

# Intermec Technologies Corporation

## 802.11(b) and RFID with 700C and GPRS

December 15, 2003

Report No. ITRM0007.1

Report Prepared By:



1-888-EMI-CERT

**Test Report**



22975 NW Evergreen Parkway  
Suite 400  
Hillsboro, Oregon 97124

### Certificate of Test

Issue Date: December 15, 2003  
Intermec Technologies Corporation  
Model: 802.11(b) and RFID with 700C and GPRS

Emissions		
Description	Pass	Fail
FCC 15.247 Spurious Radiated Emissions:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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

**Test Facility**

- The measurement facility used to collect the data is located at:  
 Northwest EMC, Inc.; 22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124  
 Phone: (503) 844-4066 Fax: 844-3826  
 This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada.

**Approved By:**

Don Facteau, IS Manager

*This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.*

*Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.*

Revision Number	Description	Date	Page Number
00	None		

**FCC:** The Open Area Test Sites, 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.



**TCB:** 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:** Accreditation has been granted to Northwest EMC, Inc. to perform the Electromagnetic Compatibility (EMC) tests described in the Scope of Accreditation. Assessment performed to ISO/IEC 17025. Certificate Number: 200629-0, Certificate Number: 200630-0.



**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)



**TÜV Product Service:** Included in TÜV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements. Certificate No. USA0302C



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



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



**Technology International:** Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.



**Industry Canada:** Accredited by Industry Canada for performance of radiated measurements. Our open area test sites comply with RSS 212, Issue 1 (Provisional).



**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 Nos. - Evergreen: C-1071 and R-1025, Trails End: C-1877 and R-1760, Sultan: C-905, R-871, C-1784 and R-1761, North Sioux City C-1246 and R-1217*)



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



**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



**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



	NVLAP	FCC	NIST	TUV PS	TUV Rheinland	Nemko	Technology International	Industry Canada	BSMI	VCCI	GOST	NATA
IEC 61000-4-2	✓			✓	✓	✓	✓					
IEC 61000-4-3	✓			✓	✓	✓	✓					
IEC 61000-4-4	✓			✓	✓	✓	✓					
IEC 61000-4-5	✓			✓	✓	✓	✓					
IEC 61000-4-6	✓			✓	✓	✓	✓					
IEC 61000-4-8	✓			✓	✓	✓	✓					
IEC 61000-4-11	✓			✓	✓	✓	✓					
IEC 61000-3-2	✓			✓	✓	✓	✓					
IEC 61000-3-3	✓			✓	✓	✓	✓					
AS/NZS 3548	✓											✓
CNS 13438	✓								✓			
ISO/IEC17025	✓			✓	✓	✓	✓		✓			
Radiated Emissions	✓			✓	✓	✓	✓	✓	✓	✓	✓	
Conducted Emissions	✓			✓	✓	✓	✓	✓	✓	✓	✓	
OATS Sites	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Hillsboro 5-Meter Chamber (EV01)	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	
TCB for Licensed Transmitters		✓										
TCB for un-Licensed Transmitters		✓										
Cab for R&TTE			✓									
CAB for EMC			✓									

This chart represents only a partial NVLAP Scope, please reference <http://ts.nist.gov/ts/htdocs/210/214/214.htm> for the full NVLAP Scope of Accreditation

**How important is it to understand performance criteria?**

It is the responsibility of the test laboratory to observe the results of the tests that are performed and to accurately report those results. As the responsible party (manufacturer, importer, etc) it is your responsibility to take those results, compare them against the specifications and standards, then, if appropriate make a declaration of conformity. As the responsible party it makes sense that you are fully aware of the requirements, how your device performs when tested to those requirements, and what information is being used to declare conformity.

To better assist you in making those conformity decisions, Northwest EMC has adopted a very simple, yet very clear performance assessment procedure. The following criteria is used when performing immunity or susceptibility tests:

**Performance Criteria 1:**

- ❑ The EUT exhibited no change in performance when operating as specified by the manufacturer. In this case no changes were observed during the test.
- ❑ In most cases this would be equivalent to Performance Criteria A. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, no changes were observed. Basically nothing happened.

**Performance Criteria 2:**

- ❑ The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment recovered without any operator intervention. The data sheets will detail the exact phenomena observed.
- ❑ In most cases this would be equivalent to Performance Criteria B. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. The EUT was able to recover from those changes without any operator intervention.

**Performance Criteria 3:**

- ❑ The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment required some operator intervention in order to recover. This intervention may be in the form of reducing the test levels, changing parameters, or even resetting the system. The data sheets will detail the exact phenomena observed.
- ❑ In most cases this would be equivalent to Performance Criteria C. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. The EUT required some sort of operator intervention to recover. There was no permanent damage and the EUT appeared to function normally after completion test.

**Performance Criteria 4:**

- ❑ The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment was damaged and would not recover. The data sheets will detail the exact phenomena observed.
- ❑ In most cases there is no specific criterion to compare this to, it typically ends the test. When operating the equipment in the modes or configurations specified by the responsible party, monitoring the parameters specified, changes were observed. There was no recovery; the equipment would no longer function as intended.

