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## **1.0 GENERAL - Product Description**

The device under test is a Doorframe Proximity Reader which operates at 125kHz and is powered by a dc source. This Radio Frequency Identification (RFID) reader or proximity reader uses radio frequency to identify, locate and track people and objects that carry the appropriate transponders. Proximity reader can work in none line-of-sight situations and in darkness, bright sun light or through dirt, grimes and smudges.

File Number: BP7169  
Project Number: 98ME50398  
Model Number: Sentinal-Prox MM-6800  
FCC ID: XXXMM6800

Issued: February 3, 1999

## 1.1 Device Configuration During Test

The EUT was configured as a stand-alone device. Tests were performed with both a 5Vdc and 12Vdc supply connected to the EUT.

### 1.1.1 Deviations from ANSI C63.4 Standard Test Set-up

None

As described below:

## 1.2 Device Modifications Necessary for Compliance

N/A

As described below:

### Environmental conditions in the lab:

Temperature:	<u>Range</u> 20-25°C
Relative Humidity	30 - 60 %
Atmospheric pressure	680 - 1060 mbar

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## 2.0 EMISSIONS TEST REGULATIONS:

- EN 50081-1 /1992
  - EN 50081-2 /1993
  - EN 55011 / 3.1991
  - EN 55013 / 6.1990
  - EN 55014 / 2.1987
  - EN 55014 / 12.1993
  - EN 55015 / 1993
  - EN 55022 / 4.1987
  - EN 55020 / 1994
  - EN60555-2/1987, EN61000-3-2, 1995
  - EN60555-3/1987, EN61000-3-3, 1995
  - VCCI
  - FCC Part, 15, Subpart B
  - FCC Part, 15, Subpart C, Paragraph 15.209.
  - FCC Part 18
  - CISPR 11 (1990)
  - CISPR 14 (1993)
  - CISPR 22
  - DENTORI
  - AS3548
  - (OTHER) \_\_\_\_\_
- Group 1
  - Class A
  - Household appliances and similar
  - Portable tools
  - Semiconductor devices
  - Household appliances and similar
  - Portable tools
  - Semiconductor devices
  - Class A
  - Class 1
  - Class A
  - Class 1
  - Class 2
  - Class B
  - Class B
- Group 2
  - Class B

## 2.1 EUT OPERATION MODE - EMISSIONS TESTS:

- Standby
- Test program (H-Pattern)
- Test program (color bar)
- Test program (customer specific)
- Practice operation
- Normal operation Mode: continuous sense for entry badge
- As per manufacturer's instructions
- other

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FCC ID: XXXMM6800

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**2.1.1 Conducted Emissions Tests:**

Test Applicable     Test Not Applicable

**2.1.2 Conducted Click Emissions Tests:**

Test Applicable     Test Not Applicable

**2.2.1 Reserved for Future Use**

### 2.2.2 Radiated Emissions Test (10 Meter Semi-Anechoic Chamber):

Test Applicable     Test Not Applicable

#### All Data Pages located in Appendix A.

120kHz-30MHz Using Magnetic Loop Antenna

The measurement antenna distance  3  10 meters from the EUT.

30MHz-1000MHz

The measurement antenna distance  3  10 meters from the EUT.

Tests were performed on the transmitter in accordance with the limitations set forth by CFR47 FCC Part 15, Subpart B, Class A, Paragraph 15.209 and tested in accordance with the test procedures and methodologies in ANSI C63.4: 1992.

The EUT was checked throughout the frequency band 120KHz to 100MHz. The transmitter operated at 125KHz. The allowable field strength limits in accordance with 15.209 were applied to the frequency. All other emissions were tested in accordance with the general limitations in 15.209.

From 120KHz to 30MHz, measurements were made at a distance of 3 meters. The limit was adjusted using the 40dB/decade limit extrapolation method.

