Model 3148B

Log Periodic Dipole Array Antenna

User Manual

ETS·LINDGREN™
An ESCO Technologies Company

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Revision Record | MANUAL 3148 | Part #399239, Rev. D

Revision	Description	Date
A–C	Initial Release; Updates	November, 1999–September, 2002
D	Updated content to Model 3148B; rebranding	June, 2008

Table of Contents

Notes, Cautions, and Warnings

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

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 3148B Log Periodic Dipole Array** is a linearly-polarized broadband antenna designed to operate over the frequency range of 200 MHz to 2 GHz. The choice of scaling factors, the various diameters of each element, and the center-to-center spacing of the booms yield excellent VSWR characteristics throughout the operating frequency range (see *VSWR* on page 29). The precise design of the feed and the positioning of the elements on the boom together yield an optimum phase relationship. This causes the active region, at any given frequency, to propagate RF energy towards the smaller elements, leaving the elements behind it electrically dead.

The Model 3148B antenna fully satisfies the CISPR-16 cross-polarization rejection requirement, and has better than 20 dB cross-polarization rejection below 1000 MHz. The constant gain of the antenna yields an antenna factor which varies linearly with frequency as shown in *Typical Data* on page 27. The variation is smooth; therefore, accurate interpolation of performance between specified frequency points is simple.

The Model 3148B is constructed of lightweight, corrosion-resistant aluminum, providing years of trouble-free indoor and outdoor service.

The Model 3148B includes an integral mount and the necessary attachments to mount the antenna to either a tripod with a 1/4–20 threaded mount or an ETS-Lindgren antenna mast. Individual antenna calibration data is included with each antenna.

The Model 93148B is a non-characterized version of the Model 3148B. Should calibration/characterization be desired please contact our calibration department.

A variety of mounting options are available for the Model 3148B. For information, see *Mounting Instructions* on page 15.

Tripod Options

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

- **Model 4-TR—**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.

- **Model 7-TR—**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:

- Warranty information
- 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

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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 3148B 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 3148B Log Periodic Dipole Array.

Part Description	Part Number
Antenna Element, .375, 14.4 inches	105567-1
Antenna Element, .375, 16.4 inches	105567-2
Antenna Element, .250, 3.81 inches	105568-1
Antenna Element, .250, 5.02 inches	105568-3
Antenna Element, .250, 5.75 inches	105568-4
Antenna Element, .250, 6.57 inches	105568-5
Antenna Element, .250, 7.51inches	105568-6

Part Description	Part Number
Antenna Element, .250, 8.58inches	105568-7
Antenna Element, .250, 9.8 inches	105568-8
Antenna Element, .250, 11.18 inches	105568-9
Antenna Element, .250, 12.62 inches	105568-10
Antenna Element, .187, .99 inches	105569-1
Antenna Element, .187, 1.17 inches	105569-2
Antenna Element, .187, 1.37 inches	105569-3
Antenna Element, .187, 1.6 inches	105569-4
Antenna Element, .187, 1.86 inches	105569-5
Antenna Element, .187, 2.16 inches	105569-6
Antenna Element, .187, 2.50 inches	105569-7
Antenna Element, .187, 2.89 inches	105569-8
Antenna Element, .187, 3.32 inches	105569-9
Polarizing Mounting Adapter	100989
Thread Insert	105861B

For additional/optional mounting hardware, see *Additional Mounting Options* on page 19.

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.

3.0 Specifications

Electrical Specifications

Frequency Range:	200 MHz–2 GHz
VSWR Ratio:	**Average:** 1.2:1 **Maximum:** 2.0:1
Maximum Continuous Power:	1 kW
Peak Power:	1.3 kW
Impedance:	50 Ω
Symmetry:	± 0.5 dB
Cross-Polarization Rejection:	Better than 20 dB below 1000 MHz
Connector:	Type N female

Physical Specifications

Height (without bracket assembly):	6.667 cm 2.625 in
Width (at widest point):	85.09 cm 33.50 in
Length (including stinger):	86.677 cm 34.125 in
Weight:	2.0 kg 4.5 lb

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4.0 Mounting Instructions

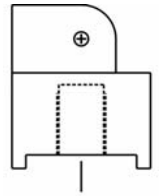
CAUTION

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

Using Included Mounting Adapters

The Model 3148B Log Periodic Dipole Array ships with these mounting adapters:

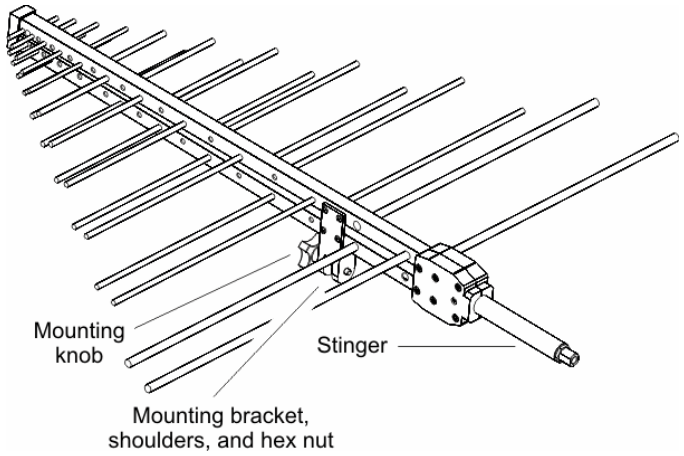
- **100989 Polarizing Mounting Adapter with 7/8–14 thread receptacle**



- **105861B 1/4–20 Thread Insert**

To use these adapters to mount the Model 3148B to a tripod or tower:

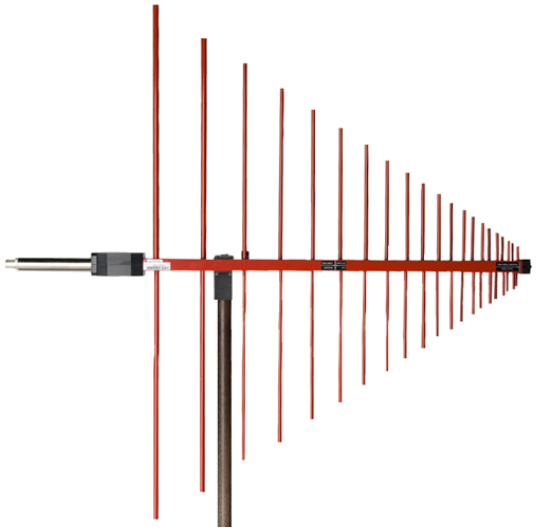
1. Located on the bottom of the polarizing adapter is a 7/8–14 thread receptacle; if you need to convert to a 1/4–20 receptacle, insert the 1/4–20 thread insert into the polarizing adapter.
2. Attach the polarizing adapter to tripod or tower.



