R&S®HL300
Handheld Log-Periodic Antenna
Manual

4097.3328.02 ─ 01

Radiomonitoring & Radiolocation

Manual

ROHDE&SCHWARZ

This manual describes the following R&S®HL300 models:

- R&S®HL300 Handheld Log-Periodic Antenna 4097.3005.02

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The following abbreviations are used throughout this manual: R&S®HL300 is abbreviated to R&S HL300, R&S®FSH4/8 is abbreviated to R&S FSH4/8.

Contents

1 Characteristics

1.1 Use

The handheld log-periodic antenna R&S HL300 in conjunction with portable spectrum analyzers (for example the R&S FSH4/8) is used to determine RF parameters and localize potential interfering sources. The direction of signal sources is found by pointing the antenna towards the direction of maximum signal voltage.

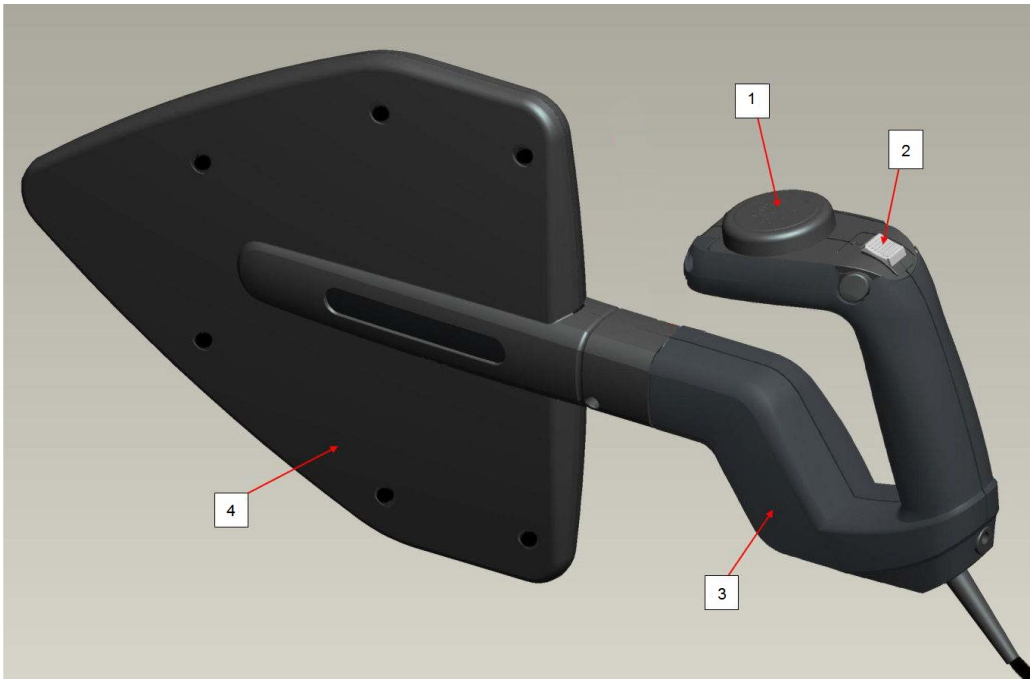

Fig. 1-1: R&S HL300 antenna overview.

1 = GPS/electronic compass unit
2 = toggle switch
3 = antenna handle
4 = log-periodic dipole array

The overall frequency range from 450 MHz to 8 GHz is covered by a log-periodic dipole array antenna structure with a distinct directional pattern. The antenna does not have to be tuned within its frequency range.

A built-in GPS receiver with an integrated patch antenna and an electronic compass provide position and bearing data for further processing in the connected spectrum analyzer. A toggle switch at the antenna handle activates or bypasses the LNA (Low Noise Amplifier) inside the R&S FSH4/8, thus allowing the use of the system in the vicinity of strong transmitters.

The R&S HL300 is characterized by the following features:

- Unambiguous direction finding, i.e. distinct directional pattern with the receive maximum pointing to the front in the frequency range from 450 MHz to 8 GHz.

- The maximum of the antenna output signal serves as a directional criterion (maximum direction finding).
- Handy size despite extreme broadband capability.
- Fatigue-free operation due to the antenna design and the material used, which keep its weight to a minimum.
- Mainly used for vertical polarization but for test purposes horizontal polarization can also be used by turning the antenna by 90°.
- May be mounted on a tripod (¼" mounting thread).
- Power supply via the connected R&S FSH4/8 through the data and control cable.