#### Test equipment used for final radiated emissions tests:

<input checked="" type="checkbox"/>	HP - 8566B	Hewlett-Packard	Spectrum Analyzer	Equipment No.: ME5-589
<input checked="" type="checkbox"/>	HP - 85662A	Hewlett-Packard	Analyzer Display	Equipment No.: ME5-590
<input checked="" type="checkbox"/>	HP - 85650A	Hewlett-Packard	Quasi-Peak Adapter	Equipment No.: ME5-591
<input checked="" type="checkbox"/>	HP - 85685A	Hewlett-Packard	Preselector	Equipment No.: ME5-588
<input type="checkbox"/>	NM- 17/27B	Carnel Labs	Field Intensity Meter	Equipment No.: ME5A-054
<input type="checkbox"/>	CCA7	Carnel Labs	CISPR Quasi-peak Adapter	Equipment No.: ME5A-053
<input type="checkbox"/>	R3261C	Advantest	Spectrum Analyzer	Equipment No.: ME5A-228
<input type="checkbox"/>	R3551	Advantest	Pre-Selector	Equipment No.: ME5A-229

#### Test Accessories:

<input checked="" type="checkbox"/>	6507	EMCO	Active Loop Antenna	Equipment No.: ME5A-288
<input type="checkbox"/>	94455-1	Ailtech	Biconnical Antenna	Equipment No.: ME5-439
<input type="checkbox"/>	3146	EMCO	Log Periodic Antenna	Equipment No.: ME5-451
<input type="checkbox"/>	3146	EMCO	Log Periodic Antenna	Equipment No.: ME5-811
<input checked="" type="checkbox"/>	3142	EMCO	BiconiLog Antenna	Equipment No.: ME5A-436
<input type="checkbox"/>	3142	EMCO	BiconiLog Antenna	Equipment No.: ME5A-261

### 2.2.3 RFI Power Measurements:

Test Applicable     Test Not Applicable

### 2.2.4 Harmonic Disturbances:

File Number: BP7169  
Project Number: 98ME50398  
Model Number: Sentinal-Prox MM-6800  
FCC ID: XXXMM6800

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**Test Applicable**     **Test Not Applicable**



### **2.3 EMISSIONS TEST RESULTS**

Conducted Emissions

- |   |                              |                                  |
|---|------------------------------|----------------------------------|
| <input type="checkbox"/> Voltage(Section 2.1.1) | <input type="checkbox"/> MET | <input type="checkbox"/> NOT MET |
| <input type="checkbox"/> Current(Section 2.1.1) | <input type="checkbox"/> MET | <input type="checkbox"/> NOT MET |
| <input type="checkbox"/> Clicks(Section 2.1.2)  | <input type="checkbox"/> MET | <input type="checkbox"/> NOT MET |

Radiated Emissions(Section 2.2.2)       MET       NOT MET

RFI Power(Section 2.2.3)       MET       NOT MET

Harmonic Disturbances

- |  |                              |                                  |
|--|------------------------------|----------------------------------|
| <input type="checkbox"/> Steady State(Section 2.2.4) | <input type="checkbox"/> MET | <input type="checkbox"/> NOT MET |
| <input type="checkbox"/> Fluctuating(Section 2.2.4)  | <input type="checkbox"/> MET | <input type="checkbox"/> NOT MET |

The tractability of the measurements contained in this report is achieved by the use of calibrated equipment which is traceable back to NIST.

### **3.0 IMMUNITY TEST REGULATIONS:**

- NOT APPLICABLE
- EN50082-1:1992
- EN50082-2:1995
- EN55104 : 1995
- FDA - Reviewer Guide
- Bellcore GR-1089, Core
- IEC 601-1-2

