



# Assessment of Compliance

for

Measurement of Field Strength of Spurious Radiation in  
Accordance with the FCC Rules & Regulations Part 2.1053

## MIST Freedom II-D Wireless Point of Sale Terminal

MIST Inc.



JUNE 2000

MISB-FREEDOM II RIM 802 DATATAC-3439

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## Engineering Report

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

**FCC ID:** O3JF2R802D1

**Equipment:** Wireless Point of Sale Terminal

**Model:** MIST Freedom II-D

**Client:** MIST Inc.  
703 Evans Avenue, Suite 500  
Toronto, Ontario, M9C 5E9  
Canada  
Tel: (416) 621-1911, Fax: (416) 621-8875

**Project #:** MISB-FREEDOM II RIM 802 DATATAC - 3439

**Prepared By:** APREL Laboratories,  
Regulatory Compliance Division

**Approved by:** Jay Sarkar Date: June 27, 2000

**Jay Sarkar**  
Director, Standards & Certification

**Released by:** Jack J. Wojcik Date: June 27/2000  
**Dr. Jack J. Wojcik, P.Eng.**



"SOLUTIONS FOR THE WIRELESS FUTURE"

**FCC ID:** O3JF2R802D1  
**Applicant:** MIST Inc.  
**Equipment:** Wireless Point of Sale Terminal  
**Model:** MIST Freedom II-D  
**Standard:** FCC Rules and Regulations Part 2.1053

### **ENGINEERING SUMMARY**

This report contains the results of Field Strength of Spurious radiation measurement performed on a MIST Freedom II-D Wireless Point of Sale Terminal operating with a built-in Research in Motion R802D radio transmitter. The measurements were carried out in accordance with the FCC Rules and Regulations Part 2.1053. The product was evaluated for Spurious Emissions when it was set at the maximum power level.

## Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Field Strength of Spurious Radiation Ref. Paragraph 2.1053	8	1	<b>Passed</b>

## **INTRODUCTION**

### General

This report describes the results of the Field Strength of Spurious Radiation measurement conducted on a MIST Wireless Point of Sale Terminal, model MIST Freedom II-D operating with a built-in Research in Motion R802D radio transmitter.

### Test Facility

The tests were performed for MIST 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, under PALCAN program (ISO Guide 25). APREL is also accredited by Industry Canada (formerly DOC) 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.

### Test Equipment

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

### Environmental Conditions

Measurements were conducted in open area test site.

- Temperature: 20 °C ± 2
- Relative Humidity: 30 - 50 %
- Air Pressure: 101 kPa ± 3

## FCC SUBMISSION INFORMATION

**FCC ID:** O3JF2R802D1

Equipment: Wireless Point of Sale Terminal

Model: MIST Freedom II-D

For: Certification

Applicant: MIST Inc.  
703 Evans Avenue, Suite 5000  
Toronto, Ontario, M9C 5E9  
Canada  
Tel: (416) 621-1911, Fax: (416) 621-8875

Manufacturer: MIST Inc.  
1101 46e Avenue  
Lachine, Montreal, H8T 3C5  
Canada  
Tel: (514) 639-6511, Fax: (514) 639-8875

Evaluated by: APREL Laboratories  
51 Spectrum Way  
Nepean, Ontario  
Canada K2R 1E6

## MANUFACTURER'S DATA

<b>FCC ID No:</b>	O3JF2R802D1
<b>Equipment Type:</b>	Wireless Point of Sale Terminal
<b>Model:</b>	MIST Inc.
<b>Reference:</b>	FCC Rules and Regulations Parts 2 and Part 90
<b>Manufacturer:</b>	MIST Inc.
<b>Power Source:</b>	7.2 VDC Battery
<b>Development Stage of Unit:</b>	Production

## GENERAL SPECIFICATIONS

1. Frequency Range: 806.00 to 821.00 MHz (Transmitter)
2. Frequency Tolerance:  $\pm 2.5$  ppm
3. Type of Modulation: GMSK
4. Antenna Impedance: 50 Ohms

**TEST RESULTS**

**FOR**

**Field Strength of Spurious Radiation  
Of  
Wireless Point of Sale Terminal  
MIST Freedom II-D with a Research in  
Motion R802D  
Radio transmitter**

**MIST Inc.**



**Test:** Field Strength of Spurious Radiation

**Ref:** FCC Parts 2.1053 and 90.210

**Criteria:** Emission Mask G :  
The permitted maximum level of spurious emission is  $43 + 10 \log (P)$  dB below the unmodulated carrier power of the transmitter (P).

