

**CERTIFICATE OF COMPLIANCE
FCC PART 90 CERTIFICATION
MPE EVALUATION**

Test Lab:

CELLTECH RESEARCH INC.
Testing and Engineering Lab
1955 Moss Court
Kelowna, B.C.
Canada V1Y 9L3
Phone: 250 - 860-3130
Fax: 250 - 860-3110
Toll Free: 1-877-545-6287
e-mail: info@celltechlabs.com
web site: www.celltechlabs.com

Applicant Information:

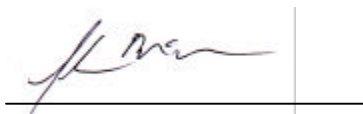
ITRONIX CORPORATION
801 South Stevens Street
Spokane, WA 99204
Contact: Fred Phillips

FCC ID:	KBCIX550RIM802
Model(s):	IX550
Equipment Type:	Rugged Laptop PC with RIM 802 DataTAC Radio Modem, Vehicle Cradle, & (2) Vehicle Magnetic Mount Antennas
Tx Frequency Range:	806 - 821 MHz
Rx Frequency Range:	851 - 870 MHz
Max. RF Output Power:	1.13 Watts (ERP)
FCC Rule Part(s):	2.1091; 1.1310; ET Docket 93-62
Antenna Type(s):	1. MaxRad Z562 Unity Gain Vehicle-Mount Antenna 2. MaxRad Z568 Unity Gain Vehicle-Mount Antenna

This wireless mobile and/or portable device has been shown to be compliant for localized Maximum Permissible Exposure (MPE) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE Std. C95.1-1992 and has been tested in accordance with the measurement procedures specified in ANSI/IEEE Std. C95.3-1999.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Celltech Research Inc. certifies that no party to this application has been denied FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).



Shawn McMillen
General Manager
Celltech Research Inc.



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SCOPE

Environmental evaluation measurements of Maximum Permissible Exposure (MPE) to radio frequency (RF) radiation from transmitting devices for compliance with the technical rules and regulations of the U.S. Federal Communications Commission (1).

1.0 INTRODUCTION

This measurement report describes the Maximum Permissible Exposure (MPE) tests of Itronix Model: IX550 Rugged Laptop PC with RIM 802D-2-0 DataTAC Radio Modem (FCC ID: KBCIX550RIM802), vehicle cradle, and loaded with two (2) vehicle rooftop magnetic mount antennas described in this report. The test procedures described in FCC CFR47 2.1091, 1.1310, American National Standards Institute C95.1-1992 (2), C95.3-1992 (3), and OET Bulletin 65 (Edition 97-01)(4) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of Equipment Under Test (EUT)

EUT Type	Rugged Laptop PC with RIM 802 DataTAC Radio Modem, Vehicle Cradle, & (2) Magnetic Vehicle-Mount Antennas	Equipment Class	Licensed Non-Broadcast Station Transmitter (TNB)
Radio Type	RIM 802D-2-O (DataTAC Network)	FCC ID	KBCIX550RIM802
Max. RF Output Power	1.13 Watts (ERP)	Model No.(s)	IX550
Tx Frequency Range (MHz)	806-821	Signal Modulation(s)	FSK
Rx Frequency Range (MHz)	851-870	Antenna Type(s)	#1. MaxRad Z562 (Unity Gain) #2. MaxRad Z568 (Unity Gain)

3.0 MPE MEASUREMENT GUIDELINES

The Federal Communications Commission (FCC) has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public from the potential hazards of RF emissions (1). The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized MPE in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz (2). The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave (3) is used for guidance in measuring MPE due to RF exposure from the particular transmitting device. The new guidelines incorporate limits for MPE in terms of electric and magnetic field strength, and power density for transmitters operating at frequencies between 300 kHz and 100 GHz. This criteria for MPE evaluation is also described in OET Bulletin 65 (Edition 97-01), Evaluation Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields (4).

4.0 DEFINITION

MPE is the rms and peak electric and magnetic field strength, their squares, or the plane-wave equivalent power densities associated with these fields to which a person may be exposed without harmful effect, and with an acceptable safety factor.

The MPE prescribed by the standard are set in terms of different parameters of effects, depending on the frequency generated by the device. The MPE levels are set in terms of power density, whose definition and relationship to electric and magnetic field strengths are described by the following equation:

$$S(mW / cm^2) = \frac{E^2}{3770} = 37.7H^2$$

where:

S = Power density (mW/cm²)

Power per unit area normal to the direction of propagation usually expressed in units of watts per square meter (W/m²), or units of milliwatts per square centimeter (mW/cm²). For plane waves, power density, electric field strength (E), and magnetic field strength (H) are related by the impedance of free space (377 Ω).

