Intermec
Technologies Corporation
EMC Test Laboratory
Cedar Rapids, IA

MEASUREMENT/TECHNICAL REPORT

Intermec Technologies Corporation
RF Identification (RFID) 2450 PC Card –5
2.4 GHz Spread Spectrum Transmitter

REPORT NO: 010312-1

DATE: March 12, 2001

APPENDIX F

THE FOLLOWING PAGES INCLUDE;

Average Radiated Spurious Emissions
Peak Radiated Spurious Emissions

Configuration
Radio as a module positioned horizontally
on a PCMCIA extender card.

Huber Suhner 3.5 dBi antenna

AVERAGE TRANSMITTER RADIATED SPURIOUS EMISSIONS

FCC ID: EHARFID2450PCC-5 **Intermec Technologies Corporation**

Product: Intermec 2450 MHz PCMCIA RFID Radio, PCB 144-886-003 **EMC Test Laboratory**

Set Up: Extended as a module placed HORIZONTAL, Huber Schuner 3.5 dBi linear gain **Cedar Rapids, IA**

Test Date (mm/dd/yy): 05/04/01 Standard: FCC 15.247

Measurement System Calibration Date: 4/18/00 Span 100 MHz, Res. B.W. 1 MHz, Video B.W. 3 kHz

Frequency (MHz)	Antenna Polarity	Spurious Measured dB(uV)	H.P.filter + Cable Loss (dB)	Antenna Correction Factor dB/M	Amplifier Gain (dB)	Calculated Result dB(uV)/M	AVERAGE Limit @ 1 Meter dB(uV)/Meter 50% duty cycle correction of 6dB	Margin (dB)
a	b	c	d	e	f	g	g	i
(formula)						(=c+d+e-f)		(=g-h)
Low Channel 02	**2402.000**	**MHz**						
1152	Vert	10.4	1.9	23.6		35.9	70	-34.1
(DSP CLK)	Hor	10.6	1.9	23.6		36.1	70	-33.9
1201.0	Vert	20.5	1.9	23.7		46.1	70	-23.9
(VCO)	Hor	31.6	1.9	23.7		57.2	70	-12.8
2402	Vert		3.6	27.9				
(Fc)	Hor		3.6	27.9				
3603.0	Vert	23.0	4.3	31.8	34.0	25.1	70	-44.9
(Fc + VCO)	Hor	23.1	4.3	31.8	34.0	25.2	70	-44.8
4804	Vert	53.9	4.5	32.7	33.1	58.0	70	-12.0
(Fc * 2)	Hor	54.6	4.5	32.7	33.1	58.7	70	-11.3
7206	Vert	45.6	6.2	36.6	33.4	55.0	70	-15.0
(Fc * 3)	Hor	44.2	6.2	36.6	33.4	53.6	70	-16.4
9608	Vert	38.5	6.6	37.5	33.9	48.7	70	-21.3
(Fc * 4)	Hor	36.2	6.6	37.5	33.9	46.4	70	-23.6
12010	Vert	40.3	7.8	38.9	32.8	54.2	70	-15.8
(Fc * 5)	Hor	40.8	7.8	38.9	32.8	54.7	70	-15.3
14412	Vert	32.2	8.4	41.0	31.7	49.9	70	-20.1
(Fc * 6)	Hor	32.4	8.4	41.0	31.7	50.1	70	-19.9
16814	Vert	32.5	9.5	40.0	31.8	50.2	70	-19.8
(Fc * 7)	Hor	31.8	9.5	40.0	31.8	49.5	70	-20.5
19216	Vert	39.8	0.7	44.2	31.2	53.5	70	-16.5
(Fc * 8)	Hor	39.9	0.7	44.2	31.2	53.6	70	-16.4
21618	Vert	39.2	0.5	45.5	30.5	54.7	70	-15.3
(Fc * 9)	Hor	39.5	0.5	45.5	30.5	55.0	70	-15.0
24020	Vert	39.1	2.4	45.8	31.0	56.3	70	-13.7
(Fc * 10)	Hor	39.9	2.4	45.8	31.0	57.1	70	-12.9

