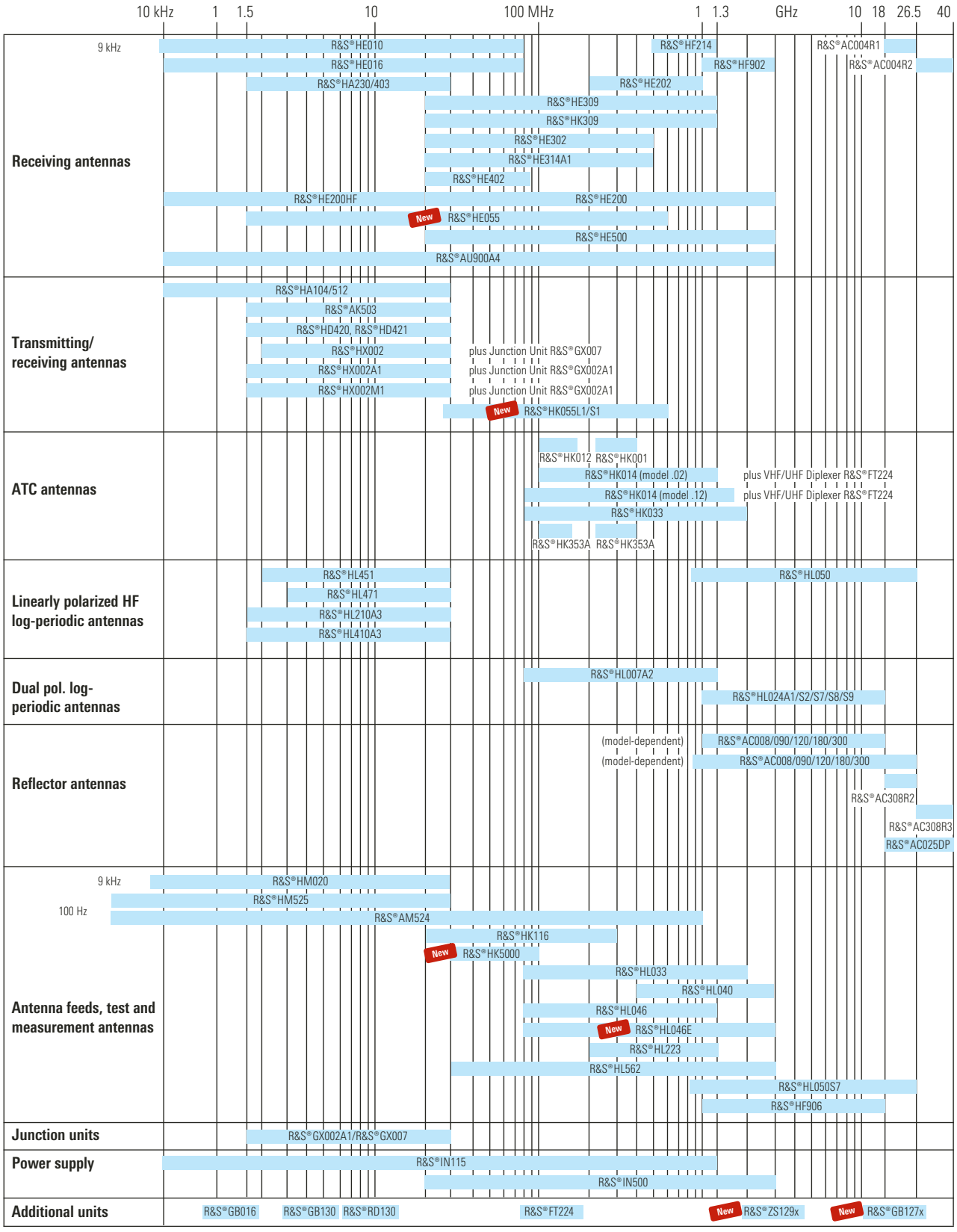
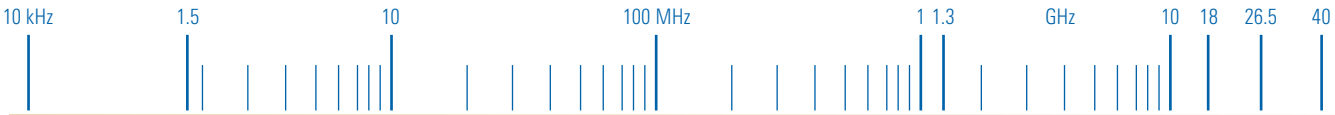
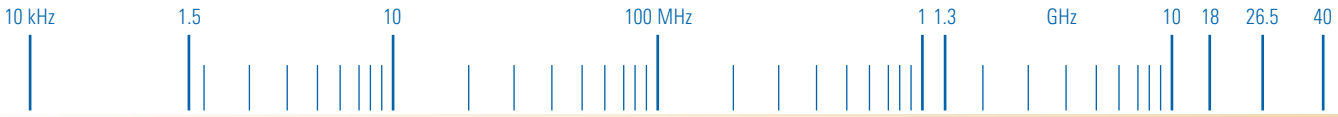
Antenna selection guide





3 SHF Antennas



SHF Antennas 3

Type	Designation	Page
R&S®HL 024A1/S1	Crossed Log-Periodic Antennas	128
R&S®HL 024S2	Crossed Log-Periodic Antenna	130
R&S®HL 024S7	Crossed Log-Periodic Antenna	132
R&S®HL 024S8	Crossed Log-Periodic Antenna	134
R&S®HL 024S9	Crossed Log-Periodic Antenna	136
R&S®HL 050/R&S®HL 050S1	Log-Periodic Antennas	138
R&S®HL 050S7	Log-Periodic Directional Antenna with Preamplifier	140
R&S®AC 004R1/R&S®AC 004R2	Omnidirectional Antennas	142
R&S®HF 906	Double-Ridged Waveguide Horn Antenna	144

SHF Antennas

Microwave Directional Antenna R&S®AC 008

1 GHz to 18 GHz/0.85 GHz to 26.5 GHz
Manually steerable directional antenna for the detection of RF signals and for field-strength measurements

Features

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

Brief description

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

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

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

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

Specifications

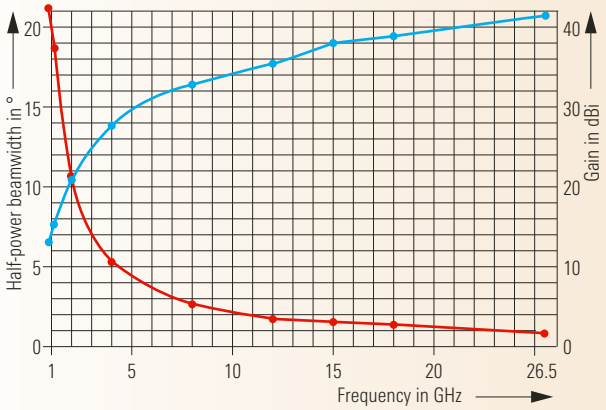
Frequency range	1 GHz to 18 GHz (models .02/.04)
	0.85 GHz to 26.5 GHz (model .05)
Polarization	
With feed R&S®HL024A1	dual-linear (model .02)
With feed R&S®HL 050	linear (model .05)
With feed R&S®HL024S2	linear/circular (model .04)
Input impedance	50 Ω
VSWR	≤2.5
Gain	15 dBi to 40 dBi (1 GHz to 18 GHz)
Half-power beamwidth	20° to 1.5° (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
Weight	approx. 12 kg

Ordering information

Microwave Directional Antenna		
1 GHz to 18 GHz, dual-linear polarization	R&S®AC 008	0671.5017.02
1 GHz to 18 GHz, linear/ circular polarization	R&S®AC 008	0671.5017.04
0.85 GHz to 26.5 GHz, linear polarization	R&S®AC 008	0671.5017.05

Recommended extras		
Tripod	R&S®AC 008-Z	0671.5117.02
Control Unit for R&S®HL024S2	R&S®GB 016	4056.7006.02
Control Cable, 10 m	R&S®GB 016Z1	4056.7270.02
Microwave Cable, 5 m	R&S®AC 008W2	0751.6931.04
Microwave Cable, 10 m	R&S®AC 008W2	0751.6931.05
Telescope	R&S®AC 008F1	0751.6919.02



Typical gain (blue) and half-power beamwidth (red) of R&S®AC 008 with feed R&S®HL 050

R&S®AC 008 collapsible for transportation

SHF Directional Antenna System R&S®AC 090

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

Features

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

Brief description

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

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

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

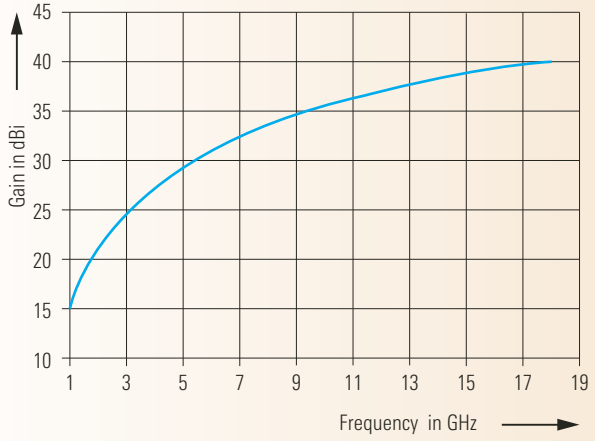
Specifications

Frequency range	
Depending 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 figure below
Range of rotation	
Azimuth	±180°
Elevation	–5° to +95°

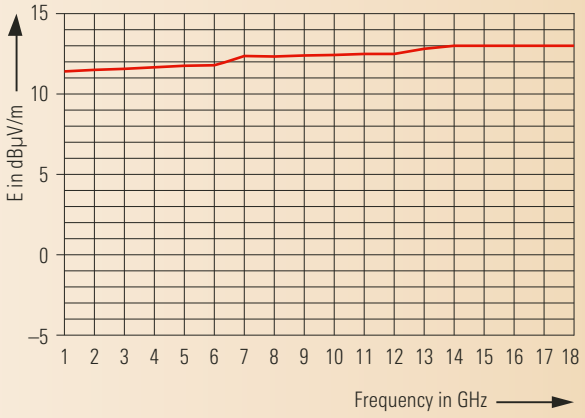
Connector	RPC3.5 female
MTBF	>8000 h
Operating temperature range	–30 °C to +50 °C
Max. wind speed	180 km/h (without ice deposit)
Reflector diameter	approx. 0.9 m
Weight	approx. 165 kg

