEST EQUIPMENT: | Antenna, bi-conical | EMCO 3110 |
| | Antenna, log periodic | EMCO 3146 |
| | Antenna, DRG horn | EMCO 3115 |
| | Antenna, Std G horn | EMCO 3160-08 |
| | Antenna, Std G horn | EMCO 3160-09 |
| | Receiver | Rohde & Schwarz ESI-40 |
| | High Pass Filter | Cir-Q-Tel R9H-1G5/10G-28A |
| | High Pass Filter | K&L 13SH10-3000/T24000-0/0 |
| | Microwave amplifier | HP 8449B |
| PERFORMED BY: | Dave Fry | Date: Dec. 15-16, 2004 |

TEST SETUP: Transmitter Radiated Spurious Emissions

Open area test site at the Intermec EMC Test Facility
Three-meter test range 30 MHz - 25 GHz.

Review the following diagrams for setup details. Refer to the photographs in appendix G (041116G2.xxx) for placement IV6.




* 30-1000 MHz, Rohde & Schwarz ESI40 receiver or
1-25 GHz, ESI40 with preamplifier and high-pass filter

TEST RESULTS: Transmitter radiated emissions conform.

The table below shows the coinciding spurious emissions based on channel selection.

R=Restricted, NR=Non-Restricted emission listed in FCC Rules 47CFR15.205

| | RFID MHz | Ch | Harm. MHz | Harmonic | BT MHz | Ch | Harm. MHz | Harmonic |
|---|---|---|---|---|---|---|---|---|
| NR | 902.625 | 7 | 7221 | 8 | 2407 | 6 | 7221 | 3 |
| R | 915.375 | 41 | 7320 | 8 | 2440 | 39 | 7320 | 3 |
| R | 927 | 72 | 12051 | 13 | 2410 | 9 | 12050 | 5 |
| R | 927.375 | 73 | 12055.875 | 13 | 2411 | 10 | 12055 | 5 |
| R | 903 | 8 | 14448 | 16 | 2408 | 7 | 14448 | 6 |
| NR | 915 | 40 | 14640 | 16 | 2440 | 39 | 14640 | 6 |
| NR | 927.375 | 73 | 14838 | 14 | 2473 | 72 | 14838 | 6 |

The IM3, FCC ID: EHARFID915PCC-6, radio module continues to use the duty cycle operation as originally tested and approved for certification. The details are contained in the original test report.

The following calculation spreadsheets show the de-rating the measurement limit for 50% duty cycle, or -6 dB. The 50% de-rating is a conservative figure, duty cycles for operation is nearer the 40-45% on time for duty cycle.

The C30XX, FCC ID: HN2-C30XX, radio shows AVERAGE test data that is over the FCC and Canada limit when measured at 100% duty cycle. Per FCC Public Notice DA 00-705 (March 30, 2003) and 47CFR Part 15 paragraph 15.35 (c), Canada RSS-210 (6.5), if the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a duty cycle correction factor, calculated as Duty Cycle CF = 20 log(dwell time/100 ms).

The application of the Duty Cycle CF is based on the worst case 100 mS. Bluetooth transmitters operate in using DH1, DH3 and DH5 packet sequences. The worst case DH5 mode, the same frequency channel could appear in two 79 channel sequence.

**DH5 calculation: DH5 uses 5 time slots of 0.625 mS per hopping cycle.**
Dwell time per 100 mS – since one 79 hop sequence is approx 50 mS and there could be two appearances of a frequency channel in 100 mS (more accurately 100 ms/49.375 ms).
DH5 dwell time =5* 0.625 mS * (100 ms/49.375 mS) = 6.329 mS (per 100 mS)

**Using the Duty Cycle CF:**
DH5 Duty Cycle CF =
20 log (DH5 dwell time/100 mS) = 20 log (0.06329) = -23.97 dB

Therefore the worst case duty cycle adjustment condition will be for the DH5 packet. The calculation shows us that we can subtract 24 dB from our AVERAGE radiated spurious emissions measurements above 1 GHz to compensate for the transmitter duty cycle.

