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Wide band HF antenna 1KW PEP

User Manual

User manual of the wide band HF antenna 1KW PEP (roof and naval mount)

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Document

Quality Control

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Revision History

Rev.	Author	Date	Description
100	Silvano Magini	15/03/2013	First issue
101	Silvano Magini	17/01/2014	Title change

Typographical Conventions

All references to filenames and commands are case sensitive and should be typed exactly as displayed.

Command line samples are shown using the *$>* screen prompt.

In the text, different elements are highlighted using different fonts and/or styles, as described in the following table:

Description	**Example**
The **bold** words in the text refer to new terms that appear for the first time in the document.	**libRDASCSI**
The `Courier` font is used for text files or code lines.	`#include <file.h>`
Words in *Italics* denote: commands, file names, book titles, terms already defined in the document.	 *$> cd /* *sys/drivers/svme744/s744_drv.o* *LynxOS User's Manual* *libRDASCSI*
Italic words within acute brackets (<>) highlight user specified information.	*$> <CpuId>*
Optional elements are within square brackets.	*[<Time>]*
The '|' symbol is used to indicate a choice among two or more items.	*$> slave 1 | 2 | 3*

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1 Introduction

1.1 Scope

This manual describes all the features and technical specifications for the Wide band HF antenna 1KW PEP, part number EASP-WHF05-ANT, furthermore it contains detailed information necessary for installation and operation both for roof and naval mounting.

Such manual is intended both to radio operators as well as service and maintenance technicians putting into service the antenna connected with other radiocomms units (i.e.: HF SSB transceivers).

1.2 Acronyms

All the acronyms used in this document are defined in Table 1.

ATU	Antenna Tuner Unit
COTS	Commercial Off The Shelf
LRU	Line Replaceable Unit
OS	Operating System
SWR	Standing Wave Ratio
TBC	To Be Confirmed
TBD	To Be Defined
VSWR	Voltage Standing Wave Ratio
WH05K	Wideband HF antenna 1KW PEP

Table 1 – Acronyms

2 Referenced Documents

All the documents referenced in this document are reported in Table 2. Documents revision, unless otherwise specified, refers to the last one applicable.

Ref.	Document No.	Rev.	Title	Publisher
[1]	MIL-STD-461	E	Requirements for the Control of Electromagnetic Interference Emissions and Susceptibility.	DoD
[2]	MIL-STD-810	F	Department of Defense Test Method Standard for Environmental Engineering considerations and Laboratory	DoD
[3]				

Table 2 – Referenced Documents

3 Product Overview

The EASP-WHF05-ANT is a relative high efficiency broadband vertical radiator intended for use with frequency agile transmission systems over the 2 - 30 MHz HF band (i.e.: HF/ALE systems).

It is produced in two different versions, respectively EASP-WHF05-ANT/R for the roof mounting solution and EASP-WHF05-ANT/N for the naval mounting solution.

3.1 Highlights

- Minimal maintenance requirements
- High Reliability
- Broadband radiator a decade frequency interval typical
- No tuning devices
- SWR 1:1.5 typical on entire bandwidth
- 50 ohm coax feed line (a MIL quality RG-213/U is suggested)
- RF power 1.0 kilowatt P.E.P., 500 watt average
- Rugged fiberglass element and steel mounting for harsh environment

3.2 Mechanical Features

- Length 10 meters
- Weight 20 Kg
- Sections 2
- Bottom diameter 57 mm
- Antenna structure epoxy fiberglass
- Finishing Polyurethane paint
- Colour grey RAL 7030
- Irradiation element material high Q Teflon line
- Ferrule material inox steel per AISI 316
- Working temperature -35 °C to +80 °C
- Max wind resistance 180 Km/h

3.3 Electrical Features

- Frequency 2 to 30 MHz
- Impedance 50 ohm
- Polarization Vertical
- Horizontal radiation pattern 360 °
- Vertical radiation pattern See diagram
- Connection to TX 50 Ohms coax cable (recommended RG-213/U)
- Ground Yes

3.4 Working Principle

The EASP-WHF05-ANT is a wideband HF whip antenna intended for use with ALE capable transceivers for HF communication. Although no external tuning is necessary for operation over the entire HF band, an ATU (Antenna Tuner Unit) can be used to improve SWR ratio.