Each of the standards and specifications has unique performance criteria. In order to make an accurate assessment, one must compare the test results provided with the specific performance criteria. **To ensure that a responsible party is compliant with the specifications, one must read and understand those specifications. Provided below is a sample performance criteria, taken from EN 50082-1.**

**EN 50082-1 Performance Criteria**

**Performance Criteria A:** *The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

**Performance Criteria B:** *The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.*

**Performance Criteria C:** *Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of controls.*

**How should a device perform in order for a declaration of conformity to be made?**

As already stated, it is the responsible party that must interpret and understand the results in such a way that a declaration of conformity is made. Having said that, we are often asked to render our opinion as to how a device should perform. Our recommendation simply follows the standards, as can be referenced below. Most of the standards and specifications offer the same performance criterion shown below as their requirements.

Test	Performance Criteria typically specified by the Standard	Equivalent Northwest EMC Performance Criteria
ESD	Performance Criteria B	Performance Criteria 1 or 2
Radiated RF	Performance Criteria A	Performance Criteria 1
EFT/Burst	Performance Criteria B	Performance Criteria 1 or 2
Surge	Performance Criteria B	Performance Criteria 1 or 2
Conducted RF	Performance Criteria A	Performance Criteria 1
Magnetic Field	Performance Criteria A	Performance Criteria 1
Voltage Dips and Variations	Performance Criteria B & C	Performance Criteria 1, 2, or 3



### What is measurement uncertainty?

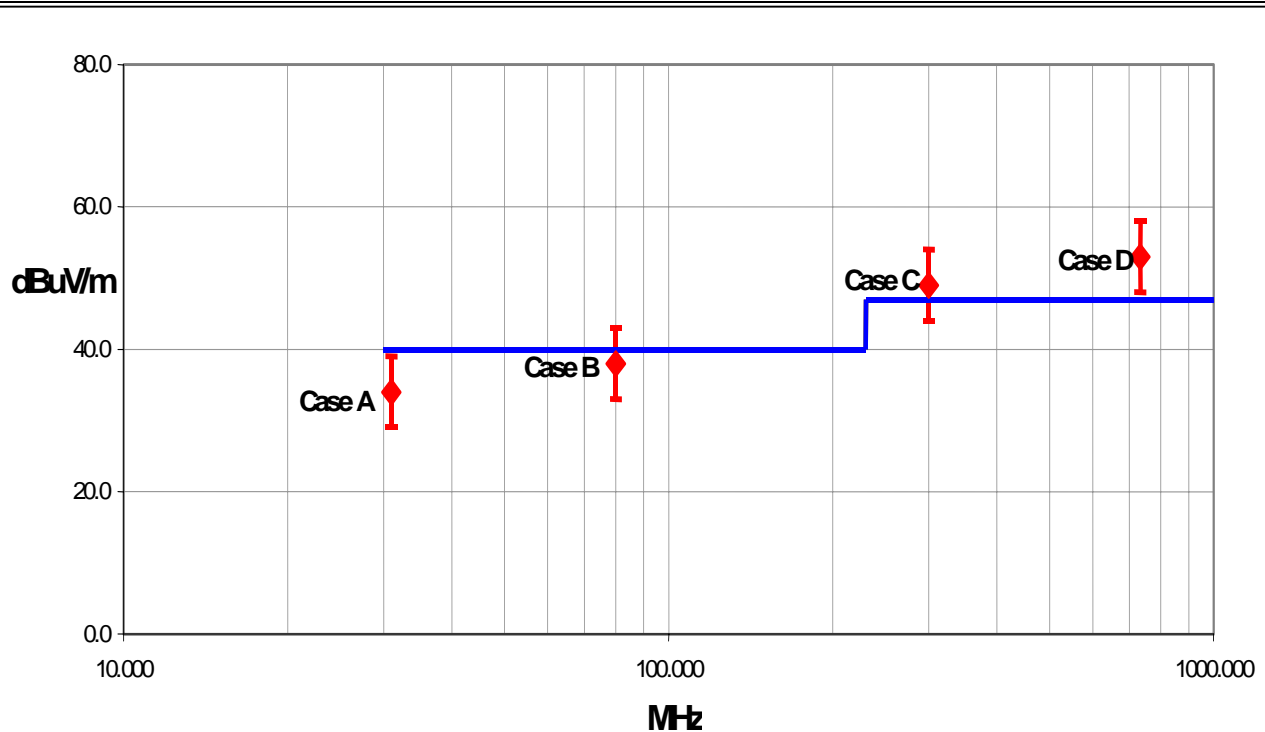
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

### How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and - measurement uncertainty, then test results can be interpreted from the diagram below.



#### Test Result Scenarios:

**Case A:** Product complies.

**Case B:** Product conditionally complies. It is not possible to say with 95% confidence that the product complies.

**Case C:** Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.

**Case D:** Product does not comply.

**Radiated Emissions ≤ 1 GHz**

Value (dB)

Test Distance	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86	+ 1.82	+ 2.23	+ 1.29	+ 1.31	+ 1.25
		- 1.88	- 1.87	- 1.41	- 1.26	- 1.27	- 1.25
Expanded uncertainty $U$ (level of confidence ≈ 95%)	normal (k=2)	+ 3.72	+ 3.64	+ 4.46	+ 2.59	+ 2.61	+ 2.49
		- 3.77	- 3.73	- 2.81	- 2.52	- 2.55	- 2.49

**Radiated Emissions > 1 GHz**

Value (dB)

Test Distance	Probability Distribution	Without High Pass Filter		With High Pass Filter	
		3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.29	+ 1.29	+ 1.38	+ 1.38
		- 1.25	- 1.25	- 1.35	- 1.35
Expanded uncertainty $U$ (level of confidence ≈ 95%)	normal (k=2)	+ 2.57	+ 2.57	+ 2.76	+ 2.76
		- 2.51	- 2.51	- 2.70	- 2.70

