

# Exhibit A: Spurious Radiated Emissions

## FCC ID: HN2ABTM3-2

**Purpose:** This exhibit was used for the certification of FCC ID: HN2SB555. While simultaneously transmitting, spurious emissions from FCC ID: HN2SB555 were compared to 22.917(e) and 24.238(a) limits; and spurious emissions from FCC ID: HN22011B were compared to 15.247(c) limits.

**Simultaneous Transmission:** FCC ID: HN2ABTM3-2 will be co-located with two other radios: FCC ID:HN2SB555 (CDMA radio), and FCC ID:HN22011B (802.11(b) radio). Any two of the three radios can transmit simultaneously. All three radios cannot 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.**

Since FCCID: HN2ABTM3-2 has such a low EIRP (.001W) and is a frequency hopper, the worst case simultaneous transmission mode was determined to be the CDMA radio transmitting simultaneously with the 802.11(b) radio (EIRP = 0.056 W & single channel operation). The CDMA radio was tested in both cellular and PCS modes while simultaneously transmitting with the 802.11(b) radio. Simultaneous low, mid, and high transmit frequencies were investigated from 30 MHz to 25 GHz.

In addition, all the possible combinations of harmonic emissions from the CDMA radio and the 802.11(b) radio were compared numerically. It was determined that only channels 526 (1876 MHz) and 930 (1896 MHz) in PCS mode could have harmonic emissions that coincide with the center frequency of harmonic emissions from the 802.11(b) radio (tuned to channels 1 (2412 MHz) and 6 (2437 MHz) respectively). The frequency range from 10 to 18 GHz was investigated for these channel combinations.

## 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
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Mid
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High
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### Operating Modes Investigated:

PSC Mode
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Cellular Mode
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PSC Mode simultaneously transmitting with co-located 802.11(b) radio
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Cellular Mode simultaneously transmitting with co-located 802.11(b) radio
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### Antennas Investigated:

PSTGO-1900SCI
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PSTGO-900 / 1900SCI
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### Data Rates Investigated:

Maximum
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### Power Input Settings Investigated:

Battery
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### Frequency Range Investigated

Start Frequency	30 MHz	Stop Frequency	25 GHz
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### Software\Firmware Applied During Test

Exercise software	Sierra SMART	Version	V.046
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Description
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The system was tested using special software developed to test all functions of the device during the test.
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## Equipment Modifications

No EMI suppression devices were added or modified. The EUT was tested as delivered.

## EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT-Radio	Intermec	SB555	6301FEOC
Host Device	Intermec	700C	E02093050443010
Antenna	Mobile Mark	PSTGO-1900SCI	N/A
Antenna	Mobile Mark	PSTGO-900 / 1900SCI	N/A

## Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
N/A	N/A	N/A	N/A	N/A	N/A

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	03/19/2002	12 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	12/03/2001	14 mo
Antenna, Biconilog	EMCO	3141	AXE	12/31/2001	36 mo
Antenna, Horn	EMCO	3115	AHJ	05/23/2002	12 mo
Pre-Amplifier	Miteq	AMF-4D-010120-30-10P	AOP	07/09/2002	12 mo
Spectrum Analyzer	Tektronix	2784	AAO	03/08/2001	24 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	01/17/2000	36 mo
Antenna, Horn	EMCO	3160-09	AHG	01/15/2000	36 mo
DC Power Supply	Topward	TPS-2000	TPD	NCR	N/A
Signal Generator	Hewlett-Packard	8341B	TGM	01/09/02	12 mo
Antenna, Horn	EMCO	3115	AHF	03/03/02	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 22.917(e) for the cellular band, and 24.238(a) for the PCS band.

Per 22.917(e), the mean power of out of band emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least  $43 + 10 \log (P)$  dB. (-13 dBm).

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 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 for the highest spurious emissions. The EUT was tested individually, then while simultaneously transmitting with a co-located radio.

**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 placed 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  $\frac{1}{2}$  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  $\frac{1}{2}$  wave dipole antenna is determined for each radiated spurious emission.

For the purposes of preliminary measurements, the field strength of the spurious emissions can be measured and compared with a 3 meter limit. The final measurements must be made utilizing the substitution method described above. The 3 meter limit was calculated to be 84.3 dBuV/m at 3 meters. This was based upon an output power of 0.224 W.

**Simultaneous Transmission:** The EUT will be co-located with two other radios: FCC ID:HN22011B (802.11(b) radio), and FCC ID:HN2ABTM3-2 (Bluetooth radio). Any two of the three radios can transmit simultaneously. All three radios cannot 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.**

Since the Bluetooth radio has such a low EIRP (.001W) and is a frequency hopper, the worst case simultaneous transmission mode was determined to be the EUT transmitting simultaneously with the 802.11(b) radio (EIRP = 0.056 W & single channel operation). The EUT was tested in both cellular and PCS modes while simultaneously transmitting with the 802.11(b) radio. Simultaneous low, mid, and high transmit frequencies were investigated from 30 MHz to 25 GHz.

