

Model 3149

BiConiLog™ Antenna

User Manual



 **ETS-LINDGREN**[®]
An ESCO Technologies Company

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C	Corrected range	December, 2016
D	Corrected electrical specs	February, 2018
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Notes, Cautions, and Warnings

	<p>Note: Denotes helpful information intended to provide tips for better use of the product.</p>
<p>CAUTION</p>	<p>Caution: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.</p>
<p>WARNING</p>	<p>Warning: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.</p>

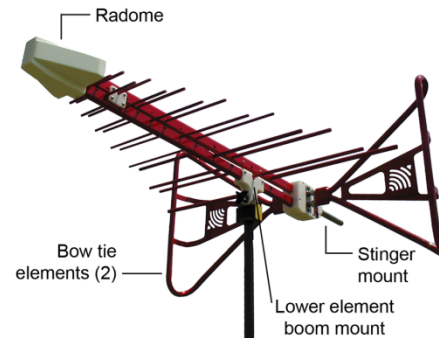


See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

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1.0 Introduction

The **ETS-Lindgren Model 3149 BiConiLog™** is a dual-purpose antenna that can be used for both emissions and immunity applications. The Model 3149 is a hybrid linearly polarized EMC antenna consisting of a log periodic dipole array (LPDA) and a single bow tie antenna.



The Model 3149 has an ultra broadband frequency range, accepts high power input, and is size-efficient for easy transport and use in compact chambers. Rugged construction assures dimensional and electrical stability over extended use.

The BiConiLog antenna combines the best characteristics of biconical and log periodic antennas, sweeping over a wide frequency range and making it ideal for automated testing. The 80 MHz to 6 GHz frequency range of the Model 3149 is the broadest and highest of all BiConiLog antennas and most commercially available antennas of this type.

The Model 3149 accepts up to 800 W of peak power input at the lower frequencies of operation. The high gain and low VSWR over the operating frequency range translate into efficient amplifier use for field generation. The Model 3149 differs from most biconical and log periodic hybrids with relatively low VSWR at the lower frequencies of operation, allowing about half the power to be radiated by the antenna.

Antenna performance can be degraded by cross polarization of horizontal and vertical signals. In high frequency log periodic antennas where elements are small and closely spaced, cross polarization can be difficult to avoid. The high frequency section of the Model 3149 was modeled and precision manufactured to avoid this problem. Cross polarization rejection in the Model 3149 exceeds 20 dB, making this antenna one of the few antennas that are compliant for CISPR16-1 measurements.

An antenna constructed to maximize structural integrity is better able to maintain its electrical properties; the benefits are better measurement repeatability, lower uncertainty values, and longer calibration validity. The Model 3149 is able to thrive in an environment of constant use due to its rugged construction and the implementation of these design elements:

- Custom aluminum extrusions are used for the boom material.
- Dipole elements connect with capped Allen screws for secure attachment, yet allow repair and replacement as necessary.
- An all-weather, energy absorbing radome protects the high frequency element.
- Tubular bow tie elements connect to the balun box using positive aligning and easily attached compression fittings.
- The finished antenna receives a durable powder coat finish.

The Model 3149 provides a flexible mounting scheme to accommodate most antenna towers and tripods. The antenna can be securely mounted using the 22-mm diameter stinger or the lower element boom mount.

- The stinger mount provides on-axis center point rotation of the antenna during polarization and can be mounted to ETS-Lindgren and most other brands of antenna towers.
- The lower element boom mount on the Model 3149 can be used with all tripods and with ETS-Lindgren antenna masts that have an offset cross boom.

For the steps to mount the Model 3149, see *Mounting Instructions* on page 18.

Standard Configuration

- Antenna
- Bow tie elements (2)
- Wrenches (2) attached to the balun box for use on bow tie compression fittings
- Lower element boom mount includes mounting bracket and mounting knob

Tripod Options

ETS-Lindgren offers the following non-metallic, non-reflective tripods for use at both indoor and outdoor EMC test sites.