**Set-up:** See Figure 1.a

**Conditions:** Voltage Supply: 7.2 DC Battery

**Equipment:** See Appendix A.

**Procedure:** 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 **Wireless Point of Sales Terminal** was configured to operate at maximum power with appropriate modulation. Special software was employed in order that the transmitter R802D 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 analyzer and the appropriate calibrated antenna for the frequency range from 9 kHz up to 10<sup>th</sup> 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.**

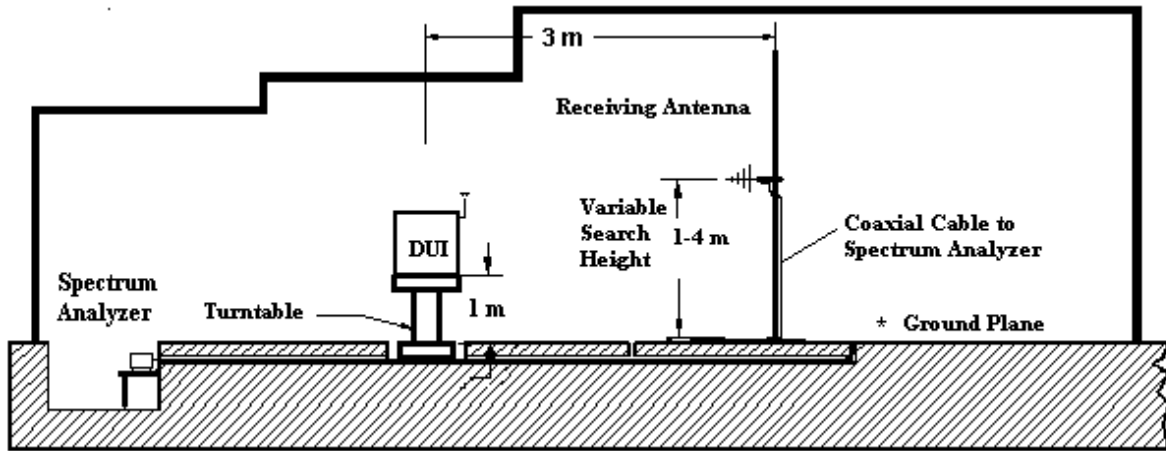


Figure 1.a Test set up for the Field Strength of Spurious Radiation Measurement in OATS  
(Not to scale)



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 maximized by the positioning of the turntable and the height of the antenna. The process was repeated for both horizontal and vertical polarization.

Information submitted includes the relative radiated power of each spurious emissions with reference to the appropriate limits as described in Mask G, 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

- A. Spectrum analyzer reading

at 1630.00 MHz a spurious level of 23.4 dB $\mu$ V @ 3 meters is measured.

- B. Correction factor (antenna factor, cable loss and amplifier gain)

Total Correction Factor: = 33.1 dB/m

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

$$C = A + B$$

$$C = 23.4 \text{ dB}\mu\text{V} + 33.1 \text{ dB}$$

$$C = 56.5 \text{ dB}\mu\text{V/m @ 3 meters}$$

- 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:

$$\text{Field Strength of unmodulated carrier (dB}\mu\text{V/m)} = 10 \log_{10}(\text{PtG}/4\pi r^2) + 146 \text{ dB}$$

Pt is transmitter carrier power, unmodulated (ERP)

G is gain, 1.64

r is distance, 3 meters

The Field Strength of the Carrier was calculated to be 129.8 dB $\mu$ V/m

D = Field Strength of the Carrier-(43+(10 log P))

D = 129.8 dB $\mu$ V/m-45.174

D = Criteria (reference) level at 3 meters from 1.65 W (ERP) into half-wave dipole antenna is 84.6 dB $\mu$ V/m.

