

M O D E L 3 1 0 6

Model 3106
200 MHz – 2 GHz

- Uniform Gain
- Power Handling up to 1.6 kW

Model 3115
1 GHz – 18 GHz

- Low VSWR

Model 3116
18 GHz – 40 GHz

- Quality Construction



Double-Ridged Waveguide Horn

PROVIDING UNIFORM GAIN, LOW VSWR AND A BROAD FREQUENCY RANGE, EMCO's three models of Double-Ridged Waveguide Horn Antennas are ideally suited for IEC 61000-4-3 and MIL-STD 461E immunity tests and ANSI C63.4 and EN 55022 emissions testing.

As a set, these linearly polarized broadband antennas have an average VSWR of less than 1.6 to 1 and cover a multi-octave bandwidth of 200 MHz to 40 GHz. These antennas are specifically designed for EMI measurements, but can also be used for EW, antenna gain and pattern measurement, surveillance, and other applications.

The mounting brackets for Models 3115 and 3116 are adjustable for changing polarization of the antenna. Standard 1/4 in x 20 threads are used on the mounting brackets of all double-ridge waveguides for mounting on an EMCO tripod or most other tripods.

EMCO Double-Ridged Waveguide Horn Features

Uniform Gain

All models have uniform gain throughout their frequency span, providing efficient performance characteristics and directionality.

Power Handling

Model 3106 can handle 1600 W peak and 800 W continuously.

Low VSWR

EMCO's double-ridged waveguides have an average VSWR of less than 1.6:1.

Quality Construction

Double-ridged waveguide antennas are constructed of light-weight corrosion-resistant aluminum and fiberglass, providing years of trouble-free indoor and outdoor service. To maximize performance, Type N connectors are used on Models 3115 and 3106, and Type K connectors are used on Model 3116.

Choosing Your Model: Three Models with Frequency Ranges of 200 MHz to 40 GHz

200 MHz to 2 GHz

The **Model 3106** has high gain and excellent VSWR characteristics over its entire frequency range. It is especially effective for generating high electromagnetic fields with relatively low power input. The antenna is also useful for receiving low-level signals where high gain characteristics are needed. Although large in size, 93.3 cm (36.7 in), this antenna weighs only 11.8 kg (26 lb). A Type N female connector is used for increased power handling.

1 to 18 GHz

The **Model 3115** has excellent gain and VSWR characteristics. This antenna is small and portable with a length of 24.4 cm (9.6 in). The feed system uses a Precision Type N female connector so the antenna can handle considerable power with low losses above 12 GHz.

18 to 40 GHz

The **Model 3116** is an extremely small antenna, offering portability and increased efficiency. The Model 3116 has a length of only 13.0 cm (5.25 in), and weighs just 135 g (4.74 oz). A Type K female connector is used for increased performance at high frequencies.

Standard Configuration

- ▶ Antenna
- ▶ Mounting bracket drilled to accept EMCO or other tripod mount with 1/4 in x 20 threads
- ▶ Individually calibrated at 1 m per SAE ARP 958. Calibration of Model 3115 at 3 m available at additional charge. Actual factors and signed Certificate of Conformance included in Manual.

Options

Custom sizes

Larger models for higher gain at lower frequencies are also available.

EMCO Tripod

EMCO offers several nonmetallic, non-reflective tripods for use at EMC test sites. The 7-TR has been specifically designed for the 3106.

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One of the earliest horn antennas was constructed by Jagadis Chandra Bose in 1897. Horn antennas are essentially flared waveguides that produce a uniform phase front larger than the waveguide itself. Adding a ridged waveguide to the horn antenna increases its bandwidth by lowering the cut off frequency of the dominant mode, while raising the cut off frequency of the next higher order mode.

Applications

MODEL	FCC-15	FCC-18	IEC/CISPR/EN	SAE J1113	SAE J551	MIL-STD-461E	MIL-STD-1541	MIL-STD-285	IEEE STD 299	NACSIM
3106	RE	RE	RE, RI	RE, RI	RE, RI	RE, RI	RE, RI			RE
3115	RE	RE	RE, RI	RE, RI	RE, RI	RE, RI	RE, RI	TX, RX	RX	RE
3116	RE	RE				RE, RI	RE	TX, RX	RX	RE

RE = Radiated Emissions RI = Radiated Immunity (Susceptibility) TX = Transmit RX = Receive

Electrical Specifications

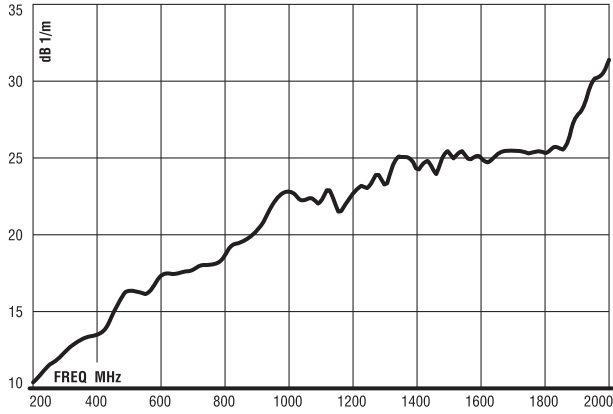
MODEL	FREQUENCY RANGE	VSWR RATIO (AVG)	MAXIMUM CONTINUOUS POWER	PEAK POWER	IMPEDANCE (NOMINAL)	CONNECTOR
3106	200 MHz – 2 GHz	< 1.6:1	800 W	1600 W	50 Ω	Type N female
3115	1 GHz – 18 GHz	< 1.5:1	300 W	500 W	50 Ω	Type N precision female
3116	18 GHz – 40 GHz	< 1.6:1	50 W	70 W	50 Ω	Type K female

Physical Specifications

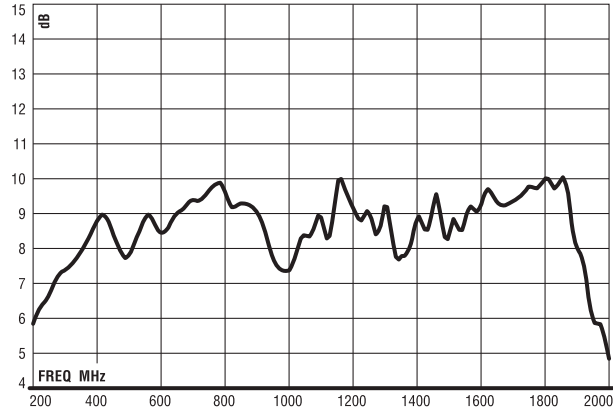
MODEL	WIDTH ¹	DEPTH	HEIGHT ¹	WEIGHT
3106	93.3 cm 36.7 in	97.8 cm 38.5 in	72.9 cm 28.7 in	11.8 kg 26.0 lb
3115	24.4 cm 9.6 in	27.9 cm 11.0 in	15.9 cm 6.2 in	1.8 kg 4.0 lb
3116	13.0 cm 5.2 in	10.0 cm 4.0 in	6.0 cm 2.4 in	135.0 g 4.7 oz

