INSTRUCTION MANUAL

ANTENNA TOWER

MODEL EM-4720

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ELECTRO-METRICS

MODEL EM-4720

SERIAL NO: N/A

ELECTRO-METRICS CORPORATION

231 Enterprise Road, Johnstown, New York 12095
Phone: (518) 762-2600 Fax: (518) 762-2812

EMAIL: info@emihq.com **WEB: http://www.electro-metrics.com**

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WARRANTY

This Model EM-4720 Antenna Tower is warranted for a period of 12 months (USA only) from date of shipment against defective materials and workmanship. This warranty is limited to the repair of or replacement of defective parts and is void if unauthorized repair or modification is attempted. Repairs for damage due to misuse or abnormal operating conditions will be performed at the factory and will be billed at our commercial hourly rates. Our estimate will be provided before the work is started.

DESCRIPTION AND USE
TEM CELL
ELECTRO-METRICS MODEL EM-7300

1.0 Introduction

The Electro-Metrics Model EM-7300 TEM (Transverse ElectroMagnetic) Cell is used to perform radiated electromagnetic susceptibility testing from DC to 230 MHz.

The EM-7300 is fundamentally a large rectangular section of coaxial cable with pyramid-shaped transitional sections at each end containing Type N connectors. The center conductor or septum is a flat sheet of metal supported by non-conductive delrin rods. The equipment under test (EUT) is normally placed on the cell floor for testing. The septum ***is not used*** for placement of test items since it is not design to handle heavy items.

The side of the cell containing the access door has:

Six (6) DC filtered input lines rated at 400 VDC at 10 A.
Location: beneath door opening, lower left.

One (1) AC filtered input rated at 130 VAC at 15 A.
Location: beneath door opening.

Four (4) BNC-to-BNC connectors.
Location: left of door opening above DC connectors.

One (1) fiber-optic opening.
Location: hinge side of door lower right.

The cell and septum are constructed of 0.090 aluminum with the external shell screwed together. The single access door has RF finger gasket material to provide shielding integrity to the cell. Seven (7) pivot latches secure the door during tests. Four (4) 102 mm (4-inch) lockable caster wheels allow easy movement of the Cell.

2.0 Specifications

2.1 Electrical

Frequency Range:	DC to 230 MHz.
Insertion Loss:	0.5 dB (DC-230 MHz).

Impedance:	50Ω nominal.
VSWR:	1.2:1 max.
Maximum Power Input:	1000 Watts.
Transition Connectors:	Type "N", female.

2.2 Mechanical

Height (max including caster wheels):	143.5 cm (56.5 inches).
Width:	125.4 cm (49.4 inches).
Length (Tip-to-Tip):	256.5 cm (101 inches).
Access Door Opening:	Height: 91.4 cm (36 inches). Width: 91.4 cm (36 inches).
Weight:	113.6 kg (250 lbs).

3.0 Theory Of Operation

The EM-7300 is fundamentally a large rectangular section of coaxial cable that propagates a transverve electromagnetic wave. The TEM wave is characterized by orthogonal electric (E) and magnetic (H) fields that are perpendicular to the direction of wave propagation along the length of the transmission line.

Within the cell, the E and H field components of the TEM mode field structure are essentially uniform over a large percentage of the volume between the septum and outer conductor (shell of the cell). This simulate a planar field in free space where a wave impedance of 377 ohms exists.

There is no low frequency cutoff in the TEM mode, the lower limit being determined by the magnetic shielding effectiveness of the material used for constructing the cell. In the case of the EM-7300, this essentially sets the lower limit of the cell at DC.

The upper frequency limit is determined by the physical size of the rectangular section of the cell. As the frequency of the test signal increases, distortions will occur caused by resonances and multimoding. The result is an increasingly distorted and non-uniform field within the cell test area. For the EM-7300, the cell size and size of the septum set an usable upper limit of 230 MHz.

4.0 Description Cell Input/Output Connectors

The location of all connectors for the EM-7300 are referenced with respect to the single access door located on one side of the cell.

The reference point orientation is: Facing door, hinge side to right.

NOTE: The door opens to the right.

4.1 Transition End Connectors

Type: Type "N" female.

Number: Two.

Location: One on each transition end section.

Function: Interfacing the Cell with the external field producing source.

NOTE: Either end connector can be used as the input. Since the cell is symmetrical in design and electrical function, there is no designated input or output.

4.2 DC Input Connectors

Type: 5-way binding posts.