By the way, working principle is based on unique method of coupling transmission line transformers with travelling wave monopole radiator. A detailed analysis of the impedance adapter network revealed that it actually consists of two separate transformers with inter-coupled windings. This technique is used in conjunction with a single feedback winding on one of the transformers.

The overall result is a complex design that forms a network, which improves the match at specific frequencies introducing, where necessary, additional series impedance.

3.5 Physical layout

The basement of the 10 meters self-supporting whip is mounted on a U–shaped, special grade stainless steel, sturdy plate, see Figure 11 and Figure 13. The impedance adaptor, along with toroidal transformers, is mounted in an aluminum enclosure with integral heat sink, see Figure 14.

3.6 Radiation Patterns

The typical vertical radiation pattern on several frequencies of the HF spectrum is provided below from Figure 1 to Figure 5. In this case the antenna is mounted on a building roof.

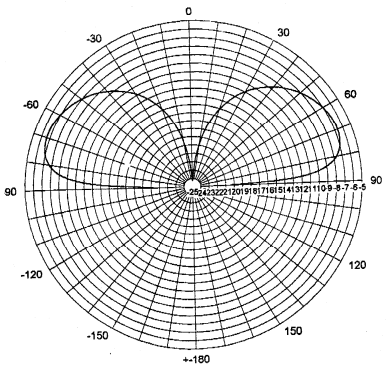

Figure 1 - Pattern radiation F=3 MHz

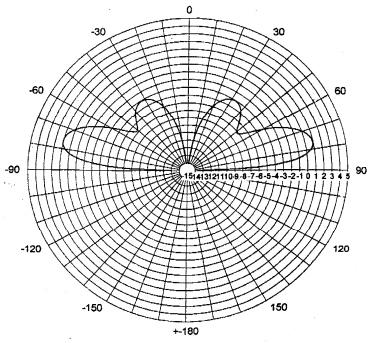

Figure 3 - Pattern radiation F=14 MHz

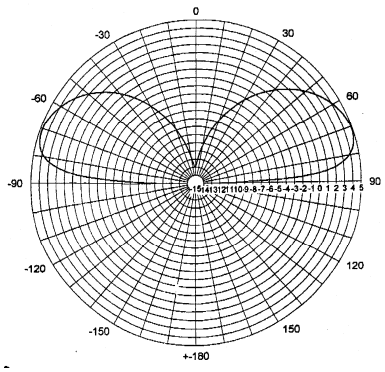

Figure 2 - Pattern radiation F=7 MHz

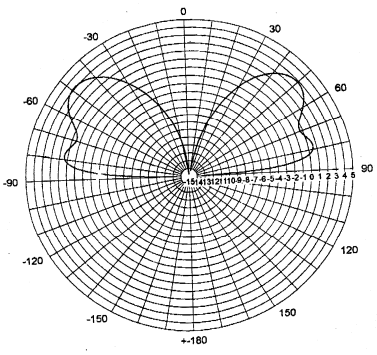

Figure 4 - Pattern radiation F=20 MHz

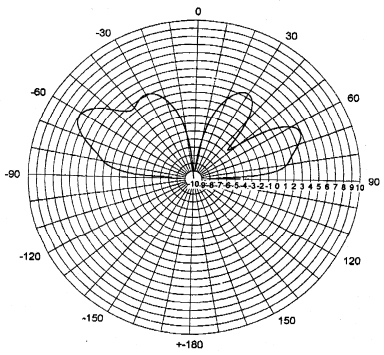

Figure 5 - Pattern radiation F=26 MHz

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4 Installation

As with all antennas, great care should be exercised in the choice of a site for the EASP-WHF05-ANT, pattern radiation as well as operating bandwidth and SWR can be greatly influenced by the antenna proximity to the earth and other conductors.

The ideal mounting for the EASP-WHF05-ANT is 6 to 10ft (2-3m) above ground, as far away as possible from reflecting metal objects. A flat roof on a concrete building is also good. This guarantees low radiation angles. Mounting too close to an obstacle (30ft or less) is less recommended.