E = Electric field strength (V/m)

H = Magnetic field strength (A/m)

5.0 MPE LIMITS

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

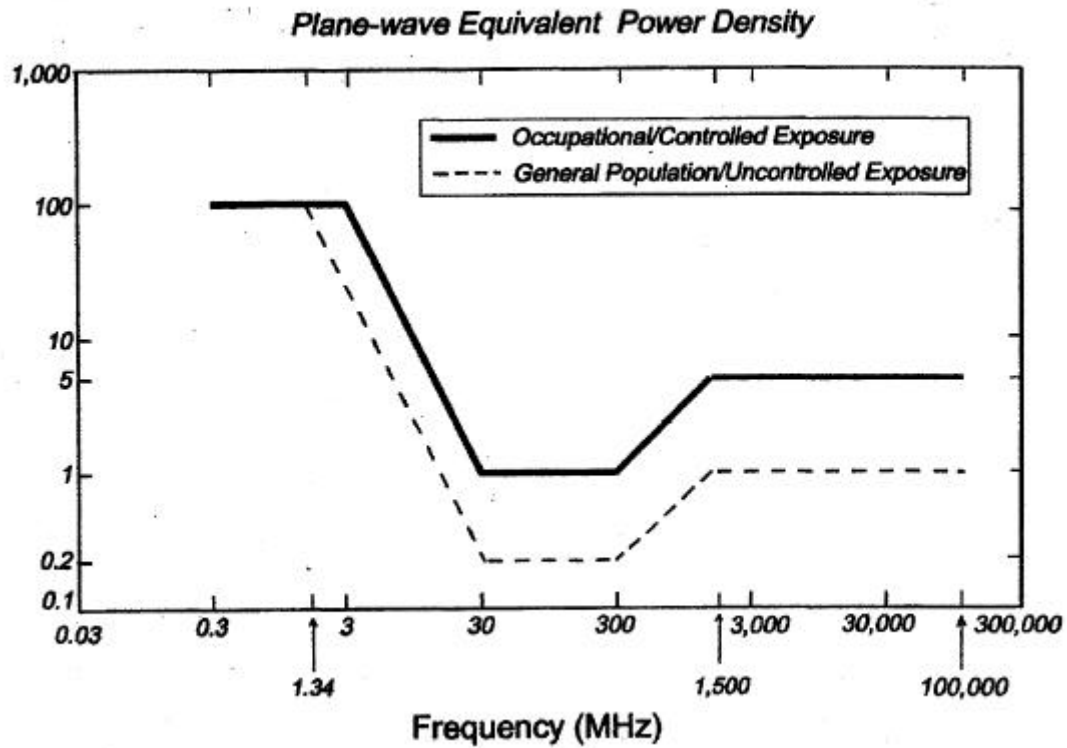
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz

*Plane-wave equivalent power density

NOTE 1: *Occupational/controlled* limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

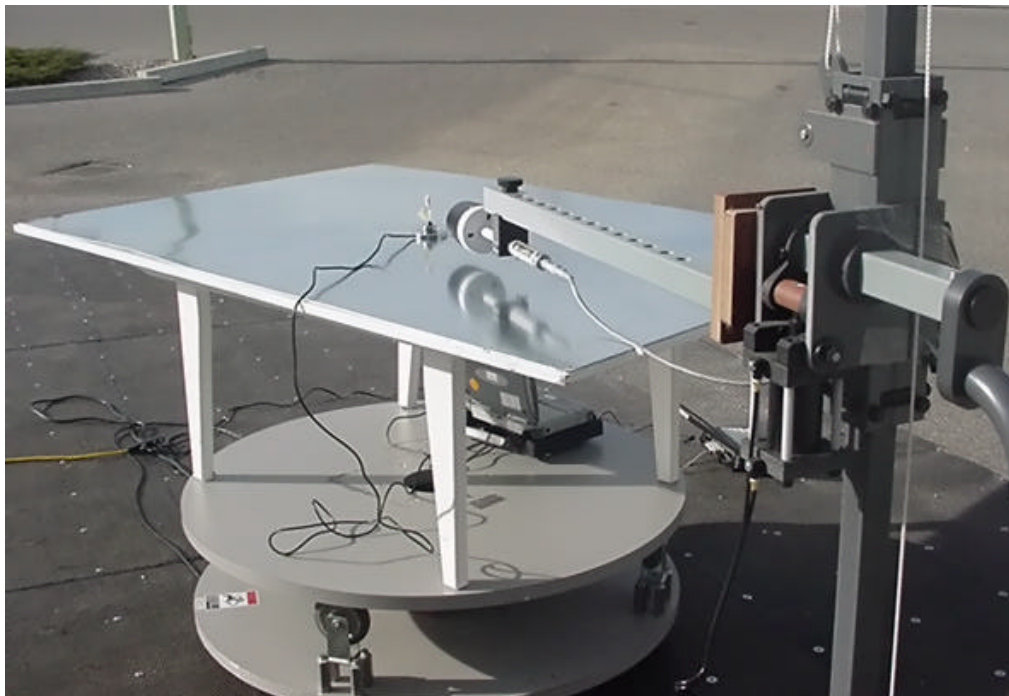
NOTE 2: *General population/uncontrolled* exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.