1.2 Description

The R&S HL300 comprises the following elements:

- Log-periodic dipole array antenna with a nearly frequency-independent directional pattern
- GPS receiver and electronic compass
- Toggle switch for activating and deactivating the LNA within the R&S FSH4/8; indication by adjacent LED
- RF and control cable (length approx. 1.5 m with N-type connector and control connector)
- Tripod mounting thread

A green LED on the rear of the supply and display unit indicates activation of the LNA within the R&S FSH4/8.

1.3 Specifications

Table 1-1: Electrical specifications.

Frequency range	450 MHz to 8 GHz
Polarization	Vertical (horizontal polarization is also possible when turning the antenna by 90°)
Nominal impedance	50 Ω
VSWR	< 2.5 (500 MHz to 8 GHz) < 3 (below 500 MHz) for typical values see figure 5-1
RF connector	N-male
Antenna factors	for typical values see figure 5-2
Practical gain	for typical values see figure 5-2
Directional patterns	for typical values see figure 5-3 and figure 5-4

Control connector	“Binder” 7 pin male
Supply voltage	5V ± 0.2 V (supplied by spectrum analyzer)
Current consumption	max. 100 mA
GPS	
Acquisition time	typ. 26s (cold start, all satellites with -130 dBm)
Time pulse frequency	1 Hz
Time pulse accuracy	30 ns RMS (under good GPS signal conditions)
Navigation update rate	1 Hz
Electronic compass	
Azimuth coverage	0° to 360° in 1° steps
Elevation range	-60° to 60° in 1° steps
Compass accuracy	typ. 2° RMS for 0° elevation typ. 4° RMS for ± 60° elevation

Table 1-2: Mechanical and environmental specifications.

Dimensions	
max. length	approx. 580 mm
max. width	approx. 310 mm
max. depth	approx. 90 mm
Weight	approx. 1 kg (excluding transport bag)
Temperature ranges	
Operating temperature range	-30 °C to +55 °C (no condensation)
Nominal temperature range	-10 °C to +50 °C
Storage temperature range	-30 °C to +60 °C
Vibration resistance according to DIN EN 60068-2-64	random 10 Hz to 300 Hz: 0.01 g^2/Hz 300 Hz to 500 Hz: 0.003 g^2/Hz every 30 minutes in the three orthogonal axes; acceleration approx. 1.9 g rms
Shock resistance acc. to DIN EN 60068-2-27 and MIL STD 810 E	max. 40 g, crossover frequency 45 Hz in three orthogonal axes
MTBF according to SN29500, ground benign, 45°C	> 100 000 hours

1.4 Equipment Supplied

Delivery of the R&S HL300 includes:

- 1 Handheld Log-Periodic Antenna R&S HL300
- 1 transport bag
- 1 carrying belt

- 1 CD-ROM with manual
- Safety instructions and customer information (print version)

1.5 Recommended Extras

The following extras are recommended:

Designation	Order number
R&S FSH4/8 Handheld Spectrum Analyzer	1309.6000.xx
Commercial tripod	available in specialist shops

1.6 Ordering Information

Designation	Order number
R&S HL300 Handheld Log-Periodic Antenna	4097.3005.02

2 Preparation for Use

2.1 Use of a Commercial Tripod

The R&S HL300 has a ¼" tripod mount in the lower part of the handle, which is suitable for attachment to a commercial tripod. The antenna is fastened to the tripod via the tripod's fastening screw.

2.2 Assembling the Belt

Upon delivery the belt is disassembled. It consists of the following components:

- 1 belt
- 2 fastening straps

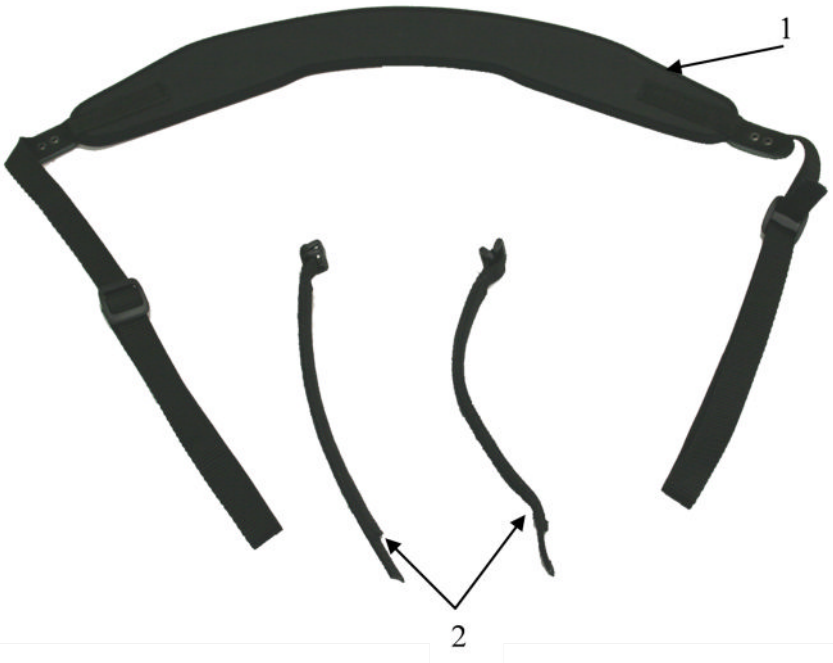

Fig. 2-1: Belt (1) and fastening straps (2).