**In accordance with:**

- |                                      |  |                                 |
|--------------------------------------|--|---------------------------------|
| <input type="checkbox"/> IEC 801-2,  | <input type="checkbox"/> IEC 1000-4-2  | Electrostatic Discharge (ESD)   |
| <input type="checkbox"/> IEC 801-3,  | <input type="checkbox"/> ENV50140      | RF Immunity                     |
| <input type="checkbox"/> IEC 801-4,  | <input type="checkbox"/> IEC 1000-4-4  | Electrical Fast Transient (EFT) |
| <input type="checkbox"/> IEC 801-5,  | <input type="checkbox"/> IEC 1000-4-5  | Surge (Lighting)                |
| <input type="checkbox"/> IEC 801-6,  | <input type="checkbox"/> ENV50141      | Conducted Immunity              |
| <input type="checkbox"/> IEC 801-11, | <input type="checkbox"/> IEC 1000-4-11 | Voltage Dips and Interruptions  |

### **3.1 EUT OPERATION MODE - IMMUNITY TESTS:**

- Standby
- Test program (H-Pattern)
- Test program (color bar)
- Test program (customer specific)
- Practice operation
- Normal operating Mode:
- As per manufacture's instructions

File Number: BP7169  
Project Number: 98ME50398  
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**3.1.1 Electrostatic Discharge (ESD) Test:**

Test Applicable     Test Not Applicable

**3.1.2 Radiated Field (RF Immunity) Test:**

Test Applicable     Test Not Applicable

**3.1.3 Electrical Fast Transient (EFT)/Burst test:**

Test Applicable     Test Not Applicable

**3.1.4 Voltage Surge Test:**

Test Applicable     Test Not Applicable

**3.1.5 Conducted Immunity Test:**

Test Applicable     Test Not Applicable

**3.1.6 Voltage Dips and Interruptions:**

Test Applicable     Test Not Applicable

File Number: BP7169  
Project Number: 98ME50398  
Model Number: Sentinal-Prox MM-6800  
FCC ID: XXXMM6800

Issued: February 3, 1999

#### **4.0 SUMMARY:**

The equipment under test has

met the technical requirements as defined under section(s)  2.0 and  3.0

not met the technical requirements as defined under section(s)  2.0 and  3.0.

Test Start Date: 12/8/98

Test Completion Date: 12/22/98

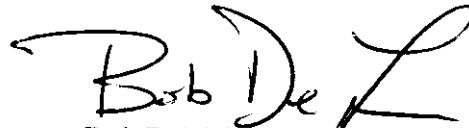
#### **- UNDERWRITERS LABORATORIES, INC. -**

Project Engineer



Bernie Papocchia (Ext.23294)  
EMC Senior Engineering Associate  
International EMC Services  
Engineering Services 3014AMEL

Reviewer



Bob DeLisi (Ext.22452)  
EMC Engineering Team Leader  
International EMC Services  
Engineering Services 3014AMEL

## APPENDIX A

### EMISSIONS TEST DATA

1.  Conducted Emissions  voltage  current
  - Peak traces, Data Pages A\_\_\_ and/through A\_\_\_
  - Quasi-Peak traces, Data Pages A\_\_\_ and/through A\_\_\_
  - Average traces, Data Pages A\_\_\_ and/through A\_\_\_  
 Discontinuous Interference (Clicks)
  - No clicks exceeded the steady state quasi-peak limit
  - Clicks exceeded the steady state quasi-peak limit. The limit was adjusted to \_\_\_\_\_ dB and no clicks exceeded the adjusted limit.
  - Clicks exceeded the adjusted limit. See Data Page A\_\_\_ for details.
  
2.  Radiated Emissions
  - Peak traces, Data Pages A1, A4, A7, A10 and A13.
  - Peak Data, Data Pages A14 and A15.
  - Average traces Data, Data Pages A2, A5, A8 and A11
  - Average Data, Data Pages A3, A6, A9 and A12.
  
