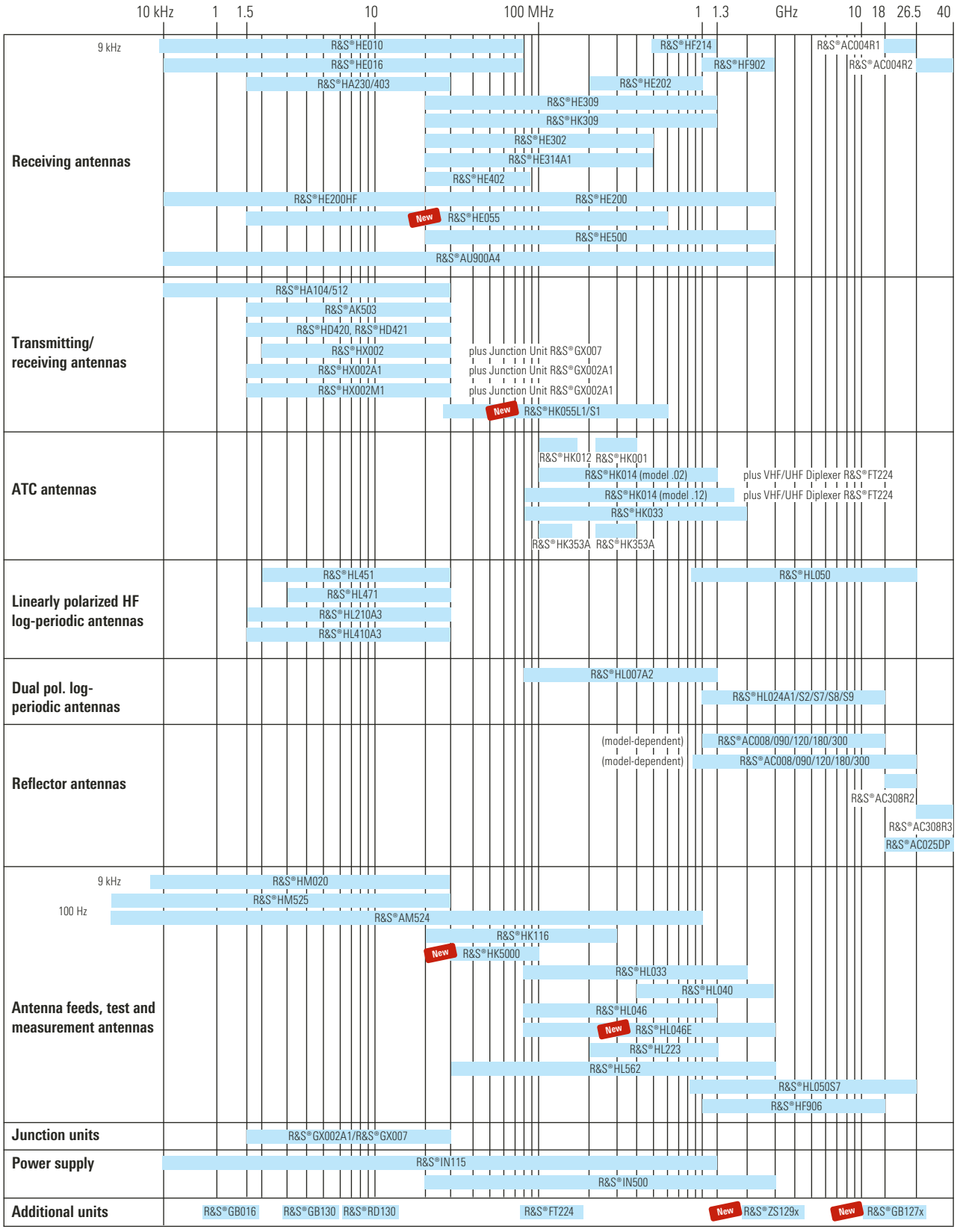
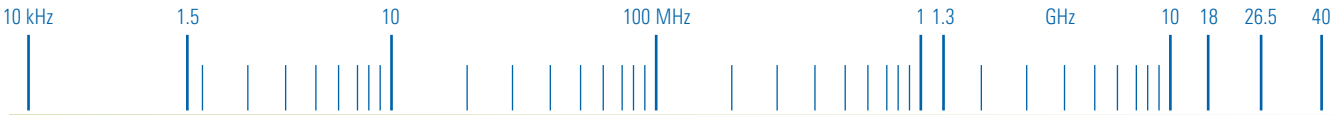
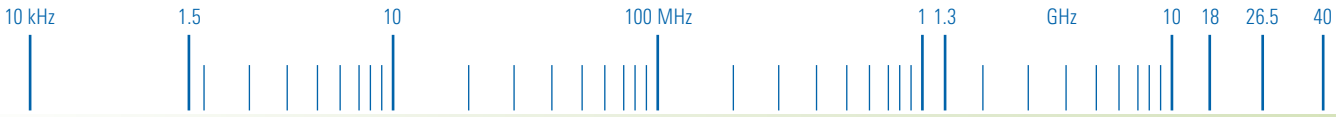
Antenna selection guide





2 VHF/UHF Antennas



VHF/UHF Antennas

2

Type		Designation	Page
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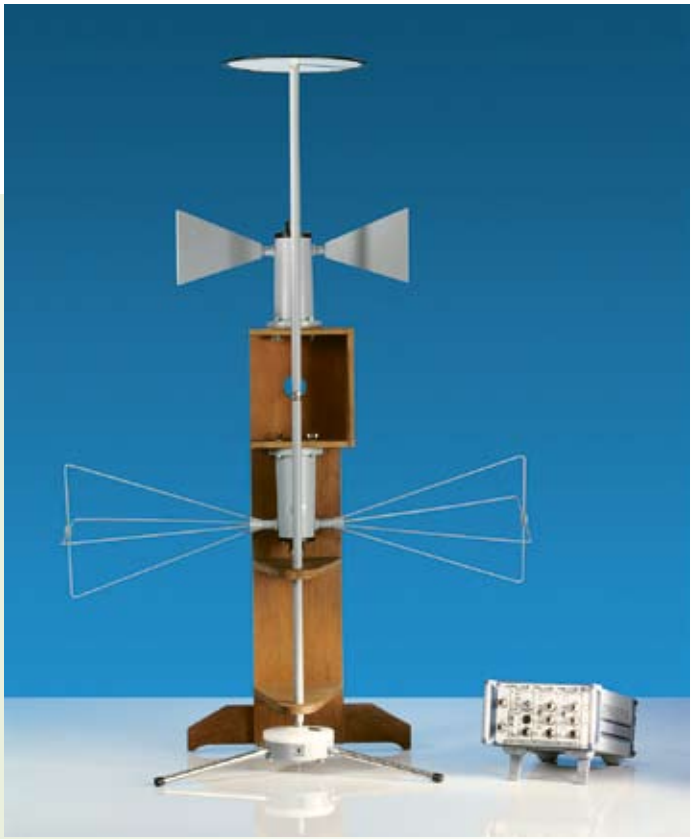
VHF/UHF Antennas

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



100 Hz to 1000 MHz

For measuring low-level signals in anechoic chambers

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

Specifications

Frequency range (in three subranges)	100 Hz to 1 GHz
Input impedance	50 Ω
Antenna factor[1]	
100 Hz to 30 MHz	0 dB
100 MHz	–10 dB
1 GHz	typ. 19 dB
Field sensitivity (Δf = 1 Hz, S/N = 0 dB)	
100 Hz	typ. 0 dB(µV/m)
100 kHz	typ. –43 dB(µV/m)
30 MHz	typ. –51 dB(µV/m)
100 MHz	typ. –54 dB(µV/m)
1 GHz	typ. –37 dB(µV/m)

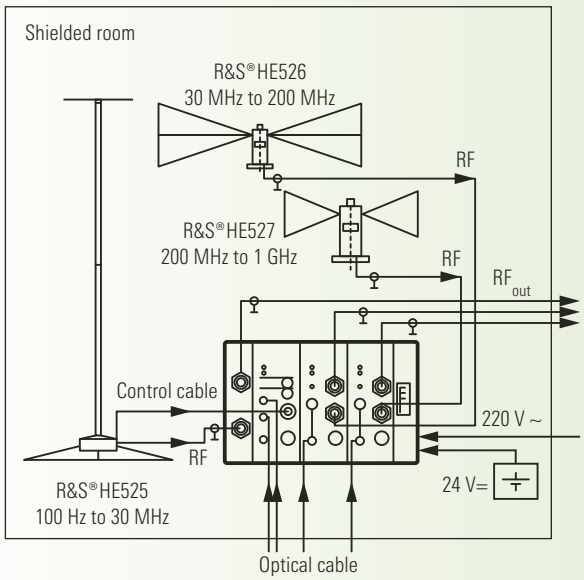
[1] Without attenuator or amplifier.

Power supply	100/120/220/230/240 V ±10 %, 47 Hz to 63 Hz
Connectors	N female
MTBF	>15 000 h
Operating temperature range	–10 °C to +55 °C
Dimensions (width × height), weight	
R&S®HE525	approx. 0.3 m × 1.5 m, approx. 5 kg
R&S®HE526	approx. 1 m × 0.3 m, approx. 1.7 kg
R&S®HE527	approx. 0.5 m × 0.25 m, approx. 1.6 kg

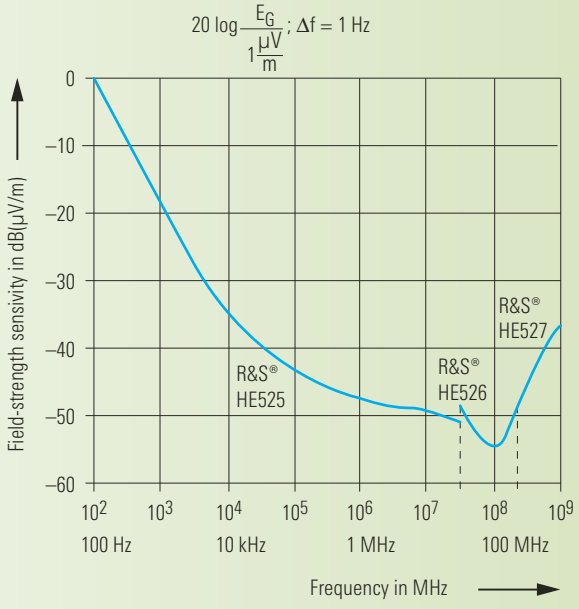
Ordering information

Low-Noise Active Antenna System	R&S®AM524	4015.7001.02

Recommended extras		
Control Unit	R&S®GS525	4035.5004.02
Optical Cable Set	R&S®GS525K1	4035.5604.02



Overview of system components



Typical field-strength sensitivity

VHF/UHF Antennas

Omnidirectional Antenna R&S®HF 214

500 MHz to 1300 MHz

Reception of horizontally polarized waves

Chapter Overview

Type Index

Main Menu

Features

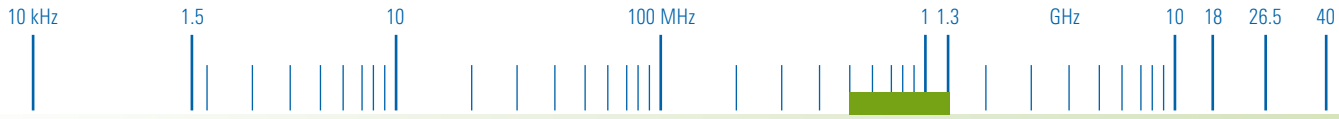
- Broadband frequency range
- Easy integration into broadband antenna systems due to cable feedthrough
- Small size
- Rugged design
- Suitable for mobile use
- Ideal for detection and monitoring of horizontally polarized signals

Brief description

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

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

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



Specifications

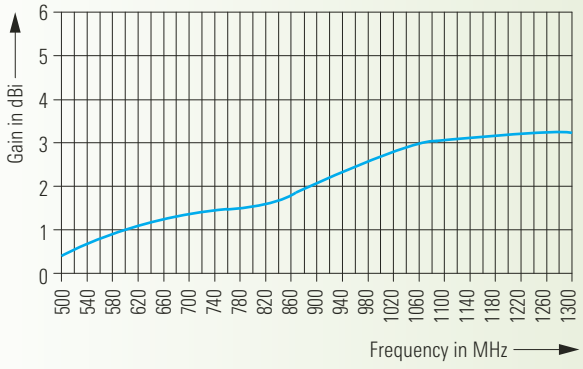
Frequency range	500 MHz to 1.3 GHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	typ. <3
Gain	see trace below
Uncircularity of horizontal radiation pattern	±3 dB
Connector	N female
MTBF	>50 000 h

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	
Diameter	approx. 310 mm
Height	approx. 490 mm
Weight	approx. 8 kg

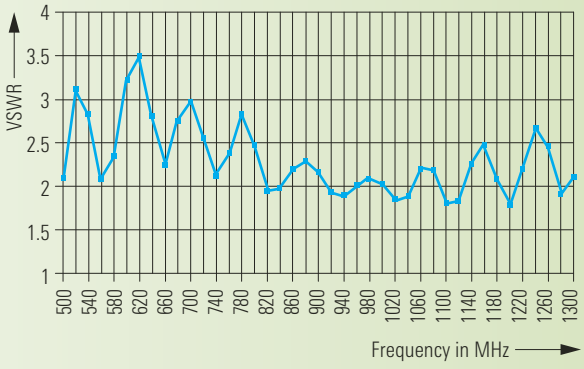
Ordering information

Omnidirectional Antenna	R&S®HF 214	4042.7009.02

Recommended extras		
Active Vertical Dipole	R&S®HE 309	4027.5009.02
Active Omnidirectional Antenna	R&S®HE 314A1	4027.6505.02
Omnidirectional Antenna	R&S®HF 902	4042.8005.02

