FCC ID: B32OMNI3600

Exhibit 2

Engineering Reports
b)Radiated Spurious Emissions (2.1053)

Assessment of Compliance

for

Measurement of Field Strength of Spurious Radiation in accordance with the FCC Rules & Regulations Part 2.1053 and 90

Wireless Handheld Point of Sale Terminal

VeriFone, INC.

March 2002

APREL Project No.: VERA-OMNI 3600-3858

51 Spectrum Way Nepean ON K2R 1E6
Tel: (613) 820-2730 Fax: (613) 820-4161
email: info@aprel.com

APREL Laboratories

Engineering Report

Subject: **Measurement of Field Strength of Spurious Radiation in accordance with the FCC Rules & Regulations Part 2.1053 and 90**

FCC ID: **B32OMNI3600**

Equipment: **Wireless Handheld Point of Sale Terminal**

Model: **OMNI 3600**

Client: **VeriFone Inc.**
3755 Atherton Road
Rocklin, CA 95765-3701
USA

Project #: VERA OMNI 3600-3858

Prepared By: **APREL Laboratories,**
Regulatory Compliance Division
51 Spectrum Way
Nepean, Ontario
K2R 1E6

Approved by: _____ Date: May 2, 2002
Jay Sarkar:
Technical Director, Standards & Certification

Submitted by: _____ Date: May 2, 2002
Jay Sarkar:
Technical Director, Standards & Certification

Released by: _____ Date: May 2/02.
Dr. Jack J. Wojcik, P.Eng.

LICENSED PROFESSIONAL ENGINEER J.J. WOJCIK PROVINCE OF ONTARIO

FCC ID: **B32OMNI3600**
Applicant: VeriFone INC.
Equipment: Wireless Handheld Point of Sale Terminal
Model: OMNI 3600
Standard: FCC Rules and Regulations Part 2.1053 and 90

ENGINEERING SUMMARY

This report contains the results of Field Strength of Spurious Radiation measurement performed on a VeriFone INC. **Wireless Handheld Point of Sale Terminal**, model OMNI 3600 with RIM **Mobitex** modem in accordance with the FCC Rules and Regulations Part 2.1053 and 90. The product was evaluated for spurious radiation when it was set at the high, medium and low frequency channels.

The measurements were carried out using 1) direct method and 2) substitution method both as radiated.

The results for Direct Method are given in tables 1 to 6 and for Substitution Method in Tables 1A to 6A.

The sample of the OMNI 3600 with FCC IDENTIFIER B32OMNI3600 covered by this report complies with the applicable requirements of the FCC Rules and Regulations Part 2.1053 and 90.210.

The results presented in this report relate only to the sample tested.

Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Field Strength of Spurious Radiation Ref. Paragraph 2.1053 and 90	8	1	**Passed**

INTRODUCTION

General

This report describes the results of the Field Strength of Spurious Radiation measurement conducted on a VeriFone INC. **Wireless Handheld Point of Sale Terminal,** model OMNI 3600 in accordance with the FCC Rules and Regulations Part 2.1053 and 90.

Test Facility

The tests were performed for VeriFone INC. by APREL Laboratories at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates an (3m and 10m) Open Area Test Site (OATS). The measurement facility is calibrated in accordance with ANSI C63.4-1992.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria per ANSI C63.4-1992 is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations.

APREL's registration number is 90416

APREL is accredited by Standard Council of Canada. APREL is also accredited by Industry Canada and recognised by the Federal Communications Commissions (FCC).

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1053 and the appropriate limits (90).

Test Equipment

The test equipment used during the evaluation is listed in Appendix A with calibration due dates.

Environmental Conditions (Open Area Teas Area):

Temperature: 24 °C ± 2, Relative Humidity: 30 - 50 %, Air Pressure: 101kPa ± 3

Personal

The measurements were performed by Roman Kuleba and the report was written by Jay Sarkar.

