narda Safety Test Solutions
an L3 Technologies Company
http://www.narda-sts.it

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Test
Solutions
S.r.l. Socio Unico

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User's Manual

PMM AS02
PMM AS03
PMM AS04
PMM AS05
PMM AS06
PMM AS07
PMM AS08

ANTENNA SET

SERIAL NUMBER OF THE INSTRUMENT
You can find the Serial Number near the RF connector on both antennas.
Serial Number is in the form: 0000X00000.
The first four digits and the letter are the Serial Number prefix, the last five digits are the Serial Number suffix. The prefix is the same for identical instruments, it changes only when a configuration change is made to the instrument.
The suffix is different for each instrument.

NOTE:

If the instrument is used in any other way than as described in this Users Manual, it may become unsafe

Before using this product, the related documentation must be read with great care and fully understood to familiarize with all the safety prescriptions.

To ensure the correct use and the maximum safety level, the User shall know all the instructions and recommendations contained in this document.

This product has a **Pollution Degree II** normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.

The information contained in this document is subject to change without notice.

KEY TO THE ELECTRIC AND SAFETY SYMBOLS:

You now own a high-quality instrument that will give you many years of reliable service. Nevertheless, even this product will eventually become obsolete. When that time comes, please remember that electronic equipment must be disposed of in accordance with local regulations. This product conforms to the WEEE Directive of the European Union (2002/96/EC) and belongs to Category 9 (Monitoring and Control Instruments). You can return the instrument to us free of charge for proper environment friendly disposal. You can obtain further information from your local Narda Sales Partner or by visiting our website at www.narda-sts.it .

Warning, danger of electric shock

Earth

Read carefully the Operating Manual and its instructions, pay attention to the safety symbols.

Unit Earth Connection

Earth Protection

Equipotential

KEY TO THE SYMBOLS USED IN THIS DOCUMENT:

DANGER **The DANGER sign draws attention to a potential risk to a person's safety. All the precautions must be fully understood and applied before proceeding.**

WARNING **The WARNING sign draws attention to a potential risk of damage to the apparatus or loss of data. All the precautions must be fully understood and applied before proceeding.**

CAUTION **The CAUTION sign draws attention against unsafe practices for the apparatus functionality.**

NOTE: **The NOTE draw attention to important information.**

Contents

Figures

Tables

1 – General Information

1.1 Introduction

This manual is a guide to the installation and use of the PMM AS-02, AS-03, AS-04, AS-05, AS-06, AS-07 and AS-08 Antenna Set.
Main information about the radiated emission and immunity testing are also explained.

1.2 Documentation

Enclosed with this manual are:

- a service questionnaire to send back to NARDA if equipment service is required.
- an accessories check list to verify all accessories enclosed in the packaging.

1.3 Introduction to the PMM Antenna Set

With a compact size, easy mounting set and polarization change, light weight and broadband frequency range the Antenna Set series is the ideal solution for automated measurements in the 30 MHz to 18 GHz frequency range.

The PMM AS-02 covers from 30 MHz to 3 GHz, the AS-03/AS-04/AS-07 from 30 MHz to 6 GHz and the AS-05/AS-06/AS-08 from 30 MHz to 18 GHz. Common applications include measurements to EN 55022 emission and CEI IEC 61000-4-3 immunity testing specifications.

The PMM AS-02 is composed of a PMM BC-01 Bi-Conical Dipole and PMM LP-02 Log Periodic Dipole Array.

The PMM AS-03 and AS-06 include a PMM BC-01 Bi-Conical Dipole, PMM LP-02 Log Periodic Dipole Array, PMM LP-03 Log Periodic Dipole Array and PMM DR-01 Double Ridged Horn Antenna (for PMM AS-06 only).

The PMM AS-04 and AS-05 are composed of a PMM BC-01 Bi-Conical Dipole, PMM LP-04 Log Periodic Dipole Array and PMM DR-01 Double Ridged Horn Antenna (for PMM AS-05 only).

The PMM AS-07 and AS-08 include a BL-01 Bi-Conical Log Periodic Dipole Array and PMM DR-01 Double Ridged Horn Antenna (for PMM AS-08 only).

The supplied tripod PMM TR-01 is highly recommended; the tripod stand is made by hard wood assuring the needed rigidity when holding the antenna, the adjustable joint allows easy to mount and antenna polarization change operations.

1.4 Standard Accessories

The PMM Antenna Set are kits that include multiple units and standard accessories; they are described in the following paragraphs.

1.4.1 PMM AS-02
(30 MHz – 3 GHz)

The PMM AS-02 Antenna Set includes the following standard accessories:

- BC-01 Bi-Conical Dipole Antenna
- LP-02 Log Periodic Dipole Array
- TR-01 Wooden tripod with extension and adjustable joint
- RF Cable/5 – RF cable (5m long)
- CC-01 Soft Carrying case
- Antennas Calibration Reports (one for each antenna unit)
- Return for Repair Form
- Operating Manual

Fig. 1-1 PMM AS-02 kit

1.4.2 PMM AS-03
(30 MHz – 6 GHz)

The PMM AS-03 Antenna Set includes the following standard accessories:

- BC-01 Bi-Conical Dipole Antenna
- LP-02 Log Periodic Dipole Array
- LP-03 Log Periodic Dipole Array
- TR-01 Wooden tripod with extension and adjustable joint
- RF Cable/5 – RF cable (5m long)
- N(f)-N(f) adapter
- CC-01 Soft Carrying case
- CC-03 Soft Carrying case
- Support for LP-03
- Antennas Calibration Reports (one for each antenna unit)
- Return for Repair Form
- Operating Manual

Fig. 1-2 PMM AS-03 kit

1.4.3 PMM AS-04
(30 MHz – 6 GHz)

The PMM AS-04 Antenna Set includes the following standard accessories:

- BC-01 Bi-Conical Dipole Antenna
- LP-04 Log Periodic Dipole Array
- CC-01 Soft Carrying case
- TR-01 Wooden tripod with extension and adjustable joint
- RF Cable/5 – RF cable (5m long)
- Antennas Calibration Reports (one for each antenna unit)
- Return for Repair Form
- Operating Manual

Fig. 1-3 PMM AS-04 kit

1.4.4 PMM AS-05
(30 MHz – 18 GHz)

The PMM AS-05 Antenna Set includes the following standard accessories:

- BC-01 Bi-Conical Dipole Antenna
- LP-04 Log Periodic Dipole Array
- DR-01 Double Ridged Horn Antenna
- TR-01 Wooden tripod with extension and adjustable joint
- Antenna Support kit for DR-01
- CC-01 Soft Carrying case
- 170/30N - Rigid Carrying case (for DR-01)
- RF Cable/5 – RF cable (5m long)
- Antennas Calibration Reports (one for each antenna unit)
- Return for Repair Form
- Operating Manual

Fig. 1-4 PMM AS-05 kit

1.4.5 PMM AS-06
(30 MHz – 18 GHz)

The PMM AS-06 Antenna Set includes the following standard accessories:

- BC-01 Bi-Conical Dipole Antenna
- LP-02 Log Periodic Dipole Array
- LP-03 Log Periodic Dipole Array
- DR-01 Double Ridged Horn Antenna
- TR-01 Wooden tripod with extension and adjustable joint
- Support for LP-03
- Antenna Support kit for DR-01
- CC-01 Soft Carrying case
- CC-03 Soft Carrying case
- 170/30N - Rigid Carrying case (for DR-01)
- RF Cable/5 – RF cable (5m long)
- N(f)-N(f) adapter
- Antennas Calibration Reports (one for each antenna unit)
- Return for Repair Form
- Operating Manual

Fig. 1-5 PMM AS-06 kit

1.4.6 PMM AS-07
(30 MHz – 6 GHz)

The PMM AS-07 Antenna Set includes the following standard accessories:

- BL-01 Bi-Conical Log Periodic Antenna
- CC-02 Soft Carrying case
- TR-01 Wooden tripod with extension and adjustable joint
- RF Cable/5 – RF cable (5m long)
- BL-01 Calibration Report
- Return for Repair Form
- Operating Manual

Fig. 1-6 PMM AS-07 kit

1.4.7 PMM AS-08
(30 MHz – 18 GHz)

The PMM AS-08 Antenna Set includes the following standard accessories:

- BL-01 – Bi-Conical Log Periodic Antenna
- DR-01 – Double Ridged Horn Antenna
- TR-01 – Wooden tripod with extension and adjustable joint
- Antenna Support kit for DR-01
- CC-02 Soft Carrying case
- 170/30N - Rigid Carrying case (for DR-01)
- RF Cable/5 – RF cable (5m long)
- Antennas Calibration Reports (one for each antenna unit)
- Return for Repair Form
- Operating Manual

Fig. 1-7 PMM AS-08 kit

1.5 Optional Accessories

The following accessories can be ordered separately:

- BC-01 Bi-Conical Dipole Antenna
- BC-01/TC Bi-Conical Dipole Antenna (typical calibration)
- BL-01 Bi-Conical Log-periodic Antenna
- BL-01/TC Bi-Conical Log-periodic Antenna (typical calibration)
- LP-02 Log Periodic Dipole Array
- LP-02/TC Log Periodic Dipole Array (typical calibration)
- LP-03 Log Periodic Dipole Array
- LP-03/F Log Periodic Dipole Array (female adapter)
- LP-03/TC Log Periodic Dipole Array (typical calibration)
- LP-03/FTC Log Periodic Dipole Array (female adapter, typ. calibration)
- LP-04 Log Periodic Dipole Array
- LP-04/TC Log Periodic Dipole Array (typical calibration)
- DR-01 Double Ridged Horn Antenna
- PMM TR-01 Wooden tripod;
- Support for LP-03
- Antenna Support kit for DR-01
- CC-01 Soft Carrying case
- CC-02 Soft Carrying case
- CC-03 Soft Carrying case
- 170/30N Rigid Carrying case (for DR-01)
- RF Cable/5 - RF cable (5 m long)
- N(f)-N(f) adapter
- AMK-01 Antenna Mounting Kit for AS-02/AS-03/AS-04/AS-05/AS-06
- AMK-02 Antenna Mounting Kit for AS-07/AS-08

For some models, it is available a “typical calibration”.
For these units, the calibration report contains typical values that are generally very close to the actual ones.

1.6 PMM BC-01 Bi-Conical Dipole Antenna

The PMM BC-01 Bi-Conical Dipole is a compact size and time saving alternative to the classical dipole antenna in the range 30 - 200 MHz; the tedious manual adjustment at each frequency of the classical dipole elements can be avoided using the compact size and broadband frequency range characteristics of the PMM AS-02, AS-03, AS-04, AS-05 and AS-06 kit.

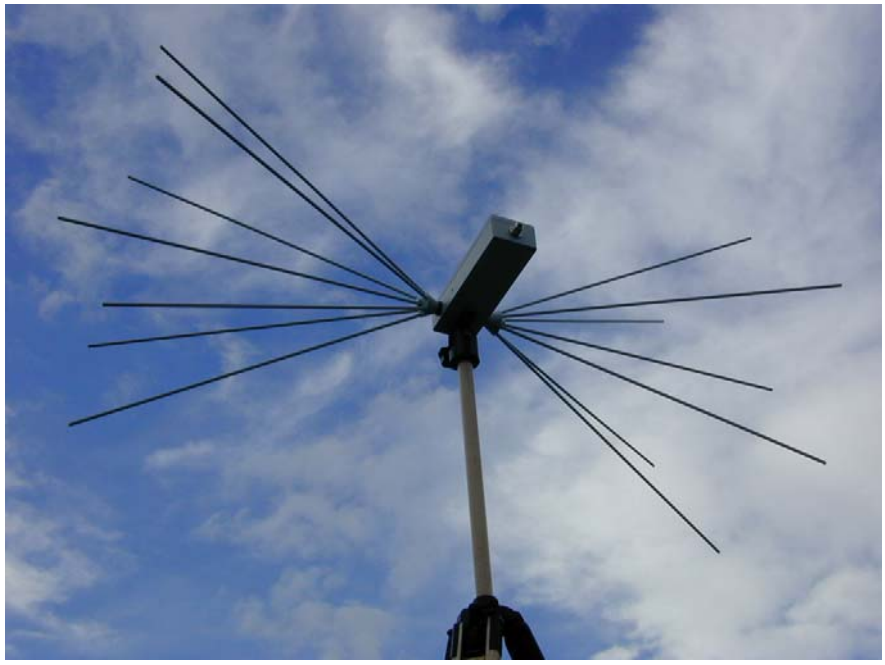


Fig. 1-8 PMM BC-01

The PMM BC-01 can be ordered separately and, in this case, includes:

- Soft Tubular Case;
- Calibration Report;
- Operating Manual;
- Return for Repair Form.