¹ At aperture

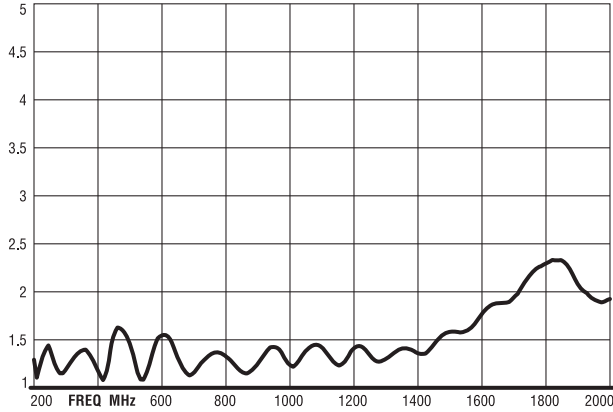
Model 3106 Antenna Factor



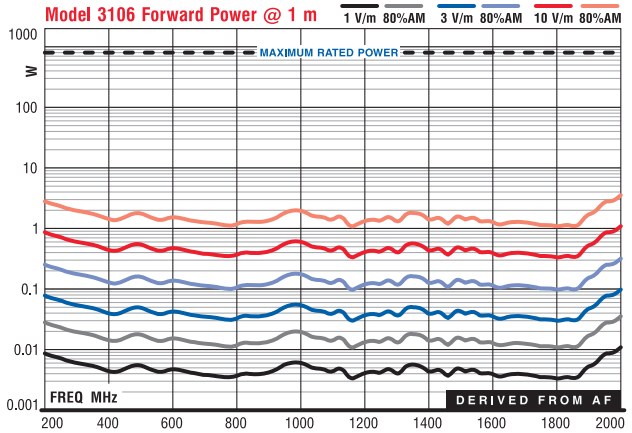
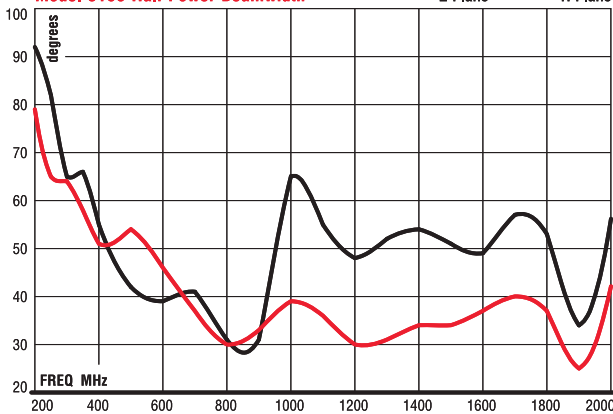
Model 3106 Gain

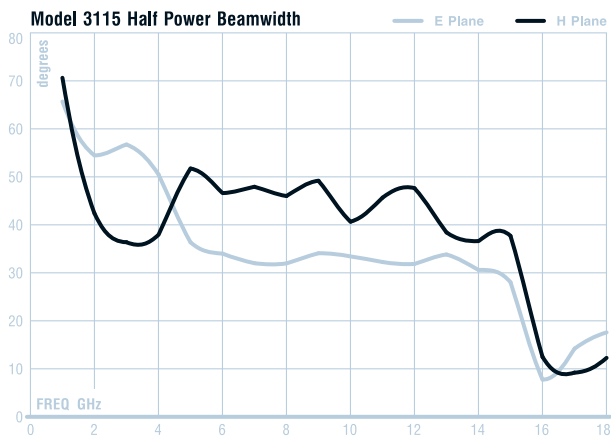
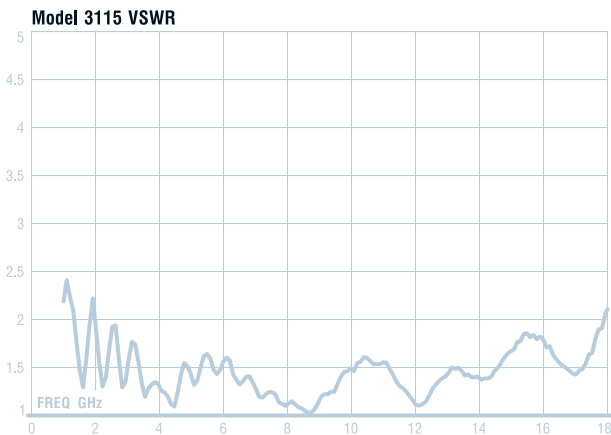
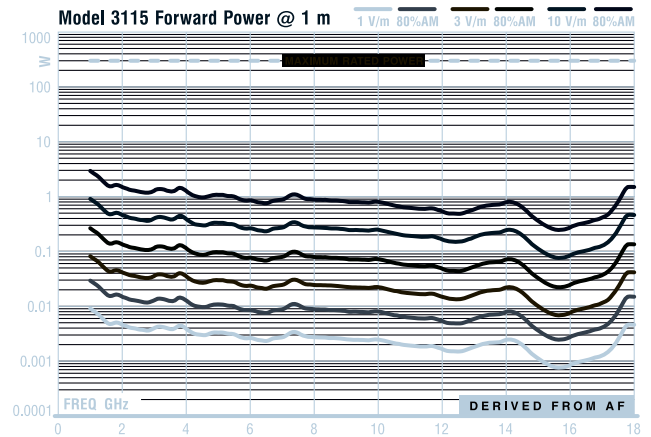
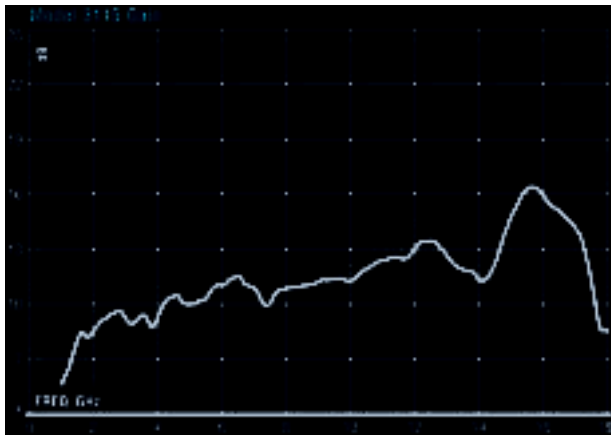
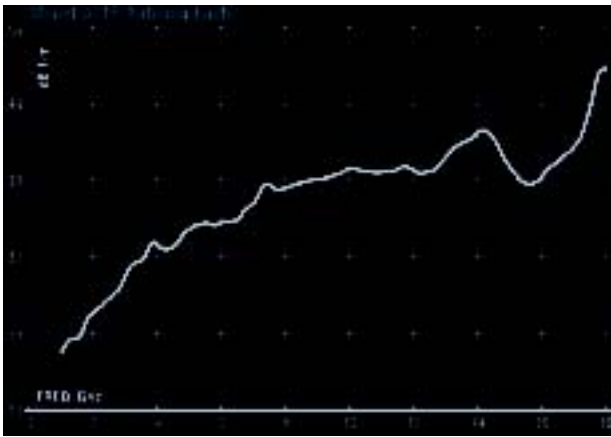


