Measurement/Technical Report

General Information

| Applicant: | Intermec Corporation | | | | | | | |
|--------------------------|-----------------------------------|--|--|--|--|--|--|--|
| Address: | 6001 36 th Avenue West | | | | | | | |
| City, State, Zip | Everett, WA 98203-9280 | | | | | | | |
| Test Requested By: | Carl Turk | | | | | | | |
| Model: | SB555 Radio in 700C | | | | | | | |
| FCC ID: | | | | | | | | |
| First Date of Test: | August 21, 2003 | | | | | | | |
| Last Date of Test: | August 21, 2003 | | | | | | | |
| Receipt Date of Samples: | August 21, 2003 | | | | | | | |
| Job Number | INMC00102 | | | | | | | |

Scope

| Regulatory Authority | Federal Communications Commission |
|---------------------------------|--|
| Approval Type | Certification |
| Equipment Type | Part 24 Licensed Body Worn Transmitter |
| Rule Parts | 47 CFR 22.917(e), 24.238(a) |
| Rule Exemptions | None |
| Related Submittals or Grants | None |

Report Information

| Prepared By | Vicki Albertson, Technical Report and Documentation Manager Northwest EMC, Inc. |
|---------------|---|
| Signature | Vicki Albertson |
| Issued By | Northwest EMC, Inc. 22975 NW Evergreen Parkway, Suite 400 Hillsboro, Oregon 97124 Ph. (503) 844-4066 Fax (503) 844-3826 |
| Report Number | INMC0102 |
| Date Issued | August 25, 2003 |

Test Facility

The measurement facility used to collect the radiated and conducted data is located at

Northwest EMC, Inc. 22975 NW Evergreen Parkway, Suite 400 Hillsboro, OR 97124 (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with the FCC (Federal Communications Commission), and accepted by the FCC in a letter maintained in our files.

Laboratory Accreditation

NVLAP has granted accreditation 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



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

| Channels in Specified Band Investigated: | |
|--|--|
| Low | |
| Mid | |
| High | |
| | |

Operating Modes Investigated: Cellular Mode PCS Mode

Antennas Investigated: PSTGO-1900SCI PSTGO-900 / 1900SCI

| Data Rates Investigated: | |
|--------------------------|--|
| Maximum | |

Power Input Settings Investigated:

120 VAC, 60 Hz.

| Software\Firmware Applied During Test | | | | | | | | | | | |
|---------------------------------------|-----------------------------|---------------------------------|----------------------------|--|--|--|--|--|--|--|--|
| Exercise software | Sierra FCC_SMART | Version | v0.47 | | | | | | | | |
| Description | | | | | | | | | | | |
| The system was tested us | ing special software develo | pped to test all functions of t | he device during the test. | | | | | | | | |

EUT and Peripherals

| Description | Manufacturer | Model/Part Number | Serial Number |
|------------------|---------------------|---------------------|---------------|
| Antenna | Mobile Mark | PSTGO-1900SCI | N/A |
| Antenna | Mobile Mark | PSTGO-900 / 1900SCI | N/A |
| Host Device | Intermec | 700C | 08200300372 |
| EUT-Radio | Sierra Wireless | SB555 | 63020FB8 |
| AC Power Adapter | ELPAC Power Systems | FW1812 | 009605 |

Cables

| Cable Type | Shield | Length (m) | Ferrite | Connection 1 | Connection 2 |
|------------|--------|------------|---------|------------------|--------------|
| AC Power | No | 1.65 | No | AC Power Adapter | AC Mains |
| DC Leads | PA | 1.9 | PA | Host Device | AC Adapter |

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 |
|---------------------------|-------------------|--------|------------|------------|----------|
| Spectrum Analyzer | Hewlett-Packard | 8566B | AAL | 01/07/2003 | 12 mo |
| Spectrum Analyzer Display | Hewlett Packard | 85662A | AALD | 01/07/2003 | 12 mo |
| Antenna, Biconilog | EMCO | 3141 | AXE | 12/31/2001 | 36 mo |
| Antenna, Horn | EMCO | 3115 | AHC | 08/12/2002 | 15 mo |
| Antenna, Dipole | Compliance Design | A100 | ADB | 12/26/2002 | 36 mo |
| Antenna, Horn | EMCO | 3115 | AHF | 03/18/2003 | 12 mo |
| Signal Generator | Hewlett Packard | 8341B | TGN | 12/20/2002 | 12 mo |
| Power Meter | Hewlett Packard | E4418A | SPA | 06/21/2002 | 24 mo |

Test Description

<u>Requirement</u>: Per 2.1043, the peak power of the modulated carrier was measured. The applicable limits are 22.913(a) for the cellular band, and 24.232(b) for the PCS band.

