Intermec Technologies Corporation

GPRS in 700C with 802.11(b) and RFID

Test Report

December 15, 2003

Report No. ITRM0007

Report Prepared By:

1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

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

Emissions		
Description	**Pass**	**Fail**
FCC 24.238 Spurious Radiated Emissions:2003	☒	☐

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 TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV'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

Explanation of Northwest EMC Performance Criteria

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?

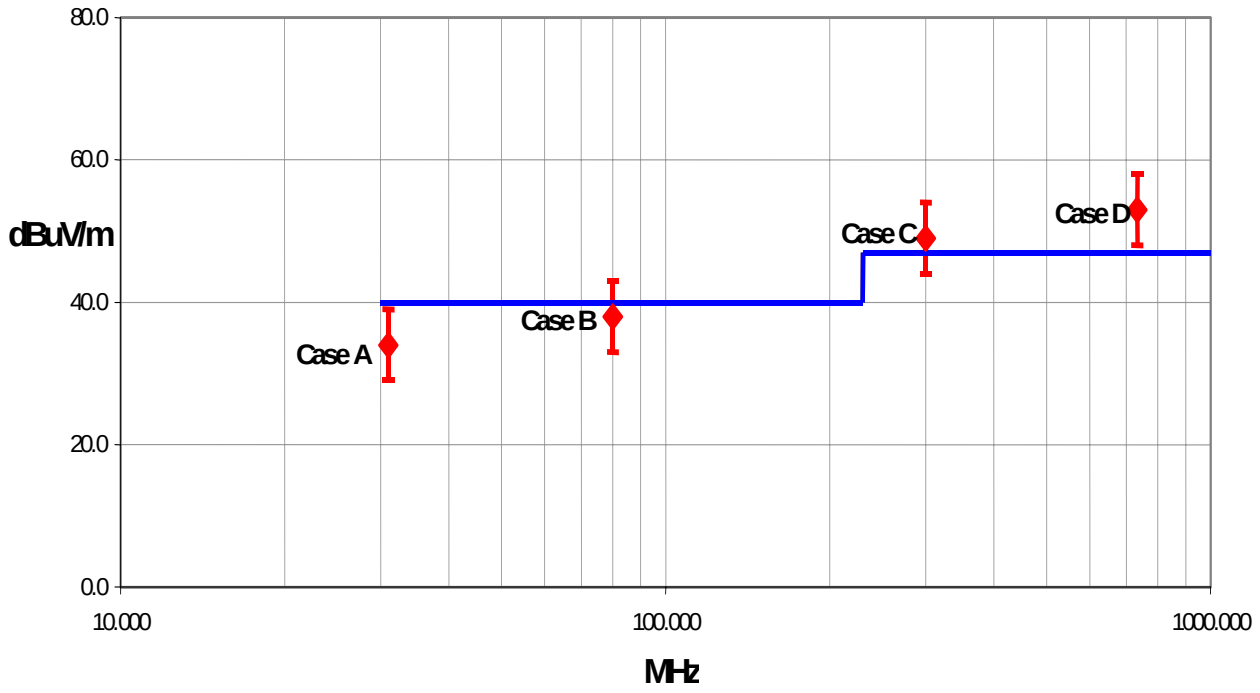
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following 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)					
	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
Test Distance		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty ***U*** (level of confidence ≈ 95%)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 -2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

Radiated Emissions > 1 GHz	Value (dB)		
	Probability Distribution	Without High Pass Filter	With High Pass Filter
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.38 - 1.35
Expanded uncertainty ***U*** (level of confidence ≈ 95%)	normal (k=2)	+ 2.57 - 2.51	+ 2.76 - -2.70

Conducted Emissions		
	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(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 ***uc(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 ***uc(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, uc(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
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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
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Washington

Sultan Facility

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

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

Information Provided by the Party Requesting the Test

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

Functional Description of the EUT (Equipment Under Test):
Handheld computer with three internal radios used for inventory control

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

Client Justification for Test Selection:
These test satisfy the requirements of FCC 24.238 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 24.238 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.

