

# **TEMPEST INC.**

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**\*\*\* *Our 17th Year in Business: 1985 - 2002* \*\*\***

**Report of Electromagnetic Interference Testing  
Performed in Accordance with the  
Rules of the Federal Communications Commission:  
Title 47, Part 15 of the Code of Federal Regulations  
on the  
Model OVC3A Transceiver  
made by  
Mobiltex Data Ltd.  
3640 26th Street Northeast, Calgary  
Alberta, Canada T1Y 4T7**

**by  
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## Abstract

1. As requested by Purchase Order Number 1754 issued by Mobiltex Data Ltd., on June 5, 2002 TEMPEST INC. performed the Electromagnetic Compatibility Tests required by the United States Code Of Federal Regulations, Title 47, Part 15: FCC Rules, Paragraph 15.249: "Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz."

on the following device made by Mobiltex Data Ltd., hereafter called the Equipment Under Test (EUT):

EUT 1: Model OVC3A Transceiver s/n P 0000 9  
CSA ID # P 0000 9 FCC ID KLU02597

The Equipment Under Test intentionally radiates signals in the 902-926 MHz band.

2. The Equipment Under Test passed all tests by wide margins of 20 dB or more.

3. The Equipment Under Test was tested in its highest power mode, at the highest, middle and lowest transmitting frequencies. At each frequency, each device was tested in both the "Mark" and "Space" modes..

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### List of Illustrations

The following illustrations are submitted electronically as Microsoft Word document: FCC6.doc and the following .jpg files:

<u>File Name</u>	<u>TITLE</u>
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Fig-1.jpg	Equipment Under Test
Fig-2.jpg	Equipment Under Test, cover removed.
Fig-3.jpg	Test Setup: Radiated Emissions

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### Reference Documents:

(a) United States Code Of Federal Regulations, Title 47, Part 15: FCC Rules, Paragraph 15.249:

"Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz."

(b) ANSI C63.4: "American National Standard for Methods of Measurement of Radio-Noise Emissions of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" IEEE

## 1.0 Introduction.

As requested by Purchase Order Number 1754 issued by Mobiltex Data Ltd., on June 5, 2002 TEMPEST INC. performed Electromagnetic Compatibility tests in accordance with References (a) and (b) on the following device, hereafter called the Equipment Under Test:

Model OVC3A Transceiver  
serial number P 0000 9  
made by Mobiltex Data Ltd. of Calgary, Alberta

## 1.1 Purpose.

The purpose of this test was to determine if the Equipment Under Test complies with the requirements of Reference (a.).

## 1.2 Test Location.

Testing was performed in the Electromagnetic Compatibility Laboratory and the FCC-listed Open Area Test Site of TEMPEST INC.

## 1.3 Cognizant Personnel.

The following personnel conducted, witnessed, or are cognizant of the test:

Mr. Alex Holland  
Mobiltex Data Ltd. 3640 26th Street Northeast  
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(403) 291-2770 aholland@mobiltex.com

:

Mr. Jerry Chilibecki, Hardware Engineer, Mobiltex Data Ltd.  
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## 2.0 Description of the Equipment Under Test.

The Equipment Under Test consists of a Model OVC3A Transceiver, a vehicle mounted mobile access point device that allows computers in vehicles to communicate using frequency modulation. Each center frequency is varied by + 32 kHz to send a “Mark” and - 32 kHz to send a space. Its maximum output power is + 5 dBm.

Its lowest center frequency (mode 1) is 903.018 MHz. Its middle center frequency (mode 2) is 914.998 MHz, and its highest center frequency (mode 3) is 927.1214 MHz.

The Equipment Under Test draws 12 Volts of d.c. power, which was supplied by a linear power supply for this test. It is controlled by a laptop computer, which can be disconnected and removed once the desired operating frequency and mode is selected.

More information about the Equipment Under Test can be found at the following internet web site:

**<http://www.mobiltex.com>**

### 3.0 Test Procedures.

As described below, final testing was performed in accordance with references (a) and (b.) Radiated emissions were measured.

#### 3.1 Test Equipment.

Table 1 is a list of the Instrumentation. Table 1A describes the power supply and laptop computer used as ancillary equipment. A log periodic antenna, and a Hewlett-Packard spectrum analyzer were used in an Open area Test Site (OATS) to detect radiated emissions.