Per 22.913(a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

Per 24.232(b), Mobile/portable stations are limited to 2 Watts e.i.r.p. peak power.

Configuration: Spectrum analyzer, signal generator, and linearly polarized antennas were used to measure the fundamental emissions. The orientation of the EUT was varied in 3 orthogonal axes to maximize the level of emissions. The EUT was configured to transmit at the highest output at low, mid, and high channels. The EUT was tested with each antenna. Only one antenna can be used at a time.

The substitution method as described in TIA/EIA-603 Section 2.2.12 was used.

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 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 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 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 (ERP or e.i.r.p) is determined for each radiated emission.



Test Setup Diagram

Test Setup for Field Strength Measurements





Test Setup for Power Measurements Utilizing the Antenna Substitution Method



During field strength measurements, the amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a ½ wave dipole (at the same height) 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.

Signal Generator

The spectrum analyzer is monitored to verify that the output of the signal generator produces a signal equal in amplitude to a previously measured spurious emission.

Completed by: Porty to Relenge

| | est C | | | | | E | ffe | eci | tiv | e | Ra | adi | a | tec | | Pow | er | | | | | | REV df4.00 08/12/2003 |
|----------------------------|-----------|----------------------|-----------|----------|-----------------|--------|--------------------|---------|---------|---------|---------|----------|-------|----------|--|----------------|-----------|-------------|---------|--------------|---------|-----|-----------------------------|
| | EUT: | SB555 F | Radio | | | | | | | | | | | | | | | ١ | Nork | Order: | INMC0 | 102 | |
| Serial N | Number: | Unknow | /n | | | | | | | | | | | | | | | | | Date: | 08/21/0 | 3 | |
| Cu | stomer: | INTERM | IEC Tee | chnolo | gies Co | orpo | ratior | ۱ | | | | | | | | | | Te | empe | rature: | 75 | | |
| Att | endees: | N/A | | | | | | | | | | | | | | | | | Hur | midity: | 39% | | |
| Cust. F | Ref. No.: | | | | | | | | | | | | | | | | Bar | ometi | ric Pre | essure | 29.94 | | |
| Те | sted by: | Rod Pel | oquin | | | | | | | | | Powe | er: 1 | 20VA | C/6 | OHz | | | Jo | b Site: | EV01 | | |
| TEST SPEC | IFICATI | ONS | | | | | | | | | | | | | | | _ | | | | | | |
| Speci | fication: | FCC Pa | rt 22.91 | 3(a) | | | | | | | | | | | | | | | | Year: | 2002 | | |
| | Method: | TIA/EIA· | -603 | | | | | | | | | | | | | | | | | Year: | 1998 | | |
| SAMPLE CA | ALCULA | TIONS | | | | | | | | | | | | | | | | | | | | | |
| Radiated E | missions: | Field Stren | ngth = Me | asured L | _evel + Ar | ntenna | Facto | r + Ca | ble Fac | tor - / | Amplifi | er Gain | + Dis | stance A | djus | tment Factor + | - Externa | al Atter | nuation | 1 | | | |
| Conducted E | missions: | Adjusted L | evel = M | easured | Level + T | ransd | ucer Fa | actor + | - Cable | Atten | uation | Factor - | - Ext | ernal At | tenu | ator | | | | | | _ | |
| SB555 radio in | TING N | st system v IODES | with PST | GO-900 / | / 1900SC | l ante | nna | | | | | | | | | | | | | | | | |
| transmitting | 0 5001 | TEOTO | TAND | | | | | | | | | | | | | | | | | | | | |
| DEVIATION No deviations | S FROM | FIESTS | TAND | ARD | | | | | | | | | | | | | | | | | | | |
| RESULTS | | | | | | | | | | | | | | | | | | | | | Run# | | |
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| r a 3 3 | | | | | | | | | | | | | | | | | | | | | | | |
| Other | | | | | | | | | | | | | т | | | | | | | | | | |
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| 10. | 0 | | | | | | | | | | | | | | | | | | | | | | _ |
| Е Др 0. | .0 | | | | | | | | | | | | | | | | | | | | | | |
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| -20. | .0 | | | | | | | | | | | | | | | | | | | | | | _ |
| -30. 8 | .0 | | 82 | 5.000 | | | 830 | .000 | | | 83 | 35.000 | | | | 840.000 | | | 845.0 | 000 | | 85 | 0.000 |
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| Freq | | | | | Azimu (dogro | uth | He | ight | | | | | | Polarit | ty | Detector | 1 | | E (a | IRP IBm) | | | ERP (Watte) |
| (MHz | .))() | | 1 | | (uegre | 0 | 9111 <i>)</i> N | 0 | 1 | | | | | | 20 | ם אם | 1 | | (a | | | | 0.075 |
| 030.70 | 0 | | | | 200. 101 | 0 | 1 | .0 | | | | | | | Jy Da | | | | 2 1 | 0.9 | | | 0.075 |
| 024.70 | 35 | | | | 191. | 0 | 1 | .ı 2 | | | | | | | Jy Da | | | | 1 | 9.0 0 1 | | | 000.0 |
| 030.00 | 50 10 | | | | 190. | 0 | 1 | .2 | | | | | | V-BIIC | Jg Jg | | | | 2 | U.I Q Q | | | 0.003 |
| δ24./(| 73 70 | | | | 199. | 0 | 1 | .2 | | | | | | v-BIIC | Jy Da | | | | 1 | 0.0 6 1 | | | 0.040 |
| 040.05 | 55 56 | | | | 198. | 0 | 1 | .u 2 | | | | | | | J. J. J. J | | | | 1 | ບ. I 5. ຊ | | | 0.020 |
| 848.66 | טנ | | | | 175. | U | 1 | .∠ | | | | | | V-BIIC | y | ۲ň | | | 1 | 0.0 | | | 0.023 |