Ordering information

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



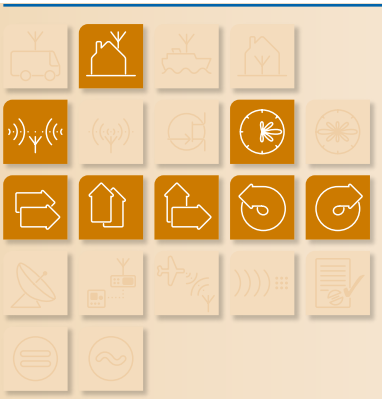
Typical gain



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

SHF Antennas

SHF Directional Antenna System R&S®AC 120



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

Features

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

Brief description

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

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

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

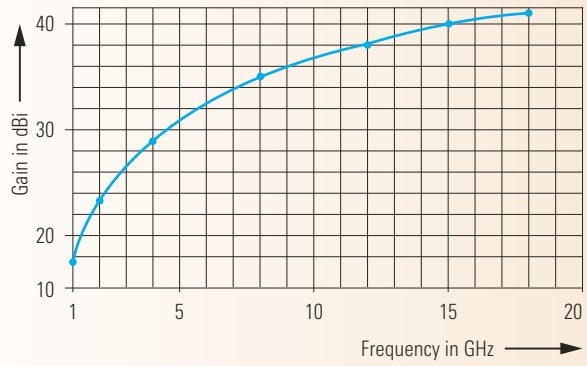
Specifications

Frequency range	
Depending on feed	1 GHz to 18 GHz
	1 GHz to 26.5 GHz
Gain	15 dBi to 42 dBi (1 GHz to 18 GHz)
Half-power beamwidth	17° to 0.9° (1 GHz to 18 GHz)
Min. field strength	see figure below
Range of rotation	
Azimuth	±180°
Elevation	–5° to +95°

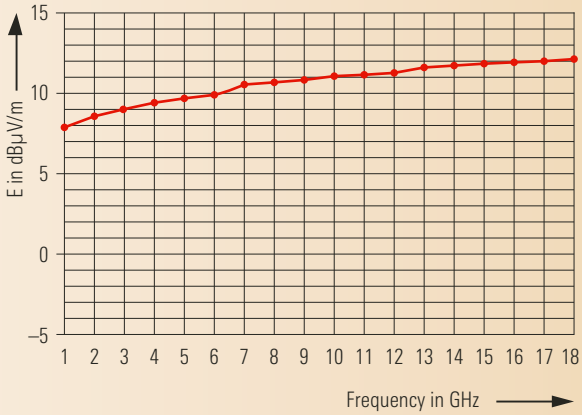
Connector	RPC3.5 female
MTBF	>8000 h
Operating temperature range	–30 °C to +50 °C
Max. wind speed	180 km/h (without ice deposit)
Reflector diameter	approx. 1.2 m
Weight	approx. 170 kg

Ordering information

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



Typical gain



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

SHF Directional Antenna System R&S®AC 180

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

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

Features

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

Brief description

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

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

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

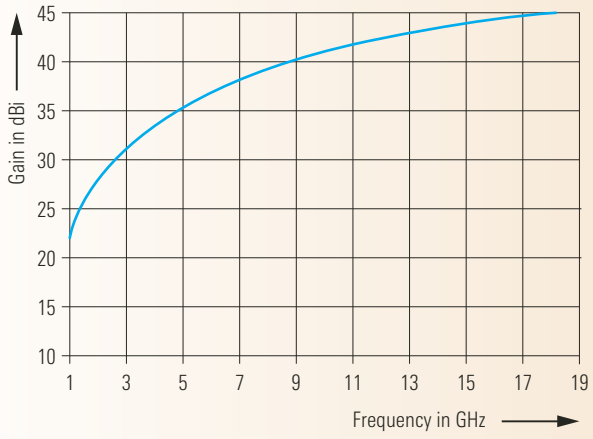
Specifications

Frequency range	
Depending on feed	1 GHz to 18 GHz
	0.85 GHz to 26.5 GHz
Gain	20 dBi to 46 dBi (1 GHz to 18 GHz)
Half-power beamwidth	12° to 0.7° (1 GHz to 18 GHz)
Min. field strength	see figure below
Range of rotation	
Azimuth	±180°
Elevation	–5° to +95°

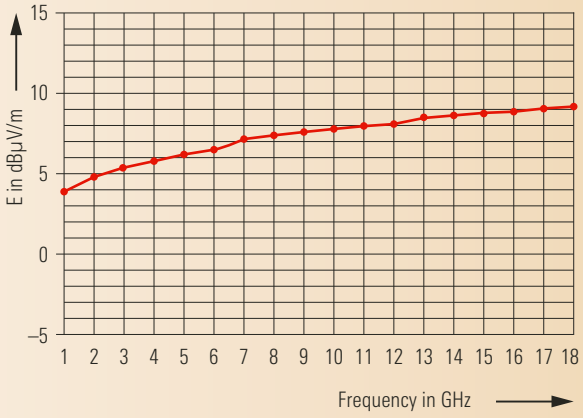
Connector	RPC3.5 female
MTBF	>8000 h
Operating temperature range	–30 °C to +55 °C
Max. wind speed	160 km/h (without ice deposit)
Reflector diameter	approx. 1.8 m
Weight	approx. 420 kg

Ordering information

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



Typical gain



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

SHF Antennas

SHF Directional Antenna System R&S®AC 300

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

Features

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

Brief description

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

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

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

Specifications

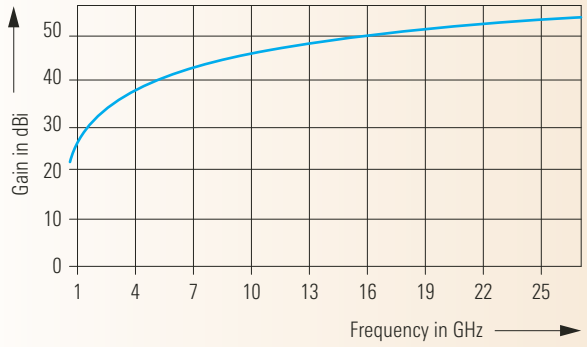
Frequency range	
Depending on feed	1 GHz to 18 GHz
	0.85 GHz to 26.5 GHz
Gain	26 dBi to 51 dBi
	22 dBi to 51 dBi
Half-power beamwidth	6° to 0.35°
Min. field strength	see figure below
Range of rotation	
Azimuth	±180°
Elevation	–5° to +95°

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
Weight	approx. 1460 kg

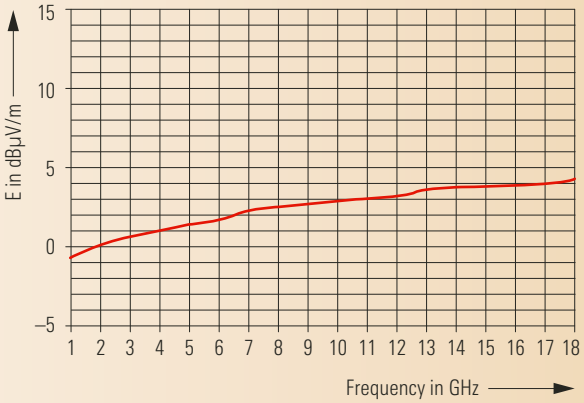
Ordering information

SHF Directional Antenna		
System	R&S®AC 300	4051.6546.00
Feed options (see also pages 128 to 141):		
Log-Periodic Antenna, 0.85 GHz to 26.5 GHz		
Basic model	R&S®HL 050S1	4065.0100.02
With preamplifier	R&S®HL 050S7	4064.6040.02
Crossed Log-Periodic Antenna, 1 GHz to 18 GHz		
Basic model	R&S®HL 024S1	4055.1256.02
With passive		
polarization network	R&S®HL 024S2	4052.1003.02
With preamplifier,		
1 RF output	R&S®HL 024S7	4042.8505.02

With preamplifier,		
2 RF outputs	R&S®HL 024S8	4042.7509.02
With active		
polarization network	R&S®HL 024S9	4047.6252.02
Recommended extras		
Reflector Antenna, 18 GHz to 26.5 GHz,		
29 dBi to 33 dBi	R&S®AC 308R2	4051.6001.02
Reflector Antenna, 26.5 GHz to 40 GHz,		
33 dBi to 36 dBi	R&S®AC 308R3	4051.6253.02



Typical gain



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

SHF Antennas

SHF Directional Antenna R&S®AC 308R2

18 GHz to 26.5 GHz

Broadband directional antenna for radiomonitoring

Features

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

Brief description

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

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

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

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

Chapter Overview
Type Index
Main Menu

Specifications

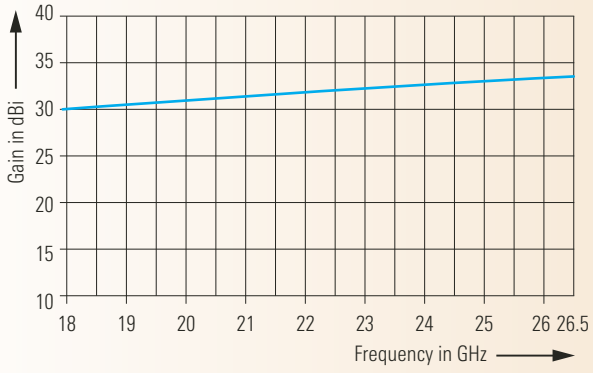
Antenna	
Frequency range	18 GHz to 26.5 GHz
Polarization	H, V or 45°, depending on installation
Input impedance	50 Ω
VSWR	<2
Gain	29 dBi to 33 dBi
Half-power beamwidth	4.5° to 3°
Reflector diameter	250 mm
Connector	K female
Preamplifier (typical values)	
Gain	28 ±2 dB
1 dB compression point	≥+8 dBm

