

... before you turn to the next page:

This catalog presents all standard HF-VHF/UHF-SHF antennas and accessories from Rohde & Schwarz. It replaces the edition 03/04. The catalog comes with a CD-ROM; the contents of the catalog are available in PDF format.

Specifications

In this catalog specifications are provided in condensed form. For full and binding specifications please refer to the relevant data sheet.

Other Rohde & Schwarz publications

Catalogs

- ◆ Test & Measurement Products (including CD-ROM)
- ◆ The World of Radio Communications (CD-ROM only)
- ◆ EMC Test & Measurement Products
- ◆ Sound and TV Broadcasting (CD-ROM only)
- ◆ Radiomonitoring and Radiolocation Products (including CD-ROM)

Data sheets

The data sheets provide a detailed description of instrument features, applications and specifications. Most of them can also be downloaded from the product page of the Rohde & Schwarz Internet site.

News from Rohde & Schwarz

Our quarterly journal provides you with articles describing newly developed instruments or systems and test suggestions for specific applications. As a regular subscriber to News you will be kept informed about all newly developed Rohde & Schwarz products. News from Rohde & Schwarz is published in German, English, French, Chinese and Russian. News from Rohde & Schwarz is also available on the Internet (www.rohde-schwarz.com, scrollbar News section). Please contact your local Rohde & Schwarz representative.

MIL NEWS from Rohde & Schwarz

This special journal is for the military markets. As a regular subscriber to MIL NEWS you will be kept informed about all newly developed Rohde & Schwarz products in this business field. MIL NEWS from Rohde & Schwarz is published in German, English and Spanish approx. two times a year. Please contact your local Rohde & Schwarz representative.

Application notes

You can download various application notes from the Rohde & Schwarz homepage (section Service and Support).

Special publications

Additional technical literature from Rohde & Schwarz such as special publications on current items, refresher topics, compendia, etc is available for various fields of application. Please contact your local Rohde & Schwarz representative.

Request for printed material

Please contact your local Rohde & Schwarz representative.

Trademarks

Trade names are trademarks of the owners. R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG
Example: 1 kW HF Dipole R&S®HX002

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Icon Description

	Antenna for mobile or semimobile applications
	Antenna for stationary applications
	Antenna for naval applications
	Antenna for indoor applications, e.g. in test chambers
	Receiving antenna
	Transmitting antenna
	Active antenna or antenna with preamplifier
	Antenna with directional radiation pattern
	Antenna with omnidirectional radiation pattern
	Linearly/horizontally polarized antenna (using recommended mounting position)
	Linearly/vertically polarized antenna (using recommended mounting position)
	Crossed antenna for linear and orthogonal linear polarization
	Left-hand circularly polarized antenna
	Right-hand circularly polarized antenna
	Antenna suitable as feed for reflector antenna systems
	Device can be remote-controlled
	Antenna for ATC (air traffic control) applications
	High gain antenna, e.g. for EMS (electromagnetic susceptibility) applications
	Calibrated antenna (calibration certificate supplied with device)
	Device can be operated with DC power supply
	Device can be operated with AC power supply

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Who we are and what we do

Rohde & Schwarz is a company with a global presence in the fields of test and measurement, information technology and communications. For more than 70 years the company group has been developing, producing and marketing a wide range of electronic products for the capital goods sector. The company is headquartered in Munich. With 6350 employees worldwide and subsidiaries and representatives in over 70 countries around the world, the Rohde & Schwarz group achieved an annual turnover of € 1.129 billion in fiscal year 2004/2005.



Due to the comprehensive know-how and the innovative strength of its employees, Rohde & Schwarz is among the market leaders in all of its business fields.

Today the Rohde & Schwarz group of companies is active in the following fields:

Test and measurement

- ◆ T & M instruments and systems for communications and electronics

Radiomonitoring and radiolocation

- ◆ Solutions for regulatory authorities and government agencies

Mission-critical communications

- ◆ Radiocommunications
- ◆ Professional mobile radio
- ◆ Communications security

Broadcasting

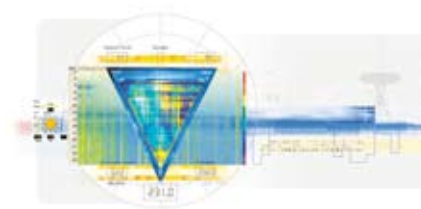
- ◆ Sound and TV broadcasting and measuring equipment

Services

- ◆ Global and local services in our fields of activities

The quality and environmental management system of Rohde & Schwarz has been certified to EN ISO 9001 and 14001 and complies with the standards of AQAP 2110 and 150. The company has approval for the development, production, installation and servicing of avionic communications equipment and is the first German transmitter manufacturer authorized to carry out BZT (Federal Approvals Office for Telecommunications) approval testing for radio transmitter systems.

Radiomonitoring and radiolocation



Rohde & Schwarz is a leading manufacturer of equipment and systems for detection, location and analysis of radiocommunications signals in the following fields of application:

- ◆ Internal and external security
- ◆ Radiomonitoring by regulatory government authorities
- ◆ Frequency management

We are leaders in the design and implementation of full-coverage automatic radiomonitoring and frequency management systems. Many years of expertise and ultramodern technology are the sound basis of our receivers, direction finders, signal analyzers, antennas and systems.

Receivers

- ◆ Digital universal broadband receivers
- ◆ Stationary and portable monitoring receivers
- ◆ Computer-controlled receiving systems

Direction finders

- ◆ Extremely fast, broadband, digital monitoring direction finders for stationary and mobile/portable use
- ◆ Automatic radiolocation networks using direction finders

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Signal analyzers

- ◆ Versatile signal analyzers for flexible use
- ◆ Automatic signal classifiers
- ◆ Signal decoders, demodulators
- ◆ Systems and equipment for recording and analyzing broadband and narrowband signals

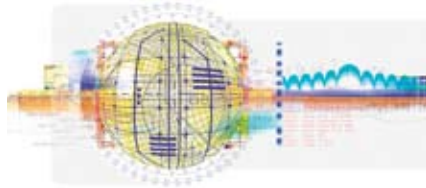
Antennas

- ◆ Receiving and transmitting antennas
- ◆ Test antennas
- ◆ MMR antennas
- ◆ Complex antenna systems

Systems

- ◆ Turnkey systems for the following applications:
 - ESM/COMINT for strategic and tactical use
 - ITU-conforming spectrum monitoring and management
 - Satellite monitoring
- ◆ Fixed stations, semi-mobile stations, mobile and transportable small systems, especially for maritime applications
- ◆ Remote-controlled and networked single- and multiuser systems
- ◆ Standalone data collection stations
- ◆ Quick system configuration in line with customer specifications due to modular hardware and software

Test and measurement



Rohde & Schwarz is the largest manufacturer of electronic test and measurement equipment in Europe. Our T & M instruments and systems are setting standards worldwide in research, development, production and service. We are the key partner of industry and network operators for all measurement tasks in the field of analog and digital communications.

- ◆ Mobile radio measurements
- ◆ EMC measurements
- ◆ General-purpose and RF measurements
- ◆ Video and broadcast measurements
- ◆ Automatic test systems

Broadcasting



For more than 50 years sound and TV broadcasting has been one of the key activities of Rohde & Schwarz. We are the only supplier of a complete range of transmission, monitoring, measurement and datacasting equipment in the world. We are an international leader in broadcasting equipment and T & M systems and instruments for the digital transmission methods DAB, DVB, ATSC and MPEG-2 and the DVB-H and T-DMB standards for mobile video.

- ◆ Sound and TV broadcast transmitters
- ◆ T & M and monitoring systems
- ◆ Video and broadcast measurements
- ◆ Datacasting

Radiocommunications



Rohde & Schwarz is a leading supplier of professional radiocommunications equipment for mission-critical environments. Organizations and armed forces entrusted with governmental tasks deploy our systems worldwide for secure voice and data transmission in stationary and mobile units as well as on board ships and aircraft. State-of-the-art frequency hopping methods (NATO SATURN/HAVE QUICK, R&S®SECOS/SECOM) and integrated encryption methods plus data services such as STANAG 5066 fully satisfy our customers' requirements. The R&S®M3xR families of software defined radios provide solutions for interoperable communications in network-centric scenarios (joint/combined). We support our customers with sophisticated logistics and service concepts during the entire life of a product.

- ◆ Communications systems for air traffic control (ATC)
- ◆ Communications systems for air defense
- ◆ Avionics
- ◆ Naval communications systems
- ◆ Army communications systems

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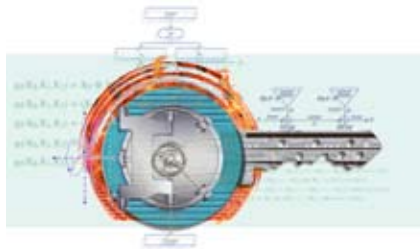
Professional mobile radio (PMR)



Rohde & Schwarz ranks among the leading suppliers of TETRA and MPT-1327 mobile radio systems for the professional user. Worldwide installations at ministries of the interior, commuter traffic enterprises, airports as well as for public network operators and the power supply industry speak for the effectiveness of our solutions.

- ◆ Switching systems
- ◆ Base stations
- ◆ Network management and applications
- ◆ Network planning and engineering
- ◆ Turnkey systems

Communications security



Rohde & Schwarz provides solutions for secure and reliable use of modern information and communications equipment. Key activities are in the development of crypto products and systems for the protection of information in modern data processing and communications systems as well as consulting and IT security analyses for industry and government authorities. Our products protect communications in numerous national and European government offices and authorities, the German Armed Forces and NATO.

Our portfolio provides solutions especially for the following tasks:

- ◆ Secure radiocommunications
- ◆ GSM encryption
- ◆ ISDN encryption
- ◆ Analog encryption
- ◆ Line encryption
- ◆ Broadband encryption
- ◆ IP encryption

Services

Rohde & Schwarz maintains a worldwide service network in order to safeguard the investments of its customers and to provide services in its field of activities. The following on-site services are offered worldwide:

- ◆ Calibration
- ◆ Maintenance and repair
- ◆ Product updates and upgrades

By cooperating with the regional Rohde & Schwarz service centers and the production plants as well as with specialized subsidiaries, the company can also provide a wide range of additional services:

- ◆ System integration
- ◆ System support
- ◆ Installation and commissioning
- ◆ Application support
- ◆ Development of customized modules, instruments and systems
- ◆ Software development
- ◆ Mechanical and electrical design
- ◆ Manufacturing to order
- ◆ Technical documentation and logistics
- ◆ Training

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Antenna calibration test site

Features

- ◆ Flat, reflective surface measuring 25 m × 20 m within a 10 000 m² area
- ◆ Test site meets CISPR 16-1-5 Ed. 1 2003-11
- ◆ Calibration of antenna factors to ANSI C63.5, ARP 958 and Draft CISPR 16-1-5 (CISPR/A/644/CD)
- ◆ Frequency range from 20 MHz to 18 GHz
- ◆ Measurements traceable to ISO and DKD (German Calibration Service) (certification procedure under way)

Brief description

The test site is a flat, reflective surface measuring 500 m² located within a 10 000 m² area.

Currently, ISO calibration measurements are performed at this open-area test site. Once certification has been obtained in autumn 2006, DKD calibration (free-space antenna factor) will also be carried out.

The test site will be used for calibrating both Rohde & Schwarz and customer antennas.



ULTRALOG R&S® HL 562 at open-area test site

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Headquarters

Company headquarters in Munich house R&D departments, a training and service center, the central divisions and administration.

Plants

Memmingen Plant

The plant in Memmingen is responsible for assembling electronic modules as well as for microwave engineering, final production, final inspection and delivery of most Rohde & Schwarz equipment. The plant's extensive know-how is also available to customers from outside the Rohde & Schwarz group of companies.

Teisnach Plant

This Rohde & Schwarz plant in northern Bavaria produces mechanical and electrical parts and systems for the final production of equipment in Memmingen and Vimperk. The plant's production resources are also available to external customers.

Vimperk Plant

The Vimperk plant in the Czech Republic near the German border specializes in the production of cables and wire-wrap parts as well as of complete instruments including the insertion of components onto boards.

Cologne Service Center

The Rohde & Schwarz Cologne Service Center is one of Europe's largest service centers for electronic T&M and communications equipment. The range of services provided includes maintenance and repair, technical information management, logistics and training. The Cologne Service Center is an accredited calibration laboratory of the German Calibration Service (DKD).

Subsidiaries

ROHDE & SCHWARZ Vertriebs-GmbH (RSV)

RSV, with headquarters in Munich, is responsible for domestic sales of Rohde & Schwarz products as well as products of other make marketed on behalf of RSE. RSV has a marketing network throughout Germany.

ROHDE & SCHWARZ International GmbH (RSI)

RSI is responsible for sales of Rohde & Schwarz products outside Europe. The company coordinates agencies, representatives and other business partners in the Asia-Pacific region, the Middle East, Africa, and North and Latin America.

ROHDE & SCHWARZ Europe GmbH (RSE)

ROHDE & SCHWARZ Europe GmbH is the main sales organization for the European and CIS regions. It promotes business development by closely interacting with regional representatives and headquarters. Both in Europe and the CIS, RSE is responsible for the sales activities of R & S BICK Mobilfunk GmbH and ROHDE & SCHWARZ SIT GmbH. RSE also offers complementary OEM products that round out the Rohde & Schwarz product portfolio.

R & S BICK Mobilfunk GmbH

R & S BICK Mobilfunk GmbH with headquarters in Bad Münden specializes in the development and implementation of professional mobile radio systems. In particular, the company supplies TETRA and MPT-1327 mobile radio networks and applications.

ROHDE & SCHWARZ FTK GmbH

ROHDE & SCHWARZ FTK GmbH in Berlin develops and implements products and systems for analog and digital sound broadcasting as well as solutions for the transmission of auxiliary data via digital broadcasting channels (datacasting). The company also provides a wide range of R&D services for special solutions in the fields of test and measurement, radiocommunications, mobile radio, broadcasting, radiomonitoring and radiolocation as well as physical engineering. The spectrum covers all service-provider tasks – from feasibility studies and development through to transfer to production and project management.

ROHDE & SCHWARZ SIT GmbH

ROHDE & SCHWARZ SIT GmbH provides solutions for security in information and communications technology. Key activities are in the development of crypto products and systems for the protection of information in modern data processing and communications systems as well as consulting and IT security analyses for industry and government authorities.

R & S Systems GmbH

R & S Systems GmbH in Cologne provides system services within and beyond the Rohde & Schwarz business fields – from system integration to delivery, assembly and commissioning of turnkey test and measurement and communications equipment.

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GEDIS GmbH

GEDIS, which is headquartered in Kiel, is a systems house with an international presence in the field of information and communications technology. GEDIS offers products and services for governmental organizations, service providers and manufacturers of large systems and products in the areas of defense, public safety, aviation, the automotive industry, medical engineering, telecommunications, traffic and logistics.

HAMEG Instruments GmbH

HAMEG, a long-established manufacturer of T&M equipment, headquartered in Mainhausen, Germany, joined the Rohde & Schwarz group of companies in April 2005. It continues to independently develop and produce its own lines of products, which complement the Rohde & Schwarz portfolio in the lower price segment. HAMEG's focus is to offer reliable measuring instruments for science, industry and education.

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Formulae

General

Tera – Atto		Prefixes			
T	Tera	10^{12}	c	Centi	10^{-2}
G	Giga	10^9	m	Milli	10^{-3}
M	Mega	10^6	μ	Micro	10^{-6}
k	Kilo	10^3	n	Nano	10^{-9}
h	Hecto	10^2	p	Pico	10^{-12}
da	Deca	10^1	f	Femto	10^{-15}
d	Deci	10^{-1}	a	Atto	10^{-18}

Frequency

Range	Frequency range	Wavelength	Classification	Principal use
VLF	3 to 30 kHz	100 to 10 km	Very low freq.	Submarines
LF	30 to 300 kHz	10 to 1 km	Low freq.	Beacons
MF	300 to 3000 kHz	1000 to 100 m	Medium freq.	AM broadcast
HF	3 to 30 MHz	100 to 10 m	High freq.	Shortwave communication
VHF	30 to 300 MHz	10 to 1 m	Very high freq.	FM, TV, ATC
UHF	300 to 3000 MHz	1 to 0.1 m	Ultra high freq.	TV, LAN, cellular services, GPS, ATC
SHF	3 to 30 GHz	10 to 1 cm	Super high freq.	Radar, GSO satellites, data transmission
EHF	30 to 300 GHz	10 to 1 mm	Extremely high freq.	Radar, automotive applications

Frequency	Old band notation	New band notation
0.5 GHz to 1.0 GHz	—	C
1.0 GHz to 2.0 GHz	L	D
2.0 GHz to 3.0 GHz	S	E
3.0 GHz to 4.0 GHz	S	F
4.0 GHz to 6.0 GHz	C	G
6.0 GHz to 8.0 GHz	C	H
8.0 GHz to 10.0 GHz	X	I
10.0 GHz to 12.5 GHz	X	J
12.5 GHz to 18.0 GHz	Ku	J
18.0 GHz to 20.0 GHz	K	J
20.0 GHz to 26 GHz	K	K
26 GHz to 40.0 GHz	Ka	K
40 GHz to 60 GHz	Q, V, W	L
60 GHz to 100 GHz	W	M

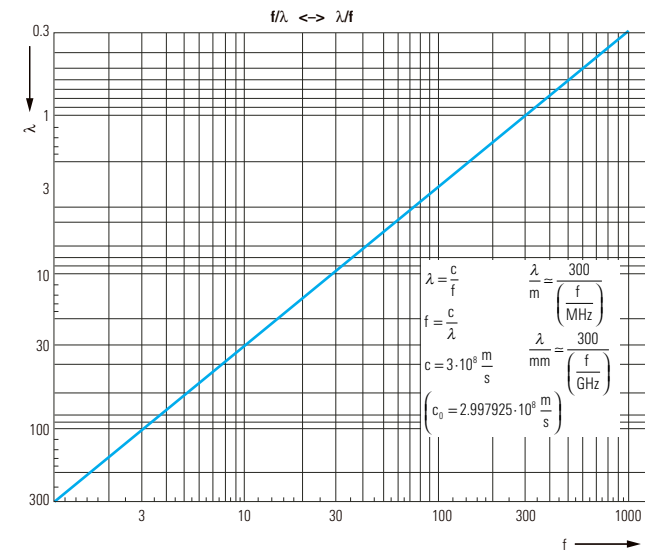
Measures of length

- 1 meter (m) = 100 centimeters (cm) = 1000 millimeters (mm) = 1 000 000 micrometers (μm)
- 1 m = 10 decimeters (dm)
- 1 kilometer (km) = 1000 m
- 1 sea mile = 10 cable lengths = 1852 m
- 1 English statute mile = 1760 yards = 1609 m
- 1 yard = 3 feet = 36 inches = 91.44 cm
- 1 inch = 25.4 mm (accurately 25.399956 mm)

Inch to mm

inch	$\frac{1}{64}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$
mm	0.397	0.794	1.587	3.175	4.762	6.350
inch	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
mm	9.525	12.700	15.875	19.050	22.225	25.400

Conversion



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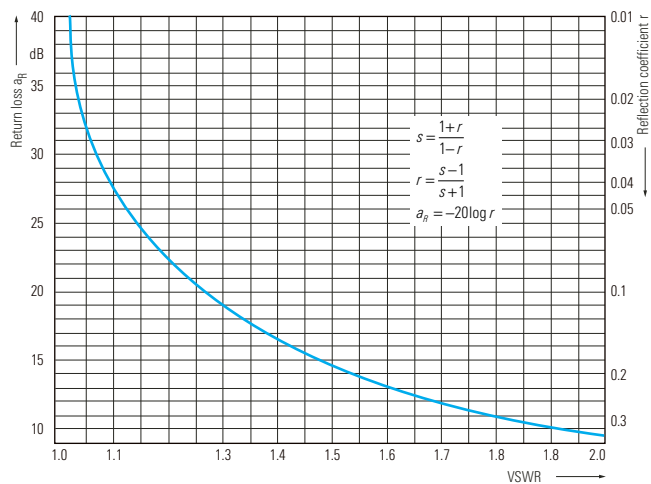
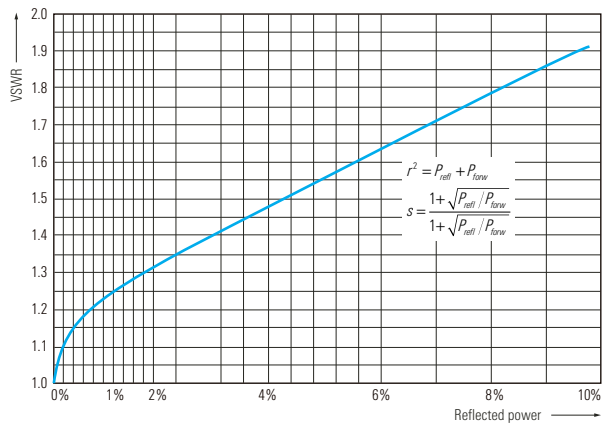
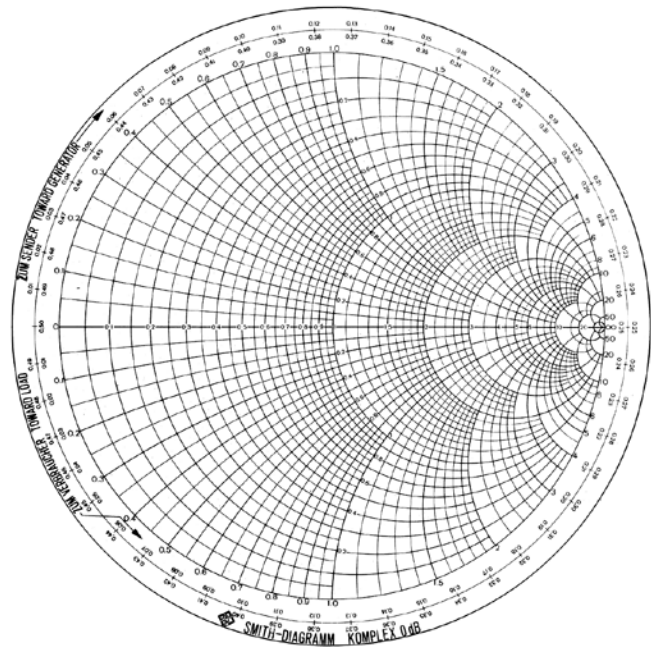
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Reflection, matching

s VSWR	r Reflection coefficient	a _R Return loss	s(VSWR)	r $\frac{U_{\max}}{U_{\min}}$	P _{refl} % $\frac{U_{\leftarrow}}{U_{\rightarrow}}$	a _R dB $20 \log \frac{U_{\leftarrow}}{U_{\rightarrow}}$
1.01	0.005		1.01	0.005		46.1
1.02	0.010		1.02	0.010	0.01	40.1
1.03	0.015		1.03	0.015	0.02	36.6
1.04	0.020		1.04	0.020	0.04	34.2
1.05	0.024		1.05	0.024	0.06	32.3
1.06	0.029		1.06	0.029	0.08	30.7
1.07	0.034		1.07	0.034	0.11	29.4
1.08	0.038		1.08	0.038	0.15	28.3
1.09	0.043		1.09	0.043	0.19	27.3
1.10	0.048		1.10	0.048	0.23	26.4
1.11	0.052		1.11	0.052	0.27	25.6
1.12	0.057		1.12	0.057	0.32	24.9
1.13	0.061		1.13	0.061	0.37	24.3
1.14	0.065		1.14	0.065	0.43	23.7
1.15	0.070		1.15	0.070	0.49	23.1
1.16	0.074		1.16	0.074	0.55	22.6
1.17	0.078		1.17	0.078	0.61	22.1
1.18	0.083		1.18	0.083	0.68	21.7
1.19	0.087		1.19	0.087	0.75	21.2
1.20	0.091		1.20	0.091	0.83	20.8
1.30	0.130		1.30	0.130	1.70	17.7
1.40	0.167		1.40	0.167	2.78	15.6
1.50	0.200		1.50	0.200	4.00	14.0
1.60	0.231		1.60	0.231	5.33	12.7
1.70	0.259		1.70	0.259	6.72	11.7
1.80	0.286		1.80	0.286	8.16	10.9
1.90	0.310		1.90	0.310	9.63	10.2
2.00	0.333		2.00	0.333	11.10	9.5
2.20	0.375		2.20	0.375	14.1	8.5
2.40	0.412		2.40	0.412	17.0	7.7
2.60	0.444		2.60	0.444	19.8	7.0
2.80	0.474		2.80	0.474	22.4	6.5
3.00	0.500		3.00	0.500	25.0	6.0
3.50	0.556		3.50	0.556	30.9	5.1
4.00	0.600		4.00	0.600	36.0	4.4
5.00	0.667		5.00	0.667	44.4	3.5
6.00	0.714		6.00	0.714	51.0	2.9
7.00	0.750		7.00	0.750	56.2	2.5
8.00	0.778		8.00	0.778	60.5	2.2
10.0	0.818		10.0	0.818	66.9	1.7
20.0	0.905		20.0	0.905	81.9	0.9
50.0	0.961		50.0	0.961	92.3	0.3

$s = \frac{1+r}{1-r}$	$r = \frac{s-1}{s+1}$	$a_R = 20 \log \frac{s+1}{s-1}$
$s = \frac{10^{0.05 a_R} + 1}{10^{0.05 a_R} - 1}$	$r = \frac{1}{10^{0.05 a_R}}$	$a_R = 20 \log \left(\frac{1}{r} \right)$



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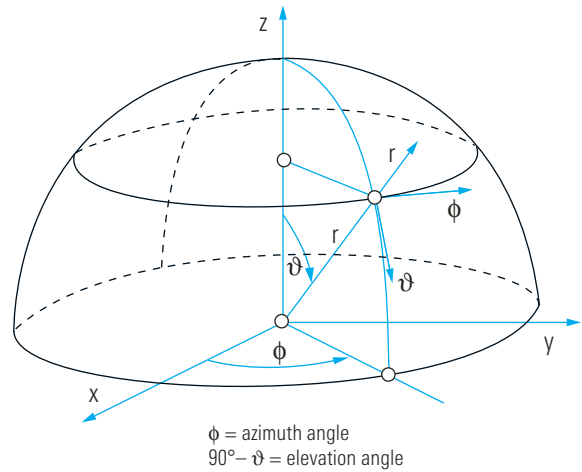
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Formulae

Voltage and power ratio

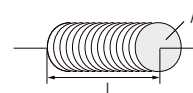
Levels

Type of level	Definition	Unit	Abbreviation
Absolute power level	$10 \log \frac{P/mV}{1mV}$	dB(mW)	dBm
	$10 \log \frac{P/W}{1W}$	dB(W)	dBW
Absolute voltage level	$20 \log \frac{U/\mu V}{1\mu V}$	dB(μ V)	dB μ V
	$20 \log \frac{U/V}{1V}$	dB(V)	dBV
Power density level referred to frequency	$10 \log \frac{P/\Delta f}{1W/Hz}$	dB(W/Hz)	—
Power density level referred to antenna surface	$10 \log \frac{P/A}{1W/m^2}$	dB(W/m ²)	—
Field strength level	$20 \log \frac{E/m}{1\mu V/m}$	dB(μ V/m)	—
Relative level	$10 \log \frac{P}{P_0}$ ¹⁾	—	dBr

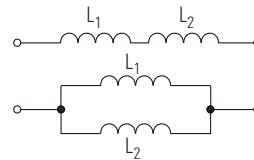


Inductance, capacitance

Cylindrical coil



$$L \approx \mu_0 \cdot \mu_r \cdot N^2 \frac{A}{l}$$

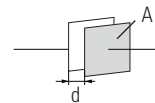


$$L_{total} = L_1 + L_2$$

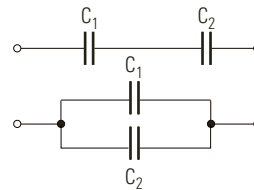
$$L_{total} = \left(\frac{1}{L_1} + \frac{1}{L_2} \right)^{-1}$$

$$\mu_0 = 4\pi \cdot 10^{-7} \frac{Vs}{Am}$$

Plate capacitor



$$C \approx \epsilon_0 \cdot \epsilon_r \frac{A}{d}$$



$$C_{total} = \left(\frac{1}{C_1} + \frac{1}{C_2} \right)^{-1}$$

$$C_{total} = C_1 + C_2$$

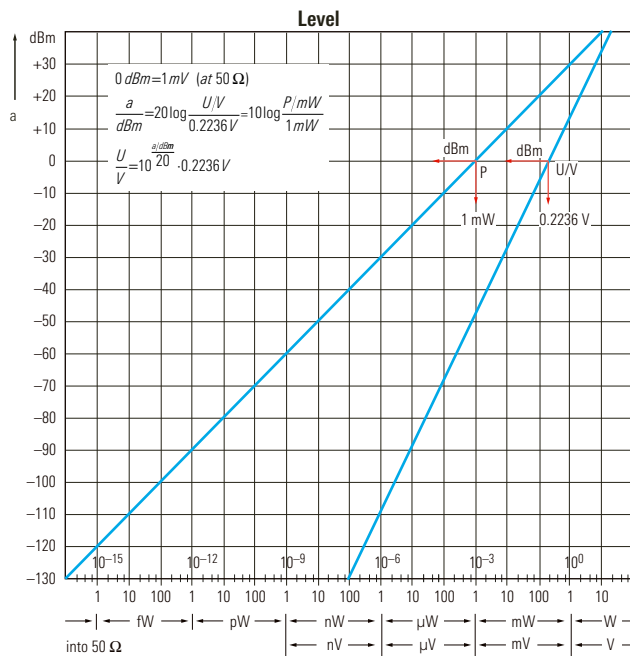
$$\epsilon_0 = 8.8541 \cdot 10^{-12} \frac{F}{m}$$

Frequency of a resonant circuit

$$f_0 = \frac{1}{2\pi \cdot \sqrt{L \cdot C}}$$

f_0 = resonant frequency
 L = inductance
 C = capacitance

Power, voltage



¹⁾ P_0 = Power level referred to as relative basis.

Intrinsic impedance of free space

$$Z_l = \sqrt{\frac{\mu_0}{\epsilon_0}} = Z_0 = 120 \cdot \pi / \Omega \approx Z_0 \approx 377 / \Omega$$

$$= 120 \pi \Omega \approx 377 \Omega$$

Z_l = intrinsic impedance of free space/ Ω
 μ_0 = permeability of vacuum/H/m
 ϵ_0 = permittivity of vacuum/F/m

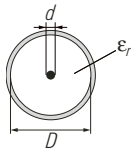
Conjunction of E field and H field via intrinsic impedance of free space

$$E = Z_0 \cdot H \quad \text{or} \quad H = \frac{E}{Z_0}$$

E = incident electrical field strength/V/m
 H = incident magnetic field strength/A/m

Coaxial line impedance

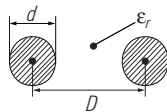
$$Z_l \approx 60(\Omega) \cdot \frac{1}{\sqrt{\epsilon_r}} \cdot \ln\left(\frac{D}{d}\right)$$



Z_l = line impedance/ Ω
 Ω = ohm/derived unit
 ϵ_r = relative permittivity/dimensionless
 D = outer diameter/m (see drawing)
 d = inner diameter/m (see drawing)

Symmetrical line impedance

$$Z_l \approx 120(\Omega) \cdot \frac{1}{\sqrt{\epsilon_r}} \cdot \ln\left(\frac{2 \cdot D}{d}\right) \quad (\text{valid for: } d \ll D)$$



Z_l = line impedance/ Ω
 Ω = ohm/derived unit
 ϵ_r = relative permittivity/dimensionless
 D = spacing between the two lines/m (see drawing)
 d = diameter of each line/m (see drawing)

Directivity

$$D = \frac{P_{\max}}{P_{\text{av}}} \quad \text{and} \quad d = 10 \log D$$

D = directivity of antenna (without any losses, linear)/dimensionless
 P_{\max} = maximum radiated power density in boresight direction of antenna/W/m²
 P_{av} = average radiated power density of a spherical isotropic radiator/W/m²
 d = logarithmic directivity value of antenna/dB

Gain (including ohmic losses)

$$G = \frac{P_{\max}}{P_{\text{av0}}} \quad \text{and} \quad g = 10 \log G$$

G = gain of antenna (linear)/dimensionless
 P_{\max} = maximum radiated power density in boresight direction of antenna/W/m²
 P_{av0} = average radiated power density of a spherical isotropic radiator with an input power equal to that of the antenna of interest/W/m²
 g = logarithmic gain value of antenna/dBi

Efficiency factor

$$\eta = \frac{G}{D} \quad \text{or} \quad g = \eta \cdot D$$

η = efficiency factor of antenna/dimensionless
 G = gain of antenna (including ohmic losses)/dimensionless
 D = directivity of antenna (without any losses)/dimensionless

Practical gain (including ohmic losses and mismatch losses)

$$G_p = G \cdot (1 - |r|^2)$$

G_p = practical gain of antenna (including ohmic losses and mismatch losses)/dimensionless
 G = gain of antenna (including ohmic losses)/dimensionless
 r = reflection coefficient/dimensionless

Gain of active antennas

$$G_p = D \cdot G_e \quad \text{and} \quad g_p = 10 \log G_p$$

G_p = practical gain of active antenna/dimensionless
 D = directivity of passive antenna part (without any losses)/dimensionless
 G_e = gain of electronic circuit of antenna/dimensionless
 g_p = logarithmic gain in value of active antenna

Effective aperture

$$A_b = G \cdot \frac{\lambda^2}{4 \cdot \pi} \quad \text{or} \quad G = A_b \cdot \frac{4 \cdot \pi}{\lambda^2}$$

A_b = effective aperture of antenna/m²
 G = gain of antenna including ohmic losses/dimensionless
 λ = wavelength of electromagnetic wave/m

Formulae

Aperture efficiency²⁾

$$\epsilon_{ap} = \frac{A_e}{A_p}$$

ϵ_{ap} = aperture efficiency/dimensionless
 A_e = effective aperture of antenna/m²
 A_p = physical (geometrical) aperture of antenna/m²

Effective antenna length³⁾

$$h_e = \frac{V}{E} \quad \text{or} \quad V = E \cdot h_e \quad \text{and} \quad V = E \cdot \cos\theta \cdot \frac{\lambda}{\pi} \cdot \sqrt{\frac{R_r \cdot G}{Z_0}}$$

$$h_e = 2 \cdot \sqrt{\frac{R_r \cdot A_e}{Z_0}} \quad \text{or} \quad A_e = \frac{h_e^2 \cdot Z_0}{4 \cdot R_r}$$

h_e = effective antenna length/m
 V = induced voltage/V
 E = incident electrical field strength/V/m
 θ = angle between polarization angles of antenna and wave/°
 λ = wavelength of electromagnetic wave/m
 R_r = radiation resistance of antenna/Ω
 G = gain of antenna including ohmic losses (linear)/dimensionless
 Z_0 = intrinsic impedance of free space/Ω
 A_e = effective aperture of antenna/m²

Antenna factor

(only valid for a 50 Ω matched system)

$$K = \frac{E}{V} \quad \text{and} \quad K = \frac{2}{h_e}$$

K = antenna factor (linear)/1/m
 E = incident electrical field strength/V/m
 V = induced voltage at a 50 Ω matched measurement device/V
 h_e = effective antenna length/m

$$K = \frac{9.73}{\lambda \cdot \sqrt{G_p}}$$

λ = wavelength of electromagnetic wave/m
 G_p = practical gain of antenna (including ohmic and mismatch losses)/dimensionless

$$k = 20 \log(K \cdot (m))$$

k = logarithmic value of antenna factor/dB
 m = meters (basic unit)

²⁾ Significant for aperture antennas only (e.g. horns, reflectors).
³⁾ Significant for electrical short and simple antennas only (e.g. a rod for low frequencies).

Free-space field strength (far field)

$$E_0 = \frac{\sqrt{30 \cdot (\Omega) \cdot P_t \cdot G_t}}{r}$$

E_0 = free-space field strength (far field)/V/m
 Ω = ohm (derived unit)
 P_t = transmitted power/W
 G_t = gain of transmitting antenna including ohmic losses (linear)/dimensionless
 r = distance from transmitting antenna/m

Friis transmission formula⁴⁾

$$\frac{P_r}{P_t} = \frac{A_r \cdot A_t}{r^2 \cdot \lambda^2} = \frac{G_r \cdot G_t}{\left(\frac{4\pi r}{\lambda}\right)^2}$$

P_r = received power/W
 P_t = transmitted power/W
 A_r = effective aperture of receiving antenna/m²
 A_t = effective aperture of transmitting antenna/m²
 G_t = gain of transmitting antenna (linear)/dimensionless
 G_r = gain of receiving antenna (linear)/dimensionless
 λ = wavelength/m
 r = distance between antennas/m

Maximum received power⁴⁾

$$P_r = P_t \cdot G_t \cdot G_r \cdot \left(\frac{\lambda}{4\pi \cdot r}\right)^2$$

P_r = received power/W
 P_t = transmitted power/W
 G_t = gain of transmitting antenna (linear)/dimensionless
 G_r = gain of receiving antenna (linear)/dimensionless
 λ = wavelength/m
 r = distance between antennas/m

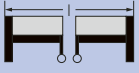

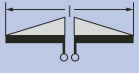
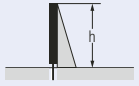
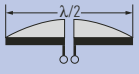

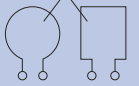
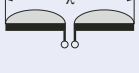
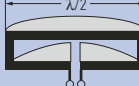
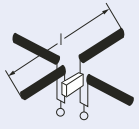

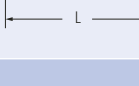
⁴⁾ Precondition: optimum alignment of both antennas concerning polarization and boresight direction.

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Parameters of selected antenna types

Type of antenna	Current distribution	Directivity factor D ⁵⁾	Effective antenna length l_w, l_e	Radiation resistance R in Ω	Field strength in direction of maximum radiation ⁶⁾ in mV/m	
					r in km, P in W	r in km, P in kW
Isotropic radiator		$1 \pm 0 \text{ dB}$			$\sqrt{30} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$173 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Hertz dipole with end capacitance ⁷⁾		$1.5 \pm 1.8 \text{ dB}$	l	$80\pi^2 \left(\frac{l}{\lambda}\right)^2$	$3 \cdot \sqrt{5} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$212 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Short antenna on infinitely conducting ground with top capacitance ⁸⁾		$3 \pm 4.8 \text{ dB}$	h	$160\pi^2 \left(\frac{h}{\lambda}\right)^2$	$3 \cdot \sqrt{10} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$300 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Short dipole without end capacitance ⁷⁾		$1.5 \pm 1.8 \text{ dB}$	$\frac{l}{2}$	$20\pi^2 \left(\frac{l}{\lambda}\right)^2$	$3 \cdot \sqrt{5} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$212 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Short antenna on infinitely conducting ground without top capacitance ⁸⁾		$3 \pm 4.8 \text{ dB}$	$\frac{h}{2}$	$40\pi^2 \left(\frac{h}{\lambda}\right)^2$	$3 \cdot \sqrt{10} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$300 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Halfwave dipole		$1.64 \pm 2.15 \text{ dB}$	$\frac{\lambda}{\pi}$	73.2	$7 \cdot \frac{\sqrt{P/W}}{(r/km)}$	$221 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Quarter-wave antenna on infinitely conducting ground		$3.28 \pm 5.2 \text{ dB}$	$\frac{\lambda}{2\pi}$	36.6	$10 \cdot \frac{\sqrt{P/W}}{(r/km)}$	$316 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Small single-turn loop in free space		$1.5 \pm 1.8 \text{ dB}$	$\frac{2\pi A}{\lambda}$	$80\pi^2 \frac{4\pi^2 A^2}{\lambda^4}$	$3 \cdot \sqrt{5} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$212 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Full-wave dipole		$2.4 \pm 3.8 \text{ dB}$			$6 \cdot \sqrt{2} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$268 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Folded halfwave dipole		$1.64 \pm 2.15 \text{ dB}$	$\frac{2\lambda}{\pi}$	$4 \cdot 73.2 \approx 280$	$7 \cdot \frac{\sqrt{P/W}}{(r/km)}$	$221 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Turnstile antenna (Hertz dipole) radiating in horizontal plane		$0.75 \pm 1.2 \text{ dB}$	l	$40\pi^2 \left(\frac{l}{\lambda}\right)^2$	$\frac{3}{2} \cdot \sqrt{10} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$150 \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Broadside array (Hertz dipoles) ($L \gg \lambda$)		$4 \cdot \frac{L}{\lambda}$			$2 \cdot \sqrt{30} \cdot \frac{\sqrt{I}}{\lambda} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$346 \cdot \frac{\sqrt{I}}{\lambda} \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Collinear array (Hertz dipoles) ($L \gg \lambda$)		$2 \cdot \frac{L}{\lambda}$			$2 \cdot \sqrt{15} \cdot \frac{\sqrt{I}}{\lambda} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$245 \cdot \frac{\sqrt{I}}{\lambda} \cdot \frac{\sqrt{P/kW}}{(r/km)}$
Antenna with directivity D		D			$\sqrt{30} \cdot \sqrt{D} \cdot \frac{\sqrt{P/W}}{(r/km)}$	$173 \cdot \sqrt{D} \cdot \frac{\sqrt{P/kW}}{(r/km)}$

⁵⁾ Corresponds to gain with loss-free antenna.

⁶⁾ Antenna and surroundings loss-free.

⁷⁾ $l < 0.2 \lambda$.

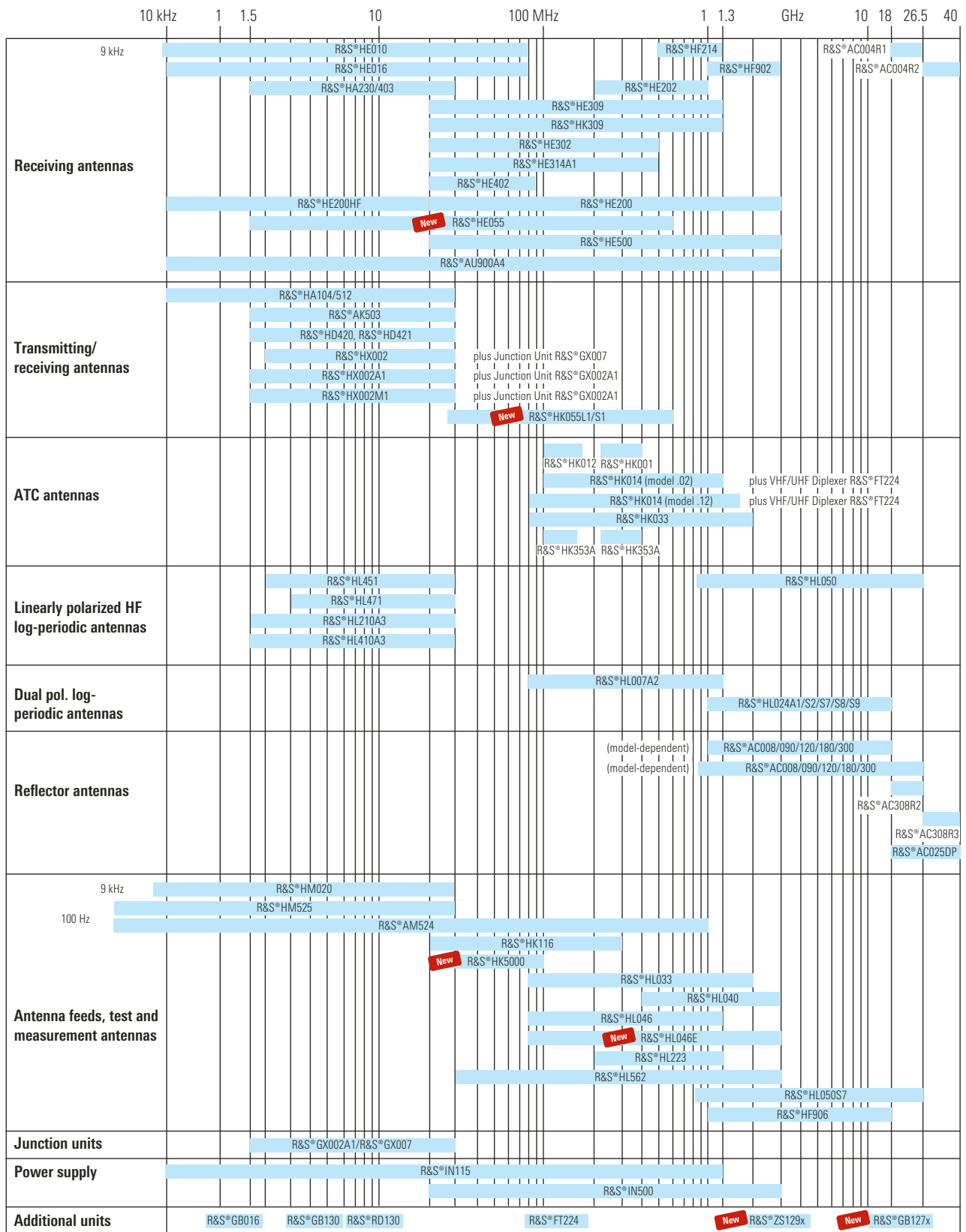
⁸⁾ $h < 0.2 \lambda$.

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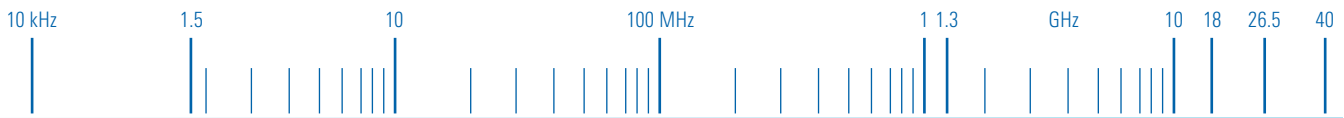
Antenna selection guide



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HF Antennas

Triple-Loop Antenna

R&S® HM 020

1



9 kHz to 30 MHz

Fully automatic measurement of magnetic field strength



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Features

- ◆ Measurement method in line with CISPR/A (Secretariat) 103, 104, 105 and CISPR/F (Central Office) 66, 67
- ◆ More sensitive, faster and cheaper than previous methods in line with CISPR Publication 16
- ◆ Loop system mobile and foldable into one plane
- ◆ Wooden pedestal for 100 kg load available (permitting antenna loops to be freely moved)
- ◆ Calibration certificate supplied with antenna

Brief description

The R&S® HM 020 allows fully automatic measurements of the magnetic field strength in the X, Y and Z planes of a centrally placed EUT.

The antenna operates according to the van Veen/Bergervoet principle.

Measurements are fully automatic and controlled by a test receiver or controller.



Specifications

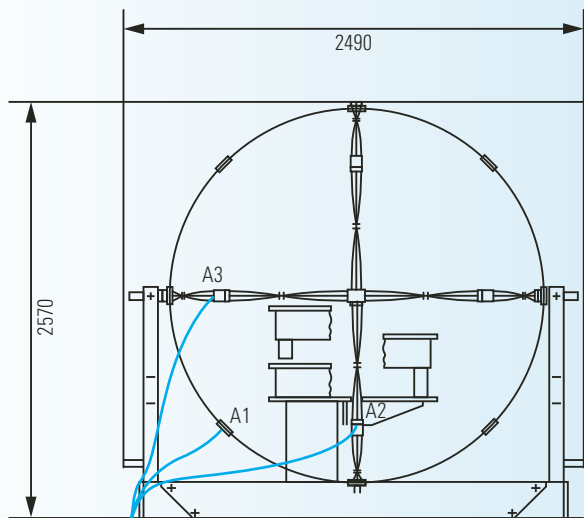
Frequency range	9 kHz to 30 MHz	Dimensions (W × H × D)	
Loop planes	switchable between X, Y and Z plane	Loops set up	approx. 2.49 m × 2.57 m ¹⁾ × 2.07 m
Input impedance	50 Ω	Loops in transport crate	approx. 2.68 m × 2.32 m × 0.57 m
Antenna factor of current probe	0 dB, referred to 1 S (in line with CISPR/A (Secretariat) 103, 104, 105)	Basic pedestal (load capacity 100 kg)	approx. 0.9 m × 1.0 m × 0.9 m
RF connector	N female	Adapter pedestal (load capacity 100 kg)	approx. 0.9 m × 0.5 m (max.) × 0.9 m
Control connector	9-contact, D-Sub, female	Weight	
Ground connector	terminal strip for copper foil	Loop system	approx. 45 kg
MTBF	>1 000 000 h	Basic pedestal	approx. 40 kg
Operating temperature range	-10 °C to +55 °C	Adapter pedestal	approx. 30 kg

¹⁾ Height reduced to 2.09 m for operation in low-ceiling rooms.

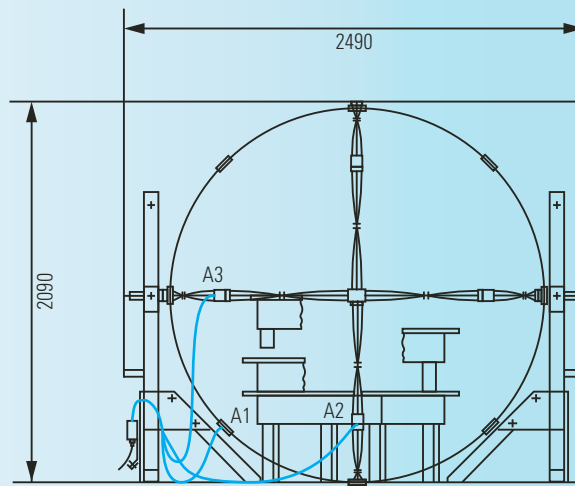
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Ordering information

Triple-Loop Antenna	R&S®HM 020	4023.4508.02	Recommended extras		
			Basic Pedestal	R&S®HM 020Z1	4023.5504.02
			Adapter Pedestal	R&S®HM 020Z2	4023.5604.02
			Calibration Dipole	R&S®HM 020Z3	4023.5704.02
			Control Unit	R&S®BG 020	4024.1002.02
			(only required for receivers without user port)		



Dimensions adjusted to upper measurement height



Dimensions adjusted to lower measurement height

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HF Antennas

Active H-Field Measurement Antenna R&S® HM 525

1



100 Hz to 30 MHz

Measurement of alternating magnetic fields with extremely high sensitivity



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Features

- ◆ Extremely high sensitivity
- ◆ Wide dynamic range
- ◆ Wide frequency range
- ◆ Compact design
- ◆ Selftest possible
- ◆ Remote-control capability (optional)
- ◆ Calibration certificate supplied with antenna

Brief description

The Measurement Antenna R&S® HM 525 is a loop antenna. The voltage at its output is proportional to the amplitude of the alternating magnetic field that is present.

