R&S®AK503 MOBILE HF ANTENNA

1.5 MHz to 30 MHz

Highly reliable HF antenna for mobile use

The R&S®AK503 mobile HF antenna has been designed especially for mobile use. Short installation and disassembly times and low space requirements for installation and transportation have been combined with good electrical characteristics.

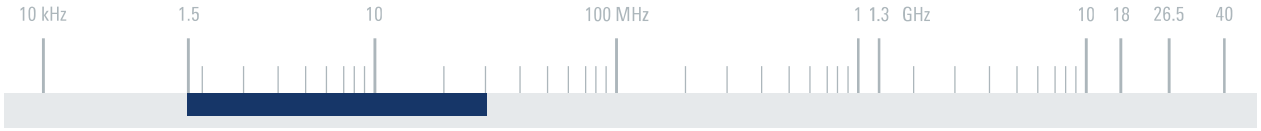
Through optimized design with a focus on propagation conditions in the medium-wave and shortwave range, the antenna provides high reliability in radiocommunications.

The automatic R&S®FK3150 antenna tuning unit ensures optimum antenna tuning in the entire operating frequency range.

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

Key facts

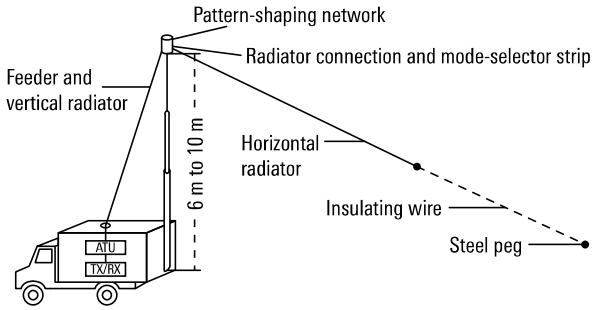
- Coverage of all distance ranges
- No skip zone
- Omnidirectional coverage with high-angle radiation (NVIS)
- Omnidirectional coverage up to 1000 km due to null fill
- Installation time approx. 10 min



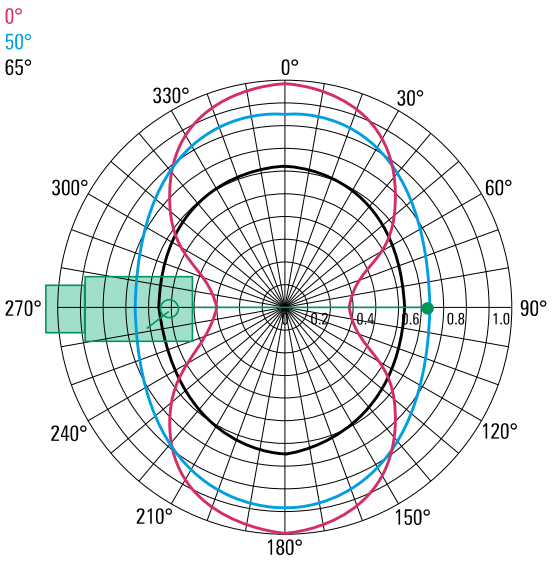
Specifications		
Frequency range		1.5 MHz to 30 MHz
Max. input power		150 W CW
Recommended operating range	mode 1	1.5 MHz to 6 MHz
	mode 2	6 MHz to 30 MHz (optimized)
	mode 3	1.5 MHz to 30 MHz for ground-wave communications and distances > 2000 km
Connector		clamp
MTBF		> 100 000 h
Operating temperature range		–40 °C to +55 °C
Max. wind speed	without ice deposit	120 km/h
Dimensions	length including guy rope	approx. 35 m (115 ft)
	height	approx. 7 m to 11 m (23 ft to 36 ft)
Weight		approx. 4 kg (9 lb)

Ordering information	Type	Order No.
Mobile HF antenna	R&S®AK503	0448.3226.02
Recommended extras		
Antenna tuning unit	R&S®FK3150	6095.5855.02
Mast, length: 6 m, can be disassembled	R&S®KM011	0273.9116.02
Mast adapter for R&S®AK503 on R&S®KM011	R&S®KM011Z3	4021.7700.02

System overview with description of individual components



Typical azimuth patterns for various elevation angles



R&S®HX002H0 HF DIPOLE WITH ATU

1.6 MHz to 30 MHz

For stationary use and 1 kW transmit power

New

The R&S®HX002H0 HF dipole with ATU permits optimum coverage of all distance ranges. It is particularly useful for radiocommunications over short and medium distances, since below 1000 km vertical rod antennas do not ensure sufficient transmission reliability because of the skip zone.

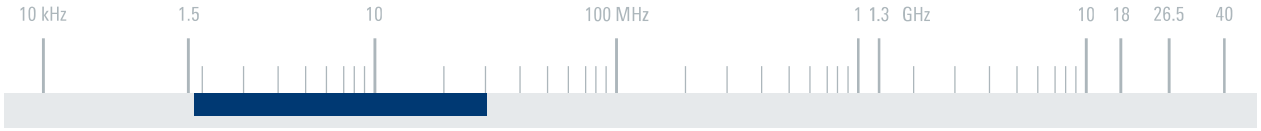
The fully automatic ATU integrated in the antenna provides perfect matching to the transmitting system so that full RF output power capabilities are available. The high efficiency of the antenna is obtained because the matching network is directly located at the feed point of the dipole.

Together with the R&S®GX002, the R&S®HX002H0 can be seamlessly integrated into the R&S®Series4100 and R&S®M3TR radio systems. Furthermore, the R&S®HX002H0 can be controlled by a third-party system controller via LAN interface or it works fully automatically with a third-party transceiver when in autonomous mode.

Lightning protection circuitry is provided in the antenna head, at multiple locations inside the ATU and in the balun section.