FCC SUBMISSION INFORMATION

FCC ID:	**B32OMNI3600**
Equipment type:	Wireless Handheld Point of Sale Terminal
Model:	OMNI 3600
For:	Certification
Applicant:	**VeriFone Inc.** 3755 Atherton Road Rocklin, CA 95765-3701 USA
Manaufacturer:	**VeriFone Inc.** 3755 Atherton Road Rocklin, CA 95765-3701 USA
Evaluated by:	**APREL Laboratories** 51 Spectrum Way Nepean, Ontario Canada K2R 1E6

Test: **Field Strength of Spurious Radiation**

Ref: FCC Parts 2.1053 and 90.210

Criteria: Emission **Mask J:**

The permitted maximum level of spurious emission is $50 + 10 \cdot \log_{10}(P)$ dB below the unmodulated carrier power of the transmitter (P).

Set-up: See Figure 1.a

Conditions: Voltage Supply: DC Battery

Equipment: See Appendix A.

Procedure: **A. Direct Method as Radiated (See Section B for Substitution Method).**

The final measurements were taken at APREL Laboratory's open area test site (OATS) measurement facility. This open area test site is calibrated to ANSI C63.4 document and a description of the measurement facility is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations.
(FCC Registration No.:90416).

The **DUI** was configured to operate at maximum power with appropriate modulation. Special software was employed in order that the transmitter was processing data in a normal manner.

Prior to final measurement in the OATS, preliminary radiated spurious emissions were scanned in a shielded enclosure at a distance of 1 m using biconical, log-periodic and horn antennas in order to determine the characteristic frequencies of the field strength of spurious emissions. Based on this information, measurements were performed in the OATS at these characteristic frequencies using calibrated antennas.

All field strength measurements were made with a spectrum analyser and the appropriate calibrated antenna for the frequency range from 9 kHz up to 10^{th} harmonics of the transmit frequency (see equipment list for the calibrated antenna used). **The Power of the carrier frequency was also measured in the OATS.**

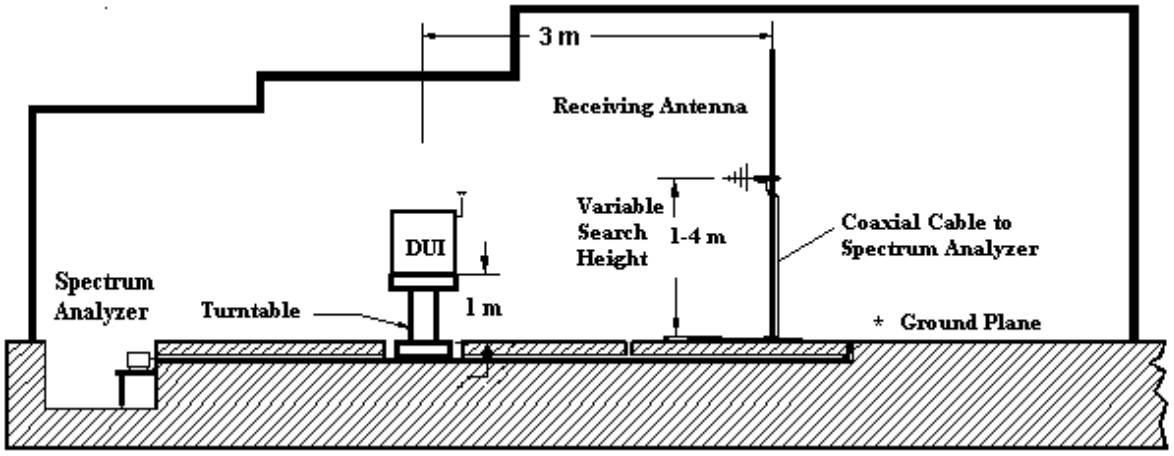


Figure 1.a Test set up for the Field Strength of Spurious Radiation Measurement in OATS (Not to scale)

Fig. 1.b APREL's OATS (Open Area Test Site)

The equipment under test was placed on a turntable positioned 3 meters away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer. For each identified frequency, the received signal was maximised by the positioning of the turntable and the height of the antenna. The process was repeated for both horizontal and vertical polarisation.

Information submitted includes the relative radiated power (Mask J) of each spurious emissions with reference to the appropriate limit per 90.210 assuming all emissions are radiated from half-wave dipole antenna.

Measurements given in the spurious emissions test result tables contain:
analyzer reading, correction factor, and final reading. The final field strength level are derived from the analyzer measurement and the correction factor (antenna factor and cable loss) as shown in the following example:

Sample Calculation for direct method

A. Spectrum analyzer reading

At 1798.00 MHz, a spurious level of 37.1 dBµV @ 3 meters is measured.