- **4-TR Tripod**—Constructed of linen phenolic and delrin, designed with an adjustable center post for precise height adjustments. Maximum height is 2.0 m (80.0 in), and minimum height is 94 cm (37.0 in). This tripod can support up to an 11.8 kg (26.0 lb) load.



- **7-TR Tripod**—Constructed of PVC and fiberglass components, providing increased stability for physically large antennas. The unique design allows for quick assembly, disassembly, and convenient storage. Allows several different configurations, including options for manual or pneumatic polarization. Quick height adjustment and locking wheels provide ease of use during testing. Maximum height is 2.17 m (85.8 in), with a minimum height of .8 m (31.8 in). This tripod can support a 13.5 kg (30 lb) load.



ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

2.0 Maintenance

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.



Maintenance of the Model 3149 is limited to external components such as cables or connectors.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

Annual Calibration

See the *Product Information Bulletin* included with your shipment for information on ETS-Lindgren calibration services.

Replacement and Optional Parts

Following are the part numbers for ordering replacement or optional parts for the Model 3149 BiConiLog™ Antenna.

Part Description	Part Number
Polarizing Mounting Adapter	100989
Thread Insert	105861B



For additional/optional mounting hardware, see *Additional Mounting Options* on page 20.

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

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3.0 Specifications

Electrical Specifications

Frequency Range:	80 MHz–6 GHz
Impedance (Nominal):	50 Ω
VSWR (Average):	6.5:1 (maximum)* <2:1 (typical)
Maximum Continuous Power:	<ul style="list-style-type: none">• 750 W: 80 MHz–150 MHz• 500 W: 150 MHz–600 MHz• 360 W: 600 MHz–1 GHz• 200 W: 1 GHz–6 GHz
Connector:	Type N

* 7:1 max is for bow tie element; better than 2:1 is for LPDA section

Physical Specifications

Height:	53.24 cm (20.96 in)
Depth:	129.50 cm (50.98 in)
Width:	91.00 cm (35.83 in)
Weight:	5.0 kg (11.0 lb)

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4.0 Bow Tie Assembly Instructions

CAUTION

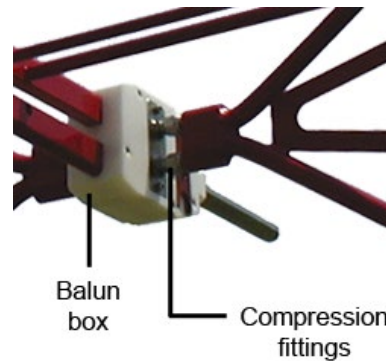
Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

The Model 3149 ships with the bow tie elements detached. The tubular bow tie elements easily attach to the balun box using positive aligning compression fittings. To attach the bow tie elements:

1. For stability, first mount the Model 3149 onto a tripod or tower. See *Mounting Instructions* on page 18 for the steps to mount the antenna.

CAUTION

To avoid losing the compression rings, do not remove the nuts on the compression fittings.



2. Align the compression fittings with the threaded connectors on the balun box.

CAUTION

Do not cross thread this connection or permanent damage to the bow tie element could occur.

3. Thread the compression fittings together using the included wrench.
4. Repeat steps 2 and 3 for the second bow tie element.

5.0 Mounting Instructions

CAUTION

Before connecting any components, follow the safety information in the ETS-Lindgren Product Information Bulletin included with your shipment.

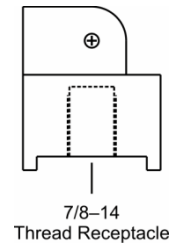
CAUTION

The Model 3149 is a precision measurement device. Handle with care.