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:	
GPRS:	719, 753, 799, 810
RFID:	10, 11, 12, 32
802.11(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:	
GPRS:	805-606-204 Antenna (external to 700C)
RFID:	IP3 integral antenna (internal to IP3)
802.11(b):	2011B integral antenna (internal to 700C)

Output Power Setting(s) Investigated:
Maximum

Data Rate(s) Investigated:
Maximum

Power Input Settings Investigated:
120VAC, 60Hz
Battery

Frequency Range Investigated			
Start Frequency	1 GHz	**Stop Frequency**	26 GHz

Software\Firmware Applied During Test			
Exercise software	Intel 802.11 AgencyTest Core IP3FCC2	**Version(s)**	unknown unknown v0.4
Description			
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			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
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					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
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: Per 2.1053, the field strength of spurious radiation was measured in the far-field at an FCC Listed semi-anechoic chamber up to 25 GHz. The applicable limits are 24.238(a) for the PCS band.

Per 24.238(a), on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. (-13 dBm).

Configuration: Spectrum analyzer, signal generator, and linearly polarized antennas were used to measure radiated harmonics and spurious emissions. The orientation of the EUT and measurement antenna were manipulated to maximize the level of emissions.

The substitution method as described in TIA/EIA-603 Section 2.2.12 was used for the highest spurious emissions. The EUT was tested while simultaneously transmitting with co-located radios.

Test Methodology: For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

At an approved test site, the transmitter is place on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a ½ wave dipole that is successively tuned to each of the highest spurious emissions. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal ½ wave dipole antenna is determined for each radiated spurious emission.

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 24.238 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:

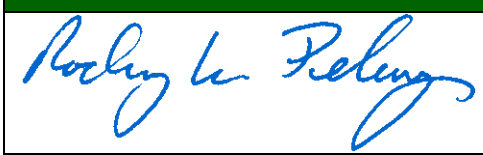
> **Assuming that the radios do not share an antenna, only radiated tests for simultaneous transmission is required. If the radios share an antenna, antenna conducted measurements would also be required. Only one set of worst case simultaneous transmission data is going to be requested to be submitted 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
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Completed by:



NORTHWEST EMC

Apparent Power Data Sheet

REV df4.02 11/25/2003

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

TEST SPECIFICATIONS

Specification:	FCC Part 24.238	Year:	2002
Method:	TIA/EIA-603	Year:	1998

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

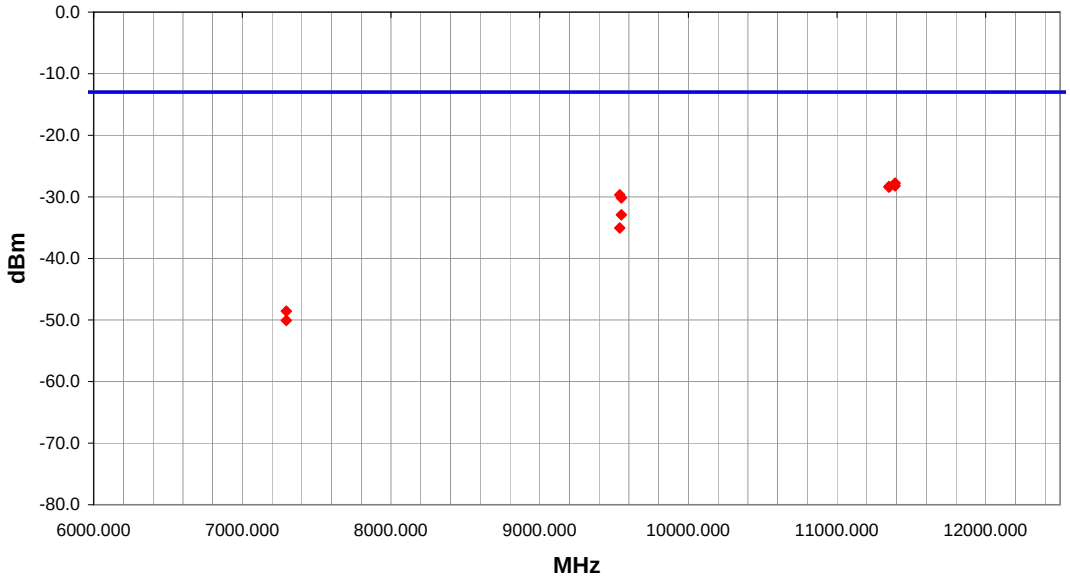
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	1