3.  RFI Power Measurements
  - Peak traces, Data Pages A\_\_\_ and/through A\_\_\_
  - Quasi-Peak traces, Data Pages A\_\_\_ and/through A\_\_\_
  - Average Traces, Data Pages A\_\_\_ and/through A\_\_\_
  
4.  Harmonic Disturbances
  - Steady State Harmonics, Data Pages A\_\_\_ and/through A\_\_\_
  - Fluctuating Harmonics, Data Pages A\_\_\_ and/through A\_\_\_
  - Changing Voltage, Data Pages A\_\_\_ and/through A\_\_\_

Radiated Emissions  
 Applied Wireless Inc. T190  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A0deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[μV/meter]

120

110

100

90

80

70

1

10

30

Frequency [MHz]

22 Dec 1998 07:01:20

UL - EMC TEST SYSTEM

120

Radiated Emissions  
 Applied Wireless Inc. T190  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A0deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[uV] Average Detection

110

100

90

80

.12

1

10

30

Frequency [MHz]

\*

Date Tested: 22 Dec 1998

07:01:20

Applied Wireless Inc. T190  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A0deg

TEST REQUIREMENTS: Radiated Emissions

RECEIVER : Hewlett-Packard Spectrum Analyzer, Model HP8566B  
 DETECTION MODE : Average  
 BANDWIDTH : 200Hz for measurements 9kHz to 150kHz  
 : 10kHz for measurements 150kHz to 30MHz  
 : 100kHz for measurements above 30MHz

TEST FREQUENCY [MHz]	METER READING [dB(uV)]	GAIN/LOSS FACTOR [dB]	TRANSDUCER FACTOR [dB]	LEVEL	LIMITS:1	2	3	4
					dB[uVolts/meter]			
.1275	85.8	.2	16.6	102.6	106	N/A	N/A	N/A

LIMIT 1 E-FIELD FCC Pt.15 SUB C (3M)  
 LIMIT 2 NONE  
 LIMIT 3 NONE  
 LIMIT 4 NONE



Radiated Emissions  
 Applied Wireless Inc. T151  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=U A45deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[μV/meter]

120

110

100

90

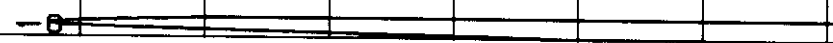
80

12

10

30

Frequency [MHz]





UL - EMC TEST SYSTEM

Date Tested: 22 Dec 1998  
07:18:09

Applied Wireless Inc. T151  
Prox. Card Reader MM6800 w12V  
FILE:BP7169,PROJECT:98ME50398  
TESTED BY:BP BL=H,Gr=V A45deg

TEST REQUIREMENTS: Radiated Emissions  
RECEIVER : Hewlett-Packard Spectrum Analyzer, Model HP8566B  
DETECTION MODE : Average  
BANDWIDTH : 200Hz for measurements 9kHz to 150kHz  
: 10kHz for measurements 150kHz to 30MHz  
: 100kHz for measurements above 30MHz

TEST	METER	GAIN/LOSS	TRANSDUCER	LEVEL	LIMITS:	1	2	3	4
FREQUENCY	READING	FACTOR	FACTOR					dB[uVolts/meter]	
[MHz]	[dB(uV)]	[dB]	[dB]						
.12538	84.4	.2	16.6	101.2	106	N/A	N/A	N/A	N/A

LIMIT 1 E-FIELD FCC Pt.15 SUB C (3M)  
LIMIT 2 NONE  
LIMIT 3 NONE  
LIMIT 4 NONE

Radiated Emissions  
 Applied Wireless Inc. T248  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A90deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[volts/meter]

120  
110

100

90

80

12

1

Frequency [MHz]