B. Correction factor (antenna factor and cable loss)

Cable loss: 2.6 dB
Antenna Factor: 27.4 dB
Total Correction Factor: 2.6 + 27.4 = 30.0 dB/m

C. Final reading (Field Strength of spurious emission):

C = A + B
C = 37.1 dBµV + 30.0 dB/m
C = 67.1 dBµV/m @ 3 meters

D. The criteria level.

The field intensity, which would be produced by the transmitter carrier operating into a half-wave dipole antenna (gain of 1.64), at a distance of 3 m, was calculated using the following formula: dB

$$\text{Field Strength of Unmodulated Carrier (dB}\mu\text{V/m)} = 10 \cdot \log_{10}\left(\frac{P_t \cdot G}{4\pi \cdot r^2}\right) + 145.8\,\text{dB}$$

P_t is transmitter carrier power, unmodulated
G = 1.64 is gain,
R = 3 m is distance,

Criteria (reference) level at 3 meters from 1.905 Watt (ERP) into half-wave dipole antenna is 77.4 dBµV/m.

E = Margin (spurious emission below the reference level)

E = D – C
E = 77.4 dBµV/m–67.1 dBµV/m
E = 10.3 dBµV/m

B: Substitution Method (Radiated)

The Terminal was also tested for spurious radiated emissions using the substitution method with a procedure similar to that used in the ERP measurement and described in the ERP measurement portion of the Test Report. A set of three reference dipoles, a horn antenna and a signal generator to duplicate the signal were used. Signals radiated from the Terminal on the fundamental frequency as well as second and third harmonic were evaluated by comparing to the signals transmitted from the reference dipoles. The antenna used for the first three harmonics were a set of three dipoles, l = 159.7 mm (first harmonic/fundamental), l = 79 mm (second harmonic), and l = 52.1 mm (third harmonic). For testing the higher frequencies, 4^{th} to 8^{th} harmonic, a calibrated horn antenna with known gain was used as a replacement source of radiation thus substituting the POS Terminal. The duplicated reading (taken in dBm) was then referenced to the dipole.

Criteria: The criteria level using substitution method was calculated to be –20.0 dBm.
This level was obtained by using the following expression:

$$\mathbf{ERP_{Limit\ (dBm)} = ERP_{Carrier\ (dBm)} - [50 + 10*\log_{10} ERP_{(W)}]}$$

Example: $ERP_{Limit(dBm)} = 32.8\ dBm - [50 + 10*\log_{10}(1.905\ W)]$
$ERP_{Limit(dBm)} = 32.8\ dBm - (50 + 2.8)\ dB = -20.0\ dBm$

Results: **Passed** **See Tables 1 and 2 for direct method**
See Tables 3 and 4 for substitution method

Test Data using Direct Method

Table 1
Field Strength of Spurious Radiation
Transmitter Frequency: 896.00 MHz
Antenna Polarization: Vertical
Resolution Bandwidth:
10 kHz (below 1 GHz)
100 kHz (above 1 GHz)
Direct Method as Radiated

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
896.00	108.0	25.6	133.6	-	-
1792.00	36.8	30.0	66.8	77.4	10.6
2688.00	30.6	33.2	63.8	77.4	13.6
3584.00	12.8	36.4	49.2	77.4	28.2
4480.00	7.5 noise floor	37.4	44.9	77.4	32.5
5376.00	6.7 noise floor	40.0	46.7	77.4	30.7
6272.00	7.9	41.4	49.3	77.4	28.1
7168.00	7.1 noise floor	42.7	49.8	77.4	27.6

Test performed by: Kristine Rousseau **Date:** March 2002

Table 2
Field Strength of Spurious Radiation
Transmitter Frequency: 899.00 MHz
Antenna Polarization: Vertical
Resolution Bandwidth:
10 kHz (below 1 GHz)
100 kHz (above 1 GHz)
Direct Method as Radiated