Model 3106 VSWR



Model 3106 Half Power Beamwidth





Model 3115 Double-Ridged Waveguide Horn

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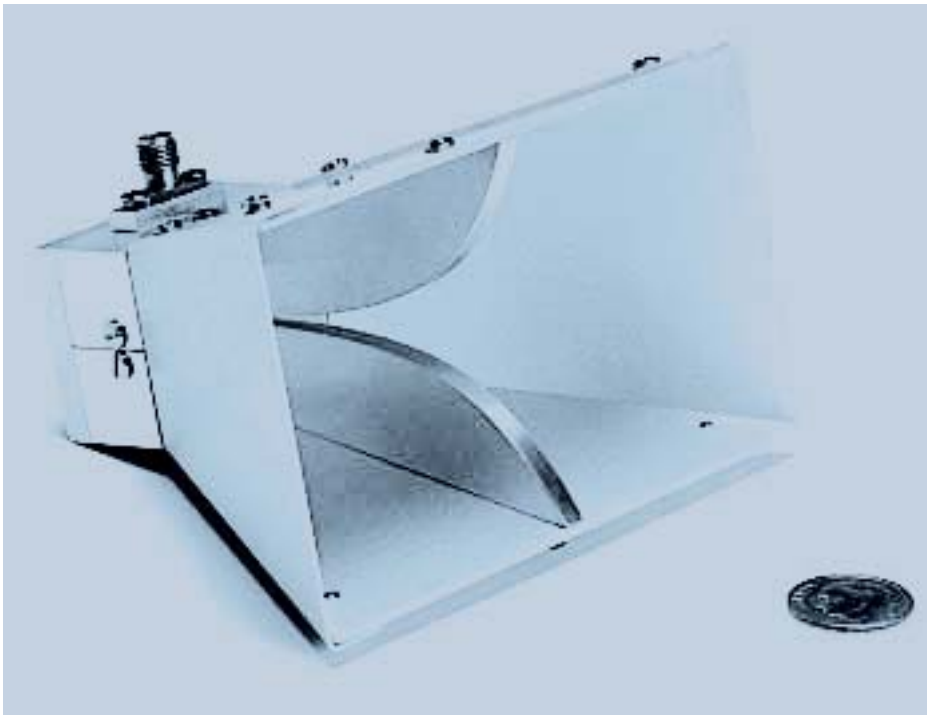
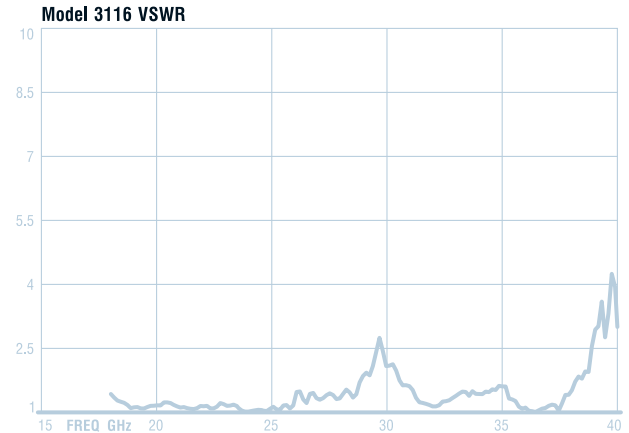
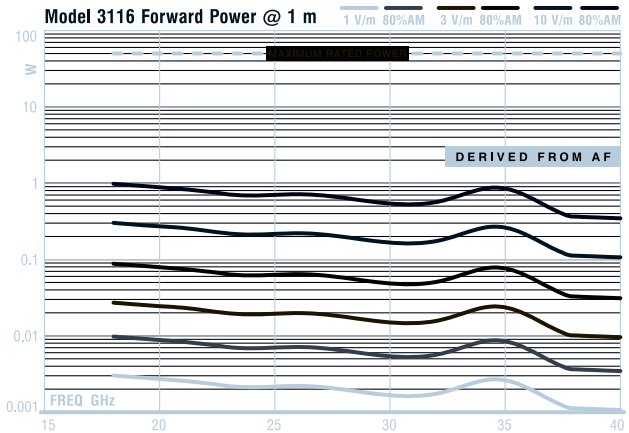
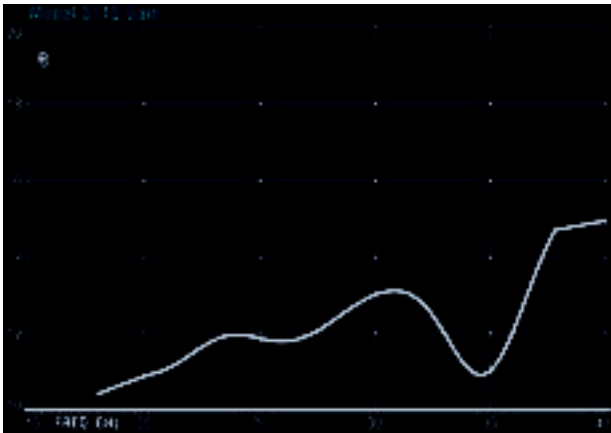
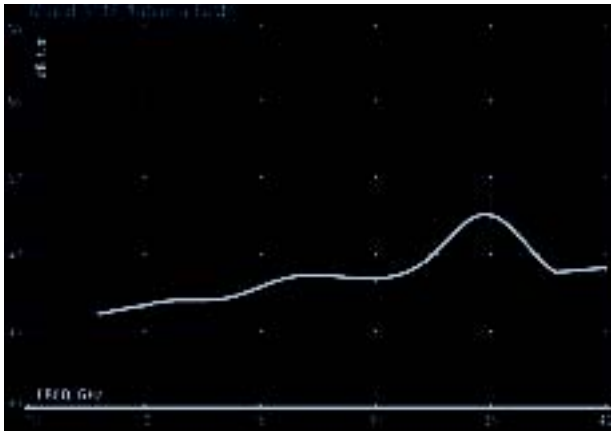
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Double-Ridged Waveguide Horn



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- 400 MHz - 6 GHz Frequency Range
- Simultaneous Measurements for Both Horizontal and Vertical Polarization
- Cross Polarization Isolation Better Than 25 dB
- High RF Power Handling Capability



MODEL 3164-03

Diagonal Dual Polarized Horn

EMCO Model 3164-03 Diagonal Dual Polarized Horn Antenna is designed for wireless test applications and covers all known wireless service frequencies. The antenna has two orthogonally placed input feeds that permit simultaneous measurements for dual polarizations. The antenna can be used as both a linearly and circularly polarized antenna over a very broad frequency range. While intended as a receive antenna, the Model 3164 can be used as a radiator, with a 200 W maximum continuous power handling capability.