The optional accessories:

- **TR-01 set** (includes: TR01 60-180 cm wooden column extendable tripod, antenna mounting adapter to change polarization, soft carrying case)
- **RF cable** 5 meter/6 GHz/N(m)-N(m)
- **AMK-01** Antenna Mounting kit

1.7 PMM BL-01 Bi-Conical Log-periodic Antenna

A versatile PMM BL-01 Bi-Conical Log Periodic Dipole Array covers the full range 30 MHz to 6 GHz without changing antennas, even if such a solutions is mostly more expensive and the antenna size is bigger.
Its ideal companion is the EMI Receiver Unit PMM 9060, which can be easily mounted on the antenna by optional accessory AMK-02.
On the PMM AS-07 kit is available the BL-01 antenna with TR-01 set and RF cable 5m.

Fig. 1-9 PMM BL-01

On the PMM AS-08 kit is also available a double ridged horn antenna for measurements above 6 GHz.

The PMM BL-01 can be ordered separately and, in this case, includes:

- CC-02 Soft Carrying Case;
- Calibration Report;
- Operating Manual;
- Return for Repair Form.

The optional accessories:

- **TR-01 set** (includes: TR01 60-180 cm wooden column extendable tripod, antenna mounting adapter to change polarization, soft carrying case)
- **RF cable** 5 meter/6 GHz/N(m)-N(m)
- **AMK-02** Antenna Mounting kit

1.8 PMM LP-02 Log Periodic Dipole Array

The PMM LP-02 Log Periodic Dipole Array obtain a broadband excellent VSWR characteristics thanks to its accurate design of the feed and elements positioning on the boom, the constant antenna gain yields an antenna factor which varies linearly with frequency in the range 200 MHz to 3 GHz.

Fig. 1-10 PMM LP-02

The PMM LP-02 can be ordered separately and, in this case, includes:

- CC-01 Soft carrying case;
- Calibration Report;
- Operating Manual;
- Return for Repair Form.

The optional accessories:

- **TR-01 set** (includes: TR01 60-180 cm wooden column extendable tripod, antenna mounting adapter to change polarization, soft carrying case)
- **RF cable** 5 meter/6 GHz/N(m)-N(m)
- **AMK-01** Antenna Mounting kit

1.9 PMM LP-03 Log Periodic Dipole Array

The PMM LP-03 Log Periodic Dipole Array obtain a broadband excellent VSWR characteristics thanks to its accurate design of the feed and elements positioning on the boom, the constant antenna gain yields an antenna factor which varies linearly with frequency in the range 0.8 to 6 GHz.
The PMM LP-03 has been developed and specified mainly as accessory of the 6 GHz receivers 9060. The LP-03 can be also offered as a general purpose antenna for both EMC and other industrial applications, alone or in an antenna kit (PMM AS-03).
The booms and the elements are made of aluminium Alodyne coated and painted; the holding pipe is made of stainless steel; the antenna is composed by a total of 28 elements.
The LP-03 combines small size with high manufacturing and calibration standards, making it perfectly suitable for portable applications and in anechoic chambers.
The tripod PMM TR-01 is highly recommended; the tripod stand is made by hard wood assuring the needed rigidity when holding the antenna, the adjustable joint allows easy to mount and antenna polarization change operations.

Fig. 1-11 PMM LP-03

The PMM LP-03 can be ordered separately and, in this case, includes:

- Support for LP-03;
- CC-03 Soft Carrying Case;
- Calibration Report;
- Operating Manual;
- Return for Repair Form.

The optional accessories:

- **TR-01 set** (includes: TR01 60-180 cm wooden column extendable tripod, antenna mounting adapter to change polarization, soft carrying case)
- **RF cable** 5 meter/6 GHz/N(m)-N(m)

1.10 PMM LP-04 Log Periodic Dipole Array

The PMM LP-04 Log Periodic Dipole Array obtain a broadband excellent VSWR characteristics thanks to its accurate design of the feed and elements positioning on the boom, the constant antenna gain yields an antenna factor which varies linearly with frequency in the range 200 MHz to 6 GHz.

Fig. 1-12 PMM LP-04

The PMM LP-04 can be ordered separately and, in this case, includes:

- CC-01 Soft carrying case;
- Calibration Report;
- Operating Manual;
- Return for Repair Form.

The optional accessories:

- **TR-01 set** (includes: TR01 60-180 cm wooden column extendable tripod, antenna mounting adapter to change polarization, soft carrying case)
- **RF cable** 5 meter/6 GHz/N(m)-N(m)
- **AMK-01** Antenna Mounting kit

1.11 PMM DR-01 Double Ridged horn antenna

The PMM DR-01 Double Ridged is a compact Horn Antenna with a broadband response in the frequency range of 6 GHz - 18 GHz. It is designed for direct connection - without cable or adapters to the 18 GHz receiver PMM 9180.
The DR-01 can be connected to any other RF equipment: small size with high manufacturing and calibration standards make it perfectly suitable for portable applications and in anechoic chambers.
Each unit is individually calibrated before shipment; the test data are supplied with the antenna.

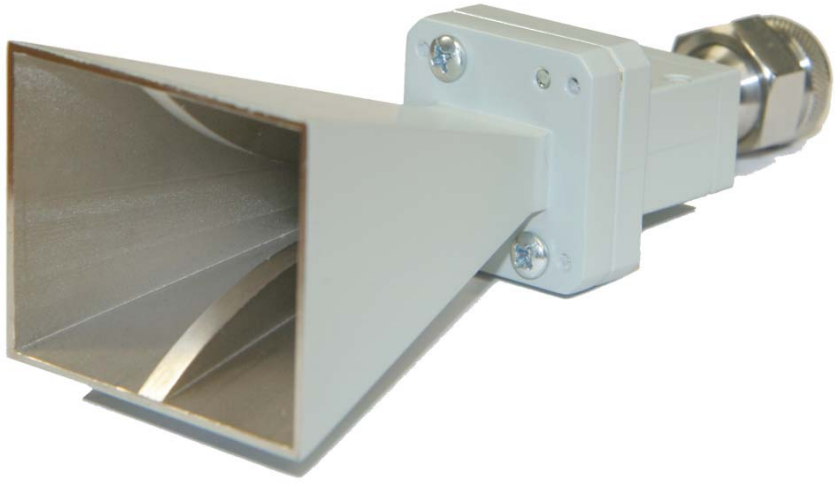


Fig. 1-13 PMM DR-01

The supplied tripod PMM TR-01 is recommended; the tripod stand is made by hard wood assuring the stability needed for holding antenna and receiver PMM 9180; the adjustable joint allows for easy antenna mounting and polarization changing.

The PMM DR-01 can be ordered separately and, in this case, includes:
- 170/30N Rigid Carrying Case;
- Antenna Support kit;
- Calibration Report;
- Return for Repair Form;
- Operating Manual.

The optional accessories:
- Nf to Nf adapter

1.12 BC-01 Main Specifications

The following Table list the BC-01 Antenna performance specifications.

TABLE 1-1 PMM BC-01 Bi-Conical Dipole Specifications	
Electrical characteristics	**Performance Limits**
Frequency range	30 to 200 MHz
Impedance	50 Ω nominal
Gain	-15 +2 dBi typical
Antenna Factor	8 to 14 dB/m typical
Construction	Aluminium
Max input power	100 W
Connector	N-female
Dimensions (L x H x W)	65 x 65 x 137 cm
Weight	1,8 kg
Colour	RAL 7035

3 m Typical Antenna Factor

Calibration Distance & Polarisation	3,0 m Horizontal
Receiving Antenna Height	1-4 m
Transmitting Antenna Height	1 m

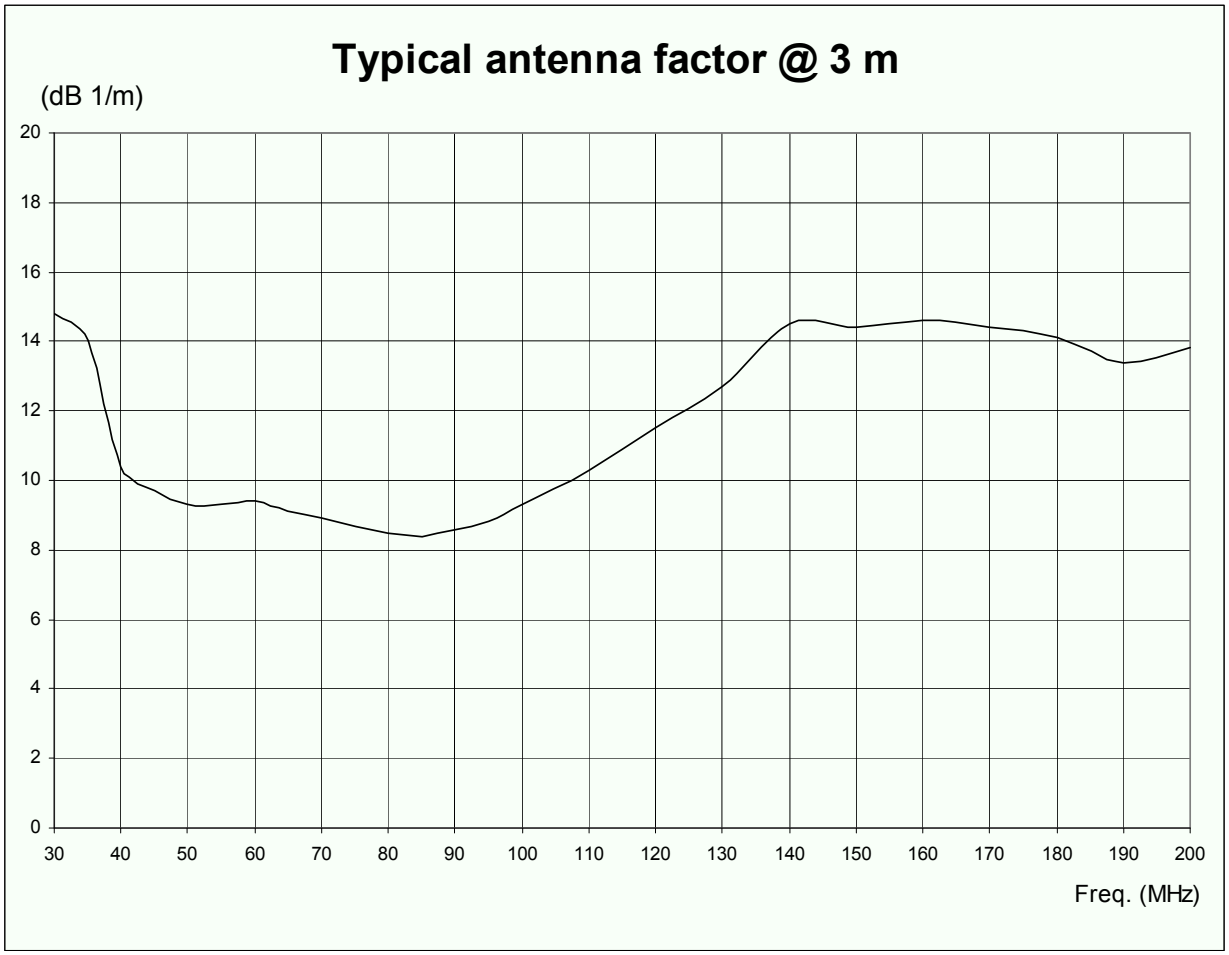


Fig. 1-14 Typical BC-01 antenna factor @ 3 m

10 m Typical Antenna Factor

Calibration Distance & Polarisation	10,0 m	Horizontal
Receiving Antenna Height	1-4 m	
Transmitting Antenna Height	1 m	