- Attach the two fastening straps to the belt as shown in figure 2-2, figure 2-3 and figure 2-4.

Make sure you insert the end of the belt in the plastic fastener facing away from the neoprene (see red arrow in figure 2-2).

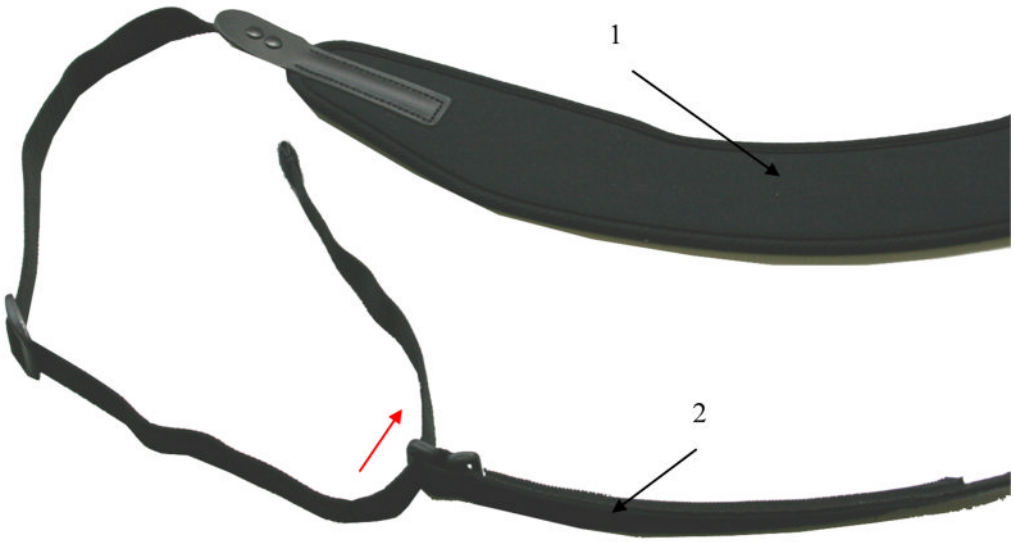

Fig. 2-2: Attaching the fastening strap, step 1.

1 = belt
2 = fastening strap

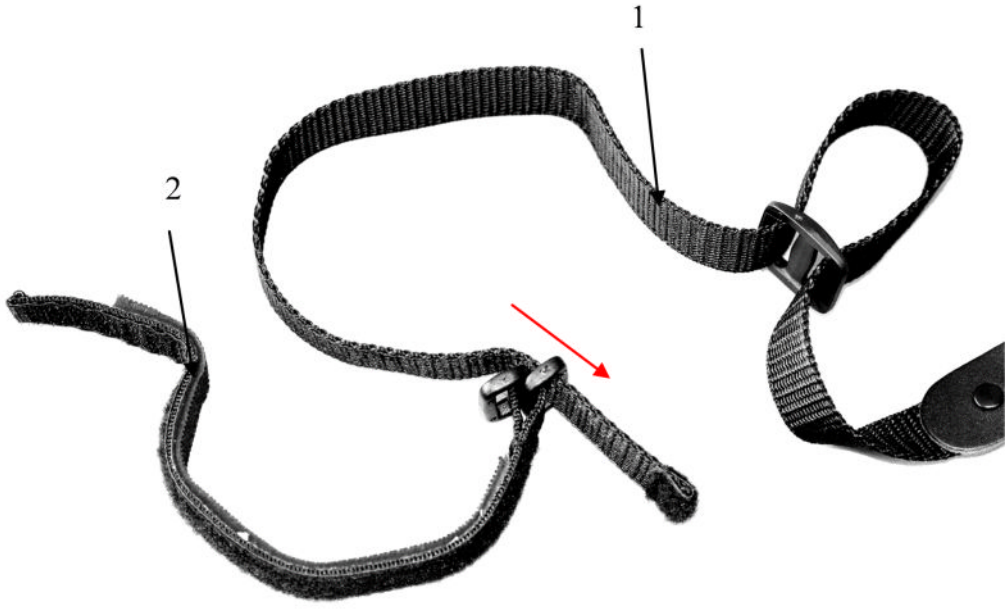

Fig. 2-3: Attaching the fastening strap, step 2.