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
899.00	109.3	25.6	134.9	-	-
1798.00	37.1	30.0	67.1	77.4	10.3
2697.00	29.7	33.2	62.9	77.4	14.5
3596.00	16.5	36.4	52.9	77.4	24.5
4495.00	7.5 noise floor	37.4	44.9	77.4	32.5
5394.00	6.6 noise floor	40.0	46.6	77.4	30.8
6293.00	14.1	41.4	55.5	77.4	21.9
7192.00	7.5 noise floor	42.7	50.2	77.4	27.2

Test performed by: Kulelua Rowan **Date:** March 2002

Table 3
Field Strength of Spurious Radiation
Transmitter Frequency: 901.00 MHz
Antenna Polarization: Vertical
Resolution Bandwidth:
10 kHz (below 1 GHz)
100 kHz (above 1 GHz)
Direct Method as Radiated

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
901.00	107.5	25.6	133.1	-	-
1802.00	36.3	30.0	66.3	77.4	11.1
2703.00	31.4	33.2	64.6	77.4	12.8
3604.00	12.8	36.4	49.2	77.4	28.2
4505.00	7.2 noise floor	37.4	44.6	77.4	32.8
5406.00	7.2 noise floor	40.0	47.2	77.4	30.2
6307.00	5.5	41.4	46.9	77.4	30.5
7208.00	7.2 noise floor	42.7	49.9	77.4	27.5

Test performed by: Kin Chee Rowan **Date:** March 2002

Table 4
Field Strength of Spurious Radiation
Transmitter Frequency: 896.00 MHz
Antenna Polarization: Horizontal
Resolution Bandwidth:
10 kHz (below 1 GHz)
100 kHz (above 1 GHz)
Direct Method as Radiated

Frequency (MHz)	Measured Level (dBµV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBµV/m) "C"	Criteria Level (dBµV/m) "D"	Margin (dB) "E"
896.00	90.8	25.6	116.4	-	-
1792.00	19.8	30.0	49.8	77.4	27.6
2688.00	8.2 noise floor	33.2	41.4	77.4	36.0
3584.00	18.8	36.4	55.2	77.4	22.2
4480.00	8.3	37.4	45.7	77.4	31.7
5376.00	0.2 noise floor	40.0	40.2	77.4	37.2
6272.00	0.2 noise floor	41.4	41.6	77.4	35.8
7168.00	0.2 noise floor	42.7	42.9	77.4	34.5

Test performed by: Kin Chee Rowan **Date:** March 2002

Table 5
Field Strength of Spurious Radiation
Transmitter Frequency: 899.00 MHz
Antenna Polarization: Horizontal
Resolution Bandwidth:
10 kHz (below 1 GHz)
100 kHz (above 1 GHz)
Direct Method as Radiated

Frequency (MHz)	Measured Level (dBμV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBμV/m) "C"	Criteria Level (dBμV/m) "D"	Margin (dB) "E"
899.00	91.1	25.6	116.7	-	-
1798.00	21.4	30.0	51.4	77.4	26.0
2697.00	3.3 noise floor	33.2	36.5	77.4	40.9
3596.00	16.2	36.4	52.6	77.4	24.8
4495.00	12.7	37.4	50.1	77.4	27.3
5394.00	0.3 noise floor	40.0	40.3	77.4	37.1
6293.00	0.3 noise floor	41.4	41.7	77.4	35.7
7192.00	0.3 noise floor	42.7	43.0	77.4	34.4

Test performed by: Kelvin Rowan **Date:** March 2002

Table 6
Field Strength of Spurious Radiation
Transmitter Frequency: 901.00 MHz
Antenna Polarization: Horizontal
Resolution Bandwidth:
10 kHz (below 1 GHz)
100 kHz (above 1 GHz)
Direct Method as Radiated

Frequency (MHz)	Measured Level (dBμV) "A"	Correction Factor (dB/m) "B"	Field Strength (dBμV/m) "C"	Criteria Level (dBμV/m) "D"	Margin (dB) "E"
901.00	89.8	25.6	115.4	-	-
1802.00	7.3	30.0	37.3	77.4	40.1
2703.00	0.3 noise floor	33.2	33.5	77.4	43.9
3604.00	4.9	36.4	41.3	77.4	36.1
4505.00	5.9	37.4	43.3	77.4	34.1
5406.00	0.3 noise floor	40.0	40.3	77.4	37.1
6307.00	8.3	41.4	49.7	77.4	27.7
7208.00	0.3 noise floor	42.7	43.0	77.4	34.4