Standard Configuration

- ▶ Horn assembly with mounting flange
- ▶ Manual
- ▶ Individually calibrated

Options

None

New!
Released as we went to press.
Model 3164.04 700 MHz – 6 GHz

Electrical Specifications

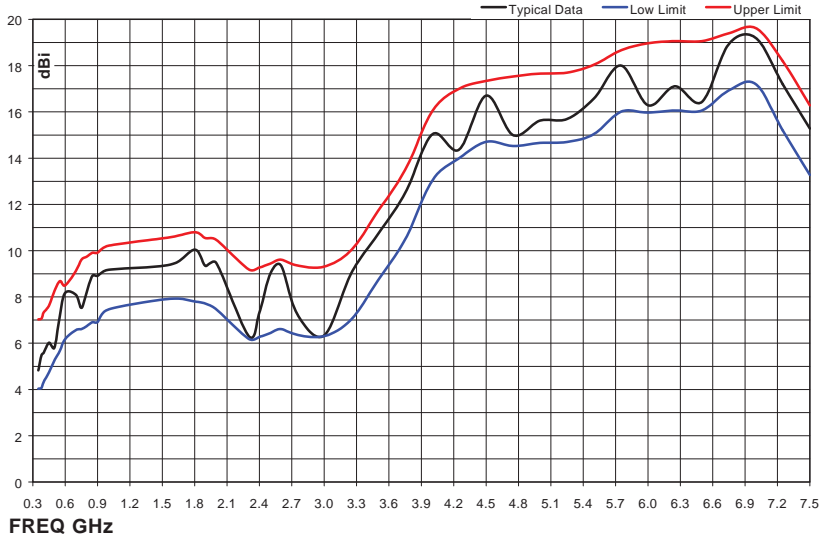
MODEL	FREQUENCY RANGE	VSWR RATIO (AVG)	DIRECTIVITY GAIN OVEROPERATING FREQUENCY	CROSS-POLARIZATION ISOLATION	MAXIMUM CONTINUOUS POWER	IMPEDANCE (NOMINAL)	CONNECTOR
3164-03	400 MHz - 6 GHz	<2.5:1	5 dBi -18 dBi	>25 dB	200 W	50 Ω	SMA (2)

Physical Specifications

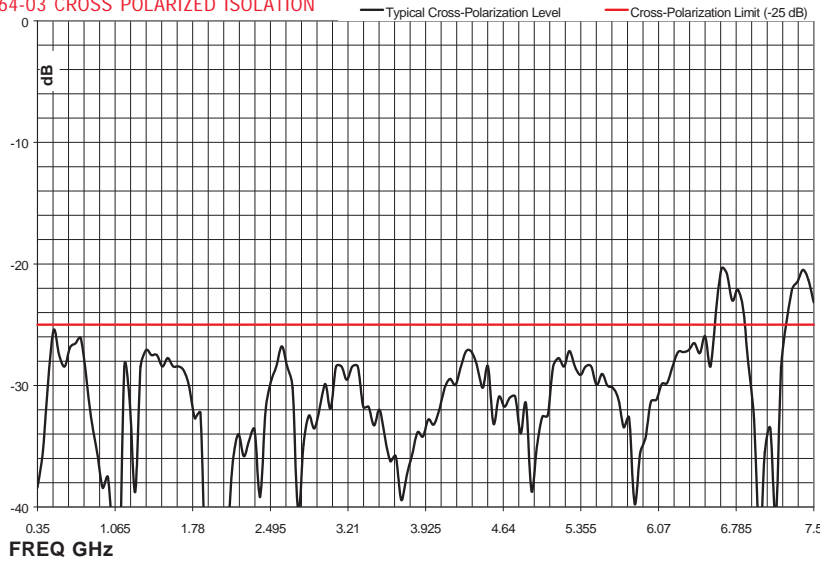
MODEL	LENGTH (OVERALL)	WIDTH (APERTURE)	HEIGHT (APERTURE)	WEIGHT
3164-03	50.8 cm 20.0 in	33.0 cm 13.0 in	33.0 cm 13.0 in	9.0 kg 20.0 lb

Model 3164-03 Technical Data

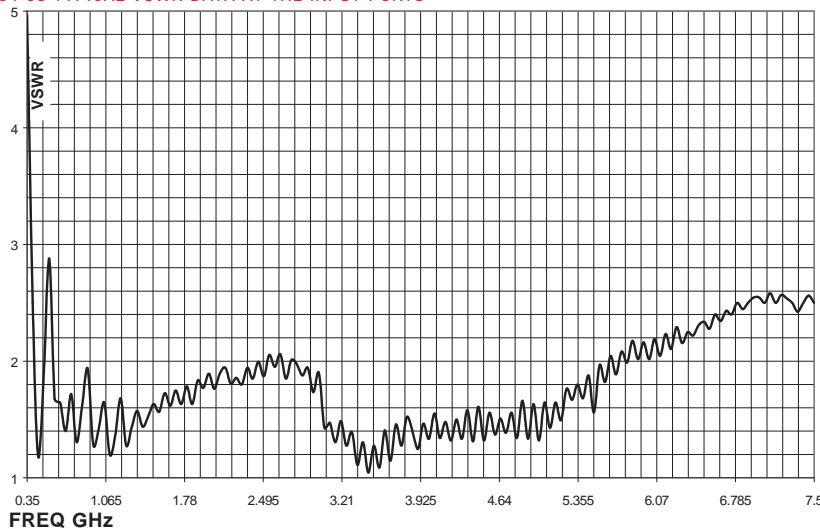
3164-03 DUAL POLARIZED ANTENNA GAIN CHARACTERISTICS

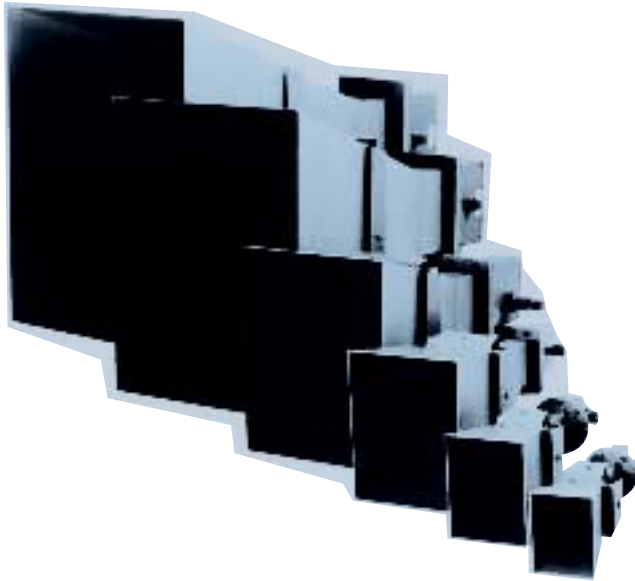


3164-03 CROSS POLARIZED ISOLATION



3164-03 TYPICAL VSWR DATA AT THE INPUT PORTS





MODEL 3160 01 - 06

Model 3160 01-10
.96 GHz – 40 GHz

- Constant Antenna Factor Over Frequency

Model 3161 01-03
1 GHz – 8 GHz

- Increased Power Dissipation
- Optimal Beamwidth
- Low VSWR
- Complete with Feed, Waveguide, and Mount



Standard Gain & Octave Horn

EMCO'S COAXIAL FED PYRAMIDAL STANDARD GAIN & OCTAVE HORN ANTENNAS cover a multi-octave bandwidth of 1 to 40 GHz in contiguous ranges. All models in the series are linearly polarized, have medium gain, optimum half power beamwidth (equal in both horizontal and vertical planes), and low VSWR. Antenna factors are constant throughout the entire operating frequency range. Comparisons of measured versus computed gain have been found to be within ± 0.5 dB. ANSI C63.4 recommends the use of standard gain horn antennas as a reference standard above 1 GHz. Octave horns are essentially the same as our standard gain horns, except that they are equipped with waveguide-to-coaxial feeds which are matched in frequency to common octave bandwidth amplifier ranges.