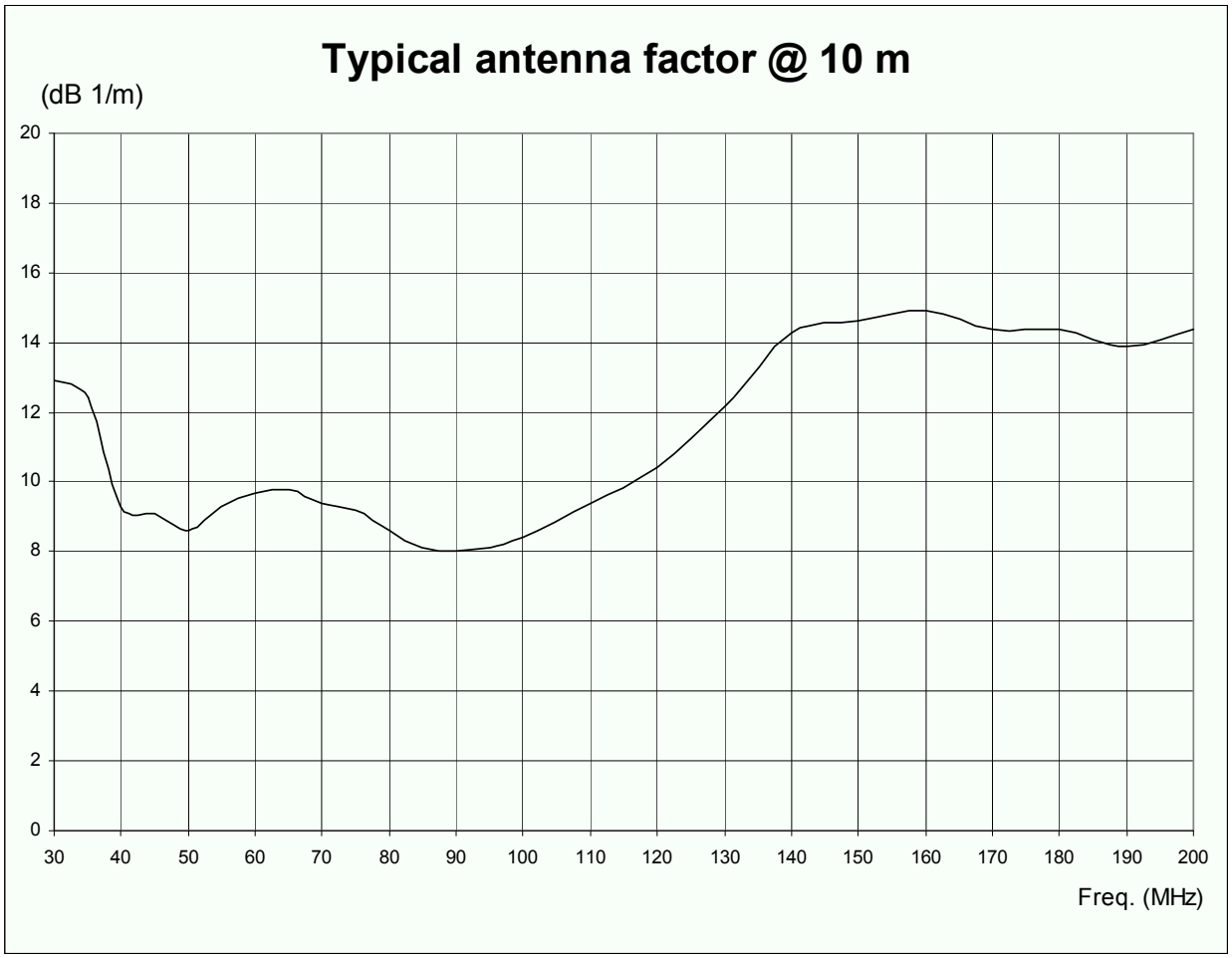


Fig. 1-15 Typical BC-01 antenna factor @ 10 m

1.13 BL-01 Main Specifications

The following Table list the BL-01 Antenna performance specifications.

TABLE 1-2 PMM BL-01 Bi-Conical Log-periodic Dipole Specifications	
Electrical characteristics	**Performance Limits**
Frequency range	30 MHz to 6 GHz
Impedance	50 Ω nominal
Gain	-9 to +5 dBi typical
Antenna factor	8 to 45 dB/m typical
VSWR	
30 MHz	< 16:1 typical
60 to 120 MHz	< 4:1 typical
120 to 170 MHz	< 2:1 typical
170 MHz to 6 GHz	< 1.5:1 typical
Construction	Aluminium
Max input power	100 W up to 1 GHz 50 W up to 3 GHz
Connector	N female
Dimensions (L x H x W)	145 x 61 x 157 cm
Weight	5,5 kg
Colour	RAL 7035

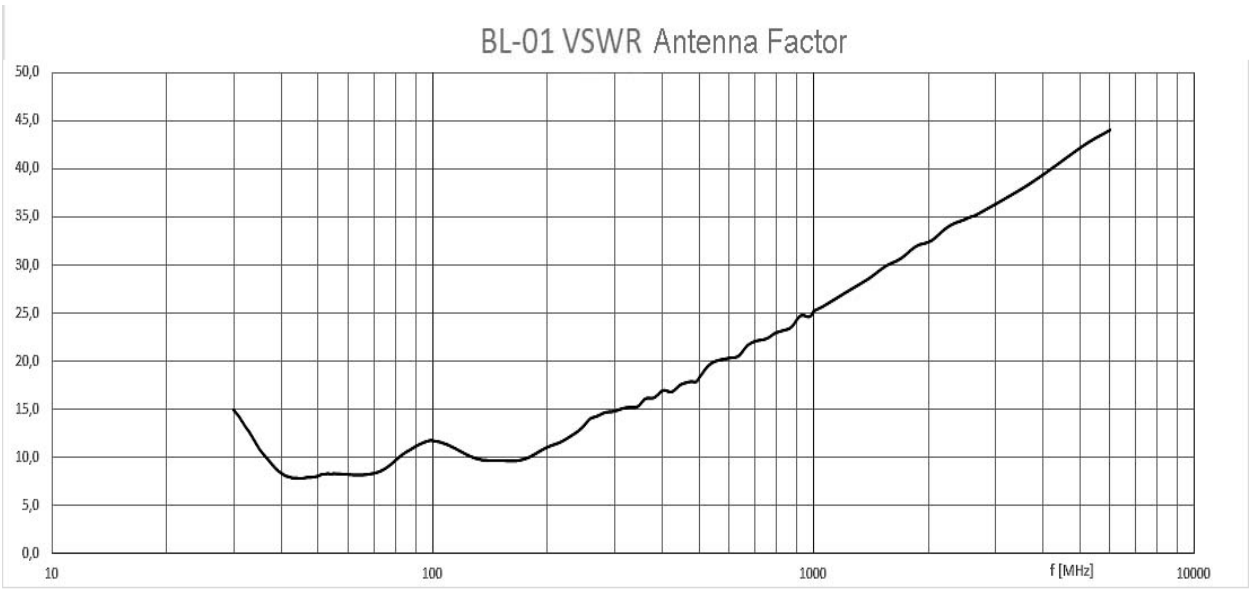


Fig. 1-16 Typical BL-01 antenna factor

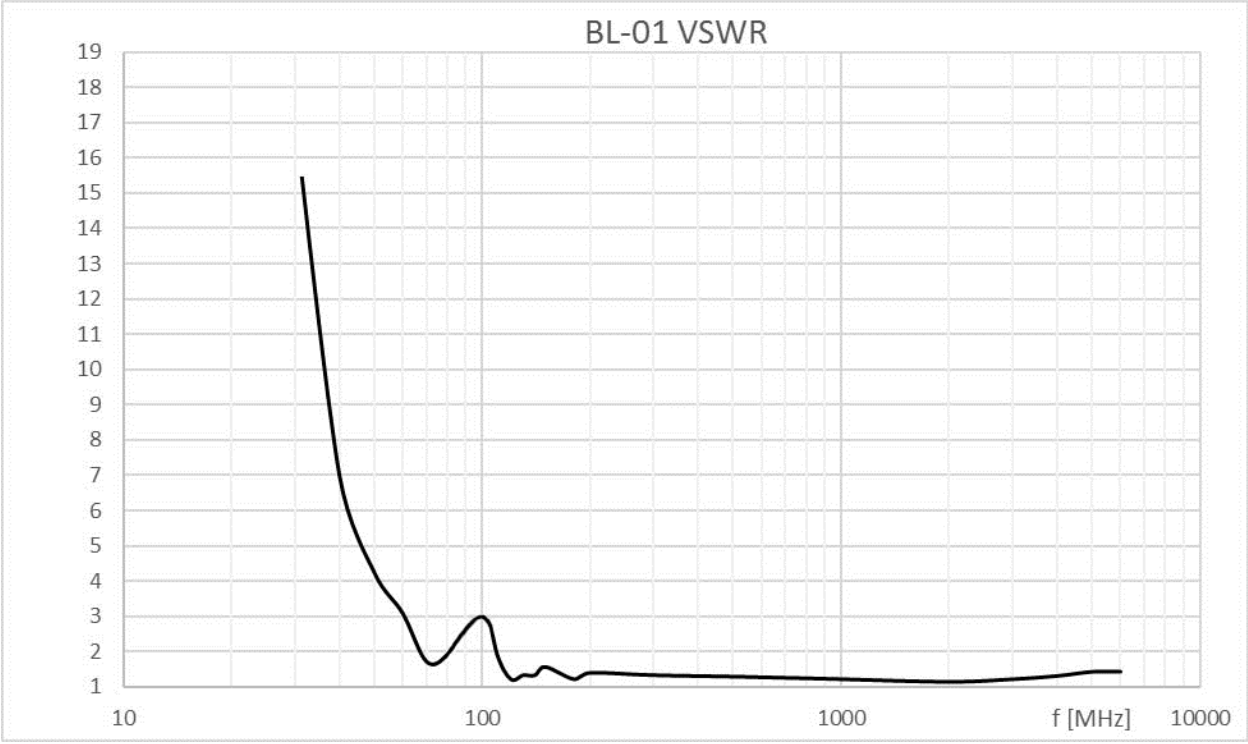


Fig. 1-17 Typical BL-01 VSWR

1.14 LP-02 Main Specifications

The following Table list the LP-02 Antenna performance specifications.