10

30

22 Dec 1998 07:34:05

UL - EMC TEST SYSTEM

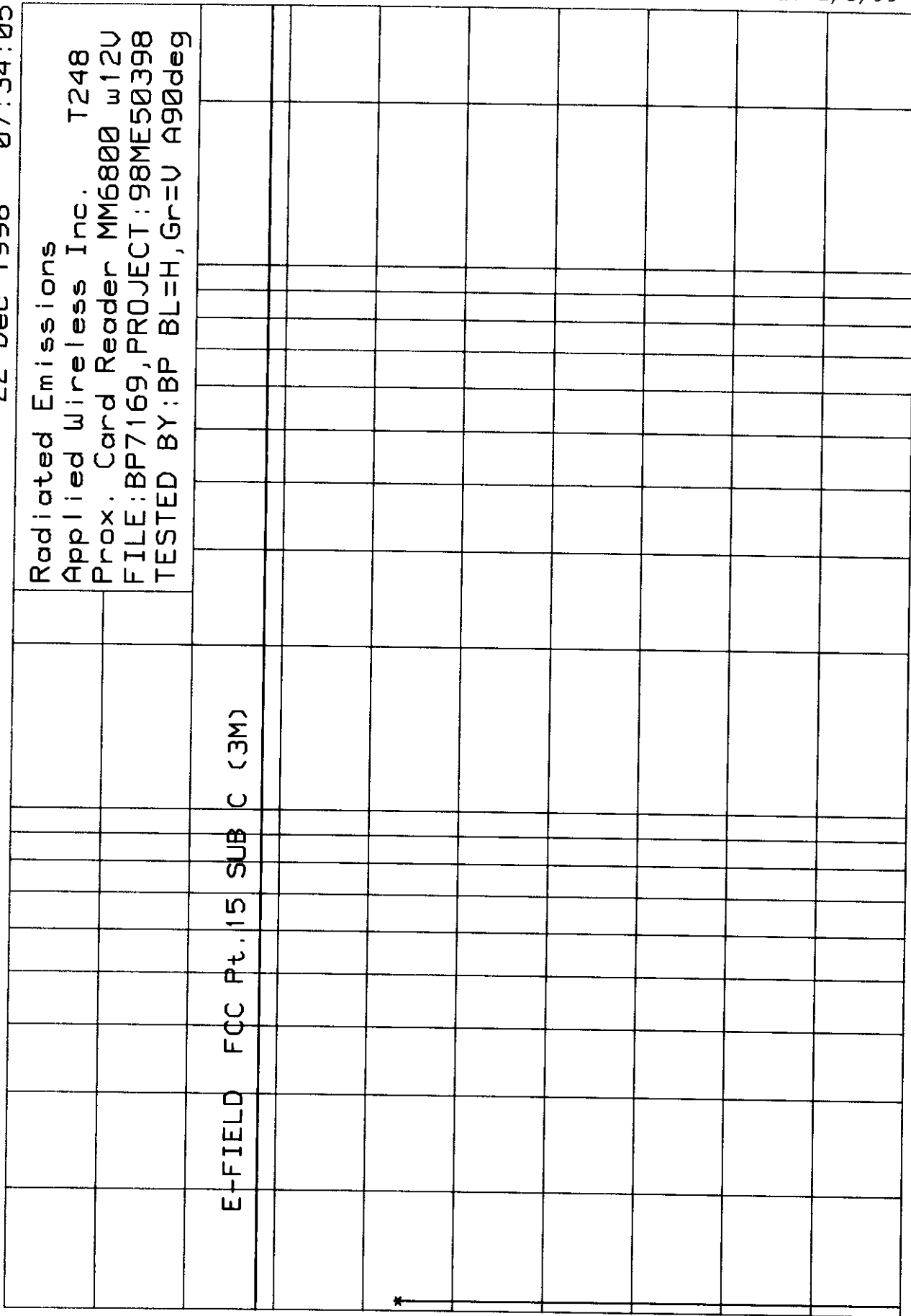
Radiated Emissions  
 Applied Wireless Inc. T248  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A90deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[uVols/meter] Average Detection

120  
 110  
 100  
 90  
 80  
 .12

1 10 30  
 Frequency [MHz]



Date Tested: 22 Dec 1998  
07:34:05

Applied Wireless Inc. T248  
Prox. Card Reader MM6800 w12V  
FILE:BP7169,PROJECT:98ME50398  
TESTED BY:BP BL=H,Gr=V A90deg

TEST REQUIREMENTS: Radiated Emissions  
RECEIVER : Hewlett-Packard Spectrum Analyzer, Model HP8566B  
DETECTION MODE : Average  
BANDWIDTH : 200Hz for measurements 9kHz to 150kHz  
: 10kHz for measurements 150kHz to 30MHz  
: 100kHz for measurements above 30MHz