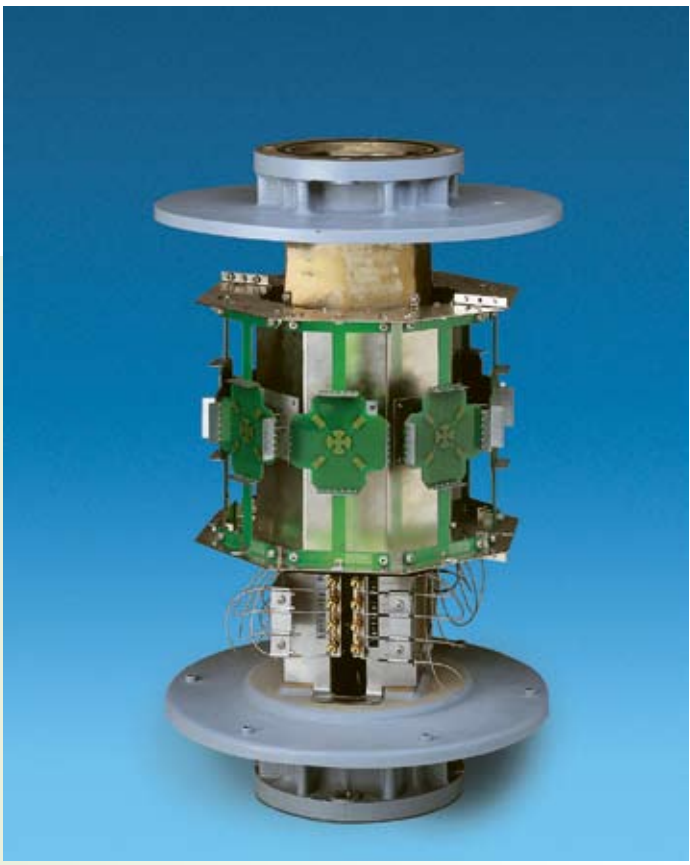


Typical gain



Typical VSWR

Omnidirectional Antenna R&S®HF 902



1 GHz to 3 GHz

Reception of vertically and horizontally polarized waves

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

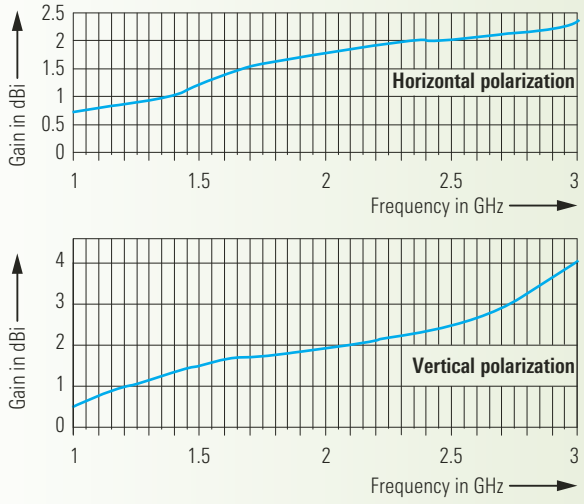
Frequency range	1 GHz to 3 GHz
Polarization	linear/horizontal and vertical
Input impedance	50 Ω
VSWR	typ. <2.5 (1.3 GHz to 3 GHz)
Gain	see trace below
Connector	2 × N female
MTBF	>1 000 000 h
Operating temperature range	–40 °C to +65 °C

Max. wind speed	
Without ice deposit	188 km/h
With 30 mm radial ice deposit	130 km/h
Dimensions	
Diameter	approx. 310 mm
Height	approx. 490 mm
Weight	approx. 8 kg

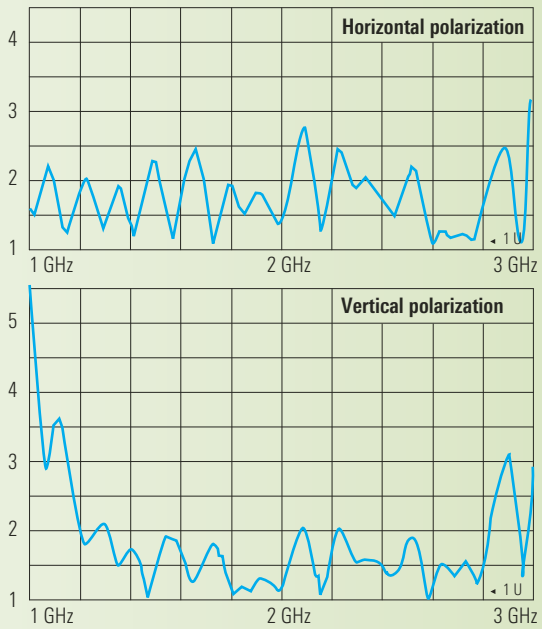
Ordering information

Omnidirectional Antenna	R&S®HF 902	4042.8005.02

Recommended extras		
Active Vertical Dipole	R&S®HE 309	4027.5009.02
Active Omnidirectional Antenna	R&S®HE 314A1	4027.6505.02
Omnidirectional Antenna	R&S®HF 214	4042.7009.02



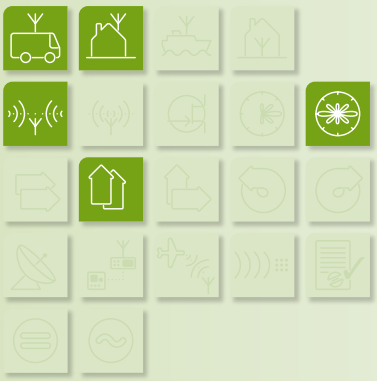
Typical gain



Typical VSWR

VHF/UHF Antennas

Passive Receiving Dipole R&S®HK 309



20 MHz to 1300 MHz

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

Chapter Overview

Type Index

Main Menu

Features

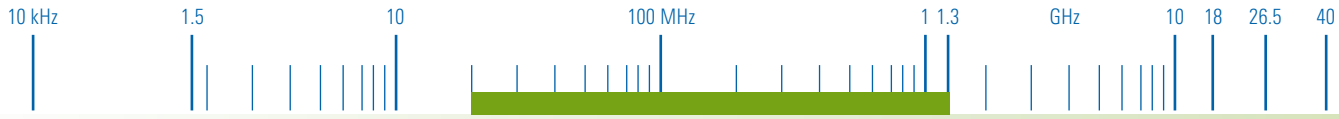
- Extremely wide frequency range
- High sensitivity
- High large-signal immunity
- High protection against lightning strokes in the vicinity
- Small dimensions (dipole length only 1.7 m)
- Low weight

Brief description

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

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

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



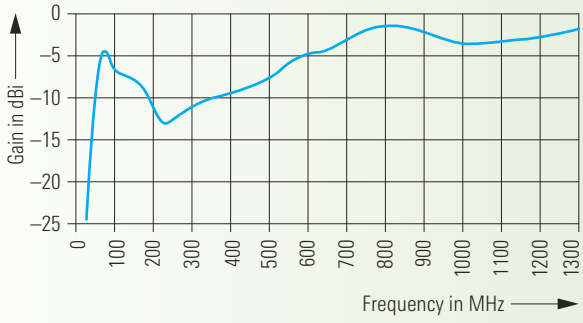
Specifications

Frequency range	20 MHz to 1.3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	typ. <3
Gain	–24 dBi to –2 dBi
Connector	N female

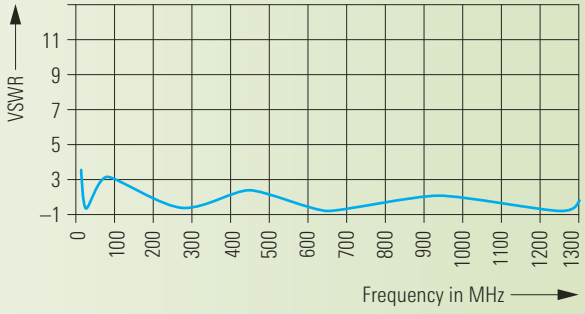
Operating temperature range	–40 °C to +70 °C
Max. wind speed	180 km/h (without ice deposit)
MTBF	>500 000 h
Dimensions	
Length	approx. 1710 mm
Diameter	approx. 100 mm
Weight	approx. 4 kg

Ordering information

Passive Receiving Dipole	R&S®HK309	4054.2007.02



Typical gain



Typical VSWR

VHF/UHF Antennas

Active Vertical Dipole
R&S®HE 309

20 MHz to 1300 MHz
High sensitivity, large bandwidth and wide dynamic range

Chapter Overview
Type Index
Main Menu

Features

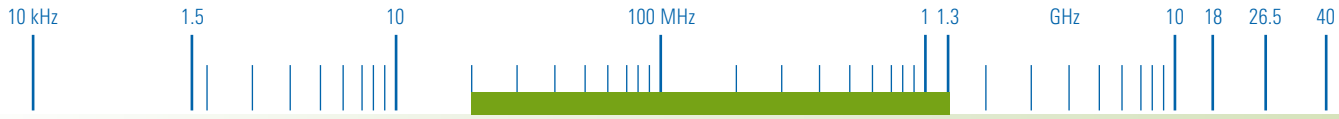
- Extremely wide frequency range
- High sensitivity
- One active antenna instead of several passive antennas
- High immunity to nonlinear distortion
- High immunity to lightning strokes in the vicinity
- Small dimensions – only 1.2 m antenna length
- Low weight

Brief description

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

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

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



Specifications

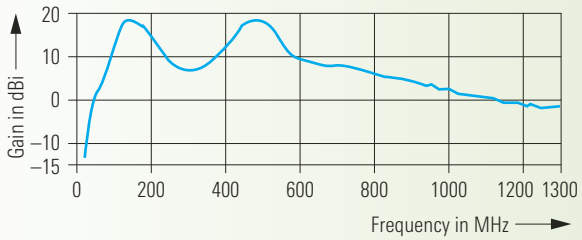
Frequency range	20 MHz to 1.3 GHz
	(up to 1.3 GHz with reduced sensitivity)
Polarization	linear/vertical
Input impedance	50 Ω
Horizontal	
radiation pattern	omnidirectional
Noise figure	
(frequency-dependent,	
as a function of external noise)	
20 MHz	typ. 22 dB
100 MHz	typ. 10 dB
1 GHz	typ. 7 dB

IP2	typ. 55 dBm
IP3	typ. 32 dBm
Power supply	21 V to 28 V DC (max. 150 mA)
Connector	N female
MTBF	>500 000 h
Operating	
temperature range	–40 °C to +70 °C
Max. wind speed	180 km/h (without ice deposit)
Dimensions	
Length	approx. 1210 mm
Diameter	approx. 100 mm
Weight	approx. 3 kg

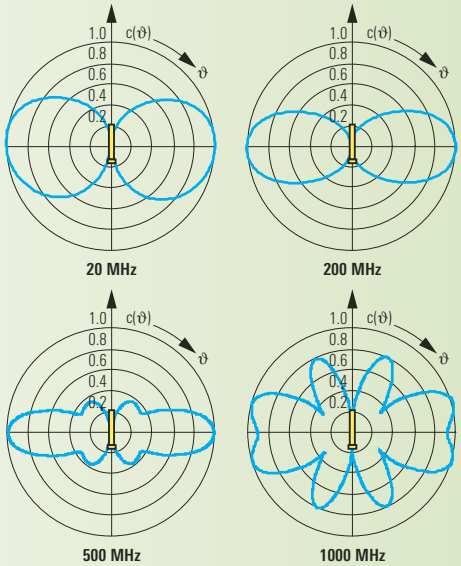
Ordering information

Active Vertical Dipole	R&S®HE 309	4027.5009.02

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



Typical practical gain



Typical vertical radiation patterns

VHF/UHF Antennas

Active Receiving Dipole R&S®HE 202

200 MHz to 1000 MHz

Optimized for very small dimensions

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

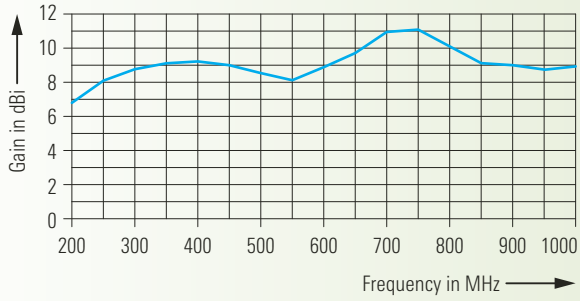
Frequency range	200 MHz to 1 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	typ. <2.5
Electronic gain	5 dB to 9 dB
Practical gain	7 dBi to 11 dBi
Directivity	2 dB (average)
Antenna factor	10 dB to 22 dB
Noise figure	
200 MHz	6 dB
2 GHz	7 dB

Field strength sensitivity (Δf = 1 kHz)	
200 MHz	–17 dB(µV/m) (S/N: typ. 0 dB)
2 GHz	–2 dB(µV/m) (S/N: typ. 0 dB)
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 × H)	approx. 510 mm × 240 mm
Weight	approx. 2.1 kg

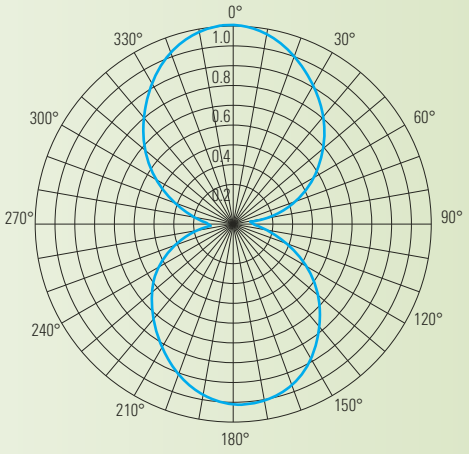
Ordering information

Active Receiving Dipole	R&S®HE 202	0630.0310.02

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



Typical practical gain



Typical radiation pattern in the E plane at 500 MHz

VHF/UHF Antennas

Active Receiving Dipole
R&S®HE 302

20 MHz to 500 MHz

Optimized for very small dimensions

Chapter Overview

Type Index

Main Menu

Features

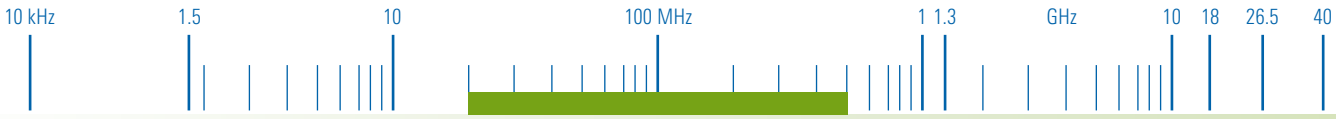
- High sensitivity despite small dimensions
- Wide frequency range
- High immunity to nonlinear distortion
- High immunity to lightning strokes in the vicinity
- Low weight
- Extremely small dimensions
- Shock- and vibration-proof

Brief description

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

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

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



Specifications

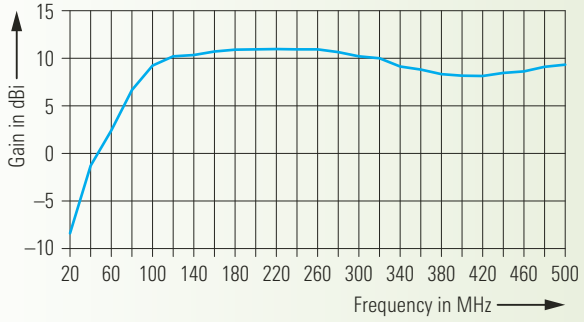
Frequency range	20 MHz to 500 MHz
Polarization	linear
Input impedance	50 Ω
VSWR	<2.5
Electronic gain	–11 dB to +8 dB
Practical gain	–9 dBi to +10 dBi
Directivity	2 dB (average)
Antenna factor	0 dB to 14 dB
Noise figure	
20 MHz	28 dB
500 MHz	9 dB
Field strength sensitivity (Δf = 1 kHz)	
20 MHz	–15 dB(µV/m) (S/N: typ. 0 dB)
500 MHz	–6 dB(µV/m) (S/N: typ. 0 dB)