Other

Tested By:



Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector		EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
11390.400			311.0	1.2			V-Horn	PK		-27.8	-13.0	-14.8	RFID 11, GSM 753, 802.11b 11
11390.400			32.0	1.3			H-Horn	PK		-28.2	-13.0	-15.2	RFID 11, GSM 753, 802.11b 11
11349.600			333.0	1.4			V-Horn	PK		-28.3	-13.0	-15.3	RFID 32, GSM 719, 802.11b 5
11349.600			42.0	1.3			H-Horn	PK		-28.4	-13.0	-15.4	RFID 32, GSM 719, 802.11b 5
9538.003			267.0	1.2			V-Horn	PK		-29.7	-13.0	-16.7	RFID 10, GSM 799, 802.11b 10
9549.010			258.0	1.2			V-Horn	PK		-30.2	-13.0	-17.2	RFID 12, GSM 810, 802.11b 1
9549.010			148.0	1.3			H-Horn	PK		-32.9	-13.0	-19.9	RFID 12, GSM 810, 802.11b 1
9538.003			319.0	1.3			H-Horn	PK		-35.1	-13.0	-22.1	RFID 10, GSM 799, 802.11b 10
7296.003			60.0	1.3			H-Horn	PK		-48.6	-13.0	-35.6	RFID 32, GSM 719, 802.11b 5
7296.003			239.0	1.2			V-Horn	PK		-50.1	-13.0	-37.1	RFID 32, GSM 719, 802.11b 5

NORTHWEST EMC

Apparent Power Data Sheet

REV df4.02 11/25/2003

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

TEST SPECIFICATIONS

Specification:	FCC Part 24.238	Year:	2002
Method:	TIA/EIA-603	Year:	1998

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

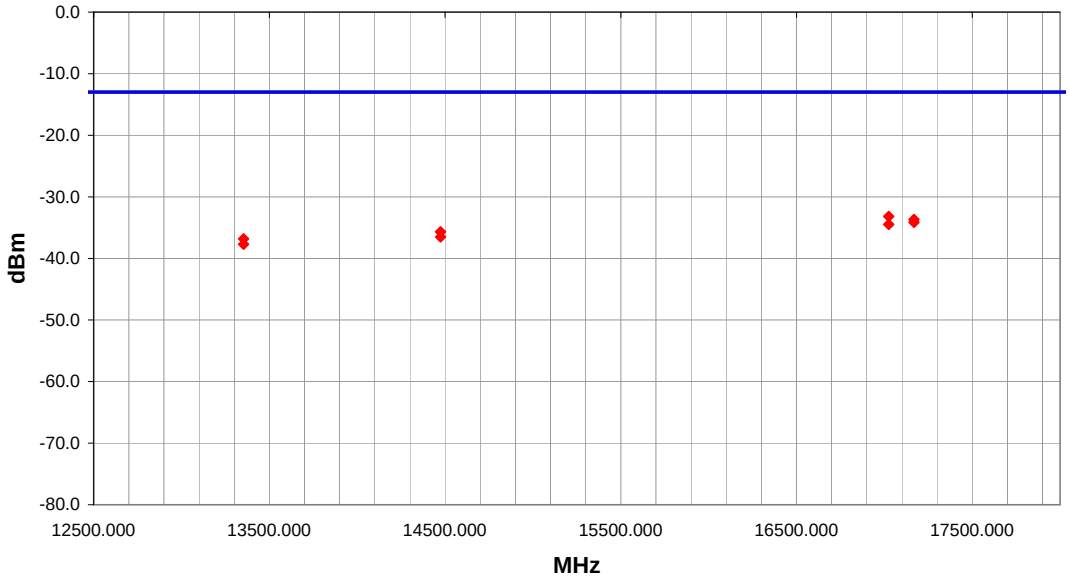
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	2