Unlike other antennas of this type, each EMCO pyramidal horn antenna comes assembled with a high performance, low VSWR coaxial-to-waveguide adapter. When additional power input levels are required, the coaxial feeds are easily removed from the waveguides. Industry standard flanges mount directly to amplifiers equipped with waveguide ports. Precision Type N female connectors are used for antennas operating below 18 GHz. Type K female connectors are used above 18 GHz. A mounting bracket is included with all models and allows either vertical or horizontal polarization measurements.

Precision manufacturing contributes to the predictable performance of these antennas. Models 3160-01 through 06 are welded using precise tooling and aluminum sheet metal. Models 3160-07 and 08 are investment cast using an aluminum alloy. Models 3160-09 and 10 are electroformed using copper deposition at the rate of 0.001 inch per hour.

EMCO Standard Gain Horn Antenna Features

Constant Antenna Factor

EMCO's standard gain horns have a constant antenna factor across their entire operating frequency, eliminating lookup in multiple charts to calculate measurements. Above 1 GHz, the antennas can be used as a reference standard per ANSI C63.4.

Increased Power Dissipation

While the coaxial feed allows power input of up to 550 W (Model 3160-01, 02, 03), higher power input is possible by removing the detachable feed and direct mounting the flange to an amplifier waveguide port.

Optimal Beamwidth

The 3 dB beamwidth in both polarization planes is very nearly equal at approximately 30 degrees. This is an optimum design for EMC testing, providing good coverage of the EUT at reasonable distances without the aiming problems of "pencil beam" antennas.

Low VSWR

EMCO's Standard Gain Horn Antennas provide a VSWR of $<1.5:1$.

Complete with Feed, Waveguide, and Mount

Unlike most antennas of this type, EMCO supplies a complete unit with detachable coax-to-waveguide feed and mounting brackets for both horizontal and vertical polarization. The waveguide features industry-standard flange mounts.

Standard Configuration

- ▶ Standard gain or octave horn assembly consisting of coaxial feed, flanged waveguide, and mounting bracket.
- ▶ Mounting bracket with 1/4 x 20 threads
- ▶ Complete calibration factors and signed Certificate of Conformance included in Manual (Octave Horns only).

Calibration by measurement not applicable to Standard Gain Horns.

Options

None

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The development of standard gain horn antennas was spurred by the arrival of World War II and with it, an increased interest in microwave frequencies. The standard gain horn is unique in that gain can be computed to a tenth of a decibel if the antenna is manufactured with precision. This characteristic allows these antennas to serve as primary standards for gain measurements. Standard gain horns also have the ability to realize specified beamwidths independently in the two principal planes.

Applications

MODEL	FCC-15	FCC-18	IEC/CISPR/EN	SAE J1113	SAE J1338	SAE J1507	SAE J1551	MIL-STD-461E	MIL-STD-1541	MIL-STD-285	NACSIM
3160	RE	RE	RE, RI	RI	RI	RI	RI	RE, RI	RE	RE, RI	RE
3161	RE	RE	RE, RI	RI	RI	RI	RI	RE, RI	RE	RE, RI	RE

RE = Radiated Emissions RI = Radiated Immunity (Susceptibility)

Electrical Specifications

MODEL	FREQUENCY RANGE	GAIN	ANTENNA FACTOR	E - PLANE	H - PLANE	MAXIMUM CONTINUOUS POWER	TYPICAL FIELD STRENGTH
3160-01	0.96 – 1.46 GHz	16.5 dBi	15.4 dB (1/m)	26°	27°	550 W	700 V/m
3160-02	1.12 – 1.70 GHz	16.3 dBi	16.9 dB (1/m)	26°	26°	550 W	700 V/m
3160-03	1.70 – 2.60 GHz	16.3 dBi	20.6 dB (1/m)	27°	27°	500 W	650 V/m
3160-04	2.60 – 3.95 GHz	16.7 dBi	23.7 dB (1/m)	26°	27°	250 W	500 V/m
3160-05	3.95 – 5.85 GHz	16.7 dBi	27.3 dB (1/m)	26°	27°	250 W	500 V/m
3160-06	5.85 – 8.20 GHz	17.1 dBi	29.9 dB (1/m)	24°	25°	250 W	500 V/m
3160-07	8.20 – 12.40 GHz	16.9 dBi	33.5 dB (1/m)	26°	26°	250 W	500 V/m
3160-08	12.40 – 18.00 GHz	16.7 dBi	37.1 dB (1/m)	26°	27°	200 W	435 V/m
3160-09	18.00 – 26.50 GHz	16.8 dBi	40.3 dB (1/m)	27°	27°	50 W	220 V/m
3160-10	26.50 – 40.00 GHz	17.0 dBi	43.5 dB (1/m)	27°	27°	10 W	100 V/m
3161-01	1.00 – 2.00 GHz	16.3 dBi	16.9 dB (1/m)	26°	26°	550 W	700 V/m
3161-02	2.00 – 4.00 GHz	17.5 dBi	22.3 dB (1/m)	22°	22°	250 W	500 V/m
3161-03	4.00 – 8.00 GHz	17.5 dBi	28.3 dB (1/m)	22°	22°	250 W	500 V/m

Gain shown is for mid-band of the operating range. Antenna factor is flat within ± 0.5 dB over each frequency. Field Strength shown is for 1 meter separation.