| NO | RTHWEST | | E | ffect | ive | Ra | adia | ated | Pow | er | | | REV df4.00 08/12/2003 |
|---------------------|---------------------------|-----------------------------------|-------------------|---------------|------------|----------|--------------|------------------|-------------|------------------|------------------|--------|-----------------------------|
| | EUT: | SB555 Radio | | | | | | | | l l | Nork Order: INI | MC0102 | |
| Se | erial Number: | Unknown | | | | | | | | | Date: 08/ | /21/03 | |
| | Customer: | INTERMEC Techno | logies Corpor | ation | | | | | | Te | emperature: 75 | | |
| | Attendees: | N/A | | | | | | | | | Humidity: 39 | % | |
| С | ust. Ref. No.: | | | | | | | | | Barometr | ric Pressure 29. | .94 | |
| | Tested by: | Rod Peloquin | | | | | Power: | 120VAC/60 |)Hz | | Job Site: EV | 01 | |
| TEST S | PECIFICATI | ONS | | | | | | | | | | | |
| S | Specification: Method: | FCC Part 24.232(b) TIA/EIA-603 | | | | | | | | | | | |
| SAMPL | E CALCULA | TIONS | | | | | | | | | | | |
| Radia | ated Emissions: | Field Strength = Measured | d Level + Antenna | Factor + Cab | le Factor | - Amplif | ier Gain + I | Distance Adjust | ment Factor | + External Atten | nuation | | |
| Condu | cted Emissions: | Adjusted Level = Measure | d Level + Transdu | ucer Factor + | Cable Atte | enuatior | n Factor + E | External Attenua | ator | | | | |
| SB555 ra | ENTS dio in 700C hos | st system with PSTGO-90 | 0 / 1900SCI antei | nna | | | | | | | | | |
| EUT OF transmitt | PERATING N | IODES | | | | | | | | | | | |
| DEVIAT | | I TEST STANDARD | | | | | | | | | | | |
| No deviat | tions. | | | | | | | | | | | | |
| RESUL | TS | | | | | | | | | | Ru | n # | |
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| | 35.0 | | | | | | | | | | | | |
| | 30.0 | | | | | | • | | | | | | |
| | 25.0 | | | | | | • | | | | | | _ |
| | 20.0 | | | | | | | | | | | | _ |
| dBm | 15.0 | | | | | | | | | | | | _ |
| | 10.0 | | | | | | | | | | | | _ |
| | 5.0 | | | | | | | | | | | | _ |
| | 0.0 | | | | | | | | | | | | _ |
| | -5.0 | | | | | | | | | | | | _ |
| | -10.0 | 1850.000 | 1860.000 | 1870 | 000 | 18 | 80.000 | 1890 (| | 1900 000 | 1910.000 | 10 | 20.000 |
| | 1040.000 | 1030.000 | 1000.000 | 1070 | .000 | 10 | MHz | 1090. | 500 | 1900.000 | 1910.000 | 10 | 20.000 |
| | | | | | | | | | | | | | |
| | Freq | | Azimuth | Height | | | | Polarity | Detector | | EIRP (dBm) | | EIRP |
| (| IVIHZ) | | (uegrees) | (1 1 1 | | | | H-Horn | סע | | (ubiii) 28 F | | 0 700 |
| 19 | 270 614 | | 191.0 | 1.1 | | | | | רא סע | | ∠0.0 27.2 | | 0.708 |
| 18 | 00 652 | | 195.0 | 1.5 | | | | | РК DV | | 21.3 | | 0.041 |
| 19 | 109.002 | | 275.0 | 1.0 | | | | | PK | | 29.1 26 F | | 0.016 |
| 18 | 049.001 | | 238.U | 1.1 | | | | | PK | | 20.5 | | 0.442 |
| 18 | 019.014 | | 345.0 | 1.0 | | | | V-HOM | PK | | ∠ö.9 | | 0.769 |
| 18 | 49.700 | | 301.0 | 1.3 | | | | v-Horn | РK | | 27.0 | | 0.502 |