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

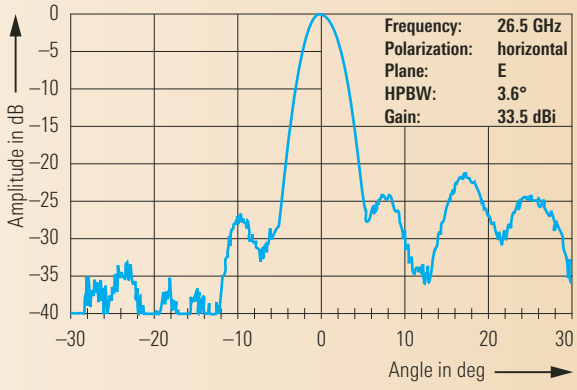
Ordering information

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

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



Typical gain



Typical radiation pattern at 26.5 GHz

SHF Antennas

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

26.5 GHz to 40 GHz

Broadband directional antenna for radiomonitoring

Features

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

Brief description

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

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

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

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

Chapter Overview
Type Index
Main Menu

Specifications

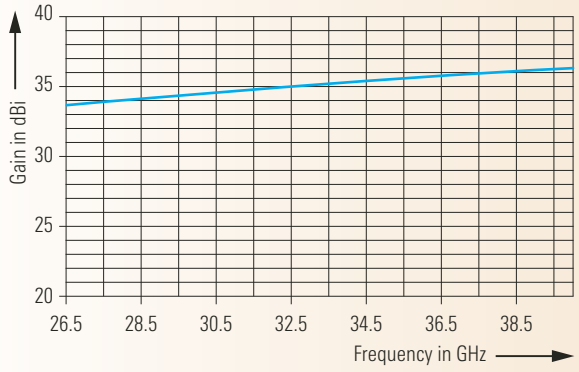
Antenna	
Frequency range	26.5 GHz to 40 GHz
Polarization	H, V or 45°, depending on installation
Input impedance	50 Ω
VSWR	<2
Gain	33 dBi to 36 dBi
Half-power beamwidth	3° to 2°
Reflector diameter	250 mm
Connector	K female
Preamplifier (typical values)	
Gain	28 ±2 dB
1 dB compression point	≥+8 dBm

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

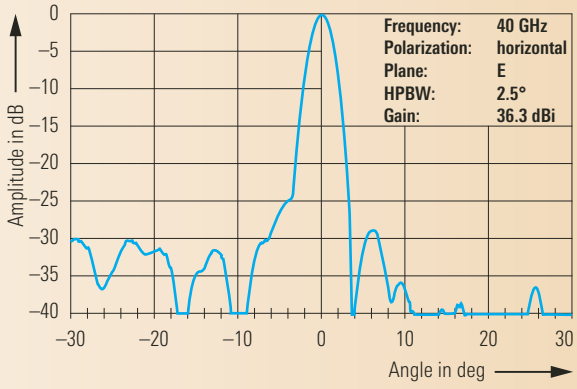
Ordering information

SHF/EHF Directional Antenna		
With preamplifier,		
26.5 GHz to 40 GHz	R&S®AC 308R3	4051.6253.02
Without preamplifier,		
26.5 GHz to 40 GHz	R&S®AC 308R3	4051.6253.04

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



Typical gain



Typical radiation pattern at 40 GHz

SHF Antennas

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

18 GHz to 40 GHz

Broadband microwave reflector antenna with preamplifier

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

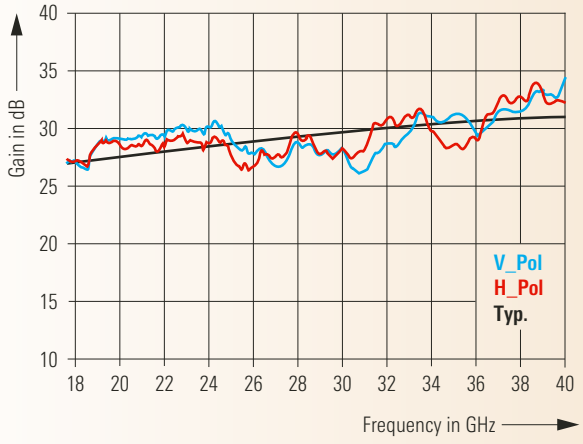
Specifications

Antenna	
Frequency range	18 GHz to 40 GHz
Polarization	2 × linear (orthogonal relative to each other)
Input impedance	50 Ω
VSWR (with preamplifier)	<3.0 (typ. <2.5)
Gain	26 dBi to 32 dBi
Half-power beamwidth	4.5° to 2° (typ.)
Reflector diameter	250 mm
Connector	2 × K female
Preamplifier (typical values)	
Gain	typ. >30 dB
1 dB compression point	typ. >8 dBm
Noise figure	typ. <5 dB
Power consumption	15 V/0.5 A (max.)
MTBF	>50 000 h
Operating temperature range	–30 °C to +55 °C
Protection class	IP 45 (in line with DIN EN 60529)
Dimensions (diameter × length)	approx. 320 mm × 340 mm
Weight	approx. 5 kg

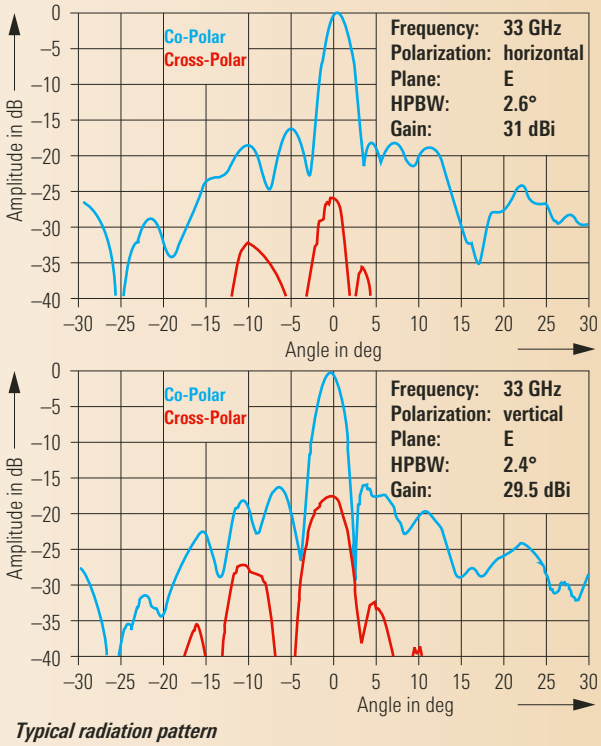
Ordering information

Dual-Polarized Reflector Antenna	R&S®AC 025DP	4062.5830.02

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



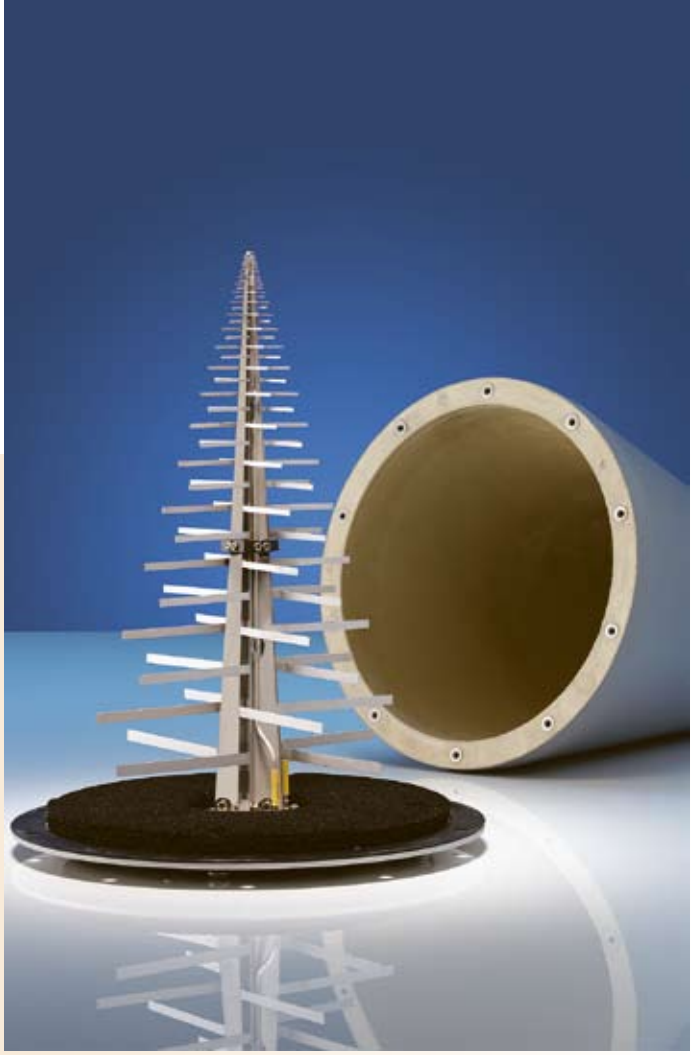
Typical gain



Typical radiation pattern

SHF Antennas

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



1 GHz to 18 GHz

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

Features

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

Brief description

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

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

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

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

Specifications

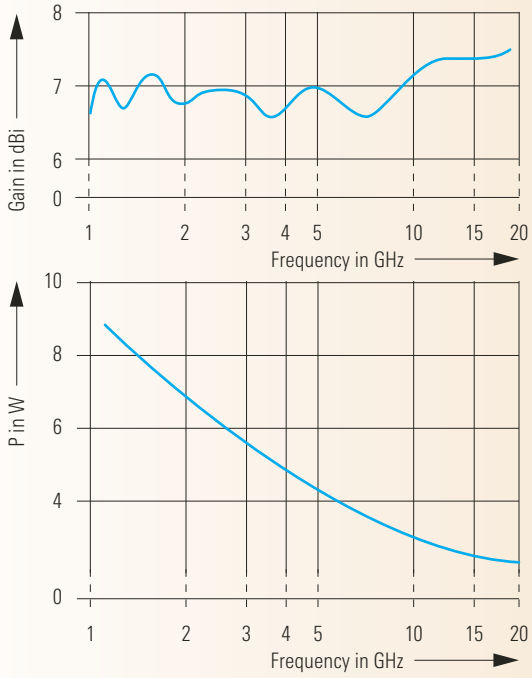
Frequency range	1 GHz to 18 GHz
Polarization	linear/horizontal and vertical
Input impedance	50 Ω
VSWR	≤2.5
Max. input power	10 W to 3 W CW
Gain	typ. 7 dBi
Connector	2 × SMA female