Using Included Mounting Adapters

The Model 3149 BiConiLog™ Antenna ships with these mounting adapters:

- **100989 Polarizing Mounting Adapter with 7/8–14 thread receptacle**

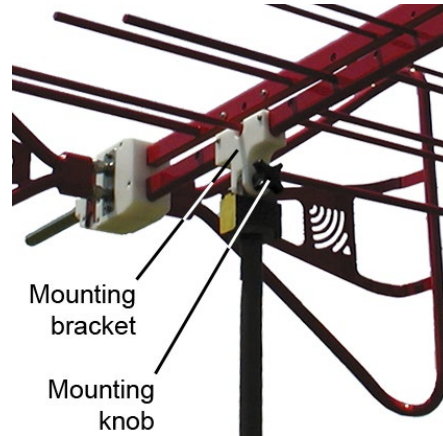


- **105861B 1/4–20 Thread Insert**



To mount the Model 3149 using the lower element boom mount and included mounting adapters:

1. Located on the bottom of the polarizing adapter is a 7/8–14 thread receptacle; if you need to convert to a 1/4–20 receptacle, insert the 1/4–20 thread insert into the polarizing adapter.
2. Attach the polarizing adapter to tripod or tower.



Do not cross thread or permanent damage to the adapter and thread insert could occur.

3. Remove the mounting knob from the mounting bracket on the antenna.
4. Slide the mounting bracket onto the polarizing adapter with the polarizing adapter placed between the shoulders of the mounting bracket.
5. Thread the mounting knob through the mounting bracket, then through the polarizing adapter, and finally through the hex nut.
6. Tighten the mounting knob to secure the antenna.

Using the Stinger Mount

The stinger mount provides on-axis rotation during 90° horizontal or vertical polarization. The stinger enables you to mount the antenna directly to an ETS-Lindgren 7-TR Tripod or mast.



If mounting the Model 3149 to a 7-TR, use the center rotate boom (part# 108197) for rear-mount stinger-type antennas.

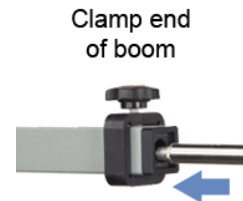


Additional hardware is required to use the stinger to mount the Model 3149 to a mast. For information on ordering optional mounting hardware, contact the ETS-Lindgren Sales Department.



Do not use the stinger to mount the Model 3149 onto a 4-TR tripod.

1. With the 108197 center rotate boom installed on the 7-TR, thread the antenna feed or receiving cable through the center of the boom so that the connector for the antenna emerges at the clamp end of the boom.

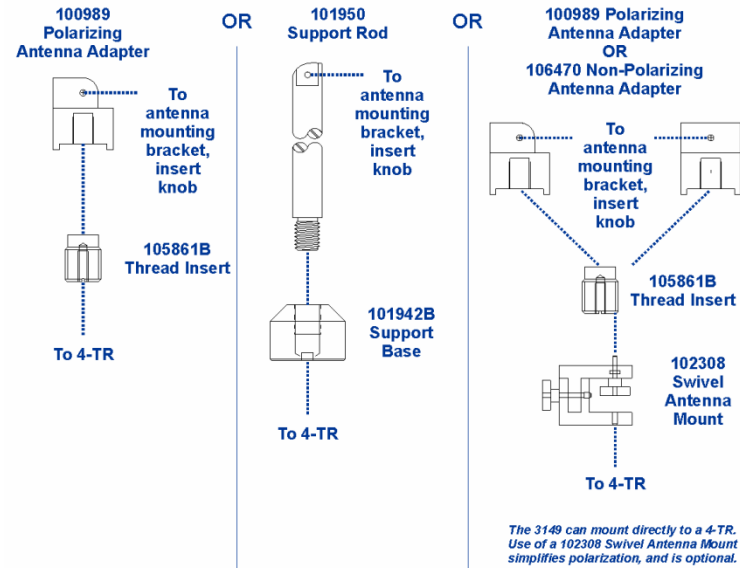


2. Attach the cable to the Type N connector on the antenna.
3. Slide the cable and stinger into the clamp on the boom, carefully guiding the cable out the other end.
4. When you reach the back of the balun box, align it with the boom receptacle, and then slide the smaller portion of the balun box into the boom. This will prevent rotation of the antenna unless the boom is being polarized.
5. Tighten the clamp knob on the boom to secure the antenna into place.