Frequency (MHz)	Antenna Polarity	Spurious Measured dB(uV)	H.P.filter + Cable Loss (dB)	Antenna Correction Factor dB/M	Amplifier Gain (dB)	Calculated Result dB(uV)/M	AVERAGE Limit @ 1 Meter dB(uV)/Meter 50% duty cycle correction of 6dB	Margin (dB)
a	b	c	d	e	f	g	h	i
(formula)						(=c+d+e-f)		(=g-h)
Middle Channel 41	**2441.000**	**MHz**						
1152	Vert	10.5	1.9	23.6		36.0	70	-34.0
(DSP CLK)	Hor	10.7	1.9	23.6		36.2	70	-33.8
1220.5	Vert	20.2	1.9	23.8		45.9	70	-24.1
(VCO)	Hor	29.9	1.9	23.8		55.6	70	-14.4
2441	Vert		1.2	27.9				
(Fc)	Hor		1.2	27.9				
3661.5	Vert	23.1	4.3	31.9	34.0	25.3	70	-44.7
(Fc + VCO)	Hor	23.2	4.3	31.9	34.0	25.4	70	-44.6
4882	Vert	55.3	4.5	32.4	33.1	59.1	70	-10.9
(Fc * 2)	Hor	54.0	4.5	32.4	33.1	57.8	70	-12.2
7323	Vert	43.3	6.0	36.8	33.4	52.7	70	-17.3
(Fc * 3)	Hor	45.2	6.0	36.8	33.4	54.6	70	-15.4
9764	Vert	40.3	6.2	37.8	33.8	50.5	70	-19.5
(Fc * 4)	Hor	38.8	6.2	37.8	33.8	49.0	70	-21.0
12205	Vert	46.0	7.3	39.0	32.6	59.7	70	-10.3
(Fc * 5)	Hor	46.5	7.3	39.0	32.6	60.2	70	-9.8
14646	Vert	31.7	8.4	40.7	31.8	49.0	70	-21.0
(Fc * 6)	Hor	31.7	8.4	40.7	31.8	49.0	70	-21.0
17087	Vert	31.7	9.6	40.9	31.7	50.5	70	-19.5
(Fc * 7)	Hor	31.8	9.6	40.9	31.7	50.6	70	-19.4
19528	Vert	39.8	1.1	44.5	31.4	54.0	70	-16.0
(Fc * 8)	Hor	39.7	1.1	44.5	31.4	53.9	70	-16.1
21969	Vert	39.7	1.9	45.5	30.8	56.3	70	-13.7
(Fc * 9)	Hor	39.6	1.9	45.5	30.8	56.2	70	-13.8
24410	Vert	40.2	3.2	46.3	31.4	58.3	70	-11.7
(Fc * 10)	Hor	40.2	3.2	46.3	31.4	58.3	70	-11.7

AVERAGE TRANSMITTER RADIATED SPURIOUS EMISSIONS

FCC ID: EHARFID2450PCC-5 **Intermec Technologies Corporation**

Product: Intermec 2450 MHz PCMCIA RFID Radio, PCB 144-886-003 **EMC Test Laboratory**

Set Up: Extended as a module placed HORIZONTAL, Huber Schuner 3.5 dBi linear gain **Cedar Rapids, IA**

Test Date (mm/dd/yy): 05/04/01 Standard: FCC 15.247

Measurement System Calibration Date: 4/18/00 Span 100 MHz, Res. B.W. 1 MHz, Video B.W. 3 kHz