TABLE 1-3 PMM LP-02 Log Periodic Dipole Array Specifications	
Electrical characteristics	**Performance Limits**
Frequency range	200 MHz - 3 GHz
Impedance	50 Ω nominal
Gain	6 dBi typical
Antenna Factor	13 to 36 dB/m typical
VSWR	< 2:1 (1,2:1 typ.)
Construction	Aluminium
Max input power	100 W up to 1 GHz 50 W up to 3 GHz
Connector	N-female
Dimensions (L x H x W)	70 x 10 x 86 cm
Weight	1,1 kg
Colour	RAL 7035

3 m Typical Antenna Factor

Calibration Distance & Polarisation	3,0 m	Horizontal
Receiving Antenna Height	1-4 m	
Transmitting Antenna Height	1 m	

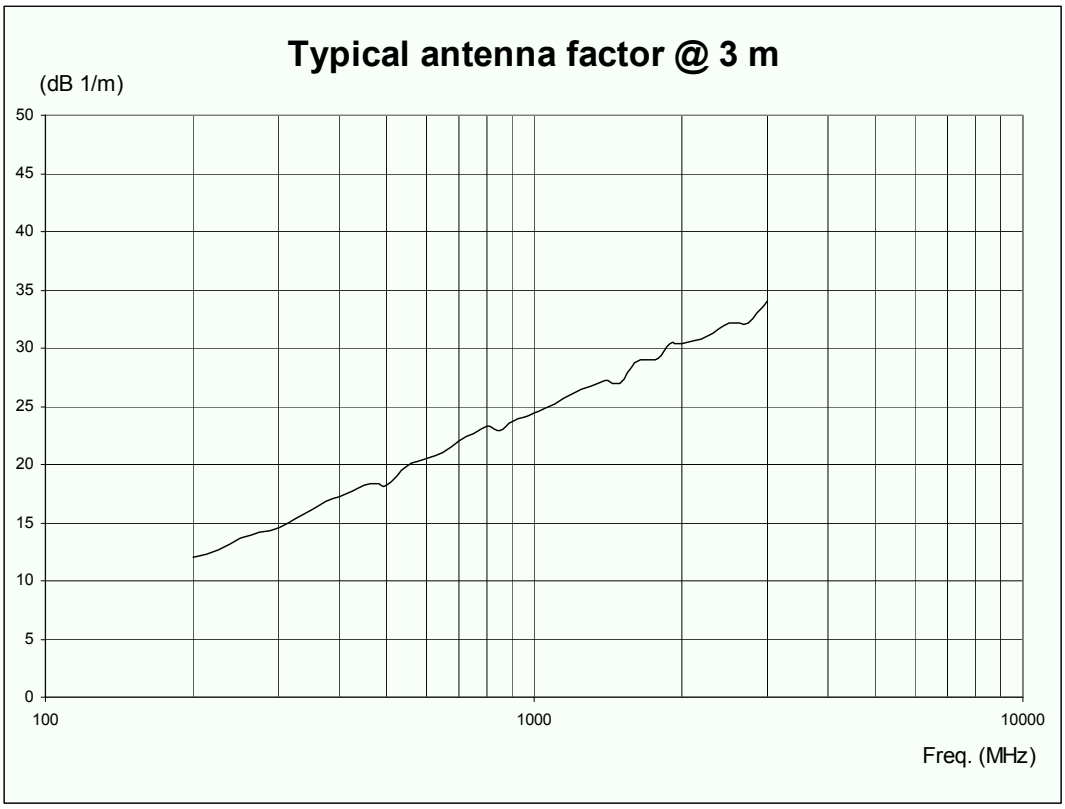


Fig. 1-18 Typical LP-02 antenna factor @ 3 m

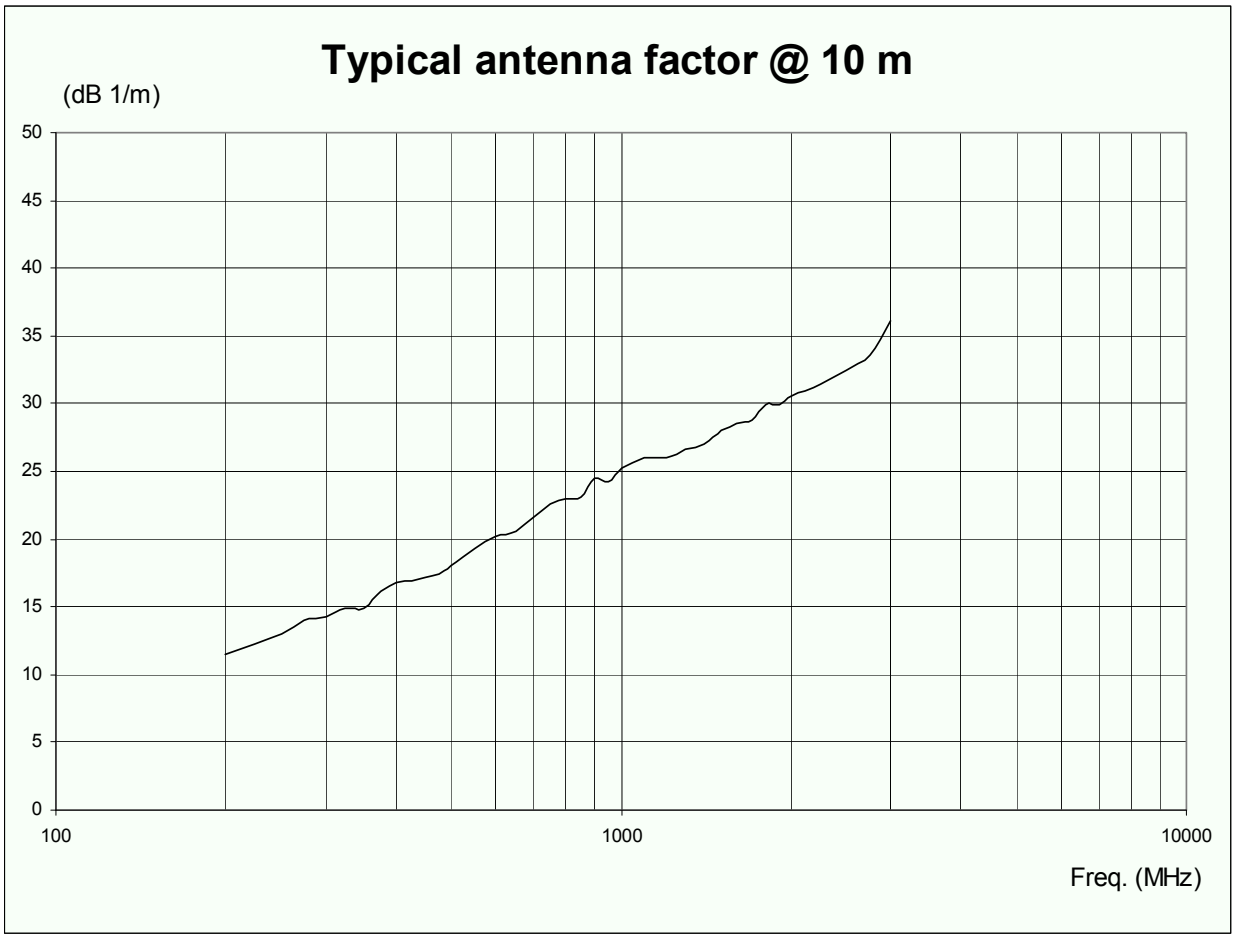


Fig. 1-19 Typical LP-02 antenna factor @ 10 m

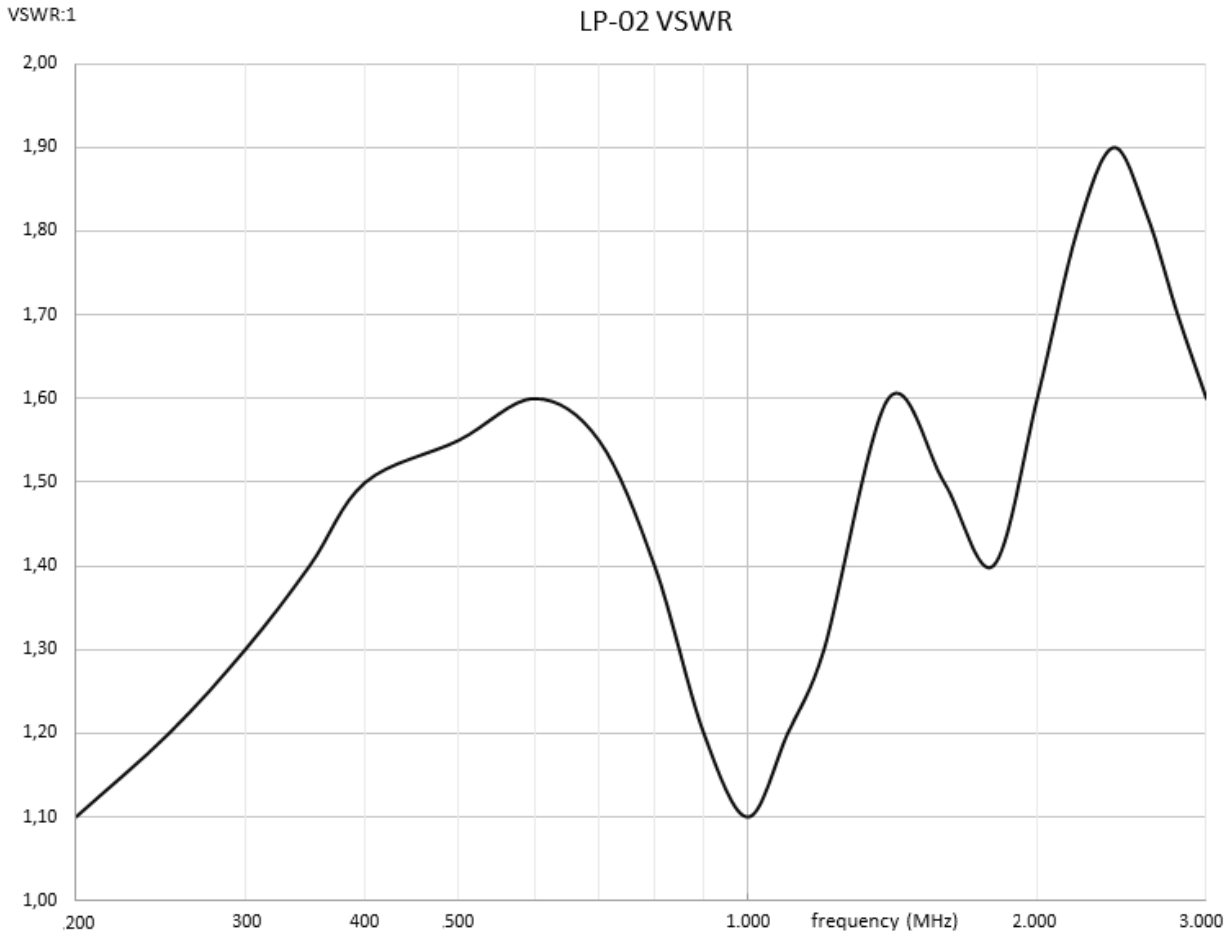


Fig. 1-20 Typical LP-02 VSWR

1.15 LP-03 Main Specifications

The following Table list the LP-03 Antenna performance specifications.