In addition, all the possible combinations of harmonic emissions from the EUT and the 802.11(b) radio were compared numerically. It was determined that only channels 526 (1876 MHz) and 930 (1896 MHz) in PCS mode could have harmonic emissions that coincide with the center frequency of harmonic emissions from the 802.11(b) radio (tuned to channels 1 (2412 MHz) and 6 (2437 MHz) respectively). The frequency range from 10 to 18 GHz was investigated for these channel combinations.

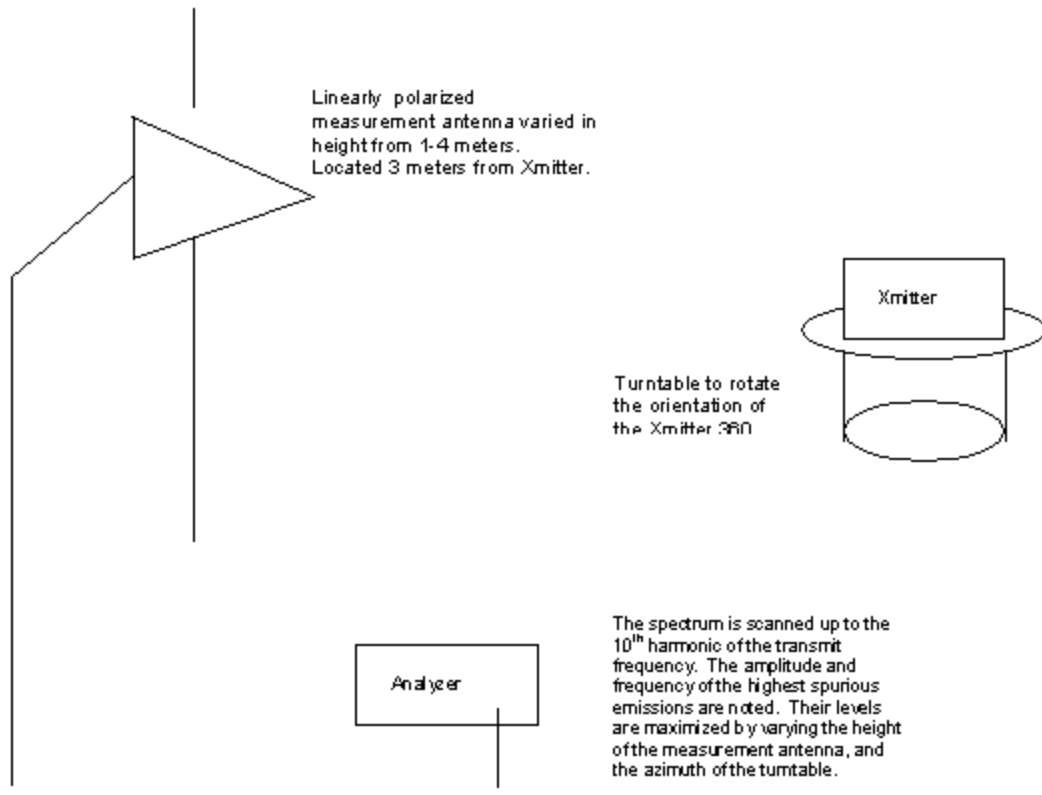
### Bandwidths Used for Measurements

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

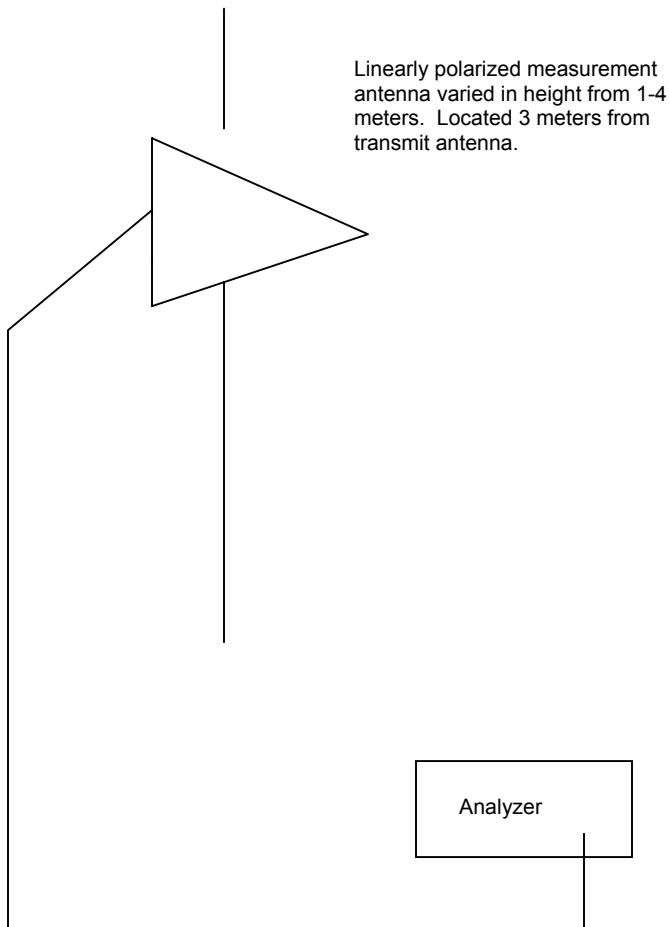
*Measurements were made using the bandwidths and detectors specified. No video filter was used.*