Listed is the Average and Peak radiated measurements for each radio specified for use with the IV6, the data shows each radio function individually and data with both radio operating simultaneously. When the substantial emissions are contributed by one transmitter versus the other, the duty cycle CF is applied for the contributing transmitter. The data presented below calculates the AVERAGE emissions by recording the 100% duty cycle emissions.

Quasi-Peak data below 1 GHz revealed no transmitter related emissions from either transmitter. The data below 1 GHz records the maximum emissions compared to the Class A limit for industrial, commercial products. The marketing of the IV6 RFID reader is only to the industrial commercial market.

# AVERAGE EMISSIONS

Intermec IV6 RFID antenna (see appendix E, 041116F2.xxx, for the measurement data)

The highest AVERAGE field strength of the out of band transmitter radiated emissions is 66.6 dB(µV)/m measured at a distance of three-meter for 7320 MHz. The emissions were observed during testing of the unit with the measurement antenna horizontally polarized. Applying the 24 dB duty cycle correction the emissions are 42.6 dB(µV)/m. That is 11.4 dB under the limit of 54 dB(µV)/m at three-meters.

***MEASUREMENT RESULT: "Semi TX 1-18_fin AV"***

12/16/04 11:23AM

| Frequency MHz | Level dBµV/m | Duty Cycle CF dB | Transd dB | Limit dBµV/m | Margin under dB | IFBW kHz | Height cm | Azimu. deg | Pol. | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f (=e-b-c) | g | h | i | j | |
| 7320 | 63.7 | -24 | 8.9 | 54 | 14.3 | 1000 | 189 | 213 | VER | BT only |
| 7320 | 62.9 | -24 | 8.9 | 54 | 15.1 | 1000 | 199 | 214 | VER | Both TX ON |
| 7320 | 40.1 | | 8.9 | 54 | 13.9 | 1000 | 167 | 208 | VER | RFID only |
| 12050 | 45.3 | | 13.3 | 54 | 8.7 | 1000 | 180 | 162 | VER | BT only |
| 12050.1 | 43.6 | | 13.3 | 54 | 10.4 | 1000 | 277 | 301 | VER | Both TX ON |
| 12051 | 46.4 | | 13.3 | 54 | 7.6 | 1000 | 183 | 358 | VER | RFID only |
| 12055 | 46.3 | | 13.3 | 54 | 7.7 | 1000 | 174 | 159 | VER | Both TX ON |
| 12055 | 45.1 | | 13.3 | 54 | 8.9 | 1000 | 182 | 162 | VER | BT only |
| 12055.6 | 45.2 | | 13.3 | 54 | 8.8 | 1000 | 182 | 358 | VER | RFID only |
| 14448.2 | 45.2 | | 13.4 | 54 | 8.8 | 1000 | 115 | 224 | VER | Both TX ON |
| 14448.2 | 44.8 | | 13.4 | 54 | 9.2 | 1000 | 122 | 224 | VER | BT only |
| 14448.2 | 42.3 | | 13.4 | 54 | 11.7 | 1000 | 139 | 291 | VER | RFID only |
| 14448.2 | 22.7 | | 13.4 | 54 | 31.3 | 1000 | 139 | 291 | VER | RFID only |

***MEASUREMENT RESULT: "Semi TX 1-18_fin AV"***

12/16/04 3:50PM

| Frequency MHz | Level dBµV/m | Duty Cycle CF dB | Transd dB | Limit dBµV/m | Margin under dB | IFBW kHz | Height cm | Azimu. deg | Pol. | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f (=e-b-c) | g | h | i | j | |
| 3356 | 31.3 | | 0.6 | 54 | 22.7 | 1000 | 148 | 189 | HOR | Both TX ON |
| 7320 | 66.6 | -24 | 8.9 | 54 | 11.4 | 1000 | 112 | 222 | HOR | BT only |
| 7320 | 66.2 | -24 | 8.9 | 54 | 11.8 | 1000 | 113 | 223 | HOR | Both TX ON |
| 7320 | 40.3 | | 8.9 | 54 | 13.7 | 1000 | 110 | 143 | HOR | RFID only |
| 12050 | 44.9 | | 13.3 | 54 | 9.1 | 1000 | 145 | 147 | HOR | Both TX ON |
| 12055 | 45.4 | | 13.3 | 54 | 8.6 | 1000 | 148 | 195 | HOR | Both TX ON |
| 14448.2 | 46.5 | | 13.4 | 54 | 7.5 | 1000 | 130 | 137 | HOR | BT only |
| 14448.2 | 45.7 | | 13.4 | 54 | 8.3 | 1000 | 135 | 138 | HOR | Both TX ON |
| 14448.2 | 41.9 | | 13.4 | 54 | 12.1 | 1000 | 163 | 164 | HOR | RFID only |