6.0 DETAILS OF MPE EVALUATION

The Itronix IX550 Rugged Laptop PC FCC ID: KBCIX550RIM802 with RIM 802 DataTAC Radio Modem, vehicle cradle, and loaded with two (2) vehicle rooftop magnetic mount antennas was found to be compliant for MPE based on the following test provisions and conditions:

- 1) The probe was positioned above a simulated metal vehicle rooftop at a separation distance of 20.0cm from the radiating antenna and at a starting height of 5.0cm to the center of the probe.
- 2) The turntable was positioned so that the initial start angle was 0 degrees.
- 3) The EUT was turned on to allow for sufficient time for stabilization. The EUT was operated at full power on a desired frequency.
- 4) The Survey Meter was set for maximum hold and on the appropriate power range.
- 5) The turntable was rotated about 360 degrees and the maximum reading was obtained for that elevation.
- 6) The EUT was then turned off and the probe raised by 5.0cm. This process was repeated to a sufficient distance past the tip of the antenna or where the maximum radiation was reduced by a significant factor to warrant no further measurement. The data was then tabulated and graphed in the charts and tables shown on next pages.



MPE Test Setup

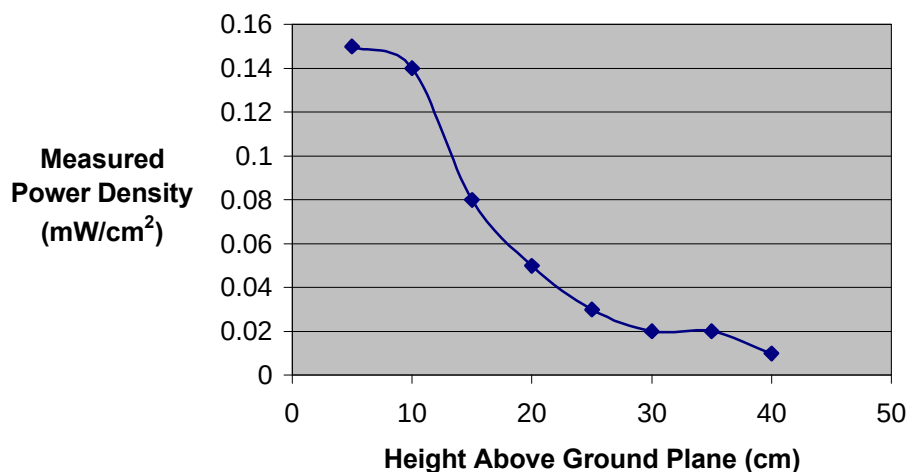
7.0 MPE MEASUREMENT SUMMARY

The measurement results were obtained with the EUT tested in the conditions described in this report.

ANTENNA #1 - MaxRad Z562 Unity Gain (P/N: 46-0059-001)

806MHz

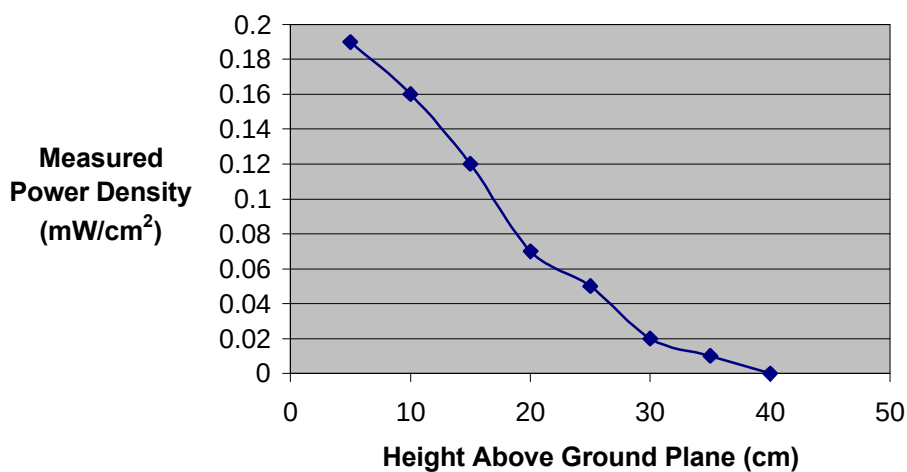
Height Above Ground Plane (cm)	Measured Power Density at 20cm (mW/cm ²)	Correction Factor to Obtain Actual mW/cm ²	Total E-Field Equivalent Power Density	MPE Limit (mW/cm ²)
5	0.15	1.02	0.1530	f/1500
10	0.14	1.02	0.1428	f/1500
15	0.08	1.02	0.0816	f/1500
20	0.05	1.02	0.0510	f/1500
25	0.03	1.02	0.0306	f/1500
30	0.02	1.02	0.0204	f/1500
35	0.02	1.02	0.0204	f/1500
40	0.01	1.02	0.0102	f/1500
45	0.00	1.02	0.0000	f/1500