TEST	METER	GAIN/LOSS	TRANSDUCER	LEVEL	LIMITS:	1	2	3	4
FREQUENCY	READING	FACTOR	FACTOR					dB[uVolts/meter]	
[MHz]	[dB(uV)]	[dB]	[dB]						
.12532	81.3	.2	16.6	98.1	106	N/A	N/A	N/A	N/A

LIMIT 1 E-FIELD FCC Pt.15 SUB C (3M)  
LIMIT 2 NONE  
LIMIT 3 NONE  
LIMIT 4 NONE

Radiated Emissions  
 Applied Wireless Inc. T199  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A135deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[uV] / meter

120  
110  
100  
90  
80  
70  
60  
50  
40  
30  
20  
10  
0

Frequency [MHz]

12

1

10

30

Radiated Emissions  
 Applied Wireless Inc. T199  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=U A135deg

E-FIELD FCC Pt. 15 SUB C (3M)

dB[uV/m] Average Detection

120  
 110  
 100  
 90  
 80  
 .12

Frequency [MHz]

30

10

1

\*



UL - EMC TEST SYSTEM

Date Tested: 22 Dec 1998

07:47:08

Applied Wireless Inc. T199  
 Prox. Card Reader MM6800 w12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BL=H,Gr=V A135deg

TEST REQUIREMENTS: Radiated Emissions  
 RECEIVER : Hewlett-Packard Spectrum Analyzer, Model HP8566B  
 DETECTION MODE : Average  
 BANDWIDTH : 200Hz for measurements 9kHz to 150kHz  
 : 10kHz for measurements 150kHz to 30MHz  
 : 100kHz for measurements above 30MHz

TEST	METER	GAIN/LOSS	TRANSDUCER	LEVEL	LIMITS:1	2	3	4
FREQUENCY	READING	FACTOR	FACTOR				dB[uVolts/meter]	
[MHz]	[dB(uV)]	[dB]	[dB]					
.1275	84.5	.2	16.6	101.3	106	N/A	N/A	N/A

LIMIT 1 E-FIELD FCC Pt.15 SUB C (3M)  
 LIMIT 2 NONE  
 LIMIT 3 NONE  
 LIMIT 4 NONE

Radiated Emissions  
 Applied Wireless Inc.  
 Prox. Card Reader MM-6800 w/12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BLUE=H, GREEN=V

FCC PT15 CLASS A-RADIATED(10m)