# QUASI-PEAK AND PEAK EMISSIONS

The highest Quasi-Peak or PEAK field strength of the out of band transmitter radiated emissions relative to the limit is 67.4 dB(µV)/m measured at a distance of three-meter for 7320 MHz. The emissions were observed during testing of the unit with the measurement antenna horizontally polarized. That is 6.6 dB under the limit of 74 dB(µV)/m at three-meters. (No duty cycle correction can be applied to QP or Pk data).

***MEASUREMENT RESULT: "Semi TX 1-18_fin PK"***

12/16/04 11:23AM

| Frequency | Level | Transd | Limit | Margin | IFBW | Height | Azimu. | Pol. | Comment |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | dB | dBµV/m | dB | kHz | cm | deg | | |
| 3356.000000 | 43.80 | 0.6 | 74.0 | 30.2 | 1000 | 171.0 | 172.0 | VER | Both TX ON |
| 7320.000000 | 65.20 | 8.9 | 74.0 | 8.8 | 1000 | 189.0 | 213.0 | VER | BT only |
| 7320.000000 | 64.90 | 8.9 | 74.0 | 9.1 | 1000 | 199.0 | 214.0 | VER | Both TX ON |
| 7320.000000 | 51.30 | 8.9 | 74.0 | 22.7 | 1000 | 167.0 | 208.0 | VER | RFID only |
| 12050.000000 | 56.70 | 13.3 | 74.0 | 17.3 | 1000 | 180.0 | 162.0 | VER | BT only |
| 12050.100000 | 55.80 | 13.3 | 74.0 | 18.2 | 1000 | 277.0 | 301.0 | VER | Both TX ON |
| 12051.000000 | 57.30 | 13.3 | 74.0 | 16.7 | 1000 | 183.0 | 358.0 | VER | RFID only |
| 12055.000000 | 57.20 | 13.3 | 74.0 | 16.8 | 1000 | 182.0 | 162.0 | VER | BT only |
| 12055.000000 | 56.50 | 13.3 | 74.0 | 17.5 | 1000 | 174.0 | 159.0 | VER | Both TX ON |
| 12055.600000 | 56.50 | 13.3 | 74.0 | 17.5 | 1000 | 182.0 | 358.0 | VER | RFID only |
| 14448.200000 | 56.70 | 13.4 | 74.0 | 17.3 | 1000 | 122.0 | 224.0 | VER | BT only |
| 14448.200000 | 56.10 | 13.4 | 74.0 | 17.9 | 1000 | 115.0 | 224.0 | VER | Both TX ON |
| 14448.200000 | 55.40 | 13.4 | 74.0 | 18.6 | 1000 | 139.0 | 291.0 | VER | RFID only |