This results in an inferior radiation pattern and, more importantly, a heavily increased noise level from house installations, power lines, etc..

Mounting on a mast or a tower much higher than 10ft over the average height of the surrounding obstacles results in high radiation pattern (up to 60 degrees).

As with all the antennas, the EASP-WHF05-ANT reacts to nearby objects such as other antennas, lightning protection systems, wires, etc..

This is particularly pronounced with items that are closer than one wavelength and longer than 1/2 wavelength at the working frequencies. Under these circumstances, the antenna can receive its own signal back, resulting in increased SWR.

Thanks to its design the antenna is electrically connected to ground, that's for safety and low static noise. The base mount needs to be well grounded.

The diagram below represents a real SWR performance relative to a typical installation on a building roof, the average return loss value is more than 15 dB or 1:1,4 in terms of VSWR.

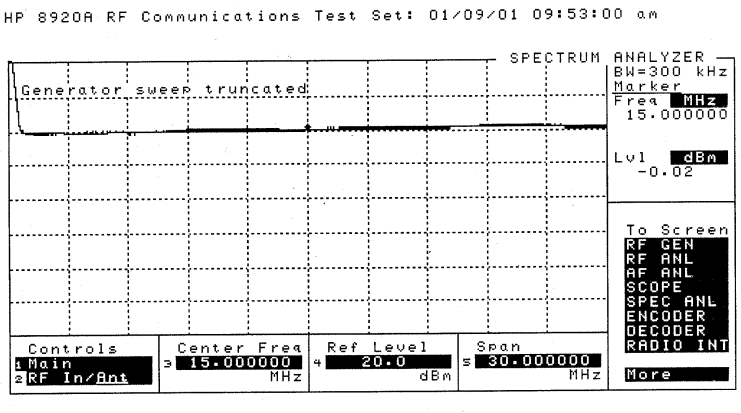

Figure 6 - Typical SWR performance (Reference level = 0dB)

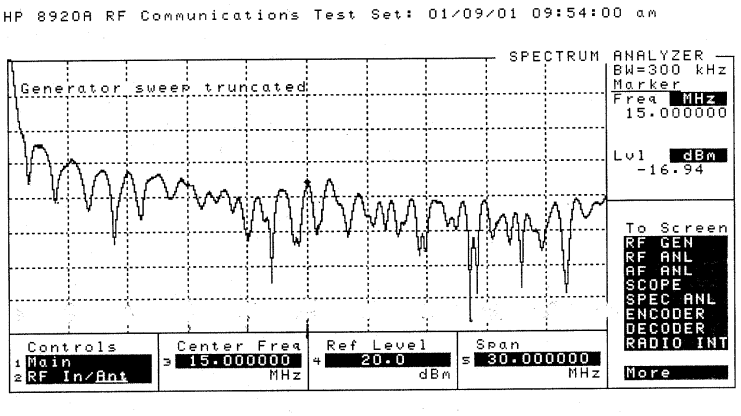

Figure 7 - Typical SWR Performance (Measure level = 20dB return loss average

4.1 Whip assembly

All models of antennas are delivered with the Whip divided in two sections. The first operation to be done at installation is to assemble the two sections by means of suitable threaded joints shown in the picture below.