E = Margin (spurious emission below the reference level)

$$E = D - C$$

$$E = 84.6 \text{ dB}\mu\text{V/m} - 56.5 \text{ dB}\mu\text{V/m}$$

$$E = 28.1 \text{ dB}\mu\text{V/m}$$

**Results:**      **Passed**      .      **See Tables 1 and 2**

**Table 1**  
**Field Strength of Spurious Radiation**  
**Transmitter Frequency Range: 806.00 MHz – 821.00 MHz**  
**Antenna Polarisation: Vertical**  
**Resolution Bandwidth:**  
**10 kHz (below 1 GHz)**  
**100 kHz (above 1 GHz)**

Frequency (MHz)	Measured Level (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	Criteria Level (dBµV/m)	Margin (dB)
	"A"	"B"	"C"	"D"	"E"
806.00 (1 <sup>st</sup> harmonic)	–	–	–	–	–
<b>1612.00</b> (2 <sup>nd</sup> harmonic)	<b>22.3</b>	<b>33.0</b>	<b>55.3</b>	<b>84.6</b>	<b>29.3</b>
2418.00 (3 <sup>rd</sup> harmonic)	< 0.9 (noise level)	37.8	< 38.7	<b>84.6</b>	> 45.9
3224.00 (4 <sup>th</sup> harmonic)	< 2.7 (noise level)	43.8	< 46.5	<b>84.6</b>	> 38.1
815.00 (1 <sup>st</sup> harmonic)	–	–	–	–	–
<b>1630.00</b> (2 <sup>nd</sup> harmonic)	<b>23.4</b>	<b>33.1</b>	<b>56.5</b>	<b>84.6</b>	<b>28.1</b>
2445.00 (3 <sup>rd</sup> harmonic)	< 0.9 (noise level)	37.9	< 38.8	<b>84.6</b>	> 45.8
3260.00 (4 <sup>th</sup> harmonic)	< 2.7 (noise level)	44.3	< 47.0	<b>84.6</b>	> 37.6
821.00 (1 <sup>st</sup> harmonic)	–	–	–	–	–
<b>1642.00</b> (2 <sup>nd</sup> harmonic)	<b>22.5</b>	<b>33.2</b>	<b>55.7</b>	<b>84.6</b>	<b>28.9</b>
2463.00 (3 <sup>rd</sup> harmonic)	< 0.9 (noise level)	38.0	< 38.9	<b>84.6</b>	> 45.7
3284.00 (4 <sup>th</sup> harmonic)	< 2.7 (noise level)	44.4	< 47.1	<b>84.6</b>	> 37.5

Test performed by *Lucretia Poirson*

Date *June 27, 2000*

**Table 2**  
**Field Strength of Spurious Radiation**  
**Transmitter Frequency Range: 806.00 MHz – 821.00 MHz**  
**Antenna Polarisation: Horizontal**  
**Resolution Bandwidth:**  
**10 kHz (below 1 GHz)**  
**100 kHz (above 1 GHz)**

Frequency (MHz)	Measured Level (dBµV)	Correction Factor (dB/m)	Field Strength (dBµV/m)	Criteria Level (dBµV/m)	Margin (dB)
	"A"	"B"	"C"	"D"	"E"
806.00 (1 <sup>st</sup> harmonic)	–	–	–	–	–
<b>1612.00</b> (2 <sup>nd</sup> harmonic)	<b>24.5</b>	<b>33.0</b>	<b>57.5</b>	<b>84.6</b>	<b>27.1</b>
2418.00 (3 <sup>rd</sup> harmonic)	< 0.9 (noise level)	37.8	< 38.7	<b>84.6</b>	> 45.9
3224.00 (4 <sup>th</sup> harmonic)	< 2.7 (noise level)	43.8	< 46.5	<b>84.6</b>	> 38.1
815.00 (1 <sup>st</sup> harmonic)	–	–	–	–	–
<b>1630.00</b> (2 <sup>nd</sup> harmonic)	<b>25.7</b>	<b>33.1</b>	<b>58.8</b>	<b>84.6</b>	<b>25.8</b>
2445.00 (3 <sup>rd</sup> harmonic)	< 0.9 (noise level)	37.9	< 38.8	<b>84.6</b>	> 45.8
3260.00 (4 <sup>th</sup> harmonic)	< 2.7 (noise level)	44.3	< 47.0	<b>84.6</b>	> 37.6
821.00 (1 <sup>st</sup> harmonic)	–	–	–	–	–
<b>1642.00</b> (2 <sup>nd</sup> harmonic)	<b>24.9</b>	<b>33.2</b>	<b>58.1</b>	<b>84.6</b>	<b>26.5</b>
2463.00 (3 <sup>rd</sup> harmonic)	< 0.9 (noise level)	38.0	< 38.9	<b>84.6</b>	> 45.7
3284.00 (4 <sup>th</sup> harmonic)	< 2.7 (noise level)	44.4	< 47.1	<b>84.6</b>	> 37.5