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.

Shown mounted onto a 4-TR



Using the Stinger Mount

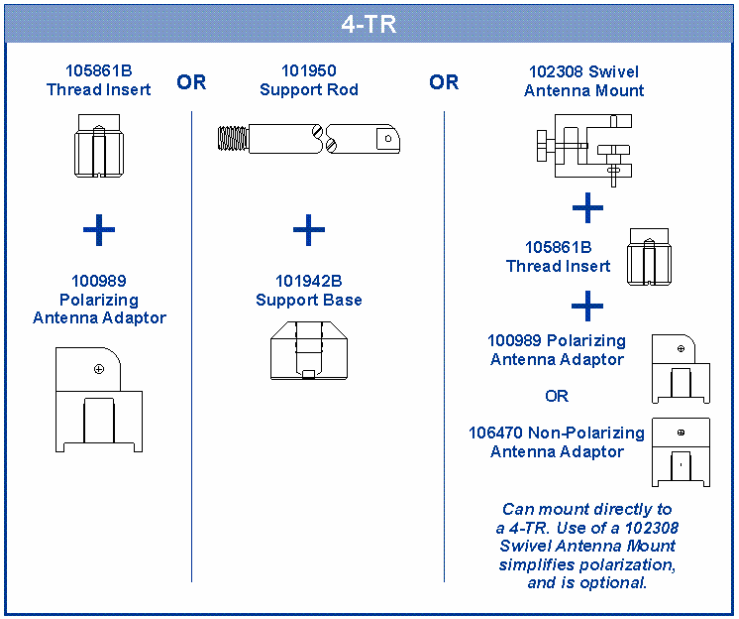
The stinger on the Model 3148B enables you to mount to antenna directly to an ETS-Lindgren 7-TR Tripod Positioner or mast.

Additional hardware is required to use the stinger to mount the Model 3148B 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 3148B onto a 4-TR tripod.

4-TR MOUNTING OPTIONS

Following are additional options for mounting the Model 3148B onto an ETS-Lindgren 4-TR tripod. Contact the ETS-Lindgren Sales Department for information on ordering optional mounting hardware.



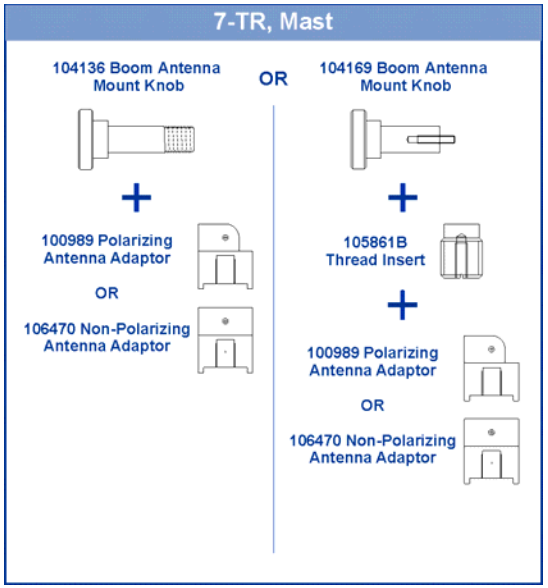
7-TR and Mast Mounting Options

The stinger on the Model 3148B enables you to mount to antenna directly to an ETS-Lindgren 7-TR Tripod Positioner. Following are additional options for mounting the Model 3148B 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:

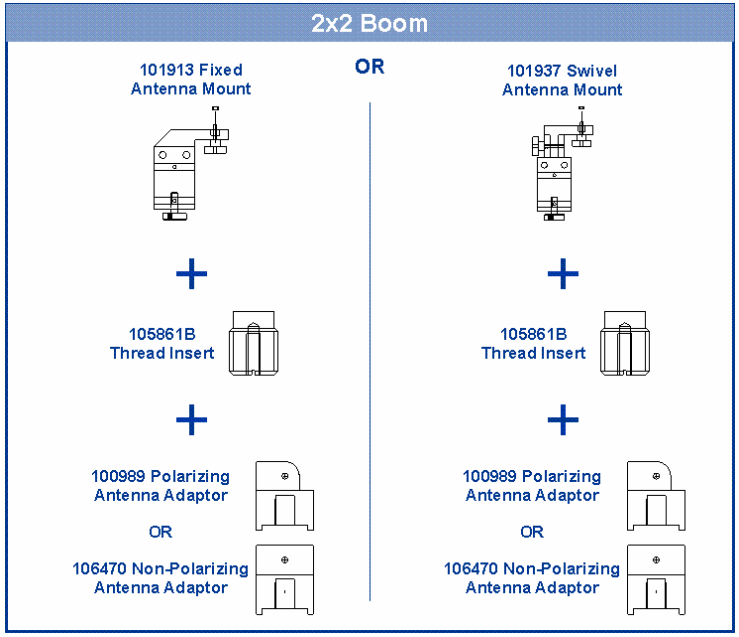
- *109042 boom*—Straight boom; for general antenna mounting on a 7-TR
- *106328 boom*—Offset boom; for general antenna mounting on a 7-TR with pneumatic or manual polarization
- *108197 boom*—Center rotate boom; for rear-mount stinger-type antennas only.



2x2 Boom Mounting Options

Following are additional options for mounting the Model 3148B 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.