***MEASUREMENT RESULT: "Semi TX 1-18_fin PK"***

12/16/04 3:50PM

| Frequency | Level | Transd | Limit | Margin | IFBW | Height | Azimu. | Pol. | Comment |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | dB | dBµV/m | dB | kHz | cm | deg | | |
| 3356.000000 | 43.10 | 0.6 | 74.0 | 30.9 | 1000 | 148.0 | 189.0 | HOR | Both TX ON |
| 7320.000000 | 67.40 | 8.9 | 74.0 | 6.6 | 1000 | 112.0 | 222.0 | HOR | BT only |
| 7320.000000 | 67.30 | 8.9 | 74.0 | 6.7 | 1000 | 113.0 | 223.0 | HOR | Both TX ON |
| 7320.000000 | 52.10 | 8.9 | 74.0 | 21.9 | 1000 | 110.0 | 143.0 | HOR | RFID only |
| 12050.000000 | 56.30 | 13.3 | 74.0 | 17.7 | 1000 | 145.0 | 147.0 | HOR | Both TX ON |
| 12055.000000 | 56.90 | 13.3 | 74.0 | 17.1 | 1000 | 148.0 | 195.0 | HOR | Both TX ON |
| 14448.200000 | 56.50 | 13.4 | 74.0 | 17.5 | 1000 | 130.0 | 137.0 | HOR | BT only |
| 14448.200000 | 54.80 | 13.4 | 74.0 | 19.2 | 1000 | 135.0 | 138.0 | HOR | Both TX ON |
| 14448.200000 | 53.50 | 13.4 | 74.0 | 20.5 | 1000 | 163.0 | 164.0 | HOR | RFID only |

MEASUREMENT DATA: EIRP (Effective Isotropic Radiated Power) for the IV6 in the 915 MHz band shows a maximum power of +34.33 dBm radiated power. The conducted power from the radio measured at +30.0 dBm, therefore the peak gain observed for the Kathrien panel antenna is +4.33 dBi.

The appendix F (041116F2.xxx) file attachment of measurements show the radiated emissions data tabulated and graphically in dB(µV)/m. The conversion for calculating dB(µV)/m to µV/m follows.

[(dB (µV)/m )/ 20] anti log = µV/m
[(54 dB (µV)/m @ 3 mtr) / 20] anti log = 501.2 µV/m @ 3 mtr

or µV/m to dB(µV)/m

20 (log µV/m) = dB (µV)/m
20 (log 500 µV/m) = 54 dB (µV)/m

These measurements show the 100% duty cycle measurements of the average and peak emissions compared to the limits.

**IM3 duty cycle CF**
Meas. dB (µV)/m @ 3 mtr - 6 dB (correction) = Duty Cycle Corrected dB (µV)/m @ 3 mtr

**C30XX duty cycle CF**
Meas. dB (µV)/m @ 3 mtr - 24 dB (correction) = Duty Cycle Corrected dB (µV)/m @ 3 mtr

## 9.0 EQUIPMENT LIST

| EQUIPMENT | MFG/MODEL | SERIAL NO. | CAL. DATE mm/yy | CYCLE |
|---|---|---|---|---|
| Antenna, dipole | EMCO 3121C | 9812-1414 | 03/03 | 24 Mo |
| Antenna, biconical | EMCO 3110B | 1787 | 09/04 | 12 Mo |
| Antenna, log periodic | EMCO 3146 | 1262 | 09/04 | 12 Mo |
| Antenna, biconical | EMCO 3110B | 1185 | 09/04 | 12 Mo |
| Antenna, log periodic | EMCO 3146 | 3277 | 09/04 | 12 Mo |
| Antenna, DRG Horn | EMCO 3115 | 4143 | 06/04 | 12 Mo |
| Antenna, Std G Horn | EMCO 3160-08 | 31562 | 02/04 | N.R. |
| Antenna, Std G Horn | EMCO 3160-09 | 34731 | 07/04 | N.R. |
| Attenuator | HP 8491-20 dB | 36824 | 05/04 | 12 Mo. |
| High Pass Filter | Cir-Q-Tel R9H-1G5/10G-28A | 01 | 05/04 | 12 Mo. |
| High Pass Filter | K&L 13SH10-3000/T24000-0/0 | 01 | 05/04 | 12 Mo. |
| Preamplifier | HP 8449B | 3008A00439 | 05/03 | 24 Mo. |
| EMI Test Receiver | Rohde & Schwarz, ESI-40 | 1088.7490.40 | 06/04 | 12 Mo |
| Signal Generator | HP 83630A | 3250A00322 | 03/03 | 24 Mo. |
| Test Automation SW | Rohde & Schwarz, ES-K1 V1.6 | 2492 | 10/04 | On Req. |

On Req. = On Request  N/A = Not Available  N.R. = Not Required