Operating temperature range	–40 °C to +55 °C
Max. wind speed	180 km/h (without ice deposit)
MTBF	>150 000 h
Dimensions (diameter × height)	
With radome	approx. 210 mm × 300 mm
Weight	approx. 0.7 kg

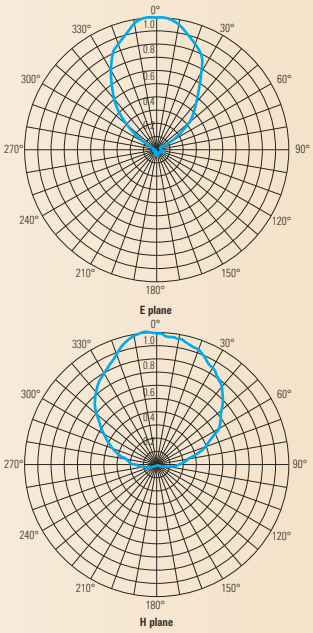
Ordering information

Crossed Log-Periodic Antenna	R&S®HL024A1	0650.7510.03
Crossed Log-Periodic Antenna	R&S®HL024S1	4055.1256.02

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



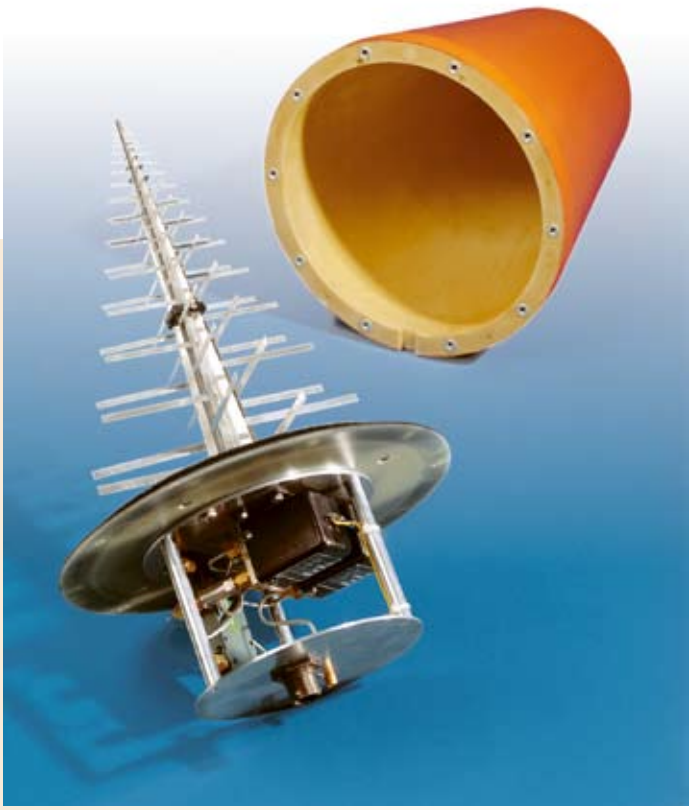
Typical gain and power-handling capacity



Typical radiation patterns in the E and H planes

SHF Antennas

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



1 GHz to 18 GHz
Log-periodic directional antenna consisting of R&S®HL 024A1 and passive polarization switching network

Features

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

Brief description

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

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

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

Chapter Overview
Type Index
Main Menu

Specifications

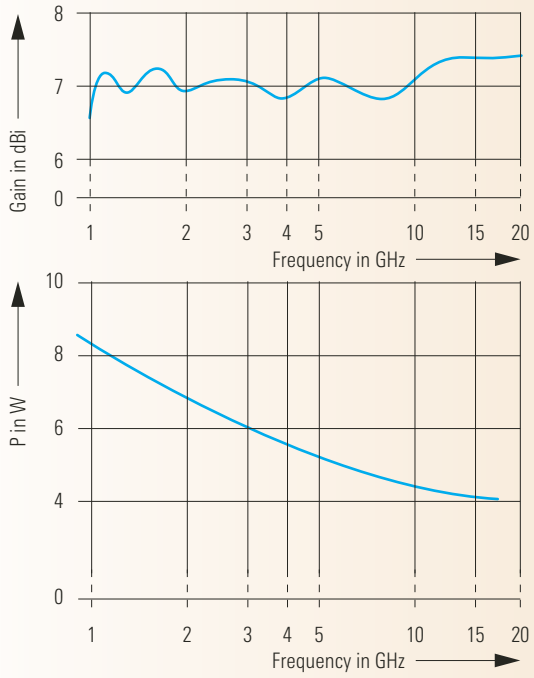
Frequency range	1 GHz to 18 GHz
Polarization	horizontal, vertical, left-hand or right-hand circular (selectable)
Input impedance	50 Ω
VSWR	
1 GHz to 12 GHz	≤2.5
12 GHz to 18 GHz	≤3
Gain (switching network taken into account)	4 dBi to 6 dBi
Circularity	typ. 2 dB

Connector	SMA female
Control connector	10-contact, round, male
Operating temperature range	–40 °C to +55 °C
Max. wind speed	180 km/h (without ice deposit)
MTBF	>150 000 h
Dimensions (diameter × height)	
With radome	approx. 210 mm × 353 mm
Weight	approx. 1 kg

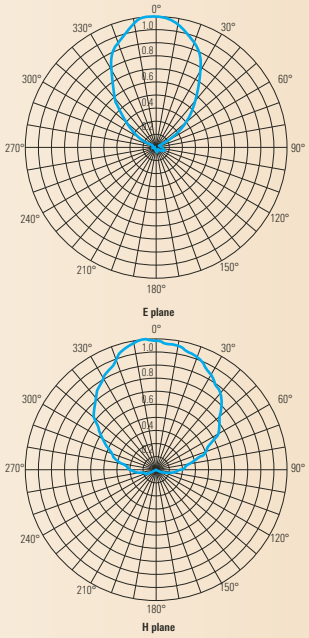
Ordering information

Crossed		
Log-Periodic Antenna	R&S®HL024S2	4052.1003.02

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



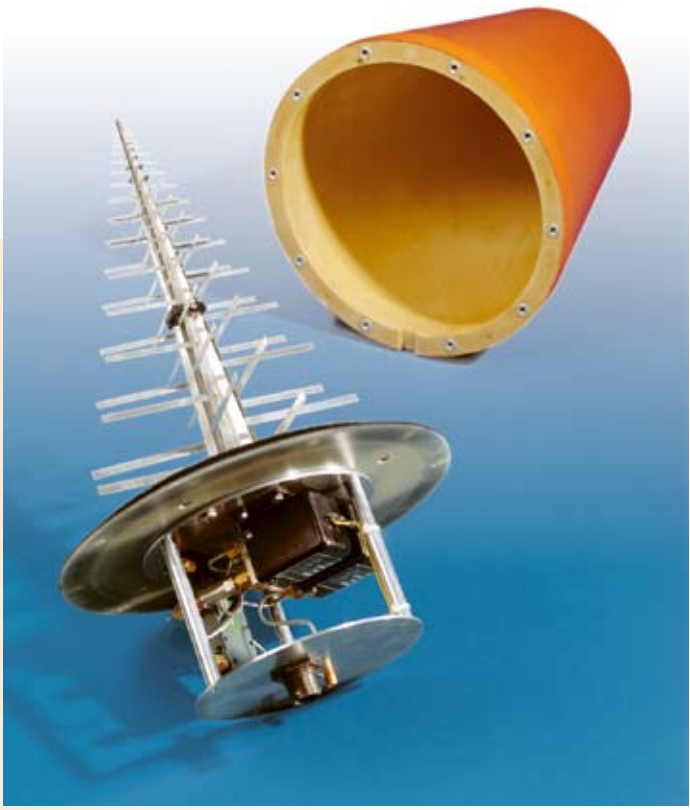
Typical gain and power-handling capacity



Typical radiation patterns in the E and H planes

SHF Antennas

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



1 GHz to 18 GHz
Log-periodic directional antenna consisting of R&S®HL 024A1 and a broadband preamplifier for horizontal or vertical polarization (selectable)

Features

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

Brief description

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

Horizontal or vertical polarization can be switch-selected.

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

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

Specifications

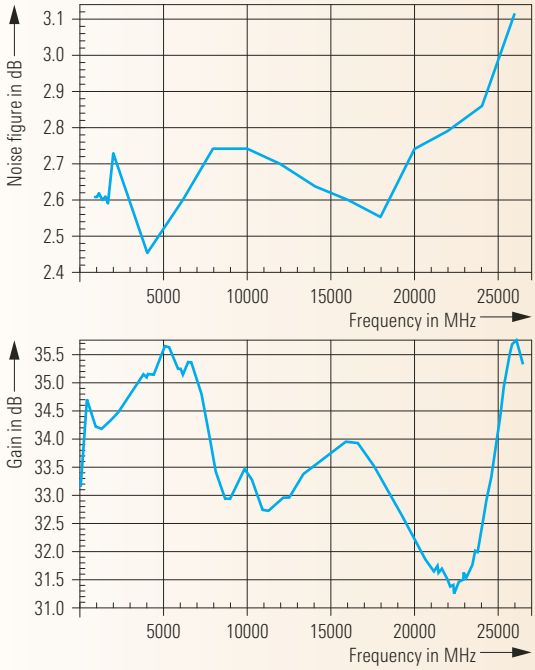
Frequency range	1 GHz to 18 GHz
Polarization	horizontal or vertical (selectable)
Input impedance	50 Ω
VSWR	<2.5
Gain (without polarization switch/preamplifier)	>6 dBi
Noise figure	≤3 dB
Gain (active network – can be switched on)	26 dB ±2 dB
1 dB compression point	approx. +8 dBm

Power supply	+15 V DC (max. 0.3 A)
Connector	SMA female
Control connector	10-contact, round, male
MTBF	>100 000 h
Operating temperature range	–30 °C to +55 °C
Dimensions (diameter × height)	
With radome	approx. 210 mm × 390 mm
Weight	approx. 1 kg

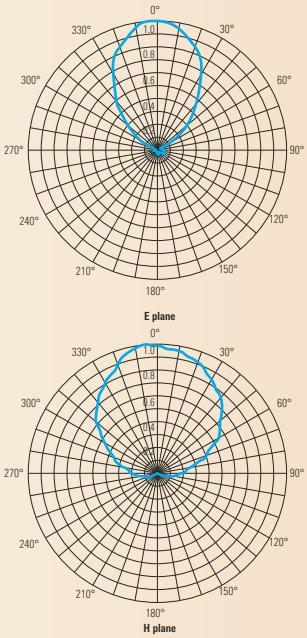
Ordering information

Crossed		
Log-Periodic Antenna	R&S®HL024S7	4042.8505.02

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



Typical noise figure and gain of broadband preamplifier



Typical radiation patterns in the E and H planes

SHF Antennas

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

1 GHz to 18 GHz
Log-periodic directional antenna consisting of R&S®HL 024A1 and two broadband preamplifiers for horizontal and vertical polarization

Features

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

Brief description

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

Connectors are provided for simultaneous use of both polarization planes.