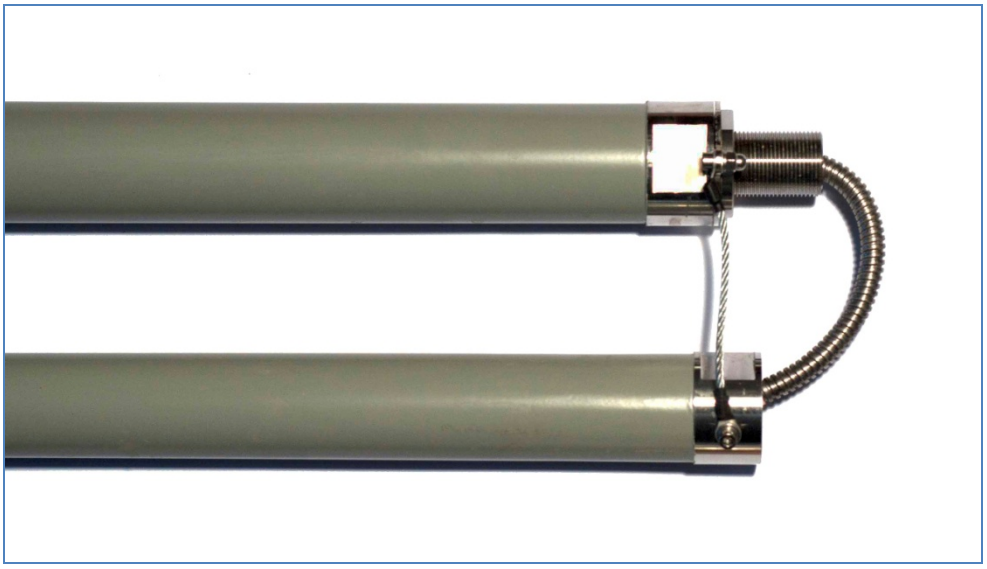

Figure 8 – Whip joints

You need to align the two parts of the whip and screw the joint, taking care to keep them aligned as shown in the next picture.

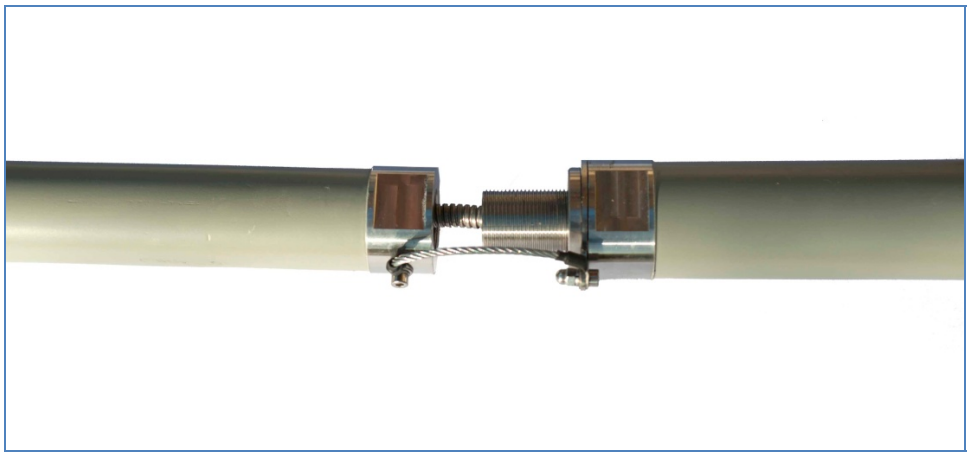

Figure 9 – Whip alignment

4.2 Roof Mount Model

The EASP-WHF05-ANT/R, is the roof mounting model, it is provided of suitable stainless steel brackets which allow the installation through an extension pole or mast.

This method is always the best if the supporting pole (diameter 58.5mm ±5%, not supplied) is high enough to guarantee an average height of the antenna of not less of 6 to 10ft (2-3m) above surroundings buildings.

Optionally the antenna can be mounted directly to the wall using an opportune adapter bracket (not supplied).The content of the delivered package is shown below.