Key facts

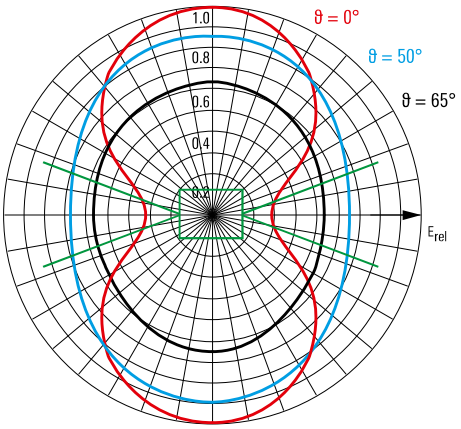
- High RF power at small antenna (1 kW, 5 m radiator radius)
- Omnidirectional coverage with high-angle radiation (NVIS), no skip zone
- Very compact dimensions, setup close to neighboring antennas possible
- High efficiency (no resistive loading)
- RF-cable-only interface
- Single supporting mast
- Cosite robust, fast tuning with low or zero RF power
- Transceiver-independent control interface and power supply (via R&S®GX002)
- Fully automatic operation possible (autonomous mode)



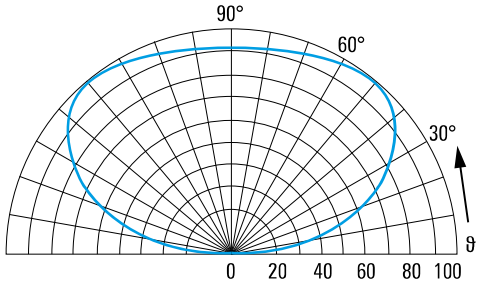
Specifications		
Frequency range		1.6 MHz to 30 MHz
Max. permissible RF input power		1 kW
Input impedance		50 Ω
VSWR	after tuning	≤ 1.8; typ. ≤ 1.3
Tuning time	silent tune/bypass activation	< 35 ms
	active tune	< 25 s; typ. < 8 s
	initial learning of whole frequency range	< 90 min
Tuning power	integrated antenna analyzer	≤ 1 W
Efficiency	at 2 MHz	> 20 %
	f > 5 MHz	> 75 %
Gain	depends on frequency, ground properties and mast height	–3.3 dBi to 7.8 dBi (typ.)
RF interface (with DC supply and control information)	to R&S®GX002	N female
Protection class		IPx6, waterproof, in line with IEC 60529
Max. wind speed	without ice deposit	275 km/h
Dimensions	ATU housing (W × D × H)	approx. 0.5 m × 0.5 m × 1.3 m (19.7 in × 19.7 in × 51.2 in)
	radiator-tip rectangle	approx. 9.6 m × 4.1 m (31.5 ft × 13.5 ft)
Weight		approx. 155 kg (341.7 lb)

Ordering information	Type	Order No.
HF dipole with ATU	R&S®HX002H0	4102.7009.02
Recommended extras		
Junction unit	R&S®GX002	4106.0009.02
Mast, length: 5 m, for roof mounting	R&S®KM002Z0	4115.9005.02
Tilt kit, for R&S®KM002Z0 mast	R&S®KM002Z0-K	4115.9505.02
Lattice mast, length: 10 m	R&S®KM451B1	4028.3351.02
Lattice mast, length: 15 m	R&S®KM451B2	4028.3400.02
Isolating rope set, for R&S®KM451B1/B2	R&S®KM002Z3	4115.9540.02
Legacy mast adapter, for e.g. old R&S®HX002Z1 mast	R&S®KM002Z2	4115.9640.02

Typical horizontal radiation pattern for various elevation angles θ



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



R&S®HX002H1 150 W HF DIPOLE

1.5 MHz to 30 MHz

With integrated antenna tuning unit for stationary applications

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

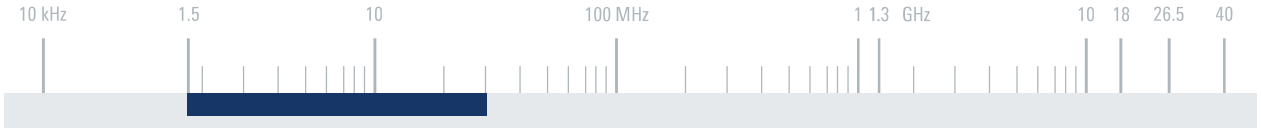
The R&S®HX002H1 can be directly connected to R&S®M3SR Series4100 HF transceivers by means of the R&S®GK4102 fiber-optic control cable.

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

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

Key facts

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

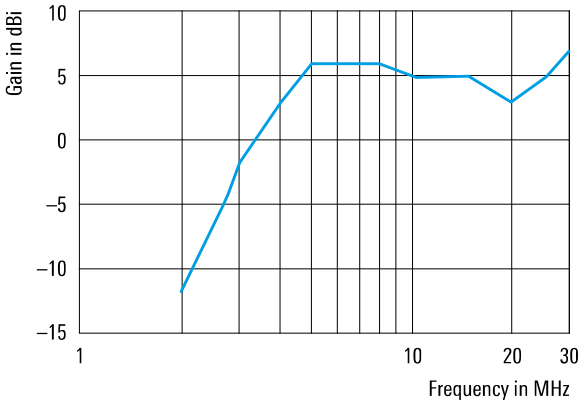


Specifications		
Frequency range		1.5 MHz to 30 MHz
Polarization	mainly vertical	1.5 MHz to 2 MHz
	mainly horizontal	2 MHz to 30 MHz
Input impedance		50 Ω
VSWR		< 1.5; typ. < 1.3
Max. input power		100 W CW/150 W PEP
Tuning time	initial tuning	< 4 s; typ. 1.5 s
	repeated tuning	typ. < 0.2 s
	silent tuning	< 5 ms
Tuning power		30 W ± 1 dB
Connector		N female
Operating temperature range		–30 °C to +55 °C [1]
Protection class		IP66
Max. wind speed (survival)	without ice deposit	250 km/h
	with 20 mm radial ice deposit	130 km/h
Dimensions	W × L	approx. 4.4 m × 10.7 m (14 ft × 35 ft)
Weight		approx. 43 kg (95 lb)