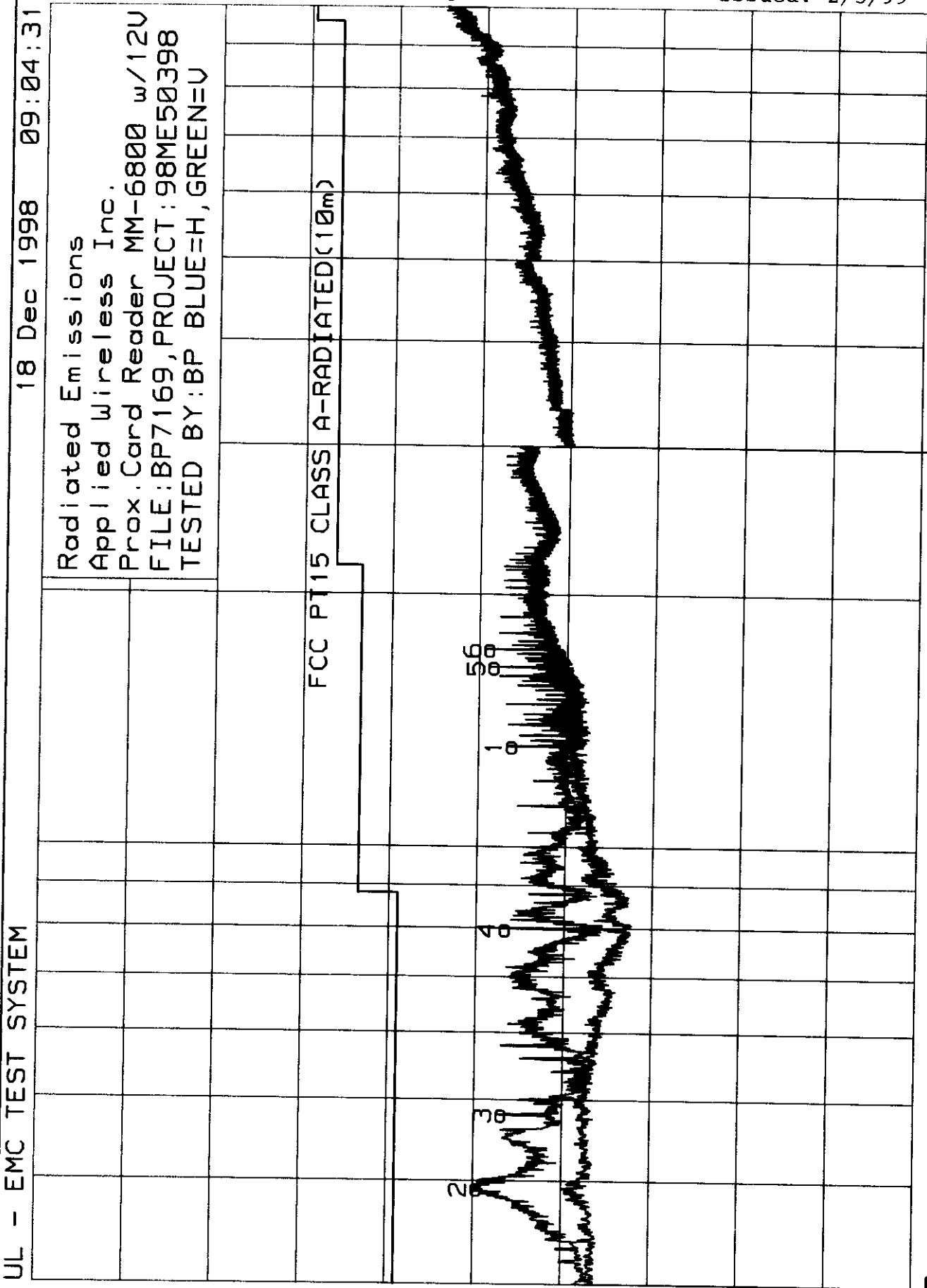
dB[ $\mu$ V/meter]

Frequency [MHz]

80  
60  
40  
20  
0  
30

2  
30  
40  
50  
56

100



## UL - EMC TEST SYSTEM

Date Tested: 18 Dec 1998

09:04:31

Applied Wireless Inc.  
 Prox.Card Reader MM-6800 w/12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BLUE=H,GREEN=V

MKR	TEST	METER	GAIN/LOSS	TRANSDUCER	LEVEL	LIMIT:1	2	3	4
NO.	FREQUENCY	READING	FACTOR	FACTOR		dB[uVolts/meter]			
	[MHz]	[dB(uV)]	[dB]	[dB]					
1	131.8906	13 pk	.7	12.9	26.6	43.5	N/A	N/A	N/A
2	39.1371	17.3 pk	.3	12.4	30	39	N/A	N/A	N/A
3	47.9708	14.1 pk	.4	12.8	27.3	39	N/A	N/A	N/A
4	79.799	19.6 pk	.6	6.9	27.1	39	N/A	N/A	N/A
5	163.8199	13.6 pk	.8	14.3	28.7	43.5	N/A	N/A	N/A
6	171.8444	13.1 pk	.8	15.3	29.2	43.5	N/A	N/A	N/A

pk - Peak detector  
 qp - Quasi-peak detector  
 av - Average detector  
 tm - Trace Math Result