## Test Setup Diagram

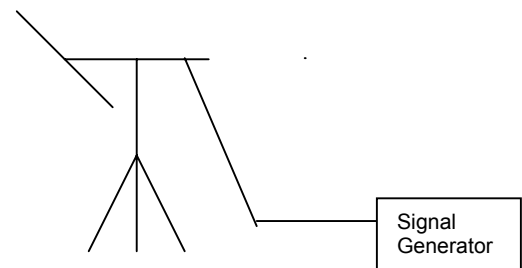
## Test Setup for Field Strength Measurements



## 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  $\frac{1}{2}$  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.



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:

*Rocky Lee Felting*

EUT: <b>SB555 Radio used in Model 700C</b>		Work Order: <b>INMC0044</b>
Serial Number: <b>6301FEOC</b>		Date: <b>12/31/02</b>
Customer: <b>INTERMEC Corporation</b>		Temperature: <b>73</b>
Attendees: <b>None</b>		Humidity: <b>34%</b>
Cust. Ref. No.:		Barometric Pressure: <b>29.75</b>
Tested by: <b>Rod Peloquin</b>	Power: <b>Battery</b>	Job Site: <b>EV01</b>

<b>TEST SPECIFICATIONS</b>	
Specification: <b>FCC Part 24E</b>	Year: <b>2002</b>
Method: <b>TIA/EIA-603</b>	Year: <b>1998</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**  
 Antenna PSTGO-900 / 1900SCI

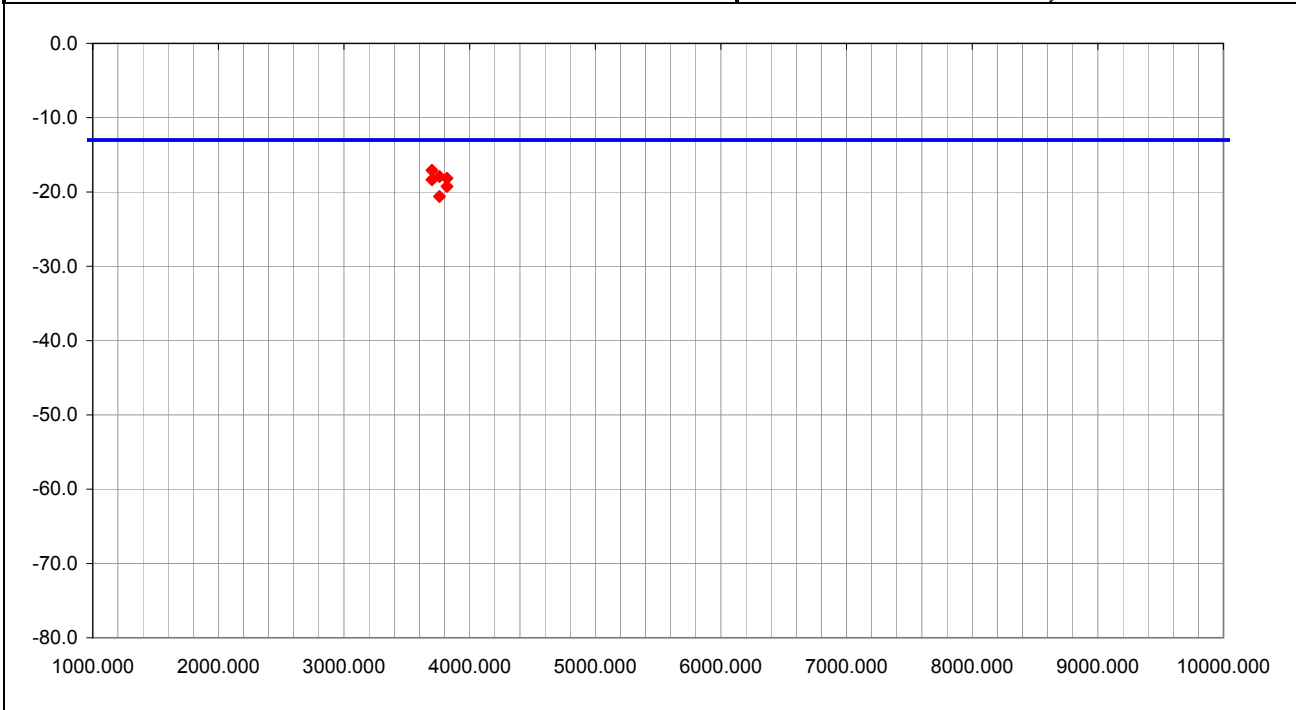
**EUT OPERATING MODES**  
 Transmitting in PCS mode and 802.11(b) mode