**Conducted Emissions**

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.48
Expanded uncertainty $U$ (level of confidence ≈ 95 %)	normal (k = 2)	2.97

**Radiated Immunity**

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty $U$ (level of confidence ≈ 95 %)	normal (k = 2)	2.11

**Conducted Immunity**

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty $U$ (level of confidence ≈ 95 %)	normal (k = 2)	2.10

**Legend**

$u_c(y)$  = square root of the sum of squares of the individual standard uncertainties

$U$  = combined standard uncertainty multiplied by the coverage factor:  $k$ . This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then  $k=3$  (CL of 99.7%) can be used. Please note that with a coverage factor of one,  $u_c(y)$  yields a confidence level of only 68%.

**California****Orange County Facility**

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

**Oregon****Evergreen Facility**

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

**Oregon****Trails End Facility**

30475 NE Trails End Lane  
Newberg, OR 97132  
(503) 844-4066  
FAX (503) 537-0735

**South Dakota****North Sioux City Facility**

745 N. Derby Lane  
P.O. Box 217  
North Sioux City, SD 57049  
(605) 232-5267  
FAX (605) 232-3873

**Washington****Sultan Facility**

14128 339<sup>th</sup> Ave. SE  
Sultan, WA 98294  
(888) 364-2378  
FAX (360) 793-2536

**Party Requesting the Test**

<b>Company Name:</b>	Intermec Technologies Corporation
<b>Address:</b>	550 Second St. SE
<b>City, State, Zip:</b>	Cedar Rapids, IA 52401-2023
<b>Test Requested By:</b>	Dave Fry
<b>Model:</b>	700C with GPRS, 802.11b, and RFID
<b>First Date of Test:</b>	November 26, 2003
<b>Last Date of Test:</b>	November 26, 2003
<b>Receipt Date of Samples:</b>	November 20, 2003
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No visual damage.

**Information Provided by the Party Requesting the Test**

<b>Clocks/Oscillators:</b>	Not provided at the time of test
<b>I/O Ports:</b>	none

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

Handheld computer with three internal radios used for inventory control
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**Client Justification for EUT Selection:**

The product is a representative production sample.
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**Client Justification for Test Selection:**

These test satisfy the requirements of FCC 15.247 for co-located transmitters.
--

**Equipment modifications**

Item	Test	Date	Modification	Note	Disposition of EUT
1	Spurious Radiated Emissions	11-26-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.	EUT was returned to client following testing.

**Justification**

The EUT is comprised of a handheld computer, Model 700C and three co-located radios installed inside the 700C (GPRS, 802.11(b), and Bluetooth). The EUT has been previously certified (FCC ID: EHA700C-SMC45) for mobile use with these three radios. This test demonstrates compliance with FCC 15.247 emissions limits while the EUT is co-located with another previously certified mobile radio (FCC ID: EHARFID915PCC-6). This new RFID radio is internal to a pistol grip (Model IP3). The IP3 is an optional accessory that attaches externally to the bottom of the 700C. Since the IP3 uses the same IRDA interface port as the Bluetooth radio, the Bluetooth and RFID radios cannot transmit simultaneously (see Intermecc's attestation letter). All other radios can transmit simultaneously. Each radio transmits through its own antenna.

All possible combinations of harmonic emissions from the GPRS, 802.11(b) and RFID radios were compared numerically. It was determined that there were no possible coincidental harmonics below 7 GHz. All the radios were configured for simultaneous transmission at the channels specified below:

**Channels in Specified Band Investigated:**

<b>GPRS:</b>	719, 753, 799, 810
<b>RFID:</b>	10, 11, 12, 32
<b>802.11(b):</b>	1, 5, 10, 11

**Operating Modes Investigated:**

Simultaneous Transmission of GPRS Channel 719, RFID Channel 32, and 802.11(b) Channel 5
Simultaneous Transmission of GPRS Channel 799, RFID Channel 10, and 802.11(b) Channel 10
Simultaneous Transmission of GPRS Channel 753, RFID Channel 11, and 802.11(b) Channel 11
Simultaneous Transmission of GPRS Channel 810, RFID Channel 12, and 802.11(b) Channel 1

**Antennas Investigated:**

<b>GPRS:</b>	805-606-204 Antenna (external to 700C)
<b>RFID:</b>	IP3 integral antenna (internal to IP3)
<b>802.11(b):</b>	2011B integral antenna (internal to 700C)

**Output Power Setting(s) Investigated:**

Maximum
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**Data Rate(s) Investigated:**

Maximum
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**Power Input Settings Investigated:**

120VAC, 60Hz
Battery

**Frequency Range Investigated**

<b>Start Frequency</b>	1 GHz	<b>Stop Frequency</b>	26 GHz
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**Software\Firmware Applied During Test**

<b>Exercise software</b>	Intel 802.11 AgencyTest Core IP3FCC2	<b>Version(s)</b>	unknown unknown v0.4
<b>Description</b>			
The system uses special software designed to exercise the functions of the device such as transmit/receive, channel, modulation, data rates, and simultaneous transmission of all three co-located radios.			