Rating: 400 VDC at 10 A.

Number: Six.

Location: Beneath door opening, lower left.

Function: Interfacing six (6) DC (filtered) input lines into the Cell. The corresponding connectors on the inside of the Cell are banana plugs. External and internal connectors are color coded for ease in equipment hookup.

RFI/EMC Filter Attenuation: 100 dB, 90 kHz-1 GHz.

4.3 AC Input Connector

Type: IEC Type 17252.

Rating: 130 VAC at 15 A.

Number: One.

Location: Beneath door opening.

Function: Interfacing AC (filtered) input line into the Cell. The AC input is divided into two (2) separate AC lines within the Cell that are then connected to a duplex receptacle on the bottom of the cell under the door opening. An IEC 320-C-13 power cord is used for the AC power source connection.

RFI/EMC Filter Attenuation: 100 dB, 90 kHz-1 GHz.

4.4 Instrumentation Connectors

Type: BNC -to-BNC feedthrough.

Number: Four.

Location: left of door opening above DC connectors.

Function: Interfacing instrumentation cabling into/out of the Cell.

4.5 Fiber-Optic Cable Opening

Number: One.

Location: Hinge side of door lower right.

Function: Interfacing optical instrumentation cabling into--out of the Cell. Opening is key hole style, with the fiber-optic cable placed into the slot. The opening is covered by a metal disk plate. Access is gained by loosening the thumb screw and swinging the disk away from the key hole.

5.0 Setups Caveats and Precautions

The following are several setup caveats and precautions to observe when using the EM-7300 TEM Cell. No setup diagrams or specific equipment usage information is provided. Test setups and equipment usage is dependent on the test standard and specification requirement being used.

5.1 General Setup Information

The following should be observed when using the EM-7300 TEM Cell:

a. Either transition end connector can be used as the input. Since the cell is symmetrical in design and electrical function, there is no designated input or output.

b. Maximum size of the EUT:

Length:	40.6 cm (16 inches).
Width:	40.6 cm (16 inches).
Height:	20.3 cm (8 inches).

Keeping the EUT at the maximum size or below will result in maintaining a uniform field within the test area of the cell. Euts' larger than the maximum stated will distort the characteristics of the radiated field, thus uniformity cannot be determined with any degree of accuracy.

c. ***Do not place Test Items on the septum*****.** It is not designed to handle heavy items.

Always use the Cell floor for placement of the Equipment Under Test.

d. The EM-7300 TEM Cell can only be used to perform radiated electromagnetic susceptibility testing from DC to 230 MHz.

NOTICE

The EM-7300 TEM Cell cannot be used for "valid" radiated emissions testing since the data obtained cannot be correlated with known radiated emission standards or test methods.

5.2 Precautions

The following precautions should be observed when using the EM-7300 TEM Cell:

a. The Cell by itself ***does not*** present a 50-ohm load to the signal source. Do not operate the Cell without a 50-ohm load (termination) connected to the unused transition end connector.

Failure to do so, may result in damage to the amplifier being used to drive the susceptibility test system.

b. The access door should be properly latched and secured before any radiated susceptibility testing is preformed.

c. Unless required by the test standard or specification, the EUT should be insulated from the cell floor. The material used should be transparent to the radiated field. Plastic foam type material is suggested.

d. Keep all internal cabling and wiring to the EUT on the cell floor or as low to the cell floor as possible. This will keep any potential disturbance to radiated field to a minimum.

5.3 Typical Field Strength Vs Input Power

The following table indicates the nominal input power required to produce the resulting field strength within the TEM Cell. The figures show are typical only. Actual input power levels to obtain the required field levels may vary from those shown.

TYPICAL FIELD STRENGTH VS INPUT POWER

Power In (Watts)	Field Strength (V/m)
1	11.6
2	16.4
5	25.9
10	36.7
20	51.9
30	63.5
40	73.3
50	82.0
60	89.9
70	97.0
80	103.7
90	110.0
100	116.0
200	164.0
300	201.0
400	232.0
500	259.3
600	284.1
700	306.8
800	328.0
900	347.9
1000	366.7

The formula used to obtain the field strength levels in the above table is:

$$E_{(V/m)} = 1.64\sqrt{50 \bullet P_{in}}$$

Where:

E = Field Strength in Volts/meter.

P_{in} = Input Power Level in Watts.

6.0 VSWR Chart

The VSWR chart for the actual serialized EM-7300 TEM Cell is provided on Page 8A.