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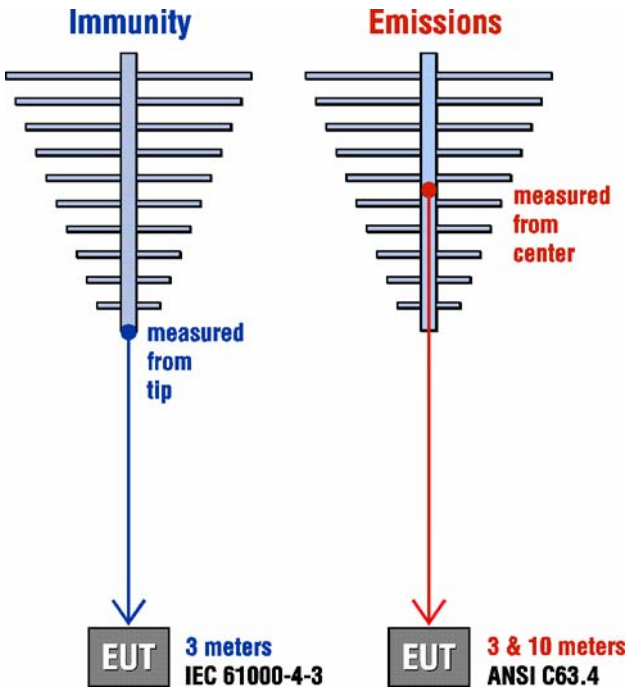
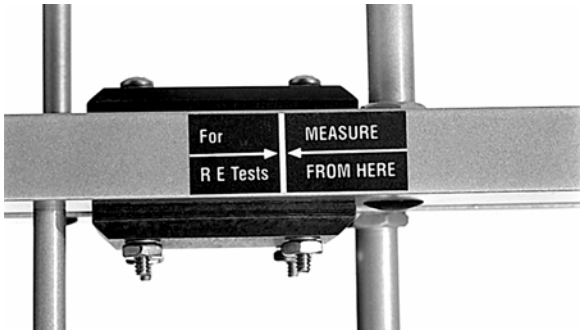
5.0 Application

Emissions and Immunity

The antenna label on the Model 3148B Log Periodic Dipole Array marks the centerline and tip of the antenna, indicating where to perform measurements.





Operation

After mounting the Model 3148B onto an ETS-Lindgren tripod or antenna mast adapter, connect an N-type coaxial cable from the antenna connector to a generator (immunity) or receiver (emissions). Both horizontal and vertical polarizations are easily accomplished when the Model 3148B is mounted onto a tower or tripod. Contact with any metallic or non-metallic structure can capacitively load the antenna, which may cause inconsistent results. Therefore, care must be taken to ensure that no part of the dipole elements is in contact with the tripod or tower, particularly in vertically-polarized tests. Where possible, run the feed cable straight at least one meter or more back from the Model 3148B before dropping vertically.

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

$$E(\text{dBV/m})=V(\text{dBV})+AF(\text{dB1/m})+\alpha(\text{dB})$$

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 ($10^{G[dB]/10}$)

P = antenna net input power, in watts

For IEC/EN 31000-4-3 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 specifications.

It is usually necessary to place RF absorbing material between the EUT and antenna to suppress ground plane reflection to ensure the field uniformly, or to conduct the immunity test in a fully-lined anechoic room. In general, closer distances require less power to create a given field strength.

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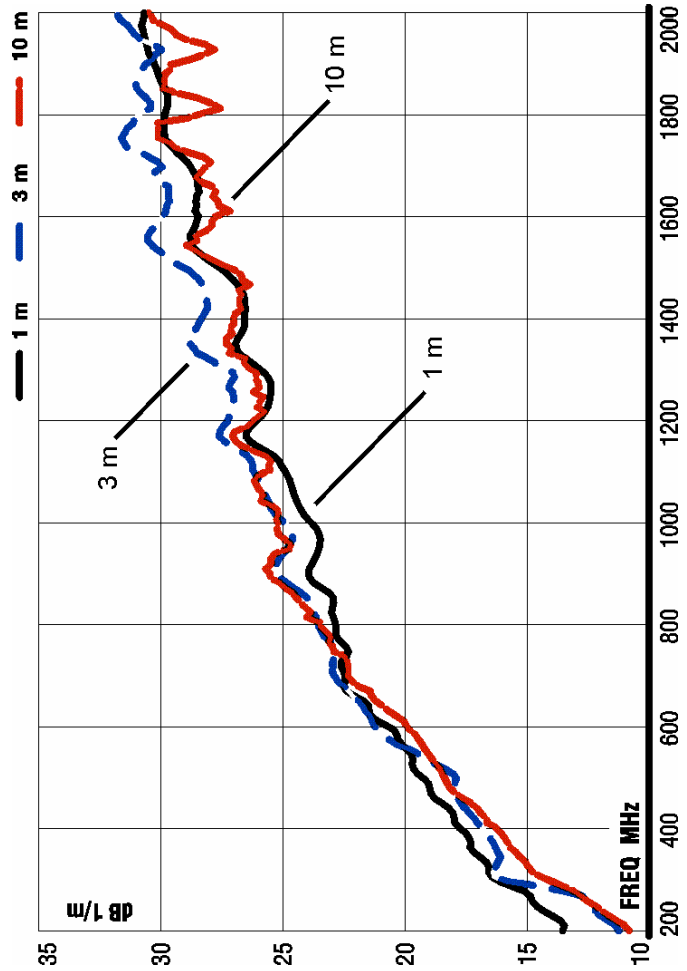
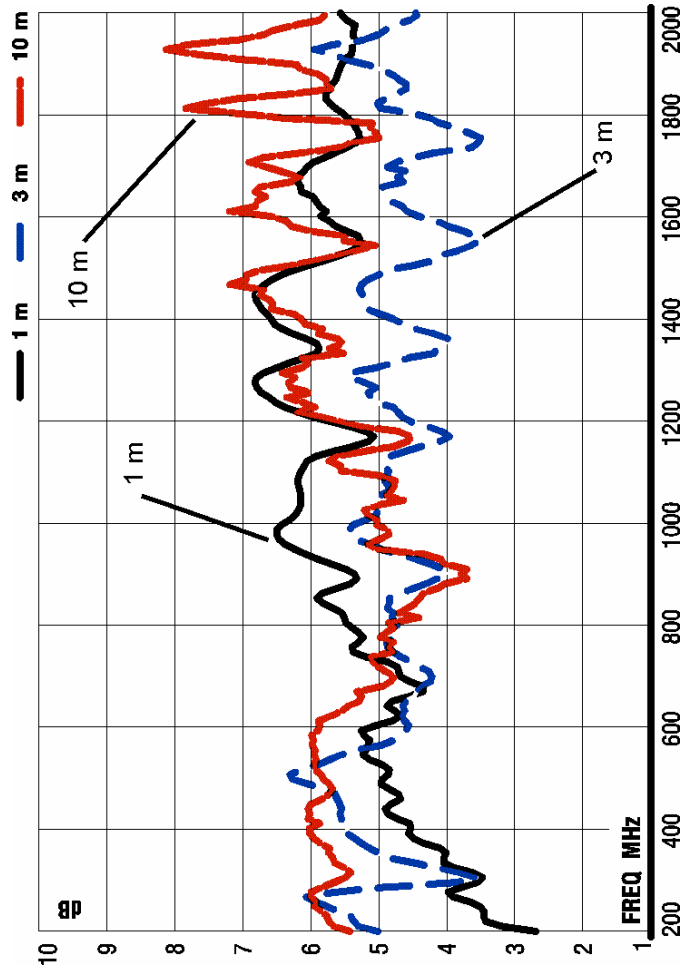
6.0 Typical Data