TABLE 1-4 PMM LP-03 Log Periodic Dipole Array Specifications

Electrical characteristics	Performance Limits
Frequency range	800 MHz to 6 GHz
Impedance	50 Ω nominal
Gain	6 dBi typical
Antenna Factor	23 to 40 dB/m typical
VSWR	< 1,7:1 typical
Construction	Aluminium
Max input power	75 W
Connector	Type N-male (LP-03) Type N-female (LP-03/F)
Dimensions (L x H x W)	32,5 x 8,1 x 18,7 cm
Weight	0,25 kg
Colour	RAL 7035

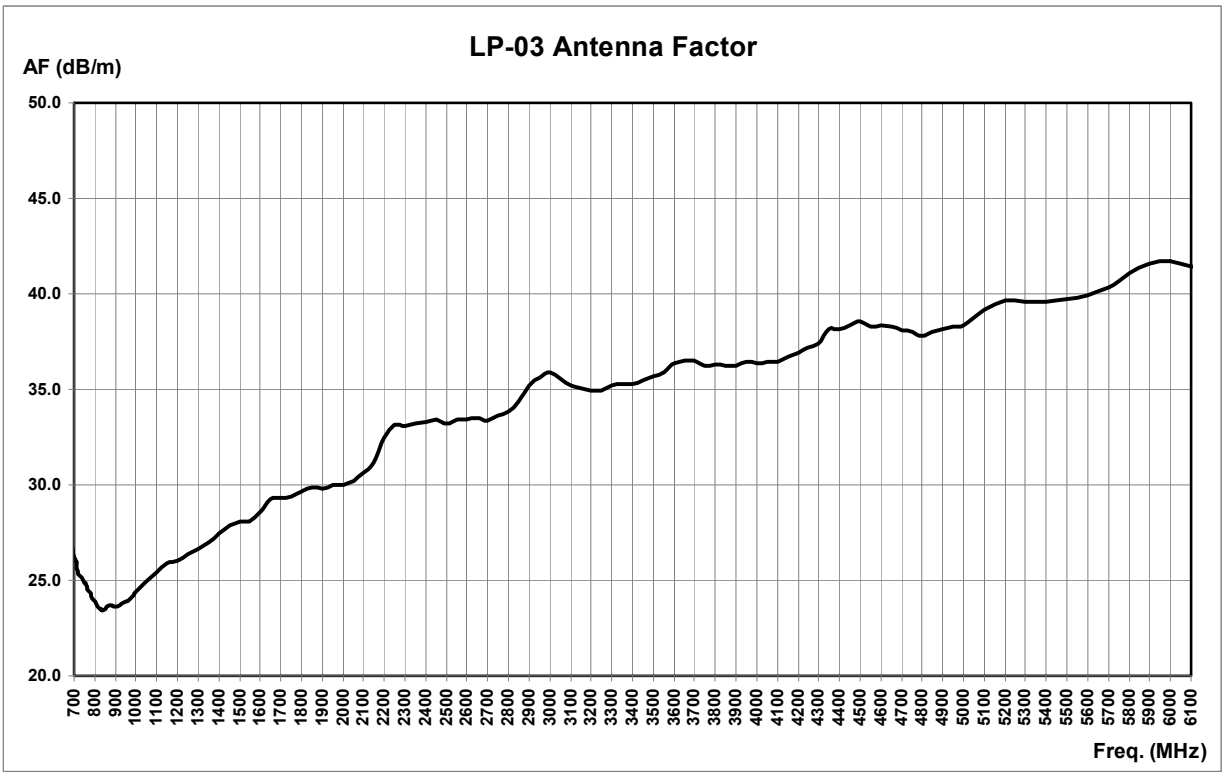


Fig. 1-21 Typical LP-03 antenna factor

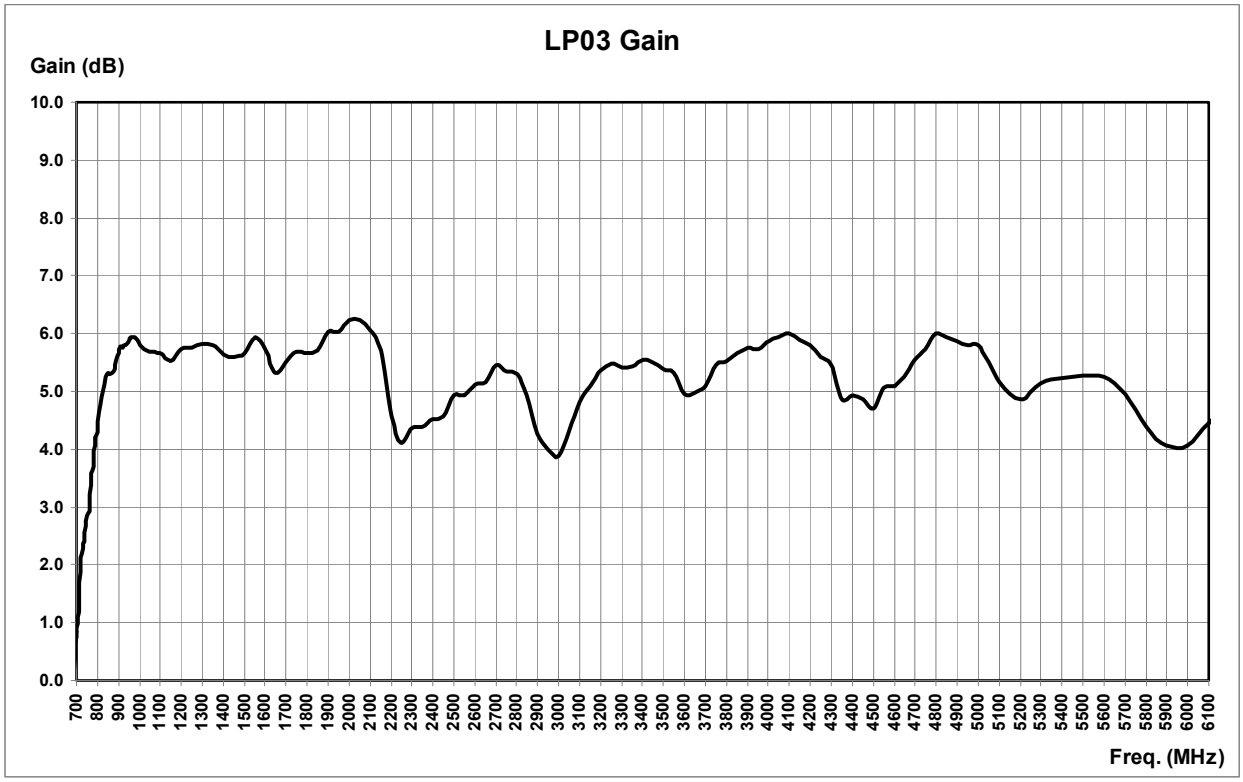


Fig. 1-22 Typical LP-03 Gain

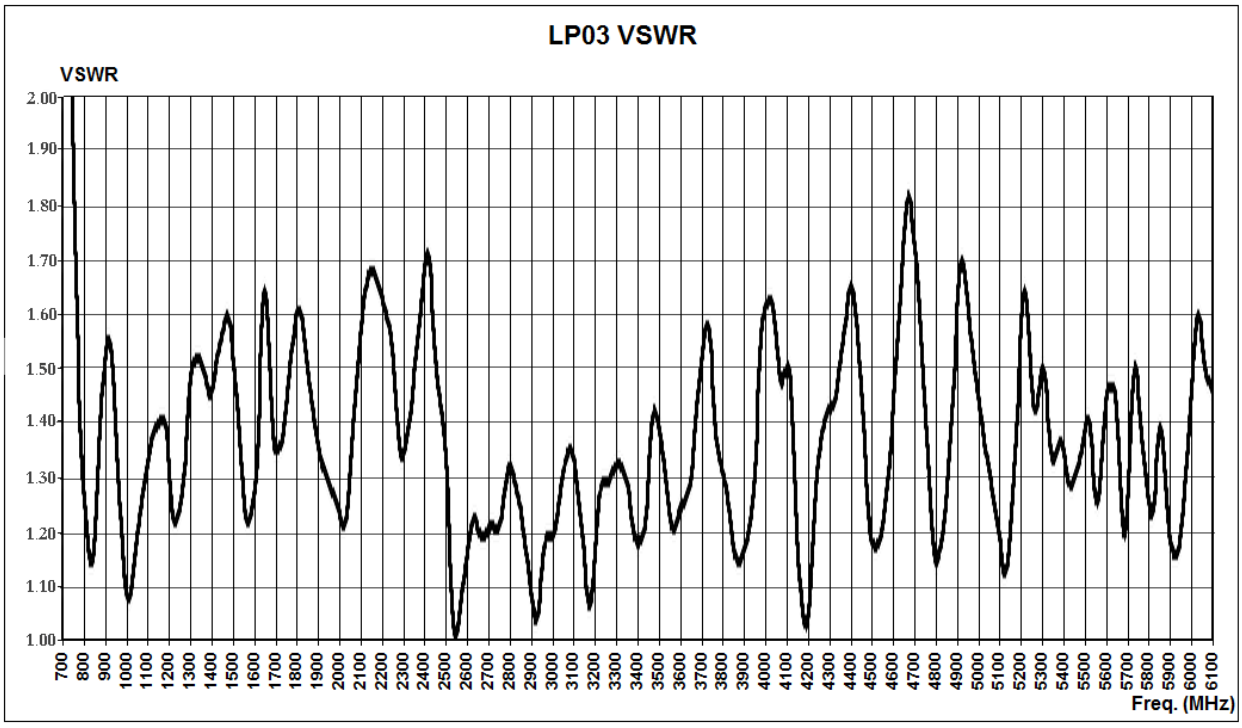


Fig. 1-23 Typical LP-03 VSWR

1.16 LP-04 Main Specifications

The following Table list the LP-04 Antenna performance specifications.

TABLE 1-5 PMM LP-04 Log Periodic Dipole Array Specifications

Electrical characteristics	Performance Limits
Frequency range	200 MHz - 6 GHz
Impedance	50 Ω nominal
Gain	6 dBi typical
Antenna Factor	12 to 40 dB/m typical
VSWR	< 1,8:1 typical
Construction	Aluminium
Max input power	100 W
Connector	Type N-female
Dimensions (L x H x W)	78 x 10 x 75 cm
Weight	1,1 kg
Colour	RAL 7035