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Test Distance (m)	Run #
Pass	3	14

Other

  
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 Tested By:



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
3699.356	71.0	2.0	H-Horn	PK	-17.1	-13.0	-4.1	Low Channel
3759.348	49.0	1.9	H-Horn	PK	-17.9	-13.0	-4.9	Mid Channel
3819.360	20.0	1.9	H-Horn	PK	-19.2	-13.0	-6.2	High Channel
3819.360	344.0	1.0	V-Horn	PK	-18.2	-13.0	-5.2	High Channel
3699.356	153.0	1.0	V-Horn	PK	-18.3	-13.0	-5.3	Low Channel
3759.400	355.0	1.3	V-Horn	PK	-20.6	-13.0	-7.6	Mid Channel

# Apparent Power Data Sheet

EUT: SB555 Radio used in Model 700C		Work Order: INMC0044
Serial Number: 6301FEOC		Date: 12/31/02
Customer: INTERMEC Corporation		Temperature: 73
Attendees: None		Humidity: 34%
Cust. Ref. No.:		Barometric Pressure: 29.75
Tested by: Rod Peloquin	Power: Battery	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	
Specification: FCC Part 22.901(d)	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**  
 Antenna PSTGO-900 / 1900SCI

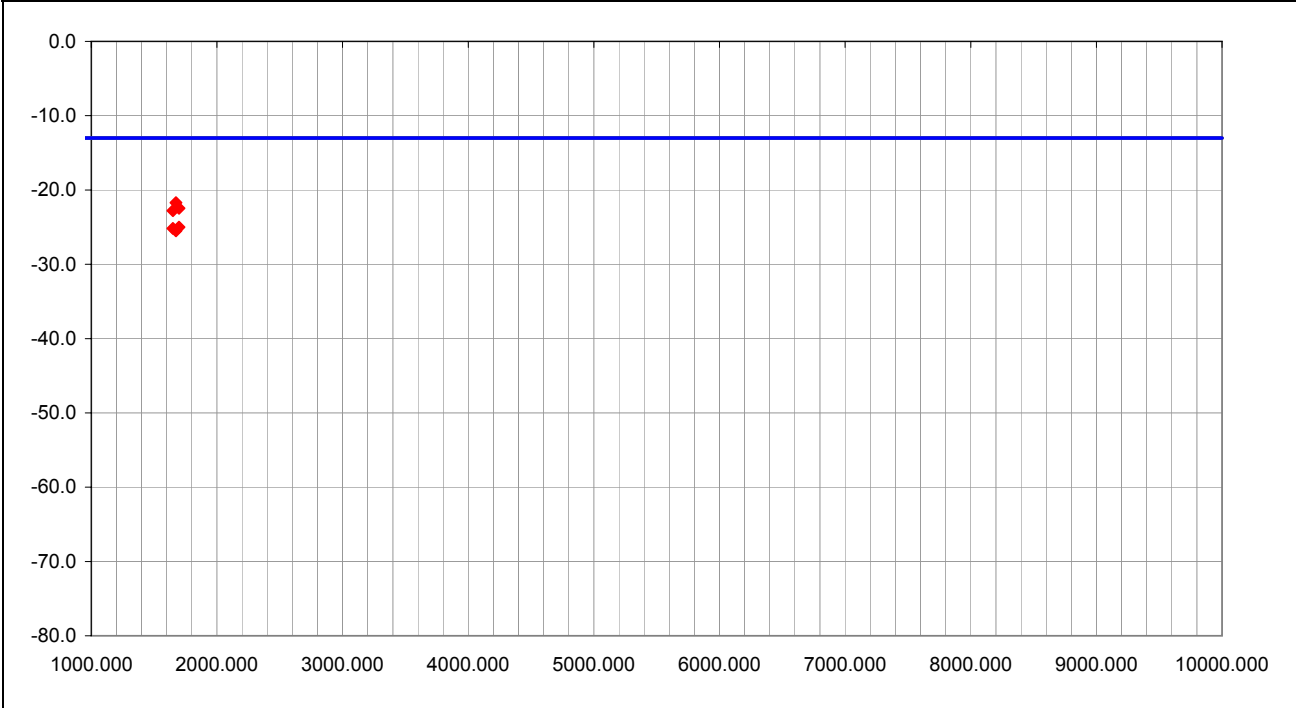
**EUT OPERATING MODES**  
 Transmitting in Cellular mode and 802.11(b) mode