Frequency (MHz)	Antenna Polarity	Spurious Measured dB(uV)	H.P.filter + Cable Loss (dB)	Antenna Correction Factor dB/M	Amplifier Gain (dB)	Calculated Result dB(uV)/M	AVERAGE Limit @ 1 Meter dB(uV)/Meter 50% duty cycle correction of 6dB	Margin (dB)
a	b	c	d	e	f	g	h	i
(formula)						(=c+d+e-f)		(=g-h)
High Channel 80	**2480.000**	**MHz**						
1152	Vert	10.4	1.9	23.6		35.9	70	-34.1
(DSP CLK)	Hor	10.5	1.9	23.6		36.0	70	-34.0
1240.0	Vert	20.9	1.9	23.9		46.7	70	-23.3
(VCO)	Hor	31.0	1.9	23.9		56.8	70	-13.2
2480	Vert		4.0	28.0				
(Fc)	Hor		4.2	28.0				
3720.0	Vert	23.3	5.0	32.0	34.0	26.3	70	-43.7
(Fc + VCO)	Hor	23.1	5.0	32.0	34.0	26.1	70	-43.9
4960	Vert	54.2	4.6	32.9	33.1	58.6	70	-11.4
(Fc * 2)	Hor	50.6	4.6	32.9	33.1	55.0	70	-15.0
7440	Vert	43.2	6.3	37.2	33.4	53.3	70	-16.7
(Fc * 3)	Hor	44.9	6.3	37.2	33.4	55.0	70	-15.0
9920	Vert	40.0	6.2	38.0	33.6	50.6	70	-19.4
(Fc * 4)	Hor	36.9	6.2	38.0	33.6	47.5	70	-22.5
12400	Vert	42.1	7.2	39.1	32.5	55.9	70	-14.1
(Fc * 5)	Hor	41.8	7.2	39.1	32.5	55.6	70	-14.4
14880	Vert	32.0	8.5	40.1	31.9	48.7	70	-21.3
(Fc * 6)	Hor	32.0	8.5	40.1	31.9	48.7	70	-21.3
17360	Vert	32.2	11.5	43.3	31.0	56.0	70	-14.0
(Fc * 7)	Hor	31.8	11.5	43.3	31.0	55.6	70	-14.4
19840	Vert	39.5	0.6	44.7	31.7	53.1	70	-16.9
(Fc * 8)	Hor	40.0	0.6	44.7	31.7	53.6	70	-16.4
22320	Vert	39.5	0.9	45.6	31.0	55.0	70	-15.0
(Fc * 9)	Hor	39.4	0.9	45.6	31.0	54.9	70	-15.1
24800	Vert	40.1	2.3	46.6	31.8	57.2	70	-12.8
(Fc * 10)	Hor	40.1	2.3	46.6	31.8	57.2	70	-12.8