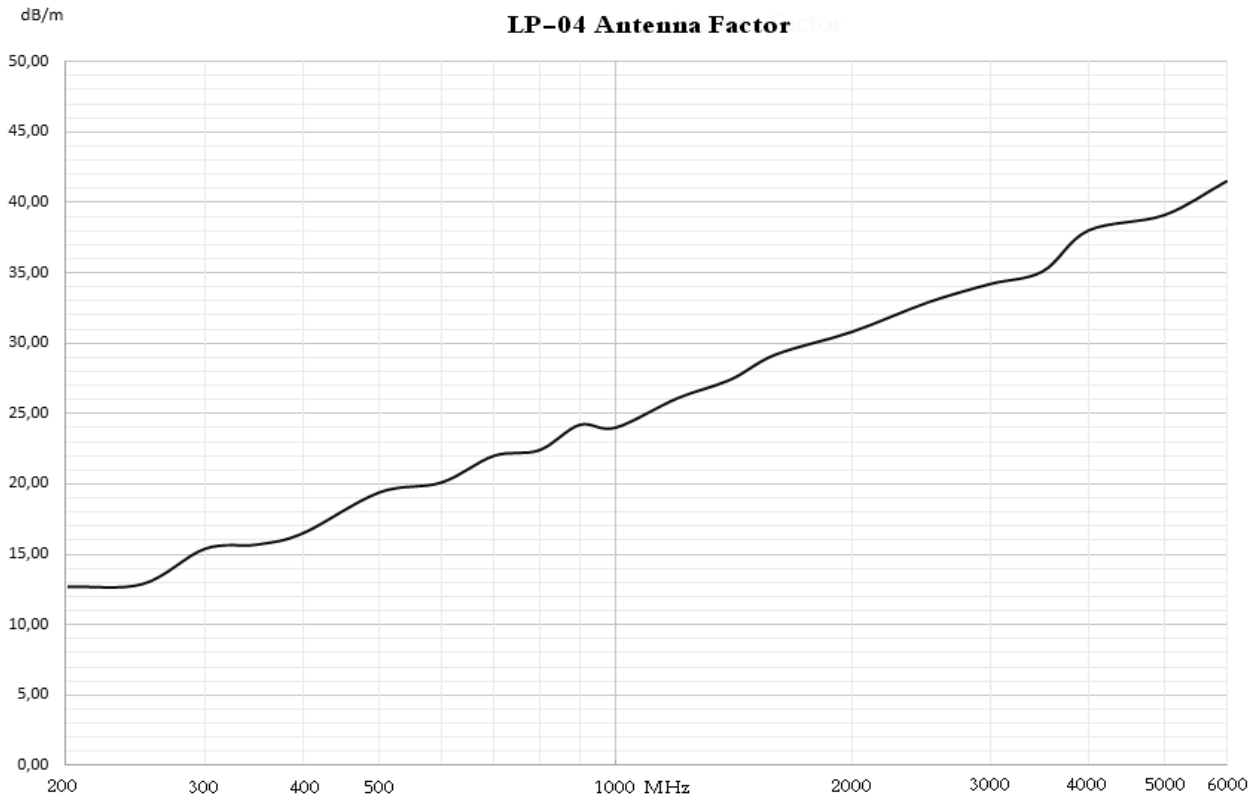


Fig. 1-24 Typical LP-04 Antenna Factor

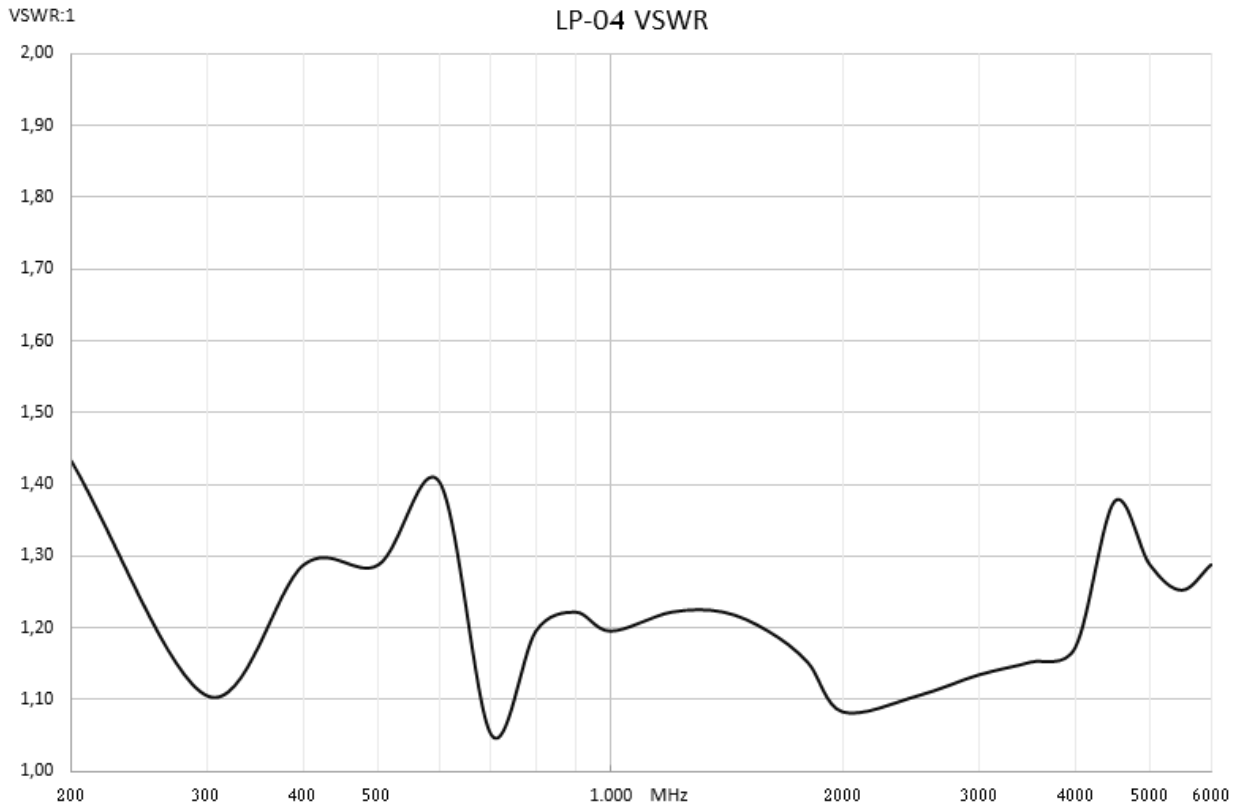


Fig. 1-25 Typical LP-04 VSWR

1.17 DR-01 Main Specifications

The following Table list the DR-01 Antenna performance specifications.

TABLE 1-6 PMM DR-01 Double ridged Antenna Specifications	
Electrical characteristics	**Performance Limits**
Frequency range	6 to 18 GHz
Impedance	50 Ω nominal
Gain	9 to 16 dBi
Antenna Factor	36 to 41 dB/m
VSWR	< 2:1 (1,8:1 typical)
Beam width **3dB @ 12 GHz**	E-plane 33° H-plane 38°
Max input power	150 W
Connector	N-male
Dimensions (W x H x D)	55 x 44 x 137 mm
Weight	0,25 kg
Colour	RAL 7035

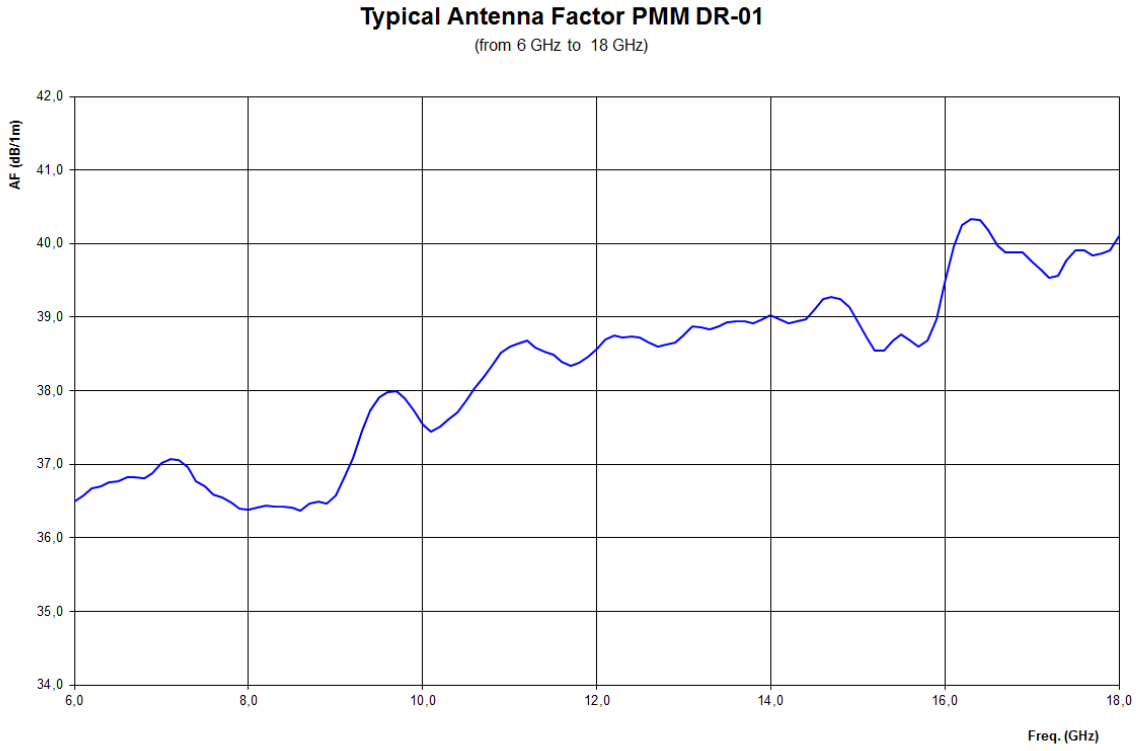


Fig. 1-26 Typical DR-01 antenna factor

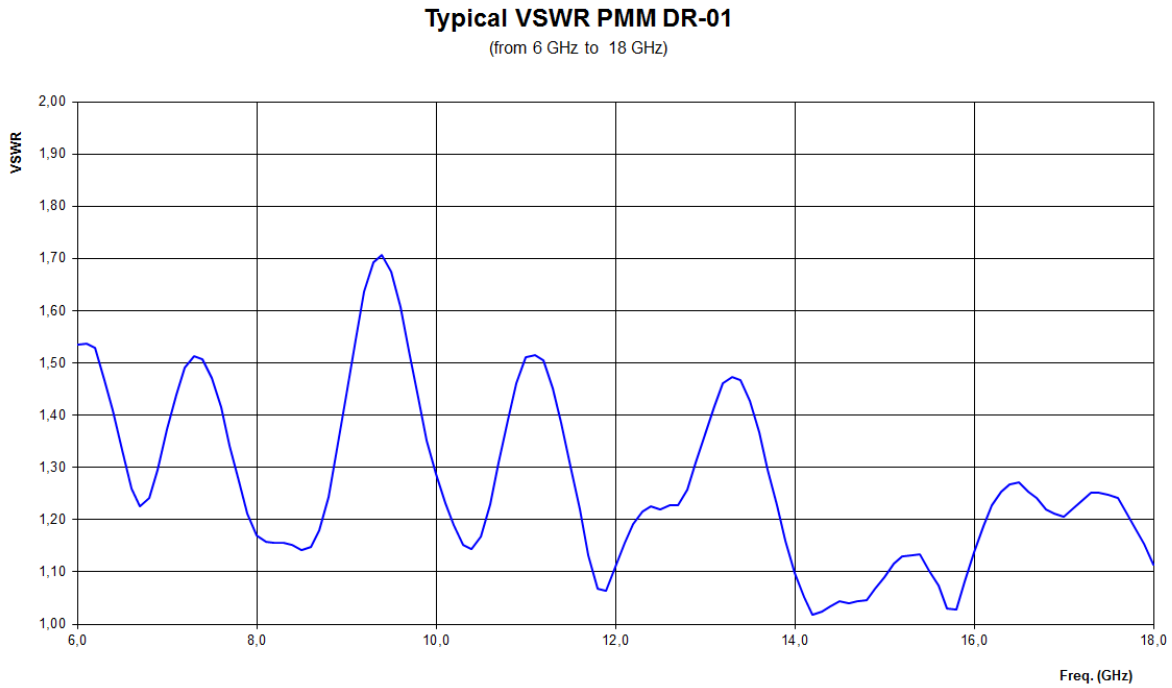


Fig. 1-27 Typical DR-01 VSWR

1.18 TR-01 Main Specifications

The following Table list the TR-01 Antenna performance specifications.

TABLE 1-7 PMM TR-01 Wooden tripod with extension and adjustable joint Specifications

Characteristics	Performance Limits
• legs	3 legs x 3 sections extensible
• transportation width:	76 x 12 x 12 cm
• minimum height:	60 cm
• maximum height:	180 cm
• weight	2,8 kg
• load capacity:	10 kg

Fig. 1-28 Mounting head with center column

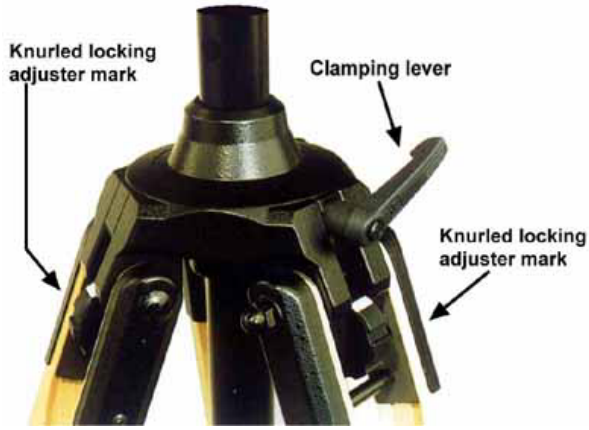


Fig. 1-29 Adjustable joint

It is possible to adjust legs spread at tree different angles, the adjustment is made rotating the knurled locking adjuster by selecting the corresponding marker on the knurled locking adjuster:

- 20° spread : knurled locking adjuster white mark;
- 45° spread : knurled locking adjuster red mark;
- variable spread : knurled locking adjuster unmarked.