1 = belt
2 = fastening strap

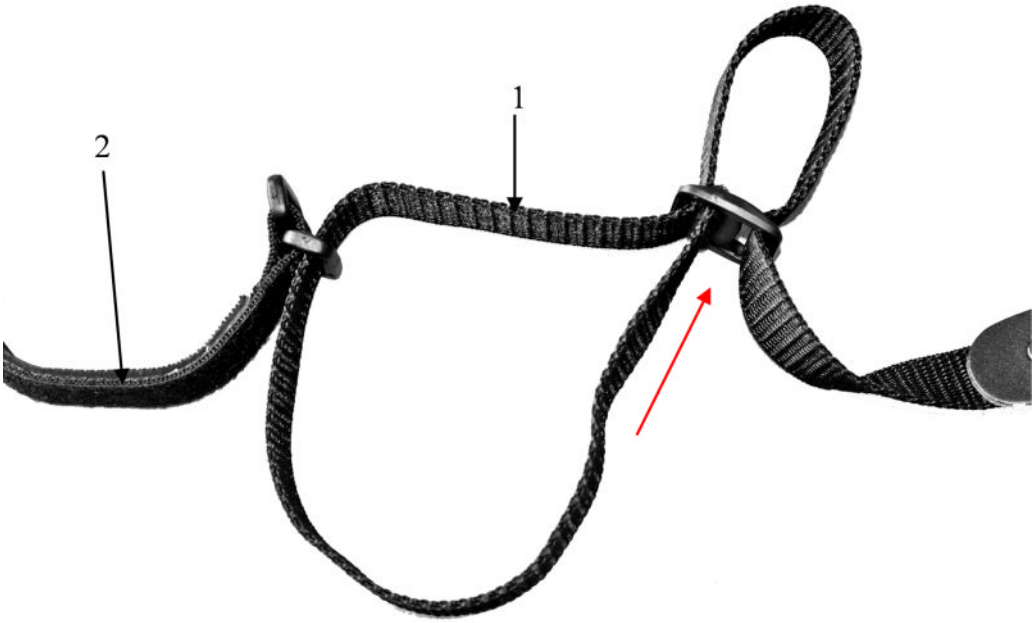

Fig. 2-4: Attaching the fastening strap, step 3.

1 = belt
2 = fastening strap

2.3 Attaching the Belt to the Antenna

Attach the two fastening straps:

1. Place the handle onto the neoprene sides of the fastening straps, see figure 2-5.

Fig. 2-5: Attaching the belt, step 1.

1 = belt
2 = rear fastening strap
3 = handle
4 = forward fastening strap

2. Move the loose end of the straps through the plastic fastener, bend them around and attach them firmly to the velcro strips, see figure 2-6.

Fig. 2-6: Attaching the belt, step 2.

1 = rear fastening strap
2 = forward fastening strap

2.3.1 Correct Position of the Carrying Belt

When you use the belt, make sure the longer side, i.e. the side with the more pronounced curve, faces inwards. The neoprene side of the shoulder pad should rest on your shoulder (see red arrow in figure 2-7).

Fig. 2-7: Correct position of the carrying belt: longer side facing inwards, neoprene side resting on the shoulder.

3 Operation

3.1 Operating Elements on the Handle

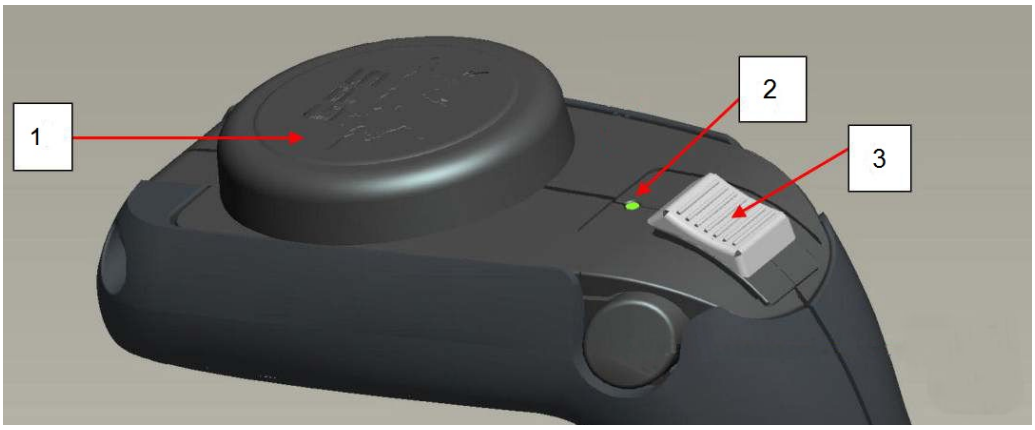

Fig. 3-1: R&S HL300 operating elements on the handle.