Test performed by: Kin Chee Rowan **Date:** March 2002

Test Data using Substitution Method

Table 1A
Field Strength of Spurious Radiation
Transmitter Frequency: 896.00 MHz
Antenna Polarization: Vertical
Substitution Method

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
896.00	32.2	-	-
1792.00	-33.9	-20.0	13.9
2688.00	-36.4	-20.0	16.4
3584.00	-51.5	-20.0	31.5
4480.00	-56.0 noise floor	-20.0	36.0
5376.00	-53.6 noise floor	-20.0	33.6
6272.00	-51.0	-20.0	31.0
7168.00	-50.3 noise floor	-20.0	30.3

Table 2A
Field Strength of Spurious Radiation
Transmitter Frequency: 899.00 MHz
Antenna Polarization: Vertical
Substitution Method

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
899.00	32.8	-	-
1798.00	-33.1	-20.0	13.1
2697.00	-37.5	-20.0	17.5
3596.00	-47.2	-20.0	27.2
4495.00	-56.0 noise floor	-20.0	36.0
5394.00	-53.9 noise floor	-20.0	33.9
6293.00	-44.9	-20.0	24.9
7192.00	-50.2 noise floor	-20.0	30.2

Test performed by: Kelene Rowan **Date:** March 2002

Table 3A
Field Strength of Spurious Radiation
Transmitter Frequency: 901.00 MHz
Antenna Polarization: Vertical
Substitution Method

Frequency MHz	ERP_V dBm	Limit dBm	Margin dB
901.00	32.0	-	-
1802.00	-34.4	-20.0	14.4
2703.00	-35.9	-20.0	15.9
3604.00	-51.6	-20.0	31.6
4505.00	-55.6 noise floor	-20.0	35.6
5406.00	-53.1 noise floor	-20.0	33.1
6307.00	-53.7	-20.0	33.7
7208.00	-50.5 noise floor	-20.0	30.5

Table 4A
Field Strength of Spurious Radiation
Transmitter Frequency: 896.00 MHz
Antenna Polarization: Horizontal
Substitution Method

Frequency MHz	ERP_V dBm	Limit dBm	Margin dB
896.00	15.7	-	-
1792.00	-50.6	-20.0	30.6
2688.00	-58.9 noise floor	-20.0	38.9
3584.00	-45.1	-20.0	25.1
4480.00	-54.9	-20.0	34.9
5376.00	-59.9 noise floor	-20.0	39.9
6272.00	-58.8 noise floor	-20.0	38.8
7168.00	-57.9 noise floor	-20.0	37.9

Test performed by: Kelcie Rowan **Date:** March 2002

Table 5A
Field Strength of Spurious Emissions
Transmitter Frequency: 899.00 MHz
Antenna Polarization: Horizontal
Substitution Method

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
899.00	16.6	-	-
1798.00	-49.0	-20.0	29.0
2697.00	-64.0 noise floor	-20.0	44.0
3596.00	-48.0	-20.0	28.0
4495.00	-50.4	-20.0	30.4
5394.00	-60.5 noise floor	-20.0	40.5
6293.00	-58.8 noise floor	-20.0	38.8
7192.00	-57.2 noise floor	-20.0	37.2

Table 6A
Field Strength of Spurious Emissions
Transmitter Frequency: 901.00 MHz
Antenna Polarization: Horizontal
Substitution Method

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
901.00	14.6	-	-
1802.00	-63.7	-20.0	43.7
2703.00	-66.6 noise floor	-20.0	46.6
3604.00	-59.6	-20.0	39.6
4505.00	-57.2	-20.0	37.2
5406.00	-60.5 noise floor	-20.0	40.5
6307.00	-51.0	-20.0	31.0
7208.00	-57.8 noise floor	-20.0	37.8