**EUT and Peripherals**

<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
Handheld Computer	Intermec Technologies Corporation	700C	N/A
GPRS Radio in 700C	Intermec Technologies Corporation	SMC45	N/A
802.11(b) Radio in 700C	Intermec Technologies Corporation	2011B	N/A
RFID Radio in Pistol Grip	Intermec Technologies Corporation	IP3	N/A
Power Adapter	Elpac Power Systems	FW1812	004506
Cellular Antenna	Intermec Technologies Corporation	805-606-204	N/A

**Cables**

<b>Cable Type</b>	<b>Shield</b>	<b>Length (m)</b>	<b>Ferrite</b>	<b>Connection 1</b>	<b>Connection 2</b>
DC Leads	PA	1.8	PA	Handheld Radio/Scanner	Power Adapter
AC Power	No	1.8	No	Power Adapter	AC Mains

**PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.**

Measurement Equipment					
Description	Manufacturer	Model	Identifier	Last Cal	Interval
High Pass Filter	RLC Electronics	F-100-4000-5-R (HPF>4GHz up to	HFF	05/01/2003	12 mo
Antenna, Biconilog	EMCO	3142	AXA	11/07/2002	36 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	01/06/2003	12 mo
Antenna, Horn	EMCO	3115	AHC	09/18/2003	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/06/2003	12 mo
Antenna, Horn	EMCO	3160-08	AHK	06/20/2003	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	10/08/2003	12 mo
Antenna, Horn	EMCO	3160-09	AHG	10/08/2003	12 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/08/2003	12 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	01/07/2003	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo
High Pass Filter	Hewlett-Packard	84300-80037	HFE	05/01/2003	12 mo

### Test Description

**Requirement:** The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

**Configuration for Simultaneous Transmission:** The EUT is comprised of a handheld computer, Model 700C and three co-located radios installed inside the 700C (GPRS, 802.11(b), and Bluetooth). The EUT has been previously certified (FCC ID: EHA700C-SMC45) for mobile use with these three radios. This test demonstrates compliance with FCC 15.247 emissions limits while the EUT is co-located with another previously certified mobile radio (FCC ID: EHARFID915PCC-6). This new RFID radio is internal to a pistol grip (Model IP3). The IP3 is an optional accessory that attaches externally to the bottom of the 700C. Since the IP3 uses the same IRDA interface port as the Bluetooth radio, the Bluetooth and RFID radios cannot transmit simultaneously (see Intermec's attestation letter). All other radios can transmit simultaneously. Each radio transmits through its own antenna.

The following is an excerpt from the FCC / TCB Training Q & A, October 2002, Day 2, Question 7:

**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.**



All possible combinations of harmonic emissions from the GPRS, 802.11(b) and RFID radios were compared numerically. It was determined that there were no possible coincidental harmonics below 7 GHz. The frequency range from 1 GHz to 26 GHz was investigated for channel combinations that would produce coincidental harmonics. Compliance with the restricted band at 2483.5 – 2500 MHz was also measured.

All the radios were configured for simultaneous transmission at the channels specified in the previous pages. The highest gain antennas to be used with the radios were tested. The spectrum was scanned throughout the specified range. While scanning, emissions from the radios were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antennas in three orthogonal axes, and adjusting the measurement antenna height and polarization (per ANSI C63.4:1992). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Bandwidths Used for Measurements			
Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
<i>Measurements were made using the bandwidths and detectors specified. No video filter was used.</i>			

Completed by:



# RADIATED EMISSIONS DATA SHEET

EUT: 700C (GPRS/802.11b) and IP3	Work Order: ITRM0002
Serial Number:	Date: 11/26/03
Customer: Intermec Technologies Corporation	Temperature: 72
Attendees: none	Humidity: 52%
Cust. Ref. No.:	Barometric Pressure: 30.16
Tested by: Rod Peloquin	Power: 120 V, 60 Hz
	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	
Specification: FCC 15.247(c)	Year: 2003
Method: ANSI C63.4	Year: 1992

**SAMPLE CALCULATIONS**  
 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation  
 Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

**COMMENTS**

Max Power, Max modulation

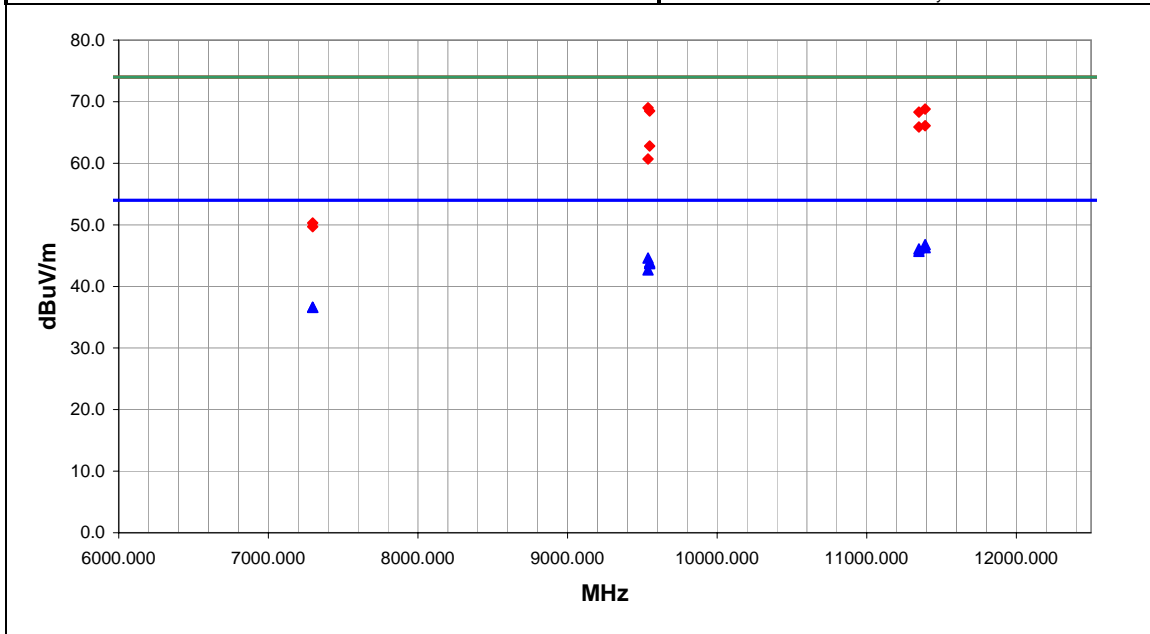
**EUT OPERATING MODES**  
 Simultaneous Transmission from RFID, 802.11b, GSM