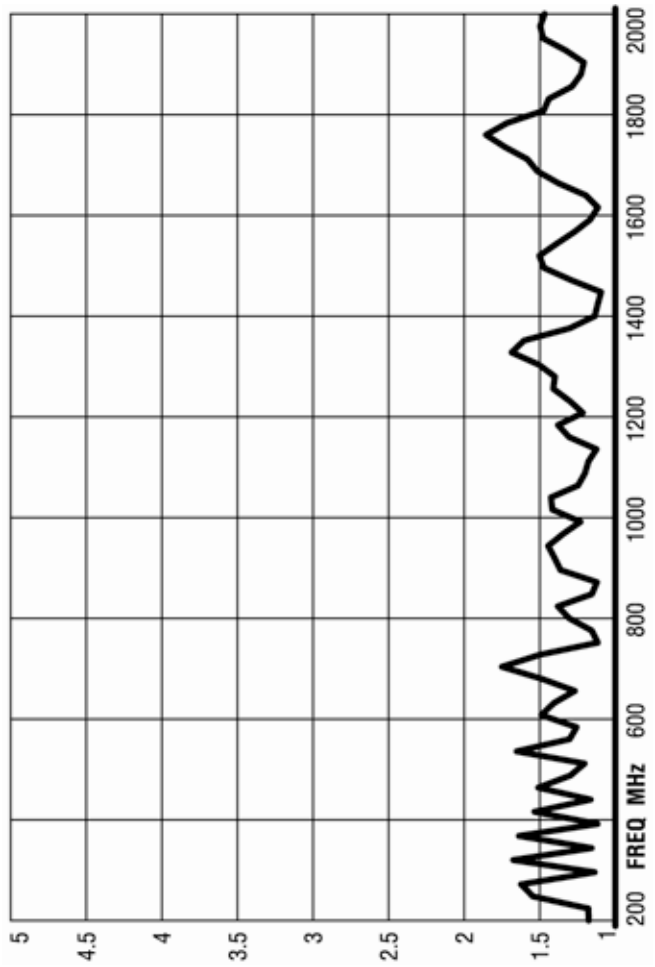
Antenna Factor



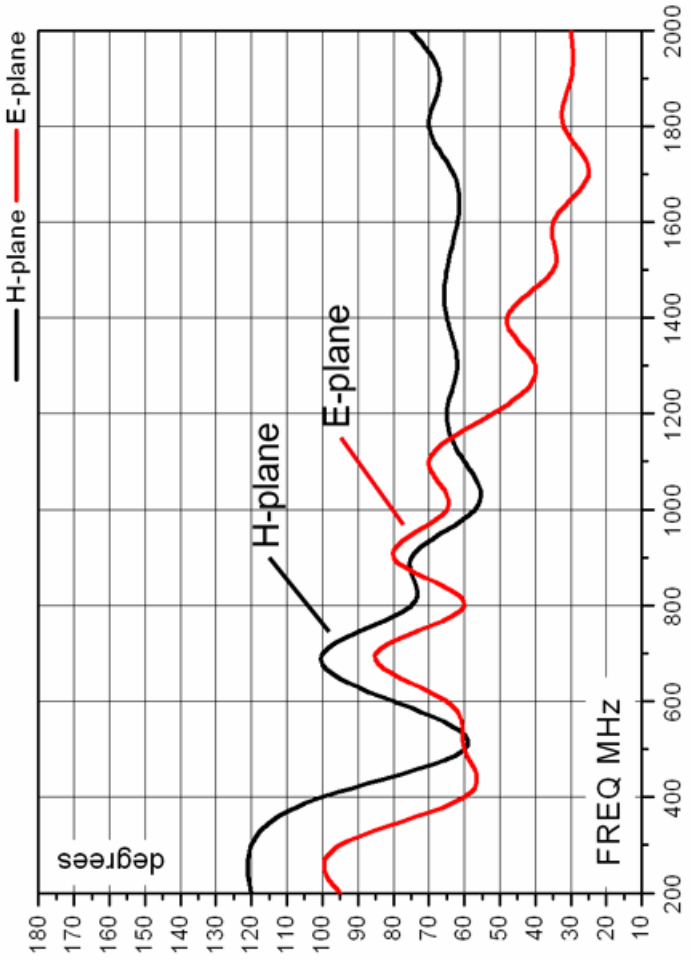
Gain


1 m
3 m
10 m
10 m
1 m
3 m
dB
10
9
8
7
6
5
4
3
2
1
FREQ MHz
200
400
600
800
1000
1200
1400
1600
1800
2000