| NO | INC | | E | ffect | ive | e R | adia | ate | d | Pov | ve | r | | | | | | REV df4.00 08/12/2003 |
|-----------|-----------------|---------------------------|-----------------|--------------|----------|----------------------|--------------|----------|---------|----------|----------|------------|---------------|---------|---------|---------|------|-----------------------------|
| | EUT: | SB555 Radio | | | | | | | | | | | Wo | ork Orc | ler: IN | IMC010 | 2 | |
| Se | erial Number: | Unknown | | | | | | | | | | | | Da | ate: 08 | 8/21/03 | | |
| | Customer: | INTERMEC Technolo | ogies Corpoi | ration | | | | | | | | | Tem | peratu | ire: 7 | 5 | | |
| | Attendees: | N/A | | | | | | | | | | | | Humid | ity: 39 | 9% | | |
| С | ust. Ref. No.: | | | | | | | | | | | Baron | netric | Press | ure 29 | 9.94 | | |
| | Tested by: | Rod Peloquin | | | | | Power | : 120V | AC/60 | OHz | | | | Job S | ite: E | V01 | | |
| TEST S | PECIFICATI | ONS | | | | | | | | | _ | | | | | | | |
| S | Specification: | FCC Part 24E | | | | | | | | | | | | Ye | ear: 20 | 002 | | |
| CAMDI | Method: | TIA/EIA-603 | | | | | | | | | | | | Ye | ear: 1 | 998 | | |
| SAMPL | | Field Strength Massured | | Faster / Cal | le Feste | n Amerika | ifier Cain 1 | Distance | Adius | mant Fac | 444 V E. | uterreal A | | 41 m m | | | | |
| Condu | ated Emissions: | Adjusted Level Measured | Level + Antenna | Factor + Cat | | r - Ampi topuotio | n Footor | Distance | Adjus | ment Fac | tor + E | xternal F | Attenua | tion | | | | |
| COMME | | Aujusted Level - Measured | | | Cable At | tentuatio | ITT actor + | External | Allenia | ator | | | | | | | | |
| SB555 ra | dio in 700C hos | st system with PSTGO-190 | 0SCI antenna | | | | | | | | | | | | | | | |
| transmitt | ing | | | | | | | | | | | | | | | | | |
| DEVIAT | | I TEST STANDARD | | | | | | | | | | | | | | | | |
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| | -10.0 | | | | | | | | | | | | | | | | | |
| | 1940.000 | 1950.000 | 1960.000 | 1070 | 000 | 10 | 000 000 | 1 | 000 | 000 | 10 | | h | 101 | 0 000 | | 1000 | 000 |
| | 1840.000 | 1850.000 | 1860.000 | 1870 | .000 | 10 | 580.000 | 1 | 890. | 000 | 19 | 00.000 | J | 191 | 0.000 |) | 1920 | 0.000 |
| | | | | | | | MHz | | | | | | | | | | | |
| <u> </u> | Freq | | Azimuth | Height | | | | Pola | rity | Detect | or | | | EIRP | | | Τ | EIRP |
| (| (MHz) | | (degrees) | (meters) | | | | | | | | | | (dBm) |) | | | (Watts) |
| 18 | 349.700 | | 245.0 | 1.1 | | | | H-H | orn | PK | | | | 28.1 | | | | 0.639 |
| 18 | 379.652 | | 187.0 | 1.5 | | | | H-H | orn | PK | | | | 25.4 | | | | 0.349 |
| 19 | 09.700 | | 208.0 | 1.4 | | | | H-H | orn | PK | | | | 24.6 | | | | 0.289 |
| 18 | 349.700 | | 300.0 | 1.4 | | | | V-H | orn | PK | | | | 27.0 | | | | 0.502 |
| 18 | 379.652 | | 309.0 | 1.3 | | | | V-H | orn | PK | | | | 25.8 | | | | 0.377 |
| 19 | 09.700 | | 14.0 | 1.7 | | | | V-H | orn | PK | | | | 25.1 | | | | 0.325 |