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

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

Specifications

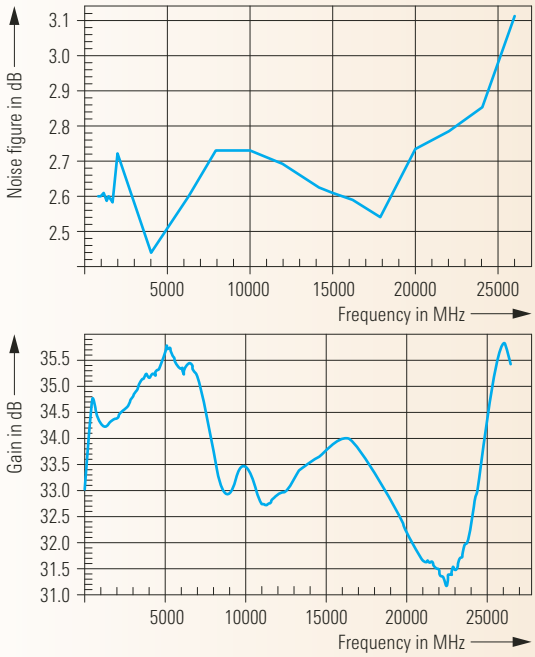
Frequency range	1 GHz to 18 GHz
Polarization	horizontal and vertical (simultaneously)
Input impedance	50 Ω
VSWR	<2.5
Gain	
(without preamplifier)	>6 dBi
Noise figure	≤3 dB
Gain (active network –	
can be switched on)	26 dB ±2 dB
1 dB compression point	approx. +8 dBm

Power supply	+15 V DC (max. 0.7 A)
Connector	2 × SMA female
Control connector	10-contact, round, male
MTBF	>55 000 h
Operating	
temperature range	–30 °C to +55 °C
Dimensions (diameter × height)	
With radome	approx. 210 mm × 390 mm
Weight	approx. 1 kg

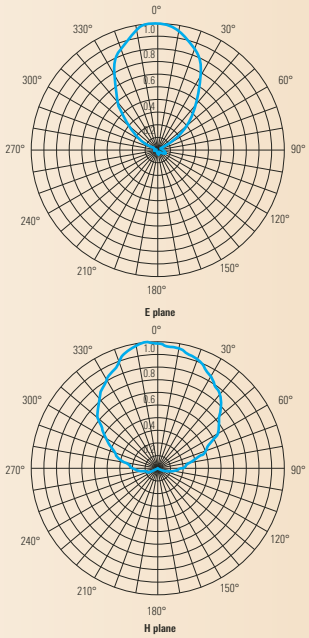
Ordering information

Crossed		
Log-Periodic Antenna	R&S®HL024S8	4042.7509.02

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



Typical noise figure and gain of broadband preamplifier



Typical radiation patterns in the E and H planes

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

1 GHz to 18 GHz

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

Features

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

Brief description

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

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

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

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

Specifications

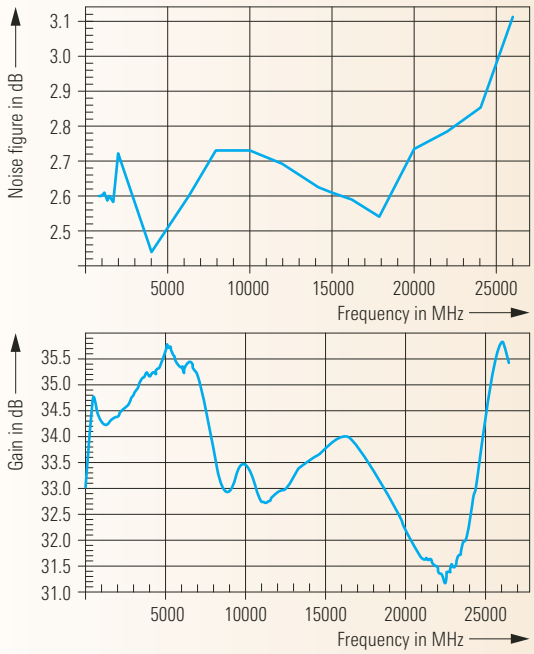
Frequency range	1 GHz to 18 GHz
Polarization	horizontal, vertical, left-hand or right-hand circular
Input impedance	50 Ω
VSWR	<2.5
Gain (without preamplifier and switching network)	>6 dBi
Circularity	typ. 3 dB
Noise figure	≤3 dB
Gain (linear polarization)	26 dB ±2 dB
Gain (circular polarization)	>22 dB ±2 dB

1 dB compression point	approx. +8 dBm
Power supply	+15 V DC (max. 0.5 A)
Connector	SMA female
Control connector	10-contact, round, male
MTBF	>55 000 h
Operating temperature range	–30 °C to +55 °C
Dimensions (diameter × height)	
With radome	approx. 210 mm × 390 mm
Weight	approx. 1.2 kg

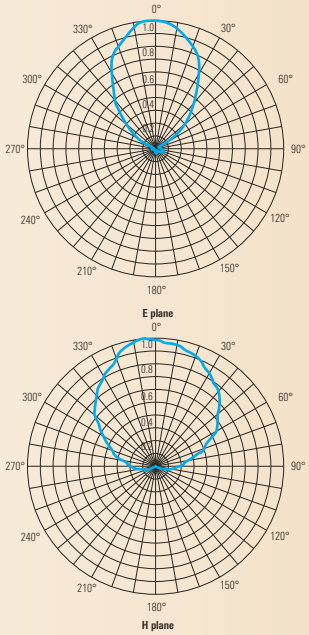
Ordering information

Crossed Log-Periodic Antenna	R&S®HL024S9	4047.6252.02

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



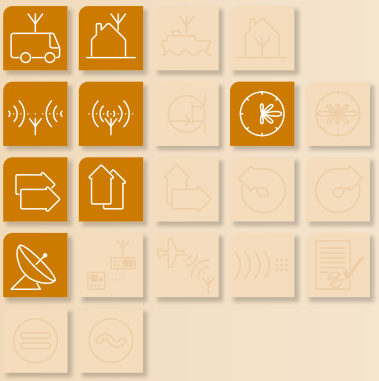
Typical noise figure and gain of broadband preamplifier



Typical radiation patterns in the E and H planes

SHF Antennas

Log-Periodic Antennas
R&S®HL 050/R&S®HL 050S1



850 MHz to 26.5 GHz

Log-periodic directional antennas for linear polarization

Features

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

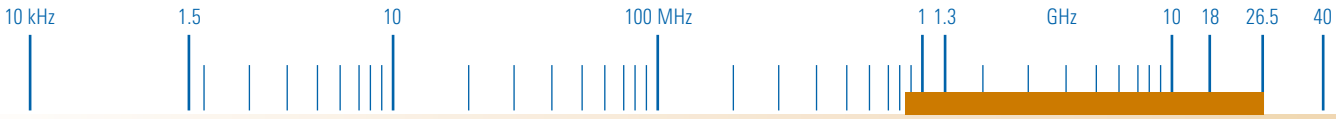
Brief description

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

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

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

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



Specifications

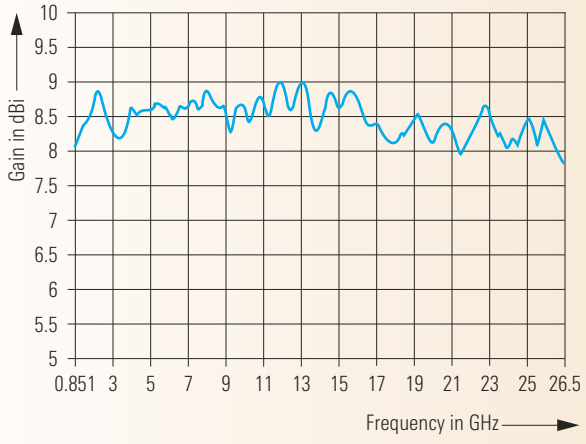
Frequency range	850 MHz to 26.5 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	≤2.5
Max. input power	10 W to 2 W
Gain	typ. 8.5 dBi
Connector	PC 3.5 female
MTBF	>1 000 000 h

Operating temperature range	–30 °C to +55 °C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (diameter × height)	
With radome	approx. 210 mm × 300 mm
Weight	approx. 0.7 kg

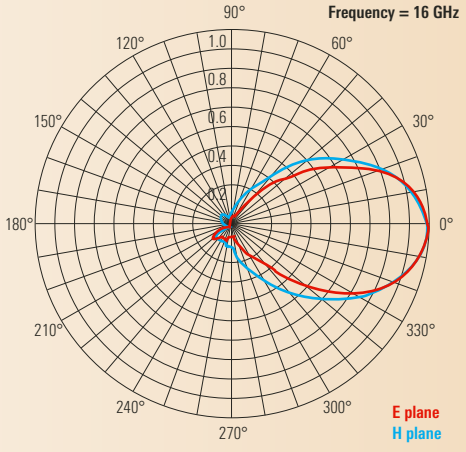
Ordering information

Log-Periodic Antenna	R&S®HL050	4062.4063.02
Log-Periodic Antenna	R&S®HL050S1	4065.0100.02

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



Typical gain



Typical radiation pattern

Log-Periodic Directional Antenna with Preamplifier R&S®HL 050S7

850 MHz to 26.5 GHz
Log-periodic directional antenna consisting of R&S®HL 050 and broadband preamplifier for linear polarization