IP2	>60 dBm
IP3	>30 dBm
Power supply	
Up to +40 °C	18 V to 30 V DC, approx. 170 mA
Up to +75 °C	18 V to 25 V DC, approx. 170 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 × H)	approx. 1 m × 240 mm
Weight	approx. 2.5 kg

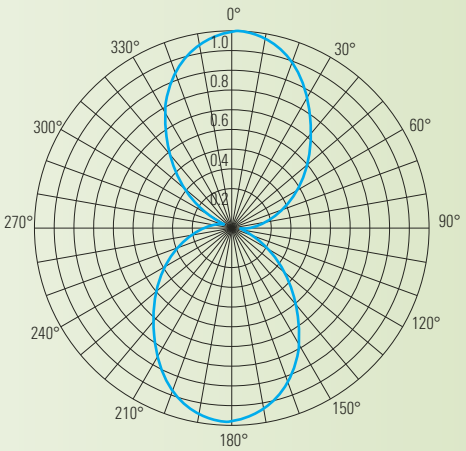
Ordering information

Active Receiving Dipole	R&S®HE 302	0644.1114.02

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



Typical practical gain



Typical radiation pattern in the E plane at 200 MHz

VHF/UHF Antennas

Active Omnidirectional Antenna R&S®HE 314A1

20 MHz to 500 MHz

Active omnidirectional reception of horizontally polarized waves

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

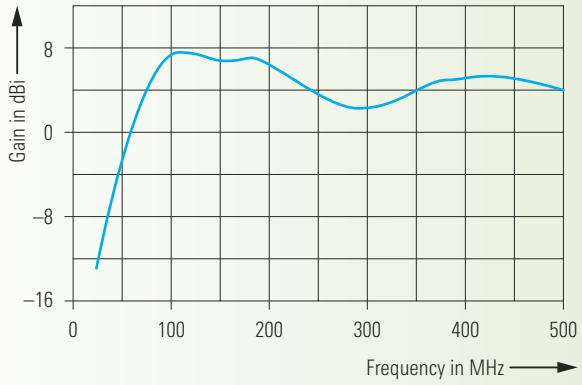
Frequency range	20 MHz to 500 MHz
Polarization	horizontal
Input impedance	50 Ω
VSWR	<2.5
Electronic gain	–15 dB to +8 dB
Practical gain	–14 dBi to +5 dBi
Directivity	1 dB (average)
Antenna factor	2 dB to 20 dB
Noise figure	
20 MHz	<29 dB
500 MHz	<10 dB
Field strength sensitivity (Δf = 1 kHz)	
20 MHz	–12 dB(µV/m) (S/N: typ. 0 dB)
500 MHz	–3 dB(µV/m) (S/N: typ. 0 dB)

IP2	>60 dBm
IP3	>30 dBm
Power supply	18 V to 30 V DC (max. 340 mA)
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 (L × W × H)	approx. 1 m × 1 m × 0.3 m
Weight	approx. 8 kg

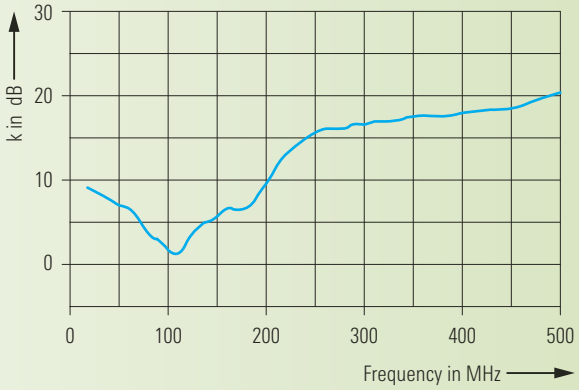
Ordering information

Active		
Omnidirectional Antenna	R&S®HE 314A1	4027.6505.02

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



Typical practical gain



Typical antenna factor

Active Directional Antenna R&S®HE 402

20 MHz to 87 MHz

Cardioid-shaped horizontal radiation pattern

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

Specifications

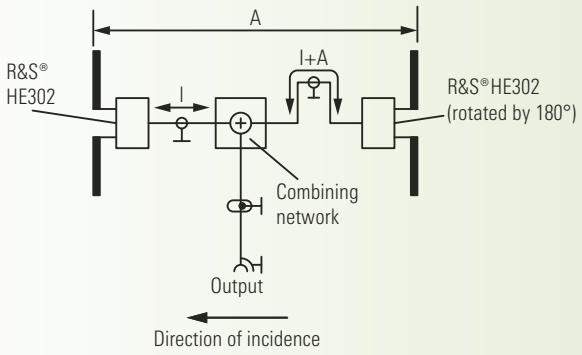
Frequency range	20 MHz to 87 MHz
Polarization	linear
Input impedance	50 Ω
VSWR	<2.5
Electronic gain	–19 dB to +5 dB
Practical gain	–14 dBi to +10 dBi
Directivity	5 dB (average)
Noise figure	
20 MHz	34 dB
87 MHz	11 dB
Field strength sensitivity (Δf = 1 kHz)	
20 MHz	–12 dB(µV/m) (S/N: typ. 0 dB)
87 MHz	–22 dB(µV/m) (S/N: typ. 0 dB)

Horizontal radiation pattern	cardioid-shaped
IP2	>60 dBm
IP3	>30 dBm
Power supply	18 V to 25 V DC (max. 340 mA)
Connector	N female
MTBF	>25 000 h
Operating temperature range	–40 °C to +75 °C
Max. wind speed	180 km/h (without ice deposit)
Dimensions (L × W × H)	approx. 1.0 m × 0.2 m × 1.1 m
Weight	approx. 12 kg

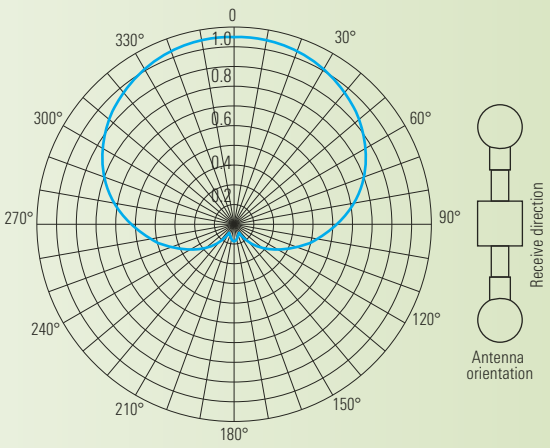
Ordering information

Active		
Directional Antenna	R&S®HE402	0684.2011.02

Recommended extras		
Power Supply Unit	R&S®IN115	4004.1707.02



Block diagram



Typical horizontal radiation pattern

VHF/UHF Antennas

Active Directional Antenna R&S®HE 200

20 MHz to 3000 MHz
Portable directional antenna for tracing signal transmitters and interference sources

Chapter Overview
Type Index
Main Menu

Features

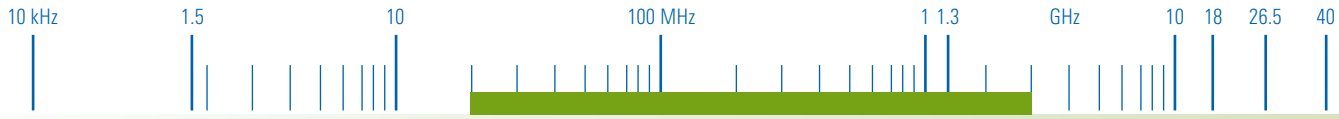
- Distinct directional pattern
- Suitable for horizontal and vertical polarization
- Wide frequency range
- Wide dynamic range
- Handy size
- Low weight

Brief description

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

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

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



Specifications

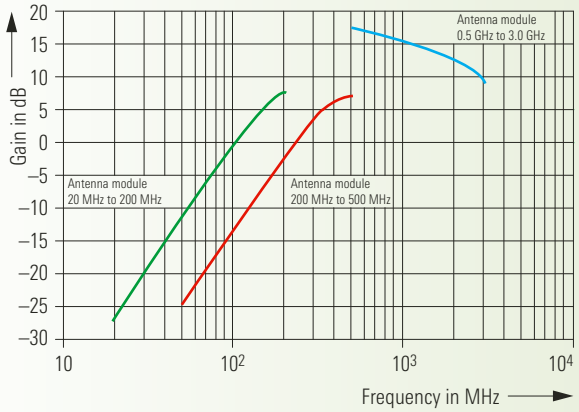
Frequency range	20 MHz to 3 GHz
RF module 1	20 MHz to 200 MHz
RF module 2	200 MHz to 500 MHz
RF module 3	500 MHz to 3 GHz
Optional HF module	
R&S®HE 200HF	10 kHz to 20 MHz
Input impedance	50 Ω
VSWR	typ. <2.5
Power supply	4 × 1.5 V DC, size: AA
Power consumption	approx. 55 mA at +25 °C

Connector	N male
MTBF	>50 000 h
Operating	
temperature range	–30 °C to +60 °C
Transit case (L × W × H)	approx. 562 mm × 430 mm × 190 mm
Length of	
connecting cable	approx. 1 m
Weight	
Antenna	approx. 1 kg (max.)
With transit case	approx. 5 kg

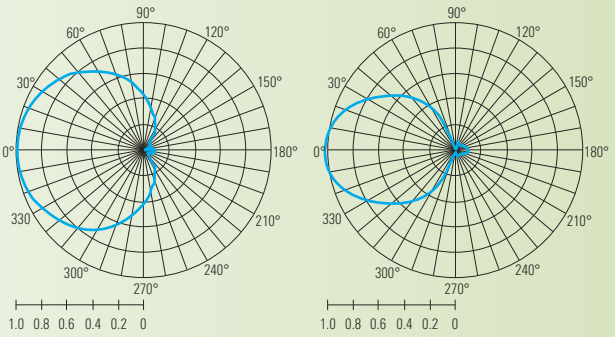
Ordering information

Active		
Directional Antenna	R&S®HE 200	4050.3509.02

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



Typical practical gain in active mode



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

VHF/UHF Antennas

Active Omnidirectional Receiving Antenna R&S®HE 055

New

1.5 MHz to 600 MHz
Omnidirectional receiving antenna with excellent large-signal characteristics and high sensitivity

Chapter Overview
Type Index
Main Menu

Features

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

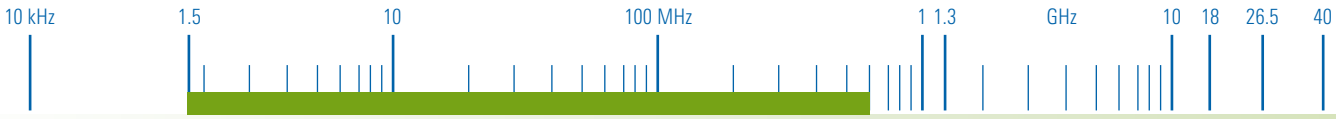
Brief description

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

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

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

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



Specifications

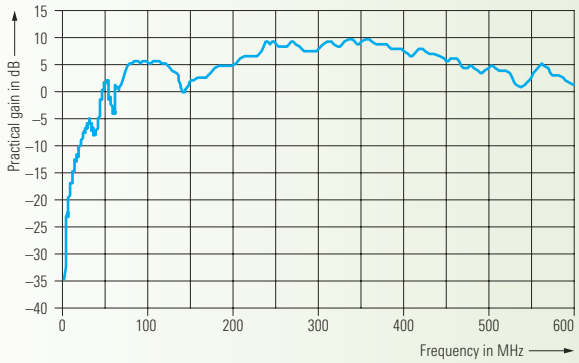
Frequency range	1.5 MHz to 600 MHz
Polarization	vertical
Input impedance	50 Ω
VSWR	
1.5 MHz to 30 MHz	<1.5
30 MHz to 600 MHz	<3.0
Transducer factor	
(for antenna mounted	
to conductive plane)	7 dB to 30 dB (typ.)
Intercept point	
2nd order (rel. to output)	≥70 dBm (f_{test} in MHz: 10 – 8 = 2)
	≥65 dBm (f_{test} in MHz: 140 – 95 = 45)
3rd order (rel. to output)	≥40 dBm (f_{test} in MHz: 2 × 10 – 8 = 12)
	≥40 dBm (f_{test} in MHz: 2 × 95 – 140 = 50)

1 dB compression point	≥10 dBm output power into 50 Ω
Power supply	21 V to 32 V DC (max. 500 mA)
Connector	N female
Operating	
temperature range	–40 °C to +85 °C
Safety class	IP 66 (in line with EN/IEC 60529)
Max. wind speed	200 km/h
	(without and with 30 mm radial icing)
Dimensions	
(length × diameter)	approx. 1406 mm × 153 mm
Weight	approx. 3.5 kg
MTBF	>250 000 h

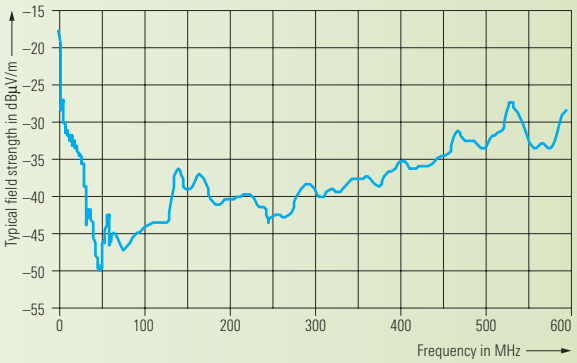
Ordering information

Active Omnidirectional		
Receiving Antenna	R&S®HE 055	4065.1120.02

Recommended extras		
Power Supply Unit	R&S®IN 115	4004.1707.02



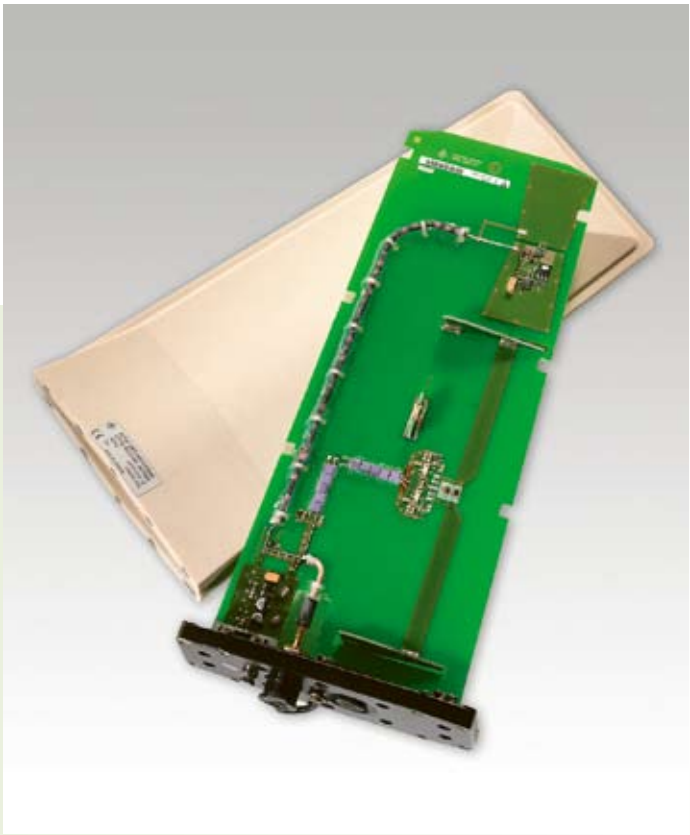
Typical practical gain



Typical field-strength sensitivity at antenna output (measurement bandwidth Δf = 1 Hz; S/N = 0 dB)