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Test Distance (m)	Run #
Pass	3	16

Other

  
 Tested By: \_\_\_\_\_



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
1673.360	319.0	1.2	V-Horn	PK	-21.7	-13.0	-8.7	Mid Channel
1697.360	113.0	1.3	H-Horn	PK	-25.0	-13.0	-12.0	High Channel
1697.360	19.0	1.2	V-Horn	PK	-22.5	-13.0	-9.5	High Channel
1649.360	78.0	1.3	H-Horn	PK	-25.2	-13.0	-12.2	Low Channel
1649.360	116.0	1.2	V-Horn	PK	-22.8	-13.0	-9.8	Low Channel
1673.360	176.0	1.3	H-Horn	PK	-25.5	-13.0	-12.5	Mid Channel



# OATS DATA SHEET

EUT: SB555 Radio used in Model 700C		Work Order: INMC0044
Serial Number: 6301FEOC	Date: 01/02/03	
Customer: INTERMEC Corporation	Temperature: 72	
Attendees: None	Humidity: 35%	
Cust. Ref. No.:	Barometric Pressure: 29.92	
Tested by: Rod Peloquin	Power: Battery	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	
Specification: FCC Part 15.247(c)	Year: 2001
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**  
 Antenna PSTGO-900 / 1900SCI

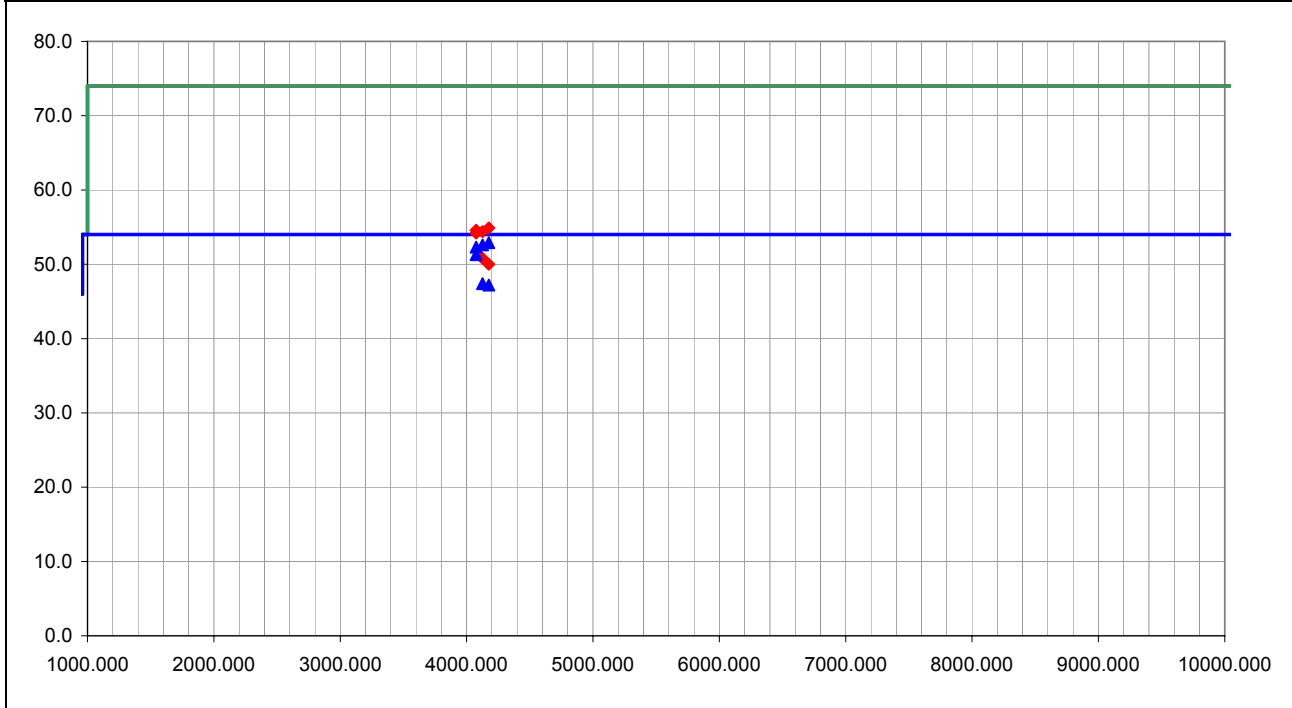
**EUT OPERATING MODES**  
 Transmitting in Cellular mode and 802.11(b) mode