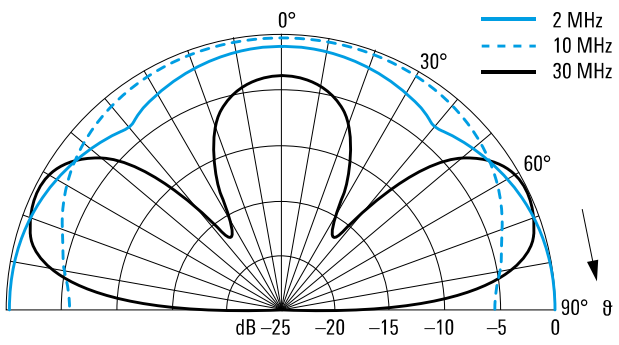
[1] Partial power reduction at > +35 °C.

Ordering information	Type	Order No.
150 W HF dipole	R&S®HX002H1	6120.7000.02
Recommended extras		
Fiber-optic control cable	R&S®GK4102	
10 m		6120.5707.10
25 m		6120.5707.25
50 m		6120.5707.50
Tiltable mast, length: 5 m, for roof mounting	R&S®KM002A1	4035.7359.02
Lattice mast, length: 10 m	R&S®KM451B1	4028.3351.02
Lattice mast, length: 15 m	R&S®KM451B2	4028.3400.02
Isolating rope set, for R&S®KM451B1/B2	R&S®KM002Z3	4115.9540.02
Mast adapter, for R&S®HX002A1/HX002H1 on R&S®KM451B1/B2/B3	R&S®KM451Z5	4039.8308.03

Typical gain on a 5 m mast above perfectly conducting ground



Typical vertical radiation patterns on a 5 m mast above perfectly conducting ground



R&S®HX002H2 150 W HF DIPOLE

1.5 MHz to 30 MHz

With integrated antenna tuning unit optimized for shipboard applications

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

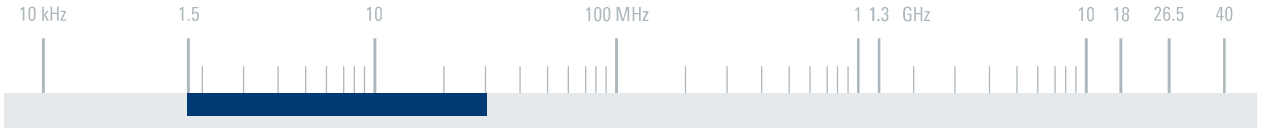
The R&S®HX002H2 can be directly connected to R&S®M3SR Series4100 HF transceivers by means of the R&S®GK4102 fiber-optic control cable.

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

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

Key facts

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

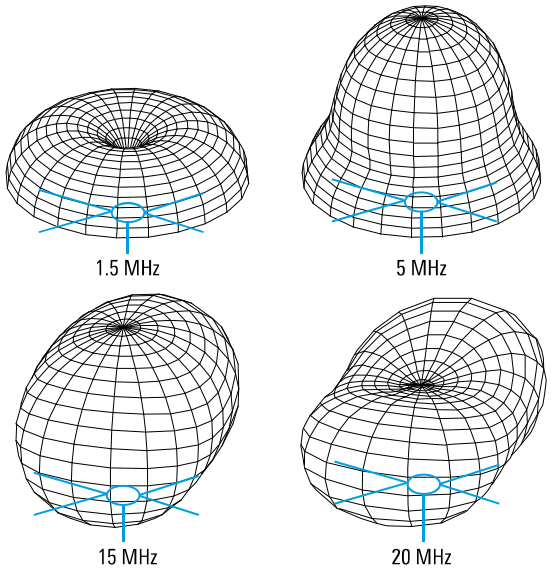


Specifications		
Frequency range		1.5 MHz to 30 MHz
Polarization	mainly vertical	1.5 MHz to 2 MHz
	mainly horizontal	2 MHz to 30 MHz
Input impedance		50 Ω
VSWR		< 1.5; typ. < 1.3
Max. input power		100 W CW/150 W PEP
Tuning time	initial tuning	< 4 s; typ. 1.5 s
	repeated tuning	typ. < 0.2 s
	silent tuning	< 5 ms
Tuning power		30 W ± 1 dB
Connector		N female
Operating temperature range		–30 °C to +55 °C [1]
Protection class		IP66
Max. wind speed (survival)	without ice deposit	250 km/h
	with 20 mm radial ice deposit	140 km/h
Dimensions	W × L	approx. 2.2 m × 5.2 m (7 ft × 17 ft)
Weight		approx. 32 kg (71 lb)

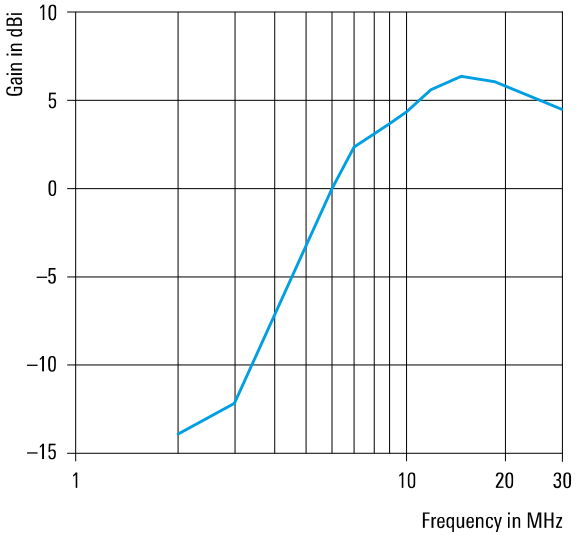
[1] Partial power reduction at > +35 °C.