MaxRad Z562
P/N: 46-0059-001

821MHz

Height Above Ground Plane (cm)	Measured Power Density at 20cm (mW/cm ²)	Correction Factor to Obtain Actual mW/cm ²	Total E-Field Equivalent Power Density	MPE Limit (mW/cm ²)
5	0.19	1.01	0.1919	f/1500
10	0.16	1.01	0.1616	f/1500
15	0.12	1.01	0.1212	f/1500
20	0.07	1.01	0.0707	f/1500
25	0.05	1.01	0.0505	f/1500
30	0.02	1.01	0.0202	f/1500
35	0.01	1.01	0.0101	f/1500
40	0.00	1.01	0.0000	f/1500
45	0.00	1.01	0.0000	f/1500

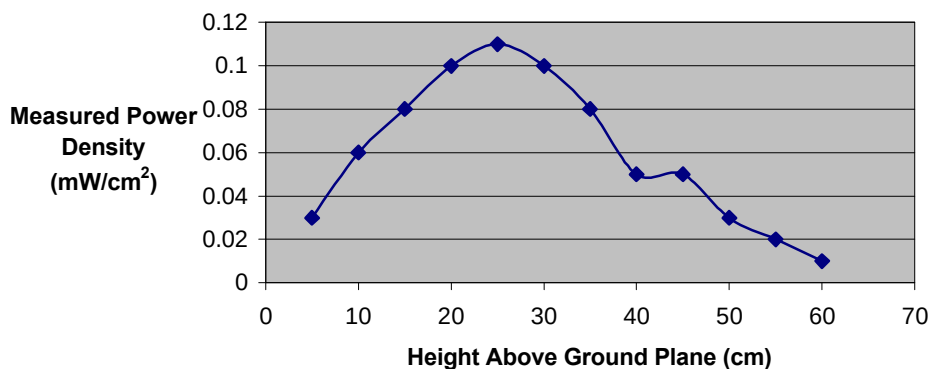


MaxRad Z562
P/N: 46-0059-001

ANTENNA #2 - MaxRad Z568 Unity Gain (P/N: 46-0064-001)

806MHz

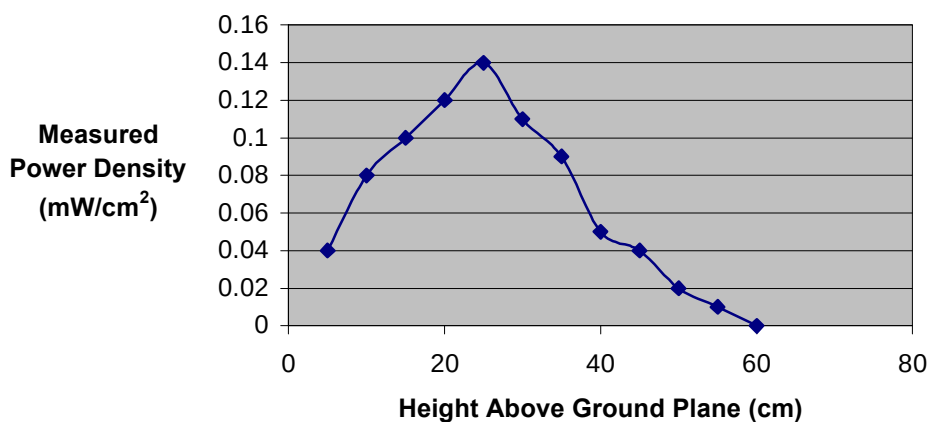
Height Above Ground Plane (cm)	Measured Power Density at 20cm (mW/cm ²)	Correction Factor to Obtain Actual mW/cm ²	Total E-Field Equivalent Power Density	MPE Limit (mW/cm ²)
5	0.03	1.02	0.0306	f/1500
10	0.06	1.02	0.0612	f/1500
15	0.08	1.02	0.0816	f/1500
20	0.10	1.02	0.1020	f/1500
25	0.11	1.02	0.1122	f/1500
30	0.10	1.02	0.1020	f/1500
35	0.08	1.02	0.0816	f/1500
40	0.05	1.02	0.0510	f/1500
45	0.05	1.02	0.0510	f/1500
50	0.03	1.02	0.0306	f/1500
55	0.02	1.02	0.0204	f/1500
60	0.01	1.02	0.1020	f/1500