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Run #
Pass	1

Other

*Rod Peloquin*  
 \_\_\_\_\_  
 Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
11390.400	28.4	18.4	311.0	1.2	3.0	0.0	V-Horn	AV	0.0	46.8	54.0	-7.2	RFID 11, GSM 753, 802.11b 11
11390.400	27.9	18.4	32.0	1.3	3.0	0.0	H-Horn	AV	0.0	46.3	54.0	-7.7	RFID 11, GSM 753, 802.11b 11
11349.600	27.9	18.2	42.0	1.3	3.0	0.0	H-Horn	AV	0.0	46.1	54.0	-7.9	RFID 32, GSM 719, 802.11b 5
11349.600	27.5	18.2	333.0	1.4	3.0	0.0	V-Horn	AV	0.0	45.7	54.0	-8.3	RFID 32, GSM 719, 802.11b 5
9538.003	29.1	15.5	267.0	1.2	3.0	0.0	V-Horn	AV	0.0	44.6	54.0	-9.4	RFID 10, GSM 799, 802.11b 10
9549.010	28.3	15.6	258.0	1.2	3.0	0.0	V-Horn	AV	0.0	43.9	54.0	-10.1	RFID 12, GSM 810, 802.11b 1
9549.010	28.1	15.6	148.0	1.3	3.0	0.0	H-Horn	AV	0.0	43.7	54.0	-10.3	RFID 12, GSM 810, 802.11b 1
9538.003	27.2	15.5	319.0	1.3	3.0	0.0	H-Horn	AV	0.0	42.7	54.0	-11.3	RFID 10, GSM 799, 802.11b 10
7296.003	27.1	9.5	60.0	1.3	3.0	0.0	H-Horn	AV	0.0	36.6	54.0	-17.4	RFID 32, GSM 719, 802.11b 5
7296.003	27.1	9.5	239.0	1.2	3.0	0.0	V-Horn	AV	0.0	36.6	54.0	-17.4	RFID 32, GSM 719, 802.11b 5
9538.003	53.5	15.5	267.0	1.2	3.0	0.0	V-Horn	PK	0.0	69.0	74.0	-5.0	RFID 10, GSM 799, 802.11b 10
11390.400	50.4	18.4	311.0	1.2	3.0	0.0	V-Horn	PK	0.0	68.8	74.0	-5.2	RFID 11, GSM 753, 802.11b 11
9549.010	52.9	15.6	258.0	1.2	3.0	0.0	V-Horn	PK	0.0	68.5	74.0	-5.5	RFID 12, GSM 810, 802.11b 1
11349.600	50.1	18.2	333.0	1.4	3.0	0.0	V-Horn	PK	0.0	68.3	74.0	-5.7	RFID 32, GSM 719, 802.11b 5
11390.400	47.7	18.4	32.0	1.3	3.0	0.0	H-Horn	PK	0.0	66.1	74.0	-7.9	RFID 11, GSM 753, 802.11b 11
11349.600	47.7	18.2	42.0	1.3	3.0	0.0	H-Horn	PK	0.0	65.9	74.0	-8.1	RFID 32, GSM 719, 802.11b 5
9549.010	47.2	15.6	148.0	1.3	3.0	0.0	H-Horn	PK	0.0	62.8	74.0	-11.2	RFID 12, GSM 810, 802.11b 1
9538.003	45.2	15.5	319.0	1.3	3.0	0.0	H-Horn	PK	0.0	60.7	74.0	-13.3	RFID 10, GSM 799, 802.11b 10
7296.003	40.8	9.5	60.0	1.3	3.0	0.0	H-Horn	PK	0.0	50.3	74.0	-23.7	RFID 32, GSM 719, 802.11b 5
7296.003	40.2	9.5	239.0	1.2	3.0	0.0	V-Horn	PK	0.0	49.7	74.0	-24.3	RFID 32, GSM 719, 802.11b 5

# RADIATED EMISSIONS DATA SHEET

EUT:	700C (GPRS/802.11b) and IP3	Work Order:	ITRM0002
Serial Number:		Date:	11/26/03
Customer:	Intermec Technologies Corporation	Temperature:	75
Attendees:	none	Humidity:	52%
Cust. Ref. No.:		Barometric Pressure:	30.15
Tested by:	Holly Ashkannejhad	Power:	120 V, 60 Hz
		Job Site:	EV01

<b>TEST SPECIFICATIONS</b>	
Specification:	FCC 15.247(c)
Method:	ANSI C63.4
Year:	2003
Year:	1992

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation  
 Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

**COMMENTS**

Max Power, Max modulation.