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Test Distance (m)	Run #
Pass	3	18

**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
4176.000	47.0	5.9	16.0	1.3	3.0	0.0	H-Horn	AV	0.0	52.9	54.0	-1.1	High Channel
4126.000	46.6	6.0	360.0	1.7	3.0	0.0	H-Horn	AV	0.0	52.6	54.0	-1.4	Mid Channel
4076.000	46.3	6.0	86.0	1.3	3.0	0.0	V-Horn	AV	0.0	52.3	54.0	-1.7	Low Channel
4076.000	45.3	6.0	66.0	1.8	3.0	0.0	H-Horn	AV	0.0	51.3	54.0	-2.7	Low Channel
4126.000	41.4	6.0	348.0	1.3	3.0	0.0	V-Horn	AV	0.0	47.4	54.0	-6.6	Mid Channel
4176.000	41.3	5.9	342.0	1.1	3.0	0.0	V-Horn	AV	0.0	47.2	54.0	-6.8	High Channel
4176.000	49.0	5.9	16.0	1.3	3.0	0.0	H-Horn	PK	0.0	54.9	74.0	-19.1	High Channel
4076.000	48.6	6.0	86.0	1.3	3.0	0.0	V-Horn	PK	0.0	54.6	74.0	-19.4	Low Channel
4126.000	48.4	6.0	360.0	1.7	3.0	0.0	H-Horn	PK	0.0	54.4	74.0	-19.6	Mid Channel
4076.000	48.2	6.0	66.0	1.8	3.0	0.0	H-Horn	PK	0.0	54.2	74.0	-19.8	Low Channel
4126.000	44.8	6.0	348.0	1.3	3.0	0.0	V-Horn	PK	0.0	50.8	74.0	-23.2	Mid Channel
4176.000	44.1	5.9	329.0	1.2	3.0	0.0	V-Horn	PK	0.0	50.0	74.0	-24.0	High Channel

EUT: SB555 Radio used in Model 700C		Work Order: INMC0044
Serial Number: 6301FEOC		Date: 01/02/03
Customer: INTERMEC Corporation		Temperature: 73
Attendees: None		Humidity: 34%
Cust. Ref. No.:		Barometric Pressure: 29.75
Tested by: Rod Peloquin	Power: Battery	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	
Specification: FCC Part 15.247(c)	Year: 2001
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**  
 Antenna PSTGO-900 / 1900SCI

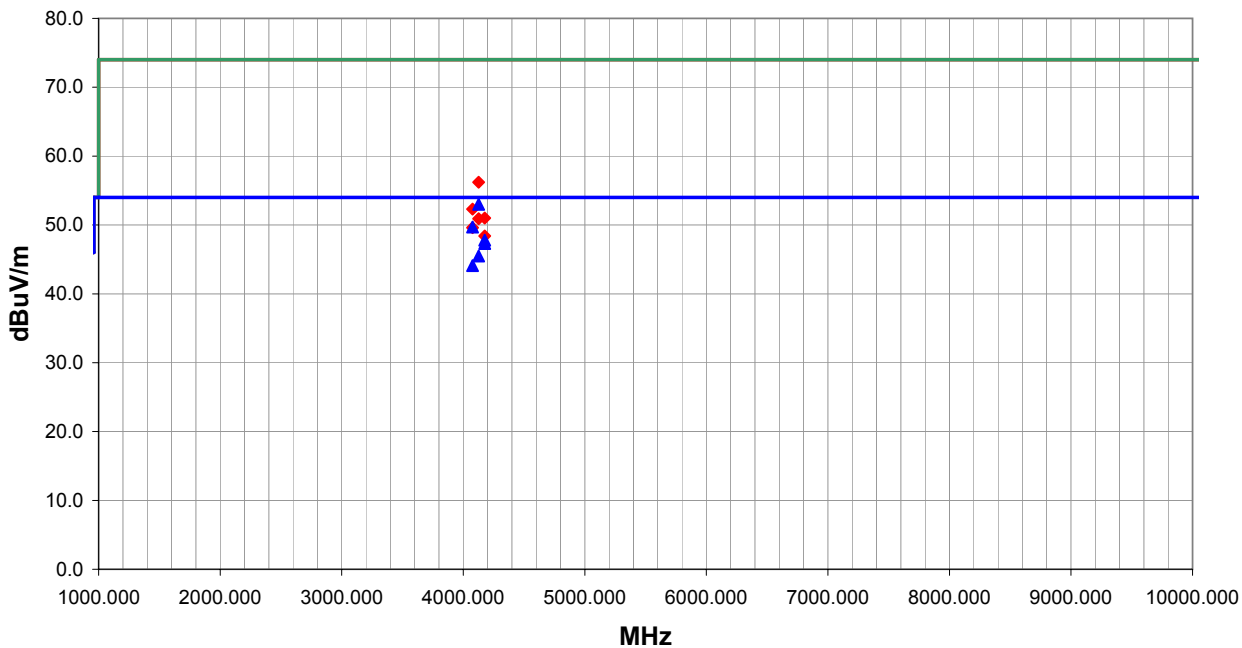
**EUT OPERATING MODES**  
 Transmitting in PCS mode and 802.11(b) mode