Test performed by: Kelsie Rowan **Date:** March 2002

APPENDIX A

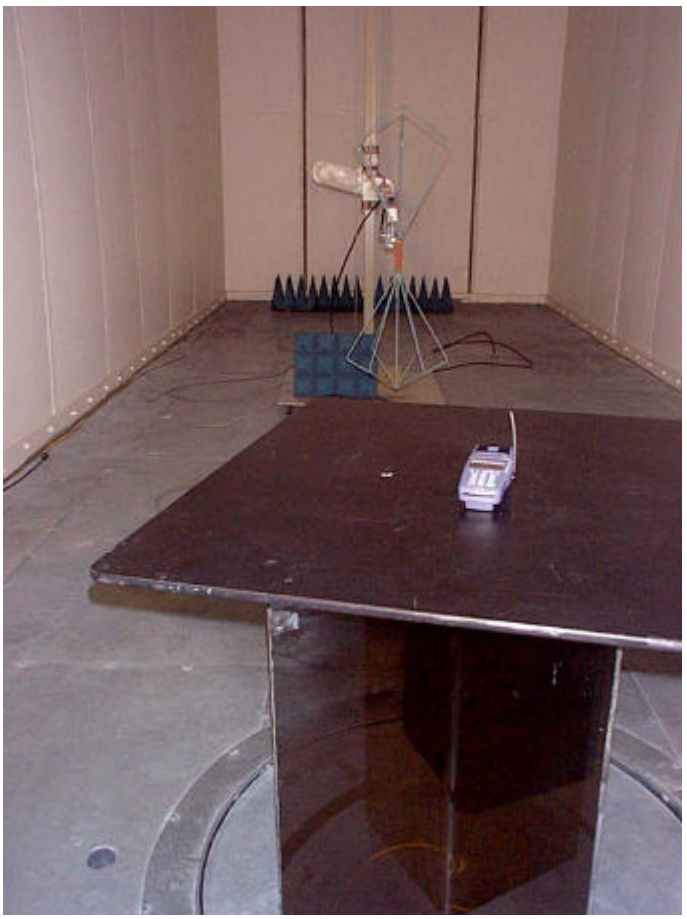
List of Test Equipment

List of Equipment

Description	Range	Manufacturer	Model #	APREL Asset #	Cal. Due Date
Spectrum Analyzer	9 kHz - 3 GHz	Anritsu	MS2661C	301330	Dec 10, 2002
Spectrum Analyzer	9 kHz - 30 GHz	Anritsu	MS2667C	301436	Nov 3, 2002
RF Signal Generator	10 MHz – 26.5 GHz	Hewlett Packard	HP 8340 B	100955	Oct 5, 2002
Amplifier (LNA)	30-1000 MHz	APREL Inc.	APRLNA-001	301415	June 20, 2002
Attenuator	20 dB	Pasternack	PE 7002-20	301370	May 18, 2002
Notch Filter	DC - 6 GHz	APREL Inc.	NFLT-835	301470	CBT
RF Power Meter	10 MHz - 18 GHz	Rohde & Schwarz	NRVS	100851	July 21, 2002
Biconical Antenna	20 MHz - 200 MHz	Eaton	94455-1	100890	July 21, 2002
Log - Periodic Antenna	200 MHz -1.0 GHz	Eaton	ALP-1	100761	July 21, 2002
Horn Antenna	1 – 18 GHz	APREL Inc.	AA – 118	100400	March 12, 2002
Anechoic Shielded Room	10 kHz - 10 GHz	APREL Inc.	_	301329	N/A
Reference Half -wave Dipole Antenna	815.00 MHz	APREL Inc.	_	_	N/A
Reference Half -wave Dipole Antenna	1630.00 MHz	APREL Inc.	_	_	N/A
Reference Half -wave Dipole Antenna	2500.00 MHz	APREL Inc.	_	_	N/A
OATS	30 MHz – 1 GHz	APREL Inc.	3 m & 10 m	N/A	N/A
Mast with the Controller	1 m – 4 m	EMCO	1051 – 12	100507	N/A
Turntable with the Controller	0° - 360°	EMCO	1060 – 1.241	100506	N/A