1 = GPS/electronic compass module
2 = status LED
3 = toggle switch

3.2 RF and Control Cable

The RF and control cable protruding from the R&S HL300 connects the antenna to the R&S FSH4/8 spectrum analyzer. It is approximately 1.5 m long.

The RF and control cable must not be extended beyond a total length of 3 m.

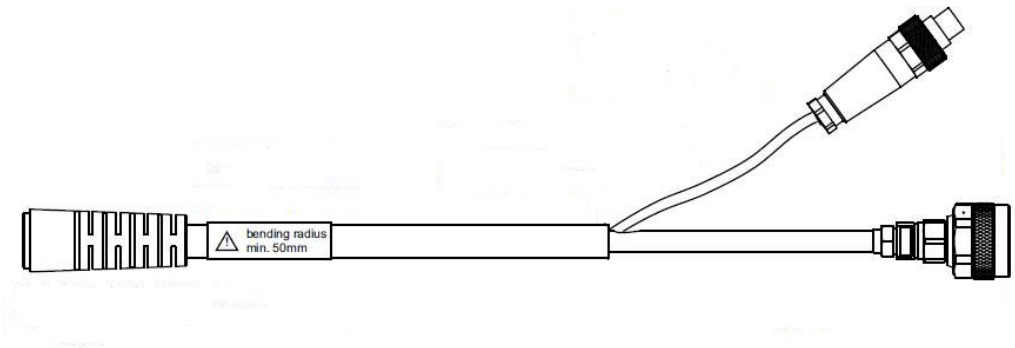

Fig. 3-2: R&S HL300 RF and control cable.

Minimum bending radius

The minimum bending radius must be at least 50 mm.

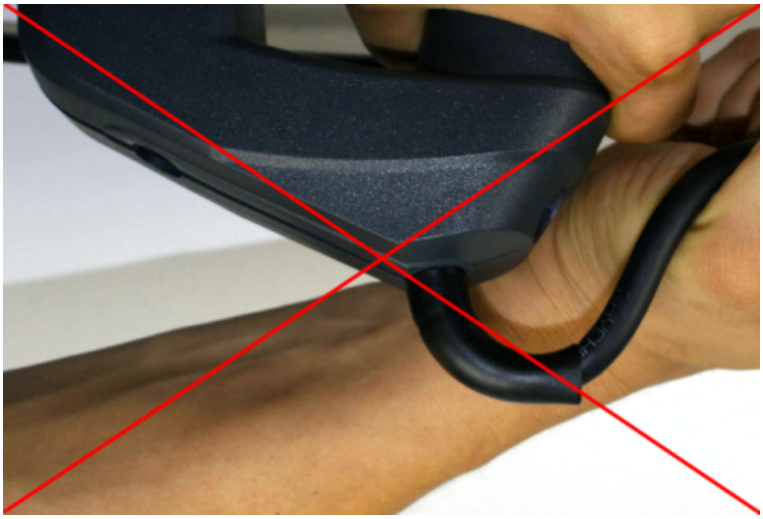

Fig. 3-3: Excessive bending of the RF and control cable will cause permanent damage to the R&S HL300 .

3.3 Activating or Deactivating the LNA in the R&S FSH4/8

"Passive" mode (bypassing the LNA):

- Move the toggle switch on the handle of the supply and display unit into position "OFF" (downwards on the handle, see figure 3-4).

"Active" mode:

- Move the toggle switch on the handle of the supply and display unit into position "ON" (upper position, see figure 3-4). This is indicated by the green LED.

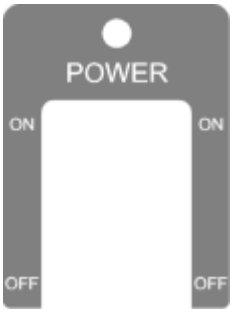

Fig. 3-4: Power label for LNA.

The R&S HL300 should only be switched to "Active" mode if there are no strong transmitters in close vicinity and the sensitivity of the receiving system (antenna with spectrum analyzer) in "Passive" mode is not sufficient to detect the signal.

The toggle switch remains in its position ; to deactivate the LNA move the switch back into position “OFF”.

3.4 Notes on Practical Use

3.4.1 How to hold the R&S HL300

To ensure optimum DF results, you have to carry the R&S HL300 with your arm stretched out for locating the maximum.