Additional Mounting Options

4-TR MOUNTING OPTIONS

Following are additional options for mounting the Model 3149 onto an ETS-Lindgren 4-TR tripod. Contact the ETS-Lindgren Sales Department for information on ordering optional mounting hardware.



7-TR AND MAST MOUNTING OPTIONS

The stinger on the Model 3149 enables you to mount to antenna directly to an ETS-Lindgren 7-TR Tripod Positioner. Following are additional options for mounting the Model 3149 onto an ETS-Lindgren 7-TR Tripod Positioner.

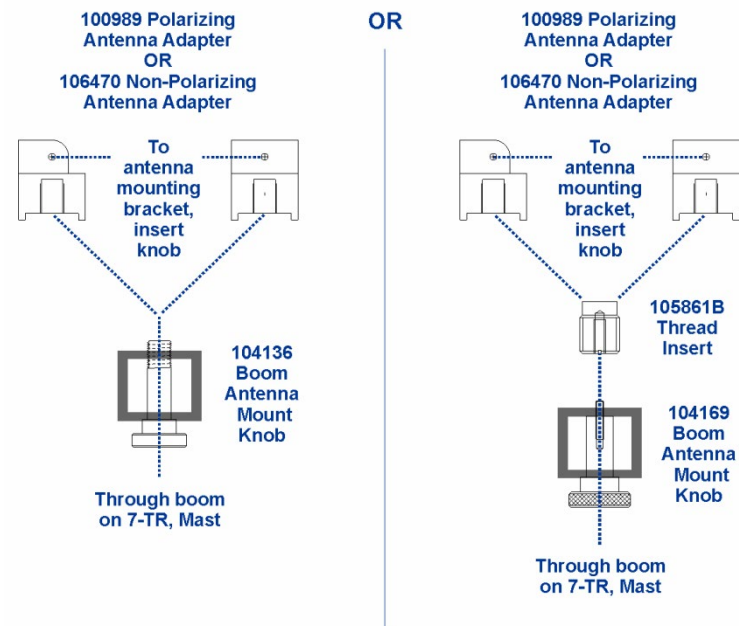
Contact the ETS-Lindgren Sales Department for information on ordering optional mounting hardware.



Mast refers to 2070 Series, 2075, and 2175 Antenna Towers.

7-TR refers to 109042, 106328, and 108197 booms:

- *109042 boom*—Straight boom; for general antenna mounting on a 7-TR
- *106328 boom*—Offset boom; for general antenna mounting on a 7-TR with pneumatic or manual polarization
- *108197 boom*—Center rotate boom; for rear-mount stinger-type antennas only

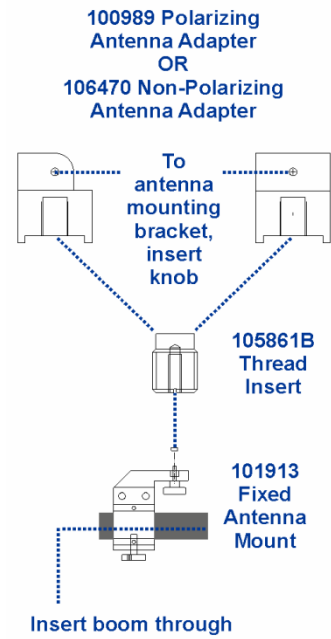


2x2 BOOM MOUNTING OPTIONS

Following are additional options for mounting the Model 3149 onto a 2x2 boom.
Contact the ETS-Lindgren Sales Department for information on ordering optional mounting hardware.

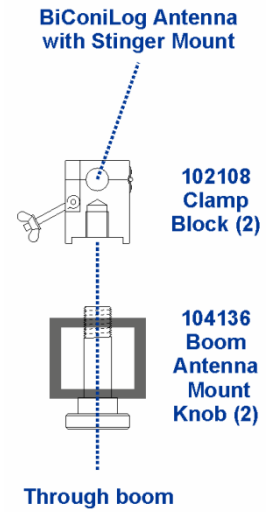


2x2 *boom* refers to a typical 2-inch by 2-inch boom.