**EUT OPERATING MODES**

Simultaneous Transmission from RFID, 802.11b, GSM

**DEVIATIONS FROM TEST STANDARD**

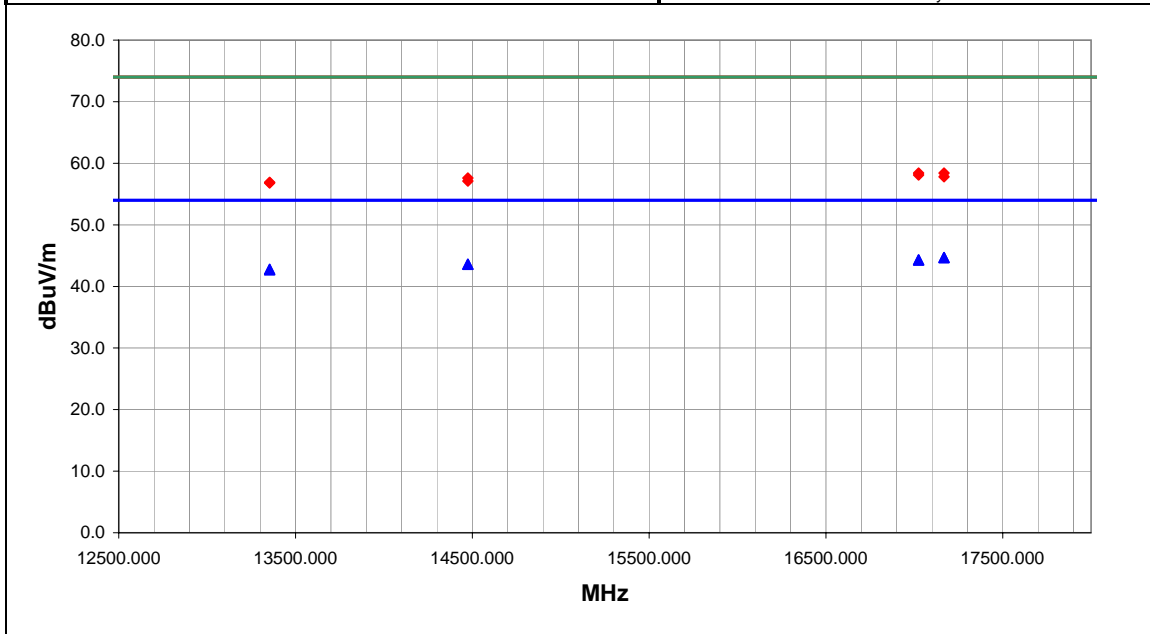
No deviations.

**RESULTS**

Pass	Run #	2
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Other

*Holly Ashkannejhad*  
Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
17168.400	26.8	17.9	241.0	1.0	3.0	0.0	H-Horn	AV	0.0	44.7	54.0	-9.3	802.11b 10, RFID 10, GSM 799
17168.400	26.8	17.9	176.0	1.0	3.0	0.0	V-Horn	AV	0.0	44.7	54.0	-9.3	802.11b 10, RFID 10, GSM 799
17024.600	26.8	17.5	283.0	1.6	3.0	0.0	H-Horn	AV	0.0	44.3	54.0	-9.7	802.11b 5, RFID 32, GSM 719
17024.600	26.8	17.5	329.0	1.1	3.0	0.0	V-Horn	AV	0.0	44.3	54.0	-9.7	802.11b 5, RFID 32, GSM 719
14474.400	27.2	16.4	348.0	1.0	3.0	0.0	H-Horn	AV	0.0	43.6	54.0	-10.4	802.11b 1, RFID 12, GSM 810
14474.400	27.2	16.4	0.0	1.2	3.0	0.0	V-Horn	AV	0.0	43.6	54.0	-10.4	802.11b 1, RFID 12, GSM 810
13353.500	27.4	15.4	239.0	1.4	3.0	0.0	H-Horn	AV	0.0	42.8	54.0	-11.2	802.11b 10, RFID 10, GSM 799
13353.500	27.3	15.4	64.0	1.8	3.0	0.0	V-Horn	AV	0.0	42.7	54.0	-11.3	802.11b 10, RFID 10, GSM 799
17024.600	40.9	17.5	329.0	1.1	3.0	0.0	V-Horn	PK	0.0	58.4	74.0	-15.6	802.11b 5, RFID 32, GSM 719
17168.400	40.5	17.9	241.0	1.0	3.0	0.0	H-Horn	PK	0.0	58.4	74.0	-15.6	802.11b 10, RFID 10, GSM 799
17024.600	40.6	17.5	283.0	1.6	3.0	0.0	H-Horn	PK	0.0	58.1	74.0	-15.9	802.11b 5, RFID 32, GSM 719
17168.400	39.9	17.9	176.0	1.0	3.0	0.0	V-Horn	PK	0.0	57.8	74.0	-16.2	802.11b 10, RFID 10, GSM 799
14474.400	41.2	16.4	348.0	1.0	3.0	0.0	H-Horn	PK	0.0	57.6	74.0	-16.4	802.11b 1, RFID 12, GSM 810
14474.400	40.7	16.4	0.0	1.2	3.0	0.0	V-Horn	PK	0.0	57.1	74.0	-16.9	802.11b 1, RFID 12, GSM 810
13353.500	41.5	15.4	64.0	1.8	3.0	0.0	V-Horn	PK	0.0	56.9	74.0	-17.1	802.11b 10, RFID 10, GSM 799
13353.500	41.4	15.4	239.0	1.4	3.0	0.0	H-Horn	PK	0.0	56.8	74.0	-17.2	802.11b 10, RFID 10, GSM 799