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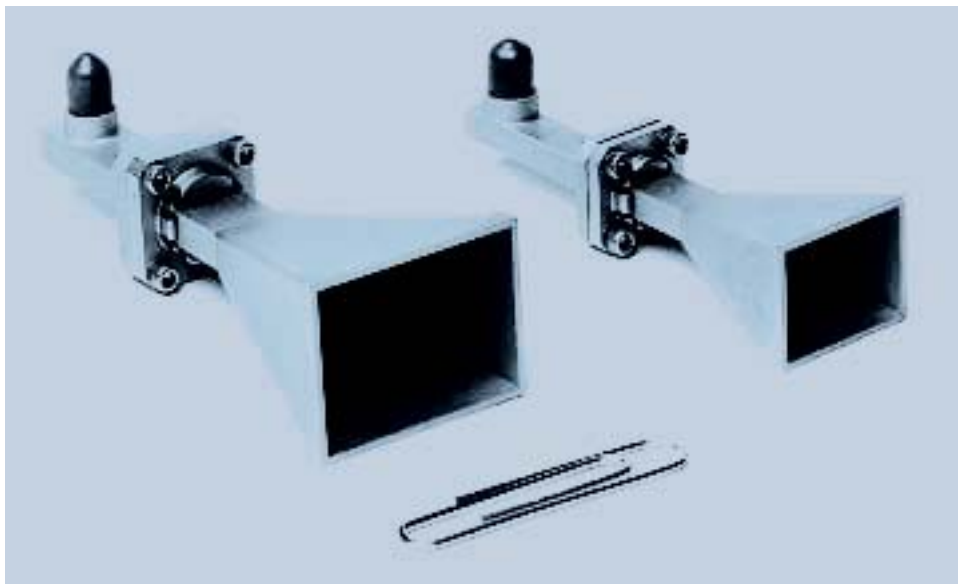
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Physical Specifications

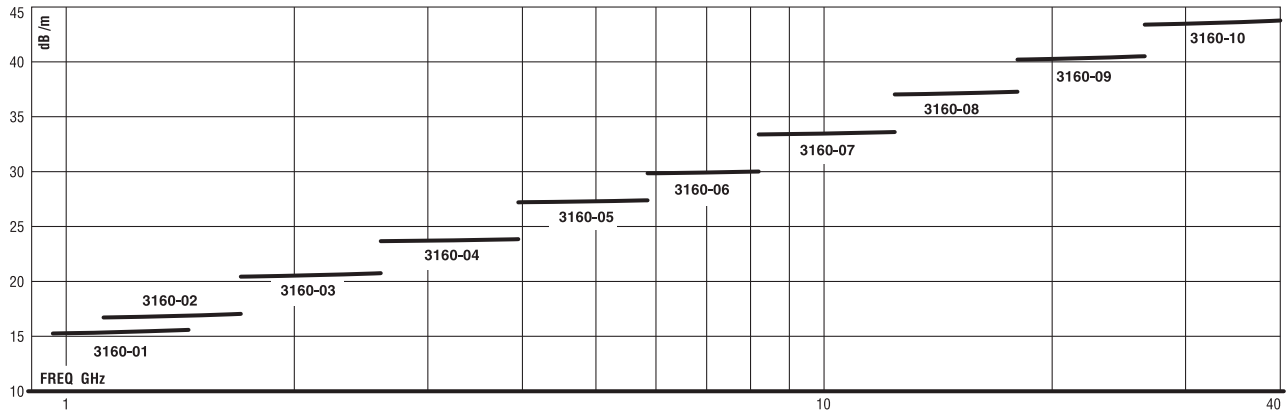
MODEL	WIDTH	DEPTH	HEIGHT	WEIGHT	WAVEGUIDE NUMBER	CONNECTOR
3160-01	63.22 cm 24.89 in	103.25 cm 40.65 in	47.50 cm 18.70 in	25.00 kg 55.00 lb	WR - 770	Type N female
3160-02	53.44 cm 21.04 in	88.29 cm 34.76 in	40.18 cm 15.82 in	10.00 kg 22.00 lb	WR - 650	Type N female
3160-03	34.65 cm 13.64 in	64.14 cm 25.25 in	64.14 cm 25.25 in	4.55 kg 10.00 lb	WR - 430	Type N female
3160-04	24.13 cm 9.50 in	55.25 cm 21.75 in	18.14 cm 7.14 in	2.27 kg 5.00 lb	WR - 284	Type N female
3160-05	16.33 cm 6.43 in	38.15 cm 15.02 in	12.24 cm 4.82 in	1.62 kg 3.50 lb	WR - 187	Type N female
3160-06	12.24 cm 4.82 in	29.90 cm 11.77 in	9.04 cm 3.56 in	0.80 kg 1.75 lb	WR - 137	Type N female
3160-07	8.06 cm 3.17 in	22.63 cm 8.91 in	6.26 cm 2.46 in	0.43 kg 0.95 lb	WR - 90	Type N female
3160-08	5.54 cm 2.18 in	14.00 cm 5.51 in	4.27 cm 1.68 in	0.28 kg 0.61 lb	WR - 62	Type N female
¹ 3160-09	3.84 cm 1.51 in	10.49 cm 4.13 in	2.95 cm 1.16 in	0.11 kg 0.24 lb	WR - 42	Type K female
¹ 3160-10	2.76 cm 1.09 in	8.69 cm 3.42 in	2.15 cm .85 in	0.06 kg 0.13 lb	WR - 28	Type K female
3161-01	53.14 cm 20.92 in	88.05 cm 34.67 in	39.86 cm 15.69 in	8.00 kg 17.60 lb	WR - 650	Type N female
3161-02	34.61 cm 13.63 in	59.34 cm 23.37 in	23.17 cm 9.12 in	5.00 kg 11.00 lb	WR - 320	Type N female
3161-03	17.47 cm 6.88 in	31.88 cm 12.55 in	11.74 cm 4.62 in	2.00 kg 4.40 lb	WR - 159	Type N female

¹ Dimensions without mounting bracket.