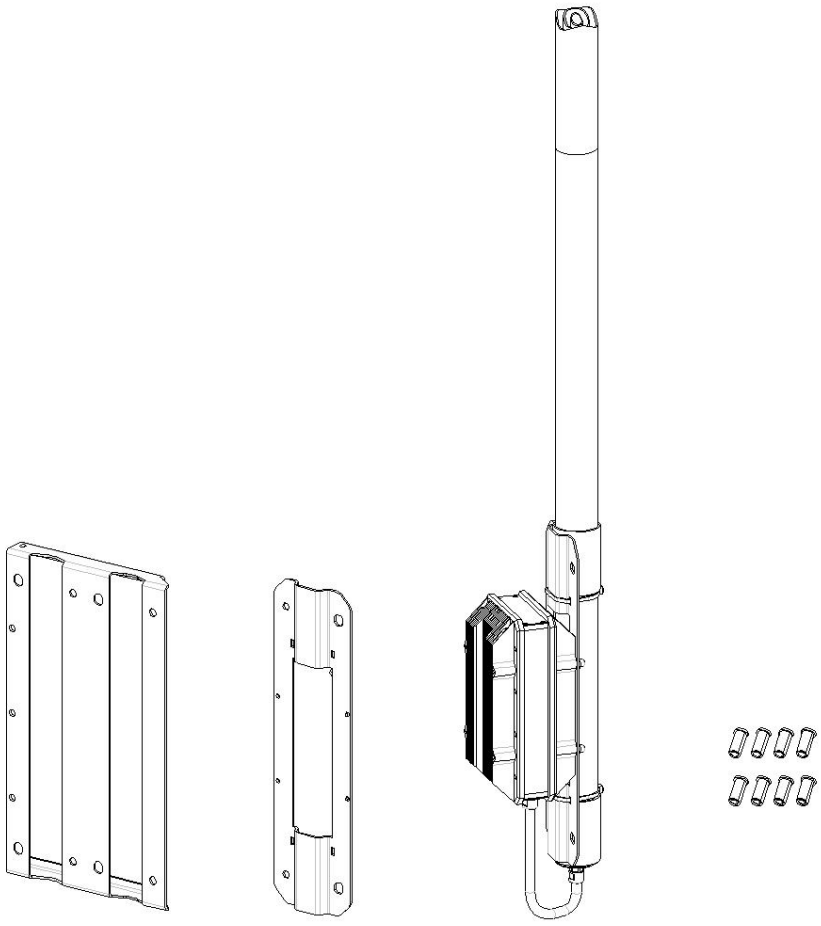

Figure 10 - EASP-WHF05-ANT/R parts included in the delivery package

The package is comprehensive of the following parts.

1. Horizontal Bracket type A
2. # 2 Whip Bracket type B (one is supplied already fitted to the Whip and Tuning Unit)
3. Two section (5 meters lenght) of Fiberglass Whip whit Tuning Adaptor box
4. # 8 Special Nuts
5. # 8 M10x30 screws
6. # 8 M10 lock washers

4.2.1 Mounting Using Extension Pole

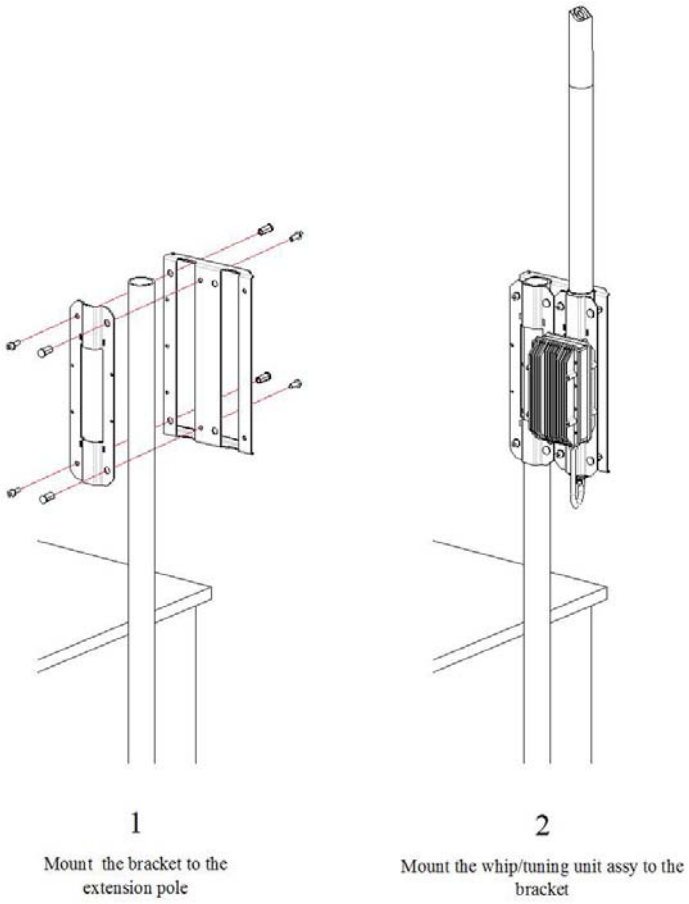

Figure 11 - Mounting using extension pole

You must follow, step-by-step, the procedure described below.