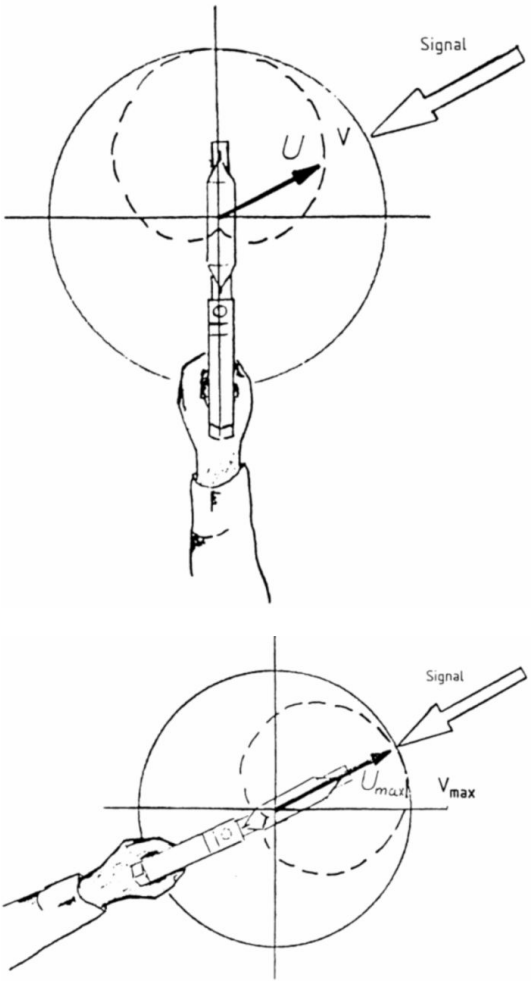

Fig. 3-5: Manual direction finding by locating the maximum.

The center of rotation should be located in the antenna rather than your body. Moving the antenna to and fro is unfavorable since the search for maximum reception is impaired by site-dependent level differences occurring in disturbed electromagnetic fields.

If an unambiguous maximum is not obtained in a closed room, for example, the interference due to reflections is too high and the site has to be changed.

Reflections and interference occur if electromagnetic waves come into contact with objects that have a high dielectric constant or are conductive.

In a disturbed environment, direction finding should best be carried out from several sites, approaching the source gradually (see figure 3-6).

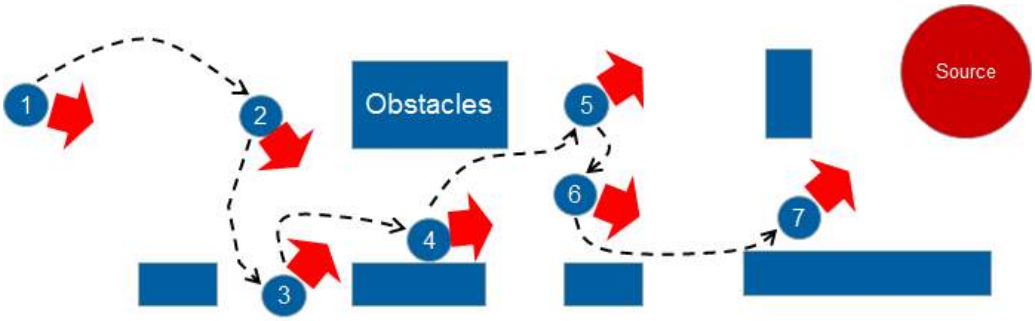

Fig. 3-6: Locating a source in a disturbed environment, for example inside a room.

4 Maintenance and Repair

4.1 Maintenance

The R&S HL300 is maintenance-free.

4.2 Disassembly and Reassembly

CAUTION

Disassembly and reassembly

Any disassembly/reassembly must be performed by skilled and authorized technical personnel observing the regulations for electrostatic sensitive devices.

4.3 Functional Check

If the green LED above the toggle switch does not light up when you activate the LNA, there is a potential problem with the connection to the R&S FSH4/8 spectrum analyzer.

In order to verify the connection:

- check the control cable connector
- check the settings of the R&S FSH4/8.

4.4 Storage and Transport

The R&S HL300 should only be stored and transported in the supplied transport bag.

Make sure that the RF and control cable is bent towards the front of the antenna. Attach the R&S HL300 with the velcro fastener inside the bag in order to avoid exceeding the allowed bending radius of the cable (see figure 4-1 and "Minimum bending radius" on page 15).