Ordering information	Type	Order No.
150 W HF dipole	R&S®HX002H2	6120.8006.02
Recommended extra		
Fiber-optic control cable	R&S®GK4102	
10 m		6120.5707.10
25 m		6120.5707.25
50 m		6120.5707.50

Typical three-dimensional radiation patterns above perfectly conducting ground



Typical gain on a 5 m mast above perfectly conducting ground



R&S®HX002H3/ R&S®HX002H3M HF DIPOLE WITH ATU

1.5 MHz to 30 MHz

For stationary use or for shipboard applications

New

The R&S®HX002H3 HF dipole with ATU permits optimum coverage of all distance ranges. It is particularly useful for radiocommunications over short and medium distances, since below 1000 km vertical rod antennas do not ensure sufficient transmission reliability because of the skip zone.

The fully automatic ATU integrated in the antenna provides perfect matching to the transmitting system so that full RF output power capabilities are available. The high efficiency of the antenna is obtained because the matching network is directly located at the feed point of the dipole.

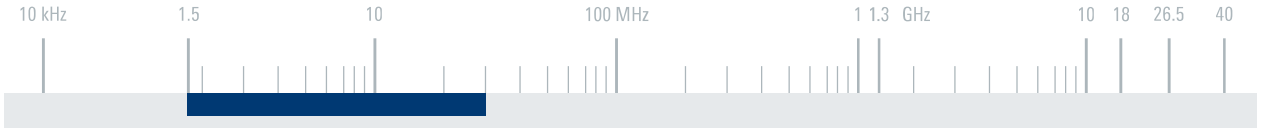
Together with R&S®GX002, the R&S®HX002H3 can be seamlessly integrated into the R&S®Series4100 and R&S®M3TR radio systems. Furthermore, the R&S®HX002H3 can be controlled by a third-party system controller via LAN interface or it works fully automatically with a third-party transceiver when in autonomous mode.

Lightning protection circuitry is provided at multiple locations inside the ATU.

The R&S®HX002H3M is especially optimized for naval applications.

Key facts

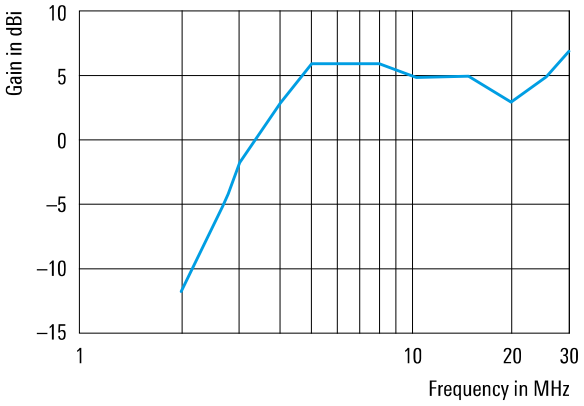
- Suitable for transmitter powers up to 150 W
- Omnidirectional coverage with high-angle radiation (NVIS), no skip zone
- Integrated antenna tuning unit with support of fast frequency hopping in line with R&S®SECOM-H
- High efficiency (no resistive loading)
- Very compact dimensions, setup close to neighboring antennas possible
- RF-cable-only interface
- Single supporting mast
- Cosite robust, fast tuning with low or zero RF power
- Transceiver-independent control interface and power supply (via R&S®GX002)
- Fully automatic operation possible (autonomous mode)



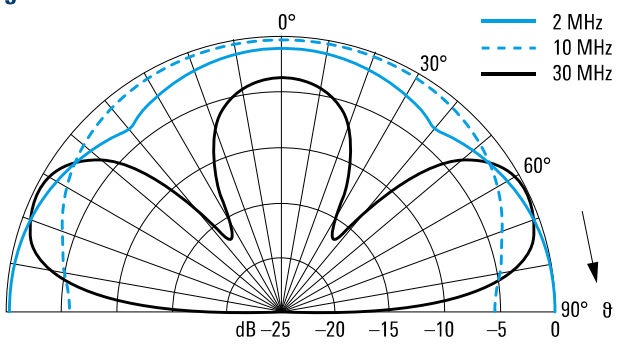
Specifications		
Frequency range		1.5 MHz to 30 MHz
Max. permissible RF input power		100 W CW, 150 W PEP
Input impedance		50 Ω
VSWR	after tuning	≤ 1.8; typ. ≤ 1.3
Tuning time	silent tune/bypass activation	< 5 ms
	active tune	< 5 s
Tuning power	integrated antenna analyzer	≤ 1 W
Gain	depends on frequency, ground properties and mast height	–3.3 dBi to 7.8 dBi (typ.)
RF interface (with DC supply and control information)	to R&S®GX002	N female
Operating temperature range		–40 °C to +65 °C
Protection class		IPx6, waterproof
Max. wind speed	without ice deposit	275 km/h
Dimensions (W × D × H)	R&S®HX002H3	approx. 9.5 m × 4 m × 1.8 m (31.2 ft × 13.1 ft × 5.9 ft)
	R&S®HX002H3M	approx. 4.5 m × 2.5 m × 1.8 m (14.8 ft × 8.2 ft × 5.9 ft)
Weight	R&S®HX002H3	approx. 50 kg (110.2 lb)
	R&S®HX002H3M	approx. 35 kg (77.2 lb)

Ordering information	Type	Order No.
HF dipole with ATU	R&S®HX002H3	4015.6003.02
HF dipole with ATU	R&S®HX002H3M	4015.6003.12
Recommended extras		
Junction unit	R&S®GX002	4106.0009.02
Tiltable mast, length: 5 m, for roof mounting	R&S®KM002A1	4035.7359.02
Lattice mast, length: 10 m	R&S®KM451B1	4028.3351.02
Lattice mast, length: 15 m	R&S®KM451B2	4028.3400.02
Isolating rope set, for R&S®KM451B1/B2	R&S®KM002Z3	4115.9540.02
Mast adapter, for R&S®HX002A1/HX002H1 on R&S®KM451B1/B2/B3	R&S®KM451Z5	4039.8308.03

Typical gain on a 5 m mast above perfectly conducting ground



Typical vertical radiation patterns above perfectly conducting ground



R&S®FK002H0 ANTENNA TUNING UNIT (1 KW)

1.5 MHz to 30 MHz

For stationary, land-mobile and shipboard applications

New

The R&S®FK002H0 is a standalone antenna tuning unit (ATU). It can match the impedance of a radiator to 50 Ω for every frequency from 1.5 MHz and 30 MHz.