1. Check presence of extension pole (not supplied) installed as required in paragraph 4.1 as per Figure 8.
2. Install as shown in step 1 of Figure 12 the Horizontal Bracket on top of the pole by means of 4 special nuts and 4 screws.
3. Assure, as shown in step 2 of Figure 12, Whip/Tuning adaptor using the supplied hardware (as shown in the previous step).

4.2.2 Direct Wall Mounting

By means of a suitable Wall bracket (not supplied, orderable), you can install the antenna directly on the wall.

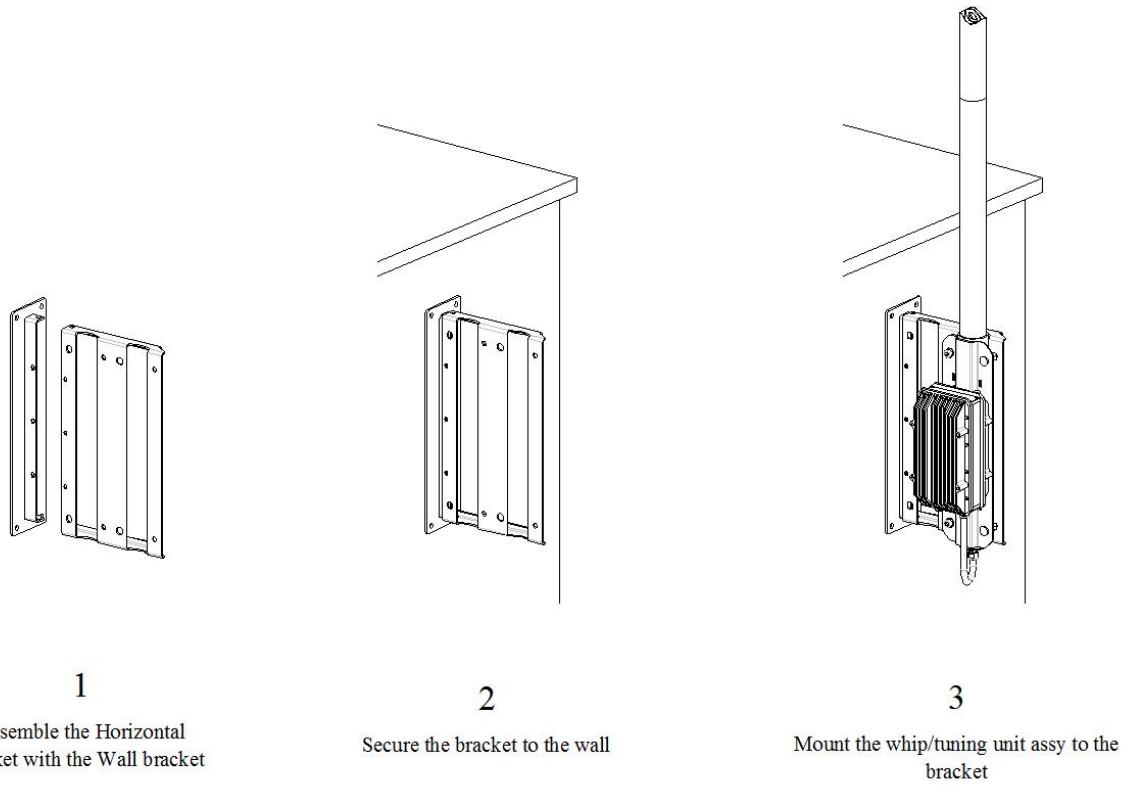

Figure 12 - Direct Wall Mounting

You must follow, step-by-step, the procedure described below.

1. As shown in the figure above, it is necessary to assemble the Horizontal bracket with the Wall bracket (not supplied).
2. Secure the Wall Bracket to the wall in the most appropriate way.
3. After step 2 you need to assure the whip/tuning adaptor assembly to the Wall Bracket by #4 special nuts.