The central mast can be adjusted and fixed with the clamping lever.

- Height: 7 cm
- Weight: 180 g
- Load capacity: 10 kg

The adjustable joint allows to easily mount the antennas on the center column of the tripod and to change the antenna polarization from horizontal to vertical or vice versa.

1.19 RF Cable 5 m Main Specifications

The following Table list the TR-01 Antenna performance specifications.

TABLE 1-8 PMM RF Cable/5 - 5 m long RF cable Specifications

Electrical characteristics	Performance Limits
Connectors	N-Male
Max Power input	300 W up to 200 MHz 100 W up to 6 GHz
Length	5 m
Weight	850 g

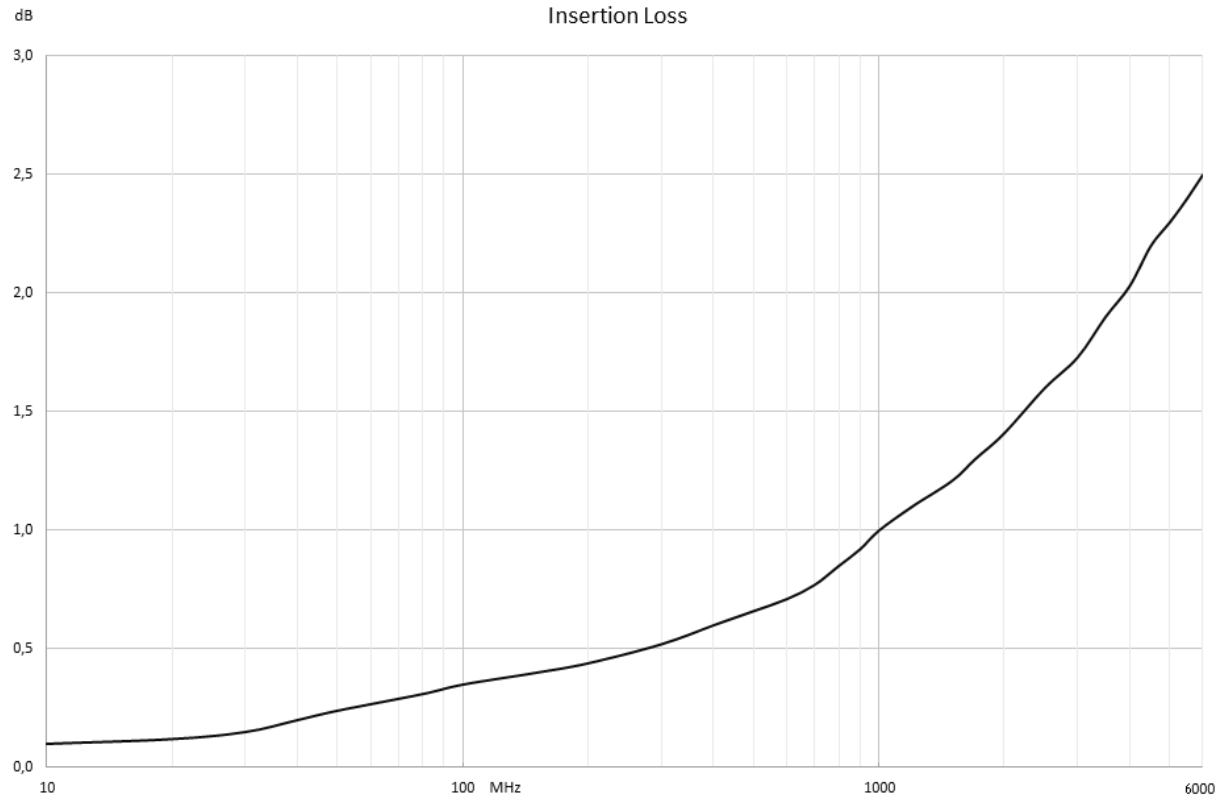


Fig. 1-30 Typical RF Cable/5 insertion loss

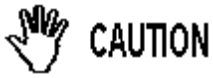
2 – Mounting Instructions

2.1 Introduction

This section provides the information needed to install and use your PMM AS-02, AS-03, AS-04, AS-05, AS-06, AS-07 and AS-08 Antenna set.
Included are information pertinent to initial inspection, interconnection, environment, mechanical mounting, cleaning, storage and shipment.

2.2 Initial inspection

Inspect the shipping container for damage.



If the shipping container or cushion material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the antennas have been checked mechanically and electrically.
Verify the accessories availability in the shipping referring to the accessories check list enclosed.
Notify any damage to the carrier personnel as well as the NARDA Representative.

2.3 Environment

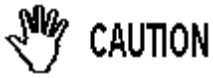
The PMM AS-02/AS-03/AS-04/AS-05/AS-06/AS-07/AS-08 Antennas are constructed of lightweight corrosion-resistant aluminum or stainless steel, providing years of indoor and outdoor service.

2.4 Return for service

If the Antenna Set should be returned to NARDA for service, please complete the service questionnaire enclosed with the Users Manual and attach it to the instrument.
To minimize the repair time, be as specific as possible when describing the failure.
If possible, reuse of the original packaging to ship the equipment is preferable.
In case other package should be used, ensure to wrap the instrument in heavy paper or plastic.
Use a strong shipping container and use enough shock absorbing material around all sides of the equipment to provide a firm cushion and prevent movement in the container.
Seal the shipping container securely.
Mark the shipping container FRAGILE to encourage careful handling.

2.5 Equipment cleaning

Use a clean, dry, non abrasive cloth for equipment cleaning.



To clean the wooden tripod do not use any solvent, thinner, turpentine, acid, acetone or similar matter to avoid damage to it.

2.6 PMM BC-01 Biconical Dipole Array

Screw the radiating elements on the conical fastening of the BICONICAL Antenna, the radiating elements are all of equal length.

Unscrew the knob without to loose it completely.

Insert the tripod joint on the adjustable joint.

Change the antenna polarization from horizontal to vertical or vice versa and tighten the knob completely.

Fig. 2-1 PMM BC-01 with TR-01

2.7 PMM BL-01 Bi-conical Log Periodic Dipole Array

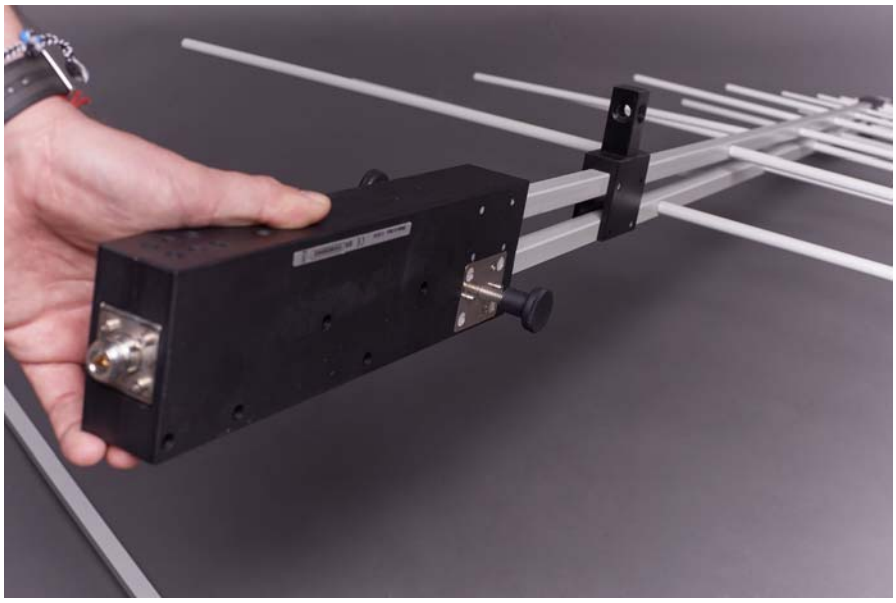
Unpacking the BL-01 antenna from the CC-02 Soft Carrying case

Assembly the BL-01 antenna starting from two shorter cylindrical dipole (299mm length) to the boom

Assembly the 366mm length cylindrical dipole to the boom

Screw the two longer cylindrical dipole (449.5mm length) to the boom

Assembly the two triangle dipole to the boom unscrewing the knob from the threaded insert.



Insert the triangle dipole on the threaded insert; position and rotate the dipole in order to the two metallic plugs and fix it into the boom by the knob.

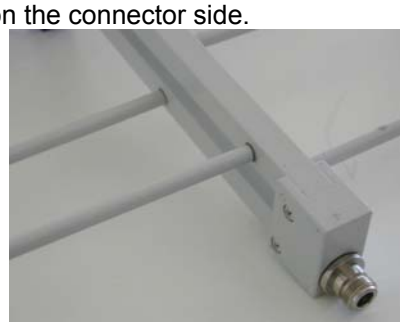
Fig. 2-2 PMM BL-01 with TR-01

NOTE

For further information on configuration and operation with PMM 9060, please refer to the operation manual supplied with it.

2.8 PMM LP-02 Log Periodic Dipole Array

Screw the radiating elements on the main body of the LOG PERIODIC Antenna, choosing the radiating elements couple of equal length.
The antenna is composed by a total of 44 elements, only the longer 14 elements are removable.
Start screwing the shortest couple on the front side of the antenna, going on installing growing length elements on the connector side.



Unscrew the knob without to loose it completely.

Insert the tripod joint on the adjustable joint.

Change the antenna polarization from horizontal to vertical or vice versa and tighten the knob completely.

Fig. 2-3 PMM LP-02 with TR01

NOTE

For further information on configuration and operation with PMM 9060, please refer to the operation manual supplied with it.

2.9 PMM LP-03 Log Periodic Dipole Array

The LP03 combines small size with high manufacturing and calibration standards, making it perfectly suitable for portable applications and in anechoic chambers.
The booms and the elements are made of aluminium Alodyne coated and painted; the holding pipe is made of stainless steel; the antenna is composed by a total of 28 elements.

Fix the adjustable joint to the TR01.

Remove the screws from the tripod joint.

Insert the LP-03 on the tripod joint and tighten the two screws to fix the LP-03 to the tripod join.

Unscrew the knob without to loose it completely.

Insert the tripod joint on the adjustable joint.

Change the antenna polarization from horizontal to vertical or vice versa and tighten the knob completely.

Fig. 2-4 PMM LP-03 with TR01

NOTE

For further information on configuration and operation with PMM 9060, please refer to the operation manual supplied with it.

2.10 PMM LP-04 Log Periodic Dipole Array

Screw the radiating elements on the main body of the LOG PERIODIC Antenna, choosing the radiating elements couple of equal length.
The antenna is composed by a total of 2 x 18 elements, only the longer 2 x 3 elements are removable.
Start screwing the longest couple on the connector side of the antenna, going on installing the shorter length elements.

Unscrew the knob without losing it completely.

Insert the tripod joint on the adjustable joint.

Set the antenna polarization desired and tighten the knob completely.

Fig. 2-5 PMM LP-04 with TR01

NOTE

For further information on configuration and operation with PMM 9060, please refer to the operation manual supplied with it.