The R&S®FK002H0 is powered and controlled by the R&S®GX002 junction unit.

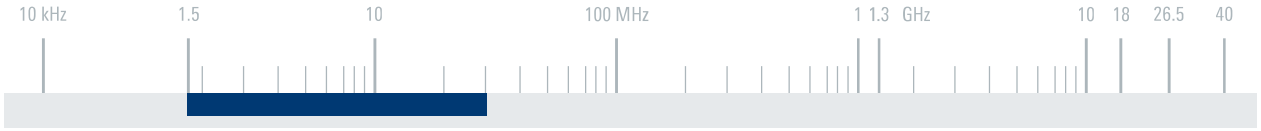
The R&S®FK002H0 can be operated under harsh environmental conditions and continuous 24-hour operation. The rugged, waterproof and dustproof construction of the R&S®FK002H0 allows its use in stationary, land-mobile and shipboard applications.

Together with the R&S®GX002, the R&S®FK002H0 is seamlessly integrable into the R&S®Series4100 radio systems. Furthermore, the R&S®FK002H0 can be controlled by a third-party system controller via LAN interface or it works fully automatically with a third-party transceiver when in autonomous mode.

For cooling, the R&S®FK002H0 is provided with a sophisticated internal air circulation system.

Key facts

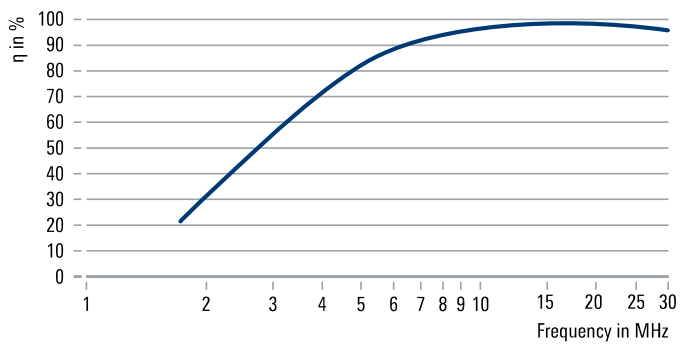
- High RF power at small antennas (1 kW RF power at rod antennas starting at 7 m)
- High efficiency (no resistive loading)
- HF-cable-only interface
- Cosite robust, fast tuning with low RF power (active tune) or zero RF power (silent tune)
- Transceiver-independent control interface and power supply (via R&S®GX002)
- Fully automatic operation possible (autonomous mode)



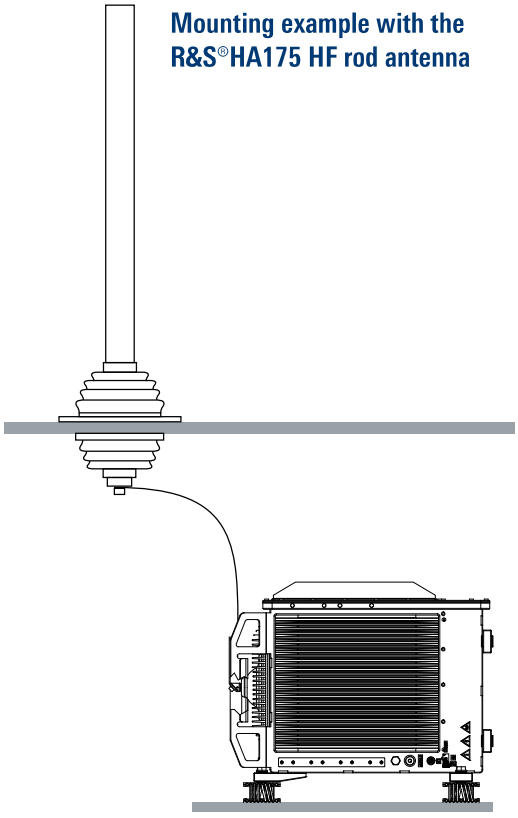
Specifications		
Frequency range		1.5 MHz to 30 MHz
Max. permissible RF input power		1 kW
Input impedance		nom. 50 Ω
Permissible antennas		monopole antennas with radiator length from 7 m to 12 m (e.g. R&S®HA175)
		wire antennas with radiator length from 8 m to 30 m (e.g. R&S®AK503)
VSWR after tuning		≤ 1.8; typ. ≤ 1.3
Tuning time	silent tune/bypass activation	< 35 ms
	active tune	< 25 s; typ. < 8 s
Tuning power	integrated antenna analyzer	≤ 1 W
Efficiency	depends on frequency and connected antenna	20% to 90% (typ.)
Power supply	via R&S®GX002	max. 150 W
Protection class		IPx6, waterproof, in line with IEC 60529
Dimensions	L × W × H	approx. 0.45 m × 0.45 m × 0.58 m (17.7 in × 17.7 in × 22.8 in)
Weight		approx. 54.5 kg (120.2 lb)

Ordering information	Type	Order No.
Antenna tuning unit (1 kW)	R&S®FK002H0	4105.8006.02
Recommended extras		
Junction unit	R&S®GX002	4106.0009.02
HF rod antenna	R&S®HA175	0101.1101.02