Other

Tested By: Holly Ashkannejhad



Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector		EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
17024.600			329.0	1.1			V-Horn	PK		-33.2	-13.0	-20.2	802.11b 5, RFID 32, GSM 719
17168.400			176.0	1.0			V-Horn	PK		-33.7	-13.0	-20.7	802.11b 10, RFID 10, GSM 799
17168.400			241.0	1.0			H-Horn	PK		-34.1	-13.0	-21.1	802.11b 10, RFID 10, GSM 799
17024.600			283.0	1.6			H-Horn	PK		-34.5	-13.0	-21.5	802.11b 5, RFID 32, GSM 719
14474.400			348.0	1.0			H-Horn	PK		-35.7	-13.0	-22.7	802.11b 1, RFID 12, GSM 810
14474.400			0.0	1.2			V-Horn	PK		-36.5	-13.0	-23.5	802.11b 1, RFID 12, GSM 810
13353.500			239.0	1.4			H-Horn	PK		-36.8	-13.0	-23.8	802.11b 10, RFID 10, GSM 799
13353.500			64.0	1.8			V-Horn	PK		-37.7	-13.0	-24.7	802.11b 10, RFID 10, GSM 799

NORTHWEST EMC

Apparent Power Data Sheet

REV df4.02 11/25/2003

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

TEST SPECIFICATIONS

Specification:	FCC Part 24.238	Year:	2002
Method:	TIA/EIA-603	Year:	1998

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

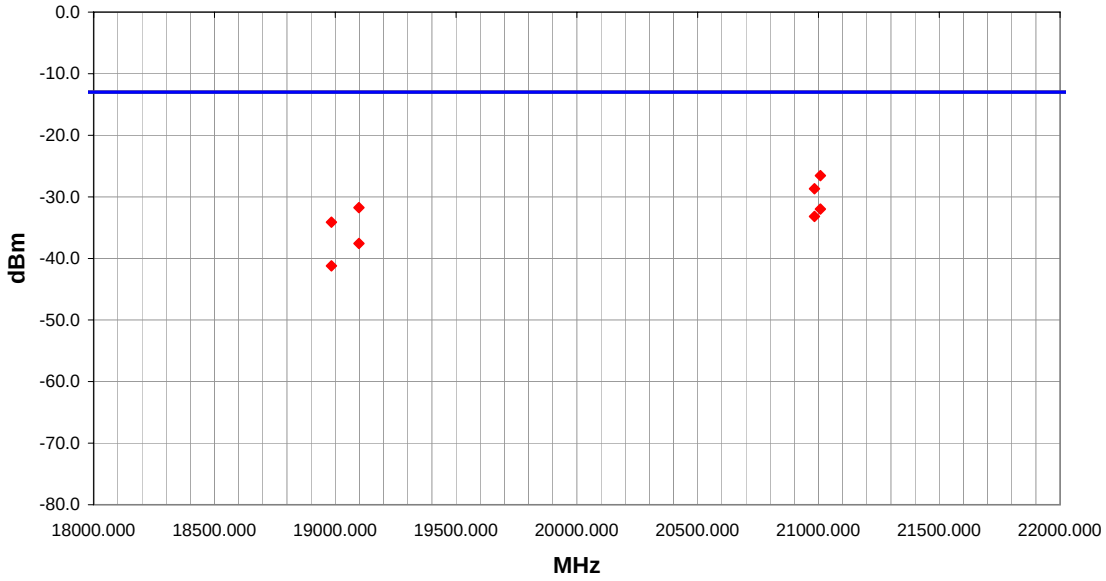
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	1