MaxRad Z568
P/N: 46-0064-001

821MHz

Height Above Ground Plane (cm)	Measured Power Density at 20cm (mW/cm ²)	Correction Factor to Obtain Actual mW/cm ²	Total E-Field Equivalent Power Density	MPE Limit (mW/cm ²)
5	0.04	1.01	0.0404	f/1500
10	0.08	1.01	0.0808	f/1500
15	0.10	1.01	0.1010	f/1500
20	0.12	1.01	0.1212	f/1500
25	0.14	1.01	0.1414	f/1500
30	0.11	1.01	0.1111	f/1500
35	0.09	1.01	0.0909	f/1500
40	0.05	1.01	0.0505	f/1500
45	0.04	1.01	0.0404	f/1500
50	0.02	1.01	0.0202	f/1500
55	0.01	1.01	0.0101	f/1500
60	0.00	1.01	0.0000	f/1500



MaxRad Z568
P/N: 46-0064-001

8.0 SYSTEM CALIBRATION

Prior to the assessment for MPE, the Electromagnetic Radiation Survey Meter and probe was calibrated as per the operating instructions in the operations manual. The unit was placed into the units electrically sealed storage case and allowed sufficient time for both units to acquire the same temperature. The system was then calibrated by a built in software routine and zeroed in an electromagnetic free environment

9.0 MPE SYSTEM SPECIFICATIONS

Radiation Detection Specifications

Electromagnetic Radiation Survey Meter:	Narda Model 8712
Isotropic Electric Field Probe:	Model 8761D
Frequency Range:	300 kHz - 3 GHz

Positioning System

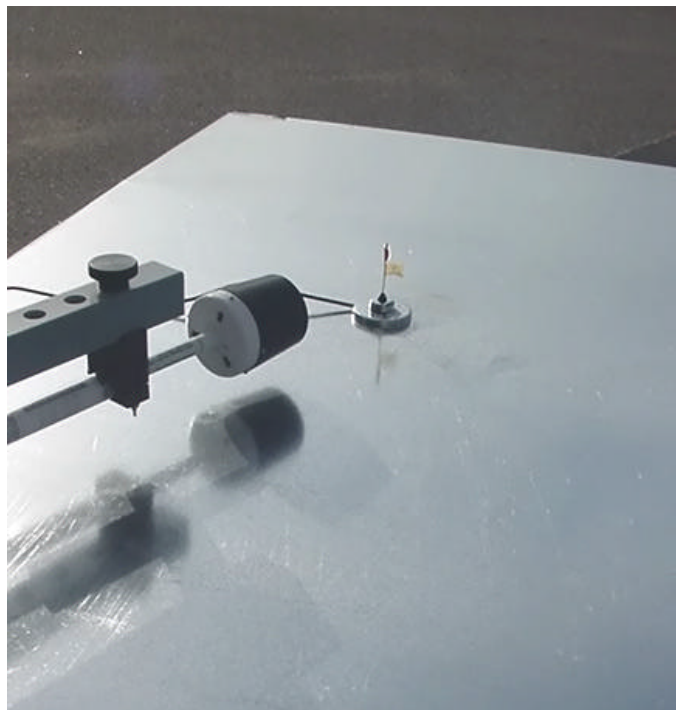
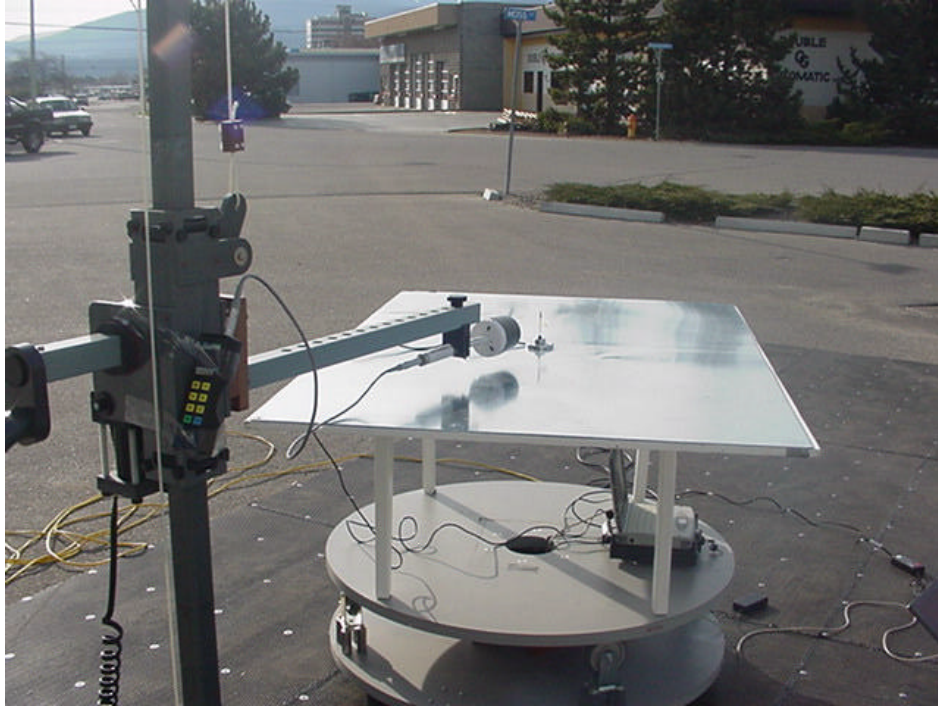
Multi-Device Controller	EMCO 2090	S/N: 9912-1484
Mini-Mast	EMCO 2075	S/N: 0001-2277
Turntable	EMCO 2080-1.2/1.5	S/N: 0002-1002