Typical efficiency for rod antenna at height of 7 m to 10 m



Mounting example with the R&S®HA175 HF rod antenna



R&S®HL451 LOG-PERIODIC HF ANTENNA

2 MHz to 30 MHz

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

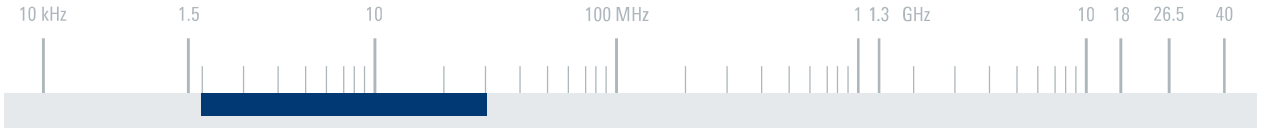
The compact, rotatable R&S®HL451 log-periodic HF antenna can be used for transmission and reception of horizontally polarized waves.

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

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

Key facts

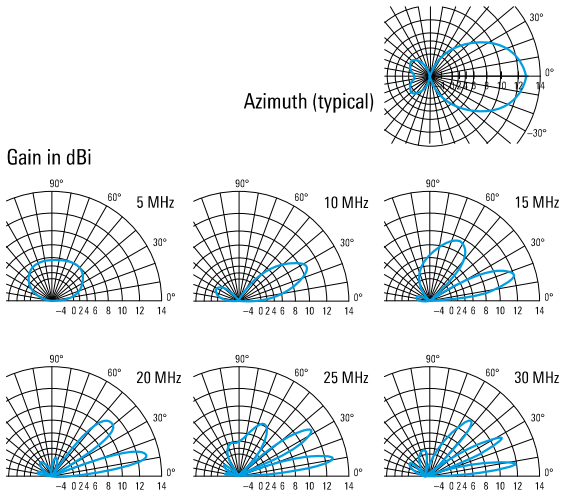
- Reception from 2 MHz
- Transmission from 5 MHz
- Unshortened half-wave elements for high gain despite extremely small size
- Easy and quick assembly
- Low maintenance
- Suitable for roof mounting



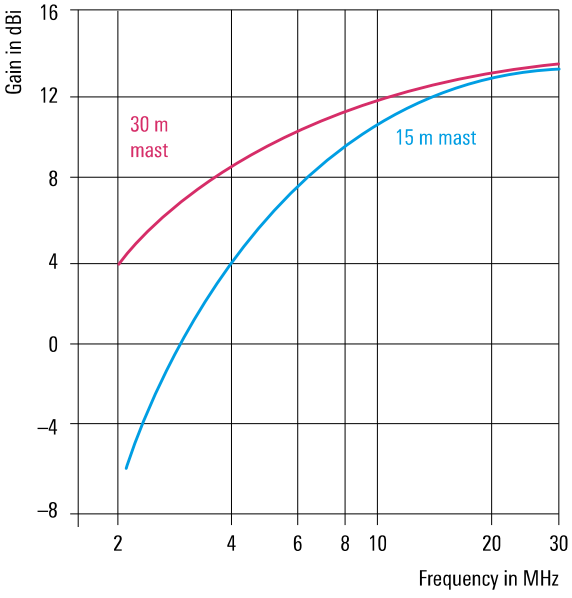
Specifications		
Frequency range		
Reception		2 MHz to 30 MHz
Transmission		5 MHz to 30 MHz
Polarization		linear/horizontal
Input impedance		50 Ω
VSWR	5 MHz to 30 MHz	≤ 2
Max. input power		1 kW CW/2 kW PEP
Gain (on 15 m mast)	5 MHz to 30 MHz	6 dBi to 12.5 dBi
Max. wind speed	without ice deposit	180 km/h
Connector		N female
MTBF		> 100 000 h
Operating temperature range		–30 °C to +50 °C
Dimensions of antenna array	W × L	approx. 16 m × 15 m (53 ft × 49 ft)
Weight of antenna array		approx. 260 kg (573 lb)

Ordering information	Type	Order No.
Log-periodic HF antenna	R&S®HL451	0733.8507.02
Recommended extras		
Lattice mast, length: 15 m (standard)	R&S®KM451B2	4028.3400.02
Lattice mast, length: 10 m (for roof mounting)	R&S®KM451B1	4028.3351.02
Hazard light	R&S®KM451F1	4028.3500.02
Antenna rotator	R&S®RD130	4059.8503.02
Rotary joint/adaption set	R&S®RD008Z1	0720.6400.02
Control unit	R&S®GB130	4059.8755.02
Set of cables (connecting R&S®GB130 to R&S®RD130, lengths: 50/80/120/200 m)	R&S®GK130	4059.8855.0x (x = 2/3/4/5)
Other configurations on request.		

Typical radiation patterns on a 15 m mast



Typical gain



R&S®HL471 LOG-PERIODIC HF ANTENNA

5 MHz to 30 MHz

Transmission and reception of horizontally polarized waves over long distances

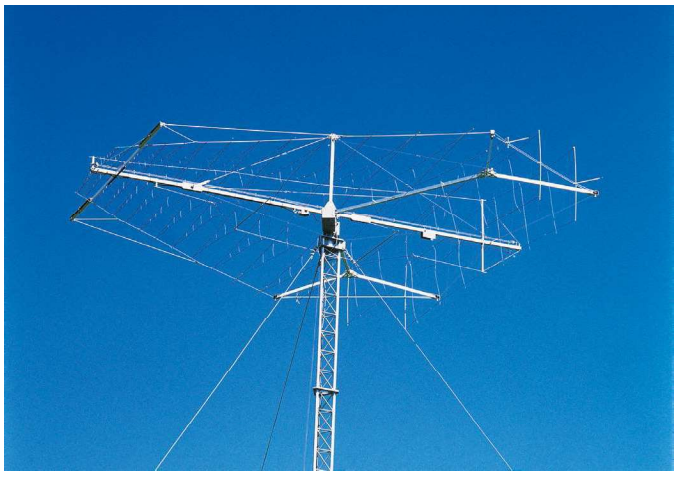
The compact, rotatable R&S®HL471 log-periodic HF antenna can be used for transmission and reception of horizontally polarized waves.