VSWR

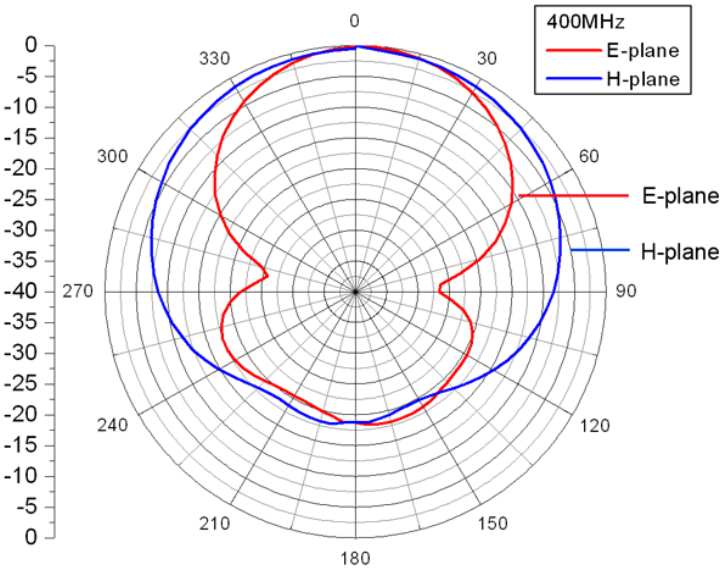

5
4.5
4
3.5
3
2.5
2
1.5
1
200
FREQ MHz
600
800
1000
1200
1400
1600
1800
2000

Half-Power Beamwidth

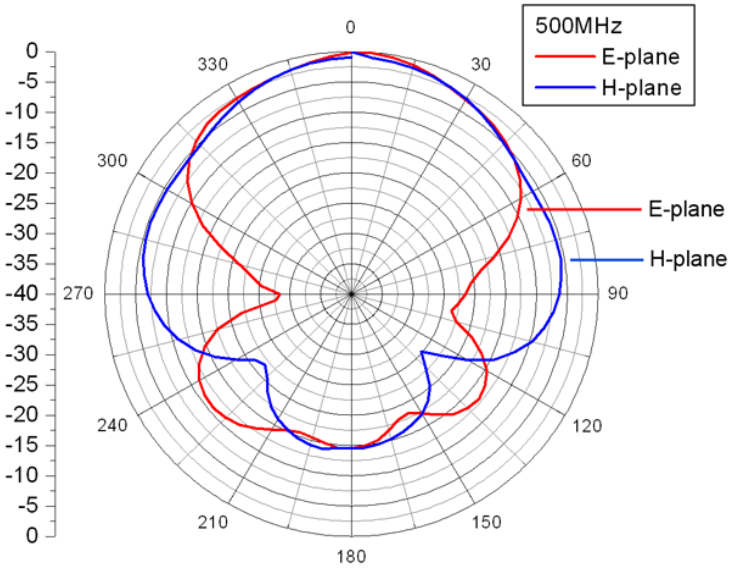


7.0 Typical Radiation Patterns

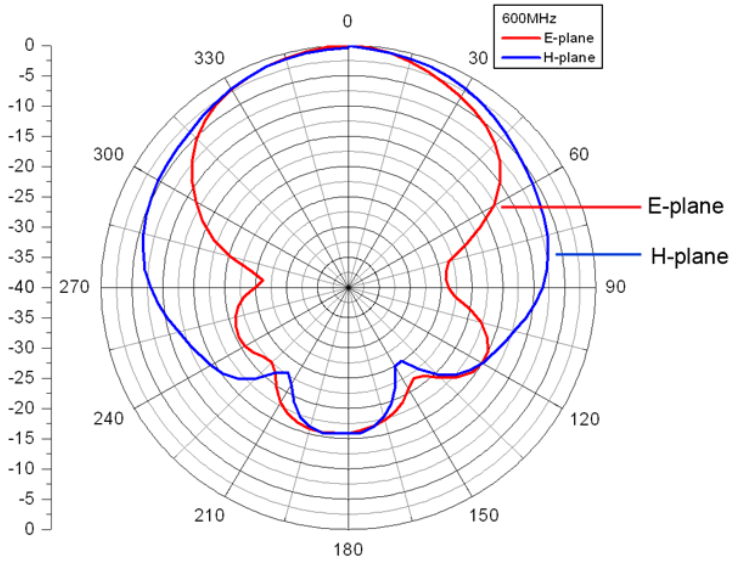
400 MHz



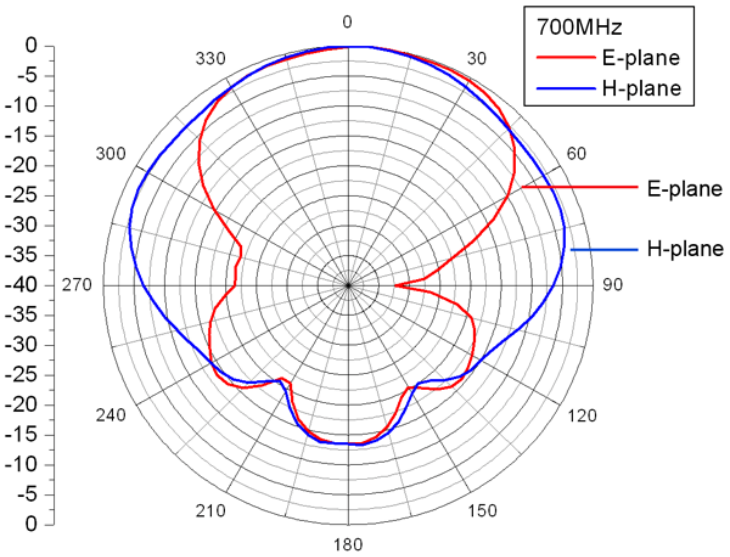
500 MHz



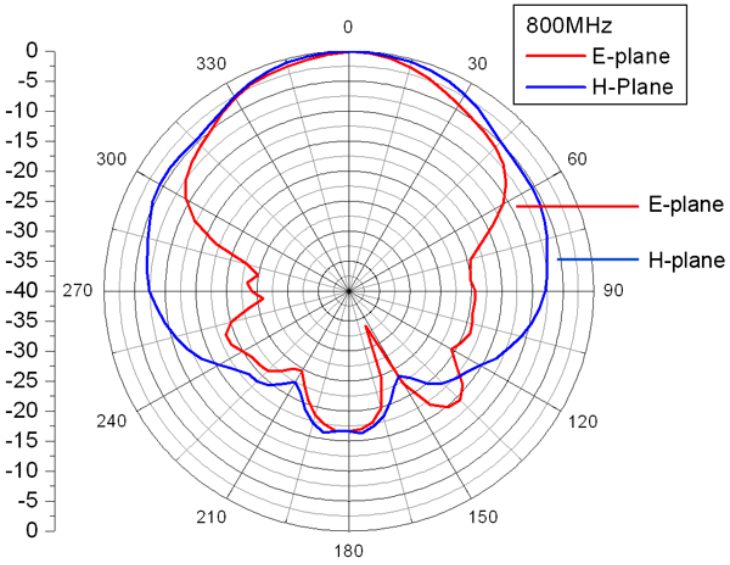
600 MHz