Other

Tested By: Holly Ashkannejhad



Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector		EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
21007.850			110.0	1.0			V-High Horr	PK		-26.6	-13.0	-13.6	802.11b 1, RFID 12, GSM 810
20983.600			106.0	1.1			V-High Horr	PK		-28.7	-13.0	-15.7	802.11b 10, RFID 10, GSM 799
19098.040			68.0	1.3			V-High Horr	PK		-31.7	-13.0	-18.7	802.11b 1, RFID 12, GSM 810
21007.850			107.0	1.2			H-High Horr	PK		-32.0	-13.0	-19.0	802.11b 1, RFID 12, GSM 810
20983.600			0.0	1.1			H-High Horr	PK		-33.2	-13.0	-20.2	802.11b 10, RFID 10, GSM 799
18984.000			64.0	1.1			V-High Horr	PK		-34.1	-13.0	-21.1	802.11b 11, RFID 11, GSM 753
19098.040			20.0	1.2			H-High Horr	PK		-37.6	-13.0	-24.6	802.11b 1, RFID 12, GSM 810
18984.000			360.0	1.2			H-High Horr	PK		-41.2	-13.0	-28.2	802.11b 11, RFID 11, GSM 753

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Apparent Power Data Sheet

REV df4.02 11/25/2003

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

TEST SPECIFICATIONS

Specification:	FCC Part 24.238	Year:	2002
Method:	TIA/EIA-603	Year:	1998

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

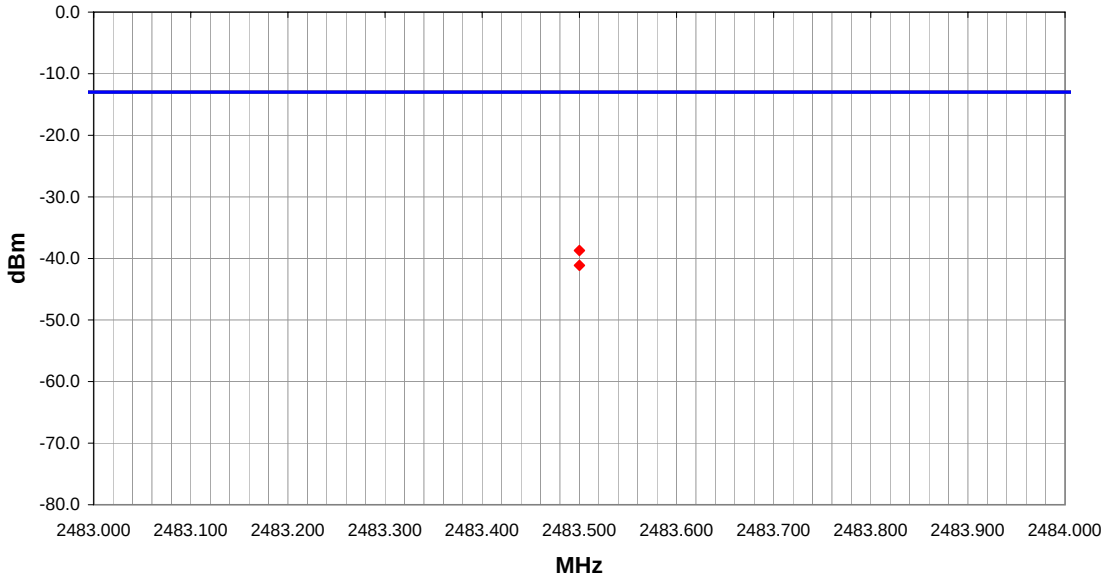
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	3

Other

Tested By: Holly Ashkannejhad



Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector		EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
2483.500			360.0	1.1			V-Horn	PK		-38.7	-13.0	-25.7	802.11b 11, RFID 11, GSM 753
2483.500			360.0	1.1			H-Horn	PK		-41.1	-13.0	-28.1	802.11b 11, RFID 11, GSM 753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