# RADIATED EMISSIONS DATA SHEET

EUT: 700C (GPRS/802.11b) and IP3		Work Order: ITRM0002
Serial Number:		Date: 11/26/03
Customer: Intermec Technologies Corporation		Temperature: 75
Attendees: none		Humidity: 52%
Cust. Ref. No.:		Barometric Pressure: 30.15
Tested by: Holly Ashkannejhad	Power: 120 V, 60 Hz	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	
Specification: FCC Part 15.247(c)	Year: 2003
Method: ANSI C63.4	Year: 1992

**SAMPLE CALCULATIONS**  
 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation  
 Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

**COMMENTS**

Max Power, Max modulation.

**EUT OPERATING MODES**

Simultaneous Transmission from RFID, 802.11b, GSM

**DEVIATIONS FROM TEST STANDARD**

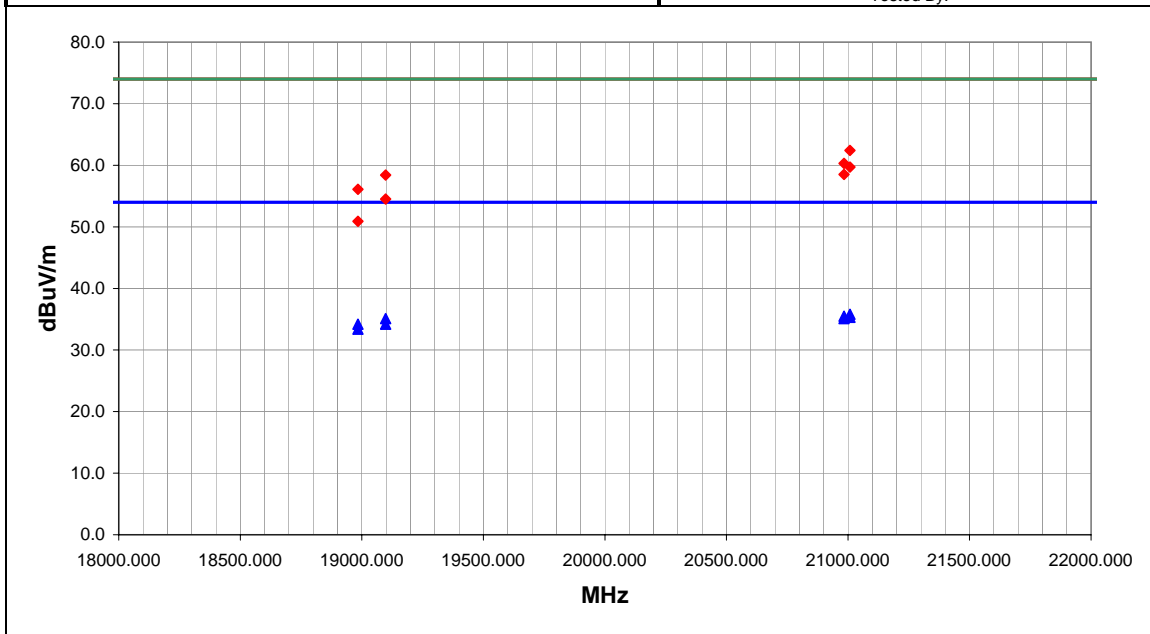
No deviations.

**RESULTS**

Pass	Run #
	1

Other

*Holly Ashkannejhad*  
Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
21007.850	27.2	8.6	110.0	1.0	3.0	0.0	V-High Horr	AV	0.0	35.8	54.0	-18.2	802.11b 1, RFID 12, GSM 810
20983.600	26.9	8.6	106.0	1.1	3.0	0.0	V-High Horr	AV	0.0	35.5	54.0	-18.5	802.11b 10, RFID 10, GSM 799
21007.850	26.7	8.6	107.0	1.2	3.0	0.0	+High Horr	AV	0.0	35.3	54.0	-18.7	802.11b 1, RFID 12, GSM 810
19098.040	27.5	7.6	68.0	1.3	3.0	0.0	V-High Horr	AV	0.0	35.1	54.0	-18.9	802.11b 1, RFID 12, GSM 810
20983.600	26.5	8.6	0.0	1.1	3.0	0.0	+High Horr	AV	0.0	35.1	54.0	-18.9	802.11b 10, RFID 10, GSM 799
18984.000	26.7	7.5	64.0	1.1	3.0	0.0	V-High Horr	AV	0.0	34.2	54.0	-19.8	802.11b 11, RFID 11, GSM 753
19098.040	26.6	7.6	20.0	1.2	3.0	0.0	+High Horr	AV	0.0	34.2	54.0	-19.8	802.11b 1, RFID 12, GSM 810
18984.000	25.9	7.5	360.0	1.2	3.0	0.0	+High Horr	AV	0.0	33.4	54.0	-20.6	802.11b 11, RFID 11, GSM 753
21007.850	53.8	8.6	110.0	1.0	3.0	0.0	V-High Horr	PK	0.0	62.4	74.0	-11.6	802.11b 1, RFID 12, GSM 810
20983.600	51.7	8.6	106.0	1.1	3.0	0.0	V-High Horr	PK	0.0	60.3	74.0	-13.7	802.11b 10, RFID 10, GSM 799
21007.850	51.1	8.6	107.0	1.2	3.0	0.0	+High Horr	PK	0.0	59.7	74.0	-14.3	802.11b 1, RFID 12, GSM 810
20983.600	49.9	8.6	0.0	1.1	3.0	0.0	+High Horr	PK	0.0	58.5	74.0	-15.5	802.11b 10, RFID 10, GSM 799
19098.040	50.8	7.6	68.0	1.3	3.0	0.0	V-High Horr	PK	0.0	58.4	74.0	-15.6	802.11b 1, RFID 12, GSM 810
18984.000	48.6	7.5	64.0	1.1	3.0	0.0	V-High Horr	PK	0.0	56.1	74.0	-17.9	802.11b 11, RFID 11, GSM 753
19098.040	46.9	7.6	20.0	1.2	3.0	0.0	+High Horr	PK	0.0	54.5	74.0	-19.5	802.11b 1, RFID 12, GSM 810
18984.000	43.4	7.5	360.0	1.2	3.0	0.0	+High Horr	PK	0.0	50.9	74.0	-23.1	802.11b 11, RFID 11, GSM 753