Features

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

Brief description

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

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

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

Specifications

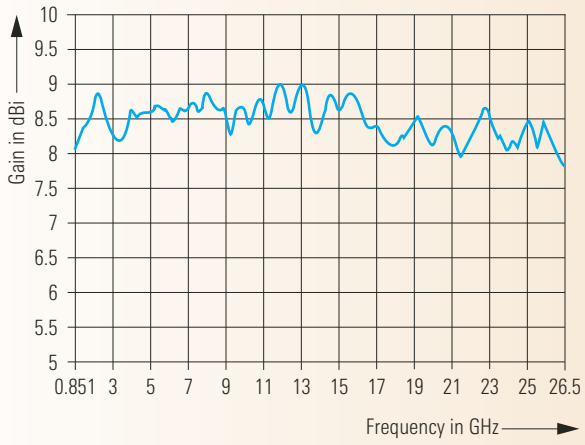
Frequency range	850 MHz to 26.5 GHz
Polarization	linear
Input impedance	50 Ω
VSWR (with preamplifier)	typ. <2.5
Gain (without preamplifier)	typ. 8.5 dBi
Gain	typ. >27 dB
Noise figure	typ. <3.6 dB
1 dB compression point (at output)	typ. >5 dBm

Power supply	
Amplifier	15 V/0.2 A (max.)
Switching relay	12 V/0.25 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 (diameter × height)	approx. 210 mm × 390 mm
Weight	approx. 0.8 kg

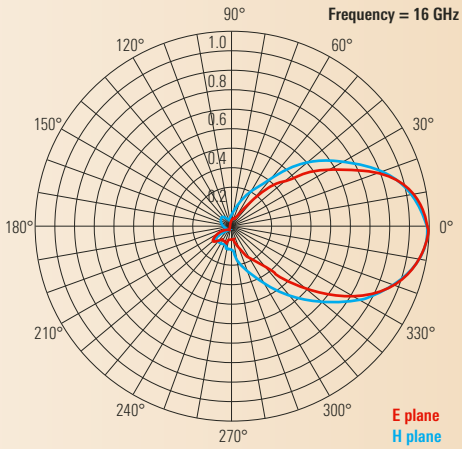
Ordering information

Log-Periodic Directional Antenna with Preamplifier	R&S®HL050S7	4064.6040.02

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



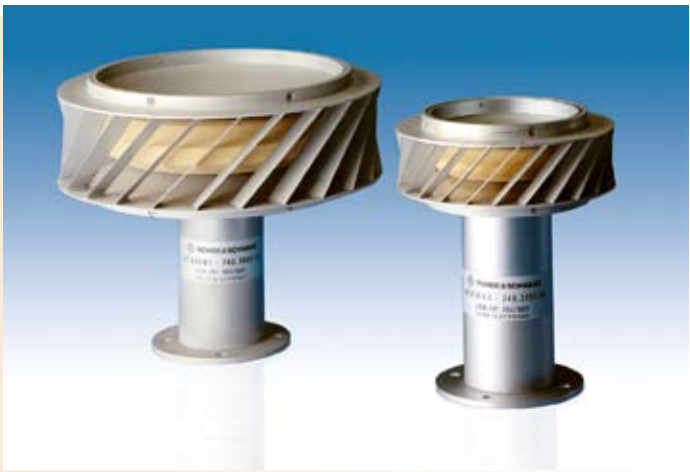
Typical gain (without preamplifier)



Typical radiation pattern

SHF Antennas

Omnidirectional Antennas
R&S®AC 004R1/R&S®AC 004R2



18 GHz to 26 GHz

26 GHz to 40 GHz

Omnidirectional broadband reception of right-hand circularly polarized signals

Features

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

Brief description

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

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

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

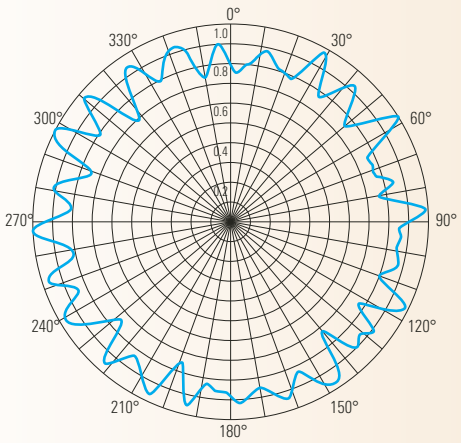
Specifications

Frequency range	
R&S®AC004R1	18 GHz to 26 GHz
R&S®AC004R2	26 GHz to 40 GHz
Polarization	right-hand circular
Input impedance	50 Ω
VSWR	<2.5
Gain	typ. 2 dBi
Uncircularity	
of azimuth pattern	typ. ±2 dB
Connector	RPC2.92 (K) female

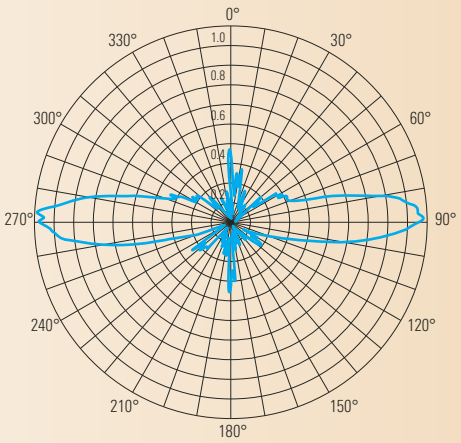
MTBF	>500 000 h
Operating	
temperature range	–35 °C to +65 °C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (diameter × height) with radome	
R&S®AC004R1	approx. 150 mm × 123 mm
R&S®AC004R2	approx. 95 mm × 127 mm
Weight	
R&S®AC004R1	approx. 1.4 kg
R&S®AC004R2	approx. 1.8 kg

Ordering information

Omnidirectional Antenna		
18 GHz to 26 GHz	R&S®AC004R1	0749.3000.03
26 GHz to 40 GHz	R&S®AC004R2	0749.3251.03



Typical horizontal radiation pattern



Typical vertical radiation pattern

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

1 GHz to 18 GHz

Broadband directional antenna, ideal for use in EMC measurements

Features

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

Brief description

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

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

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

Specifications

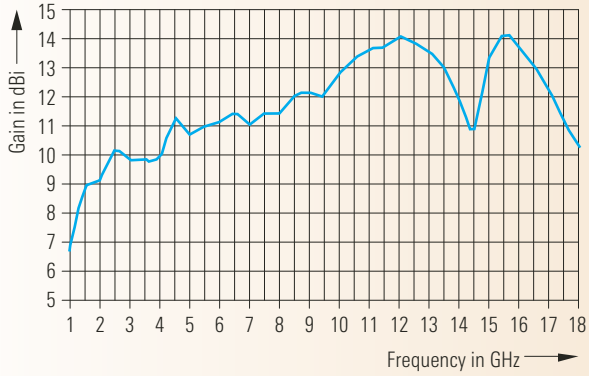
Frequency range	1 GHz to 18 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	typ. <1.5
Max. input power	300 W CW/500 W PEP
Gain	7 dBi to 14 dBi (typ.)

Connector	N female
MTBF	>250 000 h
Operating temperature range	0 °C to +50 °C
Dimensions (L × W × H)	approx. 290 mm × 250 mm × 160 mm
Weight	approx. 1.5 kg

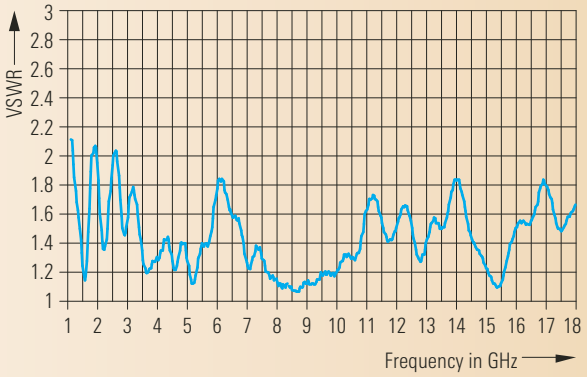
Ordering information

Double-Ridged Waveguide		
Horn Antenna	R&S®HF 906	4044.4507.02

Recommended extras		
Wooden Tripod	R&S®HZ-1	0837.2310.02



Typical gain



Typical VSWR

Glossary

A

Absorption

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

ANSI

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

Antenna

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

Antenna Aperture

see "Aperture"

Antenna Array

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

Antenna Dissipative Loss

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

Antenna Effective Area

see "Effective Area"

Antenna Efficiency

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

Antenna Factor

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

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

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

Antenna Gain

1. The ratio of the power required at the input of a loss-free reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field strength at the same distance.
→ Antenna gain is usually expressed in dB.
→ Unless otherwise specified, the gain refers to the direction of maximum radiation. The gain may be considered for a specified polarization. Depending on the choice of the reference antenna, a distinction is made between:

- absolute or isotropic gain (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; (ANS T1.523.201)

2. The ratio of the radiation intensity, in a given direction, to the radiation intensity that would be obtained if the power accepted by the antenna were radiated isotropically.
→ Gain does not include losses arising from impedance and polarization mismatches.
→ If an antenna is without dissipative loss, then, in any given direction, its gain is equal to its directivity.
→ If the direction is not specified, the direction of the maximum radiation intensity is implied. (IEEE)

Antenna Gain-to-Noise-Temperature

see "G/T Ratio"

Antenna Lobe

see "Lobe"

Antenna Noise Temperature

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

Antenna Tuning Unit

see 'ATU'

Aperture

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

Glossary

Atmospheric Duct
A horizontal layer in the lower atmosphere in which the vertical refractive index gradients are such that radio signals
(a) are guided or focused within the duct,
(b) tend to follow the curvature of the Earth, and
(c) experience less attenuation in the ducts than they would if the ducts were not present.
→ The reduced refractive index at the higher altitudes bends the signals back toward the Earth. Signals in a higher refractive index layer, i.e., duct, tend to remain in that layer because of the reflection and refraction encountered at the boundary with a lower refractive index material. (ANS T1.523.201)

Attenuation
1. A decrease in intensity of a signal, beam or wave as a result of absorption of energy and of scattering out of the path to the detector, but not including the reduction due to geometric spreading. (ANS T1.523.201)
2. A general term used to denote a decrease in signal magnitude in transmission from one point to another. Attenuation may be expressed as a scalar ratio of the input magnitude to the output magnitude or in decibels. (IEEE)

ATU
Antenna Tuning Unit
A device used to match the impedance of an antenna to the impedance of a transmitter or receiver frequency selective to provide maximum power transfer.

