HF Broadband Vertical Antenna
FAA 5522

Frequency Independent Radiator

The FAA 5522 is a high efficiency broadband vertical radiator intended for use with frequency agile transmission systems covering the 2 - 30 MHz HF band.

Highlights

- Minimal Maintenance requirements
- High Reliability
- Broadband
- No tuning devices, no radials required
- Typical SWR 1:1.5 on entire bandwidth
- 50 ohm coax feed line
- RF power 1 kilowatt average
- Rugged fiberglass element and steel mounting components for harsh environments

Mechanical Features

Length	10 meters
Weight	20 Kg
Sections	2
Bottom diameter	52 mm
Antenna structure	epoxy fiberglass
Finishing	Polyurethane paint
Color	gray RAL 7001
Irradiation element material	high Q Teflon coaxial line
Ferrule material	inox steel per AISI 304
Working temperature	-35 °C to +80 °C
Max wind resistance	180 Km/h

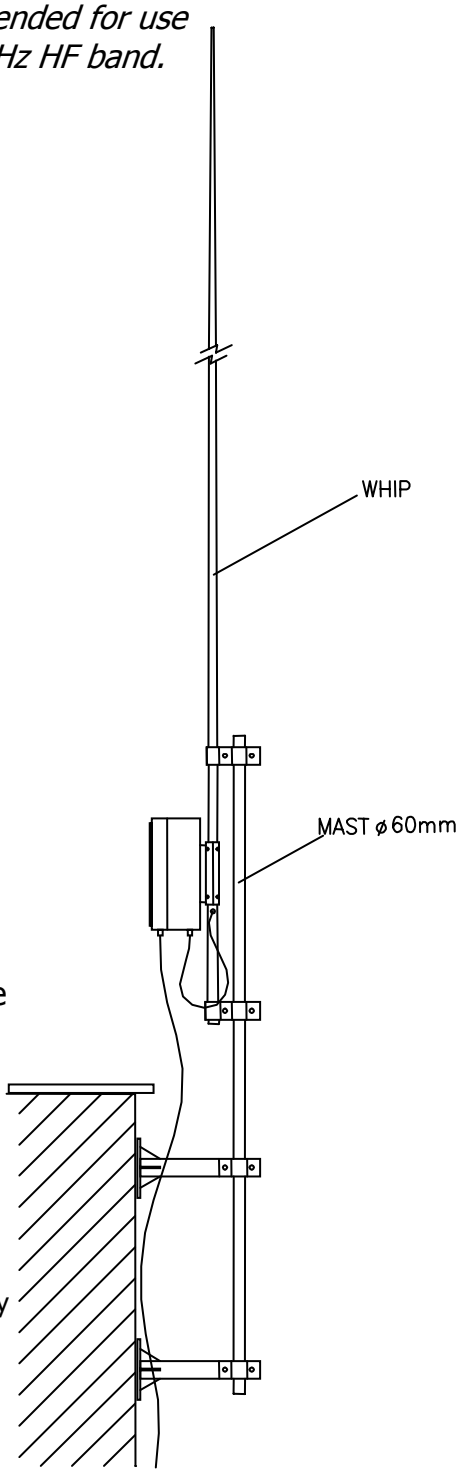

Fig. 1 Antenna Assembly

Electrical Features

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

Detailed Description

The FAA 5522 is a broadband HF tactical whip antenna intended for use with ALE capable equipment for HF communication or ECM systems. Although no external tuning is necessary for operation over the 2 to 30 MHz band, a line flattener can be employed to improve performance.

Working Principle

A vertical radiator can be matched to a 50-ohm feed line by either an inductive (L), a capacitive (C), or an L/C system. An HF-line with its end either open or shorted can be an "L", a "C", or an "L/C" matching system, depending on the ratio of its length to a given wavelength. Therefore, most matching systems can be replaced by a "coax stub."

A very long coax stub, several wavelengths long, can be used as a "multi band-tuning-system" in the 3-30 MHz range. This long line generally offers a correct L or C or L/C match for each frequency, and consequently, a good match of the vertical radiator to the feed line.