10.0 REFERENCES

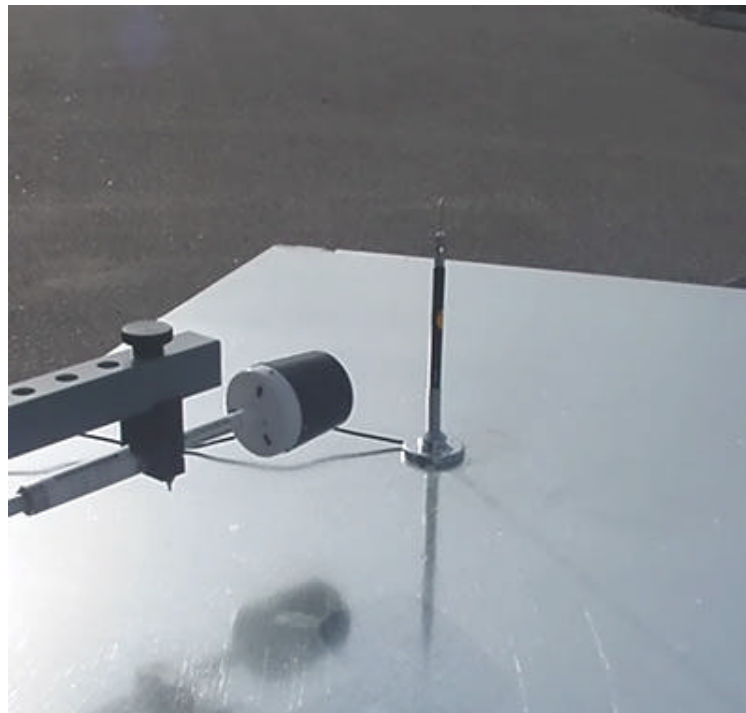
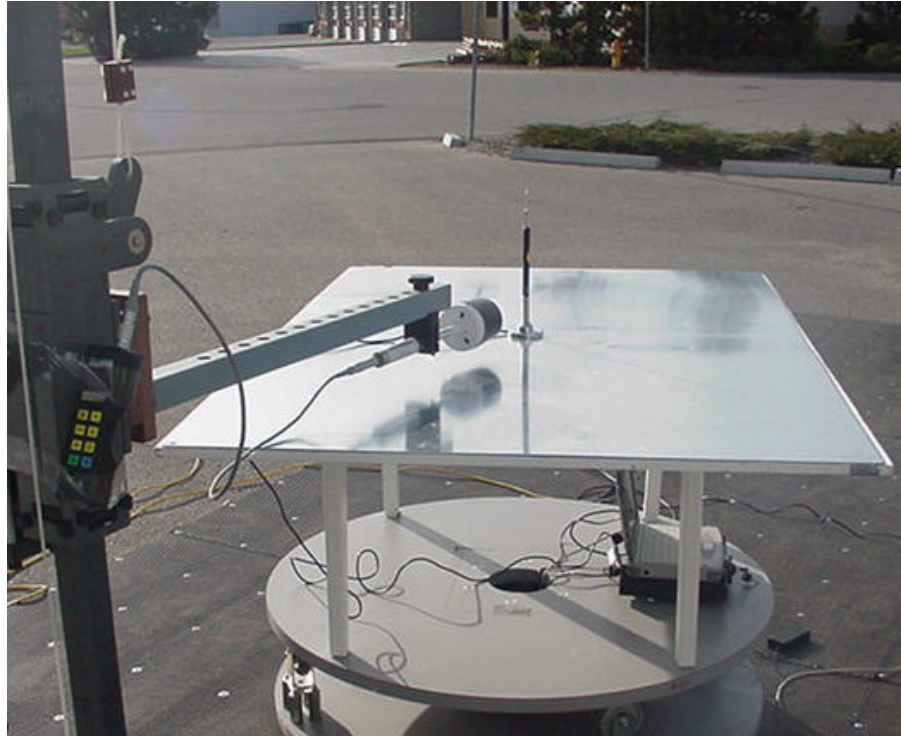
- (1) Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.
- (2) ANSI/IEEE C95.1-1992, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz.
- (3) ANSI/IEEE C95.3-1992, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.
- (4) OET Bulletin 65 (Edition 97-01), Evaluation Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