Azimuth
The angle between a horizontal reference direction (usually north) and the horizontal projection of the direction of interest, usually measured clockwise. (IEEE)

B

Bandwidth
The difference between the limiting frequencies within which performance of a device, in respect to some characteristic, falls within specified limits. (ANS T1.523.201)

Band
see "Electromagnetic Spectrum"

Beam
The main lobe of an antenna radiation pattern. (ANS T1.523.201)

Beamwidth
see "Half-power Beamwidth"

Bias Tee
A circuit which feeds a DC voltage to a RF path without affecting the RF parameters.

Boresight
The physical axis of a directional antenna. (ANS T1.523.201)

Boresight Error
1. The angular deviation of the electrical boresight of an antenna from its reference. (IEEE)
2. The deviation of the real main lobe direction to the theoretically available main lobe direction.

BW
see "Bandwidth"

C

c
see "Speed of Light"

Carrier
1. In a frequency stabilized system, the sinusoidal component of a modulated wave whose frequency is independent of the modulating wave; or the output of a transmitter when the modulating wave is made zero; or a wave generated at a point in the transmitting system and subsequently modulated by the signal; or a wave generated locally at the receiving terminal which when combined with the side bands in a suitable detector, produces the modulating wave. (ANS T1.523.201)
2. The sinusoidal output signal of a transmitter at a typical frequency without any modulations.

Carrier Power
The radio frequency power available at the antenna terminal when no modulating signal is present. (IEEE)

CCIR
Consultative Committee for International Radio
A predecessor organization of the ITU-R. (ANS T1.523.201)

CCITT
Consultative Committee for International Telegraph and Telephone
A predecessor organization of the ITU-T. (ANS T1.523.201)

CISPR
International Special Committee on Radio Interference
A committee that defines EMC measurement standards.

Clockwise Polarized Wave
see "Right-hand Polarized Wave"

Compromising Emanations
Unintentional signals that, if intercepted and analyzed, would disclose the information transmitted, received, handled, or otherwise processed by information systems equipment. (ANS T1.523.201)

Counterclockwise Polarized Wave
see "Left-hand Polarized Wave"

Glossary

D

dB see "decibel"

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

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

$1\,dBd \triangleq 2.15\,dBi$

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. (ANS T1.523.201)

decibel 1. One tenth of the common logarithm of the ratio of relative powers, equal to 0.1 B (bel).
→ The ratio in dB is given by

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

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

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

Thus dB is also given by

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

If $Z_1 = Z_2$, these become

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

2. One tenth of a bel, the number of decibels denoting the ratio of the two amounts of power being ten times the logarithm to the base 10 of this ratio.
→ The abbreviation dB is commonly used for the term decibel. With P1 and P2 designating two amounts of power and n the number of decibel denoting their ratio,

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

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

$$n = 20\log_{10}\left(\frac{I_1}{I_2}\right) \text{ decibel} \qquad n = 20\log_{10}\left(\frac{U_1}{U_2}\right) \text{ decibel}$$

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

Directive Gain see "Directivity"

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

E

Effective Area The functionally equivalent area from which an antenna directed toward the source of the received signal gathers or absorbs the energy of an incident electromagnetic wave.
→ Antenna effective area is usually expressed in square meters. (ANS T1.523.201)

Effective Aperture 1. In a given direction, the ratio of the available power at the terminals of a receiving antenna to the power flux density of a plane wave incident on the antenna from that direction, the wave being polarization matched to the antenna.
→ If the direction is not specified, the direction of maximum radiation intensity is implied. (IEEE)
2. A measure of the receive-power which an antenna can take out of the total incoming power of an certain electromagnetic power density. The effective aperture is normally smaller than the geometrical aperture.

Effective Height

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

Efficiency

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

EIRP

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

Electrical Beam Tilt

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

Electric Field

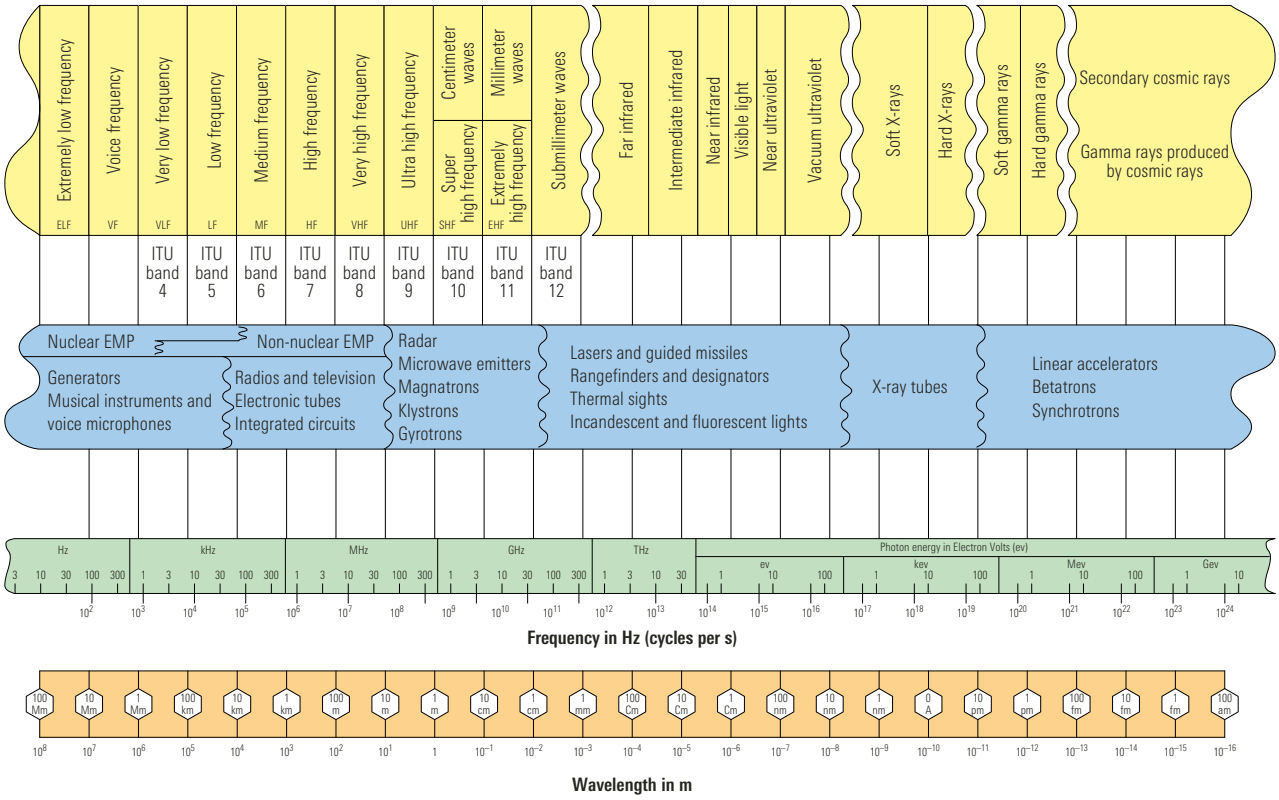
The effect produced by the existence of an electric charge, such as an electron, ion, or proton, in the volume of space or medium that surrounds it.
→ Each of a distribution of charges contributes to the whole field at a point on the basis of superposition. A charge placed in the volume of space or in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

Electric Field Strength

see "Field Strength"

Electromagnetic Spectrum

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



Electromagnetic spectrum

Electromagnetic Wave

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

Elevation

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

Contents Overview
Type Index
Main Menu

Glossary

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

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

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

Emission
Electromagnetic energy propagated from a source by radiation or conduction.
→ The emission may be either desired or undesired and may occur anywhere in the electromagnetic spectrum. (ANS T1.523.201)

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

F

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

Far-field
see "Far-field region"

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

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

Field Strength
The magnitude of an electric, magnetic, or electromagnetic field at a given point.
→ The field strength of an electromagnetic wave is usually expressed as the rms value of the electric field, in volts per meter. The field strength of a magnetic field is usually expressed in amperes per meter.
Synonym: radio field intensity (ANS T1.523.201)

Figure of Merit
see "G/T Ratio"

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

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

Front-to-Back Ratio
Of an antenna, the gain in a specified direction, i.e., azimuth, usually that of maximum gain, compared to the gain in a direction 180° from the specified azimuth.
→ Front-to-back ratio is usually expressed in dB. (ANS T1.523.201)

G

G/T ratio
Gain-to-Noise-Temperature, synonym: figure of merit
In the characterization of antenna performance, a figure of merit, where G is the antenna gain in decibels at the receive frequency, and T is the equivalent noise temperature* of the receiving system in kelvins. (ANS T1.523.201)
*(including antenna noise temperature)

Gain
see "Antenna Gain"

Ground Wave

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

H

Half-power Beamwidth

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

Hertz

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

H Plane

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

HPBW

see "Half-power Beamwidth"

Hz

see "Hertz"

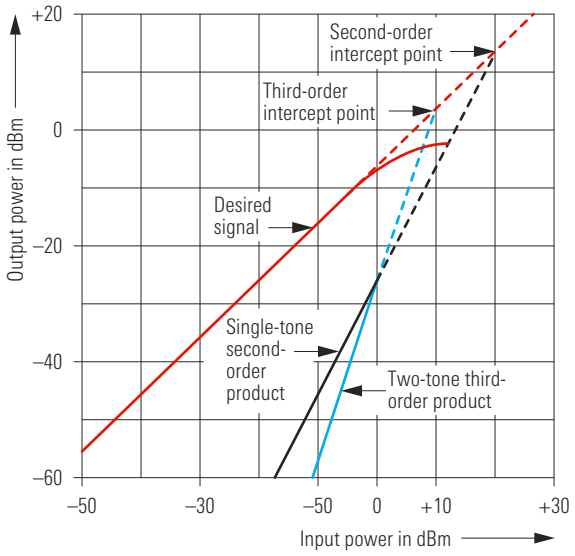
I

Impedance

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

Intercept Point

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



Intermodulation product intercept point

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

Intermodulation

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

Intermodulation Product

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

Ionosphere

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

Contents Overview
Type Index
Main Menu

Glossary

Isotropic Antenna
A hypothetical antenna that radiates or receives equally in all directions.
→ Isotropic antennas do not exist physically but represent convenient reference antennas for expressing directional properties of physical antennas. (ANS T1.523.201)