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Test Distance (m)	Run #
Pass	3	20

**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
4126.000	47.0	6.0	31.0	1.5	3.0	0.0	H-Horn	AV	0.0	53.0	54.0	-1.0	Mid Channel
4076.000	43.7	6.0	226.0	1.1	3.0	0.0	V-Horn	AV	0.0	49.7	54.0	-4.3	Low Channel
4176.000	41.9	5.9	57.0	1.2	3.0	0.0	V-Horn	AV	0.0	47.8	54.0	-6.2	High Channel
4176.000	41.4	5.9	143.0	1.3	3.0	0.0	H-Horn	AV	0.0	47.3	54.0	-6.7	High Channel
4126.000	39.5	6.0	135.0	1.2	3.0	0.0	V-Horn	AV	0.0	45.5	54.0	-8.5	Mid Channel
4076.000	38.1	6.0	221.0	1.3	3.0	0.0	H-Horn	AV	0.0	44.1	54.0	-9.9	Low Channel
4126.000	50.2	6.0	31.0	1.5	3.0	0.0	H-Horn	PK	0.0	56.2	74.0	-17.8	Mid Channel
4076.000	46.3	6.0	226.0	1.1	3.0	0.0	V-Horn	PK	0.0	52.3	74.0	-21.7	Low Channel
4176.000	45.1	5.9	143.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.0	74.0	-23.0	High Channel
4126.000	44.9	6.0	135.0	1.2	3.0	0.0	V-Horn	PK	0.0	50.9	74.0	-23.1	Mid Channel
4076.000	43.6	6.0	221.0	1.3	3.0	0.0	H-Horn	PK	0.0	49.6	74.0	-24.4	Low Channel
4176.000	42.5	5.9	145.0	1.2	3.0	0.0	V-Horn	PK	0.0	48.4	74.0	-25.6	High Channel

# Apparent Power Data Sheet

EUT: SB555 Radio used in Model 700C	Work Order: INMC0044
Serial Number: 6301FEOC	Date: 12/31/02
Customer: INTERMEC Corporation	Temperature: 75
Attendees: None	Humidity: 33%
Cust. Ref. No.:	Barometric Pressure: 29.75
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	
Specification: FCC Part 24E	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**  
 Antenna PSTGO-900 / 1900SCI

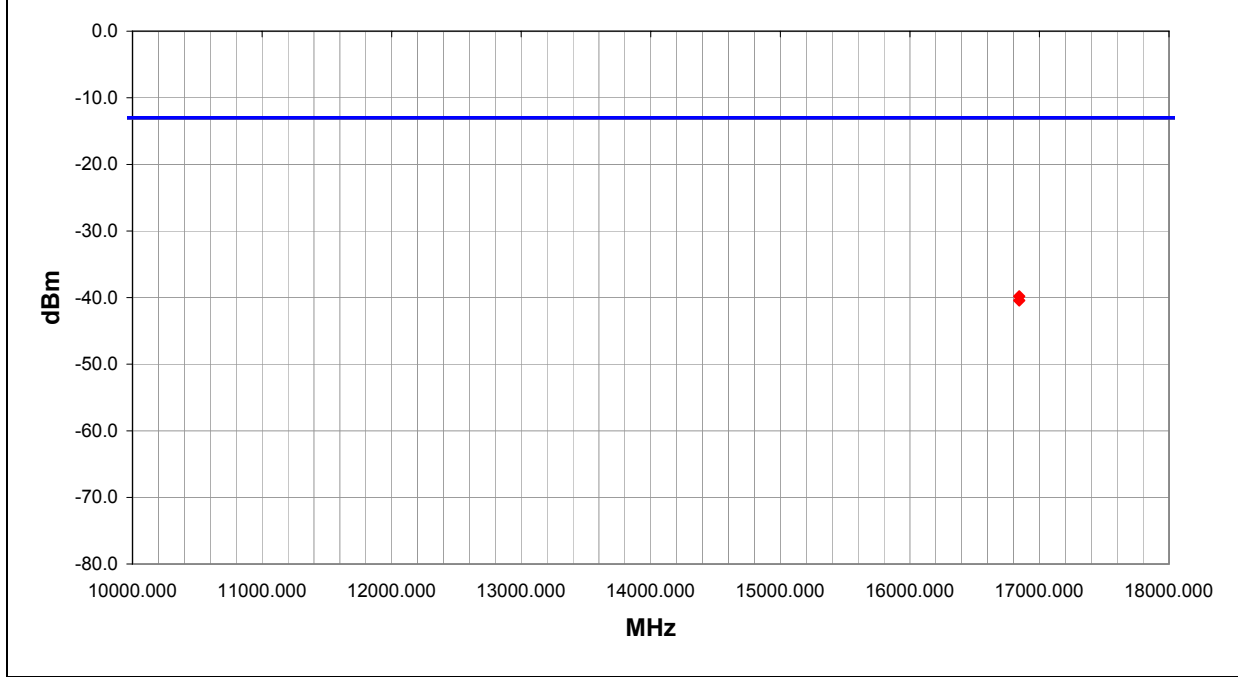
**EUT OPERATING MODES**  
 Transmitting in Channel 526 (1876MHz) PCS mode and Channel 1 (2412MHz) 802.11(b) mode