OTHER MOUNTING OPTIONS

Following are additional options for using the stinger to mount the Model 3149 onto a non-stinger mount. Contact the ETS-Lindgren Sales Department for information on ordering optional mounting hardware.



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6.0 Application

For emissions measurements, electric field strength in $db[V/m]$ is obtained from:

$$E(\text{dB}[V/m]) = V(\text{dB}[V]) + AF(\text{dB}[1/m]) + \alpha(\text{dB})$$

V = the receiver or spectrum analyzer voltage reading

AF = antenna factor

α = cable loss in dB, if cable losses are non-negligible

For immunity testing, the electric field strength generated at a distance d can be approximated by:

$$E(\text{V / m}) = \frac{\sqrt{30Pg}}{d}$$

d = distance, in meters

g = numeric gain ($10^{G[\text{dB}]/10}$)

P = antenna net input power, in watts

An estimate of the power required for any field strength E can be obtained from the gain or forward power graphs in *Typical Data* on page 28, which shows power required in watts to generate 1 V/m. For any other field strength not shown, multiply the power in watts by the desired E-field squared, or:

$$P(E \text{ V/m}) = E^2 P(1 \text{ V/m})$$

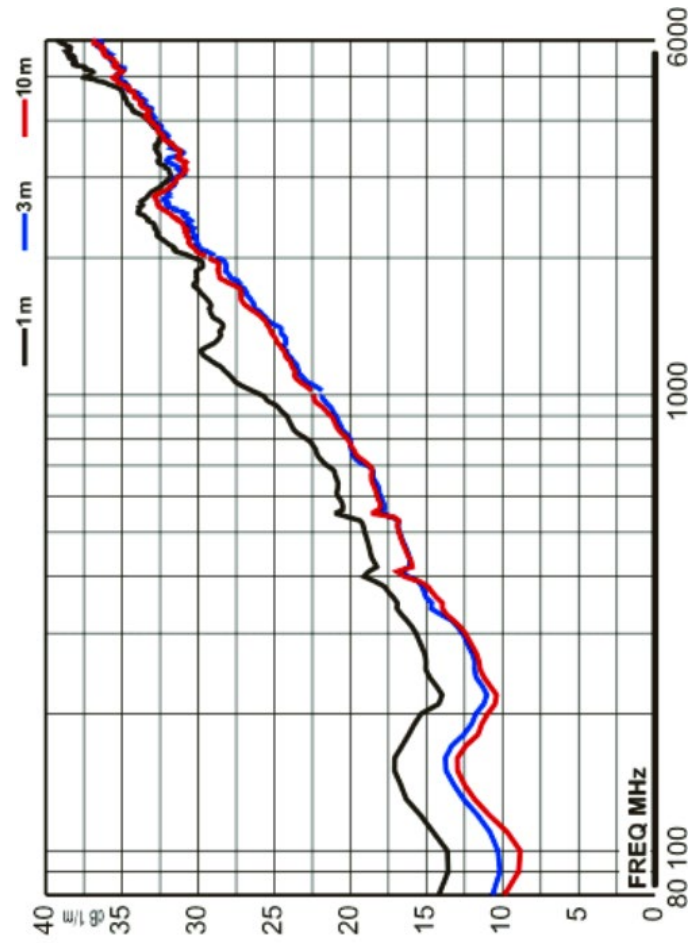
Actual transmitted field strength should be verified using an ETS-Lindgren electric field probe, or equivalent.

For IEC 1000-4-3 type testing, the antenna tip can be placed at any distance between one and three meters from the EUT as long as the front face plane is illuminated according to the -0, +6 dB uniform field specification. In general, closer distances require less power to create a given field strength