VHF/UHF Antennas

Active Receiving Antenna R&S®HE 500



20 MHz to 3000 MHz

For vertical polarization

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

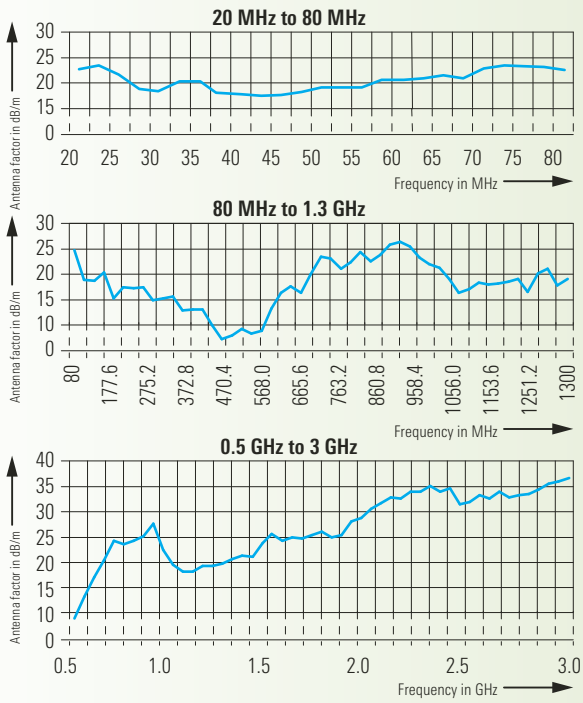
Frequency range	20 MHz to 3 GHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	typ. <3
Horizontal radiation pattern	omnidirectional
Antenna factor	see diagrams below
Field-strength sensitivity	
20 MHz to 1.3 GHz	typ. –23 dB(µV/m)
1.3 GHz to 3 GHz	typ. –20 dB(µV/m)
Destructive field strength	
Up to 10 MHz	typ. >50 V/m
10 MHz to 20 MHz	typ. >20 V/m
20 MHz to 3 GHz	typ. >10 V/m

IP2	>30 dBm (typ. >50 dBm)
IP3	typ. >25 dBm
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)
Protection class	IP 55 (in line with DIN 40050)
Dimensions (L × W × H)	approx. 170 mm × 65 mm × 365 mm
Weight	approx. 1.2 kg

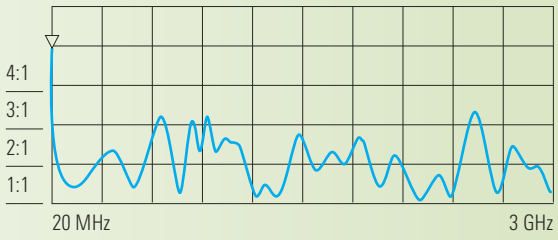
Ordering information

Active		
Receiving Antenna	R&S®HE 500	4059.2005.02

Recommended extras		
Bias Unit	R&S®IN 500	4062.0880.02



Typical antenna factor



Typical VSWR characteristic

VHF/UHF Antennas

Biconical Antenna
R&S®HK116

20 MHz to 300 MHz

For radiated emission measurements

Chapter Overview

Type Index

Main Menu

Features

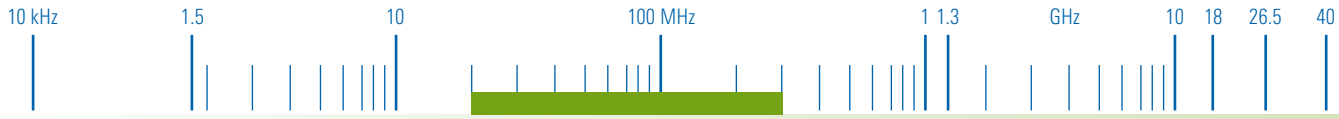
- Wide frequency range
- Radiation patterns virtually independent of frequency
- Individual calibration in line with ANSI C63.5 (free-space calibration) and ARP 958
- Low weight

Brief description

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

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

The R&S®HK116 is individually calibrated in line with ANSI C63.5 and ARP 958 and particularly suitable for radiated emission measurements in EMC test rooms.



Specifications

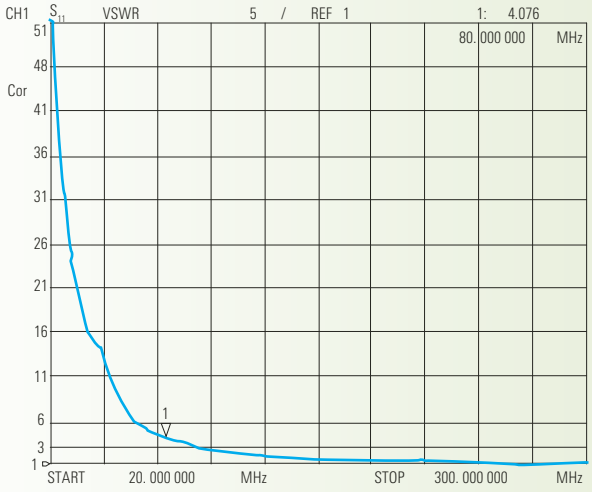
Frequency range	20 MHz to 300 MHz
Polarization	linear
Input impedance	50 Ω
VSWR	typ. 2.5
Permissible input power	75 W CW
Connector	N female

Operating temperature range	–40 °C to +55 °C
MTBF	>3 000 000 h
Dimensions (L × W × H)	approx. 1380 mm × 530 mm × 720 mm
Weight	approx. 3 kg

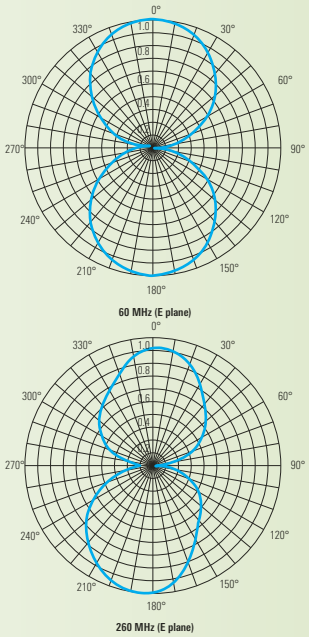
Ordering information

Biconical Antenna	R&S®HK 116	4000.7752.02

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



Typical VSWR

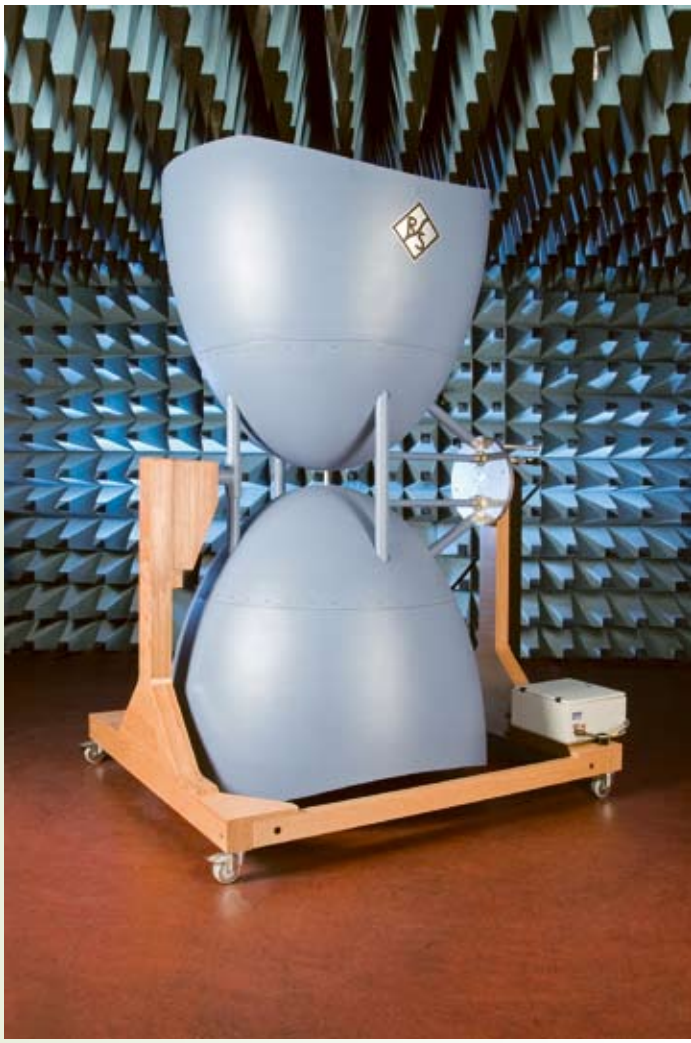


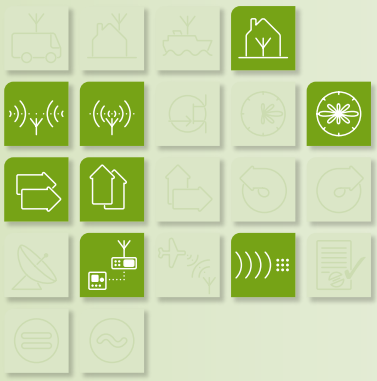
Typical horizontal radiation pattern

VHF/UHF Antennas

EMS Broadband Dipole R&S®HK5000

New





30 MHz to 100 MHz

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

Features

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

Brief description

Its broadband characteristics and high power capability make the EMS Broadband Dipole R&S®HK5000 the first choice for EMC susceptibility testing in the VHF frequency range. The R&S®HK5000 has been optimized for low VSWR and therefore high efficiency. The biconical structure allows the antenna to be set up close to the device under test, e.g. 1 m. In comparison with conventional antennas, higher field strengths can be generated at a lower input power. Despite the antenna's large dimensions, a specially designed support makes the antenna easy to handle in the test room. The polarization of the antenna can be set via a rotator and remote control.

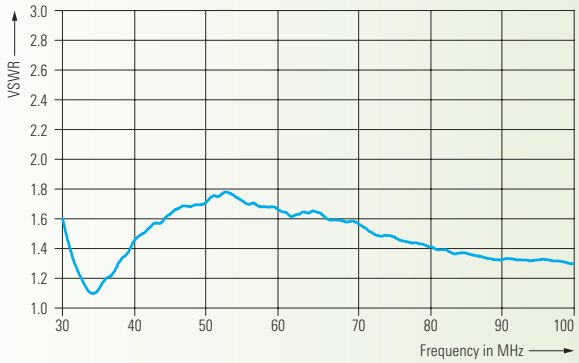
Specifications

Frequency range	30 MHz to 100 MHz
Polarization	linear
Input impedance	50 Ω
VSWR	<2 (under free space conditions)
Gain	>2 dBi (under free space conditions)
Max. input power	
With EIA 1 5/8"	
connector	10 kW CW
With 13-30 connector	
(in line with IEC 169-5)	5 kW CW

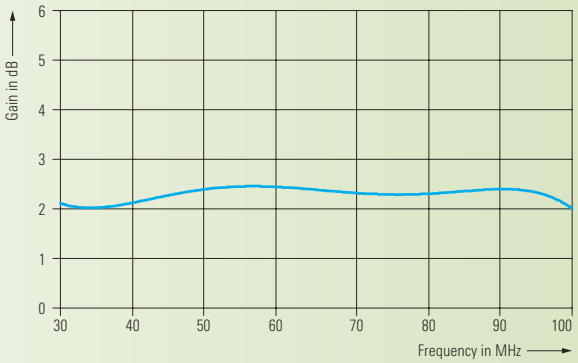
Generated field strength	>200 V/m_{rms} at a distance of 1 m and 5 kW CW input power
Operating	
temperature range	+5 °C to +40 °C
Class of application	laboratory
Dimensions (W × H × L)	
Vertically polarized	approx. 1.8 m × 2.95 m × 2.2 m
Horizontally polarized	approx. 2.9 m × 2.4 m × 2.2 m
Weight	
Antenna	approx. 150 kg
Holder with motor	approx. 120 kg

Ordering information

EMS Broadband Dipole	R&S®HK5000	4065.9043.02



Typical VSWR characteristic



Typical gain characteristic

VHF/UHF Antennas

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

80 MHz to 1300 MHz

Monitoring and measurement of RF signals

Chapter Overview

Type Index

Main Menu

Features

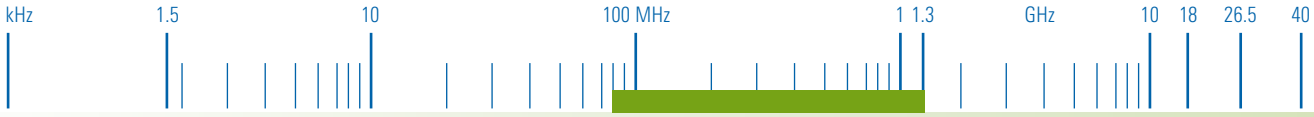
- Wide frequency range
- Radiation pattern virtually independent of frequency
- Polarization horizontal, vertical and ±45° (selectable with option R&S®ZS 107)
- Remote-controlled polarization switching with R&S®GB 016 and R&S®ZS 107

Brief description

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

The antenna features a virtually frequency-independent radiation pattern and allows horizontally, vertically and ±45° polarized signals to be received.

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



Specifications

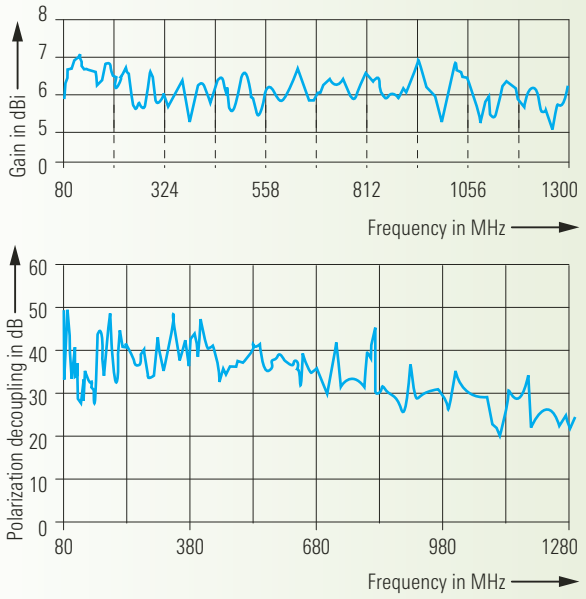
Frequency range	80 MHz to 1.3 GHz
Polarization (remotely selectable, optional)	linear/horizontal, vertical, ±45°
Input impedance	50 Ω
VSWR	≤2.5
Gain	typ. 6 dBi
Antenna connector	2 × N female

Operating temperature range	–40 °C to +50 °C
Max. wind speed	180 km/h (without ice deposit)
MTBF	>150 000 h
Dimensions (L × W × H)	approx. 1.7 m × 2 m × 2.2 m
Weight	approx. 15 kg

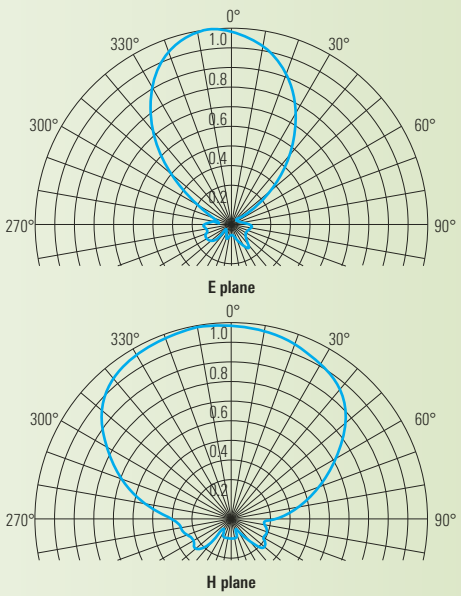
Ordering information

Crossed Log-Periodic Antenna	R&S®HL007A2	4025.8700.03

Recommended extras		
Polarization Network Switch for horiz./vert./±45° polarization	R&S®ZS107	0428.2853.02
Polarization Network Switch for horiz./vert. polarization	R&S®ZS107	0428.2853.04
Control Unit	R&S®GB016	4056.7006.02



Typical gain and polarization decoupling



Typical radiation patterns

VHF/UHF Antennas

Log-Periodic Broadband Antenna R&S®HL 033

80 MHz to 2000 MHz

Detection and measurement of RF signals

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

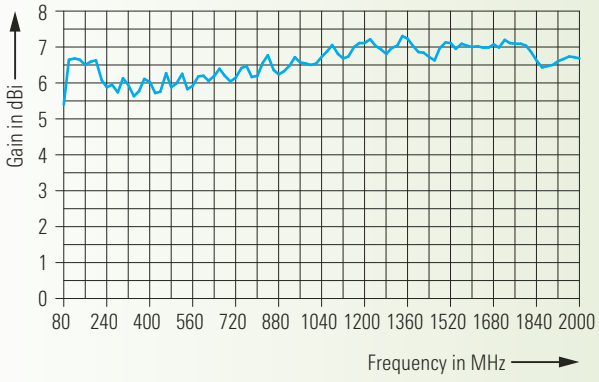
Frequency range	80 MHz to 2 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	≤2
Max. input power (T_A = +30 °C)	
80 MHz	460 W + 100 % AM
100 MHz	430 W + 100 % AM
500 MHz	210 W + 100 % AM
1000 MHz	160 W + 100 % AM
1500 MHz	140 W + 100 % AM
2000 MHz	120 W + 100 % AM

Gain	typ. 6.5 dBi
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 (L × W)	approx. 1800 mm × 1960 mm
Weight	approx. 5 kg

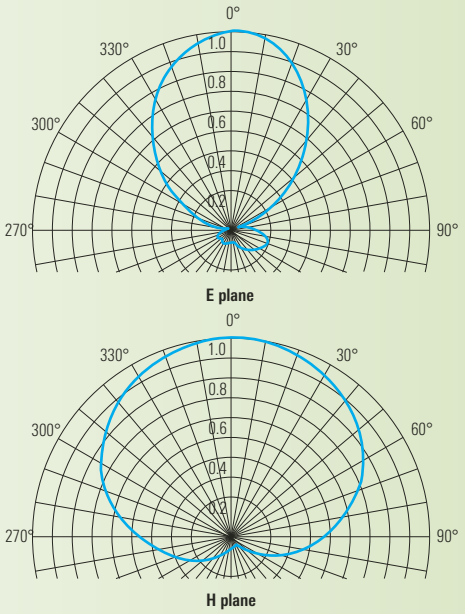
Ordering information

Log-Periodic		
Broadband Antenna	R&S®HL033	4062.6608.03

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



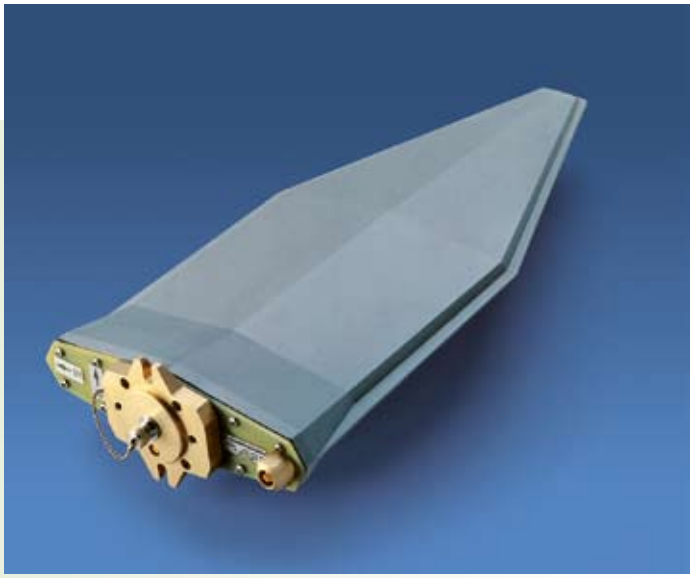
Typical gain

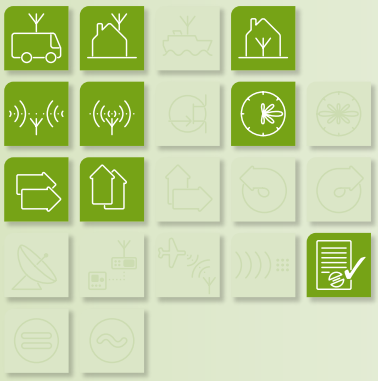


Typical radiation patterns

VHF/UHF Antennas

Log-Periodic Broadband Antenna R&S®HL 040





400 MHz to 3000 MHz

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

Features

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

Brief description

The R&S®HL 040 provides broadband transmission and reception in the frequency range 400 MHz to 3000 MHz. Due to its large bandwidth, the antenna covers frequency ranges of various mobile radio systems.

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

Each R&S®HL 040 is supplied with an individual calibration certificate so that even field-strength and EMC measurements can be performed.

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

Specifications

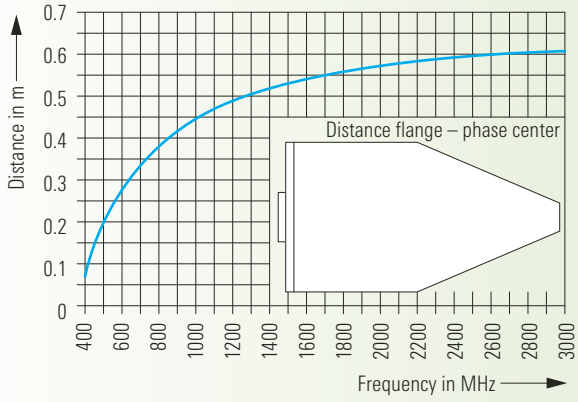
Frequency range	400 MHz to 3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	<2.5, typ. <2.0
Max. input power	150 W to 50 W CW
Gain	5 dBi to 7 dBi
Front-to-back ratio	
400 MHz to 450 MHz	>10 dB
450 MHz to 3 GHz	>15 dB
Polarization isolation	>20 dB

Connector	N female
Operating temperature range	–40 °C to +70 °C
Max. wind speed	
Without ice deposit	200 km/h
With 30 mm radial ice deposit	160 km/h
MTBF	>150 000 h
Dimensions (H × W × L)	approx. 130 mm × 300 mm × 680 mm
Weight	approx. 2.8 kg

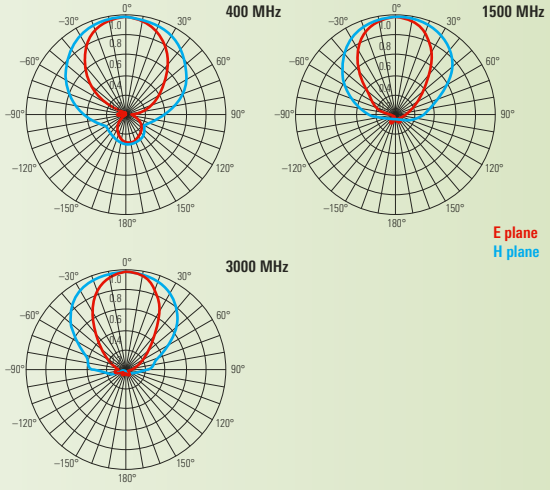
Ordering information

Log-Periodic		
Broadband Antenna	R&S®HL040	4035.8755.02

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



Typical variation of phase center



Typical radiation patterns

VHF/UHF Antennas

EMS Antenna R&S®HL 046

80 MHz to 1300 MHz

Log-periodic antenna for

EMS measurements

Chapter Overview

Type Index

Main Menu

Features

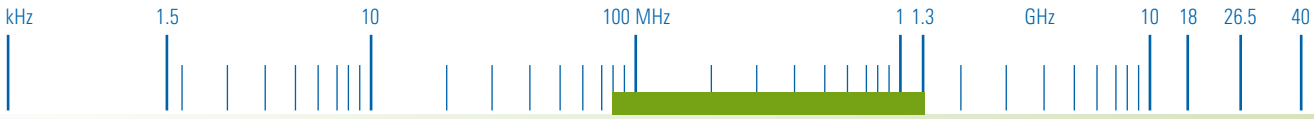
- High antenna gain, i.e. low amplifier power required
- Only one antenna required to cover a wide frequency range
- Uniform object irradiation due to optimized radiation patterns
- Reduced influence of test chamber
- Wall mounting possible
- Small size

Brief description

The R&S®HL 046 for EMS measurements consists of two log-periodic antennas arranged in a V-shape and connected in parallel. Due to this construction, high selectivity is obtained in the H plane and the radiation patterns are almost rotation-symmetrical.

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

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



Specifications

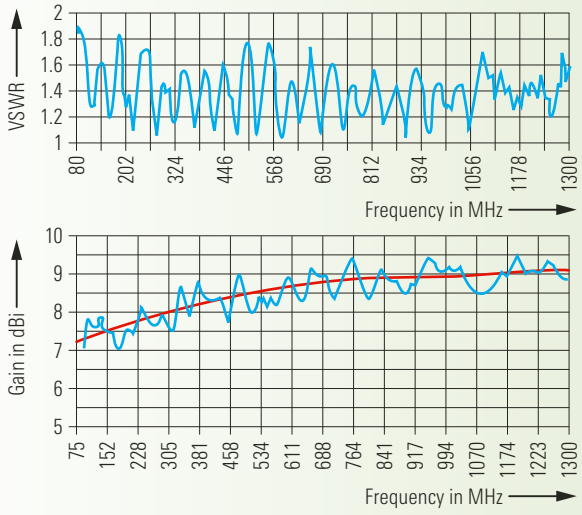
Frequency range	80 MHz to 1.3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	<2
Max. input power (T_A = +40 °C)	
80 MHz	1000 W + 100 % AM
500 MHz	500 W + 100 % AM
1 GHz	300 W + 100 % AM
1.3 GHz	250 W + 100 % AM
Gain	typ. >7 dBi
Front-to-back ratio	typ. >20 dB
Polarization decoupling	typ. 20 dB

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
With trolley	approx. 0.86 m × 1.90 m (variable up to 2.60 m) × 1.85 m
Weight	
Without trolley	approx. 12.5 kg
With trolley	approx. 22.5 kg

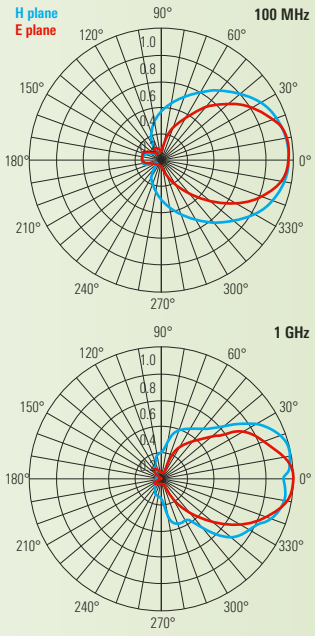
Ordering information

EMS Antenna		
With tripod	R&S®HL046	4040.8708.02
Without tripod	R&S®HL046	4040.8708.03

Recommended extras		
Pneumatic Actuators for polarization setting	R&S®HL046-P	4053.1694.02
Tripod	R&S®HL046Z1	4061.0106.02



Typical VSWR and typical gain



Typical radiation patterns

VHF/UHF Antennas

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

New

80 MHz to 3000 MHz

Log-periodic antenna for EMS measurements

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

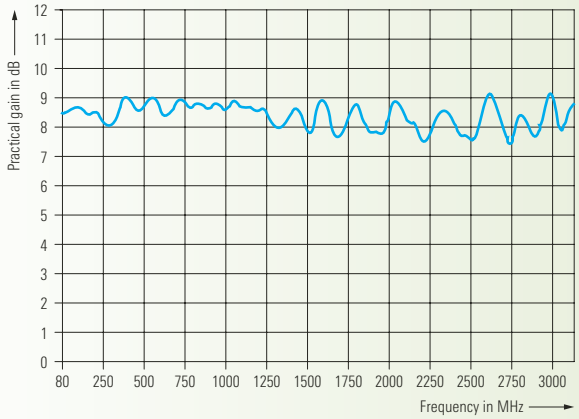
Frequency range	80 MHz to 3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	
<2500 MHz	<2
≥2500 MHz	<2.5
Practical gain	typ. >8 dBi
Max. input power	
80 MHz	1400 W + 100 % AM
500 MHz	600 W + 100 % AM
1000 MHz	400 W + 100 % AM
2000 MHz	300 W + 100 % AM
3000 MHz	250 W + 100 % AM
Connector	N female

Operating temperature range	+5 °C to +40 °C in line with MIL-STD-810E
Class of application	laboratory
Dimensions (W × H × L)	
Without tripod	
Folded	approx. 0.85 m × 1.50 m × 1.81 m
Open	approx. 1.50 m × 1.50 m × 1.81 m
With tripod	
Folded	approx. 0.86 m × 1.90 m × 1.89 m
Open	approx. 1.50 m × 1.90 m (variable up to 2.60 m) × 1.89 m
Weight	
Without tripod	approx. 17 kg
Tripod	approx. 12.5 kg

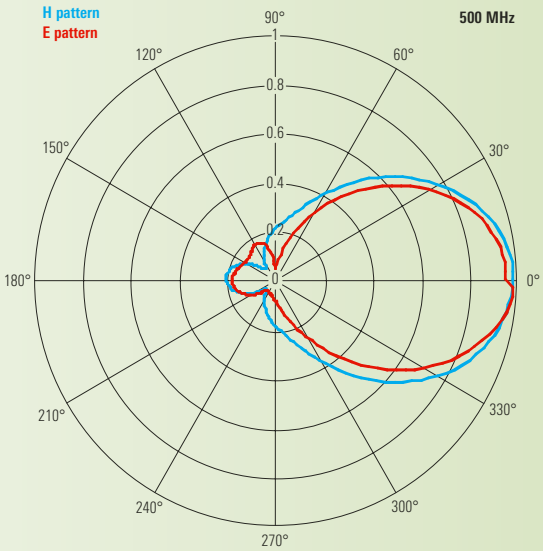
Ordering information

High Gain Log-Periodic Antenna	R&S®HL046E	4065.5960.02

Recommended extras		
Pneumatic Polarization Control	R&S®HL046-P	4053.1694.02



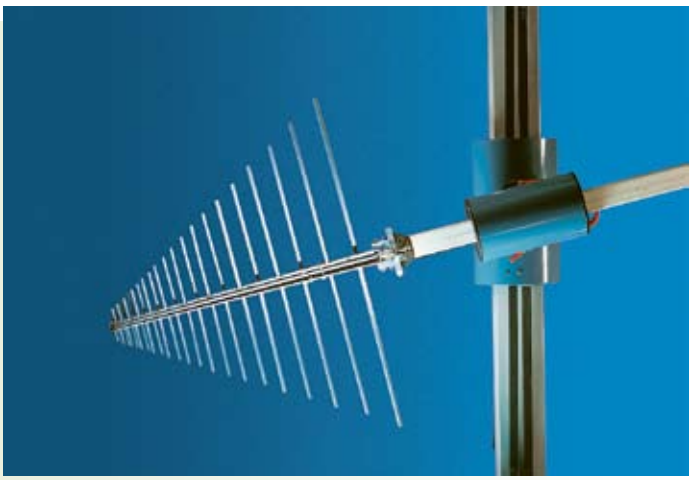
Typical practical gain (including VSWR losses)



Typical antenna pattern at 500 MHz

VHF/UHF Antennas

Log-Periodic Antenna
R&S®HL 223



200 MHz to 1300 MHz

Optimized for radiomonitoring and measurements

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

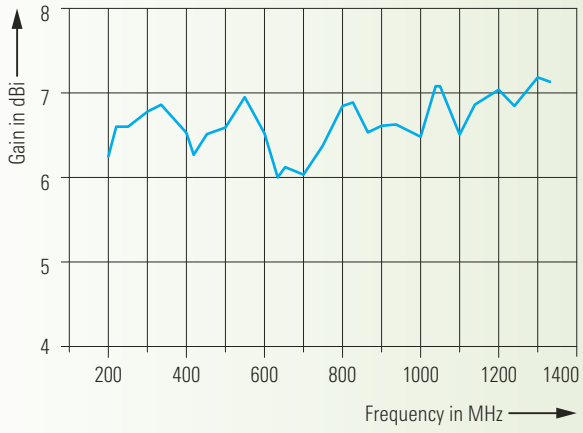
Frequency range	200 MHz to 1.3 GHz
Polarization	linear
Input impedance	50 Ω
VSWR	≤2 (typ. 1.6)
Max. input power	1500 W to 600 W CW
Gain	>6 dBi
Connector	N female

MTBF	>200 000 h
Operating temperature range	–40 °C to +50 °C
Max. wind speed	200 km/h (without ice deposit)
Dimensions (L × W)	approx. 710 mm × 765 mm
Weight	approx. 2 kg

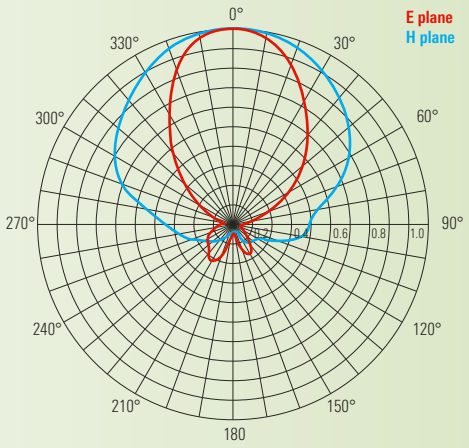
Ordering information

Log-Periodic Antenna	R&S®HL 223	4001.5501.02

Recommended extras		
Wooden Tripod	R&S®HZ-1	0837.2310.02
Tripod	R&S®HFU-Z	0100.1114.02
Mast, 1 m to 5 m, adjustable	R&S®HFU-Z	0100.1120.02



Typical gain



Typical directional radiation pattern at 750 MHz

VHF/UHF Antennas

ULTRALOG R&S®HL 562

30 MHz to 3000 MHz

Chapter Overview

Type Index

Main Menu

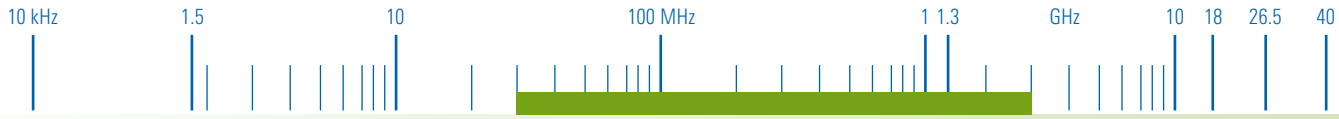
Features

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

Brief description

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

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



Specifications

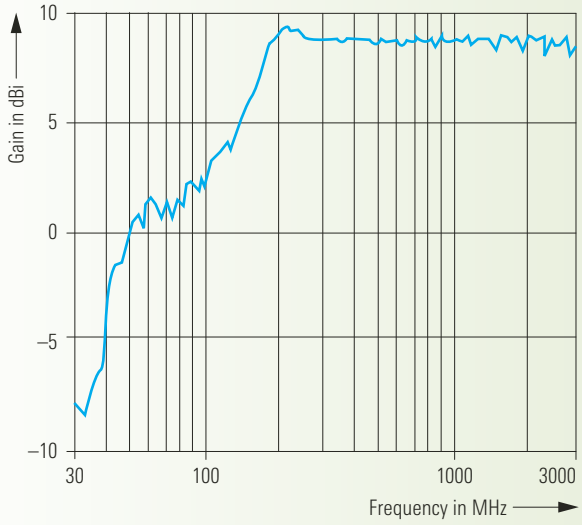
Frequency range	30 MHz to 3 GHz
Polarization	linear
Polarization isolation	>20 dB
Input impedance	50 Ω
VSWR	typ. <2
Gain above 200 MHz	typ. 8 dB
Max. input power (T_A = +40 °C)	
30 MHz	150 W + 100 % AM
80 MHz	300 W + 100 % AM
250 MHz	500 W + 100 % AM
1 GHz	280 W + 100 % AM
3 GHz	180 W + 100 % AM

Connector	N female
MTBF	>200 000 h
Class of application	laboratory
Operating temperature range	0 °C to +40 °C
Dimensions (W × H × L)	approx. 0.6 m × 1.65 m × 1.68 m
Weight	approx. 5 kg

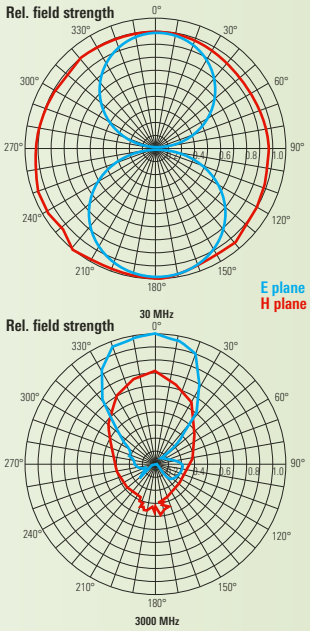
Ordering information

ULTRALOG	R&S®HL 562	4041.3000.02

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



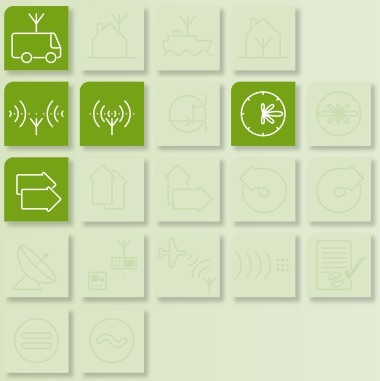
Typical gain



Typical radiation patterns

VHF/UHF Antennas

ILS/VOR Test Antenna
R&S®HF 108



108 MHz to 118 MHz
Ground measurements for instrument landing system (ILS) and very high frequency omnidirectional range (VOR)

Features

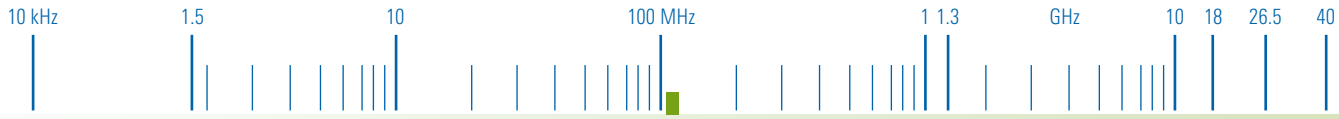
- Linear horizontal polarization
- Measurement antenna for ILS and VOR
- Highly linear gain and VSWR characteristics

Brief description

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

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

Chapter Overview
Type Index
Main Menu



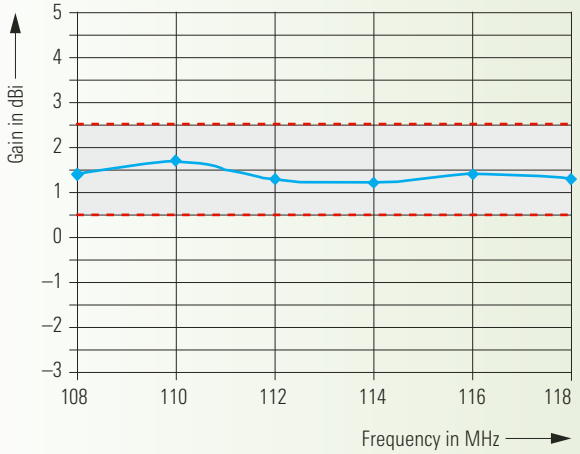
Specifications

Frequency range	108 MHz to 118 MHz
Polarization	linear/horizontal
Input impedance	50 Ω
VSWR	
108 MHz to 112 MHz	<1.4 (typ. <1.2)
112 MHz to 118 MHz	typ. <1.9
Gain	typ. 1.5 dBi
Antenna factor	typ. 10 dB
Max. input power	<10 mW

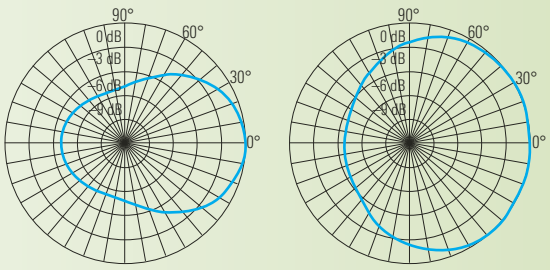
Connector	BNC female
MTBF	>500 000 h
Operating	
temperature range	–20 °C to +60 °C
Max. wind speed	200 km/h (without ice deposit)
Dimensions (L × W × H)	approx. 1370 mm × 1130 mm × 350 mm
Weight	approx. 4 kg
Protection class	IP 65 (in line with DIN 40050)

Ordering information

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



Typical gain



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

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

Typical radiation patterns

VHF/UHF Antennas

UHF Coaxial Dipole
R&S®HK 001

225 MHz to 400 MHz
UHF omnidirectional antenna for vertical polarization

Chapter Overview
Type Index
Main Menu

Features

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

Brief description

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

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

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

Specifications

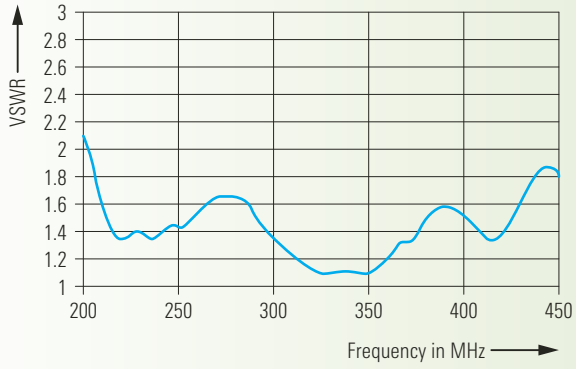
Frequency range	225 MHz to 400 MHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	≤2
Max. input power	400 W CW
Gain	typ. 2 dBi
Horizontal radiation	
pattern	omnidirectional
Max. deviation from	
circularity	±0.5 dB
Connector	N female

MTBF	>250 000 h
Operating	
temperature range	–40 °C to +85 °C
Max. wind speed	185 km/h (without ice deposit)
Wind load (at 185 km/h)	80 N
Dimensions	
Diameter	approx. 430 mm
Height	approx. 470 mm
Weight	approx. 1.6 kg

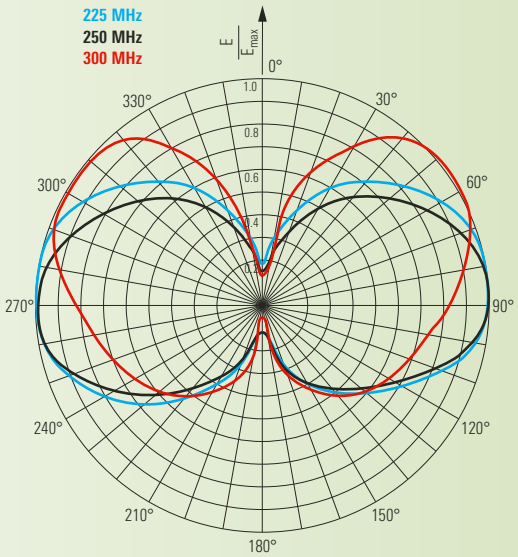
Ordering information

UHF Coaxial Dipole	R&S®HK001	0425.2781.03

Recommended extras		
Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
Mast Adapter	R&S®KM011Z1	4022.3508.02



Typical VSWR



Typical vertical radiation pattern

VHF/UHF Antennas

VHF Coaxial Dipole
R&S®HK012

100 MHz to 165 MHz

VHF omnidirectional antenna for vertical polarization

Chapter Overview

Type Index

Main Menu

Features

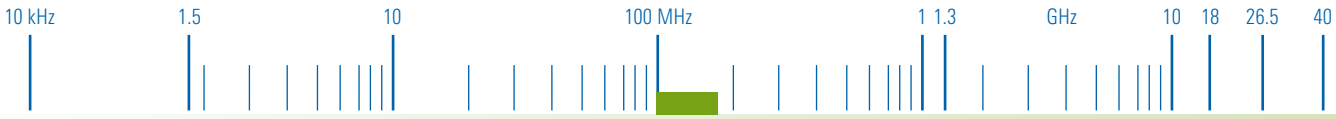
- High protection against lightning strokes in the vicinity
- Rugged design
- Minimal wind load
- Low weight
- Can be used on ships
- Ideal for military aeronautical radio

Brief description

The VHF Coaxial Dipole R&S®HK012 is an omnidirectional antenna for vertically polarized waves.

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

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



Specifications

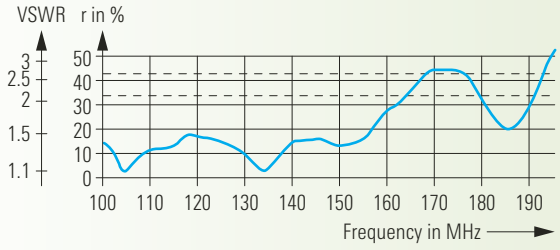
Frequency range	100 MHz to 165 MHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	≤2
Max. input power	400 W CW
Gain	typ. 2 dBi
Horizontal radiation	
pattern	omnidirectional
Max. deviation from	
circularity	±0.5 dB
Connector	N female

MTBF	>250 000 h
Operating	
temperature range	–40 °C to +85 °C
Max. wind speed	160 km/h (without ice deposit)
Wind load (at 160 km/h)	110 N
Dimensions	
Diameter	approx. 250 mm
Height	approx. 1150 mm
Weight	approx. 3 kg

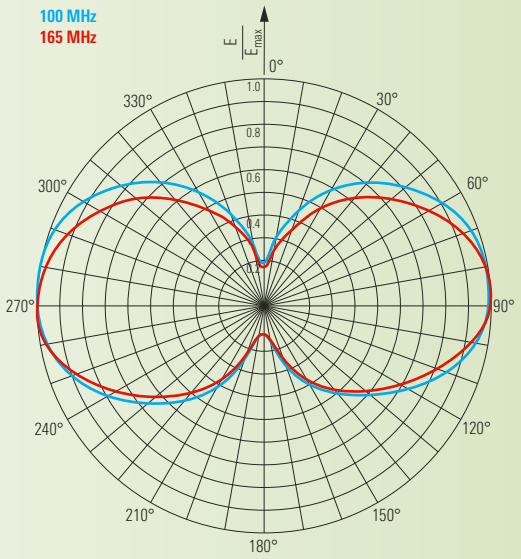
Ordering information

VHF Coaxial Dipole	R&S®HK012	0459.7611.02

Recommended extras		
Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
Mast Adapter	R&S®KM011Z1	4022.3508.02



Typical VSWR



Typical vertical radiation pattern

VHF/UHF Antennas

VHF/UHF Coaxial Dipole R&S®HK014

100 MHz to 1300 MHz

80 MHz to 1600 MHz

VHF/UHF omnidirectional antenna for vertical polarization

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

The VHF/UHF Coaxial Dipole R&S®HK014 is an omnidirectional antenna for vertically polarized waves.

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

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

Specifications

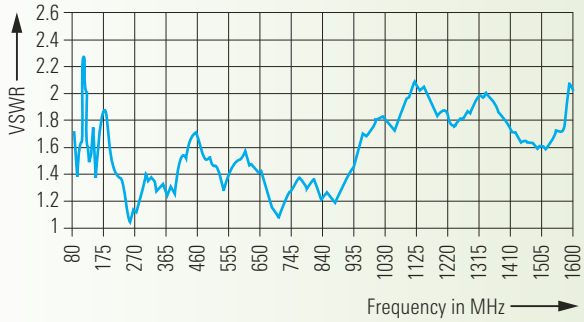
Frequency range	
Model .02	100 MHz to 1.3 GHz
Model .12	80 MHz to 1.6 GHz
Polarization	linear, vertical
Input impedance	50 Ω
VSWR	typ. <2
Permissible input power	
Model .02	
Up to 150 MHz	800 W + 100 % AM
Up to 400 MHz	430 W + 100 % AM
Up to 1 GHz	270 W + 100 % AM
Up to 1.3 GHz	240 W + 100 % AM
Model .12	20 W + 100 % AM
Gain	typ. 2 dBi

Horizontal	
radiation pattern	omnidirectional
Max. deviation from	
circularity	±1 dB
Connector	N female
Operating	
temperature range	–40 °C to +85 °C
Max. wind speed	160 km/h (without ice deposit)
Wind load (at 160 km/h)	180 N
MTBF	>150 000 h
Dimensions (diameter × height)	
Model .02	approx. 310 mm × 1100 mm
Model .12	approx. 310 mm × 1250 mm
Weight	approx. 5 kg

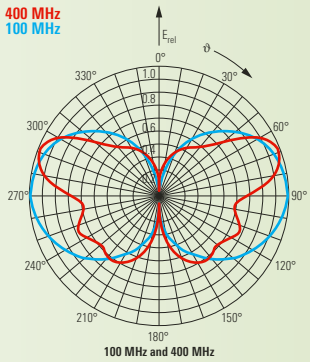
Ordering information

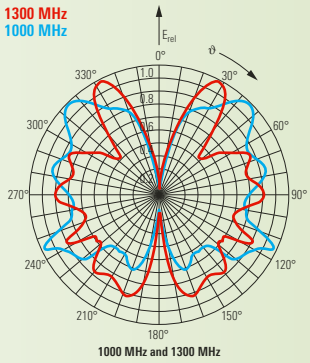
VHF/UHF Coaxial Dipole		
100 MHz to 1300 MHz	R&S®HK014	0644.1514.02
80 MHz to 1600 MHz	R&S®HK014	0644.1514.12

Recommended extras		
Diplexer for the ranges		
100 MHz to 162 MHz/		
225 MHz to 400 MHz	R&S®FT224	0525.5117.03
Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
Mast Adapter	R&S®KM011Z2	4022.3608.02



Typical VSWR





Typical vertical radiation pattern

VHF/UHF Antennas

VHF/UHF Coaxial Dipole R&S®HK033

80 MHz to 2000 MHz

Extremely broadband vertical coaxial dipole especially for use on ships

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

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

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

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

Specifications

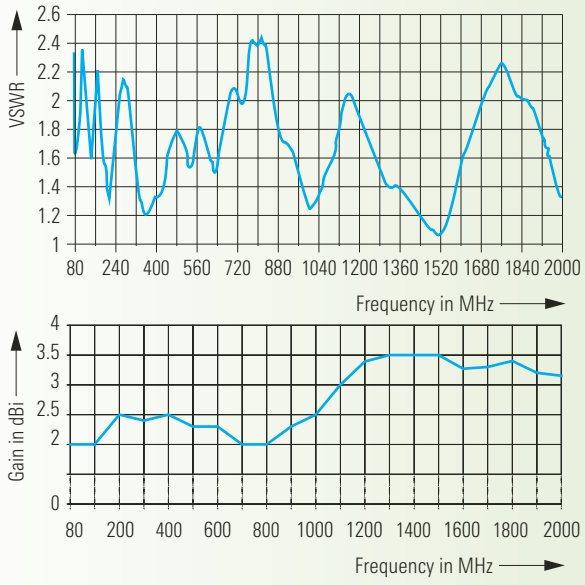
Frequency range	80 MHz to 2 GHz
Polarization	linear/vertical
Input impedance	50 Ω
VSWR	typ. <2.4
Max. input power	
Up to 100 MHz	860 W + 100 % AM
Up to 400 MHz	430 W + 100 % AM
Up to 600 MHz	360 W + 100 % AM
Up to 1000 MHz	270 W + 100 % AM
From 1300 MHz	240 W + 100 % AM
Gain	typ. 2 dBi

Horizontal	
radiation pattern	omnidirectional
Max. deviation from	
circularity	±1 dB
Connector	N female
MTBF	>1 000 000 h
Operating	
temperature range	–40 °C to +85 °C
Max. wind speed	160 km/h (without ice deposit)
Wind load (at 160 km/h)	180 N
Dimensions	
(diameter × height)	approx. 310 mm × 1250 mm
Weight	approx. 6 kg

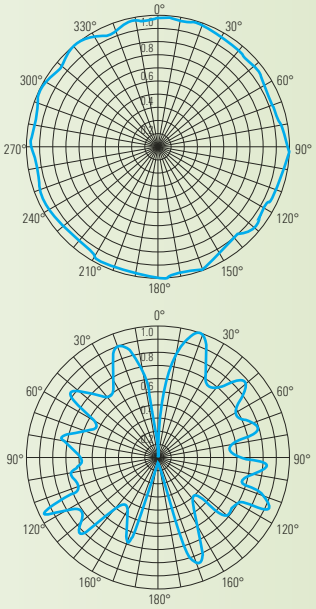
Ordering information

VHF/UHF Coaxial Dipole	R&S®HK033	4062.8369.02

Recommended extras		
Diplexer for the ranges		
100 MHz to 162 MHz/		
225 MHz to 400 MHz	R&S®FT224	0525.5117.03
Mast, 6 m, pluggable	R&S®KM011	0273.9116.02
Mast Adapter	R&S®KM 011Z2	4022.3608.02



Typical VSWR and gain

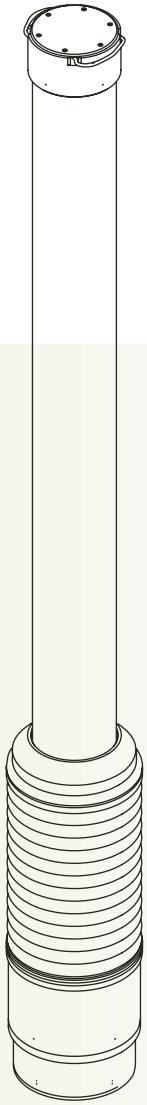


Typical horizontal (top) and vertical (bottom) radiation pattern

VHF/UHF Antennas

Broadband Mobile Antenna R&S®HK 055L1

New



27.5 MHz to 600 MHz

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

Features

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

Brief description

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

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

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

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

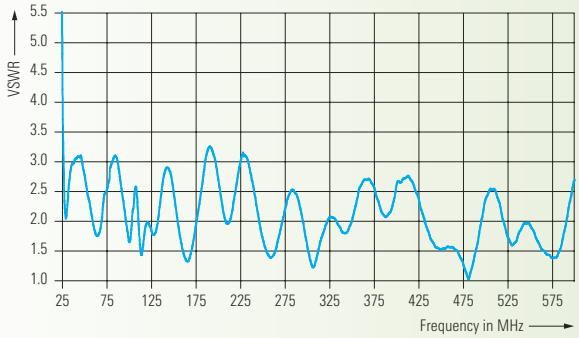
Specifications

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
Maximum deviation	
from circularity	±1 dB

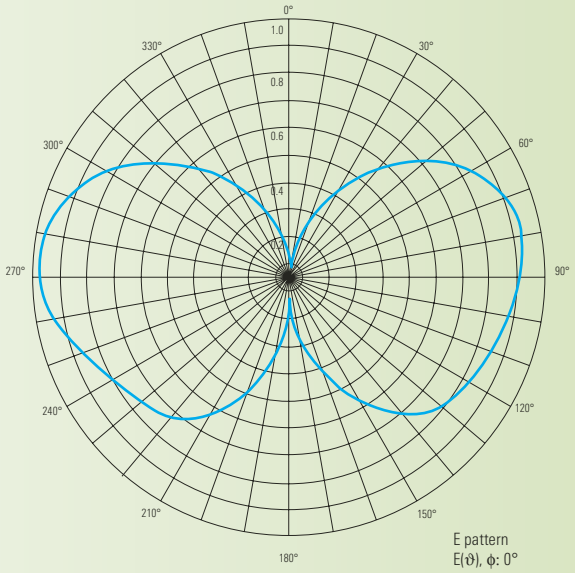
Elevation pattern	like monopoles (<110 MHz)
	like dipoles (>110 MHz)
Input power	max. 100 W CW (≥30 MHz)
	max. 50 W CW (<30 MHz)
Connector	N female
Operating	
temperature range	–40 °C to +85 °C
Safety class	IP 65 (in line with EN/IEC 60529)
Permissible wind speed	200 km/h
Deflection	≥80 km/h
Dimensions	
(length × diameter)	approx. 1590 mm × 165 mm
Weight	approx. 19 kg
MTBF	>200 000 h

Ordering information

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



Typical VSWR characteristic

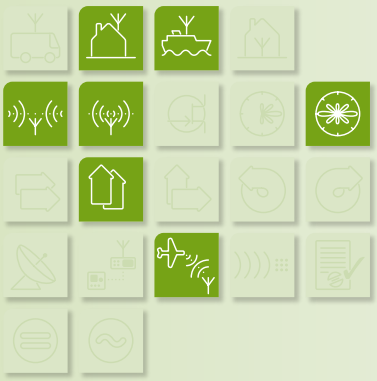


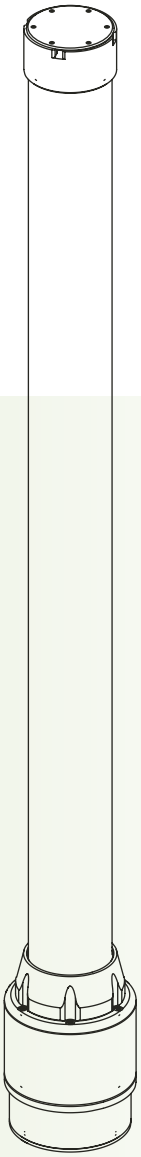
Typical elevation pattern at 120 MHz (measured on a 3 m × 3 m ground plane)

VHF/UHF Antennas

Omnidirectional Broadband Antenna R&S®HK055S1

New





27.5 MHz to 600 MHz

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

Chapter Overview

Type Index

Main Menu

Features

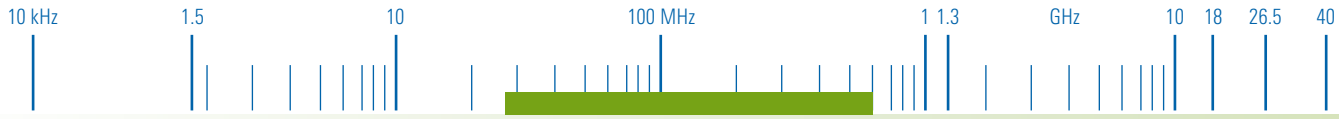
- Extremely wide frequency range
- Compact dimensions
- High efficiency
- Rugged design especially for rough handling onboard ships
- Wide operating temperature range
- Especially suitable for multiband multirole radios (MMRs)

Brief description

The Omnidirectional Broadband Antenna R&S®HK055S1 covers the extremely wide frequency range from 27.5 MHz to 600 MHz.