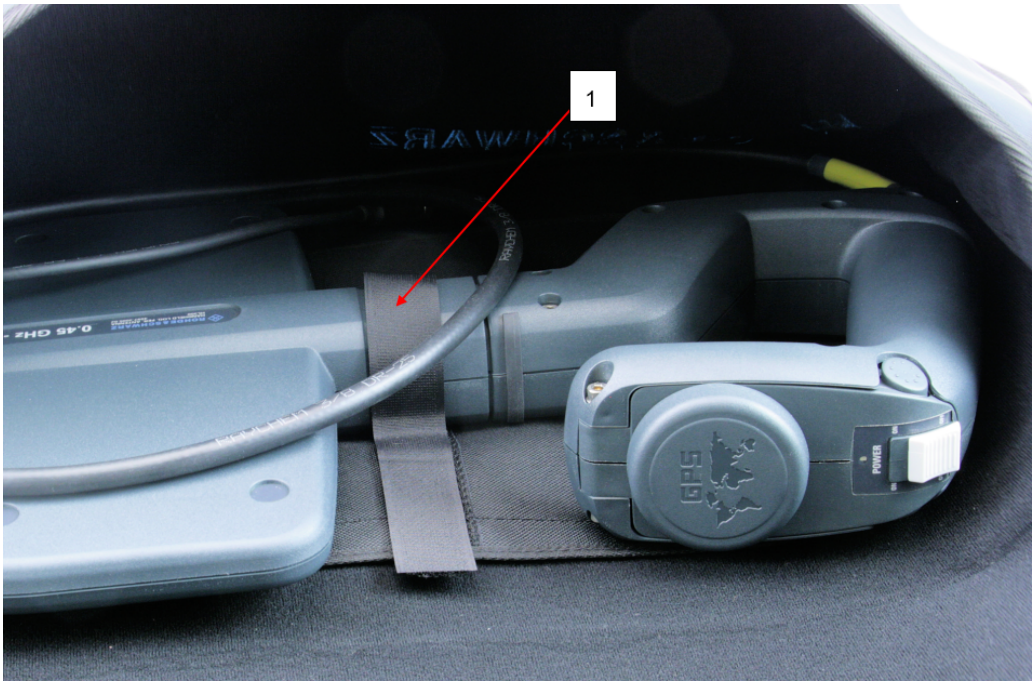

Fig. 4-1: R&S HL300 transport bag.

1 = velcro fastener

5 Diagrams and Patterns

5.1 VSWR

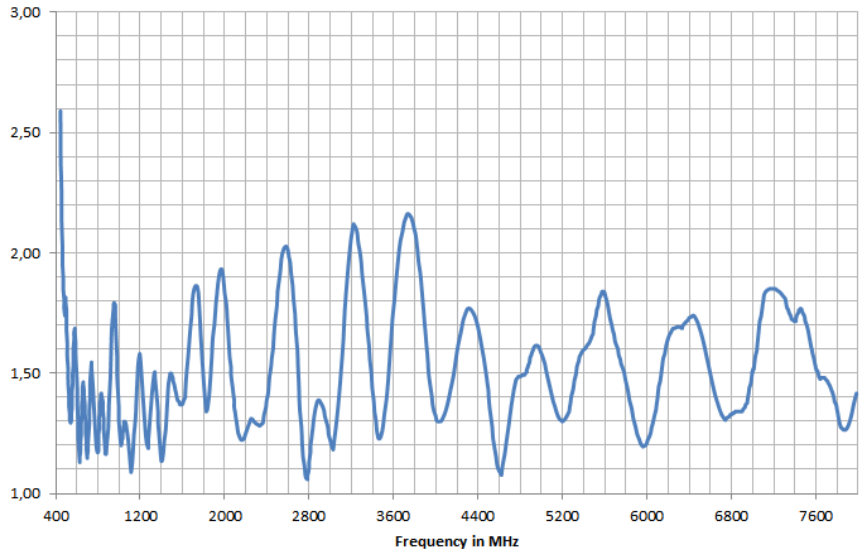

Fig. 5-1: R&S HL300 typical VSWR.