APPENDIX A - MPE TEST SETUP PHOTOGRAPHS

MPE TEST SETUP PHOTOGRAPHS
MaxRad Z562 Unity Gain Antenna
P/N: 46-0059-001



MPE TEST SETUP PHOTOGRAPHS
MaxRad Z568 Unity Gain Antenna
P/N: 46-0064-001



APPENDIX B - ANTENNA SPECIFICATIONS

802

REV	REF.	DESCRIPTION	INPT BY	APP	DATE
1		Prototype Release	CAC	SLH	10/11/99
A	1828	Release	CDC		11/30/99

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DOCUMENT

DEC 08 1999

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APPROVALS		Unless otherwise specified dimensions are in inches. NOT TO SCALE DRAWING		ITRONIX CORPORATION S 801 STEVENS AVE. P.O. BOX 0179 SPOKANE, WA 99210-0179
ORIG. D. McLean	DATE 10/8/99			TITLE: VEHICLE ANTENNA, DataTAC\CDPD, UNITY GAIN, Z562, GROUND PLANE DEPENDENT
CHK. <i>Handwritten initials</i>	DATE 12/1/99			
ENG. <i>Handwritten initials</i>	DATE 12/3/99			
MFG. <i>Handwritten initials</i>	DATE 12/4/99			Drawing Number 46-0059-000
F.S.	DATE			PAGE 1 OF 4

CHANGE RECORD

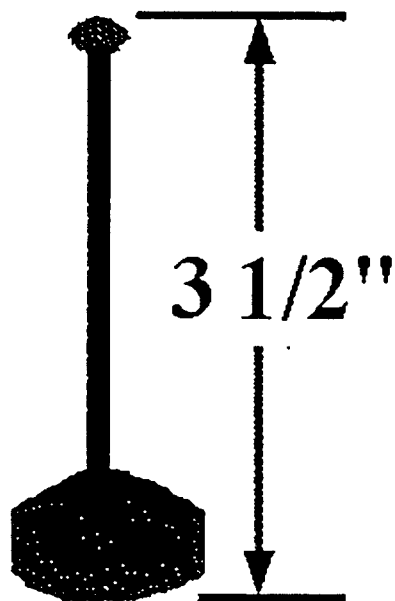
[illegible]

- 1.0 **DESCRIPTION:** Unity gain, ground plane vehicle antenna. The factory tuned frequency is 835 MHz. This antenna is for use in a DataTAC or CDPD network.
- 2.0 **APPLICABLE DOCUMENTS AND REFERENCES:**
- 2.1 **ITRONIX DOCUMENTS:**
Procedure, Reliability Design Guidelines....920-0806-001
- 2.2 **MANUFACTURER'S SPECIFICATION:** MaxRad Z562
- 3.0 **MECHANICAL REQUIREMENTS:**
- 3.1 Dimensions (For Reference Only): See Figure 1.
- 3.2 Radiator Material: Stainless steel with a bright finish.
- 3.3 Antenna Length (For Reference Only): 3-1/2 inches
- 3.4 Rod/Coil Type: Straight
- 3.5 Connectors: 1-1/8"-18 mounting threads mate with 3/4" mounts (with a rubber gasket)
- 3.6 Mounting (For Reference Only): 3/4" Magnetic Mount (46-0065-xxx) **OR** Thru-hole Mount (46-0073-xxx).
- 4.0 **ELECTRICAL REQUIREMENTS:**
- 4.1 VSWR at Resonant Point: <1.5:1
- 4.2 Nominal Impedance: 50Ω
- 4.3 Antenna Type: 1/4 wave
- 4.4 Operating Frequency: 806-896 MHz
- 4.5 Factory Tuned Frequency: 835 MHz
- 4.6 Intended for Use in Network Type: DataTAC/CDPD
- 4.7 Power Dissipation: 100 W
- 5.0 **ENVIRONMENTAL REQUIREMENTS:**
- 5.1 Temperature: -40°C to +85°C
- 5.2 Humidity: 0% to 100% Relative Humidity
- 6.0 **SAFETY REQUIREMENTS:** N/A
- 7.0 **MARKING REQUIREMENTS:**
The bulk shipping container must bear the Manufacturer's name and part number.
- 8.0 **PACKAGING REQUIREMENTS:**
Packaging of components shall be such that no damage will occur to the component during shipment. Refer to EIA STD RS-383-A.
- 9.0 **ACCEPTABILITY REQUIREMENTS:**
These units must meet inspection requirements. The antenna bag should contain an antenna rod, a nut, a rubber gasket (MaxRad part number MSGSK), a rain cap and assembly instructions.

10.0 **MANUFACTURER AND MANUFACTURER'S PART NUMBER:**

See Section 9.0 for a list of parts included.