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

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



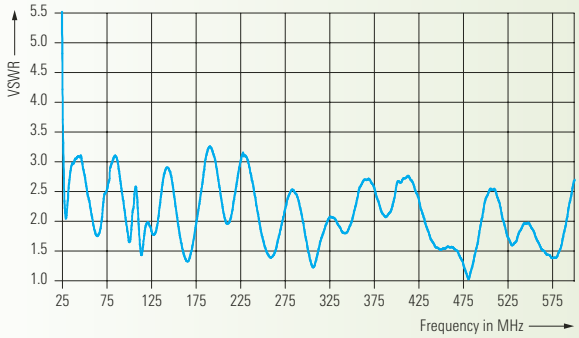
Specifications

Frequency range	27.5 MHz to 600 MHz
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
Maximum deviation	
from circularity	±1 dB

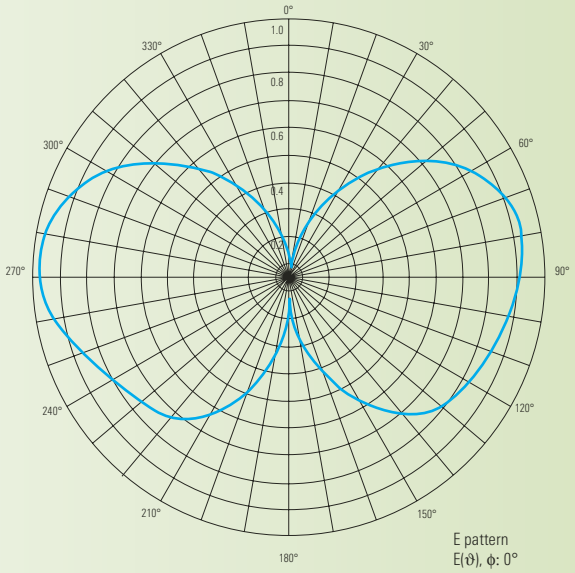
Elevation pattern	like monopoles (<110 MHz)
	like dipoles (>110 MHz)
Input power	max. 100 W CW (≥30 MHz)
	max. 50 W CW (<30 MHz)
Connector	N female
Operating	
temperature range	–40 °C to +85 °C
Safety class	IP 65 (in line with EN/IEC 60529)
Permissible wind speed	200 km/h
Dimensions	
(length × diameter)	approx. 1585 mm × 165 mm
Weight	approx. 12 kg
MTBF	>300 000 h

Ordering information

Omnidirectional Broadband Antenna		
Color: sand yellow		
(RAL 1002)	R&S®HK055S1	4067.0443.04
Color: silver grey		
(RAL 7001)	R&S®HK055S1	4067.0443.05



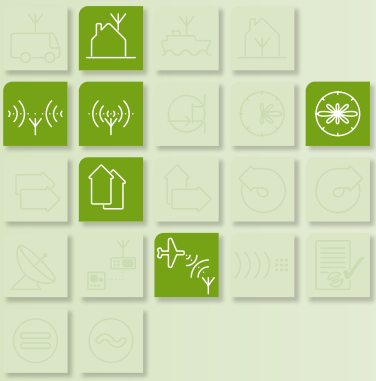
Typical VSWR characteristic



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

VHF/UHF Antennas

VHF/UHF Omnidirectional ATC Antenna R&S®HK353A



100 MHz to 156 MHz (VHF)

225 MHz to 400 MHz (UHF)

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

Chapter Overview

Type Index

Main Menu

Features

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

Brief description

The R&S®HK353A is designed for ATC ground-to-air communication. Due to its modular design, any number of antenna configurations (up to an overall height of 10 m) can be set up on the mast.

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

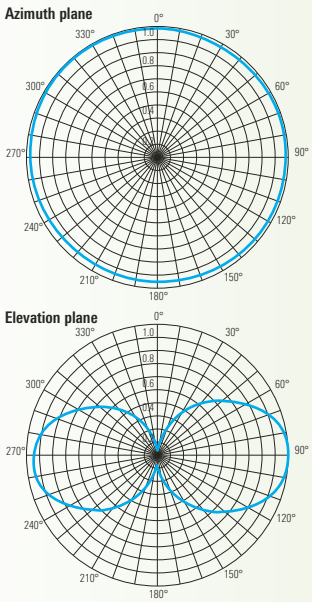
For easy transport, the antenna mast made of glassfiber-reinforced plastic comes in two sections (for masts longer than 6 m). The modular dipoles and the decoupling units are arranged inside the supporting cylinder.

Specifications

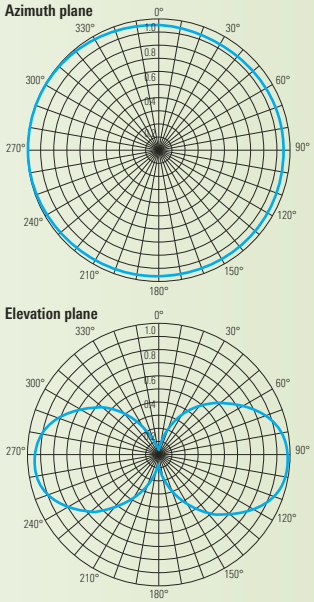
VHF Dipole R&S®HK 153D2	
Frequency range	100 MHz to 156 MHz
Polarization	linear/vertical
Max. input power	700 W CW per dipole
Input impedance	50 Ω
VSWR	<2.5 (with radome)
Gain	>2 dBi per dipole
Horizontal	
radiation pattern	omnidirectional
Uncircularity	<±1 dB
Dimensions	
(length × diameter)	approx. 1850 mm × 250 mm
Weight	approx. 6 kg
UHF Dipole R&S®HK 253D2	
Frequency range	225 MHz to 400 MHz
Polarization	linear/vertical
Max. input power	450 W CW per dipole
Input impedance	50 Ω
VSWR	<2.5 (with radome)
Gain	>2 dBi per dipole
Horizontal	
radiation pattern	omnidirectional
Uncircularity	<±1 dB
Dimensions	
(length × diameter)	approx. 925 mm × 130 mm
Weight	approx. 1.6 kg
General data	
Max. total input power	5 dipoles simultaneously at full power
Max. wind speed	
Without ice deposit	190 km/h
With 50 mm radial ice deposit	177 km/h
Operating temperature range	–30 °C to +50 °C
MTBF	>500 000 h
Dimensions	
(height × diameter)	approx. 2 m to 10 m (max.) × 280 mm
Weight	depending on system configuration

Ordering information

VHF/UHF Omnidirectional		
ATC Antenna	R&S®HK353A	on request



Typical VHF radiation patterns at 125 MHz



Typical UHF radiation patterns at 225 MHz

VHF/UHF Antennas

Receiving Antenna System R&S®AU 900A4

10 kHz to 3000 MHz

Omnidirectional and directional reception of vertically and horizontally polarized waves

Chapter Overview

Type Index

Main Menu

Features

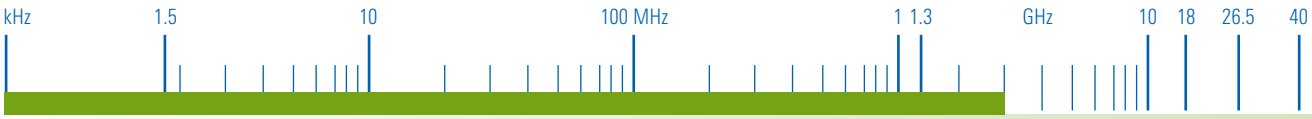
- Omnidirectional and directional reception
- Reception of vertically and horizontally polarized signals
- Rotatable
- Ideal for radiomonitoring and radiolocation
- Customized antenna configuration

Brief description

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

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

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



Specifications

Frequency range	10 kHz to 3 GHz
Polarization	horizontal and vertical
Input impedance	50 Ω
Connectors	
(type and number)	depending on antennas used
Operating	
temperature range	–40 °C to +50 °C
Max. wind speed	180 km/h (without ice deposit)[1]
Wind load (at 180 km/h)	13500 N[1]

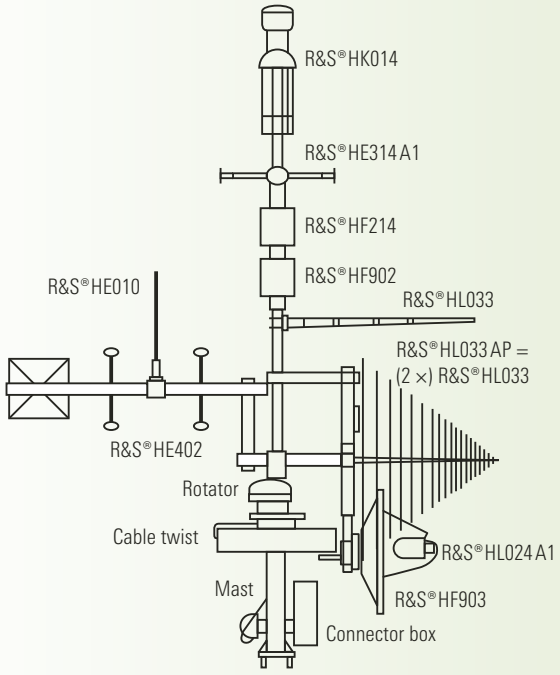
Range of rotation	0° to 400°
Dimensions (H × W)	approx. 6.5 m × 3.1 m[1]
MTBF	≥15000 h
Weight	approx. 350 kg[1]
	approx. 1000 kg[1]
	(with 30 mm radial ice deposit)

[1] Maximum configuration.

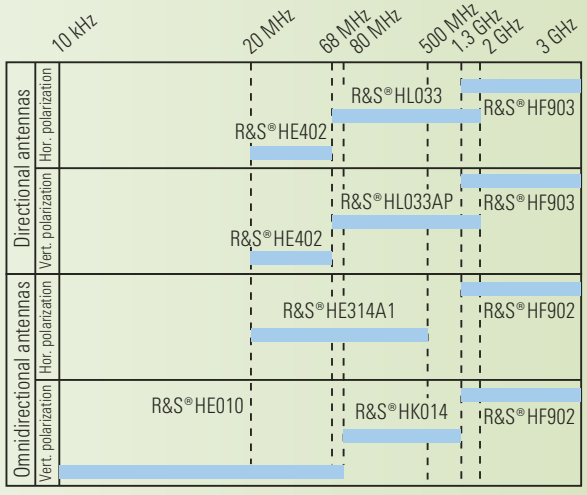
Ordering information

Receiving Antenna		
System	R&S®AU900A4	4045.0205.15

Recommended extras		
Antenna Control Unit		
(for indoor use, control via RS-232-C interface and manual operation)		
With external		
rotator control	R&S®GB127S	3022.2011.02
With integrated		
rotator control	R&S®GB127M	3022.2511.02
Rotator Control Unit		
(with switch)	R&S®RD127	3021.9012.05



Design



Operating frequency ranges

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

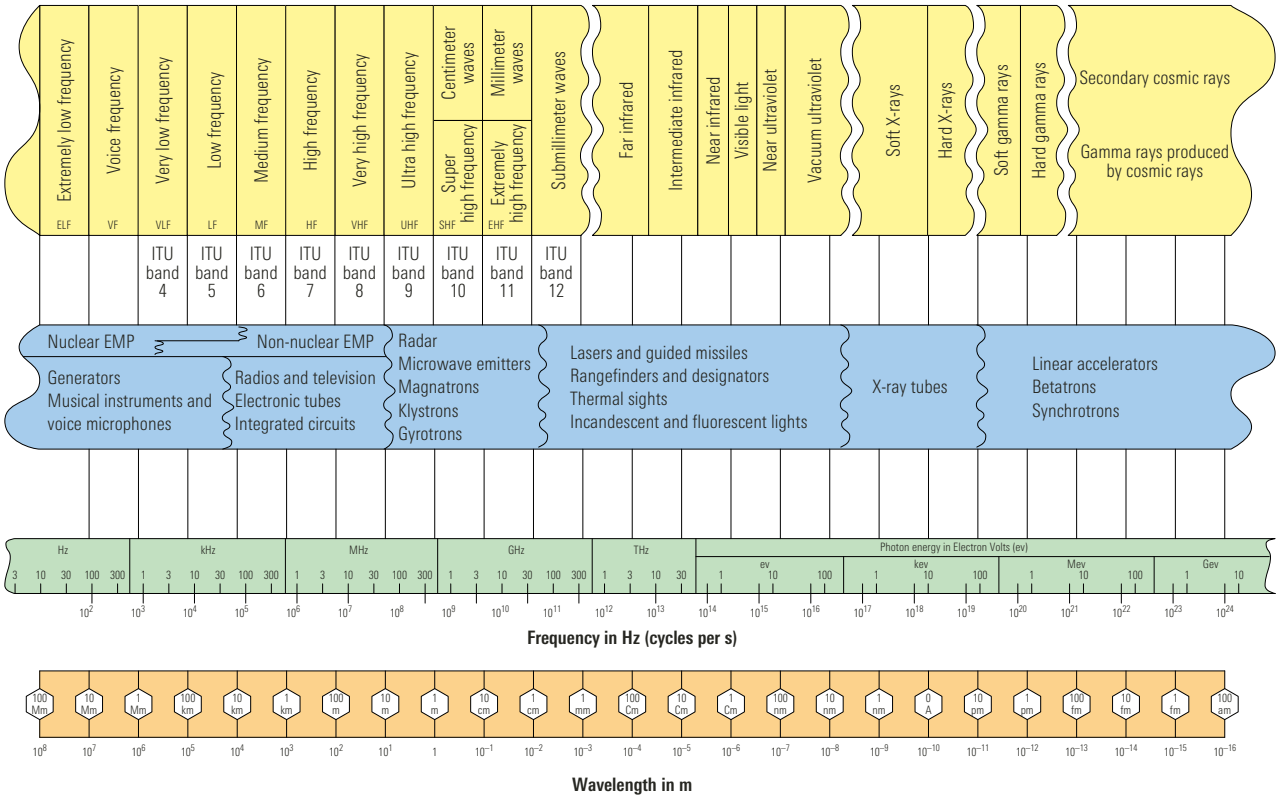
The effect produced by the existence of an electric charge, such as an electron, ion, or proton, in the volume of space or medium that surrounds it.
→ Each of a distribution of charges contributes to the whole field at a point on the basis of superposition. A charge placed in the volume of space or in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

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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"

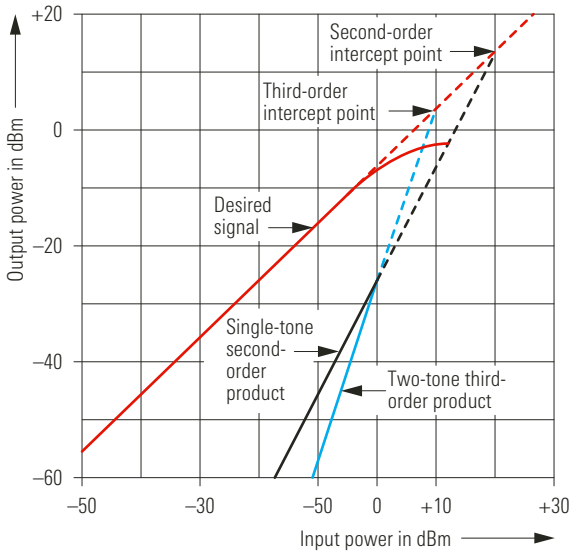
I

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)

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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

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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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