Isotropic Radiator
see "Isotropic Antenna"

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

ITU-R
International Telecommunication Union - Radiocommunications Sector
The Radiocommunications Sector of the ITU; responsible for studying technical issues related to radiocommunications, and having some regulatory powers.
→ A predecessor organization was the CCIR. (ANS T1.523.201)

ITU-T
International Telecommunication Union - Telecommunication Standardization Sector
The Telecommunication Standardization Sector of the International Telecommunication Union (ITU).
→ ITU-T is responsible for studying technical, operating, and tariff questions and issuing recommendations on them, with the goal of standardizing telecommunications worldwide.
→ In principle, the ITU-T combines the standards-setting activities of the predecessor organizations formerly called the International Telegraph and Telephone Consultative Committee (CCITT) and the International Radio Consultative Committee (CCIR). (ANS T1.523.201)

K

K Factor
see "Antenna Factor"

L

Left-hand Polarized Wave
An elliptically or circularly polarized wave, in which the electric field vector, observed in the fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a left-hand or anticlockwise direction.
→ also called anticlockwise polarized wave (ANS T1.523.201)

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

Loss
1. The diminution, usually expressed in dB, of signal level in a communications medium. (ANS T1.523.201)
2. The power, usually expressed in watts, consumed or dissipated by a circuit or component without accomplishing useful work or purpose; e.g., heating (hysteresis loss) that occurs in the core of a transformer. (ANS T1.523.201)
3. The attenuation of a signal level in a communications medium. (usually expressed in dB)

M

Main Beam
see "Main Lobe"

Main Lobe
or Major Lobe
Of an antenna radiation pattern, the lobe containing the maximum power (exhibiting the greatest field strength).
→ The width of the main lobe is usually specified as the angle encompassed between the points where the power has fallen 3 dB below the maximum value. (ANS T1.523.201)

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

Mean Power
The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.
→ Normally, a time of 0.1 second, during which the mean power is greatest, will be selected. (ANS T1.523.201)

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

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

MTBF
Mean Time Between Failure
An indicator of expected system reliability calculated on a statistical basis from the known failure rates of various components of the system. MTBF is usually expressed in hours. (ANS T1.523.201)

MTTR
Mean Time To Repair
The time interval (hours) that may be expected to return a failed equipment to proper operation. (IEEE)

N

Near Field
see "Near-field Region"

Near-field Region
The close-in region of an antenna wherein the angular field distribution is dependent upon the distance from the antenna. (ANS T1.523.201)

Near Zone
see "Near-field Region"

NF
see "Noise Figure"

Noise
An undesired disturbance within the frequency band of interest; the summation of unwanted or disturbing energy introduced into a communications system from man-made and natural sources. (ANS T1.523.201)

Noise Factor
see "Noise Figure"

Noise Figure
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
(a) measuring (determining) the ratio, usually expressed in dB, of the thermal noise power at the output, to that at the input, and
(b) subtracting from that result, the gain, in dB, of the system. Typical noise figures range from 0.5 dB for very low noise devices, to 4 to 8 dB. In some systems, e.g., heterodyne systems, total output noise power includes noise from other than thermal sources, such as spurious contributions from image-frequency transformation, but noise from these sources is not considered in determining the noise figure. In this example, the noise figure is determined only with respect to that noise that appears in the output via the principal frequency transformation of the system, and excludes noise that appears via the image frequency transformation. (ANS T1.523.201)
2. At a selected input frequency the ratio of (A) the total noise power per unit bandwidth (at a corresponding output frequency) delivered by the system into an output termination to (B) the portion thereof engendered at the input frequency by the input termination, whose noise temperature is standard (290 K (Kelvins) at all frequencies). (IEEE)

Noise Temperature
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.
→ The noise temperature of a simple resistor is the actual temperature of that resistor. The noise temperature of a diode may be many times the actual temperature of the diode. (ANS T1.523.201)
→ 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)

NVIS
Near-vertical-incidence Skywave
In radio propagation, a wave that is reflected from the ionosphere at a nearly vertical angle and that is used in short-range communications to reduce the area of the skip zone and thereby improve reception beyond the limits of the ground wave. (ANS T1.523.201)

O

Omnidirectional Antenna
An antenna that has a radiation pattern that is nondirectional in azimuth.
→ The vertical radiation pattern may be of any shape. (ANS T1.523.201)

P

Peak Envelope Power
see "PEP"

PEP
Peak envelope power
The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions. (ANS T1.523.201)

Phantom Feeding
A DC supply voltage is fed into a RF cable via a bias tee circuit

Contents Overview
Type Index
Main Menu

Glossary

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

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

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

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

Propagation
The motion of waves through or along a medium.
→ For electromagnetic waves, propagation may occur in a vacuum as well as in material media. (ANS T1.523.201)

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

Propagation Path
see "Propagation Channel"

R

Radiant Power
The rate of flow of electromagnetic energy, i.e., radiant energy.
→ Radiant power is usually expressed in watts, i.e., joules per second. (ANS T1.523.201)

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

Radio Frequency
see "RF"

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

Radiation Pattern
The variation of the field intensity of an antenna as an angular function with respect to the antenna axis.
→ A radiation pattern is usually represented graphically for the far-field conditions in either horizontal or vertical plane. (ANS T1.523.201)

Reciprocity
For antennas, this means that the same antenna can be used either for receiving as well as for transmitting purposes.
→ One exception to this rule are the active antennas. These can generally be used for receiving only.

Reference Antenna
An antenna that may be real, virtual, or theoretical, and has a radiation pattern that can be used as a basis of comparison with other antenna radiation patterns.
→ Examples of reference antennas are unit dipoles, half-wave dipoles, and isotropic, i.e., omnidirectional antennas. (ANS T1.523.201)

RF
Of, or pertaining to, any frequency within the electromagnetic spectrum normally associated with radio wave propagation.
→ For designation of subdivisions, see 'Electromagnetic Spectrum' and its associated diagram. (ANS T1.523.201)

Right-hand Polarized Wave
An elliptically or circularly polarized wave, in which the electric field vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a right-hand or clockwise direction.
Synonym: clockwise polarized wave. (ANS T1.523.201)

Rotary Joint
A device transmitting cable-bound RF signals via a mechanically rotating joint to a device which is rotated.
Slip rings at a rotary joint are used for feeding e.g. control signals through the mechanically rotating joint. They are not meant for RF signals.

S

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

Side Lobe Suppression
1. Any process, action of adjustment to reduce the level of the side lobes or to reduce the degradation of the intended antenna system performance resulting from the presence of side lobes. (IEEE)
2. Also the value of the side lobe suppression.

Glossary

Silent Tuning

A feature of some ATUs.
→ After a first learning tuning cycle the ATU stores it's frequency-depending setting values in a built-in memory. The now available 'Silent Tuning' mode can set the ATU to the stored values without initiating a new tuning process.

Silent Zone

see "Skip Zone"

Skip Zone

An annular region within the transmission range of an antenna, within the signals from the transmitter are not received.
The skip zone is bounded by the locus of the farthest points at which the ground wave can be received and the nearest points at which reflected sky waves can be received.
Synonyms: silent zone, zone of silence. (ANS T1.523.201)

Sky Wave

A radio wave that travels upward from the antenna.
→ A sky wave may be reflected to Earth by the ionosphere. (ANS T1.523.201)

Speed of Light (c)

The speed of an electromagnetic wave in free space, precisely 299,792,458 m/s.
→ The speed of an electromagnetic wave, e.g. light, is equal to the product of wavelength and frequency.

$$c = \lambda \cdot f$$

→ In any physical medium, the velocity of propagation of light is lower than the speed of light in free space. Since the frequency is not changed, in any physical medium, the wavelength is also decreased. (ANS T1.523.201)

Spillover

In a (reflector) antenna, the part of the radiated energy from the feed that does not impinge on the reflectors. (ANS T1.523.201)

Surface Duct

An atmospheric duct for which the lower boundary is the surface bounding the atmosphere. (IEEE)

T

TEMPEST

Telecommunications Electronics Material Protected from Emitting Spurious Transmissions
1. Short name referring to investigation, study, and control of compromising emanations from information systems (IS) equipment. (ANS T1.523.201)
2. To shield against compromising emanation. (ANS T1.523.201)

Terminated Folded Dipole

see "TFD"

TFD

Terminated Folded Dipole
Type of an antenna built. The dipole radiators are folded backwards at its half length. Both radiator ends are terminated to 'burn' all power which was not emitted via the radiator. In either case the reflected power would negatively influence the radiation pattern of the antenna and decrease the usability.

Troposphere

1. The lower layers of atmosphere, in which the change of temperature with height is relatively large. It is the region where clouds form, convection is active, and mixing is continuous and more or less complete. (ANS T1.523.201)
2. That part of the earth's atmosphere in which temperature generally decreases with altitude, clouds form, and convection is active. Experiments indicate that the troposphere occupies the space above the earth's surface up to a height ranging from 6 km (kilometers) at the poles to about 18 km at the equator. (IEEE)

V

Voltage Standing Wave Ratio

see "VSWR"

VSWR

Voltage Standing Wave Ratio
In a transmission line, the ratio of maximum to minimum voltage in a standing wave pattern.
→ The VSWR is a measure of impedance mismatch between the transmission line and its load. The higher the VSWR, the greater the mismatch. The minimum VSWR, i.e., that which corresponds to a perfect impedance match, is unity.
(ANS T1.523.201)

W

Wavelength

The distance between points of corresponding phase of two consecutive cycles of a wave.
→ The wavelength, λ, is related to the propagation velocity, v, and the frequency, f, by λ = v /f. (ANS T1.523.201)
→ In air the propagation velocity v is equal to c, the speed of light.

Z

Zone of Silence

see "Skip Zone"

References:

ANS T1.523.201: **www.atis.org/tg2k/**
IEEE: **Standard Dictionary of Electrical and Electronics Terms**

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- Sales Locations
- Service Locations
- National Websites

Index

Index