AVERAGE TRANSMITTER RADIATED SPURIOUS EMISSIONS

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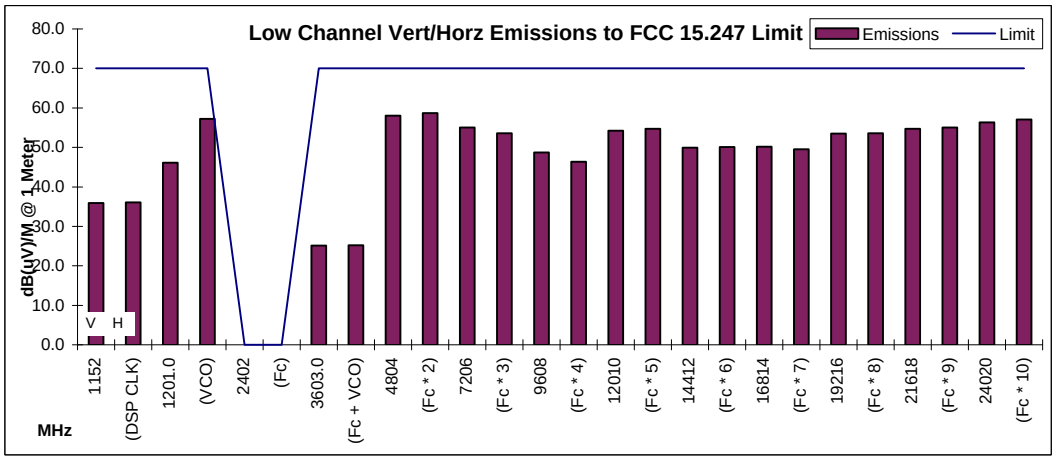
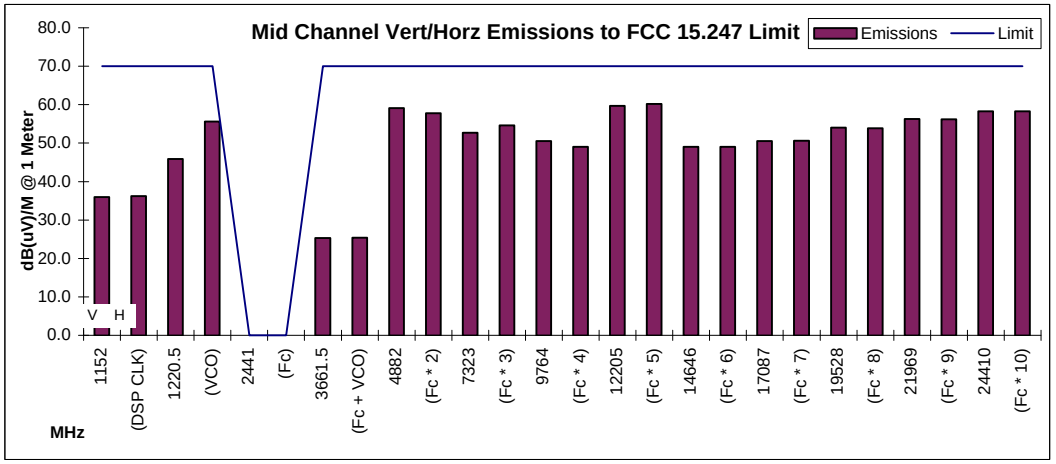
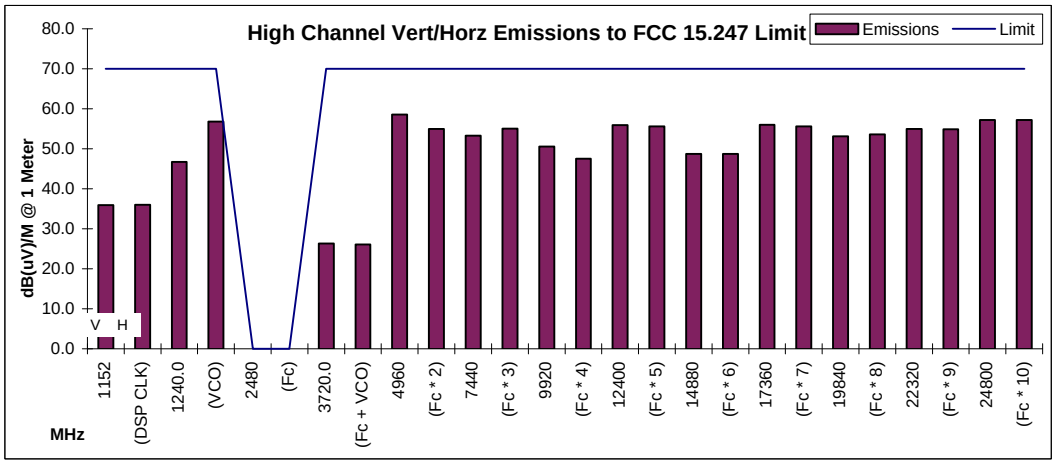
Test Date (mm/dd/yy): 05/04/01 | Standard: FCC 15.247

Measurement System Calibration Date: 4/18/00 | Span 100 MHz, Res. B.W. 1 MHz, Video B.W. 3 kHz







PEAK TRANSMITTER RADIATED SPURIOUS EMISSIONS

FCC ID: EHARFID2450PCC-5 **Intermec Technologies Corporation**

Product: Intermec 2450 MHz PCMCIA RFID Radio, PCB 144-886-003 **EMC Test Laboratory**

Set Up: Extended as a module placed HORIZONTAL, Huber Schuner 3.5 dBi linear gain **Cedar Rapids, IA**

Test Date (mm/dd/yy): 05/04/01 Standard: FCC 15.247

Measurement System Calibration Date: 4/18/00 Span 100 MHz, Res. B.W. 1 MHz, Video B.W. 1 MHz