Overview measurements are performed in the broadband mode, which covers the entire frequency range from 100 Hz to 30 MHz. To obtain maximum sensitivity, the antenna can be locally or remotely switched to the subrange mode. In this case the frequency range is divided into five subranges with different amplifier concepts in the active antenna part.

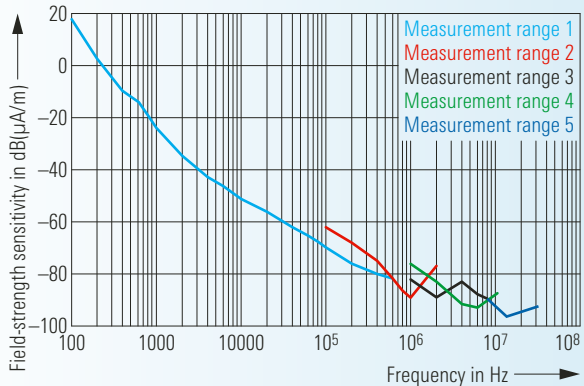
For a function check, the antenna can be operated in the test mode. The antenna is individually calibrated by comparison and comes with a calibration certificate.

Specifications

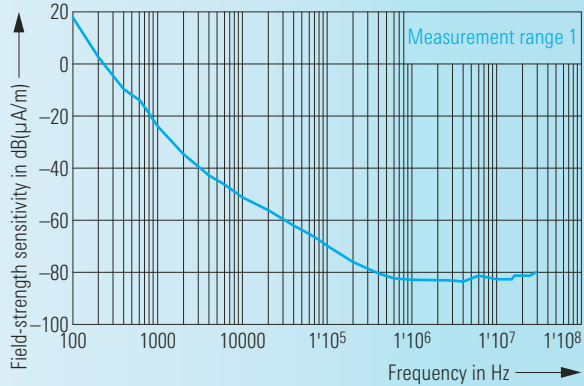
Frequency range		Power supply	18 V ±0.5 V DC (max. 0.7 A)
Broadband mode	100 Hz to 30 MHz	RF connector	N female
Subrange mode		Test signal connector	N female
Range 1	100 kHz to 600 kHz	MTBF	>300 000 h
Range 2	600 kHz to 1.2 MHz	Operating	
Range 3	1.2 MHz to 2.6 MHz	temperature range	-10 °C to +55 °C
Range 4	2.6 MHz to 8 MHz	Dimensions (H × W × D)	approx. 730 mm × 640 mm × 400 mm (without support)
Range 5	8 MHz to 30 MHz	Weight	approx. 10 kg
Input impedance	50 Ω	Class of application	laboratory
Field-strength sensitivity	see diagram		
Calibration	by comparison (as standard)		

Ordering information

Active H-Field Measurement Antenna	R&S®HM 525	4031.0508.02	Recommended extras		
			Pedestal	R&S®HM 525Z1	4036.1402.02
			Control Unit	R&S®GS 525	4035.5004.02
			Set of Fiber-Optic Cables	R&S®GS 525K1	4035.5604.02
			Junction Unit	R&S®GX 525	4015.9256.02
			Cabinet for Junction Unit	R&S®KK 524	4015.9004.02
			Integration	R&S®AM 524-K	4015.7024.02



Field-strength sensitivity; bandwidth 1 Hz; S/N ratio 0 dB (measurement ranges 1 to 5 active)



Field-strength sensitivity in broadband mode

HF Antennas

Active Rod Antenna

R&S® HE 010

1



9 kHz to 80 MHz

Excellent receiving characteristics



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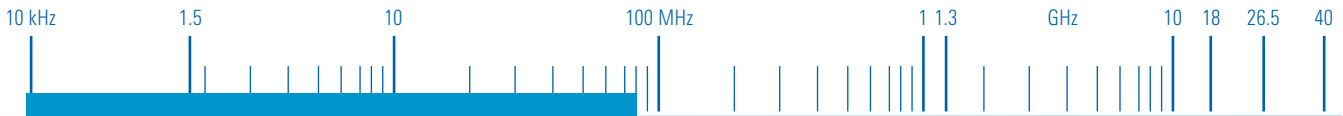
Features

- ◆ Wide frequency range
- ◆ Optimized for maximum dynamic range
- ◆ High sensitivity and excellent large-signal characteristic
- ◆ High immunity to lightning strokes in the vicinity
- ◆ Short length (1 m)

Brief description

The R&S® HE010 with its low inherent noise can be used as a broadband test antenna.

The excellent characteristics of the active receiving antenna are the result of careful matching of the passive antenna structure to the active circuit. Active antennas are smaller than comparable passive structures and minimally coupled to their environment.



Specifications

Frequency range	9 kHz to 80 MHz	Power supply	21 V to 26 V DC (max. 170 mA)
Polarization	vertical	Connector	N female
Input impedance	50 Ω	MTBF	>250 000 h
VSWR		Operating	
10 kHz to 50 kHz	<3	temperature range	-40 °C to +65 °C
50 kHz to 80 MHz	<2	Protection class	IP 55 (in line with DIN EN 40050)
Antenna factor		Max. wind speed	188 km/h (without ice deposit)
(antenna mounted on		Dimensions	
conductive plane)	typ. 17 dB	Length × diameter (max)	approx. 1 m × 120 mm
IP2	≥50 dBm (typ. 60 dBm)	Weight	approx. 0.9 kg
IP3	≥30 dBm		
Crossmodulation limit	12 V/m (up to 30 MHz)		
	6 V/m (30 MHz to 80 MHz)		

1

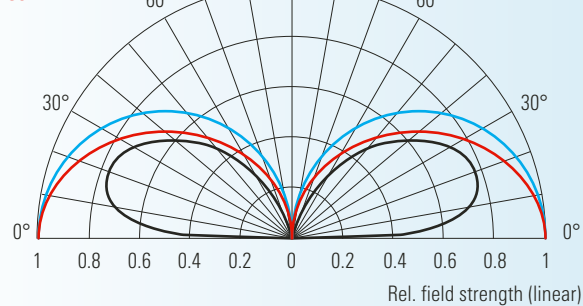
Ordering information

Active Rod Antenna	R&S®HE010	0523.1414.13	Recommended extras	
			Power Supply Unit	R&S®IN 115 4004.1707.02

Moderately conductive plane

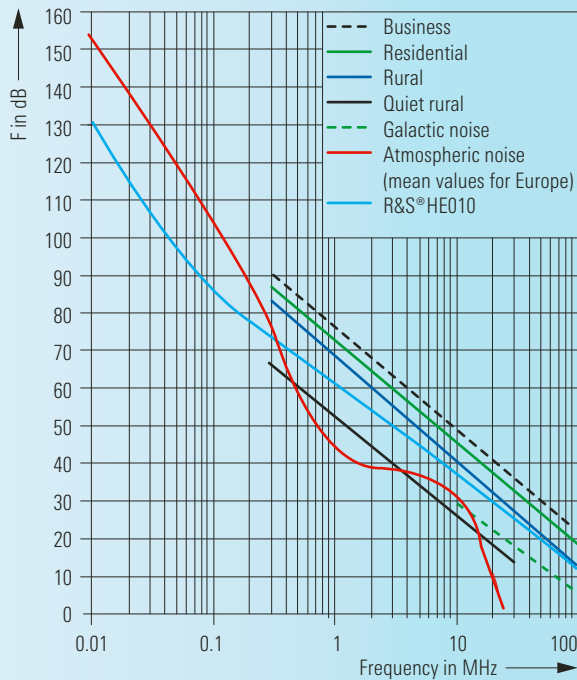
10 kHz¹⁾

80 MHz¹⁾



¹⁾ Valid for R&S®HE010 on perfectly conducting and infinitely large plane (practical dimensions >10 × λ).

Typical directional radiation pattern



Typical inherent noise compared with different standard noise environments

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HF Antennas

Active Antenna System

R&S® HE 016

1



10 kHz to 80 MHz (vertical)

600 kHz to 40 MHz (horizontal)

Omnidirectional reception of vertically and horizontally polarized signals



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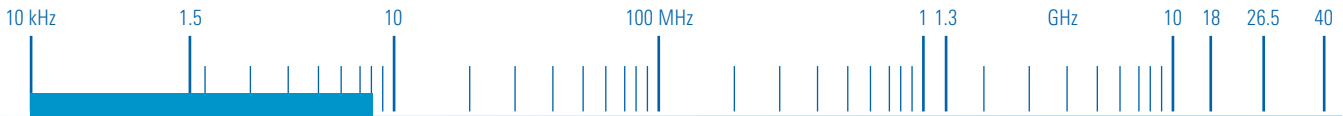
Features

- ◆ Omnidirectional reception of horizontally and vertically polarized signals
- ◆ High linearity
- ◆ High immunity to lightning strokes in the vicinity
- ◆ Extremely small dimensions
- ◆ High sensitivity – comparable to that of passive antennas that are three times larger

Brief description

The Active Antenna System R&S® HE 016 is a combination of the Active Rod Antenna R&S® HE 010 and two crossed HF dipole antennas. The two horizontal dipole antennas are combined via a 90° coupler to produce an omnidirectional radiation pattern.

The high sensitivity of the antenna system is comparable to that of passive systems although the R&S® HE 016 requires less than one third of the antenna surface of a passive system.



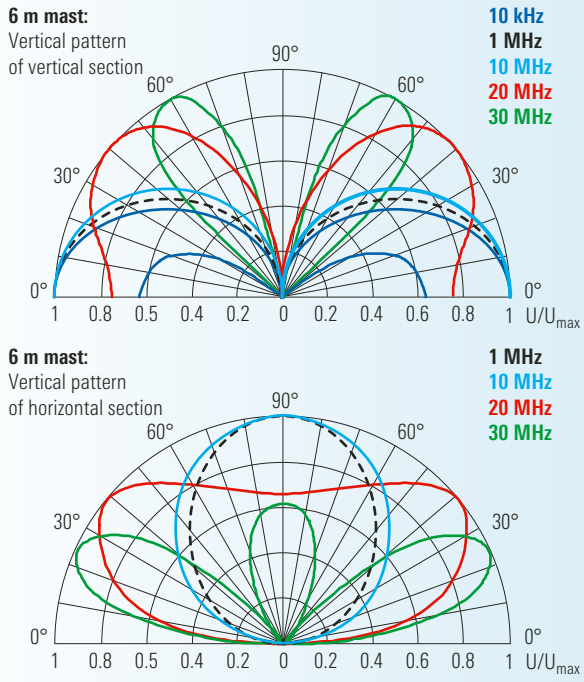
Specifications

Frequency range		Power consumption	
Vertical polarization	10 kHz to 80 MHz	Vertical	approx. 160 mA at 24 V DC
Horizontal polarization	600 kHz to 40 MHz	Horizontal	approx. 340 mA at 24 V DC
Input impedance	50 Ω	Connector	2 × N female
VSWR		MTBF	>25 000 h
10 kHz to 20 kHz	<3	Operating	
20 kHz to 80 MHz	<2	temperature range	-40 °C to +65 °C
IP2	≥50 dBm (up to 30 MHz)	Max. wind speed	188 km/h (without ice deposit)
IP3	≥30 dBm (up to 30 MHz)	Dimensions	
Power supply	21 V to 26 V DC (max. 500 mA)	Height	approx. 1.4 m
		Diameter	approx. 2.85 m
		Weight	approx. 4.5 kg

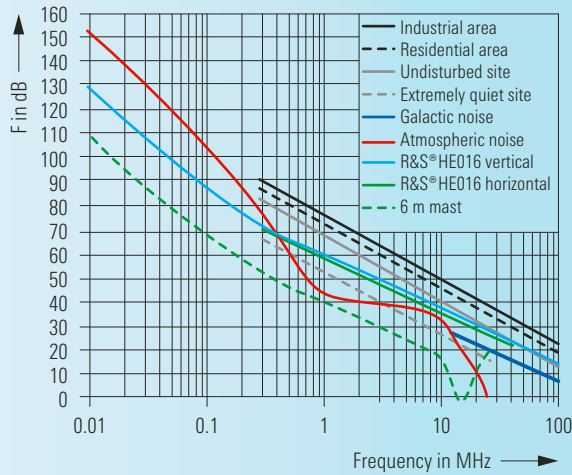
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Ordering information

Active Antenna System	R&S®HE016	4051.8504.02	Recommended extras
			Power Supply Unit
			R&S®IN 115
			4004.1707.02
			Mast, 6 m,
			can be disassembled
			R&S®KM011
			0273.9116.02



Typical directional radiation pattern



Typical inherent noise compared with different standard noise environments

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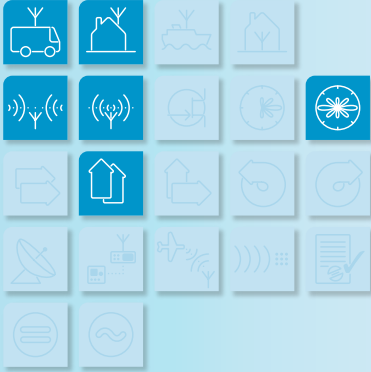
Main Menu

HF Antennas

HF Whip Antenna

R&S® HA 104/512

1



10 kHz to 30 MHz (reception)

1.5 MHz to 30 MHz (transmission)

For ground waves and vertically polarized
low-angle sky waves



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Features

- ◆ Sturdy construction
- ◆ Shock- and vibration-proof
- ◆ Optimal for mobile use
- ◆ Suitable ATU available

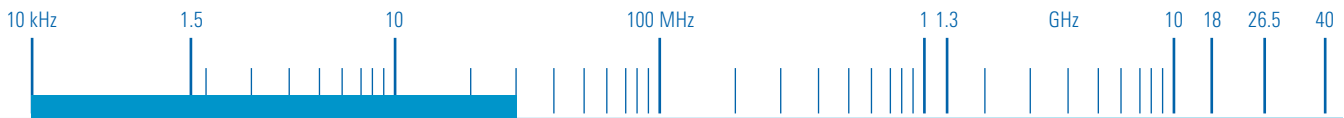
Brief description

The HF Whip Antenna R&S® HA 104/512 is suitable for ground waves and vertically polarized low-angle sky waves.

In conjunction with the Antenna Tuning Unit R&S® FK 2100, it can also be used for transmission.

The sturdy, shock- and vibration-proof construction makes the R&S® HA 104/512 ideal for mobile use.

For use on vehicles, the R&S® HA 104/512 can be tied down when the vehicle is in motion.



Specifications

Frequency range		Operating	
Reception	10 kHz to 30 MHz	temperature range	-30°C to +55°C
Transmission (with ATU)	1.5 MHz to 30 MHz	Max. wind speed	150 km/h (without ice deposit)
Polarization	linear/vertical	Height of antenna	approx. 5 m
Max. input power	150 W CW/150 W PEP	Disassembly possible	yes
Horizontal radiation pattern	omnidirectional	Weight	approx. 4 kg
Connector	clamp		
MTBF	>150 000 h		
MTTR	<20 min		

Ordering information

HF Whip Antenna	R&S®HA 104/512	0156.2039.02	Recommended extras		
			Antenna Tuning Unit	R&S®FK 2100	6046.8948.02

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HF Antennas

HF Receiving Antenna

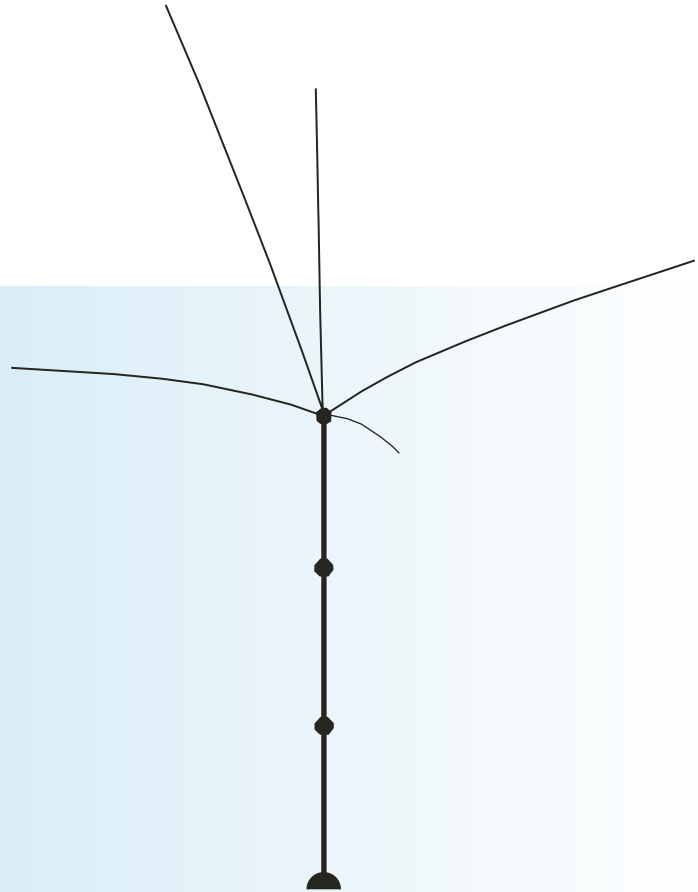
R&S® HA 230/403

1



1.5 MHz to 30 MHz

Also for polarization-diversity reception



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Features

- ◆ Radiators for horizontal reception
- ◆ Radiator for vertical reception
- ◆ Individual radiators decoupled from each other
- ◆ Suitable for polarization-diversity reception

Brief description

The HF Receiving Antenna R&S® HA 230/403 is a versatile shortwave antenna for both horizontally and vertically polarized waves.

The antenna consists of a mast head with a vertical monopole and two horizontal dipoles mounted at a 90° angle. The antenna is installed on a 6 m high mast.

Made up of electrically isolated and decoupled radiators, the antenna is particularly suitable for polarization-diversity reception.



Specifications

Frequency range	1.5 MHz to 30 MHz	Operating temperature range	-30 °C to +50 °C
Polarization	horizontal and vertical	Dimensions	
Input impedance	50 Ω	Length of radiators	approx. 5 m
Connectors	3 × N female	Height	approx. 11 m
MTBF	>100 000 h	Weight (incl. mast)	approx. 85 kg
		Max. wind speed	
		Without ice deposit	160 km/h
		With 30 mm radial ice deposit	135 km/h

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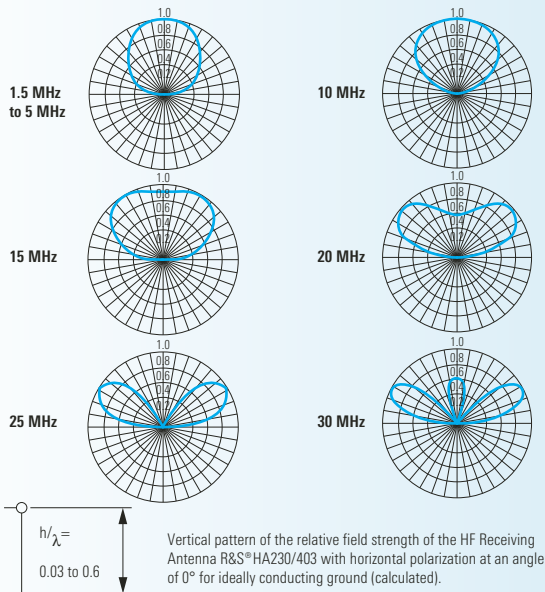
Ordering information

HF Receiving Antenna		
(stationary)	R&S® HA 230/403	0101.1176.02
Consisting of:		
Antenna Head	R&S® HA 230Z	0138.6313.00
Mast, 6 m	R&S® HA 230M	0138.6342.00

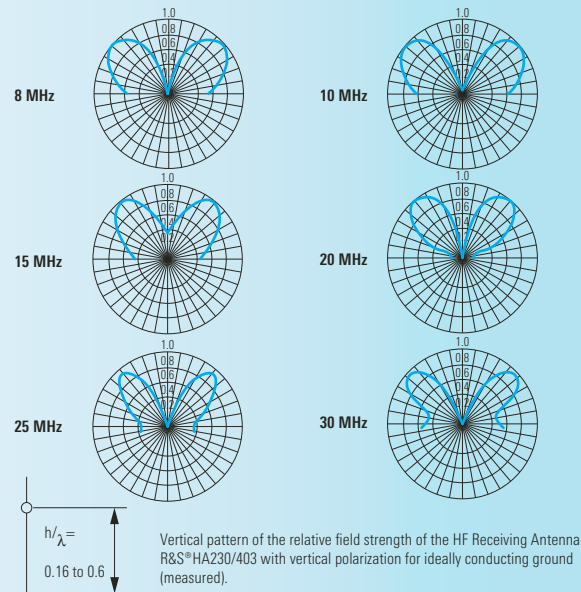
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Typical vertical radiation patterns for horizontal polarization



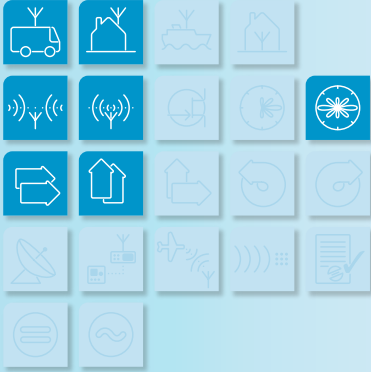
Typical vertical radiation patterns for vertical polarization

HF Antennas

Mobile HF Antenna

R&S® AK 503

1



1.5 MHz to 30 MHz

Highly reliable HF antenna for mobile use



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Features

- ◆ Coverage of all distance ranges
- ◆ No skip zone
- ◆ Omnidirectional coverage with high-angle radiation (NVIS)
- ◆ Omnidirectional coverage up to 1000 km due to null fill-in
- ◆ Installation time approx. 10 min

Brief description

The HF Antenna R&S® AK 503 has been designed especially for mobile use. Short erection and disassembly times and low space requirements for installation and transportation have been combined with good electrical characteristics. Through optimized design with a focus on propagation conditions in the medium-wave and shortwave range, the antenna provides high reliability in radiocommunication.

The automatic Antenna Tuning Unit R&S® FK 2100 ensures optimum antenna tuning in the entire operating frequency range.

Switchover between the three operating modes (optimized for specific frequency and distance ranges) is performed manually at the antenna head.



Specifications

Frequency range	1.5 MHz to 30 MHz	Operating temperature range	-40 °C to +55 °C
Max. input power	150 W CW and PEP	Max. wind speed	120 km/h (without ice deposit)
Operation		Length including guy rope	approx. 35 m
Mode 1	1.5 MHz to 30 MHz	Height	approx. 7 m to 11 m ¹⁾
Mode 2	6 MHz to 26 MHz (optimized)	Weight	approx. 6 kg
Mode 3	for ground-wave communication and distances >2000 km	¹⁾ Maximum configuration.	
Connector	clamp		
MTBF	>100 000 h		
MTTR	<1 h		

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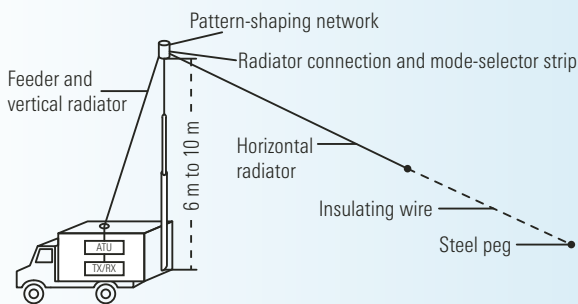
Ordering information

Mobile HF Antenna	R&S®AK 503	0448.3226.02	Recommended extras		
			Antenna Tuning Unit	R&S®FK 2100	6046.8948.02
			Mast, 6 m, can be disassembled	R&S®KM 011	0273.9116.02
			Mast Adapter for R&S®AK 503 on R&S®KM 011	R&S®KM 011Z3	4021.7700.02

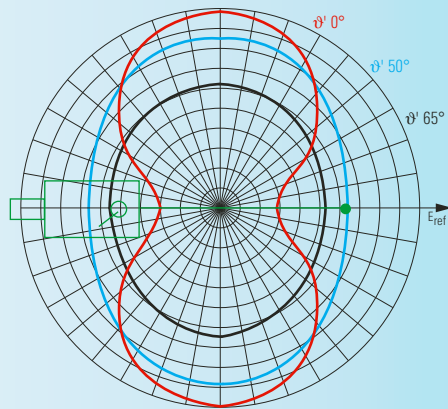
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System overview with description of individual components



Azimuth patterns for various elevation angles θ' with high-angle radiation

HF Antennas

Mobile TFD Broadband Antennas R&S® HD 420/421

1



1.5 MHz to 30 MHz

Sky wave transmission over short, medium
and global distances

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Features

- ◆ Coverage of any distance
- ◆ Omnidirectional coverage through high-angle radiation (NVIS)
- ◆ Broadband operation
- ◆ No tuning unit required
- ◆ Quick assembly/disassembly (approx. 30 min)
- ◆ Suitable for stationary use
- ◆ Extremely favorable price

Brief description

The Mobile TFD (terminated folded dipole) Broadband Antennas R&S® HD 420 and R&S® HD 421 operate as loop antennas on which travelling waves are generated by means of a termination. A tuning unit is not required to attain the specified VSWR.

Signals are fed in via a transformer at the highest point in the middle of the antenna. Corresponding to its geometry, the TFD antennas radiate horizontally polarized waves and are thus suitable for the transmission of sky waves over any distance.

Since the antennas are configured as an inverted V, only one antenna support is needed. Where space is limited, the length of the antenna can be considerably reduced through the use of two lateral 4 m masts.

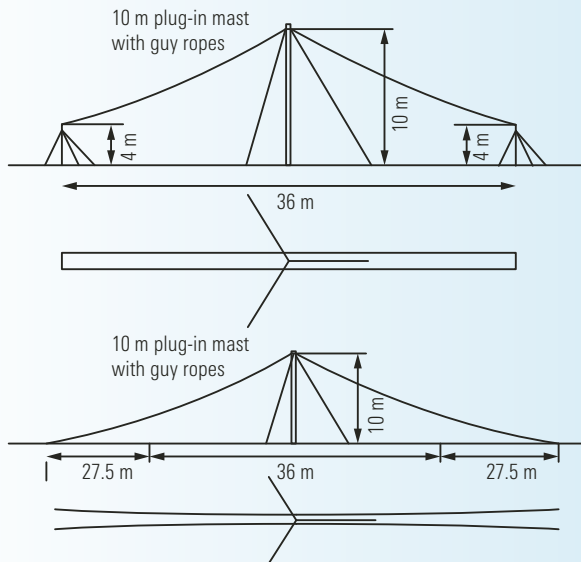


Specifications

Frequency range	1.5 MHz to 30 MHz	Mechanical interface	for R&S®KM 420A1 and 10 m tower from Geroh
Polarization	linear/horizontal	Max. wind speed	180 km/h (without ice deposit), with R&S®KM 420A1 and 2 × R&S®KM 420A2
Input impedance	50 Ω	Dimensions	
VSWR	≤3	Length	approx. 30 m (with 2 × R&S®KM 420A2) approx. 90 m
Max. input power		Recommended height of feed point	approx. 10 m
R&S®HD 420	400 W	Weight	
R&S®HD 421	1000 W	R&S®HD 420	approx. 13 kg
Connector	N female	R&S®HD 421	approx. 17 kg
MTBF	>100 000 h		
Operating temperature range	-40 °C to +55 °C		

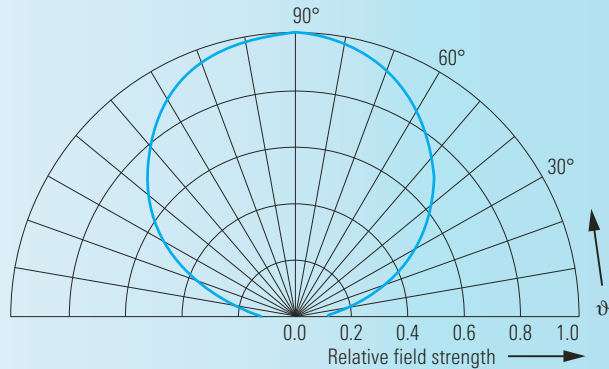
Ordering information

Mobile TFD Broadband Antenna		Recommended extras	
R&S®HD 420	4053.2503.02	Tiltable Mast, 10 m	R&S®KM 420A1 4054.1000.02
R&S®HD 421	4053.3500.02	Tiltable Mast, 4 m	R&S®KM 420A2 4054.1400.02 (two pieces required)

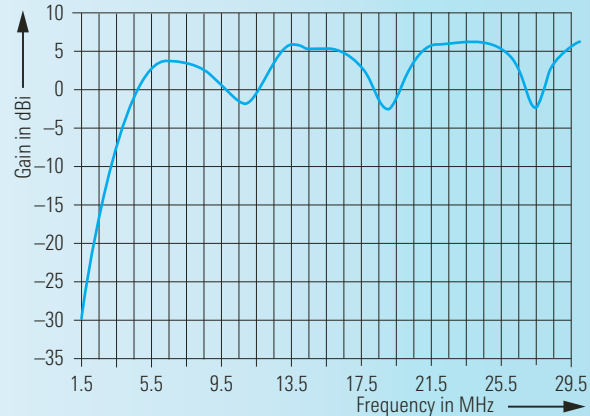


Installation options with guy ropes (bottom) and auxiliary masts for reducing the antenna length (top) (dimensions not to scale)

Typical elevation diagram for horizontal polarization



Coated wires, mast 10 m, ideal conductive ground

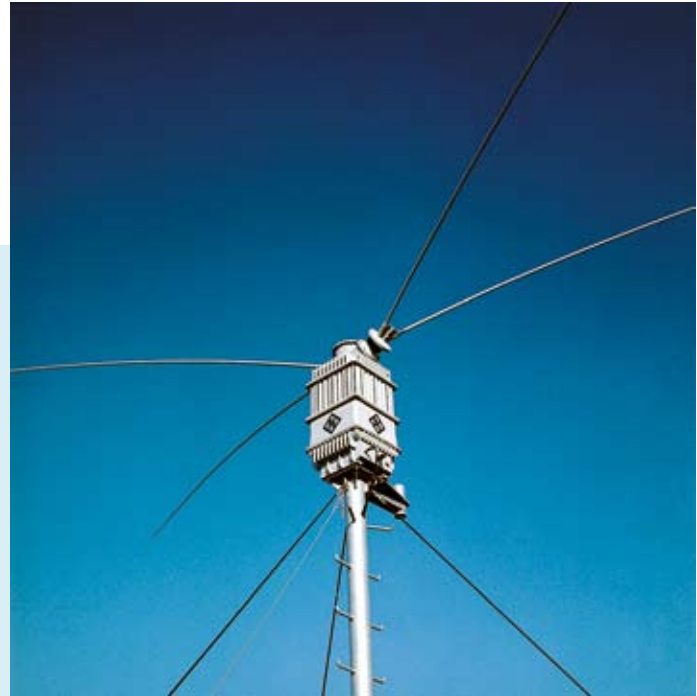


Typical gain

HF Antennas

1 kW HF Dipole R&S®HX 002

1



2 MHz to 30 MHz

HF dipole with integrated antenna tuning unit for all distance ranges

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Features

- ◆ Omnidirectional coverage with high-angle radiation (NVIS)
- ◆ No skip zone
- ◆ Automatic adaptive operation
- ◆ Silent tuning possible
- ◆ Can be set up close to neighboring antennas

Brief description

The HF Dipole R&S®HX 002 ensures optimum coverage of all distance ranges and can be used for transmission and reception. The antenna can be directly connected to the HF Transceivers R&S®XK 2500 and R&S®XK 2900 (power supply and control signals via control cable of transceiver). For operation with other transmitters, the Junction Unit R&S®GX 007 is available to provide power supply and antenna control.

Taking into account the ambient conditions, the fully automatic ATU integrated in the antenna ensures optimum matching to the transceiver. This allows antennas to be set up close to neighboring antenna systems and on difficult terrain (e.g. built-on roofs). With the aid of an optional module, the lower frequency limit of 2 MHz can be reduced to 1.6 MHz.

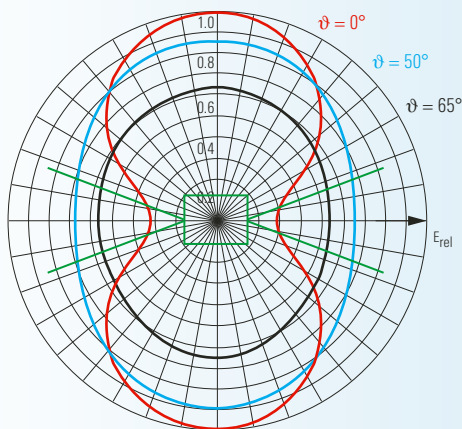


Specifications

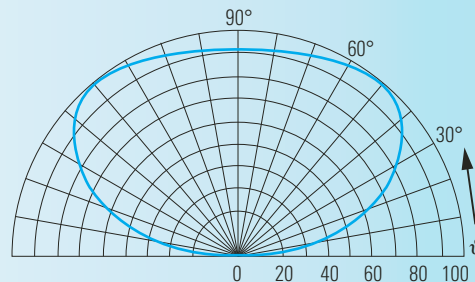
Frequency range	2 MHz to 30 MHz	Power supply	21 V to 32 V DC (max. 6 A)
With frequency extension	1.6 MHz to 30 MHz	Average	28 V DC (2.5 A)
Polarization	linear/horizontal	Power consumption	max. 165 VA
Input impedance	50 Ω	RF connector	N female
VSWR	<1.5 (typ. <1.1)	Control connector	26-contact, round, male
Max. input power	1.15 kW CW/1.15 kW PEP	MTBF	>6500 h
Tuning time		MTTR	<0.9 h
Without retuning	70 ms to 500 ms	Operating temperature range	-30 °C to +55 °C
With retuning	typ. 2 s	Max. wind speed	
Initial tuning	typ. <15 s	Without ice deposit	150 km/h
Silent tuning	<60 ms/typ. 56 ms	With 30 mm radial ice deposit	130 km/h
Tuning power	50 W to 300 W	Dimensions	
Efficiency		Length × width (dipole)	approx. 10.3 m × 3.6 m
At 2 MHz	>20 %	Height of ATU	approx. 1.10 m
From 5 MHz to 30 MHz	>75 %	Weight	approx. 103 kg
Gain	-3.3 dBi to 7.8 dBi (typ.)		

Ordering information

1 kW HF Dipole			
(with ATU)	R&S®HX002	0682.3010.24	
Recommended extras			
Junction Unit	R&S®GX007	0682.6010.02	
Frequency Extension, 1.6 MHz to 2 MHz	R&S®HX002F	4017.9053.02	
Control Cable between R&S®GX007 and R&S®HX002/R&S®FK859	R&S®FK859K1		
Length 40 m		0669.8112.40	
Length 60 m		0669.8112.60	
Length 80 m		0669.8112.80	
Tilttable Mast, 5 m, for roof mounting	R&S®HX002Z1	0506.4425.02	
Auxiliary Mast for R&S®HX002Z1	R&S®HX002ZZ	0682.6961.02	
Lattice Mast, 10 m	R&S®KM451B1	4028.3351.02	
Lattice Mast, 15 m	R&S®KM451B2	4028.3400.02	
Mast Adapter for 10 m or 15 m mast	R&S®KM451Z4	4032.2904.02	



Typical horizontal radiation pattern for various elevation angles ϑ



Typical vertical radiation pattern (12 m above an ideal conductive plane)

HF Antennas

150 W HF Dipole R&S®HX 002A1

1



1.5 MHz to 30 MHz

HF dipole with integrated antenna tuning unit for all distance ranges

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- ◆ Omnidirectional coverage with high-angle radiation (NVIS)
- ◆ No skip zone
- ◆ Automatic adaptive operation
- ◆ Silent tuning
- ◆ No control line required
- ◆ Can be set up close to neighboring antennas

Brief description

The HF Dipole R&S®HX 002A1 is highly suitable for setting up radio links over any distance range. The antenna design ensures high transmission reliability over short and medium distances. The antenna can easily be integrated in existing systems since no control lines are required. All control signals and the power for the ATU are fed via the coaxial cable. The HF Dipole R&S®HX 002A1 can be directly connected to the HF Transceiver R&S®XK 2100. For operation with other transmitters, the Junction Unit R&S®GX 002A1 is available to provide power supply and antenna control.

The automatic adaptive behaviour of the integrated antenna tuning unit allows antennas to be set up close to neighboring antenna systems and on difficult terrain (e.g. built-on roofs).



Specifications

Frequency range	1.5 MHz to 30 MHz	Power supply (via R&S®GX002A1)	
Polarization	linear/horizontal	AC supply	100/120/230 V AC ±10%, 47 Hz to 63 Hz (100 VA)
Input impedance	50 Ω	Battery	22 V to 32 V DC (typ. 2.5 A at 24 V DC)
VSWR	<1.5 (typ. <1.3)	Connector	N female
Max. input power	100 W CW/150 W PEP	MTBF	>8000 h
Tuning time		Operating temperature range	-25 °C to +55 °C
Without retuning	typ. 200 ms	Max. wind speed	
Initial tuning	≤6 s (typ. 3 s)	Without ice deposit	188 km/h
Silent tuning	<30 ms	With 30 mm radial ice deposit	130 km/h
Tuning power		Dimensions	
With transmitters from		Length × width (dipole)	approx. 10.7 m × 4.4 m
Rohde & Schwarz	30 W to 100 W	Height of ATU	approx. 0.42 m
With R&S®GX002A1	50 W to 100 W	Weight	approx. 37.5 kg
Without R&S®GX002A1	30 W to 50 W		
Efficiency	approx. 25% to 98%		
Gain (6 m above perfectly conducting ground)	-12 dBi to 8 dBi (typ.)		

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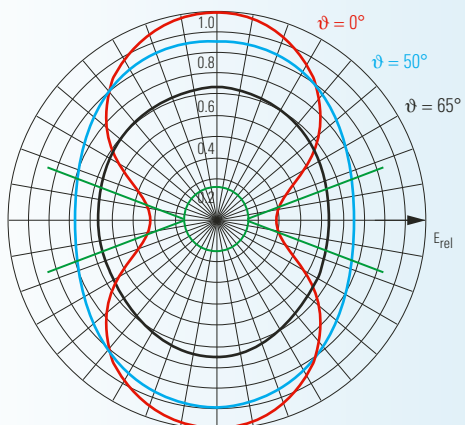
Ordering information

150 W HF Dipole	R&S®HX002A1	4031.8009.02	Tiltable Mast, 5 m, for roof mounting	R&S®KM002A1	4035.7359.02
Recommended extras			Lattice Mast, 10 m	R&S®KM451B1	4028.3351.02
Junction Unit	R&S®GX002A1	4031.9005.02	Lattice Mast, 15 m	R&S®KM451B2	4028.3400.02
Cable Set for R&S®XK852 and R&S®GX002A1	R&S®GX002K1	4031.8909.03	Mast Adapter for 10 m or 15 m mast	R&S®KM451Z4	4032.2904.02
			Mast Adapter on R&S®KM451Z4	R&S®KM451Z5	4039.8308.02

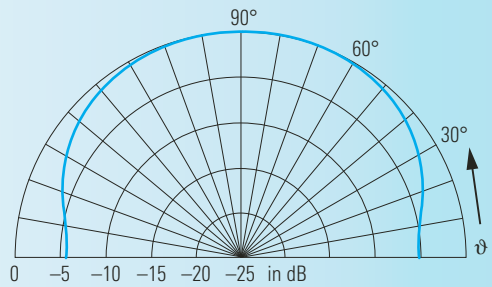
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Typical horizontal radiation pattern for various elevation angles ϑ



Typical vertical radiation pattern (relative field strength) on a 5 m mast above a large roof area

HF Antennas

150 W HF Dipole R&S®HX 002M1

1



1.5 MHz to 30 MHz

**With integrated antenna tuning unit for
all distance ranges – optimized for use on
ships**

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- ◆ Omnidirectional coverage through high-angle radiation (NVIS)
- ◆ No skip zone
- ◆ Automatic adaptive operation
- ◆ Silent tuning
- ◆ No control line required
- ◆ Can be set up close to neighboring antennas
- ◆ Optimized for use on ships

Brief description

The HF Dipole R&S®HX 002M1 provides good coverage over all distances. It is optimized for omnidirectional coverage and ensures high transmission reliability over short and medium distances. The antenna can easily be integrated into existing systems since no separate control lines are required. All control signals and the power for the ATU are fed via the coaxial cable. The HF Dipole R&S®HX 002M1 can be directly connected to the HF Transceiver R&S®XK 2100. For operation with other transmitters, the Junction Unit R&S®GX 002A1 is available to provide power supply and antenna control.

The antenna with its small size and improved environmental data is particularly suitable for use on ships.



Specifications

Frequency range	1.5 MHz to 30 MHz	Power supply	21 V to 31 V DC (typ. 1 A)
Polarization	linear/horizontal	Connector	N female
Input impedance	50 Ω	MTBF	>12000 h
VSWR	<1.5 (typ. <1.3)	Operating temperature range	-30 °C to +55 °C
Max. input power	100 W CW/150 W PEP	Max. wind speed	
Tuning time		Without ice deposit	200 km/h
Without retuning	typ. 200 ms	With 20 mm radial ice deposit	120 km/h
Initial tuning	≤6 s (typ. 3 s)	Length of dipole	approx. 5.2 m
Silent tuning	<30 ms	Weight	approx. 34 kg
Tuning power		Protection class	IP 56
With R&S®GX002A1	50 W to 100 W		
Without R&S®GX002A1	30 W to 50 W		
Efficiency			
At 1.5 MHz to 7 MHz	approx. 70% to 13%		
At 7 MHz to 30 MHz	approx. 13% to 99%		

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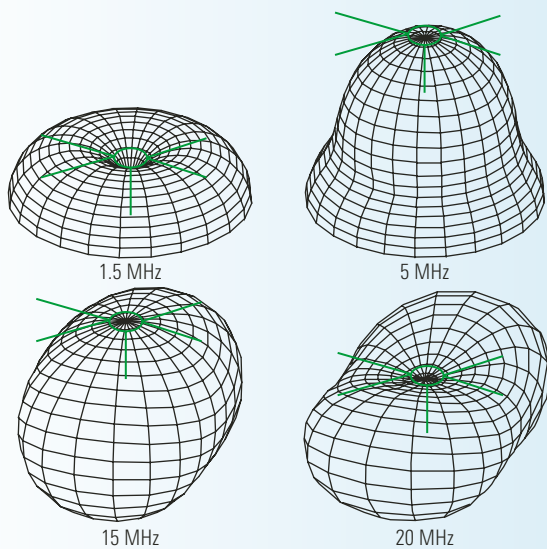
Ordering information

150 W HF Dipole	R&S®HX002M1	4021.6003.02	Recommended extras		
			Junction Unit	R&S®GX002A1	4031.9005.02

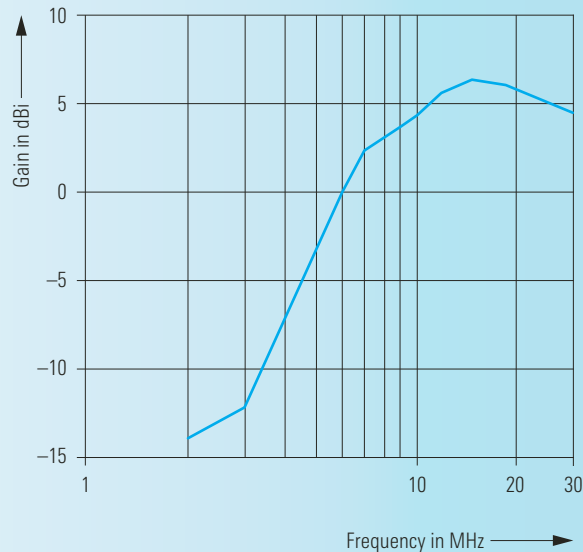
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Typical three-dimensional radiation patterns



Typical gain on a 6 m mast above perfectly conducting ground

HF Antennas

Log-Periodic HF Antenna R&S® HL 451

1



2 MHz to 30 MHz

Transmission and reception of horizontally polarized waves over medium and long distances



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Features

- ◆ Reception from 2 MHz
- ◆ Transmission from 5 MHz
- ◆ Unshortened halfwave elements for high gain despite extremely small dimensions
- ◆ Easy and quick assembly
- ◆ Little maintenance required
- ◆ Suitable for roof mounting

Brief description

The compact, rotatable HF Antenna R&S® HL 451 can be used for transmission and reception of horizontally polarized waves.

Due to a transmission frequency range from 5 MHz to 30 MHz, the antenna is particularly suitable for communication over medium and long distances. Reception is possible from 2 MHz and thus covers all distances.

The antenna has been optimized for small size. Despite the low limit of its frequency range, the R&S® HL 451 is no larger than any comparable antenna covering a range from only 6.2 MHz to 30 MHz.



Specifications

Frequency range		Max. wind speed	180 km/h (without ice deposit)
Reception	2 MHz to 30 MHz	Connector	N male
Transmission	5 MHz to 30 MHz	MTBF	>100 000 h
Polarization	linear/horizontal	Operating	
Input impedance	50 Ω	temperature range	-30 °C to +50 °C
VSWR	≤2	Dimensions of antenna array	
Max. input power	1 kW CW/2 kW PEP	Length	approx. 15 m
Gain (on 15 m mast)	6 dBi to 12.5 dBi	Width	approx. 16 m
		Weight of antenna array	approx. 260 kg

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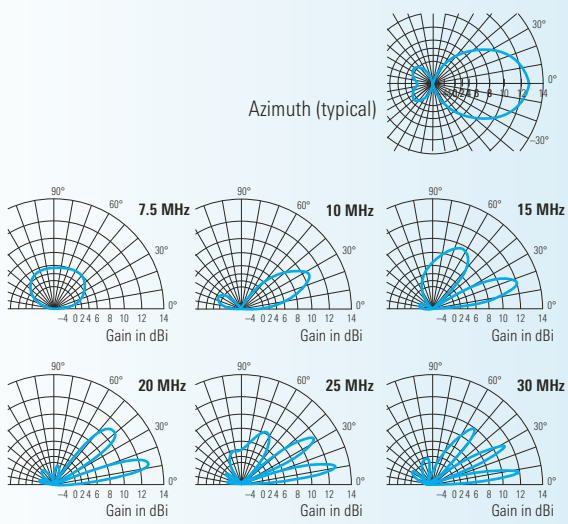
Ordering information

Log-Periodic HF Antenna	R&S®HL 451	0733.8507.02	Antenna Rotator	R&S®RD 130	4059.8503.02
Recommended extras			Rotary Joint/Adaption Set	R&S®RD 008Z1	0720.6400.02
Lattice Mast,			Control Unit	R&S®GB 130	4059.8755.02
15 m (standard)	R&S®KM 451B2	4028.3400.02	Set of Cables		
Lattice Mast,			(R&S®GB 130 ↔ R&S®RD 130,		
10 m (for roof mounting)	R&S®KM 451B1	4028.3351.02	lengths: 50/80/120/200 m)	R&S®GK 130	4059.8855.0x
Hazard Light	R&S®KM 451F1	4028.3500.02			(x = 2/3/4/5)
			Other configurations on request.		

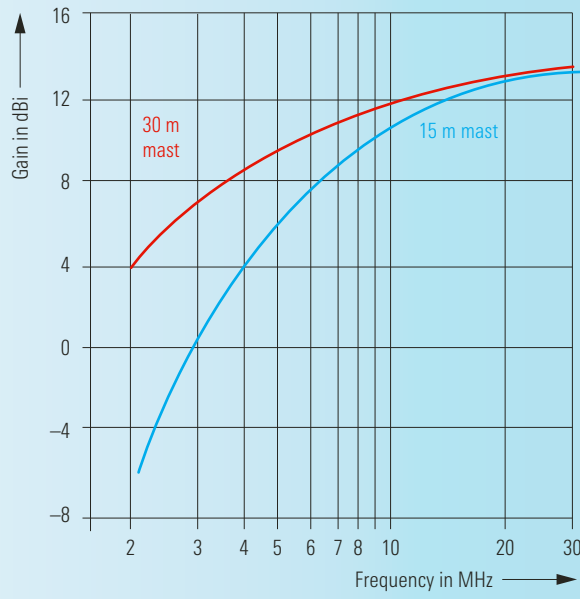
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Typical radiation patterns on a 15 m mast



Typical gain

HF Antennas

Log-Periodic HF Antenna

R&S® HL 471

1



3 MHz to 30 MHz

Transmission and reception of horizontally polarized waves over long distances

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Features

- ◆ Reception from 3 MHz
- ◆ Transmission from 7 MHz
- ◆ Extremely small dimensions
- ◆ Low weight
- ◆ Easy and quick assembly
- ◆ Little maintenance required
- ◆ Suitable for roof mounting

Brief description

The compact, rotatable HF Antenna R&S® HL 471 can be used for transmission and reception of horizontally polarized waves.

Due to a transmission frequency range from 7 MHz to 30 MHz, the antenna is particularly suitable for communication over long distances. Reception is possible from 3 MHz so that all distances can be covered.

The antenna has been optimized for small dimensions, low weight and little maintenance.

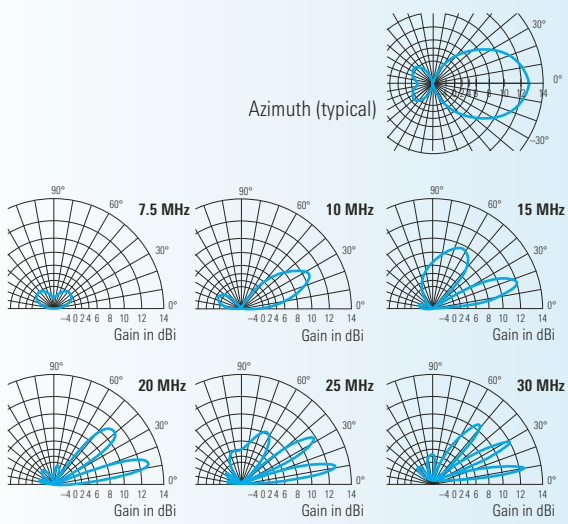


Specifications

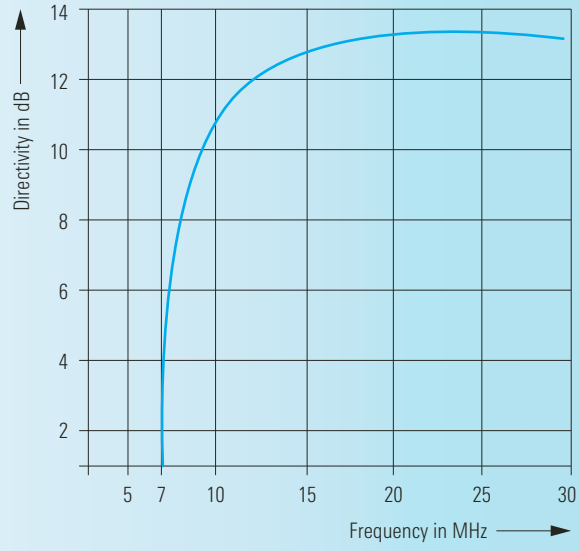
Frequency range		Max. wind speed	180 km/h (without ice deposit)
Reception	3 MHz to 30 MHz	Connector	N male
Transmission	7 MHz to 30 MHz	MTBF	>100 000 h
Polarization	linear/horizontal	Operating	
Input impedance	50 Ω	temperature range	-30 °C to +50 °C
VSWR	≤2	Dimensions of antenna array	
Max. input power	1 kW CW/2 kW PEP	Length	approx. 8.8 m
Gain (on a 15 m mast)		Width	approx. 11 m
7 MHz to 8 MHz	0 dBi to 6 dBi	Weight of antenna array	approx. 100 kg
8 MHz to 30 MHz	6 dBi to 12.5 dBi		

Ordering information

Log-Periodic HF Antenna	R&S®HL 471	0755.3008.02	Antenna Rotator	R&S®RD 130	4059.8503.02
Recommended extras			Rotary Joint/Adaption Set	R&S®RD 008Z1	0720.6400.02
Lattice Mast,			Control Unit	R&S®GB 130	4059.8755.02
15 m (standard)	R&S®KM 451B2	4028.3400.02	Set of Cables		
Lattice Mast,			(R&S®GB 130 ↔ R&S®RD 130,		
10 m (for roof mounting)	R&S®KM 451B1	4028.3351.02	lengths: 50/80/120/200 m)	R&S®GK 130	4059.8855.0x
Hazard Light	R&S®KM 451F1	4028.3500.02			(x = 2/3/4/5)
			Other configurations on request.		



Typical radiation patterns on a 15 m mast



Typical directivity on a 15 m mast

HF Antennas

Log-Periodic HF Antenna

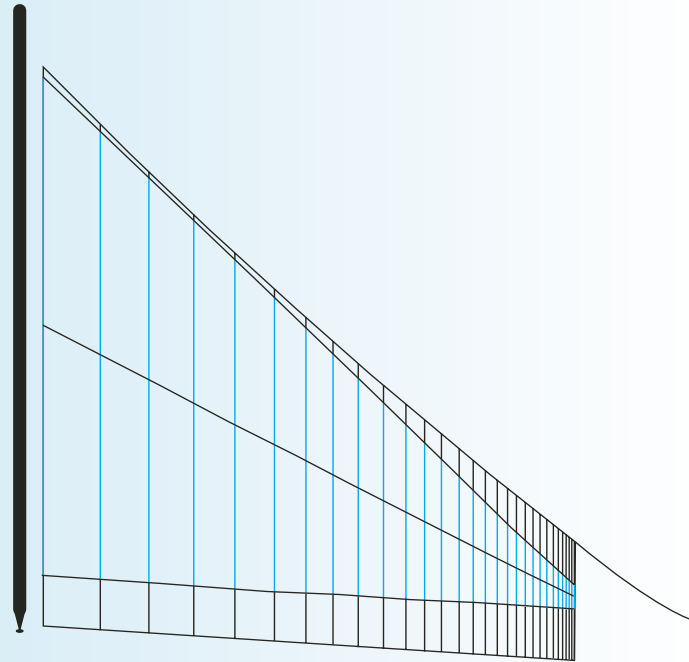
R&S® HL 210A3

1



1.5 MHz to 30 MHz

For high-sensitivity radiomonitoring
through reception of ground waves and
vertically polarized sky waves



Features

- ◆ Extremely wide frequency range
- ◆ Very high efficiency through dipole structure
- ◆ Reception of even very weak signals
- ◆ High directivity
- ◆ Small antenna size for 1.5 MHz to 30 MHz range
- ◆ No ground net required
- ◆ Little maintenance required

Brief description

The R&S® HL 210A3 is suitable for the reception of ground waves as well as vertically polarized sky waves and allows even very weak signals to be detected.

According to the physical characteristics of vertically polarized waves, maximum sensitivity is obtained at low and medium elevation angles. The radiation pattern of the R&S® HL 210A3 is optimally suited for this purpose. The azimuth range of the R&S® HL 210A3 of about 120° can be enhanced up to 360° by adding two further antennas.

For additional reception of horizontally polarized waves and high-angle radiation (predominantly horizontally polarized), the antenna can be combined with the Log-Periodic HF Antenna R&S® HL 410A3.

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Specifications

Frequency range	1.5 MHz to 30 MHz	Max. wind speed	Survival (operational)
Polarization	linear/vertical	with reduced data	225 km/h (140 mph)
Input impedance	50 Ω	Operational with	specified data
VSWR		1.5 MHz to 2 MHz	<6
		2 MHz to 30 MHz	<2.5, typ. <2.0
Directivity		Permissible wind speed	including ice deposit
1.5 MHz to 2 MHz	8 dBi to 10.5 dBi		135 km/h (84 mph)
2 MHz to 30 MHz	10.5 dBi to 12 dBi	Permissible ice deposit	
Efficiency	>90 %	20 mm radial	on wires with diameter >7 mm
Connector	N female	2 × diameter	on wires with diameter <7 mm
MTBF	≥100 000 h	Dimensions	
Operating temperature range	-40 °C to +70 °C	Length of antenna array	approx. 97 m
		Height of supporting mast	approx. 90 m

1

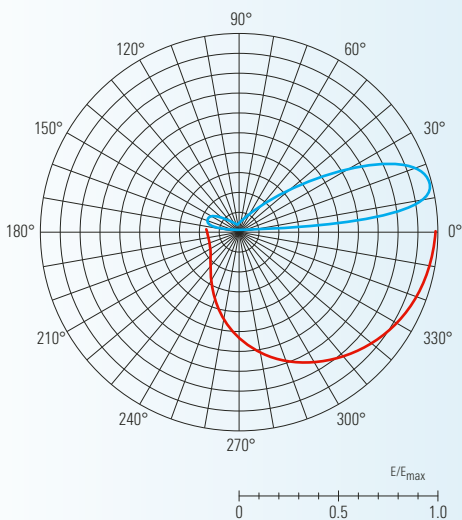
Ordering information

Log-Periodic HF Antenna R&S® HL 210A3 on request

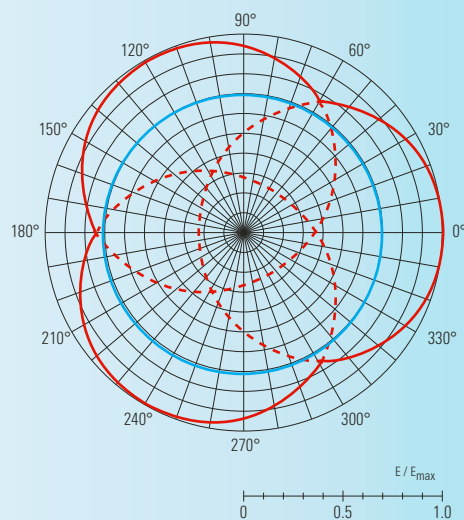
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Typical vertical (blue) or horizontal (red, only half shown) radiation pattern



Typical horizontal omnidirectional reception characteristic (red = single patterns, blue = 3 dB reference) of a system comprising three R&S® HL 210A3

HF Antennas

Log-Periodic HF Antenna

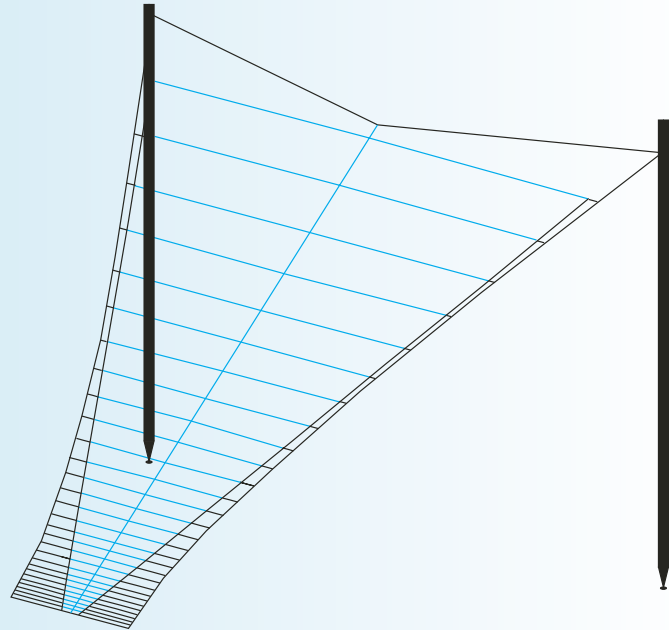
R&S® HL 410A3

1



1.5 MHz to 30 MHz

For radiomonitoring over short, medium and global distances with extremely high sensitivity



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Features

- ◆ Extremely wide frequency range
- ◆ Very high efficiency through dipole structure
- ◆ Reception of even very weak signals
- ◆ High directivity
- ◆ No skip zone
- ◆ Small antenna size for 1.5 MHz to 30 MHz range
- ◆ Little maintenance required

Brief description

The R&S® HL 410A3 is suitable for the reception of horizontally polarized waves and allows even very weak signals to be detected.

The vertical pattern is shaped taking into account the transmission characteristics in the ionosphere. In conjunction with the extremely wide frequency range from 1.5 MHz to 30 MHz, the antenna thus allows reception over short, medium and global distances.

The half-power beamwidth of the horizontal radiation pattern of about 70° can be enhanced up to 360° by adding five further antennas. For the reception of vertically polarized waves, the antenna can be combined with the Log-Periodic HF Antenna R&S® HL 210A3.



Specifications

Frequency range	1.5 MHz to 30 MHz	Max. wind speed	Survival (operational)
Polarization	linear/vertical	with reduced data	225 km/h (140 mph)
Input impedance	50 Ω	Operational with	specified data
VSWR		1.5 MHz to 2 MHz	<6
		2 MHz to 30 MHz	<2.5, typ. <2.0
Directivity		Permissible wind speed	including ice deposit
1.5 MHz	7.5 dBi		135 km/h (84 mph)
1.6 MHz to 30 MHz	8 dBi to 12 dBi	Permissible ice deposit	
Efficiency	>90 %	20 mm radial	on wires with diameter >7 mm
Connector	N female	2 \times diameter	on wires with diameter <7 mm
MTBF	\geq 100 000 h	Dimensions	
Operating temperature range	-40 $^{\circ}$ C to +70 $^{\circ}$ C	Length of antenna array	approx. 94 m
		Width of antenna array	approx. 88 m
		Height of supporting mast	approx. 66 m

1

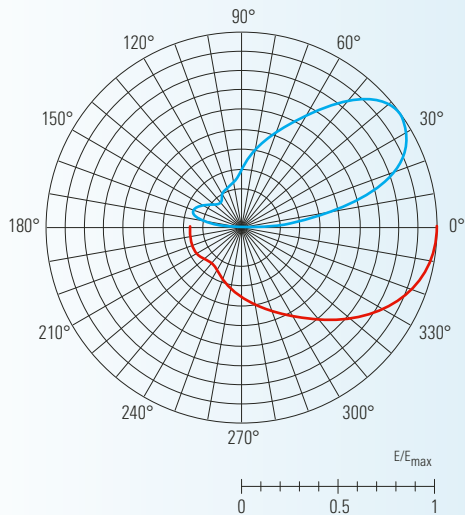
Ordering information

Log-Periodic HF Antenna R&S[®]HL410A3 on request

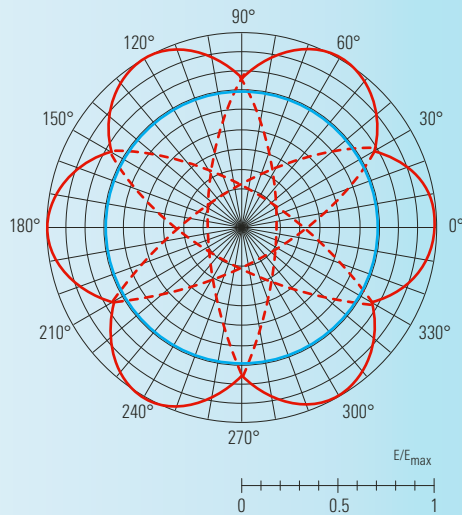
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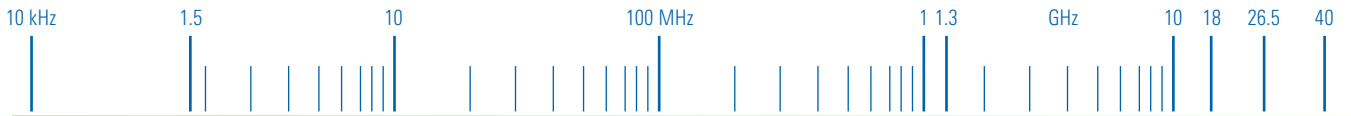
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Typical vertical (blue) or horizontal (red, only half shown) radiation pattern



Typical horizontal omnidirectional reception characteristic (red = single patterns, blue = 3 dB reference) of a system with six R&S[®]HL410A3



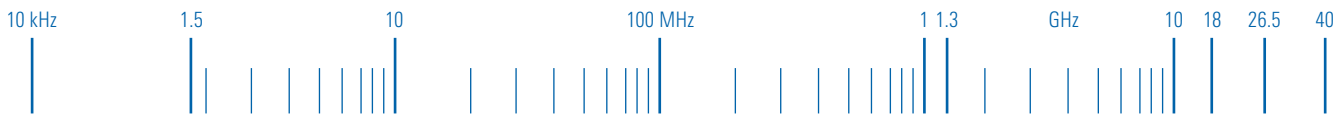
2 VHF/UHF Antennas

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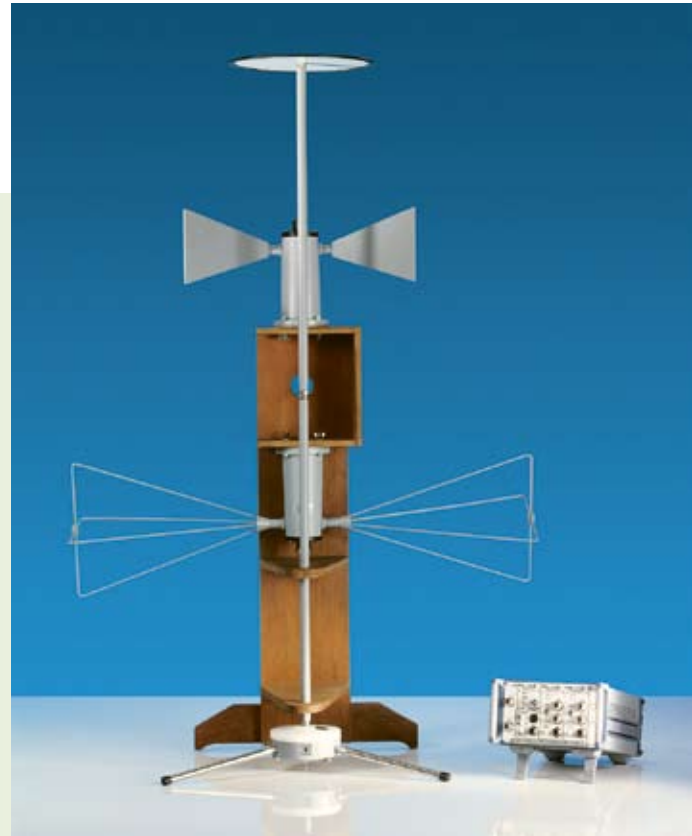
Low-Noise Active Antenna System R&S® AM 524

2



100 Hz to 1000 MHz

For measuring low-level signals in
anechoic chambers



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Features

- ◆ Extremely high sensitivity
- ◆ Excellent large-signal characteristics
- ◆ Wide frequency range
- ◆ Especially suitable for TEMPEST measurements
- ◆ Individual calibration in line with ANSI C63.5

Brief description

The Active Antenna System R&S® AM 524 has been designed for measuring low-level signals in anechoic chambers. Criteria for dimensioning such antennas are different from those of active antennas used outside shielded rooms.

Essential parameters for antennas used in anechoic chambers are for instance low dimensions, high large-signal immunity and maximum sensitivity.

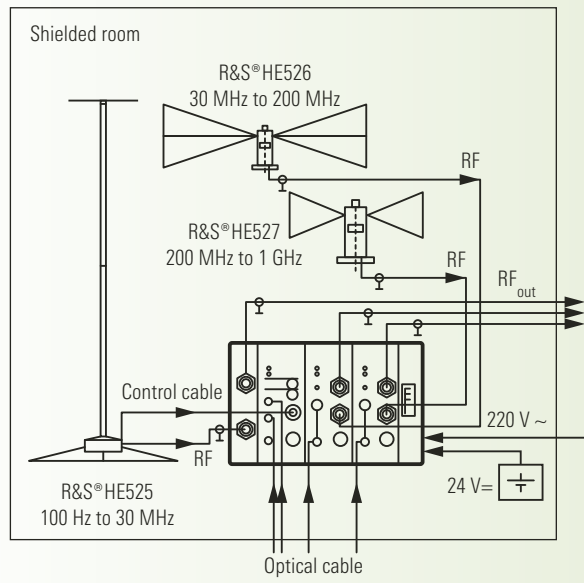
Specifications

Frequency range (in three subranges)	100 Hz to 1 GHz	Power supply	100/120/220/230/240 V ±10%, 47 Hz to 63 Hz
Input impedance	50 Ω	Connectors	N female
Antenna factor ¹⁾		MTBF	>15 000 h
100 Hz to 30 MHz	0 dB	Operating	
100 MHz	-10 dB	temperature range	-10 °C to +55 °C
1 GHz	typ. 19 dB	Dimensions (width × height), weight	
Field sensitivity (Δf = 1 Hz, S/N = 0 dB)		R&S® HE525	approx. 0.3 m × 1.5 m, approx. 5 kg
100 Hz	typ. 0 dB(μV/m)	R&S® HE526	approx. 1 m × 0.3 m, approx. 1.7 kg
100 kHz	typ. -43 dB(μV/m)	R&S® HE527	approx. 0.5 m × 0.25 m, approx. 1.6 kg
30 MHz	typ. -51 dB(μV/m)		
100 MHz	typ. -54 dB(μV/m)		
1 GHz	typ. -37 dB(μV/m)		

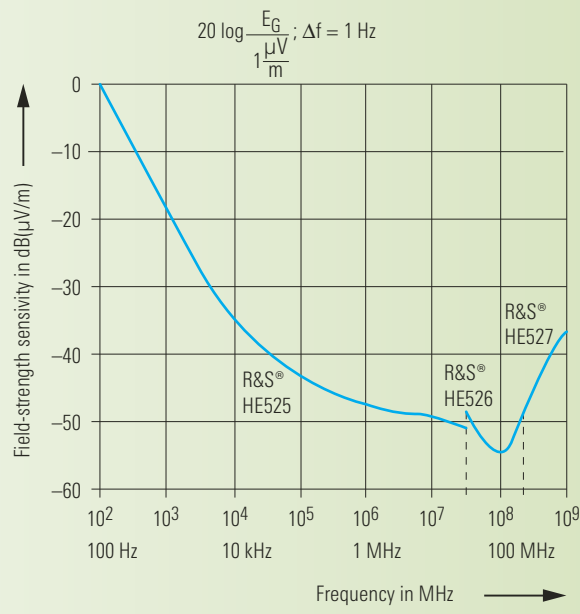
¹⁾ Without attenuator or amplifier.

Ordering information

Low-Noise Active Antenna System	R&S® AM524	4015.7001.02	Recommended extras		
			Control Unit	R&S® GS525	4035.5004.02
			Optical Cable Set	R&S® GS525K1	4035.5604.02



Overview of system components



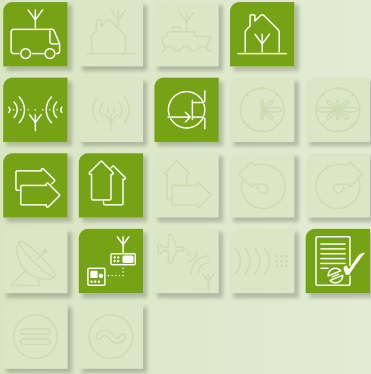
Typical field-strength sensitivity

VHF/UHF Antennas

Omnidirectional Antenna

R&S® HF 214

2



500 MHz to 1300 MHz

Reception of horizontally polarized waves



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Features

- ◆ Broadband frequency range
- ◆ Easy integration into broadband antenna systems due to cable feedthrough
- ◆ Small size
- ◆ Rugged design
- ◆ Suitable for mobile use
- ◆ Ideal for detection and monitoring of horizontally polarized signals

Brief description

The Omnidirectional Antenna R&S® HF 214 has been designed for the reception of horizontally polarized waves. It is ideal for broadband detection and monitoring of RF signals in the frequency range 500 MHz to 1300 MHz.

With a diameter of only 0.31 m and a height of 0.49 m, the compact broadband antenna is particularly suitable for applications where the available space is limited.

A compact omnidirectional receiving system for horizontally and vertically polarized waves in the frequency range 20 MHz to 3000 MHz is obtained when combining the R&S® HF 214 with the Antennas R&S® HE 309, R&S® HE 314A1 and R&S® HF 902.



Specifications

Frequency range	500 MHz to 1.3 GHz	Operating temperature range	-40 °C to +65 °C
Polarization	linear/horizontal	Max. wind speed	
Input impedance	50 Ω	Without ice deposit	188 km/h
VSWR	typ. <3	With 30 mm radial ice deposit	130 km/h
Gain	see trace below	Dimensions	
Uncircularity of horizontal radiation pattern	±3 dB	Diameter	approx. 310 mm
Connector	N female	Height	approx. 490 mm
MTBF	>50 000 h	Weight	approx. 8 kg

2

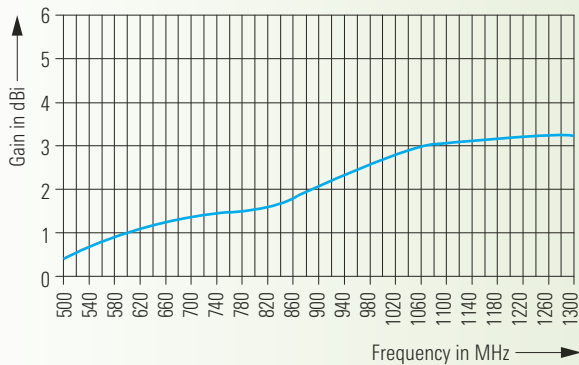
Ordering information

Omnidirectional Antenna R&S®HF214	4042.7009.02	Recommended extras	
		Active Vertical Dipole	R&S®HE309 4027.5009.02
		Active Omnidirectional Antenna	R&S®HE314A1 4027.6505.02
		Omnidirectional Antenna	R&S®HF902 4042.8005.02

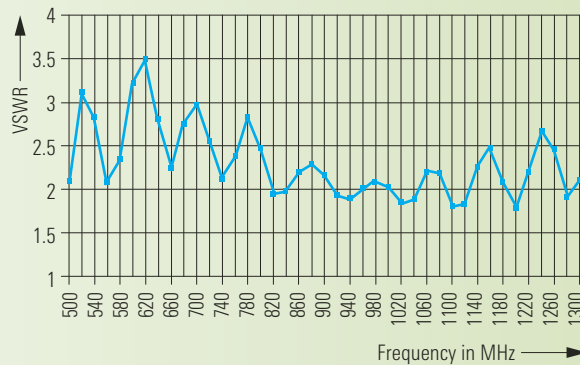
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Typical gain



Typical VSWR

VHF/UHF Antennas

Omnidirectional Antenna R&S® HF 902

2



1 GHz to 3 GHz

Reception of vertically and horizontally polarized waves

Features

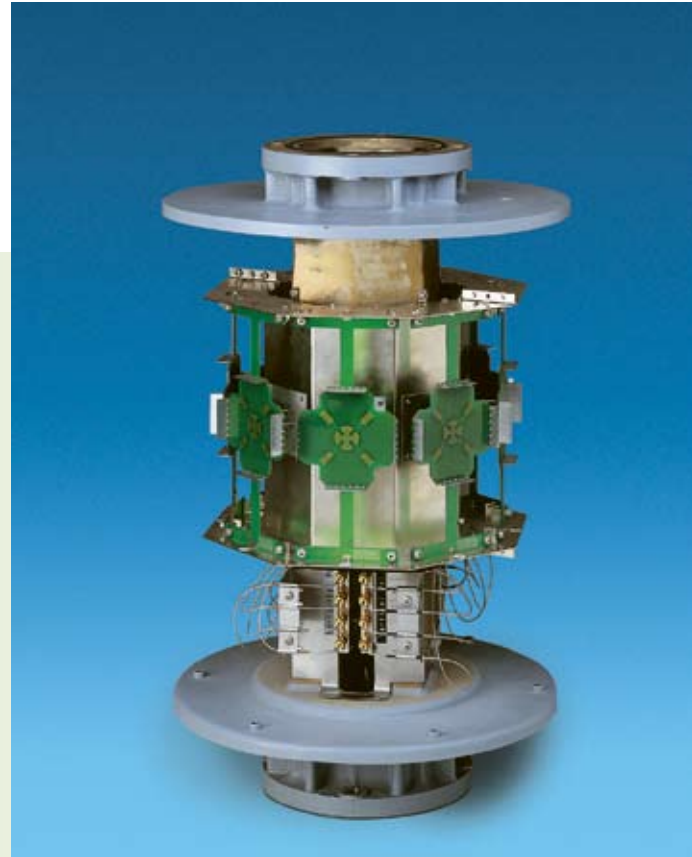
- ◆ Broadband frequency range
- ◆ Easy integration into broadband antenna systems due to cable feedthrough
- ◆ Small size
- ◆ Rugged design
- ◆ Suitable for mobile use
- ◆ Ideal for detection and monitoring of horizontally and vertically polarized signals

Brief description

The Omnidirectional Antenna R&S® HF 902 has been designed for the reception of vertically and horizontally polarized waves. It is ideal for broadband detection and monitoring of RF signals in the frequency range 1 GHz to 3 GHz.

With a diameter of only 0.31 m and a height of 0.49 m, the compact broadband antenna is particularly suitable for applications where the available space is limited.

A compact omnidirectional receiving system for horizontally and vertically polarized waves in the frequency range 20 MHz to 3 GHz is obtained when combining the R&S® HF 902 with the Antennas R&S® HE 309, R&S® HE 314A1 and R&S® HF 214.



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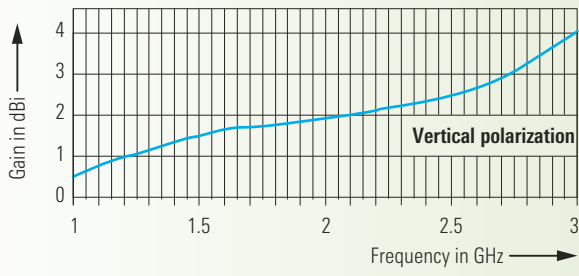
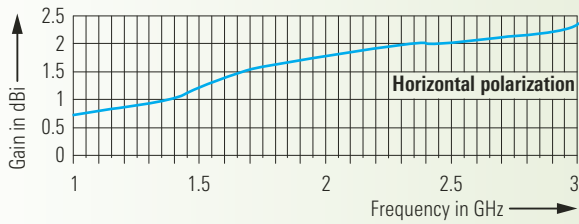


Specifications

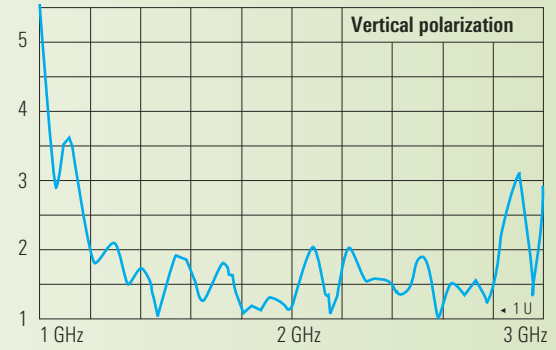
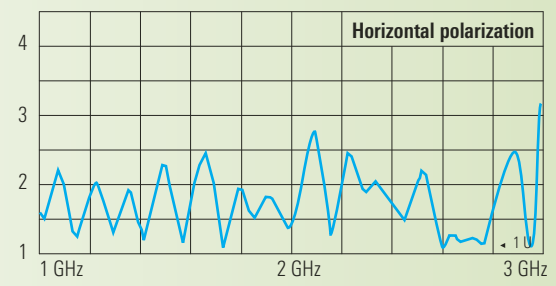
Frequency range	1 GHz to 3 GHz	Max. wind speed	
Polarization	linear/horizontal and vertical	Without ice deposit	188 km/h
Input impedance	50 Ω	With 30 mm radial ice deposit	130 km/h
VSWR	typ. <2.5 (1.3 GHz to 3 GHz)	Dimensions	
Gain	see trace below	Diameter	approx. 310 mm
Connector	2 × N female	Height	approx. 490 mm
MTBF	>1 000 000 h	Weight	approx. 8 kg
Operating temperature range	-40 °C to +65 °C		

Ordering information

Omnidirectional Antenna R&S®HF902	4042.8005.02	Recommended extras	
		Active Vertical Dipole	R&S®HE309 4027.5009.02
		Active Omnidirectional Antenna	R&S®HE314A1 4027.6505.02
		Omnidirectional Antenna	R&S®HF214 4042.7009.02



Typical gain



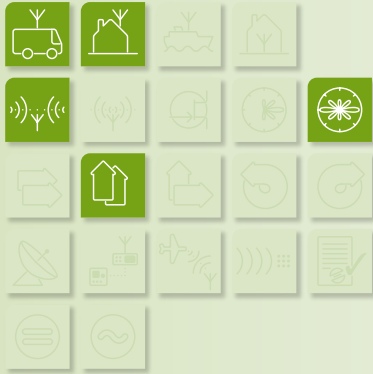
Typical VSWR

VHF/UHF Antennas

Passive Receiving Dipole

R&S® HK 309

2



20 MHz to 1300 MHz

Passive broadband receiving dipole for linearly polarized signals and high field strengths

Features

- ◆ Extremely wide frequency range
- ◆ High sensitivity
- ◆ High large-signal immunity
- ◆ High protection against lightning strokes in the vicinity
- ◆ Small dimensions (dipole length only 1.7 m)
- ◆ Low weight

Brief description

The extremely wide bandwidth plus the high sensitivity make the R&S® HK 309 particularly suitable for reception tasks in communication, reconnaissance and measurements.

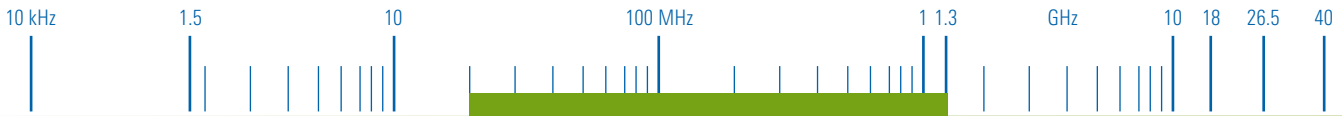
Compact design, minimum expenditure for distribution and switching and a high S/N ratio are essential features for these applications.

The broadband characteristic of the Receiving Dipole R&S® HK 309 is ensured by eight impedance elements which generate travelling waves on the antenna and suppress nulls in the radiation pattern.

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Specifications

Frequency range	20 MHz to 1.3 GHz	Operating temperature range	-40 °C to +70 °C
Polarization	linear	Max. wind speed	180 km/h (without ice deposit)
Input impedance	50 Ω	MTBF	>500 000 h
VSWR	typ. <3	Dimensions	
Gain	-24 dBi to -2 dBi	Length	approx. 1710 mm
Connector	N female	Diameter	approx. 100 mm
		Weight	approx. 4 kg

2

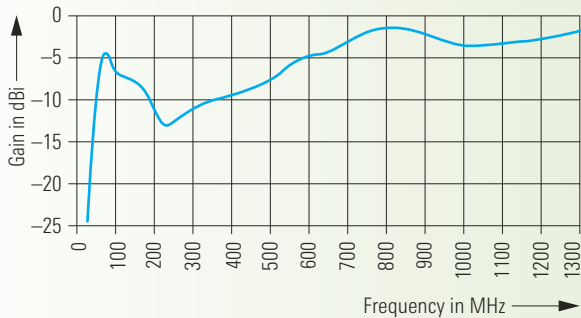
Ordering information

Passive Receiving Dipole	R&S®HK309	4054.2007.02
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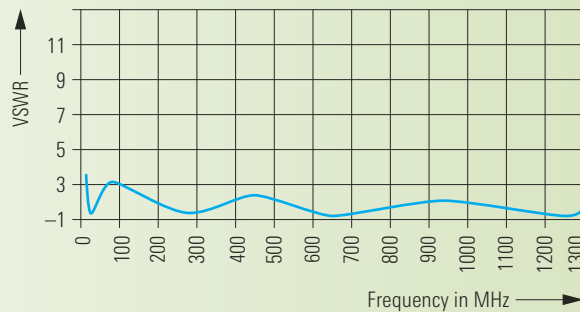
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Typical gain



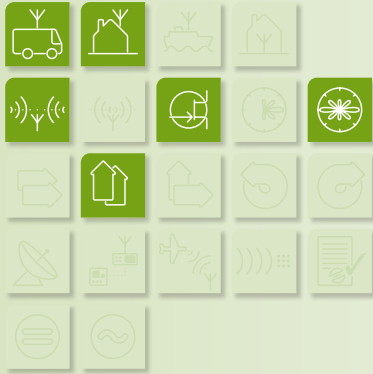
Typical VSWR

VHF/UHF Antennas

Active Vertical Dipole

R&S® HE 309

2



20 MHz to 1300 MHz

High sensitivity, large bandwidth and wide dynamic range

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Features

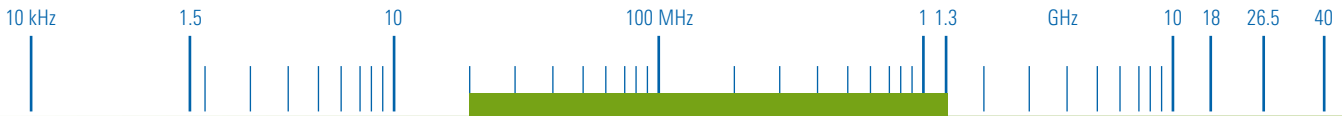
- ◆ Extremely wide frequency range
- ◆ High sensitivity
- ◆ One active antenna instead of several passive antennas
- ◆ High immunity to nonlinear distortion
- ◆ High immunity to lightning strokes in the vicinity
- ◆ Small dimensions – only 1.2 m antenna length
- ◆ Low weight

Brief description

The extremely large bandwidth, wide dynamic range and excellent sensitivity make the R&S® HE 309 ideal for all receiving tasks in radiocommunication, detection and monitoring, where the focus is on small size, a minimum amount of distribution and switching units and a high S/N ratio.

The broadband characteristics of the R&S® HE 309 are achieved through a combination of the active antenna principle with a special design of the passive radiators.

When the antenna is used together with the Active Omnidirectional Antenna R&S® HE 314A1 and the Omnidirectional Antenna R&S® HF 214, also horizontally polarized waves can be received.

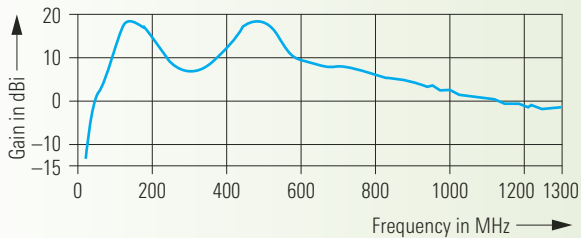


Specifications

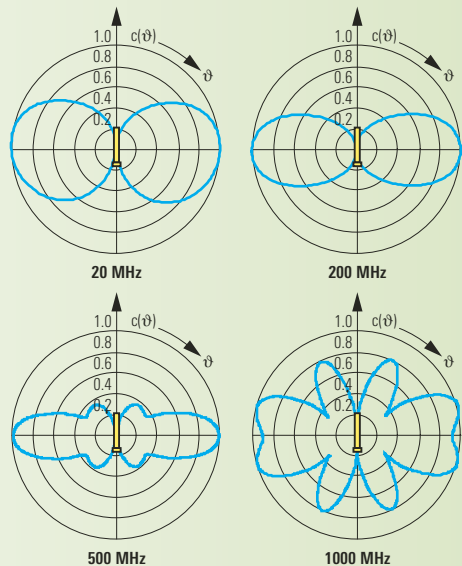
Frequency range	20 MHz to 1.3 GHz (up to 1.3 GHz with reduced sensitivity)	IP2	typ. 55 dBm
Polarization	linear/vertical	IP3	typ. 32 dBm
Input impedance	50 Ω	Power supply	21 V to 28 V DC (max. 150 mA)
Horizontal radiation pattern	omnidirectional	Connector	N female
Noise figure (frequency-dependent, as a function of external noise)		MTBF	>500 000 h
20 MHz	typ. 22 dB	Operating temperature range	-40 °C to +70 °C
100 MHz	typ. 10 dB	Max. wind speed	180 km/h (without ice deposit)
1 GHz	typ. 7 dB	Dimensions	
		Length	approx. 1210 mm
		Diameter	approx. 100 mm
		Weight	approx. 3 kg

Ordering information

Active Vertical Dipole	R&S®HE 309	4027.5009.02	Recommended extras		
			Power Supply Unit	R&S®IN 115	4004.1707.02
			Active Omnidirectional Antenna	R&S®HE 314A1	4027.6505.02
			Passive Omnidirectional Antenna	R&S®HF 214	4042.7009.02
			Omnidirectional Antenna	R&S®HF 902	4042.8005.02



Typical practical gain



Typical vertical radiation patterns

VHF/UHF Antennas

Active Receiving Dipole

R&S® HE 202

2



200 MHz to 1000 MHz

Optimized for very small dimensions

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Features

- ◆ High sensitivity despite small dimensions
- ◆ Wide frequency range
- ◆ High immunity to nonlinear distortion
- ◆ High immunity to lightning strokes in the vicinity
- ◆ Low weight
- ◆ Extremely small dimensions
- ◆ Shock- and vibration-proof

Brief description

The Active Receiving Dipole R&S® HE 202 features a very wide frequency range despite its small dimensions. Its high input sensitivity is the result of optimized matching of the passive antenna structure to the active circuitry.

These characteristics allow several passive antennas to be replaced by an Active Receiving Dipole R&S® HE 202.

Similar to a passive antenna with high-grade preamplifiers, the active antenna is highly insensitive to nonlinear distortion.

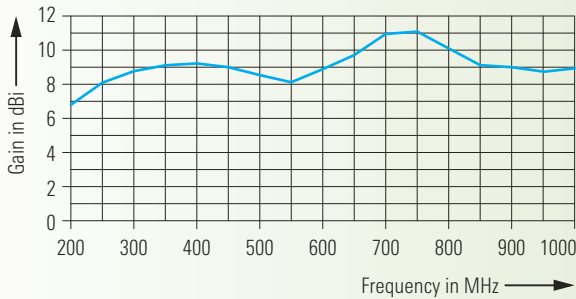


Specifications

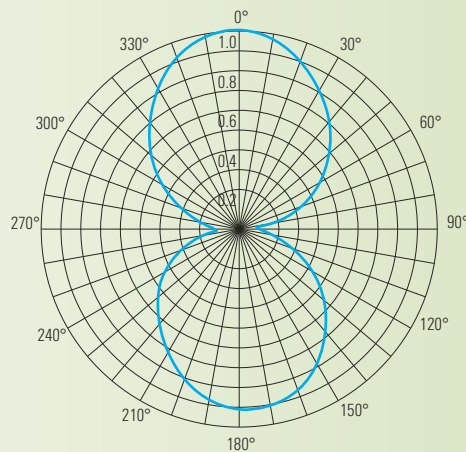
Frequency range	200 MHz to 1 GHz	Field strength sensitivity ($\Delta f = 1$ kHz)	
Polarization	linear	200 MHz	-17 dB(μ V/m) (S/N: typ. 0 dB)
Input impedance	50 Ω	2 GHz	-2 dB(μ V/m) (S/N: typ. 0 dB)
VSWR	typ. <2.5	IP2	>55 dBm
Electronic gain	5 dB to 9 dB	IP3	>30 dBm
Practical gain	7 dBi to 11 dBi	Power supply	18 V to 30 V DC (max. 200 mA)
Directivity	2 dB (average)	Connector	N female
Antenna factor	10 dB to 22 dB	MTBF	>50 000 h
Noise figure		Operating	
200 MHz	6 dB	temperature range	-40 °C to +75 °C
2 GHz	7 dB	Max. wind speed	180 km/h (without ice deposit)
		Dimensions (L x H)	approx. 510 mm x 240 mm
		Weight	approx. 2.1 kg

Ordering information

Active Receiving Dipole	R&S®HE 202	0630.0310.02	
			Recommended extras
			Power Supply Unit R&S®IN 115 4004.1707.02
			Mast Adapter (for special polarization alignment only) R&S®HE 202Z1 0649.7510.02
			RF Cable R&S®HE 202Z2 0649.7785.02



Typical practical gain



Typical radiation pattern in the E plane at 500 MHz

VHF/UHF Antennas

Active Receiving Dipole R&S® HE 302

2



20 MHz to 500 MHz

Optimized for very small dimensions

Features

- ◆ High sensitivity despite small dimensions
- ◆ Wide frequency range
- ◆ High immunity to nonlinear distortion
- ◆ High immunity to lightning strokes in the vicinity
- ◆ Low weight
- ◆ Extremely small dimensions
- ◆ Shock- and vibration-proof

Brief description

The Active Receiving Dipole R&S® HE 302 features a very wide frequency range despite its small dimensions. Its high input sensitivity is the result of optimized matching of the passive antenna structure to the active circuitry.

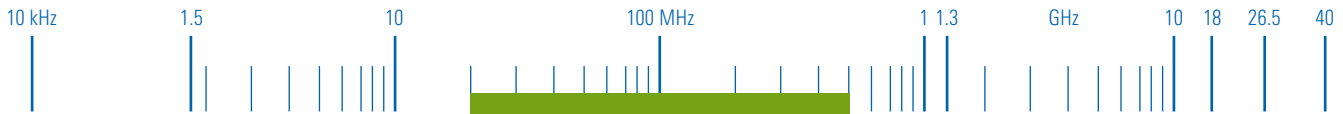
These characteristics allow several passive antennas to be replaced by an Active Receiving Dipole R&S® HE 302.

Similar to a passive antenna with high-grade preamplifiers, the active antenna is highly insensitive to nonlinear distortion.

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Specifications

Frequency range	20 MHz to 500 MHz	IP2	>60 dBm
Polarization	linear	IP3	>30 dBm
Input impedance	50 Ω	Power supply	
VSWR	<2.5	Up to +40 °C	18 V to 30 V DC, approx. 170 mA
Electronic gain	-11 dB to +8 dB	Up to +75 °C	18 V to 25 V DC, approx. 170 mA
Practical gain	-9 dBi to +10 dBi	Connector	N female
Directivity	2 dB (average)	MTBF	>50 000 h
Antenna factor	0 dB to 14 dB	Operating	
Noise figure		temperature range	-40 °C to +75 °C
20 MHz	28 dB	Max. wind speed	180 km/h (without ice deposit)
500 MHz	9 dB	Dimensions (L × H)	approx. 1 m × 240 mm
Field strength sensitivity (Δf = 1 kHz)		Weight	approx. 2.5 kg
20 MHz	-15 dB(μV/m) (S/N: typ. 0 dB)		
500 MHz	-6 dB(μV/m) (S/N: typ. 0 dB)		

2

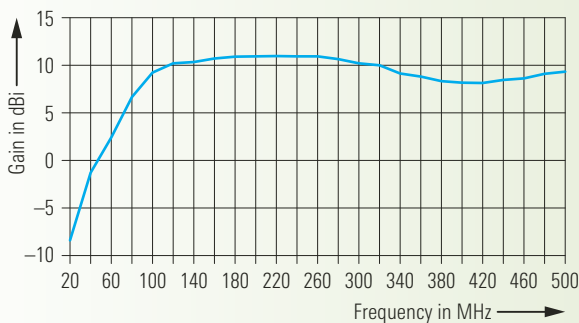
Ordering information

Active Receiving Dipole	R&S®HE 302	0644.1114.02	
			Recommended extras
			Power Supply Unit R&S®IN 115 4004.1707.02
			Mast Adapter (for special polarization alignment only) R&S®HE 202Z1 0649.7510.02
			RF Cable R&S®HE 202Z2 0649.7785.02

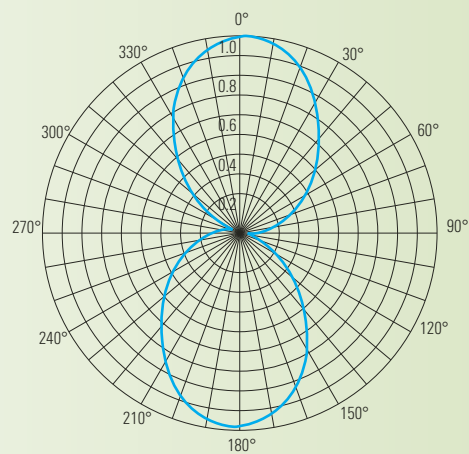
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Typical practical gain

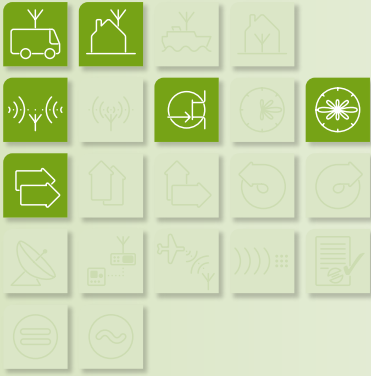


Typical radiation pattern in the E plane at 200 MHz

VHF/UHF Antennas

Active Omnidirectional Antenna R&S® HE 314A1

2



20 MHz to 500 MHz

Active omnidirectional reception of
horizontally polarized waves



Features

- ◆ High sensitivity
- ◆ Wide frequency range
- ◆ Omnidirectional reception of horizontally polarized waves
- ◆ Small dimensions
- ◆ Ideal for mobile or semi-mobile receiving systems

Brief description

The R&S® HE 314A1 is a turnstile antenna consisting of two Active Receiving Dipoles R&S® HE 302 connected via a 90° hybrid coupler.

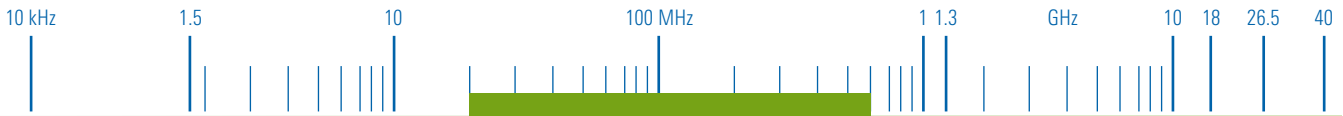
The antenna is used for the reception of horizontally polarized signals; the horizontal radiation pattern is optimized for omnidirectional reception.

The R&S® HE 314A1 can be extended for omnidirectional reception of vertically polarized waves by using, for example, an Active Vertical Dipole R&S® HE 309 mounted at the top.

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Specifications

Frequency range	20 MHz to 500 MHz	IP2	>60 dBm
Polarization	horizontal	IP3	>30 dBm
Input impedance	50 Ω	Power supply	18 V to 30 V DC (max. 340 mA)
VSWR	<2.5	Connector	N female
Electronic gain	-15 dB to +8 dB	MTBF	>25 000 h
Practical gain	-14 dBi to +5 dBi	Operating	
Directivity	1 dB (average)	temperature range	-40 °C to +70 °C
Antenna factor	2 dB to 20 dB	Max. wind speed	180 km/h (without ice deposit)
Noise figure		Dimensions (L x W x H)	approx. 1 m x 1 m x 0.3 m
20 MHz	<29 dB	Weight	approx. 8 kg
500 MHz	<10 dB		
Field strength sensitivity ($\Delta f = 1$ kHz)			
20 MHz	-12 dB(μ V/m) (S/N: typ. 0 dB)		
500 MHz	-3 dB(μ V/m) (S/N: typ. 0 dB)		

2

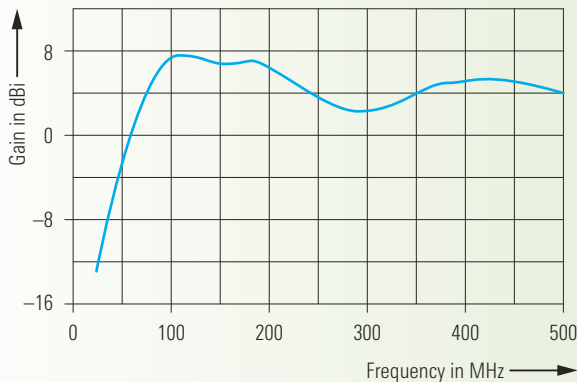
Ordering information

Active		Recommended extras	
Omnidirectional Antenna	R&S®HE314A1 4027.6505.02	Power Supply Unit	R&S®IN 115 4004.1707.02
		Active Vertical Dipole	R&S®HE 309 4027.5009.02

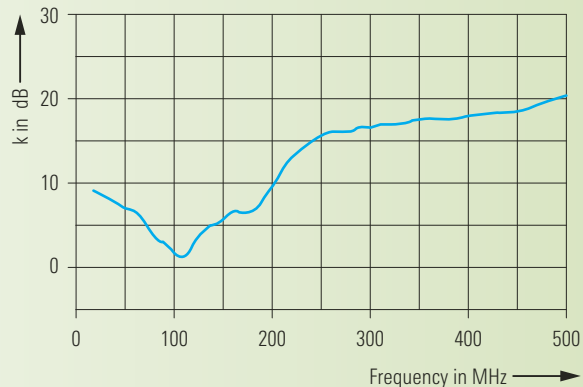
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Typical practical gain



Typical antenna factor

VHF/UHF Antennas

Active Directional Antenna R&S® HE 402

2



20 MHz to 87 MHz

Cardioid-shaped horizontal radiation
pattern

Features

- ◆ Cardioid-shaped horizontal pattern
- ◆ Small dimensions
- ◆ Optimized for use in mobile or semi-mobile systems

Brief description

The Active Directional Antenna R&S® HE 402 consists of two Active Receiving Dipoles R&S® HE 302, a combining network and the mechanical dipole fixing elements.

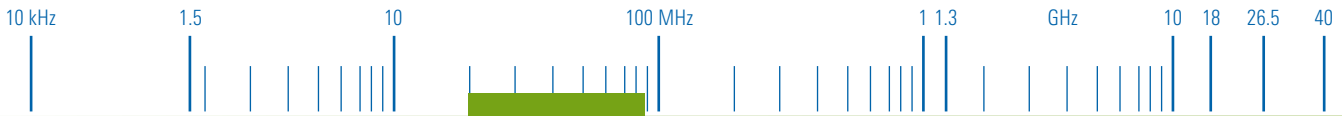
The antenna receives linearly polarized waves and is matched to the required direction of polarization (horizontal or vertical) by appropriate installation.



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Specifications

Frequency range	20 MHz to 87 MHz	Horizontal radiation pattern	cardioid-shaped
Polarization	linear	IP2	>60 dBm
Input impedance	50 Ω	IP3	>30 dBm
VSWR	<2.5	Power supply	18 V to 25 V DC (max. 340 mA)
Electronic gain	-19 dB to +5 dB	Connector	N female
Practical gain	-14 dBi to +10 dBi	MTBF	>25 000 h
Directivity	5 dB (average)	Operating temperature range	-40 °C to +75 °C
Noise figure		Max. wind speed	180 km/h (without ice deposit)
20 MHz	34 dB	Dimensions (L × W × H)	approx. 1.0 m × 0.2 m × 1.1 m
87 MHz	11 dB	Weight	approx. 12 kg
Field strength sensitivity (Δf = 1 kHz)			
20 MHz	-12 dB(μV/m) (S/N: typ. 0 dB)		
87 MHz	-22 dB(μV/m) (S/N: typ. 0 dB)		

2

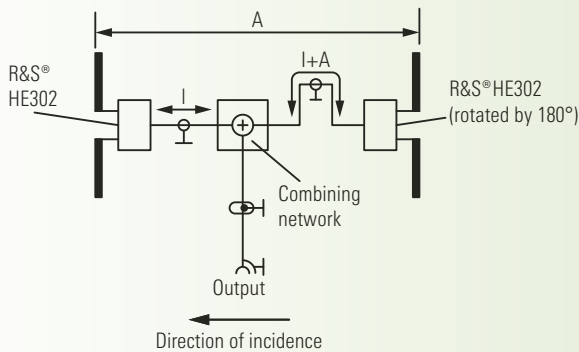
Ordering information

Active			Recommended extras		
Directional Antenna	R&S®HE402	0684.2011.02	Power Supply Unit	R&S®IN 115	4004.1707.02

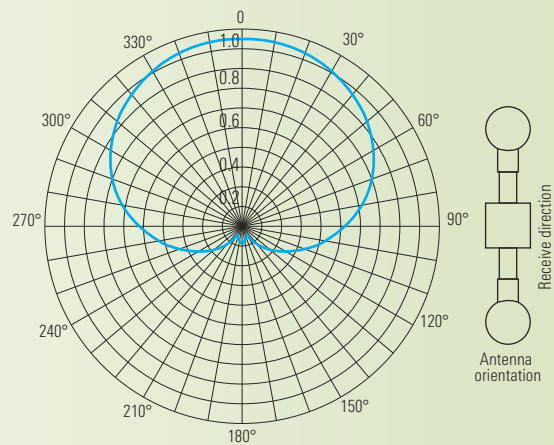
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Block diagram



Typical horizontal radiation pattern

VHF/UHF Antennas

Active Directional Antenna

R&S® HE 200

2



20 MHz to 3000 MHz

Portable directional antenna for tracing signal transmitters and interference sources

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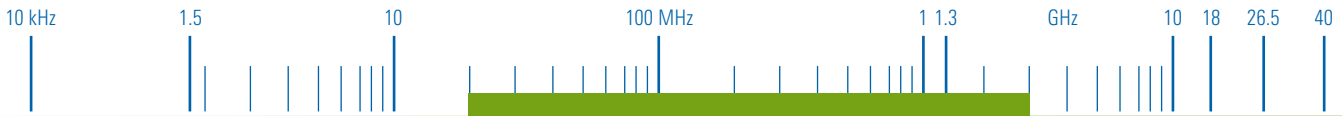
- ◆ Distinct directional pattern
- ◆ Suitable for horizontal and vertical polarization
- ◆ Wide frequency range
- ◆ Wide dynamic range
- ◆ Handy size
- ◆ Low weight

Brief description

Due to its small size and low weight, the Active Directional Antenna R&S® HE 200 is ideal for portable use.

In conjunction with portable receivers, it allows signal transmitters and interference sources to be reliably detected and localized. The direction is found by orienting the antenna towards the maximum signal level.

The wide frequency range is covered by three frequency-band-optimized antenna modules. The linearly polarized directional antennas have cardioid radiation patterns so that a constant DF accuracy is attained over the entire frequency range.

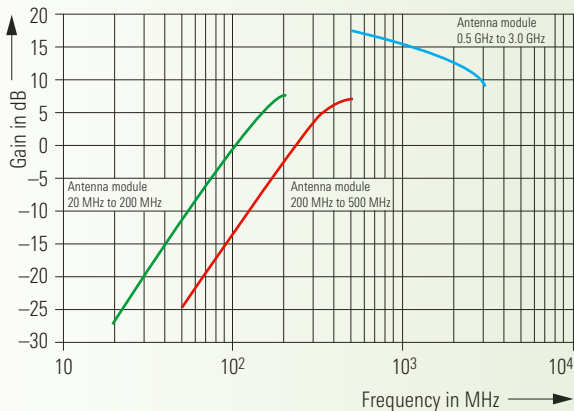


Specifications

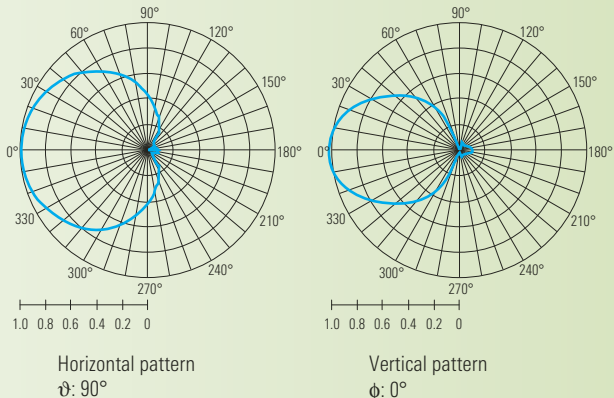
Frequency range	20 MHz to 3 GHz	Connector	N male
RF module 1	20 MHz to 200 MHz	MTBF	>50 000 h
RF module 2	200 MHz to 500 MHz	Operating temperature range	-30 °C to +60 °C
RF module 3	500 MHz to 3 GHz	Transit case (L × W × H)	approx. 562 mm × 430 mm × 190 mm
Optional HF module		Length of connecting cable	approx. 1 m
R&S®HE 200HF	10 kHz to 20 MHz	Weight	
Input impedance	50 Ω	Antenna	approx. 1 kg (max.)
VSWR	typ. <2.5	With transit case	approx. 5 kg
Power supply	4 × 1.5 V DC, size: AA		
Power consumption	approx. 55 mA at +25 °C		

Ordering information

Active			Recommended extras		
Directional Antenna	R&S®HE 200	4050.3509.02	Loop Antenna	R&S®HE 200HF	4051.4009.02



Typical practical gain in active mode



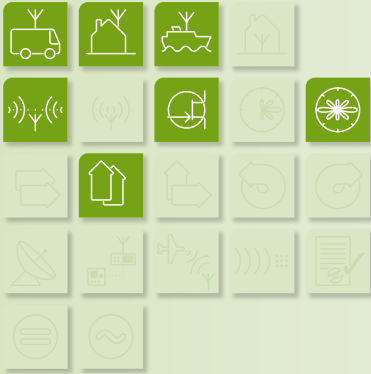
Typical directional radiation pattern in the frequency range 0.5 GHz to 3 GHz

VHF/UHF Antennas

Active Omnidirectional Receiving Antenna R&S® HE 055

New

2



1.5 MHz to 600 MHz

**Omnidirectional receiving antenna with
excellent large-signal characteristics and
high sensitivity**

Features

- ◆ Active omnidirectional receiving antenna
- ◆ Extremely wide frequency range
- ◆ Space- and cost-optimized monitoring by using only one antenna in the system
- ◆ Excellent immunity to high signal levels
- ◆ High sensitivity due to very low displayed average noise level
- ◆ Rugged mechanical design (specially designed for mobile use and rough environmental requirements)

Brief description

The Active Omidirectional Receiving Antenna R&S® HE 055 allows the reception of the extremely wide frequency range from 1.5 MHz to 600 MHz. Applications in this frequency range thus require only one antenna.

Due to its rugged mechanical design and small dimensions, the antenna is suitable both for stationary and various mobile applications.

The excellent large-signal characteristics of the antenna circuitry ensure operation in areas of high signal levels.

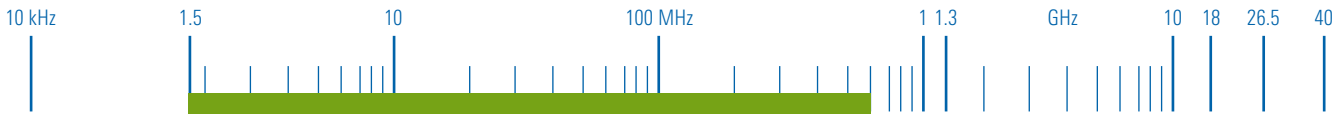
The low displayed average noise of the antenna circuitry allows sensitive reception of very weak signal levels.



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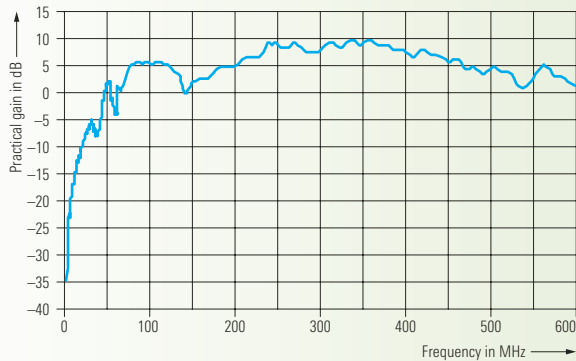


Specifications

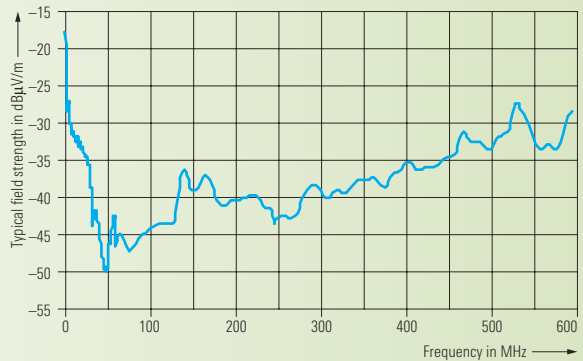
Frequency range	1.5 MHz to 600 MHz	1 dB compression point	≥10 dBm output power into 50 Ω
Polarization	vertical	Power supply	21 V to 32 V DC (max. 500 mA)
Input impedance	50 Ω	Connector	N female
VSWR		Operating	
1.5 MHz to 30 MHz	<1.5	temperature range	-40 °C to +85 °C
30 MHz to 600 MHz	<3.0	Safety class	IP 66 (in line with EN/IEC 60529)
Transducer factor		Max. wind speed	200 km/h
(for antenna mounted			(without and with 30 mm radial icing)
to conductive plane)	7 dB to 30 dB (typ.)	Dimensions	
Intercept point		(length × diameter)	approx. 1406 mm × 153 mm
2nd order (rel. to output)	≥70 dBm (f_{test} in MHz: 10 - 8 = 2)	Weight	approx. 3.5 kg
	≥65 dBm (f_{test} in MHz: 140 - 95 = 45)	MTBF	>250 000 h
3rd order (rel. to output)	≥40 dBm (f_{test} in MHz: 2 × 10 - 8 = 12)		
	≥40 dBm (f_{test} in MHz: 2 × 95 - 140 = 50)		

Ordering information

Active Omnidirectional Receiving Antenna			Recommended extras		
R&S®HE055	4065.1120.02		Power Supply Unit	R&S®IN 115	4004.1707.02



Typical practical gain

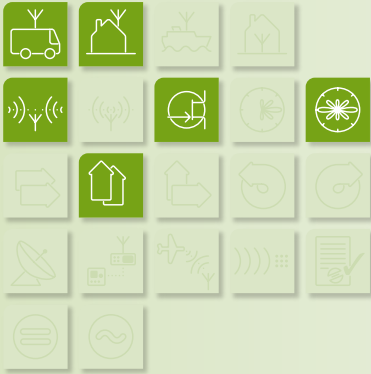


Typical field-strength sensitivity at antenna output (measurement bandwidth $\Delta f = 1 \text{ Hz}$; $S/N = 0 \text{ dB}$)

VHF/UHF Antennas

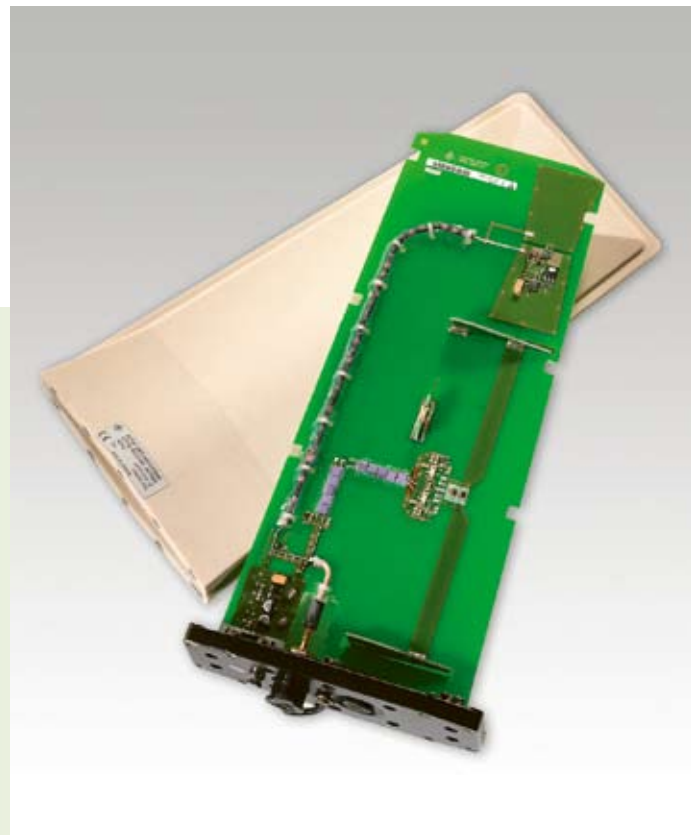
Active Receiving Antenna R&S® HE 500

2



20 MHz to 3000 MHz

For vertical polarization



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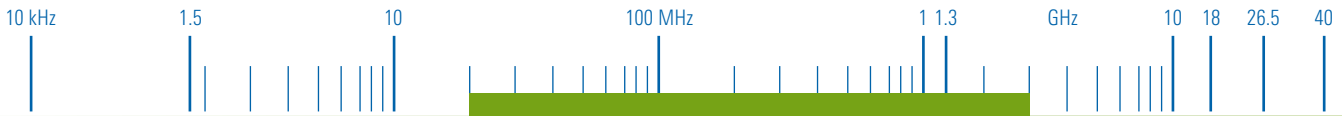
- ◆ Extremely broadband
- ◆ Omnidirectional radiation pattern
- ◆ Low weight
- ◆ Compact size
- ◆ Weatherproof housing

Brief description

The broadband Active Receiving Antenna R&S® HE 500 has been designed as a monitoring antenna for vertical polarization and omnidirectional reception in the frequency range 20 MHz to 3 GHz.

The antenna is characterized by compact design and low weight. It is therefore ideal for use in mobile systems and environments where space is at a premium.

A sturdy, composite radome protects the antenna and its electronics against effects of weather and high wind speeds.

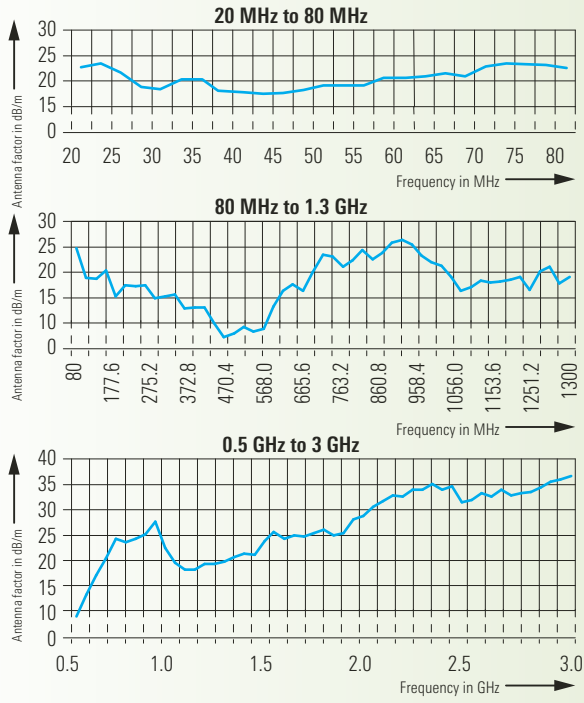


Specifications

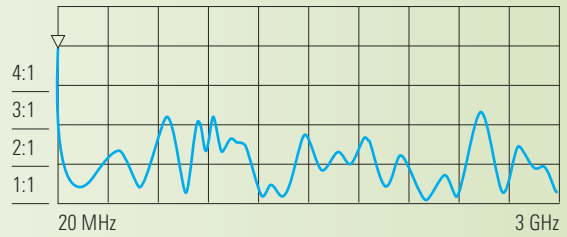
Frequency range	20 MHz to 3 GHz	IP2	>30 dBm (typ. >50 dBm)
Polarization	linear/vertical	IP3	typ. >25 dBm
Input impedance	50 Ω	Power supply	18 V to 32 V DC (max. 180 mA)
VSWR	typ. <3	Connector	N female
Horizontal radiation pattern	omnidirectional	MTBF	>50 000 h
Antenna factor	see diagrams below	Operating temperature range	-40 °C to +65 °C
Field-strength sensitivity		Max. wind speed	
20 MHz to 1.3 GHz	typ. -23 dB(μV/m)	Narrow side	600 km/h (without ice deposit)
1.3 GHz to 3 GHz	typ. -20 dB(μV/m)	Broad side	250 km/h (without ice deposit)
Destructive field strength		Protection class	IP 55 (in line with DIN 40050)
Up to 10 MHz	typ. >50 V/m	Dimensions (L × W × H)	approx. 170 mm × 65 mm × 365 mm
10 MHz to 20 MHz	typ. >20 V/m	Weight	approx. 1.2 kg
20 MHz to 3 GHz	typ. >10 V/m		

Ordering information

Active			Recommended extras		
Receiving Antenna	R&S®HE500	4059.2005.02	Bias Unit	R&S®IN 500	4062.0880.02



Typical antenna factor



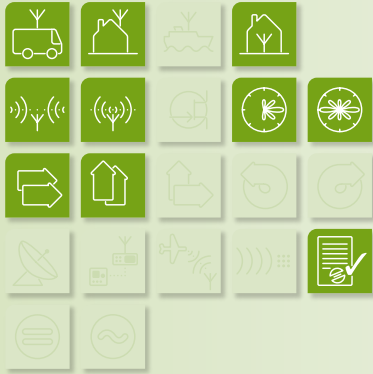
Typical VSWR characteristic

VHF/UHF Antennas

Biconical Antenna

R&S® HK 116

2



20 MHz to 300 MHz

For radiated emission measurements

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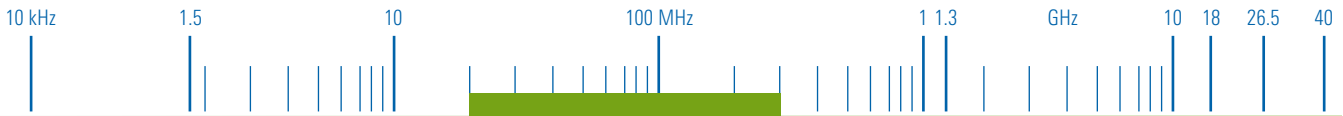
- ◆ Wide frequency range
- ◆ Radiation patterns virtually independent of frequency
- ◆ Individual calibration in line with ANSI C63.5 (free-space calibration) and ARP 958
- ◆ Low weight

Brief description

The R&S® HK 116 is a biconical dipole antenna for linearly polarized waves.

The antenna features a wide frequency range, a radiation pattern virtually independent of frequency plus low weight.

The R&S® HK 116 is individually calibrated in line with ANSI C63.5 and ARP 958 and particularly suitable for radiated emission measurements in EMC test rooms.

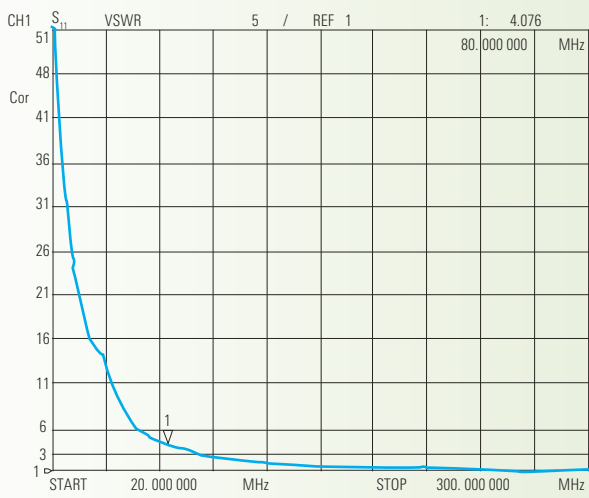


Specifications

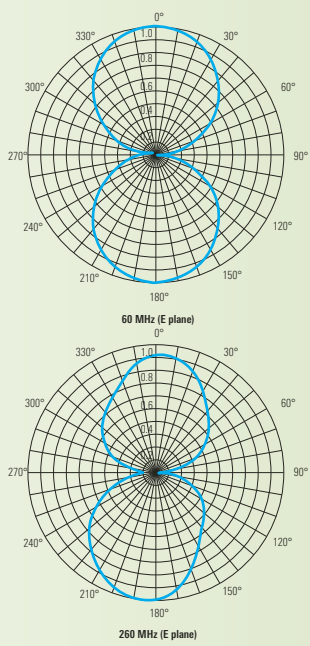
Frequency range	20 MHz to 300 MHz	Operating	
Polarization	linear	temperature range	-40 °C to +55 °C
Input impedance	50 Ω	MTBF	>3 000 000 h
VSWR	typ. 2.5	Dimensions (L × W × H)	approx. 1380 mm × 530 mm × 720 mm
Permissible input power	75 W CW	Weight	approx. 3 kg
Connector	N female		

Ordering information

Biconical Antenna	R&S®HK 116	4000.7752.02	Recommended extras		
			Wooden Tripod	R&S®HZ-1	0837.2310.02



Typical VSWR



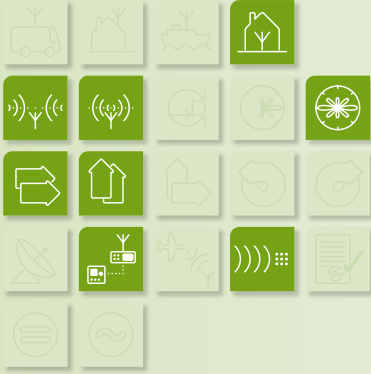
Typical horizontal radiation pattern

VHF/UHF Antennas

EMS Broadband Dipole R&S®HK 5000

New

2



30 MHz to 100 MHz

High-power transmitting antenna specially designed for EMS operation in test chambers

Features

- ◆ Generation of high field strength
- ◆ High power capability
- ◆ No tuning necessary
- ◆ Compact size
- ◆ Easy mounting and demounting



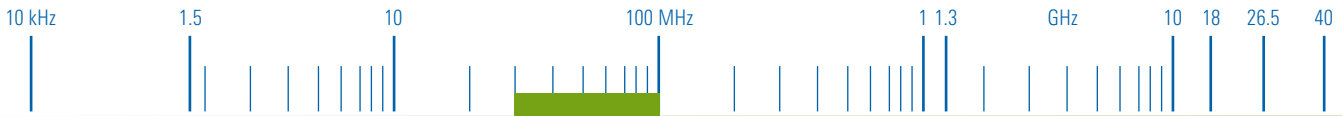
Brief description

Its broadband characteristics and high power capability make the EMS Broadband Dipole R&S®HK 5000 the first choice for EMC susceptibility testing in the VHF frequency range. The R&S®HK 5000 has been optimized for low VSWR and therefore high efficiency. The biconical structure allows the antenna to be set up close to the device under test, e.g. 1 m. In comparison with conventional antennas, higher field strengths can be generated at a lower input power. Despite the antenna's large dimensions, a specially designed support makes the antenna easy to handle in the test room. The polarization of the antenna can be set via a rotator and remote control.

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Specifications

Frequency range	30 MHz to 100 MHz	Generated field strength	>200 V/m _{rms} at a distance of 1 m and 5 kW CW input power
Polarization	linear	Operating	
Input impedance	50 Ω	temperature range	+5 °C to +40 °C
VSWR	<2 (under free space conditions)	Class of application	laboratory
Gain	>2 dBi (under free space conditions)	Dimensions (W × H × L)	
Max. input power		Vertically polarized	approx. 1.8 m × 2.95 m × 2.2 m
With EIA 1 5/8" connector	10 kW CW	Horizontally polarized	approx. 2.9 m × 2.4 m × 2.2 m
With 13-30 connector (in line with IEC 169-5)	5 kW CW	Weight	
		Antenna	approx. 150 kg
		Holder with motor	approx. 120 kg

2

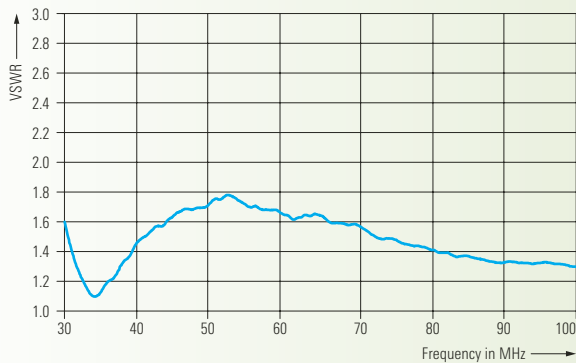
Ordering information

EMS Broadband Dipole	R&S®HK5000	4065.9043.02
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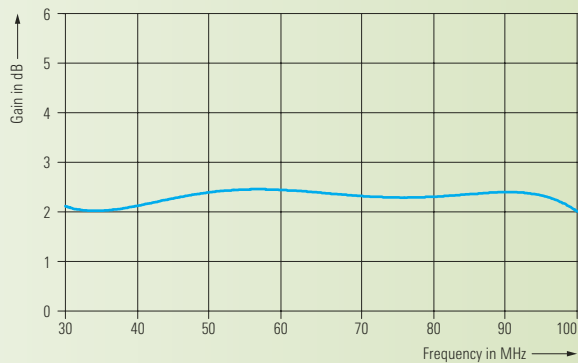
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Typical VSWR characteristic



Typical gain characteristic

VHF/UHF Antennas

Crossed Log-Periodic Antenna R&S® HL 007A2

2



80 MHz to 1300 MHz

Monitoring and measurement of
RF signals

Features

- ◆ Wide frequency range
- ◆ Radiation pattern virtually independent of frequency
- ◆ Polarization horizontal, vertical and $\pm 45^\circ$ (selectable with option R&S® ZS 107)
- ◆ Remote-controlled polarization switching with R&S® GB 016 and R&S® ZS 107

Brief description

The Log-Periodic Antenna R&S® HL 007A2 with crossed elements is particularly suitable for monitoring and measuring RF signals.

The antenna features a virtually frequency-independent radiation pattern and allows horizontally, vertically and $\pm 45^\circ$ polarized signals to be received.

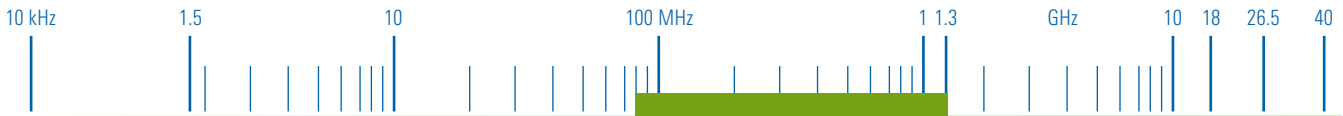
Polarization switching (optional) can also be remote-controlled (optional).



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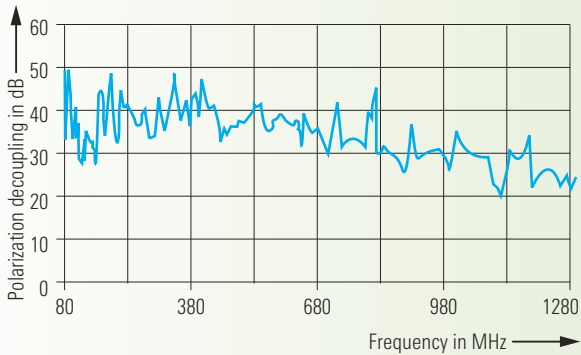
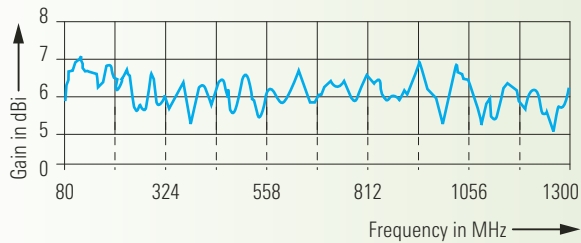


Specifications

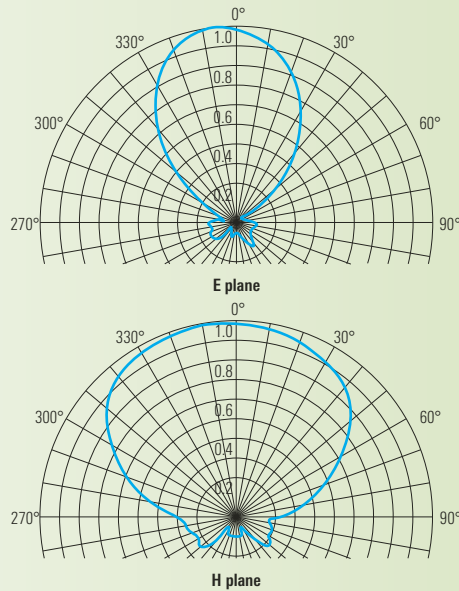
Frequency range	80 MHz to 1.3 GHz	Operating temperature range	-40 °C to +50 °C
Polarization (remotely selectable, optional)	linear/horizontal, vertical, ±45°	Max. wind speed	180 km/h (without ice deposit)
Input impedance	50 Ω	MTBF	>150 000 h
VSWR	≤2.5	Dimensions (L × W × H)	approx. 1.7 m × 2 m × 2.2 m
Gain	typ. 6 dBi	Weight	approx. 15 kg
Antenna connector	2 × N female		

Ordering information

Crossed			Recommended extras		
Log-Periodic Antenna	R&S®HL007A2	4025.8700.03	Polarization Network		
			Switch for horiz./vert./±45°		
			polarization	R&S®ZS 107	0428.2853.02
			Polarization Network		
			Switch for horiz./vert.		
			polarization	R&S®ZS 107	0428.2853.04
			Control Unit	R&S®GB016	4056.7006.02



Typical gain and polarization decoupling



Typical radiation patterns

VHF/UHF Antennas

Log-Periodic Broadband Antenna R&S® HL 033

2



80 MHz to 2000 MHz

Detection and measurement of RF signals



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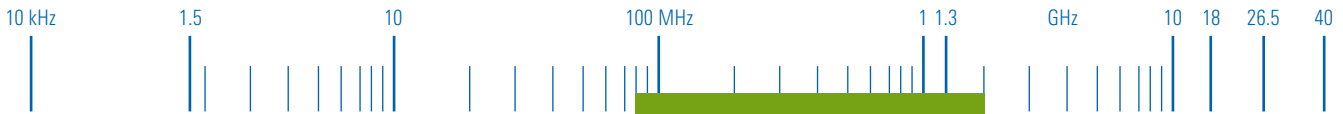
- ◆ Extremely broadband
- ◆ Only one antenna required to cover a wide frequency range
- ◆ Low frequency-dependence of radiation patterns and input impedance
- ◆ Can be used as transmit antenna
- ◆ Metal parts electrically connected to mast flange for protection against electric charges and lightning
- ◆ Highly weatherproof
- ◆ Stable installation due to optional center bracket
- ◆ Individual calibration in line with ANSI C63.5

Brief description

In conjunction with a test or monitoring receiver, the R&S® HL 033 can be used for versatile applications, e.g. field-strength measurements or determination of direction of incidence and signal polarization.

Each antenna is individually calibrated. A CD-ROM with calibration data is supplied with the antenna.

The R&S® HL 033 can also be used as a transmit antenna in the entire frequency range.

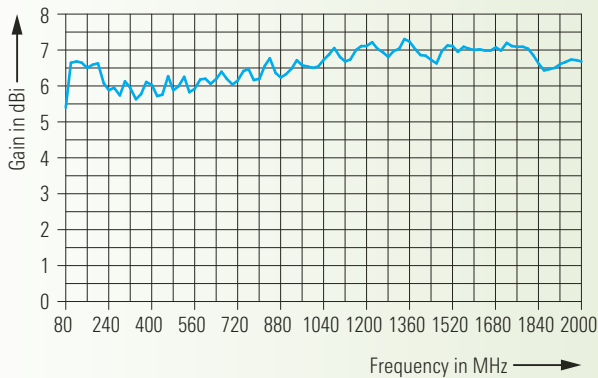


Specifications

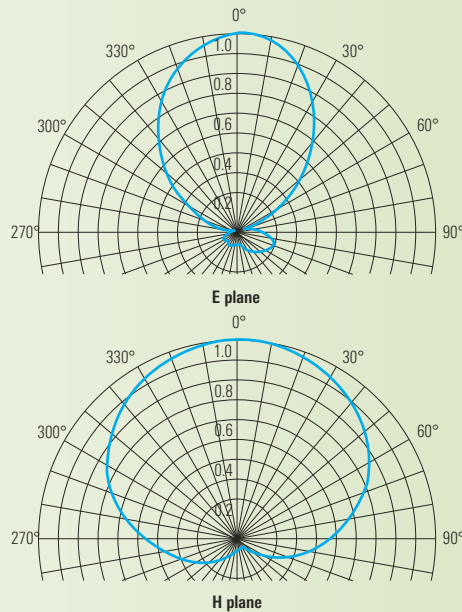
Frequency range	80 MHz to 2 GHz	Gain	typ. 6.5 dBi
Polarization	linear	Connector	N female
Input impedance	50 Ω	MTBF	>1 000 000 h
VSWR	≤2	Operating	
Max. input power (T _A = +30 °C)		temperature range	-40 °C to +65 °C
80 MHz	460 W + 100% AM	Max. wind speed	150 km/h (without ice deposit)
100 MHz	430 W + 100% AM	Dimensions (L × W)	approx. 1800 mm × 1960 mm
500 MHz	210 W + 100% AM	Weight	approx. 5 kg
1000 MHz	160 W + 100% AM		
1500 MHz	140 W + 100% AM		
2000 MHz	120 W + 100% AM		

Ordering information

Log-Periodic			Recommended extras		
Broadband Antenna	R&S®HL033	4062.6608.03	Tripod	R&S®HFU-Z	0100.1114.02
			Adapter for center support	R&S®HL033M	4062.7585.02
			Mast, 1 m to 5 m, adjustable	R&S®HFU-Z	0100.1120.02



Typical gain

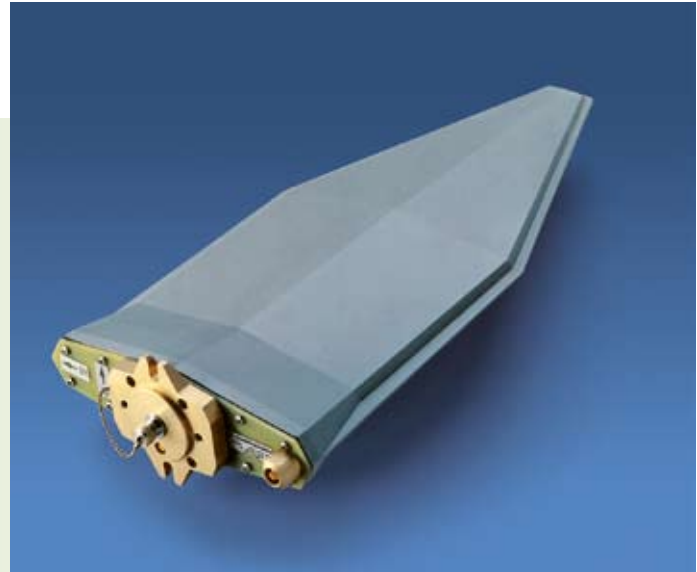


Typical radiation patterns

VHF/UHF Antennas

Log-Periodic Broadband Antenna R&S® HL 040

2



400 MHz to 3000 MHz

**For broadband transmission and reception
under open-field and laboratory conditions**

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Features

- ◆ Wide bandwidth
- ◆ Coverage of various mobile radio frequency ranges
- ◆ Suitable for field-strength and EMC measurements due to high precision
- ◆ Individual calibration in line with ANSI C63.5/DIN 45003
- ◆ Compact and sturdy design
- ◆ Can be used in the lab and for open-field applications

Brief description

The R&S® HL040 provides broadband transmission and reception in the frequency range 400 MHz to 3000 MHz. Due to its large bandwidth, the antenna covers frequency ranges of various mobile radio systems.

The antenna features a high symmetry and low frequency dependence of radiation patterns.

Each R&S® HL040 is supplied with an individual calibration certificate so that even field-strength and EMC measurements can be performed.

With the sturdy radome, the antenna can be used under the most adverse weather conditions.



Specifications

Frequency range	400 MHz to 3 GHz	Connector	N female
Polarization	linear	Operating temperature range	-40 °C to +70 °C
Input impedance	50 Ω	Max. wind speed	
VSWR	<2.5, typ. <2.0	Without ice deposit	200 km/h
Max. input power	150 W to 50 W CW	With 30 mm radial ice deposit	160 km/h
Gain	5 dBi to 7 dBi	MTBF	>150 000 h
Front-to-back ratio		Dimensions (H × W × L)	approx. 130 mm × 300 mm × 680 mm
400 MHz to 450 MHz	>10 dB	Weight	approx. 2.8 kg
450 MHz to 3 GHz	>15 dB		
Polarization isolation	>20 dB		

2

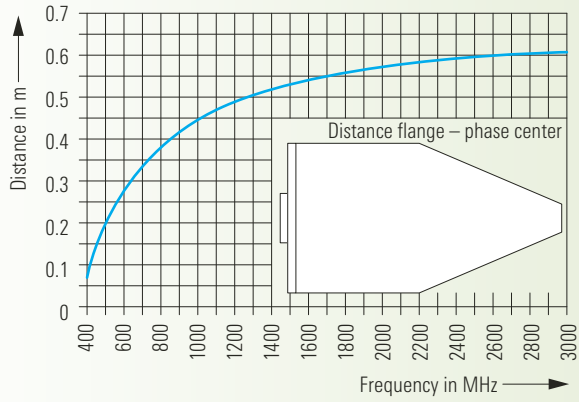
Ordering information

Log-Periodic Broadband Antenna			Recommended extras		
R&S®HL040		4035.8755.02	Adapter for		
			Wooden Tripod R&S®HZ-1	R&S®HL025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02
			Tripod	R&S®HFU-Z	0100.1114.02
			Mast, 1 m to 5 m, adjustable	R&S®HFU-Z	0100.1120.02

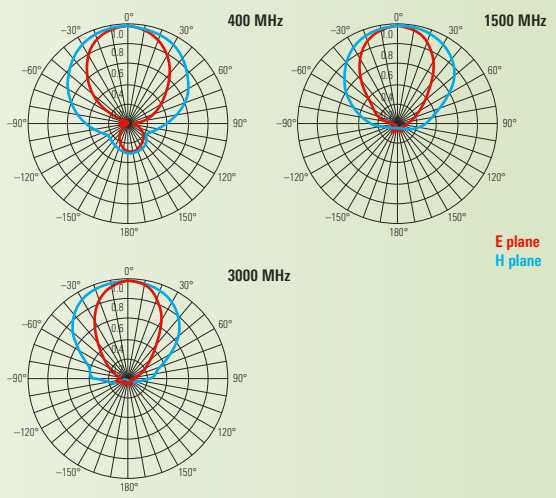
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Typical variation of phase center

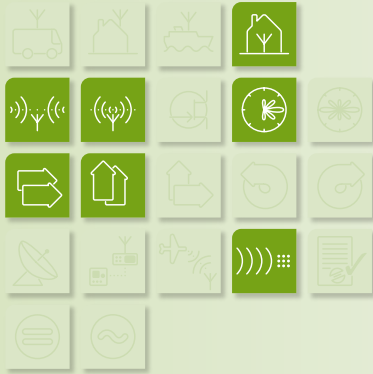


Typical radiation patterns

VHF/UHF Antennas

EMS Antenna R&S® HL 046

2



80 MHz to 1300 MHz

Log-periodic antenna for

EMS measurements



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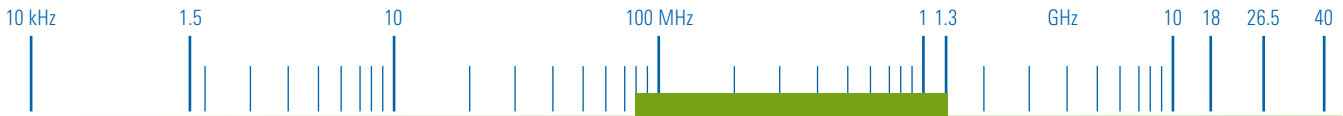
- ◆ High antenna gain, i.e. low amplifier power required
- ◆ Only one antenna required to cover a wide frequency range
- ◆ Uniform object irradiation due to optimized radiation patterns
- ◆ Reduced influence of test chamber
- ◆ Wall mounting possible
- ◆ Small size

Brief description

The R&S® HL046 for EMS measurements consists of two log-periodic antennas arranged in a V-shape and connected in parallel. Due to this construction, high selectivity is obtained in the H plane and the radiation patterns are almost rotation-symmetrical.

The small size and the wide frequency range make the antenna suitable for use in test chambers.

Antenna model .02 is mounted on a trolley whose height can be continuously adjusted between approx. 1 m and 1.75 m above ground (model .03 is without trolley). Polarization is manually set. Pneumatic actuators can optionally be provided.

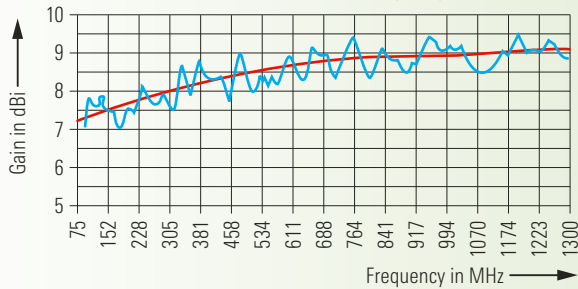
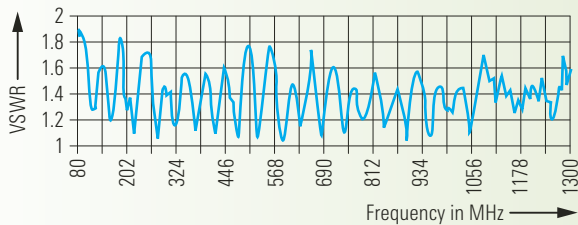


Specifications

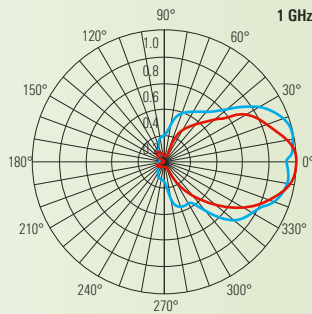
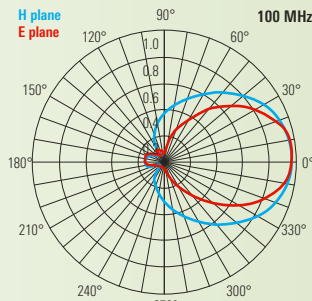
Frequency range	80 MHz to 1.3 GHz	Connector	N female
Polarization	linear	Class of application	laboratory
Input impedance	50 Ω	MTBF	>100 000 h
VSWR	<2	Operating temperature range	-10 °C to +50 °C
Max. input power (T _A = +40 °C)		Dimensions (W × H × L)	
80 MHz	1000 W + 100% AM	Without trolley	approx. 0.85 m × 1.57 m × 1.75 m
500 MHz	500 W + 100% AM	With trolley	approx. 0.86 m × 1.90 m (variable up to 2.60 m) × 1.85 m
1 GHz	300 W + 100% AM	Weight	
1.3 GHz	250 W + 100% AM	Without trolley	approx. 12.5 kg
Gain	typ. >7 dBi	With trolley	approx. 22.5 kg
Front-to-back ratio	typ. >20 dB		
Polarization decoupling	typ. 20 dB		

Ordering information

EMS Antenna			Recommended extras		
With tripod	R&S®HL 046	4040.8708.02	Pneumatic Actuators		
Without tripod	R&S®HL 046	4040.8708.03	for polarization setting	R&S®HL 046-P	4053.1694.02
			Tripod	R&S®HL 046Z1	4061.0106.02



Typical VSWR and typical gain



Typical radiation patterns

VHF/UHF Antennas

High Gain Log-Periodic Antenna R&S® HL 046E

New

2



80 MHz to 3000 MHz

Log-periodic antenna for EMS measurements



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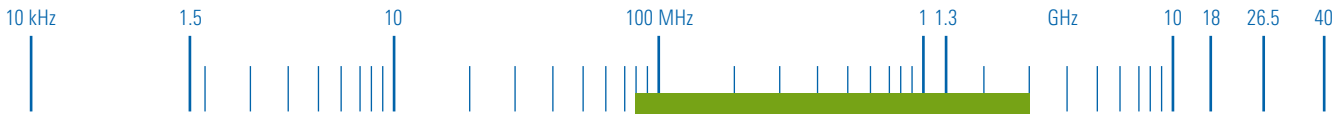
- ◆ High antenna gain, i.e. low amplifier power is required
- ◆ No change of antennas needed over wide frequency range
- ◆ Uniform object irradiation due to optimized radiation patterns
- ◆ Small size
- ◆ Influence of chamber reduced
- ◆ Antenna gain approximately constant over the whole frequency range
- ◆ Can be wall-mounted

Brief description

The High Gain Log-Periodic Antenna R&S® HL 046E offers excellent broadband characteristics, a radiation pattern that is approximately rotation-symmetrical as well as high gain, making it particularly suitable for EMS immunity measurements.

In comparison with existing systems, the required field strengths can be achieved with a lower amplifier power. This is due to the high antenna gain.

Its small size, wide frequency range and folding mechanism make the antenna ideal for use in test chambers.

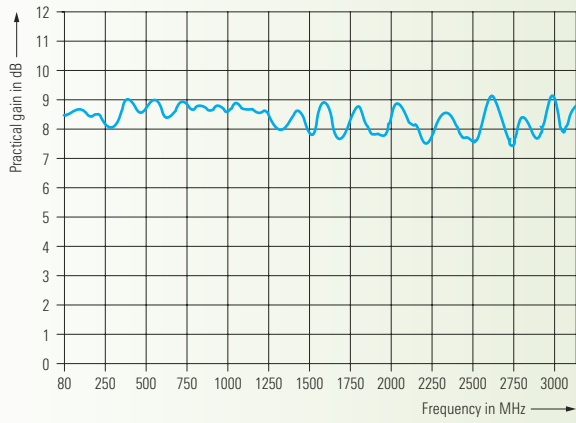


Specifications

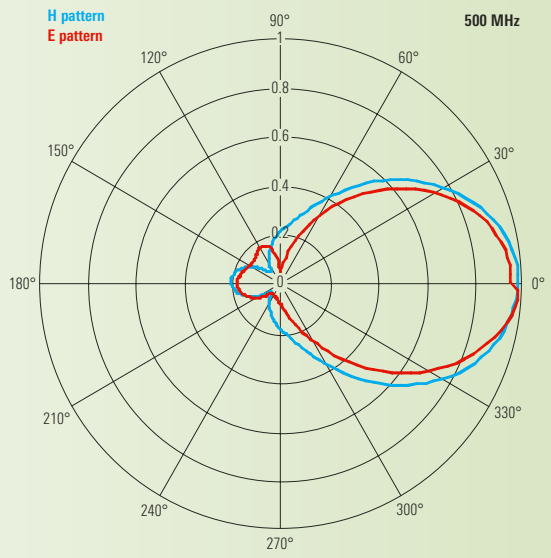
Frequency range	80 MHz to 3 GHz	Operating temperature range	+5 °C to +40 °C in line with MIL-STD-810E
Polarization	linear	Class of application	laboratory
Input impedance	50 Ω	Dimensions (W × H × L)	
VSWR		Without tripod	
<2500 MHz	<2	Folded	approx. 0.85 m × 1.50 m × 1.81 m
≥2500 MHz	<2.5	Open	approx. 1.50 m × 1.50 m × 1.81 m
Practical gain	typ. >8 dBi	With tripod	
Max. input power		Folded	approx. 0.86 m × 1.90 m × 1.89 m
80 MHz	1400 W + 100% AM	Open	approx. 1.50 m × 1.90 m (variable up to 2.60 m) × 1.89 m
500 MHz	600 W + 100% AM	Weight	
1000 MHz	400 W + 100% AM	Without tripod	approx. 17 kg
2000 MHz	300 W + 100% AM	Tripod	approx. 12.5 kg
3000 MHz	250 W + 100% AM		
Connector	N female		

Ordering information

High Gain Log-Periodic Antenna			
Antenna	R&S®HL 046E	4065.5960.02	
Recommended extras			
Pneumatic Polarization Control	R&S®HL 046-P	4053.1694.02	



Typical practical gain (including VSWR losses)



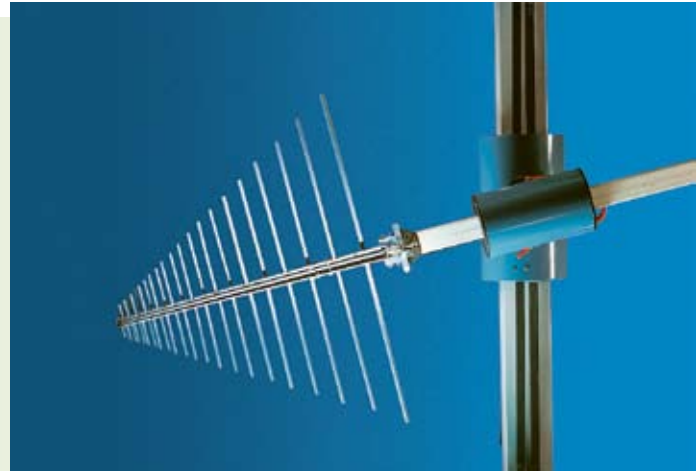
Typical antenna pattern at 500 MHz

VHF/UHF Antennas

Log-Periodic Antenna

R&S® HL 223

2



200 MHz to 1300 MHz

Optimized for radiomonitoring and measurements

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Features

- ◆ Excellent broadband characteristics
- ◆ Radiation patterns virtually independent of frequency
- ◆ Only one antenna required to cover a wide frequency range
- ◆ Selectable polarization plane
- ◆ Sturdy construction
- ◆ Suitable for mobile use
- ◆ Individual calibration in line with ANSI C63.5/DIN 45003 and ARP 958
- ◆ Adapter for Wooden Tripod R&S®HZ-1 supplied with antenna

Brief description

Owing to its broadband characteristics and the virtually frequency-independent radiation patterns, the R&S®HL 223 covers a very wide frequency range.

The sturdy construction makes the antenna suitable for stationary and mobile applications.

Each antenna is supplied with an individual calibration certificate so that measurements can be performed in addition to monitoring and transmitting applications.



Specifications

Frequency range	200 MHz to 1.3 GHz	MTBF	>200 000 h
Polarization	linear	Operating temperature range	-40 °C to +50 °C
Input impedance	50 Ω	Max. wind speed	200 km/h (without ice deposit)
VSWR	≤2 (typ. 1.6)	Dimensions (L × W)	approx. 710 mm × 765 mm
Max. input power	1500 W to 600 W CW	Weight	approx. 2 kg
Gain	>6 dBi		
Connector	N female		

2

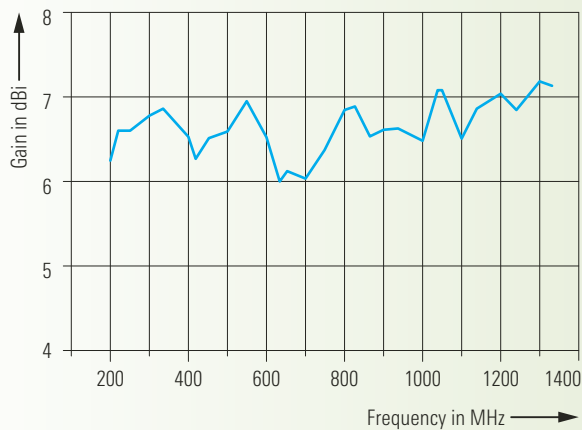
Ordering information

Log-Periodic Antenna	R&S®HL 223	4001.5501.02	Recommended extras
			Wooden Tripod R&S®HZ-1 0837.2310.02
			Tripod R&S®HFU-Z 0100.1114.02
			Mast, 1 m to 5 m, adjustable R&S®HFU-Z 0100.1120.02

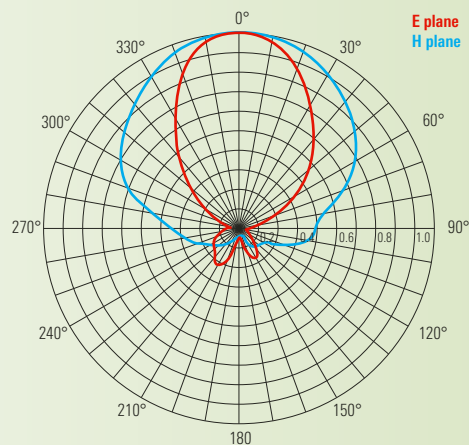
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Typical gain

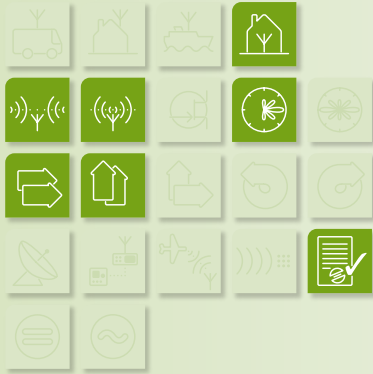


Typical directional radiation pattern at 750 MHz

VHF/UHF Antennas

ULTRALOG R&S® HL 562

2



30 MHz to 3000 MHz



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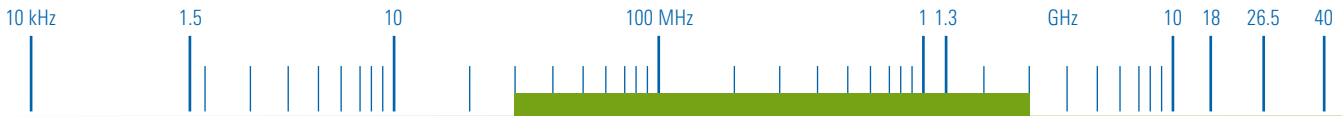
Features

- ◆ Only one antenna required to cover an extremely wide frequency range
- ◆ Selectable polarization plane
- ◆ Gain increase at high frequencies
- ◆ Generation of high field strengths for EMS measurements
- ◆ Compact size
- ◆ Individual calibration in line with ANSI C63.5 and DIN 45003

Brief description

The ULTRALOG R&S® HL 562 combines the characteristics of a biconical and a log-periodic antenna. The ULTRALOG is mainly used for measuring emissions in the extremely wide frequency range from 30 MHz to 3 GHz without change of the antenna.

The log-periodic part of the antenna is V-shaped in order to increase system sensitivity in particular between 500 MHz and 1 GHz. Unlike conventional solutions, this gain-increasing measure allows the compact size of the ULTRALOG to be maintained. Optimized symmetry and matching (VSWR) of the ULTRALOG allow its use in EMS measurements where field strengths of 10 V/m or higher are required. The ULTRALOG is supplied without tripod; the tripod shown is available as an extra.

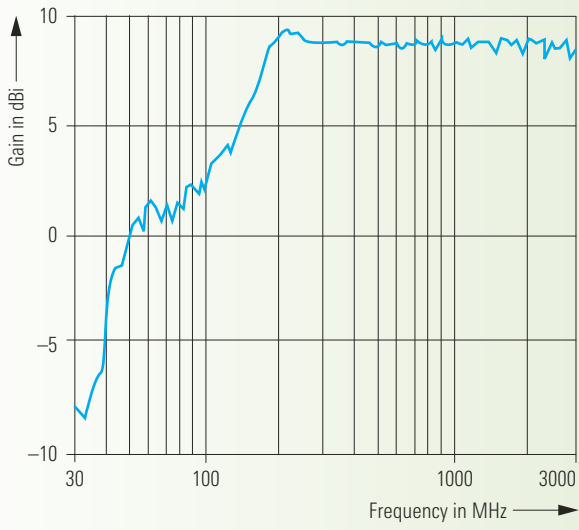


Specifications

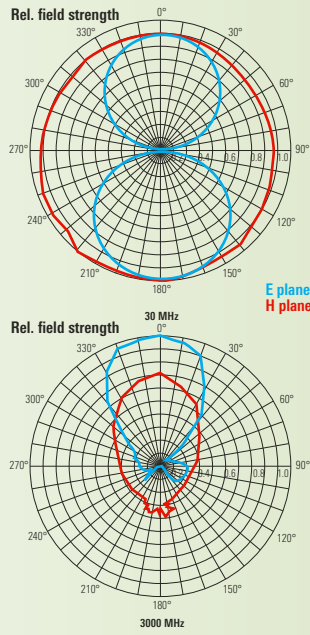
Frequency range	30 MHz to 3 GHz	Connector	N female
Polarization	linear	MTBF	>200 000 h
Polarization isolation	>20 dB	Class of application	laboratory
Input impedance	50 Ω	Operating	
VSWR	typ. <2	temperature range	0 °C to +40 °C
Gain above 200 MHz	typ. 8 dB	Dimensions (W × H × L)	approx. 0.6 m × 1.65 m × 1.68 m
Max. input power (T _A = +40 °C)		Weight	approx. 5 kg
30 MHz	150 W + 100% AM		
80 MHz	300 W + 100% AM		
250 MHz	500 W + 100% AM		
1 GHz	280 W + 100% AM		
3 GHz	180 W + 100% AM		

Ordering information

ULTRALOG	R&S®HL 562	4041.3000.02	Recommended extras		
			Tripod, movable	R&S®HL 562Z1	4041.3900.02



Typical gain



Typical radiation patterns

VHF/UHF Antennas

ILS/VOR Test Antenna

R&S® HF 108

2



108 MHz to 118 MHz

Ground measurements for instrument landing system (ILS) and very high frequency omnidirectional range (VOR)

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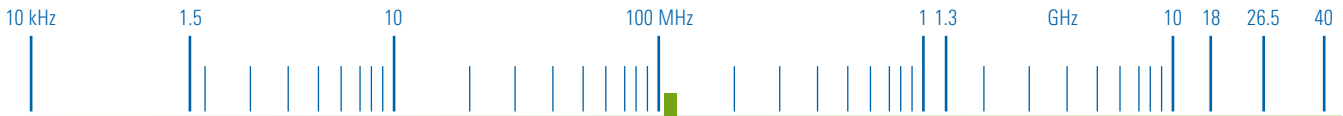
Features

- ◆ Linear horizontal polarization
- ◆ Measurement antenna for ILS and VOR
- ◆ Highly linear gain and VSWR characteristics

Brief description

The R&S® HF 108 is a VHF/UHF test antenna for horizontally polarized signals.

It is suitable for ground measurements within the instrument landing system (ILS) and for measurements in the VHF omnidirectional range (VOR).

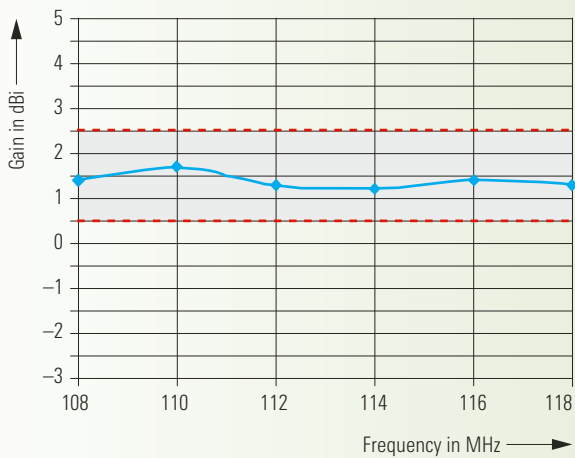


Specifications

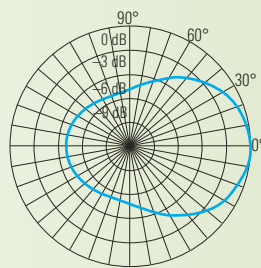
Frequency range	108 MHz to 118 MHz	Connector	BNC female
Polarization	linear/horizontal	MTBF	>500 000 h
Input impedance	50 Ω	Operating	
VSWR		temperature range	-20 °C to +60 °C
108 MHz to 112 MHz	<1.4 (typ. <1.2)	Max. wind speed	200 km/h (without ice deposit)
112 MHz to 118 MHz	typ. <1.9	Dimensions (L × W × H)	approx. 1370 mm × 1130 mm × 350 mm
Gain	typ. 1.5 dBi	Weight	approx. 4 kg
Antenna factor	typ. 10 dB	Protection class	IP 65 (in line with DIN 40050)
Max. input power	<10 mW		

Ordering information

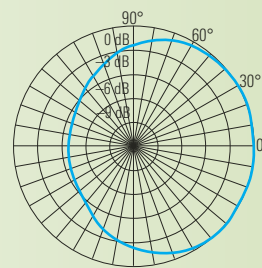
ILS/VOR Test Antenna	R&S® HF 108	4061.0506.02
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Typical gain



Azimuth diagram at 110 MHz with normal mounting (E field)



Elevation diagram at 110 MHz with normal mounting (H field)

Typical radiation patterns

VHF/UHF Antennas

UHF Coaxial Dipole R&S® HK 001

2



225 MHz to 400 MHz

UHF omnidirectional antenna for
vertical polarization



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Features

- ◆ High immunity to lightning strokes in the vicinity
- ◆ Rugged design
- ◆ Minimal wind load
- ◆ Low weight
- ◆ Can be used on ships
- ◆ Ideal for military aeronautical radio

Brief description

The UHF Coaxial Dipole R&S® HK 001 is an omnidirectional antenna for vertically polarized waves.

It features high suppression of skin currents and high immunity to lightning strokes in the vicinity.

Due to its sturdy design and low wind load, it is suitable for mobile use, particularly on ships.

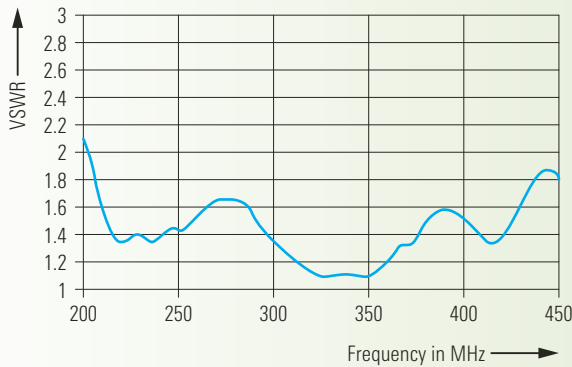


Specifications

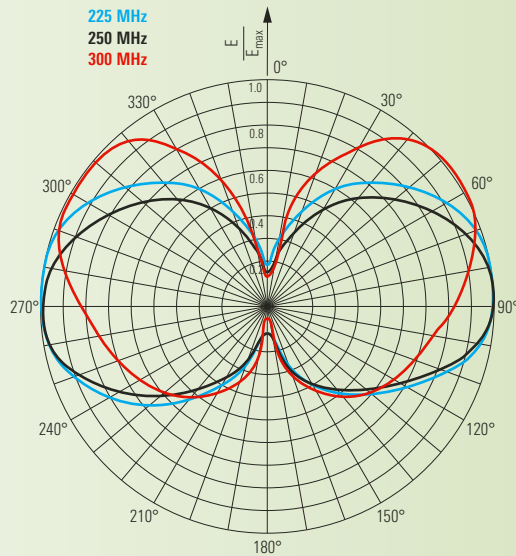
Frequency range	225 MHz to 400 MHz	MTBF	>250 000 h
Polarization	linear/vertical	Operating temperature range	-40 °C to +85 °C
Input impedance	50 Ω	Max. wind speed	185 km/h (without ice deposit)
VSWR	≤2	Wind load (at 185 km/h)	80 N
Max. input power	400 W CW	Dimensions	
Gain	typ. 2 dBi	Diameter	approx. 430 mm
Horizontal radiation pattern	omnidirectional	Height	approx. 470 mm
Max. deviation from circularity	±0.5 dB	Weight	approx. 1.6 kg
Connector	N female		

Ordering information

UHF Coaxial Dipole	R&S®HK001	0425.2781.03	Recommended extras		
			Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
			Mast Adapter	R&S®KM011Z1	4022.3508.02



Typical VSWR

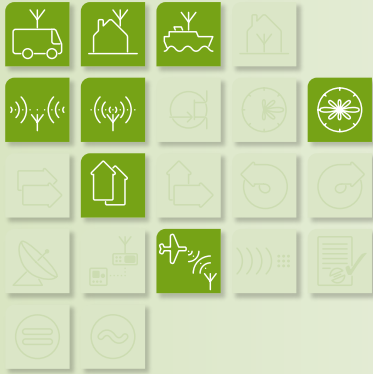


Typical vertical radiation pattern

VHF/UHF Antennas

VHF Coaxial Dipole R&S®HK 012

2



100 MHz to 165 MHz

VHF omnidirectional antenna for vertical polarization



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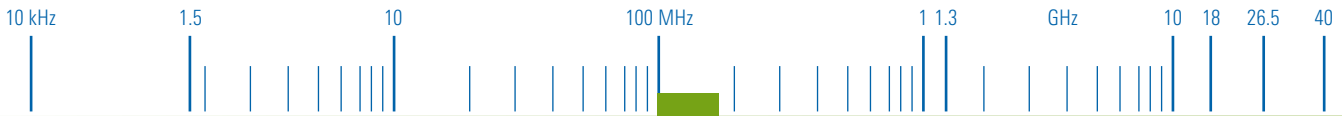
- ◆ High protection against lightning strokes in the vicinity
- ◆ Rugged design
- ◆ Minimal wind load
- ◆ Low weight
- ◆ Can be used on ships
- ◆ Ideal for military aeronautical radio

Brief description

The VHF Coaxial Dipole R&S®HK 012 is an omnidirectional antenna for vertically polarized waves.

The antenna features high suppression of skin currents and high protection against lightning strokes in the vicinity.

Due to its sturdy design and low wind load, it is suitable for mobile use, particularly on ships.

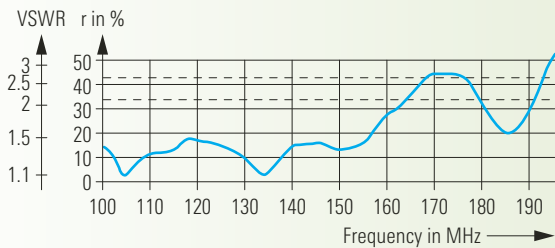


Specifications

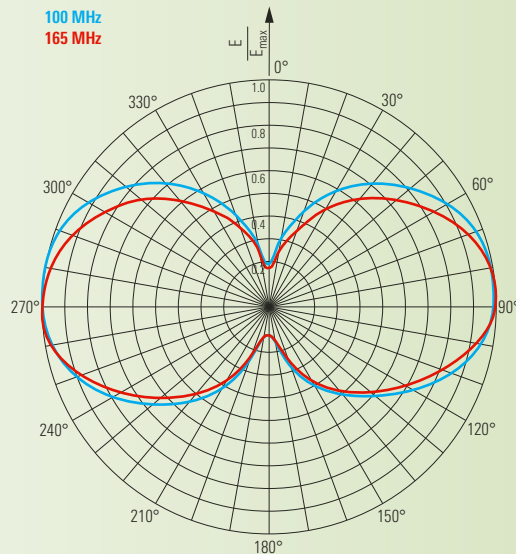
Frequency range	100 MHz to 165 MHz	MTBF	>250 000 h
Polarization	linear/vertical	Operating temperature range	-40 °C to +85 °C
Input impedance	50 Ω	Max. wind speed	160 km/h (without ice deposit)
VSWR	≤2	Wind load (at 160 km/h)	110 N
Max. input power	400 W CW	Dimensions	
Gain	typ. 2 dBi	Diameter	approx. 250 mm
Horizontal radiation pattern	omnidirectional	Height	approx. 1150 mm
Max. deviation from circularity	±0.5 dB	Weight	approx. 3 kg
Connector	N female		

Ordering information

VHF Coaxial Dipole	R&S®HK012	0459.7611.02	Recommended extras		
			Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
			Mast Adapter	R&S®KM011Z1	4022.3508.02



Typical VSWR



Typical vertical radiation pattern

VHF/UHF Antennas

VHF/UHF Coaxial Dipole R&S® HK 014

2



100 MHz to 1300 MHz

80 MHz to 1600 MHz

VHF/UHF omnidirectional antenna for
vertical polarization

Features

- ◆ Extremely broadband
- ◆ High suppression of skin currents
- ◆ Filled-in vertical radiation pattern
- ◆ High protection against lightning strokes in the vicinity
- ◆ Sturdy design
- ◆ Minimal wind load
- ◆ Low weight
- ◆ Can be used on ships

Brief description

The VHF/UHF Coaxial Dipole R&S® HK 014 is an omnidirectional antenna for vertically polarized waves.

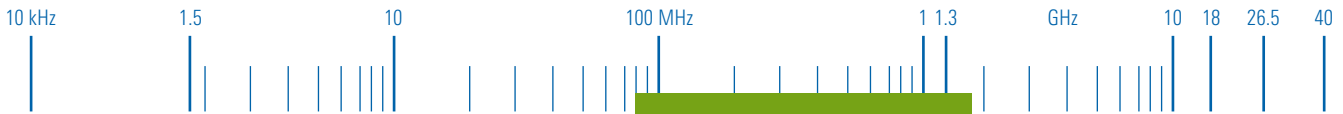
The antenna features high suppression of skin currents and high protection against lightning strokes in the vicinity.

Due to its sturdy design and low wind load, it is suitable for mobile use, in particular on ships.

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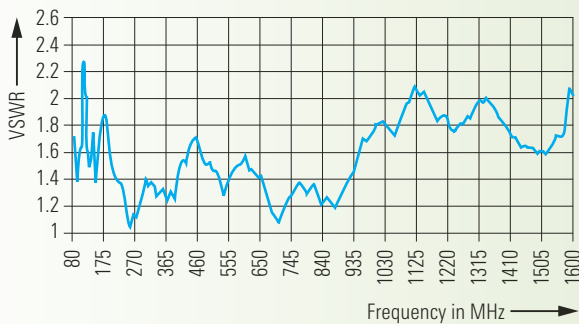


Specifications

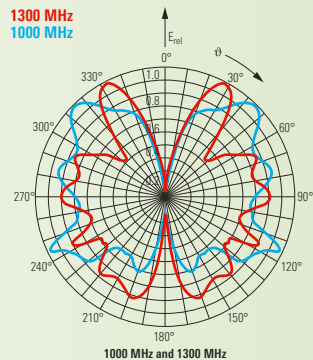
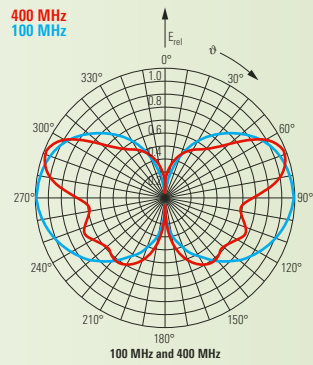
Frequency range		Horizontal	
Model .02	100 MHz to 1.3 GHz	radiation pattern	omnidirectional
Model .12	80 MHz to 1.6 GHz	Max. deviation from circularity	±1 dB
Polarization	linear, vertical	Connector	N female
Input impedance	50 Ω	Operating temperature range	-40 °C to +85 °C
VSWR	typ. <2	Max. wind speed	160 km/h (without ice deposit)
Permissible input power		Wind load (at 160 km/h)	180 N
Model .02		MTBF	>150 000 h
Up to 150 MHz	800 W + 100% AM	Dimensions (diameter × height)	
Up to 400 MHz	430 W + 100% AM	Model .02	approx. 310 mm × 1100 mm
Up to 1 GHz	270 W + 100% AM	Model .12	approx. 310 mm × 1250 mm
Up to 1.3 GHz	240 W + 100% AM	Weight	approx. 5 kg
Model .12	20 W + 100% AM		
Gain	typ. 2 dBi		

Ordering information

VHF/UHF Coaxial Dipole			Recommended extras		
100 MHz to 1300 MHz	R&S®HK014	0644.1514.02	Diplexer for the ranges		
80 MHz to 1600 MHz	R&S®HK014	0644.1514.12	100 MHz to 162 MHz/		
			225 MHz to 400 MHz	R&S®FT 224	0525.5117.03
			Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
			Mast Adapter	R&S®KM011Z2	4022.3608.02



Typical VSWR

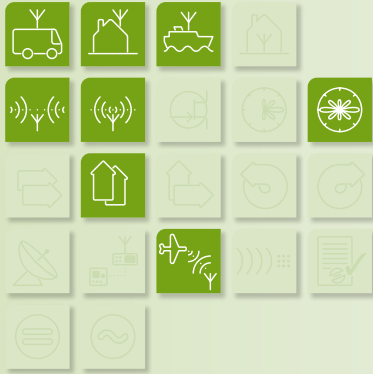


Typical vertical radiation pattern

VHF/UHF Antennas

VHF/UHF Coaxial Dipole R&S® HK 033

2



80 MHz to 2000 MHz

**Extremely broadband vertical coaxial
dipole especially for use on ships**

Features

- ◆ Wide frequency range
- ◆ Protection against lightning strokes
- ◆ Very low wind load
- ◆ Rugged mechanical design
- ◆ Low weight
- ◆ Ideal for aeronautical radio and monitoring applications

Brief description

The VHF/UHF Coaxial Dipole R&S® HK 033 is a very broadband omnidirectional antenna for vertically polarized signals.

It features a vertical radiation pattern with null fill-in and high suppression of skin currents.

Its rugged design, its low wind load and its integrated lightning protection circuit make the R&S® HK 033 ideal for use on ships.



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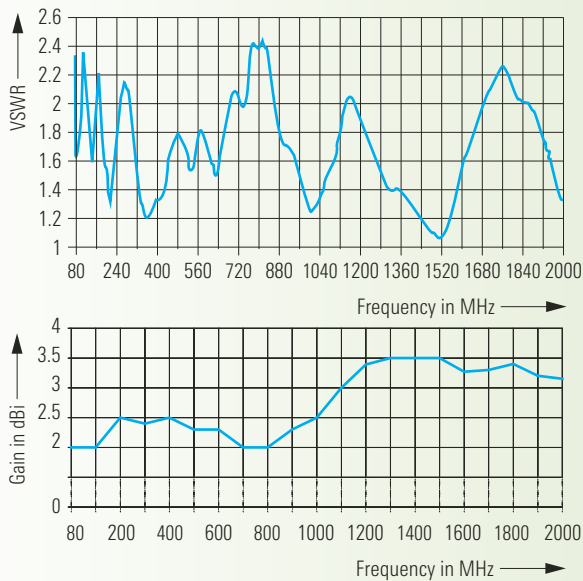


Specifications

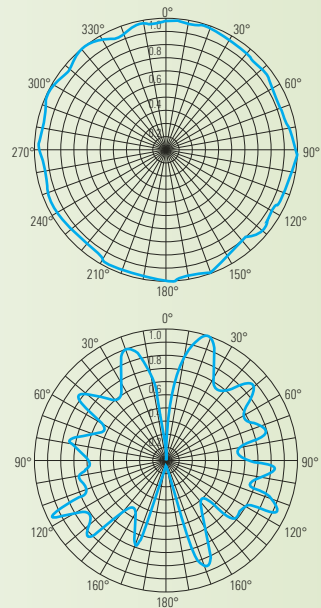
Frequency range	80 MHz to 2 GHz	Horizontal	
Polarization	linear/vertical	radiation pattern	omnidirectional
Input impedance	50 Ω	Max. deviation from circularity	±1 dB
VSWR	typ. <2.4	Connector	N female
Max. input power		MTBF	>1 000 000 h
Up to 100 MHz	860 W + 100% AM	Operating temperature range	-40 °C to +85 °C
Up to 400 MHz	430 W + 100% AM	Max. wind speed	160 km/h (without ice deposit)
Up to 600 MHz	360 W + 100% AM	Wind load (at 160 km/h)	180 N
Up to 1000 MHz	270 W + 100% AM	Dimensions (diameter × height)	approx. 310 mm × 1250 mm
From 1300 MHz	240 W + 100% AM	Weight	approx. 6 kg
Gain	typ. 2 dBi		

Ordering information

VHF/UHF Coaxial Dipole	R&S®HK033	4062.8369.02	Recommended extras
			Diplexer for the ranges
			100 MHz to 162 MHz/ 225 MHz to 400 MHz
			R&S®FT 224
			0525.5117.03
			Mast, 6 m, pluggable
			R&S®KM011
			0273.9116.02
			Mast Adapter
			R&S®KM 01122
			4022.3608.02



Typical VSWR and gain

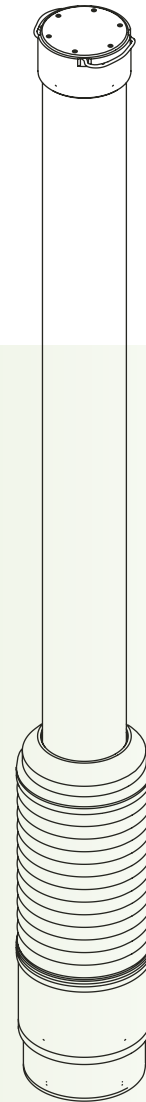


Typical horizontal (top) and vertical (bottom) radiation pattern

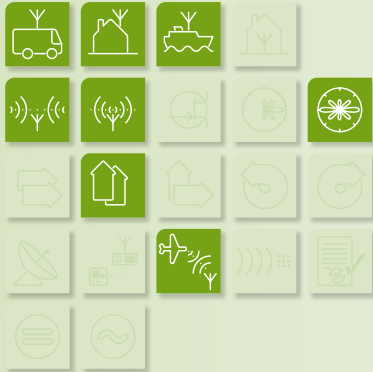
VHF/UHF Antennas

Broadband Mobile Antenna R&S® HK 055L1

New



2



27.5 MHz to 600 MHz

Compact transmitting/receiving antenna
specially designed for operation on board
vehicles

Features

- ◆ Extremely wide frequency range
- ◆ Compact dimensions
- ◆ High efficiency
- ◆ Rugged design especially for rough handling onboard vehicles
- ◆ Wide operating temperature range
- ◆ Especially suitable for multiband multirole radios (MMRs)

Brief description

The Broadband Mobile Antenna R&S® HK 055L1 covers the extremely wide frequency range from 27.5 MHz to 600 MHz.

It is designed for mobile transmission and reception in connection with MMRs. The antenna attains its outstanding characteristics without the use of any tuning equipment.

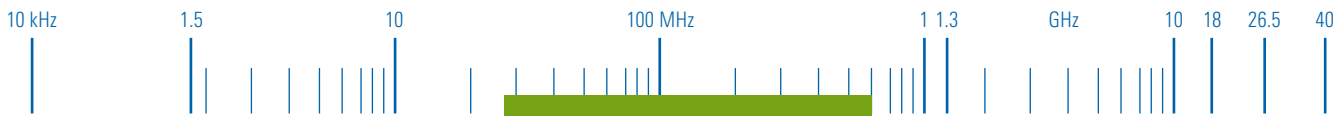
It is therefore ideally suited for hopping but also for multi-channel operation.

The antenna is equipped with a spring at its base. If the antenna strikes an obstacle, it will bend and automatically return to its vertical position.

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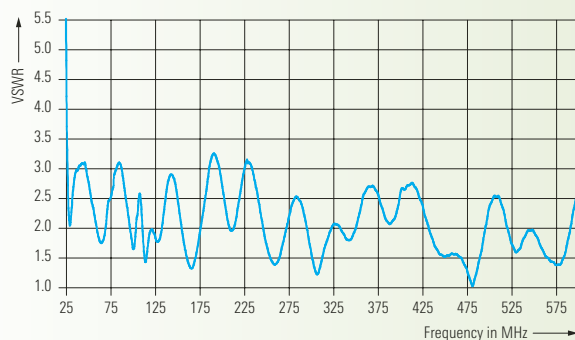
Specifications

Frequency range	27.5 MHz to 600 MHz	Elevation pattern	like monopoles (<110 MHz) like dipoles (>110 MHz)
Polarization	vertical	Input power	max. 100 W CW (≥ 30 MHz) max. 50 W CW (<30 MHz)
Input impedance	50 Ω	Connector	N female
VSWR	<3.0 (measured on a 3 m \times 3 m ground plane)	Operating temperature range	-40 °C to +85 °C
Gain		Safety class	IP 65 (in line with EN/IEC 60529)
27.5 MHz to 110 MHz	-1 dBi to +2 dBi (typ.) (measured on a 3 m \times 3 m ground plane)	Permissible wind speed	200 km/h
110 MHz to 600 MHz	0 dBi to +2 dBi (typ.) (measured under free space conditions)	Deflection	≥ 80 km/h
Azimuth pattern	omnidirectional	Dimensions	
Maximum deviation from circularity	± 1 dB	(length \times diameter)	approx. 1590 mm \times 165 mm
		Weight	approx. 19 kg
		MTBF	>200 000 h

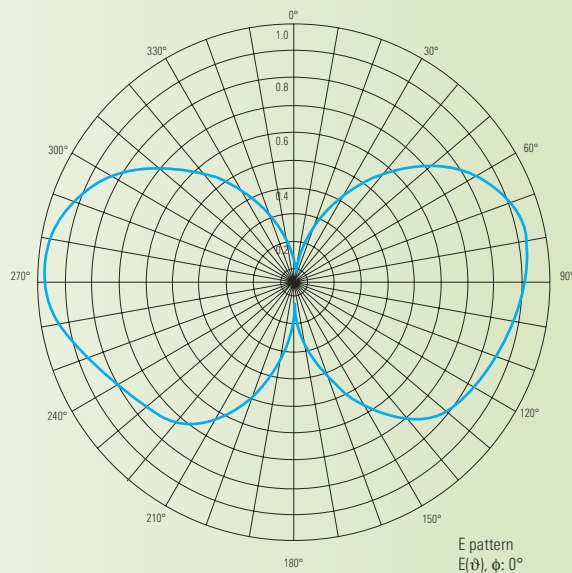
Ordering information

Broadband Mobile Antenna

Color: green (CARC 383)	R&S®HK055L1	4067.0014.03
Color: sand yellow (RAL 1002)	R&S®HK055L1	4067.0014.04



Typical VSWR characteristic

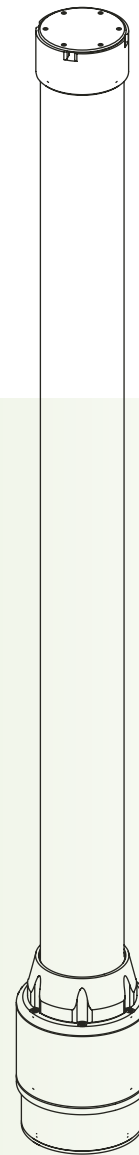


Typical elevation pattern at 120 MHz
(measured on a 3 m \times 3 m ground plane)

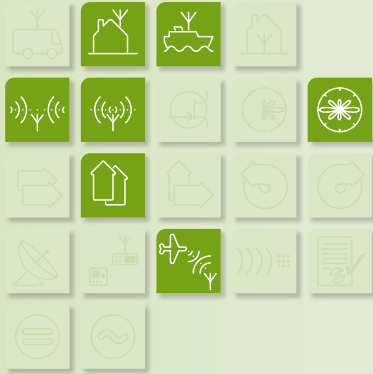
VHF/UHF Antennas

Omnidirectional Broadband Antenna R&S®HK 055S1

New



2



27.5 MHz to 600 MHz

**Compact transmitting/receiving antenna
especially designed for operation on board
ships**

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Features

- ◆ Extremely wide frequency range
- ◆ Compact dimensions
- ◆ High efficiency
- ◆ Rugged design especially for rough handling onboard ships
- ◆ Wide operating temperature range
- ◆ Especially suitable for multiband multirole radios (MMRs)

Brief description

The Omnidirectional Broadband Antenna R&S®HK 055S1 covers the extremely wide frequency range from 27.5 MHz to 600 MHz.

It is designed for stationary transmission and reception and can be used in many areas of communications as well as for monitoring tasks. The antenna attains its outstanding characteristics without the use of any tuning equipment.

It is therefore ideally suited for hopping but also for multichannel operation.



Specifications

Frequency range	27.5 MHz to 600 MHz	Elevation pattern	like monopoles (<110 MHz) like dipoles (>110 MHz)
Polarization	vertical	Input power	max. 100 W CW (≥ 30 MHz) max. 50 W CW (<30 MHz)
Input impedance	50 Ω	Connector	N female
VSWR	<3.0 (measured on a 3 m \times 3 m ground plane)	Operating temperature range	-40 °C to +85 °C
Gain		Safety class	IP 65 (in line with EN/IEC 60529)
27.5 MHz to 110 MHz	-1 dBi to +2 dBi (typ.) (measured on a 3 m \times 3 m ground plane)	Permissible wind speed	200 km/h
110 MHz to 600 MHz	0 dBi to +2 dBi (typ.) (measured under free space conditions)	Dimensions	
Azimuth pattern	omnidirectional	(length \times diameter)	approx. 1585 mm \times 165 mm
Maximum deviation from circularity	± 1 dB	Weight	approx. 12 kg
		MTBF	>300 000 h

Ordering information

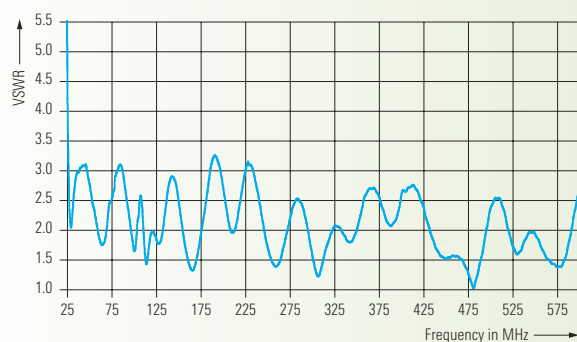
Omnidirectional Broadband Antenna

Color: sand yellow

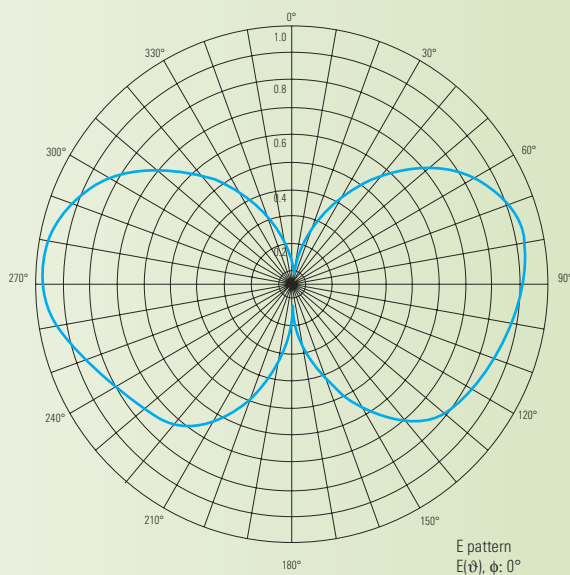
(RAL 1002) R&S®HK055S1 4067.0443.04

Color: silver grey

(RAL 7001) R&S®HK055S1 4067.0443.05



Typical VSWR characteristic

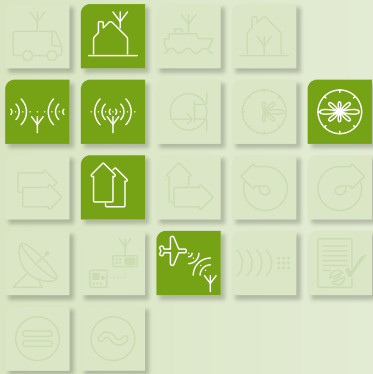


Typical elevation pattern at 120 MHz
(measured on a 3 m \times 3 m ground plane)

VHF/UHF Antennas

VHF/UHF Omnidirectional ATC Antenna R&S® HK 353A

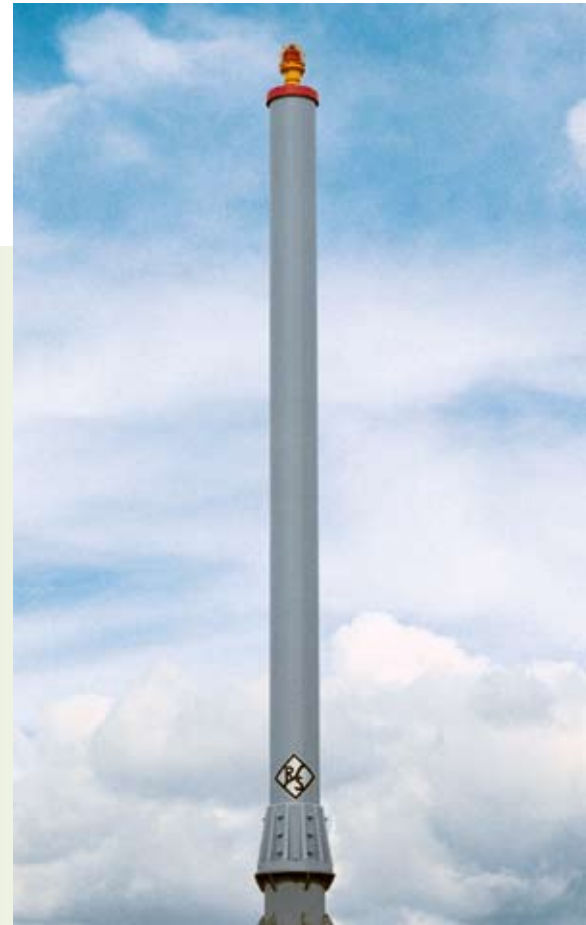
2



100 MHz to 156 MHz (VHF)

225 MHz to 400 MHz (UHF)

**Omnidirectional VHF/UHF antenna for ATC
(air traffic control)**



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Features

- ◆ Modular VHF and UHF dipoles
- ◆ Extremely high isolation with minimum space requirement
- ◆ Components individually combinable
- ◆ Self-supporting antenna mast

Brief description

The R&S® HK 353A is designed for ATC ground-to-air communication. Due to its modular design, any number of antenna configurations (up to an overall height of 10 m) can be set up on the mast.

The most important system components are the self-supporting antenna mast, the VHF dipole, the UHF dipole and the specially developed decoupling units. The coaxial arrangement of the dipoles permits several transmitting and receiving antennas to be set up.

For easy transport, the antenna mast made of glassfiber-reinforced plastic comes in two sections (for masts longer than 6 m). The modular dipoles and the decoupling units are arranged inside the supporting cylinder.

Specifications

VHF Dipole R&S®HK 153D2

Frequency range	100 MHz to 156 MHz
Polarization	linear/vertical
Max. input power	700 W CW per dipole
Input impedance	50 Ω
VSWR	<2.5 (with radome)
Gain	>2 dBi per dipole

Horizontal

radiation pattern	omnidirectional
Uncircularity	<±1 dB

Dimensions

(length × diameter)	approx. 1850 mm × 250 mm
Weight	approx. 6 kg

UHF Dipole R&S®HK 253D2

Frequency range	225 MHz to 400 MHz
Polarization	linear/vertical
Max. input power	450 W CW per dipole
Input impedance	50 Ω

VSWR	<2.5 (with radome)
Gain	>2 dBi per dipole

Horizontal

radiation pattern	omnidirectional
Uncircularity	<±1 dB

Dimensions

(length × diameter)	approx. 925 mm × 130 mm
Weight	approx. 1.6 kg

General data

Max. total input power	5 dipoles simultaneously at full power
------------------------	--

Max. wind speed

Without ice deposit	190 km/h
With 50 mm radial ice deposit	177 km/h

Operating

temperature range	-30 °C to +50 °C
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MTBF	>500 000 h
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Dimensions

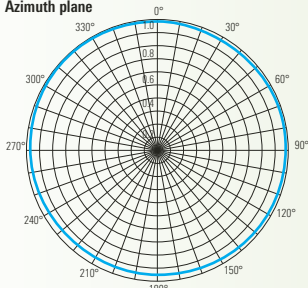
(height × diameter)	approx. 2 m to 10 m (max.) × 280 mm
Weight	depending on system configuration

Ordering information

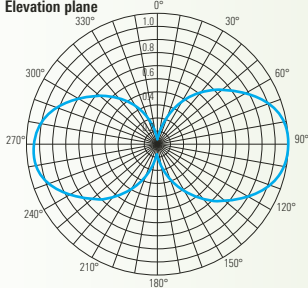
VHF/UHF Omnidirectional

ATC Antenna	R&S®HK 353A	on request
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Azimuth plane

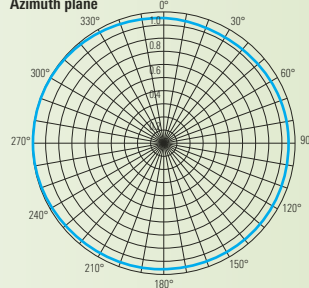


Elevation plane

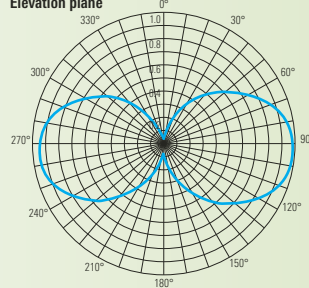


Typical VHF radiation patterns at 125 MHz

Azimuth plane



Elevation plane



Typical UHF radiation patterns at 225 MHz

VHF/UHF Antennas

Receiving Antenna System R&S® AU 900A4

2



10 kHz to 3000 MHz

**Omnidirectional and directional reception
of vertically and horizontally polarized
waves**

Features

- ◆ Omnidirectional and directional reception
- ◆ Reception of vertically and horizontally polarized signals
- ◆ Rotatable
- ◆ Ideal for radiomonitoring and radiolocation
- ◆ Customized antenna configuration

Brief description

The rotatable Receiving Antenna System R&S® AU 900A4 has been designed for the reception of linearly polarized electromagnetic waves in the frequency range 10 kHz to 3 GHz.

Owing to its excellent characteristics (wide frequency bandwidth, horizontal and vertical polarization, omnidirectional and directional reception), the antenna system is particularly suitable for radiomonitoring and radiolocation.

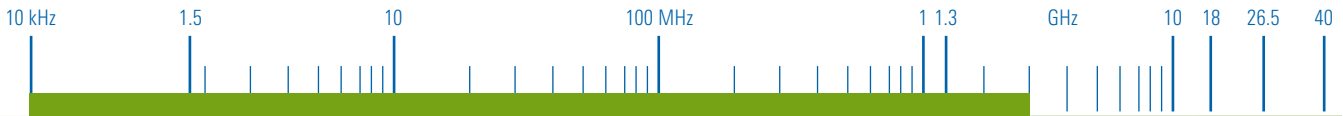
The antenna has been designed for the most adverse environmental conditions and is notable for compact design, reduced space requirements and simple installation.



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Specifications

Frequency range	10 kHz to 3 GHz
Polarization	horizontal and vertical
Input impedance	50 Ω
Connectors	
(type and number)	depending on antennas used
Operating temperature range	-40 °C to +50 °C
Max. wind speed	180 km/h (without ice deposit) ¹⁾
Wind load (at 180 km/h)	13 500 N ¹⁾

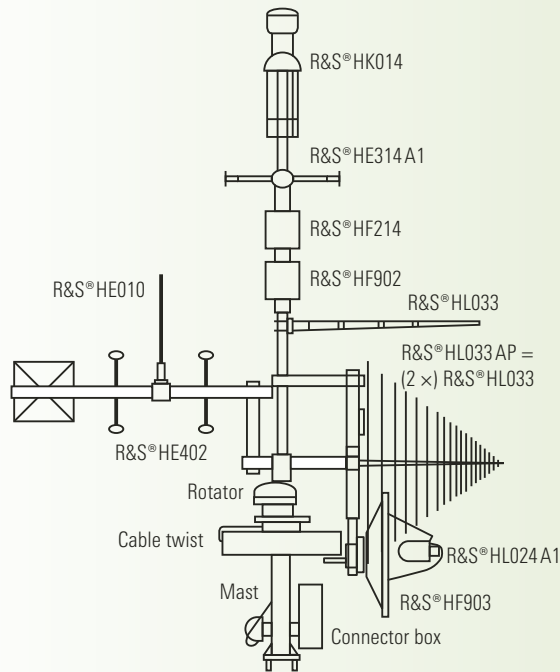
Range of rotation	0° to 400°
Dimensions (H × W)	approx. 6.5 m × 3.1 m ¹⁾
MTBF	≥15 000 h
Weight	approx. 350 kg ¹⁾
	approx. 1000 kg ¹⁾
	(with 30 mm radial ice deposit)

¹⁾ Maximum configuration.

Ordering information

Receiving Antenna System	R&S® AU 900A4	4045.0205.15
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Recommended extras		
Antenna Control Unit		
(for indoor use, control via RS-232-C interface and manual operation)		
With external		
rotator control	R&S® GB 127S	3022.2011.02
With integrated		
rotator control	R&S® GB 127M	3022.2511.02
Rotator Control Unit		
(with switch)	R&S® RD 127	3021.9012.05



Design

	10 kHz	20 MHz	68 MHz 80 MHz	500 MHz 1.3 GHz 2 GHz	3 GHz
Directional antennas	Hor. polarization		R&S® HL033	R&S® HF903	
	Vert. polarization	R&S® HE402	R&S® HL033 AP	R&S® HF903	
Omnidirectional antennas	Hor. polarization		R&S® HE314 A1	R&S® HF902	
	Vert. polarization	R&S® HE010	R&S® HK014	R&S® HF902	

Operating frequency ranges



3 SHF Antennas

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R&S® AC 300	SHF Directional Antenna System	120
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R&S®HL 024S8	Crossed Log-Periodic Antenna	134
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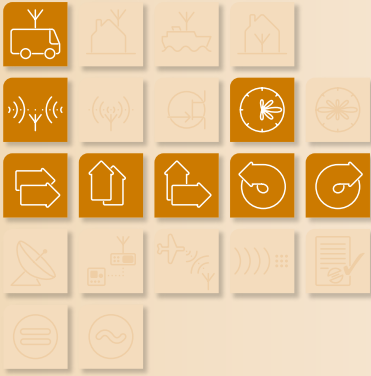
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SHF Antennas

Microwave Directional Antenna R&S® AC 008

3



1 GHz to 18 GHz/0.85 GHz to 26.5 GHz

**Manually steerable directional antenna for
the detection of RF signals and for field-
strength measurements**

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Features

- ◆ Wide frequency range
- ◆ Reception of linear, dual-linear and circular polarization (depending on feed used)
- ◆ Collapsible for easy transport
- ◆ For compensating cable loss, active feeds can be used

Brief description

The R&S® AC 008 is a manually steerable directional antenna for mobile applications.

The reflector has a diameter of 0.9 m and – depending on the feed used – receives signals in the range 1 GHz to 18 GHz or 0.85 GHz to 26.5 GHz.

The R&S® AC 008 is used for detecting radio signals and for field-strength measurements. It can also be directed toward geostationary satellites.

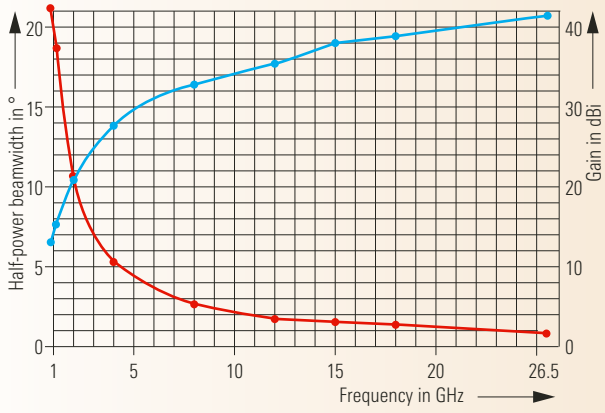
The use of different feeds allows reception of any type of polarization. For transportation, the directional antenna (including the feed) can be collapsed to a handy size.

Specifications

Frequency range	1 GHz to 18 GHz (models .02/.04) 0.85 GHz to 26.5 GHz (model .05)	Positioning range	
Polarization		Azimuth	±360°
With feed R&S®HL024A1 dual-linear (model .02)		Elevation	-6° to +44°
With feed R&S®HL050 linear (model .05)		Connector	SMA female
With feed R&S®HL024S2 linear/circular (model .04)		MTBF	>500 000 h
Input impedance	50 Ω	Operating	
VSWR	≤2.5	temperature range	-30 °C to +50 °C
Gain	15 dBi to 40 dBi (1 GHz to 18 GHz)	Reflector diameter	approx. 0.9 m
Half-power beamwidth	20° to 1.5° (1 GHz to 18 GHz)	Weight	approx. 12 kg

Ordering information

Microwave Directional Antenna			Recommended extras		
1 GHz to 18 GHz, dual-linear			Tripod	R&S®AC008-Z	0671.5117.02
polarization	R&S®AC008	0671.5017.02	Control Unit for		
1 GHz to 18 GHz, linear/			R&S®HL024S2	R&S®GB016	4056.7006.02
circular polarization	R&S®AC008	0671.5017.04	Control Cable, 10 m	R&S®GB016Z1	4056.7270.02
0.85 GHz to 26.5 GHz,			Microwave Cable, 5 m	R&S®AC008W2	0751.6931.04
linear polarization	R&S®AC008	0671.5017.05	Microwave Cable, 10 m	R&S®AC008W2	0751.6931.05
			Telescope	R&S®AC008F1	0751.6919.02



Typical gain (blue) and half-power beamwidth (red) of R&S® AC008 with feed R&S® HL050

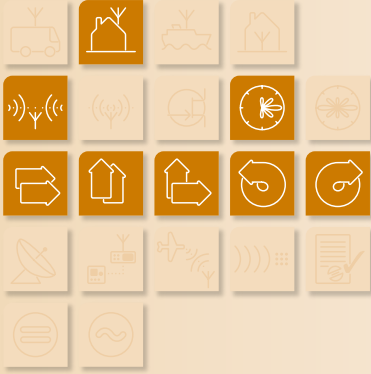


R&S® AC008 collapsible for transportation

SHF Antennas

SHF Directional Antenna System R&S® AC 090

3



1 GHz to 18 GHz/0.85 GHz to 26.5 GHz
Extremely broadband directional antenna
for radiomonitoring, steerable in azimuth
and elevation

Features

- ◆ Extremely broadband without change of feed
- ◆ 0.9 m reflector diameter
- ◆ Adjustable in azimuth and elevation
- ◆ System control via PC user interface (WindowsNT/2000/XP)
- ◆ Use of the R&S®HL 050S7 allows the preamplifier to be bypassed at high field strengths (also applies to the R&S®HL 024S7/S8)



Brief description

The R&S® AC 090 is a stationary directional antenna that can be adjusted in azimuth and elevation.

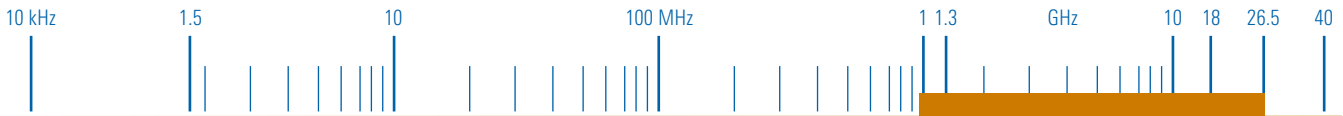
The reflector has a diameter of 0.9 m and – depending on the feed used – receives signals in the range 1 GHz to 18 GHz or 0.85 GHz to 26.5 GHz. The frequency range can be extended to up to 40 GHz by flange-connected options.

The R&S® AC 090 is used for radiomonitoring tasks, for instance.

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Specifications

Frequency range	1 GHz to 18 GHz	Connector	RPC3.5 female
Depending on feed	0.85 GHz to 26.5 GHz	MTBF	>8000 h
Gain	15 dBi to 40 dBi (1 GHz to 18 GHz)	Operating temperature range	-30 °C to +50 °C
Half-power beamwidth	19° to 1.1° (1 GHz to 18 GHz)	Max. wind speed	180 km/h (without ice deposit)
Min. field strength	see figure below	Reflector diameter	approx. 0.9 m
Range of rotation		Weight	approx. 165 kg
Azimuth	±180°		
Elevation	-5° to +95°		

3

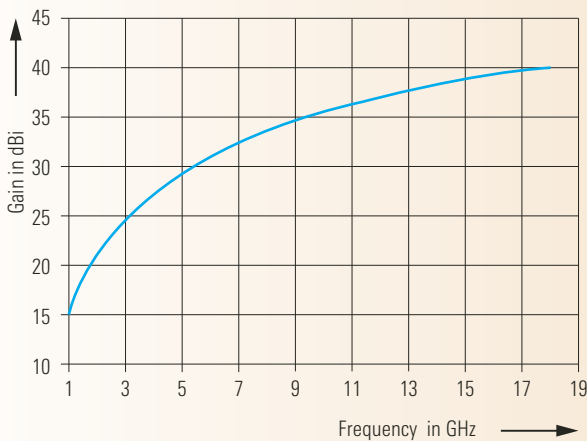
Ordering information

SHF Directional Antenna			
System	R&S®AC 090	4051.4509.00	
Feed options (see also pages 128 to 141):			
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz			
Basic model	R&S®HL 050S1	4065.0100.02	
With preamplifier	R&S®HL 050S7	4064.6040.02	
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz			
Basic model	R&S®HL 024S1	4055.1256.02	
With passive polarization network	R&S®HL 024S2	4052.1003.02	
With preamplifier, 1 RF output	R&S®HL 024S7	4042.8505.02	
With preamplifier, 2 RF outputs	R&S®HL 024S8	4042.7509.02	
With active polarization network	R&S®HL 024S9	4047.6252.02	
Recommended extras			
Reflector Antenna, 18 GHz to 26.5 GHz,			
29 dBi to 33 dBi	R&S®AC 308R2	4051.6001.02	
Reflector Antenna, 26.5 GHz to 40 GHz,			
33 dBi to 36 dBi	R&S®AC 308R3	4051.6253.02	

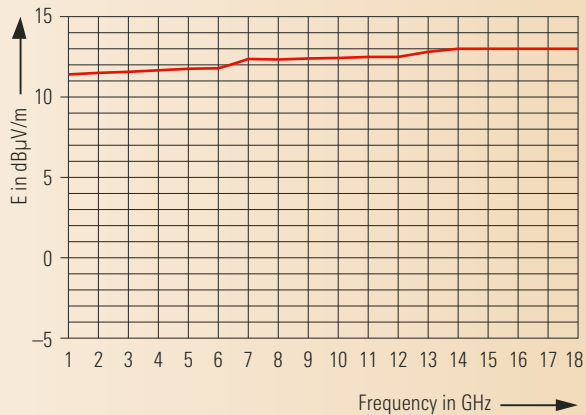
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Typical gain



Typical minimum receive field strength with R&S®HL 024S9 (for a receiver with $F = 15$ dB, $\Delta f = 1$ MHz)

SHF Antennas

SHF Directional Antenna System R&S® AC 120



1 GHz to 18 GHz/0.85 GHz to 26.5 GHz
Extremely broadband directional antenna
for radiomonitoring, steerable in azimuth
and elevation

Features

- ◆ Extremely broadband without change of feed
- ◆ 1.2 m reflector diameter
- ◆ Adjustable in azimuth and elevation
- ◆ System control via PC user interface (WindowsNT/2000/XP)
- ◆ Use of the R&S®HL 050S7 allows the preamplifier to be bypassed at high field strengths (also applies to the R&S®HL 024S7/S8)



Brief description

The R&S® AC 120 is a stationary directional antenna that can be adjusted in azimuth and elevation.

The reflector has a diameter of 1.2 m and – depending on the feed used – receives signals in the range 1 GHz to 18 GHz or 0.85 GHz to 26.5 GHz. The frequency range can be extended to up to 40 GHz by flange-connected options.

The R&S® AC 120 is used for radiomonitoring tasks, for instance.

3

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Specifications

Frequency range	1 GHz to 18 GHz	Connector	RPC3.5 female
Depending on feed	1 GHz to 26.5 GHz	MTBF	>8000 h
Gain	15 dBi to 42 dBi (1 GHz to 18 GHz)	Operating temperature range	-30 °C to +50 °C
Half-power beamwidth	17° to 0.9° (1 GHz to 18 GHz)	Max. wind speed	180 km/h (without ice deposit)
Min. field strength	see figure below	Reflector diameter	approx. 1.2 m
Range of rotation		Weight	approx. 170 kg
Azimuth	±180°		
Elevation	-5° to +95°		

3

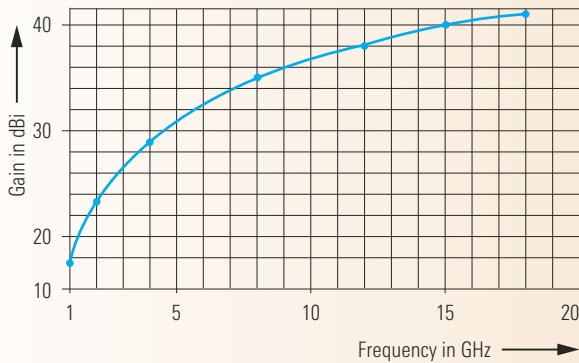
Ordering information

SHF Directional Antenna			
System	R&S®AC 120		4051.5005.00
Feed options (see also pages 128 to 141):			
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz			
Basic model	R&S®HL 050S1		4065.0100.02
With preamplifier	R&S®HL 050S7		4064.6040.02
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz			
Basic model	R&S®HL 024S1		4055.1256.02
With passive polarization network	R&S®HL 024S2		4052.1003.02
With preamplifier, 1 RF output	R&S®HL 024S7		4042.8505.02
With preamplifier, 2 RF outputs	R&S®HL 024S8		4042.7509.02
With active polarization network	R&S®HL 024S9		4047.6252.02
Recommended extras			
Reflector Antenna, 18 GHz to 26.5 GHz,			
29 dBi to 33 dBi	R&S®AC 308R2		4051.6001.02
Reflector Antenna, 26.5 GHz to 40 GHz,			
33 dBi to 36 dBi	R&S®AC 308R3		4051.6253.02

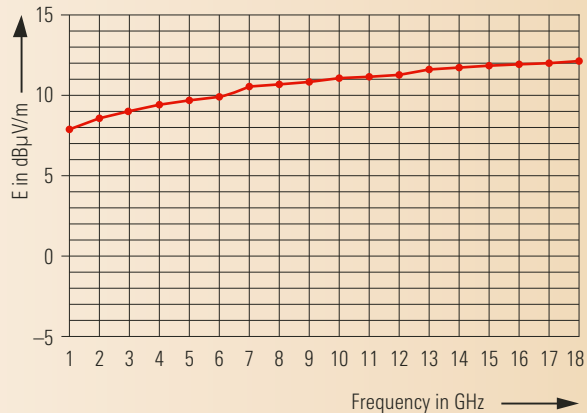
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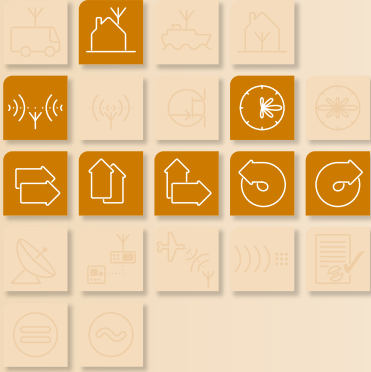
Typical gain



Typical minimum receive field strength with R&S®HL 024S9 (for a receiver with $F = 15$ dB, $\Delta f = 1$ MHz)

SHF Antennas

SHF Directional Antenna System R&S® AC 180



1 GHz to 18 GHz/0.85 GHz to 26.5 GHz
Extremely broadband directional antenna
for radiomonitoring, steerable in azimuth
and elevation

Features

- ◆ Extremely broadband without change of feed
- ◆ 1.8 m reflector diameter
- ◆ Enhanced antenna gain
- ◆ Adjustable in azimuth and elevation
- ◆ System control via PC user interface (Windows NT/2000/XP)
- ◆ Use of the R&S®HL 050S7 allows the preamplifier to be bypassed at high field strengths (also applies to the R&S®HL 024S7/S8)



R&S® AC 180 with optional R&S® AC 308R2/R3

Brief description

The R&S® AC 180 is a stationary directional antenna that can be adjusted in azimuth and elevation.

The reflector has a diameter of 1.8 m and – depending on the feed used – receives signals in the range 1 GHz to 18 GHz or 0.85 GHz to 26.5 GHz. The frequency range can be extended to up to 40 GHz by flange-connected options.

The R&S® AC 180 is used for radiomonitoring tasks, for instance.

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Specifications

Frequency range	Depending on feed	1 GHz to 18 GHz	Connector	RPC3.5 female
		0.85 GHz to 26.5 GHz	MTBF	>8000 h
Gain		20 dBi to 46 dBi (1 GHz to 18 GHz)	Operating temperature range	-30 °C to +55 °C
Half-power beamwidth		12° to 0.7° (1 GHz to 18 GHz)	Max. wind speed	160 km/h (without ice deposit)
Min. field strength		see figure below	Reflector diameter	approx. 1.8 m
Range of rotation			Weight	approx. 420 kg
Azimuth		±180°		
Elevation		-5° to +95°		

3

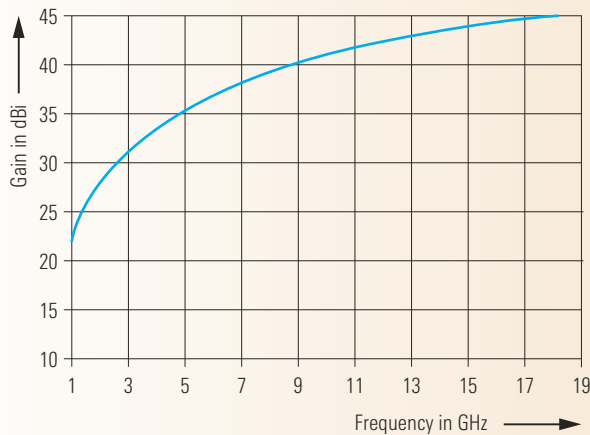
Ordering information

SHF Directional Antenna					
System	R&S®AC 180	4051.5505.00	With preamplifier,		
Feed options (see also pages 128 to 141):			2 RF outputs	R&S®HL 024S8	4042.7509.02
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz			With active		
Basic model	R&S®HL 050S1	4065.0100.02	polarization network	R&S®HL 024S9	4047.6252.02
With preamplifier	R&S®HL 050S7	4064.6040.02	Recommended extras		
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz			Reflector Antenna, 18 GHz to 26.5 GHz,		
Basic model	R&S®HL 024S1	4055.1256.02	29 dBi to 33 dBi	R&S®AC 308R2	4051.6001.02
With passive			Reflector Antenna, 26.5 GHz to 40 GHz,		
polarization network	R&S®HL 024S2	4052.1003.02	33 dBi to 36 dBi	R&S®AC 308R3	4051.6253.02
With preamplifier,					
1 RF output	R&S®HL 024S7	4042.8505.02			

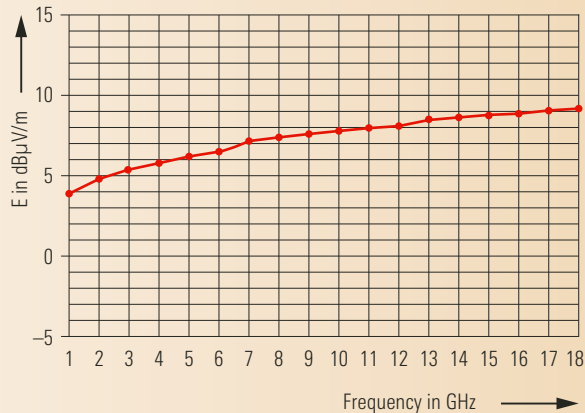
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Typical gain



Typical minimum receive field strength with R&S®HL 024S9 (for a receiver with $F = 15$ dB, $\Delta f = 1$ MHz)

SHF Antennas

SHF Directional Antenna System R&S® AC 300



1 GHz to 18 GHz/0.85 GHz to 26.5 GHz
Extremely broadband directional antenna
for radiomonitoring, steerable in azimuth
and elevation

Features

- ◆ Extremely broadband without change of feed
- ◆ 3 m reflector diameter
- ◆ Enhanced antenna gain
- ◆ Adjustable in azimuth and elevation
- ◆ System control via PC user interface (WindowsNT/2000/XP)
- ◆ Use of the R&S®HL 050S7 allows the preamplifier to be bypassed at high field strengths (also applies to the R&S®HL 024S7/S8)



Brief description

The R&S® AC 300 is a stationary directional antenna that can be adjusted in azimuth and elevation.

The reflector has a diameter of 3 m and – depending on the feed used – receives signals in the range 1 GHz to 18 GHz or 0.85 GHz to 26.5 GHz. The frequency range can be extended to up to 40 GHz by flange-connected options.

The R&S® AC 300 is used for radiomonitoring tasks, for instance.

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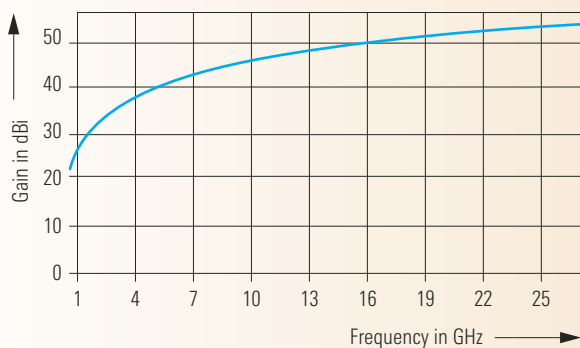


Specifications

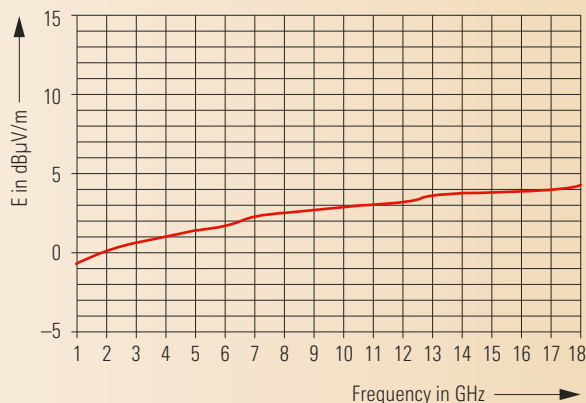
Frequency range	Depending on feed	1 GHz to 18 GHz	Connector	RPC3.5 female
		0.85 GHz to 26.5 GHz	MTBF	>8000 h
Gain		26 dBi to 51 dBi	Operating temperature range	-30 °C to +55 °C
		22 dBi to 51 dBi	Max. wind speed	160 km/h (without ice deposit)
Half-power beamwidth		6° to 0.35°	Reflector diameter	approx. 3 m
Min. field strength		see figure below	Weight	approx. 1460 kg
Range of rotation				
Azimuth		±180°		
Elevation		-5° to +95°		

Ordering information

SHF Directional Antenna			
System	R&S®AC 300	4051.6546.00	
Feed options (see also pages 128 to 141):			
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz			
Basic model	R&S®HL 050S1	4065.0100.02	
With preamplifier	R&S®HL 050S7	4064.6040.02	
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz			
Basic model	R&S®HL 024S1	4055.1256.02	
With passive polarization network	R&S®HL 024S2	4052.1003.02	
With preamplifier, 1 RF output	R&S®HL 024S7	4042.8505.02	
With preamplifier, 2 RF outputs	R&S®HL 024S8	4042.7509.02	
With active polarization network	R&S®HL 024S9	4047.6252.02	
Recommended extras			
Reflector Antenna, 18 GHz to 26.5 GHz,			
29 dBi to 33 dBi	R&S®AC 308R2	4051.6001.02	
Reflector Antenna, 26.5 GHz to 40 GHz,			
33 dBi to 36 dBi	R&S®AC 308R3	4051.6253.02	



Typical gain

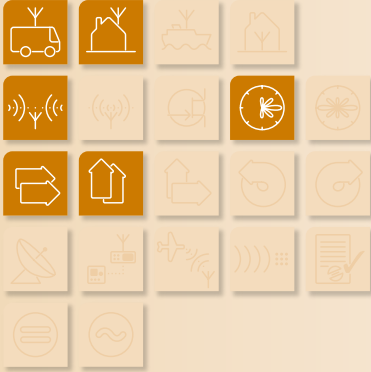


Typical minimum receive field strength with R&S®HL 024S9 (for a receiver with $F = 15$ dB, $\Delta f = 1$ MHz)

SHF Antennas

SHF Directional Antenna R&S® AC 308R2

3



18 GHz to 26.5 GHz

**Broadband directional antenna for
radiomonitoring**



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Features

- ◆ Fast and simple installation
- ◆ Rugged design
- ◆ Integrated in operational concept of SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300

Brief description

The SHF Directional Antenna R&S® AC 308R2 for the frequency range 18 GHz to 26.5 GHz has a reflector diameter of 25 cm.

The antenna is supplied with an integrated preamplifier (model .02) or without preamplifier (model .04).

The R&S® AC 308R2 is especially suitable for extending the frequency range of the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300 to which it can be flange-connected.

The R&S® AC 308R2 with optional tripod, adapter and power supply can also be used independently.



Specifications

Antenna

Frequency range	18 GHz to 26.5 GHz
Polarization	H, V or 45°, depending on installation
Input impedance	50 Ω
VSWR	<2
Gain	29 dBi to 33 dBi
Half-power beamwidth	4.5° to 3°
Reflector diameter	250 mm
Connector	K female

Preamplifier (typical values)

Gain	28 ±2 dB
1 dB compression point	≥+8 dBm

Noise figure	<3 dB
Power consumption	+15 V/0.2 A
MTBF	
Model .04 (passive)	>250 000 h
Model .02 (active)	>100 000 h
Operating temperature range	-20 °C to +50 °C
Dimensions (diameter × length)	approx. 380 mm × 300 mm
Weight	approx. 2.5 kg

3

Ordering information

SHF Directional Antenna

With preamplifier,		
18 GHz to 26.5 GHz	R&S®AC 308R2	4051.6001.02
Without preamplifier,		
18 GHz to 26.5 GHz	R&S®AC 308R2	4051.6001.04

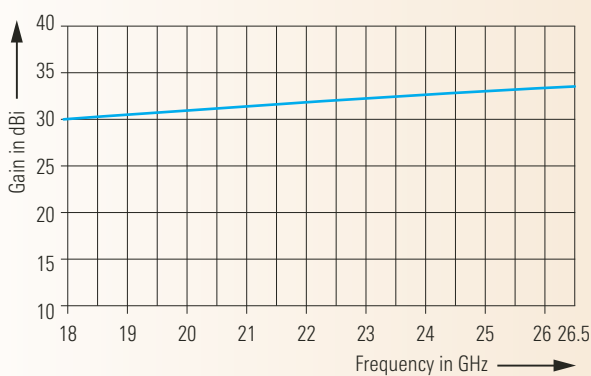
Recommended extras

Power Supply	R&S®IN 308	4059.6752.02
Transit Case	R&S®AC 308Z	4059.6500.02
Adapter for		
Wooden Tripod R&S®HZ-1	R&S®KA 308R2	4057.8606.00
Wooden Tripod	R&S®HZ-1	0837.2310.02

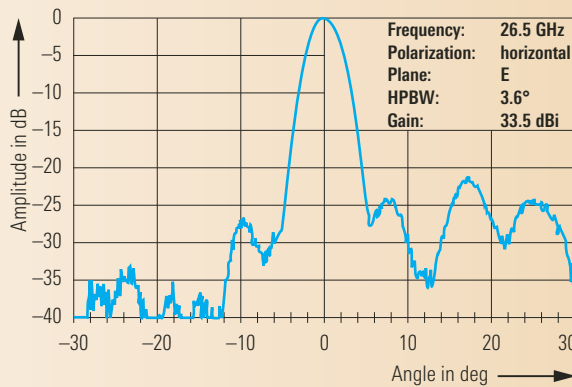
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Typical gain

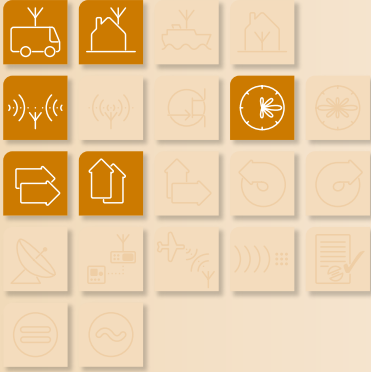


Typical radiation pattern at 26.5 GHz

SHF Antennas

SHF/EHF Directional Antenna R&S® AC 308R3

3



26.5 GHz to 40 GHz

**Broadband directional antenna for
radiomonitoring**



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Features

- ◆ Fast and simple installation
- ◆ Rugged design
- ◆ Integrated in operational concept of SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300

Brief description

The SHF Directional Antenna R&S® AC 308R3 for the frequency range 26.5 GHz to 40 GHz has a reflector diameter of 25 cm.

The antenna is supplied with integrated preamplifier (model .02) or without preamplifier (model .04).

The antenna is especially suitable for extending the frequency range of the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300 to which it can be flange-connected.

The R&S® AC 308R3 with optional tripod, adapter and power supply can also be used independently.



Specifications

Antenna

Frequency range	26.5 GHz to 40 GHz
Polarization	H, V or 45°, depending on installation
Input impedance	50 Ω
VSWR	<2
Gain	33 dBi to 36 dBi
Half-power beamwidth	3° to 2°
Reflector diameter	250 mm
Connector	K female

Preamplifier (typical values)

Gain	28 ±2 dB
1 dB compression point	≥+8 dBm

Noise figure	<4 dB
Power consumption	+15 V/0.2 A
MTBF	
Model .04 (passive)	>250 000 h
Model .02 (active)	>100 000 h
Operating temperature range	-20 °C to +50 °C
Dimensions (diameter × length)	approx. 380 mm × 300 mm
Weight	approx. 2.5 kg

3

Ordering information

SHF/EHF Directional Antenna

With preamplifier,		
26.5 GHz to 40 GHz	R&S®AC 308R3	4051.6253.02
Without preamplifier,		
26.5 GHz to 40 GHz	R&S®AC 308R3	4051.6253.04

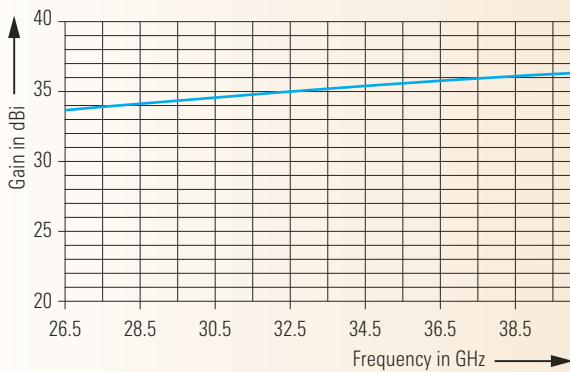
Recommended extras

Power Supply	R&S®IN 308	4059.6752.02
Transit Case	R&S®AC 308Z	4059.6500.02
Adapter for		
Wooden Tripod R&S®HZ-1	R&S®KA 308R2	4057.8606.00
Wooden Tripod	R&S®HZ-1	0837.2310.02

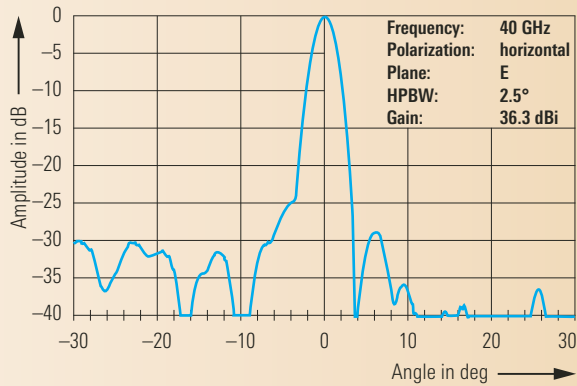
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Typical gain

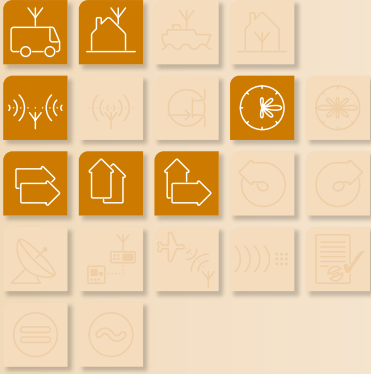


Typical radiation pattern at 40 GHz

SHF Antennas

Dual-Polarized Reflector Antenna R&S® AC 025DP

3



18 GHz to 40 GHz

**Broadband microwave reflector antenna
with preamplifier**

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Features

- ◆ Extremely wide frequency range
- ◆ Simultaneous reception of two orthogonal polarization planes
- ◆ Can be integrated into the SHF Directional Antenna Systems R&S® AC 090/120/180/300
- ◆ Fast and simple installation
- ◆ Sturdy mechanical design

Brief description

The Dual-Polarized Reflector Antenna R&S® AC 025DP has been optimized for use in the range 18 GHz to 40 GHz.

For independent operation, the antenna is installed on a tripod or, for frequency range extension, it can be combined with the steerable SHF Directional Antenna Systems R&S® AC 090/120/180/300.

The antenna is equipped with an integrated preamplifier for optimal signal processing.



Specifications

Antenna

Frequency range	18 GHz to 40 GHz
Polarization	2 × linear (orthogonal relative to each other)
Input impedance	50 Ω
VSWR (with preamplifier)	<3.0 (typ. <2.5)
Gain	26 dBi to 32 dBi
Half-power beamwidth	4.5° to 2° (typ.)
Reflector diameter	250 mm
Connector	2 × K female

Preamplifier (typical values)

Gain	typ. >30 dB
1 dB compression point	typ. >8 dBm

Noise figure	typ. <5 dB
Power consumption	15 V/0.5 A (max.)
MTBF	>50 000 h
Operating temperature range	-30 °C to +55 °C
Protection class	IP 45 (in line with DIN EN 60529)
Dimensions (diameter × length)	approx. 320 mm × 340 mm
Weight	approx. 5 kg

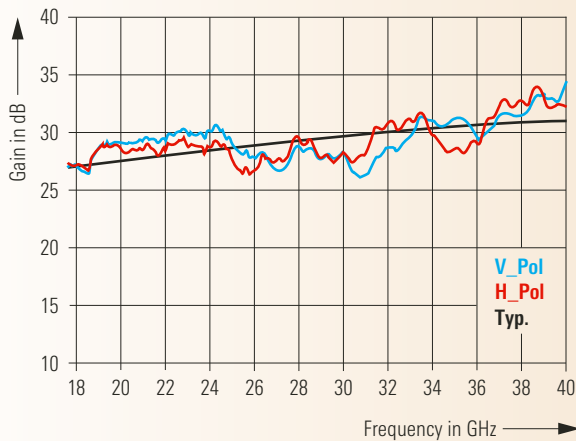
Ordering information

Dual-Polarized

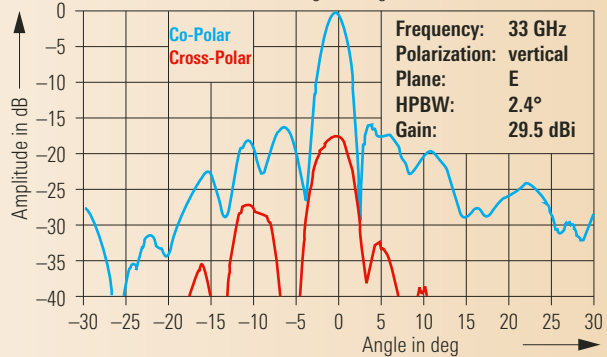
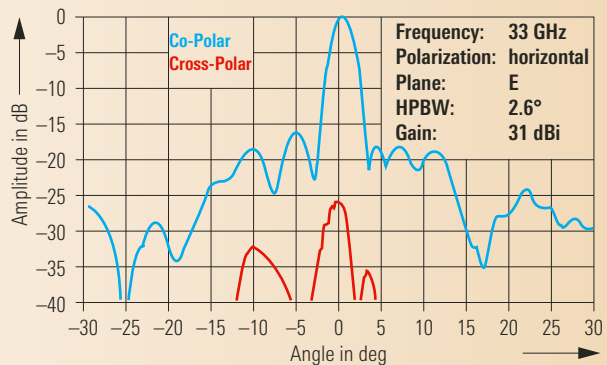
Reflector Antenna	R&S®AC025DP	4062.5830.02
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Recommended extras

Power Supply	R&S®IN 308	4059.6752.02
Adapter for		
Wooden Tripod R&S®HZ-1	R&S®KA 308R2	4057.8606.00
Wooden Tripod	R&S®HZ-1	0837.2310.02



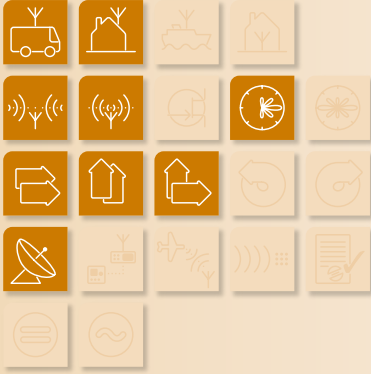
Typical gain



Typical radiation pattern

SHF Antennas

Crossed Log-Periodic Antennas R&S® HL 024A1/S1



1 GHz to 18 GHz

Log-periodic directional antennas for simultaneous reception of horizontally and vertically polarized waves

Features

- ◆ Horizontal and vertical polarization
- ◆ Wide frequency range
- ◆ Radiation pattern virtually independent of frequency
- ◆ Can be used as a feed for the Microwave Directional Antenna R&S® A C008 (R&S® HL 024A1)
- ◆ Can be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300 (R&S® HL 024S1)

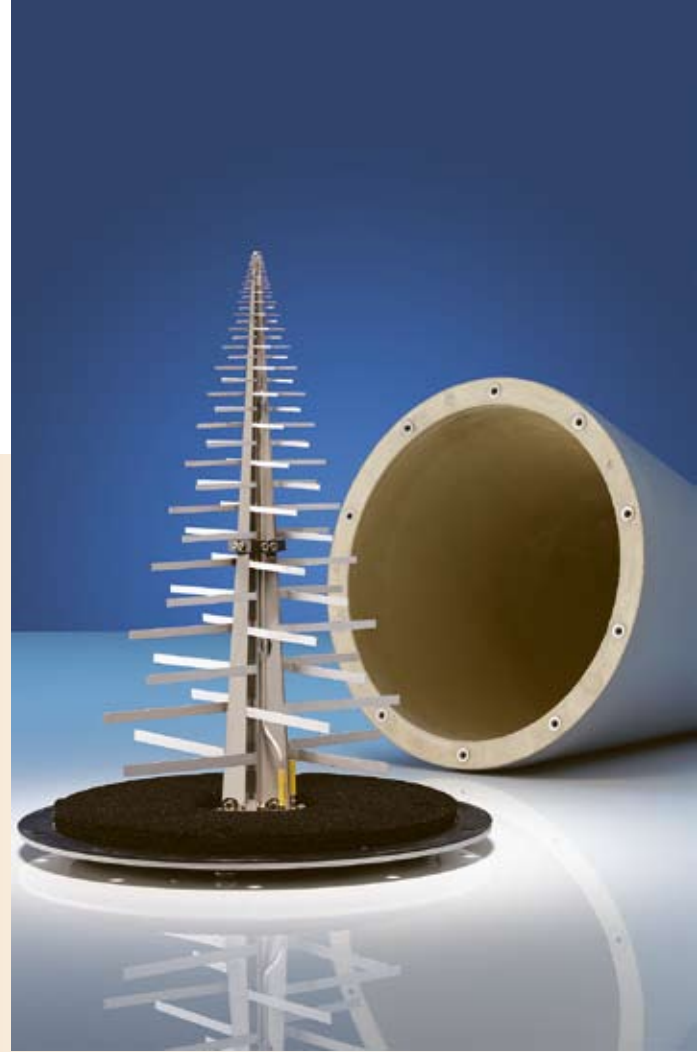
Brief description

The log-periodic directional R&S® HL 024A1 with crossed antenna elements is suitable for simultaneous reception of horizontally and vertically polarized waves.

It can also be used as a transmitting antenna for low power.

The R&S® HL 024A1 can additionally be used as a feed for the Microwave Directional Antenna R&S® AC 008.

The log-periodic directional R&S® HL 024S1 is of identical design and can be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300.



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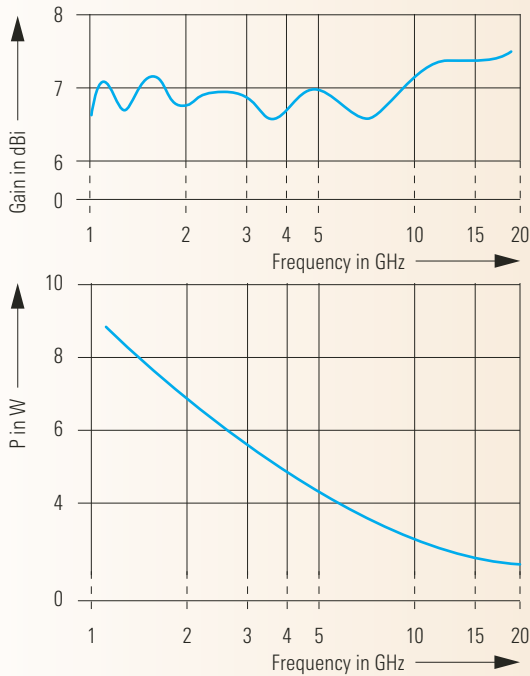


Specifications

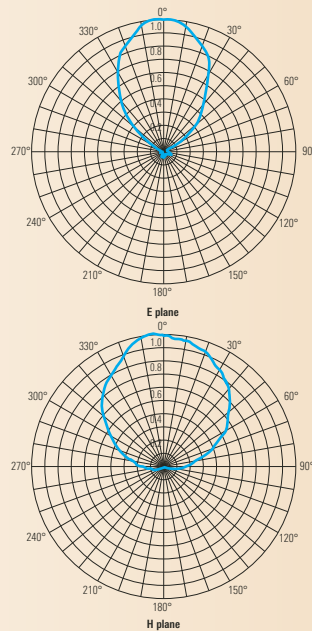
Frequency range	1 GHz to 18 GHz	Operating temperature range	-40 °C to +55 °C
Polarization	linear/horizontal and vertical	Max. wind speed	180 km/h (without ice deposit)
Input impedance	50 Ω	MTBF	>150 000 h
VSWR	≤2.5	Dimensions (diameter × height)	
Max. input power	10 W to 3 W CW	With radome	approx. 210 mm × 300 mm
Gain	typ. 7 dBi	Weight	approx. 0.7 kg
Connector	2 × SMA female		

Ordering information

Crossed			Recommended extras		
Log-Periodic Antenna	R&S®HL024A1	0650.7510.03	Microwave Cable, 5 m	R&S®AC008W2	0751.6931.04
Crossed			Microwave Cable, 10 m	R&S®AC008W2	0751.6931.05
Log-Periodic Antenna	R&S®HL024S1	4055.1256.02	Mast Adapter for R&S®HFU-Z	R&S®HL025-Z	0661.9910.02
			Tripod and Mast	R&S®HFU-Z	0100.1114.02
			Mast	R&S®HFU-Z	0100.1120.02
			Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02



Typical gain and power-handling capacity



Typical radiation patterns in the E and H planes

SHF Antennas

Crossed Log-Periodic Antenna R&S® HL 024S2

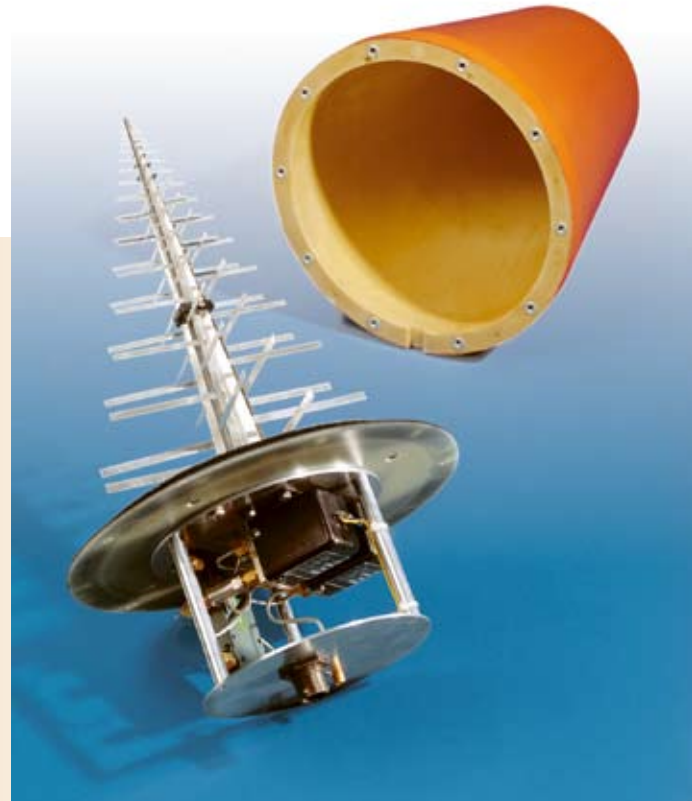


1 GHz to 18 GHz

Log-periodic directional antenna
consisting of R&S® HL 024A1 and passive
polarization switching network

Features

- ◆ Horizontal, vertical, left-hand or right-hand circular polarization
- ◆ Wide frequency range
- ◆ Radiation pattern virtually independent of frequency
- ◆ Remote-controlled polarization selection with optional Control Unit R&S® GB 016
- ◆ Can be used as a feed for the Directional Antennas R&S® AC 008 to R&S® AC 300



Brief description

The directional R&S® HL 024S2 with crossed antenna elements can be used for waves with horizontal, vertical, left-hand or right-hand circular polarization.

It consists of the Antenna R&S® HL 024A1 and a polarization switching network. Polarization can be selected by remote control using the R&S® GB 016, for instance.

The R&S® HL 024S2 can also be used as a feed for the Directional Antennas R&S® AC 008 to R&S® AC 300.

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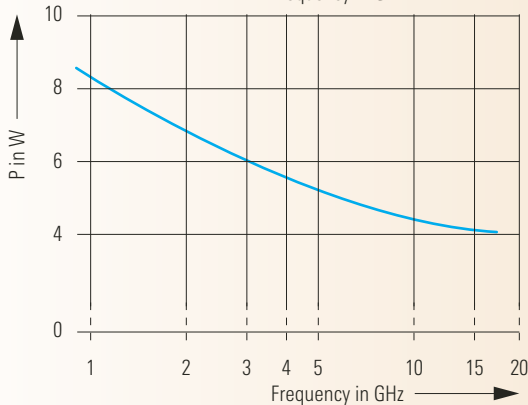
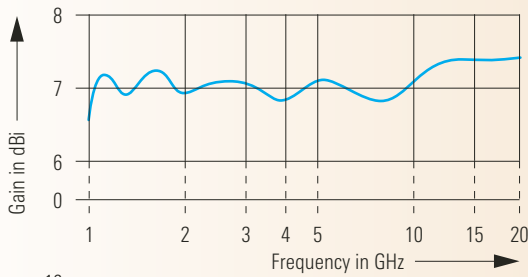


Specifications

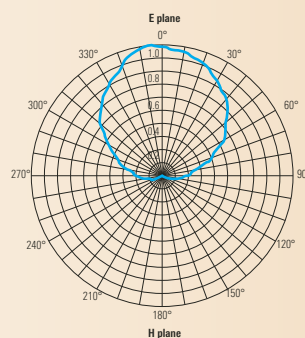
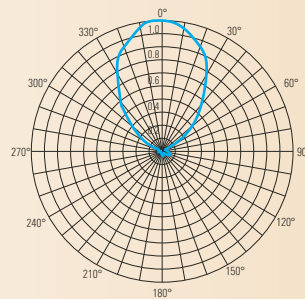
Frequency range	1 GHz to 18 GHz	Connector	SMA female
Polarization	horizontal, vertical, left-hand or right-hand circular (selectable)	Control connector	10-contact, round, male
Input impedance	50 Ω	Operating temperature range	-40 °C to +55 °C
VSWR		Max. wind speed	180 km/h (without ice deposit)
1 GHz to 12 GHz	≤2.5	MTBF	>150 000 h
12 GHz to 18 GHz	≤3	Dimensions (diameter × height)	
Gain (switching network taken into account)	4 dBi to 6 dBi	With radome	approx. 210 mm × 353 mm
Circularity	typ. 2 dB	Weight	approx. 1 kg

Ordering information

Crossed			Recommended extras		
Log-Periodic Antenna	R&S®HL024S2	4052.1003.02	Control Unit	R&S®GB016	4056.7006.02
			Control Cable, 10 m	R&S®GB016Z1	4056.7270.02
			Microwave Cable, 5 m	R&S®AC008W2	0751.6931.04
			Microwave Cable, 10 m	R&S®AC008W2	0751.6931.05
			Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02



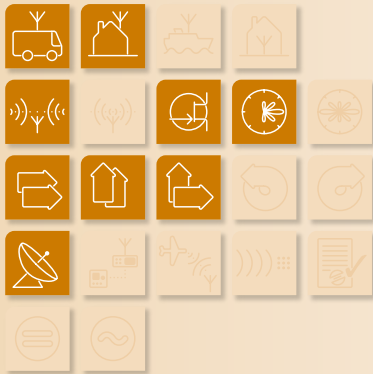
Typical gain and power-handling capacity



Typical radiation patterns in the E and H planes

SHF Antennas

Crossed Log-Periodic Antenna R&S® HL 024S7



1 GHz to 18 GHz

Log-periodic directional antenna
consisting of R&S® HL 024A1 and a
broadband preamplifier for horizontal or
vertical polarization (selectable)

Features

- ◆ Wide frequency range
- ◆ Selectable broadband preamplifier
- ◆ Horizontal or vertical polarization switch-selectable
- ◆ No reduction in S/N due to the use of a low-noise amplifier at the antenna output
- ◆ Can be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300

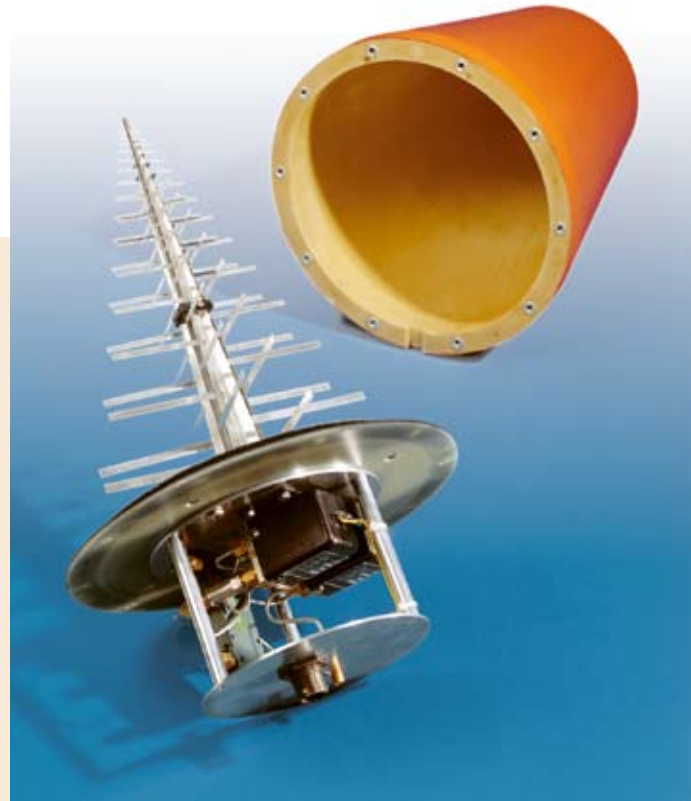
Brief description

The directional R&S® HL 024S7 consists of the Crossed Log-Periodic Antenna R&S® HL 024A1 and a broadband preamplifier. It is suitable for the reception of linearly polarized waves.

Horizontal or vertical polarization can be switch-selected.

The preamplifier can be optionally switched on. It prevents a significant reduction in S/N due to loss in RF cables connecting, for instance, the antenna to a receiver.

The antenna can also be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300.



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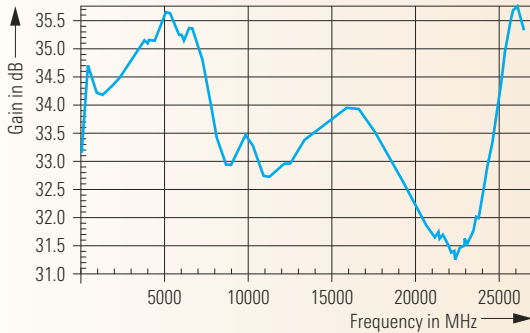
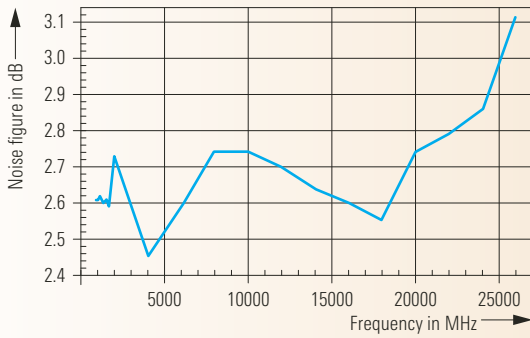


Specifications

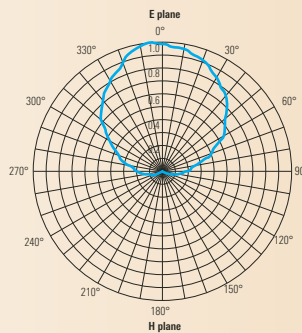
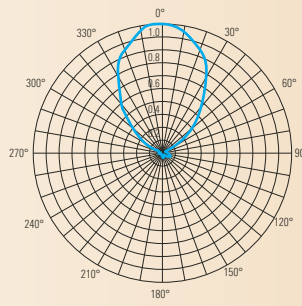
Frequency range	1 GHz to 18 GHz	Power supply	+15 V DC (max. 0.3 A)
Polarization	horizontal or vertical (selectable)	Connector	SMA female
Input impedance	50 Ω	Control connector	10-contact, round, male
VSWR	<2.5	MTBF	>100 000 h
Gain (without polarization switch/preamplifier)	>6 dBi	Operating temperature range	-30 °C to +55 °C
Noise figure	≤ 3 dB	Dimensions (diameter \times height)	
Gain (active network – can be switched on)	26 dB ± 2 dB	With radome	approx. 210 mm \times 390 mm
1 dB compression point	approx. +8 dBm	Weight	approx. 1 kg

Ordering information

Crossed			Recommended extras		
Log-Periodic Antenna	R&S®HL 024S7	4042.8505.02	Control Unit	R&S®GB 016	4056.7006.02
			Control Cable, 10 m	R&S®GB 016Z1	4056.7270.02
			Microwave Cable, 5 m	R&S®AC 008W2	0751.6931.04
			Microwave Cable, 10 m	R&S®AC 008W2	0751.6931.05
			Adapter for R&S®HZ-1	R&S®HL 025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02



Typical noise figure and gain of broadband preamplifier



Typical radiation patterns in the E and H planes

SHF Antennas

Crossed Log-Periodic Antenna R&S® HL 024S8



1 GHz to 18 GHz

Log-periodic directional antenna
consisting of R&S® HL 024A1 and two
broadband preamplifiers for horizontal and
vertical polarization

Features

- ◆ Wide frequency range
- ◆ Selectable broadband preamplifiers
- ◆ Simultaneous connection of both polarization planes
- ◆ No reduction in S/N due to the use of a low-noise amplifier at the antenna output
- ◆ Can be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300

Brief description

The directional R&S® HL 024S8 consists of the Crossed Log-Periodic Antenna R&S® HL 024A1 and two broadband preamplifiers. It is suitable for the reception of linearly polarized waves.

Connectors are provided for simultaneous use of both polarization planes.

The preamplifiers can be optionally switched on. They prevent a significant reduction in S/N due to loss in RF cables connecting, for instance, the antenna to a receiver.

The antenna can also be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300.



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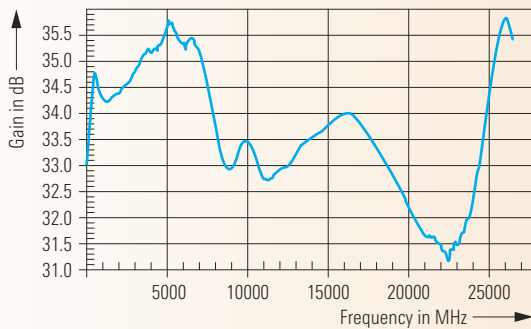
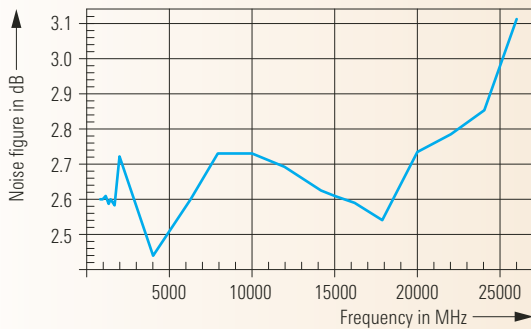


Specifications

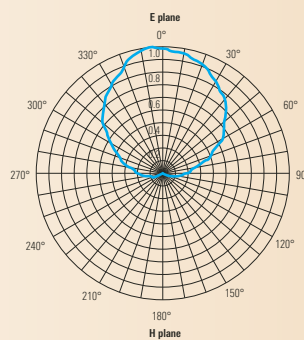
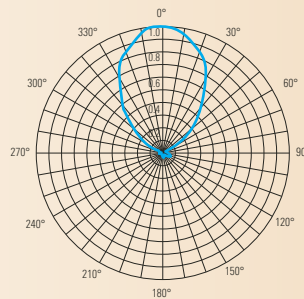
Frequency range	1 GHz to 18 GHz	Power supply	+15 V DC (max. 0.7 A)
Polarization	horizontal and vertical (simultaneously)	Connector	2 × SMA female
Input impedance	50 Ω	Control connector	10-contact, round, male
VSWR	<2.5	MTBF	>55 000 h
Gain		Operating	
(without preamplifier)	>6 dBi	temperature range	-30 °C to +55 °C
Noise figure	≤3 dB	Dimensions (diameter × height)	
Gain (active network – can be switched on)	26 dB ±2 dB	With radome	approx. 210 mm × 390 mm
1 dB compression point	approx. +8 dBm	Weight	approx. 1 kg

Ordering information

Crossed			Recommended extras		
Log-Periodic Antenna	R&S®HL024S8	4042.7509.02	Control Unit	R&S®GB016	4056.7006.02
			Control Cable, 10 m	R&S®GB016Z1	4056.7270.02
			Microwave Cable, 5 m	R&S®AC008W2	0751.6931.04
			Microwave Cable, 10 m	R&S®AC008W2	0751.6931.05
			Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02



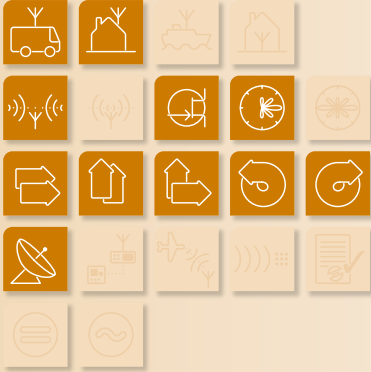
Typical noise figure and gain of broadband preamplifier



Typical radiation patterns in the E and H planes

SHF Antennas

Crossed Log-Periodic Antenna R&S® HL 024S9

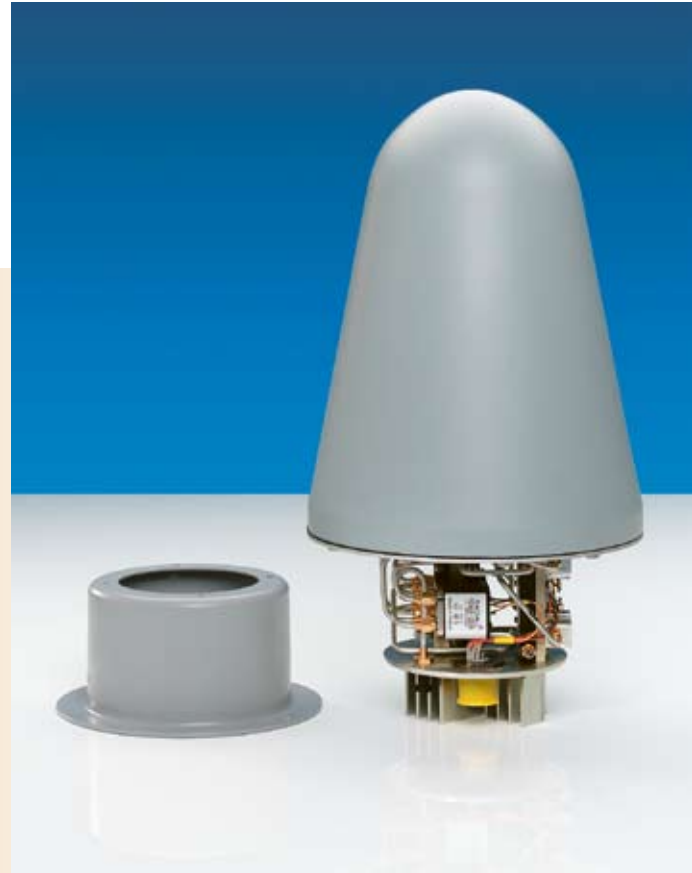


1 GHz to 18 GHz

Log-periodic directional antenna consisting of R&S® HL 024A1, two broadband preamplifiers and a switching network for linear or circular polarization

Features

- ◆ Wide frequency range
- ◆ Broadband preamplifiers
- ◆ Switching network for horizontal, vertical and circular polarization
- ◆ No reduction in S/N due to the use of a low-noise amplifier at the antenna output
- ◆ Can be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300



Brief description

The directional R&S® HL 024S9 consists of the Crossed Log-Periodic Antenna R&S® HL 024A1 and two broadband preamplifiers. It is suitable for the reception of linearly polarized waves.

Due to the integrated switching network, horizontal, vertical or left-hand and right-hand circular polarization can be selected.

The preamplifiers prevent a significant reduction in S/N due to loss in RF cables connecting, for instance, the antenna to a receiver.

The antenna can also be used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300.

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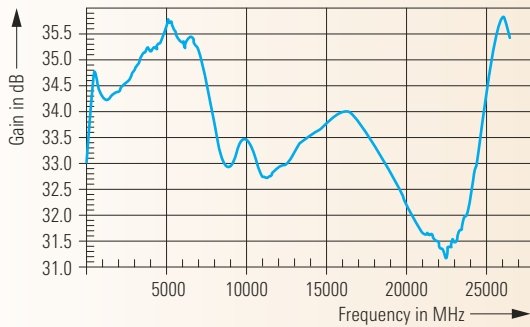
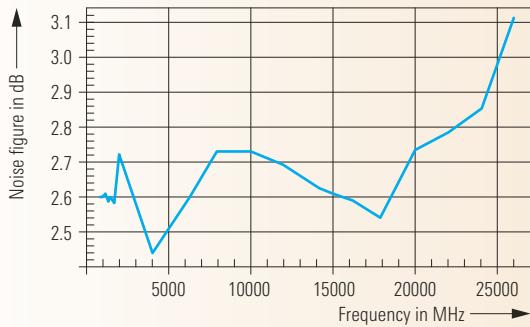


Specifications

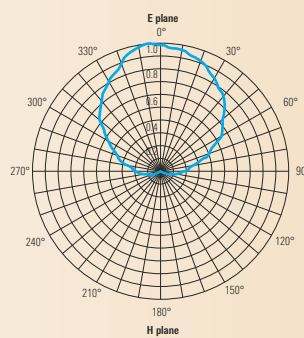
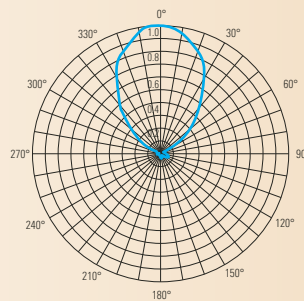
Frequency range	1 GHz to 18 GHz	1 dB compression point	approx. +8 dBm
Polarization	horizontal, vertical, left-hand or right-hand circular	Power supply	+15 V DC (max. 0.5 A)
Input impedance	50 Ω	Connector	SMA female
VSWR	<2.5	Control connector	10-contact, round, male
Gain (without preamplifier and switching network)	>6 dBi	MTBF	>55 000 h
Circularity	typ. 3 dB	Operating temperature range	-30 °C to +55 °C
Noise figure	≤3 dB	Dimensions (diameter × height)	
Gain (linear polarization)	26 dB ±2 dB	With radome	approx. 210 mm × 390 mm
Gain (circular polarization)	>22 dB ±2 dB	Weight	approx. 1.2 kg

Ordering information

Crossed			Recommended extras		
Log-Periodic Antenna	R&S®HL024S9	4047.6252.02	Control Unit	R&S®GB016	4056.7006.02
			Control Cable, 10 m	R&S®GB016Z1	4056.7270.02
			Microwave Cable, 5 m	R&S®AC008W2	0751.6931.04
			Microwave Cable, 10 m	R&S®AC008W2	0751.6931.05
			Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02



Typical noise figure and gain of broadband preamplifier



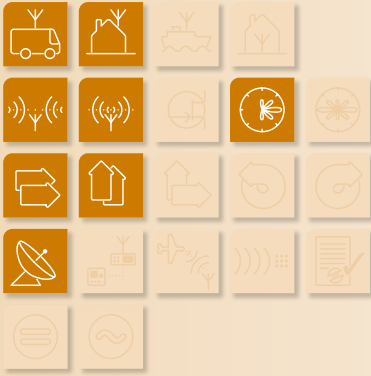
Typical radiation patterns in the E and H planes

SHF Antennas

Log-Periodic Antennas

R&S® HL 050/R&S® HL 050S1

3



850 MHz to 26.5 GHz

Log-periodic directional antennas for
linear polarization

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Features

- ◆ Extremely wide frequency range
- ◆ Rotation-symmetrical radiation patterns
- ◆ High gain due to V-shaped configuration of antenna elements
- ◆ Ideal for use as a feed for the Microwave Directional Antenna R&S® AC 008 and the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300

Brief description

Due to its broadband characteristics, the Log-Periodic Antenna R&S® HL 050 is particularly suitable for radiomonitoring and measurements.

When used as a feed in reflector antennas, the antenna offers optimum secondary radiation characteristics due to its almost rotation-symmetrical radiation pattern.

The R&S® HL 050 can be used as a separate antenna or as a feed for the Microwave Directional Antenna R&S® AC 008.

The R&S® HL 050S1 is of identical design and used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300.



Specifications

Frequency range	850 MHz to 26.5 GHz	Operating temperature range	-30 °C to +55 °C
Polarization	linear	Max. wind speed	180 km/h (without ice deposit)
Input impedance	50 Ω	Dimensions (diameter × height)	
VSWR	≤2.5	With radome	approx. 210 mm × 300 mm
Max. input power	10 W to 2 W	Weight	approx. 0.7 kg
Gain	typ. 8.5 dBi		
Connector	PC 3.5 female		
MTBF	>1 000 000 h		

3

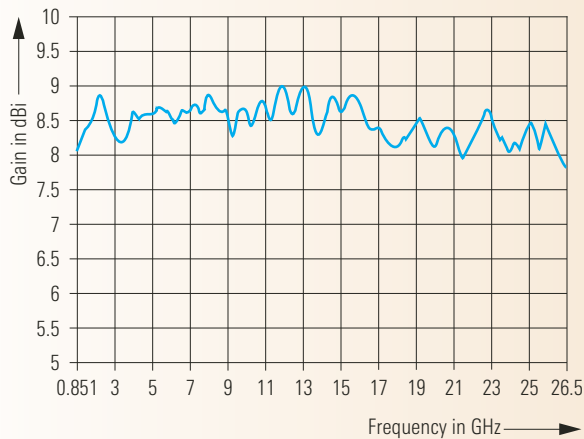
Ordering information

Log-Periodic Antenna	R&S®HL 050	4062.4063.02	Recommended extras		
Log-Periodic Antenna	R&S®HL 050S1	4065.0100.02	Microwave Cable, 5 m	R&S®AC 008W2	0751.6931.04
			Microwave Cable, 10 m	R&S®AC 008W2	0751.6931.05
			Mast Adapter for		
			R&S®HFU-Z	R&S®HL 025-Z	0661.9910.02
			Tripod and Mast	R&S®HFU-Z	0100.1114.02
			Mast	R&S®HFU-Z	0100.1120.02
			Adapter for R&S®HZ-1	R&S®HL 025Z1	4053.4006.02
			Wooden Tripod	R&S®HZ-1	0837.2310.02

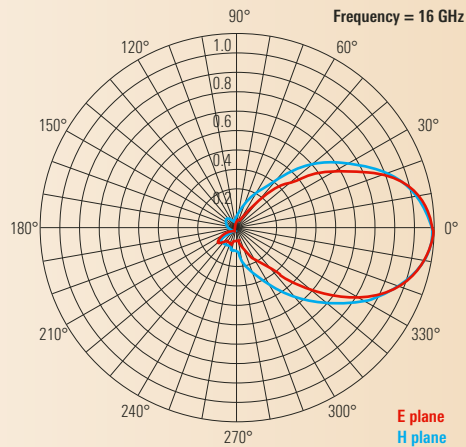
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Typical gain



Typical radiation pattern

SHF Antennas

Log-Periodic Directional Antenna with Preamplifier

R&S® HL 050S7



850 MHz to 26.5 GHz

Log-periodic directional antenna
consisting of R&S® HL 050 and broadband
preamplifier for linear polarization

Features

- ◆ Extremely wide frequency range
- ◆ Rotation-symmetrical radiation patterns
- ◆ High gain due to V-shaped configuration of antenna elements
- ◆ No reduction in S/N due to the use of a low-noise amplifier at the antenna output
- ◆ Ideal as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300
- ◆ Preamplifier can be bypassed via control unit, e.g. at high field strengths

Brief description

The Log-Periodic Directional Antenna R&S® HL 050S7 consists of a Log-Periodic Antenna R&S® HL 050 with preamplifier and is suitable for the reception of linearly polarized waves.

The integrated preamplifier is extremely broadband and low-noise. It prevents a significant reduction in S/N due to loss in RF cables connecting, for instance, the antenna to a receiver.

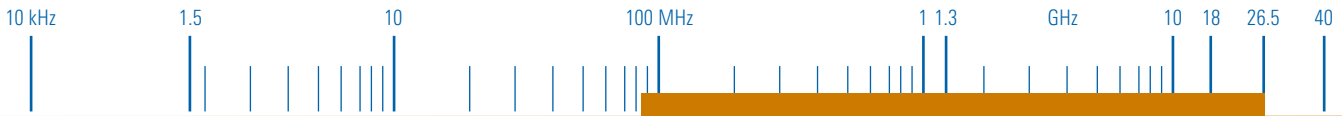
Due to its almost rotation-symmetrical radiation pattern, the R&S® HL 050S7 offers optimum secondary radiation characteristics for use as a feed in reflector antennas. The antenna is preferably used as a feed for the SHF Directional Antenna Systems R&S® AC 090 to R&S® AC 300.

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Specifications

Frequency range	850 MHz to 26.5 GHz	Power supply	
Polarization	linear	Amplifier	15 V/0.2 A (max.)
Input impedance	50 Ω	Switching relay	12 V/0.25 A (max.)
VSWR (with preamplifier)	typ. <2.5	Connector	PC 3.5 female
Gain (without preamplifier)	typ. 8.5 dBi	Control connector	10 pin female
Gain	typ. >27 dB	MTBF	>100 000 h
Noise figure	typ. <3.6 dB	Operating	
1 dB compression point (at output)	typ. >5 dBm	temperature range	-30 °C to +55 °C
		Max. wind speed	180 km/h
		Dimensions	
		(diameter \times height)	approx. 210 mm \times 390 mm
		Weight	approx. 0.8 kg

3

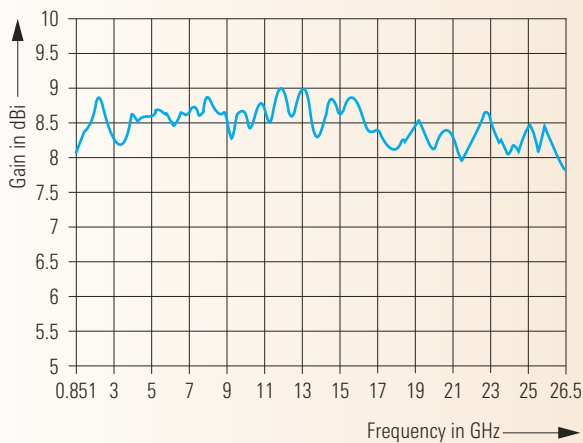
Ordering information

Log-Periodic Directional Antenna with Preamplifier	R&S®HL050S7	4064.6040.02	
Recommended extras			
Control Unit	R&S®GB016	4056.7006.02	
Control Cable, 10 m	R&S®GB016Z1	4056.7270.02	
Microwave Cable, 5 m	R&S®AC008W2	0751.6931.04	
Microwave Cable, 10 m	R&S®AC008W2	0751.6931.05	
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.02	
Wooden Tripod	R&S®HZ-1	0837.2310.02	

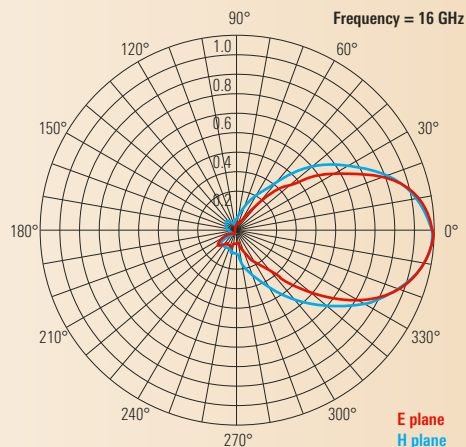
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Typical gain (without preamplifier)

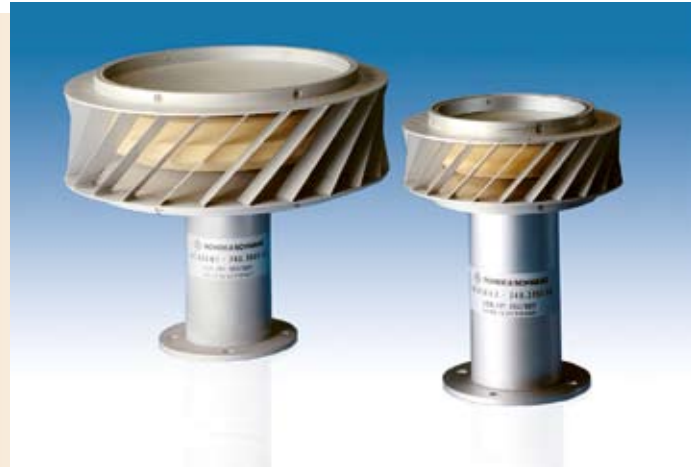


Typical radiation pattern

SHF Antennas

Omnidirectional Antennas

R&S® AC 004R1/R&S® AC 004R2



3

18 GHz to 26 GHz

26 GHz to 40 GHz

Omnidirectional broadband reception of right-hand circularly polarized signals

Features

- ◆ Omnidirectional reception
- ◆ Wide frequency range
- ◆ Circular polarization
- ◆ Reception of horizontally and vertically polarized signals

Brief description

The Omnidirectional Antennas R&S® AC 004R1 and R&S® AC 004R2 have been optimized for omnidirectional reception in the frequency ranges 18 GHz to 26 GHz and 26 GHz to 40 GHz.

The circularly polarized antennas can also be used for reception of horizontally and vertically polarized signals.

Due to their mechanical design, the antennas are suitable for use under extreme environmental conditions (e.g. in vehicles).

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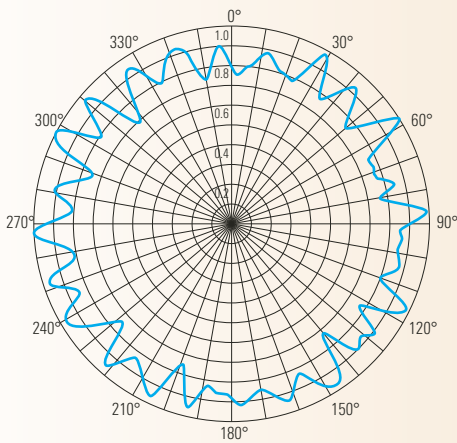


Specifications

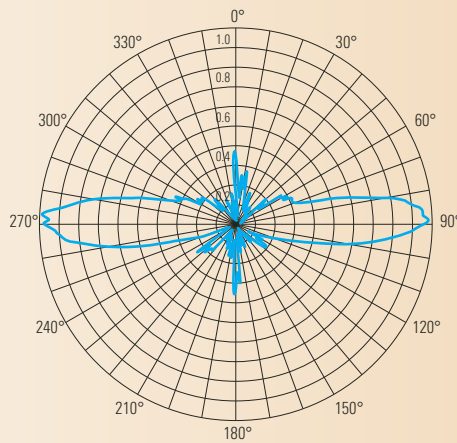
Frequency range		MTBF	>500 000 h
R&S® AC 004R1	18 GHz to 26 GHz	Operating temperature range	-35 °C to +65 °C
R&S® AC 004R2	26 GHz to 40 GHz	Max. wind speed	180 km/h (without ice deposit)
Polarization	right-hand circular	Dimensions (diameter × height) with radome	
Input impedance	50 Ω	R&S® AC 004R1	approx. 150 mm × 123 mm
VSWR	<2.5	R&S® AC 004R2	approx. 95 mm × 127 mm
Gain	typ. 2 dBi	Weight	
Uncircularity of azimuth pattern	typ. ±2 dB	R&S® AC 004R1	approx. 1.4 kg
Connector	RPC2.92 (K) female	R&S® AC 004R2	approx. 1.8 kg

Ordering information

Omnidirectional Antenna		
18 GHz to 26 GHz	R&S® AC 004R1	0749.3000.03
26 GHz to 40 GHz	R&S® AC 004R2	0749.3251.03



Typical horizontal radiation pattern

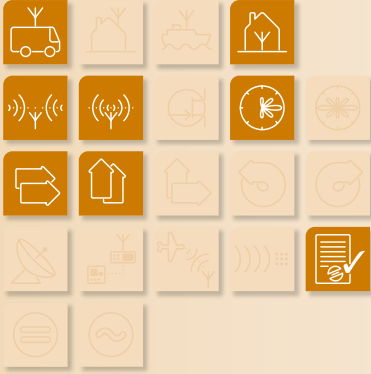


Typical vertical radiation pattern

SHF Antennas

Double-Ridged Waveguide Horn Antenna R&S® HF 906

3



1 GHz to 18 GHz

Broadband directional antenna, ideal for
use in EMC measurements



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Features

- ◆ Wide frequency range
- ◆ High gain
- ◆ Low VSWR
- ◆ Input power up to
300 W CW/500 W PEP
- ◆ Ideal for use in EMC laboratories
- ◆ Individual calibration in line with
ANSI C63.5/DIN 45003

Brief description

The linearly polarized Double-Ridged Waveguide Horn Antenna R&S® HF 906 is a broadband, compact transmitting and receiving antenna for the frequency range 1 GHz to 18 GHz.

High gain and low VSWR allow the measurement of low field strengths as well as the emission of high powers without any significant return loss.

The calibrated antenna is ideal for use in EMC measurement laboratories. The use of an N connector allows easy adaptation to existing equipment as well as high input power. The antenna is made of aluminum and tinned GRP boards to keep its weight low.

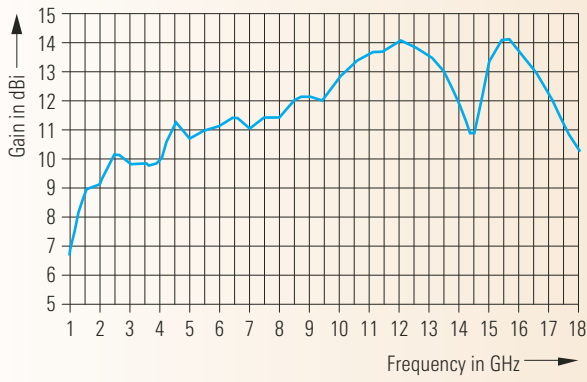


Specifications

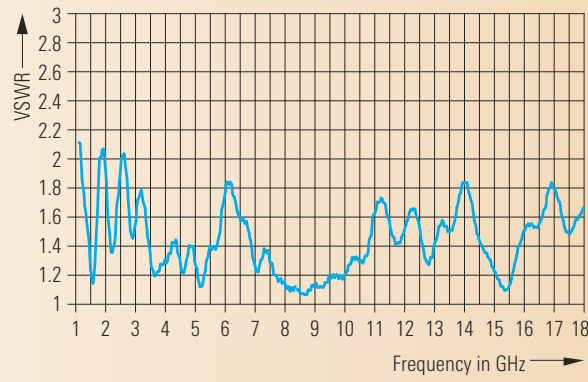
Frequency range	1 GHz to 18 GHz	Connector	N female
Polarization	linear	MTBF	>250 000 h
Input impedance	50 Ω	Operating	
VSWR	typ. <1.5	temperature range	0 °C to +50 °C
Max. input power	300 W CW/500 W PEP	Dimensions (L × W × H)	approx. 290 mm × 250 mm × 160 mm
Gain	7 dBi to 14 dBi (typ.)	Weight	approx. 1.5 kg

Ordering information

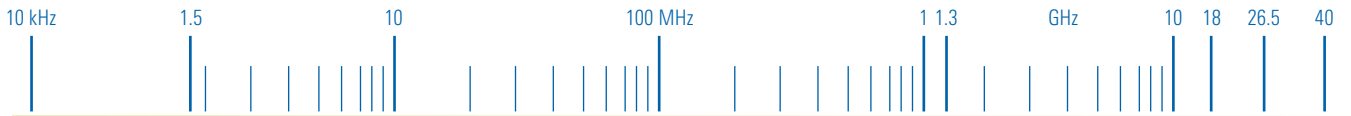
Double-Ridged Waveguide			Recommended extras		
Horn Antenna	R&S®HF 906	4044.4507.02	Wooden Tripod	R&S®HZ-1	0837.2310.02



Typical gain



Typical VSWR



4 Accessories

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R&S®IN 115	Power Supply Unit	148
R&S®IN 500	Bias Unit	150
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New

New

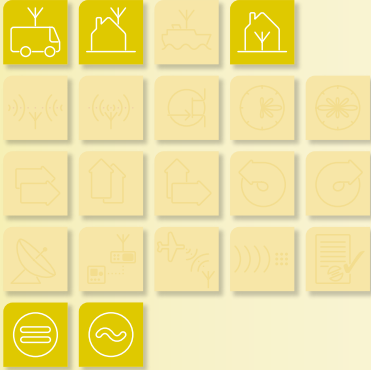
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Power Supply Unit R&S® IN 115



10 kHz to 1300 MHz

Power supply for up to three active receiving antennas via signal cable

Features

- ◆ AC supply or battery operation
- ◆ Wide supply voltage range (100 V to 240 V AC)
- ◆ Short-circuit-proof
- ◆ Wide frequency range 10 kHz to 1.3 GHz
- ◆ Three different DC feed sections
- ◆ Wall-mounting possible (clip for wall mounting included as an option)

Brief description

The Power Supply Unit R&S® IN 115 supplies active receiving antennas. The supply voltage is fed to the antennas via the inner conductor of the coaxial cable.

A regulated power supply unit generates the interference-free, smoothed DC voltage. Each DC voltage is fed to the inner conductor of the antenna connector via a DC feed section. The conductors of the receiver connectors are DC-free.

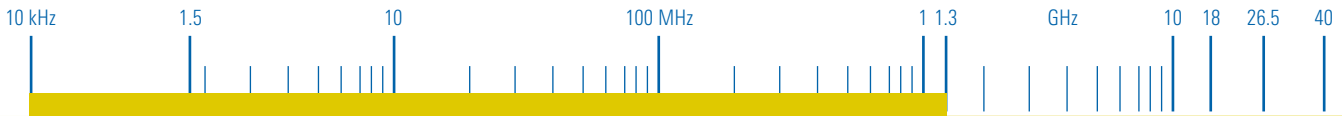
Three different antenna systems can be supplied simultaneously with the R&S® IN 115.

4

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Specifications

Frequency range	10 kHz to 1.3 GHz	Load current	max. 500 mA per output
Input impedance	50 Ω	Short-circuit current	max. 200 mA
VSWR		RF connectors	3 × 2 N female
10 kHz to 1 GHz	<2	DC connector	MIL-C-5015
1 GHz to 1.3 GHz	<2.5	MTBF	>100 000 h
Insertion loss S_{21}	<1.5 dB	MTTR	<0.5 h
Power supply		Operating	
AC/mains supply	100/120/220/240 V AC ±10%	temperature range	-25 °C to +55 °C
DC/battery supply	22 V to 31 V DC	Dimensions (W × H × D)	approx. 170 mm × 125 mm × 350 mm
Power consumption	max. 50 VA	Weight	approx. 5.5 kg
Output voltage			
AC operation	3 × 24 V DC +5%, -10%		
Battery operation	3 × 18 V DC ±5% at 22 V DC power supply		

Ordering information

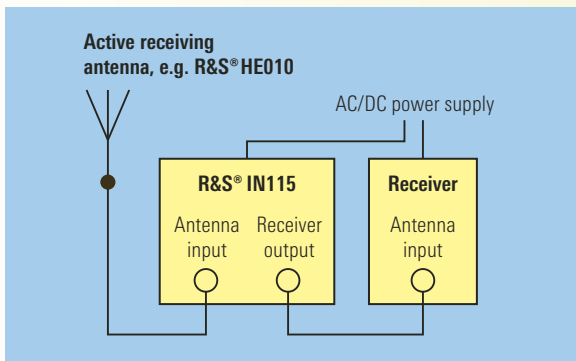
Power Supply Unit	R&S®IN 115	4004.1707.02
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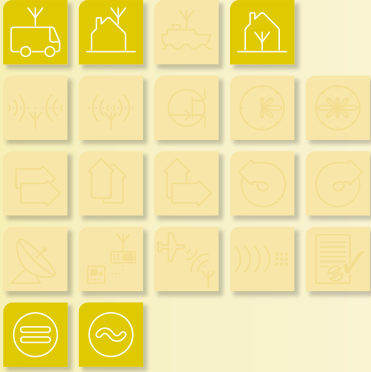
Block diagram



The R&S® IN 115 simultaneously supplies up to three independent active antenna systems

Accessories

Bias Unit R&S® IN 500



4

20 MHz to 3000 MHz

Power supply for active receiving
antennas via signal cable

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Features

- ◆ AC supply or battery operation
- ◆ 110 V or 230 V AC, selectable
- ◆ Short-circuit-proof
- ◆ Operating frequency range
20 MHz to 3 GHz
- ◆ Wall-mounting possible

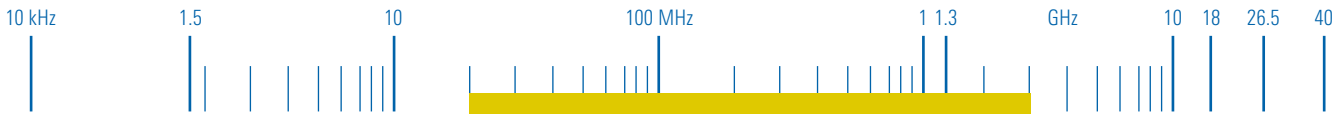
Brief description

The Bias Unit R&S® IN 500 is used to supply power to an active receiving antenna. The supply voltage is fed to the antenna via the inner conductor of the coaxial cable.

A regulated power supply unit generates the interference-free, smoothed DC voltage. The DC voltage is applied to the inner conductor of the antenna connector via a bias unit. The conductor of the receiver connector is DC-free.

The AC supply voltage of the R&S® IN 500 is factory-set to 230 V AC. The unit can also be switched to 110 V AC or battery supply.

Recommended for use with the Active Receiving Antenna R&S® HE 500.



Specifications

Frequency range	20 MHz to 3 GHz	Output voltage	
Input impedance	50 Ω	AC operation	20 V DC \pm 1.5 V DC
VSWR	≤ 2	Battery operation	20 V DC \pm 1.5 V DC at 24 V DC power supply
Insertion loss S_{21}	≤ 2 dB	Load current	max. 190 mA
Power supply		Connector	2 \times N female
AC/mains supply	100/120/220/240 V AC \pm 10%	MTBF	>150 000 h
DC/battery supply	24 V DC +35%/-20%	Operating temperature range	-40 $^{\circ}$ C to +60 $^{\circ}$ C
Power consumption	max. 10 VA	Dimensions (H \times W \times D)	approx. 90 mm \times 160 mm \times 170 mm
		Weight	approx. 1.7 kg

Ordering information

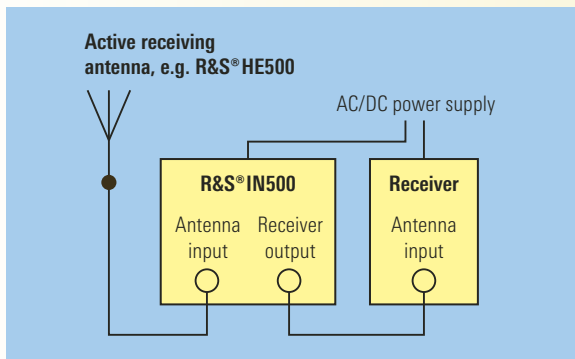
Bias Unit	R&S [®] IN 500	4062.0880.02
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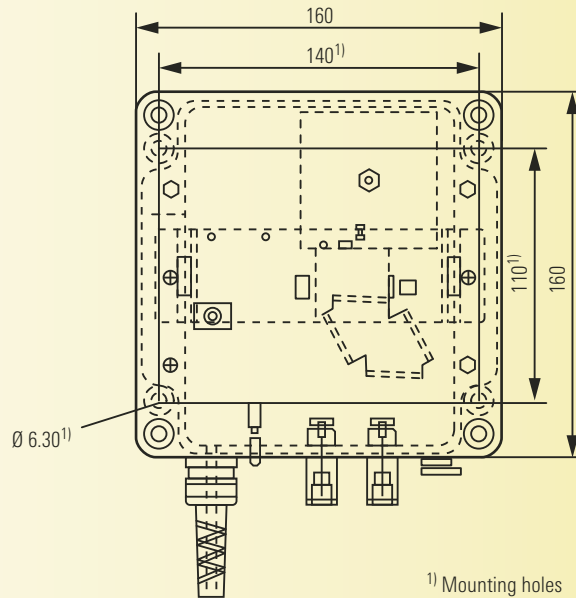
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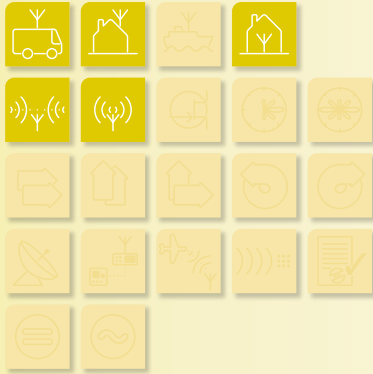
Block diagram



Dimensions for wall mounting (in mm)

Accessories

VHF/UHF Diplexer R&S® FT 224



4

100 MHz to 162 MHz

225 MHz to 400 MHz

For connecting a broadband antenna to transceivers with separate VHF and UHF outputs

Features

- ◆ Low passband attenuation
- ◆ High stopband attenuation
- ◆ 200 W CW/800 W PEP
- ◆ Compact design
- ◆ Versatile applications



Brief description

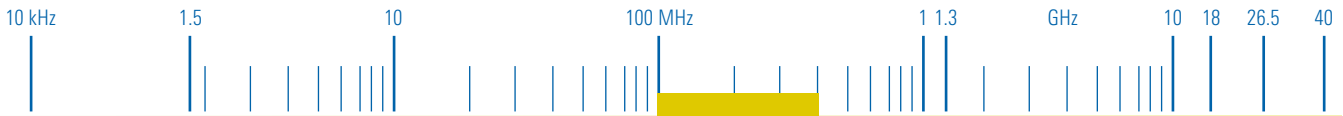
The Diplexer R&S® FT 224 allows the connection of a broadband antenna (e.g. VHF/UHF Coaxial Dipole R&S® HK 014) to transceivers with separate VHF and UHF outputs or to separate VHF and UHF transceivers.

The diplexer has a maximum input power of 200 W CW and 800 W PEP. These values (for one channel) also apply for simultaneous operation of both channels.

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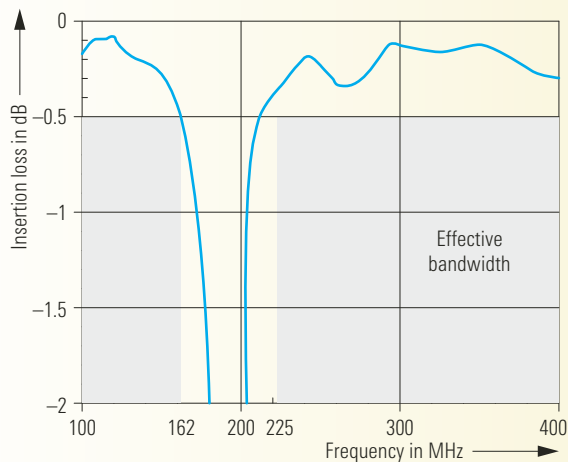


Specifications

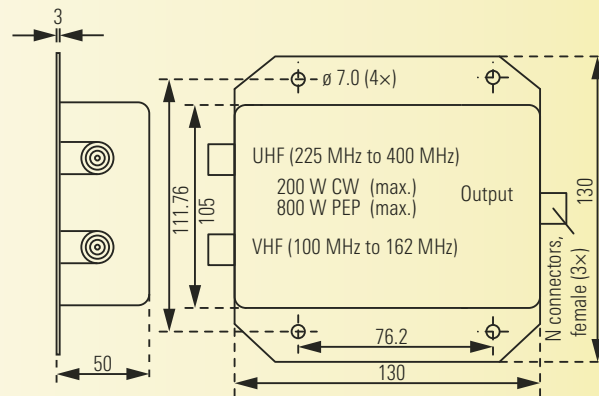
Frequency range	100 MHz to 162 MHz 225 MHz to 400 MHz	Max. input power	200 W CW, 800 W PEP (per branch with simultaneous operation)
Input impedance	50 Ω	Connectors	N female
VSWR	≤1.5 (with 50 Ω termination) ≤2.0 (with R&S®HK014)	MTBF	>100 000 h
Insertion loss		Operating temperature range	-20 °C to +55 °C
In passband	≤0.3 dB (VHF) ≤0.5 dB (UHF)	Dimensions (L × W × H)	approx. 130 mm × 130 mm × 50 mm
In stopband	>30 dB (VHF/UHF)	Weight	approx. 0.5 kg

Ordering information

VHF/UHF Diplexer	R&S®FT 224	0525.5117.03	Recommended extras		
			Coaxial Dipole	R&S®HK014	0644.1514.02
			Coaxial Dipole	R&S®HK033	4062.8369.02



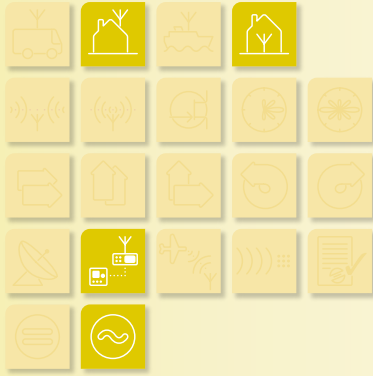
Typical filter characteristic



Dimensions and installation bore holes

Accessories

Junction Unit R&S® GX 002A1



4

1.5 MHz to 30 MHz

For connecting the HF Dipole

R&S® HX 002A1 to the HF Transceiver

R&S® XK 852 or to 100 W shortwave

transceivers from other manufacturers

Features

- ◆ Power supply of ATU in the R&S® HX 002A1
- ◆ Control of ATU
- ◆ Transmission of supply voltage and serial data via coaxial line
- ◆ Status indication
- ◆ Remote control possible

Brief description

The Junction Unit R&S® GX 002A1 allows the HF Dipole R&S® HX 002A1 to be operated together with transceivers of the R&S® XK 852 family or with 100 W shortwave transceivers from other manufacturers.

Since supply voltage and serial data for ATU control are transmitted via the coaxial cable, no separate control lines are required for operation.

The R&S® GX 002A1 can be remote-controlled via a parallel interface to which a virtual front panel can be connected.

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Specifications

Frequency range	1.5 MHz to 30 MHz	Power supply	
Max. transmitter power	150 W PEP/100 W CW	AC/mains supply	100/120/230 V AC $\pm 10\%$
Input impedance	50 Ω		47 Hz to 63 Hz (80 VA)
VSWR		DC/battery supply	22 V to 32 V DC, approx. 2 A (at 24 V DC)
Antenna connector terminated with 50 Ω	<1.3	MTBF	>15 000 h
Antenna connector terminated with any passive impedance	<2	Operating temperature range	-25 °C to +55 °C
Storable channels	max. 100 (0 to 99)	RF connector	N female
Required tuning power for R&S®HX002A1		Dimensions (W × H × D)	approx. 480 mm × 130 mm × 390 mm
With R&S®XK852	30 W to 100 W	Weight	approx. 8.5 kg
With any other transmitter	50 W to 100 W		

Ordering information

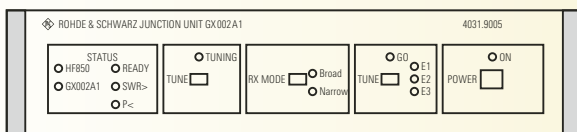
Junction Unit			Recommended extras		
(19" bench model)	R&S®GX002A1	4031.9005.02	HF Dipole with ATU	R&S®HX002A1	4031.8009.02
			HF Dipole with ATU	R&S®HX002M1	4021.6003.02

4

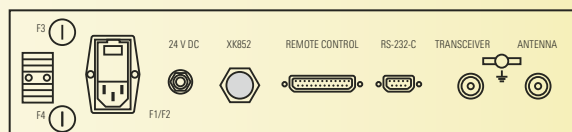
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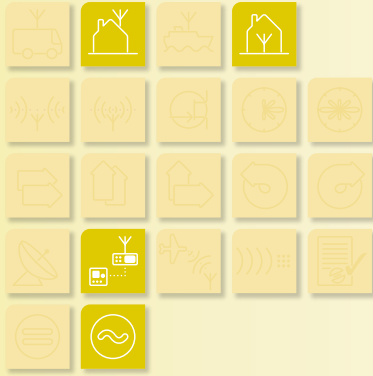
Front view



Rear view

Accessories

Junction Unit R&S® GX 007



**Control, display and power supply unit
for the HF Dipole R&S® HX 002 and the
Antenna Tuning Unit R&S® FK 859**

4

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Features

- ◆ Power supply for the HF Dipole R&S®HX002 and the Antenna Tuning Unit R&S®FK859
- ◆ Control and display unit for the R&S®HX002 and R&S®FK859
- ◆ Selection of tuning mode
- ◆ Antenna switchover
- ◆ Integrated function test

Brief description

The Junction Unit R&S®GX007 is the display, control and power supply unit for the HF Dipole R&S®HX002 and for the Antenna Tuning Unit R&S®FK859.

The control section permits selection of the required tuning mode (auto, hold, tune), switchover between antenna 1 and 2 (R&S®FK859) and a function test.

The display section indicates the operating status of the ATU or the dipole.

The power supply section provides the required DC voltage of 30 V.



Specifications

Power supply	115/125/220/235 V AC, 47 Hz to 63 Hz, max. 300 VA (with R&S®FK 859)	Control elements	on/off, broadband reception (RX mode), tuning mode, antenna 1/antenna 2, test
Connectors	AC supply, connector for R&S®FK 859, 25-contact connector (V.24 interface), 9-contact connector (for carrier loop, fault signals, transmit/receive switch)	MTBF	>9000 h
Visual displays	LEDs for operating voltages, carrier loop, READY, TUNING, power threshold, VSWR threshold, fault signals	Operating temperature range	-25 °C to +55 °C
		Dimensions (W × H × D)	approx. 490 mm × 120 mm × 390 mm
		Weight	approx. 6.5 kg

Ordering information

Junction Unit	R&S®GX 007	0682.6010.02	Recommended extras		
			Antenna Tuning Unit	R&S®FK 859	0682.1018.02
			Antenna Tuning Unit	R&S®FK 859M1	4000.1802.14
			HF Dipole	R&S®HX 002	0682.3010.24

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Front view



Rear view

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Control Unit R&S®GB 016



4

Control of polarization networks as well as amplifier and bypass circuits for crossed log-periodic antenna feeds

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Features

- ◆ Manual or remote control
- ◆ Mobile or stationary use
- ◆ AC or DC voltage supply
- ◆ Suitable for wide AC voltage range
- ◆ Little maintenance required

Brief description

The Control Unit R&S®GB 016 is used for selecting the polarization as well as for activating or bypassing amplifiers and power supplies of the following log-periodic antenna feeds:

- R&S®HL 024S2, R&S®HL 024S7
- R&S®HL 024S8, R&S®HL 024S9
- R&S®HL 050S7
- R&S®ZS 107 (model .02)
- R&S®ZS 107 (model .04)

Polarization can be selected either manually using four keys or remote-controlled via a serial RS-232-C interface. The polarity for the switchover (positive or negative logic) is set by means of device-internal jumpers.



Specifications

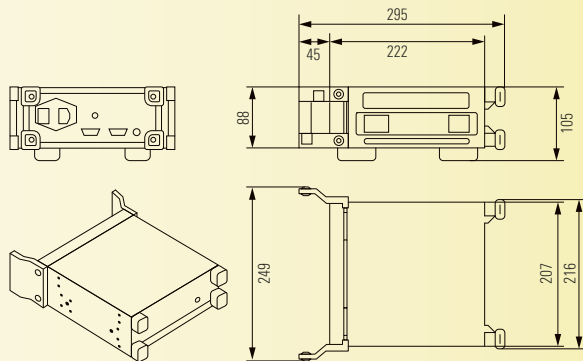
Power supply – AC/mains supply		Remote-control interface	serial RS-232-C, 9-contact
AC	85 V to 264 V AC, 50 Hz to 400 Hz	MTBF	>300 000 h (on-period 100%)
DC	100 V to 375 V DC	Operating	
Power consumption	3 A	temperature range	-10 °C to +65 °C
Power supply – DC/battery supply		Dimensions (H x W x D)	approx. 0.11 m x 0.25 m x 0.3 m
DC	+15 V DC ±15%	Weight	approx. 3 kg
Power consumption	max. <3.5 A		
Interface for			
antenna control	15-contact, D-Sub		
Supply voltage	+15 V DC (max. 1.5 A)		
	+12 V DC (max. 1.5 A)		
3 x control line	max. 0.5 A		

Ordering information

Control Unit	R&S®GB 016	4056.7006.02	Recommended extras		
			Control Cable, 10 m, for R&S®HL 024Sx and R&S®HL 025S7/ R&S®HL 050S7	R&S®GB 016Z1	4056.7270.02
			Remote-Control Software for polarization switching	R&S®GB 016P1	4057.8506.02



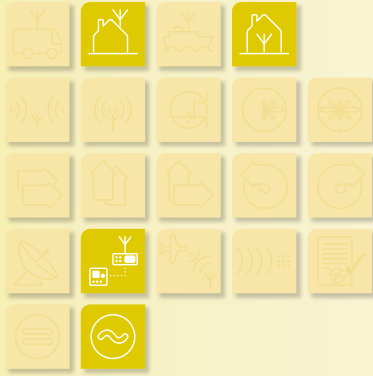
Front and rear views



Dimensions

Accessories

Control Unit R&S® GB 130



4

Control of antenna rotators in azimuth and elevation

Features

- ◆ Numeric keypad for direct data entry
- ◆ LCD for plain text display
- ◆ Manual or remote control possible
- ◆ Suitable for wide AC power range
- ◆ No maintenance required
- ◆ No calibration required

Brief description

The R&S® GB 130 is used for positioning antenna rotators in azimuth and elevation. It is equipped with an illuminated LCD for plain text display and a numeric keypad for data entry.

Positioning and data entry can also be remote-controlled via a controller interface (RS-232-C or RS-485). Optional control software is available for this purpose.

The control unit can be used, for instance, with the Antenna Rotator R&S® RD 130 (azimuth positioning only).

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Specifications

Power supply	85 V to 264 V AC, 47 Hz to 63 Hz	Display accuracy	0.1°
Power consumption	max. 300 VA	MTBF	>10 000 h
Operating mode	manual or remote-control	Operating temperature range	0 °C to +50 °C
Controller interfaces	RS-232-C/RS-485	Dimensions (W × H × L)	approx. 480 mm × 210 mm × 440 mm
Power supply of rotator		Weight	approx. 6 kg
Voltage	24 V DC		
Power	max. 300 VA		

Ordering information

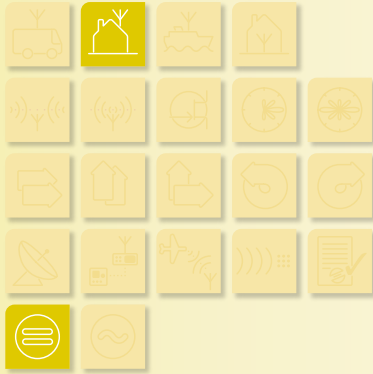
Control Unit	R&S®GB 130	4059.8755.02	Recommended extras		
			Antenna Rotator	R&S®RD 130	4059.8503.02
			Control Software	R&S®GB 130RC	4064.5944.02
			Cable Set	R&S®GK 130	
			Length 50 m		4059.8855.02
			Length 80 m		4059.8855.03
			Length 120 m		4059.8855.04
			Length 200 m		4059.8855.05



Control section and LCD display of the R&S® GB 130

Accessories

Antenna Rotator R&S® RD 130



4

For azimuth positioning of antennas and antenna systems

Chapter Overview

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Features

- ◆ High-precision gear
- ◆ Very short start-up time
- ◆ High efficiency
- ◆ Permanent lubrication/virtually maintenance-free
- ◆ Compact design

Brief description

The Antenna Rotator R&S® RD 130 is used for azimuth positioning of antennas such as the R&S® HL 451 or R&S® HL 471.

The high-precision gear is accommodated in sand-cast aluminum housing. The housing is sealed against splash water and equipped with a pressure compensation and ventilation system. The individual parts of the transmission are permanently lubricated and therefore largely maintenance-free.

The R&S® RD 130 is powered and controlled from the Control Unit R&S® GB 130. Remote control of the antenna rotator from a PC is also possible via the control unit.

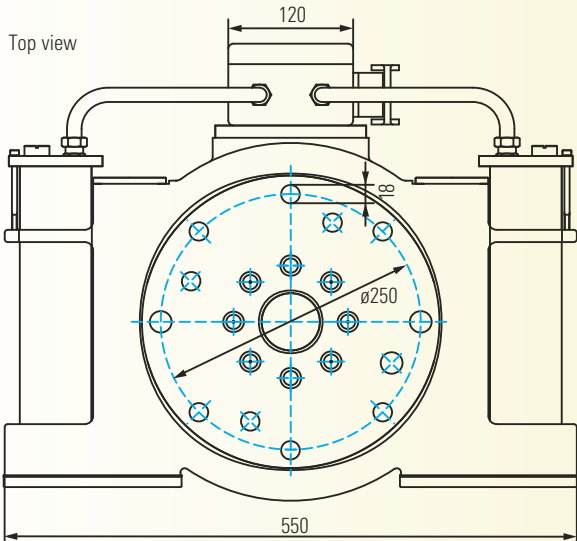
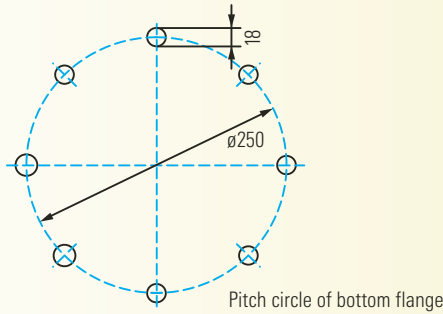


Specifications

Voltage supply	24 V DC	Permissible bending	
Power consumption	2 × max. 80 W	moment at top flange	max. 6500 Nm
Setting range (azimuth)	±(n × 360°)	Permissible axial load	max. 3500 N
Speed of rotation	approx. 3°/s	MTBF	>40 000 h (at 25 % on-time)
Positioning accuracy	±0.1°	Operating	
Permissible driving torque	approx. 1800 Nm	temperature range	-35 °C to +63 °C
Starting torque	approx. 3000 Nm	Dimensions (H × W × D)	approx. 400 mm × 550 mm × 450 mm
		Weight	approx. 110 kg

Ordering information

Antenna Rotator	R&S®RD 130	4059.8503.02	Recommended extras	
			Control Unit	R&S®GB 130 4059.8755.02
			Cable Set	R&S®GK 130
			Length 50 m	4059.8855.02
			Length 80 m	4059.8855.03
			Length 120 m	4059.8855.04
			Length 200 m	4059.8855.05



Dimensions in mm



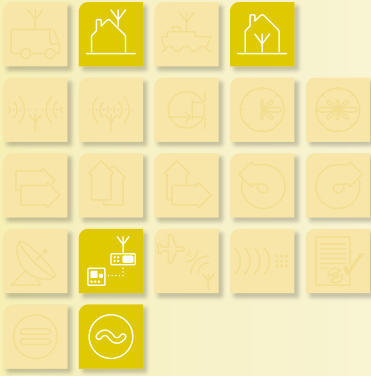
Antenna Rotator R&S® RD 130 with Control Unit R&S® GB 130

Accessories

Switch Units

R&S® ZS 129x

New



4

Intelligent RF and IF signal distribution

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Features

- ◆ Suitable for stationary, portable and mobile applications
- ◆ Compact design
- ◆ Cost-effective implementation of customer-specific solutions due to modular design and wide variety of units and modules
- ◆ Manual operation and remote control for optimum hardware and software interworking
- ◆ Additional outputs for controlling additional switch units via the same control interface
- ◆ Tried and tested in various systems

Brief description

The family of Switch Units R&S® ZS 129x is a cost-effective and reliable approach to RF and IF signal distribution. Its flexible concept allows adaptation to system requirements by adding optional extensions.

The family includes the models R&S® ZS 129A1/A2/A5. The R&S® ZS 129A1 has been designed as an indoor RF and IF switch unit. The standard models are available with a 1-out-of-6 switch to 1-out-of-12 switch.

The Switch Unit R&S® ZS 129A2 has been designed as an outdoor unit for mounting on top of masts close to receiving antennas.

The configurable R&S® ZS 129A5 is ideal for a wide variety of indoor RF and IF switching applications. Its flexible concept allows integration of switches, power splitters and DC feeds.

Specifications

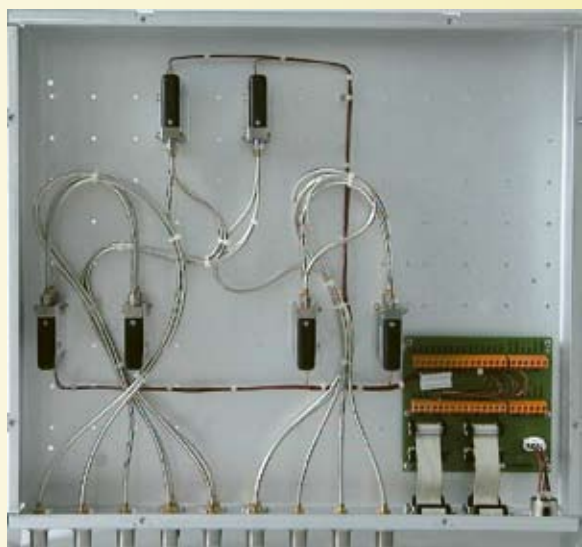
Interfaces		Storage temperature range	
R&S® ZS 129A1	RF INPUTS, RF OUTPUT, COM1, USB, TTL IN, EXP1, I2C REM CTRL, POWER IN	R&S® ZS 129A1/A2/A5	-40 °C to +70 °C
R&S® ZS 129A2	X1 to X8, OUTPUT, CTRL IN, CTRL OUT, EXT/AUX	Humidity	
R&S® ZS 129A5	SIGNAL1 to SIGNAL18, CTRL IN, CTRL OUT, POWER, SER CTRL	R&S® ZS 129A1	95% relative humidity at +40 °C
RF data (all models)		R&S® ZS 129A2/A5	95% relative humidity at +55 °C
Frequency range	DC to 3 GHz	Power supply	
Impedance	50 Ω	R&S® ZS 129A1	+10 V to +35 V DC/max. 8 A/60 W
Switching time	≤15 ms	R&S® ZS 129A2	+28 V DC (via control input)
General data		R&S® ZS 129A5	+28 V DC (via control input) or +5 V to +35 V DC (from ext. power supply)
Operating temperature range		Dimensions (W × H × D)	
R&S® ZS 129A1	-10 °C to +55 °C	R&S® ZS 129A1	484 mm × 89 mm × 495 mm (overall)
R&S® ZS 129A2/A5	-35 °C to +55 °C		19" rackmount, 2 height units
		R&S® ZS 129A2	404 mm × 335 mm × 183 mm (overall)
		R&S® ZS 129A5	450 mm × 85 mm × 460 mm (overall)

Ordering information

Switch Unit	R&S® ZS 129A1	Options	
1-out-of-12	3026.3012.02	DC Feed, 100 kHz to 3 GHz R&S® ZS 129F1	3024.6614.02
1-out-of-6	3026.3012.06	DC Feed, 100 kHz to 3 GHz R&S® ZS 129F1	3024.6614.03
1-out-of-8	3026.3012.08	Switch	
2-out-of-2	3026.3012.22	1-out-of-2	R&S® ZS 129S1 3024.6514.02
Unused inputs terminated into 50 Ω		1-out-of-6	R&S® ZS 129S2 3024.6520.02
1-out-of-6	3026.3012.16	1-out-of-8	R&S® ZS 129S3 3024.6537.02
1-out-of-8	3026.3012.18	2-out-of-2	R&S® ZS 129S5 3024.6550.02
1-out-of-12	3026.3012.12	I ² C Bus Control Board	R&S® ZS 129C1 3024.6714.02
Switch Unit	R&S® ZS 129A2	Power Splitter	R&S® ZS 129M1 3025.4515.02
1-out-of-8	3023.2015.02	Additional options are available on request.	
Switch Unit	R&S® ZS 129A5		
	3023.2515.05		



R&S® ZS 129A2 outdoor unit for mounting on antenna masts

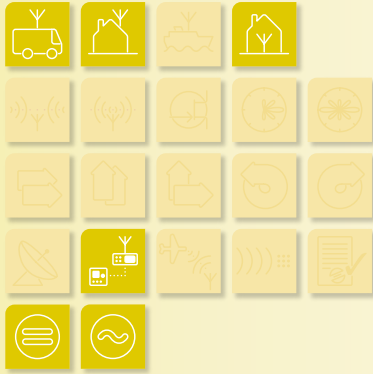


Example configuration of an R&S® ZS 129A5: Three independent switches, 1-out-of-3, unused inputs terminated, each implemented by means of two R&S® ZS 129S4

Accessories

Antenna Control Units

R&S®GB 127x



4

Rotator control plus RF and IF signal distribution

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Main Menu

Features

- ◆ Suitable for stationary and mobile applications
- ◆ Compact design
- ◆ Split concept for stationary applications with remote Rotator Control Unit R&S®RD 127 mounted close to the antennas, thus minimizing cabling
- ◆ Manual operation and remote control
- ◆ Additional outputs for controlling additional switch units via the same control interface
- ◆ Antenna controllable in all three degrees of freedom (azimuth, polarization and height)

Brief description

The family of Antenna Control Units R&S®GB 127x is a cost-effective and reliable solution for controlling antenna rotators and distributing RF and IF signals. The family includes the models R&S®GB 127S/M/MU and R&S®RD 127. The Antenna Control Unit R&S®GB 127S has been designed as a universal antenna control unit for stationary systems. Normally, it is used in combination with the Rotator Control Unit R&S®RD 127, which contains the RF switching section and the control unit for the antenna rotators. The Antenna Control Unit R&S®GB 127M has been designed for mobile systems and contains the control unit for the antenna rotators. The Mast Control Unit R&S®GB 127MU is the interface between a telescopic mast and the Antenna Control Unit R&S®GB 127M.

Specifications

Interfaces

R&S®GB 127S	COM1 to 4, LPT, EXP1 to 2, I2C REM CTRL, POWER, loudspeaker, display, keypad, chipcard reader
R&S®GB 127M	COM1 to 4, LPT, EXP1 to 2, I2C REM CTRL, POWER, ELV/POL, AZIMUTH, loudspeaker, display, keypad, chipcard reader
R&S®GB 127MU	DC IN, ENCODER, MAST CONTROL, MAST ALARM, MAN/AUTO, MAN MAST CONTROL, COM1, REM CTRL
R&S®RD 127	RF IN, RF OUT, ELV/POL, AZIMUTH, ROTATOR CONTROL

General data

Operating temperature range	
R&S®GB 127S/M	0 °C to +50 °C
R&S®GB 127MU	-20 °C to +55 °C
R&S®RD 127	-35 °C to +55 °C
Storage temperature range	
R&S®GB 127S/M/MU/	
R&S®RD 127	-40 °C to +70 °C

Humidity

R&S®GB 127S/M/MU	95 % relative humidity at +40 °C
R&S®RD 127	95 % relative humidity at +55 °C

Power supply

R&S®GB 127S	100 V to 240 V AC/50 Hz to 60Hz
	180 VA
R&S®GB 127M/MU	10 V to 33 V DC
R&S®RD 127	+28 V DC (via control input)

Dimensions (W × H × D)

R&S®GB 127S/M	484 mm × 89 mm × 495 mm (overall)
	19" rackmount, 2 height units
R&S®GB 127MU	220 mm × 83 mm × 150 mm (overall)
R&S®RD 127	404 mm × 356 mm × 183 mm (overall)

RF data R&S®RD 127

Frequency range	DC to 3 GHz
Impedance	50 Ω
Switching time	≤15 ms

Ordering information

Antenna Control Unit

(for indoor use, control via RS-232-C interface and manual operation)

With external		
rotator control	R&S®GB 127S	3022.2011.02
With integrated		
rotator control	R&S®GB 127M	3022.2511.02

Mast Control Unit

(for outdoor use, control

via R&S®GB 127M)	R&S®GB 127MU	3027.4512.02
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Options

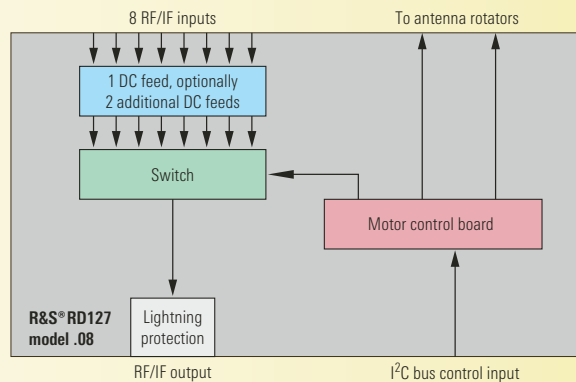
Rotator Control Unit (for outdoor use, control via R&S®GB 127S)

With 1-out-of-4 switch	R&S®RD 127	3021.9012.05
With 1-out-of-8 switch	R&S®RD127	3021.9012.08
DC Feed, 100 kHz to 3 GHz	R&S®ZS 129F1	3024.6614.02

Equipment that is typically used: Yaesu G2800 and Winter AR/AE1049 azimuth rotators as well as Yaesu G550 polarization/elevation rotator. Further models on request.



Rotator Control Unit R&S®RD 127



Block diagram of the R&S®RD 127

Glossary

A

Absorption

1. In the transmission of electrical, electromagnetic, or acoustic signals, the conversion of the transmitted energy into another form, usually thermal.
→ Absorption is one cause of signal attenuation.
→ The conversion takes place as a result of interaction between the incident energy and the material medium, at the molecular or atomic level. (ANS T1.523.201)
2. The irreversible conversion of energy of an electromagnetic wave into another form of energy as a result of its interaction with matter. (IEEE)

ANSI

American National Standards Institute
The U.S. standards organization that establishes procedures for the development and coordination of voluntary American National Standards. (ANS T1.523.201)

Antenna

1. Any structure or device used to collect or radiate electromagnetic waves. (ANS T1.523.201)
2. A device that converts radio frequency electrical energy to radiated electromagnetic energy and vice versa. (ANS T1.523.201)

Antenna Aperture

see "Aperture"

Antenna Array

An assembly of antenna elements with dimensions, spacing, and illumination sequence such that the fields for the individual elements combine to produce a maximum intensity in a particular direction and minimum field intensities in other directions. (ANS T1.523.201)

Antenna Dissipative Loss

A power loss resulting from changes in the measurable impedance of a practical antenna from a value theoretically calculated for a perfect antenna. (ANS T1.523.201)

Antenna Effective Area

see "Effective Area"

Antenna Efficiency

The ratio of the total radiated power to the total input power.
→ The total radiated power is the total input power less antenna dissipative losses. (ANS T1.523.201)

Antenna Factor

1. The antenna factor K is the quotient of the electric field strength E and the voltage V present at $50\ \Omega$ (e.g. a matched receiver input).

$$K = \frac{\text{Electric field strength}}{\text{Antenna output voltage at } 50\ \Omega}$$

- This factor includes the effects of antenna effective length or gain and mismatch and transmission line losses.
→ The factor for electric field strength is not necessarily the same as the factor for magnetic field strength. (IEEE)

Antenna Gain

1. The ratio of the power required at the input of a loss-free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength at the same distance.
→ Antenna gain is usually expressed in dB.
→ Unless otherwise specified, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization. Depending on the choice of the reference antenna, a distinction is made between:
 - ◆ absolute or isotropic gain (G_i), when the reference antenna is an isotropic antenna isolated in space;
 - ◆ gain relative to a half-wave dipole (G_d), when the reference antenna is a half-wave dipole isolated in space and with an equatorial plane that contains the given direction; (ANS T1.523.201)
2. The ratio of the radiation intensity, in a given direction, to the radiation intensity that would be obtained if the power accepted by the antenna were radiated isotropically.
→ Gain does not include losses arising from impedance and polarization mismatches.
→ If an antenna is without dissipative loss, then, in any given direction, its gain is equal to its directivity.
→ If the direction is not specified, the direction of the maximum radiation intensity is implied. (IEEE)

Antenna Gain-to-Noise-Temperature

see "G/T Ratio"

Antenna Lobe

see "Lobe"

Antenna Noise Temperature

The temperature of a hypothetical resistor at the input of an ideal noise-free receiver that would generate the same output noise power per unit bandwidth as that at the antenna output at a specified frequency.
→ The antenna noise temperature depends on antenna coupling to all noise sources in its environment as well as on noise generated within the antenna. (ANS T1.523.201)

Antenna Tuning Unit

see 'ATU'

Aperture

In a directional antenna, the portion of a plane surface very near the antenna normal to the direction of maximum radiant intensity, through which the major part of the radiation passes. (ANS T1.523.201)

Atmospheric Duct	A horizontal layer in the lower atmosphere in which the vertical refractive index gradients are such that radio signals (a) are guided or focused within the duct, (b) tend to follow the curvature of the Earth, and (c) experience less attenuation in the ducts than they would if the ducts were not present. → The reduced refractive index at the higher altitudes bends the signals back toward the Earth. Signals in a higher refractive index layer, i.e., duct, tend to remain in that layer because of the reflection and refraction encountered at the boundary with a lower refractive index material. (ANS T1.523.201)
Attenuation	1. A decrease in intensity of a signal, beam or wave as a result of absorption of energy and of scattering out of the path to the detector, but not including the reduction due to geometric spreading. (ANS T1.523.201) 2. A general term used to denote a decrease in signal magnitude in transmission from one point to another. Attenuation may be expressed as a scalar ratio of the input magnitude to the output magnitude or in decibels. (IEEE)
ATU	Antenna Tuning Unit A device used to match the impedance of an antenna to the impedance of a transmitter or receiver frequency selective to provide maximum power transfer.
Azimuth	The angle between a horizontal reference direction (usually north) and the horizontal projection of the direction of interest, usually measured clockwise. (IEEE)
B	
Bandwidth	The difference between the limiting frequencies within which performance of a device, in respect to some characteristic, falls within specified limits. (ANS T1.523.201)
Band	see "Electromagnetic Spectrum"
Beam	The main lobe of an antenna radiation pattern. (ANS T1.523.201)
Beamwidth	see "Half-power Beamwidth"
Bias Tee	A circuit which feeds a DC voltage to a RF path without affecting the RF parameters.
Boresight	The physical axis of a directional antenna. (ANS T1.523.201)
Boresight Error	1. The angular deviation of the electrical boresight of an antenna from its reference. (IEEE) 2. The deviation of the real main lobe direction to the theoretically available main lobe direction.
BW	see "Bandwidth"
C	
c	see "Speed of Light"
Carrier	1. In a frequency stabilized system, the sinusoidal component of a modulated wave whose frequency is independent of the modulating wave; or the output of a transmitter when the modulating wave is made zero; or a wave generated at a point in the transmitting system and subsequently modulated by the signal; or a wave generated locally at the receiving terminal which when combined with the side bands in a suitable detector, produces the modulating wave. (ANS T1.523.201) 2. The sinusoidal output signal of a transmitter at a typical frequency without any modulations.
Carrier Power	The radio frequency power available at the antenna terminal when no modulating signal is present. (IEEE)
CCIR	Consultative Committee for International Radio A predecessor organization of the ITU-R. (ANS T1.523.201)
CCITT	Consultative Committee for International Telegraph and Telephone A predecessor organization of the ITU-T. (ANS T1.523.201)
CISPR	International Special Committee on Radio Interference A committee that defines EMC measurement standards.
Clockwise Polarized Wave	see "Right-hand Polarized Wave"
Compromising Emanations	Unintentional signals that, if intercepted and analyzed, would disclose the information transmitted, received, handled, or otherwise processed by information systems equipment. (ANS T1.523.201)
Counterclockwise Polarized Wave	see "Left-hand Polarized Wave"

Glossary

D

dB

see "decibel"

dBc

dB relative to the carrier power (ANS T1.523.201)

dBd

In the expression of antenna gain, the number of decibels of gain of an antenna referenced to the gain of a half-wave dipole.

$$1 \text{ dBd} \triangleq 2.15 \text{ dBi}$$

dBi

In the expression of antenna gain, the number of decibels of gain of an antenna referenced to the zero dB gain of a free-space isotropic radiator. (ANS T1.523.201)

decibel

1. One tenth of the common logarithm of the ratio of relative powers, equal to 0.1 B (bel).

→ The ratio in dB is given by

$$dB = 10 \log_{10} \left(\frac{P_1}{P_2} \right),$$

where P_1 and P_2 are the actual powers. Power ratios may be expressed in terms of voltage and impedance, E and Z , or current and impedance, I and Z , since

$$P = I^2 \cdot Z = \frac{E^2}{Z}.$$

Thus dB is also given by

$$dB = 10 \log_{10} \left(\frac{E_1^2 / Z_1}{E_2^2 / Z_2} \right) = 10 \log_{10} \left(\frac{I_1^2 \cdot Z_1}{I_2^2 \cdot Z_2} \right)$$

If $Z_1 = Z_2$, these become

$$dB = 20 \log_{10} \left(\frac{E_1}{E_2} \right) = 20 \log_{10} \left(\frac{I_1}{I_2} \right). \quad (\text{ANS T1.523.201})$$

2. One tenth of a bel, the number of decibels denoting the ratio of the two amounts of power being ten times the logarithm to the base 10 of this ratio.

→ The abbreviation dB is commonly used for the term decibel. With P_1 and P_2 designating two amounts of power and n the number of decibel denoting their ratio,

$$n = 10 \log_{10} \left(\frac{P_1}{P_2} \right) \text{ decibel,}$$

When the conditions are such that the ratios of currents or ratios of voltages (or analogous quantities in other fields) are the square roots of the corresponding power ratios, the number of decibels by which the corresponding powers differ is expressed by the following equations:

$$n = 20 \log_{10} \left(\frac{I_1}{I_2} \right) \text{ decibel}$$

$$n = 20 \log_{10} \left(\frac{U_1}{U_2} \right) \text{ decibel}$$

Where I_1/I_2 and U_1/U_2 are the given current and voltage ratios, respectively. By extension, these relations between numbers of decibels and ratios of currents or voltages are sometimes applied were these ratios are not the square roots of the corresponding power ratios; to avoid confusion, such usage should be accompanied by a specific statement of this application. Such extensions of the term described should preferably be avoided. (IEEE)

Directive Gain

see "Directivity"

Directivity

The value of the directive gain in the direction of its maximum value. (IEEE)

E

Effective Area

The functionally equivalent area from which an antenna directed toward the source of the received signal gathers or absorbs the energy of an incident electromagnetic wave.

→ Antenna effective area is usually expressed in square meters. (ANS T1.523.201)

Effective Aperture

1. In a given direction, the ratio of the available power at the terminals of a receiving antenna to the power flux density of a plane wave incident on the antenna from that direction, the wave being polarization matched to the antenna.

→ If the direction is not specified, the direction of maximum radiation intensity is implied. (IEEE)

2. A measure of the receive-power which an antenna can take out of the total incoming power of a certain electromagnetic power density. The effective aperture is normally smaller than the geometrical aperture.

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Effective Height

1. The height of the center of radiation of an antenna above the effective ground level. (ANS T1.523.201)
 2. In low-frequency applications involving loaded* or nonloaded vertical antennas, the moment of the current distribution in the vertical section divided by the input current.
 → For an antenna with symmetrical current distribution, the center of radiation is the center of distribution. For an antenna with asymmetrical current distribution, the center of radiation is the center of current moments when viewed from points near the direction of maximum radiation. (ANS T1.523.201)
 *(Note: 'loaded antennas' means electrically short antennas)

Efficiency

The ratio of the useful power output to the total power input. (IEEE)

EIRP

Equivalent Isotropic Radiated Power
 The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain).

Electrical Beam Tilt

The shaping of the radiation pattern in the vertical plane of a transmitting antenna by electrical means – so that maximum radiation occurs at an angle below (downtilt) or above (uptilt) the horizontal plane.

Electric Field

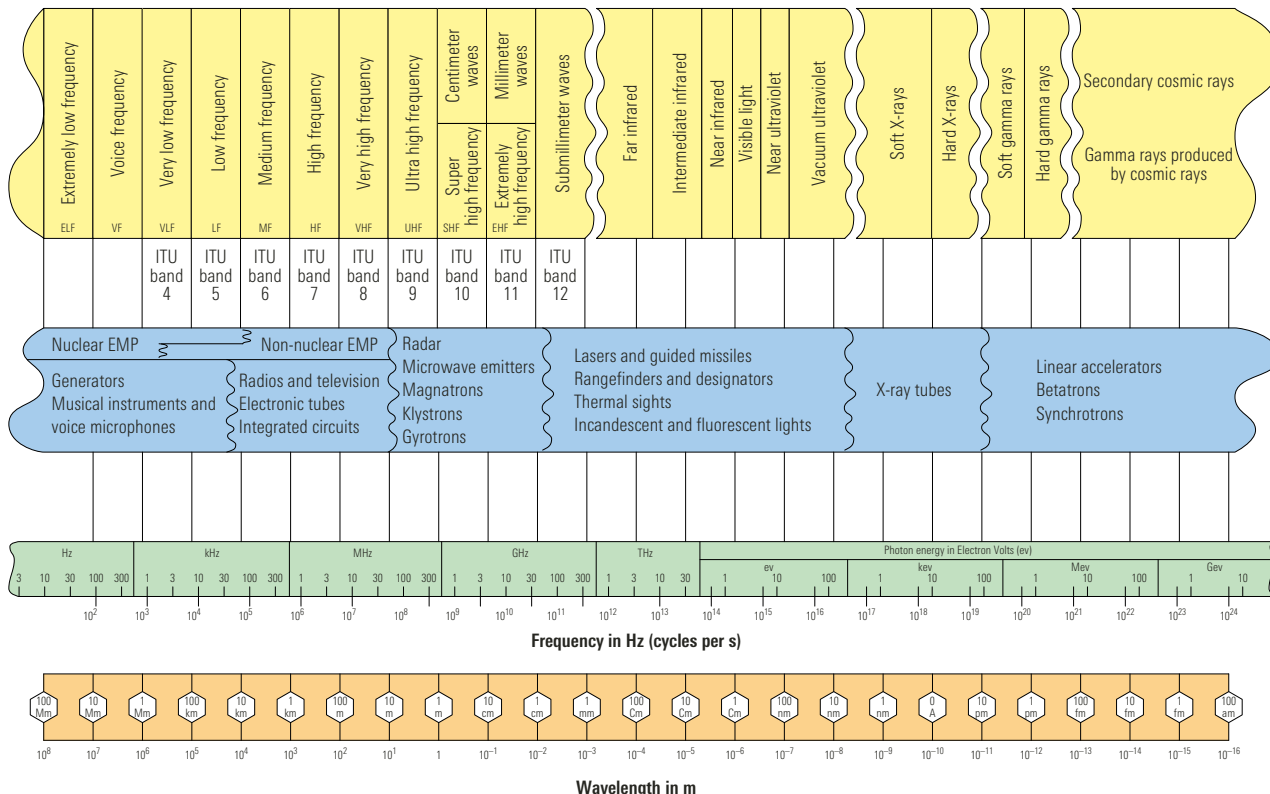
The effect produced by the existence of an electric charge, such as an electron, ion, or proton, in the volume of space or medium that surrounds it.
 → Each of a distribution of charges contributes to the whole field at a point on the basis of superposition. A charge placed in the volume of space or in the surrounding medium has a force exerted on it. (ANS T1.523.201)

Electric Field Strength

see "Field Strength"

Electromagnetic Spectrum

1. The range of frequencies of electromagnetic radiation from zero to infinity.
 → The electromagnetic spectrum was, by custom and practice, formerly divided into 26 alphabetically designated bands. This usage still prevails to some degree. However the ITU formally recognizes 12 bands, from 30 Hz to 3000 GHz. New bands, from 3 THz to 3000 THz, are under active consideration for recognition. Refer to the figure below. (ANS T1.523.201)
 2. The spectrum of electromagnetic radiation: in wavelengths, gamma ray, shorter than 0.006 nm; X-ray, 0.006 to 5 nm; ultraviolet, 5 nm to 0.4 mm; visible light, 0.4 to 0.7 μm; infrared, 0.7 μm to 1 mm; radio frequency, >1 mm. (IEEE)



Electromagnetic spectrum

Electromagnetic Wave

A wave produced by the interaction of time-varying electric and magnetic fields.
 → Electromagnetic waves are known as radio waves, heat rays, light rays, etc., depending on the frequency. (IEEE)

Elevation

The angle between the axis of a searchlight drum and the horizontal. For angles above the horizontal, elevation is positive, and below the horizontal negative. (IEEE)

Glossary

EMC

Electromagnetic Compatibility

1. Electromagnetic compatibility is the condition which prevails when telecommunications equipment is performing its individually designed function in a common electromagnetic environment without causing or suffering unacceptable degradation due to unintentional electromagnetic interference to or from other equipment in the same environment. (ANS T1.523.201)
2. A measure of equipment tolerance to external electromagnetic fields. (IEEE)

EMS

Electromagnetic Susceptibility

1. Of an electronic circuit or device, the degree to which it is subject to malfunction or failure under the influence of electromagnetic radiation. (ANS T1.523.201)
2. Electromagnetic Susceptibility includes all function tests to prove that a technical device is not disturbed by any occurring incoming electromagnetic radiation equal to the defined maximum limit-values.

EMI

Electromagnetic Interference

1. Any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. It can be induced intentionally, as in some forms of electronic warfare, or unintentionally, as a result of spurious emissions and responses, intermodulation products, and the like. (ANS T1.523.201)
2. An engineering term used to designate interference in a piece of electronic equipment caused by another piece of electronic or other equipment. EMI sometimes refers to interference caused by nuclear explosion. (ANS T1.523.201)
3. Electromagnetic Interference includes all inspection measurements to prove that a technical device does not emit any electromagnetic radiation higher than the predefined limit-values.

Emission

Electromagnetic energy propagated from a source by radiation or conduction.

→ The emission may be either desired or undesired and may occur anywhere in the electromagnetic spectrum. (ANS T1.523.201)

E Plane

The plane containing the electric field vector and the direction of maximum radiation. (IEEE)

F

Feed (Element)

1. For continuous aperture antennas, the primary radiator, for example, a horn feeding a reflector. (IEEE)
2. For array antennas, that portion of the antenna which functions to produce the excitation coefficients. (IEEE)

Far-field

see "Far-field region"

Far-field region

The region where the angular field distribution is essentially independent of distance from the source.

→ If the source has a maximum overall dimension D that is large compared to the wavelength, the far-field region is commonly taken to exist at distances greater than $2D^2/\lambda$ from the source (λ being the wavelength). (ANS T1.523.201)

Field

The volume of influence of a physical phenomenon, expressed vectorially. (ANS T1.523.201)

Field Strength

The magnitude of an electric, magnetic, or electromagnetic field at a given point.

→ The field strength of an electromagnetic wave is usually expressed as the rms value of the electric field, in volts per meter.

The field strength of a magnetic field is usually expressed in amperes per meter.

Synonym: radio field intensity (ANS T1.523.201)

Figure of Merit

see "G/T Ratio"

Flux

The rate of flow of energy through a surface. (IEEE)

Frequency

1. The number of cycles occurring per second of an electrical or electromagnetic wave; a number representing a specific point in the electromagnetic spectrum. (ANS T1.523.201)

2. The number of periods per unit time. (IEEE)

Front-to-Back Ratio

Of an antenna, the gain in a specified direction, i.e., azimuth, usually that of maximum gain, compared to the gain in a direction 180° from the specified azimuth.

→ Front-to-back ratio is usually expressed in dB. (ANS T1.523.201)

G

G/T ratio

Gain-to-Noise-Temperature, synonym: figure of merit

In the characterization of antenna performance, a figure of merit, where G is the antenna gain in decibels at the receive frequency, and T is the equivalent noise temperature* of the receiving system in kelvins. (ANS T1.523.201)

*(including antenna noise temperature)

Gain

see "Antenna Gain"

Ground Wave

1. In radio transmission, a surface wave that propagates close to the surface of the Earth. The Earth has one refractive index and the atmosphere has another, thus constituting an interface that supports surface wave transmission. These refractive indices are subject to spatial and temporal changes. Ground waves do not include ionospheric and tropospheric waves. (ANS T1.523.201)
2. A radio wave that is propagated over the earth and is ordinarily affected by the presence of the ground and troposphere. The ground wave is refracted because of variations in the dielectric constant of the troposphere including the condition known as surface duct. (IEEE)

H

Half-power Beamwidth

Of an antenna pattern, the angle between the half-power (3 dB) points of the main lobe, when referenced to the peak effective radiated power of the main lobe.
→ Beamwidth is usually expressed in degrees. (ANS T1.523.201)

Hertz

The SI unit of frequency, equal to one cycle per second.
→ A periodic phenomenon that has a period of one second has a frequency of one hertz. (ANS T1.523.201)

H Plane

The plane containing the magnetic field vector and the direction of maximum radiation.

HPBW

see "Half-power Beamwidth"

Hz

see "Hertz"

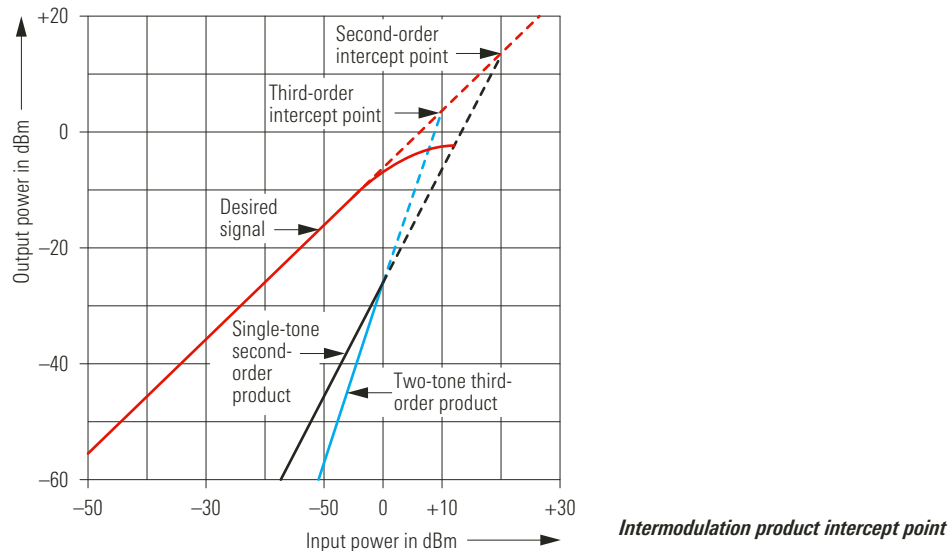
I

Impedance

The total passive opposition offered to the flow of electric current.
→ Impedance is determined by the particular combination of resistance, inductive reactance, and capacitive reactance in a given circuit.
→ Impedance is normally a function of frequency, except in the case of purely resistive networks. (ANS T1.523.201)

Intercept Point

1. Intermodulation products have an output-versus-input characteristic which, when graphically displayed, would theoretically intercept the plot of the desired output-versus-input if the nonlinear device continued to operate linearly without compression. The signal input level at which this theoretical point would occur is called the intercept point and is usually defined in dBm (decibel referred to one milliwatt). The figure below is a graphical representation of the intercept points for a single-tone second order and a two-tone third-order intermodulation product. (IEEE)



2. A point that is an extrapolated convergence – not directly measurable – of intermodulation distortion products in the desired output. That point indicates how well a receiver performs in the presence of strong nearby signals.

Intermodulation

The production, in a nonlinear element of a system, of frequencies corresponding to the sum and difference frequencies of the fundamentals and harmonics thereof that are transmitted through the element. (ANS T1.523.201)

Intermodulation Product

In the output of a nonlinear system, a frequency produced by intermodulation of harmonics of the frequencies present in the input signal. (ANS T1.523.201)

Ionosphere

That part of the atmosphere, extending from about 70 to 500 kilometers, in which ions and free electrons exist in sufficient quantities to reflect and/or refract electromagnetic waves. (ANS T1.523.201)

Glossary

Isotropic Antenna

A hypothetical antenna that radiates or receives equally in all directions.

→ Isotropic antennas do not exist physically but represent convenient reference antennas for expressing directional properties of physical antennas. (ANS T1.523.201)

Isotropic Radiator

see "Isotropic Antenna"

ITU

International Telecommunication Union

A civil international organization established to promote standardized telecommunications on a worldwide basis. The ITU-R and ITU-T are committees under the ITU. The ITU headquarters is located in Geneva, Switzerland. While older than the United Nations, it is recognized by the U.N. as the specialized agency for telecommunications. (ANS T1.523.201)

ITU-R

International Telecommunication Union - Radiocommunications Sector

The Radiocommunications Sector of the ITU; responsible for studying technical issues related to radiocommunications, and having some regulatory powers.

→ A predecessor organization was the CCIR. (ANS T1.523.201)

ITU-T

International Telecommunication Union - Telecommunication Standardization Sector

The Telecommunication Standardization Sector of the International Telecommunication Union (ITU).

→ ITU-T is responsible for studying technical, operating, and tariff questions and issuing recommendations on them, with the goal of standardizing telecommunications worldwide.

→ In principle, the ITU-T combines the standards-setting activities of the predecessor organizations formerly called the International Telegraph and Telephone Consultative Committee (CCITT) and the International Radio Consultative Committee (CCIR). (ANS T1.523.201)

K

K Factor

see "Antenna Factor"

L

Left-hand Polarized Wave

An elliptically or circularly polarized wave, in which the electric field vector, observed in the fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a left-hand or anticlockwise direction.

→ also called anticlockwise polarized wave (ANS T1.523.201)

Lobe

1. A lobe is a portion of the directional pattern bounded by one or two cones of nulls. (IEEE)

2. A three-dimensional section of the radiation pattern of a directional antenna, bounded by one or more cones of nulls or by regions of diminished irradiance. (ANS T1.523.201)

Loss

1. The diminution, usually expressed in dB, of signal level in a communications medium. (ANS T1.523.201)

2. The power, usually expressed in watts, consumed or dissipated by a circuit or component without accomplishing useful work or purpose; e.g., heating (hysteresis loss) that occurs in the core of a transformer. (ANS T1.523.201)

3. The attenuation of a signal level in a communications medium. (usually expressed in dB)

M

Main Beam

see "Main Lobe"

Main Lobe

or Major Lobe

Of an antenna radiation pattern, the lobe containing the maximum power (exhibiting the greatest field strength).

→ The width of the main lobe is usually specified as the angle encompassed between the points where the power has fallen 3 dB below the maximum value. (ANS T1.523.201)

Matched

Matched means that the impedance of e.g. an antenna is equal to the impedance of the RF cable as well as to the impedance of the connected device (e.g. transmitter or receiver). No reflections degrade the power transmission. A matched system offers the highest efficiency.

Mean Power

The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

→ Normally, a time of 0.1 second, during which the mean power is greatest, will be selected. (ANS T1.523.201)

Medium

In telecommunications, the transmission path along which a signal propagates, such as a wire pair, coaxial cable, waveguide, optical fiber, or radio path. (ANS T1.523.201)

Modulation

The process, or result of the process, of varying a characteristic parameter of a carrier, in accordance with an information-bearing signal. (ANS T1.523.201)

MTBF	Mean Time Between Failure An indicator of expected system reliability calculated on a statistical basis from the known failure rates of various components of the system. MTBF is usually expressed in hours. (ANS T1.523.201)
MTTR	Mean Time To Repair The time interval (hours) that may be expected to return a failed equipment to proper operation. (IEEE)
N	
Near Field	see "Near-field Region"
Near-field Region	The close-in region of an antenna wherein the angular field distribution is dependent upon the distance from the antenna. (ANS T1.523.201)
Near Zone	see "Near-field Region"
NF	see "Noise Figure"
Noise	An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural sources. (ANS T1.523.201)
Noise Factor	see "Noise Figure"
Noise Figure	<p>1. Of an active device, over the bandwidth of interest, the contribution by the device itself to thermal noise at its output. The noise figure is usually expressed in decibels (dB), and is with respect to thermal noise power at the system impedance, at a standard noise temperature (usually 20 °C, 293 K) over the bandwidth of interest. It is determined by</p> <p>(a) measuring (determining) the ratio, usually expressed in dB, of the thermal noise power at the output, to that at the input, and</p> <p>(b) subtracting from that result, the gain, in dB, of the system. Typical noise figures range from 0.5 dB for very low noise devices, to 4 to 8 dB. In some systems, e.g., heterodyne systems, total output noise power includes noise from other than thermal sources, such as spurious contributions from image-frequency transformation, but noise from these sources is not considered in determining the noise figure. In this example, the noise figure is determined only with respect to that noise that appears in the output via the principal frequency transformation of the system, and excludes noise that appears via the image frequency transformation. (ANS T1.523.201)</p> <p>2. At a selected input frequency the ratio of (A) the total noise power per unit bandwidth (at a corresponding output frequency) delivered by the system into an output termination to (B) the portion thereof engendered at the input frequency by the input termination, whose noise temperature is standard (290 K (Kelvins) at all frequencies). (IEEE)</p>
Noise Temperature	<p>At a pair of terminals, the temperature of a passive system having an available noise power per unit bandwidth at a specified frequency equal to that of the actual terminals of a network.</p> <p>→ The noise temperature of a simple resistor is the actual temperature of that resistor. The noise temperature of a diode may be many times the actual temperature of the diode. (ANS T1.523.201)</p> <p>→ Noise temperature of an antenna depends on its coupling to all noise sources in its environment as well as noise generated within the antenna. (IEEE)</p>
NVIS	Near-vertical-incidence Skywave In radio propagation, a wave that is reflected from the ionosphere at a nearly vertical angle and that is used in short-range communications to reduce the area of the skip zone and thereby improve reception beyond the limits of the ground wave. (ANS T1.523.201)
O	
Omnidirectional Antenna	An antenna that has a radiation pattern that is nondirectional in azimuth. → The vertical radiation pattern may be of any shape. (ANS T1.523.201)
P	
Peak Envelope Power	see "PEP"
PEP	Peak envelope power The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions. (ANS T1.523.201)
Phantom Feeding	A DC supply voltage is fed into a RF cable via a bias tee circuit

Glossary

Polarization

Of an electromagnetic wave, the property that describes the orientation, i.e., time-varying direction and amplitude, of the electric field vector.

→ States of polarization are described in terms of the figures traced as a function of time by the projection of the extremity of a representation of the electric vector onto a fixed plane in space, which plane is perpendicular to the direction of propagation. In general, the figure, i.e., polarization, is elliptical and is traced in a clockwise or counterclockwise sense, as viewed in the direction of propagation. If the major and minor axes of the ellipse are equal, the polarization is said to be circular. If the minor axis of the ellipse is zero, the polarization is said to be linear. Rotation of the electric vector in a clockwise sense is designated right-hand polarization, and rotation in a counterclockwise sense is designated left-hand polarization. (ANS T1.523.201)

Polarization Decoupling

The attenuation between a signal with a certain polarization and a signal with the same frequency but a differing polarization, e.g. cross-polarization decoupling.

Polarization Diversity

Diversity transmission and reception wherein the same information signal is transmitted and received simultaneously on orthogonally polarized waves with fade-independent propagation characteristics. (ANS T1.523.201)

Power

The rate of transfer or absorption of energy per unit time in a system. (ANS T1.523.201)

Propagation

The motion of waves through or along a medium.

→ For electromagnetic waves, propagation may occur in a vacuum as well as in material media. (ANS T1.523.201)

Propagation Channel

The physical medium in which the electromagnetic wave propagation takes place. This channel includes everything that influences the propagation between two antennas.

Propagation Path

see "Propagation Channel"

R

Radiant Power

The rate of flow of electromagnetic energy, i.e., radiant energy.

→ Radiant power is usually expressed in watts, i.e., joules per second. (ANS T1.523.201)

Radiation

In radio communication, the emission of energy in the form of electromagnetic waves. The term is also used to describe the radiated energy. (IEEE)

Radio Frequency

see "RF"

Radio Path

In the medium air, the channel or path through which the propagation between two antennas takes place.

Radiation Pattern

The variation of the field intensity of an antenna as an angular function with respect to the antenna axis.

→ A radiation pattern is usually represented graphically for the far-field conditions in either horizontal or vertical plane. (ANS T1.523.201)

Reciprocity

For antennas, this means that the same antenna can be used either for receiving as well as for transmitting purposes.

→ One exception to this rule are the active antennas. These can generally be used for receiving only.

Reference Antenna

An antenna that may be real, virtual, or theoretical, and has a radiation pattern that can be used as a basis of comparison with other antenna radiation patterns.

→ Examples of reference antennas are unit dipoles, half-wave dipoles, and isotropic, i.e., omnidirectional antennas. (ANS T1.523.201)

RF

Of, or pertaining to, any frequency within the electromagnetic spectrum normally associated with radio wave propagation.

→ For designation of subdivisions, see 'Electromagnetic Spectrum' and its associated diagram. (ANS T1.523.201)

Right-hand Polarized Wave

An elliptically or circularly polarized wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a right-hand or clockwise direction.

Synonym: clockwise polarized wave. (ANS T1.523.201)

Rotary Joint

A device transmitting cable-bound RF signals via a mechanically rotating joint to a device which is rotated.

Slip rings at a rotary joint are used for feeding e.g. control signals through the mechanically rotating joint. They are not meant for RF signals.

S

Side Lobe

A radiation lobe in any direction other than that of the major lobe. (IEEE)

Side Lobe Suppression

1. Any process, action of adjustment to reduce the level of the side lobes or to reduce the degradation of the intended antenna system performance resulting from the presence of side lobes. (IEEE)

2. Also the value of the side lobe suppression.

Silent Tuning	A feature of some ATUs. → After a first learning tuning cycle the ATU stores its frequency-depending setting values in a built-in memory. The now available 'Silent Tuning' mode can set the ATU to the stored values without initiating a new tuning process.
Silent Zone	see "Skip Zone"
Skip Zone	An annular region within the transmission range of an antenna, within the signals from the transmitter are not received. The skip zone is bounded by the locus of the farthest points at which the ground wave can be received and the nearest points at which reflected sky waves can be received. Synonyms: silent zone, zone of silence. (ANS T1.523.201)
Sky Wave	A radio wave that travels upward from the antenna. → A sky wave may be reflected to Earth by the ionosphere. (ANS T1.523.201)
Speed of Light (c)	The speed of an electromagnetic wave in free space, precisely 299,792,458 m/s. → The speed of an electromagnetic wave, e.g. light, is equal to the product of wavelength and frequency. $c = \lambda \cdot f$ → In any physical medium, the velocity of propagation of light is lower than the speed of light in free space. Since the frequency is not changed, in any physical medium, the wavelength is also decreased. (ANS T1.523.201)
Spillover	In a (reflector) antenna, the part of the radiated energy from the feed that does not impinge on the reflectors. (ANS T1.523.201)
Surface Duct	An atmospheric duct for which the lower boundary is the surface bounding the atmosphere. (IEEE)
T	
TEMPEST	Telecommunications Electronics Material Protected from Emitting Spurious Transmissions 1. Short name referring to investigation, study, and control of compromising emanations from information systems (IS) equipment. (ANS T1.523.201) 2. To shield against compromising emanation. (ANS T1.523.201)
Terminated Folded Dipole	see "TFD"
TFD	Terminated Folded Dipole Type of an antenna built. The dipole radiators are folded backwards at its half length. Both radiator ends are terminated to 'burn' all power which was not emitted via the radiator. In either case the reflected power would negatively influence the radiation pattern of the antenna and decrease the usability.
Troposphere	1. The lower layers of atmosphere, in which the change of temperature with height is relatively large. It is the region where clouds form, convection is active, and mixing is continuous and more or less complete. (ANS T1.523.201) 2. That part of the earth's atmosphere in which temperature generally decreases with altitude, clouds form, and convection is active. Experiments indicate that the troposphere occupies the space above the earth's surface up to a height ranging from 6 km (kilometers) at the poles to about 18 km at the equator. (IEEE)
V	
Voltage Standing Wave Ratio	see "VSWR"
VSWR	Voltage Standing Wave Ratio In a transmission line, the ratio of maximum to minimum voltage in a standing wave pattern. → The VSWR is a measure of impedance mismatch between the transmission line and its load. The higher the VSWR, the greater the mismatch. The minimum VSWR, i.e., that which corresponds to a perfect impedance match, is unity. (ANS T1.523.201)
W	
Wavelength	The distance between points of corresponding phase of two consecutive cycles of a wave. → The wavelength, λ , is related to the propagation velocity, v , and the frequency, f , by $\lambda = v / f$. (ANS T1.523.201) → In air the propagation velocity v is equal to c , the speed of light.
Z	
Zone of Silence	see "Skip Zone"

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Standard Dictionary of Electrical and Electronics Terms

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