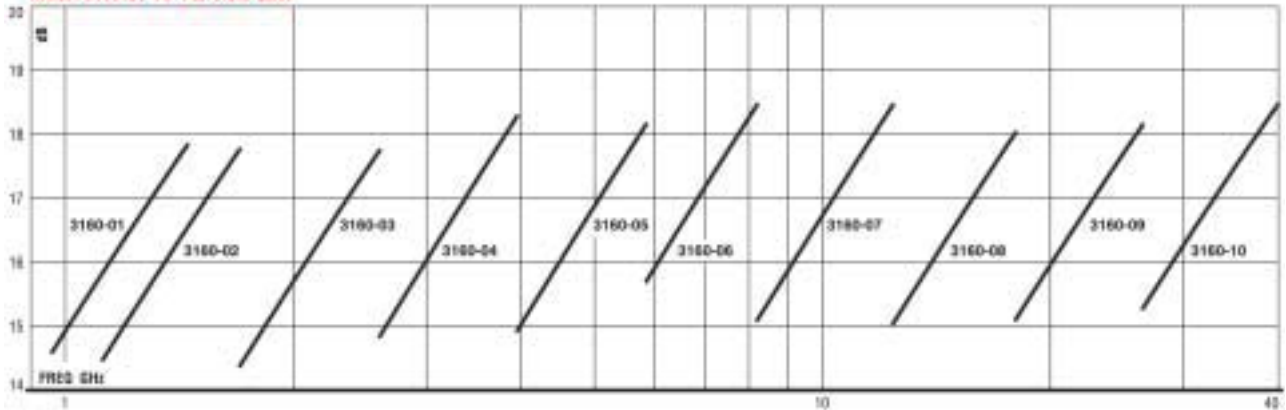


Models 3160-09 and 3160-10 Standard Gain Horn

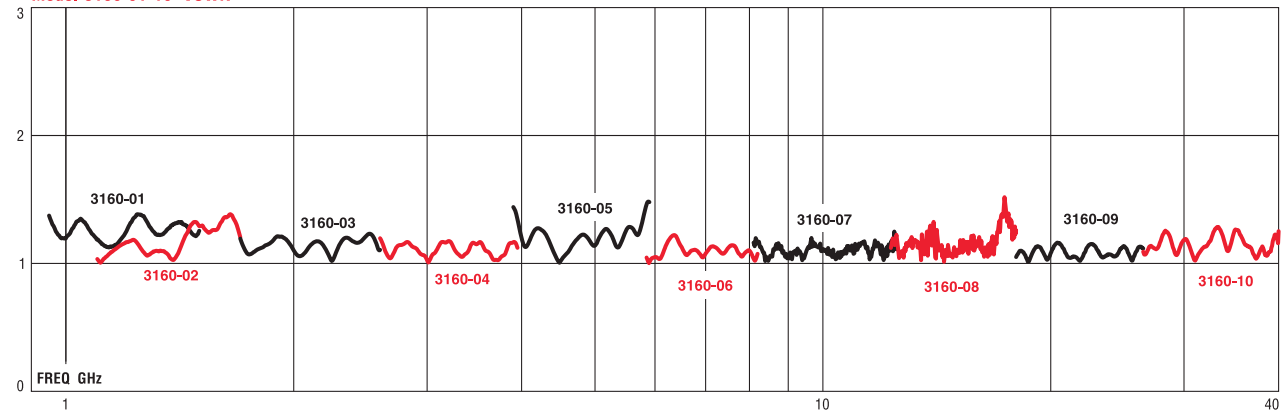
Model 3160 01-10 Antenna Factors



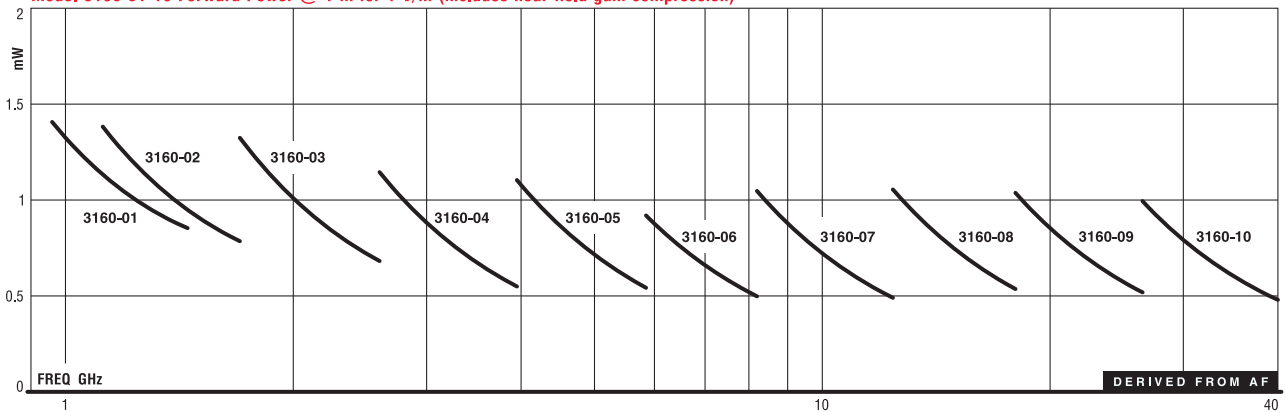
Model 3160 01-10 Far Field Gain



Model 3160 01-10 VSWR



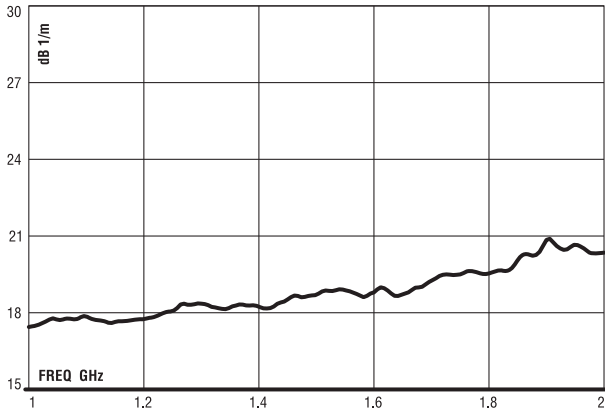
Model 3160 01-10 Forward Power @ 1 m for 1 V/m (includes near-field gain compression)