Frequency (MHz)	Antenna Polarity	Spurious Measured dB(uV)	H.P.filter + Cable Loss (dB)	Antenna Correction Factor dB/M	Amplifier Gain (dB)	Calculated Result dB(uV)/M	PEAK Limit @ 1 Meter dB(uV)/Meter	Margin (dB)
a	b	c	d	e	f	g	h	i
(formula)						(=c+d+e-f)		(=g-h)
Low Channel 02	**2402.000**	**MHz**						
1152	Vert	19.0	1.9	23.6		44.5	84	-39.5
(DSP CLK)	Hor	18.8	1.9	23.6		44.3	84	-39.7
1201	Vert	23.6	1.9	23.7		49.2	84	-34.8
(VCO)	Hor	32.5	1.9	23.7		58.1	84	-25.9
2402	Vert		3.6	27.9				
(Fc)	Hor		3.6	27.9				
3603	Vert	41.2	4.3	31.8	34.0	43.3	84	-40.7
(Fc + VCO)	Hor	41.7	4.3	31.8	34.0	43.8	84	-40.2
4804	Vert	54.9	4.5	32.7	33.1	59.0	84	-25.0
(Fc * 2)	Hor	55.3	4.5	32.7	33.1	59.4	84	-24.6
7206	Vert	47.9	6.2	36.6	33.4	57.3	84	-26.7
(Fc * 3)	Hor	47.8	6.2	36.6	33.4	57.2	84	-26.8
9608	Vert	44.6	6.6	37.5	33.9	54.8	84	-29.2
(Fc * 4)	Hor	43.4	6.6	37.5	33.9	53.6	84	-30.4
12010	Vert	45.4	7.8	38.9	32.8	59.3	84	-24.7
(Fc * 5)	Hor	46.1	7.8	38.9	32.8	60.0	84	-24.0
14412	Vert	42.8	8.4	41.0	31.7	60.5	84	-23.5
(Fc * 6)	Hor	43.5	8.4	41.0	31.7	61.2	84	-22.8
16814	Vert	43.1	9.5	40.0	31.8	60.8	84	-23.2
(Fc * 7)	Hor	43.3	9.5	40.0	31.8	61.0	84	-23.0
19216	Vert	50.2	0.7	44.2	31.2	63.9	84	-20.1
(Fc * 8)	Hor	50.0	0.7	44.2	31.2	63.7	84	-20.3
21618	Vert	50.0	0.5	45.5	30.5	65.5	84	-18.5
(Fc * 9)	Hor	49.9	0.5	45.5	30.5	65.4	84	-18.6
24020	Vert	50.3	2.4	45.8	31.0	67.5	84	-16.5
(Fc * 10)	Hor	50.2	2.4	45.8	31.0	67.4	84	-16.6