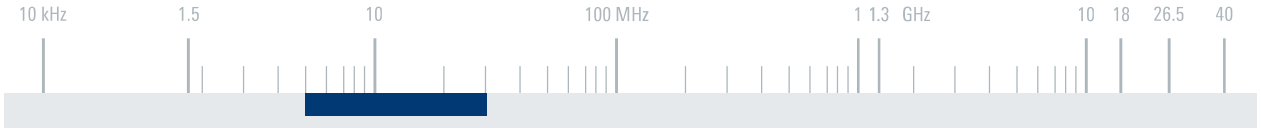
The antenna's transmission frequency range from 7 MHz to 30 MHz makes it particularly suitable for communications over long distances. Reception is possible from 5 MHz so that all distances can be covered.

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

Key facts

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

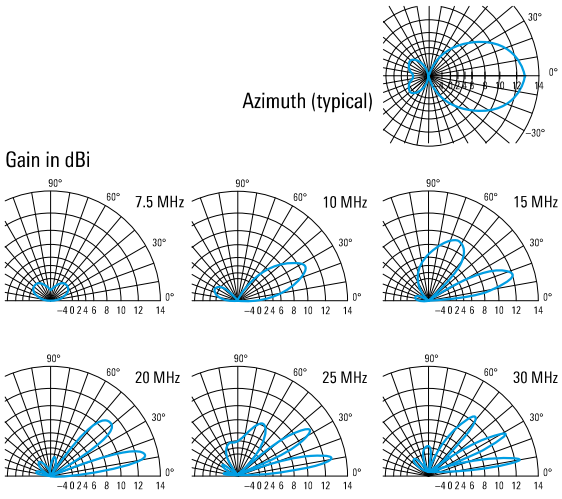




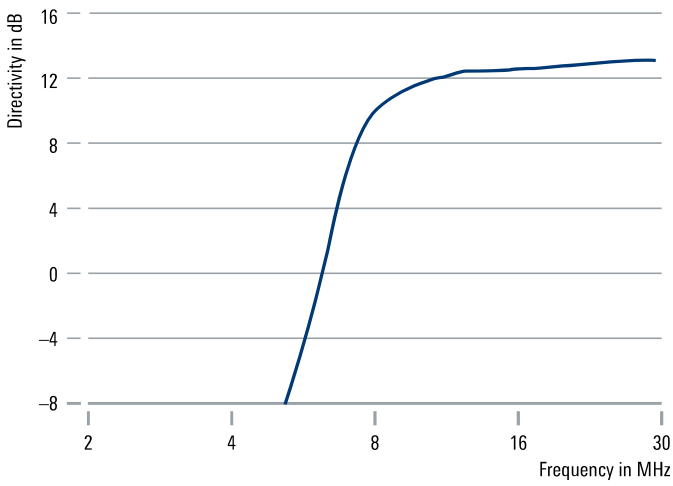
Specifications		
Frequency range	reception	5 MHz to 30 MHz
	transmission	7 MHz to 30 MHz
Polarization		linear/horizontal
Input impedance		50 Ω
VSWR	7 MHz to 30 MHz	≤ 2
Max. input power		1 kW CW/2 kW PEP
Gain (on 15 m mast)	7 MHz to 8 MHz	0 dBi to 6 dBi
	8 MHz to 30 MHz	6 dBi to 12.5 dBi
Max. wind speed	without ice deposit	180 km/h
Connector		N female
MTBF		> 100 000 h
Operating temperature range		–30 °C to +50 °C
Dimensions of antenna array	W × L	approx. 11 m × 8.8 m (36 ft × 29 ft)
Weight of antenna array		approx. 100 kg (221 lb)

Ordering information	Type	Order No.
Log-periodic HF antenna	R&S®HL471	0755.3008.02
Recommended extras		
Lattice mast, length: 15 m (standard)	R&S®KM451B2	4028.3400.02
Lattice mast, length: 10 m (for roof mounting)	R&S®KM451B1	4028.3351.02
Hazard light	R&S®KM451F1	4028.3500.02
Antenna rotator	R&S®RD130	4059.8503.02
Rotary joint/adaption set	R&S®RD008Z1	0720.6400.02
Control unit	R&S®GB130	4059.8755.02
Set of cables (connecting R&S®GB130 to R&S®RD130, lengths: 50/80/120/200 m)	R&S®GK130	4059.8855.0x (x = 2/3/4/5)
Other configurations on request.		