4.3 Naval Mount Version

The EASP-WHF05-ANT/N, is the marine version of the wideband antenna and is fully assembled with a special mounting basement suitable for ship deck floor installation.

Because of its design, mechanical installation is very easy, therefore is sufficient to secure the antenna basement to the ship deck floor previously prepared.

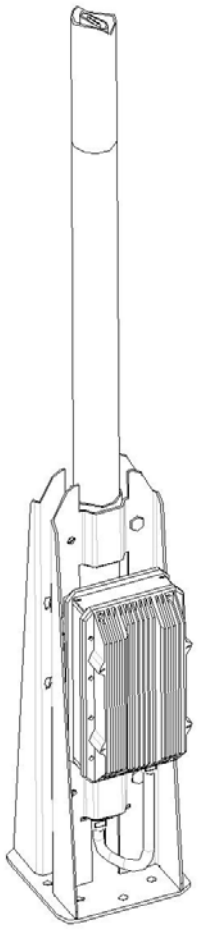

Figure 13 – Naval Mounting Model EASP-WHF05-ANT/N

4.4 Electrical connections

The antenna electrical connections are located at the bottom of the Tuning Unit as shown in Figure 14.

The feeding input is the N connector (female).

The ground connection is represented by the M6 screw with wing nut and lock washer.

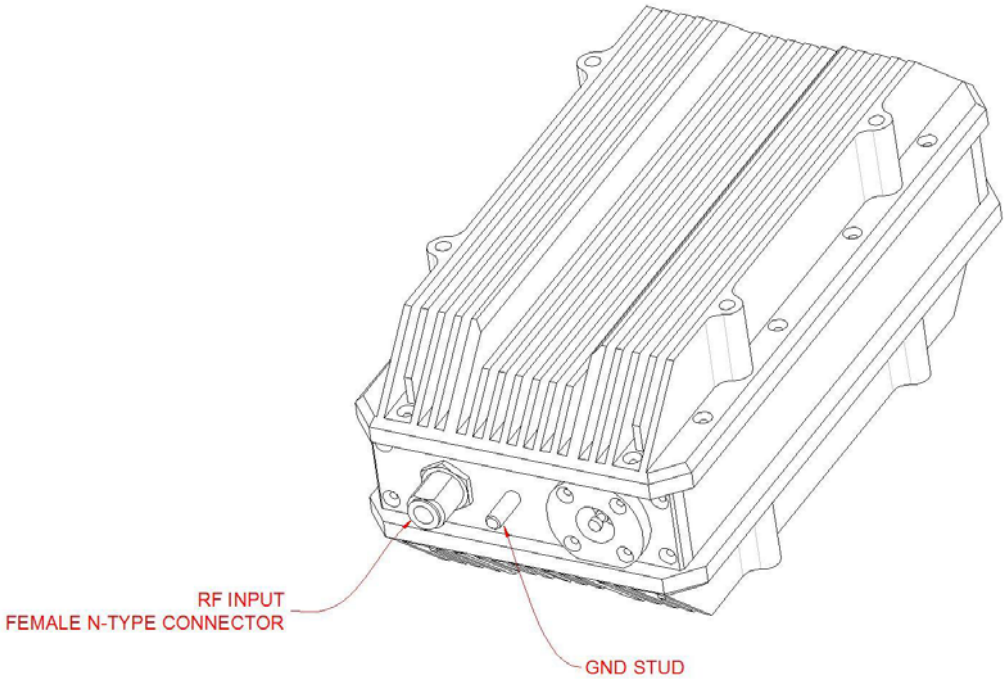

Figure 14 - Electrical Connections

5 Safety Information

Warning

At no time during assembly, installation adjustment or operation should any part of this product be allowed to come into contact with electric power line. Nor should this product be installed in such a way that any part of it may contact power line during normal operation or in the event of structural failure. Failure to exercise extreme care in this matter can result in damage property, personal injury or even death.

Caution

Some parts of the equipment become very hot and will cause burns if accidentally touched.

Warning during installation

Antenna installation is very easy, make sure that all parts and hardware are present before beginning the assembly and installation. Work in a clear area where dropped hardware may be easily recovered. Consult the parts pictorial page and parts list below.