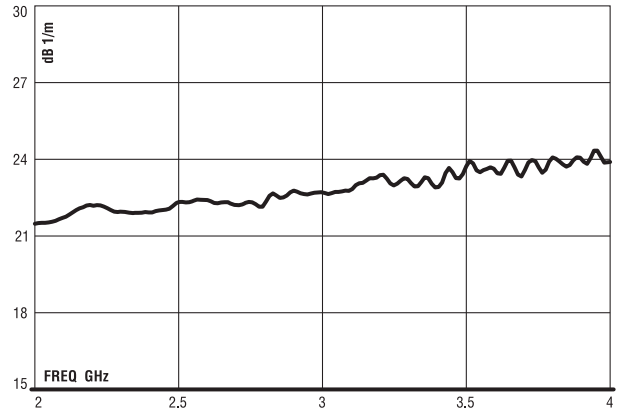
Model 3161-01 Technical Data

Model 3161-02 Technical Data

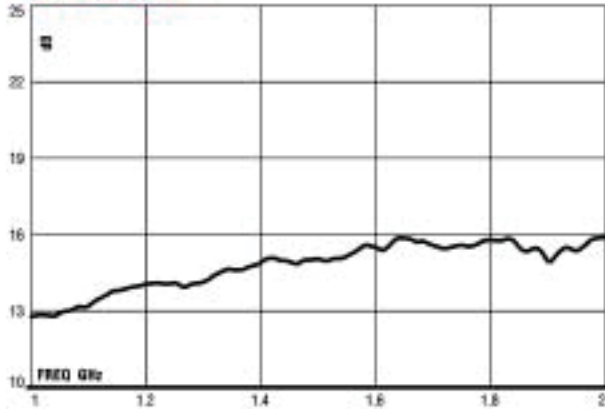
Model 3161-01 Antenna Factor



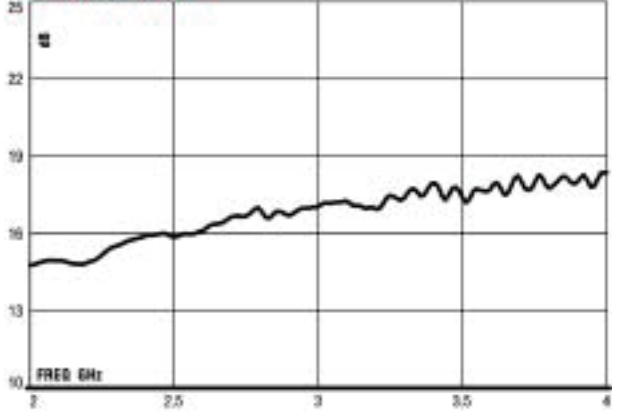
Model 3161-02 Antenna Factor



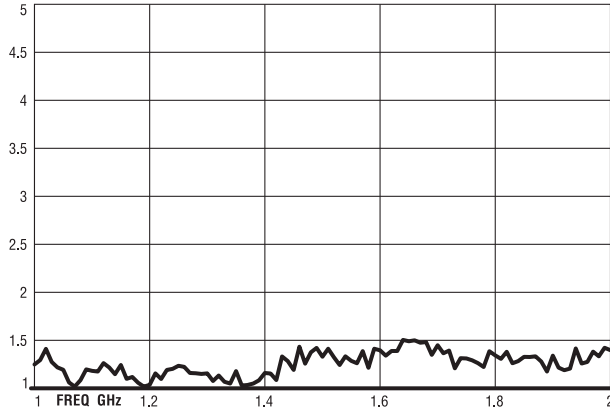
Model 3161-01 Gain



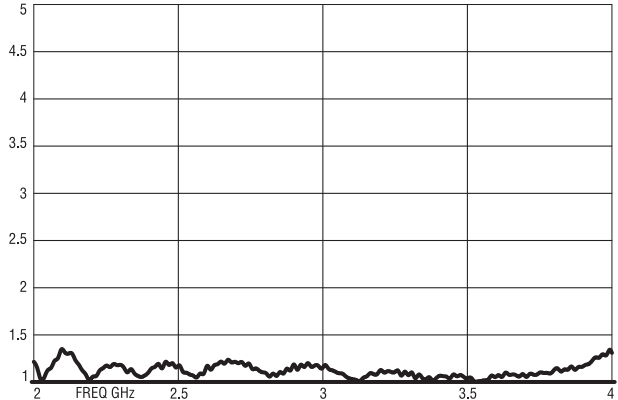
Model 3161-02 Gain



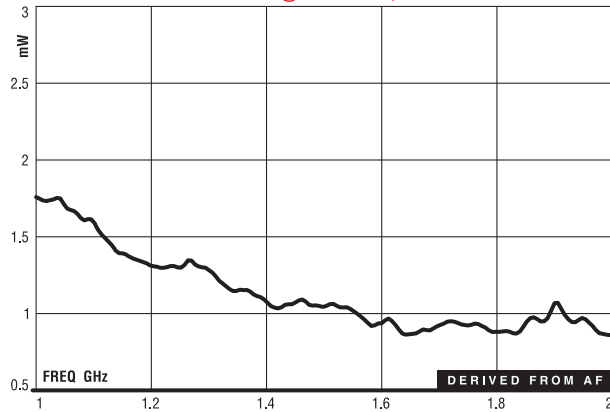
Model 3161-01 VSWR



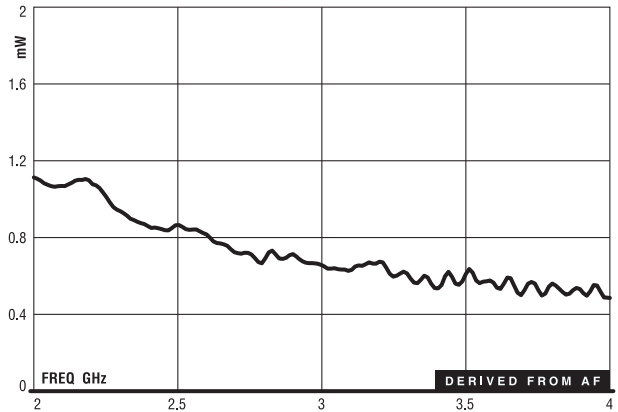
Model 3161-02 VSWR



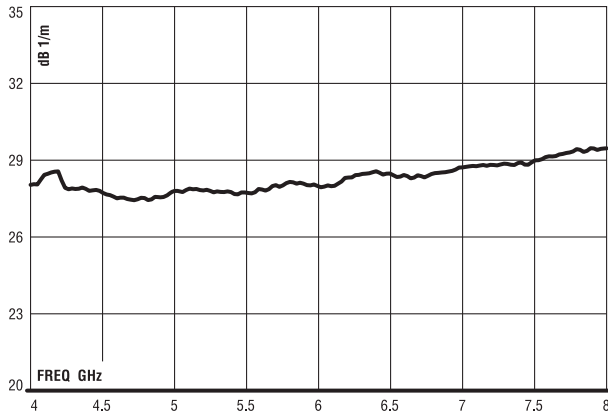
Model 3161-01 Forward Power @ 1 m for 1 V/m



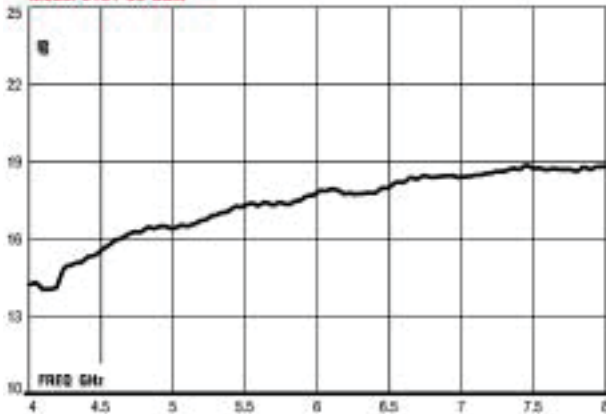
Model 3161-02 Forward Power @ 1 m for 1 V/m



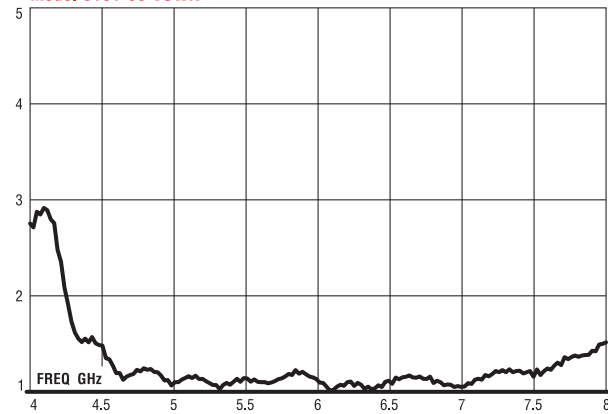
Model 3161-03 Antenna Factor



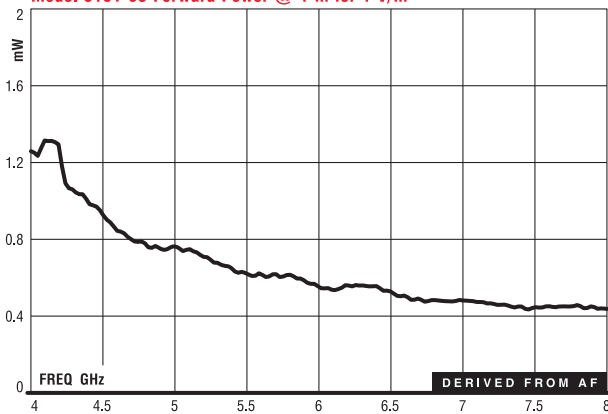
Model 3161-03 Gain



Model 3161-03 VSWR



Model 3161-03 Forward Power @ 1 m for 1 V/m



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