Typical radiation patterns on a 15 m mast



Typical directivity on a 15 m mast



R&S®HL210A3 LOG-PERIODIC HF ANTENNA

1.5 MHz to 30 MHz

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

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

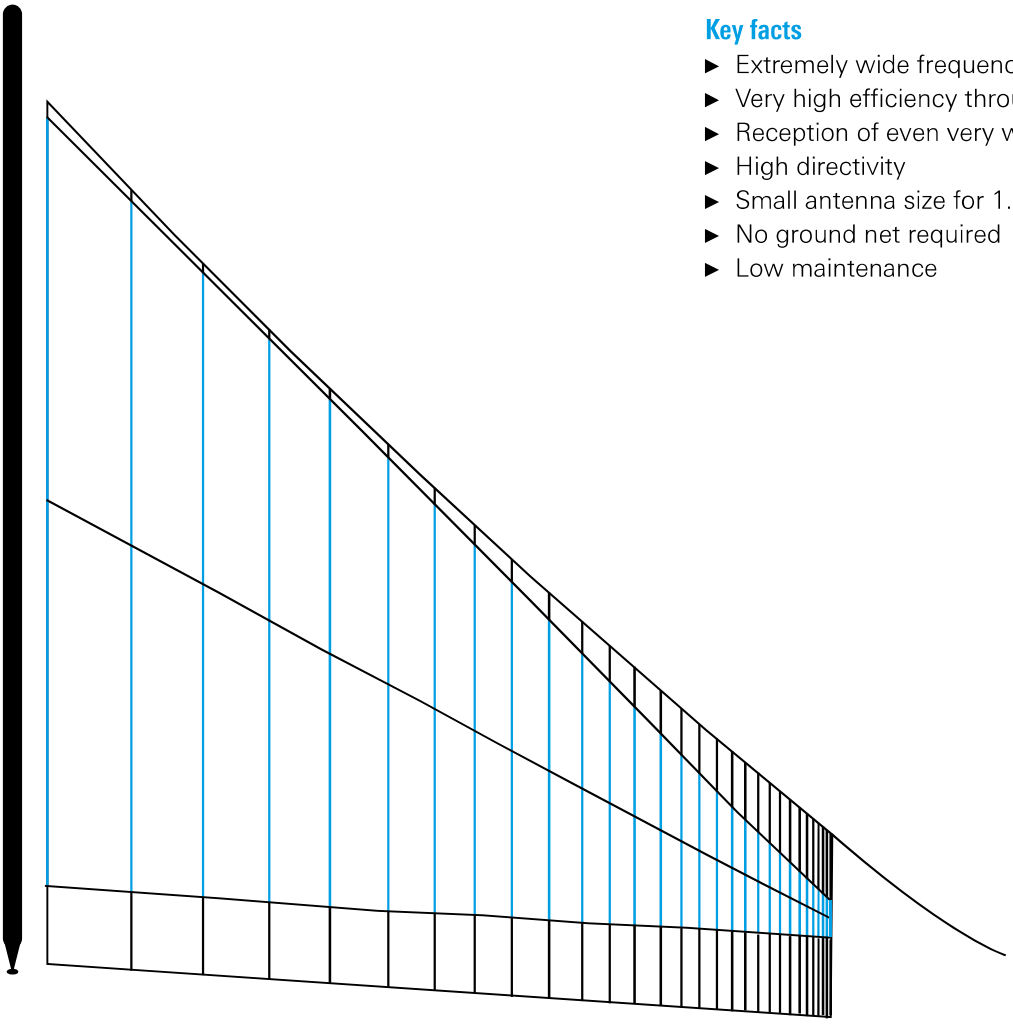
According to the physical characteristics of vertically polarized waves, maximum sensitivity is obtained at low and medium elevation angles. The radiation pattern of the R&S®HL210A3 is optimally suited for this purpose. The azimuth range of the R&S®HL210A3 of about 120° can be enhanced up to 360° by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

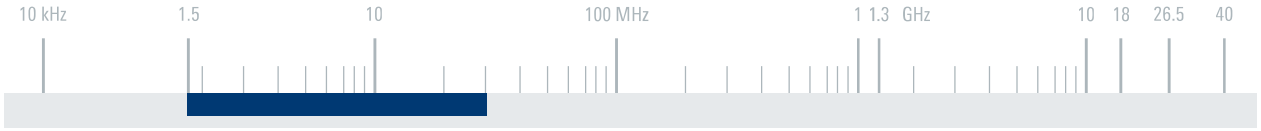
The antenna can be adapted to customer requirements regarding frequency range, environmental data and size.

For additional reception of horizontally polarized waves and high-angle radiation (predominantly horizontally polarized), the antenna can be combined with the R&S®HL410A3 log-periodic HF antenna.

Key facts

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

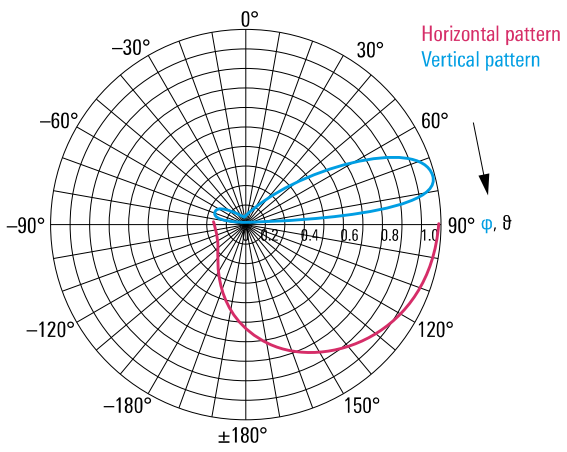




Specifications (exemplary data only)		
Frequency range		1.5 MHz to 30 MHz
Polarization		linear/vertical
Input impedance		50 Ω
VSWR	1.5 MHz to 2 MHz	< 6
	2 MHz to 30 MHz	< 2.5; typ. < 2.0
Directivity	1.5 MHz to 2 MHz	8 dBi to 10.5 dBi
	2 MHz to 30 MHz	10.5 dBi to 12 dBi
Efficiency		> 90 %
Connector		N female
MTBF		≥ 100 000 h
Operating temperature range		–40 °C to +70 °C
Max. wind speed	survival	225 km/h
	with ice deposit	135 km/h
	operational	130 km/h
Permissible ice deposit	20 mm radial	on wires with diameter > 7 mm
	2 × diameter	on wires with diameter < 7 mm
Dimensions	length of antenna array	approx. 97 m (318 ft)
	height of supporting mast	approx. 90 m (295 ft)

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

Typical vertical and horizontal radiation patterns (only half of the horizontal radiation pattern displayed)



Typical horizontal reception characteristic of a system with three R&S®HL210A3