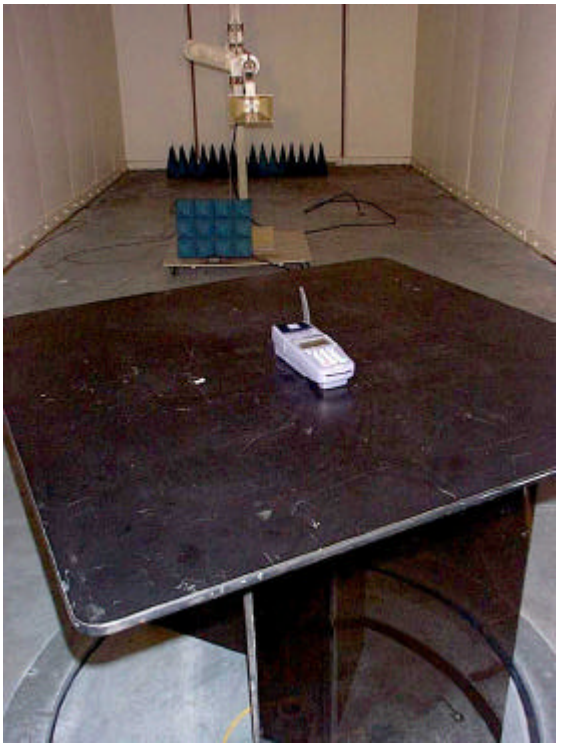
APPENDIX B
PHOTOGRAPHS

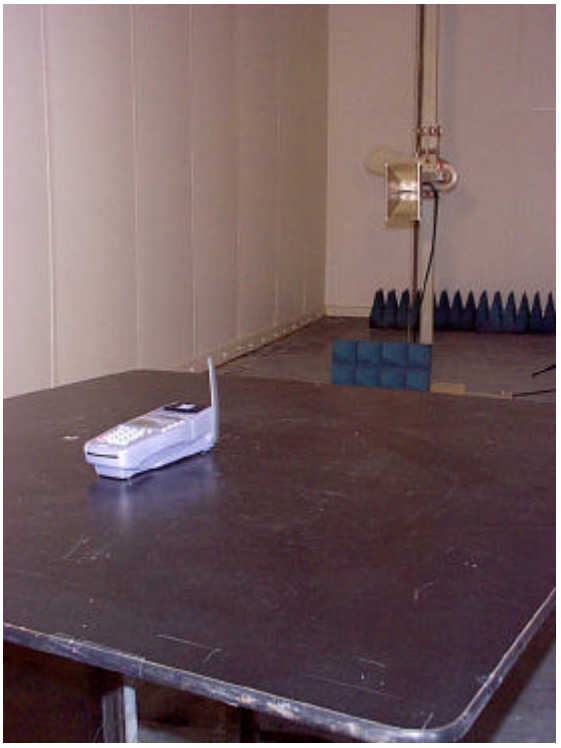
Wireless Handheld *Point of Sale* Terminal
Front View



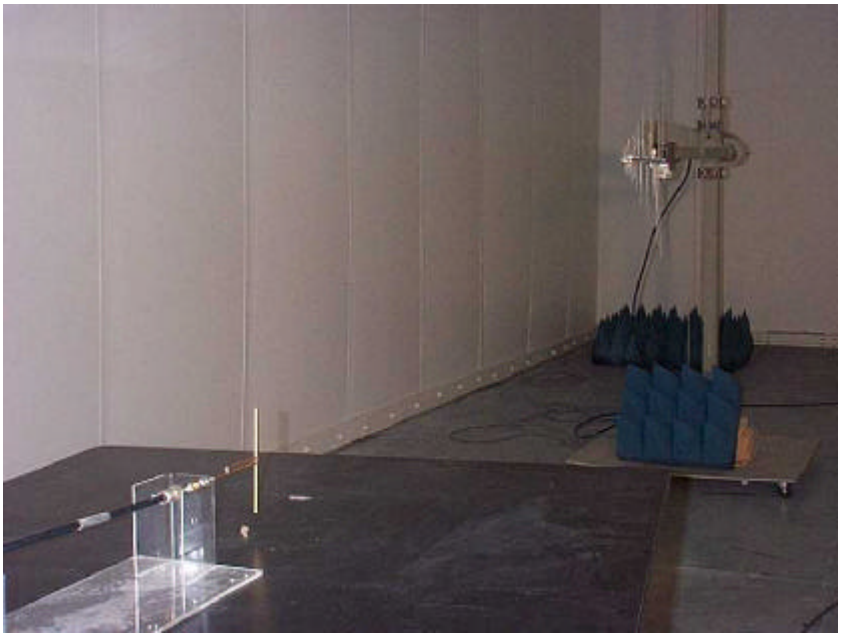
Spurious Emission Measurements
in the Frequency range 30 MHz-200 MHz