**RADIATED EMISSIONS DATA SHEET**

EUT: <b>700C (GPRS/802.11b) and IP3</b>	Work Order: <b>ITRM0002</b>
Serial Number:	Date: <b>11/26/03</b>
Customer: <b>Intermec Technologies Corporation</b>	Temperature: <b>75</b>
Attendees: <b>none</b>	Humidity: <b>52%</b>
Cust. Ref. No.:	Barometric Pressure: <b>30.15</b>
Tested by: <b>Holly Ashkannejhad</b>	Power: <b>120 V, 60 Hz</b>
	Job Site: <b>EV01</b>

<b>TEST SPECIFICATIONS</b>	
Specification: <b>FCC Part 15.247(c)</b>	Year: <b>2003</b>
Method: <b>ANSI C63.4</b>	Year: <b>1992</b>

**SAMPLE CALCULATIONS**  
 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation  
 Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator


**COMMENTS**  
 Max Power, Max modulation.

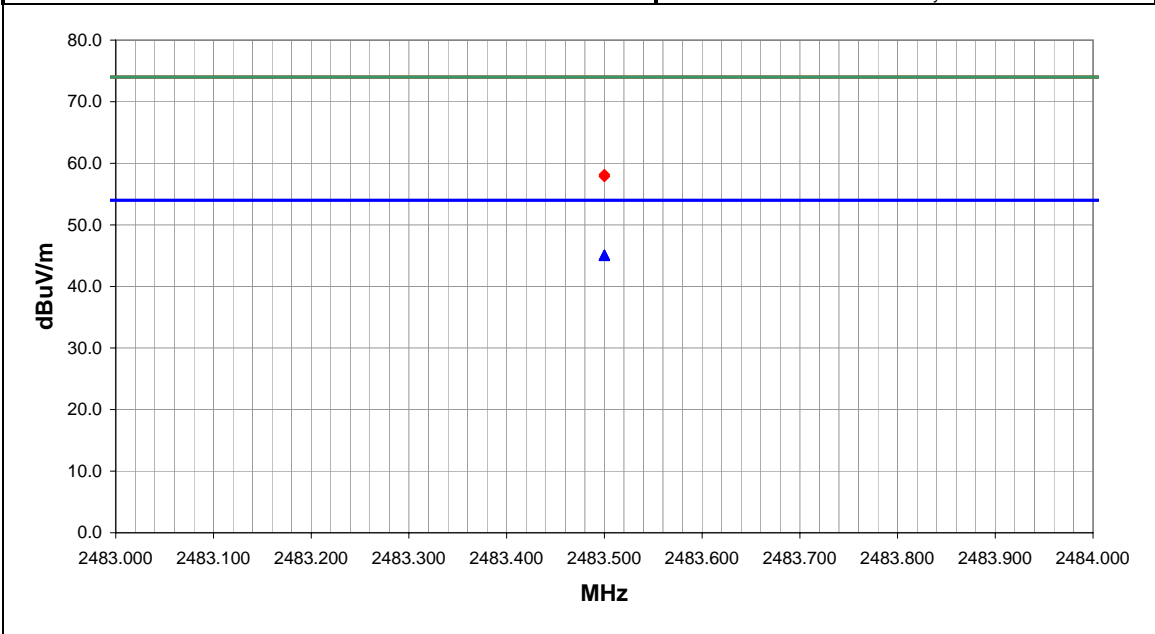
**EUT OPERATING MODES**  
 Simultaneous Transmission from RFID, 802.11b, GSM

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Run #
Pass	3

Other

  
 Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2483.500	22.6	32.0	360.0	1.1	1.0	0.0	H-Horn	AV	-9.5	45.1	54.0	-8.9	802.11b 11, RFID 11, GSM 753
2483.500	22.6	32.0	360.0	1.1	1.0	0.0	V-Horn	AV	-9.5	45.1	54.0	-8.9	802.11b 11, RFID 11, GSM 753
2483.500	35.7	32.0	360.0	1.1	1.0	0.0	V-Horn	PK	-9.5	58.2	74.0	-15.8	802.11b 11, RFID 11, GSM 753
2483.500	35.4	32.0	360.0	1.1	1.0	0.0	H-Horn	PK	-9.5	57.9	74.0	-16.1	802.11b 11, RFID 11, GSM 753