#### 3.2 Calibration Check.

Using its internal calibration source, the calibration of the spectrum analyzers was verified both immediately before and immediately after the test.

#### 3.3 Dynamic Range and Detection System Sensitivity Tests.

Before testing, the dynamic range of the instrumentation was determined to be 80 dB, and the detection system sensitivity was -80 dBm.

#### 3.4 Local Interference Test.

With the Equipment Under Test turned off, the ambient signals in the Open Area Test Site were measured and recorded, to verify that any signals being measured were coming from either the host computer or the Equipment Under Test, and not from other local sources, such as cellular telephones. Only signals produced by the Equipment Under Test are reported here.

### 3.5 Measurements.

The Equipment Under Test was placed 3 meters from the antenna hoist, and tuned to its middle frequency. It was rotated about all three axes to determine the orientation that produced the strongest signal on the spectrum analyzer. It was then rotated about 360 degrees in 22.5 degree increments. The receive antenna was raised from 1 to 4 meters above the ground plane while the emissions were measured. The peak values of the transmitted signals were recorded in dBm. These were converted to  $\mu\text{V/m}$  using the following formulas:

$$\text{level (dBm)} + 107 \text{ dB} + \text{antenna factor (dB)} = \text{level in dB}\mu\text{V/m}$$

$$\text{level in dB}\mu\text{V/m} = 20 \text{ Log}_{10} (\text{level in } \mu\text{V/m})$$

The Equipment Under Test was tested at its Highest (mode 3), Lowest (mode 1) and middle (mode 2) frequencies. At each frequency it was locked in the “mark” (s) and “space” (s) modes. For example: mode “3-m” makes the Equipment Under Test send a steady stream of marks at the highest transmit frequency. Mode “1-s” has it send a steady stream of spaces at the lowest frequency.



#### 4.0 Results.

As shown in Table 2, The Equipment Under Test passed all tests by wide margins of 20 dB or more.

#### 5.0 Conclusions and Recommendations.

The Equipment Under Test complies with the requirements of Reference (a.) We recommend that production units maintain the same configuration as the sample that was tested.

## Appendix A: Illustrations.

The following illustrations are submitted electronically as .jpg files:

Fig-1.jpg	Equipment Under Test
Fig-2.jpg	Equipment Under Test, cover removed.
Fig-3.jpg	Test Setup: Radiated Emissions

## Appendix B: Tables.

Table 1: Instrumentation

All equipment was calibrated within 11 months of the test  
Spectrum analyzer calibration was spot checked both before and after each test.

<u>Manufacturer</u>	<u>Model</u>	<u>Name</u>	<u>Serial No.</u>
Hewlett-Packard	141T	Spectrum Analyzer Display	2233A- 22141
“	“	8555A	RF Section 1.5 MHz-40 GHz
“	“	8552B	IF Section
TI-750			TI-751
TEMPEST INC.	NA 200/2G	Log Periodic Antenna	82

Table 1A: Ancillary Equipment

1. Toshiba Satellite 100 CS Laptop Computer  
Model # PA 1217CV s/n 73617981  
Canadian FCC Equivalent: CSA # LR39635
2. Radacs Model R12R Linear d.c. Power Supply  
s/n 020570 CSA# LR-82040-1

Table 2: Test Data

Radiated Emissions

Mode	Frequency, MHz	peak level dBm	dB $\mu$ V	Antenna Factor dB	Field Strength dB $\mu$ V/m	Field Strength mV/m	Limit mV/m
1-m	903.05	-61	46	14	60	1	50
1-s	902.986	-61	46	14	60	1	50
2-m	915.0308	-55	52	14	66	2	50
2-s	914.9668	-55	52	14	66	2	50
3-m	927.1534	-51	56	14	70	3.2	50
3-s	927.0894	-51	56	14	70	3.2	50
<b>All other emissions, including harmonics, were at least 20 dB below the limit,</b>							

Antenna Height: 1.5 meters, horizontal polarization

Frequency accuracy: 2%

Amplitude accuracy: +/- 2 dB

Detection System Sensitivity: -80 dBm

Bandwidth: 300 kHz

Nearest ambient: 930 MHz, 0.2 mV/m