Frequency (MHz)	Antenna Polarity	Spurious Measured dB(uV)	H.P.filter + Cable Loss (dB)	Antenna Correction Factor dB/M	Amplifier Gain (dB)	Calculated Result dB(uV)/M	PEAK Limit @ 1 Meter dB(uV)/Meter	Margin (dB)
a	b	c	d	e	f	g	h	i
(formula)						(=c+d+e-f)		(=g-h)
Middle Channel 41	**2441.000**	**MHz**						
1152	Vert	19.1	1.9	23.6		44.6	84	-39.4
(DSP CLK)	Hor	18.9	1.9	23.6		44.4	84	-39.6
1221	Vert	23.1	1.9	23.8		48.8	84	-35.2
(VCO)	Hor	30.6	1.9	23.8		56.3	84	-27.7
2441	Vert		1.2	27.9				
(Fc)	Hor		1.2	27.9				
3661.5	Vert	41.8	4.3	31.9	34.0	44.0	84	-40.0
(Fc + VCO)	Hor	41.7	4.3	31.9	34.0	43.9	84	-40.1
4882	Vert	55.9	4.5	32.4	33.1	59.7	84	-24.3
(Fc * 2)	Hor	54.7	4.5	32.4	33.1	58.5	84	-25.5
7323	Vert	46.7	6.0	36.8	33.4	56.1	84	-27.9
(Fc * 3)	Hor	48.7	6.0	36.8	33.4	58.1	84	-25.9
9764	Vert	45.1	6.2	37.8	33.8	55.3	84	-28.7
(Fc * 4)	Hor	44.9	6.2	37.8	33.8	55.1	84	-28.9
12205	Vert	48.7	7.3	39.0	32.6	62.4	84	-21.6
(Fc * 5)	Hor	49.0	7.3	39.0	32.6	62.7	84	-21.3
14646	Vert	43.3	8.4	40.7	31.8	60.6	84	-23.4
(Fc * 6)	Hor	43.3	8.4	40.7	31.8	60.6	84	-23.4
17087	Vert	43.2	9.6	40.9	31.7	62.0	84	-22.0
(Fc * 7)	Hor	43.1	9.6	40.9	31.7	61.9	84	-22.1
19528	Vert	50.2	1.1	44.5	31.4	64.4	84	-19.6
(Fc * 8)	Hor	49.9	1.1	44.5	31.4	64.1	84	-19.9
21969	Vert	50.6	1.9	45.5	30.8	67.2	84	-16.8
(Fc * 9)	Hor	50.3	1.9	45.5	30.8	66.9	84	-17.1
24410	Vert	51.2	3.2	46.3	31.4	69.3	84	-14.7
(Fc * 10)	Hor	50.8	3.2	46.3	31.4	68.9	84	-15.1

PEAK TRANSMITTER RADIATED SPURIOUS EMISSIONS

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a	b	c	d	e	f	g	h	i
(formula)						(=c+d+e-f)		(=g-h)
High Channel 80	**2480.000**	**MHz**						
1152	Vert	18.9	1.9	23.6		44.4	84	-39.6
(DSP CLK)	Hor	18.7	1.9	23.6		44.2	84	-39.8
1240	Vert	23.5	1.9	23.9		49.3	84	-34.7
(VCO)	Hor	31.3	1.9	23.9		57.1	84	-26.9
2480	Vert		4.0	28.0				
(Fc)	Hor		4.2	28.0				
3720	Vert	41.8	5.0	32.0	34.0	44.8	84	-39.2
(Fc + VCO)	Hor	41.5	5.0	32.0	34.0	44.5	84	-39.5
4960	Vert	54.9	4.6	32.9	33.1	59.3	84	-24.7
(Fc * 2)	Hor	51.8	4.6	32.9	33.1	56.2	84	-27.8
7440	Vert	46.8	6.3	37.2	33.4	56.9	84	-27.1
(Fc * 3)	Hor	48.2	6.3	37.2	33.4	58.3	84	-25.7
9920	Vert	44.9	6.2	38.0	33.6	55.5	84	-28.5
(Fc * 4)	Hor	43.7	6.2	38.0	33.6	54.3	84	-29.7
12400	Vert	46.7	7.2	39.1	32.5	60.5	84	-23.5
(Fc * 5)	Hor	46.1	7.2	39.1	32.5	59.9	84	-24.1
14880	Vert	43.1	8.5	40.1	31.9	59.8	84	-24.2
(Fc * 6)	Hor	43.1	8.5	40.1	31.9	59.8	84	-24.2
17360	Vert	43.1	11.5	43.3	31.0	66.9	84	-17.1
(Fc * 7)	Hor	43.0	11.5	43.3	31.0	66.8	84	-17.2
19840	Vert	50.6	0.6	44.7	31.7	64.2	84	-19.8
(Fc * 8)	Hor	50.5	0.6	44.7	31.7	64.1	84	-19.9
22320	Vert	50.5	0.9	45.6	31.0	66.0	84	-18.0
(Fc * 9)	Hor	50.8	0.9	45.6	31.0	66.3	84	-17.7
24800	Vert	50.7	2.3	46.6	31.8	67.8	84	-16.2
(Fc * 10)	Hor	51.0	2.3	46.6	31.8	68.1	84	-15.9

PEAK TRANSMITTER RADIATED SPURIOUS EMISSIONS

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