If a low SWR over the entire frequency range is desired, a folded monopole is the best solution. This arrangement needs two matching transformers within the feeder and the tuning line. The FAA 5522 radiator is a configuration of a coaxial-folded monopole. This means low wind load and few problems with snow and

ice. The necessary coaxial cable PTFE (Teflon) is inside the fiberglass radiator tube. The electrical length of the FAA 5522 is approximately equal to radiator length.

Physical design

The base of the 10-meter self-supporting radiator is mounted on two sturdy aluminum plates and insulated by two UV-resistant insulators.

The transmission line, the impedance adaptor (Fig. 9) and the broadband transformers (Fig. 10) are mounted in a box on the base. The transmission line is part of the antenna and is delivered on a spool.

Installation guidelines

The ideal mounting for the FAA5522 is 6-10ft (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 a structure (1/2 wavelength or less) or directly on the roof is less recommended. This results in an inferior radiation pattern and, more importantly, a heavily increased noise level from installed RF emitters.

Mounting on a tower higher than ¼ wavelength results in high radiation pattern (up to 60 degrees). The FAA 5522 is a very effective antenna. As with all good antennas, it reacts to nearby objects such as other antennas, lightning protection systems, etc. This is particularly pronounced with items that are closer than one wavelength and longer than 1/2 wavelength. Under these circumstances, the antenna can receive its own signal back, resulting in increased SWR.

The FAA 5522 is grounded through the transmission line and at the feed line in the housing. This reduces static noise. The base station needs to be well grounded. Normally this self-supporting antenna has the same base-mounting pattern as the currently used AS-3772B/U tunable HF shipboard antenna.

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

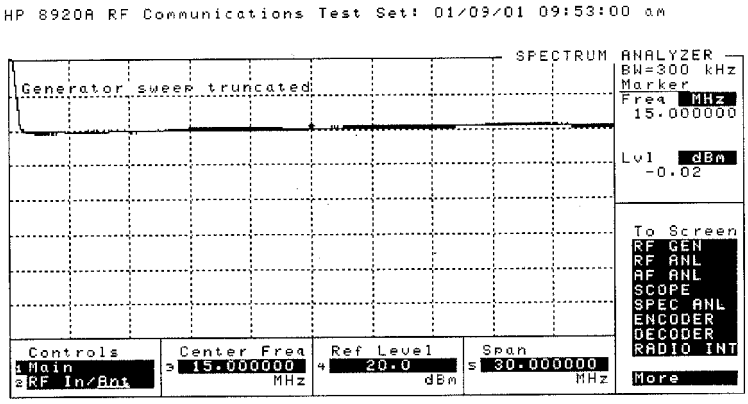

Fig. 2: Typical SWR performance
Reference level = 0 dB

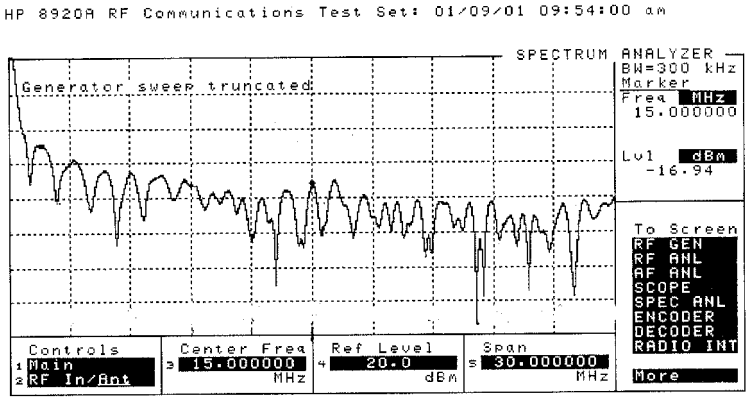

Fig. 3: Typical SWR Performance
Measure level = 20 dB return loss average

Radiation Patterns

The typical vertical radiation patterns on several frequencies of the HF spectrum is provided in Fig. 5 to 8. The antenna installation in this case is on a building roof.