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

<b>RESULTS</b>	Test Distance (m)	Run #
Pass	1	22

Other

  
 \_\_\_\_\_  
 Tested By:



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)
16844.000	135.0	1.2	H-Horn	PK	-40.4	-13.0	-27.4
16844.000	140.0	1.2	V-Horn	PK	-39.8	-13.0	-26.8

# Apparent Power Data Sheet

EUT: SB555 Radio used in Model 700C	Work Order: INMC0044
Serial Number: 6301FEOC	Date: 12/31/02
Customer: INTERMEC Corporation	Temperature: 73
Attendees: None	Humidity: 34%
Cust. Ref. No.:	Barometric Pressure: 29.75
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

**TEST SPECIFICATIONS**

Specification: FCC Part 24E	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**

Antenna PSTGO-900 / 1900SCI

**EUT OPERATING MODES**

Transmitting in Channel 930 (1896MHz) PCS mode and Channel 6 (2437MHz) 802.11(b) mode

**DEVIATIONS FROM TEST STANDARD**

No deviations.

**RESULTS**

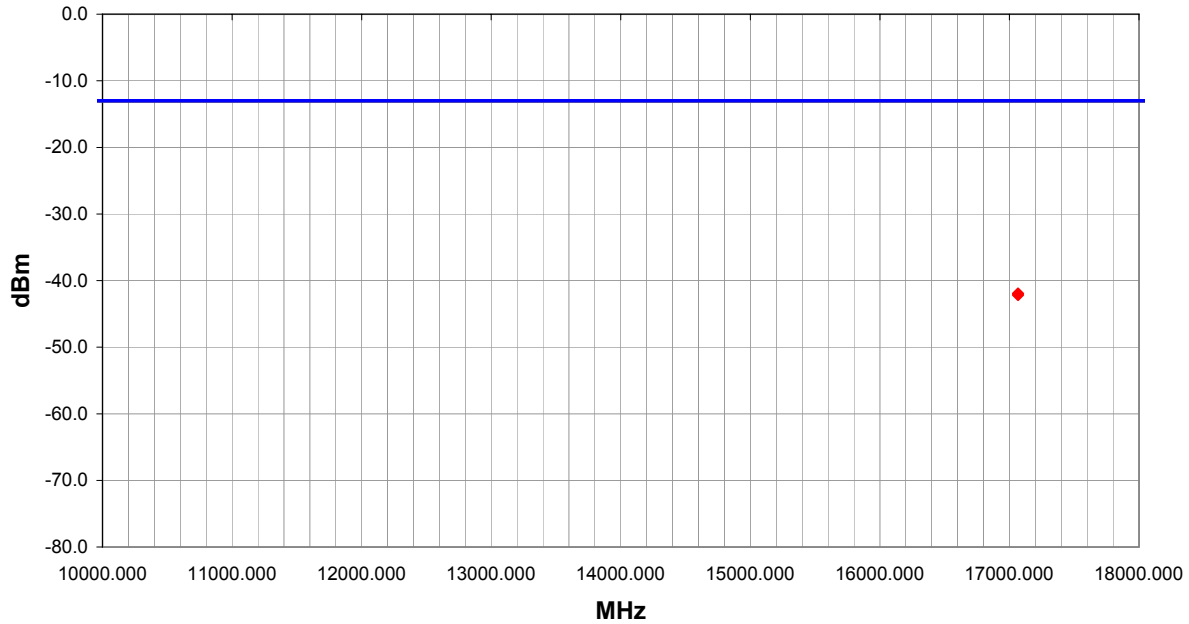
Test Distance (m)	Run #
1	24

Pass

**Other**



Tested By:



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)
17066.000	180.0	1.0	H-Horn	PK	-42.2	-13.0	-29.2
17066.000	180.0	1.0	V-Horn	PK	-41.9	-13.0	-28.9