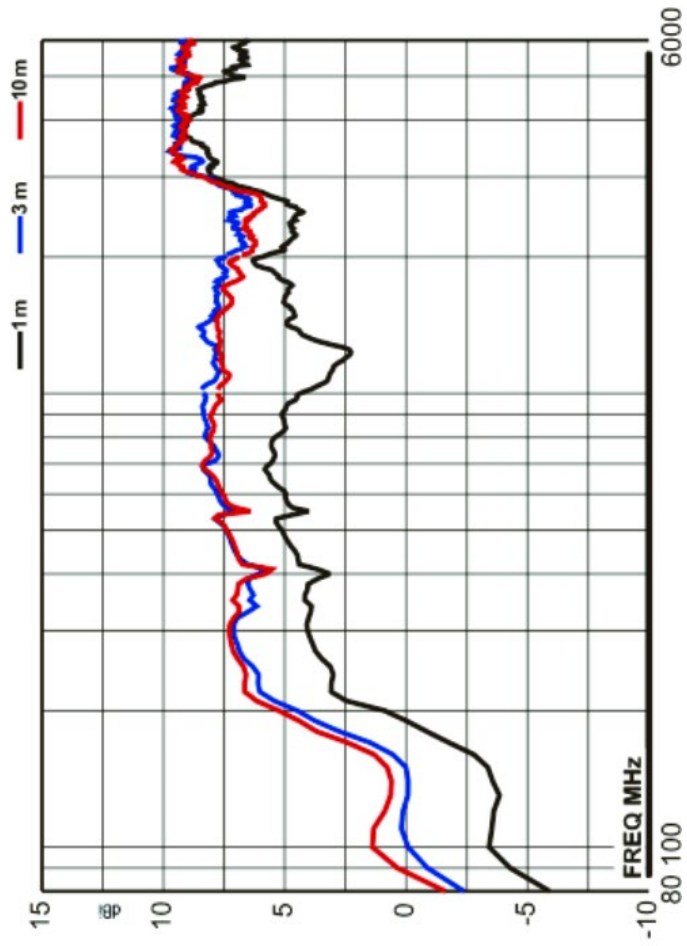
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7.0 Typical Data