Test performed by Ku Eba Pouda

Date June 07, 2020

# APPENDIX A

## List of Test Equipment

**List of Equipment**

<b>Description</b>	<b>Range</b>	<b>Manufacturer</b>	<b>Model #</b>	<b>APREL Asset #</b>	<b>Cal. Due Date</b>
Spectrum Analyzer	9 kHz - 3 GHz	Anritsu	MS2661C	301330	Dec 10, 2000
Spectrum Analyzer	9 kHz - 30 GHz	Anritsu	MS2667C	301436	Nov 3, 2000
Biconical Antenna	20 MHz - 200 MHz	Eaton	94455-1	100890	July 21, 2001
Log - Periodic Antenna	200 MHz -1.0 GHz	Eaton	ALP-1	100761	July 21, 2001
Horn Antenna	1 – 18 GHz	Aprel	AA – 118	100553	March 13, 2001
Anechoic Shielded Room	10 kHz - 10 GHz	APREL Inc.	–	301329	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



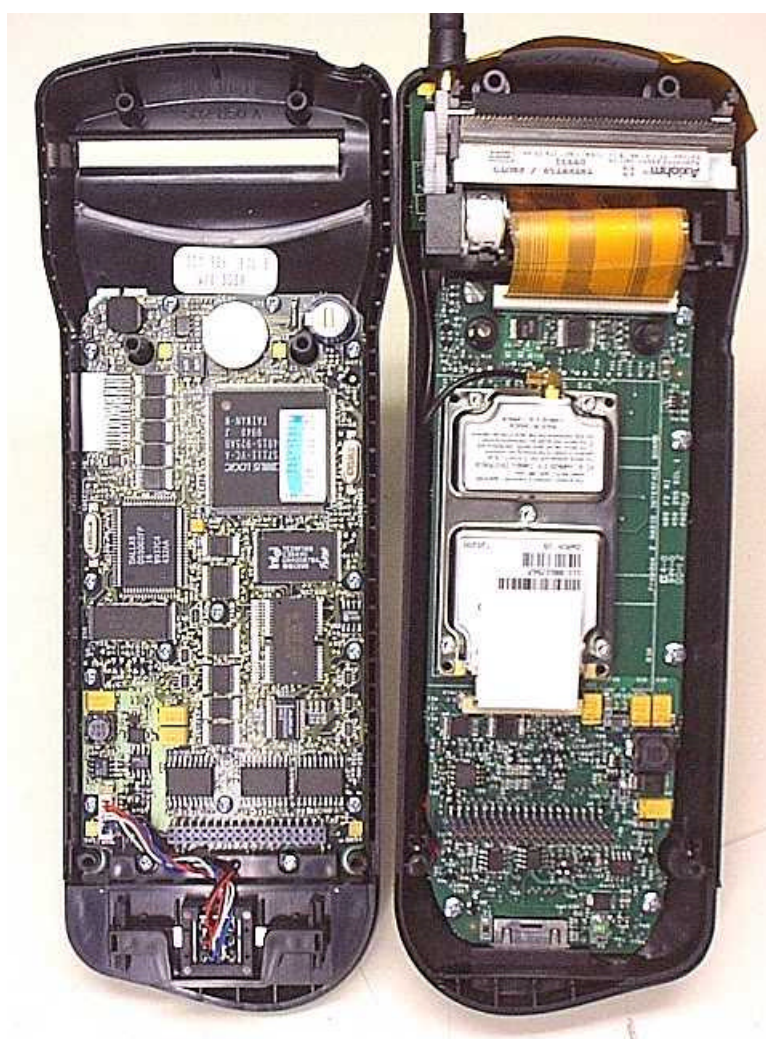
**MIST Freedom II-D with a Research in Motion DATATAC R802D Transmitter**



**Spurious Emission Testing (frequency range: 200 MHz – 1GHz)**



**Spurious Emission Testing (for frequencies above 1 GHz)**



**MIST Freedom II-D with  
a Research in Motion DATATAC R802D  
Transmitter (inside view)**