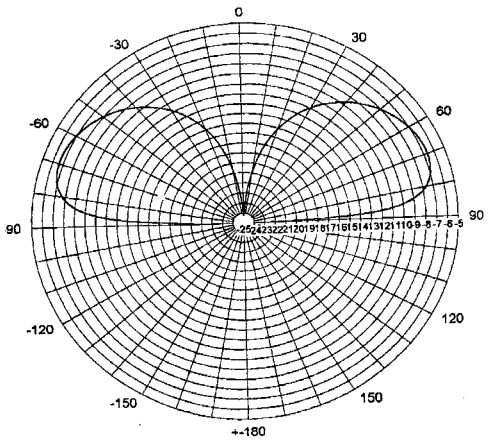

Fig. 4: Pattern radiation F=3 MHz

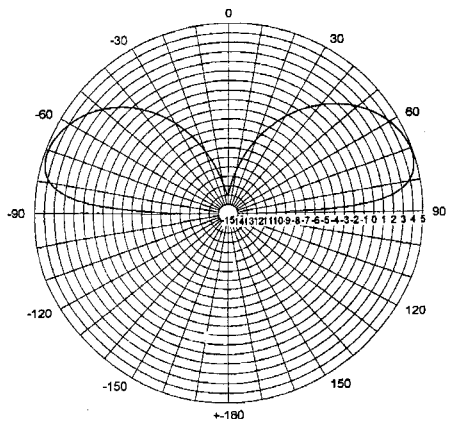

Fig. 5: Pattern radiation F=7 MHz

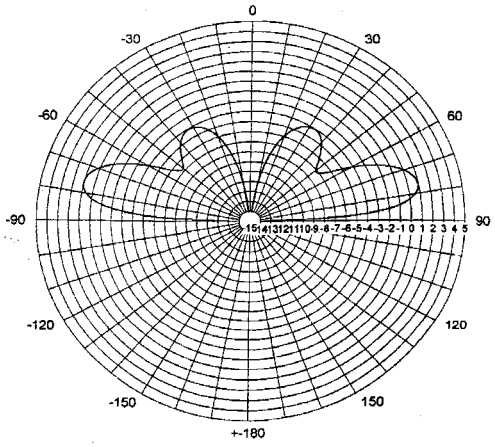

Fig. 6: Pattern radiation F=14 MHz

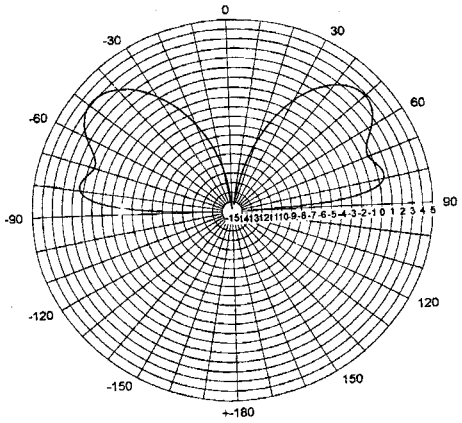

Fig. 7: Pattern radiation F=20 MHz

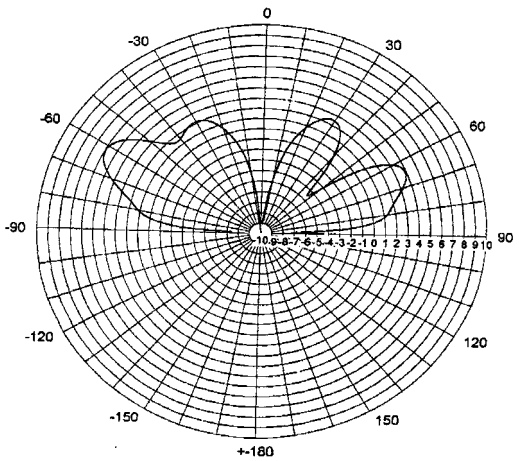

Fig. 8: Pattern radiation F=26 MHz

Fig. 9: Inside view of antenna box:
Impedance adaptor and Transmission line

Fig. 10: Inside view of impedance adaptor:
Broadband Transformers