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3 - Radiated Emission and Immunity testing

3.1 Radiated Emission testing

The electromagnetic emissions emanating from the equipment under test (EUT) are measured during a radiated emission test
According to the international Standards, the purpose of this test is to verify that the EUT's emissions are below specified limits during operation.
The receiving antenna middle point can be located either at 3 or 10 meter from the EUT and must scan from 1 to 4 meters in height. This scanning helps the operator to locate the EUT's worst case electromagnetic emission level.
The typical emissions test set-up is composed of:

- receive antenna;
- interconnecting cable;
- preamplifier;
- preamplifier cable;
- meter receiver.

3.1.1 The Antenna Factor

The performance of the antenna relating to the value of the incident's field to the voltage output of the antenna is the Antenna Factor; this value is provided in dB/m by the manufacturer.

3.1.2 The interconnecting cable

The cable connects the antenna to the preamplifier or meter receiver input. There is a loss in the cable resulting in a reduction of the measured signal, to increase the measure accuracy, these losses need to be added to the measured value.

3.1.3 The preamplifier

If the Receiver or the Spectrum Analyzer have a high input noise figure, may be necessary to compensate it with a preamplifier installed between the antenna and the meter receiver. The preamplifier makes the measured signal larger, thus the gain of the preamplifier must be subtracted from the measured value to obtain the correct final result.

3.1.4 The preamplifier interconnecting cable

An additional cable to connect the preamplifier to the meter receiver input may be necessary if the preamplifier is installed.
There is a loss in the cable resulting in a reduction of the measured signal, to increase the measure accuracy, these losses need to be added to the measured value.

3.1.5 The meter receiver

The meter receiver is typically either a radio receiver or a spectrum analyzer. Either a 120 kHz bandwidth and an output indication calibrated in dBμV are required.

The calculation of the measured E-field signal level is given by:

$$E\left(dB\frac{\mu V}{m}\right) = S(dB\mu V) + C_1(dB) - PA(dB) + C_2(dB) + AF\left(dB\frac{1}{m}\right)$$

where:

$E\left(dB\frac{\mu V}{m}\right)$ =Corresponding Electric field

$S(dB\mu V)$ = Measured signal strength

$C_1(dB)$ = Preamplifier interconnecting cable

$PA(dB)$ = Preamplifier gain

$C_2(dB)$ = Interconnecting cable loss

$AF\left(dB\frac{1}{m}\right)$ = Antenna factor

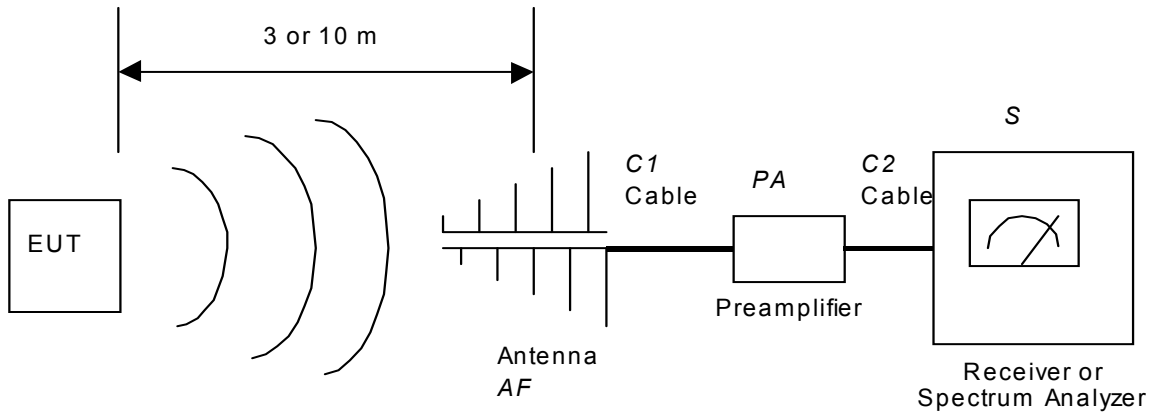

Fig. 3-1 Radiated emission test setup

3.2 Radiated Immunity testing

During a radiated immunity test a electromagnetic signal, typically 3 or 10 V/m is directed at the equipment under test (EUT), analyzing the EUT reaction.
According to the international Standards, the purpose of this test is to verify that the EUT does not show any degraded performance or failure when the signal is applied.
The test should be performed either in horizontal and in vertical polarization.
The transmitting antenna and the EUT are installed into a shielded room to avoid environmental RF pollution.
A isotropic field probe must be located near the EUT to verify the electromagnetic field strength.
The typical radiated test set-up is composed of:

- signal generator;
- power amplifier;
- transmit antenna;
- field strength meter.

3.2.1 The signal generator

The signal generator provides the test signal. It should have adequate output resolution to allow the setting of the field strength to within 1% of the desired level and must provide a sine wave 80% AM modulation at 1 kHz.

3.2.2 The power amplifier

The power amplifier is used to increase the test signal strength applied to the antenna to a level able to produce the desired E-field.
Note that the EMC amplifiers are specified with a minimum gain, they can show several dB of ripple in the pass band.
The power amplifier must be operated in linear mode to assure repeatability, in fact when a 80% AM modulation is added an additional 5.1 dB $\left\{ 20x\log_{10}(1.8) \right\}$ of linear gain from the power amplifier is required.

3.2.3 The transmit antenna

The performance of the antenna relating to the value of the emitted E-Field is the Antenna Factor.
This is usually provided by the manufacturer in dB with units of inverse meters.
Typically a combination of two antennas is used to cover the wide frequency range required by the Standard.

3.2.4 The field strength meter

The field strength meter probe is used to directly measure the field level applied to the EUT.
The typical distance between the tip of the antenna and the probe is 3 m.

The calculation of the output level is given by:

$$E\left(dB\frac{\mu V}{m}\right) = G(dB\mu V) - C_1(dB) + A(dB) - C_2(dB) + TAF\big|_{3m}\left(dB\frac{1}{m}\right)$$

where:

$E\left(dB\frac{\mu V}{m}\right)$ =Generated Electric field

$G(dB\mu V)$ = Signal Generator Level

$C_1(dB)$ = Interconnecting cable loss

$A(dB)$ = Power amplifier gain

$C_2(dB)$ = Interconnecting cable loss

$TAF\big|_{3m}\left(dB\frac{1}{m}\right)$ = Transmit Antenna factor at 3 m =

$$20\log_{10}(f_{MHz}) - AF\big|_{3m}\left(dB\frac{1}{m}\right) - 41{,}5$$

The variables and terms in the above expression are used for calibration test setup only. They demonstrate how the instrumentation and facility factors contribute to meet the typically required E-field uniformity value of -0.0 dB to + 6,0 dB.

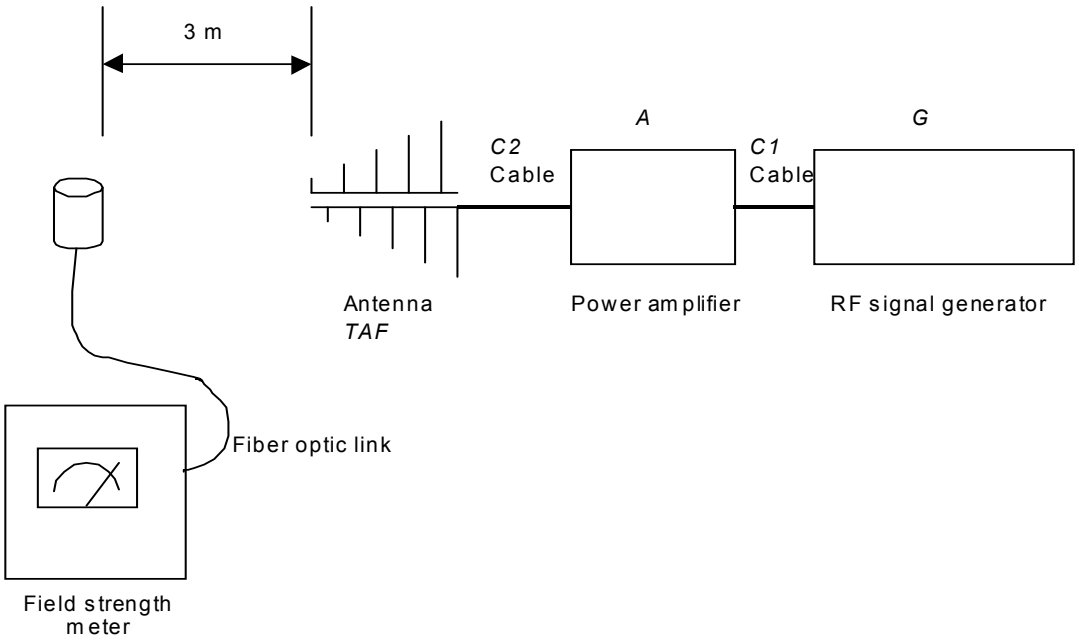

Fig. 3-2 Radiated immunity test setup

3.3 Environmental testing

The PMM BC-01, BL-01, LP02, LP03, LP-04 and DR-01 antenna can also be used on environmental testing for narrow band electromagnetic field exposure testing.
The wide frequency range and the low VSWR both allow accurate tests with linear polarization.
For this kind of test the antenna must be used according to the following test setup, the receiver must have a good selectivity performance and must be tunable on the frequency or frequencies under investigation, a spectrum analyzer can be used instead.
The RF attenuator is normally installed as closest as possible to the antenna to improve the VSWR performances and then the precision of the measurement.

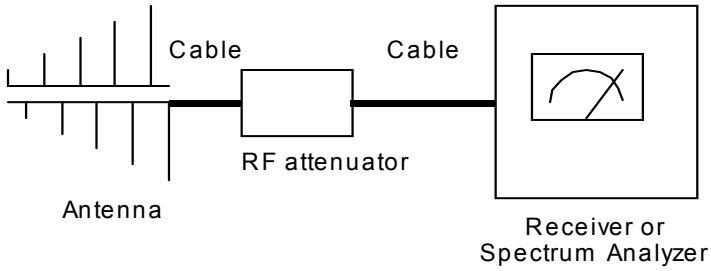

Fig. 3-3 Environmental test setup

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QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

Mod. 18-1

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Nevertheless, even this product will become obsolete. When that time comes, please remember that electronic equipment must be disposed of in accordance with local regulations. This product conforms to the WEEE Directive of the European Union
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☑ **Servizio richiesto**: ☑ *Service needed*:

☐ Solo taratura ☐ Riparazione ☐ Riparazione & Taratura ☐ Taratura SIT ☐ Altro:
☐ Calibration only ☐ Repair ☐ Repair & Calibration ☐ Certified Calibration ☐ Other:

Ditta:
Company:

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Address:

Persona da contattare: *Technical contact person:*
Telefono: *Phone n.*

Modello: *Equipment model:*
Numero di serie: *Serial n.*

☑ ***Accessori ritornati con l'apparecchiatura:*** ☐ **Nessuno** ☐ **Cavo(i)** ☐ **Cavo di alimentazione** **Altro:**
☑ *Accessories returned with unit:* ☐ None ☐ Cable(s) ☐ Power cable Other:

☑ ***Sintomi o problemi osservati:*** ☑ *Observed symptoms / problems*:

☑ ***Guasto*:** ☐ **Fisso** ☐ **Intermittente** ***Sensibile a*:** ☐ **Freddo** ☐ **Caldo** ☐ **Vibrazioni** ☐ **Altro**
☑ *Failure*: ☐ Continuous ☐ Intermittent *Sensitive to*: ☐ Cold ☐ Heat ☐ Vibration ☐ Other

Descrizione del guasto/condizioni di funzionamento:
Failure symptoms/special control settings description:

Se l'unità è parte di un sistema descriverne la configurazione:
If unit is part of system please list other interconnected equipment and system set up:

Suggerimenti / Commenti / Note:
Suggestions / Comments / Note: