

Antennas and Accessories

Catalog 2014/2015



Communications, monitoring and measurement

The Rohde&Schwarz product line encompasses a wide range of highly sensitive active and passive antennas for mobile and stationary use, providing complete coverage of the frequency range from 100Hz to 40GHz.

R&S®AD033V3
Omnidirectional UHF Antenna



R&S®HL562E
ULTRALOG



R&S®AC090
SHF Directional Antenna System












R&S®HE300
Active Directional Antenna

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Icons

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
	Device can be operated with DC power supply
	Device can be operated with AC power supply
	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 air traffic control (ATC) applications
	High gain antenna, e.g. for electromagnetic susceptibility (EMS) applications
	Calibrated antenna (calibration certificate supplied with device)

For 80 years, Rohde & Schwarz has stood for quality, precision and innovation in all fields of wireless communications.

The privately owned company group has a global presence. It develops, produces and markets a wide range of electronic capital goods for industry, infrastructure operators and government agencies.

Rohde & Schwarz is among the market leaders in all of its business fields, including wireless communications and RF test and measurement, terrestrial TV broadcasting and technologies related to the interception and analysis of radio signals.

Numerous subsidiaries and representatives not only ensure competent and customer-oriented on-site support anywhere in the world, they also safeguard customer investments with comprehensive service and support offerings.

More information: www.rohde-schwarz.com



Our business fields

Test and measurement

T&M instruments and systems for wireless communications, general-purpose electronics and aerospace and defense applications

Secure communications

(Radio) systems providing encrypted communications and IT security solutions for armed forces, government agencies and industry

Radiomonitoring and radiolocation

Spectrum monitoring systems and radiomonitoring equipment for regulatory authorities as well as for homeland and external security

Broadcasting

Broadcasting, measuring and studio equipment for network operators, broadcasters, studios, the film industry and manufacturers of entertainment electronics

Test and measurement

Rohde & Schwarz is one of the world's largest manufacturers of electronic test and measurement equipment. Our products set standards in research, development, production and service. As a key partner of industry, network operators and public institutions, we offer a broad spectrum of market-leading solutions for state-of-the-art technologies, including LTE-Advanced, the wireless standard of the next generation, as well as for hyperfrequency applications up to 500 GHz. New applications in the automotive and aerospace fields, in material research and in video technology promote the trend toward ever higher frequencies in electronics. Rohde & Schwarz meets the growing demand by offering cutting-edge products for signal generation, signal analysis, network analysis and power measurement. The company is systematically expanding its oscilloscope portfolio to meet the wide-ranging needs of customers, also in the lower price segment with products from its HAMEG subsidiary that are ideal for general lab applications.

Our test and measurement portfolio

- ▮ Test and measurement solutions for all wireless technologies
 - Wireless device testers
 - Infrastructure testers
 - Protocol testers
 - Conformance/preformance testers
 - Drive test solutions
 - Test systems and accessories
- ▮ Signal and spectrum analyzers
- ▮ Network analyzers
- ▮ Oscilloscopes
- ▮ Signal generators
- ▮ Coverage measurement systems
- ▮ EMC and field strength test solutions
- ▮ Power meters and voltmeters
- ▮ Audio analyzers
- ▮ Modular instruments
- ▮ Power supplies
- ▮ RF and microwave accessories
- ▮ System components
- ▮ Broadcasting and video T&M and monitoring solutions (see next page)

Test and measurement.



Broadcasting

TV viewers and radio listeners in more than 80 countries receive their programs via Rohde&Schwarz transmitters. Our innovative portfolio of broadcasting and measuring equipment drives the development of digital broadcasting worldwide.

To expand the company's leading position as a supplier of products for processing, distributing and transmitting audio/video signals, the signal processing chain from content creation to A/V consumers will be progressively closed. One step was the integration of the former DVS Digital Video Systems GmbH, now Rohde&Schwarz DVS GmbH, into the corporate group. DVS is a leading international manufacturer of hardware and software for professional film and video post production and storage. The broadcasting portfolio was recently expanded to include headends.

Broadcasters and network operators can now cover all their workflow and transport stream processing and routing requirements with Rohde&Schwarz products. Rohde&Schwarz supplies producers of consumer electronics with all necessary test equipment for the development and production of satellite receivers, TVs and other consumer electronics equipment, also for the latest and upcoming formats such as UltraHD. Rohde&Schwarz multistandard platforms cover the wide variety of broadcast and video technologies, providing great flexibility at all stages of the value added chain.

Secure communications

Radiocommunications systems Armed forces must be able to exchange information securely, reliably and without delay. This is crucial for the success of national and international missions. Rohde&Schwarz supplies all branches of the armed forces with interoperable radiocommunications systems for use on the ground, at sea and in the air. Our solutions use efficient encryption methods that satisfy the highest national and international security standards. The SCA-based R&S®SDTR software defined tactical radios support the network centric operations of the future.

Civil air traffic control agencies in 80 countries and at more than 200 locations – both airports and ATC centers – use Rohde&Schwarz radio systems. By adding voice communications systems to its product portfolio, the company now offers integrated all-in-one solutions for ground-to-cockpit communications – from the controller working position to the antenna.

Encryption and IT security Rohde&Schwarz SIT GmbH develops highly secure products for protected voice and data transmission via radio, wireless communications and fixed line links – for private industry, government agencies, critical infrastructures and the military. Product focus is on end-to-end encryption of communications, network security and crypto modules. The company's expertise also ensures confidentiality of communications when using Rohde&Schwarz radio equipment and systems.

Our broadcasting portfolio

- Digital and analog TV transmitters for all power classes and all conventional standards worldwide
- Digital and analog audio broadcast transmitters
- Audio/video headends
- Broadcasting and video T&M and monitoring solutions
- Hardware and software for professional film and video post production

Our secure communications portfolio

- Integrated communications systems for
 - Civil and military air traffic control (ATC)
 - Army
 - Navy
 - Air force
- Encryption technology for all classification levels
- IT security products

Broadcasting.



Secure communications.



Radiomonitoring and radiolocation

The need for mobile, wireless exchange of information is increasing drastically, but the usable frequency spectrum for radiocommunications and broadcasting is limited. As a result, it can be expensive when the market determines the price, e.g. in spectrum auctions. That is why it is important that regulatory authorities ensure proper technical and legal use of the spectrum. Network operators also have a vital interest in an error-free, performance-optimized infrastructure and require technical means to ensure this service. Rohde&Schwarz provides the necessary equipment.

The company's receivers, direction finders, signal analyzers, antennas and customized systems have made Rohde&Schwarz a reliable partner for its customers for decades. Applications include sovereign spectrum management by regulatory authorities and technical monitoring of radio networks by their operators, but also securing critical infrastructures such as power plants, as well as radiomonitoring to ensure homeland and external security.

Services

Rohde&Schwarz operates a global service network in order to safeguard the investments of its customers.

The following on-site services are offered worldwide:

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

Rohde&Schwarz regional service centers, plants and specialized subsidiaries 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
- ▮ Logistics concepts

Our radiomonitoring and radiolocation portfolio

- ▮ Radio intelligence systems
- ▮ Spectrum monitoring systems
- ▮ Satellite monitoring systems
- ▮ Signal analysis systems
- ▮ Receivers
- ▮ Direction finders
- ▮ Antennas
- ▮ Solutions for analyzing and controlling IP data streams

Service that adds value

- ▮ Worldwide
- ▮ Local and personalized
- ▮ Customized and flexible
- ▮ Uncompromising quality
- ▮ Long-term dependability

Radiomonitoring and radiolocation.



Services.



Rohde & Schwarz

worldwide

Headquarters

At company headquarters in Munich, around 2500 employees work in research and development, central sales and service, marketing and administration.

Contact

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Customer support

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Global service and sales locations



Formulas

General	
Prefix	Value
T (Tera)	10^{12}
G (Giga)	10^9
M (Mega)	10^6
k (kilo)	10^3
h (hecto)	10^2
da (deca)	10^1
d (deci)	10^{-1}
c (centi)	10^{-2}
m (milli)	10^{-3}
μ (micro)	10^{-6}
n (nano)	10^{-9}
p (pico)	10^{-12}
f (femto)	10^{-15}
a (atto)	10^{-18}

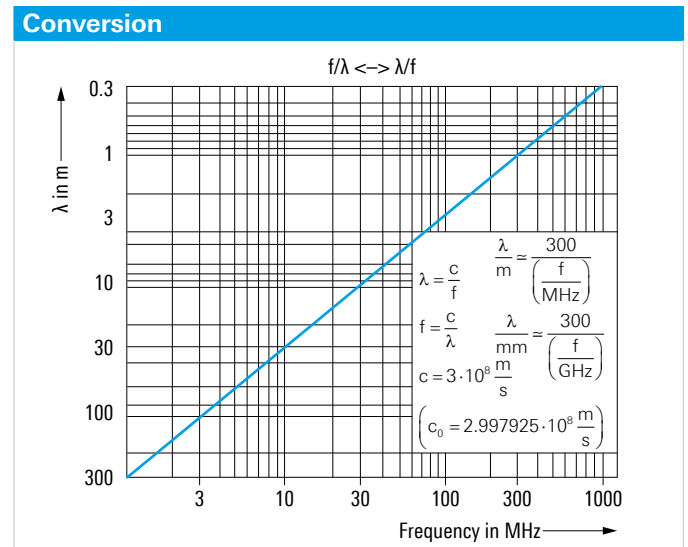
Frequency ranges				
Range	f	λ	Classification	Principal use
VLF	3 kHz to 30 kHz	100 km to 10 km	Very low frequency	Submarines
LF	30 kHz to 300 kHz	10 km to 1 km	Low frequency	Beacons
MF	300 kHz to 3 MHz	1000 m to 100 m	Medium frequency	AM broadcast
HF	3 MHz to 30 MHz	100 m to 10 m	High frequency	Shortwave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

Frequency notations		
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

Frequency notations		
Frequency	Old band notation	New band notation
20.0 GHz to 26.5 GHz	K	K
26.5 GHz to 40.0 GHz	Ka	K
40.0 GHz to 60.0 GHz	Q, V, W	L
60.0 GHz to 100.0 GHz	W	M

Measures of length	
Distance	Equivalent to
1 meter (m)	= 10 decimeters (dm) = 100 centimeters (cm) = 1000 millimeters (mm) = 1 000 000 micrometers (μm)
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 (in)	= 25.4 mm (accurately 25.399956 mm)

Inch to mm	
Inch	mm
1/64	0.397
1/32	0.794
1/16	1.587
1/8	3.175
3/16	4.762
1/4	6.350
3/8	9.525
1/2	12.700
5/8	15.875
3/4	19.050
7/8	22.225
1	25.400

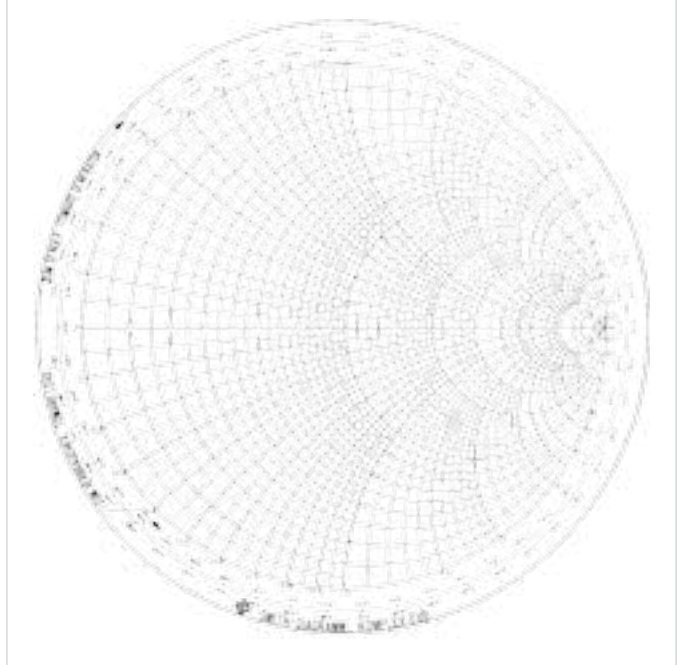


Reflection, matching

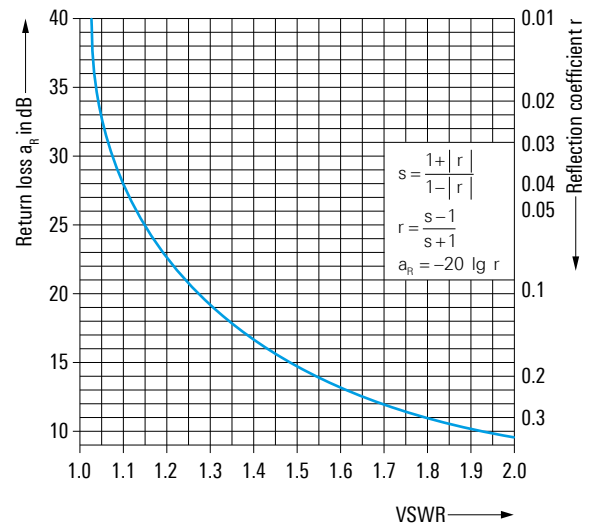
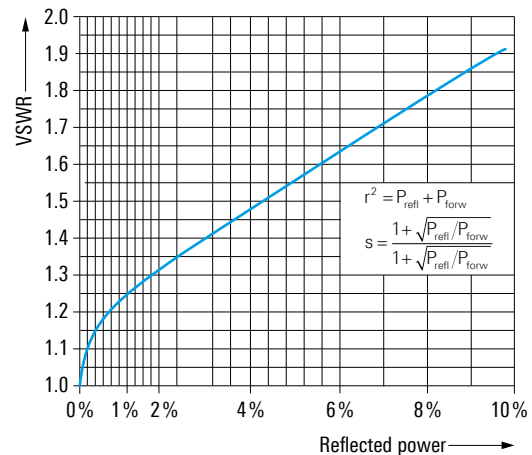
s	VSWR	r	Reflection coefficient	a _R	Return loss	
s	r	a _R	(VSWR)	r	P _{refl} in %	a _R in dB
			$\frac{V_{\max}}{V_{\min}}$	$\frac{V \leftarrow}{V \rightarrow}$		$20 \lg \left(\frac{V \leftarrow}{V \rightarrow} \right)$
1.01	0.005					46.1
1.02	0.010	0.01				40.1
1.03	0.015	0.02				36.6
1.04	0.020	0.04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

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



VSWR and return loss

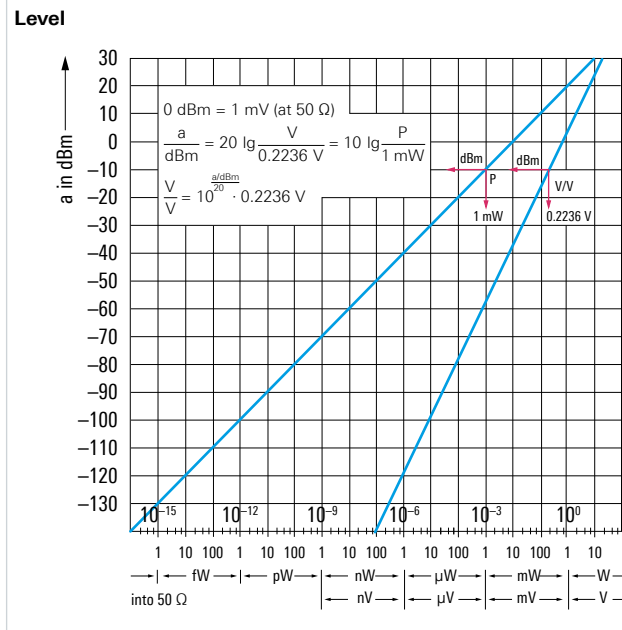


Voltage and power ratio

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

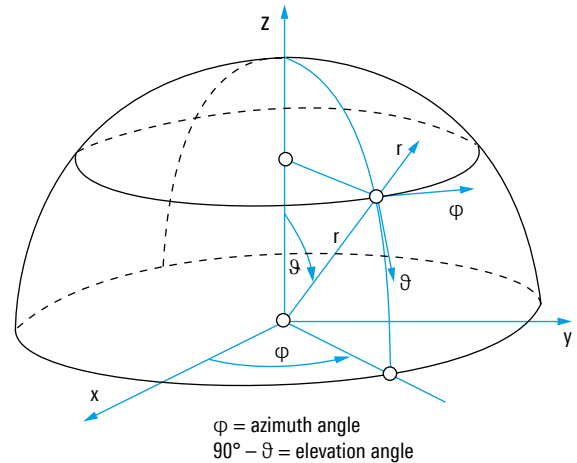
¹⁾ P₀ = base power level.

Power, voltage



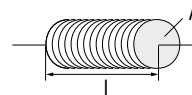
Power, voltage

Spherical coordinates



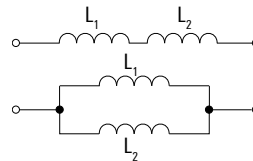
Inductance, capacitance

Cylindrical coil



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

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

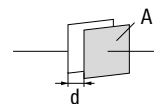


$$L_{\text{total}} = L_1 + L_2$$

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

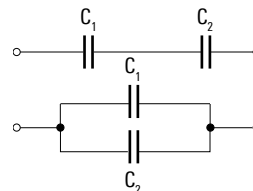
Inductance, capacitance

Plate capacitor



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

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



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

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

Frequency of a resonant circuit

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

f_0 = resonant frequency
 L = inductance
 C = capacitance

Formulas

Intrinsic impedance of free space

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

Z_0 = intrinsic impedance of free space in Ω
 μ_0 = permeability of vacuum
 ϵ_0 = permittivity of vacuum

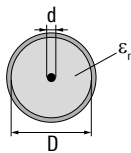
Correlation of E field and H field based on intrinsic impedance of free space

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

E = incident electric field strength
 H = incident magnetic field strength

Coaxial line impedance

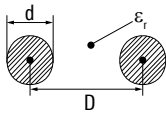
$$Z_L \approx 60 \Omega \cdot \frac{1}{\sqrt{\epsilon_r}} \ln \left(\frac{D}{d} \right)$$



Z_L = line impedance
 ϵ_r = relative permittivity (dimensionless)
 D = outer diameter in m (see drawing)
 d = inner diameter in m (see drawing)

Symmetrical line impedance

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



Z_L = line impedance
 ϵ_r = relative permittivity (dimensionless)
 D = spacing between the two lines in m (see drawing)
 d = diameter of each line in m (see drawing)

Directivity

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

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

Gain (including ohmic losses)

$$G = \frac{P_{\max}}{P_{\text{av}0}} \quad \text{and} \quad g = 10 \lg G$$

G = gain of antenna (linear, dimensionless)
 P_{\max} = maximum radiated power density in boresight direction of antenna
 $P_{\text{av}0}$ = average radiated power density of a spherical isotropic radiator with an input power equal to that of the antenna of interest
 g = logarithmic gain value of antenna in dB

Radiation efficiency

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

η = radiation efficiency 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

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

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 of active antenna

Effective aperture

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

A_e = effective aperture of antenna
 G = gain of antenna including ohmic losses (dimensionless)
 λ = wavelength of electromagnetic wave

Aperture efficiency²⁾

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

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

²⁾ Significant for aperture antennas only (e.g. horns, reflectors).

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

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)
 E = incident electric field strength
 V = induced voltage at a 50 Ω matched measurement device
 h_e = effective antenna length

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

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

$$k = 20 \lg K$$

k = logarithmic value of antenna factor

Free-space field strength (far field)

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

E_0 = free-space field strength (far field)
 P_t = transmitted power
 G_t = gain of transmitting antenna including ohmic losses (linear, dimensionless)
 r = distance from transmitting antenna

³⁾ Significant for electrical short and simple antennas only (e.g. a rod for low frequencies).

Friis transmission formula⁴⁾

$$\frac{P_r}{P_t} = \frac{A_{er} \cdot A_{et}}{r^2 \cdot \lambda^2} = \frac{G_r \cdot G_t}{(4\pi r/\lambda)^2}$$

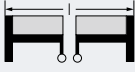
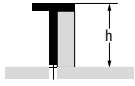
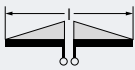
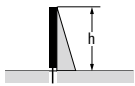
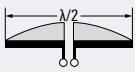
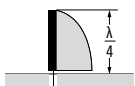
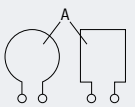
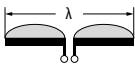
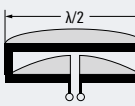
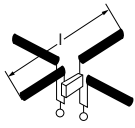


P_r = received power
 P_t = transmitted power
 A_{er} = effective aperture of receiving antenna
 A_{et} = effective aperture of transmitting antenna
 G_t = gain of transmitting antenna (linear, dimensionless)
 G_r = gain of receiving antenna (linear, dimensionless)
 λ = wavelength
 r = distance between antennas

Maximum received power⁴⁾

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

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

⁴⁾ Precondition: optimum alignment of both antennas with regard to polarization and boresight direction.

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

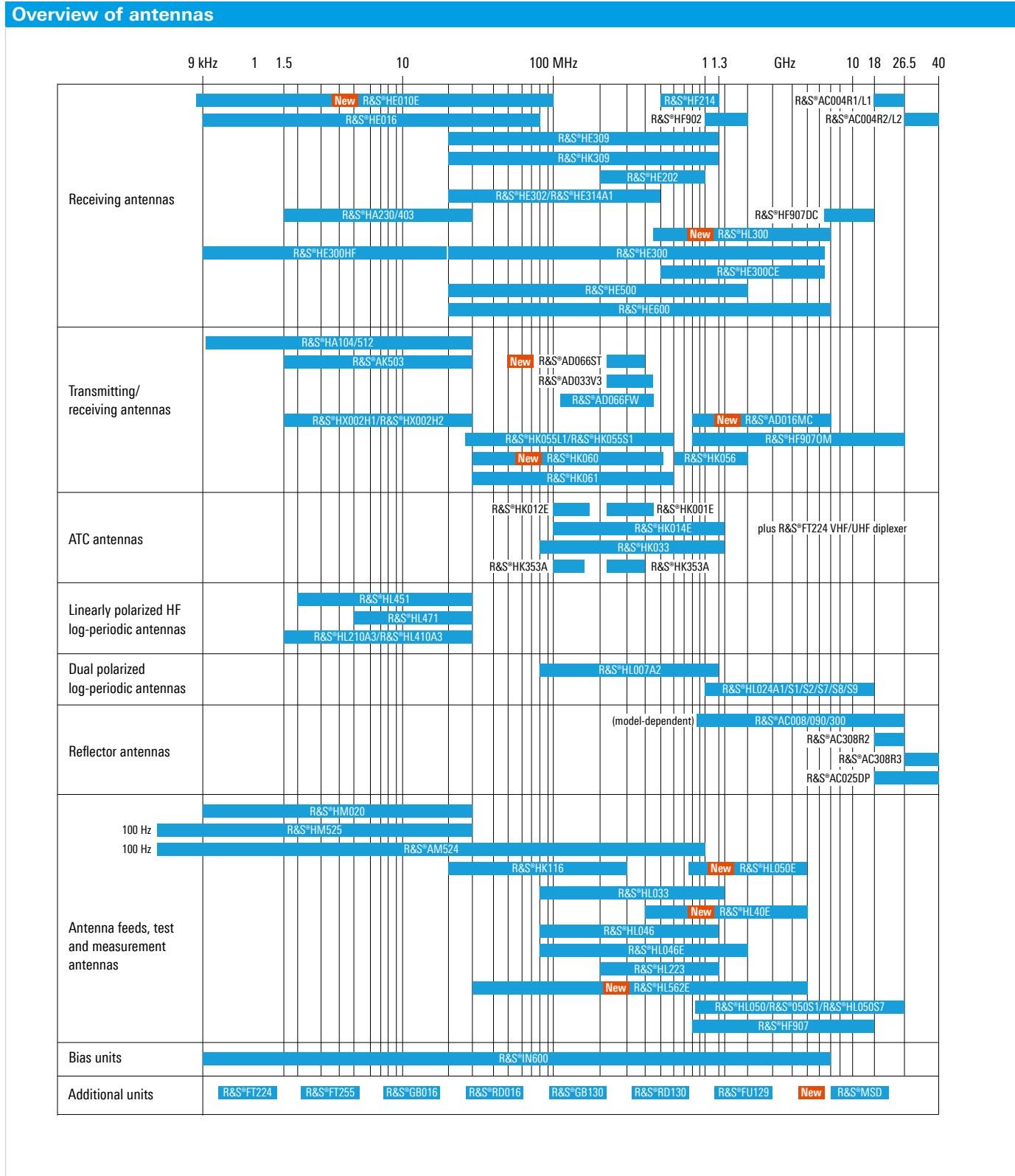
⁵⁾ Corresponds to gain for a loss-free antenna.

⁶⁾ Loss-free antenna and surroundings.

⁷⁾ l < 0.2 λ.

⁸⁾ h < 0.2 λ.

Antenna Selection Guide



Chapter 1

HF Antennas

	Type	Designation	Page
	R&S®HM020	Triple-loop antenna	20
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New	R&S®HE010E	Active rod antenna	24
	R&S®HE016	Active antenna system	26
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R&S®HM020 Triple-Loop Antenna



9 kHz to 30 MHz

Fully automatic measurement of magnetic field strength

The R&S®HM020 triple-loop antenna allows fully automatic measurement of the magnetic field strength in the X, Y and Z planes of a centrally placed EUT.

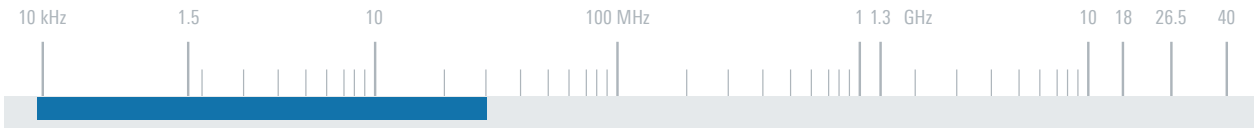
The antenna operates according to the van Veen/Bergervoet principle.

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

Key facts

- 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



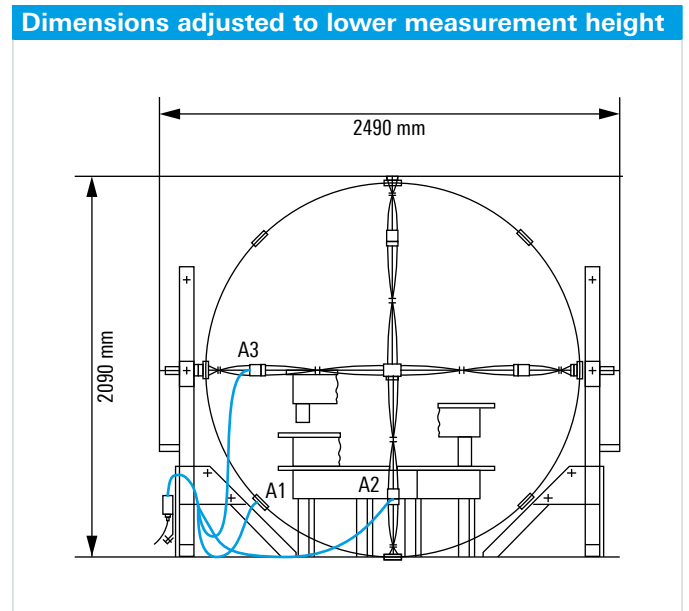
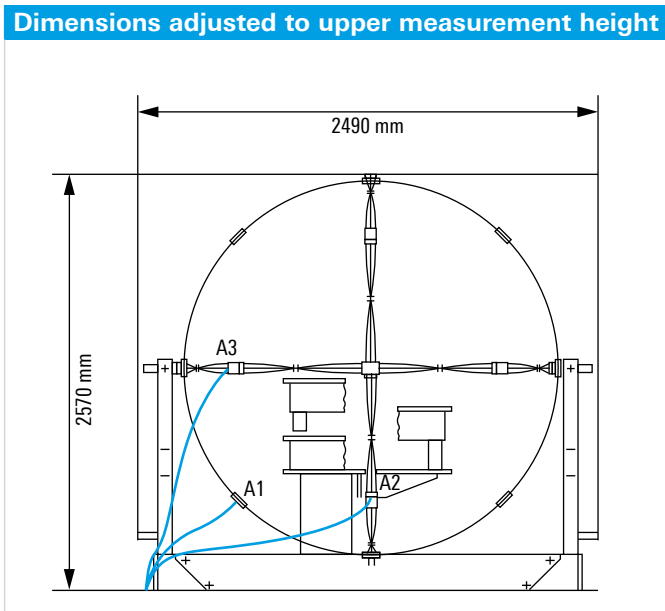


Specifications	
Frequency range	9 kHz to 30 MHz
Loop planes	switchable between X, Y and Z plane
Input impedance	50 Ω
Antenna factor of current probe	0 dB, referred to 1 S (in line with CISPR/A (Secretariat) 103, 104, 105)
RF connector	N female
Control connector	9-contact, D-Sub, female
Ground connector	terminal strip for copper foil
MTBF	> 1 000 000 h
Operating temperature range	-10 °C to +55 °C

Dimensions (W × H × D)	
Loops set up	approx. 2.49 m × 2.57 m ¹⁾ × 2.07 m (98.0 in × 101.2 in ¹⁾ × 81.5 in)
Loops in transport crate	approx. 2.68 m × 2.32 m × 0.57 m (105.5 in × 91.3 in × 22.4 in)
Basic pedestal (load capacity 100 kg)	approx. 0.9 m × 1.0 m × 0.9 m (35.4 in × 39.4 in × 35.4 in)
Adapter pedestal (load capacity 100 kg)	approx. 0.9 m × 0.5 m (max.) × 0.9 m (35.4 in × 19.7 in (max.) × 35.4 in)
Weight	
Loop system	approx. 45 kg (99.2 lb)
Basic pedestal	approx. 40 kg (88.2 lb)
Adapter pedestal	approx. 30 kg (66.1 lb)

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

Ordering information	Type	Order No.
Triple-Loop Antenna	R&S®HM020	4023.4508.02
Recommended extras		
Basic Pedestal	R&S®HM020Z1	4023.5504.02
Adapter Pedestal	R&S®HM020Z2	4023.5604.02
Calibration Dipole	R&S®HM020Z3	4023.5704.02
Control Unit (only required for receivers without user port)	R&S®BG020	4024.1002.02



R&S®HM525 Active H-Field Measurement Antenna

100 Hz to 30 MHz

Extremely high sensitivity measurement of
alternating magnetic fields



The R&S®HM525 active H-field measurement antenna is a loop antenna. The voltage at its output is proportional to the amplitude of the alternating magnetic field that is present.

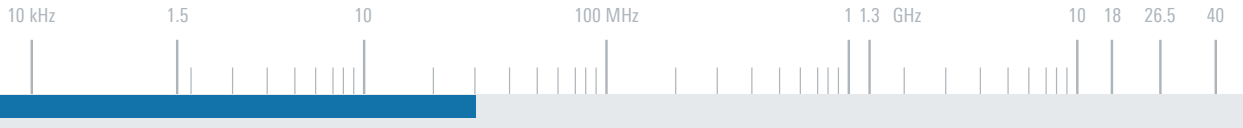
Overview measurements are performed in the broadband mode, which covers the entire frequency range from 100 Hz to 30 MHz. To obtain maximum sensitivity, the antenna can be locally or remotely switched to the sub-range mode. The frequency range is then divided into five subranges with different amplifier 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 method and comes with a calibration certificate.

Key facts

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

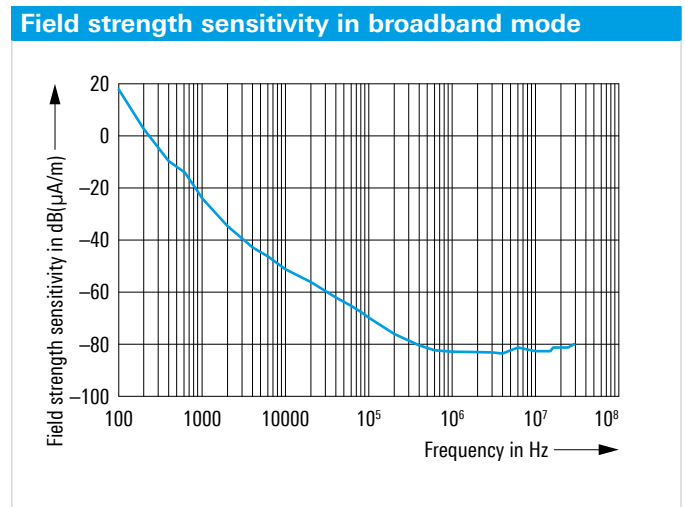
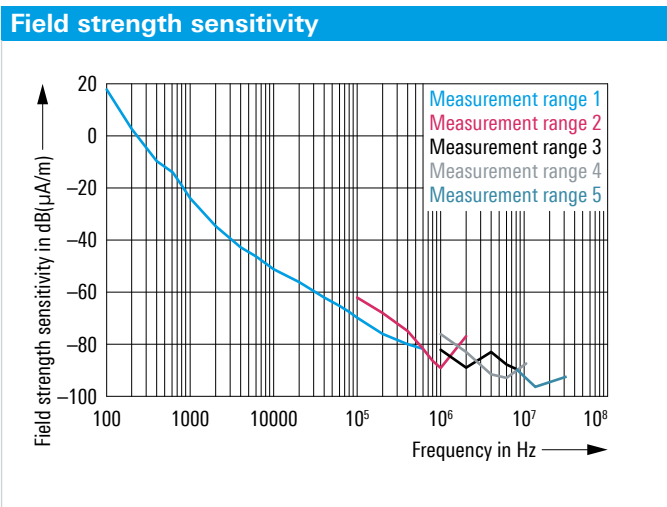




Specifications	
Frequency range	
Broadband mode	100 Hz to 30 MHz
Subrange mode	
Range 1	100 Hz to 600 kHz
Range 2	600 kHz to 1.2 MHz
Range 3	1.2 MHz to 2.6 MHz
Range 4	2.6 MHz to 8 MHz
Range 5	8 MHz to 30 MHz
Input impedance	50 Ω
Field strength sensitivity	see diagrams
Calibration	by comparison (as standard)

Power supply	18 V ±0.5 V DC (max. 0.7 A)
RF connector	N female
Test signal connector	N female
MTBF	> 300 000 h
Operating temperature range	-10°C to +55°C
Dimensions (W × H × D)	approx. 640 mm × 730 mm × 400 mm (25.2 in × 28.7 in × 15.8 in) (without support)
Weight	approx. 10 kg (22.5 lb)
Class of application	laboratory

Ordering information	Type	Order No.
Active H-Field Measurement Antenna	R&S®HM525	4031.0508.02
Recommended extras		
Pedestal	R&S®HM525Z1	4036.1402.02
Control Unit	R&S®GS525	4035.5004.02
Set of Fiber-Optic Cables	R&S®GS525K1	4035.5604.02
Junction Unit	R&S®GX525	4015.9256.02
Cabinet for Junction Unit	R&S®KK524	4015.9004.02
Integration	R&S®AM524-K	4015.7024.02



Bandwidth = 1 Hz; S/N ratio = 0 dB (measurement ranges 1 to 5 active).

R&S®HE010E

Active Rod Antenna

8.3 kHz to 100 MHz

Sensitive monitoring in stationary and mobile applications

New



The R&S®HE010E active rod antenna is designed as a broadband monitoring antenna for vertically polarized waves.

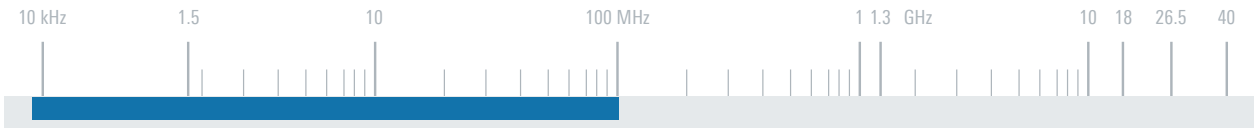
Its main application is sensitive monitoring in stationary and mobile applications where it offers very good reception results due to its low inherent noise figure, which is comparable to, and even below, the atmospheric or man-made noise.

The high sensitivity of the R&S®HE010E in combination with high interference immunity to large signals allows sensitive radiomonitoring and field strength measurements over a wide dynamic range.

Key facts

- Excellent wideband characteristics
- Low inherent noise figure
- High sensitivity in combination with high interference immunity to large signals
- Compact dimensions (rod length: 1 m)
- Protected against overvoltage that can occur as a result of atmospheric discharges or in the immediate vicinity of transmitting antennas

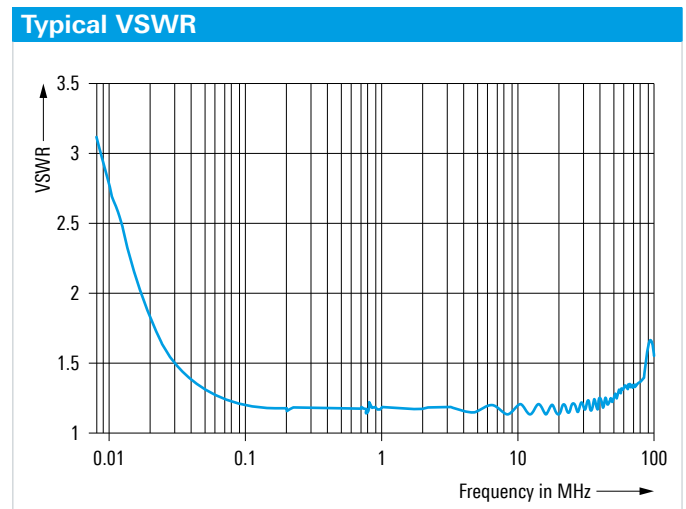
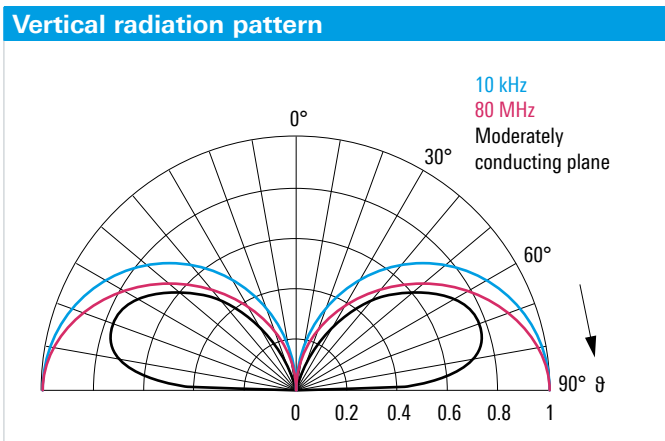




Specifications	
Frequency range	8.3 kHz to 100 MHz
Polarization	vertical
Input impedance	50 Ω
VSWR	
8.3 kHz to 20 kHz	< 4.5
20 kHz to 100 MHz	< 2
Antenna factor (antenna mounted on conductive plane)	11 dB/m (typ.)
IP2	
Up to 30 MHz	≥ 50 dBm; 60 dBm (typ.)
30 MHz to 100 MHz	≥ 40 dBm
IP3	
Up to 30 MHz	≥ 30 dBm; 33 dBm (typ.)
30 MHz to 100 MHz	≥ 20 dBm

Cross-modulation limit	
Up to 30 MHz	≤ 12 V/m
30 MHz to 100 MHz	≤ 6 V/m
Power supply	24 V DC (-3 V/+2 V) (max. 190 mA)
Connector	N female
MTBF	> 250 000 h
Operating temperature range	-40°C to +65°C
Storage temperature range	-40°C to +85°C
Protection class	IP55 (in line with EN 60529)
Permissible wind speed	275 km/h (without ice deposit)
Dimensions (Ø × L)	approx. 120 mm × 1 m (4.7 in × 39.4 in)
Weight	approx. 1 kg (2.2 lb)

Ordering information	Type	Order No.
Active Rod Antenna, squirrel gray RAL7000	R&S®HE010E	4097.6004.02
Active Rod Antenna, bronze green RAL6031	R&S®HE010E	4097.6004.03
Active Rod Antenna, light ivory RAL1015	R&S®HE010E	4097.6004.04
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx



R&S®HE016

Active Antenna System

9 kHz to 80 MHz (vertical)

600 kHz to 40 MHz (horizontal)

Omnidirectional reception of vertically and horizontally polarized signals



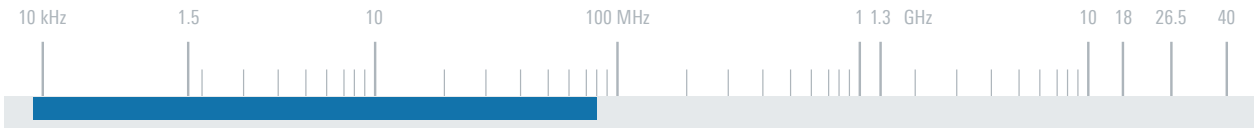
The R&S®HE016 active antenna system is a combination of the R&S®HE010 active rod antenna and two crossed HF dipole antennas. The two horizontal dipole antennas are combined via a 90° coupler to produce an omnidirectional radiation pattern.

The high sensitivity of the antenna system is comparable to that of passive systems, though the R&S®HE016 requires less than one third of the antenna surface of a passive system.

Key facts

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

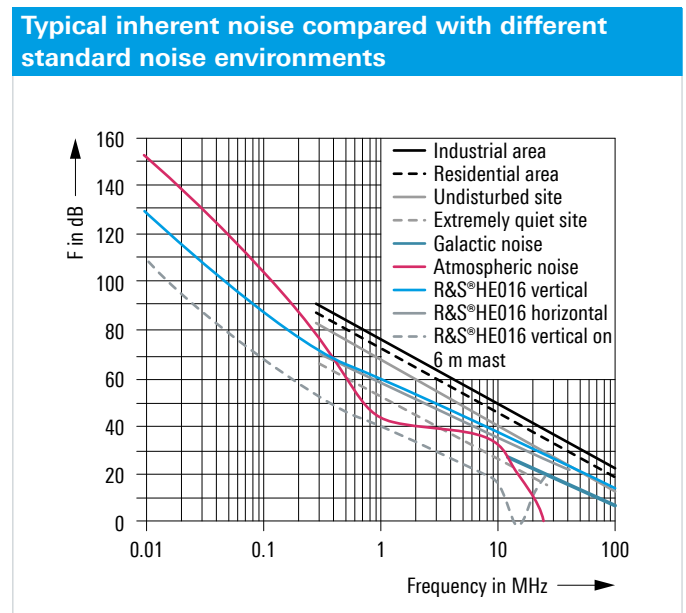
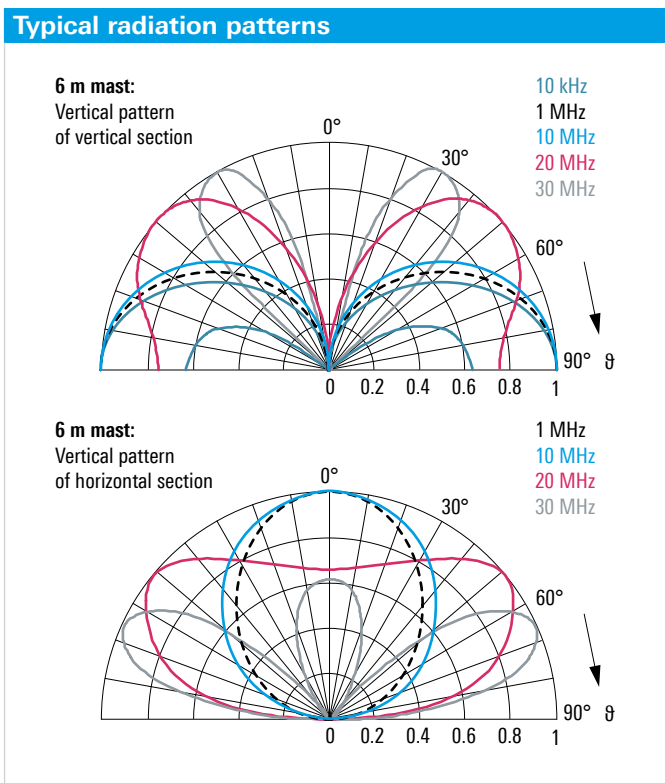




Specifications	
Frequency range	
Vertical polarization	9 kHz to 80 MHz
Horizontal polarization	600 kHz to 40 MHz
Input impedance	50 Ω
VSWR	
9 kHz to 20 kHz	< 3
20 kHz to 80 MHz	< 2
IP2	≥ 50 dBm (up to 30 MHz)
IP3	≥ 30 dBm (up to 30 MHz)
Power supply	21 V to 26 V DC (max. 500 mA)

Power consumption	
Vertical	approx. 160 mA at 24 V DC
Horizontal	approx. 340 mA at 24 V DC
Connector	2 × N female
MTBF	> 25 000 h
Operating temperature range	−40°C to +65°C
Max. wind speed	188 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 2.85 m × 1.4 m (112.2 in × 55.1 in)
Weight	approx. 5.5 kg (12.1 lb)

Ordering information	Type	Order No.
Active Antenna System	R&S®HE016	4051.8504.02
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.x2
Mast, length: 6 m, pluggable	R&S®KM011	0273.9116.02



R&S®HA104/512 HF Whip Antenna



10 kHz to 30 MHz (reception)

1.5 MHz to 30 MHz (transmission)

For ground waves and vertically polarized low-angle skywaves

The R&S®HA104/512 HF whip antenna is suitable for ground waves and vertically polarized low-angle skywaves.

In conjunction with an antenna tuning unit, it can also be used for transmission.

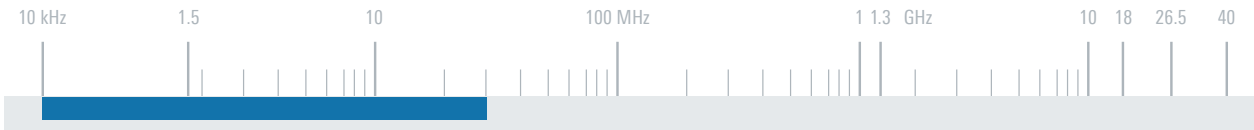
The sturdy, shock- and vibration-proof construction makes the R&S®HA104/512 ideal for mobile use.

For use on vehicles, the R&S®HA104/512 can be tied down when the vehicle is in motion.

Key facts

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





Specifications	
Frequency range	
Reception	10 kHz to 30 MHz
Transmission (with ATU)	1.5 MHz to 30 MHz
Polarization	linear/vertical
Max. input power	150 W CW/150 W PEP
Horizontal radiation pattern	omnidirectional

Connector	clamp
MTBF	> 150 000 h
Operating temperature range	-30°C to +55°C
Max. wind speed	150 km/h (without ice deposit)
Height of antenna	approx. 5 m (196.9 in)
Disassembly possible	yes
Weight	approx. 4 kg (8.8 lb)

Ordering information	Type	Order No.
HF Whip Antenna	R&S®HA104/512	0156.2039.02
Recommended extras		
Antenna Tuning Unit	R&S®FK4115M	6120.4000.03

R&S®HA230/403 HF Receiving Antenna

1.5 MHz to 30 MHz

Also for polarization-diversity reception



The R&S®HA230/403 HF receiving antenna is a versatile shortwave antenna for both horizontally and vertically polarized waves.

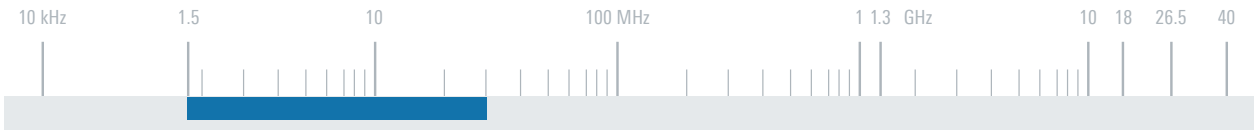
The antenna consists of a mast head with a vertical monopole and two horizontal dipoles mounted at a 90° angle. The antenna is installed on a 6 m high mast.

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

Key facts

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

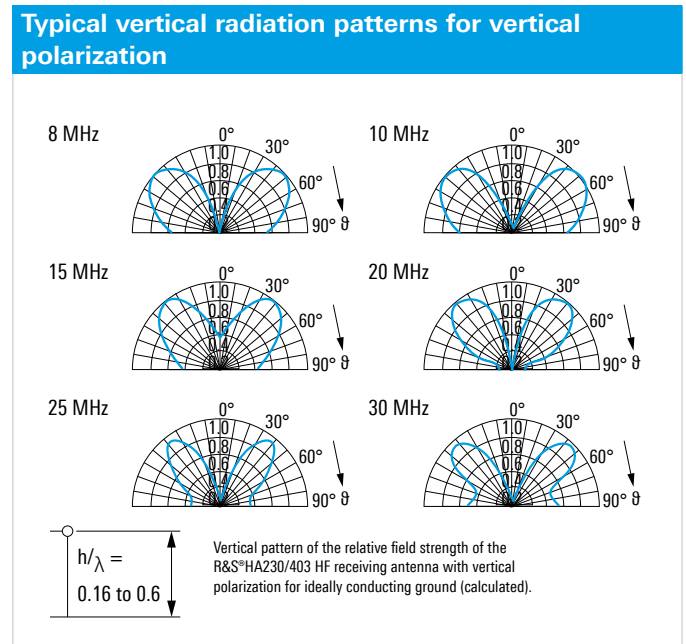
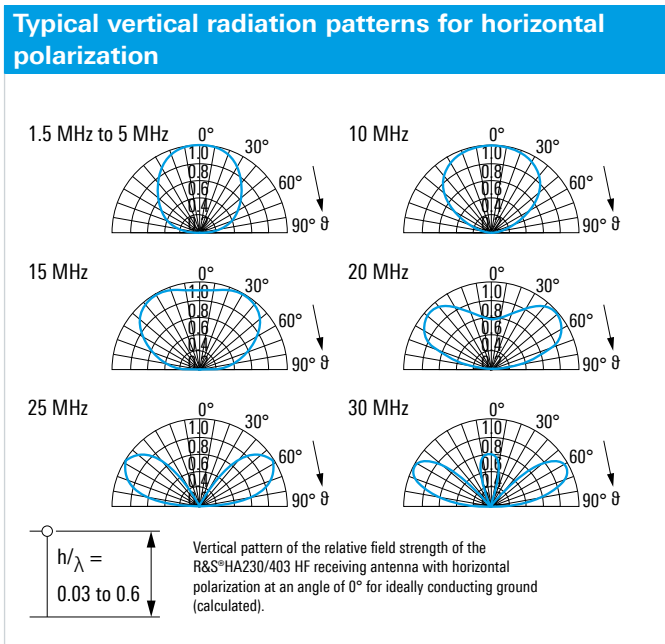




Specifications	
Frequency range	1.5 MHz to 30 MHz
Polarization	horizontal and vertical
Input impedance	50 Ω
Connectors	3 × N female
MTBF	> 100000 h
Operating temperature range	-30°C to +50°C

Max. wind speed	
Without ice deposit	160 km/h
With 30 mm radial ice deposit	135 km/h
Dimensions	
Length of radiators	approx. 5 m (196.9 in)
Height	approx. 11 m (433.1 in)
Weight (incl. mast)	approx. 85 kg (187.4 lb)

Ordering information	Type	Order No.
HF Receiving Antenna (stationary)	R&S®HA230/403	0101.1176.02
Consists of:		
Antenna Head	R&S®HA230Z	0138.6313.00
Mast, length: 6 m	R&S®HA230M	0138.6342.00



R&S®AK503 Mobile HF Antenna

1.5 MHz to 30 MHz

Highly reliable HF antenna for mobile use



The R&S®AK503 mobile HF antenna 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 radiocommunications.

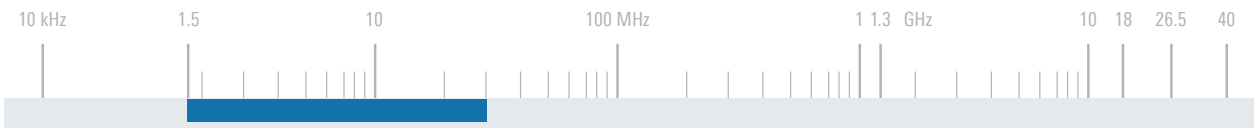
The automatic R&S®FK2100 antenna tuning unit ensures optimum antenna tuning in the entire operating frequency range.

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

Key facts

- 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
- Installation time approx. 10 min



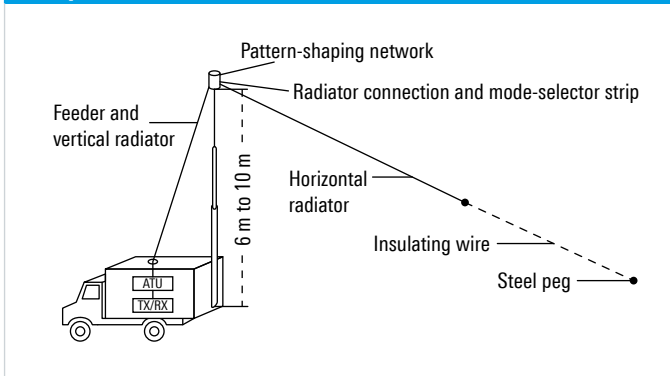


Specifications	
Frequency range	1.5 MHz to 30 MHz
Max. input power	150 W CW and PEP
Recommended operating range	
Mode 1	1.5 MHz to 6 MHz
Mode 2	6 MHz to 30 MHz (optimized)
Mode 3	1.5 MHz to 30 MHz for ground-wave communications and distances > 2000 km
Connector	clamp
MTBF	> 100000 h

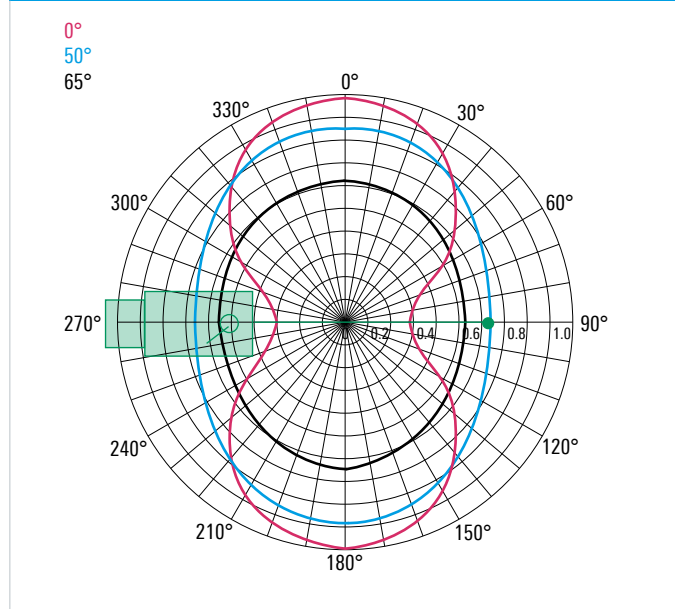
Operating temperature range	-40°C to +55°C
Max. wind speed	120 km/h (without ice deposit)
Dimensions	
Length including guy rope	approx. 35 m (1378 in)
Height	approx. 7 m to 11 m (275.6 in to 433.1 in)
Weight	approx. 6 kg (13.2 lb)

Ordering information	Type	Order No.
Mobile HF Antenna	R&S®AK503	0448.3226.02
Recommended extras		
Antenna Tuning Unit	R&S®FK2100	6046.8948.02
Mast, length: 6 m, can be disassembled	R&S®KM011	0273.9116.02
Mast Adapter for R&S®AK503 on R&S®KM011	R&S®KM011Z3	4021.7700.02

System overview with description of individual components



Typical azimuth patterns for various elevation angles



R&S®HX002H1

150 W HF Dipole



1.5 MHz to 30 MHz

With integrated antenna tuning unit for stationary applications

The R&S®HX002H1 150 W HF dipole is suitable for setting up radio links over any distance. In particular, the optimized omnidirectional coverage ensures high transmission reliability over short and medium distances.

The R&S®HX002H1 can be directly connected to R&S®M3SR Series4100 HF transceivers by means of the R&S®GK4102 fiber-optic control cable.

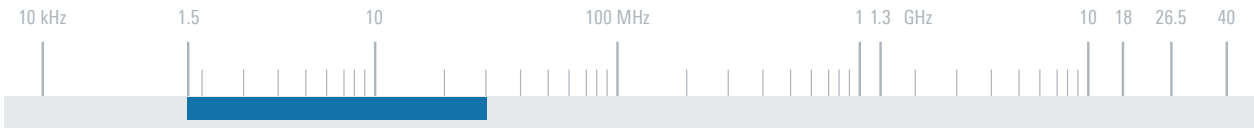
The antenna enables silent tuning over the entire frequency range from 1.5 MHz to 30 MHz. However, the antenna tuning unit must first learn the correct tuning settings for the antenna in a user-defined frequency range. The antenna then achieves tuning times of < 5 ms.

Special attention was paid to lightning protection. The integrated antenna tuning unit is protected against direct lightning strikes and was tested with 10 kV/10 kA discharges.

Key facts

- Omnidirectional coverage with high-angle radiation (NVIS)
- No skip zone
- Integrated antenna tuning unit for support of fast frequency hopping in line with R&S®SECOM-H
- Silent tuning
- Compatible with R&S®M3SR Series4100 HF transceivers
- Setup close to neighboring antennas possible

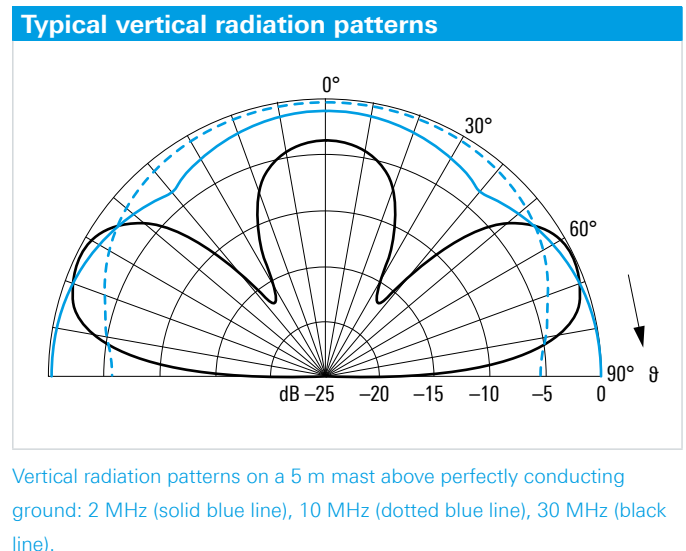
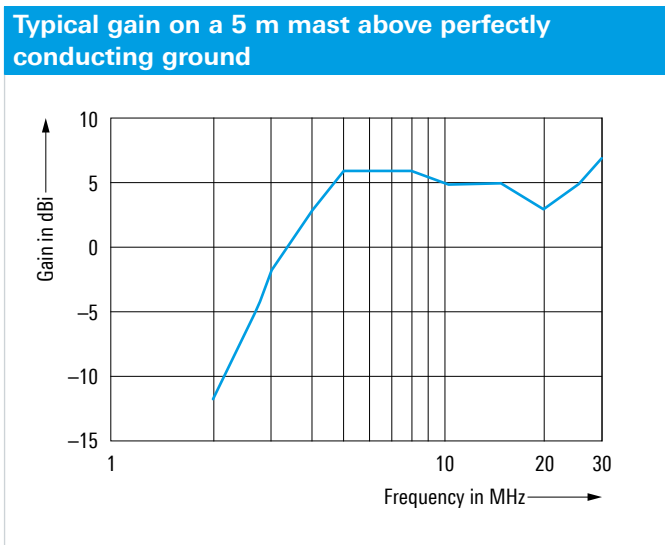




Specifications	
Frequency range	1.5 MHz to 30 MHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	< 1.5; < 1.3 (typ.)
Max. input power	100 W CW/150 W PEP
Tuning time	
Initial tuning	< 4 s; 1.5 s (typ.)
Repeated tuning	< 0.2 s (typ.)
Silent tuning	< 5 ms
Tuning power	30 W ± 1 dB

Connector	N female
MTBF	> 14 600 h
Operating temperature range	-30°C to +55°C
Max. wind speed (survival)	
Without ice deposit	250 km/h
With 20 mm radial ice deposit	130 km/h
Dimensions (W × L)	approx. 4.4 m × 10.7 m (173.2 in × 421.3 in)
Weight	approx. 43 kg (94.8 lb)

Ordering information	Type	Order No.
150 W HF Dipole	R&S®HX002H1	6120.7000.02
Recommended extra		
Fiber-Optic Control Cable	R&S®GK4102	
10 m		6120.5707.10
25 m		6120.5707.25
50 m		6120.5707.50
Tiltable Mast, length: 5 m, for roof mounting	R&S®KM002A1	4035.7359.02
Lattice Mast, length: 10 m	R&S®KM451B1	4028.3351.02
Lattice Mast, length: 15 m	R&S®KM451B2	4028.3400.02
Mast Adapter for 10 m or 15 m mast	R&S®KM451Z4	4032.2904.02
Mast Adapter on R&S®KM451Z4	R&S®KM451Z5	4039.8308.03



R&S®HX002H2

150 W HF Dipole

1.5 MHz to 30 MHz

With integrated antenna tuning unit optimized for shipboard applications



The R&S®HX002H2 150 W HF dipole is suitable for setting up radio links over any distance. In particular, the optimized omnidirectional coverage ensures high transmission reliability over short and medium distances.

The R&S®HX002H2 can be directly connected to R&S®M3SR Series4100 HF transceivers by means of the R&S®GK4102 fiber-optic control cable.

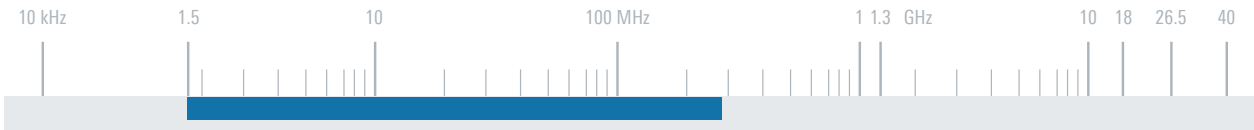
The antenna enables silent tuning over the entire frequency range from 1.5 MHz to 30 MHz. However, the antenna tuning unit must first learn the correct tuning settings for the antenna in a user-defined frequency range. The antenna then achieves tuning times of < 5 ms.

Special attention was paid to lightning protection. The integrated antenna tuning unit is protected against direct lightning strikes and was tested with 10 kV/10 kA discharges.

Key facts

- Omnidirectional coverage with high-angle radiation (NVIS)
- No skip zone
- Integrated antenna tuning unit for support of fast frequency hopping in line with R&S®SECOM-H
- Silent tuning
- Compatible with R&S®M3SR Series4100 HF transceivers
- Setup close to neighboring antennas possible
- Optimized for use on ships



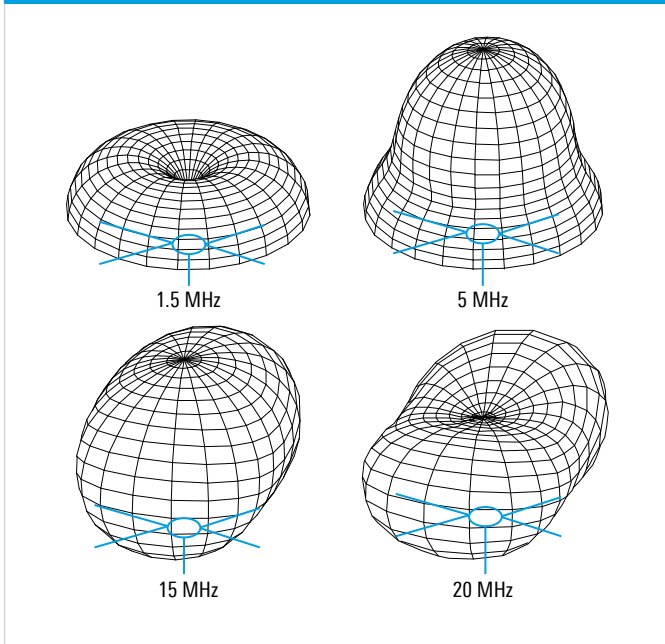


Specifications	
Frequency range	1.5 MHz to 30 MHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	< 1.5; < 1.3 (typ.)
Max. input power	100 W CW/150 W PEP
Tuning time	
Initial tuning	< 4 s; 1.5 s (typ.)
Repeated tuning	< 0.2 s (typ.)
Silent tuning	< 5 ms
Tuning power	30 W ± 1 dB

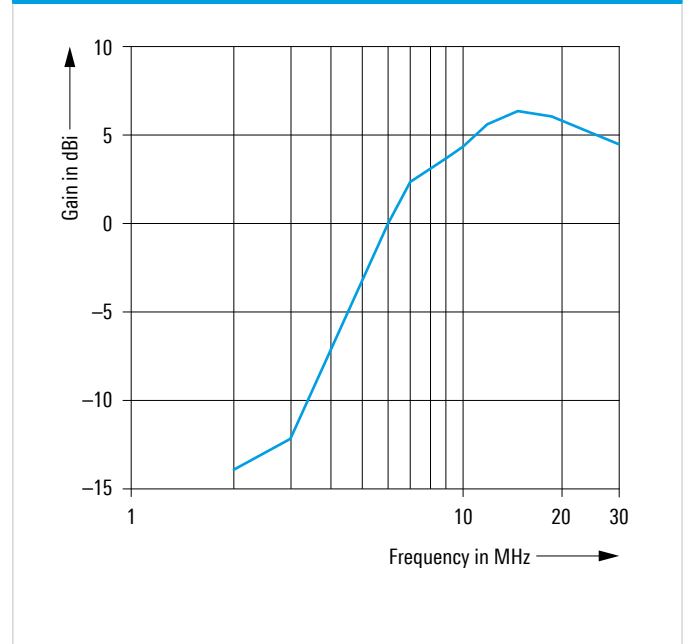
Connector	N female
MTBF	> 14 600 h
Operating temperature range	-30°C to +55°C
Max. wind speed (survival)	
Without ice deposit	250 km/h
With 20 mm radial ice deposit	140 km/h
Dimensions (W × L)	approx. 2.2 m × 5.2 m (86.6 in × 204.7 in)
Weight	approx. 32 kg (70.6 lb)

Ordering information	Type	Order No.
150 W HF Dipole	R&S®HX002H2	6120.8006.02
Recommended extra		
Fiber-Optic Control Cable	R&S®GK4102	
10 m		6120.5707.10
25 m		6120.5707.25
50 m		6120.5707.50

Typical three-dimensional radiation patterns above perfectly conducting ground



Typical gain on a 5 m mast above perfectly conducting ground



R&S®HL451 Log-Periodic HF Antenna

2 MHz to 30 MHz

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



The compact, rotatable R&S®HL451 log-periodic HF antenna can be used for transmission and reception of horizontally polarized waves.

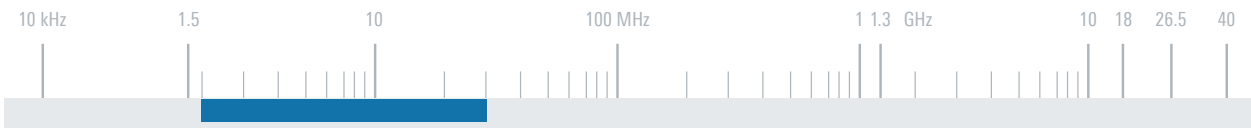
The antenna's transmission frequency range from 5 MHz to 30 MHz makes it particularly suitable for communications over medium and long distances. Reception is possible from 2 MHz so that all distances can be covered.

The antenna has been optimized for small size. Though it has a wide frequency range with a low lower limit, the R&S®HL451 is no larger than comparable antennas that cover a range of only 6.2 MHz to 30 MHz.

Key facts

- Reception from 2 MHz
- Transmission from 5 MHz
- Unshortened half-wave elements for high gain despite extremely small size
- Easy and quick assembly
- Low maintenance
- Suitable for roof mounting

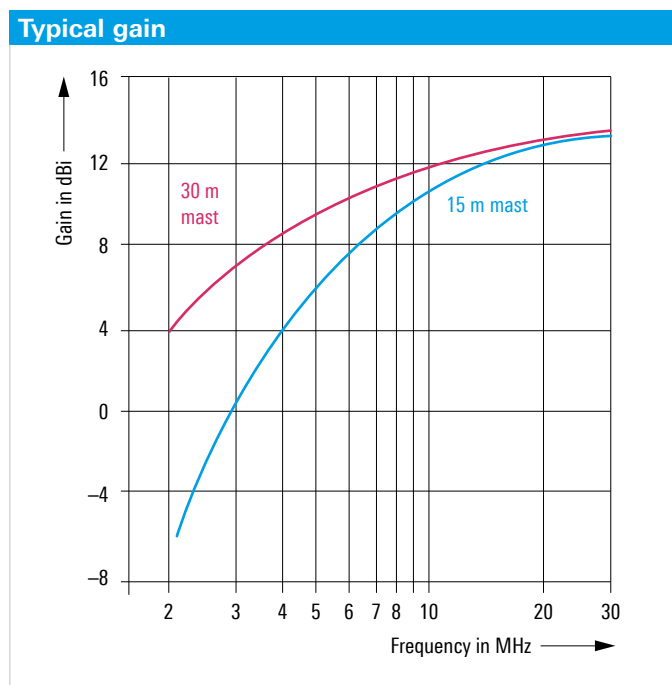
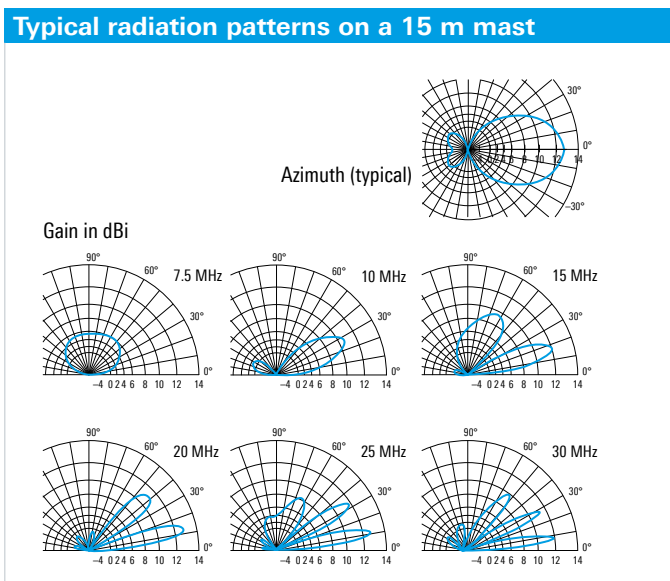




Specifications	
Frequency range	
Reception	2 MHz to 30 MHz
Transmission	5 MHz to 30 MHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	≤ 2
Max. input power	1 kW CW/2 kW PEP
Gain (on 15 m mast)	
5 MHz to 30 MHz	6 dBi to 12.5 dBi

Max. wind speed	180 km/h (without ice deposit)
Connector	N female
MTBF	> 100 000 h
Operating temperature range	-30°C to +50°C
Dimensions of antenna array (W × L)	approx. 16 m × 15 m (629.9 in × 590.6 in)
Weight of antenna array	approx. 260 kg (573.2 lb)

Ordering information	Type	Order No.
Log-Periodic HF Antenna	R&S®HL451	0733.8507.02
Recommended extras		
Lattice Mast, length: 15 m (standard)	R&S®KM451B2	4028.3400.02
Lattice Mast, length: 10 m (for roof mounting)	R&S®KM451B1	4028.3351.02
Hazard Light	R&S®KM451F1	4028.3500.02
Antenna Rotator	R&S®RD130	4059.8503.02
Rotary Joint/Adaption Set	R&S®RD008Z1	0720.6400.02
Control Unit	R&S®GB130	4059.8755.02
Set of Cables (connecting R&S®GB130 to R&S®RD130, lengths: 50/80/120/200 m)	R&S®GK130	4059.8855.0x (x = 2/3/4/5)
Other configurations on request.		



R&S®HL471 Log-Periodic HF Antenna

5 MHz to 30 MHz

Transmission and reception of horizontally polarized waves over long distances



The compact, rotatable R&S®HL471 log-periodic HF antenna can be used for transmission and reception of horizontally polarized waves.

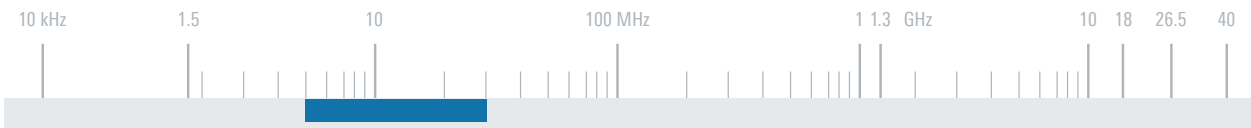
The antenna's transmission frequency range from 7 MHz to 30 MHz makes it particularly suitable for communications over long distances. Reception is possible from 5 MHz so that all distances can be covered.

The antenna has been optimized for small size, low weight and minimum maintenance.

Key facts

- Reception from 5 MHz
- Transmission from 7 MHz
- Extremely small size
- Low weight
- Easy and quick assembly
- Low maintenance
- Suitable for roof mounting

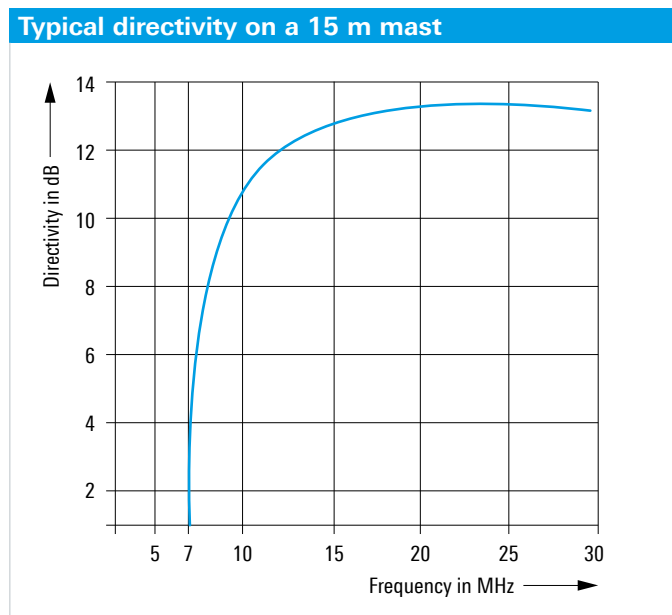
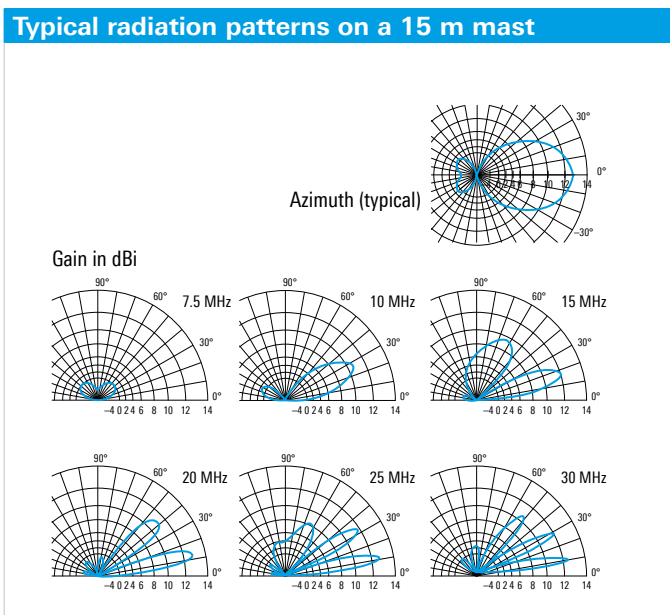




Specifications	
Frequency range	
Reception	5 MHz to 30 MHz
Transmission	7 MHz to 30 MHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	≤ 2
Max. input power	1 kW CW/2 kW PEP
Gain (on 15 m mast)	
7 MHz to 8 MHz	0 dBi to 6 dBi
8 MHz to 30 MHz	6 dBi to 12.5 dBi

Max. wind speed	180 km/h (without ice deposit)
Connector	N female
MTBF	> 100 000 h
Operating temperature range	-30°C to +50°C
Dimensions of antenna array (W × L)	approx. 11 m × 8.8 m (433.1 in × 346.5 in)
Weight of antenna array	approx. 100 kg (220.5 lb)

Ordering information	Type	Order No.
Log-Periodic HF Antenna	R&S®HL471	0755.3008.02
Recommended extras		
Lattice Mast, length: 15 m (standard)	R&S®KM451B2	4028.3400.02
Lattice Mast, length: 10 m (for roof mounting)	R&S®KM451B1	4028.3351.02
Hazard Light	R&S®KM451F1	4028.3500.02
Antenna Rotator	R&S®RD130	4059.8503.02
Rotary Joint/Adaption Set	R&S®RD008Z1	0720.6400.02
Control Unit	R&S®GB130	4059.8755.02
Set of Cables (connecting R&S®GB130 to R&S®RD130, lengths: 50/80/120/200 m)	R&S®GK130	4059.8855.0x (x = 2/3/4/5)
Other configurations on request.		



R&S®HL210A3 Log-Periodic HF Antenna

1.5 MHz to 30 MHz

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



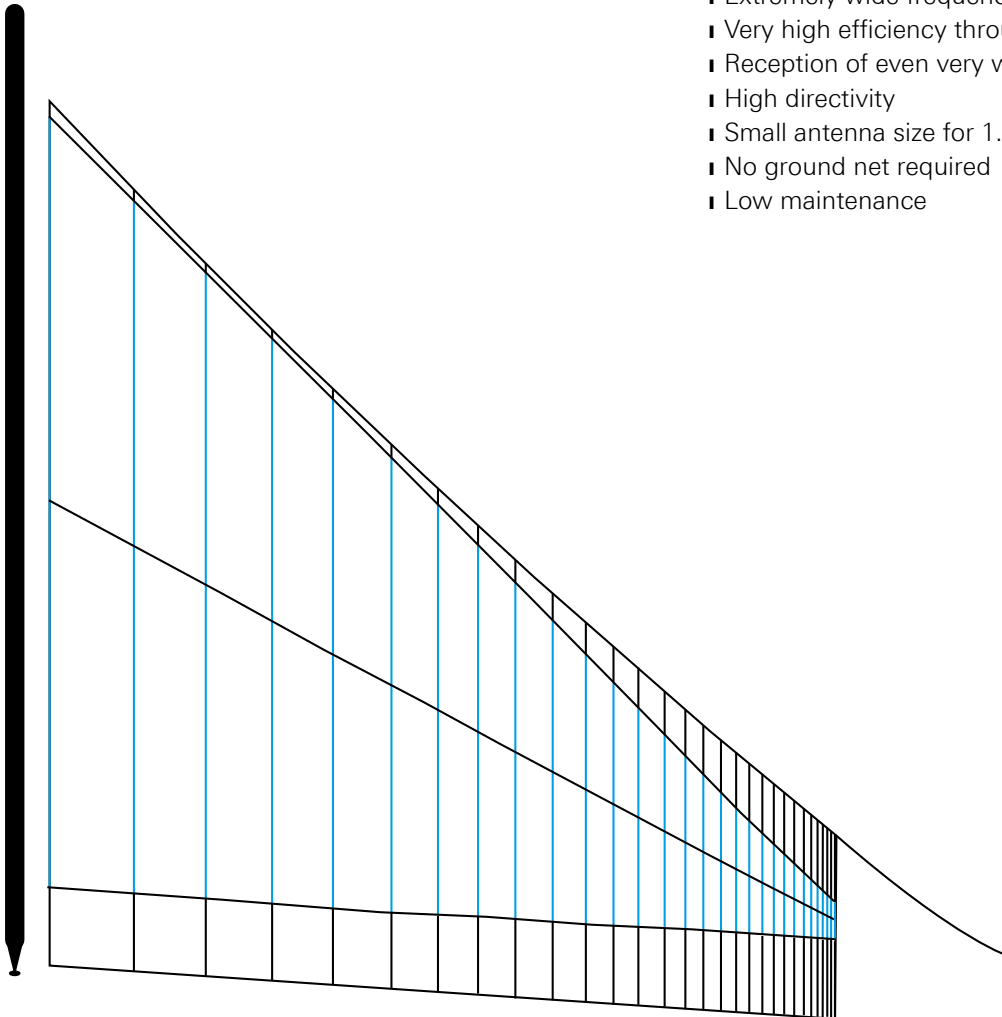
The R&S®HL210A3 log-periodic HF antenna is suitable for the reception of ground waves and vertically polarized skywaves and allows even very weak signals to be detected.

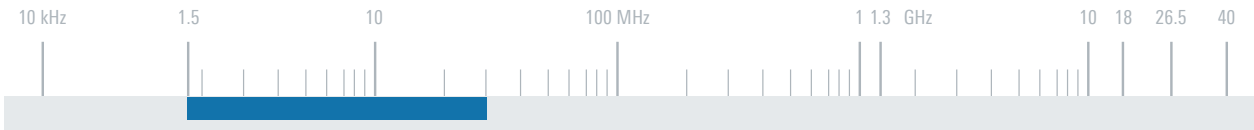
According to the physical characteristics of vertically polarized waves, maximum sensitivity is obtained at low and medium elevation angles. The radiation pattern of the R&S®HL210A3 is optimally suited for this purpose. The azimuth range of the R&S®HL210A3 of about 120° can be enhanced up to 360° by 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 R&S®HL410A3 log-periodic HF antenna.

Key facts

- 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
- Low maintenance

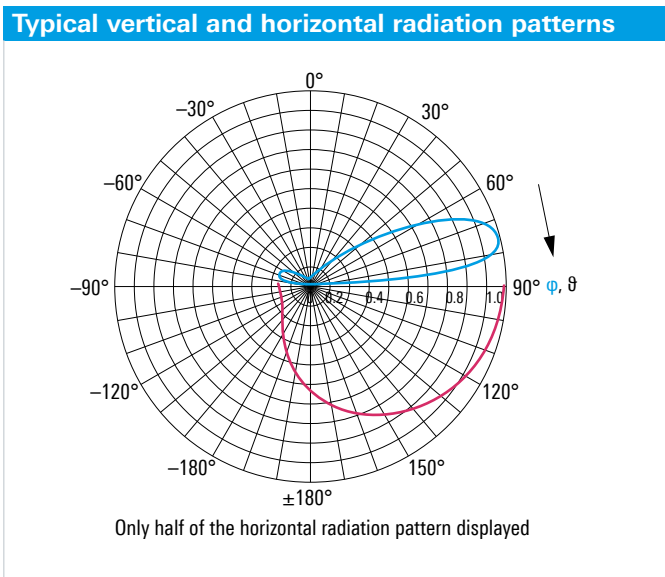




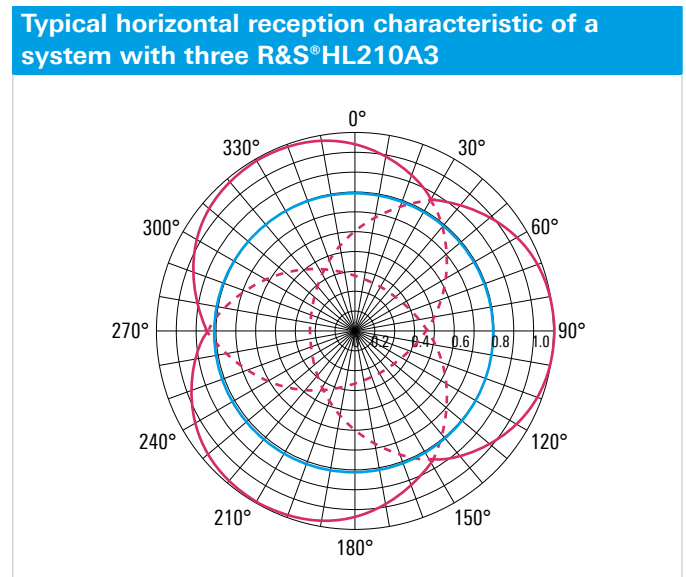
Specifications	
Frequency range	1.5 MHz to 30 MHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	
1.5 MHz to 2 MHz	< 6
2 MHz to 30 MHz	< 2.5; < 2.0 (typ.)
Directivity	
1.5 MHz to 2 MHz	8 dBi to 10.5 dBi
2 MHz to 30 MHz	10.5 dBi to 12 dBi
Efficiency	> 90%
Connector	N female
MTBF	≥ 100000 h
Operating temperature range	-40°C to +70°C

Max. wind speed	
Survival (operational with reduced data)	225 km/h
Operational with specified data	130 km/h
Permissible wind speed including ice deposit	135 km/h
Permissible ice deposit	
20 mm radial	on wires with diameter > 7 mm
2 × diameter	on wires with diameter < 7 mm
Dimensions	
Length of antenna array	approx. 97 m (3818.9 in)
Height of supporting mast	approx. 90 m (3543.3 in)

Ordering information	Type	Order No.
Log-Periodic HF Antenna	R&S®HL210A3	on request



Red = horizontal pattern; blue = vertical pattern.



Red = single patterns; blue = -3 dB gain reference.

R&S®HL410A3 Log-Periodic HF Antenna

1.5 MHz to 30 MHz

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



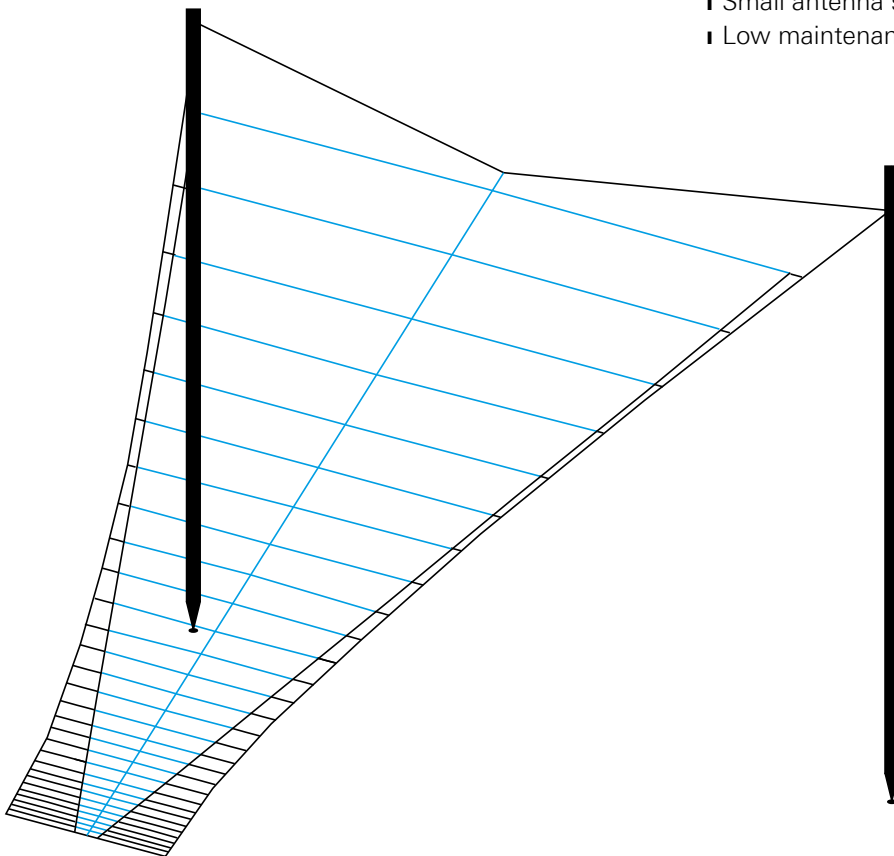
The R&S®HL410A3 log-periodic HF antenna is suitable for the reception of horizontally polarized waves and allows even very weak signals to be detected.

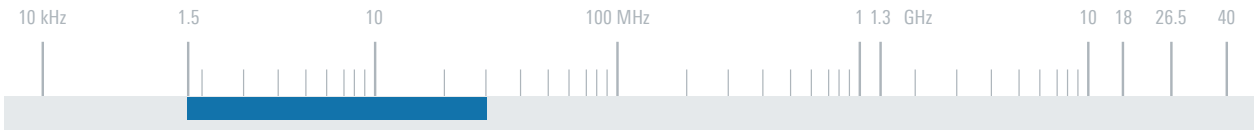
The vertical pattern is shaped taking into account the transmission characteristics in the ionosphere. In conjunction with the extremely wide frequency range from 1.5 MHz to 30 MHz, the antenna allows reception over short, medium and global distances.

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 R&S®HL210A3 log-periodic HF antenna.

Key facts

- 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
- Low maintenance

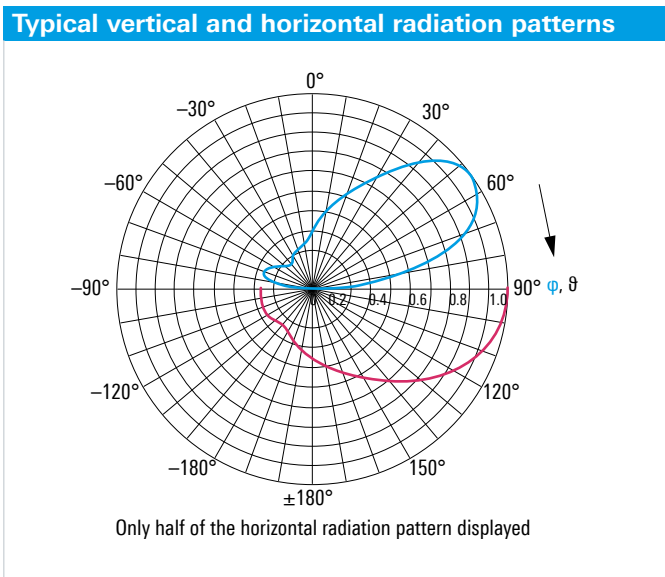




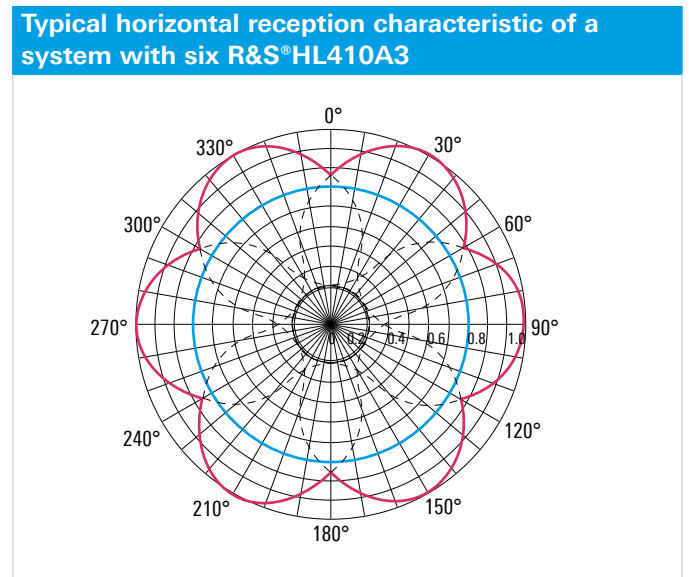
Specifications	
Frequency range	1.5 MHz to 30 MHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	
1.5 MHz	< 6
2 MHz to 30 MHz	< 2.5; < 2.0 (typ.)
Directivity	
At 1.5 MHz	7.5 dBi
1.6 MHz to 30 MHz	8 dBi to 12 dBi
Efficiency	> 90%
Connector	N female
MTBF	≥ 100000 h
Operating temperature range	-40°C to +70°C

Max. wind speed	
Survival (operational with reduced data)	225 km/h
Operational with specified data	130 km/h
Permissible wind speed including ice deposit	135 km/h
Permissible ice deposit	
20 mm radial	on wires with diameter > 7 mm
2 × diameter	on wires with diameter < 7 mm
Dimensions of antenna array (W × L)	approx. 88 m × 94 m (3464.6 in × 3700.8 in)
Height of supporting mast	approx. 66 m (2598.4 in)

Ordering information	Type	Order No.
Log-Periodic HF Antenna	R&S®HL410A3	on request



Red = horizontal pattern; blue = vertical pattern at 6 MHz.



Red = single patterns; blue = -3 dB gain reference.

Chapter 2

VHF/UHF Antennas

Type	Designation	Page	
	R&S®AM524	Low-noise active antenna system	48
	R&S®HF214	Omnidirectional antenna	50
	R&S®HF902	Omnidirectional antenna	52
	R&S®HK309	Passive receiving dipole	54
	R&S®HE309	Active vertical dipole	56
	R&S®HE202	Active receiving dipole	58
	R&S®HE302	Active receiving dipole	60
	R&S®HE314A1	Active omnidirectional antenna	62
	R&S®HE300	Active directional antenna	64
	R&S®HE300CE	Active directional antenna	66
New	R&S®HL300	Handheld log-periodic antenna	68
	R&S®HE500	Active receiving antenna	70
	R&S®HE600	Active omnidirectional receiving antenna	72
	R&S®HK116	Biconical antenna	74
	R&S®HL007A2	Crossed log-periodic antenna	76
	R&S®HL033	Log-periodic broadband antenna	78
New	R&S®HL040E	Log-periodic broadband antenna	80
	R&S®HL046	EMS antenna	82
	R&S®HL046E	High gain log-periodic antenna	84
	R&S®HL223	Log-periodic antenna	86
New	R&S®HL562E	ULTRALOG	88
	R&S®AD033V3	Omnidirectional UHF antenna	90
	R&S®AD066FW	Broadband VHF/UHF communications antenna system	92
New	R&S®AD066ST	UHF omnidirectional antenna	94
	R&S®HK001E	UHF coaxial dipole	96
	R&S®HK012E	VHF coaxial dipole	98
	R&S®HK014E	VHF/UHF coaxial dipole	100
	R&S®HK033	VHF/UHF coaxial dipole	102
	R&S®HK055L1	Broadband mobile antenna	106
	R&S®HK055S1	Omnidirectional broadband antenna	104
	R&S®HK056	Broadband mobile antenna	108
New	R&S®HK060	Broadband manpack antenna	110
	R&S®HK061	Vehicular broadband communications antenna	112
	R&S®HK353A	VHF/UHF omnidirectional ATC antenna	114

R&S®AM524 Low-Noise Active Antenna System

100 Hz to 1 GHz

For measuring low-level signals in anechoic chambers

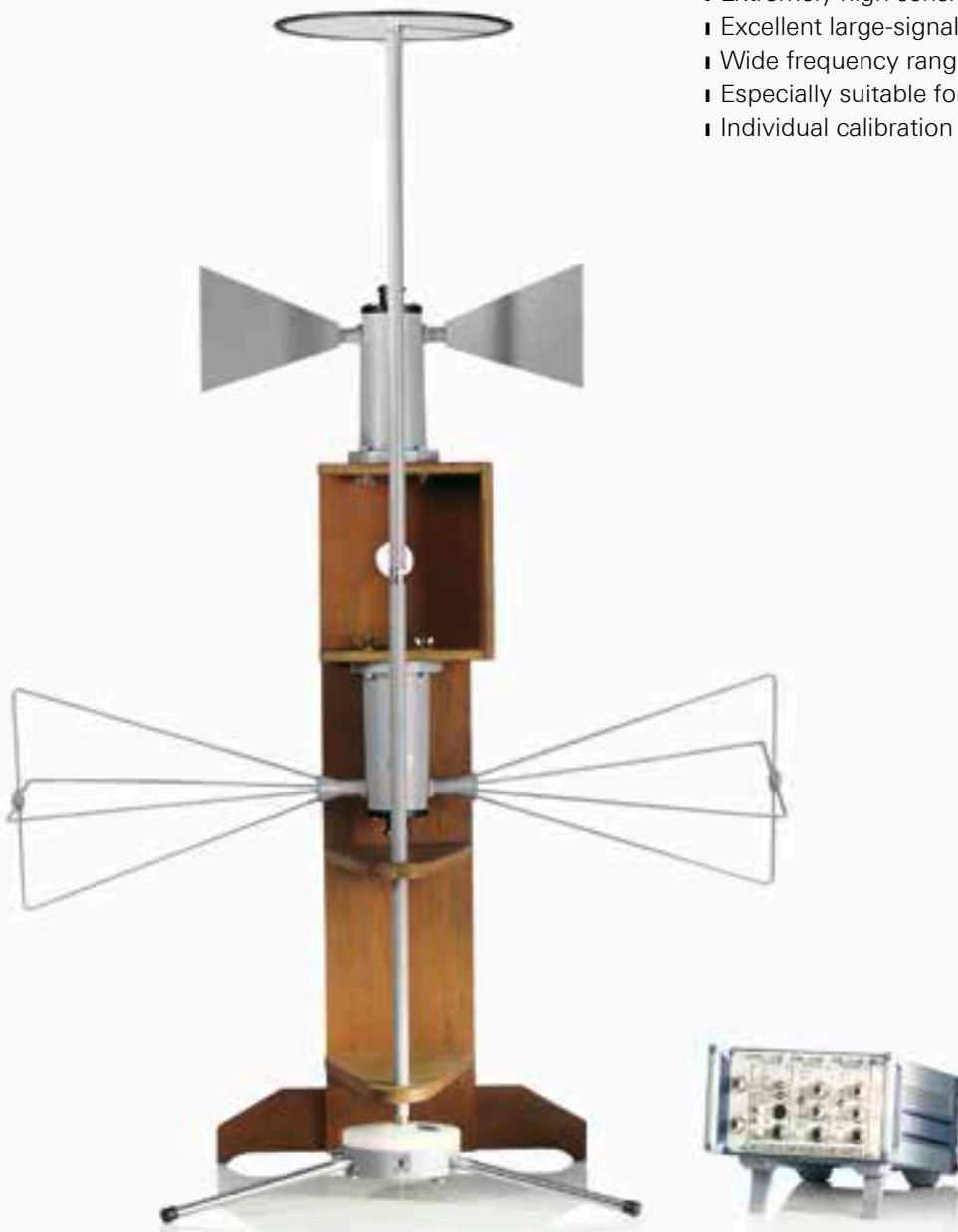


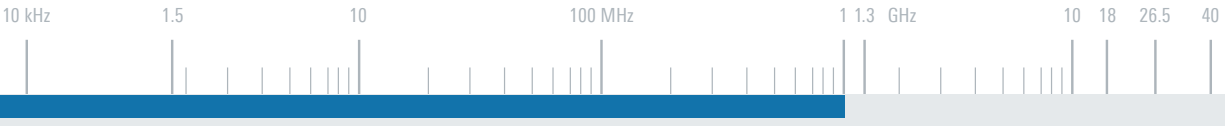
The R&S®AM524 low-noise active antenna system has been designed for measuring low-level signals in anechoic chambers. Criteria for dimensioning such antennas are different from those of active antennas used outside shielded rooms.

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

Key facts

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





Specifications

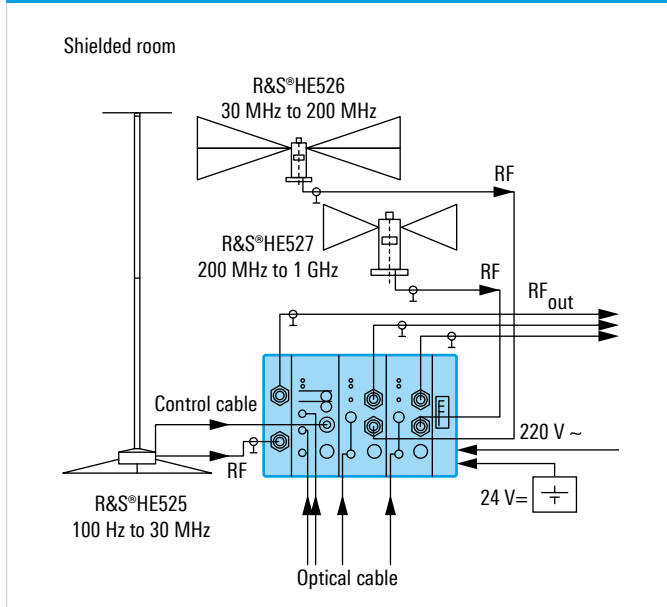
Frequency range	100 Hz to 1 GHz (in three subranges)
Input impedance	50 Ω
Antenna factor ¹⁾	
100 Hz to 30 MHz	-2 dB/m to 0 dB/m
100 MHz	-10 dB/m to -4 dB/m
1 GHz	-5 dB/m to 19 dB/m
Field strength sensitivity ($\Delta f = 1$ Hz, S/N = 0 dB)	
100 Hz	0 dB(μ V/m) (typ.)
100 kHz	-43 dB(μ V/m) (typ.)
30 MHz	-51 dB(μ V/m) (typ.)
100 MHz	-54 dB(μ V/m) (typ.)
1 GHz	-37 dB(μ V/m) (typ.)
Power supply	
AC	100/120/220/230/240 V \pm 10%, 47 Hz to 63 Hz
DC	22 V to 28 V, max. 0.7 A

Connectors	N female
MTBF	> 15000 h
Operating temperature range	-10°C to +55°C
Dimensions (W x H)	
R&S®HE525	approx. 0.3 m x 1.5 m (11.8 in x 59.1 in)
R&S®HE526	approx. 1 m x 0.3 m (39.4 in x 11.8 in)
R&S®HE527	approx. 0.5 m x 0.25 m (19.7 in x 9.9 in)
Weight	
R&S®HE525	approx. 5 kg (11.0 lb)
R&S®HE526	approx. 1.7 kg (3.8 lb)
R&S®HE527	approx. 1.6 kg (3.5 lb)

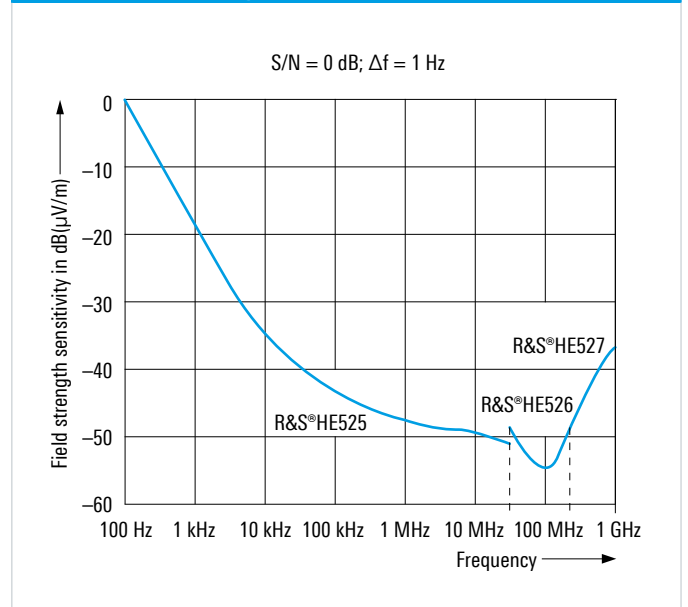
¹⁾ Without attenuator or amplifier.

Ordering information	Type	Order No.
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



R&S®HF214 Omnidirectional Antenna

500 MHz to 1.3 GHz

Reception of horizontally polarized waves



The R&S®HF214 omnidirectional antenna 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 from 500 MHz to 1.3 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.

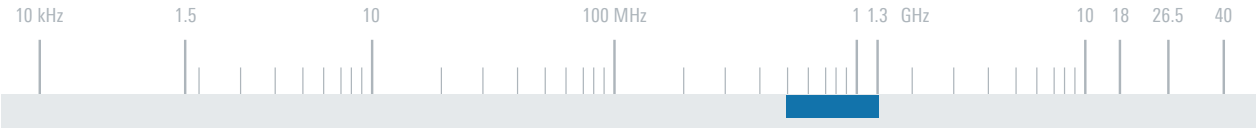
A compact omnidirectional receiving system for horizontally and vertically polarized waves in the frequency range from 20 MHz to 3 GHz is obtained by combining the R&S®HF214 with the R&S®HE309, R&S®HE314A1 and R&S®HF902 antennas.

Key facts

- 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



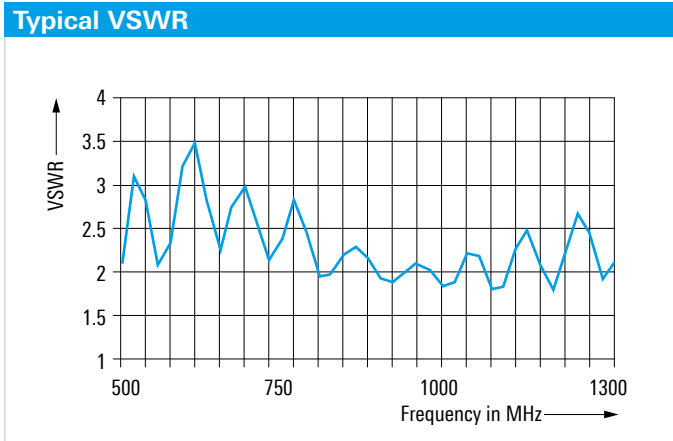
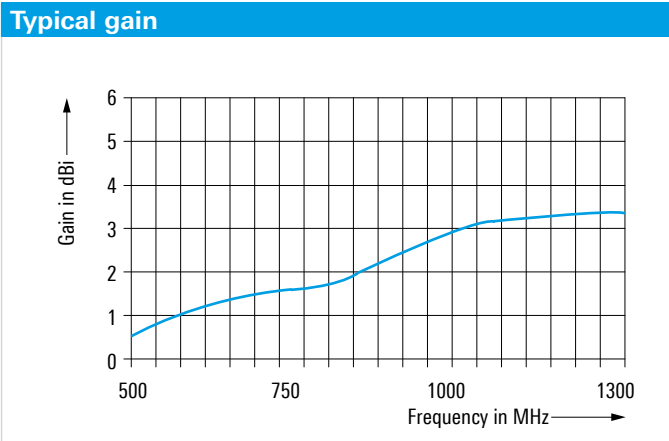
Antenna without radome.



Specifications	
Frequency range	500 MHz to 1.3 GHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	< 3 (typ.)
Gain	see diagram
Uncircularity of horizontal radiation pattern	±3 dB
Connector	N female

MTBF	> 50 000 h
Operating temperature range	-40°C to +65°C
Max. wind speed	
Without ice deposit	188 km/h
With 30 mm radial ice deposit	130 km/h
Dimensions (Ø × H)	approx. 310 mm × 490 mm (12.2 in × 19.3 in)
Weight	approx. 8 kg (17.6 lb)

Ordering information	Type	Order No.
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



R&S®HF902 Omnidirectional Antenna

1 GHz to 3 GHz

Reception of vertically and horizontally polarized waves



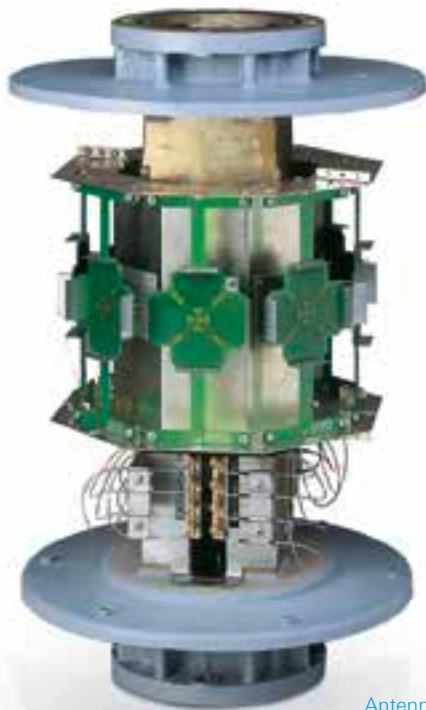
The R&S®HF902 omnidirectional antenna has been designed for the reception of vertically and horizontally polarized waves. It is ideal for broadband detection and monitoring of RF signals in the frequency range from 1 GHz to 3 GHz.

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.

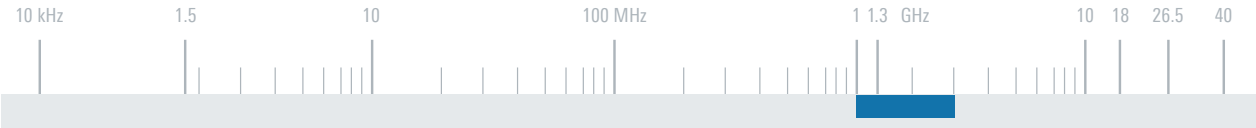
A compact omnidirectional receiving system for horizontally and vertically polarized waves in the frequency range from 20 MHz to 3 GHz is obtained when combining the R&S®HF902 with the R&S®HE309, R&S®HE314A1 and R&S®HF214 antennas.

Key facts

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



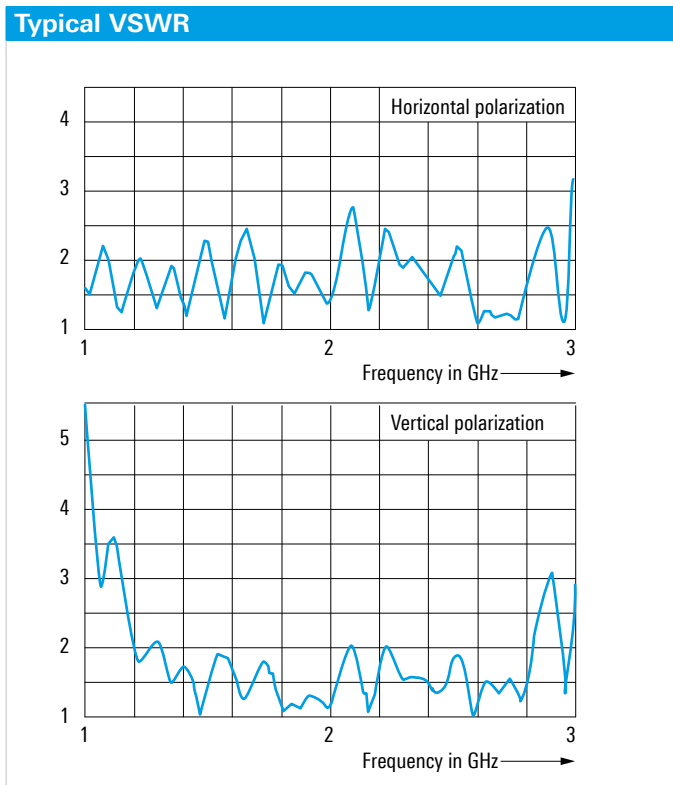
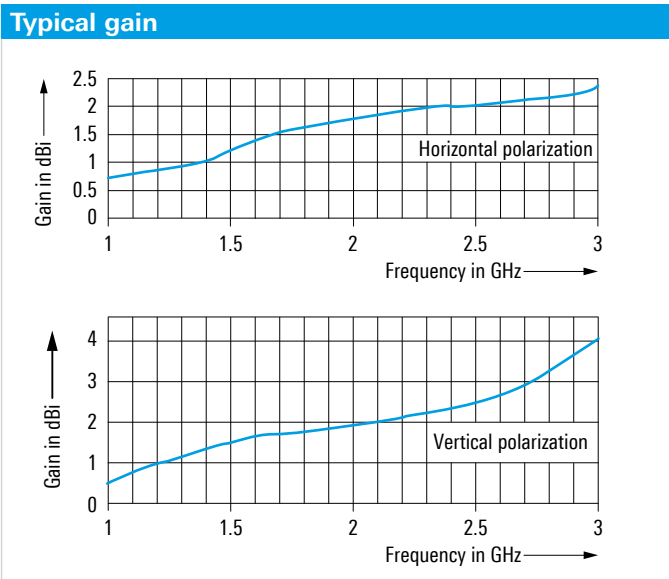
Antenna without radome.



Specifications	
Frequency range	1 GHz to 3 GHz
Polarization	linear/horizontal and vertical
Input impedance	50 Ω
VSWR	< 2.5 (typ.) (1.3 GHz to 3 GHz)
Gain	see diagram
Connector	2 × N female
MTBF	> 50000 h

Operating temperature range	-40°C to +65°C
Max. wind speed	
Without ice deposit	188 km/h
With 30 mm radial ice deposit	130 km/h
Dimensions (Ø × H)	approx. 310 mm × 490 mm (12.2 in × 19.3 in)
Weight	approx. 8 kg (17.6 lb)

Ordering information	Type	Order No.
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



R&S®HK309

Passive Receiving Dipole

20 MHz to 1.3 GHz

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



Its extremely wide bandwidth and high sensitivity make the R&S®HK309 particularly suitable for reception tasks in communications, reconnaissance and measurement.

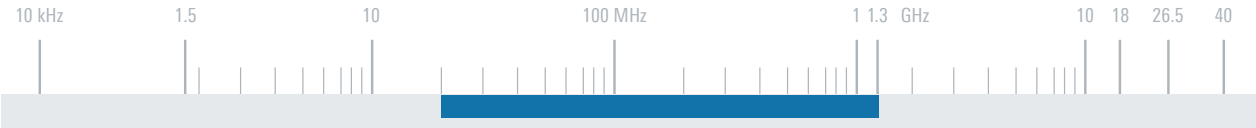
Compact design, a minimum number of distribution and switching units and a high S/N ratio are essential features for these applications.

The broadband characteristic of the R&S®HK309 passive receiving dipole is ensured by eight impedance elements which generate traveling waves on the antenna and suppress nulls in the radiation pattern.

Key facts

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

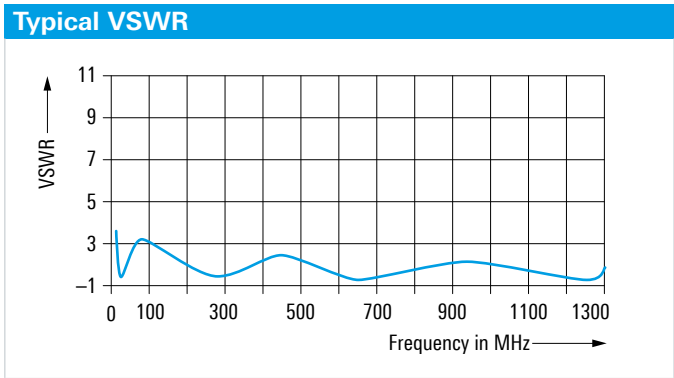
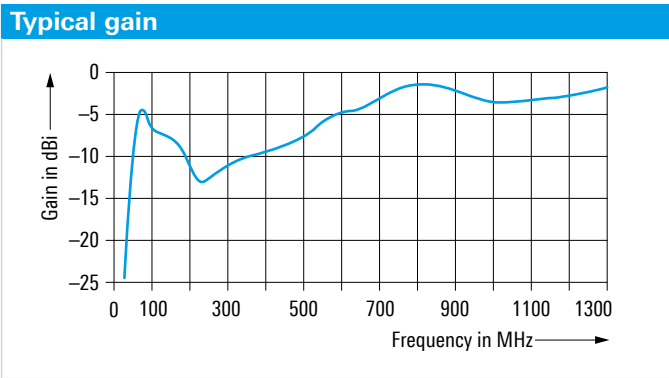




Specifications	
Frequency range	20 MHz to 1.3 GHz
Polarization	linear/vertical
Horizontal radiation pattern	omnidirectional
Input impedance	50 Ω
VSWR	< 3 (typ.)
Gain	-24 dBi to -2 dBi
Connector	N female

Operating temperature range	-40°C to +70°C
Max. wind speed	180 km/h (without ice deposit)
MTBF	> 500 000 h
Dimensions (Ø × L)	approx. 100 mm × 1710 mm (3.9 in × 67.3 in)
Weight	approx. 4 kg (8.8 lb)

Ordering information	Type	Order No.
Passive Receiving Dipole	R&S®HK309	4054.2007.02



R&S®HE309

Active Vertical Dipole

20 MHz to 1.3 GHz

High sensitivity, large bandwidth and wide dynamic range



Its extremely large bandwidth, wide dynamic range and excellent sensitivity make the R&S®HE309 ideal for all receiving tasks in radiocommunications, detection and monitoring, where the focus is on small size, a minimum number of distribution and switching units and a high S/N ratio.

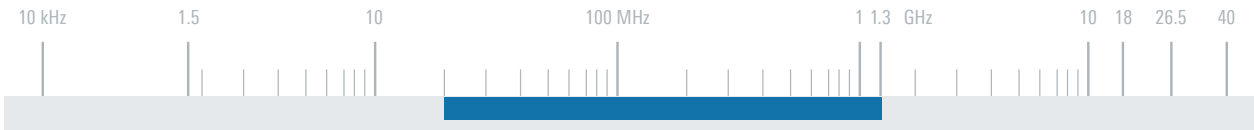
The broadband characteristics of the R&S®HE309 active vertical dipole are achieved through a combination of the active antenna principle with a special design of the passive radiators.

When the antenna is used together with the R&S®HE314A1 and the R&S®HF214 antennas, horizontally polarized waves can also be received.

Key facts

- Extremely wide frequency range
- High sensitivity
- High immunity to nonlinear distortion
- High immunity to lightning strikes in the vicinity
- Compact 1.2 m antenna
- Low weight

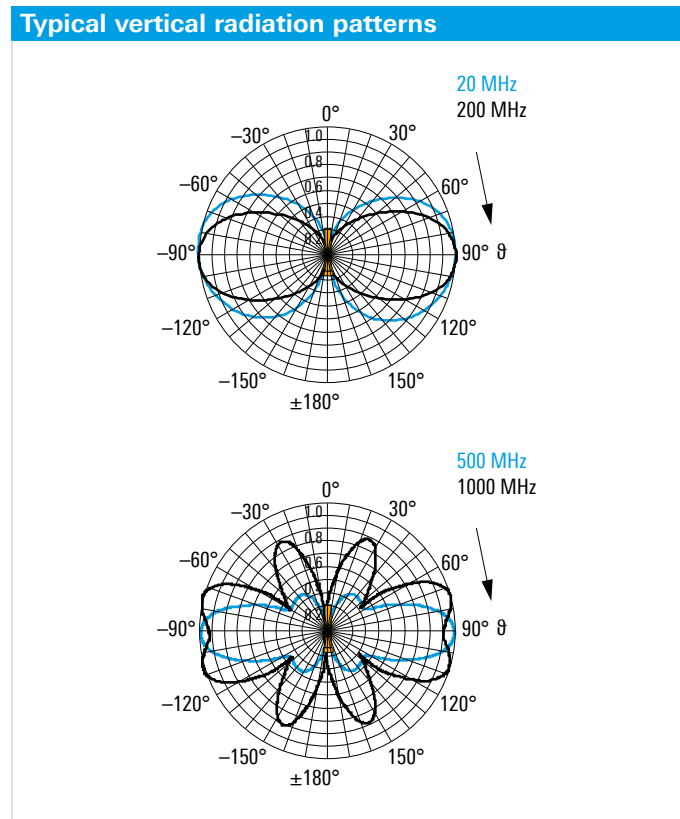
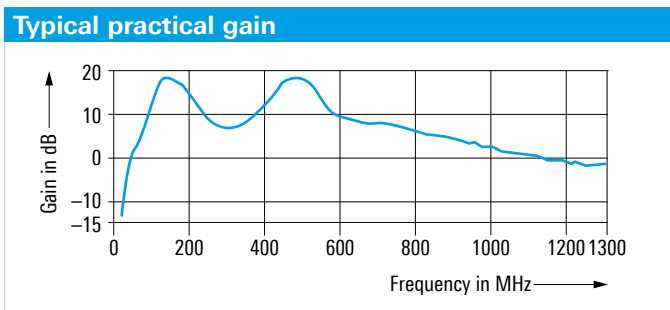




Specifications	
Frequency range	20 MHz to 1.3 GHz
Polarization	linear/vertical
Input impedance	50 Ω
Horizontal radiation pattern	omnidirectional
Noise figure (frequency-dependent, as a function of external noise)	
20 MHz	20 dB (typ.)
100 MHz	5 dB (typ.)
1 GHz	7 dB (typ.)
IP2	55 dBm (typ.)
IP3	32 dBm (typ.)

Power supply	21 V to 28 V DC (max. 150 mA)
Connector	N female
MTBF	> 100 000 h
Operating temperature range	-40°C to +70°C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (Ø × L)	approx. 100 mm × 1210 mm (3.9 in × 47.6 in)
Weight	approx. 3 kg (6.6 lb)

Ordering information	Type	Order No.
Active Vertical Dipole	R&S®HE309	4027.5009.02
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx
Active Omnidirectional Antenna	R&S®HE314A1	4027.6505.02
Passive Omnidirectional Antenna	R&S®HF214	4042.7009.02
Omnidirectional Antenna	R&S®HF902	4042.8005.02



R&S®HE202

Active Receiving Dipole

200 MHz to 1 GHz

Optimized for high sensitivity and small size



The R&S®HE202 active receiving dipole features a very wide frequency range and small size. Its high input sensitivity is the result of optimized matching of the passive antenna structure to the active circuitry.

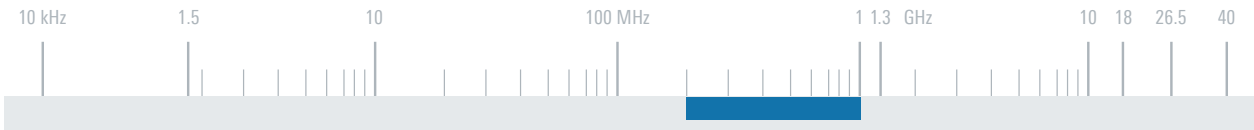
These characteristics allow several passive antennas to be replaced by an R&S®HE202.

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

Key facts

- Wide frequency range
- High immunity to nonlinear distortion
- High immunity to lightning strikes in the vicinity
- Low weight
- Extremely compact
- Shock- and vibration-proof

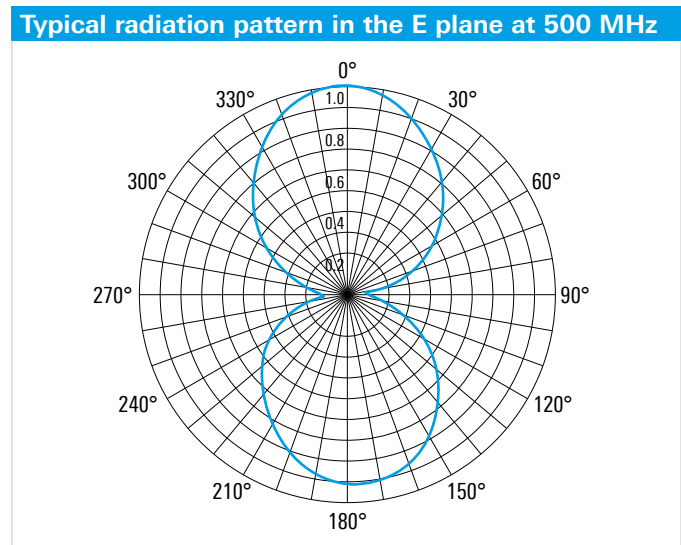
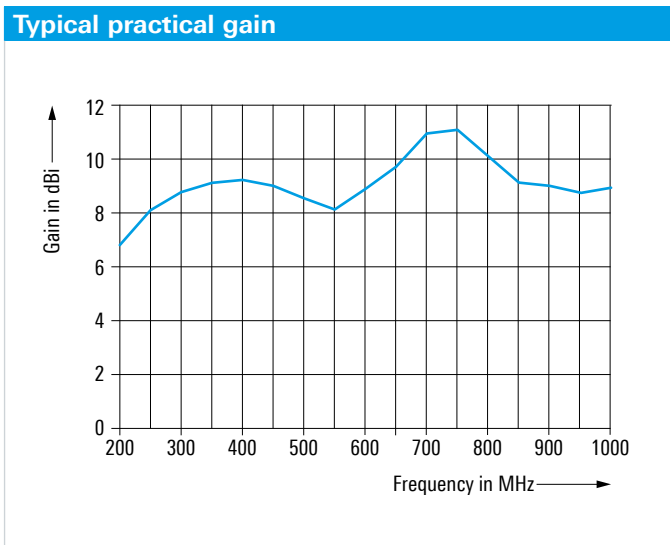




Specifications	
Frequency range	200 MHz to 1 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	< 2.5 (typ.)
Electronic gain	5 dB to 9 dB
Practical gain	7 dB to 11 dB
Directivity	2 dB (average)
Antenna factor	10 dB/m to 22 dB/m
Noise figure	
200 MHz	6 dB
2 GHz	7 dB

Field strength sensitivity ($\Delta f = 1 \text{ kHz}$; $S/N: 0 \text{ dB}$ (typ.))	
200 MHz	-17 dB($\mu\text{V/m}$)
2 GHz	-2 dB($\mu\text{V/m}$)
IP2	> 55 dBm
IP3	> 30 dBm
Power supply	18 V to 30 V DC (max. 200 mA)
Connector	N female
MTBF	> 50 000 h
Operating temperature range	-40°C to +75°C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (L x H)	approx. 510 mm x 240 mm (20.1 in x 9.5 in)
Weight	approx. 2.1 kg (4.6 lb)

Ordering information	Type	Order No.
Active Receiving Dipole	R&S®HE202	0630.0310.02
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx
Mast Adapter (only for special polarization alignment)	R&S®HE202Z1	0649.7510.02
RF Cable (for use with R&S®HE202Z1)	R&S®HE202Z2	0649.7785.02



R&S®HE302

Active Receiving Dipole

20 MHz to 500 MHz

Optimized for high sensitivity and small size



The R&S®HE302 active receiving dipole features a very wide frequency range and small size. Its high input sensitivity is the result of optimized matching of the passive antenna structure to the active circuitry.

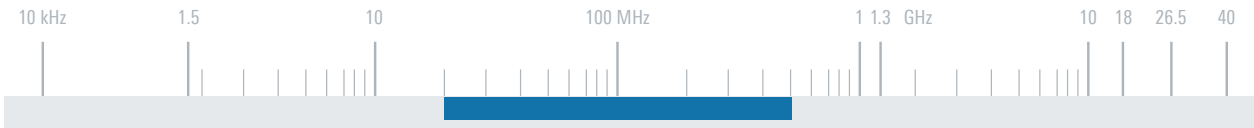
These characteristics allow several passive antennas to be replaced by an R&S®HE302.

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

Key facts

- Wide frequency range
- High immunity to nonlinear distortion
- High immunity to lightning strikes in the vicinity
- Low weight
- Extremely compact
- Shock- and vibration-proof

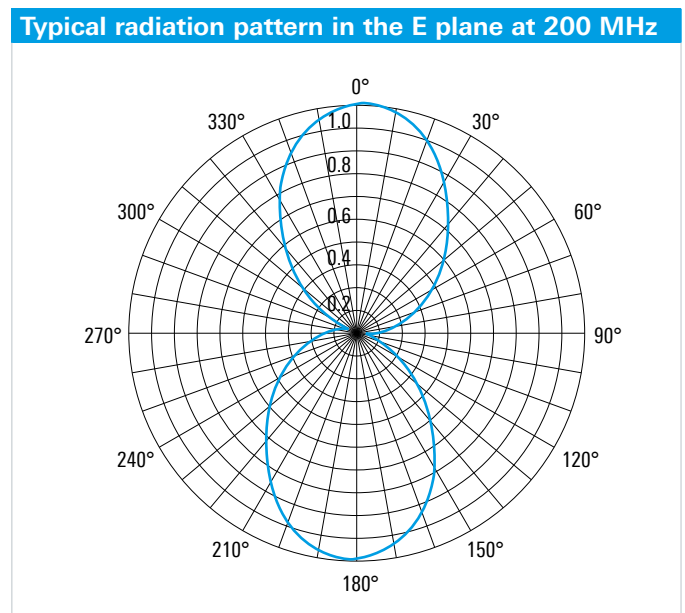
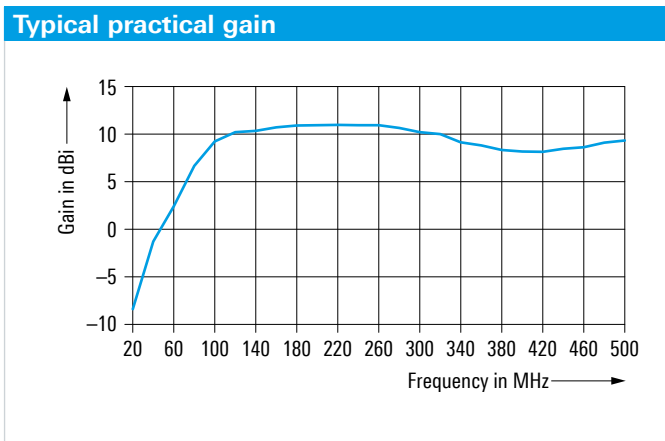




Specifications	
Frequency range	20 MHz to 500 MHz
Polarization	linear
Input impedance	50 Ω
VSWR	< 2.5
Electronic gain	-11 dB to +8 dB
Practical gain	-9 dB to +10 dB
Directivity	2 dB (average)
Antenna factor	0 dB/m to 14 dB/m
Noise figure	
20 MHz	28 dB
500 MHz	9 dB

Field strength sensitivity ($\Delta f = 1 \text{ kHz}$; $S/N: 0 \text{ dB}$ (typ.))	
20 MHz	-15 dB($\mu\text{V/m}$)
500 MHz	-6 dB($\mu\text{V/m}$)
IP2	> 60 dBm
IP3	> 30 dBm
Power supply	18 V to 30 V DC (170 mA (typ.))
Connector	N female
MTBF	> 50 000 h
Operating temperature range	-40°C to +75°C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (L x H)	approx. 1 m x 240 mm (39.4 in x 9.5 in)
Weight	approx. 2.5 kg (5.5 lb)

Ordering information	Type	Order No.
Active Receiving Dipole	R&S®HE302	0644.1114.02
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx
Mast Adapter (only for special polarization alignment)	R&S®HE202Z1	0649.7510.02
RF Cable (for use with R&S®HE202Z1)	R&S®HE202Z2	0649.7785.02



R&S®HE314A1

Active Omnidirectional Antenna

20 MHz to 500 MHz

Active omnidirectional reception of horizontally polarized waves



The R&S®HE314A1 is a turnstile antenna consisting of two R&S®HE302 active receiving dipoles connected via a 90° hybrid coupler.

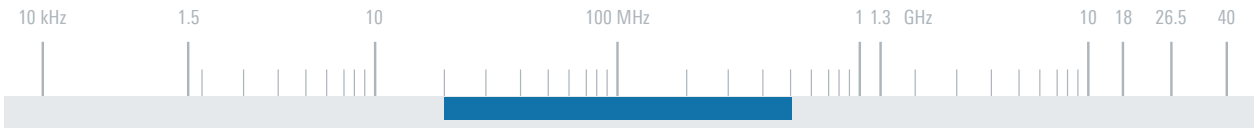
The antenna is used for the reception of horizontally polarized signals; the horizontal radiation pattern is optimized for omnidirectional reception.

The R&S®HE314A1 can be extended for omnidirectional reception of vertically polarized waves by using, for example, an R&S®HE309 active vertical dipole mounted at the top.

Key facts

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

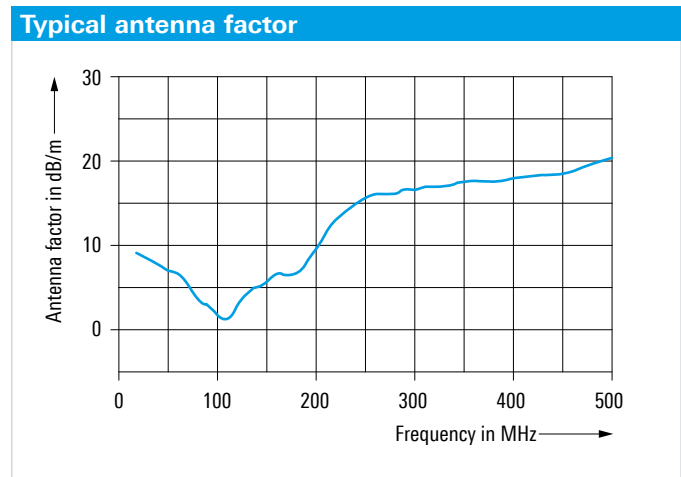
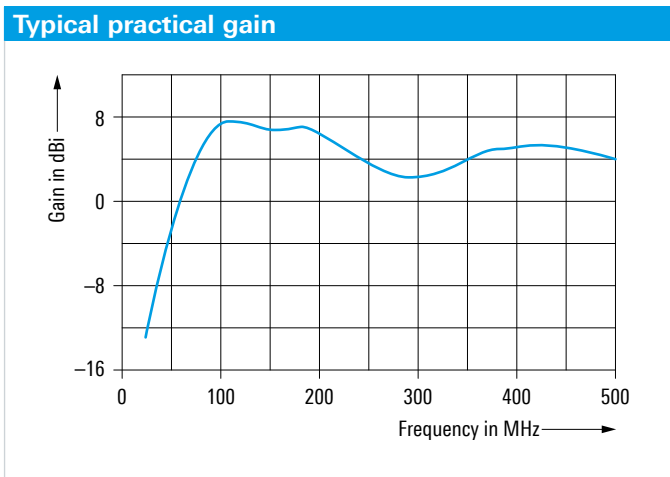




Specifications	
Frequency range	20 MHz to 500 MHz
Polarization	horizontal
Input impedance	50 Ω
VSWR	< 2.5
Electronic gain	-15 dB to +8 dB
Practical gain	-14 dB to +5 dB
Directivity	1 dB (average)
Antenna factor	2 dB/m to 20 dB/m
Noise figure	
20 MHz	< 29 dB
500 MHz	< 10 dB

Field strength sensitivity ($\Delta f = 1 \text{ kHz}$; $S/N: 0 \text{ dB}$ (typ.))	
20 MHz	-12 dB($\mu\text{V/m}$)
500 MHz	-3 dB($\mu\text{V/m}$)
IP2	> 60 dBm
IP3	> 30 dBm
Power supply	18 V to 30 V DC (340 mA (typ.))
Connector	N female
MTBF	> 25 000 h
Operating temperature range	-40°C to +70°C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (W x H x L)	approx. 1 m x 0.3 m x 1 m (39.4 in x 11.8 in x 39.4 in)
Weight	approx. 8 kg (17.6 lb)

Ordering information	Type	Order No.
Active Omnidirectional Antenna	R&S®HE314A1	4027.6505.02
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx
Active Vertical Dipole	R&S®HE309	4027.5009.02



R&S®HE300 Active Directional Antenna

20 MHz (optional 9 kHz) to 7.5 GHz

Portable directional antenna for locating transmitters and interference sources



The practical and very wideband R&S®HE300 active directional antenna locates transmitters and interference sources when combined with portable receivers (e.g. R&S®PR100). The three exchangeable antenna modules supplied with the antenna cover the 20 MHz to 7.5 GHz frequency range. An additional module (R&S®HE300HF for 9 kHz to 20 MHz) is available as an option. The modules can be plugged into the handle with the correct orientation for vertical or horizontal polarization and then mechanically locked in place.

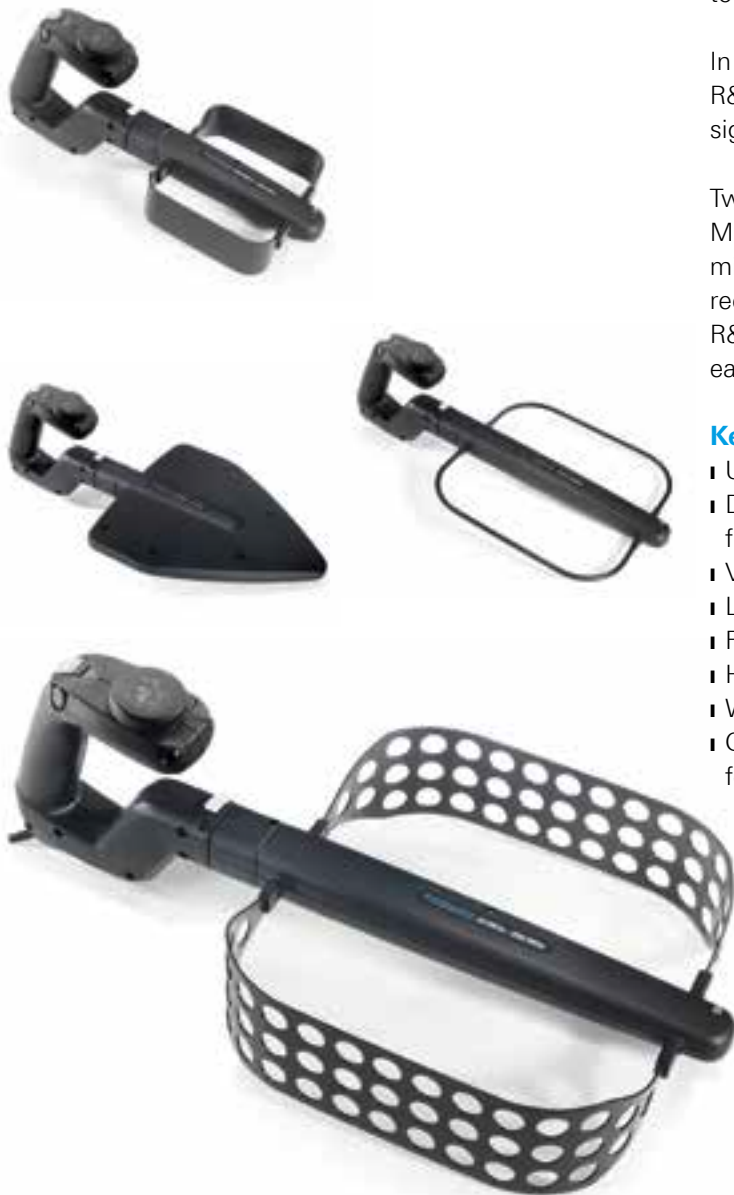
A built-in, low-noise wideband amplifier can be activated to enhance system sensitivity (active mode).

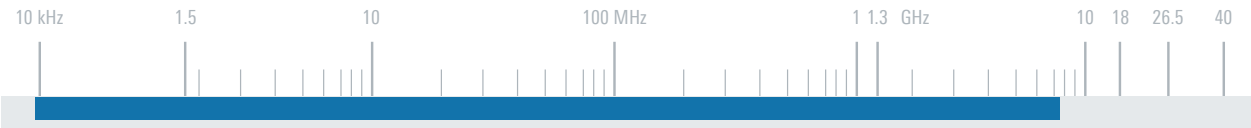
In passive mode, the amplifier is bypassed so that the R&S®HE300 can also be used in the vicinity of strong signal sources.

Two different models of the R&S®HE300 are available. Model .02 contains an analog compass for bearing determination; model .03 is equipped with an integrated GPS receiver and an electronic compass. When used with the R&S®PR100 portable receiver, the potential target can easily be located on a map using the triangulation feature.

Key facts

- Unambiguous radiation pattern
- Direction finding by orienting antenna toward maximum field strength
- Very wideband performance in a compact size
- Low weight due to optimized selection of materials
- Fatigue-proof handling
- Horizontal and vertical polarization
- Wide dynamic range
- GPS positioning, compass bearing and triangulation feature (model .03)

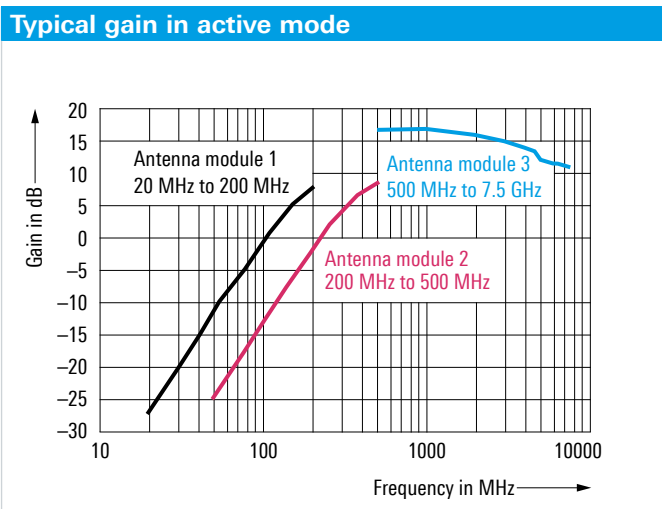




Specifications	
Frequency range	9 kHz to 7.5 GHz
Antenna module 1	20 MHz to 200 MHz
Antenna module 2	200 MHz to 500 MHz
Antenna module 3	500 MHz to 7.5 GHz
Optional antenna module (R&S®HE300HF)	9 kHz to 20 MHz
Polarization	horizontal and vertical (by rotating the module before plugging in)
Input impedance	50 Ω
VSWR	< 2.5 (typ.) (except R&S®HE300HF)
Power supply	
Batteries	1.5 V AA cells (6 ×)
Rechargeable cells	1.2 V (6 ×)
External supply	7 V to 9 V DC via plug
Current drain	approx. 100 mA at +25°C
Connector	N male on cable (approx. 1 m emerging from handle)

MTBF	> 50 000 h, in line with MIL-HDBK-217E, ground fixed, +25°C
Operating temperature range	-30°C to +55°C
GPS/electronic compass unit (only applicable for model .03 and R&S®HE300UK)	
Power supply (via R&S®PR100)	5 V DC ± 0.2 V
Current drain	max. 100 mA
GPS acquisition time	approx. 40 s
Electronic compass accuracy	2° RMS (typ.) for 0° elevation, 4° RMS (typ.) for ± 60° elevation
Compass resolution	1°
Dimensions with antenna module 1 (W × H × L)	approx. 310 mm × 90 mm × 580 mm (12.2 in × 3.5 in × 22.8 in)
Weight	
Antenna with antenna module 1	approx. 1.5 kg (3.3 lb)
Antenna, including transit case	approx. 7 kg (15.4 lb)

Ordering information	Type	Order No.
Active Directional Antenna, including analog compass	R&S®HE300	4067.5900.02
Active Directional Antenna, including GPS/electronic compass	R&S®HE300	4067.5900.03
GPS/Electronic Compass Upgrade Kit	R&S®HE300UK	4080.9011.02
Recommended extras		
Portable Receiver	R&S®PR100	4071.9006.02
HF Option (9 kHz to 20 MHz)	R&S®HE300HF	4067.6806.02



Map triangulation with R&S®HE300 and R&S®PR100.

R&S®HE300CE

Active Directional Antenna

500 MHz to 7.5 GHz

Portable directional antenna for locating transmitters and interfering sources



The R&S®HE300CE active directional antenna locates transmitters and interference sources when combined with portable receivers (e.g. the R&S®PR100).

The overall frequency range from 500 MHz to 7.5 GHz is covered by a log-periodic dipole array antenna structure with a distinct directional pattern. The antenna does not have to be tuned within its frequency range.

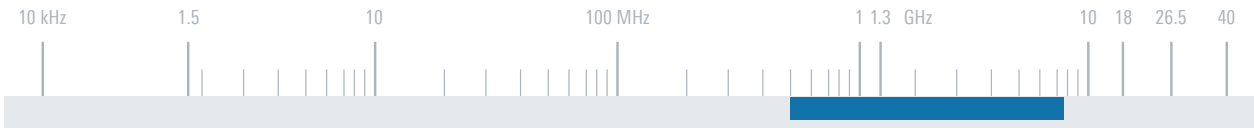
A built-in, low-noise wideband amplifier can be activated to enhance system sensitivity (active mode). In passive mode, the amplifier is bypassed so that the R&S®HE300CE can also be used in the vicinity of strong transmitters.

The antenna is mainly intended for vertical polarization, but can be rotated 90° to provide horizontal polarization for testing.

Key facts

- Unambiguous and nearly frequency-independent radiation pattern
- Direction finding by orienting antenna toward maximum field strength
- Wideband performance in a compact size
- Low weight
- Wide dynamic range due to switchable preamplifier
- Individual calibration

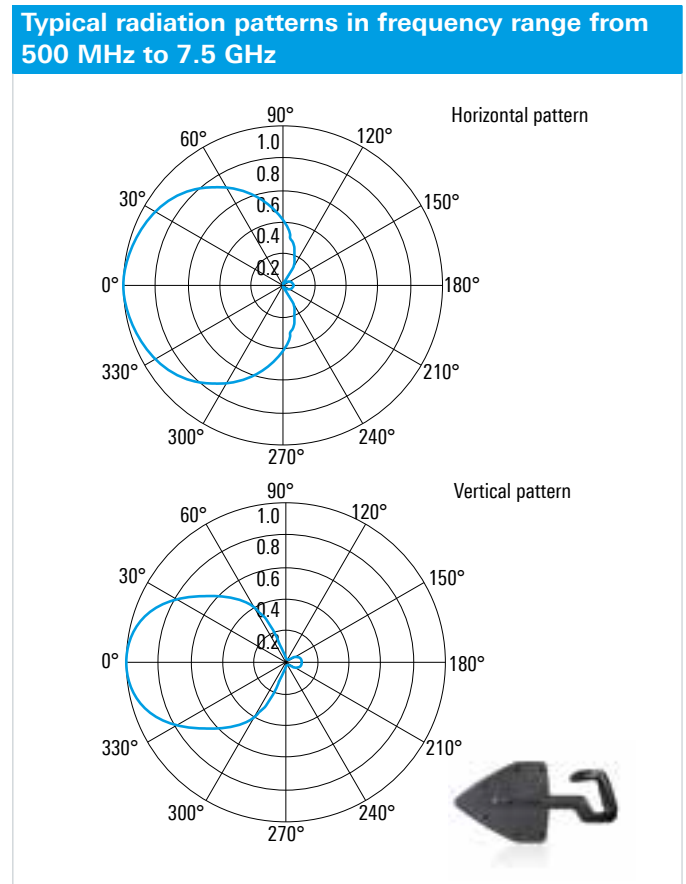
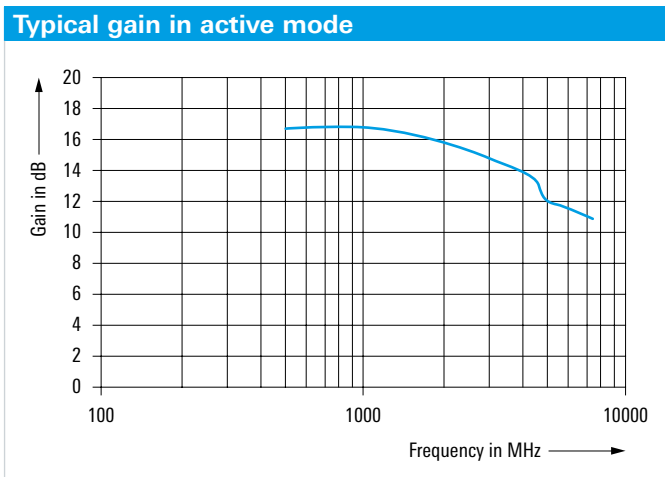




Specifications	
Frequency range	500 MHz to 7.5 GHz
Polarization	vertical (horizontal by rotating the antenna 90°)
VSWR	< 2.5 (typ.)
Nominal impedance	50 Ω
RF connector	N male on cable (approx. 1 m emerging from handle)
Power supply	
Batteries	1.5 V AA cells (6 ×)
Rechargeable batteries	1.2 V (6 ×)
External	7 V to 9 V DC via plug
Current drain	approx. 100 mA at +25°C

Operating temperature range	-30°C to +55°C
MTBF	> 50 000 h (in line with MIL-HDBK-217E, ground fixed, +25°C)
Dimensions (W × H × L)	approx. 310 mm × 90 mm × 580 mm (12.2 in × 3.5 in × 22.8 in)
Weight	approx. 1.2 kg (2.7 lb)

Ordering information	Type	Order No.
Active Directional Antenna	R&S®HE300CE	4080.9505.02
Recommended extras		
Portable Receiver	R&S®PR100	4071.9006.02



R&S®HL300

Handheld Log-Periodic Antenna

450 MHz to 8 GHz

Portable directional antenna for locating transmitters and interference sources



The R&S®HL300 handheld log-periodic antenna in combination with handheld spectrum analyzers (e.g. R&S®FSH4/8/13/20) is used for determining RF parameters and localizing interference sources.

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

A built-in GPS receiver with an integrated patch antenna and an electronic compass provides position and bearing data for further processing in the connected spectrum analyzer (e.g. R&S®FSH4/8/13/20).

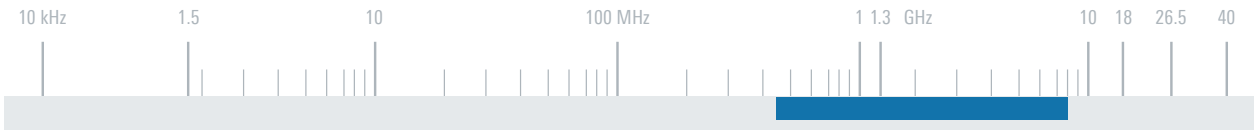
A toggle switch on the antenna handle activates or deactivates the low noise amplifier (LNA) inside the R&S®FSH4/8/13/20, allowing the use of the system in the vicinity of strong transmitters.

Key facts

- Unambiguous and nearly frequency-independent radiation pattern
- Handy size yet extreme broadband capability
- Fatigue-free operation due to antenna design and materials used, which keep weight to a minimum
- Integrated GPS receiver and electronic compass
- Power supply via the connected R&S®FSH4/8/13/20 handheld spectrum analyzer

New

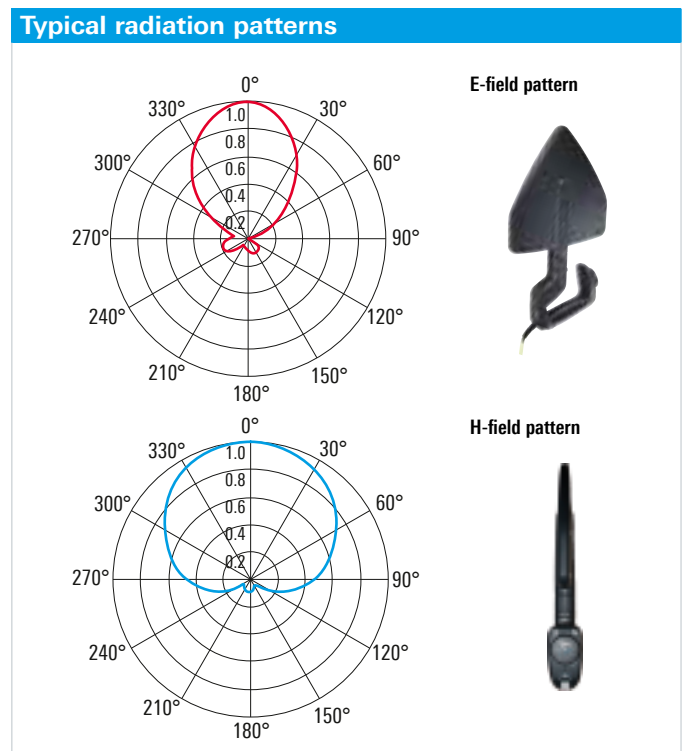
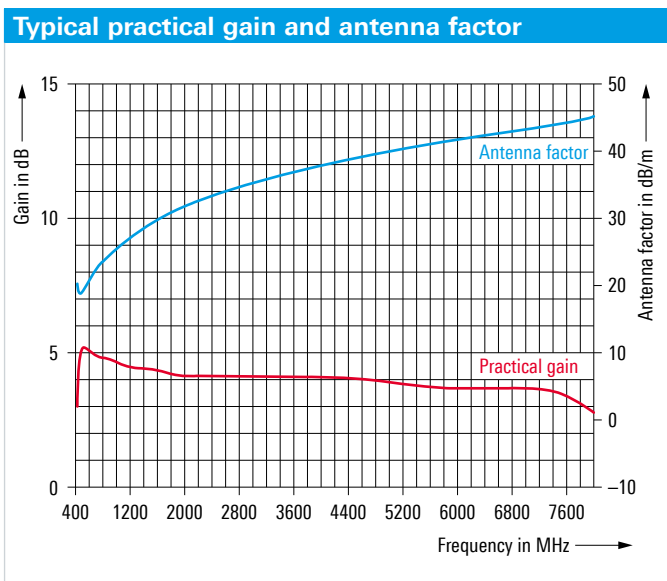




Specifications	
Frequency range	450 MHz to 8 GHz
Polarization	vertical (horizontal by turning the antenna 90°)
Nominal impedance	50 Ω
VSWR	
450 MHz to 500 MHz	< 3
500 MHz to 8 GHz	< 2.5
RF connector	N male on cable (approx. 1 m emerging from handle)
Power supply (via R&S®FSH4/8/13/20)	5 V DC (± 0.2 V) (max. 100 mA)
MTBF	> 100000 h (in line with SN 29500, ground benign, +45°C)

GPS acquisition time	26 s (typ.) (cold start)
Time pulse frequency	1 Hz
Time pulse accuracy	30 ns RMS (under good GPS conditions)
Electronic compass range	
For azimuth	0° to 360° in 1° steps
For elevation	-60° to 60° in 1° steps
Electronic compass accuracy	
For 0° elevation	2° RMS (typ.)
For ± 60° elevation	4° RMS (typ.)
Operating temperature range	-30°C to +55°C
Dimensions (W × H × L)	approx. 310 mm × 90 mm × 580 mm (12.2 in × 3.5 in × 22.8 in)
Weight	approx. 1 kg (2.2 lb)

Ordering information	Type	Order No.
Handheld Log-Periodic Antenna	R&S®HL300	4097.3005.02
Recommended extras		
Handheld Spectrum Analyzer	R&S®FSH4/8	1309.6000.xx
Handheld Spectrum Analyzer	R&S®FSH13/20	1314.2000.xx



R&S®HE500 Active Receiving Antenna

20 MHz to 3 GHz

Good reception results in a compact size



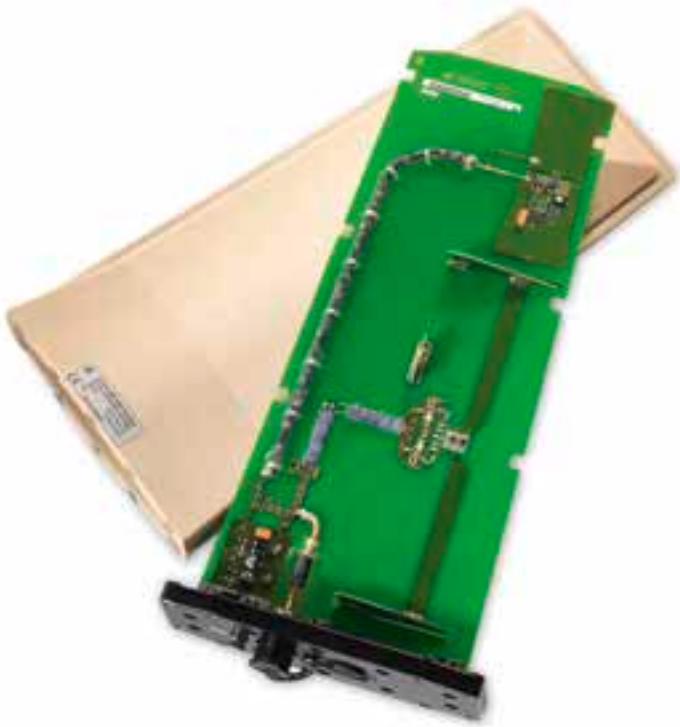
The R&S®HE500 active receiving antenna has been designed as a monitoring antenna for vertical polarization and omnidirectional reception in the frequency range from 20 MHz to 3 GHz.

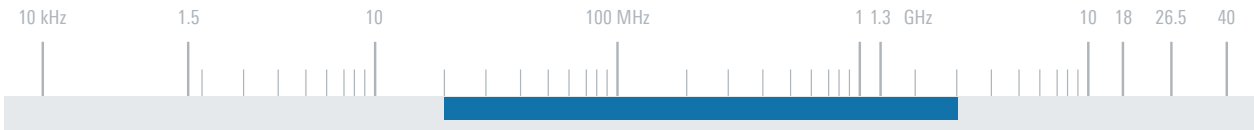
The antenna features a compact design and low weight, making it ideal for use in mobile systems and environments where space is at a premium.

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

Key facts

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

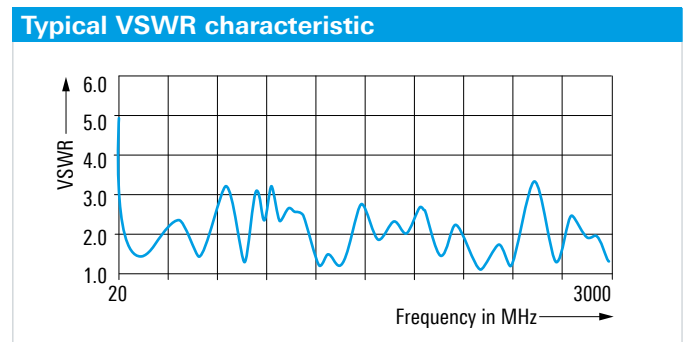
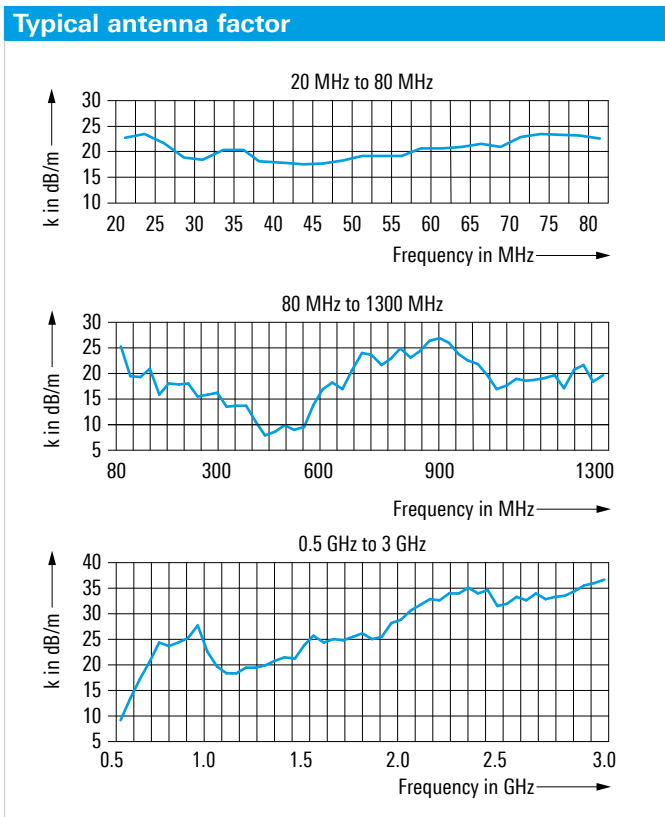




Specifications	
Frequency range	20 MHz to 3 GHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	< 3 (typ.)
Horizontal radiation pattern	omnidirectional
Antenna factor	see diagram
Field strength sensitivity (S/N = 0 dB, Δf = 1 Hz)	
20 MHz to 1.3 GHz	-23 dB(μV/m) (typ.)
1.3 GHz to 3 GHz	-20 dB(μV/m) (typ.)
Destructive field strength	
Up to 10 MHz	> 50 V/m (typ.)
10 MHz to 20 MHz	> 20 V/m (typ.)
20 MHz to 3 GHz	> 10 V/m (typ.)

IP2	> 30 dBm; > 50 dBm (typ.)
IP3	> 25 dBm (typ.)
Power supply	18 V to 32 V DC (max. 180 mA)
Connector	N female
MTBF	> 50 000 h
Operating temperature range	-40°C to +65°C
Max. wind speed	
Narrow side	600 km/h (without ice deposit)
Broad side	250 km/h (without ice deposit)
Dimensions (W × H × L)	approx. 65 mm × 365 mm × 170 mm (2.6 in × 14.4 in × 6.7 in)
Weight	approx. 1.2 kg (2.7 lb)

Ordering information	Type	Order No.
Active Receiving Antenna	R&S®HE500	4059.2005.02
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx



R&S®HE600

Active

Omnidirectional Receiving Antenna

20 MHz to 8 GHz

Sensitive monitoring in stationary and mobile installations



The R&S®HE600 active omnidirectional receiving antenna is designed as a monitoring antenna for vertical polarization in the frequency range from 20 MHz to 8 GHz.

The integrated preamplifier provides good reception results in a compact size.

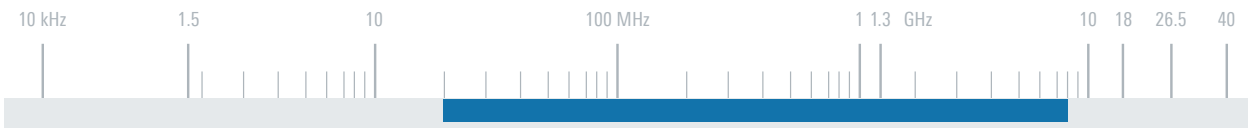
The dipole concept delivers superior radiation characteristics even without the presence of a ground plane.

A low-attenuation, weather-resistant radome makes the antenna suitable for operation under harsh environmental conditions.

Key facts

- Extremely wide frequency range
- Vertical polarization
- High sensitivity
- Low weight
- Compact size
- Suitable for operation under harsh environmental conditions

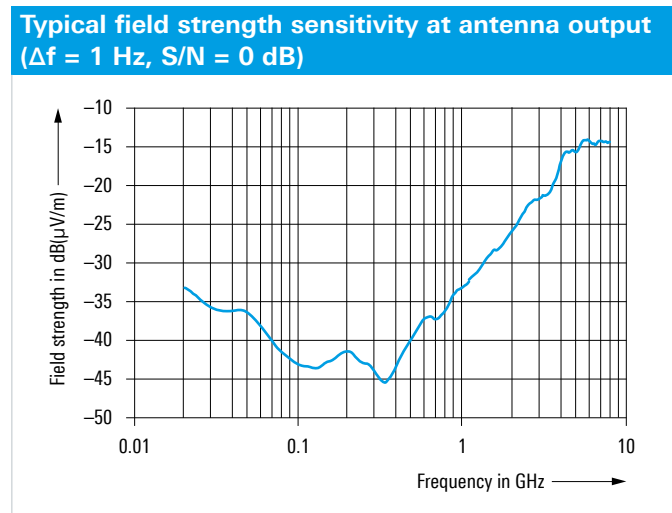
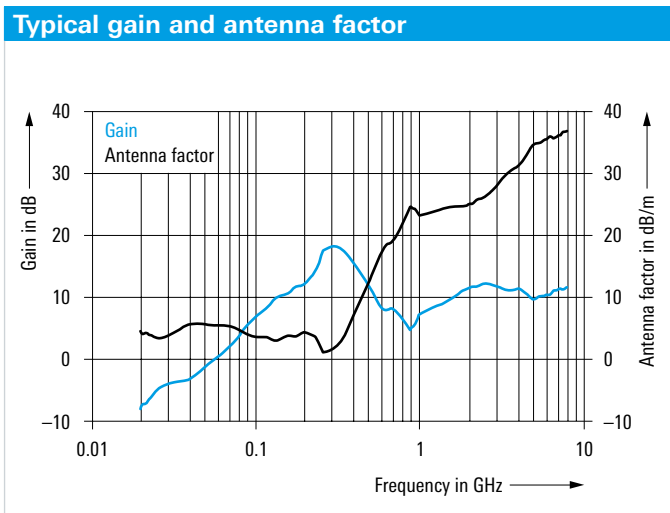




Specifications	
Frequency range	20 MHz to 8 GHz
RF connectors	N female, 50 Ω
VSWR	< 3; < 2 (typ.)
Gain and antenna factor	see diagram
Field strength sensitivity	see diagram
Circularity of azimuth pattern	< 3 dB (typ.)
IP3	
20 MHz to 1.1 GHz	> 28 dBm (typ.)
> 1.1 GHz to 3 GHz	> 22 dBm (typ.)
> 3 GHz	> 20 dBm (typ.)
IP2	
20 MHz to 1.1 GHz	> 50 dBm (typ.)
> 1.1 GHz to 3 GHz	> 38 dBm (typ.)
> 3 GHz	> 32 dBm (typ.)

Destructive field strength	> 50 V/m
Power supply (via coaxial cable)	15 V to 28 V DC (24 V (typ.), approx. 180 mA)
Operating temperature range	-40°C to +65°C
Storage temperature range	-40°C to +85°C
Max. wind speed	
Without ice deposit	275 km/h
With 30 mm ice deposit	200 km/h
MTBF	> 100 000 h
Dimensions (Ø × H)	approx. 135 mm × 550 mm (5.3 in × 21.7 in)
Weight	approx. 2 kg (4.4 lb)

Ordering information	Type	Order No.
Active Omnidirectional Receiving Antenna, color: squirrel gray (RAL7000)	R&S®HE600	4094.9002.02
Active Omnidirectional Receiving Antenna, color: bronze green (RAL6031)	R&S®HE600	4094.9002.03
Active Omnidirectional Antenna, color: light ivory (RAL1015)	R&S®HE600	4094.9002.04
Recommended extras		
Bias Unit	R&S®IN600	4094.3004.xx
Mast and Tripod Adapter	R&S®KM011Z9	4095.0750.02
Wooden Tripod	R&S®HZ-1	0837.2310.02



R&S®HK116 Biconical Antenna



20 MHz to 300 MHz

For radiated emission measurements

The R&S®HK116 is a biconical dipole antenna for linearly polarized waves.

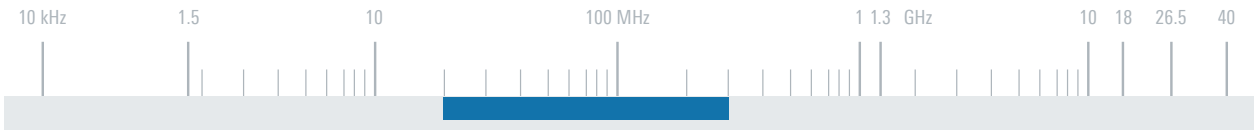
The lightweight antenna features a wide frequency range and a virtually frequency-independent radiation pattern.

Each R&S®HK116 is individually calibrated in line with ANSI C63.5 and ARP958 and is particularly suitable for radiated emission measurements in EMC test rooms.

Key facts

- Wide frequency range
- Virtually frequency-independent radiation pattern
- Individual calibration in line with ANSI C63.5 (free-space calibration) and ARP958
- Low weight

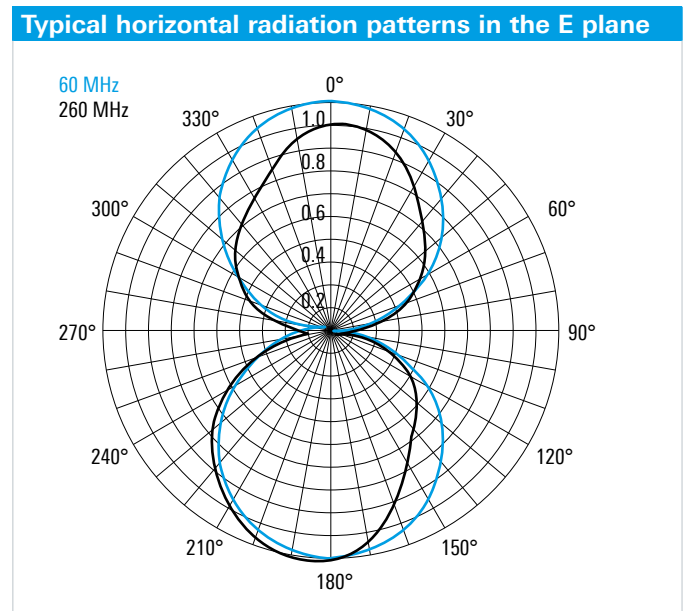
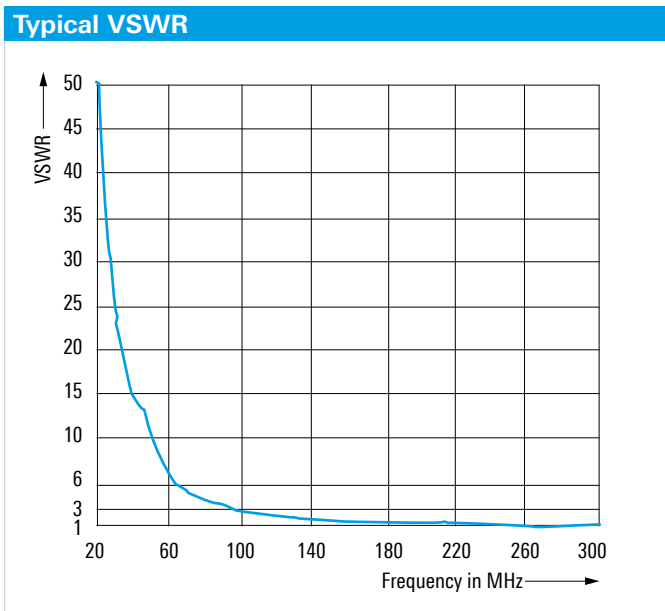




Specifications	
Frequency range	20 MHz to 300 MHz
Polarization	linear
Input impedance	50 Ω
VSWR	see diagram
Permissible input power	75 W CW
Connector	N female

Operating temperature range	-40°C to +55°C
MTBF	>1 000 000 h
Dimensions (W × H × L)	approx. 530 mm × 720 mm × 1380 mm (20.9 in × 28.4 in × 54.3 in)
Weight	approx. 3 kg (6.6 lb)

Ordering information	Type	Order No.
Biconical Antenna	R&S®HK116	4000.7752.02
Recommended extras		
Wooden Tripod	R&S®HZ-1	0837.2310.02



R&S®HL007A2

Crossed Log-Periodic Antenna

80 MHz to 1.3 GHz

Monitoring and measurement of RF signals



The R&S®HL007A2 log-periodic antenna with crossed elements is particularly suitable for monitoring and measuring RF signals.

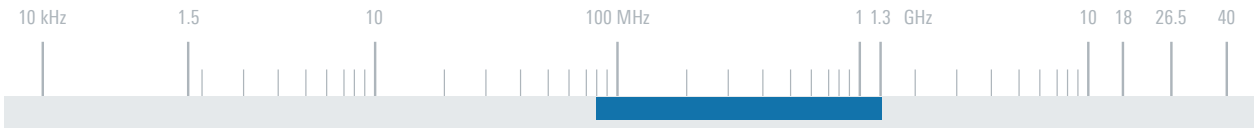
The antenna features a virtually frequency-independent radiation pattern and allows horizontally, vertically and $\pm 45^\circ$ polarized signals to be received.

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

Key facts

- Wide frequency range
- Virtually frequency-independent radiation pattern
- Polarization horizontal, vertical and $\pm 45^\circ$ (selectable with R&S®ZS107 option)
- Remote controlled polarization switching with R&S®GB016 and R&S®ZS107

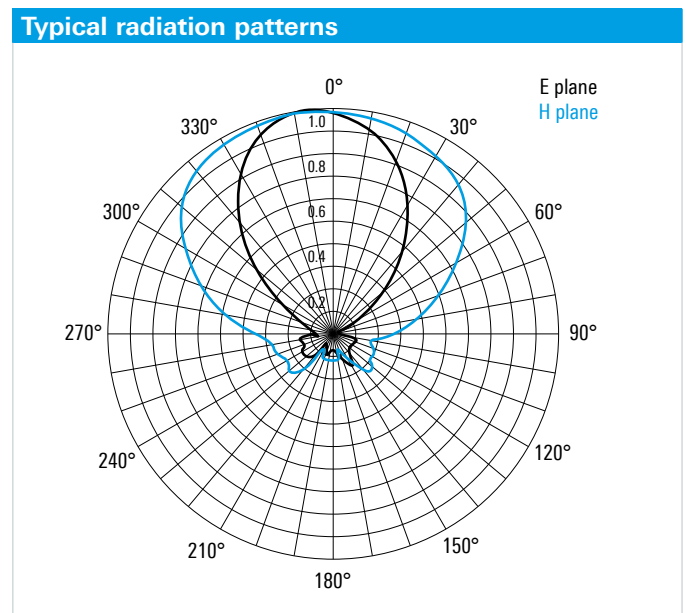
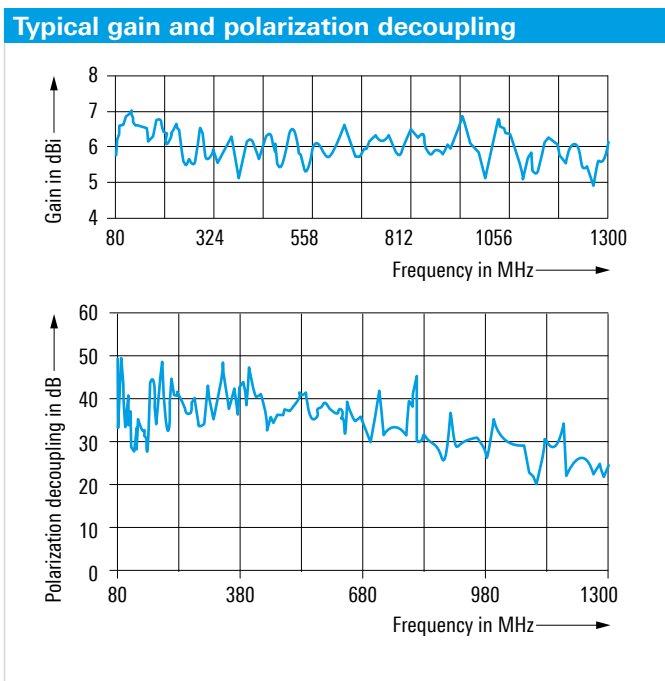




Specifications	
Frequency range	80 MHz to 1.3 GHz
Polarization	linear horizontal, vertical (optional $\pm 45^\circ$)
Input impedance	50 Ω
VSWR	≤ 2.5
Gain	6 dBi (typ.)
Antenna connector	2 x N female

Operating temperature range	-40°C to +50°C
Max. wind speed	180 km/h (without ice deposit)
MTBF	> 150 000 h
Dimensions (W x H x L)	approx. 2 m x 2.2 m x 1.7 m (78.7 in x 86.6 in x 66.9 in)
Weight	approx. 15 kg (33.1 lb)

Ordering information	Type	Order No.
Crossed Log-Periodic Antenna	R&S®HL007A2	4025.8700.03
Recommended extras		
Polarization Network Switch for horizontal/vertical/ $\pm 45^\circ$ polarization	R&S®ZS107	0428.2853.02
Polarization Network Switch for horizontal/vertical polarization	R&S®ZS107	0428.2853.04
Control Unit	R&S®GB016	4056.7006.03
Antenna Remote Control Software (ARCOS)	R&S®CP001	4069.6384.05



R&S®HL033 Log-Periodic Broadband Antenna

80 MHz to 2 GHz

Detection and measurement of RF signals



In conjunction with a test or monitoring receiver, the R&S®HL033 log-periodic broadband antenna can be used for versatile applications, e.g. field strength measurements or determination of direction of incidence and signal polarization.

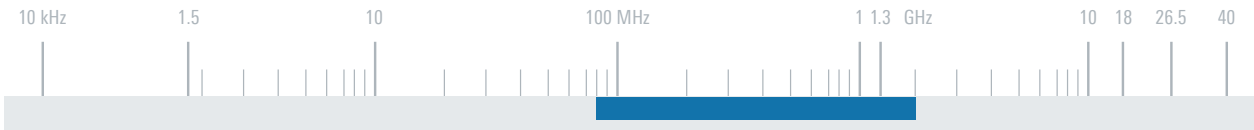
Each antenna is individually calibrated. A CD-ROM with calibration data is supplied with the antenna.

The R&S®HL033 can also be used as a transmit antenna over the entire frequency range.

Key facts

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

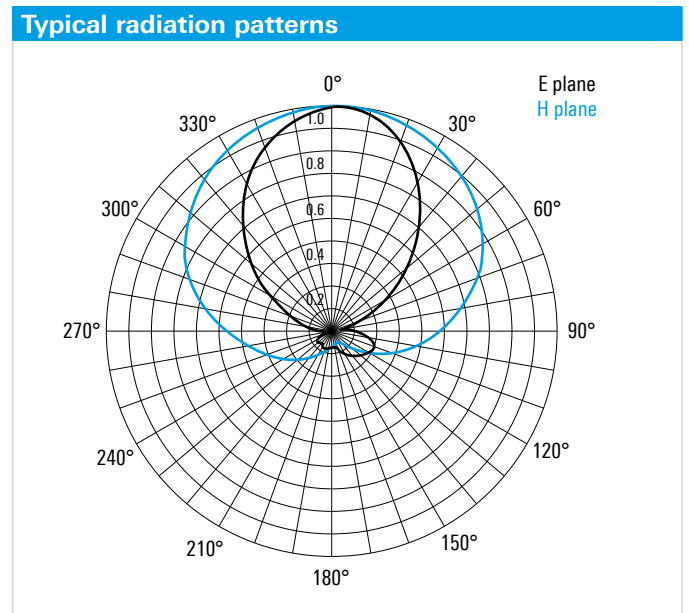
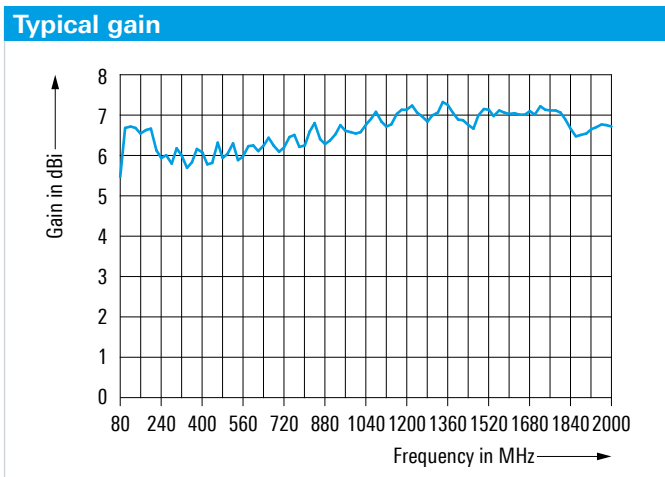




Specifications	
Frequency range	80 MHz to 2 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	≤ 2
Max. input power (T _A = +30°C)	
80 MHz	460 W + 100% AM
100 MHz	430 W + 100% AM
500 MHz	210 W + 100% AM
1000 MHz	160 W + 100% AM
1500 MHz	140 W + 100% AM
2000 MHz	120 W + 100% AM

Gain	6.5 dBi (typ.)
Connector	N female
MTBF	> 1 000 000 h
Operating temperature range	-40°C to +65°C
Max. wind speed	150 km/h (without ice deposit)
Dimensions (W × L)	approx. 1960 mm × 1800 mm (77.2 in × 70.9 in)
Weight	approx. 5 kg (11 lb)

Ordering information	Type	Order No.
Log-Periodic Broadband Antenna	R&S®HL033	4062.6608.03
Recommended extras		
Adapter for center support	R&S®HL033M	4062.7585.02



R&S®HL040E Log-Periodic Broadband Antenna

400 MHz to 6 GHz

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



The linearly polarized R&S®HL040E log-periodic broadband antenna provides broadband transmission and reception in the frequency range from 400 MHz to 6 GHz.

Precise construction and optionally available individual calibration make the antenna suitable for field strength and EMI measurements.

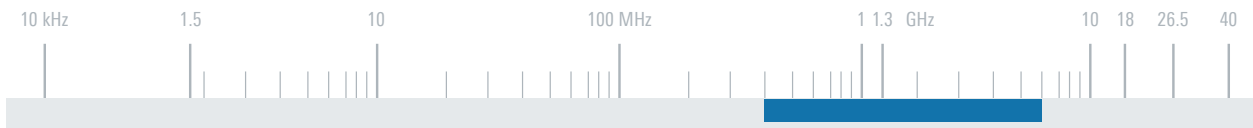
Power rating and matching (VSWR) allow its use in EMS measurements where field strengths of 10 V/m or higher are required.

Key facts

- ▀ Wide frequency range
- ▀ Suitable for susceptibility and emission measurements
- ▀ Stable radiation patterns over frequency range ensure optimum illumination of EUT
- ▀ Low cross-polarization
- ▀ Compact size, low weight
- ▀ Ease of handling
- ▀ Sturdy design

New

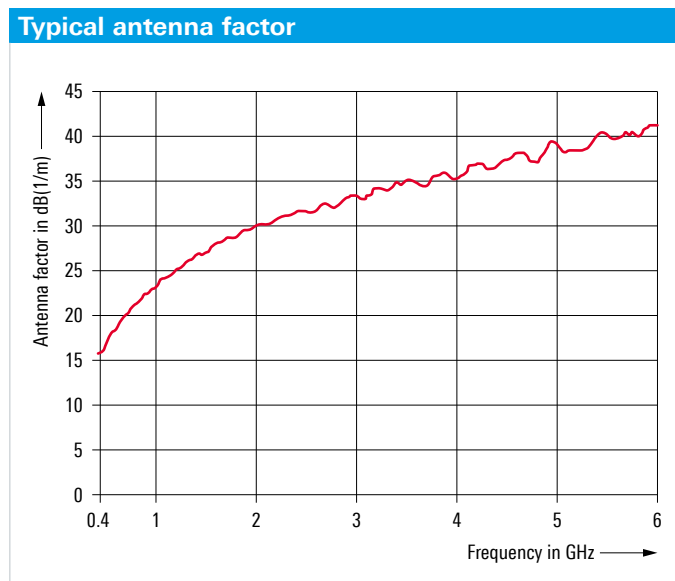
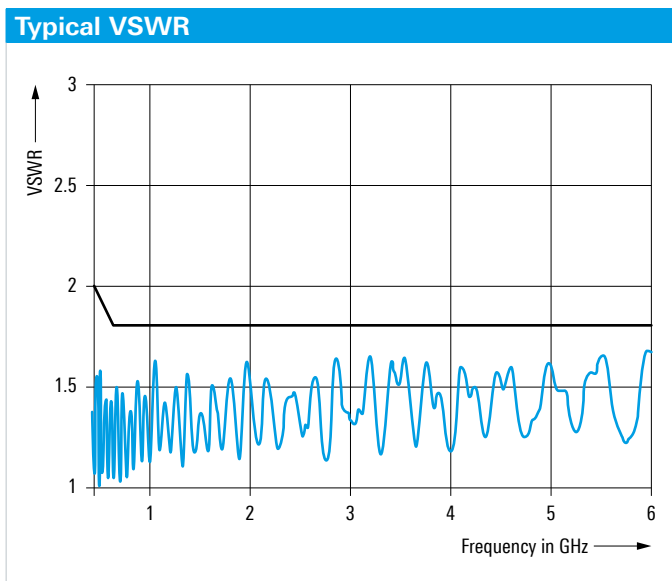




Specifications	
Frequency range	400 MHz to 6 GHz
Polarization	linear
Nominal impedance	50 Ω
VSWR	< 2.0
Gain	7 dBi to 5 dBi (typ.)
Cross-polarization	< -20 dB
Front-to-back-ratio	
400 MHz to 4.5 GHz	> 20 dB
4.5 GHz to 6 GHz	> 15 dB

Maximum input power	
400 MHz	100 W CW
1 GHz	90 W CW
3 GHz	30 W CW
6 GHz	20 W CW
RF connector	N female
MTBF	> 150 000 h
Operating temperature range	-40°C to +70°C
Max. wind speed	275 km/h (without ice deposit)
Dimensions (W × H × L)	approx. 0.43 m × 0.13 m × 0.55 m (16.9 in × 5.1 in × 21.6 in)
Weight	approx. 2.5 kg (5.5 lb)

Ordering information	Type	Order No.
Log-Periodic Broadband Antenna, without calibration	R&S®HL040E	4099.8004.02
Log-Periodic Broadband Antenna, with calibration	R&S®HL040E	4099.8004.12
Recommended extras		
Wooden Tripod	R&S®HZ-1	0837.2310.02
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03



R&S®HL046 EMS Antenna



80 MHz to 1.3 GHz

Log-periodic antenna for EMS measurements

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 practically rotation-symmetrical.

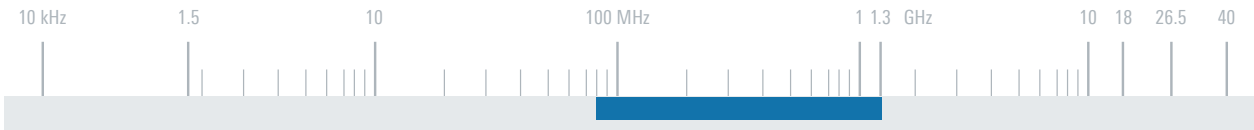
Its small size and wide frequency range make the antenna suitable for use in test chambers.

The antenna is mounted on a trolley whose height can be continuously adjusted between approx. 1 m and 1.75 m above ground. Polarization is manually set. Pneumatic actuators can optionally be provided.

Key facts

- 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

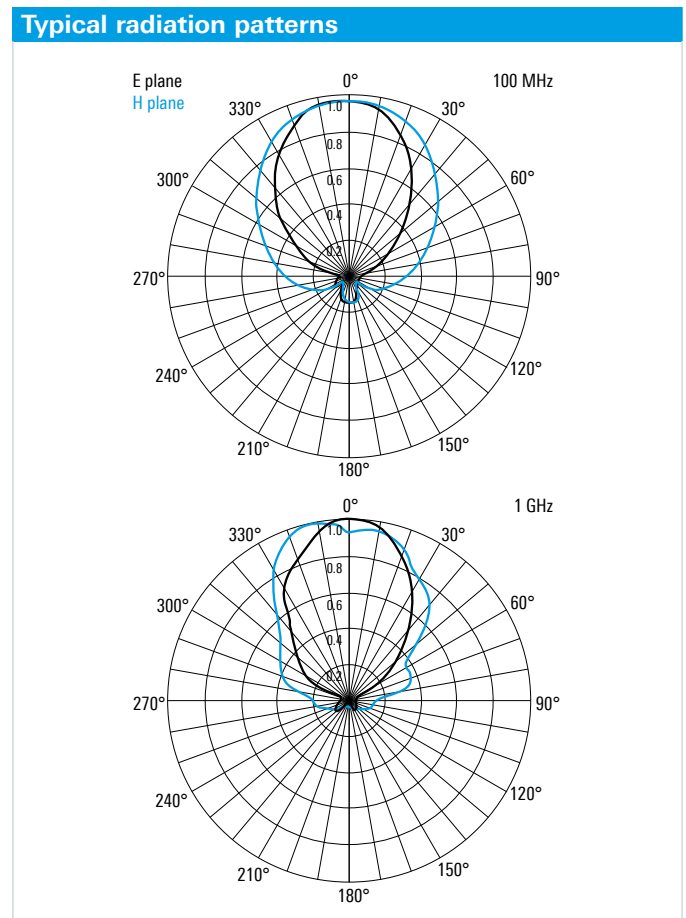
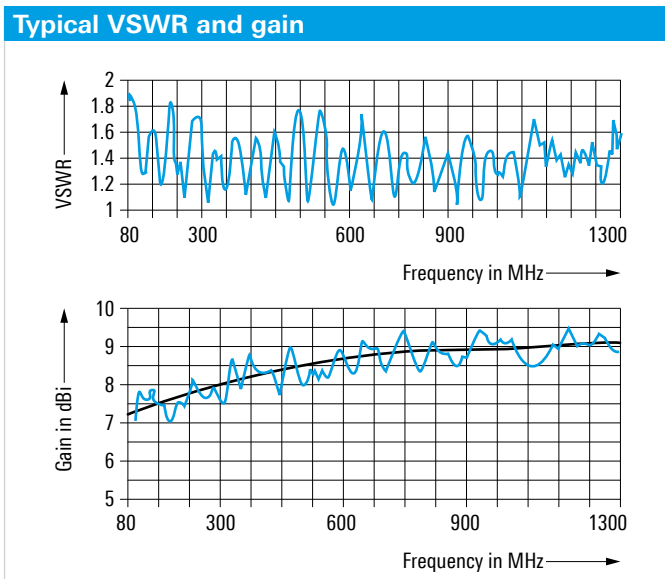




Specifications	
Frequency range	80 MHz to 1.3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	< 2
Max. input power (T _A = +40°C)	
80 MHz	1000 W + 100% AM
500 MHz	500 W + 100% AM
1 GHz	300 W + 100% AM
1.3 GHz	250 W + 100% AM
Gain	> 7 dBi (typ.)
Front-to-back ratio	> 20 dB (typ.)
Polarization decoupling	20 dB (typ.)
Connector	N female

Class of application	laboratory
MTBF	> 100 000 h
Operating temperature range	-10°C to +50°C
Dimensions (W × H × L)	
Without trolley	approx. 0.85 m × 1.57 m × 1.75 m (33.5 in × 61.8 in × 68.9 in)
With trolley	approx. 0.86 m × 1.90 m (variable up to 2.60 m) × 1.85 m (33.9 in × 74.8 in (variable up to 102.4 in) × 72.8 in)
Weight	
Without trolley	approx. 12.5 kg (27.6 lb)
With trolley	approx. 22.5 kg (49.6 lb)

Ordering information	Type	Order No.
EMS Antenna (with trolley)	R&S®HL046	4040.8708.02
Recommended extras		
Pneumatic Actuators for polarization setting	R&S®HL046-P	4053.1694.02



R&S®HL046E

High Gain Log-Periodic Antenna

80 MHz to 3 GHz

Log-periodic antenna for EMS measurements



The R&S®HL046E high gain log-periodic antenna offers excellent broadband characteristics, a radiation pattern that is approximately rotation-symmetrical and high gain, making it particularly suitable for EMS immunity measurements.

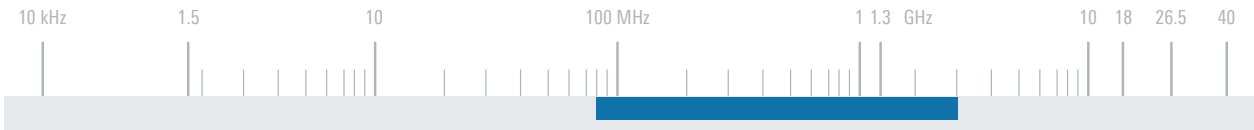
The high antenna gain means that in comparison with existing systems, the required field strengths can be achieved with a lower amplifier power.

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

Key facts

- High antenna gain, i.e. low amplifier power 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
- Wall mounting possible

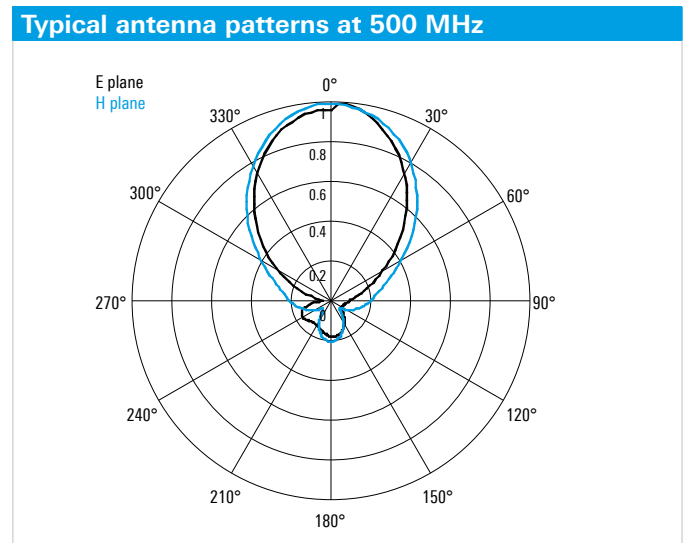
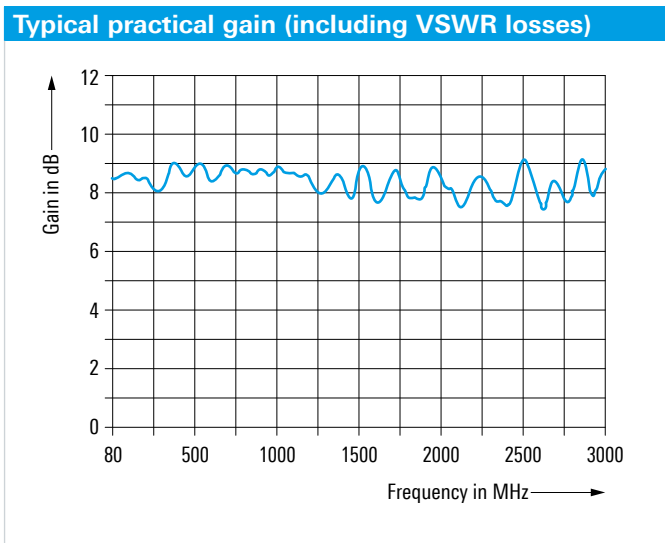




Specifications	
Frequency range	80 MHz to 3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	
< 2500 MHz	< 2
≥ 2500 MHz	< 2.5
Practical gain	> 8 dBi (typ.)
Max. input power	
80 MHz	1400 W + 100% AM
500 MHz	600 W + 100% AM
1000 MHz	400 W + 100% AM
2000 MHz	300 W + 100% AM
3000 MHz	250 W + 100% AM
Connector	N female
Operating temperature range	+5°C to +40°C in line with MIL-STD-810E
Class of application	laboratory

Dimensions (W × H × L)	
Without trolley	
Folded	approx. 0.85 m × 1.50 m × 1.81 m (33.5 in × 59.1 in × 71.3 in)
Open	approx. 1.50 m × 1.50 m × 1.81 m (59.1 in × 59.1 in × 71.3 in)
With trolley	
Folded	approx. 0.86 m × 1.90 m × 1.89 m (33.9 in × 74.8 in × 74.4 in)
Open	approx. 1.50 m × 1.90 m (variable up to 2.60 m) × 1.89 m (59.1 in × 74.8 in (variable up to 102.4 in) × 74.4 in)
Weight	
Without trolley	approx. 17 kg (37.5 lb)
With trolley	approx. 29.5 kg (60.0 lb)

Ordering information	Type	Order No.
High Gain Log-Periodic Antenna (with trolley)	R&S®HL046E	4065.5960.02
Recommended extras		
Pneumatic Polarization Control	R&S®HL046-P	4053.1694.02



R&S®HL223 Log-Periodic Antenna

200 MHz to 1.3 GHz

Optimized for radiomonitoring and measurements



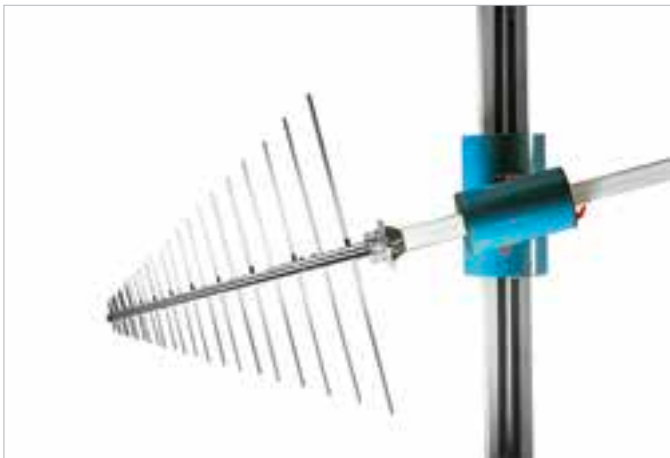
With its broadband characteristics and virtually frequency-independent radiation patterns, the R&S®HL223 log-periodic antenna covers a very wide frequency range.

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

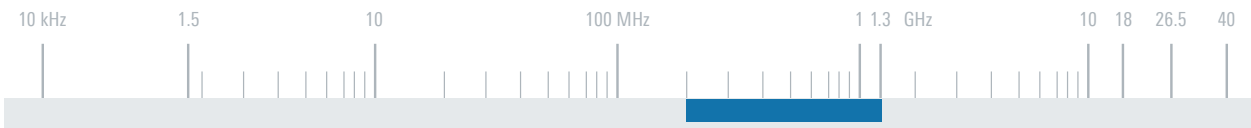
Each antenna is supplied with an individual calibration certificate so that it can be used for measurements and for monitoring and transmitting applications.

Key facts

- Excellent broadband characteristics
- Virtually frequency-independent radiation pattern
- 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 and ARP 958
- Adapter for R&S®HZ-1 wooden tripod supplied with antenna



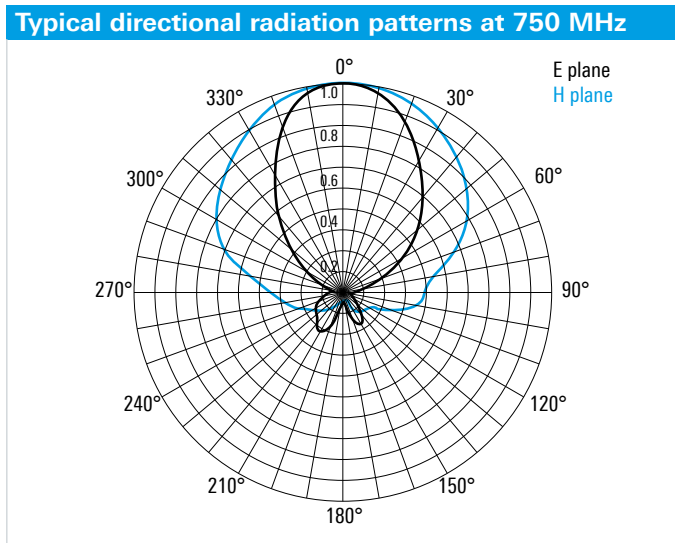
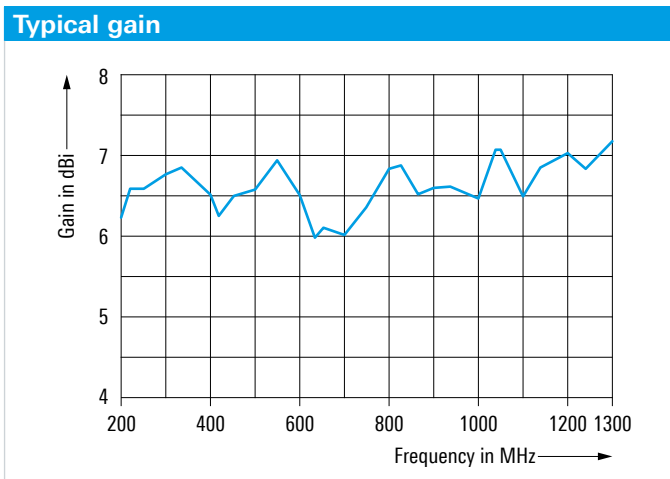
Adapter and mast not included.



Specifications	
Frequency range	200 MHz to 1.3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	≤ 2; 1.6 (typ.)
Max. input power	1500 W to 600 W CW
Gain	> 6 dBi
Connector	N female

MTBF	1 000 000 h
Operating temperature range	−40°C to +50°C
Max. wind speed	200 km/h (without ice deposit)
Dimensions (W × H × L)	approx. 765 mm × 120 mm × 710 mm (30.1 in × 4.7 in × 28 in)
Weight	approx. 2 kg (4.4 lb)

Ordering information	Type	Order No.
Log-Periodic Antenna	R&S®HL223	4001.5501.02
Recommended extras		
Wooden Tripod	R&S®HZ-1	0837.2310.02



R&S®HL562E ULTRALOG



30 MHz to 6 GHz

Ultrabroadband antenna for EMI and EMS applications

New

The R&S®HL562E ULTRALOG is used for emission and EMS measurements in the broad frequency range from 30 MHz to 6000 MHz. Measurement times are considerably reduced since it is not necessary to change antennas. Symmetry and matching (VSWR) of the R&S®HL562E allow its use in EMS measurements where field strengths of 10 V/m or higher are required.

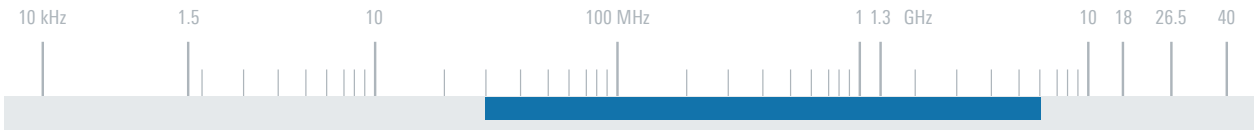
The R&S®HL562E combines the characteristics of a biconical and a log-periodic antenna. The log-periodic part of the antenna is V-shaped in order to increase the system sensitivity, in particular above 1 GHz. This measure not only increases antenna gain, it is also the reason why the radiation pattern in the H plane is practically rotationally symmetrical to the pattern in the E plane.

The ULTRALOG is supplied without a tripod; the tripod shown is available as an extra. For use with the R&S®HL562Z1 tripod, an RF cable with a 90° angle connector is required.

Key facts

- Suitable for susceptibility and emission measurements
- No change of antennas needed throughout the whole frequency range
- Radiation patterns in E and H plane practically rotationally symmetrical (from 200 MHz to 6000 MHz)
- Compact size, low weight
- High gain, low antenna factor
- Movable tripod optionally available
- Individual calibration in line with ANSI C63.5

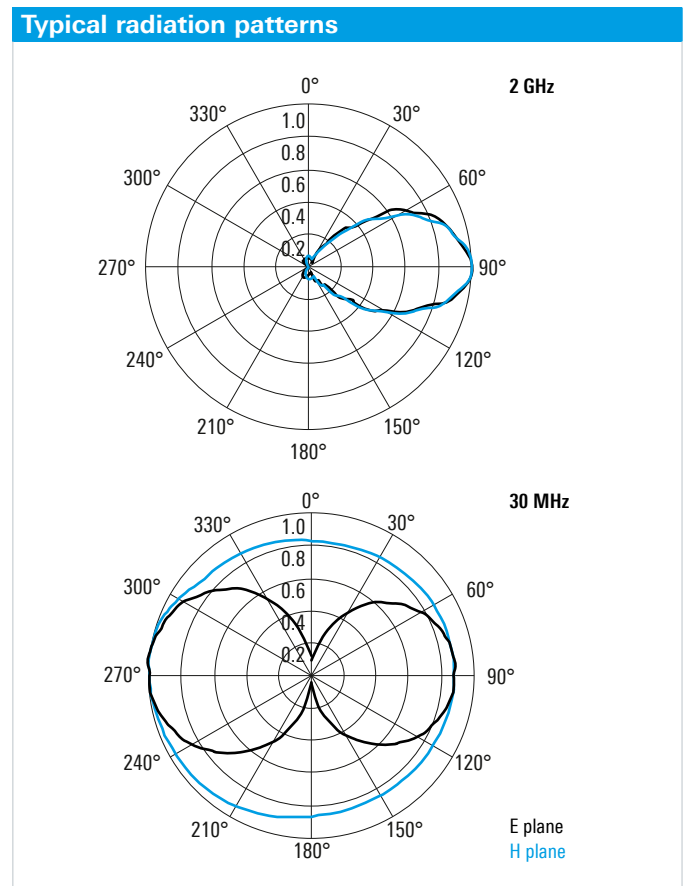
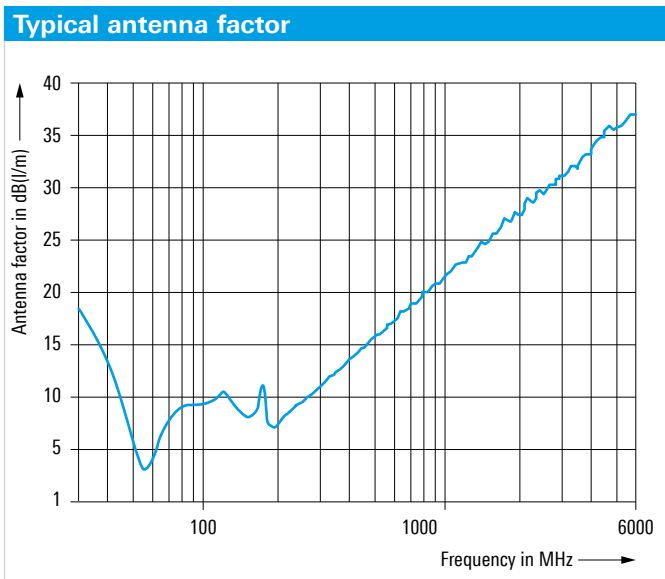




Specifications	
Frequency range	30 MHz to 6 GHz
Polarization	linear
Cross-polarization	< -20 dB
VSWR	2 (typ.)
RF connector	N female
Nominal impedance	50 Ω
Gain (above 200 MHz)	8 dBi (typ.)
MTBF	> 200000 h

Max input power	
30 MHz	225 W CW
80 MHz	900 W CW
250 MHz	750 W CW
1 GHz	420 W CW
3 GHz	270 W CW
6 GHz	150 W CW
Operating temperature range	+5 °C to +40 °C
Class of operation	laboratory, anechoic chamber, outdoor use up to 20 km/h wind speed
Dimensions (W × H × L)	approx. 0.57 m × 1.43 m × 1.65 m (22.4 in × 56.3 in × 65 in)
Weight	approx. 5 kg (11 lb)

Ordering information	Type	Order No.
ULTRALOG	R&S®HL562E	4100.0007.02
Recommended extras		
Movable Tripod	R&S®HL562Z1	4041.3900.02



R&S®AD033V3 Omnidirectional UHF Antenna

225 MHz to 450 MHz

Compact UHF transmitting/receiving antenna for
naval applications



The R&S®AD033V3 is an omnidirectional UHF antenna for naval applications. The antenna can be used for transmitting or for receiving only.

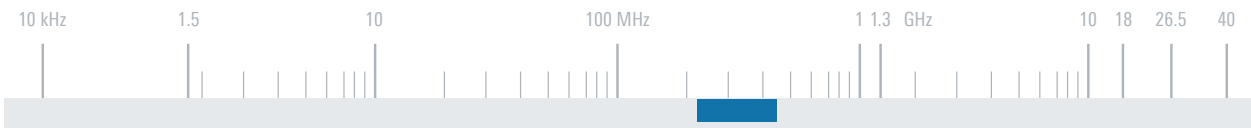
Eight vertically polarized dipoles are circularly arranged around a center support structure and combined to one output, resulting in an excellent omnidirectional behavior.

The R&S®AD033V3 can fit around mast diameters of up to 670 mm. The antenna is delivered in two prefitted half-shells for easy mounting to existing masts. Even refitting to existing ship structures is possible.

Key facts

- Excellent omnidirectionality
- High input power for simultaneous use of multiple radio lines
- Stackable antenna design
- Reduced RCS
- Protected against lightning strikes by DC grounding
- For naval applications

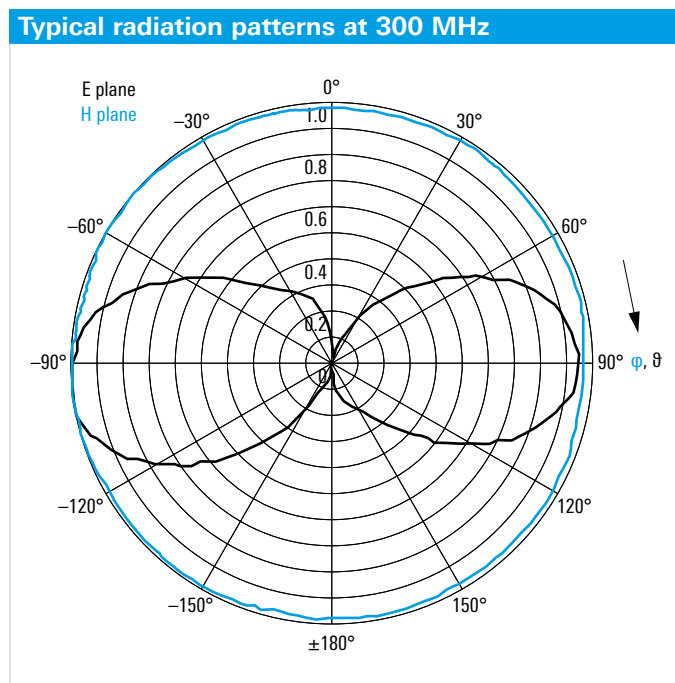
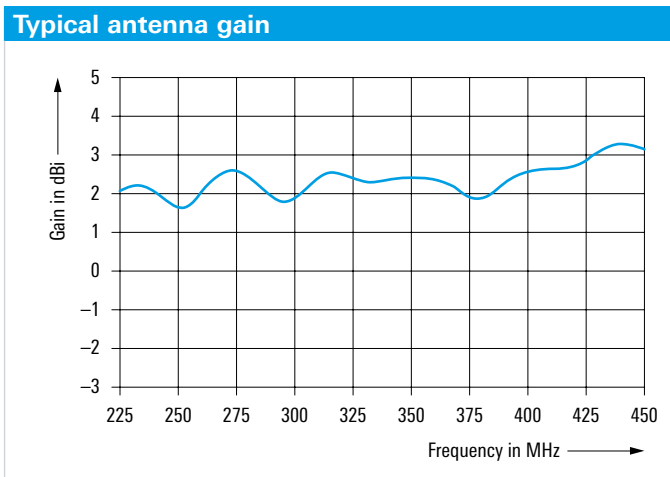




Specifications	
Frequency range	225 MHz to 450 MHz
Connector	7/16 (female), 50 Ω
VSWR	2.0 (typ.)
Gain	2 dBi (typ.)
Polarization	linear, vertical
Polarization decoupling	≥ 20 dB
Input power	max. 600 W CW
Azimuth pattern	omnidirectional
Max. deviation from circularity	< ±0.75 dB (typ.)

Operating temperature range	-30°C to +55°C
Max. permissible wind speed	275 km/h (without ice deposit) 180 km/h (with 30 mm ice deposit)
Dimensions	
Diameter × height	approx. 1270 mm × 1000 mm (50 in × 39.4 in)
Inner diameter	approx. 670 mm (26.4 in)
Weight	approx. 85 kg (187.4 lb)

Ordering information	Type	Order No.
Omnidirectional UHF Antenna, color: squirrel gray (RAL7000)	R&S®AD033V3	4091.0004.02



R&S®AD066FW Broadband VHF/UHF Communications Antenna System



118 MHz to 453 MHz

Compact VHF/UHF transmitting/receiving antenna system for naval applications

The R&S®AD066FW is an omnidirectional VHF/UHF antenna system for naval applications. The system can be used for transmitting or for receiving only.

The R&S®AD066FW consists of the R&S®AD066F broadband VHF/UHF communications antenna, the R&S®FT066F beamforming network and the applicable R&S®AD066FW-K cable sets.

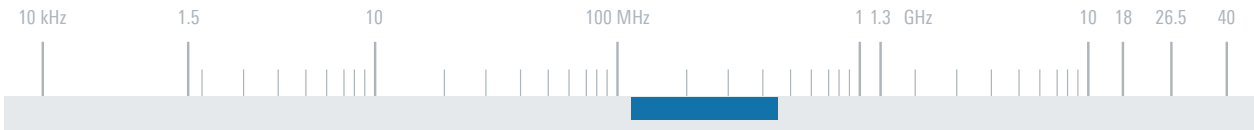
Eight vertically polarized dipoles are circularly arranged around a center support structure and combined by the beamforming network (BFN) to one output, resulting in an excellent omnidirectional behavior. The beamforming network can also be custom-designed to meet special customer requirements.

The R&S®AD066FW can fit around mast diameters of up to 700 mm. The antenna is delivered in eight identical segments for easy mounting and servicing.

Key facts

- Wide frequency range
- Excellent omnidirectionality
- High input power for simultaneous use of multiple radio lines
- Stackable antenna design
- Vertical polarization
- Especially designed for operation under harsh environmental conditions

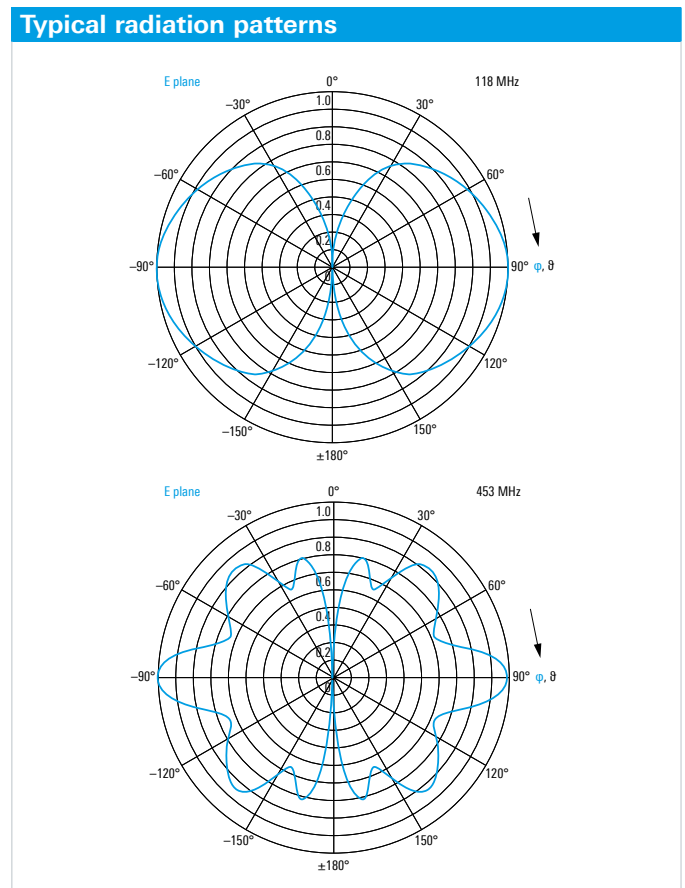
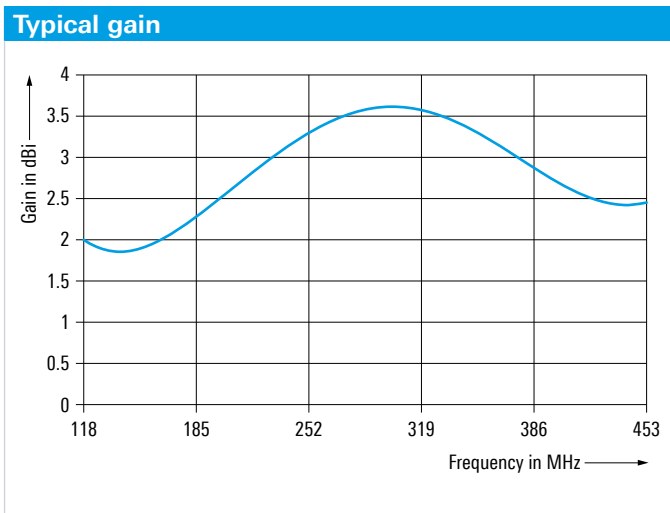




Specifications	
R&S®AD066F	
Frequency range	118 MHz to 453 MHz
Input impedance	50 Ω, unbalanced
VSWR	≤ 2.5:1
Gain	≥ 2.0 dBi
Input power	max. 600 W CW (depending on beamforming network)
Polarization	linear, vertical
Polarization decoupling	> 20 dB
Connectors	N female
Dimensions (Ø × H)	approx. 1.4 m × 1.4 m (4.6 ft × 4.6 ft)
Weight	approx. 145 kg (319.7 lb)

R&S®FT066F	
Dimensions (W × H × L)	approx. 340 mm × 130 mm × 650 mm (13.4 in × 5.1 in × 25.6 in)
Weight	approx. 27 kg (59.5 lb)
R&S®AD066FW	
Connector	N female
MTBF	> 150 000 h
Operating temperature range	-30°C to +70°C
Storage temperature range	-40°C to +70°C
Max. wind speed	200 km/h (without ice deposit)

Ordering information	Type	Order No.
Broadband VHF/UHF Communications Antenna System		
Broadband VHF/UHF Communications Antenna	R&S®AD066F	4090.0000.02
Beamforming Network for R&S®AD066F	R&S®FT066F	4090.3500.02
Cable Sets for R&S®AD066F (model depends on application)	R&S®AD066FW-K	4090.1707.xx



R&S®AD066ST UHF Omnidirectional Antenna

225 MHz to 400 MHz

For naval UHF communications



The vertically polarized R&S®AD066ST UHF omnidirectional antenna covers the frequency range from 225 MHz to 400 MHz. Four dedicated receive/transmit systems with up to 200 W transmitter power each can be used with the antenna. Due to the antenna's decoupling characteristics, particularly between its upper and lower part, it can be operated in receive and transmit mode even with close frequencies.

The R&S®AD066ST is characterized by very good omnidirectional characteristics and a high gain.

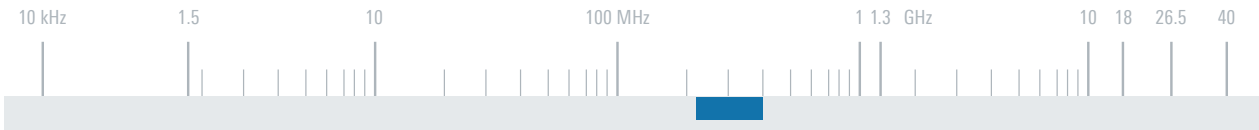
The antenna's mechanical design is optimized for employment under tough environmental conditions, e.g. on board ships.

Key facts

- Four individually accessible dipoles
- High decoupling between individual dipoles
- For naval applications
- Ruggedized design for harsh environmental conditions



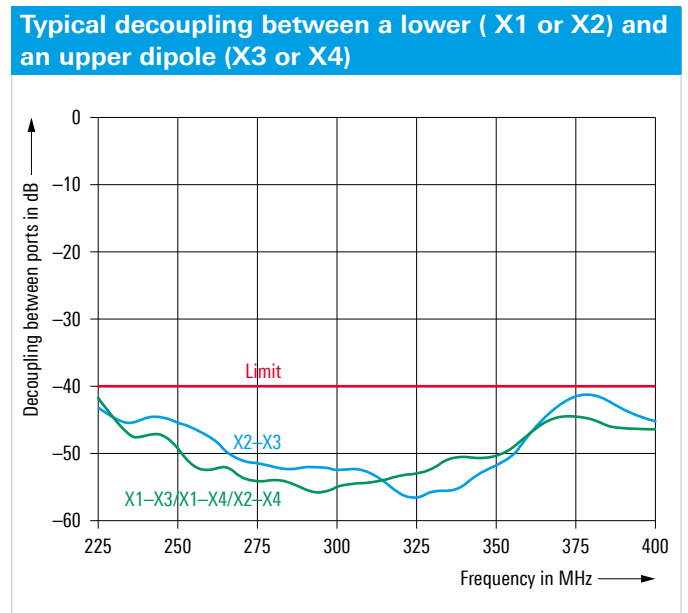
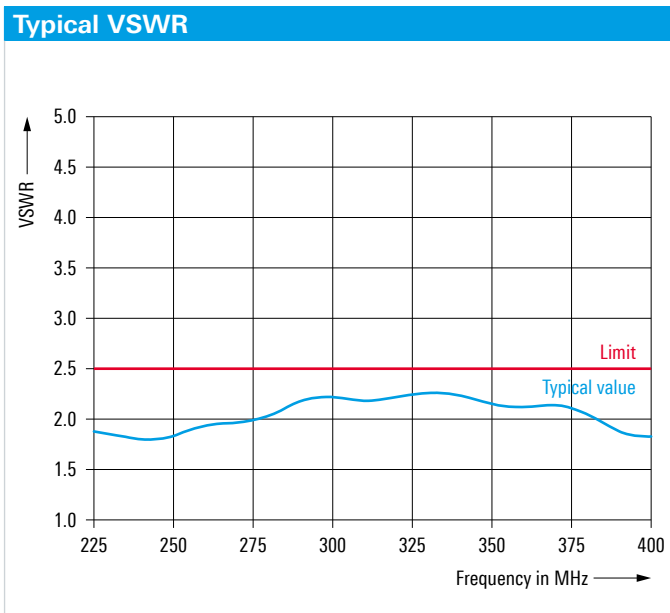
New



Specifications	
Frequency range	225 MHz to 400 MHz
Polarization	linear, vertical
Nominal impedance	50 Ω
VSWR	< 2.5
Gain	1.5 dBi (typ.)
Polarization decoupling	> 20 dB
Decoupling	
Between lower two dipoles	> 27 dB
Between upper two dipoles	> 27 dB
Between lower and upper dipoles	> 40 dB

Radiation pattern	horizontal: omnidirectional
Maximum input power	4 times 200 W CW
RF connector	4 N sockets
MTBF	> 100 000 h
Operating temperature range	-30°C to +70°C
Max. wind speed	275 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 0.13 m (radome) × 5.4 m (0.4 ft × 17.7 ft)
Weight	approx. 85 kg (187.4 lb)

Ordering information	Type	Order No.
UHF Omnidirectional Antenna	R&S®AD066ST	4095.7003.02



R&S®HK001E

UHF Coaxial Dipole

225 MHz to 450 MHz

UHF omnidirectional antenna for vertical polarization



The R&S®HK001E UHF coaxial dipole is a vertically polarized, omnidirectional antenna for fixed and mobile applications, particularly for use on board ships. It is suitable for both transmission and reception.

A mast stub mounted on the dipole's base plate provides a convenient antenna interface for customer applications.

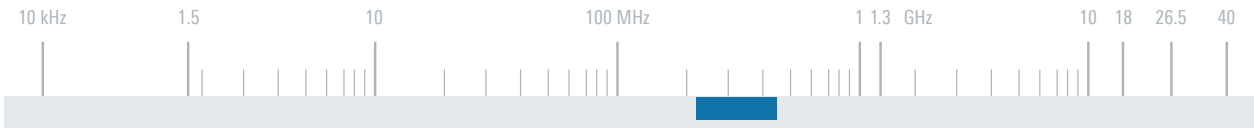
The entire antenna system is splash water resistant.

The antenna can also be fitted upside down, if required.

Key facts

- Ideal for military aeronautical radio
- Particularly for use on ships
- RCS optimized
- Rugged design
- Minimal wind load
- High protection against lightning strikes in the vicinity



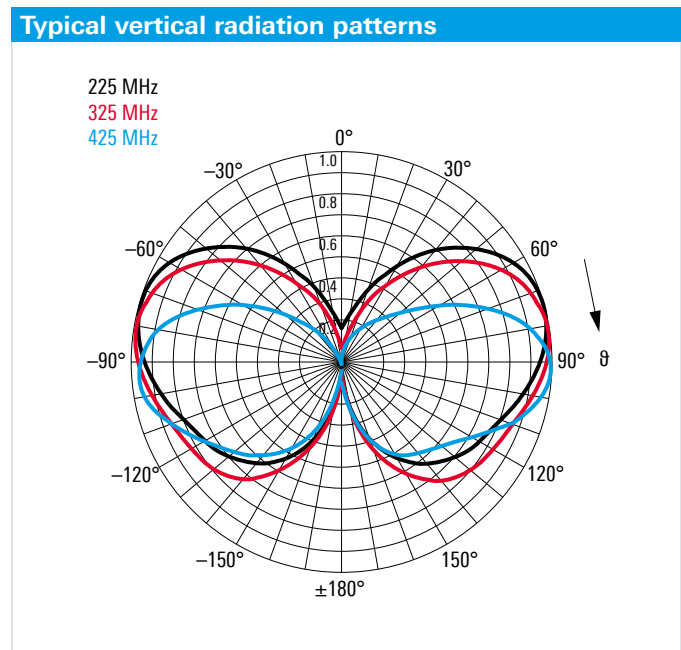
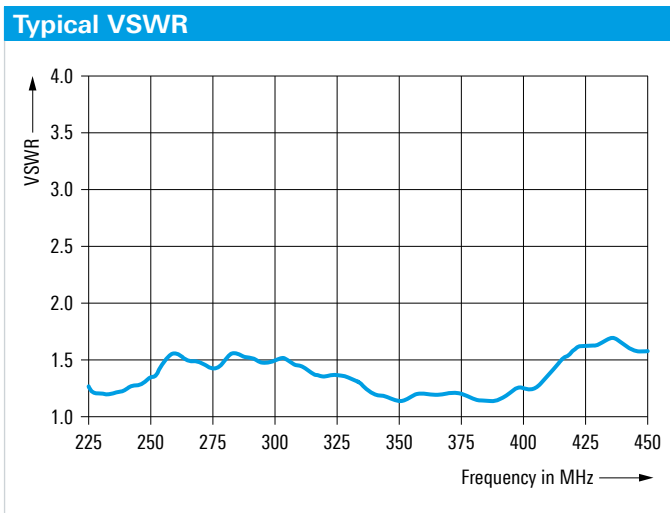


2

Specifications	
Frequency range	225 MHz to 450 MHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	≤ 2
Max. input power	400 W CW
Gain	2 dBi (typ.)
Horizontal radiation pattern	omnidirectional
Uncircularity	±0.5 dB (typ.)

RF connector	N female
MTBF	> 150 000 h
Operating temperature range	-40°C to +70°C
Max. wind speed	275 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 400 mm × 810 mm (15.8 in × 31.9 in)
Weight	approx. 3 kg (6.6 lb)

Ordering information	Type	Order No.
UHF Coaxial Dipole, color: squirrel gray (RAL7000)	R&S®HK001E	4095.1005.02
Recommended extras		
Mast, length: 6 m, pluggable	R&S®KM011	0273.9116.02



R&S®HK012E

VHF Coaxial Dipole



100 MHz to 174 MHz

VHF omnidirectional antenna for vertical polarization

The R&S®HK012E VHF coaxial dipole is a vertically polarized, omnidirectional antenna for fixed and mobile applications, particularly for use on board ships. It is suitable for both transmission and reception.

A mast stub mounted on the dipole's base plate provides a convenient antenna interface for customer applications.

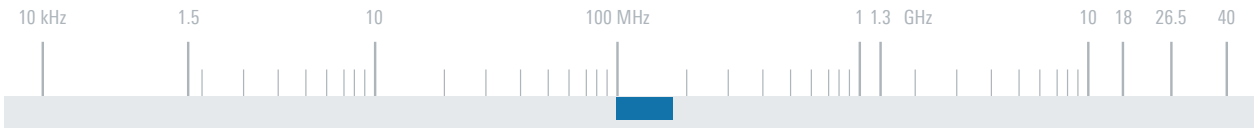
The entire antenna system is splash water resistant.

The antenna can also be fitted upside down, if required.

Key facts

- Ideal for military aeronautical radio
- Particularly for use on ships
- RCS optimized
- Rugged design
- Minimal wind load
- High protection against lightning strikes in the vicinity

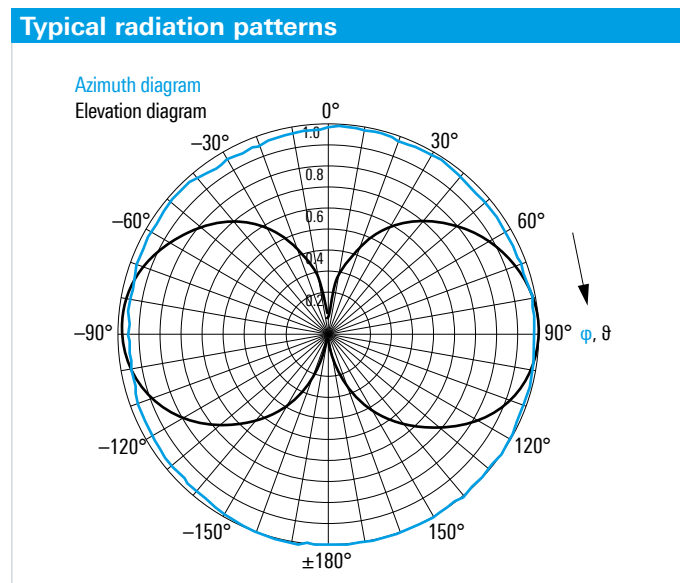
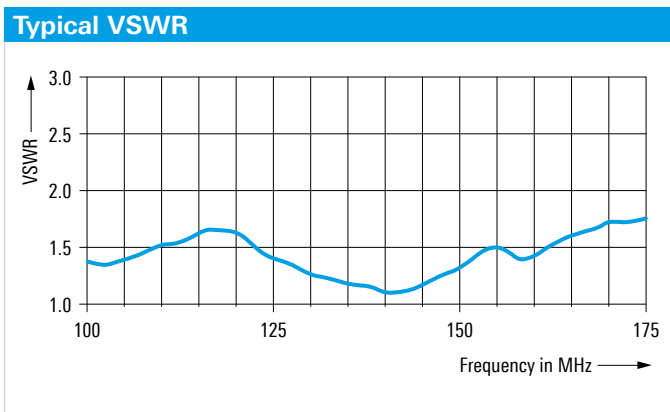




Specifications	
Frequency range	100 MHz to 174 MHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	≤ 2
Max. input power	400 W CW
Gain	2 dBi (typ.)
Horizontal radiation pattern	omnidirectional
Uncircularity	±0.5 dB (typ.)

RF connector	N female
MTBF	> 150 000 h
Operating temperature range	-40°C to +70°C
Max. wind speed	275 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 500 mm × 1450 mm (19.7 in × 57.1 in)
Weight	approx. 6 kg (13.2 lb)

Ordering information	Type	Order No.
VHF Coaxial Dipole, color: squirrel gray (RAL7000)	R&S®HK012E	4095.3008.02
Recommended extras		
Mast, length: 6 m, pluggable	R&S®KM011	0273.9116.02



R&S®HK014E

VHF/UHF

Coaxial Dipole

100 MHz to 2 GHz

VHF/UHF omnidirectional antenna for vertical polarization



The R&S®HK014E VHF/UHF coaxial dipole is a vertically polarized, omnidirectional antenna for fixed and mobile applications, particularly for use on board ships. It is suitable for both transmission and reception.

At mast stub mounted on the dipole's base plate provides a convenient antenna interface for customer applications.

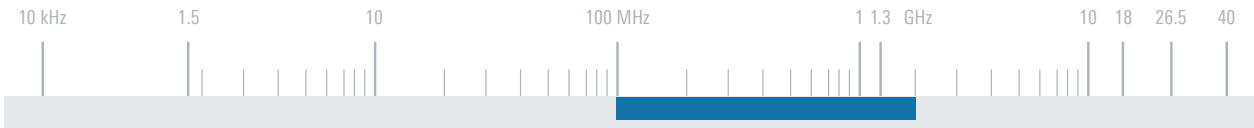
The entire antenna system is splash water resistant.

The antenna can also be fitted upside down, if required.

Key facts

- ▮ Extremely wide frequency range
- ▮ High suppression of skin currents
- ▮ Filled-in vertical radiation pattern
- ▮ High protection against lightning strikes in the vicinity
- ▮ Sturdy design
- ▮ RCS optimized
- ▮ Minimal wind load
- ▮ Particularly for use on ships

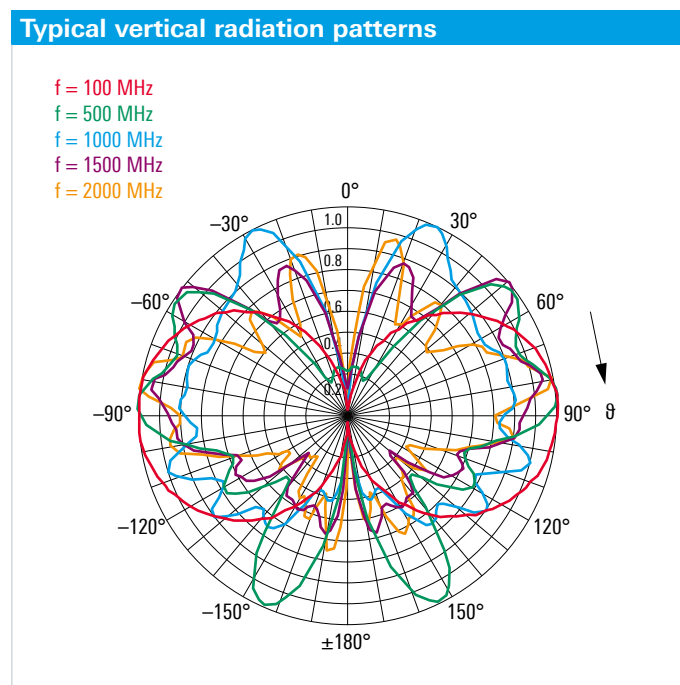
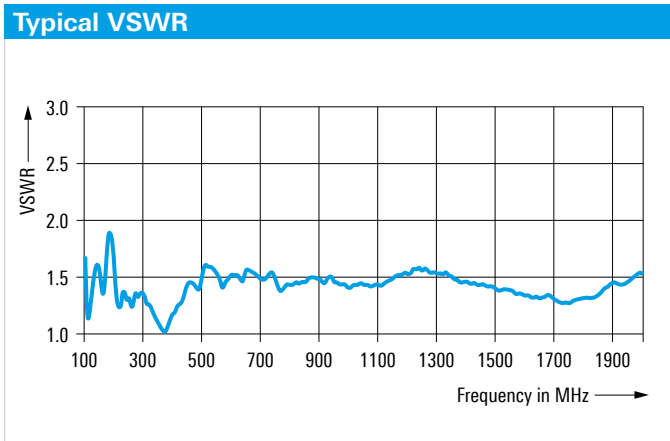




Specifications	
Frequency range	100 MHz to 2 GHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	< 2 (typ.)
Permissible input power	
Up to 200 MHz	1000 W CW
Up to 500 MHz	600 W CW
Up to 1.3 GHz	400 W CW
Up to 2 GHz	300 W CW
Gain	2 dBi (typ.)

Horizontal radiation pattern	omnidirectional
Uncircularity	±1 dB (typ.)
Connector	N female
MTBF	> 150 000 h
Operating temperature range	-40°C to +70°C
Max. wind speed	275 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 500 mm × 1400 mm (19.7 in × 55.1 in)
Weight	approx. 15 kg (33.1 lb)

Ordering information	Type	Order No.
VHF/UHF Coaxial Dipole, color: squirrel gray (RAL7000)	R&S®HK014E	4095.5000.02
Recommended extras		
Diplexer for the ranges 100 MHz to 174 MHz/225 MHz to 450 MHz	R&S®FT224	0525.5117.04



R&S®HK033

VHF/UHF

Coaxial Dipole

80 MHz to 2 GHz

Extremely broadband vertical coaxial dipole especially for use on board ships



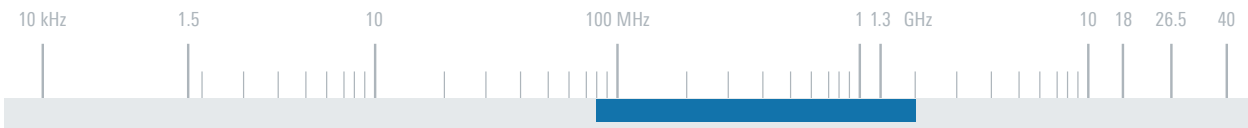
The R&S®HK033 VHF/UHF coaxial dipole is a very broadband omnidirectional antenna for vertically polarized signals.

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

Its rugged design, low wind load and integrated lightning protection make the R&S®HK033 ideal for use on board ships.

Key facts

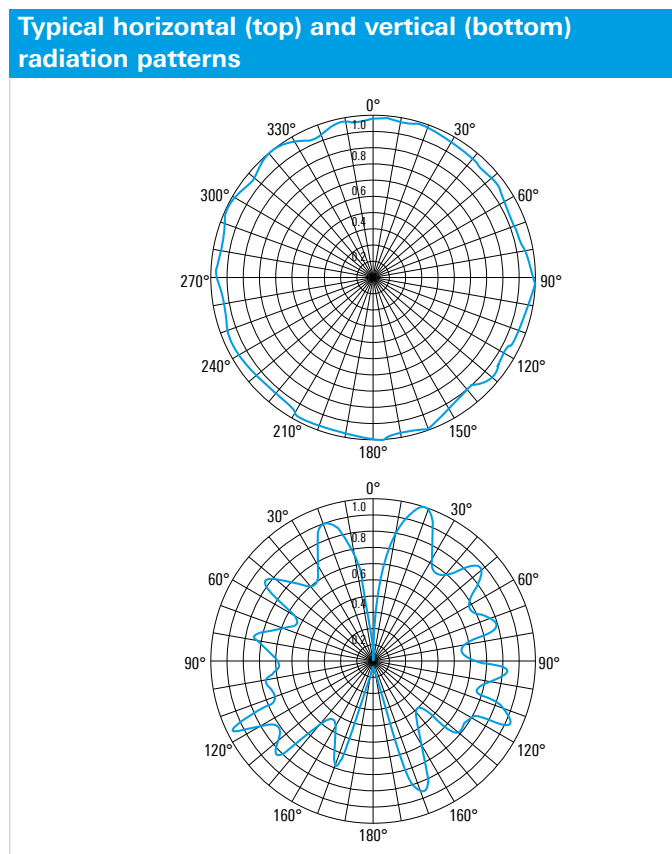
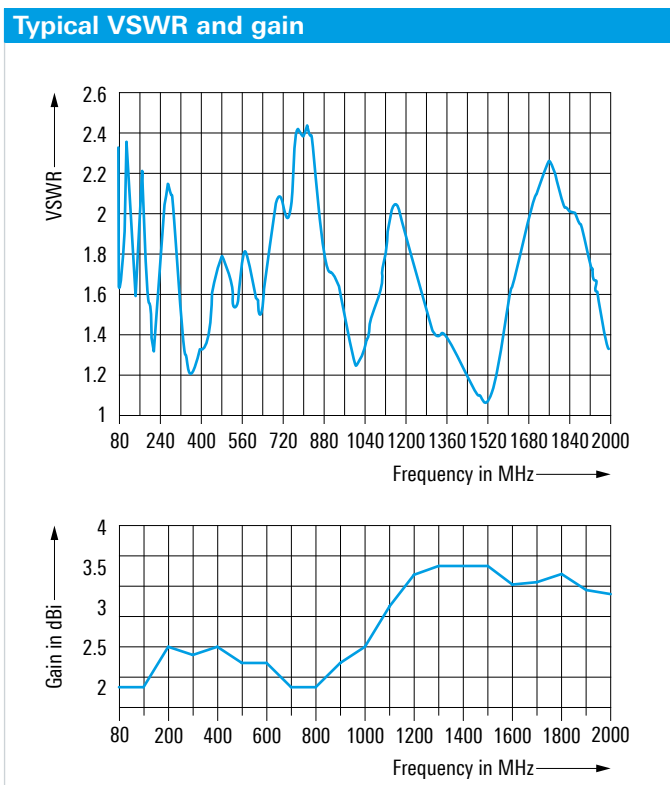
- Extremely broadband
- Protection against lightning strikes
- Very low wind load
- Rugged mechanical design
- Low weight
- Ideal for aeronautical radio and monitoring applications



Specifications	
Frequency range	80 MHz to 2 GHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	< 2.4 (typ.)
Max. input power	
100 MHz	860 W + 100% AM
400 MHz	430 W + 100% AM
600 MHz	360 W + 100% AM
1000 MHz	270 W + 100% AM
> 1300 MHz	240 W + 100% AM

Gain	2 dBi (typ.)
Horizontal radiation pattern	omnidirectional
Max. deviation from circularity	±1 dB
Connector	N female
MTBF	> 1000000 h
Operating temperature range	-40°C to +85°C
Max. permissible wind speed	240 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 310 mm × 1250 mm (12.2 in × 49.2 in)
Weight	approx. 6 kg (13.2 lb)

Ordering information	Type	Order No.
VHF/UHF Coaxial Dipole	R&S®HK033	4062.8369.02
Recommended extras		
Diplexer for the ranges from 100 MHz to 162 MHz/225 MHz to 450 MHz	R&S®FT224	0525.5117.03
Mast, length: 6 m, pluggable	R&S®KM011	0273.9116.02
Mast Adapter	R&S®KM011Z2	4022.3608.02



R&S®HK055S1 Omnidirectional Broadband Antenna

27.5 MHz to 600 MHz

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



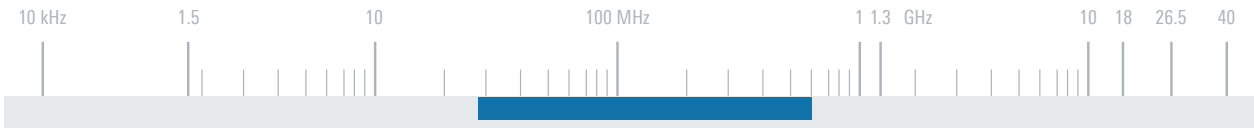
The R&S®HK055S1 omnidirectional broadband antenna covers the extremely wide frequency range from 27.5 MHz to 600 MHz.

It is designed for stationary transmission and reception and can be used for many types of communications and for monitoring tasks.

The antenna features outstanding characteristics; no tuning equipment is required, making it ideal for hopping and for multichannel operation.

Key facts

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

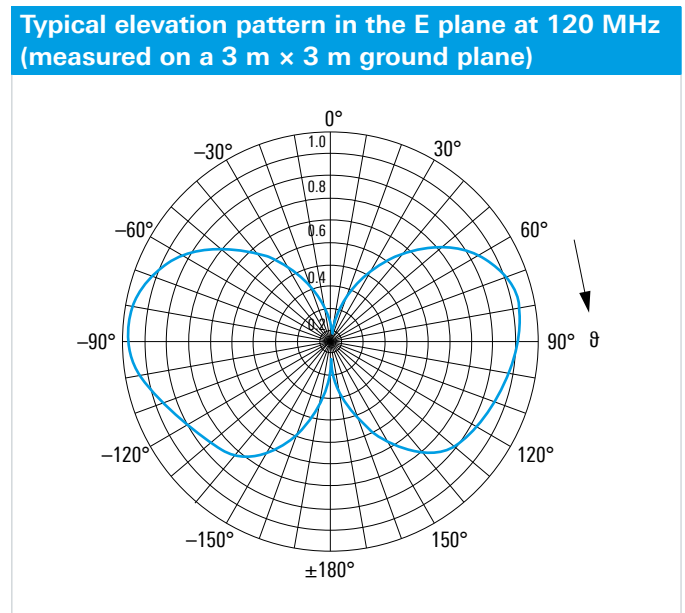
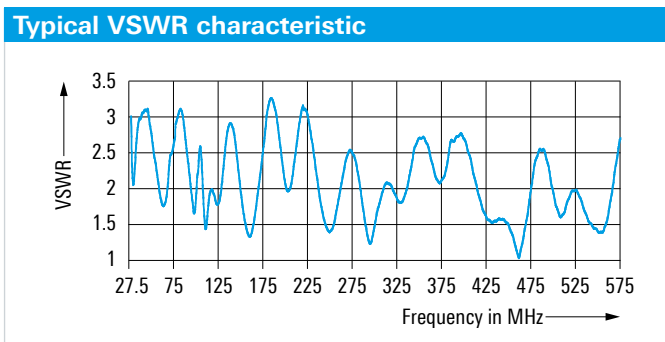


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Specifications	
Frequency range	27.5 MHz to 600 MHz
Polarization	vertical
Input impedance	50 Ω
VSWR	< 3.0 (measured on a 3 m × 3 m ground plane)
Gain	
27.5 MHz to 110 MHz	-1 dBi to +2 dBi (typ.) (measured on a 3 m × 3 m ground plane)
110 MHz to 600 MHz	0 dBi to +2 dBi (typ.) (measured under free-space conditions)
Azimuth pattern	omnidirectional
Max. deviation from circularity	±1 dB

Elevation pattern	
< 110 MHz	monopole-like
> 110 MHz	dipole-like
Input power	max. 100 W CW (≥ 30 MHz), max. 50 W CW (< 30 MHz)
Connector	N female
MTBF	> 300 000 h
Operating temperature range	-40°C to +85°C
Permissible wind speed	200 km/h
Dimensions (Ø × L)	approx. 165 mm × 1585 mm (6.5 in × 62.4 in)
Weight	approx. 12 kg (26.5 lb)

Ordering information	Type	Order No.
Omnidirectional Broadband Antenna		
Color: sand yellow (RAL 1002)	R&S®HK055S1	4067.0443.04
Color: silver gray (RAL 7001)	R&S®HK055S1	4067.0443.05
Color: light gray (RAL 7035)	R&S®HK055S1	4067.0443.06
Recommended extras		
VHF/UHF Triplexer	R&S®FT255	4077.9508.02



R&S®HK055L1 Broadband Mobile Antenna

27.5 MHz to 600 MHz

Compact transmitting/receiving antenna specially designed for operation on vehicles



The R&S®HK055L1 broadband mobile antenna covers the extremely wide frequency range from 27.5 MHz to 600 MHz.

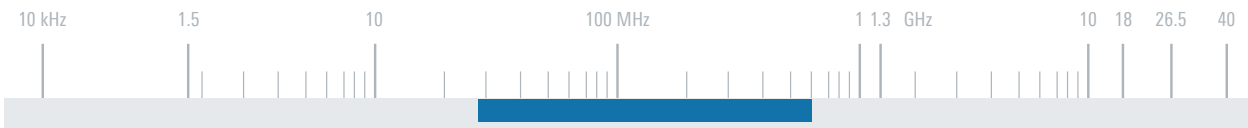
It is designed for mobile transmission and reception in connection with MMRs.

The antenna features outstanding characteristics; no tuning equipment is required, making it ideal for hopping and for multichannel operation.

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

Key facts

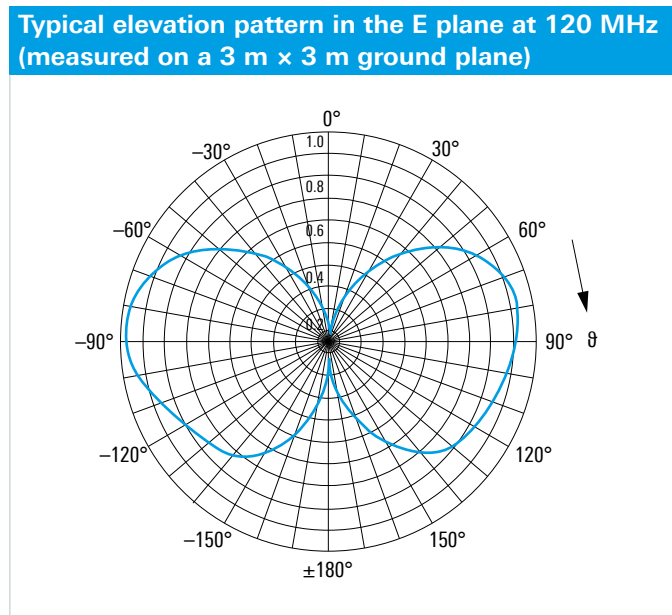
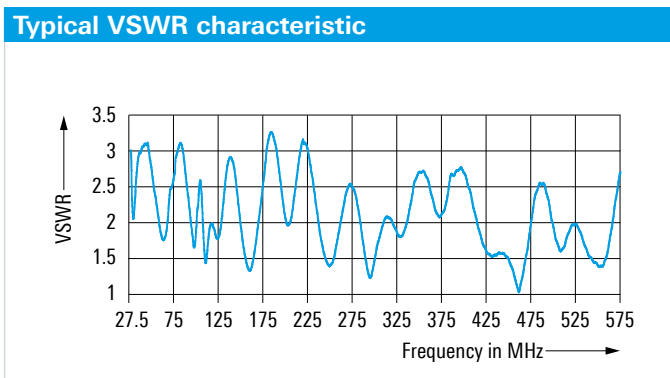
- Extremely wide frequency range
- Compact dimensions
- High efficiency
- Rugged design especially for rough handling on board vehicles
- Wide operating temperature range
- Especially suitable for multiband multirole radios (MMRs)



Specifications	
Frequency range	27.5 MHz to 600 MHz
Polarization	vertical
Input impedance	50 Ω
VSWR	< 3.0 (measured on a 3 m × 3 m ground plane)
Gain	
27.5 MHz to 110 MHz	-1 dBi to +2 dBi (typ.) (measured on a 3 m × 3 m ground plane)
110 MHz to 600 MHz	0 dBi to +2 dBi (typ.) (measured under free-space conditions)
Azimuth pattern	omnidirectional
Max. deviation from circularity	±1 dB

Elevation pattern	
< 110 MHz	monopole-like
> 110 MHz	dipole-like
Input power	max. 100 W CW (≥ 30 MHz), max. 50 W CW (< 30 MHz)
MTBF	> 200 000 h
Connector	N female
Operating temperature range	-40°C to +85°C
Permissible wind speed	200 km/h
Dimensions (Ø × L)	approx. 165 mm × 1528 mm (6.5 in × 60.2 in)
Weight	approx. 22 kg (48.5 lb)

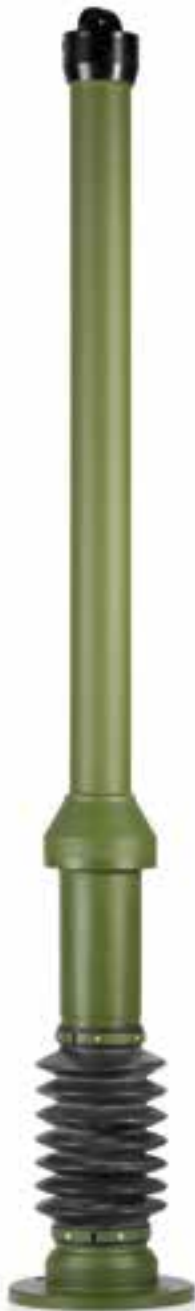
Ordering information	Type	Order No.
Broadband Mobile Antenna		
Color: green (CARC 383)	R&S®HK055L1	4067.0014.06
Color: sand yellow (RAL 1002)	R&S®HK055L1	4067.0014.05
Recommended extras		
VHF/UHF Triplexer	R&S®FT255	4077.9508.02



R&S®HK056 Broadband Mobile Antenna

600 MHz to 3 GHz

Compact transmitting/receiving antenna specially designed for operation on vehicles



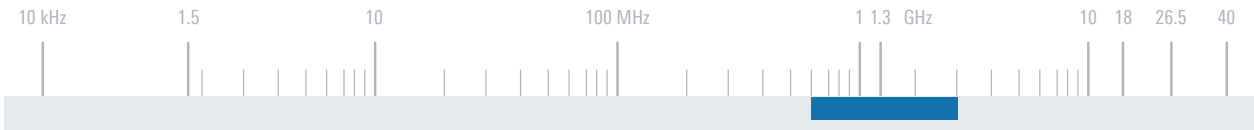
The R&S®HK056 broadband mobile antenna is designed for mobile and semi-stationary communications tasks.

The antenna elements are integrated in a highly weather-resistant radome and are connected to the antenna base via a spring element with a tilt and erect function.

The antenna is installed using a four-hole NATO flange, which provides for easy integration in numerous existing systems.

Key facts

- Extremely wide frequency range
- High efficiency
- Excellent radiation characteristics
- For use in harsh environments
- Wide operating temperature range

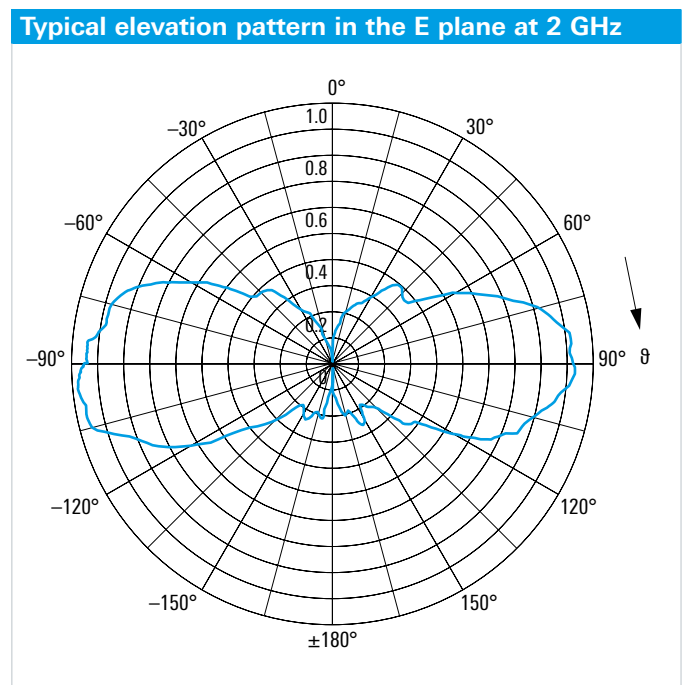
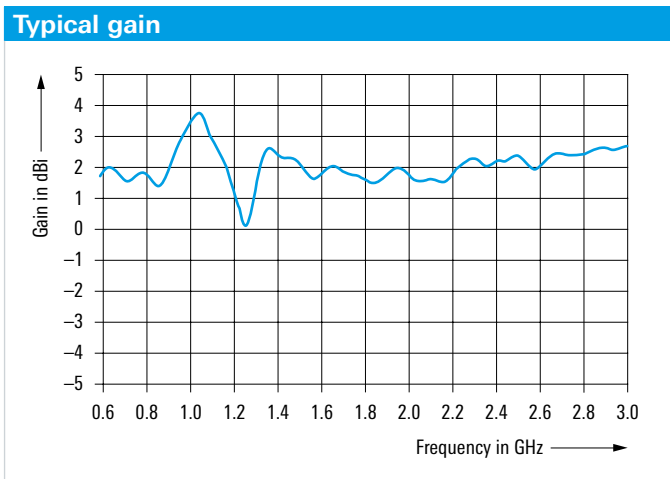


2

Specifications	
Frequency range	600 MHz to 3 GHz
Connector	N female, 50 Ω
VSWR	< 3.0 (typ.), peaks up to 3.5
Gain	2 dBi (typ.) (see diagram)
Polarization	vertical
Azimuth pattern	omnidirectional
Max. deviation from circularity	±1 dB
Elevation pattern	dipole-like

Input power	max. 100 W CW
Safety class	IP67 (in line with EN 60529)
Operating temperature range	-40°C to +70°C
Dimensions	
Diameter × length	approx. 46 mm × 968 mm (1.8 in × 38.1 in)
Flange diameter	approx. 140 mm (5.5 in)
Weight	approx. 3.5 kg (7.7 lb)

Ordering information	Type	Order No.
Broadband Mobile Antenna, color: green (CARC383)	R&S HK056	4067.4403.03



R&S®HK060 Broadband Manpack Antenna

30 MHz to 513 MHz

Reliable communications in VHF and UHF frequency bands for manpack radios

New



The R&S®HK060 broadband manpack antenna is a vertically polarized omnidirectional receive and transmit antenna specially designed for portable radios. Its extremely broad frequency range from 30 MHz to 513 MHz makes it the ideal antenna for multiband/multirole radios (MMRs).

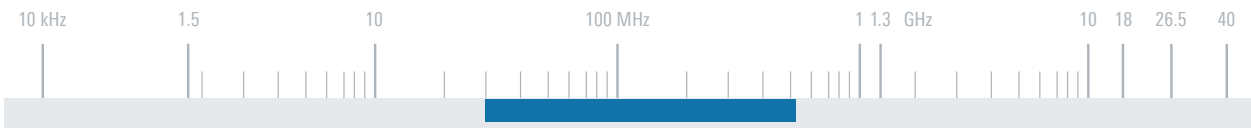
The R&S®HK060 is equipped with a highly flexible bending mechanism allowing the antenna to be bent in almost every direction, e.g.:

- If you pass underneath low overhangs, it bends back and reerects itself automatically
- If you bend the antenna twice by 180°, the length of the antenna can be reduced to approx. 60 cm for transportation

Key facts

- Extremely broad frequency range
- Good form factor
- Very good radiation characteristics
- Optimized impedance matching
- Sturdy construction
- Foldable for transportation
- Designed to bend and reerect itself

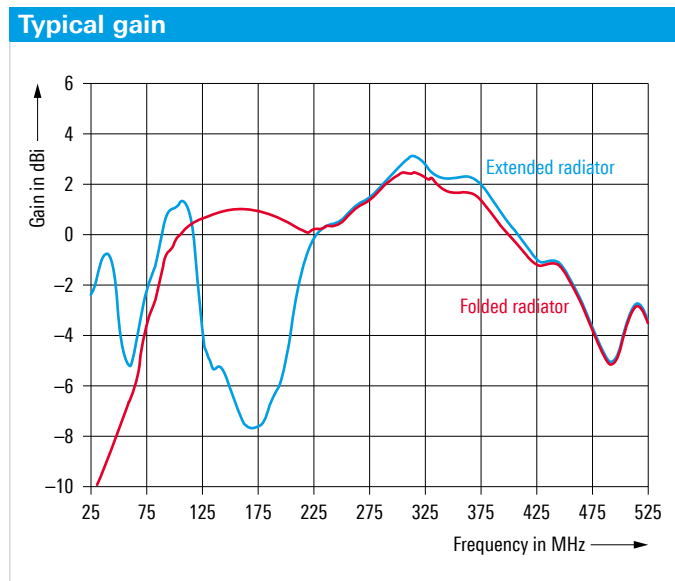
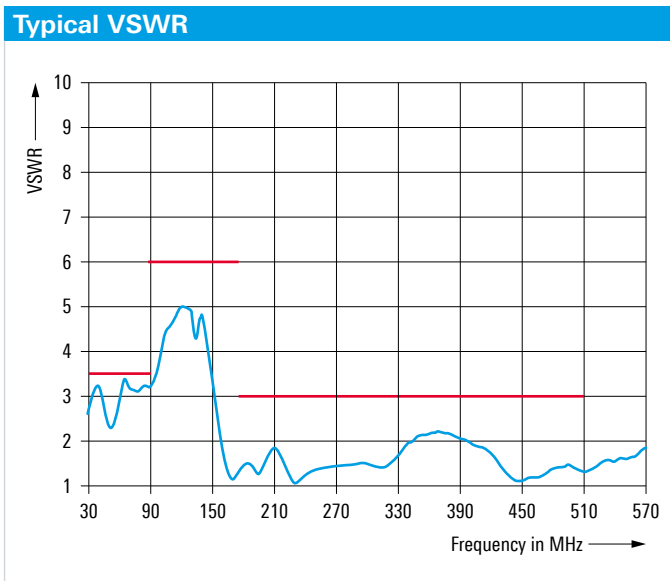




Specifications	
Frequency range	30 MHz to 513 MHz
Input impedance	50 Ω
RF connectors	on request
VSWR	< 3 (typ.)
30 MHz to 88 MHz	< 3.5
88 MHz to 175 MHz	< 6.0
175 MHz to 513 MHz	< 3.0
Gain	
30 MHz to 88 MHz	-2 dBi (typ.)
200 MHz to 513 MHz	0 dBi (typ.)
Polarization	linear vertical
Radiation pattern	horizontal: omnidirectional

Maximum input power	
30 MHz to 88 MHz	20 W CW
88 Hz to 400 MHz	15 W CW
> 400 MHz	10 W CW
MTBF	> 150000 h
Operating temperature range	-40°C to +71°C
Storage temperature range	-50°C to +80°C
Dimensions (Ø × L)	
Unbent	approx. 35 mm × 1350 mm (1.4 in × 53.1 in)
Bent for transportation	approx. 35 mm × 600 mm (1.4 in × 23.6 in)
Weight	approx. 0.7 kg (1.5 lb)

Ordering information	Type	Order No.
Broadband Manpack Antenna, color: black	R&S®HK060	4075.7008.02



R&S®HK061

Vehicular Broadband Communications Antenna



30 MHz to 600 MHz

Compact transmitting/receiving antenna specially designed for operation on vehicles



The R&S®HK061 vehicular broadband communications antenna is designed for mobile and semi-stationary communications tasks.

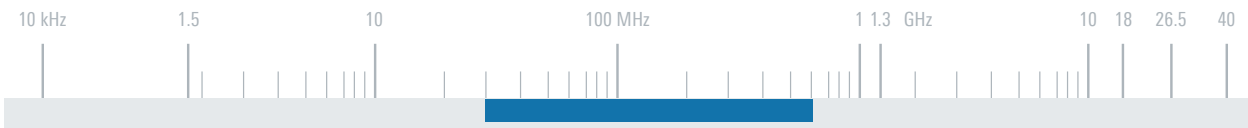
The antenna elements are integrated in a highly weather-resistant radome and are connected to the antenna base via a spring element with a tilt and erect function

The R&S®HK061 has passed the oak beam impact test.

The antenna is installed using a four-hole NATO flange, which provides for easy integration in numerous existing systems.

Key facts

- Extremely wide frequency range
- Inconspicuous design, favorable form factor
- High efficiency
- Excellent radiation characteristics
- For use in harsh environments
- Wide operating temperature range

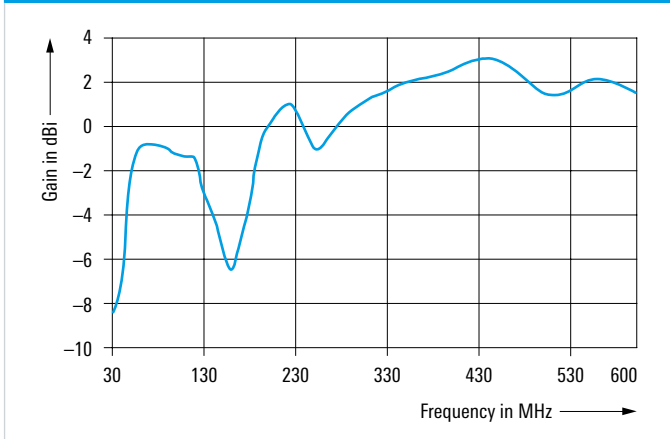


Specifications	
Frequency range	30 MHz to 600 MHz
Connector	N female, 50 Ω
VSWR (measured on a 3 m × 3 m ground plane)	< 3.0 (typ.), peaks up to 3.5
Gain	see diagram
Azimuth pattern	omnidirectional
Max. deviation from circularity	±1 dB
Elevation pattern	
< 170 MHz	monopole-like
> 170 MHz	dipole-like

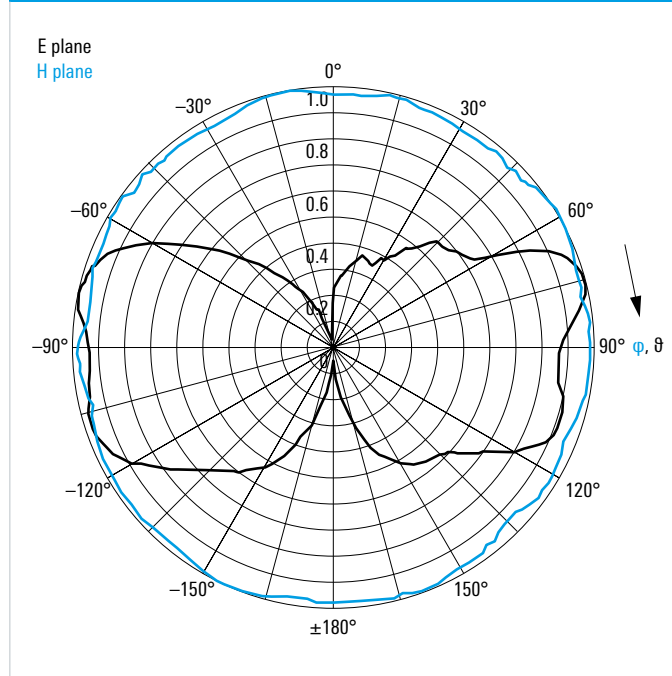
Input power	max. 100 W CW
Safety class	IP67 (in line with EN 60529)
Operating temperature range	-40°C to +71°C
Dimensions	
Length	approx. 2200 mm (86.6 in)
Radome diameter	approx. 40 mm (1.6 in)
Flange diameter	approx. 140 mm (5.5 in)
Weight	approx. 8 kg (17.6 lb)

Ordering information	Type	Order No.
Vehicular Broadband Communications Antenna		
Color: green (CARC383)	R&S®HK061	4076.0007.02
Color: sand yellow (RAL1002)	R&S®HK061	4076.0007.03
Color: squirrel gray (RAL7000)	R&S®HK061	4076.0007.04
Recommended extras		
VHF/UHF Triplexer	R&S®FT255	4077.9508.02

Typical gain measured on a 3 m × 3 m ground plane in horizontal direction



Typical patterns at 200 MHz (measured on a 3 m × 3 m ground plane)



R&S®HK353A

VHF/UHF

Omnidirectional ATC Antenna

100 MHz to 156 MHz (VHF)

225 MHz to 400 MHz (UHF)

For air traffic control (ATC)



The R&S®HK353A VHF/UHF omnidirectional ATC antenna is designed for ground-to-air ATC communications. 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.

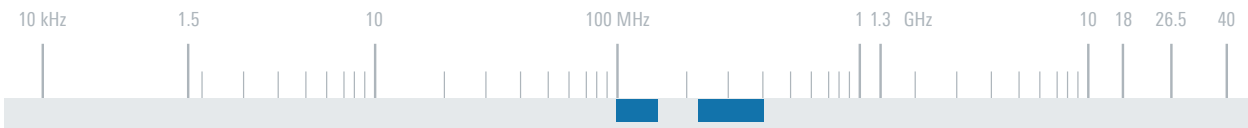
The most important system components are the self-supporting antenna mast, the VHF dipole, the UHF dipole and the specially developed decoupling unit. The coaxial arrangement of the dipoles permits several transmitting and receiving antennas to be set up.

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.

Key facts

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

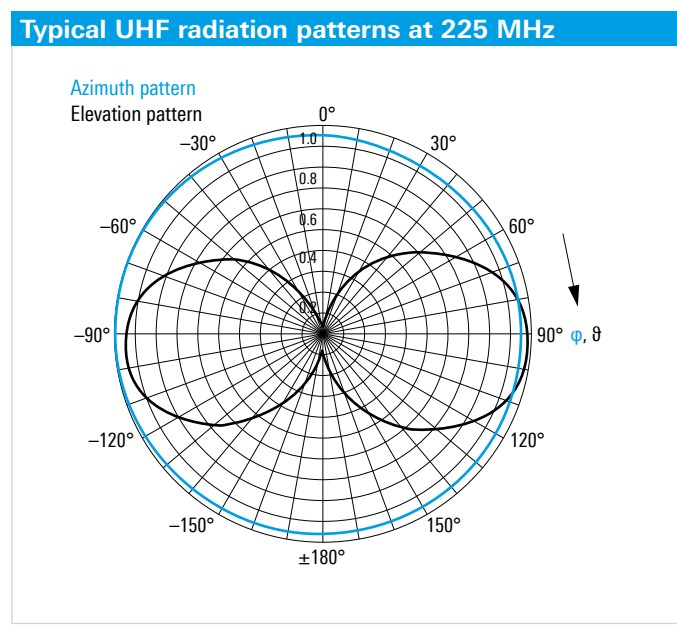
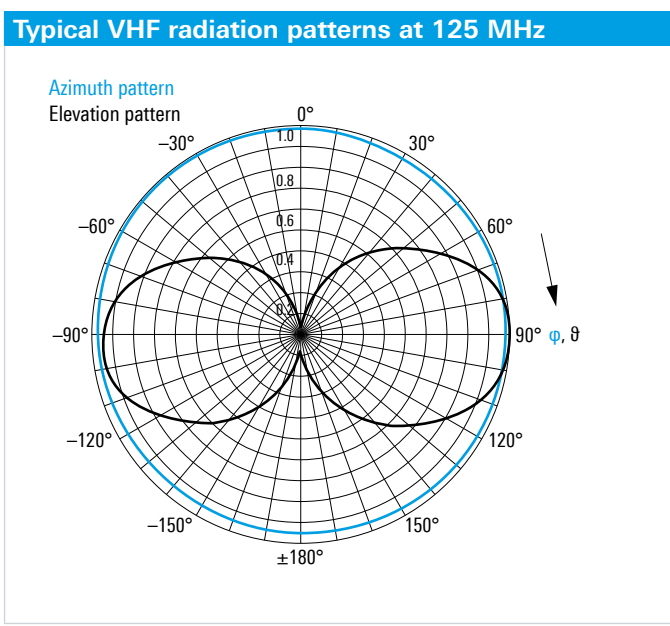




Specifications	
R&S®HK153D2 VHF dipole	
Frequency range	100 MHz to 156 MHz
Polarization	linear/vertical
Max. input power	700 W CW per dipole
Input impedance	50 Ω
VSWR	< 2.5 (with radome)
Gain	> 2 dBi per dipole
Horizontal radiation pattern	omnidirectional
Uncircularity	< ±1 dB
Dimensions (Ø × L)	approx. 250 mm × 1850 mm (9.8 in × 72.8 in)
Weight	approx. 6 kg (13.2 lb)
R&S®HK253D2 UHF dipole	
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 (Ø × L)	approx. 130 mm × 925 mm (5.1 in × 36.4 in)
Weight	approx. 1.6 kg (3.5 lb)
General data	
Max. wind speed	
Without ice deposit	190 km/h
With 50 mm radial ice deposit	177 km/h
MTBF	> 500000 h
Operating temperature range	-30°C to +50°C
Storage temperature range	-40°C to +70°C
Dimensions (Ø × H)	approx. 280 mm × 2 m to 10 m (max.) (11 in × 78.7 in to 393.7 in (max.))
Weight	depends on system configuration

Ordering information	Type	Order No.
VHF/UHF Omnidirectional ATC Antenna	R&S®HK353A	on request



Chapter 3

SHF Antennas

Type	Designation	Page
	R&S°AC008 Microwave directional antenna	118
	R&S°AC090 SHF directional antenna system	120
	R&S°AC300 SHF directional antenna system	122
	R&S°AC308R2 SHF directional antenna	124
	R&S°AC308R3 SHF/EHF directional antenna	126
	R&S°AC025DP Dual-polarized reflector antenna	128
	R&S°HL024A1/S1 Crossed log-periodic antennas	130
	R&S°HL024S2 Crossed log-periodic antenna	132
	R&S°HL024S7 Crossed log-periodic antenna	134
	R&S°HL024S8 Crossed log-periodic antenna	136
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	R&S°HL050/R&S°HL050S1 Log-periodic antennas	140
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	R&S°AC004R1/R&S°AC004L1 Omnidirectional antennas	146
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	R&S°HF907 Double-ridged waveguide horn antenna	154
	R&S°HF907DC SHF directional antenna with downconverter	156

R&S®AC008 Microwave Directional Antenna

1 GHz to 18 GHz/0.85 GHz to 26.5 GHz

Manually or automatically adjustable directional antenna for the detection of RF signals and for field strength measurements



The R&S®AC008 is a manually adjustable directional antenna for mobile applications.

When used with the R&S®RD016 antenna rotator and the R&S®GB016 control unit, the R&S®AC008 can also be automatically positioned in azimuth and elevation.

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

The R&S®AC008 is used for detecting radio signals and for field strength measurements. It can also be directed toward geostationary satellites.

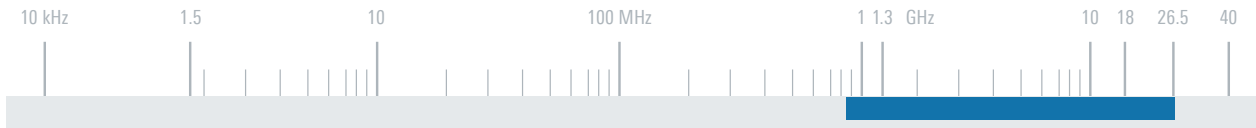
The use of different feeds allows reception of any type of polarization. For transportation, the directional antenna (including the feed) can be collapsed to a handy size.

Key facts

- Wide frequency range
- Reception of linear, dual-linear and circular polarization (depending on feed used)
- Collapsible for easy transport
- Use of active feeds to compensate cable loss possible



R&S®AC008 with R&S®RD016 antenna rotator and R&S®GB016 control unit.



Specifications

Frequency range	1 GHz to 18 GHz (models .02/.04), 0.85 GHz to 26.5 GHz (model .05)
Polarization with feed	
R&S®HL024A1	dual-linear (model .02)
R&S®HL050	linear (model .05)
R&S®HL024S2	linear/circular (model .04)
Input impedance	50 Ω
VSWR	≤ 2.5
Gain	15 dBi to 40 dBi (1 GHz to 18 GHz)

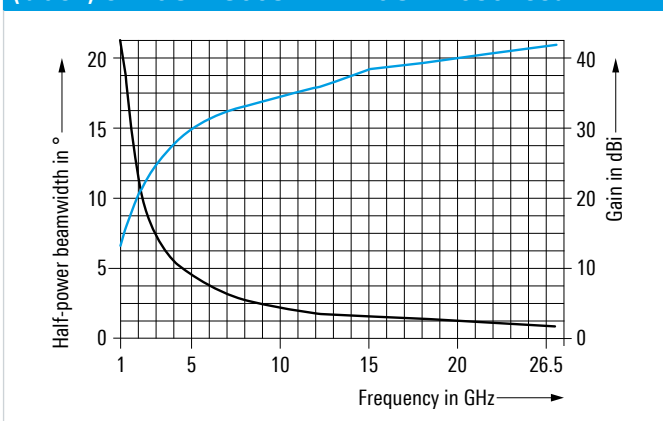
Half-power beamwidth	19° to 1.1° (1 GHz to 18 GHz)
Positioning range	
Azimuth	360°
Elevation	-6° to +44°
Connector	SMA female
MTBF	> 500 000 h
Operating temperature range	-30°C to +50°C
Reflector diameter	approx. 0.9 m (35.4 in)
Weight	approx. 12 kg (26.5 lb)

3

Ordering information

Ordering information	Type	Order No.
Microwave Directional Antenna	R&S®AC008	
1 GHz to 18 GHz, dual-linear polarization		0671.5017.02
1 GHz to 18 GHz, linear/circular polarization		0671.5017.04
0.85 GHz to 26.5 GHz, linear polarization		0671.5017.05
Recommended extras		
Tripod	R&S®AC008-Z	0671.5117.02
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GB016Z1	4056.7270.02
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Telescope	R&S®AC008F1	0751.6919.02
Antenna Rotator	R&S®RD016	4077.9008.02
Control Cable, between R&S®GB016 and R&S®RD016, length: 10 m	R&S®GK016K1	4077.9150.00
High-Resolution Elevation Adjustment Upgrade Kit	R&S®AC008-AZ	4061.2173.00

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



R&S®AC008 with
R&S®AC008-AZ
high-resolution
elevation adjustment
upgrade kit.

R&S®AC090 SHF Directional Antenna System

1 GHz to 18 GHz/0.85 GHz to 26.5 GHz

Extremely broadband directional antenna for radiomonitoring; adjustable in azimuth and elevation



The R&S®AC090 is a stationary directional antenna that can be adjusted in azimuth and elevation.

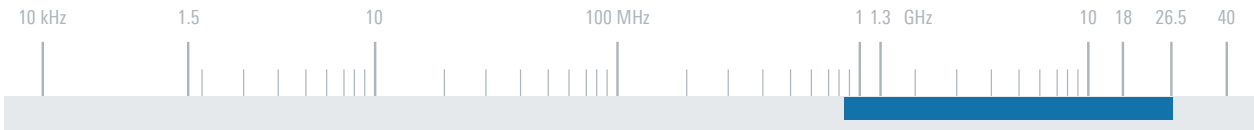
The reflector has a diameter of 0.9 m and – depending on the feed used – receives signals in the range from 1 GHz to 18 GHz or from 0.85 GHz to 26.5 GHz. The frequency range can be extended to up to 40 GHz by using flange-connected options.

The R&S®AC090 is used e.g. for radiomonitoring tasks.

Key facts

- ▀ Extremely broadband without change of feed
- ▀ 0.9 m reflector diameter
- ▀ Adjustable in azimuth and elevation
- ▀ System control via PC user interface
- ▀ Use of R&S®HL050S7 allows preamplifier to be bypassed at high field strengths (also applies to R&S®HL024S7/S8)



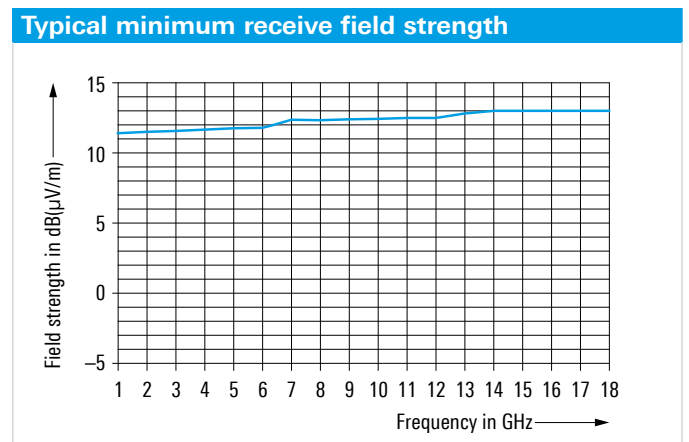
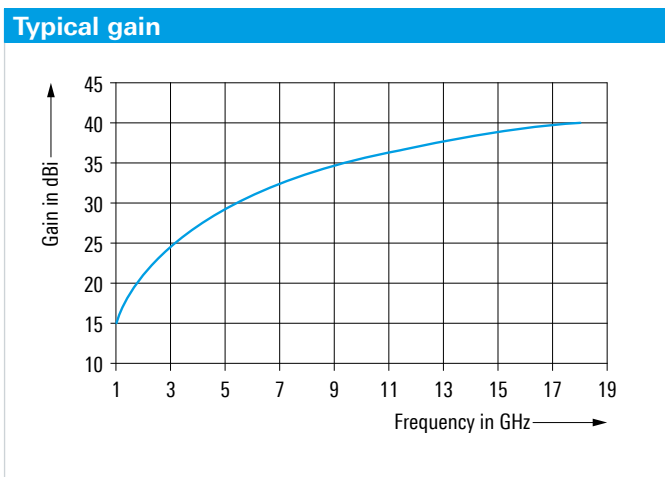


Specifications	
Frequency range (depends on feed)	1 GHz to 18 GHz, 0.85 GHz to 26.5 GHz
Gain	15 dBi to 40 dBi (1 GHz to 18 GHz)
Half-power beamwidth	19° to 1.1° (1 GHz to 18 GHz)
Min. field strength	see diagram
Range of rotation	
Azimuth	±180°
Elevation	-5° to +95°

Speed of rotation	
Azimuth	≥ 5°/s
Elevation	> 1.5°/s; 2°/s (typ.)
Connector	RPC3.5 female
MTBF	> 8000 h
Operating temperature range	-30°C to +50°C
Max. wind speed	180 km/h (without ice deposit)
Reflector diameter	approx. 0.9 m (35.4 in)
Weight	approx. 165 kg (363.8 lb)

3

Ordering information	Type	Order No.
SHF Directional Antenna System	R&S®AC090	4051.4509.00
Feed options (see also pages 130 to 142)		
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz		
Basic model	R&S®HL024S1	4055.1256.02
With passive polarization network	R&S®HL024S2	4052.1003.02
With preamplifier, 1 RF output	R&S®HL024S7	4042.8505.02
With preamplifier, 2 RF outputs	R&S®HL024S8	4042.7509.02
With active polarization network	R&S®HL024S9	4047.6252.02
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz		
Basic model	R&S®HL050S1	4065.0100.02
With preamplifier	R&S®HL050S7	4064.6040.02
Recommended extras		
Reflector Antenna, 18 GHz to 26.5 GHz, 29 dBi to 33 dBi	R&S®AC308R2	4051.6001.02
Reflector Antenna, 26.5 GHz to 40 GHz, 33 dBi to 36 dBi	R&S®AC308R3	4051.6253.02



With R&S®HL024S9 (for a receiver with F = 15 dB, Δf = 1 MHz).

R&S®AC300 SHF Directional Antenna System

1 GHz to 18 GHz/0.85 GHz to 26.5 GHz

Extremely broadband directional antenna for radiomonitoring; adjustable in azimuth and elevation



The R&S®AC300 is a stationary directional antenna that can be adjusted in azimuth and elevation.

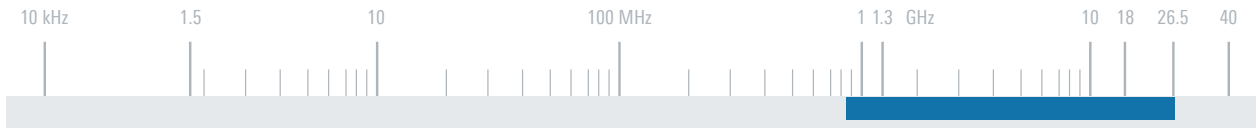
The reflector has a diameter of 3 m and – depending on the feed used – receives signals in the range from 1 GHz to 18 GHz or from 0.85 GHz to 26.5 GHz. The frequency range can be extended to up to 40 GHz by using flange-connected options.

The R&S®AC300 is used e.g. for radiomonitoring tasks.

Key facts

- Extremely broadband without change of feed
- 3 m reflector diameter
- Enhanced antenna gain
- Adjustable in azimuth and elevation
- System control via PC user interface
- Use of R&S®HL050S7 allows preamplifier to be bypassed at high field strengths (also applies to R&S®HL024S7/S8)





Specifications

Frequency range (depends on feed)	1 GHz to 18 GHz, 0.85 GHz to 26.5 GHz
Gain	26 dBi to 51 dBi (1 GHz to 18 GHz)
Half-power beamwidth	6° to 0.35° (1 GHz to 18 GHz)
Min. field strength	see diagram
Range of rotation	
Azimuth	±180°
Elevation	-5° to +95°

Speed of rotation	
Azimuth	≥ 5°/s
Elevation	> 2.5°/s
Connector	RPC3.5 female
MTBF	> 8000 h
Operating temperature range	-30°C to +55°C
Max. wind speed	160 km/h (without ice deposit)
Reflector diameter	approx. 3 m (118.1 in)
Weight	approx. 1460 kg (3218.7 lb)

3

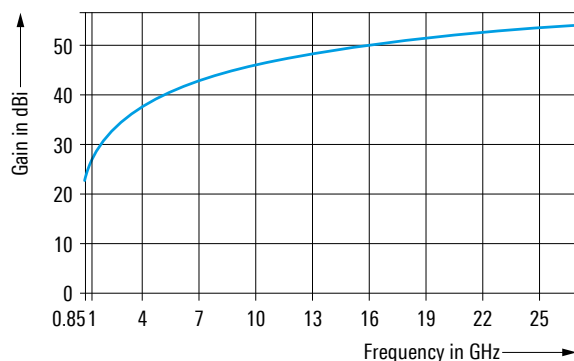
Ordering information

SHF Directional Antenna System

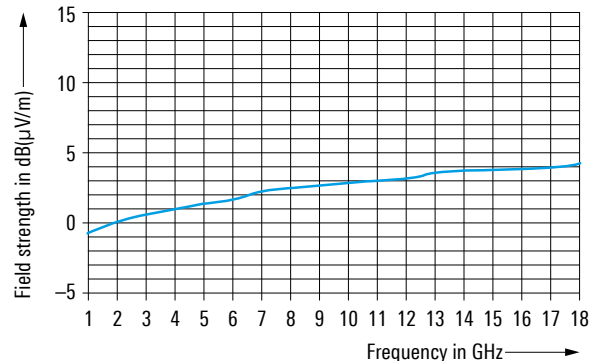
Feed options (see also pages 130 to 142)

	Type	Order No.
SHF Directional Antenna System		
R&S®AC300		
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz		
Basic model	R&S®HL024S1	4055.1256.02
With passive polarization network	R&S®HL024S2	4052.1003.02
With preamplifier, 1 RF output	R&S®HL024S7	4042.8505.02
With preamplifier, 2 RF outputs	R&S®HL024S8	4042.7509.02
With active polarization network	R&S®HL024S9	4047.6252.02
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz		
Basic model	R&S®HL050S1	4065.0100.02
With preamplifier	R&S®HL050S7	4064.6040.02
Recommended extras		
Reflector Antenna, 18 GHz to 26.5 GHz, 29 dBi to 33 dBi	R&S®AC308R2	4051.6001.02
Reflector Antenna, 26.5 GHz to 40 GHz, 33 dBi to 36 dBi	R&S®AC308R3	4051.6253.02

Typical gain



Typical minimum receive field strength



With R&S®HL024S9 (for a receiver with $F = 15$ dB, $\Delta f = 1$ MHz).

R&S®AC308R2 SHF Directional Antenna

18 GHz to 26.5 GHz

Broadband directional antenna for radiomonitoring



The R&S®AC308R2 SHF directional antenna for the frequency range from 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 a preamplifier (model .04).

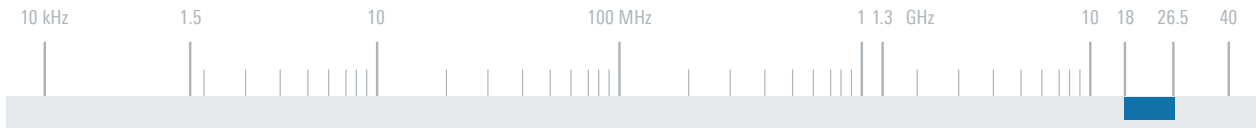
The R&S®AC308R2 is especially suitable for extending the frequency range of the R&S®AC090 and R&S®AC300 SHF directional antenna systems to which it can be flange-connected.

The R&S®AC308R2 with optional tripod, adapter and power supply can also be operated independently.

Key facts

- Fast and simple installation
- Rugged design
- Integrated in operational concept of R&S®AC090 and R&S®AC300 SHF directional antenna systems





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	30 dBi to 33 dBi
Half-power beamwidth	4.5° to 3°
Reflector diameter	250 mm
Connector	K female

Preamplifier (typical values)

Gain	28 dB ±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 (Ø × L)	approx. 380 mm × 300 mm (15.0 in × 11.8 in)
Weight	approx. 2.5 kg (5.5 lb)

Ordering information

SHF Directional Antenna

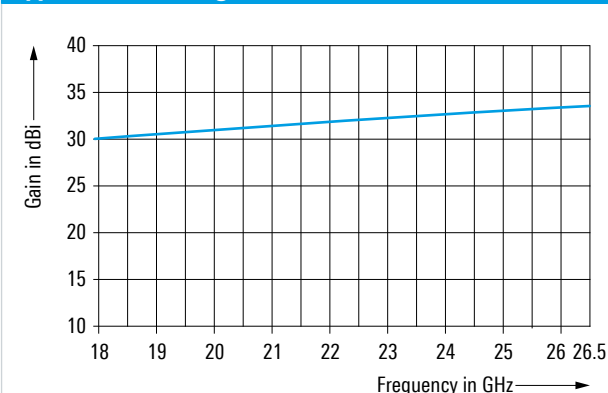
With preamplifier, 18 GHz to 26.5 GHz

Without preamplifier, 18 GHz to 26.5 GHz

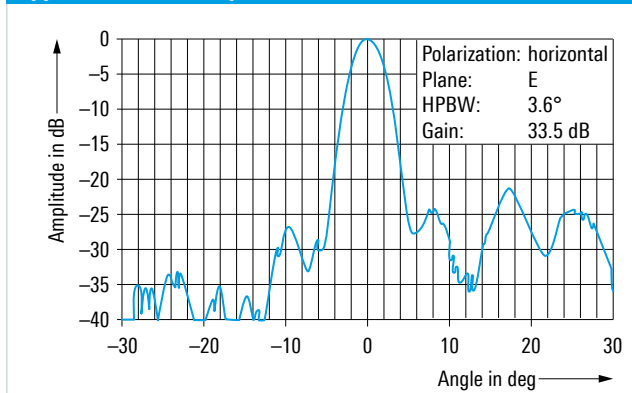
Recommended extras

	Type	Order No.
	R&S®AC308R2	
With preamplifier, 18 GHz to 26.5 GHz		4051.6001.02
Without preamplifier, 18 GHz to 26.5 GHz		4051.6001.04
Power Supply	R&S®IN308	4059.6752.02
Transit Case	R&S®AC308Z	4059.6500.02
Adapter for R&S®HZ-1	R&S®KA308R2	4057.8606.00
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical antenna gain



Typical radiation pattern at 26.5 GHz



R&S®AC308R3 SHF/EHF Directional Antenna

26.5 GHz to 40 GHz

Broadband directional antenna for radiomonitoring



The R&S®AC308R3 SHF/EHF directional antenna for the frequency range from 26.5 GHz to 40 GHz has a reflector diameter of 25 cm.

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

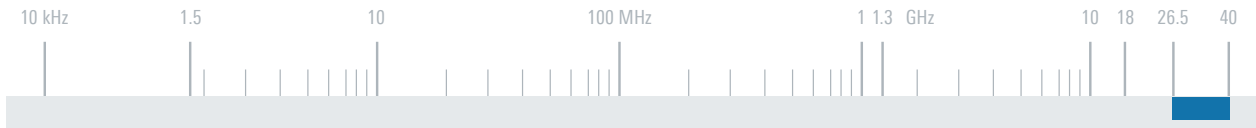
The R&S®AC308R3 is especially suitable for extending the frequency range of the R&S®AC090 and R&S®AC300 SHF directional antenna systems to which it can be flange-connected.

The R&S®AC308R3 with optional tripod, adapter and power supply can also be operated independently.

Key facts

- Fast and simple installation
- Rugged design
- Integrated in operational concept of R&S®AC090 and R&S®AC300 SHF directional antenna systems





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 dB ±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 (Ø × L)	approx. 380 mm × 300 mm (15.0 in × 11.8 in)
Weight	approx. 2.5 kg (5.5 lb)

3

Ordering information

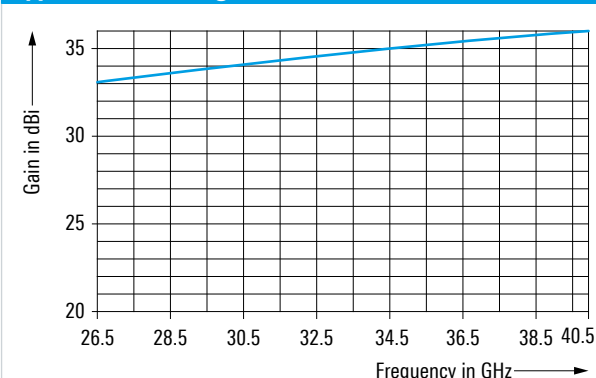
SHF/EHF Directional Antenna

	Type	Order No.
With preamplifier, 26.5 GHz to 40 GHz	R&S®AC308R3	4051.6253.02
Without preamplifier, 26.5 GHz to 40 GHz		4051.6253.04

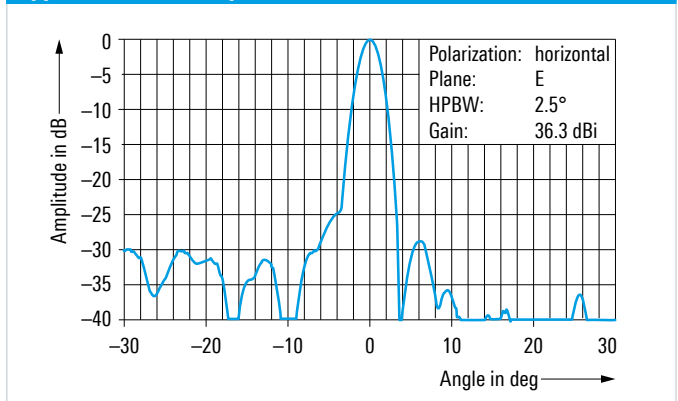
Recommended extras

Power Supply	R&S®IN308	4059.6752.02
Transit Case	R&S®AC308Z	4059.6500.02
Adapter for R&S®HZ-1	R&S®KA308R2	4057.8606.00
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical antenna gain



Typical radiation pattern at 40 GHz



R&S®AC025DP Dual-Polarized Reflector Antenna

18 GHz to 40 GHz

Broadband microwave reflector antenna
with preamplifier



The R&S®AC025DP dual-polarized reflector antenna has been optimized for use in the range from 18 GHz to 40 GHz.

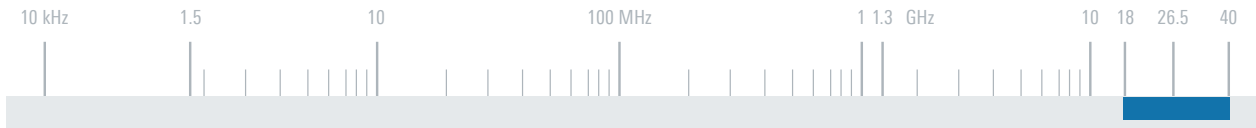
For independent operation, the antenna is installed on a tripod or, for frequency range extension, it can be integrated in the adjustable R&S®AC090 and R&S®AC300 SHF directional antenna systems.

The antenna is equipped with two integrated preamplifiers for simultaneous signal processing.

Key facts

- ▀ Extremely wide frequency range
- ▀ Simultaneous reception of two orthogonal polarization planes
- ▀ Integratable in R&S®AC090 and R&S®AC300 SHF directional antenna systems
- ▀ Fast and simple installation
- ▀ Sturdy mechanical design





Specifications

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

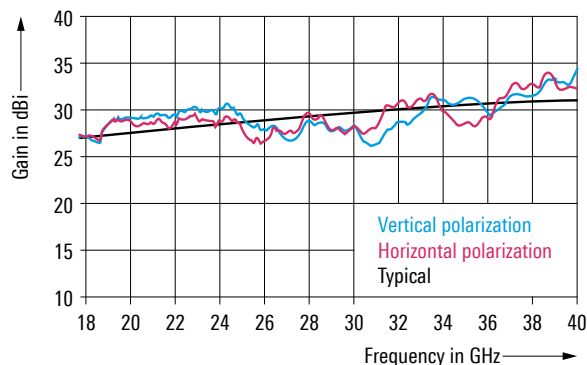
Preamplifier (typical values)

Gain	min. 28 dB
1 dB compression point	> 5 dBm
Noise figure	max. 5 dB
Power consumption	15 V/0.5 A (max.)
MTBF	> 50 000 h
Operating temperature range	−30°C to +55°C
Dimensions (Ø × L)	approx. 320 mm × 340 mm (12.6 in × 13.4 in)
Weight	approx. 5 kg (11.0 lb)

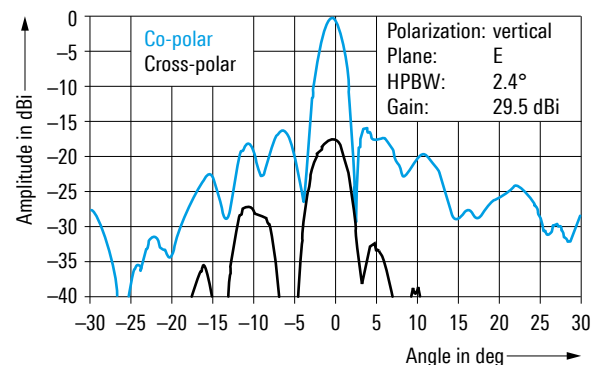
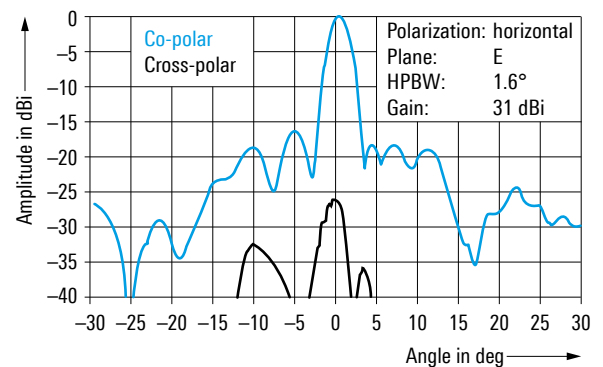
Ordering information

	Type	Order No.
Dual-Polarized Reflector Antenna	R&S®AC025DP	4062.5830.02
Recommended extras		
Power Supply	R&S®IN308	4059.6752.02
Adapter for R&S®HZ-1	R&S®KA308R2	4057.8606.00
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical antenna gain



Typical radiation patterns at 33 GHz



R&S®HL024A1/S1 Crossed Log- Periodic Antennas

1 GHz to 18 GHz

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



The R&S®HL024A1 crossed log-periodic antenna is designed for simultaneous reception of horizontally and vertically polarized waves.

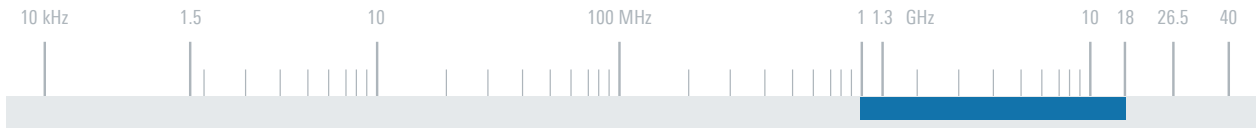
It can also be used as a transmitting antenna for low power and as a feed for the R&S®AC008 microwave directional antenna.

The R&S®HL024S1 is electrically identical but can be mechanically adapted for use as a feed for the R&S®AC090 and R&S®AC300 SHF directional antenna systems.

Key facts

- Horizontal and vertical polarization
- Wide frequency range
- Virtually frequency-independent radiation pattern
- Usable as a feed for R&S®AC008 microwave directional antenna (R&S®HL024A1)
- Usable as a feed for R&S®AC090 and R&S®AC300 directional antennas (R&S®HL024S1)





Specifications

Frequency range	1 GHz to 18 GHz
Polarization	linear/horizontal and vertical
Input impedance	50 Ω
VSWR	≤ 2.5
Max. input power	9 W to 2.5 W CW
Gain	7 dBi (typ.)
Connector	2 x SMA female

Operating temperature range	-30°C to +55°C
Max. wind speed	180 km/h (without ice deposit)
MTBF	> 150 000 h
Dimensions ($\varnothing \times H$; with radome)	approx. 210 mm x 300 mm (8.3 in x 11.8 in)
Weight	approx. 0.7 kg (1.5 lb)

3

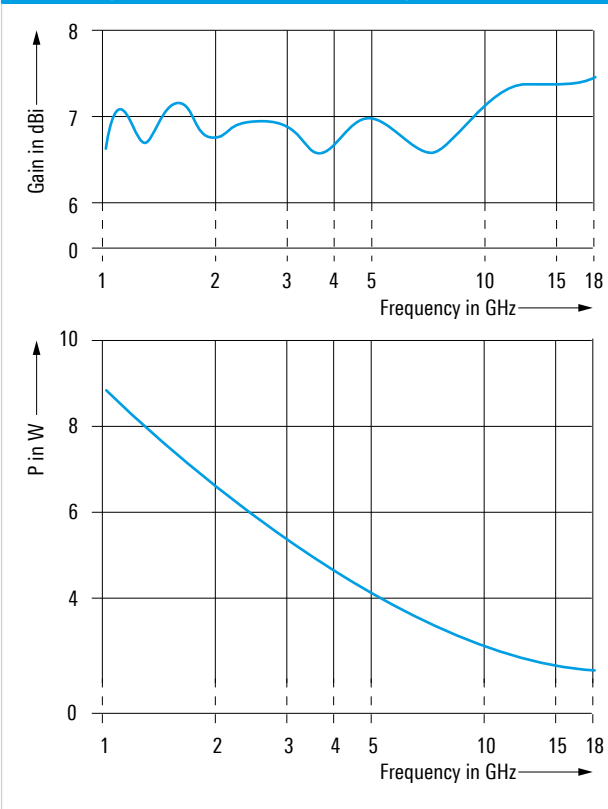
Ordering information

	Type	Order No.
Crossed Log-Periodic Antenna	R&S®HL024A1	0650.7510.03
Crossed Log-Periodic Antenna	R&S®HL024S1	4055.1256.02

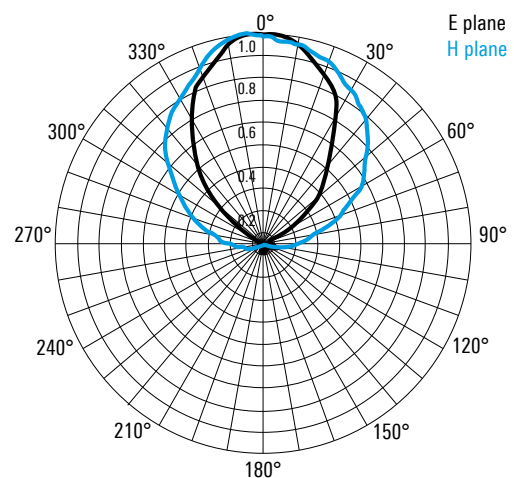
Recommended extras

Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical gain and power-handling capacity



Typical radiation patterns



R&S®HL024S2 Crossed Log- Periodic Antenna

1 GHz to 18 GHz

Log-periodic directional antenna consisting of the R&S®HL024A1 and a passive polarization switching network



The R&S®HL024S2 crossed log-periodic antenna can be used for waves with horizontal, vertical, left-hand or right-hand circular polarization.

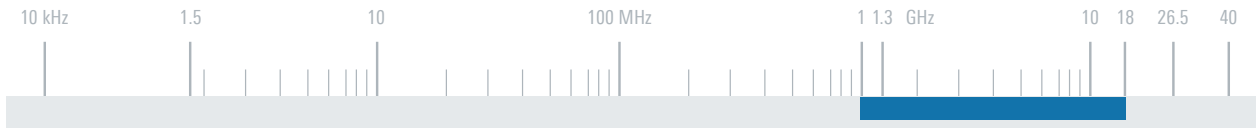
It consists of the R&S®HL024A1 antenna and a polarization switching network. Polarization can be selected by remote control using e.g. the R&S®GB016.

The R&S®HL024S2 can also be used as a feed for the R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas.

Key facts

- Horizontal, vertical, left-hand or right-hand circular polarization
- Wide frequency range
- Virtually frequency-independent radiation pattern
- Remote controlled polarization selection with optional R&S®GB016 control unit
- Usable as a feed for R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas





Specifications

Frequency range	1 GHz to 18 GHz
Polarization	horizontal, vertical, left-hand or right-hand circular (selectable)
Input impedance	50 Ω
VSWR	< 3
Antenna gain	
linear	6 dBi (typ.)
circular	5 dBi (typ.)
Axial ratio	2 dB (typ.)

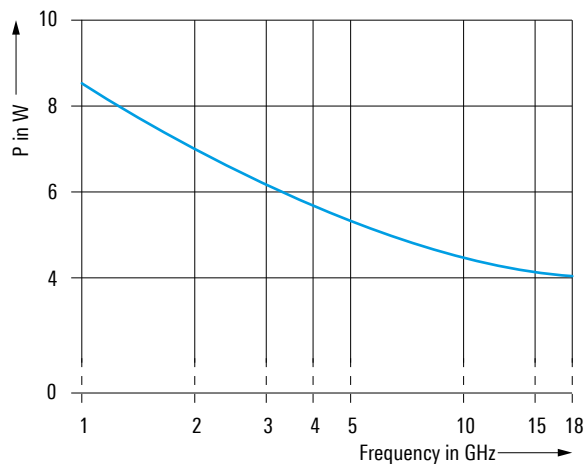
Power supply	12 V DC, 1 A
Connector	SMA female
Control connector	10-contact, round, male
Operating temperature range	-30°C to +55°C
Max. wind speed	180 km/h (without ice deposit)
MTBF	> 150 000 h
Dimensions ($\varnothing \times H$; with radome)	approx. 210 mm \times 353 mm (8.3 in \times 13.9 in)
Weight	approx. 1 kg (2.2 lb)

3

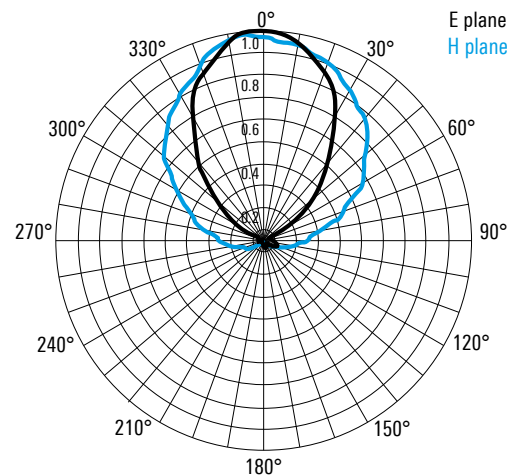
Ordering information

	Type	Order No.
Crossed Log-Periodic Antenna	R&S®HL024S2	4052.1003.02
Recommended extras		
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GB016Z1	4056.7270.02
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical linear gain and power-handling capacity



Typical radiation patterns



R&S®HL024S2 with linear polarization.

R&S®HL024S7

Crossed Log-Periodic Antenna

1 GHz to 18 GHz

Log-periodic directional antenna consisting of the R&S®HL024A1 and a broadband preamplifier for horizontal or vertical polarization (selectable)



The R&S®HL024S7 consists of the R&S®HL024A1 crossed log-periodic antenna and a broadband preamplifier. It is suitable for the reception of linearly polarized waves.

Horizontal or vertical polarization can be selected.

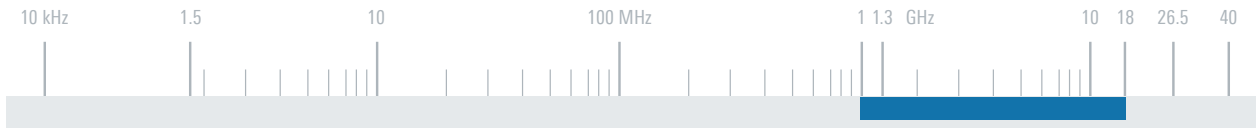
The preamplifier can be optionally switched on. It prevents a significant reduction in S/N due to loss in RF cables connecting the antenna to a receiver.

The antenna can also be used as a feed for the R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas.

Key facts

- Wide frequency range
- Selectable broadband preamplifier
- Selectable horizontal or vertical polarization
- No reduction in S/N due to the use of a low-noise amplifier at the antenna output
- Usable as a feed for R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas





Specifications

Frequency range	1 GHz to 18 GHz
Polarization	horizontal or vertical (selectable)
Input impedance	50 Ω
VSWR	< 3
Antenna gain (passive)	6 dBi (typ.)
Noise figure	max. 3.6 dB
Practical gain (active)	36 dB (typ.)
1 dB compression point	min. +5 dBm

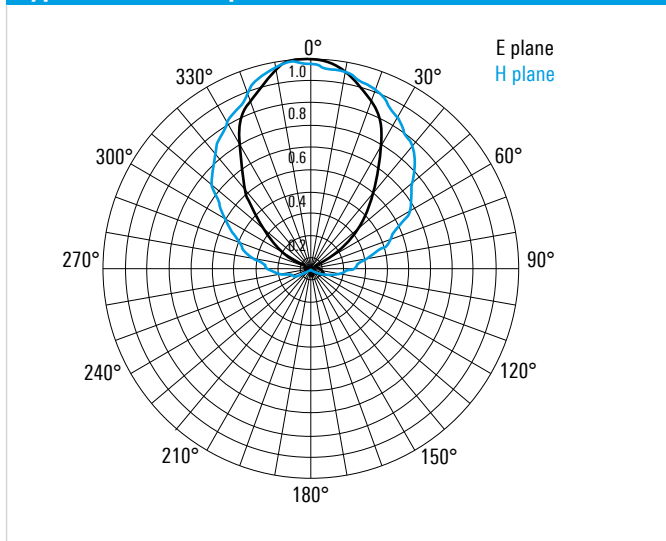
Power supply	+15 V DC (max. 0.3 A) (preamplifier), +12 V DC (max. 0.75 A) (switching network)
Connector	SMA female
Control connector	10-contact, round, male
MTBF	> 100 000 h
Operating temperature range	-30°C to +55°C
Dimensions ($\varnothing \times H$; with radome)	approx. 210 mm \times 390 mm (8.3 in \times 15.4 in)
Weight	approx. 1 kg (2.2 lb)

3

Ordering information

Ordering information	Type	Order No.
Crossed Log-Periodic Antenna	R&S®HL024S7	4042.8505.02
Recommended extras		
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GB016Z1	4056.7270.02
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical radiation patterns



R&S®HL024S8 Crossed Log- Periodic Antenna

1 GHz to 18 GHz

Log-periodic directional antenna consisting of the R&S®HL024A1 and two broadband preamplifiers for horizontal and vertical polarization



The R&S®HL024S8 consists of the R&S®HL024A1 crossed log-periodic antenna and two broadband preamplifiers. It is suitable for the reception of linearly polarized waves.

Two RF connectors are provided for simultaneous use of both polarization planes.

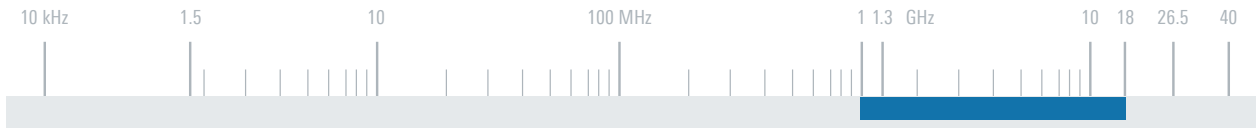
The preamplifiers can be optionally switched on. They prevent a significant reduction in S/N due to loss in RF cables connecting the antenna to a receiver.

The antenna can also be used as a feed for the R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas.

Key facts

- Wide frequency range
- Selectable broadband preamplifiers
- Simultaneous reception of both polarization planes
- No reduction in S/N due to the use of low-noise amplifiers at the antenna outputs
- Usable as a feed for R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas





Specifications

Frequency range	1 GHz to 18 GHz
Polarization	horizontal and vertical (simultaneously)
Input impedance	50 Ω
VSWR	< 3
Antenna gain (passive)	6 dBi (typ.)
Noise figure	max. 3.6 dB
Practical gain (active)	36 dB (typ.)
1 dB compression point	min. +5 dBm

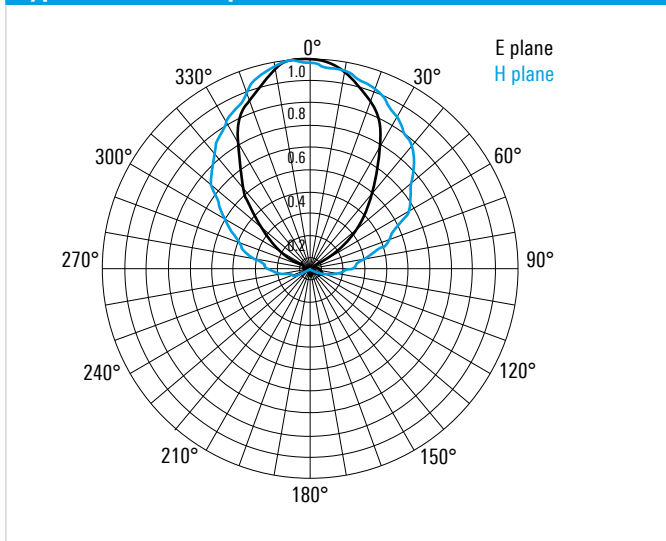
Power supply	+15 V DC (max. 0.7 A) (preamplifier), +12 V DC (max. 1 A) (switching network)
Connector	2 \times SMA female
Control connector	10-contact, round, male
MTBF	> 55 000 h
Operating temperature range	-30°C to +55°C
Dimensions ($\varnothing \times H$; with radome)	approx. 210 mm \times 390 mm (8.3 in \times 15.4 in)
Weight	approx. 1 kg (2.2 lb)

3

Ordering information

Ordering information	Type	Order No.
Crossed Log-Periodic Antenna	R&S®HL024S8	4042.7509.02
Recommended extras		
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GB016Z1	4056.7270.02
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical radiation patterns



R&S®HL024S9 Crossed Log- Periodic Antenna

1 GHz to 18 GHz

Log-periodic directional antenna consisting of the R&S®HL024A1, two broadband preamplifiers and a switching network for linear or circular polarization



The R&S®HL024S9 consists of the R&S®HL024A1 crossed log-periodic antenna and two broadband preamplifiers. It is suitable for the reception of linearly and circularly polarized waves.

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

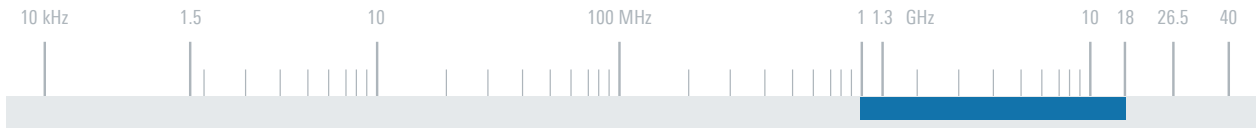
The preamplifiers prevent a significant reduction in S/N due to loss in RF cables connecting the antenna to a receiver.

The antenna can also be used as a feed for the R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas.

Key facts

- 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
- Usable as a feed for R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas





Specifications

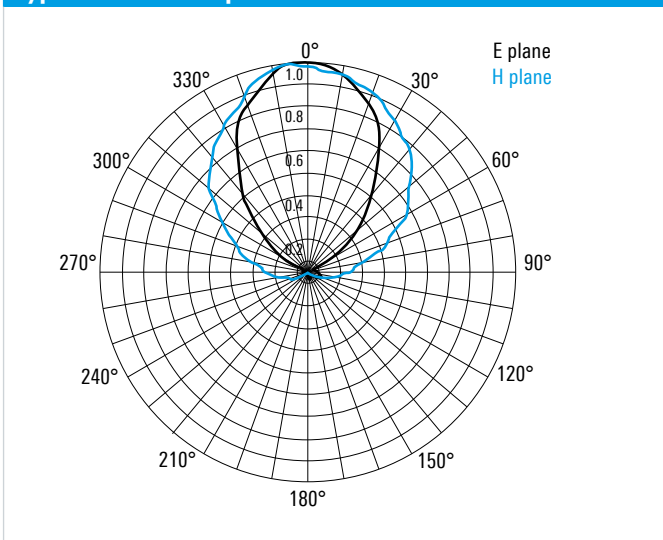
Frequency range	1 GHz to 18 GHz
Polarization	horizontal, vertical, left-hand or right-hand circular
Input impedance	50 Ω
VSWR	< 3
Practical gain	
linear	36 dB (typ.)
circular	35 dB (typ.)
Axial ratio	< 6 dB; 3 dB (typ.)
Noise figure	max. 3.6 dB

1 dB compression point	min. +5 dBm
Power supply	+15 V DC (max. 0.5 A) (preamplifier), +12 V DC (max. 1 A) (switching network)
Connector	SMA female
Control connector	10-contact, round, male
MTBF	> 55 000 h
Operating temperature range	-30°C to +55°C
Dimensions ($\varnothing \times H$; with radome)	approx. 210 mm \times 390 mm (8.3 in \times 15.4 in)
Weight	approx. 1.2 kg (2.6 lb)

Ordering information

Ordering information	Type	Order No.
Crossed Log-Periodic Antenna	R&S®HL024S9	4047.6252.02
Recommended extras		
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GB016Z1	4056.7270.02
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical radiation patterns



R&S®HL024S9 with linear polarization.

R&S®HL050/ R&S®HL050S1 Log-Periodic Antennas

850 MHz to 26.5 GHz

Log-periodic directional antennas for linear polarization



Its broadband characteristics make the R&S®HL050 log-periodic antenna ideal for radiomonitoring and measurements tasks.

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

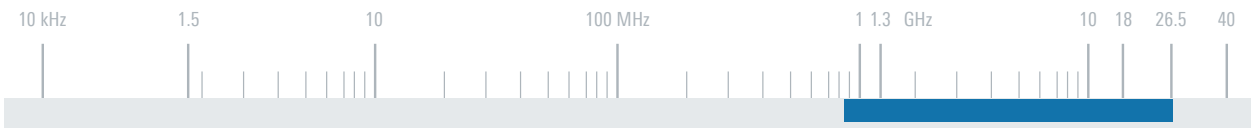
The R&S®HL050 can be used as a separate antenna or as a feed for the R&S®AC008 microwave directional antenna.

The R&S®HL050S1 is electrically identical but can be mechanically adapted for use as a feed for the R&S®AC090 and R&S®AC300 SHF directional antenna systems.

Key facts

- Extremely wide frequency range
- Rotation-symmetrical radiation patterns
- High gain due to V-shaped configuration of antenna elements
- Usable as a feed for R&S®AC008 microwave directional antenna (R&S®HL050)
- Usable as a feed for R&S®AC090 and R&S®AC300 directional antennas (R&S®HL050S1)



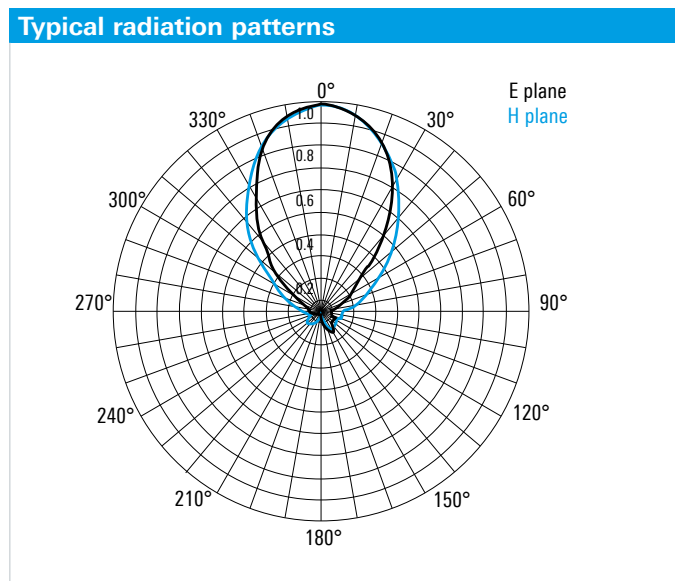
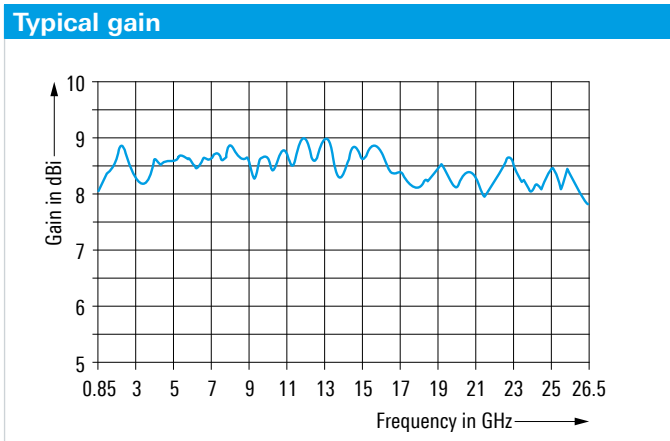


Specifications	
Frequency range	850 MHz to 26.5 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	≤ 2.5
Max. input power	10 W to 2 W
Gain	8.5 dBi (typ.)
Connector	PC 3.5 female
MTBF	> 1 000 000 h

Operating temperature range	-30°C to +55°C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (Ø × H; with radome)	approx. 210 mm × 300 mm (8.3 in × 11.8 in)
Weight	approx. 0.7 kg (1.5 lb)

3

Ordering information	Type	Order No.
Log-Periodic Antenna	R&S®HL050	4062.4063.02
Log-Periodic Antenna	R&S®HL050S1	4065.0100.02
Recommended extras		
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02



R&S®HL050S7 Log-Periodic Directional Antenna with Preamplicifier

850 MHz to 26.5 GHz

Log-periodic directional antenna consisting of the R&S®HL050 and a broadband preamplicifier for linear polarization



The R&S®HL050S7 log-periodic directional antenna consists of a R&S®HL050 log-periodic antenna with preamplicifier and is suitable for the reception of linearly polarized waves.

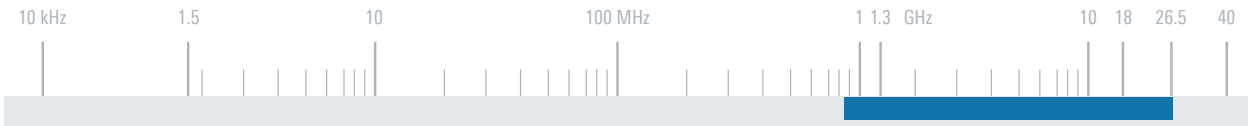
The extremely broadband and low-noise integrated preamplicifier prevents a significant reduction in S/N due to loss in RF cables connecting the antenna to a receiver.

Due to its almost rotation-symmetrical radiation pattern, the R&S®HL050S7 offers optimum secondary radiation characteristics for use as a feed in reflector antennas. It is ideal as a feed for the R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas.

Key facts

- 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
- Usable as a feed for R&S®AC008, R&S®AC090 and R&S®AC300 directional antennas
- Preamplicifier can be bypassed via control unit, e.g. at high field strengths



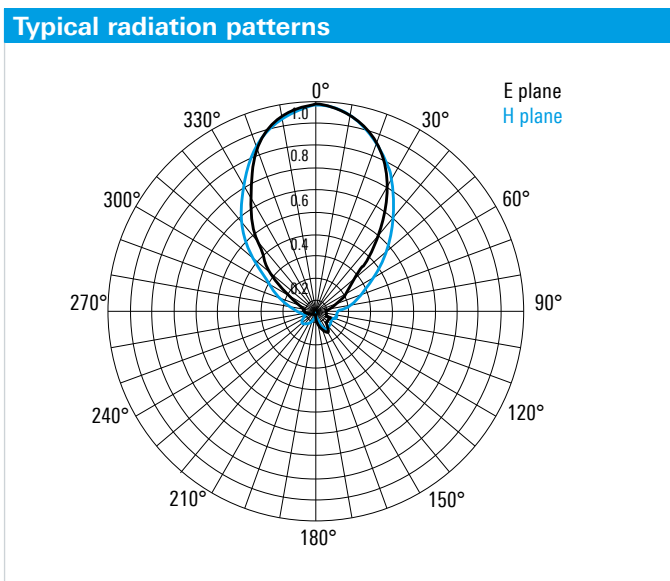


Specifications	
Frequency range	850 MHz to 26.5 GHz
Polarization	linear
Input impedance	50 Ω
VSWR (with preamplifier)	< 3
Passive antenna gain	7.5 dBi (typ.)
Practical gain (active)	37.5 dB (typ.)
Noise figure	max. 3.6 dB
1 dB compression point (at output)	min. > 5 dBm

Power supply	
Amplifier	15 V/0.2 A (max.)
Switching relay	12 V/0.75 A (max.)
Connector	PC 3.5 female
Control connector	10 pin female
MTBF	> 100 000 h
Operating temperature range	-30°C to +55°C
Max. wind speed	180 km/h
Dimensions (Ø × H)	approx. 210 mm × 390 mm (8.3 in × 15.4 in)
Weight	approx. 0.8 kg (1.8 lb)

3

Ordering information	Type	Order No.
Log-Periodic Directional Antenna with Preampfier	R&S®HL050S7	4064.6040.02
Recommended extras		
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GB016Z1	4056.7270.02
Microwave Cable, length: 5 m	R&S®AC008W2	0751.6931.04
Microwave Cable, length: 10 m	R&S®AC008W2	0751.6931.05
Adapter for R&S®HZ-1	R&S®HL025Z1	4053.4006.03
Wooden Tripod	R&S®HZ-1	0837.2310.02



R&S®HL050E Log-Periodic Antenna

750 MHz to 6 GHz

For EMI and EMS measurements



The linearly polarized R&S®HL050E log-periodic antenna provides broadband transmission and reception in the frequency range from 750 MHz to 6 GHz.

Precise construction makes the antenna suitable for field strength and EMI measurements.

Outstanding power rating and matching (VSWR) allow its use in EMS applications where field strengths of 10 V/m or higher are required.

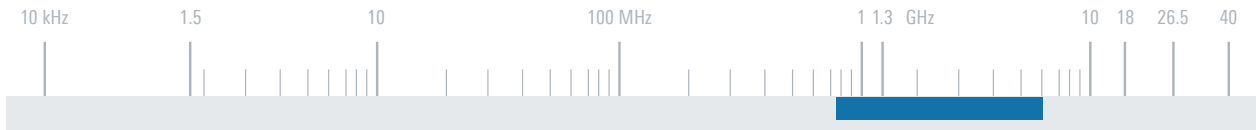
The compact size and the low weight of this antenna ensure easy handling and make it ideal for use in test chambers and for open-field applications.

Key facts

- ▀ Wide frequency range
- ▀ Suitable for susceptibility and emission measurements
- ▀ Stable radiation patterns over frequency range ensure optimum illumination of EUT
- ▀ Very low cross-polarization
- ▀ Compact size, low weight
- ▀ Ease of handling
- ▀ Outstanding power rating up to 6 GHz

New





Specifications

Frequency range	750 MHz to 6 GHz
Polarization	linear
Nominal impedance	50 Ω
VSWR	< 2.5; < 2 (typ.)
Gain	8.5 dBi (typ.)
Cross-polarization	< -20 dB
Front-to-back-ratio	
750 MHz to 1 GHz	> 15 dB
1 GHz to 6 GHz	> 20 dB

Maximum input power	100 W CW
RF connector	N female
MTBF	> 150 000 h
Operating temperature range	-30°C to +55°C
Dimensions ($\varnothing \times H$)	approx. 0.21 m \times 0.45 m (8.3 in \times 17.7 in)
Weight	approx. 1.4 kg (3.1 lb)

3

Ordering information

Log-Periodic Antenna

Type

R&S®HL050E

Order No.

4100.1003.02

Recommended extras

Wooden Tripod

R&S®HZ-1

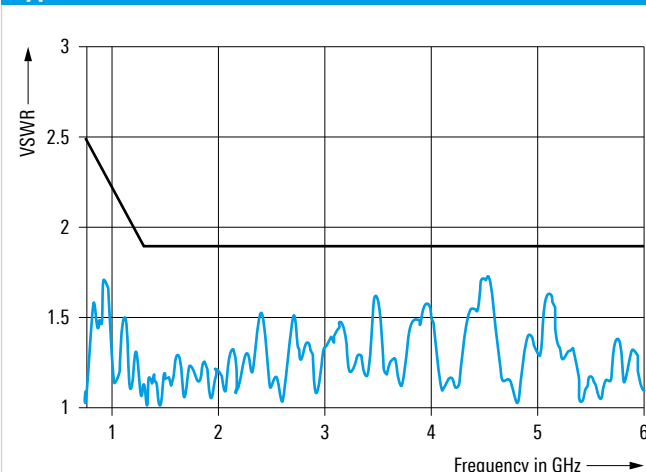
0837.2310.02

Adapter for R&S®HZ-1

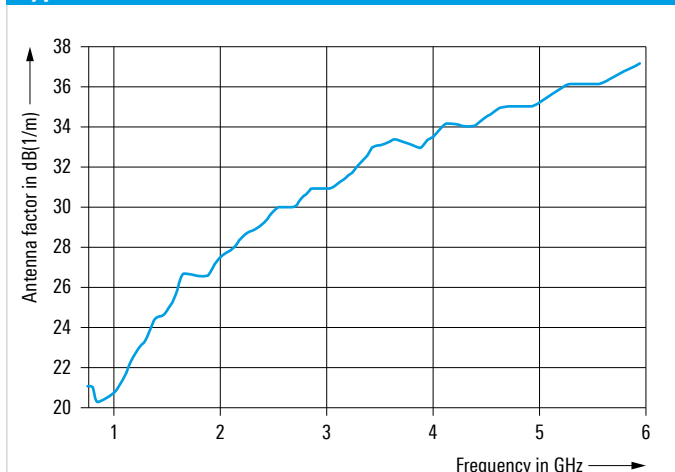
R&S®KM011Z10

4100.1703.02

Typical VSWR



Typical antenna factor



R&S®AC004R1/ R&S®AC004L1 Omnidirectional Antennas

18 GHz to 26.5 GHz

Broadband omnidirectional antennas

Available for left-hand or right-hand circular polarization



The R&S®AC004R1 and R&S®AC004L1 omnidirectional antennas are designed for reception in the frequency range from 18 GHz to 26.5 GHz.

The circularly polarized antennas can also be used to receive horizontally and vertically polarized signals.

In addition to signal reception, the antennas are capable of radiating signals at medium power.

The mechanical design of the antennas ensures reliable operation even under harsh environmental conditions, e.g. in mobile applications.

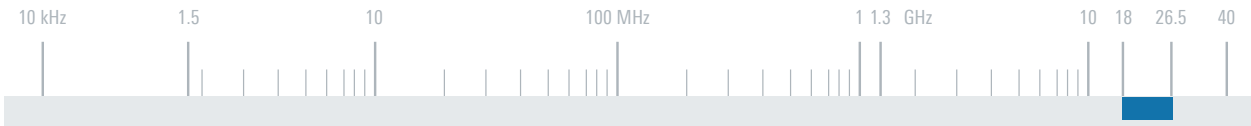
The antennas are delivered with a weather protection cover.

Key facts

- Omnidirectional reception
- Wide frequency range
- Suitable for use under harsh environmental conditions (e.g. in mobile applications)



Antennas without weather protection cover.

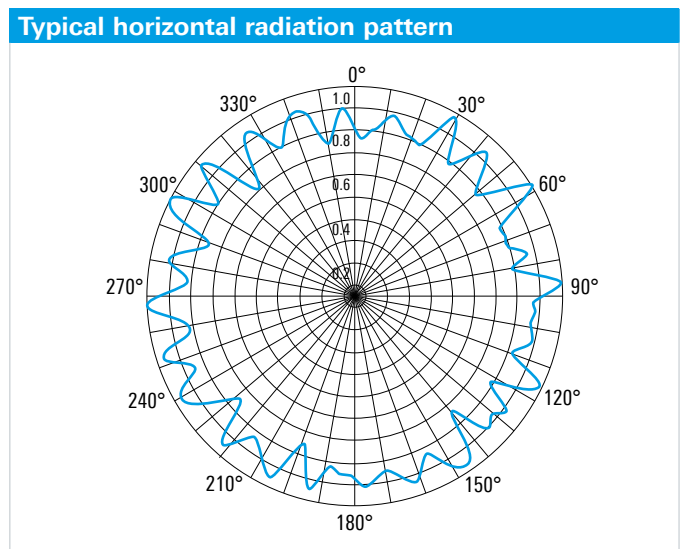
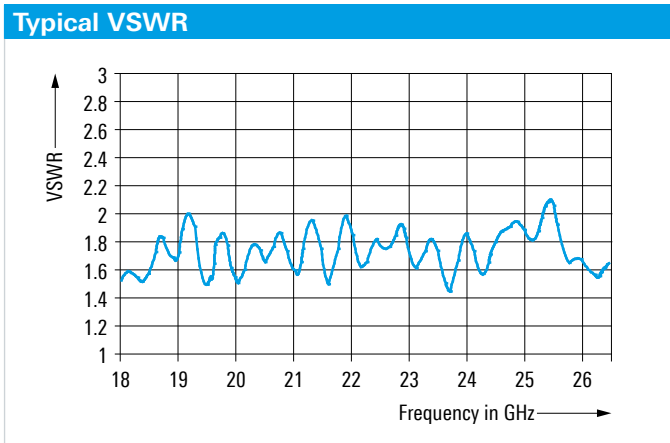


Specifications	
Frequency range	18 GHz to 26.5 GHz
Polarization	right-hand circular (R&S®AC004R1) or left-hand circular (R&S®AC004L1)
Axial ratio	±2 dB (typ.), max. ±5 dB
Input impedance	50 Ω
VSWR	< 2.5 (typ.) (see diagram)
Gain	2 dBi (typ.)
Connector	RPC2.92 (K) female
Max. input power	25 W (CW, +20°C ambient temperature)

Radiation pattern, azimuth plane	omnidirectional (see diagram), uncircularity max. ±3 dB
Radiation pattern, elevation plane	directional, half-power beamwidth 20° (typ.)
MTBF	> 500 000 h
Operating temperature range	-35°C to +65°C
Permissible wind speed	180 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 150 mm × 130 mm (5.9 in × 5.1 in)
Weight	approx. 1.4 kg (3.1 lb)

3

Ordering information	Type	Order No.
Omnidirectional Antenna		
For right-hand circular polarization	R&S®AC004R1	0749.3000.03
For left-hand circular polarization	R&S®AC004L1	4078.4000.02



R&S®AC004R2/ R&S®AC004L2 Omnidirectional Antennas

26.5 GHz to 40 GHz

Broadband omnidirectional antennas

Available for left-hand or right-hand circular polarization



The R&S®AC004R2 and R&S®AC004L2 omnidirectional antennas are designed for reception in the frequency range from 26.5 GHz to 40 GHz.

The circularly polarized antennas can also be used to receive horizontally and vertically polarized signals.

In addition to signal reception, the antennas are capable of radiating signals at medium power.

The mechanical design of the antennas ensures reliable operation even under harsh environmental conditions, e.g. in mobile applications.

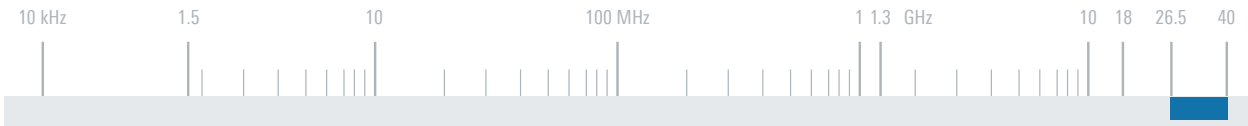
The antennas are delivered with a weather protection cover.

Key facts

- Omnidirectional reception
- Wide frequency range
- Suitable for use under harsh environmental conditions (e.g. in mobile applications)



Antennas without weather protection cover.

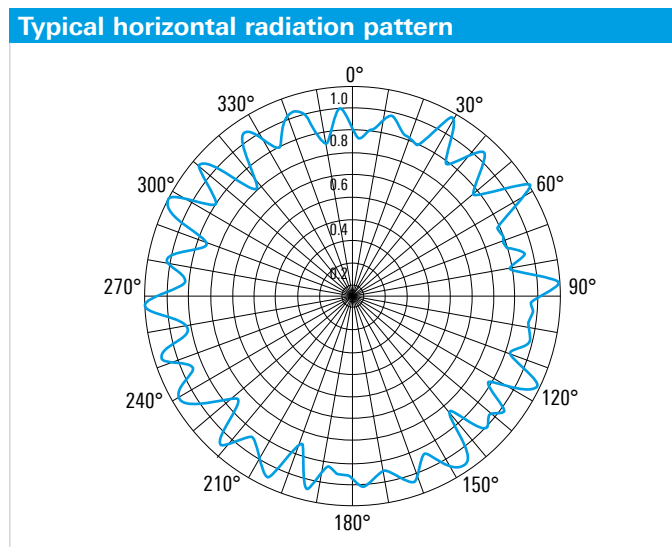
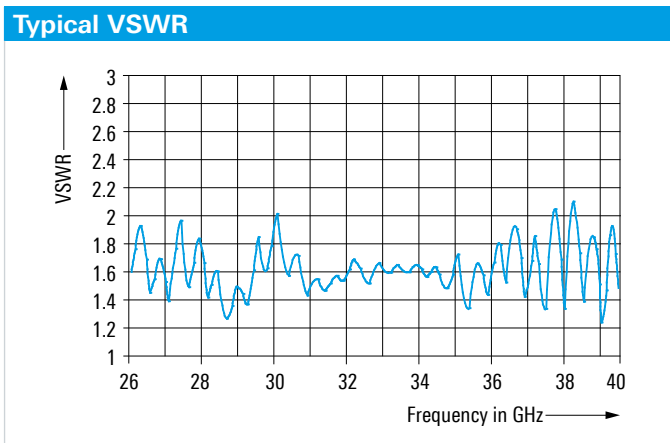


Specifications	
Frequency range	26.5 GHz to 40 GHz
Polarization	right-hand circular (R&S®AC004R2) or left-hand circular (R&S®AC004L2)
Axial ratio	±2 dB (typ.), max. ±5 dB
Input impedance	50 Ω
VSWR	< 2.5 (typ.) (see diagram)
Gain	2 dBi (typ.)
Connector	RPC2.92 (K) female
Max. input power	20 W (CW, +20°C ambient temperature)

Radiation pattern, azimuth plane	omnidirectional (see diagram), uncircularity max. ±3 dB
Radiation pattern, elevation plane	directional, half-power beamwidth 20° (typ.)
MTBF	> 500 000 h
Operating temperature range	-35°C to +65°C
Permissible wind speed	180 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 95 mm × 130 mm (3.7 in × 5.1 in)
Weight	approx. 0.9 kg (2.0 lb)

3

Ordering information	Type	Order No.
Omnidirectional Antenna		
For right-hand circular polarization	R&S®AC004R2	0749.3251.03
For left-hand circular polarization	R&S®AC004L2	4078.5006.02



R&S®HF9070M Broadband Omnidirectional Antenna

800 MHz to 26.5 GHz

Broadband omnidirectional antenna for detecting and monitoring mobile radio and microwave signals

Also capable of transmitting low-power signals (e.g. for EMS measurements)



The linearly polarized R&S®HF9070M broadband omnidirectional antenna covers the extremely wide frequency range from 800 MHz to 26.5 GHz.

Its primary fields of application as a receiving antenna are detecting, monitoring and measuring GSM and microwave signals with high sensitivity; as a transmitting antenna, it is primarily designed to transmit low-power signals (e.g. to carry out EMS measurements or to emit test signals).

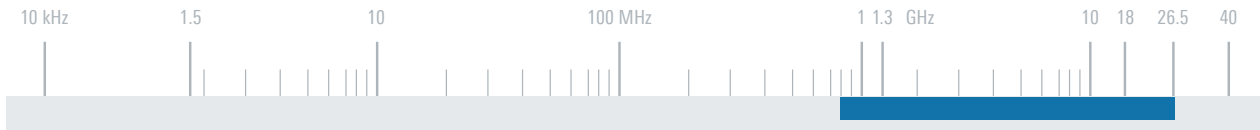
By using a low-attenuation, weatherproof radome, reliable operation of the antenna is ensured even in harsh environments.

The RF connector is a PC 3.5 female that is mechanically compatible with SMA and K connectors.

Key facts

- Extremely wide frequency range
- Compact dimensions
- High efficiency
- Robust design – ideal for use on board vehicles





Specifications

Frequency range	800 MHz to 26.5 GHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	≤ 2.5 ($f \leq 1$ GHz), < 2.0 ($f > 1$ GHz)
Max. input power	50 W to 10 W CW up to +40°C ambient temperature
Gain	1 dBi to 5 dBi (typ.)
Uncircularity of azimuth pattern	± 1 dB (at $f < 20$ GHz), ± 1.5 dB (at $f > 20$ GHz)

Connector	PC 3.5 female
Operating temperature range	-30°C to +50°C
MTBF	> 100 000 h
Permissible wind speed	
Without ice deposit	275 km/h
With 30 mm radial ice deposit	200 km/h
Dimensions ($\varnothing \times L$)	approx. 210 mm \times 260 mm (8.3 in \times 10.2 in)
Weight	approx. 1.5 kg (3.3 lb)

3

Ordering information

Broadband Omnidirectional Antenna

Type

R&S®HF9070M

Order No.

4070.3279.02

Recommended extras

Mast and Tripod Adapter

R&S®KM011Z8

4090.4006.02

Mast, length: 6 m

R&S®KM011

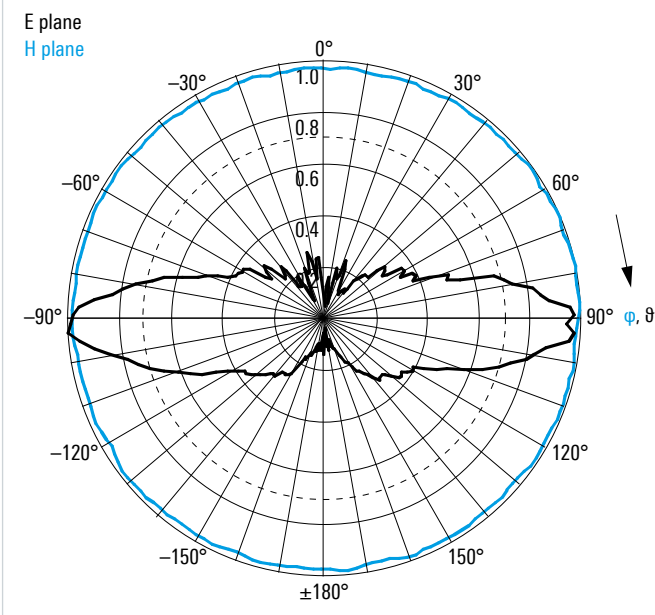
0273.9116.02

Wooden Tripod

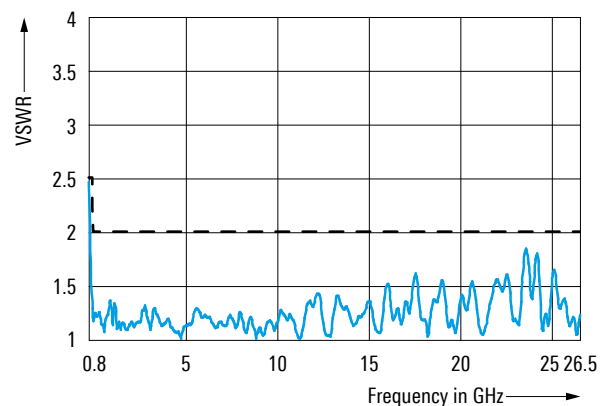
R&S®HZ-1

0837.2310.02

Typical azimuth and elevation diagrams at 15 GHz



Typical VSWR



R&S®AD016MC Compact Broadband TX Antenna

800 MHz to 8 GHz

For transmit and receive purposes



The linear polarized R&S®AD016MC compact broadband TX antenna covers the wide frequency range from 800 MHz to 8 GHz for transmit and receive purposes.

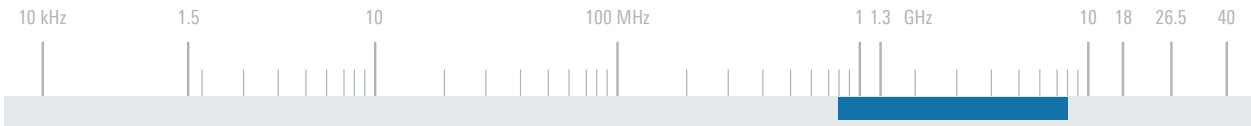
Due to its mechanical design as well as its weather protection, the antenna is suited for use in exposed positions and in tough environmental conditions, e.g. on board ships.

Key facts

- For measurement applications
- Ideally suited for aeronautical radiocommunications (e.g. LINK 16: 960 MHz to 1215 MHz)
- Very low cross-polarization
- Small size, compact design
- High efficiency

New



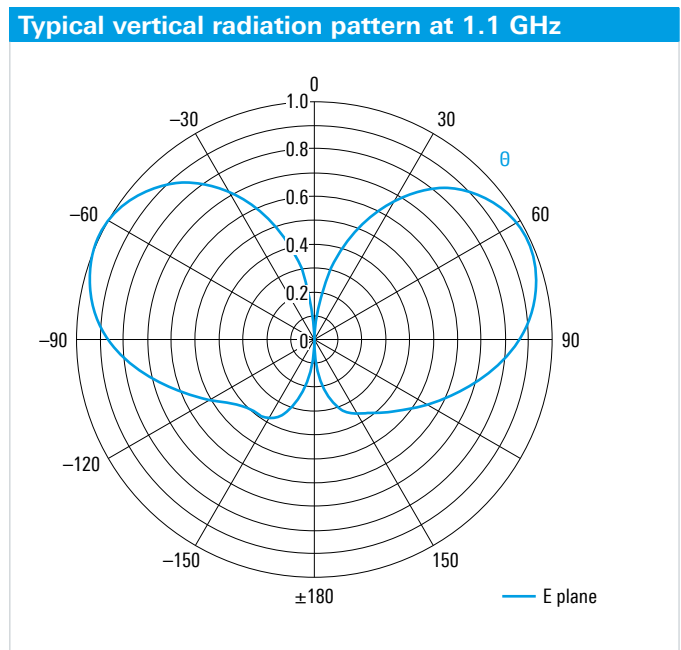
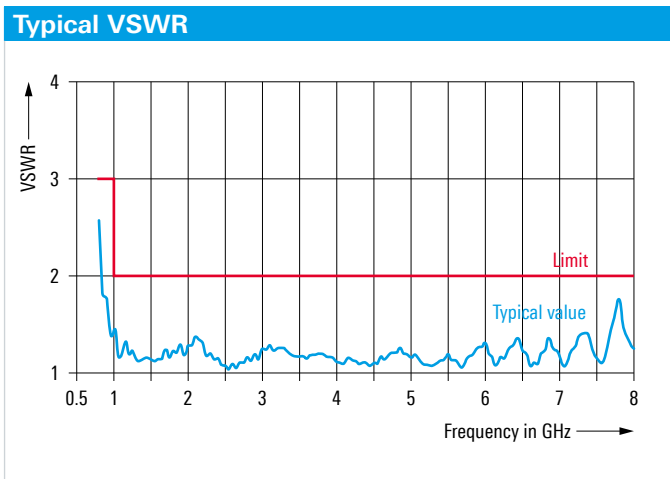


Specifications	
Frequency range	800 MHz to 8 GHz
Polarization	linear, vertical
Nominal impedance	50 Ω
VSWR	
0.8 GHz to 0.95 GHz	< 3.0
> 0.95 GHz	< 2.0
Gain	2 dBi (typ.)
Polarization decoupling	> 20 dB
Radiation patterns	horizontal: omnidirectional

Maximum input power	
For frequencies ≤ 4 GHz	200 W CW
For frequencies > 4 GHz	200 W CW
RF connector	N female
MTBF	> 100000 h
Operating temperature range	-30°C to +70°C
Max. wind speed	275 km/h (without ice deposit)
Dimensions (Ø × H)	approx. 0.21 m × 0.275 m (8.3 in × 10.8 in)
Weight	approx. 2.5 kg (5.5 lb)

3

Ordering information	Type	Order No.
Compact Broadband TX Antenna	R&S®AD016MC	4091.6002.02



R&S®HF907 Double-Ridged Waveguide Horn Antenna

800 MHz to 18 GHz

Broadband directional antenna, ideal for
EMC measurements



The linearly polarized R&S®HF907 double-ridged waveguide horn antenna is a broadband, compact transmitting and receiving antenna for the frequency range from 800 MHz to 18 GHz.

High gain and low VSWR permit the measurement of weak signals and the generation of high field strengths without any significant return loss.

Each R&S®HF907 is calibrated individually in line with ANSI C63.5 and SAE ARP958, making the antennas ideal for EMC measurements.

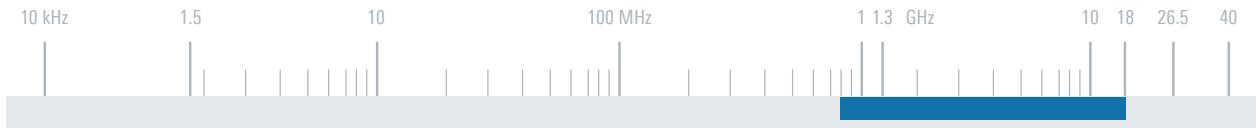
The R&S®HF907 sets itself apart from conventional broadband horn antennas in that its radiation pattern contains only a single main lobe over the entire frequency range; there are no appreciable side lobes.

The antenna is made of aluminum to keep its weight low.

Key facts

- Wide frequency range
- High and constant gain
- Low VSWR
- Radiation pattern contains only one main lobe over the entire frequency range
- Input power up to 300 W CW/500 W PEP
- Ideal for use in EMC laboratories
- Compact size
- Each antenna is calibrated individually in line with ANSI C63.5 and SAE ARP958





Specifications

Frequency range	800 MHz to 18 GHz
Polarization	linear
Polarization decoupling	> 25 dB; > 30 dB (typ.)
Input impedance	50 Ω
VSWR	≤ 3.0 ($f < 1.5$ GHz), < 2.0 ($f \geq 1.5$ GHz)
Max. input power	300 W CW/500 W PEP

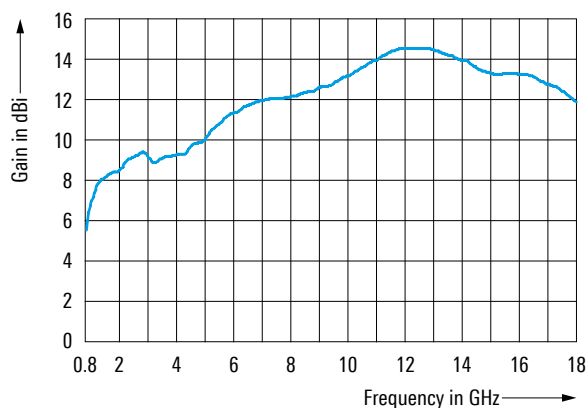
Gain	5 dBi to 14 dBi (typ.)
Connector	N female
Operating temperature range	-10°C to +50°C
MTBF	> 100 000 h
Dimensions (W × H × L)	approx. 280 mm × 226 mm × 305 mm (11.0 in × 8.9 in × 12.0 in)
Weight	approx. 1.9 kg (4.2 lb)

3

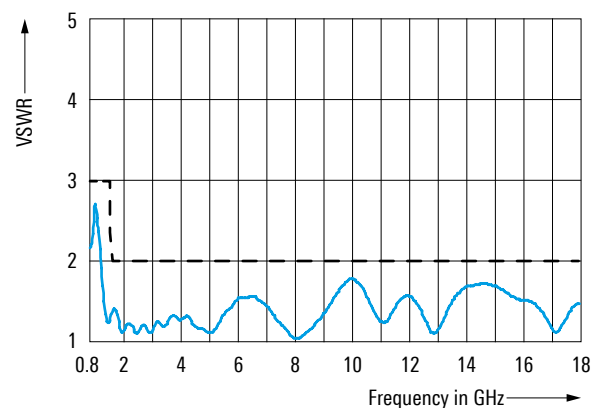
Ordering information

	Type	Order No.
Double-Ridged Waveguide Horn Antenna	R&S®HF907	4070.7000.02
Recommended extras		
Wooden Tripod	R&S®HZ-1	0837.2310.02

Typical gain



Typical VSWR



R&S®HF907DC SHF Directional Antenna with Downconverter

7.5 GHz to 18 GHz

Broadband directional antenna with downconverter

For locating transmitters and interference sources when used with a portable receiver (e.g. the R&S®PR100 portable receiver)



The R&S®HF907DC consists of a downconverter and an antenna fixed to it. In order to detect signal sources, the R&S®HF907DC must be connected to a receiver (e.g. the R&S®PR100 portable receiver).

Signal bearings are obtained by manually pointing the antenna in the direction of maximum field strength.

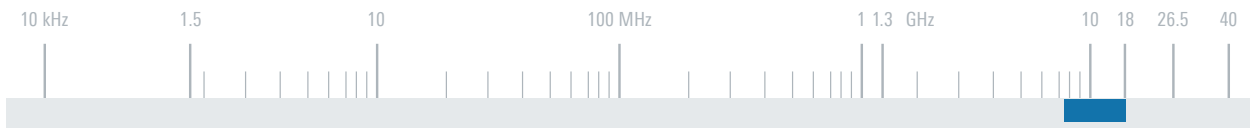
The operating frequency range is downconverted to the range below 7.5 GHz in two switchable frequency bands. Preselection filters for each frequency band suppress image frequency and IF breakthrough.

The interface and display panel contains all display and control elements and connectors and provides access to the battery compartment.

Key facts

- Manual polarization switching (horizontal, vertical, 45°)
- Distinct directional pattern
- Battery operation for portable applications
- Automatic frequency switching (when used with the R&S®PR100)
- Excellent suppression of image frequency and IF breakthrough by means of switchable preselection filters



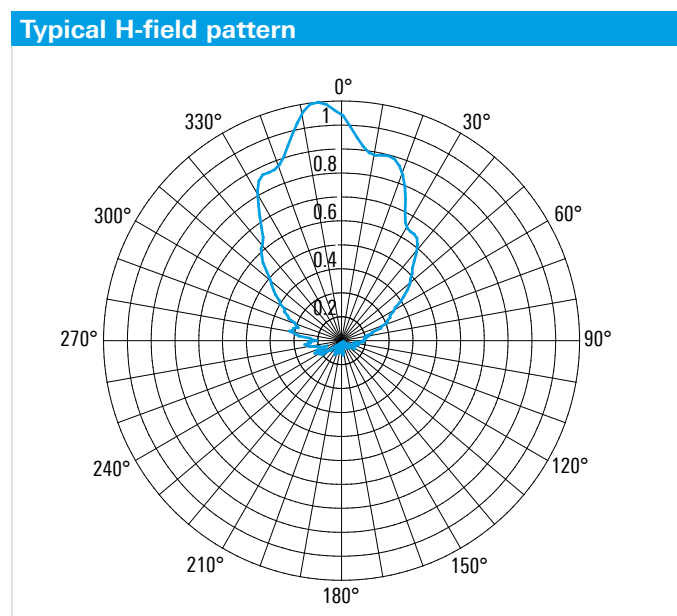
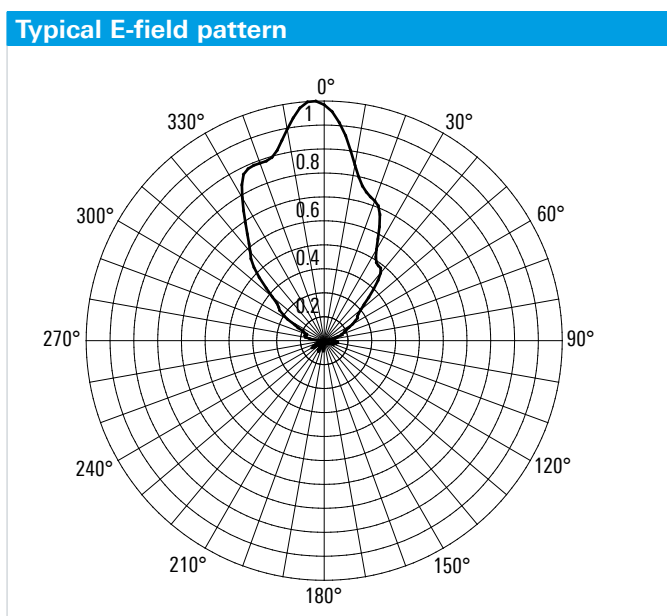


Specifications	
Frequency range	7.5 GHz to 18 GHz
Input frequency range	
Band 1	7.5 GHz to 12.5 GHz
Band 2	12.5 GHz to 18 GHz
Intermediate frequency range	
Band 1	6.5 GHz to 1.5 GHz
Band 2	7.5 GHz to 2 GHz
Antenna polarization	horizontal, vertical or 45°, manually adjustable
Nominal impedance	50 Ω
VSWR	< 2.5 (typ.), peaks up to 3.5 possible
Connector	N female
Frequency accuracy	< 25 kHz

Image frequency rejection	> 30 dB; > 45 dB (typ.)
IF breakthrough	< -30 dB; < -40 dB (typ.)
Antenna gain (passive structure)	8 dBi (typ.)
Total noise figure	6 dB (typ.)
Conversion gain of downconverter	
Band 1	42 dB (typ.)
Band 2	35 dB (typ.)
MTBF	> 30000 h
Operating temperature range	-10°C to +50°C
Dimensions (W × L × D)	approx. 147 mm × 355 mm × 172 mm (5.8 in × 14.0 in × 6.8 in)
Weight	approx. 3.5 kg (7.7 lb)

3

Ordering information	Type	Order No.
SHF Directional Antenna with Downconverter	R&S®HF907DC	4070.8006.02
Recommended extras		
Portable Receiver	R&S®PR100	4071.9006.02
Rechargeable battery, 12 V, 3 Ah		3587.5861.00
Cable Set	R&S®HF907DC-K1	4070.8958.02
Tripod Adapter	R&S®HF907DC-Z1	4079.3113.02
Carrying Case	R&S®HF907DC-Z2	4079.3207.02



Chapter 4

Accessories

Type	Designation	Page
R&S°IN600	Bias unit	160
R&S°FT224	VHF/UHF diplexer	162
R&S°FT255	VHF/UHF triplexer	164
R&S°GB016	Control unit	166
R&S°RD016	Antenna rotator	168
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R&S°RD130	Antenna rotator	172
R&S°CP001	Antenna remote control software (ARCOS)	174
R&S°FU129	Antenna filter unit	176
New R&S°MSD	Modular system device	178

R&S®IN600 Bias Unit



9 kHz to 8 GHz

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

The R&S®IN600 bias unit is used to supply power to active receiving antennas that receive power over the coaxial cable connected to the RF output.

A broadband bias tee is used to feed the antenna supply voltage to the inner conductor of the coaxial cable. The bias tee minimizes insertion loss and ideally attenuates both noise and unwanted signals at the receiver input.

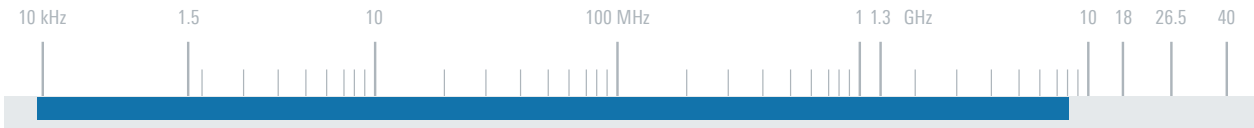
AC models are designed for stationary use where mains supply is available. DC models can be battery-supplied and used in vehicles.

The R&S®IN600 is recommended for use with Rohde&Schwarz active receiving antennas.

Key facts

- Extremely wide frequency range
- Short-circuit-proof (optical short circuit warning indication)
- DC and AC models, both featuring a very wide input voltage range
- Rack mounting or desktop use
- Suitable for vehicle installation



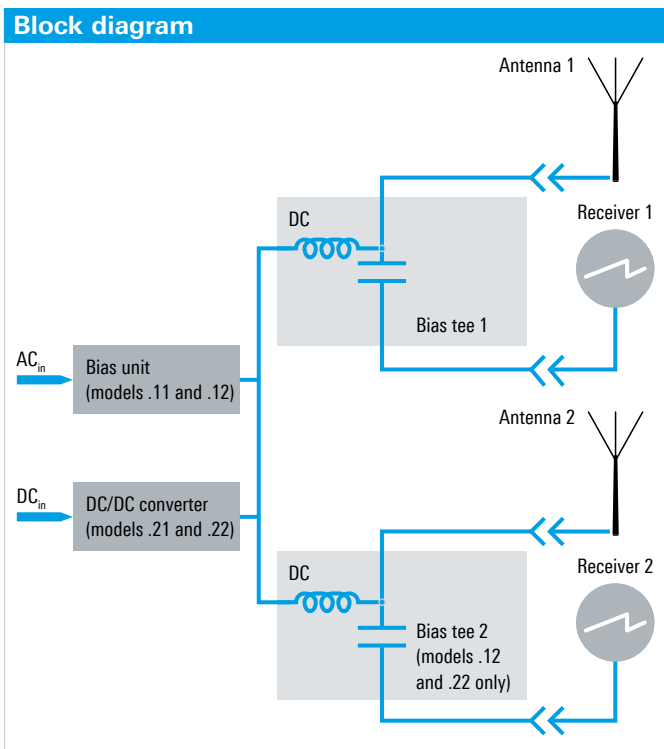


Specifications	
Frequency range	9 kHz to 8 GHz
RF connector	N female, 50 Ω
RF insertion loss	< 2.5 dB; < 1.5 dB (typ.) (> 20 kHz to 8 GHz)
VSWR	< 2.5; < 2 (typ.) (> 20 kHz to 8 GHz)
Max. RF power at antenna port	+20 dBm
Interference level at receiver port	
9 kHz to 10 MHz	< -110 dBm
> 10 MHz to 8 GHz	< -120 dBm
Power supply	
Output voltage	24 V DC ±1 V

Max. current (each antenna port)	500 mA
AC supply voltage range (models .11 and .12 only)	100 V to 240 V AC, 50 Hz to 60 Hz/400 Hz, 50 VA
DC supply voltage range (models .21 and .22 only)	10 V to 32 V DC, max. 4 A
Operating temperature range	0°C to +50°C
Storage temperature range	-40°C to +70°C
MTBF	> 75 000 h
Dimensions (W × H × L)	approx. 250 mm × 65 mm × 400 mm (9.8 in × 2.6 in × 15.8 in), (½ 19", 1 HU)
Weight	approx. 3 kg (6.6 lb)

4

Ordering information	Type	Order No.
Bias Unit		
AC operated, one antenna port	R&S®IN600	4094.3004.11
AC operated, two antenna ports	R&S®IN600	4094.3004.12
DC operated, one antenna port	R&S®IN600	4094.3004.21
DC operated, two antenna ports	R&S®IN600	4094.3004.22
Recommended extras		
19" Rack Adapter, for mounting two ½ 19" instruments	R&S®ZZA-KN20	1175.3191.00
19" Rack Adapter, for mounting one ½ 19" instruments	R&S®ZZA-KN21	1175.3204.00



Rear view of R&S®IN600, model .22.

R&S®FT224 VHF/UHF Diplexer



100 MHz to 174 MHz

225 MHz to 400 MHz

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

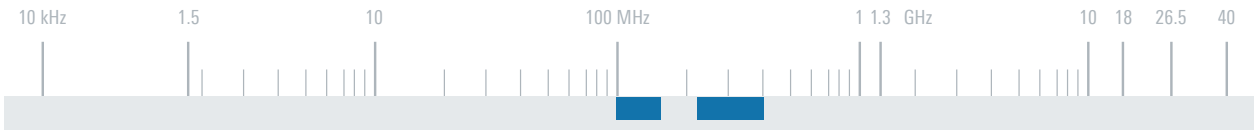
The R&S®FT224 VHF/UHF diplexer allows the connection of a broadband antenna (e.g. the R&S®HK014E VHF/UHF coaxial dipole) to transceivers with separate VHF and UHF outputs or to separate VHF and UHF transceivers.

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.

Key facts

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



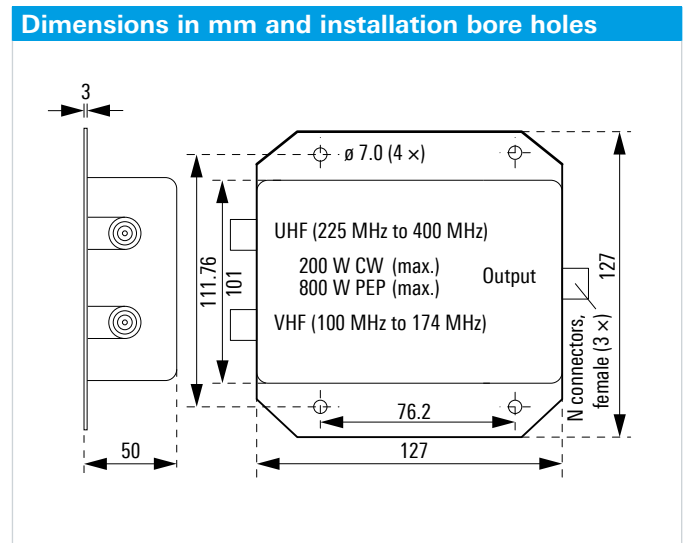
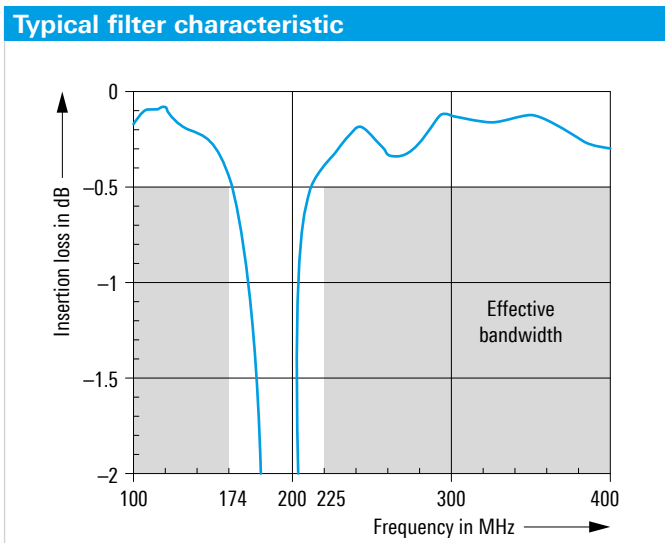


Specifications	
Frequency range	100 MHz to 174 MHz, 225 MHz to 400 MHz
Input impedance	50 Ω
VSWR	≤ 1.5 (with 50 Ω termination)
Insertion loss	
In passband	0.5 dB; 0.25 dB (typ.)
In stopband	> 30 dB (VHF/UHF)

Max. input power	200 W CW, 800 W PEP (per channel with simultaneous operation)
Connectors	3 × N female
MTBF	> 100000 h
Operating temperature range	-20°C to +55°C
Dimensions (W × H × L)	approx. 130 mm × 50 mm × 130 mm (5.1 in × 2 in × 5.1 in)
Weight	approx. 0.5 kg (1.1 lb)

4

Ordering information	Type	Order No.
VHF/UHF Diplexer	R&S®FT224	0525.5117.04
Recommended extras		
Coaxial Dipole	R&S®HK014E	4095.5000.02
Coaxial Dipole	R&S®HK033	4062.8369.02



R&S®FT255 VHF/UHF Triplexer



27.5 MHz to 88 MHz

(108 MHz) 118 MHz to 174 MHz

225 MHz to 550 MHz

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

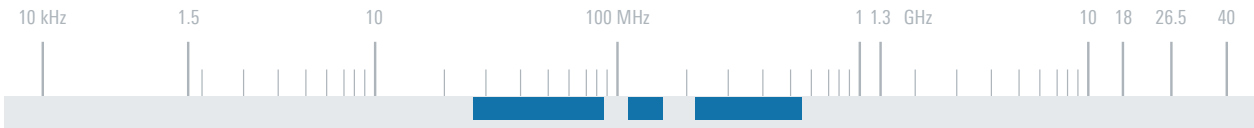
The R&S®FT255 VHF/UHF triplexer allows the connection of a broadband antenna (e.g. the R&S®HK055L1, R&S®HK055S1 or R&S®HK061) to transceivers with multiple VHF and UHF outputs or to up to three separate VHF/UHF transceivers.

The weatherproof casing allows the R&S®FT255 to be used indoors and outdoors.

Key facts

- Combined lowpass and highpass concept
- Low insertion loss
- High isolation
- Versatile application
- Compact design



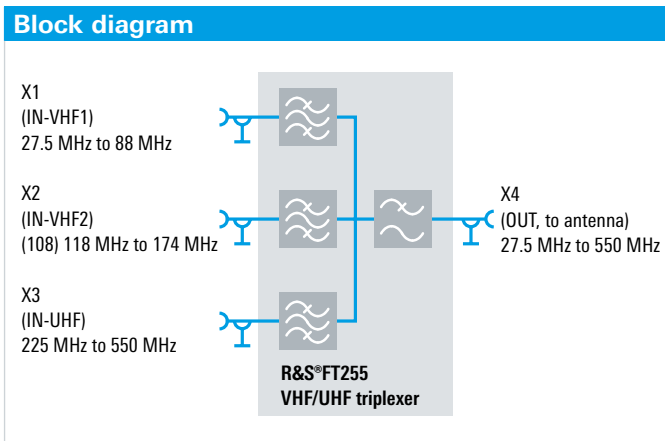


Specifications	
Frequency range	
X1 (IN-VHF1)	27.5 MHz to 88 MHz
X2 (IN-VHF2)	(108 MHz) 118 MHz to 174 MHz
X3 (IN-UHF)	225 MHz to 550 MHz
X4 (OUT)	27.5 MHz to 550 MHz
RF connectors	N female, 50 Ω
VSWR	≤ 1.4 (≤ 2 at 108 MHz)
Passband attenuation	
VHF1	0.5 dB (typ.)
VHF2	< 0.75 dB (typ.), < 1.5 dB (typ.) at 108 MHz
UHF	< 1 dB (typ.)

Decoupling	
VHF	> 30 dB (typ.), > 10 dB (typ.) at 108 MHz
UHF	> 25 dB (typ.)
Load capacity	
Sum power	max. 225 W CW
For each input	max. 100 W CW
Operating temperature range	−20°C to +55°C
Storage temperature range	−40°C to +70°C
MTBF	> 100 000 h
Dimensions (W × H × L)	approx. 140 mm × 80 mm × 260 mm (5.5 in × 3.2 in × 10.2 in)
Weight	approx. 1.3 kg (2.9 lb)

4

Ordering information	Type	Order No.
VHF/UHF Triplexer, color: silver gray (RAL7001)	R&S®FT255	4077.9508.02
Recommended extras		
Broadband Mobile Antenna	R&S®HK055L1	4067.0014.xx
Omnidirectional Broadband Antenna	R&S®HK055S1	4067.0443.xx
Vehicular Broadband Omnidirectional Antenna	R&S®HK061	4076.0007.xx



Rear view.

R&S®GB016 Control Unit



Selection of polarization, activating or bypassing the amplifiers and power supplies of rotators and selected log-periodic antenna feeds

The R&S®GB016 control unit is used for selecting the polarization and for activating or bypassing the amplifiers and power supplies of the following log-periodic antennas:

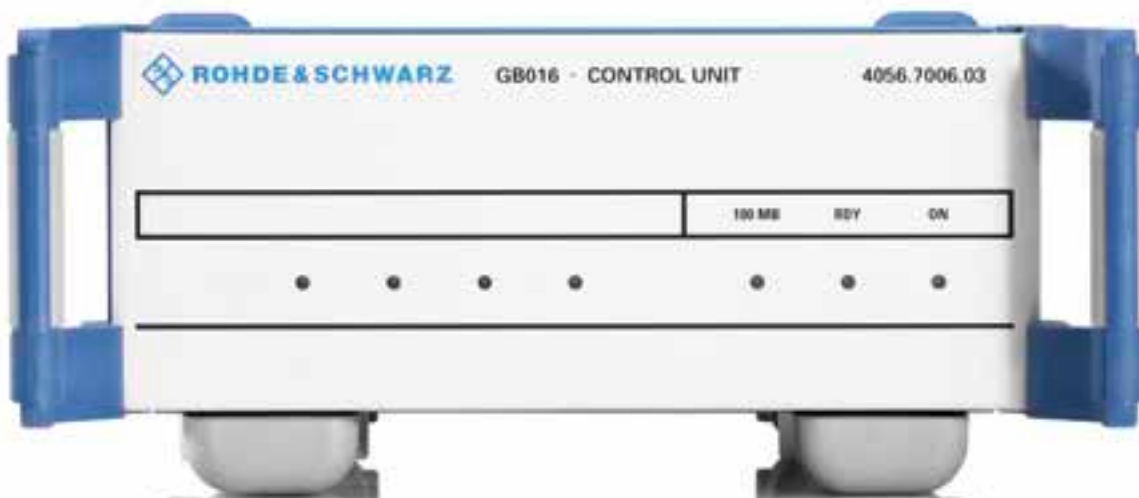
- ▮ R&S®HL024S2, R&S®HL024S7
- ▮ R&S®HL024S8, R&S®HL024S9
- ▮ R&S®HL050S7
- ▮ R&S®HL007A2 via R&S®ZS107 (model .02)
- ▮ R&S®HL007A2 via R&S®ZS107 (model .04)

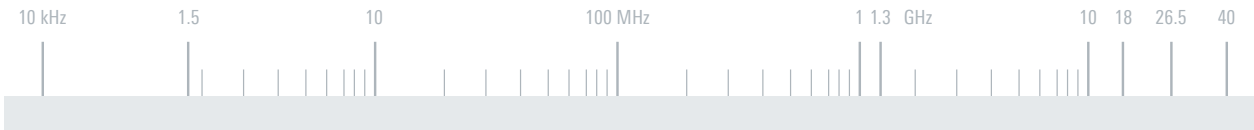
It can also control the R&S®AC008 microwave antenna system in combination with the R&S®RD016 rotator.

The R&S®GB016 is remote controlled via a LAN interface.

Key facts

- ▮ Remote control
- ▮ Mobile or stationary use
- ▮ AC or DC voltage supplied
- ▮ LAN interface (10/100 Mbit/s)
- ▮ Rotator supply and control
- ▮ Low maintenance



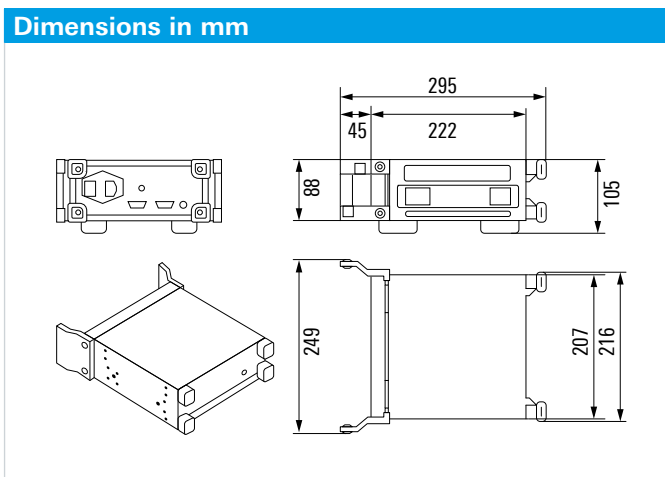


Specifications	
Mains power supply	
Voltage	100 V to 240 V AC, 50 Hz to 60 Hz or 120 V to 330 V DC
Power consumption	< 10 A (peak)
DC power supply	
Voltage	21 V to 29 V DC (stabilized)
Power consumption	< 15 A (peak)
Interface for antenna control	15-contact, D-Sub female
Supply voltages	+15 V DC (max. 1.5 A), +12 V DC (max. 1.5 A)
3 × control line	max. 0.5 A

Remote control interface	Ethernet 10/100 Mbit/s, connector RJ-45
MTBF	> 44 500 h (in line with SN29500 at +40°C ambient temperature, ground fixed)
Operating temperature range	+5°C to +40°C
Dimensions (W × H × D)	approx. 250 mm × 110 mm × 300 mm (9.8 in × 4.3 in × 11.8 in)
Weight	approx. 3 kg (6.6 lb)

4

Ordering information	Type	Order No.
Control Unit	R&S®GB016	4056.7006.03
Recommended extras		
Control Cable, for R&S®HL024Sx and R&S®HL050S7, length: 10 m	R&S®GB016Z1	4056.7270.02
Antenna Remote Control Software (ARCOS)	R&S®CP001	4069.6384.0x (x = 3/5/6, depending on application)



Rear view.

R&S®RD016 Antenna Rotator



Azimuth and elevation control of the R&S®AC008 microwave directional antenna

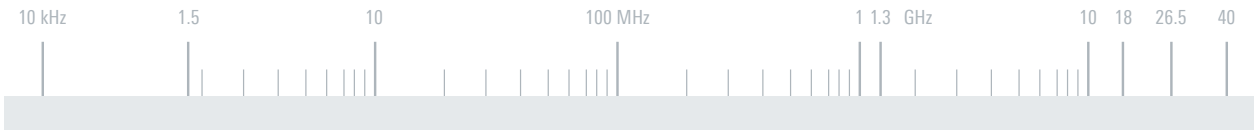
The portable R&S®RD016 antenna rotator is used to remotely rotate the R&S®AC008 microwave directional antenna for detection of RF signals and for field strength measurements.

The rotator is controlled and powered via the R&S®GB016 control unit.

Key facts

- DC gear motors ensure very short run-up time and high efficiency
- Accurate positioning
- Sturdy micro switches as limit switches for azimuth and elevation
- Protected against splash water
- Flange for fixation of the R&S®AC008 microwave directional antenna and the R&S®AC008-Z tripod





Specifications	
Supply voltage range	18 V to 36 V DC
Motor power	240 W
Range of movement	
Azimuth	360°
Elevation	0° to +30° (–6° to +74° with preadjustment of R&S®AC008)
Speed of rotation	
Azimuth	approx. 3°/s
Elevation	approx. 0.3°/s
Positioning accuracy	±0.1°

Permissible driving torque	
Azimuth	approx. 150 Nm
Elevation	approx. 80 Nm
Permissible bending moment at top flange	approx. 200 Nm
Permissible axial load	600 N
Operating temperature range	–35°C to +63°C
Dimensions (W × H × D)	approx. 360 mm × 310 mm × 270 mm (14.02 in × 12.2 in × 10.6 in)
Weight	approx. 13 kg (28.7 lb)

Ordering information	Type	Order No.
Antenna Rotator	R&S®RD016	4077.9008.02
Recommended extras		
Control Unit	R&S®GB016	4056.7006.03
Control Cable, length: 10 m	R&S®GK016K1	4077.9150.00
Antenna Remote Control Software (ARCOS), for R&S®AC008 microwave directional antenna in combination with R&S®GB016 and R&S®RD016	R&S®CP001	4069.6384.03



R&S®RD016 with R&S®AC008 and R&S®GB016.



Bottom view of R&S®RD016.

R&S®GB130 Control Unit



Control of antenna rotators in azimuth and elevation

The R&S®GB130 control unit 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 over a controller interface (RS-232 or RS-485). Optional control software is available.

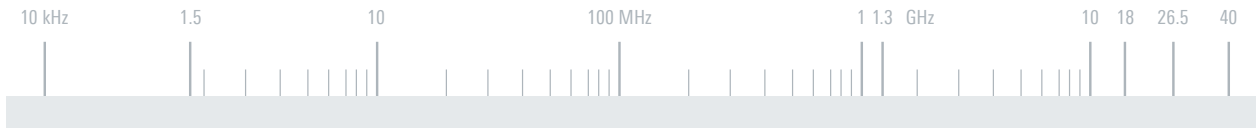
The control unit can be used, for instance, with the R&S®RD130 antenna rotator (azimuth positioning only).

Key facts

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



Control section and LC display of R&S®GB130.



Specifications	
Power supply	85 V to 264 V AC, 47 Hz to 63 Hz
Power consumption	max. 300 VA
Operating mode	manual or remote control
Controller interfaces	RS-232/RS-485
Power supply of rotator	
Voltage	24 V DC
Power	max. 100 W (azimuth), max. 80 W (elevation)

Display accuracy	0.1°
MTBF	> 10 000 h
Operating temperature range	0°C to +50°C
Dimensions (W × H × L)	approx. 480 mm × 140 mm × 360 mm (18.9 in × 5.5 in × 14.2 in)
Weight	approx. 4.5 kg (9.9 lb)

Ordering information	Type	Order No.
Control Unit	R&S®GB130	4059.8755.02
Recommended extras		
Antenna Rotator	R&S®RD130	4059.8503.02
Cable Set	R&S®GK130	
50 m		4059.8855.02
80 m		4059.8855.03
120 m		4059.8855.04
200 m		4059.8855.05
Antenna Remote Control Software (ARCOS)	R&S®CP001	4069.6384.04

R&S®RD130 Antenna Rotator



For azimuth positioning of antennas and antenna systems

The R&S®RD130 antenna rotator is used for azimuth positioning of antennas such as the R&S®HL451 or R&S®HL471 log-periodic HF antennas.

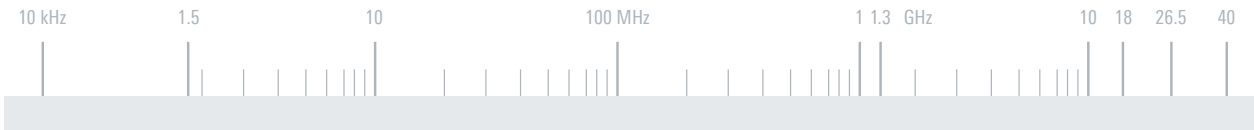
The high-precision gear is accommodated in sand-cast aluminum housing. The housing is sealed against splashing and equipped with a pressure compensation and ventilation system. The individual parts of the transmission are permanently lubricated and therefore largely maintenance-free.

The R&S®RD130 is powered and controlled by the R&S®GB130 control unit. Remote control of the antenna rotator from a PC is also possible via the control unit.

Key facts

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



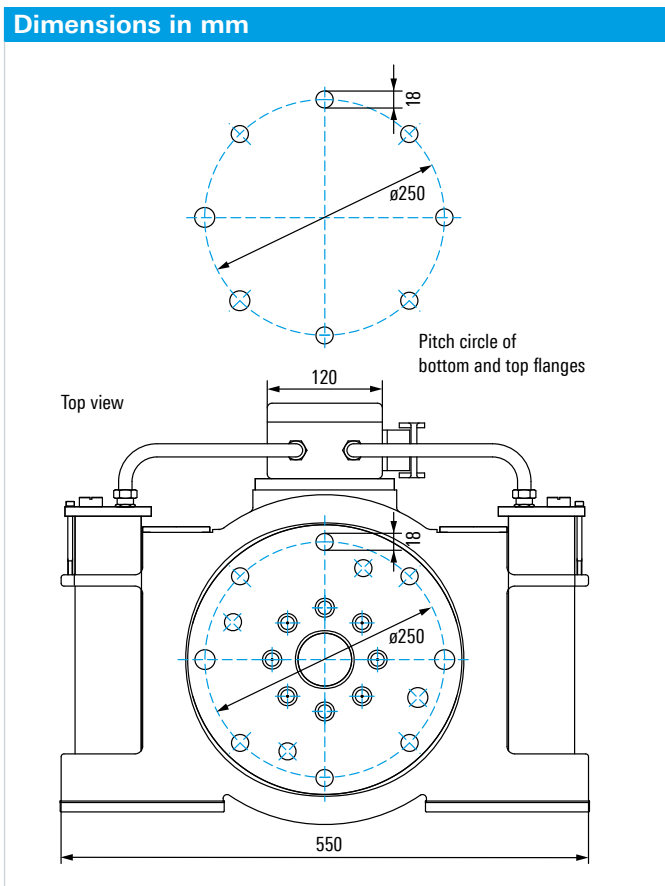


Specifications	
Voltage supply	24 V DC (via the R&S®GB130 control unit)
Power consumption	2 × max. 80 W
Setting range (azimuth)	±(n × 360°)
Speed of rotation	approx. 3°/s
Positioning accuracy	±0.1°
Permissible driving torque	approx. 1800 Nm
Starting torque	approx. 3000 Nm

Permissible bending moment at top flange	max. 6500 Nm
Permissible axial load	max. 3500 N
MTBF	> 40 000 h (at 25% on-time)
Operating temperature range	-35°C to +63°C
Dimensions (W × H × D)	approx. 550 mm × 400 mm × 450 mm (21.7 in × 15.7 in × 17.7 in)
Weight	approx. 110 kg (242.5 lb)

4

Ordering information	Type	Order No.
Antenna Rotator	R&S®RD130	4059.8503.02
Recommended extras		
Control Unit	R&S®GB130	4059.8755.02
Cable Set	R&S®GK130	
50 m		4059.8855.02
80 m		4059.8855.03
120 m		4059.8855.04
200 m		4059.8855.05



R&S®CP001 Antenna Remote Control Software (ARCOS)

All-purpose software for controlling various
Rohde & Schwarz antenna systems



The R&S®CP001 antenna remote control software (ARCOS) can be used to control the following Rohde & Schwarz antenna systems:

- R&S®AC008, R&S®AC090, R&S®AC180 and R&S®AC300 including rotators, feeds and additional antennas
- R&S®HL451 and R&S®HL471 HF antennas in combination with the R&S®RD130 antenna rotator and the R&S®GB130 or R&S®BG030 control unit
- R&S®HL007A2 log-periodic antenna in combination with R&S®ZS107 polarization selector
- R&S®HL024S2, R&S®HL024S7, R&S®HL024S8, R&S®HL024S9 and R&S®HL05S7 log-periodic antennas

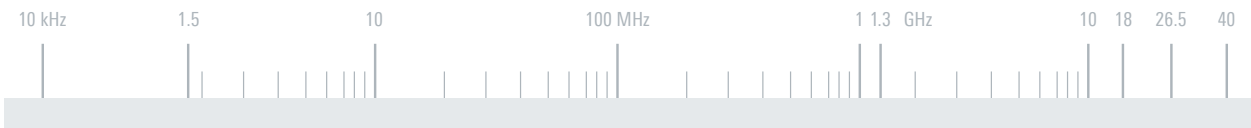
The control unit of the specific antenna system is connected to the control computer (PC) via a serial or LAN interface.

The R&S®CP001 software can be used in standalone mode or in a multiworkstation network in which multiple antenna systems are controlled by several PCs.

Key facts

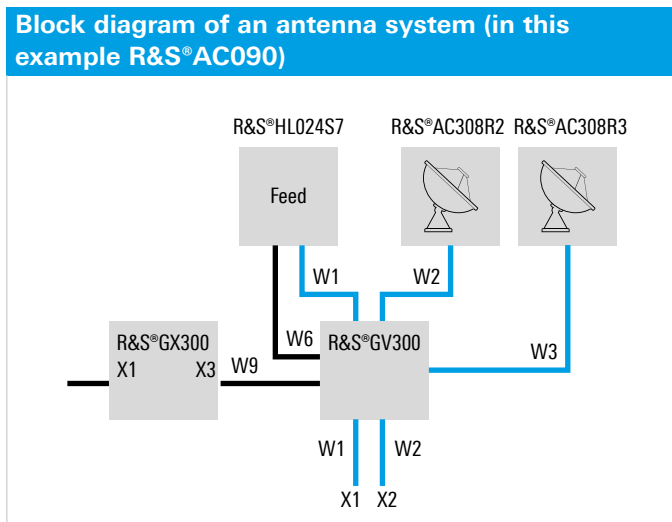
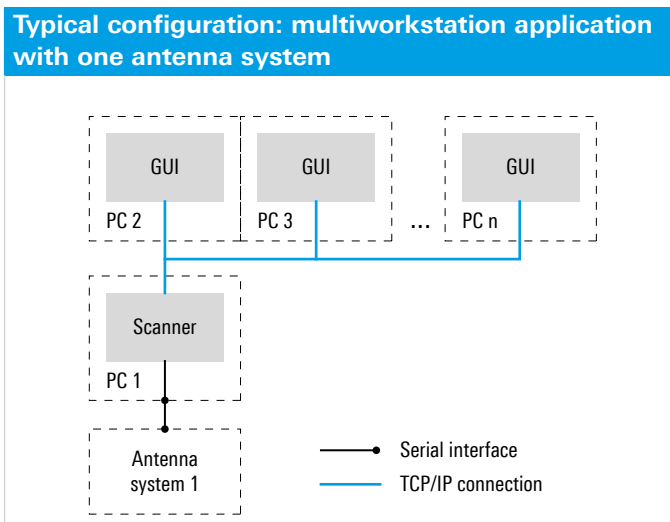
- Standardized operating concept for different systems
- Control routines can be integrated into customer-specific software projects
- Supports RS-232, RS-485 and LAN interfaces





Specifications	
System requirements	Windows XP/Windows 7 operating system
Interfaces	
External	RS-232, RS-485, LAN
Internal	TCP/IP
Supported Rohde & Schwarz control units	R&S®GX300, R&S®GV300, R&S®GB016, R&S®GB130, R&S®BG030

Ordering information	Type	Order No.
Antenna Remote Control Software (ARCOS)	R&S®CP001	
For R&S®AC090/AC180/AC300 SHF directional antenna systems		4069.6384.02
For R&S®AC008 microwave directional antenna in combination with R&S®GB016 and R&S®RD016		4069.6384.03
For R&S®HL451/HL471 HF antenna systems in combination with R&S®RD130 and R&S®GB130 or R&S®BG030		4069.6384.04
For R&S®HL007A2 log-periodic antenna in combination with R&S®ZS107 polarization selector		4069.6384.05
For R&S®HL024S2/HL024S7/HL024S8/HL024S9/HL050S7 microwave feeds in combination with R&S®GB016		4069.6384.06



R&S®FU129 Antenna Filter Unit



Antenna switching, rotator control and signal attenuation, amplification and filtering

The R&S®FU129 antenna filter unit is placed close to the receiving antennas. It comes with an antenna input selector for remote controlled switching of up to six antenna inputs to one output. Unwanted signals, such as those caused by nearby mobile radio base stations or strong sound and TV broadcast transmitters, can be reduced to levels suitable for the connected receiver by applying optional filters. Both strong useful signals and interfering signals can be suppressed.

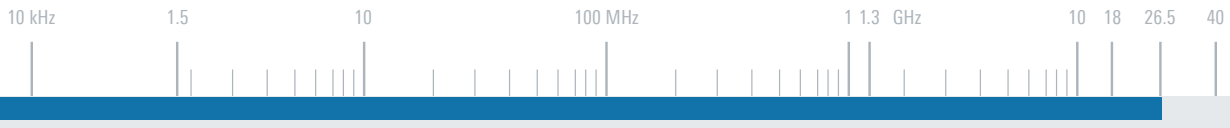
All R&S®FU129 functions are controlled either directly by a control PC (connected to the R&S®FU129 via a LAN cable) or by the tried-and-tested R&S®GB127S antenna control unit.

Excellent documentation for both interfaces ensures that end customers and system integrators can easily integrate the R&S®FU129 into customized systems and existing projects.

Key facts

- 1-out-of-6 antenna input selector
- Wide frequency range from DC to 26.5 GHz
- Suitable for outdoor use very close to antennas
- Integrated rotator control (azimuth and polarization/elevation)
- Powerful options:
 - Five selectable attenuators for reducing strong signal levels
 - Three selectable amplifiers for different frequency ranges
 - Up to ten selectable filters with different characteristics
- DC power supply for active antennas





Specifications	
Frequency range	DC to 26.5 GHz
Impedance	50 Ω
Insertion loss of base unit	
Up to 3 GHz	≤ 0.8 dB
3 GHz to 6 GHz	≤ 1.1 dB
6 GHz to 12 GHz	≤ 1.7 dB
12 GHz to 26.5 GHz	≤ 3.0 dB
Input VSWR of base unit	
Up to 6 GHz	≤ 1.4
6 GHz to 12 GHz	≤ 1.8
12 GHz to 26.5 GHz	≤ 2.0
Contact switching time	≤ 15 ms
Attenuator option (DC to 26.5 GHz)	
Without attenuation	bypassed
Stages 2 to 6	3/6/10/20/40 dB (typ.)
Amplifier option	
Without amplification: DC to 26.5 GHz	bypassed
Amplifier 1: 0.5 MHz to 35 MHz	+22 dB (typ.)
Amplifier 2: 20 MHz to 3 GHz	+12 dB (typ.)
Amplifier 3: 1 GHz to 26.5 GHz	+30 dB (typ.)

Filter option	
Without filter: DC to 26.5 GHz	bypassed
Stages 2 to 6 (11): for frequency ranges, see filter type	attenuation depends on filter
Power supply	
AC	100 V to 240 V, 50 Hz to 60 Hz
DC	10 V to 30 V
Power consumption, depends on options installed	25 W to 40 W/25 VA to 40 VA (typ.)
Power consumption, with both rotators in operation	100 W/100 VA (typ.)
MTBF	21 500 h
Operating temperature range	−40°C to +55°C (without direct sun exposure)
Storage temperature range	−40°C to +70°C

Ordering information	Type	Order No.
Antenna Filter Unit	R&S®FU129	3040.3300.02
Options		
Attenuator Option (max. 1)	R&S®FU129-ATT	3040.3400.02
Amplifier Option (max. 1)	R&S®FU129-AMP	3040.3500.02
Filter Option, for up to five filters (max. 2 filter options can be installed)	R&S®FU129-FIL	3040.3600.02
Filters for filter option		
Lowpass Filter, DC to 80 MHz	R&S®FU129-F1	3040.3616.02
Lowpass Filter, DC to 530 MHz	R&S®FU129-F2	3040.3622.02
Lowpass Filter, DC to 3000 MHz	R&S®FU129-F3	3040.3639.02
Highpass Filter, 27.5 MHz to 800 MHz	R&S®FU129-F4	3040.3645.02
Highpass Filter, 133 MHz to 1 GHz	R&S®FU129-F5	3040.3651.02
Highpass Filter, 225 MHz to 3 GHz	R&S®FU129-F6	3040.3668.02
Highpass Filter, 910 MHz to 3 GHz	R&S®FU129-F7	3040.3674.02
Highpass Filter, 1.9 GHz to 2.7 GHz	R&S®FU129-F8	3040.3680.02
Highpass Filter, 2.3 GHz to 5.5 GHz	R&S®FU129-F9	3040.3697.02
Highpass Filter, 3.9 GHz to 9.8 GHz	R&S®FU129-F10	3040.3700.02
Highpass Filter, 6 GHz to 11.5 GHz	R&S®FU129-F11	3040.3716.02
Bandpass Filter, 0.8 GHz to 1.05 GHz	R&S®FU129-F12	3040.3722.02
Bandpass Filter, 1.73 GHz to 2.27 GHz	R&S®FU129-F13	3040.3739.02
Bandpass Filter, 2 GHz to 2.26 GHz	R&S®FU129-F14	3040.3745.02
Bandstop Filter, 88 MHz to 108 MHz	R&S®FU129-F15	3040.3751.02
Other filters and options on request.		

R&S®MSD Modular System Device

Flexible antenna switching and rotator control



The R&S®MSD modular system device combines flexible antenna switching and positioning in one compact device.

In order to match project-specific requirements, various modules for antenna switching and/or positioning can be inserted into two rear slots of the 19" 2 HU rack-mountable case. The R&S®MSD can be operated with AC or DC power for maximum flexibility and easy integration into a mobile monitoring vehicle. Additional options, such as DC feeds and splitters, round off the functionality.

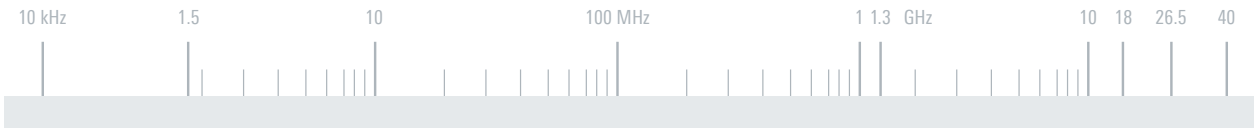
The R&S®MSD can be operated locally (via the touch-screen on the front panel) or remotely controlled (via a LAN/WAN connection).

Key facts

- Antenna switching and/or rotator control in one powerful device
- Frequency range from DC to 26.5 GHz
- Compact design (19", 2 HU)
- Variable power supply (AC or DC)

New





Specifications	
Front panel	5" touchscreen display, standby/on switch, 1 x USB2.0 interface
Modules	8 GHz RF switch module, 26.5 GHz RF switch module, rotator control basic axis #1 and #2, rotator control extension axis #3 and mast
Operating temperature range	0°C to +50°C

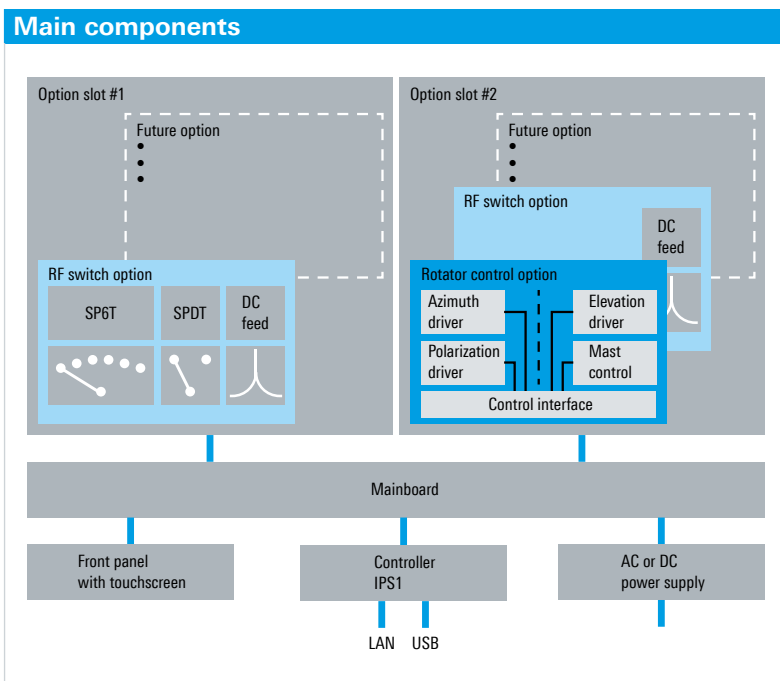
AC power supply	100 V to 240 V, 50 Hz to 60 Hz, max. 4 A
DC power supply	12 V to 30 V, max. 30 A
Dimensions (W x H x D), without feet or handles	approx. 444.6 mm x 88.1 mm x 456.0 mm (17.5 in x 3.5 in x 18 in), 19", 2 HU
Weight	approx. 6 kg to 10 kg (13.2 lb to 22.1 lb), depends on configuration

4

Ordering information	Type	Order No.
Modular System Device	R&S®MSD	3046.4008.02
Options		
Switch Module 8, SP6T switch, DC to 8 GHz	R&S®MSD-SM8	3046.4508.02
Switch Module 26, SP6T switch, DC to 26.5 GHz	R&S®MSD-SM26	3046.4608.02
SPDT Switch, DC to 8 GHz ¹⁾	R&S®MSD-SW	3046.4714.02
Splitter, DC to 8 GHz ¹⁾	R&S®MSD-SP	3046.5104.02
DC Feed, powers one external 9 kHz to 8 GHz antenna ¹⁾	R&S®MSD-DCF	3046.5004.02
Rotator Control Basic, controls 2 rotators/axes	R&S®MSD-RCB	3046.4808.02
Rotator Control Extension, controls 1 rotator/axis plus one mast ²⁾	R&S®MSD-RCE	3046.4908.02
AC Power Supply	R&S®MSD-AC	3046.5204.02
DC Power Supply	R&S®MSD-DC	3046.5304.02

¹⁾ Requires R&S®MSD-SM8/26 option.

²⁾ Requires R&S®MSD-RCB option.



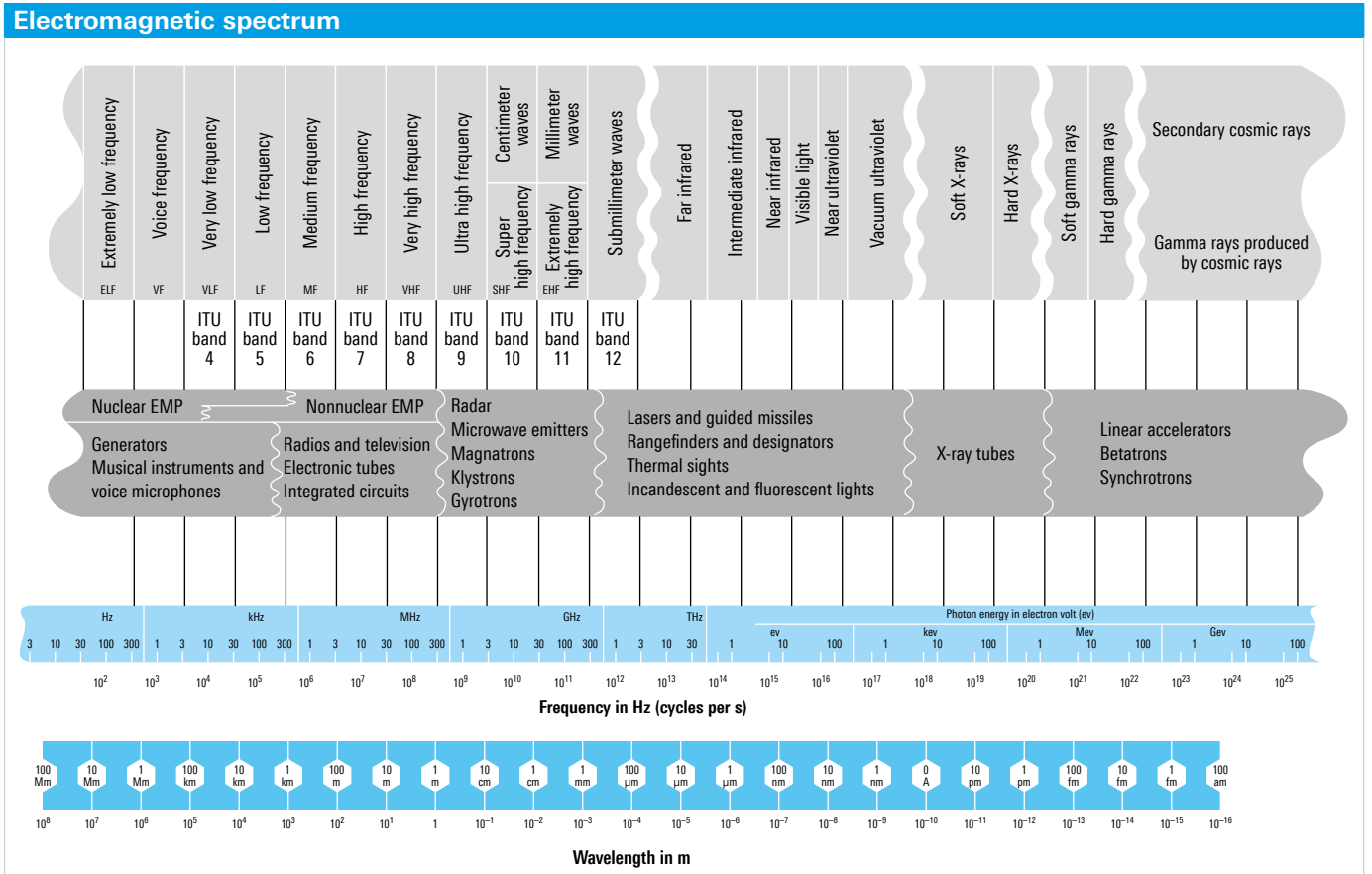
Glossary

Term	Description
A	
Absorption	<p>1. In the transmission of electrical, electromagnetic or acoustic signals, the conversion of the transmitted energy into another form, usually thermal.</p> <ul style="list-style-type: none"> ▷ 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. (ATIS-0100523.2011) <p>2. The irreversible conversion of energy of an electromagnetic wave into another form of energy as a result of its interaction with matter. (IEEE)</p>
ANSI	American National Standards Institute The US standards organization that establishes procedures for the development and coordination of voluntary American National Standards. (ATIS-0100523.2011)
Antenna	<p>1. Any structure or device used to collect or radiate electromagnetic waves. (ATIS-0100523.2011)</p> <p>2. A device that converts radio frequency electrical energy to radiated electromagnetic energy and vice versa. (ATIS-0100523.2011)</p>
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. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Antenna factor	<p>The antenna factor K is the quotient of the electric field strength E and the voltage V present at 50 Ω (e.g. a matched receiver input).</p> $K = \frac{\text{Electric field strength}}{\text{Antenna output voltage at } 50\Omega}$ <p>▷ 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)</p>
Antenna gain	<p>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.</p> <ul style="list-style-type: none"> ▷ 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: <ul style="list-style-type: none"> ▪ absolute or isotropic gain (Gi) when the reference antenna is an isotropic antenna isolated in space; ▪ gain relative to a half-wave dipole (Gd) when the reference antenna is a half-wave dipole isolated in space and with an equatorial plane that contains the given direction. (ATIS-0100523.2011) <p>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.</p> <ul style="list-style-type: none"> ▷ 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	<p>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.</p> <ul style="list-style-type: none"> ▷ The antenna noise temperature depends on antenna coupling to all noise sources in its environment as well as on noise generated within the antenna. ▷ The antenna noise temperature is a measure of noise whose value is equal to the actual temperature of a passive device. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)

Term	Description
Atmospheric duct	A horizontal layer in the lower atmosphere in which the vertical refractive index gradients are such that radio signals <ul style="list-style-type: none"> ■ are guided or focused within the duct ■ tend to follow the curvature of the Earth ■ experience less attenuation in the ducts than they would if the ducts were not present <p>▷ 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. (ATIS-0100523.2011)</p>
Attenuation	1. The 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. (ATIS-0100523.2011)
	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 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. (ATIS-0100523.2011)
Band	The frequency spectrum between two defined limits. (ATIS-0100523.2011)
Beam	The main lobe of an antenna radiation pattern. (ATIS-0100523.2011)
Beamwidth	see "Half-power beamwidth"
Bias tee	A circuit that feeds a DC voltage to an RF path without affecting the RF parameters.
Boresight	The physical axis of a directional antenna. (ATIS-0100523.2011)
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 sidebands in a suitable detector, produces the modulating wave. (ATIS-0100523.2011)
	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	International Radio Consultative Committee A predecessor organization of the ITU-R. (ATIS-0100523.2011)
CCITT	International Telegraph and Telephone Consultative Committee A predecessor organization of the ITU-T. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Counterclockwise polarized wave	see "Left-hand polarized wave"
D	
dB	see "Decibel"
dBc	dB relative to the carrier power. (ATIS-0100523.2011)
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. 0 dBd $\hat{=}$ 2.15 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. (ATIS-0100523.2011)

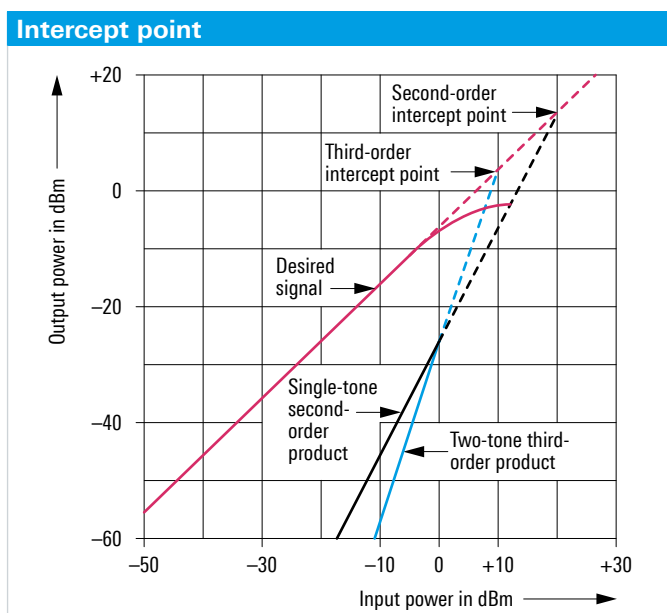
Term	Description
Decibel	<p>1. One tenth of the common logarithm of the ratio of relative powers, equal to 0.1 B (bel). ▷ The decibel is the conventional relative power ratio, rather than the bel, for expressing relative powers because the decibel is smaller and therefore more convenient than the bel. The ratio in dB is given by</p> $dB = 10 \lg \left(\frac{P_1}{P_2} \right),$ <p>where P1 and P2 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> $P = I^2 \cdot Z = \frac{E^2}{Z}.$ <p>Thus, dB is also given by</p> $dB = 10 \lg \left(\frac{E_1^2/Z_1}{E_2^2/Z_2} \right) = 10 \lg \left(\frac{I_1^2 \cdot Z_1}{I_2^2 \cdot Z_2} \right)$ <p>If Z1 = Z2, these become</p> $dB = 20 \lg \left(\frac{E_1}{E_2} \right) = 20 \lg \left(\frac{I_1}{I_2} \right). \quad (\text{ATIS-0100523.2011})$ <p>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 P1 and P2 designating two amounts of power and n the number of decibel denoting their ratio,</p> $n = 10 \lg \left(\frac{P_1}{P_2} \right) \text{ decibel.}$ <p>When the conditions are such that the ratios of currents or ratios of voltages (or analog 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:</p> $n = 20 \lg \left(\frac{I_1}{I_2} \right) \text{ decibel} \quad n = 20 \lg \left(\frac{U_1}{U_2} \right) \text{ decibel,}$ <p>where I1/I2 and U1/U2 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 where 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)</p>
Downconverter	A device for performing frequency translation in such a manner that the output frequencies are lower in the spectrum than the input frequencies.
E	
Effective area	<p>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. ▷ In the case of parabolic and horn-parabolic antennas, the antenna effective area is about 0.35 to 0.55 of the geometric area of the antenna aperture. (ATIS-0100523.2011)</p>
Effective aperture	<p>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)</p> <p>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.</p>
Effective height	<p>1. The height of the center of radiation of an antenna above the effective ground level. (ATIS-0100523.2011)</p> <p>2. In low-frequency applications involving loaded¹⁾ 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. (ATIS-0100523.2011)</p> <p>¹⁾ Loaded antennas = electrically short antennas.</p>
Efficiency	<p>The ratio of the useful power output to the total power input. (IEEE) 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. (ATIS-0100523.2011)</p>

Term	Description
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. (ATIS-0100523.2011)
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. (ATIS-0100523.2011) 2. The spectrum of electromagnetic radiation: in wavelengths, gamma ray, shorter than 0.006 nm; X-ray, 0.006 nm to 5 nm; ultraviolet, 5 nm to 0.4 μm; visible light, 0.4 μm to 0.7 μm; infrared, 0.7 μm to 1 mm; radio frequency, >1 mm. (IEEE)
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)
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. (ATIS-0100523.2011) 2. A measure of equipment tolerance to external electromagnetic fields. (IEEE)



Term	Description
EMS	<p>Electromagnetic susceptibility</p> <ol style="list-style-type: none"> 1. Of an electronic circuit or device, the degree to which it is subject to malfunction or failure under the influence of electromagnetic radiation. (ATIS-0100523.2011) 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	<p>Electromagnetic interference</p> <ol style="list-style-type: none"> 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. (ATIS-0100523.2011) 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. (ATIS-0100523.2011) 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	<p>Electromagnetic energy propagated from a source by radiation or conduction.</p> <p>▷ The emission may be either desired or undesired and may occur anywhere in the electromagnetic spectrum. (ATIS-0100523.2011)</p>
E plane	The plane containing the electric field vector and the direction of maximum radiation. (IEEE)
F	
Feed (element)	<ol style="list-style-type: none"> 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	<p>The region where the angular field distribution is essentially independent of the distance from the source.</p> <p>▷ 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).</p> <p>▷ For a beam focused at infinity, the far-field region is sometimes referred to as the Fraunhofer region. (ATIS-0100523.2011)</p>
Field	The volume of influence of a physical phenomenon, expressed vectorially. (ATIS-0100523.2011)
Field strength	<p>The magnitude of an electric, magnetic or electromagnetic field at a given point.</p> <p>▷ The field strength of an electromagnetic wave is usually expressed as the RMS value of the electric field, in volts per meter.</p> <p>The field strength of a magnetic field is usually expressed in amperes per meter.</p> <p>Synonym: radio field intensity. (ATIS-0100523.2011)</p>
Figure of merit	see "G/T ratio"
Flux	The rate of flow of energy through a surface. (IEEE)
Frequency	<ol style="list-style-type: none"> 1. For a periodic function, the number of cycles or events per unit time. 2. The number of cycles occurring per second of an electrical or electromagnetic wave; a number representing a specific point in the electromagnetic spectrum. (ATIS-0100523.2011)
Front-to-back ratio	<p>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.</p> <p>▷ Front-to-back ratio is usually expressed in dB. (ATIS-0100523.2011)</p>
G	
G/T ratio	<p>Gain-to-noise temperature, synonym: figure of merit</p> <p>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 temperature²⁾ of the receiving system in kelvin. (ATIS-0100523.2011)</p> <p>²⁾ Including antenna noise temperature.</p>
Gain	see "Antenna gain"
Graphical user interface	A computer environment or program that displays or facilitates the display of onscreen options, usually in the form of icons (pictorial symbols) or menus (lists of alphanumeric characters) by means of which users may enter commands. (ATIS-0100523.2011)

Term	Description
Ground wave	<p>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. (ATIS-0100523.2011)</p> <p>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)</p>
GUI	see "Graphical user interface"
H	
Half-power beamwidth	<p>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.</p> <p>▷ Beamwidth is usually expressed in degrees. (ATIS-0100523.2011)</p>
Hertz	<p>The SI unit of frequency, equal to one cycle per second.</p> <p>▷ A periodic phenomenon that has a period of one second has a frequency of one hertz. (ATIS-0100523.2011)</p>
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	<p>The total passive opposition offered to the flow of electric current.</p> <p>▷ Impedance is determined by the particular combination of resistance, inductive reactance and capacitive reactance in a given circuit.</p> <p>▷ Impedance is normally a function of frequency, except in the case of purely resistive networks. (ATIS-0100523.2011)</p>
Intercept point	<p>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 diagram below is a graphical representation of the intercept points for a single-tone second-order and a two-tone third-order intermodulation product. (IEEE)</p> <p>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.</p> <p>▷ Determination of a third-order intercept point is accomplished by using two test frequencies that fall within the first intermediate frequency mixer passband. Usually, the test frequencies are about 20 kHz to 30 kHz apart. (ATIS-0100523.2011)</p>
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. (ATIS-0100523.2011)



Term	Description
Intermodulation product	In the output of a nonlinear system, a frequency produced by intermodulation of harmonics of the frequencies present in the input signal. (ATIS-0100523.2011)
Ionosphere	That part of the atmosphere, extending from about 70 km to 500 km, in which ions and free electrons exist in sufficient quantities to reflect and/or refract electromagnetic waves. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Isotropic radiator	see "Isotropic antenna"
ITU	International Telecommunication Union A civil international organization established to promote standardized telecommunications on a world-wide 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 UN as the specialized agency for telecommunications. (ATIS-0100523.2011)
ITU-R	International Telecommunication Union – Radiocommunications Sector Responsible for studying technical issues related to radiocommunications, and having some regulatory powers. ▷ A predecessor organization was the CCIR. (ATIS-0100523.2011)
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector ▷ 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). (ATIS-0100523.2011)
K	
K factor	see "Antenna factor"
L	
LAN	see "Local area network"
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, while looking in the direction of propagation, rotates with time in a left-hand or counterclockwise direction. ▷ Also called counterclockwise polarized wave. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Local area network	A data communications system that (a) lies within a limited spatial area, (b) has a specific user group, (c) has a specific topology, and (d) is not a public switched telecommunications network, but maybe connected to one. (ATIS-0100523.2011)
Loss	1. The diminution, usually expressed in dB, of signal level in a communications medium. (ATIS-0100523.2011) 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. (ATIS-0100523.2011) 3. The attenuation of a signal level in a communications medium (usually expressed in dB).
M	
Main beam	see "Main lobe"
Main lobe	Also called 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. (ATIS-0100523.2011)
Matched	Matched means that the impedance of e.g. an antenna is equal to the impedance of the RF cable and 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. (ATIS-0100523.2011)
Medium	In telecommunications, the transmission path along which a signal propagates, such as a wire pair, coaxial cable, waveguide, optical fiber or radio path. (ATIS-0100523.2011)

Term	Description
Modulation	The process, or result of the process, of varying a characteristic parameter of a carrier in accordance with an information-bearing signal. (ATIS-0100523.2011)
MTBF	Mean time between failures 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. (ATIS-0100523.2011)
MTRR	Mean time to repair The time interval (hours) that may be expected to return a failed equipment to proper operation. (IEEE)
N	
Near-field region	The close-in region of an antenna wherein the angular field distribution is dependent upon the distance from the antenna. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
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 dB 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. (ATIS-0100523.2011)</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 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. (ATIS-0100523.2011)</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. (ATIS-0100523.2011)
O	
Omnidirectional antenna	An antenna that has a radiation pattern that is nondirectional in azimuth. ▷ The vertical radiation pattern may be of any shape. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Phantom feeding	A DC supply voltage is fed into an RF cable via a bias tee circuit.
Polarization	<p>Of an electromagnetic wave, the property that describes the orientation, i.e. time-varying direction and amplitude, of the electric field vector.</p> <p>▷ 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. (ATIS-0100523.2011)</p>

Term	Description
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. (ATIS-0100523.2011)
Power	The rate of transfer or absorption of energy per unit time in a system. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Propagation channel	The physical medium in which electromagnetic wave propagation takes place. This channel includes everything that influences the propagation between two antennas.
Propagation path	see "Propagation channel"
R	
Radar cross section	An expression on the extent to which an object, i.e. a target reflects radar pulses, usually with respect to their point of origin. The radar cross section of an aircraft can vary by a factor of over 100, depending on the aspect angle of the aircraft to the radar transmitter. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
Radiation	In radiocommunications, the emission of energy in the form of electromagnetic waves. The outward flow of energy from any source in the form of radio waves. (ATIS-0100523.2011)
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 the horizontal or vertical plane. (ATIS-0100523.2011)
Radio frequency	see "RF"
Radio path	In the medium air, the channel or path through which the propagation between two antennas takes place.
RCS	see "Radar cross section"
Reciprocity	For antennas, the possibility that the same antenna can be used either for receiving and for transmitting. ▷ One exception to this rule are active antennas – which 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. (ATIS-0100523.2011)
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 the associated diagram. (ATIS-0100523.2011)
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, while looking in the direction of propagation, rotates with time in a right-hand or clockwise direction. Synonym: clockwise polarized wave. (ATIS-0100523.2011)
Rotary joint	A device transmitting cable-bound RF signals via a mechanically rotating joint to a device that 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	In a directional antenna radiation pattern, a lobe in any direction other than that of the main lobe. (ATIS-0100523.2011)
Side lobe suppression	1. Any process, action or adjustment taken 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-dependent 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 that would involve the transmission of a signal.
Silent zone	see "Skip zone"
Skip zone	An annular region within the transmission range of an antenna, within which 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 skywaves can be received. Synonyms: silent zone, zone of silence. (ATIS-0100523.2011)
Skywave	A radio wave that travels upward from the antenna. ▷ A skywave may be reflected to Earth by the ionosphere. (ATIS-0100523.2011)

Term	Description
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. (ATIS-0100523.2011)
Spillover	In a (reflector) antenna, the part of the radiated energy from the feed that does not impinge on the reflectors. (ATIS-0100523.2011)
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. (ATIS-0100523.2011) 2. To shield against compromising emanation. (ATIS-0100523.2011)
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. 2. The layer of the Earth's atmosphere, between the surface and the stratosphere, in which temperature decreases with altitude and which contains approximately 80% of the total air mass. Note: The thickness of the troposphere varies with season and latitude. It is usually 16 km to 18 km thick over tropical regions, and less than 10 km thick over the poles. (ATIS-0100523.2011)
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. (ATIS-0100523.2011)
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 $\lambda = v/f$. (ATIS-0100523.2011) ▷ 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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PD 0758.0368.42 | Version 07.00 | June 2014
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0758036842