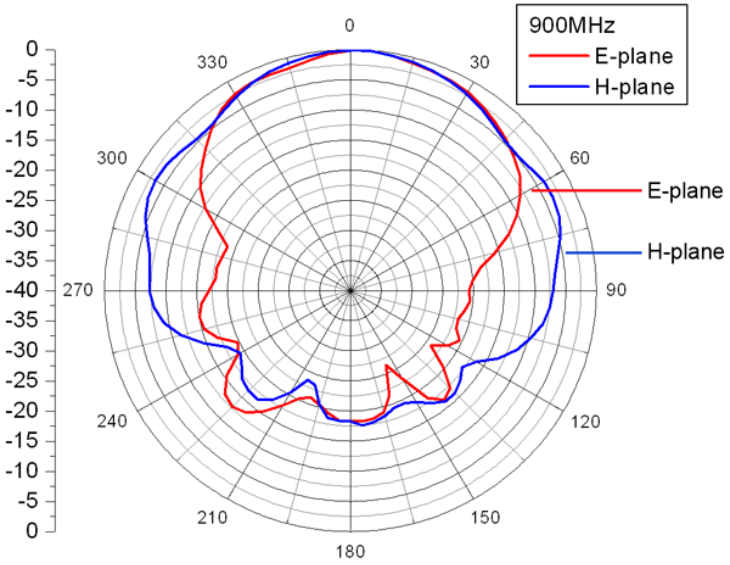
700 MHz



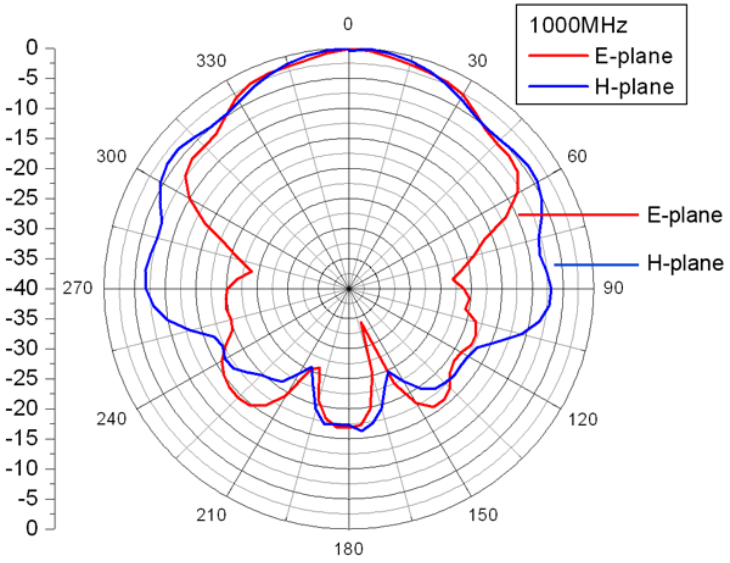
800 MHz



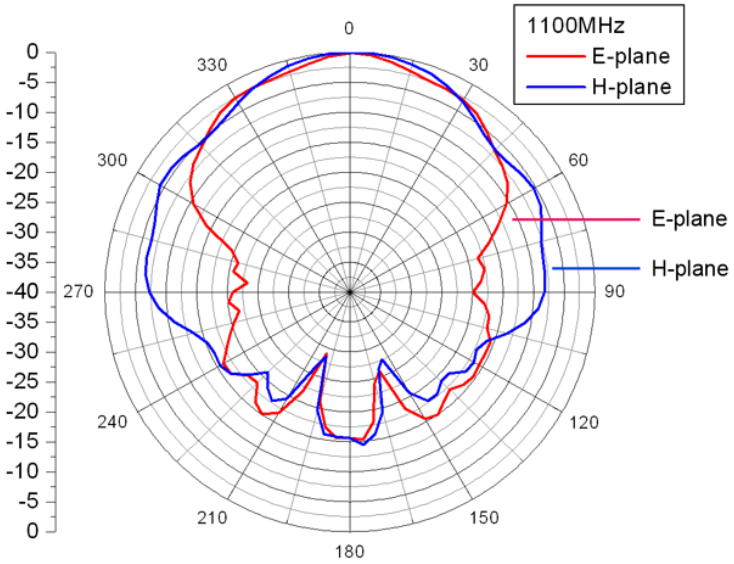
900 MHz



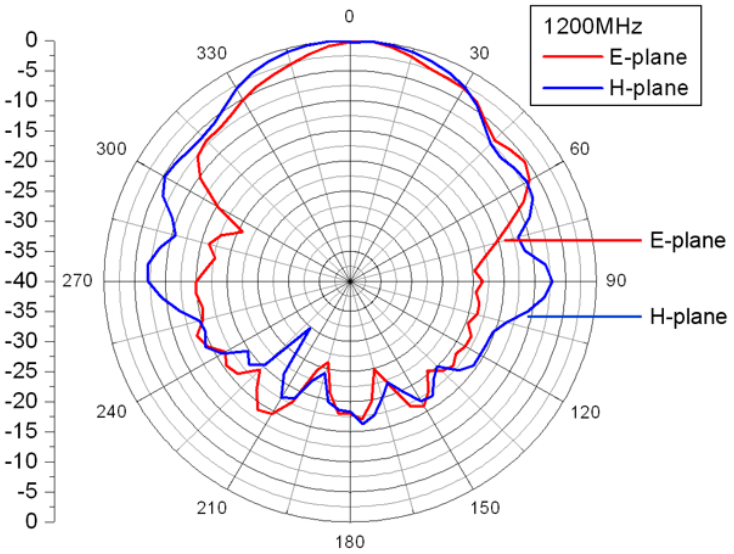
1000 MHz



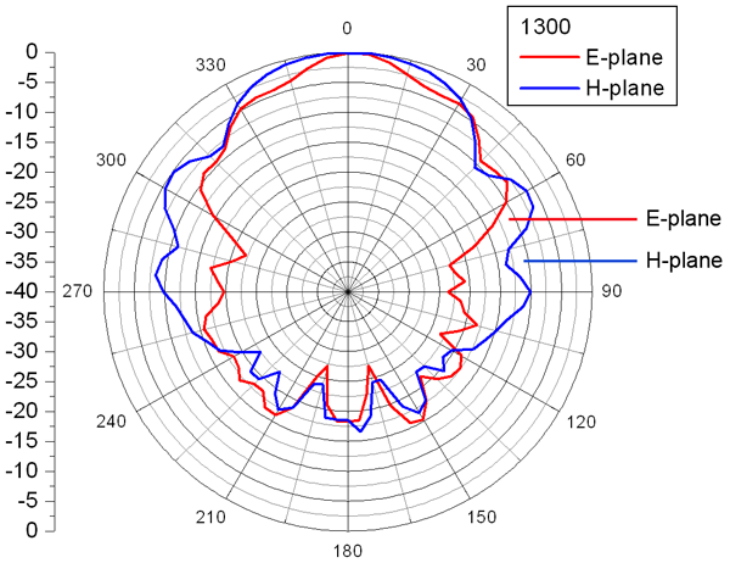
1100 MHz



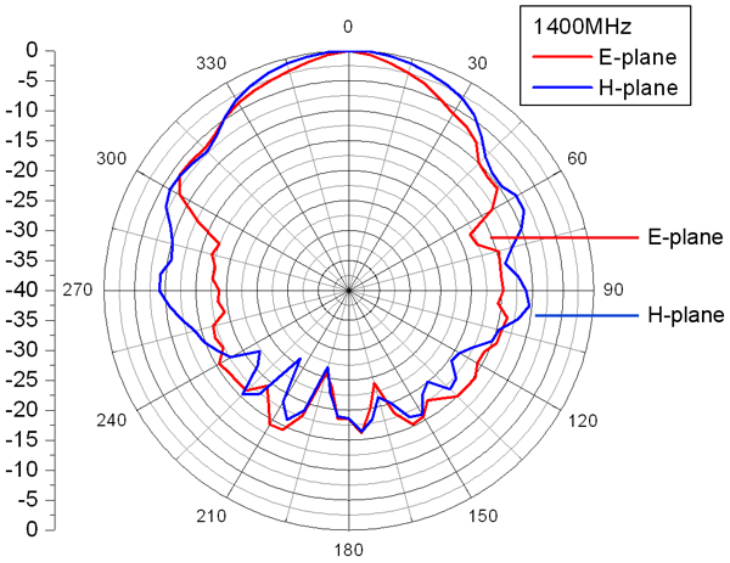
1200 MHz



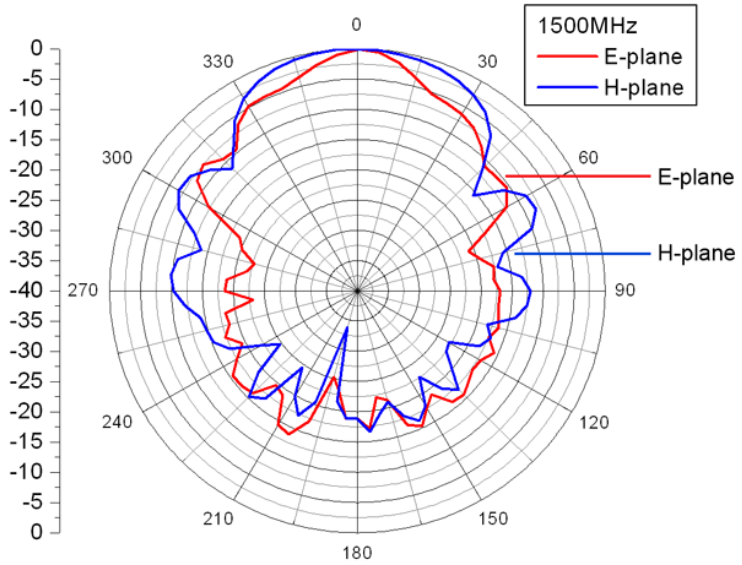
1300 MHz