Part Number	Manufacturer	Manufacturer's Part Number
46-0059-001	MaxRad	Z562



D46\Pict\59_1

Figure 1: 46-0059-001 Antenna dimensions (For Reference Only)

802

REV	REF.	DESCRIPTION	INPT BY	APP	DATE
1		Prototype Release	CAC	SLH	10/11/99
A	1828	Release			

ITRONIX

DOCUMENT

DEC 08 1999

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Information contained herein is proprietary and is the property of Itronix, Corporation. Where furnished with a proposal, the recipient shall use it solely to evaluate the proposal. Where furnished to a customer, it shall be used solely for purposes of inspection, installation, or maintenance. Where furnished to a supplier, it shall be used solely in the performance of work contracted by this company. The information shall not be used or disclosed by the recipient for any other purpose whatsoever.

APPROVALS		Unless otherwise specified dimensions are in inches. NOT TO SCALE DRAWING		ITRONIX CORPORATION S 801 STEVENS AVE. P.O. BOX 0179 SPOKANE, WA 99210-0179
ORIG. D. McLean	DATE 10/8/99			TITLE: VEHICLE ANTENNA, DataTAC, UNITY GAIN, Z568, ELEVATED FEED
CHK. <i>Handwritten initials</i>	DATE 12/3/99			
ENG. <i>Handwritten initials</i>	DATE 12/3/99			
MFG. <i>Handwritten initials</i>	DATE 12/6/99			Drawing Number 46-0064-000
F.S.	DATE			PAGE 1 OF 4

CHANGE RECORD

[illegible]

- 1.0 **DESCRIPTION:** Unity gain, elevated feed vehicle antenna. The factory tuned frequency is 815 MHz. This antenna is for use in a DataTAC network.
- 2.0 **APPLICABLE DOCUMENTS AND REFERENCES:**
- 2.1 **ITRONIX DOCUMENTS:**
Procedure, Reliability Design Guidelines....920-0806-001
- 2.2 **MANUFACTURER'S SPECIFICATION:** MaxRad Z568
- 3.0 **MECHANICAL REQUIREMENTS:**
- 3.1 Dimensions (For Reference Only): See Figure 1.
- 3.2 Radiator Material: Stainless steel with a bright finish.
- 3.3 Antenna Length (For Reference Only): 12-½ inches
- 3.4 Rod/Coil Type: Straight
- 3.5 Connectors: 1-1/8"-18 mounting threads mate with ¾" mounts (with a rubber gasket)
- 3.6 Mounting (For Reference Only): ¾" Magnetic Mount (46-0065-xxx), Thru-Hole Mount (46-0073-xxx) **OR** ¾" Chrome Frame Mount (46-0074-xxx)
- 4.0 **ELECTRICAL REQUIREMENTS:**
- 4.1 VSWR at Resonant Point: <1.5:1
- 4.2 Nominal Impedance: 50Ω
- 4.3 Antenna Type: ¼ wave
- 4.4 Operating Frequency Range: 806-866 MHz
- 4.5 Factory Tuned Frequency: 815 MHz
- 4.6 Intended for Use in Network Type: DataTAC
- 4.7 Power Dissipation: 125 W
- 5.0 **ENVIRONMENTAL REQUIREMENTS:**
- 5.1 Temperature: -40°C to +85°C
- 5.2 Humidity: 0% to 100% Relative Humidity
- 6.0 **SAFETY REQUIREMENTS:** N/A
- 7.0 **MARKING REQUIREMENTS:**
The bulk shipping container must bear the Manufacturer's name and part number.
- 8.0 **PACKAGING REQUIREMENTS:**
Packaging of components shall be such that no damage will occur to the component during shipment. Refer to EIA STD RS-383-A.
- 9.0 **ACCEPTABILITY REQUIREMENTS:**
These units must meet inspection requirements. The antenna bag should contain an elevated feed base with attached rod, a rubber gasket (MaxRad part number MSGSK), a rain cap, an allen wrench and assembly instructions.

10.0 MANUFACTURER AND MANUFACTURER'S PART NUMBER:

See Section 9.0 for list of parts included.

Part Number	Manufacturer	Manufacturer's Part Number
46-0064-001	MaxRad	Z568

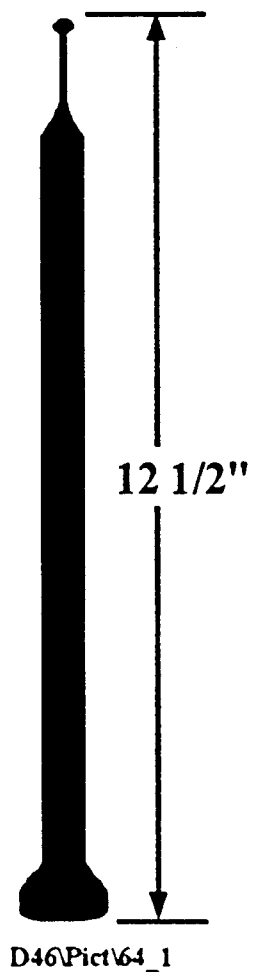


Figure 1: 46-0064-001 Antenna dimensions (For Reference Only)