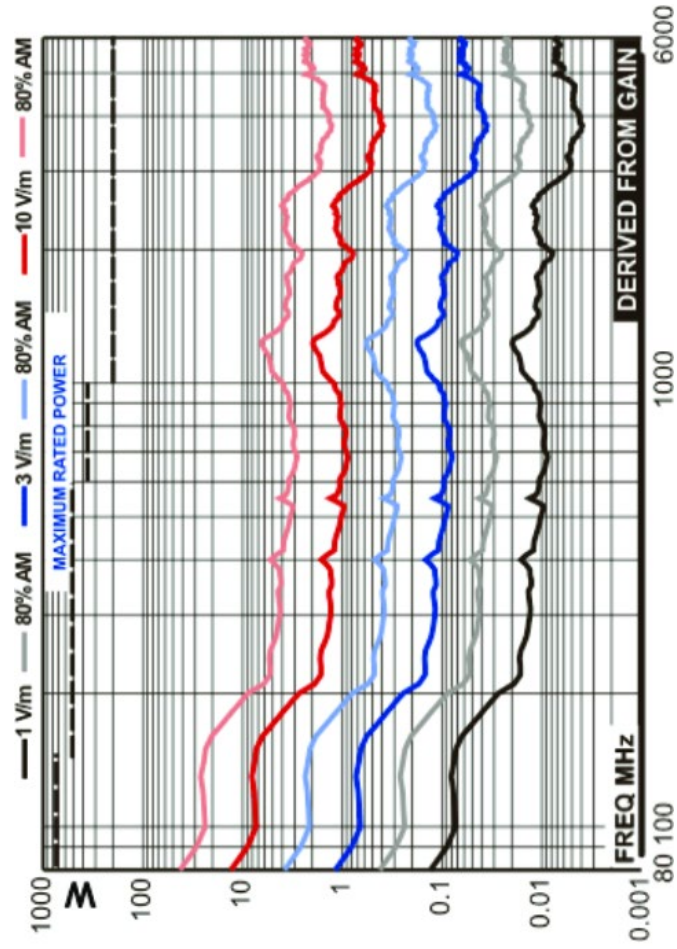
Model 3149 Antenna Factor



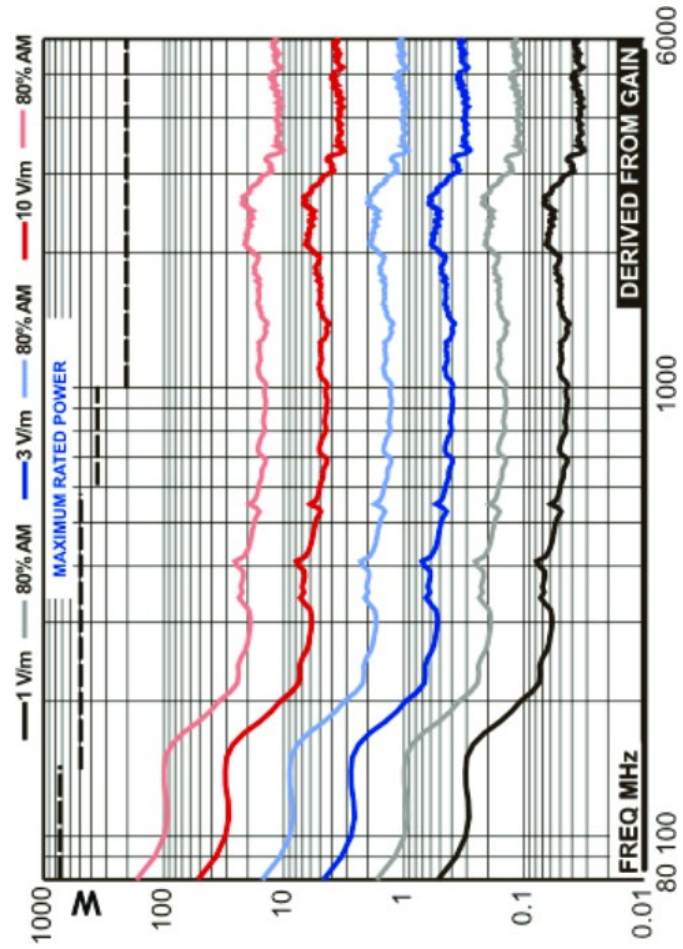
Model 3149 Gain



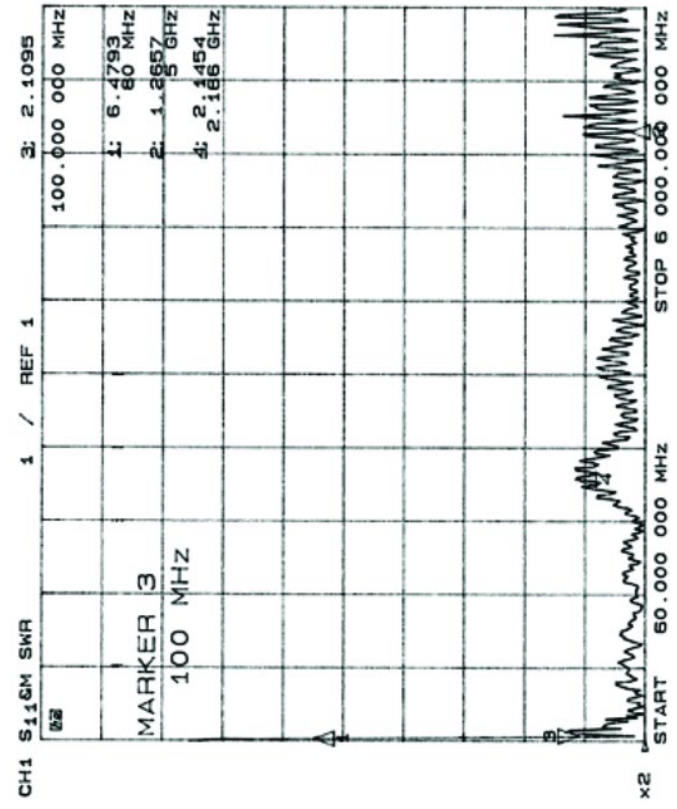
Model 3149 Forward Power at 1



Model 3149 Forward Power at 3 m



Model 3149 VSWR



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