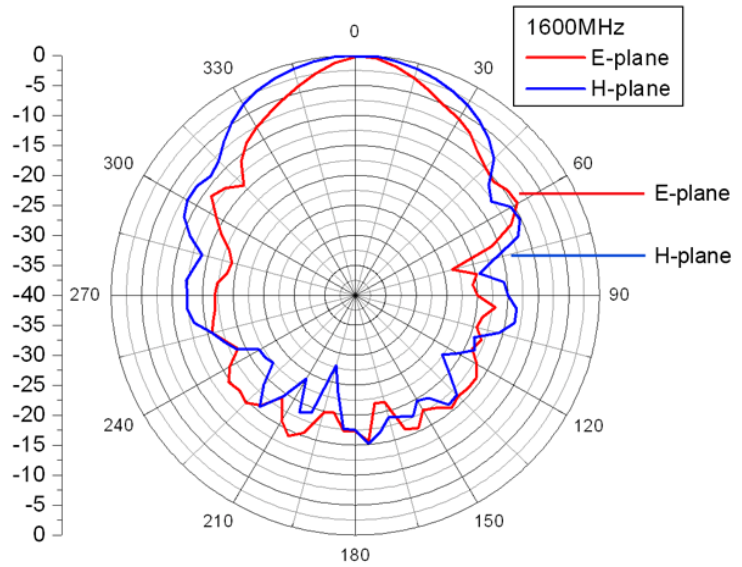
1400 MHz



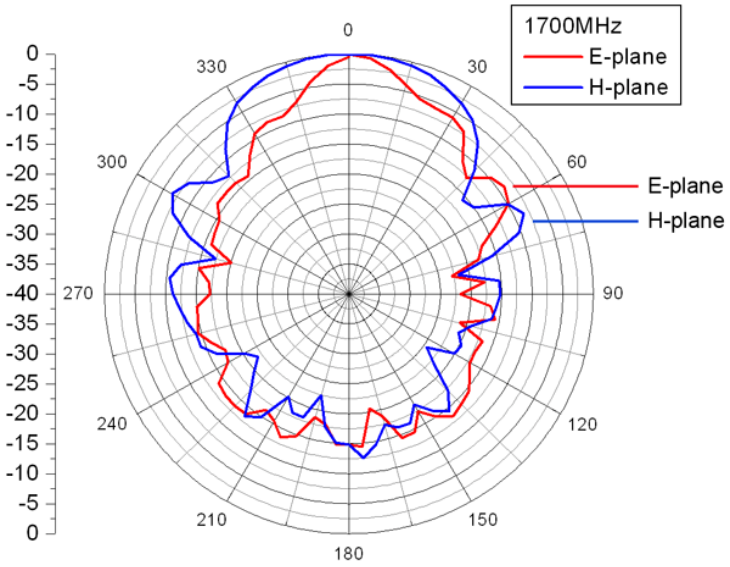
1500 MHz



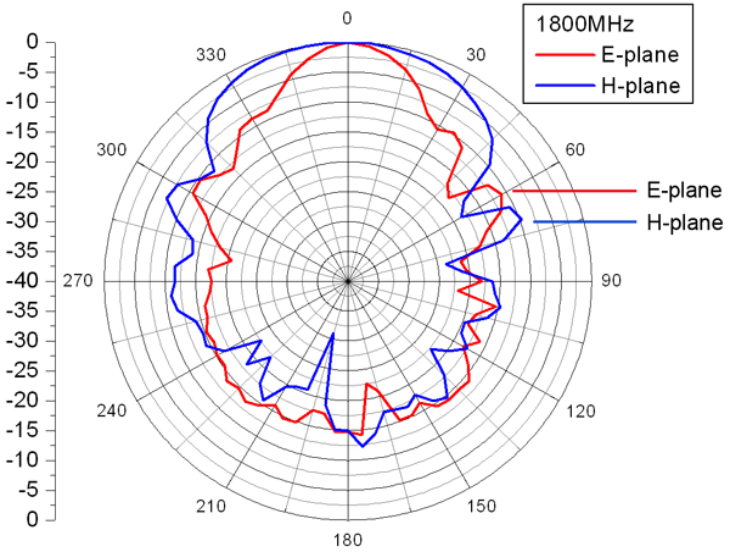
1600 MHz



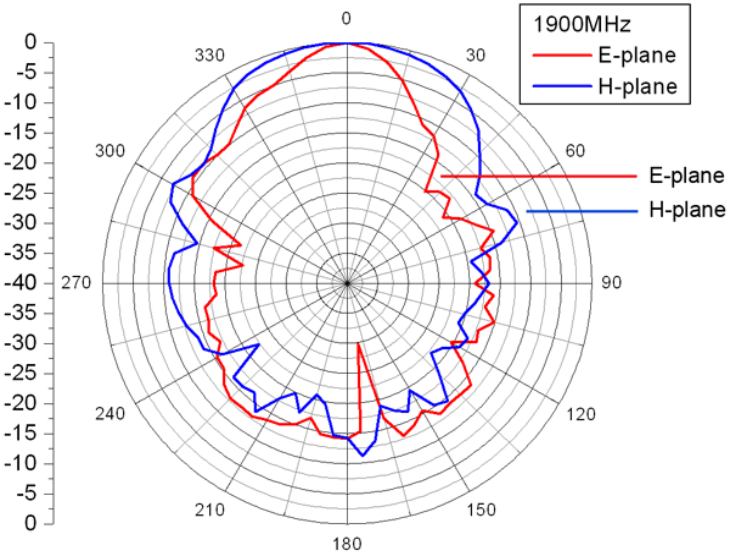
1700 MHz



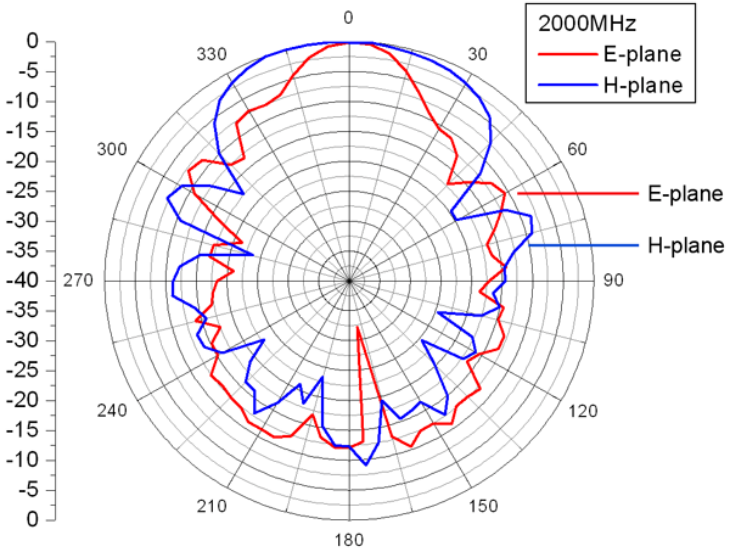
1800 MHz



1900 MHz



2000 MHz



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Appendix A: Warranty

See the *Product Information Bulletin* included with your shipment for the complete ETS-Lindgren warranty for your Model 3148B Log Periodic Dipole Array.

DURATION OF WARRANTIES FOR MODEL 3148B

All product warranties, except the warranty of title, and all remedies for warranty failures are limited to two years.

Product Warranted	Duration of Warranty Period
Model 3148B Log Periodic Dipole Array	2 Years