5.2 Antenna Factor and Practical Gain

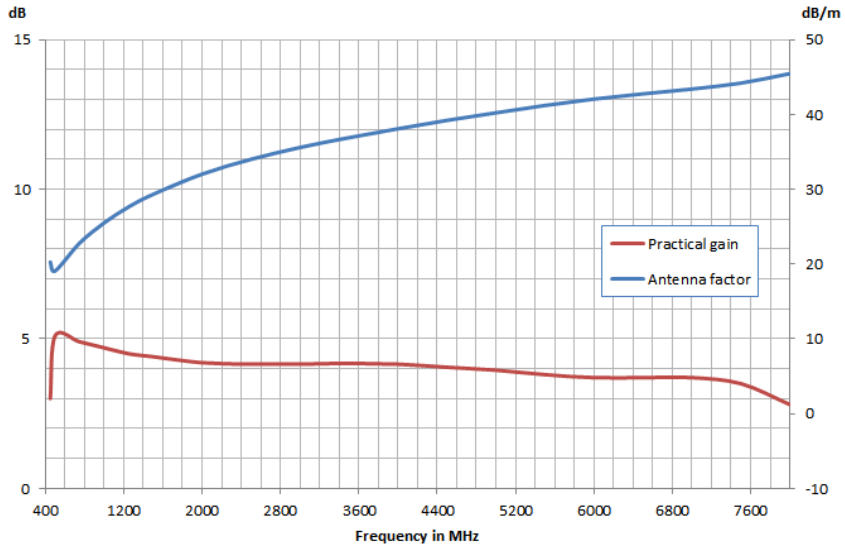

Fig. 5-2: R&S HL300 typical antenna factor and practical gain.

5.3 Radiation Patterns

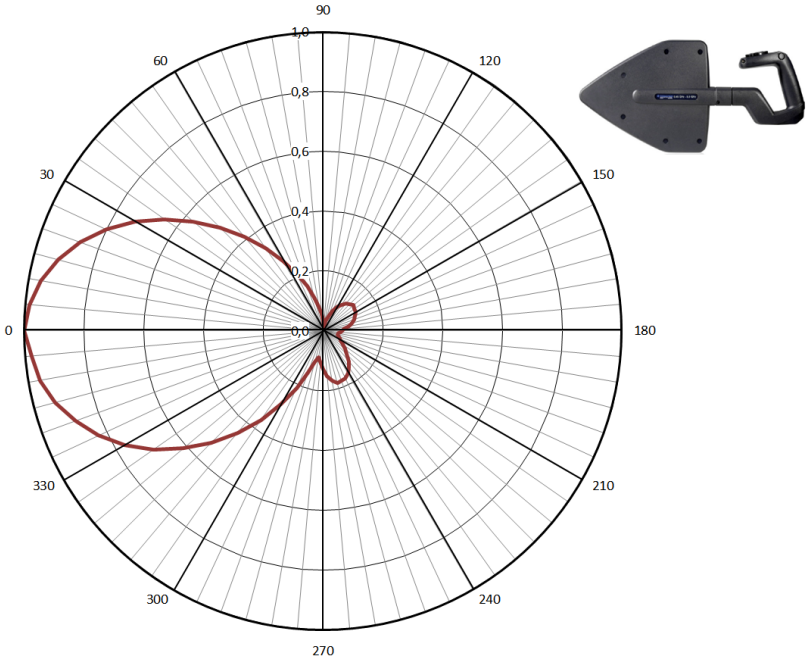

Fig. 5-3: R&S HL300 typical E-field pattern.

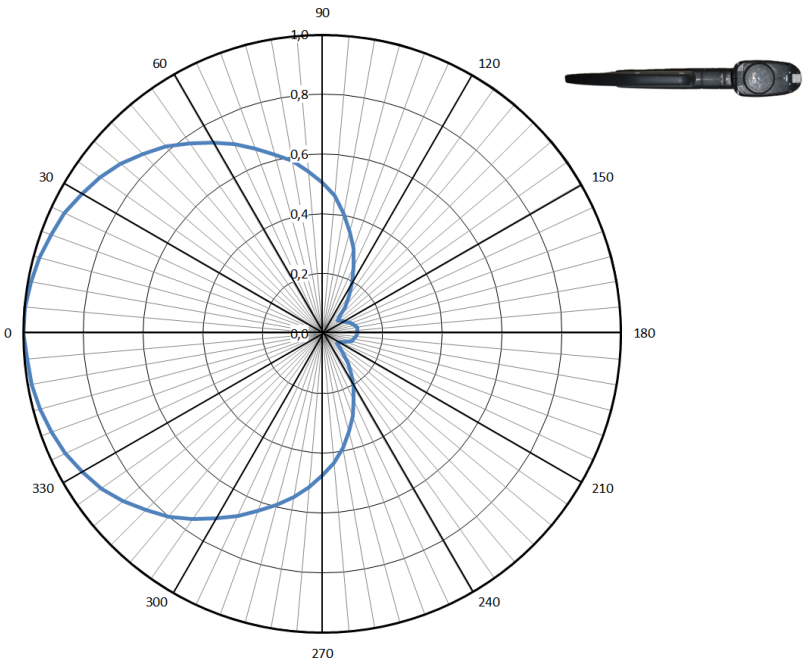

Fig. 5-4: R&S HL300 typical H-field pattern.

6 List of Appendices

Appendices:

- Drawing 4097.3005.01 D1