LIMIT 1 : FCC PT15 CLASS A-RADIATED(10m)  
 LIMIT 2 : NONE  
 LIMIT 3 : NONE  
 LIMIT 4 : NONE

## UL - EMC TEST SYSTEM

Date Tested: 18 Dec 1998

09:04:31

Applied Wireless Inc.  
 Prox.Card Reader MM-6800 w/12V  
 FILE:BP7169,PROJECT:98ME50398  
 TESTED BY:BP BLUE=H,GREEN=V

## MARK TRACE - POSITIONS

MARKER NO.	TEST FREQUENCY	LEVEL	LIMIT:1 dB[uVolts/meter]	2	3	4	TABLE AZIMUTH(deg)	TOWER HEIGHT (cm)
1	131.8906	26.6 pk	43.5	N/A	N/A	N/A	0	400 H
2	39.1371	30 pk	39	N/A	N/A	N/A	214	98 V
3	47.9708	27.3 pk	39	N/A	N/A	N/A	223	98 V
4	79.799	27.1 pk	39	N/A	N/A	N/A	168	301 V
5	163.8199	28.7 pk	43.5	N/A	N/A	N/A	278	98 V
6	171.8444	29.2 pk	43.5	N/A	N/A	N/A	299	98 V

pk - Peak detector  
 qp - Quasi-peak detector

LIMIT 1 : FCC PT15 CLASS A-RADIATED(10m)  
 LIMIT 2 : NONE  
 LIMIT 3 : NONE  
 LIMIT 4 : NONE

File Number: BP7169  
Project Number: 98ME50398  
Model Number: Sentinal-Prox MM-6800  
FCC ID: XXXMM6800

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## **APPENDIX B**

### **PHOTOGRAPHS AND DIAGRAMS**

File Number: BP7169  
Project Number: 98ME50398  
Model Number: Sentinal-Prox MM-6800  
FCC ID: XXXMM6800

Issued:February 3, 1999

## **APPENDIX C**

### **SAMPLE CALCULATIONS**

## APPENDIX C

### Sample Calculations

Radiated Emissions Limit conversion from  $\mu\text{V/m}$  to  $\text{dB}\mu\text{V/m}$   
(limits in accordance with paragraph 15.109)

$$\text{Radiated Emissions Limit (dB}\mu\text{V/m)} = 20 * \log(\mu\text{V/m})$$

$$\text{Radiated Emissions Limit (dB}\mu\text{V/m)} = 20 * \log(90)$$

$$\text{Radiated Emissions Limit (dB}\mu\text{V/m)} = 39.1$$

Radiated Emissions test data obtained during measurements.

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{Measured field strength(dB}\mu\text{V/m)} + \text{Antenna Factor(dB)} + \text{Cable Factor(dB)}$$

$$\text{Field Strength (dB}\mu\text{V/m)} = 17.3\text{dB}\mu\text{V/m} + 12.4\text{dB} + 0.3\text{dB}$$

$$\text{Field Strength (dB}\mu\text{V/m)} = 30$$

Radiated Emissions Limit conversion from  $\mu\text{V/m}$  to  $\text{dB}\mu\text{V/m}$  and 40dB/decade  
(limits in accordance with paragraph 15.209)

Radiated Emission Limits; General Requirements

$$\text{Frequency between 0.009-0.490 MHz} \quad 2400/F(\text{kHz}) \text{ at 300 meters} = \text{Field Strength in } \mu\text{V/meter}$$

$$125\text{kHz} \quad 2400/(125) \text{ at 300 meters}$$

$$\text{Radiated emissions at 125 kHz at 300 meters} = 19.2\mu\text{V/meter}$$

$$\text{dB}\mu\text{V/m} = 20 * \log(19.2\mu\text{V/m})$$

$$\text{dB}\mu\text{V/m} = 25.67 \text{ at 300meters}$$

40dB/decade

$$300 \text{ meters to 3 meters} = 80 \text{ dB}$$

$$\text{Radiated Emissions Limit} = \text{dB}\mu\text{V/m} + \text{dB}$$

$$25.66 + 80$$

$$105.66 \text{ dB}\mu\text{V/m}$$