Spurious Emission Measurements
in the frequency range of 200 MHz to 1GHz

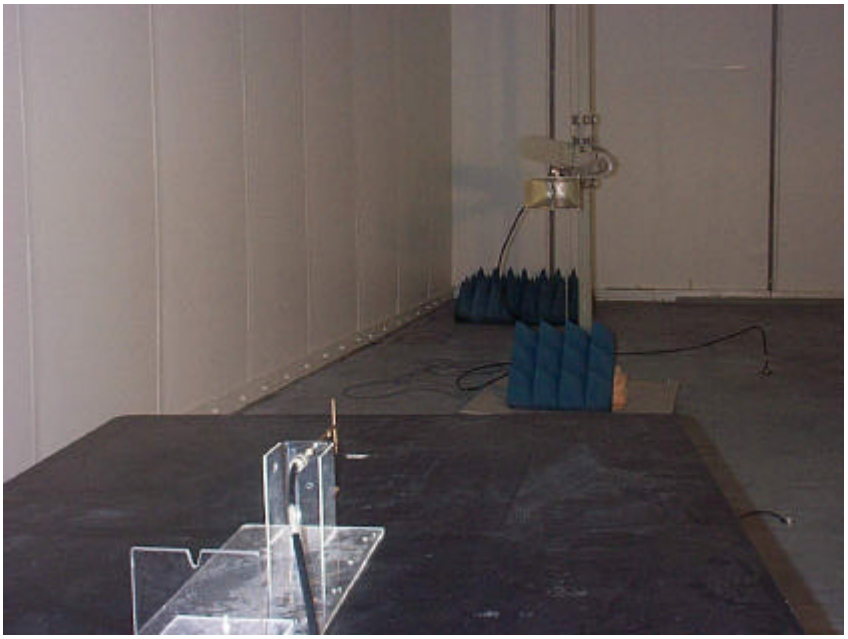




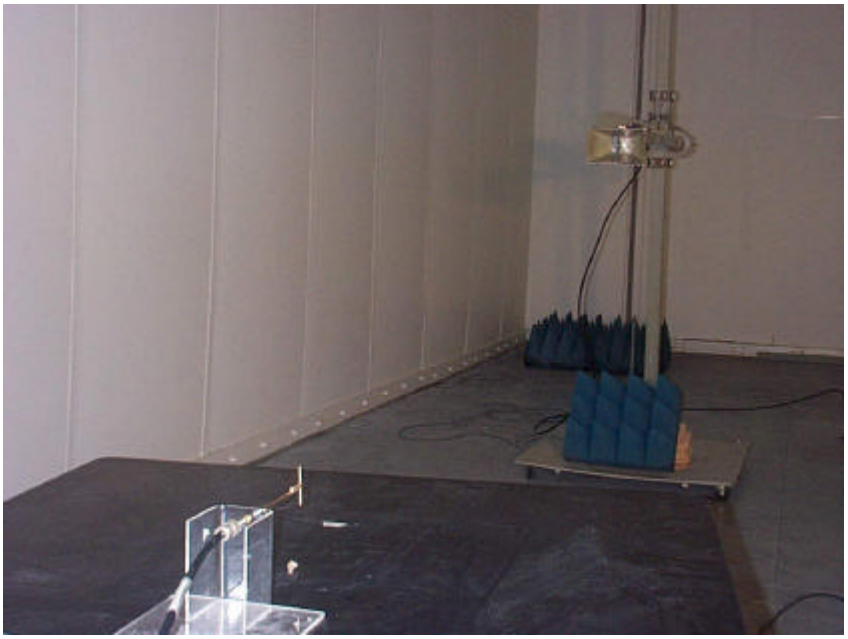
Spurious Emission Measurements in the frequency range of 1 GHz – 18 GHz



Spurious Emission Measurements
Substitution Method, 900 MHz Ref. Dipole



Spurious Emission Measurements
Substitution Method, 1.8 GHz Ref. Dipole



Spurious Emission Measurements
Substitution Method, 2.7 GHz Ref. Dipole

Spurious Emission Measurements
Substitution Method, Ref. Horn Antenna